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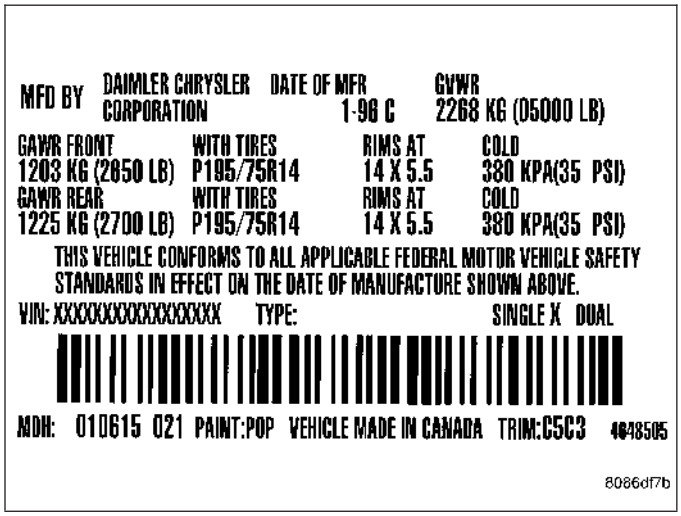
VEHICLE CERTIFICATION LABEL

DESCRIPTION

A vehicle certification label is attached to every DaimlerChrysler Corporation vehicle. The label certifies that the vehicle conforms to all applicable Federal Motor Vehicle Standards. The label also lists:

- Month and year of vehicle manufacture.
- Gross Vehicle Weight Rating (GVWR). The gross front and rear axle weight ratings (GAWR's) are based on a minimum rim size and maximum cold tire inflation pressure.
- Vehicle Identification Number (VIN).
- Type of vehicle.
- Type of rear wheels.
- Bar code.
- Month, Day and Hour (MDH) of final assembly.
- Paint and Trim codes.
- Country of origin.

The label is located on the driver-side door shut-face.

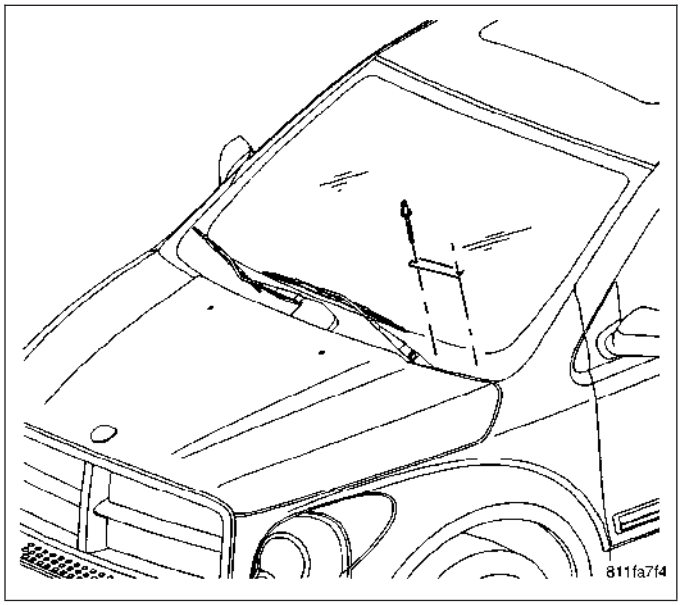


VEHICLE IDENTIFICATION NUMBER

DESCRIPTION

The Vehicle Identification Number (VIN) plate is attached to the top left side of the instrument panel. The VIN contains 17 characters that provide data concerning the vehicle. Refer to the decoding chart to determine the identification of a vehicle.

To protect the consumer from theft and possible fraud the manufacturer is required to include a Check Digit at the ninth position of the Vehicle Identification Number. The check digit is used by the manufacturer and government agencies to verify the authenticity of the vehicle and official documentation. The formula to use the check digit is not released to the general public.



VIN DECODING INFORMATION

POSITION	INTERPRETATION	CODE = DESCRIPTION
1	Country of Origin	1 = Manufactured by DaimlerChrysler Corporation
2	Make	D = Dodge
3	Vehicle Type	4 = Multipurpose Passenger Vehicle less Side Airbags 8 = Multipurpose Passenger Vehicle with Side Airbags
4	Gross Vehicle Weight Rating	H = 6001-7000 lbs.
5	Vehicle Line	D = Durango 4x2 B = Durango 4x4
6	Series	3 = Durango ST 4 = Durango SLT 5 = Durango LIMITED
7	Body Style	8 = Sport Utility 4 Door
8	Engine	K = 3.7L 6 cyl. MPI Gasoline N = 4.7L 8 cyl. MPI Gasoline D = 5.7L 8 cyl. SMPI Gasoline
9	Check Digit	0 through 9 or X
10	Model Year	5 = 2005
11	Assembly Plant	F = Newark Assembly
12 Thru 17	Vehicle Build Sequence	

VEHICLE EMISSION CONTROL INFORMATION (VECI) LABEL

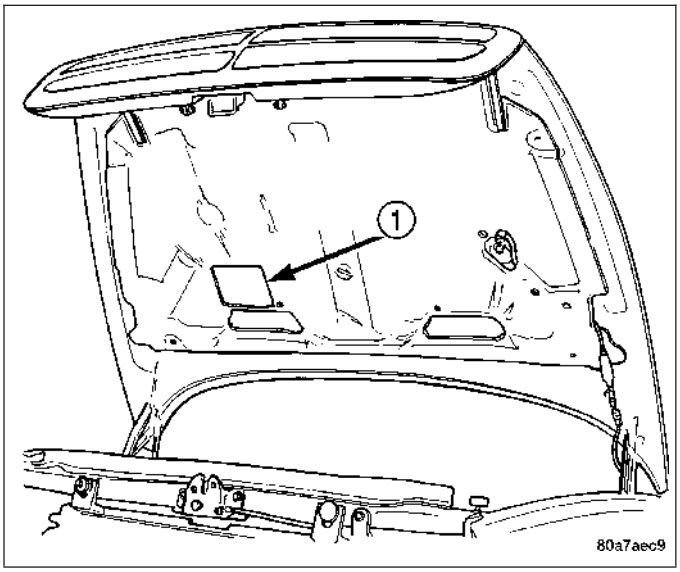
DESCRIPTION

All vehicles are equipped with a combined VECI label. This label is located in the engine compartment.

The VECI label contains the following:

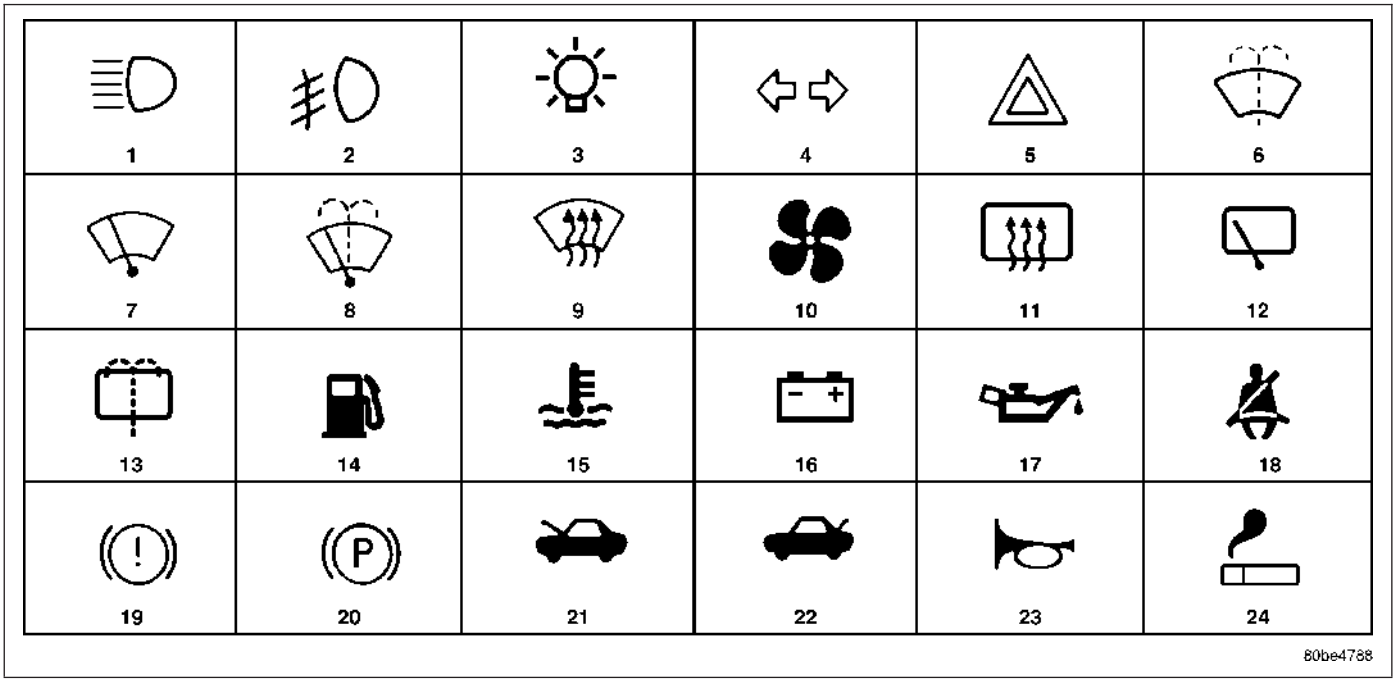
- Engine family and displacement
- Evaporative family
- Emission control system schematic
- Certification application
- Engine timing specifications (if adjustable)
- Idle speeds (if adjustable)
- Spark plug and gap

The label also contains an engine vacuum schematic. There are unique labels for vehicles built for sale in the state of California and the country of Canada. Canadian labels are written in both the English and French languages. These labels are permanently attached and cannot be removed without defacing information and destroying label.



INTERNATIONAL SYMBOLS

DESCRIPTION



The graphic symbols illustrated in the following International Control and Display Symbols Chart are used to identify various instrument controls. The symbols correspond to the controls and displays that are located on the instrument panel.

FASTENER IDENTIFICATION

DESCRIPTION

The SAE bolt strength grades range from grade 2 to grade 8. The higher the grade number, the greater the bolt strength. Identification is determined by the line marks on the top of each bolt head. The actual bolt strength grade corresponds to the number of line marks plus 2. The most commonly used metric bolt strength classes are 9.8 and 10.9. The metric strength class identification number is imprinted on the head of the bolt. The higher the class number, the greater the bolt strength. Some metric nuts are imprinted with a single-digit strength class on the nut face. Refer to the Fastener Identification and Fastener Strength Charts.

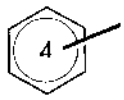
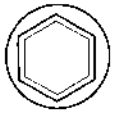
Bolt Markings and Torques - Metric

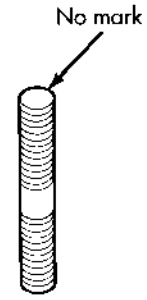
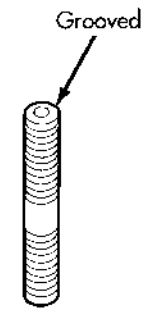
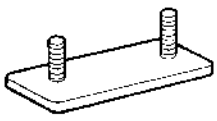
Bolt Markings	8.8/8.9		10.9		12.9	
Bolt Dia.	N·m	Ft. Lbs.	N·m	Ft. Lbs.	N·m	Ft. Lbs.
6	12	105*	14	120*	16	12
8	25	250*	32	23	38	28
10	54	40	60	45	74	55
12	95	70	108	80	135	100
14	155	115	175	130	216	160
16	243	180	324	210	324	240
* Inch Lbs.						

Bolt Markings and Torques - U. S. Customary

Bolt Markings	Grade 5		Grade 8	
Bolt Dia.	N·m	Ft. Lbs	N·m	Ft. Lbs
1/4 - 20	10	95*	14	125*
1/4 - 28	10	95*	17	150*
5/16 - 18	22	200*	30	270*
5/16 - 24	26	240*	33	300*
3/8 - 16	40	30	55	40
3/8 - 24	47	35	60	45
7/16 - 14	68	50	88	65
7/16 - 20	74	55	95	70
1/2 - 13	101	75	135	100
1/2 -20	115	85	150	110
9/16 - 12	135	105	182	135
9/16 - 18	155	115	202	150
5/8 - 11	202	150	263	195
5/8 - 18	215	160	284	210
3/4 - 10	230	170	297	220
3/4 - 16	236	175	304	225
7/8 - 14	405	300	540	400
* Inch Lbs.				

HOW TO DETERMINE BOLT STRENGTH

	Mark	Class
Hexagon head bolt	 Bolt head No. 4 — 4T; 5 — 5T; 6 — 6T; 7 — 7T; 8 — 8T; 9 — 9T; 10 — 10T; 11 — 11T	
	No mark	4T
Hexagon flange bolt w/washer hexagon bolt	 No mark	4T
Hexagon head bolt	Two protruding lines	5T
Hexagon flange bolt w/washer hexagon bolt	Two protruding lines	6T
Hexagon head bolt	Three protruding lines	7T
Hexagon head bolt	Four protruding lines	8T

	Mark	Class
Stud bolt		4T
		6T
Welded bolt		4T

95IN-4

FASTENER USAGE

DESCRIPTION

FASTENER USAGE

WARNING: Use of an incorrect fastener may result in component damage or personal injury.

Fasteners and torque specifications references in this Service Manual are identified in metric and SAE format.

During any maintenance or repair procedures, it is important to salvage all fasteners (nuts, bolts, etc.) for reassembly. If the fastener is not salvageable, a fastener of equivalent specification must be used.

THREADED HOLE REPAIR

Most stripped threaded holes can be repaired using a Helicoil®. Follow the vehicle or Helicoil® recommendations for application and repair procedures.

METRIC SYSTEM

DESCRIPTION

in-lbs to N•m

in-lb	N•m	in-lb	N•m	in-lb	N•m	in-lb	N•m	in-lb	N•m
2	.2260	42	4.7453	82	9.2646	122	13.7839	162	18.3032
4	.4519	44	4.9713	84	9.4906	124	14.0099	164	18.5292
6	.6779	46	5.1972	86	9.7165	126	14.2359	166	18.7552
8	.9039	48	5.4232	88	9.9425	128	14.4618	168	18.9811
10	1.1298	50	5.6492	90	10.1685	130	14.6878	170	19.2071
12	1.3558	52	5.8751	92	10.3944	132	14.9138	172	19.4331
14	1.5818	54	6.1011	94	10.6204	134	15.1397	174	19.6590
16	1.8077	56	6.3270	96	10.8464	136	15.3657	176	19.8850
18	2.0337	58	6.5530	98	11.0723	138	15.5917	178	20.1110
20	2.2597	60	6.7790	100	11.2983	140	15.8176	180	20.3369
22	2.4856	62	7.0049	102	11.5243	142	16.0436	182	20.5629
24	2.7116	64	7.2309	104	11.7502	144	16.2696	184	20.7889
26	2.9376	66	7.4569	106	11.9762	146	16.4955	186	21.0148
28	3.1635	68	7.6828	108	12.2022	148	16.7215	188	21.2408
30	3.3895	70	7.9088	110	12.4281	150	16.9475	190	21.4668
32	3.6155	72	8.1348	112	12.6541	152	17.1734	192	21.6927
34	3.8414	74	8.3607	114	12.8801	154	17.3994	194	21.9187
36	4.0674	76	8.5867	116	13.1060	156	17.6253	196	22.1447
38	4.2934	78	8.8127	118	13.3320	158	17.8513	198	22.3706
40	4.5193	80	9.0386	120	13.5580	160	18.0773	200	22.5966

N•m to in-lbs

N•m	in-lb	N•m	in-lb	N•m	in-lb	N•m	in-lb	N•m	in-lb
.2	1.7702	4.2	37.1747	8.2	72.5792	12.2	107.9837	16.2	143.3882
.4	3.5404	4.4	38.9449	8.4	74.3494	12.4	109.7539	16.4	145.1584
.6	5.3107	4.6	40.7152	8.6	76.1197	12.6	111.5242	16.6	146.9287
.8	7.0809	4.8	42.4854	8.8	77.8899	12.8	113.2944	16.8	148.6989
1	8.8511	5	44.2556	9	79.6601	13	115.0646	17	150.4691
1.2	10.6213	5.2	46.0258	9.2	81.4303	13.2	116.8348	17.2	152.2393
1.4	12.3916	5.4	47.7961	9.4	83.2006	13.4	118.6051	17.4	154.0096
1.6	14.1618	5.6	49.5663	9.6	84.9708	13.6	120.3753	17.6	155.7798
1.8	15.9320	5.8	51.3365	9.8	86.7410	13.8	122.1455	17.8	157.5500
2	17.7022	6	53.1067	10	88.5112	14	123.9157	18	159.3202
2.2	19.4725	6.2	54.8770	10.2	90.2815	14.2	125.6860	18.5	163.7458
2.4	21.2427	6.4	56.6472	10.4	92.0517	14.4	127.4562	19	168.1714
2.6	23.0129	6.6	58.4174	10.6	93.8219	14.6	129.2264	19.5	172.5970
2.8	24.7831	6.8	60.1876	10.8	95.5921	14.8	130.9966	20	177.0225
3	26.5534	7	61.9579	11	97.3624	15	132.7669	20.5	181.4480
3.2	28.3236	7.2	63.7281	11.2	99.1326	15.2	134.5371	21	185.8736
3.4	30.0938	7.4	65.4983	11.4	100.9028	15.4	136.3073	22	194.7247
3.6	31.8640	7.6	67.2685	11.6	102.6730	15.6	138.0775	23	203.5759
3.8	33.6342	7.8	69.0388	11.8	104.4433	15.8	139.8478	24	212.4270
4	35.4045	8	70.8090	12	106.2135	16	141.6180	25	221.2781

ft-lbs to N•m

ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m
1	1.3558	21	28.4722	41	55.5885	61	82.7049	81	109.8212
2	2.7116	22	29.8280	42	56.9444	62	84.0607	82	111.1770
3	4.0675	23	31.1838	43	58.3002	63	85.4165	83	112.5328
4	5.4233	24	32.5396	44	59.6560	64	86.7723	84	113.8888
5	6.7791	25	33.8954	45	61.0118	65	88.1281	85	115.2446
6	8.1349	26	35.2513	46	62.3676	66	89.4840	86	116.6004
7	9.4907	27	36.6071	47	63.7234	67	90.8398	87	117.9562
8	10.8465	28	37.9629	48	65.0793	68	92.1956	88	119.3120
9	12.2024	29	39.3187	49	66.4351	69	93.5514	89	120.6678
10	13.5582	30	40.6745	50	67.7909	70	94.9073	90	122.0236
11	14.9140	31	42.0304	51	69.1467	71	96.2631	91	123.3794
12	16.2698	32	43.3862	52	70.5025	72	97.6189	92	124.7352
13	17.6256	33	44.7420	53	71.8583	73	98.9747	93	126.0910
14	18.9815	34	46.0978	54	73.2142	74	100.3316	94	127.4468
15	20.3373	35	47.4536	55	74.5700	75	101.6862	95	128.8026
16	21.6931	36	48.8094	56	75.9258	76	103.0422	96	130.1586
17	23.0489	37	50.1653	57	77.2816	77	104.3980	97	131.5144
18	24.4047	38	51.5211	58	78.6374	78	105.7538	98	132.8702
19	25.7605	39	52.8769	59	79.9933	79	107.1196	99	134.2260
20	27.1164	40	54.2327	60	81.3491	80	108.4654	100	135.5820

N•m to ft-lbs

N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb
1	.7376	21	15.9888	41	30.2400	61	44.9913	81	59.7425
2	1.4751	22	16.2264	42	30.9776	62	45.7289	82	60.4801
3	2.2127	23	16.9639	43	31.7152	63	46.4664	83	61.2177
4	2.9502	24	17.7015	44	32.4527	64	47.2040	84	61.9552
5	3.6878	25	18.4391	45	33.1903	65	47.9415	85	62.6928
6	4.4254	26	19.1766	46	33.9279	66	48.6791	86	63.4303
7	5.1629	27	19.9142	47	34.6654	67	49.4167	87	64.1679
8	5.9005	28	20.6517	48	35.4030	68	50.1542	88	64.9545
9	6.6381	29	21.3893	49	36.1405	69	50.8918	89	65.6430
10	7.3756	30	22.1269	50	36.8781	70	51.6293	90	66.3806
11	8.1132	31	22.8644	51	37.6157	71	52.3669	91	67.1181
12	8.8507	32	23.6020	52	38.3532	72	53.1045	92	67.8557
13	9.5883	33	24.3395	53	39.0908	73	53.8420	93	68.5933
14	10.3259	34	25.0771	54	39.8284	74	54.5720	94	69.3308
15	11.0634	35	25.8147	55	40.5659	75	55.3172	95	70.0684
16	11.8010	36	26.5522	56	41.3035	76	56.0547	96	70.8060
17	12.5386	37	27.2898	57	42.0410	77	56.7923	97	71.5435
18	13.2761	38	28.0274	58	42.7786	78	57.5298	98	72.2811
19	14.0137	39	28.7649	59	43.5162	79	58.2674	99	73.0187
20	14.7512	40	29.5025	60	44.2537	80	59.0050	100	73.7562

in. to mm

in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
.01	.254	.21	5.334	.41	10.414	.61	15.494	.81	20.574
.02	.508	.22	5.588	.42	10.668	.62	15.748	.82	20.828
.03	.762	.23	5.842	.43	10.922	.63	16.002	.83	21.082
.04	1.016	.24	6.096	.44	11.176	.64	16.256	.84	21.336
.05	1.270	.25	6.350	.45	11.430	.65	16.510	.85	21.590
.06	1.524	.26	6.604	.46	11.684	.66	16.764	.86	21.844
.07	1.778	.27	6.858	.47	11.938	.67	17.018	.87	22.098
.08	2.032	.28	7.112	.48	12.192	.68	17.272	.88	22.352
.09	2.286	.29	7.366	.49	12.446	.69	17.526	.89	22.606
.10	2.540	.30	7.620	.50	12.700	.70	17.780	.90	22.860
.11	2.794	.31	7.874	.51	12.954	.71	18.034	.91	23.114
.12	3.048	.32	8.128	.52	13.208	.72	18.288	.92	23.368
.13	3.302	.33	8.382	.53	13.462	.73	18.542	.93	23.622
.14	3.556	.34	8.636	.54	13.716	.74	18.796	.94	23.876
.15	3.810	.35	8.890	.55	13.970	.75	19.050	.95	24.130
.16	4.064	.36	9.144	.56	14.224	.76	19.304	.96	24.384
.17	4.318	.37	9.398	.57	14.478	.77	19.558	.97	24.638
.18	4.572	.38	9.652	.58	14.732	.78	19.812	.98	24.892
.19	4.826	.39	9.906	.59	14.986	.79	20.066	.99	25.146
.20	5.080	.40	10.160	.60	15.240	.80	20.320	1.00	25.400

mm to in.

mm	in.	mm	in.	mm	in.	mm	in.	mm	in.
.01	.00039	.21	.00827	.41	.01614	.61	.02402	.81	.03189
.02	.00079	.22	.00866	.42	.01654	.62	.02441	.82	.03228
.03	.00118	.23	.00906	.43	.01693	.63	.02480	.83	.03268
.04	.00157	.24	.00945	.44	.01732	.64	.02520	.84	.03307
.05	.00197	.25	.00984	.45	.01772	.65	.02559	.85	.03346
.06	.00236	.26	.01024	.46	.01811	.66	.02598	.86	.03386
.07	.00276	.27	.01063	.47	.01850	.67	.02638	.87	.03425
.08	.00315	.28	.01102	.48	.01890	.68	.02677	.88	.03465
.09	.00354	.29	.01142	.49	.01929	.69	.02717	.89	.03504
.10	.00394	.30	.01181	.50	.01969	.70	.02756	.90	.03543
.11	.00433	.31	.01220	.51	.02008	.71	.02795	.91	.03583
.12	.00472	.32	.01260	.52	.02047	.72	.02835	.92	.03622
.13	.00512	.33	.01299	.53	.02087	.73	.02874	.93	.03661
.14	.00551	.34	.01339	.54	.02126	.74	.02913	.94	.03701
.15	.00591	.35	.01378	.55	.02165	.75	.02953	.95	.03740
.16	.00630	.36	.01417	.56	.02205	.76	.02992	.96	.03780
.17	.00669	.37	.01457	.57	.02244	.77	.03032	.97	.03819
.18	.00709	.38	.01496	.58	.02283	.78	.03071	.98	.03858
.19	.00748	.39	.01535	.59	.02323	.79	.03110	.99	.03898
.20	.00787	.40	.01575	.60	.02362	.80	.03150	1.00	.03937

J901N-10

The metric system is based on quantities of one, ten, one hundred, one thousand and one million.
The following chart will assist in converting metric units to equivalent English and SAE units, or vise versa.

CONVERSION FORMULAS AND EQUIVALENT VALUES

MULTIPLY	BY	TO GET	MULTIPLY	BY	TO GET
in-lbs	x 0.11298	= Newton Meters (N·m)	N·m	x 8.851	= in-lbs
ft-lbs	x 1.3558	= Newton Meters (N·m)	N·m	x 0.7376	= ft-lbs
Inches Hg (60° F)	x 3.377	= Kilopascals (kPa)	kPa	x 0.2961	= Inches Hg
psi	x 6.895	= Kilopascals (kPa)	kPa	x 0.145	= psi
Inches	x 25.4	= Millimeters (mm)	mm	x 0.03937	= Inches
Feet	x 0.3048	= Meters (M)	M	x 3.281	= Feet
Yards	x 0.9144	= Meters	M	x 1.0936	= Yards
mph	x 1.6093	= Kilometers/Hr. (Km/h)	Km/h	x 0.6214	= mph
Feet/Sec	x 0.3048	= Meters/Sec (M/S)	M/S	x 3.281	= Feet/Sec
mph	x 0.4470	= Meters/Sec (M/S)	M/S	x 2.237	= mph
Kilometers/Hr. (Km/h)	x 0.27778	= Meters/Sec (M/S)	M/S	x 3.600	Kilometers/Hr. (Km/h)

COMMON METRIC EQUIVALENTS

1 inch = 25 Millimeters	1 Cubic Inch = 16 Cubic Centimeters
1 Foot = 0.3 Meter	1 Cubic Foot = 0.03 Cubic Meter
1 Yard = 0.9 Meter	1 Cubic Yard = 0.8 Cubic Meter
1 Mile = 1.6 Kilometers	

Refer to the Metric Conversion Chart to convert torque values listed in metric Newton- meters (N·m). Also, use the chart to convert between millimeters (mm) and inches (in.).

TORQUE REFERENCES

DESCRIPTION

SPECIFIED TORQUE FOR STANDARD BOLTS

Class	Diameter mm	Pitch mm	Specified torque					
			Hexagon head bolt			Hexagon flange bolt		
			N•m	kgf-cm	ft-lbf	N•m	kgf-cm	ft-lbf
4T	6	1	5	55	48 in.-lbf	6	60	52 in.-lbf
	8	1.25	12.5	130	9	14	145	10
	10	1.25	26	260	19	29	290	21
	12	1.25	47	480	35	53	540	39
	14	1.5	74	760	55	84	850	61
	16	1.5	115	1,150	83	—	—	—
5T	6	1	6.5	65	56 in.-lbf	7.5	75	65 in.-lbf
	8	1.25	15.5	160	12	17.5	175	13
	10	1.25	32	330	24	36	360	26
	12	1.25	59	600	43	65	670	48
	14	1.5	91	930	67	100	1,050	76
	16	1.5	140	1,400	101	—	—	—
6T	6	1	8	80	69 in.-lbf	9	90	78 in.-lbf
	8	1.25	19	195	14	21	210	15
	10	1.25	39	400	29	44	440	32
	12	1.25	71	730	53	80	810	59
	14	1.5	110	1,100	80	125	1,250	90
	16	1.5	170	1,750	127	—	—	—
7T	6	1	10.5	110	8	12	120	9
	8	1.25	25	260	19	28	290	21
	10	1.25	52	530	38	58	590	43
	12	1.25	95	970	70	105	1,050	76
	14	1.5	145	1,500	108	165	1,700	123
	16	1.5	230	2,300	166	—	—	—
8T	8	1.25	29	300	22	33	330	24
	10	1.25	61	620	45	68	690	50
	12	1.25	110	1,100	80	120	1,250	90
9T	8	1.25	34	340	25	37	380	27
	10	1.25	70	710	51	78	790	57
	12	1.25	125	1,300	94	140	1,450	105
10T	8	1.25	38	390	28	42	430	31
	10	1.25	78	800	58	88	890	64
	12	1.25	140	1,450	105	155	1,600	116
11T	8	1.25	42	430	31	47	480	35
	10	1.25	87	890	64	97	990	72
	12	1.25	155	1,600	116	175	1,800	130

Individual Torque Charts appear within many or the Groups. Refer to the Standard Torque Specifications Chart for torque references not listed in the individual torque charts.

LUBRICATION & MAINTENANCE

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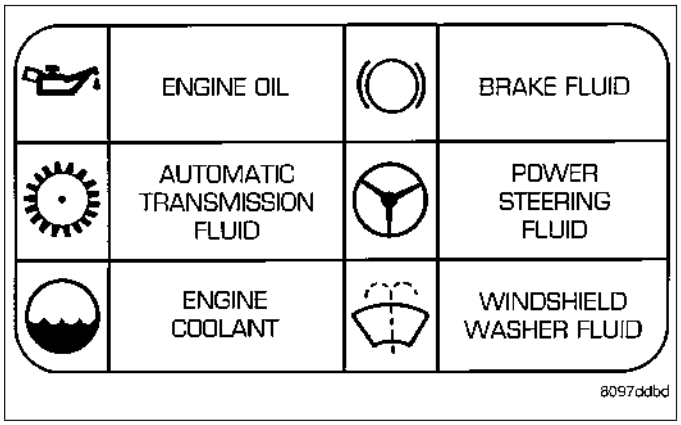
INTERNATIONAL SYMBOLS

DESCRIPTION

DaimlerChrysler Corporation uses international symbols to identify engine compartment lubricant and fluid inspection and fill locations.



PARTS & LUBRICANT RECOMMENDATION

DESCRIPTION

LUBRICANT RECOMMENDATIONS

Chassis

Component	Fluid, Lubricant, or Genuine Part
Steering Gear & Linkage, Ball Joints, Prop Shafts & Yokes, Wheel Bearings	Mopar® Multi-Purpose Lubricant NLGI Grade 2 EP, GC-LB

Body

Component	Fluid, Lubricant, and Genuine Part
Hinges:	
Door & Hood	Mopar® Engine Oil
Swing Gate	Mopar® Multi-Purpose Lube NLGI Grade 2 EP, GC-LB
Latches: Door, Hood/Safety Catch, Swing Gate	Mopar® Multi-Purpose Lube NLGI Grade 2 EP, GC-LB
Seat Regulator & Track	Mopar® Multi-Purpose Lube NLGI Grade 2 EP, GC-LB
Lock Cylinders	Mopar® Lock Cylinder Lube

FLUID TYPES

When service is required, DaimlerChrysler Corporation recommends that only Mopar® brand parts, lubricants and chemicals be used. Mopar® provides the best engineered products for servicing DaimlerChrysler Corporation vehicles.

Only lubricants bearing designations defined by the following organization should be used to service a Chrysler Corporation vehicle.

- Society of Automotive Engineers (SAE)
- American Petroleum Institute (API)
- National Lubricating Grease Institute (NLGI)

API QUALITY CLASSIFICATION

This symbol on the front of an oil container means that the oil has been certified by the American Petroleum Institute (API) to meet all the lubrication requirements specified by DaimlerChrysler Corporation.

GEAR LUBRICANTS

SAE ratings also apply to multigrade gear lubricants. In addition, API classification defines the lubricants usage. Such as API GL-5 and SAE 75W-90.

FLUID TYPES

DESCRIPTION

FUEL REQUIREMENTS

Your engine is designed to meet all emissions regulations and provide excellent fuel economy and performance when using high quality unleaded “regular” gasoline having an octane rating of 87. The routine use of premium gasoline is not recommended. Under normal conditions the use of premium fuel will not provide a benefit over high quality regular gasolines and in some circumstances may result in poorer performance.

Light spark knock at low engine speeds is not harmful to your engine. However, continued heavy spark knock at high speeds can cause damage and immediate service is required. Engine damage resulting from operation with a heavy spark knock may not be covered by the new vehicle warranty.

Poor quality gasoline can cause problems such as hard starting, stalling and hesitations. If you experience these symptoms, try another brand of gasoline before considering service for the vehicle.

Over 40 auto manufacturers world-wide have issued and endorsed consistent gasoline specifications (the Worldwide Fuel Charter, WWFC) to define fuel properties necessary to deliver enhanced emissions, performance and durability for your vehicle. We recommend the use of gasolines that meet the WWFC specifications if they are available.

REFORMULATED GASOLINE

Many areas of the country require the use of cleaner burning gasoline referred to as “reformulated” gasoline. Reformulated gasoline contain oxygenates, and are specifically blended to reduce vehicle emissions and improve air quality.

We strongly support the use of reformulated gasoline. Properly blended reformulated gasoline will provide excellent performance and durability for the engine and fuel system components.

GASOLINE/OXYGENATE BLENDS

Some fuel suppliers blend unleaded gasoline with oxygenates such as 10% ethanol, MTBE, and ETBE. Oxygenates are required in some areas of the country during the winter months to reduce carbon monoxide emissions. Fuels blended with these oxygenates may be used in your vehicle.

CAUTION: DO NOT use gasoline containing METHANOL. Gasoline containing methanol may damage critical fuel system components.

MMT IN GASOLINE

MMT is a manganese-containing metallic additive that is blended into some gasoline to increase octane. Gasoline blended with MMT provide no performance advantage beyond gasoline of the same octane number without MMT. Gasoline blended with MMT reduce spark plug life and reduce emission system performance in some vehicles. We recommend that gasolines free of MMT be used in your vehicle. The MMT content of gasoline may not be indicated on the gasoline pump; therefore, you should ask your gasoline retailer whether or not his/her gasoline contains MMT.

It is even more important to look for gasoline without MMT in Canada because MMT can be used at levels higher than allowed in the United States. MMT is prohibited in Federal and California reformulated gasoline.

SULFUR IN GASOLINE

If you live in the northeast United States, your vehicle may have been designed to meet California low emission standards with Cleaner-Burning California reformulated gasoline with low sulfur. If such fuels are not available in states adopting California emission standards, your vehicles will operate satisfactorily on fuels meeting federal specifications, but emission control system performance may be adversely affected. Gasoline sold outside of California is permitted to have higher sulfur levels which may affect the performance of the vehicle’s catalytic converter. This may cause the Malfunction Indicator Lamp (MIL), Check Engine or Service Engine Soon light to illuminate. We recommend that you try a different brand of unleaded gasoline having lower sulfur to determine if the problem is fuel related prior to returning your vehicle to an authorized dealer for service.

CAUTION: If the Malfunction Indicator Lamp (MIL), Check Engine or Service Engine Soon light is flashing, immediate service is required; see on-board diagnostics system section.

MATERIALS ADDED TO FUEL

All gasoline sold in the United States and Canada are required to contain effective detergent additives. Use of additional detergents or other additives is not needed under normal conditions.

FUEL SYSTEM CAUTIONS

CAUTION: Follow these guidelines to maintain your vehicle's performance:

- The use of leaded gas is prohibited by Federal law. Using leaded gasoline can impair engine performance, damage the emission control system, and could result in loss of warranty coverage.
- An out-of-tune engine, or certain fuel or ignition malfunctions, can cause the catalytic converter to overheat. If you notice a pungent burning odor or some light smoke, your engine may be out of tune or malfunctioning and may require immediate service. Contact your dealer for service assistance.
- When pulling a heavy load or driving a fully loaded vehicle when the humidity is low and the temperature is high, use a premium unleaded fuel to help prevent spark knock. If spark knock persists, lighten the load, or engine piston damage may result.
- The use of fuel additives which are now being sold as octane enhancers is not recommended. Most of these products contain high concentrations of methanol. Fuel system damage or vehicle performance problems resulting from the use of such fuels or additives is not the responsibility of DaimlerChrysler Corporation and may not be covered under the new vehicle warranty.

NOTE: Intentional tampering with emissions control systems can result in civil penalties being assessed against you.

ENGINE COOLANT

WARNING: ANTIFREEZE IS AN ETHYLENE GLYCOL BASE COOLANT AND IS HARMFUL IF SWALLOWED OR INHALED. IF SWALLOWED, DRINK TWO GLASSES OF WATER AND INDUCE VOMITING. IF INHALED, MOVE TO FRESH AIR AREA. SEEK MEDICAL ATTENTION IMMEDIATELY. DO NOT STORE IN OPEN OR UNMARKED CONTAINERS. WASH SKIN AND CLOTHING THOROUGHLY AFTER COMING IN CONTACT WITH ETHYLENE GLYCOL. KEEP OUT OF REACH OF CHILDREN. DISPOSE OF GLYCOL BASE COOLANT PROPERLY, CONTACT YOUR DEALER OR GOVERNMENT AGENCY FOR LOCATION OF COLLECTION CENTER IN YOUR AREA.

WARNING: DO NOT OPEN A COOLING SYSTEM WHEN THE ENGINE IS AT OPERATING TEMPERATURE OR HOT UNDER PRESSURE, PERSONAL INJURY CAN RESULT. AVOID RADIATOR COOLING FAN WHEN ENGINE COMPARTMENT RELATED SERVICE IS PERFORMED, PERSONAL INJURY CAN RESULT.

CAUTION: Use of Propylene Glycol based coolants is not recommended, as they provide less freeze protection and less corrosion protection.

The cooling system is designed around the coolant. The coolant must accept heat from engine metal, in the cylinder head area near the exhaust valves and engine block. Then coolant carries the heat to the radiator where the tube/fin radiator can transfer the heat to the air.

The use of aluminum cylinder blocks, cylinder heads, and water pumps requires special corrosion protection. Mopar® Antifreeze/Coolant, 5 Year/100,000 Mile Formula (MS-9769), or the equivalent ethylene glycol base coolant with organic corrosion inhibitors (called HOAT, for Hybrid Organic Additive Technology) is recommended. This coolant offers the best engine cooling without corrosion when mixed with 50% Ethylene Glycol and 50% distilled water to obtain a freeze point of -37°C (-35°F). If it loses color or becomes contaminated, drain, flush, and replace with fresh properly mixed coolant solution.

CAUTION: Do not use coolant additives that are claimed to improve engine cooling.

CAUTION: Mopar® Antifreeze/Coolant, 5 Year/100,000 Mile Formula (MS-9769) may not be mixed with any other type of antifreeze. Mixing of coolants other than specified non-HOAT or other HOAT coolant, may result in engine damage that may not be covered under the new vehicle warranty, and decreased corrosion protection.

COOLANT PERFORMANCE

The required ethylene-glycol (antifreeze) and distilled water mixture depends upon climate and vehicle operating conditions. The coolant performance of various mixtures follows:

Pure Distilled Water - Distilled water can absorb more heat than a mixture of water and ethylene-glycol. This is for purpose of heat transfer only. Water also freezes at a higher temperature and allows corrosion.

100 percent Ethylene-Glycol - The corrosion inhibiting additives in ethylene-glycol need the presence of distilled water to dissolve. Without water, additives form deposits in system. These act as insulation causing temperature to rise to as high as 149°C (300°F). This temperature is hot enough to melt plastic and soften solder. The increased temperature can result in engine detonation. In addition, 100 percent ethylene-glycol freezes at -22°C (-8°F).

50/50 Ethylene-Glycol and Distilled Water - Is the recommended mixture, it provides protection against freezing to -37°C (-34°F). The antifreeze concentration **must always** be a minimum of 44 percent, year-round in all climates. If percentage is lower, engine parts may be eroded by cavitation. Maximum protection against freezing is provided with a 68 percent antifreeze concentration, which prevents freezing down to -67.7°C (-90°F). A higher percentage will freeze at a warmer temperature. Also, a higher percentage of antifreeze can cause the engine to overheat because specific heat of antifreeze is lower than that of water.

CAUTION: Richer antifreeze mixtures cannot be measured with normal field equipment and can cause problems associated with 100 percent ethylene-glycol.

ENGINE OIL

WARNING: NEW OR USED ENGINE OIL CAN BE IRRITATING TO THE SKIN. AVOID PROLONGED OR REPEATED SKIN CONTACT WITH ENGINE OIL. CONTAMINANTS IN USED ENGINE OIL, CAUSED BY INTERNAL COMBUSTION, CAN BE HAZARDOUS TO YOUR HEALTH. THOROUGHLY WASH EXPOSED SKIN WITH SOAP AND WATER. DO NOT WASH SKIN WITH GASOLINE, DIESEL FUEL, THINNER, OR SOLVENTS, HEALTH PROBLEMS CAN RESULT. DO NOT POLLUTE, DISPOSE OF USED ENGINE OIL PROPERLY. CONTACT YOUR DEALER OR GOVERNMENT AGENCY FOR LOCATION OF COLLECTION CENTER IN YOUR AREA.

When service is required, DaimlerChrysler Corporation recommends that only Mopar® brand parts, lubricants and chemicals be used. Mopar® provides the best engineered products for servicing DaimlerChrysler Corporation vehicles.

Only lubricants bearing designations defined by the following organization should be used.

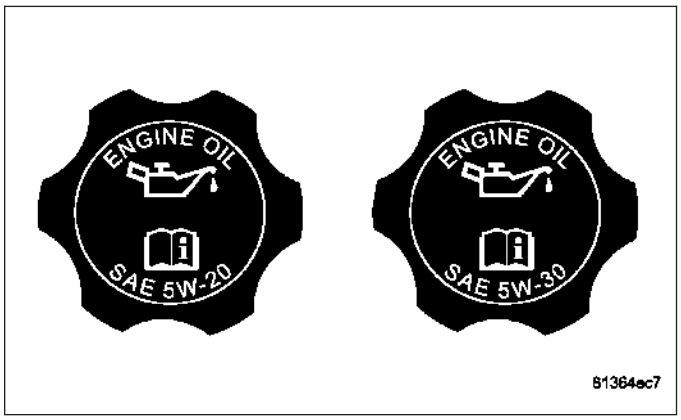
- Society of Automotive Engineers (SAE)
- American Petroleum Institute (API)
- National Lubricating Grease Institute (NLGI)
- Association des Constructeurs Européens d' Automobiles (European Automobile Manufacturers Association) (ACEA)

API SERVICE GRADE CERTIFIED

Use an engine oil that is API Certified. MOPAR® provides engine oils, that meet or exceed this requirement.

SAE VISCOSITY

An SAE viscosity grade is used to specify the viscosity of engine oil. Use only engine oils with multiple viscosities such as 5W-30 or 10W-30. These are specified with a dual SAE viscosity grade which indicates the cold-to-hot temperature viscosity range. Select an engine oil that is best suited to your particular temperature range and variation. **For 3.7L/4.7L engines SAE 5W-30 engine oil is recommended for all operating temperatures. For 5.7L engines SAE 5W-20 engine oil is recommended for all operating temperatures. These engine oils improve low temperature starting and vehicle fuel economy. Refer to your engine oil filler cap for the recommended engine oil viscosity for your vehicle.**



ACEA Categories

For countries that use the ACEA European Oil Categories for Service Fill Oils, use engine oils that meet the requirements of ACEA A1/B1, A2/B2, or A3/B3.

ENERGY CONSERVING OIL

An Energy Conserving type oil is recommended for gasoline engines. The designation of ENERGY CONSERVING is located on the label of an engine oil container.

CONTAINER IDENTIFICATION

Standard engine oil identification notations have been adopted to aid in the proper selection of engine oil. The identifying notations are located on the front label of engine oil plastic bottles and the top of engine oil cans.

This symbol means that the oil has been certified by the American Petroleum Institute (API). Diamler-Chrysler only recommend API Certified engine oils. Use Mopar® engine oil or equivalent.

TRANSFER CASE - NV144

Recommended lubricant for the NV144 transfer case is Mopar® ATF +4, Automatic Transmission Fluid.

TRANSFER CASE - NV244

Recommended lubricant for the NV244 transfer case is Mopar® ATF +4, Automatic Transmission Fluid.

AXLE

NOTE: DaimlerChrysler recommends Mopar® lubricants or lubricants of equal quality.

FRONT AXLE

- C205F - Mopar® Gear Lubricant 75W-90

REAR AXLE

- 8 1/4 - Mopar® Synthetic Gear Lubricant 75W-140
- 9 1/4 - Mopar® Synthetic Gear Lubricant 75W-140

POWER STEERING FLUID

Mopar® ATF +4, Automatic Transmission Fluid is required in the power steering system. Substitute fluids can induce power steering system failure.

Mopar® ATF +4, Automatic Transmission Fluid when new is red in color. The ATF is dyed red so it can be identified from other fluids used in the vehicle such as engine oil or antifreeze. The red color is not permanent and is not an indicator of fluid condition. As the vehicle is driven, the ATF will begin to look darker in color and may eventually become brown. **This is normal.** ATF+4 also has a unique odor that may change with age. Consequently, odor and color cannot be used to indicate the fluid condition or the need for a fluid change.

AUTOMATIC TRANSMISSION FLUID

NOTE: Refer to Service Procedures in this group for fluid level checking procedures.

Mopar® ATF +4, Automatic Transmission Fluid is the recommended fluid for DaimlerChrysler automatic transmissions.

Dexron II fluid IS NOT recommended. Clutch chatter can result from the use of improper fluid.

Mopar® ATF +4, Automatic Transmission Fluid when new is red in color. The ATF is dyed red so it can be identified from other fluids used in the vehicle such as engine oil or antifreeze. The red color is not permanent and is not an indicator of fluid condition. As the vehicle is driven, the ATF will begin to look darker in color and may eventually become brown. **This is normal.** ATF+4 also has a unique odor that may change with age. Consequently, odor and color cannot be used to indicate the fluid condition or the need for a fluid change.

FLUID ADDITIVES

DaimlerChrysler strongly recommends against the addition of any fluids to the transmission, other than those automatic transmission fluids listed above. Exceptions to this policy are the use of special dyes to aid in detecting fluid leaks.

Various “special” additives and supplements exist that claim to improve shift feel and/or quality. These additives and others also claim to improve converter clutch operation and inhibit overheating, oxidation, varnish, and sludge. These claims have not been supported to the satisfaction of DaimlerChrysler and these additives **must not be used.** The use of transmission “sealers” should also be avoided, since they may adversely affect the integrity of transmission seals.

OPERATION - AUTOMATIC TRANSMISSION FLUID

The automatic transmission fluid is selected based upon several qualities. The fluid must provide a high level of protection for the internal components by providing a lubricating film between adjacent metal components. The fluid must also be thermally stable so that it can maintain a consistent viscosity through a large temperature range. If the viscosity stays constant through the temperature range of operation, transmission operation and shift feel will remain consistent. Transmission fluid must also be a good conductor of heat. The fluid must absorb heat from the internal transmission components and transfer that heat to the transmission case.

FLUID CAPACITIES

SPECIFICATIONS

FLUID CAPACITIES

DESCRIPTION	SPECIFICATION
FUEL TANK	27 U.S. Gallons (102 Liters)****
ENGINE OIL	
3.7L - with Filter	4.7L (5.0 qts.)
4.7L - with Filter	5.6L (6.0 qts.)
5.7L - with Filter	6.6L (7.0 qts.)
COOLING SYSTEM	
3.7L	15.4L (16.2 qts.)***
4.7L	15.4L (16.2 qts.)***
5.7L	15.4L (16.2 qts.)***
AUTOMATIC TRANSMISSION	
Service Fill - 42RLE	3.8L (4.0 qts)
O-haul Fill - 42RLE	8.3L (17.6 pts)
Service Fill - 545RFE	2WD - 5.2 L (11 pts.) 4WD - 6.2 L (13 pts.)
O-haul Fill - 545RFE	13.33L (28.0 pts.)
Dry fill capacity Depending on type and size of internal cooler, length and inside diameter of cooler lines, or use of an auxiliary cooler, these figures may vary. (Refer to 21 - TRANSMISSION/AUTOMATIC/FLUID - STANDARD PROCEDURE)	
TRANSFER CASE	
NV144	0.85L (1.8 pts.)
NV244 GENII	1.6L (3.4 pts.)
FRONT AXLE	
C205F	1.66L (56 oz.)
REAR AXLE	
8 1/4 in.	2.07L (70 oz.)
9 1/4 in.	2.13L (72 oz.)
*** Includes 0.9L (1.0 qts.) for coolant reservoir.	
****Nominal refill capacities are shown. A variation may be observed from vehicle to vehicle due to manufacturing tolerance and refill procedure.	
Power Steering	
Power steering fluid capacities are dependent on engine/chassis options as well as steering gear/cooler options. Depending on type and size of internal cooler, length and inside diameter of cooler lines, or use of an auxiliary cooler, these capacities may vary.	

FLUID FILL/CHECK LOCATIONS

DESCRIPTION

The fluid check/fill points and lubrication locations are located in each applicable Sections.

MAINTENANCE SCHEDULES

DESCRIPTION

There are two maintenance schedules that show the **required** service for your vehicle.

First is Schedule **"B"**. It is for vehicles that are operated under the conditions that are listed below and at the beginning of the schedule.

- Day or night temperatures are below 0° C (32° F).
- Stop and go driving.
- Extensive engine idling.
- Driving in dusty conditions.
- Short trips of less than 16 km (10 miles).
- More than 50% of your driving is at sustained high speeds during hot weather, above 32° C (90° F).
- Trailer towing.
- Taxi, police, or delivery service (commercial service).
- Off-road or desert operation.
- **If equipped for and operating with E-85 (ethanol) fuel.**

NOTE: If ANY of these apply to you then change your engine oil every 3,000 miles (5 000 km) or 3 months, whichever comes first and follow schedule "B" of the ″Maintenance Schedules″ section of this manual.

NOTE: If ANY of these apply to you then change your coolant every 102,000 miles (163 000 km) or 60 months, whichever comes first and follow schedule "B" of the ″Maintenance Schedules″ section of this manual.

NOTE: Most vehicles are operated under the conditions listed for Schedule ″B″.

Second is Schedule **"A"**. It is for vehicles that are not operated under any of the conditions listed under Schedule ″B″.

Use the schedule that best describes your driving conditions. Where time and mileage are listed, follow the interval that occurs first.

CAUTION: Failure to perform the required maintenance items may result in damage to the vehicle.

At Each Stop for Fuel

- Check the engine oil level about 5 minutes after a fully warmed engine is shut off. Checking the oil level while the vehicle is on level ground will improve the accuracy of the oil level reading. Add oil only when the level is at or below the ADD or MIN mark.
- Check the windshield washer solvent and add if required.

Once a Month

- Check tire pressure and look for unusual wear or damage.
- Inspect the battery and clean and tighten the terminals as required.
- Check the fluid levels of coolant reservoir, brake master cylinder, power steering and transmission and add as needed.
- Check all lights and all other electrical items for correct operation.

At Each Oil Change

- Change the engine oil filter.
- Inspect the exhaust system.
- Inspect the brake hoses.
- Inspect the CV joints (if equipped) and front suspension components.
- Check the automatic transmission fluid level.
- Check the coolant level, hoses, and clamps.

Schedule “B”

Follow schedule “B” if you usually operate your vehicle under one or more of the following conditions.

- Day or night temperatures are below 0° C (32° F).
- Stop and go driving.
- Extensive engine idling.
- Driving in dusty conditions.
- Short trips of less than 16 km (10 miles).
- More than 50% of your driving is at sustained high speeds during hot weather, above 32° C (90° F).
- Trailer towing.
- Taxi, police, or delivery service (commercial service).
- Off-road or desert operation.
- **If equipped for and operating with E-85 (ethanol) fuel.**

NOTE: If ANY of these apply to you then change your engine oil every 3,000 miles (5 000 km) or 3 months, whichever comes first and follow schedule “B” of the ″Maintenance Schedules″ section of this manual.

NOTE: If ANY of these apply to you then change your coolant every 102,000 miles (163 000 km) or 60 months, whichever comes first and follow schedule “B” of the ″Maintenance Schedules″ section of this manual.

Miles (Kilometers)	**3,000 (5 000)**	**6,000 (10 000)**	**9,000 (14 000)**	**12,000 (19 000)**	**15,000 (24 000)**
Change engine oil and engine oil filter, or at 3 months whichever comes first.	X	X	X	X	X
Rotate tires.		X		X	
Change rear axle fluid.					X
Change front axle fluid (4X4).					X
Inspect engine air cleaner filter, replace if necessary.					X

Miles (Kilometers)	**18,000 (29 000)**	**21,000 (34 000)**	**24,000 (38 000)**	**27,000 (43 000)**	**30,000 (48 000)**
Change engine oil and engine oil filter, or at 3 months whichever comes first.	X	X	X	X	X
Rotate tires.	X		X		X
Change rear axle fluid.					X
Change front axle fluid (4X4).					X
Check transfer case fluid level (4X4).					X
Inspect brake linings.	X				
Inspect engine air cleaner filter, replace if necessary.					X
Replace spark plugs.					X
Inspect PCV valve, replace as necessary.*					X

Miles	**33,000**	**36,000**	**39, 000**	**42,000**	**45,000**
(Kilometers)	**(53 000)**	**(58 000)**	**(62 000)**	**(67 000)**	**(72 000)**
Change engine oil and engine oil filter, or at 3 months whichever comes first.	X	X	X	X	X
Rotate tires.		X		X	
Change rear axle fluid.					X
Change front axle fluid (4X4).					X
Inspect brake linings.		X			
Inspect engine air cleaner filter, replace if necessary.					X

Miles	**48,000**	**51,000**	**54,000**	**57,000**	**60,000**
(Kilometers)	**(77 000)**	**(82 000)**	**(86 000)**	**(91 000)**	**(96 000)**
Change engine oil and engine oil filter, or at 3 months whichever comes first.	X	X	X	X	X
Rotate tires.	X		X		X
Change rear axle fluid.					X
Change front axle fluid (4X4).					X
Inspect brake linings.			X		
Inspect engine air cleaner filter, replace if necessary.					X
Replace spark plugs.					X
Inspect PCV valve, replace as necessary.*					X
Inspect and replace ignition cables if necessary (5.7L only).					X
Inspect auto tension drive belt and replace if required.					X
Drain and refill automatic transmission fluid, change filter (3.7L). This applies only if your vehicle is used for police, taxi, fleet, or frequent trailer towing.					X
Drain and refill automatic transmission fluid and change main sump filter (4.7L/5.7L only). This applies only if your vehicle is used for police, taxi, fleet, or frequent trailer towing.					X
Inspect transfer case fluid (4X4).					X
Flush and replace engine coolant at 60 months, or 102, 000 miles (163 000 km) whichever comes first.					

Miles	**63,000**	**66,000**	**69,000**	**72,000**	**75,000**
(Kilometers)	**(101 000)**	**(106 000)**	**(110 000)**	**(115 000)**	**(120 000)**
Change engine oil and engine oil filter, or at 3 months whichever comes first.	X	X	X	X	
Rotate tires.		X		X	
Change rear axle fluid.					X
Change front axle fluid (4X4).					X
Inspect brake linings.				X	
Inspect engine air cleaner filter, replace if necessary.					X
Inspect auto tension drive belt and replace if required.					X

Miles	**78,000**	**81,000**	**84,000**	**87,000**	**90,000**
(Kilometers)	**(125 000)**	**(130 000)**	**(134 000)**	**(139 000)**	**(144 000)**
Change engine oil and engine oil filter, or at 3 months whichever comes first.	X	X	X	X	X
Rotate tires.	X		X		X
Change rear axle fluid.					X
Change front axle fluid (4X4).					X
Check transfer case fluid level (4X4).					X
Inspect brake linings.					X
Inspect engine air cleaner filter, replace if necessary.					X
Replace spark plugs.					X
Inspect PCV valve, replace as necessary.*					X
Inspect auto tension drive belt and replace if required.					X

Miles	**93,000**	**96,000**	**99,000**	**100,000**	**102,000**
(Kilometers)	**(149 000)**	**(154 000)**	**(158 000)**	**(160 000)**	**(163 000)**
Change engine oil and engine oil filter, or at 3 months whichever comes first.	X	X	X		X
Rotate tires.		X			X
Flush and replace engine coolant, if not done at 60 months.					X
Change rear axle fluid.		X			
Change front axle fluid (4X4).		X			

Miles (Kilometers)	**105,000 (168 000)**	**108,000 (173 000)**	**111,000 (178 000)**	**114,000 (182 000)**	**117,000 (187 000)**	**120,000 (192 000)**
Change engine oil and engine oil filter, or at 3 months whichever comes first.	X	X	X	X	X	X
Rotate tires.		X		X		X
Change rear axle fluid.	X					X
Change front axle fluid (4X4).	X					X
Inspect brake linings.		X				
Inspect engine air cleaner filter, replace if necessary.	X					X
Replace spark plugs.						X
Inspect and replace ignition cables if necessary (5.7L only).						X
Inspect PCV valve, replace as necessary.*						X
Inspect auto tension drive belt and replace if required.‡	X					X
Drain and refill transfer case fluid (4X4).						X
Drain and refill automatic transmission fluid, change filter (3.7L). This applies only if your vehicle is used for police, taxi, fleet, or frequent trailer towing.						X
Drain and refill automatic transmission fluid and change main sump filter and spin-on cooler return filter if equipped. (4.7L/5.7L only). This applies only if your vehicle is used for police, taxi, fleet, or frequent trailer towing.						X

‡ This maintenance is not required if previously replaced.

Inspection and service should also be performed anytime a malfunction is observed or suspected. Retain all receipts.

Schedule “A”

Miles **(Kilometers)** **[Months]**	**6,000** **(10 000)** **[6]**	**12,000** **(19 000)** **[12]**	**18,000** **(29 000)** **[18]**	**24,000** **(38 000)** **[24]**	**30,000** **(48 000)** **[30]**
Change engine oil and engine oil filter.	X	X	X	X	X
Rotate tires.	X	X	X	X	X
Check transfer case fluid level (4X4).					X
Inspect brake linings.			X		
Inspect engine air cleaner filter, replace as necessary.					X
Replace spark plugs.					X

Miles **(Kilometers)** **[Months]**	**36,000** **(58 000)** **[36]**	**42,000** **(67 000)** **[42]**	**48,000** **(77 000)** **[48]**	**54000** **(84 000)** **[54]**	**60,000** **(96 000)** **[60]**	**66,000** **(106 000)** **[66]**
Change engine oil and engine oil filter.	X	X	X	X	X	X
Rotate tires.	X	X	X	X	X	X
Check transfer case fluid level (4X4).					X	
Flush and replace engine coolant at 60 months, regardless of mileage.					X	
Inspect brake linings.	X			X		
Replace engine air cleaner filter.					X	
Replace spark plugs.					X	
Inspect PCV valve, replace as necessary. *					X	
Inspect and replace ignition cables if necessary (5.7L only).					X	
Inspect auto tension drive belt and replace if required.					X	

Miles (Kilometers) [Months]	**72,000 (115 000) [72]**	**78,000 (125 000) [78]**	**84,000 (134 000) [84]**	**90,000 (144 000) [90]**	**96,000 (154 000) [96]**	**100,000 (160 000)**
Change engine oil and engine oil filter.	X	X	X	X	X	
Rotate tires.	X	X	X	X	X	X
Check transfer case fluid level (4X4).				X		
Inspect brake linings.	X			X		
Replace engine air cleaner filter.				X		
Replace spark plugs.				X		
Inspect PCV valve, replace as necessary.*				X		
Inspect auto tension drive belt and replace if required.‡				X		

Miles (Kilometers) [Months]	**102,000 (163 000) [102]**	**108,000 (173 000) [108]**	**114,000 (182 000) [114]**	**120,000 (192 000) [120]**
Change engine oil and engine oil filter.	X	X	X	X
Rotate tires.	X	X	X	X
Drain and refill tranfer case fluid (4X4).				X
Flush and replace engine coolant, if not done at 60 months.	X			
Flush and replace engine coolant, if not done at 102,000 miles (163 000 km)				X
Inspect brake linings.		X		
Inspect engine air cleaner filter, replace as necessary.				X
Replace spark plugs.				X
Inspect PCV valve, replace as necessary.*				X

‡ This maintenance is not required if previously replaced.

Inspection and service should also be performed anytime a malfunction is observed or suspected. Retain all receipts.

WARNING: You can be badly injured working on or around a motor vehicle. Do only that service work for which you have the knowledge and the right equipment. If you have any doubt about your ability to perform a service job, take your vehicle to a competent mechanic.

HOISTING

STANDARD PROCEDURE

HOISTING AND JACKING

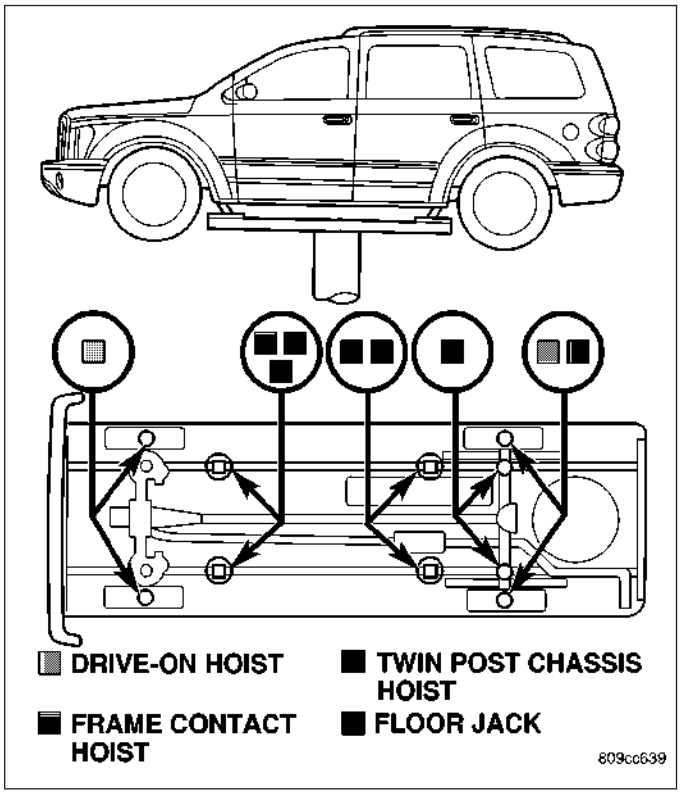
WARNING: THE HOISTING AND JACK LIFTING POINTS PROVIDED ARE FOR A COMPLETE VEHICLE. WHEN A CHASSIS OR DRIVETRAIN COMPONENT IS REMOVED FROM A VEHICLE, THE CENTER OF GRAVITY IS ALTERED MAKING SOME HOISTING CONDITIONS UNSTABLE. PROPERLY SUPPORT OR SECURE VEHICLE TO HOISTING DEVICE WHEN THESE CONDITIONS EXIST.

FLOOR JACKING

CAUTION: Do not attempt to lift a vehicle with a floor jack positioned under:

- **An axle tube.**
- **Aluminum differential.**
- **A body side sill.**
- **A steering linkage component.**
- **A drive shaft.**
- **The engine or transmission oil pan.**
- **The fuel tank.**
- **A front suspension arm.**

When properly positioned, a floor jack can be used to lift a Durango vehicle. Support the vehicle in the raised position with jack stands at the front and rear ends of the frame rails.



HOISTING

A vehicle can be lifted with:

- A single-post, frame-contact hoist.
- A twin-post, chassis hoist.
- A ramp-type, drive-on hoist.

NOTE: When a frame-contact type hoist is used, verify that the lifting pads are positioned properly.

JUMP STARTING

STANDARD PROCEDURE

JUMP STARTING

WARNING: REVIEW ALL SAFETY PRECAUTIONS AND WARNINGS IN THE BATTERY SYSTEM SECTION OF THE SERVICE MANUAL. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - STANDARD PROCEDURE)

- **DO NOT JUMP START A FROZEN BATTERY, PERSONAL INJURY CAN RESULT.**
- **IF EQUIPPED, DO NOT JUMP START WHEN MAINTENANCE FREE BATTERY INDICATOR DOT IS YELLOW OR BRIGHT COLOR.**
- **DO NOT JUMP START A VEHICLE WHEN THE BATTERY FLUID IS BELOW THE TOP OF LEAD PLATES.**
- **DO NOT ALLOW JUMPER CABLE CLAMPS TO TOUCH EACH OTHER WHEN CONNECTED TO A BOOSTER SOURCE.**
- **DO NOT USE OPEN FLAME NEAR BATTERY.**
- **REMOVE METALLIC JEWELRY WORN ON HANDS OR WRISTS TO AVOID INJURY BY ACCIDENTAL ARCING OF BATTERY CURRENT.**
- **WHEN USING A HIGH OUTPUT BOOSTING DEVICE, DO NOT ALLOW BATTERY VOLTAGE TO EXCEED 16 VOLTS. REFER TO INSTRUCTIONS PROVIDED WITH DEVICE BEING USED.**
  FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN PERSONAL INJURY.

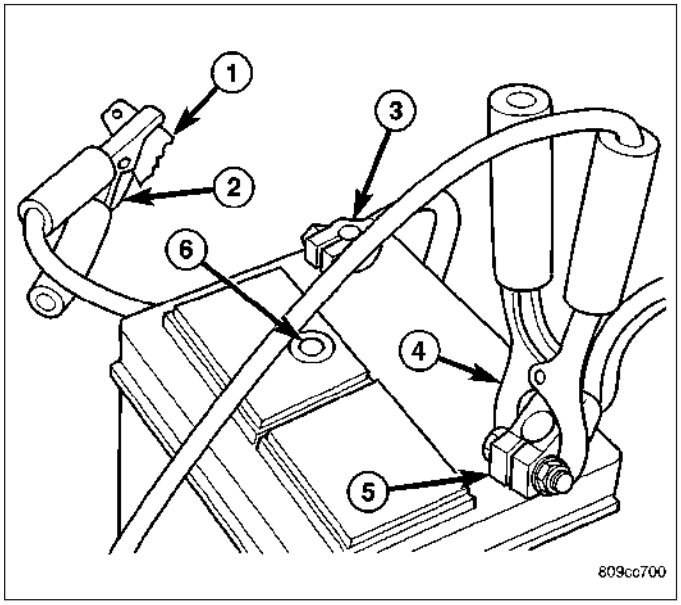
CAUTION: When using another vehicle as a booster, do not allow vehicles to touch. Electrical systems can be damaged on either vehicle.

TO JUMP START A DISABLED VEHICLE:

1. Raise hood on disabled vehicle and visually inspect engine compartment for:
   - Battery cable clamp condition, clean if necessary.
   - Frozen battery.
   - Yellow or bright color test indicator, if equipped.
   - Low battery fluid level.
   - Generator drive belt condition and tension.
   - Fuel fumes or leakage, correct if necessary.

CAUTION: If the cause of starting problem on disabled vehicle is severe, damage to booster vehicle charging system can result.

2. When using another vehicle as a booster source, park the booster vehicle within cable reach. Turn off all accessories, set the parking brake, place the automatic transmission in PARK or the manual transmission in NEUTRAL and turn the ignition OFF.



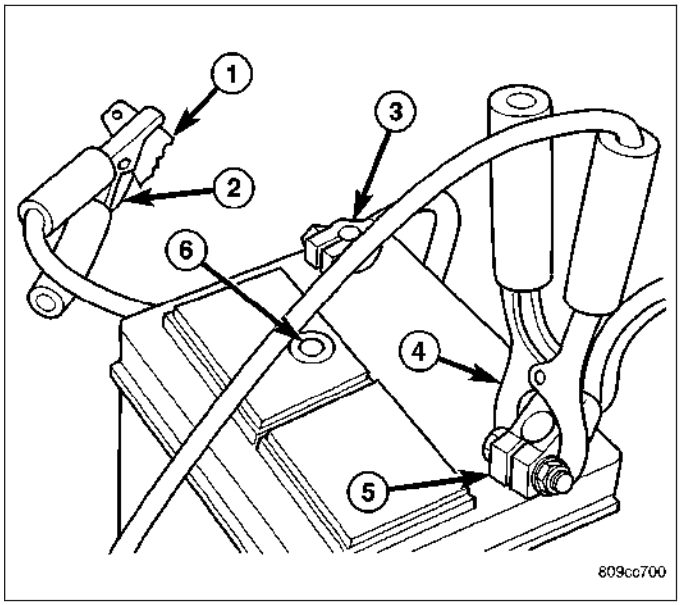
3. On disabled vehicle, place gear selector in park or neutral and set park brake. Turn off all accessories.
4. Connect jumper cables to booster battery. RED clamp (4) to positive terminal (+). BLACK clamp (2) to negative (3) terminal (-). DO NOT allow clamps at opposite end of cables to touch, electrical arc will result. Review all warnings in this procedure.
5. On disabled vehicle, connect RED jumper cable (4) clamp to positive (+) terminal. Connect BLACK jumper cable clamp to engine ground (1) as close to the ground cable attaching point as possible.
6. Start the engine in the vehicle which has the booster battery, let the engine idle a few minutes, then start the engine in the vehicle with the discharged battery.

CAUTION: Do not crank starter motor on disabled vehicle for more than 15 seconds, starter will overheat and could fail.

7. Allow battery in disabled vehicle to charge to at least 12.4 volts (75% charge) before attempting to start engine. If engine does not start within 15 seconds, stop cranking engine and allow starter to cool (15 min.), before cranking again.

DISCONNECT CABLE CLAMPS AS FOLLOWS:

- Disconnect BLACK cable clamp (2) from engine ground (1) on disabled vehicle.
- When using a booster vehicle, disconnect BLACK cable clamp (2) from battery negative terminal (3). Disconnect RED cable clamp (4) from battery positive terminal (5).
- Disconnect RED cable clamp (4) from battery positive terminal (4) on disabled vehicle.



TOWING

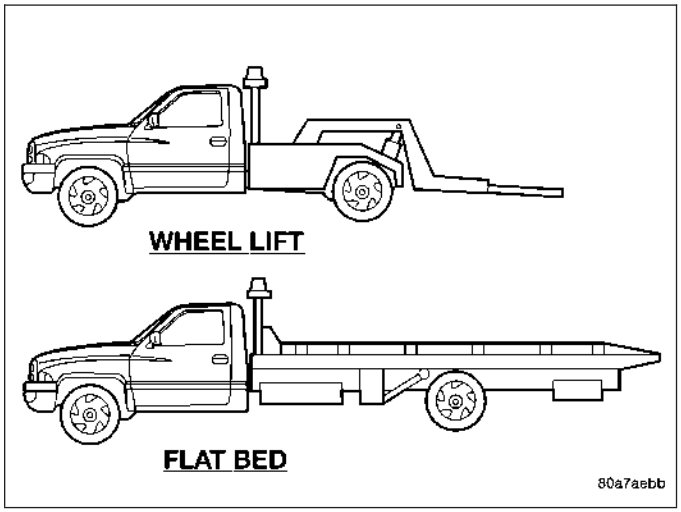
STANDARD PROCEDURE

TOWING RECOMMENDATIONS

A vehicle equipped with SAE approved wheel lift-type towing equipment can be used to tow all vehicles. When towing a 4WD vehicle using a wheel-lift towing device, use tow dollies under the opposite end of the vehicle. A vehicle with flatbed device can also be used to transport a disabled vehicle.

SAFETY PRECAUTIONS

CAUTION: The following safety precautions must be observed when towing a vehicle:



- Secure loose and protruding parts.
- Always use a safety chain system that is independent of the lifting and towing equipment.
- Do not allow towing equipment to contact the disabled vehicle's fuel tank.
- Do not allow anyone under the disabled vehicle while it is lifted by the towing device.
- Do not allow passengers to ride in a vehicle being towed.
- Always observe state and local laws regarding towing regulations.
- Do not tow a vehicle in a manner that could jeopardize the safety of the operator, pedestrians or other motorists.
- Do not attach tow chains, T-hooks, or J-hooks to a bumper, steering linkage, drive shafts or a non-reinforced frame hole.

- Do not tow a heavily loaded vehicle. Use a flatbed device to transport a loaded vehicle.

GROUND CLEARANCE

CAUTION: If vehicle is towed with wheels removed, install lug nuts to retain brake drums or rotors.

A towed vehicle should be raised until lifted wheels are a minimum 100 mm (4 in) from the ground. Be sure there is adequate ground clearance at the opposite end of the vehicle, especially when towing over rough terrain or steep rises in the road.

RAMP ANGLE

If a vehicle with flatbed towing equipment is used, the approach ramp angle should not exceed 15 degrees.

TOWING WHEN KEYS ARE NOT AVAILABLE

When the vehicle is locked and keys are not available, use a flat bed hauler. A wheel-lift device can be used on 4WD vehicles provided **all the wheels are lifted off the ground using tow dollies.**

FOUR WHEEL DRIVE TOWING

Chrysler Corporation recommends that a vehicle be transported on a flat-bed device. A Wheel-lift device can be used provided **all the wheels are lifted off the ground using tow dollies.**

WARNING: WHEN TOWING A DISABLED VEHICLE AND THE DRIVE WHEELS ARE SECURED IN A WHEEL LIFT OR TOW DOLLIES, ENSURE THE TRANSMISSION IS IN THE PARK POSITION.

CAUTION: Many vehicles are equipped with air dams, spoilers, and/or ground effect panels. To avoid component damage, a wheel-lift towing vehicle or a flat-bed hauling vehicle is recommended.

FOUR WHEEL DRIVE TOWING – REAR END LIFTED

WARNING: ENSURE VEHICLE IS ON A LEVEL SURFACE OR THE WHEELS ARE BLOCKED TO PREVENT VEHICLE FROM ROLLING.

1. Attach wheel lift device to front wheels.
2. Place the transmission in neutral.
3. Raise the front of the vehicle off the ground and install tow dollies under front wheels.
4. Attach wheel lift device to rear wheels and raise vehicle to towing position.
5. Attach safety chains to frame rails. Route chains so not to interfere with tail pipe when vehicle is lifted.
6. Turn the ignition switch to the OFF position to unlock the steering wheel.

CAUTION: Do not use steering column lock to secure steering wheel during towing operation.

7. Secure steering wheel in straight ahead position with a clamp device designed for towing.
8. Place the transmission in park.

FOUR WHEEL DRIVE TOWING – FRONT END LIFTED

WARNING: ENSURE VEHICLE IS ON A LEVEL SURFACE OR THE WHEELS ARE BLOCKED TO PREVENT VEHICLE FROM ROLLING.

1. Attach wheel lift device to rear wheels.
2. Place the transmission in neutral.
3. Raise the rear of the vehicle off the ground and install tow dollies under rear wheels.
4. Attach wheel lift device to front wheels and raise vehicle to towing position.
5. Attach the safety chains.

CAUTION: Do not use steering column lock to secure steering wheel during towing operation.

6. Turn the ignition switch to the OFF position to unlock the steering wheel.
7. Secure steering wheel in straight ahead position with a clamp device designed for towing.
8. Place the transmission in park.

RECREATIONAL TOWING (BEHIND MOTORHOME, ETC.) OF 4X4 VEHICLES

WARNING: You or others could be injured if you leave the vehicle unattended with the transfer case in the Neutral (N) position without first fully engaging the parking brake. The transfer case Neutral (N) position disengages both the front and rear driveshafts from the powertrain and will allow the vehicle to move despite the transmission position. The parking brake should always be applied when the driver is not in the vehicle.

CAUTION: Internal damage to the transfer case will occur if a front or rear wheel lift is used when recreational towing.

NOTE: Because of the design of the transfer cases only vehicles equipped with a NV 244 Generation II transfer case should be used for recreational towing.

NOTE: The NV 244 Generation II transfer case must be shifted into Neutral (N) for recreational towing. The Neutral (N) selection button is located on the lower left hand corner of the 4WD Control Switch. Shifts into and out of transfer case Neutral (N) can take place with the selector switch in any mode position.

NOTE: If the vehicle is to be towed for multiple days or one day for an eight hour or above duration, disconnect and isolate the battery to prevent discharge do to the illumination of the odometer and PRNDL light. After the battery negative cable is reinstalled the radio clock and stations will need to be reset.

Shifting into Neutral (N)

Use the following procedure to prepare your vehicle for recreational towing.

CAUTION: It is necessary to follow these steps to be certain that the transfer case is fully in Neutral (N) before recreational towing to prevent damage to internal parts.

1. Bring vehicle to a complete stop.
2. Shut engine OFF.
3. Place ignition key in the ON position.
4. Depress brake pedal.
5. Shift automatic transmission to Neutral (N) or depress clutch on manual transmission.
6. Using the point of a ballpoint pen or similar object, depress the recessed transfer case Neutral (N) button for 4 seconds.
7. After shift is completed and the Neutral (N) light comes on release Neutral (N) button.
8. Start engine.
9. Shift automatic transmission into Reverse (R).
10. Release brake pedal for five seconds and ensure that there is no vehicle movement.
11. Repeat steps 9 and 10 with the transmission in Drive (D).
12. Shut engine OFF and place ignition key to the unlocked OFF position.
13. Shift automatic transmission into Park (P).
14. Attach vehicle to tow vehicle with tow bar.

NOTE: Items 1 through 5 are requirements that must be met prior to depressing the Neutral (N) selection button, and must continue to be met until the 4 seconds elaspes and the shift has been completed. If any of these requirements (with the exception of 3 - Key ON) are not met prior to depressing the Neutral (N) button or are no longer met during the 4 second timer, then the Neutral (N) indicator light will flash continuously until all requirements are met or until the Neutral (N) button is released.

NOTE: The ignition key must be ON for a shift to take place and for the position indicator lights to be operable. If the key in not ON, the shift will not take place and no position indicator lights will be on or flashing.

NOTE: Flashing neutral (N) position indicator light indicates that shift requirements have not been met.

CAUTION: Damage to the transmission may occur if the transmission is shifted into Park (P) with the transfer case in Neutral (N) and the engine RUNNING. With the transfer case in Neutral (N) ensure that the engine is OFF prior to shifting the transmission into Park (P).

Shifting OUT of Neutral (N)

Use the following procedure to prepare your vehicle for normal usage.

1. Bring vehicle to a complete stop.
2. Shut engine OFF.
3. Place ignition key in the ON position.
4. Depress brake pedal.
5. Shift automatic transmission to Neutral (N) or depress clutch on manual transmission.
6. Using the point of a ballpoint pen or similar object, depress the recessed transfer case Neutral (N) button for 1 second.
7. After the Neutral (N) indicator light turns off release the Neutral (N) button.
8. After the Neutral (N) button has been released the transfer case will shift to the position identified by the selector switch.
9. Shift automatic transmission into Drive (D), release the clutch on manual transmission.

NOTE: Items 1 through 5 are requirements that must be met prior to depressing the Neutral (N) selection button, and must continue to be met until 1 second elapses and the shift has been completed. If any of these requirements (with the exception of 3 - key ON) are not met prior to depressing the Neutral (N) button or are no longer met during the 1 second time, then all of the mode position indicator lights will flash continuously until all requirements are met or until the Neutral (N) button is released.

NOTE: The ignition key must be ON for a shift to take place and for the position indicator lights to be operable. If the key is not ON, the shift will not take place and no position indicator lights will be on or flashing.

NOTE: Flashing neutral (N) position indicator light indicates that shift requirements have not been met.

CAUTION:

- **Do not use a bumper mounted clamp-on tow bar on your vehicle. The bumper face bar will be damaged.**
- **Do not disconnect the rear driveshaft because fluid will leak from the transfer case and damage internal parts.**

SUSPENSION

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WHEEL ALIGNMENT

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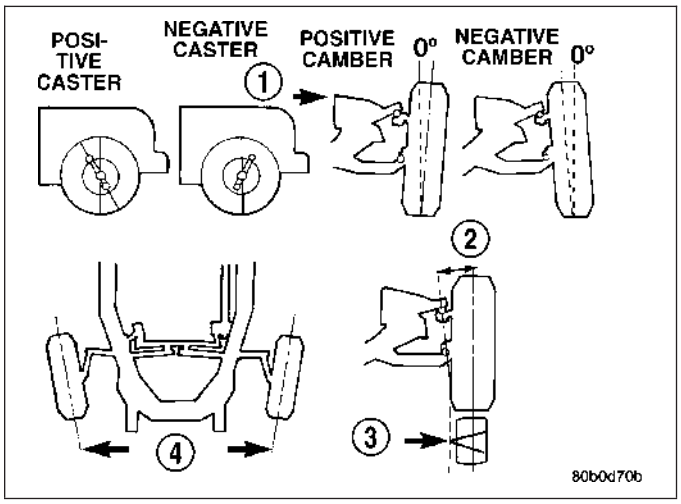
WHEEL ALIGNMENT

DESCRIPTION

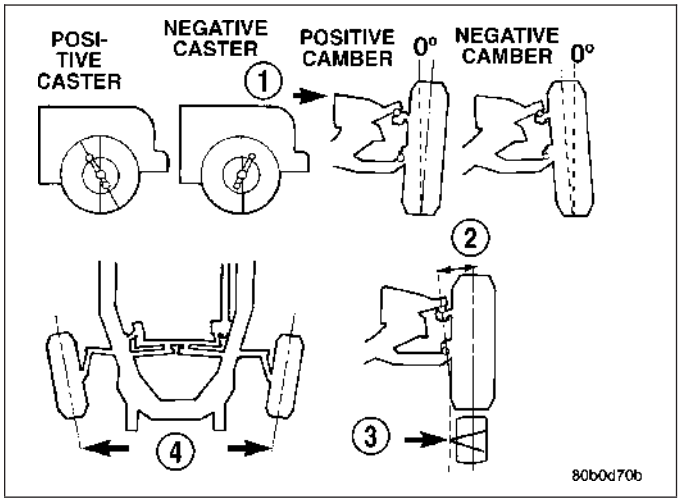
NOTE: Suspension components with rubber/urethane bushings should be tightened with the vehicle at normal ride height. It is important to have the springs supporting the weight of the vehicle when the fasteners are torqued. If springs are not at their normal ride position, vehicle ride comfort could be affected and premature bushing wear may occur.

Wheel alignment involves the correct positioning of the wheels in relation to the vehicle. The positioning is accomplished through suspension and steering linkage adjustments. An alignment is considered essential for efficient steering, good directional stability and to minimize tire wear. The most important measurements of an alignment are caster, camber and toe.



CAUTION: Never attempt to modify suspension or steering components by heating or bending.

OPERATION



- **CASTER (1)** is the forward or rearward tilt of the steering knuckle from vertical. Tilting the top of the knuckle forward provides less positive caster. Tilting the top of the knuckle rearward provides more positive caster. Positive caster promotes directional stability. This angle enables the front wheels to return to a straight ahead position after turns.
- **CAMBER (2)** is the inward or outward tilt of the wheel relative to the center of the vehicle. Tilting the top of the wheel inward provides negative camber. Tilting the top of the wheel outward provides positive camber. Incorrect camber will cause wear on the inside or outside edge of the tire.
- **TOE (4)** is the difference between the leading inside edges and trailing inside edges of the front tires. Wheel toe position out of specification cause's unstable steering, uneven tire wear and steering wheel off- center. The wheel toe position is the **final** front wheel alignment adjustment.
- **THRUST ANGLE (3)** is the angle of the rear axle relative to the centerline of the vehicle. Incorrect thrust angle can cause off-center steering and excessive tire wear. This angle is not adjustable, damaged component(s) must be replaced to correct the thrust angle.

DIAGNOSIS AND TESTING

PRE-ALIGNMENT INSPECTION

Before starting wheel alignment, the following inspection and necessary corrections must be completed. Refer to Suspension and Steering System Diagnosis Chart below for additional information.

1. Inspect tires for size, air pressure and tread wear.
2. Inspect front wheel bearings for wear.
3. Inspect front wheels for excessive radial or lateral runout and balance.
4. Inspect ball studs, linkage pivot points and steering gear for looseness, roughness or binding.
5. Inspect suspension components for wear and noise.
6. Check suspension ride height.
7. Road test the vehicle.

SUSPENSION AND STEERING SYSTEM DIAGNOSIS

CONDITION	POSSIBLE CAUSES	CORRECTION
FRONT END NOISE	1. Loose or worn wheel bearing.	1. Replace wheel bearing.
	2. Loose or worn steering or suspension components.	2. Tighten or replace components as necessary.
	3. Loose or worn steering or suspension components.	3. Tighten or replace components as necessary.

CONDITION	POSSIBLE CAUSES	CORRECTION
EXCESSIVE PLAY IN STEERING	1. Loose or worn wheel bearing. 2. Loose or worn steering or suspension components. 3. Loose or worn steering gear.	1. Replace wheel bearing. 2. Tighten or replace components as necessary. 3. Replace steering gear.
FRONT WHEELS SHIMMY	1. Loose or worn wheel bearing. 2. Loose or worn steering or suspension components. 3. Tires worn or out of balance. 4. Alignment.	1. Replace wheel bearing. 2. Tighten or replace components as necessary. 3. Replace or balance tires. 4. Align vehicle to specifications.
VEHICLE INSTABILITY	1. Loose or worn wheel bearing. 2. Loose or worn steering or suspension components. 3. Tire pressure. 4. Alignment.	1. Replace wheel bearing. 2. Tighten or replace components as necessary. 3. Adjust tire pressure. 4. Align vehicle to specifications.
EXCESSIVE STEERING EFFORT	1. Loose or worn steering gear. 2. Column coupler binding. 3. Tire pressure. 4. Alignment.	1. Replace steering gear. 2. Replace coupler. 3. Adjust tire pressure. 4. Align vehicle to specifications.
VEHICLE PULLS TO ONE SIDE	1. Tire pressure. 2. Tire. 3. Alignment. 4. Loose or worn steering or suspension components. 5. Radial tire lead. 6. Brake pull. 7. Weak or broken torsion bar. 8. Ride height.	1. Adjust tire pressure. 2. Criss-Cross Front Tires. 3. Align vehicle to specifications. 4. Tighten or replace components as necessary. 5. Rotate or replace tire as necessary. 6. Repair brake as necessary. 7. Readjust or Replace torsion bar. 8. Measure and adjust ride height.

STANDARD PROCEDURE

HEIGHT MEASUREMENT

The vehicle suspension height MUST be measured and adjusted before performing wheel alignment procedure. Also when front suspension components have been replaced. This measure must be performed with the vehicle supporting it's own weight and taken on both sides of the vehicle.

FRONT RIDE HEIGHT MEASUREMENT

1. Inspect tires and set to correct pressure.
2. Jounce the front of the vehicle.
3. With vehicle on level ground or hoist, make the following measurements:
   a. Front wheel spindle (center) to ground vertical distance.
   b. Center of the front face of bolt on the rear leg of Lower control arm to ground vertical distance.
   c. Difference between spindle and control arm bolt to ground distances should be 81mm+/-3.2mm **Note that the control arm bolt is lower than the spindle**.

4. If adjustment is required, turn the torsion bar adjuster bolts- if lowering ride height, unscrew Torsion bar adjuster bolt beyond desired point so as to set height when screwing-in adjuster bolt.
5. After making any ride height adjustment, roll vehicle preferably jouncing it also, to relieve camber Effects and then re-measure Lower control arm bolt to ground height.
6. Repeat the previous steps until the ride height is within specifications.

REAR RIDE HEIGHT MEASUREMENT

1. Inspect tires and set to correct pressure.
2. Jounce the front of the vehicle.
3. With vehicle on level ground or hoist, make the following measurements:
   a. Distance from the landing pad of the jounce bumper on the axle side to the jounce bumper cup lip of the frame side.
   b. The difference between the jounce bumper landing pad and the jounce bumper cup lip the reading should be 148 mm +/-10 mm for 9.25″ axle, 154 mm +/-10 mm for 8.25″ axle.

HEIGHT ADJUSTMENT

The vehicle suspension height MUST be measured and adjusted before performing wheel alignment procedure (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE). Also when front suspension components have been replaced. This measurement must be performed with the vehicle supporting it's own weight and taken on both sides of the vehicle.

To adjust the vehicle height turn the torsion bar adjustment bolt CLOCKWISE to raise the vehicle and COUNTER CLOCKWISE to lower the vehicle.

CAUTION: ALWAYS raise the vehicle to the correct suspension height, NEVER lower the vehicle to obtain the correct suspension height. If the vehicle suspension height is too high, lower the vehicle below the height specification. Then raise the vehicle to the correct suspension height specification. This will insure the vehicle maintains the proper suspension height.

NOTE: If a height adjustment has been made, perform height measurement again on both sides of the vehicle.

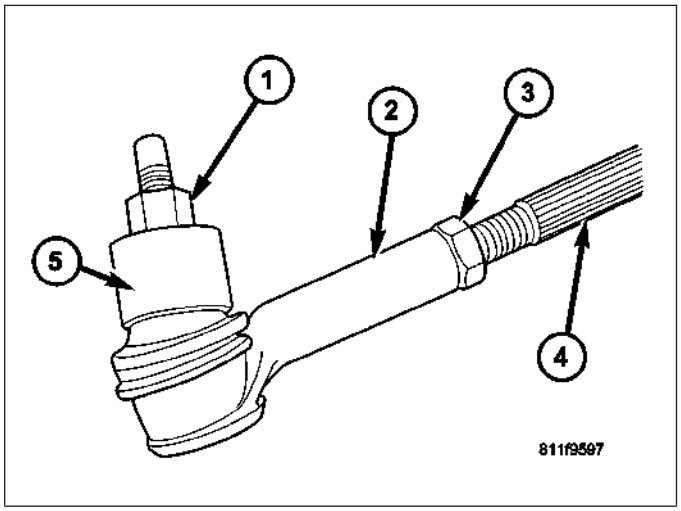
TOE ADJUSTMENT

SUSPENSION HEIGHT MESUREMENT MUST BE PERFORMED BEFORE AN ALIGNMENT.

The wheel toe position adjustment is the final adjustment.

1. Start the engine and turn wheels both ways before straightening the wheels. Secure the steering wheel with the front wheels in the straight-ahead position.
2. Loosen the tie rod jam nuts (3).

NOTE: Each front wheel should be adjusted for one-half of the total toe position specification. This will ensure the steering wheel will be centered when the wheels are positioned straight-ahead.



3. Adjust the wheel toe position by turning the inner tie rod (4) as necessary.
4. Tighten the tie rod jam nut (3) to 130 N·m (96 ft. lbs.).
5. Verify the specifications.
6. Turn off engine.

CAMBER, CASTER AND TOE ADJUSTMENT

NOTE: SUSPENSION HEIGHT MEASUREMENT MUST BE PERFORMED BEFORE AN ALIGNMENT.

Camber and caster angle adjustments involve changing the position of the lower control arm with the slots in the frame brackets to move the lower control arm inwards or outwards for proper adjustment. **This can be achieved by using a long pry bar with a curved tip and inserting the pry bar into the lower control arm frame brackets and prying inwards or outwards.**

NOTE: Camber and caster adjustments must be made at the lower control arm Do not use the upper control arm for Camber and Caster adjustments.

NOTE: When the lower control arm pivot bolts are loosened the lower control arm will normally go outwards automatically with the weight of the vehicle.

CASTER

Moving the rear position of the lower control arm at the frame in or out, will change the caster angle significantly and camber angle only slightly. To maintain the camber angle while adjusting caster, move the rear of the lower control arm in or out. Then move the front of the lower control arm slightly in the opposite direction.

CAMBER

Move both the front and rear of the lower control arm together in or out. This will change the camber angle significantly and caster angle slightly.

After adjustment is made tighten the lower control arm bolt & nuts to 244 N·m (180 ft. lbs.).

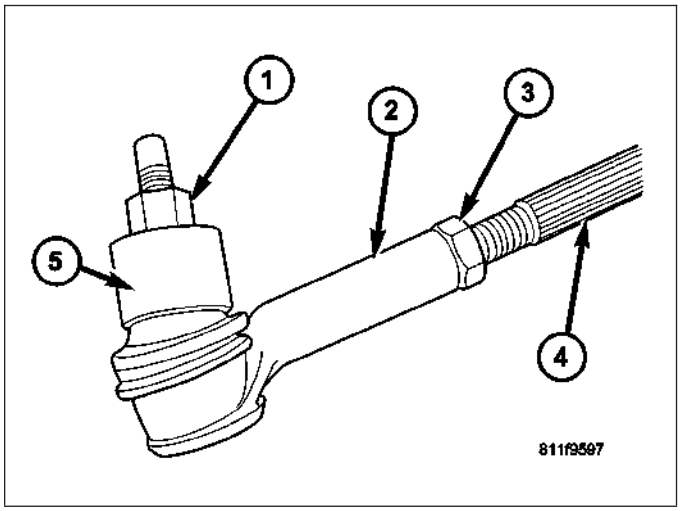
TOE ADJUSTMENT

The wheel toe position adjustment is the final adjustment.

1. Start the engine and turn wheels both ways before straightening the wheels. Secure the steering wheel with the front wheels in the straight-ahead position.
2. Loosen the tie rod jam nuts (3).

NOTE: Each front wheel should be adjusted for one-half of the total toe position specification. This will ensure the steering wheel will be centered when the wheels are positioned straight-ahead.

3. Adjust the wheel toe position by turning the inner tie rod (4) as necessary.
4. Tighten the tie rod jam nut (3) to 130 N·m (96 ft. lbs.).
5. Verify the specifications.
6. Turn off engine.



SPECIFICATIONS

ALIGNMENT

NOTE: All alignment specifications are in degrees.

SPECIFICATIONS

DESCRIPTION	SPECIFICATION			
VEHICLE	WHEEL BASE	CASTER	CAMBER	TOTAL TOE-IN
ALL	119.0 in	3.5 ±.5°°	0°±.5°	.10°
MAX RT/LT DIFFERENCE	—	.50°	.50°	0.05° ± 0.05°
DESCRIPTION	**REAR SPECIFICATION**			
CAMBER (-.10° ± 0.35°)		TOTAL TOE-IN (0.30° ± 0.35°)		
THRUST ANGLE 0° ± 0.4°				

FRONT

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FRONT

DESCRIPTION

SUSPENSION

The front suspension is designed to allow each wheel to adapt to different road surfaces independently. The wheels are mounted to hub/bearings units bolted to the steering knuckle. The double-row hub bearings are sealed and lubricated for life. The steering knuckles turn (pivot) on ball joints.

The front suspension is comprised of :

- Shock absorbers
- Torsion bar
- Control arms
- Steering knuckles
- Stabilizer bar
- Stabilizer link
- Tie Rod Ends
- Hub/Bearing
- Rack & Pinion
- Ball Joints

NOTE: Components attached with a nut must be torqued to specification.

NOTE: Suspension components with rubber/urethane bushings should be tightened with the vehicle at normal ride height. It is important to have the springs supporting the weight of the vehicle when the fasteners are torqued. If springs are not at their normal ride position, vehicle ride comfort could be affected and premature bushing wear may occur.

CONTROL ARMS

The lower control arms bolt to the lower frame brackets and pivots through bushings. The frame brackets have slotted holes which allow the arms to be adjusted for caster and camber.

The control arms have lube for life ball studs. The control arm travel (jounce) is limited through the use of rubber/urethane bumpers. Rebound travel is limited by the shock absorber.

SPECIFICATIONS

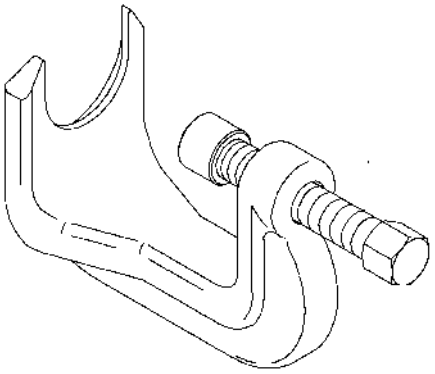
TORQUE CHART

TORQUE SPECIFICATIONS

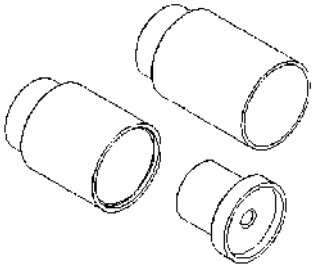
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Shock Absorber Upper Nut	102	75	—
Shock Absorber Lower Bolt	81	60	—
Lower Suspension Arm Frame Nuts	244	180	—
Lower Suspension Arm Ball Joint Nut	95	70	—
Upper Suspension Arm Frame Nuts	102	75	—
Upper Suspension Arm Ball Joint Nut	75	55	—
Stabilizer Bar Frame Bolt	61	45	—
Stabilizer Link to Lower Control Arm	169	125	—
Stabilizer Link Stabilizer Bar Nut	61	45	—
Hub/Bearing Bolts	163	120	—
Tie Rod End to Knuckle Nut	75	55	—
Tie Rod End Jam Nut	130	96	—

SPECIAL TOOLS

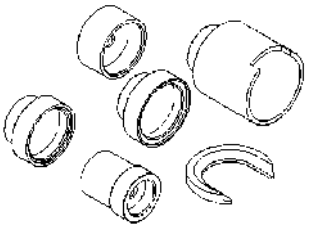
FRONT SUSPENSION



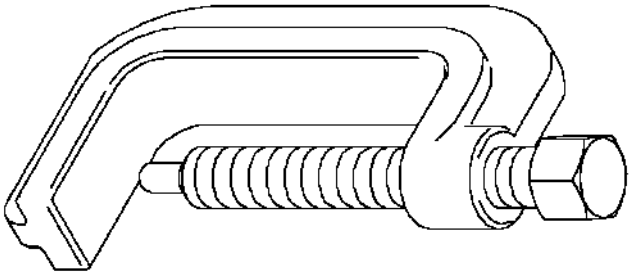
PULLER - 8677



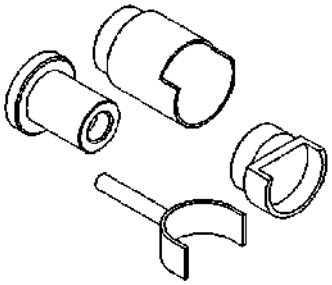
BALL JOINT INSTALLER/REMOVER - 9333



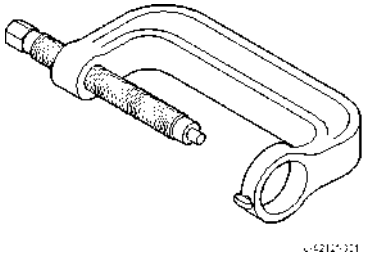
LOWER CONTROL ARM BUSHING REMOVER/ INSTALLER - 9334



TORSION BAR LOADER/UNLOADER - 8686



TORSION BAR BUSHING REMOVER/INSTALLER - 9335



BALL JOINT PRESS - C-4212F

BUSHINGS

DESCRIPTION

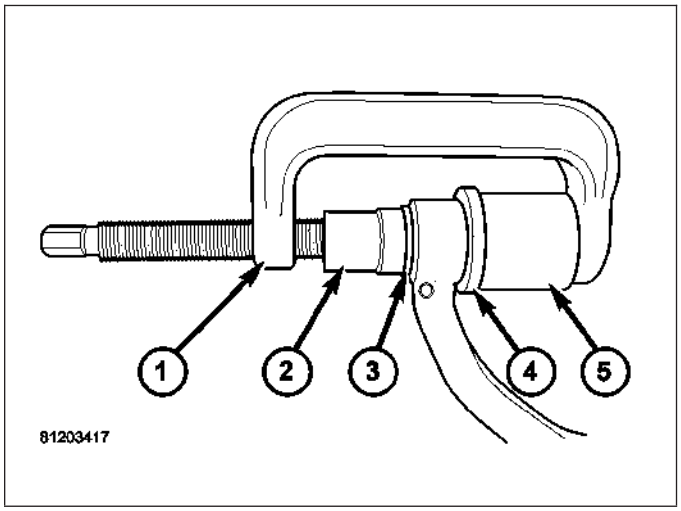
Suspension components with rubber/urethane bushings should be tightened with the vehicle at normal ride height. It is important to have the springs supporting the weight of the vehicle when the fasteners are torqued. If springs are not at their normal ride position, vehicle ride comfort could be affected and premature bushing wear may occur.

REMOVAL

LOWER CONTROL ARM BUSHINGS

1. Remove the lower control arm (Refer to 2 - SUSPENSION/FRONT/LOWER CONTROL ARM - REMOVAL).
2. Secure the control arm in a vise.

NOTE: Extreme pressure lubrication must be used on the threaded portions of the tool. This will increase the longevity of the tool and insure proper operation during the removal and installation process.

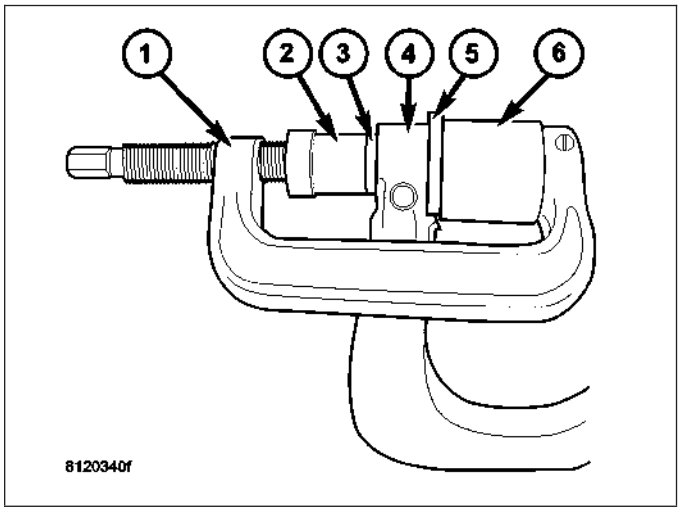


LARGE BUSHING FRONT PART OF THE CONTROL ARM

1. Install the bushing tools C4212–F (Press)(1), (9334-4 (Driver)(2), 9334–6 (Spacer)(4) and 9334-5 (Receiver)(5) as shown for the replacement of the large bushing (3).

SMALL BUSHING TORSION BAR SIDE

1. Install bushing remover tools C4212–F (Press)(1), 9334-4 (Driver)(2), 9334-6 (Spacer)(5) and 9334-5 (Receiver)(6) as shown for the small bushing (3) removal.

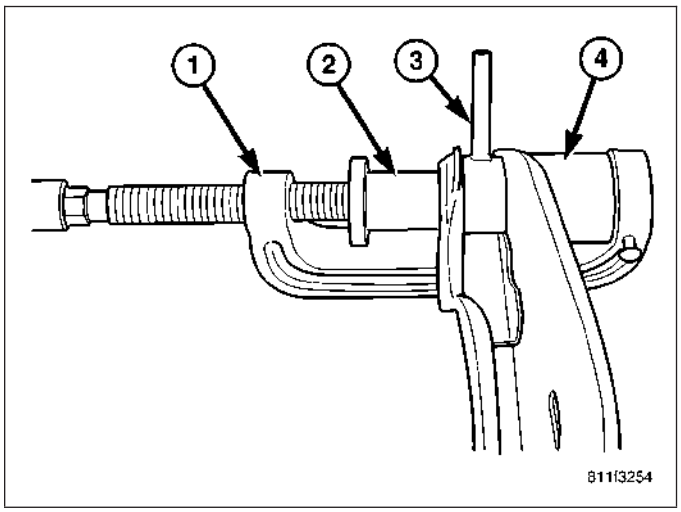


TORSION BAR CROSSMEMBER BUSHING

1. Remove the torsion bar cross member.
2. Secure the cross member in a vise.

NOTE: Extreme pressure lubrication must be used on the threaded portions of the tool. This will increase the longevity of the tool and insure proper operation during the removal and installation process.

3. Install special tools C4212–F (Press)(1), 9335-2 (Reciever)(4), 9335-3 (Driver)(2) and 9335-4 (Spacer)(3) as shown in the graphic.
4. Press out the bushing.



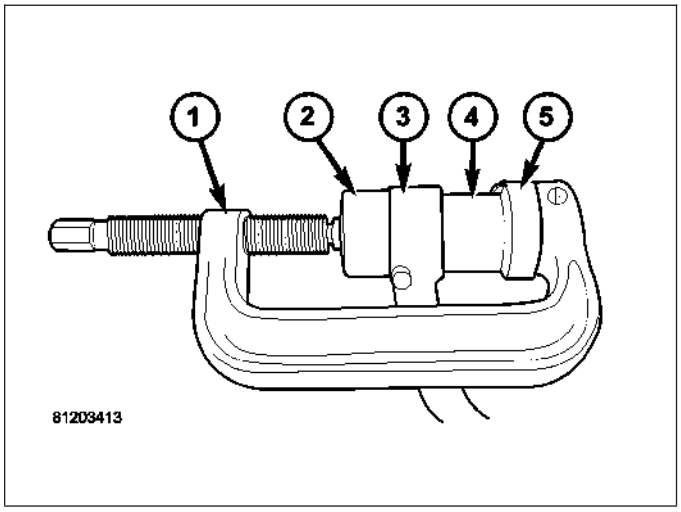
INSTALLATION

LOWER CONTROL ARM BUSHINGS

LARGE BUSHING FRONT PART OF THE CONTROL ARM

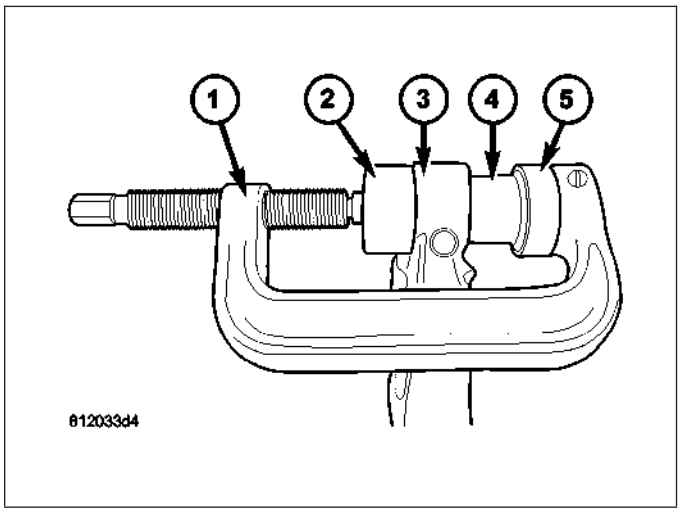
NOTE: Extreme pressure lubrication must be used on the threaded portions of the tool. This will increase the longevity of the tool and insure proper operation during the removal and installation process.

1. Install the new bushing (4) into the control arm (3) using special tools C4212–F (Press)(1), 9334-3 (Bushing installation depth spacer)(2), 9334-1 (driver)(5) as shown.



SMALL BUSHING TORSION BAR SIDE

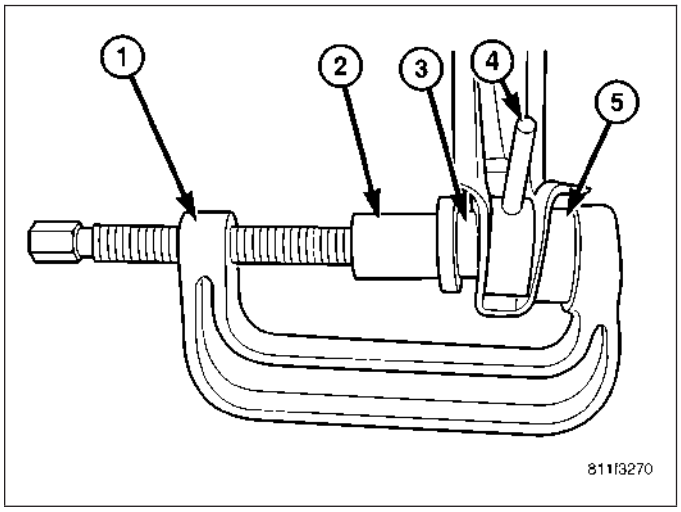
1. Install the new bushing (4) into the lower control arm (3) using tools C4212–F (Press)(1), 9334-3 (Bushing installation depth spacer), 9334-2 (Driver) as shown.



1. Remove the control arm from the vise.
2. Install the lower control arm (Refer to 2 - SUSPENSION/FRONT/LOWER CONTROL ARM - INSTALLATION).
3. Reset the vehicle ride height (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE).
4. Perform a wheel alignment (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE).

TORSION BAR CROSS MEMBER BUSHING

NOTE: Extreme pressure lubrication must be used on the threaded portions of the tool. This will increase the longevity of the tool and insure proper operation during the removal and installation process.



1. Install the new bushing (3) into the cross member using special tools C4212–F (Press)(1), 9335-3(Driver)(2), 9335-4 (Spacer)(4) and 9335-1 (Depth setting cup)(5) making sure to properly orient the bushing.
2. Remove the cross member from the vise.
3. Install the torsion bar cross member.
4. Reset the vehicle ride height (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE).
5. Perform a wheel alignment (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE).

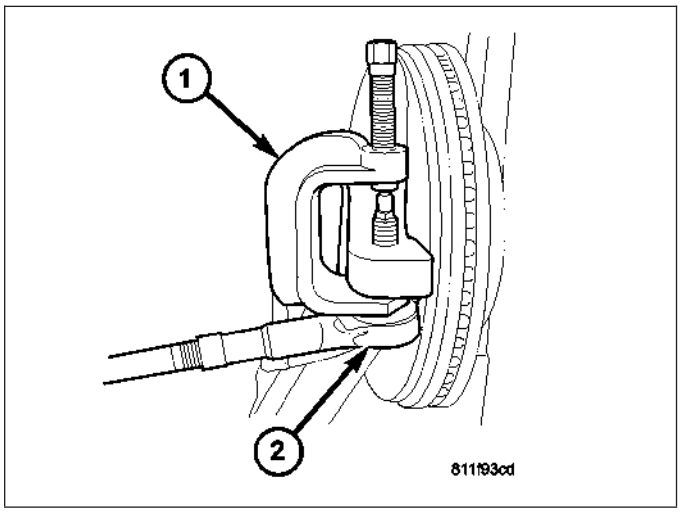
HUB / BEARING

REMOVAL

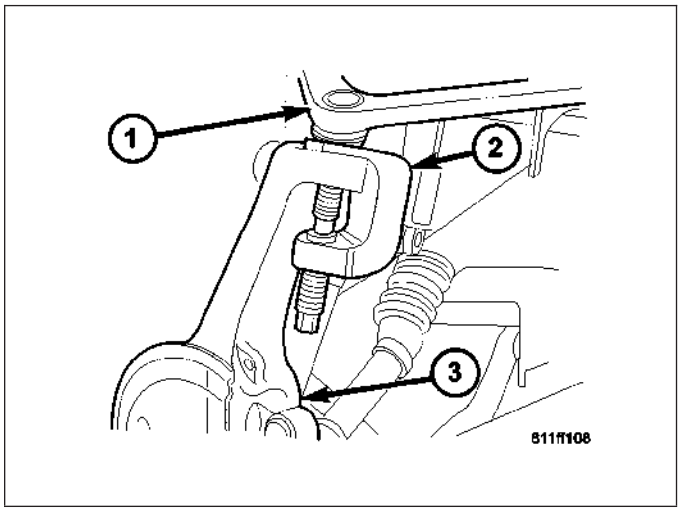
1. Raise and support the vehicle.
2. Remove the wheel and tire assembly.
3. Remove the brake caliper and rotor (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - REMOVAL).
4. Remove the ABS wheel speed sensor if equipped, (Refer to 5 - BRAKES/ELECTRICAL/FRONT WHEEL SPEED SENSOR - REMOVAL).
5. Remove the halfshaft nut **4X4 only**.

NOTE: Do not strike the knuckle with a hammer to remove the tie rod end or the ball joint. Damage to the steering knuckle will occur.

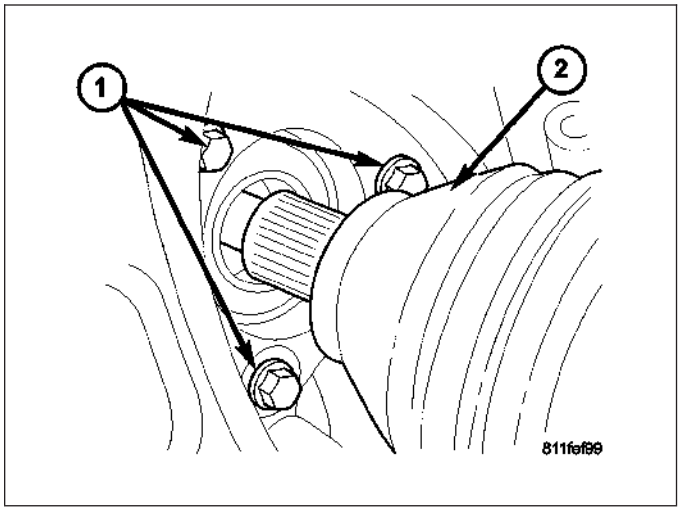
6. Remove the tie rod end nut and separate the tie rod (2) from the knuckle using special tool 8677 (1).



7. Remove the upper ball joint nut and separate the upper ball joint (1) from the knuckle (3) using special tool 8677 (2).

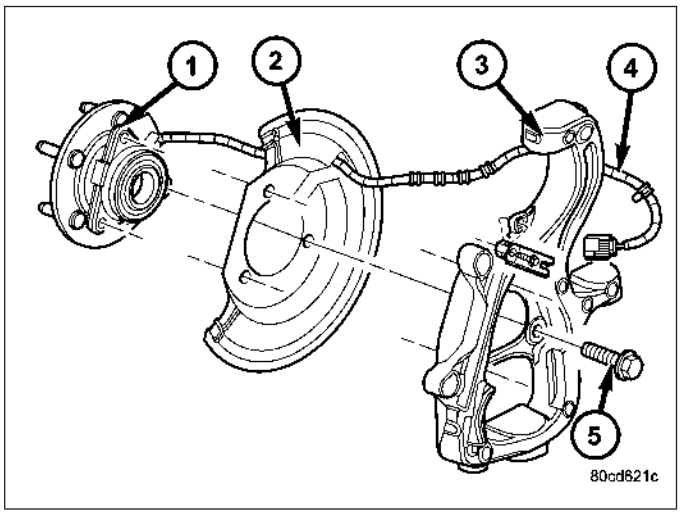


8. Pull down on the steering knuckle to separate the halfshaft from the hub/bearing. **4X4 only**
9. Remove the three hub/bearing mounting bolts (1) from the steering knuckle.
10. Slide the hub/bearing out of the steering knuckle.
11. Remove the brake dust shield.



INSTALLATION

1. Install the brake dust shield (2).
2. Install the hub/bearing (1) into the steering knuckle (3) and tighten the bolts (5) to 163 N·m (120 ft. lbs.).
3. Install the brake rotor and caliper (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - INSTALLATION).
4. Install the ABS wheel speed sensor (4) if equipped (Refer to 5 - BRAKES/ELECTRICAL/FRONT WHEEL SPEED SENSOR - INSTALLATION).



5. Install the upper ball joint nut to the steering knuckle and tighten to 75 N·m (55 ft. lbs.).
6. Install the tie rod end nut to the steering knuckle and tighten to 81 N·m (60 ft. lbs.).
7. Install the halfshaft nut and tighten to 251 N·m (185 ft. lbs.) **4X4 only**.
8. Install the wheel and tire assembly (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).
9. Remove the support and lower vehicle.

KNUCKLE

DESCRIPTION

The knuckle is a single casting with legs machined for the upper and lower ball joints. The knuckle also has machined mounting locations for the front brake calipers and hub bearing.

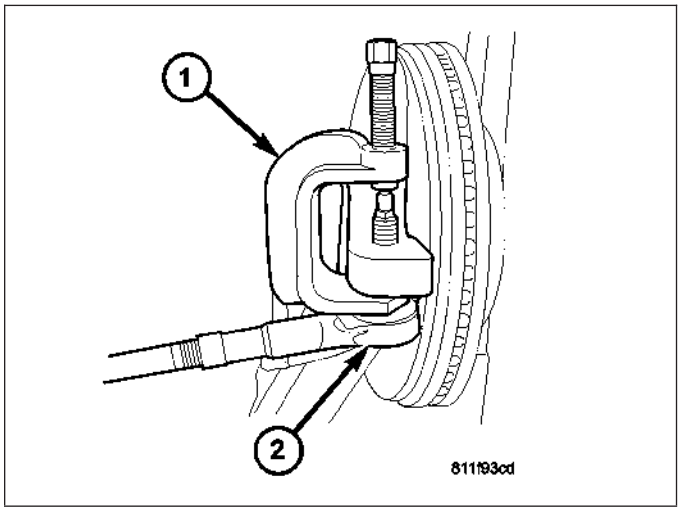
OPERATION

The steering knuckle pivot between the upper and lower ball joint. Steering linkage attached to the knuckle allows the vehicle to be steered.

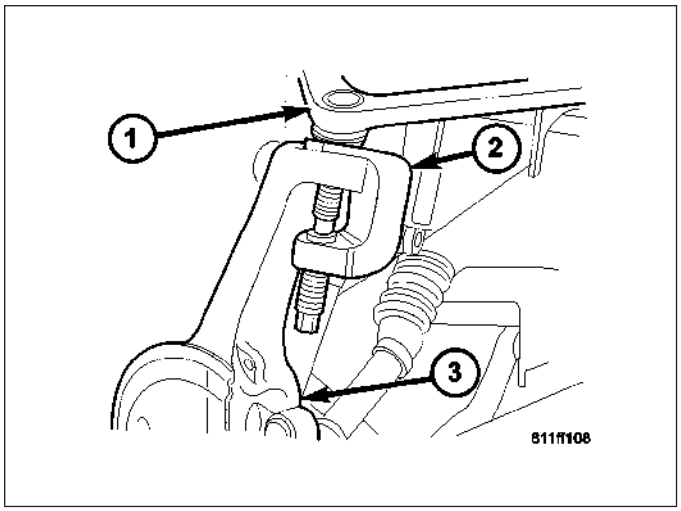
REMOVAL

1. Raise and support the vehicle.
2. Remove the wheel and tire assembly.
3. Remove the brake caliper, rotor (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - REMOVAL), shield and ABS wheel speed sensor if equipped (Refer to 5 - BRAKES/ELECTRICAL/ FRONT WHEEL SPEED SENSOR - REMOVAL).
4. Remove the front halfshaft nut **4X4 only**.
5. Remove the tie rod end nut. Separate the tie rod (2) from the knuckle with Remover 8677 (1).

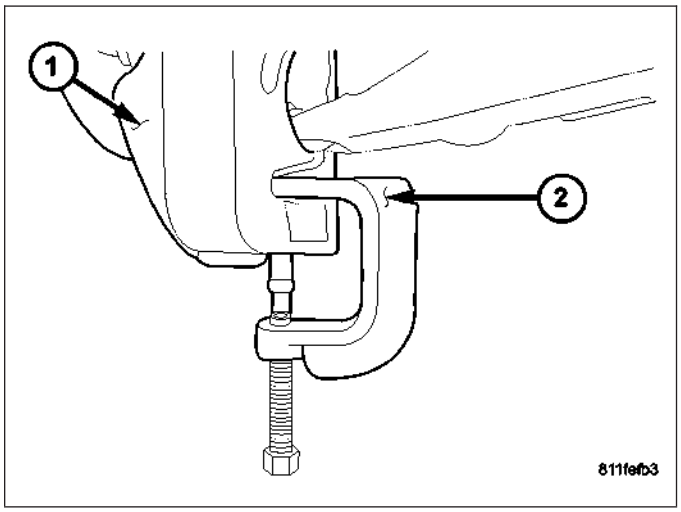
CAUTION: When installing Remover 8677 to separate the ball joint, be careful not to damage the ball joint seal.



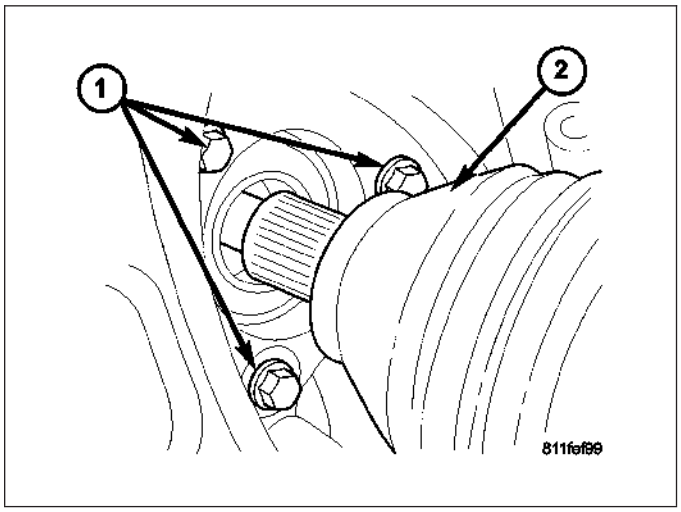
6. Remove the upper ball joint nut. Separate the ball joint (1) from the knuckle (3) with Remover 8677 (2).



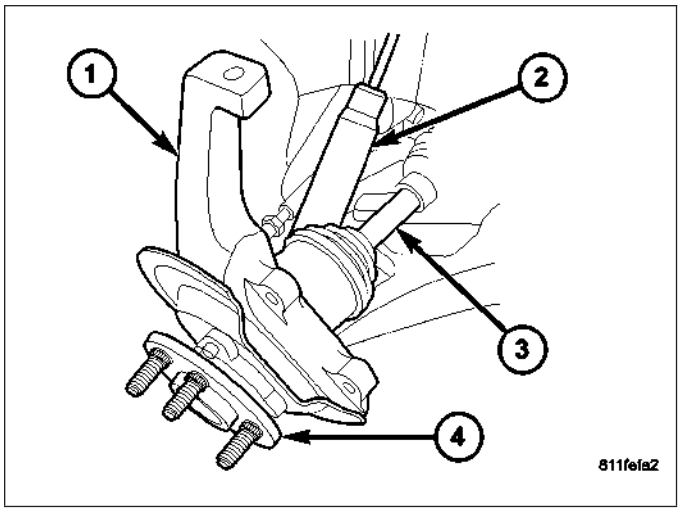
7. Install an hydraulic jack to support the lower control arm.
8. Remove the lower ball joint nut. Separate the ball joint from the knuckle (1) with Remover 8677 (2) and remove the knuckle.



9. Remove the hub/bearing bolts (1) from the knuckle.



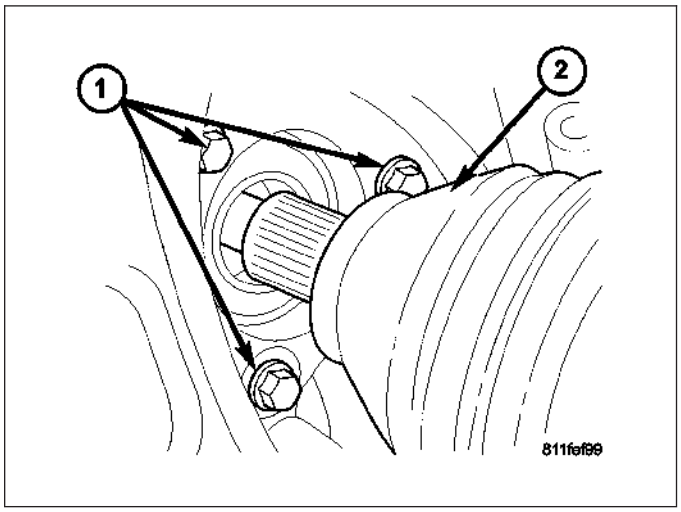
10. Remove the hub/bearing (4) from the steering knuckle (1) (Refer to 2 - SUSPENSION/FRONT/ HUB / BEARING - REMOVAL).
11. Remove the steering knuckle (1).



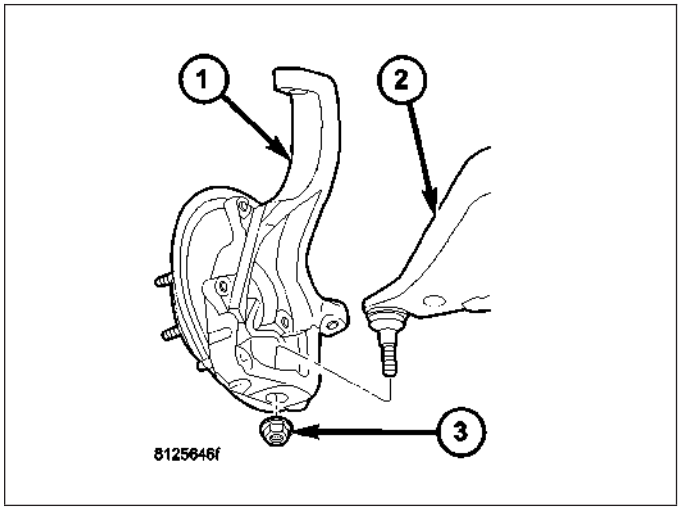
INSTALLATION

CAUTION: The ball joint stud tapers must be CLEAN and DRY before installing the knuckle. Clean the stud tapers with mineral spirits to remove dirt and grease.

1. Install the hub/bearing to the steering knuckle and tighten the bolts (1) to 163 N·m (120 ft. lbs.).

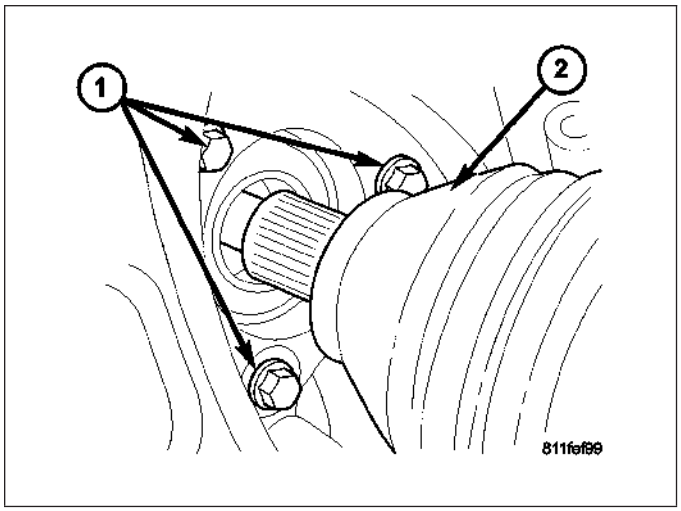


2. Install the knuckle (1) onto the upper and lower ball joints.
3. Install the upper ball joint nut. Tighten the nut to 75 N·m (55 ft. lbs.).
4. Install the lower ball joint nut (3). Tighten the nut to 95 N·m (70 ft. lbs.).
5. Remove the hydraulic jack from the lower suspension arm (2).



6. Install the tie rod end and tighten the nut to 75 N·m (55 ft. lbs.).

7. Install the front halfshaft (2) into the hub/bearing **4X4 only**.
8. Install the the halfshaft nut and tighten to 251 N·m (185 ft. lbs.) **4X4 only**.
9. Install the ABS wheel speed sensor if equipped (Refer to 5 - BRAKES/ELECTRICAL/FRONT WHEEL SPEED SENSOR - INSTALLATION) and brake shield, rotor and caliper (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - INSTALLATION).
10. Install the wheel and tire assembly (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).
11. Remove the support and lower the vehicle.
12. Perform a wheel alignment (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE).



BALL JOINT-LOWER

DIAGNOSIS AND TESTING

LOWER BALL JOINT

NOTE: If the ball joint is equipped with a lubrication fitting, grease the joint then road test the vehicle before performing test.

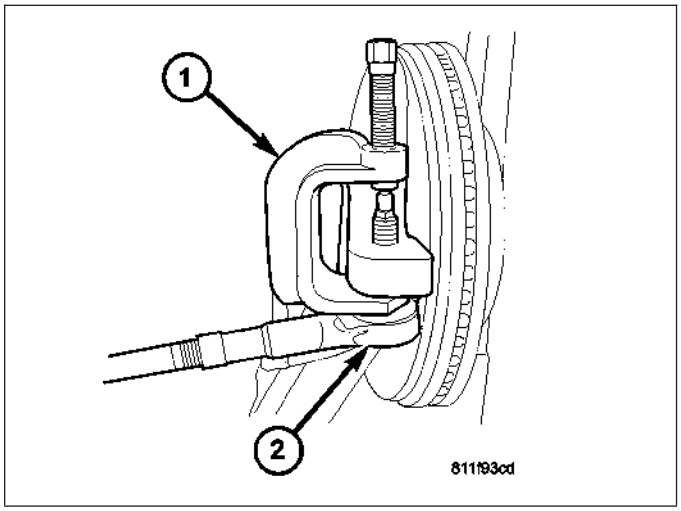
1. Raise the front of the vehicle. Place safety floor stands under both lower control arms as far outboard as possible. Lower the vehicle to allow the stands to support some or all of the vehicle weight.
2. Mount a dial indicator solidly to the topside of the lower control arm and then zero the dial indicator.
3. Position the indicator plunger against the bottom surface of the steering knuckle.

NOTE: The dial indicator plunger must be perpendicular to the machined surface of the steering knuckle.

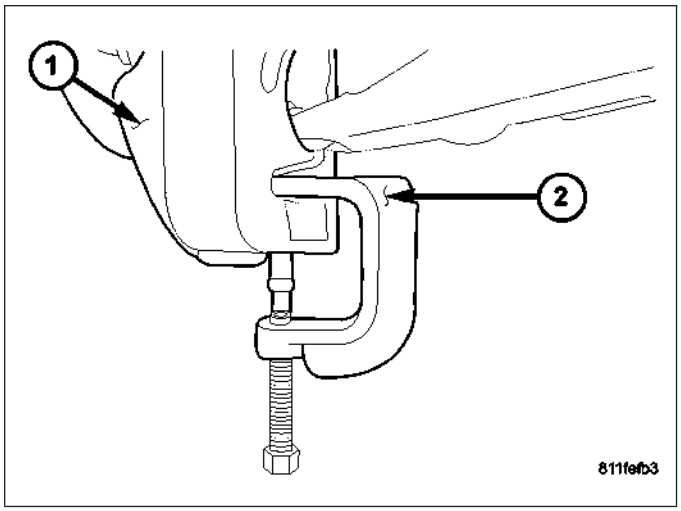
4. Position a pry bar under the tire assembly. Pry upwards on the tire assembly.
5. If the travel exceeds 0.5 mm (0.020 in.), replace the lower ball joint (Refer to 2 - SUSPENSION/FRONT/LOWER BALL JOINT - REMOVAL).

REMOVAL

1. Remove the tire and wheel assembly.
2. Remove the brake caliper and rotor (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - REMOVAL).
3. Disconnect the tie rod (1) from the steering knuckle using special tool 8677 (1) (Refer to 19 - STEERING/LINKAGE/TIE ROD END - REMOVAL).

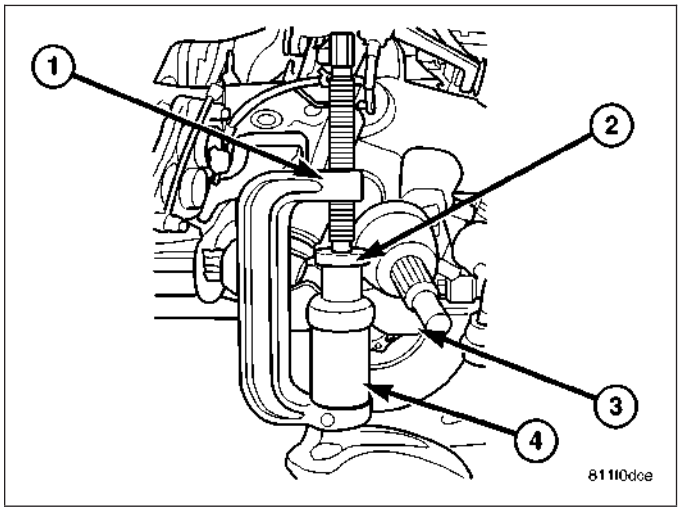


4. Seperate the lower ball joint from the steering knuckle (1) using special tool 8677 (2).
5. Remove the steering knuckle (Refer to 2 - SUSPENSION/FRONT/KNUCKLE - REMOVAL).
6. Move the halfshaft to the side and support the halfshaft out of the way **4X4 only**.
7. Chisel out the ball joint stakes.



NOTE: Extreme pressure lubrication must be used on the threaded portions of the tool. This will increase the longevity of the tool and insure proper operation during the removal and installation process.

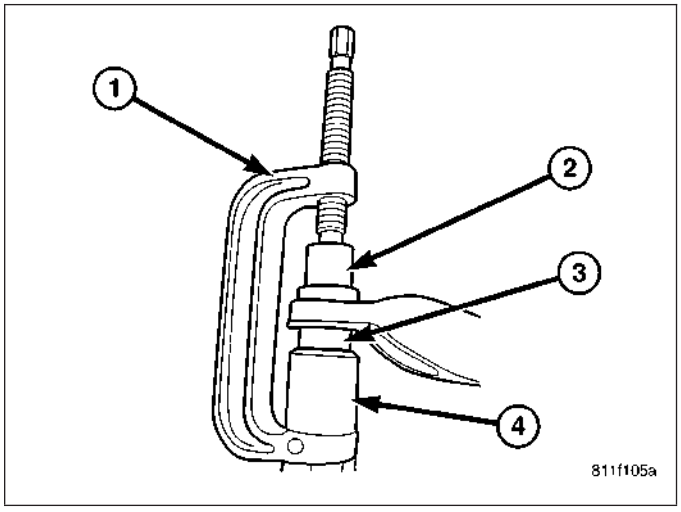
8. Press the ball joint from the lower control arm (3) using special tools C-4212–F (PRESS) (1), 9331-1 (Driver) (2) and 9331-2 (Reciever) (4).



INSTALLATION

NOTE: Extreme pressure lubrication must be used on the threaded portions of the tool. This will increase the longevity of the tool and insure proper operation during the removal and installation process.

1. Install the ball joint (3) into the control arm and press in using special tools C-4212–F (press) (1), 9331-1 (Reciever) (2) and 9331-3 (Driver) (4).



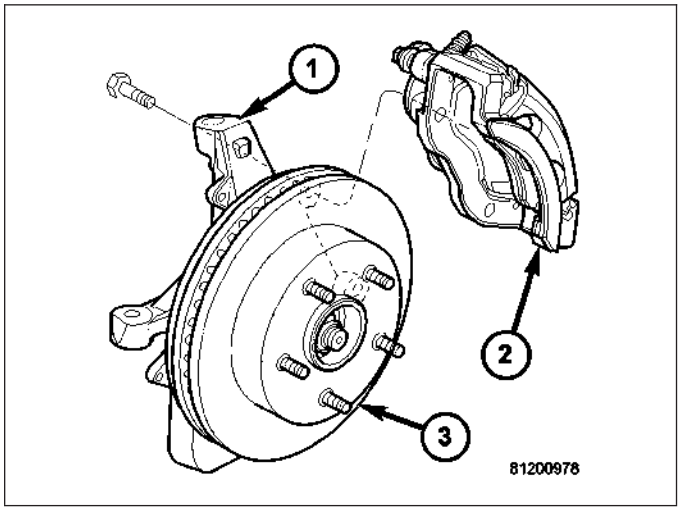
2. Stake the ball joint flange in four evenly spaced places around the ball joint flange, using a chisel and hammer.
3. Remove the support for the halfshaft and install into position **4X4 only**.
4. Install the steering knuckle (Refer to 2 - SUSPENSION/FRONT/KNUCKLE - INSTALLATION).
5. Install the tie rod end into the steering knuckle (Refer to 19 - STEERING/LINKAGE/TIE ROD END - INSTALLATION).
6. Install and tighten the halfshaft nut to 251 N·m (185 ft. lbs.). (If Equipped).

7. Install the brake caliper and rotor (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - INSTALLATION).
8. Install the tire and wheel assembly (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).
9. Check the vehicle ride height (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE).
10. Perform a wheel alignment (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE).

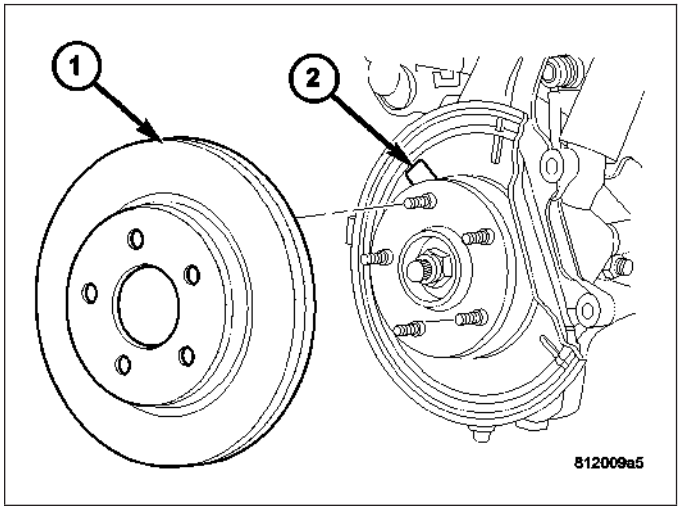
CONTROL ARM-LOWER

REMOVAL

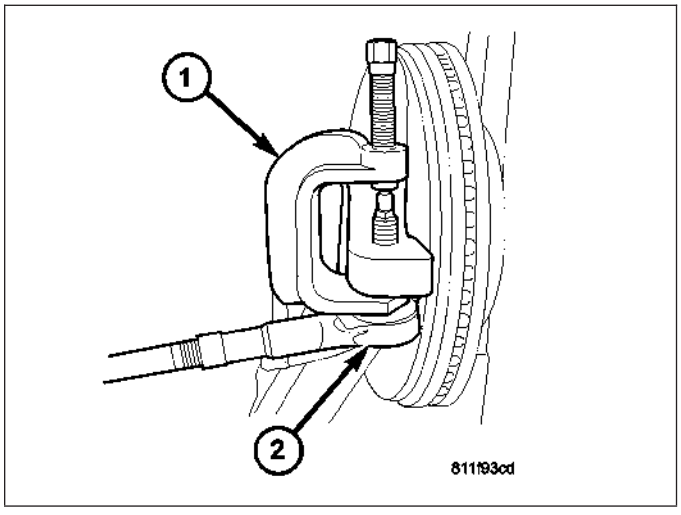
1. Raise and support the vehicle.
2. Remove the wheel and tire assembly.
3. Remove the disc brake caliper assembly (2) (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - REMOVAL).



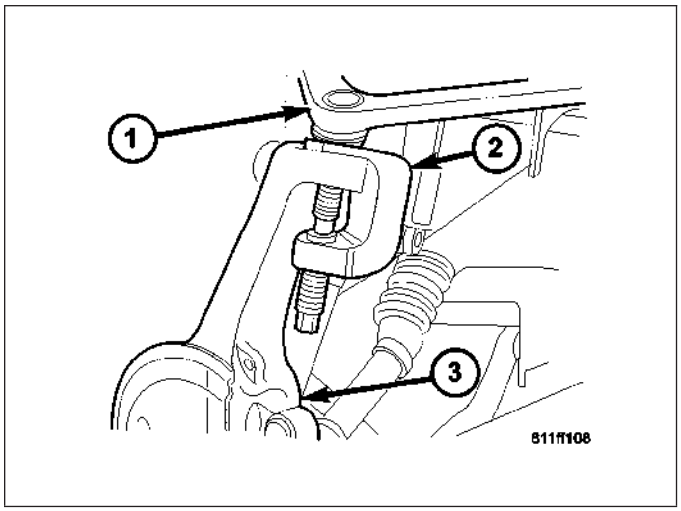
4. Remove the disc brake rotor (1) (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - REMOVAL).
5. Disconnect the wheel speed sensor at the wheel well.



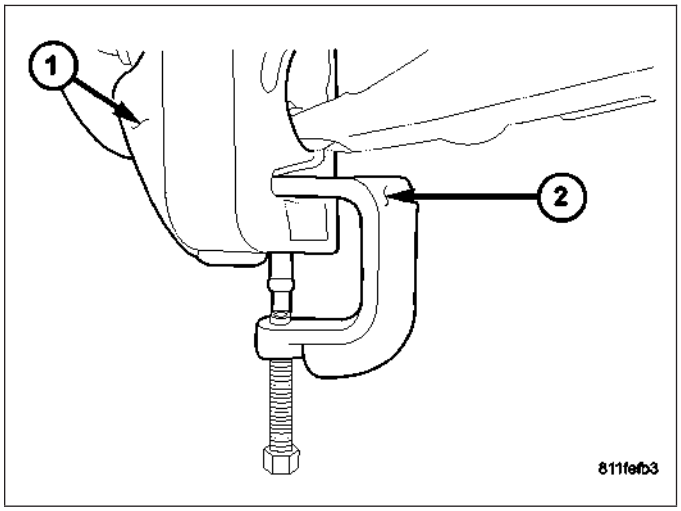
6. Disconnect the tie rod (2) from the knuckle using special tool 8677 (1) (Refer to 19 - STEERING/LINKAGE/TIE ROD END - REMOVAL).



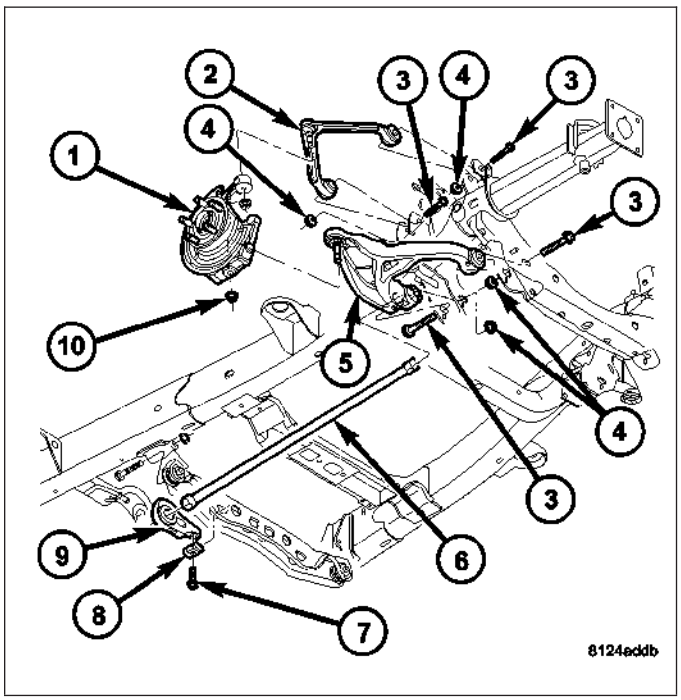
7. Remove the front halfshaft nut **4X4**.
8. Remove the upper ball joint nut. Separate the upper ball joint (1) from the steering knuckle (3) with Remover 8677 (2).



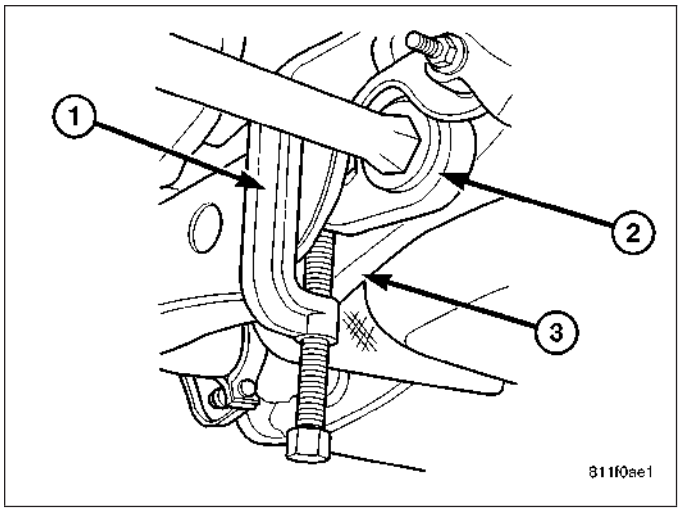
9. Remove the lower ball joint nut. Separate the lower ball joint from the steering knuckle (1) with Remover 8677 (2).



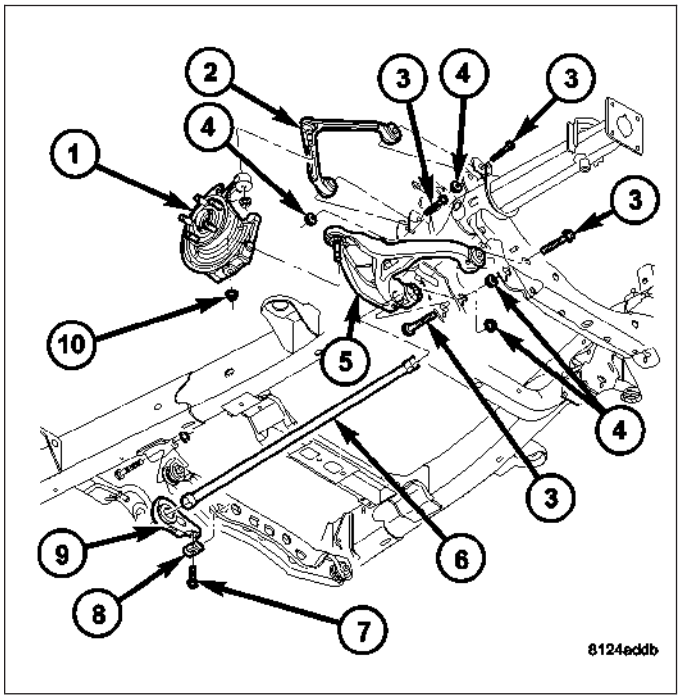
10. Remove the steering knuckle (1).



11. Unload the torsion bar using special tool 8686 (1).

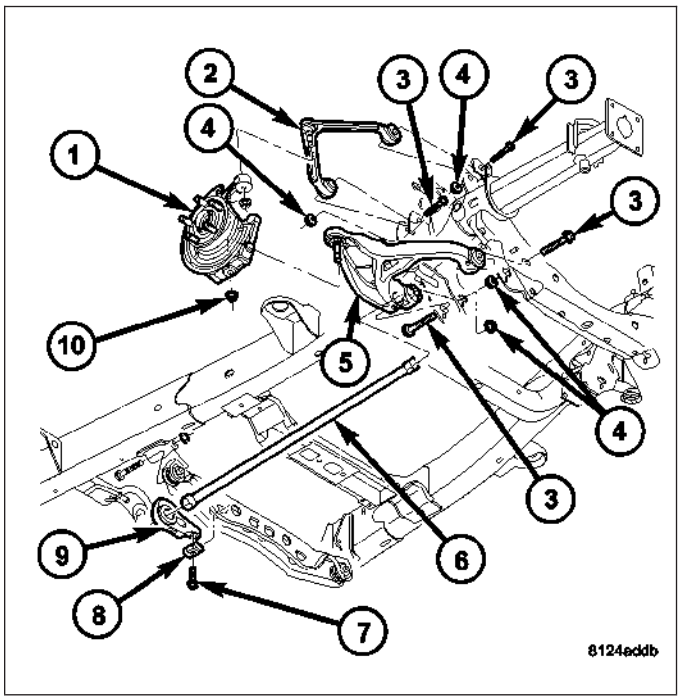


12. Remove the torsion bar (6) from the vehicle (Refer to 2 - SUSPENSION/FRONT/TORSION BAR - REMOVAL).
13. Remove the stabilizer bar link (Refer to 2 - SUSPENSION/FRONT/STABILIZER LINK - REMOVAL).
14. Remove the shock absorber lower bolt.
15. Remove the front and rear pivot bolts (3&4).
16. Remove the lower control arm (5) from the vehicle.



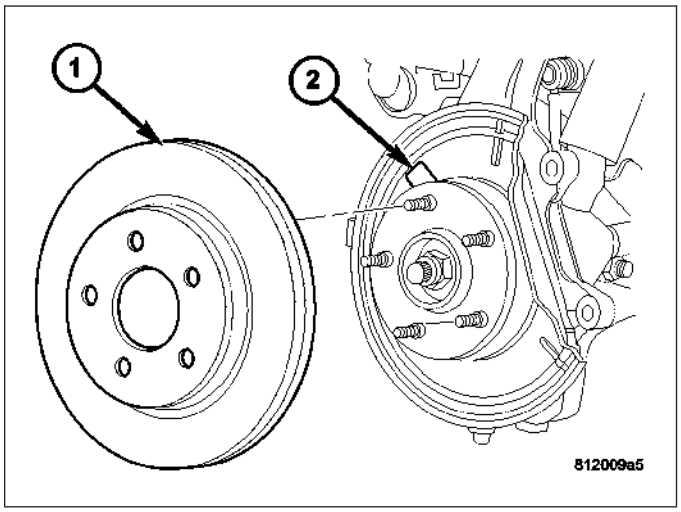
INSTALLATION

1. Position the lower control arm (5) at the frame rail brackets. Install the pivot bolts (3) and nuts (4). Tighten the nuts finger-tight.

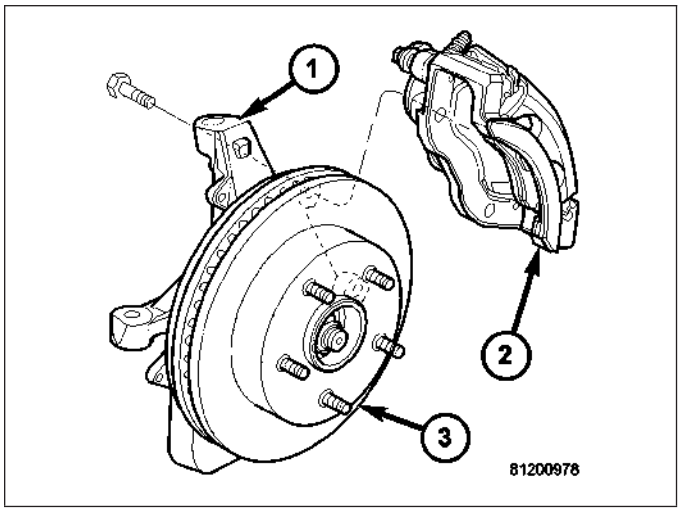


CAUTION: The ball joint stud taper must be CLEAN and DRY before installing the knuckle. Clean the stud taper with mineral spirits to remove dirt and grease.

2. Install the steering knuckle (1).
3. Insert the lower ball joint into the steering knuckle. Install and tighten the retaining nut to 95 N·m (70 ft. lbs.).
4. Install the torsion bar (6) (Refer to 2 - SUSPENSION/FRONT/TORSION BAR - INSTALLATION).
5. Install shock absorber lower bolt and tighten to 81 N·m (60 ft. lbs.).
6. Install the front halfshaft nut **4X4**.
7. Insert the upper ball joint into the steering knuckle (1). Install and tighten the retaining nut to 75 N·m (55 ft. lbs.).
8. Install the stabilizer bar link (Refer to 2 - SUSPENSION/FRONT/STABILIZER LINK - INSTALLATION) and tighten to 169 N·m (125 ft. lbs.).
9. Tighten the lower control arm pivot nut (4) and bolts (3) (to 244 N·m (180 ft. lbs.).
10. Insert the outer tie rod end into the steering knuckle (1). Install and tighten the retaining nut to 75 N·m (55 ft. lbs.).
11. Install the disc brake rotor (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - INSTALLATION).



12. Install the disc brake caliper and adaptor assembly (2) and tighten to 135 N·m (100 ft. lbs.) (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - INSTALLATION).
13. Install the wheel and tire assembly, (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).
14. Remove the support and lower the vehicle.
15. Adjust the front suspension height and perform a wheel alignment (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE).



SHOCK ABSORBER

DIAGNOSIS AND TESTING

SHOCK

A knocking or rattling noise from a shock absorber may be caused by movement between mounting bushings and metal brackets or attaching components. These noises can usually be stopped by tightening the attaching nuts. If the noise persists, inspect for damaged and worn bushings, and attaching components. Repair as necessary if any of these conditions exist.

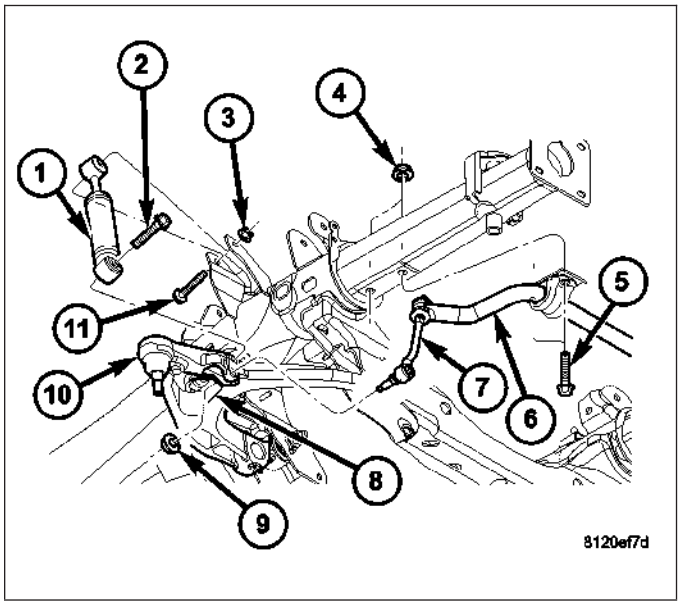
A squeaking noise from the shock absorber may be caused by the hydraulic valving and may be intermittent. This condition is not repairable and the shock absorber must be replaced.

The shock absorbers are not refillable or adjustable. If a malfunction occurs, the shock absorber must be replaced. To test a shock absorber, hold it in an upright position and force the piston in and out of the cylinder four or five times. The action throughout each stroke should be smooth and even.

The shock absorber bushings do not require any type of lubrication. Do not attempt to stop bushing noise by lubricating them. Grease and mineral oil-base lubricants will deteriorate the bushing.

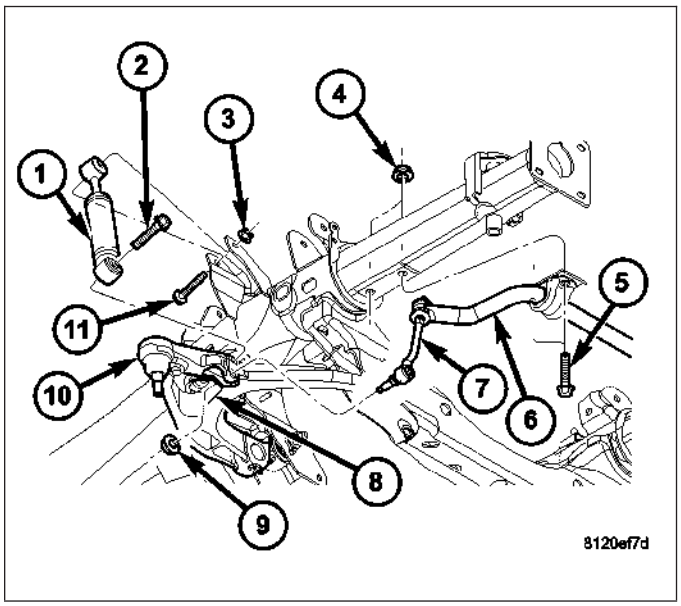
REMOVAL

1. Raise and support the vehicle.
2. Remove the tire and wheel assembly.
3. Support the lower control arm outboard end.
4. Remove the upper shock bolt (11) and nut (3).
5. Remove the stabilizer link (7) lower nut and then separate the stabilizer link from the lower control arm to gain access to the lower shock bolt (2) (Refer to 2 - SUSPENSION/FRONT/STABILIZER LINK - REMOVAL).
6. Remove the lower shock bolt (2).
7. Remove the shock (1).



INSTALLATION

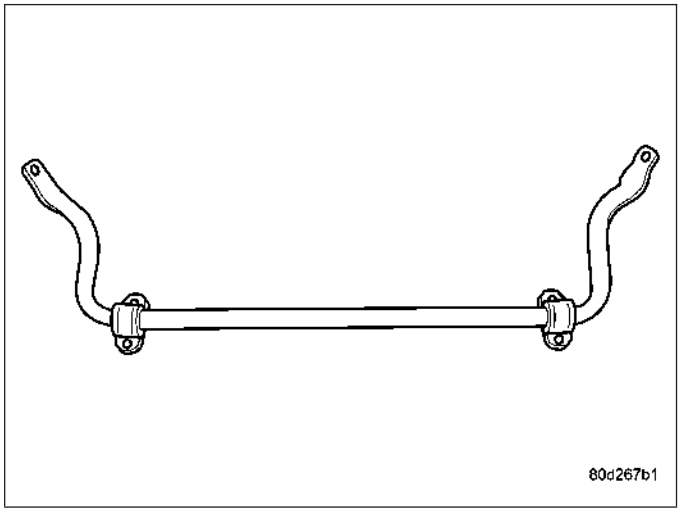
1. Install the upper part of the shock (1) into the frame bracket.
2. Install the nut (3) and bolt (11). Tighten to 102 N·m (75 ft. lbs.).
3. Install the lower part of the shock (1) into the lower control arm and Tighten the bolt (2) to 81 N·m (60 ft. lbs.).
4. Install the stabilizer link (7) lower nut to the lower control arm (Refer to 2 - SUSPENSION/FRONT/ STABILIZER LINK - INSTALLATION).
5. Remove the support from the lower control arm outboard end.
6. Install the tire and wheel assembly (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).
7. Remove the support and lower the vehicle.



STABILIZER BAR

DESCRIPTION

The bar extends across the front underside of the chassis and connects to the frame crossmember. The ends of the bar mount to the lower suspension arm. All mounting points of the stabilizer bar are isolated by bushings.



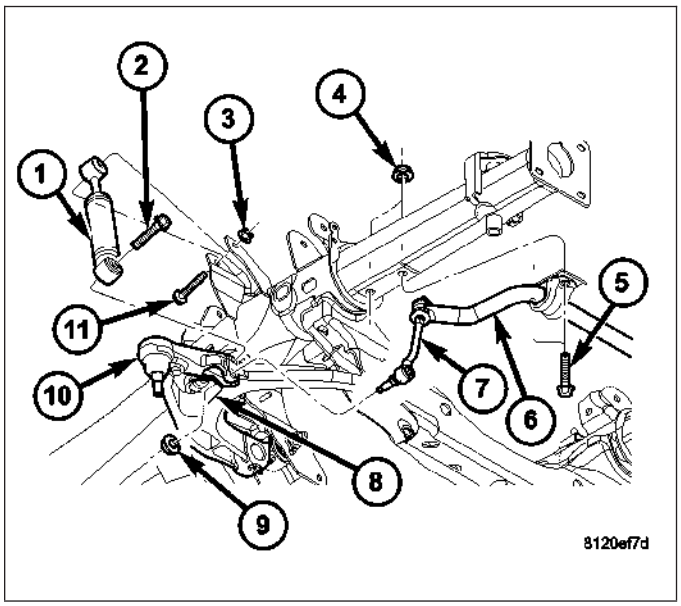
OPERATION

The stabilizer bar is used to minimize vehicle front sway during turns. The bar helps to maintain a flat attitude to the road surface.

REMOVAL

NOTE: To service the stabilizer bar the vehicle should be on a drive on hoist. The vehicle suspension must be at curb height for stabilizer bar installation.

1. Remove the stabilizer link upper nut and remove the retainers and grommets (Refer to 2 - SUSPENSION/FRONT/STABILIZER LINK - REMOVAL).
2. Remove the stabilizer bar retainer bolts (5) and nuts (4) also remove the retainers (5) from the frame sway bar and remove the bar (6).
3. If necessary, remove the bushings from the stabilizer bar.

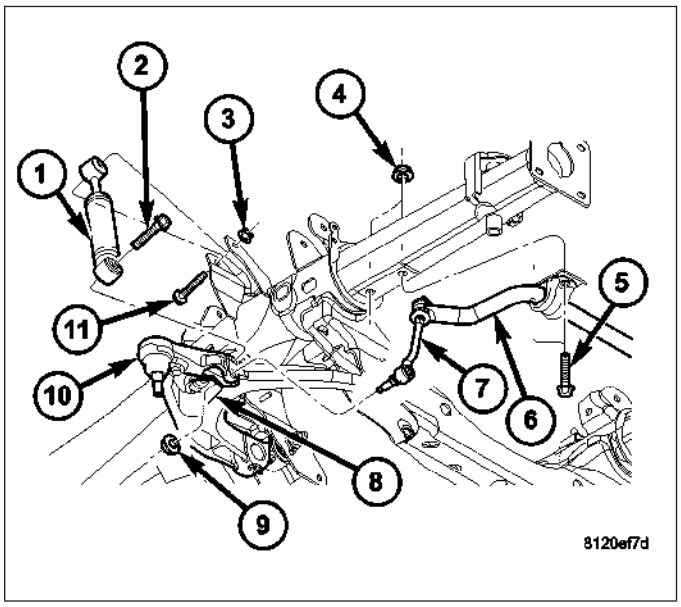


INSTALLATION

NOTE: To service the stabilizer bar the vehicle must be on a drive on hoist. The vehicle suspension must be at curb height for stabilizer bar installation.

1. If removed, install the bushings on the stabilizer bar.
2. Position the stabilizer bar (6) on the frame crossmember brackets and install the bracket and bolts (5) finger-tight.

NOTE: Check the alignment of the bar to ensure there is no interference with the either frame rail or chassis component. Spacing should be equal on both sides.

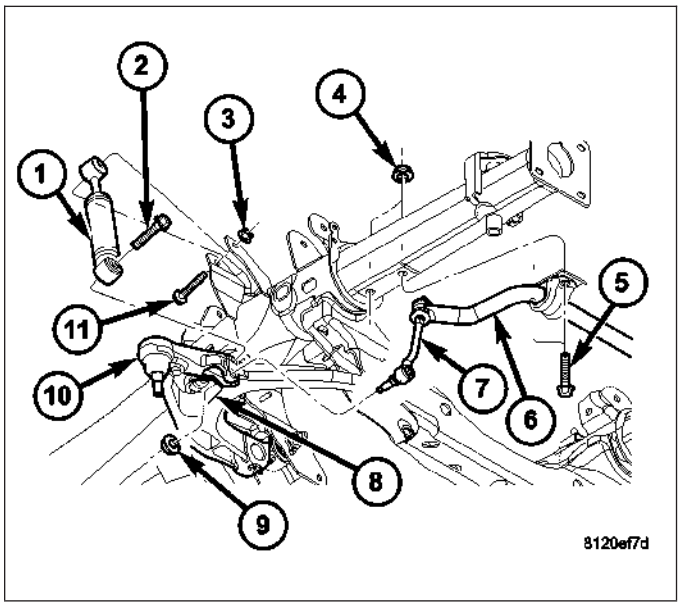


3. Install the stabilizer bar (6) to the stabilizer link (7) and install the grommets and retainers and tighten to 61 N·m (45 ft. lbs.).
4. Tighten the brackets to the frame and tighten to 61N·m (45 ft. lbs.).
5. Install the nuts to the stabilizer link and tighten to 169 N·m (125 ft. lbs.) (Refer to 2 - SUSPENSION/FRONT/STABILIZER LINK - INSTALLATION).

STABILIZER LINK

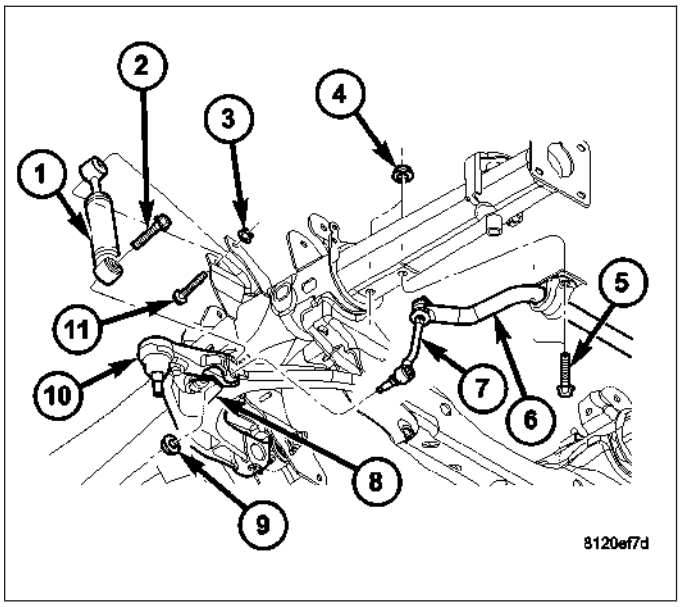
REMOVAL

1. Raise and support the vehicle.
2. Remove the lower nut (9).
3. Remove the upper nut, retainers and grommets from the stabilizer bar.
4. Remove the stabilizer link (7) from the vehicle.



INSTALLATION

1. Install the stabilizer link (7) to the vehicle.
2. Install the retainers, grommets and upper nut to the stabilizer bar (6) and Tighten to 61 N·m (45 ft. lbs.).
3. Install the lower nut and Tighten to 169 N·m (125 ft. lbs.).
4. Remove the support and lower the vehicle.



BAR-TORSION

DESCRIPTION

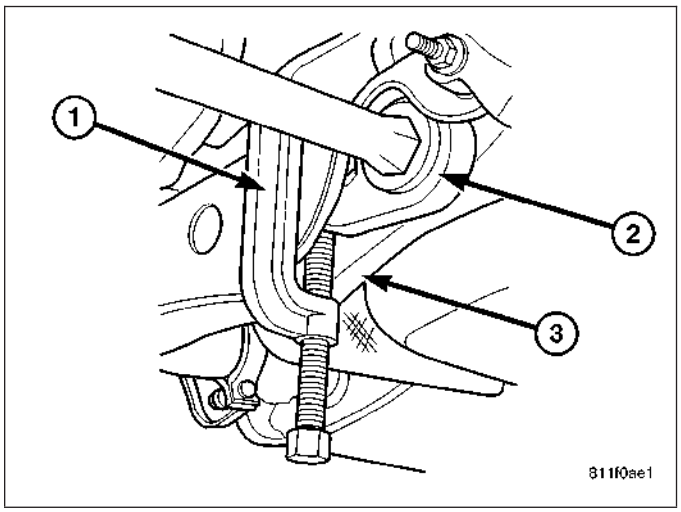
The front of the bar connects to the back side of the lower suspension arm. The rear end of the bar is mounted in a anchor that rests in the frame crossmember.

OPERATION

The torsion bars are used to control ride height and ride quality. The vehicle height is adjusted through an anchor adjustment bolt that increases or decreases the wind up of the torsion bar. Increasing or decreasing the bar angle changes the wind up of the suspension arms.

REMOVAL

CAUTION: The left and right side torsion bars are NOT interchangeable. The bars are identified and stamped R or L, for right or left. The bars do not have a front or rear end and can be installed with either end facing forward.



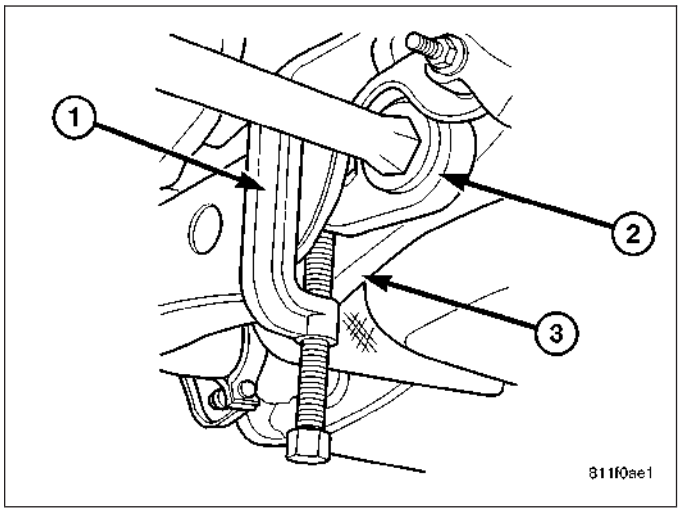
1. Raise and support the vehicle with the front suspension hanging.
2. Remove the transfer case skid plate (Refer to 13 - FRAME & BUMPERS/FRAME/TRANSFER CASE SKID PLATE - REMOVAL).

NOTE: Count and record the number of turns for installation reference.

3. Mark the adjustment bolt setting.
4. Install Special Tool - 8686 (1) to the anchor arm (2) and the cross member (3).
5. Increase the tension on the anchor arm tool 8686 (1) until the load is removed from the adjustment bolt and the adjuster nut.
6. Turn the adjustment bolt counterclockwise to remove the bolt and the adjuster nut..
7. Remove the Special Tool - 8686 (1) , allowing the torsion bar to unload.

INSTALLATION

CAUTION: The left and right side torsion bars are NOT interchangeable. The bars are identified and stamped R or L, for right or left. The bars do not have a front or rear end and can be installed with either end facing forward.



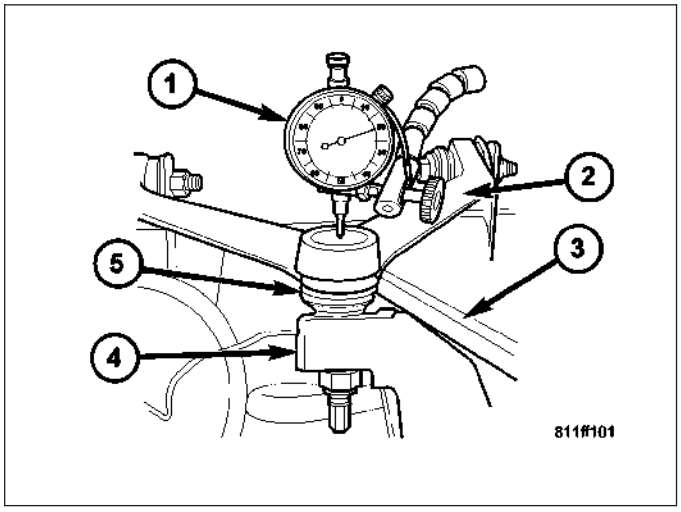
1. Insert torsion bar ends into anchor and suspension arm.
2. Position the anchor (2) in the crossmember frame (3).
3. Install Special Tool - 8686 (1) to the anchor (2) and the crossmember (3).
4. Increase the tension on the anchor in order to load the torsion bar.
5. Install the adjustment bolt and the adjuster nut.
6. Turn adjustment bolt clockwise the recorded amount of turns.
7. Remove tool - 8686 (1)from the torsion bar crossmember (3).
8. Install the transfer case skid plate (Refer to 13 - FRAME & BUMPERS/FRAME/TRANSFER CASE SKID PLATE - INSTALLATION).
9. Lower vehicle and adjust the front suspension height (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE).
10. Perform a wheel alignment (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE).

BALL JOINT-UPPER

DIAGNOSIS AND TESTING

UPPER BALL JOINT

1. Raise the front of the vehicle. Place safety floor stands under both lower control arms as far outboard as possible. Lower the vehicle to allow the stands to support some or all of the vehicle weight.
2. Remove the front tires.
3. Mount a dial indicator (1) solidly to the frame and then zero the dial indicator.
4. Position dial indicator plunger on the topside of the upper ball joint (5).



NOTE: The dial indicator plunger must be perpendicular to the machined surface of the ball joint.

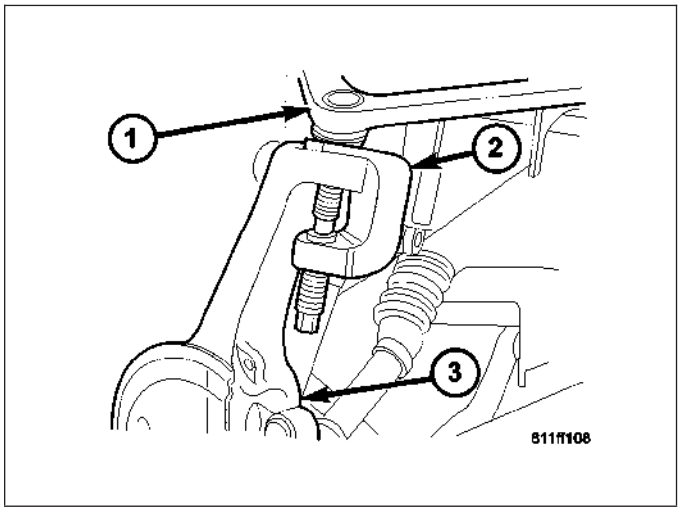
NOTE: Use care not to pry or tear the ball joint boot, when checking the free play.

5. Position a pry bar (3) between the steering knuckle (4) and the upper control arm (2). Pry upwards on the upper control arm.
6. If the travel exceeds 0.5 mm (0.020 in.), replace the upper control arm since the upper ball joint is integral to the arm (Refer to 2 - SUSPENSION/FRONT/UPPER CONTROL ARM - REMOVAL).
7. If the upper ball joint is within specs reinstall the front tires (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).

CONTROL ARM-UPPER

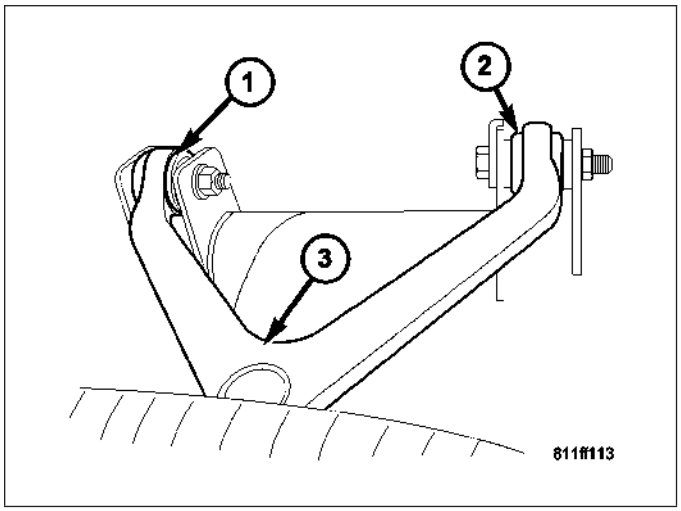
REMOVAL

1. Raise and support vehicle.
2. Remove wheel and tire assembly.
3. Remove the nut from upper ball joint.
4. Separate upper ball joint (1) from the steering knuckle (3) with Remover 8677 (2).



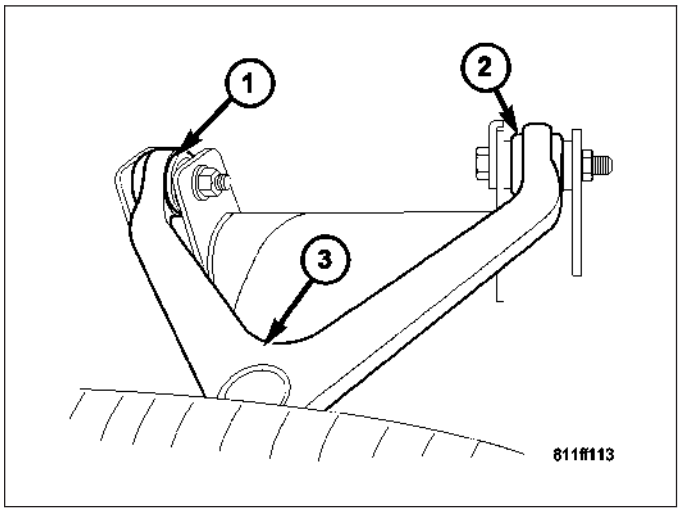
CAUTION: When installing Remover 8677 (2) to separate the ball joint, be careful not to damage the ball joint seal.

5. Remove the control arm pivot bolts (1&2) and remove control arm (3).



INSTALLATION

1. Position the control arm (3) into the frame brackets (1&2). Install bolts and tighten to 102 N·m (75 ft. lbs.).



2. Insert ball joint in steering knuckle and tighten ball joint nut to 75 N·m (55 ft. lbs.).
3. Install the wheel and tire assembly, (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).
4. Remove the support and lower vehicle.
5. Perform a wheel alignment, (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE).

REAR

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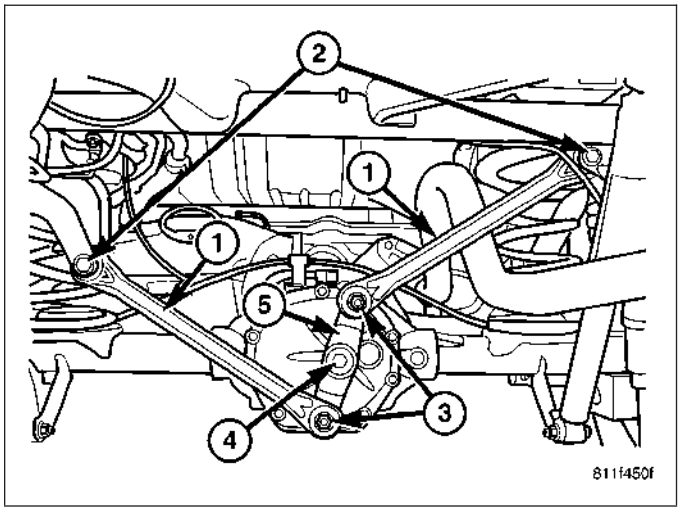
REAR

DESCRIPTION

The rear suspension is comprised of:

- Shock Absorbers
- Jounce Bumpers
- Stabilizer Bar
- Stabilizer links
- Coil Springs
- Watts Links (1)
- Bell Crank (5)
- Upper Control Arms
- Lower Control Arms
- Drive Axle



CAUTION: A vehicle should always be loaded so the vehicle weight center-line is located immediately forward of the rear axle. Correct vehicle loading provides proper front tire-to-road contact. This results in maximum vehicle handling stability and safety. Incorrect vehicle weight distribution can cause excessive tire tread wear, spring fatigue or failure, and erratic steering.

CAUTION: Suspension components with rubber/urethane bushings (except stabilizer bar) should be tightened with the vehicle at normal ride height. It is important to have the springs supporting the weight of the vehicle when the fasteners are torqued. If springs are not at their normal ride position, vehicle ride comfort could be affected and premature bushing wear may occur.

DIAGNOSIS AND TESTING

SPRING AND SHOCK

A knocking or rattling noise from a shock absorber may be caused by movement between mounting bushings and metal brackets or attaching components. These noises can usually be stopped by tightening the attaching nuts. If the noise persists, inspect for damaged and worn bushings, and attaching components. Repair as necessary if any of these conditions exist.

A squeaking noise from the shock absorber may be caused by the hydraulic valving and may be intermittent. This condition is not repairable and the shock absorber must be replaced.

The shock absorbers are not refillable or adjustable. If a malfunction occurs, the shock absorber must be replaced. To test a shock absorber, hold it in an upright position and force the piston in and out of the cylinder four or five times. The action throughout each stroke should be smooth and even.

If the vehicle is used for severe, off-road operation, the springs should be examined periodically. Check for broken colis. Refer to Spring and Shock Absorber Diagnosis chart for additional information.

SPRING AND SHOCK ABSORBER

CONDITION	POSSIBLE CAUSES	CORRECTION
REAR OF VEHICLE SAGS	1. Broken coil spring. 2. Spring fatigue.	1. Replace spring. 2. Replace spring.
SPRING NOISE	1. Worn springs. 2. Worn isolators. 3. Severly overloaded.	1. Replace spring. 2. Replace isolators. 3. Check GVW of vehicle (Unload cargo).
SHOCK NOISE	1. Loose mounting fastener. 2. Worn bushings. 3. Leaking shock.	1. Tighten to specification. 2. Replace shock. 3. Replace shock.

SPECIFICATIONS

TORQUE CHART

TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Shock Absorber Lower Nut	102	75	—
Shock Absorber Upper Bolt	102	75	—
Stabilizer Retainer to the Axle	61	45	—
Stabilizer Link to Stabilizer Bar	102	75	—
Stabilizer Link to Frame	102	75	—

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Bell Crank to Differential Bolt	251	185	—
Watts Link to Bell Crank	108	80	—
Watts Lateral Link to Frame	169	125	—
Lower Control Arm	244	180	—
Upper Control Arm	156	115	—

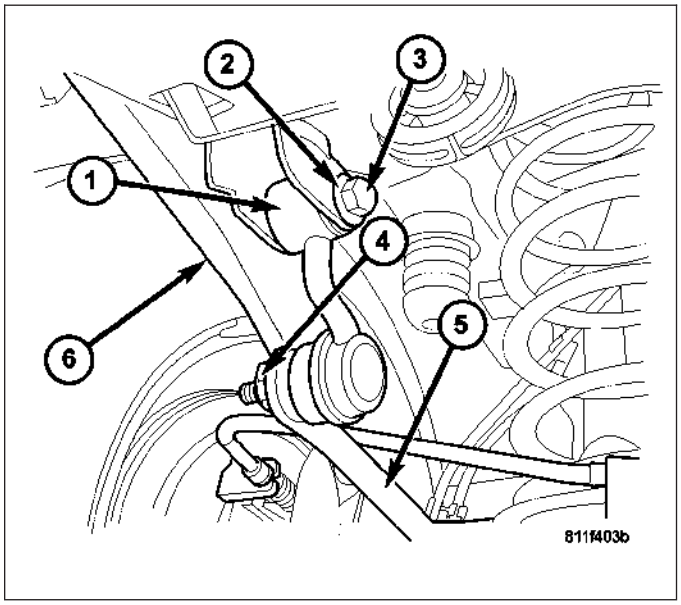
JOUNCE BUMPER

REMOVAL

1. Raise and support the vehicle.

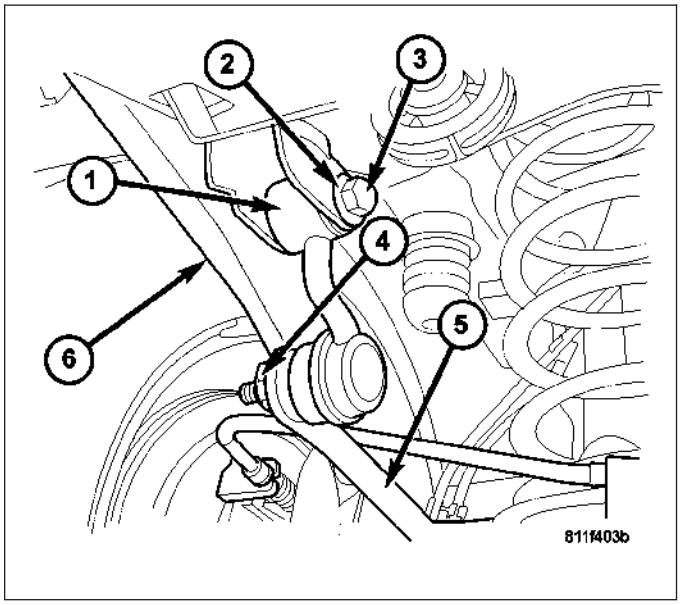
NOTE: Rocking motion may be required while pulling the jounce bumper from the seating bracket

2. Twist and pull out the jounce bumper to remove the jounce bumper from the seating bracket.



INSTALLATION

1. Install the jounce bumper and twist to seat in the bracket.
2. Remove the support and lower the vehicle.



SHOCK ABSORBER

REMOVAL

1. Raise vehicle and support the axle.
2. Lower the spare tire **This step must be done if replacing the left side shock.**
3. Remove the upper shock bolt and flag nut.
4. Remove the lower shock bolt and nut.
5. Remove the rear shock absorber from the vehicle.

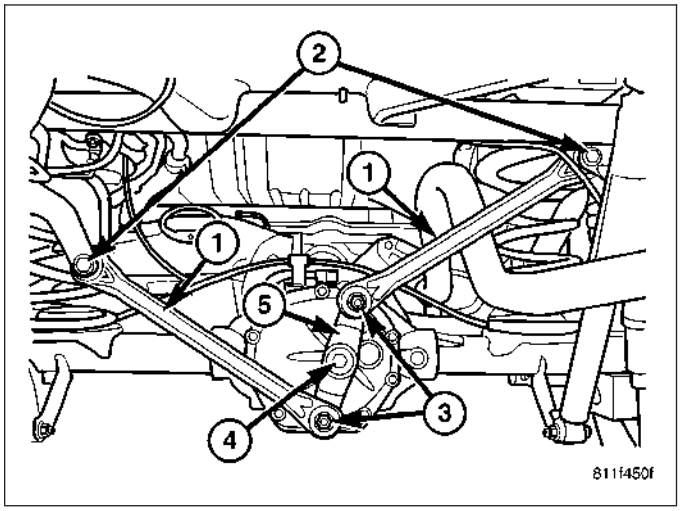
INSTALLATION

1. Position the shock absorber in the brackets.
2. Install the bolts through the brackets and the shock. Install the flag nut on the top bolt and nut on lower bolt.
3. Tighten the upper and lower bolt/nuts Tighten to 102 N.m (75 ft. lbs.)
4. Raise the spare tire back in place if lowered for the left shock.
5. Remove the support and lower the vehicle.

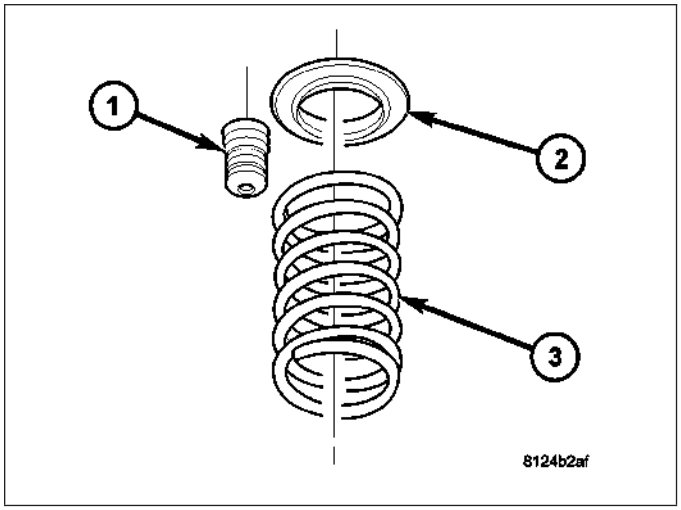
SPRING-REAR-COIL

REMOVAL

1. Raise and support the vehicle.
2. Support the axle with a suitable holding fixture.
3. Remove the lower shock bolt.
4. Remove the bell crank bolt (4) to the rear axle.



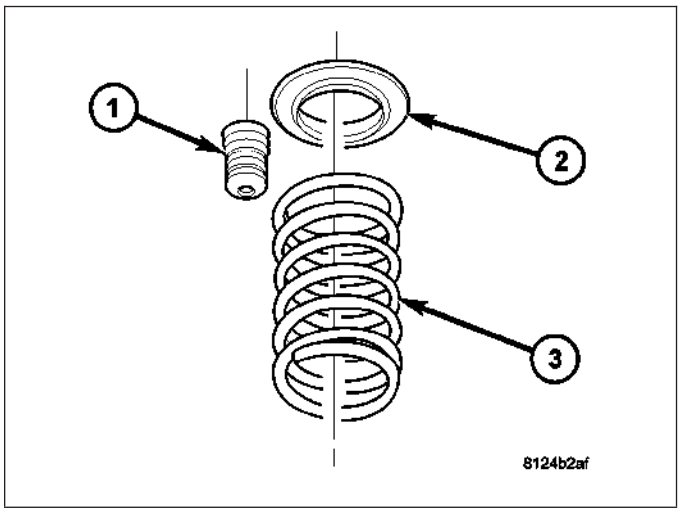
5. Lower the jack to remove the spring and isolator from the vehicle.



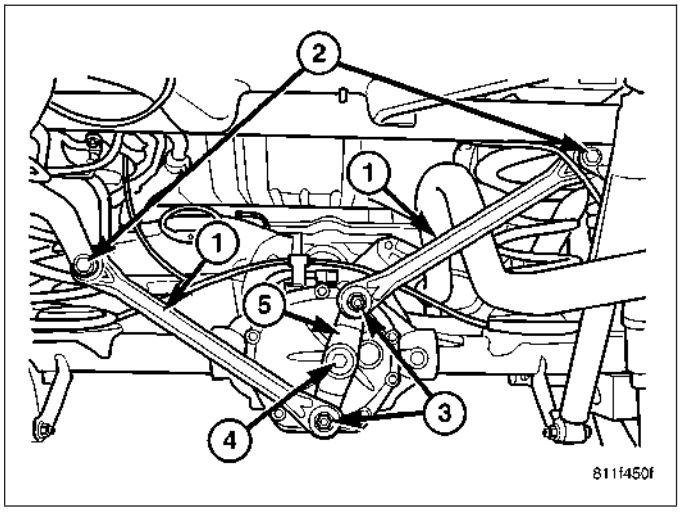
INSTALLATION

NOTE: All torques should be made with the full vehicle weight on the ground being supported by the tires.

1. Position spring (3) to the vehicle on top of the isolator (2).
2. Align the springs (3) to the spring pockets.
3. Raise the rear axle into place.



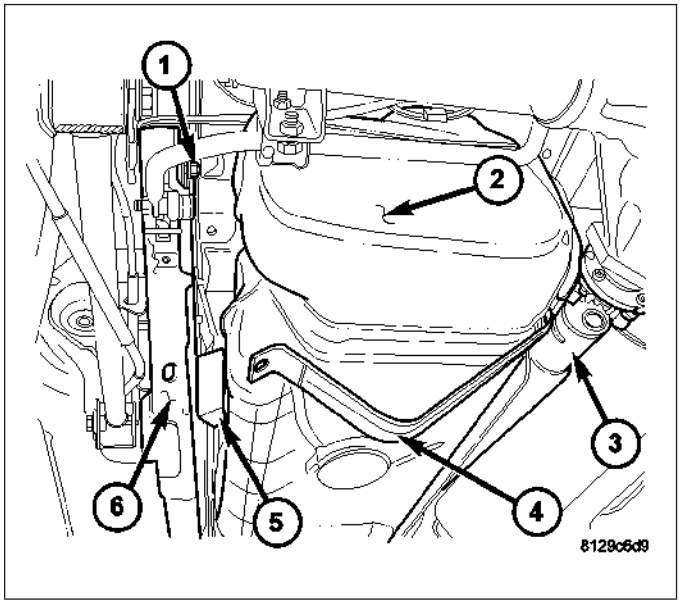
4. Install the bell crank bolt (4) to the rear axle. Tighten to 251 N·m (185 ft. lbs.).
5. Install the lower shock bolts to the rear axle. Tighten to 102 N·m (75 ft. lbs.).
6. Remove the holding fixture for the rear axle.



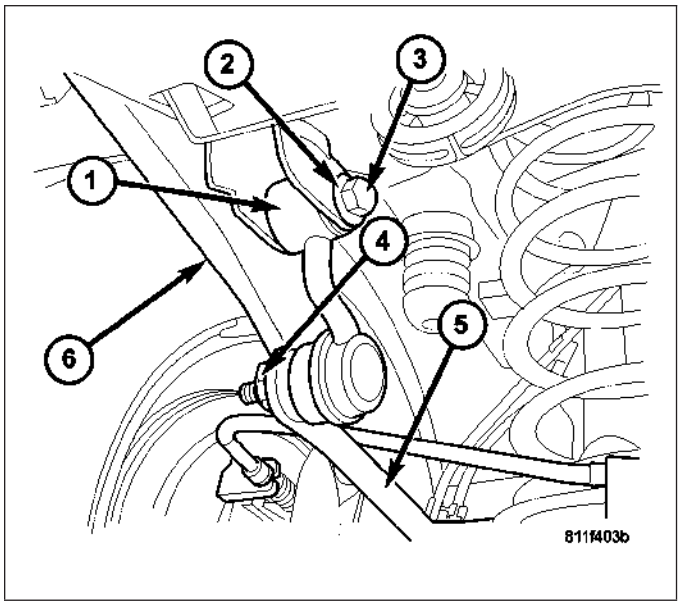
STABILIZER LINK

REMOVAL

1. Raise and support the vehicle.
2. Remove the rear tire.
3. Support the rear axle with a jack.
4. Remove the fuel tank skid plate (Refer to 13 - FRAME & BUMPERS/FRAME/FUEL TANK SKID PLATE - REMOVAL). **This step must be done for replacement of the left side stabilizer link.**
5. Remove the rear fuel tank strap bolt and let the strap (3) hang. **This step must be done for replacement of the left side stabilizer link.**
6. Push the fuel tank (2) over towards the driveshaft (3) and install a block of wood (5) between the frame (6) and the fuel tank (2) to allow for clearance of the upper stabilizer link bolt (1) **This step must be done for replacement of the left side stabilizer link.**

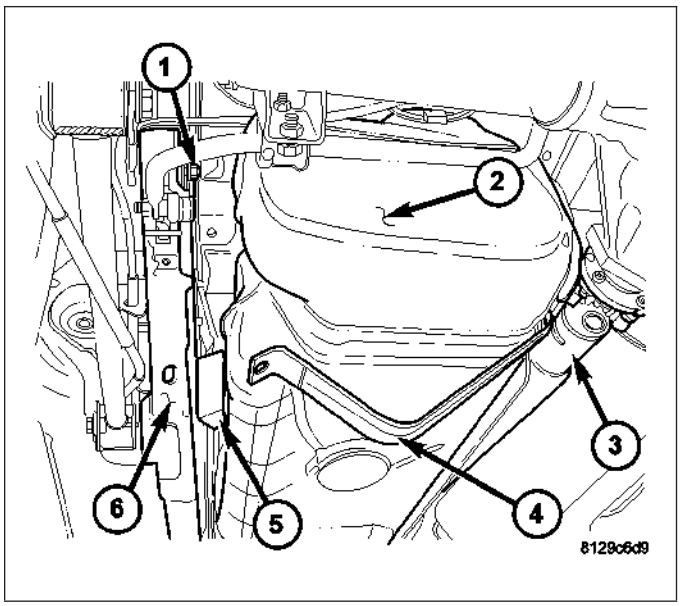


7. Remove the upper link nut (2) and bolt (3) at the frame.
8. Remove the lower link nut (4) at the stabilizer bar (5).
9. Remove stabilizer link (1).

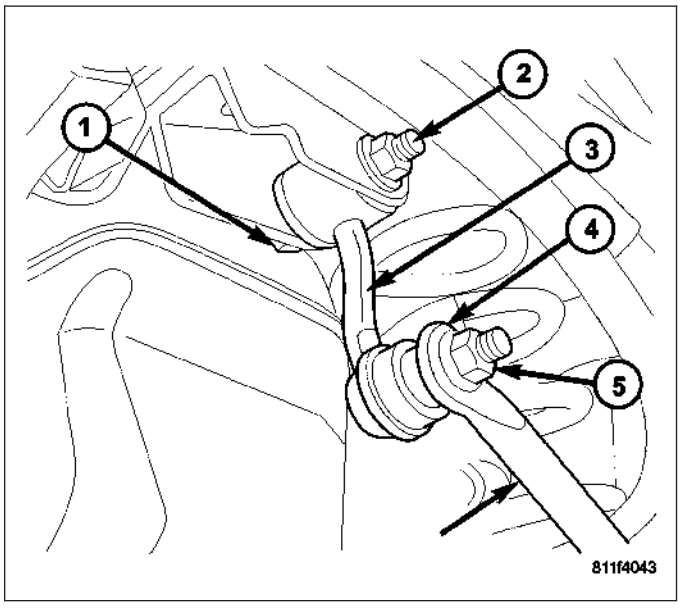


INSTALLATION

1. Install the upper bolt (1) and nut (1) for the stabilizer link to the frame and tighten to 102 N·m (75 ft. lbs.).
2. Remove the block of wood (5) between the frame (6) and fuel tank (2) **If replacement of left stabilizer link was performed**.
3. Install the rear fuel tank strap (4) **If replacement of left stabilizer link was performed**.
4. Install the fuel tank skid plate (Refer to 13 - FRAME & BUMPERS/FRAME/FUEL TANK SKID PLATE - INSTALLATION). **If replacement of left stabilizer link was performed.**



5. Install the stabilizer link (3) to the stabilizer bar (4).
6. Install the nut (5) and tighten to 102 N·m (75 ft. lbs.).
7. Remove the jack and lower the vehicle.



STABILIZER BAR

DESCRIPTION

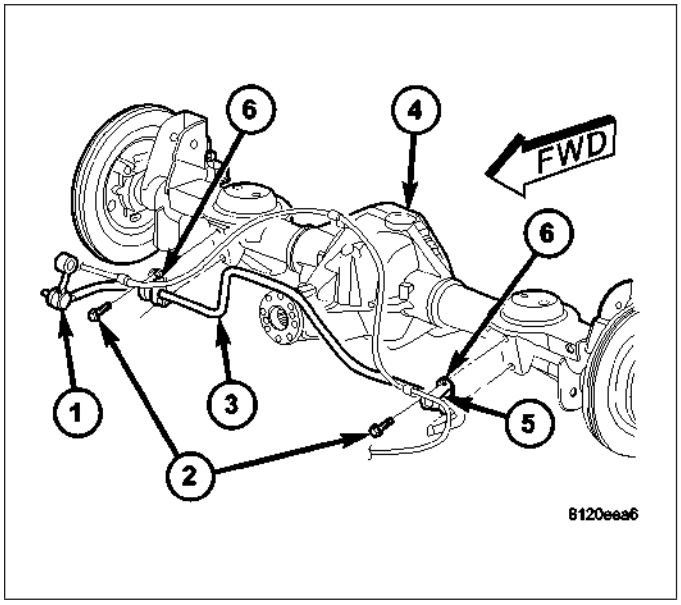
The stabilizer bar extends across the underside of the vehicle and is bolted to the top of the axle. Links at the end of the bar are bolted to the frame.

OPERATION

The stabilizer bar is used to minimize vehicle body sway. The spring steel bar helps to control the vehicle body in relationship to the suspension.

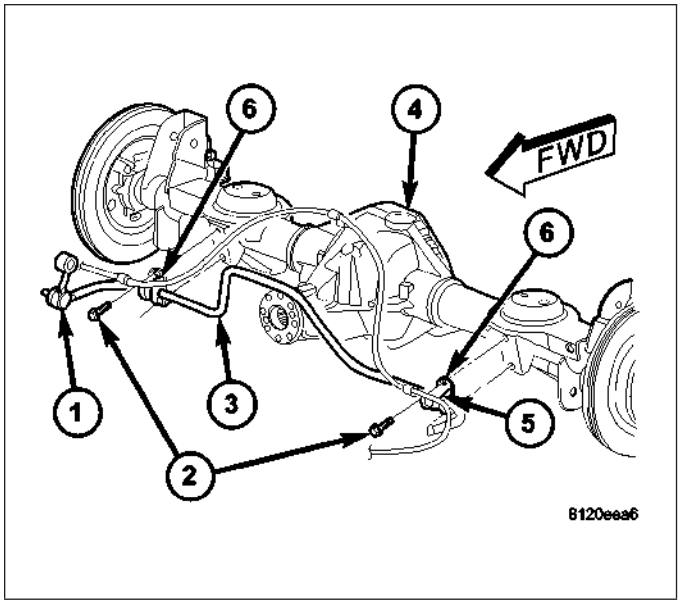
REMOVAL

1. Raise and support vehicle.
2. Remove lower links mounting nuts (1).
3. Remove stabilizer bar retainer bolts (2) and retainers (6) at the axle (4).
4. Remove the park brake cable bracket from the retainers.
5. Remove stabilizer bar (3) and remove bushings (5).



INSTALLATION

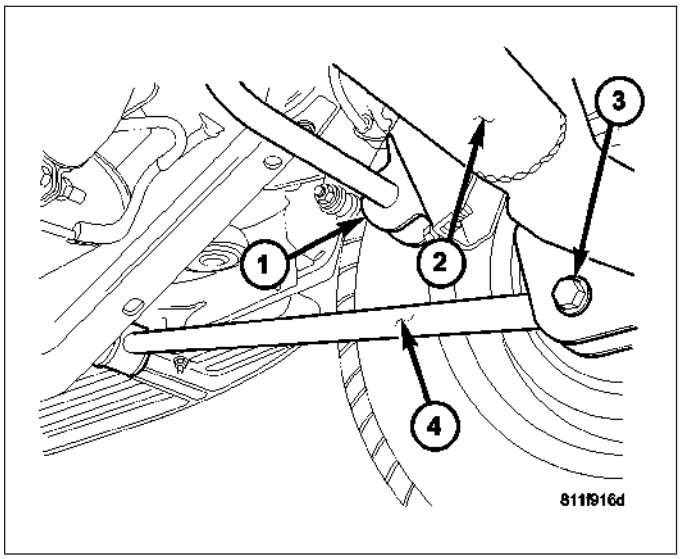
1. Install stabilizer bar bushings (5).
2. Install the stabilizer bar (3) and center it with equal spacing on both sides.
3. Install stabilizer bar retainers (6) and tighten bolts (2) to 61 N·m (45 ft. lbs.).
4. Install the park brake cable bracket to the retainers.
5. Install the links (1) on the stabilizer bar (3). Install mounting bolts and nuts.
6. Remove support and lower vehicle.
7. Tighten stabilizer link lower nuts (2) to 102 N·m (75 ft. lbs.).



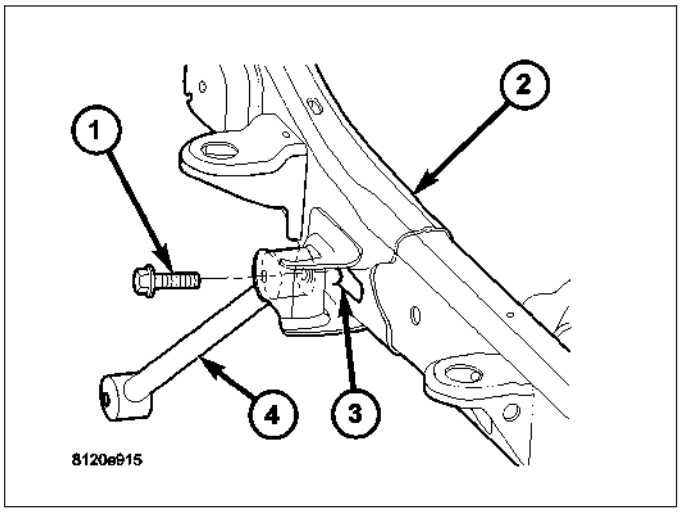
CONTROL ARM-LOWER

REMOVAL

1. Raise and support the rear axle.
2. Remove the lower control arm bolt (3) and flag nut at the axle (2).

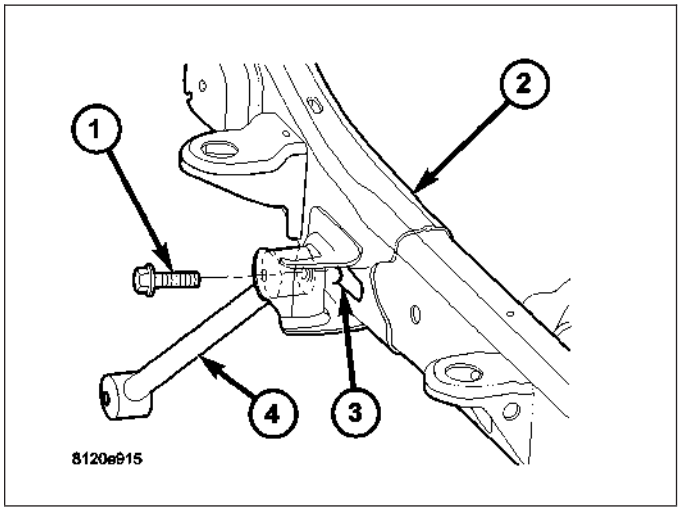


3. Remove the lower control arm bolt (1) and flag nut (3) at the frame (2).
4. Remove the lower control arm (4) from the vehicle.

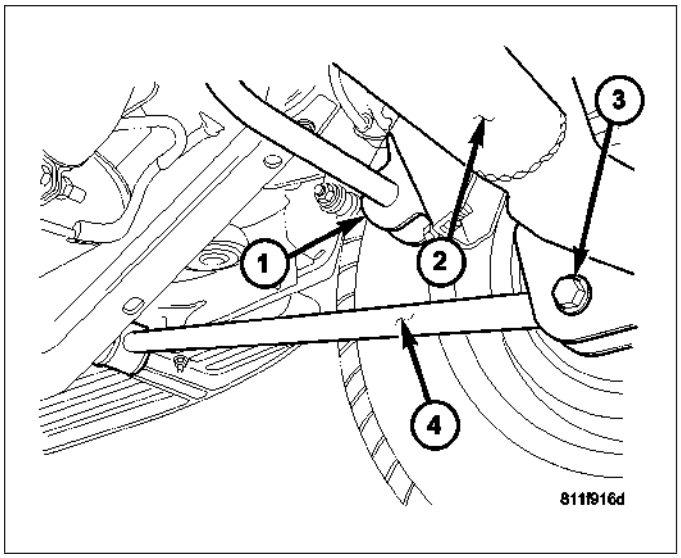


INSTALLATION

1. Install the lower control arm (4) to the vehicle.
2. Install the lower control arm bolt (1) and flag nut (3) at the frame (2).



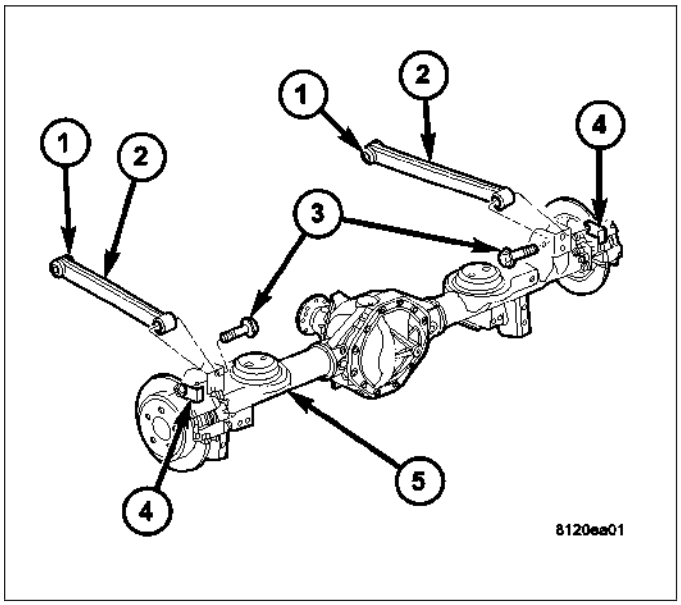
3. Install the lower control arm bolt (3) and flag nut at the axle (2).
4. Lower the vehicle to the ground and then tighten the bolts to 251 N·m (185 ft.lbs.).



CONTROL ARM-UPPER

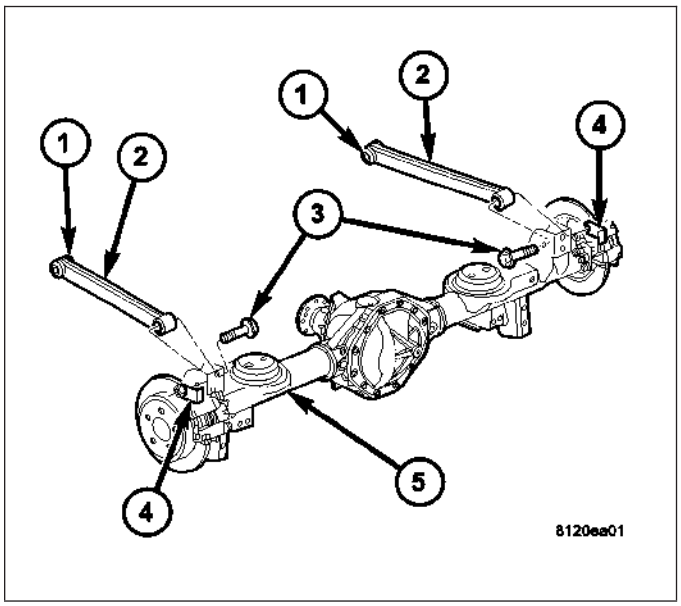
REMOVAL

1. Raise and support the rear axle.
2. Remove the upper control arm bolt (3) and flag nut (4) at the axle (5).
3. Remove the upper control arm bolt and flag nut at the frame side (1).
4. Remove the upper control arm (2) from the vehicle.



INSTALLATION

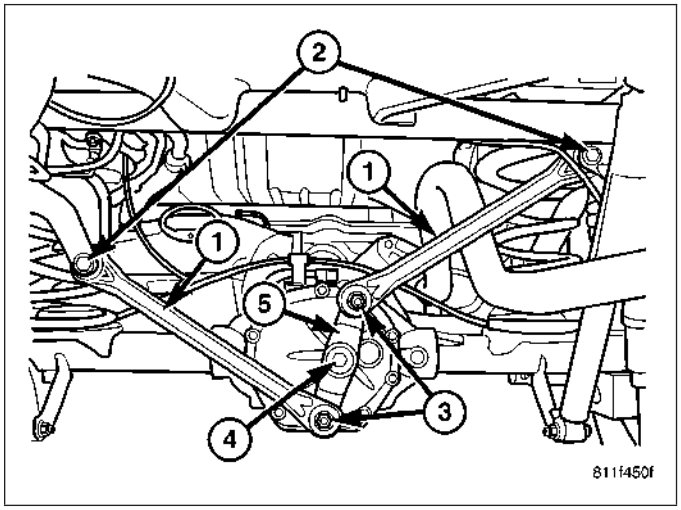
1. Install the upper control arm (2) to the vehicle.
2. Install the upper control arm bolt and flag nut (1) at the frame.
3. Install the upper control arm bolt (3) and flag nut (4) at the axle (5).
4. Lower the vehicle to the ground and then tighten the bolts to 156 N·m (115 ft.lbs.).



BELL CRANK

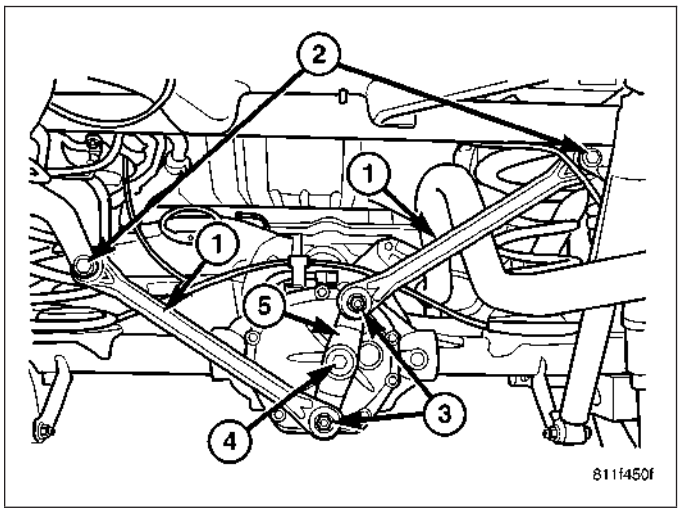
REMOVAL

1. Raise and support the vehicle.
2. Remove the watts link nuts (3) at the bell crank (5).
3. Remove both watts links (1) from the bell crank (5).
4. Remove the bell crank bolt (4) from the differential cover and remove the bell crank (5).



INSTALLATION

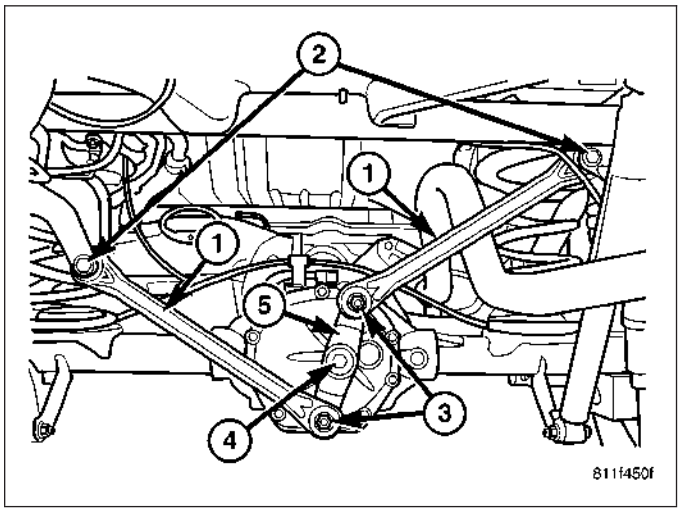
1. Install the bell crank (5) and bolt (4) to the differential cover and tighten 251 N·m (185 ft.lbs).
2. Install the watts links (1) and nuts (3) to the bell crank (5) and tighten 108 N·m (80 ft.lbs).
3. Lower the vehicle.



WATTS LINK

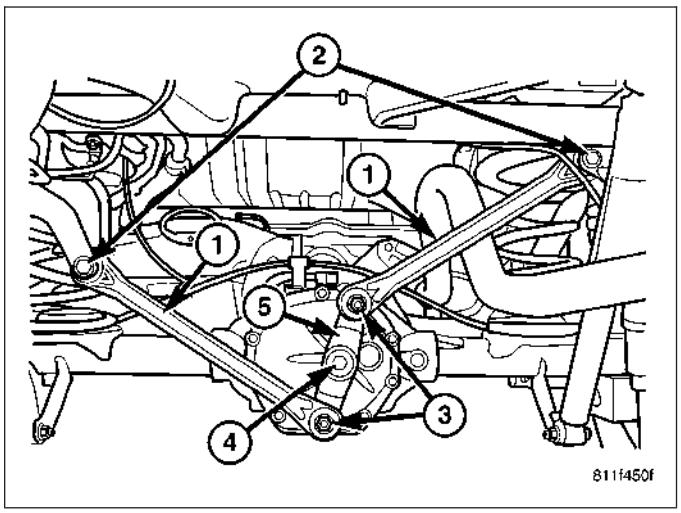
REMOVAL

1. Raise and support the vehicle.
2. Remove the upper nut (2) and bolt (2) to the watts link at the frame.
3. Remove the lower nut (3) to the watts link at the bell crank (5) and remove the watts link.



INSTALLATION

1. Install the watts link in position at the frame.
2. Install the watts link nut and bolt (2) at the frame and tighten 169 N·m (125 ft.lbs).
3. Install the watts links nuts (3) to the bell crank (5) and tighten 108 N·m (80 ft.lbs).
4. Lower the vehicle.



DIFFERENTIAL & DRIVELINE

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PROPELLER SHAFT

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PROPELLER SHAFT

DIAGNOSIS AND TESTING

PROPELLER SHAFT

PROPELLER SHAFT VIBRATION

Out-of-round tires or wheels that are out of balance, will cause a low frequency vibration.

Driveline vibration can also caused by loose or damaged engine mounts.

Propeller shaft vibration increases with vehicle speed. A vibration that occurs at a specific speed range, is not usually caused by an out of balance propeller shaft. Defective universal joints or an incorrect propeller shaft angle are usually the cause of such a vibration.

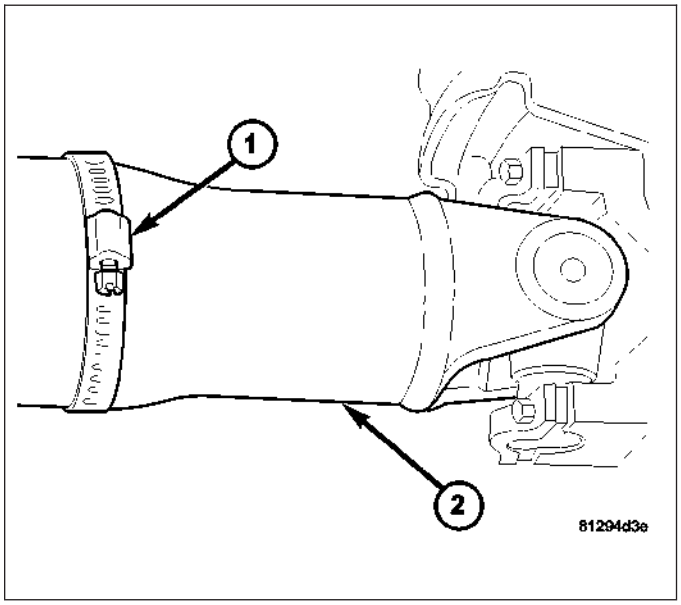
DRIVELINE VIBRATION

Drive Condition	Possible Cause	Correction
Propeller Shaft Noise	1) Undercoating or other foreign material on shaft.	1) Clean exterior of shaft and wash with solvent.
	2) Loose U-joint clamp screws.	2) Install new clamps and screws and tighten to proper torque.
	3) Loose or bent U-joint yoke or excessive runout.	3) Install new yoke.
	4) Incorrect driveline angularity.	4) Measure and correct driveline angles.
	5) Rear spring center bolt not in seat.	5) Loosen spring u-bolts and seat center bolt.
	6) Worn U-joint bearings.	6) Install new U-joint.
	7) Propeller shaft damaged or out of balance.	7) Installl new propeller shaft.
	8) Broken rear spring.	8) Install new rear spring.
	9) Excessive runout or unbalanced condition.	9) Re-index propeller shaft, test, and evaluate.
	10) Excessive drive pinion gear shaft runout.	10) Re-index propeller shaft and evaluate.
	11) Excessive axle yoke deflection.	11) Inspect and replace yoke if necessary.
	12) Excessive transfer case runout.	12) Inspect and repair as necessary.
Universal Joint Noise	1) Loose U-joint clamp screws.	1) Install new clamps and screws and tighten to proper torque.
	2) Lack of lubrication.	2) Replace as U-joints as necessary.

PROPELLER SHAFT BALANCE

If propeller shaft is suspected of being out of balance, use the following procedure.

NOTE: Indexing propeller shaft 180° relative to the yoke may eliminate some vibrations.

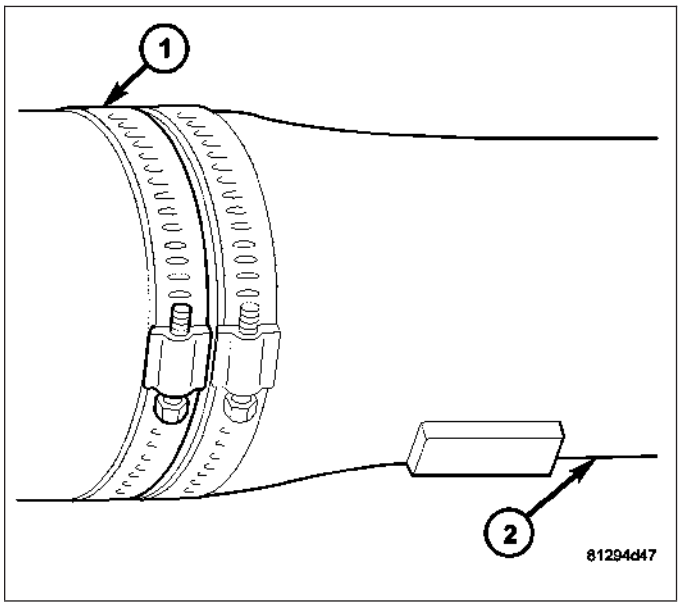


1. Raise and support vehicle.
2. Clean all foreign material from the propeller shaft and universal joints.
3. Inspect propeller shaft for missing balance weights, broken welds and bent areas. **If propeller shaft is bent, it must be replaced.**
4. Inspect universal joints for wear and properly installed.
5. Check propeller shaft bolt torques.
6. Remove wheels and install lug nuts to retain brake rotors.
7. Mark and number the shaft six inches from the pinion yoke end at four positions 90° apart.
8. Run and accelerate vehicle until vibration occurs. Note the intensity and speed the vibration occurred. Stop the engine.

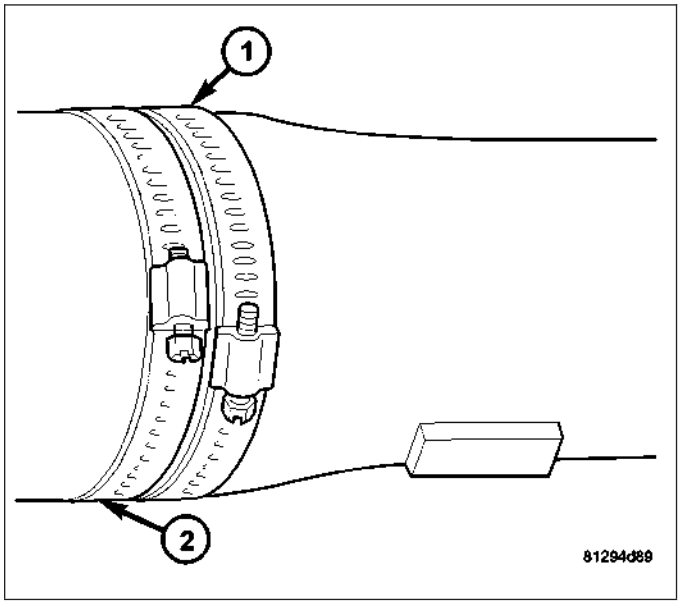
9. Install a screw clamp at position (1).
10. Start engine and check vibration. If there is little or no change move the clamp to the next positions. Repeat the vibration test.

NOTE: If there is no difference in vibration at this positions, the vibration may not be the propeller shaft.

11. If vibration decreased, install a second clamp (1) and repeat the test.



12. If additional clamp causes an additional vibration, separate the clamps 1/2 inch (1) above and below the mark. Repeat the vibration test.
13. Increase distance between the clamp screws (1) (2) and repeat test, until the least amount of vibration is noticed. Bend the slack end of the clamps so screws will not loosen.
14. If vibration remains unacceptable, repeat the procedure to the front end of the propeller shaft.
15. Install wheels and lower vehicle.



PROPELLER SHAFT RUNOUT

1. Clean propeller shaft surface, where dial indicator will contact the shaft.
2. Install dial indicator perpendicular to the shaft surface.
3. Measure runout at the center and ends of the shaft away from weld areas, so weld process does not affect measurements.
4. Refer to Runout Specifications chart.
5. If runout is out of specification, index the shaft 180° and take shaft runout measurements again.
6. If runout is now within specifications, mark shaft and yokes for proper orientation.
7. If runout is not within specifications, verify runout of the transmission/transfer case and axle are within specifications. Correct as necessary and measure propeller shaft runout again.
8. Replace propeller shaft if the runout still exceeds the limits.

RUNOUT SPECIFICATIONS

Front of Shaft	0.020 in. (0.50 mm)
Center of Shaft	0.025 in. (0.63 mm)
Rear of Shaft	0.020 in. (0.50 mm)
NOTE: Measure front/rear runout approximately 3 inches (76 mm) from the weld seam at each end of the shaft tube for tube lengths over 30 inches. For tube lengths under 30 inches, the maximum allowed runout is 0.020 in. (0.50 mm) for the full length of the tube.	

STANDARD PROCEDURE

PROPELLER SHAFT ANGLE

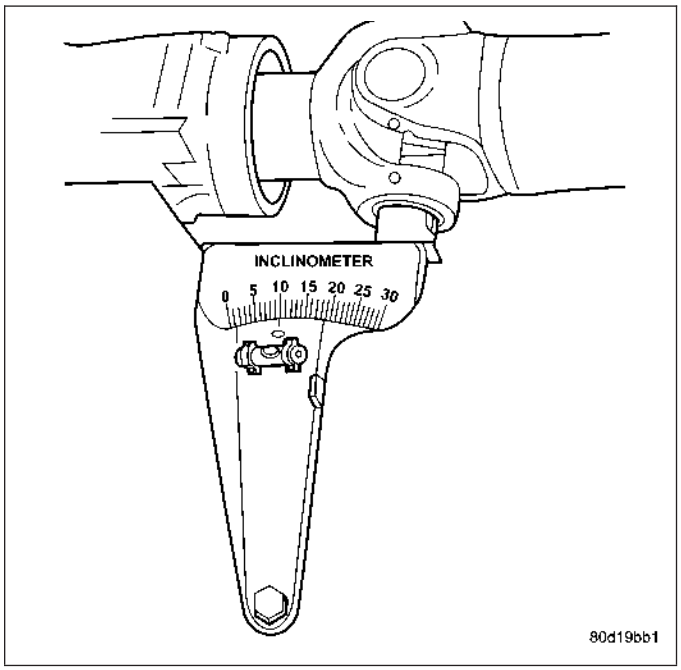
NOTE: This procedure applies to the front and rear propeller shaft.

1. Raise and support vehicle at the axles as level as possible, allowing wheels and propeller shaft to turn.
2. Remove universal joint snap rings if equipped, so inclinometer base will sits flat.
3. Rotate shaft until transmission/transfer case output yoke bearing cap is facing downward.

NOTE: Always make measurements from front to rear and from the same side of the vehicle.

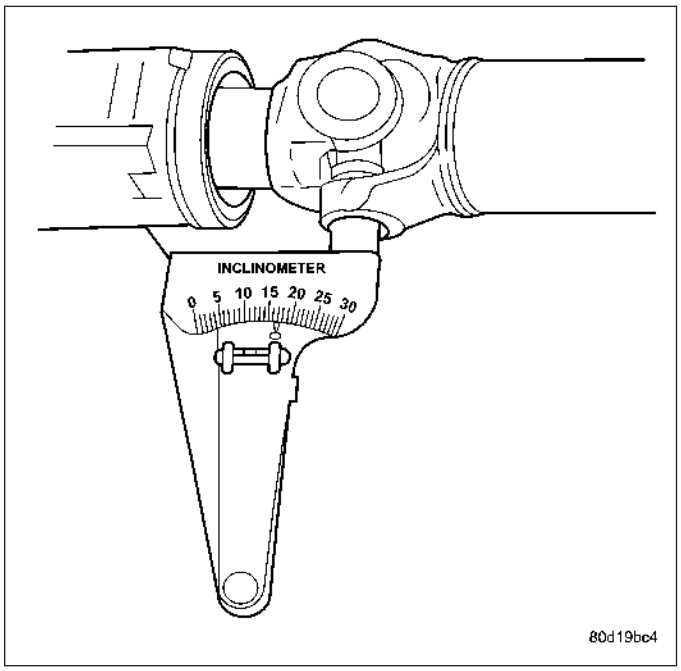
4. Place Inclinometer 7663 on yoke bearing cap or pinion flange ring, parallel to the shaft. Center bubble in sight glass and record measurement (A).

This measurement will give you the transmission or Output Yoke Angle (A).



5. Rotate propeller shaft 90 degrees and place Inclinometer 7663 on yoke bearing cap parallel to the shaft. Center bubble in sight glass and record measurement (C). This measurement can also be taken at the rear end of the shaft.

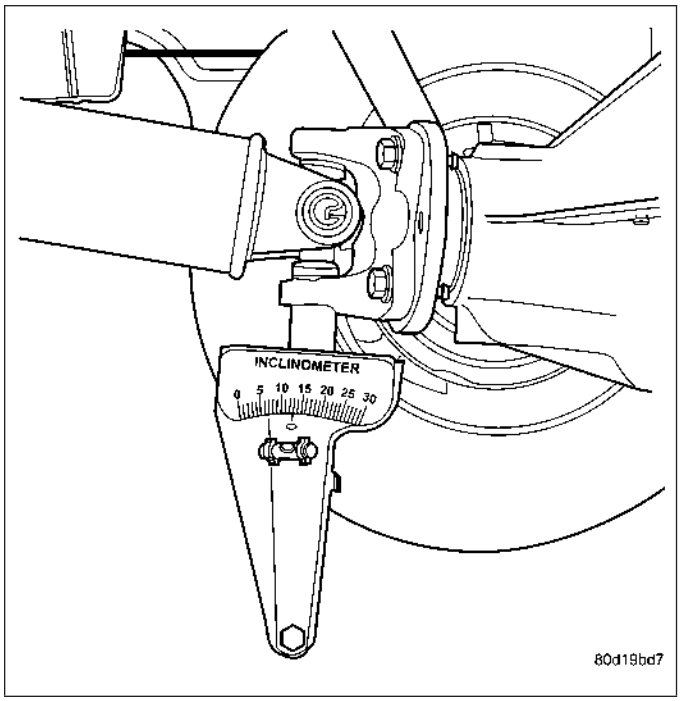
This measurement will give you the propeller shaft angle (C).



6. Subtract smaller figure from larger (C minus A) to obtain transmission output operating angle.
7. Rotate propeller shaft 90 degrees and place Inclinometer 7663 on pinion yoke bearing cap parallel to the shaft. Center bubble in sight glass and record measurement (B).

This measurement will give you the pinion shaft or input yoke angle (B).

8. Subtract smaller figure from larger (C minus B) to obtain axle Input Operating Angle.



PROPELLER SHAFT ANGLE RULES

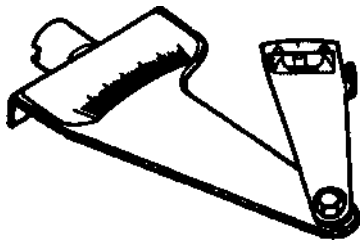
- Good cancellation of U-joint operating angles is within 1 degree.
- Operating angles less than 3 degrees.
- At least 1/2 of one degree continuous operating (propeller shaft) angle.

SPECIFICATIONS

TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Center Bearing Bolts	68	50	-
Front Companion Flange Bolts	115	85	-
Rear Companion Flange Bolts	115	85	-

SPECIAL TOOLS

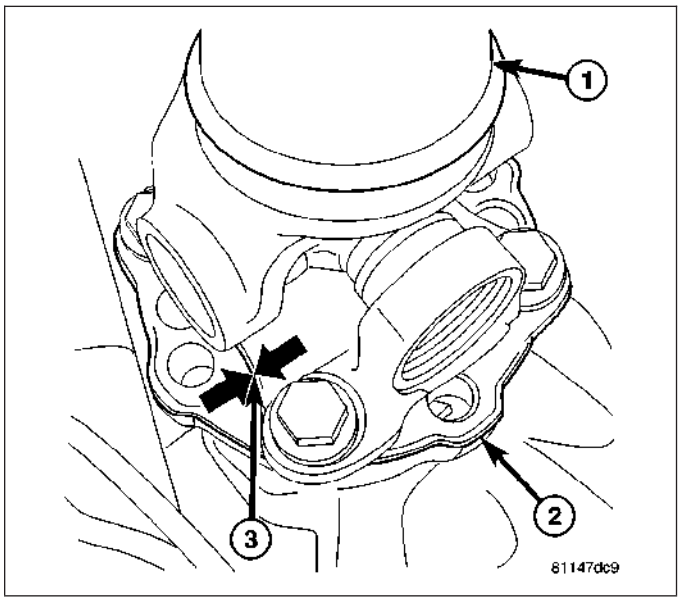


INCLINOMETER 7663

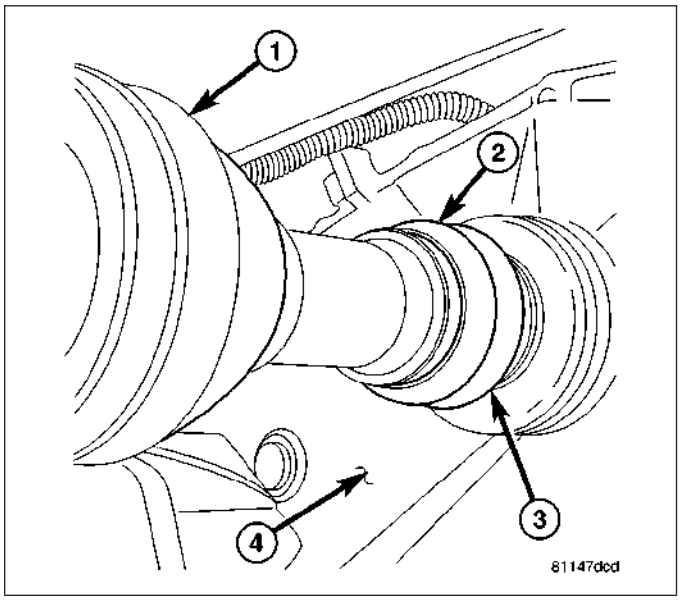
SHAFT-PROPELLER FRONT

REMOVAL

1. With vehicle in neutral, position vehicle on hoist.
2. Remove skid plate if equipped.
3. Mark a reference line (3) across propeller shaft flange and pinion flange (2).

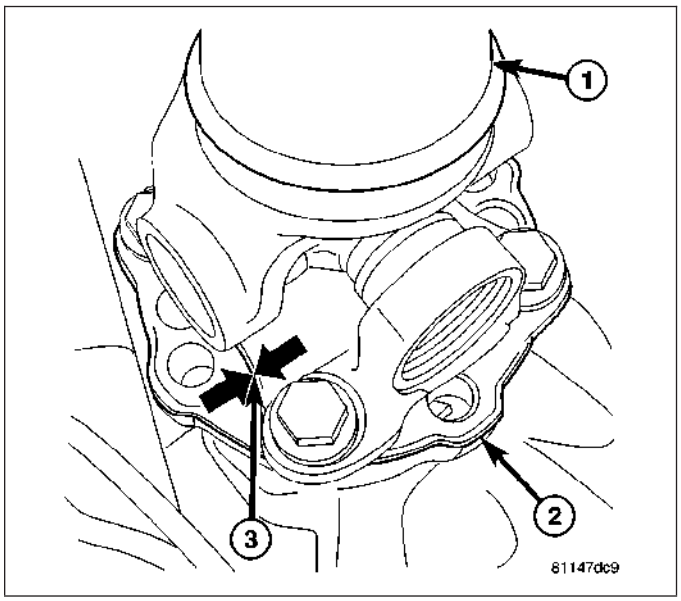


4. Remove exhaust crossover bolts from exhaust manifolds and lower crossover.
5. Remove boot clamp (3) from CV joint (1).
6. Remove pinion flange bolts.
7. Slide propeller shaft off the transfer case and remove shaft.



INSTALLATION

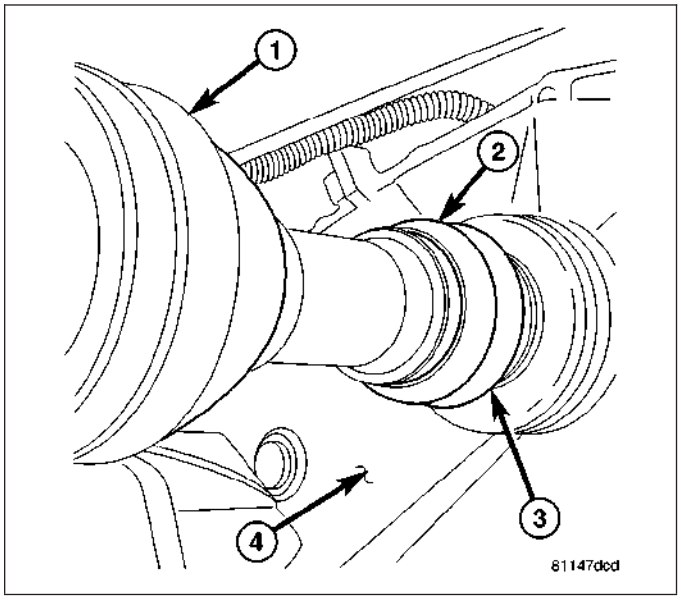
1. Slide propeller shaft onto transfer case.
2. Install propeller shaft with reference marks (3) aligned on pinion flange.



3. Install **new** pinion flange bolts and tighten to 115 N·m (85 ft. lbs.).

NOTE: Flange bolts incorporate a Loctite® patch, new bolts should be used. If bolts are not available, clean bolts and apply Loctite® 242 to the threads.

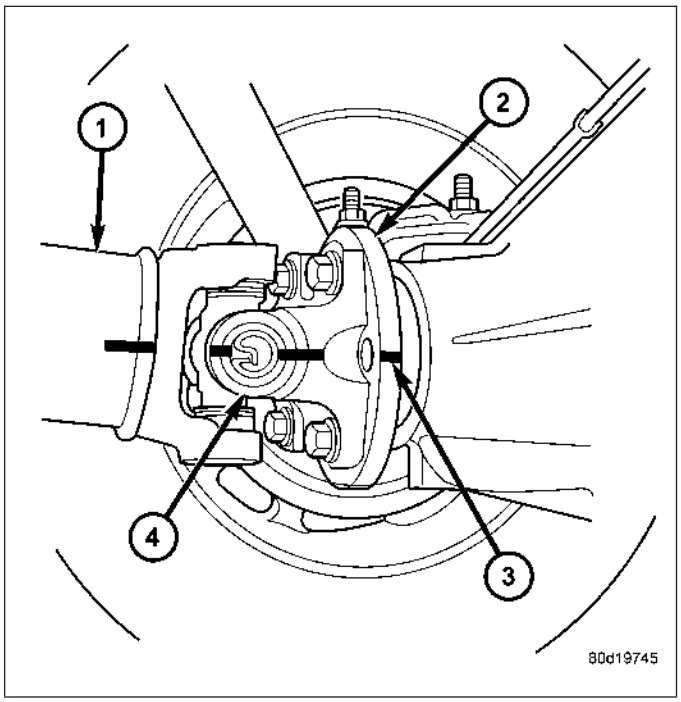
4. Install CV boot clamp (3).
5. Install skid plate, if equipped.



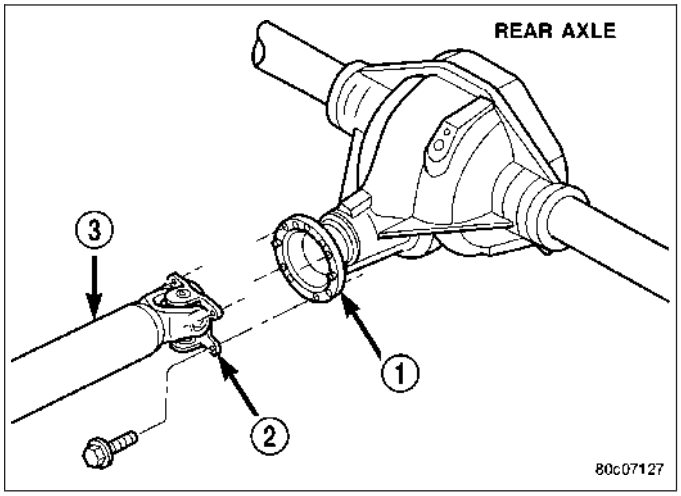
SHAFT-PROPELLER REAR

REMOVAL

1. With vehicle in neutral, position vehicle on hoist.
2. Mark a reference line (3) across the pinion flange (2) and propeller shaft flange (4).



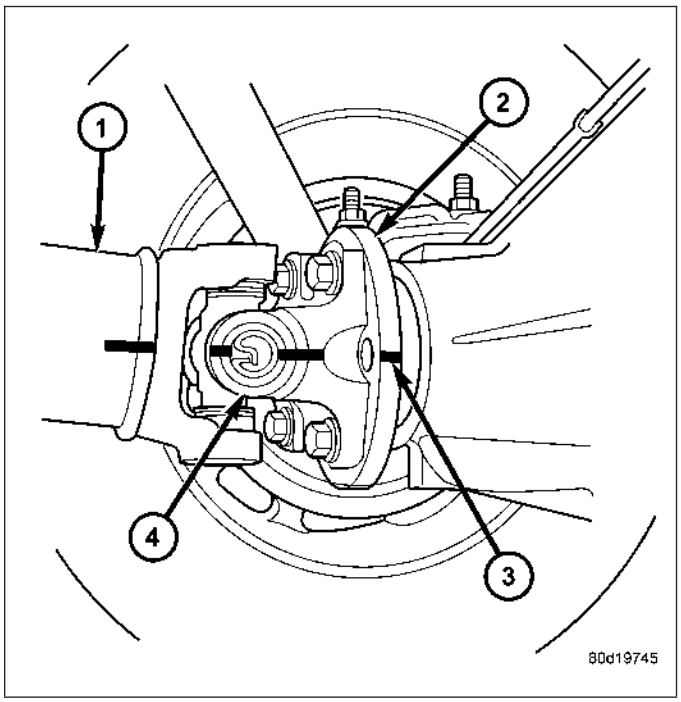
3. Remove flange bolts.
4. Slide slip yoke off of the transmission/transfer case output shaft and remove propeller shaft (3).



INSTALLATION

1. Slide slip yoke onto transmission/transfer case output shaft.
2. Align flange reference marks (3).
3. Install **new** flange bolts and tighten to 115 N·m (85 ft. lbs.).

NOTE: Flange bolts incorporate a Loctite® patch, new bolts should be used. If bolts are not available, clean bolts and apply Loctite® 242 to the threads.



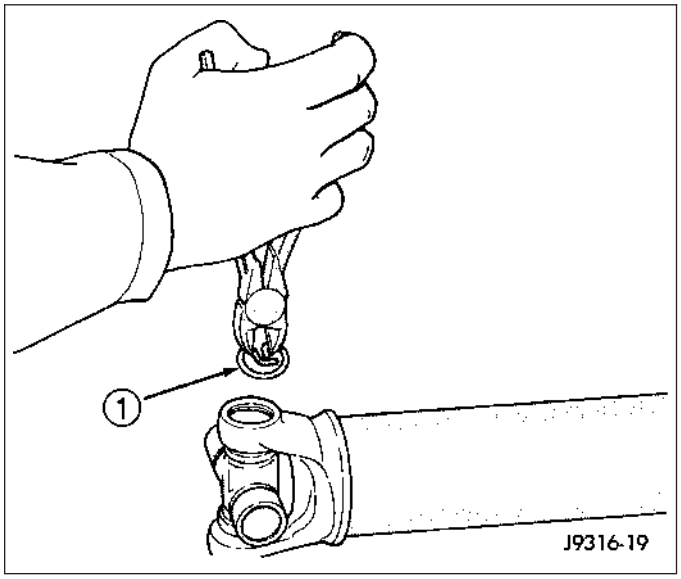
UNIVERSAL JOINTS-SINGLE CARDAN

DISASSEMBLY

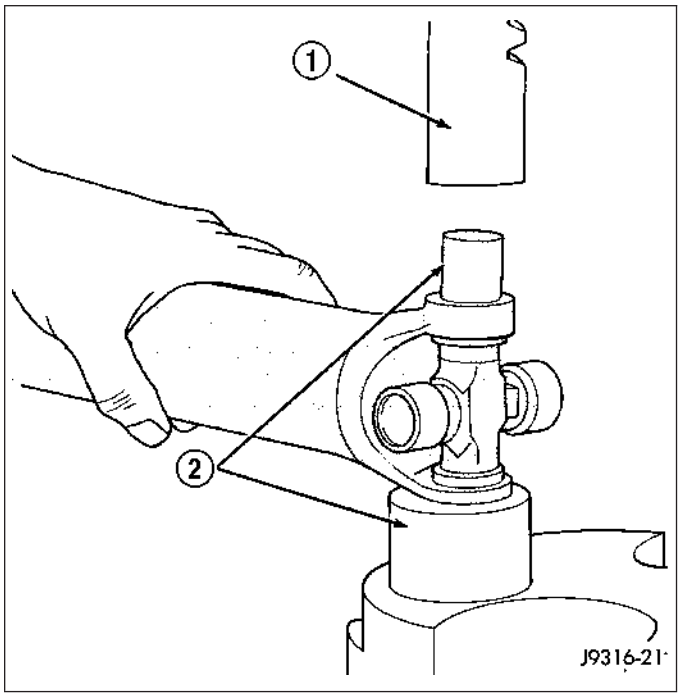
DISASSEMBLY - WITH SNAP RINGS

NOTE: This procedure describes a propeller shaft equipped with a cardan joint in the tube yoke. For propeller shafts equipped with a companion/slip yoke, repeat the steps to remove the remaining cardan joint.

1. Tap outside of bearing cap with a drift to loosen snap ring.
2. Remove snap rings (1) from both sides of yoke.



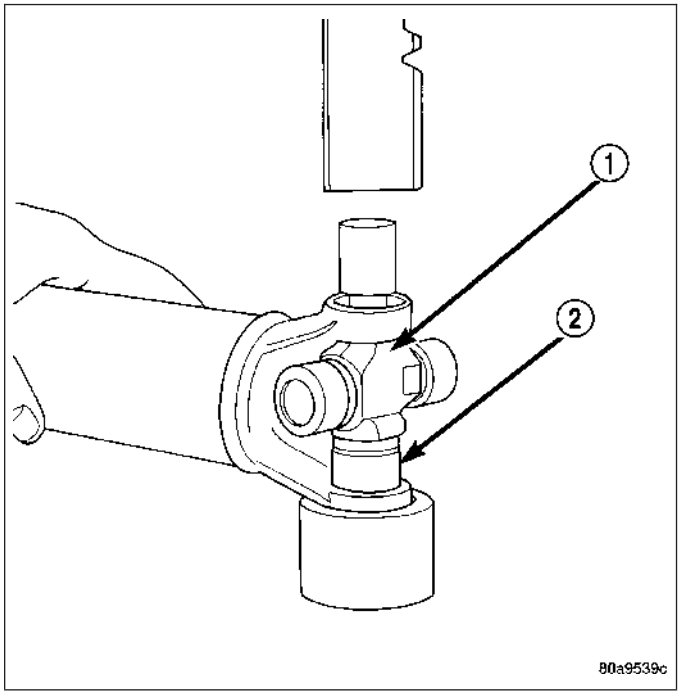
3. Position yoke with the grease fitting if equipped, pointing up.
4. Position a socket with a inside diameter large enough to receive the bearing cap, beneath the yoke on a press.
5. Place another socket with an outside diameter smaller than bearing cap on the upper bearing cap and press (1) the lower cap through the yoke.



NOTE: If the bearing cap will not pull out of the yoke by hand after pressing, tap the yoke ear near the bearing cap to dislodge the cap.

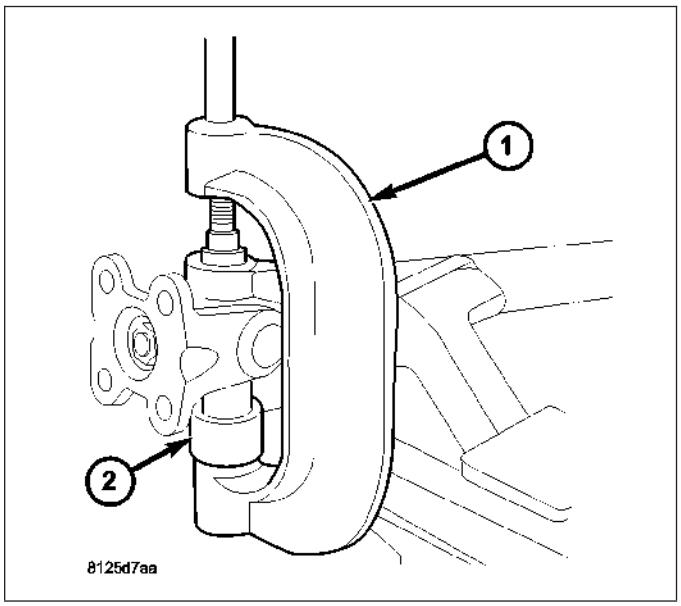
6. Pull bearing cap of the yoke.
7. Turn yoke over in the press and straighten the cross (1). Press the cross until the remaining bearing cap (2) can be removed.

CAUTION: If cross or bearing cap are not straight during removal, the bearing cap will score the walls of the yoke bore and damage can occur.

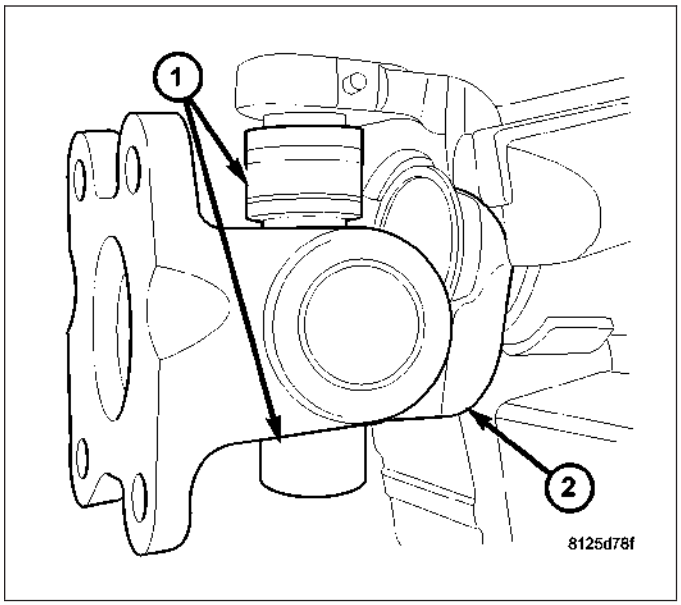


DISASSEMBLY - WITH INJECTED RINGS

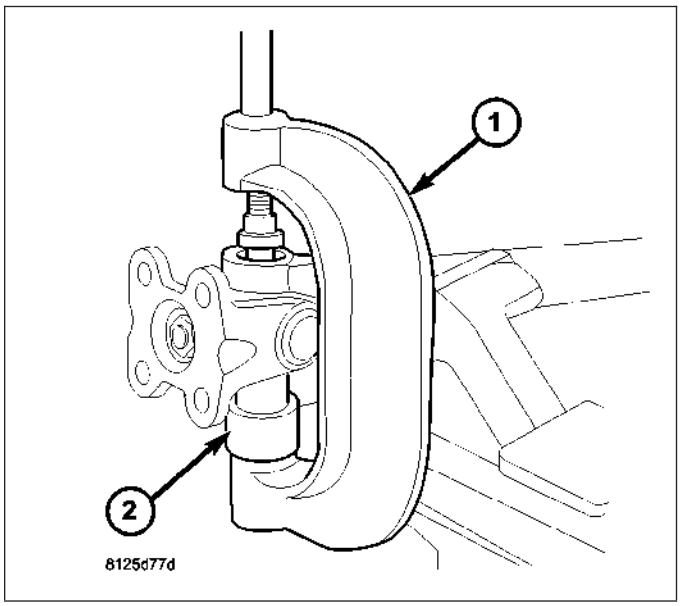
1. Place shaft yoke in vise.
2. Position U-joint press (1) with receiver (2) on propeller shaft yoke.



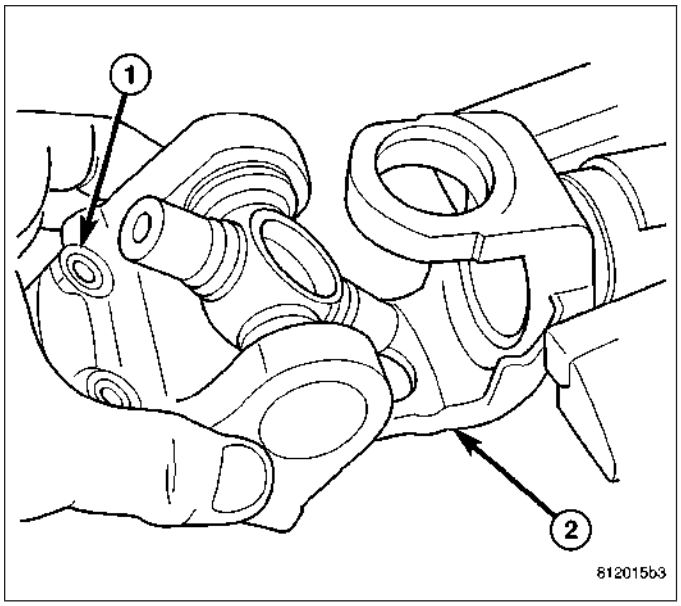
3. Pressed U-joint bearing caps (1) out of shaft yoke (2).



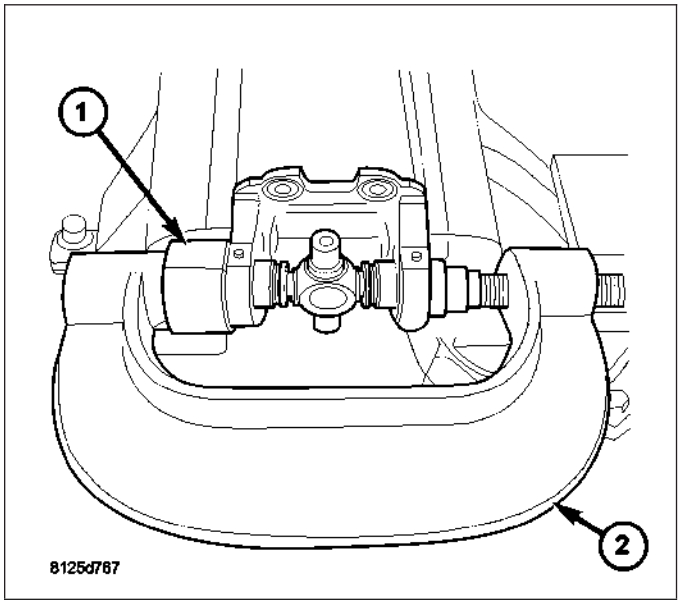
4. Remove lower bearing cap from shaft yoke.
5. Turn shaft over and position press (1) with receiver (2) on shaft yoke.



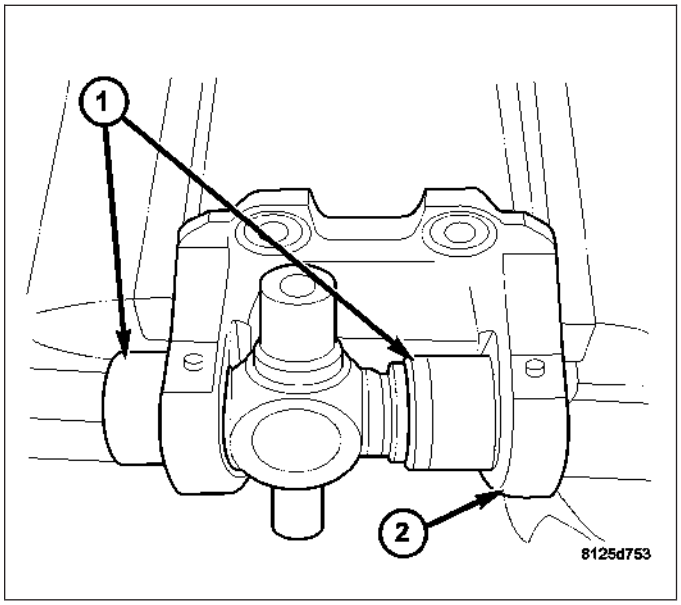
6. Press remaining U-joint bearing cap out of shaft yoke.
7. Remove flange (1) with U-joint out of shaft yoke (2).



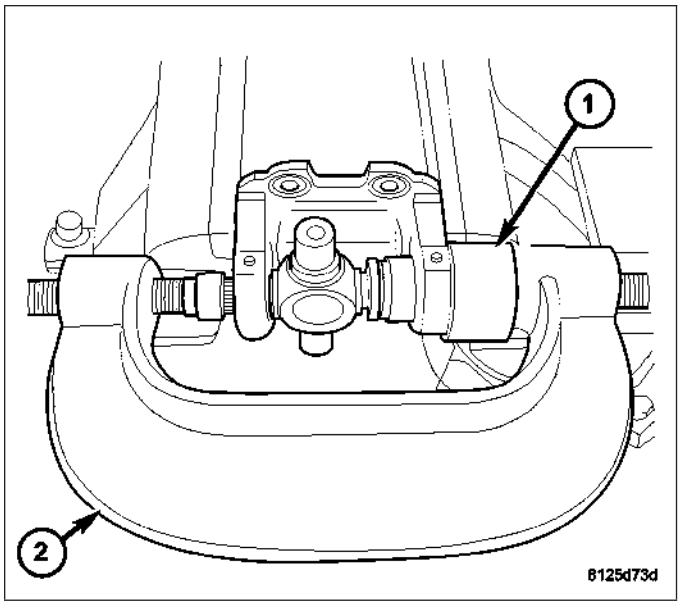
8. Position U-joint press (2) with receiver (1) on flange.



9. Press U-joint bearing caps (1) out of flange (2).



10. Remove bearing cap on the outside of the flange.
11. Position U-joint press (2) with receiver (1) on flange.
12. Press remaining U-joint bearing cap out of flange.
13. Remove U-joint from flange.

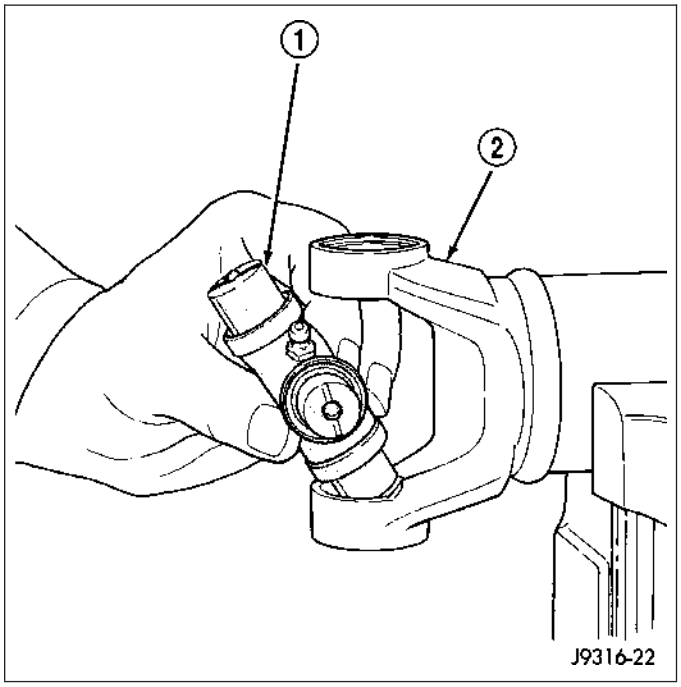


ASSEMBLY

ASSEMBLY - WITH SNAP RINGS

NOTE: This procedure describes a propeller shaft equipped a cardan joint in the tube yoke. For propeller shafts equipped with a companion/slip yoke, repeat the steps to remove the remaining cardan joint.

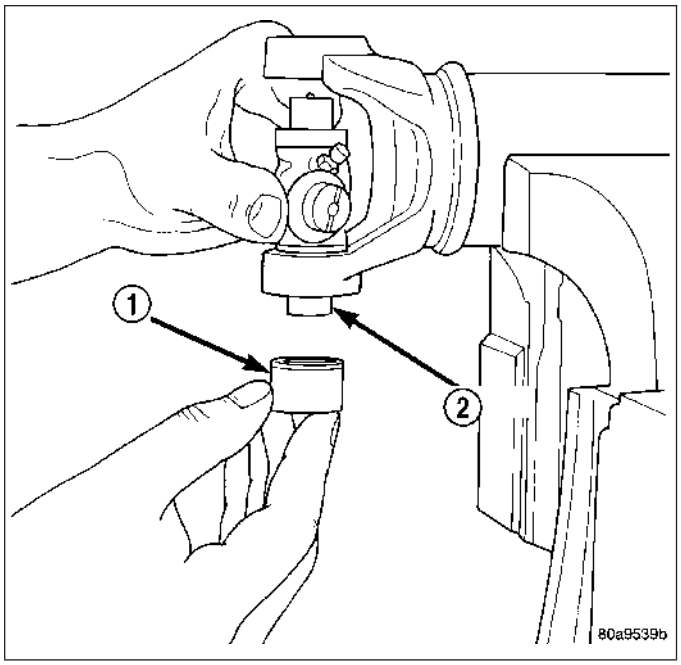
1. Apply (EP) N.L.G.I. Grade 1 or 2 grease to inside of yoke bores.
2. Position cross (1) in yoke with lube fitting pointing up, if equipped.



3. Place a bearing cap (1) over the cross end (2) and align cap with yoke bore.
4. Press bearing cap into the yoke bore enough to clear snap ring groove.
5. Repeat Step 3 and Step 4 to install the opposite bearing cap.

NOTE: If joint is stiff or binding, strike the yoke with a soft hammer to seat the needle bearings.

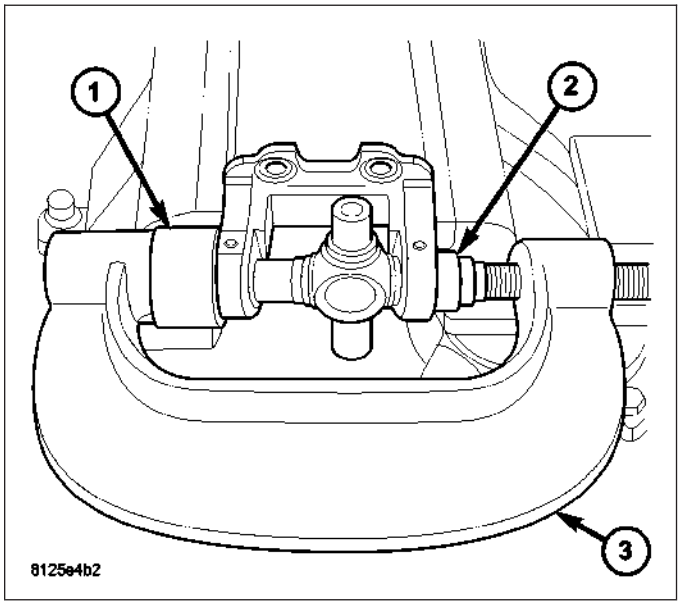
6. Add grease to lube fitting, if equipped.



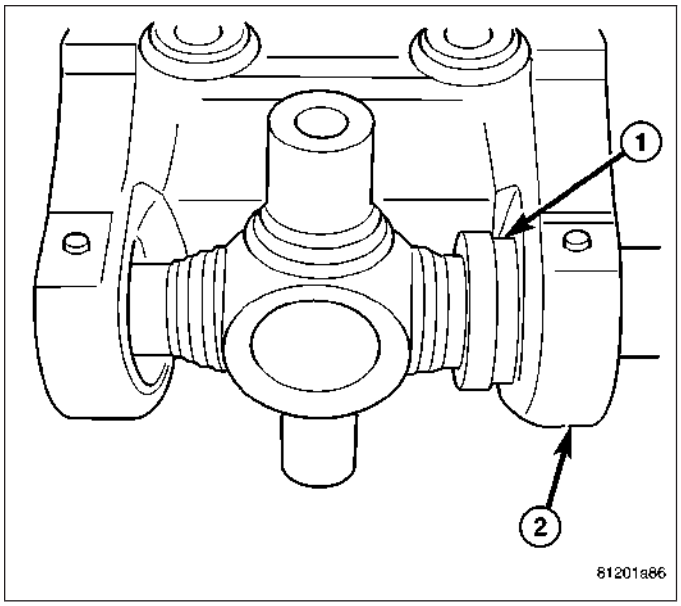
ASSEMBLY - WITH INJECTED RINGS

NOTE: Replacement joint has internal snap rings.

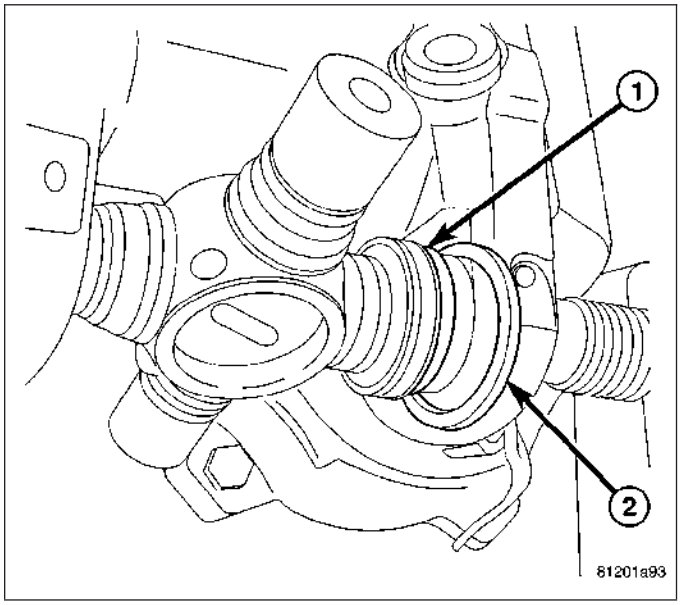
1. Place joint in flange with one bearing cap.
2. Position press (3) with receiver (1) on flange and bearing cap (2).



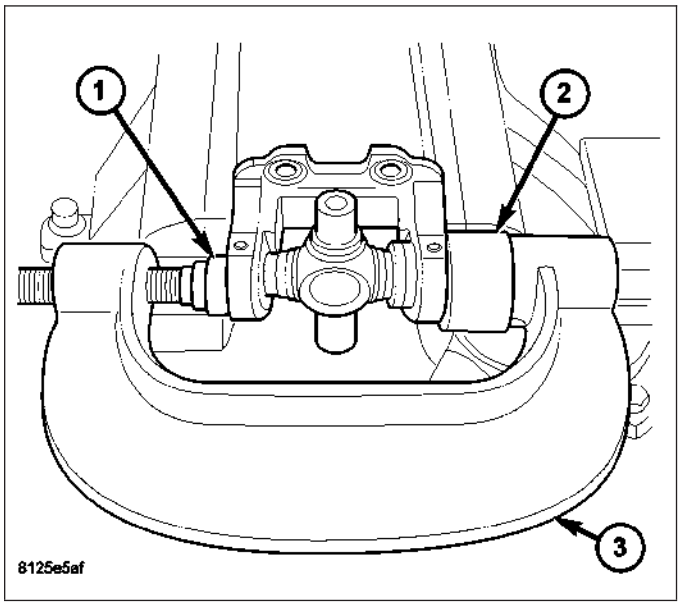
3. Press bearing cap until snap ring groove (1) is through the flange (2).



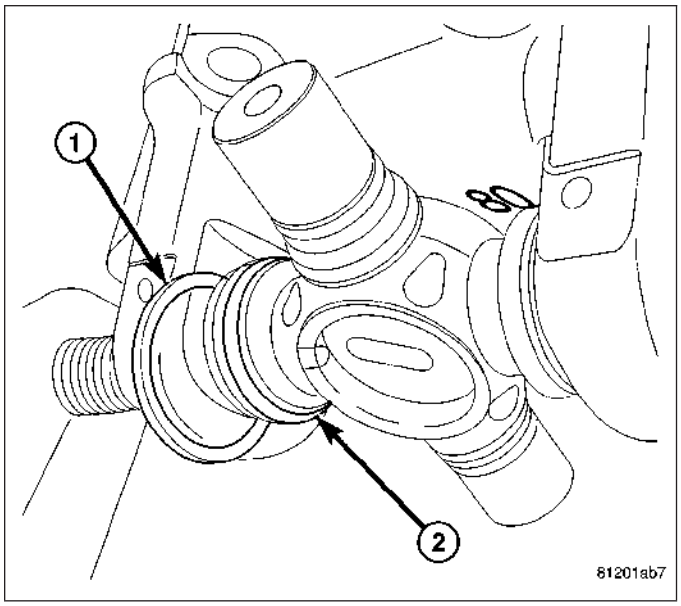
4. Install snap ring (2) on bearing (1).



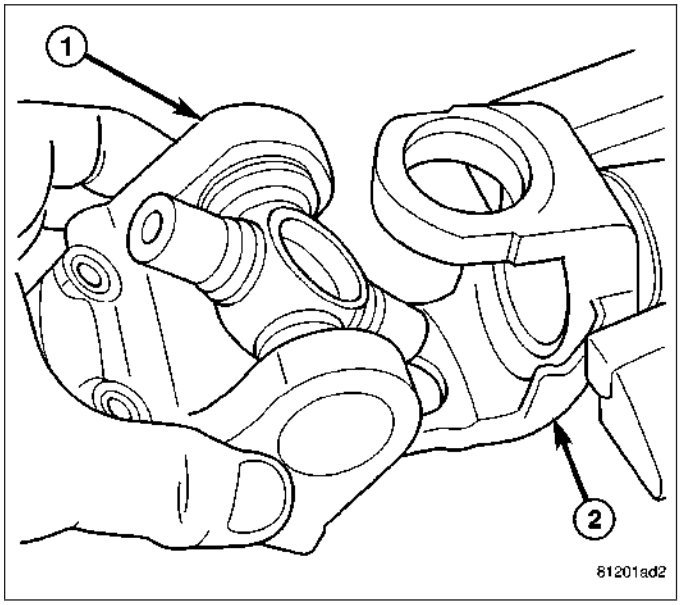
5. Position press (3) with receiver (2) on remaining bearing cap (1) and flange.



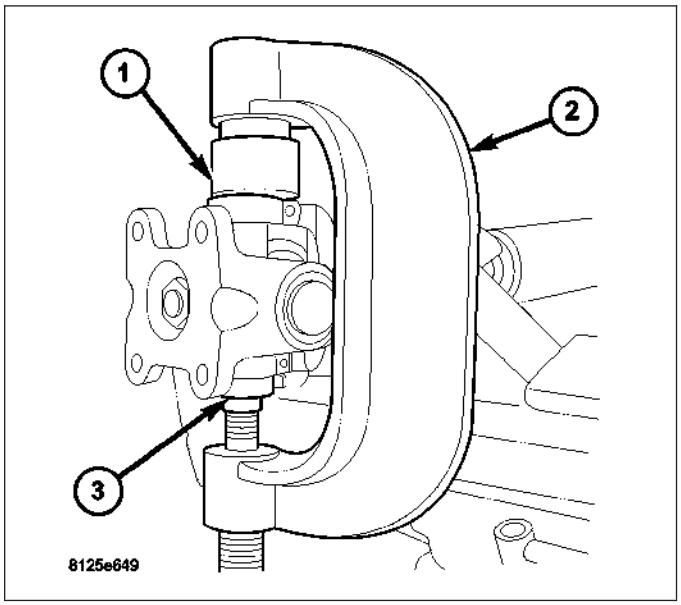
6. Press bearing cap until snap ring groove is through the flange.
7. Install snap ring (1) on bearing cap (2).



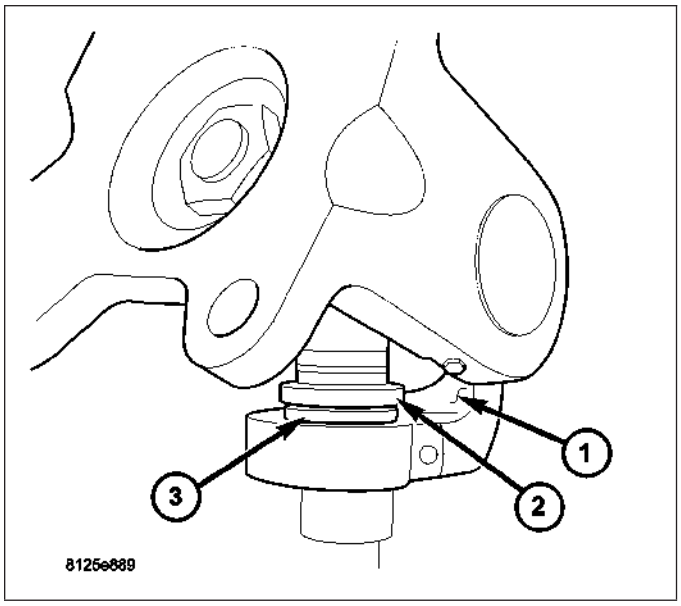
8. Install flange (1) with U-joint in yoke (2).



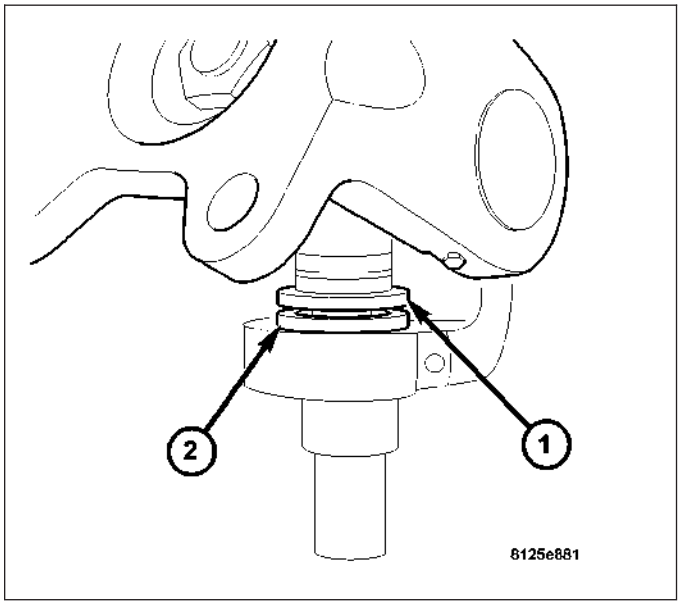
9. Position press (2) with receiver (1) and lower bearing cap (3) on yoke.



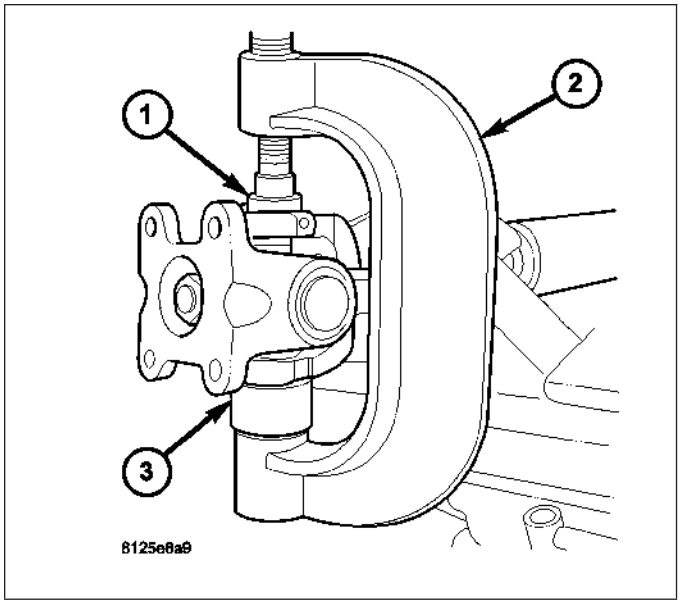
10. Press bearing cap until snap ring groove is through the yoke.



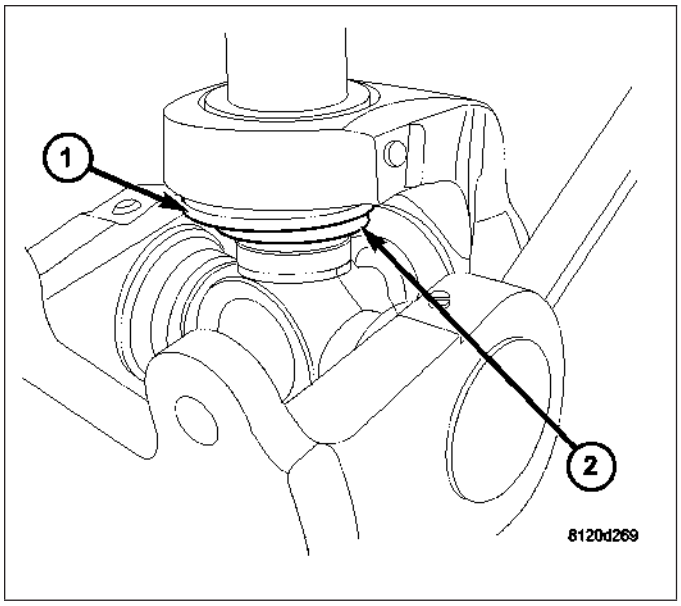
11. Install snap ring (2) on bearing cap (1).



12. Position press (2) with receiver (3) on remaining bearing cap (1) and yoke.



13. Press remaining bearing cap until snap ring groove is through the yoke.
14. Install snap ring (2) on bearing cap (1).



HALF SHAFT

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HALF SHAFT

CAUTION

CAUTION:: Never grasp half shaft assembly by the boots. This may cause the boot to pucker or crease and reduce the service life of the boot.
Avoid over angulating or stroking the C/V joints when handling the half shaft.
Half shafts exposed to battery acid, transmission fluid, brake fluid, differential fluid or gasoline may cause the boots to deteriorate. Failure to follow these instruction will result in damage.

DIAGNOSIS AND TESTING

HALF SHAFT

Check inboard and outboard C/V joint for leaking grease. This is a sign of boot or boot clamp damage.

NOISE/VIBRATION IN TURNS

A clicking noise or vibration in turns could be caused by a damaged outer C/V or inner tripod joint seal boot or seal boot clamps. This will result in the loss/contamination of the joint grease, resulting in inadequate lubrication of the joint. Noise could also be caused by another component of the vehicle coming in contact with the half shafts.

CLUNKING NOISE DURING ACCELERATION

This noise may be a damaged or worn C/V joint. A torn boot or loose/missing clamp on the inner/outer joint which has allowed the grease to be lost will damage the C/V joint.

SHUDDER/VIBRATION DURING ACCELERATION

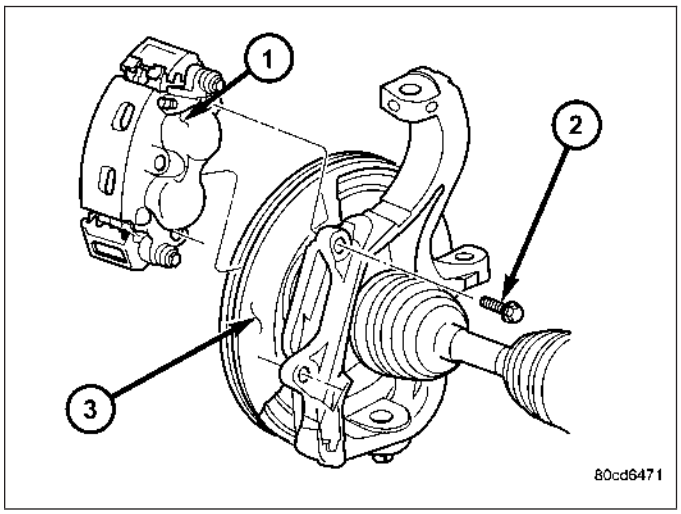
This could be a worn/damaged inner tripod joint or a sticking tripod joint. Improper wheel alignment may also cause a shudder or vibration.

VIBRATION AT HIGHWAY SPEEDS

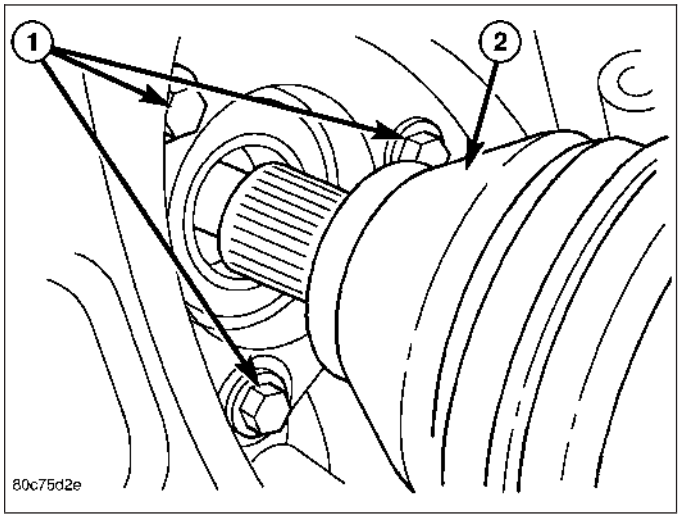
This problem could be a result of out of balance front tires or tire/wheel runout. Foreign material (mud, etc.) packed on the backside of the wheel(s) will also cause a vibration.

REMOVAL

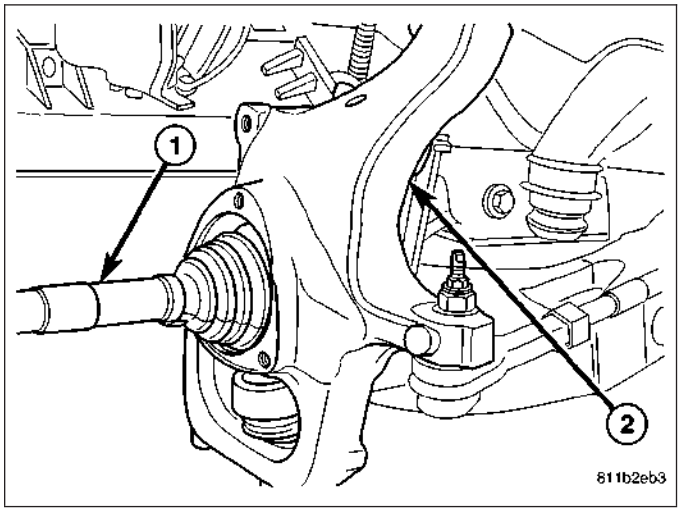
1. With vehicle in neutral, position vehicle on hoist.
2. Remove skid plate, if equipped.
3. Remove hub nut from the half shaft.
4. Remove brake caliper (1) and rotor (3).



5. Remove wheel speed sensor if equipped.
6. Remove hub bearing bolts (1) from the knuckle.

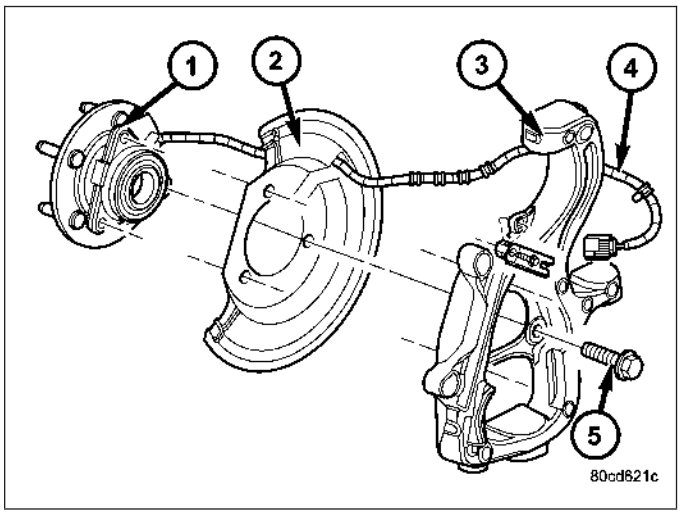


7. Remove hub bearing and brake shield from knuckle.
8. Support half shaft at the C/V joint housings.
9. Position two pry bars behind the inner C/V housing and disengage the C/V joint from the axle.
10. Remove half shaft (1) from vehicle.

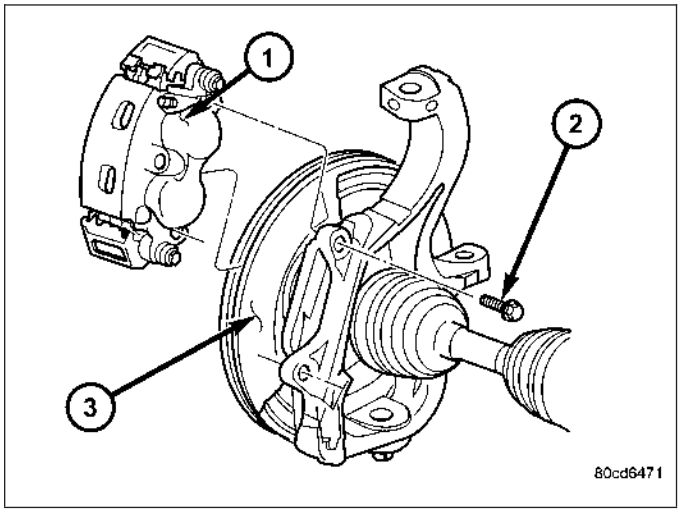


INSTALLATION

1. Apply a light coating of wheel bearing grease on the axle splines.
2. Insert half shaft into steering knuckle and onto the axle. Verify shaft snap-ring engages with the groove on the inside of the joint housing.
3. Clean hub bearing bore and hub bearing mating surface. Lightly coat mating surfaces with grease.
4. Install hub bearing (1) onto the axle half shaft and into steering knuckle (3). Tighten hub bearing bolts to 163 N·m (120 ft. lbs.).



5. Install wheel speed sensor, if equipped.
6. Install brake rotor (3) and caliper adapter with caliper (1).
7. Install half shaft nut. Apply brakes and tighten shaft nut to 251 N·m (185 ft. lbs.).
8. Install skid plate, if equipped.

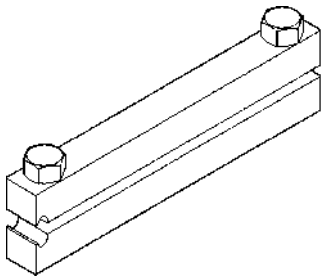


SPECIFICATIONS

TORQUE

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Hub Bearing Bolts	163	120	-
Half Shaft Nut	251	185	-

SPECIAL TOOLS



CLAMP INSTALLER C-4975A

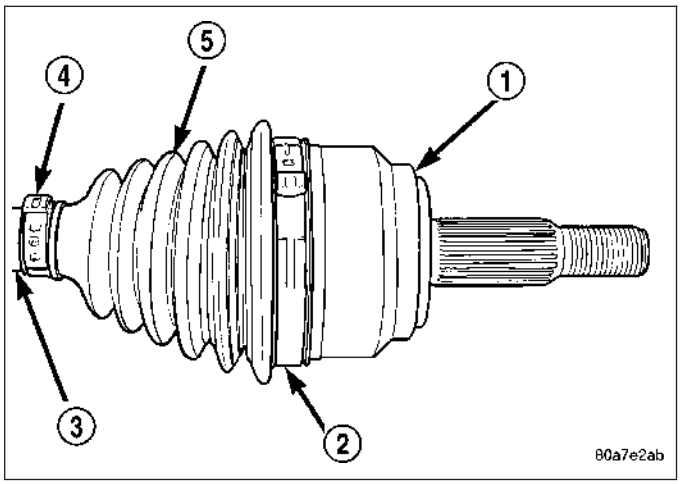
C/V JOINT/BOOT-OUTER

REMOVAL

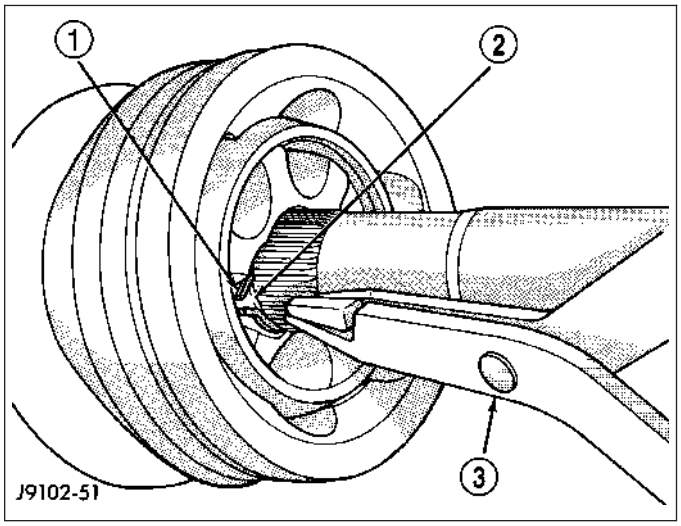
1. Place shaft in vise with soft jaws and support C/V joint.

CAUTION: Do not damage C/V housing or half shaft.

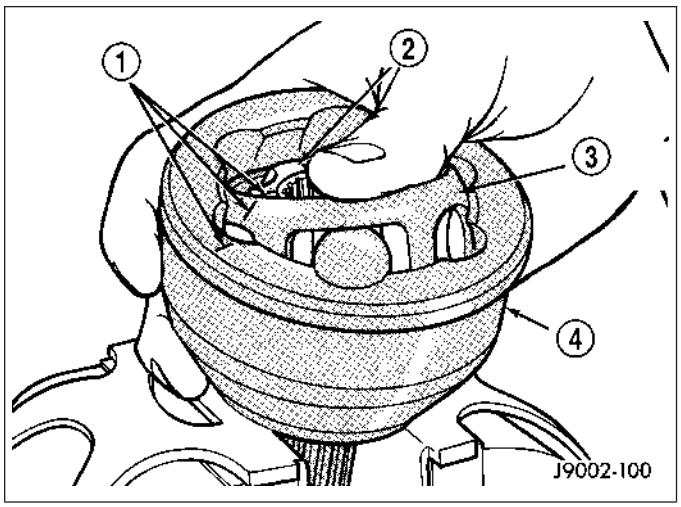
2. Remove clamps (2) (4) with a cut-off wheel or grinder.



3. Slide the boot down the shaft.
4. Remove lubricant to expose the C/V joint snap ring.
5. Spread snap ring (1) and slide the joint off the shaft.



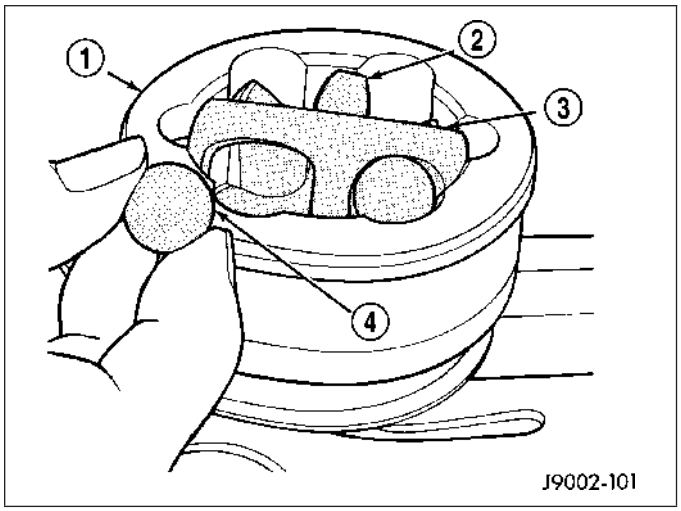
6. Slide boot off the shaft and discard old boot.
7. Mark alignment marks (1) on the inner race/hub (2), bearing cage (3) and housing with dabs of paint.



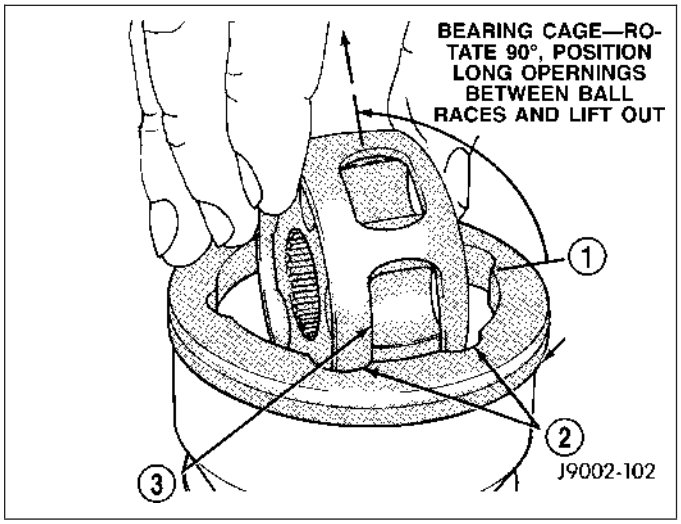
8. Clamp C/V joint in a vertical position in a soft jawed vise.
9. Press down one side of the bearing cage (3) to gain access to the ball at the opposite side.

NOTE: If joint is tight, use a hammer and brass drift to loosen the bearing hub. Do not contact the bearing cage with the drift.

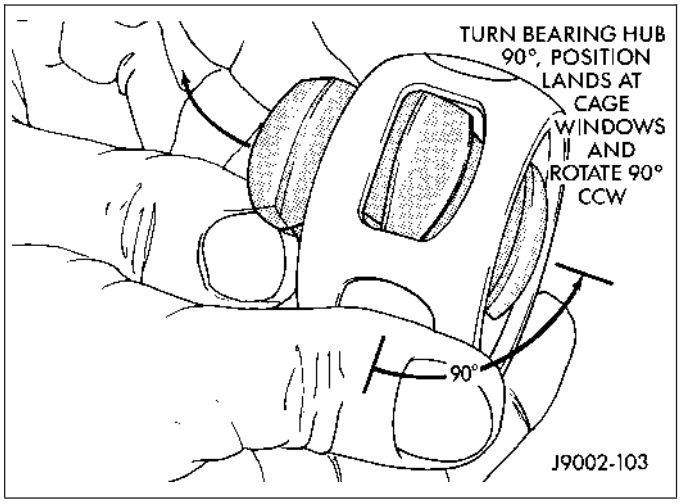
10. Remove ball (4) from the bearing cage (3).



11. Repeat step above until all six balls are removed from the bearing cage.
12. Lift cage and inner race (2) upward and out from the housing (1).

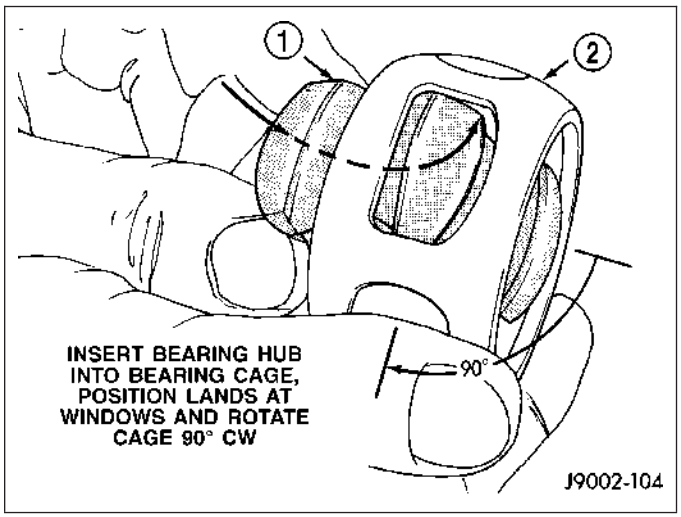


13. Turn inner race 90° in the cage and rotate the inner race/hub out of the cage.

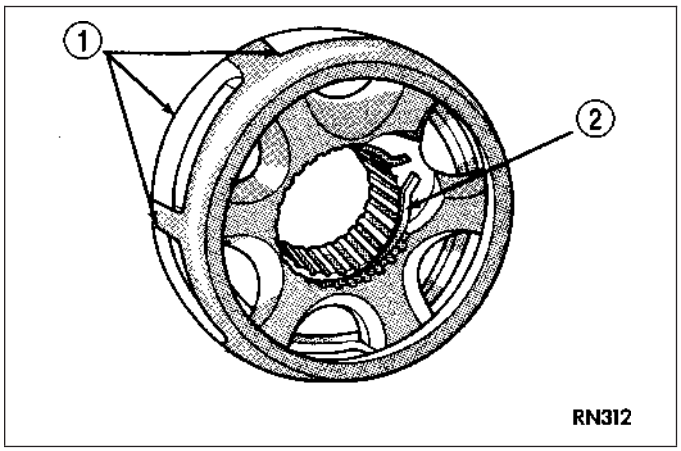


INSTALLATION

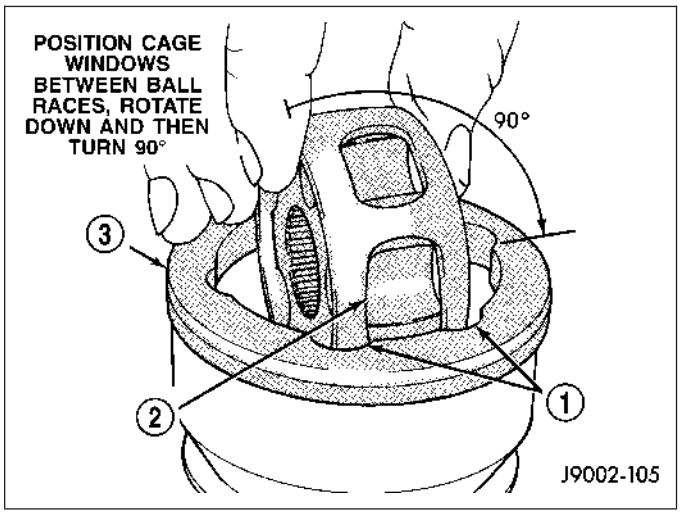
1. Apply a light coat of grease to the C/V joint components before assembling them.
2. Align inner race, cage and housing according to the alignment reference marks.
3. Insert inner race (1) into the cage (2) and rotate race into the cage.



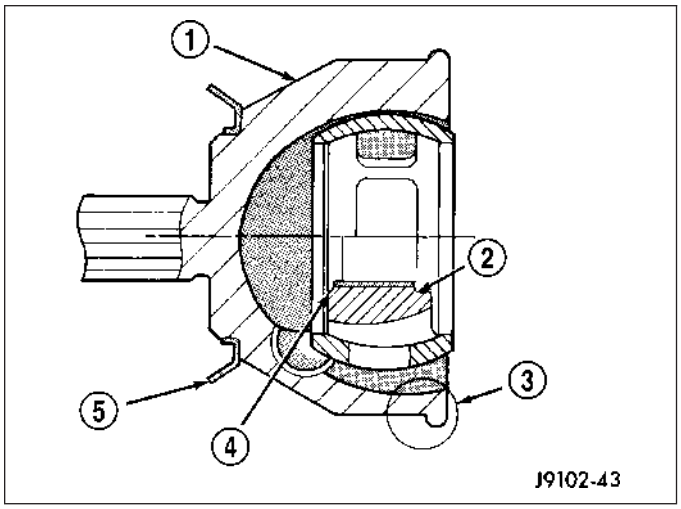
4. Rotate inner race/hub in the cage (1).



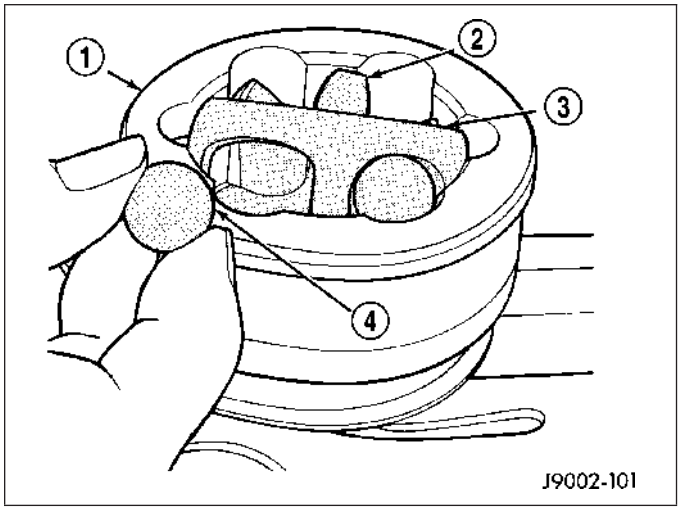
5. Insert cage into the housing (3).



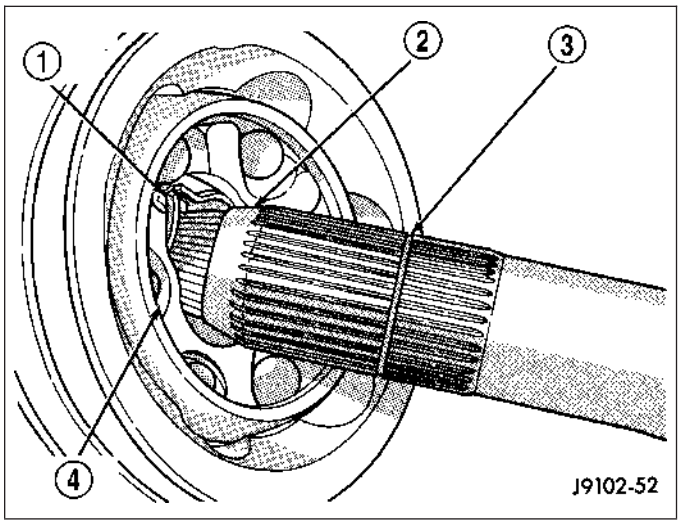
6. Rotate cage 90° into the housing (1).



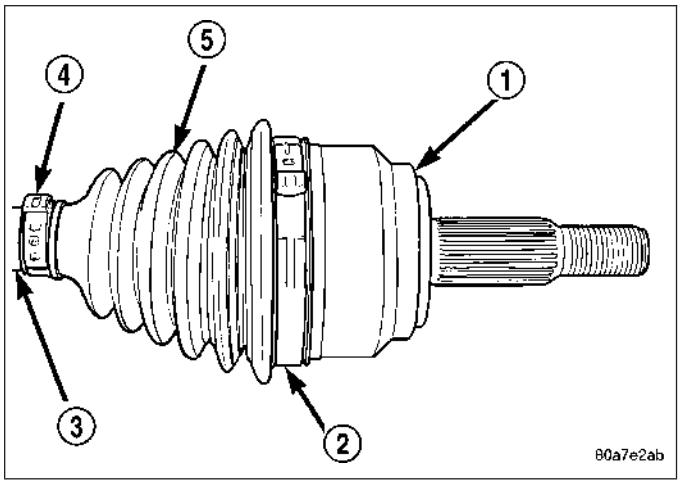
7. Apply lubricant included with replacement boot/joint to the ball races. Spread lubricant equally between all the races.
8. Tilt inner race/hub (2) and cage (3) and install the balls (4).



9. Place new clamps onto new boot and slide boot onto the shaft to it's original position.
10. Apply the rest of lubricant to the C/V joint and boot.
11. Push the joint onto the shaft until the snap ring (1) seats in the groove (3). Pull on the joint to verify the span ring has engaged.



12. Position boot on the joint in it's original position. Ensure boot is not twisted and remove any excess air.
13. Secure both boot clamps (2) (4) with Clamp Installer C-4975A. Place tool on clamp bridge and tighten tool until the jaws of the tool are closed.

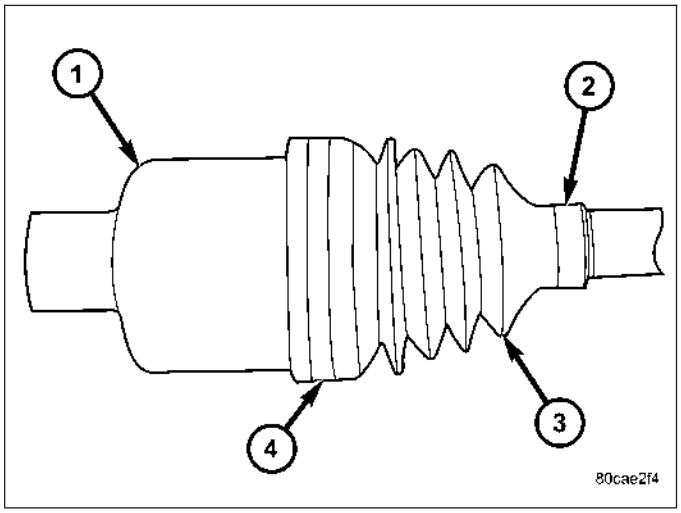


C/V JOINT/BOOT-INNER

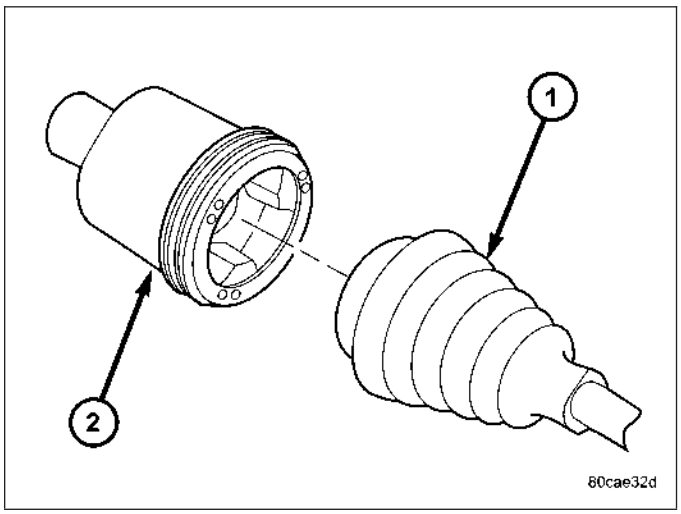
REMOVAL

1. Place shaft in vise with soft jaws and support C/V joint.
2. Remove clamps (2) (4) with a cut-off wheel or grinder.

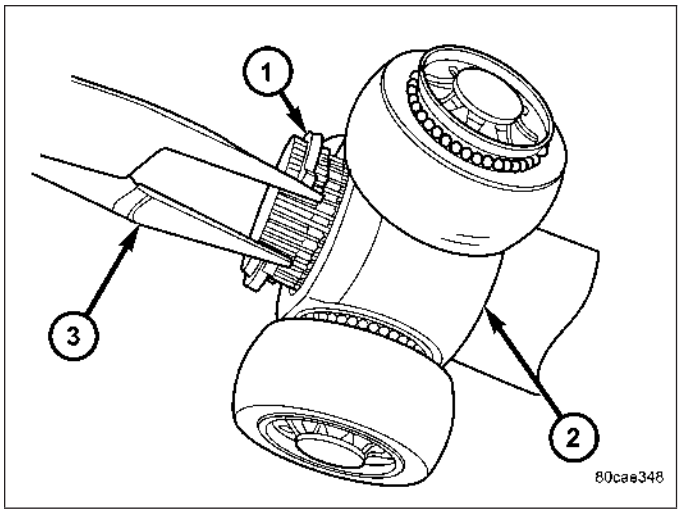
NOTE: Do not damage C/V housing or half shaft with cut-off wheel or grinder.



3. Remove housing (1) from the half shaft and slide boot (2) down shaft.

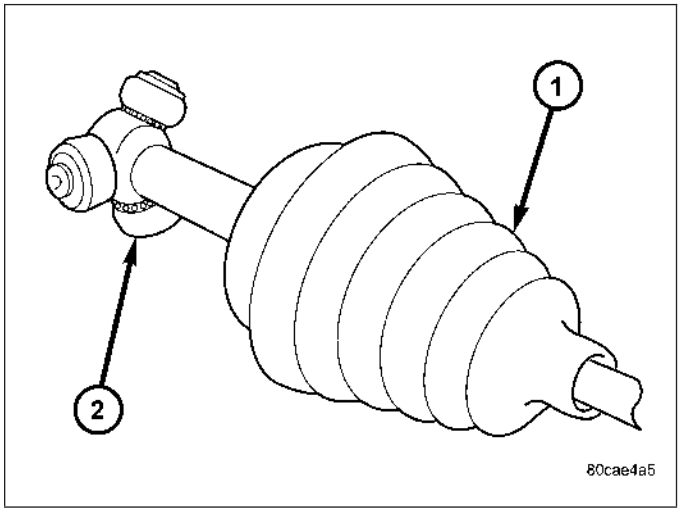


4. Remove housing bushing from the housing.
5. Remove tripod (2) snap ring (1).
6. Remove tripod and boot from the half shaft.
7. Clean and inspect C/V components for excessive wear and damage. Replace the tripod as a unit only if necessary.

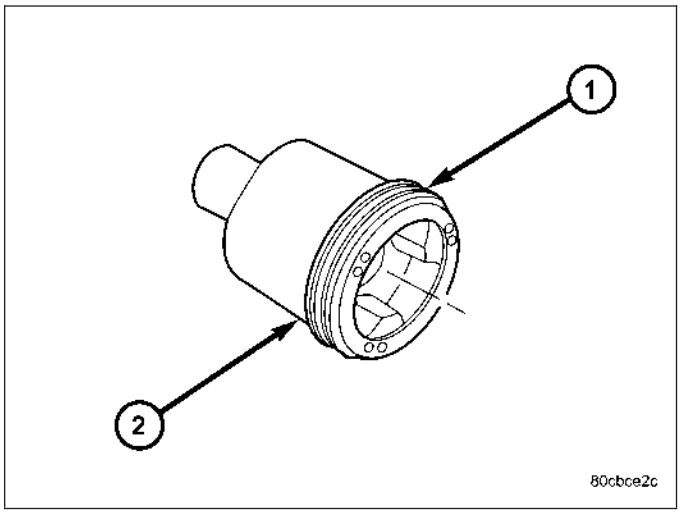


INSTALLATION

1. Slide **new** boot down the half shaft.
2. Install tripod (1) and tripod snap ring on the half shaft.



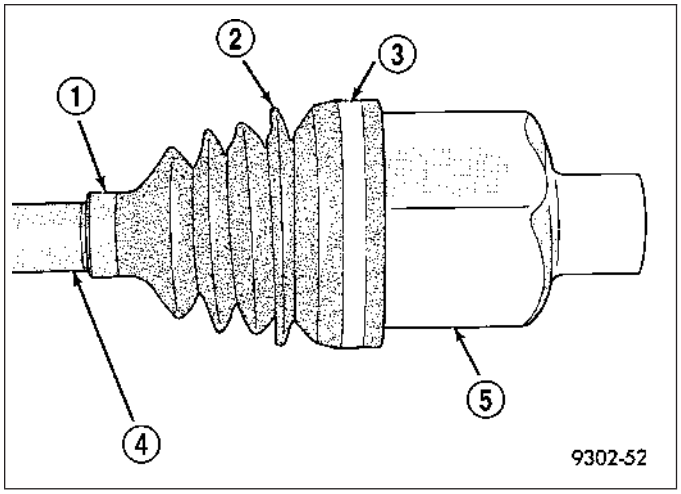
3. Pack grease supplied with the joint/boot into the housing and boot.
4. Coat tripod with supplied grease.
5. Install **new** bushing (2) onto the housing (1).



6. Insert tripod and shaft in the housing.
7. Position boot (2) on the joint in it's original position.

NOTE: Verify boot is not twisted and remove any excess air.

8. Secure both boot clamps with Clamp Installer C-4975A. Place tool on clamp bridge and tighten tool until the jaws of the tool are closed.



FRONT AXLE - C205F

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FRONT AXLE - C205F

DIAGNOSIS AND TESTING

FRONT AXLE - C205F

GEAR NOISE

Axle gear noise can be caused by insufficient lubricant, incorrect backlash, tooth contact, worn/damaged gears or the carrier housing not having the proper offset and squareness.

Gear noise usually happens at a specific speed range. The noise can also occur during a specific type of driving condition. These conditions are acceleration, deceleration, coast, or constant load.

When road testing, first warm-up the axle fluid by driving the vehicle at least 5 miles and then accelerate the vehicle to the speed range where the noise is the greatest. Shift out-of-gear and coast through the peak-noise range. If the noise stops or changes greatly:

- Check for insufficient lubricant.
- Incorrect ring gear backlash.
- Gear damage.

Differential side gears and pinions can be checked by turning the vehicle. They usually do not cause noise during straight-ahead driving when the gears are unloaded. The side gears are loaded during vehicle turns. A worn pinion mate shaft can also cause a snapping or a knocking noise.

BEARING NOISE

The axle shaft, differential and pinion bearings can all produce noise when worn or damaged. Bearing noise can be either a whining, or a growling sound.

Pinion bearings have a constant-pitch noise. This noise changes only with vehicle speed. Pinion bearing noise will be higher pitched because it rotates at a faster rate. Drive the vehicle and load the differential. If bearing noise occurs, the rear pinion bearing is the source of the noise. If the bearing noise is heard during a coast, the front pinion bearing is the source.

Differential bearings usually produce a low pitch noise. Differential bearing noise is similar to pinion bearing noise. The pitch of differential bearing noise is also constant and varies only with vehicle speed.

Axle shaft bearings produce noise and vibration when worn or damaged. The noise generally changes when the bearings are loaded. Road test the vehicle. Turn the vehicle sharply to the left and to the right. This will load the bearings and change the noise level. Where axle bearing damage is slight, the noise is usually not noticeable at speeds above 30 mph.

LOW SPEED KNOCK

Low speed knock is generally caused by a worn U-joint or by worn side-gear thrust washers. A worn pinion shaft bore will also cause low speed knock.

VIBRATION

Vibration at the rear of the vehicle is usually caused by:

- Damaged drive shaft.
- Missing drive shaft balance weight(s).
- Worn or out of balance wheels.
- Loose wheel lug nuts.
- Worn U-joints or C/V joints.
- Loose/broken springs.
- Damaged axle shaft bearing(s).
- Loose pinion gear nut.
- Excessive pinion yoke run out.
- Bent axle shaft(s).

Check for loose or damaged front end components or engine/transmission mounts. These components can contribute to what appears to be a rear end vibration. Do not overlook engine accessories, brackets and drive belts.

DRIVELINE SNAP

A snap or clunk noise when the vehicle is shifted into gear (or the clutch engaged) can be caused by:

- High engine idle speed.
- Transmission shift operation.
- Loose engine/transmission/transfer case mounts.
- Worn U-joints or C/V joints.
- Loose spring mounts.
- Loose pinion gear nut and yoke.
- Excessive ring gear backlash.
- Excessive side gear to case clearance.

The source of a snap or a clunk noise can be determined with the assistance of a helper. Raise the vehicle on a hoist with the wheels free to rotate. Instruct the helper to shift the transmission into gear. Listen for the noise, a mechanics stethoscope is helpful in isolating the source of a noise.

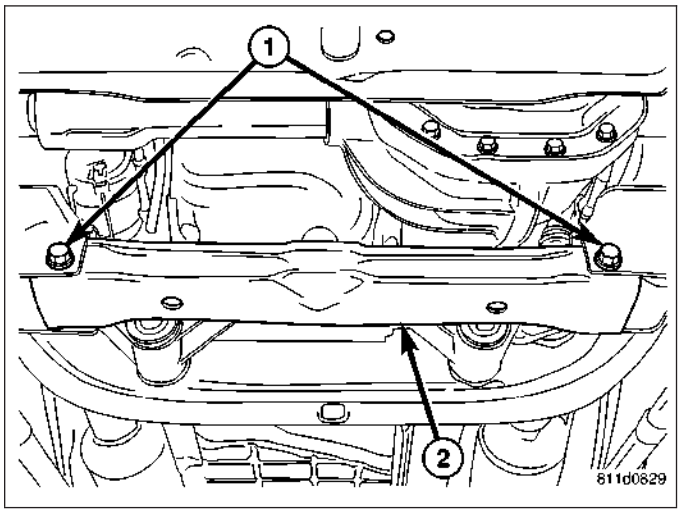
DIAGNOSTIC CHART

Condition	Possible Causes	Correction
Wheel Noise	1. Wheel loose.	1. Tighten loose nuts.
	2. Faulty, brinelled wheel bearing.	2. Replace bearing.
Axle Shaft Noise	1. Misaligned axle tube.	1. Inspect axle tube alignment. Correct as necessary.
	2. Bent or sprung axle shaft.	2. Inspect and correct as necessary.
	3. End-play in pinion bearings.	3. Refer to pinion pre-load information and correct as necessary.
	4. Excessive gear backlash between the ring gear and pinion.	4. Check adjustment of the ring gear and pinion backlash. Correct as necessary.
	5. Improper adjustment of pinion gear bearings.	5. Adjust the pinion bearings pre-load.
	6. Loose pinion yoke nut.	6. Tighten the pinion yoke nut.
	7. Scuffed gear tooth contact surfaces.	7. Inspect and replace as necessary.
Axle Shaft Broke	1. Misaligned axle tube.	1. Replace the broken shaft after correcting tube mis-alignment.
	2 Vehicle overloaded.	2. Replace broken shaft and avoid excessive weight on vehicle.
	3. Erratic clutch operation.	3. Replace broken shaft and avoid or correct erratic clutch operation.
	4. Grabbing clutch.	4. Replace broken shaft and inspect and repair clutch as necessary.
Differential Cracked	1. Improper adjustment of the differential bearings.	1. Replace case and inspect gears and bearings for further damage. Set differential bearing pre-load properly.
	2. Excessive ring gear backlash.	2. Replace case and inspect gears and bearings for further damage. Set ring gear backlash properly.
	3. Vehicle overloaded.	3. Replace case and inspect gears and bearings for further damage. Avoid excessive vehicle weight.
	4. Erratic clutch operation.	4. Replace case and inspect gears and bearings for further damage. Avoid erratic use of clutch.
Differential Gears Scored	1. Insufficient lubrication.	1. Replace scored gears. Fill differential with the correct fluid type and quantity.
	2. Improper grade of lubricant.	2. Replace scored gears. Fill differential with the correct fluid type and quantity.
	3. Excessive spinning of one wheel/tire.	3. Replace scored gears. Inspect all gears, pinion bores, and shaft for damage. Service as necessary.

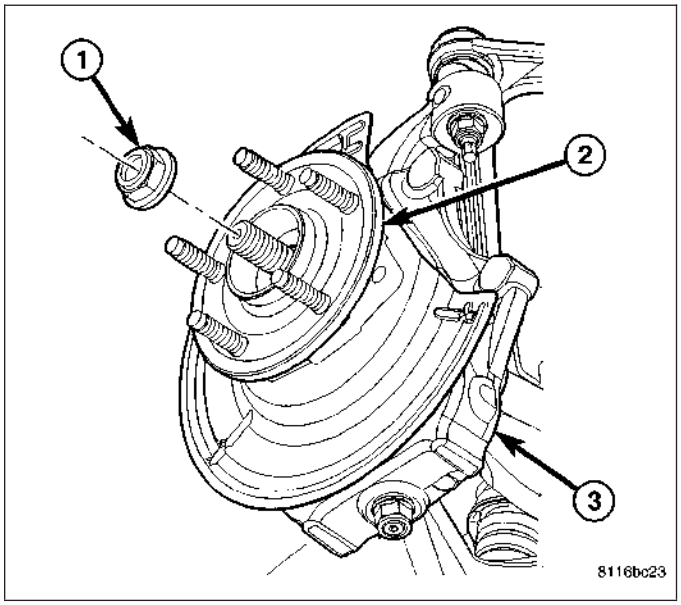
Condition	Possible Causes	Correction
Loss Of Lubricant	1. Lubricant level too high.	1. Drain lubricant to the correct level.
	2. Worn axle shaft seals.	2. Replace seals.
	3. Cracked differential housing.	3. Repair as necessary.
	4. Worn pinion seal.	4. Replace seal.
	5. Worn/scored yoke.	5. Replace yoke and seal.
	6. Axle cover not properly sealed.	6. Remove, clean, and re-seal cover.
Axle Overheating	1. Lubricant level low.	1. Fill differential to correct level.
	2. Improper grade of lubricant.	2. Fill differential with the correct fluid type and quantity.
	3. Bearing pre-loads too high.	3. Re-adjust bearing pre-loads.
	4. Insufficient ring gear backlash.	4. Re-adjust ring gear backlash.
Gear Teeth Broke	1. Overloading.	1. Replace gears. Examine other gears and bearings for possible damage.
	2. Erratic clutch operation.	2. Replace gears and examine the remaining parts for damage. Avoid erratic clutch operation.
	3. Ice-spotted pavement.	3. Replace gears and examine remaining parts for damage.
	4. Improper adjustments.	4. Replace gears and examine remaining parts for damage. Ensure ring gear backlash is correct.
Axle Noise	1. Insufficient lubricant.	1. Fill differential with the correct fluid type and quantity.
	2. Improper ring gear and pinion adjustment.	2. Check ring gear and pinion contact pattern.
	3. Unmatched ring gear and pinion.	3. Replace gears with a matched ring gear and pinion.
	4. Worn teeth on ring gear and/or pinion.	4. Replace ring gear and pinion.
	5. Loose pinion bearings.	5. Adjust pinion bearing pre-load.
	6. Loose differential bearings.	6. Adjust differential bearing pre-load.
	7. Mis-aligned or sprung ring gear.	7. Measure ring gear run-out. Replace components as necessary.
	8. Loose differential bearing cap bolts.	8. Inspect differential components and replace as necessary. Ensure that the bearing caps are torqued tot he proper specification.
	9. Housing not machined properly.	9. Replace housing.

REMOVAL

1. With vehicle in neutral, position on hoist.
2. Remove the skid plate, if equipped.
3. Remove support crossmember bolts (1) and remove crossmember (2).

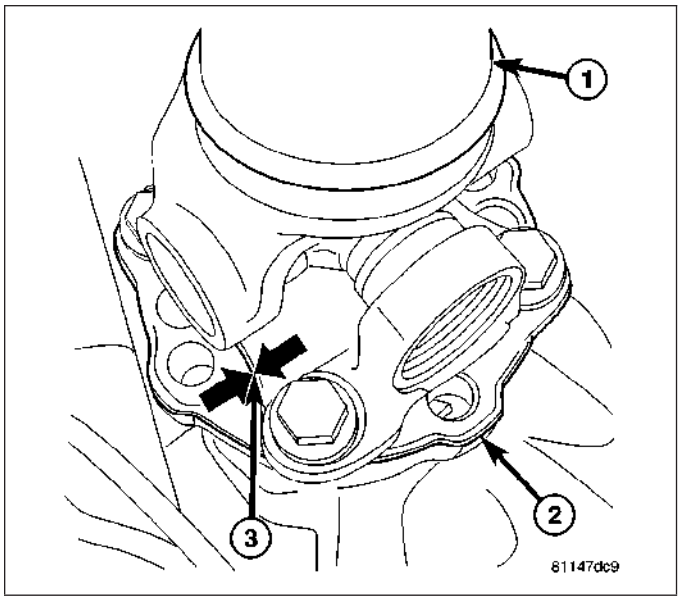


4. Remove brake components.
5. Remove axle hub nut (1).

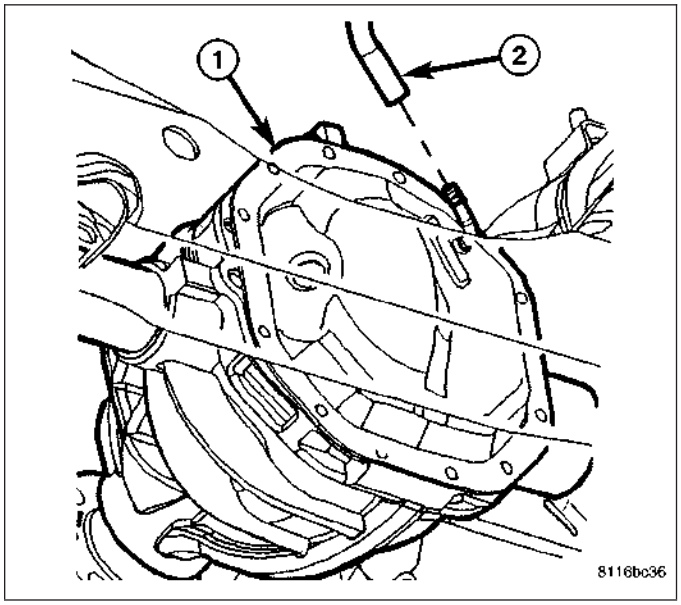


6. Remove hub bearing and brake shield.
7. Remove half shafts.

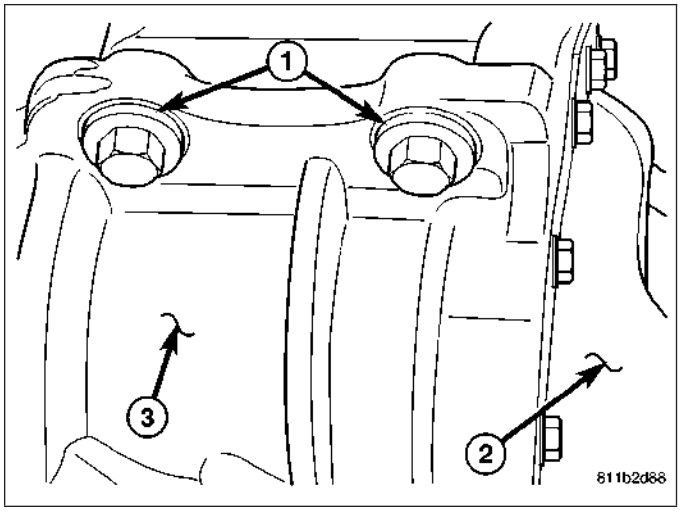
8. Mark propeller shaft (1) and flange (2) for installation reference.



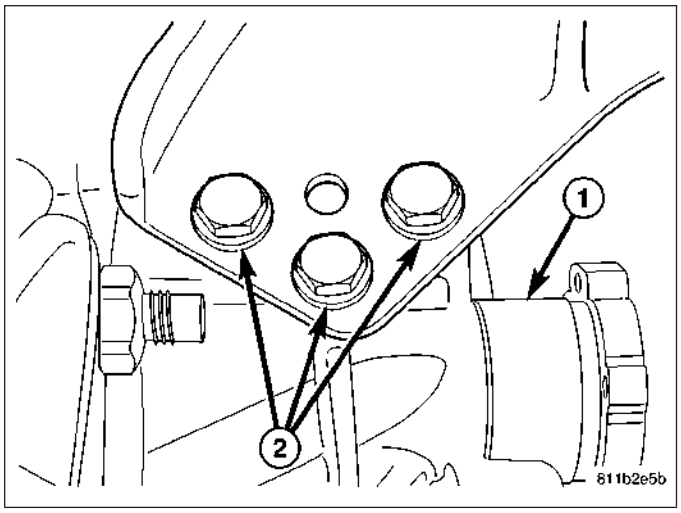
9. Remove propeller shaft.
10. Remove axle vent tube (2) from the differential cover (1).



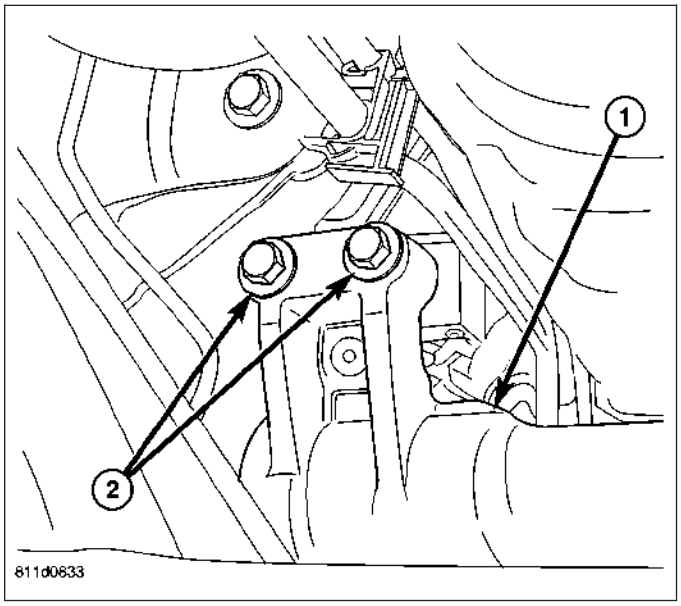
11. Support axle with a jack and secure axle to jack.
12. Remove 2 bolts (1) holding the differential housing (3) to the left engine mount.



13. Remove 3 bolts (2) holding the axle to the pinion nose bracket.



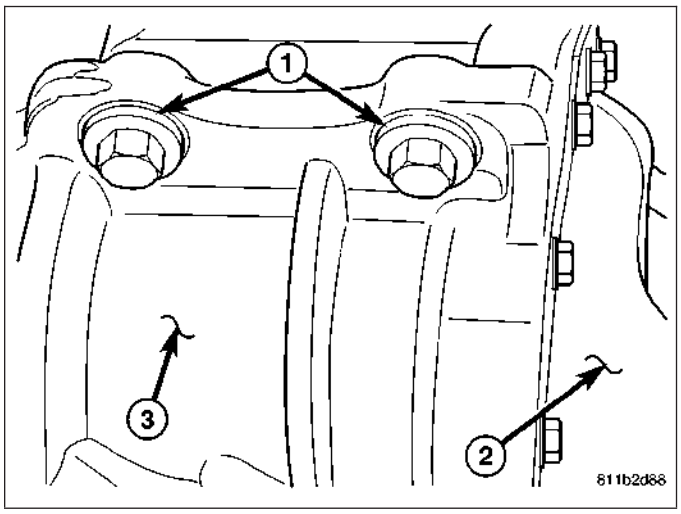
14. Remove 2 bolts (2) holding axle tube (1) to right engine mount.



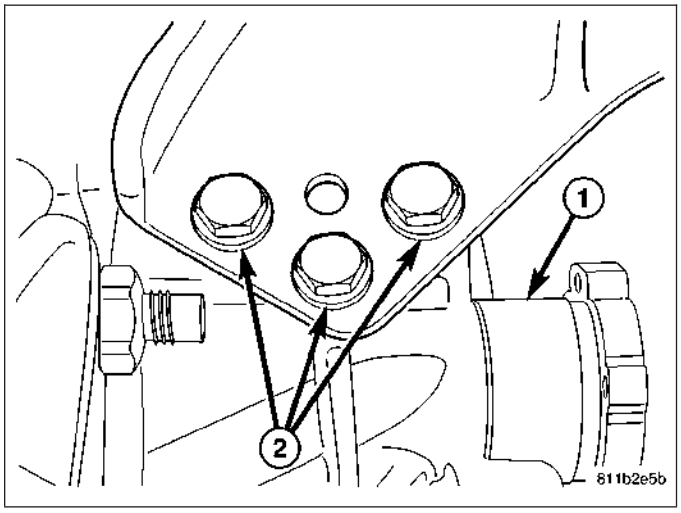
15. Lower axle from vehicle.

INSTALLATION

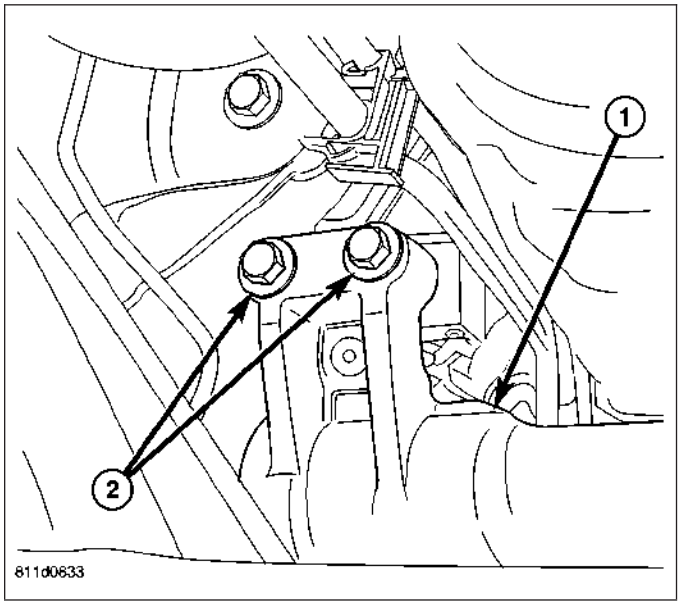
1. Raise axle into position.
2. Loosely install nuts and bolts (1) in engine mount.



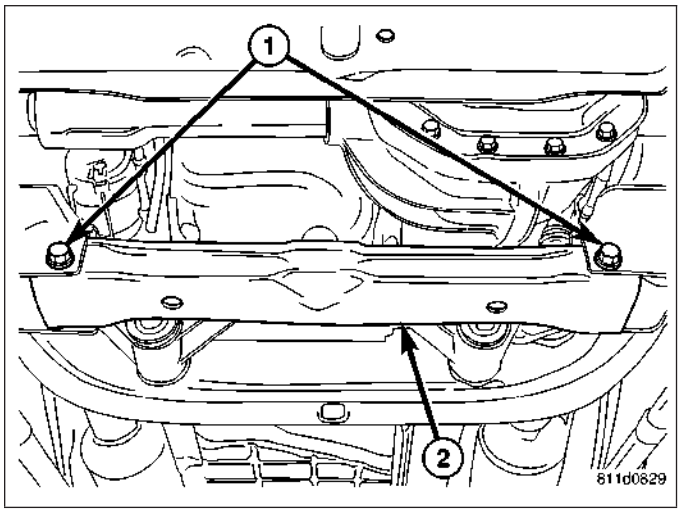
3. Loosely install nuts and bolts (2) in pinion nose bracket.



4. Loosely install bolts (2) in axle tube mount.



5. Tighten all the bolts finger-tight, then tighten all bolts to 95 N·m (70 ft. lbs.).
6. Install the axle vent tube.
7. Install propeller shaft with reference marks aligned.
8. Install half shafts.
9. Install support crossmember (2).
10. Install half shafts.
11. Install hub bearing and brake shield.
12. Install brake components.
13. Install half shafts.
14. Install skid plate, if necessary.

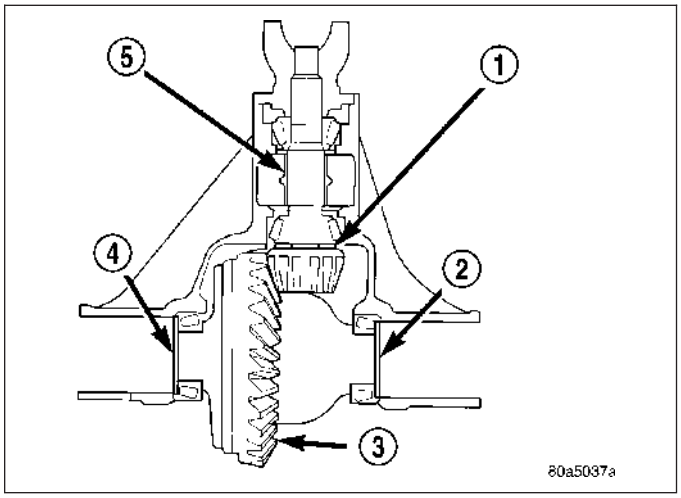


ADJUSTMENTS

FRONT AXLE - C205F

Ring gear and pinion are supplied as matched sets. Identifying numbers for the ring gear and pinion are painted onto the pinion gear shaft and the side of the ring gear. A plus (+) number, minus (–) number or zero (0) along with the gear set sequence number (01 to 99) is on each gear. This first number is the amount (in thousandths of an inch) the depth varies from the standard depth setting of a pinion marked with a (0). The next two numbers are the sequence number of the gear set. The standard depth provides the best teeth contact pattern.

Compensation for pinion depth variance is achieved with select shims (1) located between the rear pinion bearing cone and pinion gear head.



PINION GEAR DEPTH VARIANCE

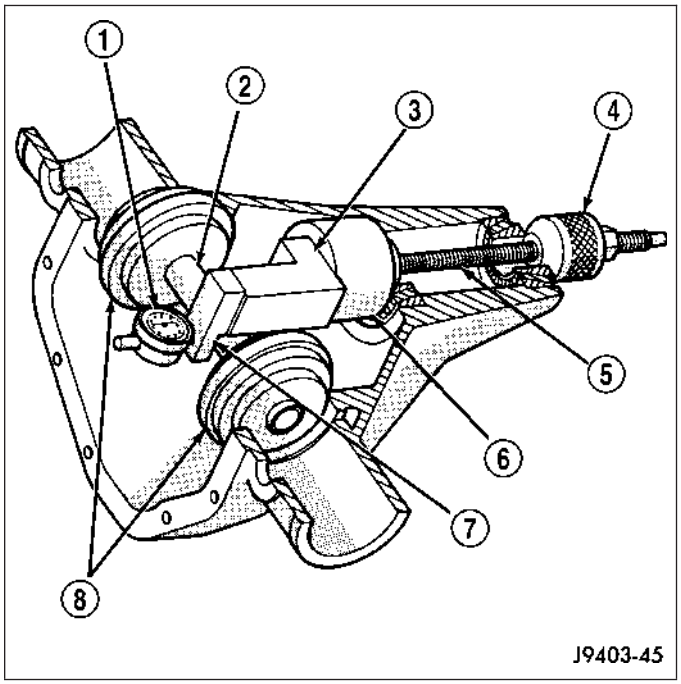
Original Pinion Gear Depth Variance	Replacement Pinion Gear Depth Variance								
	−4	−3	−2	−1	0	+1	+2	+3	+4
+4	+0.008	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0
+3	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001
+2	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002
+1	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003
0	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004
−1	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005
−2	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006
−3	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006	−0.007
−4	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006	−0.007	−0.008

If installing a new gear, note the depth variance number of the original and replacement pinion. Add or subtract this number from the original depth shim/oil slinger to compensate for the difference in the depth variances. The numbers represent thousands of an inch deviation from the standard. If the number is negative, add that value to the required thickness of the depth shims. If the number is positive, subtract that value from the thickness of the depth shim.

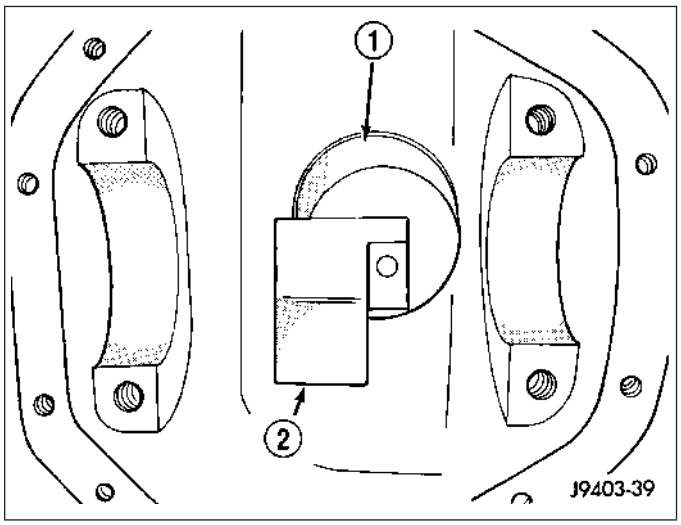
Pinion Gear Depth Variance Chart: Note where Old and New Pinion Marking columns intersect. Intersecting figure represents plus or minus the amount needed.

PINION DEPTH MEASUREMENT AND ADJUSTMENT

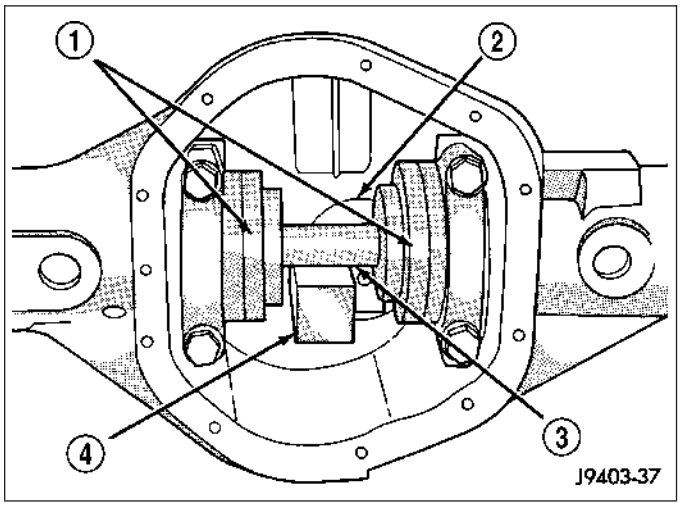
Measurements are taken with pinion cups and pinion bearings installed in housing. Take measurements with a Pinion Gauge Set, Pinion Block 8177 (6) Arbor Discs 8541 (8) and Dial Indicator C-3339.

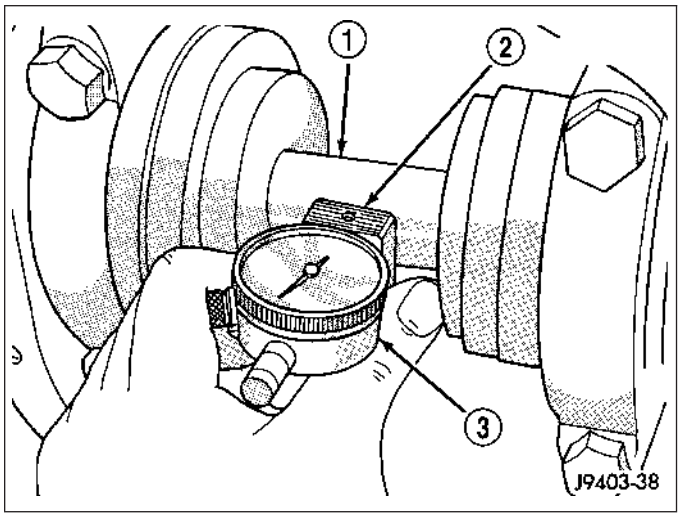


1. Assemble Pinion Height Block 6739 (2) Pinion Block 8177 (1) and rear pinion bearing onto Screw 6741.



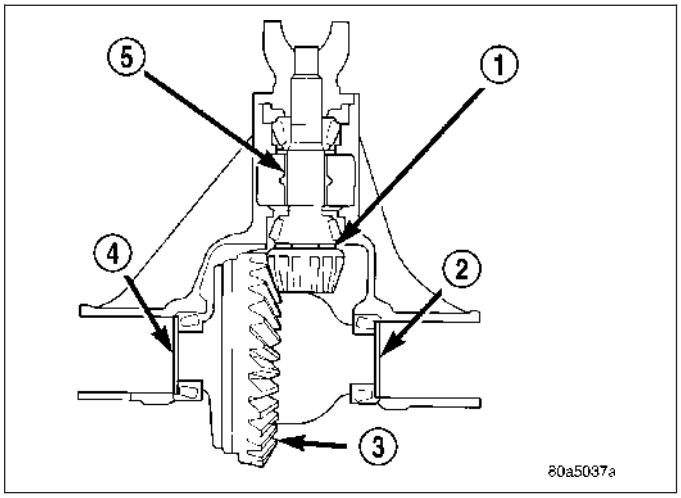
2. Insert assembled height gauge components, rear bearing and screw into the housing through the pinion bearing cups.
3. Install front pinion bearing and Cone-Nut 6740 onto the screw. Tighten cone-nut until Torque To Rotate screw is 1.7 N·m (15 in. lbs.).
4. Place Arbor Discs 8541 (1) on Arbor D-115-3 (1) in position in the housing side bearing cradles. Install differential bearing caps on arbor discs and tighten cap bolts to specification.





5. Assemble Dial Indicator C-3339 into Scooter Block D-115-2 and secure set screw.
6. Place Scooter Block/Dial Indicator in position in the housing so dial probe and scooter block are flush against the surface of the pinion height block. Hold scooter block in place and zero the dial indicator. Tighten dial indicator face lock screw.
7. Slide the dial indicator (3) probe across the gap between the pinion height block and the arbor bar (1) with the scooter block (2) against the pinion height block. Slide the dial probe to the crest of the arbor bar and record the highest reading.
8. Select a shim equal to the dial indicator reading plus the drive pinion gear depth variance number marked on the shaft of the pinion gear using the opposite sign on the variance number. For example, if the depth variance is –2, add +0.002 in. to the dial indicator reading.
9. Remove the pinion depth gauge components from the housing.

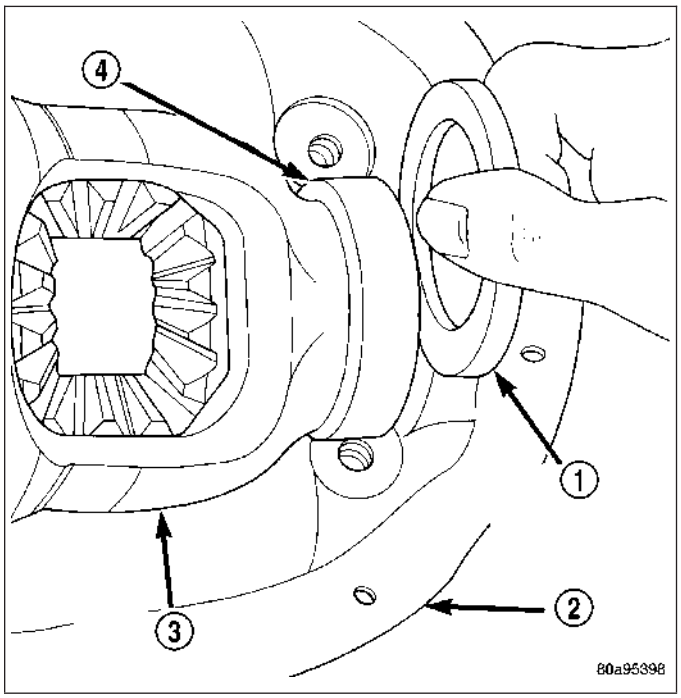
DIFFERENTIAL BEARING PRELOAD AND GEAR BACKLASH



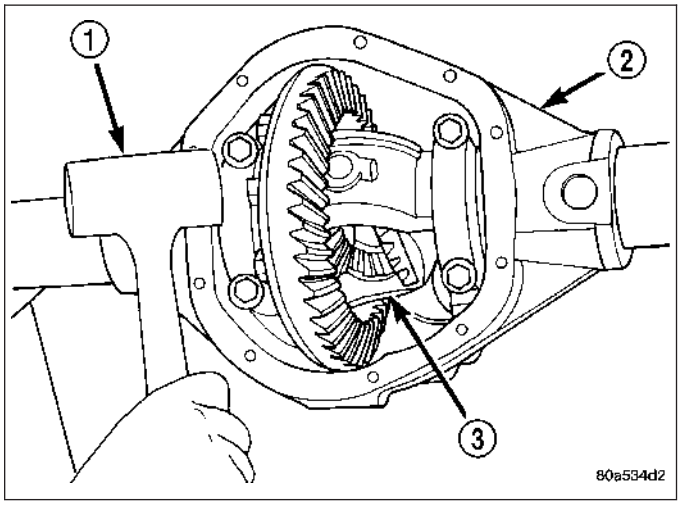
Differential side bearing preload and gear backlash is achieved by selective shims (2) (4) inserted between the bearing cup and the housing. The proper shim thickness can be determined using slip-fit Dummy Bearings 8398 in place of the differential side bearings and a Dial Indicator C-3339. Before measuring differential bearing preload and gear backlash, measure pinion gear depth and prepare pinion for installation. Pinion gear depth is essential to establishing gear backlash and tooth contact patterns. After measuring shim thickness to take up differential side play, install pinion and measure gear backlash shim thickness. Overall shim thickness is the dial indicator reading and preload specification added together. The gear backlash measurement determines the shim thickness used on the ring gear side of the differential case. Subtract gear backlash shim thickness from overall shim thickness to determine shim thickness for pinion gear side of the differential.

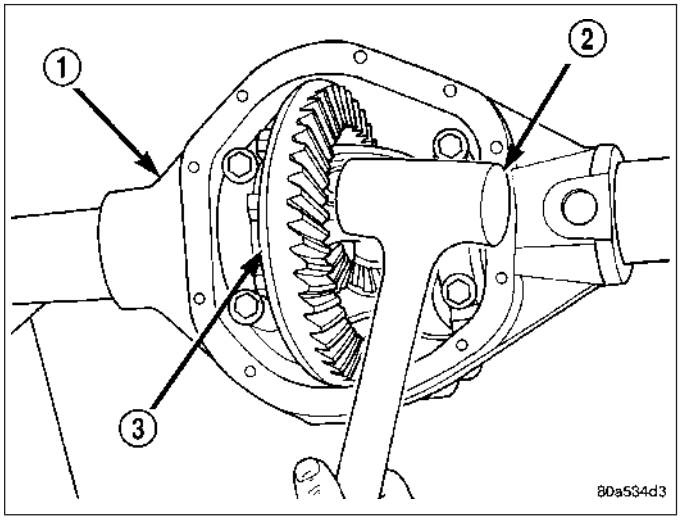
SHIM SELECTION

1. Remove side bearings from differential case.
2. Install ring gear, if necessary, on differential case and tighten bolts to specification.
3. Install Dummy Bearings 8398 on differential case.
4. Install differential case in the housing.
5. Insert Dummy Shims 8107 (1) starting point shims between both dummy bearings (4) and the housing (2).

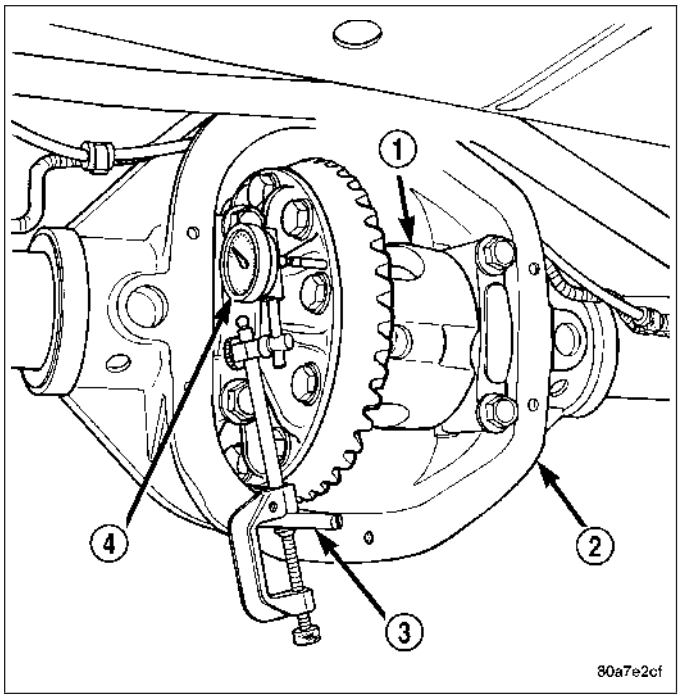


6. Install the marked bearing caps in their correct positions. Install and snug the bolts.
7. Seat differential dummy bearings to each side of the housing (2) (1) with a dead-blow hammer (1) (2).

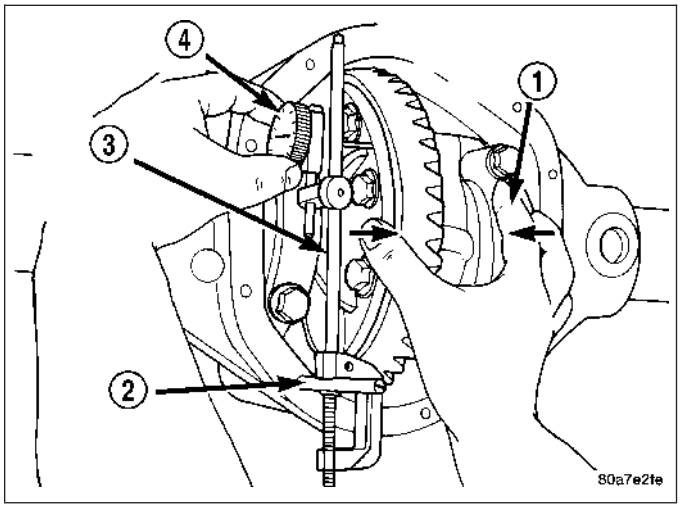




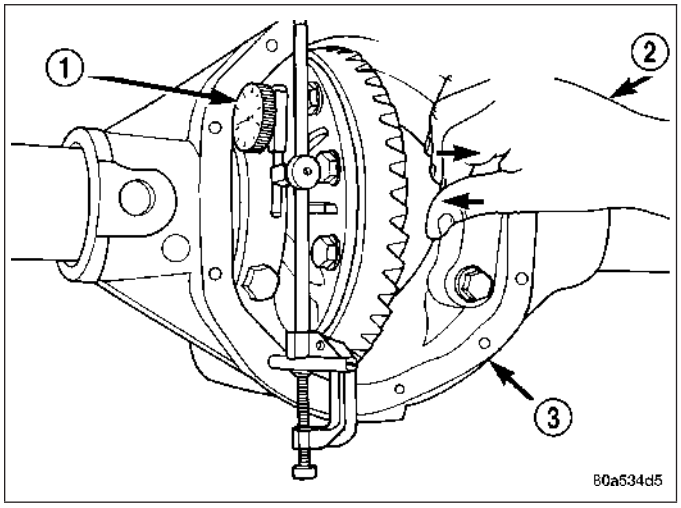
8. Thread Pilot Stud C-3288-B (3) into rear cover bolt hole below ring gear.
9. Attach Dial Indicator C-3339 (4) to post and position dial indicator plunger on a flat surface on a ring gear bolt head.

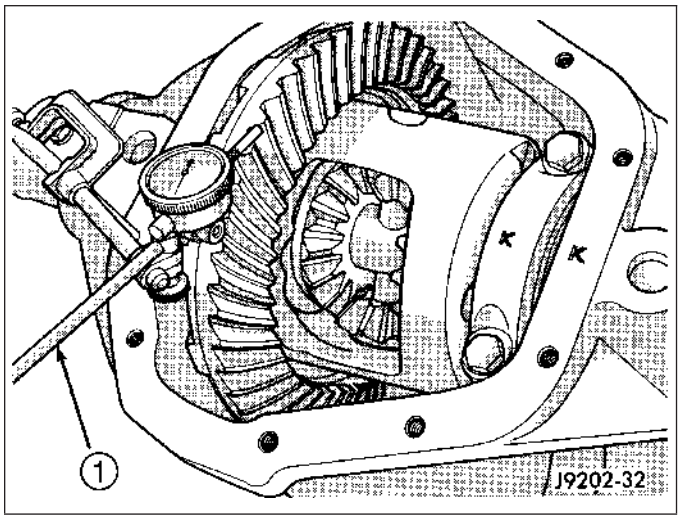


10. Hold differential case firmly to pinion side (1) of axle housing and zero dial indicator (4).



11. Hold differential case firmly (2) to the ring gear side and record dial (1) indicator reading.

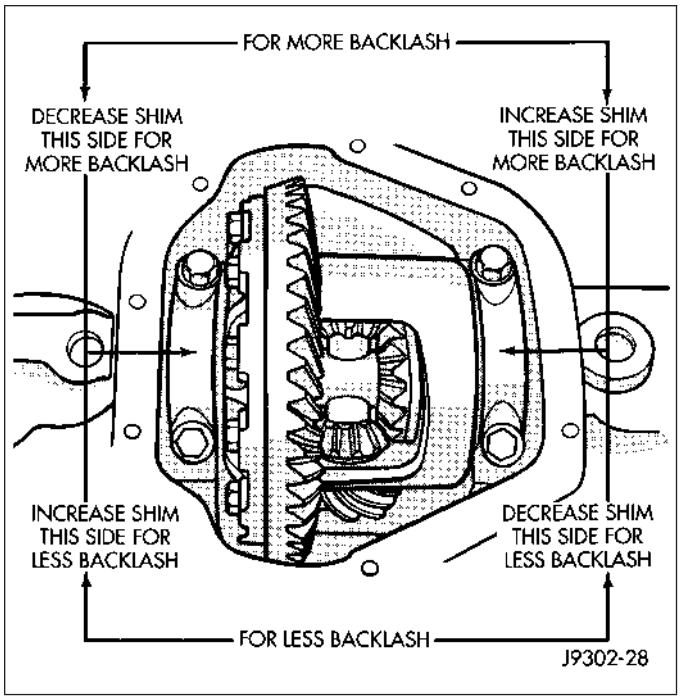




12. Add the dial indicator reading to the starting point shim thicknesses to determine the total shim thickness necessary to achieve zero differential end play.
13. Add 0.2 mm (0.008 in) to the zero end play total. This new total represents the thickness of shims necessary to compress, or preload the new bearings when the differential is installed.
14. Rotate dial indicator out of the way on pilot stud.
15. Remove differential case, dummy bearings, and starting point shims from the housing.
16. Install the pinion in the axle housing. Install the companion flange and establish the correct pinion rotating torque.
17. Install differential case and Dummy Bearings in axle housing with a single dummy shim on the ring gear side of the axle and tighten retaining cap bolts.
18. Position the dial indicator plunger on a flat surface between the ring gear bolt heads.
19. Push and hold differential case toward pinion.
20. Zero dial indicator face to pointer.
21. Push and hold differential case to ring gear side of the housing.
22. Record dial indicator reading.
23. Subtract 0.05 mm (0.002 in.) from the dial indicator reading to compensate for backlash between ring and pinion gears. Add the resulting measurement to the thickness of the single starting point shim. This total is the thickness of shim required to achieve proper backlash.
24. Subtract the backlash shim thickness from the total preload shim thickness. The remainder is the shim thickness required on the pinion side of the axle housing.
25. Rotate dial indicator out of the way on pilot stud.
26. Remove differential case, dummy bearings and dummy shim from the housing.
27. Install new side bearing cones and cups on differential case.
28. Install Spreader W-129-B and Adapter Plates 8142-A on the housing and spread open enough to receive differential case.
29. Place the side bearing shims in the differential housing against the housing shoulder.
30. Install the differential case in the housing.
31. Rotate the differential case several times to seat the side bearings.
32. Position the dial indicator (1) plunger against a ring gear tooth.
33. Push and hold ring gear upward while not allowing the pinion gear to rotate.
34. Zero dial indicator face to pointer.

35. Push and hold ring gear downward while not allowing the pinion gear to rotate. Dial indicator reading should be between 0.12 mm (0.005 in.) and 0.20 mm (0.008 in.). If backlash is not within specifications transfer the necessary amount of shim thickness from one side of the differential housing to the other.
36. Verify differential case and ring gear runout by measuring ring to pinion gear backlash at eight locations around the ring gear. Readings should not vary more than 0.05 mm (0.002 in.). If readings vary more than specified, the ring gear or the differential case is defective.

After the proper backlash is achieved, perform the Gear Contact Pattern procedure.

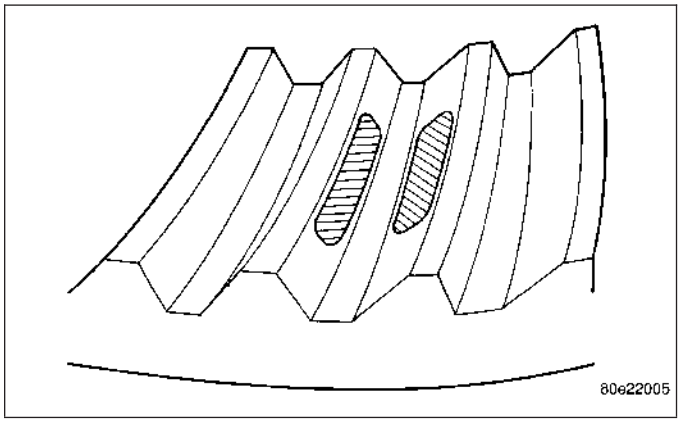


GEAR CONTACT PATTERN

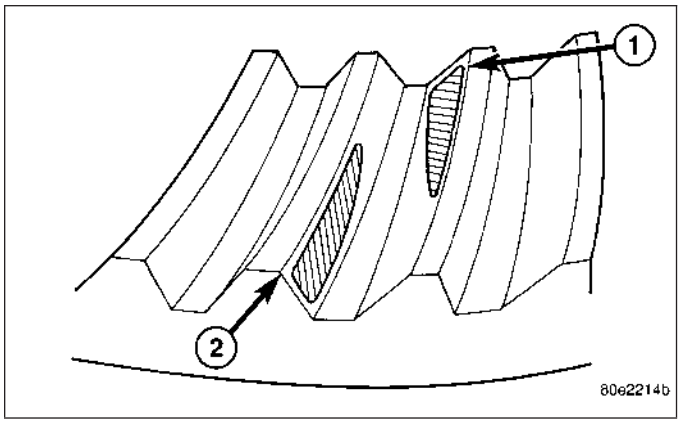
Gear tooth contact pattern is used to verify the correct running position of the ring and pinion gears. This will produce low noise and long gear life. Gears which are not positioned properly may be noisy and have shorten gear life.

1. Wipe clean each tooth of the ring gear.
2. Apply gear marking compound to all of the ring gear teeth.
3. Verify bearing cap bolts are torque specification.
4. Apply parking brakes lightly to create at 14 N·m (10 ft. lbs.) pinion rotating torque.
5. Rotate the pinion/pinion yoke 4 full revolutions in each directions.
6. Read gear tooth contact pattern.

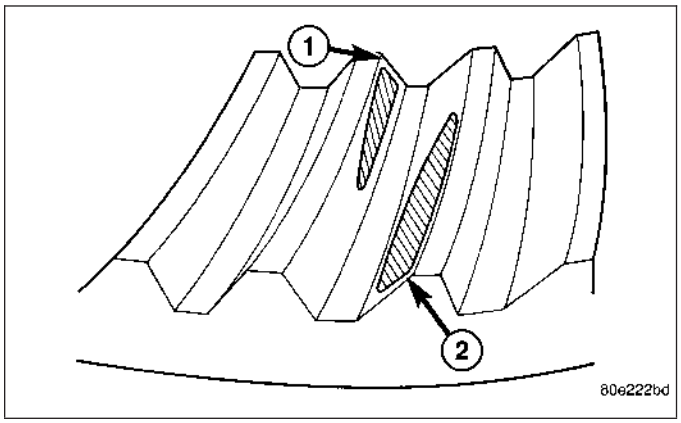
Gear contact pattern is correct. Backlash and pinion depth is correct.



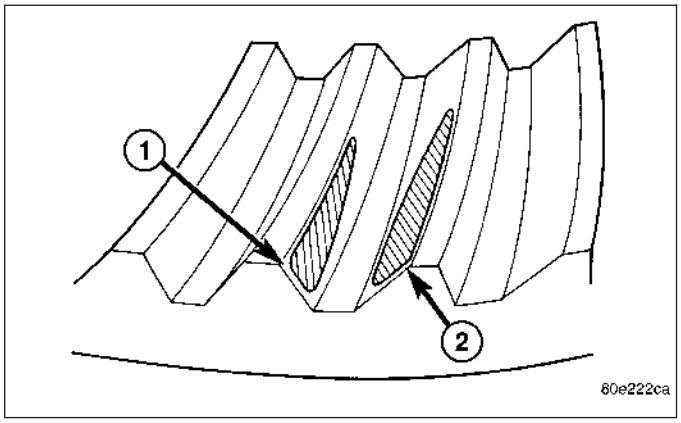
Ring gear is too far away from the pinion gear, coats side toe (1) drive side heel (2). Decrease backlash by moving ring gear closer to the pinion gear using the adjusters.



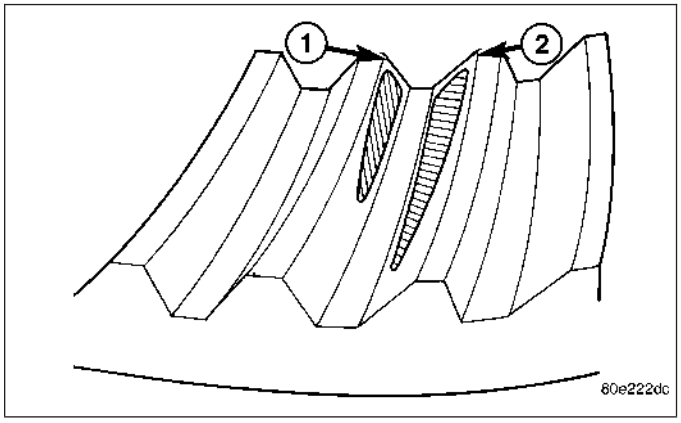
Ring gear is too close to the pinion gear, drive side toe (1) coast side heel (2). Increase backlash by moving ring gear away from the pinion gear using the adjusters.



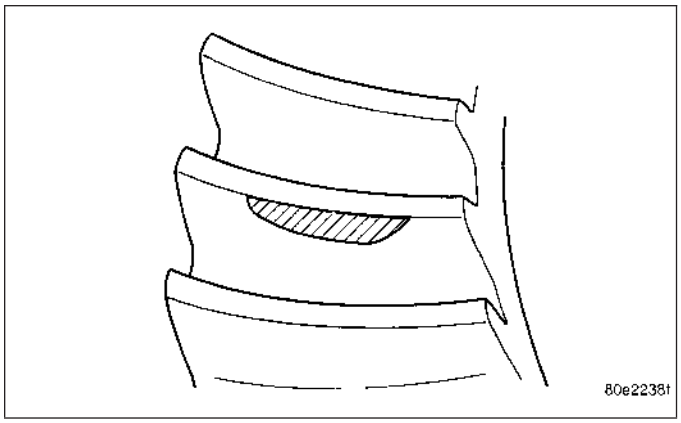
Ring gear is too far away from the pinion gear drive side heel (1) coast side heel (2). Decrease backlash by moving ring gear closer to the pinion gear using the adjusters.



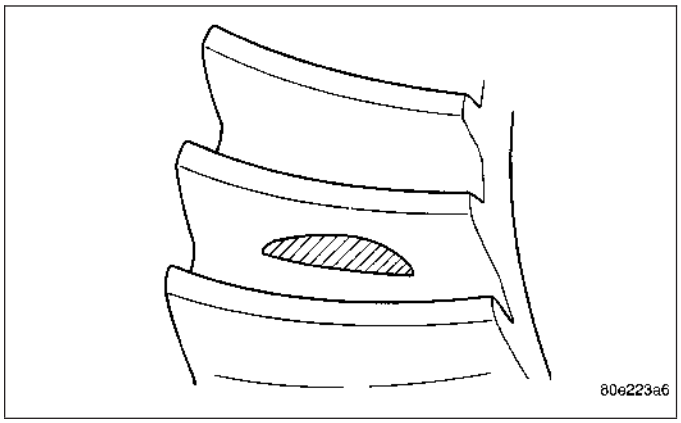
Ring gear is too close to the pinion gear, drive side toe (1) coast side toe (2). Increase backlash, by moving ring gear away from the pinion gear using the adjusters.



Pinion gear is set too low. Increase pinion gear height, by increasing pinion depth shim thickness.



Pinion gear is set too high. Decrease pinion height, by decreasing pinion depth shim thickness.



SPECIFICATIONS

FRONT AXLE - C205F

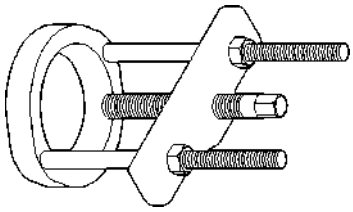
AXLE SPECIFICATIONS

DESCRIPTION	SPECIFICATION
Axle Ratio	3.55, 3.92
Differential Case Flange Runout	0.076 mm (0.003 in.)
Differential Side Gear Clearance	0-0.15 mm (0-0.006 in.)
Ring Gear Diameter	205 mm (7.562 in.)
Ring Gear Backlash	0.12-0.20 mm (0.005-0.008 in.)
Ring Gear Runout	0.12 mm (0.005 in.)
Pinion Bearing Preload - Original Bearings	1-2 N·m (10-20 in. lbs.)
Pinion Bearing Preload - New Bearings	17-2.5 N·m (15-22 in. lbs.)

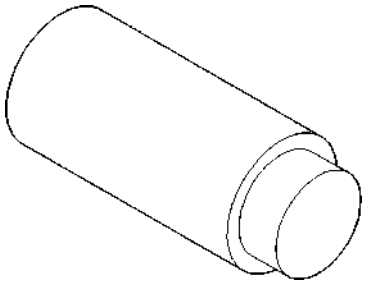
TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Differential Fill Hole Plug	34	25	-
Differential Cover Bolts	22.5	16.5	199
Bearing Cap Bolts	61	45	-
Ring Gear Bolts	108	80	-
Pinion Nut	271-474	200-350	-
Axle Mounting Bolts/Nuts	95	70	-

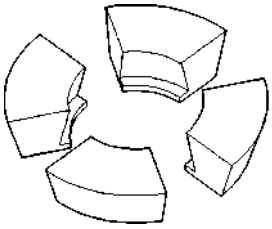
SPECIAL TOOLS



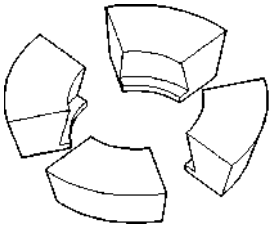
PULLER C-293-PA



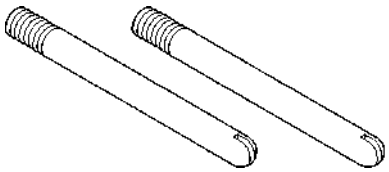
PLUG C-293-3



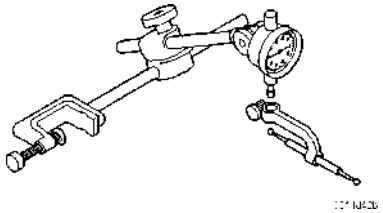
ADAPTER C-293-42



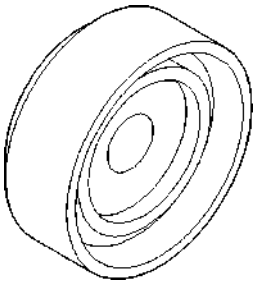
ADAPTER C-293-48



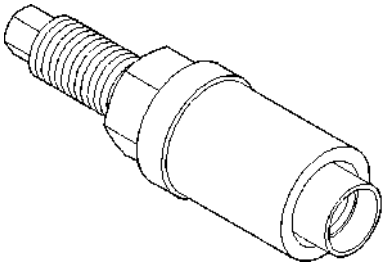
PILOT PIN C-3288-B



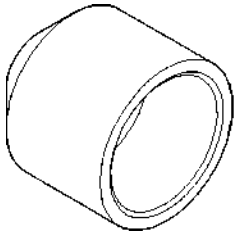
DIAL INDICATOR C-3339



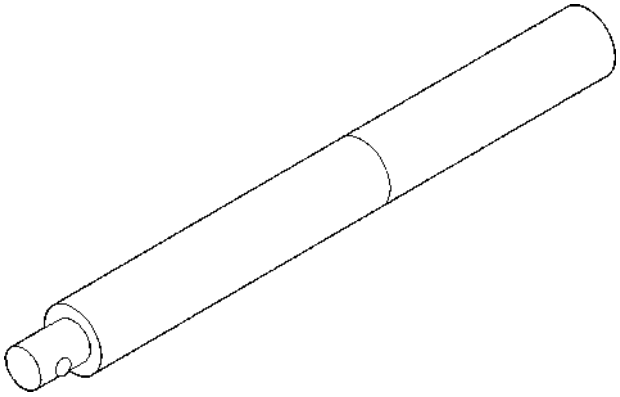
INSTALLER C-3716-A



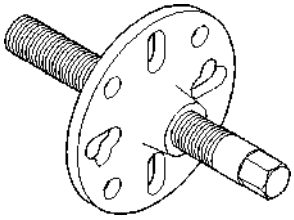
INSTALLER C-3718



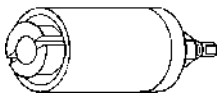
INSTALLER C-3972-A



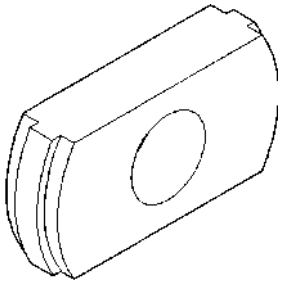
HANDLE C-4171



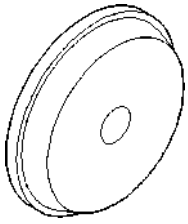
PULLER C-452



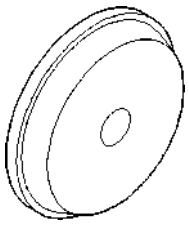
BEARING REMOVER C-4660-A



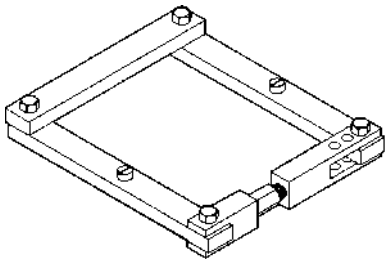
REMOVER D-103



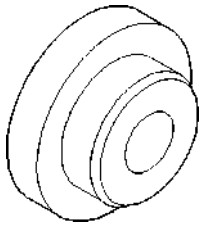
INSTALLER D-129



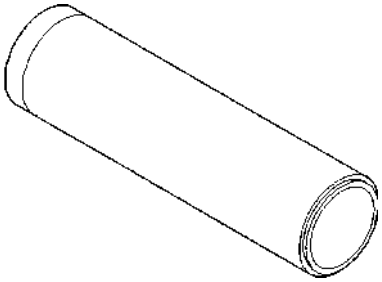
INSTALLER D-145



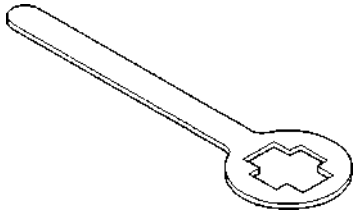
SPREADER W-129-B



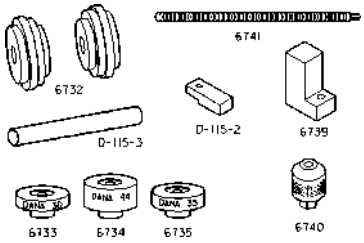
INSTALLER 5063



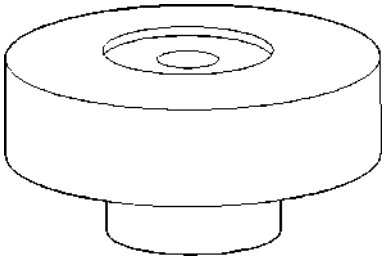
INSTALLER 6448



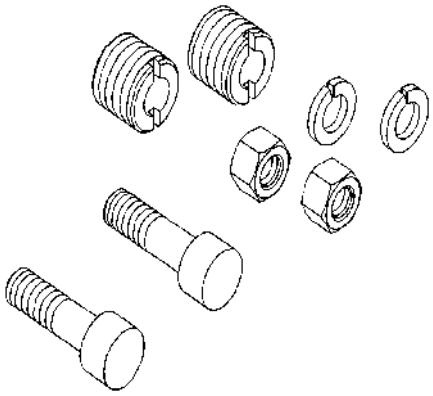
HOLDER 6719A



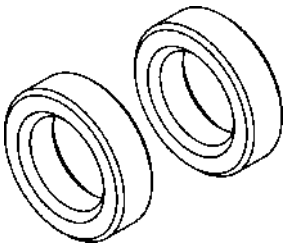
PINION DEPTH SET 6730/6774/6775



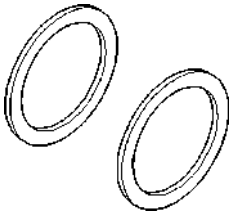
PINION BLOCK 8177



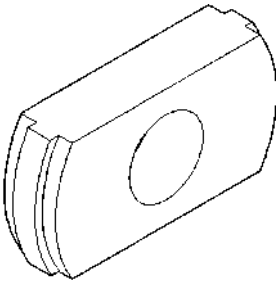
ADAPTER KIT 6987B



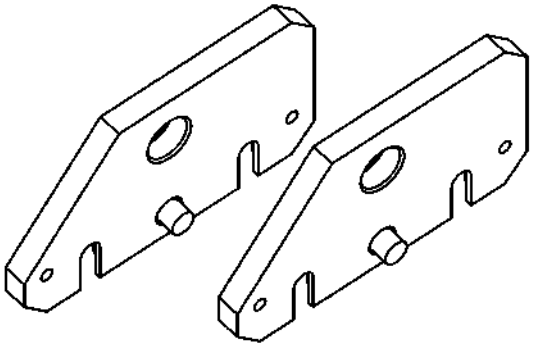
DUMMY BEARINGS 8398



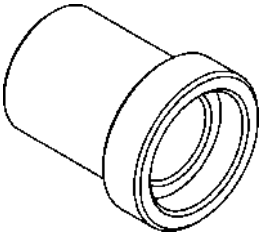
DUMMY SHIMS 8107



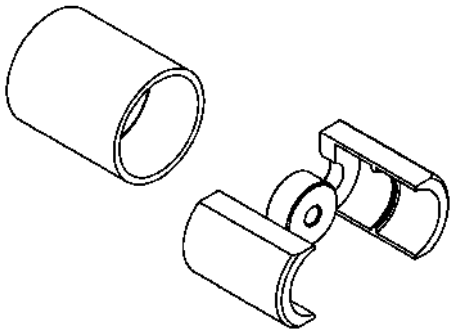
REMOVER 8401



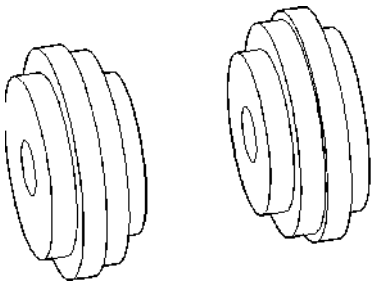
ADAPTER PLATES 8142A



INSTALLER 8402



REMOVER 8420A



ARBOR DISCS 8541

COVER-DIFFERENTIAL

REMOVAL

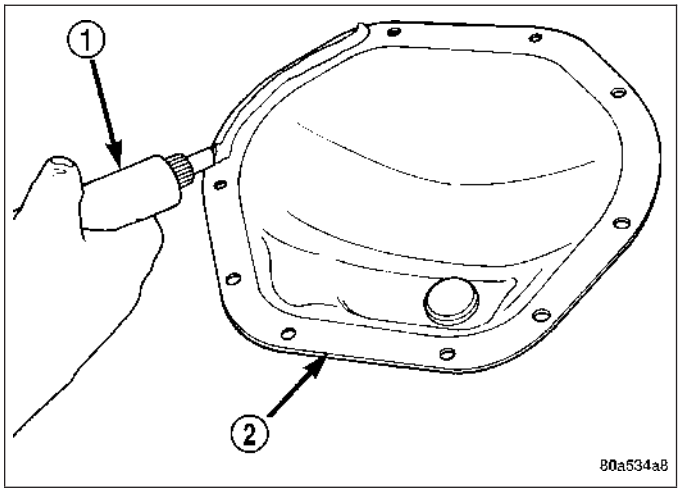
1. Remove fill plug.
2. Remove differential cover bolts.
3. Remove cover and drain fluid.

INSTALLATION

1. Apply a bead of orange Mopar Axle RTV Sealant (1) or equivalent to the housing cover (2).

CAUTION: If cover is not installed within 3 to 5 minutes, the cover must be cleaned and new RTV applied. Failure to follow these instructions will compromise adhesion quality.

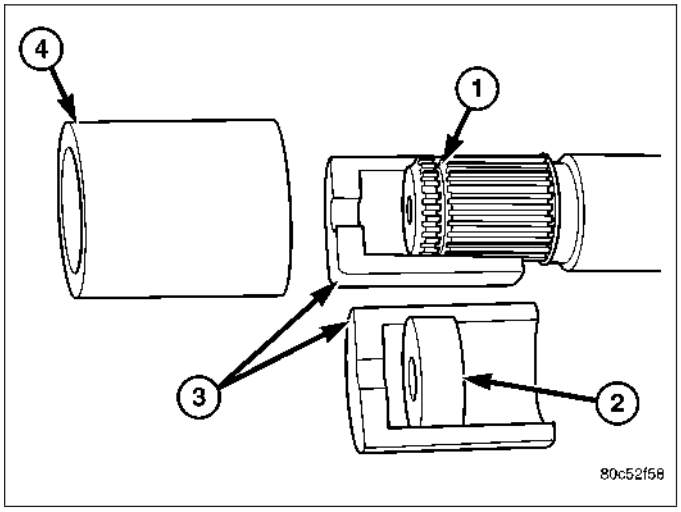
2. Install cover and tighten bolts in a criss-cross pattern to 22.5 N·m (16.5 ft. lbs.).
3. Fill differential with 1.66 L (3.5 pts.) of gear lubricant.
4. Install fill plug.



SHAFT-AXLE

REMOVAL

1. Remove half shaft from vehicle.
2. Clean axle seal area.
3. Remove snap ring from the axle shaft.
4. Remove axle (1) with Remove 8420A (2) (3) (4) and slide hammer.



INSTALLATION

1. Lubricate bearing bore and seal lip with gear lubricant.
2. Install axle shaft and engage shaft into side gear. Push firmly on axle shaft to engage snap-ring.
3. Check the differential fluid level and add fluid if necessary.
4. Install half shaft.
5. Install skid plate, if necessary.

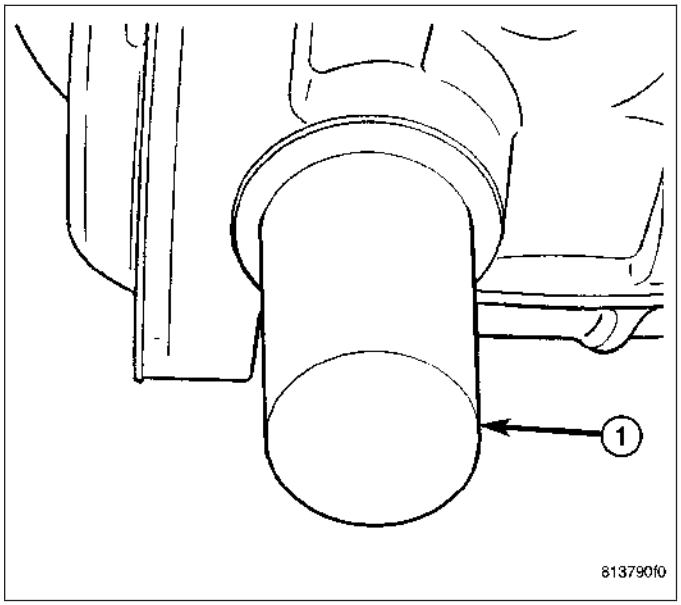
SEAL-AXLE SHAFT

REMOVAL

1. Remove half shaft and axle shaft.
2. Remove axle shaft seal with a small pry bar.

INSTALLATION

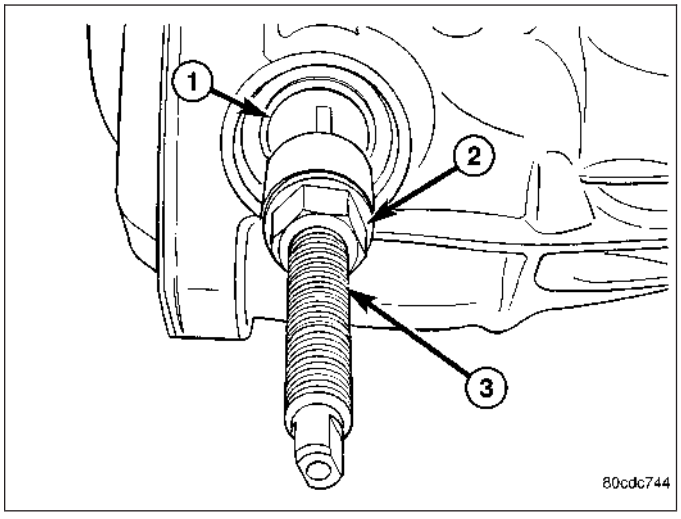
1. Wipe axle shaft tube bore clean.
2. Install **new** axle shaft seal with Installer 8402 (1).
3. Install axle shaft and half shaft.



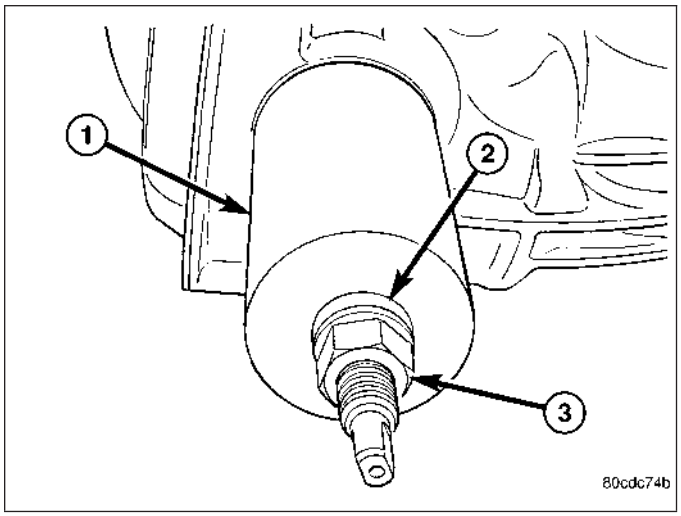
BEARING/BUSHING-AXLE

REMOVAL

1. Remove half shaft, axle shaft and seal.
2. Install axle shaft bearing Remover C-4660-A (3) in the bearing (1). Then tighten the nut (2) to spread the remover in the bearing.

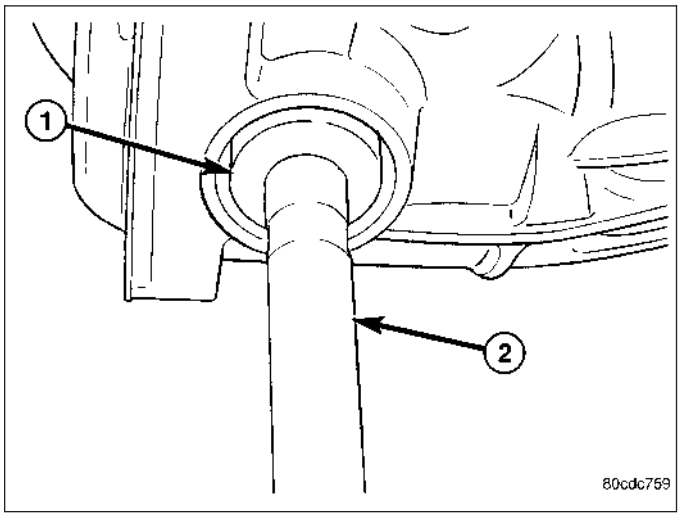


3. Install bearing remove cup (1) bearing (2) and nut (3). Tighten nut to draw bearing out.
4. Inspect axle shaft tube bore for roughness and burrs.

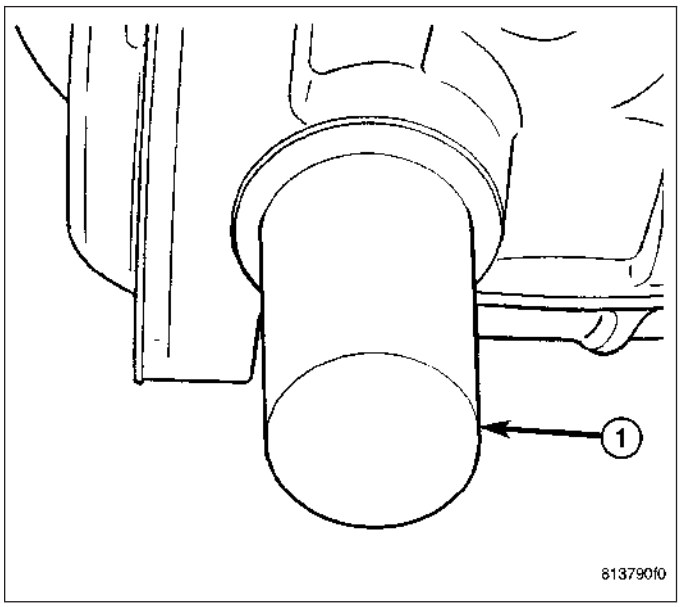


INSTALLATION

1. Wipe the axle shaft tube bore clean.
2. Install axle shaft bearing with Installer 5063 (1) and Handle C-4171 (2).



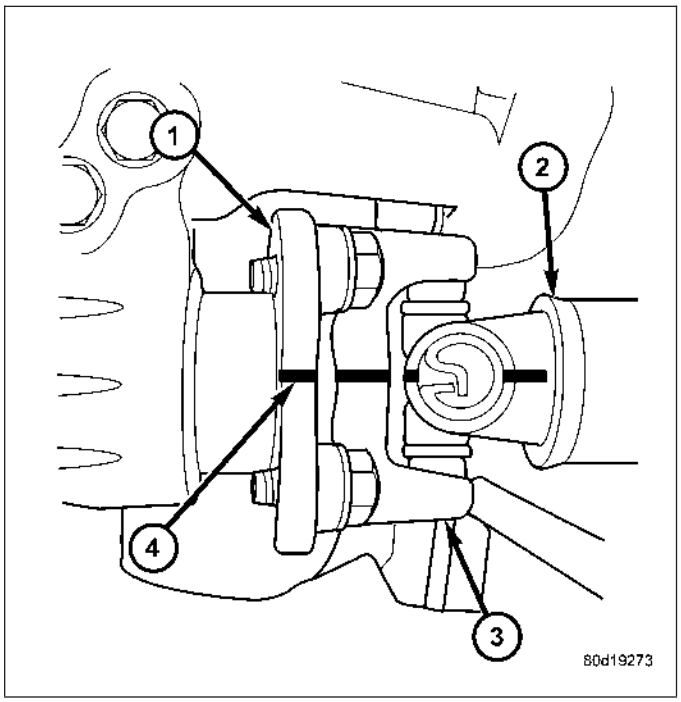
3. Install **new** axle shaft seal with Installer 8402 (1).
4. Install axle shaft and half shaft.



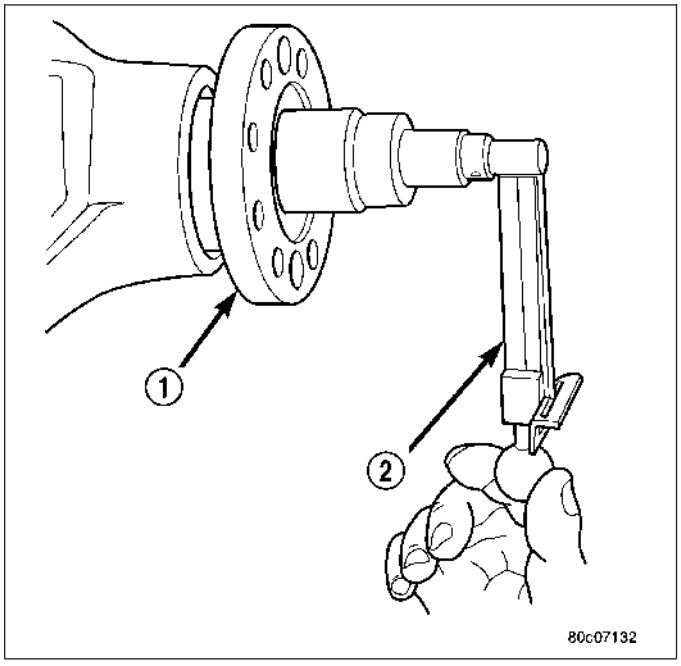
SEAL-PINION

REMOVAL

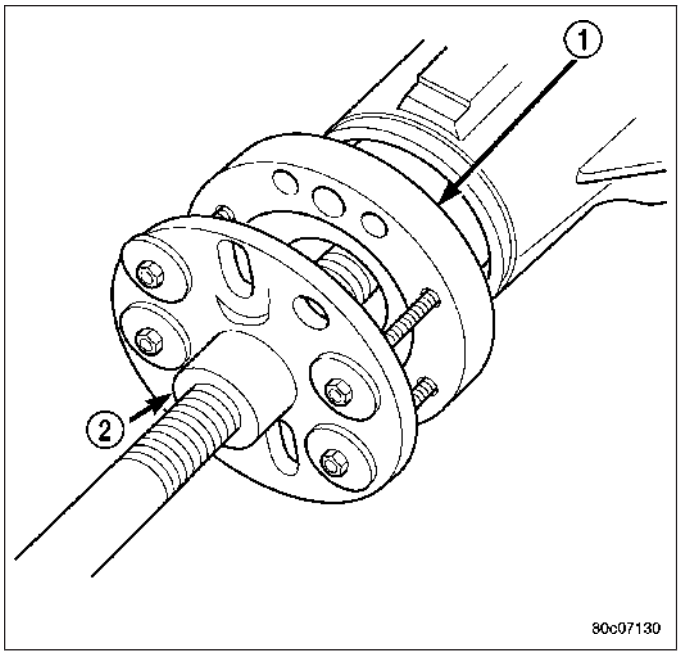
1. Remove both half shafts.
2. Mark propeller shaft (2) and pinion flange (2) for installation reference.



3. Remove front propeller shaft.
4. Rotate pinion gear three to four times, to verify pinion rotates smoothly.
5. Record pinion flange (1) rotating torque with an inch pound torque wrench (2) for installation reference.

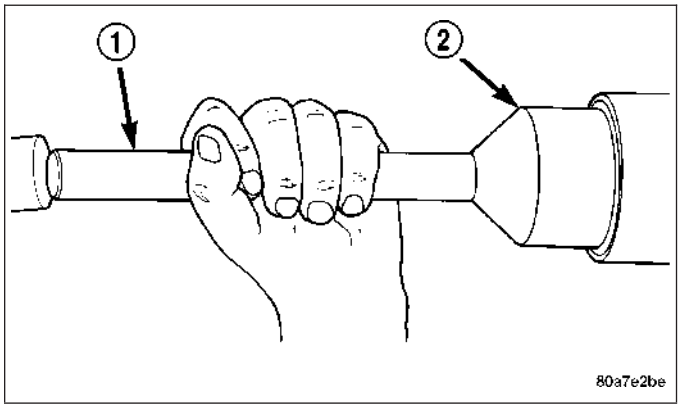


6. Hold flange with Holder 6719 and four bolts and washers.
7. Remove pinion nut.
8. Remove flange (1) with Remover C-452 (2).
9. Remove pinion seal with a pry tool.

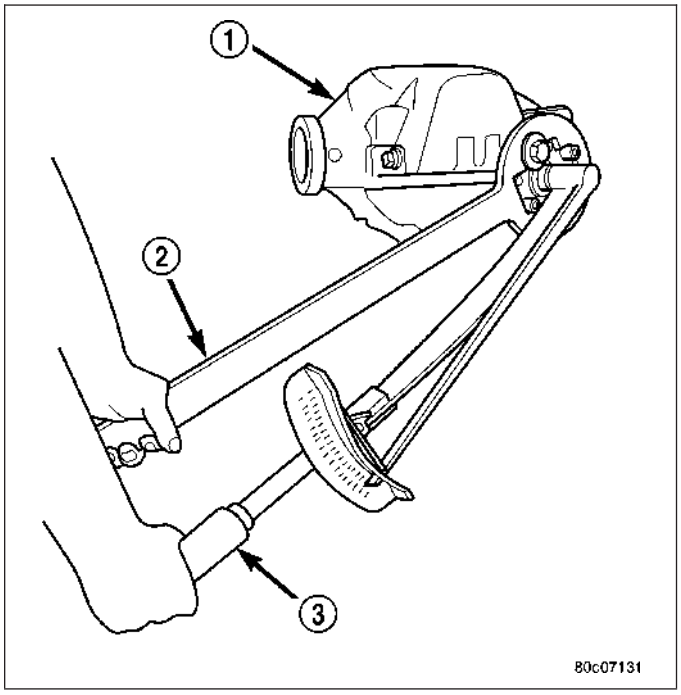


INSTALLATION

1. Apply a light coating of gear lubricant on the lip of pinion seal.
2. Install seal with Installer C-3972-A (2) and Handle C-4171 (1)
   .



3. Install pinion flange onto the pinion with Installer C-3718 and holder.
4. Hold pinion flange with Holder 6719A (2).
5. Install **new** pinion nut and tighten nut until there is zero bearing end-play.

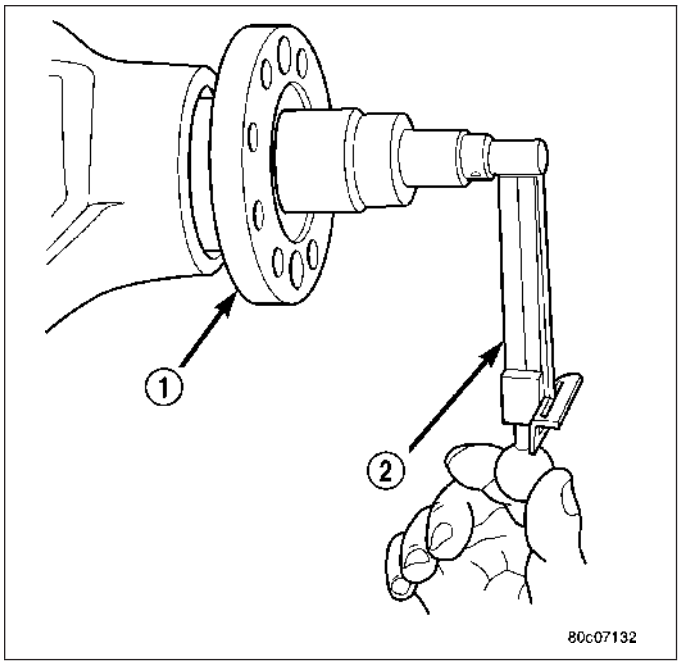


CAUTION: Do not exceed the minimum tightening torque when installing the companion flange at this point. Damage to the collapsible spacer or bearings may result.

6. Tighten pinion nut to 271 N·m (200 ft. lbs.).

CAUTION: Never loosen pinion nut to decrease pinion bearing rotating torque and never exceed specified preload torque. If preload torque or rotating torque is exceeded a new collapsible spacer must be installed.

7. Record pinion flange (1) rotating torque, with a torque wrench (2). Rotating torque should be equal to the reading recorded during removal plus an additional 0.56 N·m (5 in. lbs.).
8. If rotating torque is low, tighten pinion nut in 6.8 N·m (5 ft. lbs.) increments until rotating torque is achieved.



CAUTION: If maximum tightening torque is reached prior to reaching the required rotating torque, the collapsible spacer may have been damaged. Replace the collapsible spacer.

9. Install propeller shaft with reference marks aligned.
10. Install half shafts.

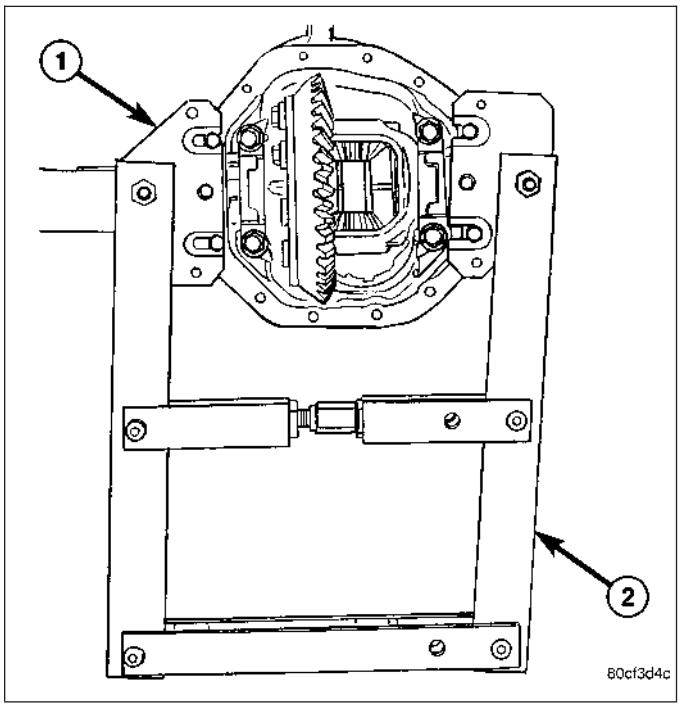
DIFFERENTIAL

REMOVAL

1. Remove differential housing cover and drain fluid.
2. Remove axle shafts.
3. Loosen bearing cap bolts.

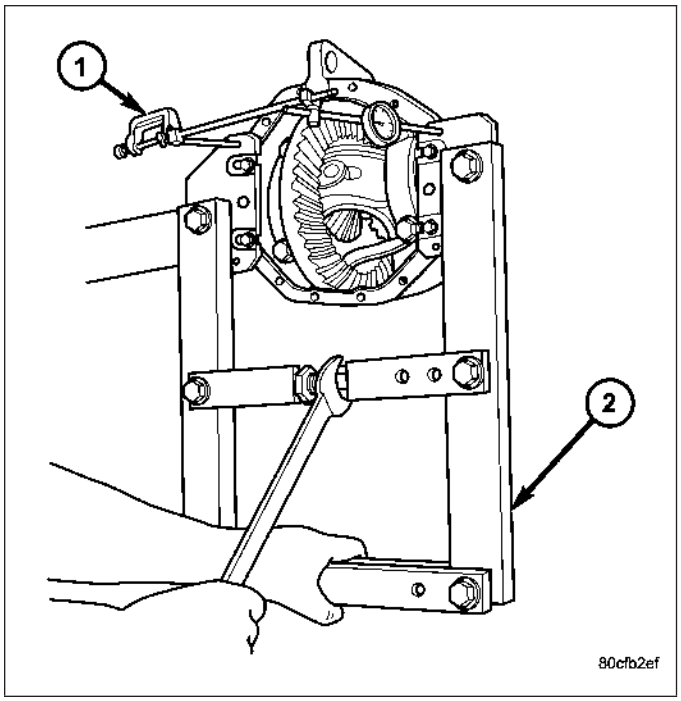
NOTE: Differential bearing cap reference numbers are stamped on caps and machined flat on the housing. If reference numbers cannot be found, make new marks for later reference.

4. Install Adapter Plates 8142-A (1) onto the housing.
5. Install Spreader W-129-B (2) onto the adapter plates and tighten the turnbuckle finger-tight.

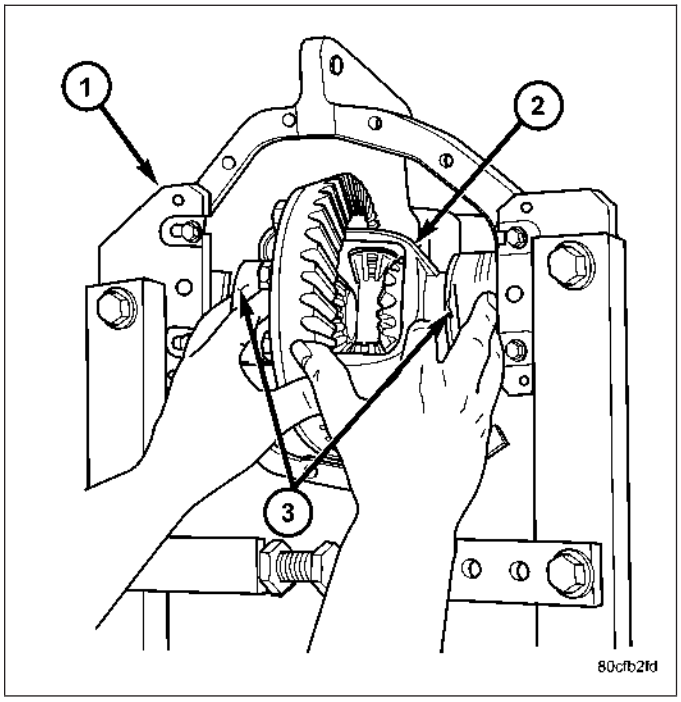


6. Install a Pilot Stud L-4438 at the left side of the differential housing. Attach Dial Indicator C-3339 (1) to pilot stud. Load the indicator plunger against the opposite side of the housing and zero the indicator.
7. Spread the housing to remove the differential case from the housing. Measure the distance with the dial indicator.

CAUTION: Never spread over 0.50 mm (0.020 in). Failure to follow these instructions will damage the housing.

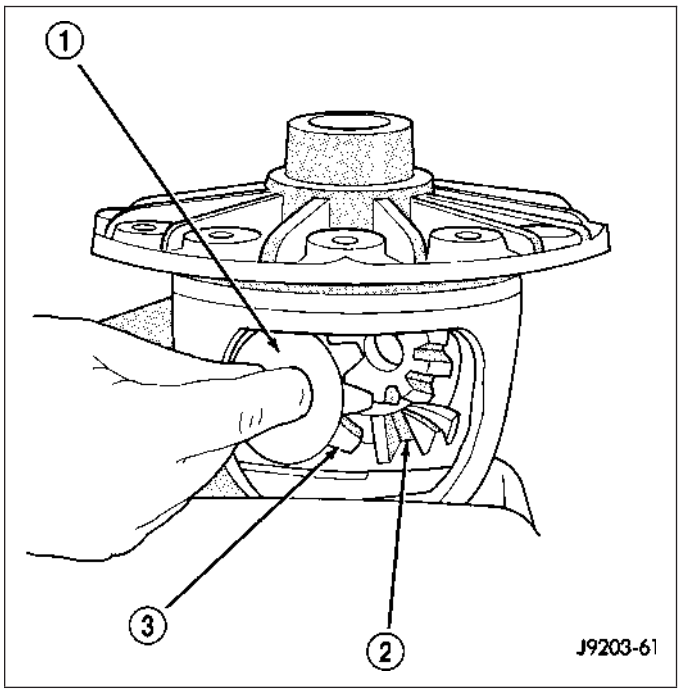


8. Remove dial indicator.
9. While holding the differential case in position, remove bearing cap bolts and caps.
10. Remove differential (2) from the housing (1). Ensure differential bearing cups and shims remain in position on the differential bearings.
11. Tag differential bearing cups and shims to indicate their location.
12. Remove spreader from housing.



DISASSEMBLY

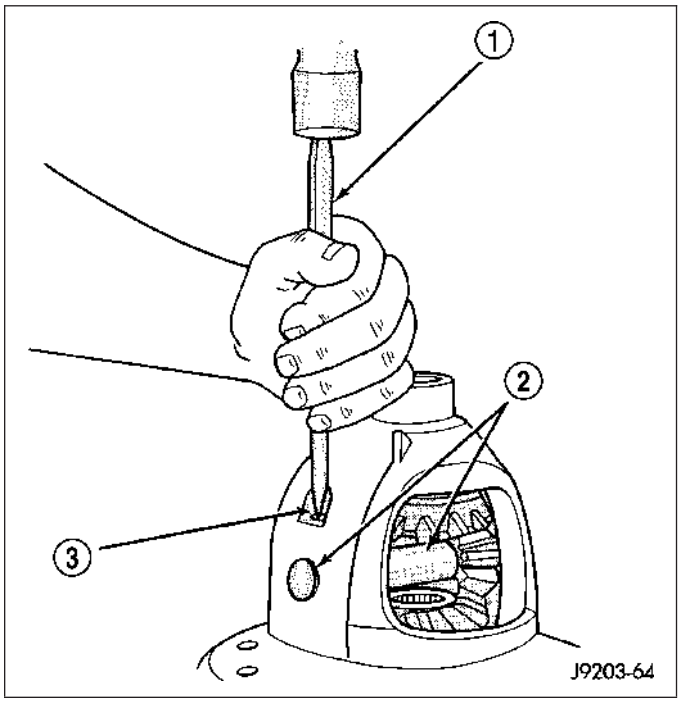
1. Remove ring gear.
2. Remove roll-pin holding mate shaft in housing.
3. Remove pinion gear mate shaft.
4. Rotate differential side gears (2) and remove pinion gears (3) and thrust washers (1)
5. Remove differential side gears and thrust washers.



ASSEMBLY

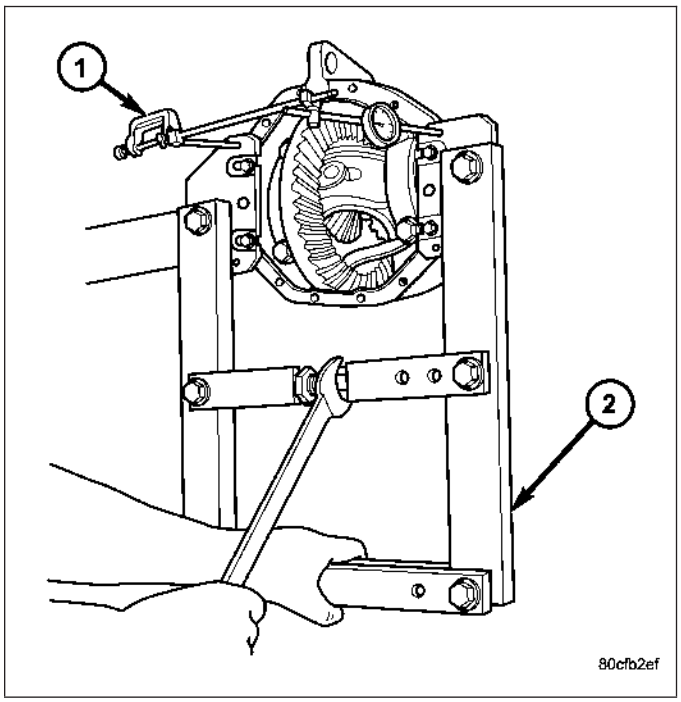
NOTE: If the same gears and thrust washers are being used, install them into their original locations.

1. Lubricate differential components with hypoid gear lubricant.
2. Install side gears and thrust washers into the differentail case.
3. Rotate pinion mate gears and thrust washers into the differentail case.
4. Install pinion gear mate shaft.
5. Align hole in pinion gear mate shaft with hole in the differential case.
6. Install roll-pin (3) in the differential case with a punch (1) and hammer. Peen edge of roll-pin hole in differential case in two places 180° apart.
7. Install ring gear.



INSTALLATION

NOTE: If replacement differential bearings or differential case are replaced, Refer to adjustments for Differential Bearing Preload and Gear Backlash procedures.



1. Install Spreader W-129-B (1) with the Adapter Plates 8142-A and install the safety hold-down clamps. Tighten the tool turnbuckle finger-tight.
2. Install a Pilot Stud L-4438 at the left side of the differential housing. Attach Dial Indicator C-3339 (2) to pilot stud. Load indicator plunger against the opposite side of the housing and zero the indicator.
3. Spread housing and measure the distance with the dial indicator.

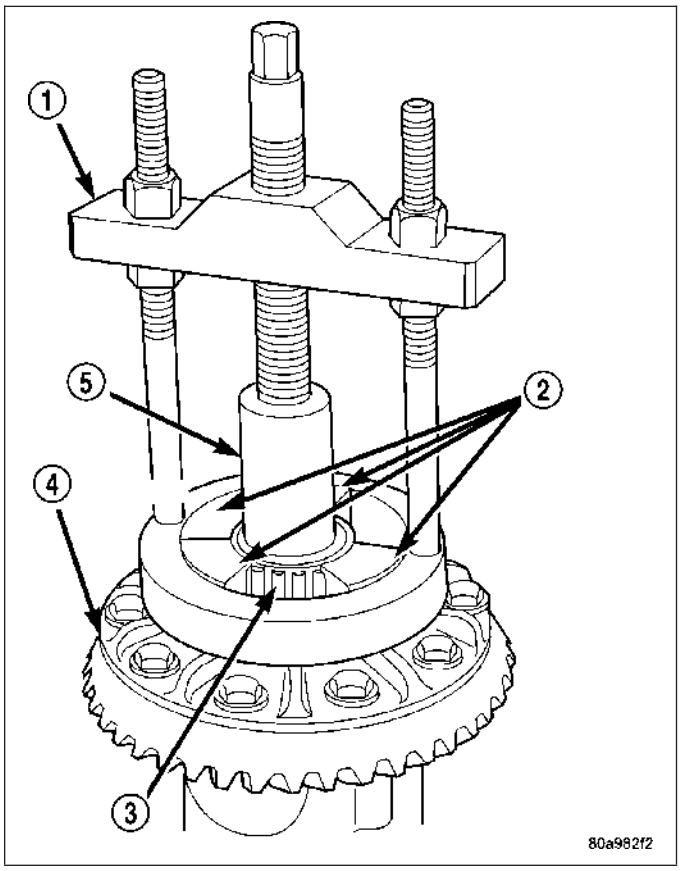
CAUTION: Never spread housing over 0.50 mm (0.020 in). Failure to follow these instructions will damage the housing.

4. Remove dial indicator (1).
5. Install differential case in the housing. Ensure differential bearing cups remain in position on the bearings and the differential preload shims are seated in the housing. Tap differential case to ensure bearings cups are seated in the housing.
6. Install bearing caps to their original locations and loosely install cap bolts.
7. Remove housing spreader (2).
8. Tighten the bearing cap bolts to 61 N·m (45 ft. lbs.).
9. Install differential.

BEARINGS-DIFFERENTIAL CASE

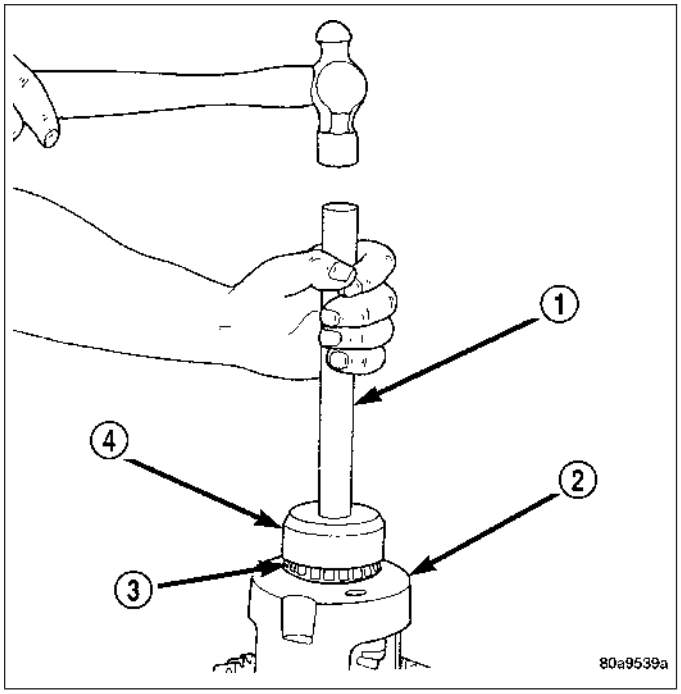
REMOVAL

1. Remove differential from housing.
2. Remove bearings (3) from differential case (4) with Puller C-293-PA (1) Adapters C-293-48 (2) and Plug C-293-3 (5).



INSTALLATION

1. Install differential case bearings (3) with Installer C-3716-A (4) and Handle C-4171 (1).
2. Install differential in axle housing.

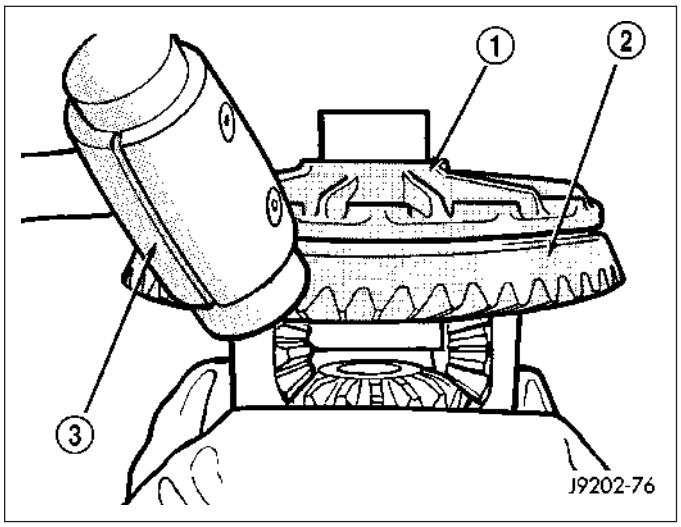


GEAR-PINION/RING

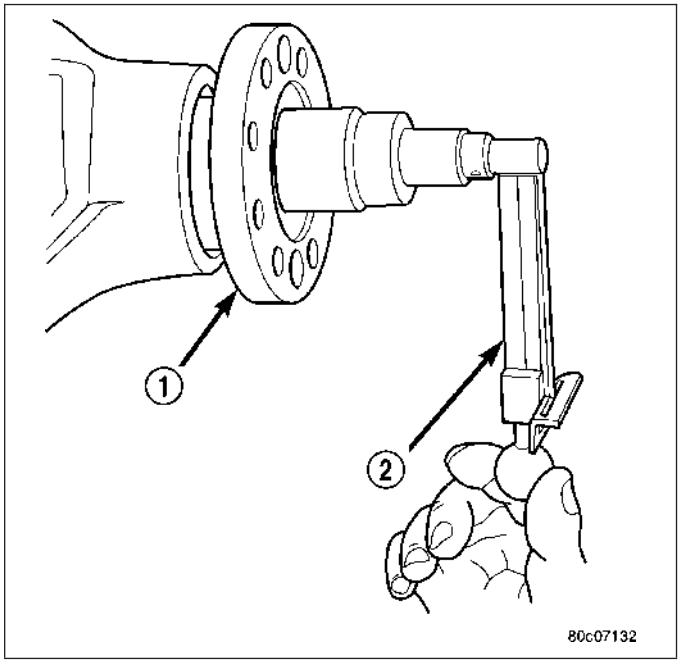
REMOVAL

NOTE: The ring gear and pinion are serviced in a matched set. Never replace one gear without replacing the other matching gear.

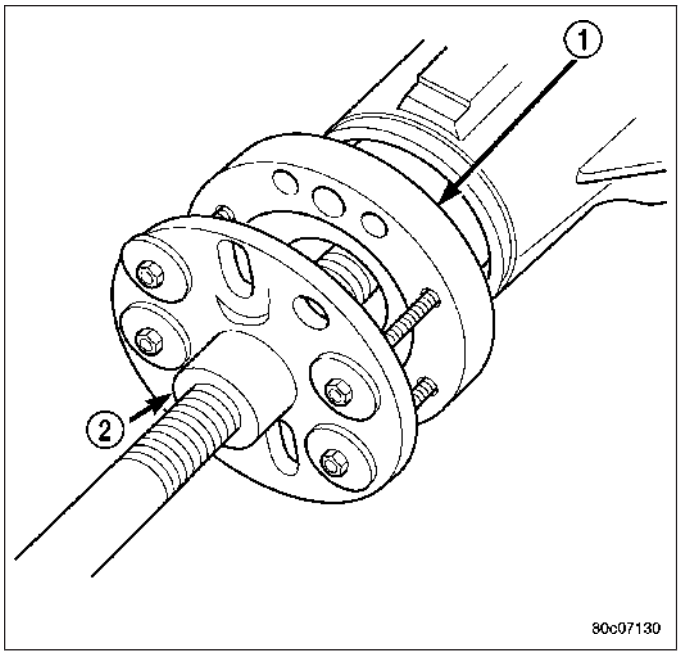
1. Remove differential from axle housing.
2. Place differential case in a vise with soft jaw.
3. Remove ring gear bolts.
4. Drive ring gear (2) from differential case (1) with a soft hammer.



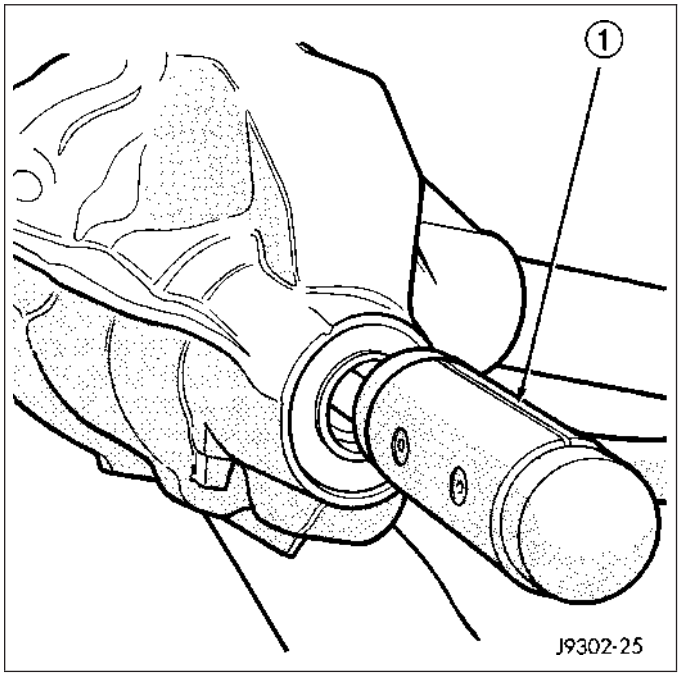
5. Remove propeller shaft.
6. Rotate companion flange and verify flange rotates smoothly.
7. Record pinion rotating torque with an inch pound torque wrench (2) for installation reference.



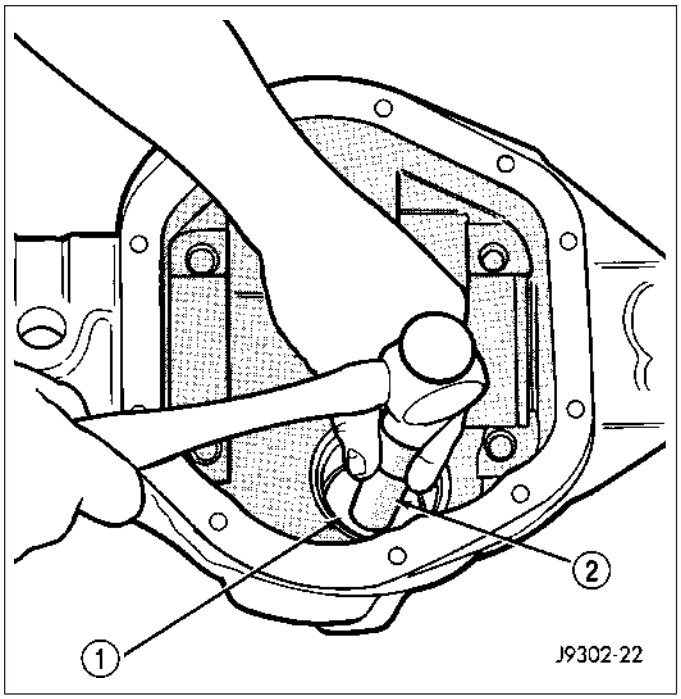
8. Install bolts into two of the threaded holes in the companion flange 180° apart.
9. Position Holder 6719 against the companion flange and install a bolt and washer into one of the remaining threaded holes. Tighten the bolts so that the Holder 6719 is held to the flange.
10. Remove pinion nut.
11. Remove companion flange (1) with Remover C-452 (2).



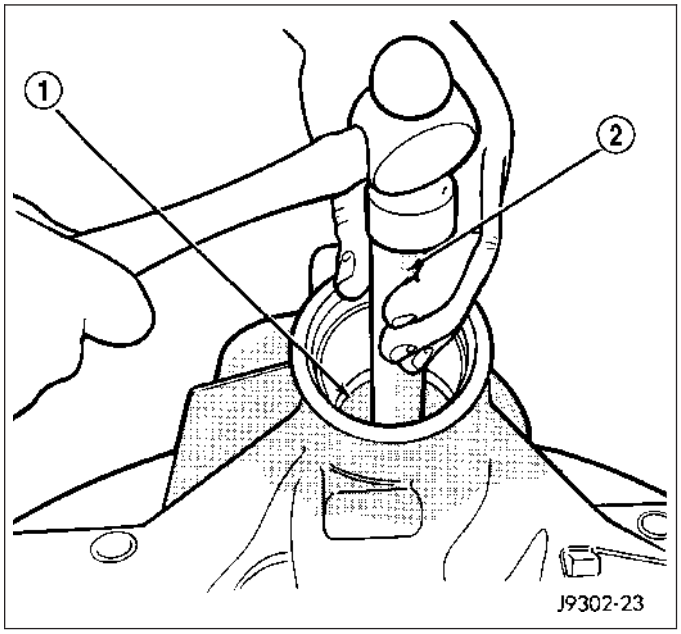
12. Remove pinion from differential housing with a hammer (1).



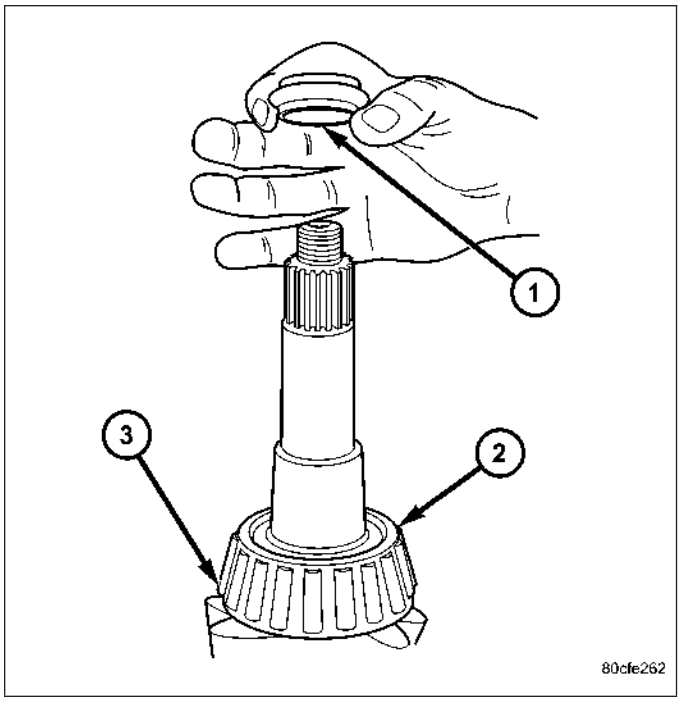
13. Remove pinion seal with a pry tool or a slide hammer mounted screw.
14. Remove oil slinger, if equipped, and front pinion bearing.
15. Remove front pinion bearing cup with Remover D-103 (1) and Handle C-4171 (2).



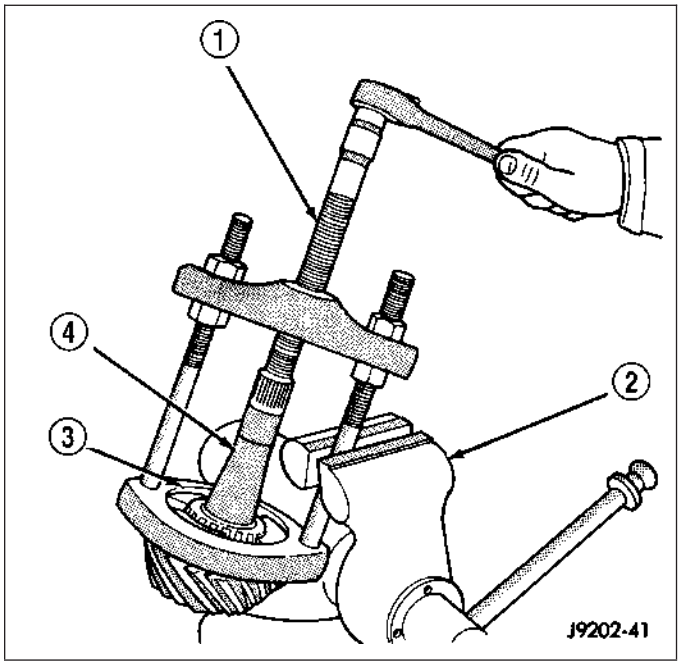
16. Remove rear pinion bearing cup with Remover 8401 (1) and Handle C-4171 (2).



17. Remove collapsible preload spacer (1).



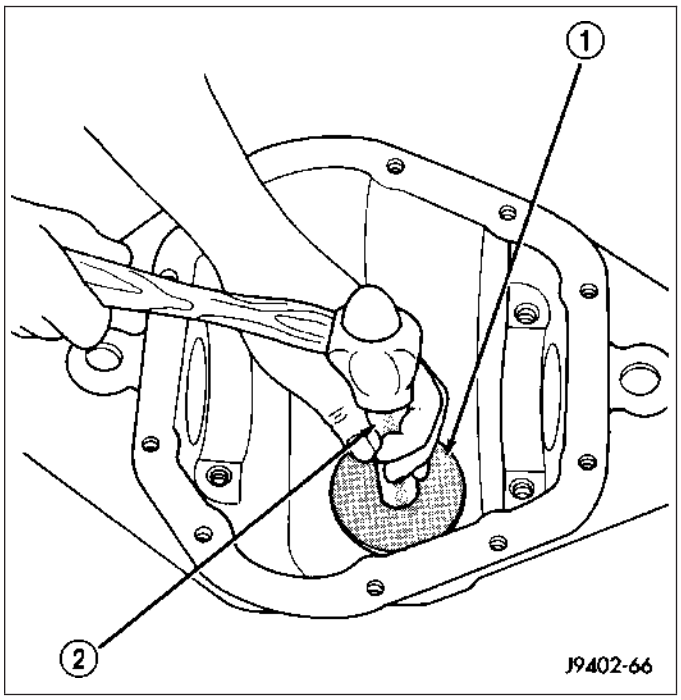
18. Remove rear pinion bearing from pinion shaft (4) with Puller C-293-PA (1) and Adapters C-293-42 (3).
19. Remove depth shims from pinion shaft and record shim thickness.



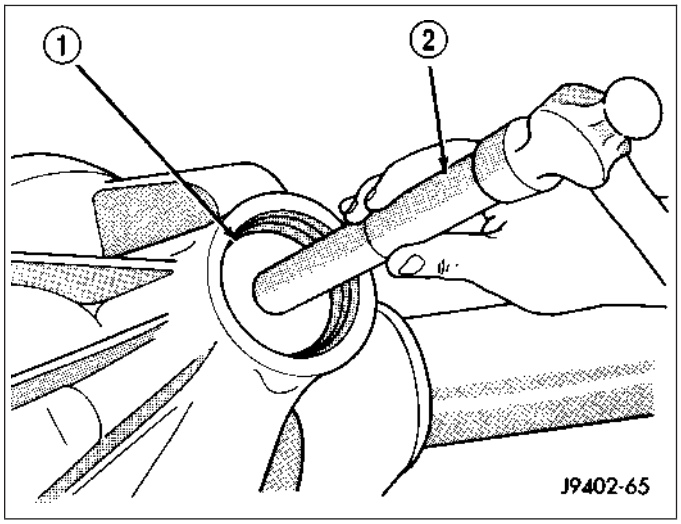
INSTALLATION

NOTE: The ring gear and pinion are serviced in a matched set. Never replace one gear without replacing the other. If ring and pinion gears or bearings are replaced, Refer to Adjustments for Pinion Gear Depth Setting.

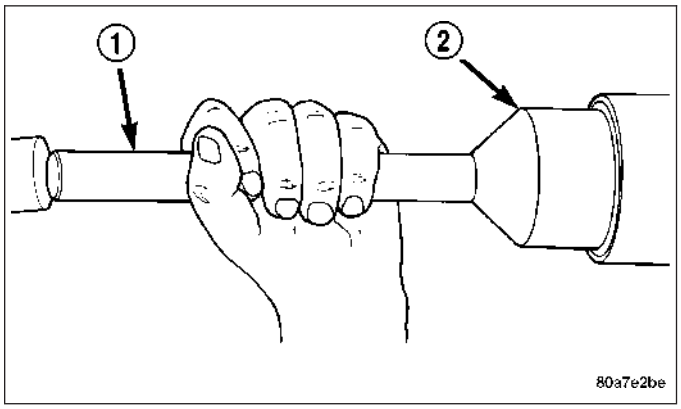
1. Apply Mopar Door Ease or equivalent lubricant to outside surface of the bearing cups.
2. Install rear pinion bearing cup with Installer D-145 (1) and Handle C-4171 (2).



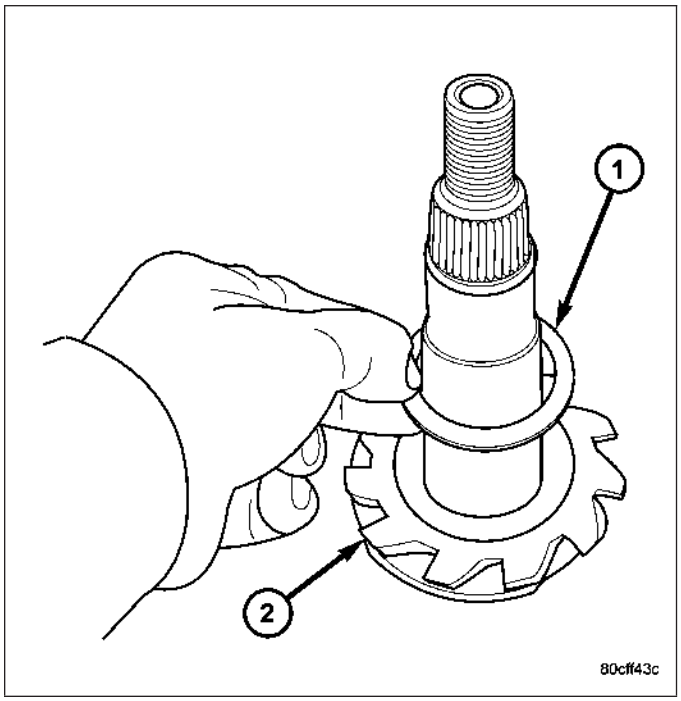
3. Install front pinion bearing cup with Installer D-129 (1) and Handle C-4171 (2).



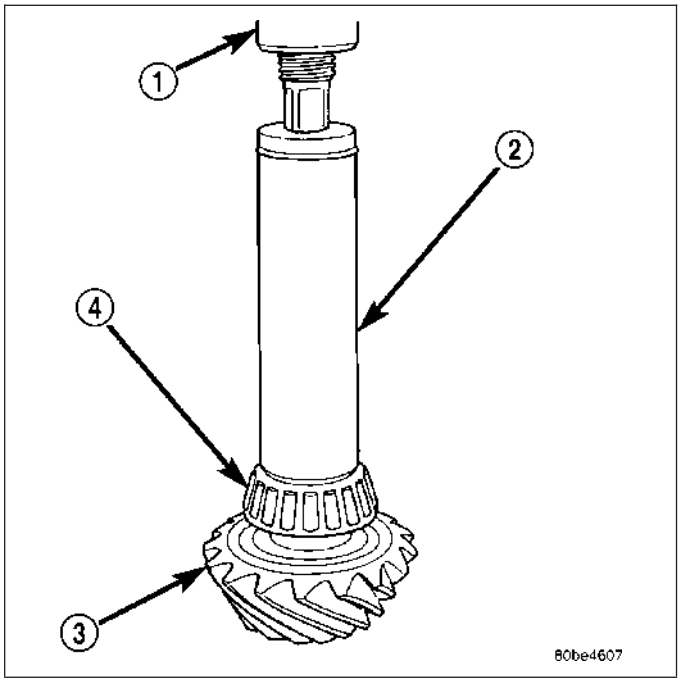
4. Install pinion front bearing and oil slinger if equipped.
5. Apply a light coating of gear lubricant on the lip of pinion seal.
6. Install pinion seal with an appropriate installer (2) and handle (1).



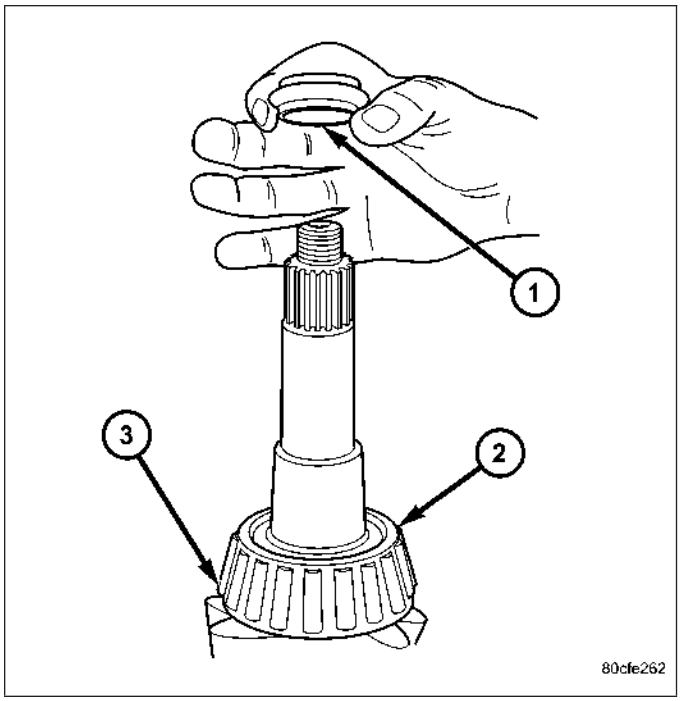
7. Place proper thickness depth shim (1) on pinion (2).



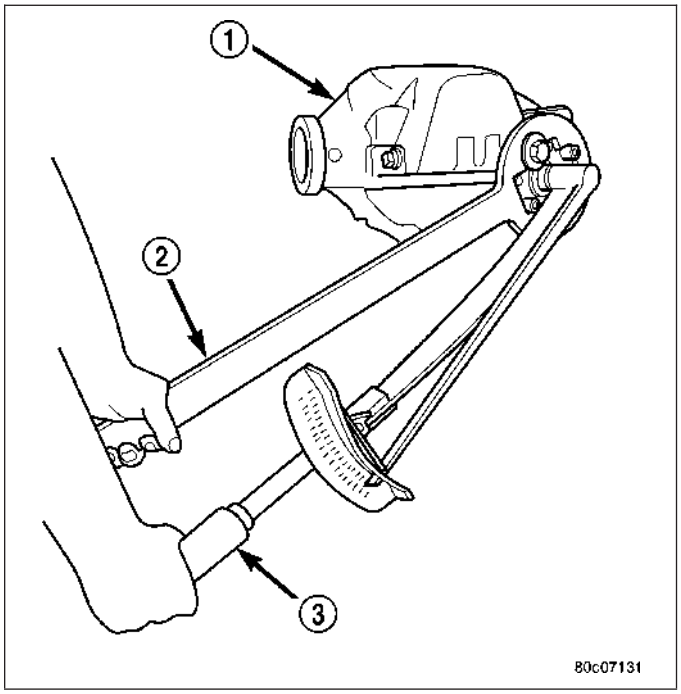
8. Install rear bearing (1) on pinion with Installer 6448 (2) and a press (1).



9. Install **new** collapsible preload spacer (1) onto the pinion.

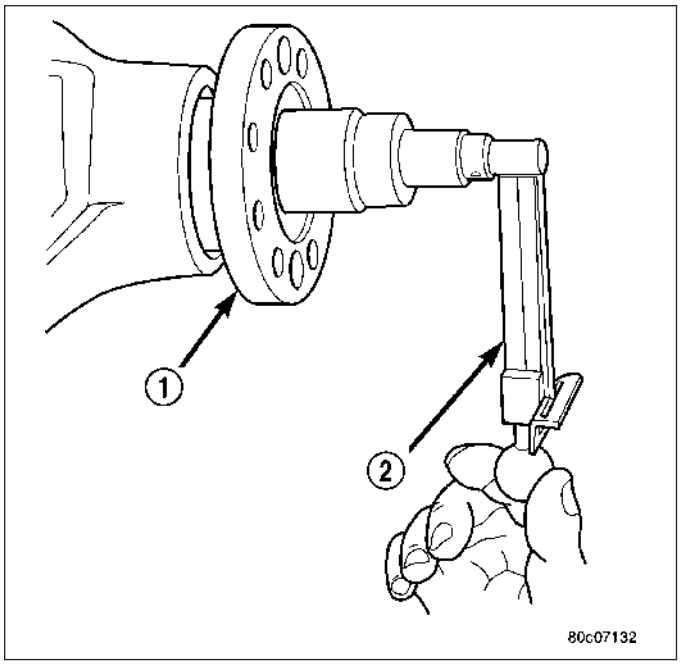


10. Install pinion gear into housing.
11. Install companion flange with Installer C-3718.
12. Install **new** pinion nut and tighten to 271 N·m (200 ft. lbs.).
13. With holder (2) and a torque wrench (3) set at 474 N·m (350 ft. lbs.), tighten pinion nut until end play is taken up.



14. Slowly tighten the pinion flange (1) nut in 6.8 N·m (5 ft. lbs.) increments until rotating torque is achieved. Measure rotating torque frequently to avoid overcrushing the collapsible spacer. The pinion rotating torque should be:
    - Original Bearings: 1 to 2.5 N·m (10 to 20 in. lbs.)
    - New Bearings: 1.7 to 2.5 N·m (15 to 22 in. lbs.)

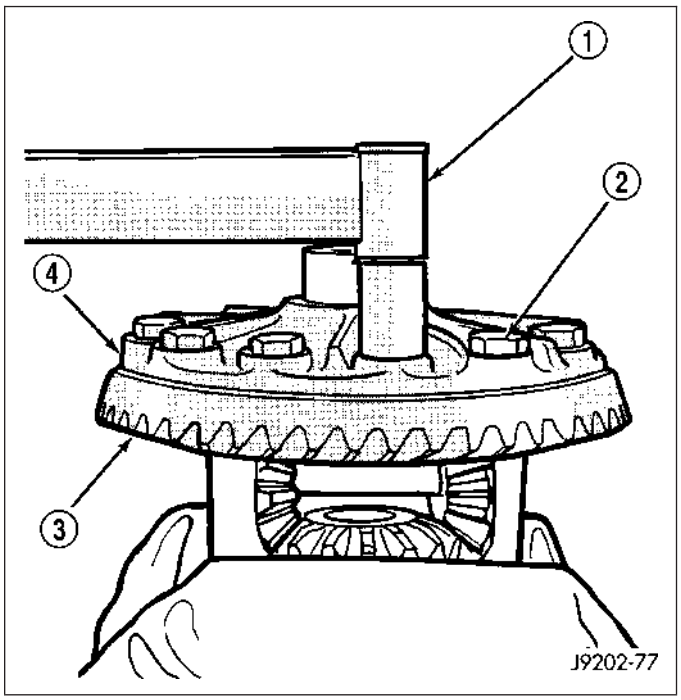
NOTE: Never loosen pinion nut to decrease pinion bearing rotating torque and never exceed specified preload torque.



15. Invert differential case and start two ring gear bolts. This will provide case-to-ring gear bolt hole alignment.
16. Invert differential case in the vise.
17. Install **new** ring gear bolts (2) and alternately tighten to 108 N·m (80 ft. lbs.).

CAUTION: Never reuse the ring gear bolts. Failure to follow these instructions will damage bolts.

18. Install differential in axle housing and verify gear mesh and contact pattern.
19. Install differential cover.



REAR AXLE - 8 1/4

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REAR AXLE - 8 1/4

DIAGNOSIS AND TESTING

REAR AXLE - 8 1/4

GEAR NOISE

Axle gear noise can be caused by insufficient lubricant, incorrect backlash, incorrect pinion depth, tooth contact, worn/damaged gears, or the carrier housing not having the proper offset and squareness.

Gear noise usually happens at a specific speed range. The noise can also occur during a specific type of driving condition. These conditions are acceleration, deceleration, coast, or constant load.

When road testing, first warm-up the axle fluid by driving the vehicle at least 5 miles and then accelerate the vehicle to the speed range where the noise is the greatest. Shift out-of-gear and coast through the peak-noise range. If the noise stops or changes greatly check for:

- Insufficient lubricant.
- Incorrect ring gear backlash.
- Gear damage.

Differential side and pinions gears, usually do not cause noise during straight-ahead driving, when the gears are unloaded. The side gears are loaded during turns. A worn pinion mate shaft can also cause a snapping or a knocking noise.

BEARING NOISE

Bearing noise can be either a whining or a growling sound.

Pinion bearings have a constant high pitch noise, because it rotates at a faster rate. This noise changes with vehicle speed. If noise is heard under a load, the rear pinion bearing is the source. If noise is heard during a coast, the front pinion bearing is the source.

Differential bearings usually produce a low pitch noise. The differential bearing noise is constant and varies only with vehicle speed.

Axle shaft bearing noise generally changes when the bearings are loaded. Turn vehicle sharply to the left and the right during a road test. This will load and unload the bearings and change the noise level. If axle bearing damage is slight, the noise is usually not noticeable at speeds above 30 m.p.h.

LOW SPEED KNOCK

Low speed knock is generally caused by:

- Worn U-joints or C/V joints.
- Worn side-gear thrust washers
- Worn pinion shaft bore.

VIBRATION

Vibration at the rear of the vehicle is usually caused by:

- Damaged drive shaft.
- Missing drive shaft balance weight(s).
- Worn or out of balance wheels.
- Loose wheel lug nuts.
- Worn U-joints or C/V joints.
- Loose/broken springs.
- Damaged axle shaft bearing(s).
- Loose pinion gear nut.
- Excessive pinion yoke run out.
- Bent axle shaft(s).

Check for loose or damaged front-end components or engine/transmission mounts. These components can contribute to what appears to be an axle vibration. Also look at engine accessories, brackets and drive belts.

NOTE: All driveline components should be examined before starting any repair.

DRIVELINE SNAP

A snap or clunk noise when the vehicle is shifted into gear or the clutch engaged can be caused by:

- High engine idle speed.
- Transmission shift operation.
- Loose engine/transmission/transfer case mounts.
- Worn U-joints or C/V joints.
- Loose spring mounts.
- Loose pinion gear nut and yoke.
- Excessive ring gear backlash.
- Excessive side gear to case clearance.

To determined the source of a snap/clunk noise, raise vehicle on a hoist with the wheels free to rotate. Have a helper shift the transmission into gear and listen for the noise.

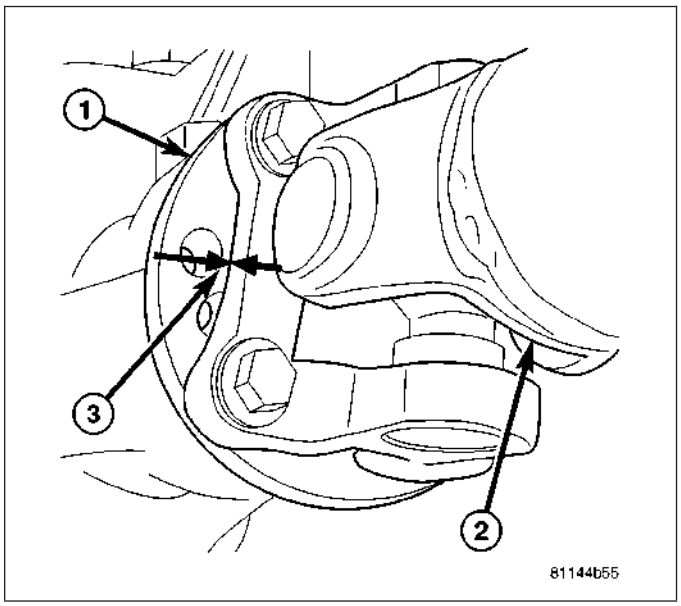
DIAGNOSTIC CHART

Condition	Possible Causes	Correction
Wheel Noise	1. Wheel loose.	1. Tighten loose nuts.
	2. Faulty, brinelled wheel bearing.	2. Replace bearing.
Axle Shaft Noise	1. Misaligned axle tube.	1. Inspect axle tube alignment. Correct as necessary.
	2. Bent or sprung axle shaft.	2. Inspect and correct as necessary.
Axle Shaft Broke	1. Misaligned axle tube.	1. Replace the broken shaft after correcting tube mis-alignment.
	2 Vehicle overloaded.	2. Replace broken shaft and avoid excessive weight on vehicle.
	3. Erratic clutch operation.	3. Replace broken shaft and avoid or correct erratic clutch operation.
	4. Grabbing clutch.	4. Replace broken shaft and inspect and repair clutch as necessary.
Differential Cracked	1. Improper adjustment of the differential bearings.	1. Replace case and inspect gears and bearings for further damage. Set differential bearing pre-load properly.
	2. Excessive ring gear backlash.	2. Replace case and inspect gears and bearings for further damage. Set ring gear backlash properly.
	3. Vehicle overloaded.	3. Replace case and inspect gears and bearings for further damage. Avoid excessive vehicle weight.
	4. Erratic clutch operation.	4. Replace case and inspect gears and bearings for further damage. Avoid erratic use of clutch.
Differential Gears Scored	1. Insufficient lubrication.	1. Replace scored gears. Fill differential with the correct fluid type and quantity.
	2. Improper grade of lubricant.	2. Replace scored gears. Fill differential with the correct fluid type and quantity.
	3. Excessive spinning of one wheel/tire.	3. Replace scored gears. Inspect all gears, pinion bores, and shaft for damage. Service as necessary.
Loss Of Lubricant	1. Lubricant level too high.	1. Drain lubricant to the correct level.
	2. Worn axle shaft seals.	2. Replace seals.
	3. Cracked differential housing.	3. Repair as necessary.
	4. Worn pinion seal.	4. Replace seal.
	5. Worn/scored yoke.	5. Replace yoke and seal.
	6. Axle cover not properly sealed.	6. Remove, clean, and re-seal cover.

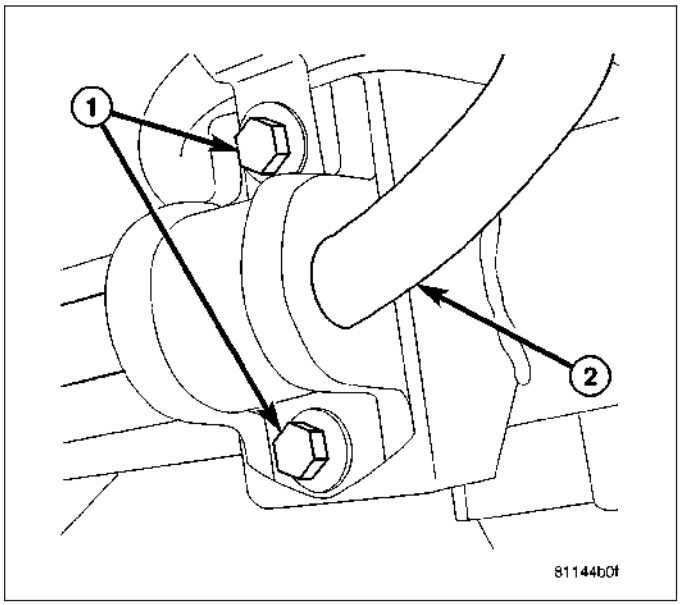
Condition	Possible Causes	Correction
Axle Overheating	1. Lubricant level low.	1. Fill differential to correct level.
	2. Improper grade of lubricant.	2. Fill differential with the correct fluid type and quantity.
	3. Bearing pre-loads too high.	3. Re-adjust bearing pre-loads.
	4. Insufficient ring gear backlash.	4. Re-adjust ring gear backlash.
Gear Teeth Broke	1. Overloading.	1. Replace gears. Examine other gears and bearings for possible damage.
	2. Erratic clutch operation.	2. Replace gears and examine the remaining parts for damage. Avoid erratic clutch operation.
	3. Ice-spotted pavement.	3. Replace gears and examine remaining parts for damage.
	4. Improper adjustments.	4. Replace gears and examine remaining parts for damage. Ensure ring gear backlash is correct.
Axle Noise	1. Insufficient lubricant.	1. Fill differential with the correct fluid type and quantity.
	2. Improper ring gear and pinion adjustment.	2. Check ring gear and pinion contact pattern. Adjust backlash or pinion depth.
	3. Unmatched ring gear and pinion.	3. Replace gears with a matched ring gear and pinion.
	4. Worn teeth on ring gear and/or pinion.	4. Replace ring gear and pinion.
	5. Loose pinion bearings.	5. Adjust pinion bearing pre-load.
	6. Loose differential bearings.	6. Adjust differential bearing pre-load.
	7. Mis-aligned or sprung ring gear.	7. Measure ring gear run-out. Replace components as necessary.
	8. Loose differential bearing cap bolts.	8. Inspect differential components and replace as necessary. Ensure that the bearing caps are torqued tot he proper specification.
	9. Housing not machined properly.	9. Replace housing.

REMOVAL

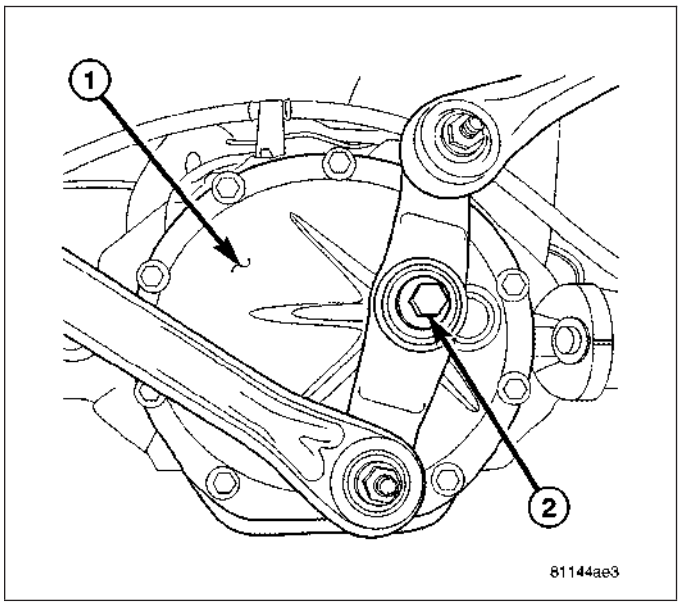
1. With vehicle in neutral, position it on a hoist.
2. Position a lift under axle and secure lift to axle.
3. Remove brake components from the axle.
4. Remove ABS wheel speed sensors.
5. Remove vent hose from the axle shaft tube.
6. Mark a reference line (3) across the propeller shaft (2) and pinion flange (1) for installation alignment.



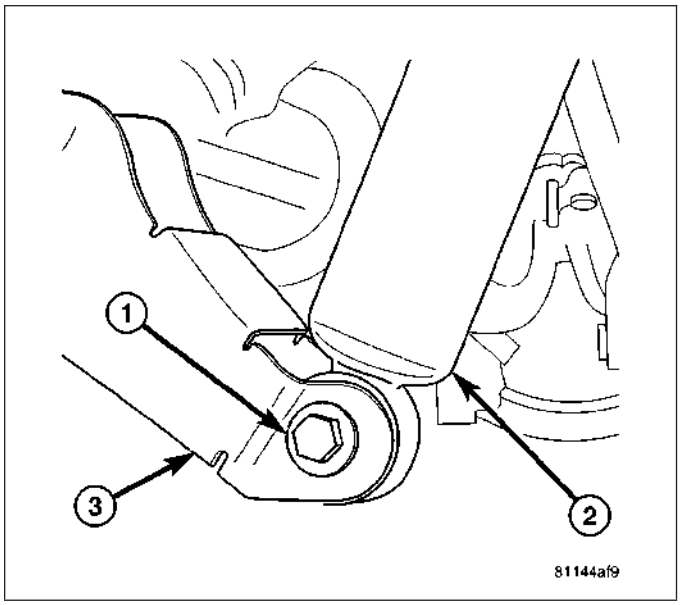
7. Remove propeller shaft.
8. Remove stabilizer bar (2) clamps bolts (1) from the axle.



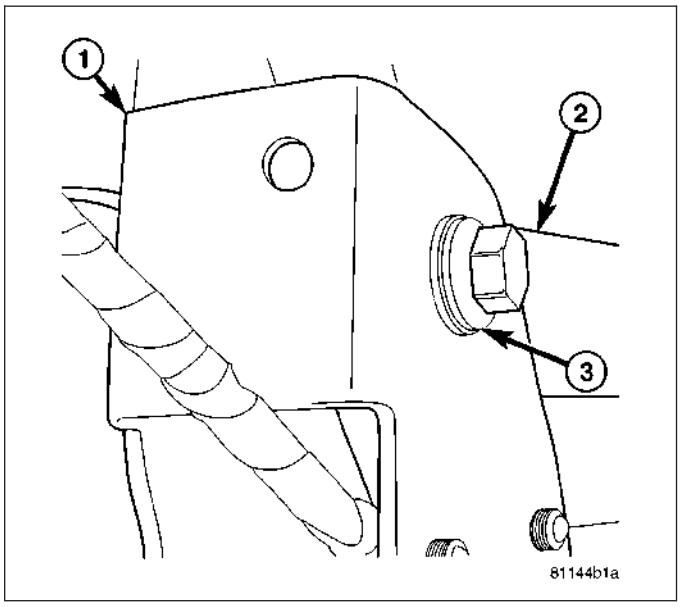
9. Remove watts link bell crank bolt (2) from differential cover (1).



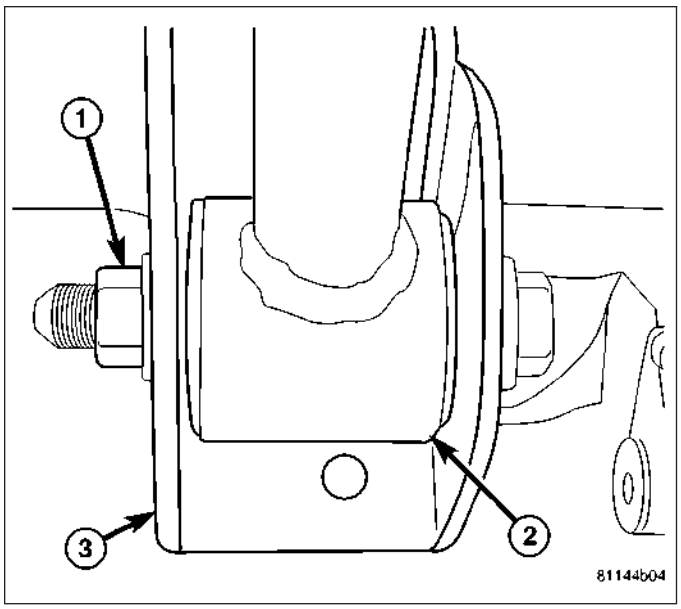
10. Remove shock absorbers (2) from axle bracket (3).



11. Remove upper control arms (2) from axle brackets (1).



12. Lower axle and remove coil springs and spring isolators.
13. Remove lower control arms (2) from axle brackets (3).
14. Lower axle and remove from vehicle.

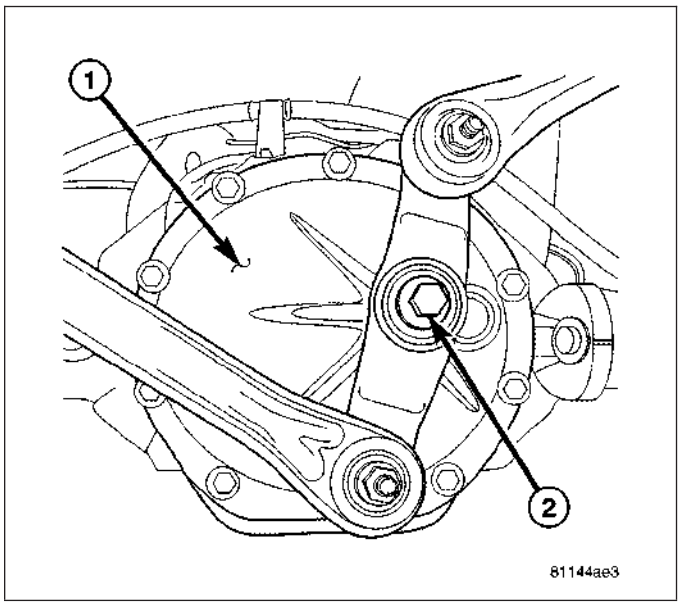


INSTALLATION

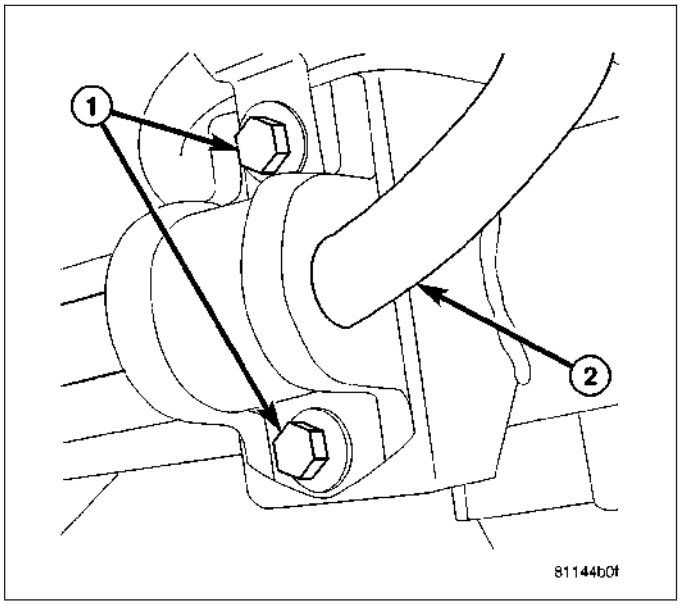
1. Raise axle and align lower control arms. Install control arm bolts loose at this time.
2. Install coil springs.
3. Raise axle and align upper control arms. Install control arm bolts loose at this time.

NOTE: Bell crank bolt has a Loctite® patch, a new bolt should be used. If bolt is not available, clean bolt and apply Loctite® 242 to the threads.

4. Install watts link bell crank bolt (2) and tighten to 217 N·m (160 ft. lbs.).



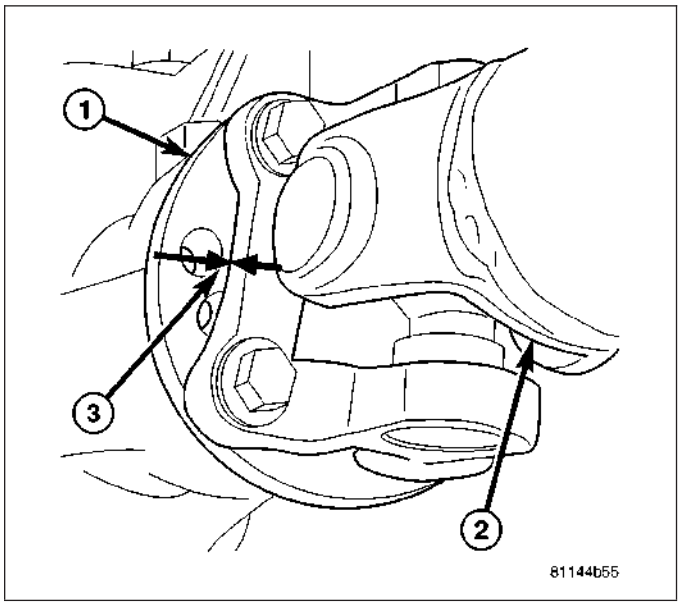
5. Install shock absorbers and tighten nuts to 102 N·m (75 ft. lbs.).
6. Install parking brake and brake components.
7. Install axle vent hose.
8. Install stabilizer bar (2) and center it with equal spacing on both sides. Tighten bolts to 61 N·m (45 ft. lbs.).



9. Install propeller shaft (2) with reference marks (3) aligned.
10. Install **new** companion flange bolts and tighten to 108 N·m (80 ft. lbs.).

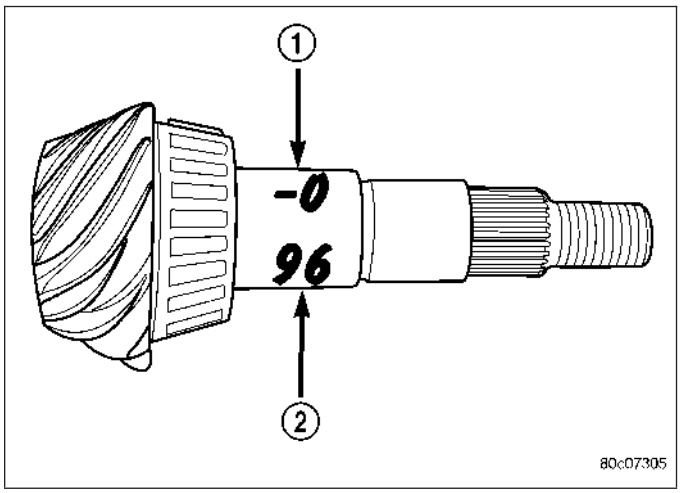
NOTE: Companion flange bolts have a Loctite® patch, new bolts should be used. If bolts are not available, clean bolts and apply Loctite® 242 to the threads.

11. With vehicle on the ground, tighten upper control arm bolts to 170 N·m (125 ft. lbs.). Tighten lower control arm nuts to 230 N·m (170 ft. lbs.).



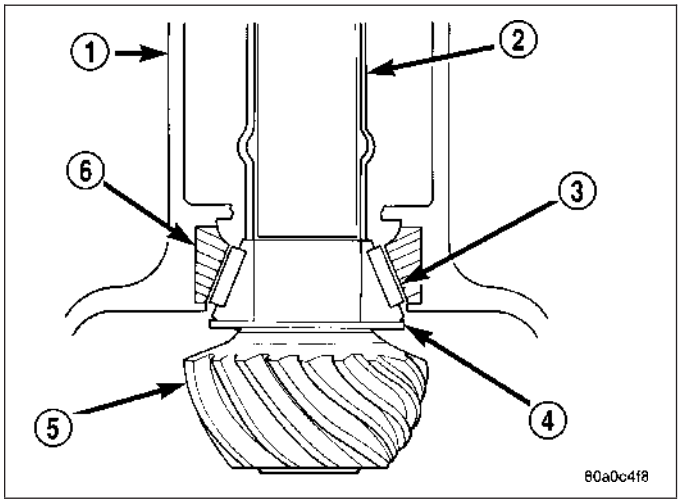
ADJUSTMENTS

Ring gear and pinion are supplied as matched sets. Identifying numbers for the ring gear and pinion are painted onto the pinion gear shaft and the side of the ring gear. A plus + number, minus – number or zero 0 along with the gear set sequence number 01 to 99 is on each gear. This first number (1) is the amount (in thousandths of an inch) the depth varies from the standard depth setting of a pinion marked with a zero 0. The next two numbers (2) are the sequence number of the gear set. The standard depth provides the best teeth contact pattern.



The pinion depth variance select shims (4) are placed behind the rear pinion bearing (3).

If installing a new gear, note the depth variance number of the original and replacement pinion. Add or subtract this number from the original depth shim/oil slinger to compensate for the difference in the depth variances. The numbers represent thousands of an inch deviation from the standard. If the number is negative, add that value to the required thickness of the depth shims. If the number is positive, subtract that value from the thickness of the depth shim.



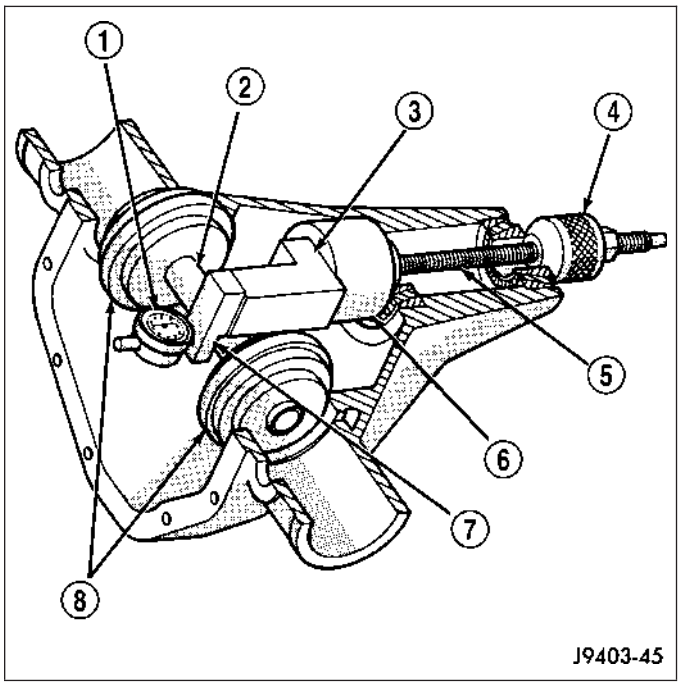
Pinion Gear Depth Variance Chart: Note where Old and New Pinion Marking columns intersect. Intersecting figure represents plus or minus the amount needed.

PINION GEAR DEPTH VARIANCE

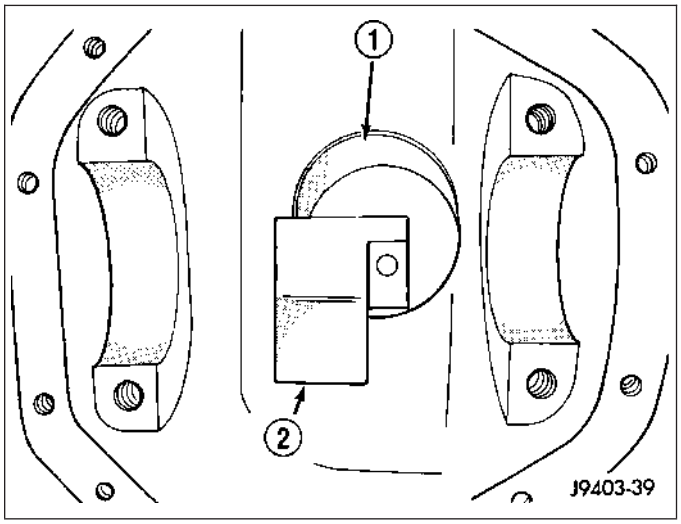
Original Pinion Gear Depth Variance	Replacement Pinion Gear Depth Variance								
	−4	−3	−2	−1	0	+1	+2	+3	+4
+4	+0.008	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0
+3	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001
+2	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002
+1	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003
0	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004
−1	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005
−2	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006
−3	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006	−0.007
−4	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006	−0.007	−0.008

PINION DEPTH MEASUREMENT

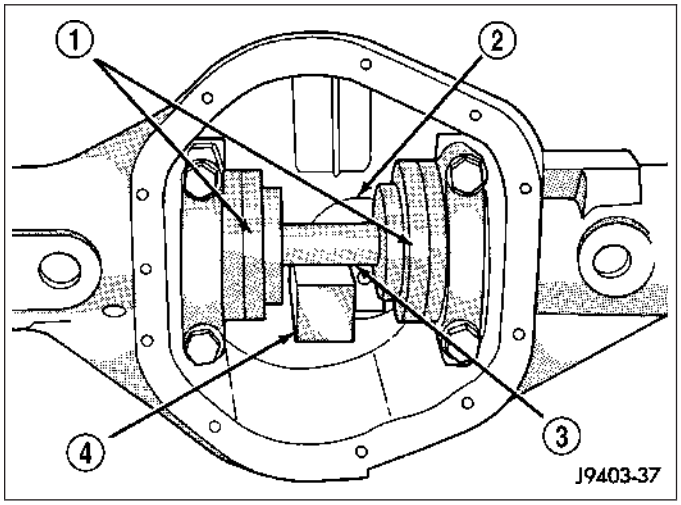
Measurements are taken with pinion bearing cups and pinion bearings installed in the housing. Take measurements with Pinion Gauge Set and Dial Indicator C-3339 (1).



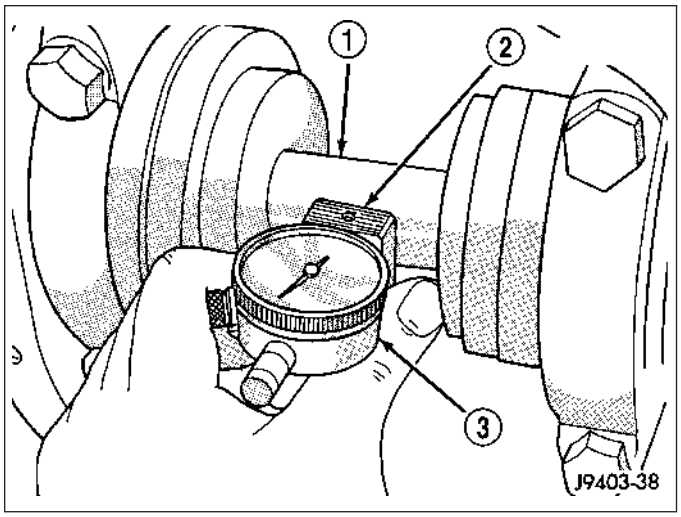
1. Assemble Pinion Height Block 6739 (2) Pinion Block 8540 (1) and rear pinion bearing onto Screw 6741.



2. Insert assembled height gauge components, rear bearing and screw into housing through pinion bearing cups.
3. Install front pinion bearing and Cone-Nut 6740 onto the screw. Tighten cone-nut until Torque To Rotate screw is 1.7 N·m (15 in. lbs.).
4. Place Arbor Disc 8541 (1) on Arbor D-115-3 (3) in position in the housing side bearing cradles. Install differential bearing caps on arbor discs and tighten cap bolts to specifications.



NOTE: Arbor Discs 8541 (1) has different step diameters to fit other axles. Choose proper step for axle being serviced.

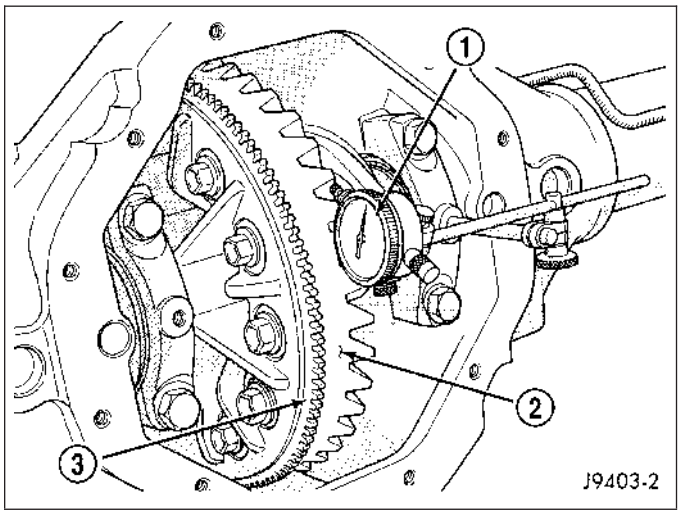


5. Assemble Dial Indicator C-3339 into Scooter Block D-115-2 and secure set screw.
6. Place Scooter Block/Dial Indicator in position in axle housing so dial probe and scooter block are flush against the rearward surface of the pinion height block. Hold scooter block in place and zero the dial indicator. Tighten dial indicator face lock screw.
7. Slowly slide dial indicator probe over the edge of the pinion height block.
8. Slide dial indicator (3) probe across the gap between the pinion height block and arbor bar (1) with the scooter block (2) against the pinion height block. When dial probe contacts the arbor bar, the dial pointer will turn clockwise. Continue moving dial probe to the crest of the arbor bar and record the highest reading. If the dial indicator can not achieve a zero reading, the rear bearing cup or the pinion depth gauge set is not installed correctly.
9. Select a shim equal to the dial indicator reading, plus the drive pinion gear depth variance number marked on the shaft of the pinion. For example, if the depth variance is –2, add +0.002 in. to the dial indicator reading. Then subtract 0.04064 mm (0.0016 in.) from the total measurement. This will be the correct shim selection for the pinion height.

DIFFERENTIAL BEARING PRELOAD AND GEAR BACKLASH

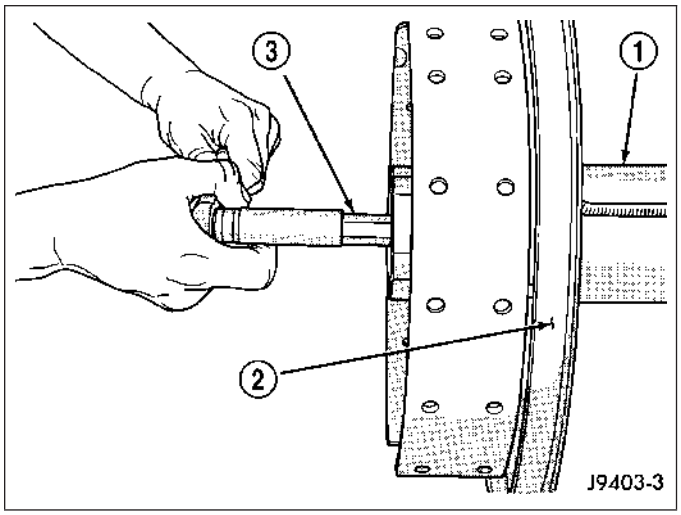
The following must be considered when adjusting bearing preload and gear backlash:

- The maximum ring gear backlash variation is 0.076 mm (0.003 in.).
- Mark the gears so the same teeth are meshed during all backlash measurements.
- Maintain the torque while adjusting the bearing preload and ring gear backlash.
- Excessive adjuster torque will introduce a high bearing load and cause premature bearing failure. Insufficient adjuster torque can result in excessive differential case free-play and ring gear noise.
- Insufficient adjuster torque will not support the ring gear correctly and can cause excessive differential case free-play and ring gear noise.



NOTE: The differential bearing cups will not always immediately follow the threaded adjusters as they are moved during adjustment. To ensure accurate bearing cup responses to the adjustments:

- **Maintain the gear teeth engaged (meshed) as marked.**
- **The bearings must be seated by rapidly rotating the pinion gear a half turn back and forth.**
- **Do this five to ten times each time the threaded adjusters are adjusted.**



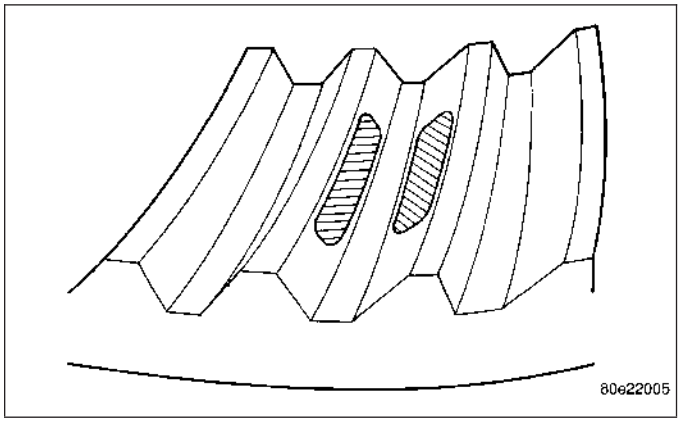
1. Through the axle tube with Wrench C-4164 adjust each threaded adjuster inward until the differential bearing free-play is eliminated. Allow some ring gear backlash, approximately 0.25 mm (0.01 in.) between the ring and pinion gear. Seat the bearing cups with the procedure described above.
2. Install dial indicator (1) and position the plunger against the drive side of a ring gear (2) tooth. Measure the backlash at 4 positions, 90 degrees apart around the ring gear. Locate and mark the area of minimum backlash.
3. Rotate the ring gear to the position of the least backlash. Mark the gear so that all future backlash measurements will be taken with the same gear teeth meshed.
4. Loosen the right-side, tighten the left-side threaded adjuster. Obtain backlash of 0.076-0.102 mm (0.003-0.004 in.) with each adjuster tightened to 14 N·m (10 ft. lbs.). Seat the bearing cups with the procedure described above.
5. Tighten the differential bearing cap bolts to 135 N·m (100 ft. lbs.).
6. Tighten the right-side threaded adjuster to 102 N·m (75 ft. lbs.). Seat the bearing cups with the procedure described above. Continue to tighten the right-side adjuster and seat bearing cups until the torque remains constant at 102 N·m (75 ft. lbs.)
7. Measure the ring gear backlash. The range of backlash is 0.15-0.203 mm (0.006-0.008 in.).
8. Continue increasing the torque at the right-side threaded adjuster until the specified backlash is obtained.

NOTE: The left-side threaded adjuster torque should have approximately 102 N·m (75 ft. lbs.). If the torque is considerably less, the complete adjustment procedure must be repeated.

9. Tighten the left-side threaded adjuster until 102 N·m (75 ft. lbs.) torque is indicated. Seat the bearing rollers with the procedure described above. Do this until the torque remains constant.
10. Install the threaded adjuster locks and tighten the lock screws to 10 N·m (90 in. lbs.).

After the proper backlash is achieved, perform the Gear Contact procedure.

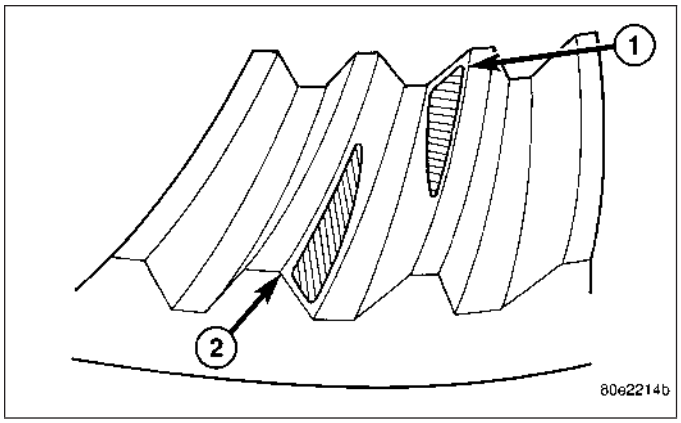
GEAR CONTACT PATTERN



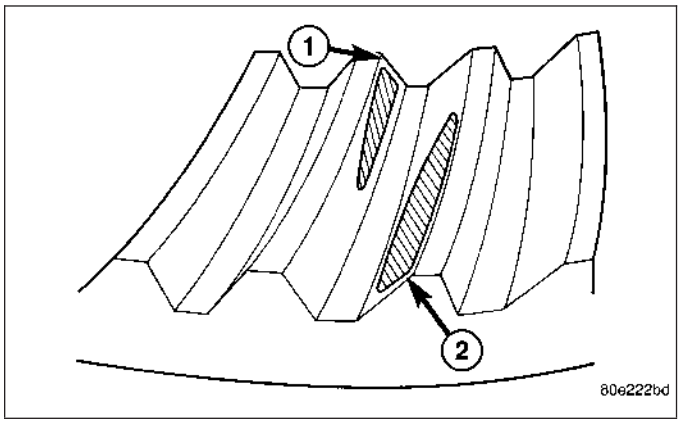
1. Wipe clean each tooth of the ring gear.
2. Apply gear marking compound to all of the ring gear teeth.
3. Verify bearing cap bolts are torque specification.
4. Apply parking brakes lightly to create at 14 N·m (10 ft. lbs.) pinion rotating torque.
5. Rotate the pinion/pinion yoke 4 full revolutions in each directions.
6. Read gear tooth contact pattern.

Gear contact pattern is correct. Backlash and pinion depth is correct.

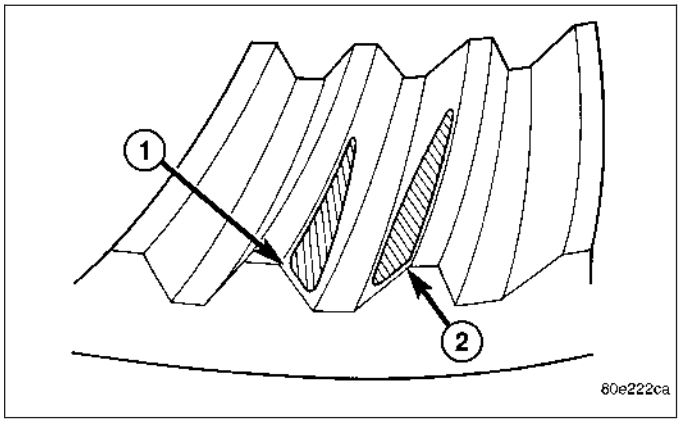
Ring gear is too far away from the pinion gear, coast side toe (1) drive side heel (2). Decrease backlash by moving ring closer to the pinion gear using the adjusters.



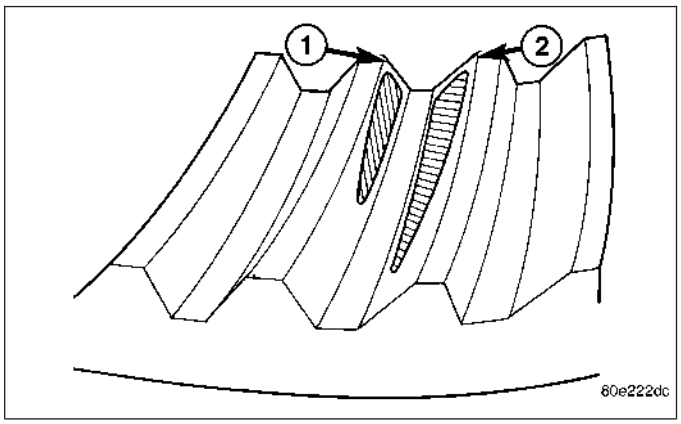
Ring gear is too close to the pinion gear, drive side toe (1) coast side heel (2). Increase backlash by moving ring away from the pinion gear using the adjusters.



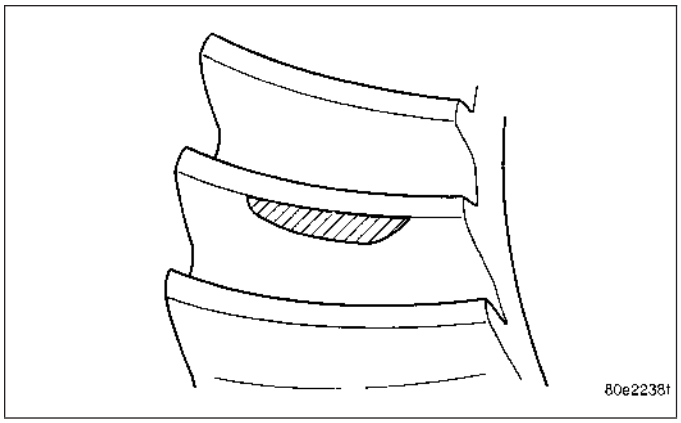
Ring gear is too far away from the pinion gear, drive side heel (1) coast side heel (2). Decrease backlash by moving ring gear closer to the pinion gear using the adjusters.



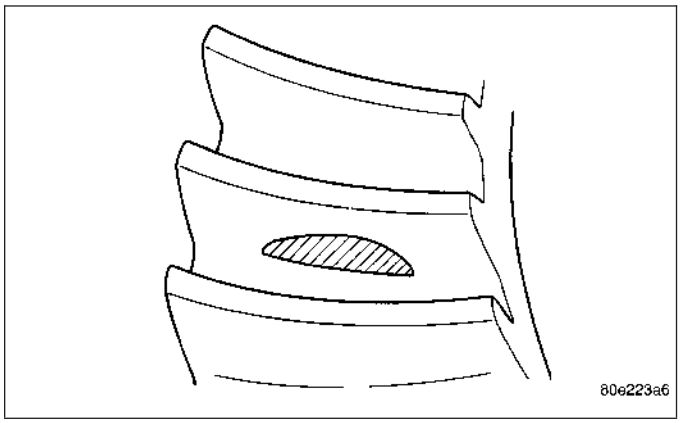
Ring gear is too close to the pinion gear, drive side toe (1) coast side toe (2). Increase backlash by moving ring gear away from the pinion gear using the adjusters.



Pinion gear is set too low. Increase pinion gear height, by increasing pinion depth shim thickness.



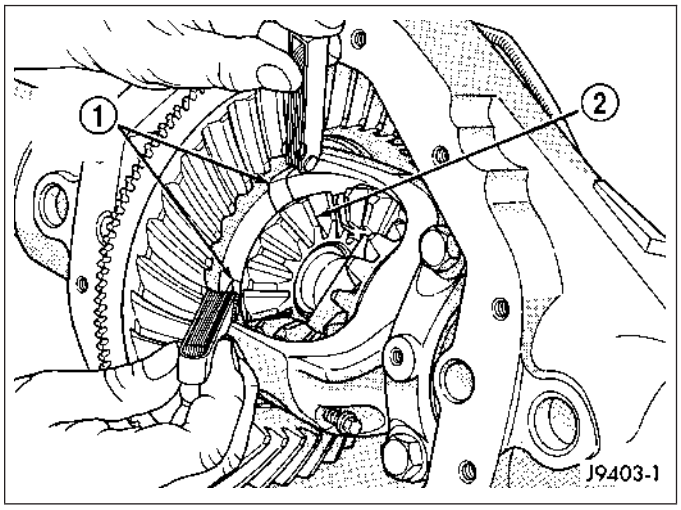
Pinion gear is set too high. Decrease pinion height by decreasing the pinion depth shim thickness.



SIDE GEAR CLEARANCE

When measuring side gear clearance, check each gear independently. If it necessary to replace a side gear, replace both gears as a matched set.

1. Install axle shafts and C-locks and pinion mate shaft.
2. Measure each side gear clearance. Insert a matched pair of feeler gauge (1) blades between the side gear (2) and differential housing on opposite sides of the hub.



SIDE GEAR CLEARANCE	0.007
THRUST WASHER THICKNESS	+ 0.033
TOTAL	0.040
	0.040
REPLACEMENT WASHER THICKNESS	− 0.037
NEW SIDE GEAR CLEARANCE	0.003

J9203-31

3. If side gear clearances is no more than 0.005 inch. Determine if the axle shaft is contacting the pinion mate shaft. **Do not remove the feeler gauges, inspect the axle shaft with the feeler gauge inserted behind the side gear.** If the end of the axle shaft is not contacting the pinion mate shaft, the side gear clearance is acceptable.
4. If clearance is more than 0.005 inch (axle shaft not contacting mate shaft), record the side gear clearance. Remove the thrust washer and measure its thickness with a micrometer. Add the washer thickness to the recorded side gear clearance. The sum of gear clearance and washer thickness will determine required thickness of replacement thrust washer.

In some cases, the end of the axle shaft will move and contact the mate shaft when the feeler gauge is inserted. The C-lock is preventing the side gear from sliding on the axle shaft.

5. If there is no side gear clearance, remove the C-lock from the axle shaft. Use a micrometer to measure the thrust washer thickness. Record the thickness and re-install the thrust washer. Assemble the differential case without the C-lock installed and re-measure the side gear clearance.
6. Compare both clearance measurements. If the difference is less than 0.012 inch (0.305 mm), add clearance recorded when the C-lock was installed to thrust washer thickness measured. The sum will determine the required thickness of the replacement thrust washer.
7. If clearance is 0.012 inch (0.305 mm) or greater, both side gears must be replaced (matched set) and the clearance measurements repeated.
8. If clearance (above) continues to be 0.012 inch (0.305 mm) or greater, the case must be replaced.

SPECIFICATIONS

REAR AXLE - 8 1/4

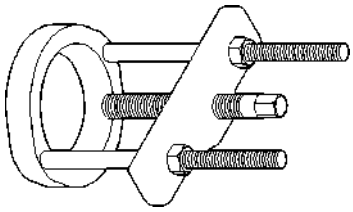
AXLE SPECIFICATIONS

DESCRIPTION	SPECIFICATION
Axle Ratio	3.55, 3.92
Differential Case Flange Runout	0.076 mm (0.003 in.)
Differential Case Clearance	0.12 mm (0.005 in.)
Ring Gear Diameter	209.5 mm (8.25 in.)
Ring Gear Backlash	0.12-0.20 mm (0.005-0.008 in.)
Ring Gear Runout	0.12 mm (0.005 in.)
Pinion Bearing Preload - Original Bearings	1-2 N·m (10-20 in. lbs.)
Pinion Bearing Preload - New Bearings	1.7-4 N·m (15-35 in. lbs.)

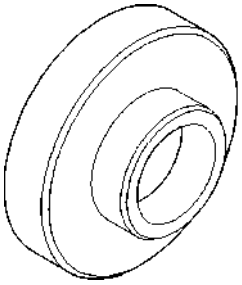
TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Differential Cover Bolts	44	32	-
Bearing Cap Bolts	135	100	-
Ring Gear Bolts	102	75	-
Pinion Nut Minimum	285	210	-
Adjuster Lock Screw	10	-	95
Pinion Shaft Lock Screw	25	18.5	220
Bell Crank Bolt	217	160	-

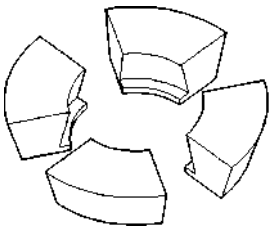
SPECIAL TOOLS



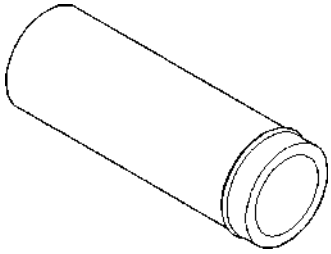
PULLER C-293-PA



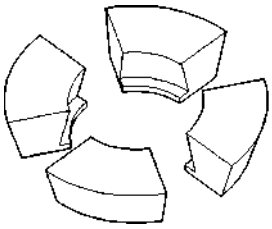
INSTALLER C-4076-B



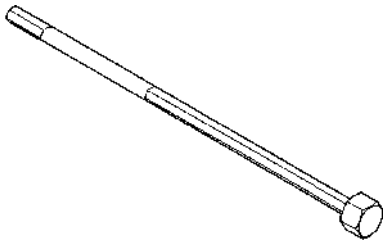
ADAPTERS C-293-47



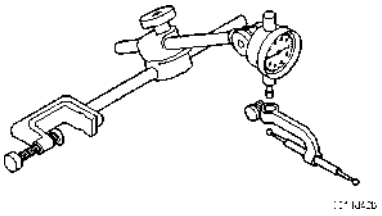
HANDLE C-4735



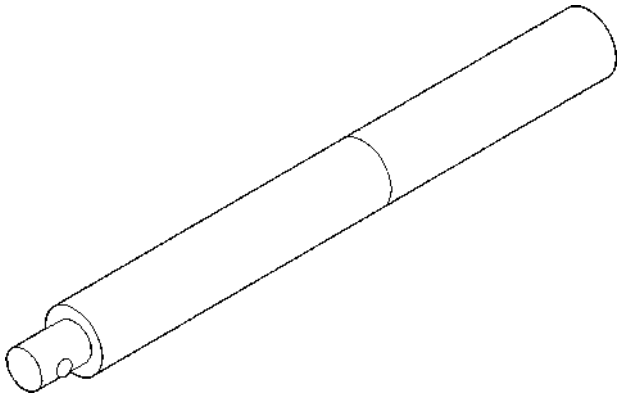
ADAPTERS C-293-48



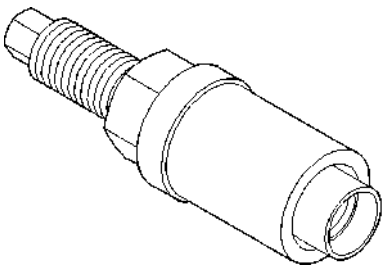
ADJUSTMENT WRENCH C-4164



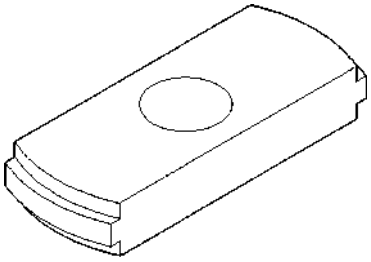
DIAL INDICATOR C-3339



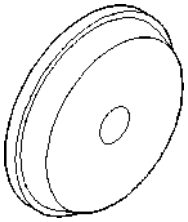
HANDLE C-4171



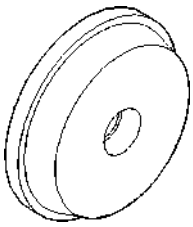
INSTALLER C-3718



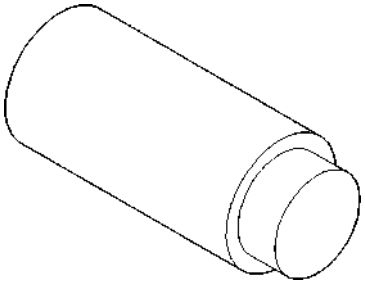
REMOVER C-4307



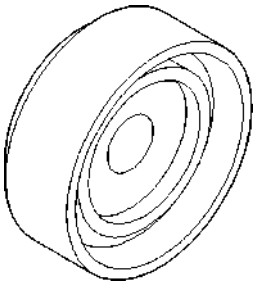
INSTALLER D-130



INSTALLER C-4308



ADAPTER PLUG SP-3289



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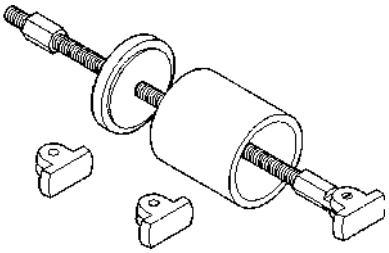
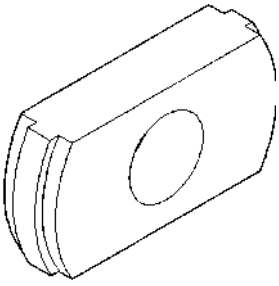
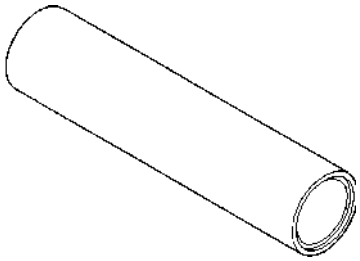


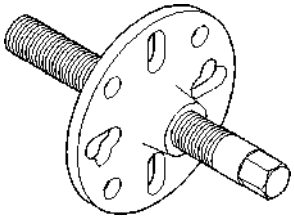
REMOVER 6310



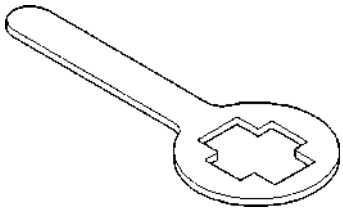
INSTALLER C-4345



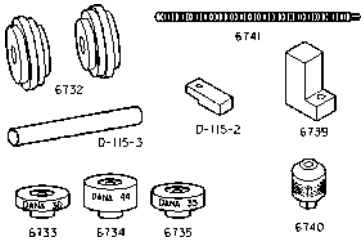
INSTALLER 6448



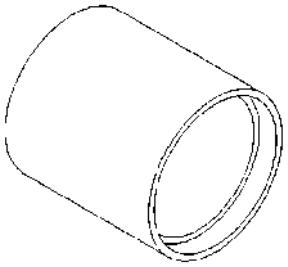
PULLER C-452



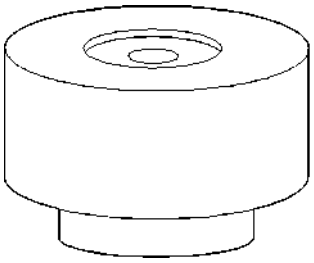
HOLDER 6719A



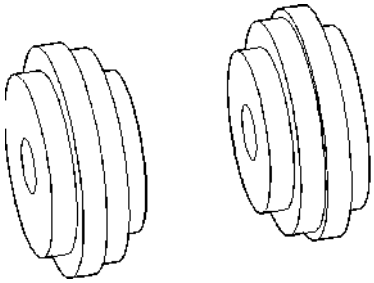
PINION GAUGE SET 6730/6774/6775



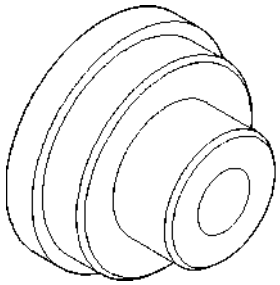
RECEIVER 9338



PINION BLOCK 8540



ARBOR DISCS 8541

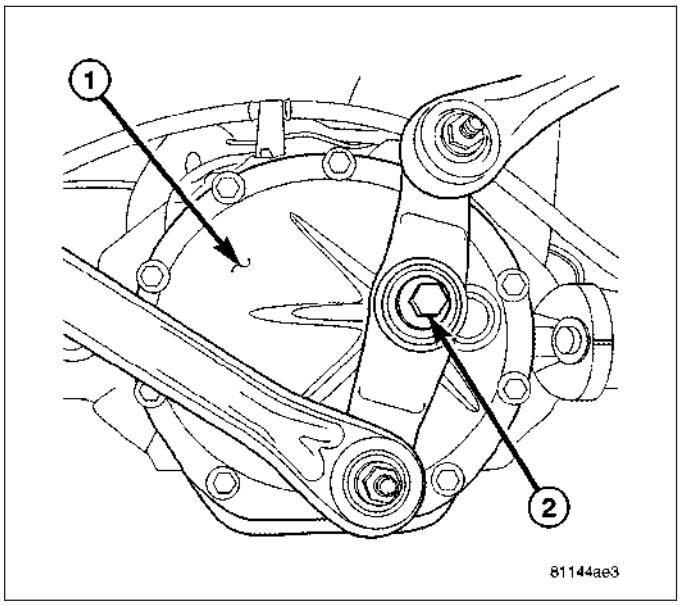


INSTALLER 9337

COVER-DIFFERENTIAL

REMOVAL

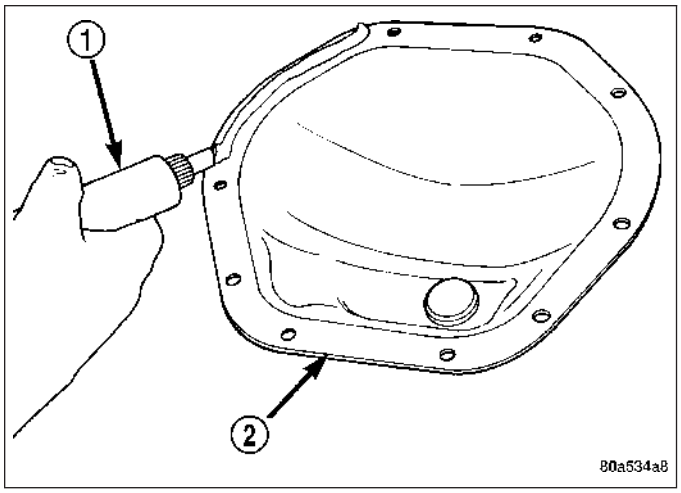
1. Remove diffrential fill plug.
2. Remove watts link bell crank bolt (2) from differential cover (1).
3. Remove differential cover bolts.
4. Remove cover and drain fluid.



INSTALLATION

1. Clean differential cover.
2. Apply a bead of orange Mopar Axle RTV Sealant (1) or equivalent to the cover (2).

CAUTION: If cover is not installed within 3 to 5 minutes, the cover must be cleaned and new RTV applied. Failure to follow these instructions will compromise adhesion quality.



3. Install cover and tighten bolts in a criss-cross pattern to 44 N·m (32 ft. lbs.).
4. Fill differential with 2.07 L (4.375 pts.) of gear lubricant.

CAUTION: Fill differential by volume only, not to the bottom of fill plug. Failure to follow these instructions will cause an over fill condition.

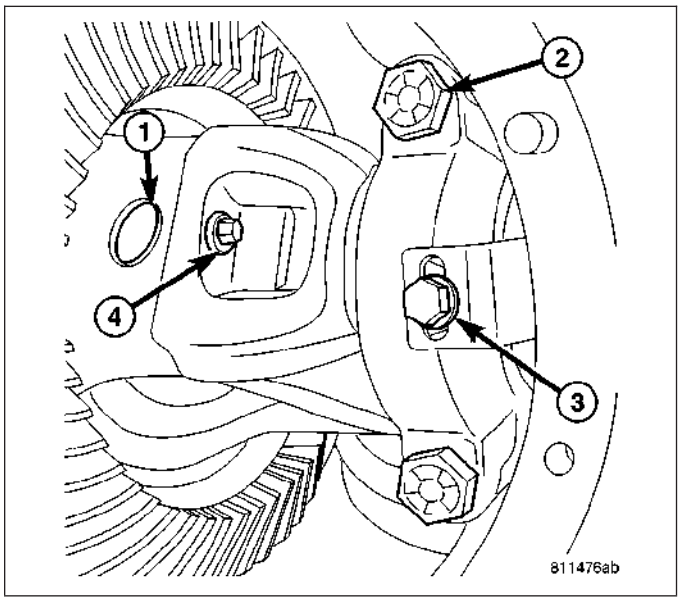
5. Install fill hole plug.
6. Install watts link bell crank bolt and tighten to 217 N·m (160 ft. lbs.).

NOTE: Bell crank bolt has a Loctite® patch, a new bolt should be used. If bolt is not available, clean bolt and apply Loctite® 242 to the threads.

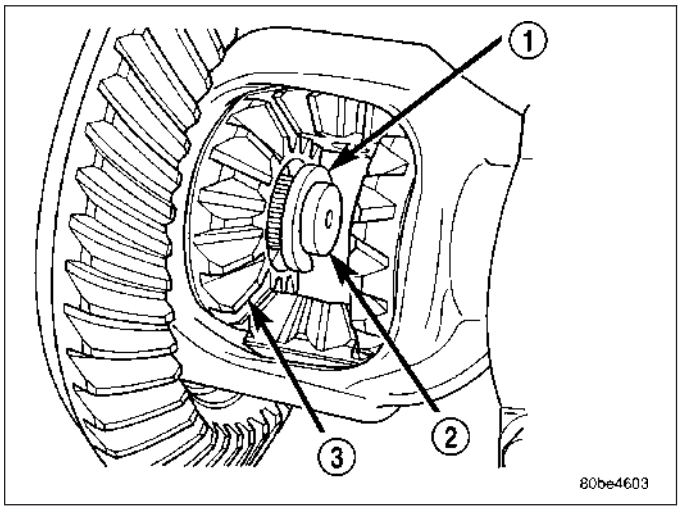
SHAFT-AXLE

REMOVAL

1. With vehicle in neutral, position it on a hoist.
2. Remove brake caliper adapter with caliper and remove rotor.
3. Remove differential housing cover and drain lubricant.
4. Rotate differential case, to access pinion mate shaft lock screw (4). Remove screw (4) and pinion mate shaft (1) from differential case.

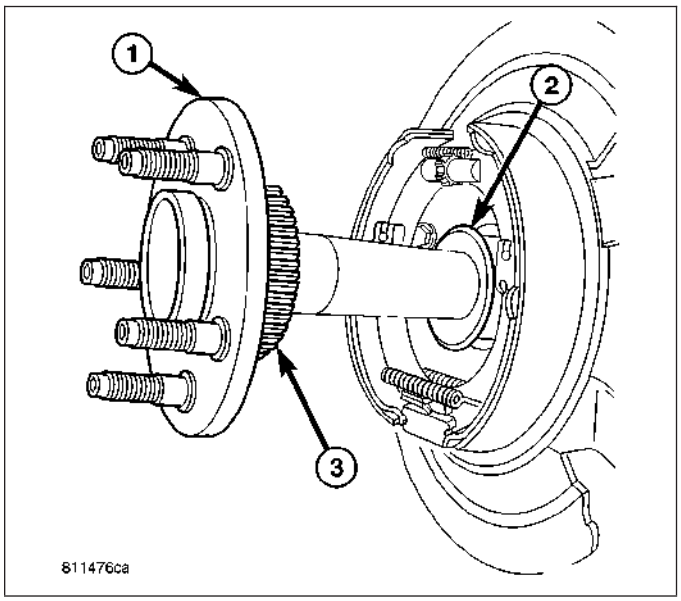


5. Push axle shaft (2) inward and remove axle shaft C-lock (1).
6. Remove axle shaft.

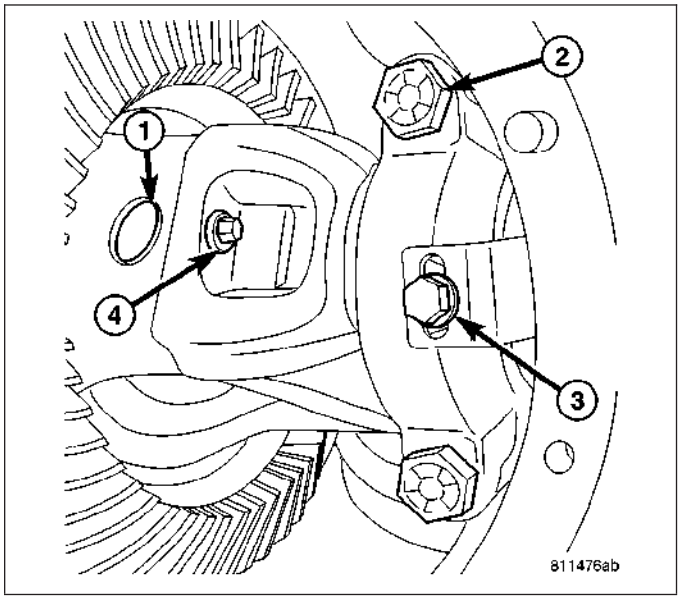


INSTALLATION

1. Lubricate bearing bore and seal lip with gear lubricant.
2. Insert axle shaft (1) through seal (2) and engage into side gear splines.



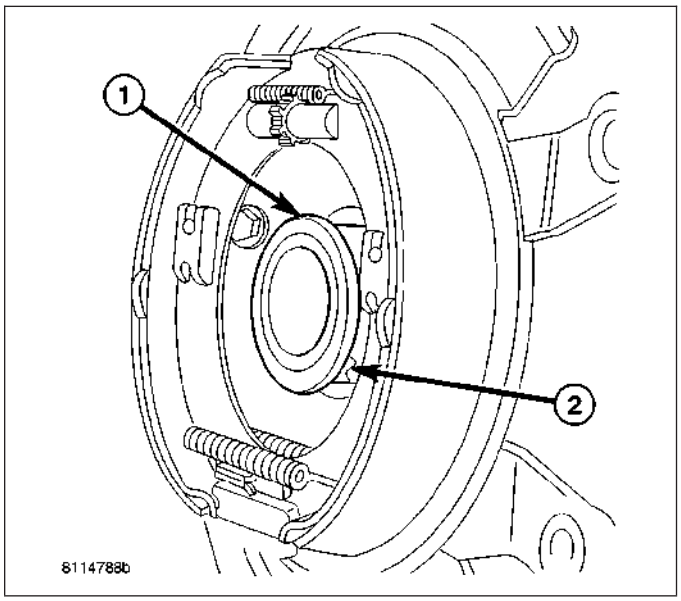
3. Insert C-lock in end of axle shaft then push axle shaft outward to seat C-lock in side gear.
4. Insert pinion shaft into differential case and through thrust washers and differential pinions.
5. Align hole in shaft with hole in differential case and install lock screw (4) with Loctite® on the threads. Tighten lock screw to 25 N·m (220 in. lbs.).
6. Install differential cover and fill with gear lubricant.
7. Install brake rotor and caliper adapter with caliper.



SEAL-AXLE SHAFT

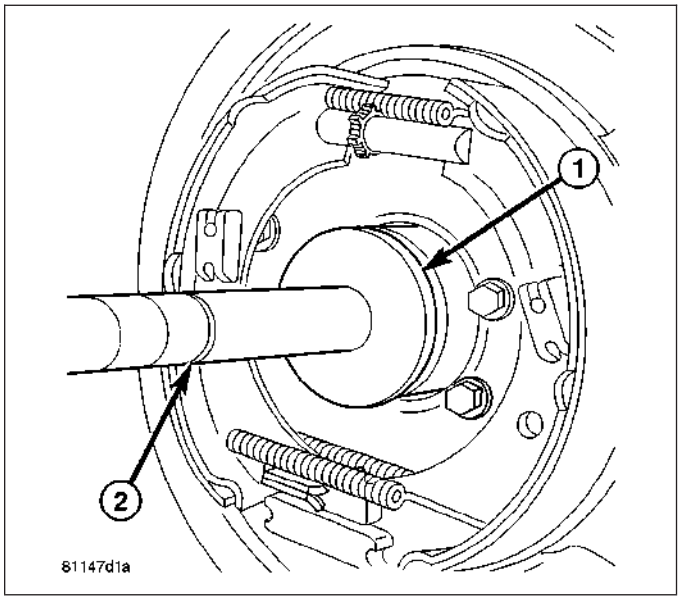
REMOVAL

1. Remove axle shaft.
2. Remove axle shaft seal (1) from end of the axle tube (2) with a pry bar.



INSTALLATION

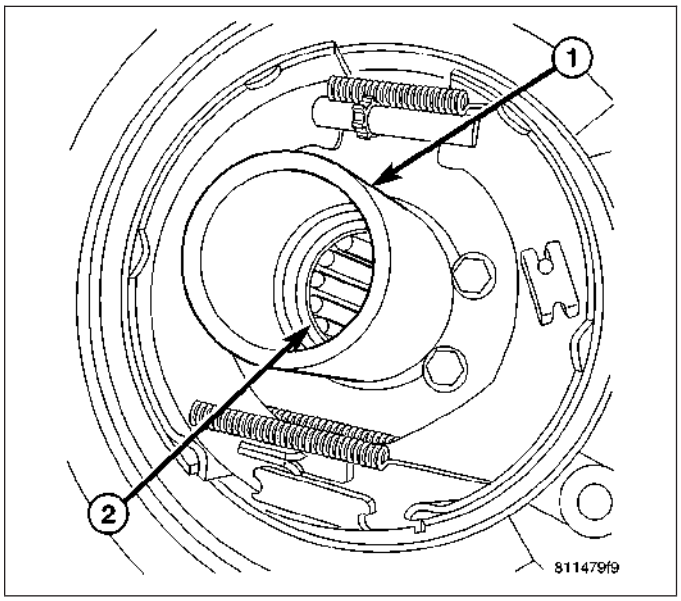
1. Remove any old sealer/burrs from axle tube.
2. Coat **new** seal lip with axle lubricant and install seal with Installer 9337 (1) and Handle C-4171 (2).
3. Install axle shaft.



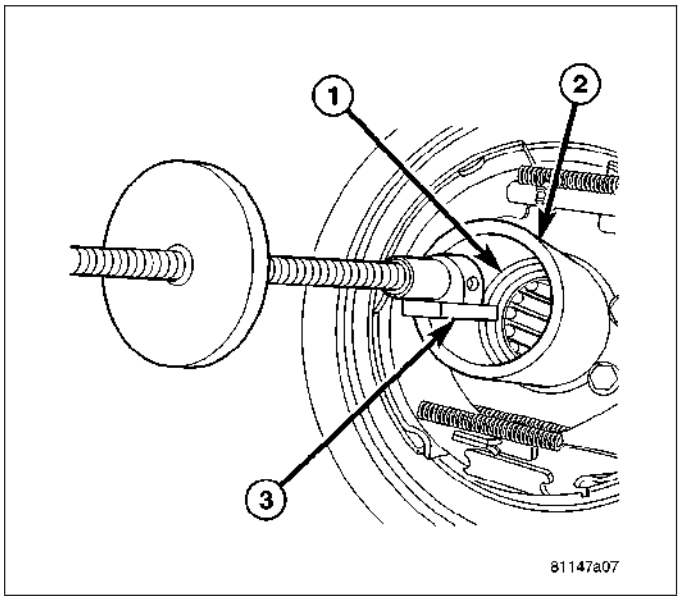
BEARING-AXLE

REMOVAL

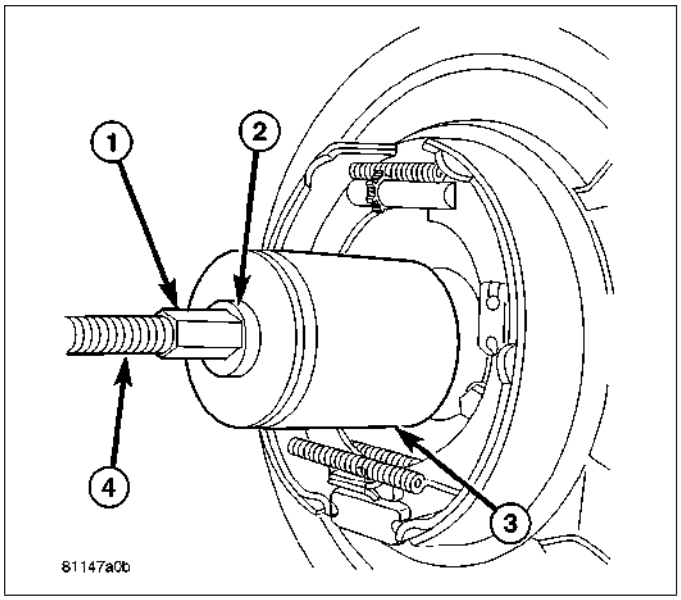
1. Remove axle shaft.
2. Remove axle seal with pry bar.
3. Position bearing Receiver 9338 (1) on axle tube.



4. Insert bearing Remover 6310 (4) with Foot 6310-9 (3) through receiver (2) and bearing (1).



5. Tighten Remove 6310 nut (1) to pull bearing into the receiver (3).

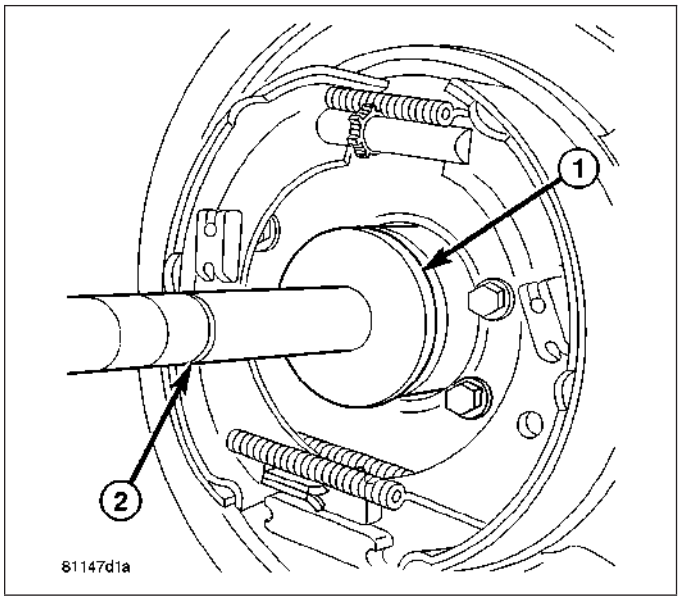


INSTALLATION

1. Remove any old sealer/burrs from axle tube.
2. Install axle shaft bearing with Installer 9337 (1) and Handle C-4171 (2). Drive bearing in until tool contacts the axle tube.

NOTE: Bearing is installed with the bearing part number against the installer.

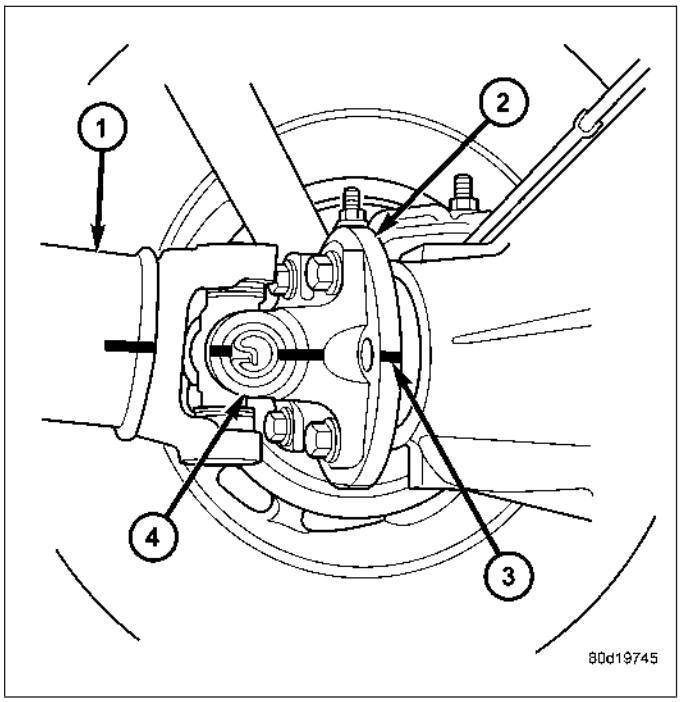
3. Coat **new** axle seal lip with axle lubricant and install with Installer 9337 and Handle C-4171.
4. Install axle shaft.



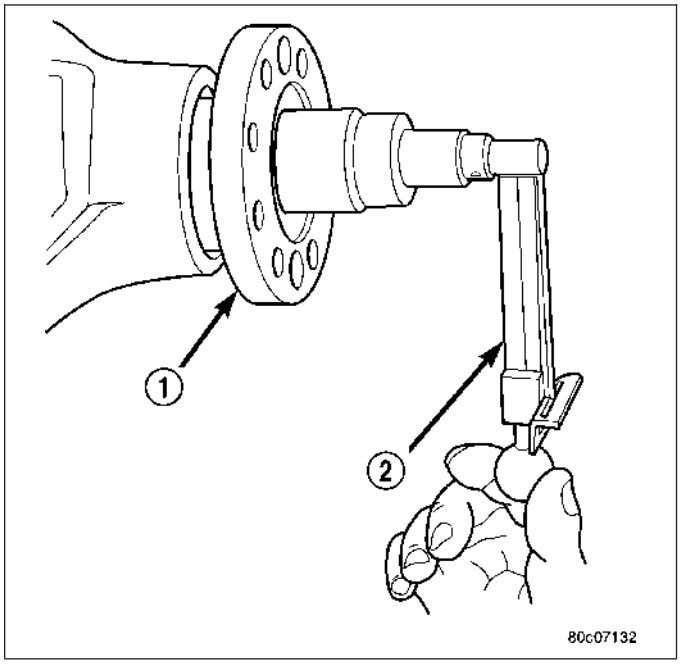
SEAL-PINION

REMOVAL

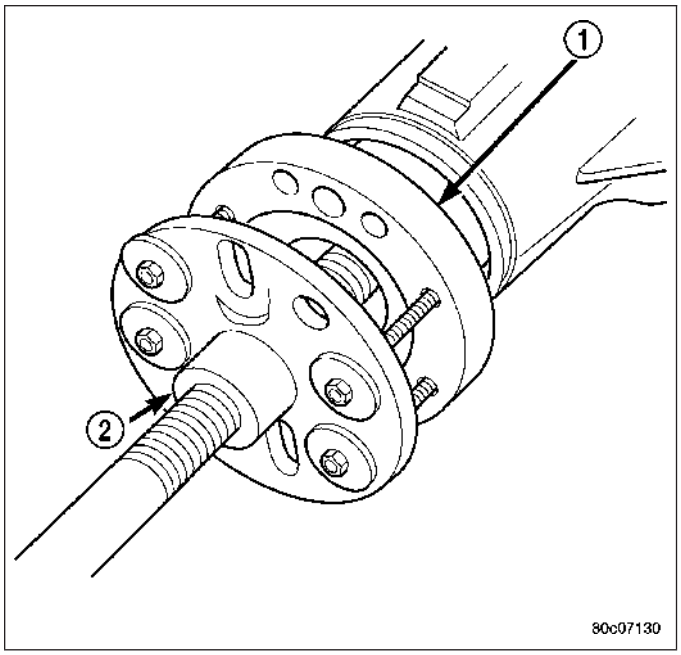
1. With vehicle in neutral, position vehicle on hoist.
2. Mark a reference line across the axle flange (3) and propeller shaft flange (4).



3. Remove propeller shaft
4. Remove brake calipers and rotors to prevent any drag.
5. Rotate flange three or four times and verify flange rotates smoothly.
6. Measure torque to rotating pinion flange (1) with a inch pound torque wrench (2). Record reading for installation reference.

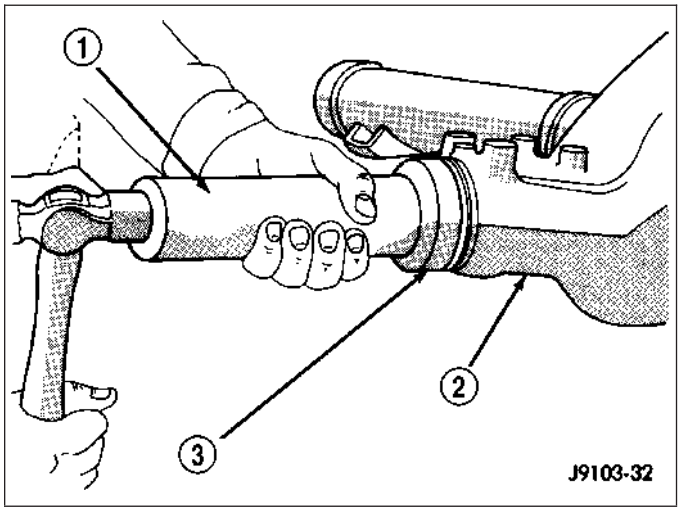


7. Install bolts into two of the threaded holes in the flange 180° apart.
8. Position Holder 6719 against the flange and install a bolt and washer into one of the remaining threaded holes. Tighten the bolts so the Holder 6719 is held to the flange.
9. Remove pinion nut and washer.
10. Remove flange (1) with Remover C-452 (2).
11. Remove pinion seal with a pry tool or slide-hammer mounted screw.

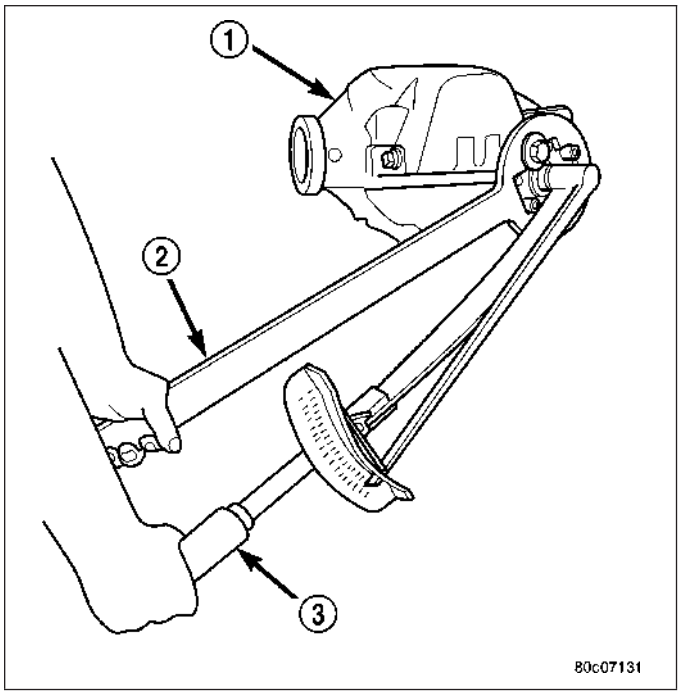


INSTALLATION

1. Apply a light coating of gear lubricant on the lip of pinion seal.
2. Install **new** pinion seal with Installer C-4076-B (3) and Handle C-4735 (1).



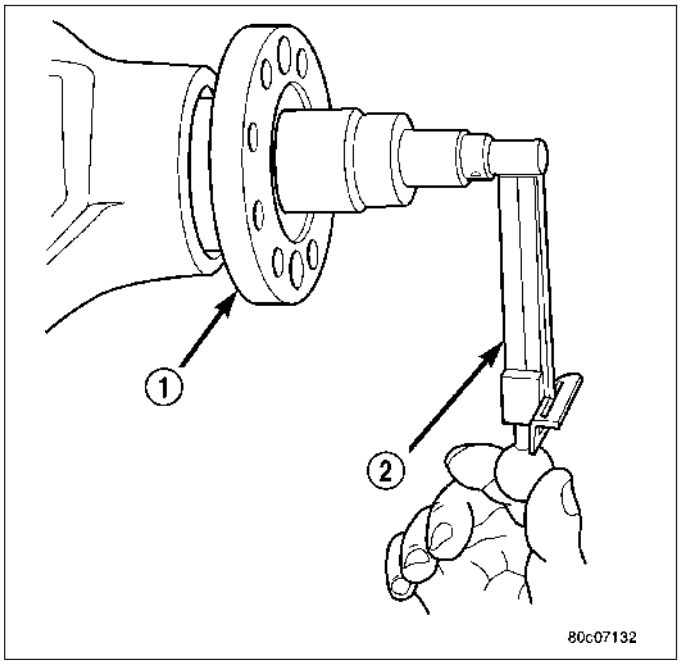
3. Install flange on the end of the shaft with the reference marks aligned.
4. Install bolts into two of the threaded holes in the flange 180° apart.
5. Position Holder 6719 against flange. Install a bolt and washer into one of the remaining threaded holes. Tighten bolts so Holder 6719 is held to the flange.
6. Install flange on pinion shaft with Installer C-3718 and Holder 6719.
7. Install pinion washer and a **new** pinion nut. The convex side of the washer must face outward.



CAUTION: Do not exceed the minimum tightening torque when installing the companion flange retaining nut at this point. Failure to follow these instructions can damage the collapsible spacer or bearings.

8. Hold flange with Holder 6719 (2) and tighten pinion nut to 285 N·m (210 ft. lbs.). Rotate pinion several revolutions to ensure bearing rollers are seated.

9. Rotate pinion flange (1) with an inch pound torque wrench (2). Rotating torque should be equal to the reading recorded during removal plus an additional 0.56 N·m (5 in. lbs.).



CAUTION: Never loosen pinion nut to decrease pinion bearing rotating torque and never exceed specified preload torque. If rotating torque is exceeded, a new collapsible spacer must be installed. Failure to follow these instructions can damage the collapsible spacer or bearings.

10. If rotating torque is low use Holder 6719, to hold flange and tighten pinion nut in 6.8 N·m (5 ft. lbs.) increments until proper rotating torque is achieved.

NOTE: The seal replacement is unacceptable if final pinion nut torque is less than 285 N·m (210 ft. lbs.).

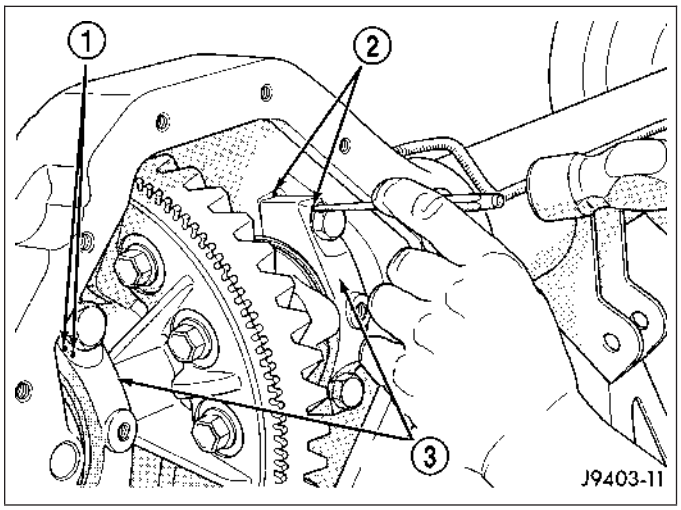
NOTE: The bearing rotating torque should be constant during a complete revolution of the pinion. If the rotating torque varies, this indicates a binding condition.

11. Install propeller shaft.
12. Install rear brake rotors components.

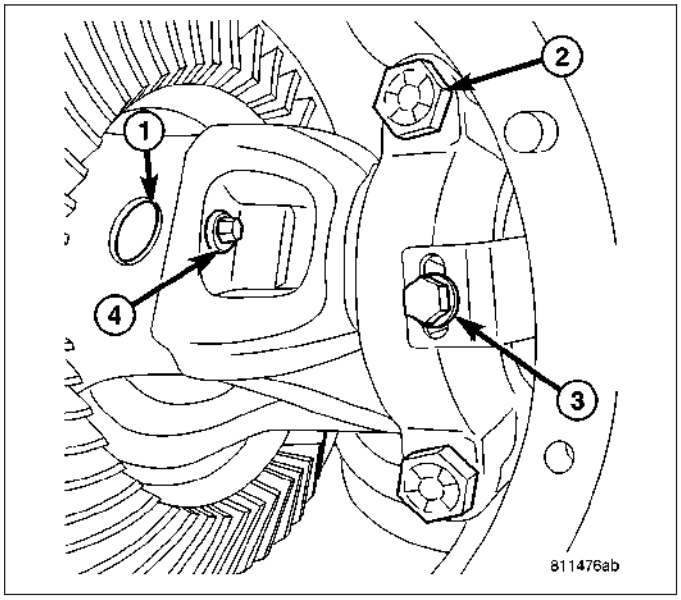
DIFFERENTIAL

REMOVAL

1. Remove differential cover.
2. Remove axle shafts.
3. Remove ABS sensor from housing.
4. Mark differential housing and bearing caps (3) for installation reference.

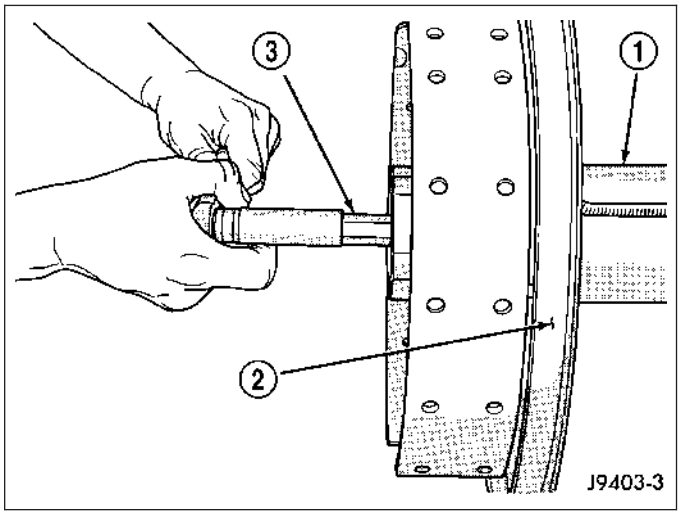


5. Remove bearing adjuster lock bolt (3) from bearing caps.



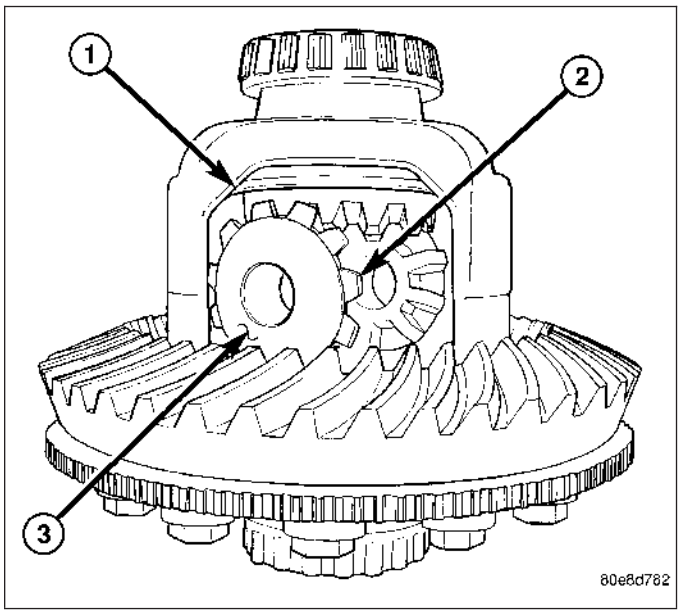
6. Loosen differential bearing cap bolts.
7. Loosen differential bearing adjusters through the axle tubes (1) with Wrench C-4164 (3).
8. Hold differential case while removing bearing caps and adjusters.
9. Remove differential case and tag differential bearing cups and adjusters to indicate location.
10. Clean housing cavity with flushing oil, light engine oil or a lint free cloth.

NOTE: Do not use steam, kerosene or gasoline to clean the housing.

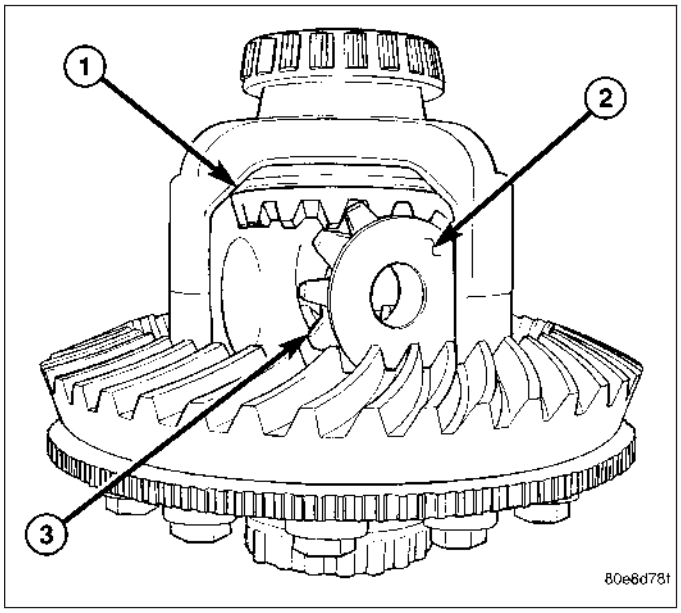


DISASSEMBLY

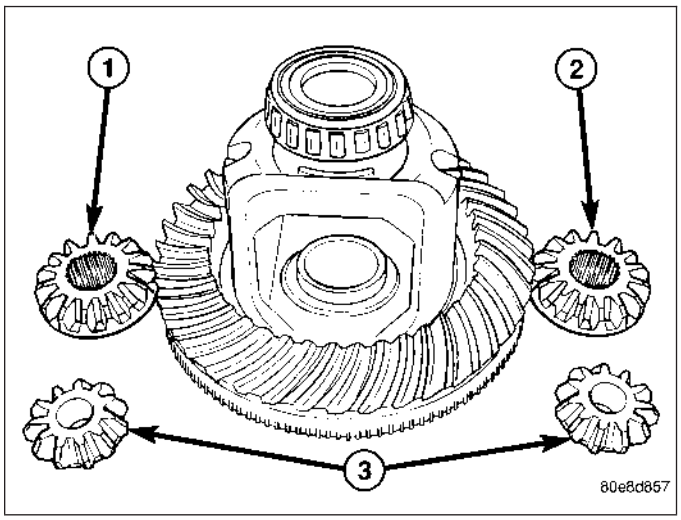
1. Rotate one pinion gear (2) with thrust washer (3) to the differential window (1). Remove gear and thrust washer.



2. Rotate remaining pinion gear (3) with thrust washer (2) to the differential window (1). Remove gear and washer.



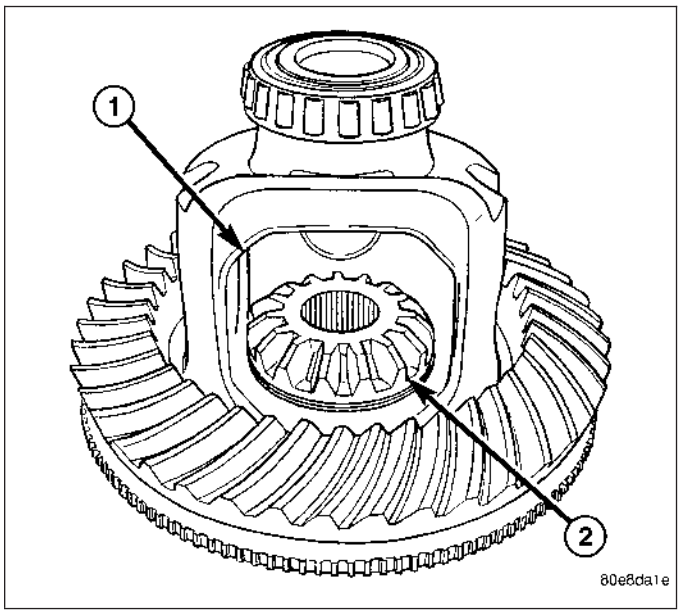
3. Remove differential side gears (1) (2) and thrust washers.



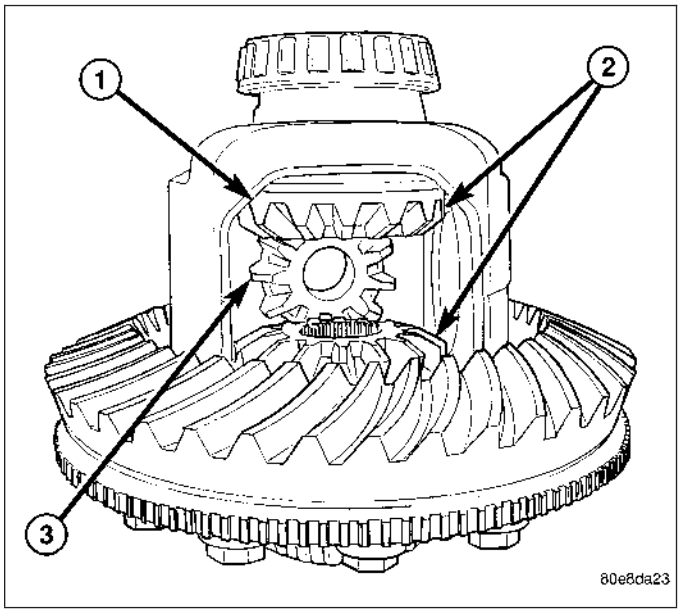
ASSEMBLY

NOTE: If same gears and thrust washers are being used, install them into their original locations.

1. Lubricate all differential components with axle lubricant.
2. Install differential side gears (2) and thrust washers.



3. Install first pinion gear (3) with thrust washer into differential window (1) and side gears (2). Rotate pinion gear into the case.
4. Install remaining pinion gear and thrust washer. Rotate gears to align hole in the pinion gears with hole in the differential case.
5. Slide pinion shaft into the case and through the pinion gears to align the gears.

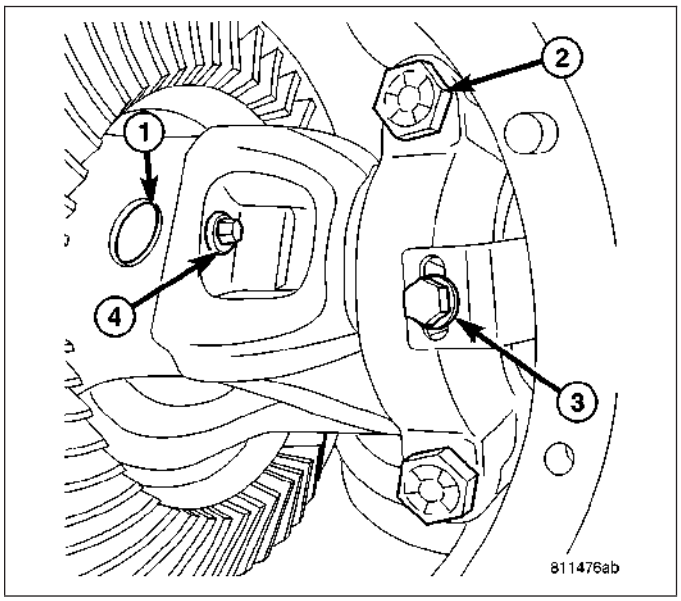


INSTALLATION

1. Apply a coat of hypoid gear lubricant to differential bearings, bearing cups and threaded adjusters.

NOTE: Grease can be used to keep the adjusters in position.

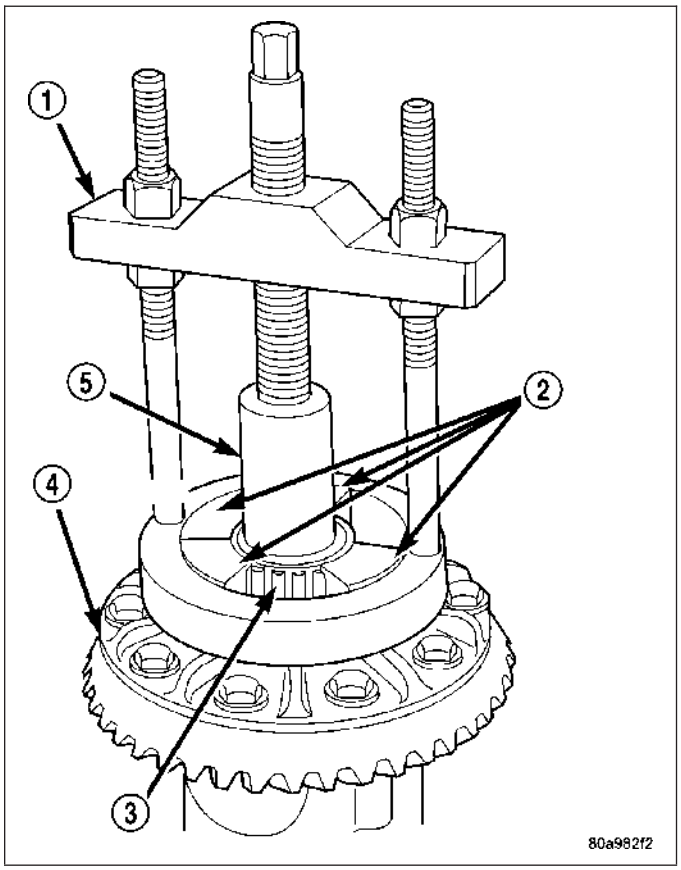
2. Install differential assembly into the housing.
3. Install differential bearing caps in their original locations.
4. Install bearing cap bolts and tighten upper bolts to 14 N·m (10 ft. lbs.). Tighten lower bolts finger-tight until the bolt head is seated.
5. Perform differential bearing preload and adjustment procedure.
6. Tighten bearing cap bolts (2) to 135 N·m (100 ft. lbs).
7. Install adjuster locks (3) on bearing caps and tighten bolts to 10 N·m (95 in. lbs.).
8. Install axle shafts.
9. Install differential cover.



BEARINGS-DIFFERENTIAL CASE

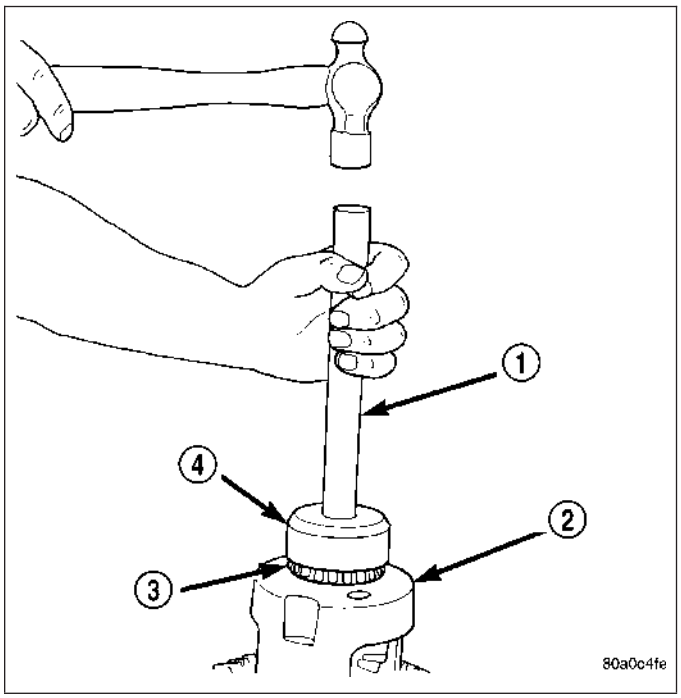
REMOVAL

1. Remove differential case.
2. Remove differential bearings with Puller C-293-PA (1) and Adapters C-293-48 (2) and Plug SP-3289 (5).



INSTALLATION

1. Install differential side bearings (3) with Installer C-4340 (4) and Handle C-4171 (1).
2. Install differential case.

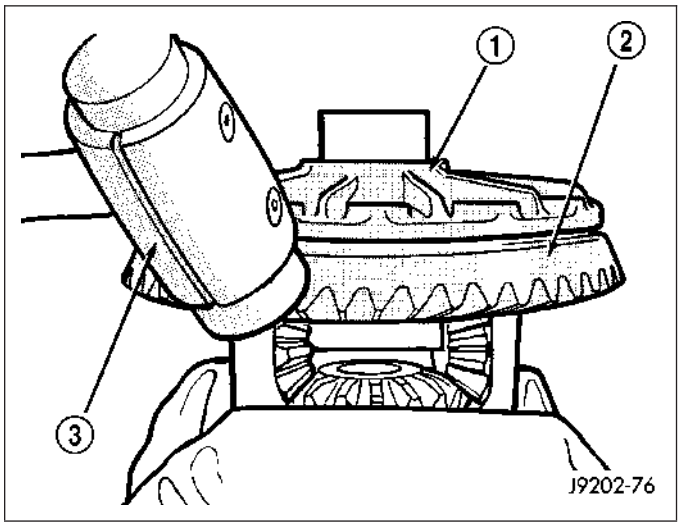


GEAR-PINION/RING/TONE RING

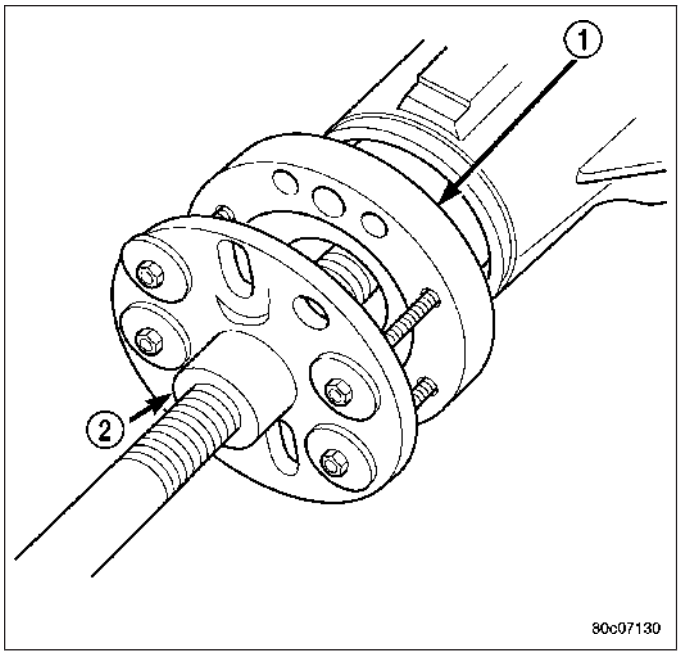
REMOVAL

NOTE: The ring gear and pinion are serviced in a matched set. Never replace one gear without replacing the matching gear.

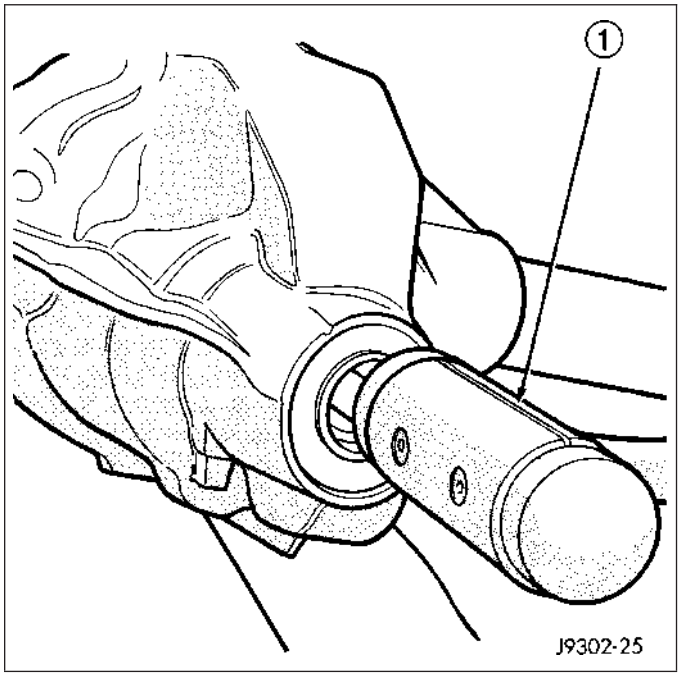
1. Remove propeller shaft.
2. Remove differential from the axle housing.
3. Place differential case in vise with soft metal jaw protectors.
4. Remove ring gear bolts and drive ring gear (2) off differential case with a soft hammer (3).



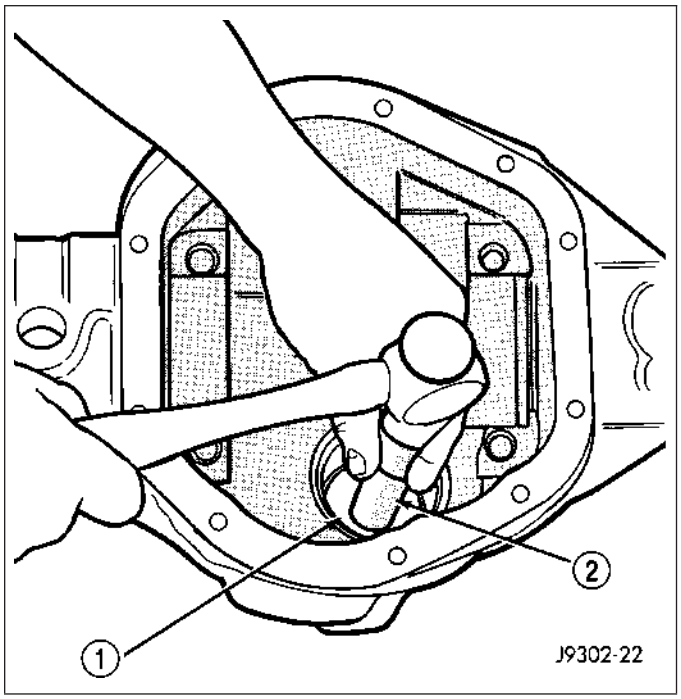
5. Install bolts into two of the threaded holes in the pinion flange 180° apart.
6. Position Holder 6719 against flange and install a bolt and washer into one of the remaining threaded holes. Tighten bolts so the Holder 6719 is held to the flange.
7. Hold flange with Holder 6719 and remove flange nut and washer.
8. Remove flange (1) with Remover C-452 (2).



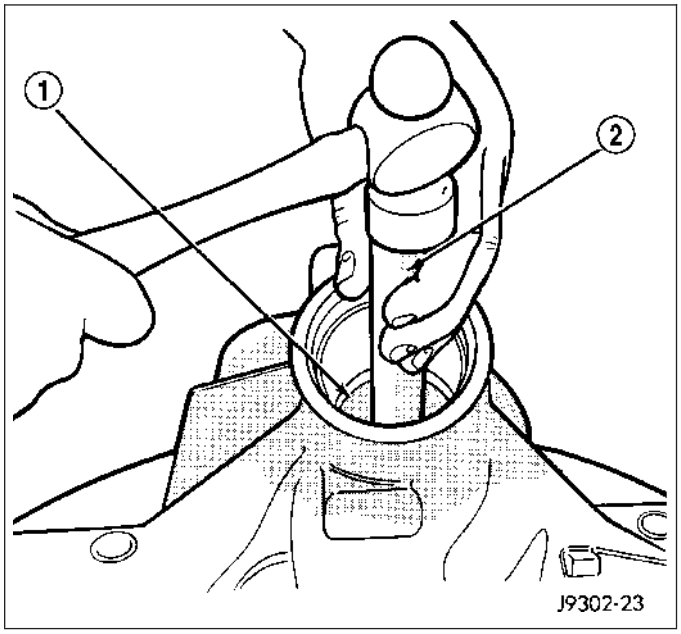
9. Remove pinion from housing with a soft hammer (1).



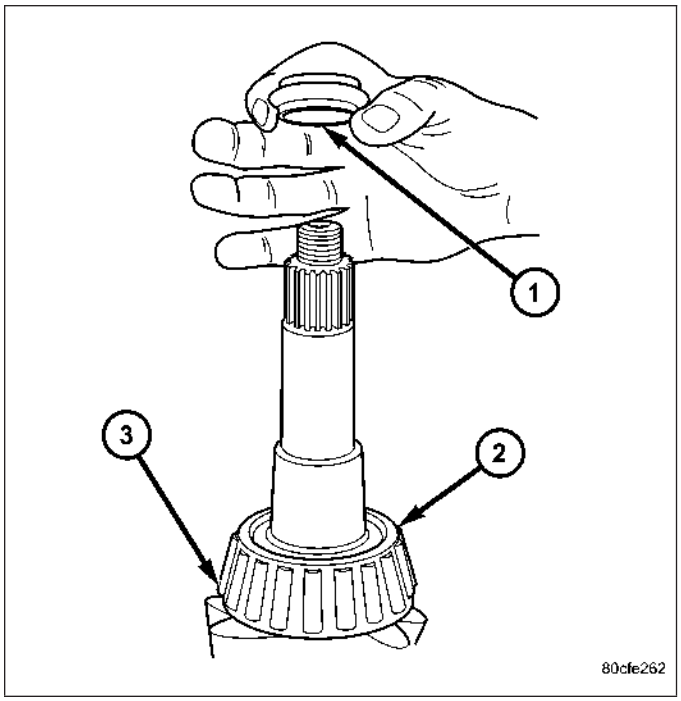
10. Remove pinion seal with a pry tool or slide-hammer mounted screw.
11. Remove oil slinger if equipped and front pinion bearing.
12. Remove front pinion bearing cup with Remover C-4345 (1) and Handle C-4171 (2).



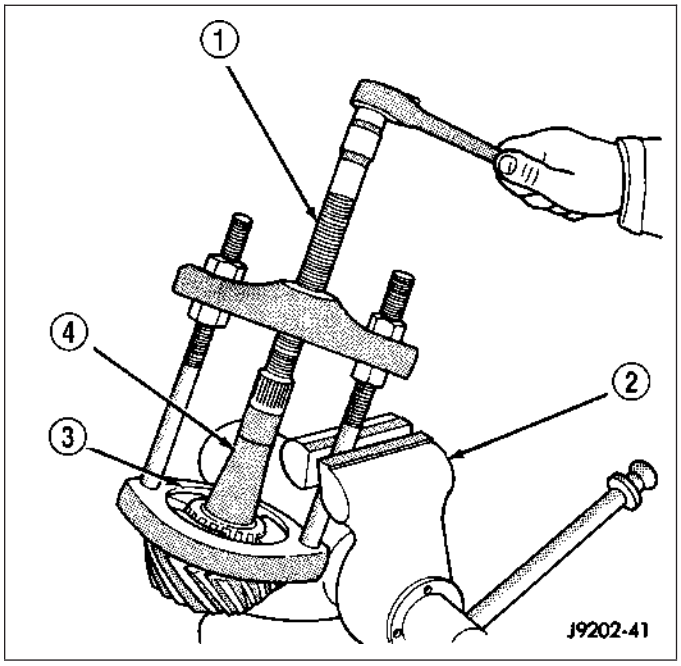
13. Remove rear bearing cup from housing with Remover C-4307 (1) and Handle C-4171 (2).



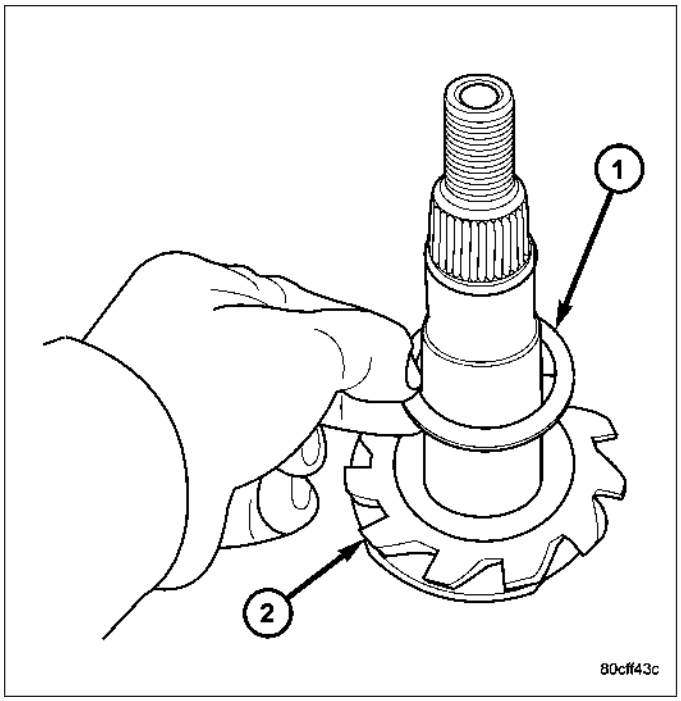
14. Remove collapsible preload spacer (1) from pinion gear.



15. Remove rear bearing from pinion with Puller/ Press C-293-PA (1) and Adapters C-293-47 (3).



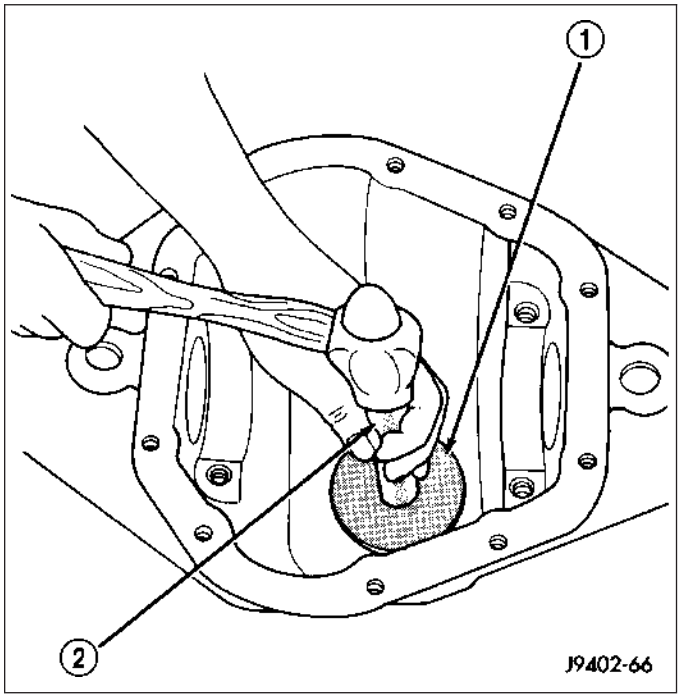
16. Remove depth shims (1) from pinion gear (2) and record shim thickness.



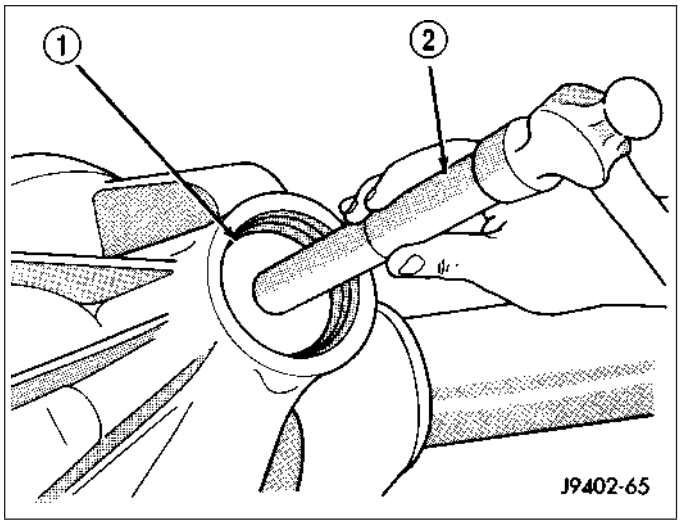
INSTALLATION

NOTE: Ring and pinion gears are a matched set. Do not replace one gear without replacing the other matching gear. If ring and pinion gears or bearings are replaced, Refer to Adjustments for Pinion Gear Depth Setting.

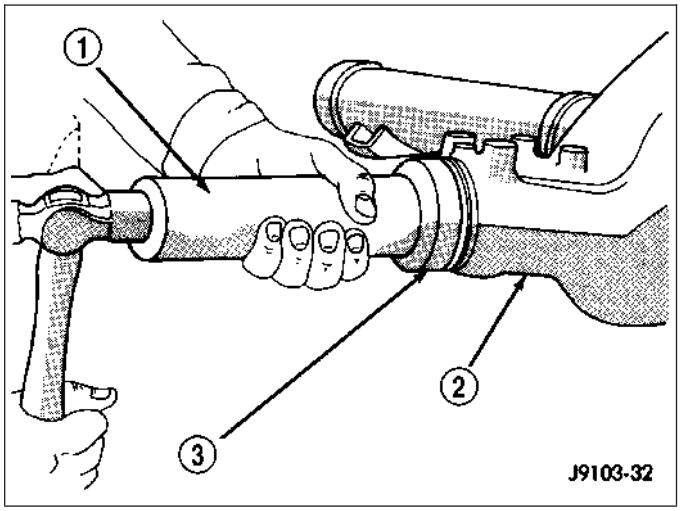
1. Apply Mopar Door Ease or stick lubricant to outside surface of pinion bearing cups.
2. Install rear pinion bearing cup with Installer C-4308 (1) and Handle C-4171 (20).



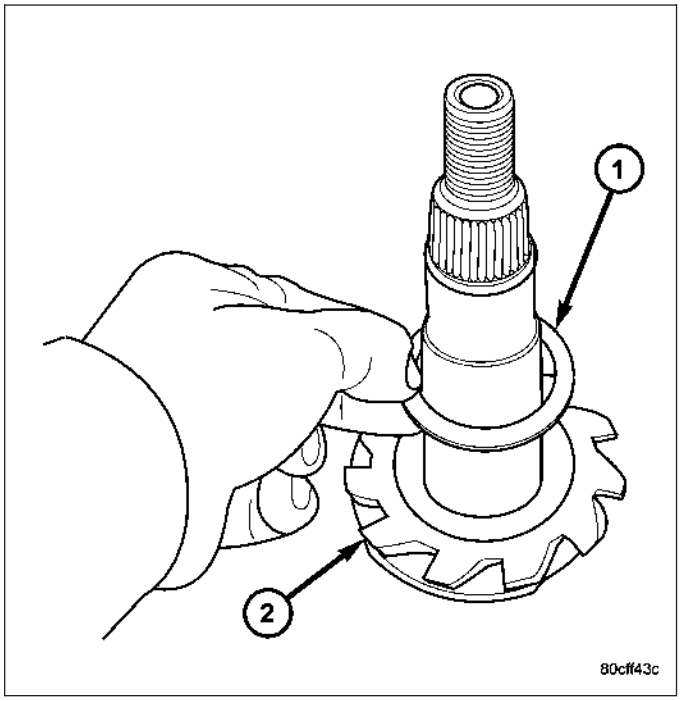
3. Install front pinion bearing cup with Installer D-130 (1) and Handle C-4171 (2).



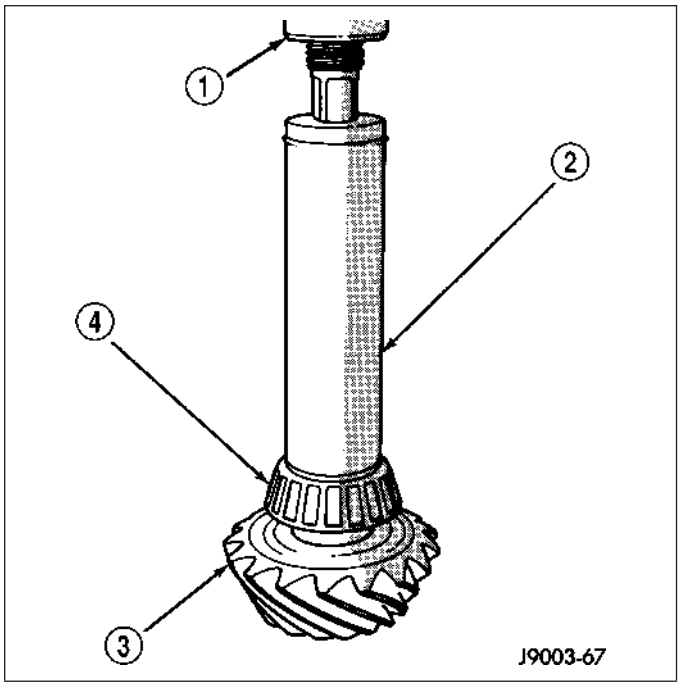
4. Install front pinion bearing and oil slinger if equipped.
5. Apply a light coating of gear lubricant on the lip of pinion seal. Install seal with Installer C-4076-B (3) and Handle C-4735 (1).



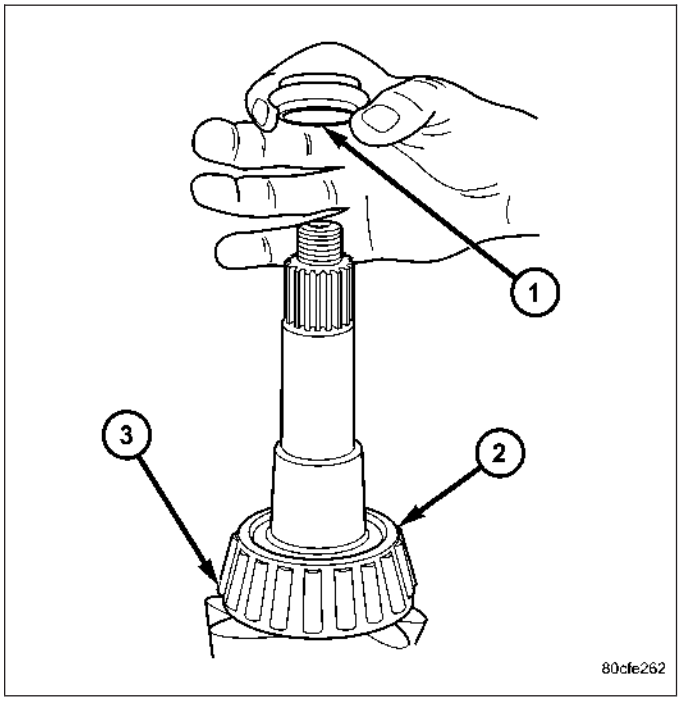
6. Install proper thickness depth shim (1) on pinion gear (2).



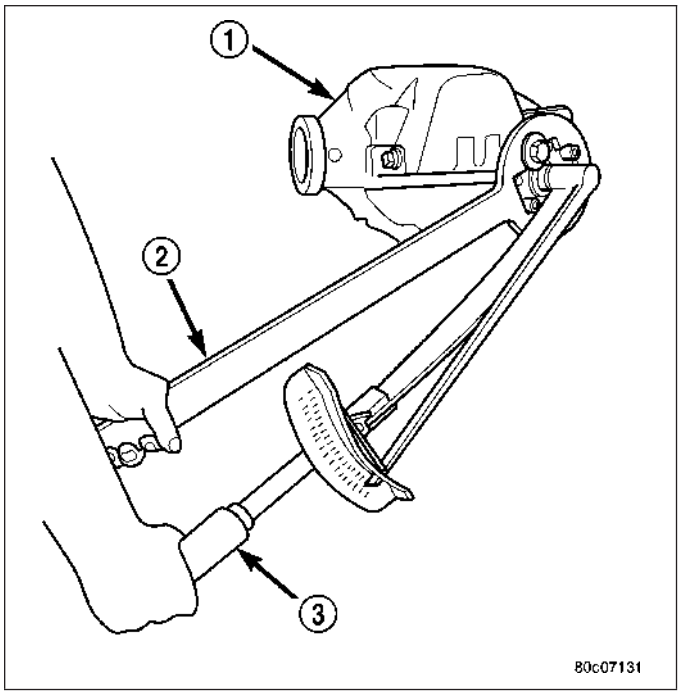
7. Install rear bearing (4) and slinger if equipped, on pinion gear (3) with Installer 6448 (2) and a press (1).



8. Install **new** collapsible spacer (1) on pinion gear and install pinion in housing.

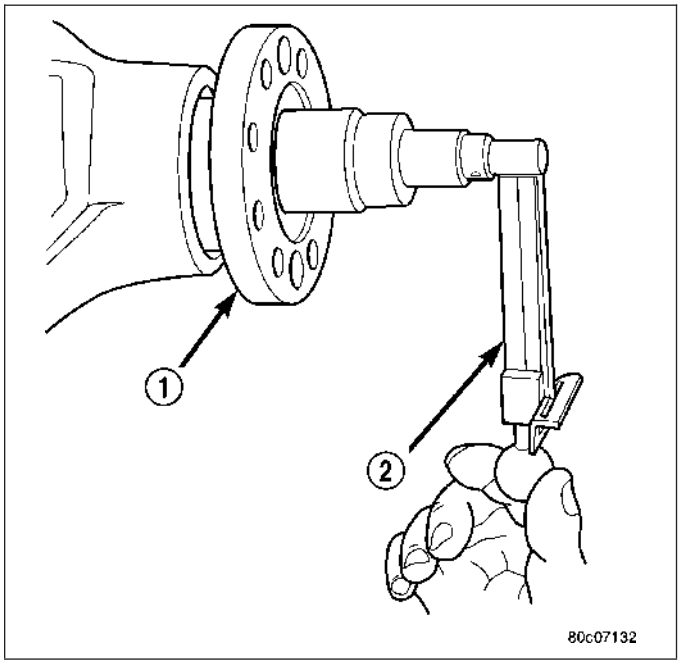


9. Install front pinion bearing on pinion shaft.
10. Install new pinion seal with Installer C-4076-B and Handle C-4735-1.
11. Install pinion flange with Installer C-3718.
12. Install bolts into two of the threaded holes in the flange 180° apart.
13. Position Holder 6719 against the flange and install a bolt and washer into one of the remaining threaded holes. Tighten the bolts so the Holder 6719 is held to the flange.
14. Install flange washer and a new nut on pinion and tighten pinion nut until there is zero end-play.
15. With a torque wrench (3) tighten the pinion nut to 285 N·m (210 ft. lbs.).



CAUTION: Never loosen pinion nut to decrease pinion bearing rotating torque and never exceed specified preload torque. If preload torque or rotating torque is exceeded a new collapsible spacer must be installed. Failure to follow these instructions will result in damage.

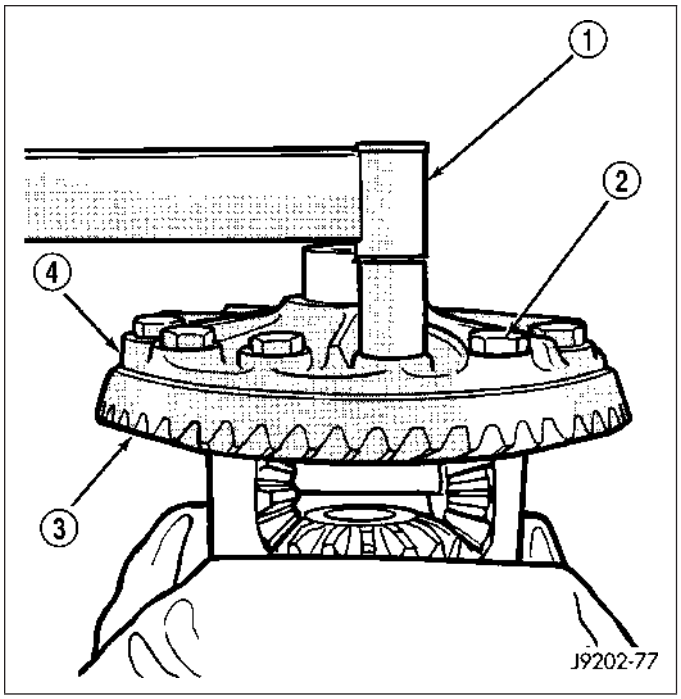
16. Slowly tighten the nut in 6.8 N·m (5 ft. lbs.) increments until the desired rotating torque is achieved. Measure rotating torque frequently with an inch pound torque wrench (2) to avoid over crushing the collapsible spacer.
17. Check pinion rotating torque with an inch pound torque wrench. The pinion rotating torque should be:
    - Original Bearings: 1 to 3 N·m (10 to 20 in. lbs.).
    - New Bearings: 2 to 5 N·m (15 to 35 in. lbs.).



18. Position exciter ring on differential case. With a brass drift slowly and evenly tap the exciter ring into position.
19. Position ring gear on the differential case and start two ring gear bolts. This will provide case-to-ring gear bolt hole alignment.
20. Invert the differential case in the vise.
21. Install **new** ring gear bolts (2) and alternately tighten to 102 N·m (75 ft. lbs.).

CAUTION: Never reuse the bolts that held the ring gear to the differential case. Failure to follow these instructions will result in fracture bolts can causing extensive damage.

22. Install differential in housing and verify gear mesh, backlash and contact pattern.
23. Install differential cover.



REAR AXLE - 9 1/4

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REAR AXLE - 9 1/4

DIAGNOSIS AND TESTING

REAR AXLE - 9 1/4

GEAR NOISE

Axle gear noise can be caused by insufficient lubricant, incorrect backlash, incorrect pinion depth, tooth contact, worn/damaged gears, or the carrier housing not having the proper offset and squareness.

Gear noise usually happens at a specific speed range. The noise can also occur during a specific type of driving condition. These conditions are acceleration, deceleration, coast, or constant load.

When road testing, first warm-up the axle fluid by driving the vehicle at least 5 miles and then accelerate the vehicle to the speed range where the noise is the greatest. Shift out-of-gear and coast through the peak-noise range. If the noise stops or changes greatly check for:

- Insufficient lubricant.
- Incorrect ring gear backlash.
- Gear damage.

Differential side and pinions gears, usually do not cause noise during straight-ahead driving, when the gears are unloaded. The side gears are loaded during turns. A worn pinion mate shaft can also cause a snapping or a knocking noise.

BEARING NOISE

Bearing noise can be either a whining or a growling sound.

Pinion bearings have a constant high pitch noise, because it rotates at a faster rate. This noise changes with vehicle speed. If noise is heard under a load, the rear pinion bearing is the source. If noise is heard during a coast, the front pinion bearing is the source.

Differential bearings usually produce a low pitch noise. The differential bearing noise is constant and varies only with vehicle speed.

Axle shaft bearing noise generally changes when the bearings are loaded. Turn vehicle sharply to the left and the right during a road test. This will load and unload the bearings and change the noise level. If axle bearing damage is slight, the noise is usually not noticeable at speeds above 30 m.p.h.

LOW SPEED KNOCK

Low speed knock is generally caused by:

- Worn U-joints or C/V joints.
- Worn side-gear thrust washers
- Worn pinion shaft bore.

VIBRATION

Vibration at the rear of the vehicle is usually caused by:

- Damaged drive shaft.
- Missing drive shaft balance weight(s).
- Worn or out of balance wheels.
- Loose wheel lug nuts.
- Worn U-joints or C/V joints.
- Loose/broken springs.
- Damaged axle shaft bearing(s).
- Loose pinion gear nut.
- Excessive pinion yoke run out.
- Bent axle shaft(s).

Check for loose or damaged front-end components or engine/transmission mounts. These components can contribute to what appears to be an axle vibration. Also look at engine accessories, brackets and drive belts.

NOTE: All driveline components should be examined before starting any repair.

DRIVELINE SNAP

A snap or clunk noise when the vehicle is shifted into gear or the clutch engaged can be caused by:

- High engine idle speed.
- Transmission shift operation.
- Loose engine/transmission/transfer case mounts.
- Worn U-joints or C/V joints.
- Loose spring mounts.
- Loose pinion gear nut and yoke.
- Excessive ring gear backlash.
- Excessive side gear to case clearance.

To determined the source of a snap/clunk noise, raise vehicle on a hoist with the wheels free to rotate. Have a helper shift the transmission into gear and listen for the noise.

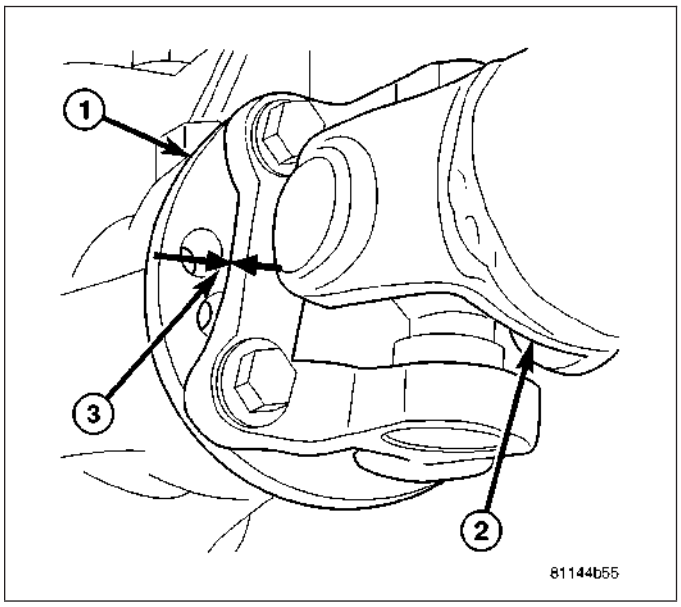
DIAGNOSTIC CHART

Condition	Possible Causes	Correction
Wheel Noise	1. Wheel loose.	1. Tighten loose nuts.
	2. Faulty, brinelled wheel bearing.	2. Replace bearing.
Axle Shaft Noise	1. Misaligned axle tube.	1. Inspect axle tube alignment. Correct as necessary.
	2. Bent or sprung axle shaft.	2. Inspect and correct as necessary.
Axle Shaft Broke	1. Misaligned axle tube.	1. Replace the broken shaft after correcting tube mis-alignment.
	2 Vehicle overloaded.	2. Replace broken shaft and avoid excessive weight on vehicle.
	3. Erratic clutch operation.	3. Replace broken shaft and avoid or correct erratic clutch operation.
	4. Grabbing clutch.	4. Replace broken shaft and inspect and repair clutch as necessary.
Differential Cracked	1. Improper adjustment of the differential bearings.	1. Replace case and inspect gears and bearings for further damage. Set differential bearing pre-load properly.
	2. Excessive ring gear backlash.	2. Replace case and inspect gears and bearings for further damage. Set ring gear backlash properly.
	3. Vehicle overloaded.	3. Replace case and inspect gears and bearings for further damage. Avoid excessive vehicle weight.
	4. Erratic clutch operation.	4. Replace case and inspect gears and bearings for further damage. Avoid erratic use of clutch.
Differential Gears Scored	1. Insufficient lubrication.	1. Replace scored gears. Fill differential with the correct fluid type and quantity.
	2. Improper grade of lubricant.	2. Replace scored gears. Fill differential with the correct fluid type and quantity.
	3. Excessive spinning of one wheel/tire.	3. Replace scored gears. Inspect all gears, pinion bores, and shaft for damage. Service as necessary.
Loss Of Lubricant	1. Lubricant level too high.	1. Drain lubricant to the correct level.
	2. Worn axle shaft seals.	2. Replace seals.
	3. Cracked differential housing.	3. Repair as necessary.
	4. Worn pinion seal.	4. Replace seal.
	5. Worn/scored yoke.	5. Replace yoke and seal.
	6. Axle cover not properly sealed.	6. Remove, clean, and re-seal cover.

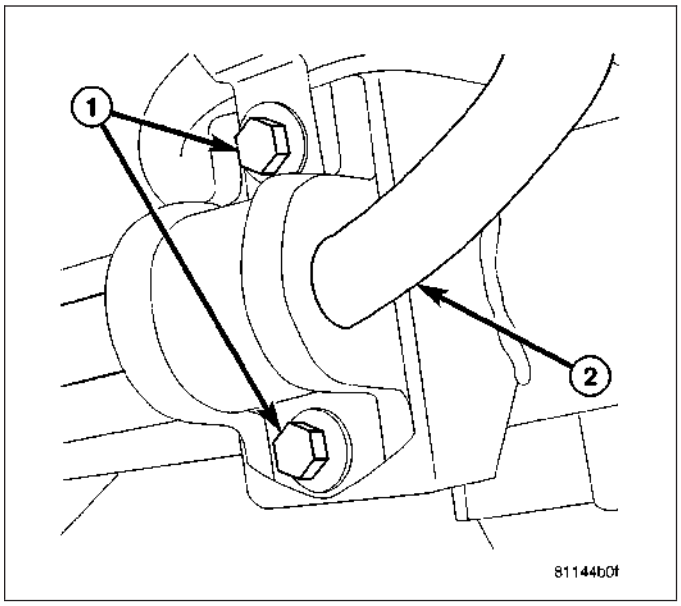
Condition	Possible Causes	Correction
Axle Overheating	1. Lubricant level low.	1. Fill differential to correct level.
	2. Improper grade of lubricant.	2. Fill differential with the correct fluid type and quantity.
	3. Bearing pre-loads too high.	3. Re-adjust bearing pre-loads.
	4. Insufficient ring gear backlash.	4. Re-adjust ring gear backlash.
Gear Teeth Broke	1. Overloading.	1. Replace gears. Examine other gears and bearings for possible damage.
	2. Erratic clutch operation.	2. Replace gears and examine the remaining parts for damage. Avoid erratic clutch operation.
	3. Ice-spotted pavement.	3. Replace gears and examine remaining parts for damage.
	4. Improper adjustments.	4. Replace gears and examine remaining parts for damage. Ensure ring gear backlash is correct.
Axle Noise	1. Insufficient lubricant.	1. Fill differential with the correct fluid type and quantity.
	2. Improper ring gear and pinion adjustment.	2. Check ring gear and pinion contact pattern. Adjust backlash or pinion depth.
	3. Unmatched ring gear and pinion.	3. Replace gears with a matched ring gear and pinion.
	4. Worn teeth on ring gear and/or pinion.	4. Replace ring gear and pinion.
	5. Loose pinion bearings.	5. Adjust pinion bearing pre-load.
	6. Loose differential bearings.	6. Adjust differential bearing pre-load.
	7. Mis-aligned or sprung ring gear.	7. Measure ring gear run-out. Replace components as necessary.
	8. Loose differential bearing cap bolts.	8. Inspect differential components and replace as necessary. Ensure that the bearing caps are torqued tot he proper specification.
	9. Housing not machined properly.	9. Replace housing.

REMOVAL

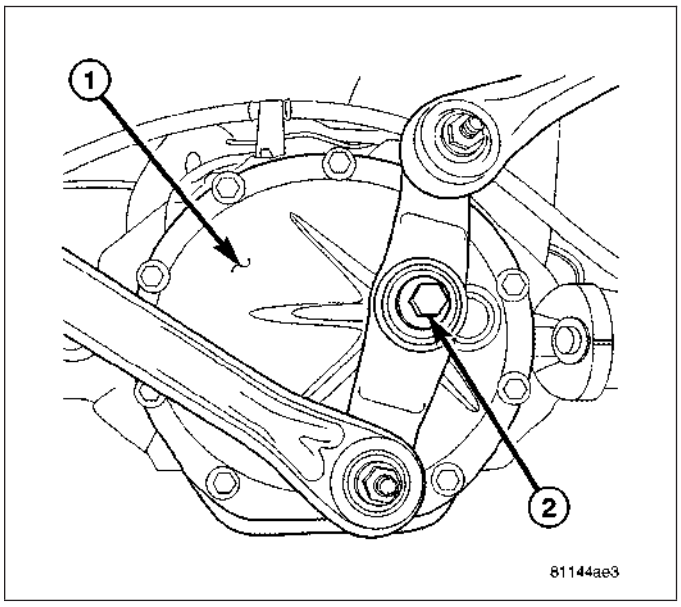
1. With vehicle in neutral, position it on a hoist.
2. Position a lift under axle and secure lift to axle.
3. Remove brake components from the axle.
4. Remove ABS wheel speed sensors.
5. Remove vent hose from the axle shaft tube.
6. Mark a reference line (3) across the propeller shaft (2) and pinion flange (1) for installation alignment.



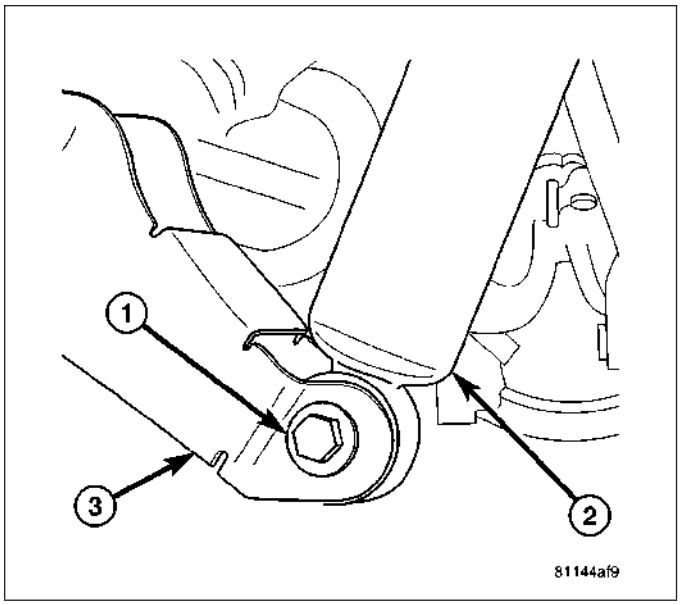
7. Remove propeller shaft.
8. Remove stabilizer bar (2) clamps bolts (1) from the axle.



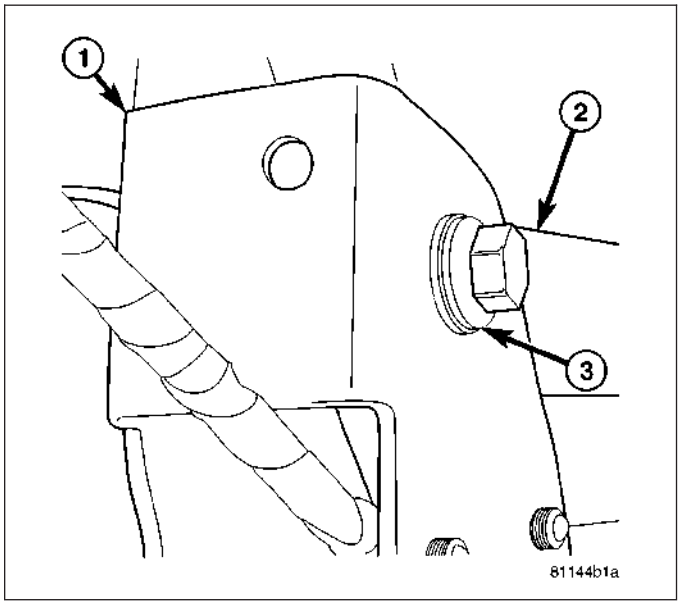
9. Remove watts link bell crank bolt (2) from differential cover (1).



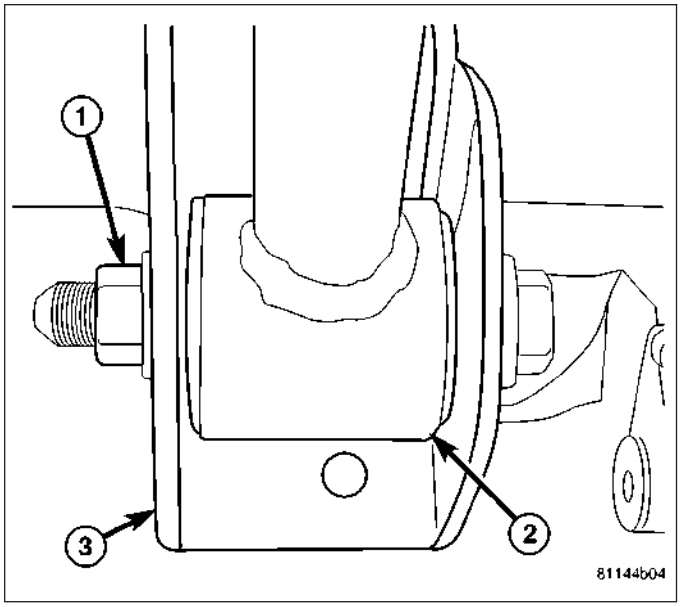
10. Remove shock absorbers (2) from axle bracket (3).



11. Remove upper control arms (2) from axle brackets (1).



12. Lower axle and remove coil springs and spring isolators.
13. Remove lower control arms (2) from axle brackets (3).
14. Lower axle and remove from vehicle.

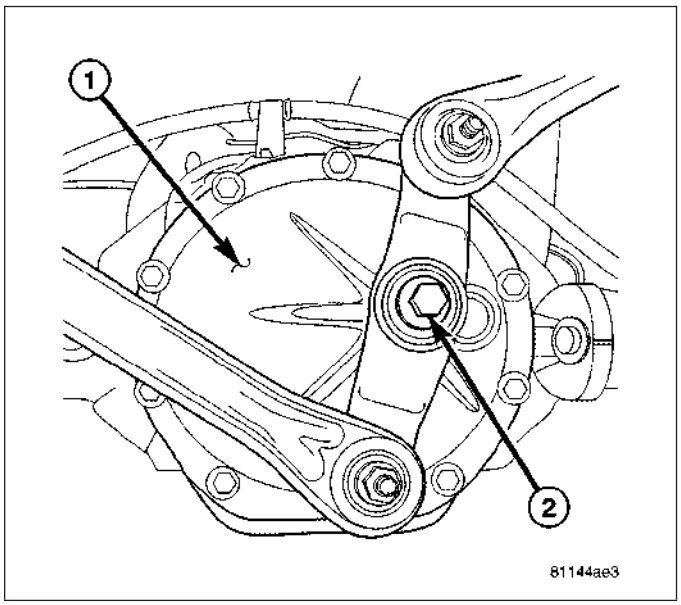


INSTALLATION

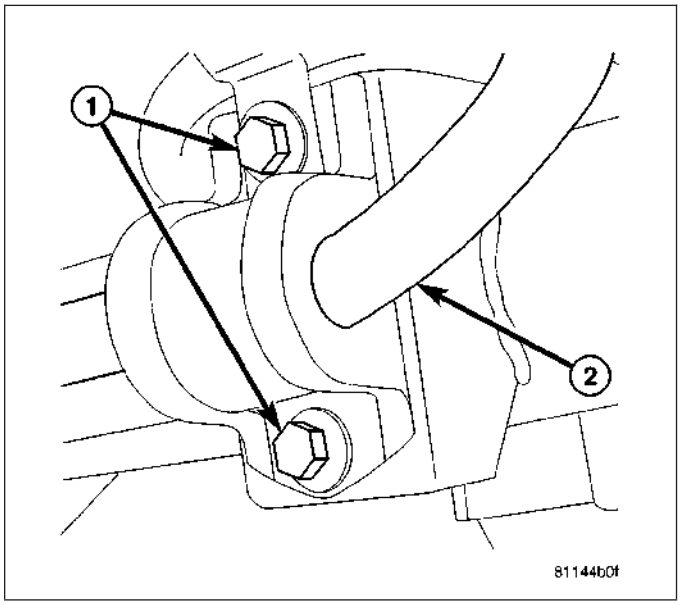
1. Raise axle and align lower control arms. Install control arm bolts loose at this time.
2. Install coil springs.
3. Raise axle and align upper control arms. Install control arm bolts loose at this time.

NOTE: Bell crank bolt has a Loctite® patch, a new bolt should be used. If bolt is not available, clean bolt and apply Loctite® 242 to the threads.

4. Install watts link bell crank bolt (2) and tighten to 217 N·m (160 ft. lbs.).



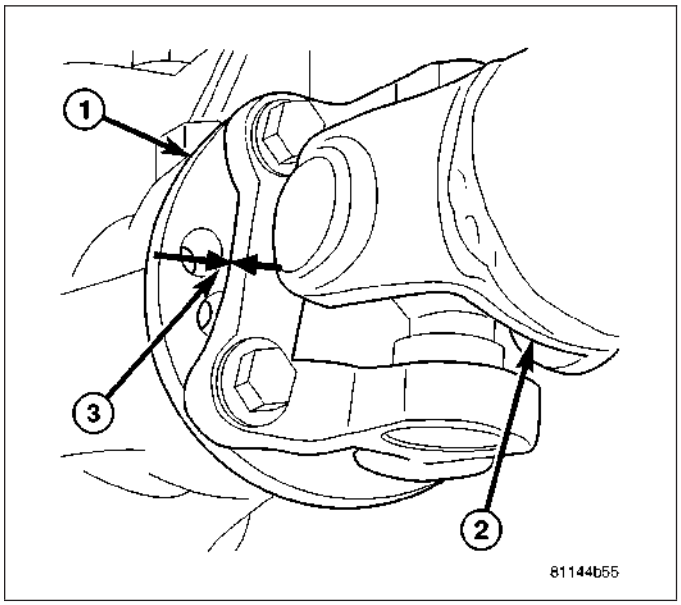
5. Install shock absorbers and tighten nuts to 102 N·m (75 ft. lbs.).
6. Install parking brake and brake components.
7. Install axle vent hose.
8. Install stabilizer bar (2) and center it with equal spacing on both sides. Tighten bolts to 61 N·m (45 ft. lbs.).



9. Install propeller shaft (2) with reference marks (3) aligned.
10. Install **new** companion flange bolts and tighten to 108 N·m (80 ft. lbs.).

NOTE: Companion flange bolts have a Loctite® patch, new bolts should be used. If bolts are not available, clean bolts and apply Loctite® 242 to the threads.

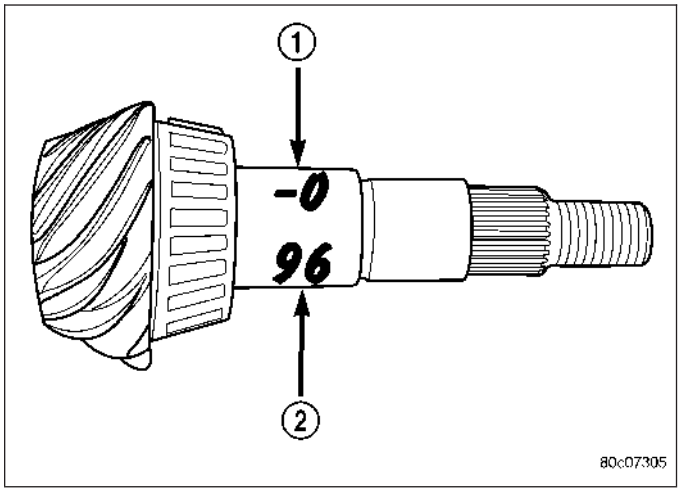
11. With vehicle on the ground, tighten upper control arm bolts to 170 N·m (125 ft. lbs.). Tighten lower control arm nuts to 230 N·m (170 ft. lbs.).



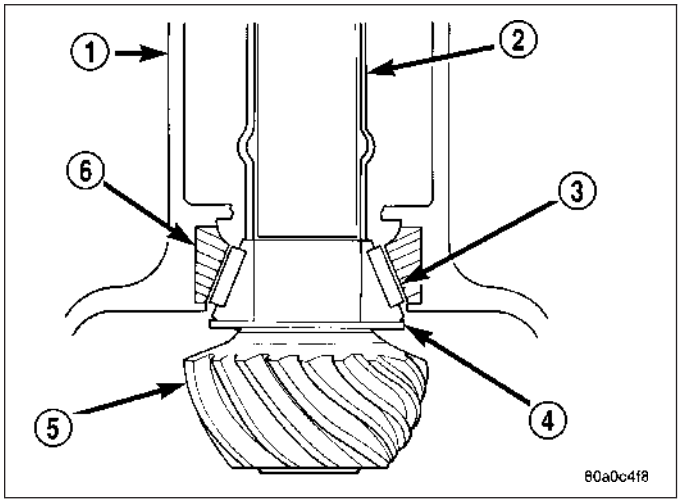
ADJUSTMENTS

REAR AXLE - 9 1/4

Ring gear and pinion are supplied as matched sets. Identifying numbers for the ring gear and pinion are painted onto the pinion gear shaft and the side of the ring gear. A plus + number, minus – number or zero 0 along with the gear set sequence number 01 to 99 is on each gear. This first number (1) is the amount in thousandths of an inch the depth varies from the standard depth setting of a pinion marked with a zero 0. The next two numbers (2) are the sequence number of the gear set. The standard depth provides the best teeth contact pattern.



Compensation for pinion depth variance is achieved with select shims (4) located behind the rear pinion bearing (3).



PINION GEAR DEPTH VARIANCE

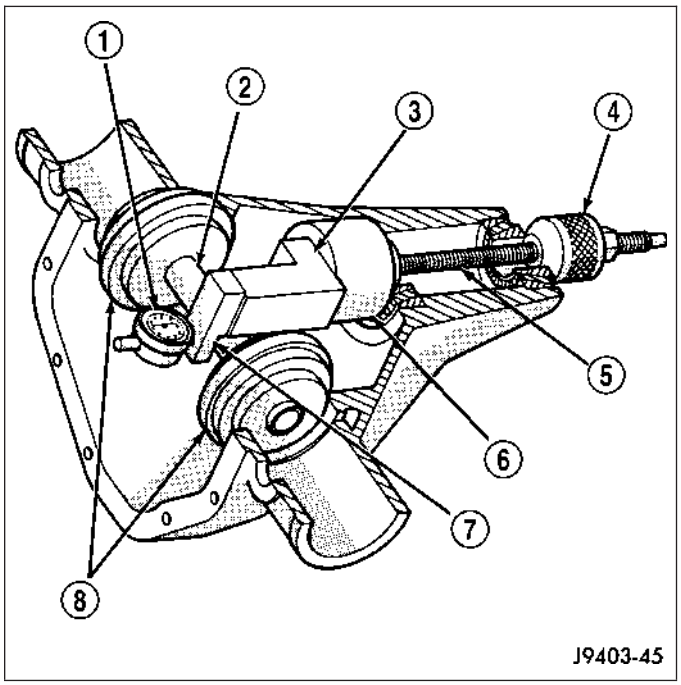
Original Pinion Gear Depth Variance	Replacement Pinion Gear Depth Variance								
	−4	−3	−2	−1	0	+1	+2	+3	+4
+4	+0.008	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0
+3	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001
+2	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002
+1	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003
0	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004
−1	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005
−2	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006
−3	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006	−0.007
−4	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006	−0.007	−0.008

If installing a new gear, note the depth variance number of the original and replacement pinion. Add or subtract this number from the original depth shim/oil slinger to compensate for the difference in the depth variances. The numbers represent thousands of an inch deviation from the standard. If the number is negative, add that value to the required thickness of the depth shims. If the number is positive, subtract that value from the thickness of the depth shim.

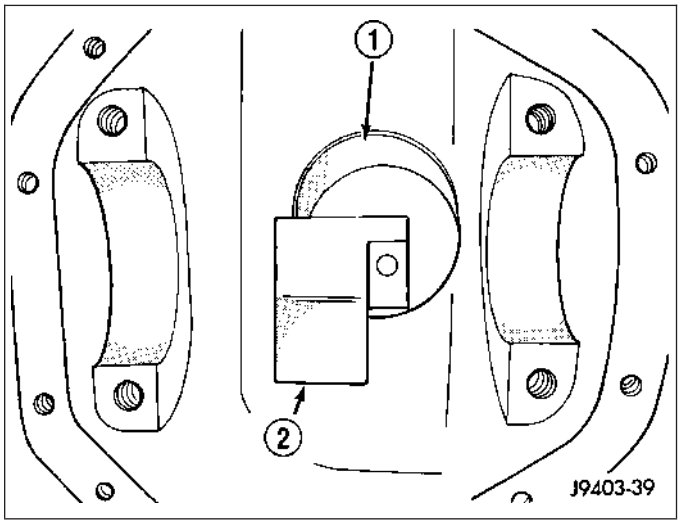
Pinion Gear Depth Variance Chart: Note where Old and New Pinion Marking columns intersect. Intersecting figure represents plus or minus the amount needed.

PINION DEPTH MEASUREMENT

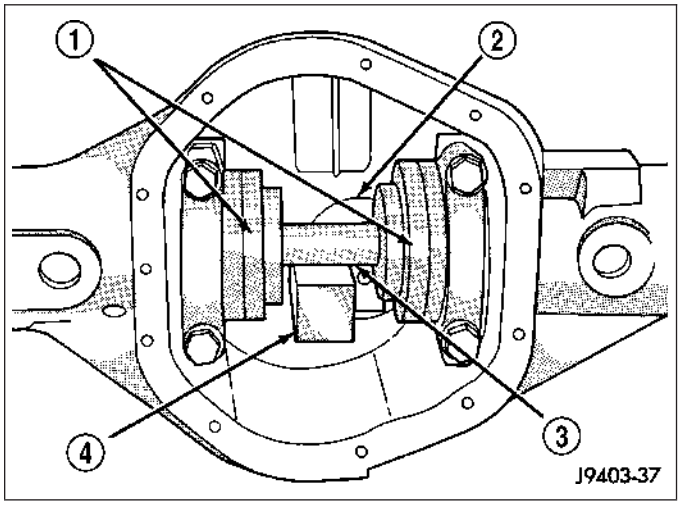
Measurements are taken with pinion bearing cups and pinion bearings installed in the housing. Take measurements with Pinion Gauge Set and Dial Indicator C-3339 (1).



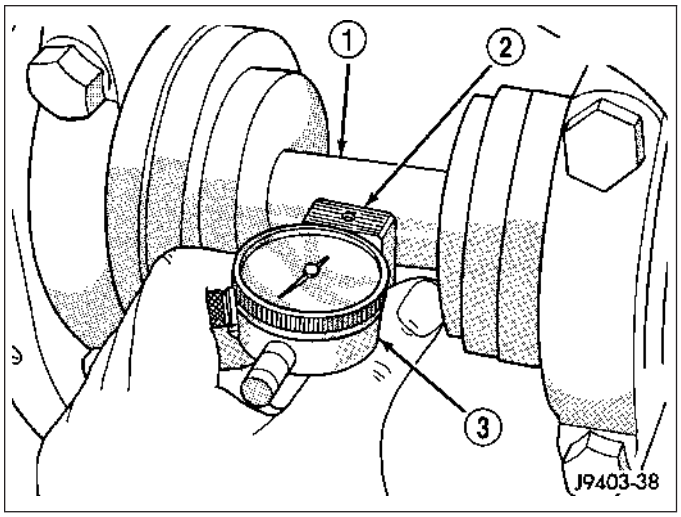
1. Assemble Pinion Height Block 6739 (1) Pinion Block 8542 (1) and rear pinion bearing onto Screw 6741.



2. Insert assembled height gauge components, rear bearing, and screw into the housing through pinion bearing cups.
3. Install front pinion bearing and Cone-Nut 6740 on screw. Tighten cone-nut on screw until Torque To Rotate screw is 1.7 N·m (15 in. Lbs.).
4. Place Arbor Disc 8541 (1) on Arbor D-115-3 (3) in position in the housing side bearing cradles. Install differential bearing caps on arbor discs and tighten cap bolts to 41 N·m (30 ft. lbs.).



NOTE: Arbor Discs 8541 has different step diameters to fit other axles. Choose proper step for axle being serviced.

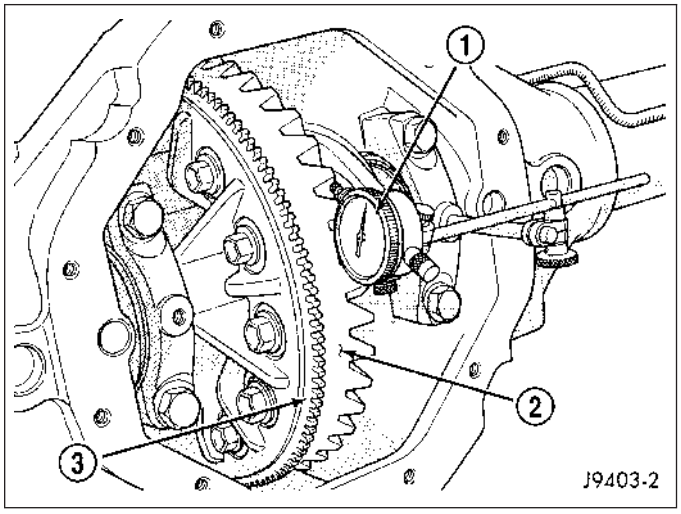


5. Assemble Dial Indicator C-3339 into Scooter Block D-115-2 and secure set screw.
6. Place Scooter Block/Dial Indicator in axle housing so dial probe and scooter block are flush against the pinion height block. Hold scooter block in place and zero the dial indicator. Tighten dial indicator face lock screw.
7. Slide the dial indicator (3) probe across the gap between the pinion height block and the arbor bar (1) with the scooter block (2) against the pinion height block. Move the dial probe to the crest of the arbor bar and record the highest reading.
8. Select a shim equal to the dial indicator reading plus the drive pinion gear depth variance number marked on the shaft of the pinion. For example, if the depth variance is –2, add +0.002 in. to the dial indicator reading.

DIFFERENTIAL BEARING PRELOAD AND GEAR BACKLASH

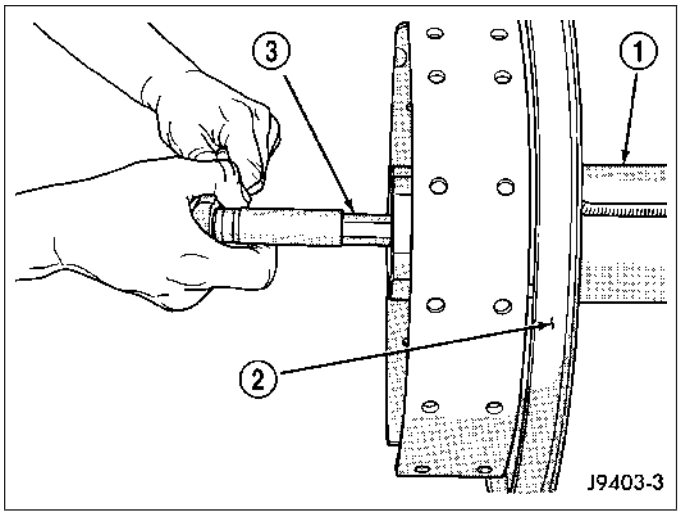
The following must be considered when adjusting bearing preload and gear backlash:

- The maximum ring gear backlash variation is 0.076 mm (0.003 in.).
- Mark the gears so the same teeth are meshed during all backlash measurements.
- Maintain the torque while adjusting the bearing preload and ring gear backlash.
- Excessive adjuster torque will introduce a high bearing load and cause premature bearing failure. Insufficient adjuster torque can result in excessive differential case free-play and ring gear noise.
- Insufficient adjuster torque will not support the ring gear correctly and can cause excessive differential case free-play and ring gear noise.



NOTE: The differential bearing cups will not always immediately follow the threaded adjusters as they are moved during adjustment. To ensure accurate bearing cup responses to the adjustments:

- **Maintain the gear teeth engaged (meshed) as marked.**
- **The bearings must be seated by rapidly rotating the pinion gear a half turn back and forth.**
- **Do this five to ten times each time the threaded adjusters are adjusted.**



1. Through the axle tube use Wrench C-4164 to adjust each threaded adjuster inward until the differential bearing free-play is eliminated. Allow some ring gear backlash approximately 0.25 mm (0.01 in.) between the ring and pinion gear. Seat the bearing cups with the procedure described above.
2. Install dial indicator (1) and position the plunger against the drive side of a ring gear (2) tooth. Measure the backlash at 4 positions, 90 degrees apart around the ring gear. Locate and mark the area of minimum backlash.
3. Rotate the ring gear to the position of the least backlash. Mark the gear so that all future backlash measurements will be taken with the same gear teeth meshed.
4. Loosen the right-side, tighten the left-side threaded adjuster. Obtain backlash of 0.076-0.102 mm (0.003-0.004 in.) with each adjuster tightened to 14 N·m (10 ft. lbs.). Seat the bearing cups with the procedure described above.
5. Tighten differential bearing cap bolts to 135 N·m (100 ft. lbs.).
6. Tighten right-side threaded adjuster to 102 N·m (75 ft. lbs.). Seat the bearing cups with the procedure described above. Continue to tighten the right-side adjuster and seat bearing cups until the torque remains constant at 102 N·m (75 ft. lbs.)
7. Measure the ring gear backlash. The range of backlash is 0.15-0.203 mm (0.006-0.008 in.).
8. Continue increasing the torque at the right-side threaded adjuster until the specified backlash is obtained.

NOTE: The left-side threaded adjuster torque should have approximately 102 N·m (75 ft. lbs.). If the torque is considerably less, the complete adjustment procedure must be repeated.

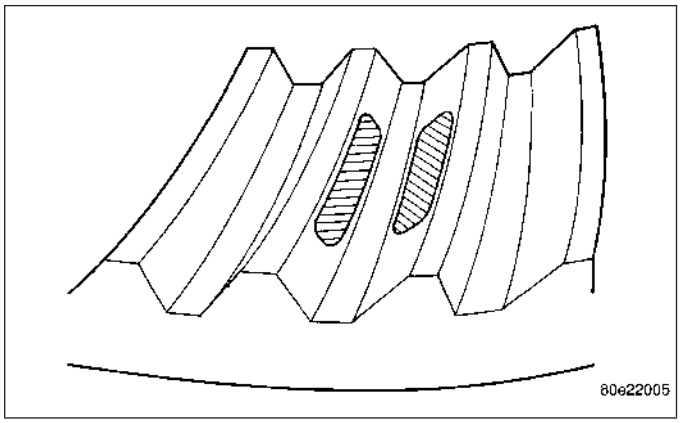
9. Tighten the left-side threaded adjuster until 102 N·m (75 ft. lbs.) torque is indicated. Seat the bearing rollers with the procedure described above. Do this until the torque remains constant.
10. Install the threaded adjuster locks and tighten the lock screws to 10 N·m (90 in. lbs.).

GEAR CONTACT PATTERN

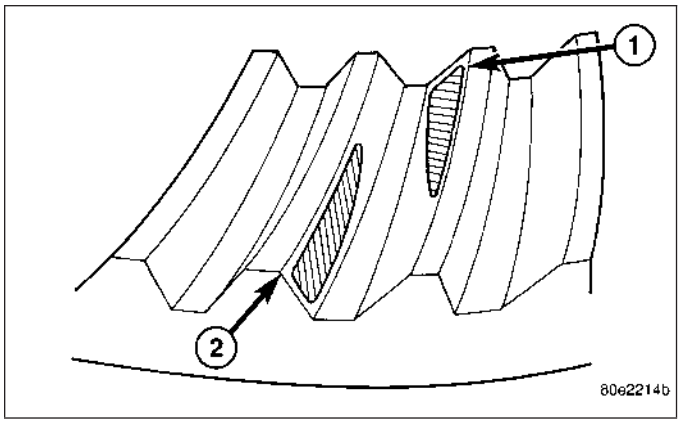
Gear tooth contact pattern is used to verify the correct running position of the ring and pinion gears. This will produce low noise and long gear life. Gears which are not positioned properly may be noisy and have shorten gear life.

1. Wipe clean each tooth of the ring gear.
2. Apply gear marking compound to all of the ring gear teeth.
3. Verify bearing cap bolts are torque specification.
4. Apply parking brakes lightly to create at 14 N·m (10 ft. lbs.) pinion rotating torque.
5. Rotate the pinion/pinion yoke 4 full revolutions in each directions.
6. Read gear tooth contact pattern.

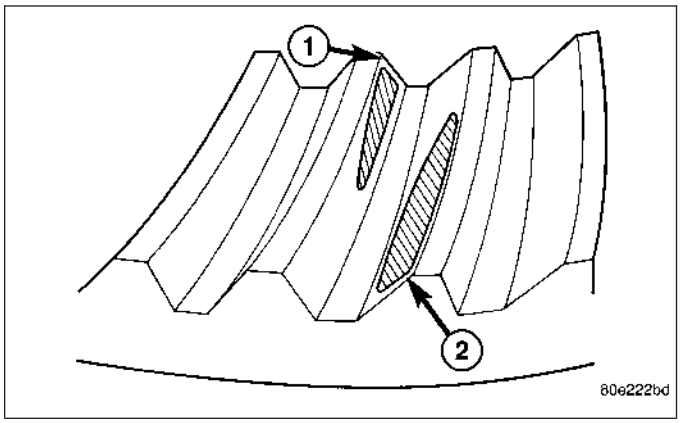
Gear contact pattern is correct. Backlash and pinion depth is correct.



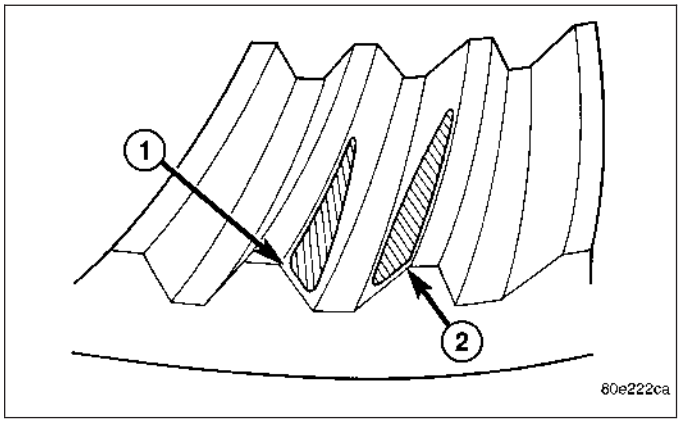
Ring gear is too far away from the pinion gear, coast side toe (1) drive side heel (2). Decrease the backlash, by moving the ring closer to the pinion gear using the adjusters.



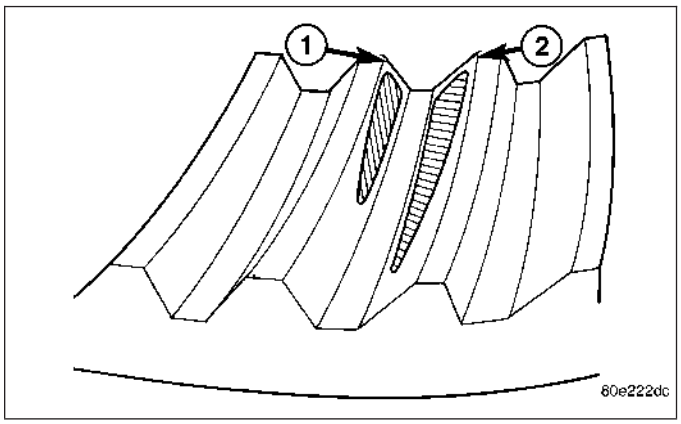
Ring gear is too close to the pinion gear, drive side toe (1) and coast side heel (2). Increase the backlash, by moving the ring away from the pinion gear using the adjusters.



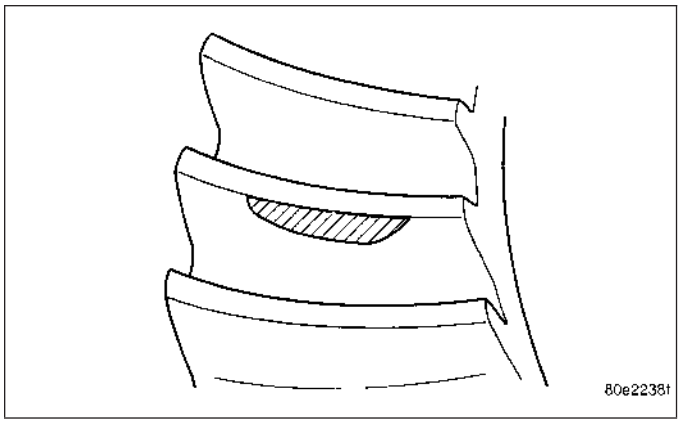
Ring gear is too far away from the pinion gear, drive side heel (1) and coast side heel (2). Decrease the backlash, by moving the ring closer to the pinion gear using the adjusters.



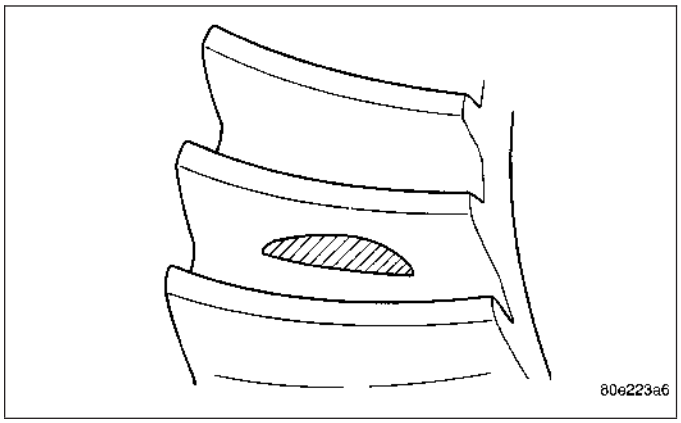
Ring gear is too close to the pinion gear, drive side toe (1) and coast side toe (2). Increase the backlash, by moving the ring away from the pinion gear using the adjusters.



Pinion gear is set too low. Increase the pinion gear height, by increasing the pinion depth shim thickness.



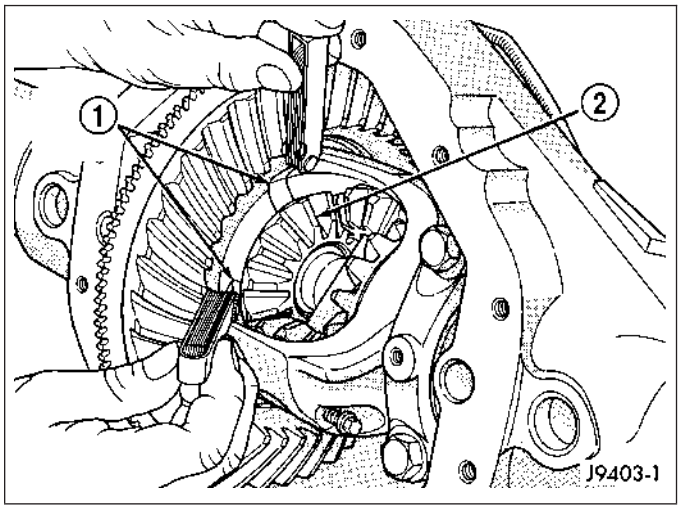
Pinion gear is set too high. Decrease the pinion depth, by decreasing the pinion depth shim thickness.



SIDE GEAR CLEARANCE

When measuring side gear clearance, check each gear independently. If it necessary to replace a side gear, replace both gears as a matched set.

1. Install the axle shafts and C-locks and pinion mate shaft.
2. Measure each side gear clearance. Insert a matched pair of feeler gauge (1) blades between the side gear (2) and differential housing on opposite sides of the hub.



3. If side gear clearances is no more than 0.005 inch. Determine if the axle shaft is contacting the pinion mate shaft. **Do not remove the feeler gauges, inspect the axle shaft with the feeler gauge inserted behind the side gear.** If the end of the axle shaft is not contacting the pinion mate shaft, the side gear clearance is acceptable.

SIDE GEAR CLEARANCE	0.007
THRUST WASHER THICKNESS	+ 0.033
TOTAL	0.040
	→ 0.040
REPLACEMENT WASHER THICKNESS	− 0.037
NEW SIDE GEAR CLEARANCE	0.003

J9203-31

4. If clearance is more than 0.005 inch (axle shaft not contacting mate shaft), record the side gear clearance. Remove the thrust washer and measure its thickness with a micrometer. Add the washer thickness to the recorded side gear clearance. The sum of gear clearance and washer thickness will determine required thickness of replacement thrust washer.

In some cases, the end of the axle shaft will move and contact the mate shaft when the feeler gauge is inserted. The C-lock is preventing the side gear from sliding on the axle shaft.

5. If there is no side gear clearance, remove the C-lock from the axle shaft. Use a micrometer to measure the thrust washer thickness. Record the thickness and re-install the thrust washer. Assemble the differential case without the C-lock installed and re-measure the side gear clearance.
6. Compare both clearance measurements. If the difference is less than 0.012 inch (0.305 mm), add clearance recorded when the C-lock was installed to thrust washer thickness measured. The sum will determine the required thickness of the replacement thrust washer.
7. If clearance is 0.012 inch (0.305 mm) or greater, both side gears must be replaced (matched set) and the clearance measurements repeated.
8. If clearance (above) continues to be 0.012 inch (0.305 mm) or greater, the case must be replaced.

SPECIFICATIONS

REAR AXLE - 9 1/4

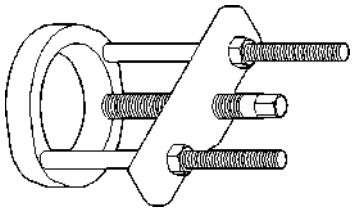
AXLE SPECIFICATIONS

DESCRIPTION	SPECIFICATION
Axle Ratio	3.55, 3.92
Differential Case Flange Runout	0.076 mm (0.003 in.)
Differential Case Clearance	0.12 mm (0.005 in.)
Ring Gear Diameter	235 mm (9.25 in.)
Ring Gear Backlash	0.12-0.20 mm (0.005-0.008 in.)
Ring Gear Runout	0.12 mm (0.005 in.)
Pinion Bearing Preload - Original Bearings	1-2 N·m (10-20 in. lbs.)
Pinion Bearing Preload - New Bearings	1.7-4 N·m (15-35 in. lbs.)

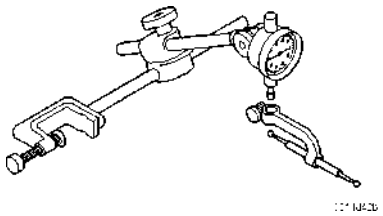
TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Differential Cover Bolts	44	32	-
Bearing Cap Bolts	135	100	-
Ring Gear Bolts	157	115	-
Pinion Nut Minimum	285	210	-
Adjuster Lock Screw	10	-	95
Pinion Mate Shaft Lock Screw	25	-	220
Bell Crank Bolt	217	160	-

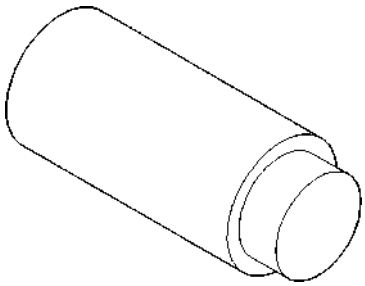
SPECIAL TOOLS



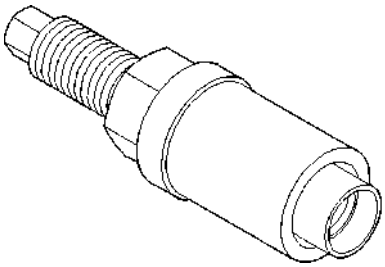
PULLER C-293-PA



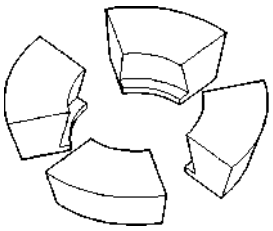
DIAL INDICATOR C-3339



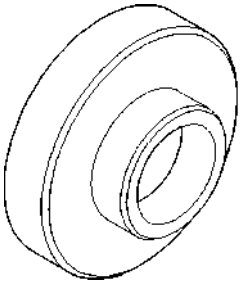
PLUG C-293-3



INSTALLER C-3718



ADAPTERS C-293-37



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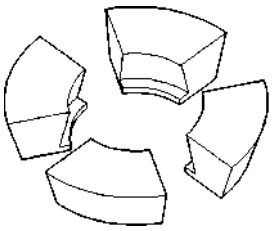
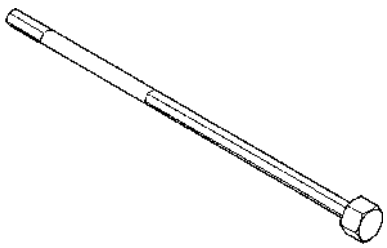
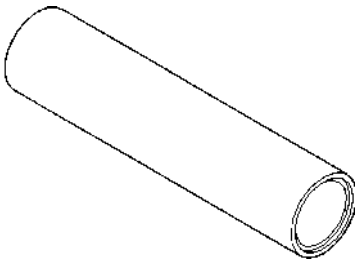


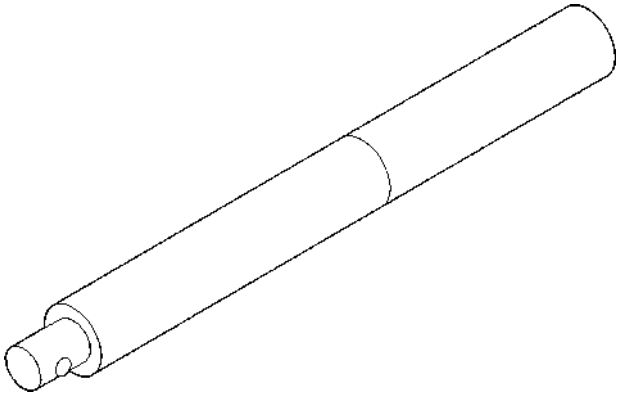
ADAPTERS C-293-47



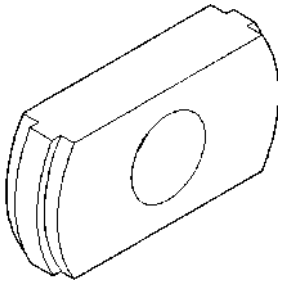
WRENCH C-4164



INSTALLER C-3095-A



HANDLE C-4171



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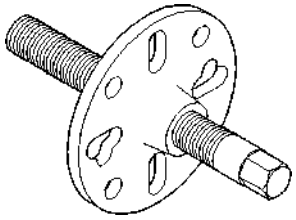
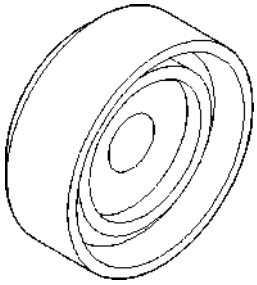


PULLER C-452



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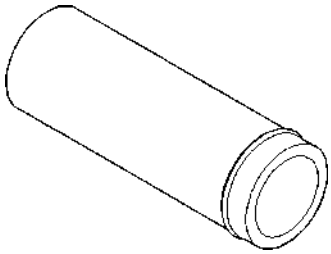
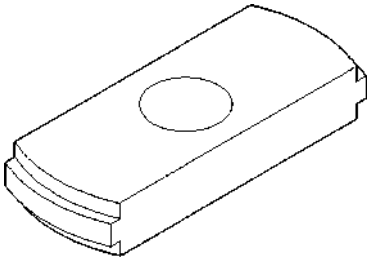
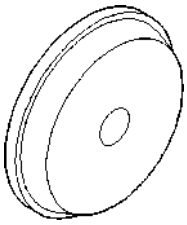


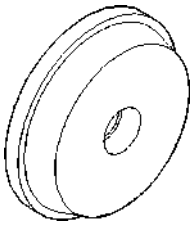
HANDLE C-4735



REMOVER C-4307



INSTALLER D-129



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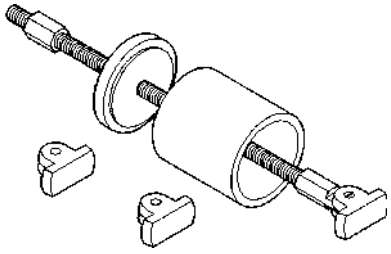
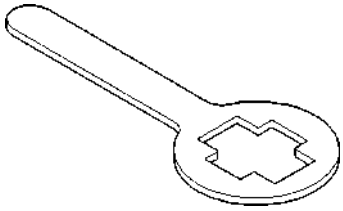
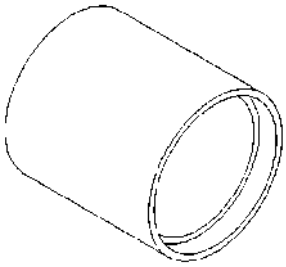


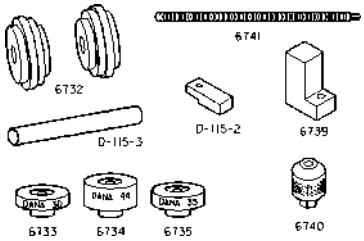
REMOVER 6310



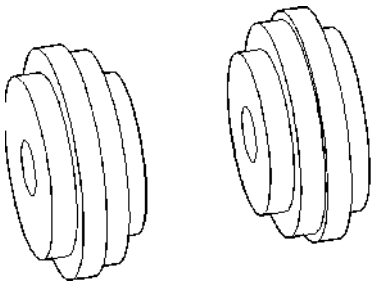
HOLDER 6719A



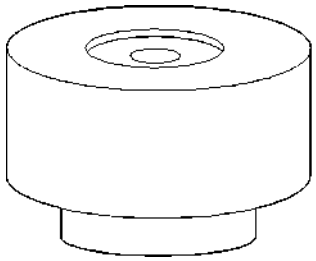
RECEIVER 9338



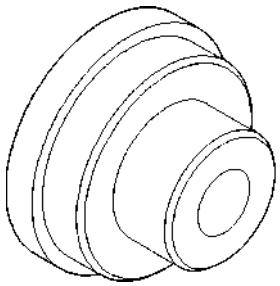
PINION GAUGE SET 6730/6774/6775



ARBOR DISCS 8541



PINION BLOCK 8542

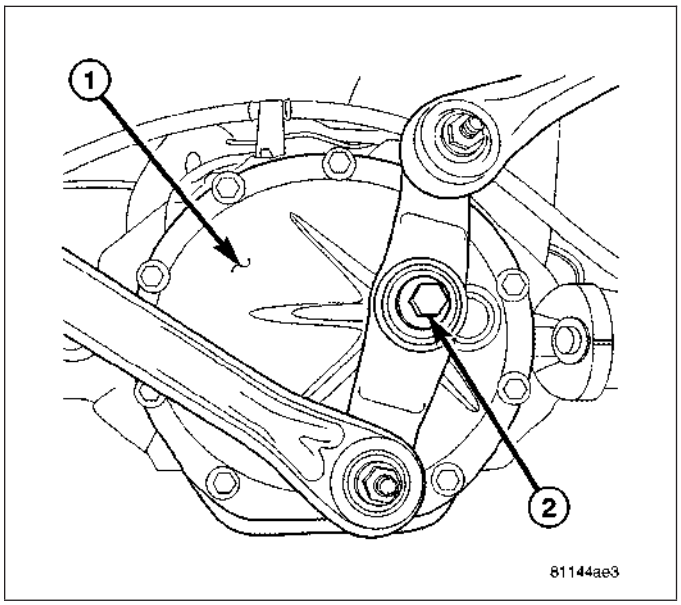


INSTALLER 9337

COVER-DIFFERENTIAL

REMOVAL

1. Remove watts link bell crank bolt (2) from differential cover (1).
2. Remove differential cover bolts.
3. Remove cover and drain fluid.



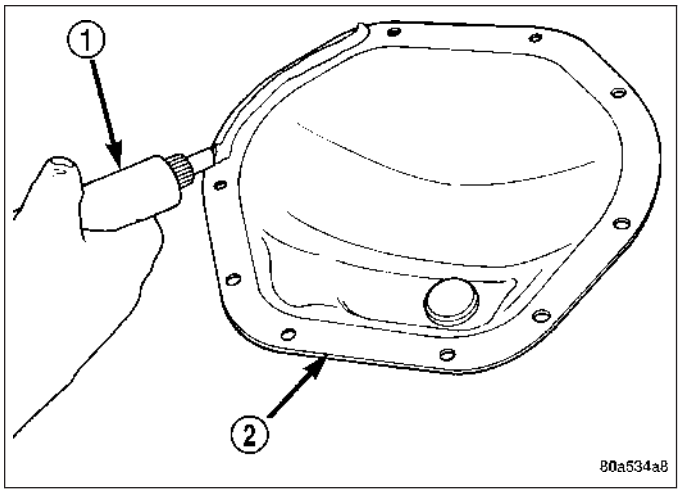
INSTALLATION

1. Clean differential cover.
2. Apply a bead of orange Mopar Axle RTV Sealant (1) or equivalent to the cover (2).

CAUTION: If cover is not installed within 3 to 5 minutes, the cover must be cleaned and new RTV applied or adhesion quality will be compromised.

3. Install cover and tighten bolts in a criss-cross pattern to 44 N·m (32 ft. lbs.).
4. Fill differential with 2.13 L (4.501 pts.) of gear lubricant.

CAUTION: Fill differential by volume only, not to the bottom of fill plug.



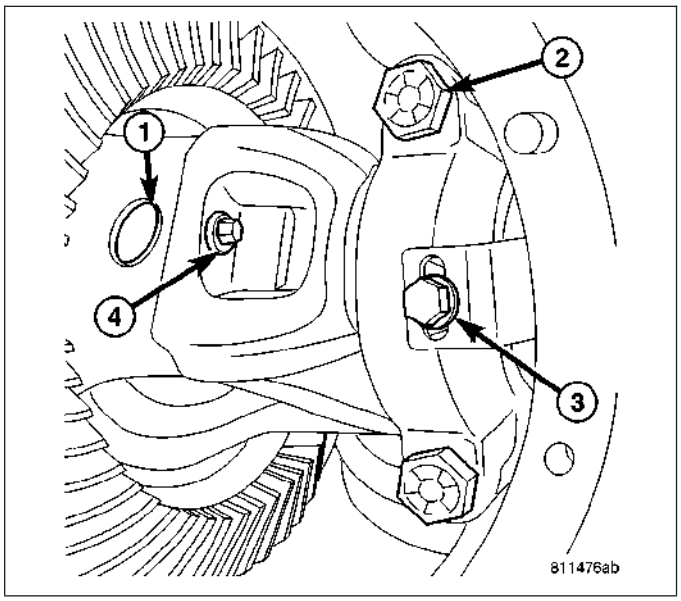
5. Install fill hole plug.
6. Install watts link bell crank bolt and tighten to 217 N·m (160 ft. lbs.).

NOTE: Bell crank bolt has a Loctite® patch, a new bolt should be used. If bolt is not available, clean bolt and apply Loctite® 242 to the threads.

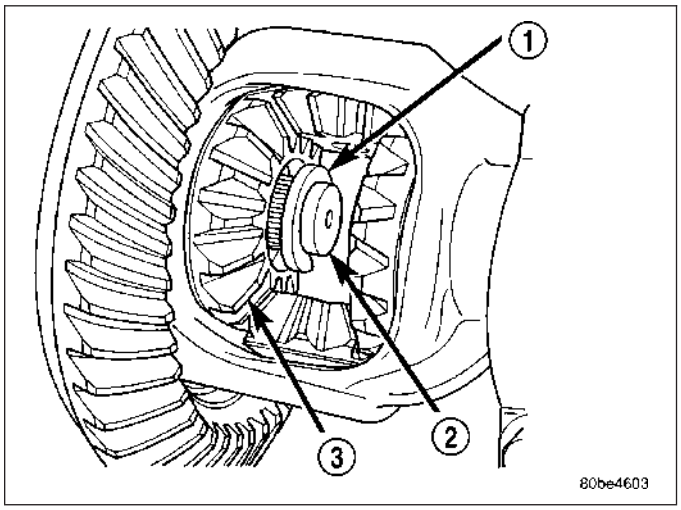
SHAFT-AXLE

REMOVAL

1. With vehicle in neutral, position it on a hoist.
2. Remove brake caliper adapter with caliper and remove rotor.
3. Remove differential housing cover and drain lubricant.
4. Rotate differential case, to access pinion mate shaft lock screw (4). Remove screw (4) and pinion mate shaft (1) from differential case.

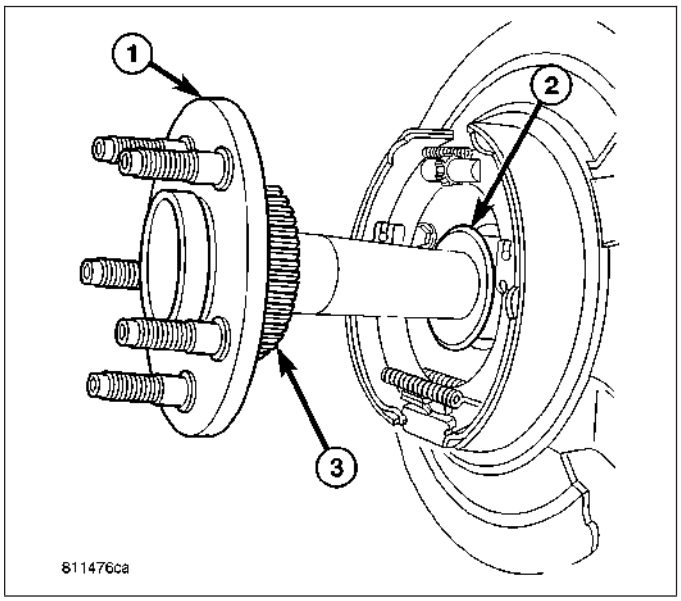


5. Push axle shaft (2) inward and remove axle shaft C-lock (1).
6. Remove axle shaft.

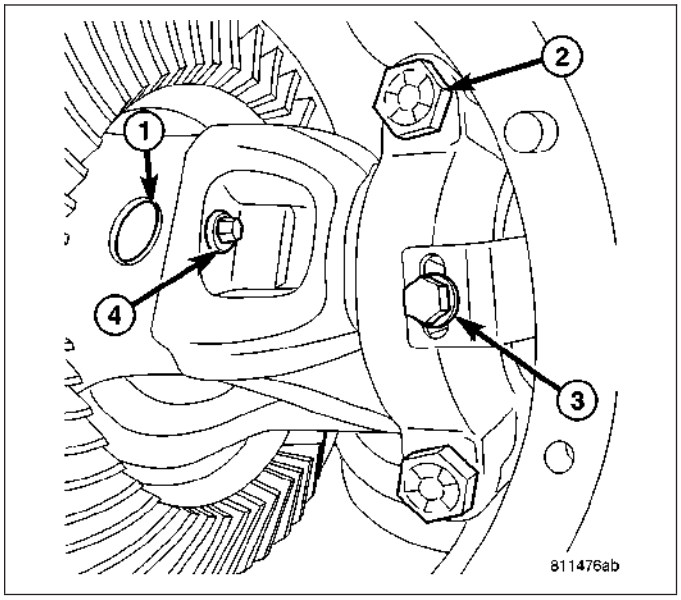


INSTALLATION

1. Lubricate bearing bore and seal lip with gear lubricant.
2. Insert axle shaft (1) through seal (2) and engage into side gear splines.



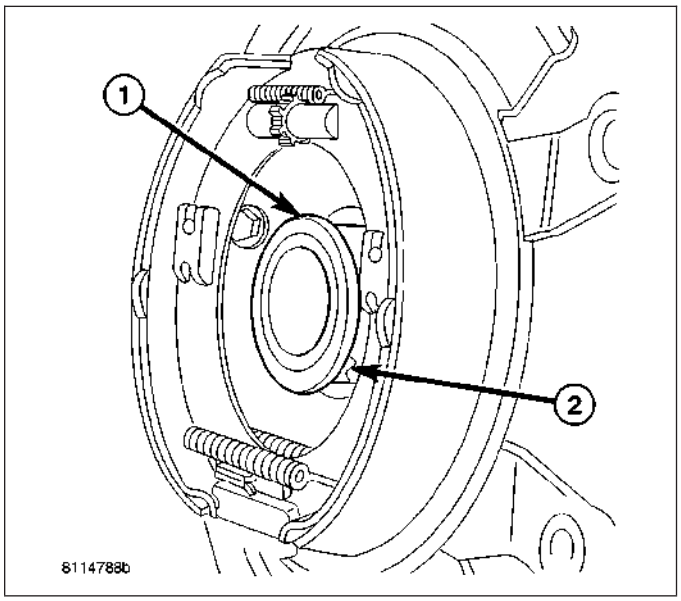
3. Insert C-lock in end of axle shaft then push axle shaft outward to seat C-lock in side gear.
4. Insert pinion shaft into differential case and through thrust washers and differential pinions.
5. Align hole in shaft with hole in differential case and install lock screw (4) with Loctite® on the threads. Tighten lock screw to 25 N·m (220 in. lbs.).
6. Install differential cover and fill with gear lubricant.
7. Install brake rotor and caliper adapter with caliper.



SEAL-AXLE SHAFT

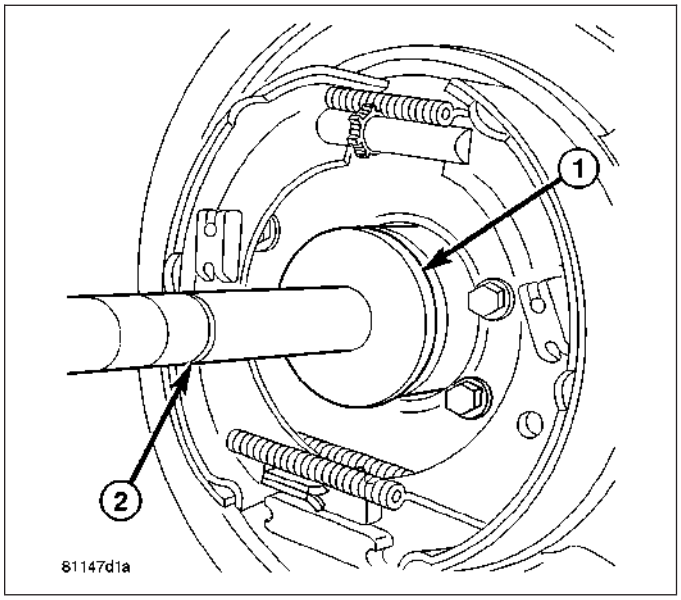
REMOVAL

1. Remove axle shaft.
2. Remove axle shaft seal (1) from end of the axle tube (2) with a pry bar.



INSTALLATION

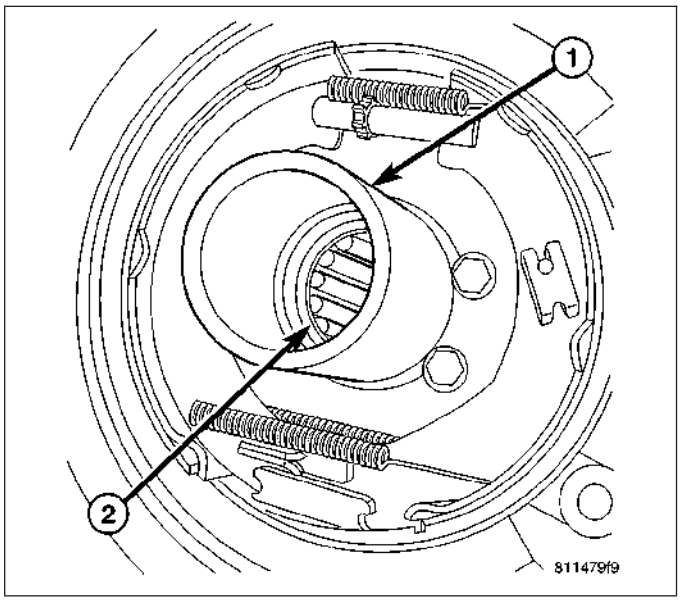
1. Remove any old sealer/burrs from axle tube.
2. Coat **new** seal lip with axle lubricant and install seal with Installer 9337 (1) and Handle C-4171 (2).
3. Install axle shaft.



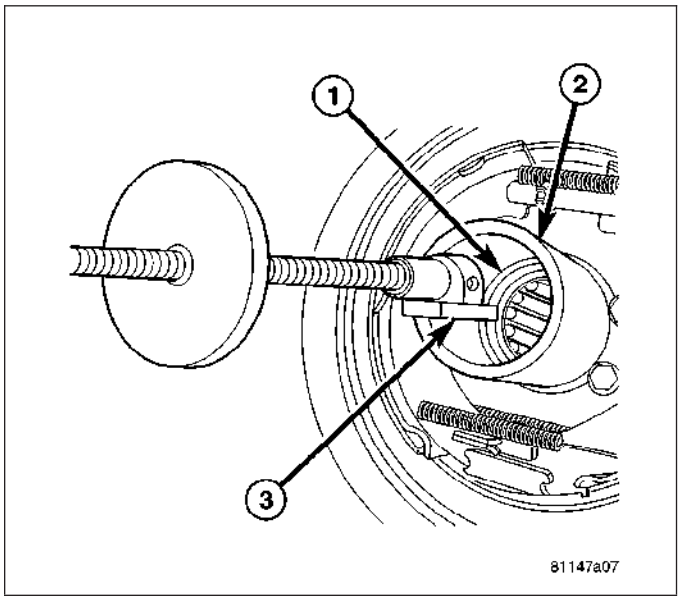
BEARING-AXLE

REMOVAL

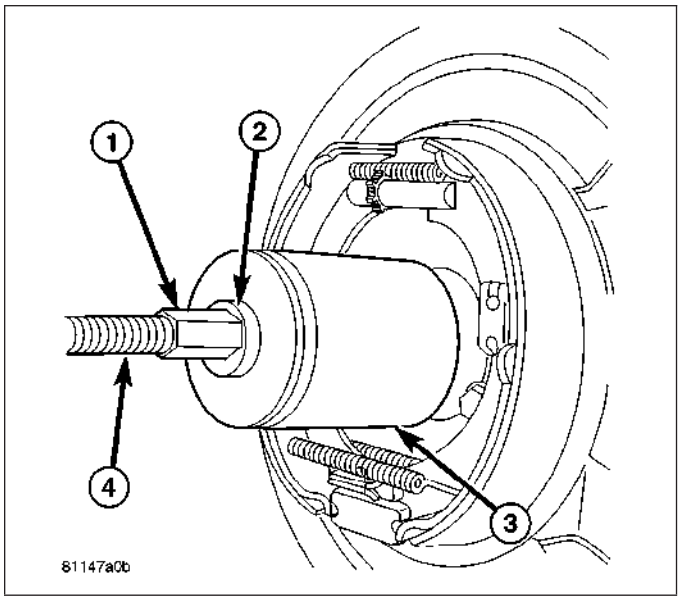
1. Remove axle shaft.
2. Remove axle seal with pry bar.
3. Position bearing Receiver 9338 (1) on axle tube.



4. Insert bearing Remover 6310 (4) with Foot 6310-9 (3) through receiver (2) and bearing (1).



5. Tighten Remove 6310 nut (1) to pull bearing into the receiver (3).

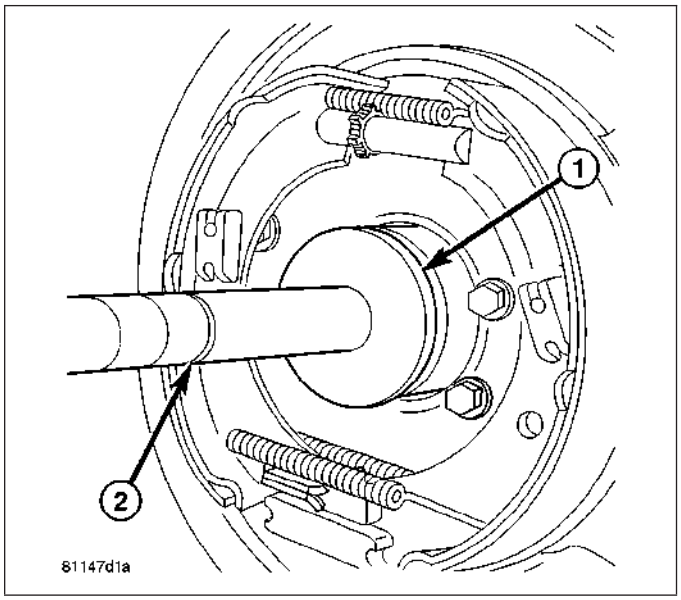


INSTALLATION

1. Remove any old sealer/burrs from axle tube.
2. Install axle shaft bearing with Installer 9337 (1) and Handle C-4171 (2). Drive bearing in until tool contacts the axle tube.

NOTE: Bearing is installed with the bearing part number against the installer.

3. Coat **new** axle seal lip with axle lubricant and install with Installer 9337 and Handle C-4171.
4. Install axle shaft.

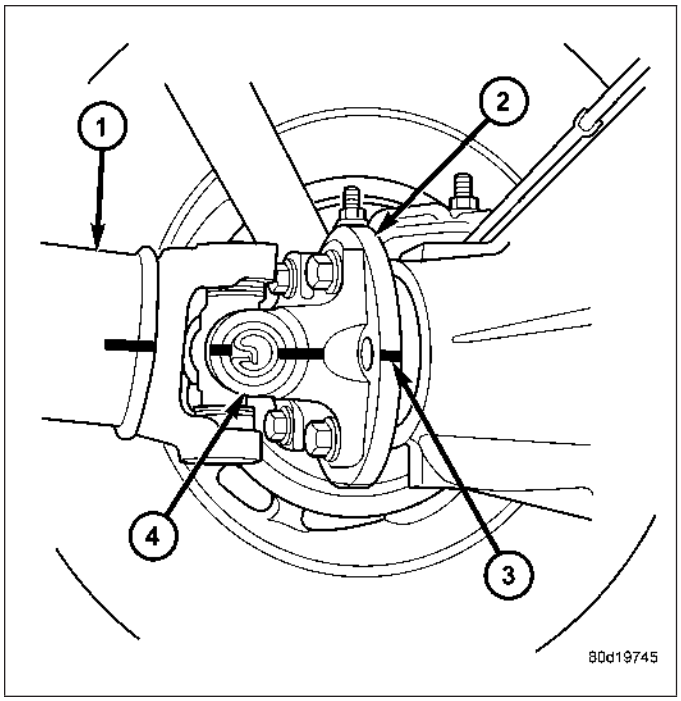


SEAL-PINION

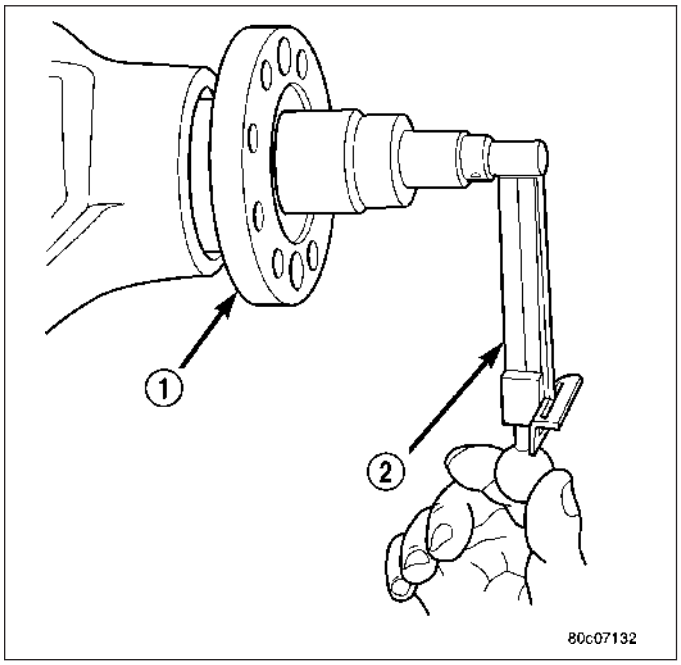
REMOVAL

1. With vehicle in neutral, position it on a hoist.

2. Mark a installation reference line (3) across the pinion flange (3) and propeller shaft flange (4).

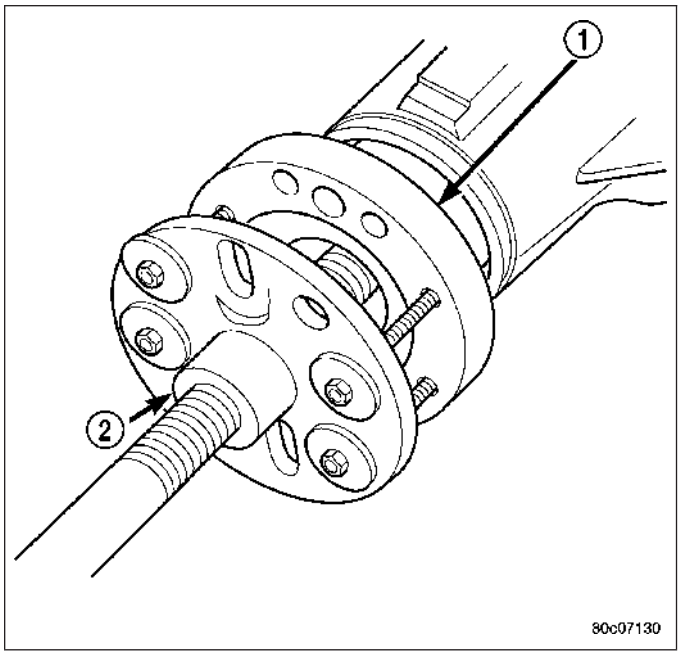


3. Remove propeller shaft.
4. Remove brake calipers and rotors to prevent any drag.
5. Rotate pinion flange three or four times and verify flange rotates smoothly.
6. Measure rotating torque of the pinion with a inch pound torque wrench (2) and record reading.



7. Install two bolts into the pinion flange threaded holes, 180° apart. Position Holder 6719A against the flange and install and tighten two bolts and washers into the remaining holes.
8. Hold the flange with Holder 6719A and remove pinion nut and washer.

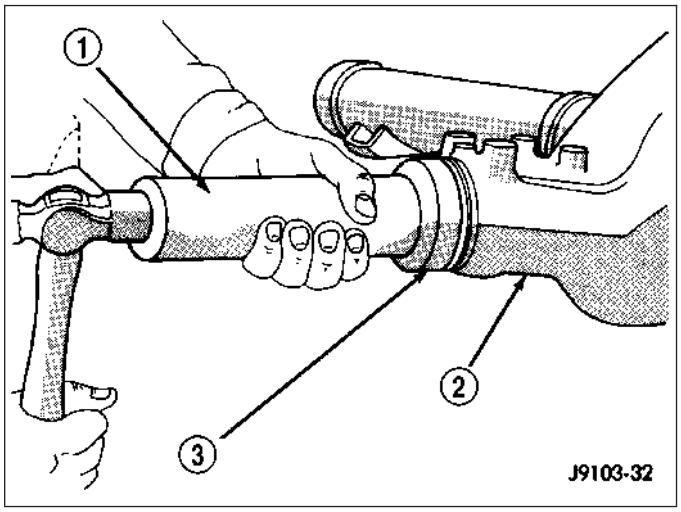
9. Remove companion flange (1) with Remover C-452 (2).



10. Remove pinion seal with pry tool or slide-hammer mounted screw.

INSTALLATION

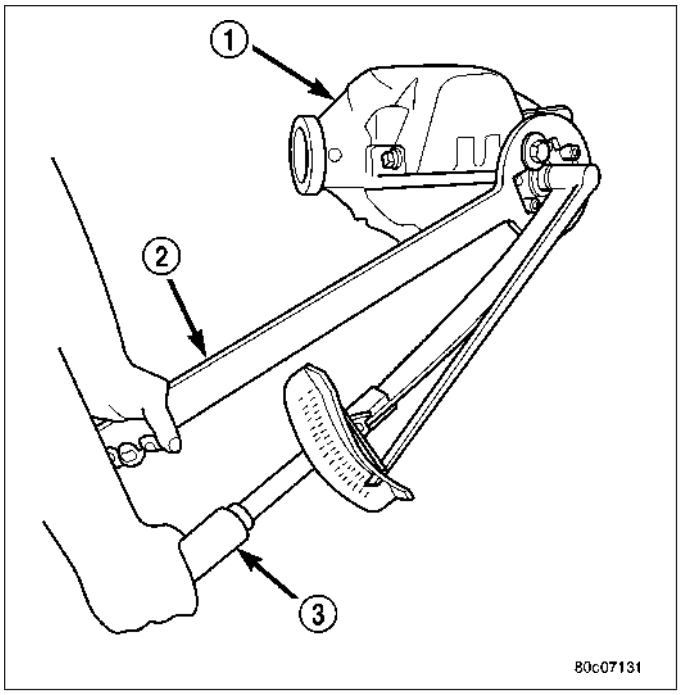
1. Apply a light coating of gear lubricant on the lip of pinion seal.
2. Install **new** pinion seal with Installer C-4076-B (3) and Handle C-4735 (1).



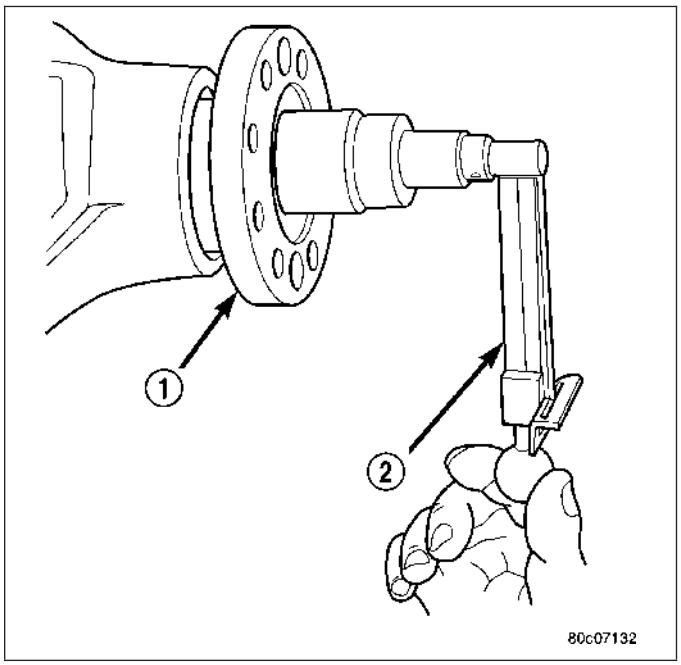
3. Install pinion flange on pinion shaft with Installer C-3718.
4. Install two bolts into the threaded holes in the flange, 180° apart.
5. Position Holder 6719 against the flange and install a bolt and washer into one of the remaining threaded holes. Tighten the bolts so holder is held to the flange.
6. Install pinion washer and a **new** pinion nut. The convex side of the washer must face outward.

CAUTION: Never exceed the minimum tightening torque 285 N·m (210 ft. lbs.) when installing the companion flange retaining nut at this point. Failure to follow these instruction will result in damage to collapsible spacer or bearings.

7. Hold companion flange with Holder 6719 (2) and tighten pinion nut with a torque set to 285 N·m (210 ft. lbs.). Rotate pinion several revolutions to ensure the bearing rollers are seated.



8. Rotate pinion with an inch pound torque wrench (2). Rotating torque should be equal to the reading recorded during removal plus an additional 0.56 N·m (5 in. lbs.).



CAUTION: Never loosen pinion nut to decrease pinion bearing rotating torque and never exceed specified preload torque. If rotating torque is exceeded, a new collapsible spacer must be installed. Failure to follow these instructions will result in damage to the collapsible spacer

9. If rotating torque is low, use Holder 6719 to hold the companion flange and tighten pinion nut in 6.8 N·m (5 ft. lbs.) increments until proper rotating torque is achieved.

NOTE: The bearing rotating torque should be constant during a complete revolution of the pinion. If the rotating torque varies, this indicates a binding condition.

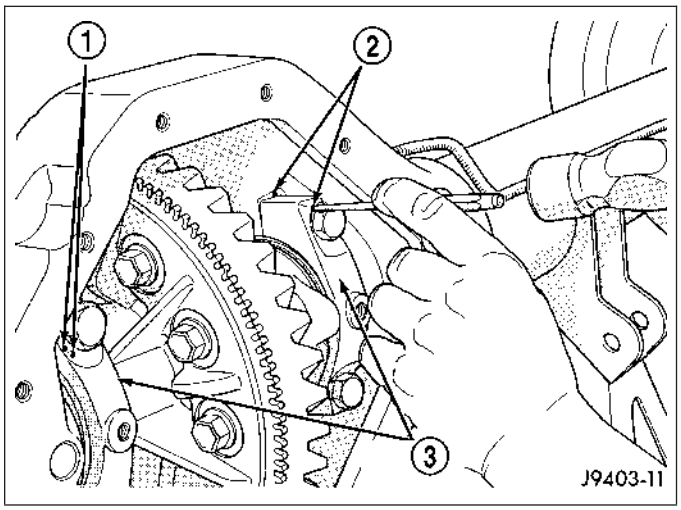
NOTE: The seal replacement is unacceptable if the final pinion nut torque is less than 285 N·m (210 ft. lbs.).

10. Install propeller shaft..

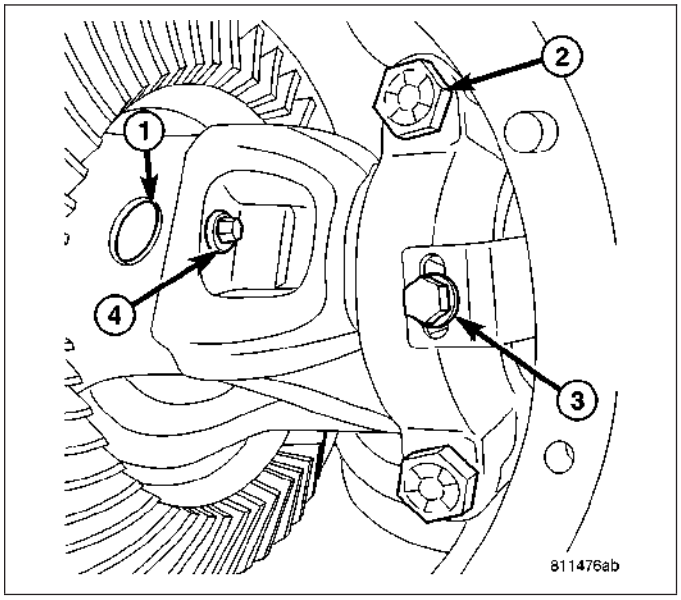
DIFFERENTIAL

REMOVAL

1. Remove differential cover.
2. Remove axle shafts.
3. Remove ABS sensor from housing.
4. Mark differential housing and bearing caps (3) for installation reference.

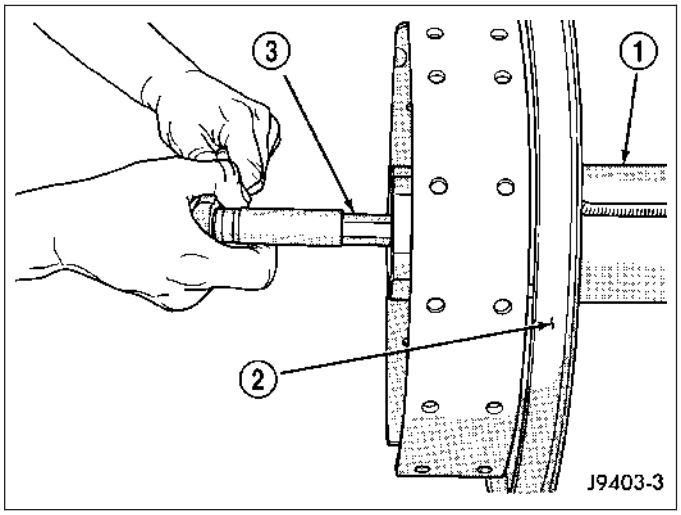


5. Remove bearing adjuster lock bolt (3) from bearing caps.



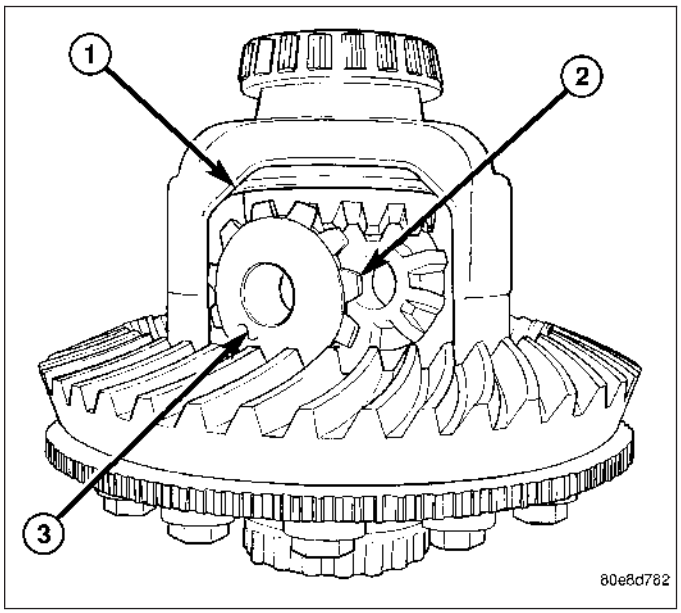
6. Loosen differential bearing cap bolts.
7. Loosen differential bearing adjusters through the axle tubes (1) with Wrench C-4164 (3).
8. Hold differential case while removing bearing caps and adjusters.
9. Remove differential case and tag differential bearing cups and adjusters to indicate location.
10. Clean housing cavity with flushing oil, light engine oil or a lint free cloth.

NOTE: Do not use steam, kerosene or gasoline to clean the housing.

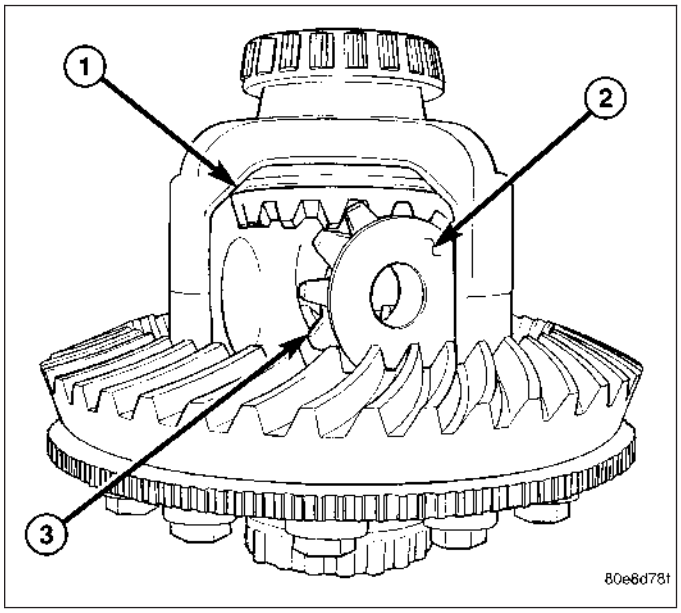


DISASSEMBLY

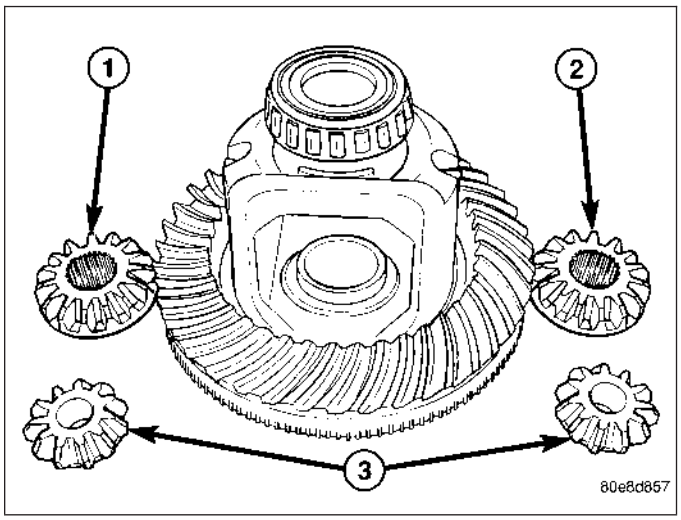
1. Rotate one pinion gear (2) with thrust washer (3) to the differential window (1). Remove gear and thrust washer.



2. Rotate remaining pinion gear (3) with thrust washer (2) to the differential window (1). Remove gear and washer.



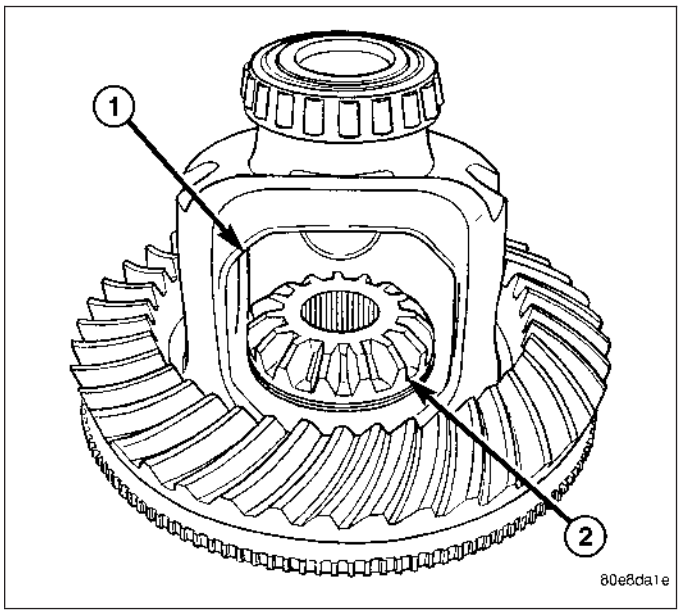
3. Remove differential side gears (1) (2) and thrust washers.



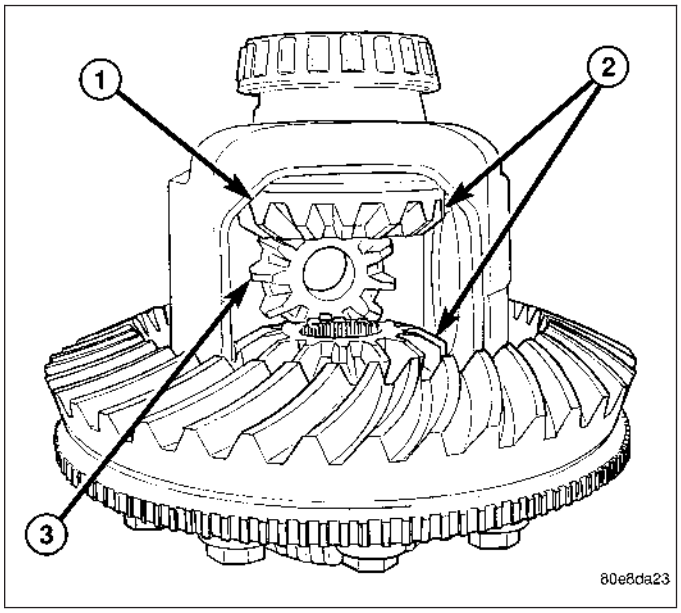
ASSEMBLY

NOTE: If same gears and thrust washers are being used, install them into their original locations.

1. Lubricate all differential components with axle lubricant.
2. Install differential side gears (2) and thrust washers.



3. Install first pinion gear (3) with thrust washer into differential window (1) and side gears (2). Rotate pinion gear into the case.
4. Install remaining pinion gear and thrust washer. Rotate gears to align hole in the pinion gears with hole in the differential case.
5. Slide pinion shaft into the case and through the pinion gears to align the gears.



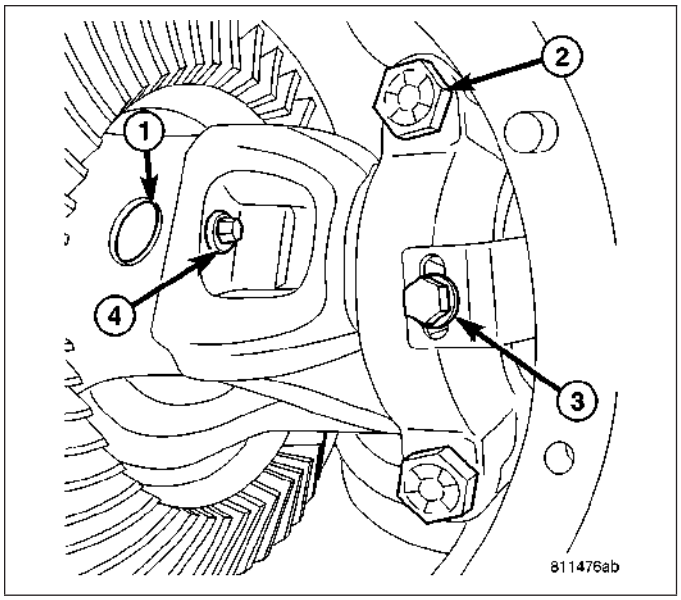
INSTALLATION

1. Apply a coat of hypoid gear lubricant to differential bearings, bearing cups and threaded adjusters.

NOTE: Grease can be used to keep the adjusters in position.

2. Install differential assembly into the housing.
3. Install differential bearing caps in their original locations.
4. Install bearing cap bolts and tighten the upper bolts to 14 N·m (10 ft. lbs.). Tighten lower bolts finger-tight until the bolt head is seated.
5. Perform differential bearing preload and adjustment procedure.

6. Tighten bearing cap bolts (2) to 136 N·m (100 ft.lbs.). Install adjuster locks and tight adjuster lock bolts (3) to 10 N·m (95 in. lbs.).

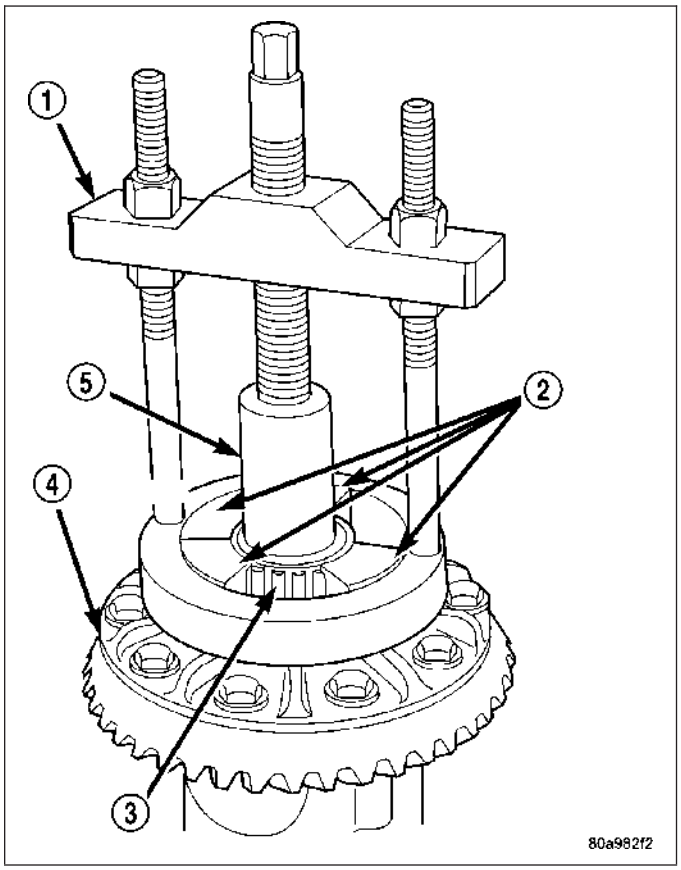


7. Install axle shafts.

BEARINGS-DIFFERENTIAL CASE

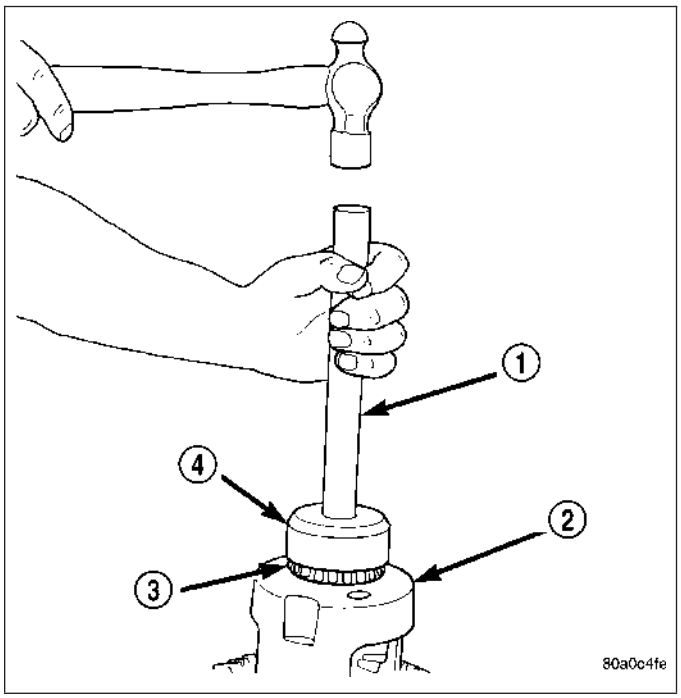
REMOVAL

1. Remove differential case from axle housing.
2. Remove differential bearings from the case with Puller/Press C-293-PA (1) Adapters C-293-47 (2) and Plug C-293-3 (5).



INSTALLATION

1. Install differential side bearings (3) with Installer C-4213 (4) and Handle C-4171 (1).



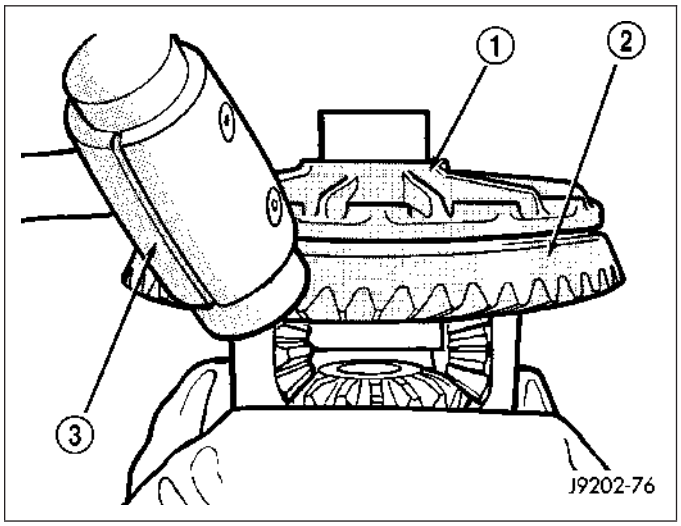
2. Install differential case into housing.

GEAR-PINION/RING/TONE RING

REMOVAL

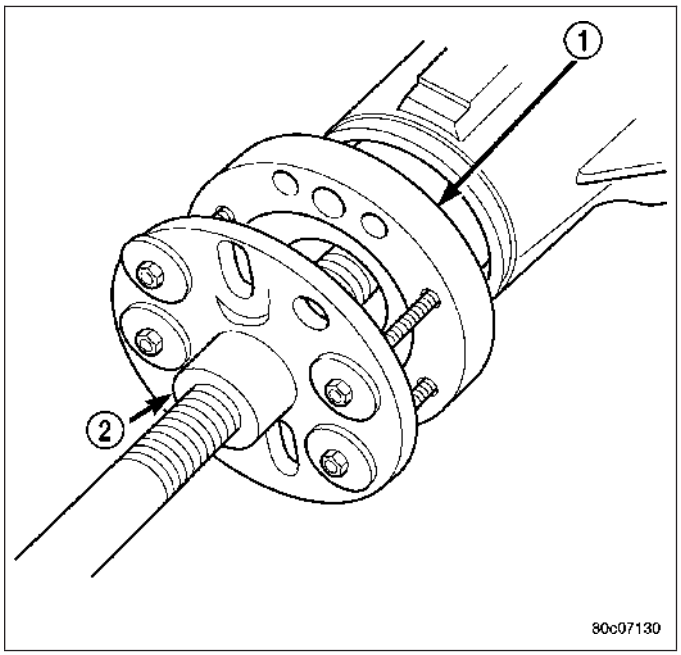
NOTE: The ring gear and pinion are serviced in a matched set. Never replace one gear without replacing the other matching gear.

1. Remove differential from differential housing.
2. Place differential case in a vise with soft metal jaw protectors.
3. Remove ring gear bolts and drive ring gear (2) off the differential case (1) with a soft hammer (3).

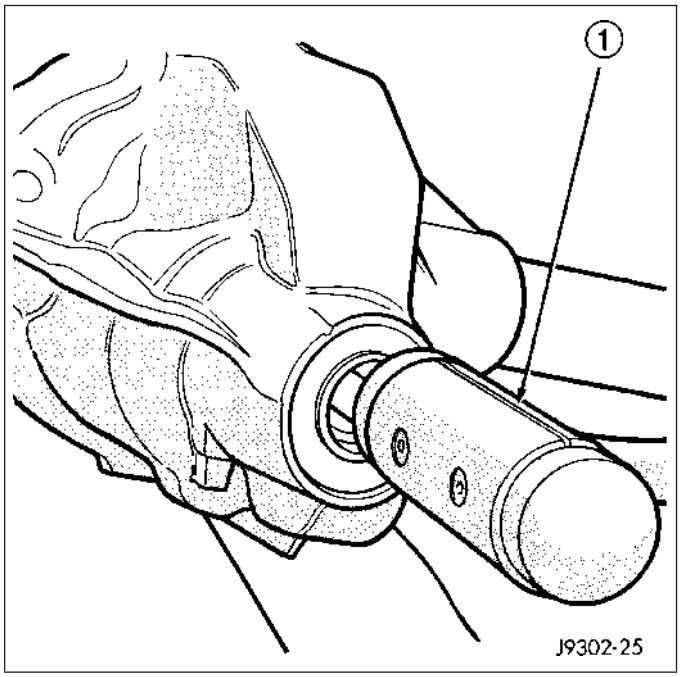


4. Install bolts into two of the threaded holes in the pinion flange 180° apart.
5. Position Holder 6719 against flange and install a bolt and washer into one of the remaining threaded holes. Tighten bolts so the Holder 6719 is held to the flange.

6. Use Holder 6719 to hold flange and remove the companion flange nut and washer.
7. Remove flange (1) from pinion with Remover C-452 (2).

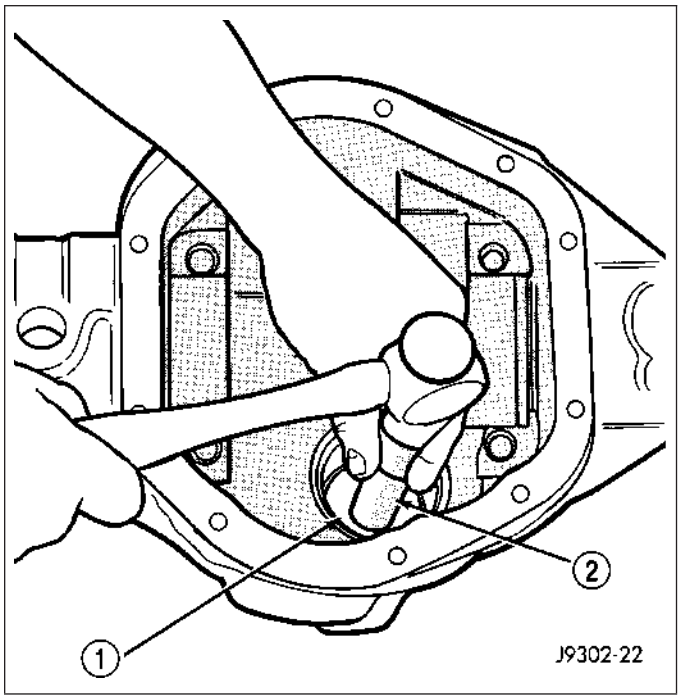


8. Remove pinion from housing with a soft hammer (1).

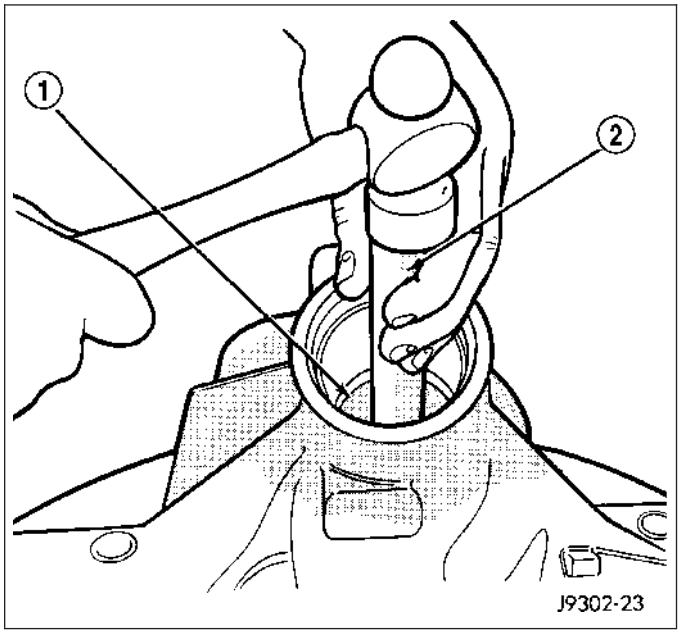


9. Remove pinion seal with a pry tool or slide-hammer mounted screw.
10. Remove oil slinger if equipped and front pinion bearing.

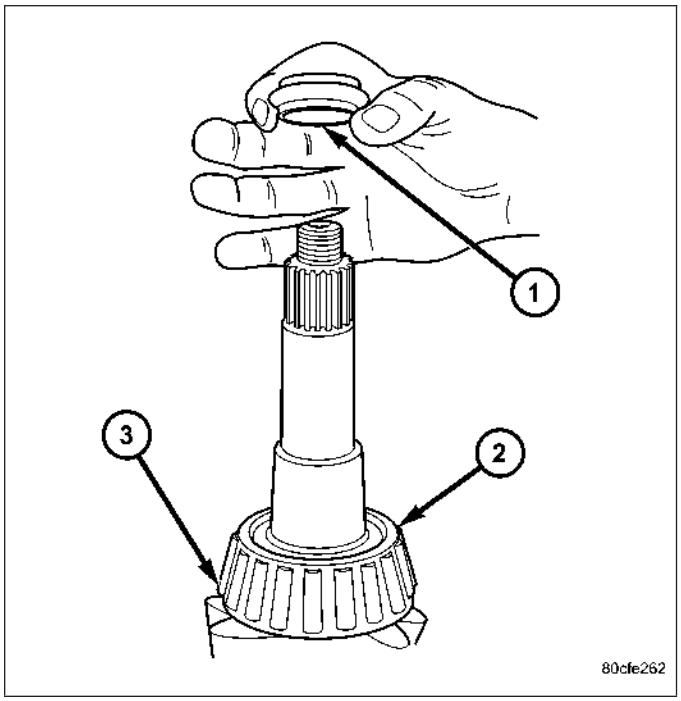
11. Remove front pinion bearing cup with Remover C-4345 (1) and Handle C-4171 (2).



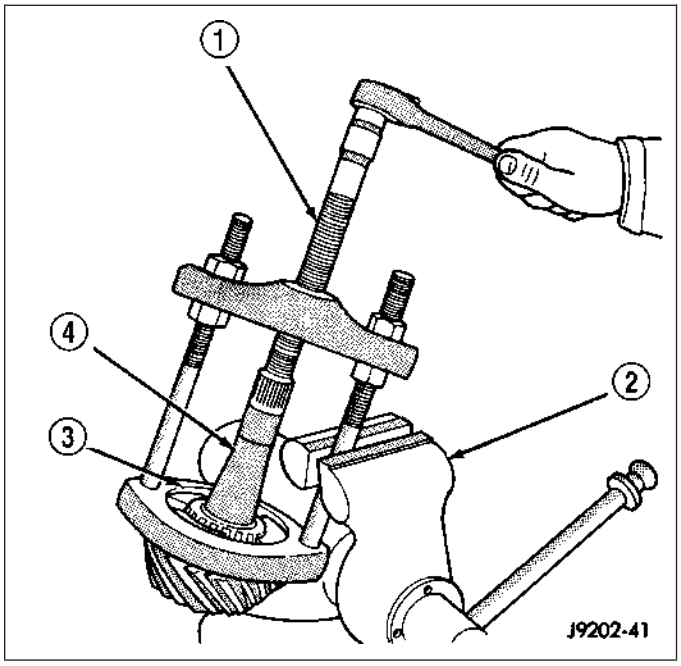
12. Remove rear bearing cup from housing with Remover C-4307 (1) and Handle C-4171 (2).



13. Remove collapsible spacer (1) from pinion gear.



14. Remove rear bearing from the pinion with Puller/ Press C-293-PA (1) and Adapters C-293-47 (3).



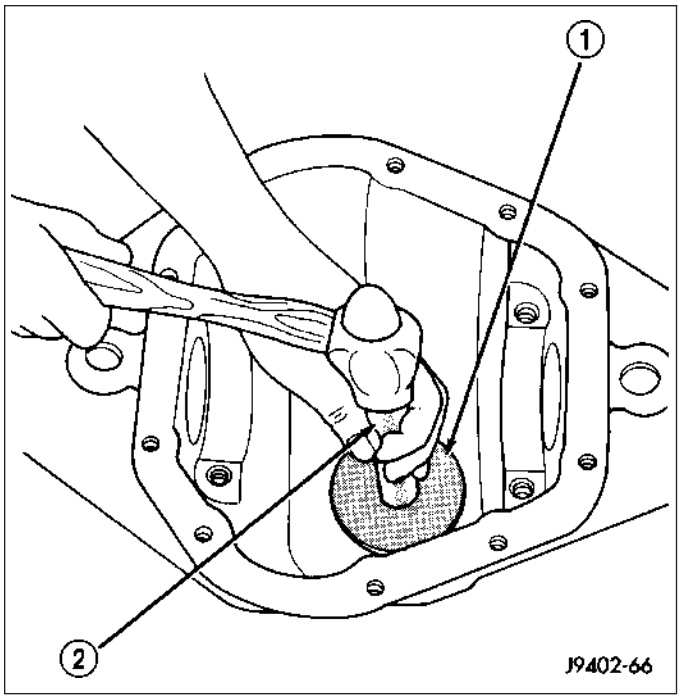
15. Remove depth shims from the pinion shaft and record shim thickness.

INSTALLATION

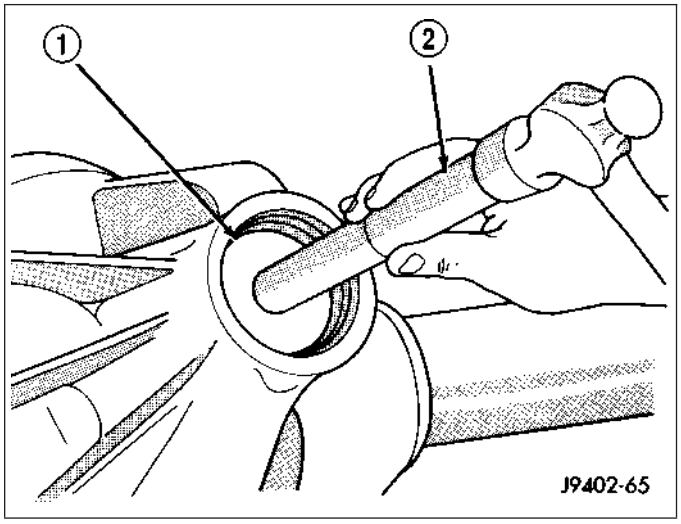
NOTE: The ring gear and pinion are serviced in a matched set. Do not replace the one gear without replacing the other matching gear. If ring and pinion gears or bearings are replaced, Refer to Adjustments for Pinion Gear Depth Setting.

1. Apply Mopar Door Ease or stick lubricant to outside surface of pinion bearing cups.

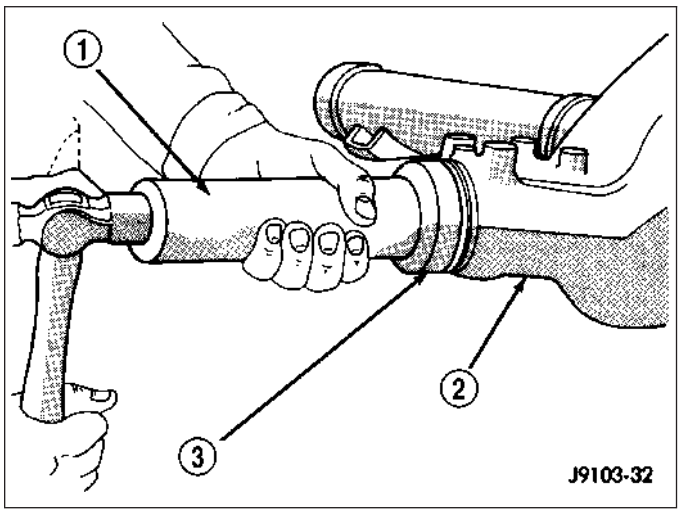
2. Install rear pinion bearing cup with Installer C-4308 (1) and Driver Handle C-4171 (2).



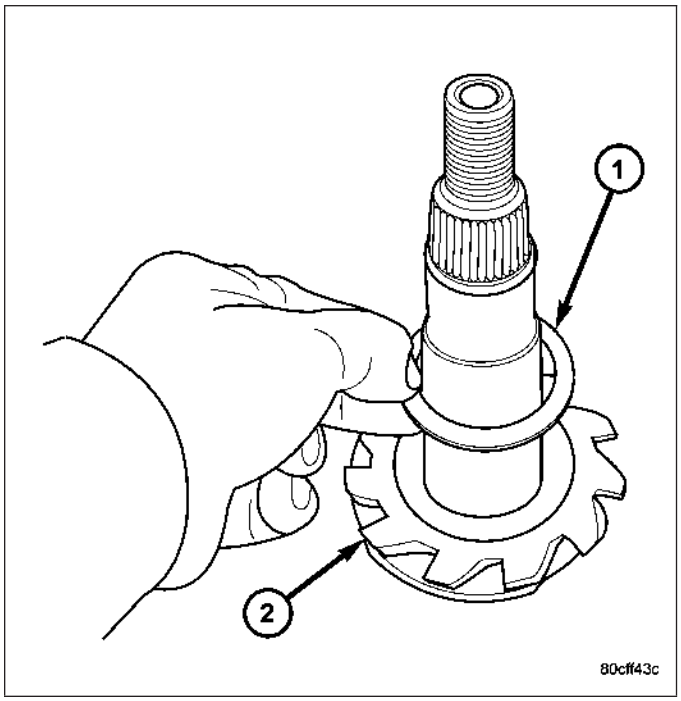
3. Install front pinion bearing cup with Installer D-129 (1) and Handle C-4171 (2).



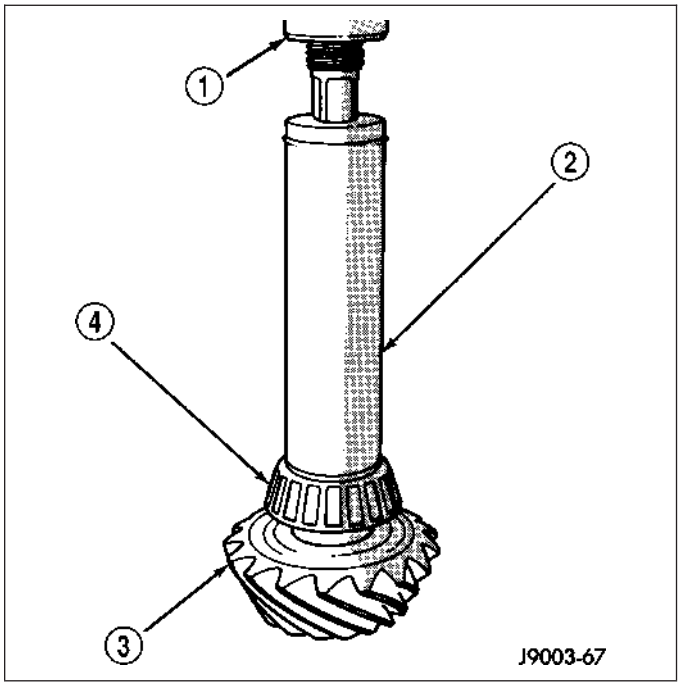
4. Lubricate and install front pinion bearing.
5. Apply a light coating of gear lubricant on the lip of pinion seal. Install seal with Installer C-4076-B (1) and Handle C-4735 (3).



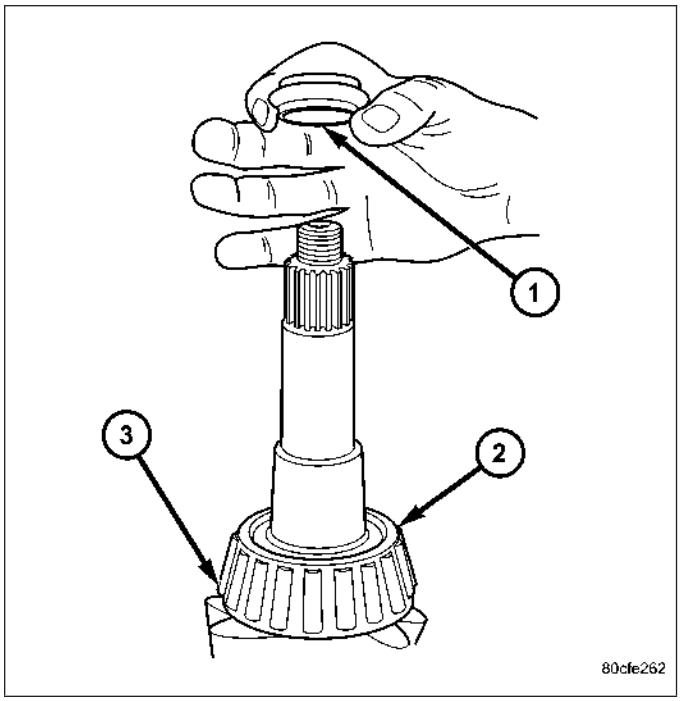
6. Install proper thickness depth shim (1) on the pinion gear (2).



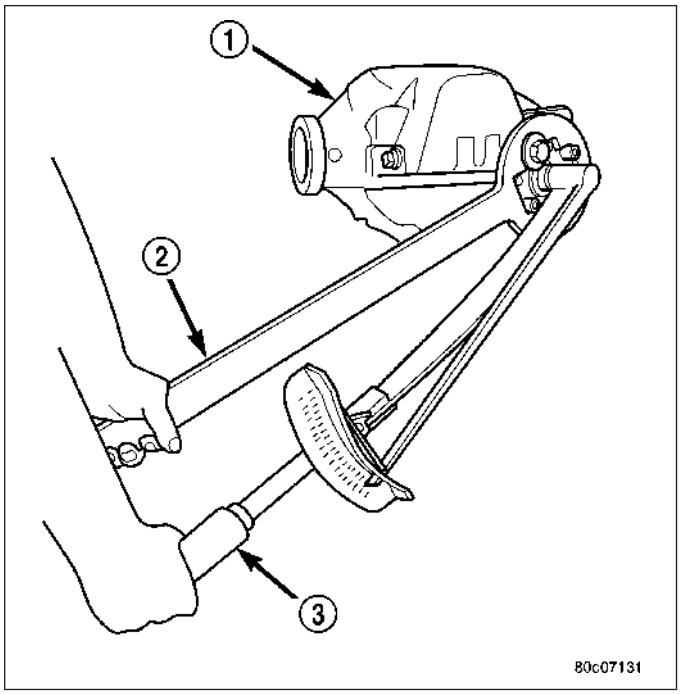
7. Install rear bearing (4) on pinion gear (3) with Installer C-3095-A (2) and a press (1).



8. Install a **new** collapsible spacer (1) on pinion shaft. Lubricate rear bearing and install pinion into the housing.

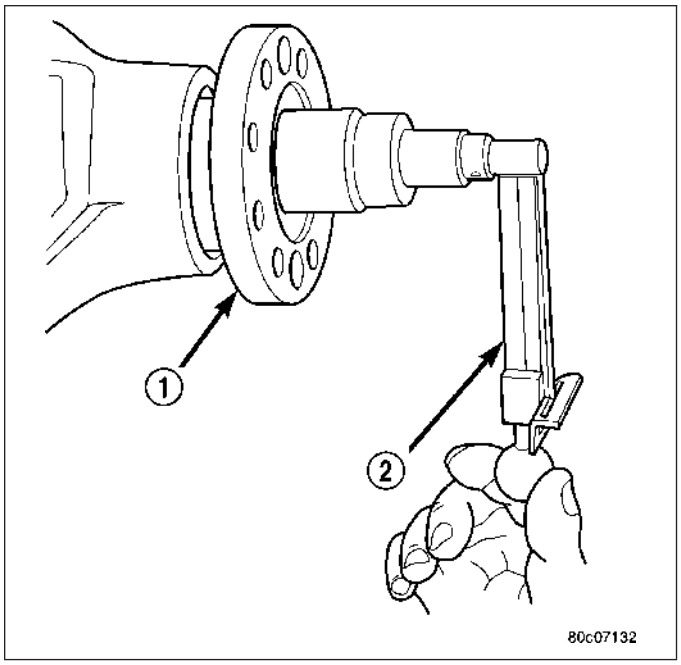


9. Install pinion flange with Installer C-3718.
10. Install bolts into two of the threaded holes in the flange 180° apart.
11. Position Holder 6719 against the flange and install a bolt and washer into one of the remaining threaded holes. Tighten bolts so the Holder 6719 is held to the flange.
12. Install flange washer and new nut on the pinion and tighten nut until there is zero bearing end-play.
13. With a torque wrench (3) tighten the pinion nut to 285 N·m (210 ft. lbs.).



CAUTION: Never loosen pinion nut to decrease pinion rotating torque and never exceed specified preload torque. If preload torque or rotating torque is exceeded a new collapsible spacer must be installed. Failure to follow these instructions will result in damage.

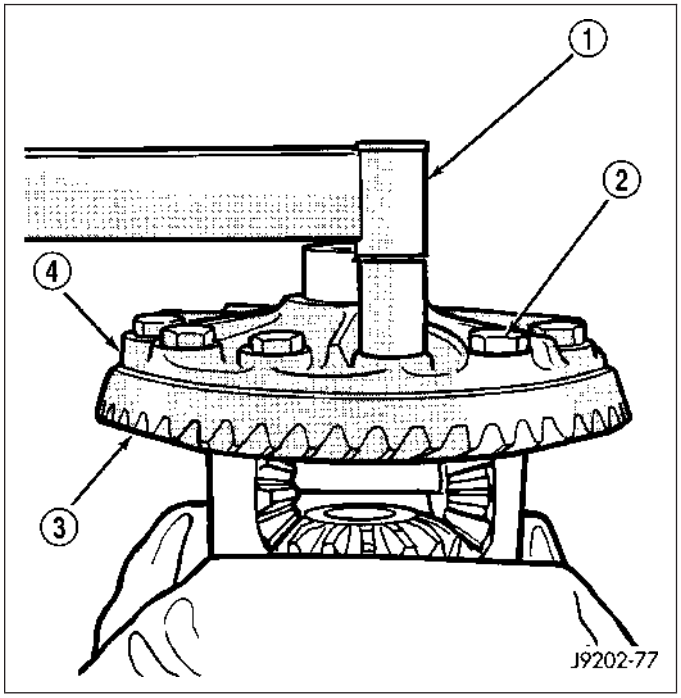
14. Slowly tighten pinion nut in 6.8 N·m (5 ft. lbs.) increments until the desired rotating torque is achieved. Measure the rotating torque frequently with an inch pound torque wrench (2) to avoid over crushing the collapsible spacer.
15. Check pinion rotating torque with an inch pound torque wrench. The pinion rotating torque should be:
    - Original Bearings: 1 to 3 N·m (10 to 20 in. lbs.).
    - New Bearings: 2 to 5 N·m (15 to 35 in. lbs.).
16. Position exciter ring on differential case. With a brass drift, slowly and evenly tap the exciter ring into position.



17. Position ring gear on the differential case and start two ring gear bolts. This will provide case-to-ring gear bolt hole alignment.
18. Invert the differential case in the vise.
19. Install **new** ring gear bolts (2) and alternately tighten to 156 N·m (115 ft. lbs.).

CAUTION: Never reuse the ring gear bolts. Failure to follow these instructions will result in bolts fracture.

20. Install differential in housing and verify gear mesh and contact pattern.



BRAKES

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BRAKES - BASE

DIAGNOSIS AND TESTING

BASE BRAKE SYSTEM

Base brake components consist of the brake pads, calipers, brake drum in hat rotor in the rear, rotors, brake lines, master cylinder, booster, and parking brake components.

Brake diagnosis involves determining if the problem is related to a mechanical, hydraulic, or vacuum operated component.

The first diagnosis step is the preliminary check.

PRELIMINARY BRAKE CHECK

1. Check condition of tires and wheels. Damaged wheels and worn, damaged, or underinflated tires can cause pull, shudder, vibration, and a condition similar to grab.
2. If complaint was based on noise when braking, check suspension components. Jounce front and rear of vehicle and listen for noise that might be caused by loose, worn or damaged suspension or steering components.
3. Inspect brake fluid level and condition. Note that the brake reservoir fluid level will decrease in proportion to normal lining wear. **Also note that brake fluid tends to darken over time. This is normal and should not be mistaken for contamination.**
   a. If fluid level is abnormally low, look for evidence of leaks at calipers, wheel cylinders, brake lines, and master cylinder.
   b. If fluid appears contaminated, drain out a sample to examine. System will have to be flushed if fluid is separated into layers, or contains a substance other than brake fluid. The system seals and cups will also have to be replaced after flushing. Use clean brake fluid to flush the system.

4. Check parking brake operation. Verify free movement and full release of cables and pedal. Also note if vehicle was being operated with parking brake partially applied.
5. Check brake pedal operation. Verify that pedal does not bind and has adequate free play. If pedal lacks free play, check pedal and power booster for being loose or for bind condition. Do not road test until condition is corrected.
6. Check booster vacuum check valve and hose.
7. If components checked appear OK, road test the vehicle.

ROAD TESTING

1. If complaint involved low brake pedal, pump pedal and note if it comes back up to normal height.
2. Check brake pedal response with transmission in Neutral and engine running. Pedal should remain firm under constant foot pressure.
3. During road test, make normal and firm brake stops in 10 mph range. Note faulty brake operation such as low pedal, hard pedal, fade, pedal pulsation, pull, grab, drag, noise, etc.
4. Attempt to stop the vehicle with the parking brake only and note grab, drag, noise, etc.

PEDAL FALLS AWAY

A brake pedal that falls away under steady foot pressure is generally the result of a system leak. The leak point could be at a brake line, fitting, hose, or caliper/wheel cylinder. If leakage is severe, fluid will be evident at or around the leaking component.

Internal leakage (seal by-pass) in the master cylinder caused by worn or damaged piston cups, may also be the problem cause.

An internal leak in the ABS system may also be the problem with no physical evidence.

LOW PEDAL

If a low pedal is experienced, pump the pedal several times. If the pedal comes back up worn linings, rotors, drums, or rear brakes out of adjustment are the most likely causes. The proper course of action is to inspect and replace all worn component and make the proper adjustments.

SPONGY PEDAL

A spongy pedal is most often caused by air in the system. However, thin brake drums or substandard brake lines and hoses can also cause a spongy pedal. The proper course of action is to bleed the system, and replace thin drums and substandard quality brake hoses if suspected.

HARD PEDAL OR HIGH PEDAL EFFORT

A hard pedal or high pedal effort may be due to lining that is water soaked, contaminated, glazed, or badly worn. The power booster or check valve could also be faulty.

PEDAL PULSATION

Pedal pulsation is caused by components that are loose, or beyond tolerance limits.

The primary cause of pulsation are disc brake rotors with excessive lateral runout or thickness variation, or out of round brake drums (If Equipped). Other causes are loose wheel bearings or calipers and worn, damaged tires.

NOTE: Some pedal pulsation may be felt during ABS activation.

BRAKE DRAG

Brake drag occurs when the lining is in constant contact with the rotor or drum. Drag can occur at one wheel, all wheels, fronts only, or rears only.

Drag is a product of incomplete brake shoe release. Drag can be minor or severe enough to overheat the linings, rotors and drums.

Minor drag will usually cause slight surface charring of the lining. It can also generate hard spots in rotors and drums from the overheat-cool down process. In most cases, the rotors, drums, wheels and tires are quite warm to the touch after the vehicle is stopped.

Severe drag can char the brake lining all the way through. It can also distort and score rotors and drums to the point of replacement. The wheels, tires and brake components will be extremely hot. In severe cases, the lining may generate smoke as it chars from overheating.

Common causes of brake drag are:

- Seized or improperly adjusted parking brake cables.
- Loose/worn wheel bearing.
- Seized caliper or wheel cylinder piston.
- Caliper binding on corroded bushings or rusted slide surfaces.
- Loose caliper mounting.
- Drum brake shoes binding on worn/damaged support plates.
- Mis-assembled components.
- Long booster output rod.

If brake drag occurs at all wheels, the problem may be related to a blocked master cylinder return port, or faulty power booster (binds-does not release).

BRAKE FADE

Brake fade is usually a product of overheating caused by brake drag. However, brake overheating and resulting fade can also be caused by riding the brake pedal, making repeated high deceleration stops in a short time span, or constant braking on steep mountain roads. Refer to the Brake Drag information in this section for causes.

BRAKE PULL

Front brake pull condition could result from:

- Contaminated lining in one caliper
- Seized caliper piston
- Binding caliper
- Loose caliper
- Rusty caliper slide surfaces
- Improper brake pads
- Damaged rotor

A worn, damaged wheel bearing or suspension component are further causes of pull. A damaged front tire (bruised, ply separation) can also cause pull.

A common and frequently misdiagnosed pull condition is where direction of pull changes after a few stops. The cause is a combination of brake drag followed by fade at one of the brake units.

As the dragging brake overheats, efficiency is so reduced that fade occurs. Since the opposite brake unit is still functioning normally, its braking effect is magnified. This causes pull to switch direction in favor of the normally functioning brake unit.

An additional point when diagnosing a change in pull condition concerns brake cool down. Remember that pull will return to the original direction, if the dragging brake unit is allowed to cool down (and is not seriously damaged).

REAR BRAKE GRAB OR PULL

Rear grab or pull is usually caused by improperly adjusted or seized parking brake cables, contaminated lining, bent or binding shoes and support plates, or improperly assembled components. This is particularly true when only one rear wheel is involved. However, when both rear wheels are affected, the master cylinder or proportioning valve could be at fault.

BRAKES DO NOT HOLD AFTER DRIVING THROUGH DEEP WATER PUDDLES

This condition is generally caused by water soaked lining. If the lining is only wet, it can be dried by driving with the brakes very lightly applied for a mile or two. However, if the lining is both soaked and dirt contaminated, cleaning and/or replacement will be necessary.

BRAKE LINING CONTAMINATION

Brake lining contamination is mostly a product of leaking calipers or worn seals, driving through deep water puddles, or lining that has become covered with grease and grit during repair. Contaminated lining should be replaced to avoid further brake problems.

WHEEL AND TIRE PROBLEMS

Some conditions attributed to brake components may actually be caused by a wheel or tire problem.

A damaged wheel can cause shudder, vibration and pull. A worn or damaged tire can also cause pull.

Severely worn tires with very little tread left can produce a grab-like condition as the tire loses and recovers traction. Flat-spotted tires can cause vibration and generate shudder during brake operation. A tire with internal damage such as a severe bruise, cut, or ply separation can cause pull and vibration.

BRAKE NOISES

Some brake noise is common with rear drum brakes and on some disc brakes during the first few stops after a vehicle has been parked overnight or stored. This is primarily due to the formation of trace corrosion (light rust) on metal surfaces. This light corrosion is typically cleared from the metal surfaces after a few brake applications causing the noise to subside.

BRAKE SQUEAK/SQUEAL

Brake squeak or squeal may be due to linings that are wet or contaminated with brake fluid, grease, or oil. Glazed linings and rotors with hard spots can also contribute to squeak. Dirt and foreign material embedded in the brake lining will also cause squeak/squeal.

A very loud squeak or squeal is frequently a sign of severely worn brake lining. If the lining has worn through to the brake pads in spots, metal-to-metal contact occurs. If the condition is allowed to continue, rotors can become so scored that replacement is necessary.

BRAKE CHATTER

Brake chatter is usually caused by loose or worn components, or glazed/burnt lining. Rotors with hard spots can also contribute to chatter. Additional causes of chatter are out-of-tolerance rotors, brake lining not securely attached to the shoes, loose wheel bearings and contaminated brake lining.

THUMP/CLUNK NOISE

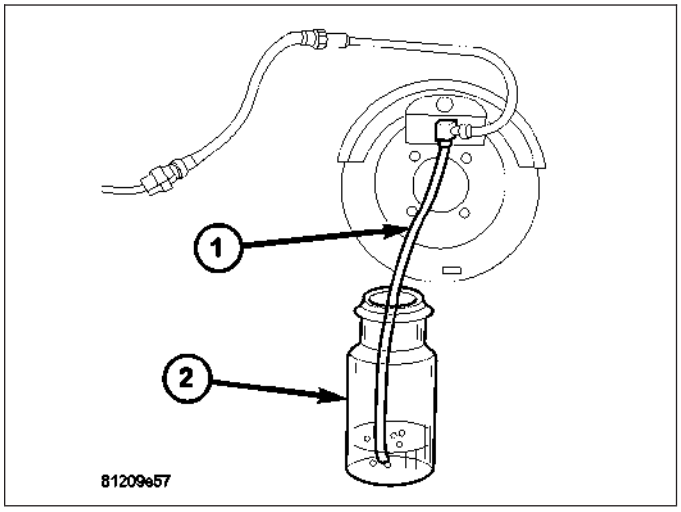
Thumping or clunk noises during braking are frequently **not** caused by brake components. In many cases, such noises are caused by loose or damaged steering, suspension, or engine components. However, calipers that bind on the slide surfaces can generate a thump or clunk noise.

STANDARD PROCEDURE

MANUAL BLEEDING

Use Mopar brake fluid, or an equivalent quality fluid meeting SAE J1703-F and DOT 3 standards only. Use fresh, clean fluid from a sealed container at all times.

1. Remove reservoir filler caps and fill reservoir.
2. If calipers were overhauled, open all caliper bleed screws. Then close each bleed screw as fluid starts to drip from it. Top off master cylinder reservoir once more before proceeding.
3. Attach one end of bleed hose (1) to bleed screw and insert opposite end in glass container (2) partially filled with brake fluid. Be sure end of bleed hose is immersed in fluid.



NOTE: Bleed procedure should be in this order (1) Right rear (2) Left rear (3) Right front (4) Left front.

4. Open up bleeder, then have a helper press down the brake pedal. Once the pedal is down close the bleeder. Repeat bleeding until fluid stream is clear and free of bubbles. Then move to the next wheel.
5. Before moving the vehicle verify the pedal is firm and not mushy.
6. Top off the brake fluid and install the reservoir cap.

PRESSURE BLEEDING

Use Mopar brake fluid, or an equivalent quality fluid meeting SAE J1703-F and DOT 3 standards only. Use fresh, clean fluid from a sealed container at all times.

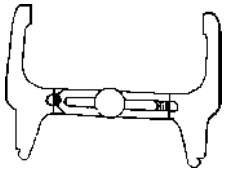
Follow the manufacturers instructions carefully when using pressure equipment. Do not exceed the tank manufacturers pressure recommendations. Generally, a tank pressure of 15-20 psi is sufficient for bleeding.

Fill the bleeder tank with recommended fluid and purge air from the tank lines before bleeding.

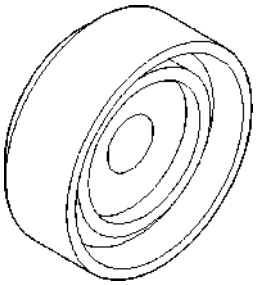
Do not pressure bleed without a proper master cylinder adapter. The wrong adapter can lead to leakage, or drawing air back into the system.

SPECIAL TOOLS

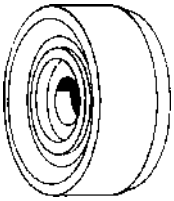
BASE BRAKES



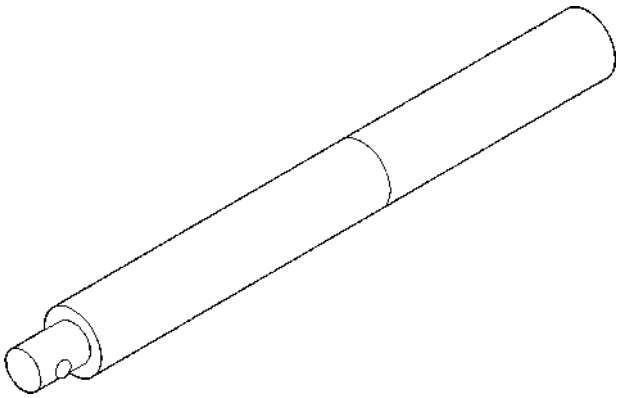
GAUGE, BRAKE SAFE-SET C-3919



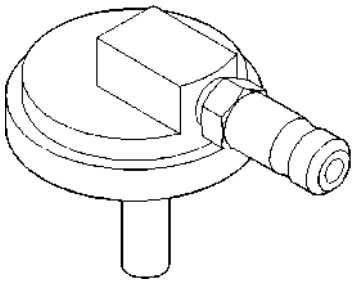
INSTALLER, BRAKE CALIPER DUST BOOT C-4340



INSTALLER, BRAKE CALIPER DUST BOOT C-3716-A



HANDLE C-4171

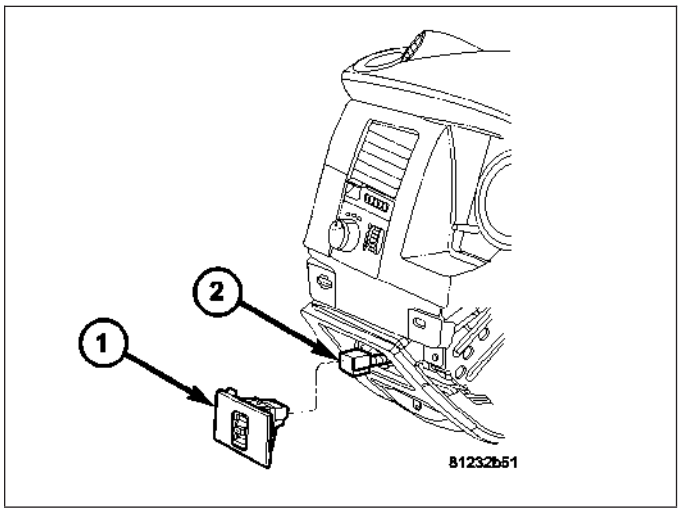


CAP, MASTER CYLINDER PRESSURE BLEED 6921

SWITCH-ADJUSTABLE PEDALS

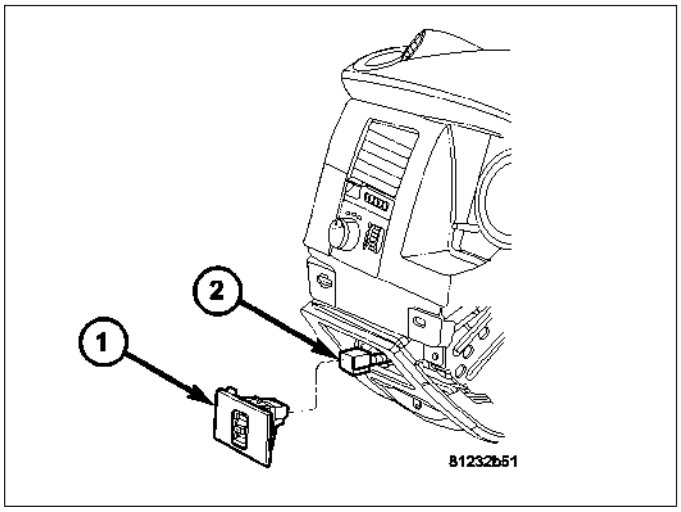
REMOVAL

1. Remove the lower drivers side bezel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL DR SIDE BEZEL - REMOVAL).
2. Disconnect the electrical connector (2) from the adjustable pedal switch(1).
3. Remove the switch from the lower drivers side bezel by squeezing the retaining clips together and pushing the switch outwards



INSTALLATION

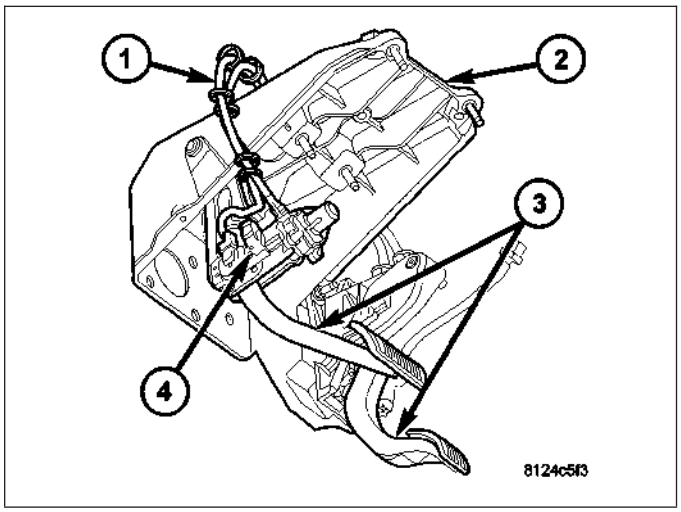
1. Install the switch to the lower drivers side bezel by pushing the switch inwards seating the retaining clips to the lower drivers side bezel.
2. Reconnect the electrical connector to the adjustable pedal switch.
3. Install the lower drivers side bezel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL DR SIDE BEZEL - INSTALLATION).



MOTOR-ADJUSTABLE PEDALS

DESCRIPTION

NOTE: The Adjustable Pedal Motor (4) is not serviced separately. The Adjustable Pedal Motor (4) comes as an assembly which includes the aluminum pedals bracket (2), pedals (3), cables (1) and motor (4).



The Adjustable Pedals System (APS) is designed to enable the fore and aft repositioning of the brake and accelerator pedals. This results in improved ergonomics in relation to the steering wheel for taller and shorter drivers. Being able to adjust the pedal positions also allows the driver to set steering wheel tilt and seat position to the most comfortable position. The position of the brake and accelerator pedals can be adjusted without compromising safety or comfort in actuating the pedals.

Change of pedal position is accomplished by means of a motor driven screw. Operating the adjustable pedal switch activates the pedal drive motor. The pedal drive motor turns a screw that changes the position of the brake and accelerator pedals. The pedal can be moved rearward (closer to the driver) or forward (away from driver). The brake pedal is moved on its drive screw to a position where the driver feels most comfortable.

The accelerator pedal is moved at the same time and the same distance as the brake pedal.

Neither the pedal drive motor nor drive mechanism are subject to the mechanical stress of brake or accelerator application.

- SYSTEM FEATURES:
  - Range of Adjustment: The pedals may be adjusted up to 3 in. (75 mm)
  - Pedal Adjustment Speed: 0.5 in./sec (12.5 mm/sec)
  - Pedal Adjustment Inhibitors: Pedal adjustment is inhibited when the vehicle is in reverse or when cruise control is activated.

REMOVAL

The Adjustable Pedal Motor is not serviced separately, It is service as an assembly. For service refer to the brake pedal replacement (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/PEDAL - REMOVAL).

HYDRAULIC/MECHANICAL

SPECIFICATIONS

TORQUE CHART

TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Brake Booster Mounting Nuts	28	21	250
Master Cylinder Mounting Nuts	10	—	90
Caliper Mounting Pins Front	32	24	—

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Caliper Mounting Pins Rear	15	11	—
Caliper Adapter Mounting Bolts Front	176	130	—
Caliper Adapter Mounting Bolts Rear	135	100	—
Junction Block Bolts To Frame	10	7.5	—
Brake Pedal Assembly Bracket Nuts	8	—	75
Support Plate Mounting Bolts/Nuts	64	47	—
Brake Line Fittings Master Cylinder	19	14	170
Brake Line Fittings Junction Block	19	14	170
Caliper Brake Line Banjo Bolt Front	28	21	250
Caliper Brake Line Banjo Bolt Rear	28	21	250
Brake Hose Front Fitting	19	14	170
Brake Hose Rear Fitting	19	14	170
Parking Brake Pedal Assembly	14	—	125
Hub/Bearing Bolts	163	120	—

BASE BRAKE

SPECIFICATIONS

DESCRIPTION	SPECIFICATION
Front Disc Brake Caliper Type	Dual Piston Sliding
Rear Disc Brake Caliper Type	Single Piston Sliding
Front Disc Brake Caliper	2X54 mm (2.00 in.)
Front Disc Brake Rotor	336×28 mm (13.2×1.1 in.)
Front Disc Brake Rotor Max. Runout	0.025 mm (0.001 in.)
Rear Disc Brake Rotor Max. Runout	0.127 mm (0.005 in.)

DESCRIPTION	SPECIFICATION
Front Disc Brake Rotor Max. Thickness Variation	0.010 mm (0.0004 in.)
Rear Disc Brake Rotor Max. Thickness Variation	0.025 mm (0.001 in.)
Minimum Front Rotor Thickness	26.4 mm (1.039 in.)
Mininium Rear Rotor Thickness	28.39 mm (1.117 in)
Rear Disc Brake Caliper	1x54 mm (2.12 in)
Rear Disc Brake Rotor	350x22 mm (13.9X.87 in)
Brake Booster Type Gasoline Engines	Vacuum Dual Diaphragm

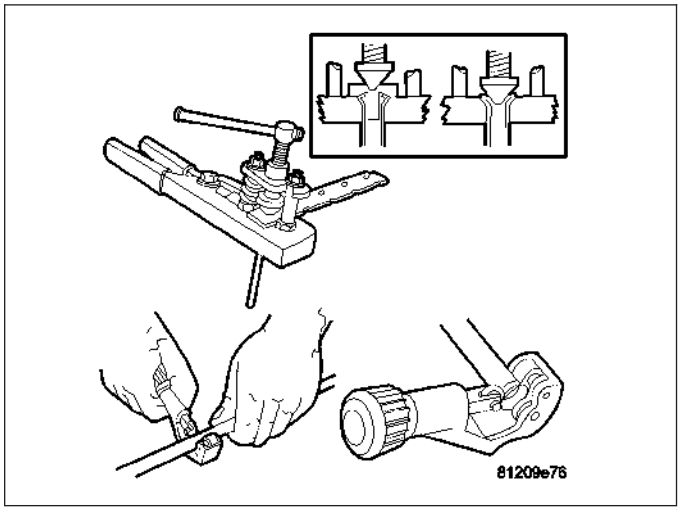
BRAKE LINES

STANDARD PROCEDURE

DOUBLE INVERTED FLARING

A preformed metal brake tube is recommended and preferred for all repairs. However, double-wall steel tube can be used for emergency repair when factory replacement parts are not readily available.

1. Cut off damaged tube with Tubing Cutter.
2. Ream cut edges of tubing to ensure proper flare.
3. Install replacement tube nut on the tube.
4. Insert tube in flaring tool.
5. Place gauge form over the end of the tube.
6. Push tubing through flaring tool jaws until tube contacts recessed notch in gauge that matches tube diameter.
7. Tighten the tool bar on the tube
8. Insert plug on gauge in the tube. Then swing compression disc over gauge and center tapered flaring screw in recess of compression disc.
9. Tighten tool handle until plug gauge is squarely seated on jaws of flaring tool. This will start the inverted flare.



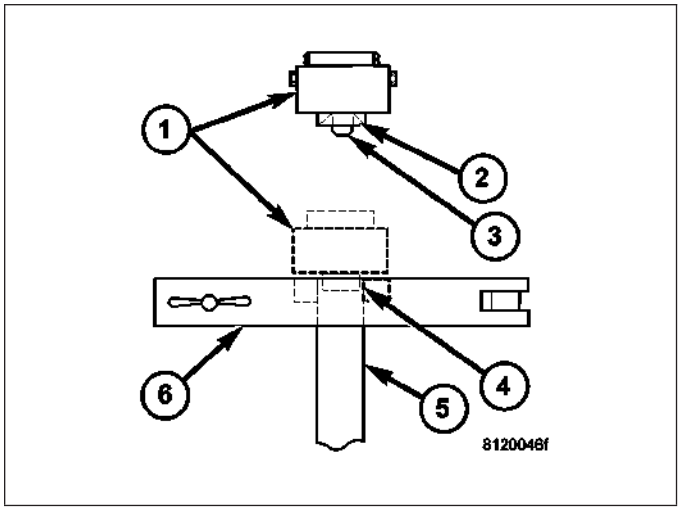
10. Remove the plug gauge and complete the inverted flare.

ISO FLARING

A preformed metal brake tube is recommended and preferred for all repairs. However, double-wall steel tube can be used for emergency repair when factory replacement parts are not readily available.

To make a ISO flare use an ISO flaring tool kit.

1. Cut off damaged tube with Tubing Cutter.
2. Remove any burrs from the inside of the tube.
3. Install tube nut on the tube.
4. Position the tube in the flaring tool flush with the top of the tool bar (6). Then tighten the tool bar on the tube.
5. Install the correct size adaptor (1) on the flaring tool yoke screw.
6. Lubricate the adaptor (2).
7. Align the adaptor and yoke screw over the tube.
8. Turn the yoke screw in until the adaptor is squarely seated on the tool bar.



REMOVAL

REAR BRAKE LINES

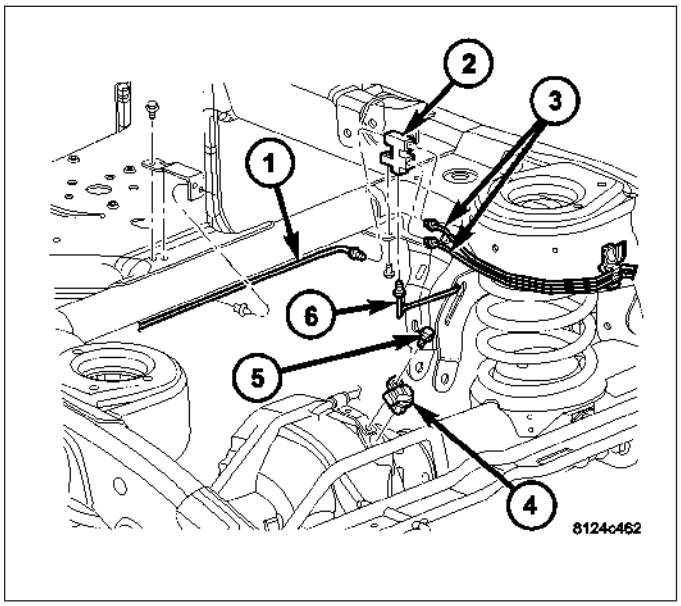
1. Raise and support the vehicle.

NOTE: If brake line (6) is being replaced

2. Remove the brake line (6) from the junction block (2) at the frame, then remove the other end of the line at the caliper hose connection.

NOTE: If brake line (1) is being replaced

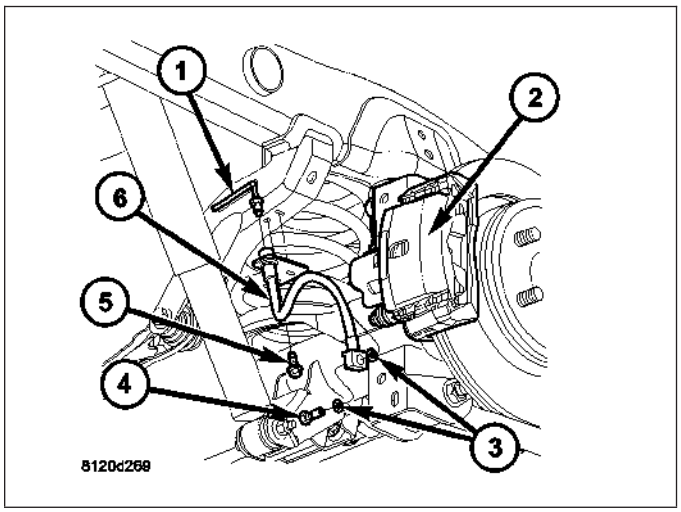
3. Remove the brake line (1) from the junction block (2) at the frame, then remove the other end of the line at the caliper hose connection.
4. Remove the line being replaced.



CALIPER HOSE ASSEMBLY

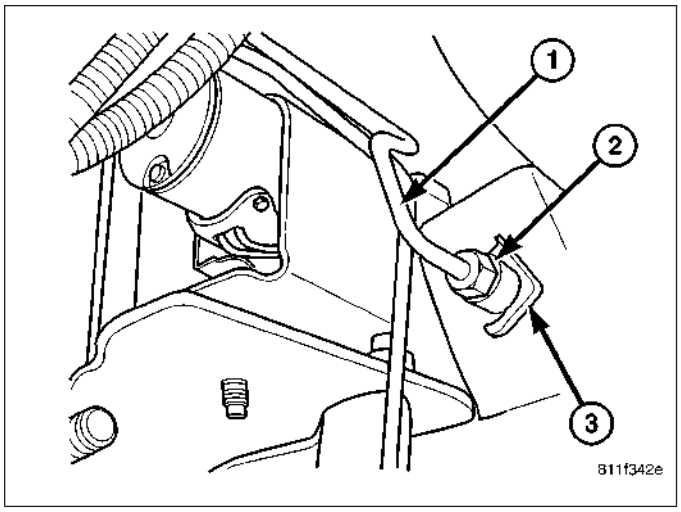
NOTE: The axle should be supported in the normal curb position for rear brake hose change.

1. Raise and support the vehicle.
2. Remove the brake line going into the brake hose.
3. Remove the mounting bolt for the brake hose at the frame.
4. Remove the banjo bolt (4) at the caliper (2) and discard the copper washers (3).
5. Remove the hose (6).

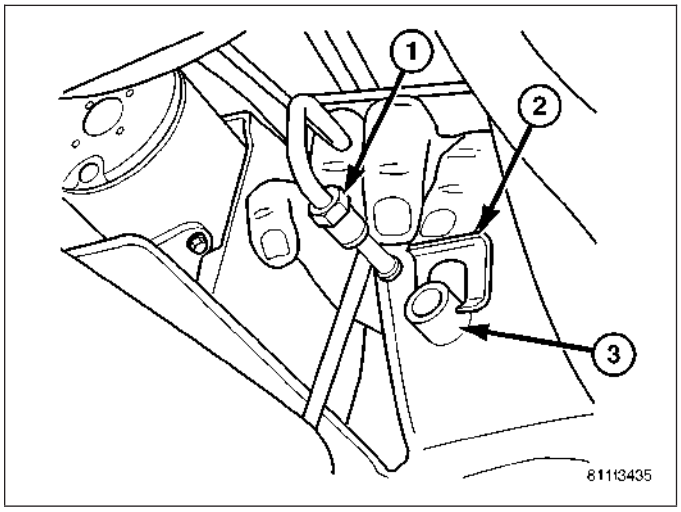


FRONT HOSE

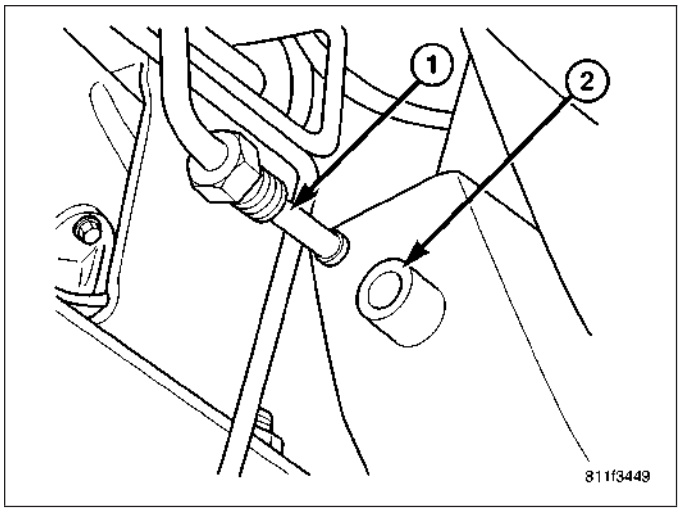
1. Raise and support vehicle.
2. Remove the tire and wheel assembly.
3. Loosen the brake line (1) from the brake hose (2) at the frame.



4. Remove the brake line (1) from the brake hose (3) and remove the retaining clip (2) located at the frame.



5. Remove the retaining clip from the brake hose (2).
6. Remove the brake hose banjo bolt at the caliper.
7. Remove the hose.



INSTALLATION

REAR BRAKE LINE

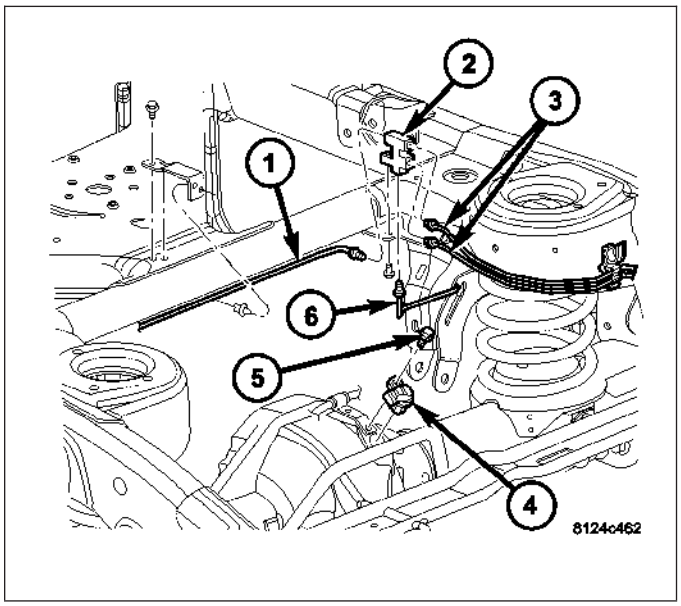
1. Install the line.

NOTE: If brake line (6) was replaced

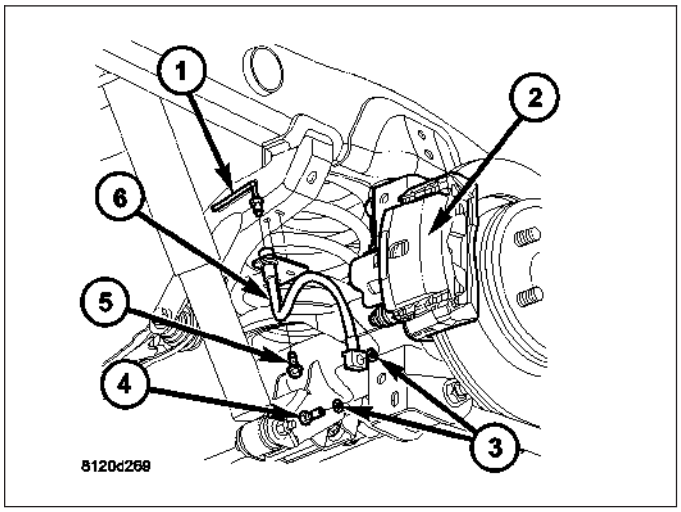
2. Install the brake line (6) at the junction block (2) located at the frame.
3. Install the brake line (6) at the brake caliper hose.

NOTE: If brake line (1) was replaced

4. Install the brake line (1) at the junction block located at the frame.

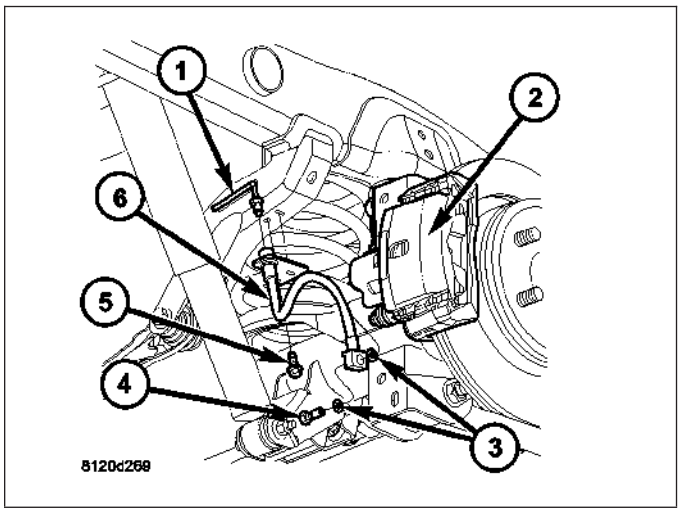


5. Install the brake line (1) at the brake caliper hose (6).
6. Lower the vehicle and remove the support.
7. Bleed the brake system (Refer to 5 - BRAKES - STANDARD PROCEDURE).



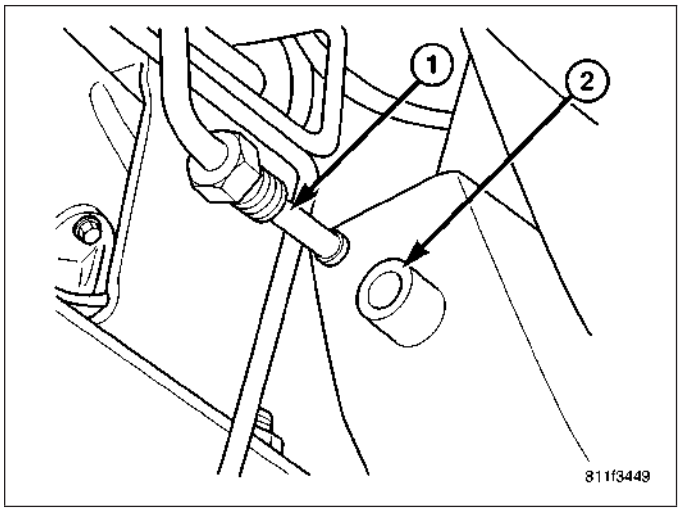
CALIPER HOSE ASSEMBLY

1. Install the hose (6).
2. Install the banjo bolt (4) and new cooper washers (3) at the caliper (2).
3. Install the mounting bolt (5) for the brake hose (6) at the frame.
4. Install the brake line (1) into the caliper hose (6).
5. Lower the vehicle and remove the support.
6. Bleed the brake system (Refer to 5 - BRAKES - STANDARD PROCEDURE).

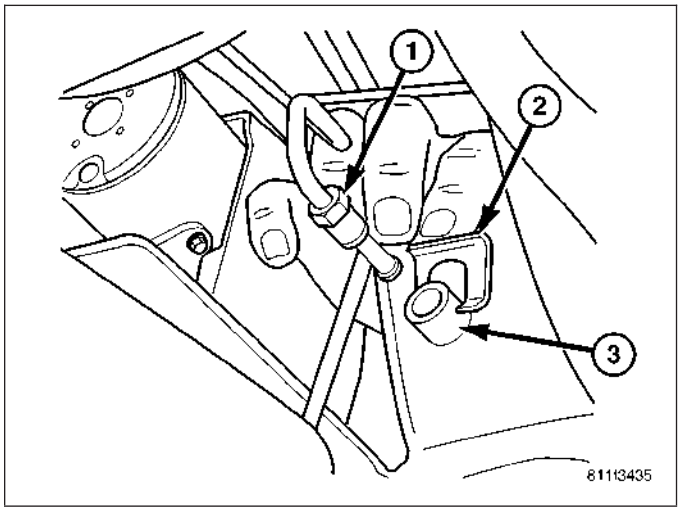


FRONT BRAKE HOSE

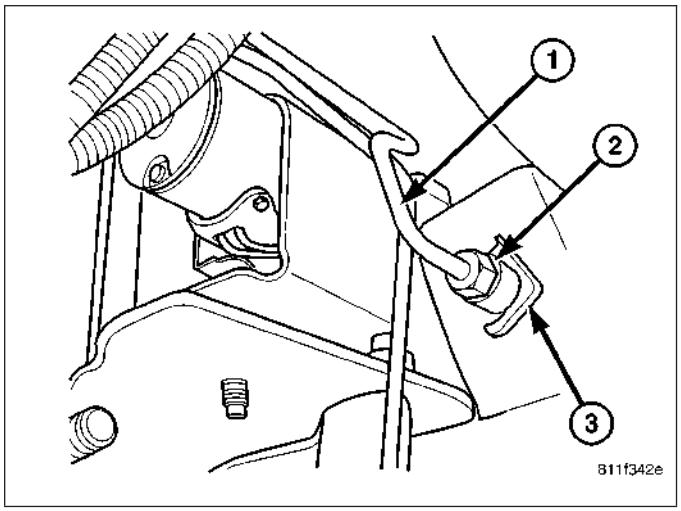
1. Install the brake hose (2) in position.



2. Install the retaining clip (2) for the brake hose (3) at the frame.



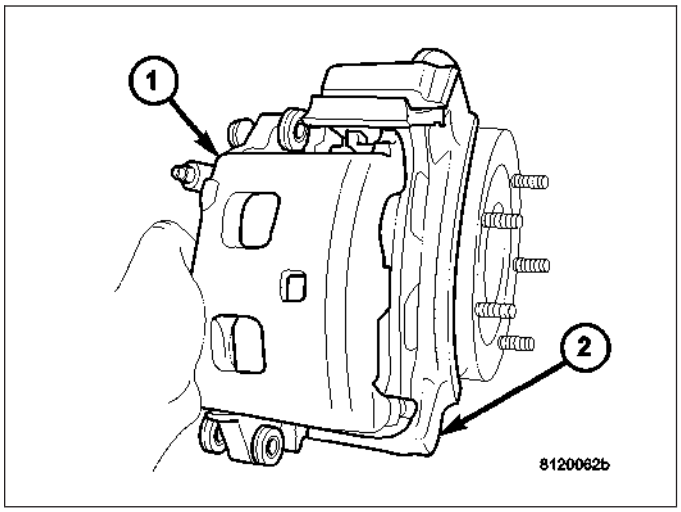
3. Install the brake line (1) into the brake hose (2) and tighten to 19 N·m (250 in.lbs).
4. Install the brake hose banjo bolt at the caliper and tighten to 27 N·m (245 in.lbs).
5. Remove the support and lower the vehicle.
6. Bleed the brake system (Refer to 5 - BRAKES - STANDARD PROCEDURE).



BRAKE PADS/SHOES

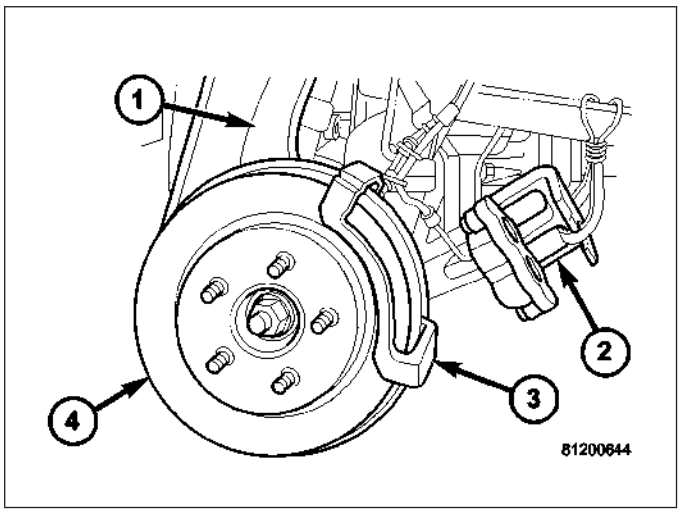
REMOVAL

1. Raise and support vehicle.
2. Remove the wheel and tire assemblies.
3. Compress the caliper.
4. Remove the caliper, (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - REMOVAL).
5. Remove the caliper by tilting the top up and off the caliper adapter.

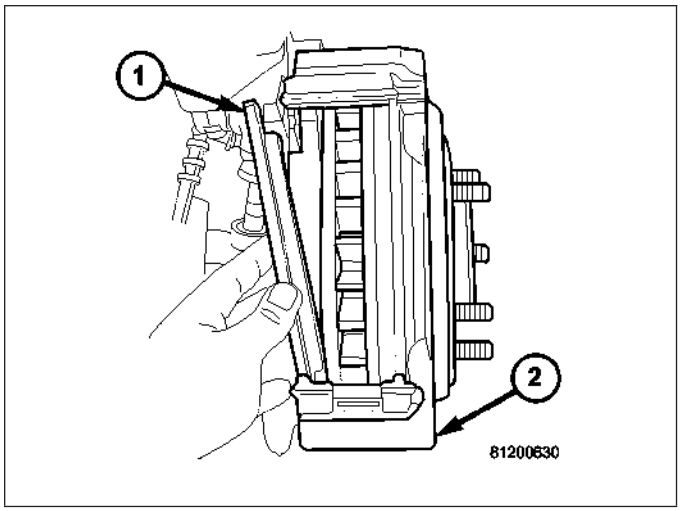


NOTE: Do not allow brake hose to support caliper assembly.

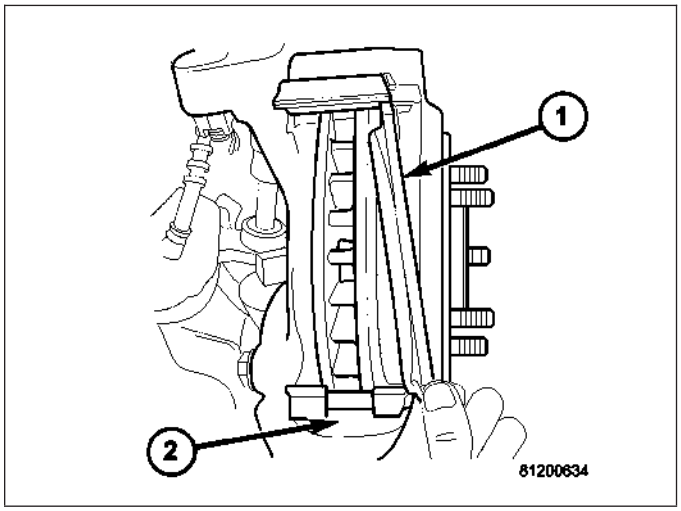
6. Support and hang the caliper.



7. Remove the inboard brake shoe from the caliper adapter.

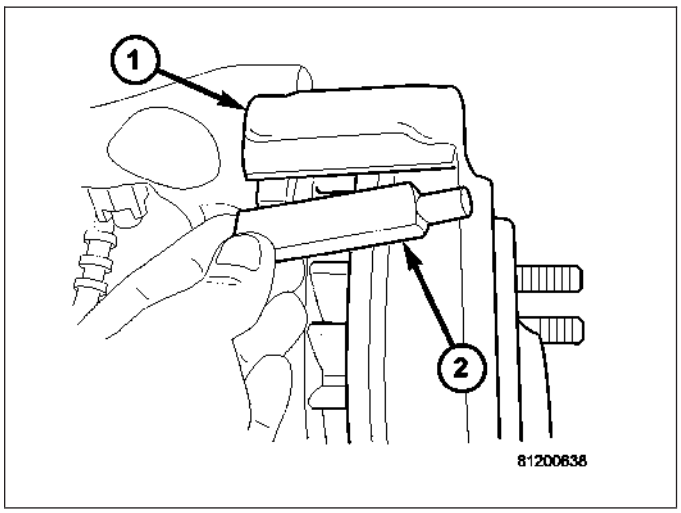


8. Remove the outboard brake shoe from the caliper adapter.

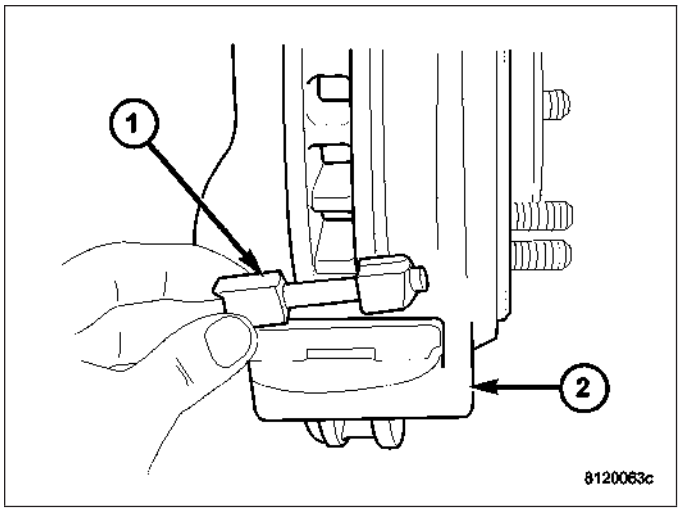


NOTE: Anti-rattle springs are not interchangeable.

9. Remove the top anti-rattle springs from the caliper adapter.



10. Remove the bottom anti-rattle springs from the caliper adapter.

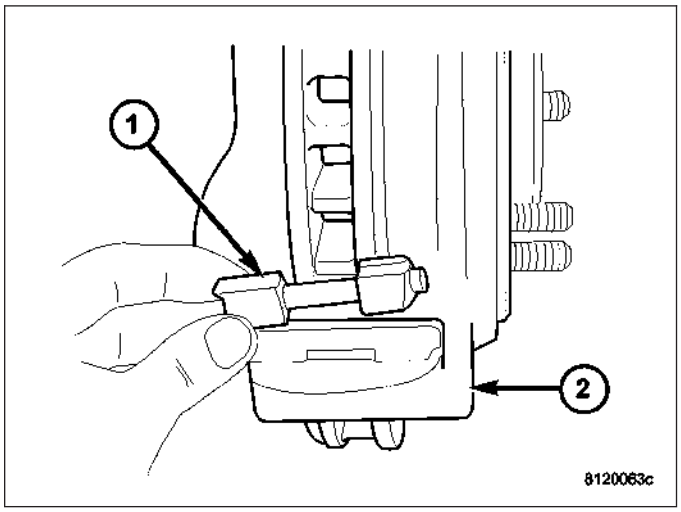


INSTALLATION

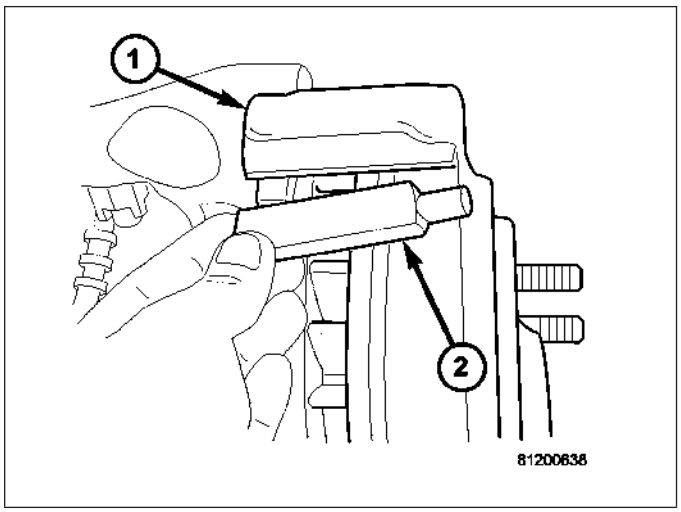
1. Bottom pistons in caliper bore with C-clamp. Place an old brake shoe between a C-clamp and caliper piston.
2. Clean caliper mounting adapter and anti-rattle springs.
3. Lubricate anti-rattle springs with Mopar brake grease.

NOTE: Anti-rattle springs are not interchangeable.

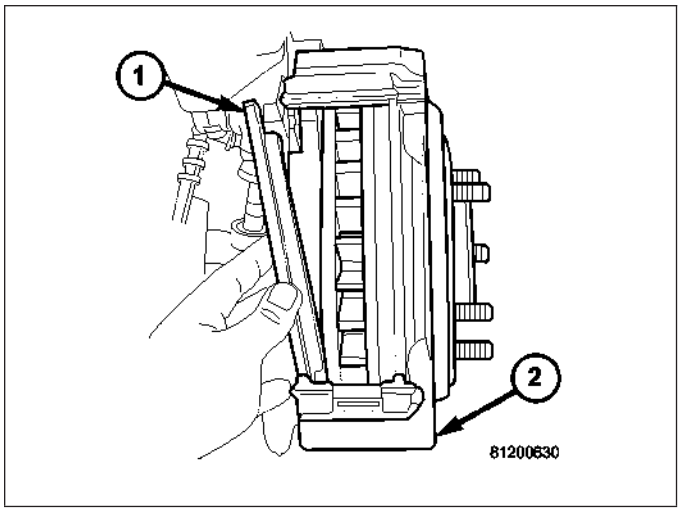
4. Install the bottom anti-rattle springs.



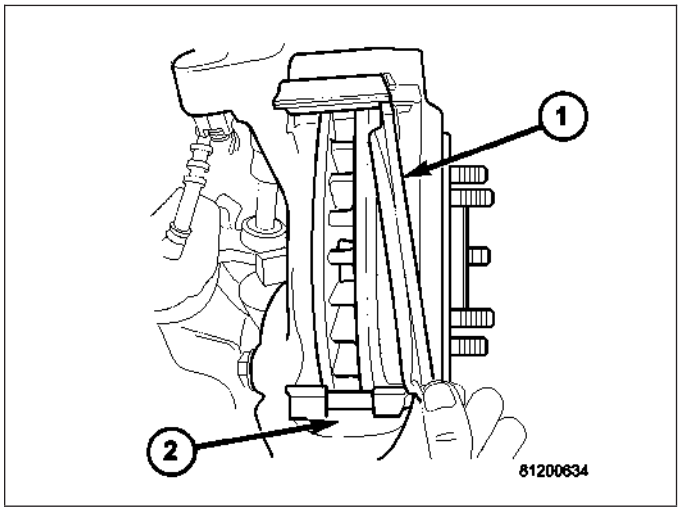
5. Install the top anti-rattle springs.



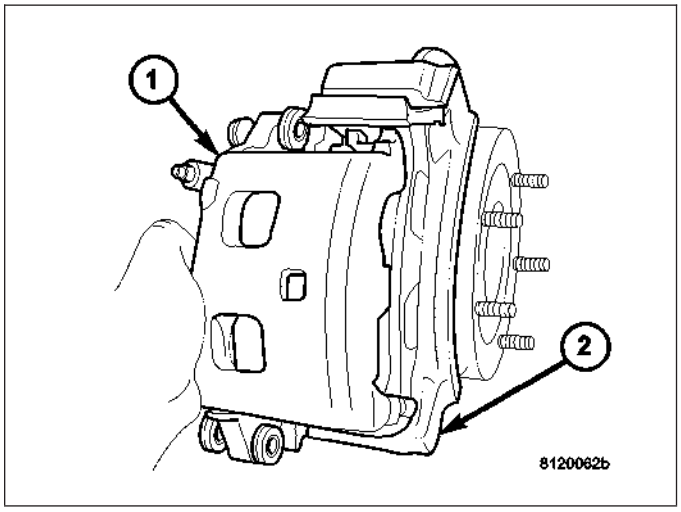
6. Install inboard brake shoe in adapter.



7. Install outboard brake shoe in adapter.



8. Tilt the top of the caliper over rotor and under adapter. Then push the bottom of the caliper down onto the adapter.
9. Install caliper, (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - INSTALLATION).
10. Install wheel and tire assemblies and lower vehicle, (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).
11. Apply brakes several times to seat caliper pistons and brake shoes and obtain firm pedal.
12. Top off master cylinder fluid level.



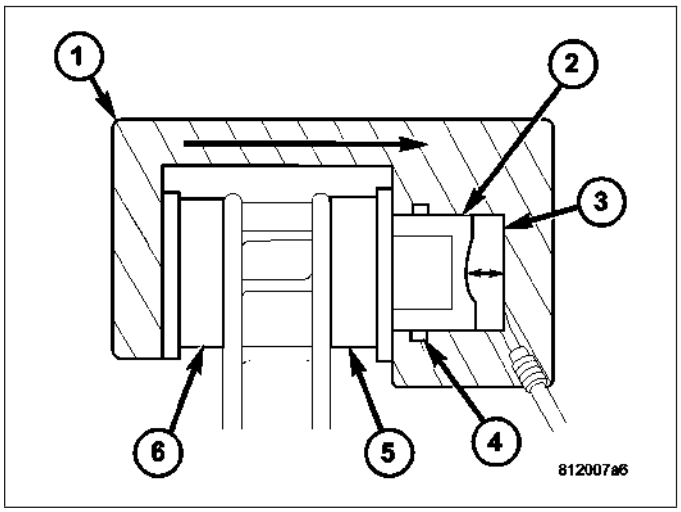
DISC BRAKE CALIPERS

DESCRIPTION

The calipers are a single piston type in the rear and dual piston type in the front. The calipers are free to slide laterally, this allows continuous compensation for lining wear.

OPERATION

When the brakes are applied fluid pressure is exerted against the caliper piston (2). The fluid pressure is exerted equally and in all directions. This means pressure exerted against the caliper piston and within the caliper bore will be equal.



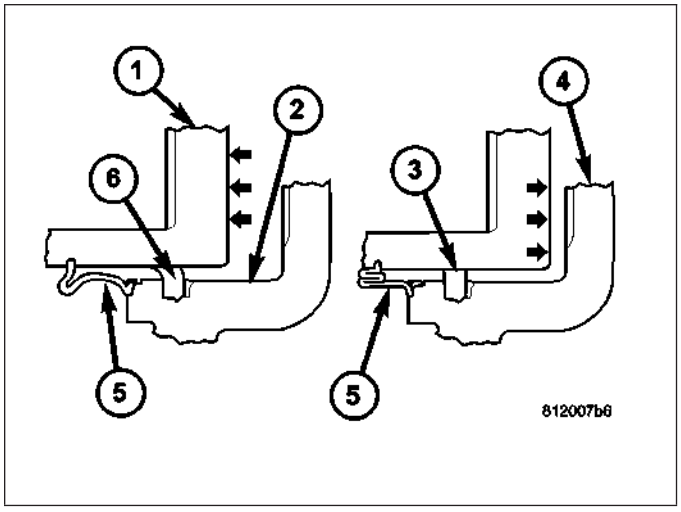
Fluid pressure applied to the piston is transmitted directly to the inboard brake pad (5). This forces the pad lining against the inner surface of the disc brake rotor. At the same time, fluid pressure within the piston bore forces the caliper to slide inward on the mounting bolts. This action brings the outboard brake pad lining (6) into contact with the outer surface of the disc brake rotor.

In summary, fluid pressure acting simultaneously on both piston and caliper, produces a strong clamping action. When sufficient force is applied, friction will attempt to stop the rotors from turning and bring the vehicle to a stop.

Application and release of the brake pedal generates only a very slight movement of the caliper and piston. Upon release of the pedal, the caliper and piston return to a rest position. The brake pads do not retract an appreciable distance from the rotor. In fact, clearance is usually at, or close to zero. The reasons for this are to keep road debris from getting between the rotor and lining and in wiping the rotor surface clear each revolution.

The caliper piston seal (4) controls the amount of piston (2) extension needed to compensate for normal lining wear.

During brake application, the seal is deflected outward by fluid pressure and piston movement(6). When the brakes (and fluid pressure) are released, the seal relaxes and retracts the piston (3).



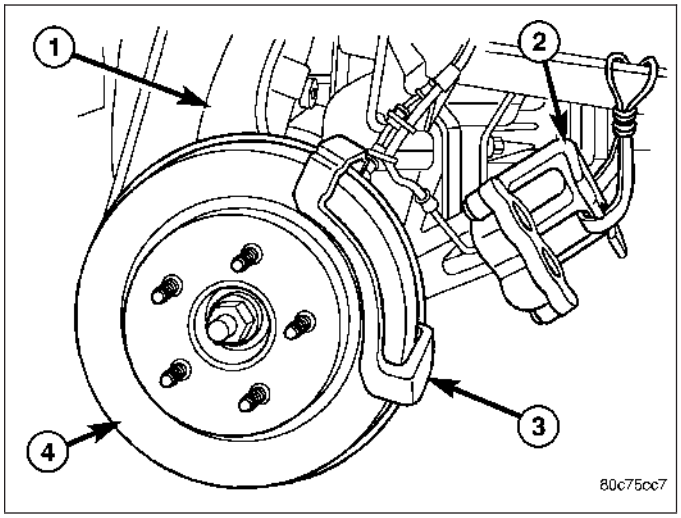
The amount of piston retraction is determined by the amount of seal deflection. Generally the amount is just enough to maintain contact between the piston and inboard brake pad.

REMOVAL

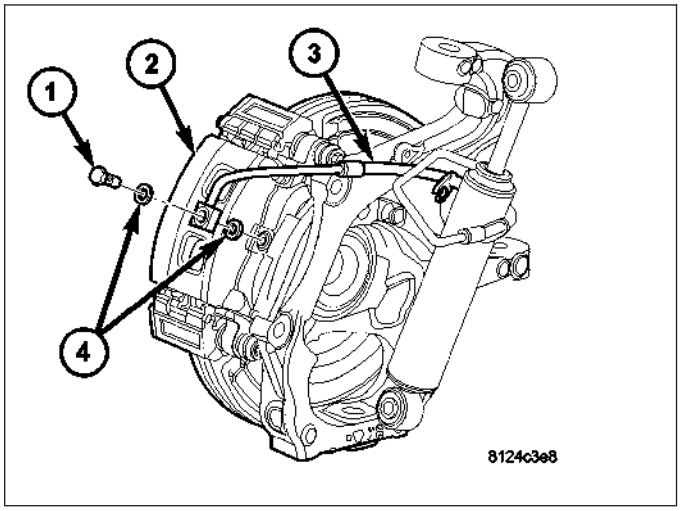
FRONT

CAUTION: Never allow the disc brake caliper to hang from the brake hose. Damage to the brake hose with result. Provide a suitable support to hang the caliper securely.

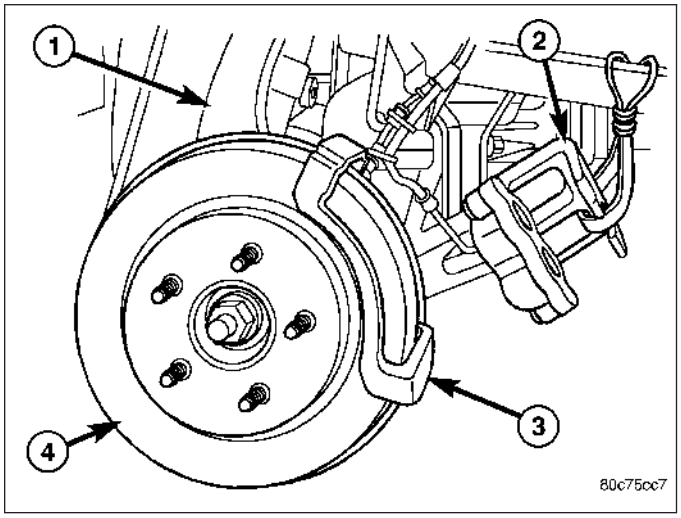
1. Raise and support the vehicle.
2. Remove the tire and wheel assembly.
3. Compress the disc brake caliper (2).



4. Remove the banjo bolt (1) and discard the copper washers (4).

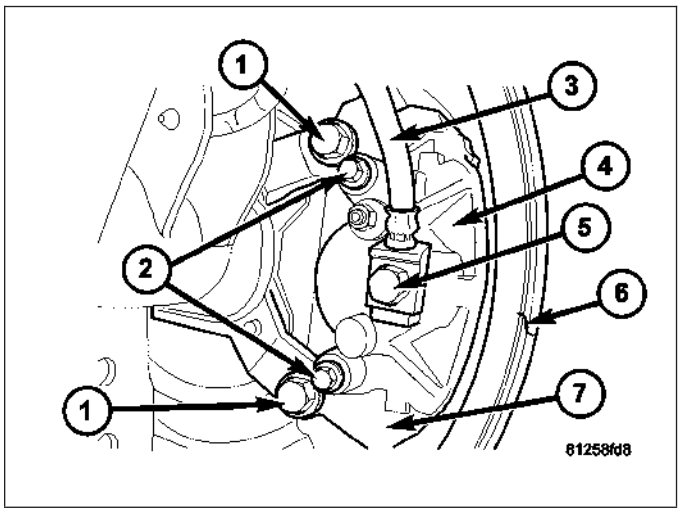


5. Remove the caliper slide pin bolts.
6. Remove the disc brake caliper from the caliper adapter (3).



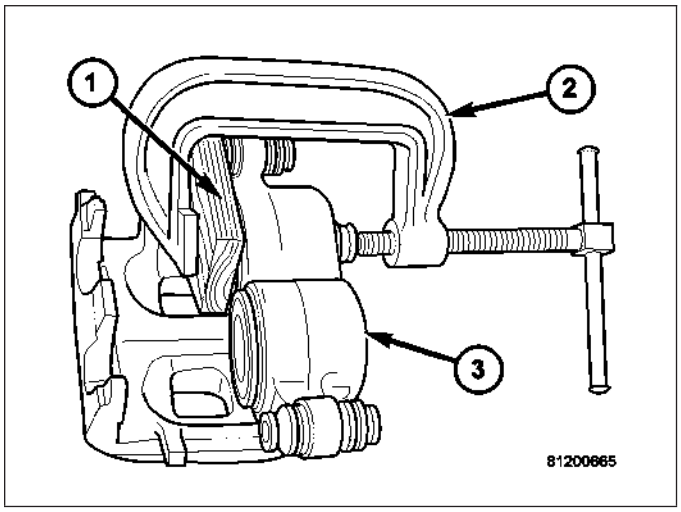
REAR

1. Raise and support vehicle.
2. Remove the wheel and tire assembly (6).
3. Drain small amount of fluid from master cylinder brake reservoir with suction gun.
4. Remove the brake hose banjo bolt (5) if replacing caliper (4).
5. Remove the caliper mounting slide pin bolts (2).
6. Remove the caliper (4) from vehicle.

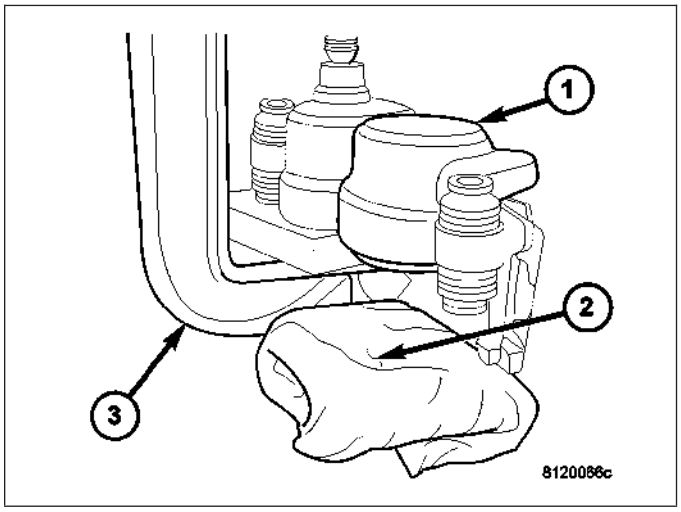


DISASSEMBLY

1. Drain the brake fluid from caliper.
2. C-clamp (2) a block of wood (1) over one piston.



3. Take another piece of wood and pad it with one-inch thickness of shop towels (2). Place this piece in the outboard shoe side of the caliper in front of the other piston. This will cushion and protect caliper piston during removal.
4. To remove the caliper piston direct **short bursts of low pressure air** with a blow gun through the caliper brake hose port. Use only enough air pressure to ease the piston out.

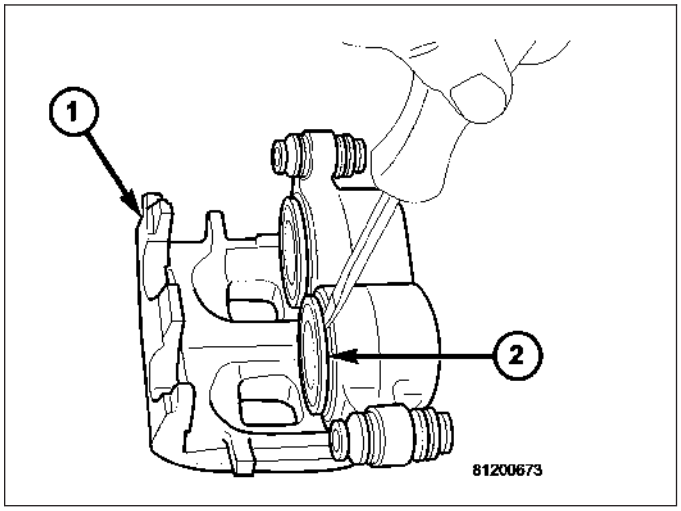


CAUTION: Do not blow the piston out of the bore with sustained air pressure. This could result in a cracked piston.

WARNING: NEVER ATTEMPT TO CATCH THE PISTON AS IT LEAVES THE BORE. THIS COULD RESULT IN PERSONAL INJURY.

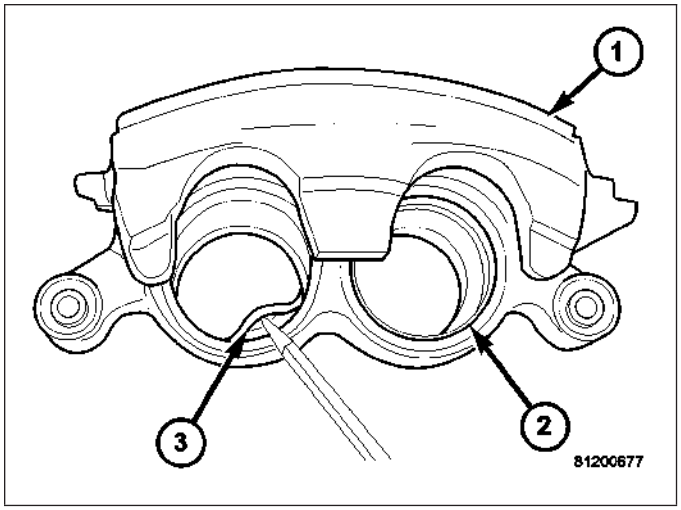
5. Remove the C-clamp and block of wood from the caliper and clamp it over the dust boot of the first piston removed. This will seal the empty piston bore.

6. Move the padded piece of wood in front of the other piston.
7. Remove the second piston using the same procedure with **short bursts of low pressure air**.
8. Remove piston dust boots (2) with a suitable pry tool.

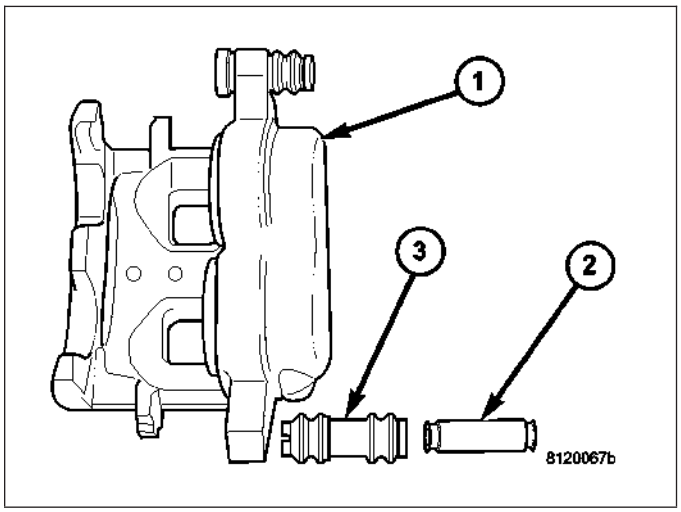


CAUTION: Do not scratch piston bore while removing the seals.

9. Remove piston seals (3) from caliper (1).



10. Push caliper mounting bolt bushings (3) out of the boot seals (2) and remove the boot seals from the caliper (1).
11. Remove caliper bleed screw.



CLEANING - DISC BRAKE CALIPER

Clean the caliper components with clean brake fluid or brake clean only. Wipe the caliper and piston dry with lint free towels or use low pressure compressed air.

CAUTION: Do not use gasoline, kerosene, paint thinner, or similar solvents. These products may leave a residue that could damage the piston and seal.

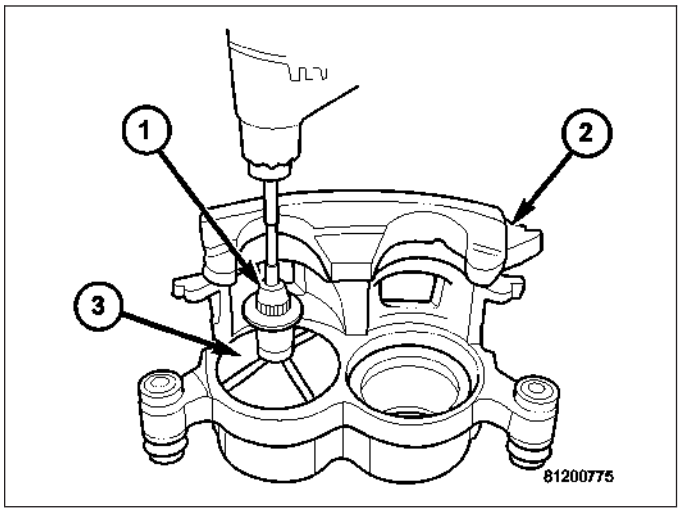
INSPECTION

The piston is made from a phenolic resin (plastic material) and should be smooth and clean.

The piston must be replaced if cracked or scored. Do not attempt to restore a scored piston surface by sanding or polishing.

CAUTION: If the caliper piston is replaced, install the same type of piston in the caliper. Never interchange phenolic resin and steel caliper pistons. The pistons, seals, seal grooves, caliper bore and piston tolerances are different.

The bore can be **lightly** polished with a brake hone (3) to remove very minor surface imperfections. The caliper should be replaced if the bore is severely corroded, rusted, scored, or if polishing would increase bore diameter more than 0.025 mm (0.001 inch).



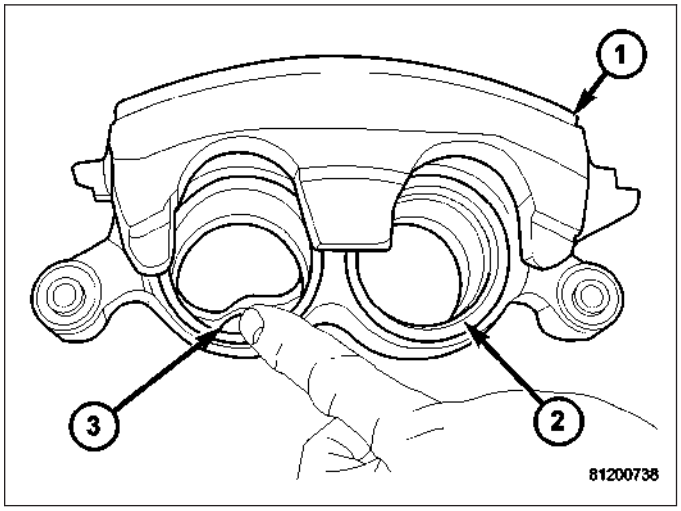
ASSEMBLY

CAUTION: Dirt, oil, and solvents can damage caliper seals. Insure assembly area is clean and dry.

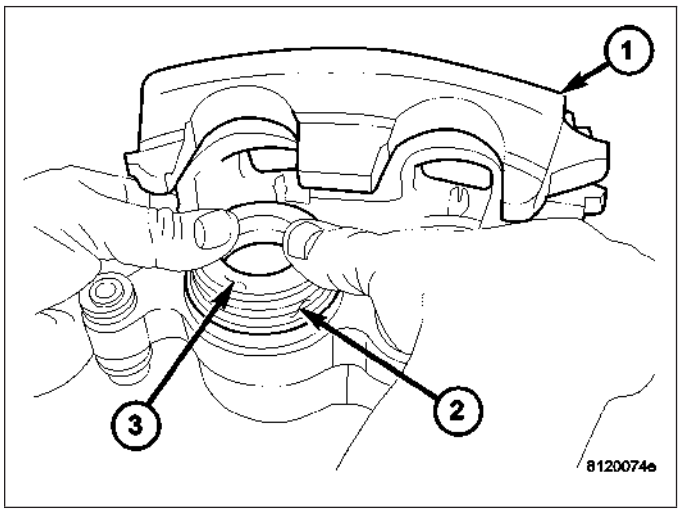
1. Lubricate caliper pistons, piston seals and piston bores with clean, fresh brake fluid.

NOTE: Verify seal is fully seated and not twisted.

2. Install new piston seals (3) into caliper bores (2).



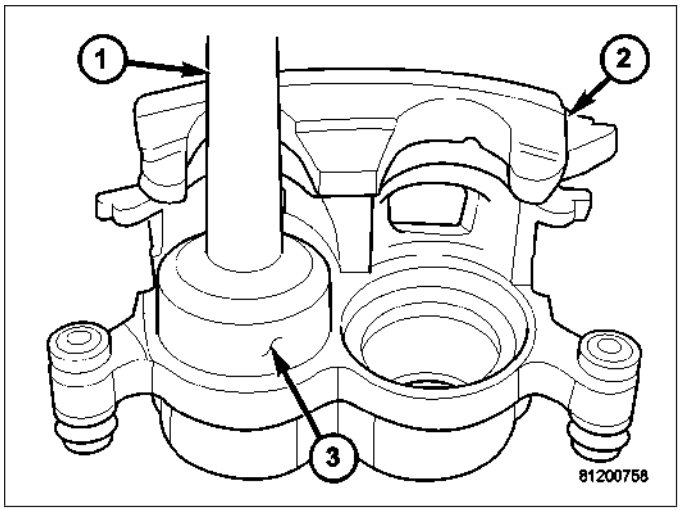
3. Lightly lubricate lip of new boot with silicone grease. Install boot on piston and work boot lip into the groove at the top of piston (3).
4. Stretch boot (2) rearward to straighten boot folds, then move boot forward until folds snap into place.
5. Install piston (3) into caliper bore and press piston down to the bottom of the caliper bore by hand or with hammer handle.



6. Seat dust boot in caliper (2) with Handle C-4171 (1) and Installer (3):
   - 54 mm caliper: Installer C-3716-A
7. Install the second piston and dust boot.
8. Lubricate caliper mounting bolt bushings, boot seals and bores with Mopar brake grease or Dow Corning® 807 grease only.

CAUTION: Use of alternative grease may cause damage to the boots seals.

9. Install the boot seals into the caliper seal bores and center the seals in the bores.
10. Install mounting bolt bushings into the boot seals and insure seal lip is engaged into the bushing grooves at either end of the bushing.
11. Install caliper bleed screw.

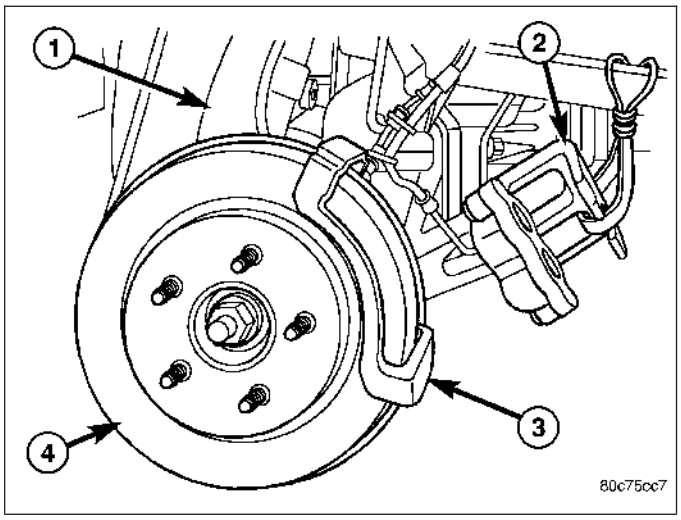


INSTALLATION

FRONT

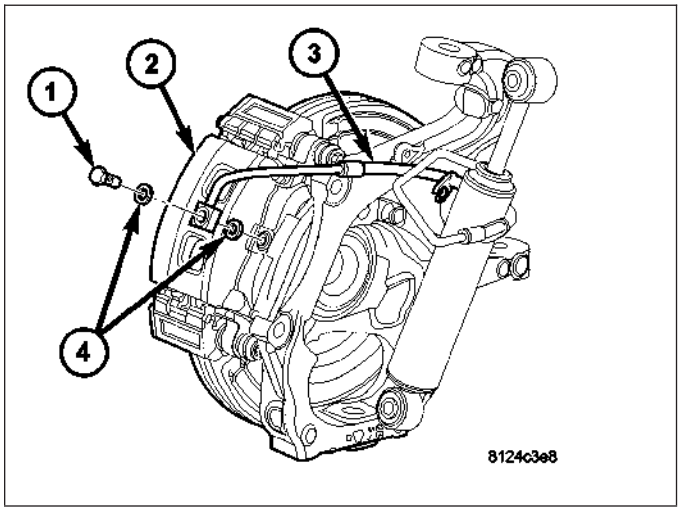
NOTE: Install a new copper washers on the banjo bolt when installing

1. Install the disc brake caliper (2) to the brake caliper adapter (3).

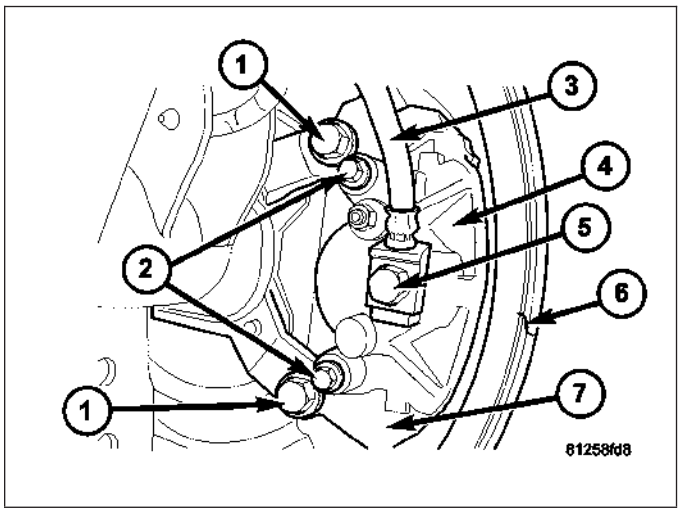


CAUTION: Verify brake hose (3) is not twisted or kinked before tightening fitting bolt.

2. Install the banjo bolt (1) with new copper washers (4) to the caliper (2). Tighten to 28 N·m (250 in. lbs.)
3. Install the caliper slide pin bolts. tighten to 32 N·m (24 ft. lbs.)
4. Bleed the base brake system, (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL - STANDARD PROCEDURE).
5. Install the tire and wheel assembly, (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).
6. Lower the vehicle.



REAR



1. Install caliper (4) to the caliper adapter (7).
2. Coat the caliper mounting slide pin bolts (2) with silicone grease. Then install and tighten the bolts to 15 N·m (11 ft. lbs.).
3. Install the brake hose banjo bolt (5) and **new copper seal washers** if caliper was removed.
4. Install the brake hose (3) to the caliper (4) with and tighten fitting bolt to 28 N·m (250 in. lbs.).

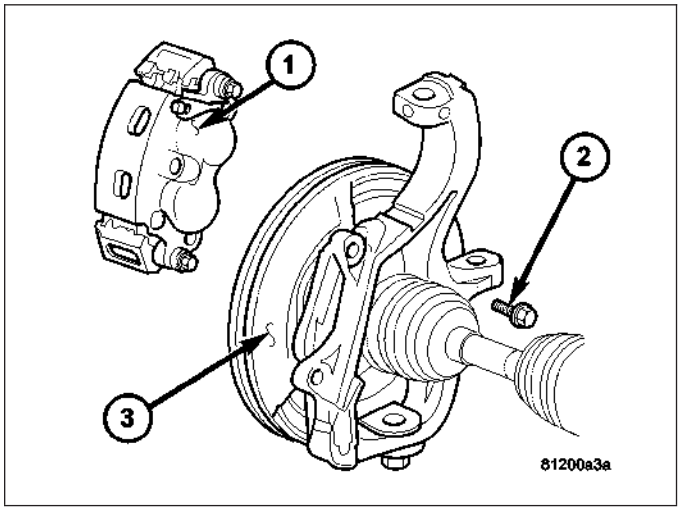
CAUTION: Verify brake hose is not twisted or kinked before tightening fitting bolt.

5. Bleed the base brake system, (Refer to 5 - BRAKES - STANDARD PROCEDURE) OR (Refer to 5 - BRAKES - STANDARD PROCEDURE).
6. Install the wheel and tire assemblies (6) (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).
7. Remove the supports and lower the vehicle.
8. Verify a firm pedal before moving the vehicle.

DISC BRAKE CALIPER ADAPTER

REMOVAL

FRONT



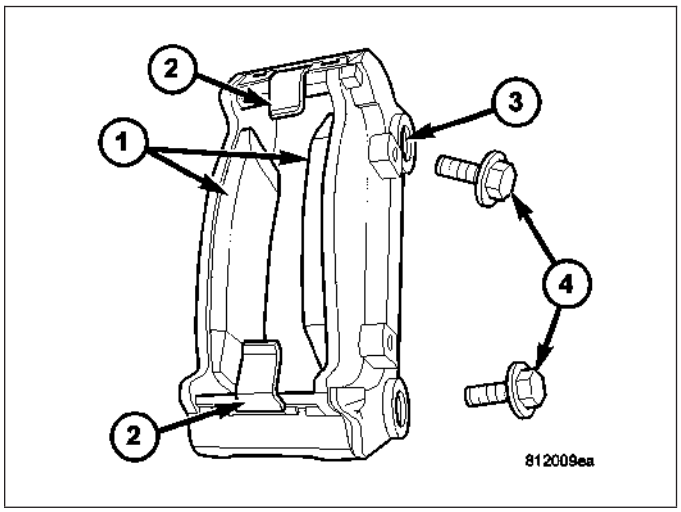
1. Raise and support the vehicle.
2. Remove the tire and wheel assembly.
3. Remove the disc brake caliper (1) (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - REMOVAL).
4. Remove the bolts securing the caliper adapter (2) to the steering knuckle
5. Remove the caliper adapter.

REAR

1. Raise and support the vehicle.
2. Remove the wheel and tire assembly.
3. Drain a small amount of fluid from master cylinder brake reservoir with a **clean** suction gun.
4. Bottom the caliper pistons into the caliper by prying the caliper over.
5. Remove the caliper mounting bolts.
6. Remove the disc brake caliper from the mount.

CAUTION: Never allow the disc brake caliper to hang from the brake hose. Damage to the brake hose will result. Provide a suitable support to hang the caliper securely.

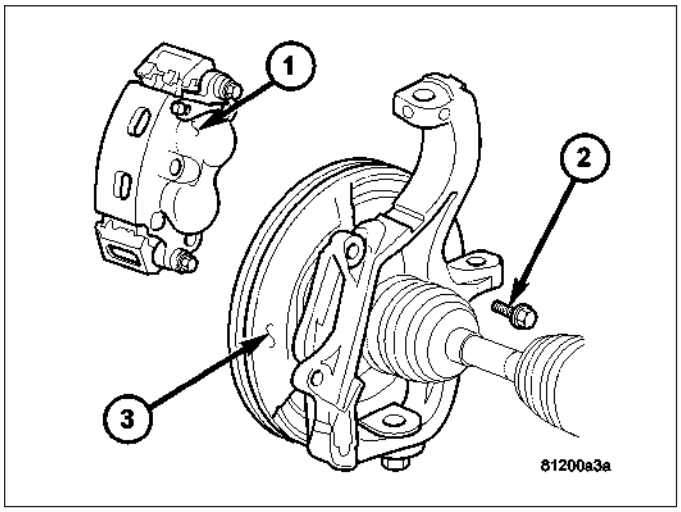
7. Remove the inboard and outboard brake pads (1).
8. Remove the anti-rattle clips (2).
9. Remove the caliper adapter mounting bolts (4).



INSTALLATION

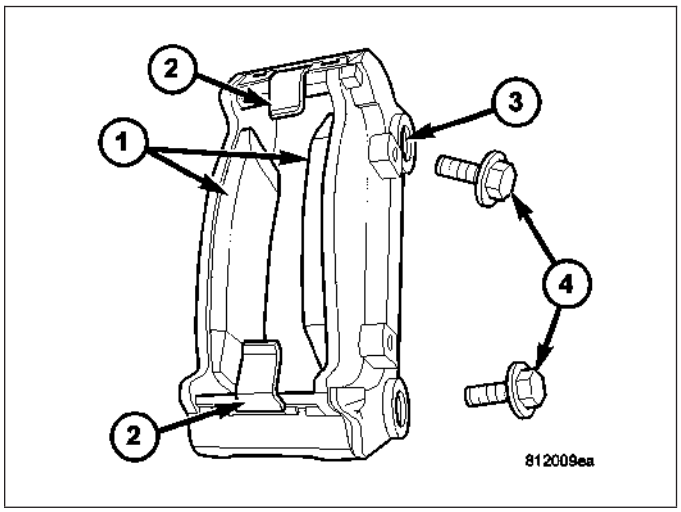
FRONT

1. Install the caliper adapter (1) to the steering knuckle.
2. Install the caliper adapter mounting bolts (2) and tighten to 176 N·m (130 ft.lbs.).
3. Install the disc brake caliper (1) (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - INSTALLATION).
4. Install the tire and wheel assembly (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).
5. Remove the support and lower the vehicle.



REAR

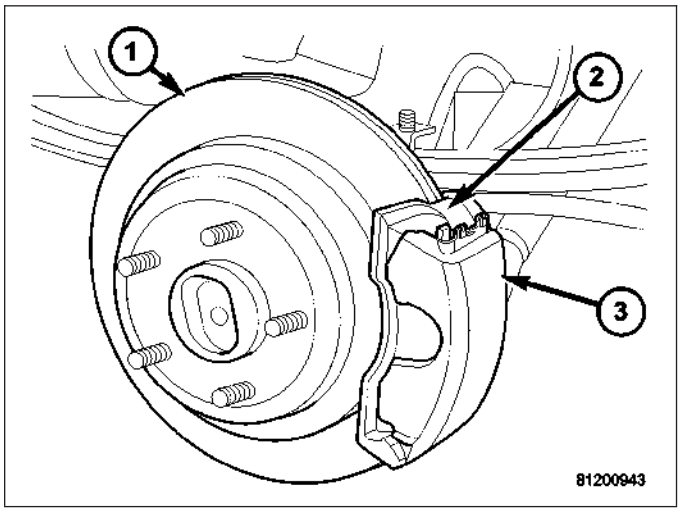
1. Install the caliper adapter mounting bolts (4). Tighten the mounting bolts to 135 N·m (100 ft.lbs).
2. Install the anti-rattle clips (2).
3. Install the inboard and outboard pads (1).
4. Install the caliper mounting bolts.
5. Install the tire and wheel assembly.



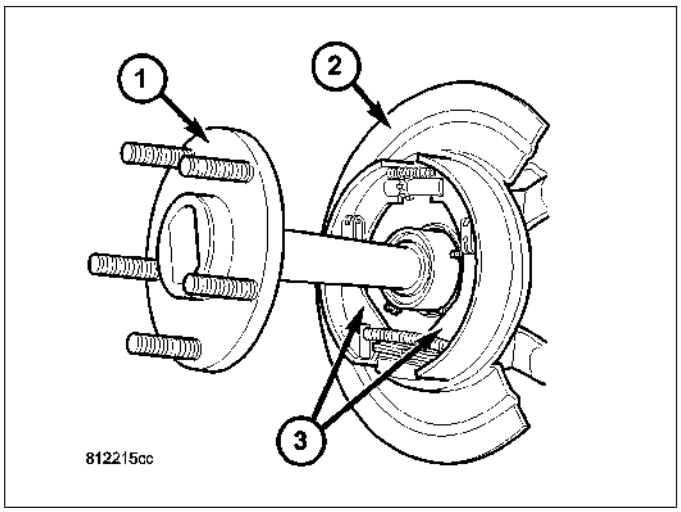
DISC BRAKE CALIPER ADAPTER MOUNT

REMOVAL - REAR

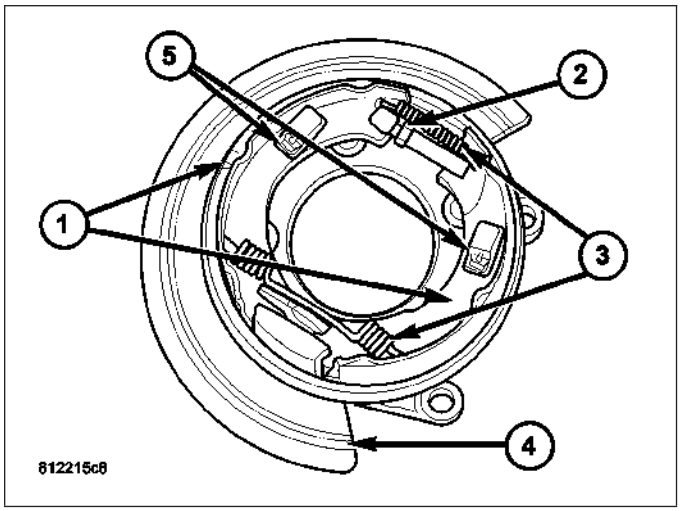
1. Remove wheel and tire assembly.
2. Remove the disc brake caliper (3) (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - REMOVAL).
3. Remove the caliper adapter (2) (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPER ADAPTER - REMOVAL).
4. Remove the rotor (1) (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - REMOVAL).



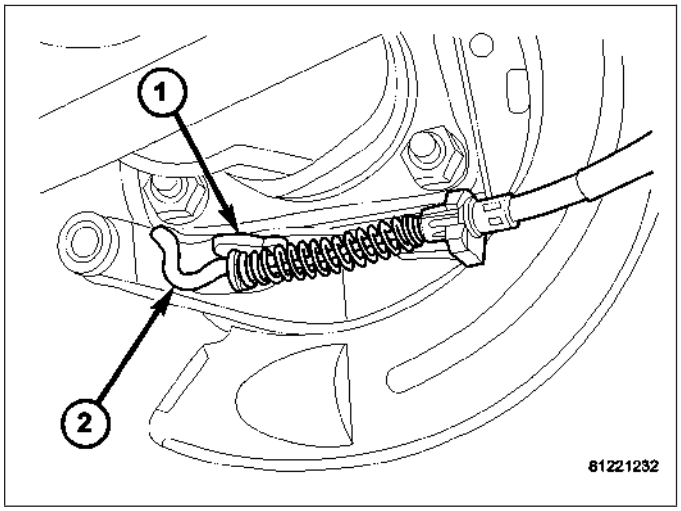
5. Remove the axle shaft (1) (Refer to 3 - DIFFERENTIAL & DRIVELINE/REAR AXLE - 9 1/4/AXLE SHAFTS - REMOVAL).



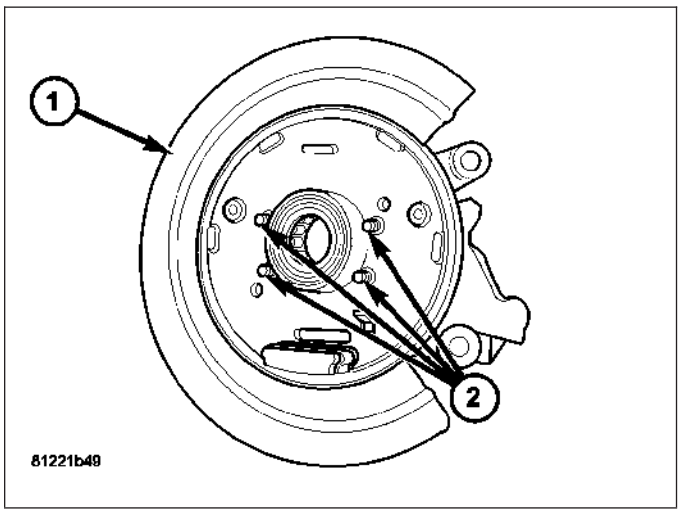
6. Remove the park brake shoes (1) (Refer to 5 - BRAKES/PARKING BRAKE/SHOES - REMOVAL).



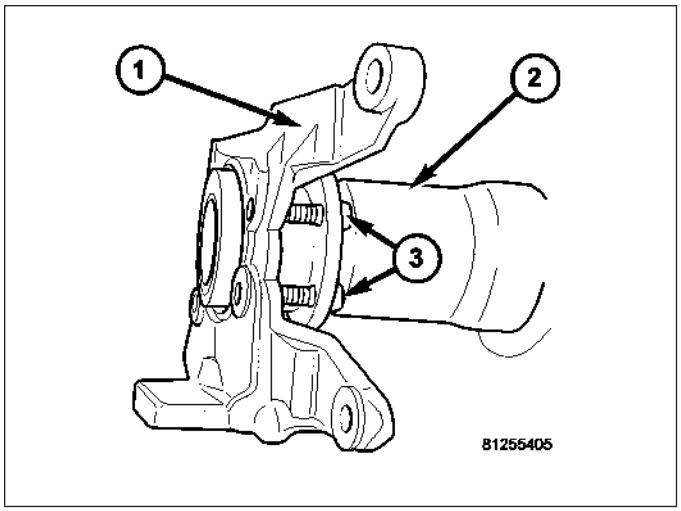
7. Remove the parking brake cable (2) from the brake lever (1).



8. Remove the bolts (2) attaching the support plate to the axle and remove the support plate (1).

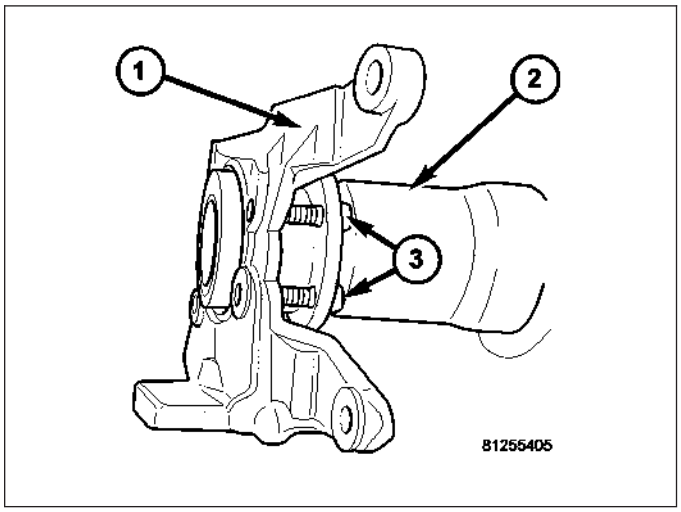


9. Remove the caliper adapter mount (1) from the axle housing (2).

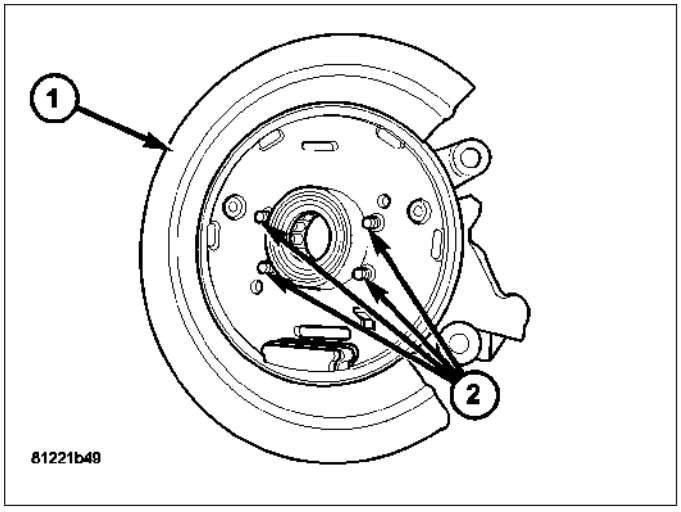


INSTALLATION

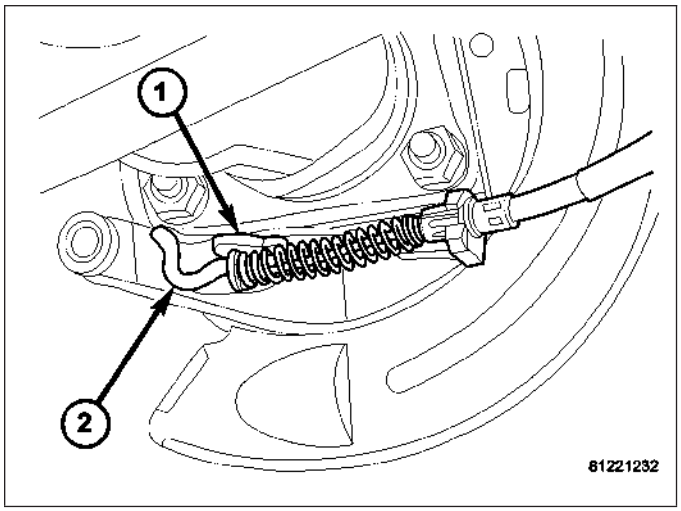
1. Install the caliper adapter mount (1) on the axle housing (2).



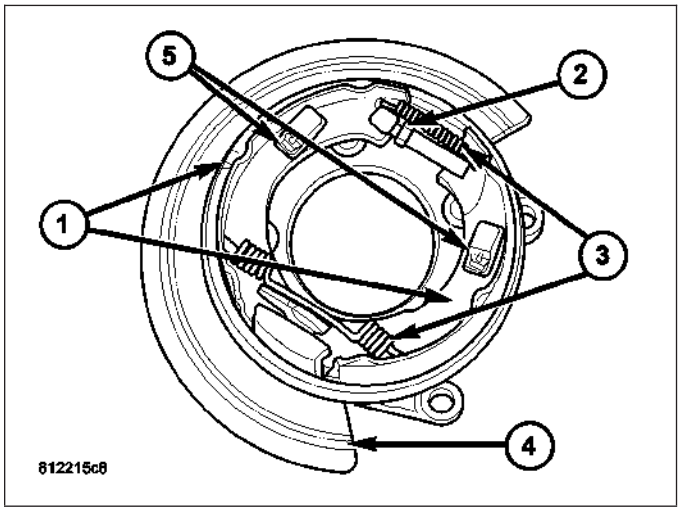
2. Install support plate (1) on axle flange. Tighten attaching bolts (2) to 115 N·m (85 ft. lbs.).



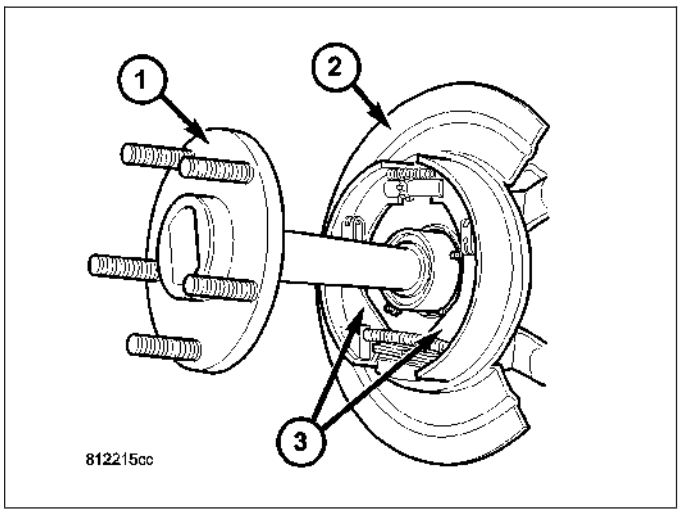
3. Install parking brake cable (2) in the brake lever (1).



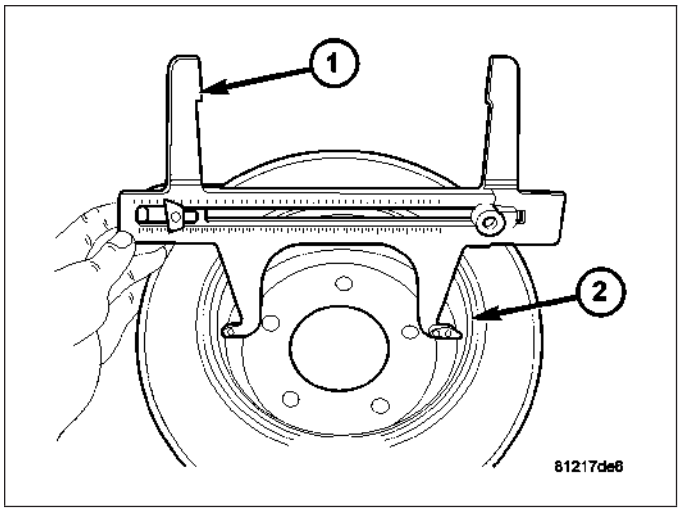
4. Install the park brake shoes (1) (Refer to 5 - BRAKES/PARKING BRAKE/SHOES - INSTALLATION).



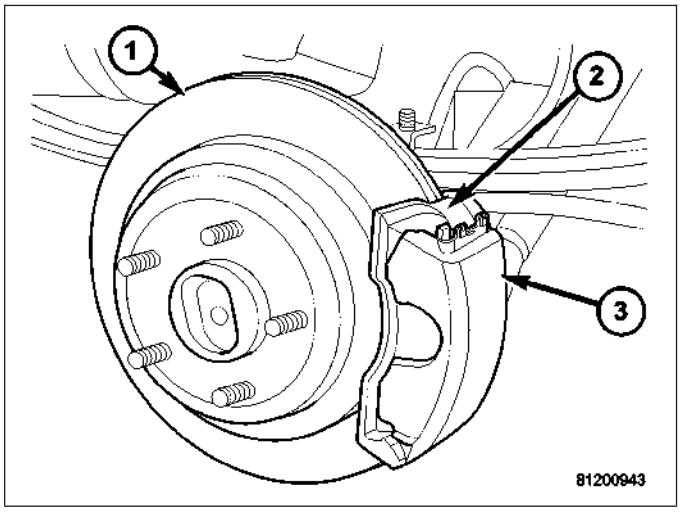
5. Install axle shaft (1), (Refer to 3 - DIFFERENTIAL & DRIVELINE/REAR AXLE - 9 1/4/AXLE SHAFTS - INSTALLATION).



6. Adjust brake shoes to drum (2) with brake gauge (1) (Refer to 5 - BRAKES/PARKING BRAKE/ SHOES - ADJUSTMENTS).



7. Install the rotor (1) (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - INSTALLATION).
8. Install the caliper adapter (2) (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPER ADAPTER - INSTALLATION).
9. Install the caliper (3) (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - INSTALLATION).
10. Install wheel and tire assembly.



FLUID

DIAGNOSIS AND TESTING

BRAKE FLUID CONTAMINATION

Indications of fluid contamination are swollen or deteriorated rubber parts.

Swollen rubber parts indicate the presence of petroleum in the brake fluid.

To test for contamination, put a small amount of drained brake fluid in clear glass jar. If fluid separates into layers, there is mineral oil or other fluid contamination of the brake fluid.

If brake fluid is contaminated, drain and thoroughly flush system. Replace master cylinder, proportioning valve, caliper seals, wheel cylinder seals, Antilock Brakes hydraulic unit and all hydraulic fluid hoses.

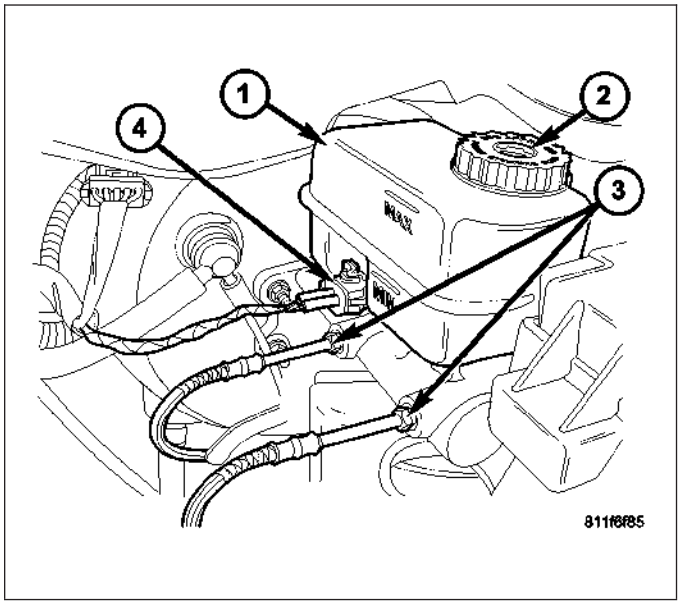
STANDARD PROCEDURE

BRAKE FLUID LEVEL

Always clean the master cylinder reservoir (1) and cap (2) before checking fluid level. If not cleaned, dirt could enter the fluid.

The fluid fill level is indicated on the side of the master cylinder reservoir (1).

The correct fluid level is to the MAX indicator on the side of the reservoir. If necessary, add fluid to the proper level.



SPECIFICATIONS

BRAKE FLUID

The brake fluid used in this vehicle must conform to DOT 3 specifications and SAE J1703 standards. No other type of brake fluid is recommended or approved for usage in the vehicle brake system. Use only Mopar brake fluid or an equivalent from a tightly sealed container.

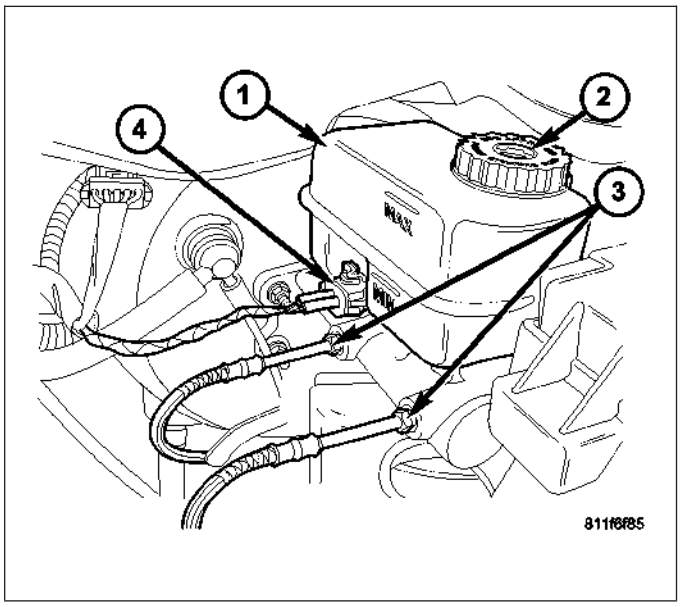
CAUTION: Never use reclaimed brake fluid or fluid from an container which has been left open. An open container of brake fluid will absorb moisture from the air and contaminate the fluid.

CAUTION: Never use any type of a petroleum-based fluid in the brake hydraulic system. Use of such type fluids will result in seal damage of the vehicle brake hydraulic system causing a failure of the vehicle brake system. Petroleum based fluids would be items such as engine oil, transmission fluid, power steering fluid, etc.

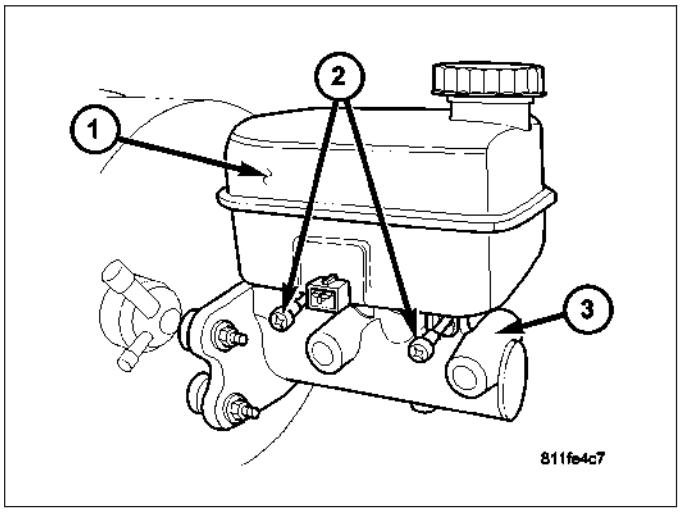
FLUID RESERVOIR

REMOVAL

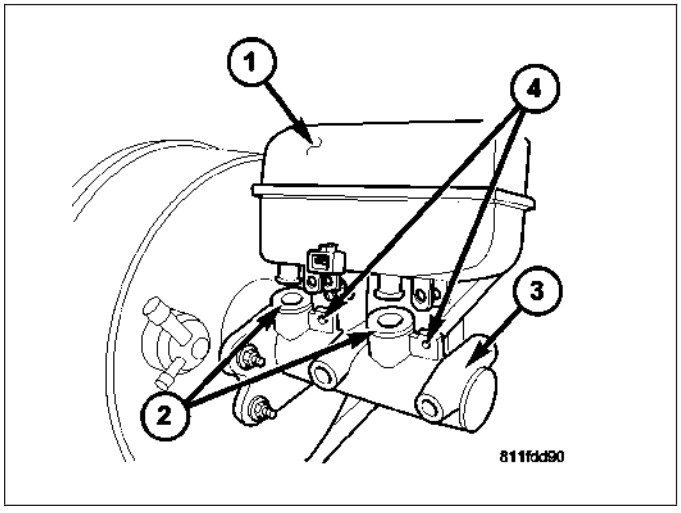
1. Install the prop rod on the brake pedal to keep pressure on the brake system.
2. Remove the reservoir cap (2) and siphon fluid into a drain container.
3. Disconnect the electrical connector (4) from the fluid level switch in the reservoir (1).



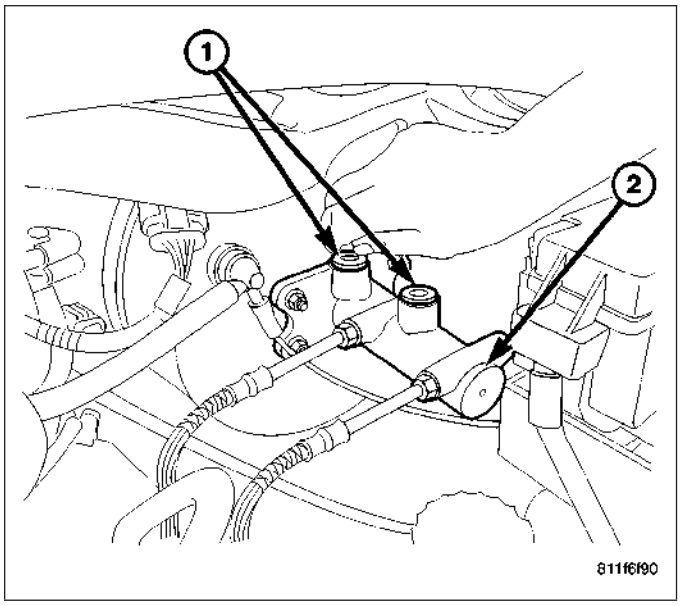
4. Remove the reservoir mounting bolts (2).



5. Remove the reservoir (1) from the master cylinder (3) by pulling upwards and to the side.



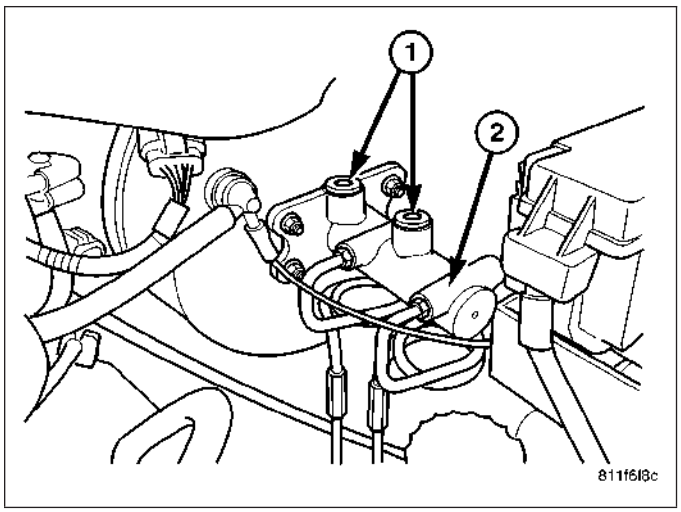
6. Remove old seals (1) from the cylinder body (2).



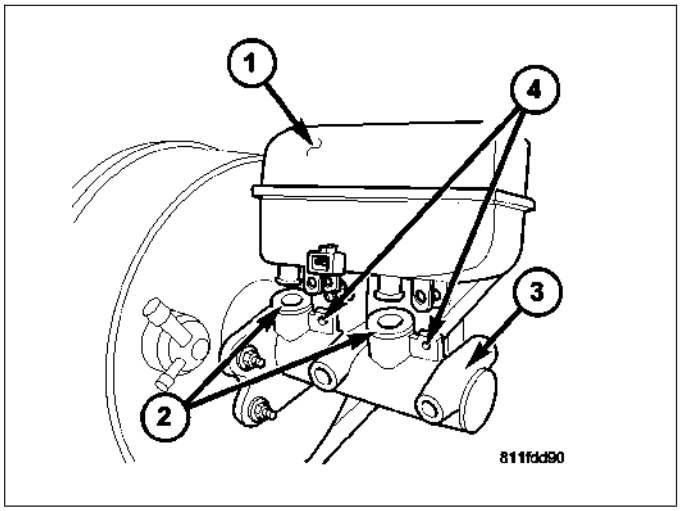
INSTALLATION

CAUTION: Do not use any type of tool to install the seals. Tools may cut, or tear the seals creating a leak problem after installation. Install the seals using finger pressure only.

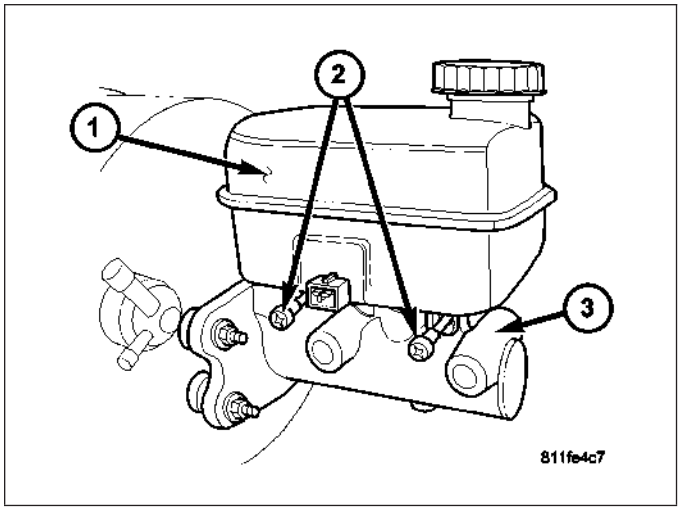
1. Lubricate the new seals (1) with clean brake fluid and Install new seals in cylinder body (2). Use finger pressure to install and seat seals.



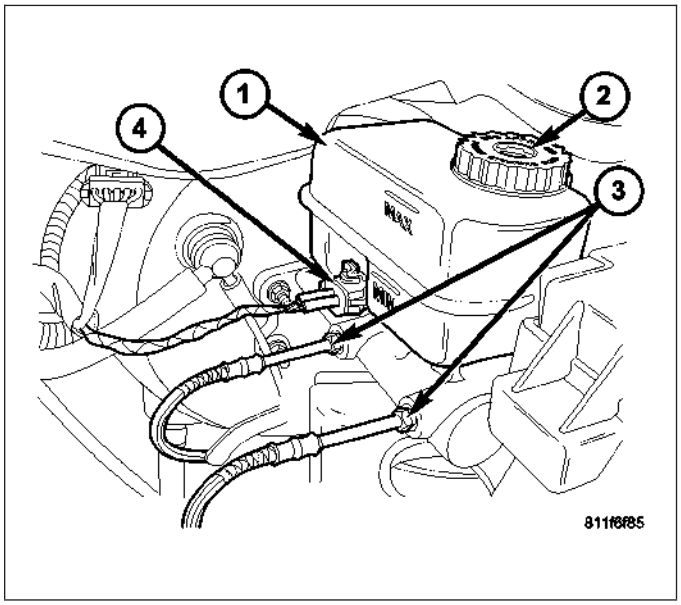
2. Start the reservoir (1) in the seals (2). Then rock the reservoir (1) back and forth while pressing downward to seat it into the seals (2).



3. Install the mounting bolts (2) for the reservoir (1) to the master cylinder (3).



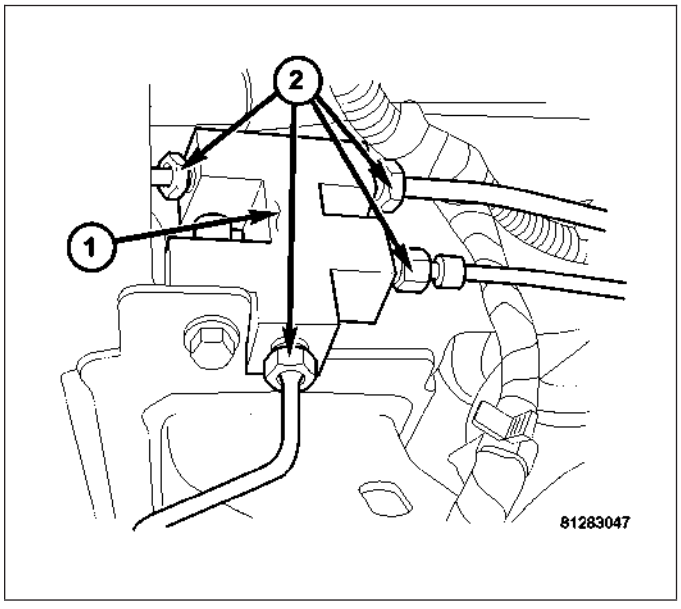
4. Reconnect the electrical connector (4) to the fluid reservoir level switch.
5. Remove the prop rod from the vehicle.
6. Fill and bleed base brake system, (Refer to 5 - BRAKES - STANDARD PROCEDURE).



BRAKE JUNCTION BLOCK

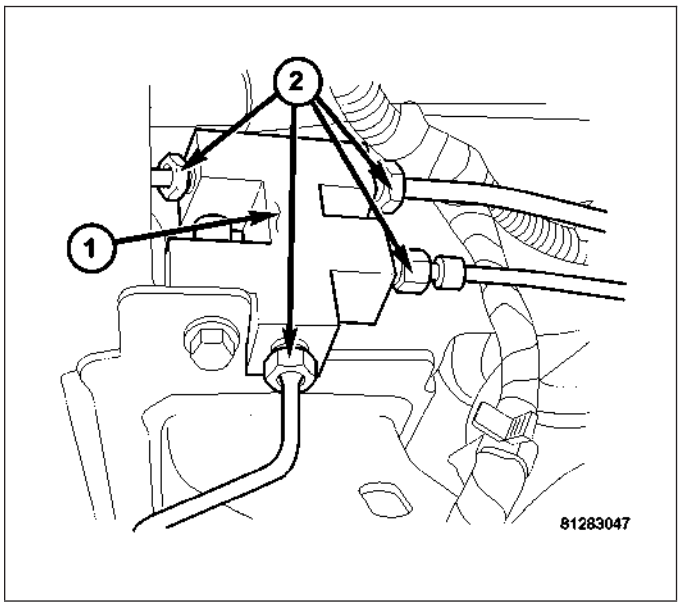
REMOVAL

1. Remove the brake lines (2) from the junction block (1).
2. Remove the junction block (1) mounting bolt and remove the junction block from the bracket.



INSTALLATION

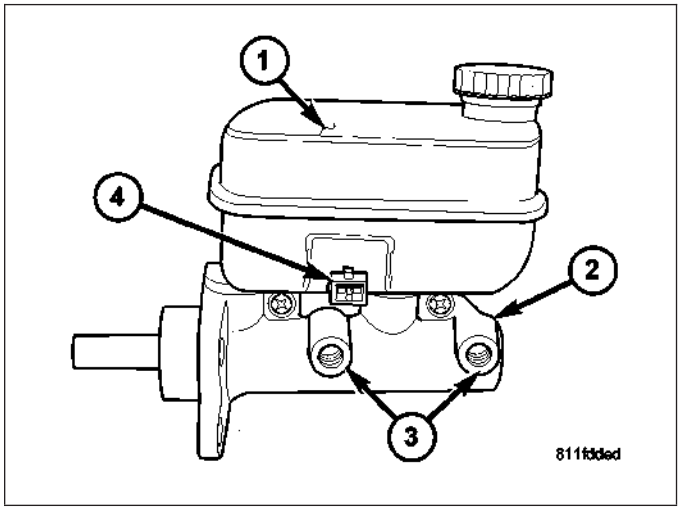
1. Position the junction block (1) on the bracket and install the mounting bolt. Tighten the mounting bolt to 23 N·m (210 in. lbs.).
2. Install the brake lines (2) into the junction block and tighten to 19-23 N·m (170-200 in. lbs.).
3. Bleed the base brake system, (Refer to 5 - BRAKES - STANDARD PROCEDURE).



MASTER CYLINDER

DESCRIPTION

A two-piece master cylinder is used on all models. The cylinder body containing the primary and secondary pistons is made of aluminum. The removable fluid reservoir (1) is made of nylon reinforced with glass fiber. The reservoir stores reserve brake fluid for the hydraulic brake circuits and has a switch (4) for indicating low fluid levels. The reservoir is the only serviceable component.



The fluid compartments of the nylon reservoir are interconnected to permit fluid level equalization. However, the equalization feature does not affect circuit separation in the event of a front or rear brake malfunction. The reservoir compartments will retain enough fluid to operate the functioning hydraulic circuit.

Care must be exercised when removing/installing the master cylinder connecting lines. The threads in the cylinder fluid ports (3) can be damaged if care is not exercised. Start all brake line fittings by hand to avoid cross threading.

The cylinder reservoir can be replaced when necessary. However, the aluminum body section (2) of the master cylinder is not a repairable component.

NOTE: If diagnosis indicates that an internal malfunction has occurred, the aluminum body section must be replaced as an assembly.

OPERATION

The master cylinder bore contains a primary and secondary piston. The primary piston supplies hydraulic pressure to the front brakes. The secondary piston supplies hydraulic pressure to the rear brakes.

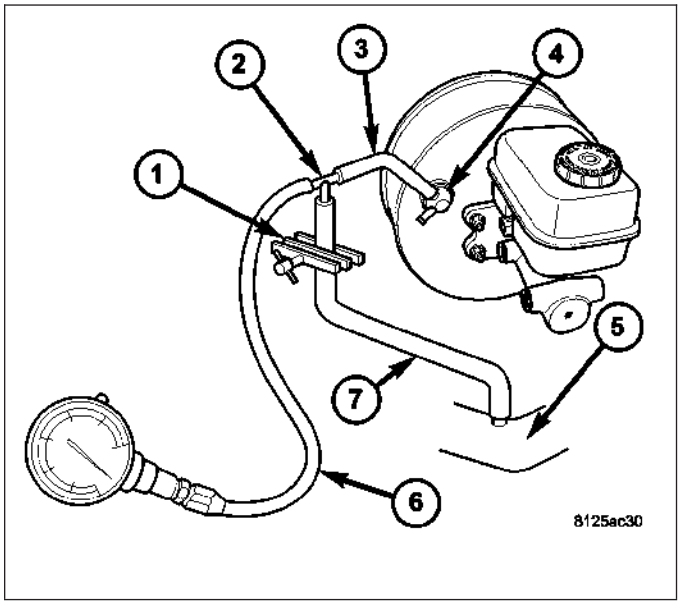
DIAGNOSIS AND TESTING

MASTER CYLINDER/POWER BOOSTER

1. Start engine and check booster vacuum hose connections. A hissing noise indicates vacuum leak. Correct any vacuum leak before proceeding.
2. Stop engine and shift transmission into Neutral.
3. Pump brake pedal until all vacuum reserve in booster is depleted.
4. Press and hold brake pedal under light foot pressure. The pedal should hold firm, if the pedal falls away master cylinder is faulty (internal leakage).
5. Start engine and note pedal action. It should fall away slightly under light foot pressure then hold firm. If no pedal action is discernible, power booster, vacuum supply, or vacuum check valve is faulty. Proceed to the POWER BOOSTER VACUUM TEST.
6. If the POWER BOOSTER VACUUM TEST passes, rebuild booster vacuum reserve as follows: Release brake pedal. Increase engine speed to 1500 rpm, close the throttle and immediately turn off ignition to stop engine.
7. Wait a minimum of 90 seconds and try brake action again. Booster should provide two or more vacuum assisted pedal applications. If vacuum assist is not provided, booster is faulty.

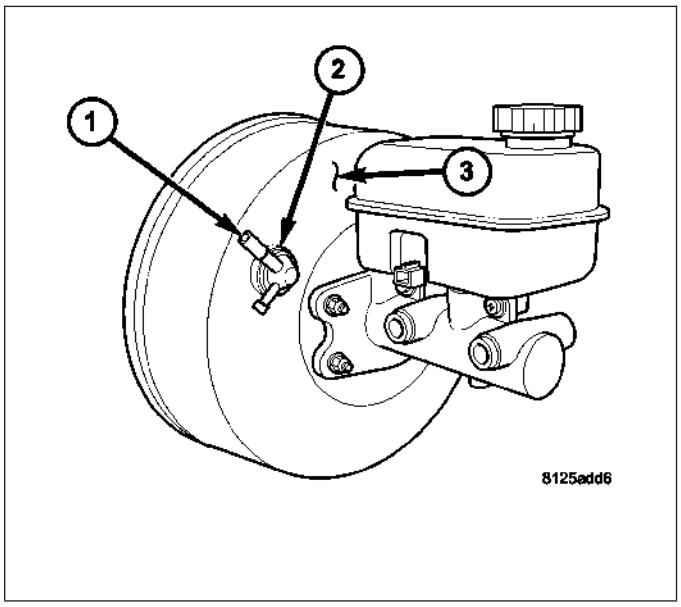
POWER BOOSTER VACUUM TEST

1. Connect vacuum gauge (6) to booster check valve (4) with short length of hose (3) and T-fitting (2).
2. Start and run engine at curb idle speed for one minute.
3. Observe the vacuum supply. If vacuum supply is not adequate, repair vacuum supply.
4. Clamp (1) hose (7) shut between intake vacuum source (5) and check valve (4).
5. Stop engine and observe vacuum gauge (6).
6. If vacuum drops more than one inch HG (33 millibars) within 15 seconds, booster diaphragm or check valve is faulty.



POWER BOOSTER CHECK VALVE TEST

1. Disconnect vacuum hose from check valve (1).
2. Remove check valve (1) and valve seal (2) from booster (3).
3. Use a hand operated vacuum pump for test.
4. Apply 15-20 inches vacuum at large end of check valve.
5. Plug off the small end to prevent vacuum leakage.
6. Vacuum should hold steady. If gauge on pump indicates vacuum loss, check valve is faulty and should be replaced.

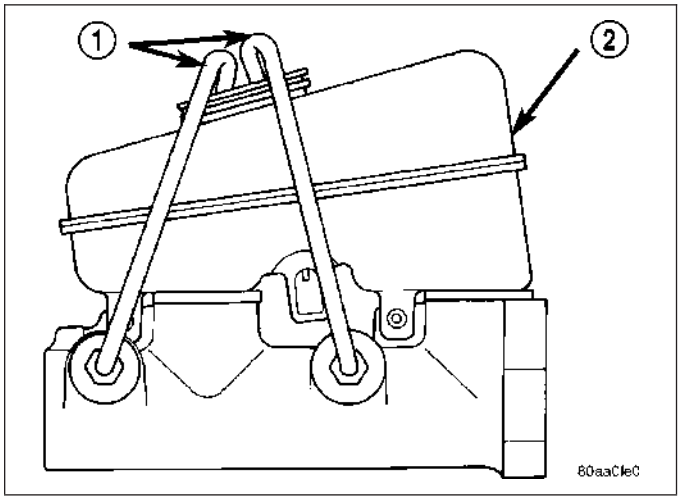


STANDARD PROCEDURE

MASTER CYLINDER BLEEDING

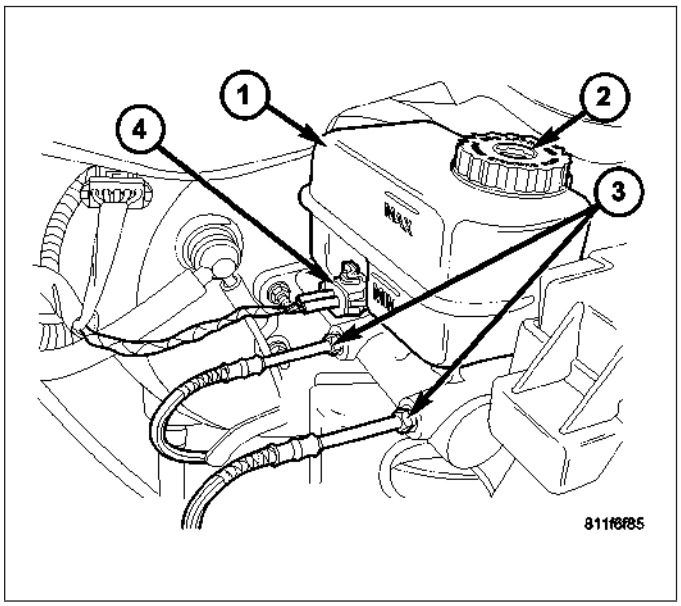
A new master cylinder should be bled before installation on the vehicle. Required bleeding tools include bleed tubes and a wood dowel to stroke the pistons. Bleed tubes can be fabricated from brake line.

1. Mount master cylinder in vise.
2. Attach bleed tubes to cylinder outlet ports (1). Then position each tube end into reservoir (2).
3. Fill reservoir with fresh brake fluid.
4. Press cylinder pistons inward with wood dowel. Then release pistons and allow them to return under spring pressure. Continue bleeding operations until air bubbles are no longer visible in fluid.



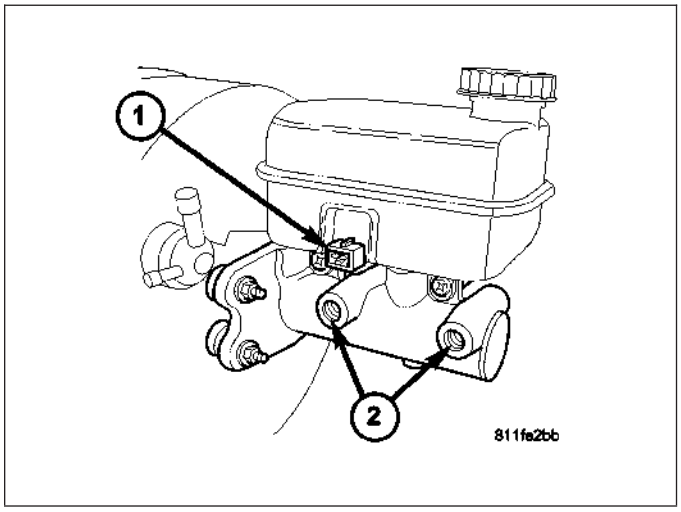
REMOVAL

1. Depress the brake pedal five times to deplete any vacuum that may remain in the booster unit.
2. Siphon and drain the fluid from the reservoir.
3. Disconnect the electrical connector (4) for the low fluid level.

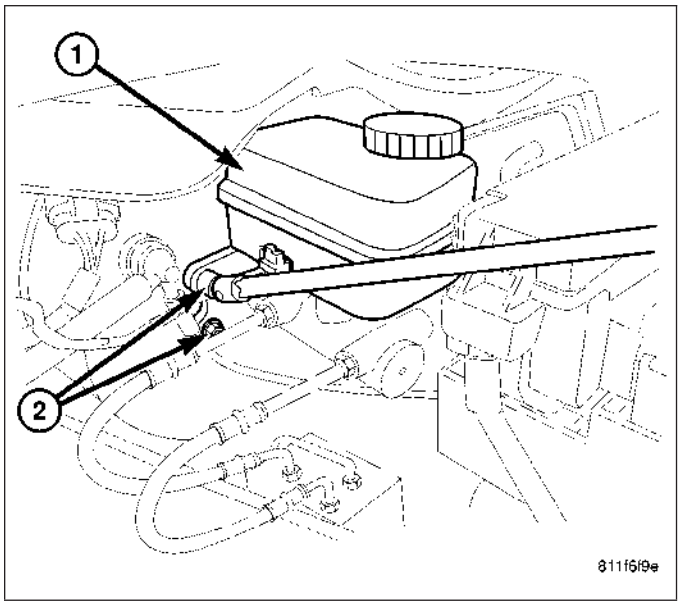


NOTE: Place a towel or rag under the master cylinder outlet port area to protect the vehicle from brake fluid damage.

4. Remove the brake lines (2) from the master cylinder.

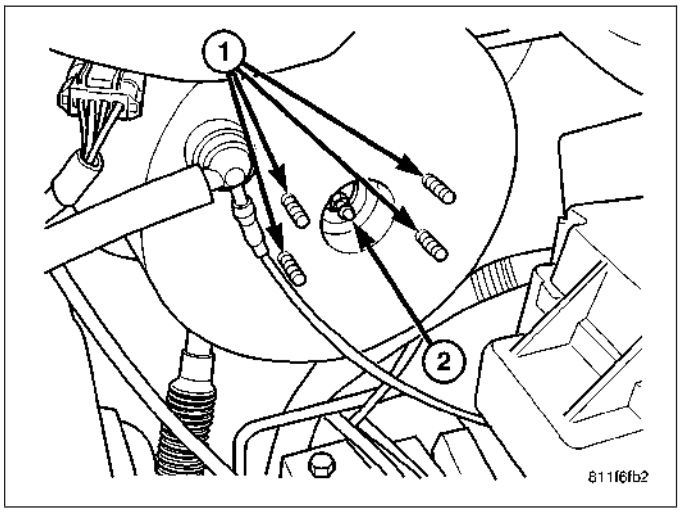


5. Remove the four mounting nuts (2) from the master cylinder (1).



6. Remove the master cylinder.

NOTE: Gently ease the master cylinder & reservoir assembly away from the booster, During removal the master cylinder should be kept as perpendicular to the front of the booster as possible to avoid excess interference with the booster output rod and in order not to dislodge the output rod (2) from its seat inside the booster.

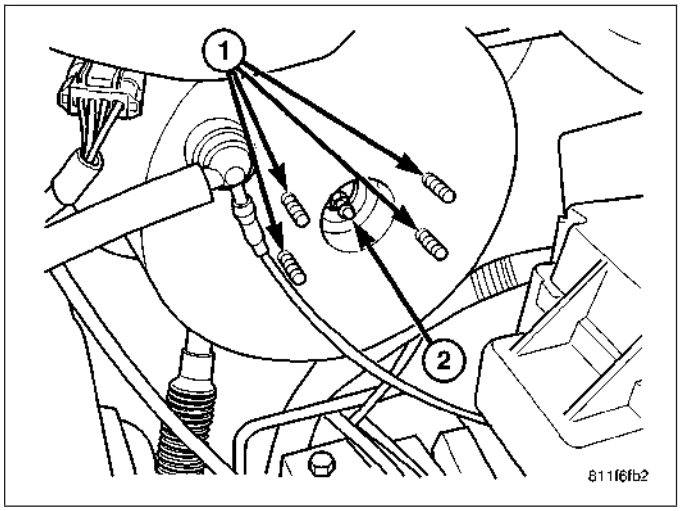


INSTALLATION

NOTE: If master cylinder is replaced bleed cylinder before installation.

NOTE: Make sure the output rod (2) of the brake booster is in position and retained by a output rod retaining ring, by looking into the boosters master cylinder mounting hole. This position will enable the output rod to enter inside of the master cylinder plunger sleeve during installation. Proper position is obtained when the output rod is centered perpendicular to the master cylinder mounting hole.

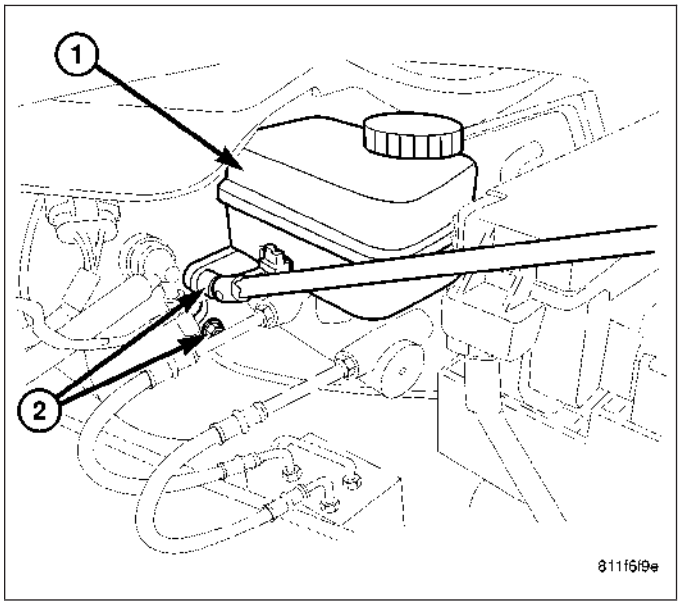
NOTE: Prior to installing the master cylinder assembly check that there is a vacuum seal present at the shoulder of the master cylinder flange and it's neck. A square seal must be present to ensure vacuum integrity with the booster.



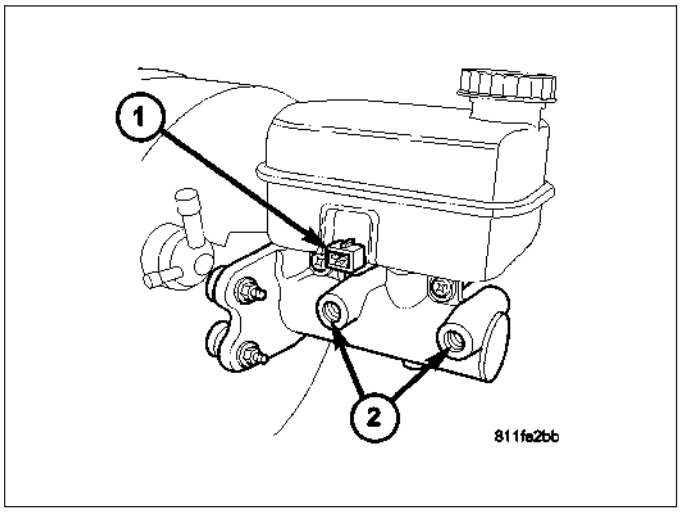
1. Gently install the master cylinder on the booster mounting studs (1).

NOTE: Take precautions to locate the master cylinder plunger over the booster output rod, before installing the master cylinder. If correctly fitted the master cylinder should slide easily onto the booster output rod before the mounting studs are engaged in the flange holes of the master cylinder.

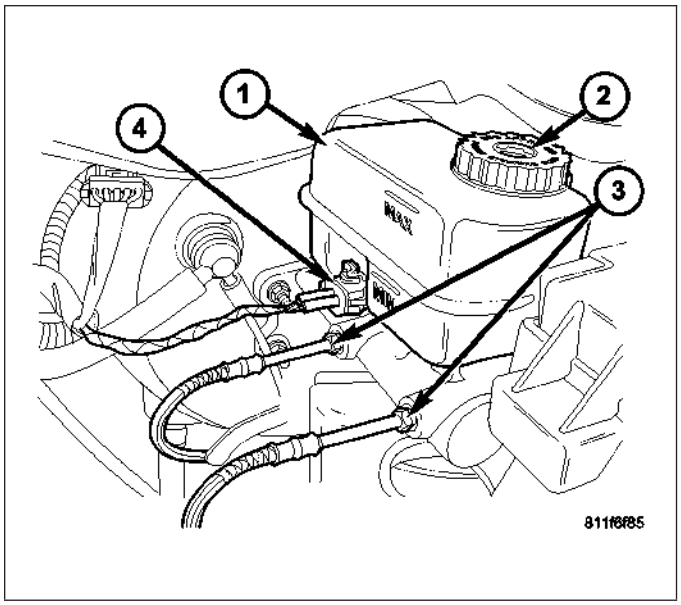
2. Install new mounting nuts (2) and tighten to 10 N·m (90 in. lbs.)



3. Install the brake lines (2) and tighten to 19 N·m (170 in. lbs.).



4. Reconnect the electrical connector (4) for the low fluid level switch.
5. Fill and bleed the base brake system. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

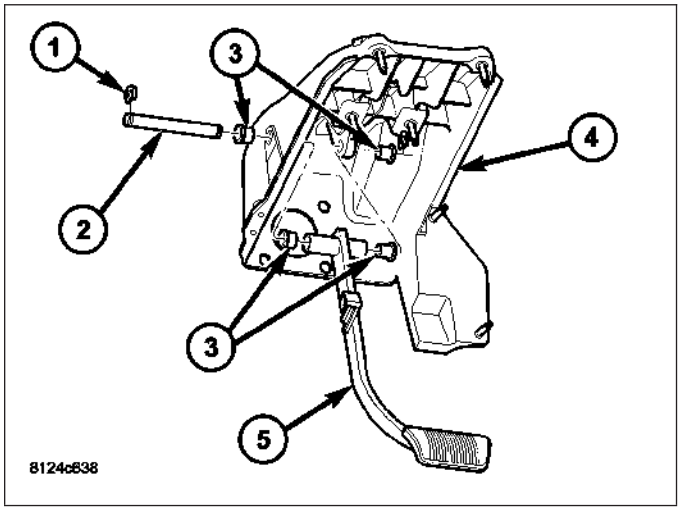


PEDAL

DESCRIPTION

NOTE: The brake pedal is serviced as a complete assembly including the bracket. Including vehicles with Adjustable Pedals.

A suspended-type brake pedal (5) is used. The pedal is attached to the pedal support bracket (4) with a pivot shaft pin (2), bushings (3) and clips (1). If the bushings (3) become dry a spray lubricant can be used to eliminate noises. The booster push rod is attached to the pedal with a clip. The pedal (5), bushings (3), pivot pin (2) and support bracket (4) are not serviceable components.



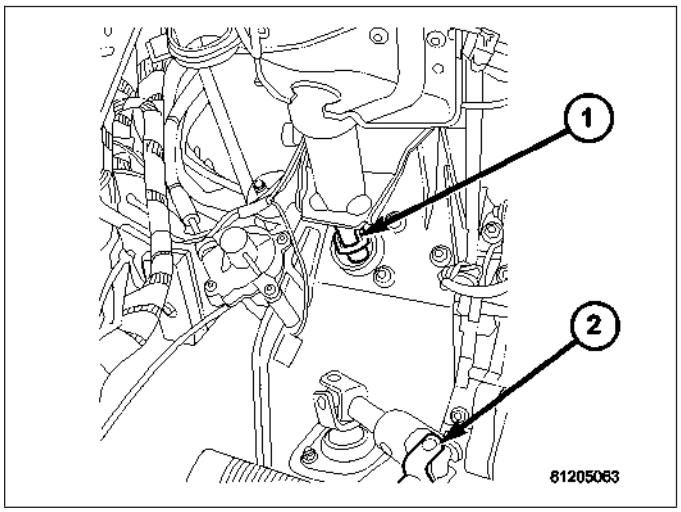
OPERATION

The brake pedal is attached to the booster push rod. When the pedal is depressed, the primary booster push rod is depressed which move the booster secondary rod. The booster secondary rod depress the master cylinder piston.

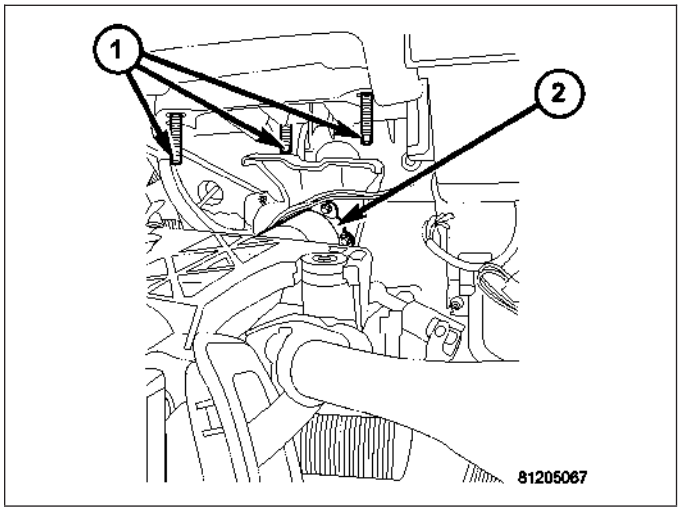
REMOVAL

WARNING: BEFORE SERVICING THE STEERING COLUMN THE AIRBAG SYSTEM MUST BE DISARMED. REFER TO ELECTRICAL RESTRAINT SYSTEM FOR SERVICE PROCEDURES. FAILURE TO DO SO MAY RESULT IN ACCIDENTAL DEPLOYMENT OF THE AIRBAG AND POSSIBLE PERSONAL INJURY.

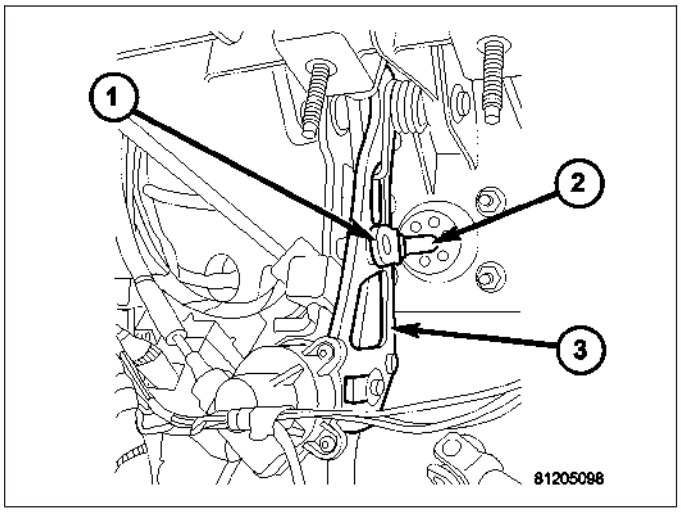
NOTE: The brake pedal is serviced as a complete assembly including accelerator pedal and the bracket.



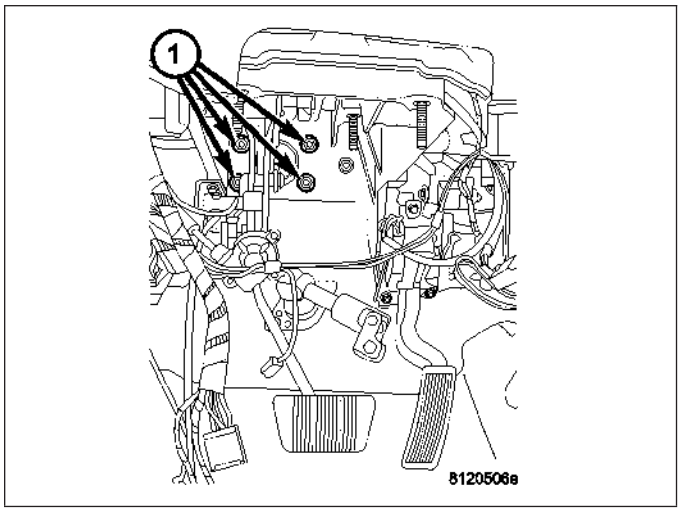
1. Disconnect and isolate the battery negative cable to disable the airbag system. Wait two minutes for the system capacitor to discharge before further service.
2. Remove the steering column opening cover (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - REMOVAL).
3. Remove the steering column opening cover reinforcement.
4. Remove the upper and lower shrouds.
5. Remove the upper coupling pinch bolt and separate the upper coupling (2) from the steering column (1) (Refer to 19 - STEERING/COLUMN/STEERING COUPLING - REMOVAL).
6. Remove the column mounting nuts (1) and lower the column (2) downwards.
7. Remove the steering column (Refer to 19 - STEERING/COLUMN - REMOVAL).
8. Remove the brake lamp switch and discard (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/BRAKE LAMP SWITCH - REMOVAL).



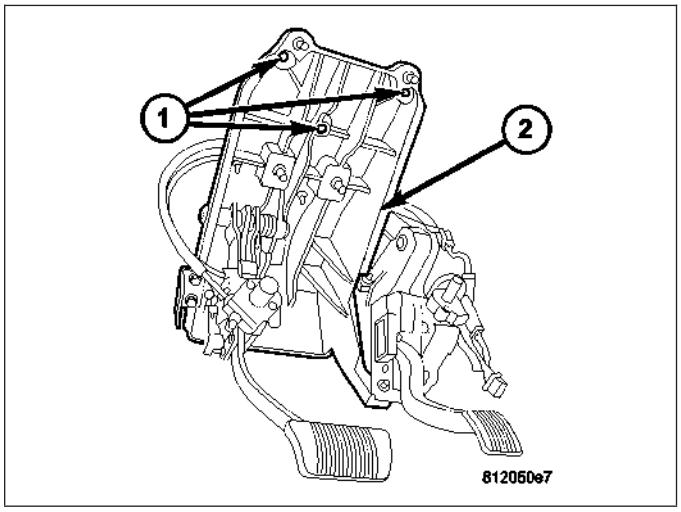
9. Disconnect the booster push rod clip (1) and remove the rod (2) from the pedal (3).



10. Remove the four booster mounting nuts (1).
11. Push the booster into the engine compartment for clearance.
12. Disconnect the adjustable pedal assembly electrical connectors.



13. Remove the two bolts securing the electrical bulkhead to the pedal bracket.
14. Remove the pedal assembly bracket bolts (1).
15. Remove the pedal assembly (2) from the vehicle.

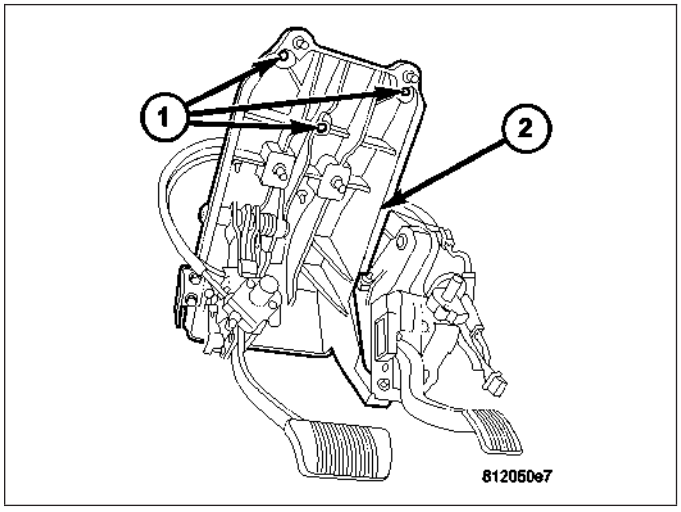


INSTALLATION

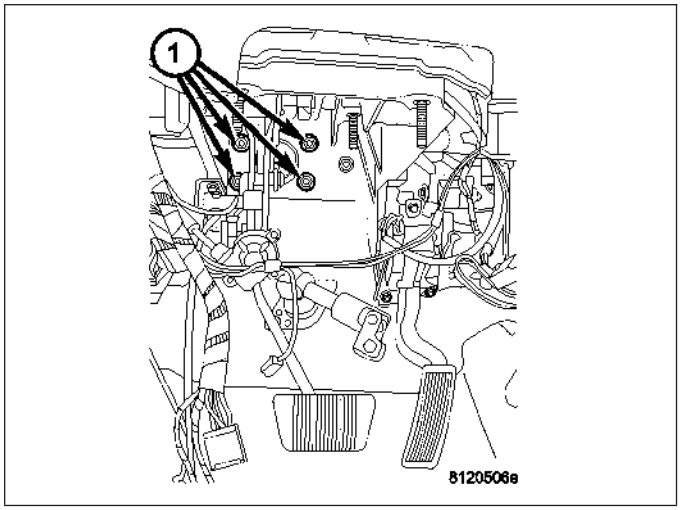
NOTE: The brake pedal is serviced as a complete assembly including accelerator pedal and the bracket.

NOTE: The adjustable brake pedal is serviced as a complete assembly including the adjustable pedal motor, cable and the bracket.

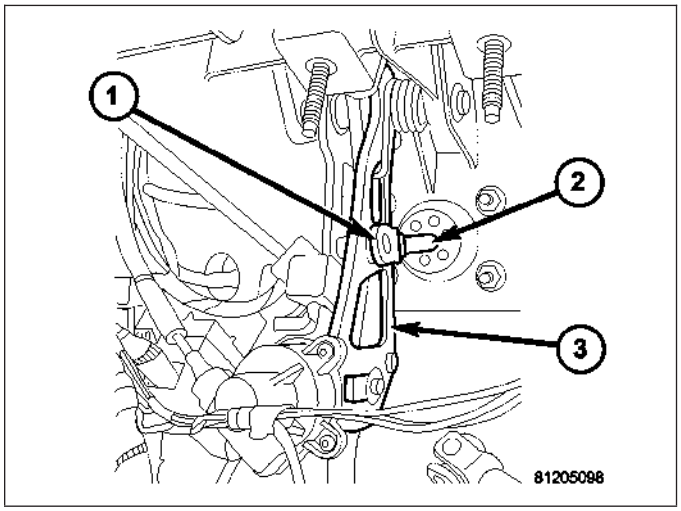
1. Install the pedal assembly (2) to the vehicle.
2. Install the mounting bolts (1) and tighten to 8 N·m (75 in. lbs.).
3. Push the booster back into the cowl.
4. Install the two bolts to the electrical bulkhead to the pedal bracket.
5. Reconnect the adjustable pedal assembly electrical connectors.**Adjustable pedals only.**



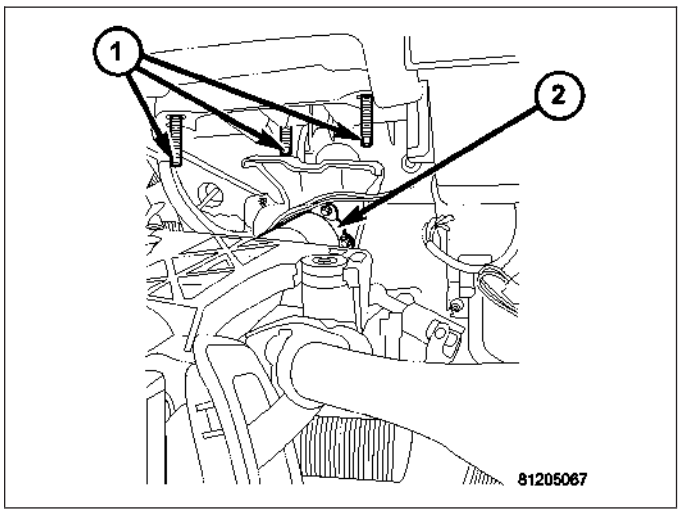
6. Install the four booster mounting nuts (1) Tighten to 28 N·m (250 in. lbs.).



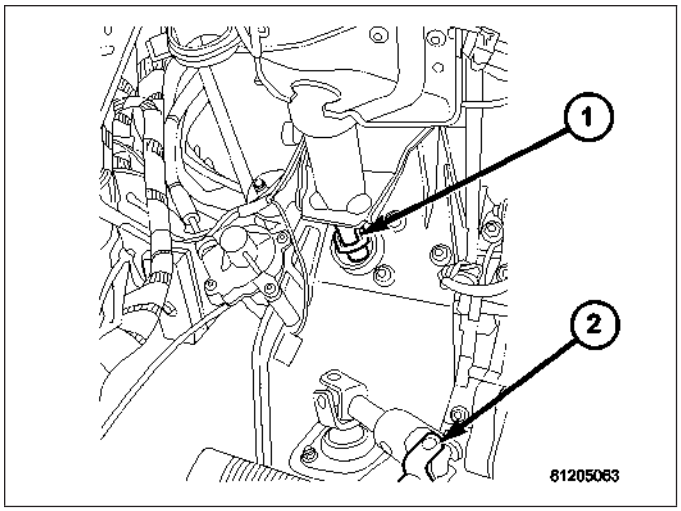
7. Reconnect the booster push rod clip (1) and install the rod (2) to the pedal (3).



8. Install the steering column (2) to the vehicle. (Refer to 19 - STEERING/COLUMN - REMOVAL).
9. Raise the column (2) upwards on the mounting studs and then install the mounting nuts (1). Tighten to 28 N·m (250 in. lbs.).
10. Install a new brake lamp switch (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/ BRAKE LAMP SWITCH - REMOVAL).



11. Install the upper coupling to the steering column (1) then install the pinch bolt to the upper coupling (2). Tighten to 38 N·m (28 ft. lbs.).
12. Install the steering column opening cover (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - REMOVAL).
13. Install the steering column opening cover reinforcement.
14. Install the upper and lower shrouds.
15. Reconnect the negative battery cable.

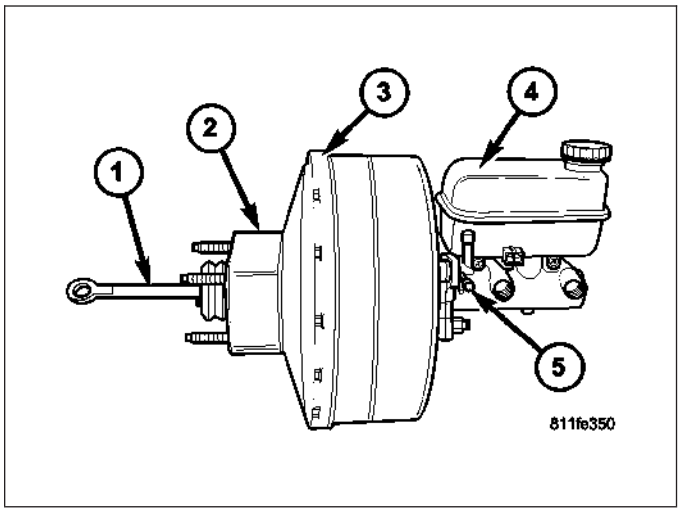


POWER BRAKE BOOSTER

DESCRIPTION

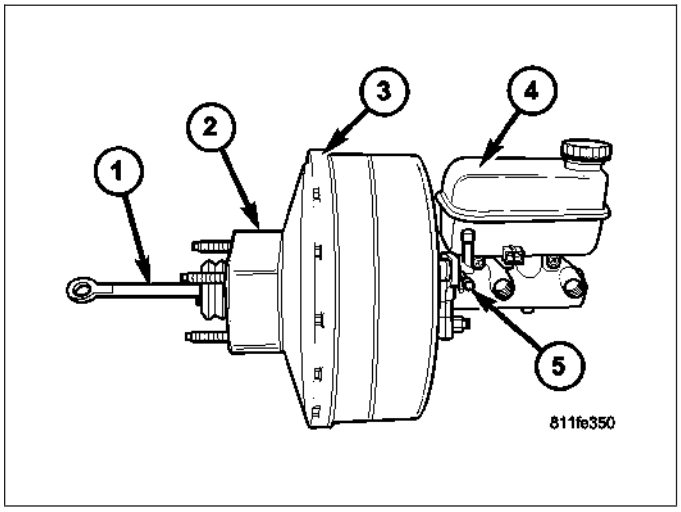
All models use a tandem diaphragm, power brake booster (3).

NOTE: The power brake booster is not a repairable component. The booster must be replaced as an assembly if diagnosis indicates a malfunction has occurred.



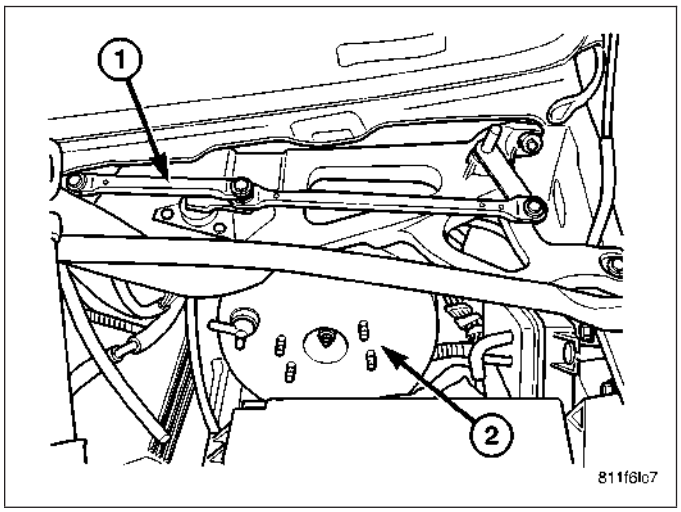
OPERATION

The booster unit consists of a single housing divided into two by a tandem diaphragm (3). The outer edge of the diaphragm is secured to the housing. A spacer block (2) is located in between the cowl and the booster housing. The booster push rod (1), connects the booster to the brake pedal and master cylinder (4), is attached to the center of the diaphragm. A check valve (5) is used in the booster outlet connected to the engine intake manifold. Power assist is generated by utilizing a combination of vacuum and atmospheric pressure to boost brake assist.

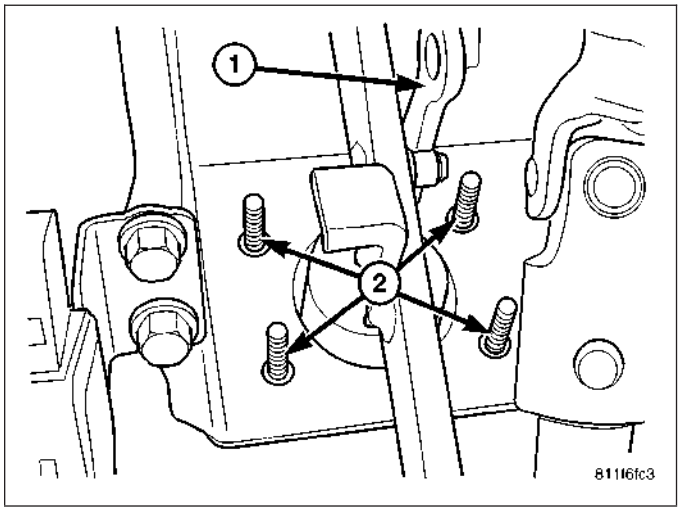


REMOVAL

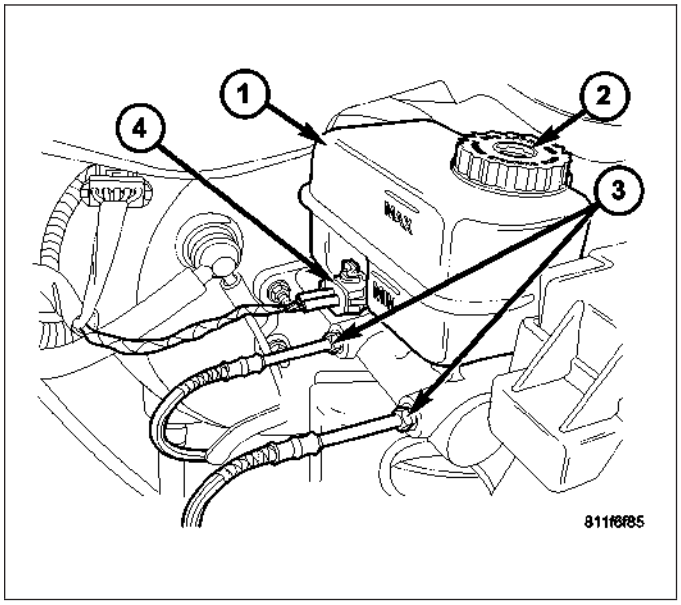
1. Depress the brake pedal five times to deplete any vacuum that may remain in the booster unit.
2. Siphon and drain the fluid from the reservoir.
3. Remove the wiper arm (1) and cowl assembly (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/ WIPER ARMS - REMOVAL).



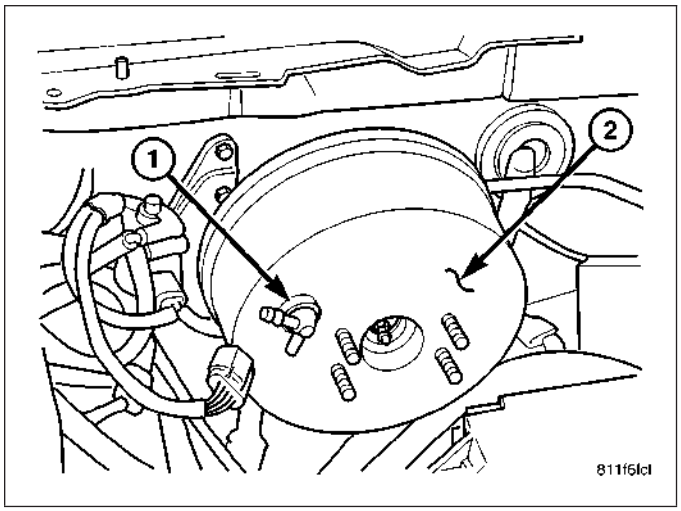
4. Remove the brake lamp switch (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/BRAKE LAMP SWITCH - REMOVAL).
5. Remove clip securing booster push rod to brake pedal (1) (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/PEDAL - REMOVAL).
6. Remove the brake booster mounting nuts (2).



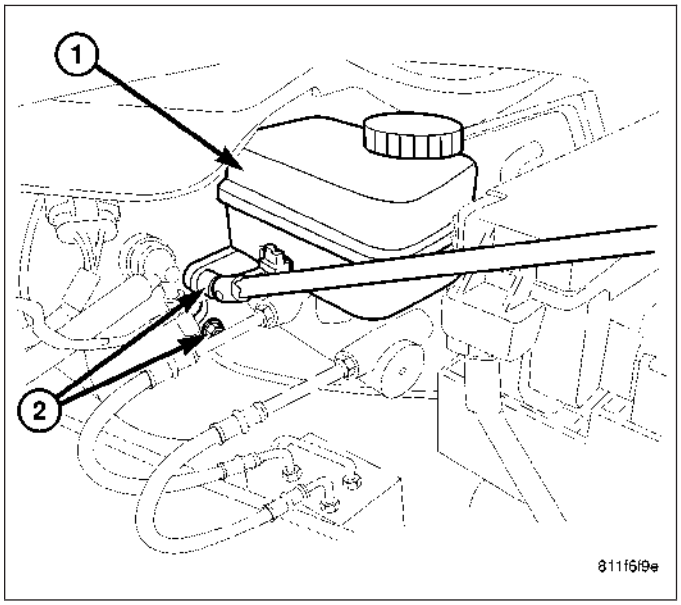
7. Disconnect the brake level electrical connector (4).



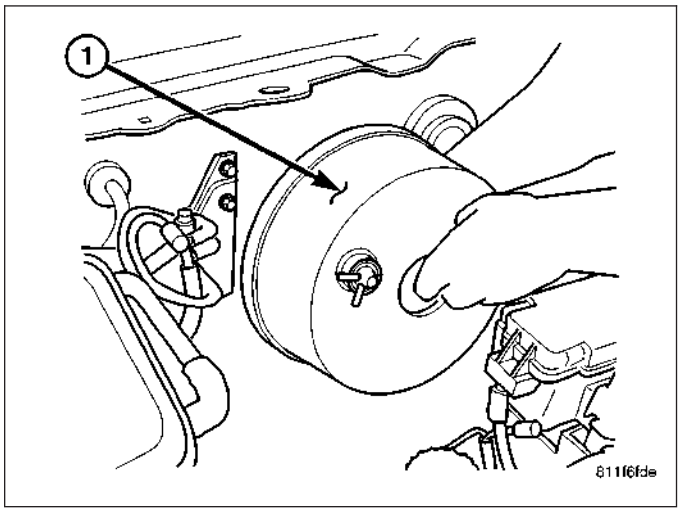
8. Disconnect the brake lines at the master cylinder.
9. Disconnect vacuum line (1) at booster.



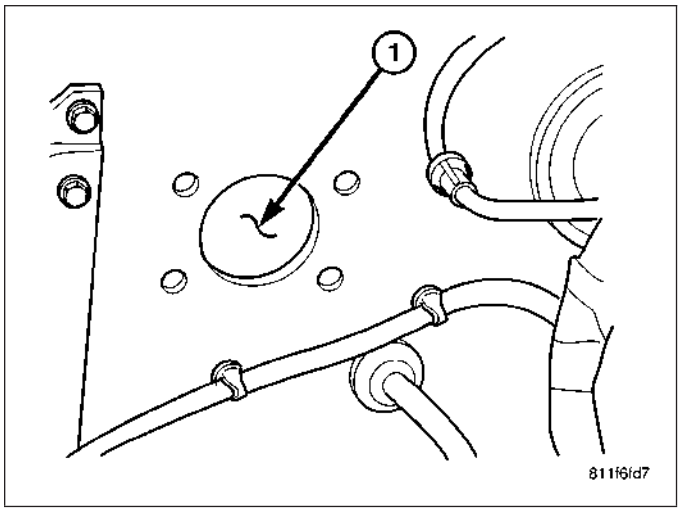
10. Remove master cylinder (1) from the mounting studs (2) on the power brake booster.



11. Remove the booster (1) and spacer block from front cowl panel.

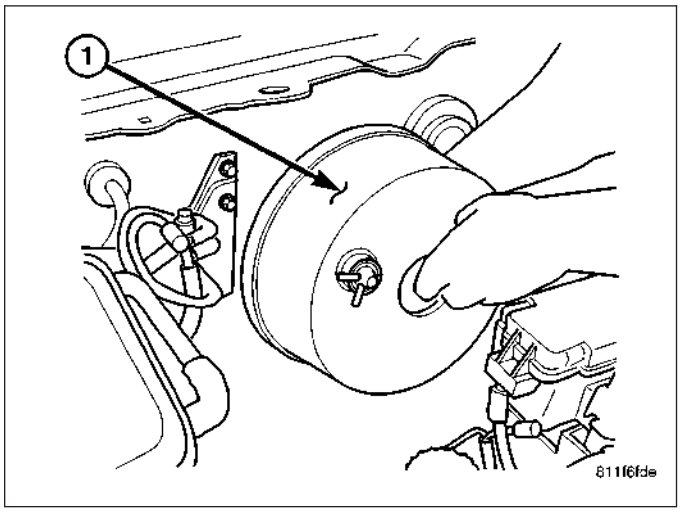


12. Wipe clean any debris from the brake booster cowl mounting hole (2).

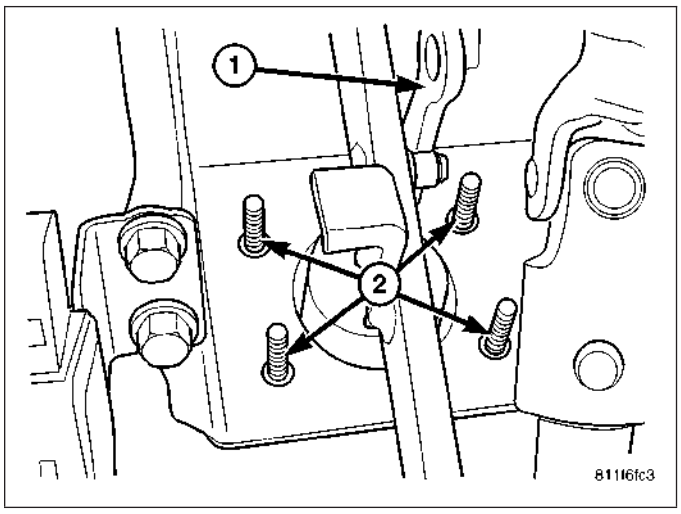


INSTALLATION

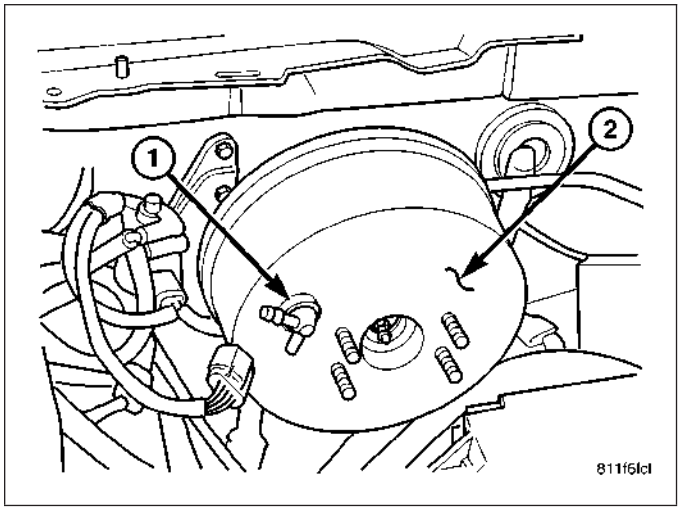
1. Install the spacer block and gaskets if removed.
2. Guide the booster studs into the cowl panel holes and seat the booster (1) on the panel.



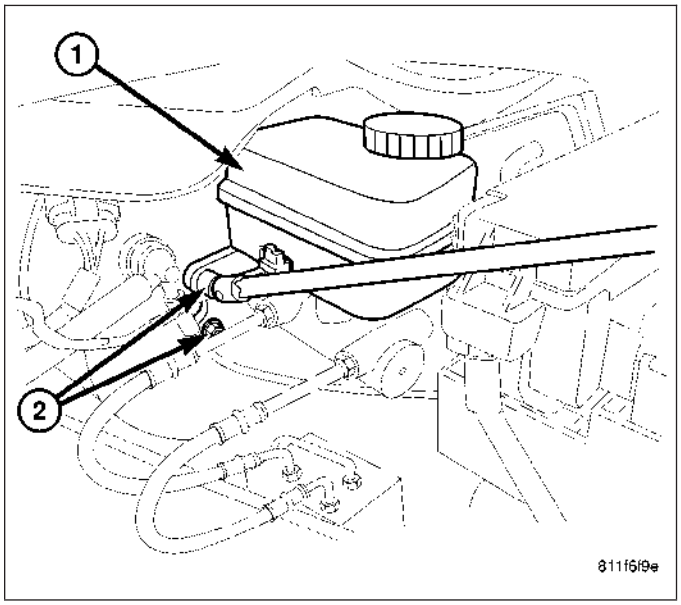
3. Install and tighten new booster attaching nuts (2) to 28 N·m (250 in. lbs.).
4. Install the booster push rod (1) on brake pedal and install clip.
5. Install a new brake lamp switch (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/ BRAKE LAMP SWITCH - INSTALLATION).



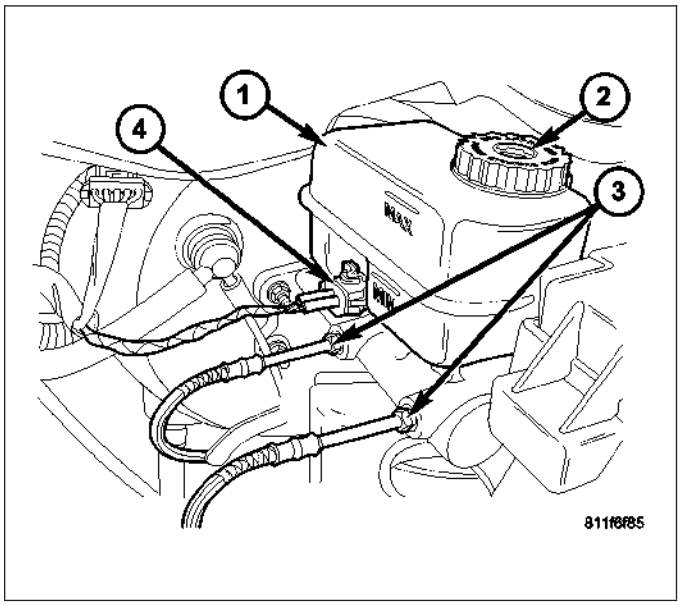
6. Install the vacuum hose to the check valve (1).



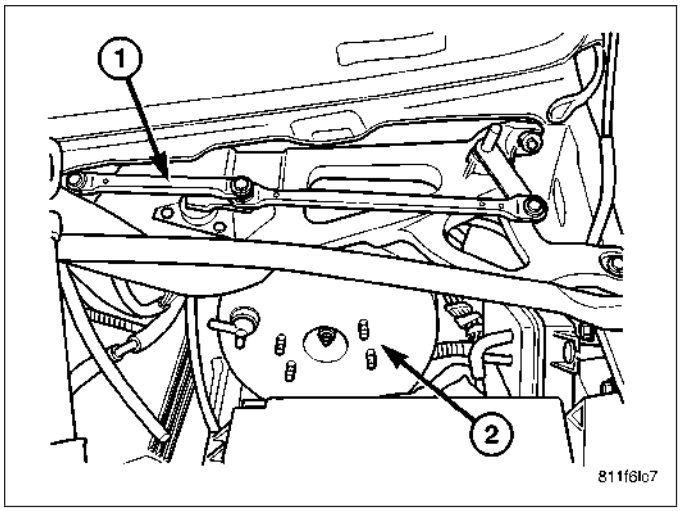
7. Install the master cylinder (1) on the brake booster and tighten the nuts (2) to 10 N·m (90 in. lbs.).



8. Reconnect the brake fluid level electrical connector (4).
9. Recconnect the brake lines at the master cylinder and tighten the lines to 19 N·m (170 in. lbs.)..



10. Install the wiper arm and cowl assembly (1) (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/ WIPER ARMS - INSTALLATION).
11. Fill and bleed the brake system. (Refer to 5 - BRAKES - STANDARD PROCEDURE).



ROTORS

DIAGNOSIS AND TESTING

DISC BRAKE ROTOR

The rotor braking surfaces should not be refinished unless necessary.

Light surface rust and scale can be removed with a lathe equipped with dual sanding discs. The rotor surfaces can be restored by machining with a disc brake lathe if surface scoring and wear are light.

Replace the rotor for the following conditions:

- Severely Scored
- Tapered
- Hard Spots
- Cracked
- Below Minimum Thickness

ROTOR MINIMUM THICKNESS

Measure rotor thickness at the center of the brake shoe contact surface. Replace the rotor if below minimum thickness, or if machining would reduce thickness below the allowable minimum.

Rotor minimum thickness is usually specified on the rotor hub. The specification is either stamped or cast into the hub surface.

ROTOR RUNOUT

Check rotor lateral runout with dial indicator C-3339. Excessive lateral runout will cause brake pedal pulsation and rapid, uneven wear of the brake shoes. Position the dial indicator plunger approximately 25.4 mm (1 in.) inward from the rotor edge.

NOTE: Be sure wheel bearing has zero end play before checking rotor runout.

Maximum allowable rotor runout is 0.131 mm (0.002 in.).

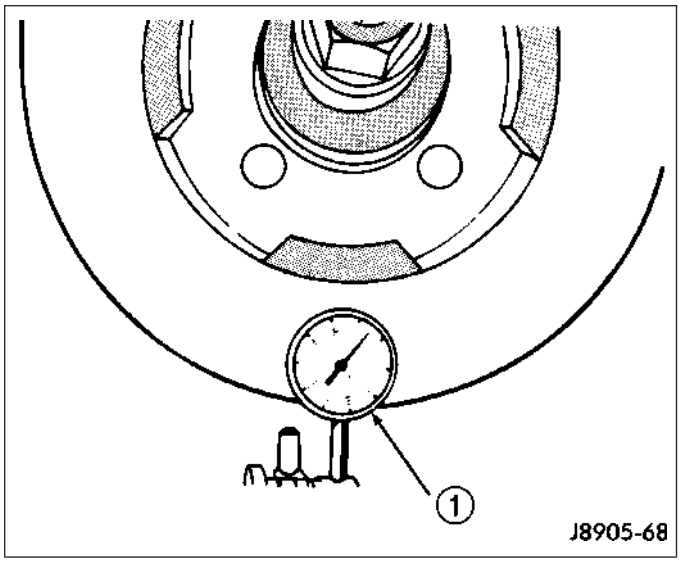
ROTOR THICKNESS VARIATION

Variations in rotor thickness will cause pedal pulsation, noise and shudder.

Measure rotor thickness at 6 to 12 points around the rotor face.

Position the micrometer approximately 25.4 mm (1 in.) from the rotor outer circumference for each measurement.

Thickness should not **vary** by more than 0.015 mm (0.0059 in.) from point-to-point on the rotor. Machine or replace the rotor if necessary.

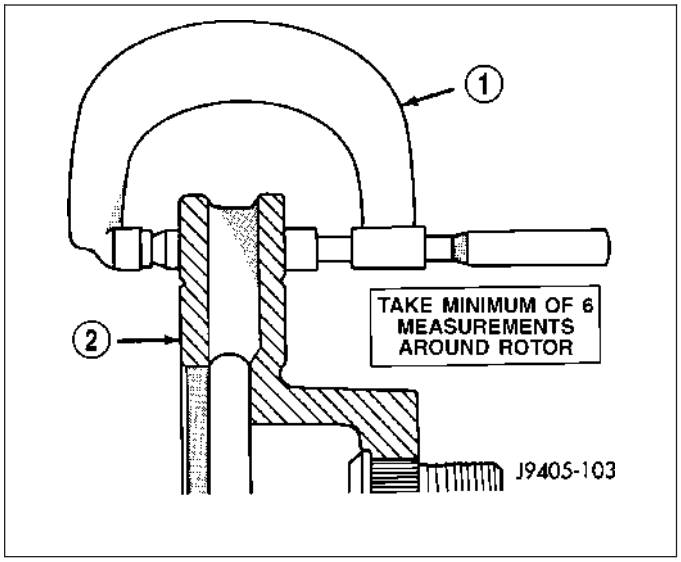


STANDARD PROCEDURE

FRONT/REAR - DISC BRAKE ROTORS

The disc brake rotor can be machined if scored or worn. The lathe must machine both sides of the rotor simultaneously with dual cutter heads. The rotor mounting surface must be clean before placing on the lathe. Equipment capable of machining only one side at a time may produce a tapered rotor. A hub mounted on-vehicle lathe is recommended. This type of lathe trues the rotor to the vehicles hub/bearing.

CAUTION: Brake rotors that do not meet minimum thickness specifications before or after machining must be replaced.



BRAKE DRUM IN HAT ROTOR MACHINING

The brake drum in hat rotor can be machined on a drum lathe when necessary. Initial machining cuts should be limited to 0.12 - 0.20 mm (0.005 - 0.008 in.) at a time as heavier feed rates can produce taper and surface variation. Final finish cuts of 0.025 to 0.038 mm (0.001 to 0.0015 in.) are recommended and will generally provide the best surface finish.

Be sure the drum in hat rotor is securely mounted in the lathe before machining operations. A damper strap should always be used around the drum to reduce vibration and avoid chatter marks.

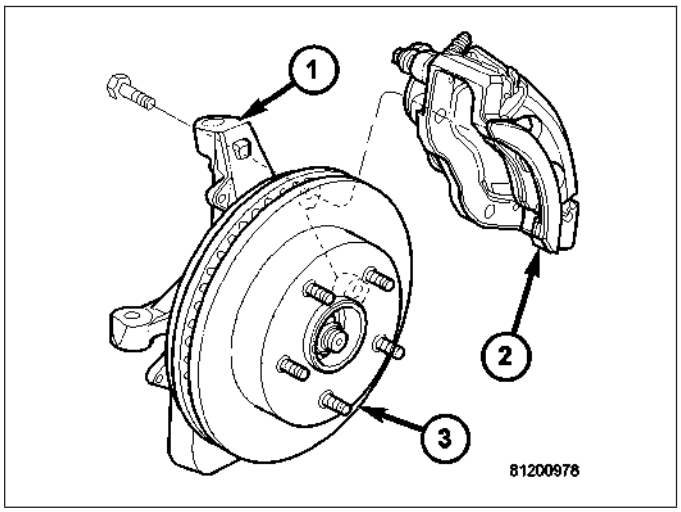
The maximum allowable diameter of the drum braking surface is stamped or cast into the drum in hat rotor.

CAUTION: Replace the drum in hat rotor if machining will cause the drum to exceed the maximum allowable diameter.

REMOVAL

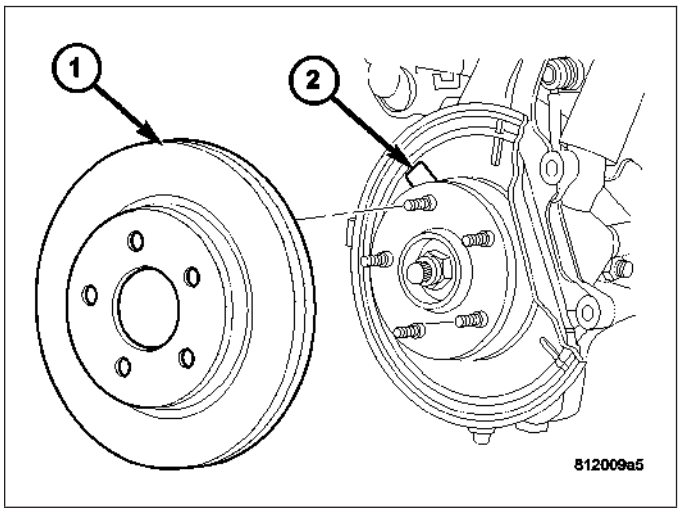
FRONT

1. Raise and support the vehicle.
2. Remove the wheel and tire assembly.
3. Remove the caliper (2) from the steering knuckle (1), (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - REMOVAL) and remove caliper adapter assembly.



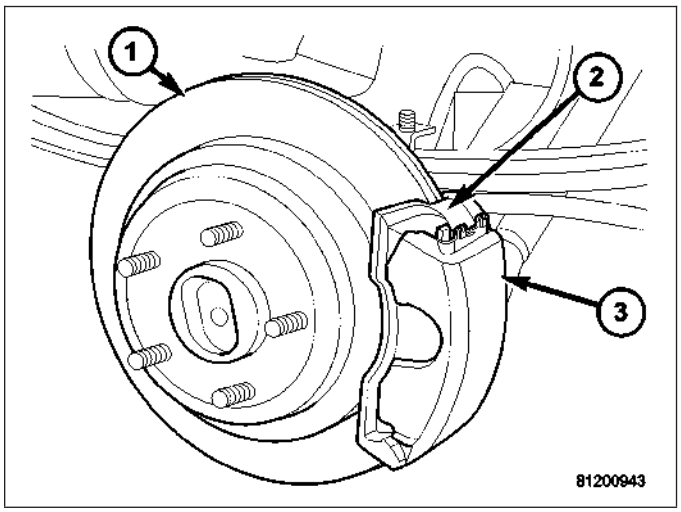
NOTE: Do not allow brake hose to support caliper adapter assembly.

4. Remove the rotor (1) from the hub/bearing wheel studs (2).



REAR

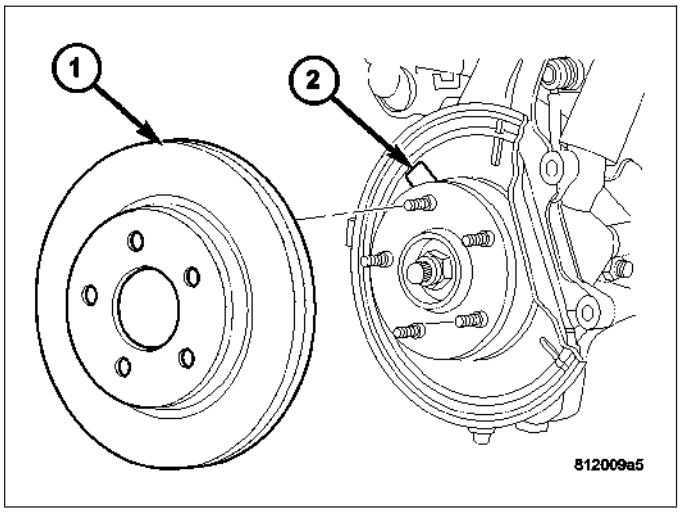
1. Raise and support the vehicle
2. Remove the tire and wheel assembly.
3. Remove the disc brake caliper (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - REMOVAL).
4. Remove the caliper adapter bolts. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPER ADAPTER - REMOVAL)
5. Remove the disc brake caliper adapter (2).
6. Remove the retianing clips and rotor assembly (1).



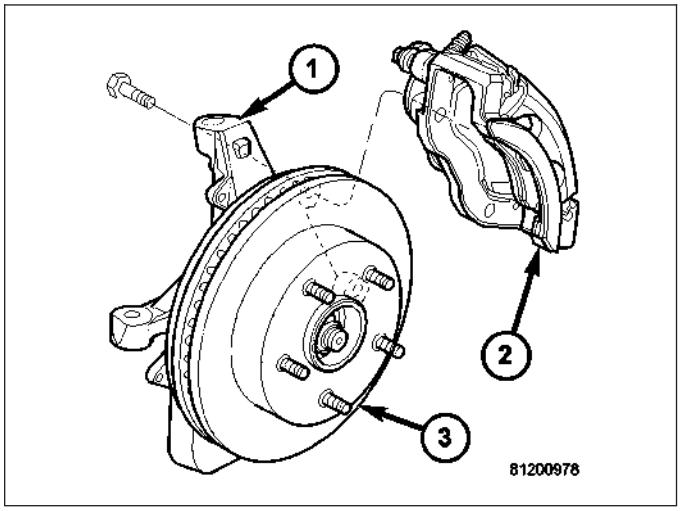
INSTALLATION

FRONT

1. On models with all-wheel antilock system (ABS), check condition of tone wheel on hub/bearing. If teeth on wheel are damaged, hub/bearing assembly will have to be replaced (tone wheel is not serviced separately).
2. Install the rotor (1) onto the hub/bearing wheel studs (2).

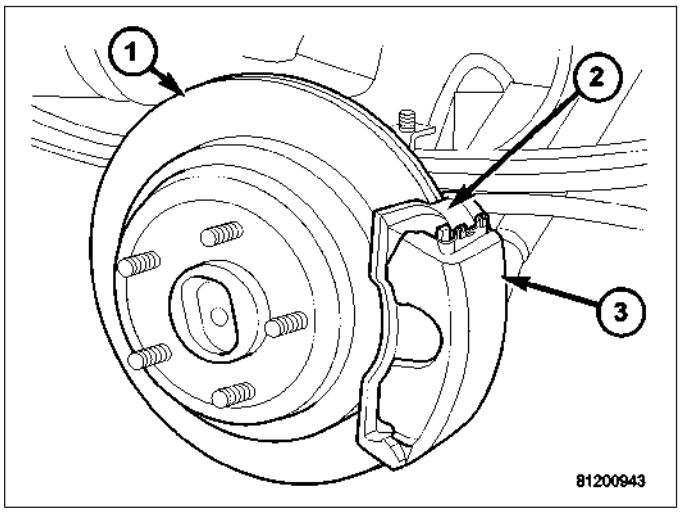


3. Install the caliper adapter assembly (2), (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - INSTALLATION) and tighten adapter bolts to 176 N·m (130 ft.lbs.).
4. Install the wheel and tire assembly, (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE) and lower the vehicle.
5. Apply the brakes several times to seat brake pads. Be sure to obtain firm pedal before moving vehicle.



REAR

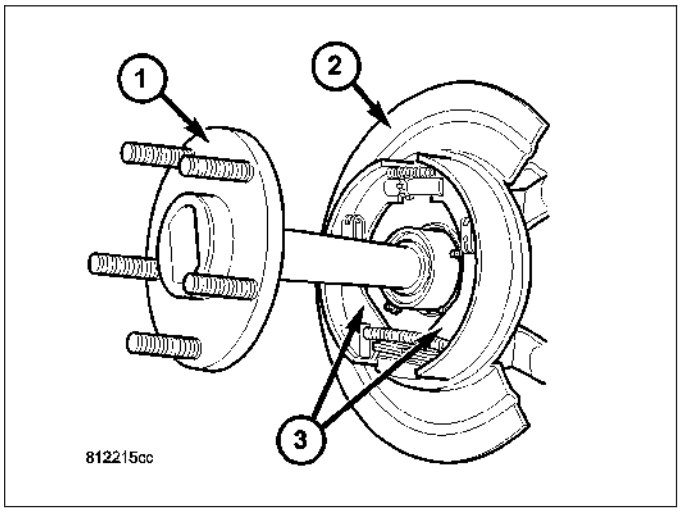
1. Install the rotor (1) to the hub/bearing.
2. Install the caliper adapter (2) (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPER ADAPTER - INSTALLATION).
3. Install the caliper adapter bolts and tighten the mounting bolts to 135 N·m (100 ft.lbs).
4. Install the disc brake caliper, (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - INSTALLATION).
5. Install the tire and wheel assembly (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).
6. Lower the vehicle.

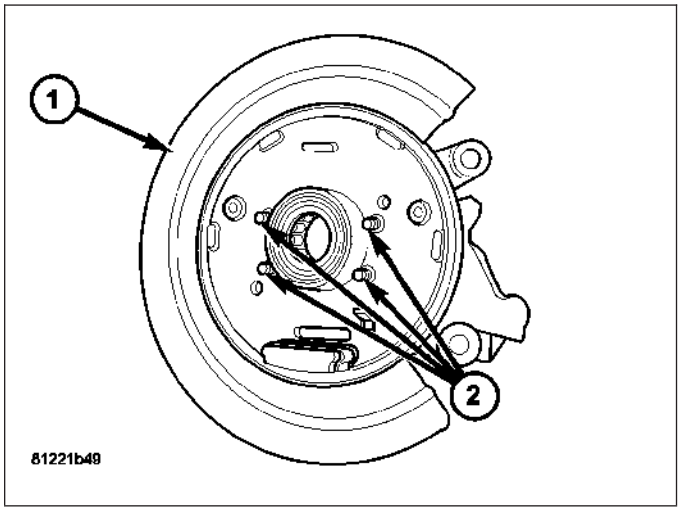


SUPPORT PLATE

REMOVAL

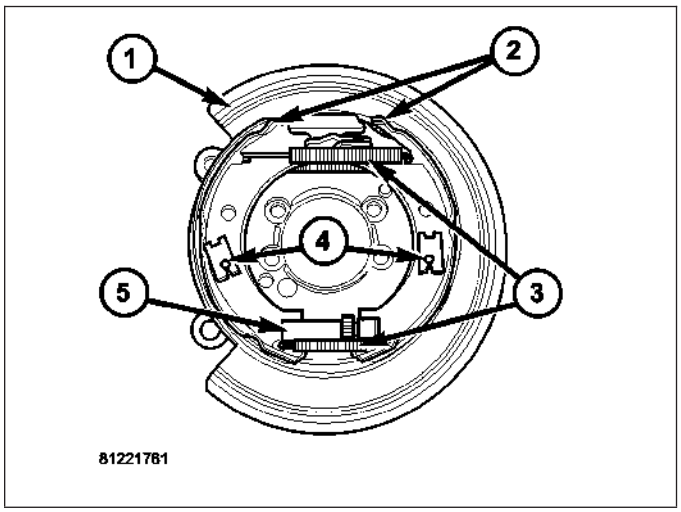
1. Remove wheel and tire assembly.
2. Remove the disc brake caliper (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - REMOVAL).
3. Remove the caliper adapter (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPER ADAPTER - REMOVAL).
4. Remove the rotor (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - REMOVAL).
5. Remove the axle shaft (1) (Refer to 3 - DIFFERENTIAL & DRIVELINE/REAR AXLE - 9 1/4/AXLE SHAFTS - REMOVAL).
6. Remove the park brake shoes (3) (Refer to 5 - BRAKES/PARKING BRAKE/SHOES - REMOVAL).
7. Remove the parking brake cable from the brake lever.
8. Remove the four bolts (2) attaching the support plate (1) to the axle and remove the support plate (1).



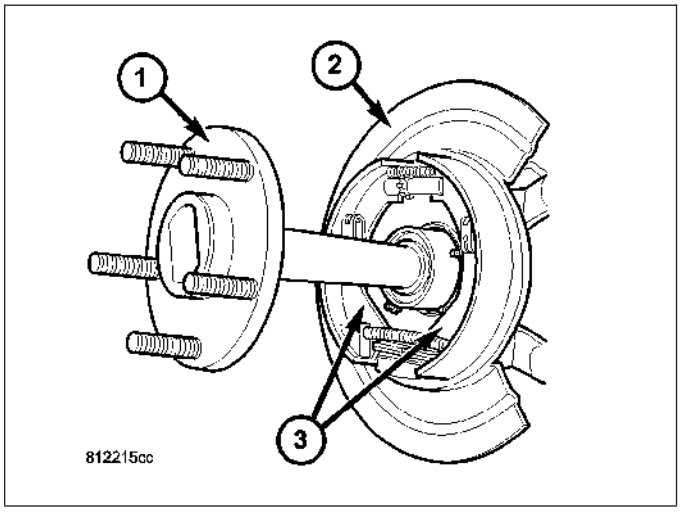


INSTALLATION

1. Install support plate (1) on axle flange. Tighten attaching bolts (3) to 115 N·m (85 ft. lbs.).
2. Install parking brake cable in the brake lever.
3. Install the park brake shoes (2) (Refer to 5 - BRAKES/PARKING BRAKE/SHOES - INSTALLATION).



4. Install axle shaft (1), (Refer to 3 - DIFFERENTIAL & DRIVELINE/REAR AXLE - 9 1/4/AXLE SHAFTS - INSTALLATION).
5. Adjust brake shoes to drum with brake gauge (Refer to 5 - BRAKES/PARKING BRAKE/SHOES - ADJUSTMENTS).
6. Install the rotor (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - INSTALLATION).
7. Install the caliper adapter (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPER ADAPTER - INSTALLATION).
8. Install the caliper (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - INSTALLATION).



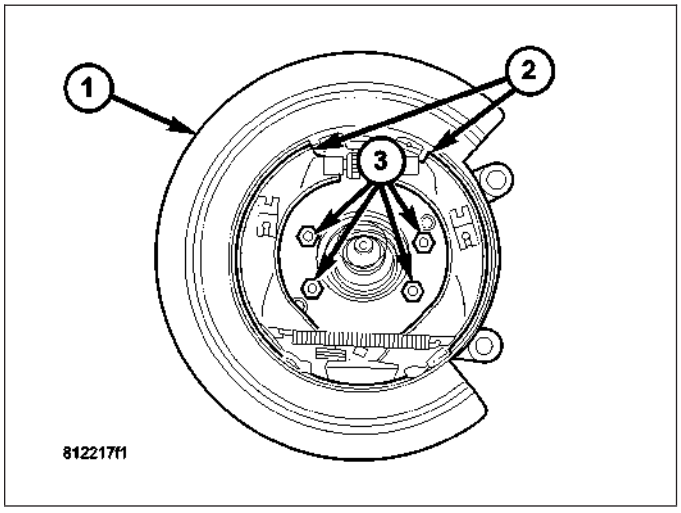
9. Install the wheel and tire assembly (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).

PARKING BRAKE

DESCRIPTION

The parking brakes are secured to a support plate (1) and operated by a system of cables and levers attached to a primary and secondary shoe (2) positioned within the drum section of the rotor.

The drum-in-hat design utilizes an independent set of shoes (2) to park the vehicle.



OPERATION

To apply the parking brake the pedal is depressed. This creates tension in the cable which pulls forward on the park brake lever. The lever pushes the park brake shoes outward and into contact with the drum section of the rotor. The contact of shoe to rotor parks the vehicle.

A torsion locking mechanism is used to hold the pedal in an applied position. Parking brake release is accomplished by the hand release.

A parking brake switch is mounted on the parking brake lever and is actuated by movement of the lever. The switch, which is in circuit with the red warning light in the dash, will illuminate the warning light whenever the parking brake is applied.

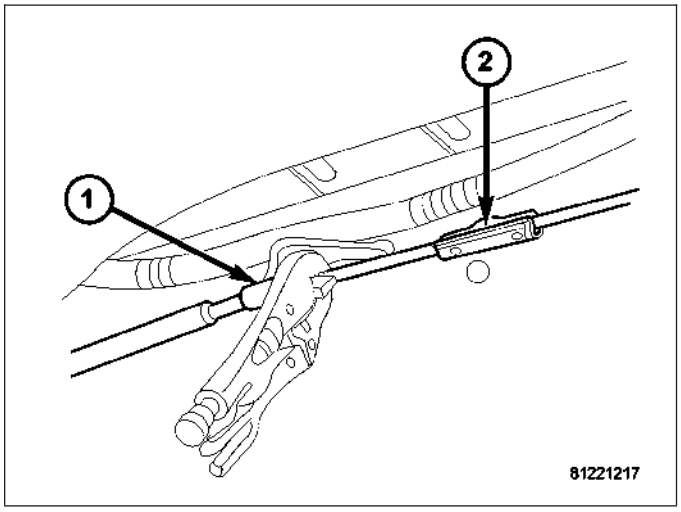
Parking brake adjustment is controlled by a cable tensioner mechanism. The cable tensioner, once adjusted at the factory, should not need further adjustment under normal circumstances. Adjustment may be required if a new tensioner, or cables are installed, or disconnected.

CABLES

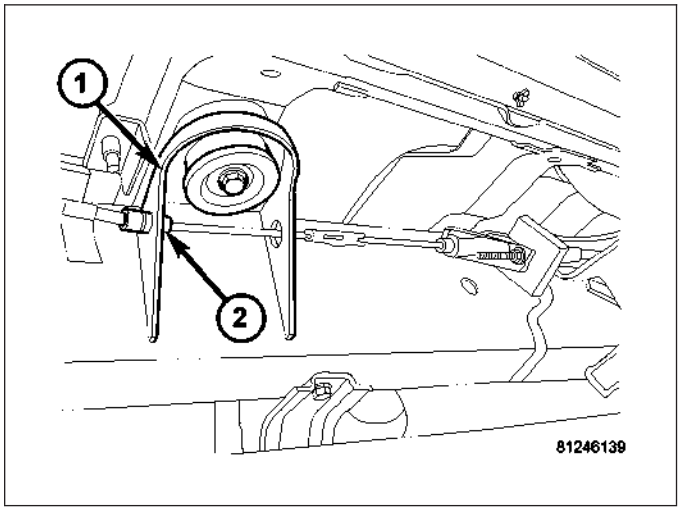
REMOVAL

FRONT PARKING BRAKE CABLE

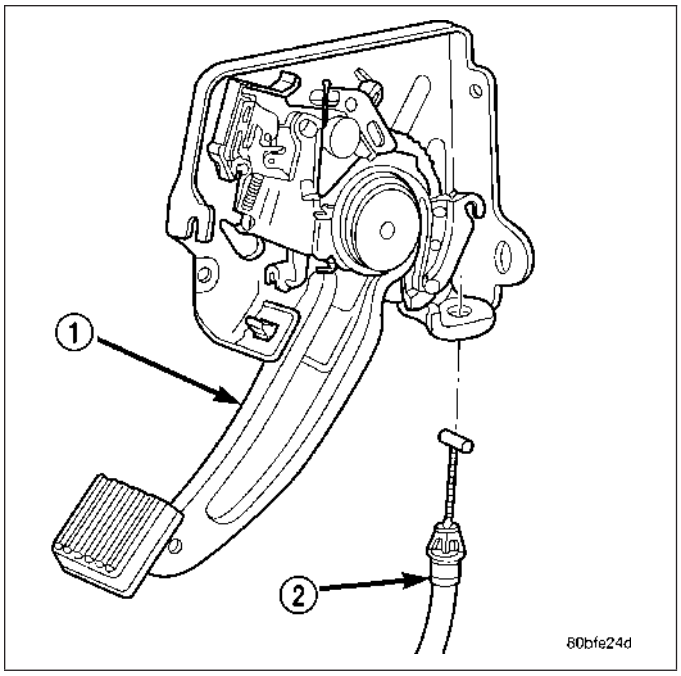
1. Raise and support vehicle.
2. Lockout the parking brake cable (2).
3. Loosen adjusting nut (1) to create slack in front cable.
4. Remove the front cable from the cable connector.



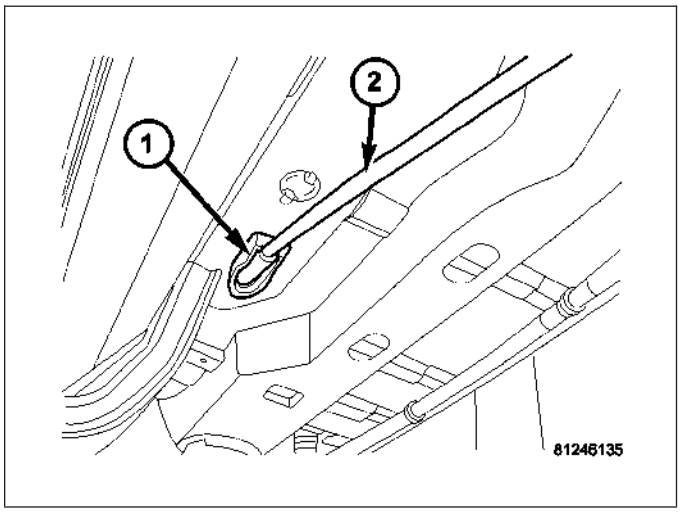
5. Compress cable end fitting at underbody bracket (1) and remove the cable (2) from the bracket.
6. Lower vehicle.



7. Push ball end of cable out of pedal clevis with small screwdriver.
8. Compress cable end fitting (2) at the pedal bracket and remove the cable (1).
9. Remove the left cowl trim and sill plate.
10. Pull up the carpet and remove the cable from the body clip.

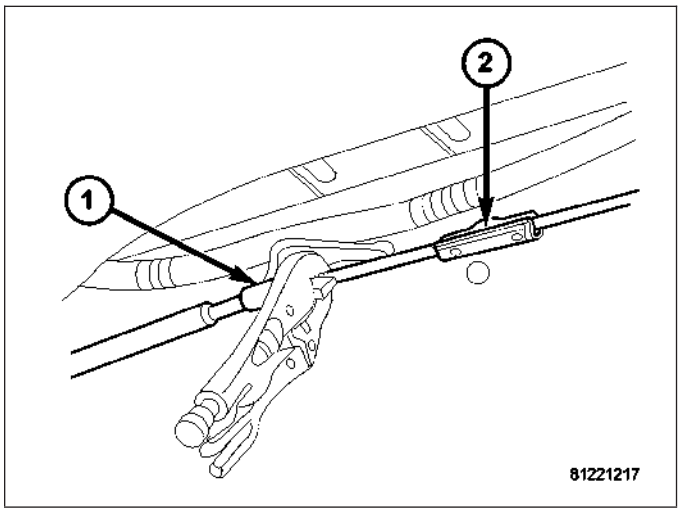


11. Pull up on the cable (2) and remove the cable with the body grommet (1).

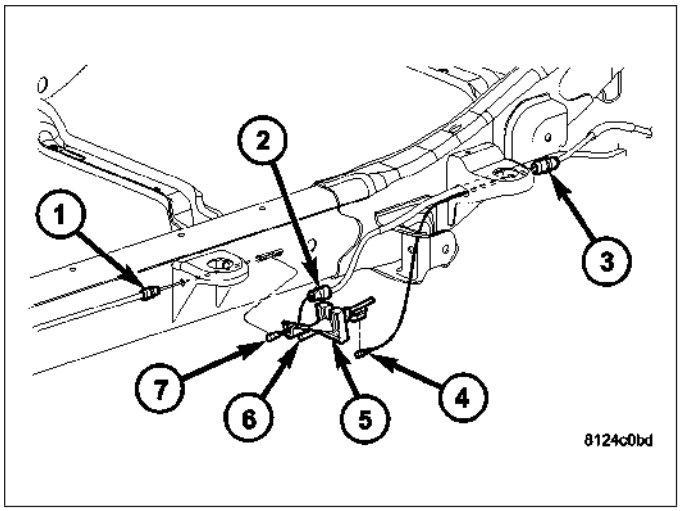


REAR PARK BRAKE CABLE

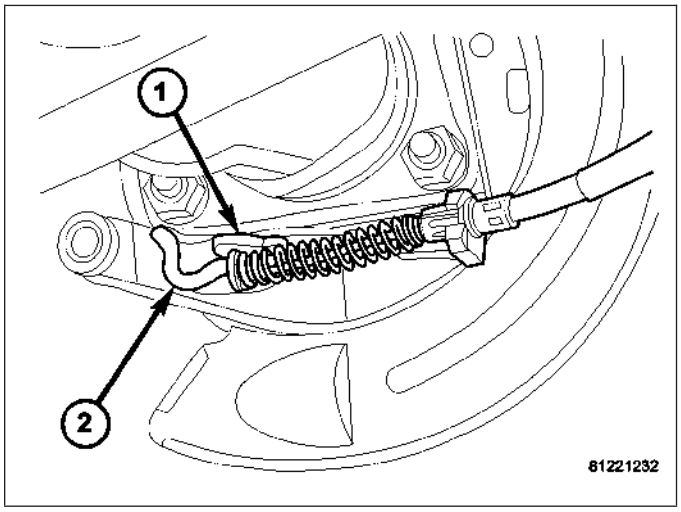
1. Raise and support the vehicle.
2. Lockout the parking brake cable (1).



3. Loosen cable adjuster nut (6).
4. Remove the rear park brake cable (5) from the intermediate park brake cable (1).
5. Compress tabs on cable end fitting (3) on the rear park brake cable (4) to the frame mount bracket. Then pull the cable through the bracket.

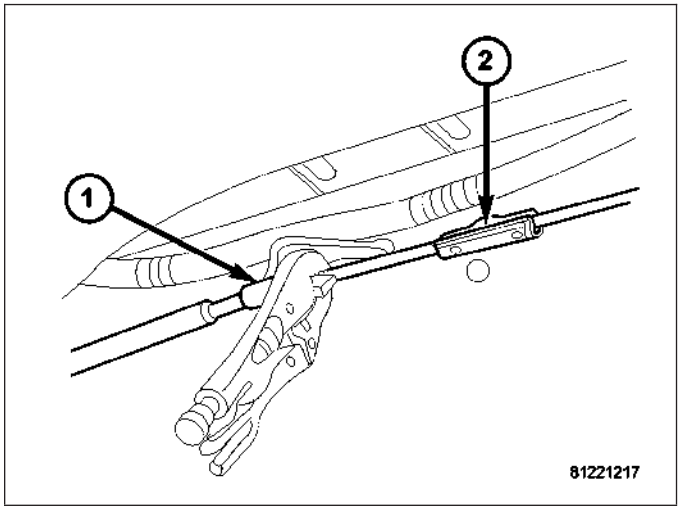


6. Disengage the park brake cable (2) from behind the rotor assembly.
7. Compress cable tabs on each cable end fitting at the brake cable support plate (1).
8. Remove the cables from the brake cable support plates.

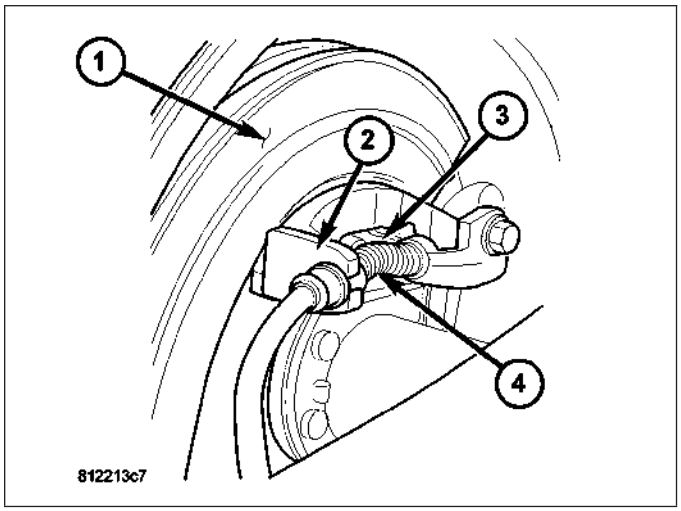


RIGHT REAR CABLE

1. Raise and support the vehicle.
2. Lockout the parking brake cable (1).
3. Loosen the brake cable at the equalizer and adjuster nut.
4. Remove the right cable from the front cable.
5. Remove the right cable from the equalizer.
6. Remove the cable from the frame bracket.

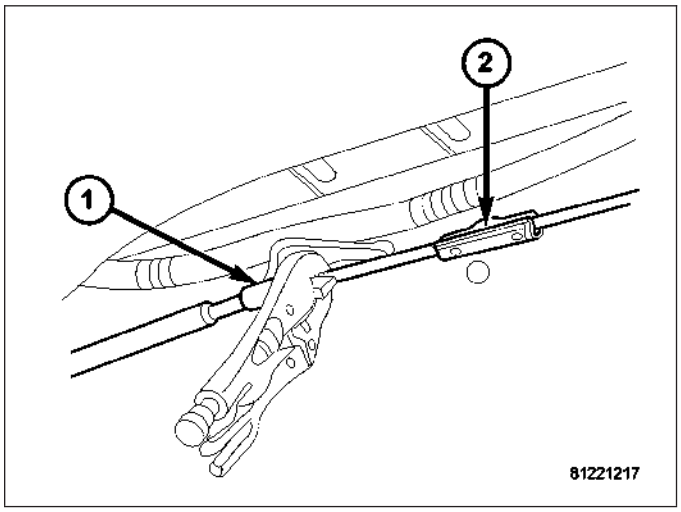


7. Remove the cable (4) from the axle bracket (2).
8. Remove the cable bracket from the shock bracket.
9. Remove the brake cable from the brake lever (3).

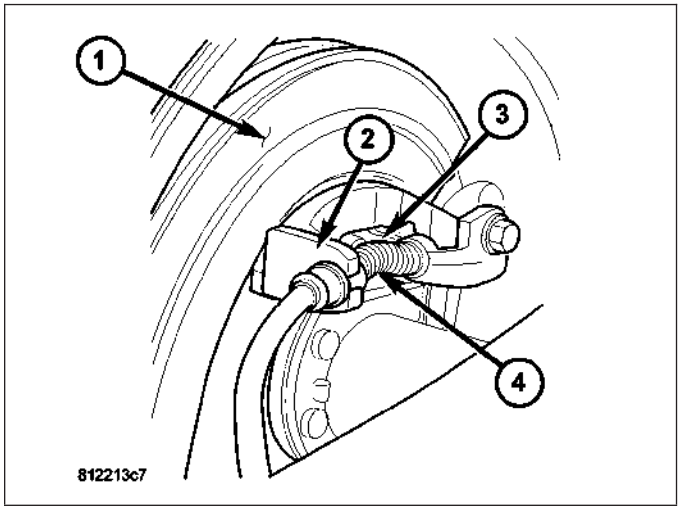


LEFT REAR CABLE

1. Raise and support the vehicle.
2. Lockout the parking brake cable (1).
3. Loosen the brake cable at the equalizer and adjuster nut.
4. Remove the left cable from the front cable.
5. Remove the left cable from the equalizer.
6. Remove the cable from the frame bracket.



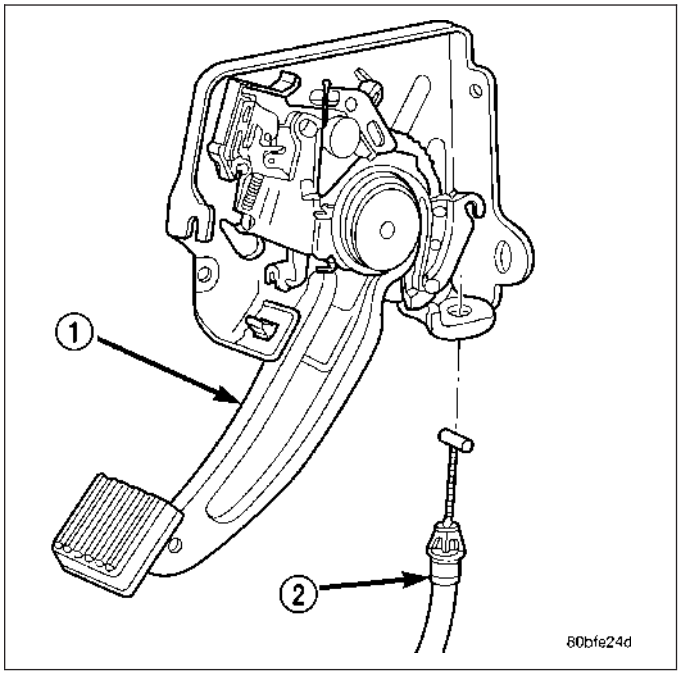
7. Remove the cable (4) from the axle bracket (2).
8. Remove the brake cable from the brake lever (3).



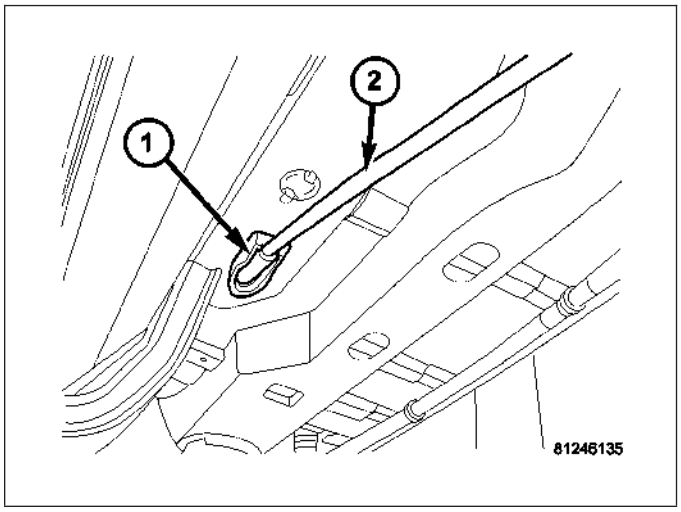
INSTALLATION

FRONT PARKING BRAKE CABLE

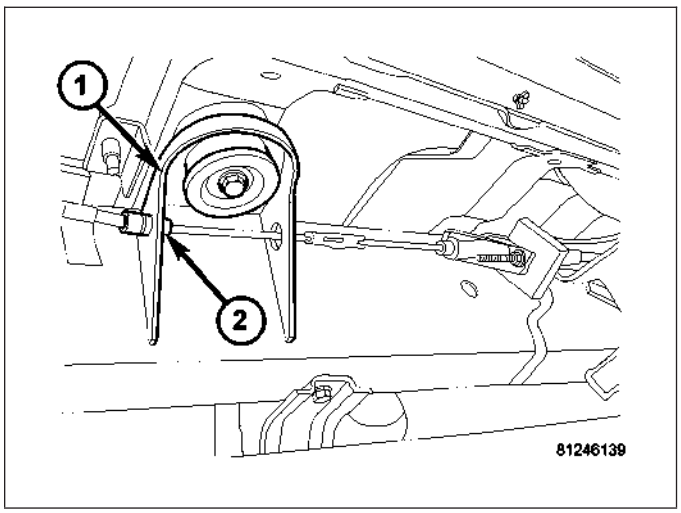
1. From inside the vehicle, insert the cable end fitting (2) into the hole in the pedal assembly (1).
2. Seat the cable retainer in the pedal assembly (1).
3. Engage the cable ball end in clevis on the pedal assembly.



4. Route the cable (2) through the floorpan and install the body grommet (1).
5. Place the carpet down and install the left cowl trim and sill plate.



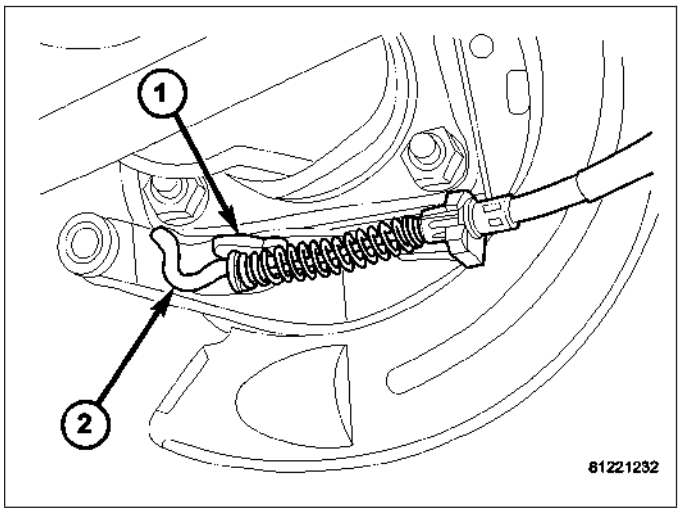
6. Raise and support the vehicle.
7. Route the cable through the underbody bracket (1) and seat the cable end fitting (2) in the bracket.
8. Connect the cable to the cable connector.
9. Perform the park brake adjustment procedure, (Refer to 5 - BRAKES/PARKING BRAKE/CABLE TENSIONER - ADJUSTMENTS).
10. Lower the vehicle.



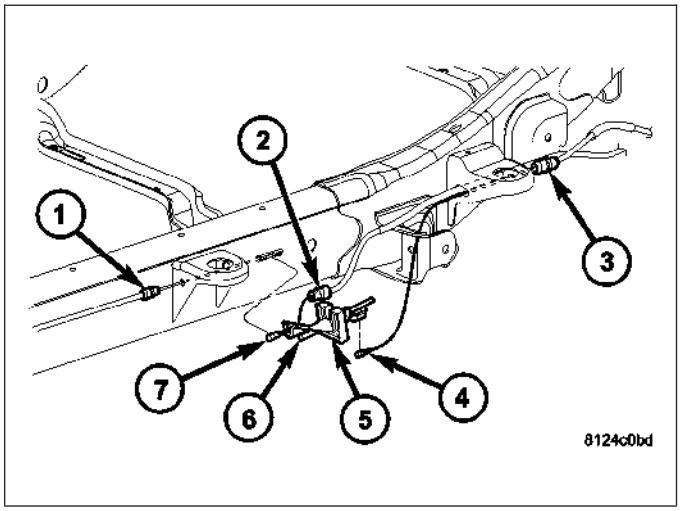
REAR PARK BRAKE CABLE

1. Push each cable end through the brake cable support plate hole until the cable end fitting tabs lock into place.

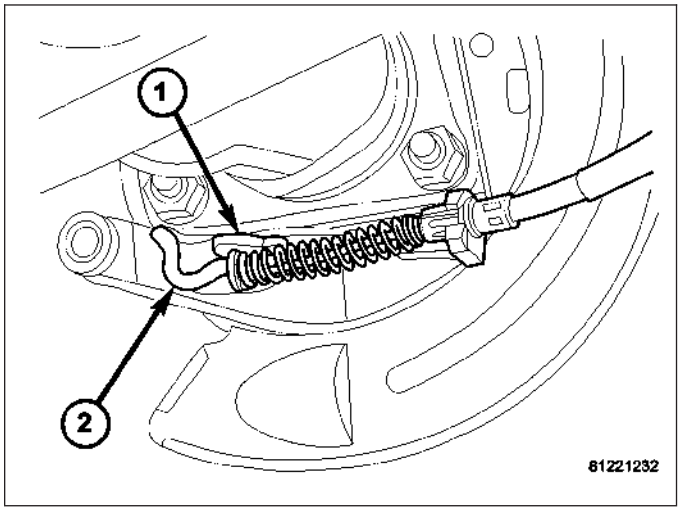
NOTE: Pull on the cable to ensure it is locked into place.



2. Push the cable (4) through the frame bracket.
3. Lock the left cable end fitting tabs (3) into the frame bracket hole.

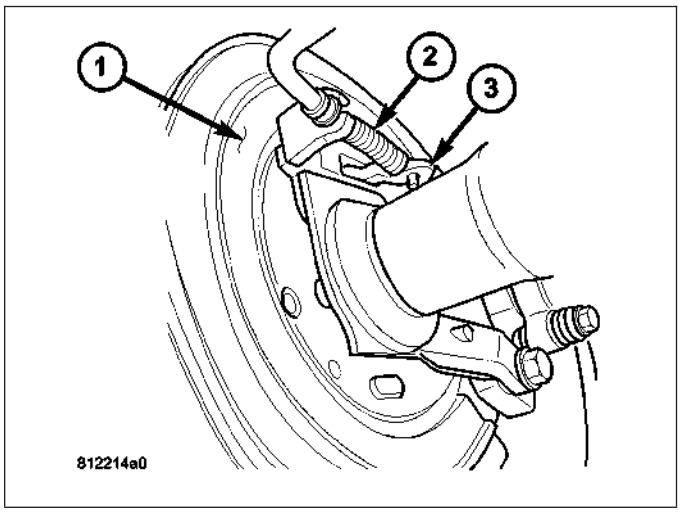


4. Install the rear cables (2) into the tensioner rod behind the rear of the brake assembly (1).
5. Install the cable to the intermediate cable connector.
6. Release and remove the lock out device.
7. Perform the park brake adjustment procedure, (Refer to 5 - BRAKES/PARKING BRAKE/CABLE TENSIONER - ADJUSTMENTS).
8. Remove the supports and lower the vehicle.



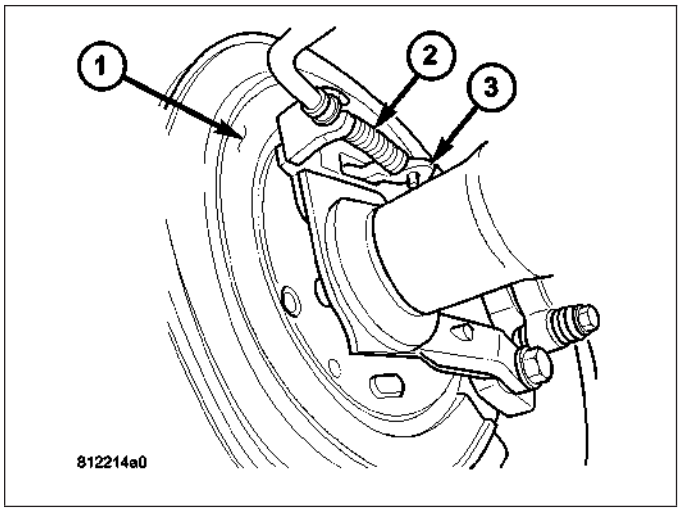
RIGHT REAR CABLE

1. Install the brake cable (2) to the brake lever (3).
2. Install the cable bracket to the shock bracket.
3. Install the cable to the axle bracket.
4. Install the cable to the frame bracket.
5. Install the right cable to the equalizer.
6. Install the right cable to the front cable.
7. Adjust the brake cable at the equalizer and using the adjuster nut.



LEFT REAR CABLE

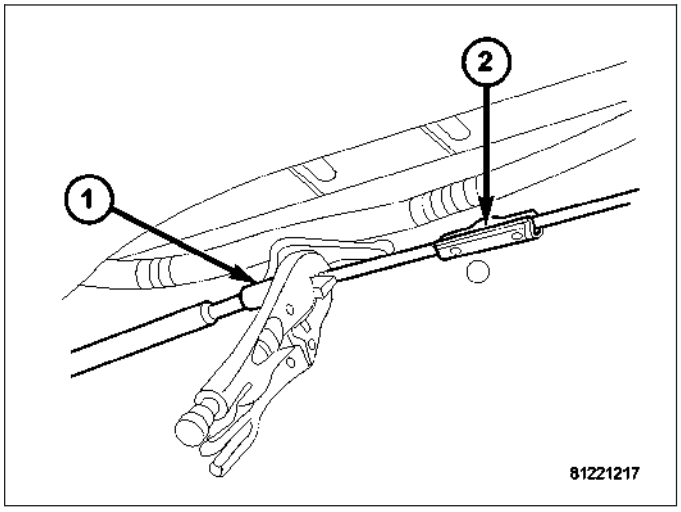
1. Install the brake cable (2) to the brake lever (3).
2. Install the cable to the axle bracket.
3. Install the cable to the frame bracket.
4. Install the left cable to the equalizer.
5. Install the left cable to the front cable.
6. Adjust the brake cable at the equalizer and using the adjuster nut.



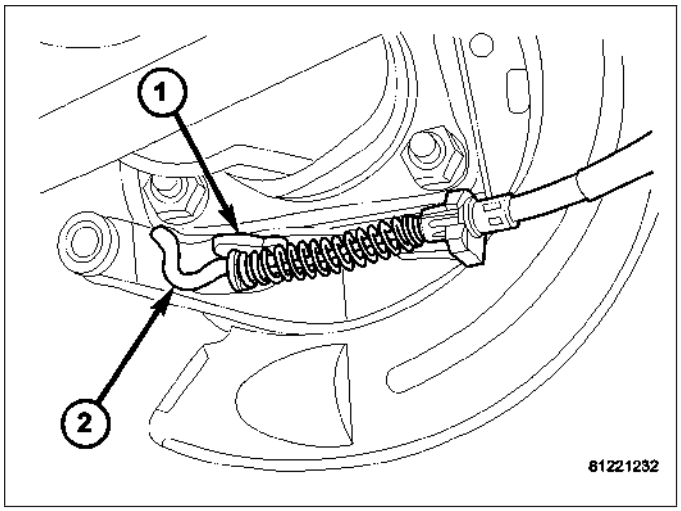
SHOES

REMOVAL

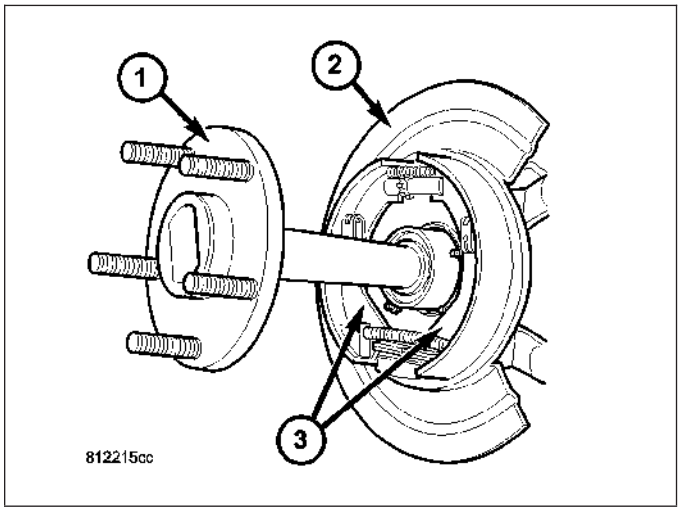
1. Raise and support the vehicle.
2. Remove the tire and wheel assembly.
3. Remove the disc brake caliper, (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - REMOVAL).
4. Remove the disc brake rotor, (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - REMOVAL).
5. Lockout the parking brake cable (1).



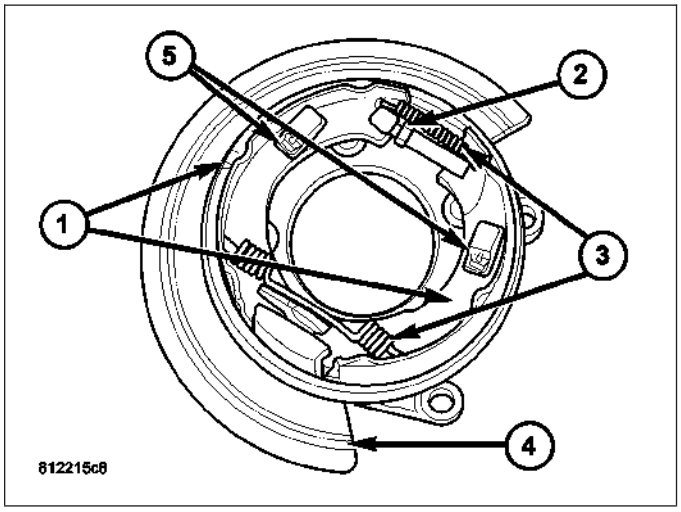
6. Disengage the park brake cable (2) from behind the rotor assembly to allow easier disassembly of the park brake shoes.



7. Remove the axleshaft (1) (Refer to 3 - DIFFERENTIAL & DRIVELINE/REAR AXLE - 9 1/4/AXLE SHAFTS - REMOVAL).



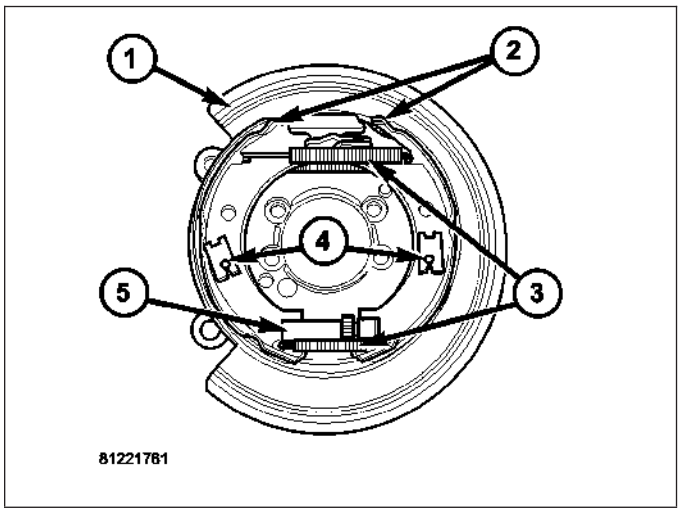
8. Disassemble the rear park brake shoes (1).



CLEANING - REAR DRUM IN HAT BRAKE

Clean the individual brake components, including the support plate exterior, with a water dampened cloth or with brake cleaner. Do not use any other cleaning agents. Remove light rust and scale from the brake shoe contact pads on the support plate with fine sandpaper.

INSPECTION - REAR DRUM IN HAT BRAKE



As a general rule, riveted brake shoes (2) should be replaced when worn to within 0.78 mm (1/32 in.) of the rivet heads. Bonded lining should be replaced when worn to a thickness of 1.6 mm (1/16 in.).

Examine the lining contact pattern to determine if the shoes are bent or the drum is tapered. The lining should exhibit contact across its entire width. Shoes (2) exhibiting contact only on one side should be replaced and the drum checked for runout or taper.

Inspect the adjuster screw assembly (5). Replace the assembly if the star wheel or threads are damaged, or the components are severely rusted or corroded.

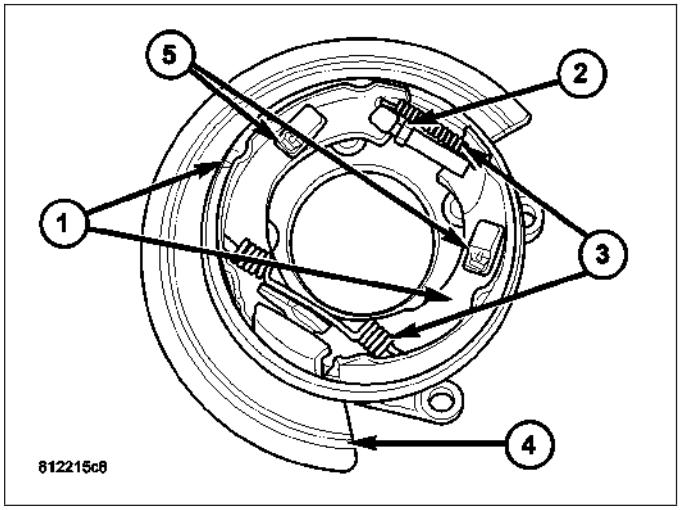
Discard the brake springs (3) and retainer components (4) if worn, distorted or collapsed. Also replace the springs if a brake drag condition had occurred. Overheating will distort and weaken the springs.

Inspect the brake shoe contact pads on the support plate (1), replace the support plate if any of the pads are worn or rusted through. Also replace the plate (1) if it is bent or distorted.

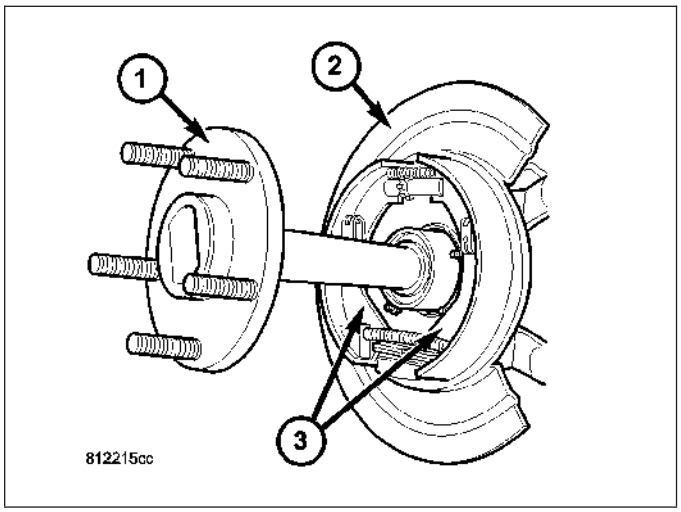
INSTALLATION

NOTE: On a new vehicle or after parking brake lining replacement, it is recommended that the parking brake system be conditioned prior to use. This is done by making one stop from 25 mph on dry pavement or concrete using light to moderate force on the parking brake foot pedal.

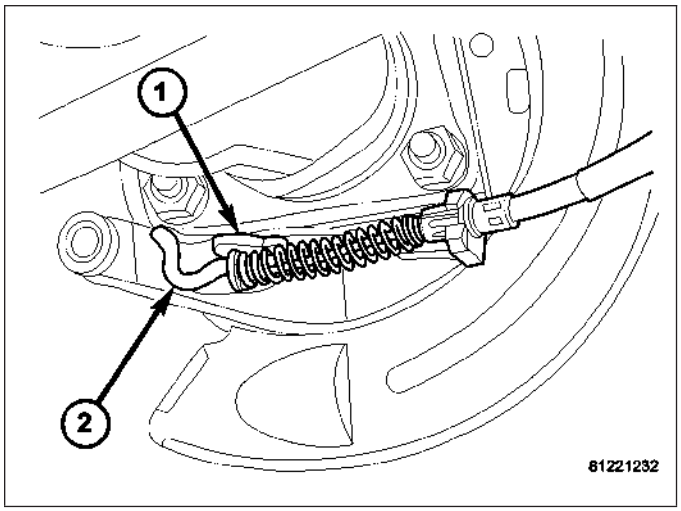
1. Reassemble the rear park brake shoes (1).



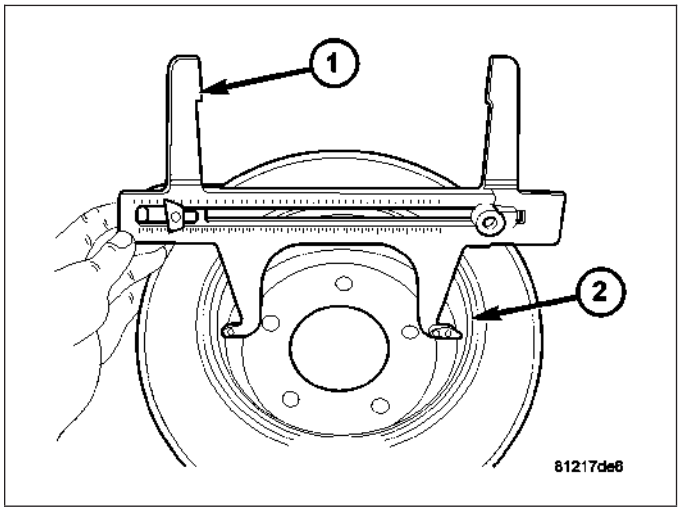
2. Install the axleshaft (1) (Refer to 3 - DIFFERENTIAL & DRIVELINE/REAR AXLE - 9 1/4/AXLE SHAFTS - INSTALLATION).



3. Install the park brake cable (2) to the lever behind the support plate (1).
4. Unlock the park brake cable.



5. Adjust the rear brake shoes (Refer to 5 - BRAKES/ PARKING BRAKE/SHOES - ADJUSTMENTS).
6. Install the disc brake rotor (Refer to 5 - BRAKES/ HYDRAULIC/MECHANICAL/ROTORS - INSTALLATION).
7. Install the disc brake caliper (Refer to 5 - BRAKES/ HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - INSTALLATION).
8. Install the tire and wheel assembly (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).
9. Lower the vehicle.

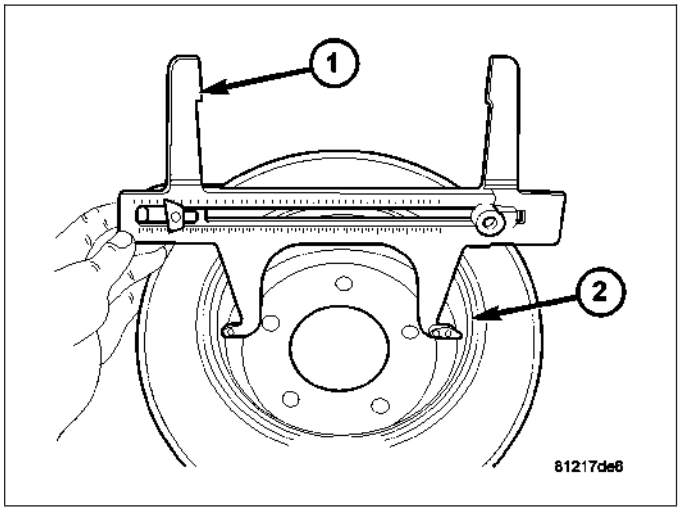


ADJUSTMENTS

PARKING BRAKE SHOES

CAUTION: Before adjusting the park brake shoes be sure that the park brake pedal is in the fully released position. If park brake pedal is not in the fully released position, the park brake shoes can not be accurately adjusted.

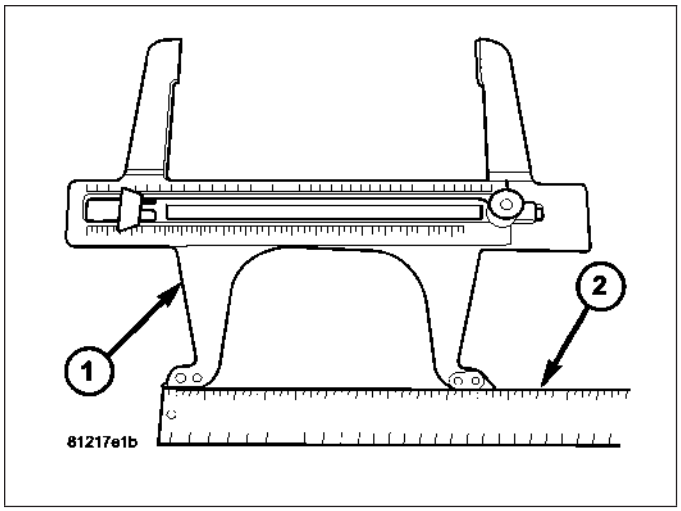
1. Raise vehicle.
2. Remove tire and wheel.
3. Remove disc brake caliper from caliper adapter (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ DISC BRAKE CALIPERS - REMOVAL).
4. Remove rotor from the axleshaft (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - REMOVAL).



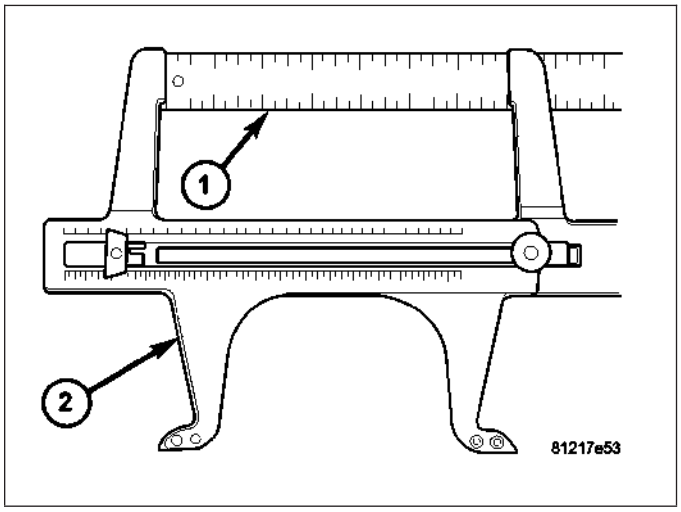
NOTE: When measuring the brake drum diameter, the diameter should be measured in the center of the area in which the park brake shoes contact the surface of the brake drum.

5. Using Brake Shoe Gauge, Special Tool C-3919 (1), or equivalent, **accurately** measure the inside diameter of the park brake drum portion (2) of the rotor.

6. Using a ruler (2) that reads in 64th of an inch, accurately read the measurement of the inside diameter of the park brake drum from the special tool (2).



7. Reduce the inside diameter measurement of the brake drum that was taken using Special Tool C-3919 (2) by 1/64 of an inch. Reset Gauge, Brake Shoe, Special Tool C-3919 (2) or the equivalent used, so that the outside measurement jaws are set to the reduced measurement.



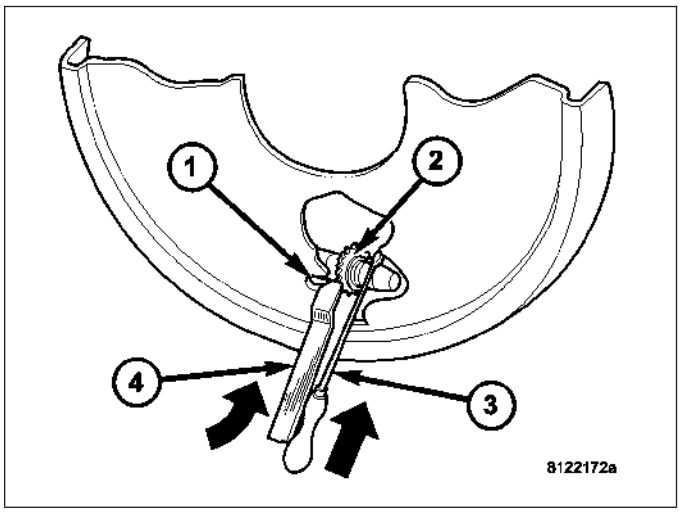
8. Place Gauge, Brake Shoe, Special Tool C-3919, or equivalent over the park brake shoes. The special tool must be located diagonally across at the top of one shoe and bottom of opposite shoe (widest point) of the park brake shoes.
9. Using the star wheel adjuster, adjust the park brake shoes until the lining on the park brake shoes just touches the jaws on the special tool.
10. Repeat step 8 above and measure shoes in both directions.
11. Install brake rotor on the axleshaft (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - INSTALLATION).
12. Rotate rotor to verify that the park brake shoes are not dragging on the brake drum. If park brake shoes are dragging, remove rotor and back off star wheel adjuster one notch and recheck for brake shoe drag against drum. Continue with the previous step until brake shoes are not dragging on brake drum.
13. Install disc brake caliper on caliper adapter (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - INSTALLATION).
14. Install wheel and tire.
15. Tighten the wheel mounting nuts in the proper sequence until all nuts are torqued to half the specified torque. Then repeat the tightening sequence to the full specified torque of 129 N·m (95 ft. lbs.).
16. Lower vehicle.
17. Apply and release the park brake pedal one time. This will seat and correctly adjust the park brake cables.

CAUTION: Before moving vehicle, pump brake pedal several times to ensure the vehicle has a firm enough pedal to stop the vehicle.

18. Road test the vehicle to ensure proper function of the vehicle's brake system.

WITH ADJUSTING TOOL

Adjustment can be made with a standard brake gauge or with adjusting tool. Adjustment is performed with the complete brake assembly installed on the backing plate.

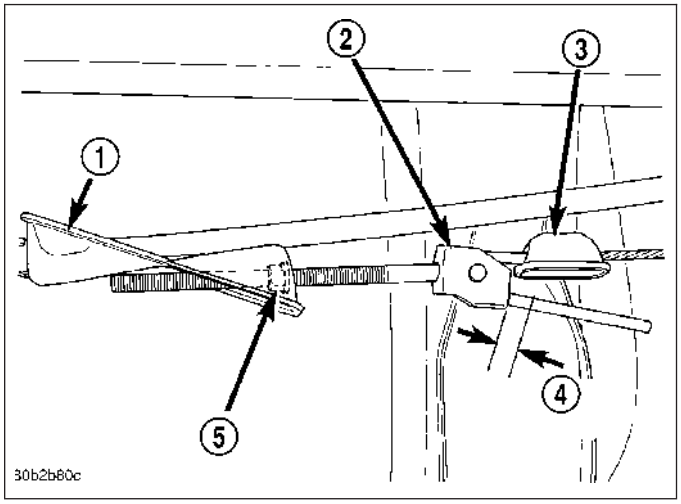


1. Be sure parking brake lever is fully released.
2. Raise vehicle so rear wheels can be rotated freely.
3. Remove plug from each access hole in brake support plates.
4. Loosen parking brake cable adjustment nut until there is slack in front cable.
5. Insert adjusting tool (4) through support plate access hole (1) and engage tool in teeth of adjusting screw star wheel (2).
6. Rotate adjuster screw star wheel (move tool handle upward) until slight drag can be felt when wheel is rotated.
7. Push and hold adjuster lever away from star wheel with thin screwdriver (3).
8. Back off adjuster screw star wheel until brake drag is eliminated.
9. Repeat adjustment at opposite wheel. Be sure adjustment is equal at both wheels.
10. Install support plate access hole plugs.
11. Adjust parking brake cable and lower vehicle.
12. Depress park brake pedal and make sure park brakes hold the vehicle staionary.
13. Release park brake pedal.

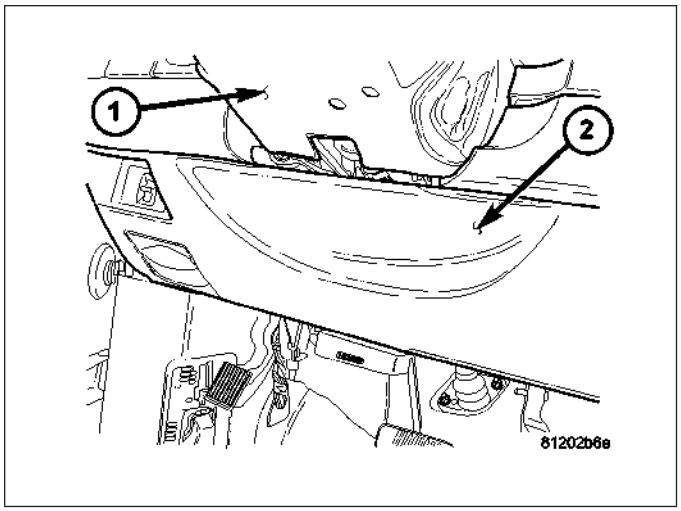
PEDAL

REMOVAL

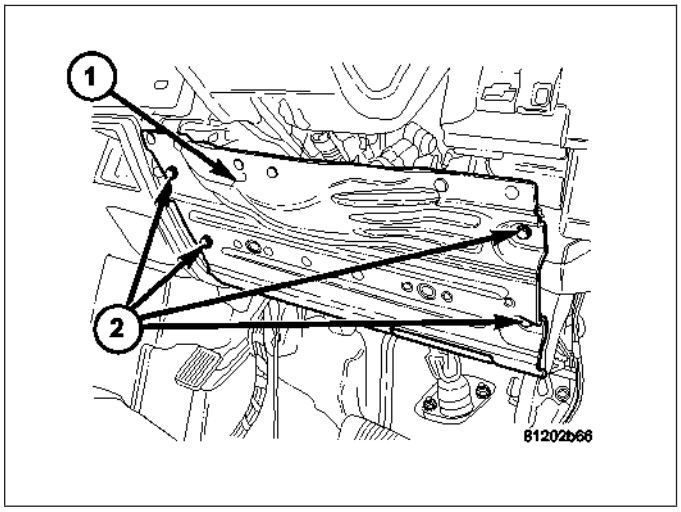
1. Release the parking brake.
2. Raise the vehicle.
3. Loosen the cable tensioner nut at the equalizer (5) to create slack in the front cable.
4. Lower the vehicle.



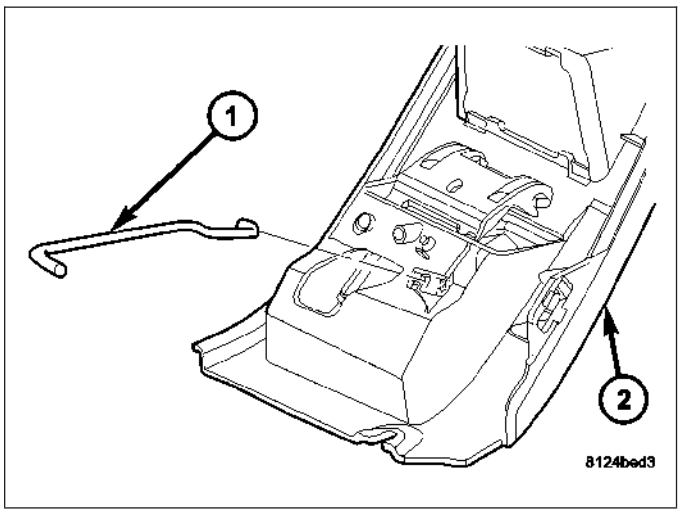
5. Remove the steering column opening cover (2), (Refer to 23 - BODY/INSTRUMENT PANEL/ STEERING COLUMN OPENING COVER - REMOVAL).



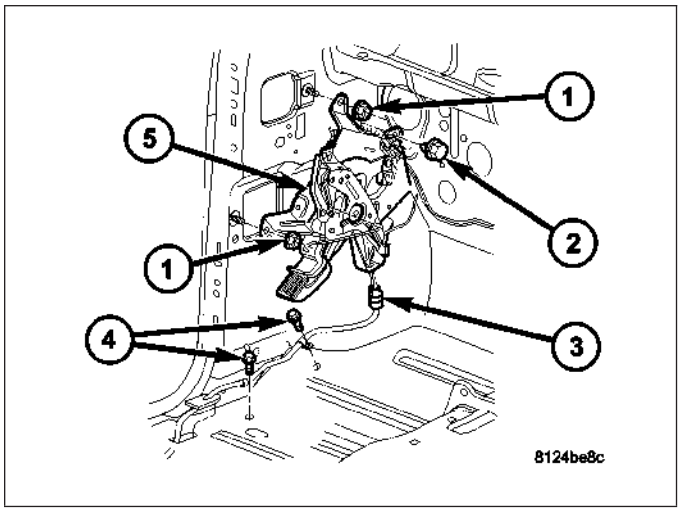
6. Remove the steering column opening reinforcement (1).



7. Disconnect the brake lamp wire from the switch on the pedal assembly.
8. Roll the carpet back, loosen the front cable grommet from the floor pan and the cable retainer.
9. Disengage the release rod (1) from the arm on the pedal assembly.

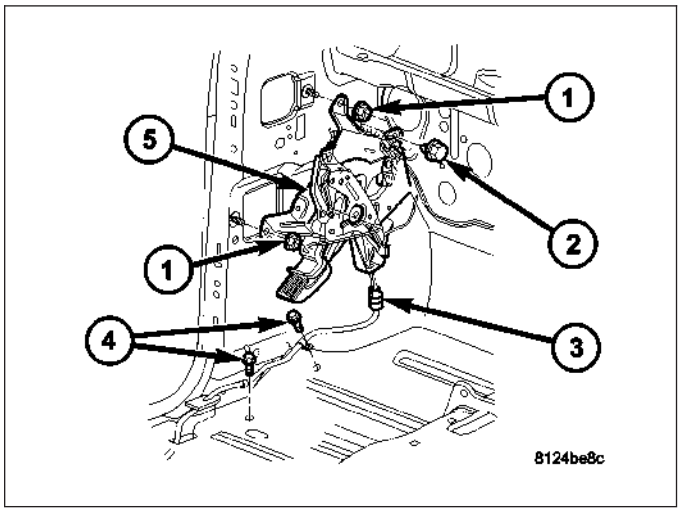


10. Remove the bolts (2) /nuts (1) from the pedal assembly (5) and remove the assembly.

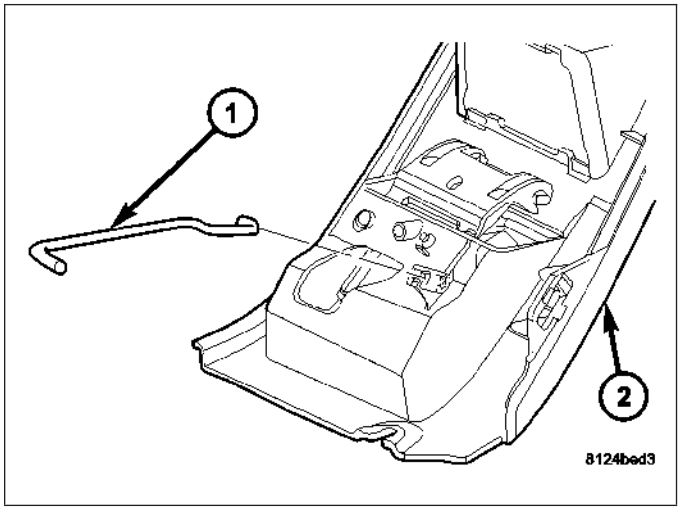


INSTALLATION

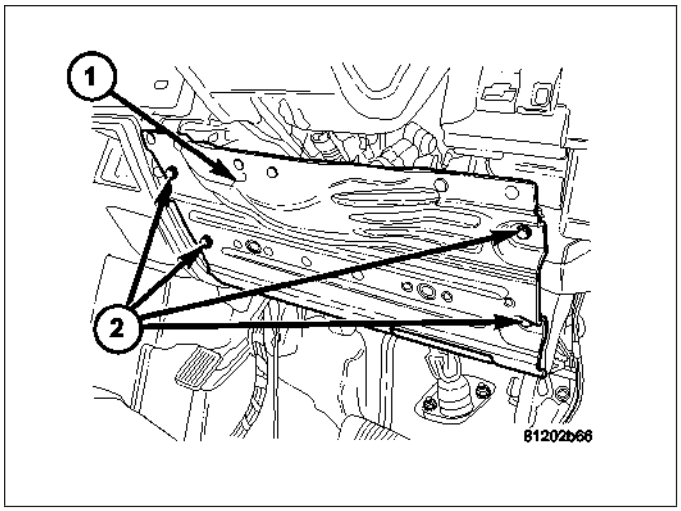
1. Position the replacement pedal assembly (5) on the dash and cowl.
2. Install the bolts (2) / nuts (1) and tighten to 14 N·m (125 in. lbs.).
3. Connect the front cable (3) to the arm on the pedal assembly (5).
4. Tighten the front cable grommet (4) to the floor pan and the cable retainer, roll the carpet back.
5. Connect the wires to the brake lamp switch.



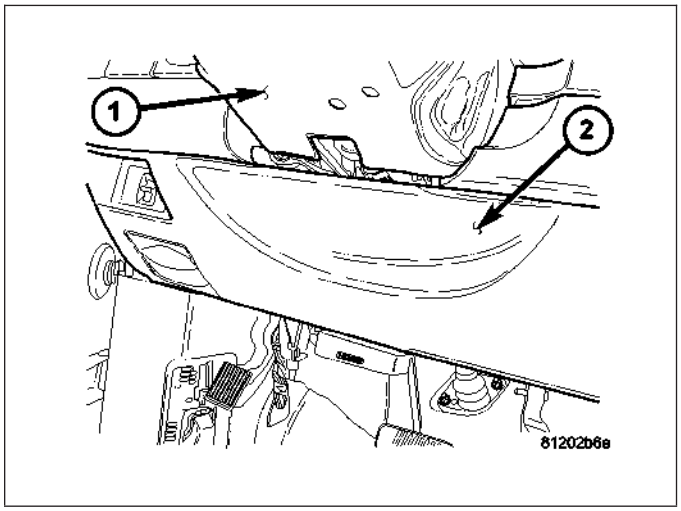
6. Install the park brake release rod (1).



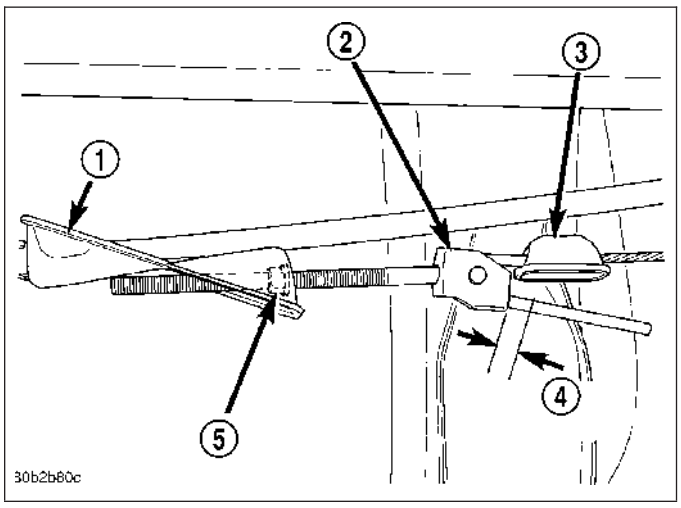
7. Install the steering column opening reinforcement.



8. Install the steering column opening cover, (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - INSTALLATION).



9. Raise the vehicle.
10. Adjust the parking brake cable tensioner (5) (Refer to 5 - BRAKES/PARKING BRAKE/CABLE TENSIONER - ADJUSTMENTS).



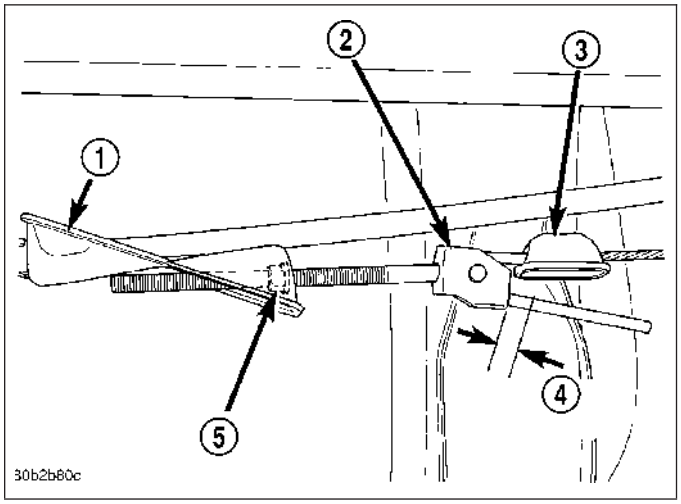
CABLE TENSIONER

ADJUSTMENTS

CABLE TENSIONER

NOTE: Tensioner adjustment is only necessary when the tensioner, or a cable has been replaced or disconnected for service. When adjustment is necessary, perform adjustment only as described in the following procedure. This is necessary to avoid faulty park brake operation.

1. Raise the vehicle.
2. Back off the cable tensioner adjusting nut (5) to create slack in the cables.



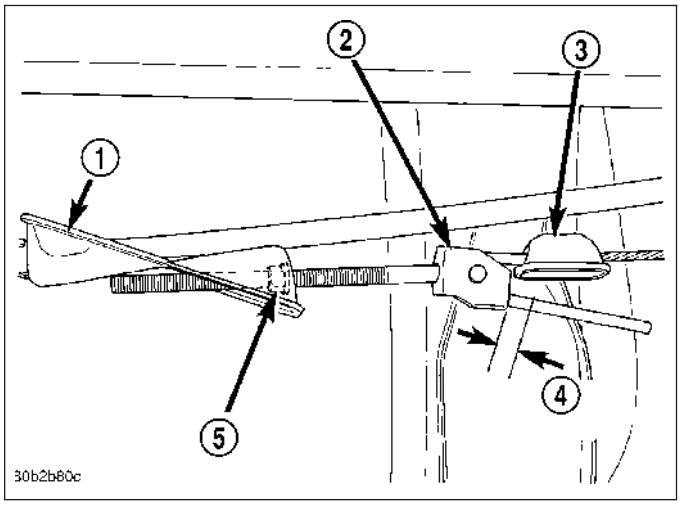
3. Remove the rear wheel/tire assemblies. Then remove the brake rotors (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - REMOVAL).
4. Verify the brakes are in good condition and operating properly.
5. Verify the park brake cables operate freely and are not binding, or seized.
6. Check the rear brake shoe adjustment with standard brake gauge (Refer to 5 - BRAKES/PARKING BRAKE/SHOES - ADJUSTMENTS).
7. Install the rotors (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - INSTALLATION) and verify that the rotors rotate freely without drag.
8. Install the wheel/tire assemblies, (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).
9. Lower the vehicle enough for access to the park brake foot pedal. Then fully apply the park brakes.

NOTE: Leave park brakes applied until adjustment is complete.

10. Raise the vehicle again.
11. Mark the tensioner rod 6.35 mm (1/4 in.) from edge of the tensioner (2).
12. Tighten the adjusting nut (5) on the tensioner rod until the mark is no longer visible.

CAUTION: Do not loosen, or tighten the tensioner adjusting nut for any reason after completing adjustment.

13. Lower the vehicle until the rear wheels are 15-20 cm (6-8 in.) off the shop floor.
14. Release the park brake foot pedal and verify that rear wheels rotate freely without drag. Then lower the vehicle.



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BRAKES - ABS ELECTRICAL DIAGNOSTICS

DIAGNOSIS AND TESTING

INTERMITTENT CONDITION

For the Brake circuit diagrams. (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

POSSIBLE CAUSES
INTERMITTENT CONDITION

Diagnostic Test

1. INTERMITTENT CONDITION

NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Refer to any Technical Service Bulletins (TSBs) that may apply.

Review the scan tool Freeze Frame information. If possible, try to duplicate the conditions under which the DTC set.

Turn the ignition off.

Visually inspect the related wire harness. Disconnect all the related harness connectors. Look for any chafed, pierced, pinched, partially broken wires and broken, bent, pushed out, or corroded terminals.

Perform a voltage drop test on the related circuits between the suspected faulty component and the Anti-Lock Brake Module.

Inspect and clean all PCM, ABS, engine, and chassis grounds that are related to the most current DTC.

If numerous trouble codes were set, use a wire schematic and look for any common ground or supply circuits

For any Relay DTCs, actuate the Relay with the scan tool and wiggle the related wire harness to try to interrupt the actuation.

Use the scan tool to perform a System Test if one applies to failing component.

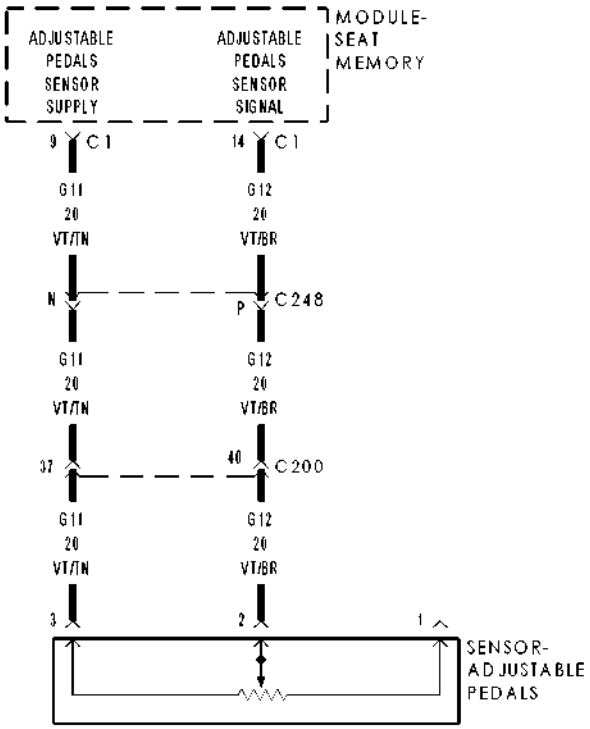
A co-pilot, data recorder, and/or lab scope should be used to help diagnose intermittent conditions.

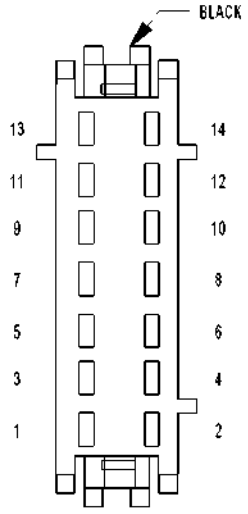
Were any problems found during the above inspections?

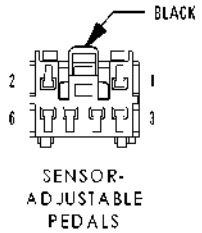
Yes >> Perform the necessary repairs.
Perform ABS VERIFICATION TEST VER - 1.

No >> Test Complete.

B1D56–ADJUSTABLE PEDAL SENSOR CIRCUIT LOW







B1D56–ADJUSTABLE PEDAL SENSOR CIRCUIT LOW (CONTINUED)

For the Adjustable Pedal System circuit diagram. (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  The Adjustable Pedal Motor is in active operation.
- **Set Condition:**
  The Seat Memory Module detects a low signal circuit voltage that is not within voltage specification from the Adjustable Pedal Sensor.

Possible Causes
CONNECTOR/TERMINAL DAMAGE
(G11) ADJUSTABLE PEDALS SENSOR SUPPLY CIRCUIT SHORTED TO GROUND, OR OPEN
(G12) ADJUSTABLE PEDALS SENSOR SIGNAL CIRCUIT SHORTED TO GROUND, OR OPEN
ADJUSTABLE PEDALS SENSOR - INTERNAL FAULT
SEAT MEMORY MODULE - INTERNAL FAULT

Diagnostic Test

1. CHECK FOR DTC B1D56–ADJUSTABLE PEDAL SENSOR CIRCUIT LOW

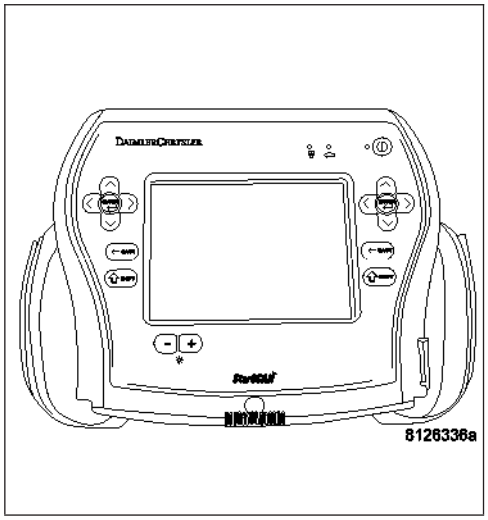
NOTE: This DTC must be active for the results of this test to be valid.

Turn the ignition on.
With the scan tool, record and erase DTC's.
Cycle the ignition switch from off to on.
Cycle the Adjustable Pedals Switch forward and rearward.
With the scan tool, read DTC's

Does the scan tool display: B1D56–ADJUSTABLE PEDAL SENSOR CIRCUIT LOW?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION diagnostic procedure.
Perform APS VERIFICATION TEST - VER 1.



B1D56–ADJUSTABLE PEDAL SENSOR CIRCUIT LOW (CONTINUED)

2. CHECK CONNECTOR/TERMINAL FOR DAMAGE

NOTE: Check all terminals for broken, bent, pushed out, or corroded terminals.

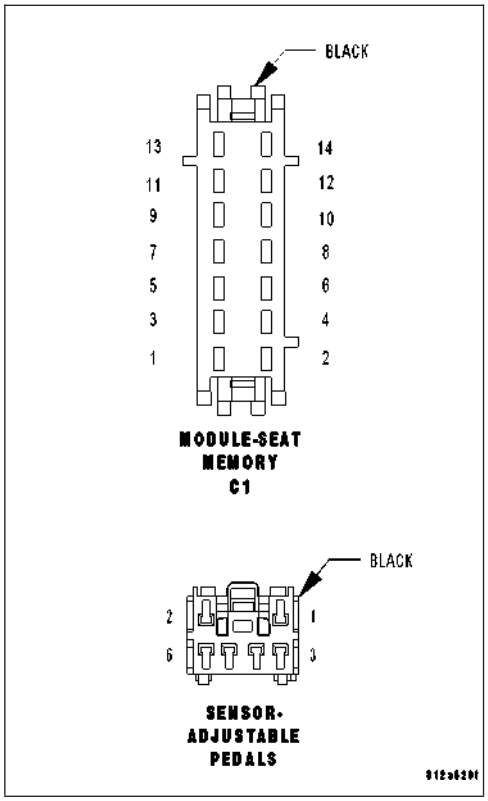
Turn the ignition off.

Inspect the Seat Memory Module harness connector, Adjustable Pedals Sensor, and Adjustable Pedals Sensor harness connector.

Is the Adjustable Pedals Sensor or any of the connectors/terminals damaged?

Yes >> Repair as necessary.
Perform APS VERIFICATION TEST - VER 1.

No >> Go To 3



3. CHECK (G11) ADJUSTABLE PEDALS SENSOR SUPPLY CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

Disconnect the Seat Memory Module harness connector.

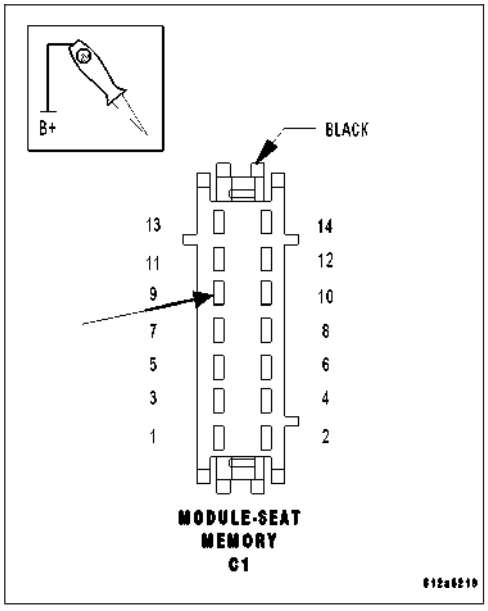
Disconnect the Adjustable Pedals Sensor harness connector.

Using a 12-volt test light connected to 12-volts, probe the (G11) Adjustable Pedals Sensor Supply circuit.

Does the test light illuminate brightly?

Yes >> Repair the (G11) Adjustable Pedals Sensor Supply circuit for a short to ground.
Perform APS VERIFICATION TEST - VER 1.

No >> Go To 4



B1D56–ADJUSTABLE PEDAL SENSOR CIRCUIT LOW (CONTINUED)

4. CHECK (G11) ADJUSTABLE PEDALS SENSOR SUPPLY CIRCUIT FOR AN OPEN

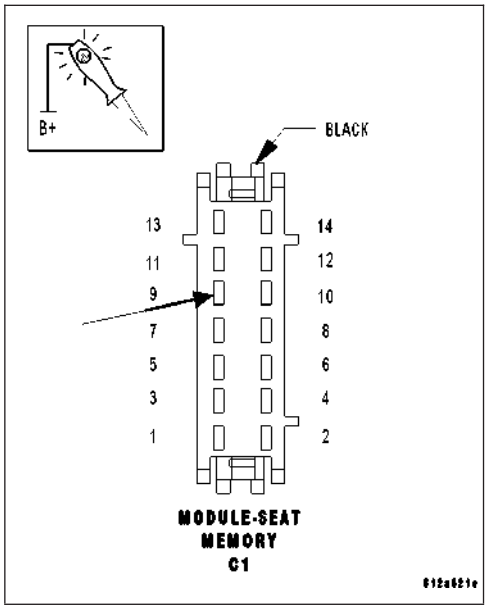
Turn the ignition off.

Disconnect the Seat Memory Module harness connector.

Disconnect the Adjustable Pedals Sensor harness connector.

Connect a jumper wire between the (G11) Adjustable Pedals Sensor Supply circuit and ground.

Using a 12-volt test light connected to 12-volts, probe the (G11) Adjustable Pedals Sensor Supply circuit.



Does the test light illuminate brightly

Yes >> Go To 5

No >> Repair the (G11) Adjustable Pedals Sensor Supply circuit for an open.
Perform APS VERIFICATION TEST - VER 1.

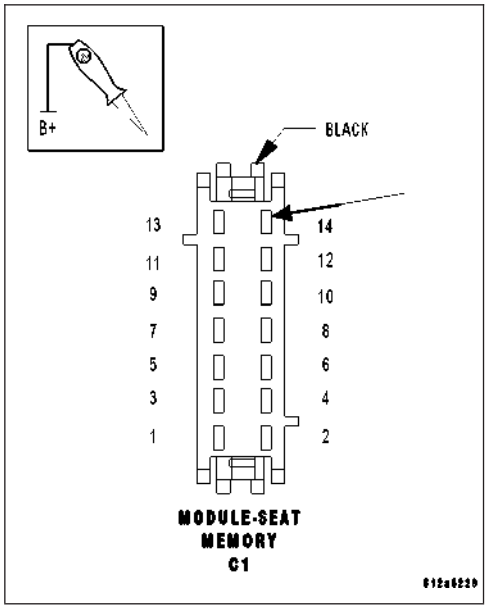
5. CHECK (G12) ADJUSTABLE PEDALS SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

Disconnect the Seat Memory Module harness connector.

Disconnect the Adjustable Pedals Sensor harness connector.

Using a 12-volt test light connected to 12-volts, probe the (G12) Adjustable Pedals Sensor Signal circuit.



Does the test light illuminate brightly?

Yes >> Repair the (G12) Adjustable Pedals Sensor Signal circuit for a short to ground.
Perform APS VERIFICATION TEST - VER 1.

No >> Go To 6

B1D56–ADJUSTABLE PEDAL SENSOR CIRCUIT LOW (CONTINUED)

6. CHECK (G12) ADJUSTABLE PEDALS SENSOR SIGNAL CIRCUIT FOR AN OPEN

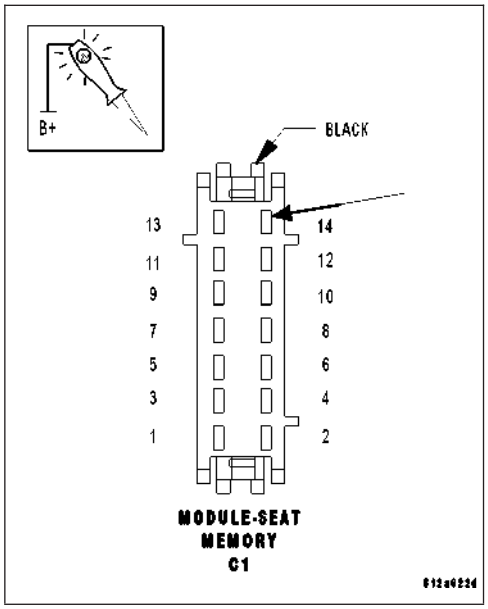
Turn the ignition off.

Disconnect the Seat Memory Module harness connector.

Disconnect the Adjustable Pedals Sensor harness connector.

Connect a jumper wire between the (G12) Adjustable Pedals Sensor Signal circuit and ground.

Using a 12-volt test light connected to 12-volts, probe the (G12) Adjustable Pedals Sensor Signal circuit.



Does the test light illuminate brightly?

Yes >> Go To 7

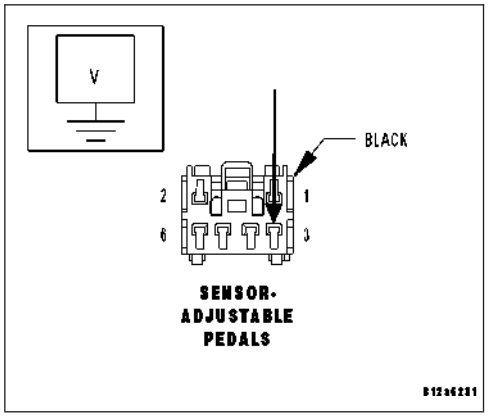
No >> Repair the (G12) Adjustable Pedals Sensor Signal circuit for an open.
Perform APS VERIFICATION TEST - VER 1.

7. CHECK (G11) ADJUSTABLE PEDALS SENSOR SUPPLY CIRCUIT VOLTAGE

Turn the ignition off.

Disconnect the Adjustable Pedals Sensor harness connector.

Measure the voltage between the (G11) Adjustable Pedals Sensor Supply circuit and ground.



Is the voltage between 4.0 and 5.0 volts?

Yes >> Go To 8

No >> Replace and reprogram the Seat Memory Module in accordance with the Service Information.
Perform APS VERIFICATION TEST - VER 1.

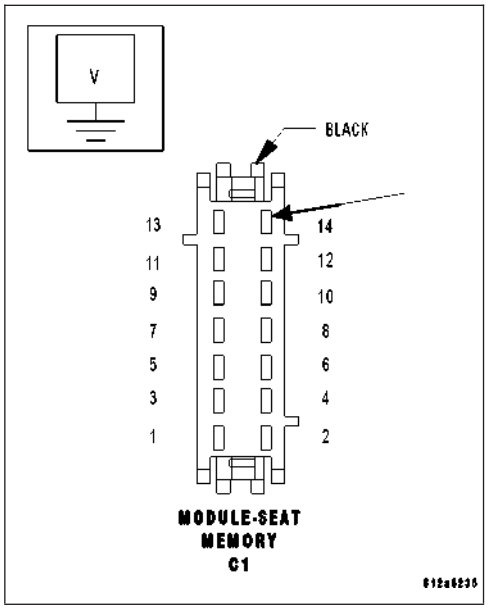
B1D56–ADJUSTABLE PEDAL SENSOR CIRCUIT LOW (CONTINUED)

8. CHECK (G12) ADJUSTABLE PEDALS SENSOR SIGNAL CIRCUIT VOLTAGE

Turn the ignition off.

Reconnect all connectors.

Measure the voltage of the (G12) Adjustable Pedals Sensor Signal circuit in the Seat Memory Module harness connector.

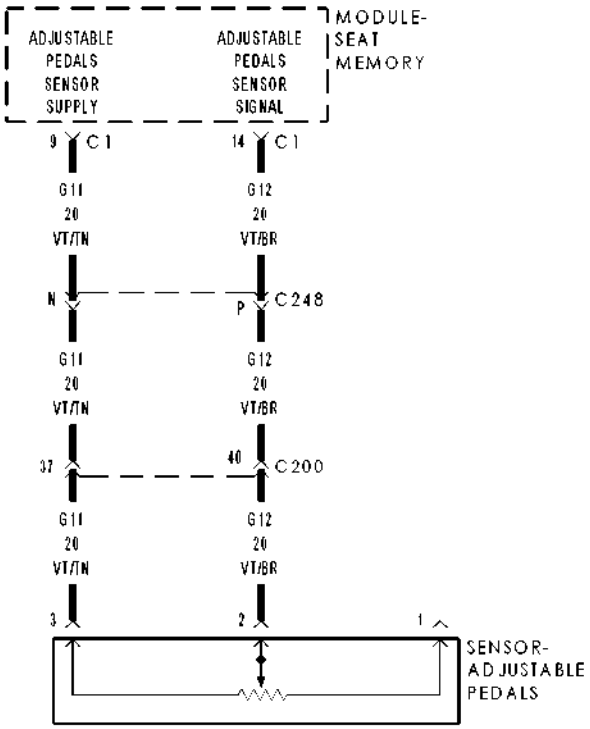


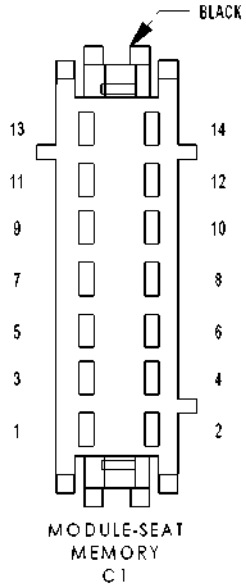
Is the voltage above 0.5 volts?

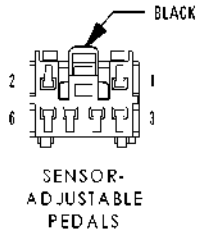
Yes >> Replace and reprogram the Seat Memory Module in accordance with the Service Information.
Perform APS VERIFICATION TEST - VER 1.

No >> Replace the Adjustable Pedals Sensor in accordance with the Service Information.
Perform APS VERIFICATION TEST - VER 1.

B1D57–ADJUSTABLE PEDAL SENSOR CIRCUIT HIGH







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B1D57–ADJUSTABLE PEDAL SENSOR CIRCUIT HIGH (CONTINUED)

For the Adjustable Pedal System circuit diagram. (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  The Adjustable Pedal Motor is in active operation.
- **Set Condition:**
  The Seat Memory Module detects a high signal circuit voltage that is not within voltage specification from the Adjustable Pedal Sensor.

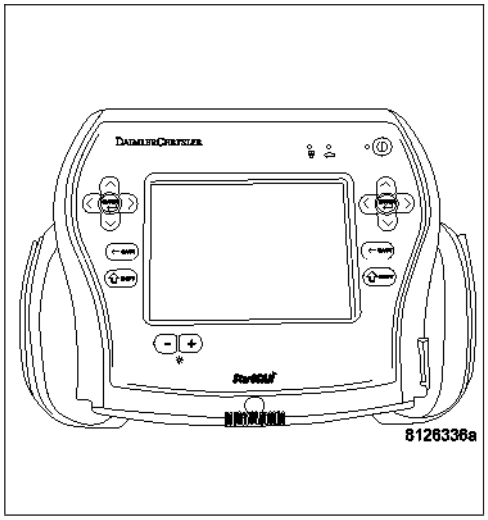
Possible Causes
CONNECTOR/TERMINAL DAMAGE
(G11) ADJUSTABLE PEDALS SENSOR SUPPLY CIRCUIT SHORTED TO VOLTAGE
(G12) ADJUSTABLE PEDALS SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
ADJUSTABLE PEDALS SENSOR - INTERNAL FAULT
SEAT MEMORY MODULE - INTERNAL FAULT

Diagnostic Test

1. CHECK FOR DTC B1D57–ADJUSTABLE PEDAL SENSOR CIRCUIT HIGH

NOTE: This DTC must be active for the results of this test to be valid.

Turn the ignition on.
With the scan tool, record and erase DTC's.
Cycle the ignition switch from off to on.
Cycle the Adjustable Pedals Switch forward and rearward.
With the scan tool, read DTC's



Does the scan tool display: B1D57–ADJUSTABLE PEDAL SENSOR CIRCUIT HIGH?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION diagnostic procedure.
Perform APS VERIFICATION TEST - VER 1.

B1D57–ADJUSTABLE PEDAL SENSOR CIRCUIT HIGH (CONTINUED)

2. CHECK CONNECTOR/TERMINAL FOR DAMAGE

NOTE: Check all terminals for broken, bent, pushed out, or corroded terminals.

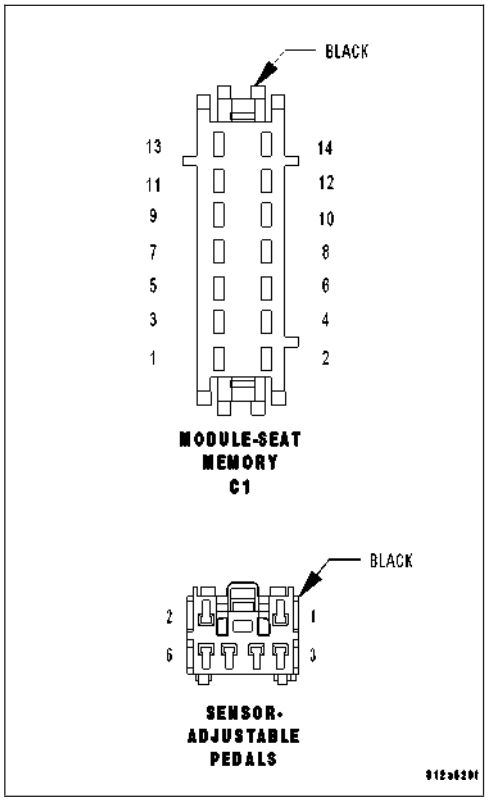
Turn the ignition off.

Inspect the Seat Memory Module harness connector, Adjustable Pedals Sensor, and Adjustable Pedals Sensor harness connector.

Is the Adjustable Pedals Sensor or any of the connectors/terminals damaged?

Yes >> Repair as necessary.
Perform APS VERIFICATION TEST - VER 1.

No >> Go To 3



3. CHECK (G11) ADJUSTABLE PEDALS SENSOR SUPPLY CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the Seat Memory Module harness connector.

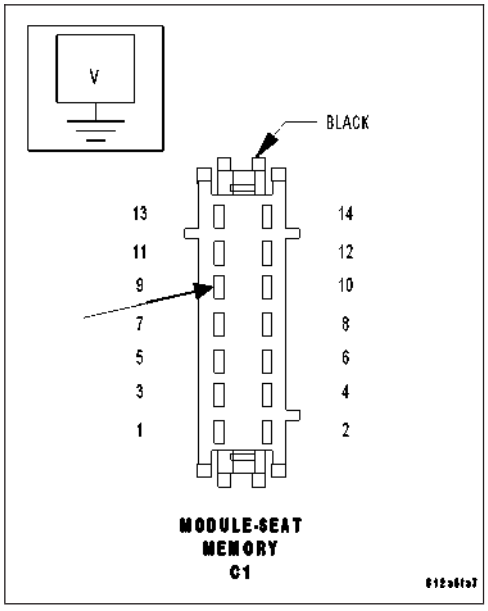
Turn the ignition on.

Measure the voltage between the (G11) Adjustable Pedals Sensor Supply circuit and ground.

Is the voltage above 5.0 volts?

Yes >> Repair the (G11) Adjustable Pedals Sensor Supply circuit for a short to voltage.
Perform APS VERIFICATION TEST - VER 1.

No >> Go To 4



B1D57–ADJUSTABLE PEDAL SENSOR CIRCUIT HIGH (CONTINUED)

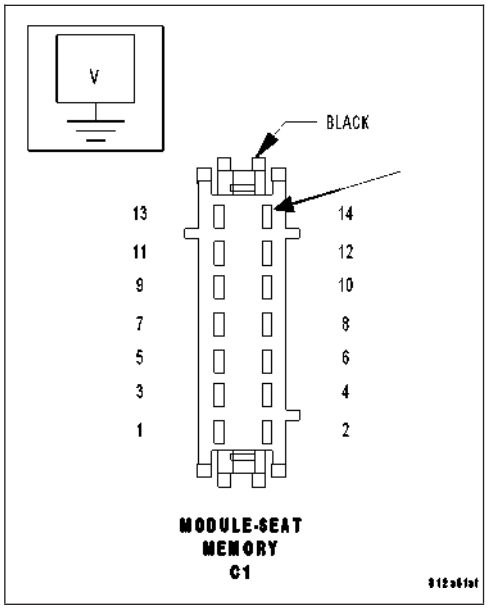
4. CHECK (G12) ADJUSTABLE PEDALS SENSOR SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the Seat Memory Module harness connector.

Turn the ignition on.

Measure the voltage between the (G12) Adjustable Pedals Sensor Signal circuit and ground.



Is the voltage above 5.0 volts?

Yes >> Repair the (G12) Adjustable Pedals Sensor Signal circuit for a short to voltage.
Perform APS VERIFICATION TEST - VER 1.

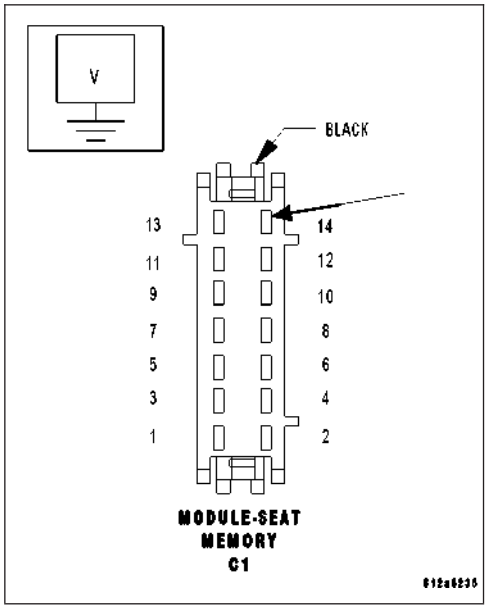
No >> Go To 5

5. CHECK (G12) ADJUSTABLE PEDALS SENSOR SIGNAL CIRCUIT VOLTAGE

Turn the ignition off.

Reconnect all connectors.

Measure the voltage of the (G12) Adjustable Pedals Sensor Signal circuit in the Seat Memory Module harness connector.

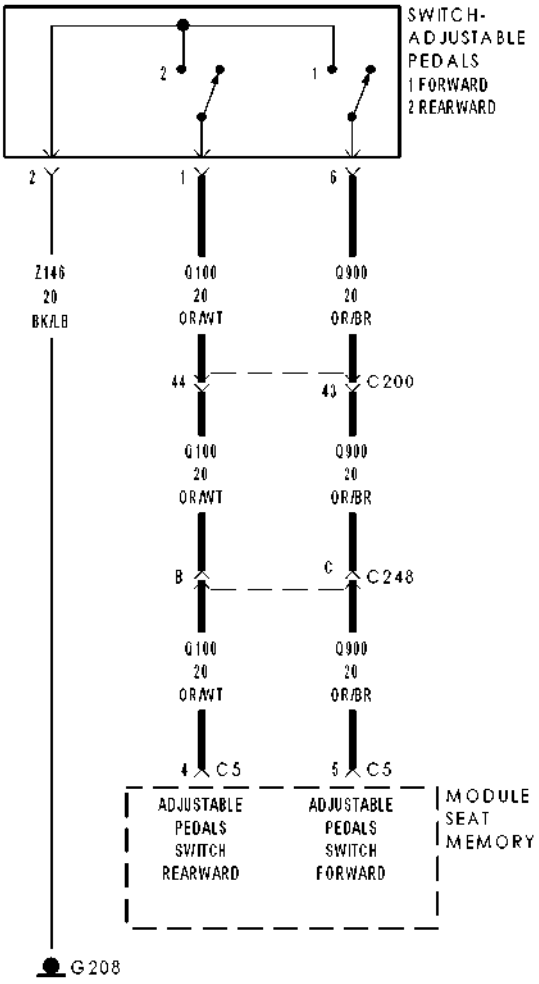


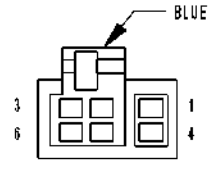
Is the voltage below 4.0 volts?

Yes >> Replace and reprogram the Seat Memory Module in accordance with the Service Information.
Perform APS VERIFICATION TEST - VER 1.

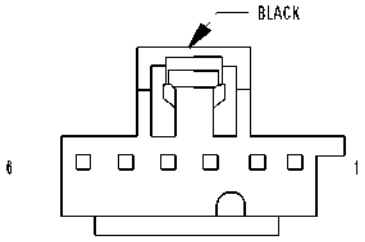
No >> Replace the Adjustable Pedals Sensor in accordance with the Service Information.
Perform APS VERIFICATION TEST - VER 1.

B1D5B–ADJUSTABLE PEDAL SWITCH CIRCUIT PERFORMANCE





SWITCH-ADJUSTABLE
PEDALS



MODULE-SEAT
MEMORY
C5
(ADJUSTABLE PEDALS)

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B1D5B–ADJUSTABLE PEDAL SWITCH CIRCUIT PERFORMANCE (CONTINUED)

For the Adjustable Pedal System circuit diagram. (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  The Adjustable Pedals Switch is in active operation.
- **Set Condition:**
  The Seat Memory Module detects an activation of both pedal switches at the same time.

Possible Causes
CONNECTOR/TERMINAL DAMAGE
(Q100) ADJUSTABLE PEDALS SWITCH REARWARD CIRCUIT SHORTED TO GROUND
(Q900) ADJUSTABLE PEDALS SWITCH FORWARD CIRCUIT SHORTED TO GROUND
(Q100) ADJUSTABLE PEDALS SWITCH REARWARD CIRCUIT AND (Q900) ADJUSTABLE PEDALS SWITCH FORWARD CIRCUIT SHORTED TOGETHER
ADJUSTABLE PEDALS SWITCH - INTERNAL FAULT
SEAT MEMORY MODULE - INTERNAL FAULT

Diagnostic Test

1. CHECK FOR DTC B1D5B–ADJUSTABLE PEDAL SWITCH CIRCUIT PERFORMANCE

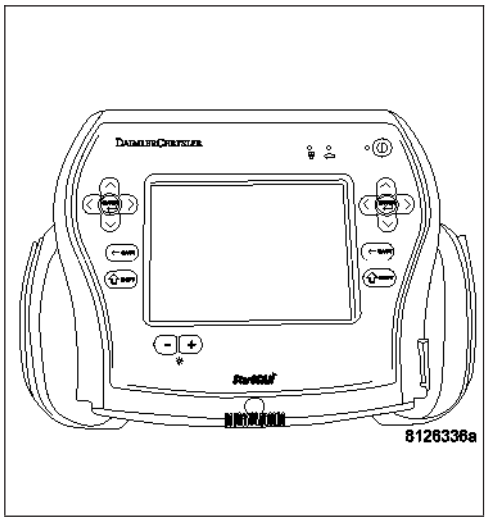
NOTE: This DTC must be active for the results of this test to be valid.

Turn the ignition on.
With the scan tool, record and erase DTC's.
Cycle the ignition switch from off to on.
Cycle the Adjustable Pedals Switch forward and rearward.
With the scan tool, read DTC's

Does the scan tool display: B1D5B–ADJUSTABLE PEDAL SWITCH CIRCUIT PERFORMANCE?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION diagnostic procedure.
Perform APS VERIFICATION TEST - VER 1.



B1D5B–ADJUSTABLE PEDAL SWITCH CIRCUIT PERFORMANCE (CONTINUED)

2. CHECK CONNECTOR/TERMINAL FOR DAMAGE

NOTE: Check all terminals for broken, bent, pushed out, or corroded terminals.

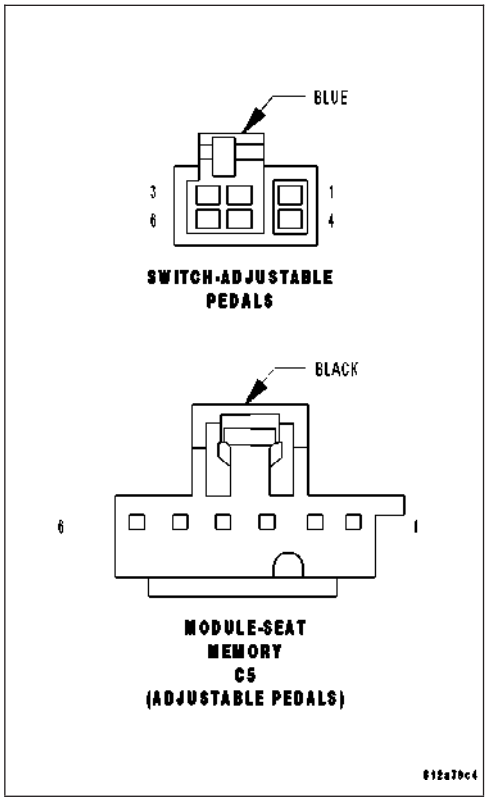
Turn the ignition off.

Inspect the Seat Memory Module harness connector, Adjustable Pedals Switch, and Adjustable Pedals Switch harness connector.

Is the Adjustable Pedals Switch or any of the connectors/terminals damaged?

Yes >> Repair as necessary.
Perform APS VERIFICATION TEST - VER 1.

No >> Go To 3



3. CHECK (Q100) ADJUSTABLE PEDALS SWITCH REARWARD CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

Disconnect the Seat Memory Module harness connector.

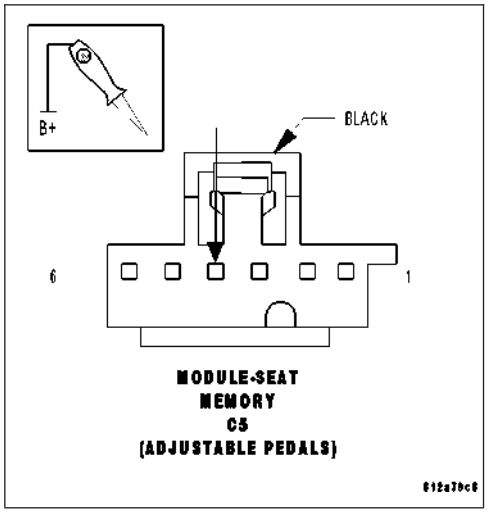
Disconnect the Adjustable Pedals Switch harness connector.

Using a 12-volt test light connected to 12-volts, probe the (Q100) Adjustable Pedals Switch Rearward circuit.

Does the test light illuminate brightly?

Yes >> Repair the (Q100) Adjustable Pedals Switch Rearward circuit for a short to ground.
Perform APS VERIFICATION TEST - VER 1.

No >> Go To 4



B1D5B–ADJUSTABLE PEDAL SWITCH CIRCUIT PERFORMANCE (CONTINUED)

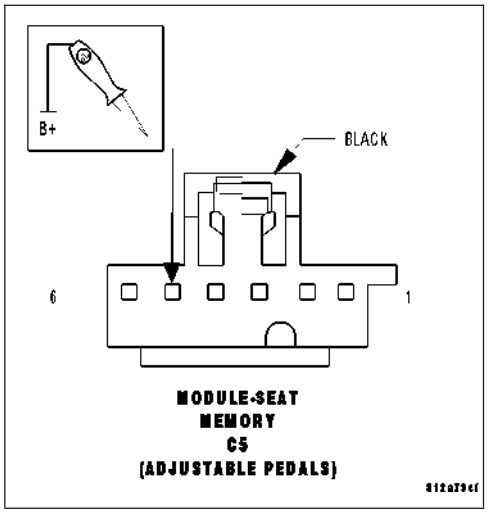
4. CHECK (Q900) ADJUSTABLE PEDALS SWITCH FORWARD CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

Disconnect the Seat Memory Module harness connector.

Disconnect the Adjustable Pedals Switch harness connector.

Using a 12-volt test light connected to 12-volts, probe the (Q900) Adjustable Pedals Switch Forward circuit.



Does the test light illuminate brightly?

Yes >> Repair the (Q900) Adjustable Pedals Switch Forward circuit for a short to ground.
Perform APS VERIFICATION TEST - VER 1.

No >> Go To 5

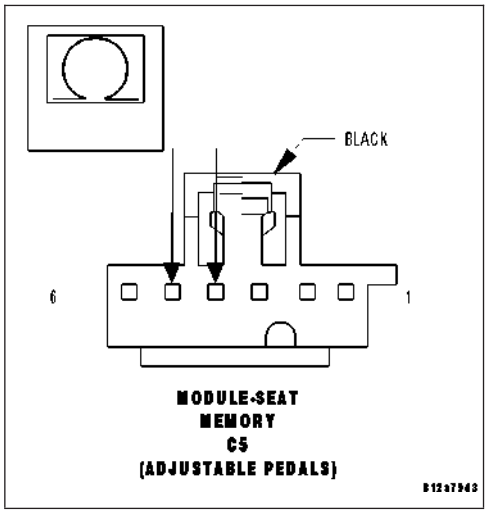
5. CHECK (Q100) ADJUSTABLE PEDALS SWITCH REARWARD CIRCUIT AND (Q900) ADJUSTABLE PEDALS SWITCH FORWARD CIRCUIT FOR A SHORT TOGETHER

Turn the ignition off.

Disconnect the Seat Memory Module harness connector.

Disconnect the Adjustable Pedals Switch harness connector.

Measure the resistance between the (Q100) Adjustable Pedals Switch Rearward circuit and (Q900) Adjustable Pedals Switch Forward circuit.



Is the resistance above 5.0 ohms?

Yes >> Go To 6

No >> Repair the (Q100) Adjustable Pedals Switch Rearward circuit and (Q900) Adjustable Pedals Switch Forward circuit for a short together.
Perform APS VERIFICATION TEST - VER 1.

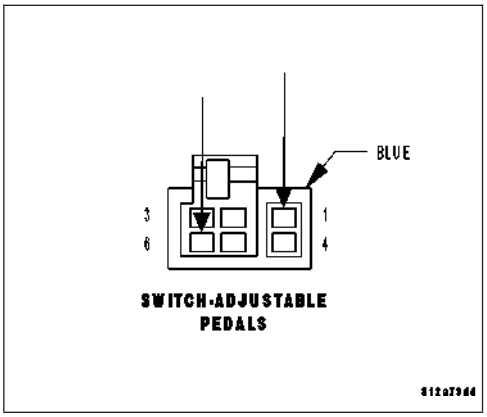
B1D5B–ADJUSTABLE PEDAL SWITCH CIRCUIT PERFORMANCE (CONTINUED)

6. CHECK ADJUSTABLE PEDALS SWITCH SHORTED

Turn the ignition off.

Disconnect the Adjustable Pedals Switch harness connector.

Measure the resistance between the (Q100) Adjustable Pedals Switch Rearward and (Q900) Adjustable Pedals Switch Forward terminals at the Adjustable Pedals Switch.

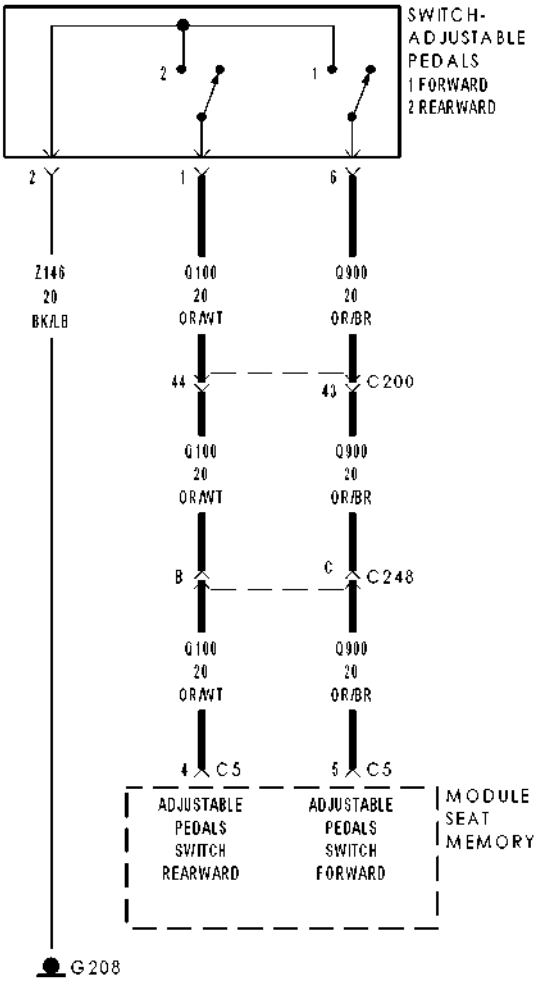


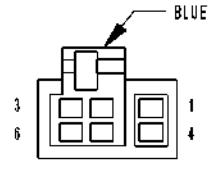
Is the resistance below 5.0 ohms?

Yes >> Replace and reprogram the Seat Memory Module in accordance with the Service Information.
Perform APS VERIFICATION TEST - VER 1.

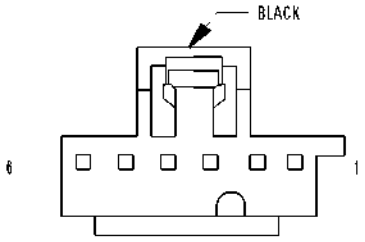
No >> Replace the Adjustable Pedals Switch in accordance with the Service Information.
Perform APS VERIFICATION TEST - VER 1.

B1D5C–ADJUSTABLE PEDAL SWITCH CIRCUIT STUCK FORWARD





SWITCH-ADJUSTABLE
PEDALS



MODULE-SEAT
MEMORY
C5
(ADJUSTABLE PEDALS)

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B1D5C–ADJUSTABLE PEDAL SWITCH CIRCUIT STUCK FORWARD (CONTINUED)

For the Adjustable Pedal System circuit diagram. (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  The Adjustable Pedals Switch is in active operation.
- **Set Condition:**
  The Seat Memory Module detects that the Adjustable Pedals Switch has been activated for a time period of more than 50 seconds.

Possible Causes
CONNECTOR/TERMINAL DAMAGE
(Q900) ADJUSTABLE PEDALS SWITCH FORWARD CIRCUIT SHORTED TO GROUND
ADJUSTABLE PEDALS SWITCH - INTERNAL FAULT
SEAT MEMORY MODULE - INTERNAL FAULT

Diagnostic Test

1. CHECK FOR DTC B1D5C–ADJUSTABLE PEDAL SWITCH CIRCUIT STUCK FORWARD

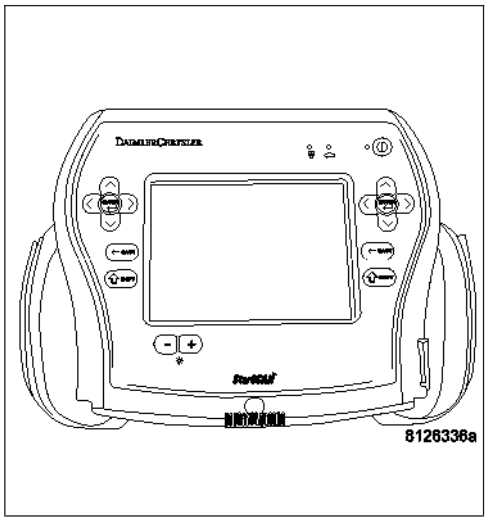
NOTE: This DTC must be active for the results of this test to be valid.

Turn the ignition on.
With the scan tool, record and erase DTC's.
Cycle the ignition switch from off to on.
Cycle the Adjustable Pedals Switch forward and rearward.
With the scan tool, read DTC's

Does the scan tool display: B1D5C–ADJUSTABLE PEDAL SWITCH CIRCUIT STUCK FORWARD?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION diagnostic procedure.
Perform APS VERIFICATION TEST - VER 1.



B1D5C–ADJUSTABLE PEDAL SWITCH CIRCUIT STUCK FORWARD (CONTINUED)

2. CHECK CONNECTOR/TERMINAL FOR DAMAGE

NOTE: Check all terminals for broken, bent, pushed out, or corroded terminals.

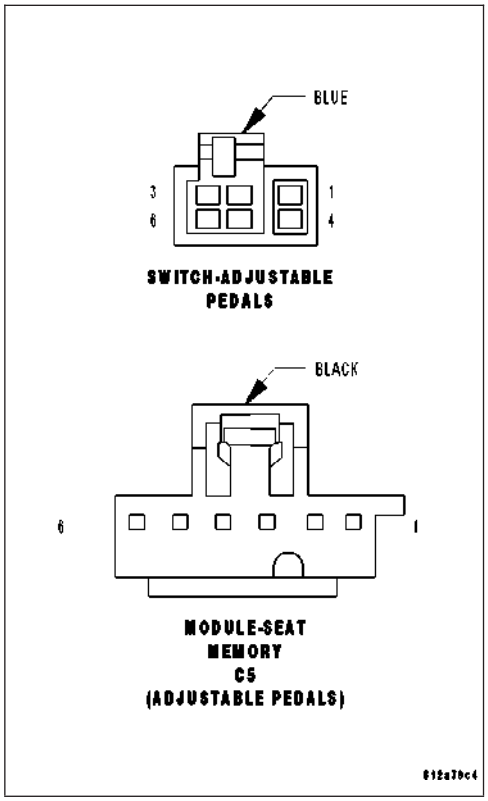
Turn the ignition off.

Inspect the Seat Memory Module harness connector, Adjustable Pedals Switch, and Adjustable Pedals Switch harness connector.

Is the Adjustable Pedals Switch or any of the connectors/terminals damaged?

Yes >> Repair as necessary.
Perform APS VERIFICATION TEST - VER 1.

No >> Go To 3



3. CHECK (Q900) ADJUSTABLE PEDALS SWITCH FORWARD CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

Disconnect the Seat Memory Module harness connector.

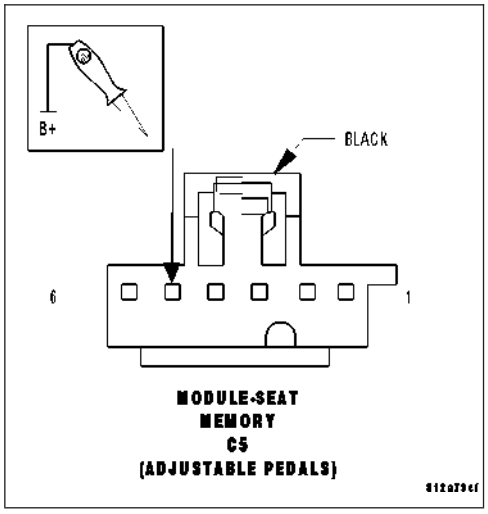
Disconnect the Adjustable Pedals Switch harness connector.

Using a 12-volt test light connected to 12-volts, probe the (Q900) Adjustable Pedals Switch Forward circuit.

Does the test light illuminate brightly?

Yes >> Repair the (Q900) Adjustable Pedals Switch Forward circuit for a short to ground.
Perform APS VERIFICATION TEST - VER 1.

No >> Go To 4



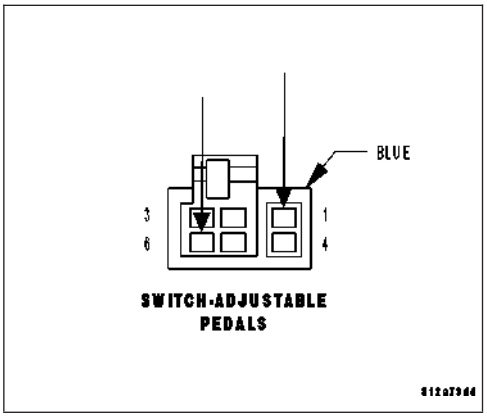
B1D5C–ADJUSTABLE PEDAL SWITCH CIRCUIT STUCK FORWARD (CONTINUED)

4. CHECK ADJUSTABLE PEDALS SWITCH SHORTED

Turn the ignition off.

Disconnect the Adjustable Pedals Switch harness connector.

Measure the resistance between the (Q100) Adjustable Pedals Switch Rearward and (Q900) Adjustable Pedals Switch Forward terminals at the Adjustable Pedals Switch.



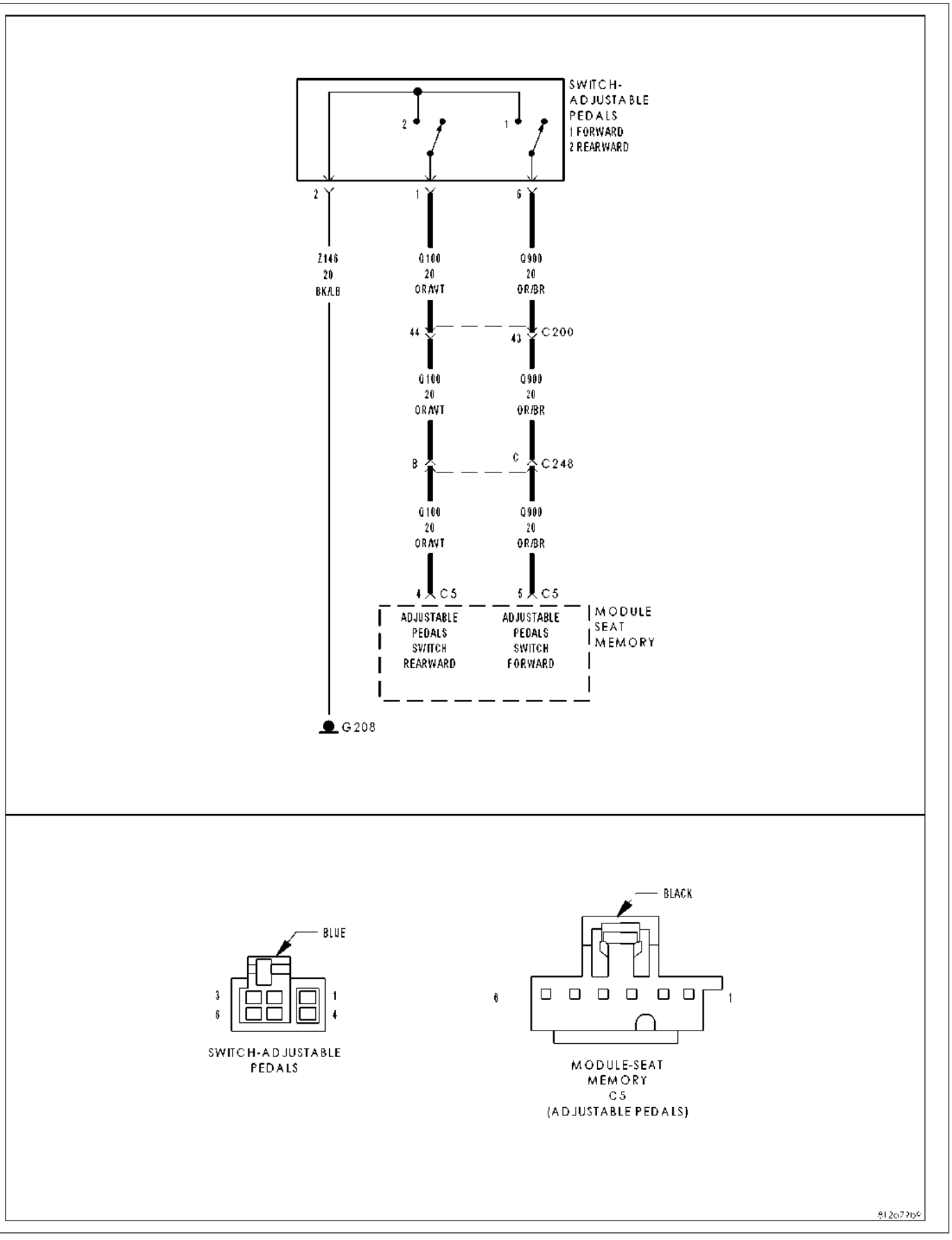
Is the resistance below 5.0 ohms?

Yes >> Replace and reprogram the Seat Memory Module in accordance with the Service Information.
Perform APS VERIFICATION TEST - VER 1.

No >> Replace the Adjustable Pedals Switch in accordance with the Service Information.
Perform APS VERIFICATION TEST - VER 1.

B1D5D–ADJUSTABLE PEDAL SWITCH CIRCUIT STUCK REARWARD

For the Adjustable Pedal System circuit diagram. (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)
For a complete wiring diagram **Refer to Section 8W**.



B1D5D–ADJUSTABLE PEDAL SWITCH CIRCUIT STUCK REARWARD (CONTINUED)

- **When Monitored:**
  The Adjustable Pedals Switch is in active operation.
- **Set Condition:**
  The Seat Memory Module detects that the Adjustable Pedals Switch has been activated for a time period of more than 50 seconds.

Possible Causes
CONNECTOR/TERMINAL DAMAGE
(Q100) ADJUSTABLE PEDALS SWITCH FORWARD CIRCUIT SHORTED TO GROUND
ADJUSTABLE PEDALS SWITCH - INTERNAL FAULT
SEAT MEMORY MODULE - INTERNAL FAULT

Diagnostic Test

1.

NOTE: This DTC must be active for the results of this test to be valid. CHECK FOR DTC B1D5D–ADJUSTABLE PEDAL SWITCH CIRCUIT STUCK REARWARD

Turn the ignition on.

With the scan tool, record and erase DTC's.

Cycle the ignition switch from off to on.

Cycle the Adjustable Pedals Switch forward and rearward.

With the scan tool, read DTC's

Does the scan tool display: B1D5D–ADJUSTABLE PEDAL SWITCH CIRCUIT STUCK REARWARD?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION diagnostic procedure.
Perform APS VERIFICATION TEST - VER 1.

B1D5D–ADJUSTABLE PEDAL SWITCH CIRCUIT STUCK REARWARD (CONTINUED)

2. CHECK CONNECTOR/TERMINAL FOR DAMAGE

NOTE: Check all terminals for broken, bent, pushed out, or corroded terminals.

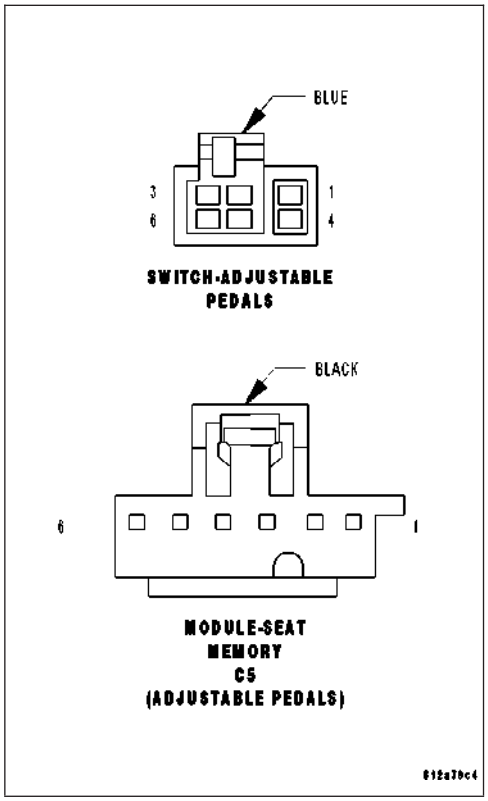
Turn the ignition off.

Inspect the Seat Memory Module harness connector, Adjustable Pedals Switch, and Adjustable Pedals Switch harness connector.

Is the Adjustable Pedals Switch or any of the connectors/terminals damaged?

Yes >> Repair as necessary.
Perform APS VERIFICATION TEST - VER 1.

No >> Go To 3



3. CHECK (Q100) ADJUSTABLE PEDALS SWITCH REARWARD CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

Disconnect the Seat Memory Module harness connector.

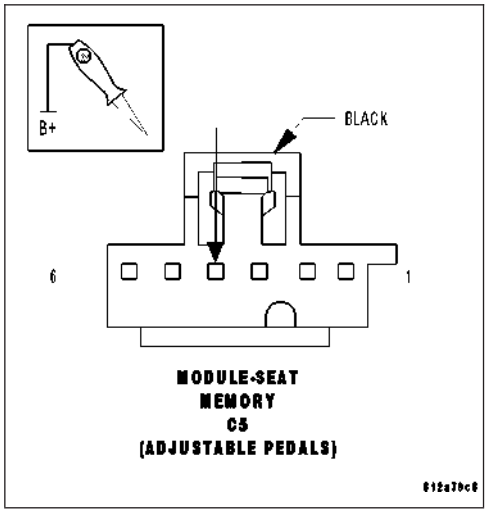
Disconnect the Adjustable Pedals Switch harness connector.

Using a 12-volt test light connected to 12-volts, probe the (Q100) Adjustable Pedals Switch Rearward circuit.

Does the test light illuminate brightly?

Yes >> Repair the (Q100) Adjustable Pedals Switch Rearward circuit for a short to ground.
Perform APS VERIFICATION TEST - VER 1.

No >> Go To 4



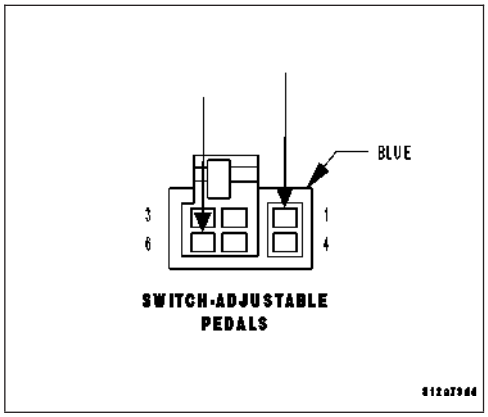
B1D5D–ADJUSTABLE PEDAL SWITCH CIRCUIT STUCK REARWARD (CONTINUED)

4. CHECK ADJUSTABLE PEDALS SWITCH SHORTED

Turn the ignition off.

Disconnect the Adjustable Pedals Switch harness connector.

Measure the resistance between the (Q100) Adjustable Pedals Switch Rearward and (Q900) Adjustable Pedals Switch Forward terminals at the Adjustable Pedals Switch.

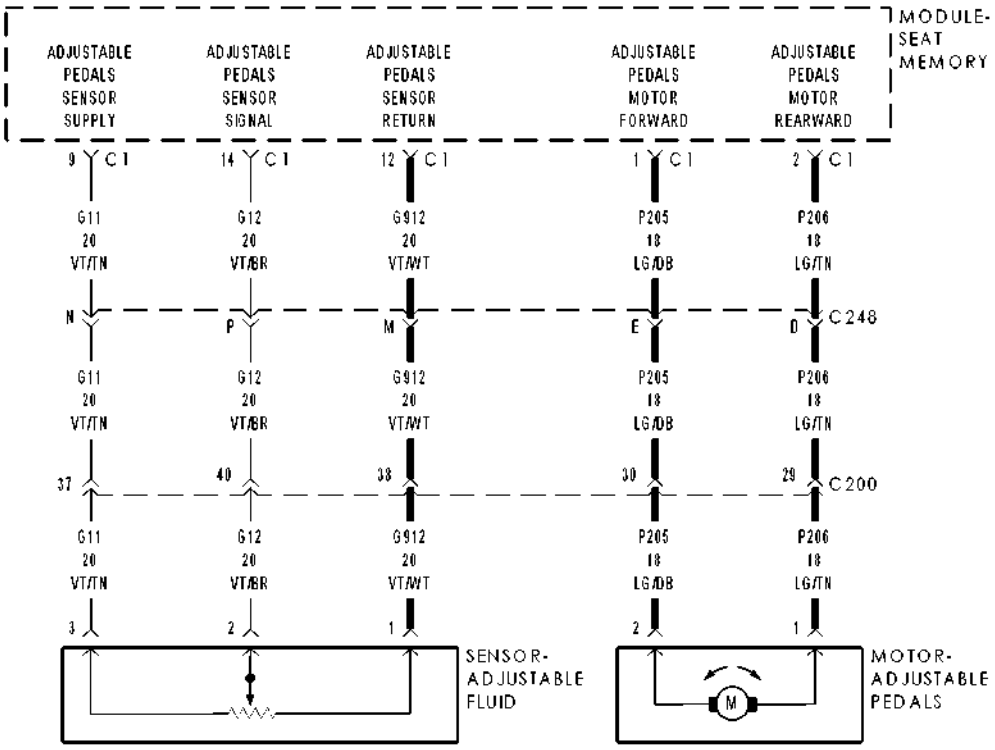


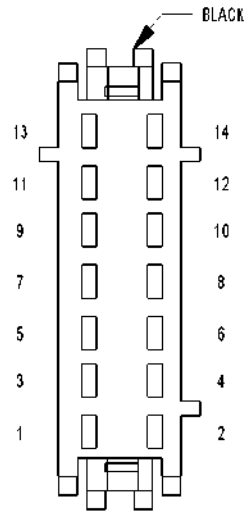
Is the resistance below 5.0 ohms?

Yes >> Replace and reprogram the Seat Memory Module in accordance with the Service Information.
Perform APS VERIFICATION TEST - VER 1.

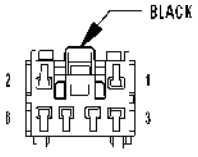
No >> Replace the Adjustable Pedals Switch in accordance with the Service Information.
Perform APS VERIFICATION TEST - VER 1.

B1D67–ADJUSTABLE PEDAL CONTROL CIRCUIT PERFORMANCE

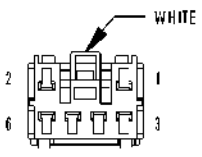




MODULE-SEAT MEMORY C1



SENSOR-ADJUSTABLE PEDALS



MOTOR-ADJUSTABLE PEDALS

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B1D67–ADJUSTABLE PEDAL CONTROL CIRCUIT PERFORMANCE (CONTINUED)

For the Adjustable Pedal System circuit diagram. (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  The Adjustable Pedals Motor is in active operation.
- **Set Condition:**
  The Seat Memory Module detects that the Adjustable Pedals Motor has been activated for a time period and has not spun with three motor direction commands.

Possible Causes
CONNECTOR/TERMINAL DAMAGE
MECHANICAL FAILURE IN THE ADJUSTABLE PEDALS
(P205) ADJUSTABLE PEDALS MOTOR FORWARD CIRCUIT OPEN
(P206) ADJUSTABLE PEDALS MOTOR REARWARD CIRCUIT OPEN
(G912) ADJUSTABLE PEDALS SENSOR RETURN CIRCUIT OPEN
ADJUSTABLE PEDALS MOTOR - INTERNAL FAULT
SEAT MEMORY MODULE - INTERNAL FAULT

Diagnostic Test

1. CHECK FOR DTC B1D67–ADJUSTABLE PEDAL CONTROL CIRCUIT PERFORMANCE

NOTE: This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, record and erase DTC's.

Cycle the ignition switch from off to on.

Cycle and hold the Adjustable Pedals Switch forward, rearward, and forward at two second intervals.

With the scan tool, read DTC's

Does the scan tool display: B1D67–ADJUSTABLE PEDAL CONTROL CIRCUIT PERFORMANCE?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION diagnostic procedure.
Perform APS VERIFICATION TEST - VER 1.

B1D67–ADJUSTABLE PEDAL CONTROL CIRCUIT PERFORMANCE (CONTINUED)

2. CHECK CONNECTOR/TERMINAL FOR DAMAGE

NOTE: Check all terminals for broken, bent, pushed out, or corroded terminals.

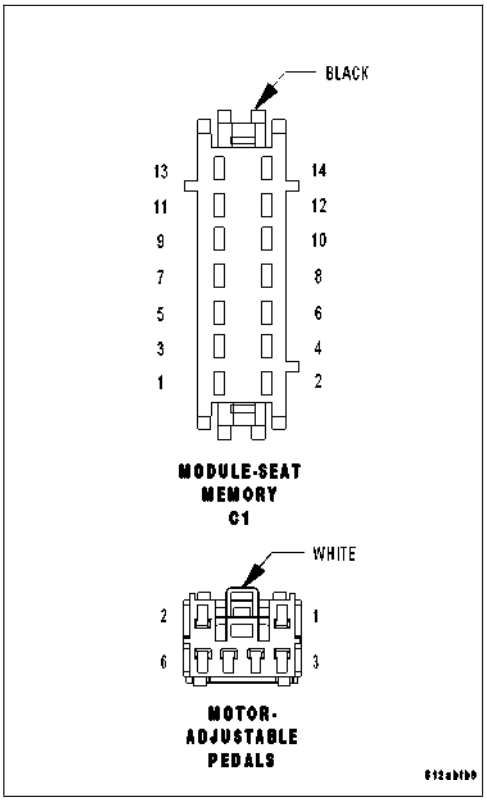
Turn the ignition off.

Inspect the Seat Memory Module harness connector, Adjustable Pedals Motor, and Adjustable Pedals Motor harness connector.

Is the Adjustable Pedals Motor or any of the connectors/terminals damaged?

Yes >> Repair as necessary.
Perform APS VERIFICATION TEST - VER 1.

No >> Go To 3



3. CHECK ADJUSTABLE PEDALS ASSEMBLY FOR MECHANICAL DAMAGE

Turn the ignition off.

Inspect the Adjustable Pedals Assembly for any physical damage.

NOTE: Check for any conditions that would cause the motor to stall or be stuck.

Is the Adjustable Pedals Assembly damaged or broken?

Yes >> Replace the Adjustable Pedals Assembly in accordance with the Service Information.
Perform APS VERIFICATION TEST - VER 1.

No >> Go To 4

4. CHECK (P205) ADJUSTABLE PEDALS MOTOR FORWARD CIRCUIT FOR AN OPEN

Turn the ignition off.

Disconnect the Seat Memory Module harness connector.

Disconnect the Adjustable Pedals Motor harness connector

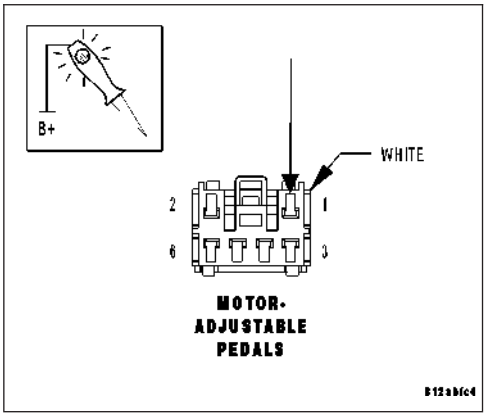
Connect a jumper wire between the (P205) Adjustable Pedals Motor Forward circuit and ground.

Using a 12-volt test light connected to 12-volts, probe the (P205) Adjustable Pedals Motor Forward circuit.

Does the test light illuminate brightly?

Yes >> Go To 5

No >> Repair the (P205) Adjustable Pedals Motor Forward circuit for an open.
Perform APS VERIFICATION TEST - VER 1.



B1D67–ADJUSTABLE PEDAL CONTROL CIRCUIT PERFORMANCE (CONTINUED)

5. CHECK (P206) ADJUSTABLE PEDALS MOTOR REARWARD CIRCUIT FOR AN OPEN

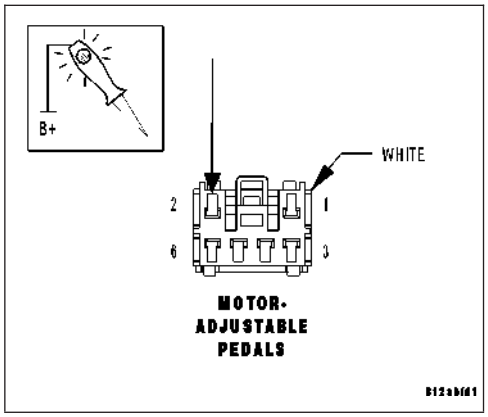
Turn the ignition off.

Disconnect the Seat Memory Module harness connector.

Disconnect the Adjustable Pedals Motor harness connector

Connect a jumper wire between the (P206) Adjustable Pedals Motor Rearward circuit and ground.

Using a 12-volt test light connected to 12-volts, probe the (P206) Adjustable Pedals Motor Rearward circuit.



Does the test light illuminate brightly?

Yes >> Go To 6

No >> Repair the (P206) Adjustable Pedals Motor Rearward circuit for an open.
Perform APS VERIFICATION TEST - VER 1.

6. CHECK (G912) ADJUSTABLE PEDALS SENSOR RETURN CIRCUIT FOR AN OPEN

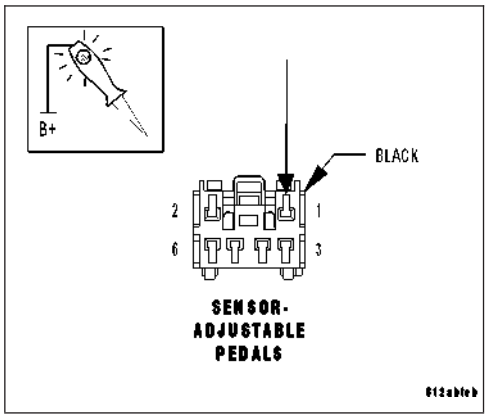
Turn the ignition off.

Disconnect the Seat Memory Module harness connector.

Disconnect the Adjustable Pedals Sensor harness connector

Connect a jumper wire between the (G912) Adjustable Pedals Sensor Return circuit and ground.

Using a 12-volt test light connected to 12-volts, probe the (G912) Adjustable Pedals Sensor Return circuit.



Does the test light illuminate brightly?

Yes >> Go To

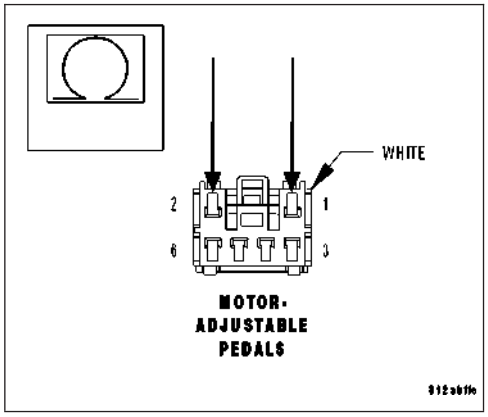
No >> Repair the (G912) Adjustable Pedals Sensor Return circuit for an open.
Perform APS VERIFICATION TEST - VER 1.

7. CHECK ADJUSTABLE PEDALS MOTOR

Turn the ignition off.

Disconnect the Adjustable Pedals Motor harness connector.

Measure the resistance between the (P205) Adjustable Pedals Motor Forward and (P206) Adjustable Pedals Motor Rearward terminals at the Adjustable Pedals Motor.

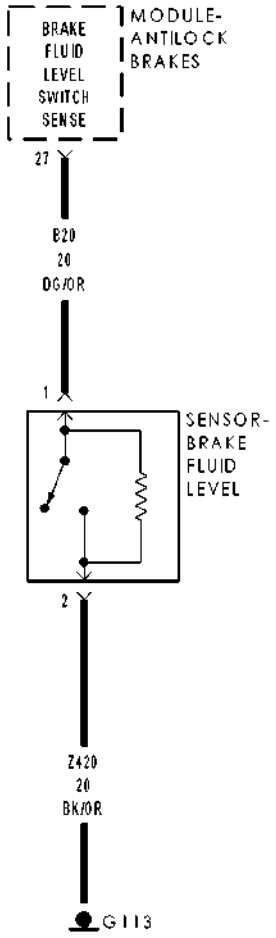


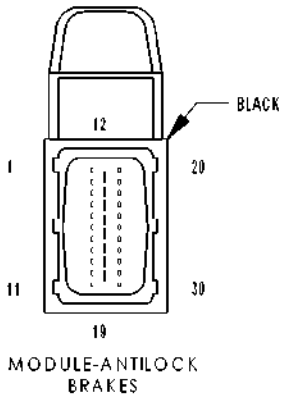
Is the resistance below 100.0 ohms?

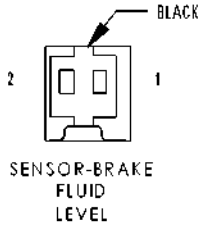
Yes >> Replace and reprogram the Seat Memory Module in accordance with the Service Information.
Perform APS VERIFICATION TEST - VER 1.

No >> Replace the Adjustable Pedals Motor in accordance with the Service Information.
Perform APS VERIFICATION TEST - VER 1.

C1008–BRAKE FLUID LEVEL INPUT CIRCUIT HIGH







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C1008–BRAKE FLUID LEVEL INPUT CIRCUIT HIGH (CONTINUED)

For the Anti-Lock Brake System circuit diagram. (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When above normal voltage is detected on the Brake Fluid Level Switch Sense circuit.

Possible Causes
BRAKE FLUID LEVEL SENSOR CONNECTOR DAMAGED
(B20) BRAKE FLUID LEVEL SWITCH SENSE CIRCUIT SHORTED TO VOLTAGE, OR OPEN
(Z420) GROUND CIRCUIT OPEN
BRAKE FLUID LEVEL SENSOR - INTERNAL FAULT
ANTI-LOCK BRAKE MODULE - INTERNAL FAULT

Diagnostic Test

1.

CHECK FOR DTC C1008–BRAKE FLUID LEVEL INPUT CIRCUIT HIGH

NOTE: This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, record and erase DTC's.

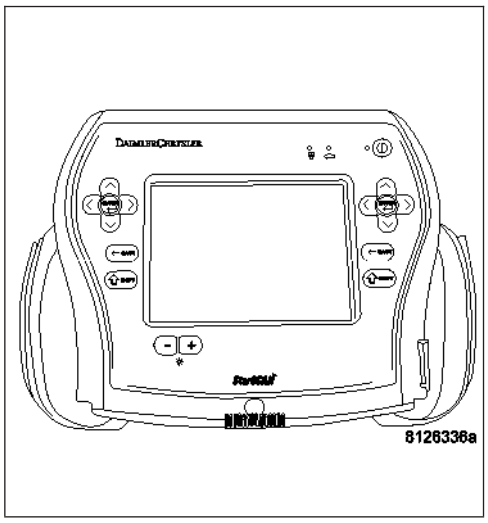
Cycle the ignition switch from off to on.

With the scan tool, read DTC's

Does the scan tool display: C1008–BRAKE FLUID LEVEL INPUT CIRCUIT HIGH?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION diagnostic procedure.
Perform ABS VERIFICATION TEST - VER 1.



C1008–BRAKE FLUID LEVEL INPUT CIRCUIT HIGH (CONTINUED)

2. CHECK BRAKE FLUID LEVEL SENSOR CONNECTION

Turn the ignition off.

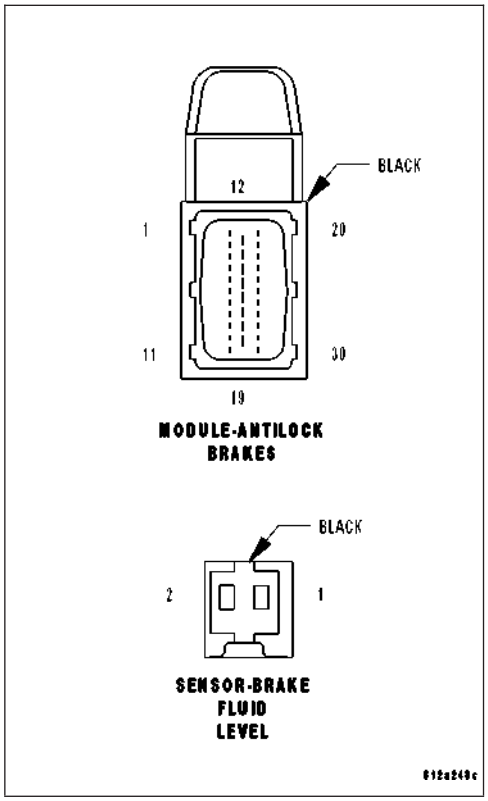
Inspect the connection of the Brake Fluid Level Sensor harness connector.

NOTE: Check all terminals for broken, bent, pushed out, or corroded terminals.

Is there any damage?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 3



3. CHECK (B20) BRAKE FLUID LEVEL SWITCH SENSE CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Fluid Level Sensor harness connector.

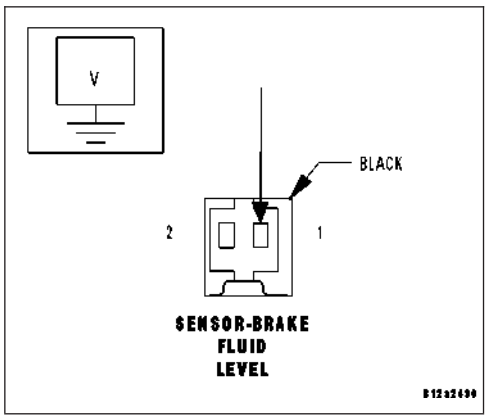
Turn the ignition on.

Measure the voltage between (B20) Brake Fluid Level Switch Sense circuit and ground.

Is there any voltage present?

Yes >> Repair the (B20) Brake Fluid Level Switch Sense circuit for a short to voltage.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 4



C1008–BRAKE FLUID LEVEL INPUT CIRCUIT HIGH (CONTINUED)

4. CHECK (B20) BRAKE FLUID LEVEL SWITCH SENSE CIRCUIT FOR AN OPEN

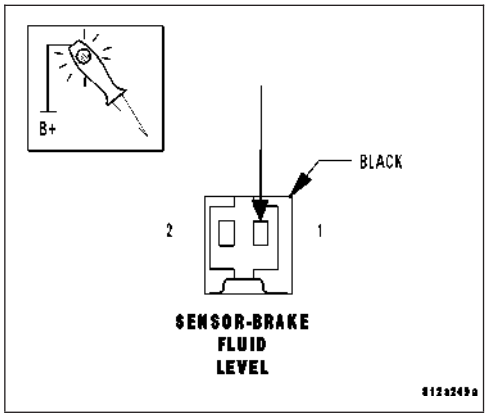
Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Fluid Level Sensor harness connector.

Connect a jumper wire between the (B20) Brake Fluid Level Switch Sense and ground.

Using a 12-volt test light connected to 12-volts, probe the (B20) Brake Fluid Level Switch Sense circuit.



Does the test light illuminate brightly?

Yes >> Go To 5

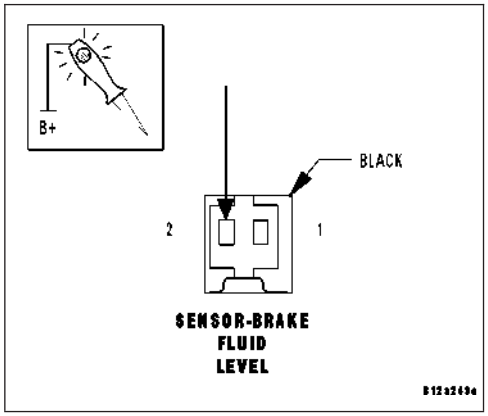
No >> Repair the (B20) Brake Fluid Level Switch Sense circuit for an open.
Perform ABS VERIFICATION TEST - VER 1.

5. CHECK (Z420) GROUND CIRCUIT FOR AN OPEN

Turn the ignition off.

Disconnect the Brake Fluid Level Sensor harness connector.

Using a 12-volt test light connected to 12-volts, probe the (Z420) Ground circuit.



Does the test light illuminate brightly?

Yes >> Go To 6

No >> Repair the (Z420) Ground circuit for an open.
Perform ABS VERIFICATION TEST - VER 1.

6. CHECK BRAKE FLUID LEVEL SENSOR FOR AN OPEN

Turn the ignition off.

Disconnect the Brake Fluid Level Sensor harness connector.

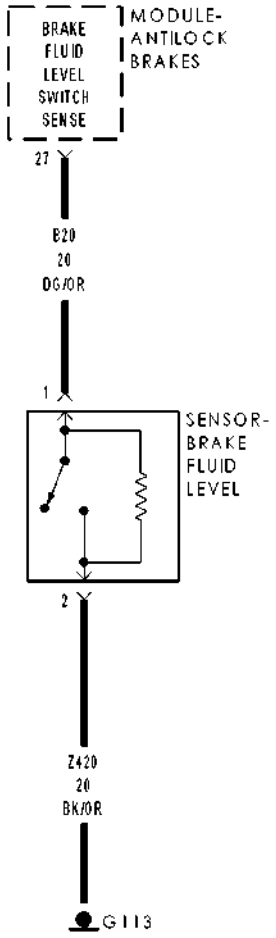
Measure the resistance between the Brake Fluid Level Sensor terminals.

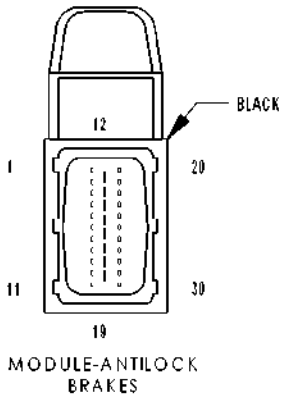
Is the resistance above 11.0k ohms?

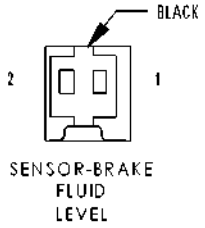
Yes >> Replace the Brake Fluid Level Sensor in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1.

No >> Replace the Anti-Lock Brake Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1.

C1009–BRAKE FLUID LEVEL LOW







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C1009–BRAKE FLUID LEVEL LOW (CONTINUED)

For the ABS circuit diagram (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuous.
- **Set Condition:**
  Below normal voltage detected on the brake fluid level sensor circuit.

Possible Causes
LOW BRAKE FlUID
(B20) BRAKE FlUID LEVEL SWITCH SENSE CIRCUIT SHORTED TO GROUND
DEFECTIVE SENSOR

Diagnostic Test

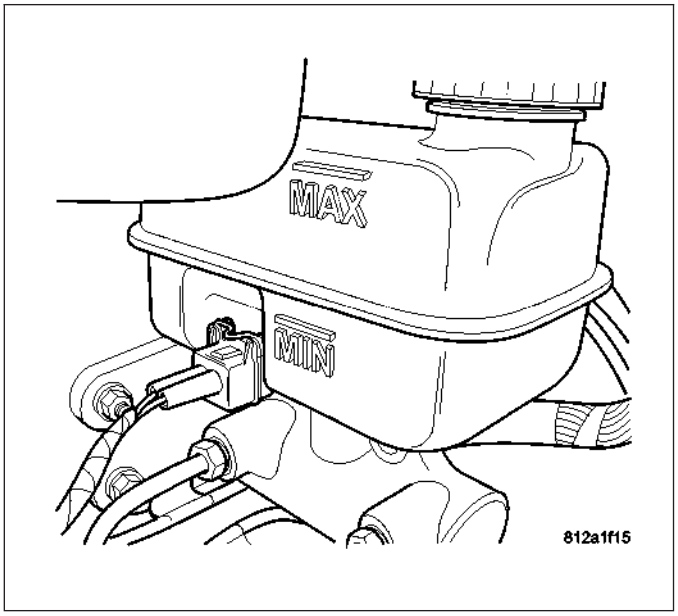
1. LOW BRAKE FlUID

Check the Brake fluid level.

Is the brake fluid full?

Yes >> Go To 2

No >> Fill the Brake fluid to proper level.
Perform ABS VERIFICATION TEST — VER 1.



C1009–BRAKE FLUID LEVEL LOW (CONTINUED)

2. (B20) BRAKE FIUID LEVEL SWITCH SENSE CIRCUIT SHORTED TO GROUND

Disconnect the Anti-lock brake module (ABM)

Disconnect the Brake fluid level sensor harness connector.

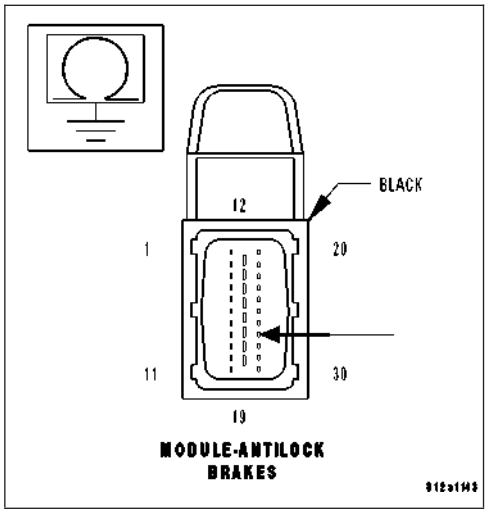
NOTE: Check connector - Clean/repair as necessary.

Measure the resistance of the Brake fluid level sensor switch sense circuit at the ABM harness connector to ground.

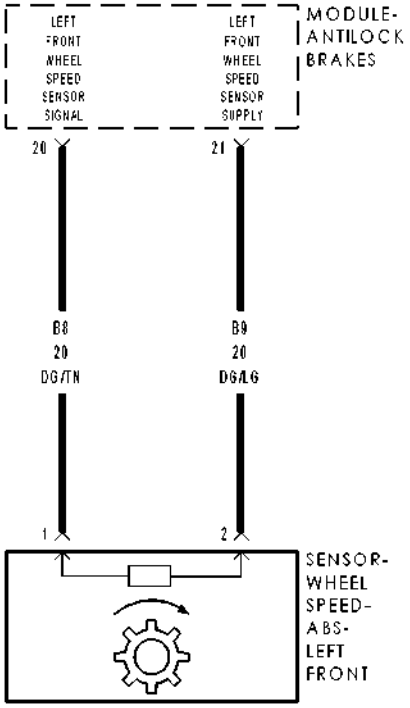
Is the resistance below 5 ohms?

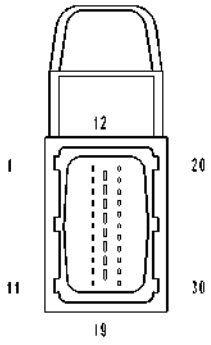
Yes >> Repair the (B20) Brake fluid level switch sense circuit for a short to ground.
Perform ABS VERIFICATION TEST — VER 1.

No >> Replace the Brake fluid level sensor.
Perform ABS VERIFICATION TEST — VER 1.

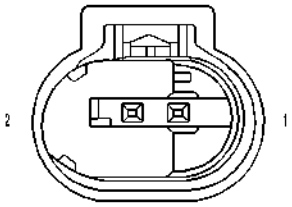


C100A–LEFT FRONT WHEEL SPEED SENSOR CIRCUIT





MODULE-ANTILOCK BRAKES



SENSOR-WHEEL SPEED-ABS-LEFT FRONT

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C100A–LEFT FRONT WHEEL SPEED SENSOR CIRCUIT (CONTINUED)

For the Anti-Lock Brake System circuit diagram. (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When the Left Front Wheel Speed Sensor circuit fails the diagnostic test.

Possible Causes
CONNECTOR/TERMINAL DAMAGE
(B9) LEFT FRONT WSS SUPPLY CIRCUIT SHORTED TO GROUND OR OPEN
(B8) LEFT FRONT WSS SIGNAL CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN
(B8) LEFT FRONT WSS SIGNAL CIRCUIT AND (B9) LEFT FRONT WSS SUPPLY CIRCUIT SHORTED TOGETHER
LEFT FRONT WSS - INTERNAL FAULT
ANTI-LOCK BRAKE MODULE - INTERNAL FAULT

Diagnostic Test

1. CHECK FOR DTC C100A–LEFT FRONT WHEEL SPEED SENSOR CIRCUIT

NOTE: This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, record and erase DTC's.

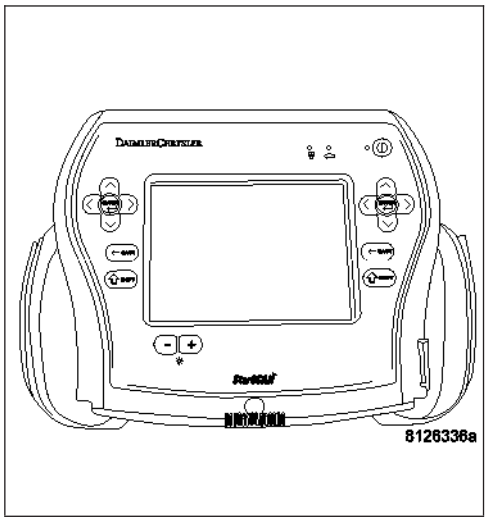
Cycle the ignition switch from off to on.

With the scan tool, read DTC's

Does the scan tool display: C100A–LEFT FRONT WHEEL SPEED SENSOR CIRCUIT?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION diagnostic procedure.
Perform ABS VERIFICATION TEST - VER 1.



C100A–LEFT FRONT WHEEL SPEED SENSOR CIRCUIT (CONTINUED)

2. CHECK CONNECTOR/TERMINAL FOR DAMAGE

NOTE: Check all terminals for broken, bent, pushed out, or corroded terminals.

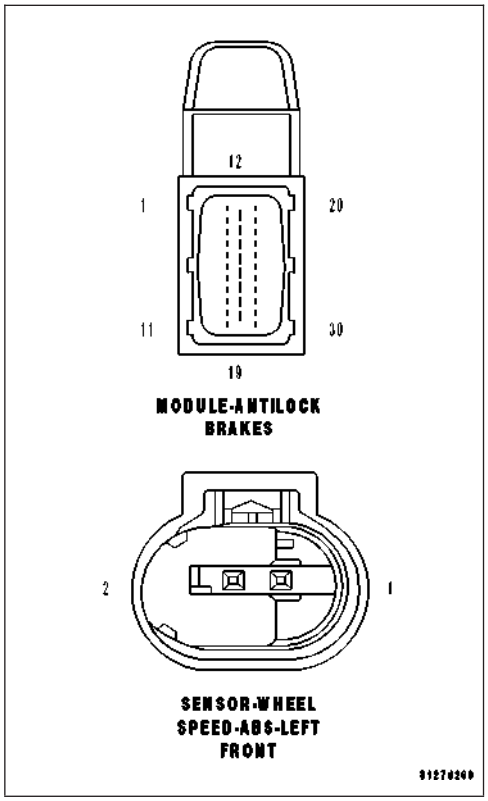
Turn the ignition off.

Inspect the Anti-Lock Brake Module harness connector, Left Front WSS, and Left Front WSS harness connector.

Is the Left Front WSS or any of the connectors/terminals damaged?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 3



3. CHECK (B9) LEFT FRONT WSS SUPPLY CIRCUIT VOLTAGE

Turn the ignition off.

Disconnect the Left Front WSS harness connector.

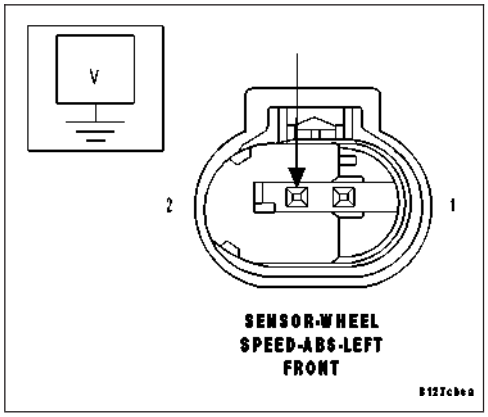
Turn the ignition on.

Measure the voltage between the (B9) Left Front WSS Supply circuit and ground.

Is the voltage above 10 volts?

Yes >> Go To 6

No >> Go To 4



C100A–LEFT FRONT WHEEL SPEED SENSOR CIRCUIT (CONTINUED)

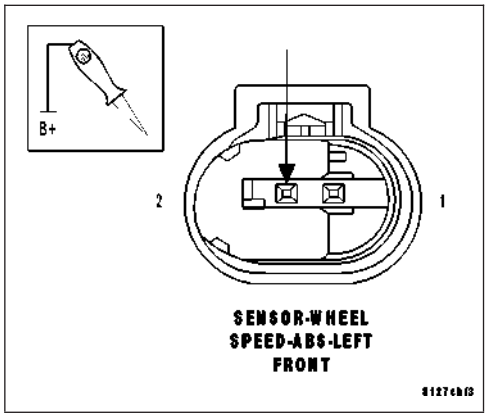
4. CHECK (B9) LEFT FRONT WSS SUPPLY CIRCUIT SHORT TO GROUND

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Left Front WSS harness connector.

Using a 12-volt test light connected to 12-volts, probe the (B9) Left Front WSS Supply circuit.



Does the test light illuminate brightly?

Yes >> Repair the (B9) Left Front WSS Supply circuit for a short to ground.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 5

5. CHECK (B9) LEFT FRONT WSS SUPPLY CIRCUIT OPEN

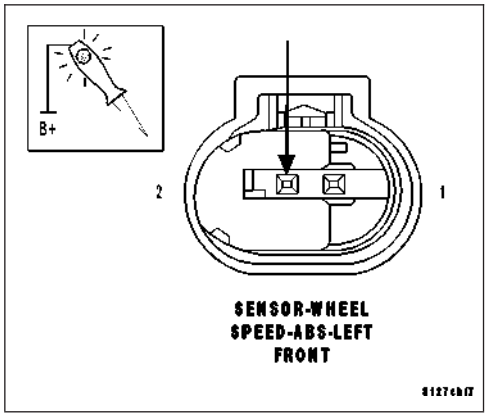
Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Left Front WSS harness connector.

Connect a jumper wire between the (B9) Left Front WSS Supply circuit and ground.

Using a 12-volt test light connected to 12-volts, probe the (B9) Left Front WSS Supply circuit.



Does the test light illuminate brightly

Yes >> Go To 6

No >> Repair the (B9) Left Front WSS Supply circuit for an open.
Perform ABS VERIFICATION TEST - VER 1.

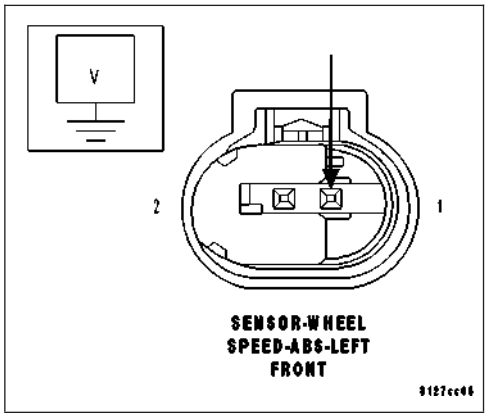
6. CHECK (B8) LEFT FRONT WSS SIGNAL CIRCUIT SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the Left Front WSS harness connector.

Turn the ignition on.

Measure the voltage between the (B8) Left Front WSS Signal circuit and ground.



Is the voltage above one volt?

Yes >> Repair the (B8) Left Front WSS Signal circuit for a short to voltage.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 7

C100A–LEFT FRONT WHEEL SPEED SENSOR CIRCUIT (CONTINUED)

7. CHECK (B8) LEFT FRONT WSS SIGNAL CIRCUIT SHORT TO GROUND

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

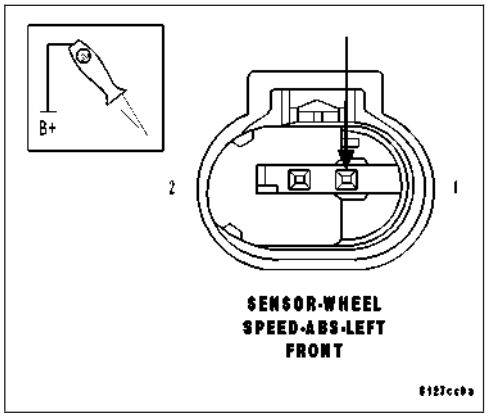
Disconnect the Left Front WSS harness connector.

Using a 12-volt test light connected to 12-volts, probe the (B8) Left Front WSS Signal circuit.

Does the test light illuminate brightly?

Yes >> Repair the (B8) Left Front WSS Signal circuit for a short to ground.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 8



8. CHECK (B8) LEFT FRONT WSS SIGNAL CIRCUIT OPEN

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Left Front WSS harness connector.

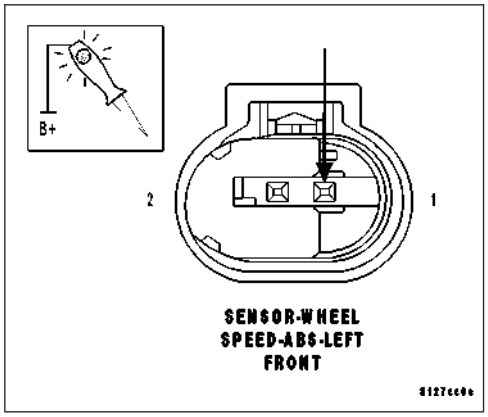
Connect a jumper wire between the (B8) Left Front WSS Signal circuit and ground.

Using a 12-volt test light connected to 12-volts, probe the (B8) Left Front WSS Signal circuit.

Does the test light illuminate brightly?

Yes >> Go To 9

No >> Repair the (B8) Left Front WSS Signal circuit for an open.
Perform ABS VERIFICATION TEST - VER 1.



9. CHECK (B8) LEFT FRONT WSS SIGNAL CIRCUIT AND (B9) LEFT FRONT WSS SUPPLY CIRCUIT SHORT TOGETHER

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

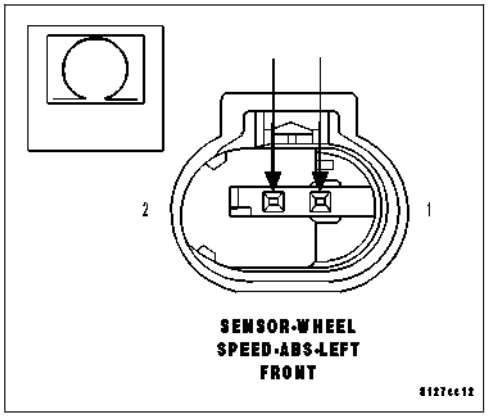
Disconnect the Left Front WSS harness connector.

Measure the resistance between the (B8) Left Front WSS Signal circuit and the (B9) Left Front WSS Supply circuit.

Is the resistance above 5.0 ohms?

Yes >> Go To 10

No >> Repair the (B8) Left Front WSS Signal circuit and the (B9) Left Front WSS Supply circuit for a short together.
Perform ABS VERIFICATION TEST - VER 1.



C100A–LEFT FRONT WHEEL SPEED SENSOR CIRCUIT (CONTINUED)

10. CHECK LEFT FRONT WSS

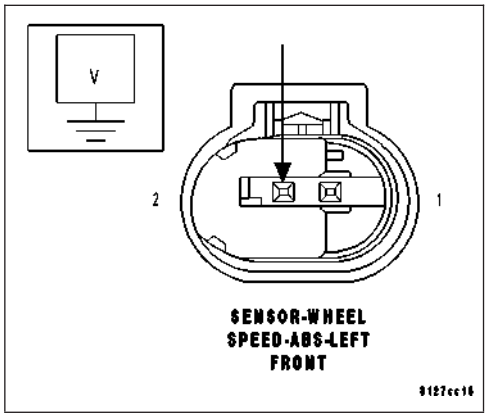
Turn the ignition off.

Reconnect all connectors.

Disconnect the Left Front WSS harness connector.

Turn the ignition on.

Measure the voltage of the (B9) Left Front WSS Supply circuit while reconnecting the Left Front WSS harness connector.



Did the (B9) Left Front WSS Supply circuit drop voltage to 0 volts?

Yes >> Replace the Left Front WSS in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 11

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11. CHECK LEFT FRONT WSS OUTPUT

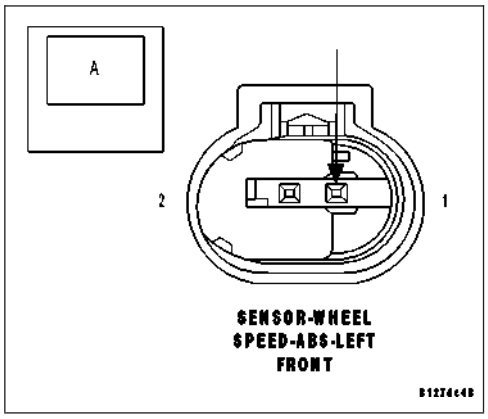
Turn the ignition off.

Reconnect all connectors.

Turn the ignition on.

Measure the amperage of the (B8) Left Front WSS Signal circuit in the Left Front WSS harness connector.

Slowly rotate the Left Front wheel.



Does the amperage toggle between 7 mA to 14 mA?

Yes >> Go To 12

No >> Replace the Left Front WSS in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1.

---

12. ANTI-LOCK BRAKE MODULE INTERNAL FAULT - (B9) LEFT FRONT WSS SUPPLY CIRCUIT

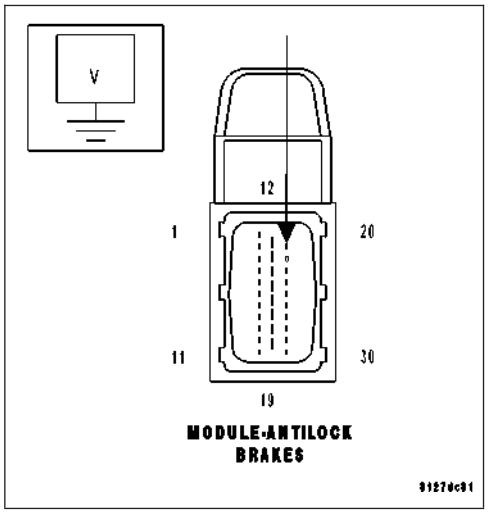
Turn the ignition off.

Remove the Anti-Lock Brake Module harness connector strain relief to access wires.

Reconnect the Anti-Lock Brake Module harness connector.

Turn the ignition on.

Measure the voltage between the (B9) Left Front WSS Supply circuit and ground.



Is the voltage above 10 volts?

Yes >> Go To 13

No >> Replace the Anti-Lock Brake Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1.

C100A–LEFT FRONT WHEEL SPEED SENSOR CIRCUIT (CONTINUED)

13. ANTI-LOCK BRAKE MODULE INTERNAL FAULT - (B8) LEFT FRONT WSS SIGNAL CIRCUIT

Turn the ignition off.

Remove the Anti-Lock Brake Module harness connector strain relief to access wires.

Reconnect the Anti-Lock Brake Module harness connector.

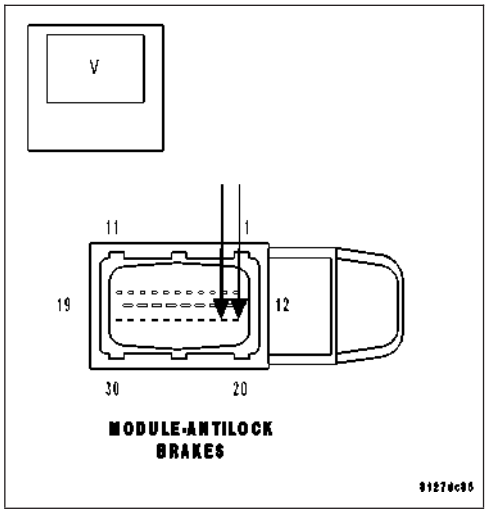
Turn the ignition on.

Measure the voltage between the (B9) Left Front WSS Supply circuit and the (B8) Left Front WSS Signal circuit.

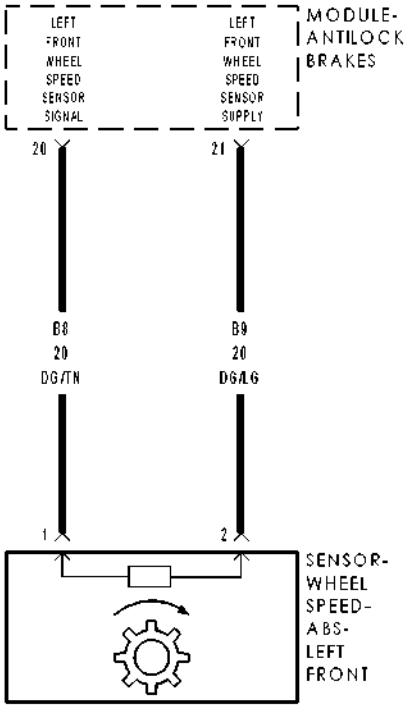
Is the voltage above 10 volts?

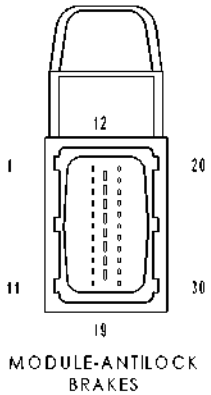
Yes >> Refer to the INTERMITTENT CONDITION diagnostic procedure.
Perform ABS VERIFICATION TEST - VER 1.

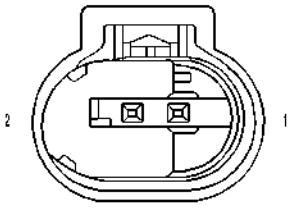
No >> Replace the Anti-Lock Brake Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1.



C1011–LEFT FRONT WHEEL SPEED SENSOR INPUT SIGNAL ERRATIC PERFORMANCE







C1011–LEFT FRONT WHEEL SPEED SENSOR INPUT SIGNAL ERRATIC PERFORMANCE (CONTINUED)

For the Anti-Lock Brake System circuit diagram. (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When the Left Front WSS Signal is intermittently missing at a vehicle speed above at 40 kph (25 mph) or erratic wheel speed signal during acceleration or sensed wheel speed is different from other wheels.

Possible Causes
LEFT FRONT WSS LOOSE - B8,B9 CIRCUITS/CONNECTOR/TERMINAL DAMAGE
LEFT FRONT TONE WHEEL DAMAGE
LEFT FRONT WSS AIR GAP FAULT
LEFT FRONT WHEEL BEARING DAMAGE
LEFT FRONT BRAKE HARDWARE DAMAGE
LEFT FRONT WSS - INTERNAL FAULT
ANTI-LOCK BRAKE MODULE - INTERNAL FAULT

Diagnostic Test

1. CHECK FOR DTC C1011–LEFT FRONT WHEEL SPEED SENSOR INPUT SIGNAL ERRATIC PERFORMANCE

NOTE: This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, record and erase DTC's.

Cycle the ignition switch from off to on.

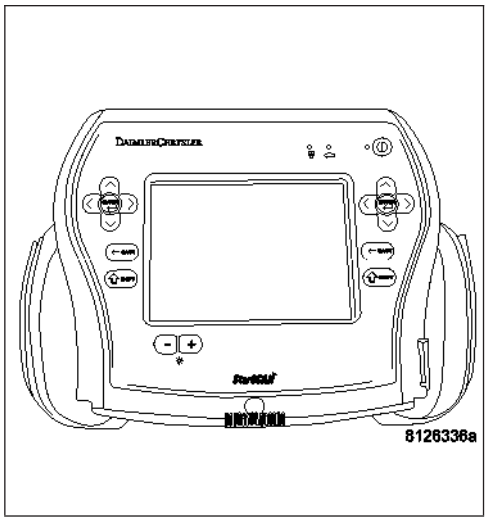
With the scan tool, read DTC's

NOTE: The Anti-Lock Brake Module must sense ALL 4 wheels at 12 km/h (7.5 mph) before it will extinguish the ABS indicators.

Does the scan tool display: C1011–LEFT FRONT WHEEL SPEED SENSOR INPUT SIGNAL ERRATIC PERFORMANCE and C100A–LEFT FRONT WHEEL SPEED SENSOR CIRCUIT?

Yes >> Refer to C100A–Left Front Wheel Speed Sensor Circuit for the related symptom(s).
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 2



C1011–LEFT FRONT WHEEL SPEED SENSOR INPUT SIGNAL ERRATIC PERFORMANCE (CONTINUED)

2. CHECK WHEEL SPEED SENSOR SIGNALS

Turn the ignition on.

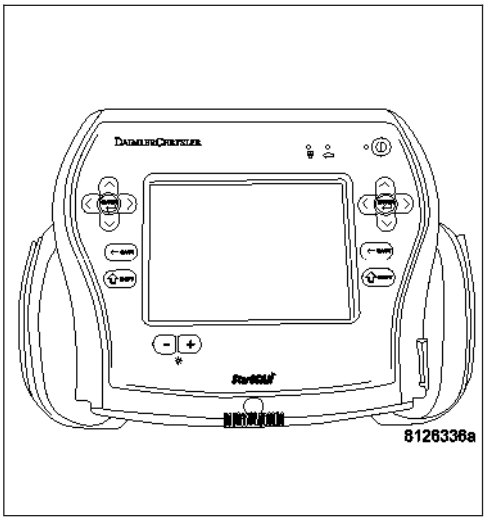
With the scan tool, monitor ALL the WSS speeds while an assistant drives the vehicle.

Slowly accelerate as straight as possible from a stop to 40 km/h (25 m.p.h.).

Is the Left Front WSS speed showing 0 km/h (0 m.p.h.) or not matching other wheel speeds?

Yes >> Go To 3

No >> Refer to the INTERMITTENT CONDITION diagnostic procedure.
Perform ABS VERIFICATION TEST - VER 1.



3. CHECK LEFT FRONT WSS LOOSENESS, INSPECT B8,B9 CIRCUITS/CONNECTORS/TERMINALS FOR DAMAGE

NOTE: Check all terminals for broken, bent, pushed out, or corroded terminals.

Turn the ignition off.

Inspect the Anti-Lock Brake Module harness connector, Left Front WSS, and Left Front WSS harness connector.

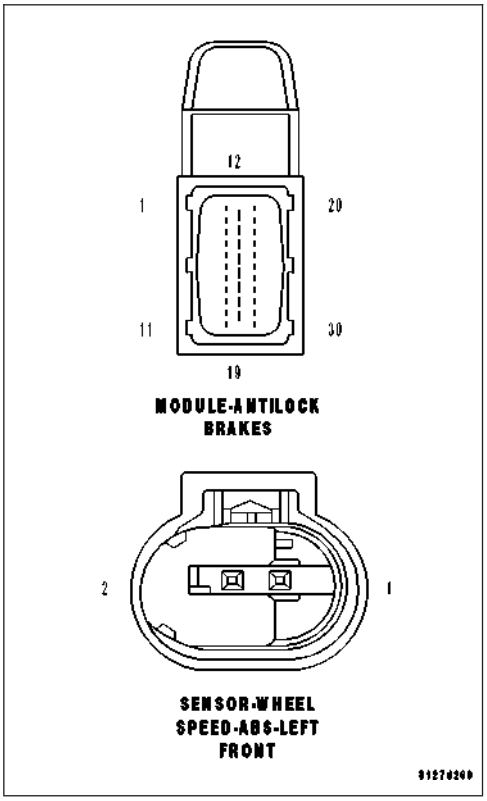
Inspect the Left Front WSS for looseness and not properly fastened.

Inspect the (B8) Left Front WSS Signal and (B9) Left Front WSS Supply circuits between the Left Front WSS and Anti-Lock Brake Module for damage.

Is the Left Front WSS loose or any of the wiring/connectors/terminals damaged?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 4



C1011–LEFT FRONT WHEEL SPEED SENSOR INPUT SIGNAL ERRATIC PERFORMANCE (CONTINUED)

4. CHECK LEFT FRONT TONE WHEEL FOR DAMAGE

Turn the ignition off.

Inspect the Left Front Tone Wheel for damage, missing teeth, cracks, or looseness.

NOTE: The Tone Wheel teeth should be perfectly square, not bent, or nicked.

Is the Left Front Tone Wheel damaged?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 5

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5. CHECK LEFT FRONT WSS AIR GAP

Turn the ignition off.

Using a feeler gauge, measure the Left Front WSS air gap.

NOTE: Refer to the appropriate service information, if necessary, for procedures or specifications.

Is the Left Front WSS air gap within specifications?

Yes >> Go To 6

No >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

---

6. CHECK LEFT FRONT WHEEL BEARING DAMAGE

Turn the ignition off.

Inspect the Left Front wheel bearing for excessive runout or clearance.

NOTE: Refer to the appropriate service information, if necessary, for procedures or specifications.

Is the Left Front Wheel Bearing damaged?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 7

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7. CHECK LEFT FRONT BRAKE HARDWARE DAMAGE

Turn the ignition off.

Visually inspect the Left Front brake linings for contamination or overheating. Check for dragging, bent, or seized components/hardware.

Is any brake lining, component, or hardware damaged?

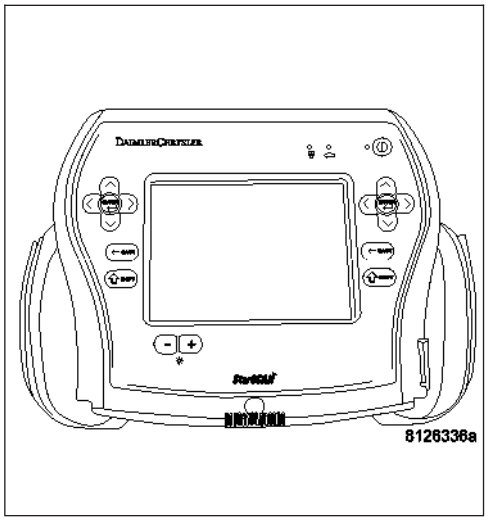
Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 8

C1011–LEFT FRONT WHEEL SPEED SENSOR INPUT SIGNAL ERRATIC PERFORMANCE (CONTINUED)

8. ANTI-LOCK BRAKE MODULE – INTERNAL FAULT

Turn the ignition off.
Replace the Left Front WSS.
With the scan tool, erase DTC's.
Road test the vehicle over 40 km/h (25 m.p.h.).
Turn the ignition on.
With the scan tool, read DTC's

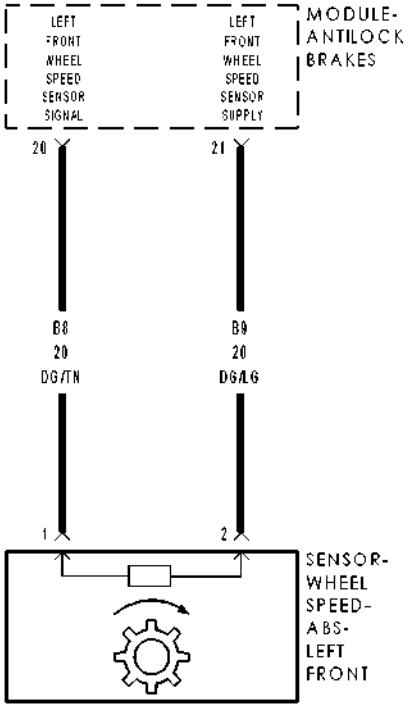


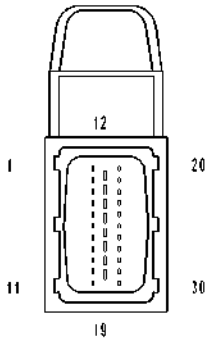
Did the DTC C1011–LEFT FRONT WHEEL SPEED SENSOR INPUT SIGNAL ERRATIC PERFORMANCE reset?

Yes >> Replace the Anti-Lock Brake Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1.

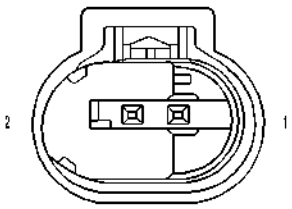
No >> Test Complete.

C1014–LEFT FRONT WHEEL SPEED COMPARATIVE PERFORMANCE





MODULE-ANTILOCK BRAKES



SENSOR-WHEEL SPEED-ABS-LEFT FRONT

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C1014–LEFT FRONT WHEEL SPEED COMPARATIVE PERFORMANCE (CONTINUED)

For the Anti-Lock Brake System circuit diagram. (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When the Left Front WSS reading is different from the readings received from the other WSS's. The Anti-Lock Brake Module compares WSS readings from side-to-side on an axle and front-to-rear.

Possible Causes
LEFT FRONT WSS LOOSE - B8,B9 CIRCUITS/CONNECTOR/TERMINAL DAMAGE
IMPROPER LEFT FRONT TIRE PRESSURE/MISMATCHED TIRES
LEFT FRONT TONE WHEEL DAMAGE
LEFT FRONT BRAKE HARDWARE DAMAGE
LEFT FRONT WSS - INTERNAL FAULT
ANTI-LOCK BRAKE MODULE - INTERNAL FAULT

Diagnostic Test

1. CHECK FOR DTC C1014–LEFT FRONT WHEEL SPEED COMPARATIVE PERFORMANCE

NOTE: This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, record and erase DTC's.

Cycle the ignition switch from off to on.

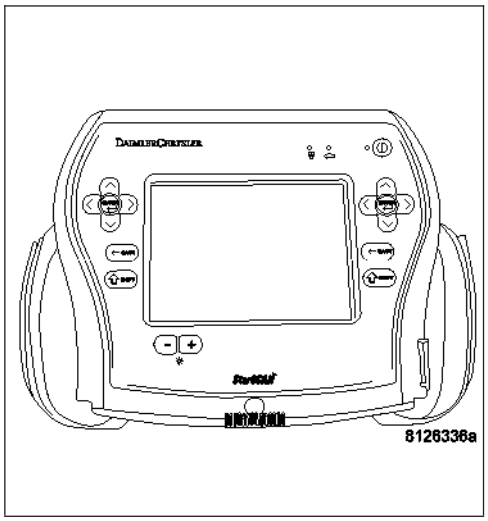
With the scan tool, read DTC's

NOTE: The Anti-Lock Brake Module must sense ALL 4 wheels at 12 km/h (7.5 m.p.h.) before it will extinguish the ABS indicators.

Does the scan tool display: C1014–LEFT FRONT WHEEL SPEED COMPARATIVE PERFORMANCE and C100A–LEFT FRONT WHEEL SPEED SENSOR CIRCUIT?

Yes >> Refer to C100A–Left Front Wheel Speed Sensor Circuit for the related symptom(s).
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 2



C1014–LEFT FRONT WHEEL SPEED COMPARATIVE PERFORMANCE (CONTINUED)

2. CHECK WHEEL SPEED SENSOR SIGNALS

Turn the ignition on.

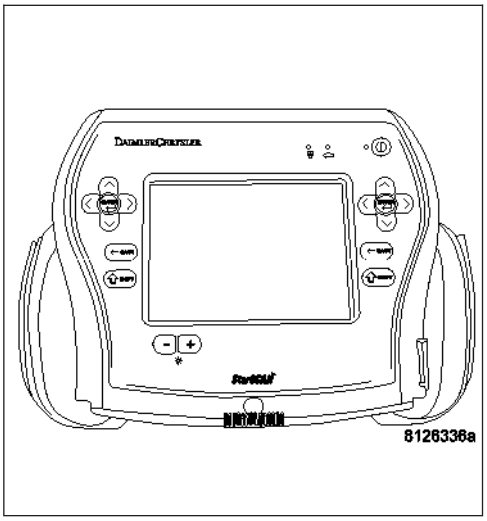
With the scan tool, monitor ALL the WSS speeds while an assistant drives the vehicle.

Slowly accelerate as straight as possible from a stop to 40 km/h (25 m.p.h.).

Is the Left Front WSS speed showing 0 km/h (0 m.p.h.) or not matching other wheel speeds?

Yes >> Go To 3

No >> Refer to the INTERMITTENT CONDITION diagnostic procedure.
Perform ABS VERIFICATION TEST - VER 1.



3. CHECK LEFT FRONT WSS LOOSENESS, INSPECT B8,B9 CIRCUITS/CONNECTORS/TERMINALS FOR DAMAGE

NOTE: Check all terminals for broken, bent, pushed out, or corroded terminals.

Turn the ignition off.

Inspect the Anti-Lock Brake Module harness connector, Left Front WSS, and Left Front WSS harness connector.

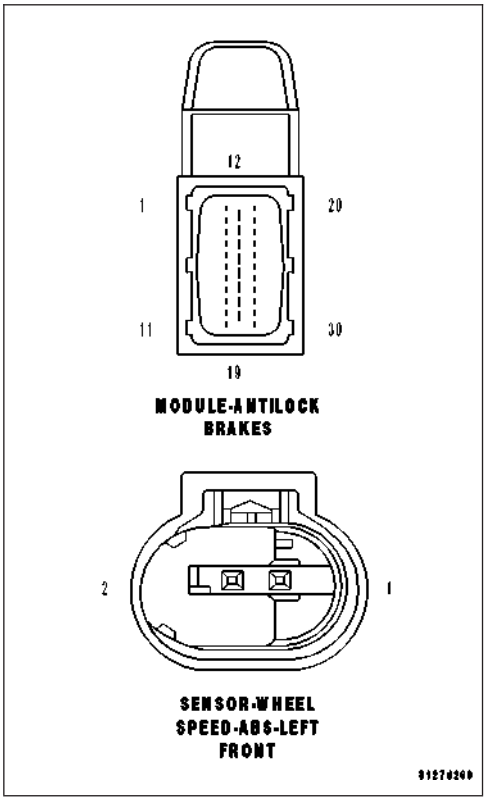
Inspect the Left Front WSS for looseness and not properly fastened.

Inspect the (B8) Left Front WSS Signal and (B9) Left Front WSS Supply circuits between the Left Front WSS and Anti-Lock Brake Module for damage.

Is the Left Front WSS loose or any of the wiring/connectors/terminals damaged?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 4



C1014–LEFT FRONT WHEEL SPEED COMPARATIVE PERFORMANCE (CONTINUED)

4. CHECK LEFT FRONT TIRE PRESSURE/INSPECT ALL TIRES

Turn the ignition off.
Check and adjust the Left Front Tire pressure.
Check and adjust all other tire pressures.
Inspect for mismatched tires on vehicle.

Is the Left Front Tire improperly inflated or mismatched tires on vehicle?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 5

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5. CHECK LEFT FRONT TONE WHEEL FOR DAMAGE

Turn the ignition off.
Inspect the Left Front Tone Wheel for damage, missing teeth, cracks, or looseness.

NOTE: The Tone Wheel teeth should be perfectly square, not bent, or nicked.

Is the Left Front Tone Wheel damaged?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 6

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6. CHECK LEFT FRONT BRAKE HARDWARE DAMAGE

Turn the ignition off.
Visually inspect the Left Front brake linings for contamination or overheating. Check for dragging, bent, or seized components/hardware.

Is any brake lining, component, or hardware damaged?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 7

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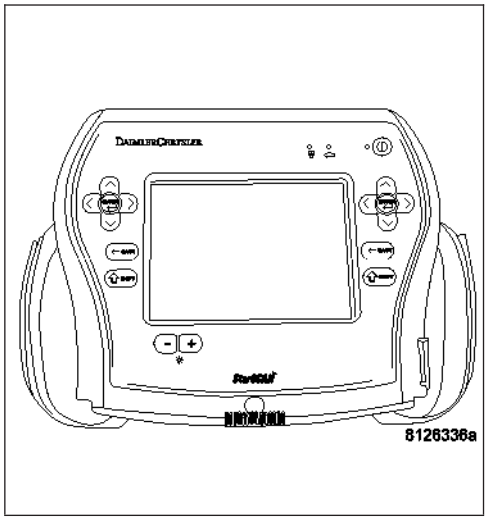
7. ANTI-LOCK BRAKE MODULE – INTERNAL FAULT

Turn the ignition off.
Replace the Left Front WSS.
With the scan tool, erase DTC's.
Road test the vehicle over 40 km/h (25 m.p.h.).
Turn the ignition on.
With the scan tool, read DTC's

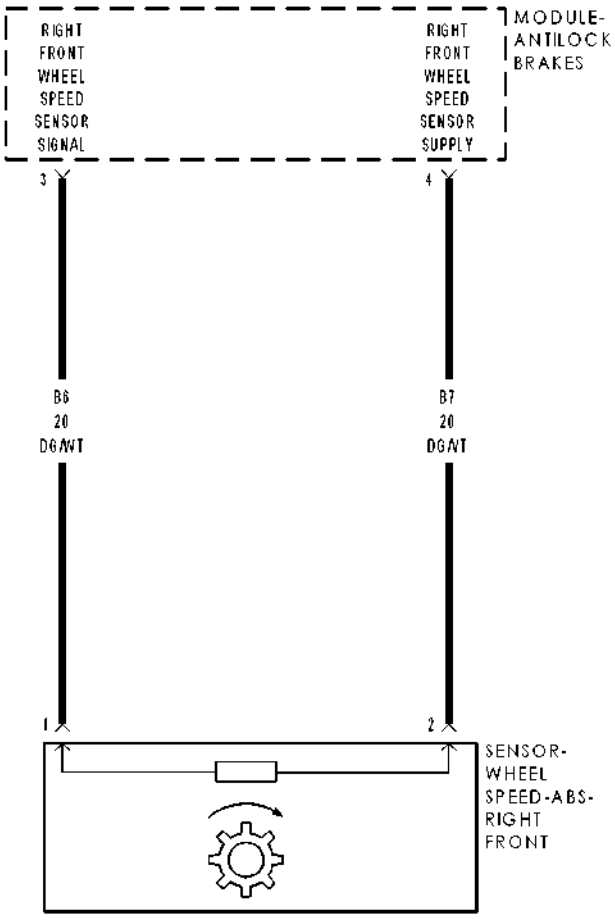
Did the DTC C1014–LEFT FRONT WHEEL SPEED COMPARATIVE PERFORMANCE reset?

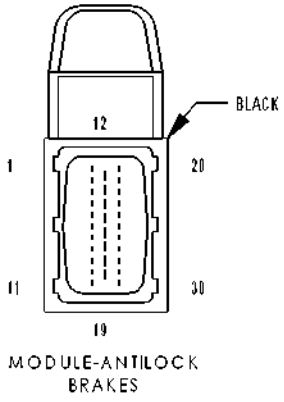
Yes >> Replace the Anti-Lock Brake Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1.

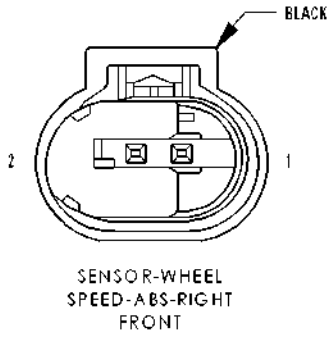
No >> Test Complete.



C1015–RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT







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C1015–RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT (CONTINUED)

For the Anti-Lock Brake System circuit diagram. (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When the Right Front Wheel Speed Sensor circuit fails the diagnostic test.

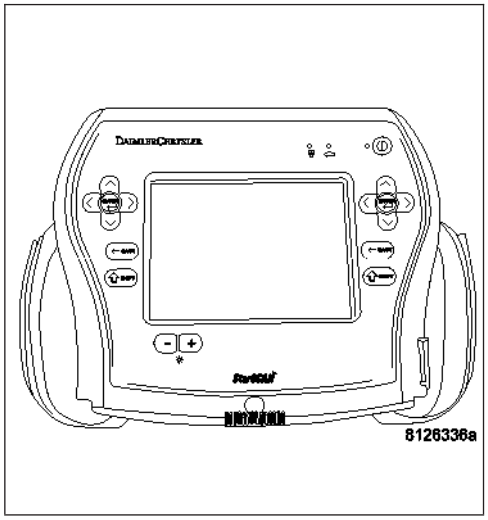
Possible Causes
CONNECTOR/TERMINAL DAMAGE
(B4) RIGHT FRONT WSS SUPPLY CIRCUIT SHORTED TO GROUND OR OPEN
(B3) RIGHT FRONT WSS SIGNAL CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN
(B3) RIGHT FRONT WSS SIGNAL CIRCUIT AND (B4) RIGHT FRONT WSS SUPPLY CIRCUIT SHORTED TOGETHER
RIGHT FRONT WSS - INTERNAL FAULT
ANTI-LOCK BRAKE MODULE - INTERNAL FAULT

Diagnostic Test

1.

NOTE: This DTC must be active for the results of this test to be valid. CHECK FOR DTC C1015–RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT

Turn the ignition on.
With the scan tool, record and erase DTC's.
Cycle the ignition switch from off to on.
With the scan tool, read DTC's



Does the scan tool display: C1015–RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION diagnostic procedure.
Perform ABS VERIFICATION TEST - VER 1.

C1015–RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT (CONTINUED)

2. CHECK CONNECTOR/TERMINAL FOR DAMAGE

NOTE: Check all terminals for broken, bent, pushed out, or corroded terminals.

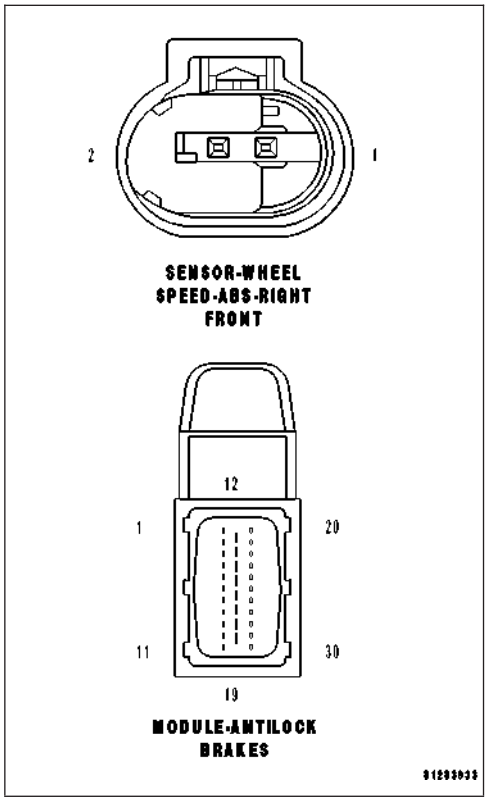
Turn the ignition off.

Inspect the Anti-Lock Brake Module harness connector, Right Front WSS, and Right Front WSS harness connector.

Is the Right Front WSS or any of the connectors/terminals damaged?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 3



3. CHECK (B7) RIGHT FRONT WSS SUPPLY CIRCUIT VOLTAGE

Turn the ignition off.

Disconnect the Right Front WSS harness connector.

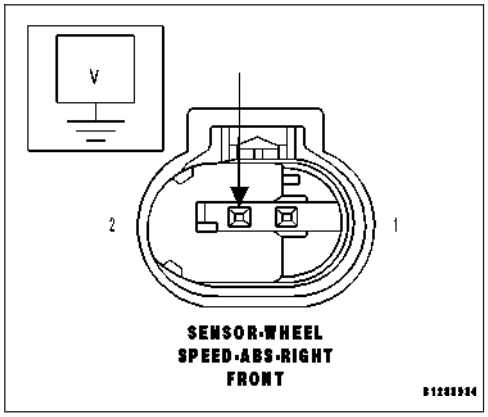
Turn the ignition on.

Measure the voltage between the (B7) Right Front WSS Supply circuit and ground.

Is the voltage above 10 volts?

Yes >> Go To 6

No >> Go To 4



C1015–RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT (CONTINUED)

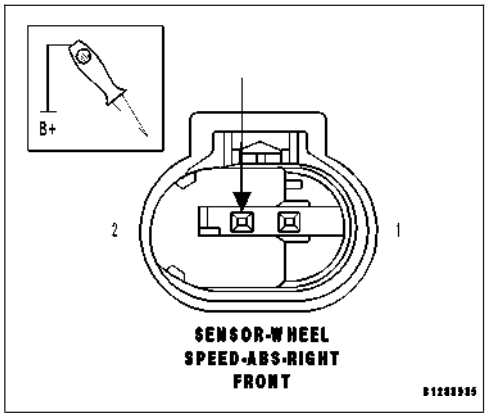
4. CHECK (B7) RIGHT FRONT WSS SUPPLY CIRCUIT SHORT TO GROUND

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Right Front WSS harness connector.

Using a 12-volt test light connected to 12-volts, probe the (B7) Right Front WSS Supply circuit.



Does the test light illuminate brightly?

Yes >> Repair the (B7) Right Front WSS Supply circuit for a short to ground.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 5

5. CHECK (B7) RIGHT FRONT WSS SUPPLY CIRCUIT OPEN

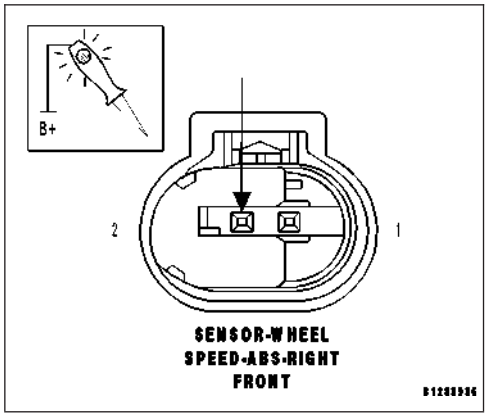
Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Right Front WSS harness connector.

Connect a jumper wire between the (B7) Right Front WSS Supply circuit and ground.

Using a 12-volt test light connected to 12-volts, probe the (B7) Right Front WSS Supply circuit.



Does the test light illuminate brightly

Yes >> Go To 6

No >> Repair the (B7) Right Front WSS Supply circuit for an open.
Perform ABS VERIFICATION TEST - VER 1.

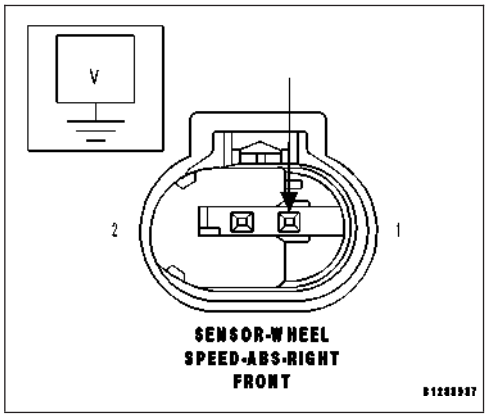
6. CHECK (B6) LEFT FRONT WSS SIGNAL CIRCUIT SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the Right Front WSS harness connector.

Turn the ignition on.

Measure the voltage between the (B6) Right Front WSS Signal circuit and ground.



Is the voltage above one volt?

Yes >> Repair the (B6) Right Front WSS Signal circuit for a short to voltage.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 7

C1015–RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT (CONTINUED)

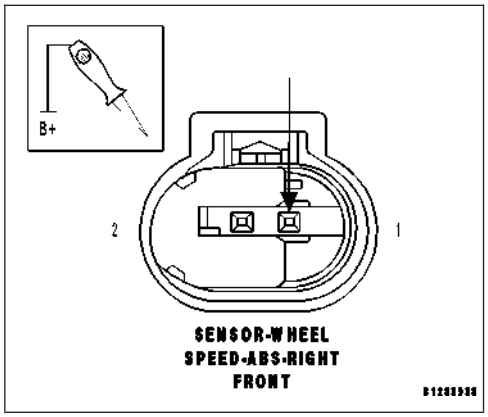
7. CHECK (B6) LEFT FRONT WSS SIGNAL CIRCUIT SHORT TO GROUND

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Right Front WSS harness connector.

Using a 12-volt test light connected to 12-volts, probe the (B6) Right Front WSS Signal circuit.



Does the test light illuminate brightly?

Yes >> Repair the (B6) Right Front WSS Signal circuit for a short to ground.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 8

8. CHECK (B6) RIGHT FRONT WSS SIGNAL CIRCUIT OPEN

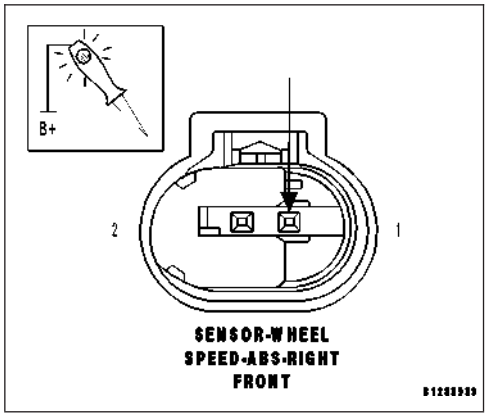
Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Right Front WSS harness connector.

Connect a jumper wire between the (B6) Right Front WSS Signal circuit and ground.

Using a 12-volt test light connected to 12-volts, probe the (B6) Right Front WSS Signal circuit.



Does the test light illuminate brightly?

Yes >> Go To 9

No >> Repair the (B6) Right Front WSS Signal circuit for an open.
Perform ABS VERIFICATION TEST - VER 1.

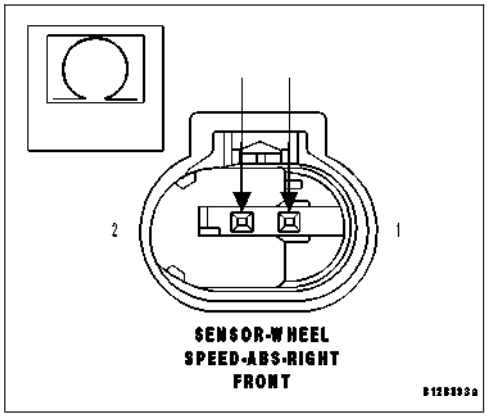
9. CHECK (B6) RIGHT FRONT WSS SIGNAL CIRCUIT AND (B7) RIGHT FRONT WSS SUPPLY CIRCUIT SHORT TOGETHER

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Right Front WSS harness connector.

Measure the resistance between the (B6) Right Front WSS Signal circuit and the (B7) Right Front WSS Supply circuit.



Is the resistance above 5.0 ohms?

Yes >> Go To 10

No >> Repair the (B6) Right Front WSS Signal circuit and the (B7) Right Front WSS Supply circuit for a short together.
Perform ABS VERIFICATION TEST - VER 1.

C1015–RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT (CONTINUED)

10. CHECK RIGHT FRONT WSS

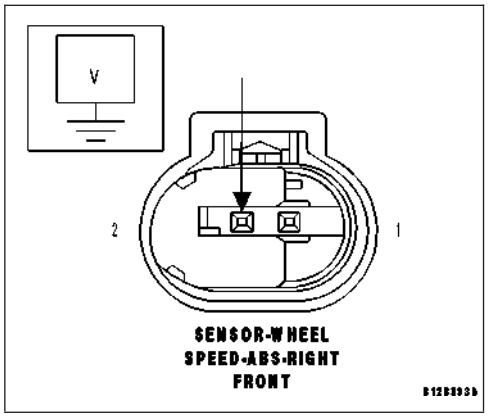
Turn the ignition off.

Reconnect all connectors.

Disconnect the Right Front WSS harness connector.

Turn the ignition on.

Measure the voltage of the (B7) Right Front WSS Supply circuit while reconnecting the Right Front WSS harness connector.



Did the (B7) Right Front WSS Supply circuit drop voltage to 0 volts?

Yes >> Replace the Right Front WSS in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 11

11. CHECK RIGHT FRONT WSS OUTPUT

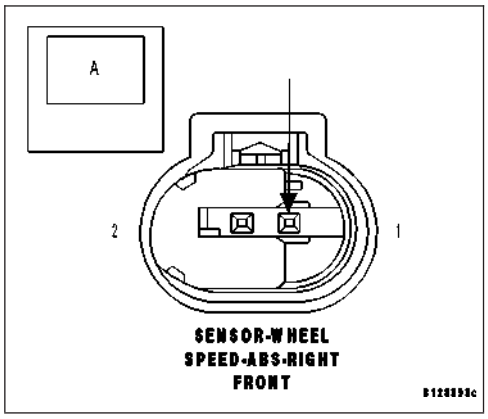
Turn the ignition off.

Reconnect all connectors.

Turn the ignition on.

Measure the amperage of the (B6) Right Front WSS Signal circuit in the Right Front WSS harness connector.

Slowly rotate the Right Front wheel.



Does the amperage toggle between 7 mA to 14 mA?

Yes >> Go To 12

No >> Replace the Right Front WSS in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1.

12. ANTI-LOCK BRAKE MODULE INTERNAL FAULT - (B7) RIGHT FRONT WSS SUPPLY CIRCUIT

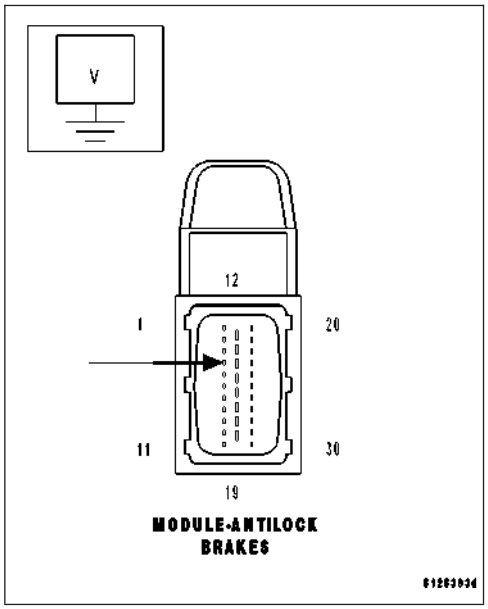
Turn the ignition off.

Remove the Anti-Lock Brake Module harness connector strain relief to access wires.

Reconnect the Anti-Lock Brake Module harness connector.

Turn the ignition on.

Measure the voltage between the (B7) Right Front WSS Supply circuit and ground.



Is the voltage above 10 volts?

Yes >> Go To 13

No >> Replace the Anti-Lock Brake Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1.

C1015–RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT (CONTINUED)

13. ANTI-LOCK BRAKE MODULE INTERNAL FAULT - (B6) RIGHT FRONT WSS SIGNAL CIRCUIT

Turn the ignition off.

Remove the Anti-Lock Brake Module harness connector strain relief to access wires.

Reconnect the Anti-Lock Brake Module harness connector.

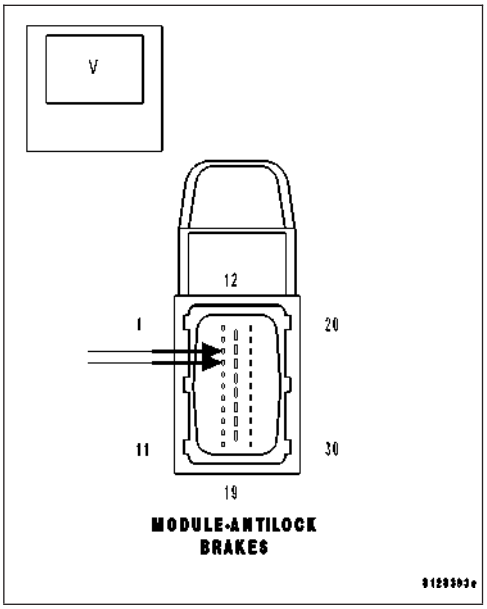
Turn the ignition on.

Measure the voltage between the (B7) Right Front WSS Supply circuit and the (B6) Right Front WSS Signal circuit.

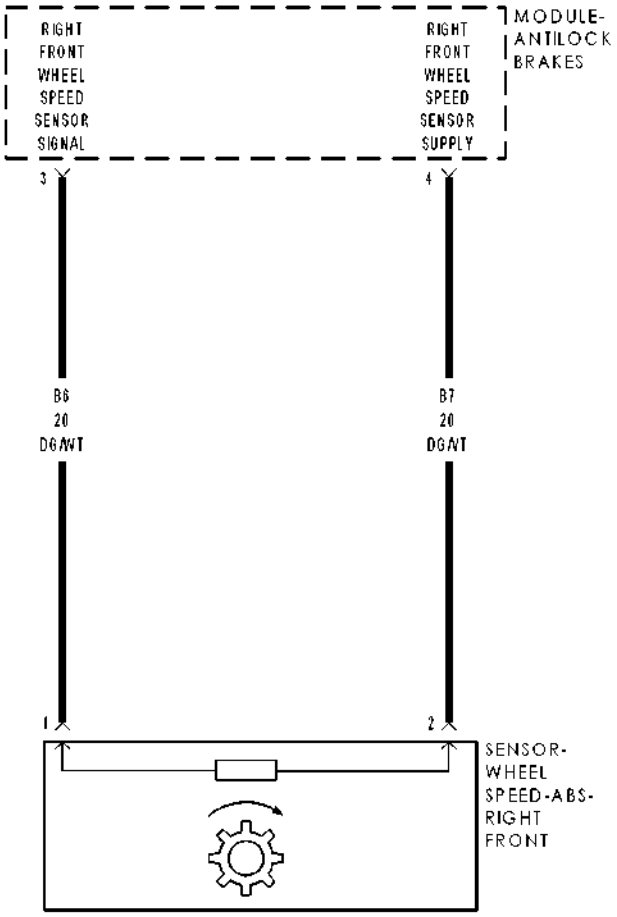
Is the voltage above 10 volts?

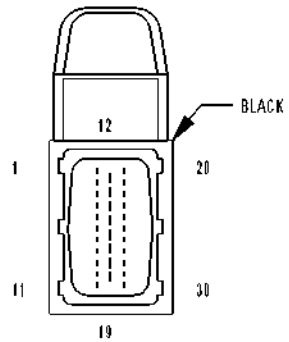
Yes >> Refer to the INTERMITTENT CONDITION diagnostic procedure.
Perform ABS VERIFICATION TEST - VER 1.

No >> Replace the Anti-Lock Brake Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1.

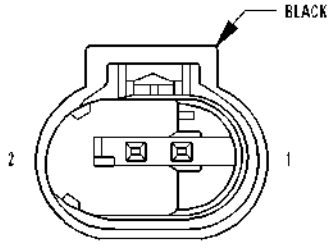


C101C–RIGHT FRONT WHEEL SPEED SENSOR INPUT SIGNAL ERRATIC PERFORMANCE





MODULE-ANTILOCK BRAKES



SENSOR-WHEEL SPEED-ABS-RIGHT FRONT

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C101C–RIGHT FRONT WHEEL SPEED SENSOR INPUT SIGNAL ERRATIC PERFORMANCE (CONTINUED)

For the Anti-Lock Brake System circuit diagram. (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When the Right Front WSS Signal is intermittently missing at a vehicle speed above at 40 kph (25 m.p.h.) or erratic wheel speed signal during acceleration or sensed wheel speed is different from other wheels.

Possible Causes
RIGHT FRONT WSS LOOSE - B6,B7 CIRCUITS/CONNECTOR/TERMINAL DAMAGE
RIGHT FRONT TONE WHEEL DAMAGE
RIGHT FRONT WSS AIR GAP FAULT
RIGHT FRONT WHEEL BEARING DAMAGE
RIGHT FRONT BRAKE HARDWARE DAMAGE
RIGHT FRONT WSS - INTERNAL FAULT
ANTI-LOCK BRAKE MODULE - INTERNAL FAULT

Diagnostic Test

1. CHECK FOR DTC C101C–RIGHT FRONT WHEEL SPEED SENSOR INPUT SIGNAL ERRATIC PERFORMANCE

NOTE: This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, record and erase DTC's.

Cycle the ignition switch from off to on.

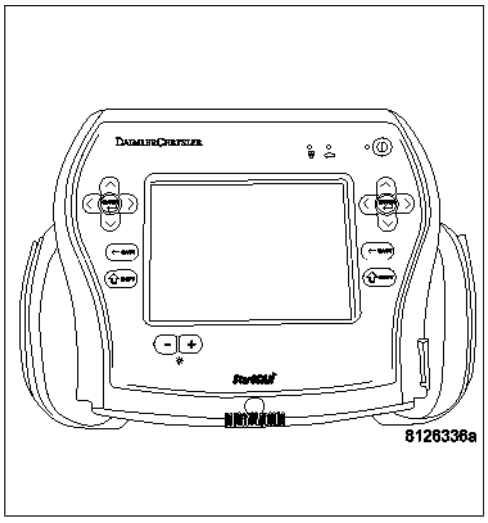
With the scan tool, read DTC's

NOTE: The Anti-Lock Brake Module must sense ALL 4 wheels at 12 km/h (7.5 m.p.h.) before it will extinguish the ABS indicators.

Does the scan tool display: C101C–RIGHT FRONT WHEEL SPEED SENSOR INPUT SIGNAL ERRATIC PERFORMANCE and C1015–RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT?

Yes >> Refer to C1015–Right Front Wheel Speed Sensor Circuit for the related symptom(s).
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 2



C101C–RIGHT FRONT WHEEL SPEED SENSOR INPUT SIGNAL ERRATIC PERFORMANCE (CONTINUED)

2. CHECK WHEEL SPEED SENSOR SIGNALS

Turn the ignition on.

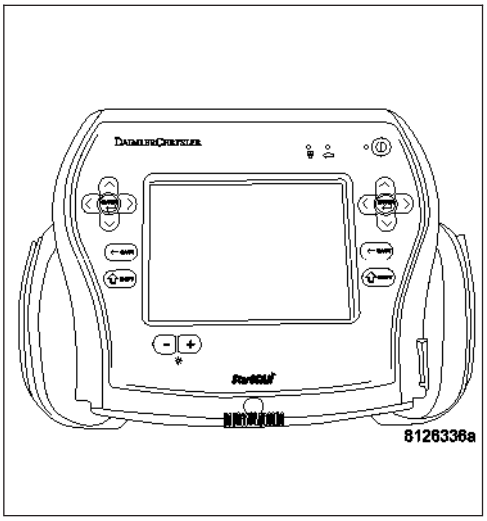
With the scan tool, monitor ALL the WSS speeds while an assistant drives the vehicle.

Slowly accelerate as straight as possible from a stop to 40 km/h (25 m.p.h.).

Is the Right Front WSS speed showing 0 km/h (0 m.p.h.) or not matching other wheel speeds?

Yes >> Go To 3

No >> Refer to the INTERMITTENT CONDITION diagnostic procedure.
Perform ABS VERIFICATION TEST - VER 1.



3. CHECK RIGHT FRONT WSS LOOSENESS, INSPECT B6,B7 CIRCUITS/CONNECTORS/TERMINALS FOR DAMAGE

NOTE: Check all terminals for broken, bent, pushed out, or corroded terminals.

Turn the ignition off.

Inspect the Anti-Lock Brake Module harness connector, Right Front WSS, and Right Front WSS harness connector.

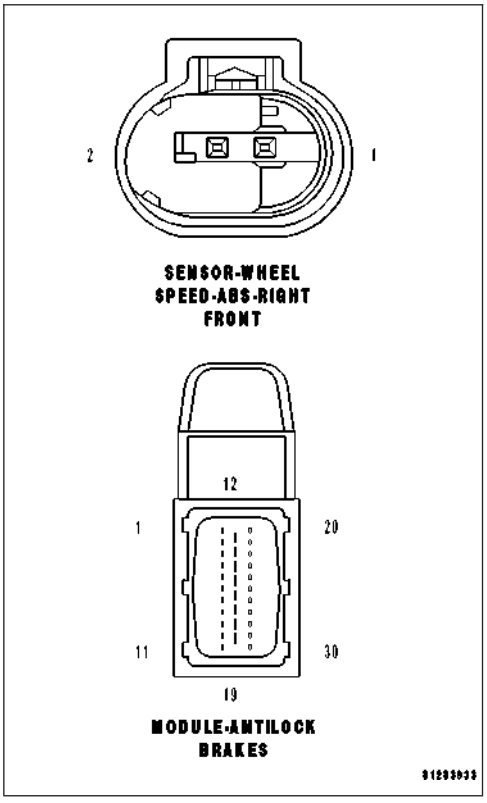
Inspect the Right Front WSS for looseness and not properly fastened.

Inspect the (B6) Right Front WSS Signal and (B7) Right Front WSS Supply circuits between the Right Front WSS and Anti-Lock Brake Module for damage.

Is the Right Front WSS loose or any of the wiring/connectors/terminals damaged?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 4



C101C–RIGHT FRONT WHEEL SPEED SENSOR INPUT SIGNAL ERRATIC PERFORMANCE (CONTINUED)

4. CHECK RIGHT FRONT TONE WHEEL FOR DAMAGE

Turn the ignition off.

Inspect the Right Front Tone Wheel for damage, missing teeth, cracks, or looseness.

NOTE: The Tone Wheel teeth should be perfectly square, not bent, or nicked.

Is the Right Front Tone Wheel damaged?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 5

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5. CHECK RIGHT FRONT WSS AIR GAP

Turn the ignition off.

Using a feeler gauge, measure the Right Front WSS air gap.

NOTE: Refer to the appropriate service information, if necessary, for procedures or specifications.

Is the Right Front WSS air gap within specifications?

Yes >> Go To 6

No >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

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6. CHECK RIGHT FRONT WHEEL BEARING DAMAGE

Turn the ignition off.

Inspect the Right Front wheel bearing for excessive runout or clearance.

NOTE: Refer to the appropriate service information, if necessary, for procedures or specifications.

Is the Right Front Wheel Bearing damaged?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 7

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7. CHECK RIGHT FRONT BRAKE HARDWARE DAMAGE

Turn the ignition off.

Visually inspect the Right Front brake linings for contamination or overheating. Check for dragging, bent, or seized components/hardware.

Is any brake lining, component, or hardware damaged?

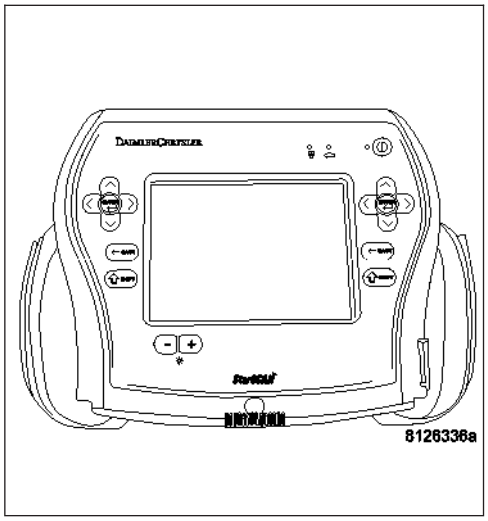
Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 8

C101C–RIGHT FRONT WHEEL SPEED SENSOR INPUT SIGNAL ERRATIC PERFORMANCE (CONTINUED)

8. ANTI-LOCK BRAKE MODULE – INTERNAL FAULT

Turn the ignition off.
Replace the Right Front WSS.
With the scan tool, erase DTC's.
Road test the vehicle over 40 km/h (25 m.p.h.).
Turn the ignition on.
With the scan tool, read DTC's

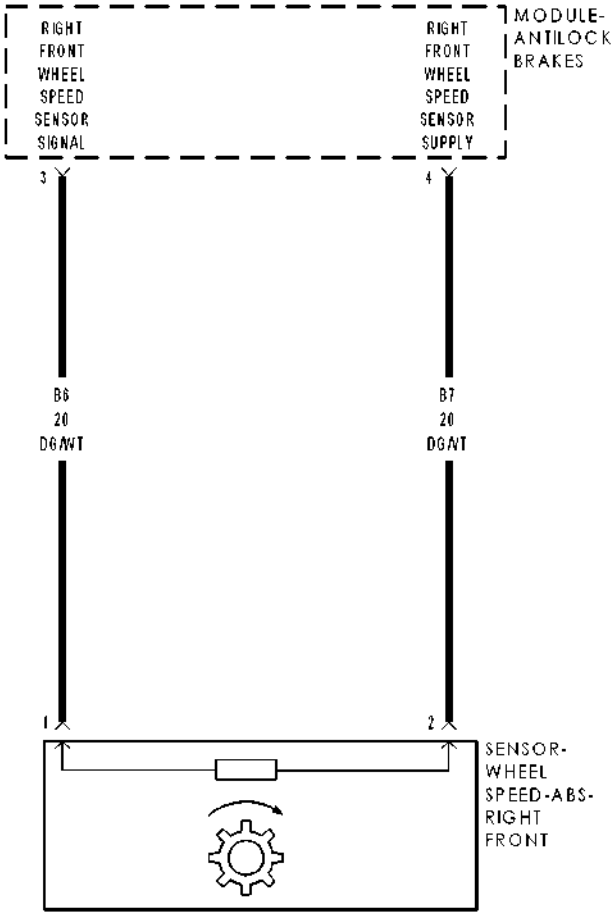


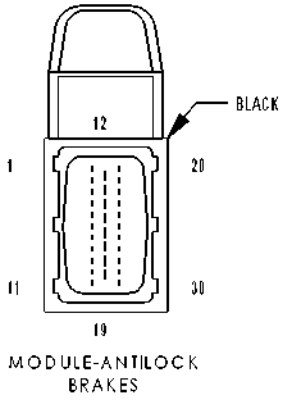
Did the DTC C101C–RIGHT FRONT WHEEL SPEED SENSOR INPUT SIGNAL ERRATIC PERFORMANCE reset?

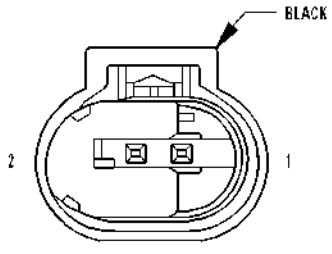
Yes >> Replace the Anti-Lock Brake Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1.

No >> Test Complete.

C101F–RIGHT FRONT WHEEL SPEED COMPARATIVE PERFORMANCE







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C101F–RIGHT FRONT WHEEL SPEED COMPARATIVE PERFORMANCE (CONTINUED)

For the Anti-Lock Brake System circuit diagram. (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When the Right Front WSS reading is different from the readings received from the other WSS's. The Anti-Lock Brake Module compares WSS readings from side-to-side on an axle and front-to-rear.

Possible Causes
RIGHT FRONT WSS LOOSE - B6,B7 CIRCUITS/CONNECTOR/TERMINAL DAMAGE
IMPROPER RIGHT FRONT TIRE PRESSURE/MISMATCHED TIRES
RIGHT FRONT TONE WHEEL DAMAGE
RIGHT FRONT BRAKE HARDWARE DAMAGE
RIGHT FRONT WSS - INTERNAL FAULT
ANTI-LOCK BRAKE MODULE - INTERNAL FAULT

Diagnostic Test

1. CHECK FOR DTC C101F–RIGHT FRONT WHEEL SPEED COMPARATIVE PERFORMANCE

NOTE: This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, record and erase DTC's.

Cycle the ignition switch from off to on.

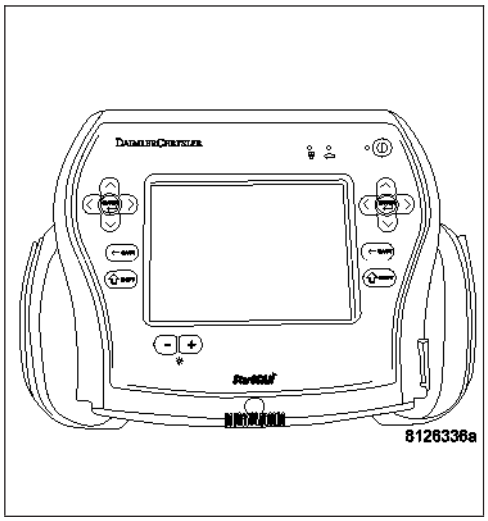
With the scan tool, read DTC's

NOTE: The Anti-Lock Brake Module must sense ALL 4 wheels at 12 km/h (7.5 m.p.h.) before it will extinguish the ABS indicators.

Does the scan tool display: C101F–RIGHT FRONT WHEEL SPEED COMPARATIVE PERFORMANCE and C1015–RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT?

Yes >> Refer to C1015–Right Front Wheel Speed Sensor Circuit for the related symptom(s).
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 2



C101F–RIGHT FRONT WHEEL SPEED COMPARATIVE PERFORMANCE (CONTINUED)

2. CHECK WHEEL SPEED SENSOR SIGNALS

Turn the ignition on.

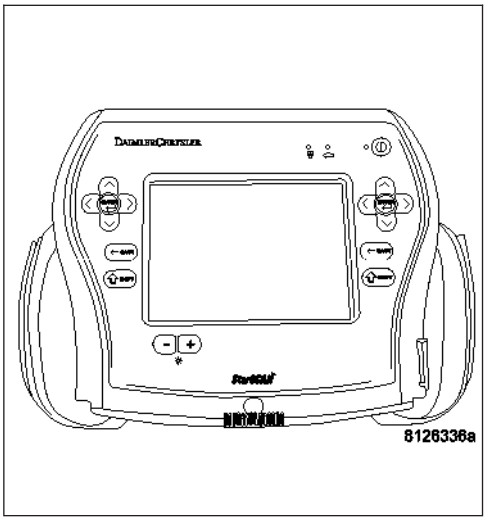
With the scan tool, monitor ALL the WSS speeds while an assistant drives the vehicle.

Slowly accelerate as straight as possible from a stop to 40 km/h (25 m.p.h.).

Is the Right Front WSS speed showing 0 km/h (0 m.p.h.) or not matching other wheel speeds?

Yes >> Go To 3

No >> Refer to the INTERMITTENT CONDITION diagnostic procedure.
Perform ABS VERIFICATION TEST - VER 1.



3. CHECK RIGHT FRONT WSS LOOSENESS, INSPECT B6,B7 CIRCUITS/CONNECTORS/TERMINALS FOR DAMAGE

NOTE: Check all terminals for broken, bent, pushed out, or corroded terminals.

Turn the ignition off.

Inspect the Anti-Lock Brake Module harness connector, Right Front WSS, and Right Front WSS harness connector.

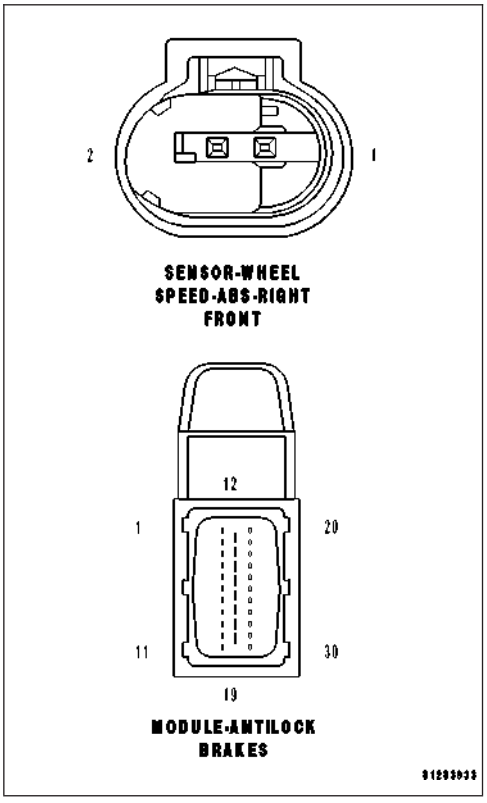
Inspect the Right Front WSS for looseness and not properly fastened.

Inspect the (B6) Right Front WSS Signal and (B7) Right Front WSS Supply circuits between the Right Front WSS and Anti-Lock Brake Module for damage.

Is the Right Front WSS loose or any of the wiring/connectors/terminals damaged?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 4



C101F–RIGHT FRONT WHEEL SPEED COMPARATIVE PERFORMANCE (CONTINUED)

4. CHECK RIGHT FRONT TIRE PRESSURE/INSPECT ALL TIRES

Turn the ignition off.
Check and adjust the Right Front Tire pressure.
Check and adjust all other tire pressures.
Inspect for mismatched tires on vehicle.

Is the Right Front Tire improperly inflated or mismatched tires on vehicle?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 5

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5. CHECK RIGHT FRONT TONE WHEEL FOR DAMAGE

Turn the ignition off.
Inspect the Right Front Tone Wheel for damage, missing teeth, cracks, or looseness.

NOTE: The Tone Wheel teeth should be perfectly square, not bent, or nicked.

Is the Right Front Tone Wheel damaged?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 6

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6. CHECK RIGHT FRONT BRAKE HARDWARE DAMAGE

Turn the ignition off.
Visually inspect the Right Front brake linings for contamination or overheating. Check for dragging, bent, or seized components/hardware.

Is any brake lining, component, or hardware damaged?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 7

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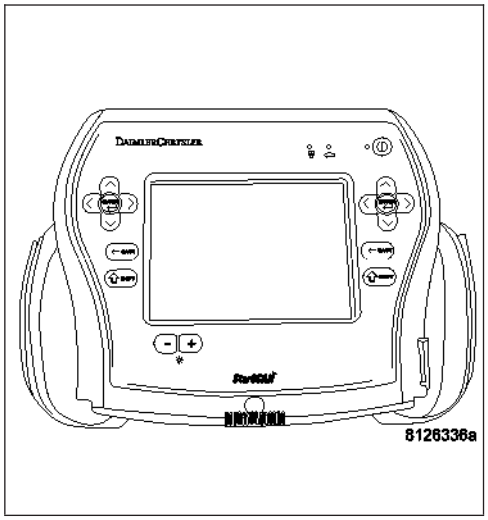
7. ANTI-LOCK BRAKE MODULE – INTERNAL FAULT

Turn the ignition off.
Replace the Right Front WSS.
With the scan tool, erase DTC's.
Road test the vehicle over 40 km/h (25 m.p.h.).
Turn the ignition on.
With the scan tool, read DTC's

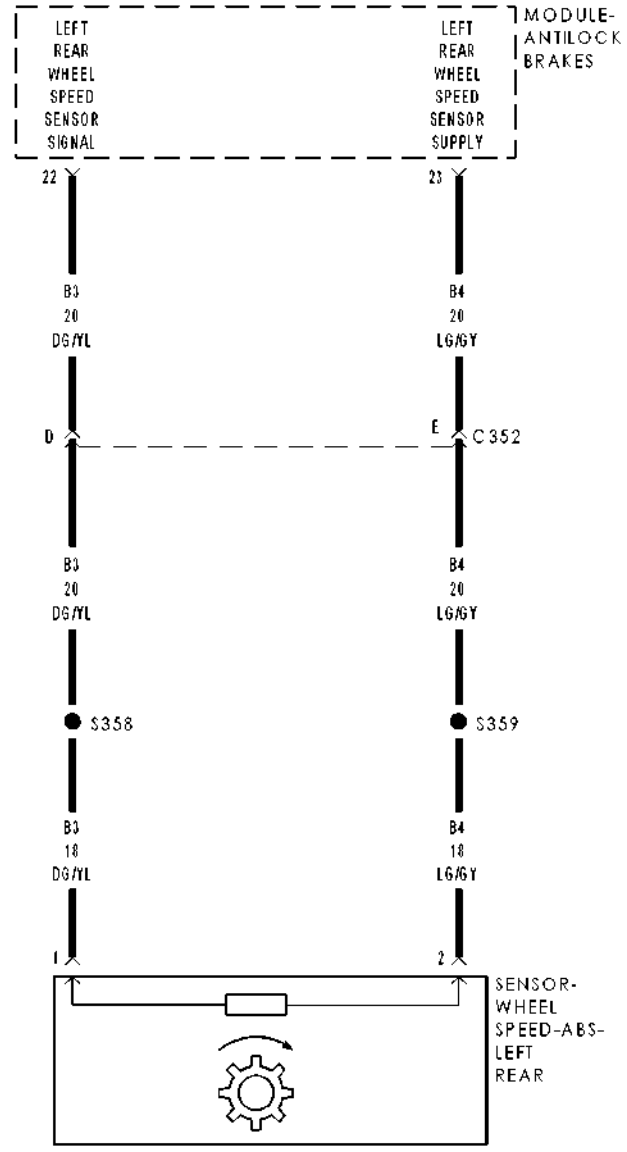
Did the DTC C101F–RIGHT FRONT WHEEL SPEED COMPARATIVE PERFORMANCE reset?

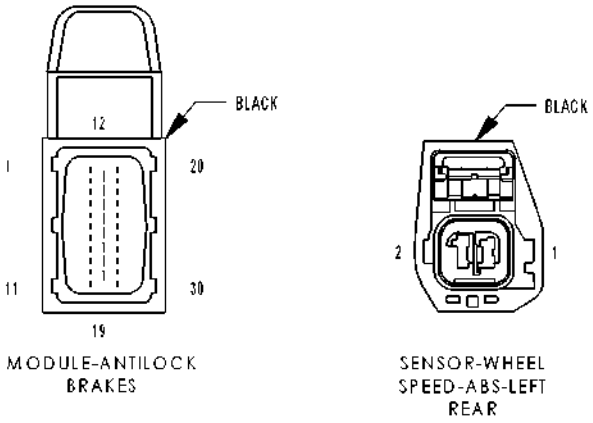
Yes >> Replace the Anti-Lock Brake Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1.

No >> Test Complete.



C1020–LEFT REAR WHEEL SPEED SENSOR CIRCUIT





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C1020–LEFT REAR WHEEL SPEED SENSOR CIRCUIT (CONTINUED)

For the Anti-Lock Brake System circuit diagram. (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When the Left Rear Wheel Speed Sensor circuit fails the diagnostic test.

Possible Causes
CONNECTOR/TERMINAL DAMAGE
(B4) LEFT REAR WSS SUPPLY CIRCUIT SHORTED TO GROUND OR OPEN
(B3) LEFT REAR WSS SIGNAL CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN
(B3) LEFT REAR WSS SIGNAL CIRCUIT AND (B4) LEFT REAR WSS SUPPLY CIRCUIT SHORTED TOGETHER
LEFT REAR WSS - INTERNAL FAULT
ANTI-LOCK BRAKE MODULE - INTERNAL FAULT

Diagnostic Test

1. CHECK FOR DTC C1020–LEFT REAR WHEEL SPEED SENSOR CIRCUIT

NOTE: This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, record and erase DTC's.

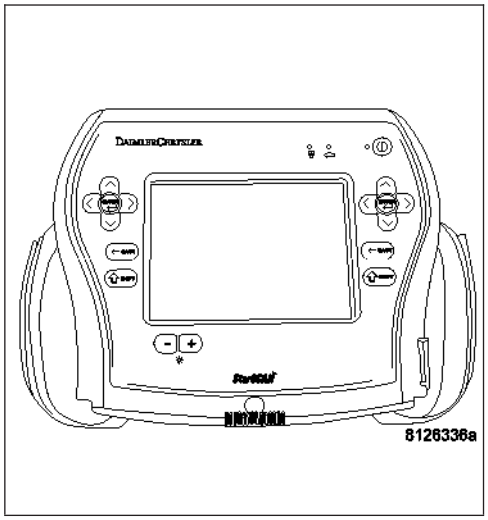
Cycle the ignition switch from off to on.

With the scan tool, read DTC's

Does the scan tool display: C1020–LEFT REAR WHEEL SPEED SENSOR CIRCUIT?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION diagnostic procedure.
Perform ABS VERIFICATION TEST - VER 1.



C1020–LEFT REAR WHEEL SPEED SENSOR CIRCUIT (CONTINUED)

2. CHECK CONNECTOR/TERMINAL FOR DAMAGE

NOTE: Check all terminals for broken, bent, pushed out, or corroded terminals.

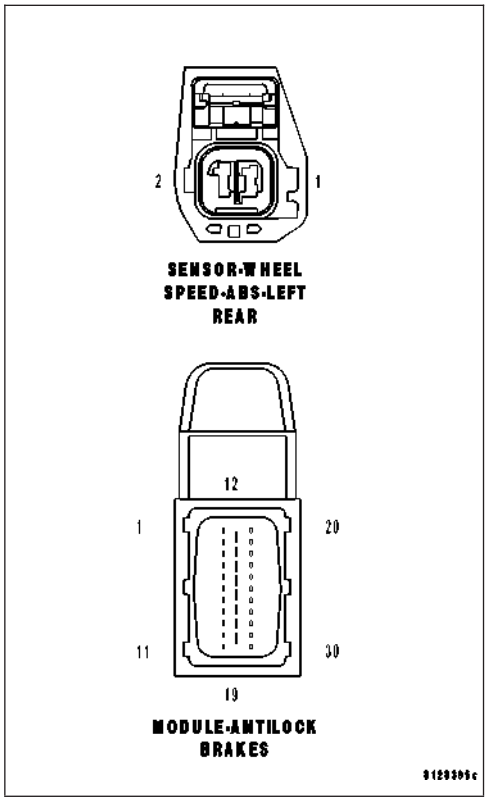
Turn the ignition off.

Inspect the Anti-Lock Brake Module harness connector, Left Rear WSS, and Left Rear WSS harness connector.

Is the Left Rear WSS or any of the connectors/terminals damaged?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 3



3. CHECK (B4) LEFT FRONT WSS SUPPLY CIRCUIT VOLTAGE

Turn the ignition off.

Disconnect the Left Rear WSS harness connector.

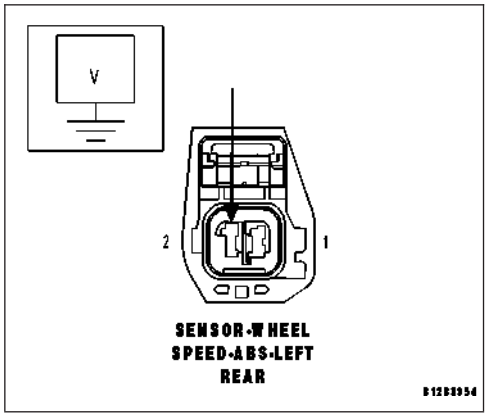
Turn the ignition on.

Measure the voltage between the (B4) Left Rear WSS Supply circuit and ground.

Is the voltage above 10 volts?

Yes >> Go To 6

No >> Go To 4



C1020–LEFT REAR WHEEL SPEED SENSOR CIRCUIT (CONTINUED)

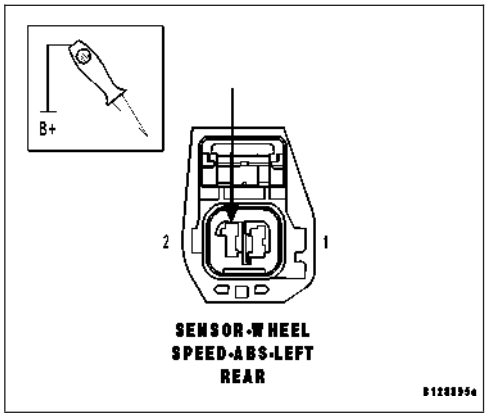
4. CHECK (B4) LEFT REAR WSS SUPPLY CIRCUIT SHORT TO GROUND

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Left Rear WSS harness connector.

Using a 12-volt test light connected to 12-volts, probe the (B4) Left Rear WSS Supply circuit.



Does the test light illuminate brightly?

Yes >> Repair the (B4) Left Rear WSS Supply circuit for a short to ground.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 5

5. CHECK (B4) LEFT REAR WSS SUPPLY CIRCUIT OPEN

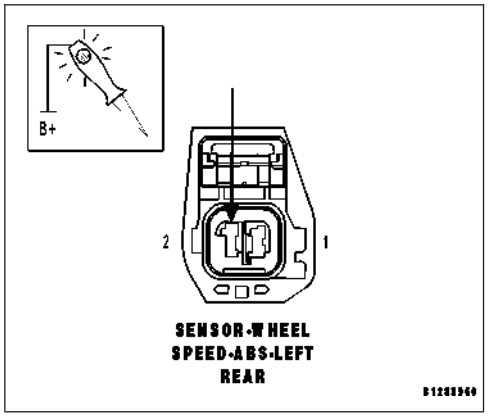
Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Left Rear WSS harness connector.

Connect a jumper wire between the (B4) Left Rear WSS Supply circuit and ground.

Using a 12-volt test light connected to 12-volts, probe the (B4) Left Rear WSS Supply circuit.



Does the test light illuminate brightly

Yes >> Go To 6

No >> Repair the (B4) Left Rear WSS Supply circuit for an open.
Perform ABS VERIFICATION TEST - VER 1.

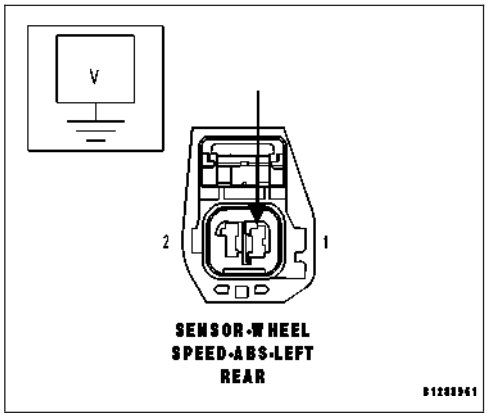
6. CHECK (B3) LEFT REAR WSS SIGNAL CIRCUIT SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the Left Rear WSS harness connector.

Turn the ignition on.

Measure the voltage between the (B3) Left Rear WSS Signal circuit and ground.



Is the voltage above one volt?

Yes >> Repair the (B3) Left Rear WSS Signal circuit for a short to voltage.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 7

C1020–LEFT REAR WHEEL SPEED SENSOR CIRCUIT (CONTINUED)

7. CHECK (B3) LEFT REAR WSS SIGNAL CIRCUIT SHORT TO GROUND

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

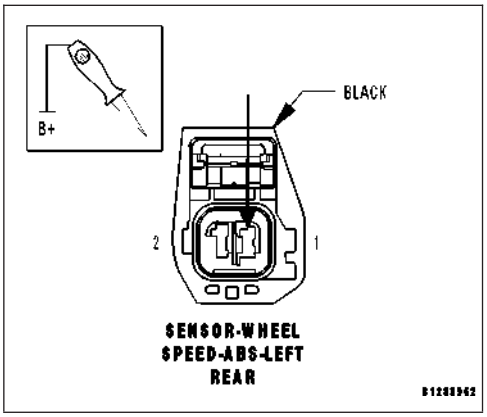
Disconnect the Left Rear WSS harness connector.

Using a 12-volt test light connected to 12-volts, probe the (B3) Left Rear WSS Signal circuit.

Does the test light illuminate brightly?

Yes >> Repair the (B3) Left Rear WSS Signal circuit for a short to ground.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 8



8. CHECK (B3) LEFT REAR WSS SIGNAL CIRCUIT OPEN

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Left Rear WSS harness connector.

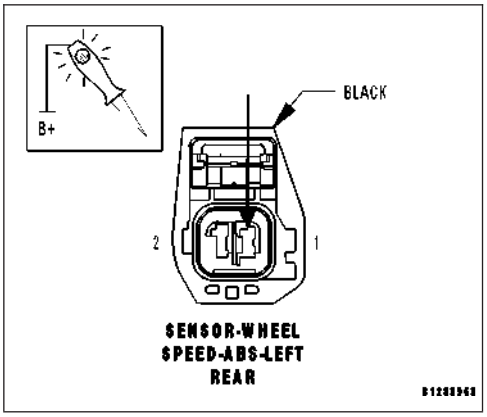
Connect a jumper wire between the (B3) Left Rear WSS Signal circuit and ground.

Using a 12-volt test light connected to 12-volts, probe the (B3) Left Rear WSS Signal circuit.

Does the test light illuminate brightly?

Yes >> Go To 9

No >> Repair the (B3) Left Rear WSS Signal circuit for an open.
Perform ABS VERIFICATION TEST - VER 1.



9. CHECK (B3) LEFT REAR WSS SIGNAL CIRCUIT AND (B4) LEFT REAR WSS SUPPLY CIRCUIT SHORT TOGETHER

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

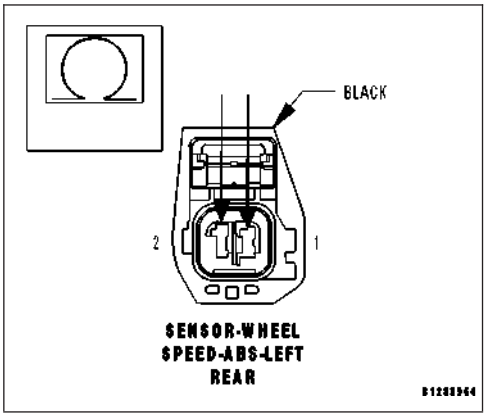
Disconnect the Left Rear WSS harness connector.

Measure the resistance between the (B3) Left Rear WSS Signal circuit and the (B4) Left Rear WSS Supply circuit.

Is the resistance above 5.0 ohms?

Yes >> Go To 10

No >> Repair the (B3) Left Rear WSS Signal circuit and the (B4) Left Rear WSS Supply circuit for a short together.
Perform ABS VERIFICATION TEST - VER 1.



C1020–LEFT REAR WHEEL SPEED SENSOR CIRCUIT (CONTINUED)

10. CHECK LEFT REAR WSS

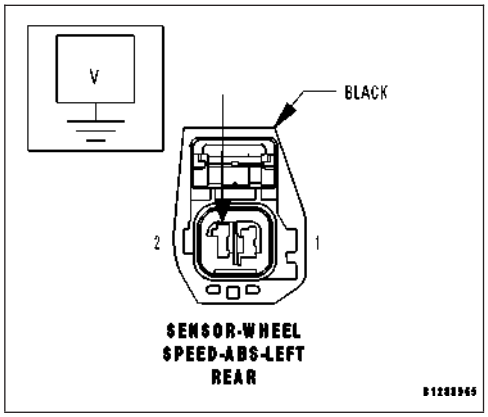
Turn the ignition off.

Reconnect all connectors.

Disconnect the Left Rear WSS harness connector.

Turn the ignition on.

Measure the voltage of the (B4) Left Rear WSS Supply circuit while reconnecting the Left Rear WSS harness connector.



Did the (B4) Left Rear WSS Supply circuit drop voltage to 0 volts?

Yes >> Replace the Left Rear WSS in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 11

11. CHECK LEFT REAR WSS OUTPUT

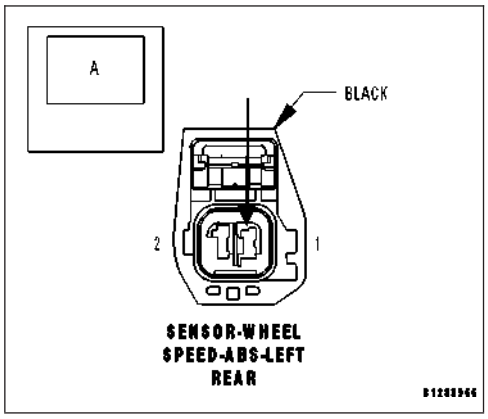
Turn the ignition off.

Reconnect all connectors.

Turn the ignition on.

Measure the amperage of the (B3) Left Rear WSS Signal circuit in the Left Rear WSS harness connector.

Slowly rotate the Left Rear wheel.



Does the amperage toggle between 7 mA to 14 mA?

Yes >> Go To 12

No >> Replace the Left Rear WSS in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1.

12. ANTI-LOCK BRAKE MODULE INTERNAL FAULT - (B4) LEFT REAR WSS SUPPLY CIRCUIT

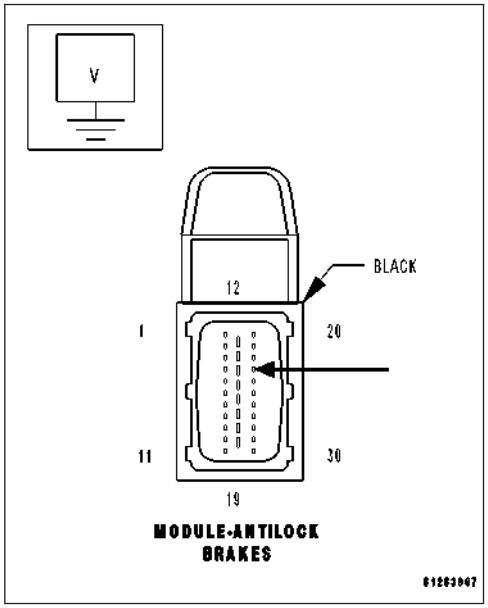
Turn the ignition off.

Remove the Anti-Lock Brake Module harness connector strain relief to access wires.

Reconnect the Anti-Lock Brake Module harness connector.

Turn the ignition on.

Measure the voltage between the (B4) Left Rear WSS Supply circuit and ground.



Is the voltage above 10 volts?

Yes >> Go To 13

No >> Replace the Anti-Lock Brake Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1.

C1020–LEFT REAR WHEEL SPEED SENSOR CIRCUIT (CONTINUED)

13. ANTI-LOCK BRAKE MODULE INTERNAL FAULT - (B3) LEFT REAR WSS SIGNAL CIRCUIT

Turn the ignition off.

Remove the Anti-Lock Brake Module harness connector strain relief to access wires.

Reconnect the Anti-Lock Brake Module harness connector.

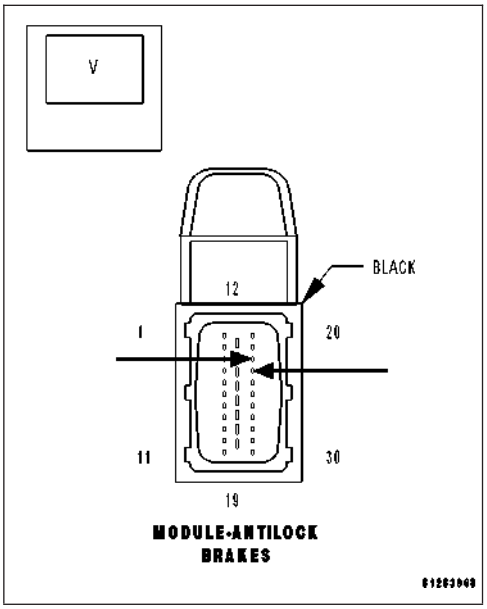
Turn the ignition on.

Measure the voltage between the (B4) Left Rear WSS Supply circuit and the (B3) Left Rear WSS Signal circuit.

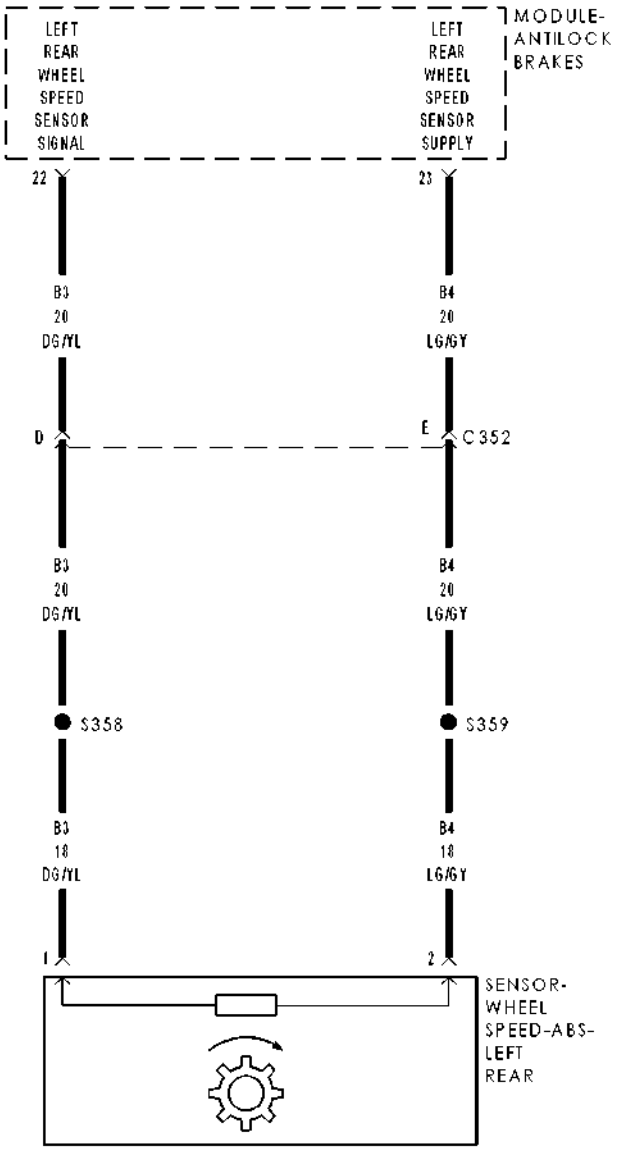
Is the voltage above 10 volts?

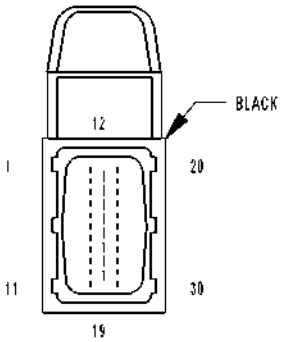
Yes >> Refer to the INTERMITTENT CONDITION diagnostic procedure.
Perform ABS VERIFICATION TEST - VER 1.

No >> Replace the Anti-Lock Brake Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1.

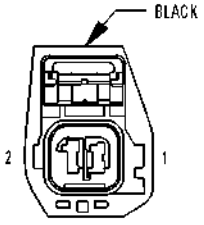


C1027–LEFT REAR WHEEL SPEED SENSOR INPUT SIGNAL ERRATIC PERFORMANCE





MODULE-ANTILOCK BRAKES



SENSOR-WHEEL SPEED-ABS-LEFT REAR

81283956

C1027–LEFT REAR WHEEL SPEED SENSOR INPUT SIGNAL ERRATIC PERFORMANCE (CONTINUED)

For the Anti-Lock Brake System circuit diagram. (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When the Left Rear WSS Signal is intermittently missing at a vehicle speed above at 40 kph (25 m.p.h.) or erratic wheel speed signal during acceleration or sensed wheel speed is different from other wheels.

Possible Causes
LEFT REAR WSS LOOSE - B3,B4 CIRCUITS/CONNECTOR/TERMINAL DAMAGE
LEFT REAR TONE WHEEL DAMAGE
LEFT REAR WSS AIR GAP FAULT
LEFT REAR WHEEL BEARING DAMAGE
LEFT REAR BRAKE HARDWARE DAMAGE
LEFT REAR WSS - INTERNAL FAULT
ANTI-LOCK BRAKE MODULE - INTERNAL FAULT

Diagnostic Test

1.

NOTE: This DTC must be active for the results of this test to be valid. CHECK FOR DTC C1027–LEFT REAR WHEEL SPEED SENSOR INPUT SIGNAL ERRATIC PERFORMANCE

Turn the ignition on.

With the scan tool, record and erase DTC's.

Cycle the ignition switch from off to on.

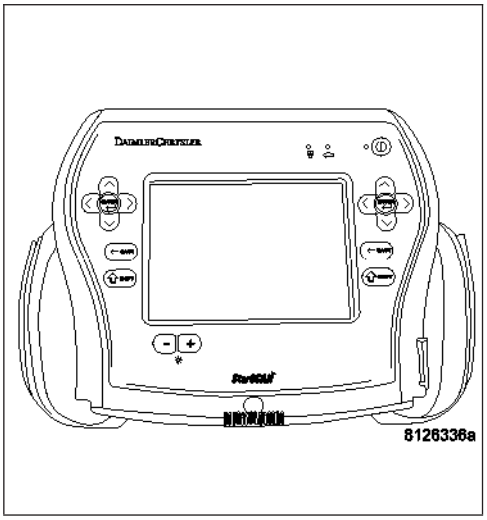
With the scan tool, read DTC's

NOTE: The Anti-Lock Brake Module must sense ALL 4 wheels at 12 km/h (7.5 m.p.h.) before it will extinguish the ABS indicators.

Does the scan tool display: C1027–LEFT REAR WHEEL SPEED SENSOR INPUT SIGNAL ERRATIC PERFORMANCE and C1020–LEFT REAR WHEEL SPEED SENSOR CIRCUIT?

Yes >> Refer to C1020–Left Rear Wheel Speed Sensor Circuit for the related symptom(s).
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 2



C1027–LEFT REAR WHEEL SPEED SENSOR INPUT SIGNAL ERRATIC PERFORMANCE (CONTINUED)

2. CHECK WHEEL SPEED SENSOR SIGNALS

Turn the ignition on.

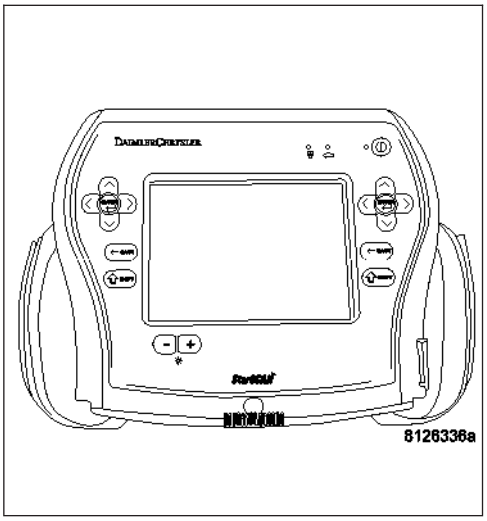
With the scan tool, monitor ALL the WSS speeds while an assistant drives the vehicle.

Slowly accelerate as straight as possible from a stop to 40 km/h (25 m.p.h.).

Is the Left Rear WSS speed showing 0 km/h (0 m.p.h.) or not matching other wheel speeds?

Yes >> Go To 3

No >> Refer to the INTERMITTENT CONDITION diagnostic procedure.
Perform ABS VERIFICATION TEST - VER 1.



3. CHECK LEFT REAR WSS LOOSENESS, INSPECT B3,B4 CIRCUITS/CONNECTORS/TERMINALS FOR DAMAGE

NOTE: Check all terminals for broken, bent, pushed out, or corroded terminals.

Turn the ignition off.

Inspect the Anti-Lock Brake Module harness connector, Left Rear WSS, and Left Rear WSS harness connector.

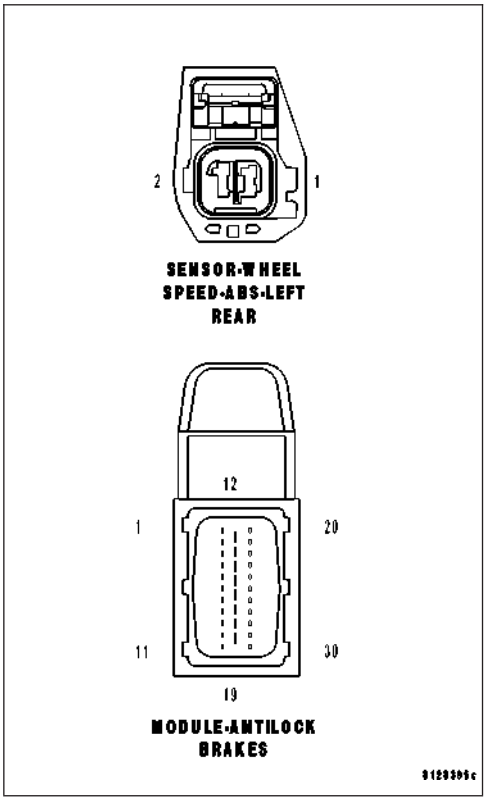
Inspect the Left Rear WSS for looseness and not properly fastened.

Inspect the (B3) Left Rear WSS Signal and (B4) Left Rear WSS Supply circuits between the Left Rear WSS and Anti-Lock Brake Module for damage.

Is the Left Rear WSS loose or any of the wiring/connectors/terminals damaged?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 4



C1027–LEFT REAR WHEEL SPEED SENSOR INPUT SIGNAL ERRATIC PERFORMANCE (CONTINUED)

4. CHECK LEFT REAR TONE WHEEL FOR DAMAGE

Turn the ignition off.

Inspect the Left Rear Tone Wheel for damage, missing teeth, cracks, or looseness.

NOTE: The Tone Wheel teeth should be perfectly square, not bent, or nicked.

Is the Left Rear Tone Wheel damaged?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 5

---

5. CHECK LEFT REAR WSS AIR GAP

Turn the ignition off.

Using a feeler gauge, measure the Left Rear WSS air gap.

NOTE: Refer to the appropriate service information, if necessary, for procedures or specifications.

Is the Left Rear WSS air gap within specifications?

Yes >> Go To 6

No >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

---

6. CHECK LEFT REAR WHEEL BEARING DAMAGE

Turn the ignition off.

Inspect the Left Rear wheel bearing for excessive runout or clearance.

NOTE: Refer to the appropriate service information, if necessary, for procedures or specifications.

Is the Left Rear Wheel Bearing damaged?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 7

---

7. CHECK LEFT REAR BRAKE HARDWARE DAMAGE

Turn the ignition off.

Visually inspect the Left Rear brake linings for contamination or overheating. Check for dragging, bent, or seized components/hardware.

Is any brake lining, component, or hardware damaged?

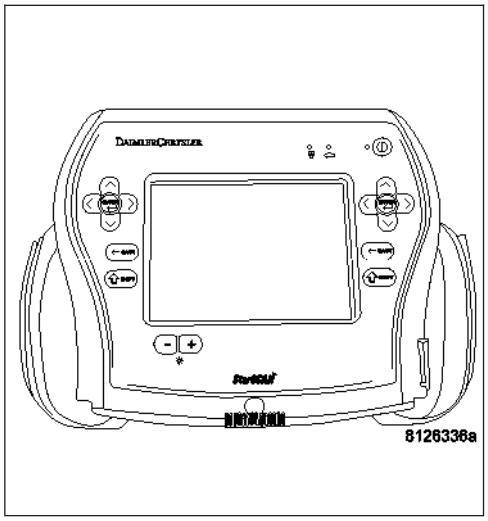
Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 8

C1027–LEFT REAR WHEEL SPEED SENSOR INPUT SIGNAL ERRATIC PERFORMANCE (CONTINUED)

8. ANTI-LOCK BRAKE MODULE – INTERNAL FAULT

Turn the ignition off.
Replace the Left Rear WSS.
With the scan tool, erase DTC's.
Road test the vehicle over 40 km/h (25 m.p.h.).
Turn the ignition on.
With the scan tool, read DTC's

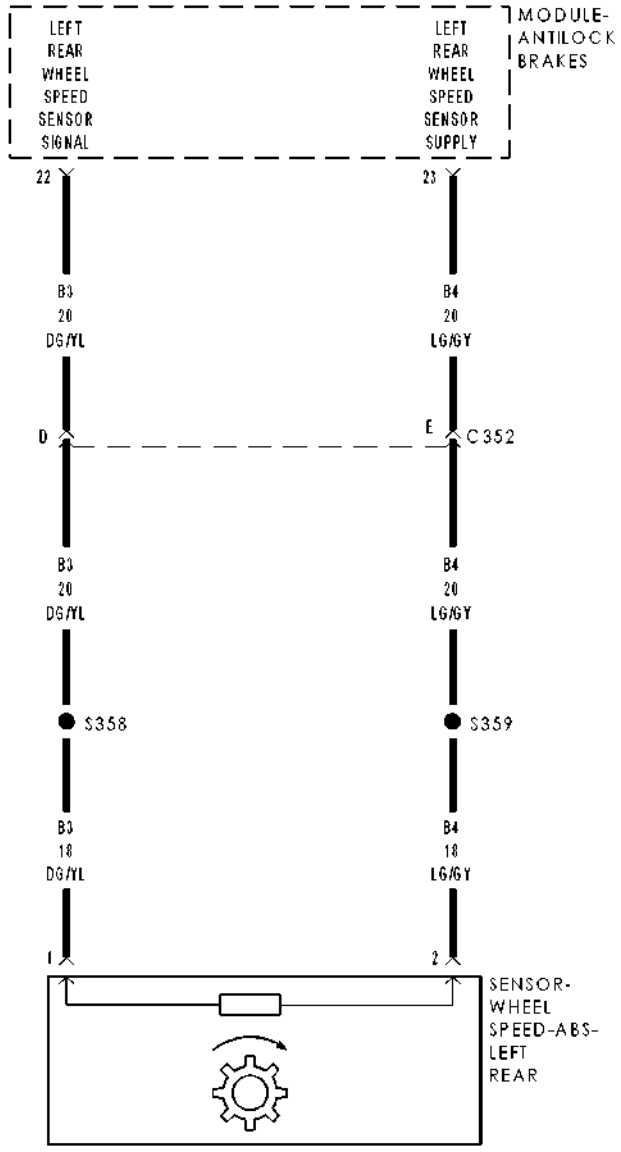


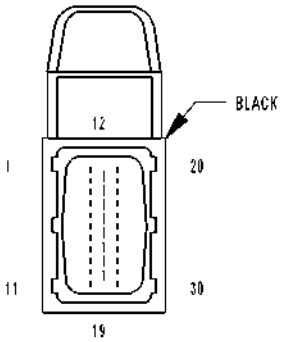
Did the DTC C1027–LEFT REAR WHEEL SPEED SENSOR INPUT SIGNAL ERRATIC PERFORMANCE reset?

Yes >> Replace the Anti-Lock Brake Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1.

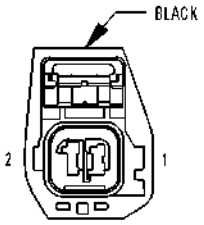
No >> Test Complete.

C102A–LEFT REAR WHEEL SPEED COMPARATIVE PERFORMANCE





MODULE-ANTILOCK BRAKES



SENSOR-WHEEL SPEED-ABS-LEFT REAR

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C102A–LEFT REAR WHEEL SPEED COMPARATIVE PERFORMANCE (CONTINUED)

For the Anti-Lock Brake System circuit diagram. (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When the Left Rear WSS reading is different from the readings received from the other WSS's. The Anti-Lock Brake Module compares WSS readings from side-to-side on an axle and front-to-rear.

Possible Causes
LEFT REAR WSS LOOSE - B3,B4 CIRCUITS/CONNECTOR/TERMINAL DAMAGE
IMPROPER LEFT REAR TIRE PRESSURE/MISMATCHED TIRES
LEFT REAR TONE WHEEL DAMAGE
LEFT REAR BRAKE HARDWARE DAMAGE
LEFT REAR WSS - INTERNAL FAULT
ANTI-LOCK BRAKE MODULE - INTERNAL FAULT

Diagnostic Test

1. CHECK FOR DTC C102A–LEFT REAR WHEEL SPEED COMPARATIVE PERFORMANCE

NOTE: This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, record and erase DTC's.

Cycle the ignition switch from off to on.

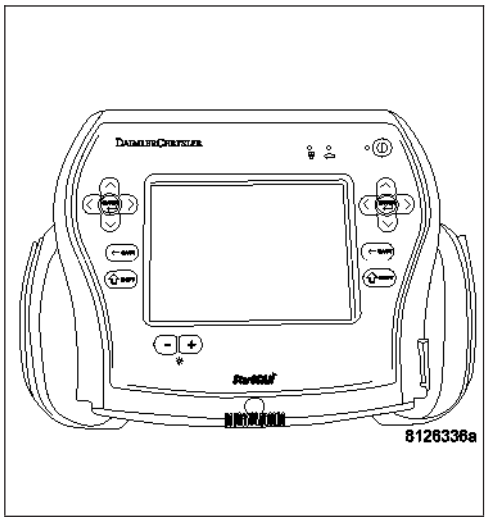
With the scan tool, read DTC's

NOTE: The Anti-Lock Brake Module must sense ALL 4 wheels at 12 km/h (7.5 m.p.h.) before it will extinguish the ABS indicators.

Does the scan tool display: C102A–LEFT REAR WHEEL SPEED COMPARATIVE PERFORMANCE and C1020–LEFT REAR WHEEL SPEED SENSOR CIRCUIT?

Yes >> Refer to C1020–Left Rear Wheel Speed Sensor Circuit for the related symptom(s).
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 2



C102A–LEFT REAR WHEEL SPEED COMPARATIVE PERFORMANCE (CONTINUED)

2. CHECK WHEEL SPEED SENSOR SIGNALS

Turn the ignition on.

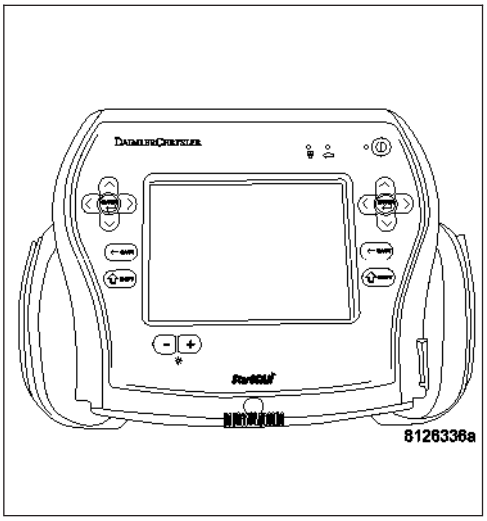
With the scan tool, monitor ALL the WSS speeds while an assistant drives the vehicle.

Slowly accelerate as straight as possible from a stop to 40 km/h (25 m.p.h.).

Is the Left Rear WSS speed showing 0 km/h (0 m.p.h.) or not matching other wheel speeds?

Yes >> Go To 3

No >> Refer to the INTERMITTENT CONDITION diagnostic procedure.
Perform ABS VERIFICATION TEST - VER 1.



3. CHECK LEFT REAR WSS LOOSENESS, INSPECT B3,B4 CIRCUITS/CONNECTORS/TERMINALS FOR DAMAGE

NOTE: Check all terminals for broken, bent, pushed out, or corroded terminals.

Turn the ignition off.

Inspect the Anti-Lock Brake Module harness connector, Left Rear WSS, and Left Rear WSS harness connector.

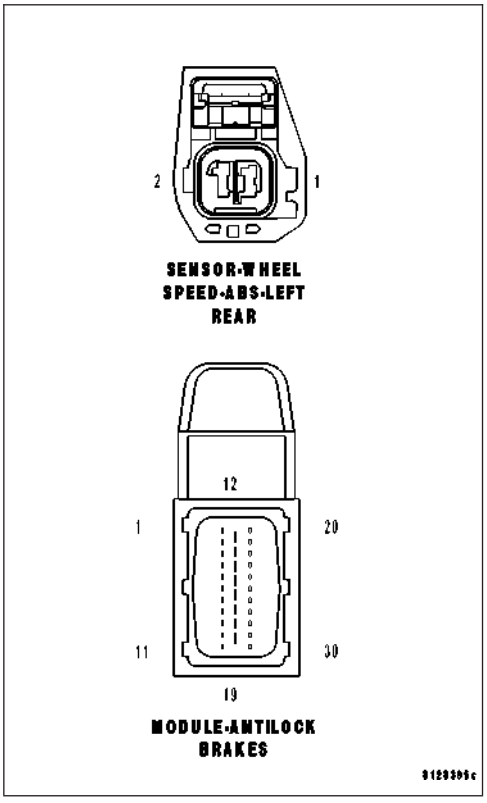
Inspect the Left Rear WSS for looseness and not properly fastened.

Inspect the (B3) Left Rear WSS Signal and (B4) Left Rear WSS Supply circuits between the Left Rear WSS and Anti-Lock Brake Module for damage.

Is the Left Rear WSS loose or any of the wiring/connectors/terminals damaged?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 4



C102A–LEFT REAR WHEEL SPEED COMPARATIVE PERFORMANCE (CONTINUED)

4. CHECK LEFT REAR TIRE PRESSURE/INSPECT ALL TIRES

Turn the ignition off.
Check and adjust the Left Rear Tire pressure.
Check and adjust all other tire pressures.
Inspect for mismatched tires on vehicle.

Is the Left Rear Tire improperly inflated or mismatched tires on vehicle?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 5

---

5. CHECK LEFT REAR TONE WHEEL FOR DAMAGE

Turn the ignition off.
Inspect the Left Rear Tone Wheel for damage, missing teeth, cracks, or looseness.

NOTE: The Tone Wheel teeth should be perfectly square, not bent, or nicked.

Is the Left Rear Tone Wheel damaged?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 6

---

6. CHECK LEFT REAR BRAKE HARDWARE DAMAGE

Turn the ignition off.
Visually inspect the Left Rear brake linings for contamination or overheating. Check for dragging, bent, or seized components/hardware.

Is any brake lining, component, or hardware damaged?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 7

---

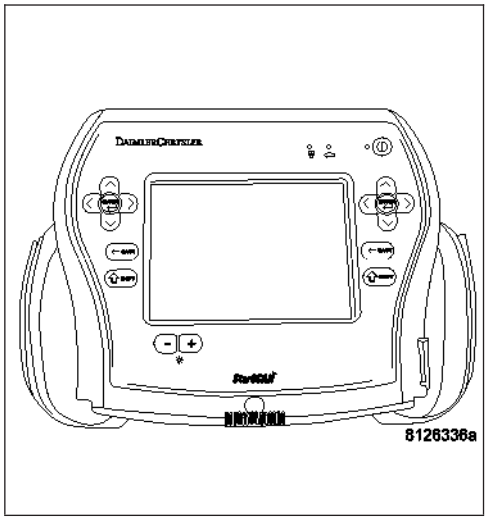
7. ANTI-LOCK BRAKE MODULE – INTERNAL FAULT

Turn the ignition off.
Replace the Left Rear WSS.
With the scan tool, erase DTC's.
Road test the vehicle over 40 km/h (25 m.p.h.).
Turn the ignition on.
With the scan tool, read DTC's

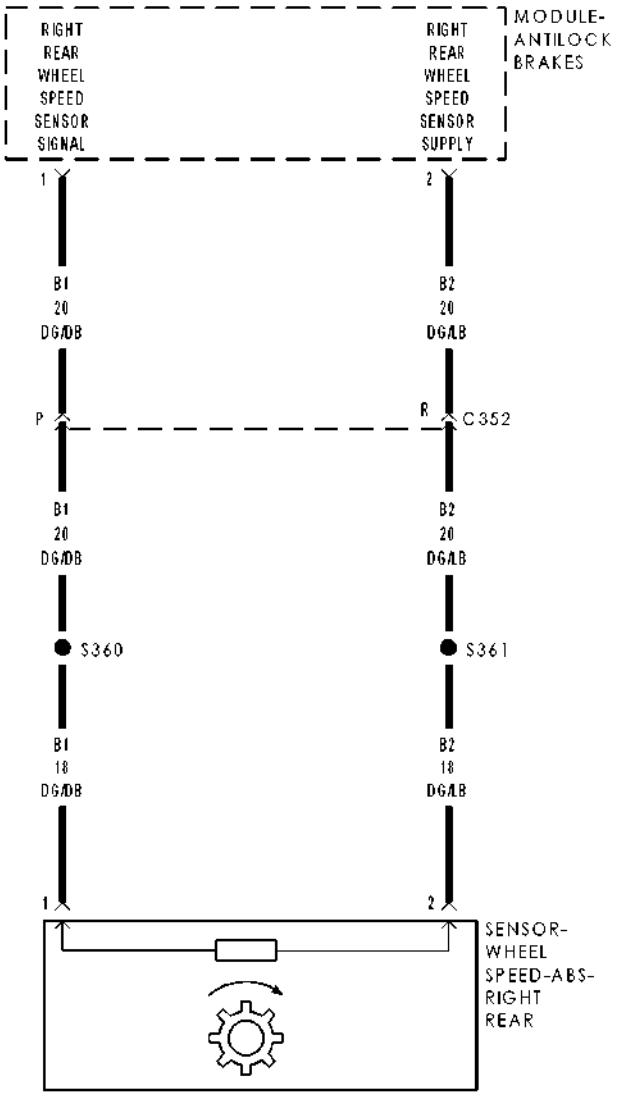
Did the DTC C102A–LEFT REAR WHEEL SPEED COMPARATIVE PERFORMANCE reset?

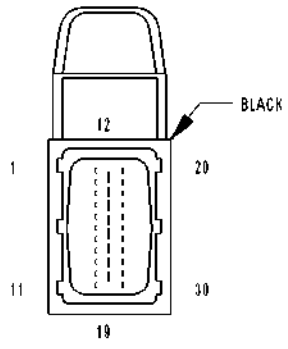
Yes >> Replace the Anti-Lock Brake Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1.

No >> Test Complete.

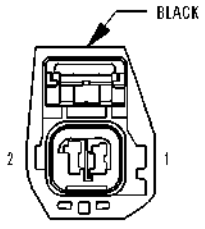


C102B–RIGHT REAR WHEEL SPEED SENSOR CIRCUIT





MODULE-ANTILOCK BRAKES



SENSOR-WHEEL SPEED-ABS-RIGHT REAR

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C102B–RIGHT REAR WHEEL SPEED SENSOR CIRCUIT (CONTINUED)

For the Anti-Lock Brake System circuit diagram. (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When the Right Rear Wheel Speed Sensor circuit fails the diagnostic test.

Possible Causes
CONNECTOR/TERMINAL DAMAGE
(B2) RIGHT REAR WSS SUPPLY CIRCUIT SHORTED TO GROUND OR OPEN
(B1) RIGHT REAR WSS SIGNAL CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN
(B1) RIGHT REAR WSS SIGNAL CIRCUIT AND (B2) RIGHT REAR WSS SUPPLY CIRCUIT SHORTED TOGETHER
RIGHT REAR WSS - INTERNAL FAULT
ANTI-LOCK BRAKE MODULE - INTERNAL FAULT

Diagnostic Test

1. CHECK FOR DTC C102B–RIGHT REAR WHEEL SPEED SENSOR CIRCUIT

NOTE: This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, record and erase DTC's.

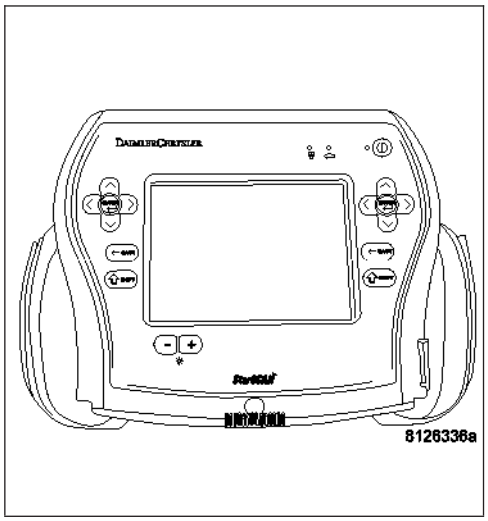
Cycle the ignition switch from off to on.

With the scan tool, read DTC's

Does the scan tool display: C102B–RIGHT REAR WHEEL SPEED SENSOR CIRCUIT?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION diagnostic procedure.
Perform ABS VERIFICATION TEST - VER 1.



C102B–RIGHT REAR WHEEL SPEED SENSOR CIRCUIT (CONTINUED)

2. CHECK CONNECTOR/TERMINAL FOR DAMAGE

NOTE: Check all terminals for broken, bent, pushed out, or corroded terminals.

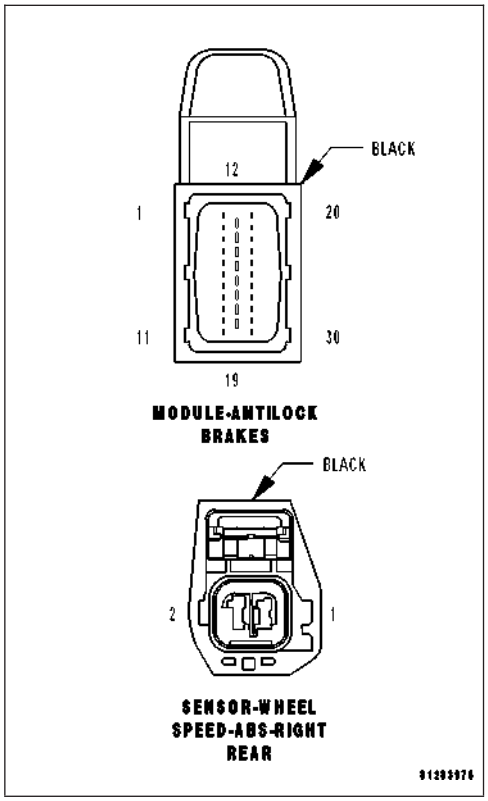
Turn the ignition off.

Inspect the Anti-Lock Brake Module harness connector, Right Rear WSS, and Right Rear WSS harness connector.

Is the Right Rear WSS or any of the connectors/terminals damaged?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 3



3. CHECK (B2) RIGHT REAR WSS SUPPLY CIRCUIT VOLTAGE

Turn the ignition off.

Disconnect the Right Rear WSS harness connector.

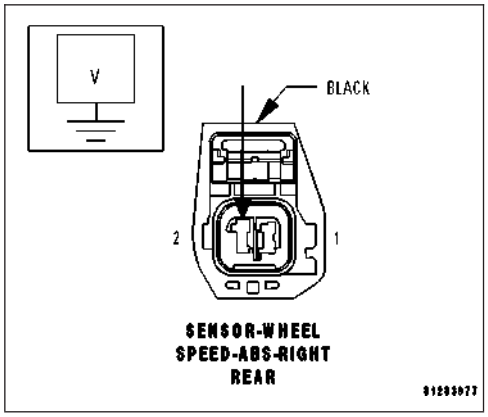
Turn the ignition on.

Measure the voltage between the (B2) Right Rear WSS Supply circuit and ground.

Is the voltage above 10 volts?

Yes >> Go To 6

No >> Go To 4



C102B–RIGHT REAR WHEEL SPEED SENSOR CIRCUIT (CONTINUED)

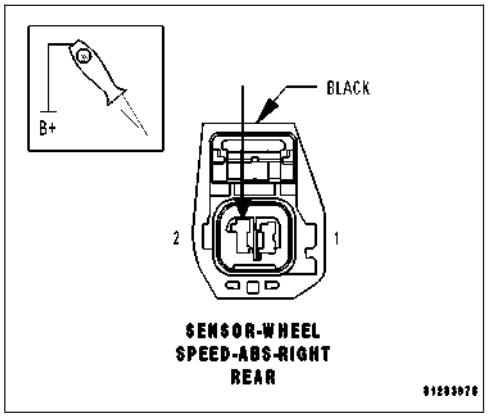
4. CHECK (B2) RIGHT REAR WSS SUPPLY CIRCUIT SHORT TO GROUND

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Right Rear WSS harness connector.

Using a 12-volt test light connected to 12-volts, probe the (B2) Right Rear WSS Supply circuit.



Does the test light illuminate brightly?

Yes >> Repair the (B2) Right Rear WSS Supply circuit for a short to ground.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 5

5. CHECK (B2) RIGHT REAR WSS SUPPLY CIRCUIT OPEN

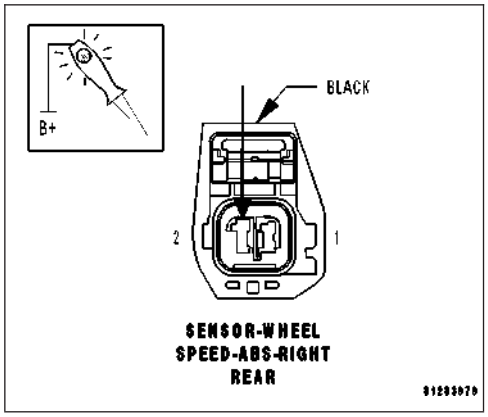
Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Right Rear WSS harness connector.

Connect a jumper wire between the (B2) Right Rear WSS Supply circuit and ground.

Using a 12-volt test light connected to 12-volts, probe the (B2) Right Rear WSS Supply circuit.



Does the test light illuminate brightly

Yes >> Go To 6

No >> Repair the (B2) Right Rear WSS Supply circuit for an open.
Perform ABS VERIFICATION TEST - VER 1.

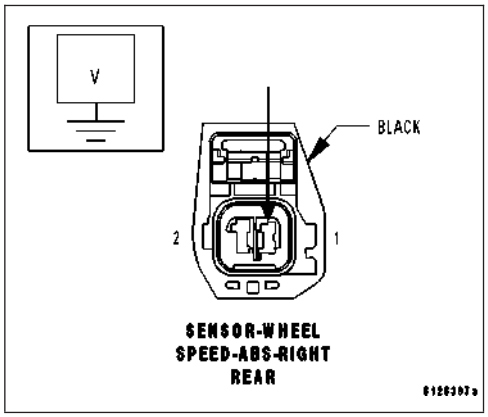
6. CHECK (B1) RIGHT REAR WSS SIGNAL CIRCUIT SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the Right Rear WSS harness connector.

Turn the ignition on.

Measure the voltage between the (B1) Right Rear WSS Signal circuit and ground.



Is the voltage above one volt?

Yes >> Repair the (B1) Right Rear WSS Signal circuit for a short to voltage.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 7

C102B–RIGHT REAR WHEEL SPEED SENSOR CIRCUIT (CONTINUED)

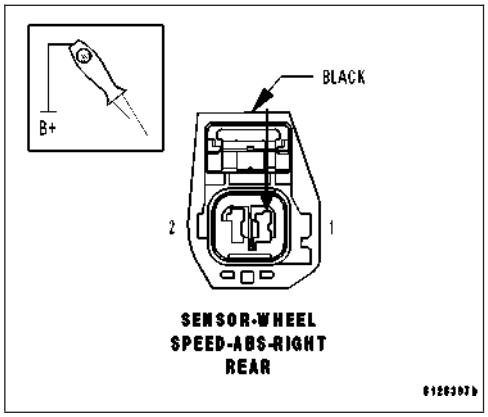
7. CHECK (B1) RIGHT REAR WSS SIGNAL CIRCUIT SHORT TO GROUND

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Right Rear WSS harness connector.

Using a 12-volt test light connected to 12-volts, probe the (B1) Right Rear WSS Signal circuit.



Does the test light illuminate brightly?

Yes >> Repair the (B1) Right Rear WSS Signal circuit for a short to ground.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 8

8. CHECK (B1) RIGHT REAR WSS SIGNAL CIRCUIT OPEN

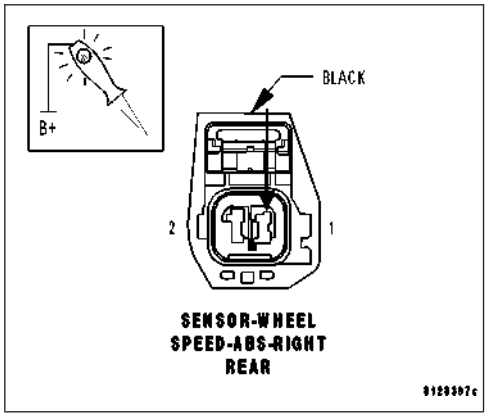
Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Right Rear WSS harness connector.

Connect a jumper wire between the (B1) Right Rear WSS Signal circuit and ground.

Using a 12-volt test light connected to 12-volts, probe the (B1) Right Rear WSS Signal circuit.



Does the test light illuminate brightly?

Yes >> Go To 9

No >> Repair the (B1) Right Rear WSS Signal circuit for an open.
Perform ABS VERIFICATION TEST - VER 1.

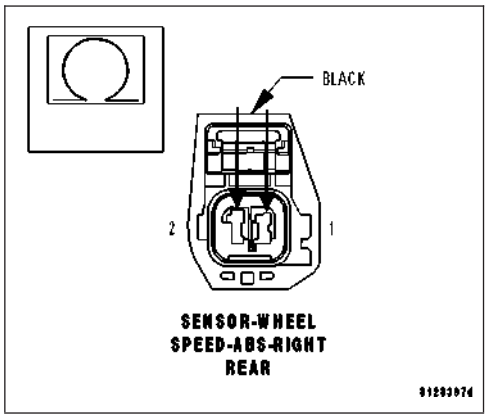
9. CHECK (B1) RIGHT REAR WSS SIGNAL CIRCUIT AND (B2) RIGHT REAR WSS SUPPLY CIRCUIT SHORT TOGETHER

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Right Rear WSS harness connector.

Measure the resistance between the (B1) Right Rear WSS Signal circuit and the (B2) Right Rear WSS Supply circuit.



Is the resistance above 5.0 ohms?

Yes >> Go To 10

No >> Repair the (B1) Right Rear WSS Signal circuit and the (B2) Right Rear WSS Supply circuit for a short together.
Perform ABS VERIFICATION TEST - VER 1.

C102B–RIGHT REAR WHEEL SPEED SENSOR CIRCUIT (CONTINUED)

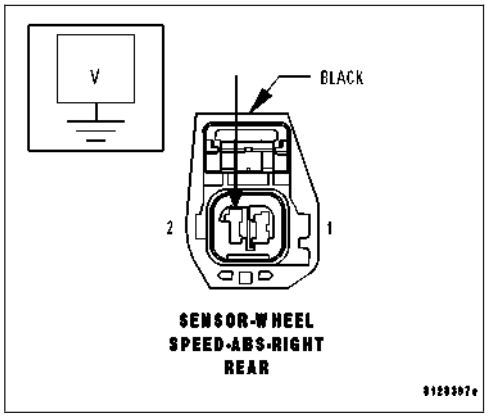
10. CHECK RIGHT REAR WSS

Turn the ignition off.
Reconnect all connectors.
Disconnect the Right Rear WSS harness connector.
Turn the ignition on.
Measure the voltage of the (B2) Right Rear WSS Supply circuit while reconnecting the Right Rear WSS harness connector.

Did the (B2) Right Rear WSS Supply circuit drop voltage to 0 volts?

Yes >> Replace the Right Rear WSS in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 11



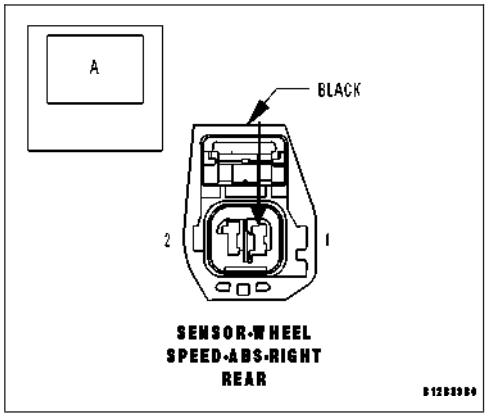
11. CHECK RIGHT REAR WSS OUTPUT

Turn the ignition off.
Reconnect all connectors.
Turn the ignition on.
Measure the amperage of the (B1) Right Rear WSS Signal circuit in the Right Rear WSS harness connector.
Slowly rotate the Right Rear wheel.

Does the amperage toggle between 7 mA to 14 mA?

Yes >> Go To 12

No >> Replace the Right Rear WSS in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1.



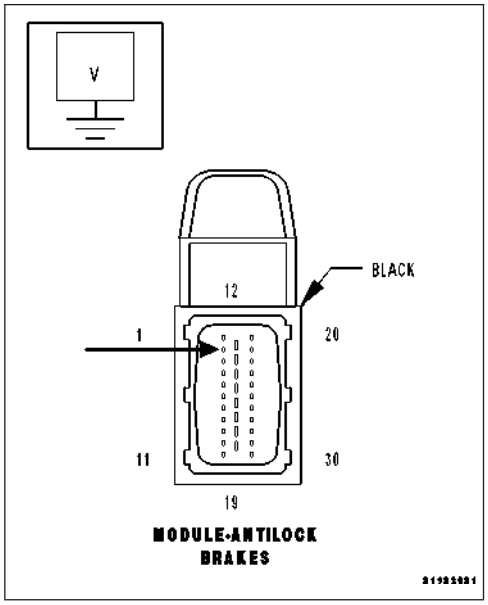
12. ANTI-LOCK BRAKE MODULE INTERNAL FAULT - (B2) RIGHT REAR WSS SUPPLY CIRCUIT

Turn the ignition off.
Remove the Anti-Lock Brake Module harness connector strain relief to access wires.
Reconnect the Anti-Lock Brake Module harness connector.
Turn the ignition on.
Measure the voltage between the (B2) Right Rear WSS Supply circuit and ground.

Is the voltage above 10 volts?

Yes >> Go To 13

No >> Replace the Anti-Lock Brake Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1.



C102B–RIGHT REAR WHEEL SPEED SENSOR CIRCUIT (CONTINUED)

13. ANTI-LOCK BRAKE MODULE INTERNAL FAULT - (B1) RIGHT REAR WSS SIGNAL CIRCUIT

Turn the ignition off.

Remove the Anti-Lock Brake Module harness connector strain relief to access wires.

Reconnect the Anti-Lock Brake Module harness connector.

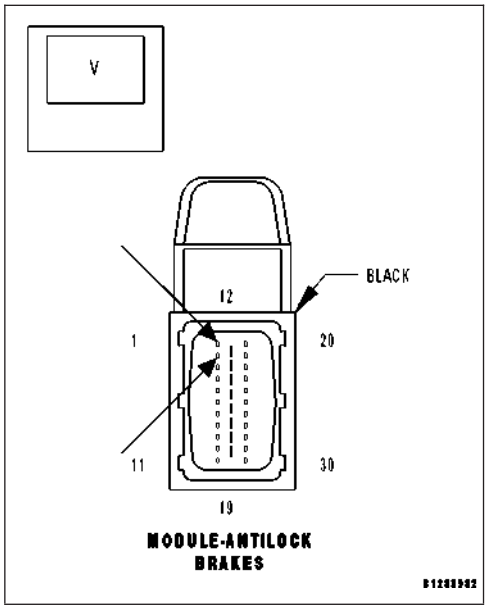
Turn the ignition on.

Measure the voltage between the (B2) Right Rear WSS Supply circuit and the (B1) Right Rear WSS Signal circuit.

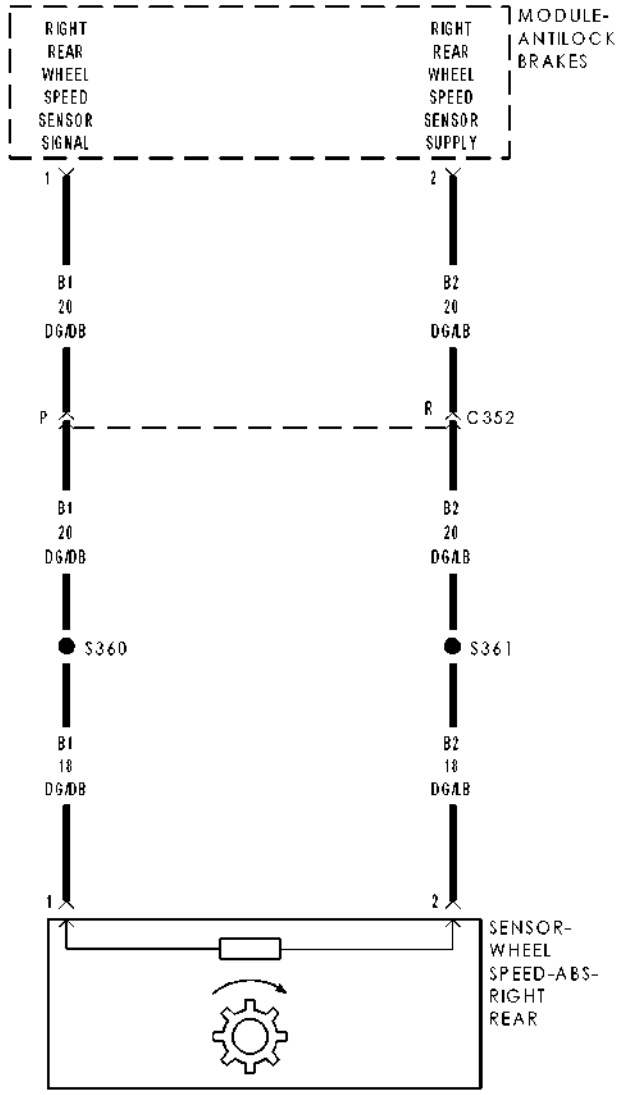
Is the voltage above 10 volts?

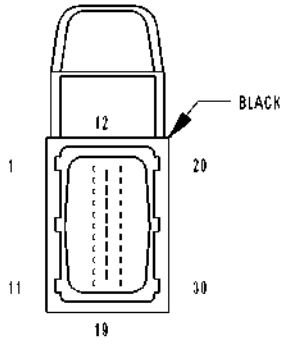
Yes >> Refer to the INTERMITTENT CONDITION diagnostic procedure.
Perform ABS VERIFICATION TEST - VER 1.

No >> Replace the Anti-Lock Brake Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1.

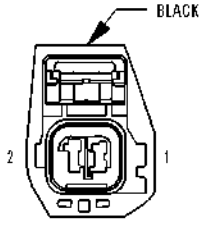


C1032–RIGHT REAR WHEEL SPEED SENSOR INPUT SIGNAL ERRATIC PERFORMANCE





MODULE-ANTILOCK BRAKES



SENSOR-WHEEL SPEED-ABS-RIGHT REAR

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C1032–RIGHT REAR WHEEL SPEED SENSOR INPUT SIGNAL ERRATIC PERFORMANCE (CONTINUED)

For the Anti-Lock Brake System circuit diagram. (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When the Right Rear WSS Signal is intermittently missing at a vehicle speed above at 40 kph (25 m.p.h.) or erratic wheel speed signal during acceleration or sensed wheel speed is different from other wheels.

Possible Causes
RIGHT REAR WSS LOOSE - B1,B2 CIRCUITS/CONNECTOR/TERMINAL DAMAGE
RIGHT REAR TONE WHEEL DAMAGE
RIGHT REAR WSS AIR GAP FAULT
RIGHT REAR WHEEL BEARING DAMAGE
RIGHT REAR BRAKE HARDWARE DAMAGE
RIGHT REAR FRONT WSS - INTERNAL FAULT
ANTI-LOCK BRAKE MODULE - INTERNAL FAULT

Diagnostic Test

1. CHECK FOR DTC C1032–RIGHT REAR WHEEL SPEED SENSOR INPUT SIGNAL ERRATIC PERFORMANCE

NOTE: This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, record and erase DTC's.

Cycle the ignition switch from off to on.

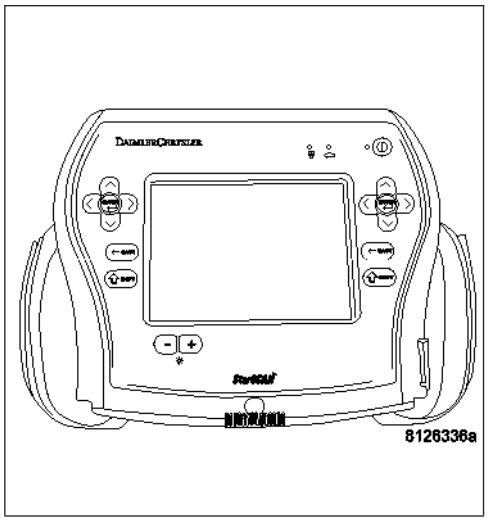
With the scan tool, read DTC's

NOTE: The Anti-Lock Brake Module must sense ALL 4 wheels at 12 km/h (7.5 m.p.h.) before it will extinguish the ABS indicators.

Does the scan tool display: C1032–RIGHT REAR WHEEL SPEED SENSOR INPUT SIGNAL ERRATIC PERFORMANCE and C102B–RIGHT REAR WHEEL SPEED SENSOR CIRCUIT?

Yes >> Refer to C102B–Right Rear Wheel Speed Sensor Circuit for the related symptom(s).
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 2



C1032–RIGHT REAR WHEEL SPEED SENSOR INPUT SIGNAL ERRATIC PERFORMANCE (CONTINUED)

2. CHECK WHEEL SPEED SENSOR SIGNALS

Turn the ignition on.

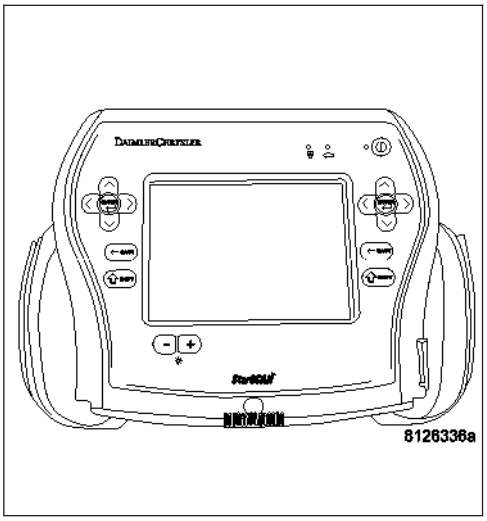
With the scan tool, monitor ALL the WSS speeds while an assistant drives the vehicle.

Slowly accelerate as straight as possible from a stop to 40 km/h (25 m.p.h.).

Is the Right Rear WSS speed showing 0 km/h (0 m.p.h.) or not matching other wheel speeds?

Yes >> Go To 3

No >> Refer to the INTERMITTENT CONDITION diagnostic procedure.
Perform ABS VERIFICATION TEST - VER 1.



3. CHECK RIGHT REAR WSS LOOSENESS, INSPECT B1,B2 CIRCUITS/CONNECTORS/TERMINALS FOR DAMAGE

NOTE: Check all terminals for broken, bent, pushed out, or corroded terminals.

Turn the ignition off.

Inspect the Anti-Lock Brake Module harness connector, Right Rear WSS, and Right Rear WSS harness connector.

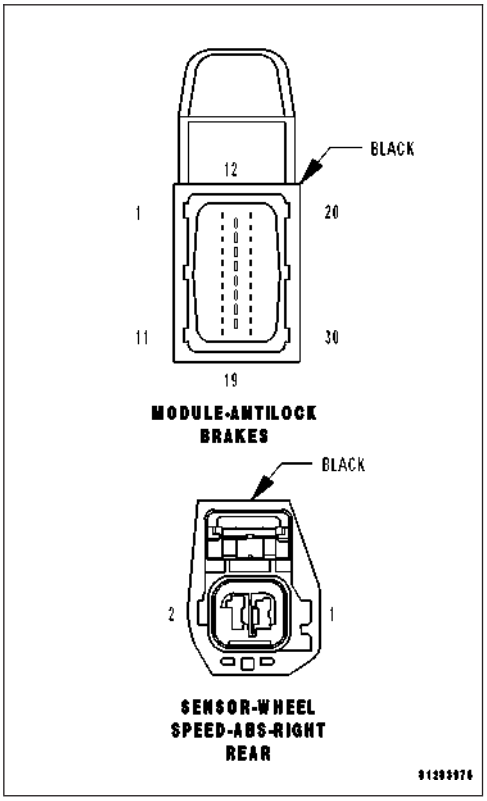
Inspect the Right Rear WSS for looseness and not properly fastened.

Inspect the (B1) Right Rear WSS Signal and (B2) Right Rear WSS Supply circuits between the Right Rear WSS and Anti-Lock Brake Module for damage.

Is the Right Rear WSS loose or any of the wiring/connectors/terminals damaged?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 4



C1032–RIGHT REAR WHEEL SPEED SENSOR INPUT SIGNAL ERRATIC PERFORMANCE (CONTINUED)

4. CHECK RIGHT REAR TONE WHEEL FOR DAMAGE

Turn the ignition off.

Inspect the Right Rear Tone Wheel for damage, missing teeth, cracks, or looseness.

NOTE: The Tone Wheel teeth should be perfectly square, not bent, or nicked.

Is the Right Rear Tone Wheel damaged?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 5

---

5. CHECK RIGHT REAR WSS AIR GAP

Turn the ignition off.

Using a feeler gauge, measure the Right Rear WSS air gap.

NOTE: Refer to the appropriate service information, if necessary, for procedures or specifications.

Is the Right Rear WSS air gap within specifications?

Yes >> Go To 6

No >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

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6. CHECK RIGHT REAR WHEEL BEARING DAMAGE

Turn the ignition off.

Inspect the Right Rear wheel bearing for excessive runout or clearance.

NOTE: Refer to the appropriate service information, if necessary, for procedures or specifications.

Is the Right Rear Wheel Bearing damaged?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 7

---

7. CHECK RIGHT REAR BRAKE HARDWARE DAMAGE

Turn the ignition off.

Visually inspect the Right Rear brake linings for contamination or overheating. Check for dragging, bent, or seized components/hardware.

Is any brake lining, component, or hardware damaged?

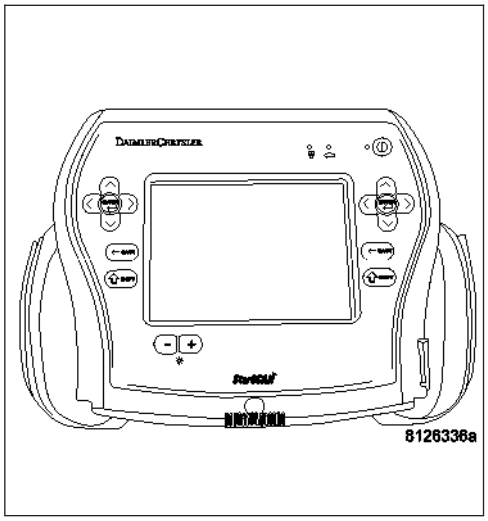
Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 8

C1032–RIGHT REAR WHEEL SPEED SENSOR INPUT SIGNAL ERRATIC PERFORMANCE (CONTINUED)

8. ANTI-LOCK BRAKE MODULE – INTERNAL FAULT

Turn the ignition off.
Replace the Right Rear WSS.
With the scan tool, erase DTC's.
Road test the vehicle over 40 km/h (25 m.p.h.).
Turn the ignition on.
With the scan tool, read DTC's

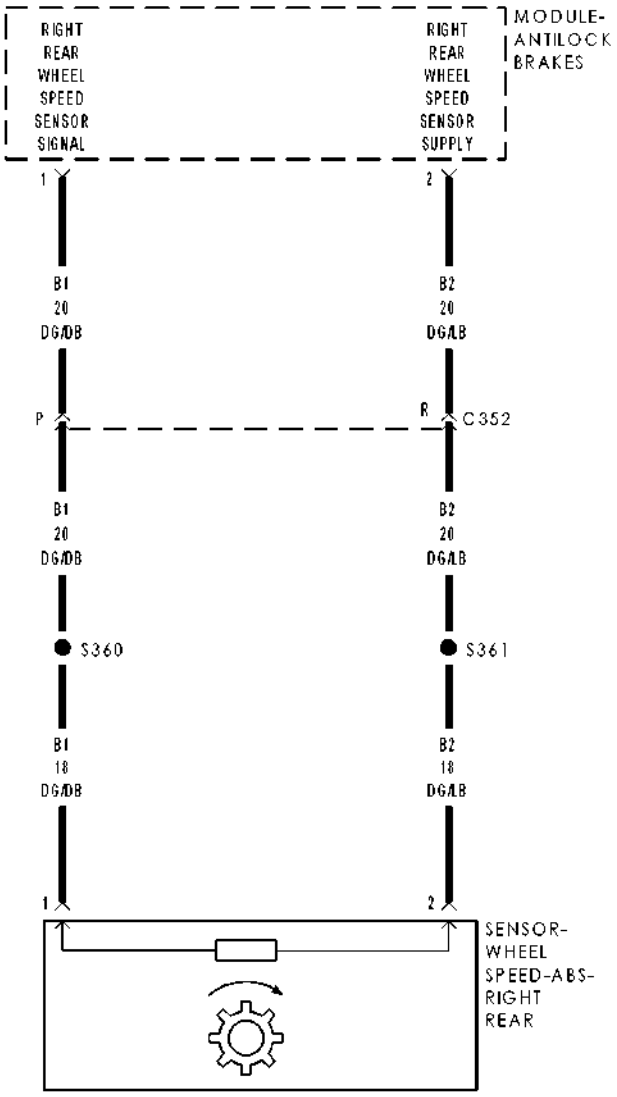


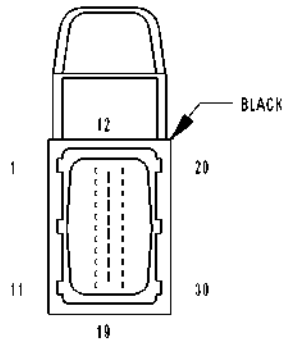
Did the DTC C1032–RIGHT REAR WHEEL SPEED SENSOR INPUT SIGNAL ERRATIC PERFORMANCE reset?

Yes >> Replace the Anti-Lock Brake Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1.

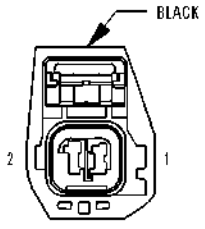
No >> Test Complete.

C1035–RIGHT REAR WHEEL SPEED COMPARATIVE PERFORMANCE





MODULE-ANTILOCK BRAKES



SENSOR-WHEEL SPEED-ABS-RIGHT REAR

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C1035–RIGHT REAR WHEEL SPEED COMPARATIVE PERFORMANCE (CONTINUED)

For the Anti-Lock Brake System circuit diagram. (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When the Right Rear WSS reading is different from the readings received from the other WSS's. The Anti-Lock Brake Module compares WSS readings from side-to-side on an axle and front-to-rear.

Possible Causes
RIGHT REAR WSS LOOSE - B1,B2 CIRCUITS/CONNECTOR/TERMINAL DAMAGE
IMPROPER RIGHT REAR TIRE PRESSURE/MISMATCHED TIRES
RIGHT REAR TONE WHEEL DAMAGE
RIGHT REAR BRAKE HARDWARE DAMAGE
RIGHT REAR WSS - INTERNAL FAULT
ANTI-LOCK BRAKE MODULE - INTERNAL FAULT

Diagnostic Test

1. CHECK FOR DTC C1035–RIGHT REAR WHEEL SPEED COMPARATIVE PERFORMANCE

NOTE: This DTC must be active for the results of this test to be valid.

Turn the ignition on.

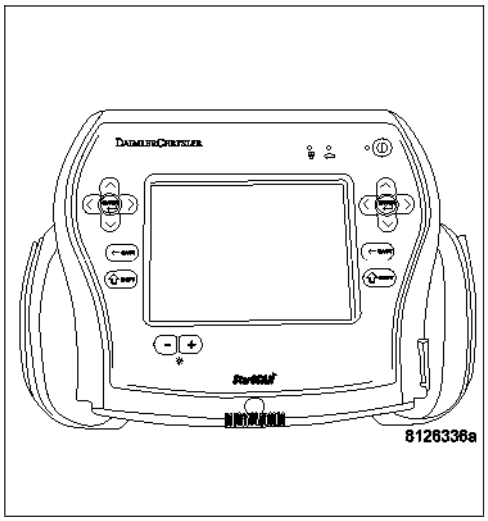
With the scan tool, record and erase DTC's.

Cycle the ignition switch from off to on.

With the scan tool, read DTC's

NOTE: The Anti-Lock Brake Module must sense ALL 4 wheels at 12 km/h (7.5 m.p.h.) before it will extinguish the ABS indicators.

Does the scan tool display: C1035–RIGHT REAR WHEEL SPEED COMPARATIVE PERFORMANCE and C102B–RIGHT REAR WHEEL SPEED SENSOR CIRCUIT?



Yes >> Refer to C102B–Right Rear Wheel Speed Sensor Circuit for the related symptom(s).
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 2

C1035–RIGHT REAR WHEEL SPEED COMPARATIVE PERFORMANCE (CONTINUED)

2. CHECK WHEEL SPEED SENSOR SIGNALS

Turn the ignition on.

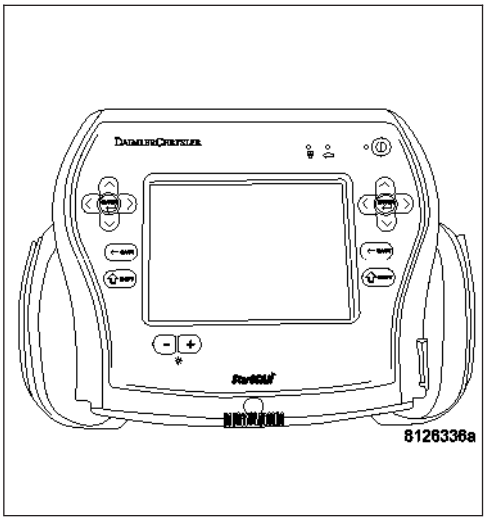
With the scan tool, monitor ALL the WSS speeds while an assistant drives the vehicle.

Slowly accelerate as straight as possible from a stop to 40 km/h (25 m.p.h.).

Is the Right Rear WSS speed showing 0 km/h (0 m.p.h.) or not matching other wheel speeds?

Yes >> Go To 3

No >> Refer to the INTERMITTENT CONDITION diagnostic procedure.
Perform ABS VERIFICATION TEST - VER 1.



3. CHECK RIGHT REAR WSS LOOSENESS, INSPECT B1,B2 CIRCUITS/CONNECTORS/TERMINALS FOR DAMAGE

NOTE: Check all terminals for broken, bent, pushed out, or corroded terminals.

Turn the ignition off.

Inspect the Anti-Lock Brake Module harness connector, Right Rear WSS, and Right Rear WSS harness connector.

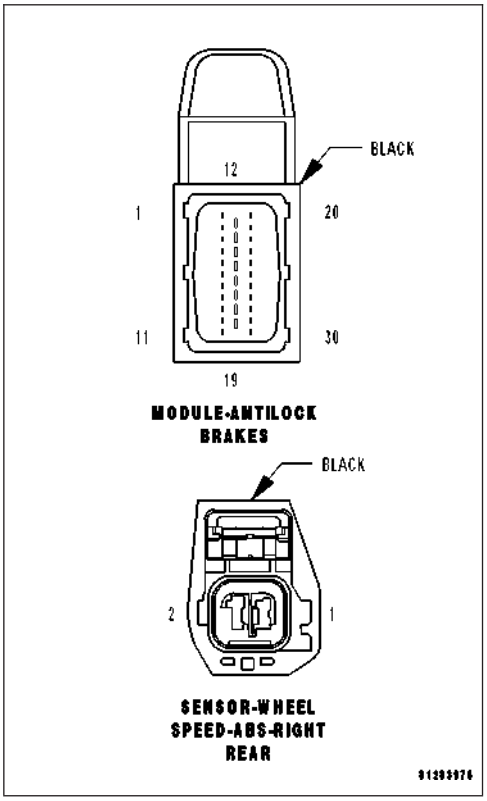
Inspect the Right Rear WSS for looseness and not properly fastened.

Inspect the (B1) Right Rear WSS Signal and (B2) Right Rear WSS Supply circuits between the Right Rear WSS and Anti-Lock Brake Module for damage.

Is the Right Rear WSS loose or any of the wiring/connectors/terminals damaged?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 4



C1035–RIGHT REAR WHEEL SPEED COMPARATIVE PERFORMANCE (CONTINUED)

4. CHECK RIGHT REAR TIRE PRESSURE/INSPECT ALL TIRES

Turn the ignition off.
Check and adjust the Right Rear Tire pressure.
Check and adjust all other tire pressures.
Inspect for mismatched tires on vehicle.

Is the Right Rear Tire improperly inflated or mismatched tires on vehicle?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 5

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5. CHECK RIGHT REAR TONE WHEEL FOR DAMAGE

Turn the ignition off.
Inspect the Right Rear Tone Wheel for damage, missing teeth, cracks, or looseness.

NOTE: The Tone Wheel teeth should be perfectly square, not bent, or nicked.

Is the Right Rear Front Tone Wheel damaged?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 6

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6. CHECK RIGHT REAR BRAKE HARDWARE DAMAGE

Turn the ignition off.
Visually inspect the Right Rear brake linings for contamination or overheating. Check for dragging, bent, or seized components/hardware.

Is any brake lining, component, or hardware damaged?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 7

---

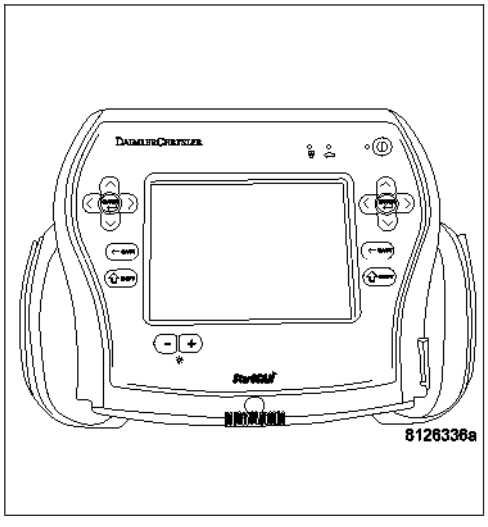
7. ANTI-LOCK BRAKE MODULE – INTERNAL FAULT

Turn the ignition off.
Replace the Right Rear WSS.
With the scan tool, erase DTC's.
Road test the vehicle over 40 km/h (25 m.p.h.).
Turn the ignition on.
With the scan tool, read DTC's

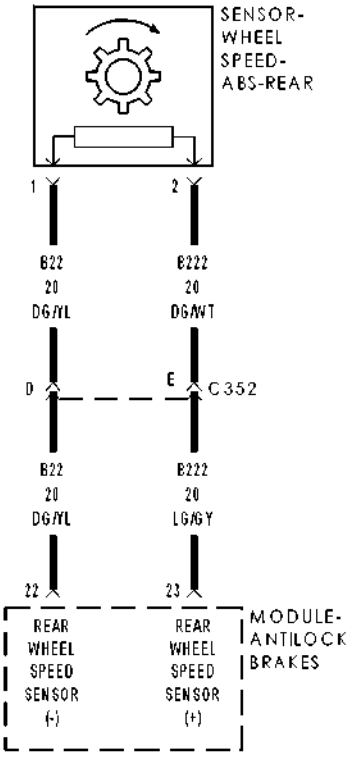
Did the DTC C1035–RIGHT REAR WHEEL SPEED COMPARATIVE PERFORMANCE reset?

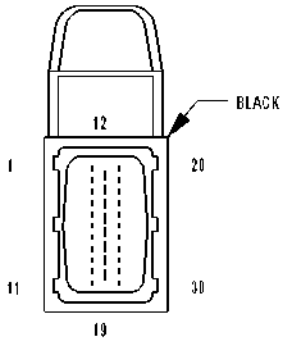
Yes >> Replace the Anti-Lock Brake Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1.

No >> Test Complete.

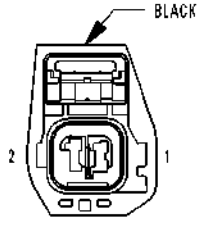


C1036–REAR WHEEL SPEED SENSOR CIRCUIT





MODULE-ANTILOCK
BRAKES



SENSOR-WHEEL
SPEED-ABS-REAR

81263987

C1036–REAR WHEEL SPEED SENSOR CIRCUIT (CONTINUED)

For the Anti-Lock Brake System circuit diagram. (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When the Rear Wheel Speed Sensor circuit fails the diagnostic test.

Possible Causes
CONNECTOR/TERMINAL DAMAGE
(B222) REAR WSS SUPPLY CIRCUIT SHORTED TO GROUND OR OPEN
(B22) REAR WSS SIGNAL CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN
(B22) REAR WSS SIGNAL CIRCUIT AND (B222) REAR WSS SUPPLY CIRCUIT SHORTED TOGETHER
REAR WSS - INTERNAL FAULT
ANTI-LOCK BRAKE MODULE - INTERNAL FAULT

Diagnostic Test

1. CHECK FOR DTC C1036–REAR WHEEL SPEED SENSOR CIRCUIT

NOTE: This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, record and erase DTC's.

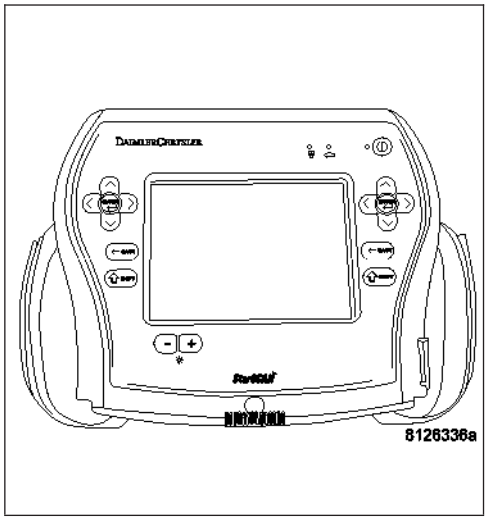
Cycle the ignition switch from off to on.

With the scan tool, read DTC's

Does the scan tool display: C1036–REAR WHEEL SPEED SENSOR CIRCUIT?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION diagnostic procedure.
Perform ABS VERIFICATION TEST - VER 1.



C1036–REAR WHEEL SPEED SENSOR CIRCUIT (CONTINUED)

2. CHECK CONNECTOR/TERMINAL FOR DAMAGE

NOTE: Check all terminals for broken, bent, pushed out, or corroded terminals.

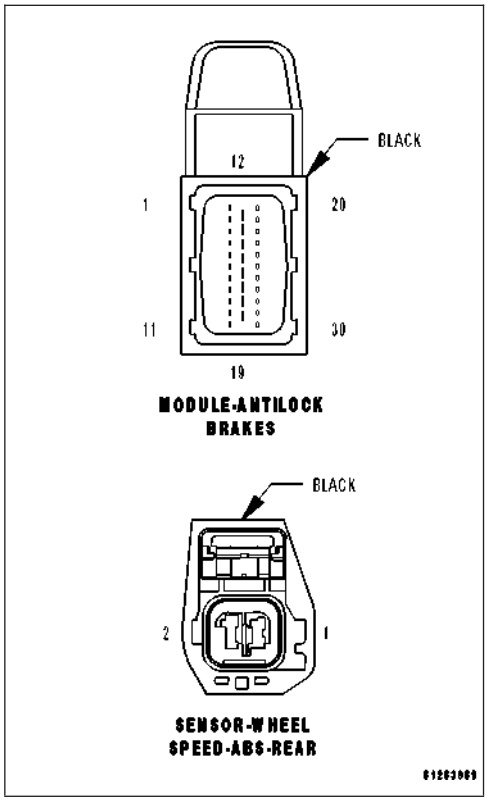
Turn the ignition off.

Inspect the Anti-Lock Brake Module harness connector, Rear WSS, and Rear WSS harness connector.

Is the Rear WSS or any of the connectors/terminals damaged?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 3



3. CHECK (B222) REAR WSS SUPPLY CIRCUIT VOLTAGE

Turn the ignition off.

Disconnect the Rear WSS harness connector.

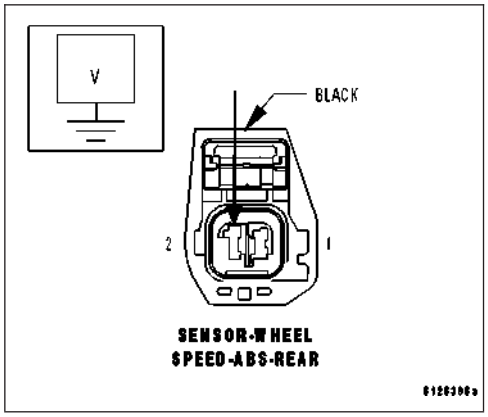
Turn the ignition on.

Measure the voltage between the (B222) Rear WSS Supply circuit and ground.

Is the voltage above 10 volts?

Yes >> Go To 6

No >> Go To 4



C1036–REAR WHEEL SPEED SENSOR CIRCUIT (CONTINUED)

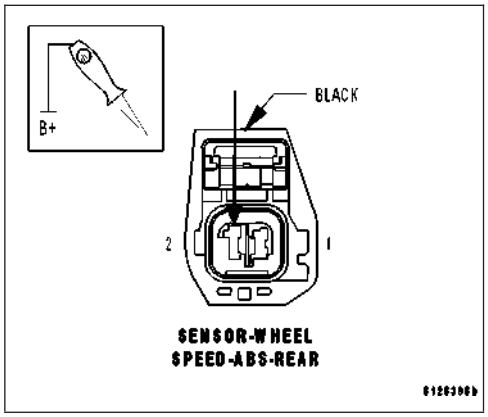
4. CHECK (B222) REAR WSS SUPPLY CIRCUIT SHORT TO GROUND

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Rear WSS harness connector.

Using a 12-volt test light connected to 12-volts, probe the (B222) Rear WSS Supply circuit.



Does the test light illuminate brightly?

Yes >> Repair the (B222) Rear WSS Supply circuit for a short to ground.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 5

5. CHECK (B222) REAR WSS SUPPLY CIRCUIT OPEN

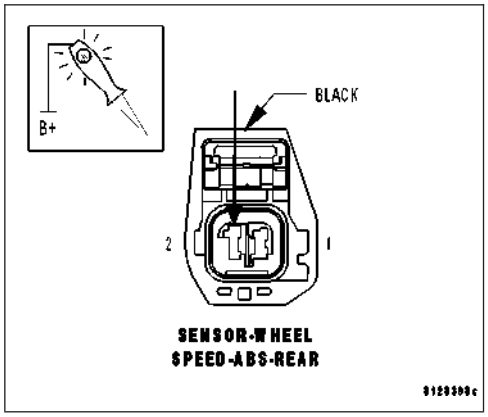
Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Rear WSS harness connector.

Connect a jumper wire between the (B222) Rear WSS Supply circuit and ground.

Using a 12-volt test light connected to 12-volts, probe the (B222) Rear WSS Supply circuit.



Does the test light illuminate brightly

Yes >> Go To 6

No >> Repair the (B222) Rear WSS Supply circuit for an open.
Perform ABS VERIFICATION TEST - VER 1.

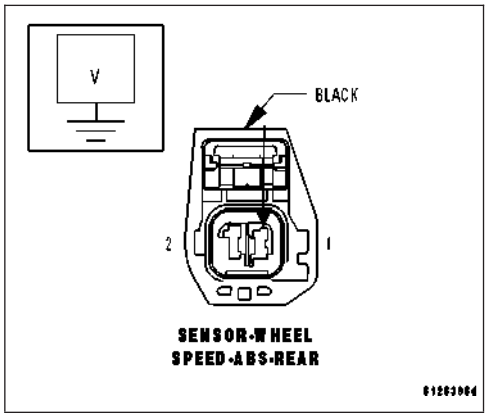
6. CHECK (B22) REAR WSS SIGNAL CIRCUIT SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the Rear WSS harness connector.

Turn the ignition on.

Measure the voltage between the (B22) Rear WSS Signal circuit and ground.



Is the voltage above one volt?

Yes >> Repair the (B22) Rear WSS Signal circuit for a short to voltage.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 7

C1036–REAR WHEEL SPEED SENSOR CIRCUIT (CONTINUED)

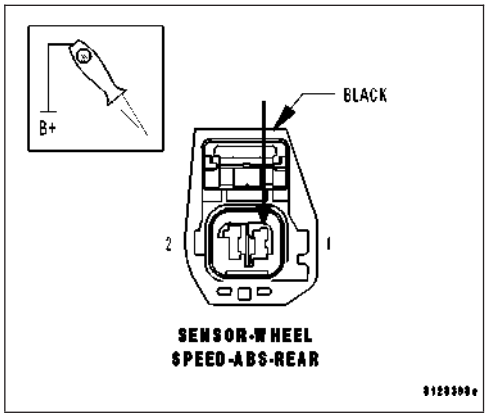
7. CHECK (B22) REAR WSS SIGNAL CIRCUIT SHORT TO GROUND

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Rear WSS harness connector.

Using a 12-volt test light connected to 12-volts, probe the (B22) Rear WSS Signal circuit.



Does the test light illuminate brightly?

Yes >> Repair the (B22) Rear WSS Signal circuit for a short to ground.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 8

8. CHECK (B22) REAR WSS SIGNAL CIRCUIT OPEN

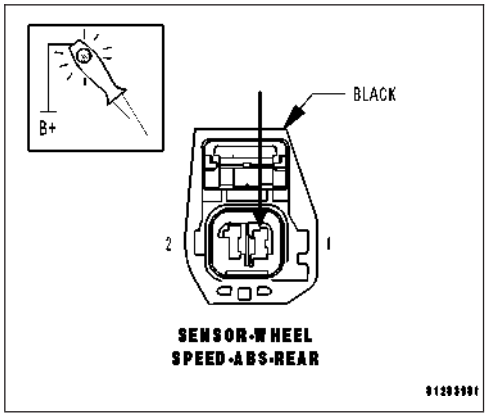
Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Rear WSS harness connector.

Connect a jumper wire between the (B22) Rear WSS Signal circuit and ground.

Using a 12-volt test light connected to 12-volts, probe the (B22) Rear WSS Signal circuit.



Does the test light illuminate brightly?

Yes >> Go To 9

No >> Repair the (B22) Rear WSS Signal circuit for an open.
Perform ABS VERIFICATION TEST - VER 1.

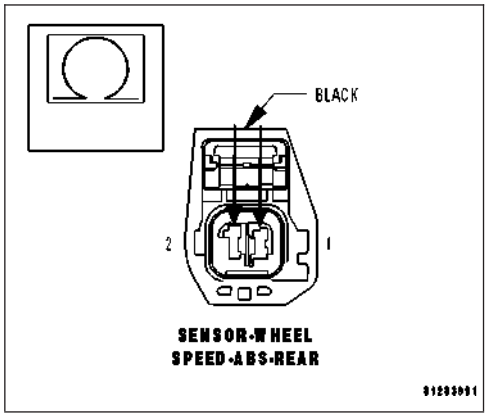
9. CHECK (B22) REAR WSS SIGNAL CIRCUIT AND (B222) REAR WSS SUPPLY CIRCUIT SHORT TOGETHER

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Rear Front WSS harness connector.

Measure the resistance between the (B22) Rear WSS Signal circuit and the (B222) Rear WSS Supply circuit.



Is the resistance above 5.0 ohms?

Yes >> Go To 10

No >> Repair the (B22) Rear WSS Signal circuit and the (B222) Rear WSS Supply circuit for a short together.
Perform ABS VERIFICATION TEST - VER 1.

C1036–REAR WHEEL SPEED SENSOR CIRCUIT (CONTINUED)

10. CHECK REAR WSS

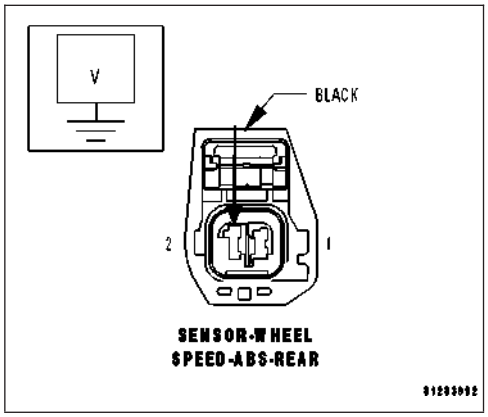
Turn the ignition off.

Reconnect all connectors.

Disconnect the Rear WSS harness connector.

Turn the ignition on.

Measure the voltage of the (B222) Rear WSS Supply circuit while reconnecting the Rear WSS harness connector.



Did the (B222) Rear WSS Supply circuit drop voltage to 0 volts?

Yes >> Replace the Rear WSS in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 11

11. CHECK REAR WSS OUTPUT

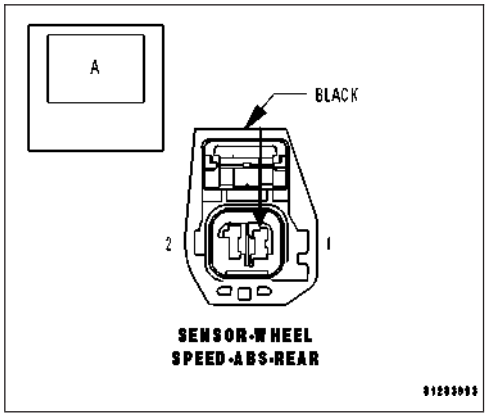
Turn the ignition off.

Reconnect all connectors.

Turn the ignition on.

Measure the amperage of the (B22) Rear WSS Signal circuit in the Rear WSS harness connector.

Slowly rotate the Rear wheels.



Does the amperage toggle between 7 mA to 14 mA?

Yes >> Go To 12

No >> Replace the Rear WSS in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1.

12. ANTI-LOCK BRAKE MODULE INTERNAL FAULT - (B222) REAR WSS SUPPLY CIRCUIT

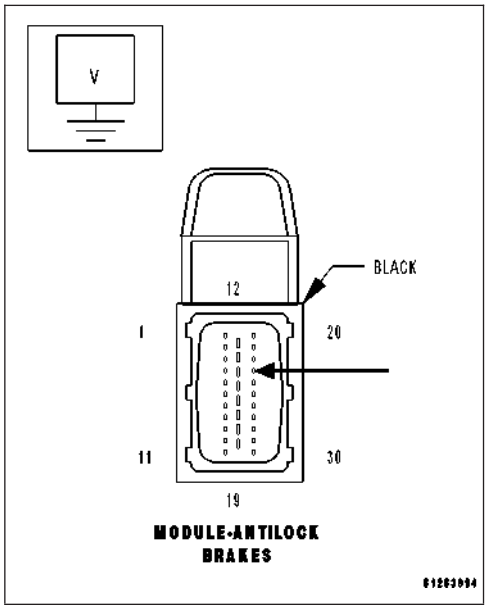
Turn the ignition off.

Remove the Anti-Lock Brake Module harness connector strain relief to access wires.

Reconnect the Anti-Lock Brake Module harness connector.

Turn the ignition on.

Measure the voltage between the (B222) Rear WSS Supply circuit and ground.



Is the voltage above 10 volts?

Yes >> Go To 13

No >> Replace the Anti-Lock Brake Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1.

C1036–REAR WHEEL SPEED SENSOR CIRCUIT (CONTINUED)

13. ANTI-LOCK BRAKE MODULE INTERNAL FAULT - (B22) REAR WSS SIGNAL CIRCUIT

Turn the ignition off.

Remove the Anti-Lock Brake Module harness connector strain relief to access wires.

Reconnect the Anti-Lock Brake Module harness connector.

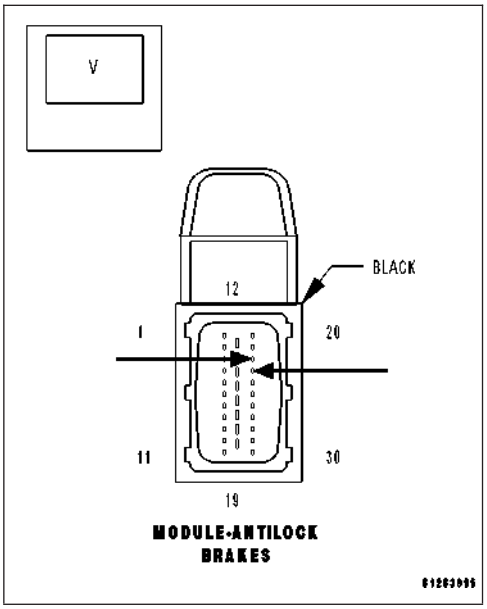
Turn the ignition on.

Measure the voltage between the (B222) Rear WSS Supply circuit and the (B22) Rear WSS Signal circuit.

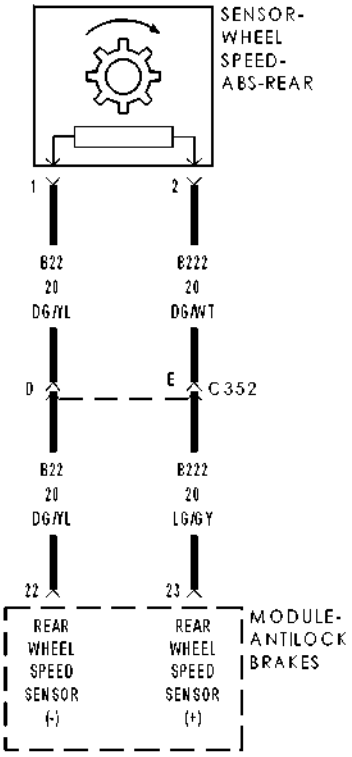
Is the voltage above 10 volts?

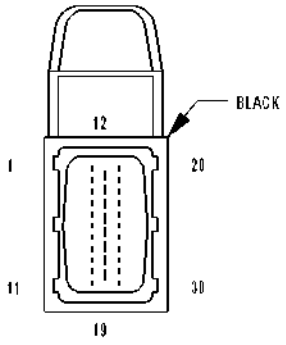
Yes >> Refer to the INTERMITTENT CONDITION diagnostic procedure.
Perform ABS VERIFICATION TEST - VER 1.

No >> Replace the Anti-Lock Brake Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1.

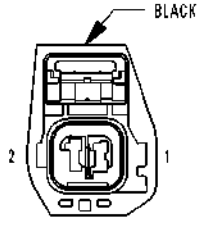


C103D–REAR WHEEL SPEED SENSOR INPUT SIGNAL ERRATIC PERFORMANCE





MODULE-ANTILOCK
BRAKES



SENSOR-WHEEL
SPEED-ABS-REAR

81263987

C103D–REAR WHEEL SPEED SENSOR INPUT SIGNAL ERRATIC PERFORMANCE (CONTINUED)

For the Anti-Lock Brake System circuit diagram. (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When the Rear WSS Signal is intermittently missing at a vehicle speed above at 40 kph (25 m.p.h.) or erratic wheel speed signal during acceleration or sensed wheel speed is different from other wheels.

Possible Causes
REAR WSS LOOSE - B22,B222 CIRCUITS/CONNECTOR/TERMINAL DAMAGE
REAR TONE WHEEL DAMAGE
REAR WSS AIR GAP FAULT
REAR CARRIER BEARINGS LOOSE
REAR BRAKE HARDWARE DAMAGE
REAR WSS - INTERNAL FAULT
ANTI-LOCK BRAKE MODULE - INTERNAL FAULT

Diagnostic Test

1. CHECK FOR DTC C103D–REAR WHEEL SPEED SENSOR INPUT SIGNAL ERRATIC PERFORMANCE

NOTE: This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, record and erase DTC's.

Cycle the ignition switch from off to on.

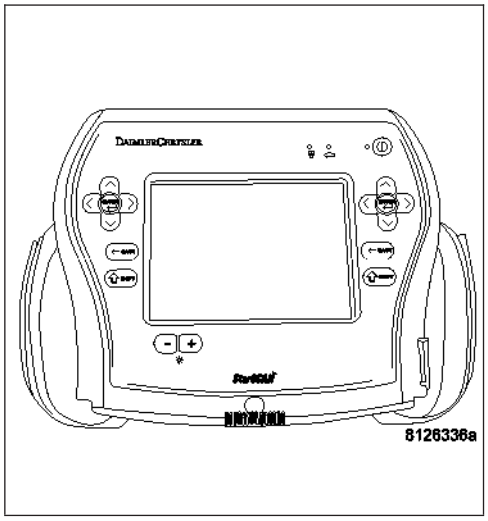
With the scan tool, read DTC's

NOTE: The Anti-Lock Brake Module must sense ALL 4 wheels at 12 km/h (7.5 m.p.h.) before it will extinguish the ABS indicators.

Does the scan tool display: C103D–REAR WHEEL SPEED SENSOR INPUT SIGNAL ERRATIC PERFORMANCE and C1036–REAR WHEEL SPEED SENSOR CIRCUIT?

Yes >> Refer to C1036–Rear Wheel Speed Sensor Circuit for the related symptom(s).
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 2



C103D–REAR WHEEL SPEED SENSOR INPUT SIGNAL ERRATIC PERFORMANCE (CONTINUED)

2. CHECK WHEEL SPEED SENSOR SIGNALS

Turn the ignition on.

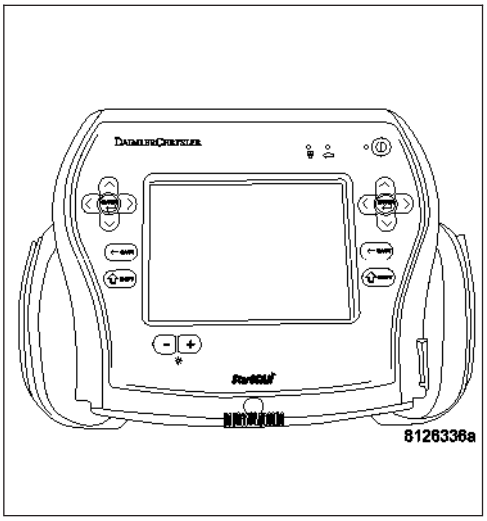
With the scan tool, monitor ALL the WSS speeds while an assistant drives the vehicle.

Slowly accelerate as straight as possible from a stop to 40 km/h (25 m.p.h.).

Is the Rear WSS speed showing 0 km/h (0 m.p.h.) or not matching other wheel speeds?

Yes >> Go To 3

No >> Refer to the INTERMITTENT CONDITION diagnostic procedure.
Perform ABS VERIFICATION TEST - VER 1.



3. CHECK REAR WSS LOOSENESS, INSPECT B22,B222 CIRCUITS/CONNECTORS/TERMINALS FOR DAMAGE

NOTE: Check all terminals for broken, bent, pushed out, or corroded terminals.

Turn the ignition off.

Inspect the Anti-Lock Brake Module harness connector, Rear WSS, and Rear WSS harness connector.

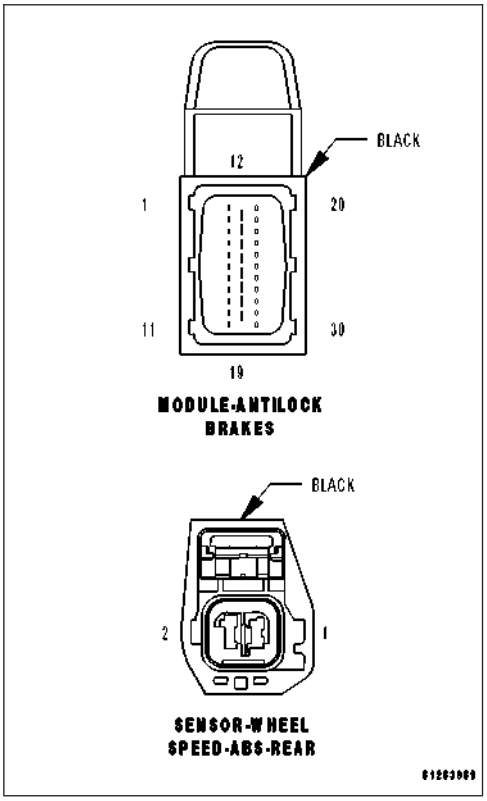
Inspect the Rear WSS for looseness and not properly fastened.

Inspect the (B22) Rear WSS Signal and (B222) Rear WSS Supply circuits between the Rear WSS and Anti-Lock Brake Module for damage.

Is the Rear WSS loose or any of the wiring/connectors/terminals damaged?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 4



C103D–REAR WHEEL SPEED SENSOR INPUT SIGNAL ERRATIC PERFORMANCE (CONTINUED)

4. CHECK REAR TONE WHEEL FOR DAMAGE

Turn the ignition off.

Inspect the Rear Tone Wheel for damage, missing teeth, cracks, or looseness.

NOTE: The Tone Wheel teeth should be perfectly square, not bent, or nicked.

Is the Rear Tone Wheel damaged?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 5

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5. CHECK REAR WSS AIR GAP

Turn the ignition off.

Using a feeler gauge, measure the Rear WSS air gap.

NOTE: Refer to the appropriate service information, if necessary, for procedures or specifications.

Is the Rear WSS air gap within specifications?

Yes >> Go To 6

No >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

---

6. CHECK REAR CARRIER BEARINGS LOOSE

Turn the ignition off.

Inspect the Rear Carrier Bearings for looseness.

NOTE: Refer to the appropriate service information, if necessary, for procedures or specifications.

Is the Rear Carrier Bearings loose?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 7

---

7. CHECK REAR BRAKE HARDWARE DAMAGE

Turn the ignition off.

Visually inspect both Rear brake linings for contamination or overheating. Check for dragging, bent, or seized components/hardware.

Is any brake lining, component, or hardware damaged?

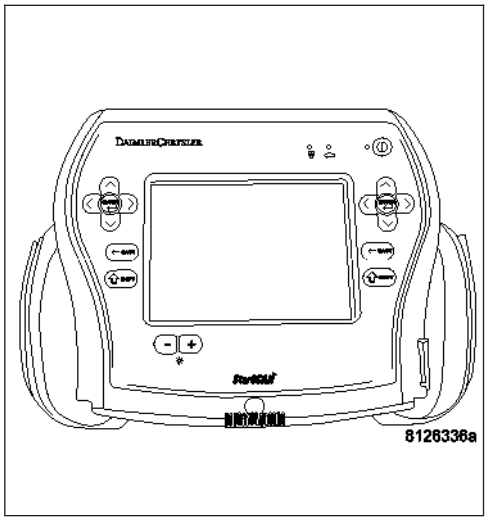
Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 8

C103D–REAR WHEEL SPEED SENSOR INPUT SIGNAL ERRATIC PERFORMANCE (CONTINUED)

8. ANTI-LOCK BRAKE MODULE – INTERNAL FAULT

Turn the ignition off.
Replace the Rear WSS.
With the scan tool, erase DTC's.
Road test the vehicle over 40 km/h (25 m.p.h.).
Turn the ignition on.
With the scan tool, read DTC's

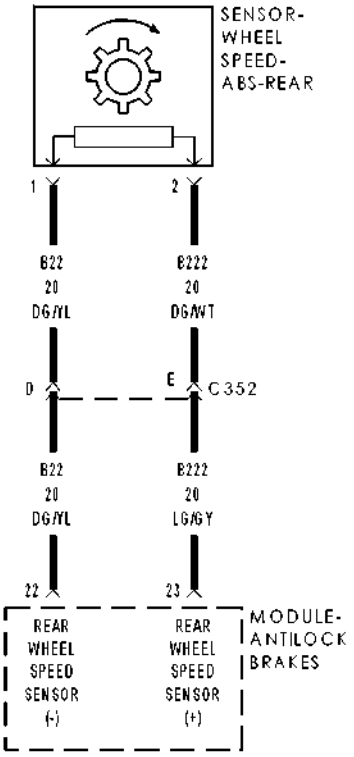


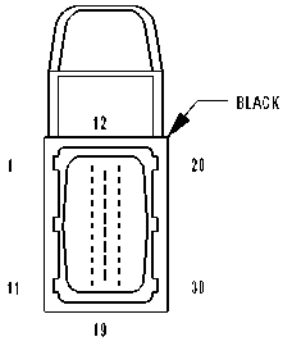
Did the DTC C103D–REAR WHEEL SPEED SENSOR INPUT SIGNAL ERRATIC PERFORMANCE reset?

Yes >> Replace the Anti-Lock Brake Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1.

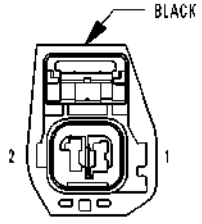
No >> Test Complete.

C1040–REAR WHEEL SPEED COMPARATIVE PERFORMANCE





MODULE-ANTILOCK
BRAKES



SENSOR-WHEEL
SPEED-ABS-REAR

81269987

C1040–REAR WHEEL SPEED COMPARATIVE PERFORMANCE (CONTINUED)

For the Anti-Lock Brake System circuit diagram. (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When the Rear WSS reading is different from the readings received from the other WSS's. The Anti-Lock Brake Module compares WSS readings from side-to-side on an axle and front-to-rear.

Possible Causes
REAR WSS LOOSE - B22,B222 CIRCUITS/CONNECTOR/TERMINAL DAMAGE
IMPROPER REAR TIRE PRESSURE/MISMATCHED TIRES
REAR TONE WHEEL DAMAGE
REAR BRAKE HARDWARE DAMAGE
REAR WSS - INTERNAL FAULT
ANTI-LOCK BRAKE MODULE - INTERNAL FAULT

Diagnostic Test

1. CHECK FOR DTC C1040–REAR WHEEL SPEED COMPARATIVE PERFORMANCE

NOTE: This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, record and erase DTC's.

Cycle the ignition switch from off to on.

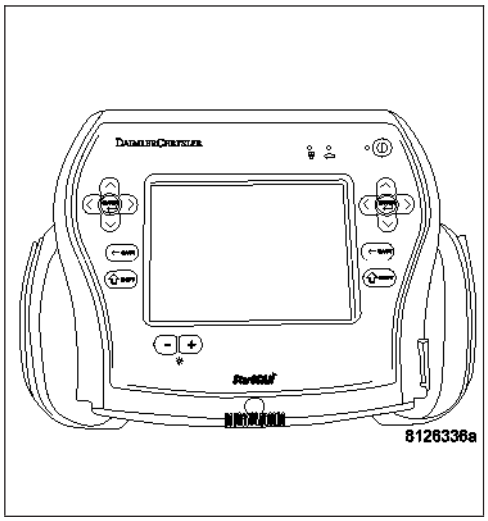
With the scan tool, read DTC's

NOTE: The Anti-Lock Brake Module must sense ALL 4 wheels at 12 km/h (7.5 m.p.h.) before it will extinguish the ABS indicators.

Does the scan tool display: C1040–REAR WHEEL SPEED COMPARATIVE PERFORMANCE and C1036–REAR WHEEL SPEED SENSOR CIRCUIT?

Yes >> Refer to C1036–Rear Wheel Speed Sensor Circuit for the related symptom(s).
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 2



C1040–REAR WHEEL SPEED COMPARATIVE PERFORMANCE (CONTINUED)

2. CHECK WHEEL SPEED SENSOR SIGNALS

Turn the ignition on.

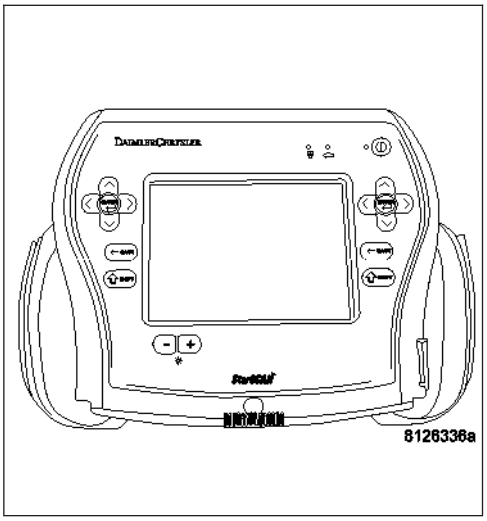
With the scan tool, monitor ALL the WSS speeds while an assistant drives the vehicle.

Slowly accelerate as straight as possible from a stop to 40 km/h (25 m.p.h.).

Is the Rear WSS speed showing 0 km/h (0 m.p.h.) or not matching other wheel speeds?

Yes >> Go To 3

No >> Refer to the INTERMITTENT CONDITION diagnostic procedure.
Perform ABS VERIFICATION TEST - VER 1.



3. CHECK REAR WSS LOOSENESS, INSPECT B22,B222 CIRCUITS/CONNECTORS/TERMINALS FOR DAMAGE

NOTE: Check all terminals for broken, bent, pushed out, or corroded terminals.

Turn the ignition off.

Inspect the Anti-Lock Brake Module harness connector, Rear WSS, and Rear WSS harness connector.

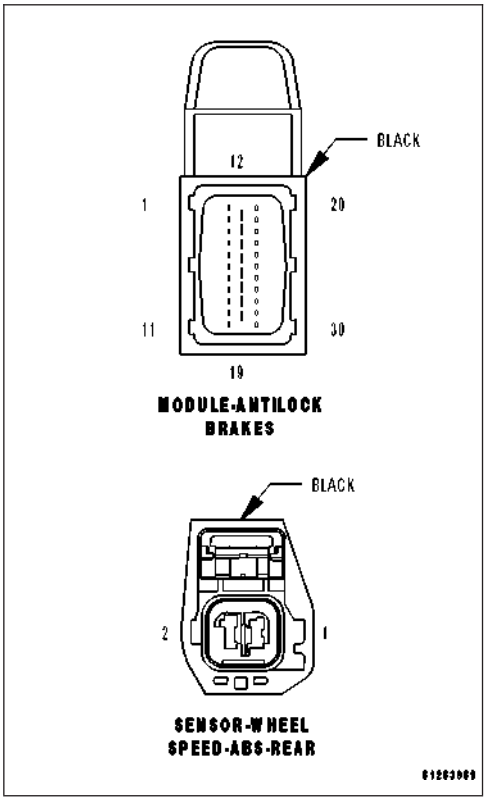
Inspect the Rear WSS for looseness and not properly fastened.

Inspect the (B22) Rear WSS Signal and (B222) Rear WSS Supply circuits between the Rear WSS and Anti-Lock Brake Module for damage.

Is the Rear WSS loose or any of the wiring/connectors/terminals damaged?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 4



C1040–REAR WHEEL SPEED COMPARATIVE PERFORMANCE (CONTINUED)

4. CHECK REAR TIRE PRESSURE/INSPECT ALL TIRES

Turn the ignition off.
Check and adjust the Rear Tire pressure.
Check and adjust all other tire pressures.
Inspect for mismatched tires on vehicle.

Is the Rear Tire improperly inflated or mismatched tires on vehicle?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 5

---

5. CHECK REAR TONE WHEEL FOR DAMAGE

Turn the ignition off.
Inspect the Rear Tone Wheel for damage, missing teeth, cracks, or looseness.

NOTE: The Tone Wheel teeth should be perfectly square, not bent, or nicked.

Is the Rear Tone Wheel damaged?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 6

---

6. CHECK REAR BRAKE HARDWARE DAMAGE

Turn the ignition off.
Visually inspect the Rear brake linings for contamination or overheating. Check for dragging, bent, or seized components/hardware.

Is any brake lining, component, or hardware damaged?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 7

---

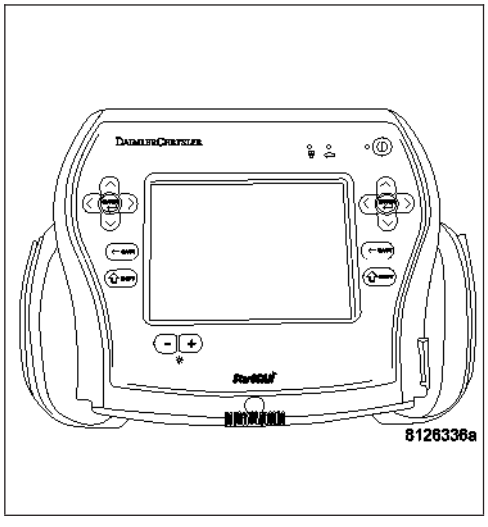
7. ANTI-LOCK BRAKE MODULE – INTERNAL FAULT

Turn the ignition off.
Replace the Rear WSS.
With the scan tool, erase DTC's.
Road test the vehicle over 40 km/h (25 m.p.h.).
Turn the ignition on.
With the scan tool, read DTC's

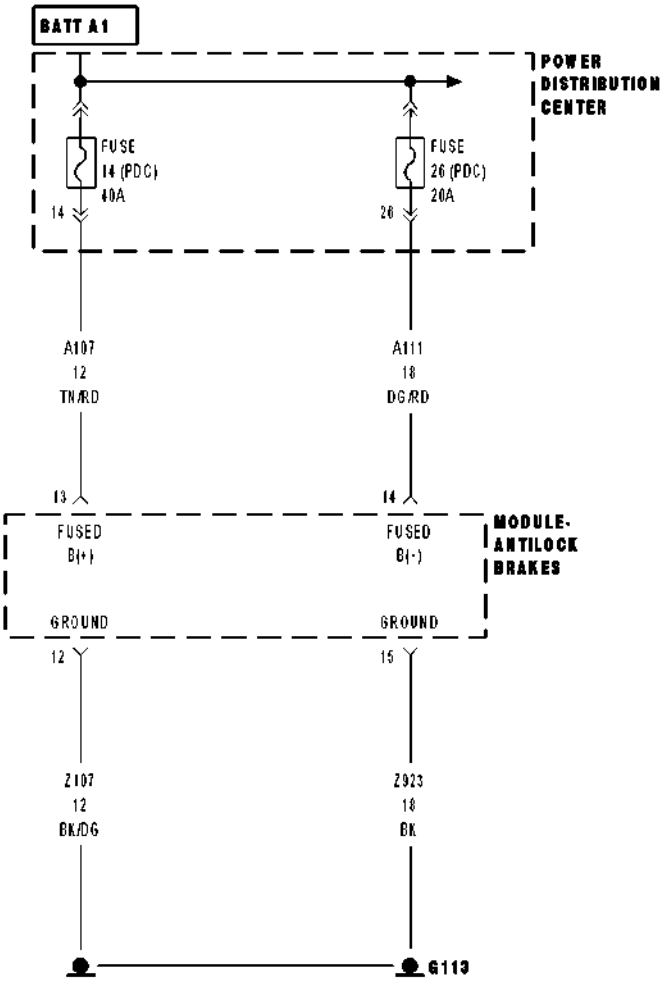
Did the DTC C1040–REAR WHEEL SPEED COMPARATIVE PERFORMANCE reset?

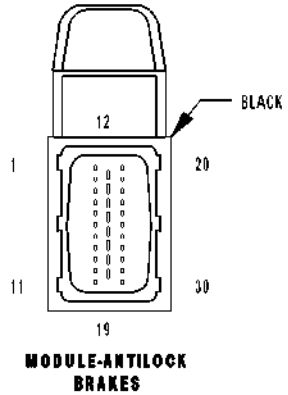
Yes >> Replace the Anti-Lock Brake Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1.

No >> Test Complete.



C104C-LEFT FRONT INLET VALVE CONTROL CIRCUIT LOW





C104C-LEFT FRONT INLET VALVE CONTROL CIRCUIT LOW (CONTINUED)

For the ABS circuit diagram (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuous
- **Set Condition:**
  The electrical feedback signal does not match the actuation signal for the corresponding valve.

Possible Causes
HIGH RESISTANCE IN B+ CIRCUITS
HIGH RESISTANCE IN GROUND CIRCUITS
ABM INTERNAL

Diagnostic Test

1. HIGH RESISTANCE IN B+ CIRCUITS

Turn key off.

Disconnect the ABM harness connector.

NOTE: Check connector - Clean/repair as necessary.

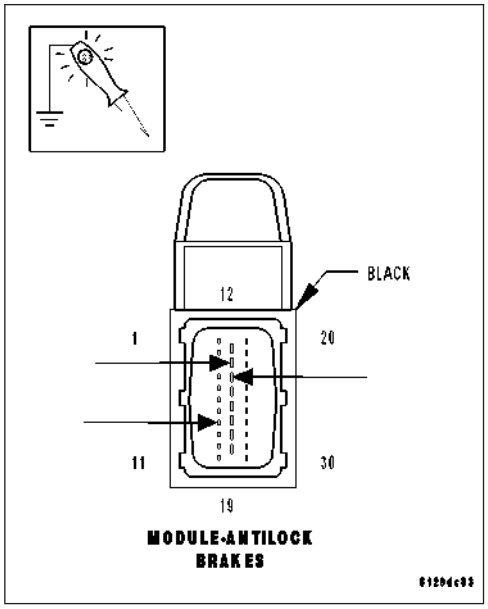
Turn key on, engine off.

With a test light connected to ground check (A107) Fused B+, (A111) Fused B+ and (F500) Fused ignition switch output.

Is the test light bright like when connected to the battery?

Yes >> Go to 2

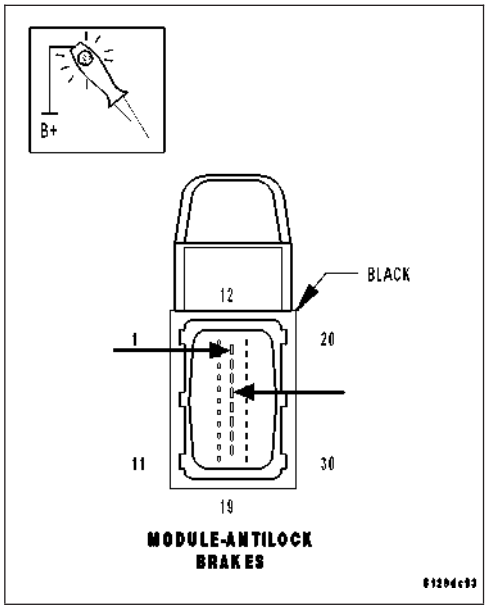
No >> Repair the high resistance in the circuits.
Perform ABS VERIFICATION TEST — VER 1.



C104C-LEFT FRONT INLET VALVE CONTROL CIRCUIT LOW (CONTINUED)

2. HIGH RESISTANCE IN GROUND CIRCUITS

With a test light Connected to B+ check (Z923) Ground and (Z107) Ground.

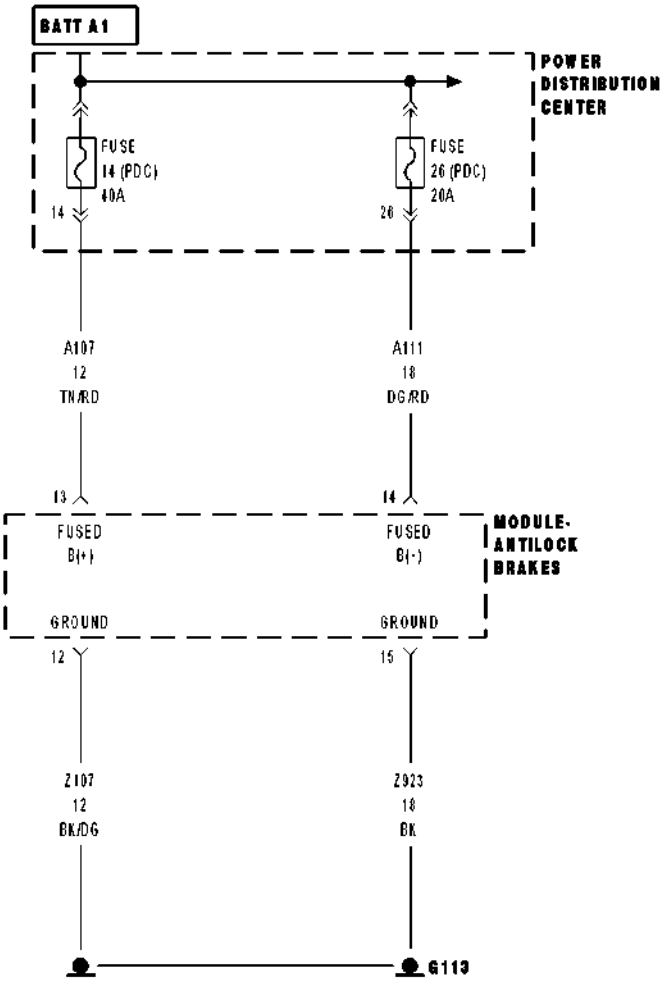


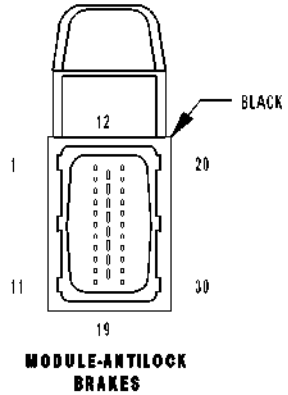
Is the test light bright like when connected to the battery?

Yes >> Replace the ABM per service information.
Perform ABS VERIFICATION TEST — VER 1.

No >> Repair the high resistance in the circuits.
Perform ABS VERIFICATION TEST — VER 1.

C1050-RIGHT FRONT INLET VALVE CONTROL CIRCUIT LOW





C1050-RIGHT FRONT INLET VALVE CONTROL CIRCUIT LOW (CONTINUED)

For the ABS circuit diagram (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuous
- **Set Condition:**
  The electrical feedback signal does not match the actuation signal for the corresponding valve.

Possible Causes
HIGH RESISTANCE IN B+ CIRCUITS
HIGH RESISTANCE IN GROUND CIRCUITS
ABM INTERNAL

Diagnostic Test

1. HIGH RESISTANCE IN B+ CIRCUITS

Turn key off.

Disconnect the ABM harness connector.

NOTE: Check connector - Clean/repair as necessary.

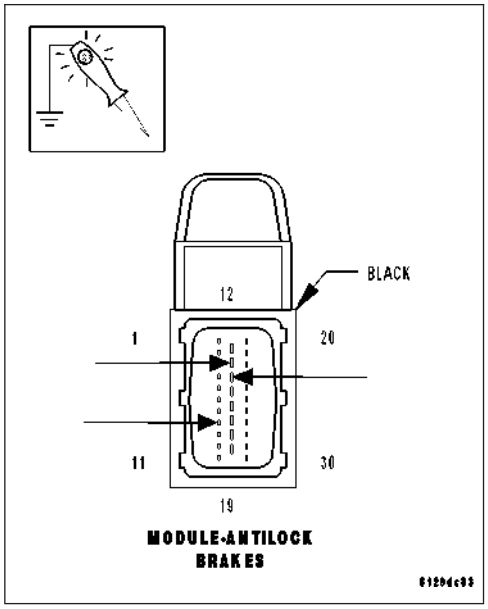
Turn key on, engine off.

With a test light connected to ground check (A107) Fused B+, (A111) Fused B+ and (F500) Fused ignition switch output.

Is the test light bright like when connected to the battery?

Yes >> Go to 2

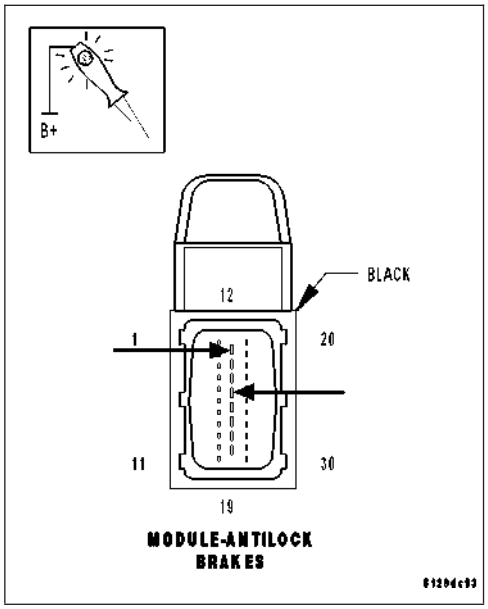
No >> Repair the high resistance in the circuits.
Perform ABS VERIFICATION TEST — VER 1.



C1050-RIGHT FRONT INLET VALVE CONTROL CIRCUIT LOW (CONTINUED)

2. HIGH RESISTANCE IN GROUND CIRCUITS

With a test light Connected to B+ check (Z923) Ground and (Z107) Ground.

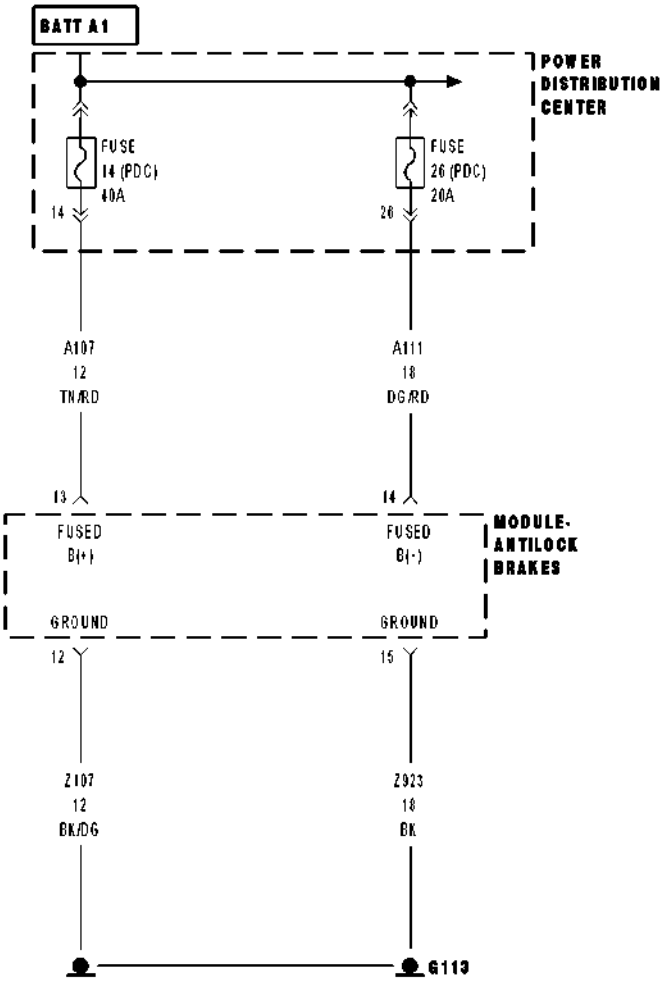


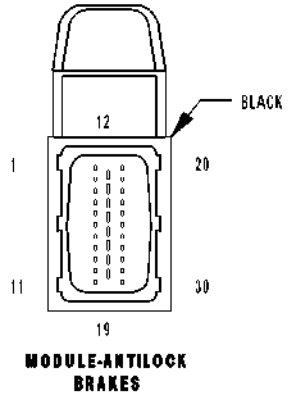
Is the test light bright like when connected to the battery?

Yes >> Replace the ABM per service information.
Perform ABS VERIFICATION TEST — VER 1.

No >> Repair the high resistance in the circuits.
Perform ABS VERIFICATION TEST — VER 1.

C1054-LEFT REAR INLET VALVE CONTROL CIRCUIT LOW





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C1054-LEFT REAR INLET VALVE CONTROL CIRCUIT LOW (CONTINUED)

For the ABS circuit diagram (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuous
- **Set Condition:**
  The electrical feedback signal does not match the actustion signal for the corresponding valve.

Possible Causes
HIGH RESISTANCE IN B+ CIRCUITS
HIGH RESISTANCE IN GROUND CIRCUITS
ABM INTERNAL

Diagnostic Test

1. HIGH RESISTANCE IN B+ CIRCUITS

Turn key off.

Disconnect the ABM harness connector.

NOTE: Check connector - Clean/repair as necessary.

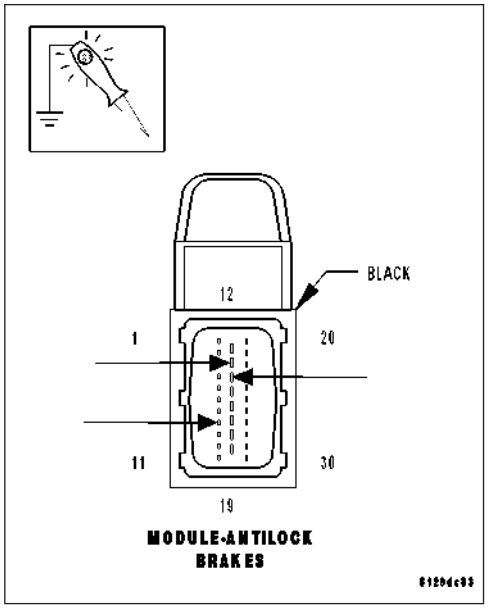
Turn key on, engine off.

With a test light connected to ground check (A107) Fused B+, (A111) Fused B+ and (F500) Fused ignition switch output.

Is the test light bright like when connected to the battery?

Yes >> Go to 2

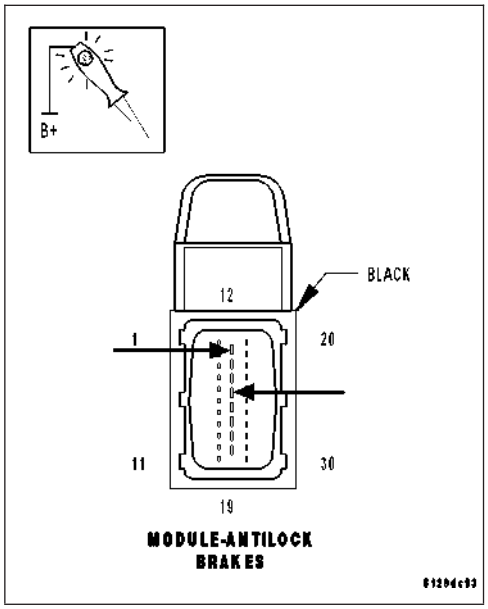
No >> Repair the high resistance in the circuits.
Perform ABS VERIFICATION TEST — VER 1.



C1054-LEFT REAR INLET VALVE CONTROL CIRCUIT LOW (CONTINUED)

2. HIGH RESISTANCE IN GROUND CIRCUITS

With a test light Connected to B+ check (Z923) Ground and (Z107) Ground.

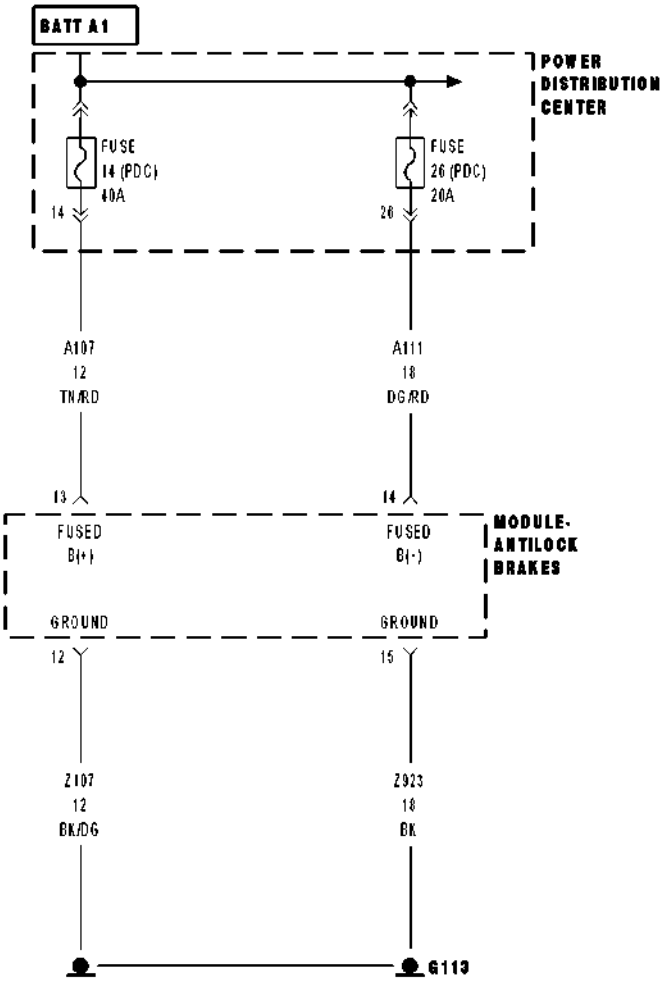


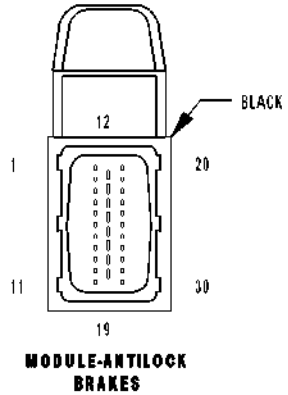
Is the test light bright like when connected to the battery?

Yes >> Replace the ABM per service information.
Perform ABS VERIFICATION TEST — VER 1.

No >> Repair the high resistance in the circuits.
Perform ABS VERIFICATION TEST — VER 1.

C1058-RIGHT REAR INLET VALVE CONTROL CIRCUIT LOW





C1058-RIGHT REAR INLET VALVE CONTROL CIRCUIT LOW (CONTINUED)

For the ABS circuit diagram (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuous
- **Set Condition:**
  The electrical feedback signal does not match the actustion signal for the corresponding valve.

Possible Causes
HIGH RESISTANCE IN B+ CIRCUITS
HIGH RESISTANCE IN GROUND CIRCUITS
ABM INTERNAL

Diagnostic Test

1. HIGH RESISTANCE IN B+ CIRCUITS

Turn key off.

Disconnect the ABM harness connector.

NOTE: Check connector - Clean/repair as necessary.

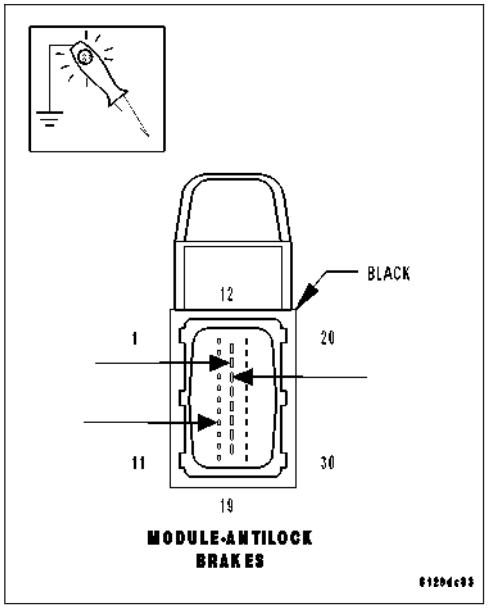
Turn key on, engine off.

With a test light connected to ground check (A107) Fused B+, (A111) Fused B+ and (F500) Fused ignition switch output.

Is the test light bright like when connected to the battery?

Yes >> Go to 2

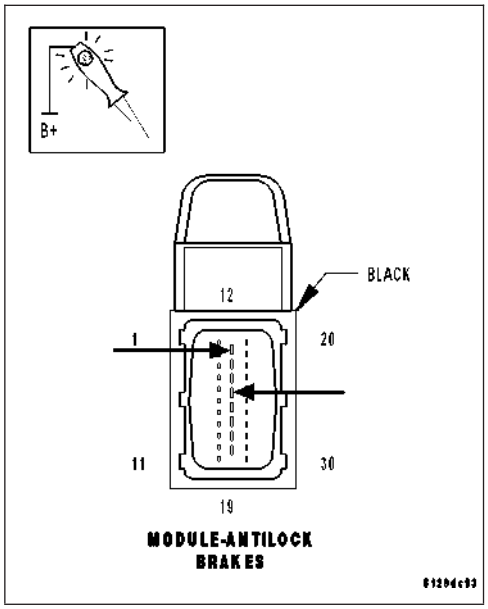
No >> Repair the high resistance in the circuits.
Perform ABS VERIFICATION TEST — VER 1.



C1058-RIGHT REAR INLET VALVE CONTROL CIRCUIT LOW (CONTINUED)

2. HIGH RESISTANCE IN GROUND CIRCUITS

With a test light Connected to B+ check (Z923) Ground and (Z107) Ground.

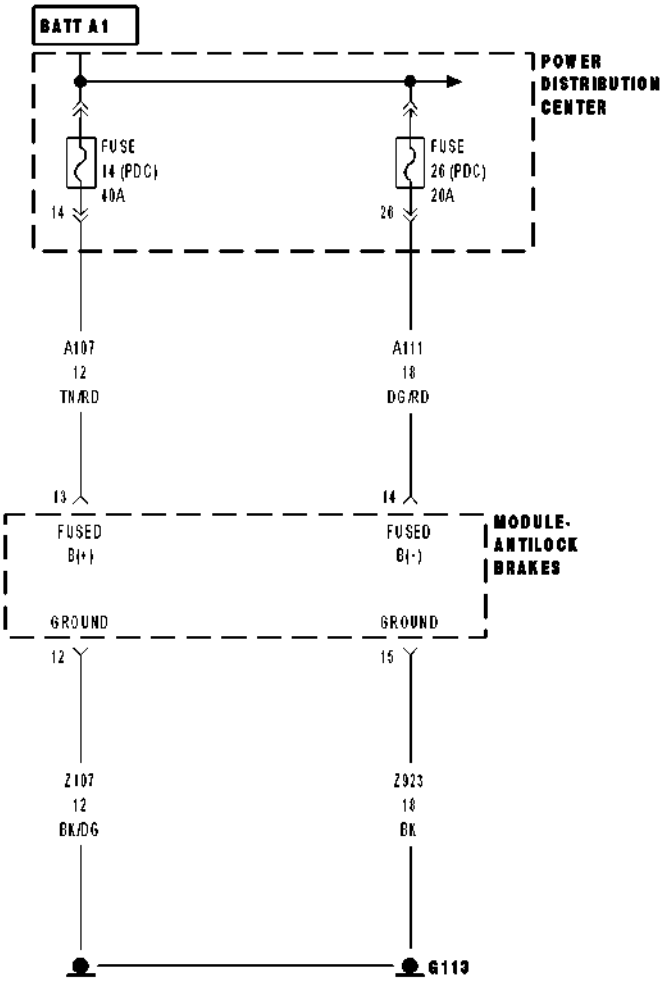


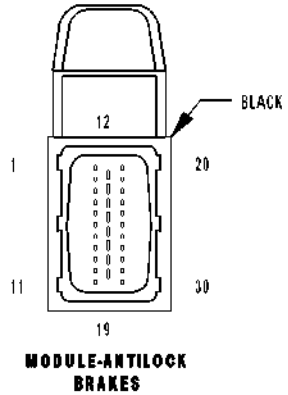
Is the test light bright like when connected to the battery?

Yes >> Replace the ABM per service information.
Perform ABS VERIFICATION TEST — VER 1.

No >> Repair the high resistance in the circuits.
Perform ABS VERIFICATION TEST — VER 1.

C105C-REAR INLET VALVE CONTROL CIRCUIT LOW





C105C-REAR INLET VALVE CONTROL CIRCUIT LOW (CONTINUED)

For the ABS circuit diagram (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuous
- **Set Condition:**
  The electrical feedback signal does not match the actustion signal for the corresponding valve.

Possible Causes
HIGH RESISTANCE IN B+ CIRCUITS
HIGH RESISTANCE IN GROUND CIRCUITS
ABM INTERNAL

Diagnostic Test

1. HIGH RESISTANCE IN B+ CIRCUITS

Turn key off.

Disconnect the ABM harness connector.

NOTE: Check connector - Clean/repair as necessary.

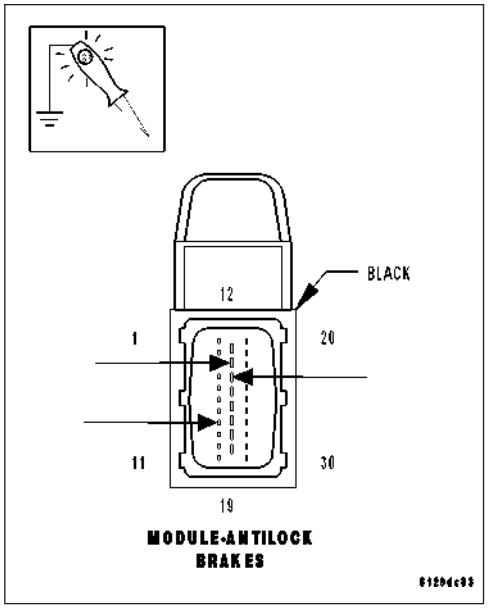
Turn key on, engine off.

With a test light connected to ground check (A107) Fused B+, (A111) Fused B+ and (F500) Fused ignition switch output.

Is the test light bright like when connected to the battery?

Yes >> Go to 2

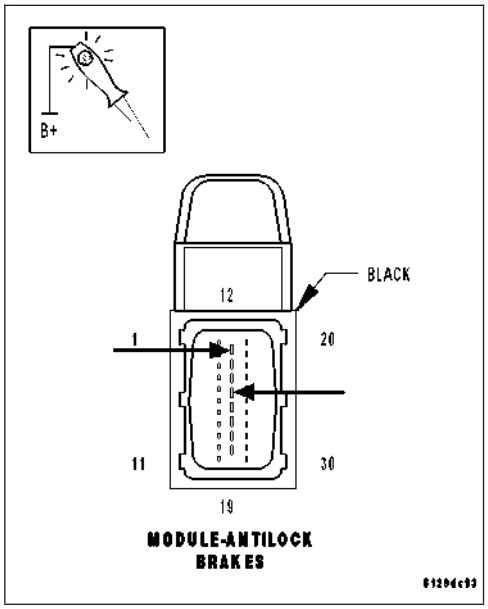
No >> Repair the high resistance in the circuits.
Perform ABS VERIFICATION TEST — VER 1.



C105C-REAR INLET VALVE CONTROL CIRCUIT LOW (CONTINUED)

2. HIGH RESISTANCE IN GROUND CIRCUITS

With a test light Connected to B+ check (Z923) Ground and (Z107) Ground.

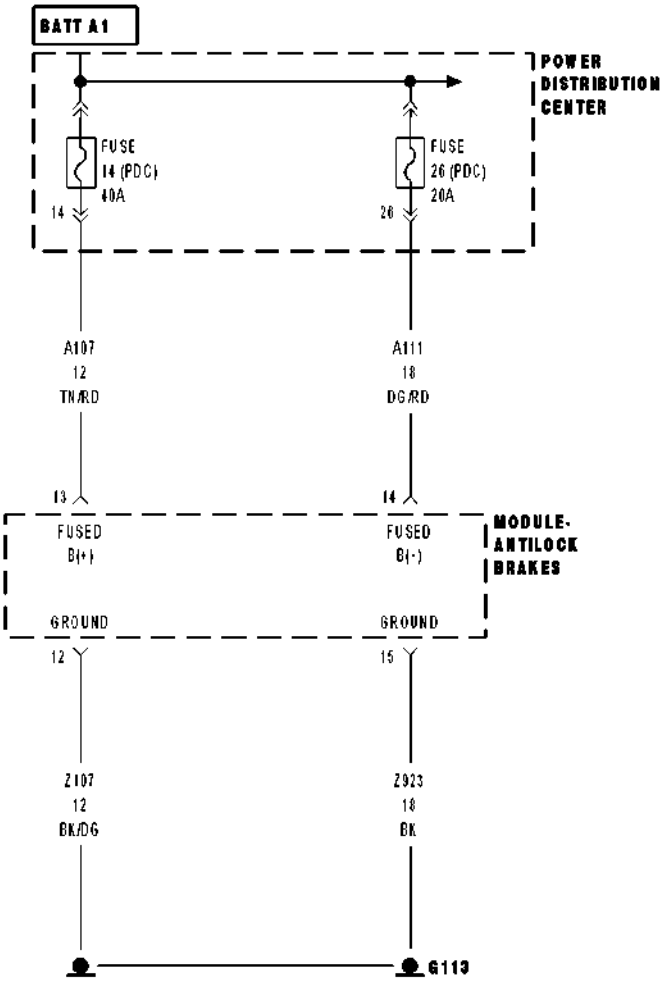


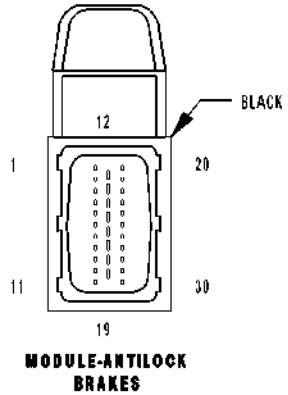
Is the test light bright like when connected to the battery?

Yes >> Replace the ABM per service information.
Perform ABS VERIFICATION TEST — VER 1.

No >> Repair the high resistance in the circuits.
Perform ABS VERIFICATION TEST — VER 1.

C1060-LEFT FRONT OUTLET VALVE CONTROL CIRCUIT LOW





C1060-LEFT FRONT OUTLET VALVE CONTROL CIRCUIT LOW (CONTINUED)

For the ABS circuit diagram (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuous
- **Set Condition:**
  The electrical feedback signal does not match the actustion signal for the corresponding valve.

Possible Causes
HIGH RESISTANCE IN B+ CIRCUITS
HIGH RESISTANCE IN GROUND CIRCUITS
ABM INTERNAL

Diagnostic Test

1. HIGH RESISTANCE IN B+ CIRCUITS

Turn key off.

Disconnect the ABM harness connector.

NOTE: Check connector - Clean/repair as necessary.

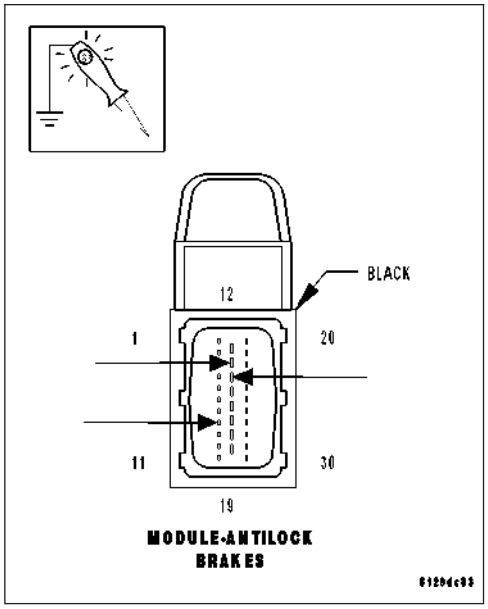
Turn key on, engine off.

With a test light connected to ground check (A107) Fused B+, (A111) Fused B+ and (F500) Fused ignition switch output.

Is the test light bright like when connected to the battery?

Yes >> Go to 2

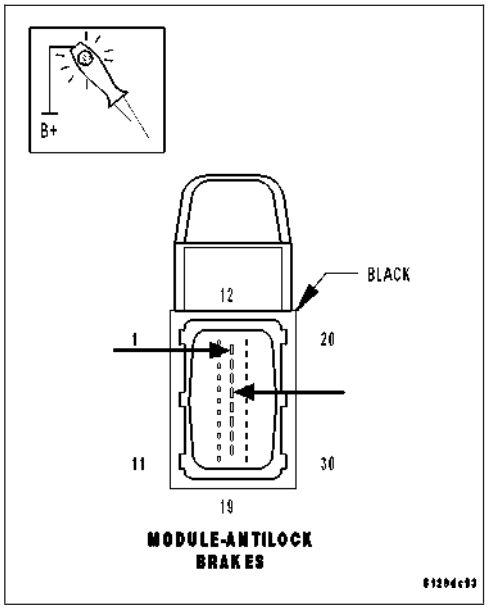
No >> Repair the high resistance in the circuits.
Perform ABS VERIFICATION TEST — VER 1.



C1060-LEFT FRONT OUTLET VALVE CONTROL CIRCUIT LOW (CONTINUED)

2. HIGH RESISTANCE IN GROUND CIRCUITS

With a test light Connected to B+ check (Z923) Ground and (Z107) Ground.

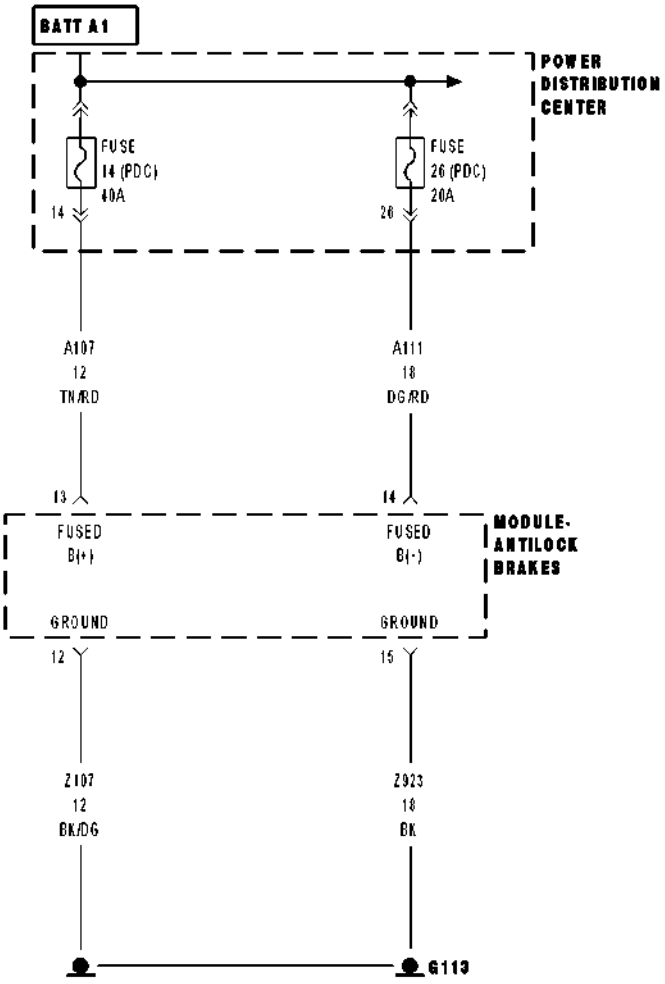


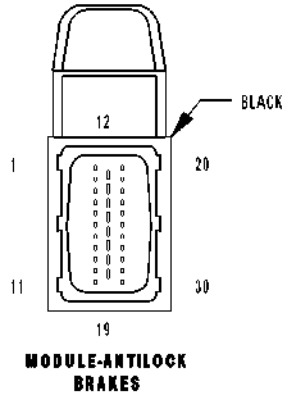
Is the test light bright like when connected to the battery?

Yes >> Replace the ABM per service information.
Perform ABS VERIFICATION TEST — VER 1.

No >> Repair the high resistance in the circuits.
Perform ABS VERIFICATION TEST — VER 1.

C1064-RIGHT FRONT OUTLET VALVE CONTROL CIRCUIT LOW





C1064-RIGHT FRONT OUTLET VALVE CONTROL CIRCUIT LOW (CONTINUED)

For the ABS circuit diagram (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuous
- **Set Condition:**
  The electrical feedback signal does not match the actustion signal for the corresponding valve.

Possible Causes
HIGH RESISTANCE IN B+ CIRCUITS
HIGH RESISTANCE IN GROUND CIRCUITS
ABM INTERNAL

Diagnostic Test

1. HIGH RESISTANCE IN B+ CIRCUITS

Turn key off.

Disconnect the ABM harness connector.

NOTE: Check connector - Clean/repair as necessary.

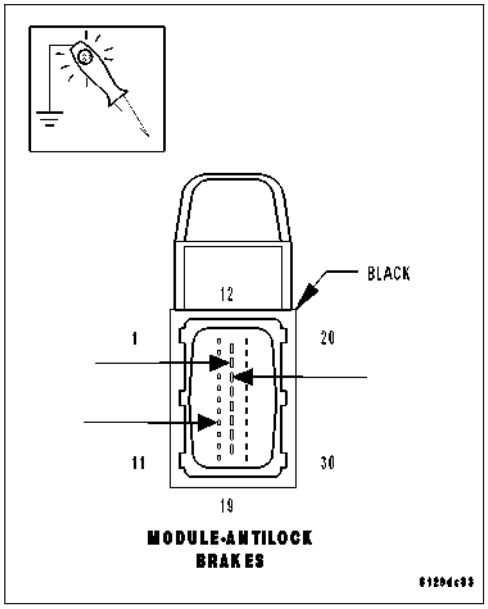
Turn key on, engine off.

With a test light connected to ground check (A107) Fused B+, (A111) Fused B+ and (F500) Fused ignition switch output.

Is the test light bright like when connected to the battery?

Yes >> Go to 2

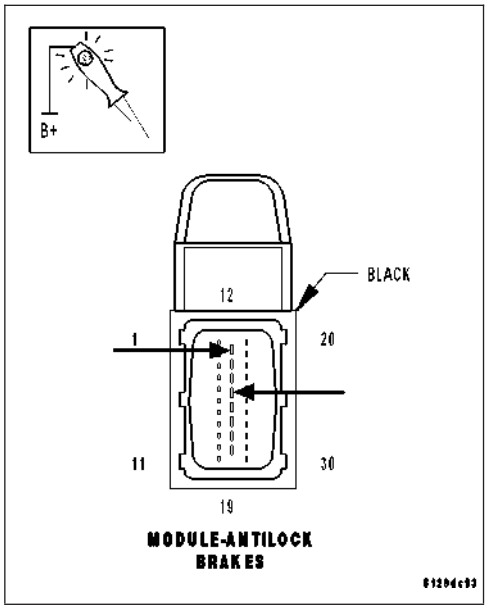
No >> Repair the high resistance in the circuits.
Perform ABS VERIFICATION TEST — VER 1.



C1064-RIGHT FRONT OUTLET VALVE CONTROL CIRCUIT LOW (CONTINUED)

2. HIGH RESISTANCE IN GROUND CIRCUITS

With a test light Connected to B+ check (Z923) Ground and (Z107) Ground.

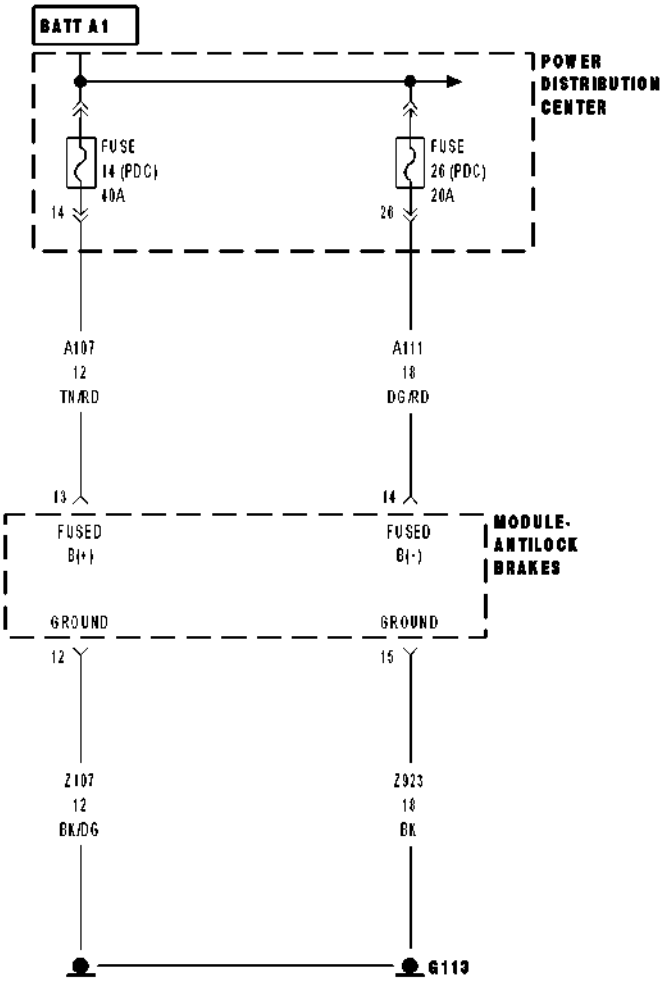


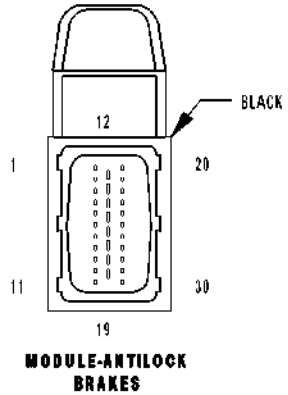
Is the test light bright like when connected to the battery?

Yes >> Replace the ABM per service information.
Perform ABS VERIFICATION TEST — VER 1.

No >> Repair the high resistance in the circuits.
Perform ABS VERIFICATION TEST — VER 1.

C1068-LEFT REAR OUTLET VALVE CONTROL CIRCUIT LOW





C1068-LEFT REAR OUTLET VALVE CONTROL CIRCUIT LOW (CONTINUED)

For the ABS circuit diagram (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuous
- **Set Condition:**
  The electrical feedback signal does not match the actustion signal for the corresponding valve.

Possible Causes
HIGH RESISTANCE IN B+ CIRCUITS
HIGH RESISTANCE IN GROUND CIRCUITS
ABM INTERNAL

Diagnostic Test

1. HIGH RESISTANCE IN B+ CIRCUITS

Turn key off.

Disconnect the ABM harness connector.

NOTE: Check connector - Clean/repair as necessary.

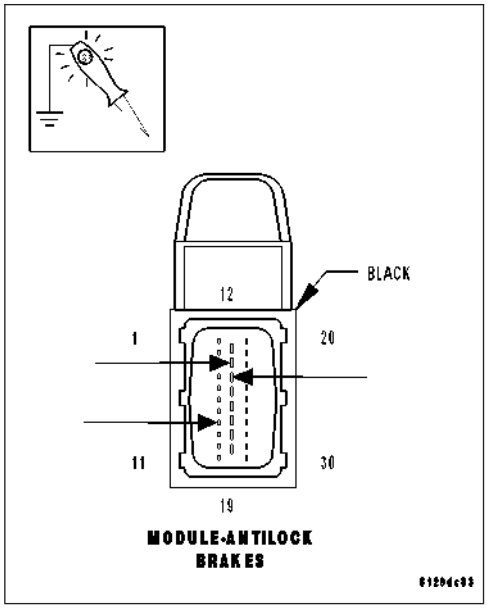
Turn key on, engine off.

With a test light connected to ground check (A107) Fused B+, (A111) Fused B+ and (F500) Fused ignition switch output.

Is the test light bright like when connected to the battery?

Yes >> Go to 2

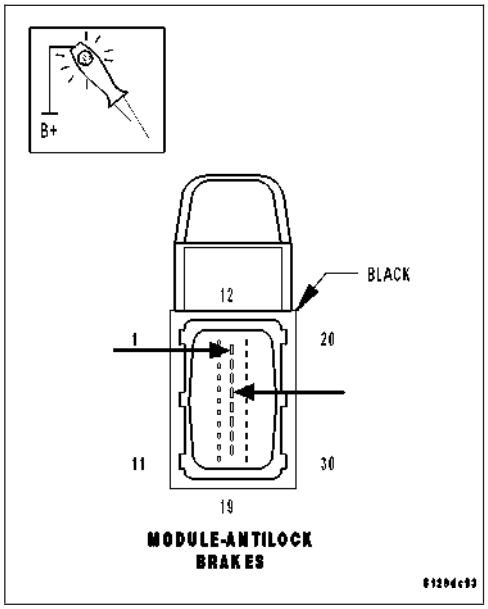
No >> Repair the high resistance in the circuits.
Perform ABS VERIFICATION TEST — VER 1.



C1068-LEFT REAR OUTLET VALVE CONTROL CIRCUIT LOW (CONTINUED)

2. HIGH RESISTANCE IN GROUND CIRCUITS

With a test light Connected to B+ check (Z923) Ground and (Z107) Ground.

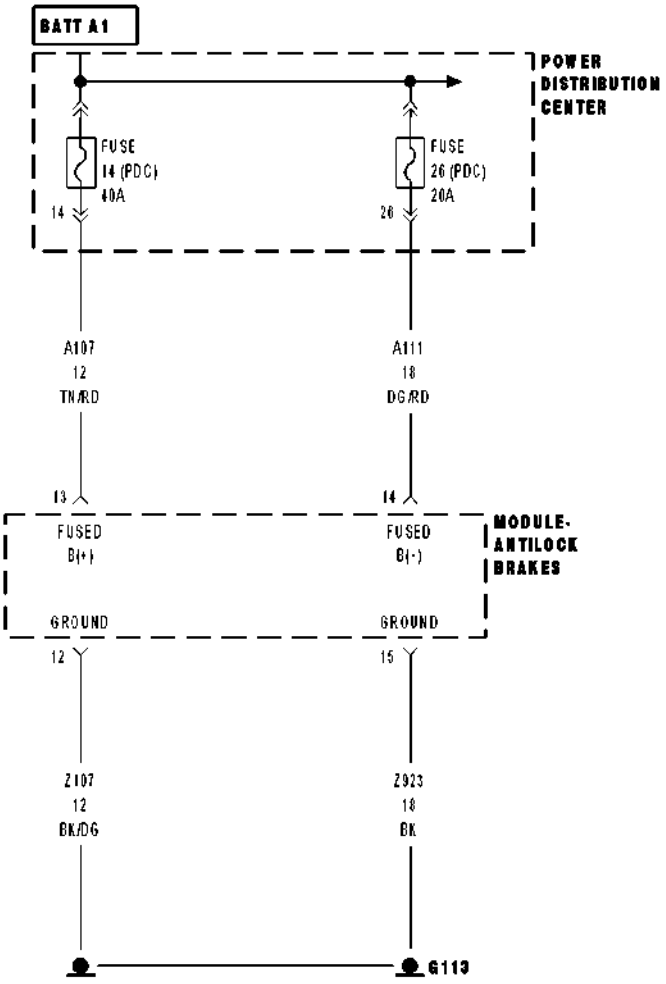


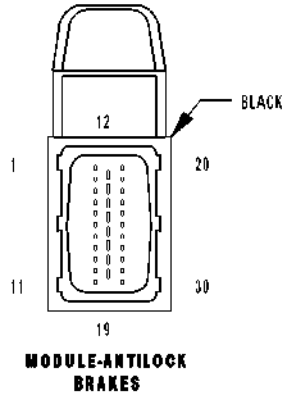
Is the test light bright like when connected to the battery?

Yes >> Replace the ABM per service information.
Perform ABS VERIFICATION TEST — VER 1.

No >> Repair the high resistance in the circuits.
Perform ABS VERIFICATION TEST — VER 1.

C106C-RIGHT REAR OUTLET VALVE CONTROL CIRCUIT LOW





C106C-RIGHT REAR OUTLET VALVE CONTROL CIRCUIT LOW (CONTINUED)

For the ABS circuit diagram (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuous
- **Set Condition:**
  The electrical feedback signal does not match the actustion signal for the corresponding valve.

Possible Causes
HIGH RESISTANCE IN B+ CIRCUITS
HIGH RESISTANCE IN GROUND CIRCUITS
ABM INTERNAL

Diagnostic Test

1. HIGH RESISTANCE IN B+ CIRCUITS

Turn key off.

Disconnect the ABM harness connector.

NOTE: Check connector - Clean/repair as necessary.

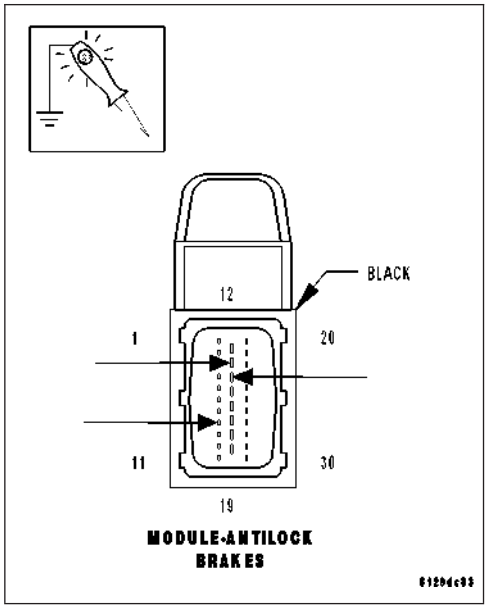
Turn key on, engine off.

With a test light connected to ground check (A107) Fused B+, (A111) Fused B+ and (F500) Fused ignition switch output.

Is the test light bright like when connected to the battery?

Yes >> Go to 2

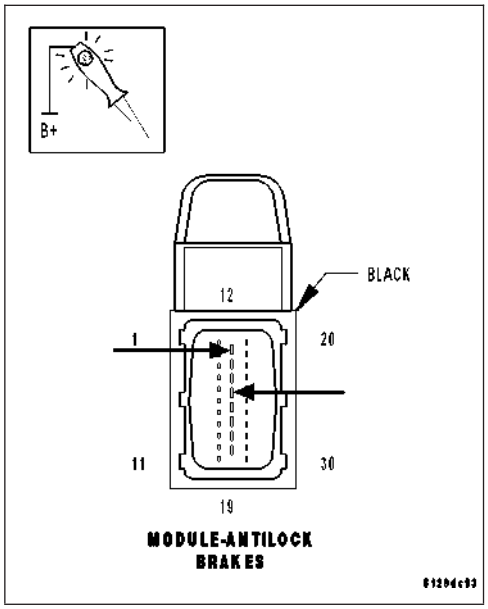
No >> Repair the high resistance in the circuits.
Perform ABS VERIFICATION TEST — VER 1.



C106C-RIGHT REAR OUTLET VALVE CONTROL CIRCUIT LOW (CONTINUED)

2. HIGH RESISTANCE IN GROUND CIRCUITS

With a test light Connected to B+ check (Z923) Ground and (Z107) Ground.

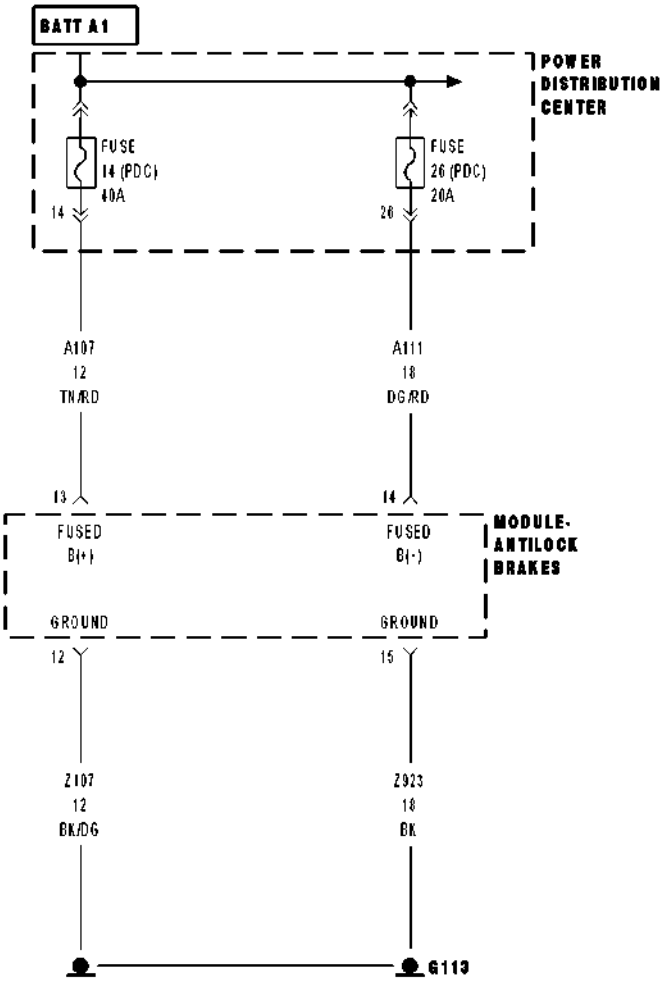


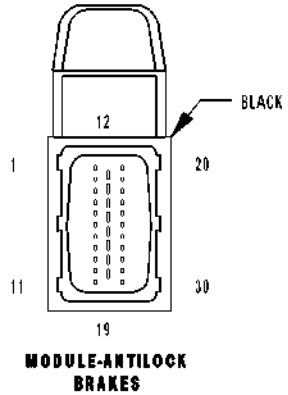
Is the test light bright like when connected to the battery?

Yes >> Replace the ABM per service information.
Perform ABS VERIFICATION TEST — VER 1.

No >> Repair the high resistance in the circuits.
Perform ABS VERIFICATION TEST — VER 1.

C1070-REAR OUTLET VALVE CONTROL CIRCUIT LOW





C1070-REAR OUTLET VALVE CONTROL CIRCUIT LOW (CONTINUED)

For the ABS circuit diagram (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuous
- **Set Condition:**
  The electrical feedback signal does not match the actustion signal for the corresponding valve.

Possible Causes
HIGH RESISTANCE IN B+ CIRCUITS
HIGH RESISTANCE IN GROUND CIRCUITS
ABM INTERNAL

Diagnostic Test

1. HIGH RESISTANCE IN B+ CIRCUITS

Turn key off.

Disconnect the ABM harness connector.

NOTE: Check connector - Clean/repair as necessary.

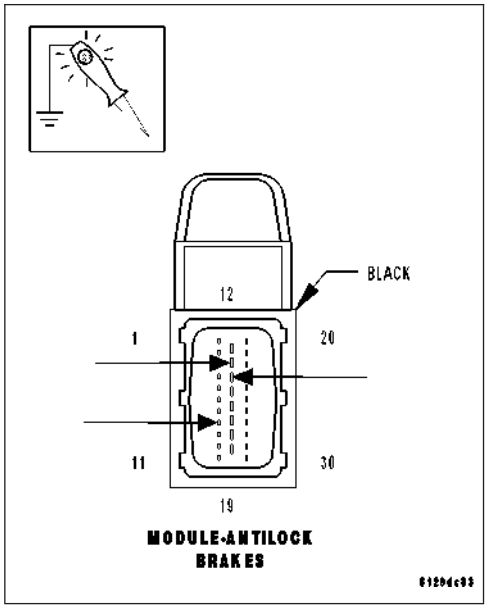
Turn key on, engine off.

With a test light connected to ground check (A107) Fused B+, (A111) Fused B+ and (F500) Fused ignition switch output.

Is the test light bright like when connected to the battery?

Yes >> Go to 2

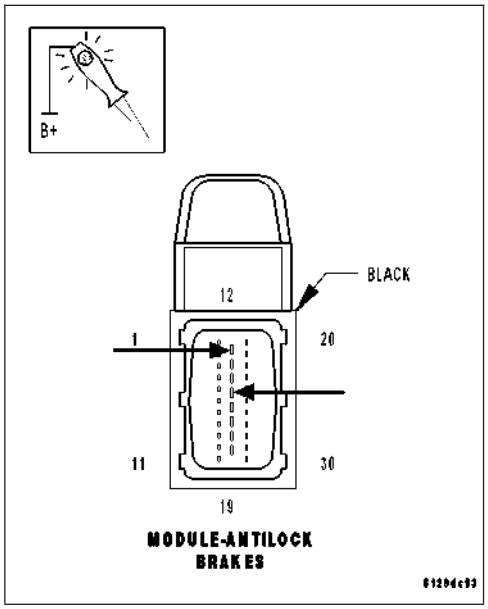
No >> Repair the high resistance in the circuits.
Perform ABS VERIFICATION TEST — VER 1.



C1070-REAR OUTLET VALVE CONTROL CIRCUIT LOW (CONTINUED)

2. HIGH RESISTANCE IN GROUND CIRCUITS

With a test light Connected to B+ check (Z923) Ground and (Z107) Ground.

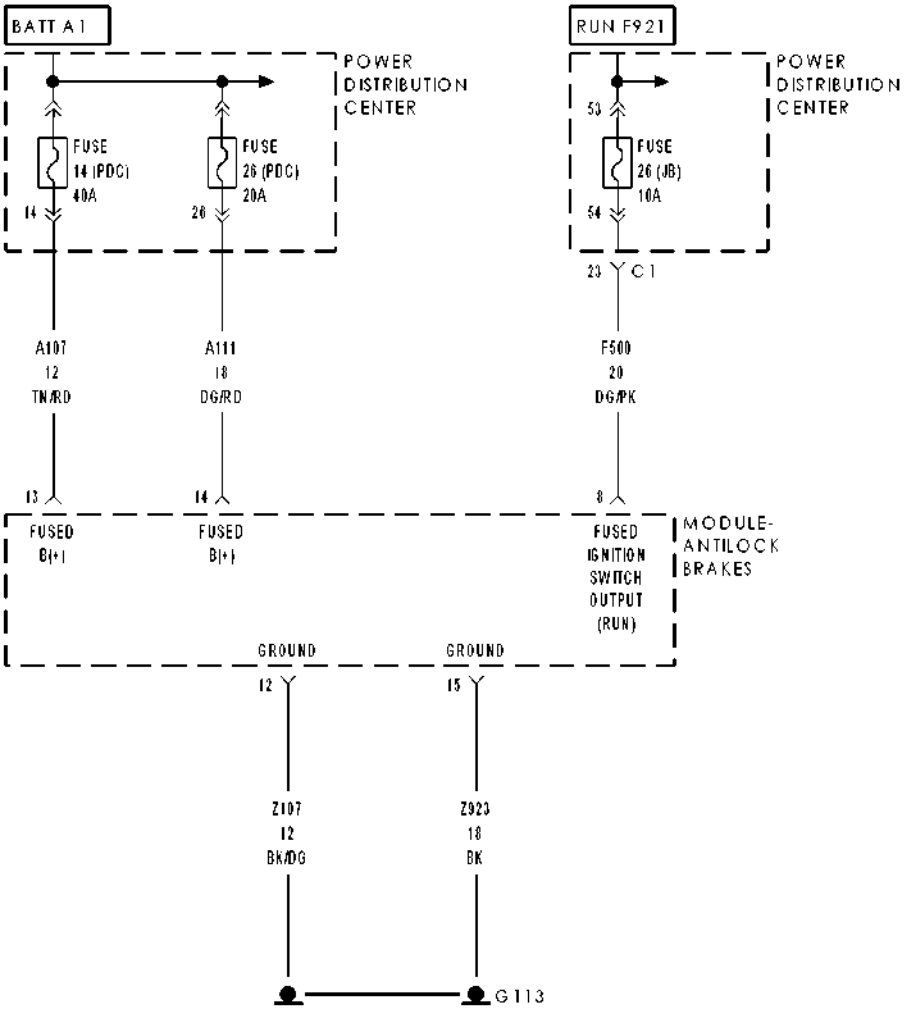


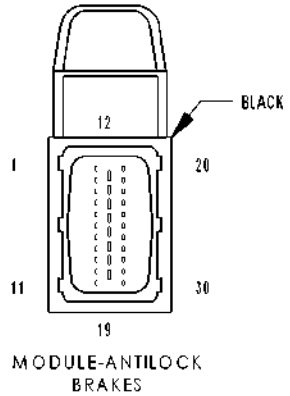
Is the test light bright like when connected to the battery?

Yes >> Replace the ABM per service information.
Perform ABS VERIFICATION TEST — VER 1.

No >> Repair the high resistance in the circuits.
Perform ABS VERIFICATION TEST — VER 1.

C1074-ABS PUMP MOTOR CONTROL CIRCUIT LOW





C1074-ABS PUMP MOTOR CONTROL CIRCUIT LOW (CONTINUED)

For the ABS circuit diagram (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuous
- **Set Condition:**
  The ABM detects low pump motor feedback voltage with actuation of the pump motor relay.

Possible Causes
HIGH RESISTANCE IN B+ CIRCUITS
HIGH RESISTANCE IN GROUND CIRCUITS
ABM INTERNAL

Diagnostic Test

1. HIGH RESISTANCE IN B+ CIRCUITS

Turn key off.

Disconnect the ABM harness connector.

NOTE: Check connector - Clean/repair as necessary.

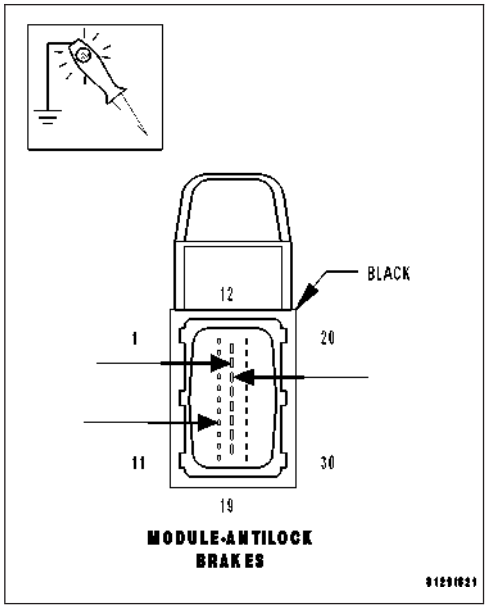
Turn key on, engine off.

With a test light connected to ground check (A107) Fused B+, (A111) Fused B+ and (F500) Fused ignition switch output.

Is the test light bright like when connected to the battery?

Yes >> Go to 2

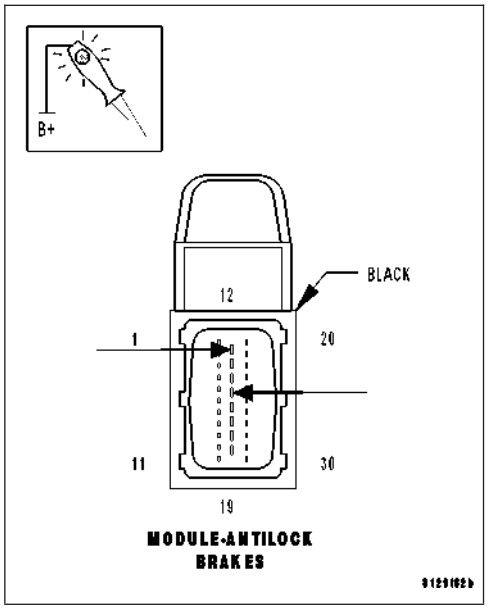
No >> Repair the high resistance in the circuits.
Perform ABS VERIFICATION TEST — VER 1.



C1074-ABS PUMP MOTOR CONTROL CIRCUIT LOW (CONTINUED)

2. HIGH RESISTANCE IN GROUND CIRCUITS

With a test light Connected to B+ check (Z923) Ground and (Z107) Ground.

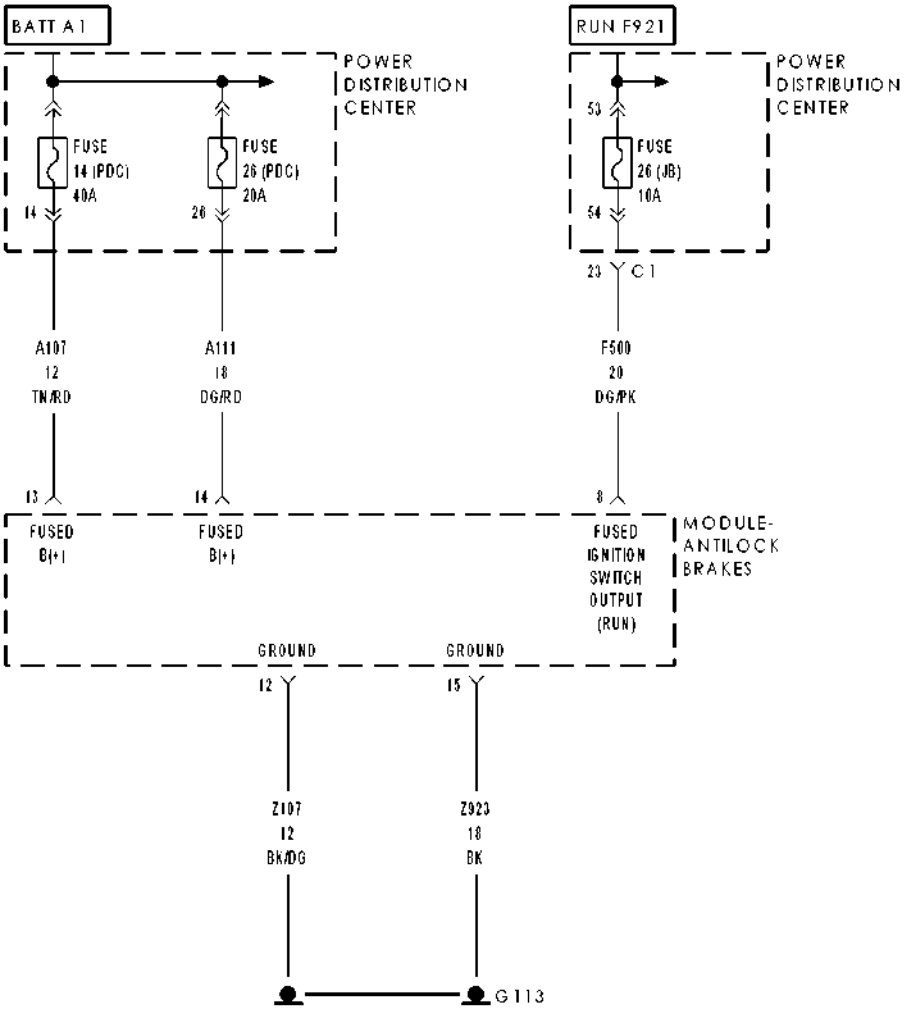


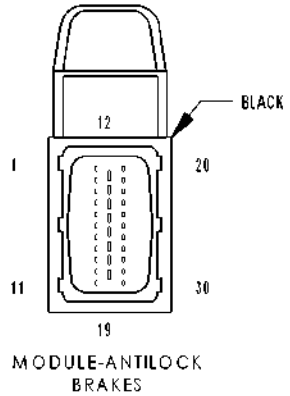
Is the test light bright like when connected to the battery?

Yes >> Replace the ABM per service information.
Perform ABS VERIFICATION TEST — VER 1.

No >> Repair the high resistance in the circuits.
Perform ABS VERIFICATION TEST — VER 1.

C1077-ABS PUMP MOTOR EXCESSIVE ON TIME





C1077-ABS PUMP MOTOR EXCESSIVE ON TIME (CONTINUED)

For the ABS circuit diagram (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuous
- **Set Condition:**
  The ABM detects pump motor feedback voltage with no actuation of the pump motor relay for more than 2.5 sec.

Possible Causes
HIGH RESISTANCE IN B+ CIRCUITS
HIGH RESISTANCE IN GROUND CIRCUITS
ABM INTERNAL

Diagnostic Test

1. HIGH RESISTANCE IN B+ CIRCUITS

Turn key off.

Disconnect the ABM harness connector.

NOTE: Check connector - Clean/repair as necessary.

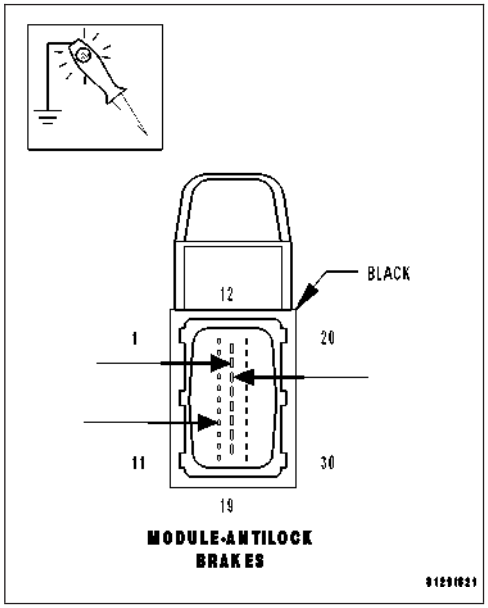
Turn key on, engine off.

With a test light connected to ground check (A107) Fused B+, (A111) Fused B+ and (F500) Fused ignition switch output.

Is the test light bright like when connected to the battery?

Yes >> Go to 2

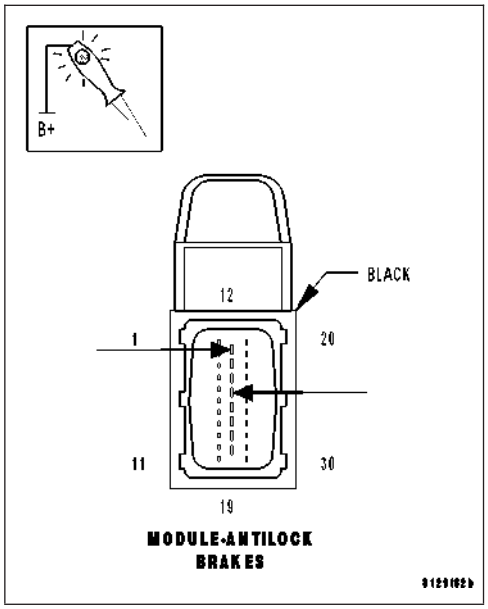
No >> Repair the high resistance in the circuits.
Perform ABS VERIFICATION TEST — VER 1.



C1077-ABS PUMP MOTOR EXCESSIVE ON TIME (CONTINUED)

2. HIGH RESISTANCE IN GROUND CIRCUITS

With a test light Connected to B+ check (Z923) Ground and (Z107) Ground.



Is the test light bright like when connected to the battery?

Yes >> Replace the ABM per service information.
Perform ABS VERIFICATION TEST — VER 1.

No >> Repair the high resistance in the circuits.
Perform ABS VERIFICATION TEST — VER 1.

C1078-TIRE EVOLUTIONS RANGE PERFORMANCE

TRUCK VSS PROGRAMMING PARAMETER						
TIRE SIZE	TIRE NAME	TIRE SALES CODE	AXLE SALES CODE	TIRE REVS PER MILE	PINION FACTOR	BRAKES Sales Code
P245/70R17	GY WRANGLER SRA	TTH = TUW	DRB	655	108	BRT - BNM
P245/70R17	GY WRANGLER SRA	TTH = TUW	DRA	655	104	BRT - BNM
P245/70R17	GY WRANGLER SRA	TTH = TUW	DRB = DRA	655	48	BRT + BNM
P265/65R17	GY WRANGLER SRA	TXK = TXX	DRB	655	108	BRT - BNM
P265/65R17	GY WRANGLER SRA	TXK = TXX	DRA	655	104	BRT - BNM
P265/65R17	GY WRANGLER SRA	TXK = TXX	DRB = DRA	655	48	BRT + BNM
P275/60R17	GY Eagle RS-A	TX2	DRB	660	108	BRT - BNM
P275/60R17	GY Eagle RS-A	TX2	DRA	660	104	BRT - BNM
P275/60R17	GY Eagle RS-A	TX2	DRB = DRA	660	48	BRT + BNM

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C1078-TIRE EVOLUTIONS RANGE PERFORMANCE (CONTINUED)

For the ABS circuit diagram (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuous.
- **Set Condition:**
  Programmed value for tire sizeis not within acceptable range.

Possible Causes
INCORRECT VALUE PROGRAMED INTO ABM

Diagnostic Test

1. INCORRECT VALUE PROGRAMED INTO ABM

Verify the correct Tire/wheel information is programed in the ABM.

Is the correct value programed is the ABM acording to the chart?

Yes >> Test complete.
Perform ABS VERIFICATION TEST — VER 1.

No >> Program the correct Tire/Wheel information in the ABM.
Perform ABS VERIFICATION TEST — VER 1.

P1079-TONE WHEEL TEETH COUNT RANGE PERFORMANCE

TRUCK VSS PROGRAMMING PARAMETER						
TIRE SIZE	TIRE NAME	TIRE SALES CODE	AXLE SALES CODE	TIRE REVS PER MILE	PINION FACTOR	BRAKES Sales Code
P245/70R17	GY WRANGLER SRA	TTH = TUW	DRB	655	108	BRT - BNM
P245/70R17	GY WRANGLER SRA	TTH = TUW	DRA	655	104	BRT - BNM
P245/70R17	GY WRANGLER SRA	TTH = TUW	DRB = DRA	655	48	BRT + BNM
P265/65R17	GY WRANGLER SRA	TXK = TXX	DRB	655	108	BRT - BNM
P265/65R17	GY WRANGLER SRA	TXK = TXX	DRA	655	104	BRT - BNM
P265/65R17	GY WRANGLER SRA	TXK = TXX	DRB = DRA	655	48	BRT + BNM
P275/60R17	GY Eagle RS-A	TX2	DRB	660	108	BRT - BNM
P275/60R17	GY Eagle RS-A	TX2	DRA	660	104	BRT - BNM
P275/60R17	GY Eagle RS-A	TX2	DRB = DRA	660	48	BRT + BNM

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P1079-TONE WHEEL TEETH COUNT RANGE PERFORMANCE (CONTINUED)

For the ABS circuit diagram (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuous.
- **Set Condition:**
  Programmed value for tone wheel is not within acceptable range.

Possible Causes
WRONG TONE WHEEL PROGRAMED INTO THE ABM

Diagnostic Test

1. WRONG TONE WHEEL PROGRAMED INTO THE ABM

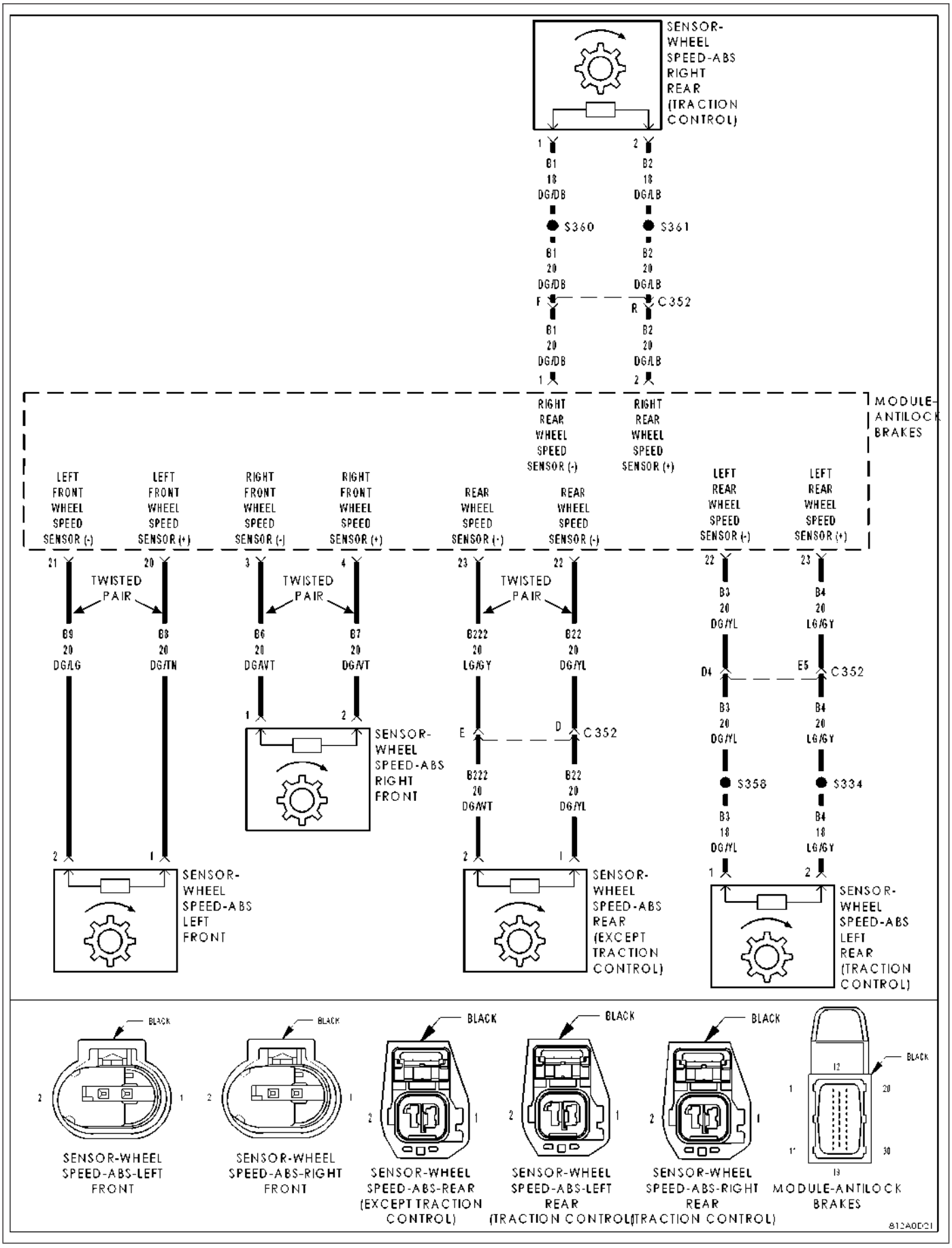
Compair the programed tone wheel value in the ABM to the actual tone wheels on the vehicle.

Is the ABM programed correctly?

Yes >> Test Complete.
Perform ABS VERIFICATION TEST VER — 1.

No >> Reprogram the ABM with the correct values.
Perform ABS VERIFICATION TEST VER — 1.

C107B–WHEEL SPEED COMPARATIVE PERFORMANCE



C107B–WHEEL SPEED COMPARATIVE PERFORMANCE (CONTINUED)

For the Anti-Lock Brake System circuit diagram. (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When one or more WSS reading is different from the readings received from the other WSS's. The Anti-Lock Brake Module compares WSS readings from side-to-side on an axle and front-to-rear.

Possible Causes
WSS LOOSE - SIGNAL,SUPPLY CIRCUITS/CONNECTOR/TERMINAL DAMAGE
BRAKE SYSTEM FAULT
TONE WHEEL DAMAGE
WSS - INTERNAL FAULT
ANTI-LOCK BRAKE MODULE - INTERNAL FAULT

Diagnostic Test

1.

NOTE: This DTC must be active for the results of this test to be valid. CHECK FOR DTC C107B–WHEEL SPEED COMPARATIVE PERFORMANCE

Turn the ignition on.

With the scan tool, record and erase DTC's.

Cycle the ignition switch from off to on.

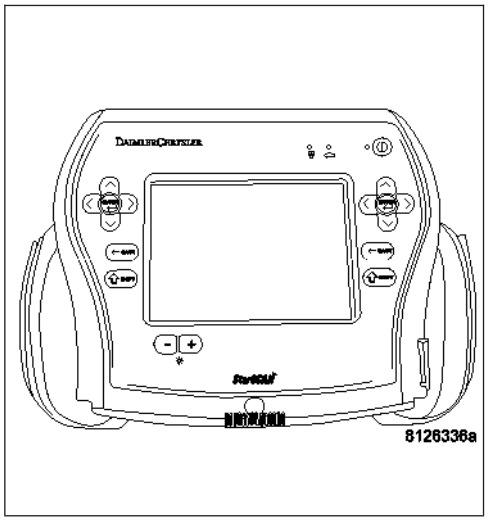
With the scan tool, read DTC's

NOTE: The Anti-Lock Brake Module must sense ALL 4 wheels at 12 km/h (7.5 m.p.h.) before it will extinguish the ABS indicators.

Does the scan tool display: C107B–WHEEL SPEED COMPARATIVE PERFORMANCE?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION diagnostic procedure.
Perform ABS VERIFICATION TEST - VER 1.



C107B–WHEEL SPEED COMPARATIVE PERFORMANCE (CONTINUED)

2. CHECK WHEEL SPEED SENSOR SIGNALS

Turn the ignition on.

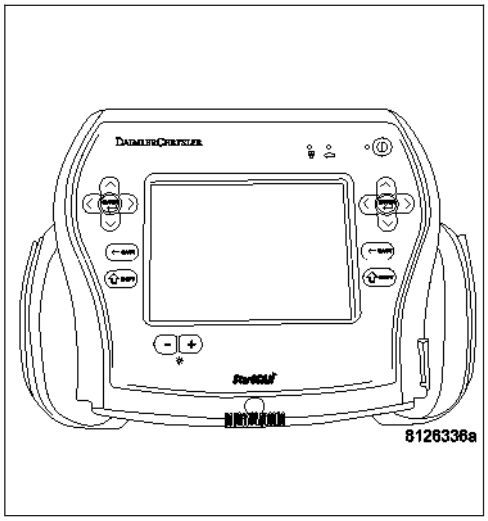
With the scan tool, monitor ALL the WSS speeds while an assistant drives the vehicle.

Slowly accelerate as straight as possible from a stop to 40 km/h (25 m.p.h.).

Is one or more WSS speeds showing 0 km/h (0 m.p.h.) or not matching other wheel speeds?

Yes >> Go To 3

No >> Refer to the INTERMITTENT CONDITION diagnostic procedure.
Perform ABS VERIFICATION TEST - VER 1.



3. CHECK WSS LOOSENESS, INSPECT SIGNAL,SUPPLY CIRCUITS/CONNECTORS/TERMINALS FOR DAMAGE

NOTE: Check all terminals for broken, bent, pushed out, or corroded terminals.

Turn the ignition off.

Inspect the Anti-Lock Brake Module harness connector, each WSS, and each WSS harness connector.

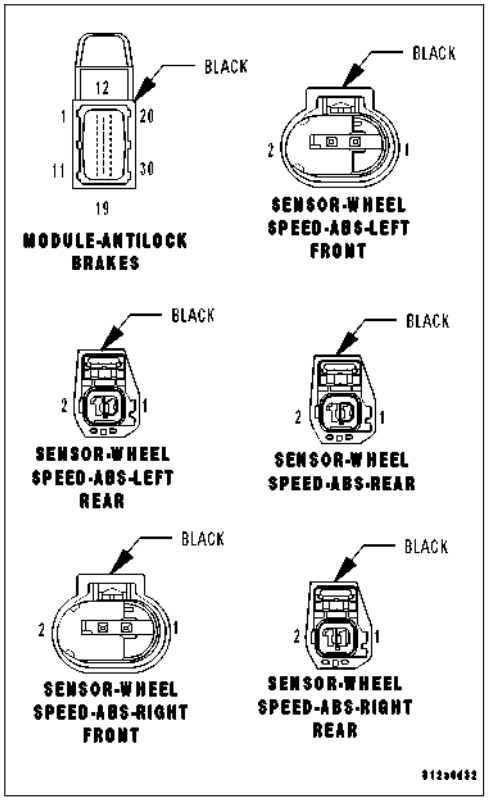
Inspect each WSS for looseness and not properly fastened.

Inspect each WSS Signal and WSS Supply circuits between each WSS and Anti-Lock Brake Module for damage.

Is any WSS loose or any of the wiring/connectors/terminals damaged?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 4



C107B–WHEEL SPEED COMPARATIVE PERFORMANCE (CONTINUED)

4. CHECK BRAKE SYSTEM

Turn the ignition off.
Check the brake fluid level.
Check for trapped air in brake lines.
Inspect for brake fluid leakage on vehicle.
Inspect for loose mounted brake hardware.

Is any of the above conditions present?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 5

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5. CHECK EACH TONE WHEEL FOR DAMAGE

Turn the ignition off.
Inspect each Tone Wheel for damage, missing teeth, cracks, or looseness.

NOTE: The Tone Wheel teeth should be perfectly square, not bent, or nicked.

Is the Tone Wheels damaged?

Yes >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go To 6

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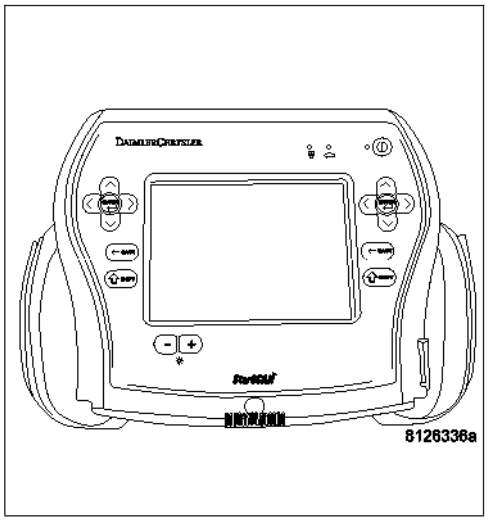
6. ANTI-LOCK BRAKE MODULE – INTERNAL FAULT

Turn the ignition off.
Replace all WSS's.
With the scan tool, erase DTC's.
Road test the vehicle over 40 km/h (25 m.p.h.).
Turn the ignition on.
With the scan tool, read DTC's

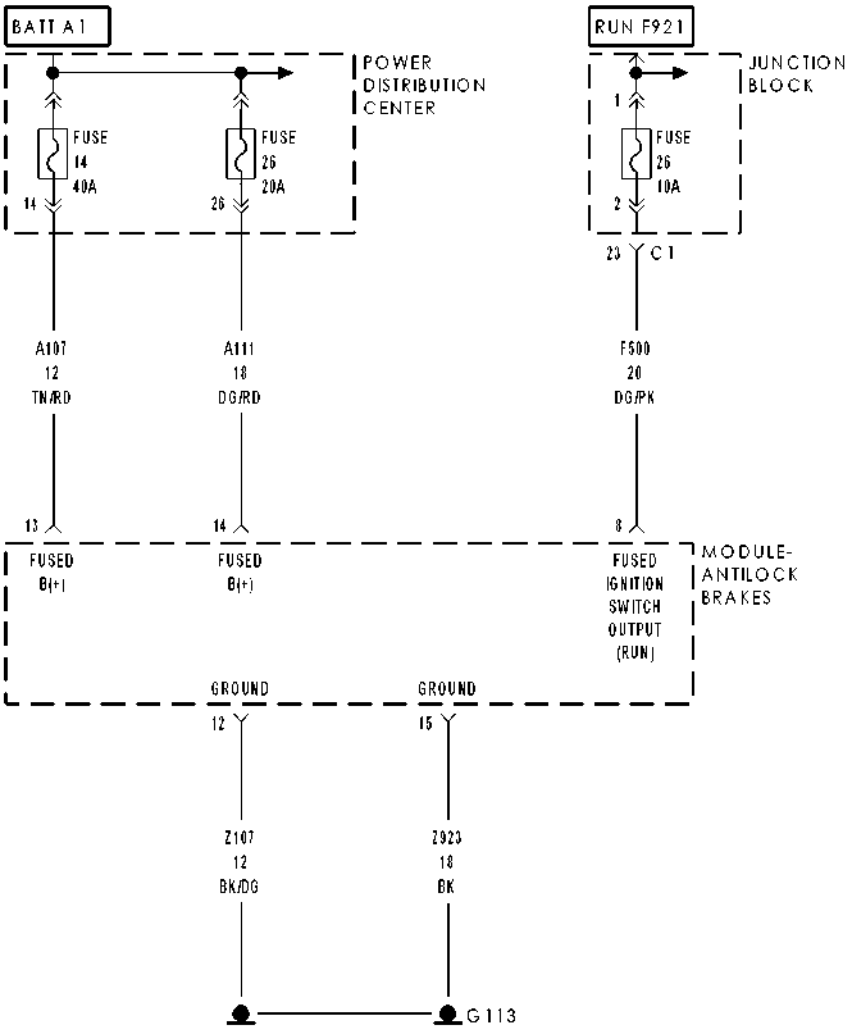
Did the DTC C107B–WHEEL SPEED COMPARATIVE PERFORMANCE reset?

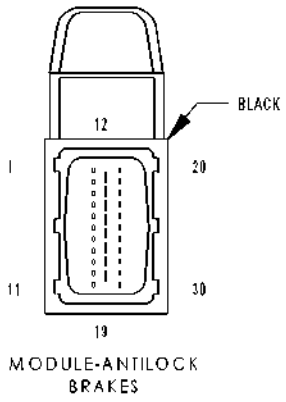
Yes >> Replace the Anti-Lock Brake Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1.

No >> Test Complete.



C1201-FRONT TRACTION CONTROL INLET VALVE CONTROL CIRCUIT LOW





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C1201-FRONT TRACTION CONTROL INLET VALVE CONTROL CIRCUIT LOW (CONTINUED)

For the ABS circuit diagram (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuous
- **Set Condition:**
  The electrical feedback of the power stage does not correspond with the activation of the respective valve.

Possible Causes
HIGH RESISTANCE IN B+ CIRCUITS
HIGH RESISTANCE IN GROUND CIRCUITS
ABM INTERNAL

Diagnostic Test

1. HIGH RESISTANCE IN B+ CIRCUITS

Turn key off.

Disconnect the ABM harness connector.

NOTE: Check connector - Clean/repair as necessary.

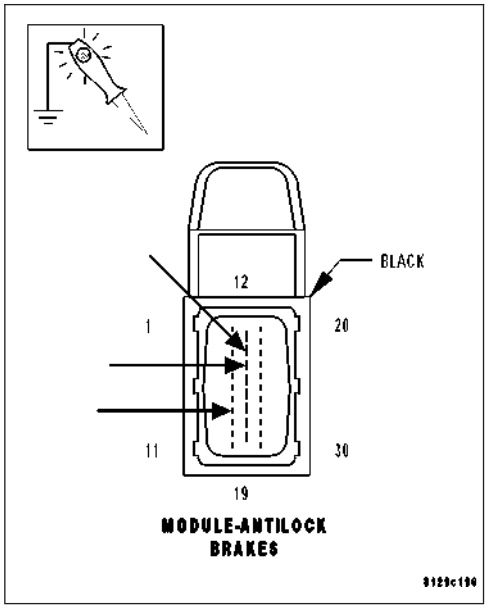
Turn key on, engine off.

With a test light connected to ground check (A107) Fused B+, (A111) Fused B+ and (F500) Fused ignition switch output.

Is the test light bright like when connected to the battery?

Yes >> Go to 2

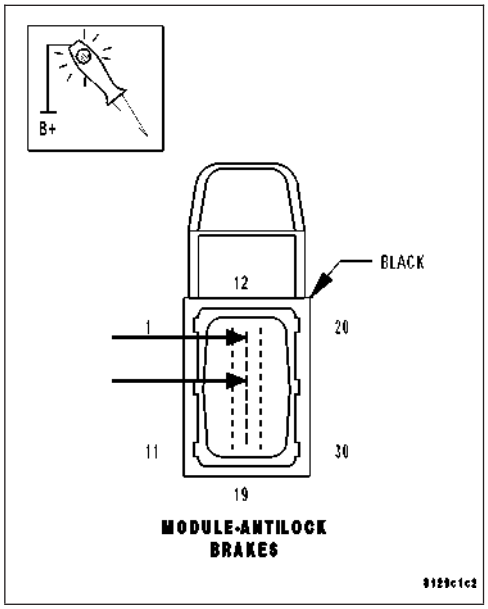
No >> Repair the high resistance in the circuits.
Perform ABS VERIFICATION TEST — VER 1.



C1201-FRONT TRACTION CONTROL INLET VALVE CONTROL CIRCUIT LOW (CONTINUED)

2. HIGH RESISTANCE IN GROUND CIRCUITS

With a test light Connected to B+ check (Z923) Ground and (Z107) Ground.

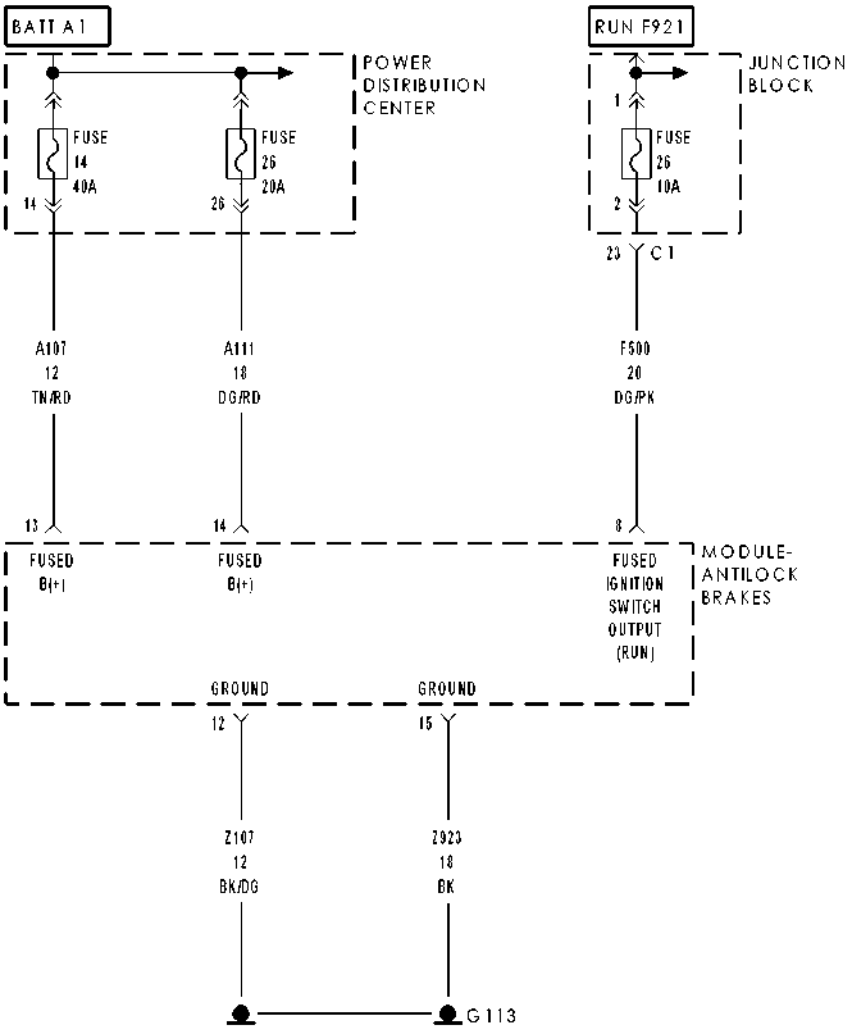


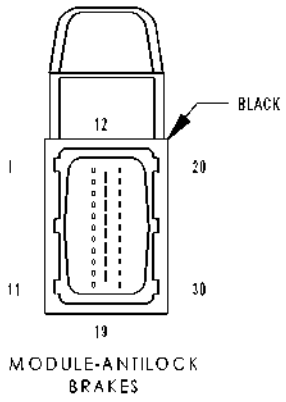
Is the test light bright like when connected to the battery?

Yes >> Replace the ABM per service information.
Perform ABS VERIFICATION TEST — VER 1.

No >> Repair the high resistance in the circuits.
Perform ABS VERIFICATION TEST — VER 1.

C1205-REAR TRACTION CONTROL INLET VALVE CONTROL CIRCUIT LOW





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C1205-REAR TRACTION CONTROL INLET VALVE CONTROL CIRCUIT LOW (CONTINUED)

For the ABS circuit diagram (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuous
- **Set Condition:**
  The electrical feedback of the power stage does not correspond with the activation of the respective valve.

Possible Causes
HIGH RESISTANCE IN B+ CIRCUITS
HIGH RESISTANCE IN GROUND CIRCUITS
ABM INTERNAL

Diagnostic Test

1. HIGH RESISTANCE IN B+ CIRCUITS

Turn key off.

Disconnect the ABM harness connector.

NOTE: Check connector - Clean/repair as necessary.

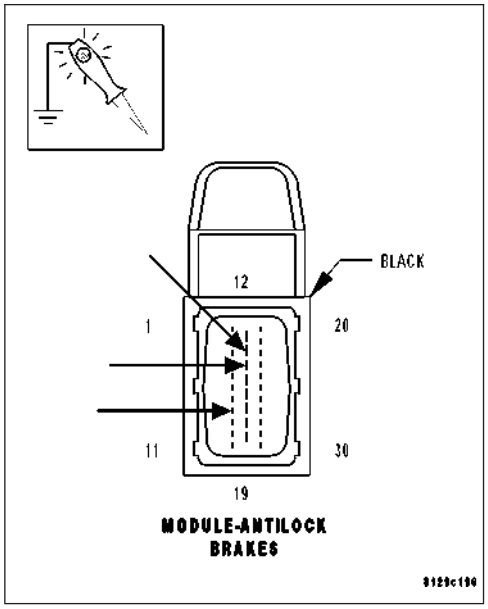
Turn key on, engine off.

With a test light connected to ground check (A107) Fused B+, (A111) Fused B+ and (F500) Fused ignition switch output.

Is the test light bright like when connected to the battery?

Yes >> Go to 2

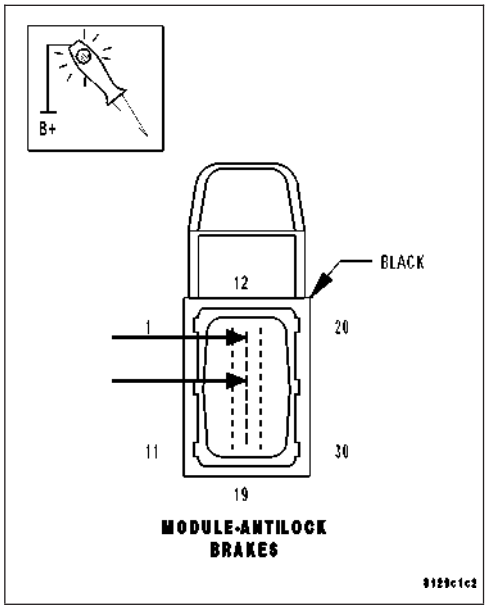
No >> Repair the high resistance in the circuits.
Perform ABS VERIFICATION TEST — VER 1.



C1205-REAR TRACTION CONTROL INLET VALVE CONTROL CIRCUIT LOW (CONTINUED)

2. HIGH RESISTANCE IN GROUND CIRCUITS

With a test light Connected to B+ check (Z923) Ground and (Z107) Ground.

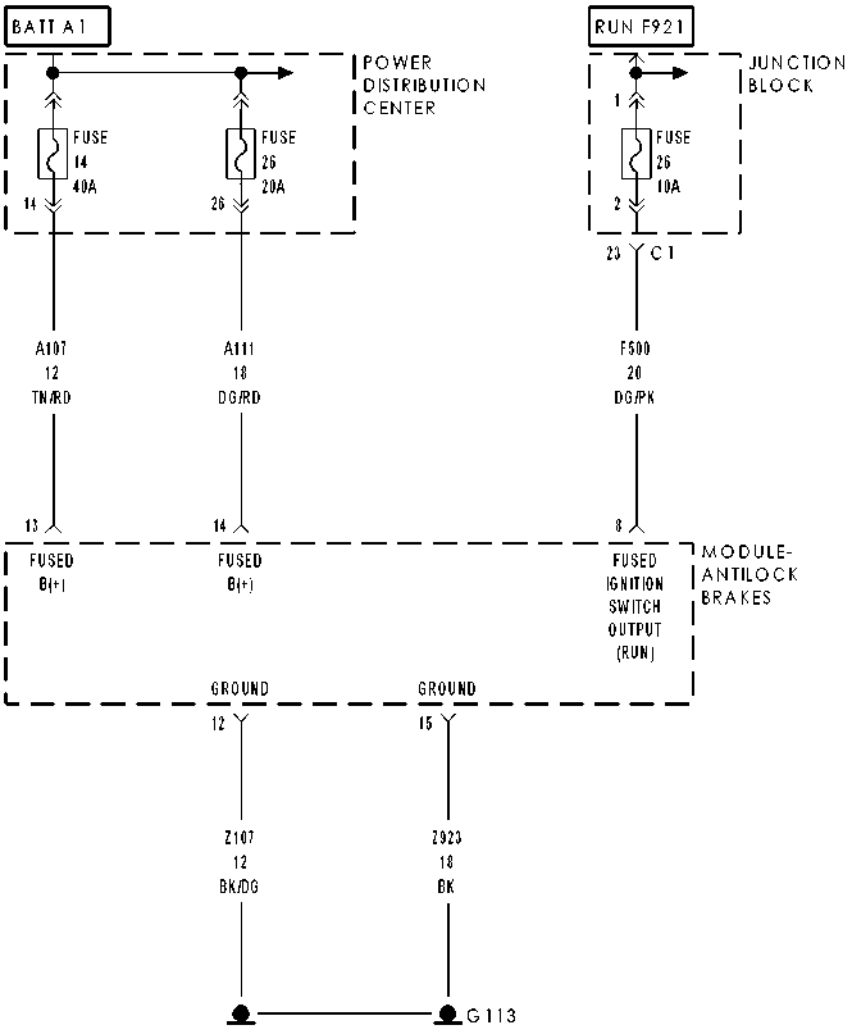


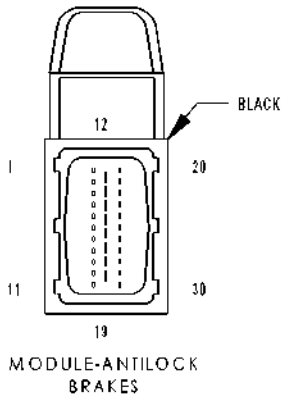
Is the test light bright like when connected to the battery?

Yes >> Replace the ABM per service information.
Perform ABS VERIFICATION TEST — VER 1.

No >> Repair the high resistance in the circuits.
Perform ABS VERIFICATION TEST — VER 1.

C1209-FRONT TRACTION CONTROL PRIME VALVE CONTROL CIRCUIT LOW





8129c130

C1209-FRONT TRACTION CONTROL PRIME VALVE CONTROL CIRCUIT LOW (CONTINUED)

For the ABS circuit diagram (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuous
- **Set Condition:**
  The electrical feedback of the power stage does not correspond with the activation of the respective valve.

Possible Causes
HIGH RESISTANCE IN B+ CIRCUITS
HIGH RESISTANCE IN GROUND CIRCUITS
ABM INTERNAL

Diagnostic Test

1. HIGH RESISTANCE IN B+ CIRCUITS

Turn key off.

Disconnect the ABM harness connector.

NOTE: Check connector - Clean/repair as necessary.

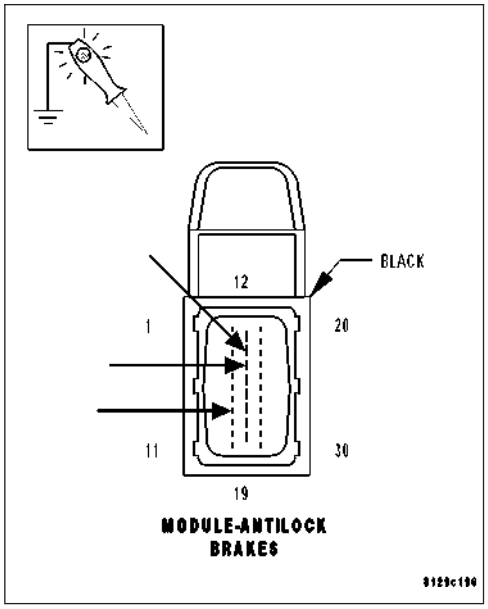
Turn key on, engine off.

With a test light connected to ground check (A107) Fused B+, (A111) Fused B+ and (F500) Fused ignition switch output.

Is the test light bright like when connected to the battery?

Yes >> Go to 2

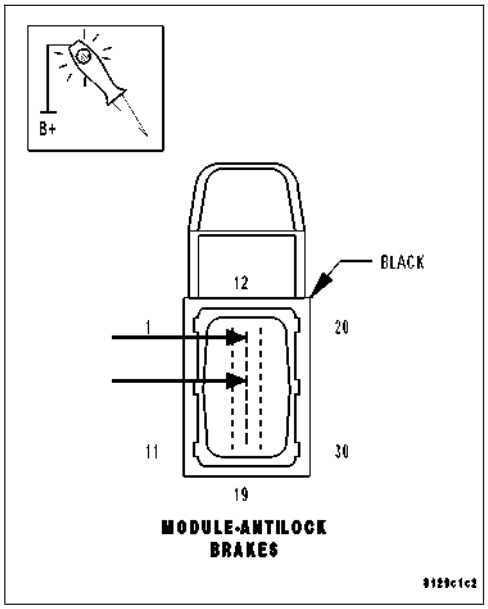
No >> Repair the high resistance in the circuits.
Perform ABS VERIFICATION TEST — VER 1.



C1209-FRONT TRACTION CONTROL PRIME VALVE CONTROL CIRCUIT LOW (CONTINUED)

2. HIGH RESISTANCE IN GROUND CIRCUITS

With a test light Connected to B+ check (Z923) Ground and (Z107) Ground.

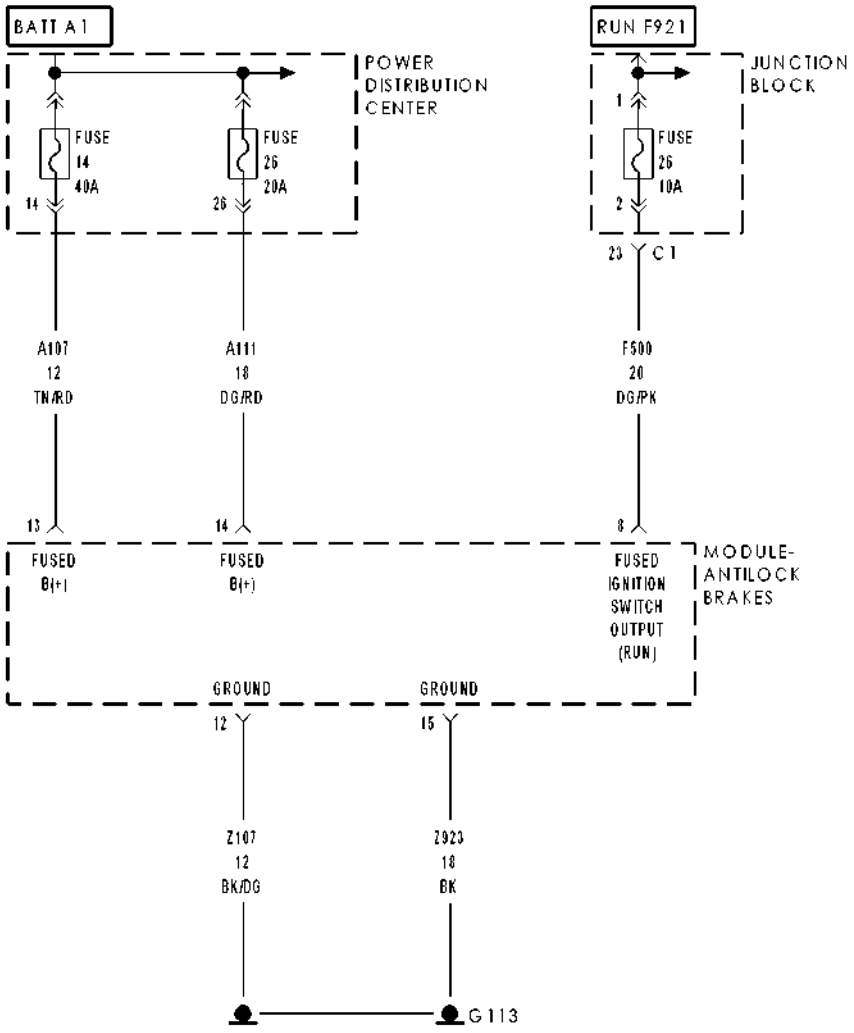


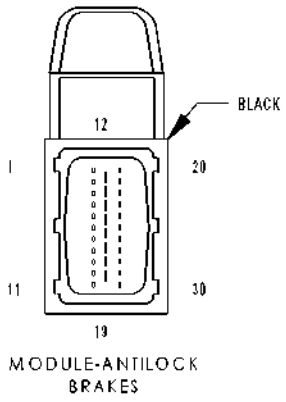
Is the test light bright like when connected to the battery?

Yes >> Replace the ABM per service information.
Perform ABS VERIFICATION TEST — VER 1.

No >> Repair the high resistance in the circuits.
Perform ABS VERIFICATION TEST — VER 1.

C120D-REAR TRACTION CONTROL PRIME VALVE CONTROL CIRCUIT LOW





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C120D-REAR TRACTION CONTROL PRIME VALVE CONTROL CIRCUIT LOW (CONTINUED)

For the ABS circuit diagram (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuous
- **Set Condition:**
  The electrical feedback of the power stage does not correspond with the activation of the respective valve.

Possible Causes
HIGH RESISTANCE IN B+ CIRCUITS
HIGH RESISTANCE IN GROUND CIRCUITS
ABM INTERNAL

Diagnostic Test

1. HIGH RESISTANCE IN B+ CIRCUITS

Turn key off.

Disconnect the ABM harness connector.

NOTE: Check connector - Clean/repair as necessary.

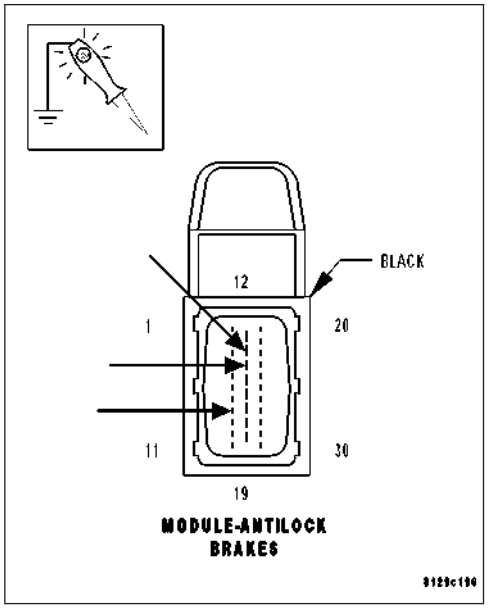
Turn key on, engine off.

With a test light connected to ground check (A107) Fused B+, (A111) Fused B+ and (F500) Fused ignition switch output.

Is the test light bright like when connected to the battery?

Yes >> Go to 2

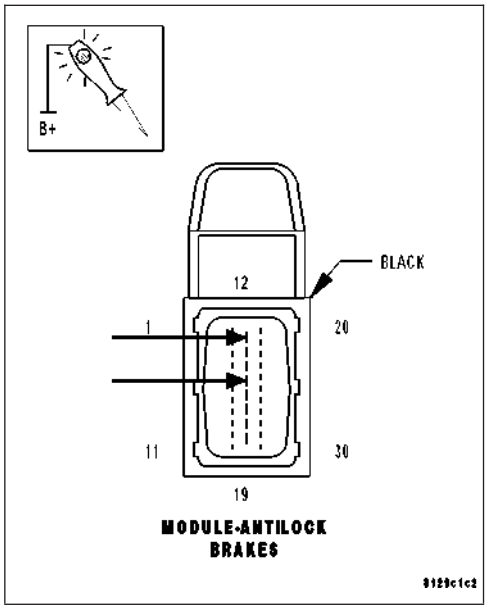
No >> Repair the high resistance in the circuits.
Perform ABS VERIFICATION TEST — VER 1.



C120D-REAR TRACTION CONTROL PRIME VALVE CONTROL CIRCUIT LOW (CONTINUED)

2. HIGH RESISTANCE IN GROUND CIRCUITS

With a test light Connected to B+ check (Z923) Ground and (Z107) Ground.

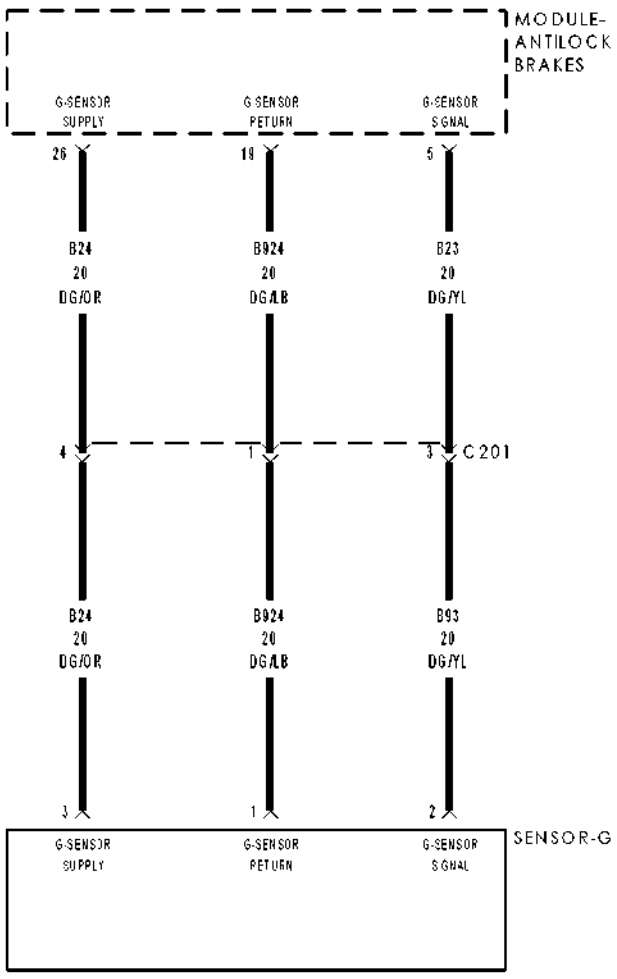


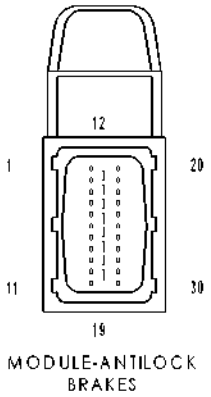
Is the test light bright like when connected to the battery?

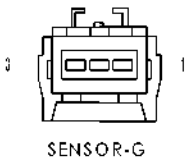
Yes >> Replace the ABM per service information.
Perform ABS VERIFICATION TEST — VER 1.

No >> Repair the high resistance in the circuits.
Perform ABS VERIFICATION TEST — VER 1.

C1210-G SENSOR INPUT CIRCUIT PERFORMANCE







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C1210-G SENSOR INPUT CIRCUIT PERFORMANCE (CONTINUED)

For the ABS circuit diagram (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  After initialization.
- **Set Condition:**
  The voltage of the G-sensor is out of range < 0.48 volts or > 4.82 volts.

Possible Causes
(B24) G-SENSOR SUPPLY CIRCUIT OPEN
(B24) G-SENSOR SUPPLY CIRCUIT SHORT TO GROUND
(B23) G-SENSOR SIGNAL CIRCUIT OPEN
(B23) G-SENSOR SIGNAL CIRCUIT SHORT TO GROUND
(B924) G-SENSOR RETURN CIRCUIT OPEN
(B924) G-SENSOR RETURN CIRCUIT SHORT TO GROUND
G-SENSOR

1. (B24) G-sensor supply circuit open

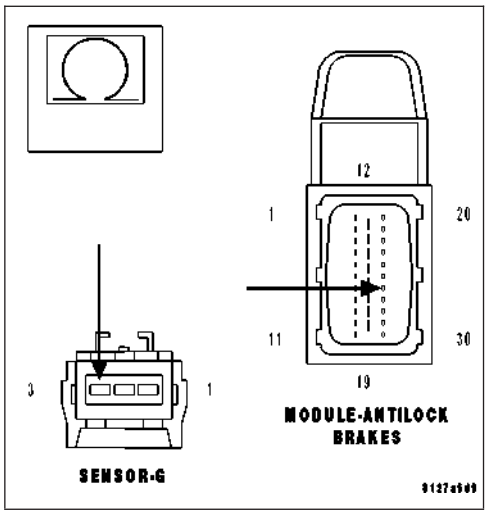
Turn the ignition off.
Disconnect the Anti-lock Brake module harness connector.
Disconnect the G—sensor harness connector.

NOTE: Check connector - Clean/repair as necessary.
Measure the resistance of the (B24) G-sensor supply circuit from the G-sensor harness connector to the Anti-lock brake module.

Is the resistance above 5 ohms?

Yes >> Repair the open (B24) G-sensor supply circuit.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go to 2



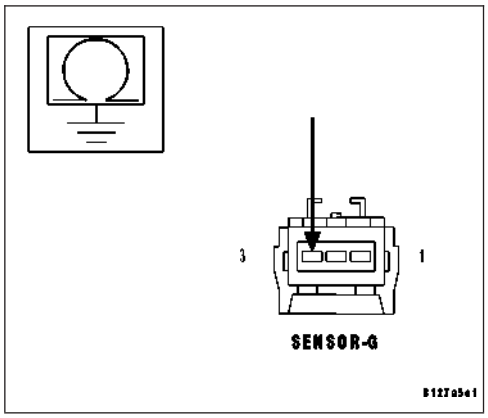
2. (B24) G-sensor supply circuit shorted to ground

Measure the resistance of the (B24) G-sensor supply circuit from the G-sensor harness connector to ground.

Is the resistance below 5 ohms?

Yes >> Repair the (B24) G-sensor supply circuit shorted to ground.
Perform ABS VERIFICATION TEST - VER 1.

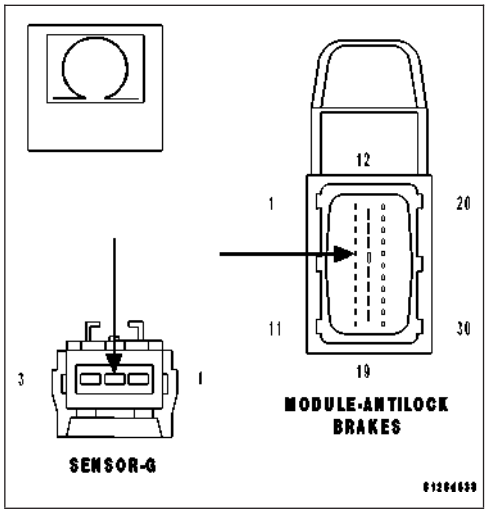
No >> Go to 3



C1210-G SENSOR INPUT CIRCUIT PERFORMANCE (CONTINUED)

3. (B23) G-sensorsignal circuit open

Measure the resistance of the (B23) G-sensor signal circuit from the G-sensor harness connector to the Anti-lock brake module.



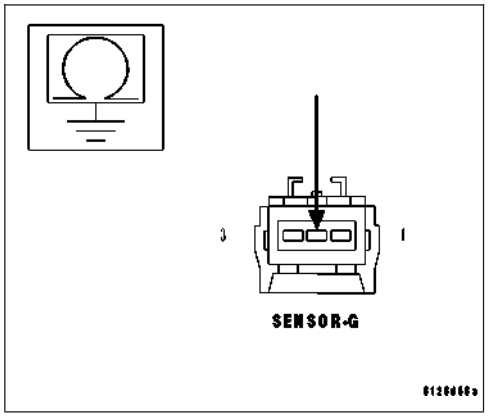
Is the resistance above 5 ohms?

Yes >> Repair the open (B23) G-sensor signal circuit. Perform ABS VERIFICATION TEST - VER 1.

No >> Go to 4

4. (B23) G-sensor signal circuit shorted to ground

Measure the resistance of the (B23) G-sensor signal circuit from the G-sensor harness connector to ground.



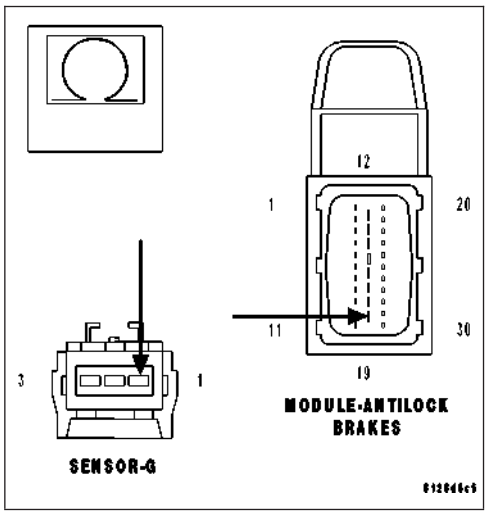
Is the resistance below 5 ohms?

Yes >> Repair the (B23) G-sensor signal circuit shorted to ground. Perform ABS VERIFICATION TEST - VER 1.

No >> Go to 5

5. (B924) G-sensor return circuit open

Measure the resistance of the (B924) G-sensor return circuit from the G-sensor harness connector to the Anti-lock brake module.



Is the resistance above 5 ohms?

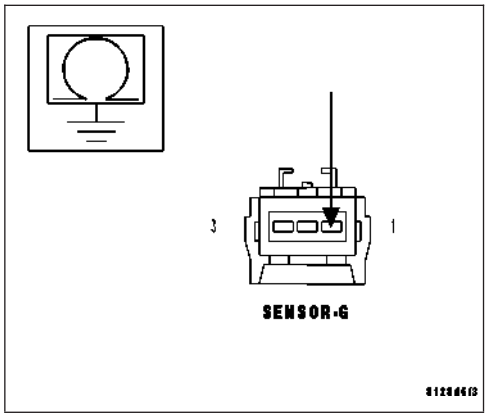
Yes >> Repair the open (B924) G-sensor return circuit. Perform ABS VERIFICATION TEST - VER 1.

No >> Go to 6

C1210-G SENSOR INPUT CIRCUIT PERFORMANCE (CONTINUED)

6. (B924) G-sensor return circuit shorted to ground

Measure the resistance of the (B924) G-sensor return circuit from the G-sensor harness connector to ground.

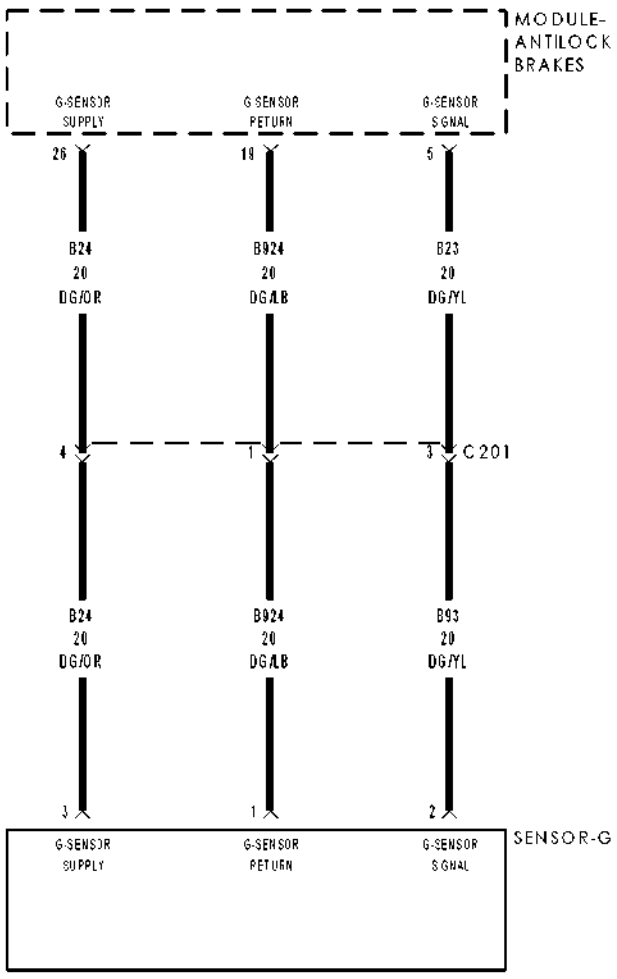


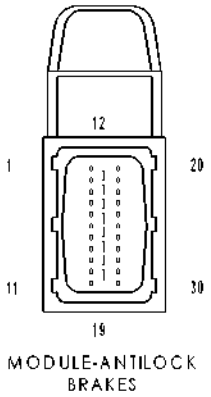
Is the resistance below 5 ohms?

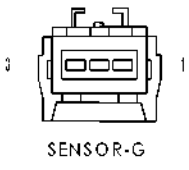
Yes >> Repair the (B924) G-sensor return circuit shorted to ground.
Perform ABS VERIFICATION TEST - VER 1.

No >> Replace the G-sensor.
Perform ABS VERIFICATION TEST - VER 1.

C1213-G SENSOR INPUT SIGNAL STUCK







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C1213-G SENSOR INPUT SIGNAL STUCK (CONTINUED)

For the ABS circuit diagram (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition ON. Continuously monitored when speed is greater than 2 km/h (1 mph) and there is no Brake Lamp Switch input.
- **Set Condition:**
  When the ABM detects a condition outside programmed parameters from the G-Sensor.

Possible Causes
(B24) G-SENSOR SUPPLY CIRCUIT OPEN
(B24) G-SENSOR SUPPLY CIRCUIT SHORT TO GROUND
(B23) G-SENSOR SIGNAL CIRCUIT OPEN
(B23) G-SENSOR SIGNAL CIRCUIT SHORT TO GROUND
(B924) G-SENSOR RETURN CIRCUIT OPEN
(B924) G-SENSOR RETURN CIRCUIT SHORT TO GROUND
G-SENSOR

1. (B24) G-sensor supply circuit open

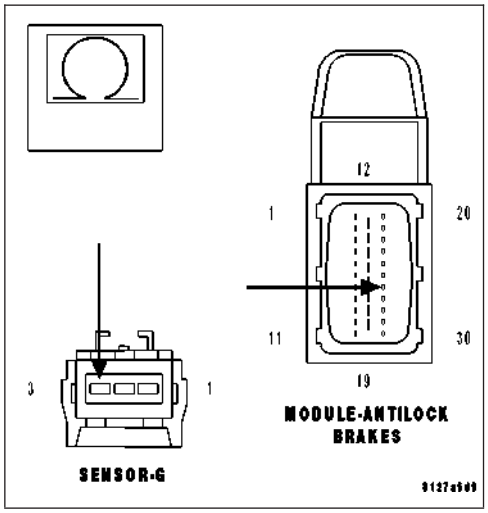
Turn the ignition off.

Disconnect the Anti-lock Brake module harness connector.

Disconnect the G—sensor harness connector.

NOTE: Check connector - Clean/repair as necessary.

Measure the resistance of the (B24) G-sensor supply circuit from the G-sensor harness connector to the Anti-lock brake module.



Is the resistance above 5 ohms?

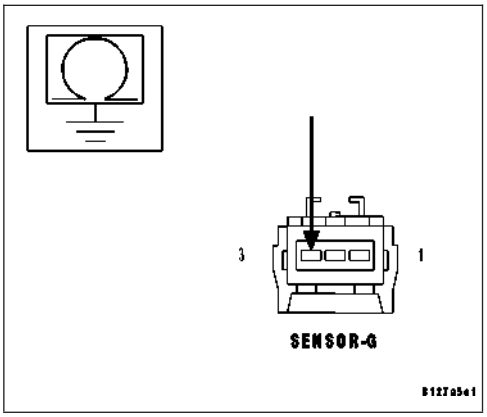
Yes >> Repair the open (B24) G-sensor supply circuit. Perform ABS VERIFICATION TEST - VER 1.

No >> Go to 2

C1213-G SENSOR INPUT SIGNAL STUCK (CONTINUED)

2. (B24) G-sensor supply circuit shorted to ground

Measure the resistance of the (B24) G-sensor supply circuit from the G-sensor harness connector to ground.



Is the resistance below 5 ohms?

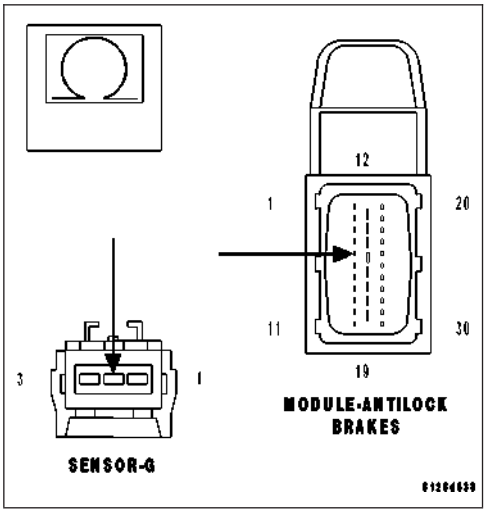
Yes >> Repair the (B24) G-sensor supply circuit shorted to ground.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go to 3

---

3. (B23) G-sensorsignal circuit open

Measure the resistance of the (B23) G-sensor signal circuit from the G-sensor harness connector to the Anti-lock brake module.



Is the resistance above 5 ohms?

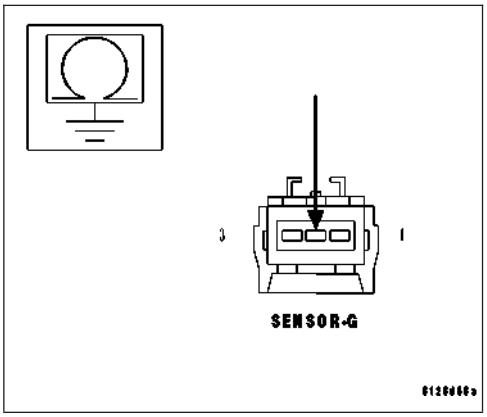
Yes >> Repair the open (B23) G-sensor signal circuit.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go to 4

---

4. (B23) G-sensor signal circuit shorted to ground

Measure the resistance of the (B23) G-sensor signal circuit from the G-sensor harness connector to ground.



Is the resistance below 5 ohms?

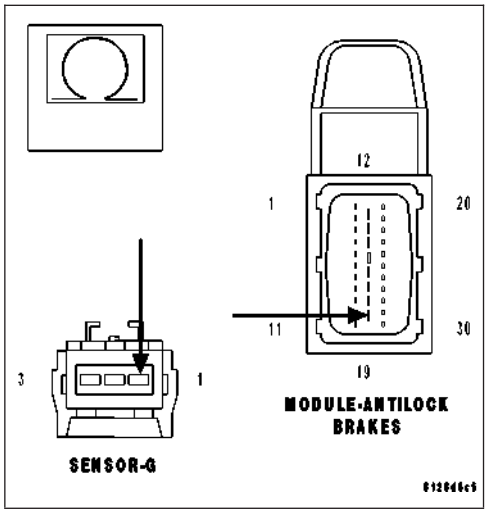
Yes >> Repair the (B23) G-sensor signal circuit shorted to ground.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go to 5

C1213-G SENSOR INPUT SIGNAL STUCK (CONTINUED)

5. (B924) G-sensor return circuit open

Measure the resistance of the (B924) G-sensor return circuit from the G-sensor harness connector to the Anti-lock brake module.



Is the resistance above 5 ohms?

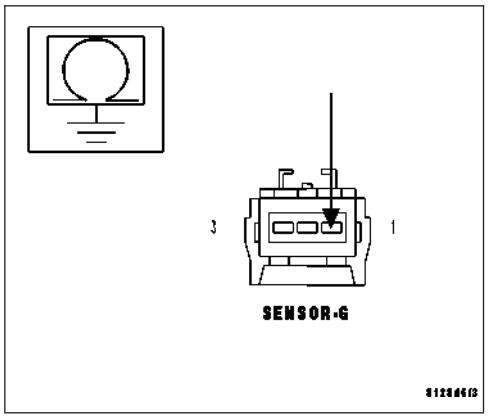
Yes >> Repair the open (B924) G-sensor return circuit.
Perform ABS VERIFICATION TEST - VER 1.

No >> Go to 6

---

6. (B924) G-sensor return circuit shorted to ground

Measure the resistance of the (B924) G-sensor return circuit from the G-sensor harness connector to ground.

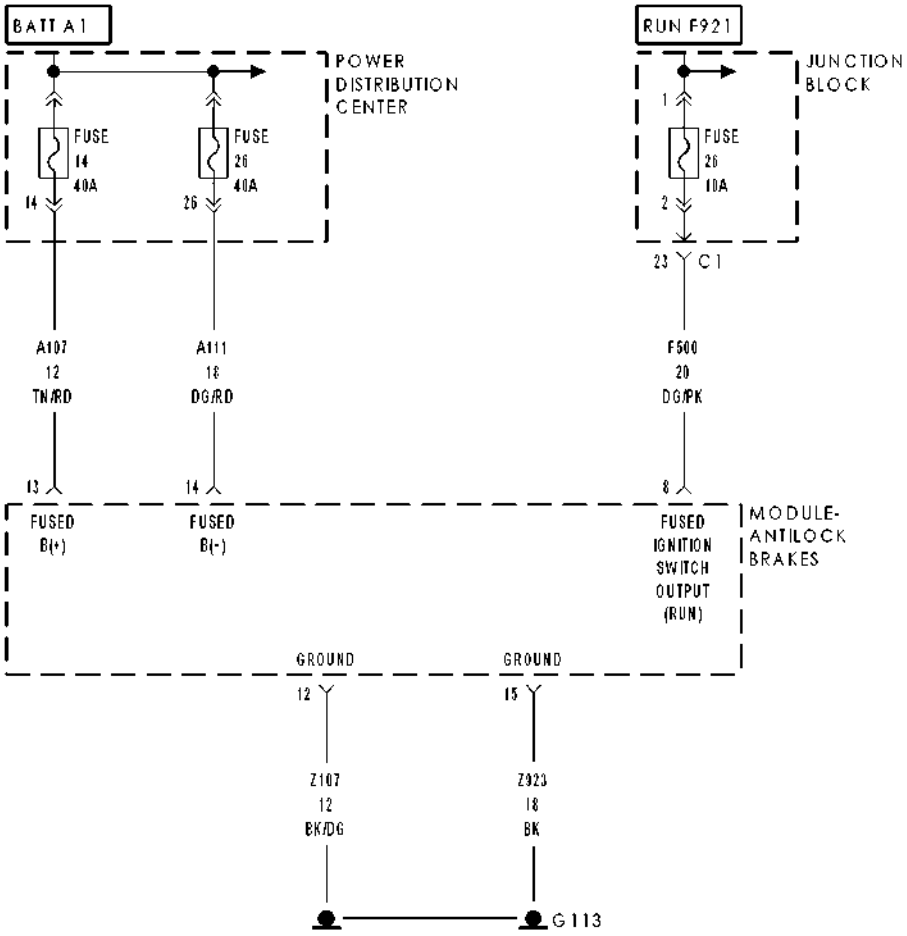


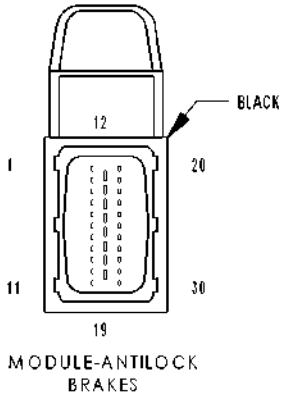
Is the resistance below 5 ohms?

Yes >> Repair the (B924) G-sensor return circuit shorted to ground.
Perform ABS VERIFICATION TEST - VER 1.

No >> Replace the G-sensor.
Perform ABS VERIFICATION TEST - VER 1.

C2100-BATTERY VOLTAGE LOW





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C2100-BATTERY VOLTAGE LOW (CONTINUED)

For the ABS circuit diagram (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Vehicle speeds above 6 km/h (3.4 mph).
- **Set Condition:**
  Voltage is <8.8 volts for >500 ms at vehicle speeds above 6 km/h (3.4 mph).

Possible Causes
DTC'S IN THE PCM
CHARGING SYSTEM FAILURE

Diagnostic Test

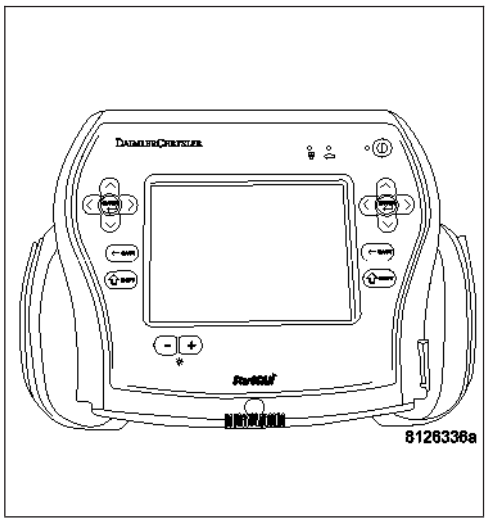
1. DTC'S IN THE PCM

With the scan tool read DTC's from the PCM.

Are any charging system codes present?

Yes >> Repair the charging system DTC in the PCM.
Perform ABS VERIFICATION TEST — VER 1.

No >> Go To 2



2. CHARGING SYSTEM FAILURE

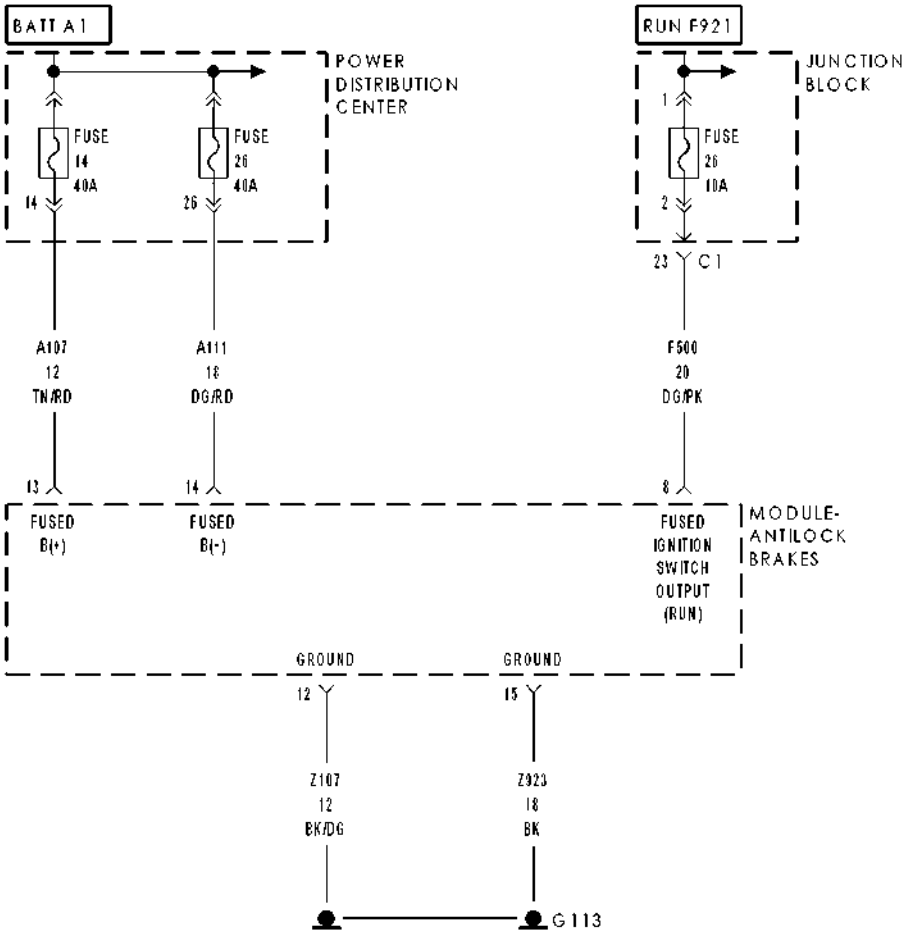
With a scan tool read input voltage.

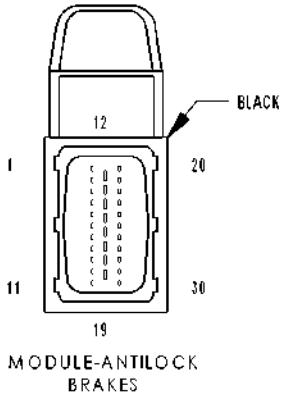
Is voltage under 8.8 volts?

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Yes >> Repair the charging system per service information.
Perform ABS VERIFICATION TEST — VER 1.

C2101-BATTERY VOLTAGE HIGH





C2101-BATTERY VOLTAGE HIGH (CONTINUED)

For the ABS circuit diagram (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

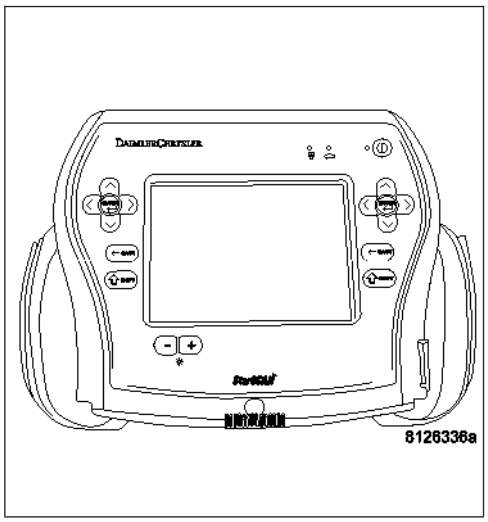
- **When Monitored:**
  Vehicle speeds above 6 km/h (3.4 mph).
- **Set Condition:**
  Voltage is >17.4 volts for >500 ms at vehicle speeds above 6 km/h

Possible Causes
DTC'S IN THE PCM
CHARGING SYSTEM FAILURE

Diagnostic Test

1. DTC'S IN THE PCM

With the scan tool read DTC's from the PCM.



Are any charging system codes present?

Yes >> Repair the charging system DTC in the PCM.
Perform ABS VERIFICATION TEST — VER 1.

No >> Go To 2

2. CHARGING SYSTEM FAILURE

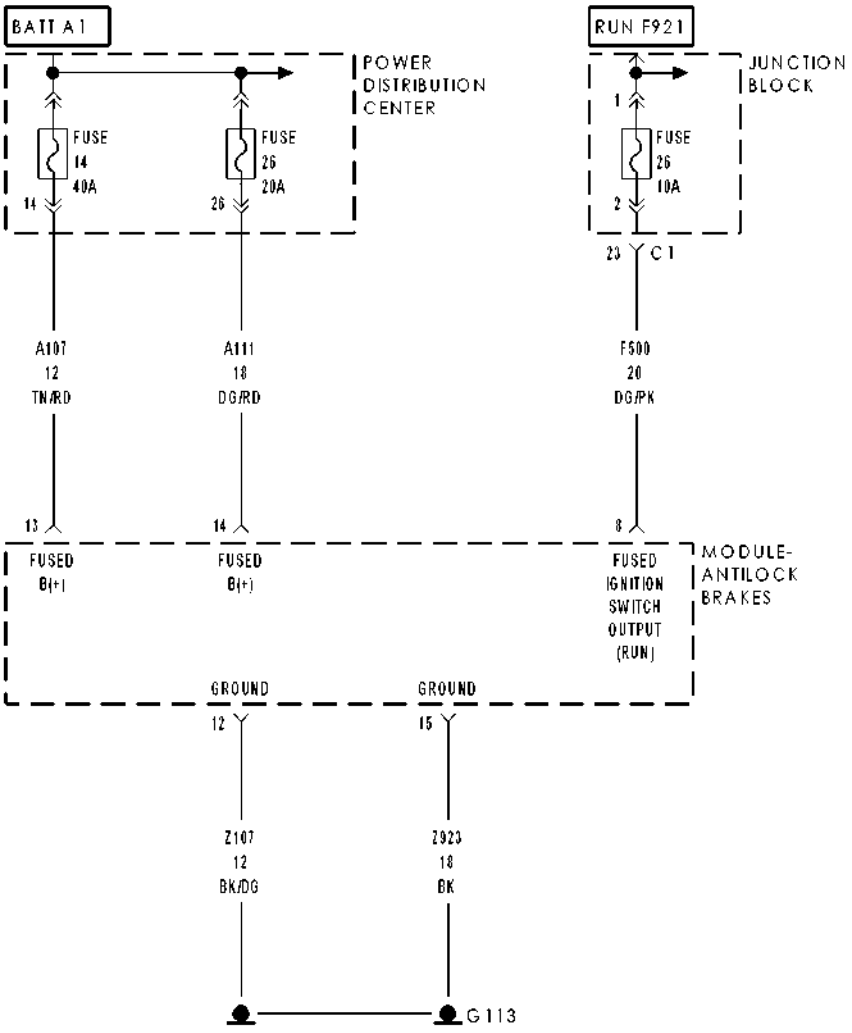
With a scan tool read input voltage.

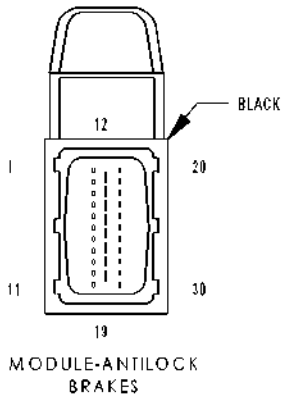
Is voltage over 17.0 volts?

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Yes >> Repair the charging system per service information.
Perform ABS VERIFICATION TEST — VER 1.

C2105-ABS VALVE SUPPLY VOLTAGE CIRCUIT LOW





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C2105-ABS VALVE SUPPLY VOLTAGE CIRCUIT LOW (CONTINUED)

For the ABS circuit diagram (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously.
- **Set Condition:**
  The monitor function test the supply voltage of the valves via the valve feedback lines. If three or more valve response falts occur simultaneously, a DTC is set.

Possible Causes
LOW VOLTAGE AT THE ABM
ABM INTERNAL

Diagnostic Test

1. LOW VOLTAGE AT THE ABM

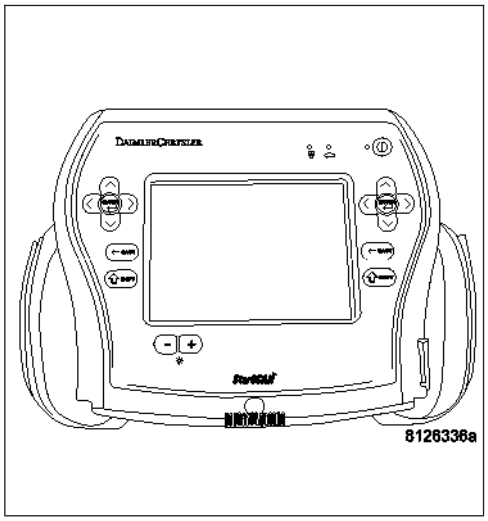
With the scan tool read battery voltage and ignition voltage in the ABM and compare the two reading to actual battery voltage from a voltmeter.

NOTE: Battery must be fully charged.

Are all readings within a half of volt?

Yes >> Replace the ABM per service information.
Perform ABS VERIFICATION TEST — VER 1.

No >> Go To 2



C2105-ABS VALVE SUPPLY VOLTAGE CIRCUIT LOW (CONTINUED)

2. ABM INTERNAL

Turn key off.

Disconnect the ABM harness connector.

NOTE: Check connector - Clean/repair as necessary.

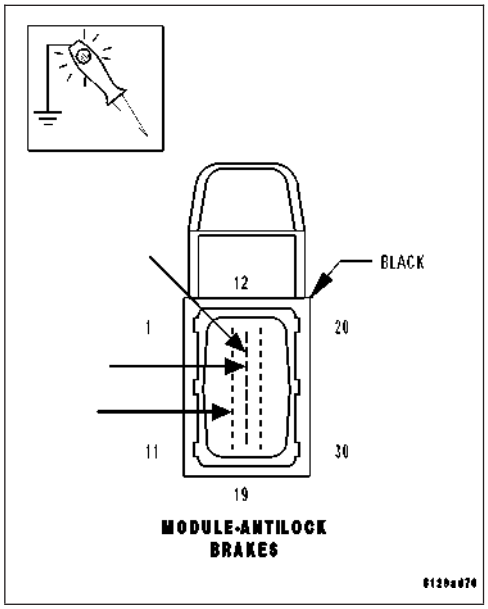
Turn key on, engine off.

With a test light check (A107) Fused B+, (A111) Fused B+ and (F500) Fused ignition switch output.

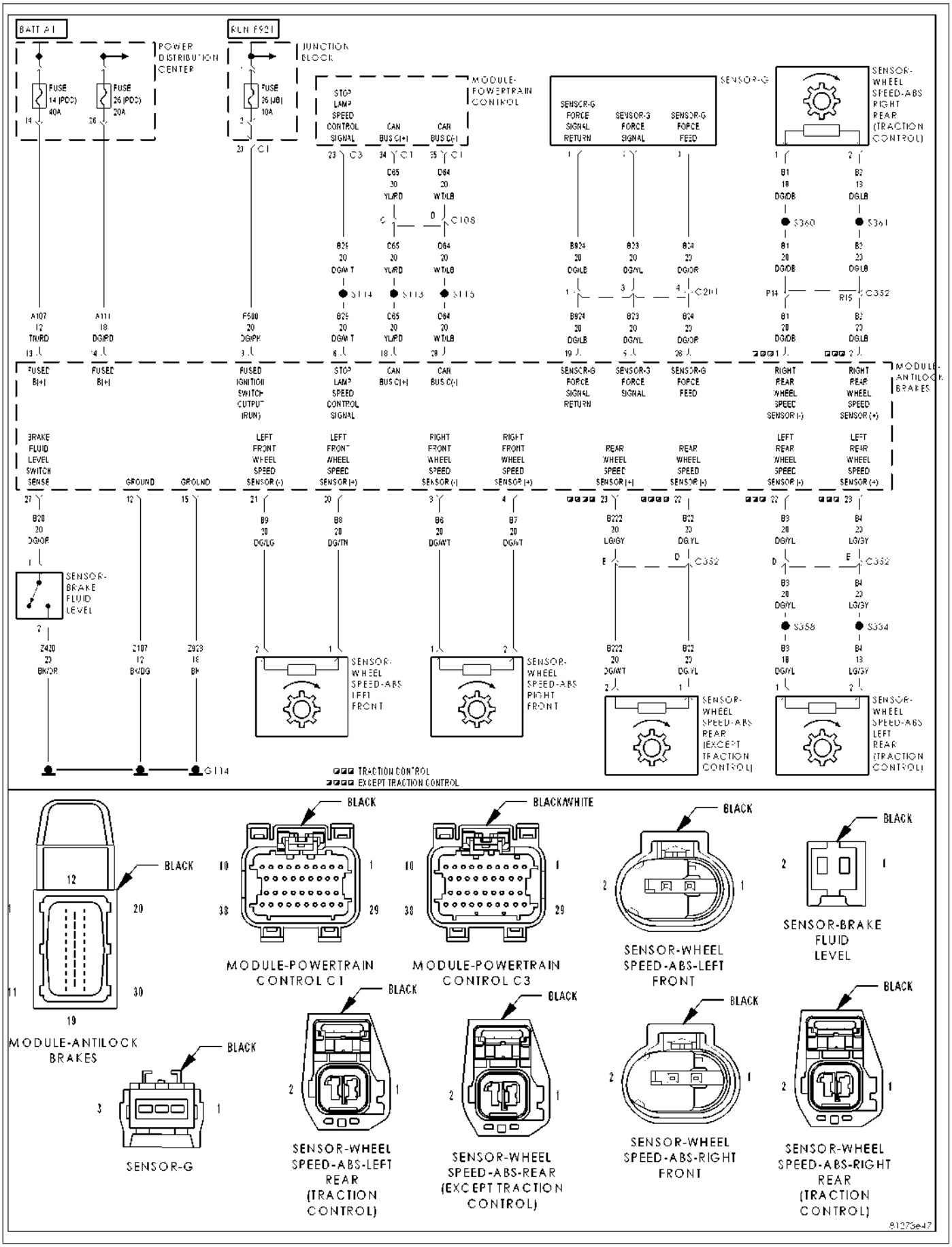
Is test light bright like when connected to the battery?

Yes >> Replace the ABM per service information.
Perform ABS VERIFICATION TEST — VER 1.

No >> Repair the high resistance in the circuits.
Perform ABS VERIFICATION TEST — VER 1.



C2200-ANTI—LOCK BRAKE MODULE INTERNAL



C2200-ANTI—LOCK BRAKE MODULE INTERNAL (CONTINUED)

For the ABS circuit diagram (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

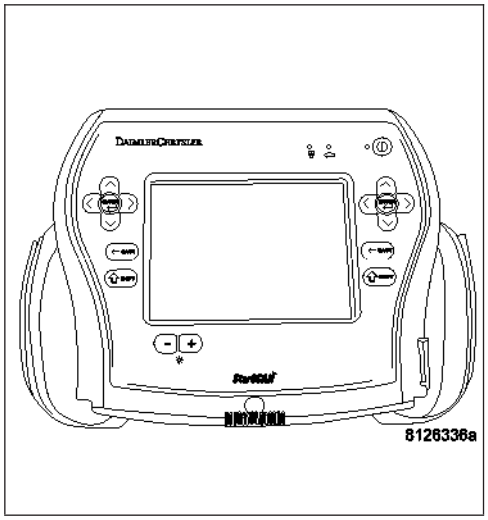
For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on. The Anti—lock brake module monitors its internal microprocessors for correct operation.
- **Set Condition:**
  If the Anti—lock brake module detects an internal fault, the DTC is set.

Possible Causes
ABM - GROUND CIRCUIT OPEN
ABS FUSED B(+) CIRCUIT OPEN
ABS PUMP FUSED B(+) CIRCUIT OPEN
ABM - INTERNAL FAULT

Diagnostic Test

1. ABM INTERNAL FAILURE DTC PRESENT



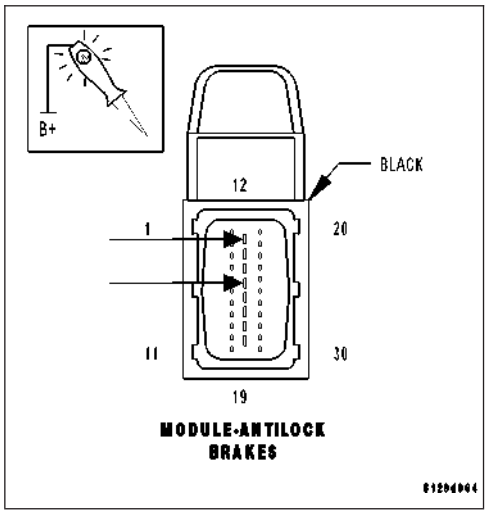
Turn the ignition on.
With the scan tool, read DTCs.
With the scan tool, erase DTCs.
Turn the ignition off.
Turn the ignition on.
With the scan tool, read DTCs.

Does the scan tool display ANTI—LOCK BRAKE MODULE INTERNAL FAILURE?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

2. CAB - GROUND CIRCUIT OPEN



Turn the ignition off.
Disconnect the ABM harness connector.
Note: Check clean connectors and terminals,.
Using a 12-volt test light connected to 12-volts, probe the ABM harness connector ground circuits.

Did the test light illuminate?

Yes >> Go To 3

No >> Repair the ABM Ground circuit for an open.
Perform ABS VERIFICATION TEST - VER 1.

C2200-ANTI—LOCK BRAKE MODULE INTERNAL (CONTINUED)

3. ABS FUSED B(+) CIRCUIT OPEN

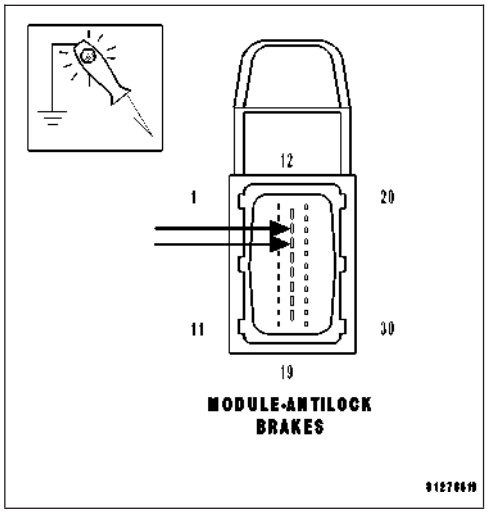
Turn the ignition on.

Using a 12-volt test light connected to ground, probe the ABS Fused B(+) circuit at the ABM harness connector.

Did the test light illuminate?

Yes >> Go To 4

No >> Repair the ABS Valve Fused B(+) circuit for an open.
Perform ABS VERIFICATION TEST - VER 1.



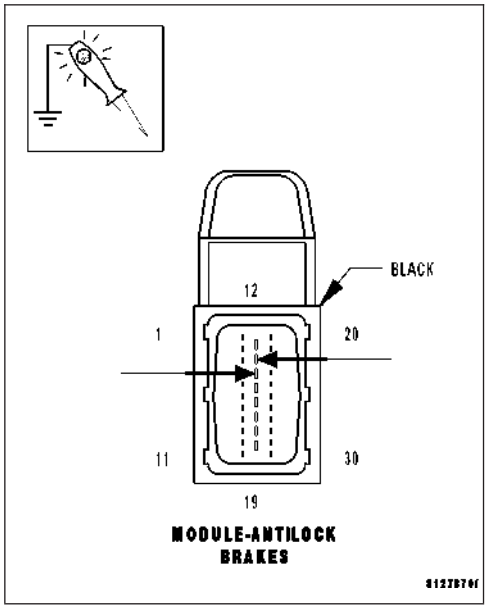
4. ABS PUMP FUSED B(+) CIRCUIT OPEN

Using a 12-volt test light connected to ground, probe the ABS Pump Fused B(+) circuit at the ABM harness connector.

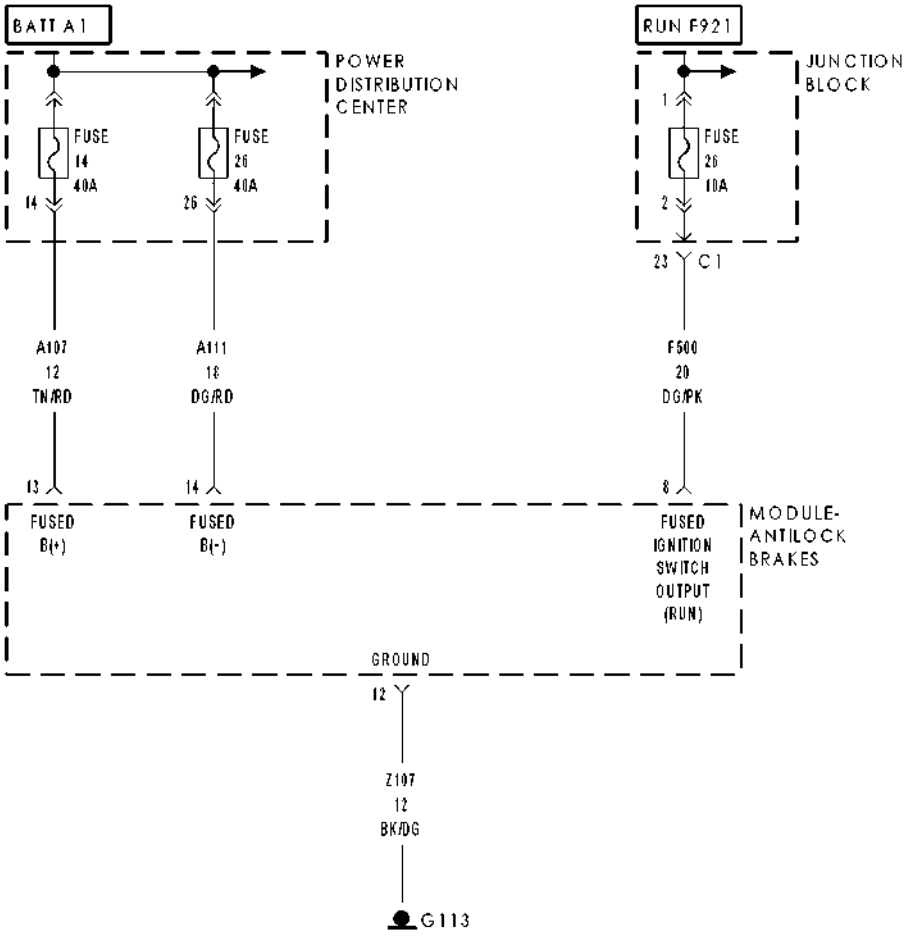
Did the test light illuminate?

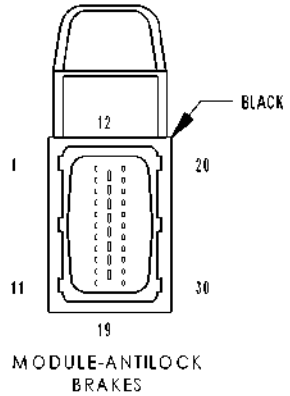
Yes >> Replace the Anti—lock brake module in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1.

No >> Repair the ABS Pump Fused B(+) circuit for an open.
Perform ABS VERIFICATION TEST - VER 1.



C2202-VIN 1 MISMATCH/MISSING





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C2202-VIN 1 MISMATCH/MISSING (CONTINUED)

For the ABS circuit diagram (Refer to 5 — BRAKES — SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  At power up, VIN is read off the CAN bus, If the VIN message is not received then the VIN stored in EEPROM is used for the comparison.
- **Set Condition:**
  The VIN stored in the ABM does not match the VIN read off of the CAN bus. The 5th character in the VIN should be 'D' for 4x2 or 'B' for4x4.

Possible Causes
WRONG MODULE
WRONG VIN PROGRAMED INTO VEHICLE

Diagnostic Test

1. WRONG VIN PROGRMED INTO VEHICLE

NOTE: 4x4 vehicles have different modules than 4x2 vehicles

Is the correct VIN programed into the vehicle?

Yes >> Replace the Anti-lock brake module with the correct module.
Perform ABS VERIFICATION TEST — VER 1.

No >> Reprogram the VIN per service information.
Perform ABS VERIFICATION TEST — VER 1.

ABS VERIFICATION TEST — VER 1

Diagnostic Test

1. ABS VERIFICATION TEST — VER 1

1. Turn the ignition off.

2. Connect all previously disconnected components and connectors.

3. Ensure all accessories are turned off and the battery is fully charged.

4. Ensure that the ignition is on, and with the scan tool, erase all Diagnostic Trouble Codes from All modules. Start the engine and allow it to run for 2 minutes and fully operate the system that was malfunctioning.

5. Turn the ignition off and wait 5 seconds. Turn the ignition on and using the scan tool, read DTC's from all modules.

6. If any Diagnostic Trouble Codes are present, return to symptom list and trouble shoot new or recurring symptom.

7. NOTE: For Sensor Signal and Pump Motor faults, the ABM must sense all 4 wheels at 12 km/h (7.5 mph) before it will extinguish the ABS indicator.

8. If there are no DTC's present after turning ignition on, road test the vehicle for at lleast 5 minutes. Perform several antilock braking stops.

9. Caution: Ensure braking capability is available before road testing.

10. Again, with the scan tool read DTC's. If any DTC's are present, return to Symptom list.

11.If there are no Diagnostic Trouble Codes (DTC's) present, and the customer's concern can no longer be duplicated, the repair is complete.

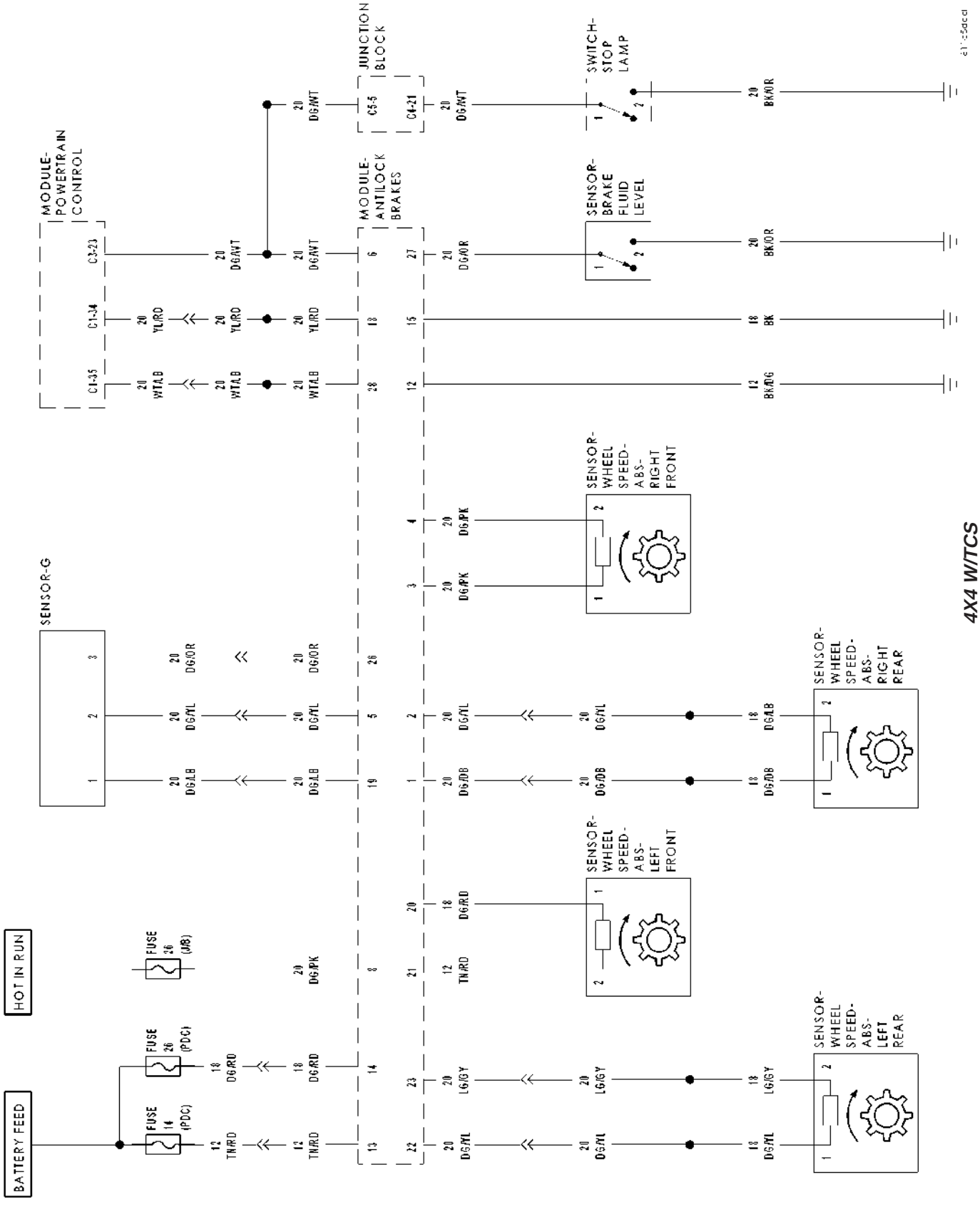
Are any DTC's present or is the original concern still present?

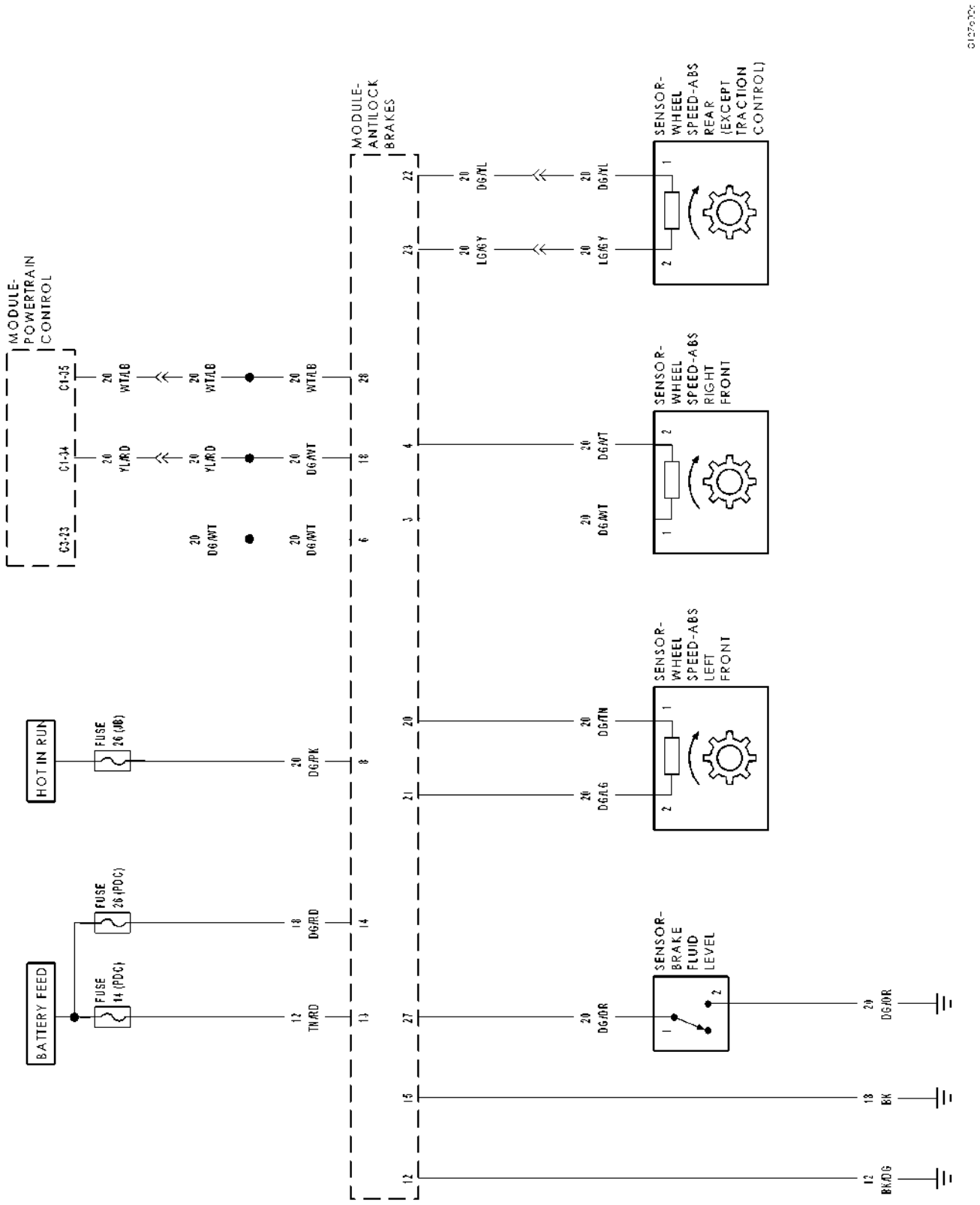
Yes >> Repair is not complete, refer to appropriate symptom.

No >> Repair is complete.

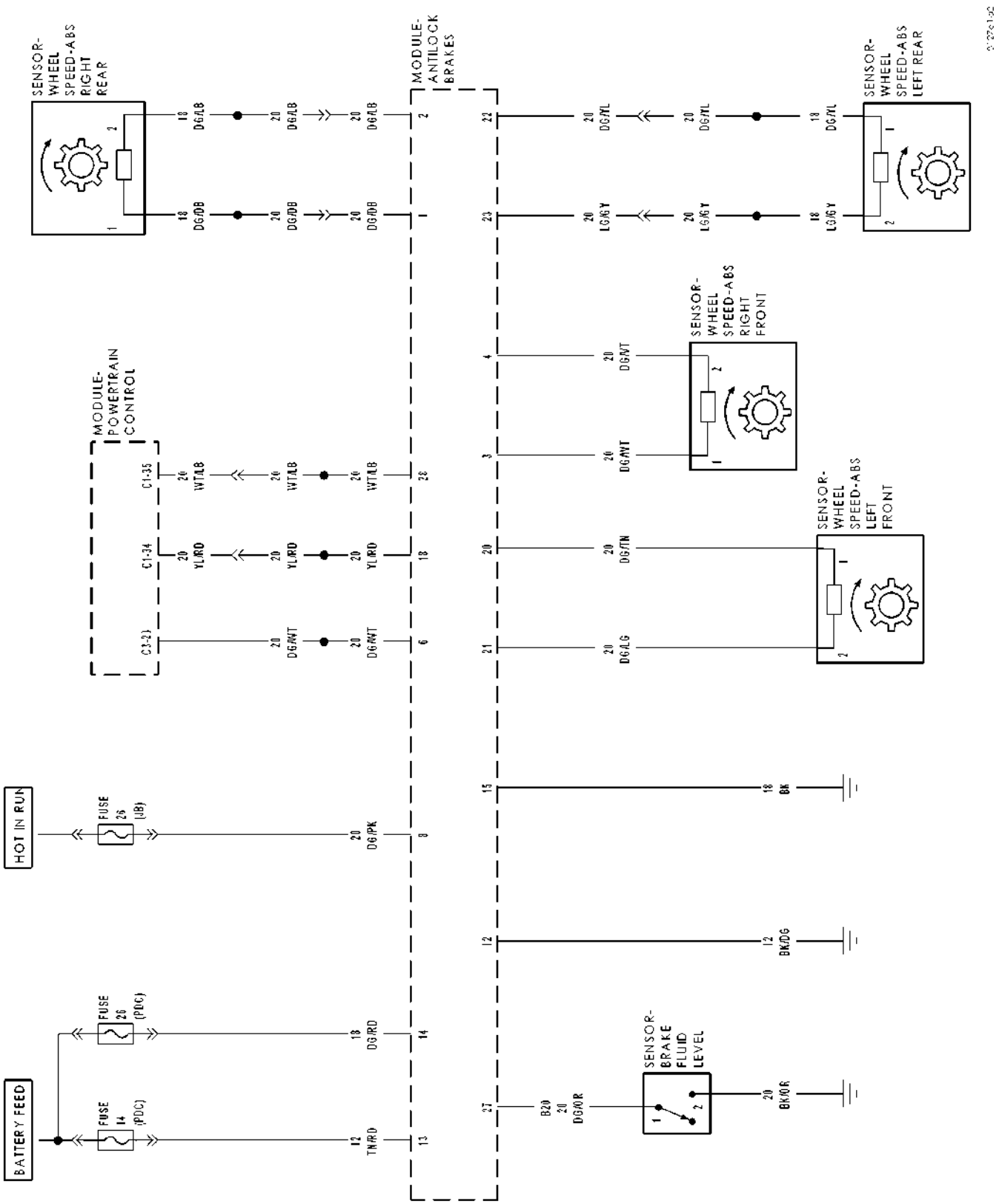
SCHEMATICS AND DIAGRAMS

SCHEMATICS AND DIAGRAMS

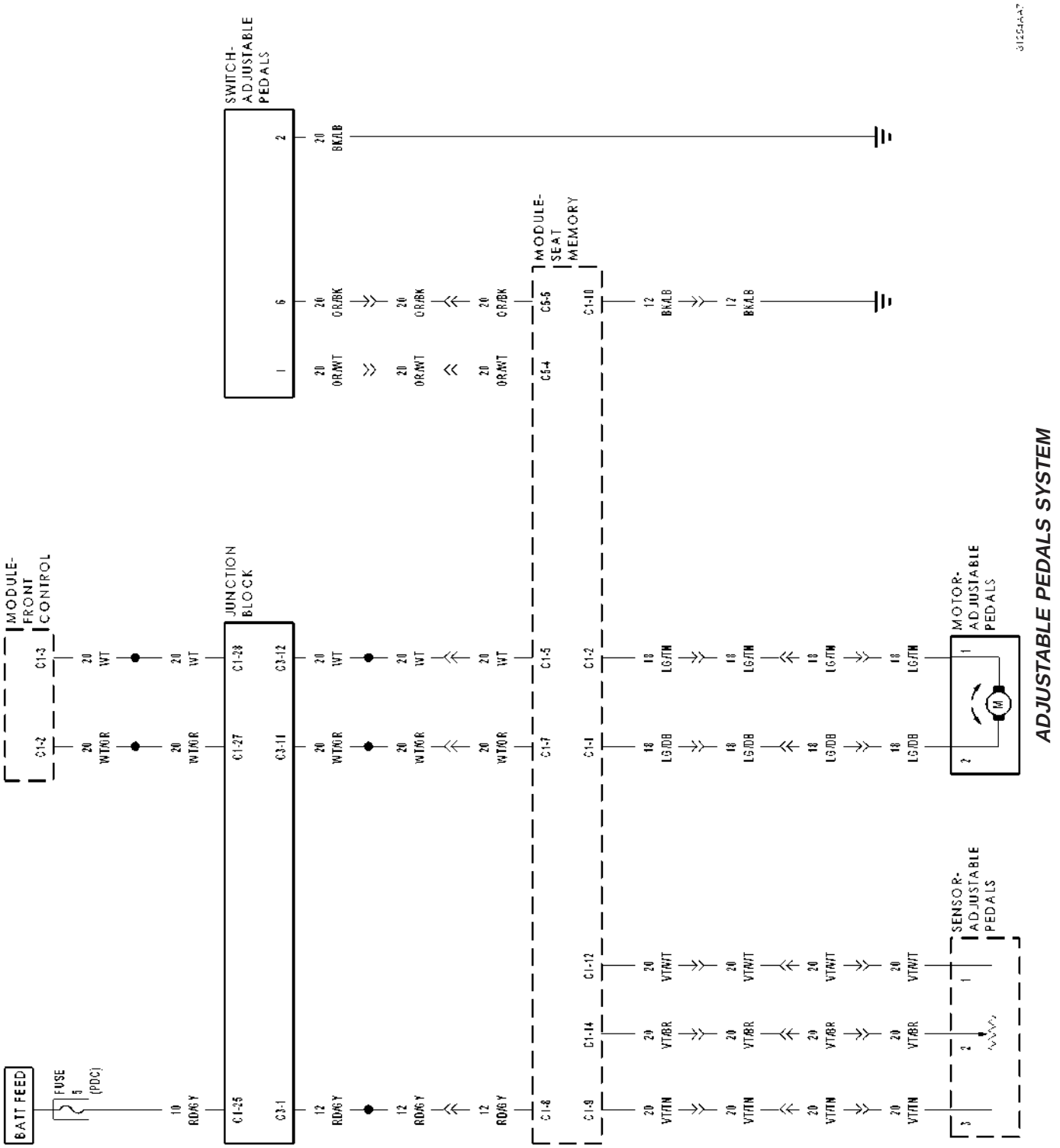



MODULE-
POWERTRAIN
CONTROL
C3-23
C1-34
C1-35
MODULE-
ANTILOCK
BRAKES
HOT IN RUN
FUSE
26 (MB)
FUSE
26 (PDC)
FUSE
14 (PDC)
BATTERY FEED
SENSOR-
WHEEL
SPEED-ABS
LEFT
FRONT
SENSOR-
WHEEL
SPEED-ABS
RIGHT
FRONT
SENSOR-
WHEEL
SPEED-ABS
REAR
(EXCEPT
TRACTION
CONTROL)
SENSOR-
BRAKE
FLUID
LEVEL
20 DG/PK
18 DG/RD
12 TN/RD
20 DG/TN
20 DG/LG
20 DG/OR
20 DG/WT
20 YL/RD
20 WT/LB
20 DG/YL
20 LG/DG/Y
29 DG/OR
18 BK
12 BK/DG

WO/TCS


BATTERY FEED
HOT IN RUN
FUSE 14 (PDC)
FUSE 26 (PDC)
FUSE 26 (JB)
MODULE-POWERTRAIN CONTROL
MODULE-ANTILOCK BRAKES
SENSOR-WHEEL SPEED-ABS RIGHT REAR
SENSOR-WHEEL SPEED-ABS LEFT REAR
SENSOR-WHEEL SPEED-ABS RIGHT FRONT
SENSOR-WHEEL SPEED-ABS LEFT FRONT
SENSOR-BRAKE FLUID LEVEL
C3-21
C1-34
C1-35
TN/RD
DG/RD
DG/PK
DG/AB
DG/OB
WT/LB
YL/RD
DG/WT
DG/YL
LG/GY
DG/TN
DG/LG
BK
BK/DG
BK/OR
B20
DG/OR
4X2 W/TCS

SCHEMATICS AND DIAGRAMS



BRAKES - ABS SERVICE INFORMATION

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BRAKES - ABS SERVICE INFORMATION

DESCRIPTION

The antilock brake system (ABS) is an electronically operated, three channel brake control system. The vehicle has Electronic Brakeforce Distribution (EBD) designed into the system which eliminates the combination/proportioning valve.

The system is designed to prevent wheel lockup and maintain steering control during braking. Preventing lockup is accomplished by modulating fluid pressure to the wheel brake units.

The hydraulic system is a four channel design with traction control. The front wheel brakes are controlled individually and the rear wheel brakes in individually. The ABS electrical system is separate from other electrical circuits in the vehicle. A specially programmed controller antilock brake unit operates the system components.

ABS system major components include:

- Antilock Brake Module (ABM)
- Hydraulic Control Unit (HCU)
- Wheel Speed Sensors (WSS)
- G-Sensor
- ABS Warning Light

OPERATION

When wheel slip is detected during a brake application, the ABS enters antilock mode. During antilock braking, hydraulic pressure in the individual wheel circuits is controlled to prevent any wheel from slipping. A separate hydraulic line and specific solenoid valves are provided for each wheel. The ABS can decrease, hold, or increase hydraulic pressure to each wheel brake. The ABS cannot, however, increase hydraulic pressure above the amount which is transmitted by the master cylinder during braking

During antilock braking, a series of rapid pulsations is felt in the brake pedal. These pulsations are caused by the rapid changes in position of the individual solenoid valves as the ICU responds to wheel speed sensor inputs and attempts to prevent wheel slip. These pedal pulsations are present only during antilock braking and stop when normal braking is resumed or when the vehicle comes to a stop. A ticking or popping noise may also be heard as the solenoid valves cycle rapidly. During antilock braking on dry pavement, intermittent chirping noises may be heard as the tires approach slipping. These noises and pedal pulsations are considered normal during antilock operation.

Vehicles equipped with ABS may be stopped by applying normal force to the brake pedal. Brake pedal operation during normal braking is no different than that of previous non-ABS systems. Maintaining a constant force on the brake pedal provides the shortest stopping distance while maintaining vehicle stability.

PRESSURE DECREASE

The ICU (Integrated Control Unit) decreases the pressure to individual wheels during a deceleration when wheel slip occurs. The inlet valve is closed and the outlet valve is opened. The excess fluid is stored in the accumulator until the return pump can return the fluid to the master cylinder.

PRESSURE HOLD

The ICU closes the inlet valve and keeps the outlet valve closed in order to isolate the system when wheel slip occurs. This holds the pressure steady on the brake so that the hydraulic pressure does not increase or decrease.

PRESSURE INCREASE

The ICU increases the pressure to individual wheels during a deceleration in order to reduce the speed of the wheel. The inlet valve is opened and the outlet valve is closed. The increased pressure is delivered from the master cylinder.

ELECTRONIC BRAKEFORCE DISTRIBUTION (EBD)

The electronic brakeforce distribution (EBD) is a control system that replaces the hydraulic proportioning function of the mechanical proportioning valve in the base brake system. The EBD control system is part of the operation software in the ICU. The EBD uses active control with existing ABS in order to regulate the vehicle's rear brake pressure. The red brake warning indicator is illuminated when the dynamic rear proportioning function is disabled.

TRACTION CONTROL (TCS)

The primary function of the Traction Control System (TCS) is to optimize vehicle performance with varying vehicle load and changing road conditions by controlling wheel slip at the driven wheels during an acceleration maneuver. The wheel slip is controlled by actively applying braking force. This modulation is applied and occur under all throttle input conditions where the difference between wheel speed' and vehicle speed indicate a loss of longitudinal traction. TCS operation for each mode of driveline operation include the following. When high range is selected for the transfer case, the system controls wheel slip in the order of stability and acceleration. When low range is selected for the transfer case, the system controls wheel slip in the order of acceleration and stability. The TCS switch turns the system on/off. The braking is accomplished by closing the TCS Master Cylinder Isolating Valve, this isolates the master cylinder from the rest of the system. The TCS Prime valve opens to allow the pump to get brake fluid to build pressure for braking. The drive wheel circuit solenoids are energized as needed to allow for pressure hold, pressure increase, or pressure decrease

DIAGNOSIS AND TESTING

ANTILOCK BRAKE SYSTEM

Diagnosis of base brake conditions which are mechanical in nature should be performed first. This includes brake noise, lack of power assist, parking brake, or vehicle vibration during normal braking.

The Anitilock brake system performs several self-tests every time the ignition switch is turned on and the vehicle is driven. The ABM monitors the system inputs and outputs circuits to verify the system is operating properly. If the ABM senses a malfunction in the system it will set a DTC into memory and trigger the warning lamp.

NOTE: The scan tool is used to diagnose the Anitlock Braking System. For test procedures refer to the Chassis Diagnostic Manual.

STANDARD PROCEDURE

ABS BRAKE BLEEDING

ABS system bleeding requires conventional bleeding methods plus use of the scan tool. The procedure involves performing a base brake bleeding, followed by use of the scan tool to cycle and bleed the HCU pump and solenoids. A second base brake bleeding procedure is then required to remove any air remaining in the system.

1. Perform base brake bleeding, (Refer to 5 - BRAKES - STANDARD PROCEDURE) OR (Refer to 5 - BRAKES - STANDARD PROCEDURE).
2. Connect scan tool to the Data Link Connector.
3. Select ANTILOCK BRAKES, followed by MISCELLANEOUS, then ABS BRAKES. Follow the instructions displayed. When scan tool displays TEST COMPLETE, disconnect scan tool and proceed.
4. Perform base brake bleeding a second time, (Refer to 5 - BRAKES - STANDARD PROCEDURE) OR (Refer to 5 - BRAKES - STANDARD PROCEDURE).
5. Top off master cylinder fluid level and verify proper brake operation before moving vehicle.

SPECIFICATIONS

TORQUE CHART

TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
HCU Assembly Mounting Bolts	15	11	—
ABM Mounting Screws	6	—	53
ABS Assembly Brake Line Fittings	19	—	170
Wheel Speed Sensors Front Sensor Bolt	21	—	190
Rear Wheel Speed Sensor Mounting Bolt	24	—	200
G-Sensor With (TCS)	5.6	—	50

ELECTRICAL

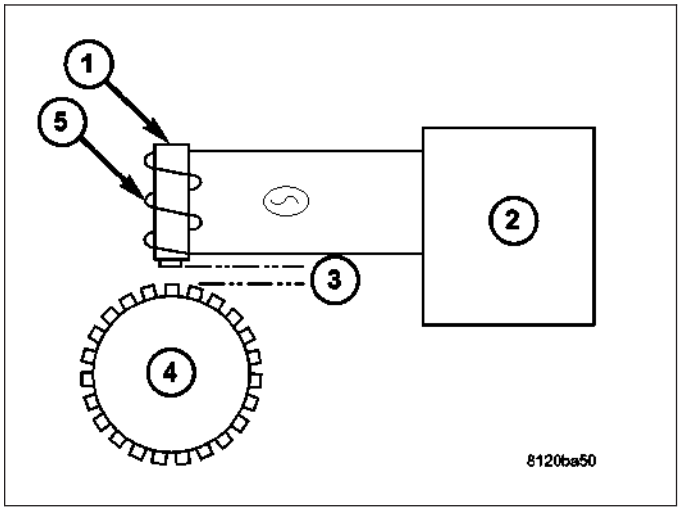
DESCRIPTION

WHEEL SPEED SENSORS

The ABS brake system uses 3 or 4 wheel speed sensors. Vehicles with **traction control** use 4 sensors, individual sensors are mounted to each front and rear hub/bearings. Vehicles **without traction control** use 3 sensors, 2 individual sensors are mounted to the front hub/bearing and the third sensor is mounted on top of the rear axle differential housing. **4X4 vehicles without traction control** use a G-sensor that is internally located in the ABM and is not serviced separately. **4X4 vehicles with traction control** use a G-sensor that is located under the Instrument Top Cover and can be serviced separately.

SENSOR-WHEEL SPEED-ABS-FRONT

OPERATION



The Wheel Speed Sensor consists of a magnet (1) surrounded by windings from a single strand of wire (5). The sensor sends a small AC signal to the ABM. This signal is generated by magnetic induction. The magnetic induction is created when a toothed sensor ring (exciter ring or tone wheel) (4) passes the stationary magnetic WSS.

When the ring gear is rotated, the exciter ring (4) passes the tip of the WSS. As the exciter ring tooth approaches the tip of the WSS, the magnetic lines of force expand, causing the magnetic field to cut across the sensor's windings (5). This, in turn causes current to flow through the WSS circuit in one direction. When the exciter ring tooth moves away from the sensor tip, the magnetic lines of force collapse cutting the winding in the opposite direction. This causes the current to flow in the opposite direction. Every time a tooth of the exciter ring passes the tip of the WSS, an AC signal is generated current. Each AC signal (positive to negative signal or squarewave) is interpreted by the ABM. It then compares the frequency of the sinewave to a time value to calculate vehicle speed. The ABM continues to monitor the frequency to determine a deceleration rate that would indicate a possible wheel-locking tendency.

The signal strength of any magnetic induction sensor is directly affected by:

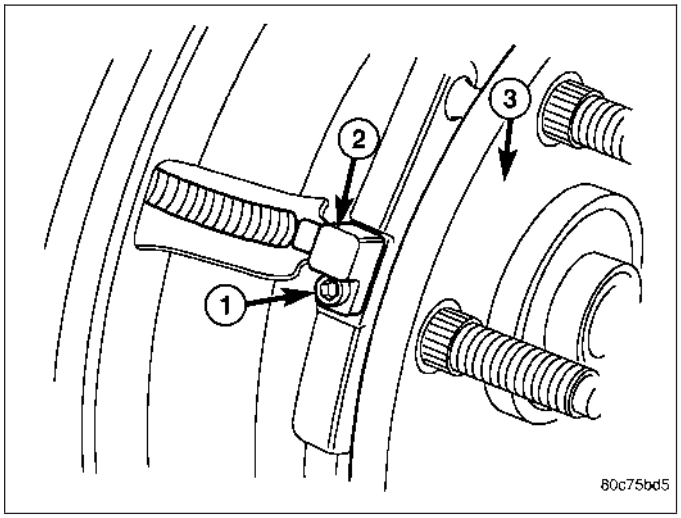
- Magnetic field strength; the stronger the magnetic field, the stronger the signal
- Number of windings in the sensor; more windings provide a stronger signal
- Exciter ring speed; the faster the exciter ring/tone wheel rotates, the stronger the signal will be
- Distance (3) "air gap" between the exciter ring teeth and WSS; the closer the WSS is to the exciter ring/tone wheel, the stronger the signal will be.

The WSS is not adjustable. A clearance specification has been established for manufacturing tolerances. If the clearance is not within these specifications, then either the WSS or other components may be damaged. The clearance between the WSS and the exciter ring is 0.005 – 0.050 in.

The assembly plant performs a "Rolls Test" on every vehicle that leaves the assembly plant. One of the test performed is a test of the WSS. To properly test the sensor, the assembly plant connects test equipment to the Data Link Connector (DLC). This connector is located to the right of the steering column and attached to the lower portion of the instrument panel. The rolls test terminal is spliced to the WSS circuit. The vehicle is then driven on a set of rollers and the WSS output is monitored for proper operation.

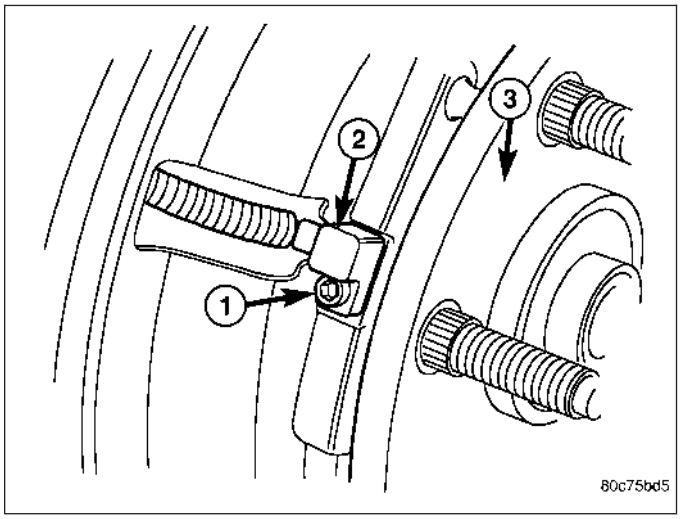
REMOVAL

1. Remove the front rotor (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - REMOVAL).
2. Remove the wheel speed sensor mounting bolt (1) from the hub (3).
3. Remove the wheel speed sensor (2) from the hub (3).
4. Remove the wiring from the clips and disconnect the electrical connector.



INSTALLATION

1. Install the wiring to the clips and Reconnect the electrical connector.
2. Install the wheel speed sensor (2) to the hub (3).
3. Install the wheel speed sensor mounting bolt (1) to the hub (3). Tighten the bolt to 21 N·m (190 in. lbs.).
4. Install the front rotor and brake caliper assembly (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - INSTALLATION).

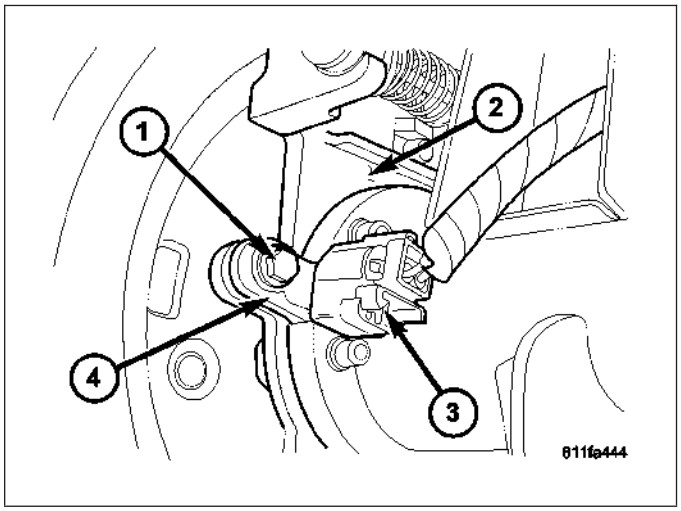


SENSOR-WHEEL SPEED-ABS-REAR

REMOVAL

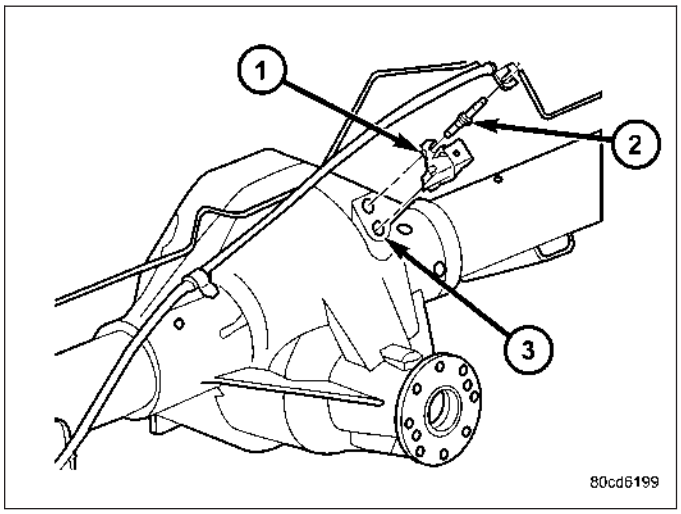
WITH TRACTION CONTROL

1. Raise the vehicle on a hoist.
2. Disconnect the wheel speed sensor electrical connector (3).
3. Remove the mounting bolt (1) from the sensor (4).
4. Remove the sensor (4) from the brake caliper adapter (2).



WITHOUT TRACTION CONTROL

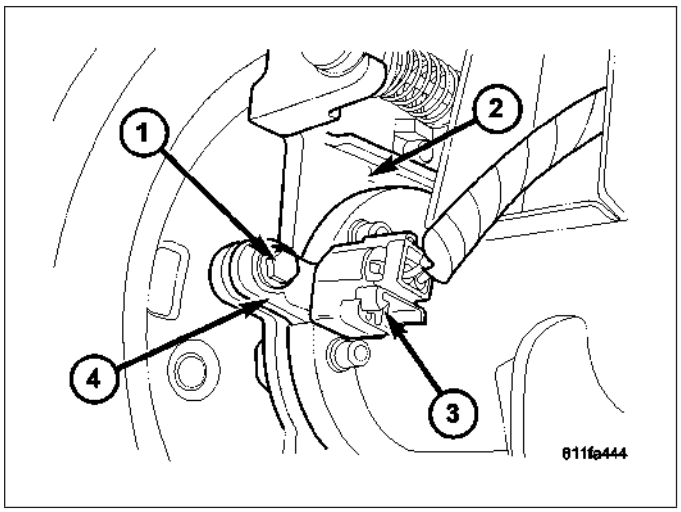
1. Raise the vehicle on a hoist.
2. Disconnect the sensor wire harness.
3. Remove the brake line mounting nut and remove the brake line from the sensor stud (2).
4. Remove the mounting stud (2) from the sensor (1) and shield.
5. Remove the sensor (1) and shield from the differential housing (3).



INSTALLATION

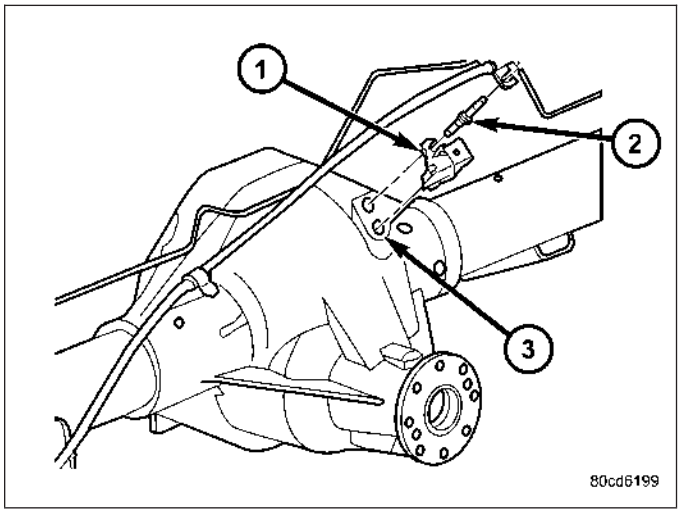
WITH TRACTION CONTROL

1. Insert the wheel speed sensor (4) in the brake caliper adapter (2).
2. Install the sensor mounting bolt (1) and tighten to 24 N·m (200 in. lbs.).
3. Reconnect the electrical wiring connector (3) to the sensor (4).
4. Lower the vehicle.



WITHOUT TRACTION CONTROL

1. Install the O-ring on the sensor (1) (if removed).
2. Insert the sensor (1) in the differential housing (3).
3. Install the sensor shield.
4. Install the sensor mounting stud (2) and tighten to 24 N·m (200 in. lbs.).
5. Install the brake line on the sensor stud (2) and install the nut.
6. Connect the harness to the sensor. **Be sure the seal is securely in place between the sensor and the wiring connector.**
7. Lower the vehicle.



SENSOR-G

DESCRIPTION

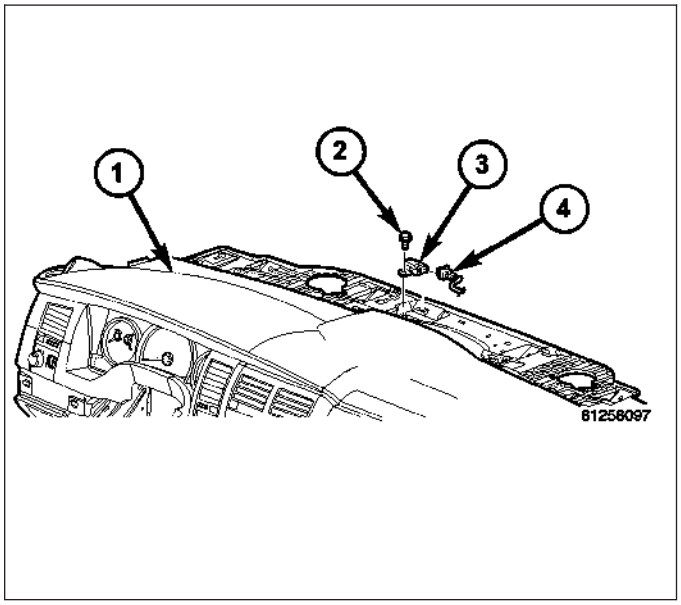
4X4 WITHOUT TRACTION CONTROL

The G-sensor is located inside the ABS controller. The sensor is not a separate serviceable part from the antilock brake module (ABM).

4X4 WITH TRACTION CONTROL

NOTE: If the G-sensor (3) was mounted incorrectly in the area designed for the GPS antenna, the G-sensor will be off 90 ° and not function properly.

The G-sensor (3) is located under the instrument panel top cover (1). The sensor (3) must be mounted with the electrical connector (4) facing the passenger side of the vehicle to function properly.



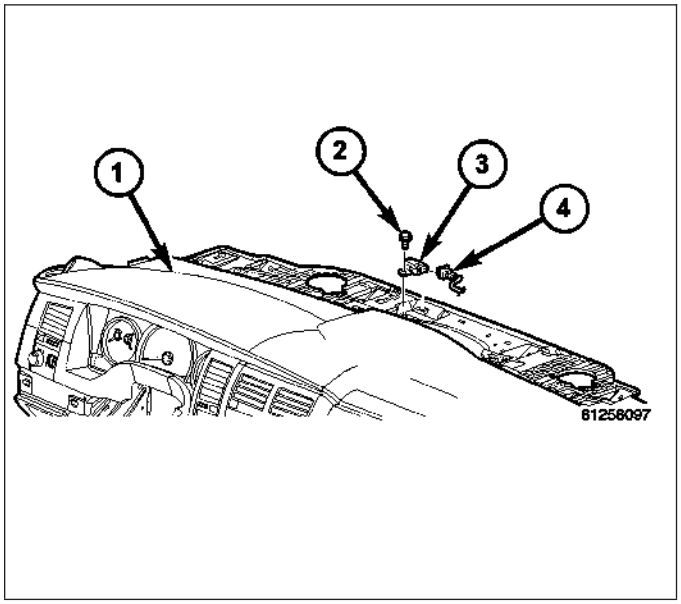
OPERATION

4X4 WITH TRACTION CONTROL

The sensor is monitored by the ABM at all times. The sensor contains an accelerometer which monitors vehicle deceleration rates (G-force). The accelerometer reads the rate of deceleration, sending a signal to the ABM.

REMOVAL – 4X4 WITH TRACTION CONTROL

1. Disconnect the battery.
2. Remove the IP top cover (1) for access to the sensor (3). (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - REMOVAL).
3. Disconnect the sensor harness (4).
4. Remove the sensor mounting bolt (2) and remove the sensor (3).

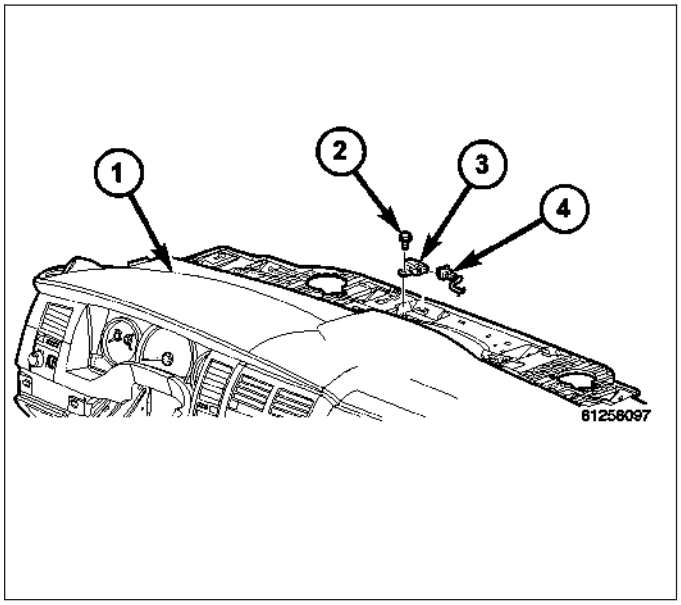


INSTALLATION – 4X4 WITH TRACTION CONTROL

CAUTION: The G-sensor (3), will not function properly if the sensor is installed incorrectly. Verify that the sensor is correctly installed when the electrical connector (4) is pointing toward the passenger side of the vehicle.

NOTE: If the G-sensor (3) was mounted incorrectly in the area designed for the GPS antenna, the G-sensor will be off 90 ° and not function properly.

1. Install the sensor (3) and tighten the mounting bolt (2) to 5.6 N·m (50 in. lbs.).
2. Connect the harness (4) to the sensor (3). Be sure the harness connector (4) is firmly seated.
3. Install the IP top cover (1) (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - INSTALLATION).
4. Reconnect the battery.



HYDRAULIC/MECHANICAL

DESCRIPTION - ELECTRONIC VARIABLE BRAKE PROPORTIONING

Vehicles equipped with ABS use electronic variable brake proportioning (EVBP) to balance front-to-rear braking. The EVBP is used in place of a rear proportioning valve. The EVBP system uses the ABS system to control the slip of the rear wheels in partial braking range. The braking force of the rear wheels is controlled electronically by using the inlet and outlet valves located in the Hydraulic control unit (HCU).

OPERATION - ELECTRONIC VARIABLE BRAKE PROPORTIONING

EVBP is able to decrease, hold and increase rear brake pressure without activating full ABS control. Upon entry into EVBP the inlet valve for the rear brake circuit is switched on so that the fluid supply from the master cylinder is shut off. In order to decrease the rear brake pressure, the outlet valve for the rear brake circuit is pulsed. This allows fluid to enter the low pressure accumulator (LPA) in the hydraulic control unit (HCU) resulting in a drop in fluid pressure to the rear brakes. In order to increase the rear brake pressure, the outlet valve is switched off and the inlet valve is pulsed. This increases the pressure to the rear brakes.

The EVBP will remain functional during many ABS fault modes. If both the red BRAKE and amber ABS warning indicators are illuminated, the EVBP may not be functioning.

HCU (HYDRAULIC CONTROL UNIT)

DESCRIPTION

The HCU consists of a valve body, pump motor, low pressure accumulators, inlet valves, outlet valves and noise attenuators.

OPERATION

Accumulators in the valve body store extra fluid released to the system for ABS mode operation. The pump provides the fluid volume needed and is operated by a DC type motor. The motor is controlled by the ABM.

The valves modulate brake pressure during antilock braking and are controlled by the ABM.

The HCU provides three channel **ABS** or four channel **With Traction Control** pressure control to the front and rear brakes. One channel controls the rear wheel brakes in tandem **ABS**. The two remaining channels control the front wheel brakes individually.

During antilock braking, the solenoid valves are opened and closed as needed.

During normal braking, the HCU solenoid valves and pump are not activated. The master cylinder and power booster operate the same as a vehicle without an ABS brake system.

NOTE: The three modes mentioned below do occur but not necessarily in the order listed everytime.

During antilock braking, solenoid valve pressure modulation occurs in three stages, pressure increase, pressure hold, and pressure decrease. The valves are all contained in the valve body portion of the HCU.

PRESSURE DECREASE

The outlet valve is opened and the inlet valve is closed during the pressure decrease cycle.

A pressure decrease cycle is initiated when speed sensor signals indicate high wheel slip at one or more wheels. At this point, the ABM closes the inlet then opens the outlet valve, which also opens the return circuit to the accumulators. Fluid pressure is allowed to bleed off (decrease) as needed to prevent wheel lock.

Once the period of high wheel slip has ended, the ABM closes the outlet valve and begins a pressure increase or hold cycle as needed.

PRESSURE HOLD

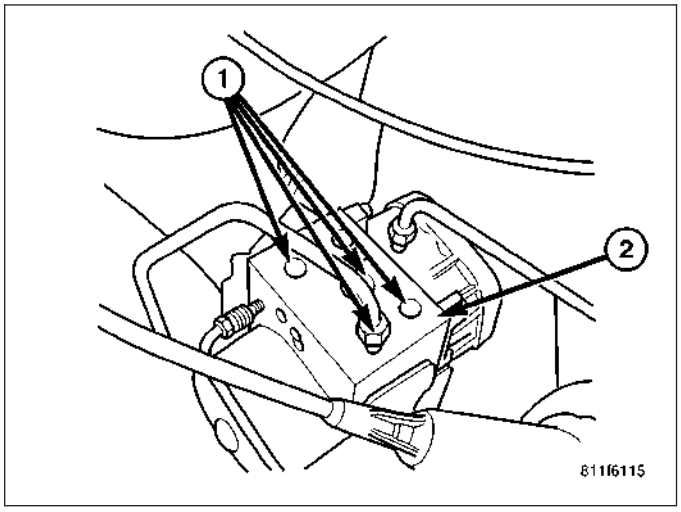
Both solenoid valves are closed in the pressure hold cycle but only the inlet valve is energized. Fluid apply pressure in the control channel is maintained at a constant rate. The ABM maintains the hold cycle until sensor inputs indicate a pressure change is necessary.

PRESSURE INCREASE

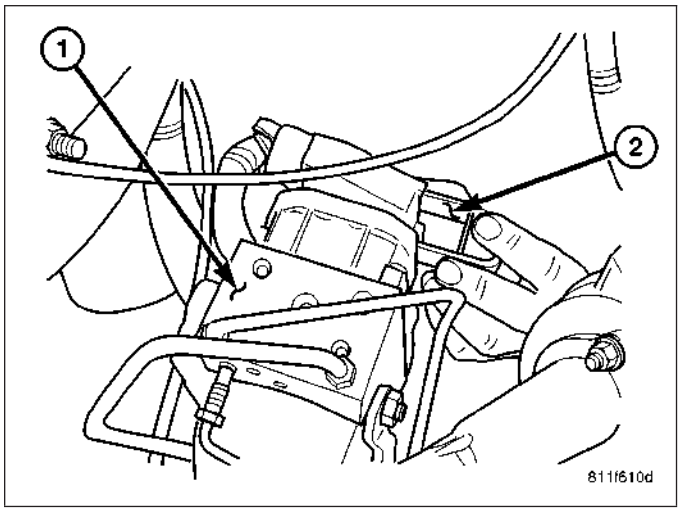
The inlet valve is open and the outlet valve is closed during the pressure increase cycle. The pressure increase cycle is used to reapply thew brakes. This cycle controls re-application of fluid apply pressure.

REMOVAL

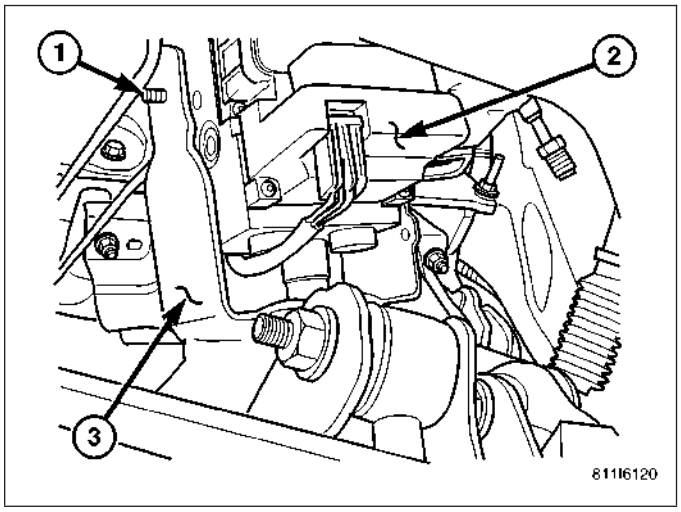
1. Disconnect the battery cables from the battery.
2. Disconnect the brake lines (1) to the HCU (2).



3. Disconnect the electrical harness connector (2).

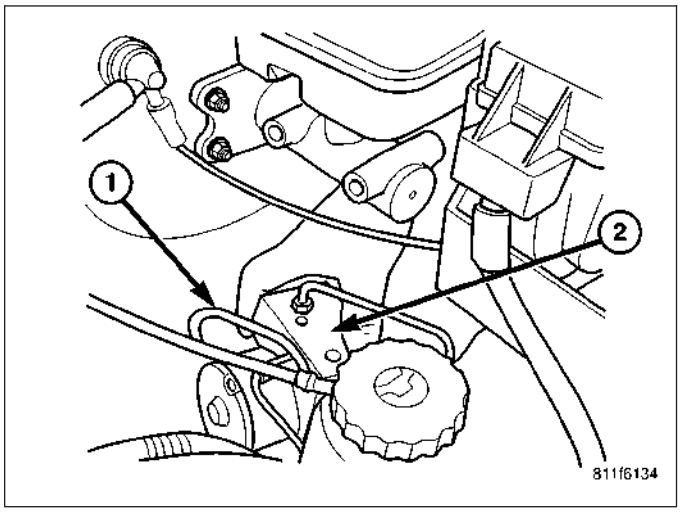


4. Remove HCU assembly mounting nuts (1).
5. Raise and support the vehicle.
6. Remove the left front tire.

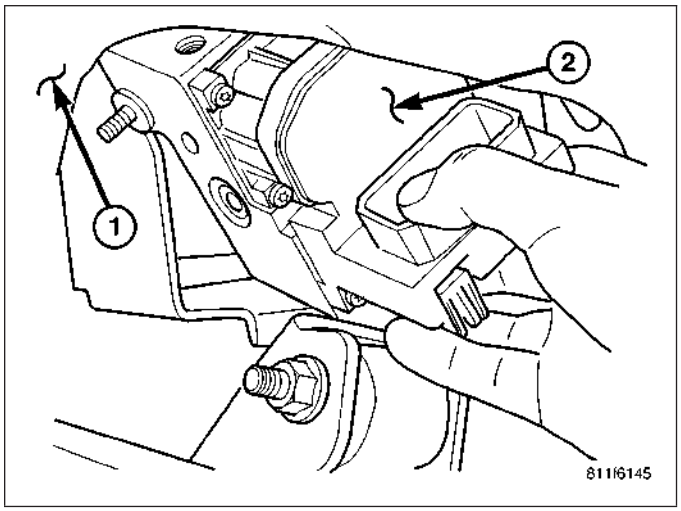


NOTE: Careful not to lose the mounting pins when remove the HCU from the vehicle.

7. Lift the HCU assembly (2) off the mounting bracket (1).



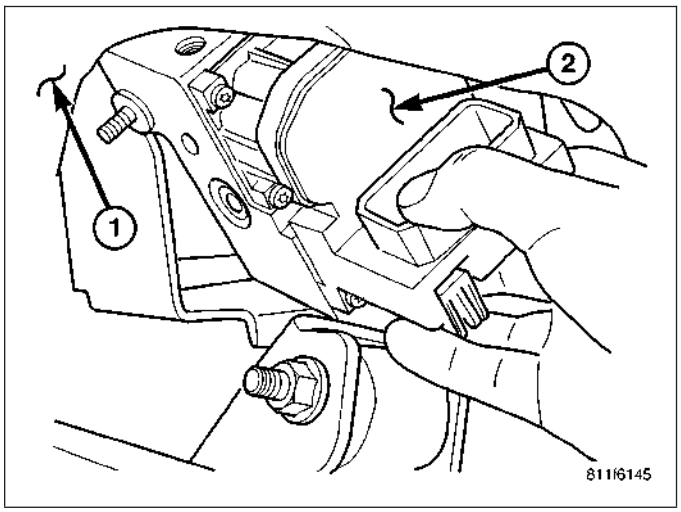
8. Remove the HCU assembly (2) through the left wheel well (1).



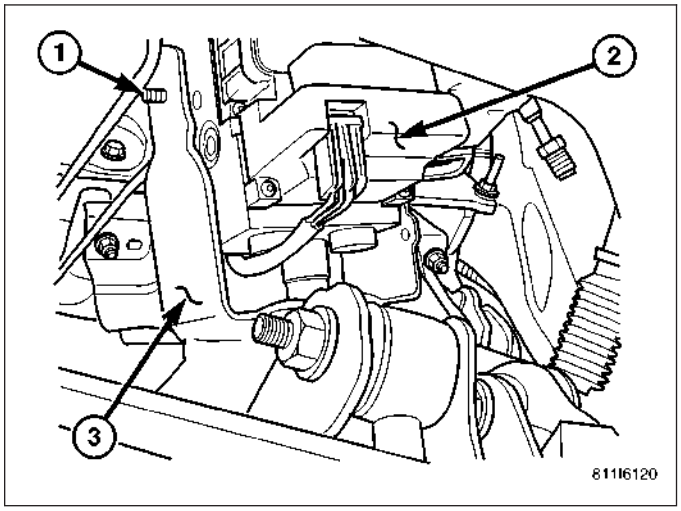
INSTALLATION

NOTE: If the ABM is being replaced with a new ABM it must be reprogrammed with the use of a scantool.

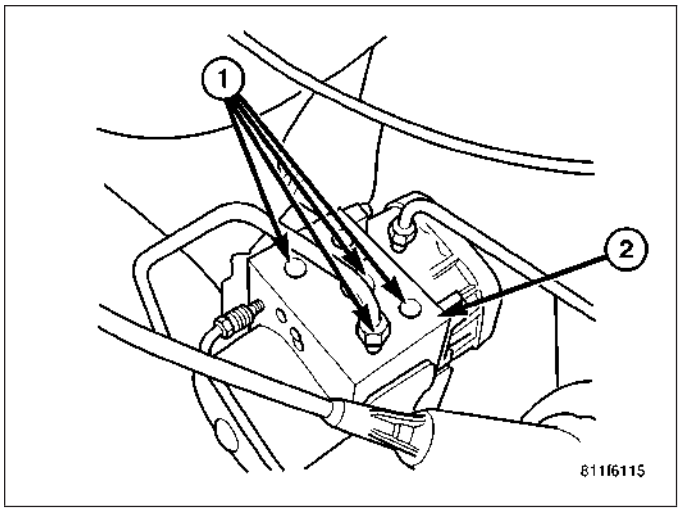
1. Reinstall the HCU assembly (2) through the left wheel well (1).



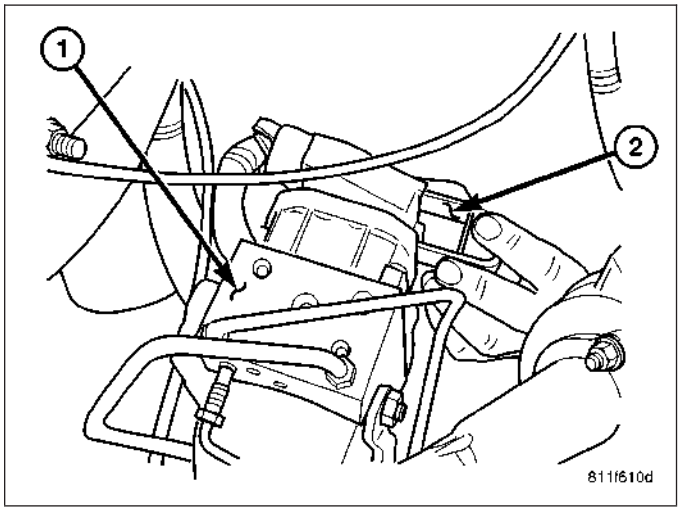
2. Install HCU assembly (2) on the mounting bracket (1) and Tighten the nuts to 15 N·m (11 ft. lbs.).



3. Install the brake lines (1) to the HCU (2) and tighten to 19 N·m (170 in. lbs.).



4. Install the electrical harness connector (2) to the HCU/ABM assembly (1).
5. Install the left front tire.
6. Install the battery cables to the battery.
7. Bleed ABS brake system (Refer to 5 - BRAKES - STANDARD PROCEDURE).



COOLING

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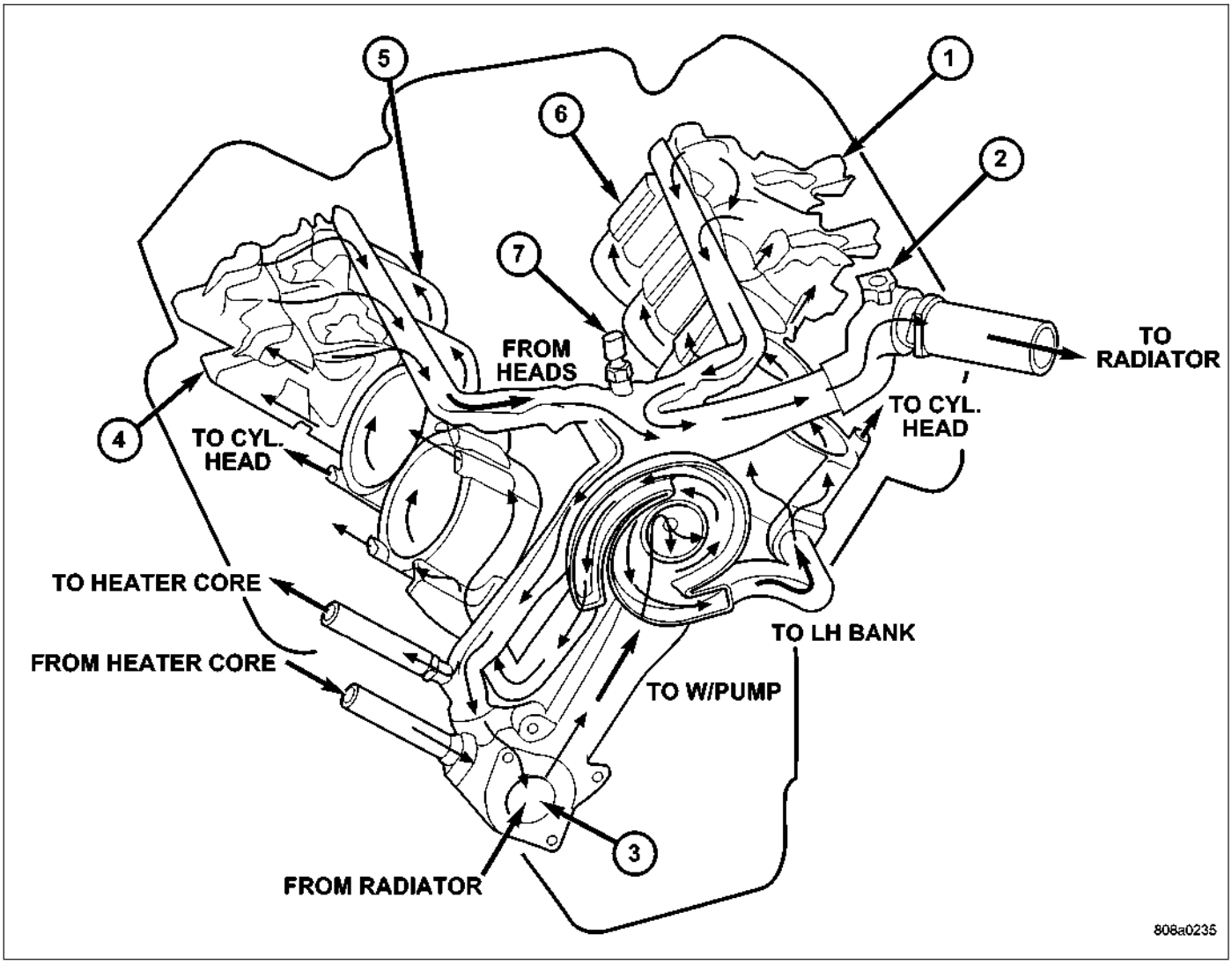
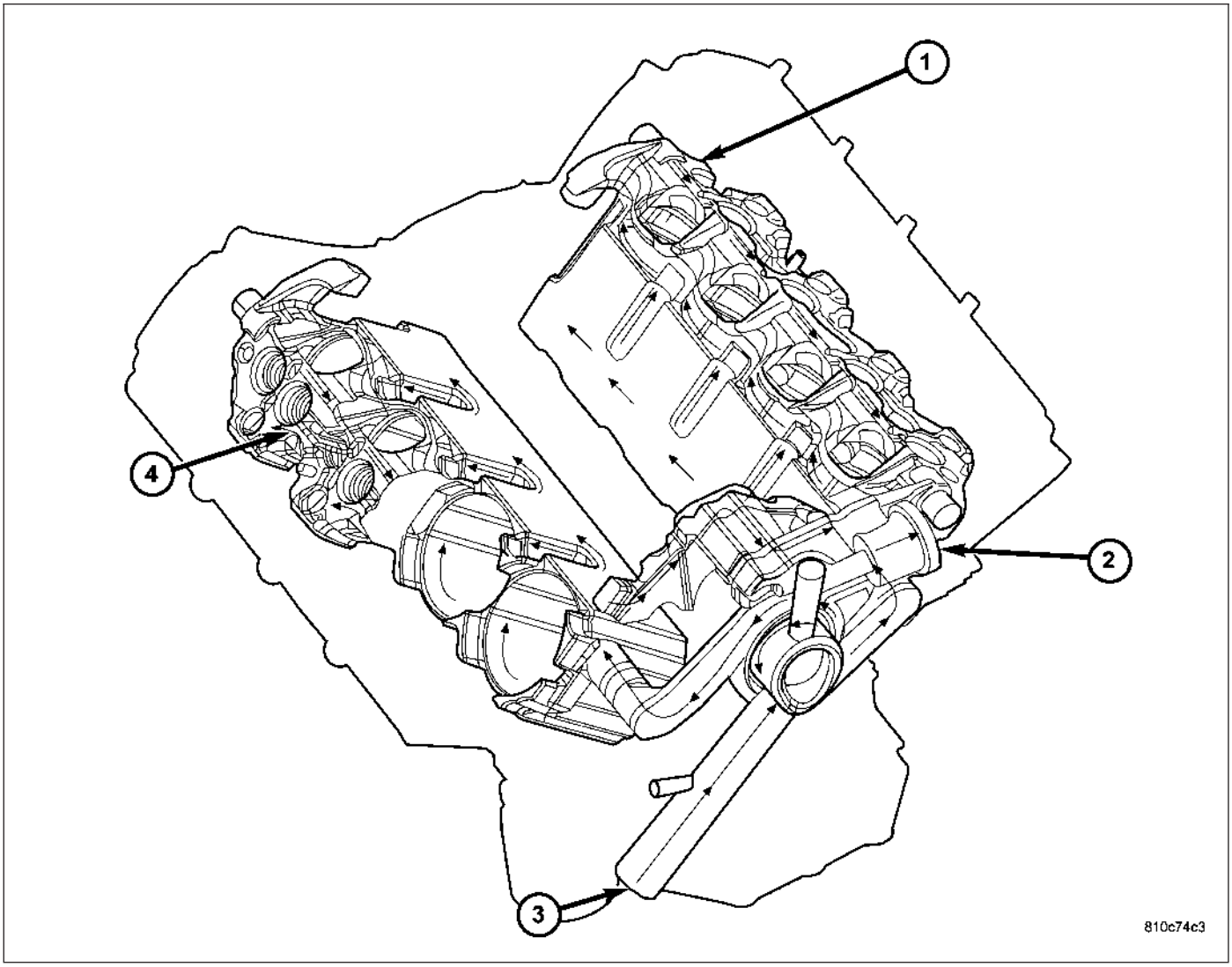
COOLING

DESCRIPTION



3.7L/4.7L COOLANT FLOW

1 - LH CYL. HEAD
2 - BLEED
3 - THERMOSTAT LOCATION
4 - RH CYL. HEAD
5 - RH BANK CYL. BLOCK
6 - LH BANK CYL. BLOCK
7 - COOLANT TEMP. SENSOR
8 - FROM HEATER CORE
9 - TO HEATER CORE



5.7L Engine Coolant System Flow

1 - LH CYLINDER HEAD
2 - TO RADIATOR
3 - FROM RADIATOR
4 - TO RH CYLINDER HEAD

The cooling system consists of :

- Radiator
- Cooling fan (mechanical/Electrical)
- Thermal viscous fan drive
- Fan shroud
- Radiator pressure cap
- Thermostat
- Coolant reserve/overflow system (integral to upper fan shroud)
- Transmission oil cooler (if equipped with an automatic transmission)
- Coolant
- Water pump
- Hoses and hose clamps

OPERATION

The cooling system regulates engine operating temperature. It allows the engine to reach normal operating temperature as quickly as possible. It also maintains normal operating temperature and prevents overheating.

The cooling system also provides a means of heating the passenger compartment and cooling the automatic transmission fluid (if equipped). The cooling system is pressurized and uses a centrifugal water pump to circulate coolant throughout the system.

An optional factory installed maximum duty cooling package is available on most models. This package will provide additional cooling capacity for vehicles used under extreme conditions such as trailer towing in high ambient temperatures.

DIAGNOSIS AND TESTING

ON-BOARD DIAGNOSTICS (OBD)

COOLING SYSTEM RELATED DIAGNOSTICS

The powertrain control module (PCM) has been programmed to monitor certain cooling system components:

- If the engine has remained cool for too long a period, such as with a stuck open thermostat, a Diagnostic Trouble Code (DTC) can be set.
- If an open or shorted condition has developed in the relay circuit controlling the electric radiator fan, a Diagnostic Trouble Code (DTC) can be set.

If the problem is sensed in a monitored circuit often enough to indicated an actual problem, a DTC is stored. The DTC will be stored in the PCM memory for eventual display to the service technician. (Refer to 25 - EMISSIONS CONTROL - DESCRIPTION).

ACCESSING DIAGNOSTIC TROUBLE CODES

To read DTC's and to obtain cooling system data, (Refer to 25 - EMISSIONS CONTROL - DESCRIPTION).

ERASING TROUBLE CODES

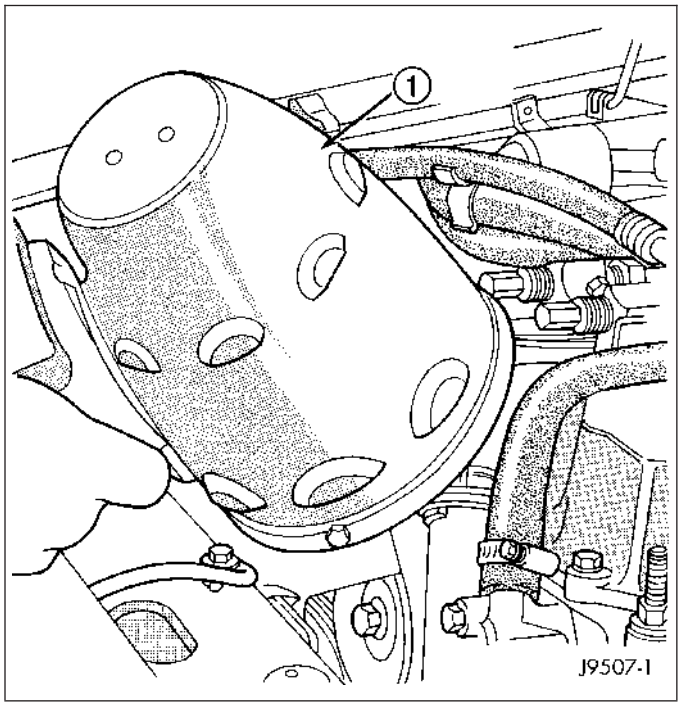
After the problem has been repaired, use the scan tool to erase a DTC. Refer to the appropriate Powertrain Diagnostic Procedures service information for operation of the scan tool.

COOLING SYSTEM - TESTING FOR LEAKS

ULTRAVIOLET LIGHT METHOD

A leak detection additive is available through the parts department that can be added to cooling system. The additive is highly visible under ultraviolet light (black light) (1). Pour one ounce of additive into cooling system. Place heater control unit in HEAT position. Start and operate engine until the radiator upper hose is warm to touch. Aim the commercially available black light tool at components to be checked. If leaks are present, black light will cause the additive to glow a bright green color.

The black light can be used in conjunction with a pressure tester to determine if any external leaks exist.



PRESSURE TESTER METHOD

The engine should be at normal operating temperature. Recheck the system cold if the cause of coolant loss is not located during the warm engine examination.

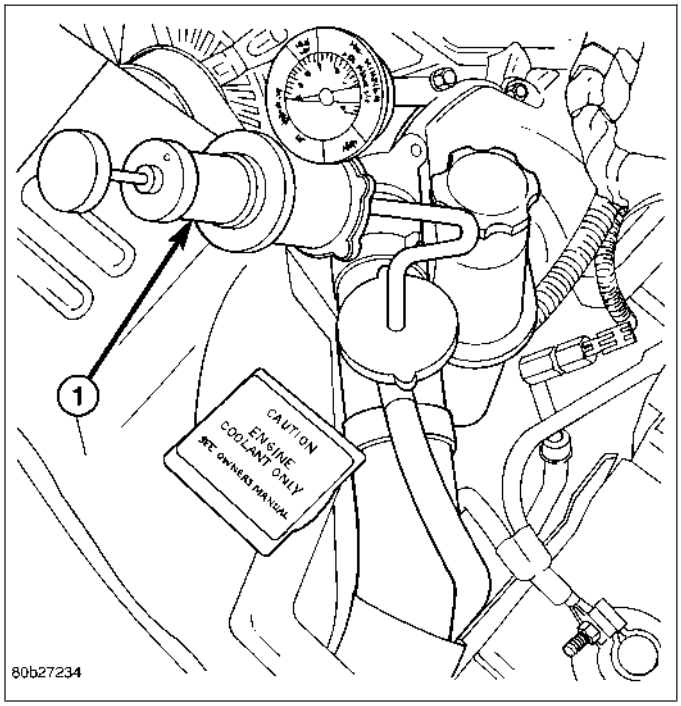
WARNING: HOT, PRESSURIZED COOLANT CAN CAUSE INJURY BY SCALDING.

Carefully remove the radiator pressure cap from the filler neck and check coolant level. Push down on cap to disengage it from the stop tabs. Wipe the inside of filler neck and examine the lower inside sealing seat for nicks, cracks, paint, dirt and solder residue. Inspect the radiator-to- reserve/overflow tank hose for internal obstructions. Insert a wire through the hose to be sure it is not obstructed.

Inspect cams on the outside of filler neck. If the cams are damaged, seating of the pressure cap valve and tester seal will be affected.

Attach pressure tester (7700 or an equivalent) to radiator filler neck (1).

Operate tester pump to apply 103.4 kPa (15 psi) pressure to system. If hoses enlarge excessively or bulge while testing, replace as necessary. Observe the gauge pointer and determine the condition of the cooling system according to the following criteria:



Holds Steady: If the pointer remains steady for two minutes, serious coolant leaks are not present in system. However, there could be an internal leak that does not appear with normal system test pressure. If it is certain that coolant is being lost and leaks cannot be detected, inspect for interior leakage or perform Internal Leakage Test. Refer to INTERNAL LEAKAGE INSPECTION .

Drops Slowly: Indicates a small leak or seepage is occurring. Examine all connections for seepage or slight leakage with a flashlight. Inspect radiator, hoses, gasket edges and heater. Seal small leak holes with a Sealer Lubricant (or equivalent). Repair leak holes and inspect system again with pressure applied.

Drops Quickly: Indicates that serious leakage is occurring. Examine system for external leakage. If leaks are not visible, inspect for internal leakage. Large radiator leak holes should be repaired by a reputable radiator repair shop.

INTERNAL LEAKAGE INSPECTION

Remove engine oil pan drain plug and drain a small amount of engine oil. If coolant is present in the pan, it will drain first because it is heavier than oil. An alternative method is to operate engine for a short period to churn the oil. After this is done, remove engine dipstick and inspect for water globules. Also inspect the transmission dipstick for water globules and the transmission fluid cooler for leakage.

WARNING: WITH RADIATOR PRESSURE TESTER TOOL INSTALLED ON RADIATOR, DO NOT ALLOW PRESSURE TO EXCEED 145 KPA (21 PSI). PRESSURE WILL BUILD UP QUICKLY IF A COMBUSTION LEAK IS PRESENT. TO RELEASE PRESSURE, ROCK TESTER FROM SIDE TO SIDE. WHEN REMOVING TESTER, DO NOT TURN TESTER MORE THAN 1/2 TURN IF SYSTEM IS UNDER PRESSURE.

Operate the engine without the pressure cap on the radiator until the thermostat opens. Attach a Pressure Tester to filler neck. If pressure builds up quickly it indicates a combustion leak exists. This is usually the result of a cylinder head gasket leak or crack in engine. Repair as necessary.

If there is not an immediate pressure increase, pump the Pressure Tester. Do this until indicated pressure is within system range of 110 kPa (16 psi). Fluctuation of gauge pointer indicates compression or combustion leakage into cooling system.

Because the vehicle is equipped with a catalytic converter, **do not** remove spark plug cables or short out cylinders to isolate compression leak.

If the needle on the dial of pressure tester does not fluctuate, race engine a few times to check for an abnormal amount of coolant or steam. This would be emitting from exhaust pipe. Coolant or steam from exhaust pipe may indicate a faulty cylinder head gasket, cracked engine cylinder block or cylinder head.

A convenient check for exhaust gas leakage into cooling system is provided by a commercially available Block Leak Check tool. Follow manufacturers instructions when using this product.

COMBUSTION LEAKAGE TEST - WITHOUT PRESSURE TESTER

DO NOT WASTE reusable coolant. If the solution is clean, drain the coolant into a clean container for reuse.

WARNING: DO NOT REMOVE CYLINDER BLOCK DRAIN PLUGS OR LOOSEN RADIATOR DRAINCOCK WITH SYSTEM HOT AND UNDER PRESSURE. SERIOUS BURNS FROM COOLANT CAN OCCUR.

Drain sufficient coolant to allow thermostat removal. (Refer to 7 - COOLING/ENGINE/ENGINE COOLANT THERMOSTAT - REMOVAL) for the 5.9L Diesel Engine or (Refer to 7 - COOLING/ENGINE/ENGINE COOLANT THERMOSTAT - REMOVAL) for the 3.7L/4.7L Engine. Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL) for the 5.9L Diesel Engine or (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL) for the 3.7L/4.7L Engine.

Add coolant to radiator to bring level to within 6.3 mm (1/4 in) of the top of the thermostat housing.

CAUTION: Avoid overheating. Do not operate engine for an excessive period of time. Open draincock immediately after test to eliminate boil over.

Start engine and accelerate rapidly three times, to approximately 3000 rpm while observing coolant. If internal engine combustion gases are leaking into cooling system, bubbles will appear in coolant. If bubbles do not appear, internal combustion gas leakage is not present.

PRELIMINARY CHECKS

ENGINE COOLING SYSTEM OVERHEATING

Establish what driving conditions caused the complaint. Abnormal loads on the cooling system such as the following may be the cause:

- Prolonged idle
- Very high ambient temperature
- Slight tail wind at idle
- Slow traffic
- Traffic jams
- High speed or steep grades

Driving techniques that avoid overheating are:

- Idle with A/C off when temperature gauge is at end of normal range.
- Increasing engine speed for more air flow is recommended.

TRAILER TOWING:

Consult Trailer Towing section of owners manual. Do not exceed limits.

RECENT SERVICE OR ACCIDENT REPAIR:

Determine if any recent service has been performed on vehicle that may effect cooling system. This may be:

- Engine adjustments (incorrect timing)
- Slipping engine accessory drive belt(s)
- Brakes (possibly dragging)
- Changed parts. Incorrect water pump or pump rotating in wrong direction due to belt not correctly routed
- Reconditioned radiator or cooling system refilling (possibly under filled or air trapped in system).

Note: If investigation reveals none of the previous items as a cause for an engine overheating complaint, refer to COOLING SYSTEM DIAGNOSIS CHART BELOW.

These charts are to be used as a quick-reference only. Refer to COOLING SYSTEM DIAGNOSIS CHART

COOLING SYSTEM DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSES	CORRECTION
TEMPERATURE GAUGE READS LOW	1. Has a Diagnostic Trouble Code (DTC) been set indicating a stuck open thermostat?	1. (Refer to 25 - EMISSIONS CONTROL - DESCRIPTION). Replace thermostat if necessary.
	2. Is the temperature sending unit connected?	2. Check the temperature sensor connector. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING) . Repair connector if necessary.
	3. Is the temperature gauge operating OK?	3. Check gauge operation. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER/ENGINE TEMPERATURE GAUGE - DESCRIPTION). Repair as necessary.
	4. Coolant level low in cold ambient temperatures accompanied with poor heater performance.	4. Check coolant level in the coolant reserve/overflow tank or degas bottle and the radiator. Inspect system for leaks. Repair leaks as necessary. Refer to the Coolant section of the manual text for WARNINGS and CAUTIONS associated with removing the radiator cap.
	5. Improper operation of internal heater doors or heater controls.	5. Inspect heater and repair as necessary. (Refer to 24 - HEATING & AIR CONDITIONING - DIAGNOSIS AND TESTING) .

CONDITION	POSSIBLE CAUSES	CORRECTION
TEMPERATURE GAUGE READS HIGH OR THE COOLANT WARNING LAMP ILLUMINATES. COOLANT MAY OR MAY NOT BE LOST OR LEAKING FROM THE COOLING SYSTEM	1. Trailer is being towed, a steep hill is being climbed, vehicle is operated in slow moving traffic, or engine is being idled with very high ambient (outside) temperatures and the air conditioning is on. Higher altitudes could aggravate these conditions.	1. This may be a temporary condition and repair is not necessary. Turn off the air conditioning and attempt to drive the vehicle without any of the previous conditions. Observe the temperature gauge. The gauge should return to the normal range. If the gauge does not return to the normal range, determine the cause for overheating and repair. Refer to Possible Causes (2-18).
	2. Is the temperature gauge reading correctly?	2. Check gauge. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). Repair as necessary.
	3. Is the temperature warning illuminating unnecessarily?	3. (Refer to 8 - ELECTRICAL/ INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).
	4. Coolant low in coolant reserve/ overflow tank and radiator?	4. Check for coolant leaks and repair as necessary. (Refer to 7 - COOLING - DIAGNOSIS AND TESTING).
	5. Pressure cap not installed tightly. If cap is loose, boiling point of coolant will be lowered. Also refer to the following Step 6.	5. Tighten cap
	6. Poor seals at the radiator cap.	6. (a) Check condition of cap and cap seals. Refer to Radiator Cap. Replace cap if necessary. (b) Check condition of radiator filler neck or degas bottle. If neck is bent or damaged, replace radiator or degas bottle.
	7. Coolant level low in radiator but not in coolant reserve/overflow tank. This means the radiator is not drawing coolant from the coolant reserve/overflow tank as the engine cools	7. (a) Check condition of radiator cap and cap seals. Refer to Radiator Cap in this Group. Replace cap if necessary. (b) Check condition of radiator filler neck. If neck is bent or damaged, replace radiator. (c) Check condition of the hose from the radiator to the coolant tank. It should fit tight at both ends without any kinks or tears. Replace hose if necessary. (d) Check coolant reserve/overflow tank and tanks hoses for blockage. Repair as necessary.

CONDITION	POSSIBLE CAUSES	CORRECTION
	8. Incorrect coolant concentration	8. Check coolant. (Refer to LUBRICATION & MAINTENANCE/ FLUID TYPES - DESCRIPTION)
	9. Coolant not flowing through system	9. Check for coolant flow at radiator filler neck with some coolant removed, engine warm and thermostat open. Coolant should be observed flowing through radiator. If flow is not observed, determine area of obstruction and repair as necessary.
	10. Radiator or A/C condenser fins are dirty or clogged.	10. Remove insects and debris. (Refer to 7 - COOLING - STANDARD PROCEDURE).
	11. Radiator core is corroded or plugged.	11. Have radiator re-cored or replaced.
	13. Dragging brakes	13. Check and correct as necessary. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)
	12. Fuel or ignition system problems.	12. Refer to 14 - Fuel System or 8 - Electrical for diagnosis and testing procedures.
	14. Bug screen or cardboard is being , reducing airflow.	14. Remove bug screen or cardboard.
	15. Thermostat partially or completely shut.	15. Check thermostat operation and replace as necessary. (Refer to 7 - COOLING/ENGINE/ENGINE COOLANT THERMOSTAT - REMOVAL).
	16. Viscous fan drive not operating properly.	16. Check fan drive operation and replace as necessary. (Refer to 7 - COOLING/ENGINE/FAN DRIVE VISCOUS CLUTCH - DIAGNOSIS AND TESTING).
	17. Cylinder head gasket leaking.	17. Check for cylinder head gasket leaks. (Refer to 7 - COOLING - DIAGNOSIS AND TESTING).
	18. Heater core leaking.	18. Check heater core for leaks. (Refer to 24 - HEATING & AIR CONDITIONING - DIAGNOSIS AND TESTING). Repair as necessary.

CONDITION	POSSIBLE CAUSES	CORRECTION
TEMPERATURE GAUGE READING IS INCONSISTANT (FLUCTUATES, CYCLES, OR IS ERRATIC	1. During cold weather operation, with the heater in the high position, the gauge reading may drop slightly.	1. During cold weather operation, with the heater in the high position, the gauge reading may drop slightly.
	2. Temperature gauge or engine mounted gauge sensor defective or shorted. Also, corroded or loose wiring in this circuit.	2. Check operation of gauge and repair if necessary. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).
	3. Gauge reading rises when vehicle is brought to a stop after heavy use (engine still running)	3. A normal condition. No correction is necessary. Gauge should return to normal range after vehicle is driven.
	4. Gauge reading high after re-starting a warmed up (hot) engine.	4. A normal condition. No correction is necessary. The gauge should return to normal range after a few minutes of engine operation.
	5. Coolant level low in radiator (air will build up in the cooling system causing the thermostat to open late).	5. Check and correct coolant leaks. (Refer to 7 - COOLING - DIAGNOSIS AND TESTING).
	6. Cylinder head gasket leaking allowing exhaust gas to enter cooling system causing a thermostat to open late.	6. (a) Check for cylinder head gasket leaks. (Refer to 7 - COOLING - DIAGNOSIS AND TESTING). (b) Check for coolant in the engine oil. Inspect for white steam emitting from the exhaust system. Repair as necessary.
	7. Water pump impeller loose on shaft.	7. Check water pump and replace as necessary. (Refer to 7 - COOLING/ENGINE/WATER PUMP - REMOVAL).
	8. Loose accessory drive belt. (water pump slipping)	8.. Check and correct as necessary. (Refer to 7 - COOLING/ ACCESSORY DRIVE/DRIVE BELTS - DIAGNOSIS AND TESTING)
	9. Air leak on the suction side of the water pump allows air to build up in cooling system causing thermostat to open late.	9. Locate leak and repair as necessary.
PRESSURE CAP IS BLOWING OFF STEAM AND/OR COOLANT TO COOLANT TANK. TEMPERATURE GAUGE READING MAY BE ABOVE NORMAL BUT NOT HIGH. COOLANT LEVEL MAY BE HIGH IN COOLANT RESERVE/ OVERFLOW TANK	1. Pressure relief valve in radiator cap is defective.	1. Check condition of radiator cap and cap seals. (Refer to 7 - COOLING/ENGINE/RADIATOR PRESSURE CAP - DIAGNOSIS AND TESTING). Replace cap as necessary.

CONDITION	POSSIBLE CAUSES	CORRECTION
COOLANT LOSS TO THE GROUND WITHOUT PRESSURE CAP BLOWOFF. GAUGE READING HIGH OR HOT	1. Coolant leaks in radiator, cooling system hoses, water pump or engine.	1. Pressure test and repair as necessary. (Refer to 7 - COOLING - DIAGNOSIS AND TESTING).
DETONATION OR PRE-IGNITION (NOT CAUSED BY IGNITION SYSTEM). GAUGE MAY OR MAY NOT BE READING HIGH	1. Engine overheating. 2. Freeze point of coolant not correct. Mixture is too rich or too lean.	1. Check reason for overheating and repair as necessary. 2. Check coolant concentration. (Refer to LUBRICATION & MAINTENANCE/FLUID TYPES - DESCRIPTION).
HOSE OR HOSES COLLAPSE WHILE ENGINE IS RUNNING	1. Vacuum created in cooling system on engine cool-down is not being relieved through coolant reserve/overflow system.	1. (a) Radiator cap relief valve stuck. (Refer to 7 - COOLING/ ENGINE/RADIATOR PRESSURE CAP - DIAGNOSIS AND TESTING) . Replace if necessary (b) Hose between coolant reserve/overflow tank and radiator is kinked. Repair as necessary. (c) Vent at coolant reserve/overflow tank is plugged. Clean vent and repair as necessary. (d) Reserve/overflow tank is internally blocked or plugged. Check for blockage and repair as necessary.
NOISY VISCOUS FAN/DRIVE	1. Fan blades loose. 2. Fan blades striking a surrounding object. 3. Air obstructions at radiator or air conditioning condenser. 4. Thermal viscous fan drive has defective bearing. 5. A certain amount of fan noise may be evident on models equipped with a thermal viscous fan drive. Some of this noise is normal.	1. Replace fan blade assembly. (Refer to 7 - COOLING/ENGINE/ FAN DRIVE VISCOUS CLUTCH - REMOVAL). 2. Locate point of fan blade contact and repair as necessary. 3. Remove obstructions and/or clean debris or insects from radiator or A/C condenser. 4. Replace fan drive. Bearing is not serviceable. (Refer to 7 - COOLING/ ENGINE/FAN DRIVE VISCOUS CLUTCH - REMOVAL). 5. (Refer to 7 - COOLING/ENGINE/ FAN DRIVE VISCOUS CLUTCH - DESCRIPTION) for an explanation of normal fan noise.

CONDITION	POSSIBLE CAUSES	CORRECTION
INADEQUATE HEATER PERFORMANCE. THERMOSTAT FAILED IN OPEN POSITION	1. Has a Diagnostic trouble Code (DTC) been set?	1. (Refer to 25 - EMISSIONS CONTROL - DESCRIPTION) for correct procedures and replace thermostat if necessary
	2. Coolant level low	2. (Refer to 7 - COOLING - STANDARD PROCEDURE)
	3. Obstructions in heater hose/ fittings	3. Remove heater hoses at both ends and check for obstructions
	4. Heater hose kinked	4. Locate kinked area and repair as necessary
	5. Water pump is not pumping water to/through the heater core. When the engine is fully warmed up, both heater hoses should be hot to the touch. If only one of the hoses is hot, the water pump may not be operating correctly or the heater core may be plugged. Accessory drive belt may be slipping causing poor water pump operation.	5. (Refer to 7 - COOLING/ENGINE/ WATER PUMP - REMOVAL) If a slipping belt is detected, (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - DIAGNOSIS AND TESTING). If heater core obstruction is detected, (Refer to 24 - HEATING & AIR CONDITIONING - DIAGNOSIS AND TESTING).
STEAM IS COMING FROM THE FRONT OF VEHICLE NEAR THE GRILL AREA WHEN WEATHER IS WET, ENGINE IS WARMED UP AND RUNNING, AND VEHICLE IS STATIONARY. TEMPERATURE GAUGE IS IN NORMAL RANGE	1. During wet weather, moisture (snow, ice or rain condensation) on the radiator will evaporate when the thermostat opens. This opening allows heated water into the radiator. When the moisture contacts the hot radiator, steam may be emitted. This usually occurs in cold weather with no fan or airflow to blow it away.	1. Occasional steam emitting from this area is normal. No repair is necessary.
COOLANT COLOR	1. Coolant color is not necessarily an indication of adequate corrosion or temperature protection. Do not rely on coolant color for determining condition of coolant.	1. (Refer to LUBRICATION & MAINTENANCE/FLUID TYPES - DESCRIPTION) Adjust coolant mixture as necessary.
COOLANT LEVEL CHANGES IN COOLANT RESERVE/OVERFLOW TANK. TEMPERATURE GAUGE IS IN NORMAL RANGE	1. Level changes are to be expected as coolant volume fluctuates with engine temperature. If the level in the tank was between the FULL and ADD marks at normal operating temperature, the level should return to within that range after operation at elevated temperatures.	1. A normal condition. No repair is necessary.

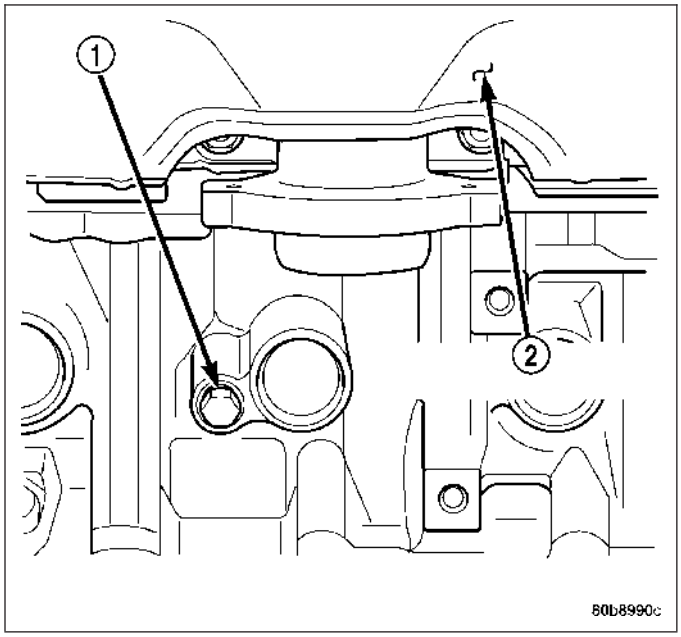
STANDARD PROCEDURE

DRAINING COOLING SYSTEM - ALL ENGINES

WARNING: DO NOT REMOVE CYLINDER BLOCK DRAIN PLUGS OR LOOSEN RADIATOR DRAIN-COCK WITH SYSTEM HOT AND UNDER PRESSURE. SERIOUS BURNS FROM COOLANT CAN OCCUR.

DO NOT WASTE reusable coolant. If solution is clean, drain coolant into a clean container for reuse.

1. Remove radiator pressure cap.
2. Loosen radiator petcock.
3. Remove cylinder block drain plugs (1).

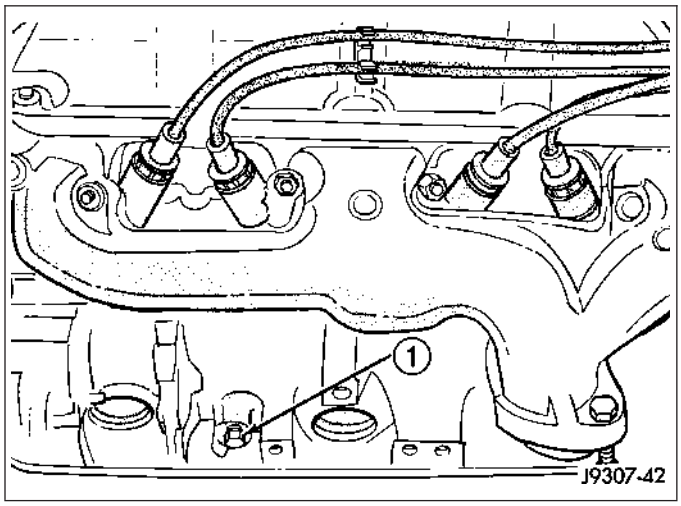


REFILLING COOLING SYSTEM

WARNING: DO NOT REMOVE CYLINDER BLOCK DRAIN PLUGS OR LOOSEN RADIATOR DRAIN-COCK WITH SYSTEM HOT AND UNDER PRESSURE. SERIOUS BURNS FROM COOLANT CAN OCCUR.

DO NOT WASTE reusable coolant. If solution is clean, drain coolant into a clean container for reuse.

Clean cooling system prior to refilling. (Refer to 7 - COOLING - STANDARD PROCEDURE).



1. Install cylinder block drain plugs. Coat the threads with Mopar® Thread Sealant with Teflon.
2. Close radiator petcock.
3. Fill cooling system with a 50/50 mixture of water and antifreeze.
4. Fill coolant reserve/overflow tank to MAX mark on indicator stick.
5. Start and operate engine until thermostat opens (upper radiator hose warm to touch).
6. If necessary, add a 50/50 water and antifreeze mixture to the coolant reserve/overflow tank. This is done to maintain coolant level between the MAX and MIN marks. The level in the reserve/overflow tank may drop below the MIN mark after three or four warm-up and cool-down cycles.

ADDING ADDITIONAL COOLANT

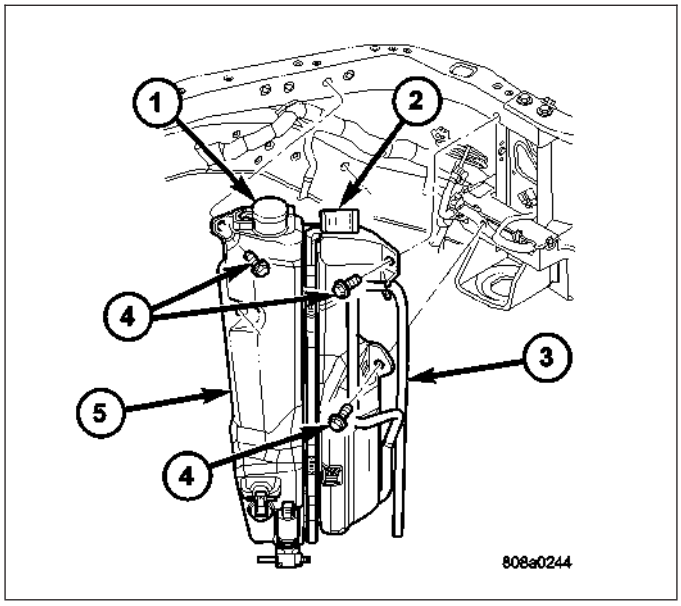
The use of aluminum cylinder blocks, cylinder heads and water pumps requires special corrosion protection. Only Mopar® Antifreeze/Coolant, 5 Year/100,000 Mile Formula (glycol base coolant with corrosion inhibitors called HOAT, for Hybrid Organic Additive Technology) is recommended. This coolant offers the best engine cooling without corrosion when mixed with 50% distilled water to obtain to obtain a freeze point of -37°C (-35°F). If it loses color or becomes contaminated, drain, flush, and replace with fresh properly mixed coolant solution.

CAUTION: Do not use coolant additives that are claimed to improve engine cooling.

COOLANT LEVEL CHECK

Note: Do not remove radiator cap for routine coolant level inspections. The coolant level can be checked at coolant recovery bottle (2).

The coolant reserve/overflow system (5) provides a quick method for determining coolant level without removing radiator pressure cap. With engine not running, open the coolant recovery bottle cap and remove coolant level indicator dipstick to observe coolant level in coolant recovery bottle. The coolant level should be between ADD and FULL marks. If the coolant level is at or below the ADD mark, fill the recovery bottle with a 50/50 mixture of antifreeze and water ONE QUART AT A TIME. Repeat this procedure until the coolant level is at the FULL mark.



COOLING SYSTEM CLEANING/REVERSE FLUSHING

CLEANING

Drain cooling system and refill with water. Run engine with radiator cap installed until upper radiator hose is hot. Stop engine and drain water from system. If water is dirty, fill system with water, run engine and drain system. Repeat until water drains clean.

REVERSE FLUSHING

Reverse flushing of cooling system is the forcing of water through the cooling system. This is done using air pressure in the opposite direction of normal coolant flow. It is usually only necessary with very dirty systems with evidence of partial plugging.

REVERSE FLUSHING RADIATOR

Disconnect radiator hoses from radiator inlet and outlet. Attach a section of radiator hose to radiator bottom outlet fitting and insert flushing gun. Connect a water supply hose and air supply hose to flushing gun.

CAUTION: Internal radiator pressure must not exceed 138 kPa (20 psi) as damage to radiator may result.

Allow radiator to fill with water. When radiator is filled, apply air in short blasts. Allow radiator to refill between blasts. Continue this reverse flushing until clean water flows out through rear of radiator cooling tube passages. Have radiator cleaned more extensively by a radiator repair shop.

REVERSE FLUSHING ENGINE

Drain cooling system. Remove thermostat housing and thermostat. Install thermostat housing. Disconnect radiator upper hose from radiator and attach flushing gun to hose. Disconnect radiator lower hose from water pump and attach a lead-away hose to water pump inlet fitting.

CAUTION: On vehicles equipped with a heater water control valve, be sure heater control valve is closed (heat off). This will prevent coolant flow with scale and other deposits from entering heater core.

Connect water supply hose and air supply hose to flushing gun. Allow engine to fill with water. When engine is filled, apply air in short blasts, allowing system to fill between air blasts. Continue until clean water flows through the lead away hose.

Remove lead away hose, flushing gun, water supply hose and air supply hose. Remove thermostat housing and install thermostat. Install thermostat housing with a replacement gasket. Refer to Thermostat Replacement. Connect radiator hoses. Refill cooling system with correct antifreeze/water mixture. Refer to Refilling the Cooling System.

CHEMICAL CLEANING

In some instances, use a radiator cleaner (Mopar Radiator Kleen or equivalent) before flushing. This will soften scale and other deposits and aid flushing operation.

CAUTION: Follow manufacturers instructions when using these products.

SPECIFICATIONS

TORQUE

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Automatic Belt Tensioner to Block - Bolts	41	30	-
Automatic Belt Tensioner Pulley - Bolt	61	45	-
Block Heater - Bolt	2	-	17
Generator/Compressor Mounting Bracket - Bolts -			
No. 1 and 2	54	40	-
No. 3	40	30	-
Fan Shroud Mounting - Bolts	6	-	50
Fan Blade to Fan Drive - Bolts	23	17	-
Idler Pulley - Bolt	54	40	-
Radiator to Support - Bolts	23	-	200
Thermostat Housing - Bolts - All Except 4.7L	23	-	200
Thermostat Housing - Bolts - 4.7L	13	-	112
Transmission Auxiliary Oil Cooler - Bolts	10	-	90
Upper Radiator Closure Panel - Bolts	10	-	90
Water Pump - Bolts	58	43	-

FILL VOLUMES

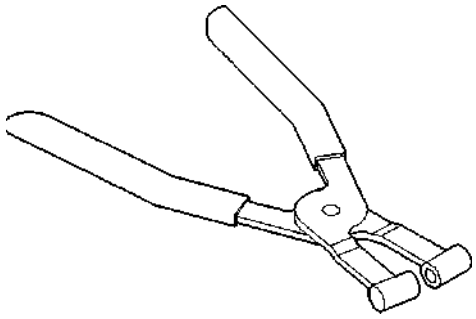
SPECIFICATIONS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
3.7L	15.4L	16.2 qts.- to the middle of the cold fill range
4.7L	15.4L	16.3 qts.
5.7L	15.4L	16.2 qts.

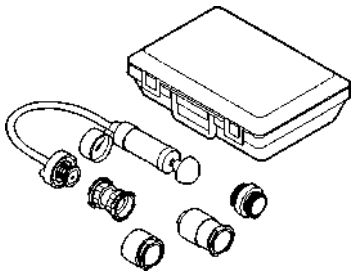
SPECIAL TOOLS

COOLING

3/8” Quick Connect Release Tool - 6935



Pliers Constant Pressure Hose Clamp - 6094



Cooling System Pressure Tester - 7700A

ACCESSORY DRIVE

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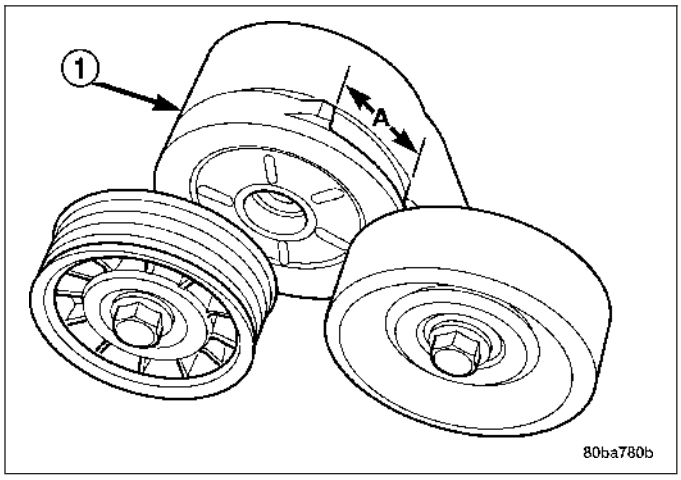
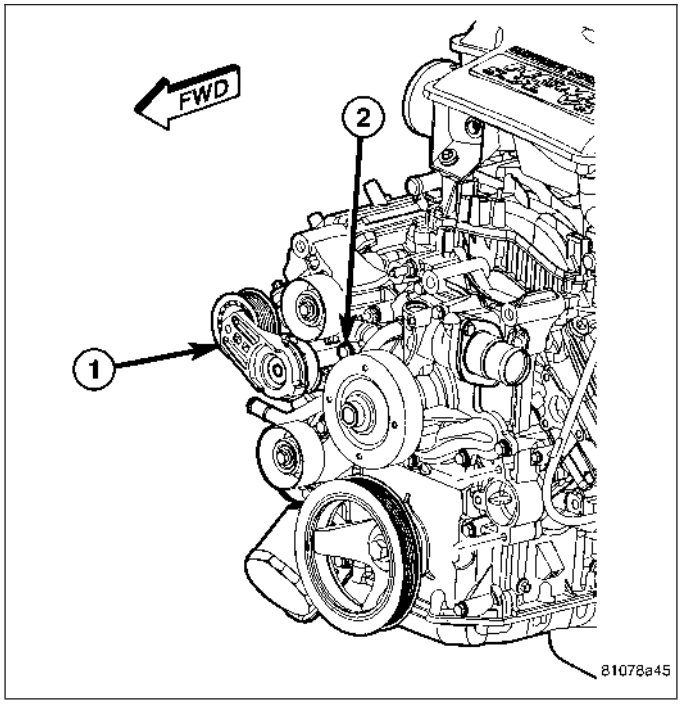
TENSIONERS-BELT

DESCRIPTION



Correct drive belt tension is required to ensure optimum performance of the belt driven engine accessories. If specified tension is not maintained, belt slippage may cause; engine overheating, lack of power steering assist, loss of air conditioning capacity, reduced generator output rate, and greatly reduced belt life.

It is not necessary to adjust belt tension on the 3/7L/ 4.7L or 5.7L engines. These engines are equipped with an automatic belt tensioner (1). The tensioner maintains correct belt tension at all times. Due to use of this belt tensioner, do not attempt to use a belt tension gauge on these engines.



OPERATION

The automatic belt tensioner maintains belt tension by using internal spring pressure, a pivoting arm and pulley to press against the drive belt.

REMOVAL

3.7L/4.7L ENGINE

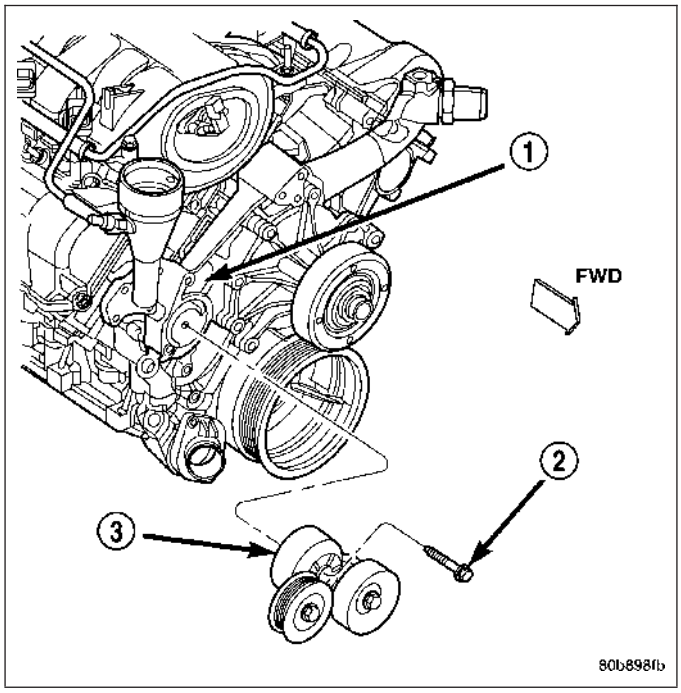
On 4.7L engines, the tensioner (3) is equipped with an indexing tang on back of tensioner and an indexing stop on tensioner housing. If a new belt is being installed, tang must be within approximately 24 mm (.94 inches) of indexing stop. Belt is considered new if it has been used 15 minutes or less.

If the above specification cannot be met, check for:

- The wrong belt being installed (incorrect length/width)
- Worn bearings on an engine accessory (A/C compressor, power steering pump, water pump, idler pulley or generator)
- A pulley on an engine accessory being loose
- Misalignment of an engine accessory
- Belt incorrectly routed.

Note: A used belt should be replaced if tensioner indexing arrow has moved to the minmum tension indicator. Tensioner travel stops at this point.

1. Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).



2. Remove tensioner assembly from mounting bracket (1).

WARNING: BECAUSE OF HIGH SPRING PRESSURE, DO NOT ATTEMPT TO DISASSEMBLE AUTOMATIC TENSIONER. UNIT IS SERVICED AS AN ASSEMBLY EXCEPT FOR PULLEY ON TENSIONER.

3. Remove pulley bolt. Remove pulley from tensioner.

5.7L ENGINE

1. Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
2. Remove tensioner and mounting bracket.
3. Remove the tensioner assembly from the mounting bracket.
4.

INSTALLATION

3.7L/4.7L ENGINE

1. Install pulley and pulley bolt to tensioner. Tighten bolt to 61 N·m (45 ft. lbs.) torque.
2. An indexing slot is located on back of tensioner. Align this slot to the head of the bolt on the front cover. Install the mounting bolt. Tighten bolt to 41 N·m (30 ft. lbs.).
3. Install accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).
4. Check belt indexing marks.

5.7L ENGINE

1. Install tensioner on to the mounting bracket. Tighten bolt to 41 N·m (30 ft. lbs.).
2. Install tensioner and bracket assembly
3. Install accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

BELTS-DRIVE

DIAGNOSIS AND TESTING

ACCESSORY DRIVE BELT

VISUAL DIAGNOSIS

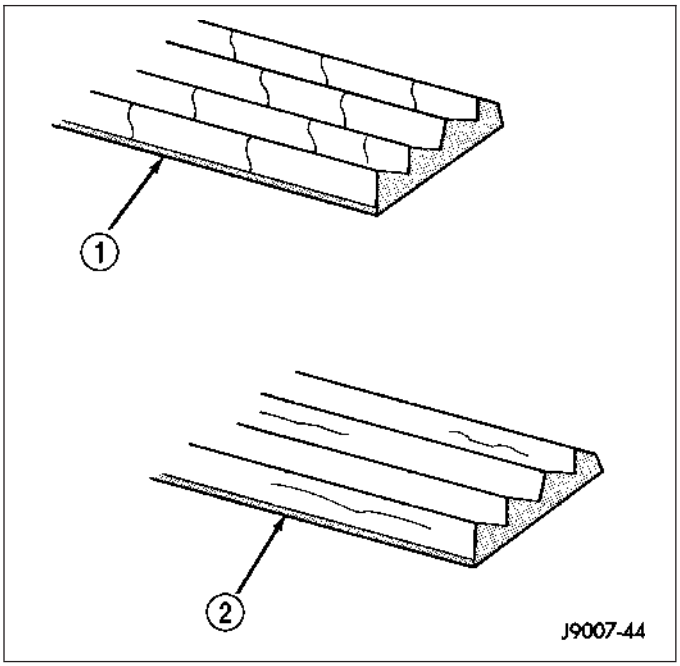
When diagnosing serpentine accessory drive belts, small cracks that run across the ribbed surface of the belt from rib to rib , are considered normal. These are not a reason to replace the belt. However, cracks running along a rib (not across) are **not** normal. Any belt with cracks running along a rib must be replaced. Also replace the belt if it has excessive wear, frayed cords or severe glazing.

Refer to ACCESSORY DRIVE BELT DIAGNOSIS CHART for further belt diagnosis.

NOISE DIAGNOSIS

Noises generated by the accessory drive belt are most noticeable at idle. Before replacing a belt to resolve a noise condition, inspect all of the accessory drive pulleys for alignment, glazing, or excessive end play.

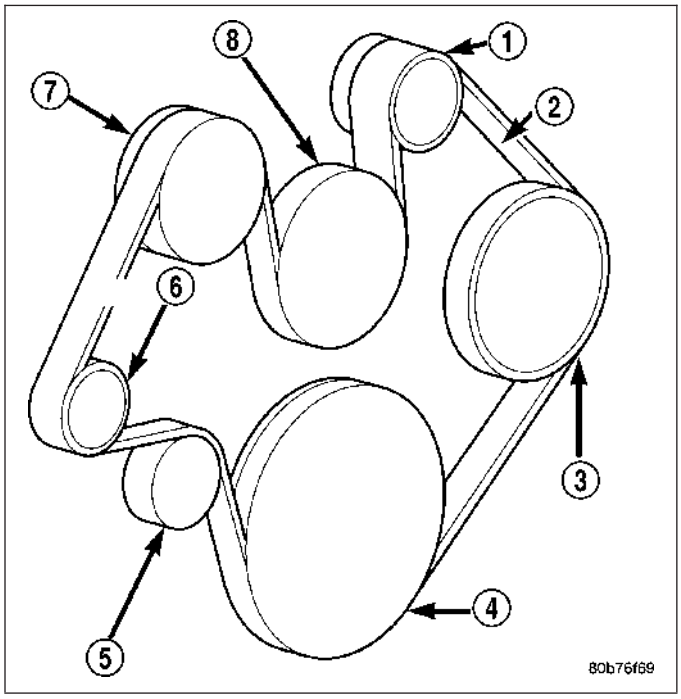
ACCESSORY DRIVE BELT DIAGNOSIS CHART



CONDITION	POSSIBLE CAUSES	CORRECTION
RIB CHUNKING (One or more ribs has separated from belt body)	1. Foreign objects imbedded in pulley grooves.	1. Remove foreign objects from pulley grooves. Replace belt.
	2. Installation damage	2. Replace belt
RIB OR BELT WEAR	1. Pulley misaligned	1. Align pulley(s)
	2. Abrasive environment	2. Clean pulley(s). Replace belt if necessary
	3. Rusted pulley(s)	3. Clean rust from pulley(s)
	4. Sharp or jagged pulley groove tips	4. Replace pulley. Inspect belt.
	5. Belt rubber deteriorated	5. Replace belt
BELT SLIPS	1. Belt slipping because of insufficient tension	1. Inspect/Replace tensioner if necessary
	2. Belt or pulley exposed to substance that has reduced friction (belt dressing, oil, ethylene glycol)	2. Replace belt and clean pulleys
	3. Driven component bearing failure (seizure)	3. Replace faulty component or bearing
	4. Belt glazed or hardened from heat and excessive slippage	4. Replace belt.
LONGITUDAL BELT CRACKING	1. Belt has mistracked from pulley groove	1. Replace belt
	2. Pulley groove tip has worn away rubber to tensile member	2. Replace belt

CONDITION	POSSIBLE CAUSES	CORRECTION
″GROOVE JUMPING″ (Belt does not maintain correct position on pulley)	1. Incorrect belt tension	1. Inspect/Replace tensioner if necessary
	2. Pulley(s) not within design tolerance	2. Replace pulley(s)
	3. Foreign object(s) in grooves	3. Remove foreign objects from grooves
	4. Pulley misalignment	4. Align component
	5. Belt cordline is broken	5. Replace belt
BELT BROKEN (Note: Identify and correct problem before new belt is installed)	1. Incorrect belt tension	1. Replace Inspect/Replace tensioner if necessary
	2. Tensile member damaged during belt installation	2. Replace belt
	3. Severe misalignment	3. Align pulley(s)
	4. Bracket, pulley, or bearing failure	4. Replace defective component and belt
NOISE (Objectionable squeal, squeak, or rumble is heard or felt while drive belt is in operation)	1. Incorrect belt tension	1. Inspect/Replace tensioner if necessary
	2. Bearing noise	2. Locate and repair
	3. Belt misalignment	3. Align belt/pulley(s)
	4. Belt to pulley mismatch	4. Install correct belt
	5. Driven component induced vibration	5. Locate defective driven component and repair
TENSION SHEETING FABRIC FAILURE (Woven fabric on outside, circumference of belt has cracked or separated from body of belt)	1. Tension sheeting contacting stationary object	1. Correct rubbing condition
	2. Excessive heat causing woven fabric to age	2. Replace belt
	3. Tension sheeting splice has fractured	3. Replace belt
CORD EDGE FAILURE (Tensile member exposed at edges of belt or separated from belt body)	1. Incorrect belt tension	1. Inspect/Replace tensioner if necessary
	2. Belt contacting stationary object	2. Replace belt
	3. Pulley(s) out of tolerance	3. Replace pulley
	4. Insufficient adhesion between tensile member and rubber matrix	4. Replace belt

REMOVAL - 3.7L/4.7L/5.7L



CAUTION: DO NOT LET TENSIONER ARM SNAP BACK TO THE FREEARM POSITION, SEVER DAMAGE MAY OCCUR TO THE TENSIONER.

Belt tension is not adjustable. Belt adjustment is maintained by an automatic (spring load) belt tensioner.

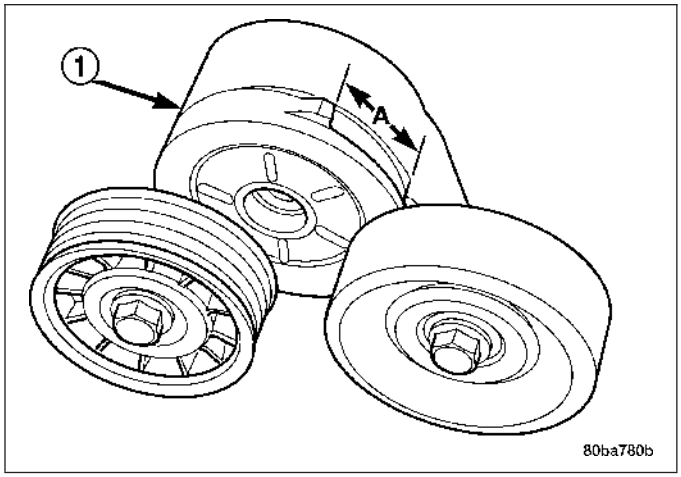
1. Disconnect negative battery cable from battery.
2. Rotate belt tensioner (6) until it contacts it's stop. Remove belt (2), then slowly rotate the tensioner (6) into the freearm position.

INSTALLATION - 3.7L/4.7L/5.7L

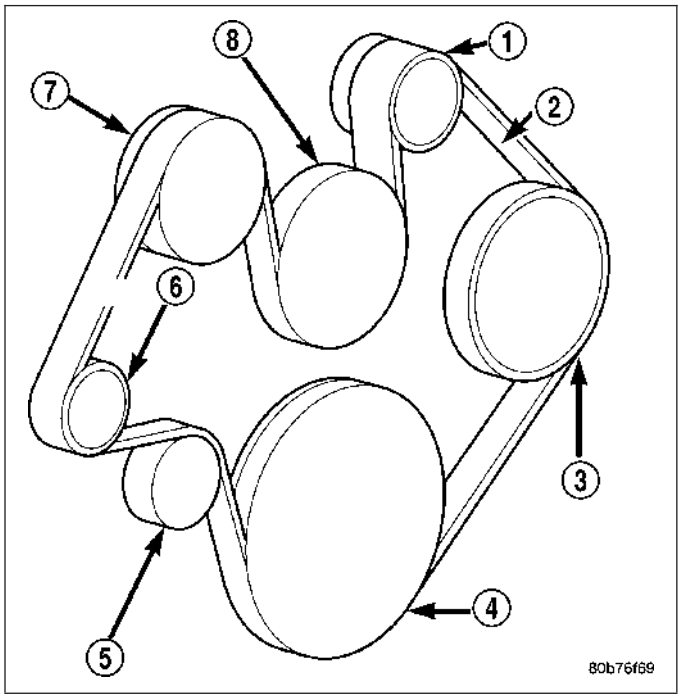
Belt tension is not adjustable. Belt adjustment is maintained by an automatic (spring load) belt tensioner.

1. Check condition of all pulleys.

CAUTION: When installing the serpentine accessory drive belt, the belt MUST be routed correctly. If not, the engine may overheat due to the water pump rotating in the wrong direction.



2. Install new belt. Route the belt around all pulleys except the idler pulley (5). Rotate the tensioner arm until it contacts it's stop position. Route the belt around the idler (5) and slowly let the tensioner rotate into the belt. Make sure the belt is seated onto all pulleys.
3. With the drive belt installed, inspect the belt wear indicator. On 4.7L Engines only, the gap between the tang and the housing stop (measurement A) must not exceed 24 mm (.94 inches). If the measurement exceeds this specification replace the serpentine accessory drive belt.



ENGINE

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CONTAINER-COOLANT RECOVERY

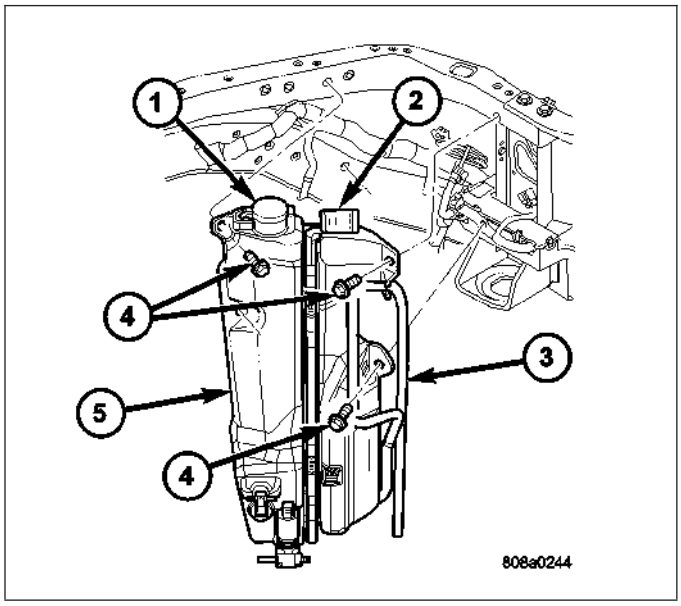
DESCRIPTION

The coolant recovery containeris integral to the upper fan shroud assembly and is made of high temperature plastic.

OPERATION

The coolant recovery container works in conjunction with the radiator pressure cap. It utilizes thermal expansion and contraction of coolant to keep coolant free of trapped air. It provides a volume for expansion and contraction of coolant. It also provides a convenient and safe method for checking coolant level and adjusting level at atmospheric pressure. This is done without removing the radiator pressure cap. The system also provides some reserve coolant to the radiator to cover minor leaks and evaporation or boiling losses.

As the engine cools, a vacuum is formed in the cooling system of both the radiator and engine. Coolant will then be drawn from the coolant tank and returned to a proper level in the radiator.

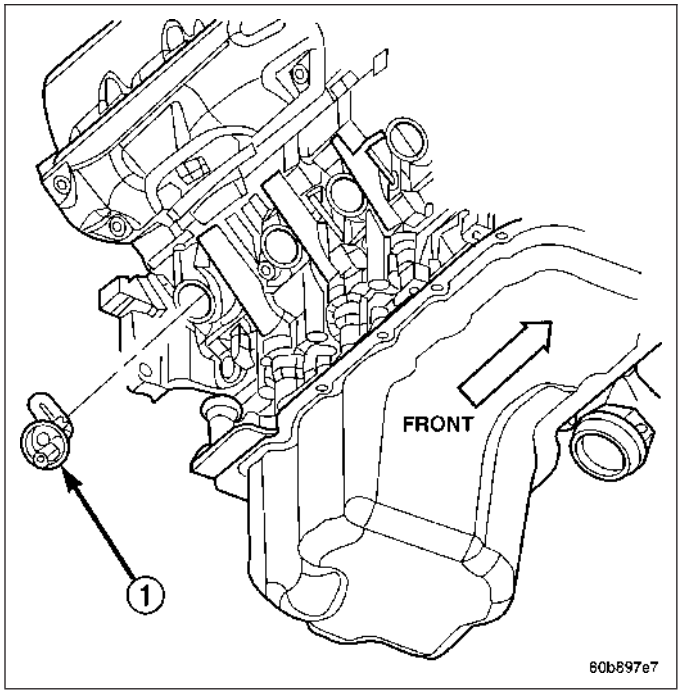


HEATER-ENGINE BLOCK

DESCRIPTION

WARNING: DO NOT OPERATE ENGINE UNLESS BLOCK HEATER CORD HAS BEEN DISCONNECTED FROM POWER SOURCE AND SECURED IN PLACE. THE POWER CORD MUST BE SECURED IN ITS RETAINING CLIPS AND ROUTED AWAY FROM EXHAUST MANIFOLDS AND MOVING PARTS.

An optional engine block heater is available on all models. The heater is equipped with a power cord. The heater is mounted in a core hole of the engine cylinder block (1) (in place of a freeze plug) with the heating element immersed in engine coolant. The cord is attached to an engine compartment component with tie-straps.



OPERATION

The heater warms the engine coolant providing easier engine starting and faster warm-up in low temperatures. Connecting the power cord to a grounded 110-120 volt AC electrical outlet with a grounded three wire extension cord provides the electricity needed to heat the element..

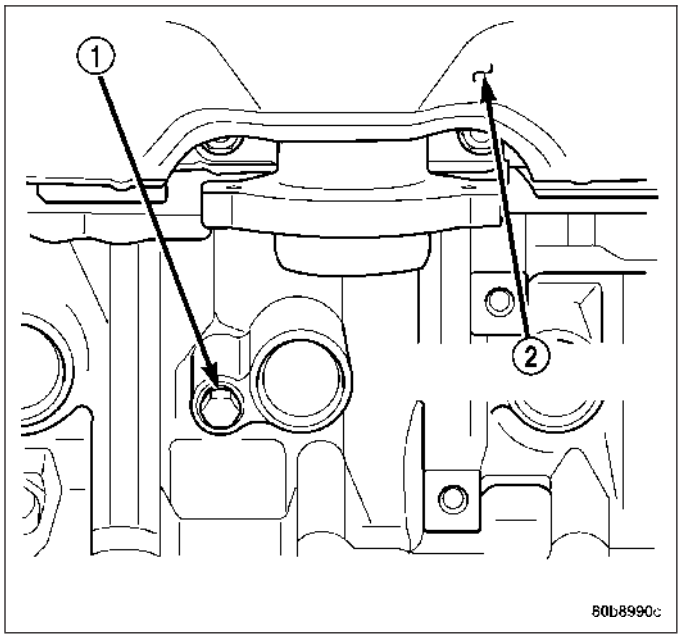
DIAGNOSIS AND TESTING - ENGINE BLOCK HEATER

If the unit does not operate, possible causes can be either the power cord or the heater element. Test the power cord for continuity with a 110-volt voltmeter or 110-volt test light. Test heater element continuity with an ohmmeter or a 12-volt test light.

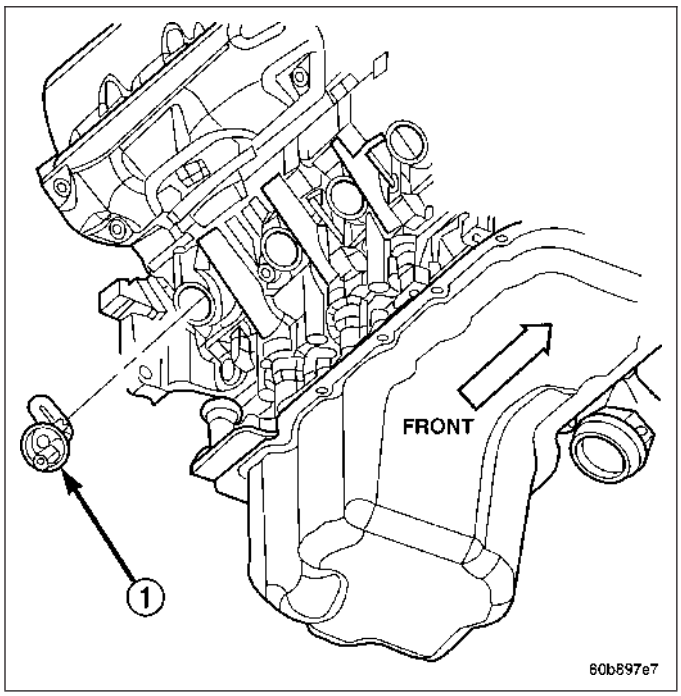
CAUTION: To prevent damage, the power cord must be secured in it's retainer clips and away from any components that may cause abrasion or damage, such as linkages, exhaust components, etc.

REMOVAL

1. Disconnect negative battery cable from battery.
2. Drain coolant from radiator (Refer to 7 - COOLING - STANDARD PROCEDURE).
3. Raise vehicle.
4. Remove engine cylinder block drain plug(s) (1) located on the sides of cylinder block above the oil pan rail.



5. Remove power cord from block heater.
6. Loosen screw at center of block heater. Remove heater assembly (1).



INSTALLATION

1. Thoroughly clean cylinder block core hole and block heater seat.
2. Insert block heater assembly with element loop pointing at twelve o'clock.
3. With block heater fully seated, tighten center screw to 2 N·m (17 in. lbs.) torque.
4. Refill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
5. Start and warm the engine. Check for leaks.

SENSOR-ENGINE COOLANT TEMPERATURE

DESCRIPTION

The Engine Coolant Temperature (ECT) sensor is used to sense engine coolant temperature. The sensor protrudes into an engine water jacket.

The ECT sensor is a two-wire Negative Thermal Coefficient (NTC) sensor. Meaning, as engine coolant temperature increases, resistance (voltage) in the sensor decreases. As temperature decreases, resistance (voltage) in the sensor increases.

OPERATION

At key-on, the Powertrain Control Module (PCM) sends out a regulated 5 volt signal to the ECT sensor. The PCM then monitors the signal as it passes through the ECT sensor to the sensor ground (sensor return).

When the engine is cold, the PCM will operate in Open Loop cycle. It will demand slightly richer air-fuel mixtures and higher idle speeds. This is done until normal operating temperatures are reached.

The PCM uses inputs from the ECT sensor for the following calculations:

- for engine coolant temperature gauge operation through CCD or PCI (J1850) communications
- Injector pulse-width
- Spark-advance curves
- ASD relay shut-down times
- Idle Air Control (IAC) motor key-on steps
- Pulse-width prime-shot during cranking
- O2 sensor closed loop times
- Purge solenoid on/off times
- EGR solenoid on/off times (if equipped)
- Leak Detection Pump operation (if equipped)
- Radiator fan relay on/off times (if equipped)
- Target idle speed

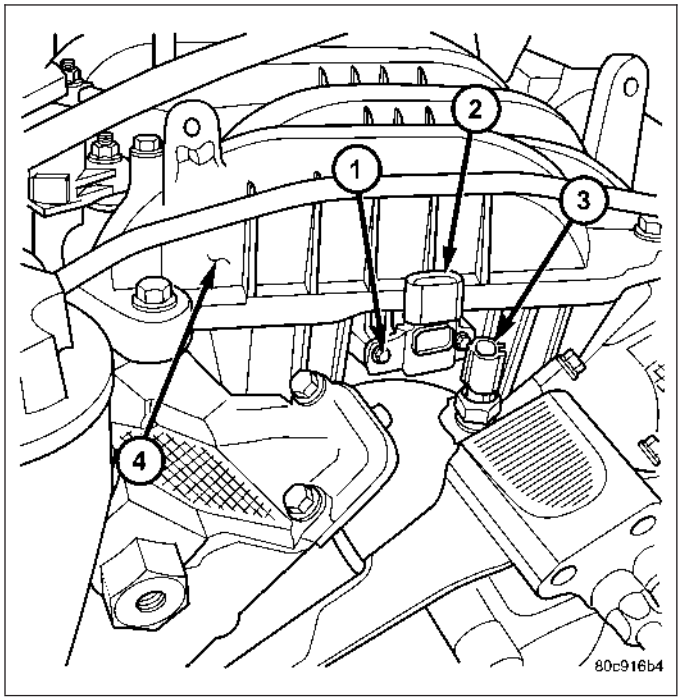
REMOVAL

3.7L ENGINE

The Engine Coolant Temperature (ECT) sensor (3) on the 3.7L engine is installed into a water jacket at front of intake manifold near rear of generator.

WARNING: HOT, PRESSURIZED COOLANT CAN CAUSE INJURY BY SCALDING. COOLING SYSTEM MUST BE PARTIALLY DRAINED BEFORE REMOVING THE COOLANT TEMPERATURE SENSOR.

1. Partially drain the cooling system. (Refer to 7 - COOLING - STANDARD PROCEDURE).
2. Disconnect the electrical connector from the sensor (3).
3. Remove the sensor from the intake manifold.

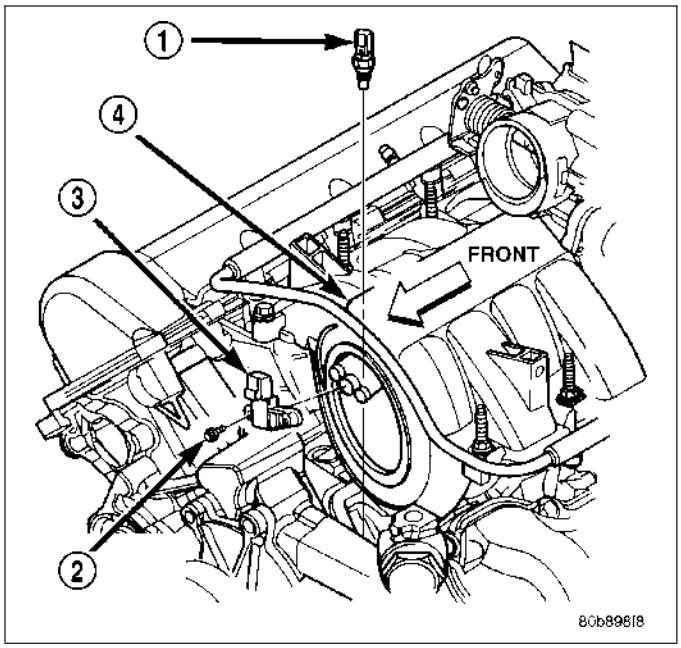


4.7L V-8

WARNING: HOT, PRESSURIZED COOLANT CAN CAUSE INJURY BY SCALDING. COOLING SYSTEM MUST BE PARTIALLY DRAINED BEFORE REMOVING THE ENGINE COOLANT TEMPERATURE (ECT) SENSOR.

The Engine Coolant Temperature (ECT) sensor (1) on the 4.7L V-8 engine is located near the front of the intake manifold.

1. Partially drain the cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
2. Disconnect the electrical connector from the ECT sensor (1).
3. Remove the sensor (1) from the intake manifold.

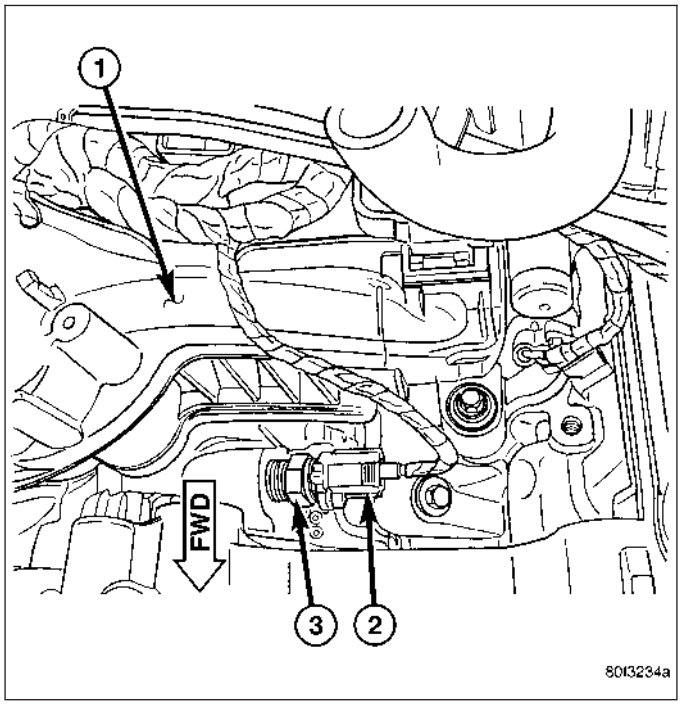


5.7L V-8

The Engine Coolant Temperature (ECT) sensor (3) on the 5.7L engine is located under the air conditioning compressor. It is installed into a water jacket at the front of the cylinder block.

WARNING: HOT, PRESSURIZED COOLANT CAN CAUSE INJURY BY SCALDING. COOLING SYSTEM MUST BE PARTIALLY DRAINED BEFORE REMOVING THE COOLANT TEMPERATURE SENSOR.

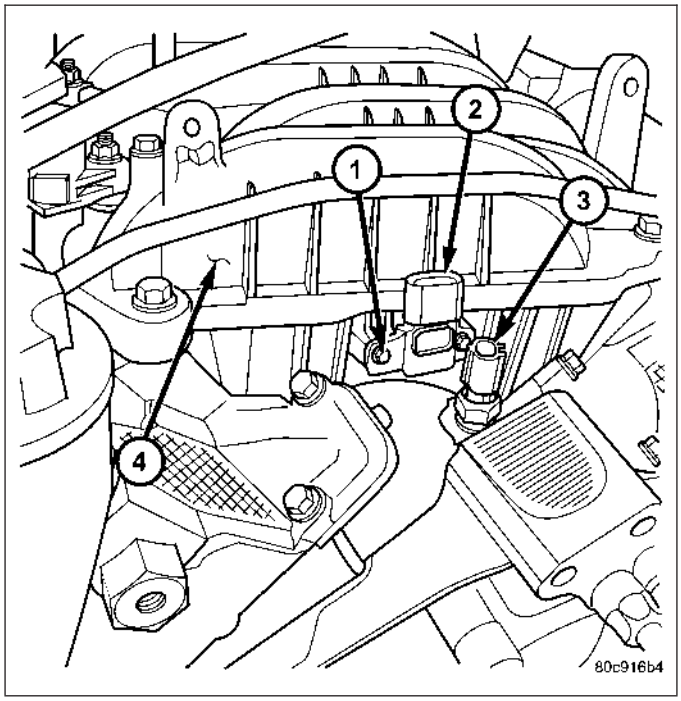
1. Partially drain the cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
2. Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
3. Carefully unbolt air conditioning compressor from front of engine. Do not disconnect any A/C hoses from compressor. Temporarily support compressor to gain access to ECT sensor (3).
4. Disconnect electrical connector (2) from sensor (3).
5. Remove sensor (3) from cylinder block.



INSTALLATION

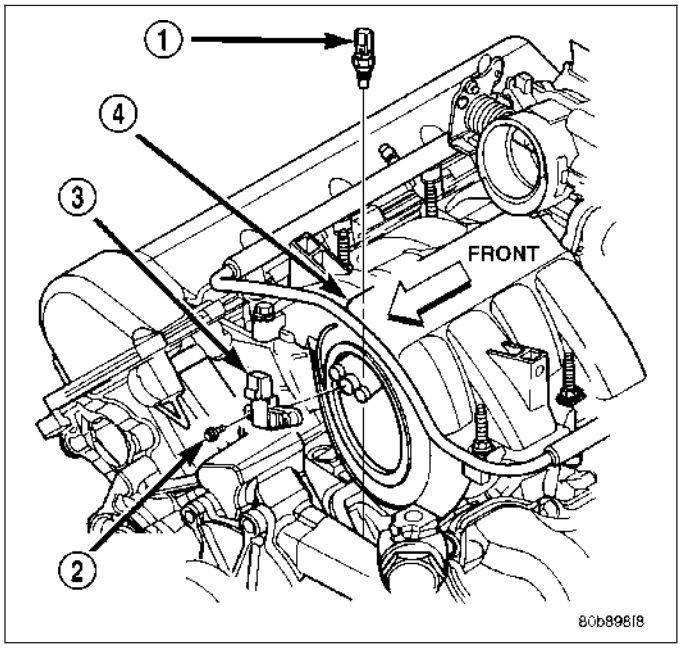
3.7L ENGINE

1. Apply thread sealant to sensor threads.
2. Install engine coolant sensor into intake manifold. (3). Tighten sensor to 11 N·m (97.3 in. lbs.) torque.
3. Connect the electrical connector.
4. Fill the cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).



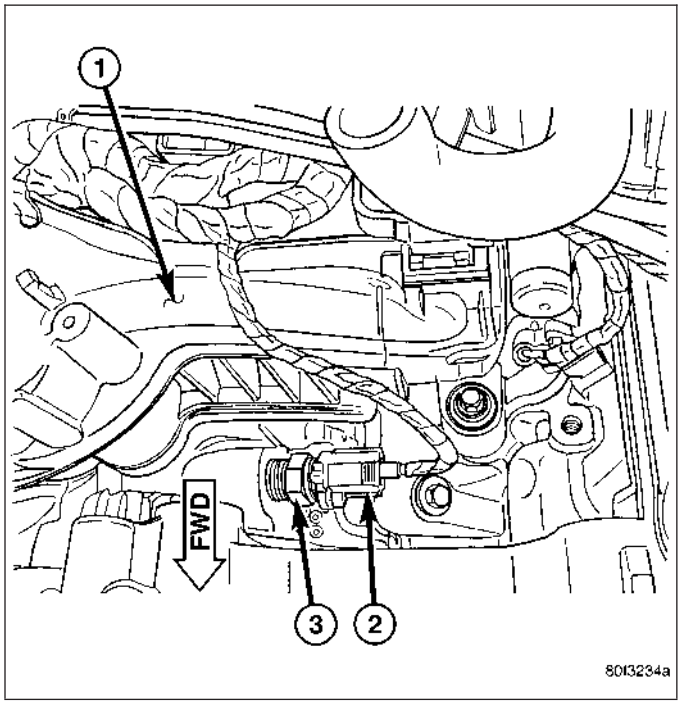
4.7L V-8

1. Apply thread sealant to sensor threads.
2. Install ECT sensor (1) to engine.
3. Tighten sensor to 11 N·m (97.3 in. lbs.) torque.
4. Connect electrical connector to sensor (1).
5. Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).



5.7L V-8

1. Apply thread sealant to sensor threads.
2. Install ECT sensor (3) to engine.
3. Tighten sensor to 11 N·m (97.3 in. lbs.) torque.
4. Connect electrical connector (2) to ECT sensor (3).
5. Fill the cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).



THERMOSTAT-ENGINE COOLANT

DESCRIPTION

CAUTION: Do not operate an engine without a thermostat, except for servicing or testing.

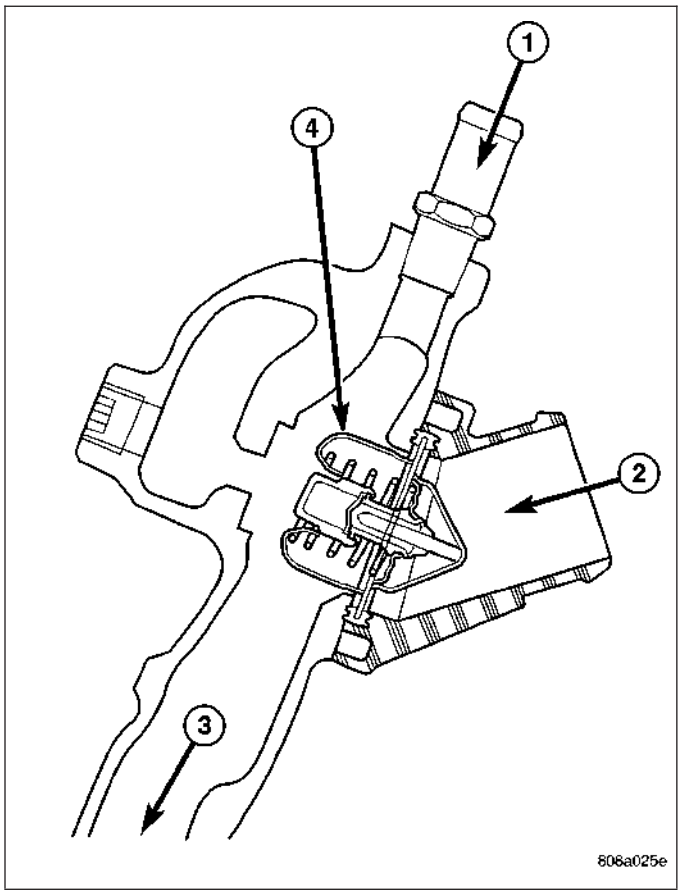
The thermostat on the 5.7L gas powered engine is located beneath the thermostat housing (1) at the front of the intake manifold.

On the 3.7L/4.7L engine the thermostat (4) is designed to block the flow of the coolant bypass journal by 50% instead of completely blocking the flow.

The thermostat is a wax pellet driven, reverse poppet choke type.

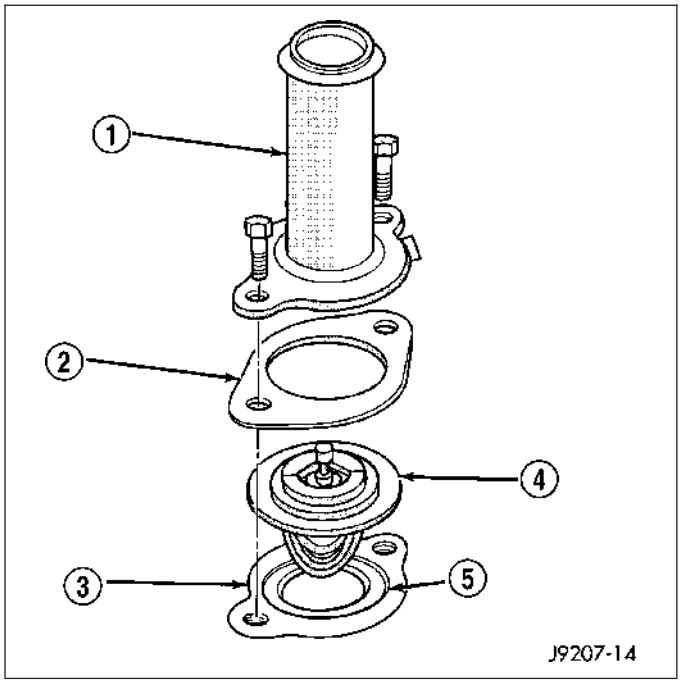
Coolant leakage into the pellet container will cause the thermostat to fail in the open position. Thermostats very rarely stick. Do not attempt to free a thermostat with a prying device.

The same thermostat is used for winter and summer seasons. An engine should not be operated without a thermostat, except for servicing or testing. Operating without a thermostat causes longer engine warmup time, unreliable warmup performance, increased exhaust emissions and crankcase condensation that can result in sludge formation.



OPERATION

The wax pellet is located in a sealed container at the spring end of the thermostat. When heated, the pellet expands, overcoming closing spring tension and water pump pressure to force the valve to open.



DIAGNOSIS AND TESTING - THERMOSTAT

ON-BOARD DIAGNOSTICS

All **gasoline powered models** are equipped with On-Board Diagnostics for certain cooling system components. Refer to On-Board Diagnostics (OBD) in the Diagnosis section of this group for additional information. If the powertrain control module (PCM) detects low engine coolant temperature, it will record a Diagnostic Trouble Code (DTC) in the PCM memory. Do not change a thermostat for lack of heat as indicated by the instrument panel gauge or by poor heater performance unless a DTC is present. Refer to the Diagnosis section of this group for other probable causes. For other DTCs, (Refer to 25 - EMISSIONS CONTROL - DESCRIPTION)

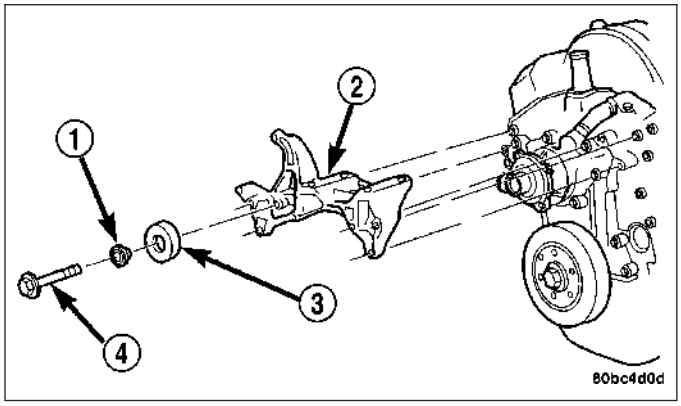
The DTC can also be accessed through the DRB scan tool. Refer to the appropriate Powertrain Diagnostic Procedures information for diagnostic information and operation of the DRB scan tool.

REMOVAL

5.7L ENGINE

If the thermostat is being replaced, be sure that the replacement is the specified thermostat for the vehicle model and engine type.

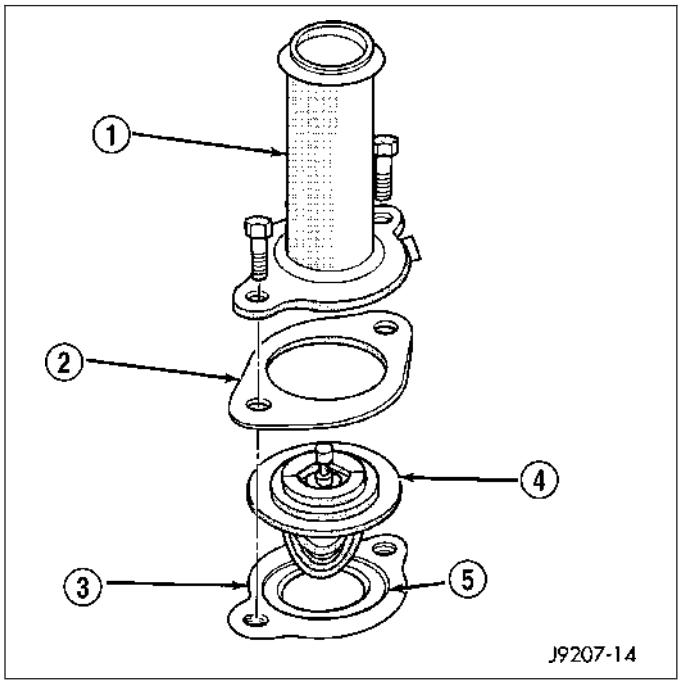
1. Disconnect the negative battery cable.
2. Drain the cooling system until the coolant level is below the thermostat (Refer to 7 - COOLING - STANDARD PROCEDURE)
3. Air Conditioned vehicles: Remove the support bracket (generator mounting bracket-to-intake manifold) (2) located near the rear of the generator.



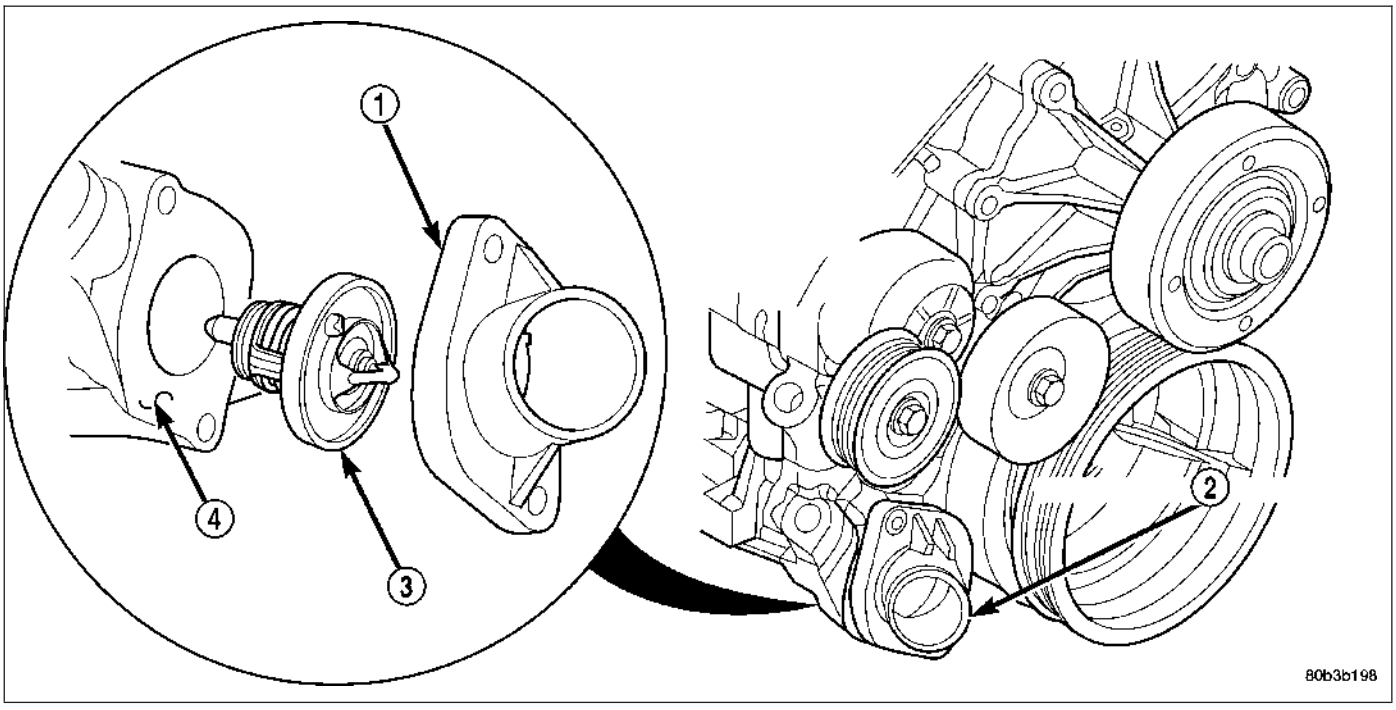
Note: On air conditioning equipped vehicles, the generator must be partially removed.

4. Remove the accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
5. Remove the generator mounting bolts. Do not remove any of the wiring at the generator. If equipped with 4WD, unplug the 4WD indicator lamp wiring harness (located near rear of generator).
6. Remove the generator. Position the generator to gain access for the thermostat gasket removal.
7. Remove the radiator upper hose clamp and upper hose at the thermostat housing.
8. Position the wiring harness (behind thermostat housing) to gain access to the thermostat housing.

9. Remove the thermostat housing mounting bolts, thermostat housing (1), gasket (2) and thermostat (3). Discard old gasket (3).



3.7L/4.7L ENGINE



If thermostat is being replaced, be sure that replacement is specified thermostat for vehicle model and engine type.

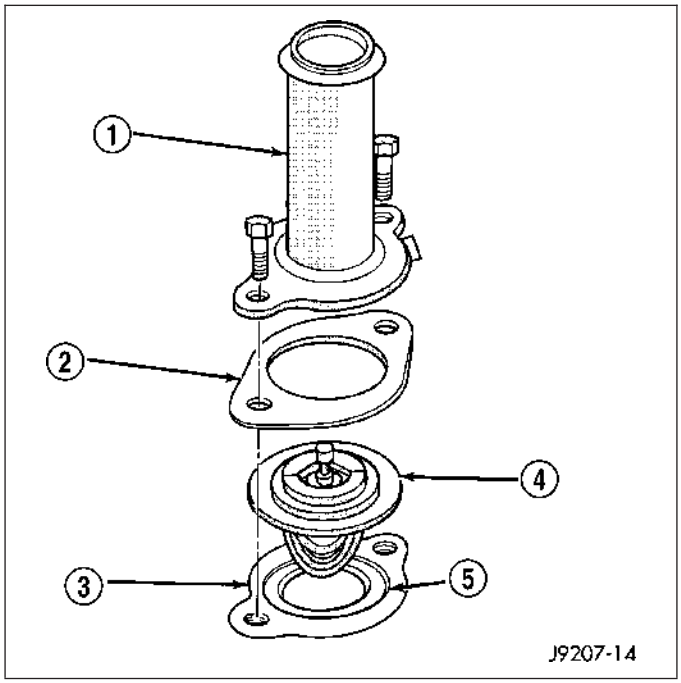
1. Disconnect negative battery cable at battery.
2. Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE)
3. Raise vehicle on hoist.
4. Remove splash shield.
5. Remove lower radiator hose clamp and lower radiator hose at thermostat housing.

6. Remove thermostat housing mounting bolts , thermostat housing (1) and thermostat (3).

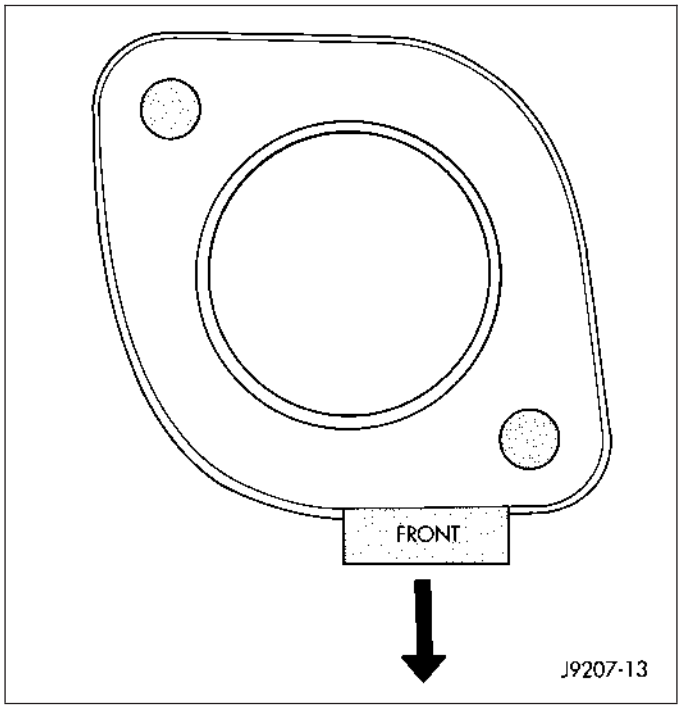
INSTALLATION

5.7L ENGINE

1. Clean the mating areas of the intake manifold and thermostat housing (1).
2. Install the thermostat (4) (spring side down) into the recessed machined groove on the intake manifold.
3. Install the gasket on the intake manifold and over the thermostat.
4. Position the thermostat housing (1) to the intake manifold. **Note:** The word FRONT stamped on housing. For adequate clearance, this **must** be placed towards the front of the vehicle. The housing is slightly angled forward after the installation to the intake manifold.
5. Install the housing-to-intake manifold bolts. Tighten the bolts to 23 N·m (200 in. lbs.)
   .



6. Install the radiator upper hose to the thermostat housing.
7. Air Conditioned vehicles; Install the generator. Tighten the bolts to 41 N·m (30 ft. lbs.).
8. Install the support bracket (generator mounting bracket-to-intake manifold).. Tighten the bolts to 54 N·m (40 ft. lbs.).
9. Install the accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).
10. Fill the cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
11. Connect battery negative cable.
12. Start and warm the engine. Check for leaks.



3.7L/4.7L ENGINE

1. Clean mating areas of timing chain cover and thermostat housing.
2. Install thermostat (spring side down) into recessed machined groove on timing chain cover.
3. Position thermostat housing on timing chain cover.
4. Install two housing-to-timing chain cover bolts. Tighten bolts to 13 N·m (112 in. lbs.) torque.

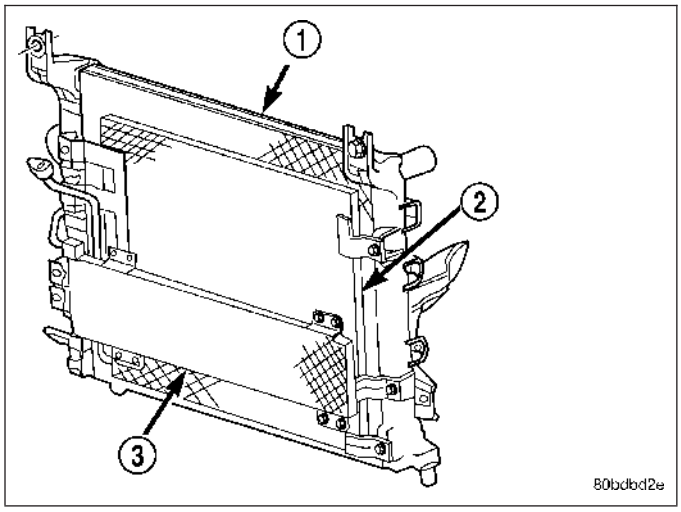
CAUTION: Housing must be tightened evenly and thermostat must be centered into recessed groove in timimg chain cover. If not, it may result in a cracked housing, damaged timing chain cover threads or coolant leaks.

5. Install lower radiator hose on thermostat housing.
6. Install splash shield.
7. Lower vehicle.
8. Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
9. Connect negative battery cable to battery.
10. Start and warm the engine. Check for leaks.

RADIATOR

DESCRIPTION

The radiator (1) is a aluminum cross-flow design with horizontal tubes through the radiator core and vertical plastic side tanks.



OPERATION

The radiator supplies sufficient heat transfer using the cooling fins interlaced between the horizontal tubes in the radiator core to cool the engine.

DIAGNOSIS AND TESTING

RADIATOR COOLANT FLOW

Use the following procedure to determine if coolant is flowing through cooling system.

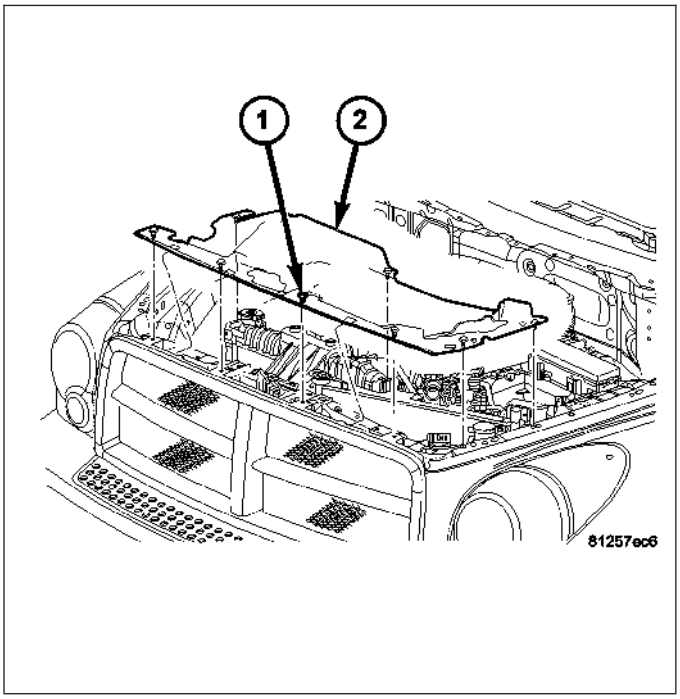
1. Idle engine until operating temperature is reached. If upper radiator hose is warm to the touch, thermostat is opening and coolant is flowing to radiator.

WARNING: HOT, PRESSURIZED COOLANT CAN CAUSE INJURY BY SCALDING. USING A RAG TO COVER RADIATOR PRESSURE CAP, OPEN RADIATOR CAP SLOWLY TO FIRST STOP. ALLOW ANY BUILT-UP PRESSURE TO VENT TO THE RESERVE/OVERFLOW TANK. AFTER PRESSURE BUILD-UP HAS BEEN RELEASED, REMOVE CAP FROM FILLER NECK.

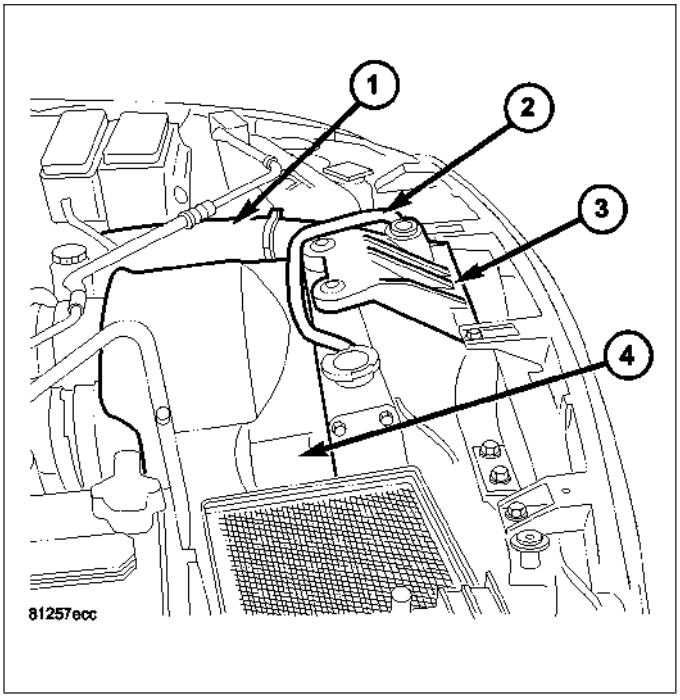
2. Drain a small amount of coolant from radiator until ends of radiator tubes are visible through filler neck. Idle engine at normal operating temperature. If coolant is flowing past exposed tubes, coolant is circulating.

REMOVAL

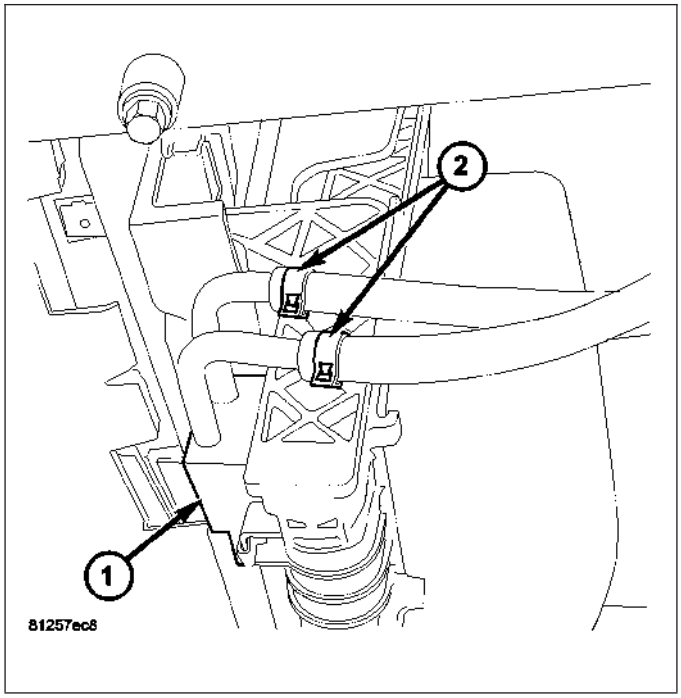
1. Disconnect battery negative cable.
2. Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE)
3. Remove pushpins (1) and the upper condenser/radiator seal (2).
4. Remove air filer housing assembly.(Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER ELEMENT - REMOVAL).



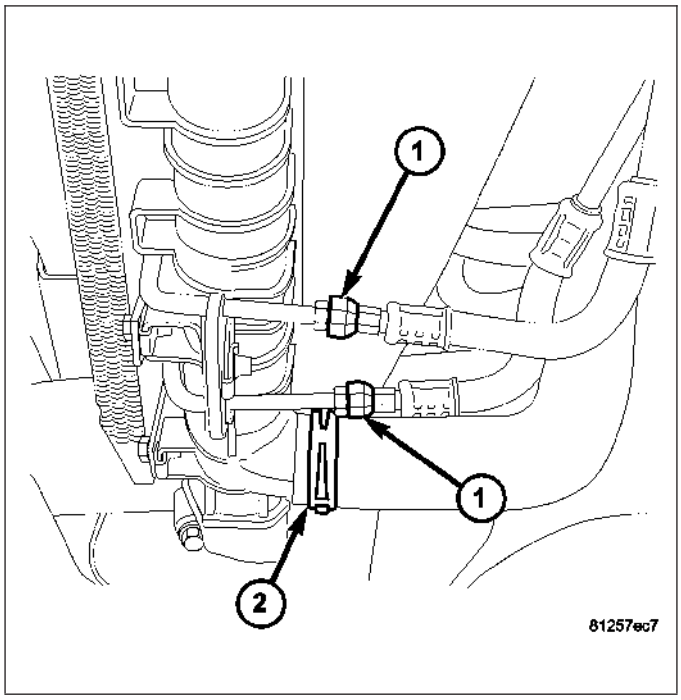
5. Remove upper radiator hose (1).
6. Remove overflow tube (2).
7. Remove radiator fan shroud (4) from the radiator and position over the radiator fan.
8. Remove the upper radiator support (3).
9. Raise vehicle.



10. Disconnect the power steering cooler lines (2).



11. Disconnect the transmission cooler lines (1).
12. Remove the lower radiator hose (2).
13. Lower vehicle.
14. Remove upper radiator mount.
15. Remove LH and RH radiator side seals.
16. Remove radiator.
17. Remove power steering cooler form the radiator, if necessary.
18. Remove transmission cooler from radiator, if necessary.



CLEANING

Clean radiator fins With the engine cold, apply cold water and compressed air to the back (engine side) of the radiator to flush the radiator and/or A/C condenser of debris.

INSPECTION

The radiator cooling fins should be checked for damage or deterioration. Inspect cooling fins to make sure they are not bent or crushed, these areas result in reduced heat exchange causing the cooling system to operate at higher temperatures. Inspect the plastic end tanks for cracks, damage or leaks.

Inspect the radiator neck for damage or distortion.

INSTALLATION

The radiator has two isolator pins on bottom of both tanks. These fit into alignment holes in radiator lower support.

1. Install power steering cooler, if removed.
2. Install transmission oil cooler if removed.
3. Install the upper radiator mount
4. Position isolator pins into alignment holes in radiator lower support.
5. Install upper radiator support. Tighten bolts to 23 N·m (200 in. lbs.)
6. Install LH and RH radiator side seals.
7. Install upper radiator hose.
8. Install overflow tube.
9. Install radiator shroud.
10. Raise vehicle.
11. Install power steering cooler lines.
12. Install transmission cooler lines.
13. Install lower radiator hose.
14. Lower vehicle.
15. Install air filter housing assembly (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER ELEMENT - INSTALLATION).
16. Fill radiator (Refer to 7 - COOLING - STANDARD PROCEDURE).
17. Connect battery negative cable.
18. Start and warm the engine. Check for leaks.

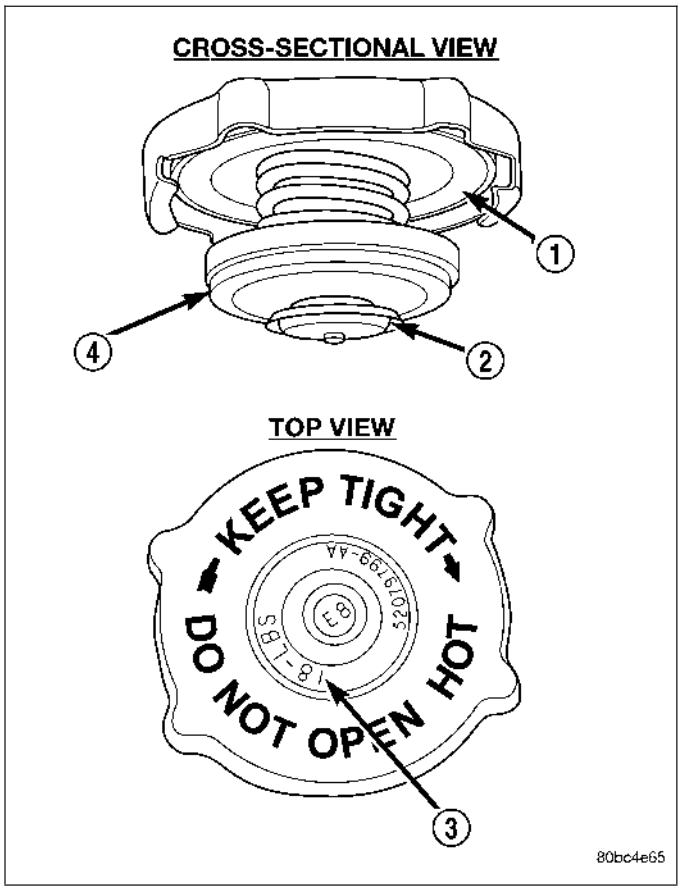
CAP-RADIATOR PRESSURE

DESCRIPTION

All cooling systems are equipped with a pressure cap on the radiator. This cap releases pressure at some point within a range of 131-to-158 kPa (19-to-23 psi). The pressure relief point (in pounds) is engraved on top of the cap (3).

The cooling system will operate at pressures slightly above atmospheric pressure. This results in a higher coolant boiling point allowing increased radiator cooling capacity. The cap contains a spring-loaded pressure relief valve (4). This valve opens when system pressure reaches the release range of 131-to-158 kPa (19-to-23 psi).

A rubber gasket (2) seals the radiator filler neck. This is done to maintain vacuum during coolant cool-down and to prevent leakage when system is under pressure.



OPERATION

A vent valve in the center of the cap will remain shut as long as the cooling system is pressurized. As the coolant cools, it contracts and creates a vacuum in cooling system. This causes the vacuum valve to open and coolant in reserve/overflow tank to be drawn through connecting hose into radiator. If the vacuum valve is stuck shut, or overflow hose is kinked, radiator hoses will collapse on cool-down.

DIAGNOSIS AND TESTING

RADIATOR CAP-TO-FILLER NECK SEAL

The pressure cap upper gasket (seal) pressure relief can be tested by removing overflow hose from radiator filler neck nipple. Attach hose of pressure tester tool 7700 (or equivalent) to nipple. It will be necessary to disconnect hose from its adapter for filler neck. Pump air into radiator. The pressure cap upper gasket should relieve at 131 kPa (21 psi) and hold pressure at a minimum of 130 kPa (18.8 psi).

WARNING: THE WARNING WORDS “DO NOT OPEN HOT” ON RADIATOR PRESSURE CAP, ARE A SAFETY PRECAUTION. WHEN HOT, PRESSURE BUILDS UP IN COOLING SYSTEM. TO PREVENT SCALDING OR INJURY, RADIATOR CAP SHOULD NOT BE REMOVED WHILE SYSTEM IS HOT AND/OR UNDER PRESSURE.

Do not remove radiator cap at any time **except** for the following purposes:

1. Check and adjust antifreeze freeze point.
2. Refill system with new antifreeze.
3. Conducting service procedures.

4. Checking for vacuum leaks.

WARNING: IF VEHICLE HAS BEEN RUN RECENTLY, WAIT AT LEAST 15 MINUTES BEFORE REMOVING RADIATOR CAP. WITH A RAG, SQUEEZE RADIATOR UPPER HOSE TO CHECK IF SYSTEM IS UNDER PRESSURE. PLACE A RAG OVER CAP AND WITHOUT PUSHING CAP DOWN, ROTATE IT COUNTER-CLOCKWISE TO FIRST STOP. ALLOW FLUID TO ESCAPE THROUGH THE COOLANT RESERVE/OVERFLOW HOSE INTO RESERVE/OVERFLOW TANK. SQUEEZE RADIATOR UPPER HOSE TO DETERMINE WHEN PRESSURE HAS BEEN RELEASED. WHEN COOLANT AND STEAM STOP BEING PUSHED INTO TANK AND SYSTEM PRESSURE DROPS, REMOVE RADIATOR CAP COMPLETELY.

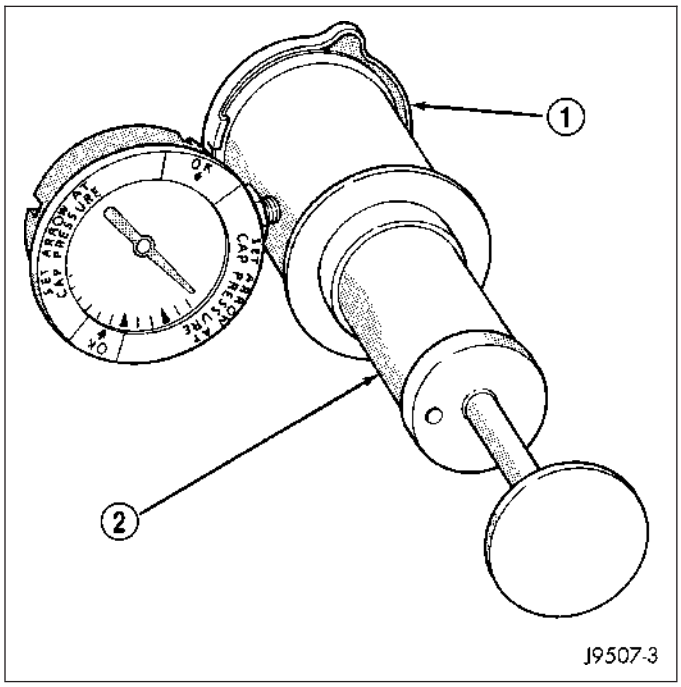
RADIATOR CAP

Remove cap (1) from radiator. Be sure that sealing surfaces are clean. Moisten rubber gasket with water and install cap (1) on pressure tester 7700 (2) or an equivalent.

Operate tester pump to bring pressure to 138 kPa (20 psi) on gauge. If pressure cap (1) fails to hold pressure of at least 131 kPa (19 psi) replace cap. Refer to the following **CAUTION** .

The pressure cap may test properly while positioned on tool 7700 (or equivalent). It may not hold pressure or vacuum when installed on radiator. If so, inspect radiator filler neck and cap's top gasket for damage. Also inspect for dirt or distortion that may prevent cap from sealing properly.

CAUTION: Radiator pressure testing tools are very sensitive to small air leaks, which will not cause cooling system problems. A pressure cap that does not have a history of coolant loss should not be replaced just because it leaks slowly when tested with this tool. Add water to tool. Turn tool upside down and recheck pressure cap to confirm that cap needs replacement.



CLEANING

Use only a mild soap and water to clean the radiator cap. Using any type solvent may cause damage to the seal in the radiator cap.

INSPECTION

Hold cap at eye level, right side up. The vent valve at bottom of cap should open. If rubber gasket has swollen and prevents vent valve from opening, replace cap.

Hold cap at eye level, upside down. If any light can be seen between vent valve and rubber gasket, replace cap. **Do not use a replacement cap that has a spring to hold vent shut.** A replacement cap must be the type designed for a coolant reserve/overflow system with a completely sealed diaphragm spring and a rubber gasket. This gasket is used to seal to radiator filler neck top surface. Use of proper cap will allow coolant return to radiator.

PUMP-WATER

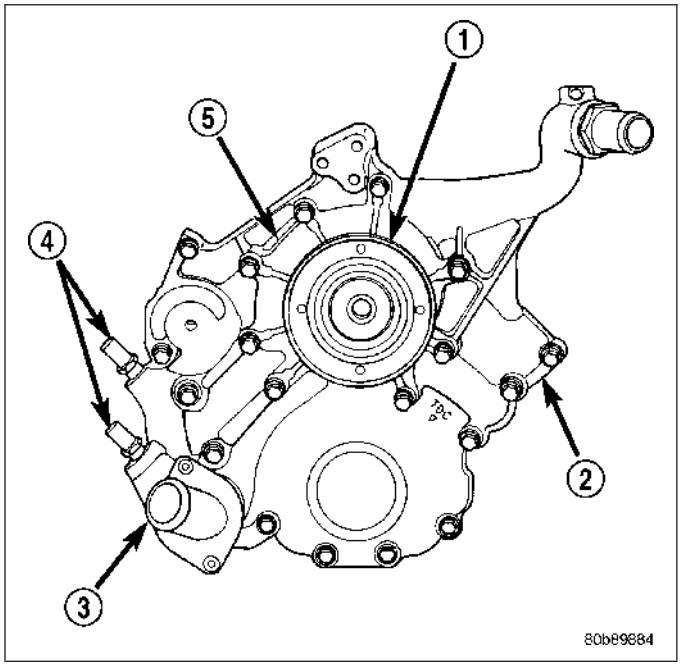
DESCRIPTION

WATER PUMP

A centrifugal water pump (1) circulates coolant through the water jackets, passages, intake manifold, radiator core, cooling system hoses and heater core. The pump is driven from the engine crankshaft by a single serpentine drive belt that drives the water pump pulley (1).

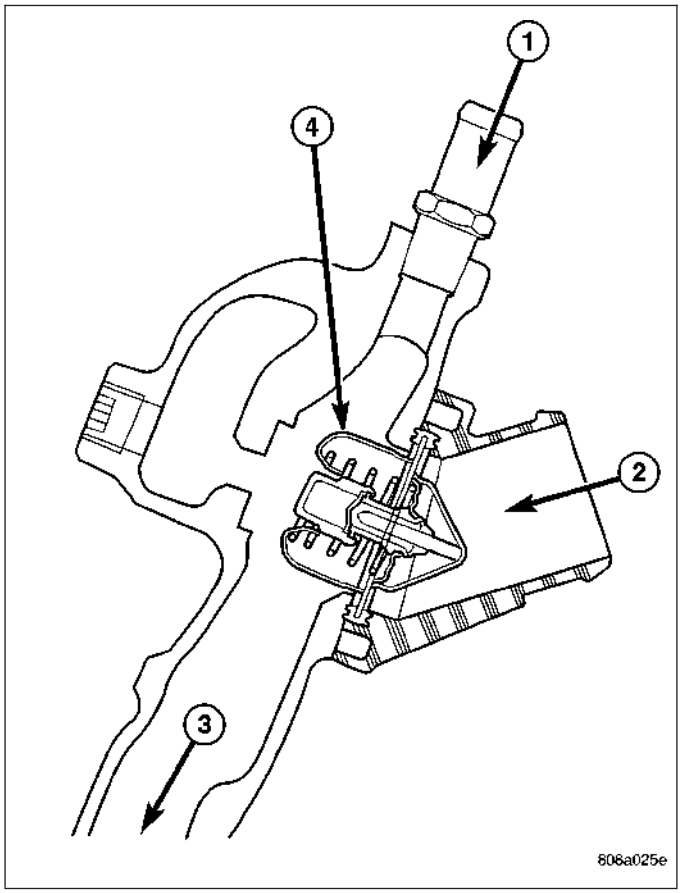
The water pump impeller is pressed onto the rear of a shaft that rotates in bearings pressed into the housing. The housing has two small holes to allow seepage to escape. The water pump seals are lubricated by the antifreeze in the coolant mixture. No additional lubrication is necessary.

Both heater hoses are connected to fittings on the timing chain front cover. The water pump is also mounted directly to the timing chain cover and is equipped with a non serviceable integral pulley.



WATER PUMP BYPASS - 4.7L

The 4.7L engine uses an internal water/coolant bypass system. The design uses galleries in the timing chain cover to circulate coolant during engine warm-up preventing the coolant from flowing through the radiator. The thermostat (4) uses a stub shaft located at the rear of the thermostat to control flow through the bypass gallery.



OPERATION

WATER PUMP

A centrifugal water pump circulates coolant through the water jackets, passages, intake manifold, radiator core, cooling system hoses and heater core, this coolant absorbs the heat generated when the engine is running. The pump is driven by the engine crankshaft via a drive belt.

WATER PUMP BYPASS - 4.7L ENGINE

When the thermostat is in the closed position the bypass gallery is not obstructed allowing 100% flow. When the thermostat is in the open position the pill partially covers the bypass hole, reducing the amount of bypass flow. This design allows the coolant to reach operating temperature quickly when cold, while adding extra cooling during normal temperature operation.

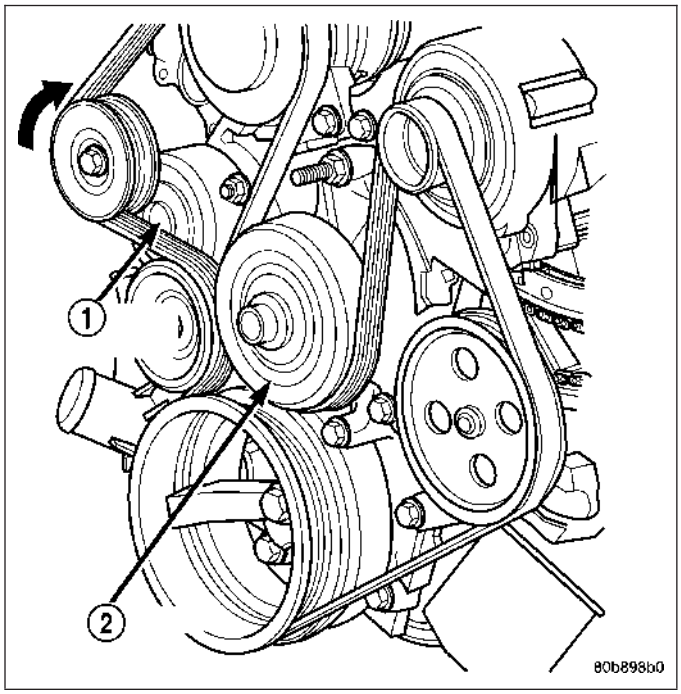
REMOVAL

3.7L/4.7L ENGINE

The water pump on 3.7L/4.7L engines is bolted directly to the engine timing chain case cover.

1. Disconnect negative battery cable.
2. Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).

3. Remove fan/viscous fan drive assembly from water pump (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - REMOVAL). Do not attempt to remove fan/ viscous fan drive assembly from vehicle at this time.
4. If water pump is being replaced, do not unbolt fan blade assembly from thermal viscous fan drive.
5. Remove two fan shroud-to-radiator screws. Disconnect the coolant overflow hose, windshield washer fluid hose and washer pump electrical connector.
6. Remove fan shroud and fan blade/viscous fan drive assembly from vehicle.
7. After removing fan blade/viscous fan drive assembly, **do not** place thermal viscous fan drive in horizontal position. If stored horizontally, silicone fluid in viscous fan drive could drain into its bearing assembly and contaminate lubricant.
8. Remove accessory drive belt from the water pump pulley (2) (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).



9. Remove lower radiator hose clamp and remove lower hose at water pump.
10. Remove seven water pump mounting bolts and one stud bolt.

CAUTION: Do not pry water pump at timing chain case/cover. The machined surfaces may be damaged resulting in leaks.

11. Remove water pump and gasket. Discard gasket.

5.7L ENGINE

1. Disconnect negative battery cable.
2. Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE)
3. Remove fan/viscous fan drive assembly from water pump (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - REMOVAL). Do not attempt to remove fan/ viscous fan drive assembly from vehicle at this time.

4. If water pump is being replaced, do not unbolt fan blade assembly from thermal viscous fan drive.
5. Remove two fan shroud-to-radiator screws. Disconnect the coolant overflow hose, windshield washer fluid hose and washer pump electrical connector.
6. Remove fan shroud and fan blade/viscous fan drive assembly from vehicle.
7. Remove A/C compressor and generator brace.
8. Remove idler pulleys.
9. Remove belt tensioner assembly (Refer to 7 - COOLING/ACCESSORY DRIVE/BELT TENSIONERS - REMOVAL).
10. Remove upper and lower radiator hoses.
11. Remove heater hoses.
12. Remove water pump mounting bolts and remove pump.

CLEANING

Clean the gasket mating surface. Use caution not to damage the gasket sealing surface.

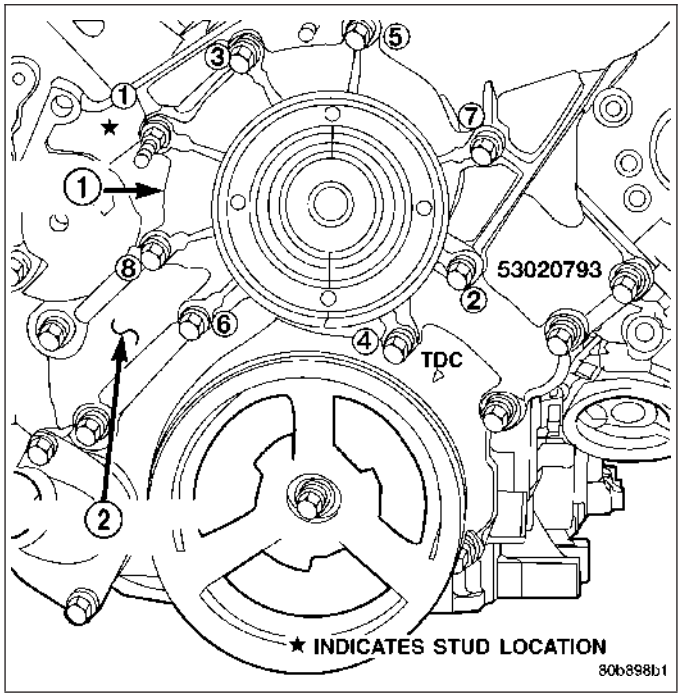
INSPECTION

Inspect the water pump assembly for cracks in the housing, water leaks from shaft seal, worn bearing or impeller rubbing either the pump body or timing chain case/cover.

INSTALLATION

3.7/4.7L ENGINE

1. Clean gasket mating surfaces.
2. Using a new gasket, position water pump (1) and install mounting bolts as shown. Tighten water pump mounting bolts to 58 N·m (43 ft. lbs.) torque.
3. Spin water pump to be sure that pump impeller does not rub against timing chain case/cover.



4. Connect radiator lower hose to water pump.

5. Install accessory drive belt (Refer to 7 - COOLING/ ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).
6. Position fan shroud and fan blade/viscous fan drive assembly.
7. Install two fan shroud-to-radiator screws.
8. Be sure of at least 25 mm (1.0 inches) between tips of fan blades and fan shroud.
9. Install fan blade/viscous fan drive assembly to water pump shaft (Refer to 7 - COOLING/ENGINE/ RADIATOR FAN - INSTALLATION).
10. Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
11. Connect negative battery cable.
12. Start and warm the engine. Check for leaks.

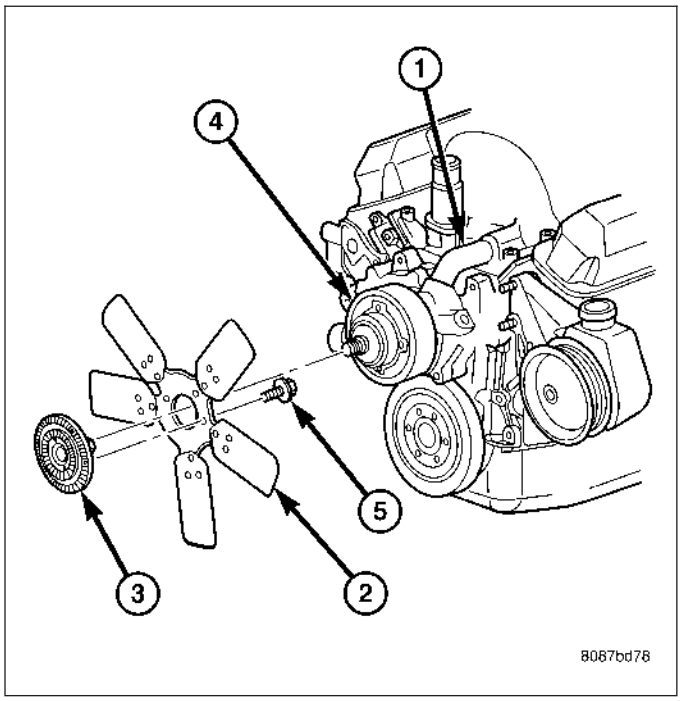
5.7L ENGINE

1. Install water pump and mounting bolts. Tighten moubting bolts to 24 N·m (18 ft. lbs.).
2. Install heater hoses.
3. Install upper and lower radiator hoses.
4. Install belt tensioner assembly (Refer to 7 - COOLING/ACCESSORY DRIVE/BELT TENSIONERS - INSTALLATION).
5. Install idler pulleys.
6. Install A/C compressor and alternator brace. Tighten bolt and nuts to 28 N·m (21 ft. lbs.).
7. Install fan shroud assembly and two fan shroud mounting screws.
8. Install the fan/viscous fdrive assembly (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - INSTALLATION).
9. Be sure of at least 25 mm (1.0 inches) between tips of fan blades and fan shroud.
10. Install accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).
11. Connect negative battery cable.
12. Fill coolant (Refer to 7 - COOLING - STANDARD PROCEDURE).
13. Pressure test coolant system (Refer to 7 - COOLING - DIAGNOSIS AND TESTING).

FAN-RADIATOR VISCOUS

DESCRIPTION

The thermal viscous fan drive (3) is a silicone-fluid-filled coupling used to connect the fan blades to the water pump shaft (4). The coupling allows the fan to be driven in a normal manner. This is done at low engine speeds while limiting the top speed of the fan to a predetermined maximum level at higher engine speeds.

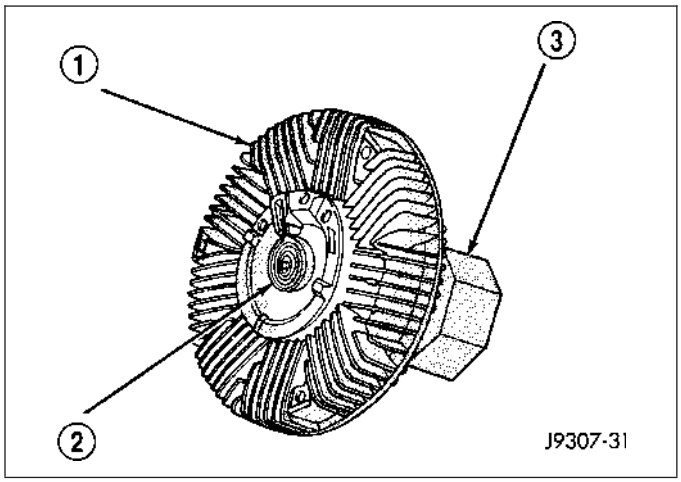


OPERATION

A thermostatic bimetallic spring coil (2) is located on the front face of the viscous fan drive unit (1). This spring coil reacts to the temperature of the radiator discharge air. It engages the viscous fan drive for higher fan speed if the air temperature from the radiator rises above a certain point. Until additional engine cooling is necessary, the fan will remain at a reduced rpm regardless of engine speed.

Only when sufficient heat is present, will the viscous fan drive engage. This is when the air flowing through the radiator core causes a reaction to the bimetallic coil. It then increases fan speed to provide the necessary additional engine cooling.

Once the engine has cooled, the radiator discharge temperature will drop. The bimetallic coil again reacts and the fan speed is reduced to the previous disengaged speed.



DIAGNOSIS AND TESTING - VISCOUS FAN DRIVE

NOISE

Note: It is normal for fan noise to be louder (roaring) when:

- The underhood temperature is above the engagement point for the viscous drive coupling. This may occur when ambient (outside air temperature) is very high.
- Engine loads and temperatures are high such as when towing a trailer.
- Cool silicone fluid within the fan drive unit is being redistributed back to its normal disengaged (warm) position. This can occur during the first 15 seconds to one minute after engine start-up on a cold engine.

LEAKS

Viscous fan drive operation is not affected by small oil stains near the drive bearing. If leakage appears excessive, replace the fan drive unit.

VISCOUS DRIVE

If the fan assembly free-wheels without drag (the fan blades will revolve more than five turns when spun by hand), replace the fan drive. This spin test must be performed when the engine is cool.

For the following test, the cooling system must be in good condition. It also will ensure against excessively high coolant temperature.

WARNING: BE SURE THAT THERE IS ADEQUATE FAN BLADE CLEARANCE BEFORE DRILLING.

1. Drill a 3.18-mm (1/8-in) diameter hole in the top center of the fan shroud.
2. Obtain a dial thermometer with an 8 inch stem (or equivalent). It should have a range of -18°-to-105°C (0°-to-220° F). Insert thermometer through the hole in the shroud. Be sure that there is adequate clearance from the fan blades.
3. Connect a tachometer and an engine ignition timing light. The timing light is to be used as a strobe light. This step cannot be used on the diesel engine.
4. Block the air flow through the radiator. Secure a sheet of plastic in front of the radiator. Use tape at the top to secure the plastic and be sure that the air flow is blocked.
5. Be sure that the air conditioner (if equipped) and blowe fan is turned off.

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING. DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.

6. Start the engine and operate at 2400 rpm. Within ten minutes the air temperature (indicated on the dial thermometer) should be up to 88° C (190° F). Fan drive **engagement** should start to occur at/between:
   - 3.7L Automatic - 93° C - 99°C (200° F - 210° F)
   - 3.7L Manual/4.7L Automatic/5.9L - 85° - 91° C (185° - 195° F)
   - 4.7L Manual - 74° - 79° C (165° - 175° F)
   - 5.7L
   - 5.9L
   - Engagement is distinguishable by a definite **increase** in fan flow noise (roaring). The timing light also will indicate an increase in the speed of the fan.

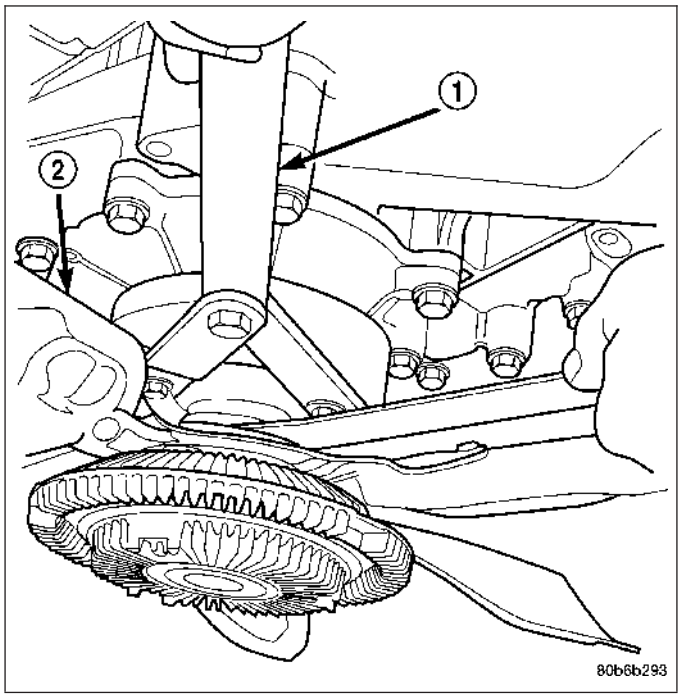
7. When viscous drive engagement is verified, remove the plastic sheet. Fan drive **disengagement** should start to occur at or between:
   - 3.7L Automatic - 76°C - 81°C (168° F - 178° F)
   - 3.7L Manual/4.7L Auto/ 5.9L - 67°C - 73°C (153° F - 163° F)
   - 4.7L Manual - 56°C - 62°C (133° F - 143° F)
   - 5.7L A definite **decrease** of fan flow noise (roaring) should be noticed. If not, replace the defective viscous fan drive unit.

CAUTION: Some engines equipped with serpentine drive belts have reverse rotating fans and viscous fan drives. They are marked with the word REVERSE to designate their usage. Installation of the wrong fan or viscous fan drive can result in engine overheating.

CAUTION: If the viscous fan drive is replaced because of mechanical damage, the cooling fan blades should also be inspected. Inspect for fatigue cracks, loose blades, or loose rivets that could have resulted from excessive vibration. Replace fan blade assembly if any of these conditions are found. Also inspect water pump bearing and shaft assembly for any related damage due to a viscous fan drive malfunction.

REMOVAL

1. Partially drain the cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
2. Remove the upper radiator hose.
3. Remove the air filter housing assembly(Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER ELEMENT - REMOVAL).
4. Using Tool 6958 and adapter pins 8346 (1), remove fan/viscous fan drive assembly from water pump. Do not attempt to remove fan/viscous fan drive assembly from vehicle at this time.
5. Position the fan/fan drive assembly in the radiator shroud.



6. Remove the two shroud mounting screws.
7. Remove the radiator shroud and fan drive assembly.
8. After removing fan blade/viscous fan drive assembly, **do not** place viscous fan drive in horizontal position. If stored horizontally, silicone fluid in the viscous fan drive could drain into its bearing assembly and contaminate lubricant.

9. Remove four bolts securing fan blade assembly to viscous fan drive.

CLEANING

Clean the fan blades using a mild soap and water. Do not use an abrasive to clean the blades.

INSPECTION

WARNING: DO NOT ATTEMPT TO BEND OR STRAIGHTEN FAN BLADES IF FAN IS NOT WITHIN SPECIFICATIONS.

CAUTION: If fan blade assembly is replaced because of mechanical damage, water pump and viscous fan drive should also be inspected. These components could have been damaged due to excessive vibration.

1. Remove fan blade assembly from viscous fan drive unit (four bolts).
2. Lay fan on a flat surface with leading edge facing down. With tip of blade touching flat surface, replace fan if clearance between opposite blade and surface is greater than 2.0 mm (.090 inch). Rocking motion of opposite blades should not exceed 2.0 mm (.090 inch). Test all blades in this manner.
3. Inspect fan assembly for cracks, bends, loose rivets or broken welds. Replace fan if any damage is found.

INSTALLATION

1. Install fan blade assembly to viscous fan drive. Tighten bolts to 23 N·m (17 ft. lbs.) torque.
2. Position fan blade/viscous fan drive assembly into the radiator shroud.
3. Install the radiator shroud and fan drive assemblu into the vehicle.
4. Install fan shroud retaining screws.Tighten screws to 6 N·M (50 lbs. in.)
5. Install fan blade/viscous fan drive assembly to water pump shaft.
6. Install the upper radiator hose.
7. Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
8. Connect battery negative cable.

TUBE-WATER PUMP INLET

REMOVAL

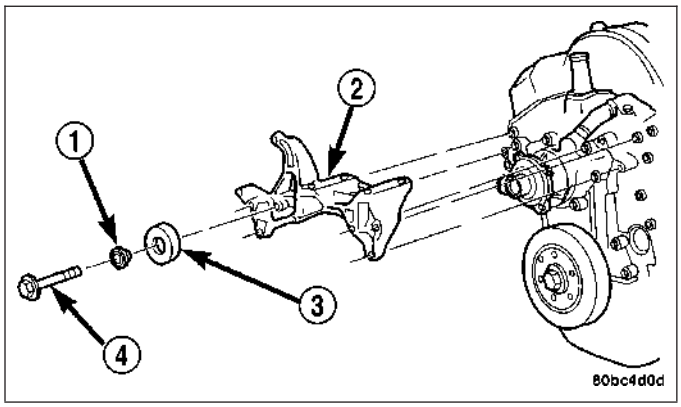
WITHOUT AIR CONDITIONING

1. Partially drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
2. Loosen both bypass hose clamps and position to center of hose. Remove hose from vehicle.

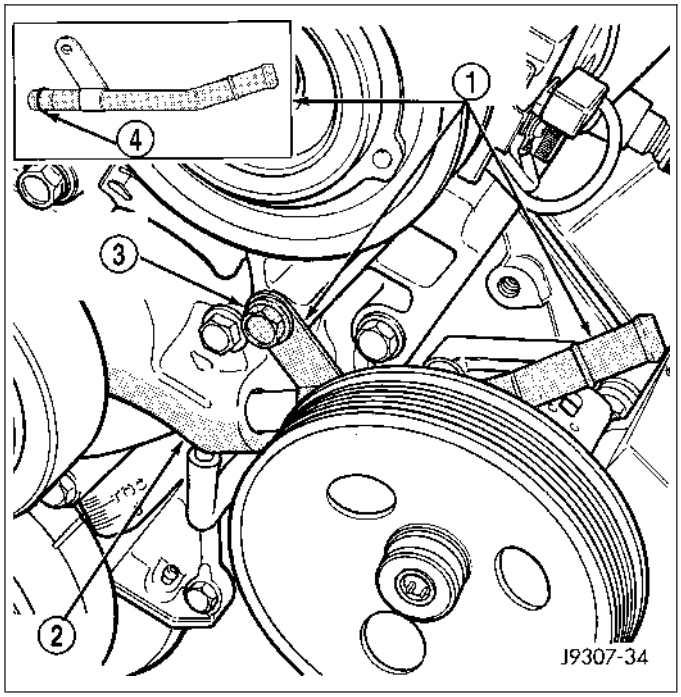
WITH AIR CONDITIONING

If equipped with A/C, the generator and A/C compressor along with their common mounting bracket (2) must be partially removed. Removing generator or A/C compressor from their mounting bracket is not necessary. Also, discharging A/C system is not necessary. **Do not** remove any refrigerant lines from A/C compressor.

WARNING: THE A/C SYSTEM IS UNDER PRESSURE EVEN WITH ENGINE OFF. REFER TO REFRIGERANT WARNINGS IN GROUP 24, HEATING AND AIR CONDITIONING.



1. Disconnect battery negative cable.
2. Partially drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
3. Remove upper radiator hose clamp and hose at radiator.
4. Unplug wiring harness from A/C compressor.
5. Remove air cleaner assembly.
6. Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
7. Remove bracket-to-intake manifold bolts.
8. The drive belt idler pulley must be removed to gain access to one of A/C compressor/generator bracket mounting bolts (3). Remove idler pulley bolt and remove idler pulley.
9. Remove oil dipstick tube mounting bol (3) at side of A/C-generator mounting bracket.
10. Disconnect throttle body cables.
11. Remove heater hose clamp and heater hose from heater hose coolant return tube.
12. Remove heater hose coolant return tube mounting bolt and remove tube from engine. Discard the old tube O-ring.
13. Remove six bracket bolts.
14. Lift and position generator and A/C compressor (along with their common mounting bracket) to gain access to bypass hose. A block of wood may be used to hold assembly in position.
15. Loosen and position both hose clamps to center of bypass hose. Remove hose from vehicle.



INSTALLATION

WITHOUT AIR CONDITIONING

1. Position bypass hose clamps to center of hose.
2. Install bypass hose to engine.
3. Secure both hose clamps.
4. Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
5. Start and warm the engine. Check for leaks.

WITH AIR CONDITIONING

1. Position bypass hose clamps to center of hose.
2. Install bypass hose to engine.
3. Secure both hose clamps.
4. Install generator-A/C mounting bracket assembly to engine. Tighten bolts (number 1 and 2) to 54 N·m (40 ft. lbs.) torque. Tighten bolts (number 3) to 40 N·m (30 ft. lbs.) torque.
5. Install a new O-ring to the heater hose coolant return tube. Coat the new O-ring with antifreeze before installation.
6. Install coolant return tube and its mounting bolt to engine.
7. Connect throttle body control cables.
8. Install oil dipstick mounting bolt.
9. Install idler pulley. Tighten bolt to 54 N·m (40 ft. lbs.) torque.

10. Install drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).
11. Install air cleaner assembly.
12. Install upper radiator hose to radiator.
13. Connect wiring harness to A/C compressor.
14. Connect battery negative cable.
15. Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
16. Start and warm the engine. Check for leaks.

TRANSMISSION

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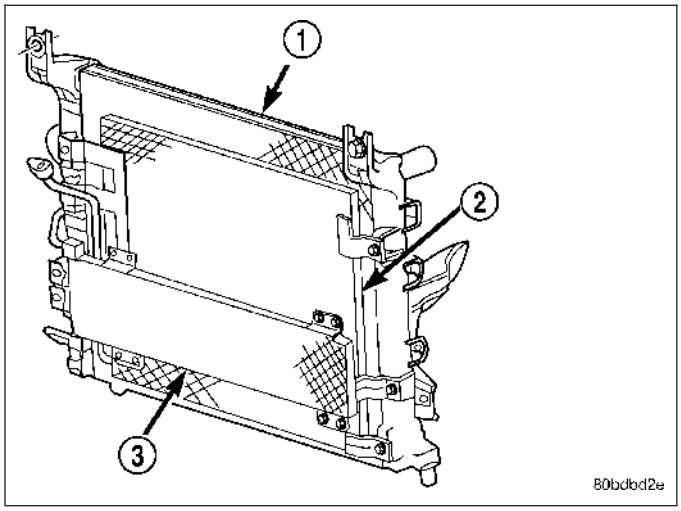
COOLER-TRANSMISSION

DESCRIPTION

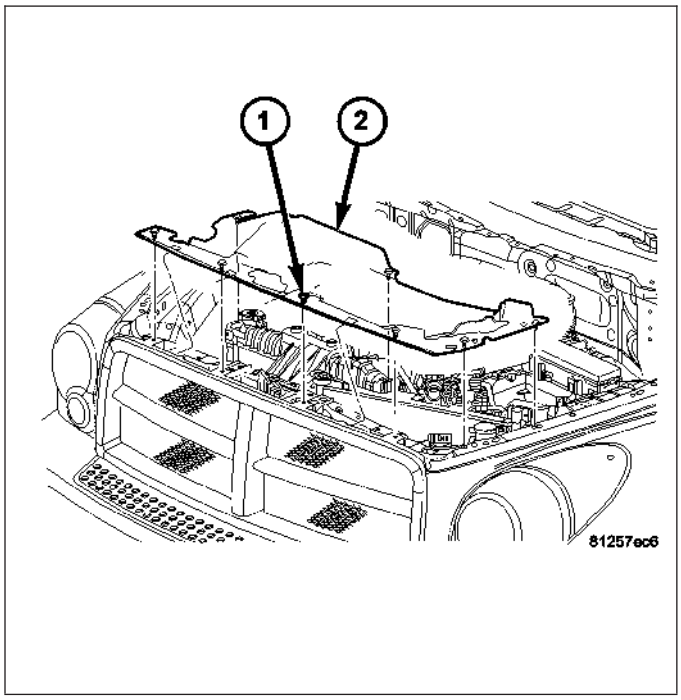
CAUTION: On in-radiator type oil coolers, if transmission oil cooler is leaking, engine coolant may enter cooler, or transmission oil may enter engine cooling system. Both engine cooling system and transmission oil circuit should be drained, flushed, and inspected.

There are two types of transmission oil coolers used. One type of cooler is the in-radiator type or oil to coolant type. This type oil cooler is not serviceable. The second type used is a remote type auxiliary oil cooler or oil to air cooler. The oil to air type cooler (3) is located in front of the radiator, and is serviceable.



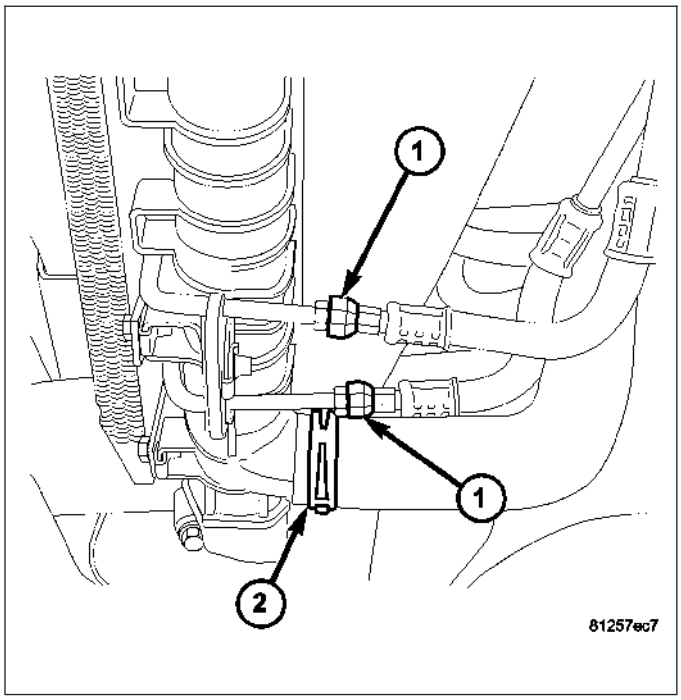
REMOVAL

1. Remove pushpins (1) and the upper condensor/radiator seal (2).



2. Remove upper radiator support.

3. Remove upper transmission cooler mounting bolt.
4. Raise vehicle.
5. Disconnect the transmission cooler lines (1).
6. Remove lower transmission cooler mounting bolts.
7. Remove transmission cooler from vehicle.



INSTALLATION

1. Position tramsmission cooler in vehicle.
2. Install lower transmission cooler mounting bolt. Tighten to 10 N·NM (90 in. lbs.)
3. Connect transmission cooler lines.
4. Lower vehicle.
5. Install upper tranmission cooler mounting bolt. Tighten bolt to 10 N·m (90 in. lbs.).
6. Install upper condenser/radiator seal.
7. Check transmission fluid level (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE/ FLUID - STANDARD PROCEDURE).

AUDIO/VIDEO

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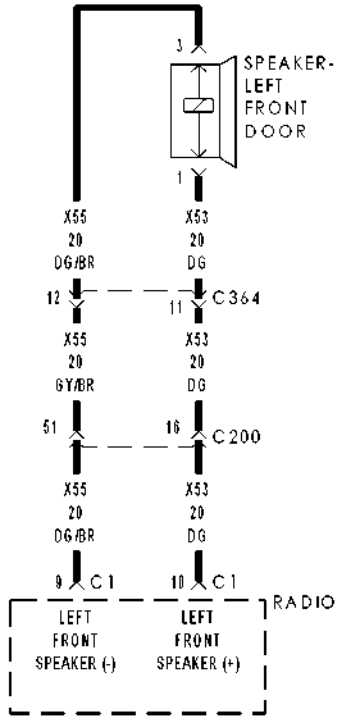
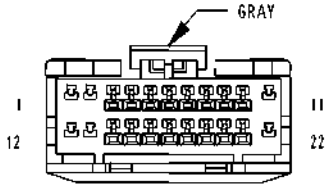
AUDIO/VIDEO SYSTEMS - ELECTRICAL DIAGNOSIS

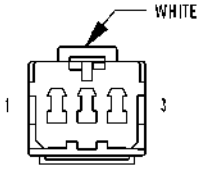
DIAGNOSIS AND TESTING

B1401-FRONT LEFT AUDIO SPEAKER OUTPUT CIRCUIT LOW





RADIO C1



SPEAKER-LEFT
FRONT DOOR

8l2ce839

B1401-FRONT LEFT AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)

For the Audio system circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Radio on.
- **Set Condition:**
- When the Output circuit is LOW for more than 3 seconds.

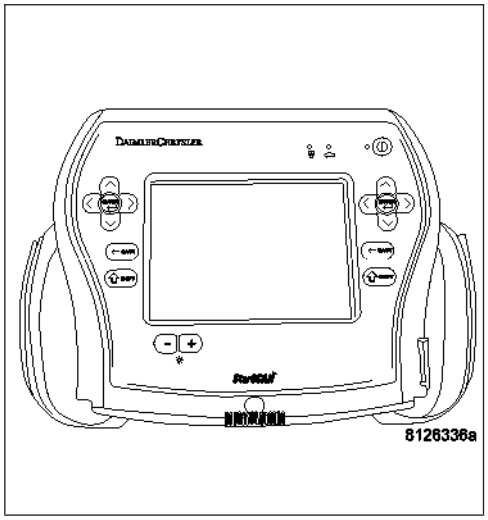
Possible Causes
SPEAKER
(X55) (X53) LEFT FRONT SPEAKER OUTPUT CIRCUIT

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.
With the Scan Tool, clear all Audio DTC's.
Turn the Radio on.
With the Scan Tool, read the DTC information.



Does the Scan Tool read: B1401-FRONT LEFT AUDIO SPEAKER OUTPUT CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST VER 1.

---

2. (X53) (X55) SPEAKER OUTPUT CIRCUITS.

Turn the ignition off.
Disconnect the Radio C1 harness connector.
Disconnect the Front Left Audio Speaker connector.
Measure the resistance between ground and each speaker (X53)(+) and (X55)(-) circuit.

Is the resistance below 1000.0 ohms for each circuit?

Yes >> Repair the applicable Speaker (+) or (-) Output circuit for a short to ground condition.

No >> Go To 3

B1401-FRONT LEFT AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)

3. SPEAKER

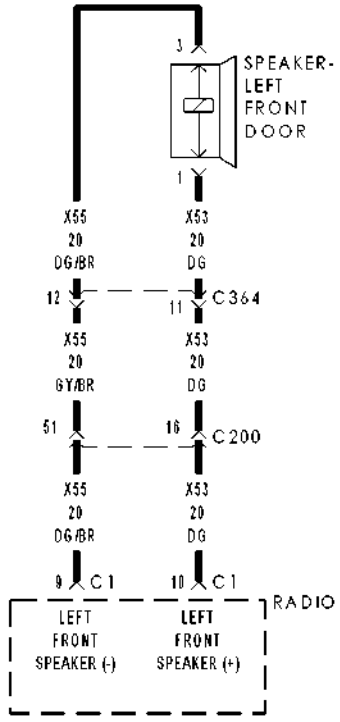
Turn the ignition off.
Disconnect the Front Left Audio Speaker.
Turn the ignition on.
Turn the Radio on.
With the Scan Tool, clear all Audio DTC's.
With the Scan Tool, read the DTC information.

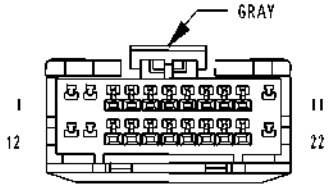
Does the Scan Tool read: B1401-FRONT LEFT AUDIO SPEAKER OUTPUT CIRCUIT LOW?

Yes >> Replace the Speaker in accordance with the service information.
Perform the BODY VERIFICATION TEST VER 1.

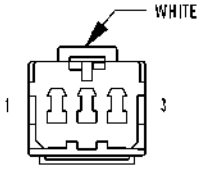
No >> Test Complete.

B1402-FRONT LEFT AUDIO SPEAKER OUTPUT CIRCUIT HIGH





RADIO C1



SPEAKER-LEFT
FRONT DOOR

8l2ce839

B1402-FRONT LEFT AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)

For the Audio system circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- **Set Condition:**

Possible Causes
SPEAKER
(X53) SPEAKER OUTPUT CIRCUIT (+)
(X55) SPEAKER OUTPUT CIRCUIT (-)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.

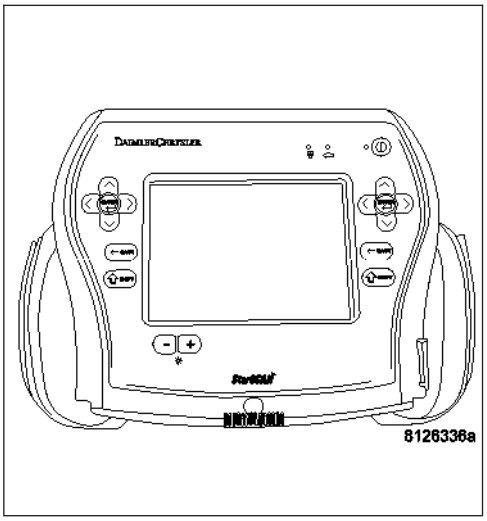
With the scan tool, read Radio DTCs.

Does the scan tool display active: B1402-FRONT LEFT AUDIO SPEAKER OUTPUT CIRCUIT HIGH?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform BODY VERIFICATION TEST VER-1.



B1402-FRONT LEFT AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)

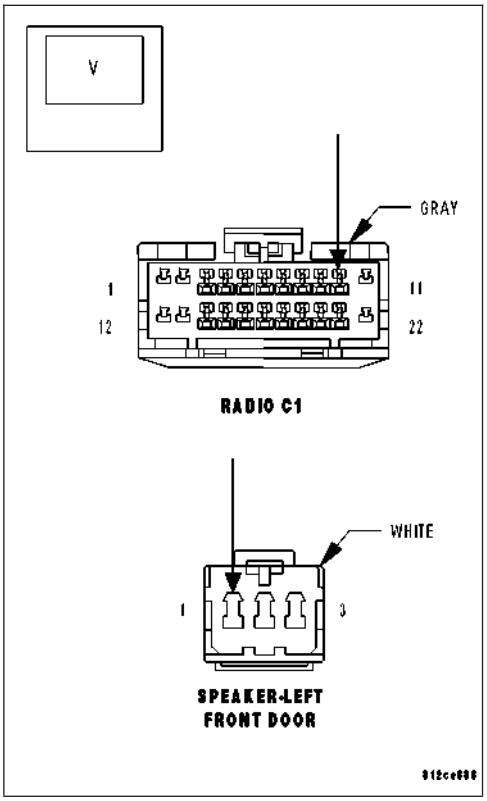
2. CHECK FOR VOLTAGE ON THE (X53) SPEAKER (+) CIRCUIT

Turn the ignition off.
Disconnect the Radio C1 harness connector.
Disconnect the Left Front Speaker harness connector.
Measure for voltage on the (X53) Speaker (+) circuit.

Is the voltage above 10.0 volts?

Yes >> Repair the (X53) Speaker (+) circuit for a short to voltage. Perform BODY VERIFICATION TEST VER-1.

No >> Go To 3



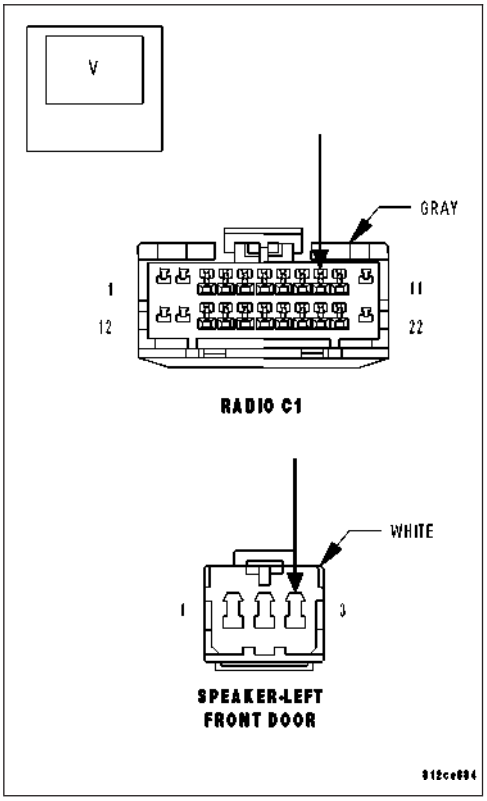
3. CHECK FOR VOLTAGE ON THE (X55) SPEAKER (-) CIRCUIT

Measure for voltage on the (X55) Speaker (-) circuit.

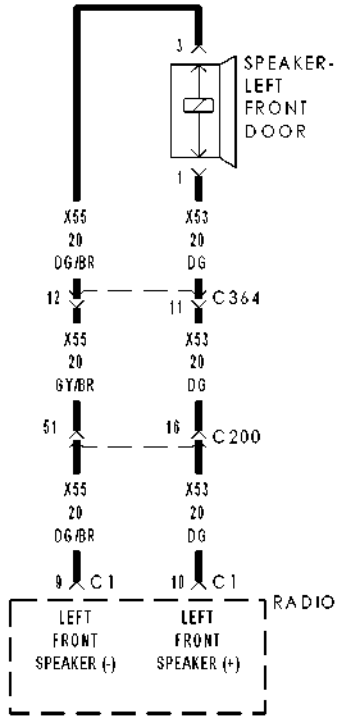
Is the voltage above 10.0 volts?

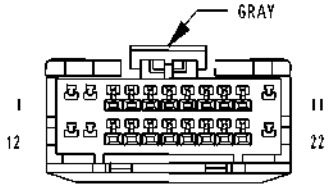
Yes >> Repair the (X55) Speaker (-) circuit for a short to voltage. Perform BODY VERIFICATION TEST VER-1.

No >> Replace the Radio in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

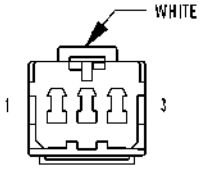


B1403-FRONT LEFT AUDIO SPEAKER OUTPUT CIRCUIT OPEN





RADIO C1



SPEAKER-LEFT
FRONT DOOR

8l2ce839

B1403-FRONT LEFT AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)

For the Audio system circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Radio on.
- **Set Condition:**
- When the Output circuit is open for more than 3 seconds. The Radio will not set the fault if the radio confirms an amplifier is on the BUS.

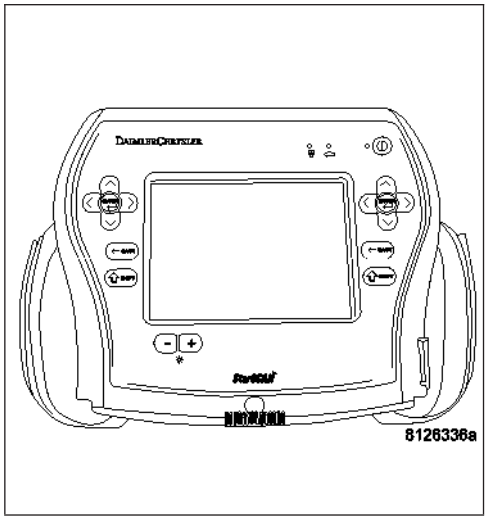
Possible Causes
SPEAKER
(X55) (X53) LEFT FRONT SPEAKER OUTPUT CIRCUIT

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.
With the Scan Tool, clear all Audio DTC's.
Turn the Radio on.
With the Scan Tool, read the DTC information.



Does the Scan Tool read: B1403-FRONT LEFT AUDIO SPEAKER OUTPUT CIRCUIT OPEN?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST VER 1.

---

2. (X55) (X53) SPEAKER OUTPUT CIRCUITS.

Turn the ignition off.
Disconnect the Radio C1 harness connector.
Disconnect the Front Left Audio Speaker connector.
Measure the resistance of each speaker (X53)(+) and (X55)(-) circuit between the Radio and the Speaker.

Is the resistance below 5.0 ohms for each circuit?

Yes >> Go To 3

No >> Repair the applicable Output Speaker circuit for an open condition.
Perform the BODY VERIFICATION TEST VER 1.

B1403-FRONT LEFT AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)

3. SPEAKER

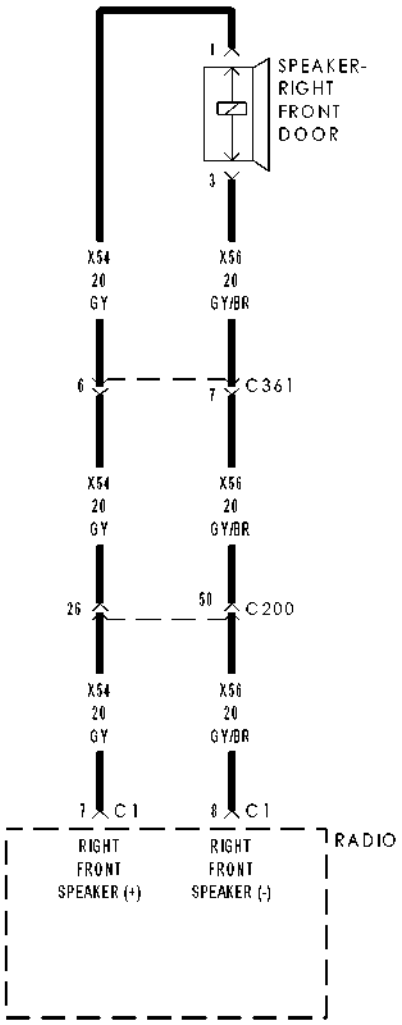
Turn the ignition off.
Disconnect the Front Left Audio Speaker.
Turn the ignition on.
Turn the Radio on.
With the Scan Tool, clear all Audio DTC's.
With the Scan Tool, read the DTC information.

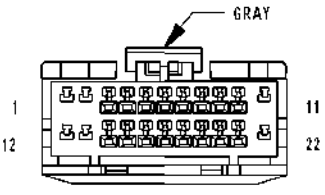
Does the Scan Tool read: B1403-FRONT LEFT AUDIO SPEAKER OUTPUT CIRCUIT OPEN?

Yes >> Replace the Speaker in accordance with the service information.
Perform the BODY VERIFICATION TEST VER 1.

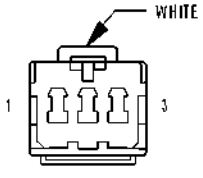
No >> Test Complete.

B1405-FRONT RIGHT AUDIO SPEAKER OUTPUT CIRCUIT LOW





RADIO C1



SPEAKER-RIGHT
FRONT DOOR

B1405-FRONT RIGHT AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)

For the Audio system circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Radio on.
- **Set Condition:**
- When the Output circuit is LOW for more than 3 seconds.

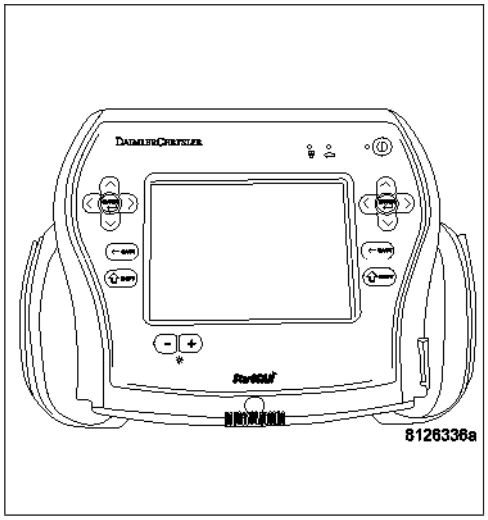
Possible Causes
SPEAKER
(X56) (X54) RIGHT FRONT SPEAKER OUTPUT CIRCUIT

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.
With the Scan Tool, clear all Audio DTC's.
Turn the Radio on.
With the Scan Tool, read the DTC information.



Does the Scan Tool read: B1405-FRONT RIGHT AUDIO SPEAKER OUTPUT CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST VER 1.

---

2. (X54) (X56) SPEAKER OUTPUT CIRCUITS.

Turn the ignition off.
Disconnect the Radio C1 harness connector.
Disconnect the Front Right Audio Speaker connector.
Measure the resistance between ground and each speaker (X54)(+) and (X56)(-) circuit.

Is the resistance below 1000.0 ohms for each circuit?

Yes >> Repair the applicable Speaker (+) or (-) Output circuit for a short to ground condition.

No >> Go To 3

B1405-FRONT RIGHT AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)

3. SPEAKER

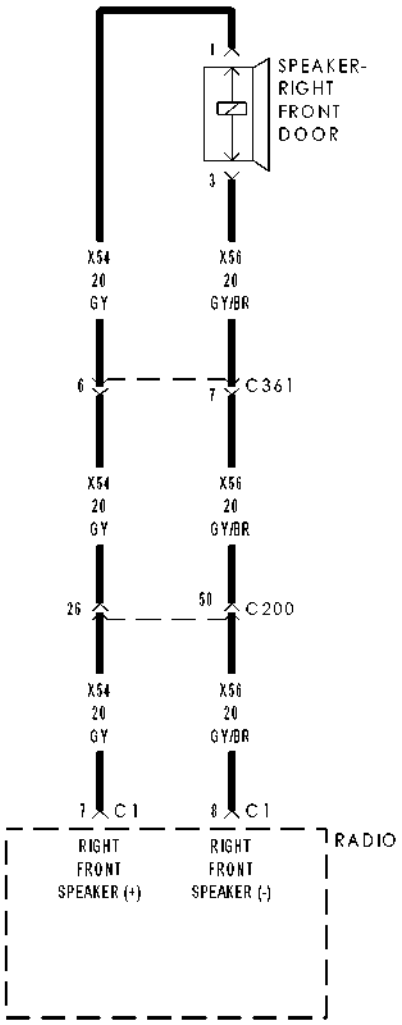
Turn the ignition off.
Disconnect the Front Right Audio Speaker.
Turn the ignition on.
Turn the Radio on.
With the Scan Tool, clear all Audio DTC's.
With the Scan Tool, read the DTC information.

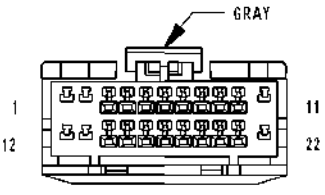
Does the Scan Tool read: B1405-FRONT RIGHT AUDIO SPEAKER OUTPUT CIRCUIT LOW?

Yes >> Replace the Speaker in accordance with the service information.
Perform the BODY VERIFICATION TEST VER 1.

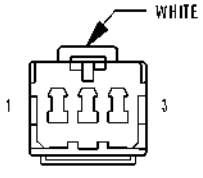
No >> Test Complete.

B1406-FRONT RIGHT AUDIO SPEAKER OUTPUT CIRCUIT HIGH





RADIO C1



SPEAKER-RIGHT
FRONT DOOR

B1406-FRONT RIGHT AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)

For the Audio system circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- **Set Condition:**

Possible Causes
SPEAKER
(X54) SPEAKER OUTPUT CIRCUIT (+)
(X56) SPEAKER OUTPUT CIRCUIT (-)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

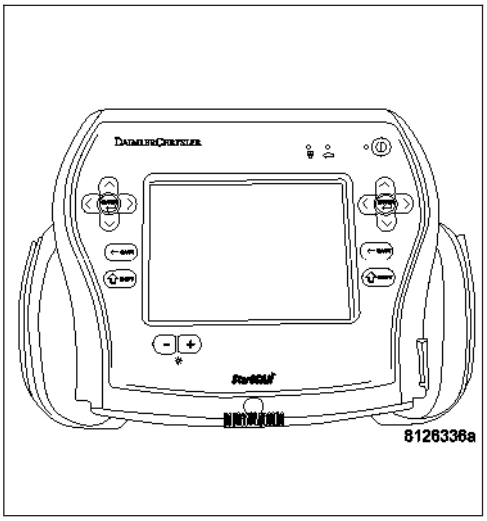
1. INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.
With the scan tool, read Radio DTCs.

Does the scan tool display active: B1406-FRONT RIGHT AUDIO SPEAKER OUTPUT CIRCUIT HIGH?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.



B1406-FRONT RIGHT AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)

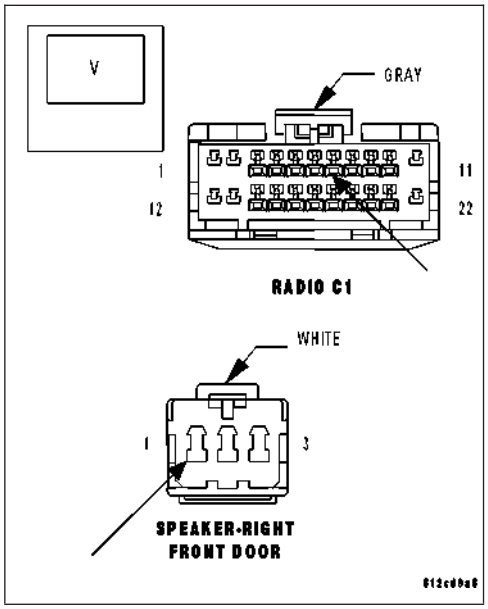
2. CHECK FOR VOLTAGE ON THE (X54) SPEAKER (+) CIRCUIT

Turn the ignition off.
Disconnect the Radio C1 harness connector.
Disconnect the Right Rear Speaker harness connector.
Measure for voltage on the (X52) Speaker (+) circuit.

Is the voltage above 10.0 volts?

Yes >> Repair the (X52) Speaker (+) circuit for a short to voltage. Perform BODY VERIFICATION TEST VER-1.

No >> Go To 3



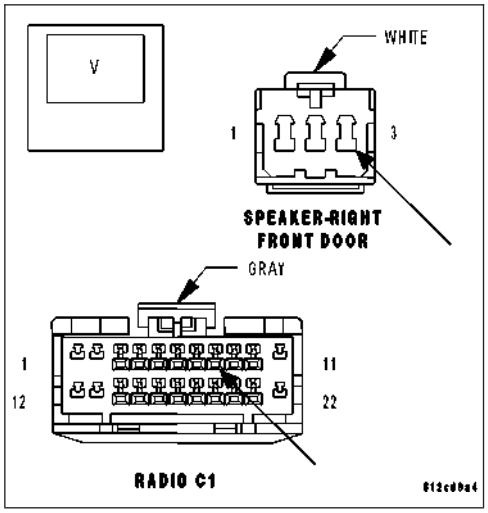
3. CHECK FOR VOLTAGE ON THE (X56) SPEAKER (-) CIRCUIT

Measure for voltage on the (X58) Speaker (-) circuit.

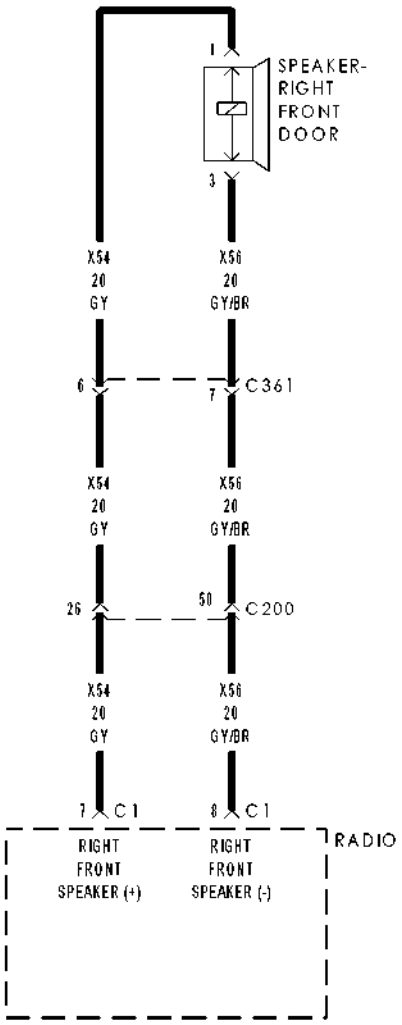
Is the voltage above 10.0 volts?

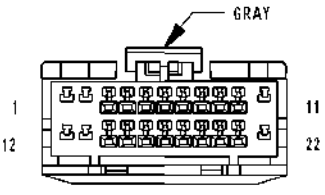
Yes >> Repair the (X58) Speaker (-) circuit for a short to voltage. Perform BODY VERIFICATION TEST VER-1.

No >> Replace the Radio in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

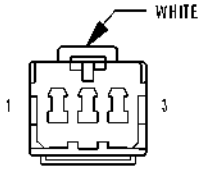


B1407-FRONT RIGHT AUDIO SPEAKER OUTPUT CIRCUIT OPEN





RADIO C1



SPEAKER-RIGHT
FRONT DOOR

B1407-FRONT RIGHT AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)

For the Audio system circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Radio on.
- **Set Condition:**
- When the Output circuit is open for more than 3 seconds. The Radio will not set the fault if the radio confirms an amplifier is on the BUS.

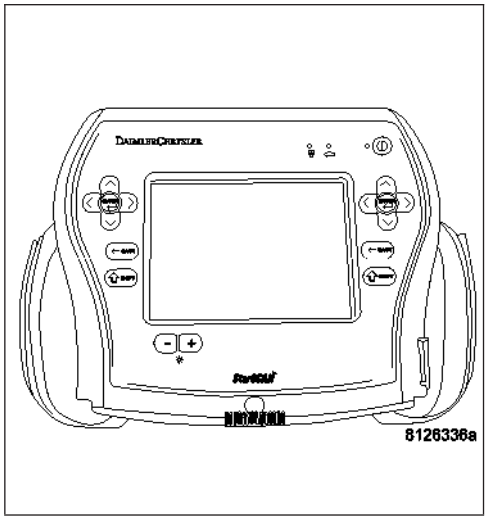
Possible Causes
SPEAKER
(X56) (X54) RIGHT FRONT SPEAKER OUTPUT CIRCUIT

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.
With the Scan Tool, clear all Audio DTC's.
Turn the Radio on.
With the Scan Tool, read the DTC information.



Does the Scan Tool read: B1407-FRONT RIGHT AUDIO SPEAKER OUTPUT CIRCUIT OPEN?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST VER 1.

---

2. (X56) (X54) Speaker Output circuits.

Turn the ignition off.
Disconnect the Radio C1 harness connector.
Disconnect the Front Right Audio Speaker connector.
Measure the resistance of each speaker (X54)(+) and (X56)(-) circuit between the Radio and the Speaker.

Is the resistance below 5.0 ohms for each circuit?

Yes >> Go To 3

No >> Repair the applicable Output Speaker circuit for an open condition.
Perform the BODY VERIFICATION TEST VER 1.

B1407-FRONT RIGHT AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)

3. **Speaker**

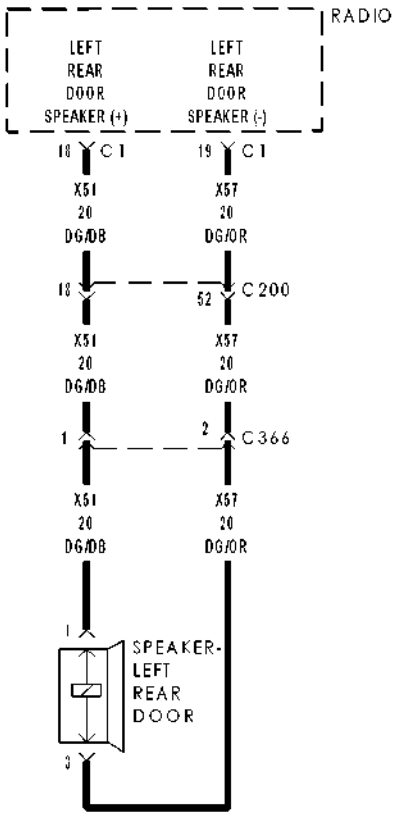
Turn the ignition off.
Disconnect the Front Right Audio Speaker.
Turn the ignition on.
Turn the Radio on.
With the Scan Tool, clear all Audio DTC's.
With the Scan Tool, read the DTC information.

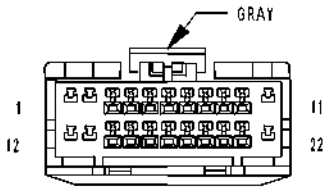
Does the Scan Tool read: B1407-FRONT RIGHT AUDIO SPEAKER OUTPUT CIRCUIT OPEN?

Yes >> Replace the Speaker in accordance with the service information.
Perform the BODY VERIFICATION TEST VER 1.

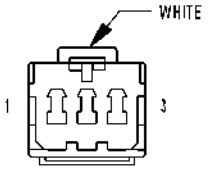
No >> Test Complete.

B1409-REAR LEFT AUDIO SPEAKER OUTPUT CIRCUIT LOW





RADIO C1



SPEAKER-LEFT REAR DOOR

B1409-REAR LEFT AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)

For the Audio system circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Radio on.
- **Set Condition:**
- When the Output circuit is LOW for more than 3 seconds.

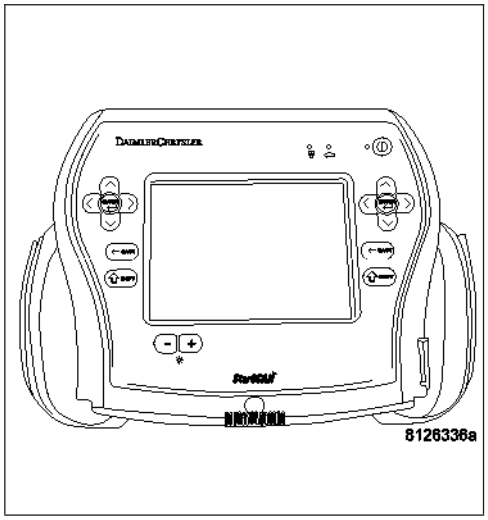
Possible Causes
SPEAKER
(X57) (X51) LEFT REAR SPEAKER OUTPUT CIRCUIT

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.
With the Scan Tool, clear all Audio DTC's.
Turn the Radio on.
With the Scan Tool, read the DTC information.



Does the Scan Tool read: B1409-REAR LEFT AUDIO SPEAKER OUTPUT CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST VER 1.

---

2. (X51) (X57) SPEAKER OUTPUT CIRCUITS.

Turn the ignition off.
Disconnect the Radio C1 harness connector.
Disconnect the Rear Left Audio Speaker connector.
Measure the resistance between ground and each speaker (X51)(+) and (X57)(-) circuit.

Is the resistance below 1000.0 ohms for each circuit?

Yes >> Repair the applicable Speaker (+) or (-) Output circuit for a short to ground condition.

No >> Go To 3

B1409-REAR LEFT AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)

3. **SPEAKER**

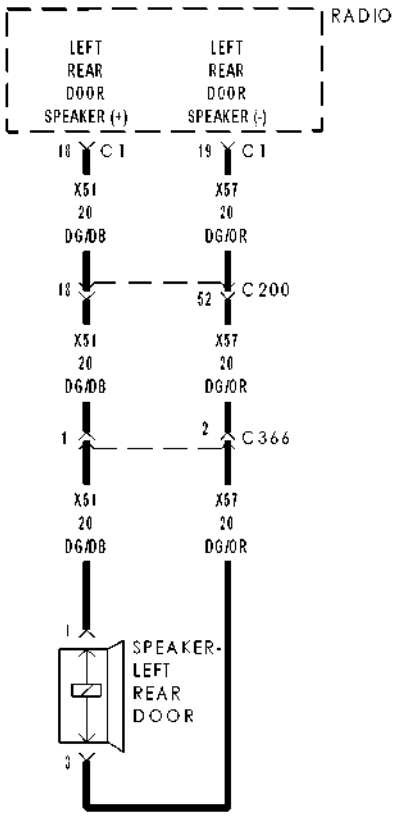
Turn the ignition off.
Disconnect the Rear Left Audio Speaker.
Turn the ignition on.
Turn the Radio on.
With the Scan Tool, clear all Audio DTC's.
With the Scan Tool, read the DTC information.

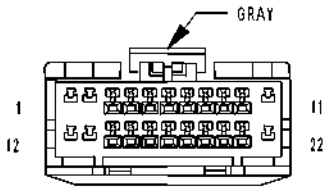
Does the Scan Tool read: B1409-REAR LEFT AUDIO SPEAKER OUTPUT CIRCUIT LOW?

Yes >> Replace the Speaker in accordance with the service information.
Perform the BODY VERIFICATION TEST VER 1.

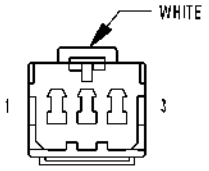
No >> Test Complete.

B140A-REAR LEFT AUDIO SPEAKER OUTPUT CIRCUIT HIGH





RADIO C1



SPEAKER-LEFT REAR DOOR

B140A-REAR LEFT AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)

For the Audio system circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- **Set Condition:**

Possible Causes
SPEAKER
(X51) SPEAKER OUTPUT CIRCUIT (+)
(X57) SPEAKER OUTPUT CIRCUIT (-)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

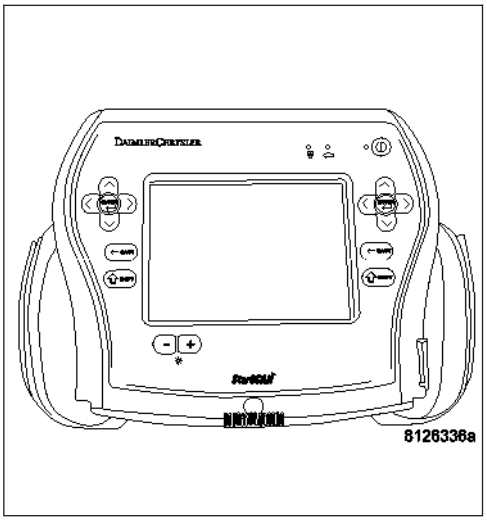
1. INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.
With the scan tool, read Radio DTCs.

Does the scan tool display active: B140A-REAR LEFT AUDIO SPEAKER OUTPUT CIRCUIT HIGH?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.



B140A-REAR LEFT AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)

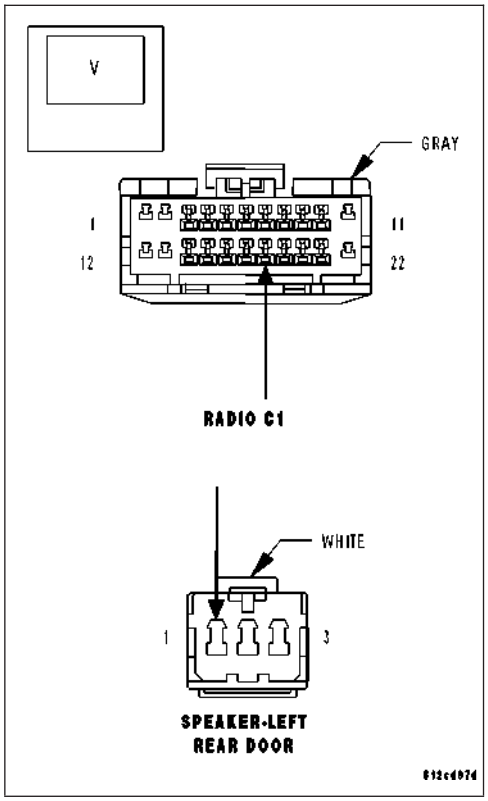
2. CHECK FOR VOLTAGE ON THE (X51) SPEAKER (+) CIRCUIT

Turn the ignition off.
Disconnect the Radio C1 harness connector.
Disconnect the Left Rear Speaker harness connector.
Measure for voltage on the (X51) Speaker (+) circuit.

Is the voltage above 10.0 volts?

Yes >> Repair the (X51) Speaker (+) circuit for a short to voltage. Perform BODY VERIFICATION TEST VER-1.

No >> Go To 3



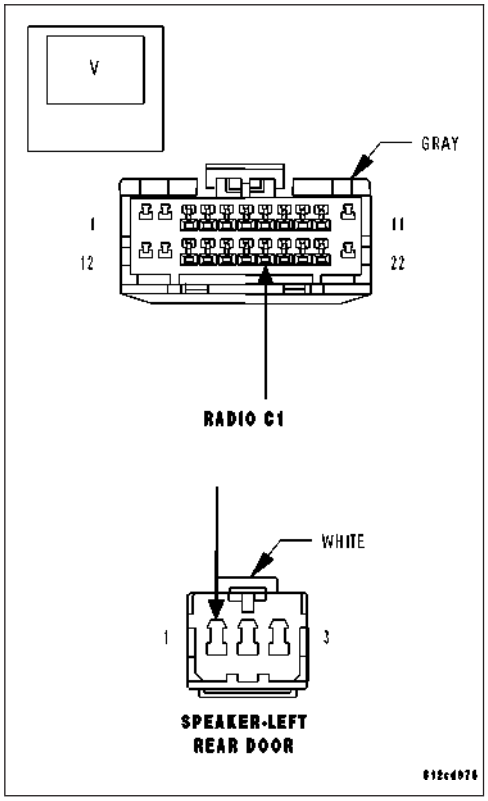
3. CHECK FOR VOLTAGE ON THE (X57) SPEAKER (-) CIRCUIT

Measure for voltage on the (X57) Speaker (-) circuit.

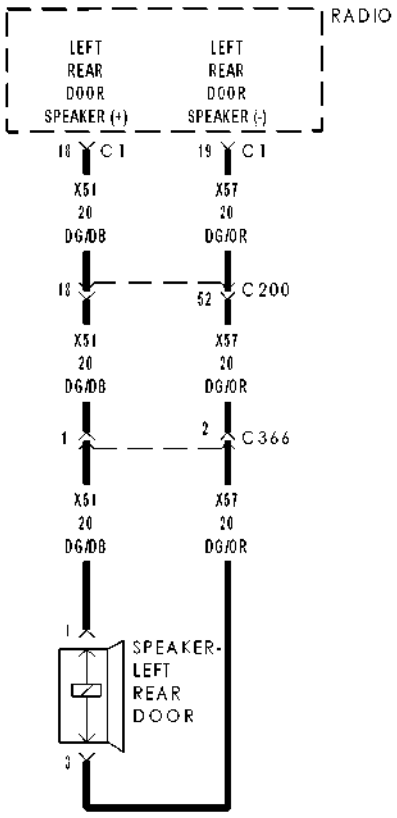
Is the voltage above 10.0 volts?

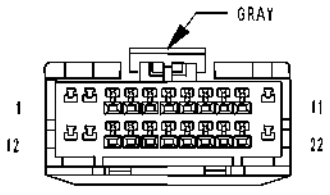
Yes >> Repair the (X57) Speaker (-) circuit for a short to voltage. Perform BODY VERIFICATION TEST VER-1.

No >> Replace the Radio in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

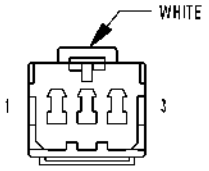


B140B-REAR LEFT AUDIO SPEAKER OUTPUT CIRCUIT OPEN





RADIO C1



SPEAKER-LEFT REAR DOOR

B140B-REAR LEFT AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)

For the Audio system circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Radio on.
- **Set Condition:**
- When the Output circuit is open for more than 3 seconds. The Radio will not set the fault if the radio confirms an amplifier is on the BUS.

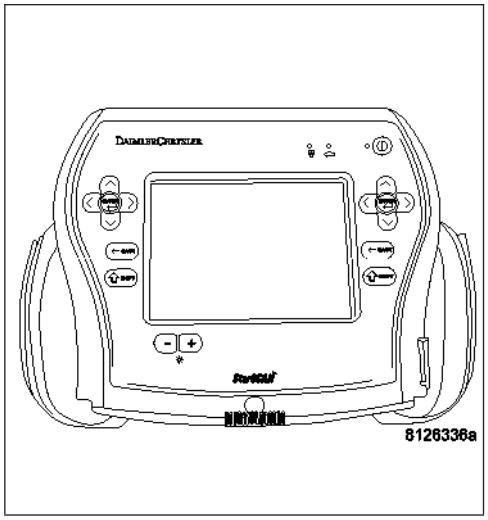
Possible Causes
SPEAKER
(X57) (X51) LEFT REAR SPEAKER OUTPUT CIRCUIT

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. Intermittent Condition

Turn the ignition on.
With the Scan Tool, clear all Audio DTC's.
Turn the Radio on.
With the Scan Tool, read the DTC information.



Does the Scan Tool read: B140B-REAR LEFT AUDIO SPEAKER OUTPUT CIRCUIT OPEN?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST VER 1.

---

2. (X57) (X51) Speaker Output circuits.

Turn the ignition off.
Disconnect the Radio C1 harness connector.
Disconnect the Rear Left Audio Speaker connector.
Measure the resistance of each speaker (X51)(+) and (X57)(-) circuit between the Radio and the Speaker.

Is the resistance below 5.0 ohms for each circuit?

Yes >> Go To 3

No >> Repair the applicable Output Speaker circuit for an open condition.
Perform the BODY VERIFICATION TEST VER 1.

B140B-REAR LEFT AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)

3. **Speaker**

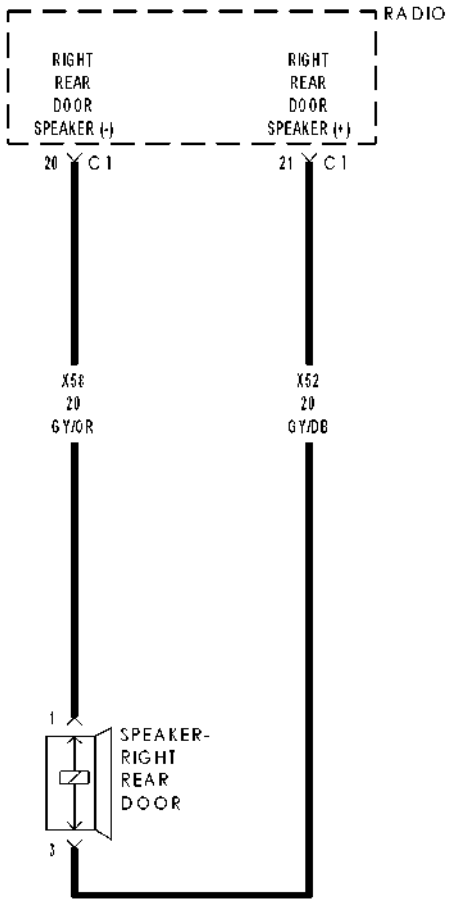
Turn the ignition off.
Disconnect the Rear Left Audio Speaker.
Turn the ignition on.
Turn the Radio on.
With the Scan Tool, clear all Audio DTC's.
With the Scan Tool, read the DTC information.

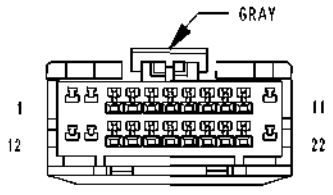
Does the Scan Tool read: B140B-REAR LEFT AUDIO SPEAKER OUTPUT CIRCUIT OPEN?

Yes >> Replace the Speaker in accordance with the service information.
Perform the BODY VERIFICATION TEST VER 1.

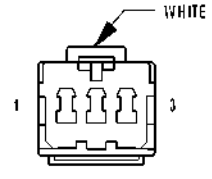
No >> Test Complete.

B140D-REAR RIGHT AUDIO SPEAKER OUTPUT CIRCUIT LOW





RADIO C1



SPEAKER-RIGHT REAR DOOR

B140D-REAR RIGHT AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)

For the Audio system circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Radio on.
- **Set Condition:**
- When the Output circuit is LOW for more than 3 seconds.

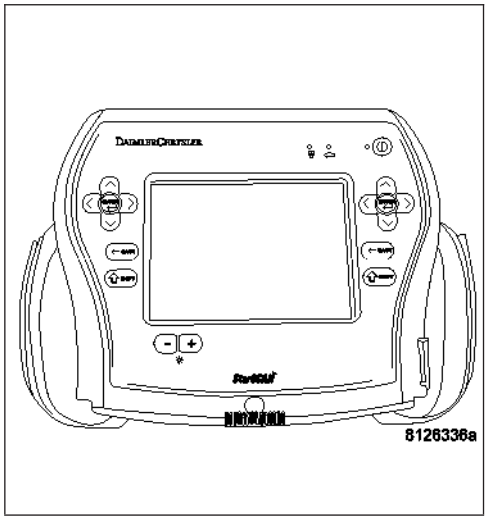
Possible Causes
SPEAKER
(X58) (X52) RIGHT REAR SPEAKER OUTPUT CIRCUIT

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. Intermittent Condition

Turn the ignition on.
With the Scan Tool, clear all Audio DTC's.
Turn the Radio on.
With the Scan Tool, read the DTC information.



Does the Scan Tool read: B140D-REAR RIGHT AUDIO SPEAKER OUTPUT CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST VER 1.

---

2. (X58) (X52) Speaker Output circuits.

Turn the ignition off.
Disconnect the Radio C1 harness connector.
Disconnect the Rear Right Audio Speaker connector.
Measure the resistance between ground and each speaker (X58)(+) and (X52)(-) circuit.

Is the resistance below 1000.0 ohms for each circuit?

Yes >> Repair the applicable Speaker (+) or (-) Output circuit for a short to ground condition.

No >> Go To 3

B140D-REAR RIGHT AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)

3. **Speaker**

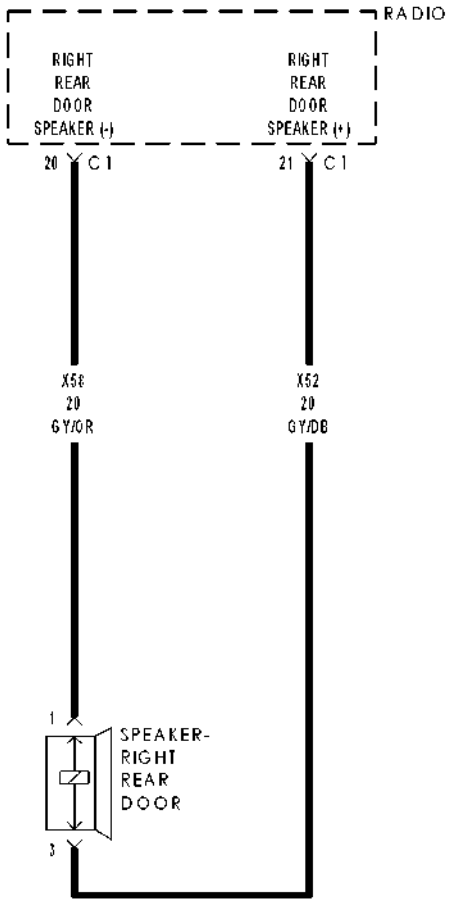
Turn the ignition off.
Disconnect the Rear Right Audio Speaker.
Turn the ignition on.
Turn the Radio on.
With the Scan Tool, clear all Audio DTC's.
With the Scan Tool, read the DTC information.

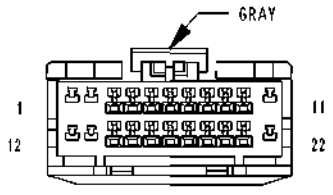
Does the Scan Tool read: B140D-REAR RIGHT AUDIO SPEAKER OUTPUT CIRCUIT LOW?

Yes >> Replace the Speaker in accordance with the service information.
Perform the BODY VERIFICATION TEST VER 1.

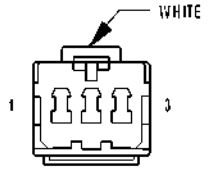
No >> Test Complete.

B140E-REAR RIGHT AUDIO SPEAKER OUTPUT CIRCUIT HIGH





RADIO C1



SPEAKER-RIGHT REAR DOOR

B140E-REAR RIGHT AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)

For the Audio system circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- **Set Condition:**

Possible Causes
SPEAKER
(X52) SPEAKER OUTPUT CIRCUIT (+)
(X58) SPEAKER OUTPUT CIRCUIT (-)

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

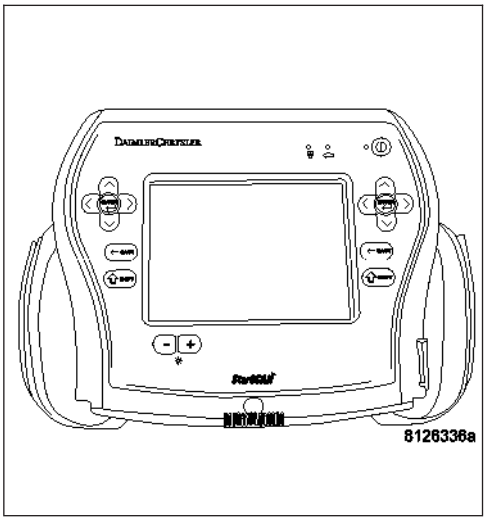
1. INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.
With the scan tool, read Radio DTCs.

Does the scan tool display active: B140E-REAR RIGHT AUDIO SPEAKER OUTPUT CIRCUIT HIGH?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.



B140E-REAR RIGHT AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)

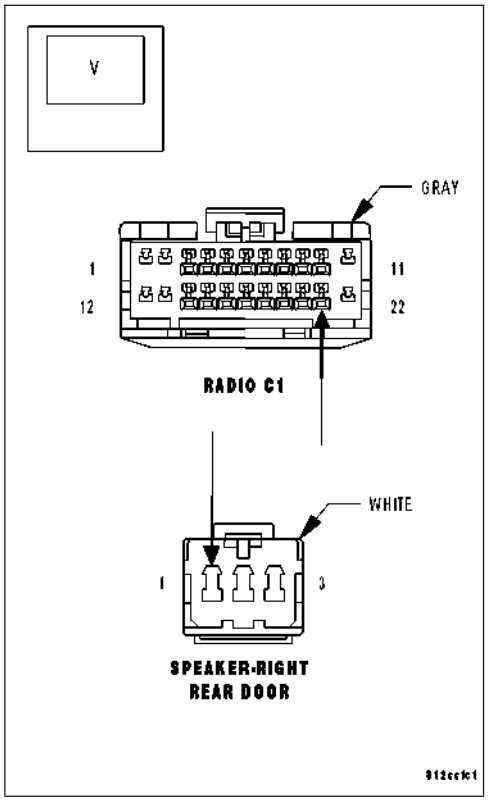
2. CHECK FOR VOLTAGE ON THE (X52) SPEAKER (+) CIRCUIT

Turn the ignition off.
Disconnect the Radio C1 harness connector.
Disconnect the Right Rear Speaker harness connector.
Measure for voltage on the (X52) Speaker (+) circuit.

Is the voltage above 10.0 volts?

Yes >> Repair the (X52) Speaker (+) circuit for a short to voltage. Perform BODY VERIFICATION TEST VER-1.

No >> Go To 3



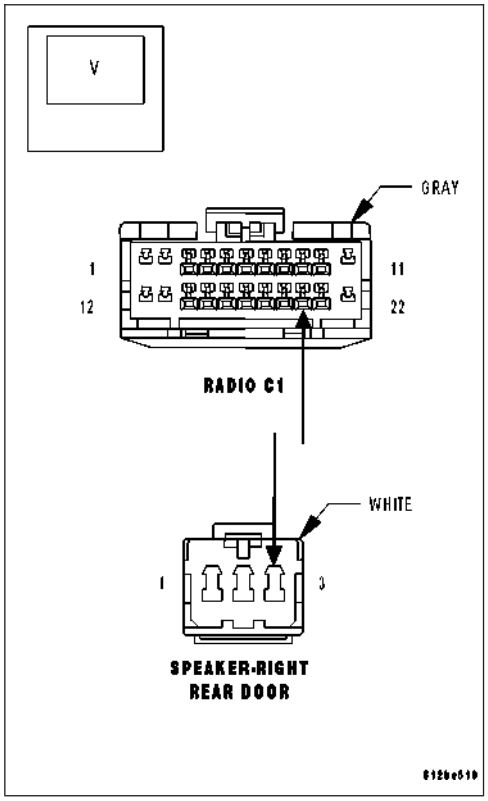
3. CHECK FOR VOLTAGE ON THE (X58) SPEAKER (-) CIRCUIT

Measure for voltage on the (X58) Speaker (-) circuit.

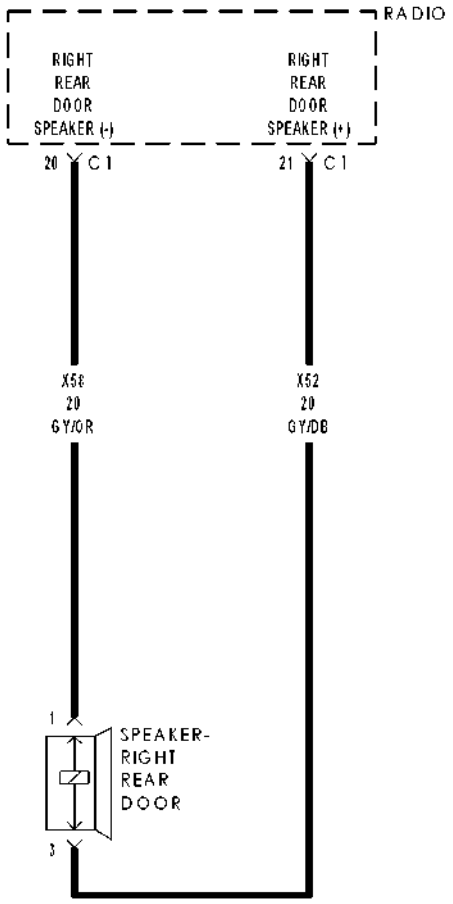
Is the voltage above 10.0 volts?

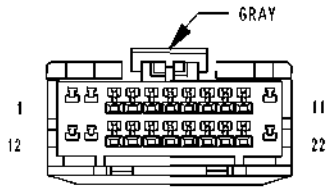
Yes >> Repair the (X58) Speaker (-) circuit for a short to voltage. Perform BODY VERIFICATION TEST VER-1.

No >> Replace the Radio in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

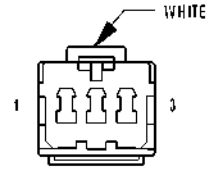


B140F-REAR RIGHT AUDIO SPEAKER OUTPUT CIRCUIT OPEN





RADIO C1



SPEAKER-RIGHT REAR DOOR

B140F-REAR RIGHT AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)

For the Audio system circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Radio on.
- **Set Condition:**
- When the Output circuit is open for more than 3 seconds. The Radio will not set the fault if the radio confirms an amplifier is on the BUS.

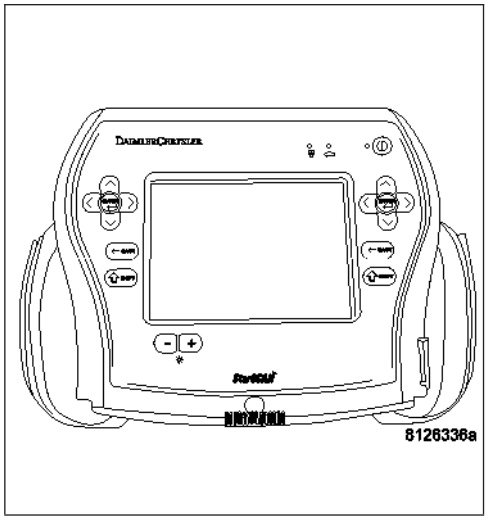
Possible Causes
SPEAKER
(X58) (X52) RIGHT REAR SPEAKER OUTPUT CIRCUIT

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. Intermittent Condition

Turn the ignition on.
With the Scan Tool, clear all Audio DTC's.
Turn the Radio on.
With the Scan Tool, read the DTC information.



Does the Scan Tool read: B140F-REAR RIGHT AUDIO SPEAKER OUTPUT CIRCUIT OPEN?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST VER 1.

---

2. (X58) (X52) Speaker Output circuits.

Turn the ignition off.
Disconnect the Radio C1 harness connector.
Disconnect the Rear Right Audio Speaker connector.
Measure the resistance of each speaker (X58)(+) and (X52)(-) circuit between the Radio and the Speaker.

Is the resistance below 5.0 ohms for each circuit?

Yes >> Go To 3

No >> Repair the applicable Output Speaker circuit for an open condition.
Perform the BODY VERIFICATION TEST VER 1.

B140F-REAR RIGHT AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)

3. **Speaker**

Turn the ignition off.
Disconnect the Rear Right Audio Speaker.
Turn the ignition on.
Turn the Radio on.
With the Scan Tool, clear all Audio DTC's.
With the Scan Tool, read the DTC information.

Does the Scan Tool read: B140F-REAR RIGHT AUDIO SPEAKER OUTPUT CIRCUIT OPEN?

Yes >> Replace the Speaker in accordance with the service information.
Perform the BODY VERIFICATION TEST VER 1.

No >> Test Complete.

B142A-RADIO UNIT HIGH TEMPERATURE

For the Audio System circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- When Monitored:
- Continuously with the ignition and Radio on.
- Set Condition:
- The code will set if the temperature inside the radio is above +65°C (+145°F)

Possible Causes
HIGH TEMPERATURE FAILURE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. VERIFY THAT DTC B142A—RADIO UNIT HIGH TEMPERATURE IS ACTIVE.

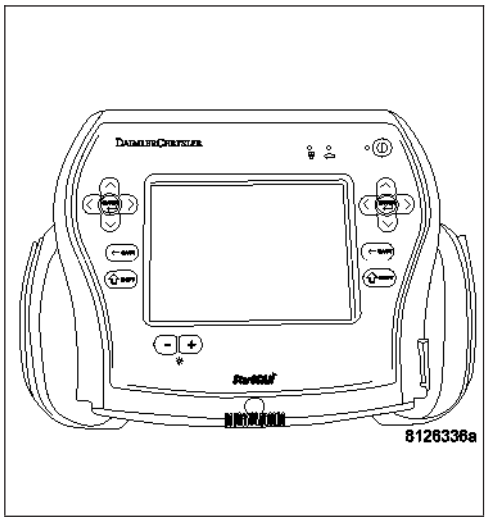
With the Scan Tool, erase the Audio DTC's.

Start the engine and allow the engine to reach normal operating temperature.

If the vehicle has been in the hot sunlight or extreme cold, move the vehicle indoors and open the doors to allow the inside temperature to stabilize.

The Radio should operate between —23°C and 65°C (—10°F and +145°F).

With the Scan Tool, read the DTC's.



Does the Scan Tool display, B142A— Radio Unit High Temperature?

Yes >> Replace the Radio in accordance with the service information.

Perform the BODY VERIFICATION TEST — VER 1.

No >> Test Complete.

B142D-AUDIO ANTENNA NOT CONNECTED

For the Audio System circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the ignition on and the radio in seek mode.
- **Set Condition:**
- With the radio in seek mode for two loops around the band. The radio does not detect an antenna connection or does not receive a radio station signal.

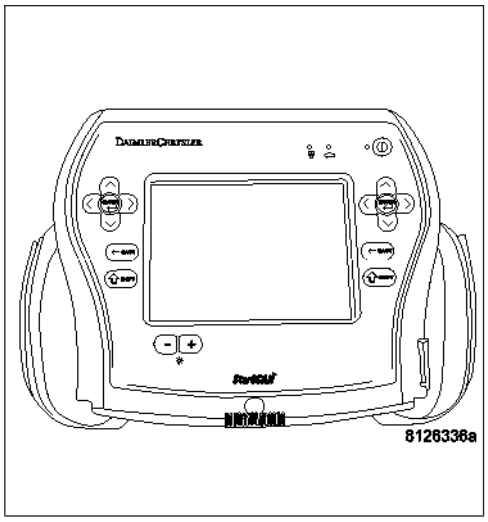
Possible Causes
BAD ANTENNA CONNECTION
RADIO

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. Test Antenna

Turn the ignition off.
Disconnect the Radio Antenna connector.
Inspect the Radio Antenna connection.



Was the Antenna connection clean and secure?

Yes >> Go To 2

No >> Repair the Antenna connection as needed.
Perform the BODY VERIFICATION TEST — VER1.

2. ANTENNA

Refer to the Audio System in the service information and test the antenna in accordance with the service procedure.

Is the Antenna ok?

Yes >> Go To 3

No >> Repair or replace the Antenna assembly as necessary.
Perform the BODY VERIFICATION TEST — VER1.

B142D-AUDIO ANTENNA NOT CONNECTED (CONTINUED)

3. RADIO

NOTE: Reconnect all previously disconnected components.

NOTE: Move vehicle outside approximately 30ft from any structure.

Turn the ignition and radio on.

With the Scan Tool, erase the audio DTC's, put the radio in seek up and down mode for 2 loops around the band cycle before proceeding.

With the Scan Tool, read the audio DTC's.

Did this DTC reset?

Yes >> Replace the radio in accordance with the service information.
Perform the BODY VERIFICATION TEST-VER1.

No >> Test Complete.

B142F-SATELLITE RADIO ANTENNA NOT CONNECTED

For the Audio System circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the ignition on and the Satellite Radio in seek mode.
- **Set Condition:**
- With the radio in seek mode for two loops around the band. The radio does not detect an antenna connection or does not receive a radio satellite signal.

Possible Causes
BAD ANTENNA CONNECTION
SATELLITE RADIO RECEIVER

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

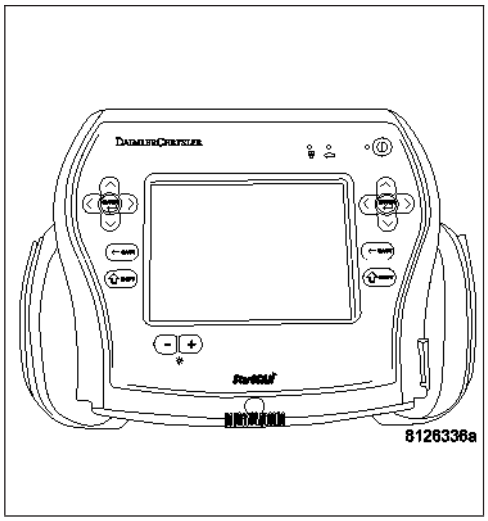
1. Test Antenna

Turn the ignition off.
Disconnect the Satellite Radio Antenna connector.
Inspect the Satellite Radio Antenna connection.

Was the Antenna connection clean and secure?

Yes >> Go To 2

No >> Repair the Antenna connection as needed.
Perform the BODY VERIFICATION TEST — VER1.



2. SATELLITE RADIO ANTENNA

Refer to the Audio System in the service information and test the antenna in accordance with the service procedure.

Is the Antenna ok?

Yes >> Go To 3

No >> Repair or replace the Antenna assembly as necessary.
Perform the BODY VERIFICATION TEST — VER1.

B142F-SATELLITE RADIO ANTENNA NOT CONNECTED (CONTINUED)

3. SATELLITE RADIO RECEIVER

NOTE: Reconnect all previously disconnected components.

NOTE: Move vehicle outside approximately 30ft from any structure.

Turn the ignition and radio on.

With the Scan Tool, erase the audio DTC's, put the satellite radio in seek up and down mode for 2 loops around the band cycle before proceeding.

With the Scan Tool, read the audio DTC's.

Did this DTC reset?

Yes >> Replace the Satellite Radio Receiver in accordance with the service information. Perform the BODY VERIFICATION TEST-VER1.

No >> Test Complete.

B221E-RADIO INTERNAL

For the Audio System circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- When Monitored:
- Continuously with the ignition on and radio turned on.
- Set Condition:
- The code will set if the radio detects a radio internal failure.

Possible Causes
RADIO INTERNAL FAILURE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. Verify DTC B221E-RADIO INTERNAL IS ACTIVE

NOTE: If a DTC is set, erase the DTC and attempt to reset the DTC. If the DTC resets, follow test.

This is an internal radio failure

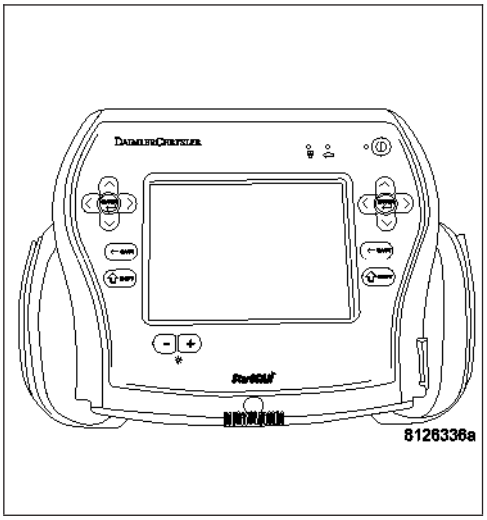
View repair

Does the DTC reset and read B221E-Radio Internal?

Repair

Replace the Radio in accordance with the service information.

Perform the BODY VERIFICATION TEST — VER 1.



B2222-SATELLITE RADIO RECEIVER INTERNAL

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Satellite Radio Receiver detects a software checksum test failure.

Possible Causes
SATELLITE RADIO RECEIVER

Diagnostic Test

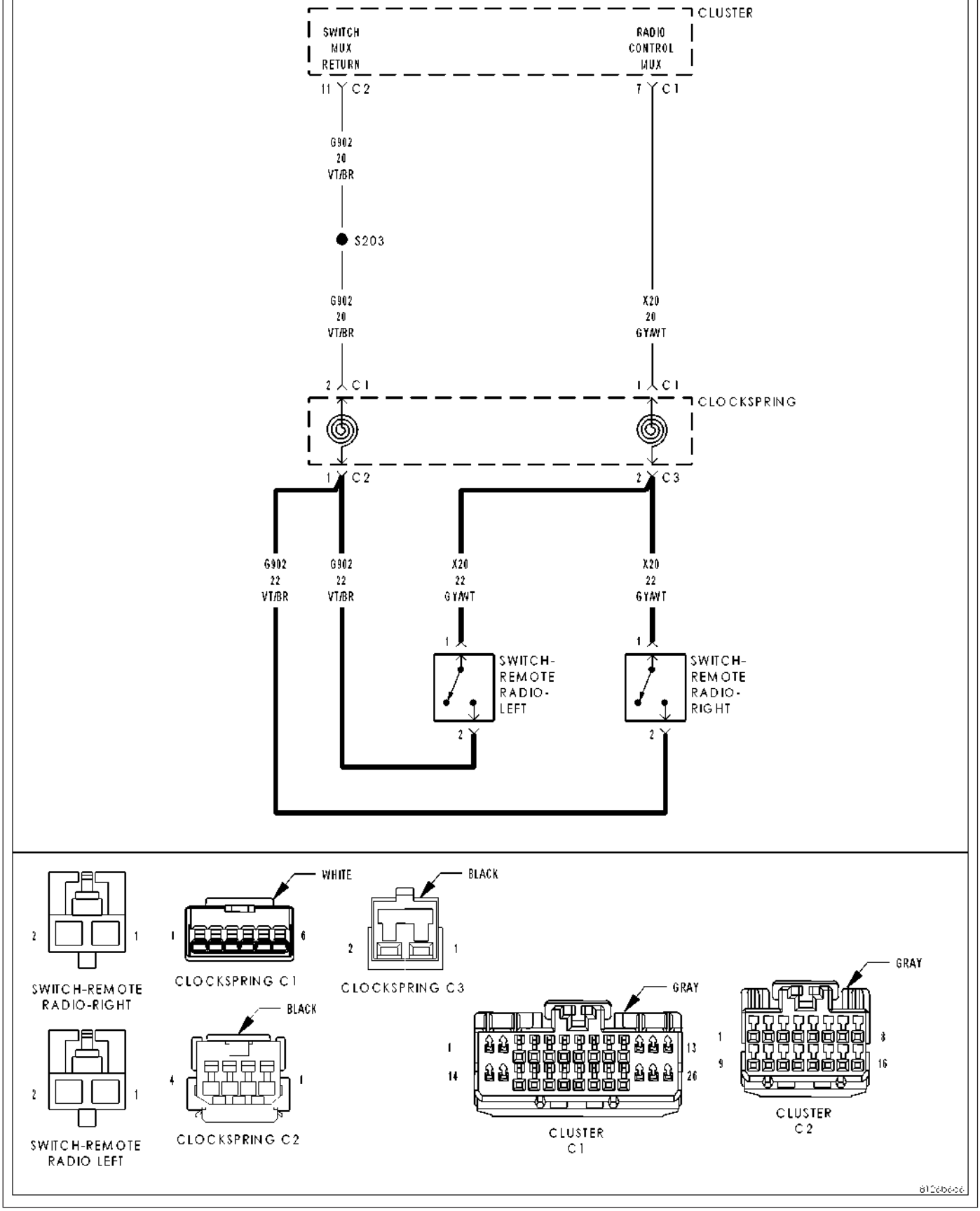
1. REPLACE THE SATELLITE RADIO RECEIVER

When this code is set, the Satellite Radio must be replaced.

Repair

Replace the Satellite Radio Receiver in accordance with the Service Information.
Perform the BODY VERIFICATION TEST-VER 1.

B1428-REMOTE RADIO SWITCH INPUT CIRCUIT STUCK



B1428-REMOTE RADIO SWITCH INPUT CIRCUIT STUCK (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition in any position except off.
- **Set Condition:**
  The Instrument Cluster detects a stuck switch state on the (X20) Radio Control MUX circuit for more than 30 seconds.

Possible Causes
(X20) REMOTE CONTROL MUX CIRCUIT SHORT TO GROUND
(X20) REMOTE CONTROL MUX CIRCUIT SHORT TO (G902) SWITCH MUX RETURN CIRCUIT
LEFT REMOTE RADIO SWITCH
RIGHT REMOTE RADIO SWITCH
CLOCKSPRING
INSTRUMENT CLUSTER (CCN)

Diagnostic Test

1. CHECK FOR ACTIVE DTC

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

---

2. LEFT REMOTE RADIO SWITCH

Turn the ignition off.

Disconnect the Left Remote Radio Switch harness connector.

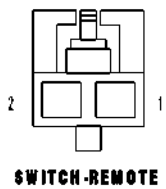
Turn the ignition on.

With the scan tool monitor the Remote Radio Control Switch voltage.

Is the voltage approximately 5.0 volts?

Yes >> Replace the Left Remote Radio Switch in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 3



B1428-REMOTE RADIO SWITCH INPUT CIRCUIT STUCK (CONTINUED)

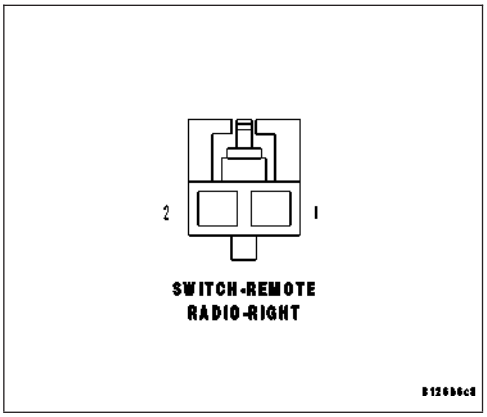
3. RIGHT REMOTE RADIO SWITCH

Turn the ignition off.
Disconnect the Right Remote Radio Switch harness connector.
Turn the ignition on.
With the scan tool monitor the Remote Radio Control Switch voltage.

Is the voltage approximately 5.0 volts?

Yes >> Replace the Right Remote Radio Switch in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 4



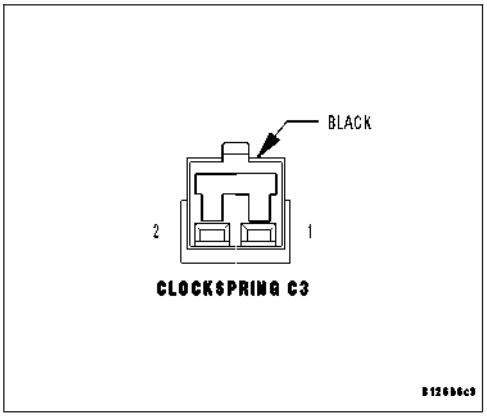
4. CLOCKSPRING

Turn the ignition off.
Disconnect the Clockspring C1 harness connector.
Turn the ignition on.
With the scan tool monitor the Remote Radio Control Switch voltage.

Is the voltage approximately 5.0 volts?

Yes >> Check the (X20) Radio Control MUX circuit for a short between the clockspring and the remote radio switches. If ok, replace the Clockspring in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 5



B1428-REMOTE RADIO SWITCH INPUT CIRCUIT STUCK (CONTINUED)

5. (X20) RADIO CONTROL MUX CIRCUIT SHORT TO GROUND

Turn the ignition off.

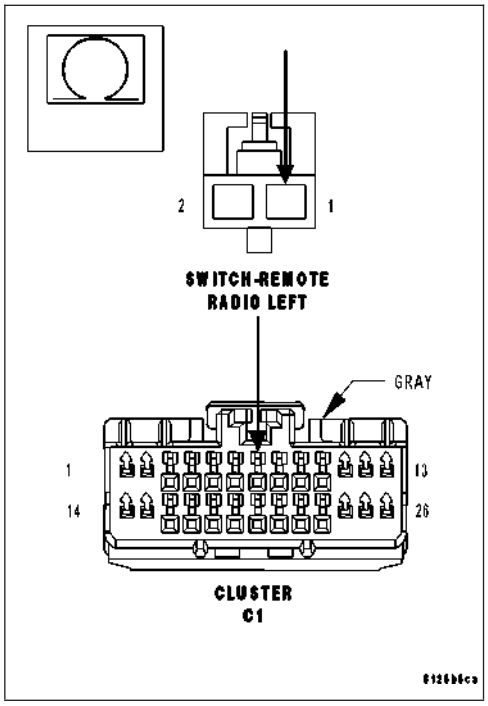
Disconnect the Instrument Cluster C1 harness connector.

Measure the resistance between ground and the (X20) Radio Control MUX circuit.

Is the resistance below 100.0 ohms?

Yes >> Repair the (X20) Radio Control MUX circuit for a short to ground.
Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 6



6. (X20) RADIO CONTROL MUX CIRCUIT SHORT TO (G902) SWITCH MUX RETURN CIRCUIT

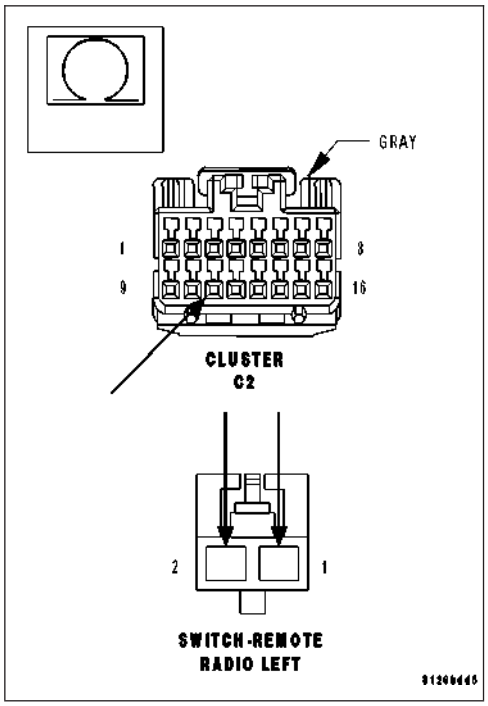
Disconnect the Instrument Cluster C2 harness connector.

Measure the resistance between the (X20) Radio Control MUX circuit and the (G902) Switch MUX Return circuit.

Is the resistance below 100.0 ohms?

Yes >> Repair the (X20) Radio Control MUX circuit for a short to the (G902) Switch MUX Return circuit.
Perform BODY VERIFICATION TEST – VER 1.

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Instrument Cluster (CCN) in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.



B1429-RADIO DISPLAY HIGH TEMPERATURE

For the Audio System circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- When Monitored:
- Continuously with the ignition and Navigation Radio on.
- Set Condition:
- The code will set if the temperature inside the display exceeds 158°F

Possible Causes
HIGH TEMPERATURE FAILURE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. VERIFY THAT DTC B1429—RADIO DISPLAY HIGH TEMPERATURE IS ACTIVE.

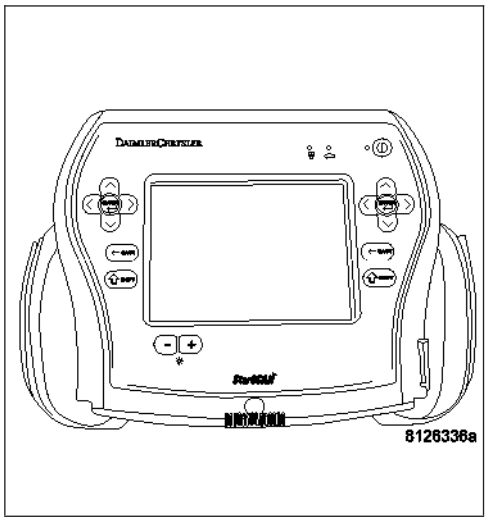
With the Scan Tool, erase the Audio DTC's.

Start the engine and allow the engine to reach normal operating temperature.

If the vehicle has been in the hot sunlight or extreme cold, move the vehicle indoors and open the doors to allow the inside temperature to stabilize.

The radio display should operate to 158°F.

With the Scan Tool, read the DTC's.



Does the Scan Tool display, B1429— Radio Display High Temperature?

Yes >> Replace the Radio in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.

No >> Test Complete.

B142E-GPS ANTENNA NOT CONNECTED

For the Audio System circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the ignition on and the radio in navigation mode.
- **Set Condition:**
- With the radio does not detect GPS antenna connection.

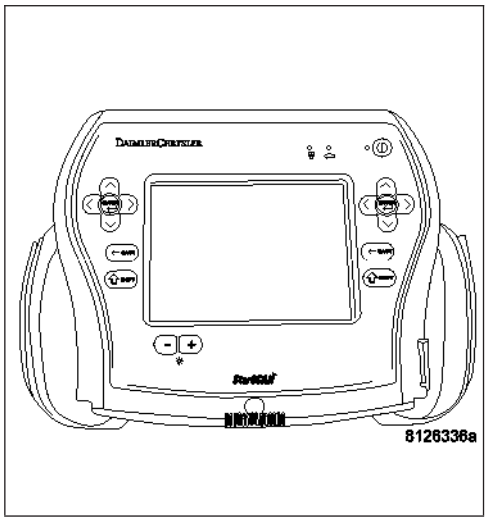
Possible Causes
BAD ANTENNA CONNECTION
RADIO

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. TEST ANTENNA

Turn the ignition off.
Disconnect the GPS Antenna connector.
Inspect the GPS Antenna connection.



Was the Antenna connection clean and secure?

Yes >> Go To 2

No >> Repair the Antenna connection as needed.
Perform the BODY VERIFICATION TEST — VER1.

2. ANTENNA

Refer to the Audio System in the service information and test the antenna in accordance with the service procedure.

Is the Antenna ok?

Yes >> Go To 3

No >> Repair or replace the Antenna assembly as necessary.
Perform the BODY VERIFICATION TEST — VER1.

B142E-GPS ANTENNA NOT CONNECTED (CONTINUED)

3. RADIO

NOTE: Reconnect all previously disconnected components.

NOTE: Move vehicle outside approximately 30ft from any structure.

Turn the ignition and radio on.

With the Scan Tool, erase the audio DTC's and operate the navigation system.

With the Scan Tool, read the audio DTC's.

Did this DTC reset?

Yes >> Replace the radio in accordance with the service information.
Perform the BODY VERIFICATION TEST-VER1.

No >> Test Complete.

B1421-AUDIO CD READ ERROR/INOPERABLE DISC

For the Audio System circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- Continuously with the ignition on and the radio CD player turned on.
- **Set Condition:**
- The code will set if a CD that is not formatted as a music CD is installed in the radio CD player.

Possible Causes
CD READ FAILURE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. RADIO

Replace the problem CD with a good, clean,unscratched, music CD.

Turn the radio CD player on.

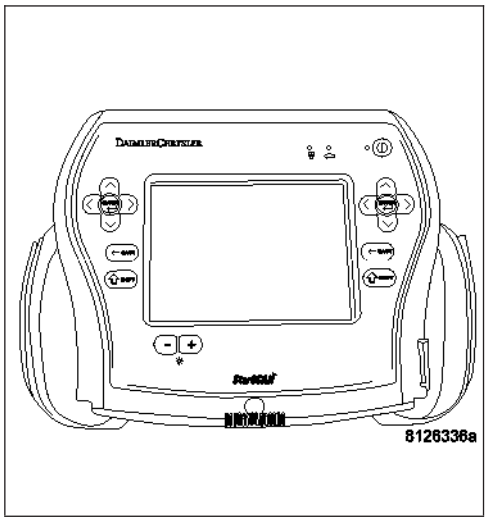
With the Scan Tool, read DTC's.

Does the Scan Tool display: B1421 Audio CD Read Error/Inoperable Disc?

Yes >> Eject the inoperative CD and replace the CD in accordance with the service information.

Perform the BODY VERIFICATION TEST — VER 1.

No >> Test Complete.



B1422-AUDIO DVD READ ERROR/INOPERABLE DISC

For the Audio System circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- Continuously with the ignition on and the DVD player turned on.
- **Set Condition:**
- The code will set if a DVD that is not formatted as a DVD is installed in the DVD player.

Possible Causes
DVD READ FAILURE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. DVD PLAYER

Replace the problem DVD with a good, clean,unscratched DVD.

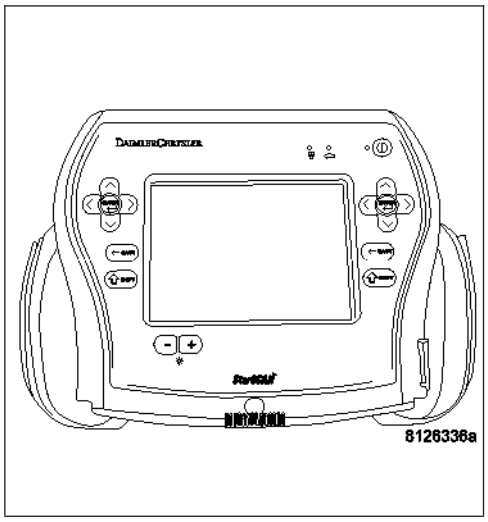
Turn the DVD player on.

With the Scan Tool, read DTC's.

Does the Scan Tool display: B1422 Audio DVD Read Error/Inoperable Disc?

Yes >> Eject the inoperative DVD and replace the DVD in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.

No >> Test Complete.



B221F-AMPLIFIER INTERNAL

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Amplifier detects a software checksum test failure.

Possible Causes
AMPLIFIER

Diagnostic Test

1. REPLACE THE AMPLIFIER

When this code is set, the Amplifier must be replaced.

Repair

Replace the Amplifier in accordance with the Service Information.
Perform the BODY VERIFICATION TEST-VER 1.

B210D-BATTERY VOLTAGE LOW

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

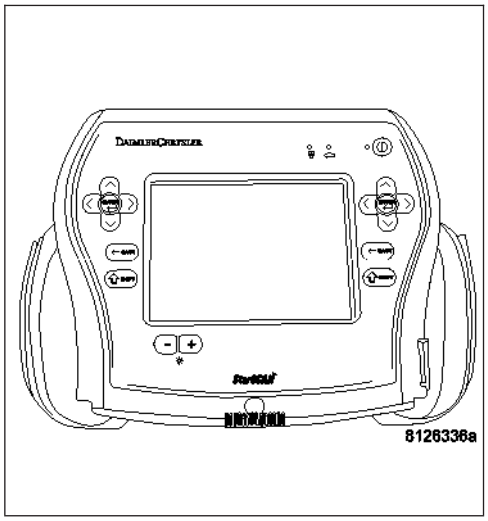
- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the module detects that the battery voltage is less than 9.0 volts for 1 second.

Possible Causes
VEHICLE CHARGING SYSTEM
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.
With the scan tool, read Amplifier DTCs.



Does the scan tool display active: B210D-BATTERY VOLTAGE LOW?

Yes >> Go To

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

---

2. CHECK THE BATTERY VOLTAGE TO THE AMPLIFIER

With the scan tool in Data Display, read Amplifier battery voltage.

Is the battery voltage less than 9.0 volts?

Yes >> Go To 3

No >> Replace the Amplifier in accordance with the Service Information.
Perform OCS VERIFICATION TEST - VER 1.

---

3. CHECK FOR CHARGING SYSTEM RELATED DTCs IN THE POWERTRAIN CONTROL MODULE (PCM)

With the scan tool in ECU View, select PCM and check for any Charging System related DTCs.

Does the scan tool display any Charging System related DTCs?

Yes >> Diagnose and repair the DTCs. Refer to (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Amplifier in accordance with the Service Information.
Perform OCS VERIFICATION TEST - VER 1.

B210E-BATTERY VOLTAGE HIGH

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the module detects that the battery voltage is greater 16.5 volts for 1 second.

Possible Causes
VEHICLE CHARGING SYSTEM
AMPLIFIER

Diagnostic Test

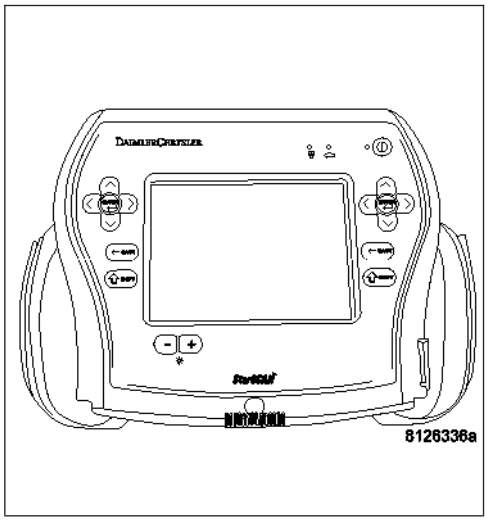
1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.
With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B210E-BATTERY VOLTAGE HIGH?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.



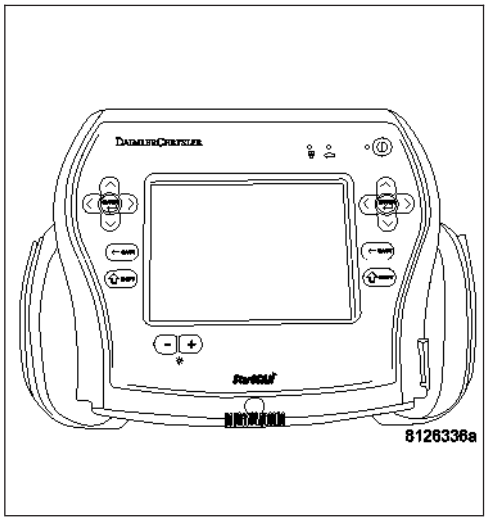
2. CHECK THE BATTERY VOLTAGE TO THE AMPLIFIER

With the scan tool in Data Display, read Amplifier battery voltage.

Is the battery voltage greater than 16.5 volts?

Yes >> Go To 3

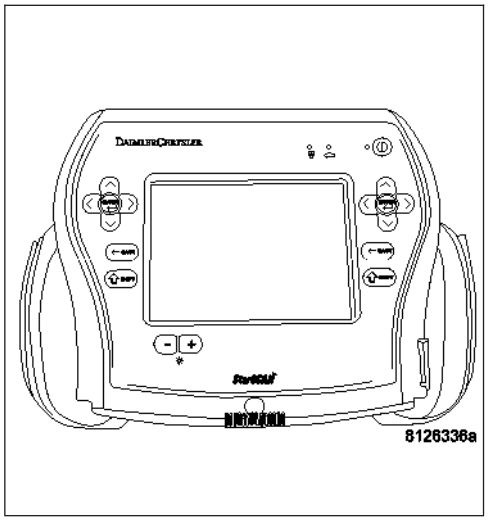
No >> Replace the Amplifier in accordance with the Service Information.
Perform OCS VERIFICATION TEST - VER 1.



B210E-BATTERY VOLTAGE HIGH (CONTINUED)

3. CHECK FOR CHARGING SYSTEM RELATED DTCs IN THE POWERTRAIN CONTROL MODULE (PCM)

With the scan tool in ECU View, select PCM and check for any Charging System related DTCs.



Does the scan tool display any Charging System related DTCs?

Yes >> Diagnose and repair the DTCs. Refer to (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the Amplifier in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

B1488–CABIN EQ MISMATCH PERFORMANCE

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

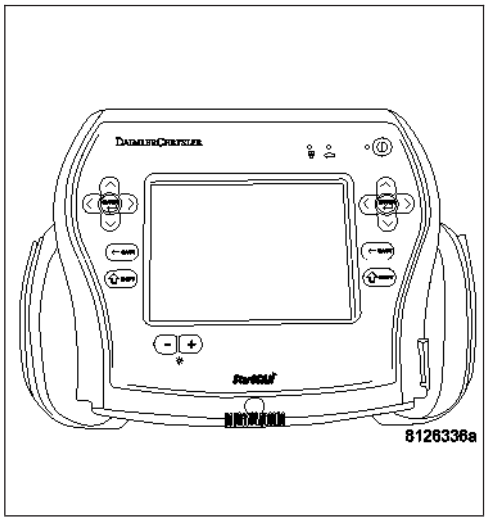
- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the cabin EQ message is incompatible with the EQ's stored in the amplifier for 10 consecutive cycles, then the amplifier will set this DTC.

POSSIBLE CAUSES
NO COMMUNICATION WITH FRONT CONTROL MODULE
ACTIVE FCM DTCs
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on.
Turn the radio on.
With the scan tool, erase Amplifier DTCs.
With the scan tool, reset the amplifier.
With the scan tool, read Amplifier DTCs.



Does the scan tool display active: B1488–CABIN EQ MISMATCH PERFORMANCE?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

---

2. CHECK AMPLIFIER BUSSED INPUTS/OUTPUTS

With the scan tool in Amplifier Data Display, read the Cabin EQ# settings in the Bussed Inputs and Bussed Outputs Sections.

NOTE: The Cabin EQ# settings in the Inputs/Outputs section should match one another. The Cabin EQ# in the Inputs section is the information that is received form the FCM. The Cabin EQ# in the Outputs section is the information that is Stored in the Amplifier's memory.
The Cabin EQ# settings are as follows:

- •$51: HB Premium 1 (w/o Subwoofer)
- •$52: HB Premium 2 (with Subwoofer)

Do the Cabin EQ# settings match one another?

Yes >> Replace the Amplifier in accordance to the service information.
Perform the BODY VERIFICATION TEST-VER 1.

No >> Go To 3

B1488–CABIN EQ MISMATCH PERFORMANCE (CONTINUED)

3. VERIFY COMMUNICATION WITH FRONT CONTROL MODULE

With the scan tool in ECU VIEW, read active modules on the bus.

Does the scan tool show the Front Control Module active on the bus?

Yes >> Go To 4

No >> Refer to the Communication category for the related symptoms.
Perform the BODY VERIFICATION TEST VER 1.

---

4. CHECK FRONT CONTROL MODULE FOR ACTIVE DTCs

With the scan tool, erase FCM DTCs.
Turn the ignition off. Wait approximately 10 seconds.
Turn the ignition on.
With the scan tool, read FCM DTCs.

Are any active DTCs present?

Yes >> Refer to symptom list for problems related to the Front Control Module.
Perform the BODY VERIFICATION TEST VER 1.

No >> Replace the Front Control Module in accordance with the Service Information.
Perform the BODY VERIFICATION TEST-VER.1

B1460-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  This DTC will set if a DC offset occurs on the output channel, the amplifier shall set a DTC after a maturity rate of 5 ±1 sec.

Possible Causes
AMPLIFIER

Diagnostic Test

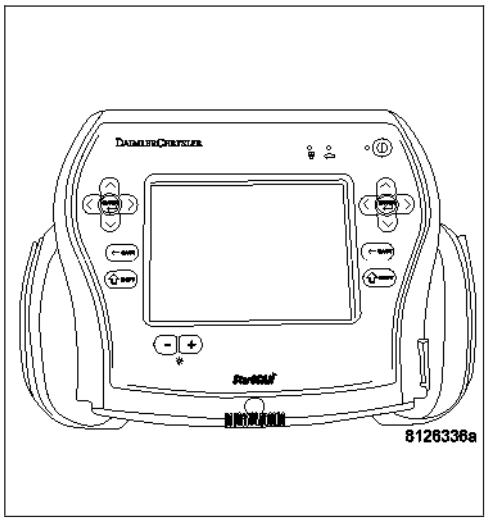
1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.
With the scan tool, read Amplifier DTCs.

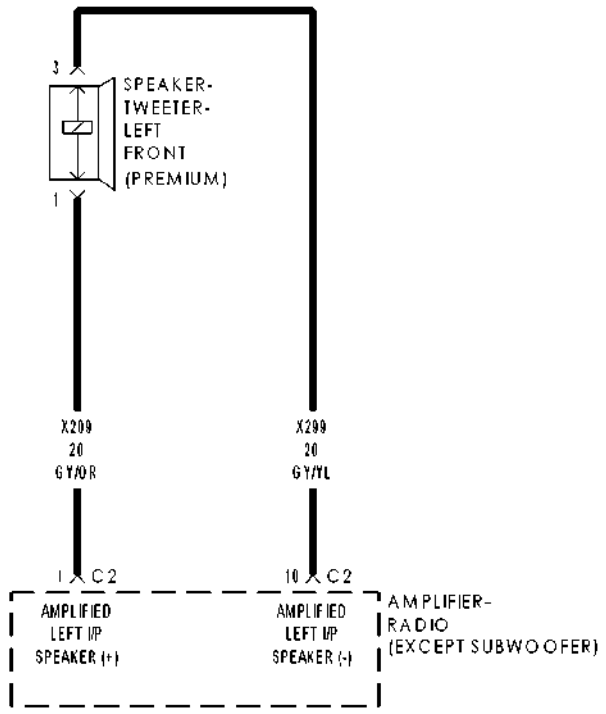
Does the scan tool display active: B1460-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT PERFORMANCE?

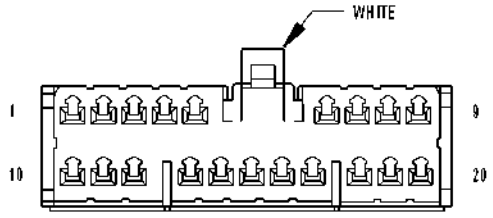
Yes >> Replace the Amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

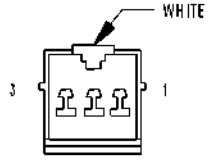


B1461-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT LOW





AMPLIFIER-RADIO
C2
(EXCEPT SUBWOOFER)



SPEAKER-TWEETER
LEFT FRONT
(PREMIUM)

8l2eff7

B1461-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Amplifier detects a shorted to ground condition on the speaker output circuit.

Possible Causes
(X209) AMPLIFIED LEFT FRONT I/P SPEAKER (+) CIRCUIT SHORTED TO GROUND
(X299) AMPLIFIED LEFT FRONT I/P SPEAKER (-) CIRCUIT SHORTED TO GROUND
LEFT FRONT I/P SPEAKER
AMPLIFIER

Diagnostic Test

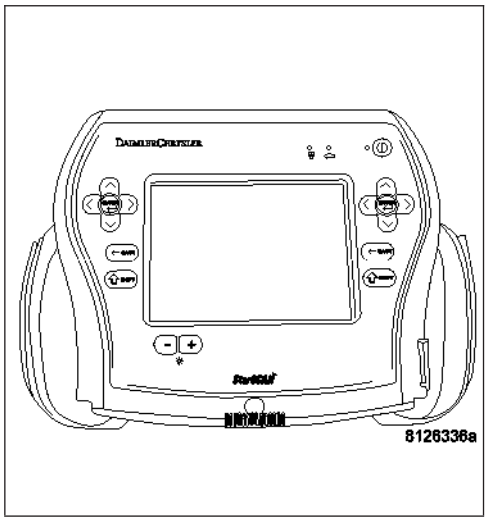
1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.
With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B1461-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT LOW?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.



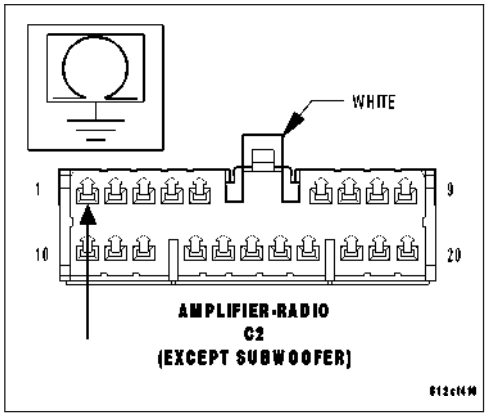
2. CHECK THE (X209) AMPLIFIED LEFT FRONT I/P SPEAKER (+) CIRCUIT FOR A SHORT TO GROUND

Disconnect the Amplifier C2 harness connector.
Measure the resistance between ground and the (X209) Amplified Left Front I/P Speaker (+) circuit.

Is the resistance below 10K ohms?

Yes >> Repair the (X209) Amplified Left Front I/P Speaker (+) circuit for a short to ground.
Perform BODY VERIFICATION TEST VER-1.

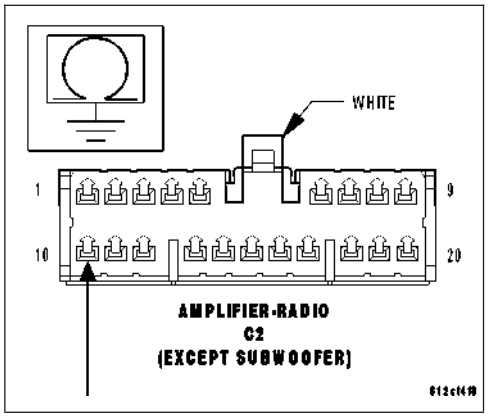
No >> Go To 3



B1461-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)

3. CHECK THE (X299) AMPLIFIED LEFT FRONT I/P SPEAKER (-) CIRCUIT FOR A SHORT TO GROUND

Measure the resistance between ground and the (X299) Amplified Left Front I/P Speaker (-) circuit.



Is the resistance below 10K ohms?

Yes >> Repair the (X299) Amplified Left Front I/P Speaker (-) for a short to ground.
Perform BODY VERIFICATION TEST VER-1.

No >> Go To 4

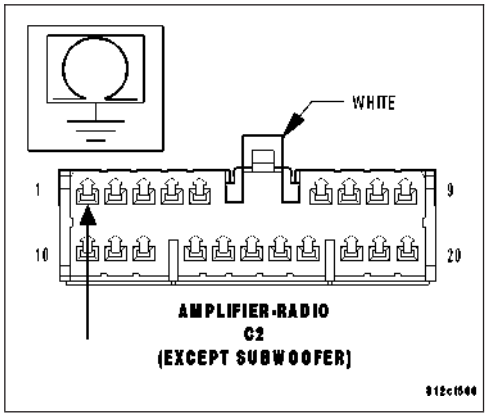
---

4. CHECK OPERATION OF THE AMPLIFIED LEFT FRONT I/P SPEAKER

Turn the ignition off.

Reconnect and reinstall the Left Front I/P Speaker.

Measure the resistance of the speaker circuit between the Amplifier C2 harness connector and ground.

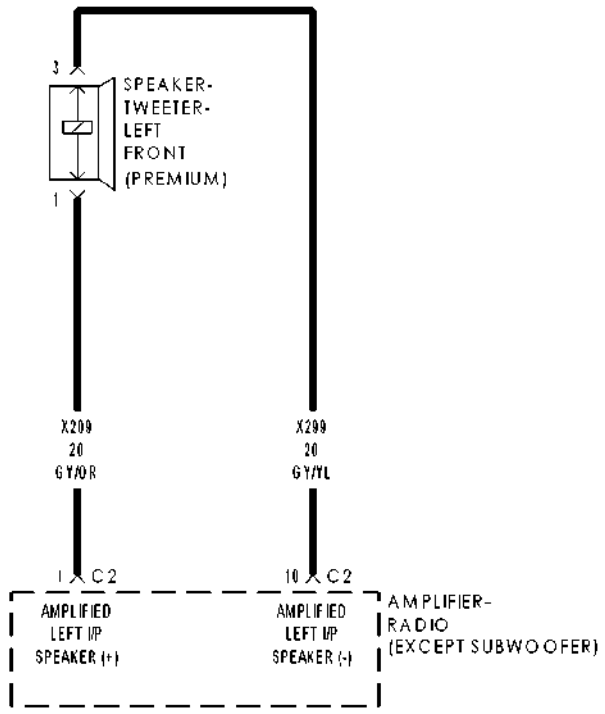


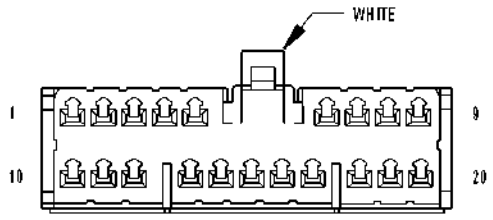
Is the resistance below 10K ohms?

Yes >> Replace the Left Front I/P Speaker in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

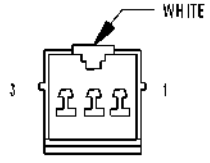
No >> Replace the Amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

B1462-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT HIGH





AMPLIFIER-RADIO
C2
(EXCEPT SUBWOOFER)



SPEAKER-TWEETER
LEFT FRONT
(PREMIUM)

8l12eff7

B1462-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Amplifier detects a short to battery condition on the output circuit.

Possible Causes
(X209) AMPLIFIED LEFT I/P SPEAKER (+) CIRCUIT SHORT TO VOLTAGE
(X299) AMPLIFIED LEFT I/P SPEAKER (-) CIRCUIT SHORT TO VOLTAGE
AMPLIFIER

Diagnostic Test

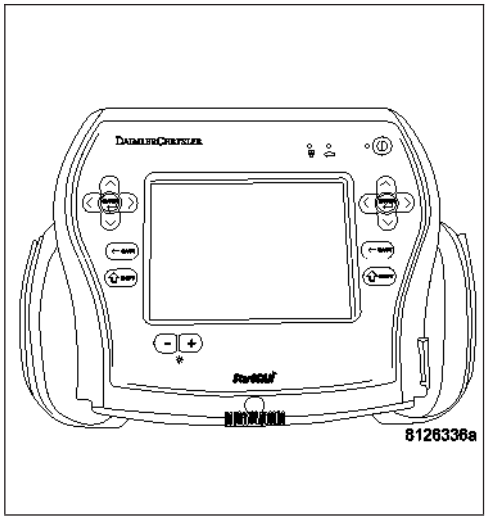
1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.
With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B1462-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT HIGH?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.



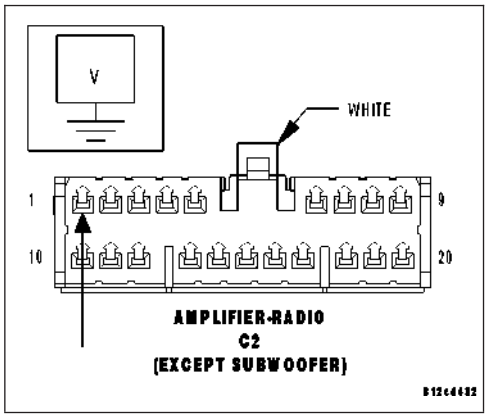
2. CHECK FOR VOLTAGE ON THE (X209) AMPLIFIED LEFT I/P SPEAKER (+) CIRCUIT

Turn the ignition off.
Disconnect the Amplifier C2 harness connector.
Disconnect the Amplified Left I/P Speaker harness connector.
Turn the ignition on.
Measure for voltage on the (X209) Amplified Left I/P Speaker (+) circuit.

Is the voltage above 10.0 volts?

Yes >> Repair the (X209) Amplified Left I/P Speaker (+) circuit for a short to voltage.
Perform BODY VERIFICATION TEST VER-1.

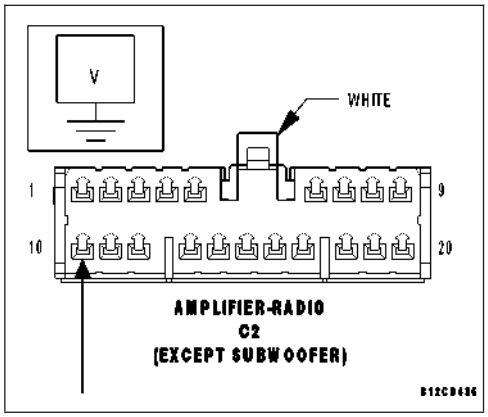
No >> Go To 3



B1462-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)

3. CHECK FOR VOLTAGE ON THE (X299) AMPLIFIED LEFT I/P SPEAKER (-) CIRCUIT

Measure for voltage on the (X299) Amplified Left I/P Speaker (-) circuit.

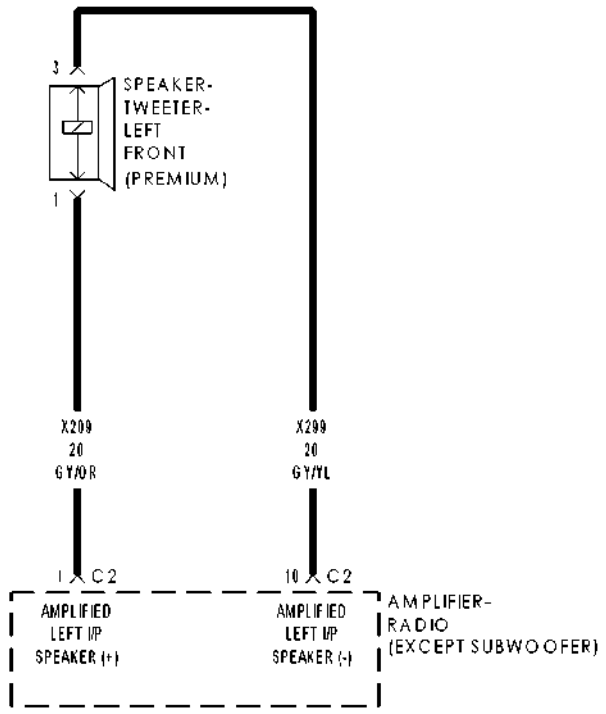


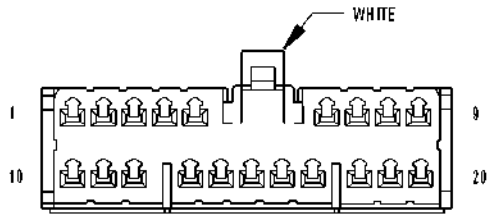
Is the voltage above 10.0 volts?

Yes >> Repair the (X299) Amplified Left I/P Speaker (-) circuit for a short to voltage.
Perform BODY VERIFICATION TEST VER-1.

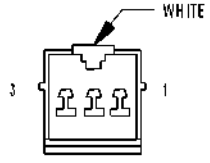
No >> Replace the Amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

B1463-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT OPEN





AMPLIFIER-RADIO
C2
(EXCEPT SUBWOOFER)



SPEAKER-TWEETER
LEFT FRONT
(PREMIUM)

8l2eff7

B1463-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

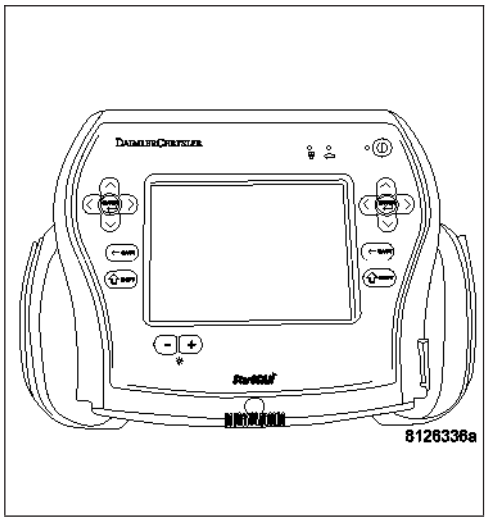
- **When Monitored:**
  Amplifier Bus wake-up. Amplifier reset with scan tool.
- **Set Condition:**
  The Amplifier detects an open condition on the speaker output circuit.

Possible Causes
(X209) AMPLIFIED LEFT I/P SPEAKER (+) CIRCUIT OPEN
(X299) AMPLIFIED LEFT I/P SPEAKER (-) CIRCUIT OPEN
LEFT FRONT I/P SPEAKER
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on.
Turn the radio on.
With the scan tool, erase Amplifier DTCs.
With the scan tool, reset the amplifier.
With the scan tool, read Amplifier DTCs.



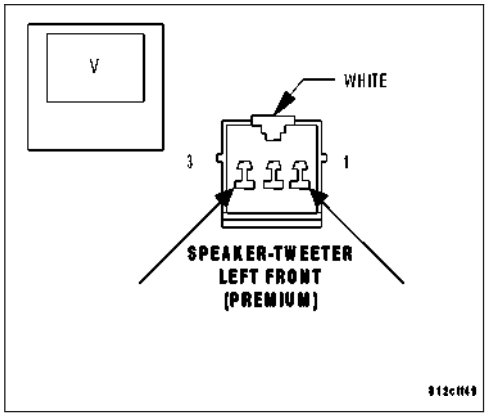
Does the scan tool display active: B1463-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT OPEN?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

2. CHECK THE OPERATION OF THE LEFT FRONT I/P SPEAKER

Disconnect the Left I/P Speaker harness connector.
Turn the radio on and turn the volume to mid level.
With a voltmeter set to read in A/C voltage, measure the voltage of the Amplified Left I/P Speaker circuits in the Amplified Left I/P Speaker harness connector.



Is the voltage present greater than 1 volt?

Yes >> Replace the Amplified Left I/P Speaker in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

No >> Go To 3

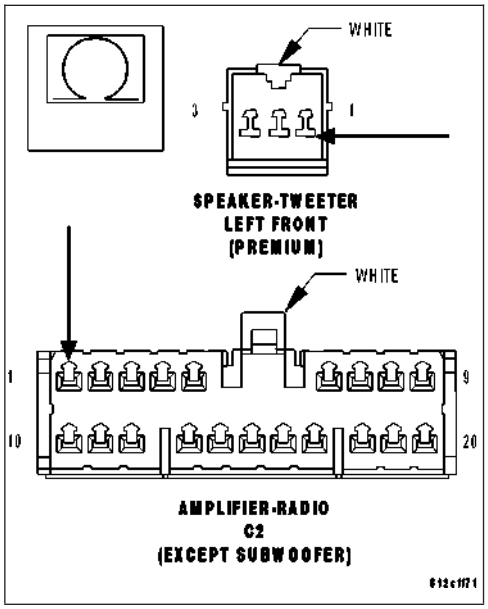
B1463-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)

3. CHECK THE (X209) AMPLIFIED LEFT I/P SPEAKER (+) CIRCUIT FOR AN OPEN

Turn the ignition off.

Disconnect the Amplifier C2 harness connector.

Measure the resistance of the (X209) Amplified Left I/P Speaker (+) circuit between the Amplifier C2 harness connector and the Amplified Left I/P Speaker harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go To 4

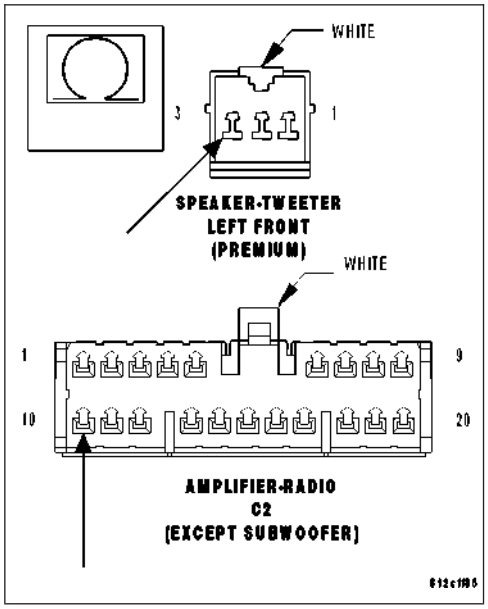
No >> Repair the (X209) Amplified Left I/P Speaker (+) circuit for an open.
Perform BODY VERIFICATION TEST VER-1.

4. CHECK THE (X299) AMPLIFIED LEFT I/P SPEAKER (-) CIRCUIT FOR AN OPEN

Turn the ignition off.

Disconnect the Amplifier C2 harness connector.

Measure the resistance of the (X299) Amplified Left I/P Speaker (-) circuit between the Amplifier C2 harness connector and the Amplified Left I/P Speaker harness connector.

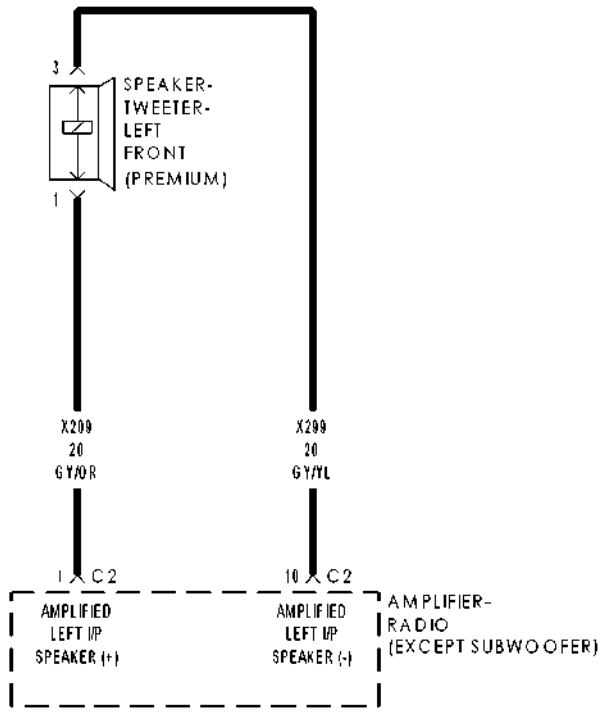


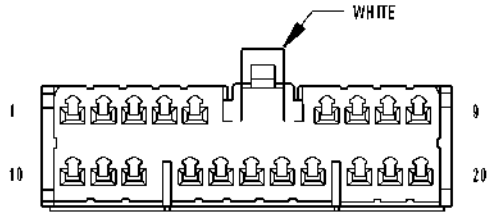
Is the resistance below 5.0 ohms?

Yes >> Replace the Amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

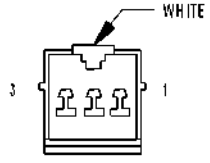
No >> Repair the (X299) Amplified Left I/P Speaker (-) circuit for an open.
Perform BODY VERIFICATION TEST VER-1.

B1464-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER





AMPLIFIER-RADIO
C2
(EXCEPT SUBWOOFER)



SPEAKER-TWEETER
LEFT FRONT
(PREMIUM)

8l2eff7

B1464-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER (CONTINUED)

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

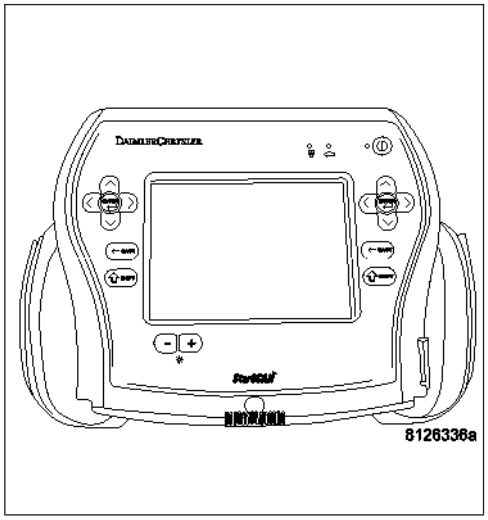
- **When Monitored:**
  With the ignition on. Radio volume at 25 or higher.
- **Set Condition:**
  The amplifier detects that the output circuits are shorted together.

Possible Causes
(X209) AMPLIFIED LEFT I/P SPEAKER (+) CIRCUIT SHORTED TO THE (X299) AMPLIFIED LEFT I/P SPEAKER (-) CIRCUIT
AMPLIFIED LEFT I/P SPEAKER
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.
With the scan tool, erase Amplifier DTCs.
Turn the radio on.
Turn the volume level to 25.
With the scan tool, read Amplifier DTCs.



Does the scan tool display active: B1464-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

---

2. CHECK THE OPERATION OF THE AMPLIFIED LEFT I/P SPEAKER

Disconnect the Amplified Left I/P Speaker.
Measure the resistance of the speaker between the two terminals.

Is the resistance of the speaker less than 1 ohm?

Yes >> Replace the Amplified Left I/P Speaker in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

No >> Go To 3

B1464-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER (CONTINUED)

3. CHECK THE (X209) AMPLIFIED LEFT I/P SPEAKER (+) CIRCUIT, AND THE (X299) AMPLIFIED LEFT I/P SPEAKER (-) CIRCUITS FOR A SHORT TOGETHER

Turn the ignition off.

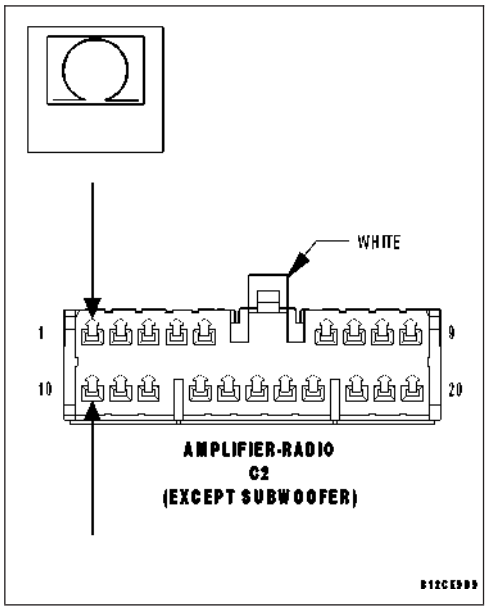
Disconnect the Amplifier C2 harness connector.

Measure the resistance between the (X209) Amplified Left I/P Speaker (+) circuit, and the (X299) Amplified Left I/P Speaker (-) circuit.

Is the resistance below 10K ohms?

Yes >> Repair the (X209) Amplified Left I/P Speaker (+) circuit, and the (X299) Amplified Left I/P Speaker (-) circuit for a short together.
Perform BODY VERIFICATION TEST VER-1.

No >> Replace the Amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.



B1465-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

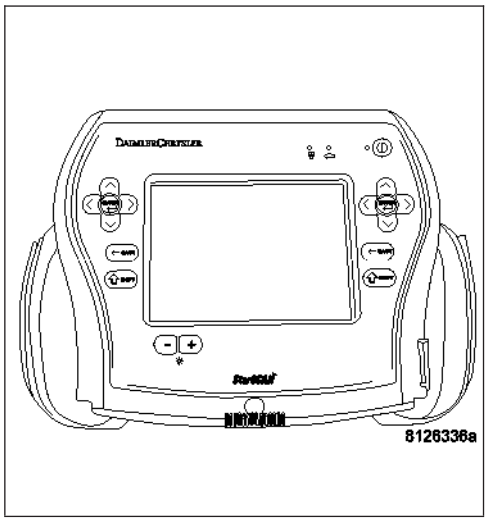
- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  This DTC will set if a DC offset occurs on the output channel, the amplifier shall set a DTC after a maturity rate of 5 ±1 sec.

Possible Causes
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.
With the scan tool, read Amplifier DTCs.

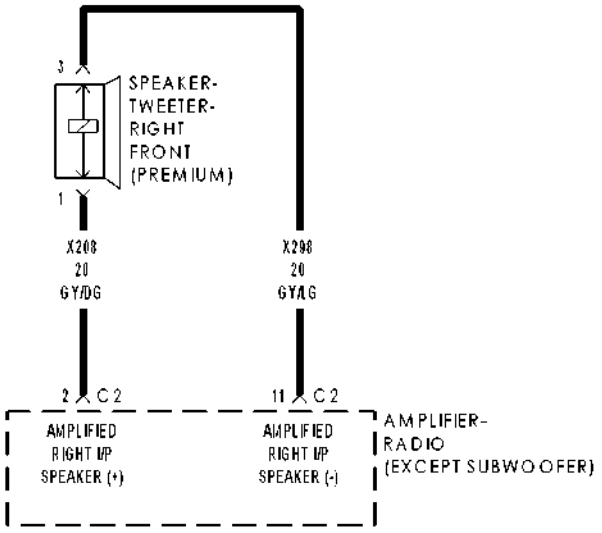


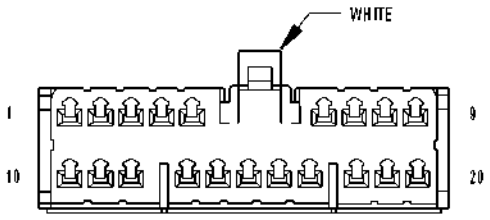
Does the scan tool display active: B1465-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT PERFORMANCE?

Yes >> Replace the Amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

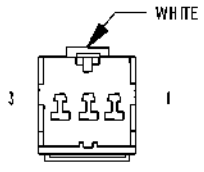
No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

B1466-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT LOW





AMPLIFIER-RADIO
C2
(EXCEPT SUBWOOFER)



SPEAKER-TWEETER-
RIGHT FRONT
(PREMIUM)

512c6ffb

B1466-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Amplifier detects a shorted to ground condition on the speaker output circuit.

Possible Causes
(X208) AMPLIFIED RIGHT FRONT I/P SPEAKER (+) CIRCUIT SHORTED TO GROUND
(X298) AMPLIFIED RIGHT FRONT I/P SPEAKER (-) CIRCUIT SHORTED TO GROUND
RIGHT FRONT I/P SPEAKER
AMPLIFIER

Diagnostic Test

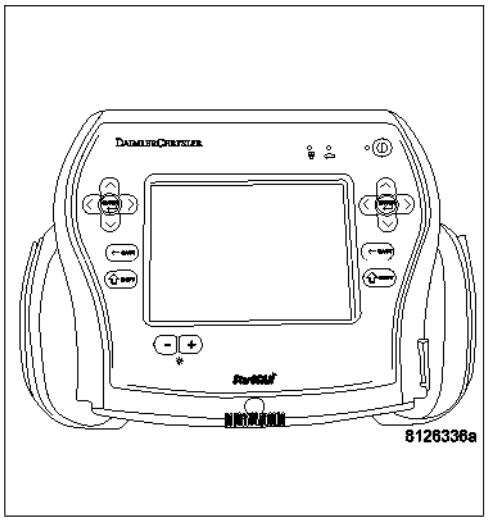
1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.
With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B1466-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT LOW?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.



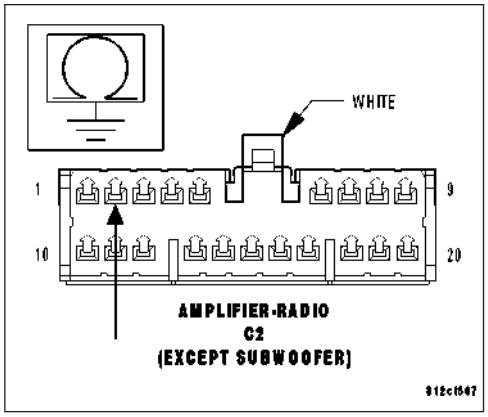
2. CHECK THE (X208) AMPLIFIED RIGHT FRONT I/P SPEAKER (+) CIRCUIT FOR A SHORT TO GROUND

Disconnect the Amplifier C2 harness connector.
Measure the resistance between ground and the (X208) Amplified Right Front I/P Speaker (+) circuit.

Is the resistance below 10K ohms?

Yes >> Repair the (X208) Amplified Right Front I/P Speaker (+) circuit for a short to ground.
Perform BODY VERIFICATION TEST VER-1.

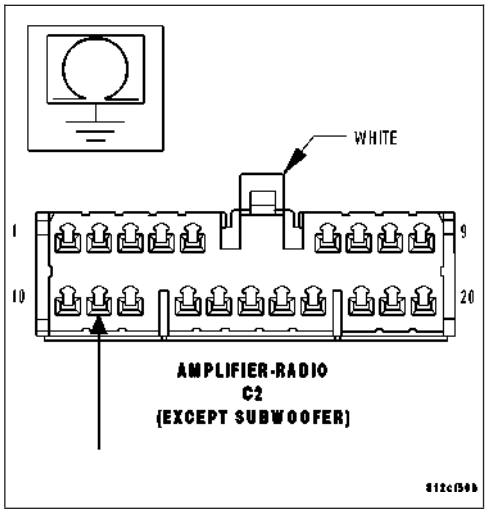
No >> Go To 3



B1466-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)

3. CHECK THE (X298) AMPLIFIED RIGHT FRONT I/P SPEAKER (-) CIRCUIT FOR A SHORT TO GROUND

Measure the resistance between ground and the (X298) Amplified Right Front I/P Speaker (-) circuit.



Is the resistance below 10K ohms?

Yes >> Repair the (X298) Amplified Right Front I/P Speaker (-) for a short to ground.
Perform BODY VERIFICATION TEST VER-1.

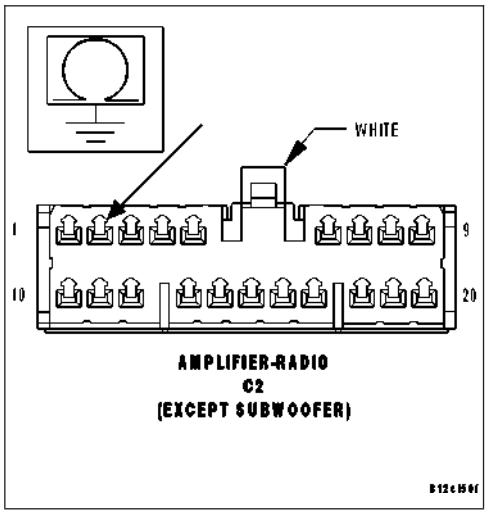
No >> Go To 4

4. CHECK OPERATION OF THE AMPLIFIED RIGHT FRONT I/P SPEAKER

Turn the ignition off.

Reconnect and reinstall the Right Front I/P Speaker.

Measure the resistance of the speaker circuit between the Amplifier C2 harness connector and ground..

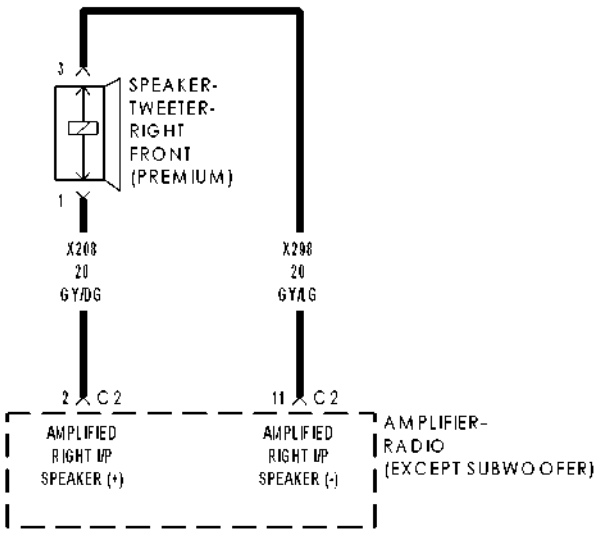


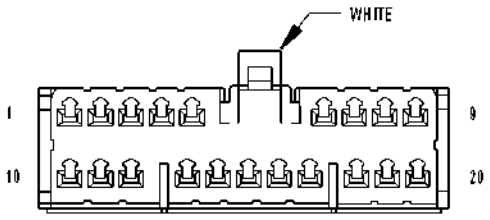
Is the resistance below 10K ohms?

Yes >> Replace the Right Front I/P Speaker in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

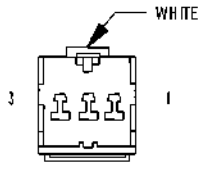
No >> Replace the Amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

B1467-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT HIGH





AMPLIFIER-RADIO
C2
(EXCEPT SUBWOOFER)



SPEAKER-TWEETER-
RIGHT FRONT
(PREMIUM)

512c6ffb

B1467-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Amplifier detects a short to battery condition on the output circuit.

Possible Causes
(X208) AMPLIFIED RIGHT I/P SPEAKER (+) CIRCUIT SHORT TO VOLTAGE
(X298) AMPLIFIED RIGHT I/P SPEAKER (-) CIRCUIT SHORT TO VOLTAGE
AMPLIFIER

Diagnostic Test

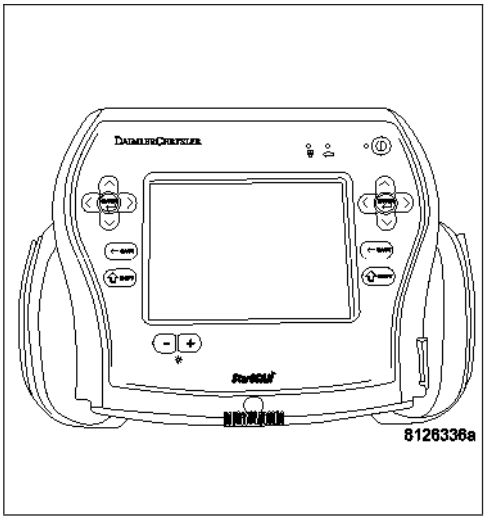
1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.
With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B1467-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT HIGH?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.



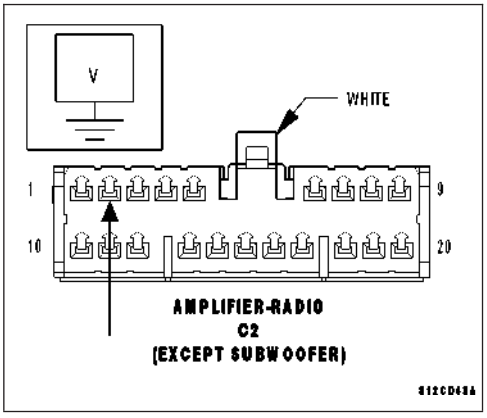
2. CHECK FOR VOLTAGE ON THE (X208) AMPLIFIED RIGHT I/P SPEAKER (+) CIRCUIT

Turn the ignition off.
Disconnect the Amplifier C2 harness connector.
Disconnect the Amplified Right I/P Speaker harness connector.
Turn the ignition on.
Measure for voltage on the (X208) Amplified Right I/P Speaker (+) circuit.

Is the voltage above 10.0 volts?

Yes >> Repair the (X208) Amplified Right I/P Speaker (+) circuit for a short to voltage.
Perform BODY VERIFICATION TEST VER-1.

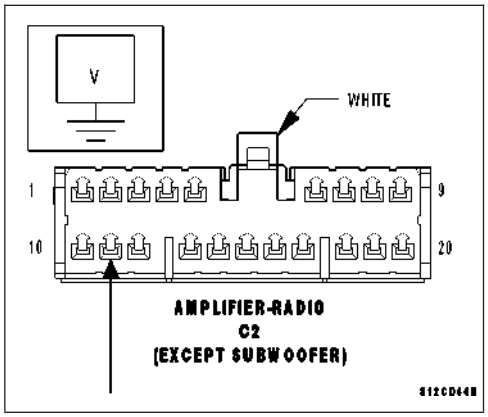
No >> Go To 3



B1467-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)

3. CHECK FOR VOLTAGE ON THE (X298) AMPLIFIED RIGHT I/P SPEAKER (-) CIRCUIT

Measure for voltage on the (X298) Amplified Right I/P Speaker (-) circuit.

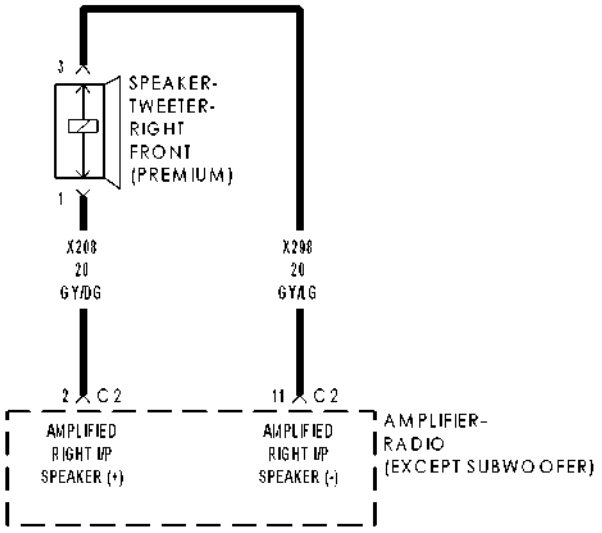


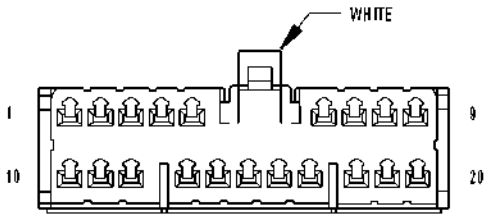
Is the voltage above 10.0 volts?

Yes >> Repair the (X298) Amplified Right I/P Speaker (-) circuit for a short to voltage.
Perform BODY VERIFICATION TEST VER-1.

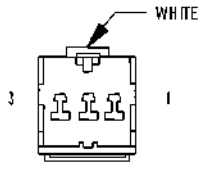
No >> Replace the Amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

B1468-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT OPEN





AMPLIFIER-RADIO
C2
(EXCEPT SUBWOOFER)



SPEAKER-TWEETER-
RIGHT FRONT
(PREMIUM)

512c6ffb

B1468-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

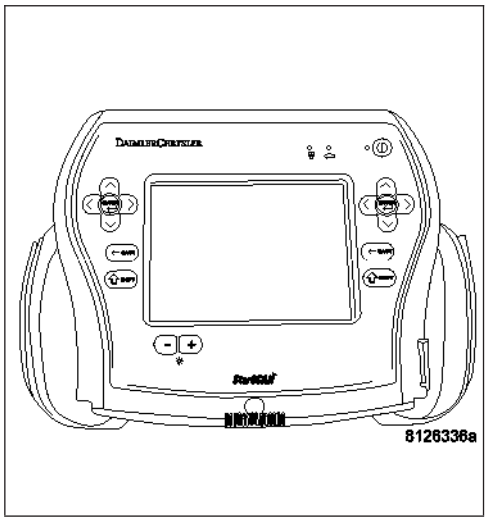
- **When Monitored:**
  Amplifier Bus wake-up. Amplifier reset with scan tool.
- **Set Condition:**
  The Amplifier detects an open condition on the speaker output circuit.

Possible Causes
(X208) AMPLIFIED RIGHT I/P SPEAKER (+) CIRCUIT OPEN
(X298) AMPLIFIED RIGHT I/P SPEAKER (-) CIRCUIT OPEN
RIGHT I/P SPEAKER
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on.
Turn the radio on.
With the scan tool, erase Amplifier DTCs.
With the scan tool, reset the amplifier.
With the scan tool, read Amplifier DTCs.



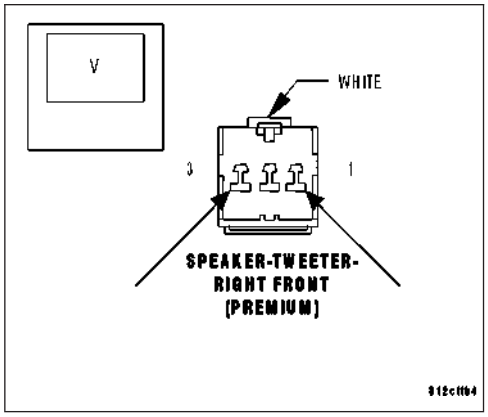
Does the scan tool display active: B1468-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT OPEN?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

2. CHECK THE OPERATION OF THE RIGHT FRONT I/P SPEAKER

Disconnect the Right I/P Speaker harness connector.
Turn the radio on and turn the volume to mid level.
With a voltmeter set to read in A/C voltage, measure the voltage of the Amplified Right I/P Speaker circuits in the Amplified Right I/P Speaker harness connector.



Is the voltage present greater than 1 volt?

Yes >> Replace the Amplified Right I/P Speaker in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

No >> Go To 3

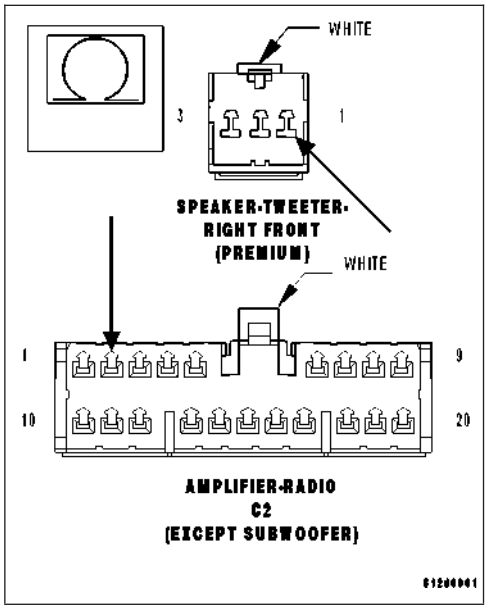
B1468-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)

3. CHECK THE (X208) AMPLIFIED RIGHT I/P SPEAKER (+) CIRCUIT FOR AN OPEN

Turn the ignition off.

Disconnect the Amplifier C2 harness connector.

Measure the resistance of the (X208) Amplified Right I/P Speaker (+) circuit between the Amplifier C2 harness connector and the Amplified Right I/P Speaker harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go To 4

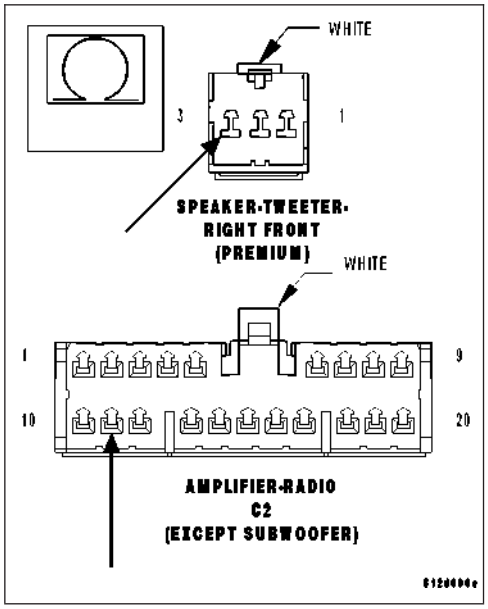
No >> Repair the (X208) Amplified Right I/P Speaker (+) circuit for an open.
Perform BODY VERIFICATION TEST VER-1.

4. CHECK THE (X298) AMPLIFIED RIGHT I/P SPEAKER (-) CIRCUIT FOR AN OPEN

Turn the ignition off.

Disconnect the Amplifier C2 harness connector.

Measure the resistance of the (X298) Amplified Right I/P Speaker (-) circuit between the Amplifier C2 harness connector and the Amplified Right I/P Speaker harness connector.

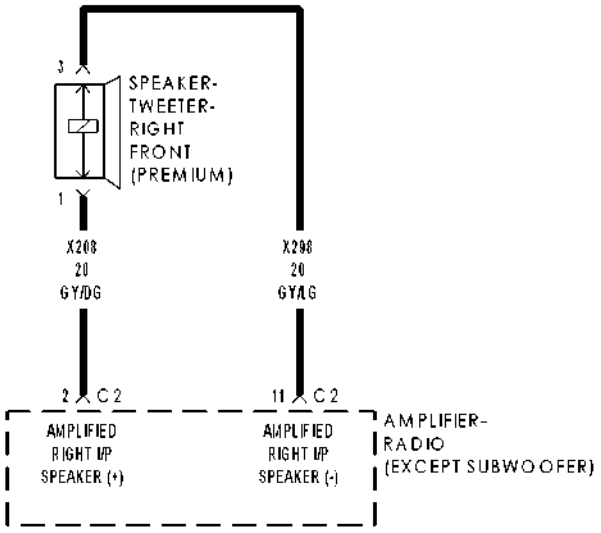


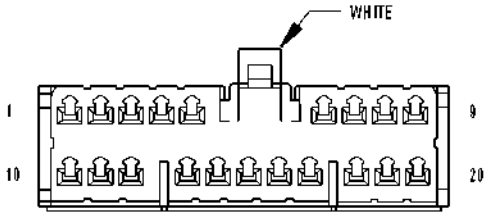
Is the resistance below 5.0 ohms?

Yes >> Replace the Amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

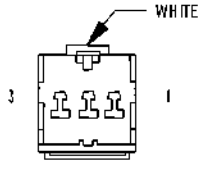
No >> Repair the (X298) Amplified Right I/P Speaker (-) circuit for an open.
Perform BODY VERIFICATION TEST VER-1.

B1469-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER





AMPLIFIER-RADIO
C2
(EXCEPT SUBWOOFER)



SPEAKER-TWEETER-
RIGHT FRONT
(PREMIUM)

512c6ffb

B1469-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER (CONTINUED)

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

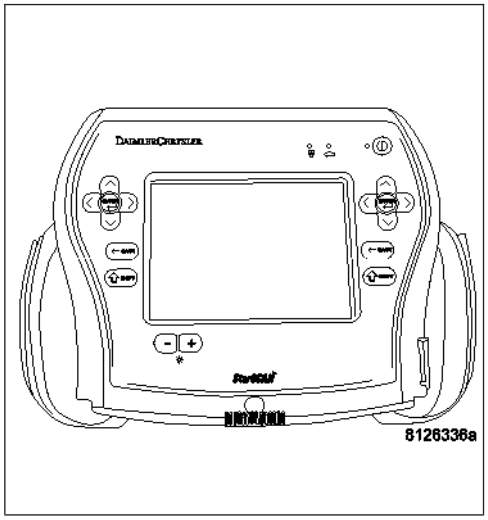
- **When Monitored:**
  With the ignition on. Radio volume at 25 or higher.
- **Set Condition:**
  The amplifier detects that the output circuits are shorted together.

Possible Causes
(X208) AMPLIFIED RIGHT I/P SPEAKER (+) CIRCUIT SHORTED TO THE (X298) AMPLIFIED RIGHT I/P SPEAKER (-) CIRCUIT
AMPLIFIED RIGHT I/P SPEAKER
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.
With the scan tool, erase Amplifier DTCs.
Turn the radio on.
Turn the volume level to 25.
With the scan tool, read Amplifier DTCs.



Does the scan tool display active: B1469-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

---

2. CHECK THE OPERATION OF THE AMPLIFIED RIGHT I/P SPEAKER

Disconnect the Amplified Right I/P Speaker.
Measure the resistance of the speaker between the two terminals.

Is the resistance of the speaker less than 1 ohm?

Yes >> Replace the Amplified Right I/P Speaker in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

No >> Go To 3

B1469-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER (CONTINUED)

3. CHECK THE (X208) AMPLIFIED RIGHT I/P SPEAKER (+) CIRCUIT, AND THE (X298) AMPLIFIED RIGHT I/P SPEAKER (-) CIRCUITS FOR A SHORT TOGETHER

Turn the ignition off.

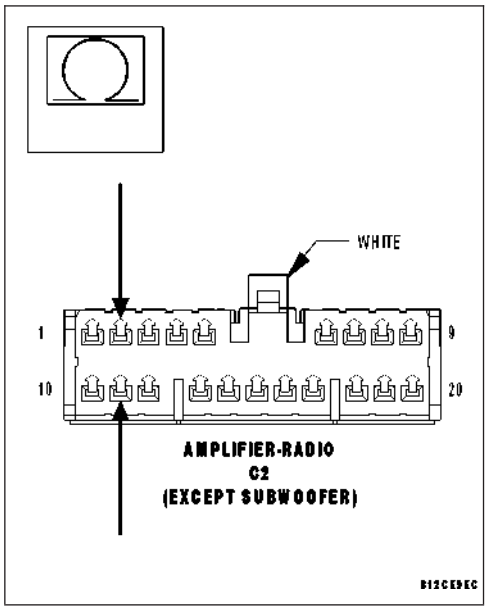
Disconnect the Amplifier C2 harness connector.

Measure the resistance between the (X208) Amplified Right I/P Speaker (+) circuit, and the (X298) Amplified Right I/P Speaker (-) circuit.

Is the resistance below 10K ohms?

Yes >> Repair the (X208) Amplified Right I/P Speaker (+) circuit, and the (X298) Amplified Right I/P Speaker (-) circuit for a short together.
Perform BODY VERIFICATION TEST VER-1.

No >> Replace the Amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.



B146A-CHANNEL 3 AUDIO SPEAKER OUTPUT CIRCUIT PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  This DTC will set if a DC offset occurs on the output channel, the amplifier shall set a DTC after a maturity rate of 5 ±1 sec.

Possible Causes
AMPLIFIER

Diagnostic Test

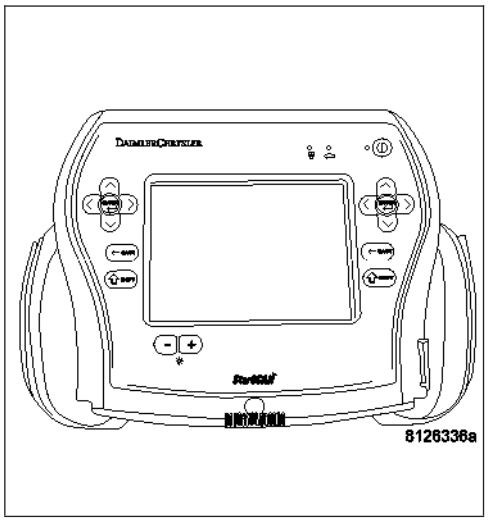
1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.
With the scan tool, read Amplifier DTCs.

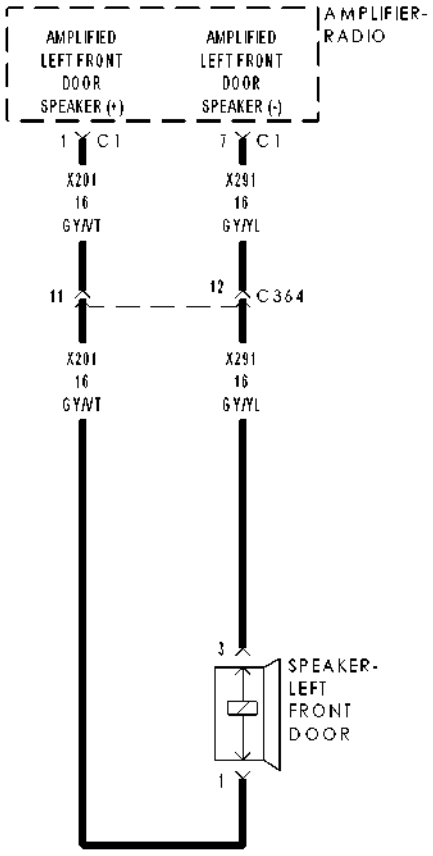
Does the scan tool display active: B146A-CHANNEL 3 AUDIO SPEAKER OUTPUT CIRCUIT PERFORMANCE?

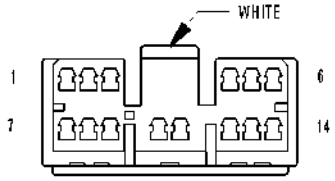
Yes >> Replace the Amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

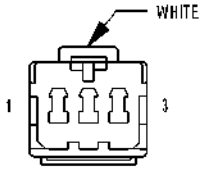


B146B-CHANNEL 3 AUDIO SPEAKER OUTPUT CIRCUIT LOW





AMPLIFIER-
RADIO C1



SPEAKER-LEFT
FRONT DOOR

B146B-CHANNEL 3 AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Amplifier detects a shorted to ground condition on the speaker output circuit.

Possible Causes
(X201) AMPLIFIED LEFT FRONT DOOR SPEAKER (+) CIRCUIT SHORTED TO GROUND
(X291) AMPLIFIED LEFT FRONT DOOR SPEAKER (-) CIRCUIT SHORTED TO GROUND
LEFT FRONT DOOR SPEAKER
AMPLIFIER

Diagnostic Test

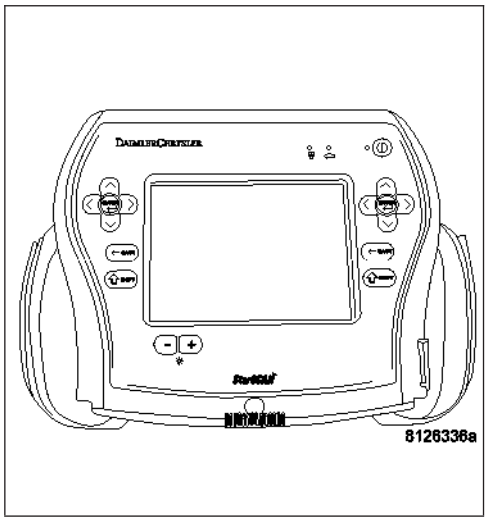
1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.
With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B146B-CHANNEL 3 AUDIO SPEAKER OUTPUT CIRCUIT LOW?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.



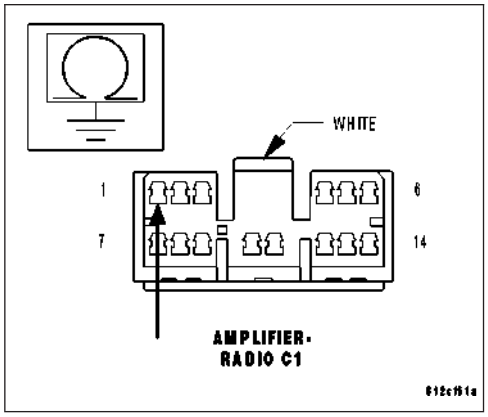
2. CHECK THE (X201) AMPLIFIED LEFT FRONT DOOR SPEAKER (+) CIRCUIT FOR A SHORT TO GROUND

Disconnect the Amplifier C1 harness connector.
Measure the resistance between ground and the (X201) Amplified Left Front Door Speaker (+) circuit.

Is the resistance below 10K ohms?

Yes >> Repair the (X201) Amplified Left Front Door Speaker (+) circuit for a short to ground.
Perform BODY VERIFICATION TEST VER-1.

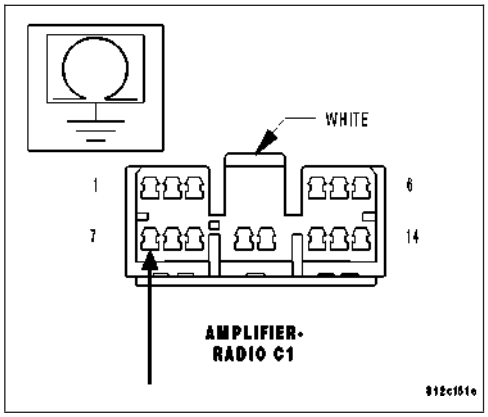
No >> Go To 3



B146B-CHANNEL 3 AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)

3. CHECK THE (X291) AMPLIFIED LEFT FRONT DOOR SPEAKER (-) CIRCUIT FOR A SHORT TO GROUND

Measure the resistance between ground and the (X291) Amplified Left Front Door Speaker (-) circuit.



Is the resistance below 10K ohms?

Yes >> Repair the (X291) Amplified Left Front Door Speaker (-) for a short to ground.
Perform BODY VERIFICATION TEST VER-1.

No >> Go To 4

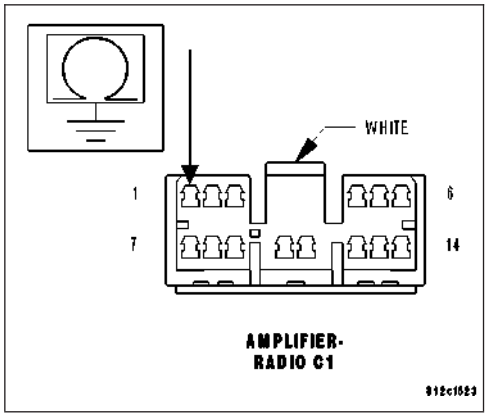
---

4. CHECK OPERATION OF THE AMPLIFIED LEFT FRONT DOOR SPEAKER

Turn the ignition off.

Reconnect and reinstall the Left Front Door Speaker.

Measure the resistance of the speaker circuit between the Amplifier C1 harness connector and ground..

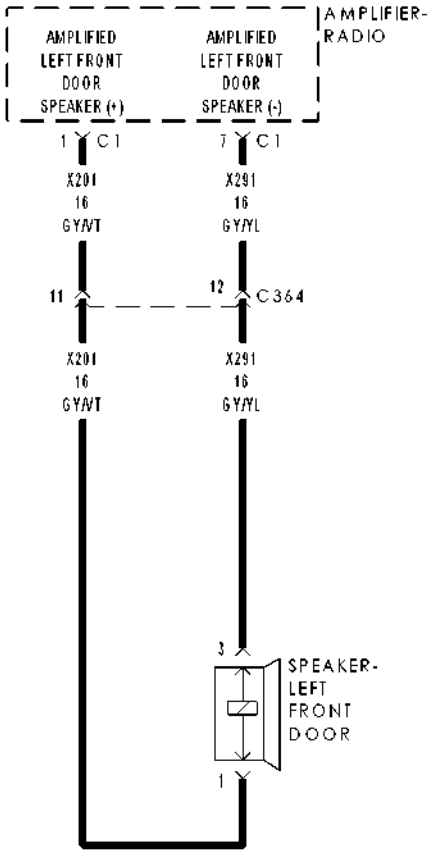


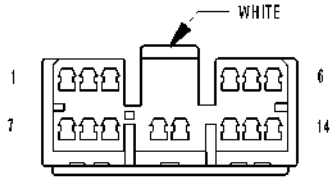
Is the resistance below 10K ohms?

Yes >> Replace the Left Front Door Speaker in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

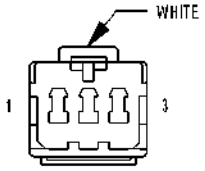
No >> Replace the Amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

B146C-CHANNEL 3 AUDIO SPEAKER OUTPUT CIRCUIT HIGH





AMPLIFIER-
RADIO C1



SPEAKER-LEFT
FRONT DOOR

B146C-CHANNEL 3 AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Amplifier detects a short to battery condition on the output circuit.

Possible Causes
(X201) AMPLIFIED LEFT FRONT DOOR SPEAKER (+) CIRCUIT SHORT TO VOLTAGE
(X291) AMPLIFIED LEFT FRONT DOOR SPEAKER (-) CIRCUIT SHORT TO VOLTAGE
AMPLIFIER

Diagnostic Test

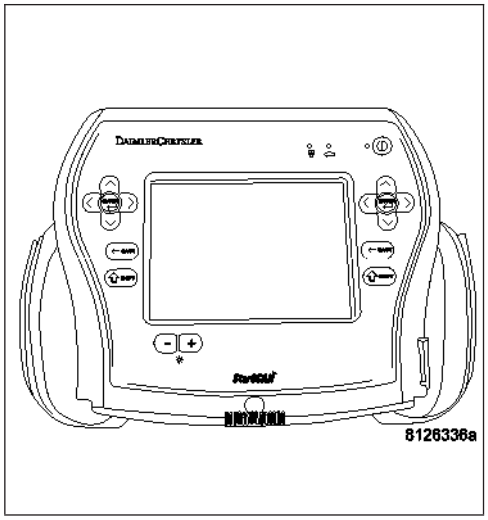
1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.
With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B146C-CHANNEL 3 AUDIO SPEAKER OUTPUT CIRCUIT HIGH?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.



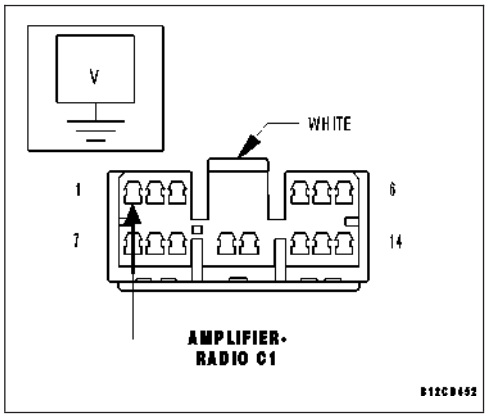
2. CHECK FOR VOLTAGE ON THE (X201) AMPLIFIED LEFT FRONT DOOR SPEAKER (+) CIRCUIT

Turn the ignition off.
Disconnect the Amplifier C1 harness connector.
Disconnect the Amplified Left Front Door Speaker harness connector.
Turn the ignition on.
Measure for voltage on the (X201) Amplified Left Front Door Speaker (+) circuit.

Is the voltage above 10.0 volts?

Yes >> Repair the (X201) Amplified Left Front Door Speaker (+) circuit for a short to voltage.
Perform BODY VERIFICATION TEST VER-1.

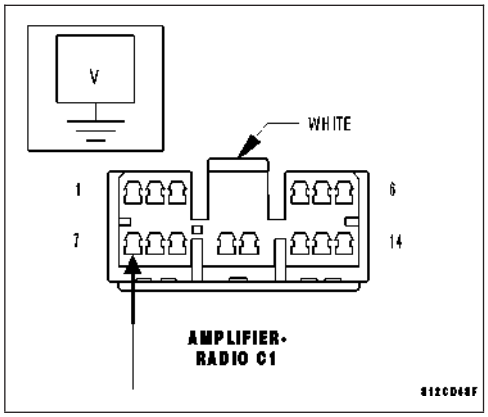
No >> Go To 3



B146C-CHANNEL 3 AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)

3. CHECK FOR VOLTAGE ON THE (X291) AMPLIFIED LEFT FRONT DOOR SPEAKER (-) CIRCUIT

Measure for voltage on the (X291) Amplified Left Front Door Speaker (-) circuit.

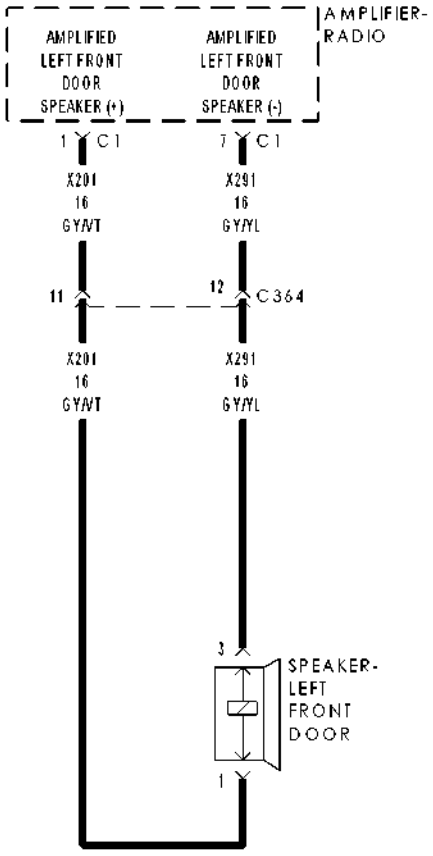


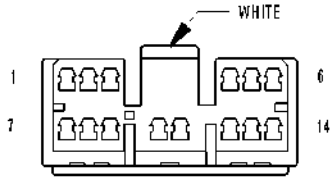
Is the voltage above 10.0 volts?

Yes >> Repair the (X291) Amplified Left Front Door Speaker (-) circuit for a short to voltage.
Perform BODY VERIFICATION TEST VER-1.

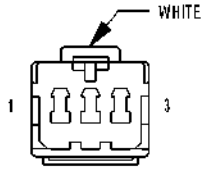
No >> Replace the Amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

B146D-CHANNEL 3 AUDIO SPEAKER OUTPUT CIRCUIT OPEN





AMPLIFIER-
RADIO C1



SPEAKER-LEFT
FRONT DOOR

B146D-CHANNEL 3 AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

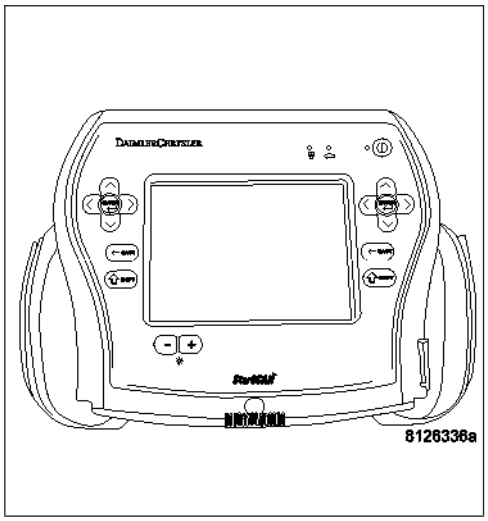
- **When Monitored:**
  Amplifier Bus wake-up. Amplifier reset with scan tool.
- **Set Condition:**
  The Amplifier detects an open condition on the speaker output circuit.

Possible Causes
(X201) AMPLIFIED LEFT REAR DOOR SPEAKER (+) CIRCUIT OPEN
(X291) AMPLIFIED LEFT REAR DOOR SPEAKER (-) CIRCUIT OPEN
LEFT REAR DOOR SPEAKER
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on.
Turn the radio on.
With the scan tool, erase Amplifier DTCs.
With the scan tool, reset the amplifier.
With the scan tool, read Amplifier DTCs.



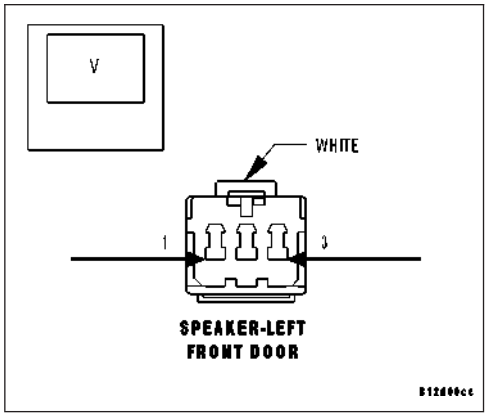
Does the scan tool display active: B146D-CHANNEL 3 AUDIO SPEAKER OUTPUT CIRCUIT OPEN?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

2. CHECK THE OPERATION OF THE LEFT REAR DOOR SPEAKER

Disconnect the Left Rear Door Speaker harness connector.
Turn the radio on and turn the volume to mid level.
With a voltmeter set to read in A/C voltage, measure the voltage of the Amplified Left Rear Door Speaker circuits in the Amplified Left Rear Door Speaker harness connector.



Is the voltage present greater than 1 volt?

Yes >> Replace the Amplified Left Rear Door Speaker in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

No >> Go To 3

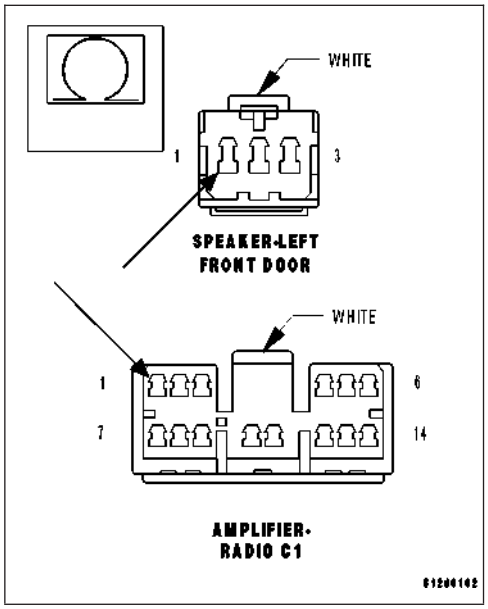
B146D-CHANNEL 3 AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)

3. CHECK THE (X201) AMPLIFIED LEFT REAR DOOR SPEAKER (+) CIRCUIT FOR AN OPEN

Turn the ignition off.

Disconnect the Amplifier C1 harness connector.

Measure the resistance of the (X201) Amplified Left Rear Door Speaker (+) circuit between the Amplifier C1 harness connector and the Amplified Left Rear Door Speaker harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go To 4

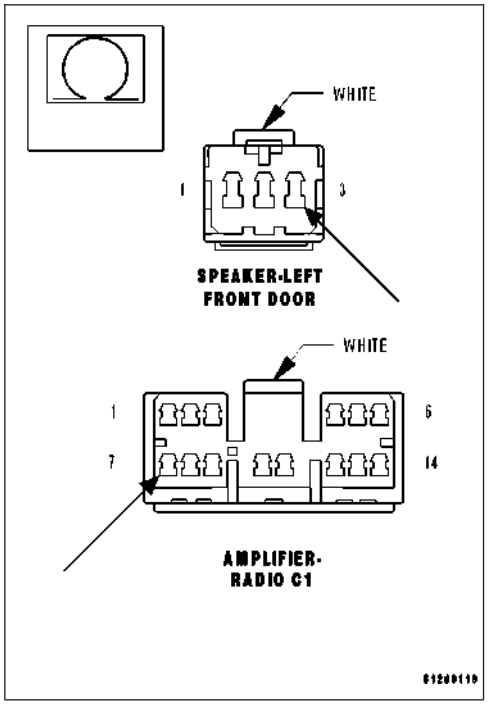
No >> Repair the (X201) Amplified Left Rear Door Speaker (+) circuit for an open.
Perform BODY VERIFICATION TEST VER-1.

4. CHECK THE (X291) AMPLIFIED LEFT REAR DOOR SPEAKER (-) CIRCUIT FOR AN OPEN

Turn the ignition off.

Disconnect the Amplifier C1 harness connector.

Measure the resistance of the (X291) Amplified Left Rear Door Speaker (-) circuit between the Amplifier C1 harness connector and the Amplified Left Rear Door Speaker harness connector.

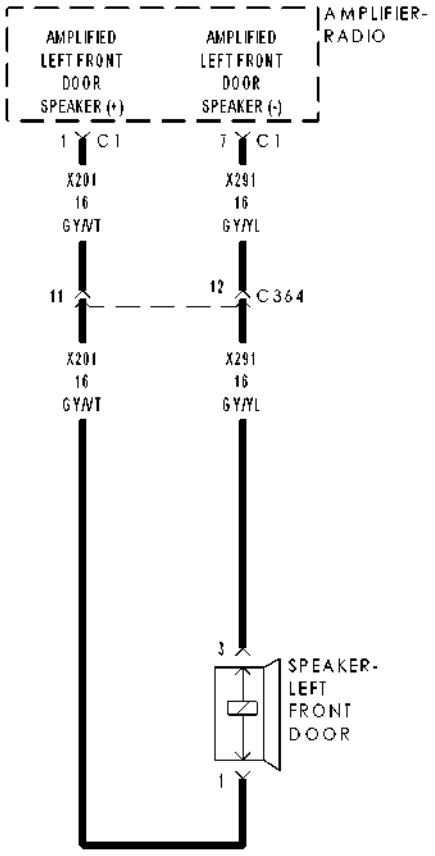


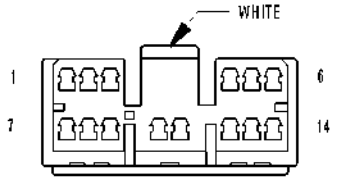
Is the resistance below 5.0 ohms?

Yes >> Replace the Amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

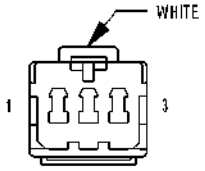
No >> Repair the (X291) Amplified Left Rear Door Speaker (-) circuit for an open.
Perform BODY VERIFICATION TEST VER-1.

B146E-CHANNEL 3 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER





AMPLIFIER-
RADIO C1



SPEAKER-LEFT
FRONT DOOR

B146E-CHANNEL 3 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER (CONTINUED)

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

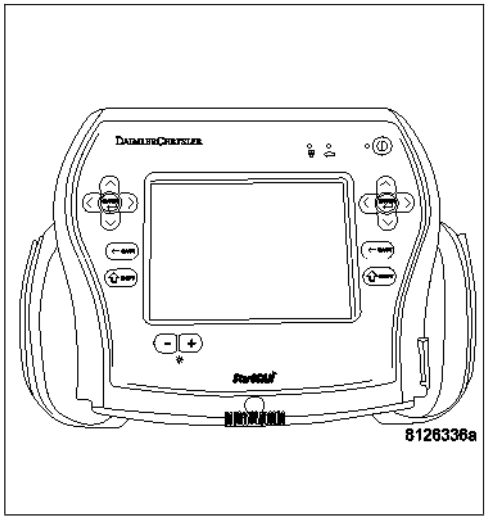
- **When Monitored:**
  With the ignition on. Radio volume at 25 or higher.
- **Set Condition:**
  The amplifier detects that the output circuits are shorted together.

Possible Causes
(X201) AMPLIFIED LEFT FRONT DOOR SPEAKER (+) CIRCUIT SHORTED TO THE (X291) AMPLIFIED LEFT FRONT DOOR SPEAKER (-) CIRCUIT
AMPLIFIED LEFT FRONT DOOR SPEAKER
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.
With the scan tool, erase Amplifier DTCs.
Turn the radio on.
Turn the volume level to 25.
With the scan tool, read Amplifier DTCs.



Does the scan tool display active: B146E-CHANNEL 3 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

---

2. CHECK THE OPERATION OF THE AMPLIFIED LEFT FRONT DOOR SPEAKER

Disconnect the Amplified Left Front Door Speaker.
Measure the resistance of the speaker between the two terminals.

Is the resistance of the speaker less than 1 ohm?

Yes >> Replace the Amplified Left Front Door Speaker in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

No >> Go To 3

B146E-CHANNEL 3 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER (CONTINUED)

3. CHECK THE (X201) AMPLIFIED LEFT FRONT DOOR SPEAKER (+) CIRCUIT, AND THE (X291) AMPLIFIED LEFT FRONT DOOR SPEAKER (-) CIRCUITS FOR A SHORT TOGETHER

Turn the ignition off.

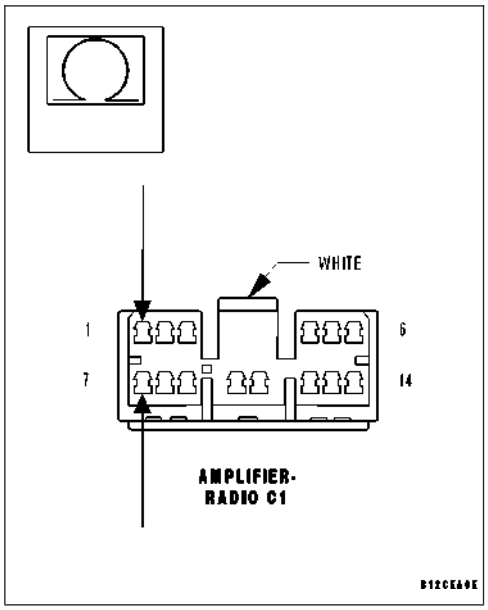
Disconnect the Amplifier C1 harness connector.

Measure the resistance between the (X201) Amplified Left Front Door Speaker (+) circuit, and the (X291) Amplified Left Front Door Speaker (-) circuit.

Is the resistance below 10K ohms?

Yes >> Repair the (X201) Amplified Left Front Door Speaker (+) circuit, and the (X291) Amplified Left Front Door Speaker (-) circuit for a short together.
Perform BODY VERIFICATION TEST VER-1.

No >> Replace the Amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.



B146F-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

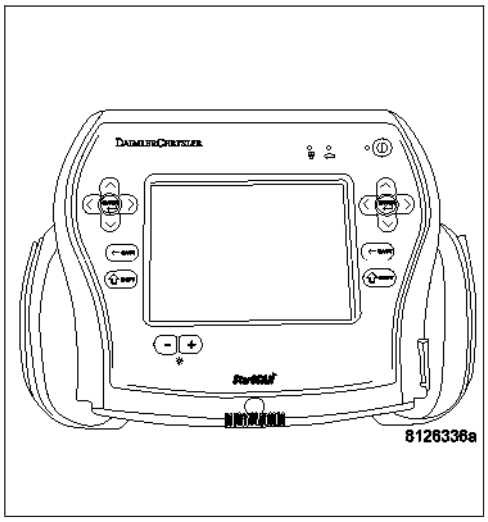
- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  This DTC will set if a DC offset occurs on the output channel, the amplifier shall set a DTC after a maturity rate of 5 ±1 sec.

Possible Causes
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.
With the scan tool, read Amplifier DTCs.

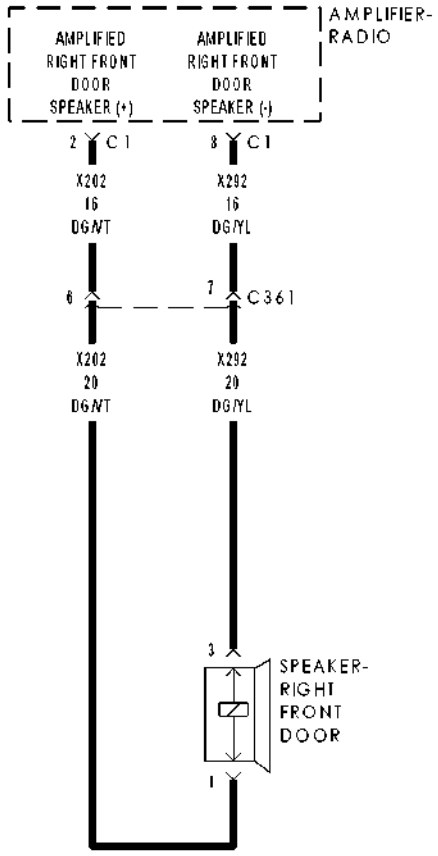


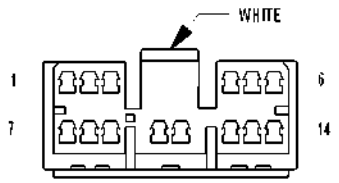
Does the scan tool display active: B146F-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT PERFORMANCE?

Yes >> Replace the Amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

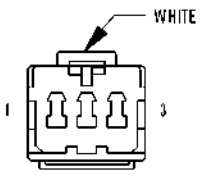
No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

B1470-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT LOW





AMPLIFIER-
RADIO C1



SPEAKER-RIGHT
FRONT DOOR

8A1caf024

B1470-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Amplifier detects a shorted to ground condition on the speaker output circuit.

Possible Causes
(X202) AMPLIFIED RIGHT FRONT DOOR SPEAKER (+) CIRCUIT SHORTED TO GROUND
(X292) AMPLIFIED RIGHT FRONT DOOR SPEAKER (-) CIRCUIT SHORTED TO GROUND
RIGHT FRONT DOOR SPEAKER
AMPLIFIER

Diagnostic Test

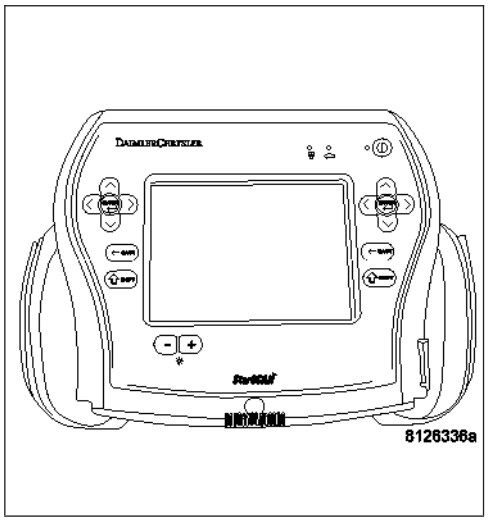
1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.
With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B1470-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT LOW?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.



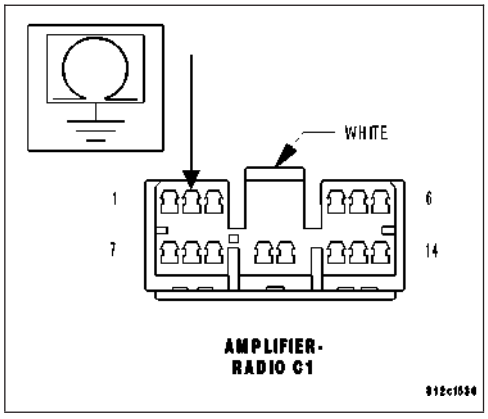
2. CHECK THE (X202) AMPLIFIED RIGHT FRONT DOOR SPEAKER (+) CIRCUIT FOR A SHORT TO GROUND

Disconnect the Amplifier C1 harness connector.
Measure the resistance between ground and the (X202) Amplified Right Front Door Speaker (+) circuit.

Is the resistance below 10K ohms?

Yes >> Repair the (X202) Amplified Left Front Door Speaker (+) circuit for a short to ground.
Perform BODY VERIFICATION TEST VER-1.

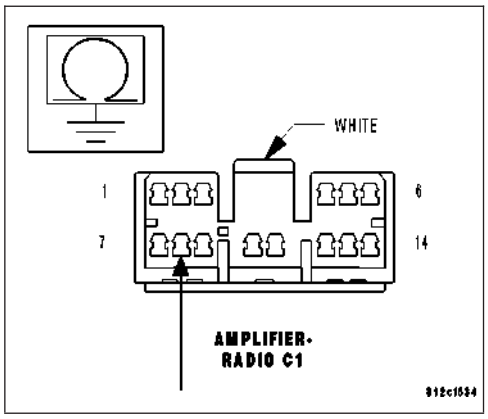
No >> Go To 3



B1470-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)

3. CHECK THE (X292) AMPLIFIED RIGHT FRONT DOOR SPEAKER (-) CIRCUIT FOR A SHORT TO GROUND

Measure the resistance between ground and the (X292) Amplified Right Front Door Speaker (-) circuit.



Is the resistance below 10K ohms?

Yes >> Repair the (X292) Amplified Right Front Door Speaker (-) for a short to ground.
Perform BODY VERIFICATION TEST VER-1.

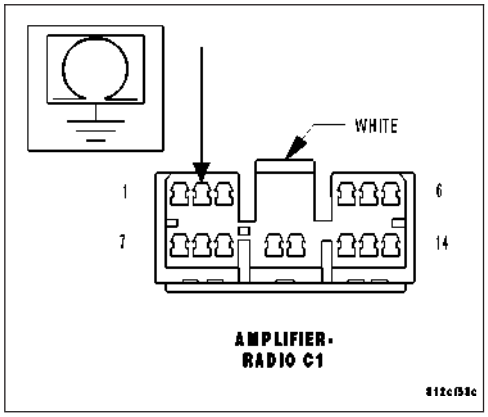
No >> Go To 4

4. CHECK OPERATION OF THE AMPLIFIED RIGHT FRONT DOOR SPEAKER

Turn the ignition off.

Reconnect and reinstall the Right Front Door Speaker.

Measure the resistance of the speaker circuit between the Amplifier C1 harness connector and ground..

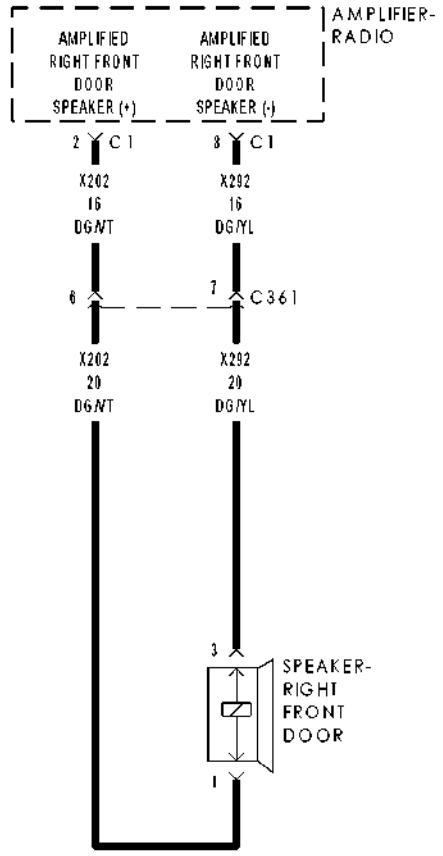


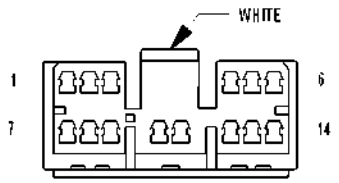
Is the resistance below 10K ohms?

Yes >> Replace the Right Front Door Speaker in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

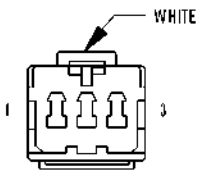
No >> Replace the Amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

B1471-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT HIGH





AMPLIFIER-
RADIO C1



SPEAKER-RIGHT
FRONT DOOR

B1471-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Amplifier detects a short to battery condition on the output circuit.

Possible Causes
(X202) AMPLIFIED RIGHT FRONT DOOR SPEAKER (+) CIRCUIT SHORT TO VOLTAGE
(X292) AMPLIFIED RIGHT FRONT DOOR SPEAKER (-) CIRCUIT SHORT TO VOLTAGE
AMPLIFIER

Diagnostic Test

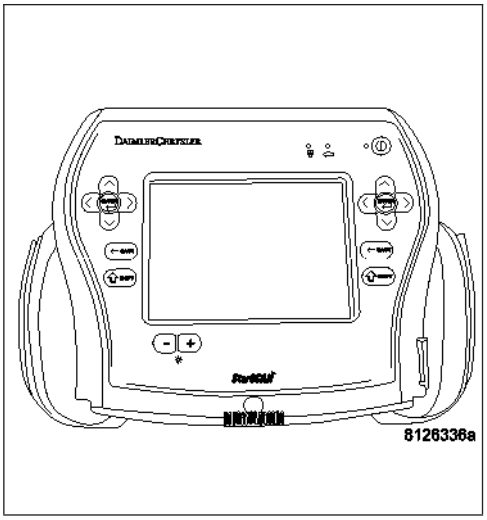
1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.
With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B1471-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT HIGH?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.



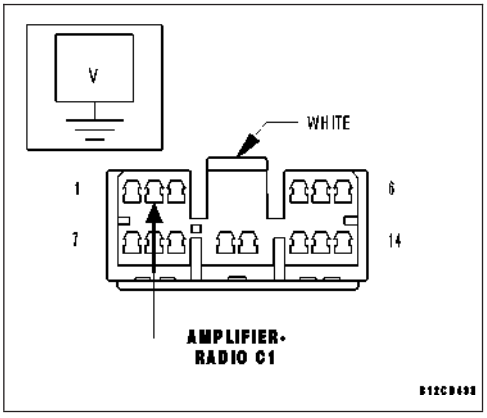
2. CHECK FOR VOLTAGE ON THE (X202) AMPLIFIED RIGHT FRONT DOOR SPEAKER (+) CIRCUIT

Turn the ignition off.
Disconnect the Amplifier C1 harness connector.
Disconnect the Amplified Right Front Door Speaker harness connector.
Turn the ignition on.
Measure for voltage on the (X202) Amplified Right Front Door Speaker (+) circuit.

Is the voltage above 10.0 volts?

Yes >> Repair the (X202) Amplified Right Front Door Speaker (+) circuit for a short to voltage.
Perform BODY VERIFICATION TEST VER-1.

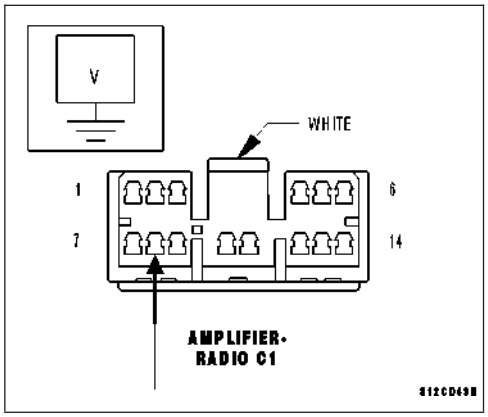
No >> Go To 3



B1471-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)

3. CHECK FOR VOLTAGE ON THE (X292) AMPLIFIED RIGHT FRONT DOOR SPEAKER (-) CIRCUIT

Measure for voltage on the (X292) Amplified Right Front Door Speaker (-) circuit.

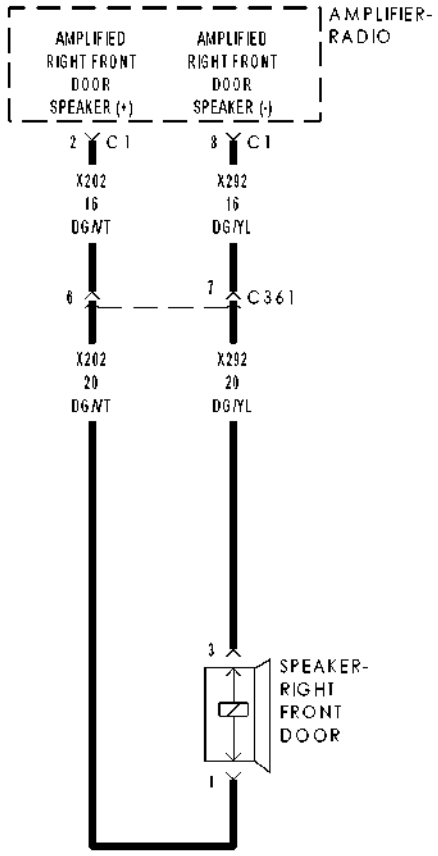


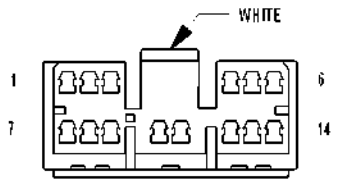
Is the voltage above 10.0 volts?

Yes >> Repair the (X292) Amplified Right Front Door Speaker (-) circuit for a short to voltage.
Perform BODY VERIFICATION TEST VER-1.

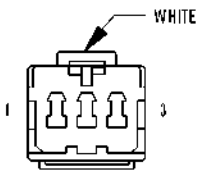
No >> Replace the Amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

B1472-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT OPEN





AMPLIFIER-
RADIO C1



SPEAKER-RIGHT
FRONT DOOR

B1472-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

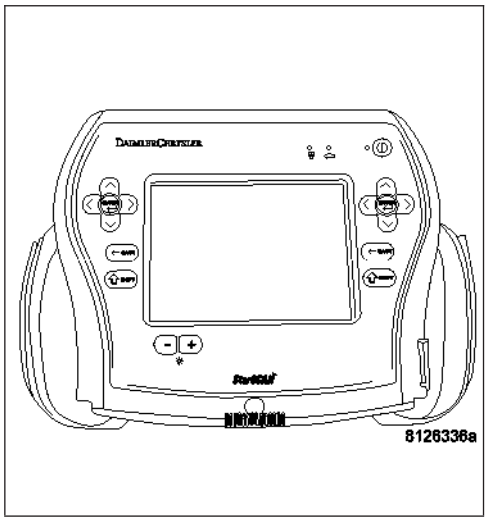
- **When Monitored:**
  Amplifier Bus wake-up. Amplifier reset with scan tool.
- **Set Condition:**
  The Amplifier detects an open condition on the speaker output circuit.

Possible Causes
(X202) AMPLIFIED RIGHT FRONT DOOR SPEAKER (+) CIRCUIT OPEN
(X292) AMPLIFIED RIGHT FRONT DOOR SPEAKER (-) CIRCUIT OPEN
RIGHT FRONT DOOR SPEAKER
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on.
Turn the radio on.
With the scan tool, erase Amplifier DTCs.
With the scan tool, reset the amplifier.
With the scan tool, read Amplifier DTCs.



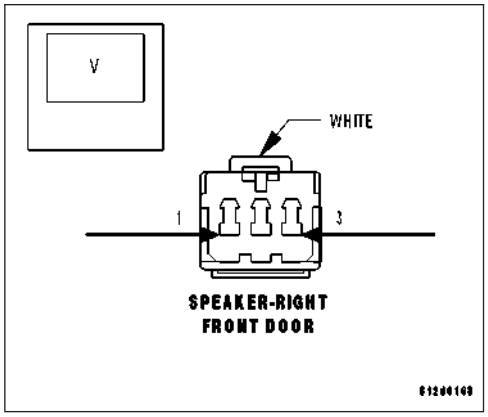
Does the scan tool display active: B1472-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT OPEN?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

2. CHECK THE OPERATION OF THE RIGHT FRONT DOOR SPEAKER

Disconnect the Right Front Door Speaker harness connector.
Turn the radio on and turn the volume to mid level.
With a voltmeter set to read in A/C voltage, measure the voltage of the Amplified Right Front Door Speaker circuits in the Amplified Right Front Door Speaker harness connector.



Is the voltage present greater than 1 volt?

Yes >> Replace the Amplified Right Front Door Speaker in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

No >> Go To 3

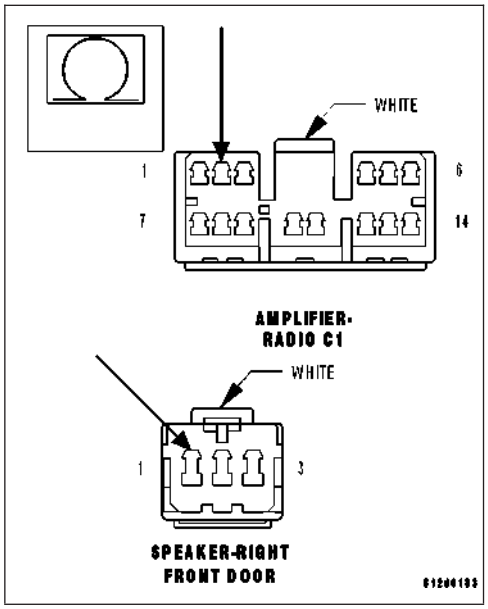
B1472-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)

3. CHECK THE (X202) AMPLIFIED RIGHT FRONT DOOR SPEAKER (+) CIRCUIT FOR AN OPEN

Turn the ignition off.

Disconnect the Amplifier C1 harness connector.

Measure the resistance of the (X202) Amplified Right Front Door Speaker (+) circuit between the Amplifier C1 harness connector and the Amplified Right Front Door Speaker harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go To 4

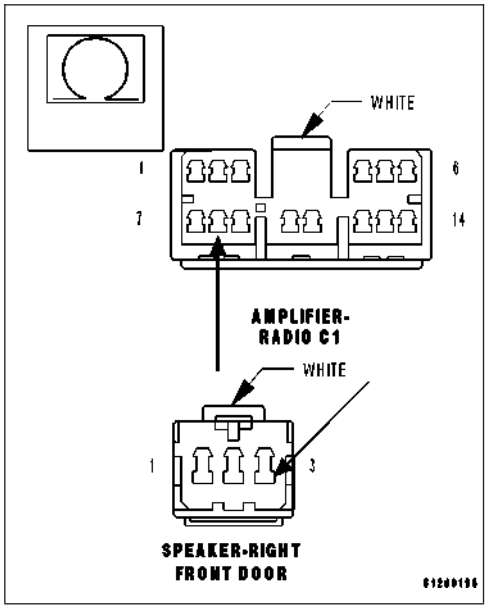
No >> Repair the (X202) Amplified Right Front Door Speaker (+) circuit for an open.
Perform BODY VERIFICATION TEST VER-1.

4. CHECK THE (X292) AMPLIFIED RIGHT FRONT DOOR SPEAKER (-) CIRCUIT FOR AN OPEN

Turn the ignition off.

Disconnect the Amplifier C1 harness connector.

Measure the resistance of the (X292) Amplified Right Front Door Speaker (-) circuit between the Amplifier C1 harness connector and the Amplified Right Front Door Speaker harness connector.

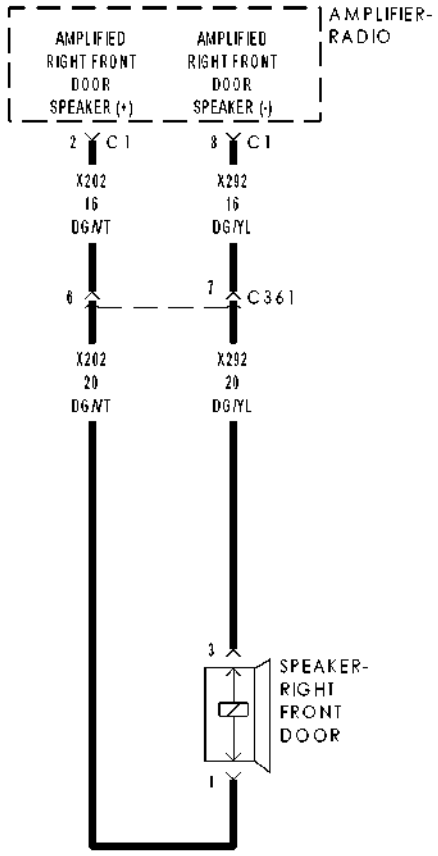


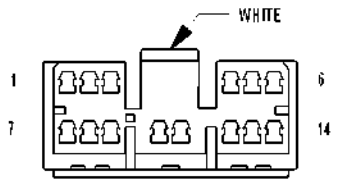
Is the resistance below 5.0 ohms?

Yes >> Replace the Amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

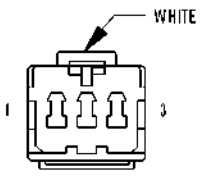
No >> Repair the (X292) Amplified Right Front Door Speaker (-) circuit for an open.
Perform BODY VERIFICATION TEST VER-1.

B1473-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER





AMPLIFIER-
RADIO C1



SPEAKER-RIGHT
FRONT DOOR

8J0af004

B1473-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER (CONTINUED)

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

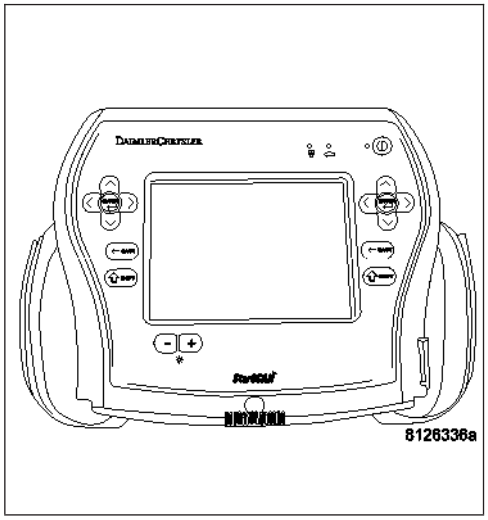
- **When Monitored:**
  With the ignition on. Radio volume at 25 or higher.
- **Set Condition:**
  The amplifier detects that the output circuits are shorted together.

Possible Causes
(X202) AMPLIFIED RIGHT FRONT DOOR SPEAKER (+) CIRCUIT SHORTED TO THE (X292) AMPLIFIED RIGHT FRONT DOOR SPEAKER (-) CIRCUIT
AMPLIFIED RIGHT FRONT DOOR SPEAKER
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.
With the scan tool, erase Amplifier DTCs.
Turn the radio on.
Turn the volume level to 25.
With the scan tool, read Amplifier DTCs.



Does the scan tool display active: B1473-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

---

2. CHECK THE OPERATION OF THE AMPLIFIED RIGHT FRONT DOOR SPEAKER

Disconnect the Amplified Right Front Door Speaker.
Measure the resistance of the speaker between the two terminals.

Is the resistance of the speaker less than 1 ohm?

Yes >> Replace the Amplified Right Front Door Speaker in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

No >> Go To 3

B1473-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER (CONTINUED)

3. CHECK THE (X202) AMPLIFIED RIGHT FRONT DOOR SPEAKER (+) CIRCUIT, AND THE (X292) AMPLIFIED RIGHT FRONT DOOR SPEAKER (-) CIRCUITS FOR A SHORT TOGETHER

Turn the ignition off.

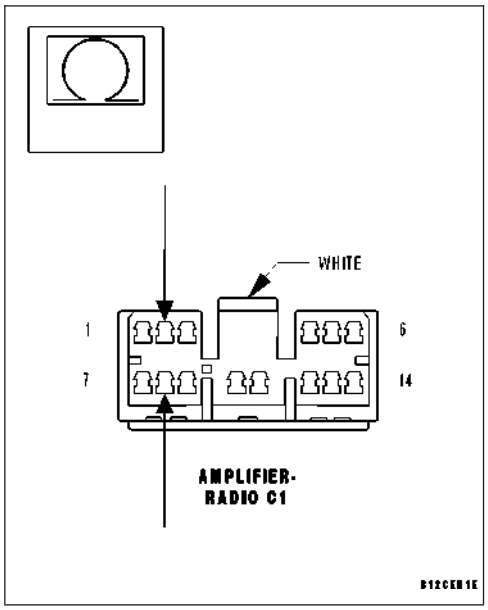
Disconnect the Amplifier C1 harness connector.

Measure the resistance between the (X202) Amplified Right Front Door Speaker (+) circuit, and the (X292) Amplified Right Front Door Speaker (-) circuit.

Is the resistance below 10K ohms?

Yes >> Repair the (X202) Amplified Right Front Door Speaker (+) circuit, and the (X292) Amplified Right Front Door Speaker (-) circuit for a short together.
Perform BODY VERIFICATION TEST VER-1.

No >> Replace the Amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.



B1474-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  This DTC will set if a DC offset occurs on the output channel, the amplifier shall set a DTC after a maturity rate of 5 ±1 sec.

Possible Causes
AMPLIFIER

Diagnostic Test

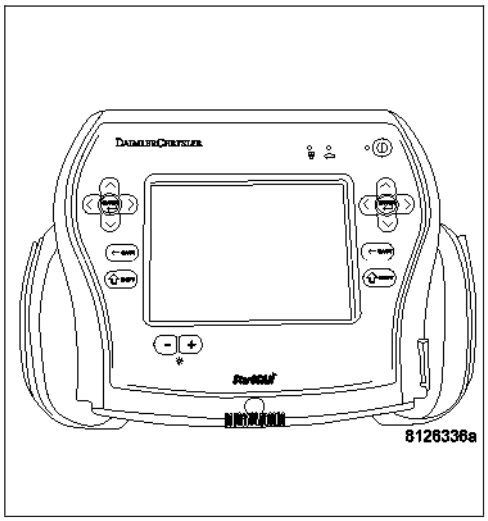
1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.
With the scan tool, read Amplifier DTCs.

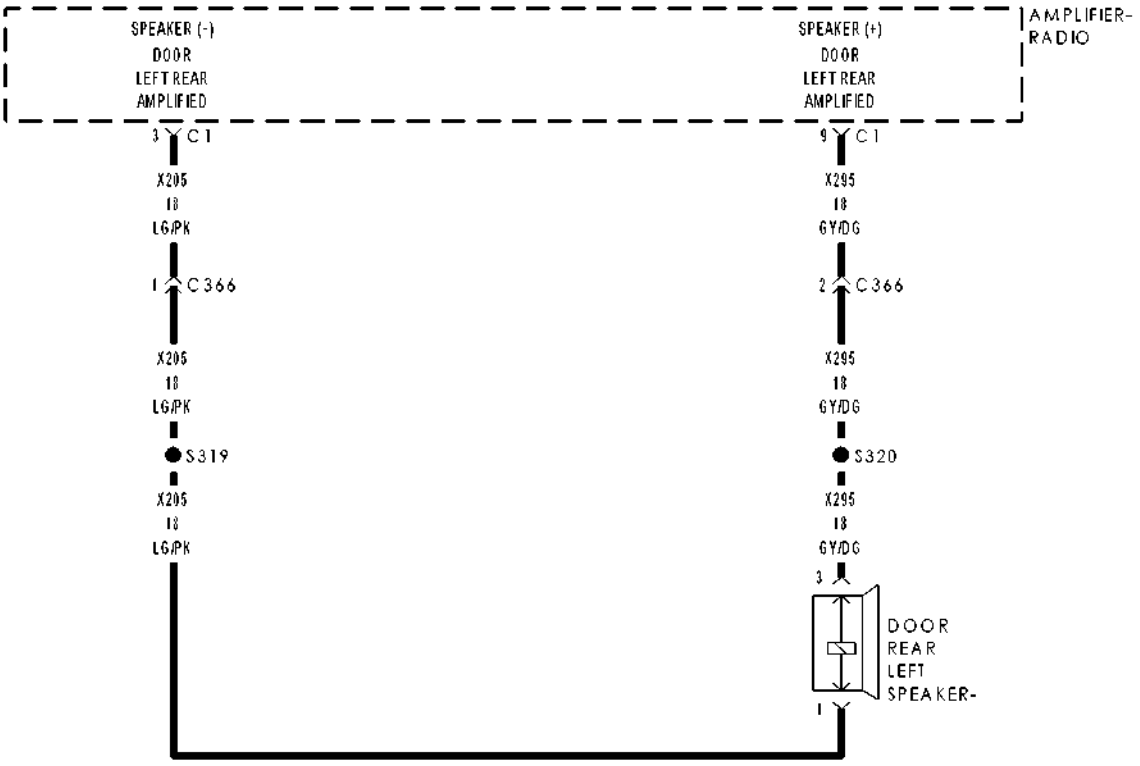
Does the scan tool display active: B1474-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT PERFORMANCE?

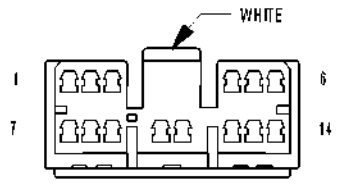
Yes >> Replace the Amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

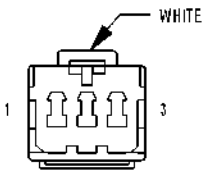


B1475-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT LOW





AMPLIFIER-
RADIO C1



SPEAKER-LEFT
REAR DOOR

B1475-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Amplifier detects a shorted to ground condition on the speaker output circuit.

Possible Causes
(X205) AMPLIFIED LEFT REAR DOOR SPEAKER (+) CIRCUIT SHORTED TO GROUND
(X295) AMPLIFIED LEFT REAR DOOR SPEAKER (-) CIRCUIT SHORTED TO GROUND
LEFT REAR DOOR SPEAKER
AMPLIFIER

Diagnostic Test

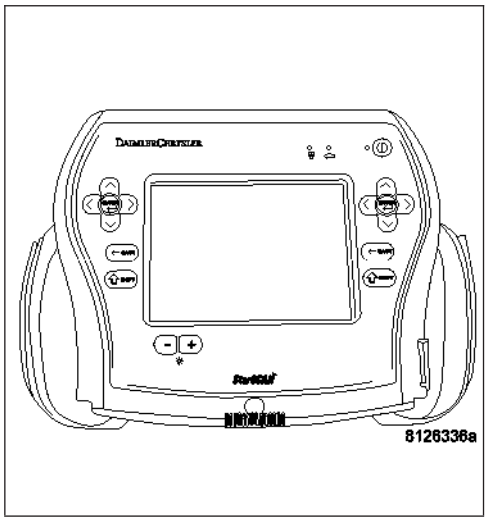
1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.
With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B1475-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT LOW?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.



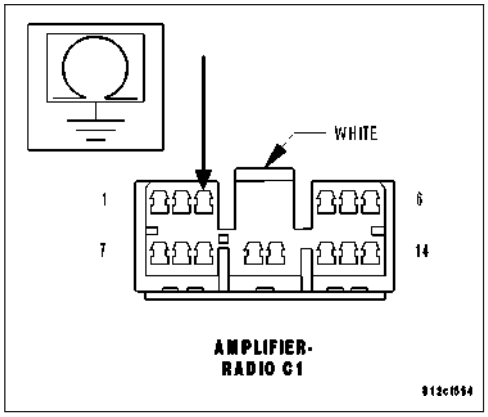
2. CHECK THE (X205) AMPLIFIED LEFT REAR DOOR SPEAKER (+) CIRCUIT FOR A SHORT TO GROUND

Disconnect the Amplifier C1 harness connector.
Measure the resistance between ground and the (X205) Amplified Left Rear Door Speaker (+) circuit.

Is the resistance below 10K ohms?

Yes >> Repair the (X205) Amplified Left Rear Door Speaker (+) circuit for a short to ground.
Perform BODY VERIFICATION TEST VER-1.

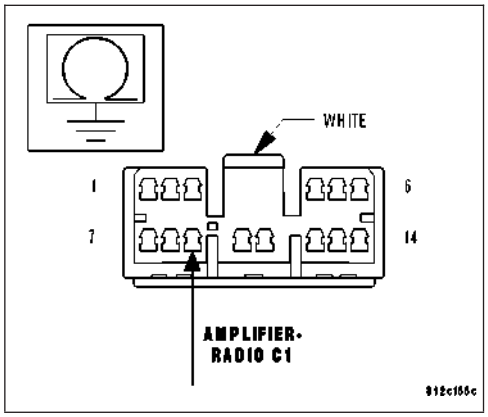
No >> Go To 3



B1475-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)

3. CHECK THE (X295) AMPLIFIED LEFT REAR DOOR SPEAKER (-) CIRCUIT FOR A SHORT TO GROUND

Measure the resistance between ground and the (X295) Amplified Left Rear Door Speaker (-) circuit.



Is the resistance below 10K ohms?

Yes >> Repair the (X295) Amplified Left Rear Door Speaker (-) for a short to ground.
Perform BODY VERIFICATION TEST VER-1.

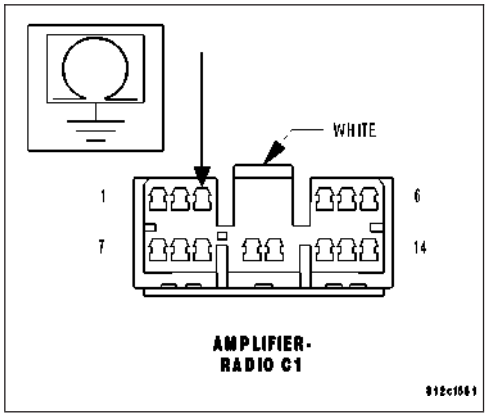
No >> Go To 4

4. CHECK OPERATION OF THE AMPLIFIED LEFT REAR DOOR SPEAKER

Turn the ignition off.

Reconnect and reinstall the Left Rear Door Speaker.

Measure the resistance of the speaker circuit between the Amplifier C1 harness connector and ground..

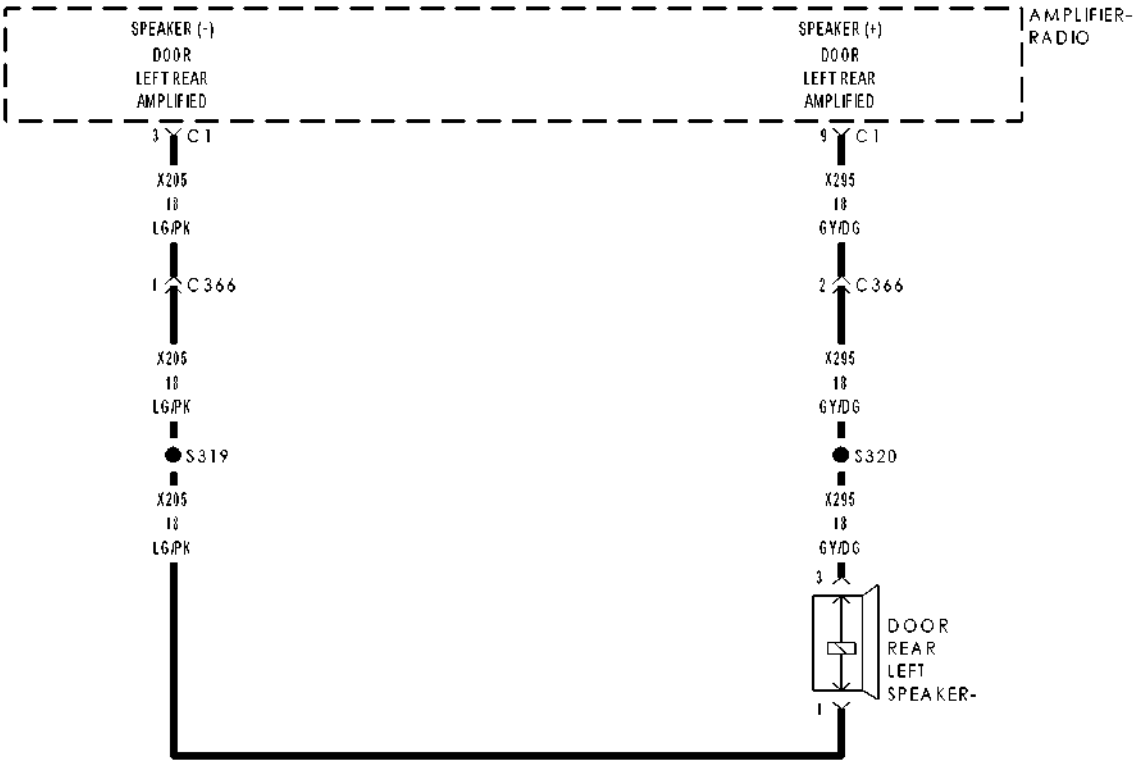


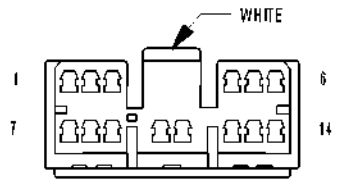
Is the resistance below 10K ohms?

Yes >> Replace the Left Rear Door Speaker in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

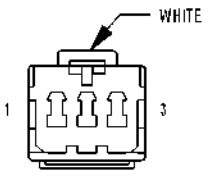
No >> Replace the Amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

B1476-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT HIGH





AMPLIFIER-
RADIO C1



SPEAKER-LEFT
REAR DOOR

B1476-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Amplifier detects a short to battery condition on the output circuit.

Possible Causes
(X205) AMPLIFIED LEFT REAR DOOR SPEAKER (+) CIRCUIT SHORT TO VOLTAGE
(X295) AMPLIFIED LEFT REAR DOOR SPEAKER (-) CIRCUIT SHORT TO VOLTAGE
AMPLIFIER

Diagnostic Test

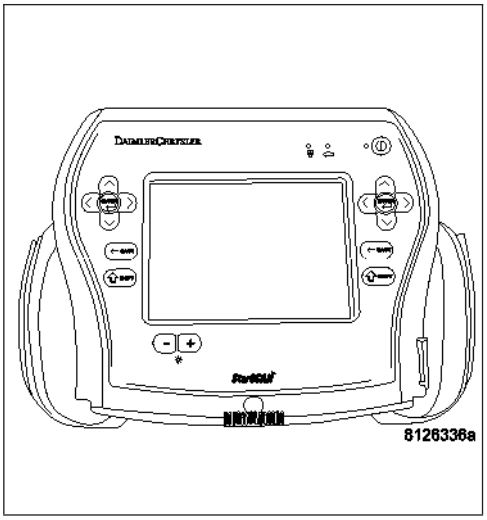
1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.
With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B1476-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT HIGH?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.



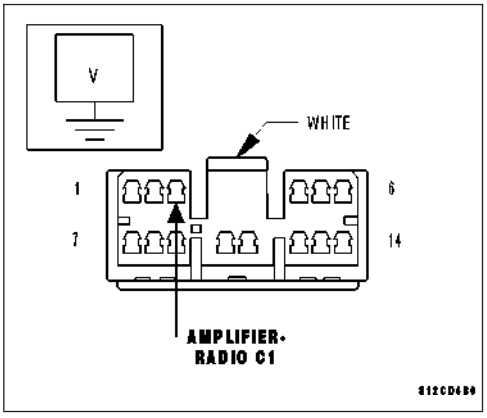
2. CHECK FOR VOLTAGE ON THE (X205) AMPLIFIED LEFT REAR DOOR SPEAKER (+) CIRCUIT

Turn the ignition off.
Disconnect the Amplifier C1 harness connector.
Disconnect the Amplified Left Rear Door Speaker harness connector.
Turn the ignition on.
Measure for voltage on the (X205) Amplified Left Rear Door Speaker (+) circuit.

Is the voltage above 10.0 volts?

Yes >> Repair the (X205) Amplified Left Rear Door Speaker (+) circuit for a short to voltage.
Perform BODY VERIFICATION TEST VER-1.

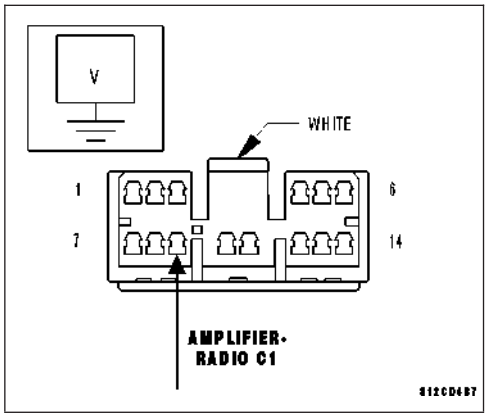
No >> Go To 3



B1476-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)

3. CHECK FOR VOLTAGE ON THE (X295) AMPLIFIED LEFT REAR DOOR SPEAKER (-) CIRCUIT

Measure for voltage on the (X295) Amplified Left Rear Door Speaker (-) circuit.

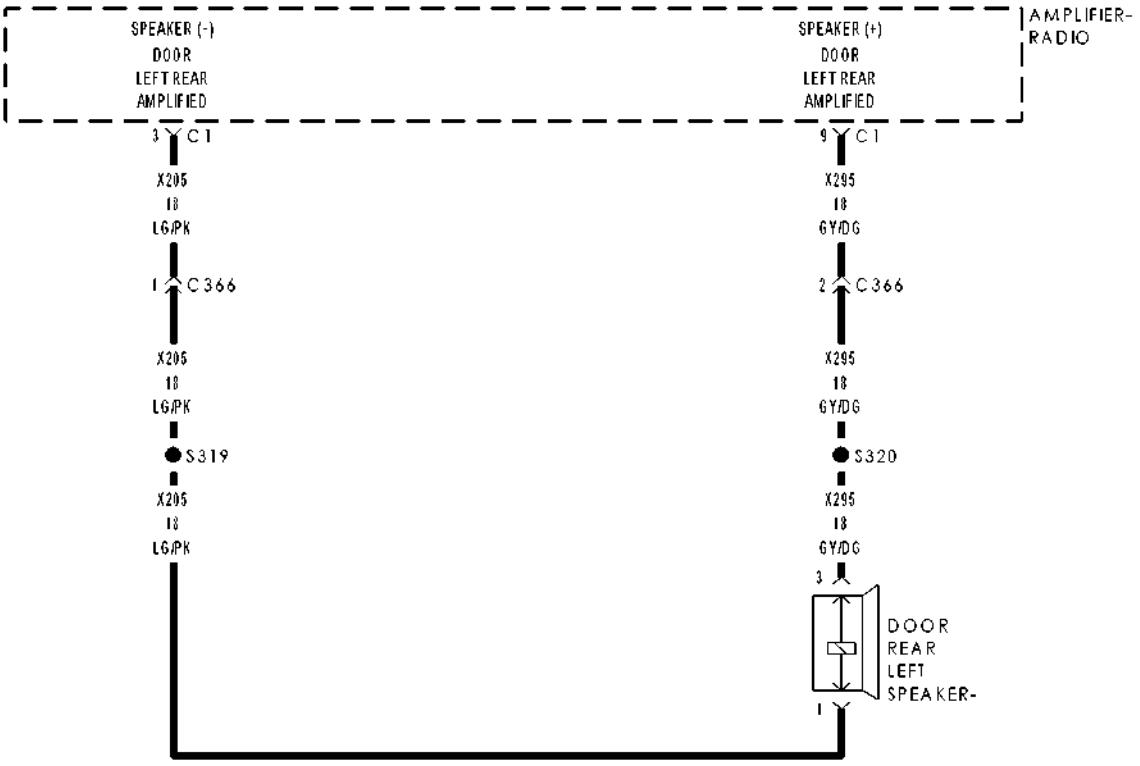


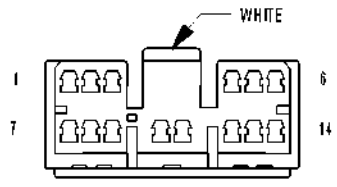
Is the voltage above 10.0 volts?

Yes >> Repair the (X295) Amplified Left Rear Door Speaker (-) circuit for a short to voltage.
Perform BODY VERIFICATION TEST VER-1.

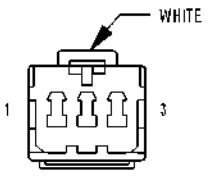
No >> Replace the Amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

B1477-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT OPEN





AMPLIFIER-
RADIO C1



SPEAKER-LEFT
REAR DOOR

B1477-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

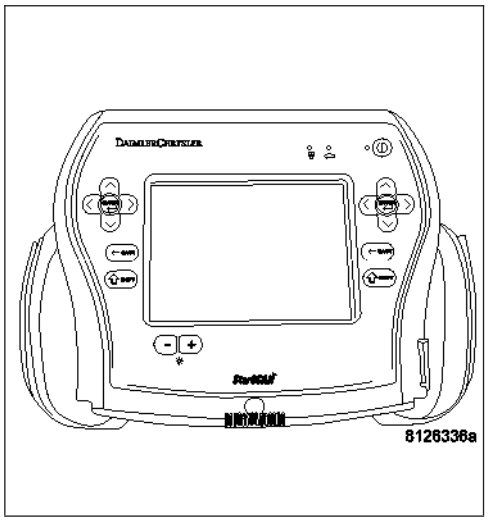
- **When Monitored:**
  Amplifier Bus wake-up. Amplifier reset with scan tool.
- **Set Condition:**
  The Amplifier detects an open condition on the speaker output circuit.

Possible Causes
(X205) AMPLIFIED LEFT REAR DOOR SPEAKER (+) CIRCUIT OPEN
(X295) AMPLIFIED LEFT REAR DOOR SPEAKER (-) CIRCUIT OPEN
LEFT REAR DOOR SPEAKER
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on.
Turn the radio on.
With the scan tool, erase Amplifier DTCs.
With the scan tool, reset the amplifier.
With the scan tool, read Amplifier DTCs.



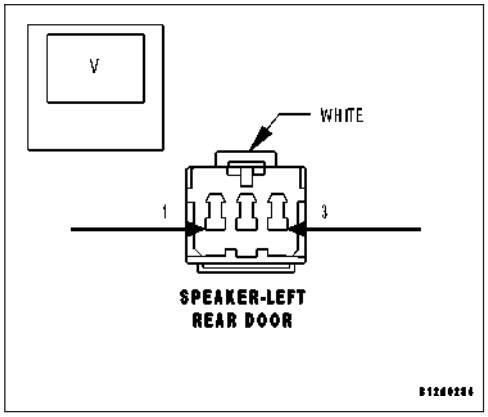
Does the scan tool display active: B1477-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT OPEN?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

2. CHECK THE OPERATION OF THE LEFT REAR DOOR SPEAKER

Disconnect the Left Rear Door Speaker harness connector.
Turn the radio on and turn the volume to mid level.
With a voltmeter set to read in A/C voltage, measure the voltage of the Amplified Left Rear Door Speaker circuits in the Amplified Left Rear Door Speaker harness connector.



Is the voltage present greater than 1 volt?

Yes >> Replace the Amplified Left I/P Speaker in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

No >> Go To 3

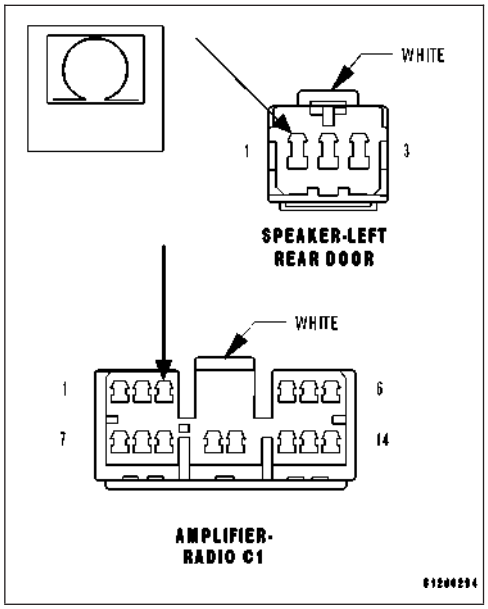
B1477-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)

3. CHECK THE (X205) AMPLIFIED LEFT REAR DOOR SPEAKER (+) CIRCUIT FOR AN OPEN

Turn the ignition off.

Disconnect the Amplifier C1 harness connector.

Measure the resistance of the (X205) Amplified Left Rear Door Speaker (+) circuit between the Amplifier C1 harness connector and the Amplified Left Rear Door Speaker harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go To 4

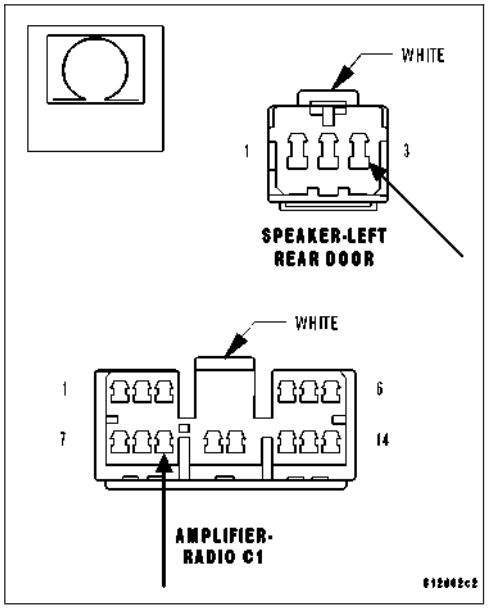
No >> Repair the (X205) Amplified Left Rear Door Speaker (+) circuit for an open.
Perform BODY VERIFICATION TEST VER-1.

4. CHECK THE (X295) AMPLIFIED LEFT REAR DOOR SPEAKER (-) CIRCUIT FOR AN OPEN

Turn the ignition off.

Disconnect the Amplifier C1 harness connector.

Measure the resistance of the (X295) Amplified Left Rear Door Speaker (-) circuit between the Amplifier C1 harness connector and the Amplified Left Rear Door Speaker harness connector.

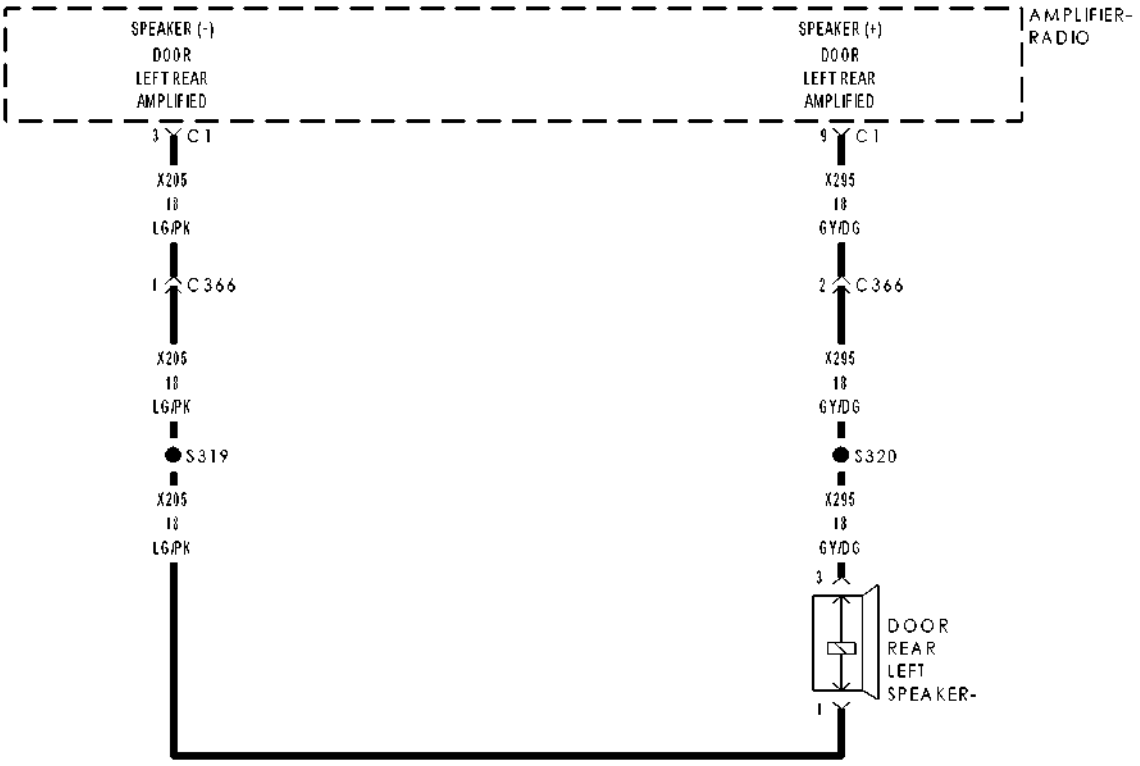


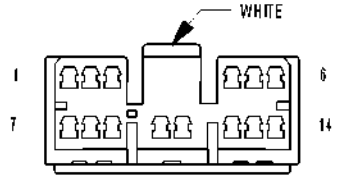
Is the resistance below 5.0 ohms?

Yes >> Replace the Amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

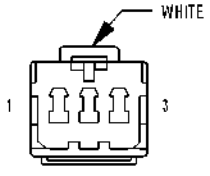
No >> Repair the (X295) Amplified Left Rear Door Speaker (-) circuit for an open.
Perform BODY VERIFICATION TEST VER-1.

B1478-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER





AMPLIFIER-
RADIO C1



SPEAKER-LEFT
REAR DOOR

B1478-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER (CONTINUED)

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

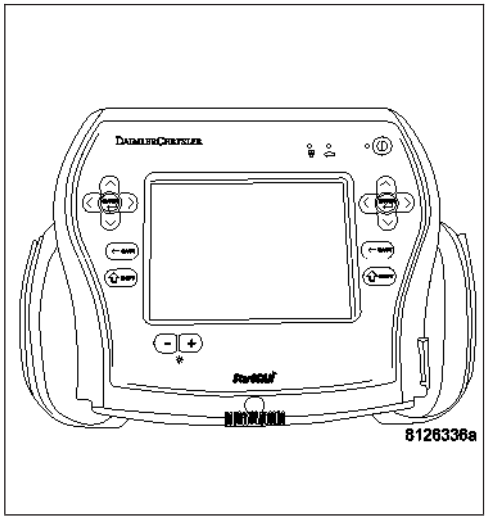
- **When Monitored:**
  With the ignition on. Radio volume at 25 or higher.
- **Set Condition:**
  The amplifier detects that the output circuits are shorted together.

Possible Causes
(X205) AMPLIFIED LEFT REAR DOOR SPEAKER (+) CIRCUIT SHORTED TO THE (X295) AMPLIFIED LEFT REAR DOOR SPEAKER (-) CIRCUIT
AMPLIFIED LEFT REAR DOOR SPEAKER
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.
With the scan tool, erase Amplifier DTCs.
Turn the radio on.
Turn the volume level to 25.
With the scan tool, read Amplifier DTCs.



Does the scan tool display active: B1478-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

---

2. CHECK THE OPERATION OF THE AMPLIFIED LEFT REAR DOOR SPEAKER

Disconnect the Amplified Left Rear Door Speaker.
Measure the resistance of the speaker between the two terminals.

Is the resistance of the speaker less than 1 ohm?

Yes >> Replace the Amplified Left Rear Door Speaker in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

No >> Go To 3

B1478-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER (CONTINUED)

3. CHECK THE (X205) AMPLIFIED LEFT REAR DOOR SPEAKER (+) CIRCUIT, AND THE (X295) AMPLIFIED LEFT REAR DOOR SPEAKER (-) CIRCUITS FOR A SHORT TOGETHER

Turn the ignition off.

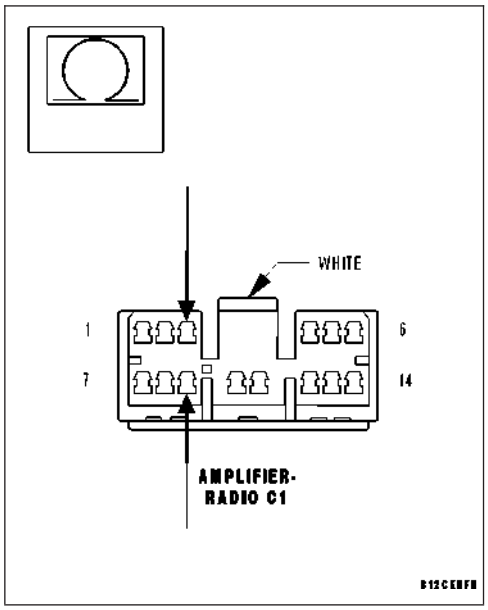
Disconnect the Amplifier C1 harness connector.

Measure the resistance between the (X205) Amplified Left Rear Door Speaker (+) circuit, and the (X295) Amplified Left Rear Door Speaker (-) circuit.

Is the resistance below 10K ohms?

Yes >> Repair the (X205) Amplified Left Rear Door Speaker (+) circuit, and the (X295) Amplified Left Rear Door Speaker (-) circuit for a short together.
Perform BODY VERIFICATION TEST VER-1.

No >> Replace the Amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.



B1479-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  This DTC will set if a DC offset occurs on the output channel, the amplifier shall set a DTC after a maturity rate of 5 ±1 sec.

Possible Causes
AMPLIFIER

Diagnostic Test

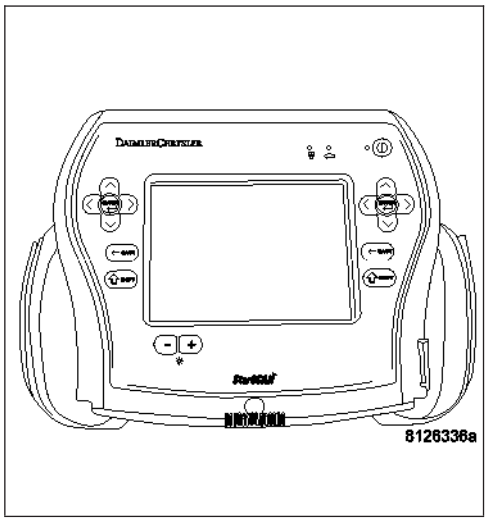
1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.
With the scan tool, read Amplifier DTCs.

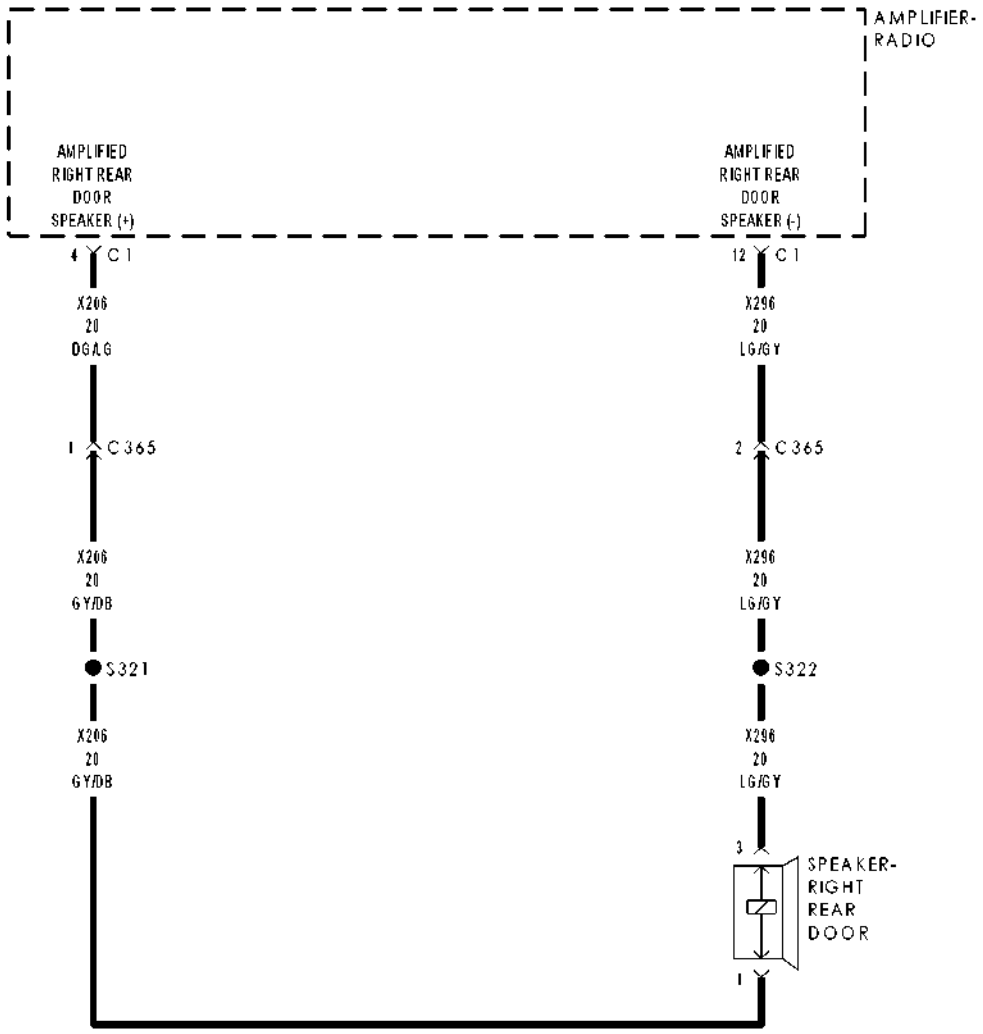
Does the scan tool display active: B1479-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT PERFORMANCE?

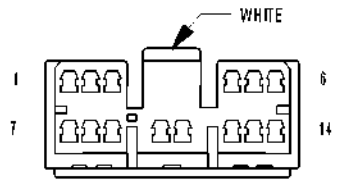
Yes >> Replace the Amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

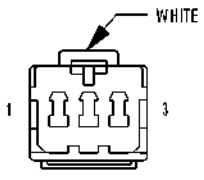


B147A-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT LOW





AMPLIFIER-
RADIO C1



SPEAKER-RIGHT
REAR DOOR

B147A-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Amplifier detects a shorted to ground condition on the speaker output circuit.

Possible Causes
(X206) AMPLIFIED RIGHT REAR DOOR SPEAKER (+) CIRCUIT SHORTED TO GROUND
(X296) AMPLIFIED RIGHT REAR DOOR SPEAKER (-) CIRCUIT SHORTED TO GROUND
RIGHT REAR DOOR SPEAKER
AMPLIFIER

Diagnostic Test

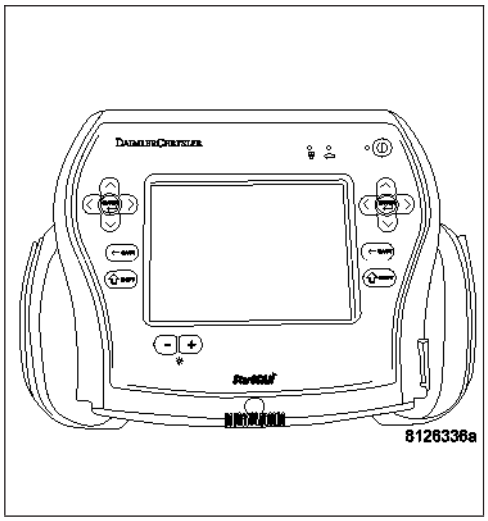
1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.
With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B147A-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT LOW?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.



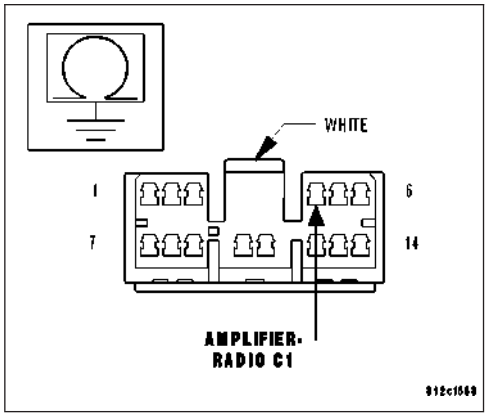
2. CHECK THE (X206) AMPLIFIED RIGHT REAR DOOR SPEAKER (+) CIRCUIT FOR A SHORT TO GROUND

Disconnect the Amplifier C1 harness connector.
Measure the resistance between ground and the (X206) Amplified Right Rear Door Speaker (+) circuit.

Is the resistance below 10K ohms?

Yes >> Repair the (X206) Amplified Right Rear Door Speaker (+) circuit for a short to ground.
Perform BODY VERIFICATION TEST VER-1.

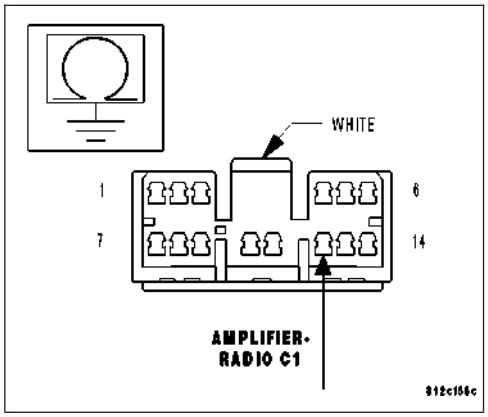
No >> Go To 3



B147A-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)

3. CHECK THE (X296) AMPLIFIED RIGHT REAR DOOR SPEAKER (-) CIRCUIT FOR A SHORT TO GROUND

Measure the resistance between ground and the (X296) Amplified Right Rear Door Speaker (-) circuit.



Is the resistance below 10K ohms?

Yes >> Repair the (X296) Amplified Right Rear Door Speaker (-) for a short to ground.
Perform BODY VERIFICATION TEST VER-1.

No >> Go To 4

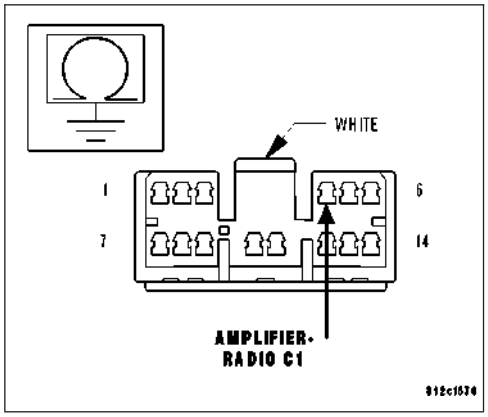
---

4. CHECK OPERATION OF THE AMPLIFIED RIGHT REAR DOOR SPEAKER

Turn the ignition off.

Reconnect and reinstall the Right Rear Door Speaker.

Measure the resistance of the speaker circuit between the Amplifier C1 harness connector and ground..

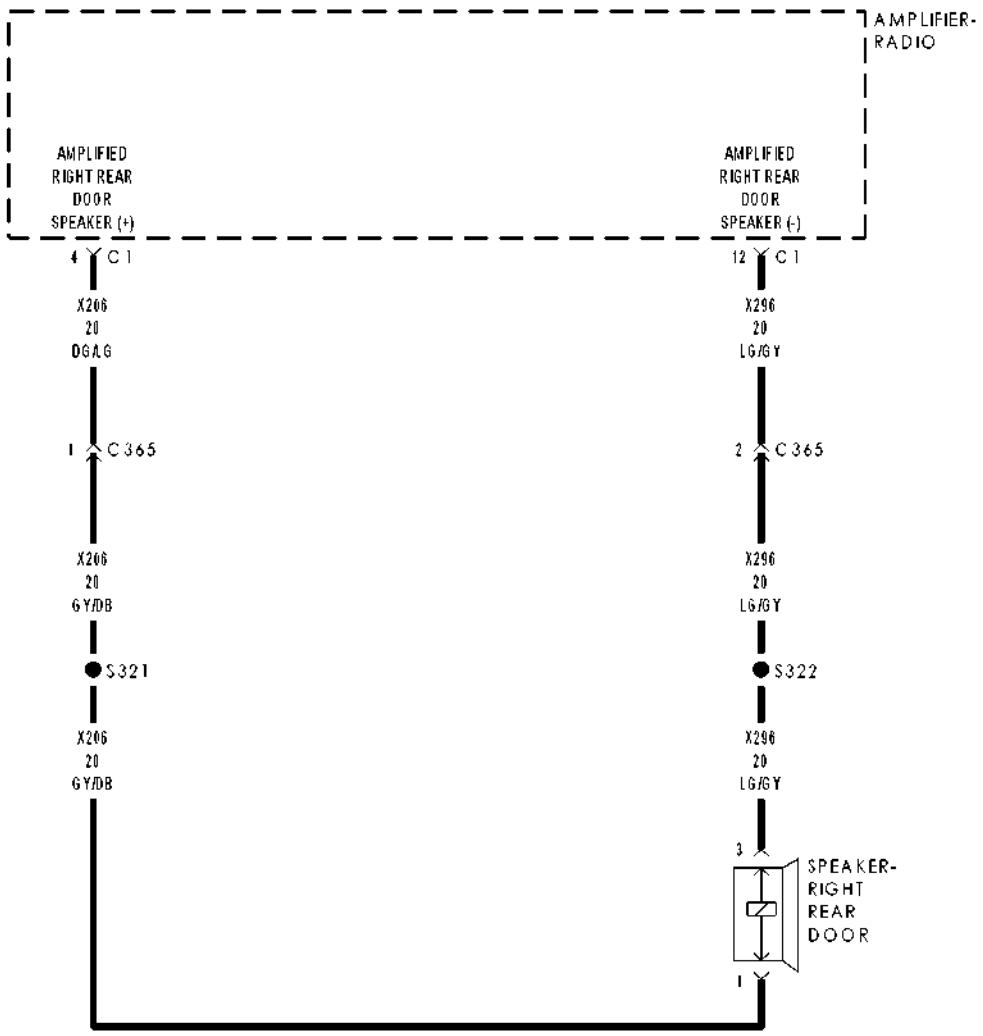


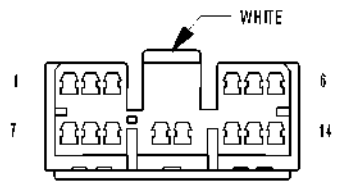
Is the resistance below 10K ohms?

Yes >> Replace the Right Rear Door Speaker in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

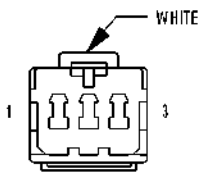
No >> Replace the Amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

B147B-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT HIGH





AMPLIFIER-
RADIO C1



SPEAKER-RIGHT
REAR DOOR

B147B-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Amplifier detects a short to battery condition on the output circuit.

Possible Causes
(X206) AMPLIFIED RIGHT REAR DOOR SPEAKER (+) CIRCUIT SHORT TO VOLTAGE
(X296) AMPLIFIED RIGHT REAR DOOR SPEAKER (-) CIRCUIT SHORT TO VOLTAGE
AMPLIFIER

Diagnostic Test

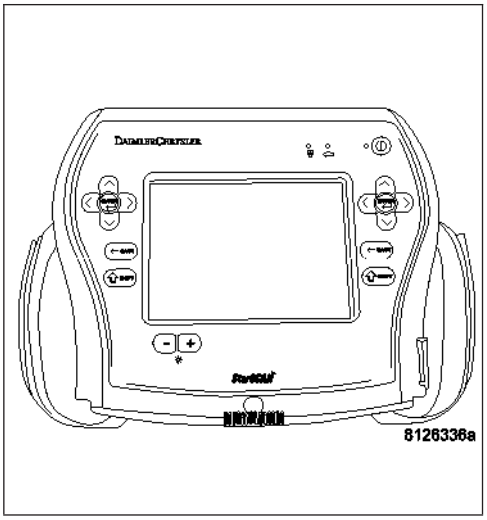
1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.
With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B147B-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT HIGH?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.



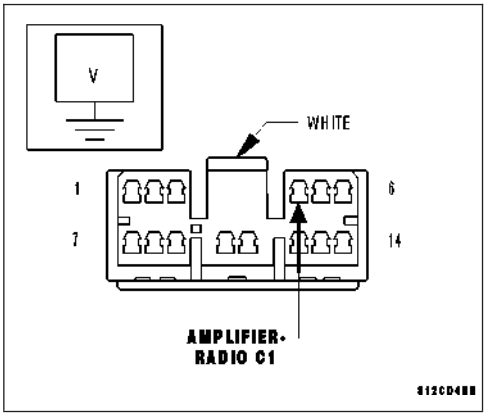
2. CHECK FOR VOLTAGE ON THE (X206) AMPLIFIED RIGHT REAR DOOR SPEAKER (+) CIRCUIT

Turn the ignition off.
Disconnect the Amplifier C1 harness connector.
Disconnect the Amplified Right Rear Door Speaker harness connector.
Turn the ignition on.
Measure for voltage on the (X206) Amplified Right Rear Door Speaker (+) circuit.

Is the voltage above 10.0 volts?

Yes >> Repair the (X206) Amplified Right Rear Door Speaker (+) circuit for a short to voltage.
Perform BODY VERIFICATION TEST VER-1.

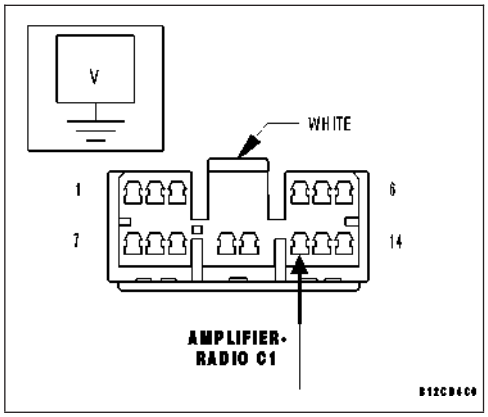
No >> Go To 3



B147B-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)

3. CHECK FOR VOLTAGE ON THE (X296) AMPLIFIED RIGHT REAR SPEAKER SPEAKER (-) CIRCUIT

Measure for voltage on the (X296) Amplified Right Rear Door Speaker (-) circuit.

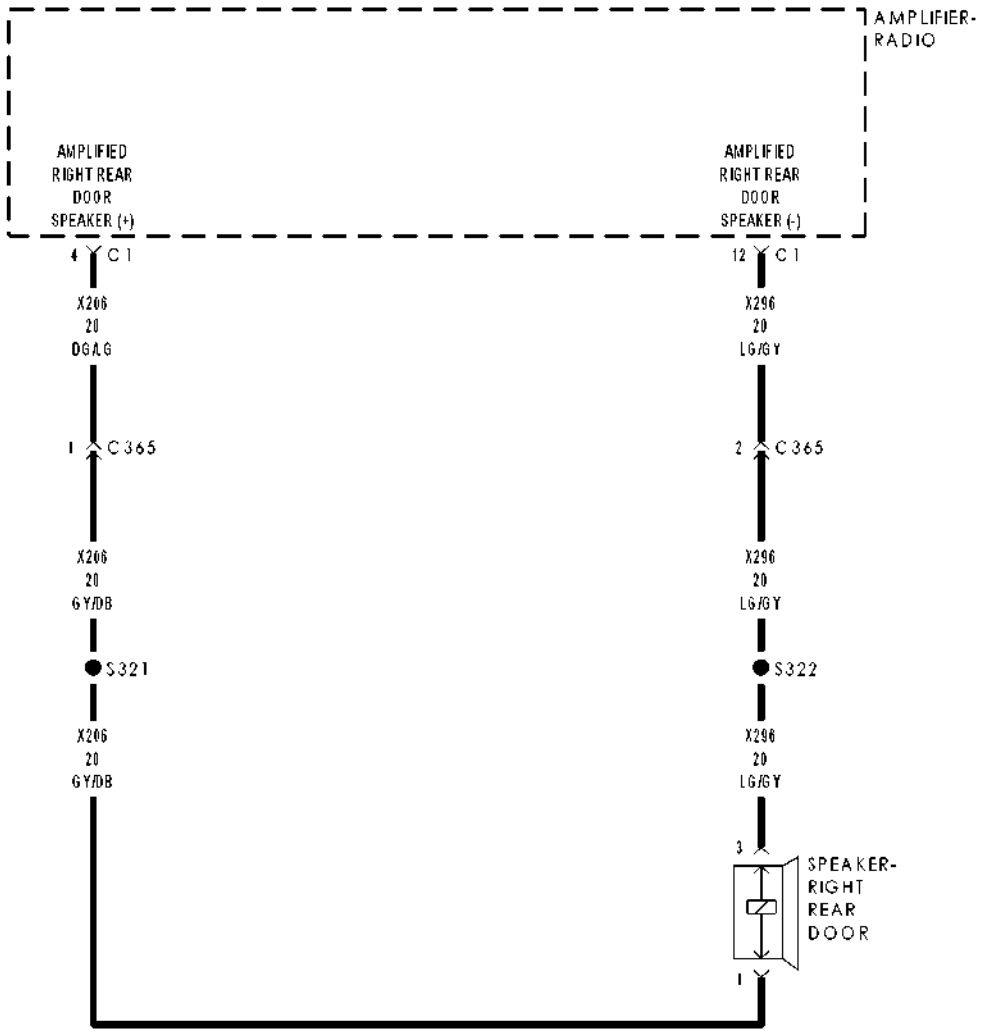


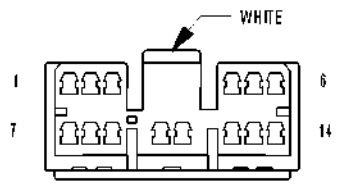
Is the voltage above 10.0 volts?

Yes >> Repair the (X296) Amplified Right Rear Door Speaker (-) circuit for a short to voltage.
Perform BODY VERIFICATION TEST VER-1.

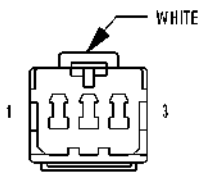
No >> Replace the Amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

B147C-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT OPEN





AMPLIFIER-
RADIO C1



SPEAKER-RIGHT
REAR DOOR

B147C-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

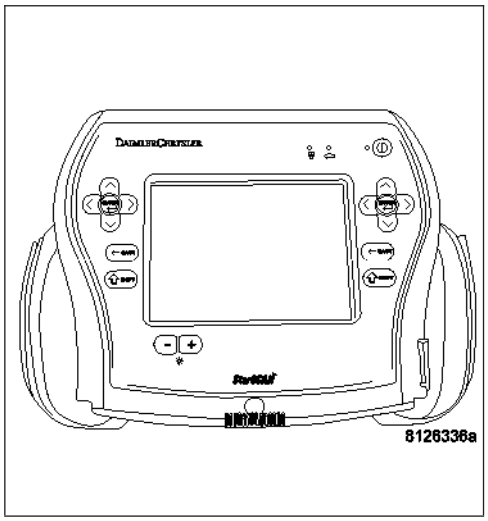
- **When Monitored:**
  Amplifier Bus wake-up. Amplifier reset with scan tool.
- **Set Condition:**
  The Amplifier detects an open condition on the speaker output circuit.

Possible Causes
(X206) AMPLIFIED RIGHT REAR DOOR SPEAKER (+) CIRCUIT OPEN
(X296) AMPLIFIED RIGHT REAR DOOR SPEAKER (-) CIRCUIT OPEN
RIGHT REAR DOOR SPEAKER
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on.
Turn the radio on.
With the scan tool, erase Amplifier DTCs.
With the scan tool, reset the amplifier.
With the scan tool, read Amplifier DTCs.



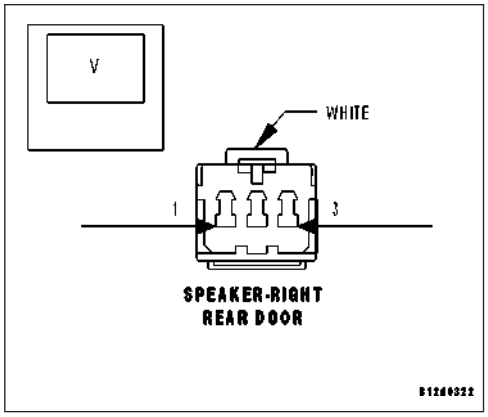
Does the scan tool display active: B147C-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT OPEN?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

2. CHECK THE OPERATION OF THE RIGHT REAR DOOR SPEAKER

Disconnect the Right Rear Door Speaker harness connector.
Turn the radio on and turn the volume to mid level.
With a voltmeter set to read in A/C voltage, measure the voltage of the Amplified Right Rear Door Speaker circuits in the Amplified Right Rear Door Speaker harness connector.



Is the voltage present greater than 1 volt?

Yes >> Replace the Amplified Right Rear Door Speaker in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

No >> Go To 3

B147C-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)

3. CHECK THE (X206) AMPLIFIED RIGHT REAR DOOR SPEAKER (+) CIRCUIT FOR AN OPEN

Turn the ignition off.

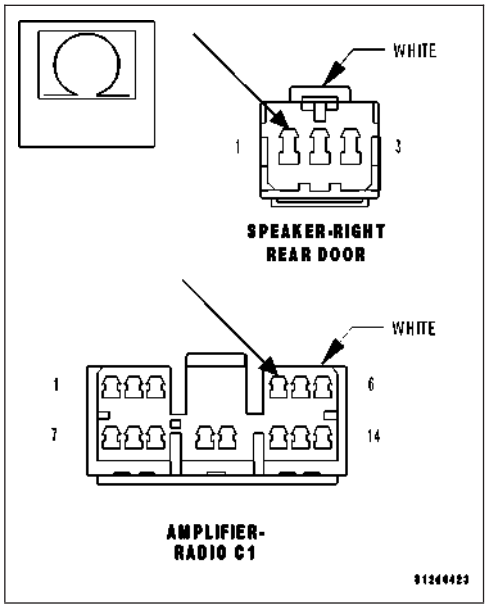
Disconnect the Amplifier C1 harness connector.

Measure the resistance of the (X206) Amplified Right Rear Door Speaker (+) circuit between the Amplifier C1 harness connector and the Amplified Right Rear Door Speaker harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 4

No >> Repair the (X206) Amplified Right Rear Door Speaker (+) circuit for an open.
Perform BODY VERIFICATION TEST VER-1.



4. CHECK THE (X296) AMPLIFIED RIGHT REAR DOOR SPEAKER (-) CIRCUIT FOR AN OPEN

Turn the ignition off.

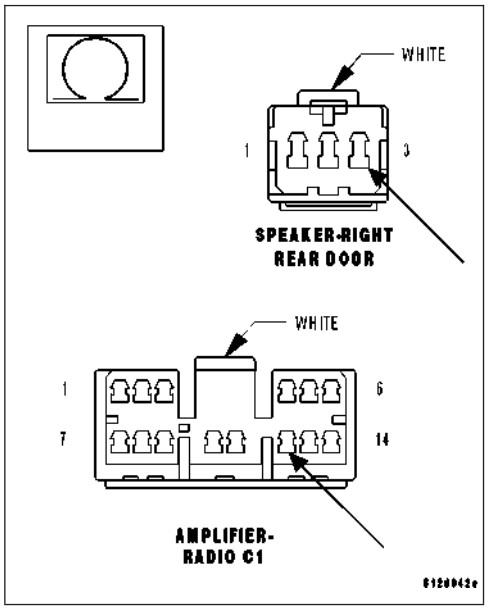
Disconnect the Amplifier C1 harness connector.

Measure the resistance of the (X296) Amplified Right Rear Door Speaker (-) circuit between the Amplifier C1 harness connector and the Amplified Right Rear Door Speaker harness connector.

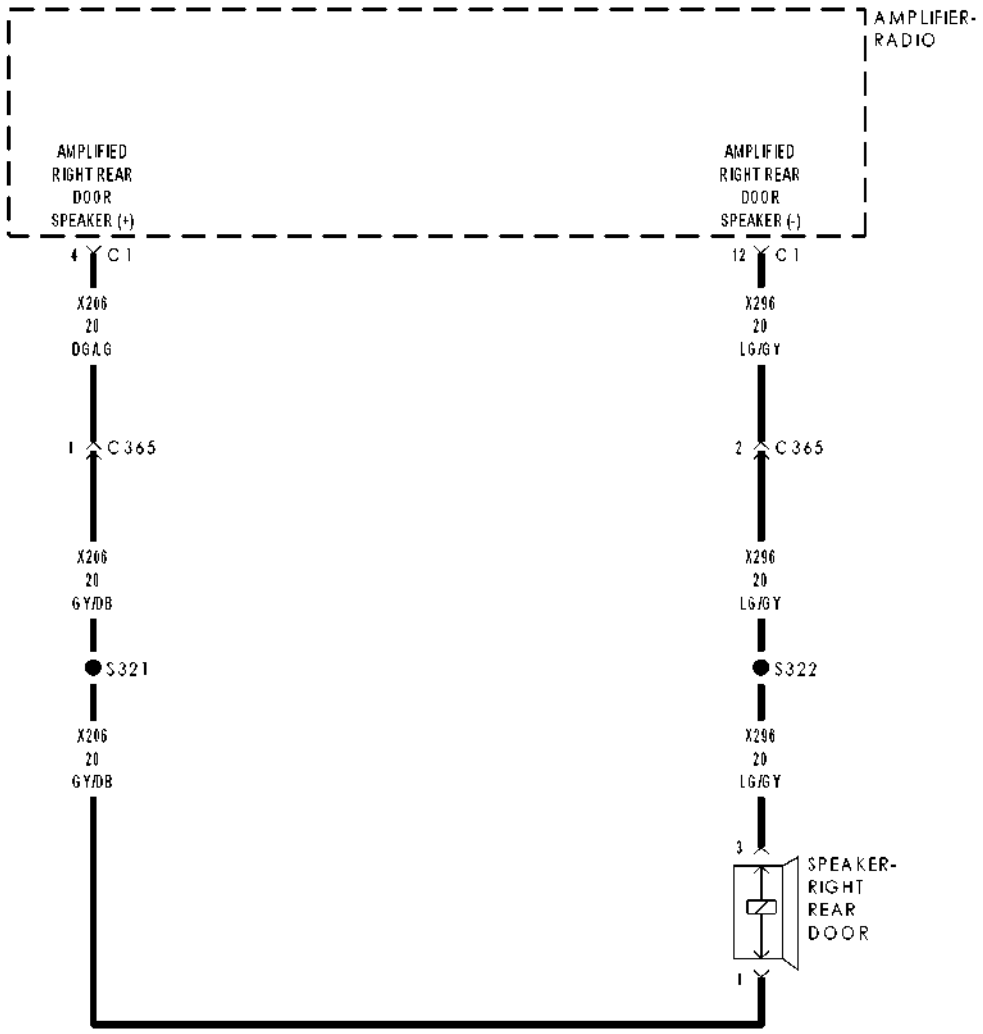
Is the resistance below 5.0 ohms?

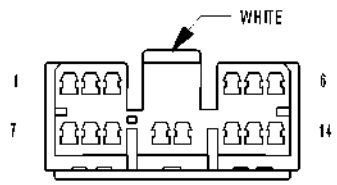
Yes >> Replace the Amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

No >> Repair the (X296) Amplified Right Rear Door Speaker (-) circuit for an open.
Perform BODY VERIFICATION TEST VER-1.

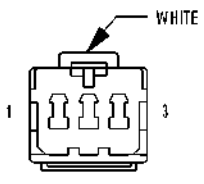


B147D-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER





AMPLIFIER-
RADIO C1



SPEAKER-RIGHT
REAR DOOR

B147D-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER (CONTINUED)

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

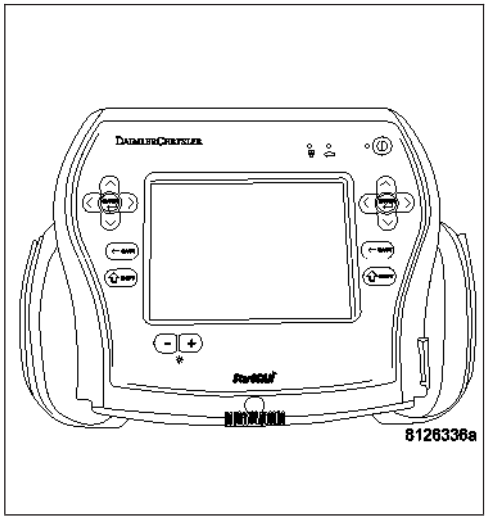
- **When Monitored:**
  With the ignition on. Radio volume at 25 or higher.
- **Set Condition:**
  The amplifier detects that the output circuits are shorted together.

Possible Causes
(X206) AMPLIFIED RIGHT REAR DOOR SPEAKER (+) CIRCUIT SHORTED TO THE (X296) AMPLIFIED RIGHT REAR DOOR SPEAKER (-) CIRCUIT
AMPLIFIER
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.
With the scan tool, erase Amplifier DTCs.
Turn the radio on.
Turn the volume level to 25.
With the scan tool, read Amplifier DTCs.



Does the scan tool display active: B147D-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

---

2. CHECK THE OPERATION OF THE AMPLIFIED RIGHT REAR DOOR SPEAKER

Disconnect the Amplified Right Rear Door Speaker.
Measure the resistance of the speaker between the two terminals.

Is the resistance of the speaker less than 1 ohm?

Yes >> Replace the Amplified Right Rear Door Speaker in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

No >> Go To 3

B147D-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER (CONTINUED)

3. CHECK THE (X206) AMPLIFIED RIGHT REAR DOOR SPEAKER (+) CIRCUIT, AND THE (X296) AMPLIFIED RIGHT REAR DOOR SPEAKER (-) CIRCUITS FOR A SHORT TOGETHER

Turn the ignition off.

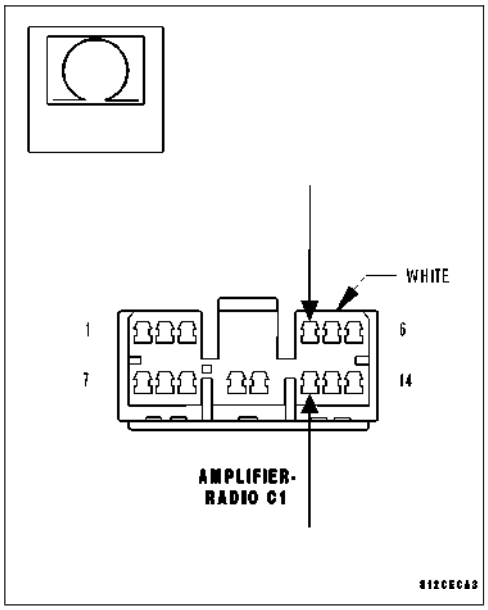
Disconnect the Amplifier C1 harness connector.

Measure the resistance between the (X206) Amplified Right Rear Door Speaker (+) circuit, and the (X296) Amplified Right Rear Door Speaker (-) circuit.

Is the resistance below 10K ohms?

Yes >> Repair the (X206) Amplified Right Rear Door Speaker (+) circuit, and the (X296) Amplified Right Rear Door Speaker (-) circuit for a short together.
Perform BODY VERIFICATION TEST VER-1.

No >> Replace the Amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.



B147E-CHANNEL 7 AUDIO SPEAKER OUTPUT CIRCUIT PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  This DTC will set if a DC offset occurs on the output channel, the amplifier shall set a DTC after a maturity rate of 5 ±1 sec.

Possible Causes
AMPLIFIER

Diagnostic Test

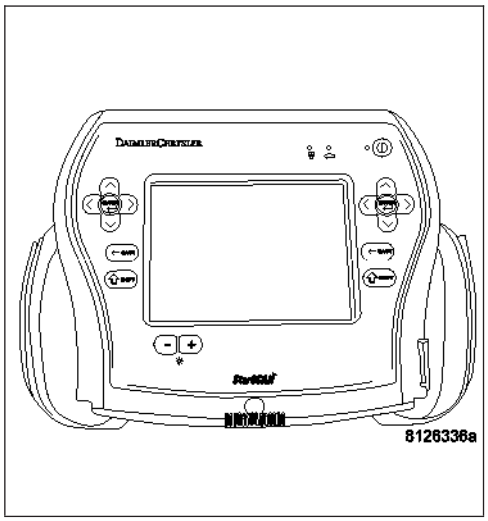
1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.
With the scan tool, read Amplifier DTCs.

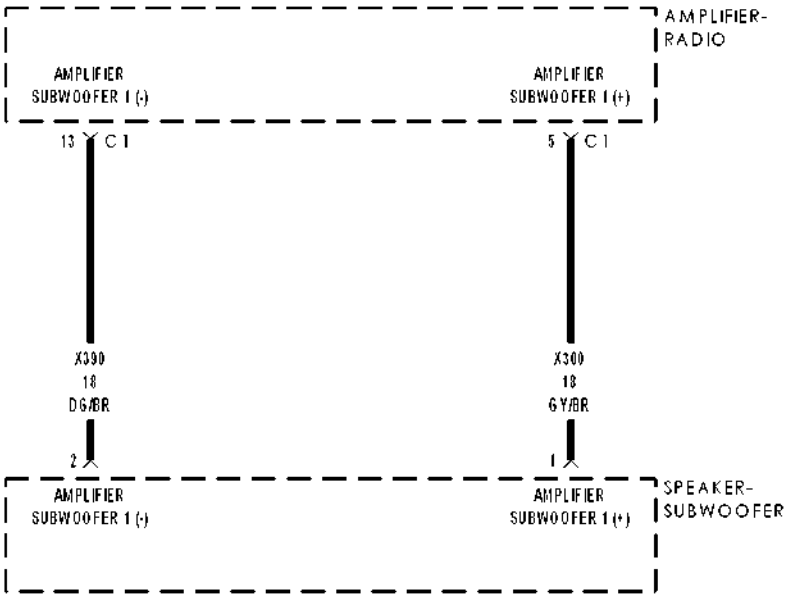
Does the scan tool display active: B147E-CHANNEL 7 AUDIO SPEAKER OUTPUT CIRCUIT PERFORMANCE?

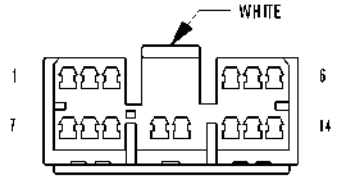
Yes >> Replace the Amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

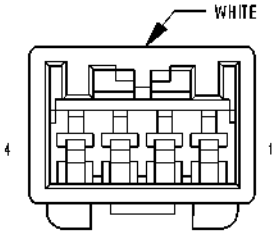


B147F-CHANNEL 7 AUDIO SPEAKER OUTPUT CIRCUIT LOW





AMPLIFIER-
RADIO C1



SPEAKER-SUBWOOFER
(PREMIUM)

8l3cf020

B147F-CHANNEL 7 AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Amplifier detects a shorted to ground condition on the speaker output circuit.

Possible Causes
(X300) AMPLIFIED SUBWOOFER 1(+) CIRCUIT SHORTED TO GROUND
(X390) AMPLIFIED SUBWOOFER 1 (-) CIRCUIT SHORTED TO GROUND
SUBWOOFER
AMPLIFIER

Diagnostic Test

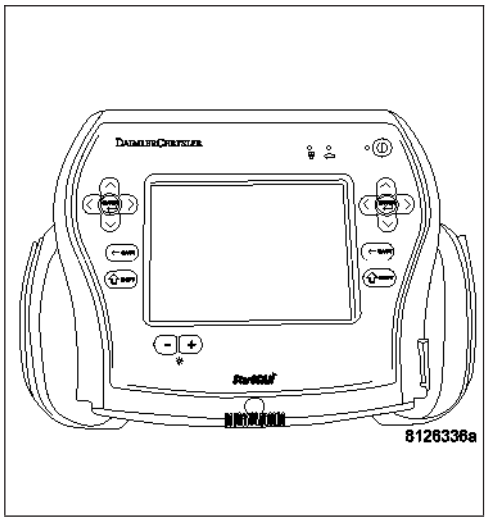
1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.
With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B147F-CHANNEL 7 AUDIO SPEAKER OUTPUT CIRCUIT LOW?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.



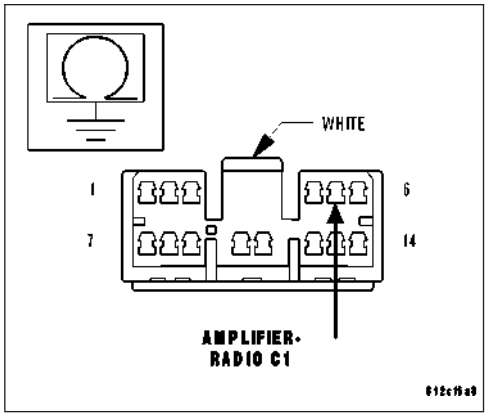
2. CHECK THE (X300) AMPLIFIED SUBWOOFER 1 (+) CIRCUIT FOR A SHORT TO GROUND

Disconnect the Amplifier C1 harness connector.
Measure the resistance between ground and the (X300) Amplified Subwoofer 1 (+) circuit.

Is the resistance below 10K ohms?

Yes >> Repair the (X300) Amplified Subwoofer 1 (+) circuit for a short to ground.
Perform BODY VERIFICATION TEST VER-1.

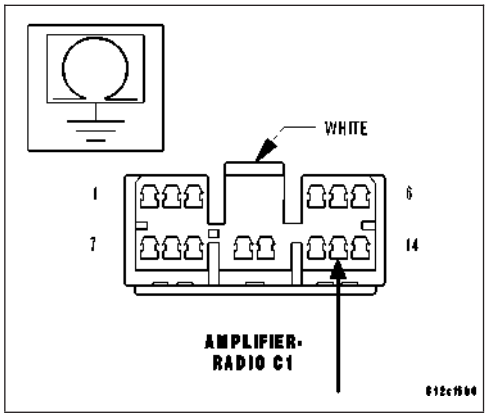
No >> Go To 3



B147F-CHANNEL 7 AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)

3. CHECK THE (X390) AMPLIFIED SUBWOOFER 1 (-) CIRCUIT FOR A SHORT TO GROUND

Measure the resistance between ground and the (X390) Amplified Subwoofer 1 (-) circuit.



Is the resistance below 10K ohms?

Yes >> Repair the (X390) Amplified Subwoofer 1 (-) for a short to ground.
Perform BODY VERIFICATION TEST VER-1.

No >> Go To 4

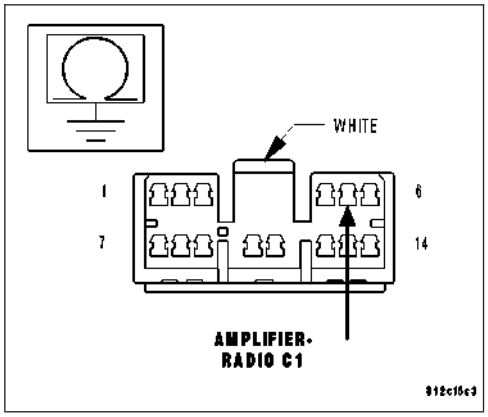
---

4. CHECK OPERATION OF THE AMPLIFIED SUBWOOFER

Turn the ignition off.

Reconnect the Subwoofer harness connector.

Measure the resistance of the speaker circuit between the Amplifier C1 harness connector and ground..

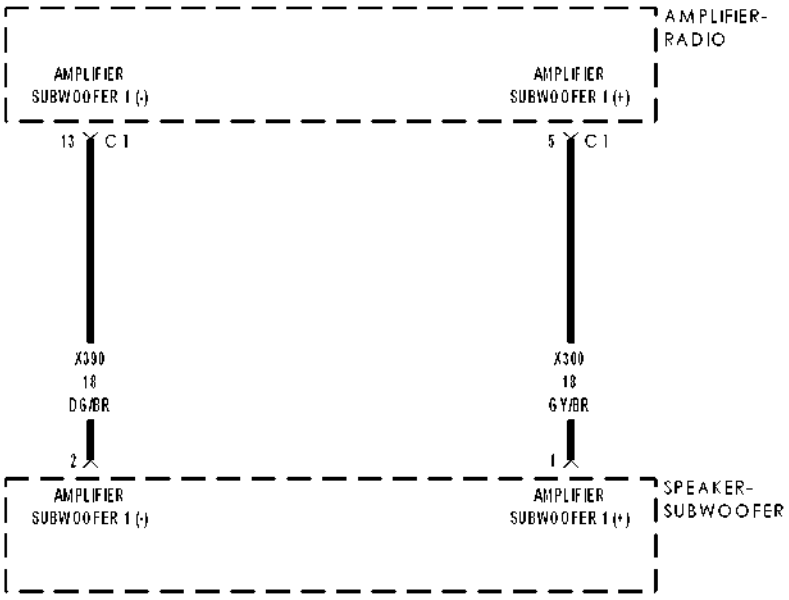


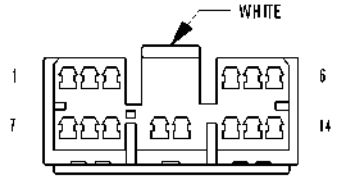
Is the resistance below 10K ohms?

Yes >> Replace the Subwoofer 1 in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

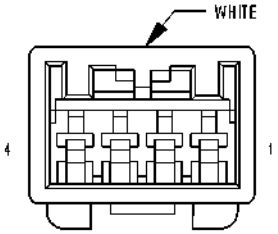
No >> Replace the Amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

B1480-CHANNEL 7 AUDIO SPEAKER OUTPUT CIRCUIT HIGH





AMPLIFIER-
RADIO C1



SPEAKER-SUBWOOFER
(PREMIUM)

8a1cdf020

B1480-CHANNEL 7 AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Amplifier detects a short to battery condition on the output circuit.

Possible Causes
(X300) AMPLIFIED SUBWOOFER 1 (+) CIRCUIT SHORT TO VOLTAGE
(X390) AMPLIFIED SUBWOOFER 1 (-) CIRCUIT SHORT TO VOLTAGE
AMPLIFIER

Diagnostic Test

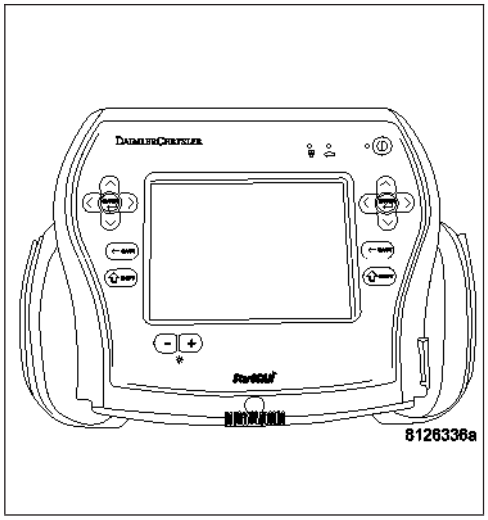
1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.
With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B1480-CHANNEL 7 AUDIO SPEAKER OUTPUT CIRCUIT HIGH?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.



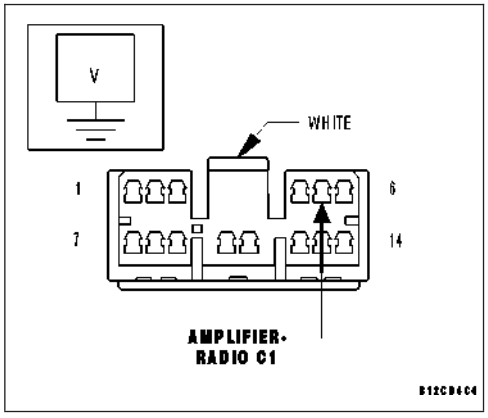
2. CHECK FOR VOLTAGE ON THE (X300) AMPLIFIED SUBWOOFER 1 (+) CIRCUIT

Turn the ignition off.
Disconnect the Amplifier C1 harness connector.
Disconnect the Amplified Subwoofer 1 harness connector.
Turn the ignition on.
Measure for voltage on the (X300) Amplified Subwoofer 1 (+) circuit.

Is the voltage above 10.0 volts?

Yes >> Repair the (X300) Amplified Subwoofer 1 (+) circuit for a short to voltage.
Perform BODY VERIFICATION TEST VER-1.

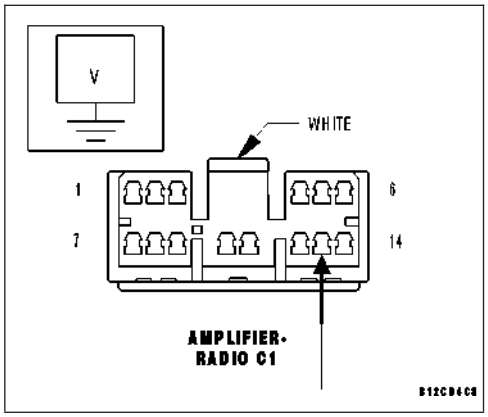
No >> Go To 3



B1480-CHANNEL 7 AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)

3. CHECK FOR VOLTAGE ON THE (X390) AMPLIFIED SUBWOOFER 1 (-) CIRCUIT

Measure for voltage on the (X390) Amplified Subwoofer 1 (-) circuit.

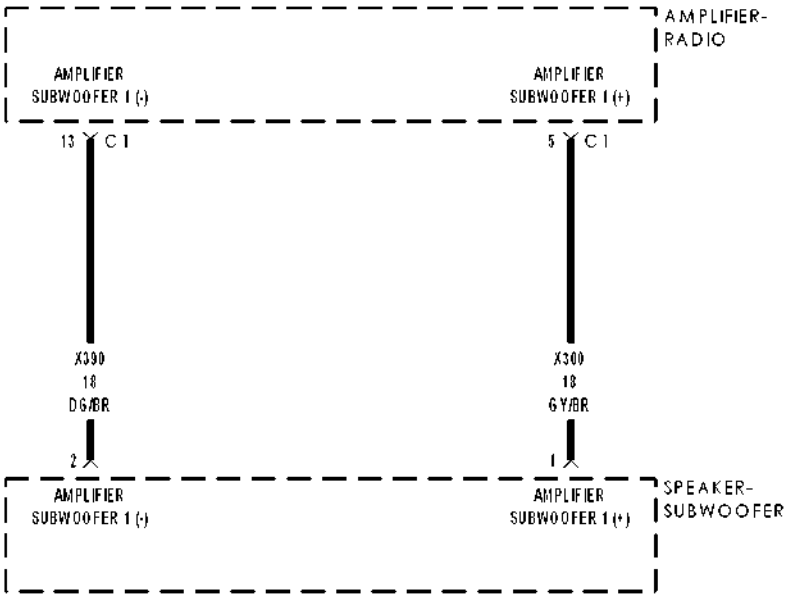


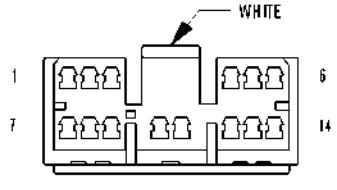
Is the voltage above 10.0 volts?

Yes >> Repair the (X390) Amplified Subwoofer 1 (-) circuit for a short to voltage.
Perform BODY VERIFICATION TEST VER-1.

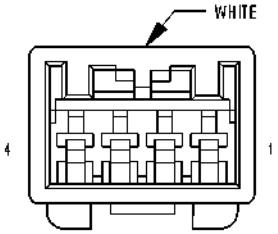
No >> Replace the Amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

B1481-CHANNEL 7 AUDIO SPEAKER OUTPUT CIRCUIT OPEN





AMPLIFIER-
RADIO C1



SPEAKER-SUBWOOFER
(PREMIUM)

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B1481-CHANNEL 7 AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

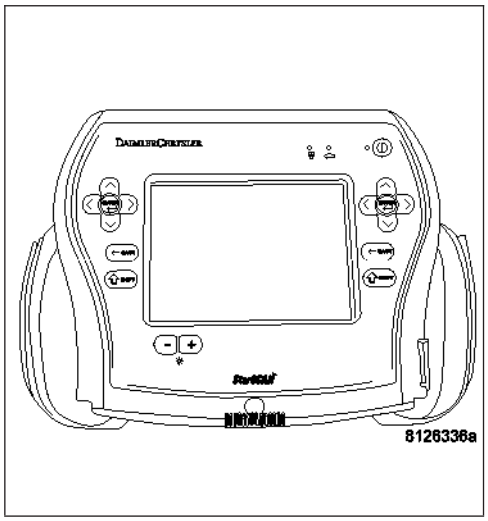
- **When Monitored:**
  Amplifier Bus wake-up. Amplifier reset with scan tool.
- **Set Condition:**
  The Amplifier detects an open condition on the speaker output circuit.

Possible Causes
(X300) AMPLIFIED SUBWOOFER 1 (+) CIRCUIT OPEN
(X299) AMPLIFIED SUBWOOFER 1 (-) CIRCUIT OPEN
SUBWOOFER
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on.
Turn the radio on.
With the scan tool, erase Amplifier DTCs.
With the scan tool, reset the amplifier.
With the scan tool, read Amplifier DTCs.



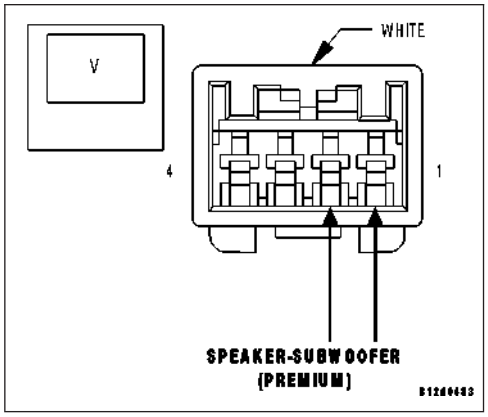
Does the scan tool display active: B1481-CHANNEL 7 AUDIO SPEAKER OUTPUT CIRCUIT OPEN?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

2. CHECK THE OPERATION OF THE SUBWOOFER

Disconnect the Subwoofer harness connector.
Turn the radio on and turn the volume to mid level.
With a voltmeter set to read in A/C voltage, measure the voltage of the Amplified Subwoofer 1 circuits in the Amplified Subwoofer harness connector.



Is the voltage present greater than 1 volt?

Yes >> Replace the Amplified Subwoofer in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

No >> Go To 3

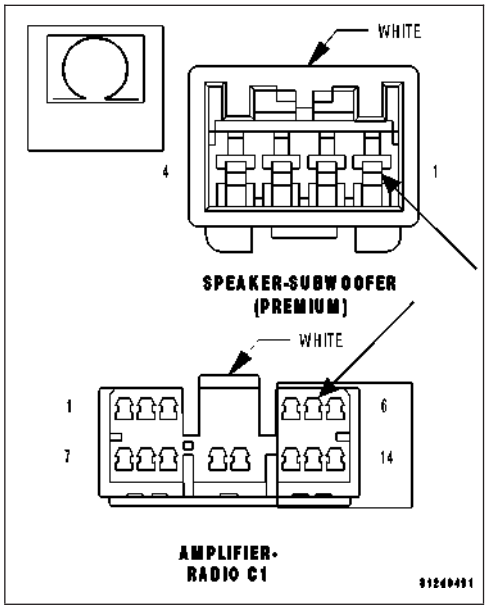
B1481-CHANNEL 7 AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)

3. CHECK THE (X300) AMPLIFIED SUBWOOFER 1 (+) CIRCUIT FOR AN OPEN

Turn the ignition off.

Disconnect the Amplifier C1 harness connector.

Measure the resistance of the (X300) Amplified Subwoofer 1 (+) circuit between the Amplifier C1 harness connector and the Amplified Subwoofer harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go To 4

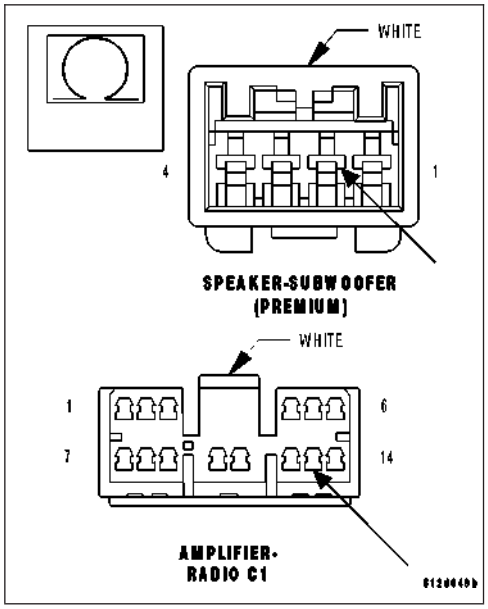
No >> Repair the (X300) Amplified Subwoofer 1 (+) circuit for an open.
Perform BODY VERIFICATION TEST VER-1.

4. CHECK THE (X390) AMPLIFIED SUBWOOFER 1 (-) CIRCUIT FOR AN OPEN

Turn the ignition off.

Disconnect the Amplifier C1 harness connector.

Measure the resistance of the (X390) Amplified Subwoofer 1 (-) circuit between the Amplifier C1 harness connector and the Amplified Subwoofer harness connector.

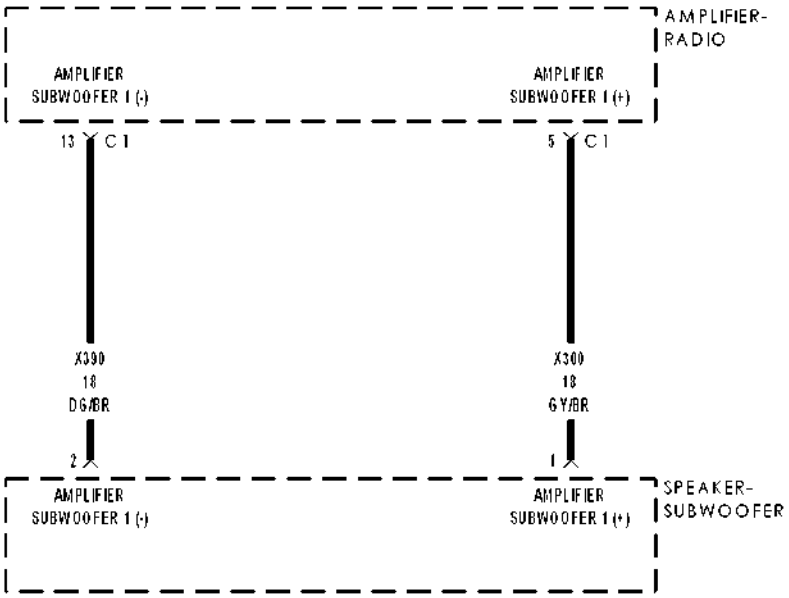


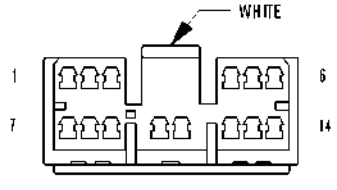
Is the resistance below 5.0 ohms?

Yes >> Replace the Amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

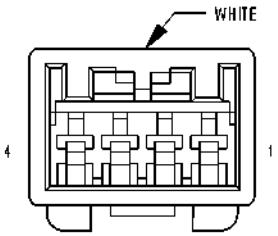
No >> Repair the (X390) Amplified Subwoofer 1 (-) circuit for an open.
Perform BODY VERIFICATION TEST VER-1.

B1482-CHANNEL 7 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER





AMPLIFIER-
RADIO C1



SPEAKER-SUBWOOFER
(PREMIUM)

8ADaf020

B1482-CHANNEL 7 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER (CONTINUED)

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

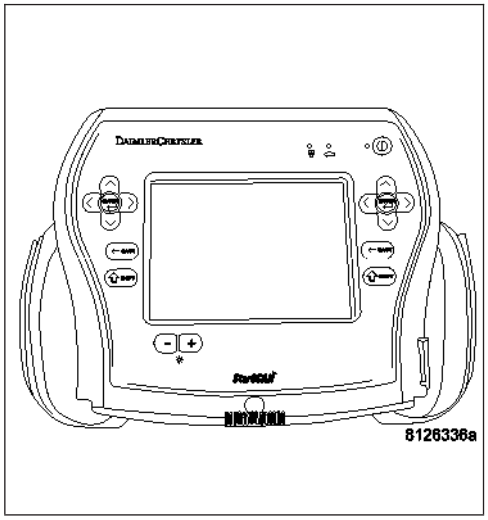
- **When Monitored:**
  With the ignition on. Radio volume at 25 or higher.
- **Set Condition:**
  The amplifier detects that the output circuits are shorted together.

Possible Causes
(X300) AMPLIFIED SUBWOOFER 1 (+) CIRCUIT SHORTED TO THE (X390) AMPLIFIED SUBWOOFER 1 (-) CIRCUIT
AMPLIFIED SUBWOOFER 1
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.
With the scan tool, erase Amplifier DTCs.
Turn the radio on.
Turn the volume level to 25.
With the scan tool, read Amplifier DTCs.



Does the scan tool display active: B1482-CHANNEL 7 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

---

2. CHECK THE OPERATION OF THE AMPLIFIED SUBWOOFER 1

Disconnect the Amplified Subwoofer 1.
Measure the resistance of the speaker between the two terminals.

Is the resistance of the speaker less than 1 ohm?

Yes >> Replace the Amplified Subwoofer 1 in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

No >> Go To 3

B1482-CHANNEL 7 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER (CONTINUED)

3. CHECK THE (X300) AMPLIFIED SUBWOOFER 1 (+) CIRCUIT, AND THE (X390) AMPLIFIED SUBWOOFER 1 (-) CIRCUITS FOR A SHORT TOGETHER

Turn the ignition off.

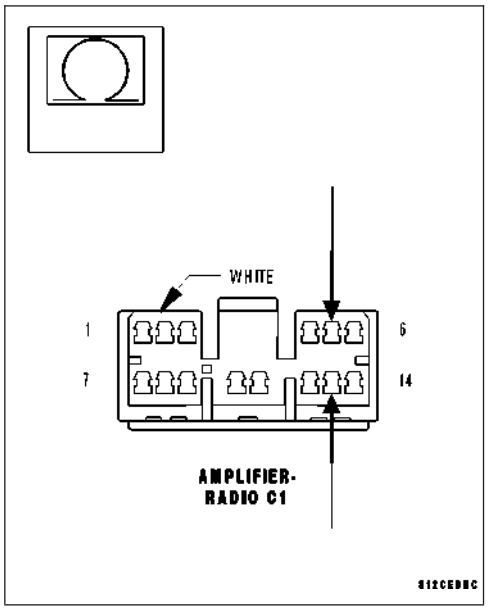
Disconnect the Amplifier C1 harness connector.

Measure the resistance between the (X300) Amplified Subwoofer 1 (+) circuit, and the (X390) Amplified Subwoofer 1 (-) circuit.

Is the resistance below 10K ohms?

Yes >> Repair the (X300) Amplified Subwoofer 1 (+) circuit, and the (X390) Amplified Subwoofer 1 (-) circuit for a short together.
Perform BODY VERIFICATION TEST VER-1.

No >> Replace the Amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.



B1483-CHANNEL 8 AUDIO SPEAKER OUTPUT CIRCUIT PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

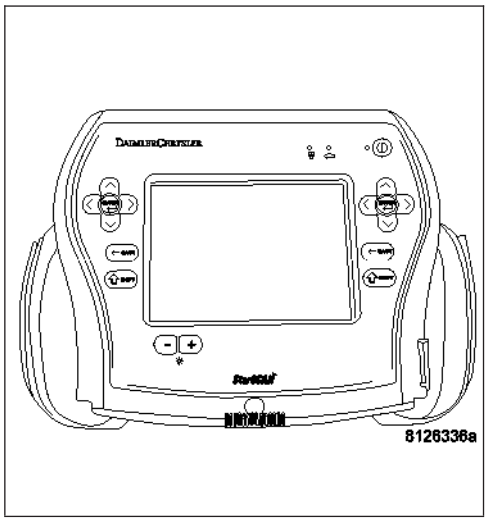
- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  This DTC will set if a DC offset occurs on the output channel, the amplifier shall set a DTC after a maturity rate of 5 ±1 sec.

Possible Causes
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.
With the scan tool, read Amplifier DTCs.

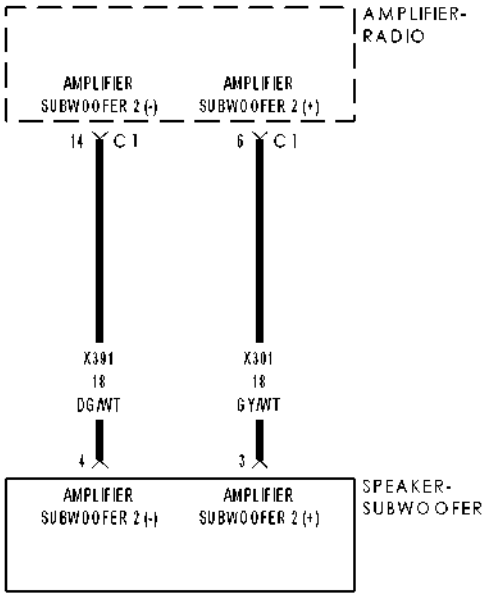


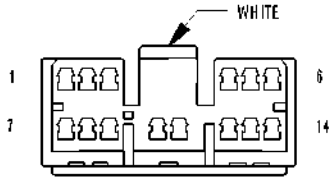
Does the scan tool display active: B1483-CHANNEL 8 AUDIO SPEAKER OUTPUT CIRCUIT PERFORMANCE?

Yes >> Replace the Amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

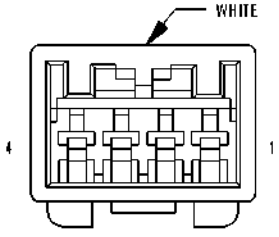
No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

B1484-CHANNEL 8 AUDIO SPEAKER OUTPUT CIRCUIT LOW





AMPLIFIER-
RADIO C1



SPEAKER-SUBWOOFER
(PREMIUM)

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B1484-CHANNEL 8 AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Amplifier detects a shorted to ground condition on the speaker output circuit.

Possible Causes
(X301) AMPLIFIED SUBWOOFER 2 (+) CIRCUIT SHORTED TO GROUND
(X391) AMPLIFIED SUBWOOFER 2 (-) CIRCUIT SHORTED TO GROUND
SUBWOOFER
AMPLIFIER

Diagnostic Test

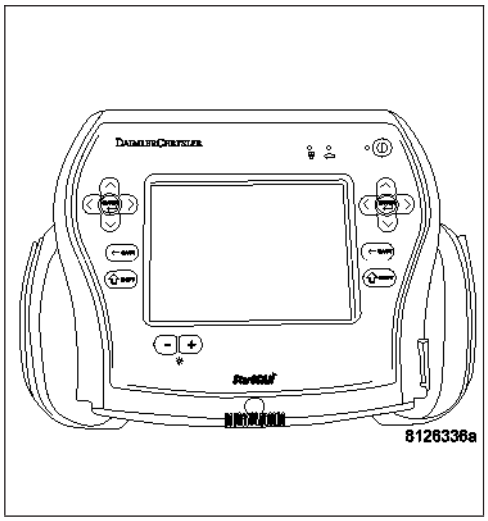
1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.
With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B1484-CHANNEL 8 AUDIO SPEAKER OUTPUT CIRCUIT LOW?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.



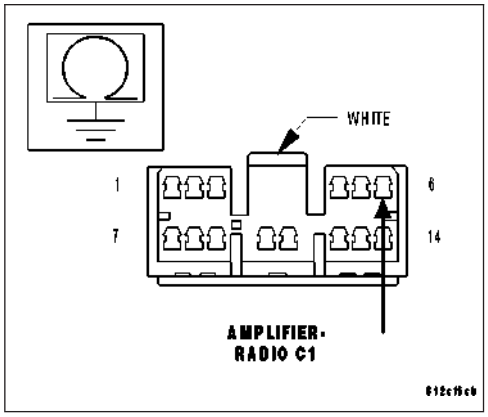
2. CHECK THE (X301) AMPLIFIED SUBWOOFER 2 (+) CIRCUIT FOR A SHORT TO GROUND

Disconnect the Amplifier C1 harness connector.
Measure the resistance between ground and the (X301) Amplified Subwoofer 2 (+) circuit.

Is the resistance below 10K ohms?

Yes >> Repair the (X301) Amplified Subwoofer 2 (+) circuit for a short to ground.
Perform BODY VERIFICATION TEST VER-1.

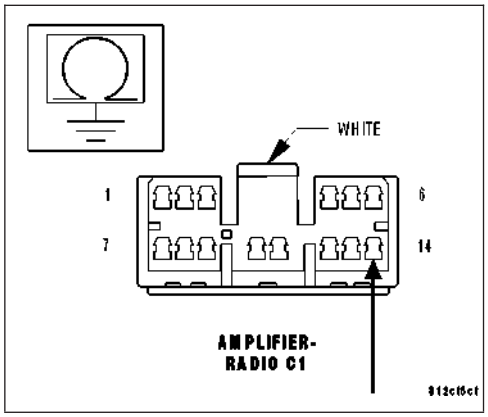
No >> Go To 3



B1484-CHANNEL 8 AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)

3. CHECK THE (X391) AMPLIFIED SUBWOOFER 2 (-) CIRCUIT FOR A SHORT TO GROUND

Measure the resistance between ground and the (X391) Amplified Subwoofer 2 (-) circuit.



Is the resistance below 10K ohms?

Yes >> Repair the (X391) Amplified Subwoofer 2 (-) for a short to ground.
Perform BODY VERIFICATION TEST VER-1.

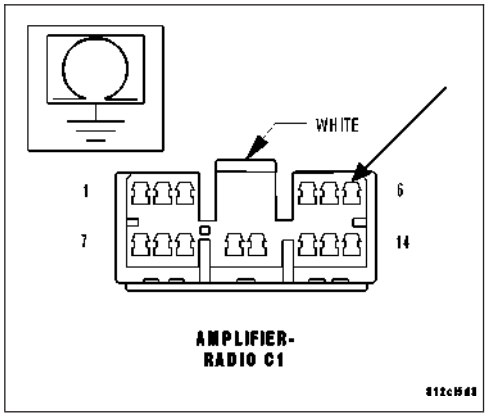
No >> Go To 4

4. CHECK OPERATION OF THE AMPLIFIED SUBWOOFER

Turn the ignition off.

Reconnect the Subwoofer harness connector.

Measure the resistance of the speaker circuit between the Amplifier C1 harness connector and ground..

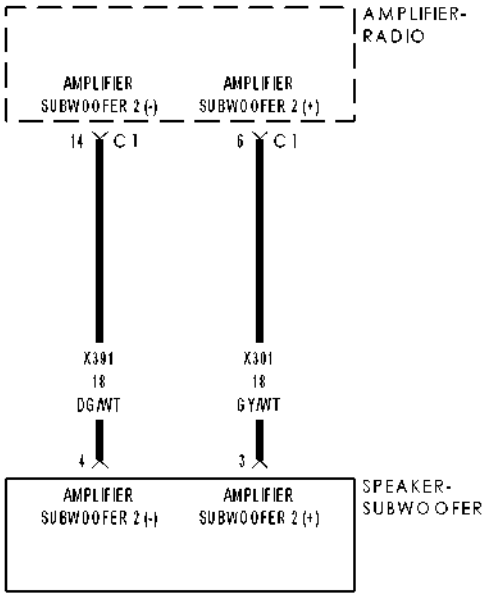


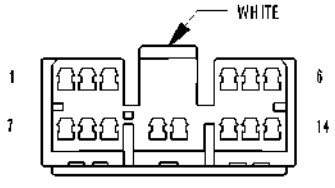
Is the resistance below 10K ohms?

Yes >> Replace the Subwoofer in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

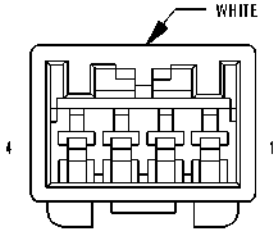
No >> Replace the Amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

B1485-CHANNEL 8 AUDIO SPEAKER OUTPUT CIRCUIT HIGH





AMPLIFIER-
RADIO C1



SPEAKER-SUBWOOFER
(PREMIUM)

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B1485-CHANNEL 8 AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Amplifier detects a short to battery condition on the output circuit.

Possible Causes
(X301) AMPLIFIED SUBWOOFER 2 (+) CIRCUIT SHORT TO VOLTAGE
(X391) AMPLIFIED SUBWOOFER 2 (-) CIRCUIT SHORT TO VOLTAGE
AMPLIFIER

Diagnostic Test

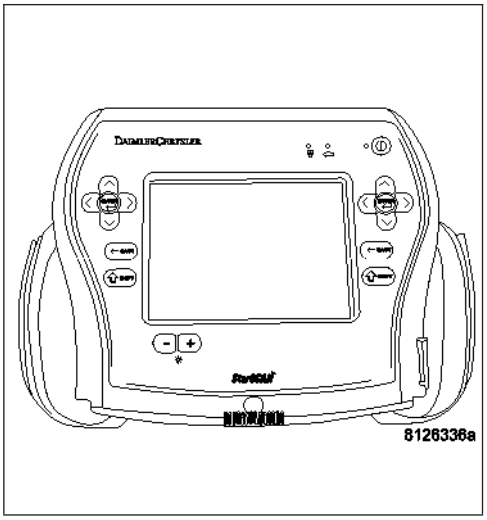
1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.
With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B1485-CHANNEL 8 AUDIO SPEAKER OUTPUT CIRCUIT HIGH?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.



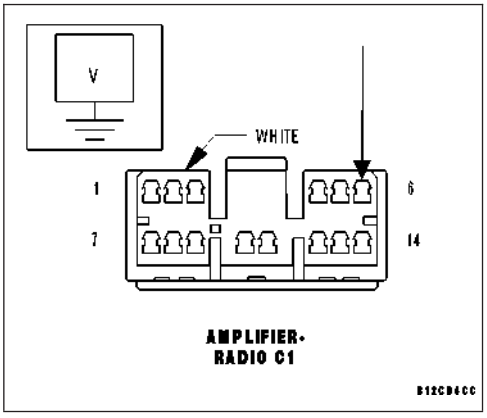
2. CHECK FOR VOLTAGE ON THE (X301) AMPLIFIED SUBWOOFER 2 (+) CIRCUIT

Turn the ignition off.
Disconnect the Amplifier C1 harness connector.
Disconnect the Amplified Subwoofer 2 harness connector.
Turn the ignition on.
Measure for voltage on the (X301) Amplified Subwoofer 2 (+) circuit.

Is the voltage above 10.0 volts?

Yes >> Repair the (X301) Amplified Subwoofer 2 (+) circuit for a short to voltage.
Perform BODY VERIFICATION TEST VER-1.

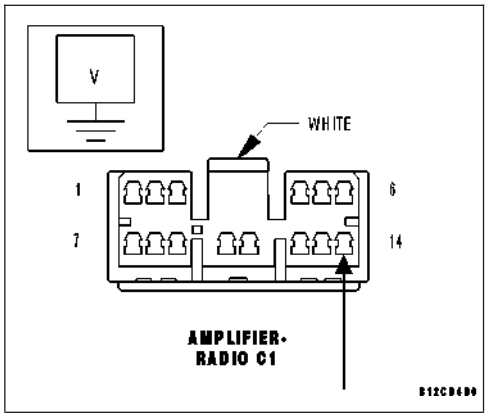
No >> Go To 3



B1485-CHANNEL 8 AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)

3. CHECK FOR VOLTAGE ON THE (X391) AMPLIFIED SUBWOOFER 2 (-) CIRCUIT

Measure for voltage on the (X391) Amplified Subwoofer 2 (-) circuit.

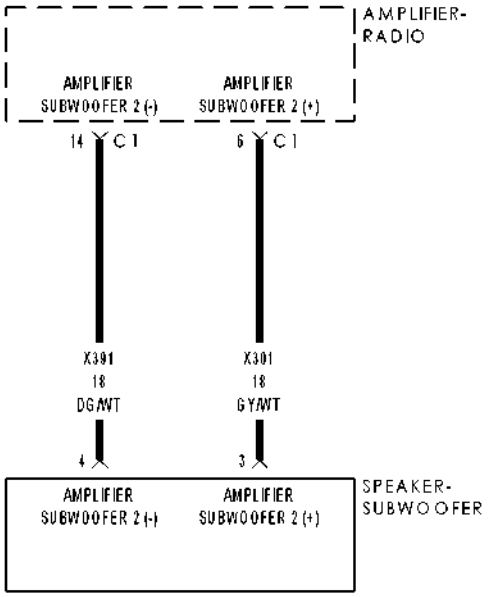


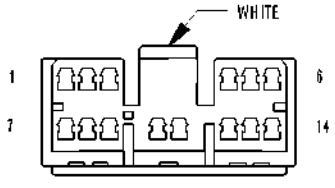
Is the voltage above 10.0 volts?

Yes >> Repair the (X391) Amplified Subwoofer 2 (-) circuit for a short to voltage.
Perform BODY VERIFICATION TEST VER-1.

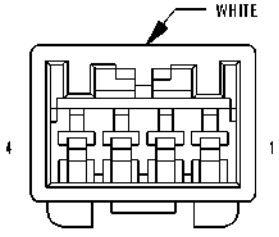
No >> Replace the Amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

B1486-CHANNEL 8 AUDIO SPEAKER OUTPUT CIRCUIT OPEN





AMPLIFIER-
RADIO C1



SPEAKER-SUBWOOFER
(PREMIUM)

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B1486-CHANNEL 8 AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

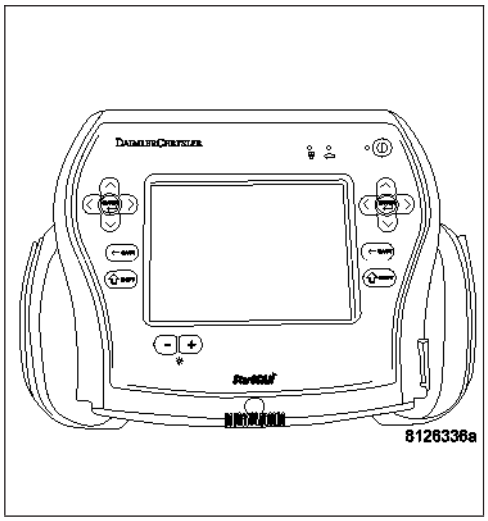
- **When Monitored:**
  Amplifier Bus wake-up. Amplifier reset with scan tool.
- **Set Condition:**
  The Amplifier detects an open condition on the speaker output circuit.

Possible Causes
(X301) AMPLIFIED SUBWOOFER 2 (+) CIRCUIT OPEN
(X391) AMPLIFIED SUBWOOFER 2 (-) CIRCUIT OPEN
SUBWOOFER
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on.
Turn the radio on.
With the scan tool, erase Amplifier DTCs.
With the scan tool, reset the amplifier.
With the scan tool, read Amplifier DTCs.



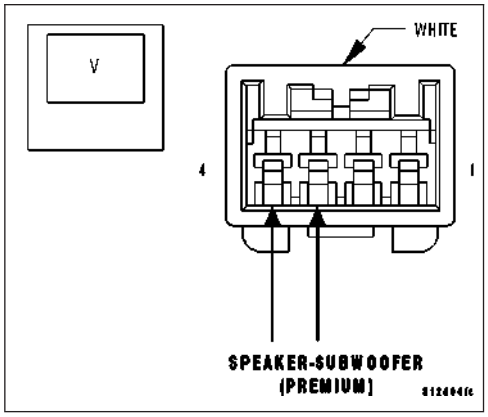
Does the scan tool display active: B1486-CHANNEL 8 AUDIO SPEAKER OUTPUT CIRCUIT OPEN?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

2. CHECK THE OPERATION OF THE SUBWOOFER

Disconnect the Subwoofer harness connector.
Turn the radio on and turn the volume to mid level.
With a voltmeter set to read in A/C voltage, measure the voltage of the Amplified Subwoofer 2 circuits in the Amplified Subwoofer harness connector.



Is the voltage present greater than 1 volt?

Yes >> Replace the Amplified Subwoofer in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

No >> Go To 3

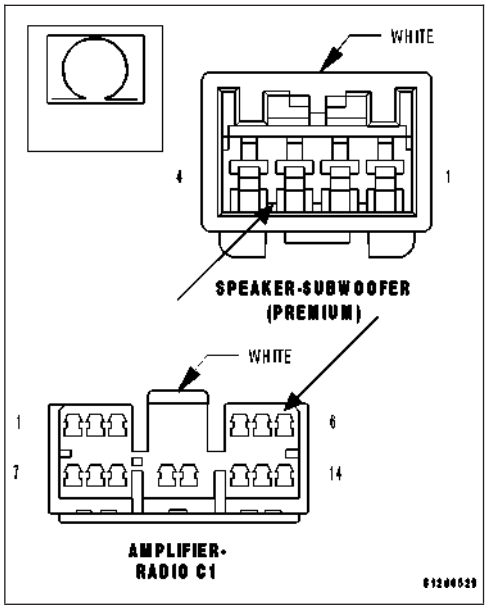
B1486-CHANNEL 8 AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)

3. CHECK THE (X301) AMPLIFIED SUBWOOFER 2 (+) CIRCUIT FOR AN OPEN

Turn the ignition off.

Disconnect the Amplifier C1 harness connector.

Measure the resistance of the (X301) Amplified Subwoofer 2 (+) circuit between the Amplifier C1 harness connector and the Amplified Subwoofer harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go To 4

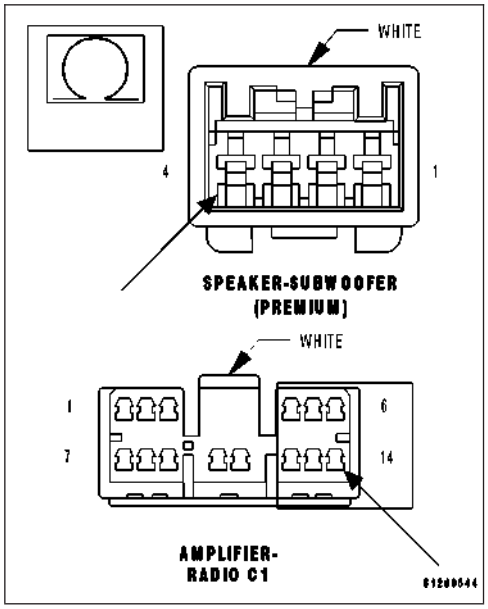
No >> Repair the (X301) Amplified Subwoofer 2 (+) circuit for an open.
Perform BODY VERIFICATION TEST VER-1.

4. CHECK THE (X391) AMPLIFIED SUBWOOFER 2 (-) CIRCUIT FOR AN OPEN

Turn the ignition off.

Disconnect the Amplifier C1 harness connector.

Measure the resistance of the (X391) Amplified Subwoofer 2 (-) circuit between the Amplifier C1 harness connector and the Amplified Subwoofer harness connector.

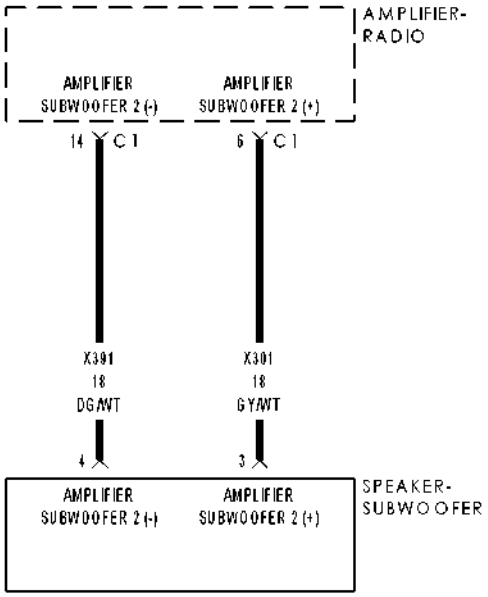


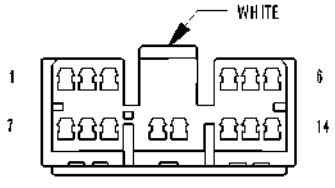
Is the resistance below 5.0 ohms?

Yes >> Replace the Amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

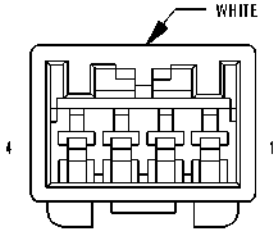
No >> Repair the (X391) Amplified Subwoofer 2 (-) circuit for an open.
Perform BODY VERIFICATION TEST VER-1.

B1487-CHANNEL 8 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER





AMPLIFIER-
RADIO C1



SPEAKER-SUBWOOFER
(PREMIUM)

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B1487-CHANNEL 8 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER (CONTINUED)

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

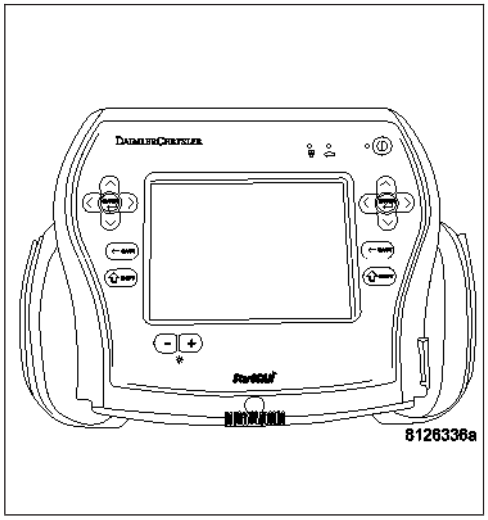
- **When Monitored:**
  With the ignition on. Radio volume at 25 or higher.
- **Set Condition:**
  The amplifier detects that the output circuits are shorted together.

Possible Causes
(X301) AMPLIFIED SUBWOOFER 2 (+) CIRCUIT SHORTED TO THE (X391) AMPLIFIED SUBWOOFER 2 (-) CIRCUIT
AMPLIFIED SUBWOOFER 2
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.
With the scan tool, erase Amplifier DTCs.
Turn the radio on.
Turn the volume level to 25.
With the scan tool, read Amplifier DTCs.



Does the scan tool display active: B1487-CHANNEL 8 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST VER-1.

---

2. CHECK THE OPERATION OF THE AMPLIFIED SUBWOOFER 2

Disconnect the Amplified Subwoofer 2.
Measure the resistance of the speaker between the two terminals.

Is the resistance of the speaker less than 1 ohm?

Yes >> Replace the Amplified Subwoofer in accordance with the service information.
Perform BODY VERIFICATION TEST VER-1.

No >> Go To 3

B1487-CHANNEL 8 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER (CONTINUED)

3. CHECK THE (X301) AMPLIFIED SUBWOOFER 2 (+) CIRCUIT, AND THE (X391) AMPLIFIED SUBWOOFER 2 (-) CIRCUITS FOR A SHORT TOGETHER

Turn the ignition off.

Disconnect the Amplifier C1 harness connector.

Measure the resistance between the (X301) Amplified Subwoofer 2 (+) circuit, and the (X391) Amplified Subwoofer 2 (-) circuit.

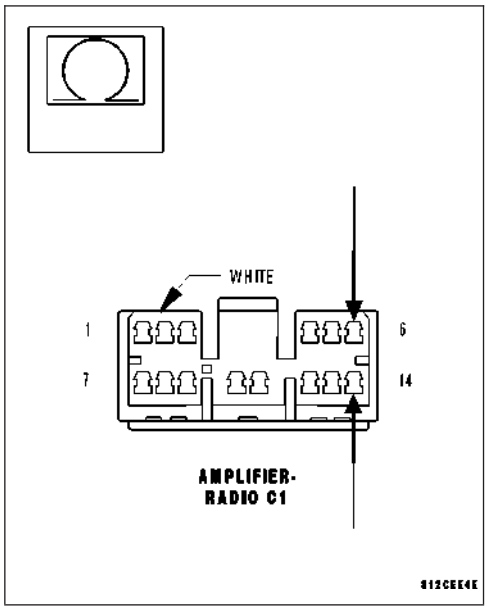
Is the resistance below 10K ohms?

Yes >> Repair the (X301) Amplified Subwoofer 2 (+) circuit, and the (X391) Amplified Subwoofer 2 (-) circuit for a short together.

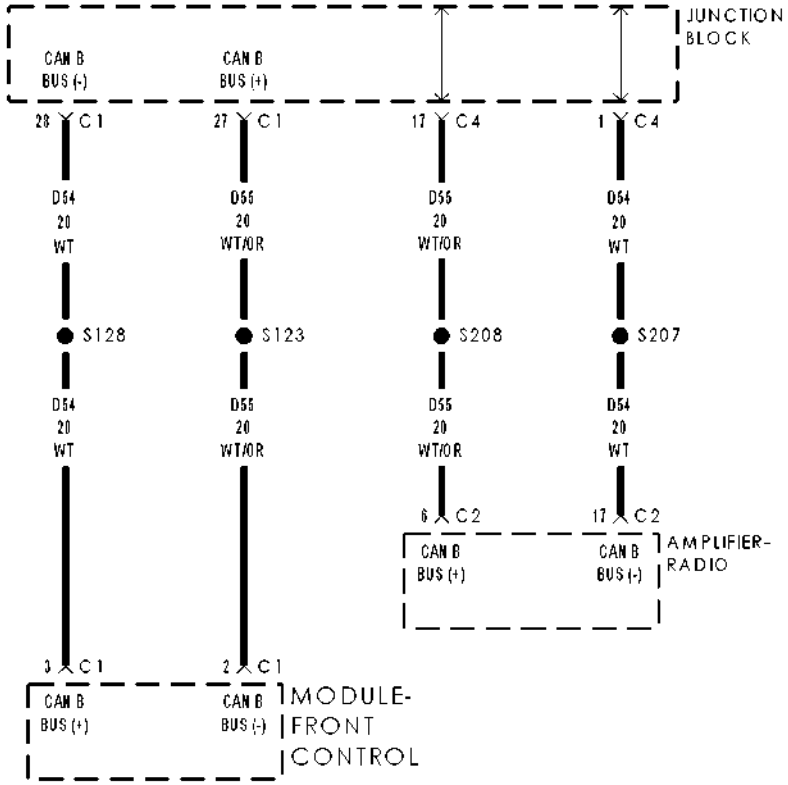
Perform BODY VERIFICATION TEST VER-1.

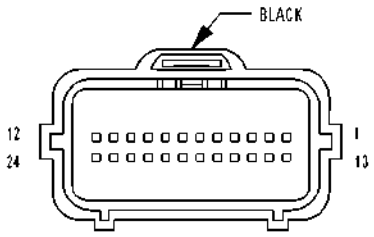
No >> Replace the Amplifier in accordance with the service information.

Perform BODY VERIFICATION TEST VER-1.

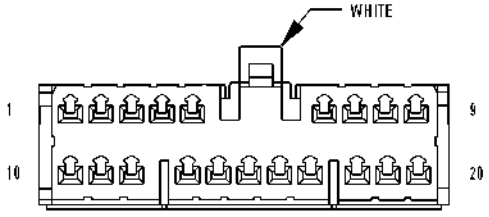


U0019–CAN B BUS





MODULE-FRONT CONTROL C1



AMPLIFIER-RADIO C2 (EXCEPT SUBWOOFER)

U0019–CAN B BUS (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

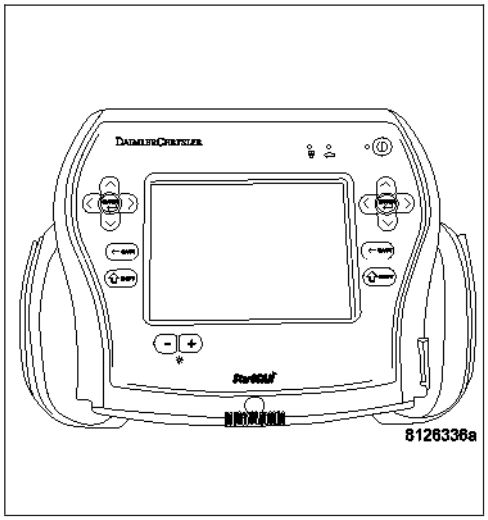
- **When Monitored:**
  Continuously.
- **Set Condition:**
  Whenever the Can B Bus (+) or B Bus (–) circuit is open, shorted to voltage or shorted to ground, this code will set.

Possible Causes
CAN B BUS DTCs IN FRONT CONTROL MODULE
(D54) CAN B BUS (–) CIRCUIT OPEN
(D55) CAN B BUS (+) CIRCUIT OPEN
AMPLIFIER

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase DTCs
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read DTCs.



Does the scan tool display U0019–CAN B BUS CIRCUIT?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST - VER 1.

---

2. CHECK FRONT CONTROL MODULE DTCs

With the scan tool, read Front Control Module DTCs

Does the scan tool display any CAN B BUS DTCs – ACTIVE?

Yes >> Refer to the symptom list for problems related to Communication in the ELECTRICAL.– ELECTRONIC CONTROL MODULES – ELECTRICAL DIAGNOSES section.

No >> Go to 3

U0019–CAN B BUS (CONTINUED)

3. CAN B BUS (+) CIRCUIT OPEN

Turn the ignition off.

Disconnect the Amplifier harness connector.

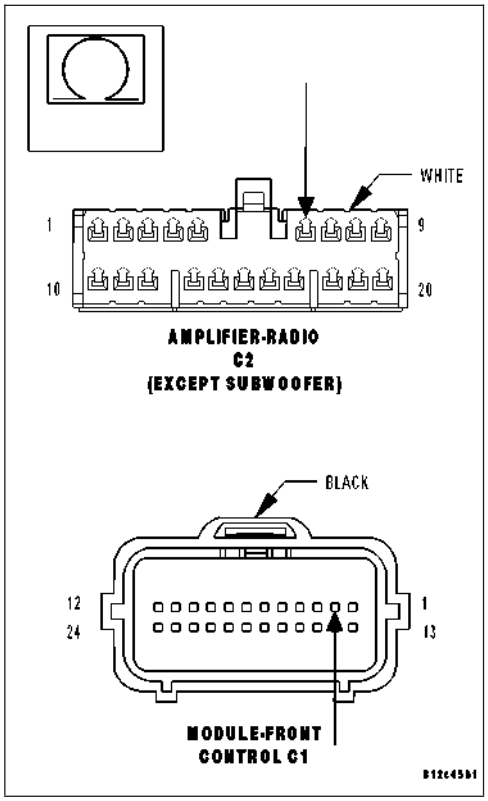
Disconnect the Front Control Module C1 harness connector.

Measure the resistance of the (D55) Can B Bus (+) circuit between the Front Control Module C1 harness connector and the Amplifier harness connector.

Is the resistance below 2.0 ohms?

Yes >> Go To 4
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the Can B Bus (+) circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.



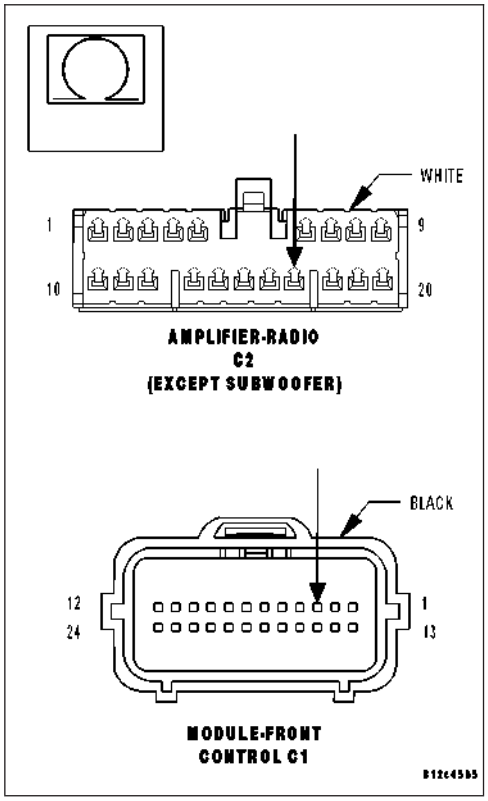
4. CAN B BUS (–) CIRCUIT OPEN

Measure the resistance of the (D54) Can B Bus (–) circuit between the Front Control Module C1 harness connector and the Amplifier harness connector.

Is the resistance below 2.0 ohms?

Yes >> Replace the Amplifier in accordance with the service information..
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the Can B Bus (–) circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

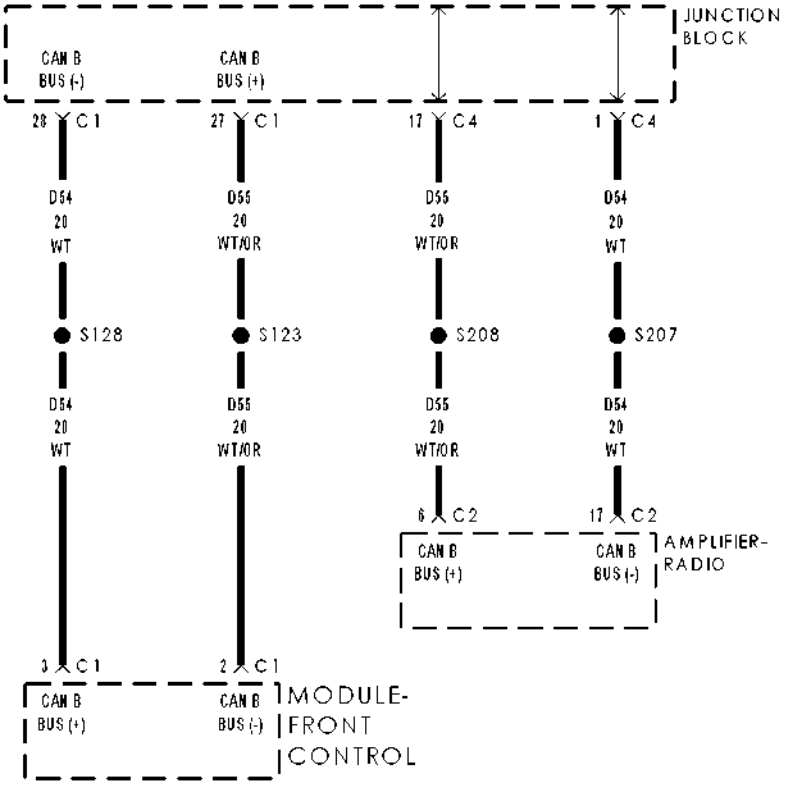


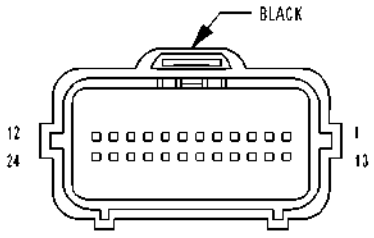
U0020-CAN B BUS OFF PERFORMANCE

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

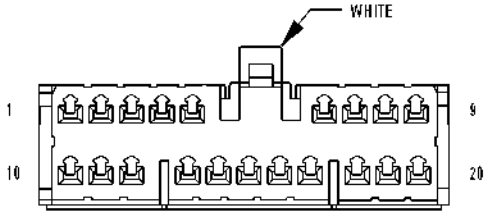
For a complete wiring diagram **Refer to Section 8W**.

U0020-CAN B BUS OFF PERFORMANCE (CONTINUED)





MODULE-FRONT CONTROL C1



AMPLIFIER-RADIO
C2
(EXCEPT SUBWOOFER)

U0020-CAN B BUS OFF PERFORMANCE (CONTINUED)

- **When Monitored:**
  Continuously.
- **Set Condition:**
  Whenever the Can B Bus (+) or B Bus (–) circuit is open, shorted to voltage or shorted to ground, this code will set.

Possible Causes
CAN B BUS DTCs IN FRONT CONTROL MODULE
(D54) CAN B BUS (–) CIRCUIT OPEN
(D55) CAN B BUS (+) CIRCUIT OPEN
AMPLIFIER

Diagnostic Test

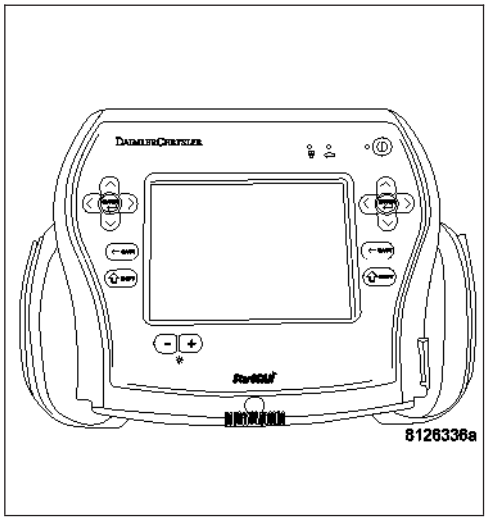
1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase DTCs
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read DTCs.

Does the scan tool display U0020-CAN B BUS OFF PERFORMANCE?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST - VER 1.



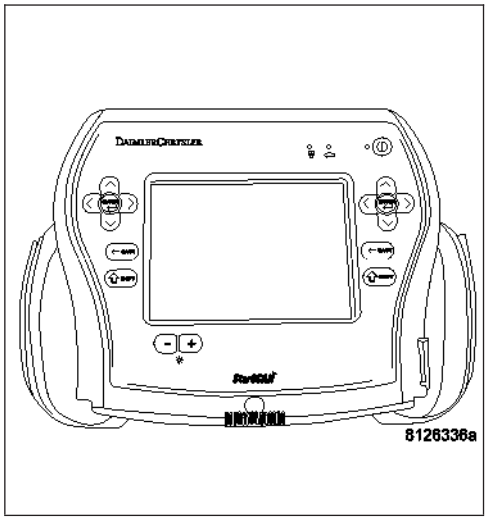
2. CHECK FRONT CONTROL MODULE DTCs

With the scan tool, read Front Control Module DTCs

Does the scan tool display any CAN B BUS DTCs – ACTIVE?

Yes >> Refer to the symptom list for problems related to Communication in the ELECTRICAL.– ELECTRONIC CONTROL MODULES – ELECTRICAL DIAGNOSES section.

No >> Go to 3



U0020-CAN B BUS OFF PERFORMANCE (CONTINUED)

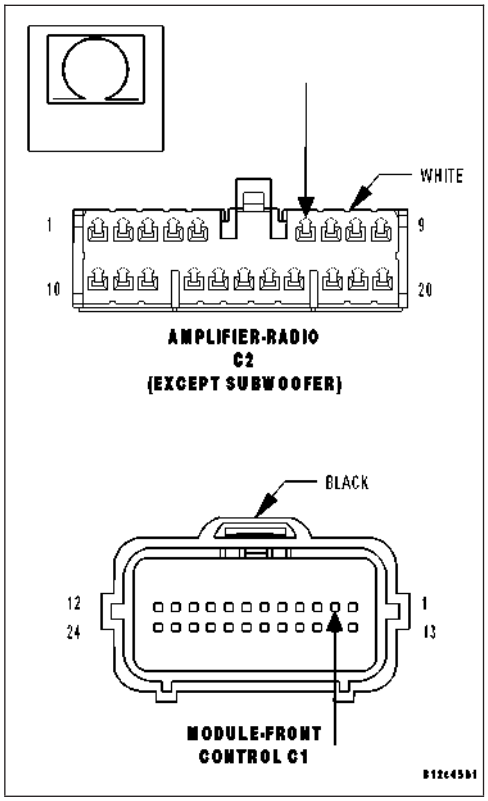
3. CAN B BUS (+) CIRCUIT OPEN

Turn the ignition off.

Disconnect the Amplifier harness connector.

Disconnect the Front Control Module C1 harness connector.

Measure the resistance of the (D55) Can B Bus (+) circuit between the Front Control Module C1 harness connector and the Amplifier harness connector.



Is the resistance below 2.0 ohms?

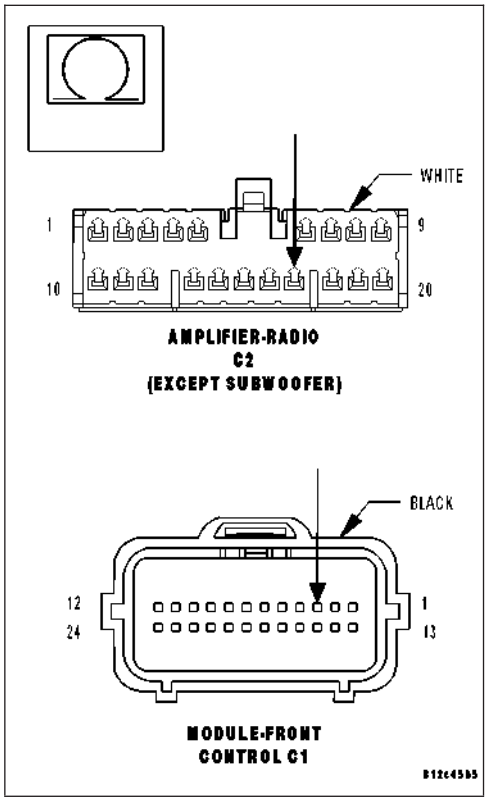
Yes >> Go To 4
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the Can B Bus (+) circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

U0020-CAN B BUS OFF PERFORMANCE (CONTINUED)

4. CAN B BUS (–) CIRCUIT OPEN

Measure the resistance of the (D54) Can B Bus (–) circuit between the Front Control Module C1 harness connector and the Amplifier harness connector.



Is the resistance below 2.0 ohms?

Yes >> Replace the Amplifier in accordance with the service information..
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the Can B Bus (–) circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

U0141–LOST COMMUNICATION WITH FRONT CONTROL MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0151-LOST COMMUNICATION WITH OCCUPANT RESTRAINT CONTROLLER (ORC)

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0154-LOST COMMUNICATION WITH OCCUPANT CLASSIFICATION MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0155-LOST COMMUNICATION WITH CLUSTER/CCN

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0156-LOST COMMUNICATION WITH EOM

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0164-LOST COMMUNICATION WITH HVAC CONTROL MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0168-LOST COMMUNICATION WITH VEHICLE SECURITY CONTROL MODULE (SKREEM/WCM)

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0184-LOST COMMUNICATION WITH RADIO

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0186-LOST COMMUNICATION WITH AUDIO AMPLIFIER

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0141–LOST COMMUNICATION WITH FRONT CONTROL MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0197-LOST COMMUNICATION WITH HANDS FREE PHONE MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0199-LOST COMMUNICATION WITH DRIVER DOOR MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0200-LOST COMMUNICATION WITH PASSENGER DOOR MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0208-LOST COMMUNICATION WITH HEATED SEAT CONTROL MODULE

For a complete wiring diagram **Refer to Section 8W**.

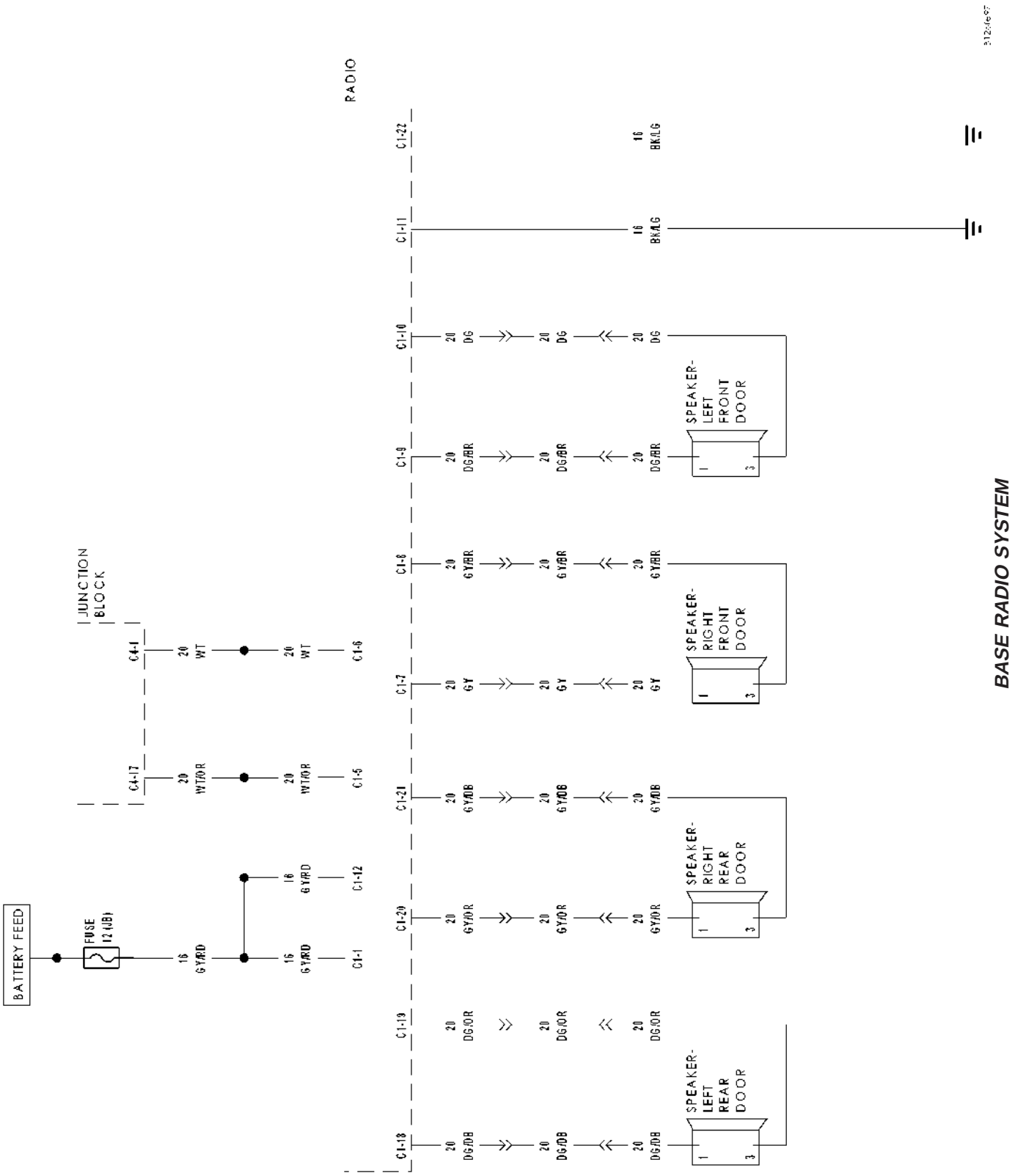
(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

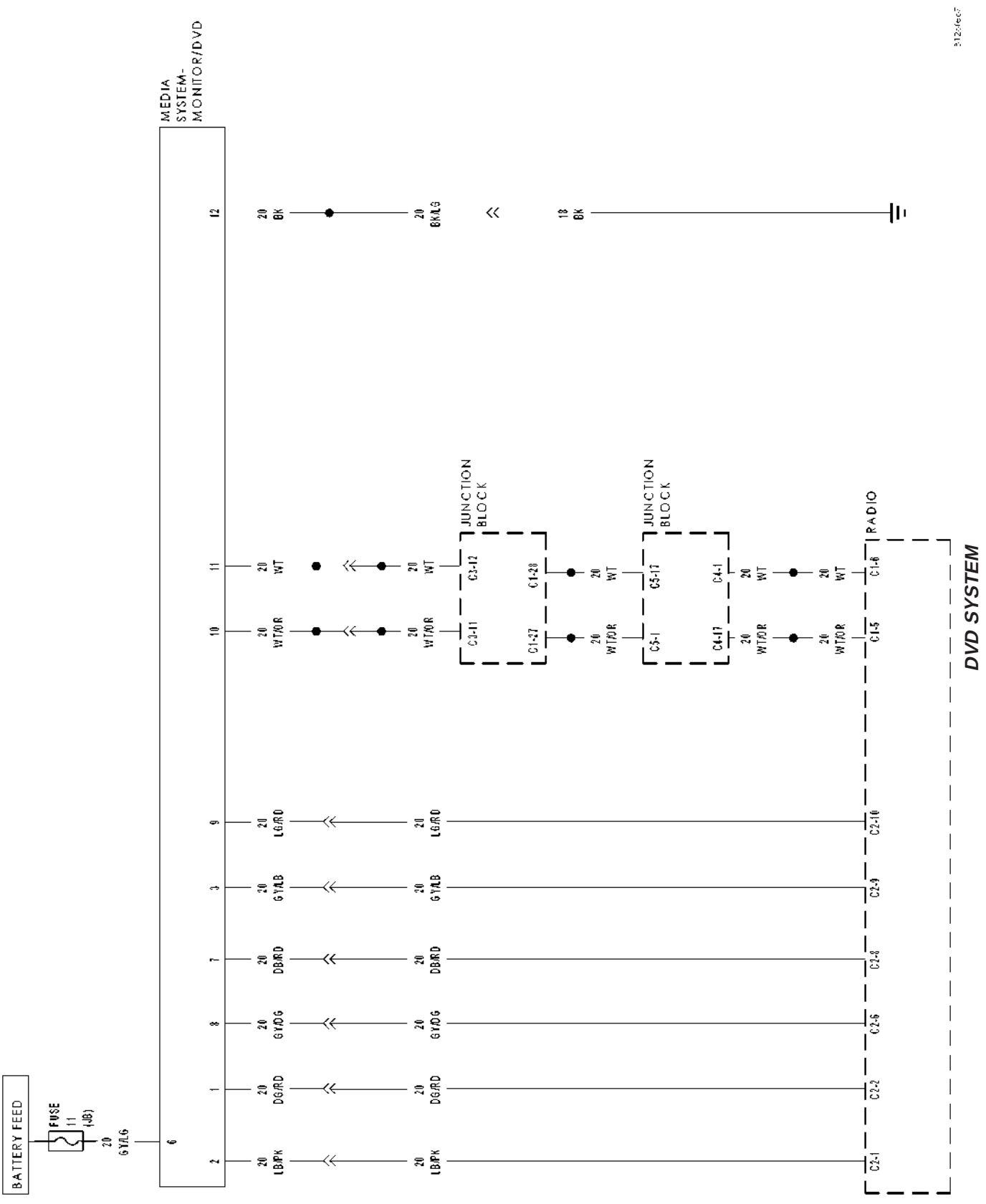
U0209-LOST COMMUNICATION WITH MEMORY SEAT CONTROL MODULE

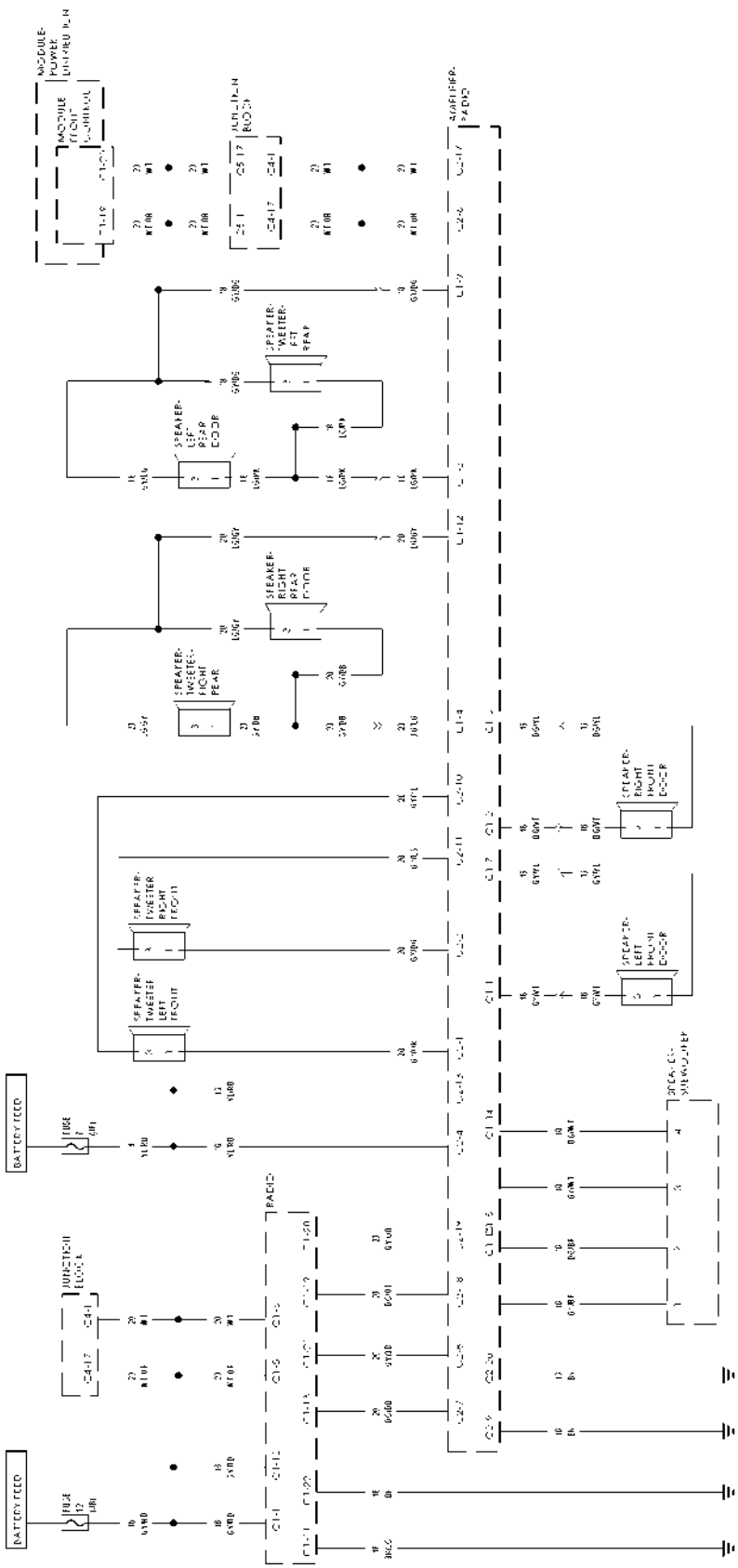
For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

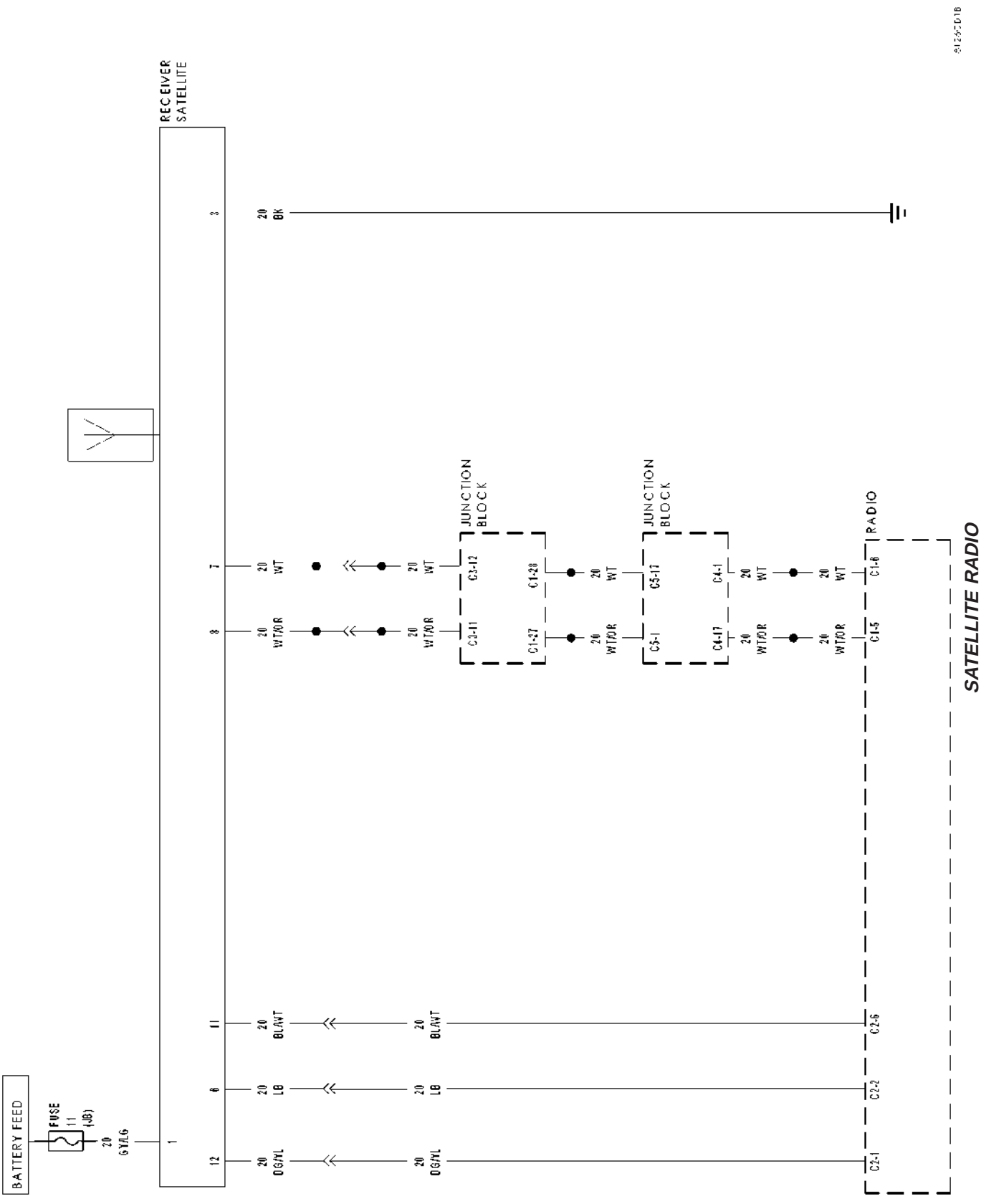
SCHEMATICS AND DIAGRAMS




MEDIA SYSTEM-MONITOR/DVD
BATTERY FEED
FUSE 11 (JB)
20 GY/LG
JUNCTION BLOCK
JUNCTION BLOCK
RADIO
DVD SYSTEM



PREMIUM RADIO SYSTEM


RECEIVER SATELLITE
BATTERY FEED
FUSE 11 (JB)
20 GY/LG
1
12
6
11
8
7
3
20 OG/YL
20 LB
20 BLAV/T
20 WT/OR
20 WT
20 BK
JUNCTION BLOCK
C3-12
C3-11
C1-20
C1-27
C5-17
C5-1
C4-1
C4-17
RADIO
C1-6
C1-5
C2-6
C2-2
C2-1
SATELLITE RADIO

AUDIO/VIDEO - SERVICE INFORMATION

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DIAGNOSIS AND TESTING
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REMOVAL 214
INSTALLATION 215

AUDIO/VIDEO - SERVICE INFORMATION

DESCRIPTION

Several combinations of radio receivers and speaker systems are offered on this vehicle. A rear seat video system is also available. The audio system receives fused battery current from a fuse in the Junction Block (JB) at all times.

A navigation radio is available on this vehicle. With this system, the operator has the option of choosing a street address, point of interest, trip itinerary and other features outlined in the operator's manual. The audio/video system includes the following components:

- Antenna
- Clockspring (with remote radio switches only)
- DVD Player
- Hands free module
- Power amplifier
- Radio noise suppression components
- Radio receiver
- Remote radio switches (if equipped)

- Speakers
- Video Monitor

DIAGNOSIS AND TESTING

AUDIO SYSTEM

Any diagnosis of the Audio system should begin with the use of a scan tool and the appropriate Diagnostic Service information.

Refer to the appropriate wiring information.

WARNING: DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, SIDE AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

AUDIO SYSTEM DIAGNOSIS TABLE

CONDITION	POSSIBLE CAUSES	CORRECTION
NO AUDIO	1. Fuse inoperative.	1. Check radio fuse and Ignition-Off Draw (IOD) fuse in the Integrated Power Module (IPM). Replace fuses, if required.
	2. Radio/amplifier (if equipped) connector damaged.	2. Check for loose or corroded radio/amplifier connector. Repair, if required.
	3. Wiring damaged.	3. Check for shorted or open wires. Repair wiring, if required.
	4. Radio/amplifier (if equipped) ground damaged.	4. Check for continuity between radio chassis and a known good ground. There should be continuity. Repair ground, if required.
	5. Radio/amplifier (if equipped) inoperative.	5. Refer to appropriate Diagnostic Service Information.
	6. Speakers inoperative.	6. Refer to speaker diagnosis.
NO RADIO DISPLAY	1. Fuse inoperative.	1. Check radio fuse and Ignition-Off Draw (IOD) fuse in Integrated Power Module (IPM). Replace fuses, if required.
	2. Radio connector damaged.	2. Check for loose or corroded radio connector. Repair, if required.
	3. Wiring damaged.	3. Check for battery voltage at radio connector. Repair wiring, if required.
	4. Radio ground damaged.	4. Check for continuity between radio chassis and a known good ground. There should be continuity. Repair ground, if required.
	5. Radio inoperative.	5. Refer to appropriate Diagnostic Service Information.

CONDITION	POSSIBLE CAUSES	CORRECTION
CLOCK WILL NOT KEEP SET TIME	1. Fuse inoperative.	1. Check Ignition-Off Draw (IOD) fuse in the Integrated Power Module (IPM). Replace fuse, if required.
	2. Radio connector damaged.	2. Check for loose or corroded radio connector. Repair, if required.
	3. Wiring damaged.	3. Check for battery voltage at radio connector. Repair wiring, if required.
	4. Radio ground faulty.	4. Check for continuity between radio chassis and a known good ground. There should be continuity. Repair ground, if required.
	5. Radio inoperative.	5. Refer to appropriate Diagnostic Service Information.
POOR RADIO RECEPTION	1. Antenna inoperative.	1. (Refer to 8 - ELECTRICAL/AUDIO/ANTENNA BODY & CABLE - DIAGNOSIS AND TESTING).
	2. Radio ground damaged.	2. Check for continuity between radio chassis and a known good ground. There should be continuity. Repair ground, if required.
	3. Radio noise suppression damaged.	3. Repair or replace ground strap as necessary.
	4. Radio inoperative.	4. Refer to appropriate Diagnostic Service Information.
SOUND DISTORTION (VIBRATION FROM SPEAKER AREA, BUZZING - HUMMING)	1. Door trim panel loose or missing fasteners.	1. Inspect door trim panel and correct as necessary. Replace any misssing fasteners.
	2. Water shield loose or misaligned.	2. Inspect water shield and adjust as required.
	3. Items placed in door trim panel map pockets vibrating or moving from side to side.	Remove items from door trim panel. Ensure that vibration is no longer present.
NO COMPACT DISC OPERATION	1. CD faulty.	1. Insert known good CD and test operation.
	2. Foreign material on CD.	2. Clean CD and test operation.
	3. Condensation on CD or optics.	3. Allow temperature of vehicle interior to stabilize and test operation.
	4. Radio inoperative.	4. Refer to appropriate Diagnostic Service Information.

VIDEO SYSTEM DIAGNOSIS

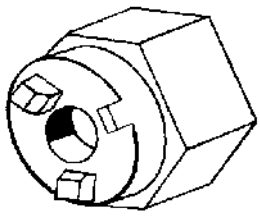
CONDITION	POSSIBLE CAUSES	CORRECTION
NO VIDEO (DVD PLAYER WILL NOT LOAD OR EJECT)	1. FUSE INOPERATIVE.	1. CHECK FUSES. REPLACE FUSES IF REQUIRED.
	2. LOOSE OR DAMAGED DVD PLAYER CONNECTOR	2. CHECK FOR LOOSE OR CORRODED DVD PLAYER CONNECTOR (16 PIN). REPAIR OR REPLACE AS REQUIRED.
	3. LOOSE OR DAMAGED WIRING/DVD PLAYER INOPERATIVE	3. CHECK PIN 1 (B+) AND PIN 9 (GROUND) OF THE 16 PIN CONNECTOR, THEN CHECK PIN 1 (B+) AND PIN 7 (GROUND) OF THE 12 PIN CONNECTOR. IF THE 16 PIN CONNECTOT DOES NOT SHOW VOLTAGE, THE 12 PIN CONNECTOR WILL NOT SHOW VOLTAGE (THE 12 PIN IS FED FROM THE 16 PIN). IF VOLTAGE IS OK ON THE 16 PIN, BUT NOT PRESENT ON THE 12 PIN, UNPLUG THE 12 PIN HARNESS FROM THE PLAYER AND CHECK THE CONNECTOR PINSON THE BACK OF THE PLAYER. IF VOLTAGE IS PRESENT ON THE 12 PIN CONNECTOR, THE SCREEN OR THE 12 PIN HARNESS SHOULD BE REPLACED. IF THERE IS STILL NO VOLTAGE ON THE 12 PIN CONNECTOR, THE DVD PLAYER SHOULD BE REPLACED.
	4. GROUND CONNECTION DAMAGED	4. CHECK FOR CONTINUITY BETWEEN DVD PLAYER AND A KNOWN GOOD GROUND. THERE SHOULD BE CONTINUITY. REPAIR GROUND IF REQUIRED.
	5. DVD PLAYER DAMAGED	5. EXCHANGE OR REPLACE DVD PLAYER IF REQUIRED.
	6. DVD DAMAGED. AVOID USING CD'S OR DVD'S THAT HAVE ADHESIVE TYPE LABELS, AS THEY MAY CAUSE THE DISC TO BECOME JAMMED.	6. INSERT KNOWN GOOD DVD AND TEST OPERATION.

CONDITION	POSSIBLE CAUSES	CORRECTION
NO DISPLAY. AUDIO HEARD THROUGH SPEAKERS	1. LOOSE OR DAMAGED CONNECTORS	1. CHECK FOR LOOSE OR CORRODED DVD PLAYER CONNECTOR (12 PIN). CHECK FOR LOOSE OR CORRODED VIDEO SCREEN CONNECTOR. REPAIR IF REQUIRED. CHECK FOR LOOSE OR DAMAGED IN-LINE CONNECTOR.
	2. WIRING DAMAGED	2. WITH HARNESS CONNECTED, CHECK FOR VIDEO SIGNAL VOLTAGE AT DVD PLAYER AND AT VIDEO SCREEN HARNESS. PLACE KNOWN GOOD DVD INTO DVD PLAYER. PLACE POSITIVE LEAD OF VOLTMETER ON PIN 5 (VIDEO SIGNAL) OF THE 12 PIN CONNECTOR. PLACE NEGATIVE LEAD ON PIN 6 (VIDEO GROUND). READINGS SHOULD BE BETWEEN 0.1V TO 2V DC.
	3. VIDEO SCREEN DAMAGED	3. EXCHANGE OR REPLACE VIDEO SCREEN IF REQUIRED.
WHITE DISPLAY	1. LOW VOLTAGE	1. CHECK FOR BATTERY VOLTAGE (9V-16V) AT DVD PLAYER 12 PIN CONNECTOR (PIN 1-BATTERY, PIN 7-GROUND). DISPLAY WILL BE WHITE IF VOLTAGE DROPS BELOW 6V.
	2. VIDEO SCREEN DAMAGED	2. EXCHANGE OR REPLACE VIDEO SCREEN IF REQUIRED.
DARK OR BRIGHT SPOTS ON SCREEN	1. BRIGHTNESS SETTING REQUIRES ADJUSTMENT.	1. ADJUST BRIGHTNESS SETTING OF VIDEO SCREEN BY PRESSING BUTTONS ON SIDE OF VIDEO SCREEN UNTIL DESIRED LEVEL IS REACHED. START WITH A BLACK SCREEN, THEN PRESS BUTTON UP 16-20 TIMES. THERE ARE 64 TOTAL STEPS OF BRIGHTNESS.

CONDITION	POSSIBLE CAUSES	CORRECTION
BRIGHT OR DARK DISPLAY	1. VIDEO SCREEN DISPLAY PIXEL DEFECT.	1. THE ACCEPTABLE LEVEL OF DOTS ON THE SCREEN IS (GREEN-1, RED-2) OR A TOTAL (GREEN+RED+BLUE+WHITE +BLACK) = 8. REPLACE OR EXCHANGE VIDEO SCREEN IF NECESSARY.
VIDEO SELECTIONS DO NOT APPEAR FULL SCREEN WIDTH	1. ASPECT RATIO IS SET INCORRECTLY.	1. USING MODE BUTTON, ADJUST UNTIL VIDEO APPEARS CORRECTLY.
	2. SOME DVD'S ARE TWO SIDED. ONE SIDE IS WIDE SCREEN FORMAT AND THE OTHER IS FULL SCREEN OR THERE MAY BE A WIDE SCREEN OR STANDARD SCREEN FORMAT ON THE DISC.	2. ENSURE THAT DVD IS INSERTED CORRECTLY.
BUTTONS ON VIDEO SCREEN INOPERATIVE	1. VIDEO SCREEN DAMAGED.	1. PLACE KNOWN GOOD DVD INTO DVD PLAYER. ONCE IMAGE APPEARS ON VIDEO SCREEN, PRESS TOP BUTTON ON SIDE OF VIDEO SCREEN TO ADJUST WIDTH OF DISPLAY. PRESS BOTTOM BUTTONS TO ADJUST BRIGHTNESS. ONCE DVD MENU APPEARS ON VIDEO SCREEN, PRESS MIDDLE BUTTON ON VIDEO SCREEN. HIGHLIGHTED SELECTION WILL BEGIN TO PLAY. IF ANY OF THE BUTTONS DO NOT FUNCTION, REPLACE OR EXCHANGE VIDEO SCREEN.

SPECIAL TOOLS

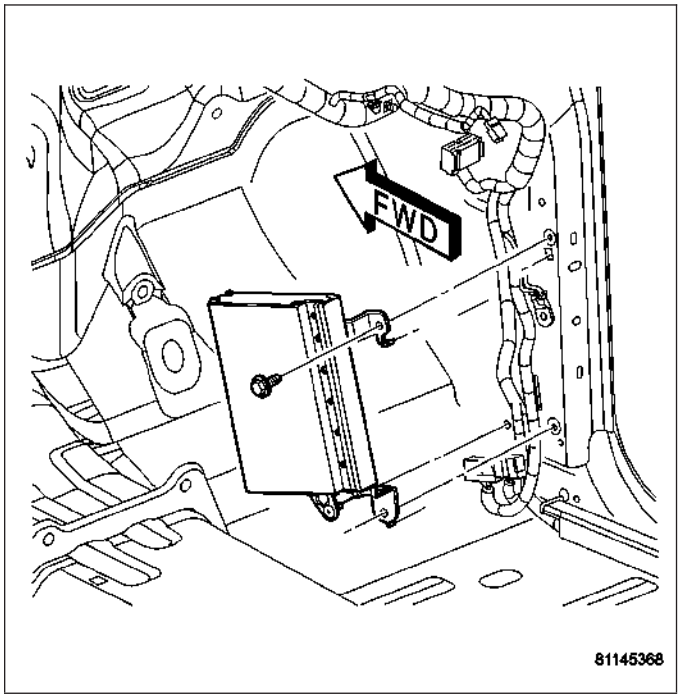
AUDIO SYSTEMS



AMPLIFIER-RADIO

DESCRIPTION

The amplifier can have two ratings: 288 watt (RD7), and 384 watt (RD6). The amplifier is mounted to the right cowl side panel under the passenger side of the instrument panel.



OPERATION

The amplifier receives fused battery current from a fuse in the Junction Block (JB) at all times. The internal circuitry of the amplifier switches the amplifier on based upon a CAN bus message that is received from the radio receiver whenever the radio is turned on. The amplifier receives the sound signal inputs from the left and right rear outputs of the radio, then sends the amplified speaker outputs for each of those channels to the speakers.

DIAGNOSIS AND TESTING

AMPLIFIER

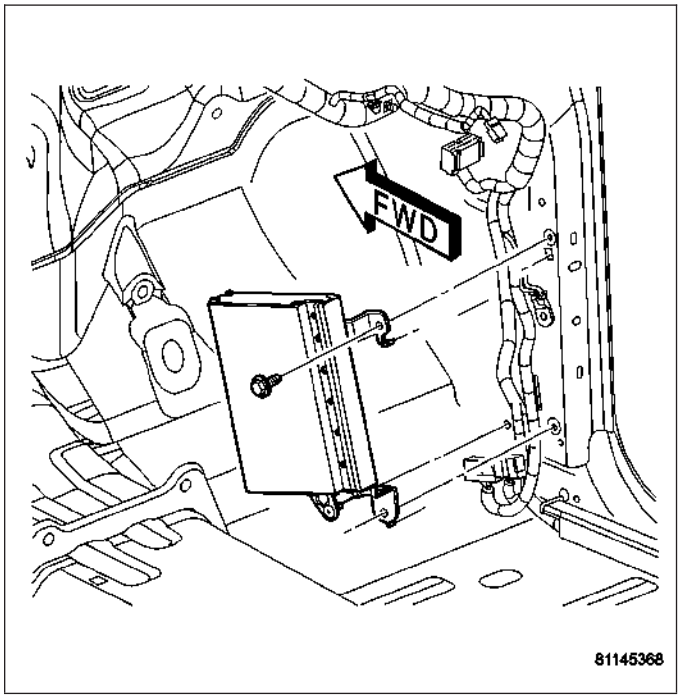
Any diagnosis of the Audio system should begin with the use of a scan tool and the appropriate Diagnostic Service information.

Refer to the appropriate wiring information.

The amplifier unit should be checked if there is no sound output noted from the speakers. For diagnosis of the power amplifier, (Refer to 8 - ELECTRICAL/AUDIO/SPEAKER - DIAGNOSIS AND TESTING).

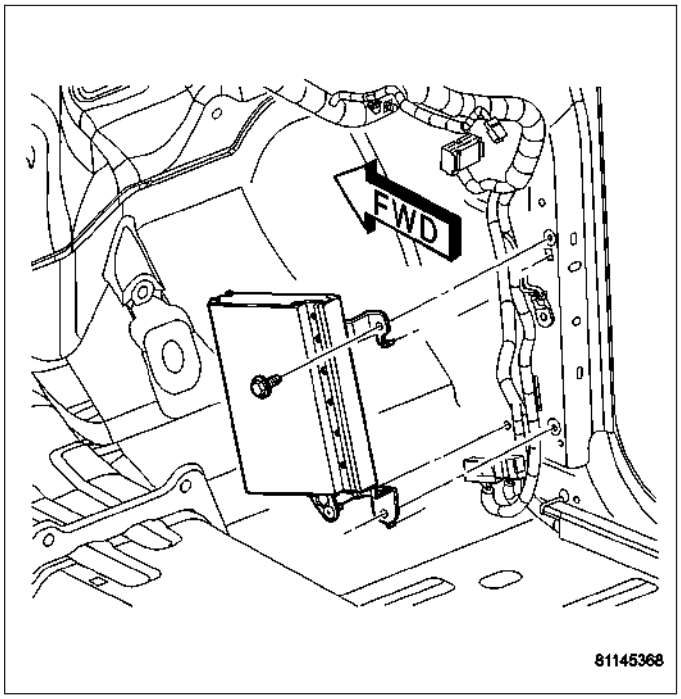
REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Remove the right side cowl trim.
3. Remove mounting fasteners.
4. Disconnect electrical harness connectors and remove amplifier.



INSTALLATION

1. Connect wire harness connectors to amplifier. Position amplifier into place.
2. Install and tighten mounting fasteners.
3. Install right side cowl trim cover.
4. Connect battery negative cable.



ANTENNA BODY & CABLE

DESCRIPTION

A fixed-length stainless steel antenna mast is used, installed on the right front fender of the vehicle. The antenna mast is connected to the center wire of the coaxial antenna cable, and is not grounded to any part of the vehicle.

To eliminate static, the antenna base must have a good ground. The coaxial antenna cable shield (the outer wire mesh of the cable) is grounded to the antenna base and the radio receiver chassis.

The antenna coaxial cable has an additional disconnect, located near the outboard side of the glove box opening on the back side of the lower instrument panel reinforcement.

DIAGNOSIS AND TESTING

ANTENNA BODY AND CABLE

WARNING: DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, SIDE AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

The following four tests are used to diagnose the antenna with an ohmmeter:

- **Test 1** - Mast to ground test
- **Test 2** - Tip-of-mast to tip-of-conductor test
- **Test 3** - Body ground to battery ground test
- **Test 4** - Body ground to coaxial shield test.

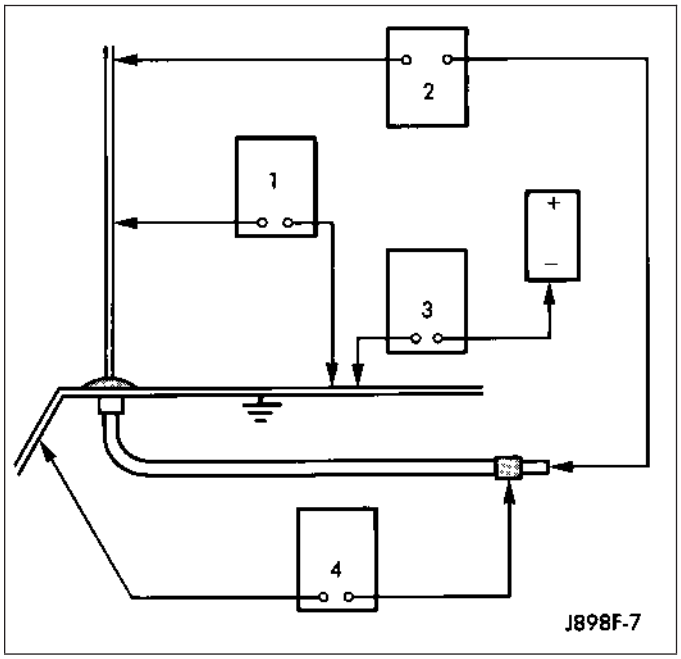
The ohmmeter test lead connections for each test are shown in Antenna Tests.

NOTE: This model has a two-piece antenna coaxial cable. Tests 2 and 4 must be conducted in two steps to isolate a coaxial cable problem; from the coaxial cable connection under the right end of the instrument panel near the outboard side of the glove box opening to the antenna base, and then from the coaxial cable connection to the radio chassis connection.

TEST 1

Test 1 determines if the antenna mast is insulated from the base. Proceed as follows:

1. Disconnect the antenna coaxial cable connector from the radio receiver chassis and isolate.
2. Connect one ohmmeter test lead to the antenna mast in the center of the antenna base. Connect the other test lead to the perimeter of the antenna base. Check for continuity.
3. There should be no continuity. If continuity is found, replace the faulty or damaged antenna base and cable assembly.



TEST 2

Test 2 checks the antenna for an open circuit as follows:

1. Disconnect the antenna coaxial cable connector from the radio receiver chassis.
2. Connect one ohmmeter test lead to the antenna mast in the center of the antenna base. Connect the other test lead to the center pin of the antenna coaxial cable connector.
3. Continuity should exist (the ohmmeter should only register a fraction of an ohm). High or infinite resistance indicates damage to the base and cable assembly. Replace the faulty base and cable, if required.

TEST 3

Test 3 checks the condition of the vehicle body ground connection. This test should be performed with the battery positive cable removed from the battery. Disconnect both battery cables, the negative cable first. Reconnect the battery negative cable and perform the test as follows:

1. Connect one ohmmeter test lead to the vehicle fender. Connect the other test lead to the battery negative terminal post.
2. The resistance should be less than one ohm.
3. If the resistance is more than one ohm, check the braided ground strap(s) connected to the engine and the vehicle body for being loose, corroded, or damaged. Repair the ground strap connections, if required.

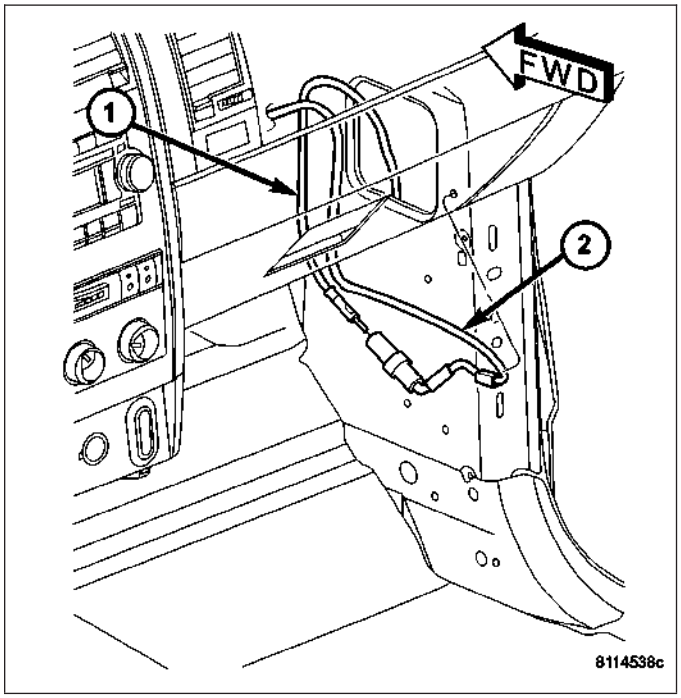
TEST 4

Test 4 checks the condition of the ground between the antenna base and the vehicle body as follows:

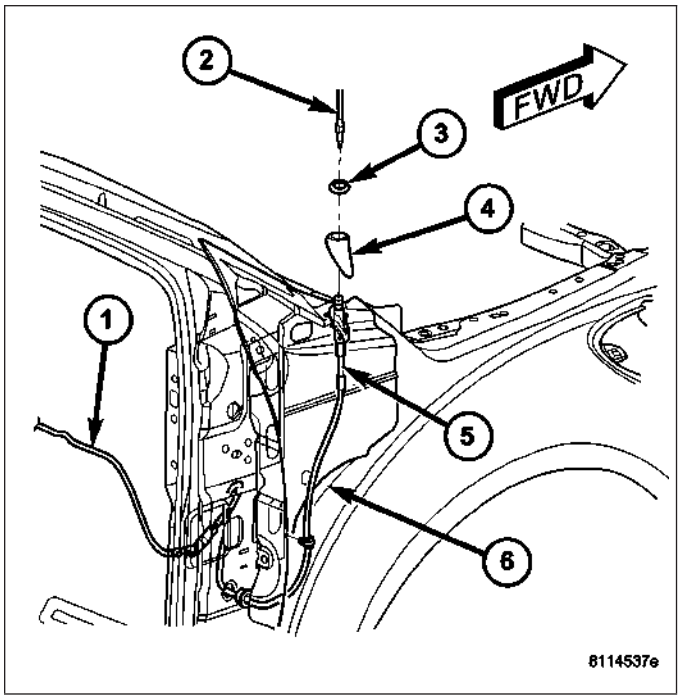
1. Connect one ohmmeter test lead to the vehicle fender. Connect the other test lead to the outer crimp on the antenna coaxial cable connector.
2. The resistance should be less then one ohm.
3. If the resistance is more then one ohm, clean and/or tighten the antenna base to fender mounting hardware.

REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Remove the right side cowl trim cover.
3. Reach under the instrument panel outboard of the glove box to access and disconnect the antenna coaxial cable connector (2). Disconnect the connector by pulling it apart while twisting the metal connector halves. Do not pull on the cable.
4. Disengage the antenna coaxial cable retainer at the right cowl side inner panel.

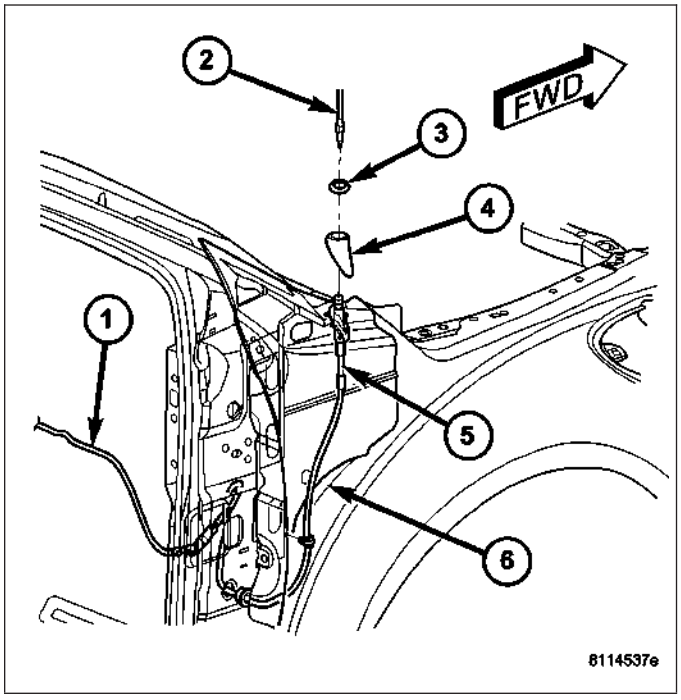


5. Remove the right side wheelhouse splash shield.
6. Unscrew the antenna mast (2) from the antenna body.
7. Remove the antenna cap nut (3) using an antenna nut wrench (Special Tool C-4816)
8. Remove the antenna adapter (4) from the top of the fender.
9. Lower the antenna body (5) through the mounting hole in the top of the fender.
10. Disengage the antenna coaxial cable grommet from the hole in the right cowl side outer panel.
11. Pull the antenna body and cable out through the opening between the right cowl side outer panel and the fender.

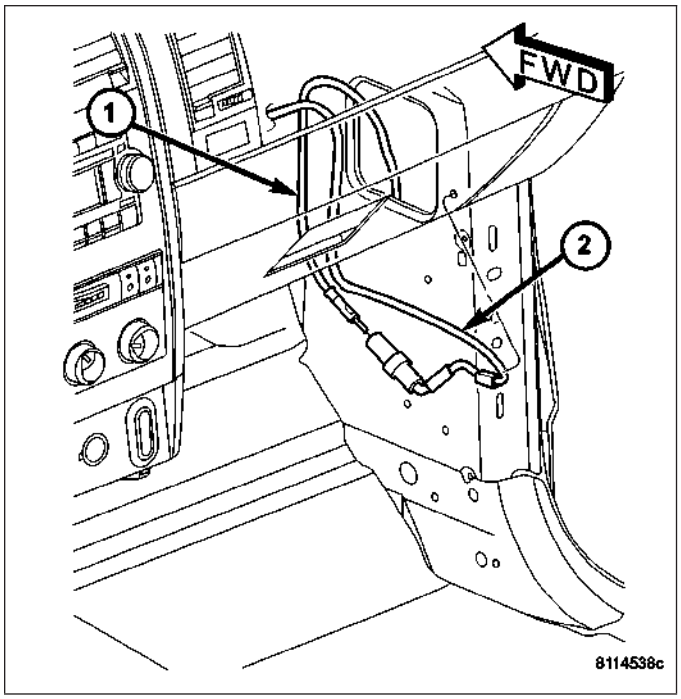


INSTALLATION

1. Position the antenna body and cable (5) in the opening between the right cowl side outer panel and the fender.
2. Push the antenna coaxial cable into the passenger compartment through the hole in the right cowl side outer panel.
3. Engage the antenna coaxial cable grommet in the hole in the right cowl side outer panel.
4. Position the antenna body through the mounting hole in the top of the fender.
5. Install the adapter (4) over the antenna body from the top of the fender.
6. Install and tighten the antenna cap nut (3) using an antenna nut wrench (Special Tool C-4816).
7. Install and tighten the antenna mast (2) onto the antenna body.
8. Engage the antenna coaxial cable retainers at the right cowl side inner panel and inside the right front fender.



9. Engage the antenna coaxial cable in the retainer clips on the lower instrument panel support and the glovebox.
10. Reach under the instrument panel outboard of the glove box to reconnect the antenna coaxial cable connector (2).
11. Install the cowl trim cover.
12. Install the wheelhouse splash shield.
13. Connect the battery negative cable.

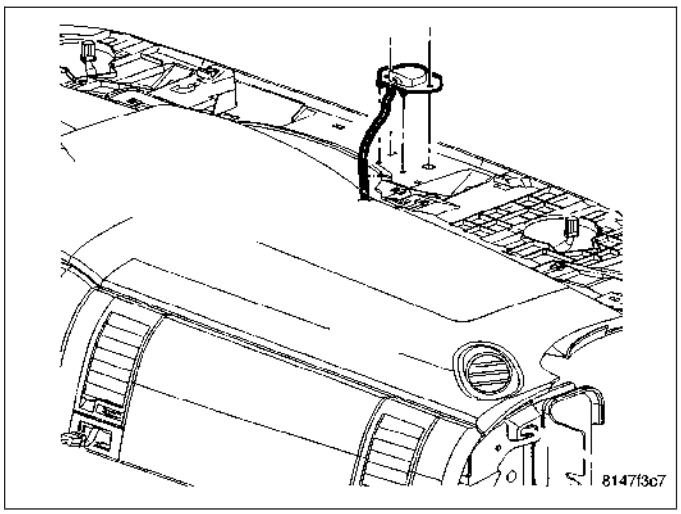


ANTENNA - NAVIGATION RADIO

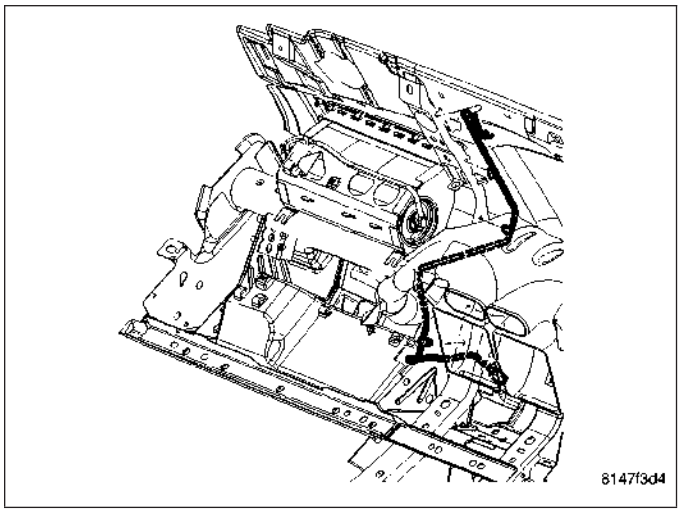
REMOVAL

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

1. Disconnect and isolate the battery negative cable.
2. Remove the radio (Refer to 8 - ELECTRICAL/AUDIO/RADIO - REMOVAL).
3. Remove the instrument panel defroster grille (Refer to 23 - BODY/INSTRUMENT PANEL/DEFROSTER GRILLE - REMOVAL).
4. Remove the passenger airbag (Refer to 8 - ELECTRICAL/RESTRAINTS/PASSENGER AIRBAG - REMOVAL).
5. Remove the antenna mounting fasteners
   .



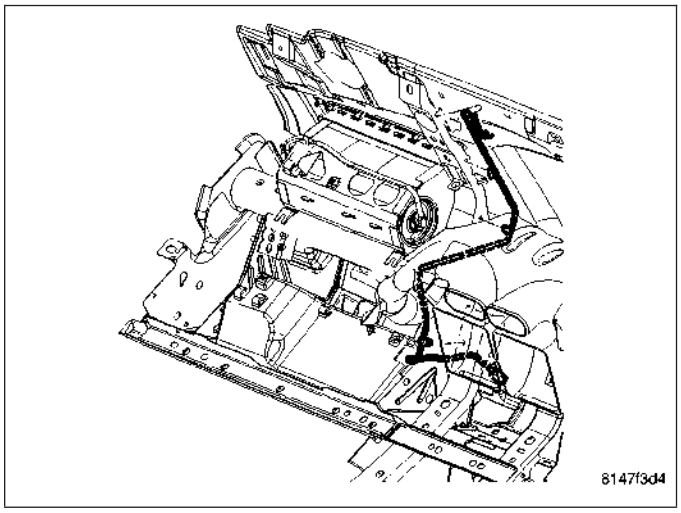
6. Remove the navigation radio antenna .



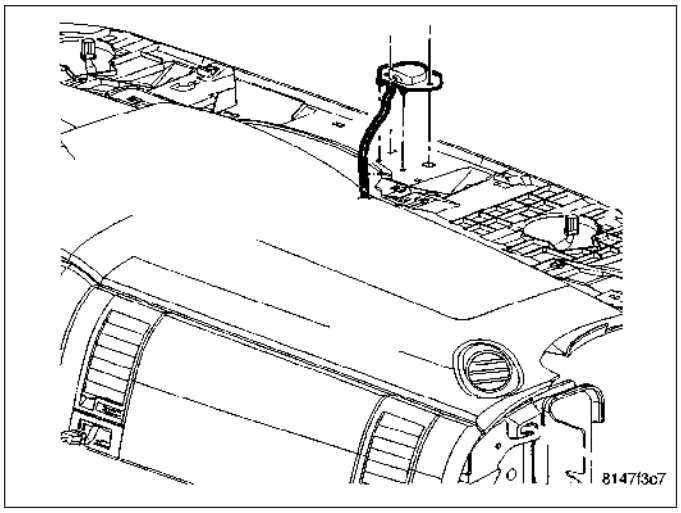
INSTALLATION

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

1. Position antenna to instrument panel.
2. Connect antenna to radio.
3. Install radio (Refer to 8 - ELECTRICAL/AUDIO/RADIO - INSTALLATION).



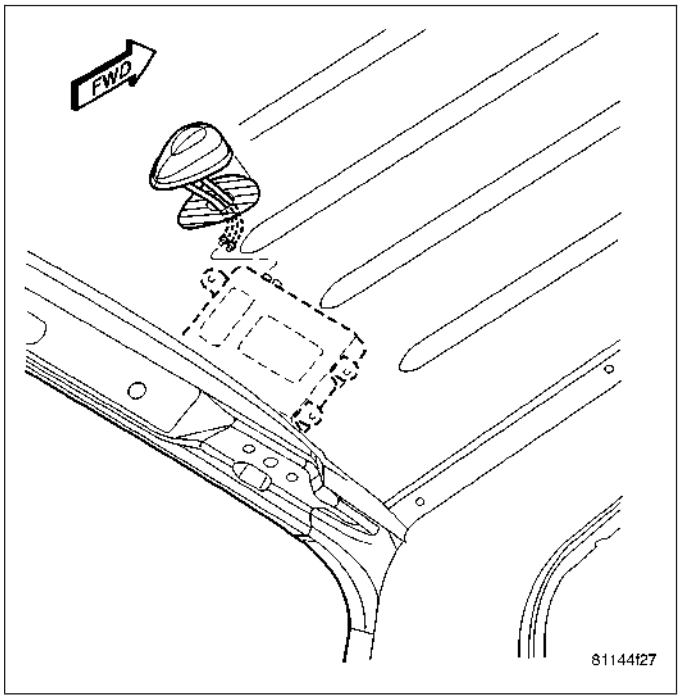
4. Install and tighten mounting fasteners.
5. Install instrument panel defroster grille (Refer to 23 - BODY/INSTRUMENT PANEL/DEFROSTER GRILLE - INSTALLATION).
6. Install passenger airbag (Refer to 8 - ELECTRICAL/RESTRAINTS/PASSENGER AIRBAG - INSTALLATION).
7. Connect battery negative cable.



ANTENNA-SATELLITE

DESCRIPTION

The satellite radio antenna is secured by a threaded fastener and two retainers which protrude through a hole in the roof panel. Two wires from the antenna are connected to the satellite receiver module located above the headliner.

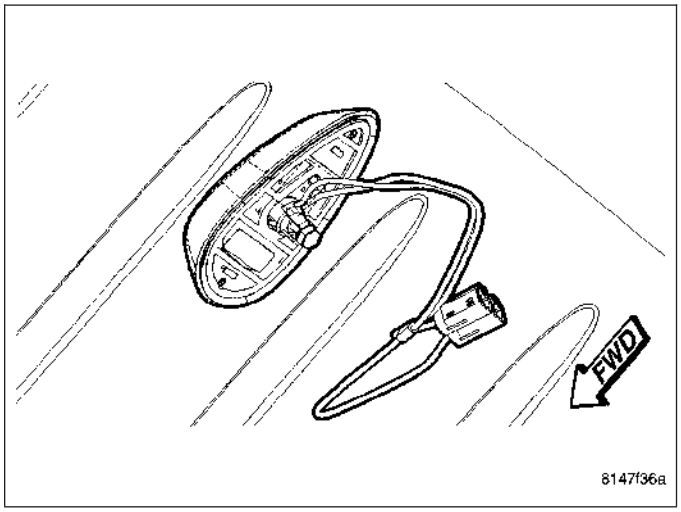


OPERATION

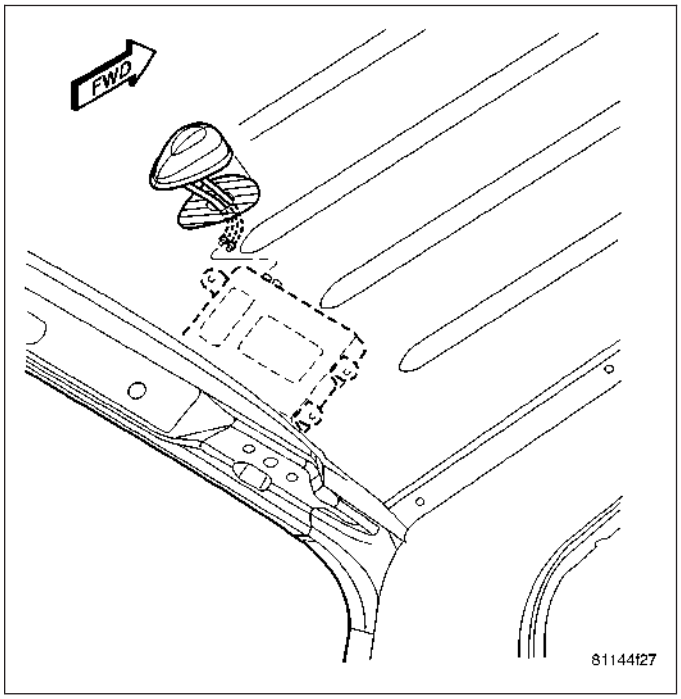
The satellite radio antenna receives signals from orbiting satellites and sends these signals to the satellite receiver module. The satellite radio antenna must have open space in which to operate. Items carried on the roof, parking inside etc. can have an effect on the antenna's ability to receive signals.

REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Lower the rear portion of the headliner as necessary to access underside of antenna (1) (Refer to 23 - BODY/INTERIOR/HEADLINER - REMOVAL).
3. Disconnect the wire harness connectors from the antenna.
4. Remove fastener and retainer.

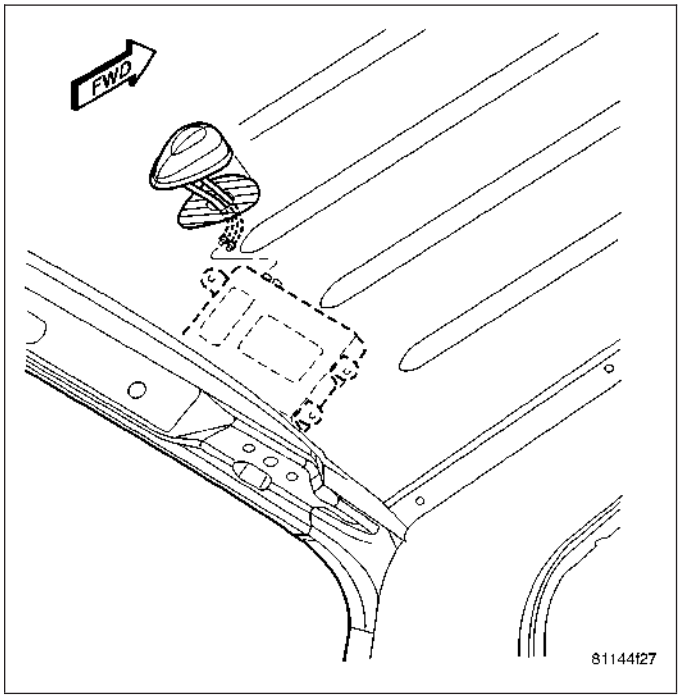


5. From inside the vehicle, and using a flat bladed tool, depress one of the retaining tabs on the antenna. Push up the one side of the antenna connector through the roof panel. Depress the other side of the connector and remove the antenna.

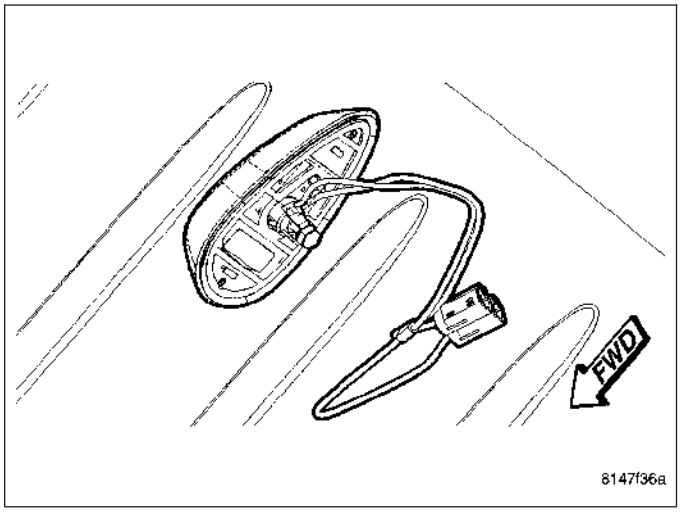


INSTALLATION

1. Insert wire harness through hole in roof panel. Press antenna into position until both retainers snap into place.



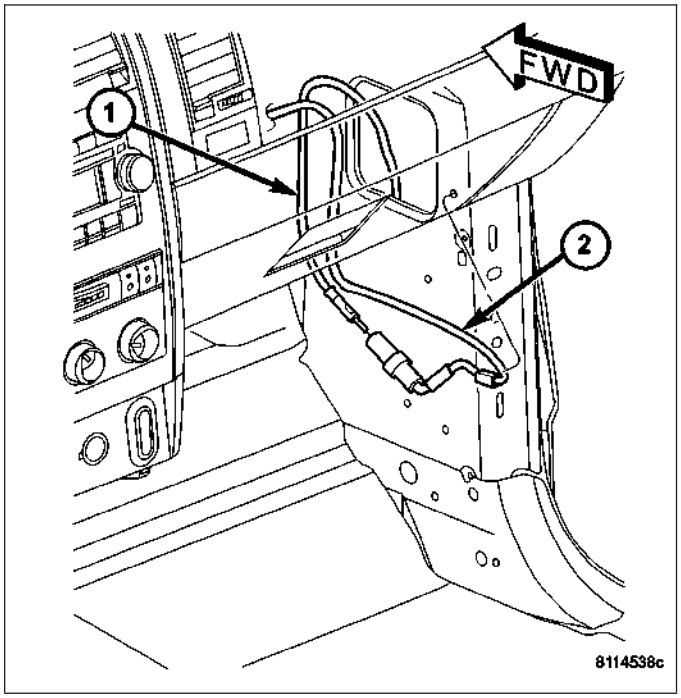
2. Connect wire harness connectors to antenna.
3. Install and tighten retaining fastener.
4. Install headliner (Refer to 23 - BODY/INTERIOR/ HEADLINER - INSTALLATION).
5. Connect battery negative cable.



ANTENNA CABLE-INSTRUMENT PANEL

REMOVAL

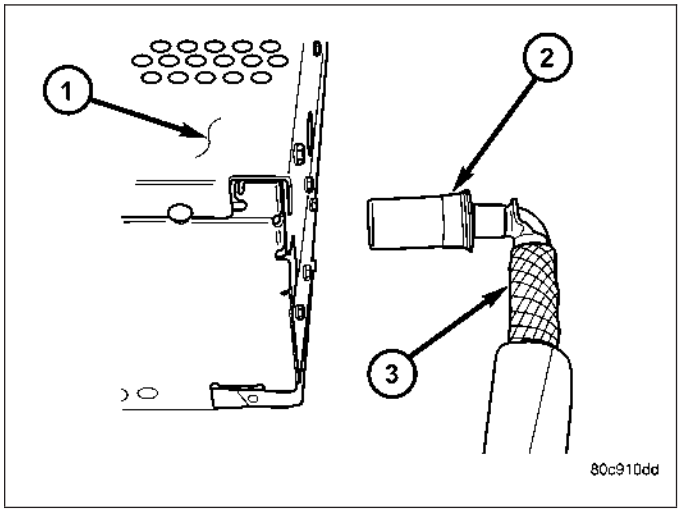
1. Disconnect and isolate the battery negative cable.
2. Remove the right side cowl trim.
3. Reach under the instrument panel outboard of the glove box to access and disconnect the antenna coaxial cable connector (1) and (2). Disconnect the connector by pulling it apart while twisting the metal connector halves. Do not pull on the cable.
4. Disengage the instrument panel antenna cable from the retainer clips on the glove box opening and instrument panel support.



5. Remove the radio (1) (Refer to 8 - ELECTRICAL/ AUDIO/RADIO - REMOVAL).

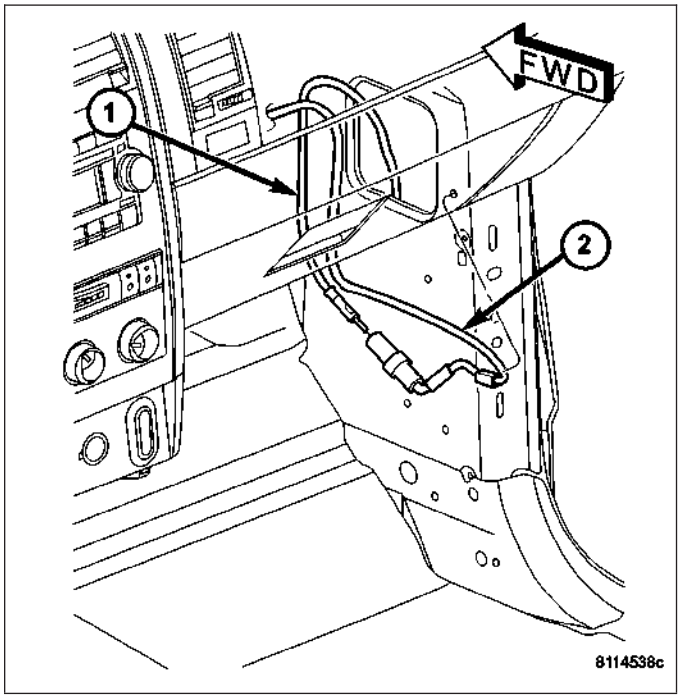
CAUTION: Pulling the antenna cable straight out of the radio without pulling on the locking antenna connector could damage the cable or radio.

6. Disconnect the antenna cable by pulling the locking antenna connector (2) away from the radio.
7. Pull the antenna cable out through the radio opening in the instrument panel.



INSTALLATION

1. Insert cable through radio opening. Route behind glove box and attach to retainers.
2. Install the radio.
3. Reach under the instrument panel outboard of the glove box to access and connect the antenna coaxial cable connector (1) and (2).
4. Install cowl trim.
5. Connect the battery negative cable.

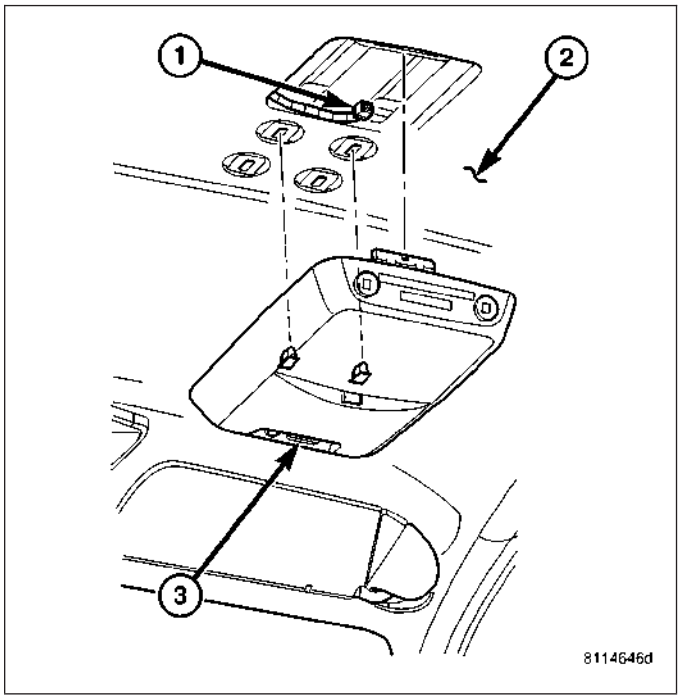


MEDIA SYSTEM-MONITOR/DVD

DESCRIPTION

The video entertainment system, consist of a DVD player (3), battery powered remote control, and two headsets. the DVD player is located on the headliner (2) behind the driver and front seat passenger seat. In addition to video DVDs, the system will play audio DVDs, audio CDs, MP3 audio disc, and video CDs.

There are plug-in jacks on the housing to show video directly from a video camera, connect video games for display on the screen, and play music directly from a MP3 player.

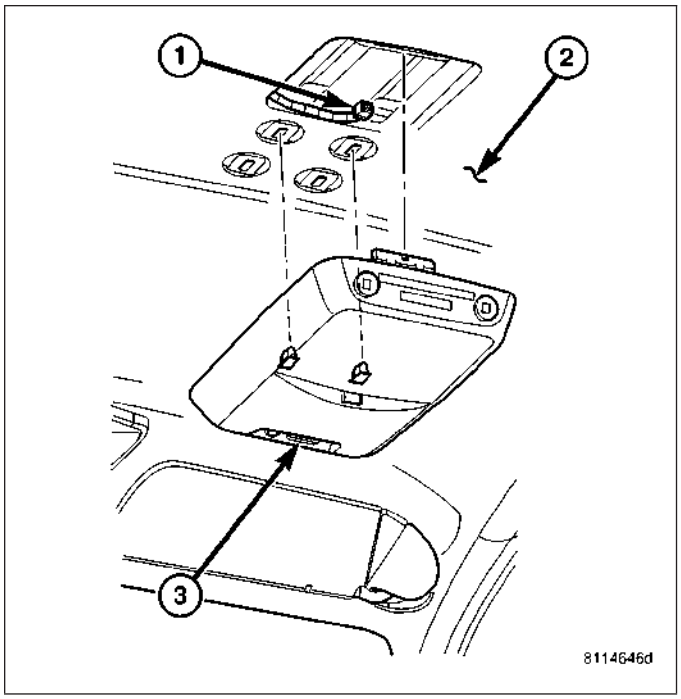


OPERATION

The DVD player is self contained. The DVD disc are loaded and ejected through a slot in the faceplate. A seven inch (diagonal measurement) liquid crystal display (LCD) screen supports both 3 X 4 and 6 X 9 video formats. The hinged screen latches in the closed position and swings down for viewing. A lock-out switch on the front of the housing enables front seat occupants to disable the DVD player.

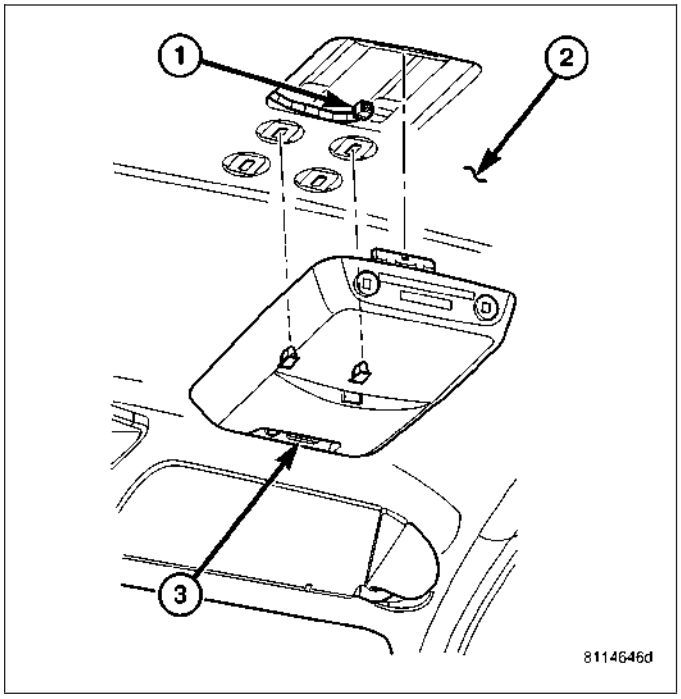
REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Remove the two mounting fasteners.
3. Using a trim stick, press the retaining clip at the rear of the DVD player. Move the DVD player from side to side to release from roof panel (2).
4. Disconnect electrical harness connector (1) and remove DVD player.



INSTALLATION

1. Connect electrical harness connector (1) to DVD player (3).
2. Position DVD player and press into place.
3. Install and tighten mounting fasteners.
4. Connect battery negative cable.

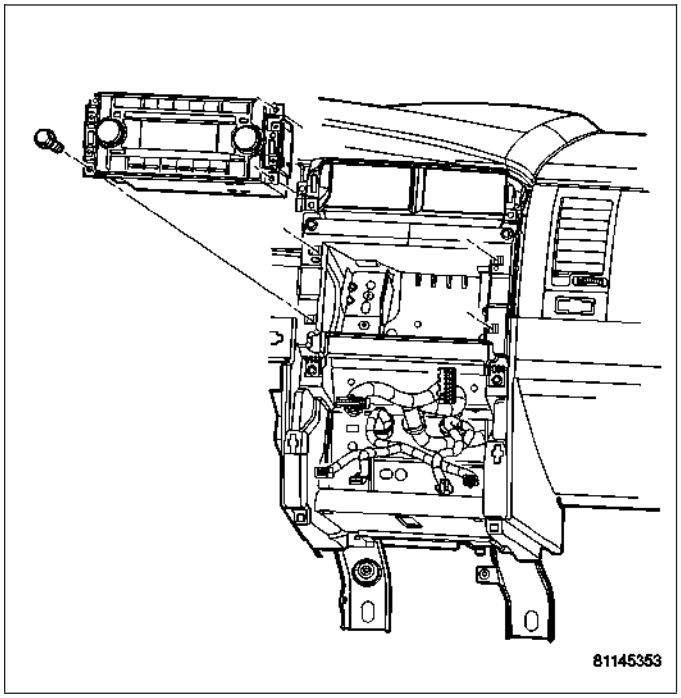


RADIO

DESCRIPTION

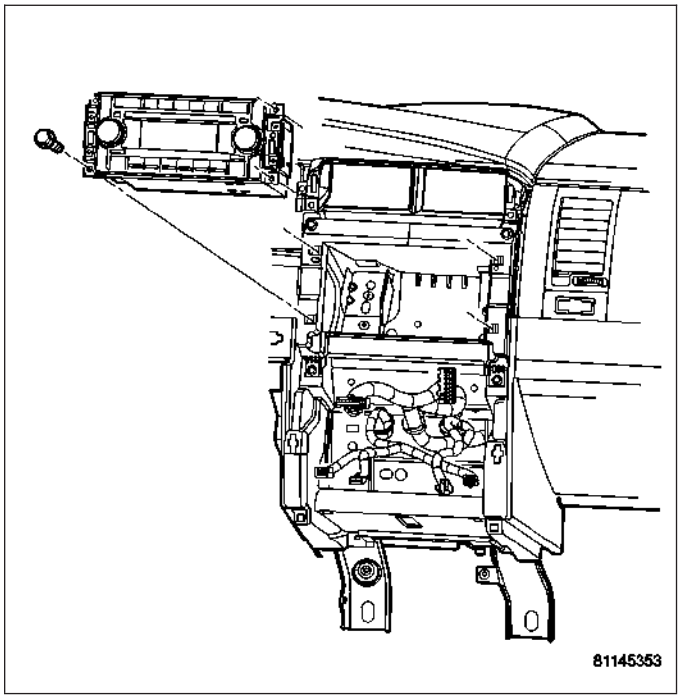
Available radios include:

- AM/FM/CD (REF sales code)
- AM/FM/6 disc CD/MP3 (RAQ sales code)
- AM/FM/6CD/RDS/MP3/Navigation with integrated display (REC sales code)
- AM/FM/CD/RDS (RAR sales code) - export only



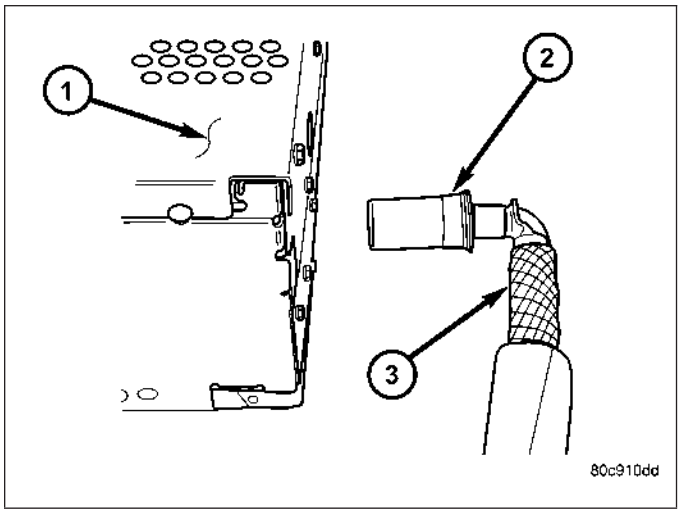
REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Remove the instrument panel center bezel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - REMOVAL).
3. Remove the radio mounting fasteners.



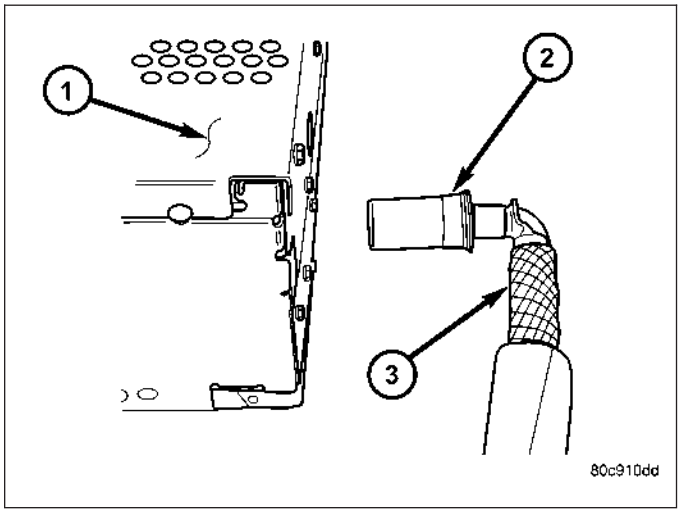
CAUTION: Pulling the antenna cable straight out of the radio without pulling on the locking antenna connector could damage the cable or radio.

4. Disconnect the antenna cable (3) by pulling the locking antenna connector (2) away from the radio (1).
5. Disconnect the electrical harness connector and remove radio.

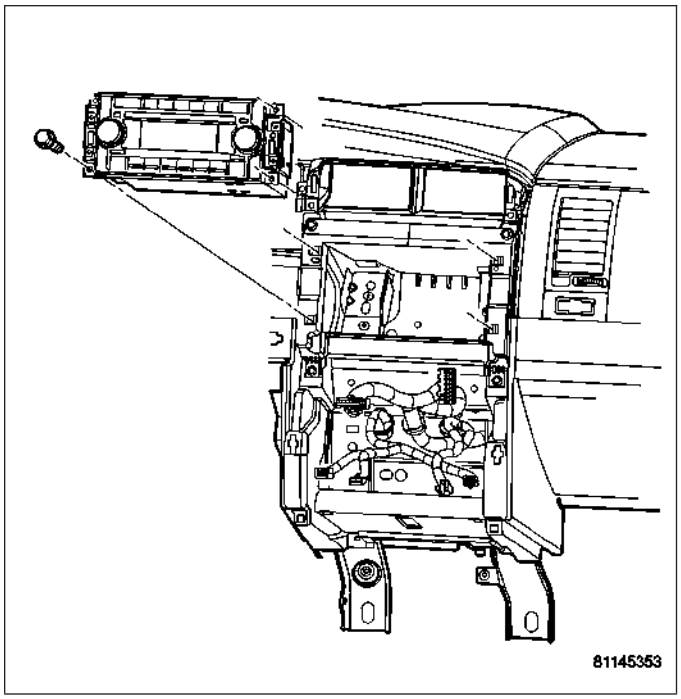


INSTALLATION

1. Connect the electrical harness and antenna cable (3) to radio.



2. Position radio to instrument panel, and install mounting fasteners.
3. Install instrument panel center bezel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - INSTALLATION).



RADIO NOISE SUPPRESSION COMPONENTS

DESCRIPTION

Radio noise suppression devices are installed on this vehicle. Radio Frequency Interference (RFI) and ElectroMagnetic Interference (EMI) can be produced by any on-board or external source of electromagnetic energy. These electromagnetic energy sources can radiate electromagnetic signals through the air, or conduct them through the vehicle electrical system.

When the audio system converts RFI or EMI to an audible acoustic wave form, it is referred to as radio noise. This undesirable radio noise is generally manifested in the form of “buzzing,” “hissing,” “popping,” “clicking,” “crackling,” and/or “whirring” sounds. In most cases, RFI and EMI radio noise can be suppressed using a combination of vehicle and component grounding, filtering and shielding techniques. This vehicle is equipped with radio noise suppression devices that were designed to minimize exposure to typical sources of RFI and EMI; thereby, minimizing radio noise complaints.

Radio noise suppression is accomplished primarily through circuitry or devices that are integral to the radios, audio power amplifiers and other on-board electrical components such as generators, wiper motors, blower motors, and fuel pumps that have been found to be potential sources of RFI or EMI. External radio noise suppression devices that are used on this vehicle to control RFI or EMI, and can be serviced, include the following:

- **Engine-to-frame ground strap** - This length of braided ground strap has an eyelet terminal connector crimped to each end. One end is secured to the engine cylinder heads. The other is secured to the frame.
- **Resistor-type spark plugs** - This type of spark plug has an internal resistor connected in series between the spark plug terminal and the center electrode to help reduce the production of electromagnetic radiation that can result in radio noise.
- **Exhaust-to-frame ground strap** - This length of braided ground strap has an eyelet terminal connector crimped to each end. One end is secured to the exhaust pipe. The other is secured to the frame.

OPERATION

There are two common strategies that can be used to suppress Radio Frequency Interference (RFI) and Electro-Magnetic Interference (EMI) radio noise. The first suppression strategy involves preventing the production of RFI and EMI electromagnetic signals at their sources. The second suppression strategy involves preventing the reception of RFI and EMI electromagnetic signals by the audio system components.

The use of braided ground straps in key locations is part of the RFI and EMI prevention strategy. These ground straps ensure adequate ground paths, particularly for high current components such as many of those found in the starting, charging, ignition, engine control and transmission control systems. An insufficient ground path for any of

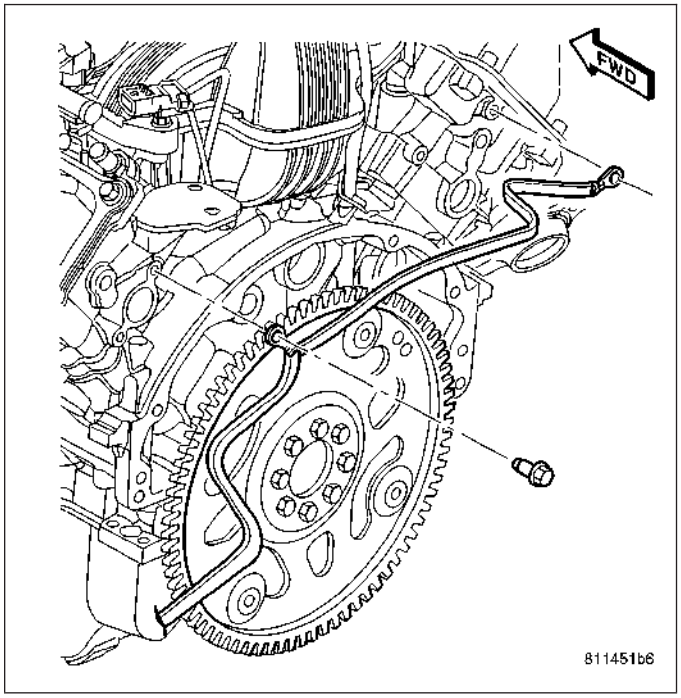
these high current components may result in radio noise caused by induced voltages created as the high current seeks alternative ground paths through components or circuits intended for use by, or in close proximity to the audio system components or circuits.

Preventing the reception of RFI and EMI is accomplished by ensuring that the audio system components are correctly installed in the vehicle. Loose, corroded or improperly soldered wire harness connections, improperly routed wiring and inadequate audio system component grounding can all contribute to the reception of RFI and EMI. A properly grounded antenna body and radio chassis, as well as a shielded antenna coaxial cable with clean and tight connections will each help reduce the potential for reception of RFI and EMI.

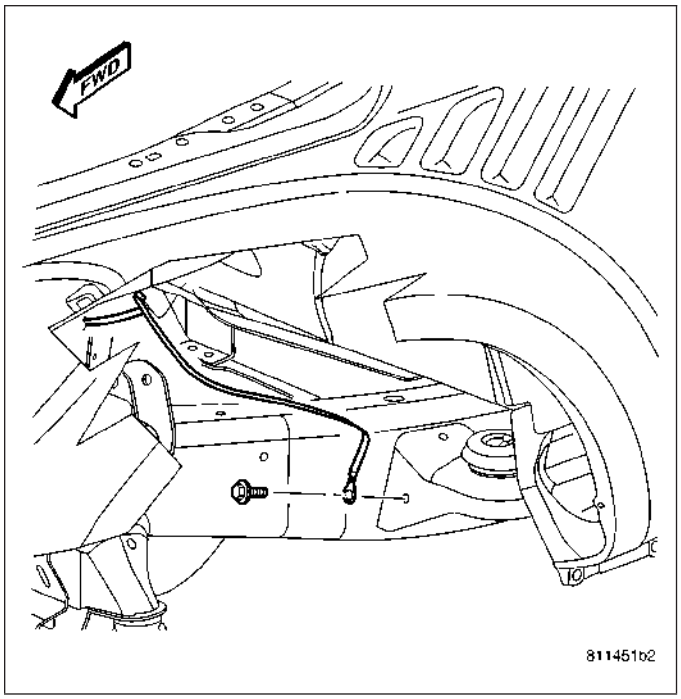
REMOVAL

ENGINE TO FRAME

1. Disconnect and isolate the battery negative cable.
2. Remove the mounting fasteners from the engine cylinder heads.

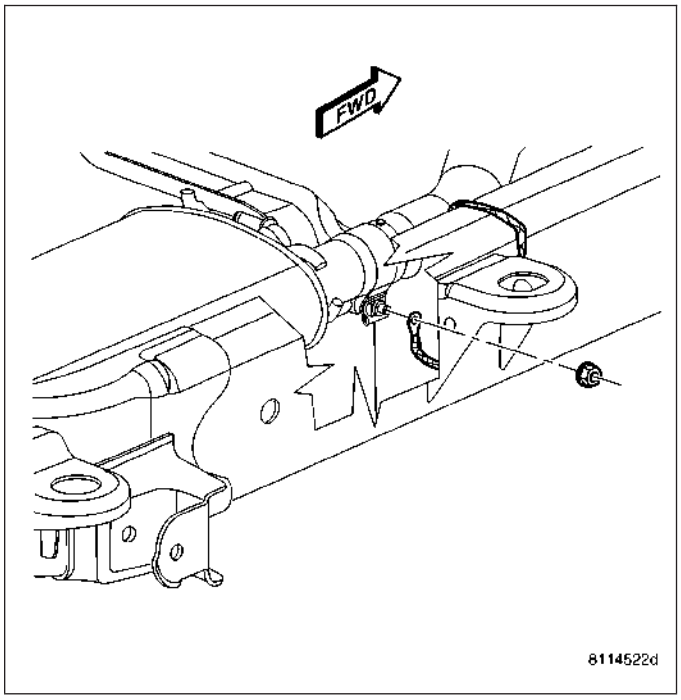


3. Remove mounting fastener from frame and remove strap.

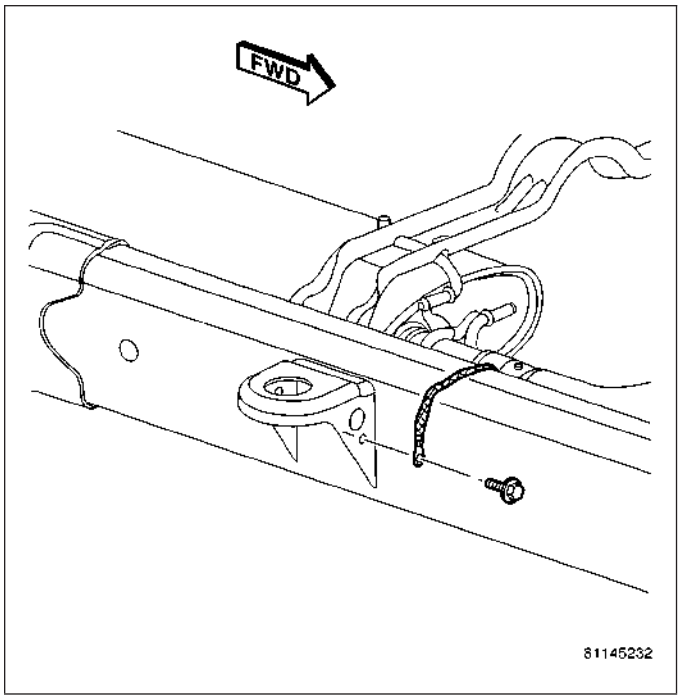


EXHAUST TO FRAME GROUND STRAP

1. Disconnect and isolate the battery negative cable.
2. Remove mounting fastener from exhaust pipe.



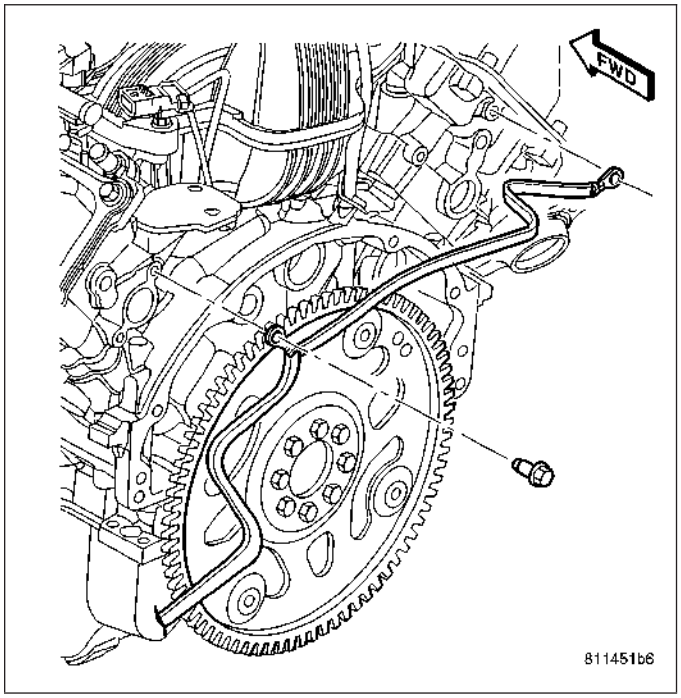
3. Remove mounting fastener from frame and remove ground strap.



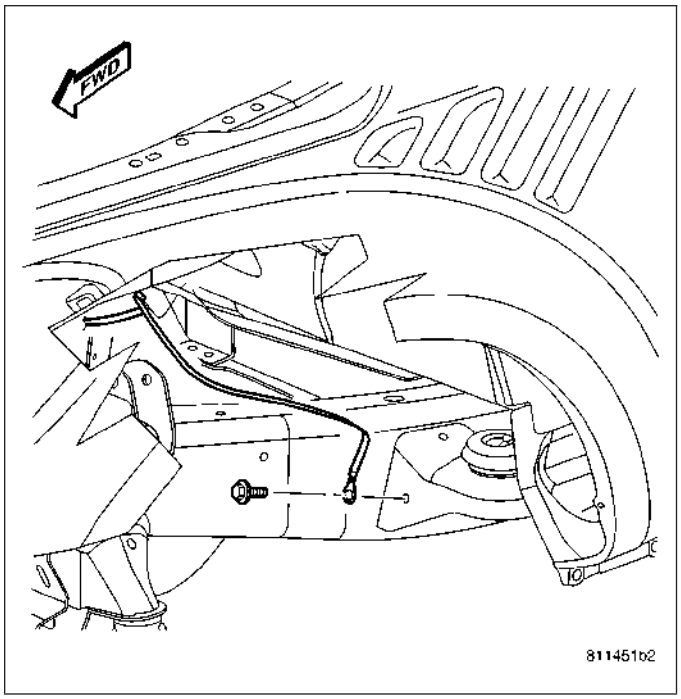
INSTALLATION

ENGINE TO BODY

1. Position ground strap to engine and install mounting fasteners.
2. Tighten mounting fasteners.

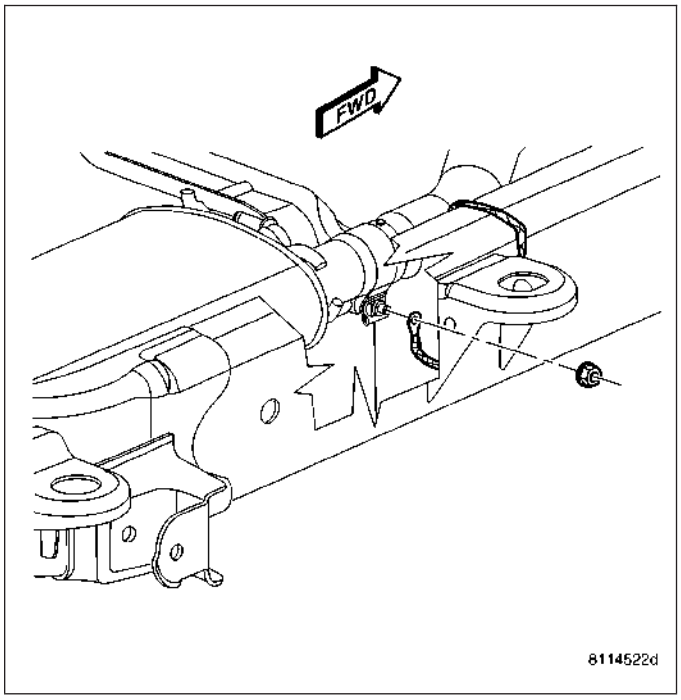


3. Position ground strap and install mounting fastener.
4. Tighten mounting fastener.

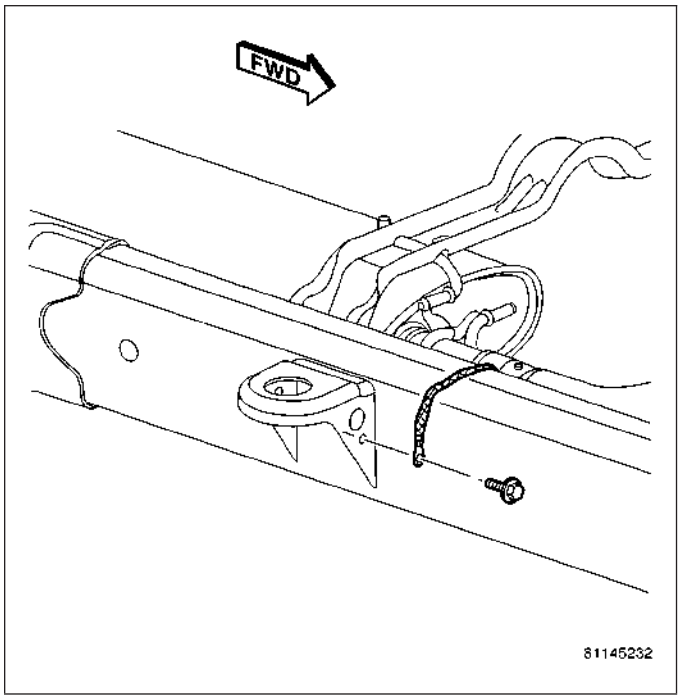


EXHAUST TO FRAME GROUND STRAP

1. Position ground strap to exhaust pipe and install mounting fastener.
2. Tighten mounting fastener.



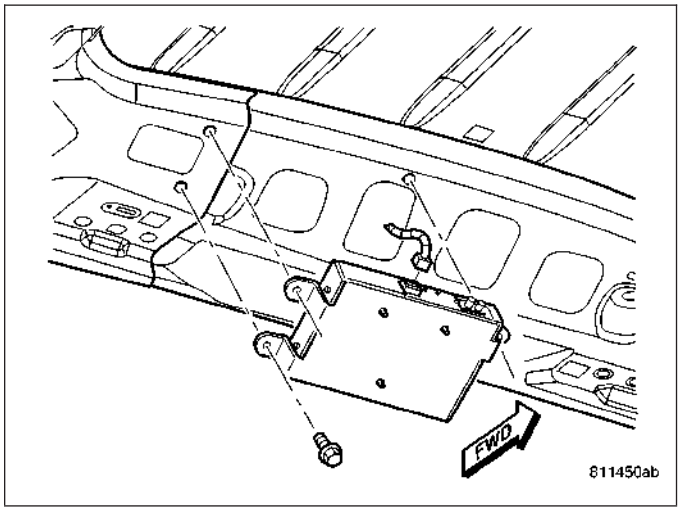
3. Position ground strap to frame and install mounting fastener.
4. Tighten mounting fastener.



RECEIVER-SATELLITE

DESCRIPTION

The satellite receiver module is located above the headliner near the rear liftgate opening. It is mounted to the roof panel with three mounting fasteners.



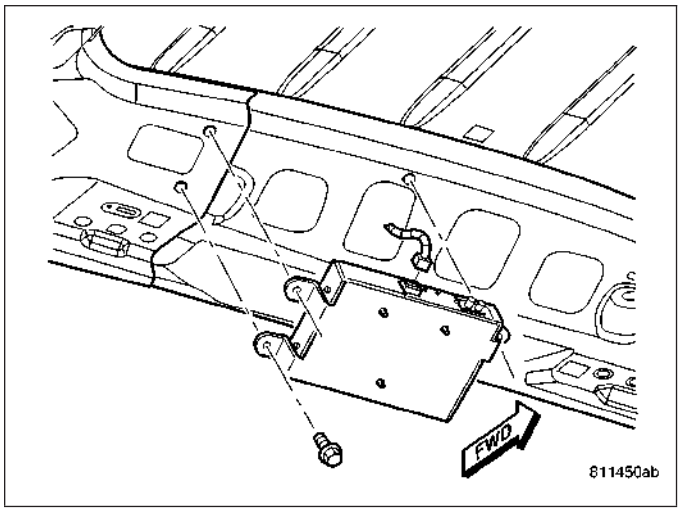
OPERATION

The satellite receiver module receives signals from the roof mounted antenna and processes this information before it is sent to the radio. The module operates on both battery feed circuits and CAN bus messages. It will operate with the ignition key in the run or accessory position only.

REMOVAL

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

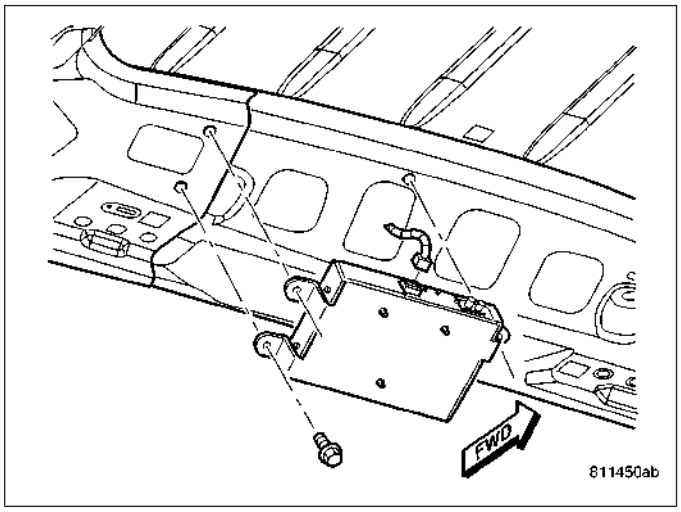
1. Disconnect and isolate the battery negative cable.
2. Lower the headliner as necessary.
3. Remove the mounting bracket fasteners.
4. Disconnect the antenna and electrical harness connectors.
5. Remove the module from the mounting bracket.



INSTALLATION

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

1. Connect antenna and electrical harness connector to module.
2. Install module to mounting bracket. Tighten mounting fasteners.
3. Position module and bracket. Install new mounting fasteners.
4. Install headliner.
5. Connect battery negative cable.



SPEAKER

DESCRIPTION

STANDARD

The standard equipment speaker system includes speakers in four locations. One 16.5 centimeter (6.5 inch) diameter speaker is located in each front door. There is also one 16.5 centimeter (6.5 inch) diameter speaker located in each rear door.

MIDLEVEL

The midlevel speaker system features eight speakers in eight locations. One 16.5 centimeter (6.5 inch) diameter speaker is located in each front door. There is also one 16.5 centimeter (6.5 inch) diameter speaker located in each rear door. A 1.9 centimeter tweeter is mounted high in each rear door trim panel. Two tweeters (8.9 centimeter (3.5

inch)) are also located on the top portion of the instrument panel. The midlevel speaker system includes an amplifier. The total available power of the premium speaker system is 288 watts.

PREMIUM

The premium speaker system features nine speakers in nine locations. One 16.5 centimeter (6.5 inch) diameter speaker is located in each front door. There is also one 16.5 centimeter (6.5 inch) diameter speaker located in each rear door. A 1.9 centimeter tweeter is mounted high in each rear door trim panel. Two tweeters (8.9 centimeter (3.5 inch)) are also located on the top portion of the instrument panel. Included with the premium speaker package is a subwoofer located in the left rear quarter panel. The premium speaker system also includes an amplifier. The total available power of the premium speaker system is 384 watts.

DIAGNOSIS AND TESTING

SPEAKER

Any diagnosis of the Audio system should begin with the use of a scan tool and the appropriate Diagnostic Service information.

Refer to the appropriate wiring information.

WARNING: DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, SIDE AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

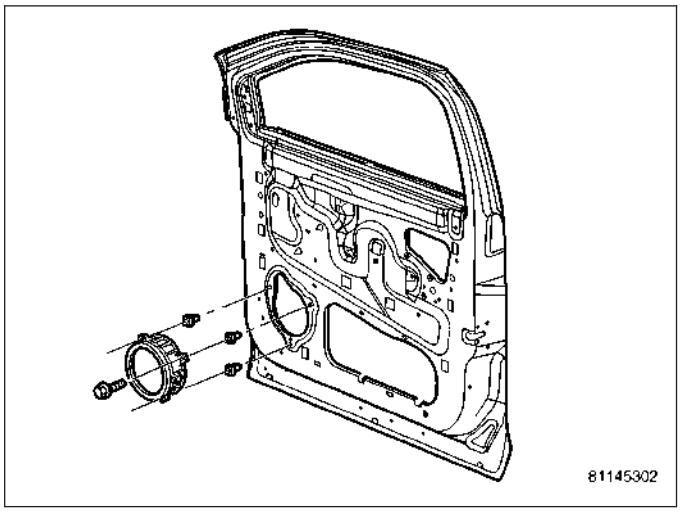
CAUTION: The speaker output of the radio is a "floating ground" system. Do not allow any speaker lead to short to ground, as damage to the radio may result.

1. If all speakers are inoperative, check the radio fuses in the junction block. If OK, go to Step 2. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.
2. Check the amplifier fuse (if equipped) in the junction block. If OK, go to Step 3. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.
3. Turn the ignition switch to the ON position. Turn the radio receiver ON. Adjust the balance and fader control controls to check the performance of each individual speaker. Note the speaker locations that are not performing correctly. Go to Step 4.
4. Turn the radio OFF. Turn the ignition OFF. Disconnect and isolate the battery negative cable. If vehicle is **not** equipped with a amplifier, remove the radio receiver. If the vehicle is equipped with an amplifier, disconnect the wire harness connectors. There are two connectors. The one on the body harness has body speakers only. The other on the instrument panel harness has the instrument panel speakers, battery, ground, and CAN. Go to Step 5.
5. Check both the speaker feed (+) circuit and return (-) circuit cavities for the inoperative speaker at the wire harness connector for continuity to ground. There should be no continuity. If OK, go to Step 6. If not OK, repair the shorted speaker feed (+) and/or return (-) circuits(s) to the speaker as required.
6. Disconnect wire harness connector at the inoperative speaker. Check for continuity between the speaker feed (+) circuit cavities of the radio receiver wire harness connector or if equipped, the amplifier wire harness connector and the speaker wire harness connector. Repeat the check between the speaker return (-) circuit cavities of the radio receiver wire harness connector and the speaker wire harness connector. In each case, there should be continuity. If OK, replace the faulty speaker. If not OK, repair the open speaker feed (+) and/or return (-) circuits(s) as required.

REMOVAL

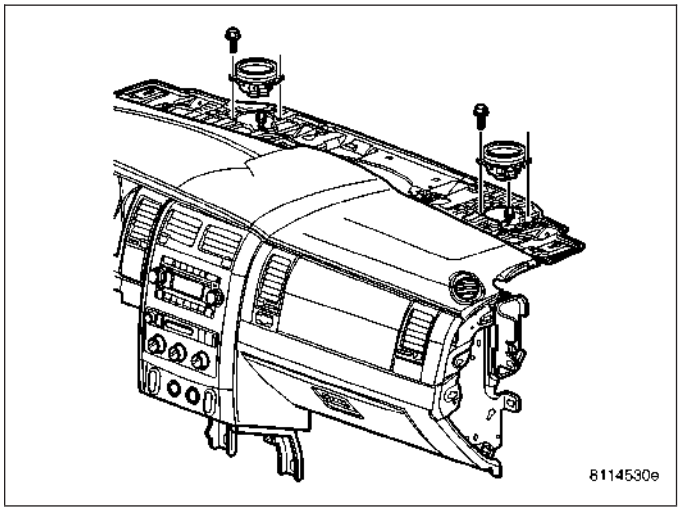
FRONT DOOR

1. Disconnect and isolate the battery negative cable.
2. Remove the front door trim panel (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - REMOVAL).
3. Remove the mounting fasteners.
4. Remove speaker and disconnect the electrical harness connector.



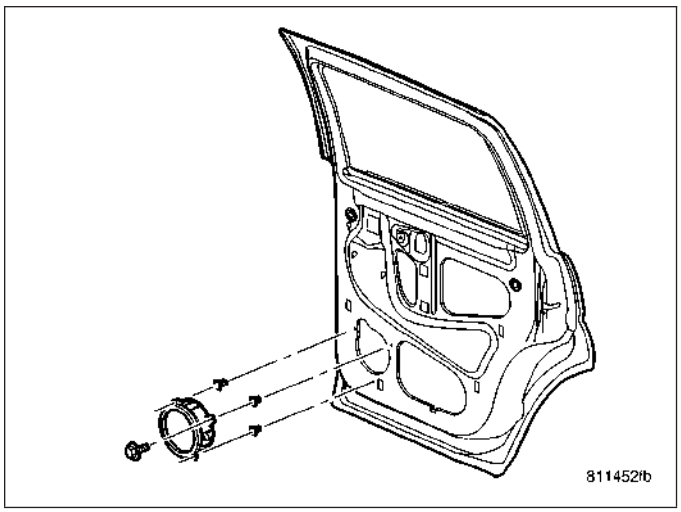
INSTRUMENT PANEL

1. Disconnect and isolate the battery negative cable.
2. Remove instrument panel defroster grille (Refer to 23 - BODY/INSTRUMENT PANEL/DEFROSTER GRILLE - REMOVAL).
3. Remove the mounting fasteners.
4. Remove speaker and disconnect the electrical harness connector.



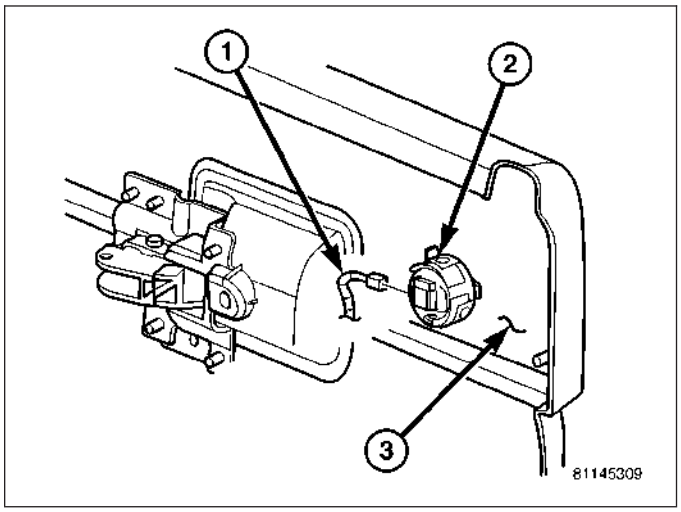
REAR DOOR

1. Disconnect and isolate the battery negative cable.
2. Remove the rear door trim panel (Refer to 23 - BODY/DOORS - REAR/TRIM PANEL - REMOVAL).
3. Remove the mounting fasteners.
4. Remove speaker and disconnect the electrical harness connector.



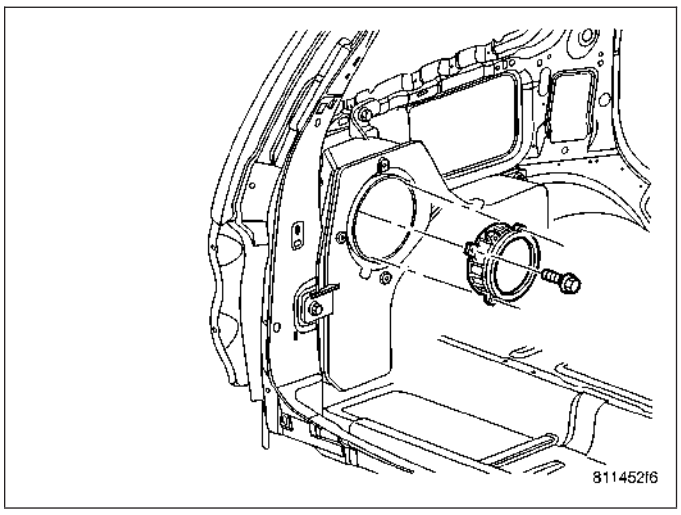
REAR DOOR TWEETER

1. Disconnect and isolate the battery negative cable.
2. Remove the rear door trim panel (Refer to 23 - BODY/DOORS - REAR/TRIM PANEL - REMOVAL).
3. Disconnect the electrical harness connector (1) and remove tweeter (2).



SUBWOOFER

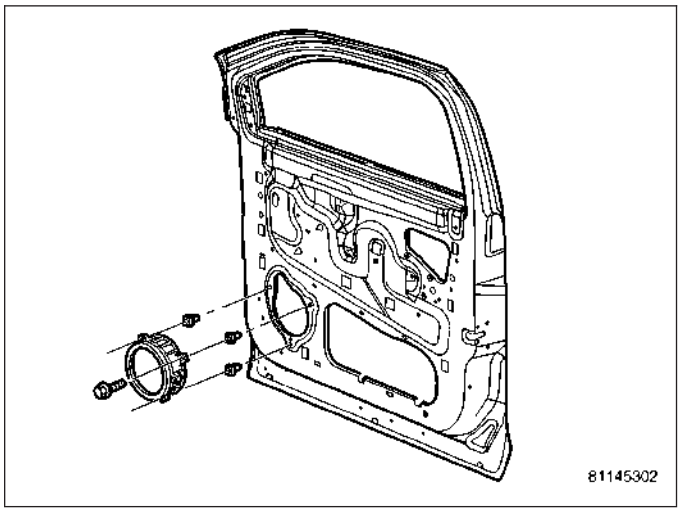
1. Disconnect and isolate the battery negative cable.
2. Remove the quarter panel trim (Refer to 23 - BODY/INTERIOR/QUARTER PANEL TRIM - REMOVAL).
3. Remove the mounting fasteners.
4. Remove speaker and disconnect the electrical harness connectors.



INSTALLATION

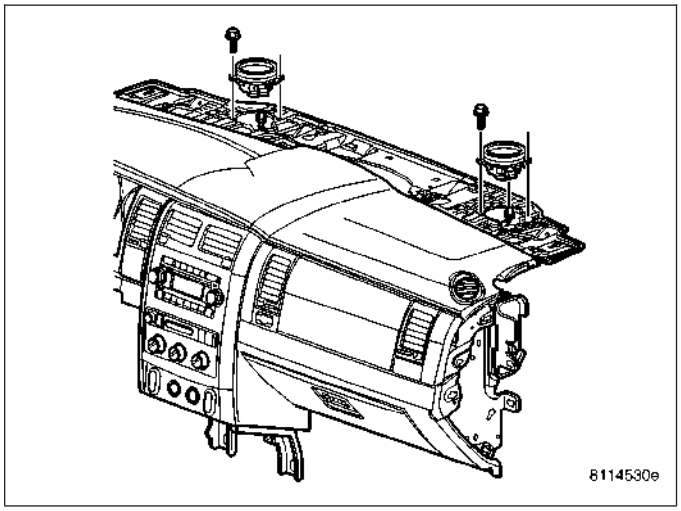
FRONT DOOR

1. Connect electrical harness connector and position speaker to door.
2. Install and tighten mounting fasteners.
3. Install door trim panel (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - INSTALLATION).
4. Connect battery negative cable.



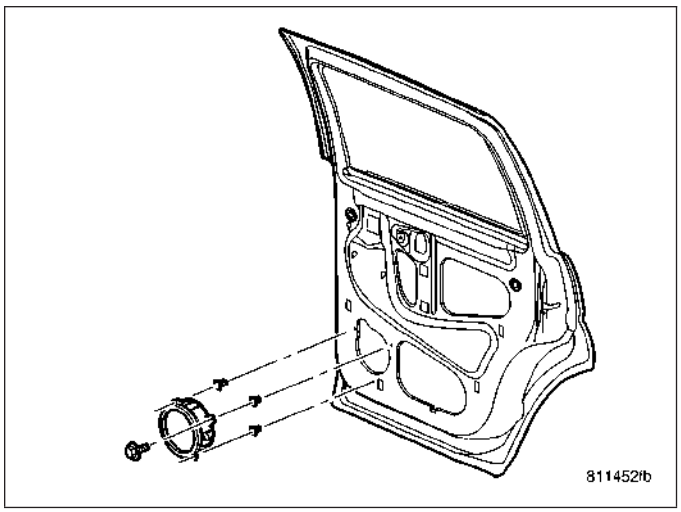
INSTRUMENT PANEL

1. Connect electrical harness connector and position speaker to instrument panel.
2. Install and tighten mounting fasteners.
3. Install instrument panel top cover.
4. Connect battery negative cable.



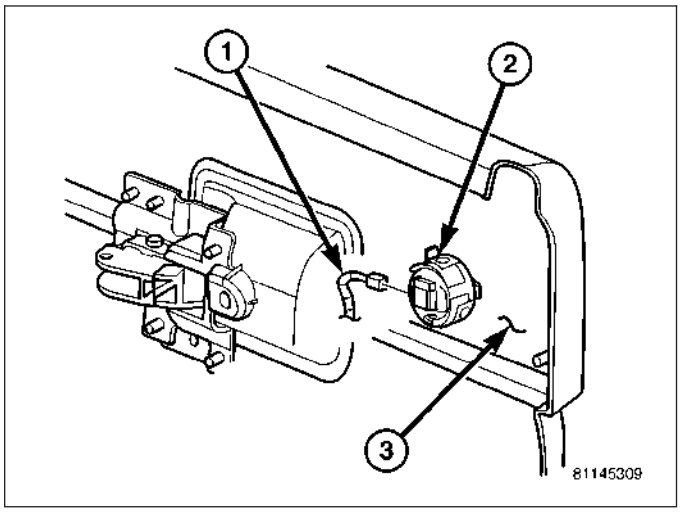
REAR DOOR

1. Connect electrical harness connector and position speaker to door.
2. Install and tighten mounting fasteners.
3. Install door trim panel (Refer to 23 - BODY/ DOORS - REAR/TRIM PANEL - INSTALLATION).
4. Connect battery negative cable.



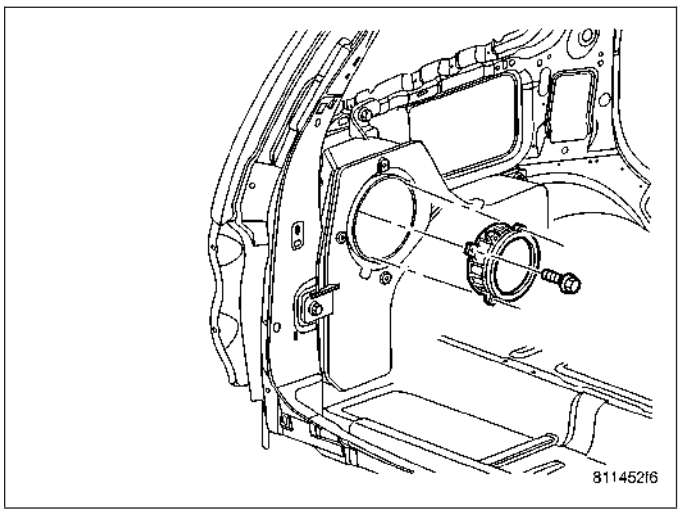
REAR DOOR TWEETER

1. Connect electrical harness connector and position speaker to door trim panel.
2. Install and tighten mounting fasteners.
3. Install door trim panel (Refer to 23 - BODY/ DOORS - REAR/TRIM PANEL - INSTALLATION).
4. Connect battery negative cable.



SUBWOOFER

1. Connect electrical harness connector and position speaker.
2. Install and tighten mounting fasteners.
3. Install quarter panel trim (Refer to 23 - BODY/INTERIOR/QUARTER PANEL TRIM - INSTALLATION).
4. Connect battery negative cable.



SWITCH-REMOTE RADIO

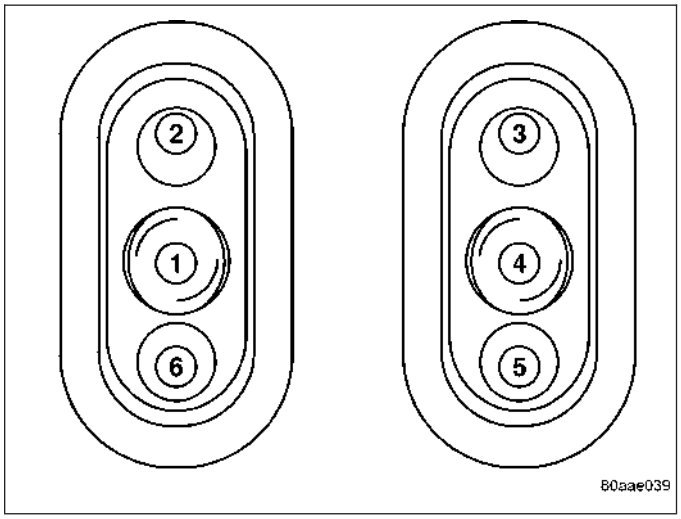
DESCRIPTION

Two rocker-type switches are mounted in the sides of the rear (instrument panel side) steering wheel trim cover. The switch on the left spoke is the seek switch and has seek up, seek down, and preset station advance functions. The switch on the right spoke is the volume control switch and has volume up, and volume down functions. The switch on the right spoke also includes a “mode” control that allows the driver to sequentially select AM radio, FM radio, cassette player or CD player.

OPERATION

The six switches in the two remote radio switch units are normally open, resistor multiplexed momentary switches that are hard wired to the Instrument cluster through the clockspring. The instrument cluster sends a five volt reference signal to both switch units on one circuit, and senses the status of all of the switches by reading the voltage drop on a second circuit.

When the instrument cluster senses an input (voltage drop) from any one of the remote radio switches, it sends the proper switch status messages on the Controller Area Network (CAN) data bus to the radio. The electronic circuitry within the radio is programmed to respond to these remote radio switch status messages by adjusting the radio settings as requested.



DIAGNOSIS AND TESTING

REMOTE SWITCHES

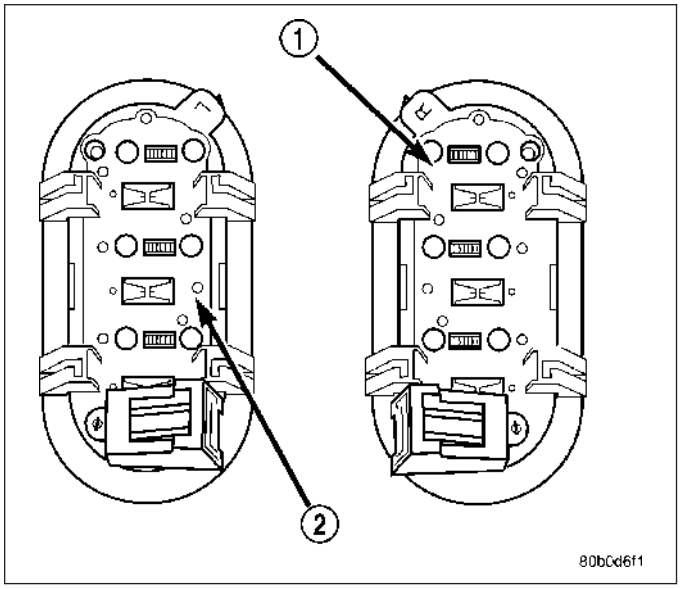
Any diagnosis of the Audio system should begin with the use of a scan tool and the appropriate Diagnostic Service information.

Refer to the appropriate wiring information.

WARNING: DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, SIDE AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

1. Remove the remote radio switch(es) (1) and (2) from the steering wheel (Refer to 8 - ELECTRICAL/ AUDIO/REMOTE SWITCHES - REMOVAL).
2. Use an ohmmeter to check the switch resistances as shown in the Remote Radio Switch test table. If the remote radio switch resistances are not as indicated, replace the inoperative switch.

REMOTE RADIO SWITCH TEST

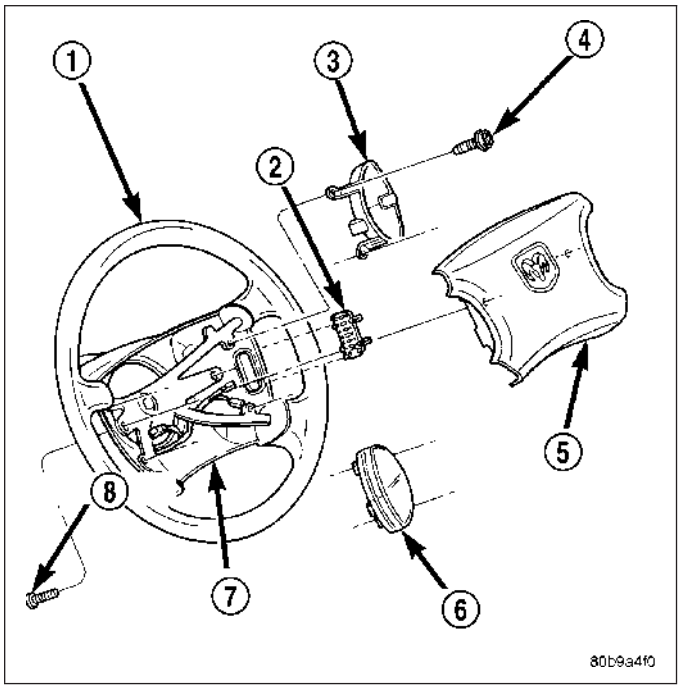


SWITCH	SWITCH POSITION	RESISTANCE
Right or Left	Neutral	24K Ohms ± 5%
Right (White)	Volume Up	6.8K Ohms ± 5%
Right (White)	Volume Down	15.6K Ohms ± 1%
Right (White)	Mode	0 Ohms
Left (Black)	Seek Up	1.2K Ohms ± 5%
Left (Black)	Seek Down	3.3K Ohms ± 5%
Left (Black)	Pre-Set Station Advance	.47K Ohms ± 5%

REMOVAL

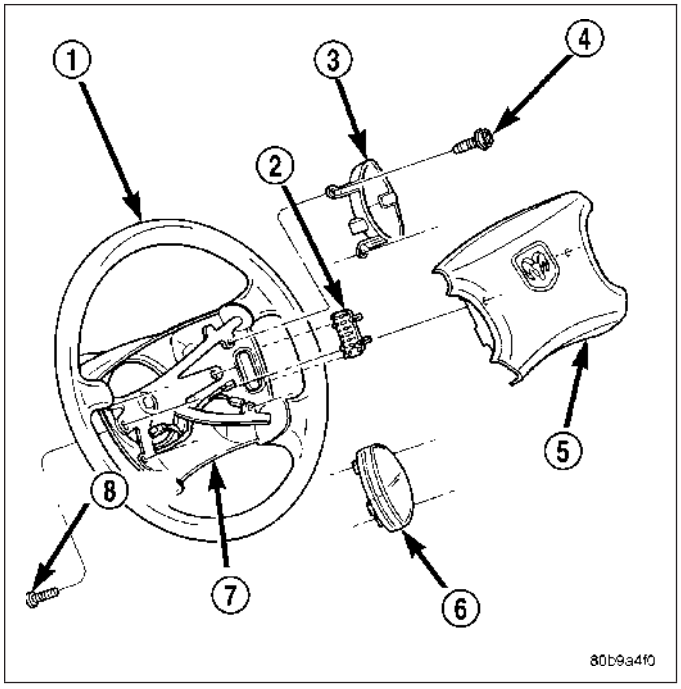
WARNING: DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, SIDE AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

1. Disconnect and isolate the battery negative cable.
2. Remove the driver side airbag (5) from the steering wheel (1). (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - REMOVAL).
3. Remove the speed control switch (3) or (6) located on the same side of the steering wheel as the remote radio switch that is being serviced. (Refer to 8 - ELECTRICAL/SPEED CONTROL/SWITCH - REMOVAL).
4. Disconnect the steering wheel wire harness connector from the connector receptacle of the remote radio switch.
5. Disengage the four remote radio switch latches that secure the switch to the inside of the mounting hole in the steering wheel rear trim cover.
6. From the outside of the steering wheel rear trim cover, remove the remote radio switch (2) from the trim cover.



INSTALLATION

1. Position the remote radio switch to the mounting hole on the outside of the steering wheel rear trim cover. Be certain that the connector receptacle is oriented toward the bottom of the switch and pointed toward the center of the steering wheel.
2. Press firmly and evenly on the remote radio switch until each of the switch latches is fully engaged in the mounting hole of the steering wheel rear trim cover.
3. Reconnect the steering wheel wire harness connector to the connector receptacle of the remote radio switch.
4. Install the speed control switch onto the steering wheel. (Refer to 8 - ELECTRICAL/SPEED CONTROL/SWITCH - INSTALLATION).
5. Install the driver side airbag to the steering wheel. (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - INSTALLATION).
6. Reconnect the battery negative cable.



CHIME/BUZZER

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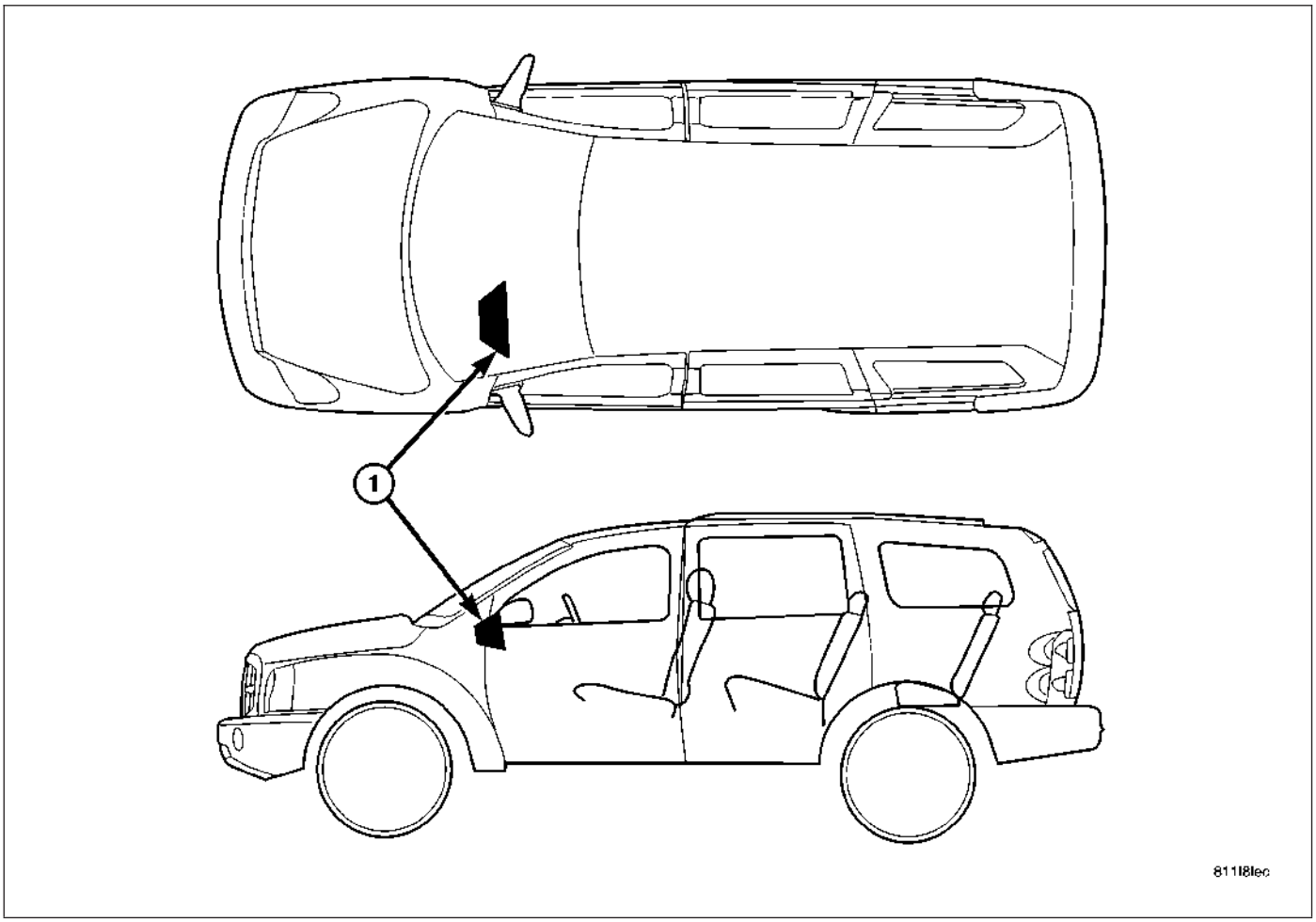
CHIME/BUZZER - SERVICE INFORMATION

DESCRIPTION



A chime warning system is standard factory-installed equipment. The chime warning system uses an electromechanical transducer and an electromechanical relay that are soldered onto the electronic circuit board inside of the ElectroMechanical Instrument Cluster (EMIC) (1) to provide audible indications of various vehicle conditions that may require the attention of the vehicle operator or occupants. The EMIC also includes the hardware and software necessary to serve as the electronic body control module and is sometimes referred to as the Cab Compartment Node or CCN.

The electromechanical transducer generates beep tones and chime tones, while the electromechanical relay generates click tones to emulate the sounds associated with conventional turn signal and hazard warning flasher operation. The microprocessor-based EMIC utilizes electronic chime request messages received from other modules in the vehicle over the Controller Area Network (CAN) data bus along with hard wired inputs to monitor many sensors

and switches throughout the vehicle. In response to those inputs, the circuitry and programming of the EMIC allow it to control the audible outputs that are produced through its on-board transducer and relay.

The EMIC is capable of producing the following audible outputs:

- **Slow Rate Repetitive Click** - Repeated “click” tones that are issued at a slow rate of about 50 clicks per minute.
- **Fast Rate Repetitive Click** - Repeated “click” tones that are issued at a fast rate of more than about 100 clicks per minute.
- **Fixed Duration Beep** - A short, sharp, single tactile “beep” tone.
- **Single Chime Tone** - A single “chime” tone.
- **Slow Rate Repetitive Chime** - Repeated “chime” tones that are issued at a slow rate of about 50 chimes per minute.
- **Fast Rate Repetitive Chime** - Repeated “chime” tones that are issued at a fast rate of about 180 chimes per minute.

Hard wired circuitry connects the EMIC and the various chime warning system switch and sensor inputs to their modules and to each other through the electrical system of the vehicle. These hard wired circuits are integral to several wire harnesses, which are routed throughout the vehicle and retained by many different methods. These circuits may be connected to each other, to the vehicle electrical system and to the EMIC through the use of a combination of soldered splices, splice block connectors, and many different types of wire harness terminal connectors and insulators. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, further details on wire harness routing and retention, as well as pin-out and location views for the various wire harness connectors, splices and grounds.

The EMIC chime warning system circuits and components cannot be adjusted or repaired. If the EMIC circuitry, the on-board transducer or the relay are damaged or faulty, the EMIC unit must be replaced.

OPERATION

The chime warning system operates on battery voltage received through a fuse in the Junction Block (JB) on a non-switched fused B(+) circuit so that the system may operate regardless of the ignition switch position. The chime warning system also monitors the ignition switch position so that some chime features are functional only with the ignition switch in the On position, while others are functional regardless of the ignition switch position.

The chime warning system provides an audible indication to the vehicle operator or occupants under the following conditions:

- **Airbag Indicator Warning** - The ElectroMechanical Instrument Cluster (EMIC) transducer will generate one short chime when the ignition switch is in the On position, and an electronic message is received over the Controller Area Network (CAN) data bus from the Occupant Restraint Controller (ORC) requesting “Airbag” indicator illumination. This warning will only occur following completion of the “Airbag” indicator bulb test, and will only occur once during any ignition cycle.
- **Compass Mini-Trip Computer Global Reset** - The EMIC transducer will generate one short chime when the ignition switch is in the On position, and an electronic message is received over the CAN data bus from the optional Compass Mini-Trip Computer (CMTC) requesting that the CMTC average fuel economy, trip odometer and distance to empty data be reset. The CMTC monitors hard wired inputs from the U.S./Metric and Reset button switches to determine the proper reset messages to send to the EMIC.
- **Door Ajar Indicator Warning** - The EMIC transducer will generate one short chime when the ignition switch is in the On position, a hard wired input is received indicating that the status of any door ajar switch has changed, and an electronic message is received over the CAN data bus indicating that the vehicle is moving.
- **Fasten Seat Belt Indicator Warning** - The EMIC transducer will generate repetitive chimes at a slow rate to announce that a hard wired input from the seat belt switch indicates that the driver side front seat belt is not fastened with the ignition switch in the On position. The chime warning system also supports the enhanced seatbelt reminder (beltminder) when this feature is enabled. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER/SEATBELT INDICATOR - OPERATION).
- **Gate Ajar Indicator Warning** - The EMIC transducer will generate one short chime when the ignition switch is in the On position, a hard wired input is received indicating that the status of the liftgate ajar switch has changed, and an electronic message is received over the CAN data bus indicating that the vehicle is moving.

- **Head/Park Lamps-On Warning** - The EMIC transducer will generate repetitive chimes at a fast rate to indicate that hard wired inputs from the driver door ajar switch, the headlamp switch, and the ignition switch indicate that the exterior lamps are turned On with the driver side front door opened and the ignition switch in the Off position. The chimes will continue to sound until the exterior lamps are turned Off, the driver side front door is closed, or the ignition switch is turned to the On position, whichever occurs first.
- **Key-In-Ignition Warning** - The EMIC transducer will generate repetitive chimes at a fast rate to indicate that hard wired inputs from the driver door ajar switch, the ignition switch, and the key-in ignition switch circuitry of the ignition switch indicate that the key is in the ignition lock cylinder with the driver side front door open and the ignition switch in the Off position. The chimes will continue to sound until the key is removed from the ignition lock cylinder, the driver side front door is closed, or the ignition switch is turned to the On position, whichever occurs first.
- **Low Fuel Indicator Warning** - The EMIC transducer will generate one short chime when the low fuel indicator is illuminated by the instrument cluster circuitry. This chime will only occur once during any ignition cycle.
- **Low Wash Indicator Warning** - The EMIC transducer will generate one short chime when the low washer fluid indicator is illuminated by the instrument cluster circuitry. This chime will only occur once during any ignition cycle.
- **Overspeed Warning** - The EMIC transducer will generate repetitive chimes at a slow rate to indicate that the vehicle speed is over a pre-programmed speed value. The EMIC monitors electronic vehicle speed messages received over the CAN data bus. This feature is only enabled on an EMIC that has been programmed with a Middle East Gulf Coast Country (GCC) country code.
- **Park Brake Reminder** - The EMIC transducer will generate one short chime to announce that the hard wired input from the park brake switch and a vehicle speed message input received over the CAN data bus indicate that the park brake is applied and the vehicle is moving. This chime will repeat each time the input conditions are met.
- **Sentry Key “Customer Learn” Mode Announcement** - The EMIC transducer will generate one short chime to confirm that an electronic “Customer Learn” mode message has been received over the CAN data bus to indicate that the Sentry Key Remote Entry Module (SKREEM) is prepared for programming additional sentry key transponders. This chime feature is only active on vehicles equipped with the optional Sentry Key system, and sold in a market where “Customer Learn” programming is an allowed feature.
- **Trans Overtemp Indicator Warning** - The EMIC transducer will generate repetitive chimes at a slow rate when the transmission overtemp indicator is illuminated by the instrument cluster for a high or critical transmission fluid temperature condition. This chime will repeat each time the trans overtemp indicator is cycled from Off to On.
- **Turn Signal/Hazard Warning Flasher Emulation** - The EMIC relay will generate repetitive clicks at a slow rate to emulate an electromechanical flasher when the turn signal or hazard warning system are operating. The EMIC relay will generate repetitive clicks at a fast rate to indicate that the right or left turn signal are operating with one or more bulbs inoperative. In either case, the clicks will continue until the turn signal and hazard warning systems are turned off.
- **Turn Signal On Warning** - The EMIC transducer will generate repetitive chimes at a slow rate to indicate that a turn signal has been active continuously for 1.6 kilometers (1 mile) with the vehicle speed greater than 22 kilometers-per-hour (15 miles-per hour). Vehicles built for markets other than the United States and Canada have a revised distance threshold of 4 kilometers for this feature. The chime will continue until the turn signal input becomes inactive or until the vehicle speed message indicates that the speed is less than 22 kilometers-per-hour (15 miles-per-hour), whichever occurs first. The hazard warning flashers will not activate this chime feature.
- **Warning Indicator Announcement** - The EMIC transducer will generate one short chime each time the check gauges indicator is illuminated by the instrument cluster circuitry. The check gauges indicator may be illuminated when any critical engine or transmission systems are operating outside of their normal parameters. The instrument cluster monitors electronic messages received over the CAN data bus to determine when to illuminate the check gauges indicator.

The EMIC provides chime service for all available features in the chime warning system. The EMIC relies upon its internal programming, numerous hard wired inputs, and electronic message inputs received from other modules over the CAN data bus network to provide the chime warning system features. The internal programming of the EMIC determines the priority of each chime request input that is received, as well as the rate and duration of each chime that is to be generated.

The hard wired chime warning system inputs to the EMIC may be diagnosed and tested using conventional diagnostic tools and procedures. However, conventional diagnostic methods may not prove conclusive in the diagnosis of the EMIC, the CAN data bus, or the electronic messages received by the EMIC from other modules. The most reliable, efficient and accurate means to diagnose the EMIC, the CAN data bus, or the electronic message inputs used for the chime warning system requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

DIAGNOSIS AND TESTING

CHIME WARNING SYSTEM

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

The hard wired chime warning system inputs to the ElectroMechanical Instrument Cluster (EMIC), as well as other hard wired circuits for this system may be diagnosed and tested using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

However, conventional diagnostic methods may not prove conclusive in the diagnosis of the EMIC, the Controller Area Network (CAN) data bus, or the electronic message inputs used by the EMIC to provide chime warning system service. The most reliable, efficient, and accurate means to diagnose the EMIC, the CAN data bus, and the electronic message inputs for the chime warning system requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

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ELECTRONIC CONTROL MODULES - ELECTRICAL DIAGNOSTICS

DIAGNOSIS AND TESTING

BODY VERIFICATION TEST – VER 1

Diagnostic Test

1. Perform Body Verification Test

Disconnect all jumper wires and reconnect all previously disconnected components and connectors.

Ensure that all accessories are turned off.

Ensure that the battery is fully charged.

Turn the ignition on.

With the scan tool, record and erase DTCs from all modules.

If an electronic control module was replaced, select the applicable module from the scan tool menu and press “Misc. Functions”. If the module has programable features, program as necessary.

If repairs were made to any of the HVAC door actuator circuits, with the scan tool in HVAC, select System Tests and then select Actuator DTC Detection. The test must pass before proceeding to the next step.

If repairs were made to any of the HVAC doors, linkage, door actuators, or door actuator circuits, with the scan tool in HVAC, select System Tests and then select Actuator Calibration Test. The test must pass before proceeding to the next step.

Turn the ignition off, wait 10 seconds, and then turn the ignition on.

Operate all functions of the system that caused the original concern.

With the scan tool, select ECU View.

Check for DTCs in the modules.

Are DTCs present in any of the modules or is the original condition still present?

Yes >> The repair is not complete. Refer to the related category for the DTC or symptom that is still present.

No >> The repair is complete.

B210D-BATTERY VOLTAGE LOW

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  Battery voltage less than 9 volts for more than 15 seconds.

Possible Causes
RESISTANCE IN THE (A1) BATTERY POSITIVE CIRCUIT
RESISTANCE IN THE GENERATOR CASE GROUND
GENERATOR OPERATION
(K20) GENERATOR FIELD CONTROL CIRCUIT OPEN
(K20) GENERATOR FIELD CONTROL CIRCUIT SHORTED TO GROUND
(Z20) GROUND CIRCUIT OPEN
PCM

Diagnostic Test

1. CHECK FOR ANY POWERTRAIN CONTROL MODULES DTCS

NOTE: Make sure the Battery is in good condition. Using the Midtronics Battery Tester, test the Battery before continuing.

NOTE: Inspect the vehicle for after market accessories that may exceed the Generator System output.

NOTE: Make sure the generator drive belt is in good operating condition.

NOTE: Inspect the fuses in the IPM. If an open fuse is found, use the wire diagram/schematic as a guide, inspect the wiring and connectors for damage.

Turn the ignition on.

With the scan tool, read active PCM DTC's.

Does the scan tool display any active PCM DTC's?

Yes >> (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

No >> Check the above conditions that can cause a low voltage condition. Repair as necessary. Perform BODY VERIFICATION TEST – VER 1.

B210E-BATTERY VOLTAGE HIGH

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  Battery voltage greater than 16 volts for more than 15 seconds.

Possible Causes
(K20) GENERATOR FIELD CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE
GENERATOR
PCM

Diagnostic Test

1. CHECK FOR ANY POWERTRAIN CONTROL MODULES DTCS

NOTE: Make sure the Battery is in good condition. Using the Midtronics Battery Tester, test the Battery before continuing.

NOTE: Inspect the vehicle for after market accessories that may exceed the Generator System output.

NOTE: Make sure the generator drive belt is in good operating condition.

NOTE: Inspect the fuses in the IPM. If an open fuse is found, use the wire diagram/schematic as a guide, inspect the wiring and connectors for damage.

Turn the ignition on.

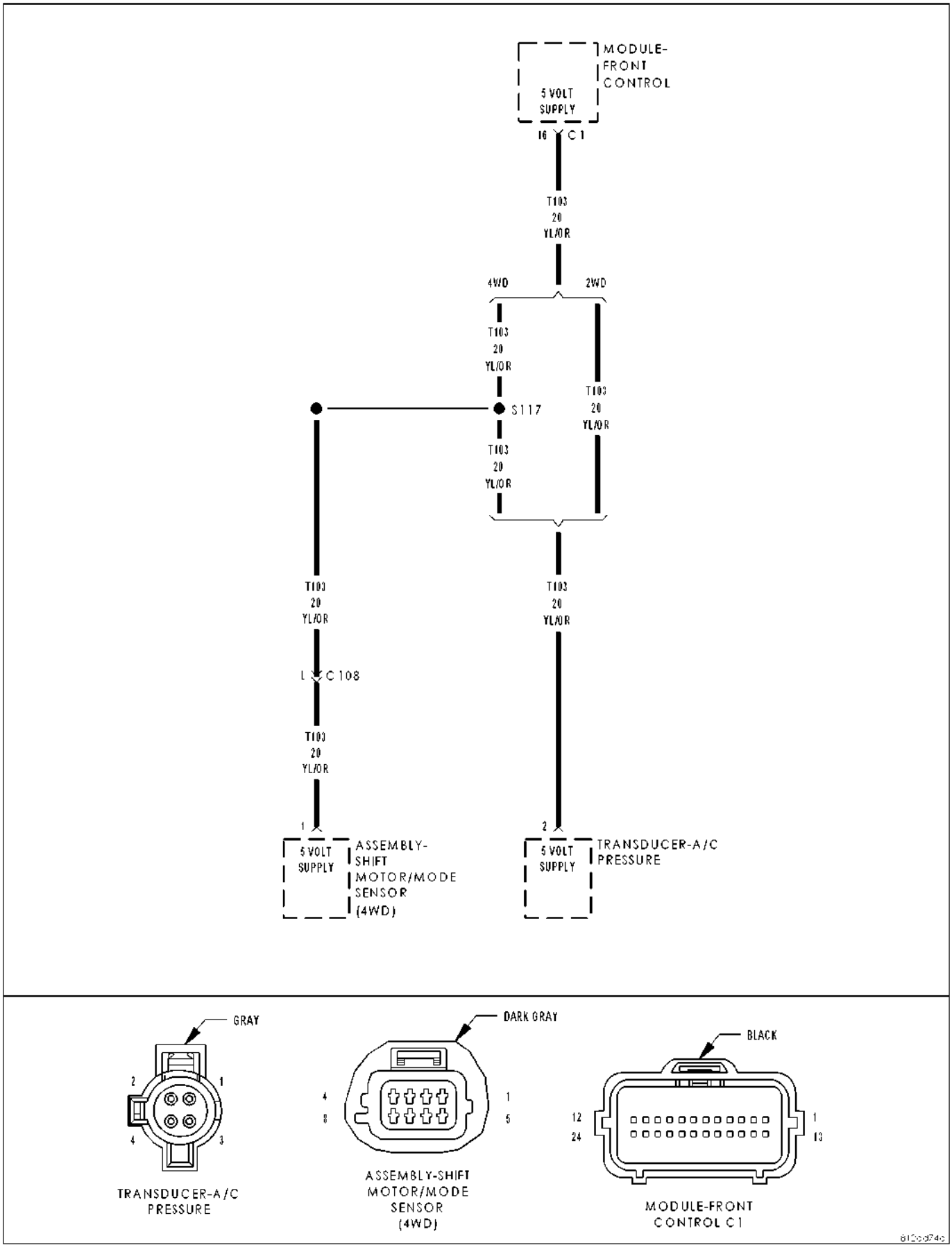
With the scan tool, read active PCM DTC's.

Does the scan tool display any active PCM DTC's?

Yes >> (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

No >> Check the above conditions that can cause a high voltage condition. Repair as necessary. Perform BODY VERIFICATION TEST – VER 1.

B2112-5 VOLT SUPPLY CIRCUIT LOW



B2112-5 VOLT SUPPLY CIRCUIT LOW (CONTINUED)
For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Front Control Module detects the (T103) 5 volt supply circuit voltage below 0.3 volts.

Possible Causes
(T103) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND
A/C PRESSURE TRANSDUCER
SHIFT MOTOR/MODE SENSOR ASSEMBLY
FRONT CONTROL MODULE

Diagnostic Test

1. CHECK FOR ACTIVE DTC

With the scan tool, read the active DTC's.
Cycle the ignition switch from off to on, leaving the ignition on for a minimum of 90 seconds.
With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

---

2. A/C PRESSURE TRANSDUCER

Turn the ignition off.
Disconnect the A/C Pressure Transducer harness connector.
Cycle the ignition switch from off to on, leaving the ignition on for a minimum of 90 seconds.
With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 3

No >> Replace the A/C Pressure Transducer in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

---

3. SHIFT MOTOR/MODE SENSOR ASSEMBLY

Turn the ignition off.
Disconnect the Shift Motor/Mode Sensor Assembly harness connector.
Cycle the ignition switch from off to on, leaving the ignition on for a minimum of 90 seconds.
With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 4

No >> Replace the Shift Motor/Mode Sensor Assembly in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

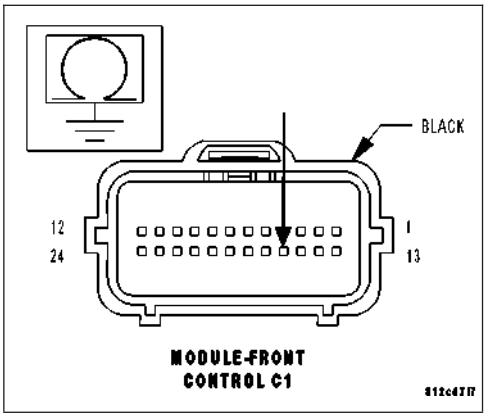
B2112-5 VOLT SUPPLY CIRCUIT LOW (CONTINUED)

4. (T103) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the FCM C1 harness connector.

Measure the resistance between ground and the (T103) 5 Volt Supply circuit.

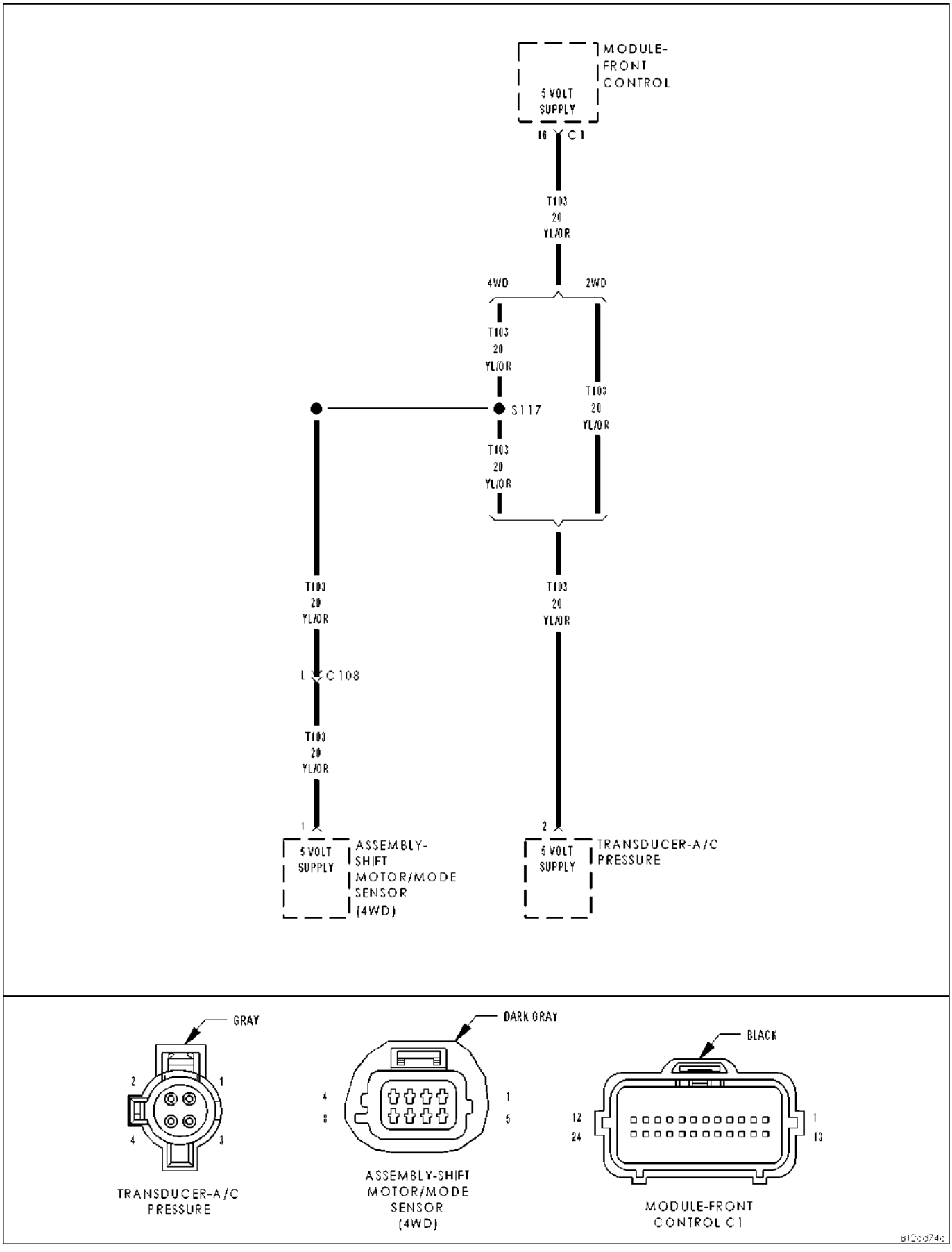


Is the resistance below 1000.0 ohms?

Yes >> Repair the (T103) 5 Volt Supply circuit for a short to ground.
Perform BODY VERIFICATION TEST – VER 1.

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Front Control Module in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

B2113-5 VOLT SUPPLY CIRCUIT HIGH



B2113-5 VOLT SUPPLY CIRCUIT HIGH (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Front Control Module detects the (T103) 5 volt supply circuit voltage above 5.0 volts.

Possible Causes
(T103) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
A/C PRESSURE TRANSDUCER
SHIFT MOTOR/MODE SENSOR ASSEMBLY
FRONT CONTROL MODULE

Diagnostic Test

1. CHECK FOR ACTIVE DTC

With the scan tool, read the active DTC's.
Cycle the ignition switch from off to on, leaving the ignition on for a minimum of 90 seconds.
With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

---

2. A/C PRESSURE TRANSDUCER

Turn the ignition off.
Disconnect the A/C Pressure Transducer harness connector.
Cycle the ignition switch from off to on, leaving the ignition on for a minimum of 90 seconds.
With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 3

No >> Replace the A/C Pressure Transducer in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

---

3. SHIFT MOTOR/MODE SENSOR ASSEMBLY

Turn the ignition off.
Disconnect the Shift Motor/Mode Sensor Assembly harness connector.
Cycle the ignition switch from off to on, leaving the ignition on for a minimum of 90 seconds.
With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

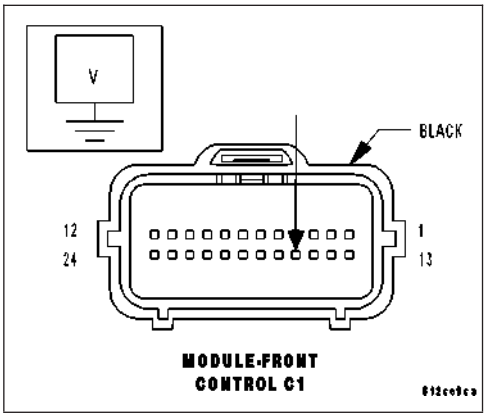
Yes >> Go To 4

No >> Replace the Shift Motor/Mode Sensor Assembly in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

B2113-5 VOLT SUPPLY CIRCUIT HIGH (CONTINUED)

4. (T103) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.
Disconnect the FCM C1 harness connector.
Turn the ignition on.
Measure the voltage of the (T103) 5 Volt Supply circuit.



Is the voltage above 5.5 volts?

Yes >> Repair the (T103) 5 Volt Supply circuit for a short to voltage.
Perform BODY VERIFICATION TEST – VER 1.

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Front Control Module in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

B2215-FRONT CONTROL MODULE INTERNAL

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously.
- **Set Condition:**
  The Front Control Module detects an internal fault.

Possible Causes
FRONT CONTROL MODULE

Diagnostic Test

1. REPLACE THE FRONT CONTROL MODULE IF DTC IS ACTIVE

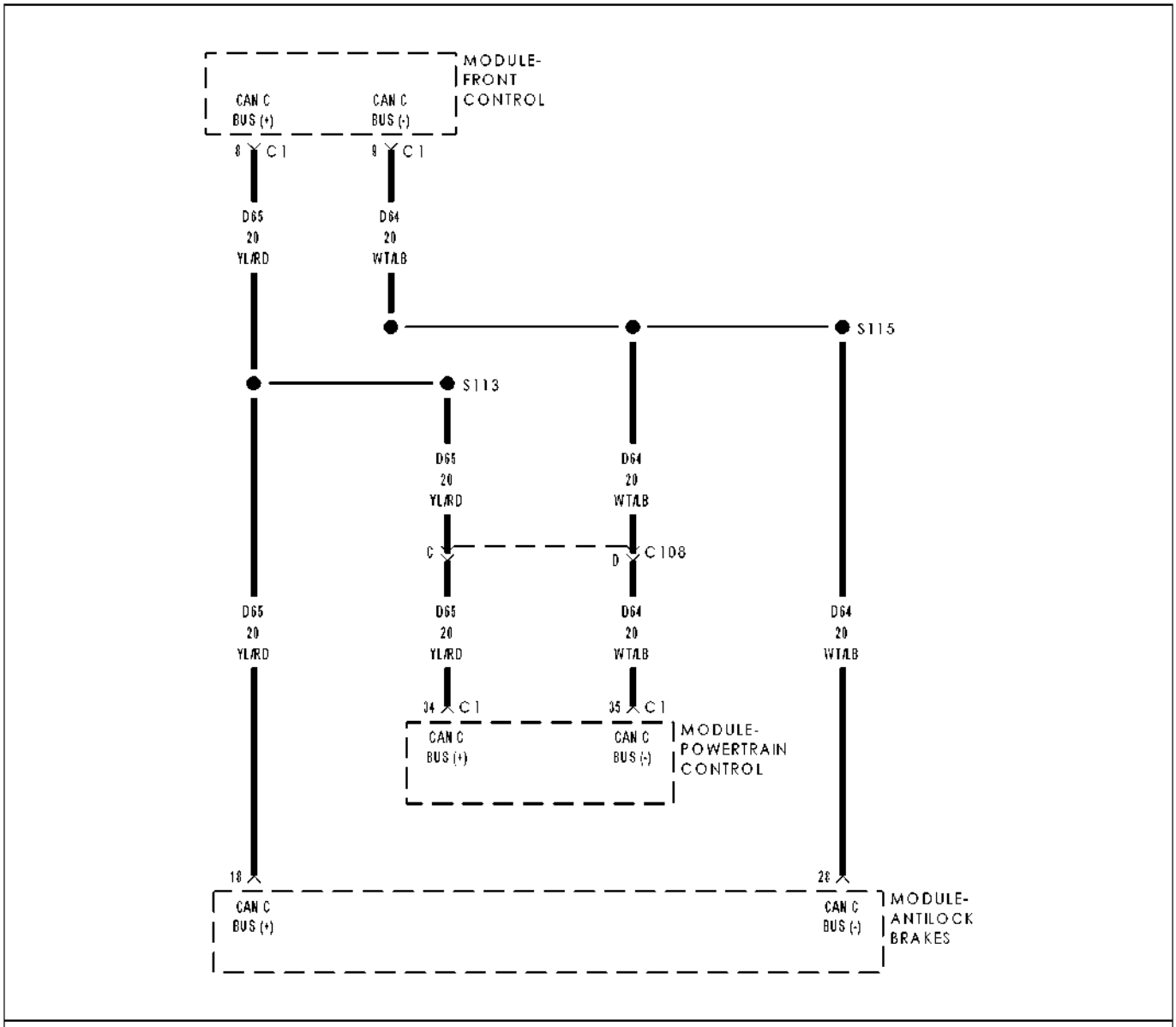
With the scan tool, read the active DTC's.

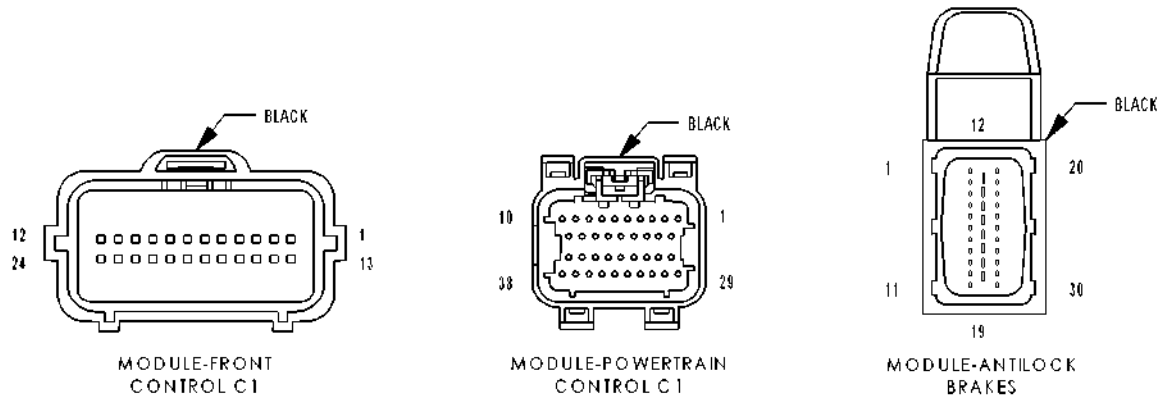
Does the scan tool display this DTC as active?

Yes >> Replace and program the Front Control Module in accordance with the service information. Perform BODY VERIFICATION TEST – VER 1.

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

U0001-CAN C BUS CIRCUIT





U0001-CAN C BUS CIRCUIT (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The FCM detects a short in either CAN C Bus circuit.

Possible Causes
(D65) CAN C BUS (+) CIRCUIT SHORTED TO GROUND
(D64) CAN C BUS (-) CIRCUIT SHORTED TO GROUND
(D65) CAN C BUS (+) CIRCUIT SHORTED TO VOLTAGE
(D64) CAN C BUS (-) CIRCUIT SHORTED TO VOLTAGE
(D65) CAN C BUS (+) CIRCUIT SHORTED TO (D64) CAN C BUS (-) CIRCUIT
ANTILOCK BRAKE MODULE
POWERTRAIN CONTROL MODULE
FRONT CONTROL MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase FCM DTC's.
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read active FCM DTC's.

Does the scan tool display U0001–CAN C BUS CIRCUIT as active?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

---

2. ANTILOCK BRAKE MODULE — INTERNAL SHORT

Turn the ignition off.
Disconnect the Antilock Brake Module harness connector.
Turn the ignition on.
With the scan tool, record and erase FCM DTC's.
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read active FCM DTC's.

Does the scan tool display U0001–CAN C BUS CIRCUIT as active?

Yes >> Go To 3

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Antilock Brake Module in accordance with the service information.
Perform ABS VERIFICATION TEST — VER 1.

U0001-CAN C BUS CIRCUIT (CONTINUED)

3. POWERTRAIN CONTROL MODULE — INTERNAL SHORT

Turn the ignition off.
Disconnect the Powertrain Control Module C1 harness connector.
Turn the ignition on.
With the scan tool, record and erase FCM DTC's.
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read active FCM DTC's.

Does the scan tool display U0001–CAN C BUS CIRCUIT as active?

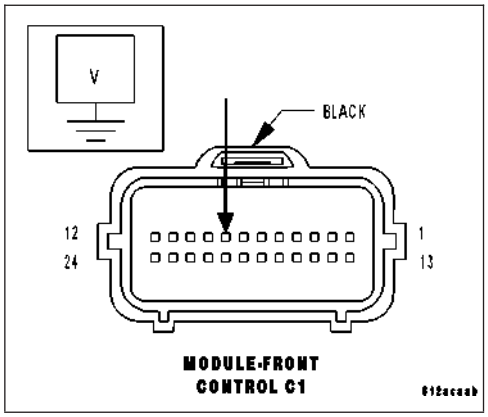
Yes >> Go To 4

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Powertrain Control Module in accordance with the service information.
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

---

4. (D65) CAN C BUS (+) CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.
Disconnect the Front Control Module C1 harness connector.
Turn the ignition on.
Measure the voltage between the (D65) CAN C Bus (+) circuit and ground.



Is there any voltage present?

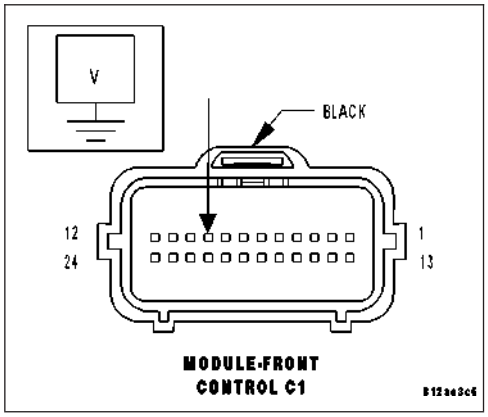
Yes >> Repair the (D65) CAN C Bus (+) circuit for a short to voltage.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 5

---

5. (D64) CAN C BUS (-) CIRCUIT SHORTED TO VOLTAGE

Measure the voltage between the (D64) CAN C Bus (-) circuit and ground.



Is there any voltage present?

Yes >> Repair the (D64) CAN C Bus (-) circuit for a short to voltage.
Perform BODY VERIFICATION TEST - VER 1.

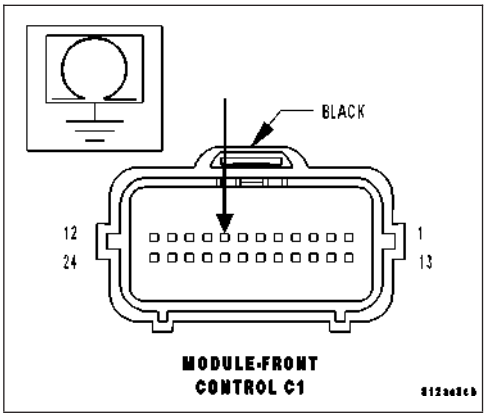
No >> Go To 6

U0001-CAN C BUS CIRCUIT (CONTINUED)

6. (D65) CAN C BUS (+) CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Measure the resistance between ground and the (D65) CAN C Bus (+) circuit.



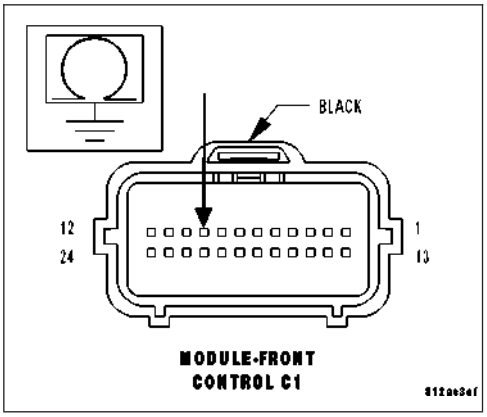
Is any resistance present?

Yes >> Repair the (D65) CAN C Bus (+) circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 7

7. (D64) CAN C BUS (-) CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (D64) CAN C Bus (-) circuit.



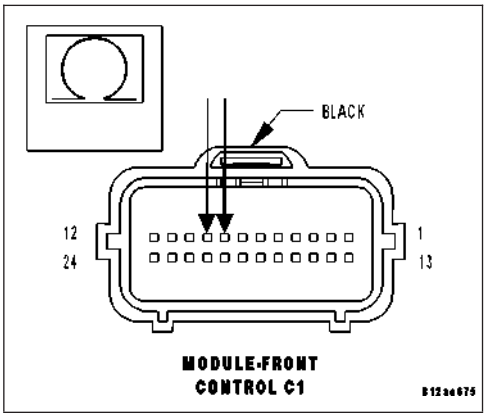
Is any resistance present?

Yes >> Repair the (D64) CAN C Bus (-) circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 8

8. (D65) CAN C BUS (+) CIRCUIT SHORTED TO (D64) CAN C BUS (-) CIRCUIT

Measure the resistance between the (D65) CAN C Bus (+) circuit and the (D64) CAN C Bus (-) circuit.

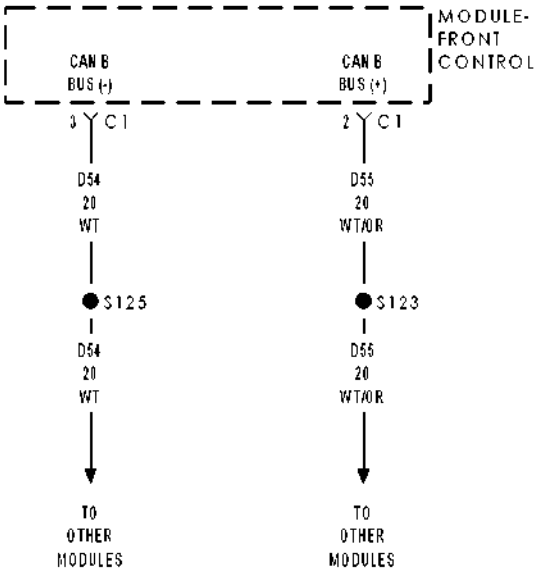


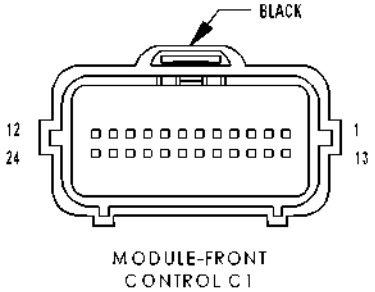
Is any resistance present?

Yes >> Repair the (D65) CAN C Bus (+) circuit for a short to the (D64) CAN C Bus (-) circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Front Control Module in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1.

U0021-CAN B BUS (+) CIRCUIT OPEN





U0021-CAN B BUS (+) CIRCUIT OPEN (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on and battery voltage between 10 and 16 volts.
- **Set Condition:**
  The FCM detects the (D55) CAN B Bus (+) circuit is open.

Possible Causes
CAN B BUS TERMINAL PUSH OUT
SPREAD CAN B BUS TERMINAL
(D55) CAN B BUS (+) CIRCUIT OPEN
INTERNAL OPEN IN A CAN B BUS MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase FCM DTC's
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read active FCM DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

U0021-CAN B BUS (+) CIRCUIT OPEN (CONTINUED)

2. ATTEMPT TO ISOLATE THE OPEN CONDITION

Turn the ignition on.

Verify that all CAN B Bus modules are communicating with the scan tool.

NOTE: A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

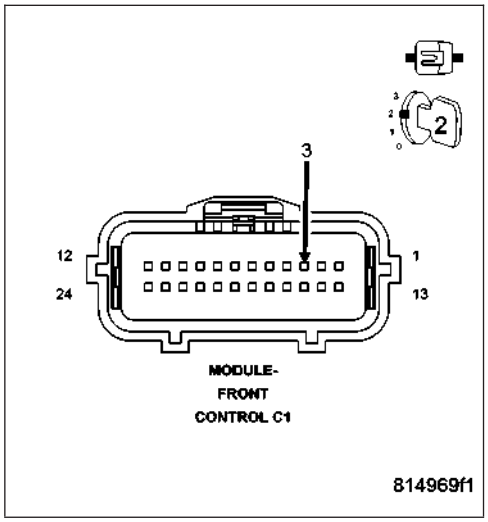
NOTE: If any module is not communicating, perform the appropriate no response test procedure before proceeding.

Turn the ignition off.

Gain access to the Front Control Module C1 harness connector, but do not disconnect.

Using a fused jumper wire, connect one end to ground and with the other end backprobe the CAN B Bus (-) circuit at the FCM C1 harness connector.

Turn the ignition on.



With the scan tool monitor the network status screen and document all modules that display a red X.

Are there any red X's displayed next to the modules?

Yes >> Go To 3

No >> Check backprobe connection to ground, make sure it is proper. The CAN B Bus open DTC may no longer be active, it may be stored. Check all module connections

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

---

3. ATTEMPT TO ISOLATE THE OPEN CONDITION — MULTIPLE RED X'S

With the scan tool continue monitoring the network status screen.

Are there multiple red X's displayed next to the modules?

Yes >> The most likely cause of this condition is an open CAN B Bus (+) circuit between a common CAN B Bus splice and the modules that display the red X next to them. Use the wiring diagrams will help you determine where open condition exists.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

No >> Go To 4

U0021-CAN B BUS (+) CIRCUIT OPEN (CONTINUED)

4. (D55) CAN B BUS (+) CIRCUIT OPEN — SINGLE RED X

Turn the ignition off.

Disconnect the module that has the red X displayed next to it.

Turn the ignition on.

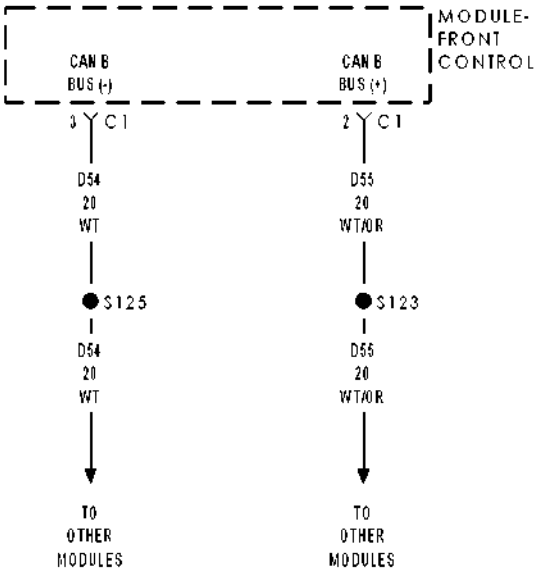
Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

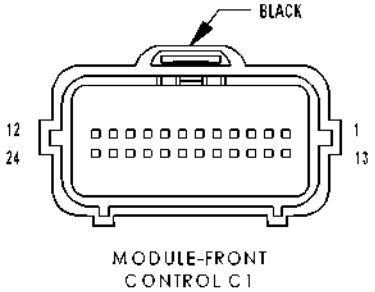
Is there any voltage present?

Yes >> Inspect the connector and terminal for damage, inspect for spread terminals, or push out terminals. If ok, replace the module that displayed the red X next to it in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

No >> Repair the (D55) CAN B Bus (+) circuit for an open between the next common splice and the module that has the red X displayed next to it. Use the wiring diagrams will help you determine where open condition exists.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

U0022-CAN B BUS (+) CIRCUIT LOW





U0022-CAN B BUS (+) CIRCUIT LOW (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  The FCM detects the (D55) CAN B Bus (+) circuit is shorted to ground.

Possible Causes
(D55) CAN B BUS (+) CIRCUIT SHORTED TO GROUND
ANY CAN B BUS MODULE
FRONT CONTROL MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase FCM DTC's.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read active FCM DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

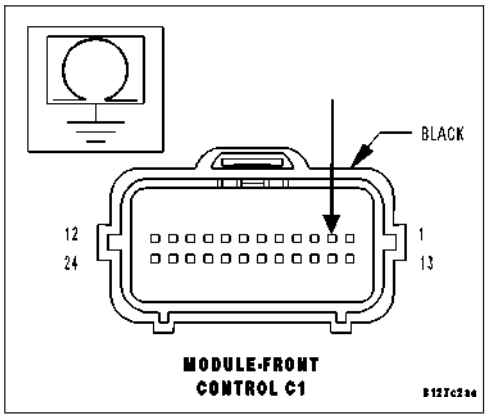
---

2. CHECK THE (D55) CAN B BUS (+) CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

Disconnect the Front Control Module C1 harness connector.

Measure the resistance between ground and the (D55) CAN B Bus (+) circuit.



Is resistance below 1000.0 ohms?

Yes >> Go To 3

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Front Control Module in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1.

U0022-CAN B BUS (+) CIRCUIT LOW (CONTINUED)

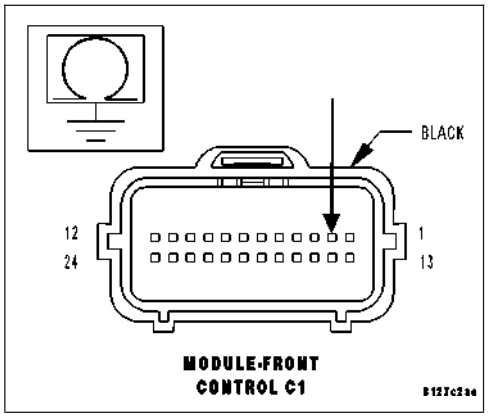
3. (D55) CAN B BUS (+) CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (D55) CAN B Bus (+) circuit.

While monitoring the ohmmeter, disconnect each CAN B Bus module one at a time.

NOTE: This is to determine if the short to ground is internal within a module or if the circuit is shorted.

NOTE: Disconnecting an in-line connector can eliminate a module or group of modules from the list of possible causes for this fault. Refer to the wiring diagrams to assist in diagnosis.

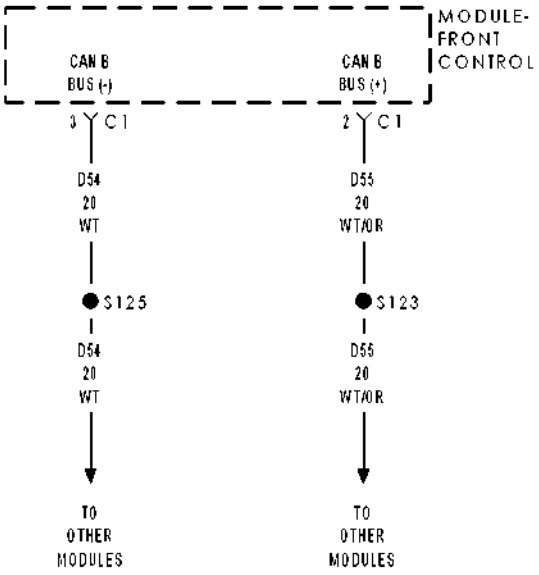


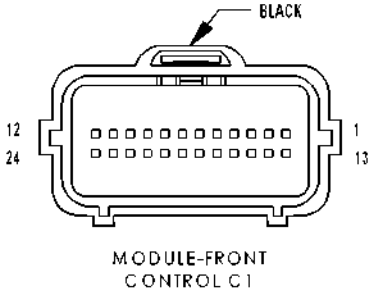
Is resistance below 1000.0 ohms with all the CAN B Bus modules disconnected?

Yes >> Repair the (D55) CAN B Bus (+) circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1

No >> Replace the module that when disconnected the short to ground was eliminated, in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1.

U0023-CAN B BUS (+) CIRCUIT HIGH





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U0023-CAN B BUS (+) CIRCUIT HIGH (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  The FCM detects the (D55) CAN B Bus (+) circuit is shorted to voltage.

Possible Causes
(D55) CAN B BUS (+) CIRCUIT SHORTED TO VOLTAGE
ANY CAN B BUS MODULE
FRONT CONTROL MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase FCM DTC's.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read active FCM DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

---

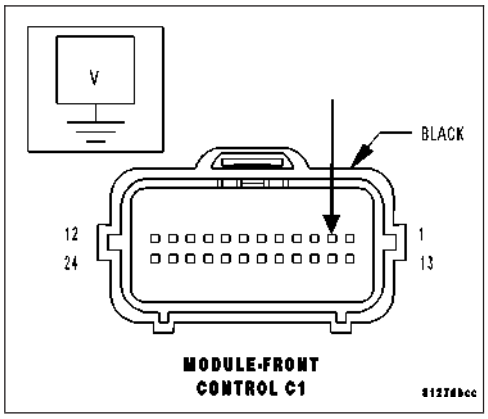
2. CHECK THE (D55) CAN B BUS (+) CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the Front Control Module C1 harness connector.

Turn the ignition on.

Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.



Is voltage above 10.0 volts?

Yes >> Go To 3

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Front Control Module in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1.

U0023-CAN B BUS (+) CIRCUIT HIGH (CONTINUED)

3. (D55) CAN B BUS (+) CIRCUIT SHORTED TO VOLTAGE

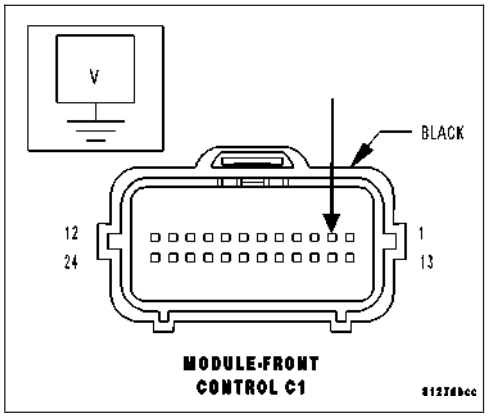
Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

While monitoring the voltmeter, disconnect each CAN B Bus module one at a time.

NOTE: When performing the above step, turn the ignition off (wait one minute) before disconnecting any module. When the module is disconnected turn the ignition on to check for a short to voltage.

NOTE: This is to determine if the short to voltage is internal within a module or if the circuit is shorted.

NOTE: Disconnecting an in-line connector can eliminate a module or group of modules from the list of possible causes for this fault. Refer to the wiring diagrams to assist in diagnosis.

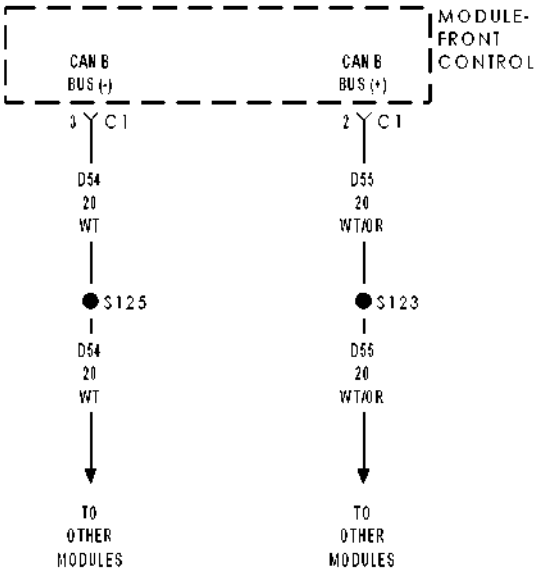


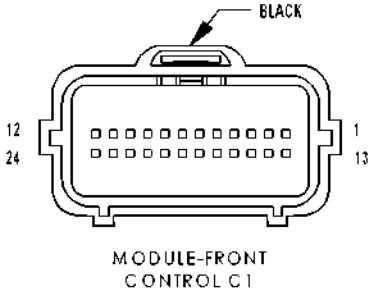
Is the voltage above 10.0 volts with all the CAN B Bus modules disconnected?

Yes >> Repair the (D55) CAN B Bus (+) circuit for a short to voltage.
Perform BODY VERIFICATION TEST - VER 1

No >> Replace the module that when disconnected the short to voltage was eliminated, in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1.

U0024-CAN B BUS (-) CIRCUIT OPEN





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U0024-CAN B BUS (-) CIRCUIT OPEN (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on and battery voltage between 10 and 16 volts.
- **Set Condition:**
  The FCM detects the (D54) CAN B Bus (-) circuit is open.

Possible Causes
CAN B BUS TERMINAL PUSH OUT
SPREAD CAN B BUS TERMINAL
(D54) CAN B BUS (-) CIRCUIT OPEN
INTERNAL OPEN IN A CAN B BUS MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase FCM DTC's
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read active FCM DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

U0024-CAN B BUS (-) CIRCUIT OPEN (CONTINUED)

2. ATTEMPT TO ISOLATE THE OPEN CONDITION

Turn the ignition on.

Verify that all CAN B Bus modules are communicating with the scan tool.

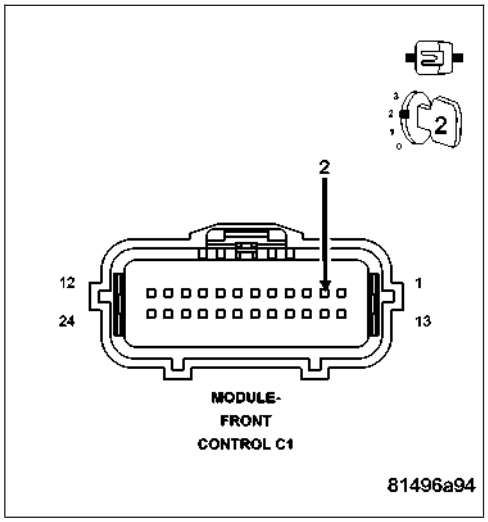
NOTE: A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

NOTE: If any module is not communicating, perform the appropriate no response test procedure before proceeding.

Turn the ignition off.

Gain access to the Front Control Module C1 harness connector, but do not disconnect.

Using a fused jumper wire, connect one end to ground and with the other end backprobe the CAN B Bus (+) circuit at the FCM C1 harness connector.



Turn the ignition on.

With the scan tool monitor the network status screen and document all modules that display a red X.

Are there any red X's displayed next to the modules?

Yes >> Go To 3

No >> Check backprobe connection to ground, make sure it is proper. The CAN B Bus open DTC may no longer be active, it may be stored. Check all module connections

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

---

3. ATTEMPT TO ISOLATE THE OPEN CONDITION — MULTIPLE RED X'S

With the scan tool continue monitoring the network status screen.

Are there multiple red X's displayed next to the modules?

Yes >> The most likely cause of this condition is an open CAN B Bus (-) circuit between a common CAN B Bus splice and the modules that display the red X next to them. Use the wiring diagrams will help you determine where open condition exists.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

No >> Go To 4

U0024-CAN B BUS (-) CIRCUIT OPEN (CONTINUED)

4. (D54) CAN B BUS (-) CIRCUIT OPEN — SINGLE RED X

Turn the ignition off.

Disconnect the module that has the red X displayed next to it.

Turn the ignition on.

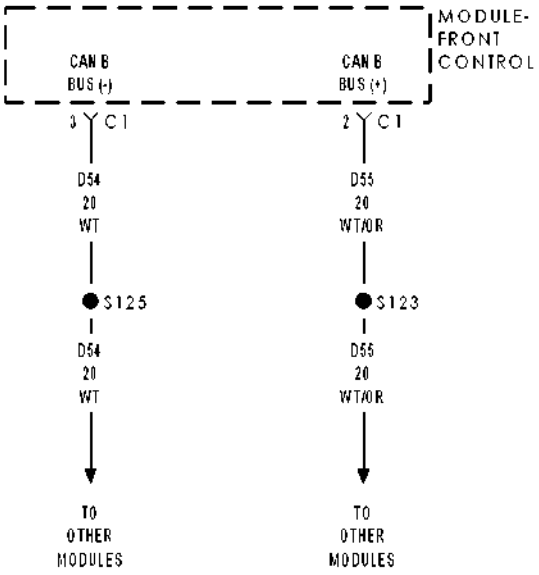
Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.

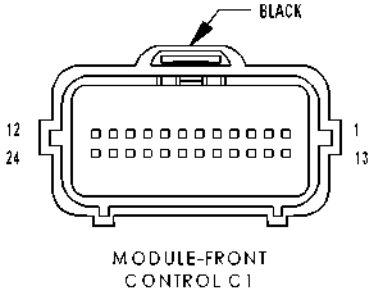
Is there any voltage present?

Yes >> Inspect the connector and terminal for damage, inspect for spread terminals, or push out terminals. If ok, replace the module that displayed the red X next to it in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

No >> Repair the (D54) CAN B Bus (-) circuit for an open between the next common splice and the module that has the red X displayed next to it. Use the wiring diagrams will help you determine where open condition exists.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

U0025-CAN B BUS (-) CIRCUIT LOW





U0025-CAN B BUS (-) CIRCUIT LOW (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  The FCM detects the (D54) CAN B Bus (-) circuit is shorted to ground.

Possible Causes
(D54) CAN B BUS (-) CIRCUIT SHORTED TO GROUND OR TO (D54) CAN B BUS (-) CIRCUIT
ANY CAN B BUS MODULE
FRONT CONTROL MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase FCM DTC's.
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read active FCM DTC's.

Does the scan tool display this DTC as active?

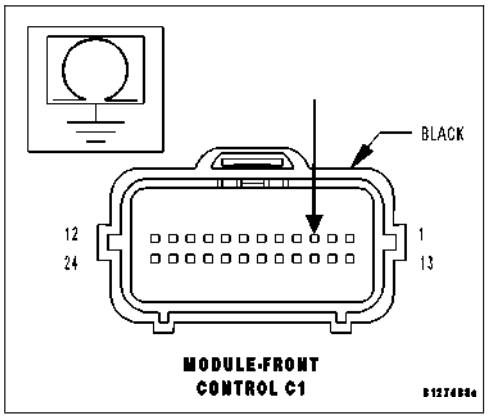
Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

---

2. CHECK THE (D54) CAN B BUS (-) CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.
Disconnect the Front Control Module C1 harness connector.
Measure the resistance between ground and the (D54) CAN B Bus (-) circuit.



Is resistance below 1000.0 ohms?

Yes >> Go To 3

No >> Go To 4

U0025-CAN B BUS (-) CIRCUIT LOW (CONTINUED)

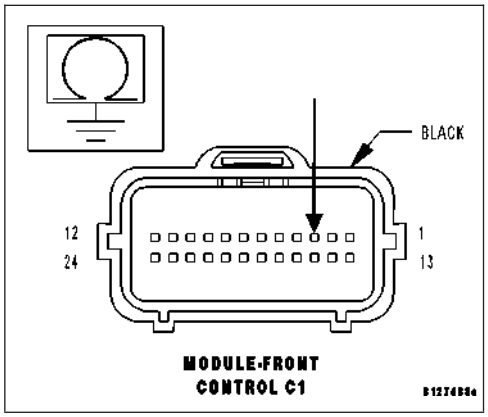
3. (D54) CAN B BUS (-) CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (D54) CAN B Bus (-) circuit.

While monitoring the ohmmeter, disconnect each CAN B Bus module one at a time.

NOTE: This is to determine if the short to ground is internal within a module or if the circuit is shorted.

NOTE: Disconnecting an in-line connector can eliminate a module or group of modules from the list of possible causes for this fault. Refer to the wiring diagrams to assist in diagnosis.



Is resistance below 1000.0 ohms with all the CAN B Bus modules disconnected?

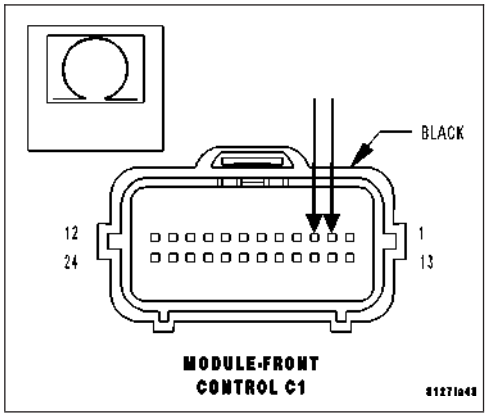
Yes >> Repair the (D54) CAN B Bus (-) circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1

No >> Replace the module that when disconnected the short to ground was eliminated, in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1.

---

4. CHECK THE (D55) CAN B BUS (+) CIRCUIT FOR A SHORT TO THE (D54) CAN B BUS (-) CIRCUIT

Measure the resistance between the (D55) CAN B Bus (+) circuit and (D54) CAN B Bus (-) circuit.



Is resistance below 1000.0 ohms?

Yes >> Go To 5

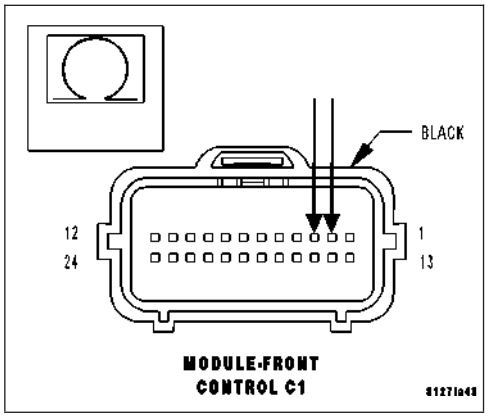
No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Front Control Module in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1.

U0025-CAN B BUS (-) CIRCUIT LOW (CONTINUED)

5. (D55) CAN B BUS (+) CIRCUIT SHORTED TO THE (D54) CAN B BUS (-) CIRCUIT

Measure the resistance between the (D55) CAN B Bus (+) circuit and (D54) CAN B Bus (-) circuit.

While monitoring the ohmmeter, disconnect each CAN B Bus module one at a time.



NOTE: This is to determine if the short together is internal within a module or if the circuits are shorted together.

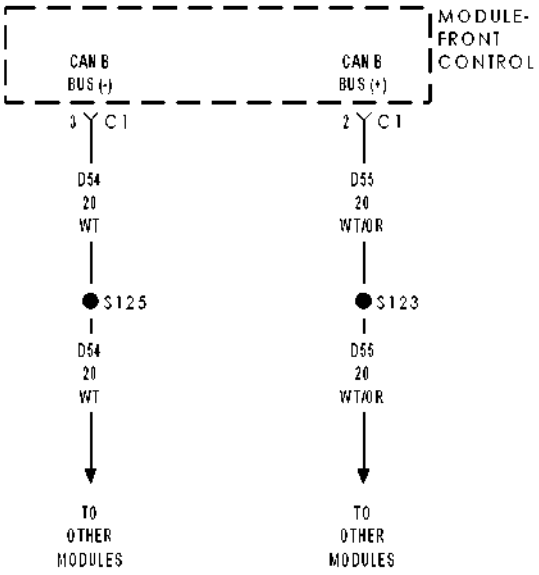
NOTE: Disconnecting an in-line connector can eliminate a module or group of modules from the list of possible causes for this fault. Refer to the wiring diagrams to assist in diagnosis.

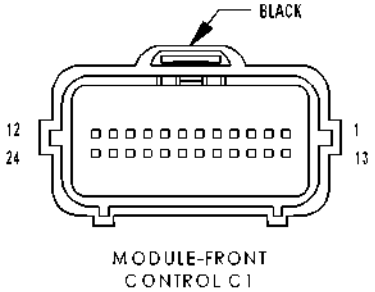
Is resistance below 1000.0 ohms with all the CAN B Bus modules disconnected?

Yes >> Repair the (D55) CAN B Bus (+) circuit for a short to the (D54) CAN B Bus (-) circuit.
Perform BODY VERIFICATION TEST - VER 1

No >> Replace the module that when disconnected the short to ground was eliminated, in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1.

U0026-CAN B BUS (-) CIRCUIT HIGH





U0026-CAN B BUS (-) CIRCUIT HIGH (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  The FCM detects the (D54) CAN B Bus (-) circuit is shorted to voltage.

Possible Causes
(D54) CAN B BUS (-) CIRCUIT SHORTED TO VOLTAGE
ANY CAN B BUS MODULE
FRONT CONTROL MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase FCM DTC's.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read active FCM DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

---

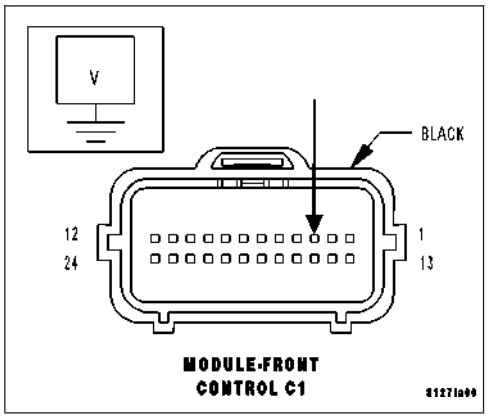
2. CHECK THE (D54) CAN B BUS (-) CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the Front Control Module C1 harness connector.

Turn the ignition on.

Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.



Is voltage above 10.0 volts?

Yes >> Go To 3

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Front Control Module in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1.

U0026-CAN B BUS (-) CIRCUIT HIGH (CONTINUED)

3. (D54) CAN B BUS (-) CIRCUIT SHORTED TO VOLTAGE

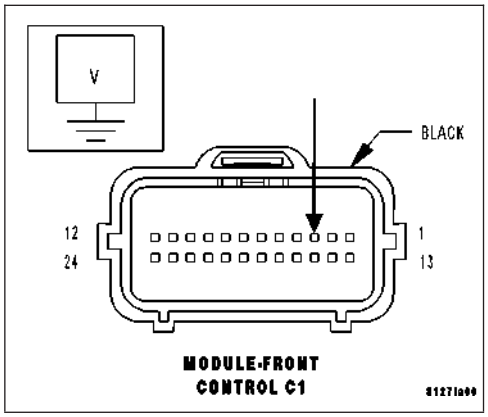
Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.

While monitoring the voltmeter, disconnect each CAN B Bus module one at a time.

NOTE: When performing the above step, turn the ignition off (wait one minute) before disconnecting any module. When the module is disconnected turn the ignition on to check for a short to voltage.

NOTE: This is to determine if the short to voltage is internal within a module or if the circuit is shorted.

NOTE: Disconnecting an in-line connector can eliminate a module or group of modules from the list of possible causes for this fault. Refer to the wiring diagrams to assist in diagnosis.

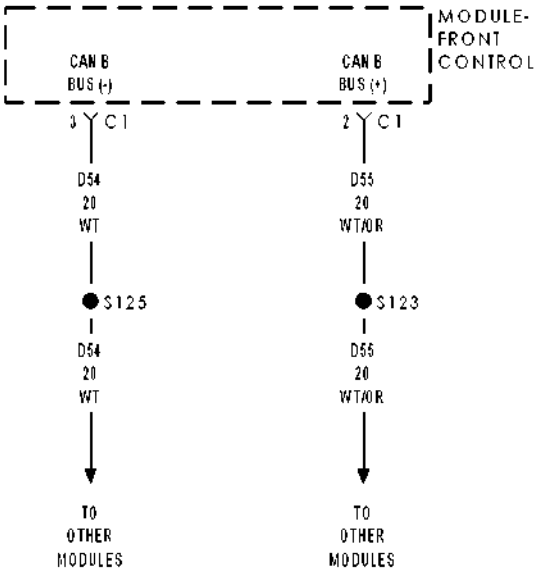


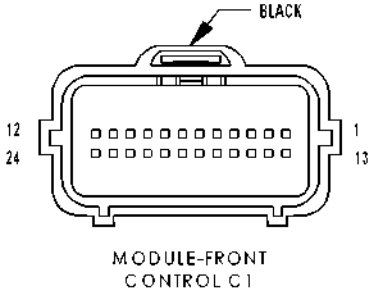
Is the voltage above 10.0 volts with all the CAN B Bus modules disconnected?

Yes >> Repair the (D54) CAN B Bus (-) circuit for a short to voltage.
Perform BODY VERIFICATION TEST - VER 1

No >> Replace the module that when disconnected the short to voltage was eliminated, in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1.

U0027-CAN B BUS (-) SHORTED TO BUS (+)





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U0027-CAN B BUS (-) SHORTED TO BUS (+) (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  The FCM detects the (D55) CAN B Bus (+) circuit is shorted to the (D54) CAN B Bus (-) circuit.

Possible Causes
(D55) CAN B BUS (+) CIRCUIT SHORTED TO THE (D54) CAN B BUS (-) CIRCUIT
ANY CAN B BUS MODULE
FRONT CONTROL MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase FCM DTC's.
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read active FCM DTC's.

Does the scan tool display this DTC as active?

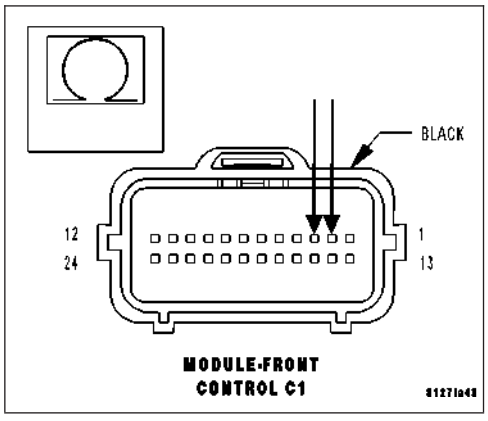
Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

---

2. CHECK THE (D55) CAN B BUS (+) CIRCUIT FOR A SHORT TO THE (D54) CAN B BUS (-) CIRCUIT

Turn the ignition off.
Disconnect the Front Control Module C1 harness connector.
Measure the resistance between the (D55) CAN B Bus (+) circuit and (D54) CAN B Bus (-) circuit.



Is resistance below 1000.0 ohms?

Yes >> Go To 3

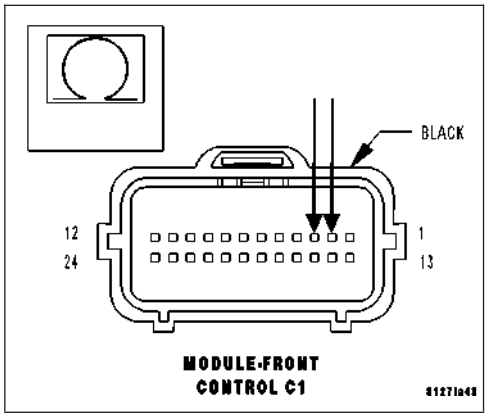
No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Front Control Module in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1.

U0027-CAN B BUS (-) SHORTED TO BUS (+) (CONTINUED)

3. (D55) CAN B BUS (+) CIRCUIT SHORTED TO THE (D54) CAN B BUS (-) CIRCUIT

Measure the resistance between the (D55) CAN B Bus (+) circuit and (D54) CAN B Bus (-) circuit.

While monitoring the ohmmeter, disconnect each CAN B Bus module one at a time.



NOTE: This is to determine if the short together is internal within a module or if the circuits are shorted together.

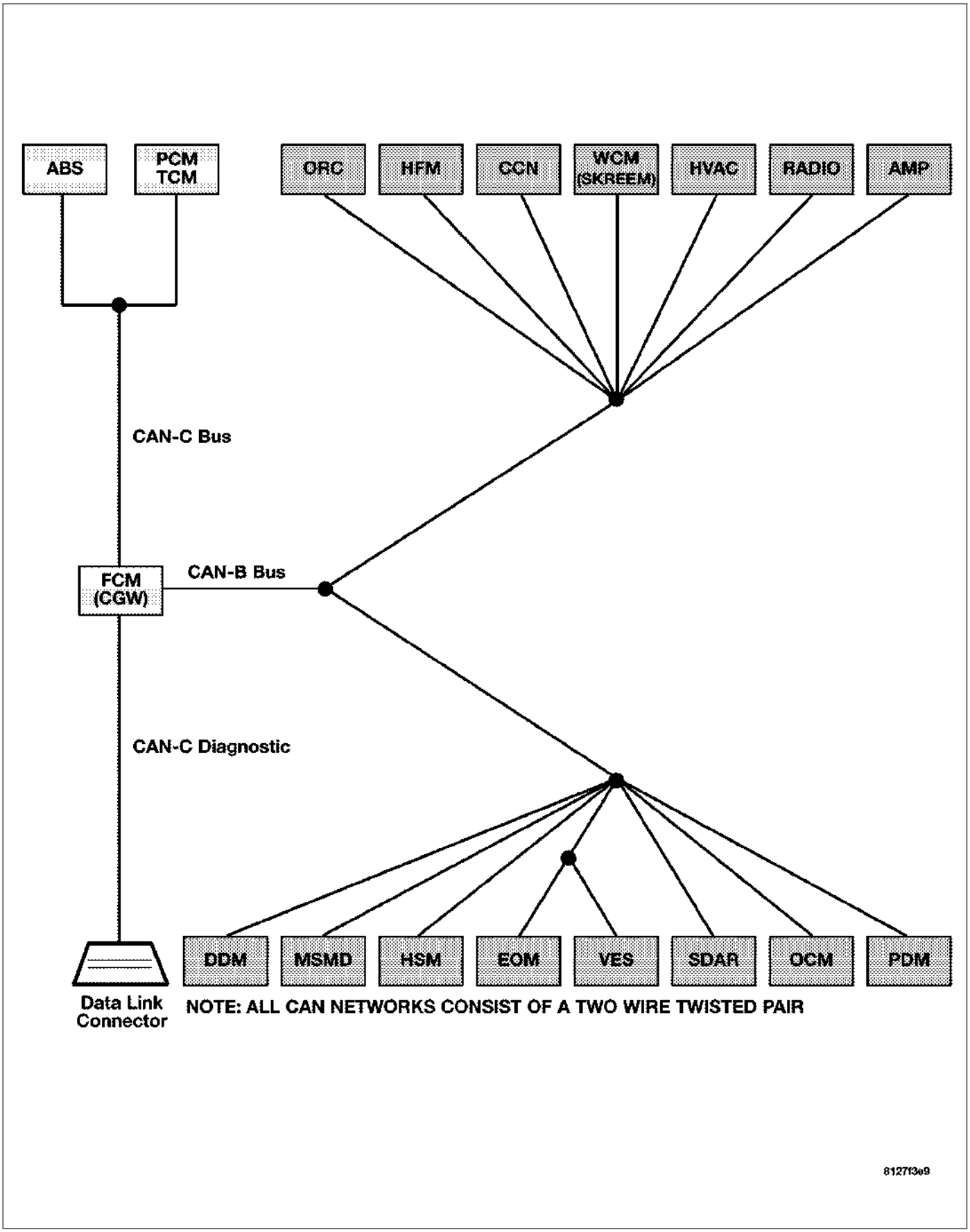
NOTE: Disconnecting an in-line connector can eliminate a module or group of modules from the list of possible causes for this fault. Refer to the wiring diagrams to assist in diagnosis.

Is resistance below 1000.0 ohms with all the CAN B Bus modules disconnected?

Yes >> Repair the (D55) CAN B Bus (+) circuit for a short to the (D54) CAN B Bus (-) circuit.
Perform BODY VERIFICATION TEST - VER 1

No >> Replace the module that when disconnected the short to ground was eliminated, in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1.

U0100-LOST COMMUNICATION WITH ECM/PCM



U0100-LOST COMMUNICATION WITH ECM/PCM (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  - With the ignition on
  - Battery voltage between 10 and 16 volts
  - IOD fuse installed
  - FCM is configured correctly
- **Set Condition:**
  Bus messages not received from the ECM/PCM for approximately 2 to 5 seconds.

Possible Causes
CAN B OR CAN C BUS CIRCUITS OPEN OR SHORTED
DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
FCM NOT CONFIGURED CORRECTLY
ECM/PCM
ECM/PCM POWER AND GROUND
MODULE THAT SET THIS DTC

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.
With the scan tool, read active DTCs.

Is this DTC active?

Yes >> Go To 2

No >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section. Perform BODY VERIFICATION TEST – VER 1.

---

2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS

With the scan tool, read all active DTCs from all modules.

NOTE: Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

Does the scan tool display any active DTCs to the conditions listed above?

Yes >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms. Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 3

U0100-LOST COMMUNICATION WITH ECM/PCM (CONTINUED)

3. VERIFY THAT THE ECM/PCM IS ACTIVE ON THE BUS

Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the ECM/PCM is active on the bus.

Is the ECM/PCM active on the bus?

Yes >> Go To 4

No >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for No Response diagnostic procedures.
Perform BODY VERIFICATION TEST – VER 1.

---

4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS

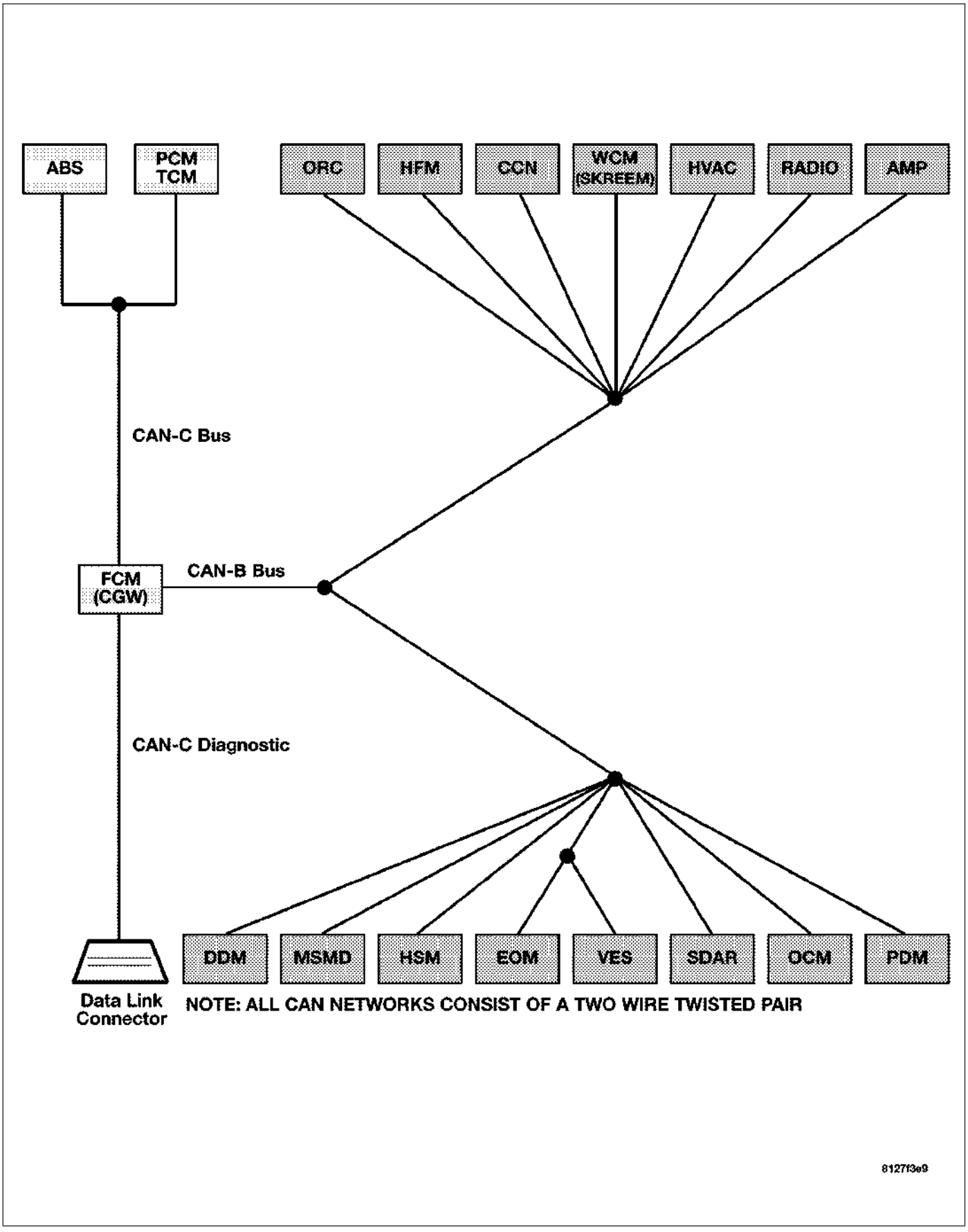
With the scan tool, select Network Diagnostics.

Is there more than one module with active DTCs "Logged Against" the ECM/PCM?

Yes >> Replace/update the ECM/PCM in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Replace/update the module that set this DTC in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

U0101-LOST COMMUNICATION WITH TCM



U0101-LOST COMMUNICATION WITH TCM (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  - With the ignition on
  - Battery voltage between 10 and 16 volts
  - IOD fuse installed
  - FCM is configured correctly
- **Set Condition:**
  Bus messages not received from the TCM for approximately 2 to 5 seconds.

Possible Causes
CAN B OR CAN C BUS CIRCUITS OPEN OR SHORTED
DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
FCM NOT CONFIGURED CORRECTLY
TCM (PCM)
TCM POWER AND GROUND
MODULE THAT SET THIS DTC

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding. With the scan tool, read active DTCs.

Is this DTC active?

Yes >> Go To 2

No >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section. Perform BODY VERIFICATION TEST – VER 1.

---

2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS

With the scan tool, read all active DTCs from all modules.

NOTE: Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

Does the scan tool display any active DTCs to the conditions listed above?

Yes >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms. Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 3

U0101-LOST COMMUNICATION WITH TCM (CONTINUED)

3. VERIFY THAT THE TCM IS ACTIVE ON THE BUS

Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the TCM is active on the bus.

Is the TCM active on the bus?

Yes >> Go To 4

No >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for No Response diagnostic procedures.
Perform BODY VERIFICATION TEST – VER 1.

---

4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS

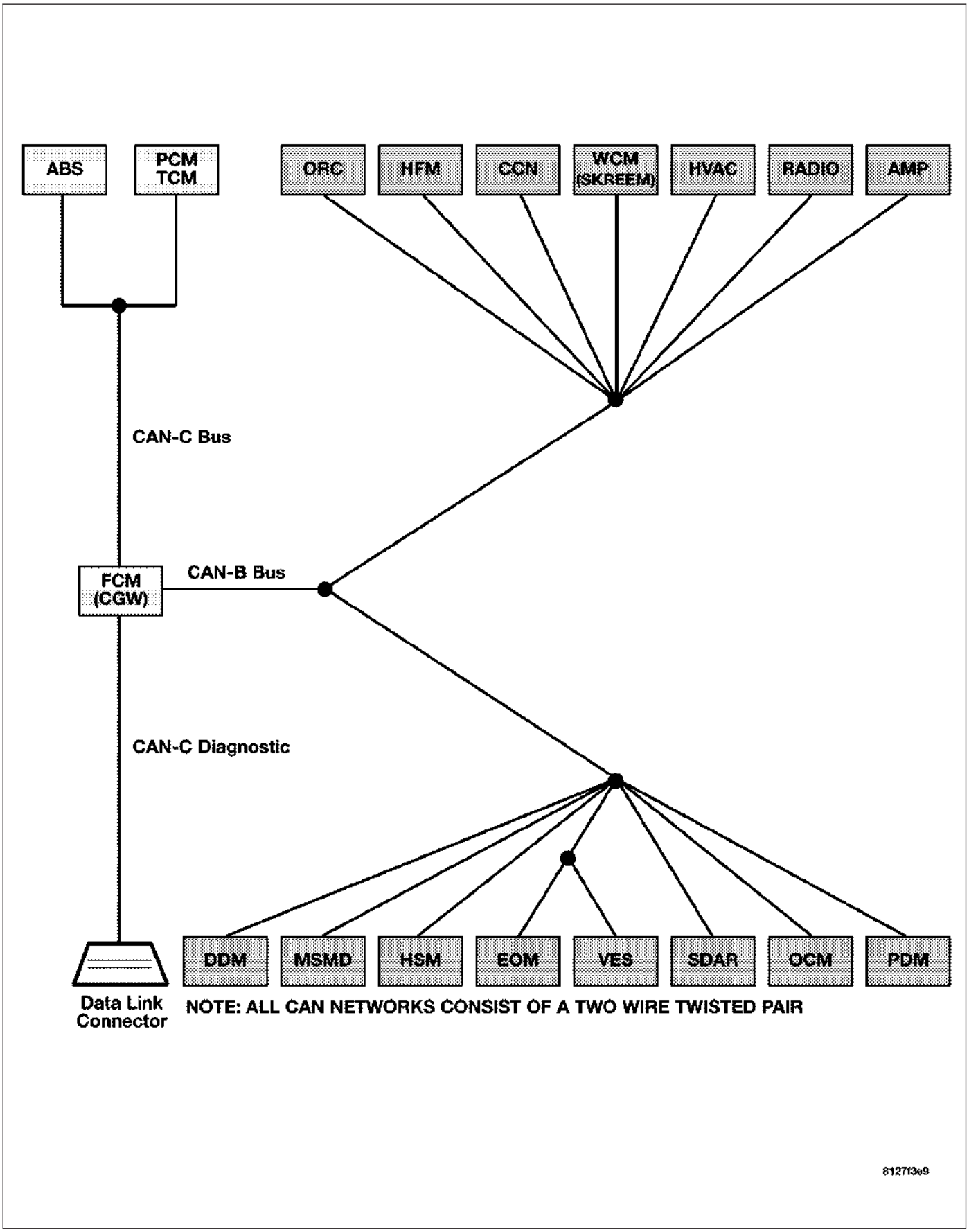
With the scan tool, select Network Diagnostics.

Is there more than one module with active DTCs “Logged Against” the TCM?

Yes >> Replace/update the TCM (PCM) in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Replace/update the module that set this DTC in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

U0121-LOST COMMUNICATION WITH ANTI-LOCK BRAKE SYSTEM (ABS) CONTROL MODULE



U0121-LOST COMMUNICATION WITH ANTI-LOCK BRAKE SYSTEM (ABS) CONTROL MODULE (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  - With the ignition on
  - Battery voltage between 10 and 16 volts
  - IOD fuse installed
  - FCM is configured correctly
- **Set Condition:**
  Bus messages not received from the Antilock Brake Module for approximately 2 to 5 seconds.

Possible Causes
CAN B OR CAN C BUS CIRCUITS OPEN OR SHORTED
DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
FCM NOT CONFIGURED CORRECTLY
ANTILOCK BRAKE MODULE
ANTILOCK BRAKE MODULE POWER AND GROUND
MODULE THAT SET THIS DTC

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.
With the scan tool, read active DTCs.

Is this DTC active?

Yes >> Go To 2

No >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section. Perform BODY VERIFICATION TEST – VER 1.

---

2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS

With the scan tool, read all active DTCs from all modules.

NOTE: Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

Does the scan tool display any active DTCs to the conditions listed above?

Yes >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms. Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 3

U0121-LOST COMMUNICATION WITH ANTI-LOCK BRAKE SYSTEM (ABS) CONTROL MODULE (CONTINUED)

3. VERIFY THAT THE ABS IS ACTIVE ON THE BUS

Turn the ignition on.
With the scan tool, select Network Diagnostics.
Verify that the ABS is active on the bus.

Is the ABS active on the bus?

Yes >> Go To 4

No >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for No Response diagnostic procedures.
Perform BODY VERIFICATION TEST – VER 1.

---

4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS

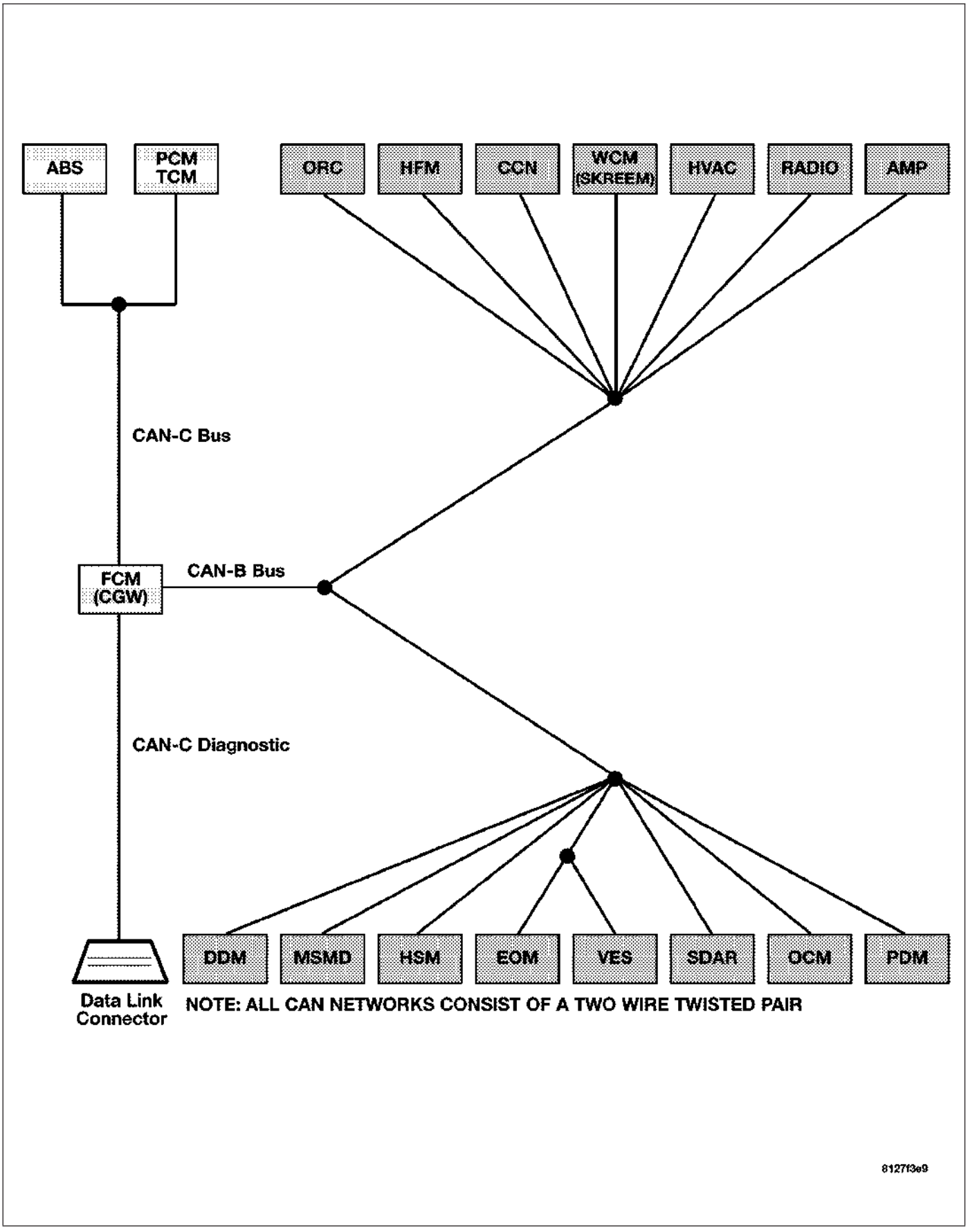
With the scan tool, select Network Diagnostics.

Is there more than one module with active DTCs “Logged Against” the ABS?

Yes >> Replace/update the Antilock Brake Module in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Replace/update the module that set this DTC in accordance with the service information
Perform BODY VERIFICATION TEST – VER 1.

U0141–LOST COMMUNICATION WITH FRONT CONTROL MODULE



U0141–LOST COMMUNICATION WITH FRONT CONTROL MODULE (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  - With the ignition on
  - Battery voltage between 10 and 16 volts
  - IOD fuse installed
  - FCM is configured correctly
- **Set Condition:**
  Bus messages not received from the Front Control Module for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED
DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
FCM NOT CONFIGURED CORRECTLY
FRONT CONTROL MODULE
FRONT CONTROL MODULES POWER AND GROUND
MODULE THAT SET THIS DTC

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding. With the scan tool, read active DTCs.

Is this DTC active?

Yes >> Go To 2

No >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section. Perform BODY VERIFICATION TEST – VER 1.

---

2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS

With the scan tool, read all active DTCs from all modules.

NOTE: Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

Does the scan tool display any active DTCs to the conditions listed above?

Yes >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms. Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 3

U0141–LOST COMMUNICATION WITH FRONT CONTROL MODULE (CONTINUED)

3. VERIFY THAT THE FCM IS ACTIVE ON THE BUS

Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the FCM is active on the bus.

Is the FCM active on the bus?

Yes >> Go To 4

No >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for No Response diagnostic procedures.
Perform BODY VERIFICATION TEST – VER 1.

---

4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS

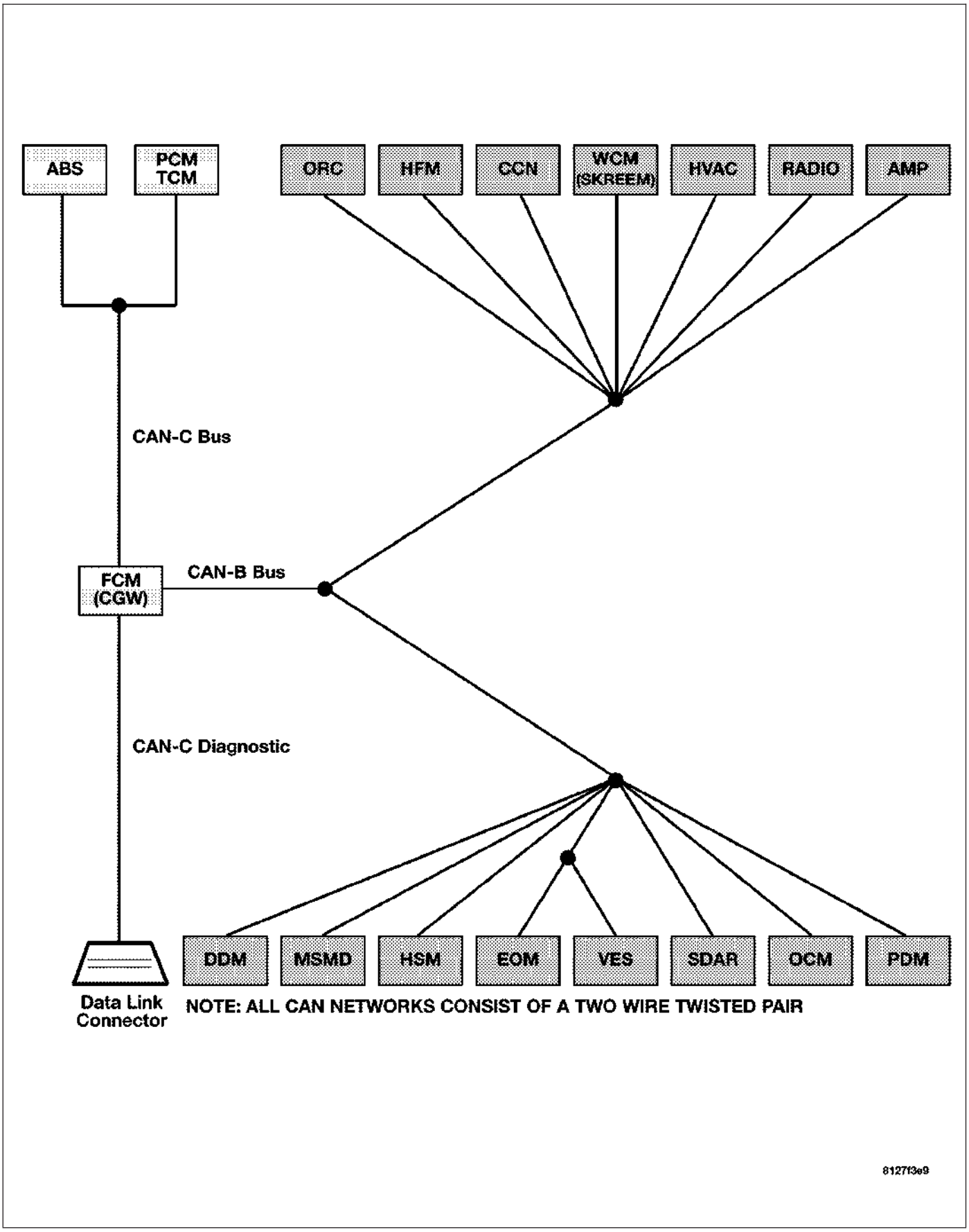
With the scan tool, select Network Diagnostics.

Is there more than one module with active DTCs “Logged Against” the FCM?

Yes >> Replace/update the Front Control Module in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Replace/update the module that set this DTC in accordance with the service information
Perform BODY VERIFICATION TEST – VER 1.

U0151–LOST COMMUNICATION WITH OCCUPANT RESTRAINT CONTROLLER (ORC)



U0151–LOST COMMUNICATION WITH OCCUPANT RESTRAINT CONTROLLER (ORC) (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  - With the ignition on
  - Battery voltage between 10 and 16 volts
  - IOD fuse installed
  - FCM is configured correctly
- **Set Condition:**
  Bus messages not received from the Occupant Restraint Controller for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED
DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
FCM NOT CONFIGURED CORRECTLY
OCCUPANT RESTRAINT CONTROLLER
OCCUPANT RESTRAINT CONTROLLERS POWER AND GROUND
MODULE THAT SET THIS DTC

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.
With the scan tool, read active DTCs.

Is this DTC active?

Yes >> Go To 2

No >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section. Perform BODY VERIFICATION TEST – VER 1.

---

2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS

With the scan tool, read all active DTCs from all modules.

NOTE: Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

Does the scan tool display any active DTCs to the conditions listed above?

Yes >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms. Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 3

U0151–LOST COMMUNICATION WITH OCCUPANT RESTRAINT CONTROLLER (ORC) (CONTINUED)

3. VERIFY THAT THE ORC IS ACTIVE ON THE BUS

Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the ORC is active on the bus.

Is the ORC active on the bus?

Yes >> Go To 4

No >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for No Response diagnostic procedures.
Perform BODY VERIFICATION TEST – VER 1.

---

4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS

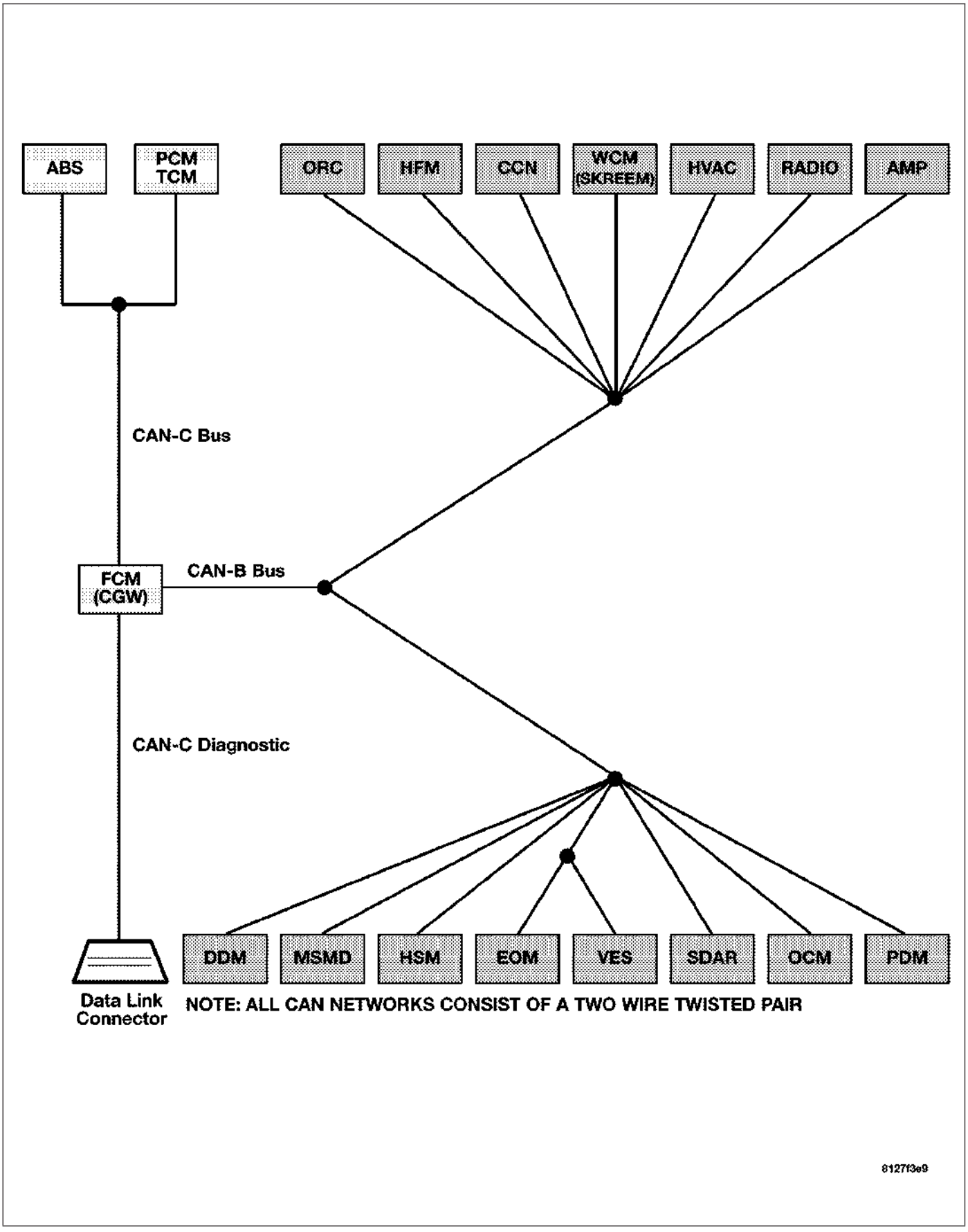
With the scan tool, select Network Diagnostics.

Is there more than one module with active DTCs "Logged Against" the ORC?

Yes >> Replace/update the Occupant Restraint Controller in accordance with the service information.
Perform AIRBAG VERIFICATION TEST – VER 1.

No >> Replace/update the module that set this DTC in accordance with the service information
Perform BODY VERIFICATION TEST – VER 1.

U0154–LOST COMMUNICATION WITH OCCUPANT CLASSIFICATION MODULE



U0154–LOST COMMUNICATION WITH OCCUPANT CLASSIFICATION MODULE (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  - With the ignition on
  - Battery voltage between 10 and 16 volts
  - IOD fuse installed
  - FCM is configured correctly
- **Set Condition:**
  Bus messages not received from the Occupant Classification Module for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED
DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
FCM NOT CONFIGURED CORRECTLY
OCCUPANT CLASSIFICATION MODULE
OCCUPANT CLASSIFICATION MODULES POWER AND GROUND
MODULE THAT SET THIS DTC

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.
With the scan tool, read active DTCs.

Is this DTC active?

Yes >> Go To 2

No >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section. Perform BODY VERIFICATION TEST – VER 1.

---

2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS

With the scan tool, read active DTCs from all modules.

NOTE: Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

Does the scan tool display any active DTCs to the conditions listed above?

Yes >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms. Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 3

U0154–LOST COMMUNICATION WITH OCCUPANT CLASSIFICATION MODULE (CONTINUED)

3. VERIFY THAT THE OCM IS ACTIVE ON THE BUS

Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the OCM is active on the bus.

Is the OCM active on the bus?

Yes >> Go To 4

No >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for No Response diagnostic procedures.
Perform BODY VERIFICATION TEST – VER 1.

---

4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS

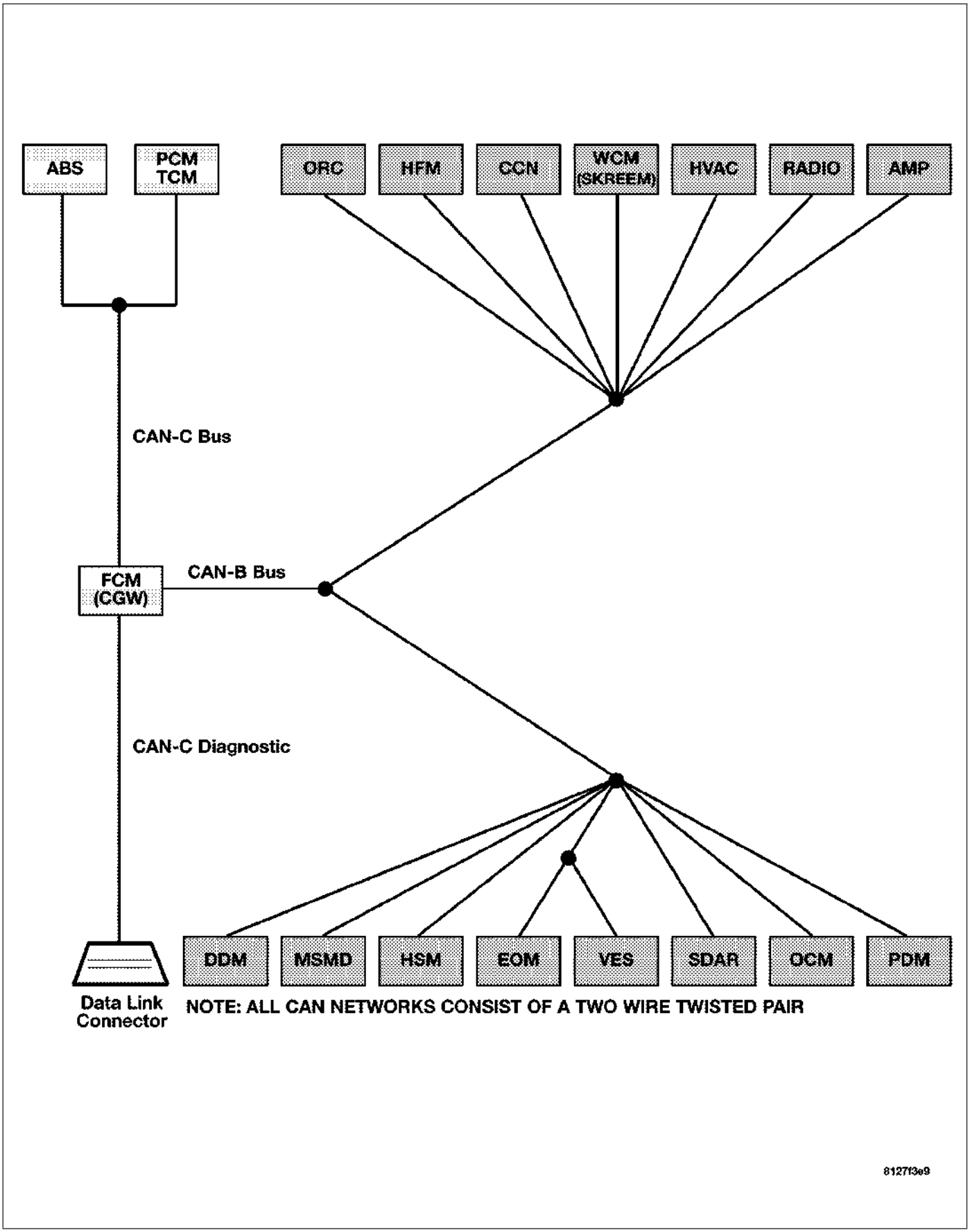
With the scan tool, select Network Diagnostics.

Is there more than one module with active DTCs “Logged Against” the OCM?

Yes >> Replace/update the Occupant Classification Module in accordance with the service information.
Perform AIRBAG VERIFICATION TEST – VER 1.

No >> Replace/update the module that set this DTC in accordance with the service information
Perform BODY VERIFICATION TEST – VER 1.

U0155-LOST COMMUNICATION WITH CLUSTER/CCN



U0155-LOST COMMUNICATION WITH CLUSTER/CCN (CONTINUED)
For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  - With the ignition on
  - Battery voltage between 10 and 16 volts
  - IOD fuse installed
  - FCM is configured correctly
- **Set Condition:**
  Bus messages not received from the Cluster/CCN for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED
DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
FCM NOT CONFIGURED CORRECTLY
CLUSTER/CCN
CLUSTER/CCN POWER AND GROUND
MODULE THAT SET THE DTC

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.
With the scan tool, read active DTCs.

Is this DTC active?

Yes >> Go To 2

No >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section. Perform BODY VERIFICATION TEST – VER 1.

---

2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS

With the scan tool, read active DTCs from all modules.

NOTE: Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

Does the scan tool display any active DTCs to the conditions listed above?

Yes >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms. Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 3

U0155-LOST COMMUNICATION WITH CLUSTER/CCN (CONTINUED)

3. VERIFY THAT THE CCN IS ACTIVE ON THE BUS

Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the CCN is active on the bus.

Is the CCN active on the bus?

Yes >> Go To 4

No >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for No Response diagnostic procedures.
Perform BODY VERIFICATION TEST – VER 1.

---

4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS

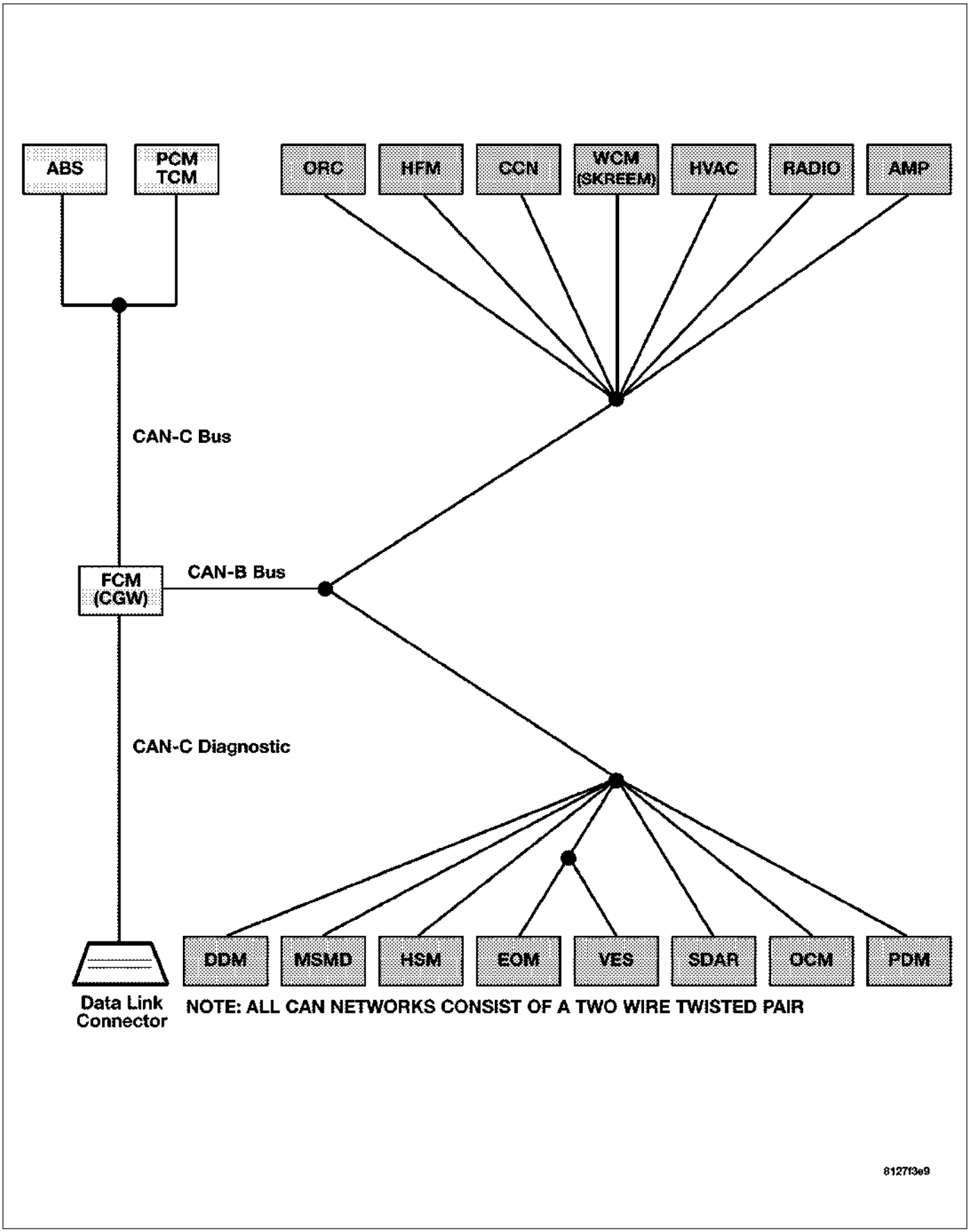
With the scan tool, select Network Diagnostics.

Is there more than one module with active DTCs “Logged Against” the CCN?

Yes >> Replace/update the Cluster (CCN) in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Replace/update the module that set this DTC in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

U0156–LOST COMMUNICATION WITH EOM



U0156–LOST COMMUNICATION WITH EOM (CONTINUED)
For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  - With the ignition on
  - Battery voltage between 10 and 16 volts
  - IOD fuse installed
  - FCM is configured correctly
- **Set Condition:**
  Bus messages not received from the Compass Temperature Module (EOM) for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED
DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
FCM NOT CONFIGURED CORRECTLY
COMPASS TEMPERATURE MODULE (EOM)
COMPASS TEMPERATURE MODULES POWER OR GROUND
MODULE THAT SET THIS DTC

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.
With the scan tool, read active DTCs.

Is this DTC active?

Yes >> Go To 2

No >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section. Perform BODY VERIFICATION TEST – VER 1.

---

2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS

With the scan tool, read all active DTCs from all modules.

NOTE: Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

Does the scan tool display any active DTCs to the conditions listed above?

Yes >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms. Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 3

U0156–LOST COMMUNICATION WITH EOM (CONTINUED)

3. VERIFY THAT THE EOM IS ACTIVE ON THE BUS

Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the EOM is active on the bus.

Is the EOM active on the bus?

Yes >> Go To 4

No >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for No Response diagnostic procedures.
Perform BODY VERIFICATION TEST – VER 1.

---

4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS

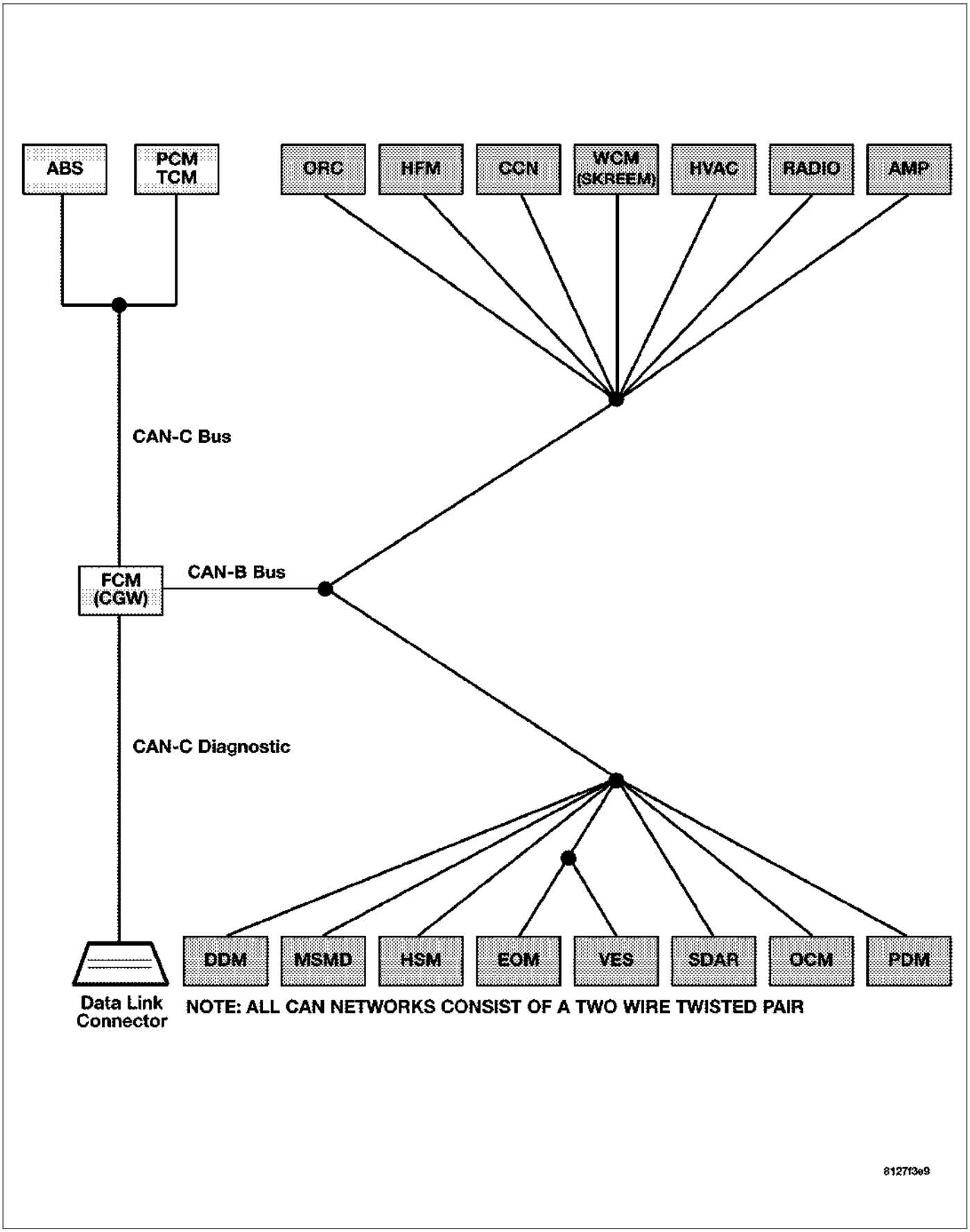
With the scan tool, select Network Diagnostics.

Is there more than one module with active DTCs "Logged Against" the EOM?

Yes >> Replace/update the Compass Temperature Module (EOM) in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Replace/update the module that set this DTC in accordance with the service information
Perform BODY VERIFICATION TEST – VER 1.

U0164-LOST COMMUNICATION WITH HVAC CONTROL MODULE



U0164-LOST COMMUNICATION WITH HVAC CONTROL MODULE (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  - With the ignition on
  - Battery voltage between 10 and 16 volts
  - IOD fuse installed
  - FCM is configured correctly
- **Set Condition:**
  Bus messages not received from the A/C Heater Control (HVAC) for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED
DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
FCM NOT CONFIGURED CORRECTLY
A/C HEATER CONTROL
A/C HEATER CONTROLS POWER AND GROUND
MODULE THAT SET THIS DTC

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.
With the scan tool, read active DTCs.

Is this DTC active?

Yes >> Go To 2

No >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section. Perform BODY VERIFICATION TEST – VER 1.

---

2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS

With the scan tool, read active DTCs from all modules.

NOTE: Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

Does the scan tool display any active DTCs to the conditions listed above?

Yes >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms. Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 3

U0164-LOST COMMUNICATION WITH HVAC CONTROL MODULE (CONTINUED)

3. VERIFY THAT THE HVAC IS ACTIVE ON THE BUS

Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the HVAC is active on the bus.

Is the HVAC active on the bus?

Yes >> Go To 4

No >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for No Response diagnostic procedures.
Perform BODY VERIFICATION TEST – VER 1.

---

4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS

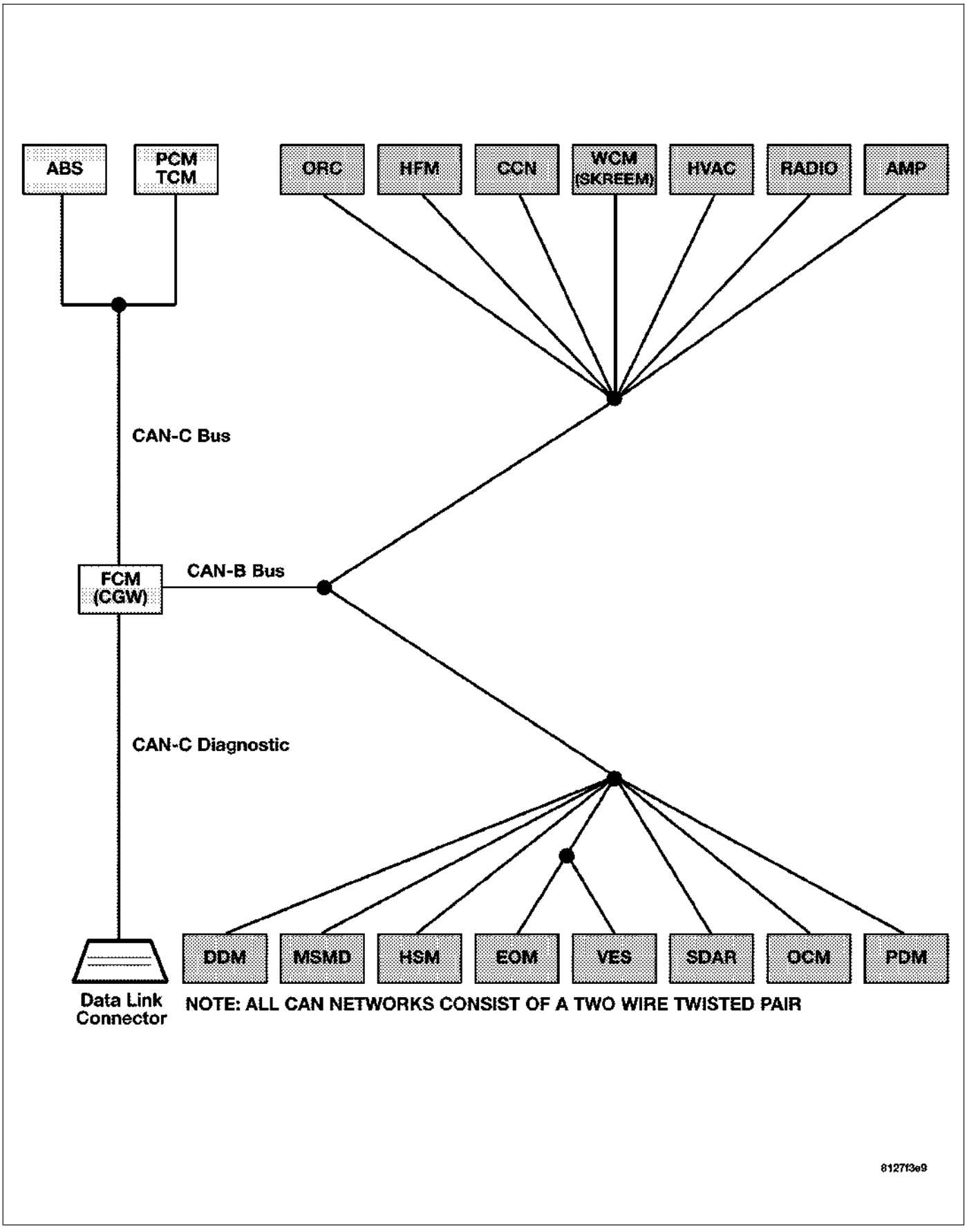
With the scan tool, select Network Diagnostics.

Is there more than one module with active DTCs "Logged Against" the HVAC?

Yes >> Replace/update the A/C Heater Control in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Replace/update the module that set the DTC in accordance with the service information
Perform BODY VERIFICATION TEST – VER 1.

U0168-LOST COMMUNICATION WITH VEHICLE SECURITY CONTROL MODULE (SKREEM/WCM)



U0168-LOST COMMUNICATION WITH VEHICLE SECURITY CONTROL MODULE (SKREEM/WCM) (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  - With the ignition on
  - Battery voltage between 10 and 16 volts
  - IOD fuse installed
  - FCM is configured correctly
- **Set Condition:**
  Bus messages not received from the Sentry Key Remote Entry Module (WCM) for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED
DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
FCM NOT CONFIGURED CORRECTLY
SENTRY KEY REMOTE ENTRY MODULE
SENTRY KEY REMOTE ENTRY MODULE POWER AND GROUND
MODULE THAT SET THIS DTC

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding. With the scan tool, read active DTCs.

Is this DTC active?

Yes >> Go To 2

No >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section. Perform BODY VERIFICATION TEST – VER 1.

---

2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS

With the scan tool, read active DTCs from all modules.

NOTE: Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

Does the scan tool display any active DTCs to the conditions listed above?

Yes >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms. Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 3

U0168-LOST COMMUNICATION WITH VEHICLE SECURITY CONTROL MODULE (SKREEM/WCM) (CONTINUED)

3. VERIFY THAT THE WCM IS ACTIVE ON THE BUS

Turn the ignition on.
With the scan tool, select Network Diagnostics.
Verify that the WCM is active on the bus.

Is the WCM active on the bus?

Yes >> Go To 4

No >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for No Response diagnostic procedures.
Perform BODY VERIFICATION TEST – VER 1.

---

4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS

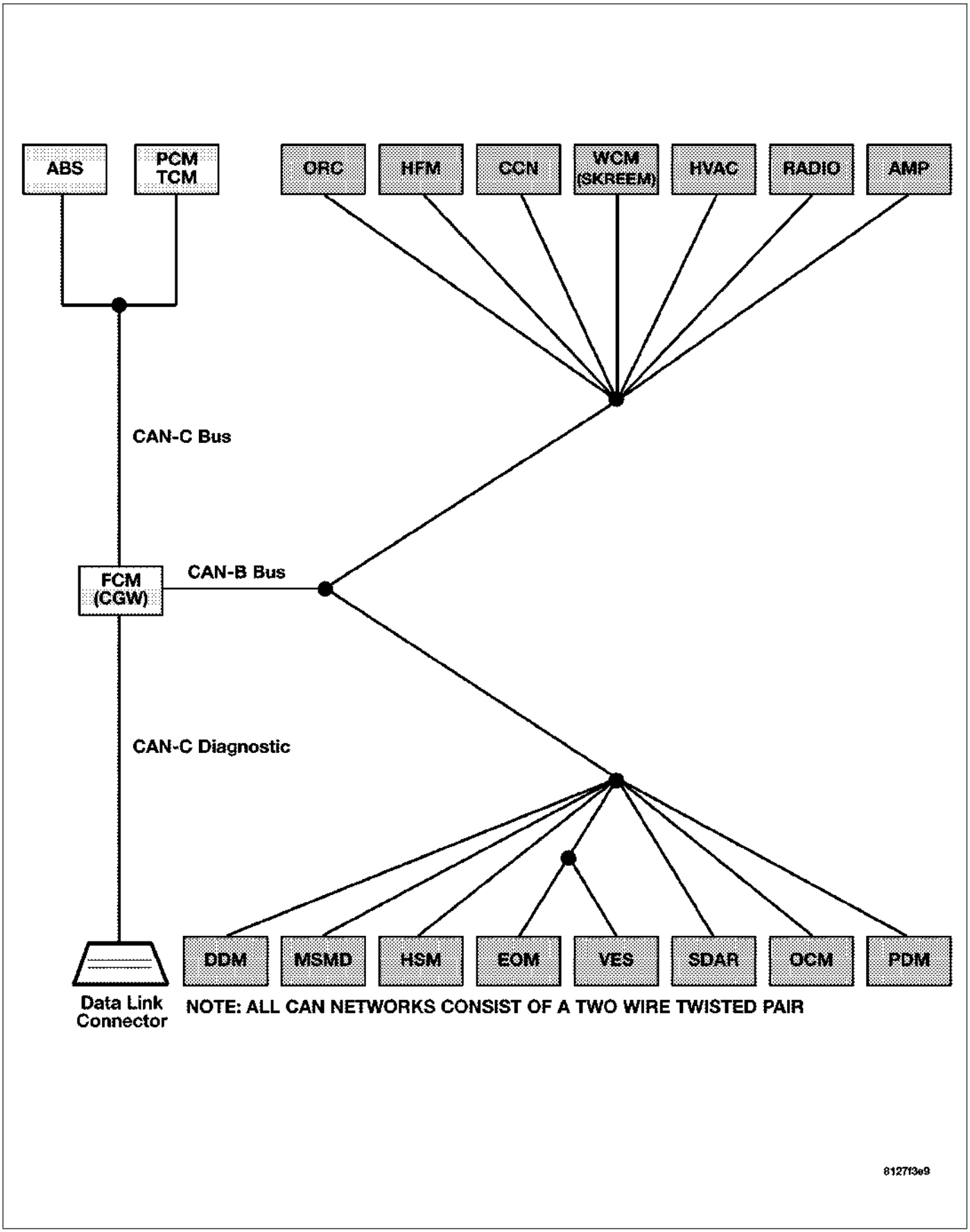
With the scan tool, select Network Diagnostics.

Is there more than one module with active DTCs “Logged Against” the WCM?

Yes >> Replace/update the Sentry Key Remote Entry Module in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Replace/update the module that set this DTC in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

U0184-LOST COMMUNICATION WITH RADIO



U0184-LOST COMMUNICATION WITH RADIO (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  - With the ignition on
  - Battery voltage between 10 and 16 volts
  - IOD fuse installed
  - FCM is configured correctly
- **Set Condition:**
  Bus messages not received from the Radio for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED
DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
FCM NOT CONFIGURED CORRECTLY
RADIO
RADIO POWER AND GROUND
MODULE THAT SET THIS DTC

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.
With the scan tool, read active DTCs.

Is this DTC active?

Yes >> Go To 2

No >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section. Perform BODY VERIFICATION TEST – VER 1.

---

2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS

With the scan tool, read active DTCs from all modules.

NOTE: Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

Does the scan tool display any active DTCs to the conditions listed above?

Yes >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms. Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 3

U0184-LOST COMMUNICATION WITH RADIO (CONTINUED)

3. VERIFY THAT THE RADIO IS ACTIVE ON THE BUS

Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the Radio is active on the bus.

Is the Radio active on the bus?

Yes >> Go To 4

No >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for No Response diagnostic procedures.
Perform BODY VERIFICATION TEST – VER 1.

---

4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS

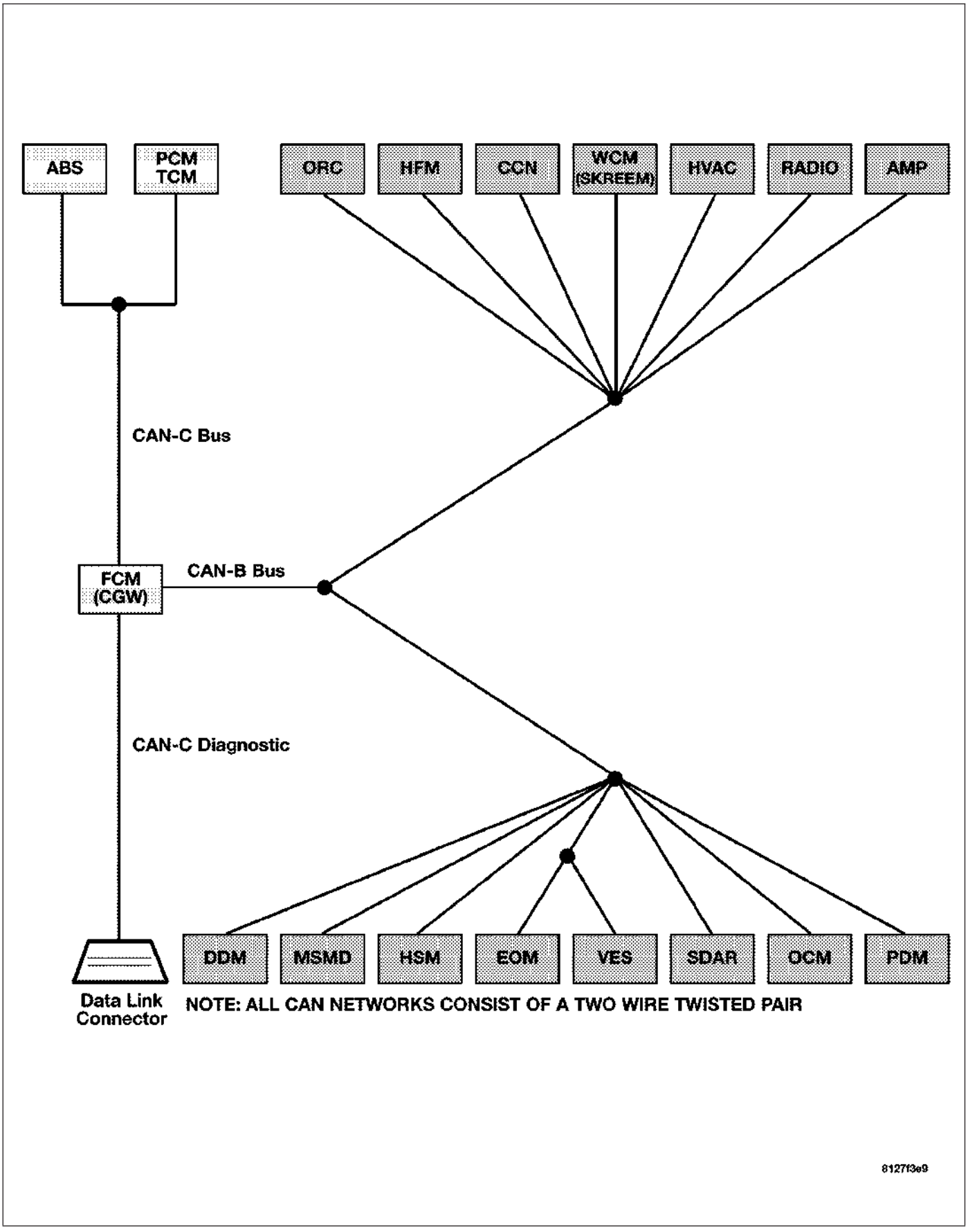
With the scan tool, select Network Diagnostics.

Is there more than one module with active DTCs "Logged Against" the Radio?

Yes >> Replace/update the Radio in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Replace/update the module that set this DTC in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

U0186-LOST COMMUNICATION WITH AUDIO AMPLIFIER



U0186-LOST COMMUNICATION WITH AUDIO AMPLIFIER (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  - With the ignition on
  - Battery voltage between 10 and 16 volts
  - IOD fuse installed
  - FCM is configured correctly
- **Set Condition:**
  Bus messages not received from the Amplifier for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED
DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
FCM NOT CONFIGURED CORRECTLY
AMPLIFIER
AMPLIFIER POWER AND GROUND
MODULE THAT SET THIS DTC

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.
With the scan tool, read active DTCs.

Is this DTC active?

Yes >> Go To 2

No >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section. Perform BODY VERIFICATION TEST – VER 1.

---

2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS

With the scan tool, read active DTCs from all modules.

NOTE: Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

Does the scan tool display any active DTCs to the conditions listed above?

Yes >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms. Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 3

U0186-LOST COMMUNICATION WITH AUDIO AMPLIFIER (CONTINUED)

3. VERIFY THAT THE AMPLIFIER IS ACTIVE ON THE BUS

Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the Amplifier is active on the bus.

Is the Amplifier active on the bus?

Yes >> Go To 4

No >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for No Response diagnostic procedures.
Perform BODY VERIFICATION TEST – VER 1.

---

4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS

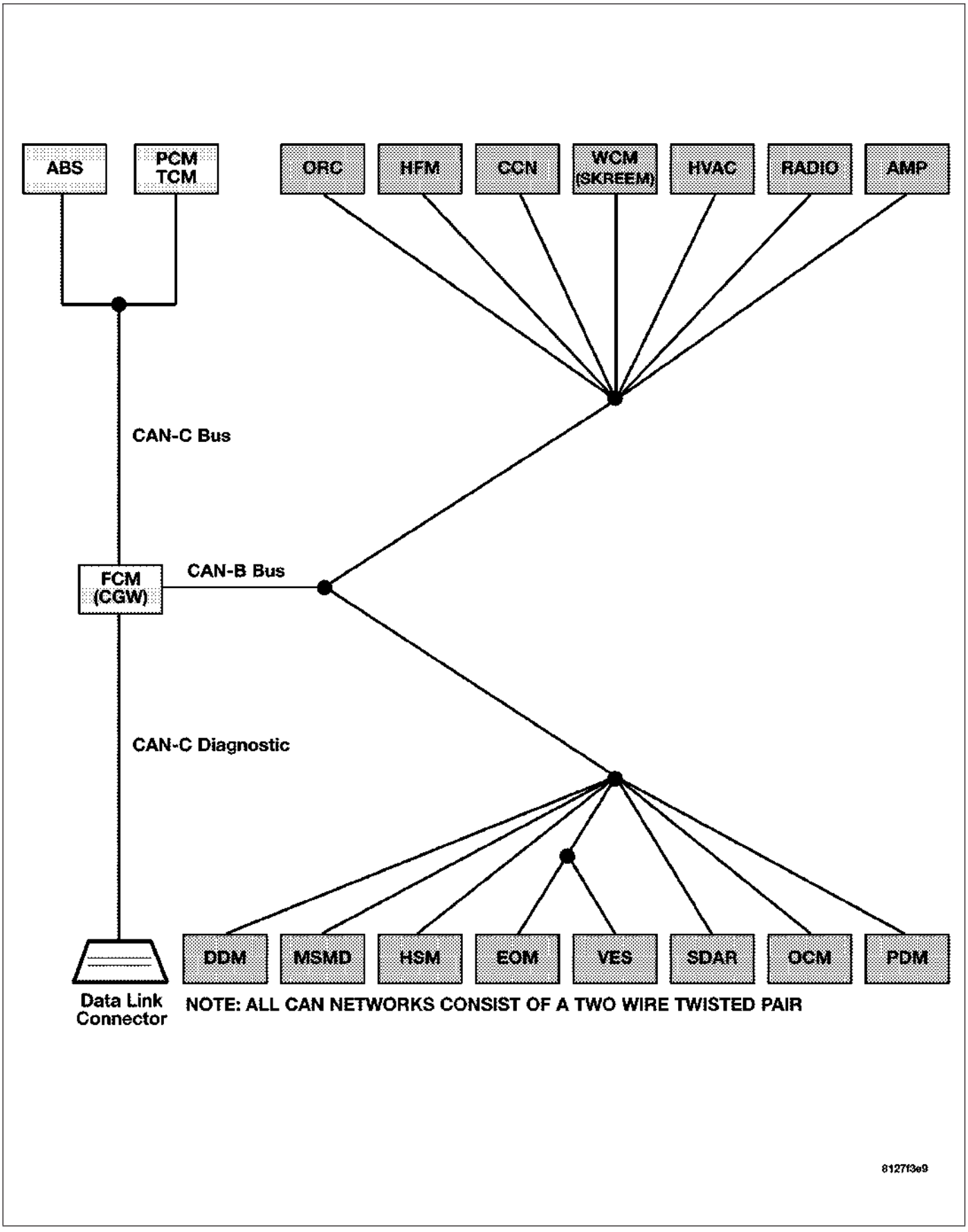
With the scan tool, select Network Diagnostics.

Is there more than one module with active DTCs “Logged Against” the Amplifier?

Yes >> Replace/update the Amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Replace/update the module that set this DTC in accordance with the service information
Perform BODY VERIFICATION TEST – VER 1.

U0195-LOST COMMUNICATION WITH SDARS



U0195-LOST COMMUNICATION WITH SDARS (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  - With the ignition on
  - Battery voltage between 10 and 16 volts
  - IOD fuse installed
  - FCM is configured correctly
- **Set Condition:**
  Bus messages not received from the Satellite Receiver (SDAR) for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED
DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
FCM NOT CONFIGURED CORRECTLY
SATELLITE RECEIVER
SATELLITE RECEIVER POWER AND GROUND
MODULE THAT SET THIS DTC

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.
With the scan tool, read active DTCs.

Is this DTC active?

Yes >> Go To 2

No >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section. Perform BODY VERIFICATION TEST – VER 1.

---

2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS

With the scan tool, read active DTCs from all modules.

NOTE: Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

Does the scan tool display any active DTCs to the conditions listed above?

Yes >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms. Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 3

U0195-LOST COMMUNICATION WITH SDARS (CONTINUED)

3. VERIFY THAT THE SATELLITE RECEIVER IS ACTIVE ON THE BUS

Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the SDARS is active on the bus.

Is the SDARS active on the bus?

Yes >> Go To 4

No >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for No Response diagnostic procedures.
Perform BODY VERIFICATION TEST – VER 1.

---

4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS

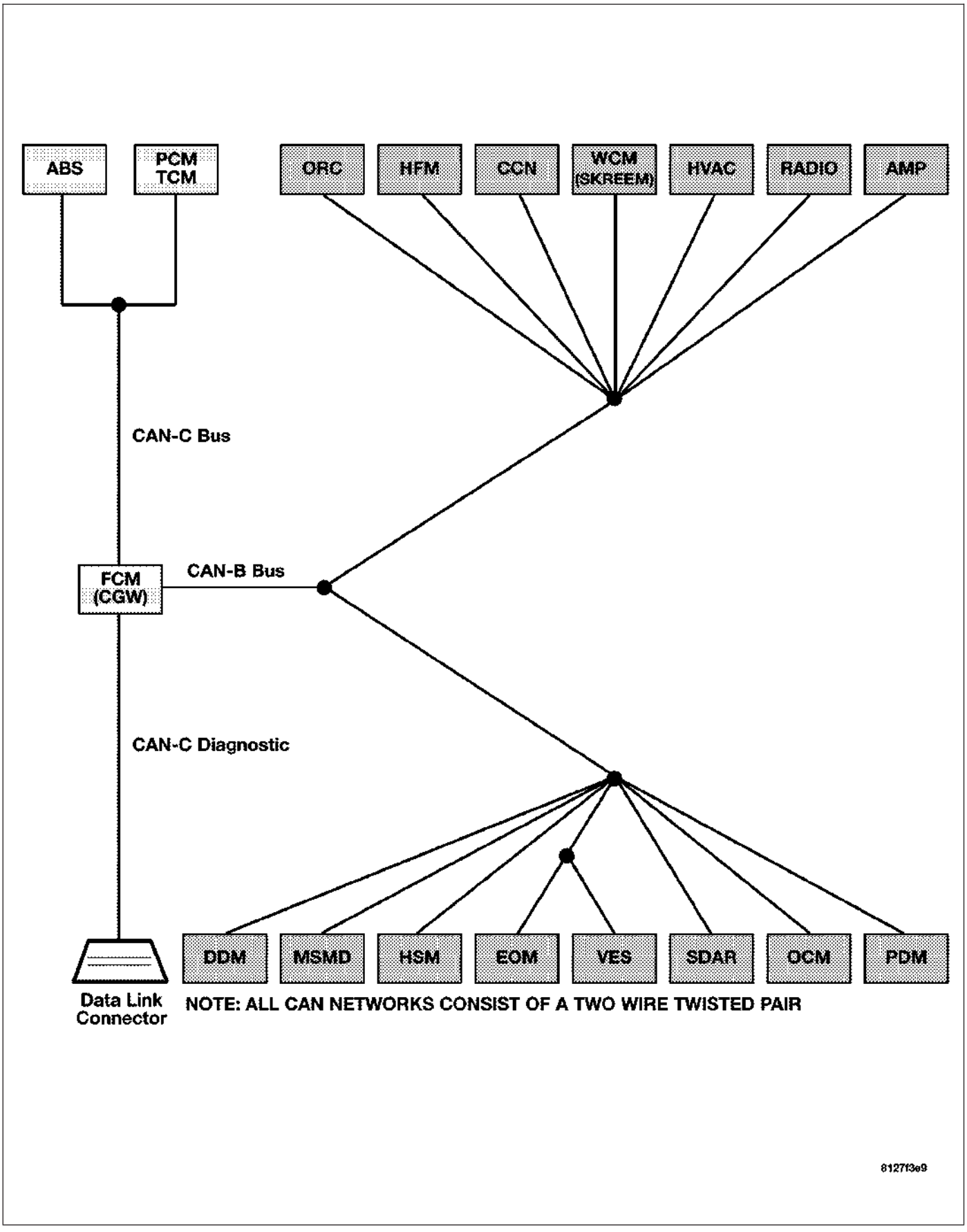
With the scan tool, select Network Diagnostics.

Is there more than one module with active DTCs "Logged Against" the SDARS?

Yes >> Replace/update the Satellite Receiver in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Replace/update the module that set the DTC in accordance with the service information
Perform BODY VERIFICATION TEST – VER 1.

U0196-LOST COMMUNICATION WITH VEHICLE ENTERTAINMENT CONTROL MODULE



U0196-LOST COMMUNICATION WITH VEHICLE ENTERTAINMENT CONTROL MODULE (CONTINUED)
For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  - With the ignition on
  - Battery voltage between 10 and 16 volts
  - IOD fuse installed
  - FCM is configured correctly
- **Set Condition:**
  Bus messages not received from the vehicle entertainment system (DVD player) for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED
DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
FCM NOT CONFIGURED CORRECTLY
MONITOR/DVD MEDIA SYSTEM (DVD PLAYER)
MONITOR/DVD MEDIA SYSTEM (DVD PLAYER) POWER AND GROUND
MODULE THAT SET THIS DTC

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.
With the scan tool, read active DTCs.

Is this DTC active?

Yes >> Go To 2

No >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section. Perform BODY VERIFICATION TEST – VER 1.

---

2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS

With the scan tool, read active DTCs from all modules.

NOTE: Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

Does the scan tool display any active DTCs to the conditions listed above?

Yes >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms. Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 3

U0196-LOST COMMUNICATION WITH VEHICLE ENTERTAINMENT CONTROL MODULE (CONTINUED)

3. VERIFY THAT THE VES IS ACTIVE ON THE BUS

Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the VES is active on the bus.

Is the VES active on the bus?

Yes >> Go To 4

No >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for No Response diagnostic procedures.
Perform BODY VERIFICATION TEST – VER 1.

---

4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS

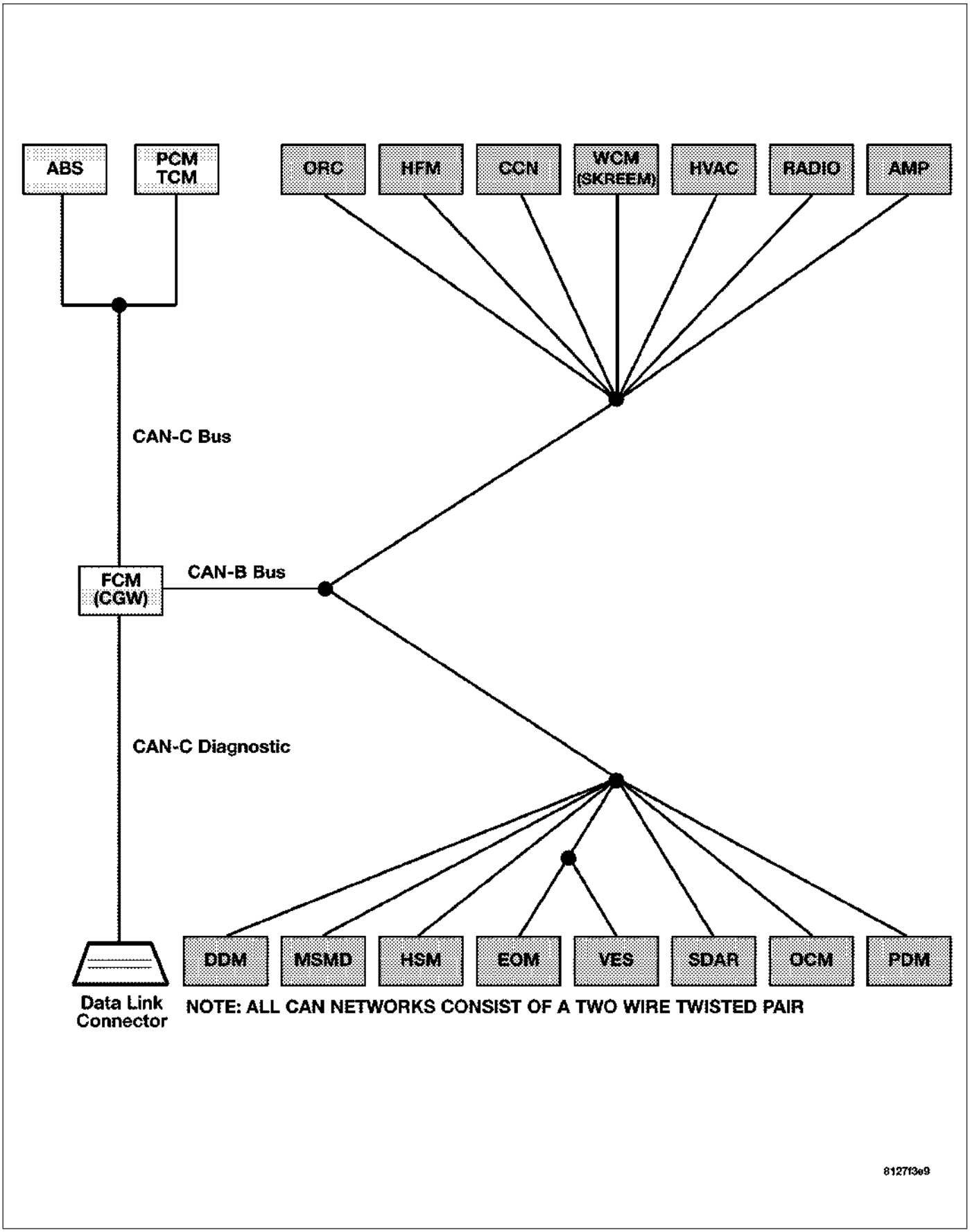
With the scan tool, select Network Diagnostics.

Is there more than one module with active DTCs “Logged Against” the VES?

Yes >> Replace/update the Monitor/DVD Media System (DVD Player) in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Replace/update the module that set this DTC in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

U0197-LOST COMMUNICATION WITH HANDS FREE PHONE MODULE



U0197-LOST COMMUNICATION WITH HANDS FREE PHONE MODULE (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  - With the ignition on
  - Battery voltage between 10 and 16 volts
  - IOD fuse installed
  - FCM is configured correctly
- **Set Condition:**
  Bus messages not received from the HFM for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED
DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
FCM NOT CONFIGURED CORRECTLY
HANDS FREE MODULE
HANDS FREE MODULE POWER AND GROUND
MODULE THAT SET THIS DTC

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.
With the scan tool, read active DTCs.

Is this DTC active?

Yes >> Go To 2

No >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section. Perform BODY VERIFICATION TEST – VER 1.

---

2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS

With the scan tool, read active DTCs from all modules.

NOTE: Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

Does the scan tool display any active DTCs to the conditions listed above?

Yes >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms. Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 3

U0197-LOST COMMUNICATION WITH HANDS FREE PHONE MODULE (CONTINUED)

3. VERIFY THAT THE HFM IS ACTIVE ON THE BUS

Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the HFM is active on the bus.

Is the HFM active on the bus?

Yes >> Go To 4

No >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for No Response diagnostic procedures.
Perform BODY VERIFICATION TEST – VER 1.

---

4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS

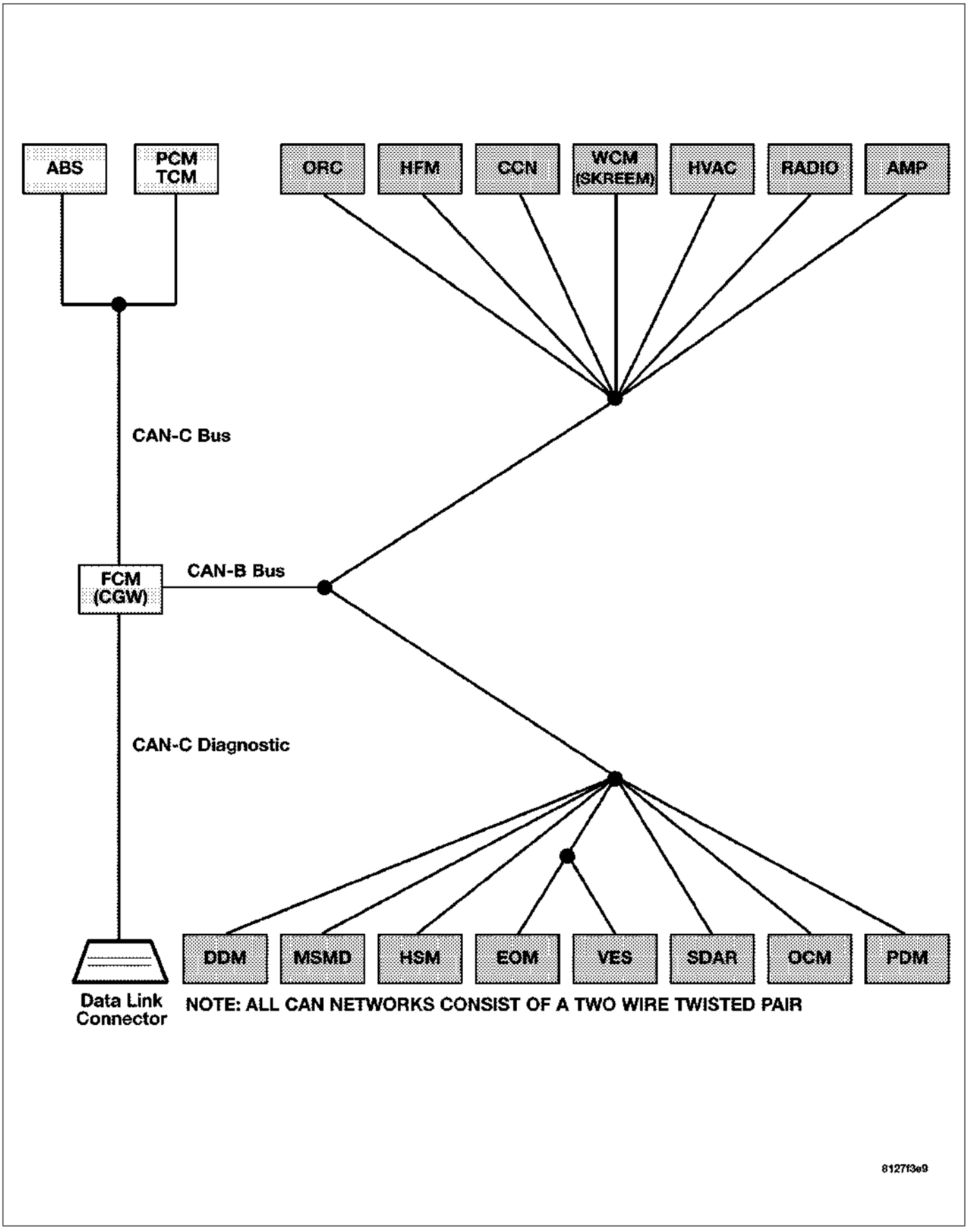
With the scan tool, select Network Diagnostics.

Is there more than one module with active DTCs "Logged Against" the HFM?

Yes >> Replace/update the Hands Free Module in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Replace/update the module that set this DTC in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

U0199-LOST COMMUNICATION WITH DRIVER DOOR MODULE



U0199-LOST COMMUNICATION WITH DRIVER DOOR MODULE (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  - With the ignition on
  - Battery voltage between 10 and 16 volts
  - IOD fuse installed
  - FCM is configured correctly
- **Set Condition:**
  Bus messages not received from the DDM for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED
DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
FCM NOT CONFIGURED CORRECTLY
DRIVER MEMORY MIRROR MODULE
DRIVER MEMORY MIRROR MODULE POWER AND GROUND
MODULE THAT SET THE DTC

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding. With the scan tool, read active DTCs.

Is this DTC active?

Yes >> Go To 2

No >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section. Perform BODY VERIFICATION TEST – VER 1.

---

2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS

With the scan tool, read active DTCs from all modules.

NOTE: Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

Does the scan tool display any active DTCs to the conditions listed above?

Yes >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms. Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 3

U0199-LOST COMMUNICATION WITH DRIVER DOOR MODULE (CONTINUED)

3. VERIFY THAT THE DDM IS ACTIVE ON THE BUS

Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the DDM is active on the bus.

Is the DDM active on the bus?

Yes >> Go To 4

No >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for No Response diagnostic procedures.
Perform BODY VERIFICATION TEST – VER 1.

---

4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS

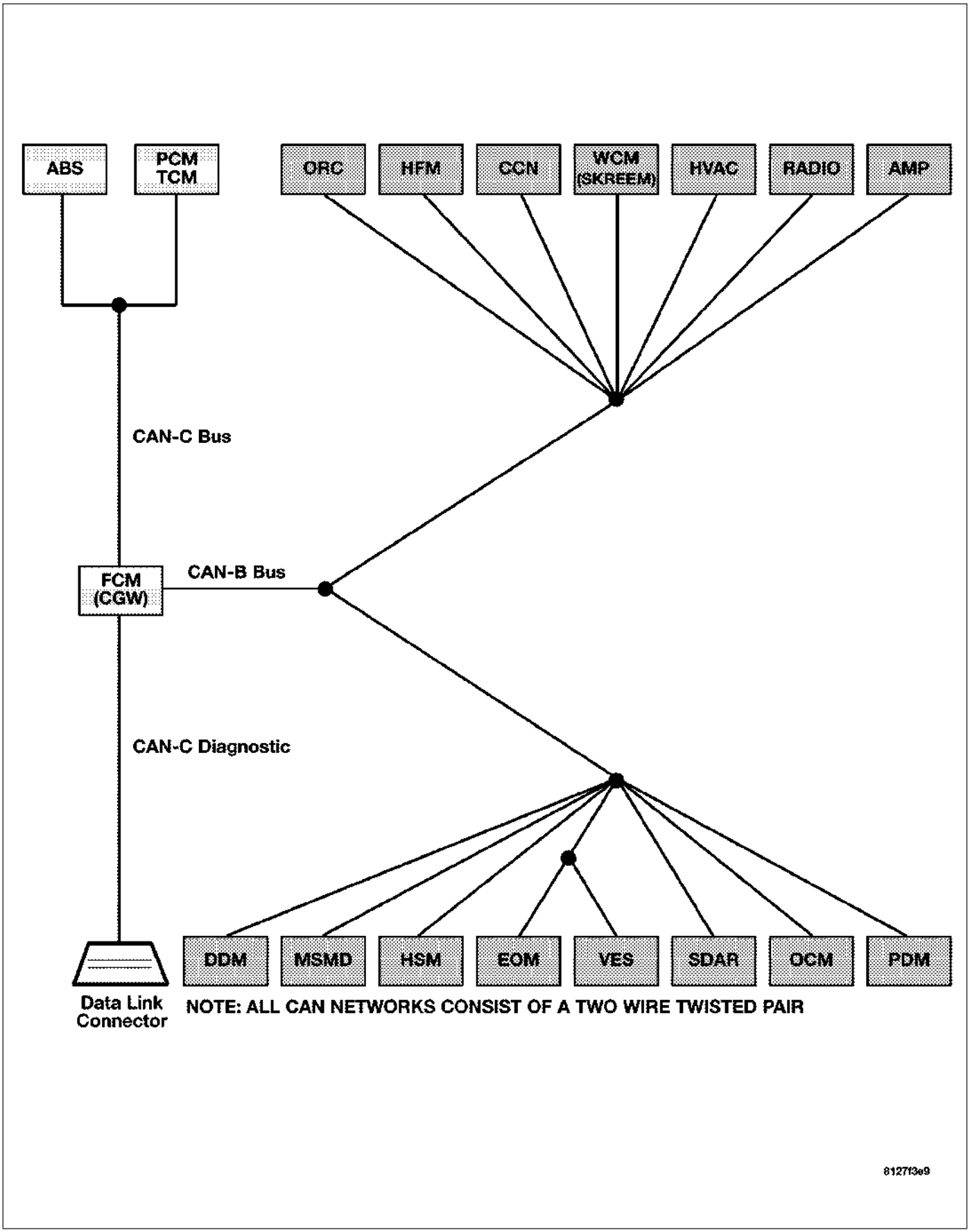
With the scan tool, select Network Diagnostics.

Is there more than one module with active DTCs "Logged Against" the DDM?

Yes >> Replace/update the Driver Memory Mirror Module in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Replace/update the module that set this DTC in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

U0200-LOST COMMUNICATION WITH PASSENGER DOOR MODULE



U0200-LOST COMMUNICATION WITH PASSENGER DOOR MODULE (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  - With the ignition on
  - Battery voltage between 10 and 16 volts
  - IOD fuse installed
  - FCM is configured correctly
- **Set Condition:**
  Bus messages not received from the PDM for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED
DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
FCM NOT CONFIGURED CORRECTLY
PASSENGER MEMORY MIRROR MODULE
PASSENGER MEMORY MIRROR MODULE POWER AND GROUND
MODULE THAT SET THIS DTC

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.
With the scan tool, read active DTCs.

Is this DTC active?

Yes >> Go To 2

No >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section. Perform BODY VERIFICATION TEST – VER 1.

---

2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS

With the scan tool, read active DTCs from all modules.

NOTE: Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

Does the scan tool display any active DTCs to the conditions listed above?

Yes >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms. Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 3

U0200-LOST COMMUNICATION WITH PASSENGER DOOR MODULE (CONTINUED)

3. VERIFY THAT THE PDM IS ACTIVE ON THE BUS

Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the PDM is active on the bus.

Is the PDM active on the bus?

Yes >> Go To 4

No >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for No Response diagnostic procedures.
Perform BODY VERIFICATION TEST – VER 1.

---

4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS

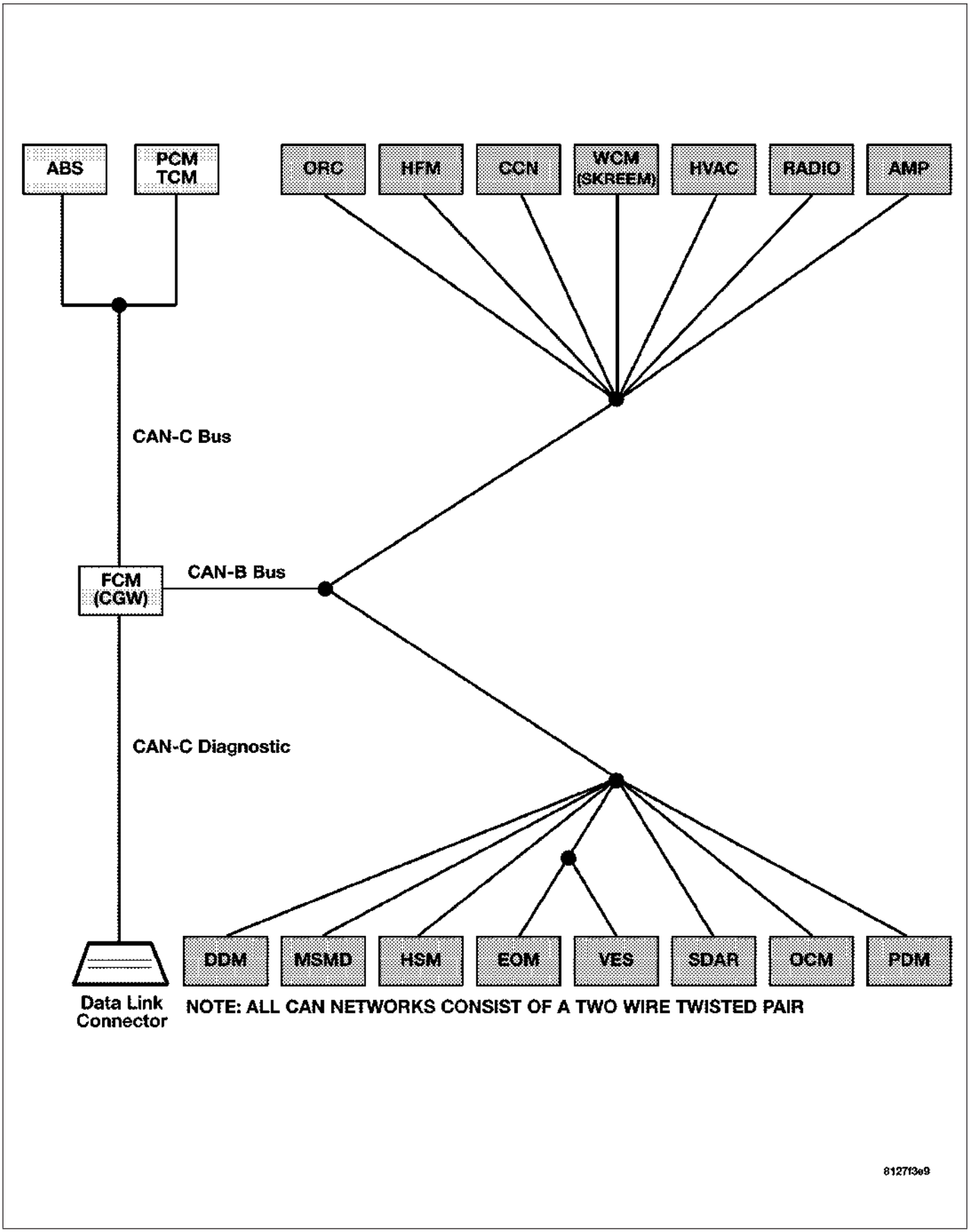
With the scan tool, select Network Diagnostics.

Is there more than one module with active DTCs "Logged Against" the PDM?

Yes >> Replace/update the Passenger Memory Mirror Module in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Replace/update the module that set this DTC in accordance with the service information
Perform BODY VERIFICATION TEST – VER 1.

U0208-LOST COMMUNICATION WITH HEATED SEAT CONTROL MODULE



U0208-LOST COMMUNICATION WITH HEATED SEAT CONTROL MODULE (CONTINUED)
For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  - With the ignition on
  - Battery voltage between 10 and 16 volts
  - IOD fuse installed
  - FCM is configured correctly
- **Set Condition:**
  Bus messages not received from the HSM for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED
DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
FCM NOT CONFIGURED CORRECTLY
HEATED SEAT MODULE
HEATED SEAT MODULE POWER AND GROUND
MODULE THAT SET THIS DTC

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.
With the scan tool, read active DTCs.

Is this DTC active?

Yes >> Go To 2

No >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section. Perform BODY VERIFICATION TEST – VER 1.

---

2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS

With the scan tool, read active DTCs from all modules.

NOTE: Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

Does the scan tool display any active DTCs to the conditions listed above?

Yes >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms. Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 3

U0208-LOST COMMUNICATION WITH HEATED SEAT CONTROL MODULE (CONTINUED)

3. VERIFY THAT THE HSM IS ACTIVE ON THE BUS

Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the HSM is active on the bus.

Is the HSM active on the bus?

Yes >> Go To 4

No >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for No Response diagnostic procedures.
Perform BODY VERIFICATION TEST – VER 1.

---

4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS

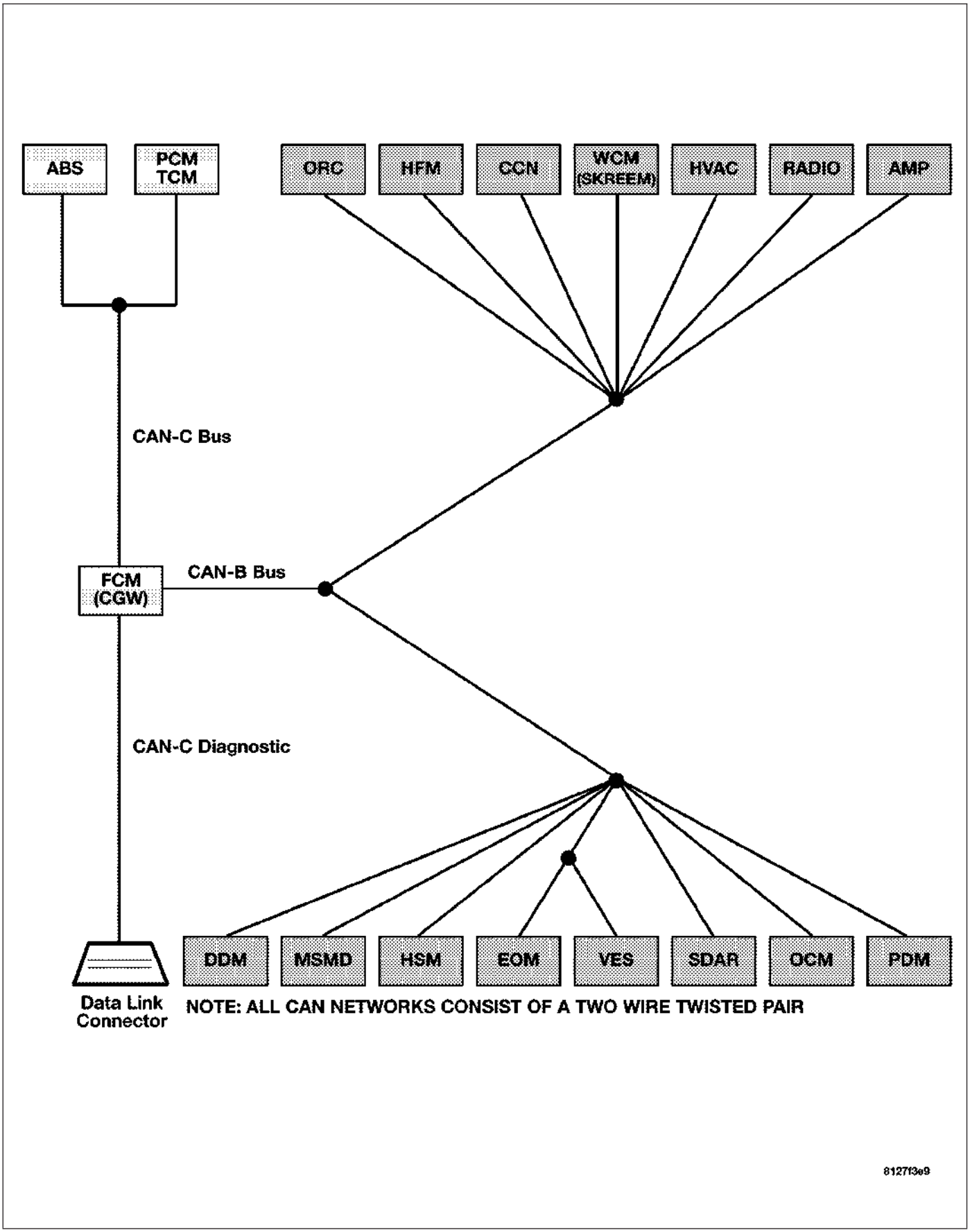
With the scan tool, select Network Diagnostics.

Is there more than one module with active DTCs “Logged Against” the HSM?

Yes >> Replace/update the Heated Seat Module in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Replace/update the module that set this DTC in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

U0209-LOST COMMUNICATION WITH MEMORY SEAT CONTROL MODULE



U0209-LOST COMMUNICATION WITH MEMORY SEAT CONTROL MODULE (CONTINUED)
For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  - With the ignition on
  - Battery voltage between 10 and 16 volts
  - IOD fuse installed
  - FCM is configured correctly
- **Set Condition:**
  Bus messages not received from the MSMD for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED
DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
FCM NOT CONFIGURED CORRECTLY
SEAT MEMORY MODULE
SEAT MEMORY MODULE POWER AND GROUND
MODULE THAT SET THIS DTC

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.
With the scan tool, read active DTCs.

Is this DTC active?

Yes >> Go To 2

No >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section. Perform BODY VERIFICATION TEST – VER 1.

---

2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS

With the scan tool, read active DTCs from all modules.

NOTE: Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

Does the scan tool display any active DTCs to the conditions listed above?

Yes >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms. Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 3

U0209-LOST COMMUNICATION WITH MEMORY SEAT CONTROL MODULE (CONTINUED)

3. VERIFY THAT THE MSMD IS ACTIVE ON THE BUS

Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the MSMD is active on the bus.

Is the MSMD active on the bus?

Yes >> Go To 4

No >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for No Response diagnostic procedures.
Perform BODY VERIFICATION TEST – VER 1.

---

4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS

With the scan tool, select Network Diagnostics.

Is there more than one module with active DTCs "Logged Against" the MSMD?

Yes >> Replace/update the Seat Memory Module in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Replace/update the module that set this DTC in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

U1108-ADDITIONAL CAN B ECU DETECTED

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously.
- **Set Condition:**
  The Front Control Module detects an additional CAN B module and requires a reconfiguration.

Possible Causes
ADDITIONAL MODULE ADDED/REMOVED FROM THE CAN B BUS NETWORK

Diagnostic Test

1. RECONFIGURE THE FRONT CONTROL MODULE

Turn the ignition on.

With the scan tool, select network view and press the gateway button. This will list the CAN modules on the vehicle. Read and record the listed modules.

With the scan tool, select FCM, miscellaneous functions then add/remove ECUs.

With the scan tool, add or remove the module that was not configured in the FCM.

With the scan tool, erase DTC's.

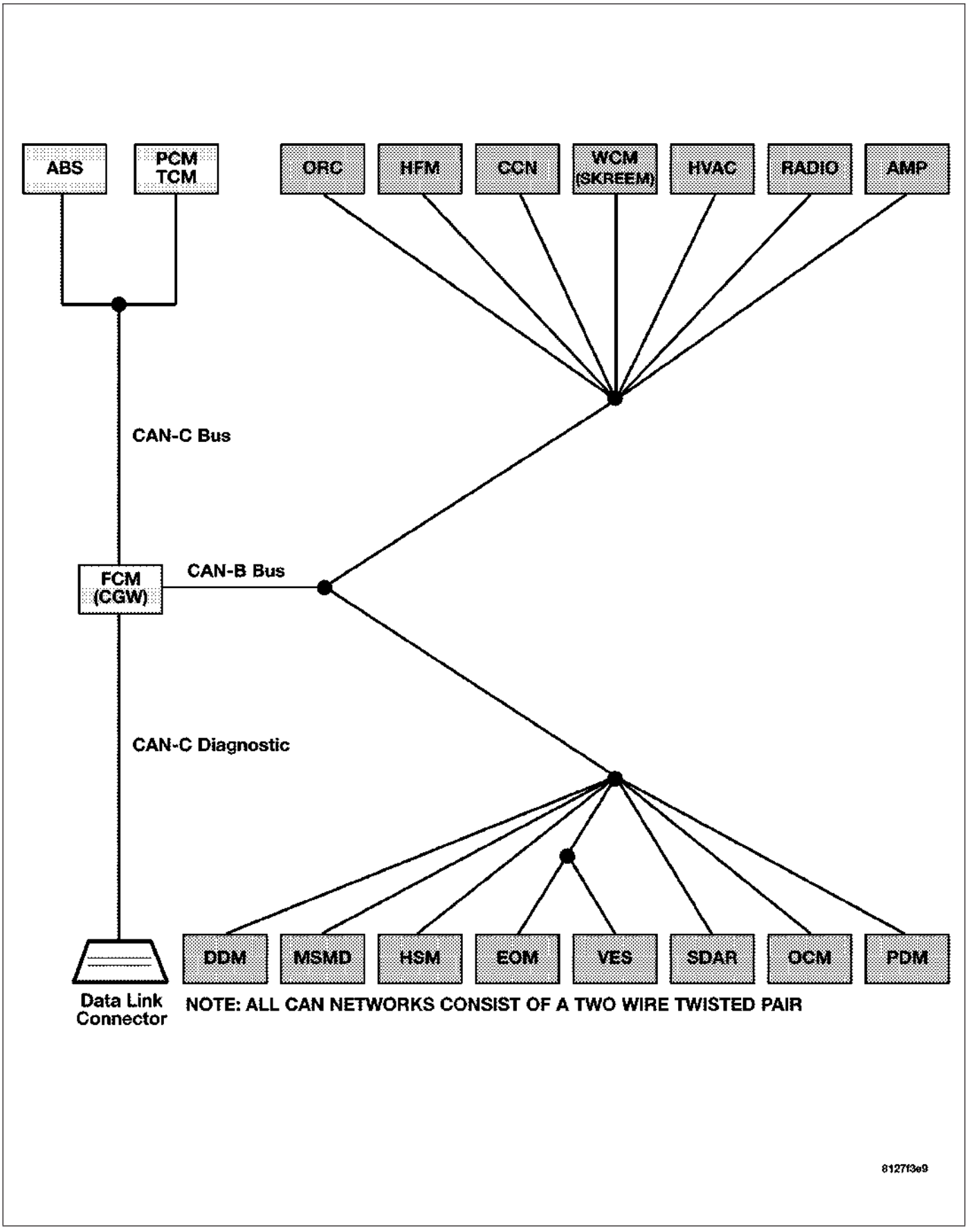
Cycle the ignition from on to off 3 times and read the active FCM DTC's.

Does the scan tool display this DTC as active?

Yes >> Retest system and attempt to reconfigure the FCM.
Perform BODY VERIFICATION TEST – VER 1.

No >> Repair is complete.
Perform BODY VERIFICATION TEST – VER 1.

*STORED LOST COMMUNICATION DTCS



***STORED LOST COMMUNICATION DTCS (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  - With the ignition on
  - Battery voltage between 10 and 16 volts
  - IOD fuse installed
  - FCM is configured correctly
- **Set Condition:**
  Bus messages not received from for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED
DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
FCM NOT CONFIGURED CORRECTLY
POWER OR GROUND FROM THE REPORTING MODULE
MODULE THAT SET THIS DTC
PREVIOUS SERVICE PERFORMED WITHIN THE LAST 100 KEY CYCLES (FUSE/RELAYS REMOVED, WIRING SERVICE, BATTERY DISCONNECT)
LOW BATTERY/JUMP START CONDITION
IOD FUSE WAS REMOVED DURING SHIPPING
CHECK FOR RELATED TSBS

Diagnostic Test

1. VERIFY DTC IS STORED

NOTE: Stored faults may indicate a customer perceived intermittent condition.

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding. With the scan tool, read stored DTCs.

Is this DTC stored?

Yes >> Go To 2

No >> Diagnose the active DTC. Refer to the table of contents for a list of the symptoms. Perform BODY VERIFICATION TEST – VER 1.

---

2. CHECK THE ENVIRONMENTAL DATA

With the scan tool, read the loss of communication environmental data.

Does the loss of communication environmental odometer data match up to any of the previous service procedures listed in the possible causes or are their any stored CAN B or C hardware electrical, battery, ignition voltage, VIN missing/mismatch, FCM configuration DTCs present with match environmental data?

Yes >> These DTCs may have been the result of other service procedures performed. Clear DTCs. Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 3

***STORED LOST COMMUNICATION DTCS (CONTINUED)**

3. VERIFY INTERMITTENT LOST COMMUNICATION DTC-WIRING CONCERNS

Turn the ignition on.

With the scan tool, select Network Diagnostics.

Is there more than one ECU with stored DTCs "Logged Against" the module and one or more lost communication DTCs stored in the offending module?

Yes >> Verify if the vehicle was recently in for this type of service. Otherwise, visually inspect the related wiring harness for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent, pushed out, and corroded terminals. Repair as necessary.

No >> Go To 4

---

4. VERIFY INTERMITTENT LOST COMMUNICATION DTC-OFFENDING MODULE

Turn the ignition on.

With the scan tool, select Network Diagnostics.

Is there more than one ECU with stored DTCs "Logged Against" the module and NO lost communication DTCs stored in the offending module?

Yes >> Check for TSB related to this offending module.

No >> Go To 5

---

5. VERIFY INTERMITTENT LOST COMMUNICATION DTC-REPORTING MODULE

Turn the ignition on.

With the scan tool, select Network Diagnostics.

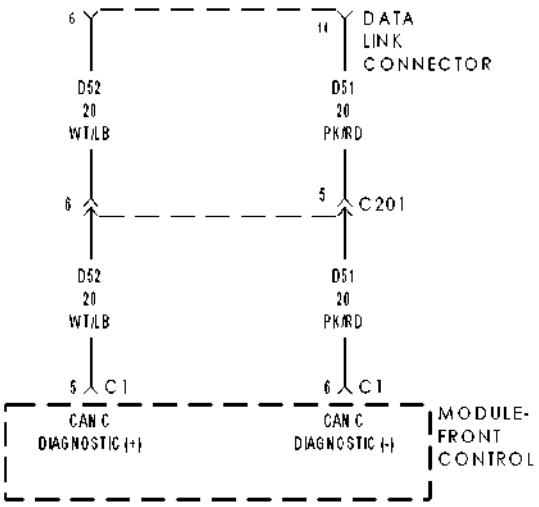
Is there ONLY ONE ECU with stored DTCs "Logged Against" the module?

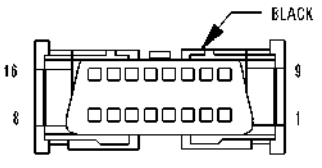
Yes >> Check for TSB related to the module that set this DTC.

No >> Verify if the vehicle was recently in for this type of service. Otherwise, visually inspect the related wiring harness for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent, pushed out, and corroded terminals. Repair as necessary.

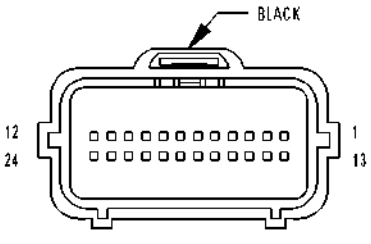
---

*CAN C DIAGNOSTIC (+) AND/OR CAN C DIAGNOSTIC (-) CIRCUITS HIGH





DATA LINK
CONNECTOR



MODULE-FRONT
CONTROL C1

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***CAN C DIAGNOSTIC (+) AND/OR CAN C DIAGNOSTIC (-) CIRCUITS HIGH (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the scan tool queries the FCM.
- **Set Condition:**
  The scan tool has detected a shorted high condition on either or both CAN C Diagnostic circuits.

Possible Causes
(D52) CAN C DIAGNOSTIC (+) CIRCUIT SHORTED TO VOLTAGE
(D51) CAN C DIAGNOSTIC (-) CIRCUIT SHORTED TO VOLTAGE
FRONT CONTROL MODULE

Diagnostic Test

1. CHECK THE STATUS OF THE ERROR MESSAGE

NOTE: Ensure the vehicle being tested is a CAN BUS VEHICLE. If not, false error messages may be displayed.

NOTE: Ensure the scan tool is updated to the latest software.

With the scan tool, record the error message.

Disconnect the scan tool from the DLC.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

Does the scan tool display this same error message?

Yes >> Go To 2

No >> The conditions that caused this error message to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

---

2. CAN C DIAGNOSTIC CIRCUITS SHORTED TO VOLTAGE

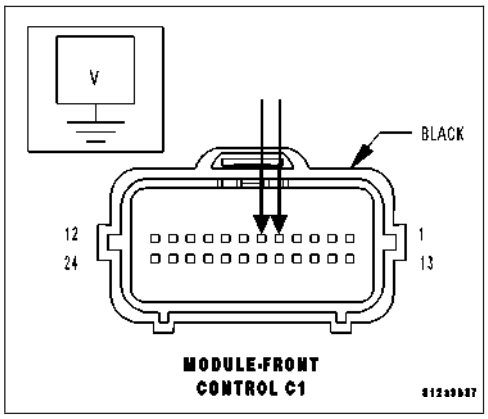
Turn the ignition off.

Disconnect the Front Control Module C1 harness connector.

Disconnect the scan tool from the DLC.

Turn the ignition on.

Measure the voltage of the CAN C Diagnostic circuits.



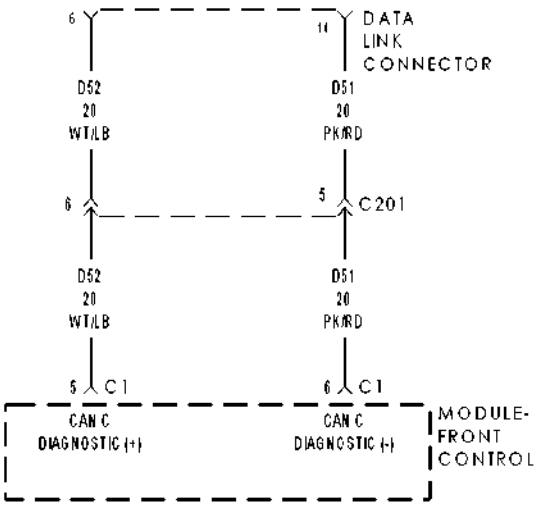
Is the voltage above 6.0 volts for either circuit?

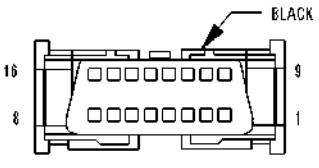
Yes >> Repair the CAN C Diagnostic circuits for a short to voltage.
Perform BODY VERIFICATION TEST - VER 1.

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Front Control Module in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1.

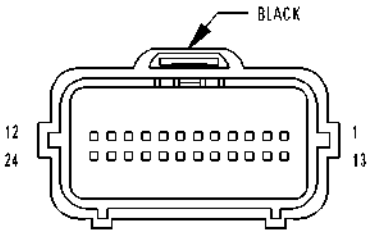
---

*CAN C DIAGNOSTIC (+) CIRCUIT LOW





DATA LINK
CONNECTOR



MODULE-FRONT
CONTROL C1

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***CAN C DIAGNOSTIC (+) CIRCUIT LOW (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the scan tool queries the FCM.
- **Set Condition:**
  The scan tool has detected a shorted low condition on the (D52) CAN C Diagnostic (+) circuit.

Possible Causes
(D52) CAN C DIAGNOSTIC (+) CIRCUIT SHORTED TO GROUND
FRONT CONTROL MODULE

Diagnostic Test

1. CHECK THE STATUS OF THE ERROR MESSAGE

NOTE: Ensure the vehicle being tested is a CAN BUS VEHICLE. If not, false error messages may be displayed.

NOTE: Ensure the scan tool is updated to the latest software.

With the scan tool, record the error message.

Disconnect the scan tool from the DLC.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

Does the scan tool display this same error message?

Yes >> Go To 2

No >> The conditions that caused this error message to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

---

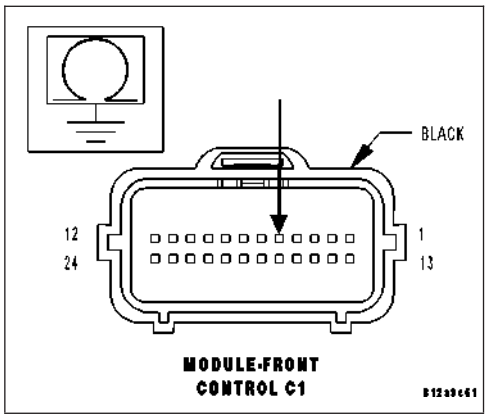
2. (D52) CAN C DIAGNOSTIC (+) CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Front Control Module C1 harness connector.

Disconnect the scan tool from the DLC.

Measure the resistance between ground and the (D52) CAN C Diagnostic (+) circuit.



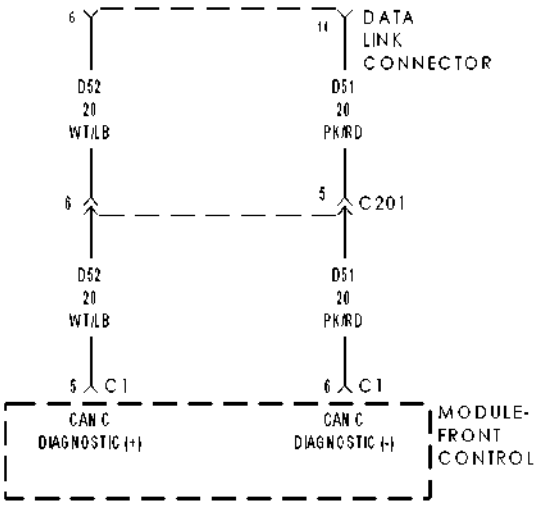
Is the resistance below 100.0 ohms?

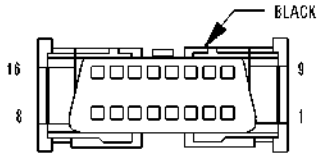
Yes >> Repair the (D52) CAN C Diagnostic (+) circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Front Control Module in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1.

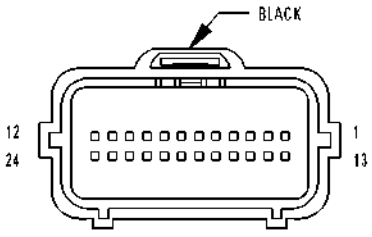
---

*CAN C DIAGNOSTIC (-) CIRCUIT LOW





DATA LINK
CONNECTOR



MODULE-FRONT
CONTROL C1

***CAN C DIAGNOSTIC (-) CIRCUIT LOW (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the scan tool queries the FCM.
- **Set Condition:**
  The scan tool has detected a shorted low condition on the (D51) CAN C Diagnostic (-) circuit.

Possible Causes
(D51) CAN C DIAGNOSTIC (-) CIRCUIT SHORTED TO GROUND
FRONT CONTROL MODULE

Diagnostic Test

1. CHECK THE STATUS OF THE ERROR MESSAGE

NOTE: Ensure the vehicle being tested is a CAN BUS VEHICLE. If not, false error messages may be displayed.

NOTE: Ensure the scan tool is updated to the latest software.

With the scan tool, record the error message.

Disconnect the scan tool from the DLC.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

Does the scan tool display this same error message?

Yes >> Go To 2

No >> The conditions that caused this error message to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

---

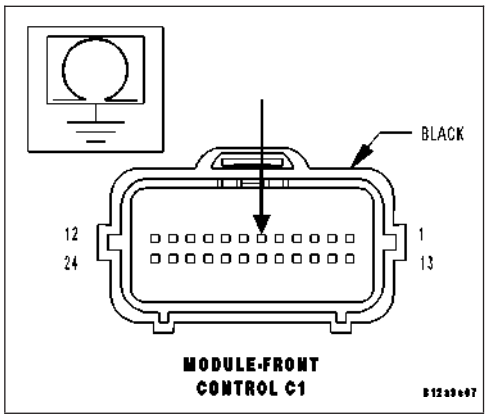
2. (D51) CAN C DIAGNOSTIC (-) CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Front Control Module C1 harness connector.

Disconnect the scan tool from the DLC.

Measure the resistance between ground and the (D51) CAN C Diagnostic (-) circuit.



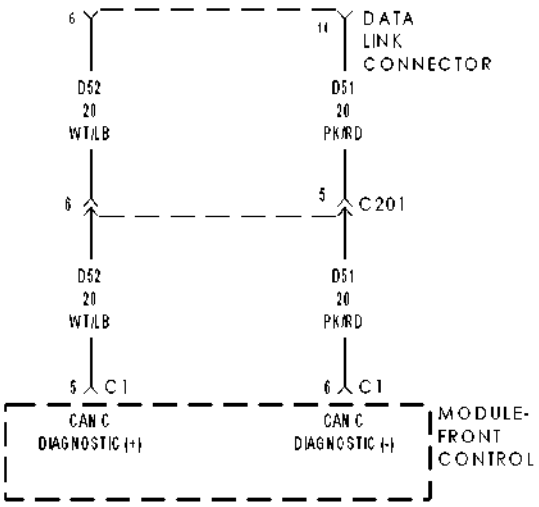
Is the resistance below 100.0 ohms?

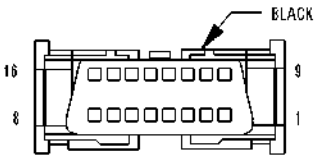
Yes >> Repair the (D51) CAN C Diagnostic (-) circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Front Control Module in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1.

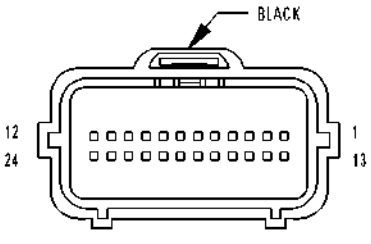
---

*CAN C DIAGNOSTIC (+) SHORTED TO CAN C DIAGNOSTIC (-)





DATA LINK
CONNECTOR



MODULE-FRONT
CONTROL C1

81209e36

***CAN C DIAGNOSTIC (+) SHORTED TO CAN C DIAGNOSTIC (-) (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the scan tool queries the FCM.
- **Set Condition:**
  The scan tool has detected a shorted together condition on the CAN C Diagnostic circuits.

Possible Causes
(D52) CAN C DIAGNOSTIC (+) CIRCUIT SHORTED TO (D51) CAN C DIAGNOSTIC (-) CIRCUIT
FRONT CONTROL MODULE

Diagnostic Test

1. CHECK THE STATUS OF THE ERROR MESSAGE

NOTE: Ensure the vehicle being tested is a CAN BUS VEHICLE. If not, false error messages may be displayed.

NOTE: Ensure the scan tool is updated to the latest software.

With the scan tool, record the error message.

Disconnect the scan tool from the DLC.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

Does the scan tool display this same error message?

Yes >> Go To 2

No >> The conditions that caused this error message to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

---

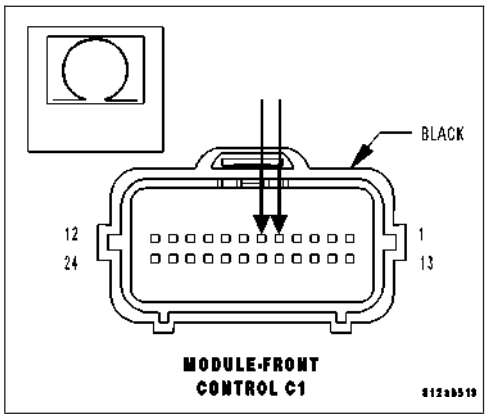
2. (D52) CAN C DIAGNOSTIC (+) CIRCUIT SHORTED TO (D51) CAN C DIAGNOSTIC (-) CIRCUIT

Turn the ignition off.

Disconnect the Front Control Module C1 harness connector.

Disconnect the scan tool from the DLC.

Measure the resistance between the (D52) CAN C Diagnostic (+) circuit and the (D51) CAN C Diagnostic (-) circuit.



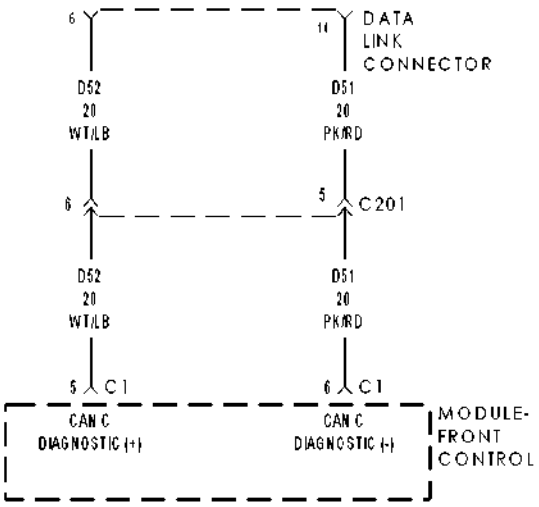
Is the resistance below 100.0 ohms?

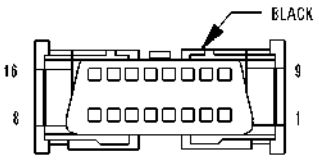
Yes >> Repair the (D52) CAN C Diagnostic (+) circuit for a short to the CAN C Diagnostic (-) circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Front Control Module in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1.

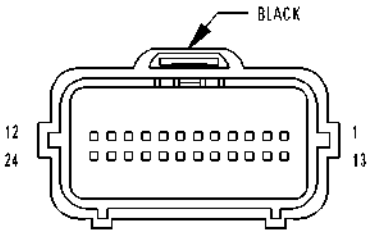
---

*CAN C DIAGNOSTIC (-) CIRCUIT OPEN





DATA LINK
CONNECTOR



MODULE-FRONT
CONTROL C1

81a9e36

***CAN C DIAGNOSTIC (-) CIRCUIT OPEN (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the scan tool queries the FCM.
- **Set Condition:**
  The scan tool has detected an open condition on the (D51) CAN C Diagnostic (-) circuit.

Possible Causes
(D51) CAN C DIAGNOSTIC (-) CIRCUIT OPEN
FRONT CONTROL MODULE

Diagnostic Test

1. CHECK THE STATUS OF THE ERROR MESSAGE

NOTE: Ensure the vehicle being tested is a CAN BUS VEHICLE. If not, false error messages may be displayed.

NOTE: Ensure the scan tool is updated to the latest software.

With the scan tool, record the error message.

Disconnect the scan tool from the DLC.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

Does the scan tool display this same error message?

Yes >> Go To 2

No >> The conditions that caused this error message to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

*CAN C DIAGNOSTIC (-) CIRCUIT OPEN (CONTINUED)

2. (D51) CAN C DIAGNOSTIC (-) CIRCUIT OPEN

Turn the ignition off.

Disconnect the Front Control Module C1 harness connector.

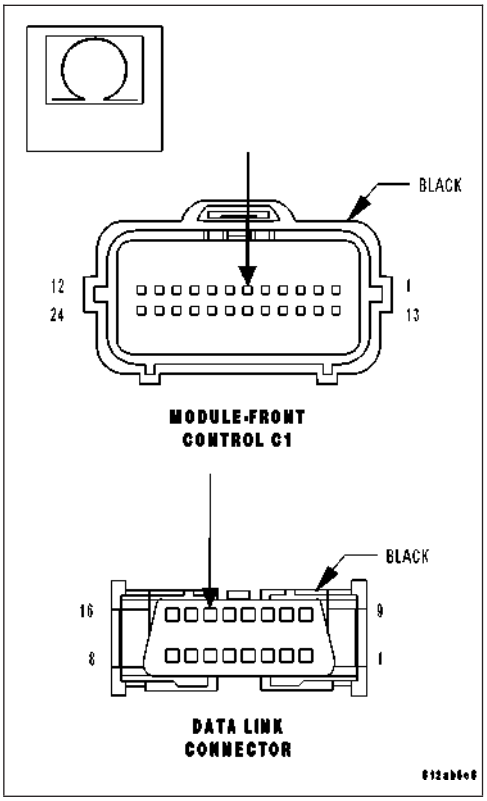
Disconnect the scan tool from the DLC.

Measure the resistance of the (D51) CAN C Diagnostic (-) circuit between the FCM connector and the DLC.

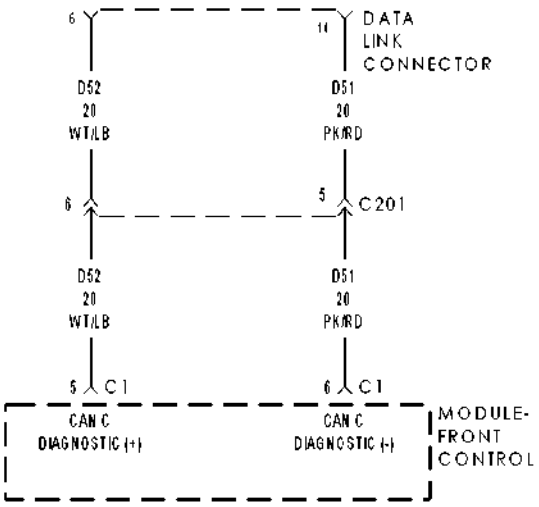
Is the resistance below 5.0 ohms?

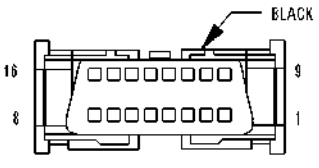
Yes >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Front Control Module in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the (D51) CAN C Diagnostic (-) circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

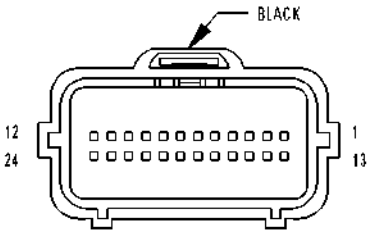


*CAN C DIAGNOSTIC (+) CIRCUIT OPEN





DATA LINK
CONNECTOR



MODULE-FRONT
CONTROL C1

81209e36

***CAN C DIAGNOSTIC (+) CIRCUIT OPEN (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the scan tool queries the FCM.
- **Set Condition:**
  The scan tool has detected an open condition on the (D52) CAN C Diagnostic (+) circuit.

Possible Causes
(D52) CAN C DIAGNOSTIC (+) CIRCUIT OPEN
FRONT CONTROL MODULE

Diagnostic Test

1. CHECK THE STATUS OF THE ERROR MESSAGE

NOTE: Ensure the vehicle being tested is a CAN BUS VEHICLE. If not, false error messages may be displayed.

NOTE: Ensure the scan tool is updated to the latest software.

With the scan tool, record the error message.

Disconnect the scan tool from the DLC.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

Does the scan tool display this same error message?

Yes >> Go To 2

No >> The conditions that caused this error message to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

*CAN C DIAGNOSTIC (+) CIRCUIT OPEN (CONTINUED)

2. (D52) CAN C DIAGNOSTIC (+) CIRCUIT OPEN

Turn the ignition off.

Disconnect the Front Control Module C1 harness connector.

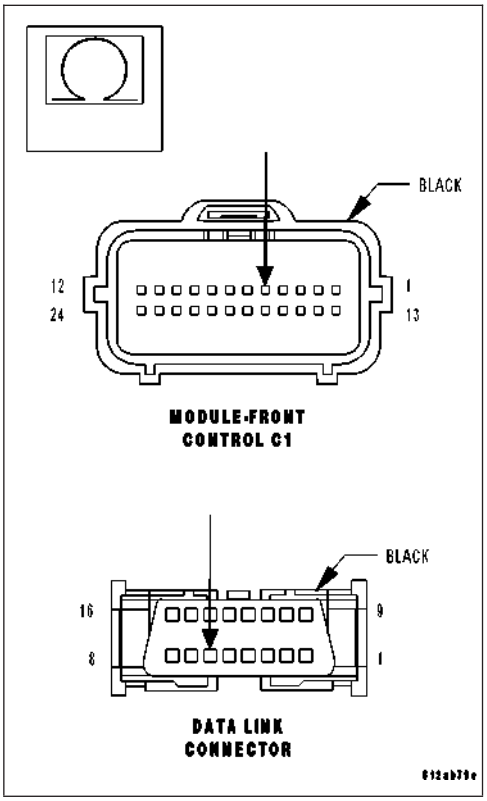
Disconnect the scan tool from the DLC.

Measure the resistance of the (D52) CAN C Diagnostic (+) circuit between the FCM connector and the DLC.

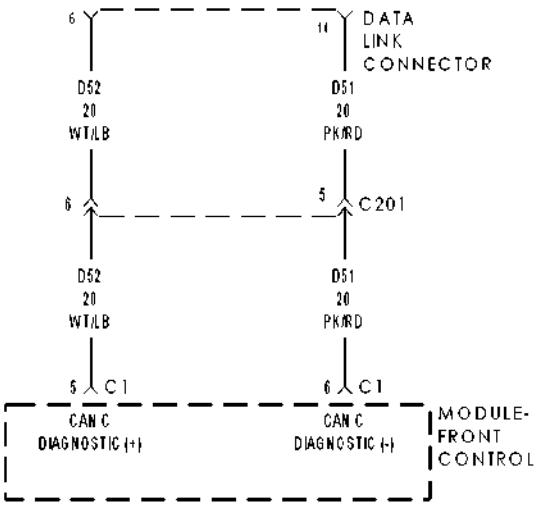
Is the resistance below 5.0 ohms?

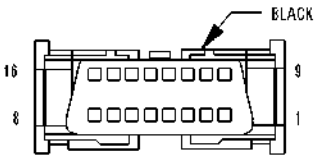
Yes >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Front Control Module in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the (D52) CAN C Diagnostic (+) circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

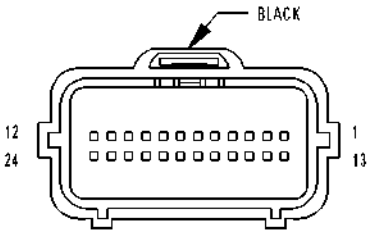


*BOTH CAN C DIAGNOSTIC (+) AND CAN C DIAGNOSTIC (-) CIRCUITS OPEN





DATA LINK
CONNECTOR



MODULE-FRONT
CONTROL C1

81209e36

***BOTH CAN C DIAGNOSTIC (+) AND CAN C DIAGNOSTIC (-) CIRCUITS OPEN (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the scan tool queries the FCM.
- **Set Condition:**
  The scan tool has detected an open condition on both CAN C Diagnostic circuits.

Possible Causes
(D52) CAN C DIAGNOSTIC (+) CIRCUIT OPEN
(D51) CAN C DIAGNOSTIC (-) CIRCUIT OPEN
FRONT CONTROL MODULE

Diagnostic Test

1. CHECK THE STATUS OF THE ERROR MESSAGE

NOTE: Ensure the vehicle being tested is a CAN BUS VEHICLE. If not, false error messages may be displayed.

NOTE: Ensure the scan tool is updated to the latest software.

With the scan tool, record the error message.

Disconnect the scan tool from the DLC.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

Does the scan tool display this same error message?

Yes >> Go To 2

No >> The conditions that caused this error message to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

*BOTH CAN C DIAGNOSTIC (+) AND CAN C DIAGNOSTIC (-) CIRCUITS OPEN (CONTINUED)

2. (D52) CAN C DIAGNOSTIC (+) CIRCUIT OPEN

Turn the ignition off.

Disconnect the Front Control Module C1 harness connector.

Disconnect the scan tool from the DLC.

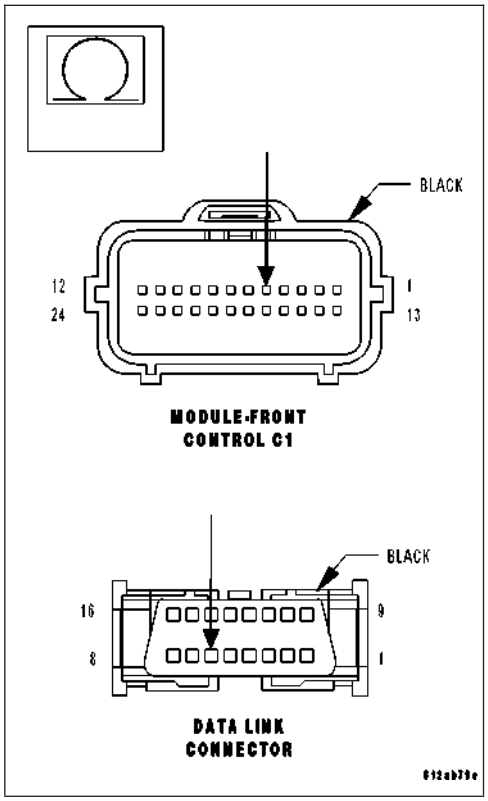
NOTE: Check the connectors at both the DLC and the FCM.

Measure the resistance of the (D52) CAN C Diagnostic (+) circuit between the FCM connector and the DLC.

Is the resistance below 5.0 ohms?

Yes >> Go To 3

No >> Repair the (D52) CAN C Diagnostic (+) circuit for an open. Perform BODY VERIFICATION TEST - VER 1.



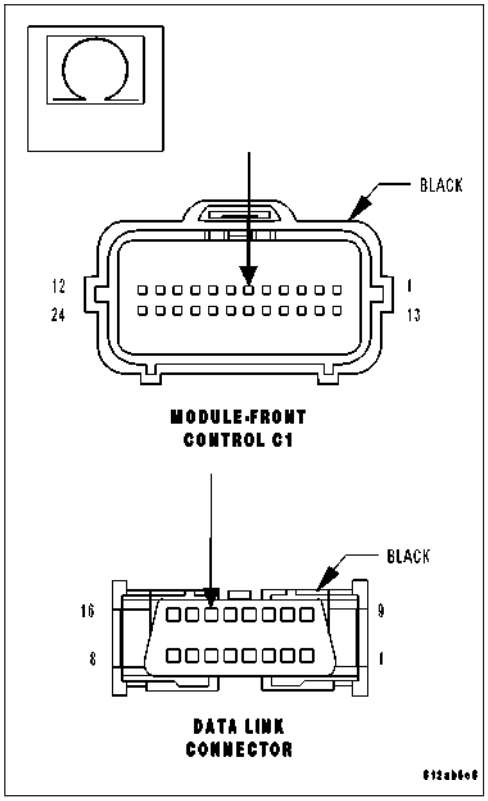
3. (D51) CAN C DIAGNOSTIC (-) CIRCUIT OPEN

Measure the resistance of the (D51) CAN C Diagnostic (-) circuit between the FCM connector and the DLC.

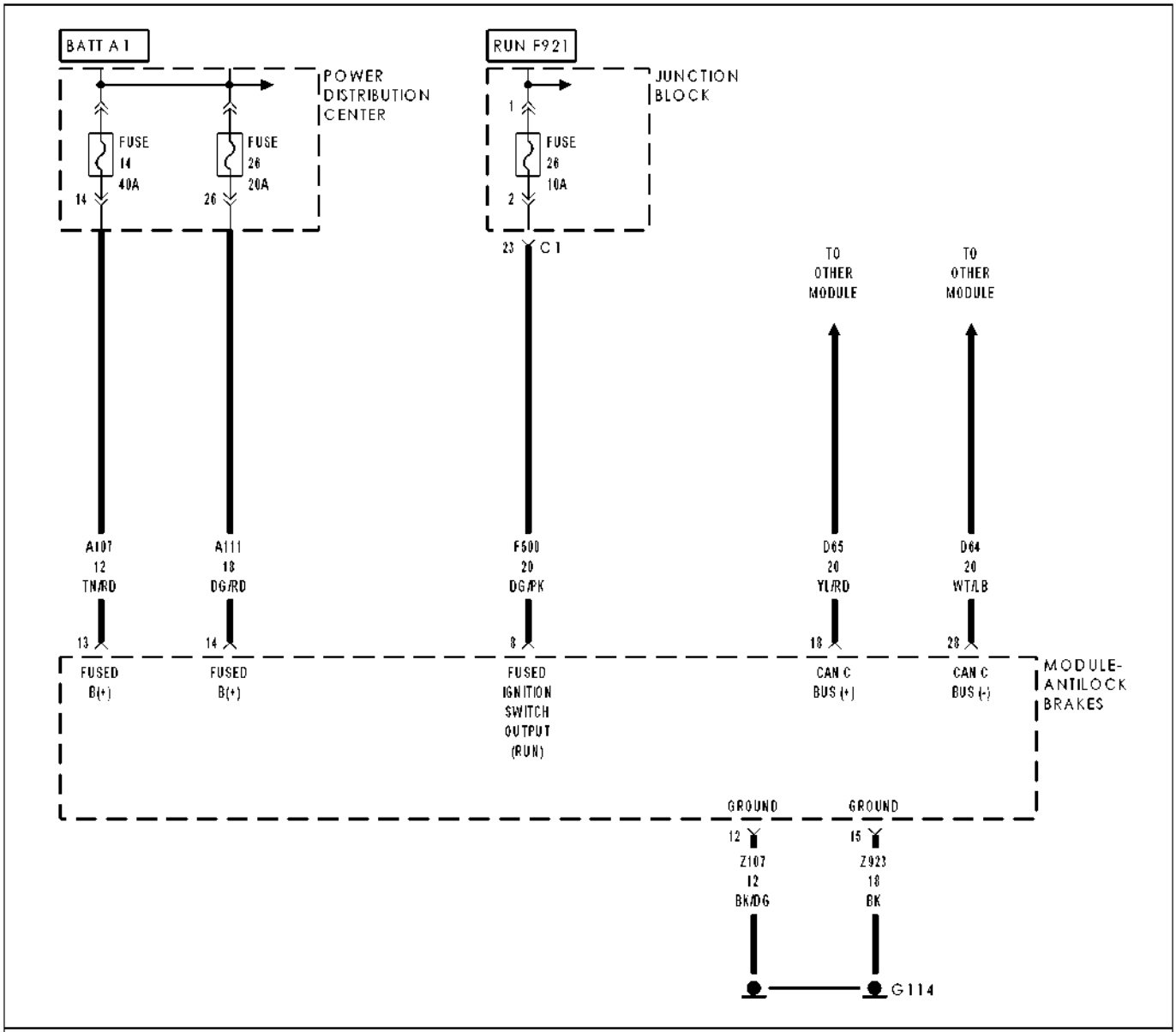
Is the resistance below 5.0 ohms?

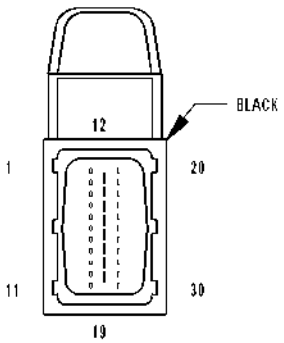
Yes >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Front Control Module in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the (D51) CAN C Diagnostic (-) circuit for an open. Perform BODY VERIFICATION TEST - VER 1.



*NO RESPONSE FROM ABS





MODULE-ANTILOCK BRAKES

81c046e5

***NO RESPONSE FROM ABS (CONTINUED)**
For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
(A107) (A111) FUSED B(+) CIRCUIT OPEN OR SHORTED
(Z107) (Z923) GROUND CIRCUIT OPEN
(F500) FUSED IGNITION SW OUTPUT CIRCUIT OPEN OR SHORTED
(D65) CAN C BUS (+) CIRCUIT OPEN
(D64) CAN C BUS (-) CIRCUIT OPEN
ANTILOCK BRAKE MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.
With the scan tool, select ECU view.

NOTE: A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

NOTE: Check the FCM for any active CAN C hardware DTCs, perform DTC before proceeding.

Does the scan tool display a red X next to the module?

Yes >> Go To 2

No >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent , pushed out, and corroded terminals.

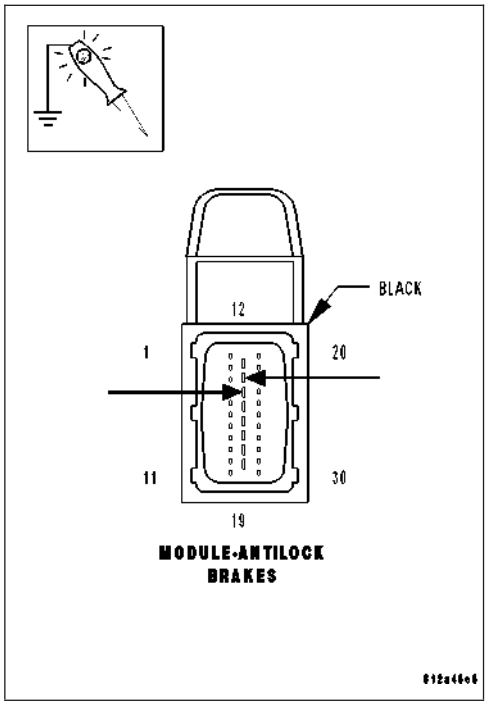
***NO RESPONSE FROM ABS (CONTINUED)**

2. (A107) (A111) FUSED B(+) CIRCUIT OPEN OR SHORTED

Turn the ignition off.

Disconnect the Antilock Brake Module harness connector.

Using a 12-volt test light connected to ground, check each (A107) and (A111) Fused B(+) circuit.



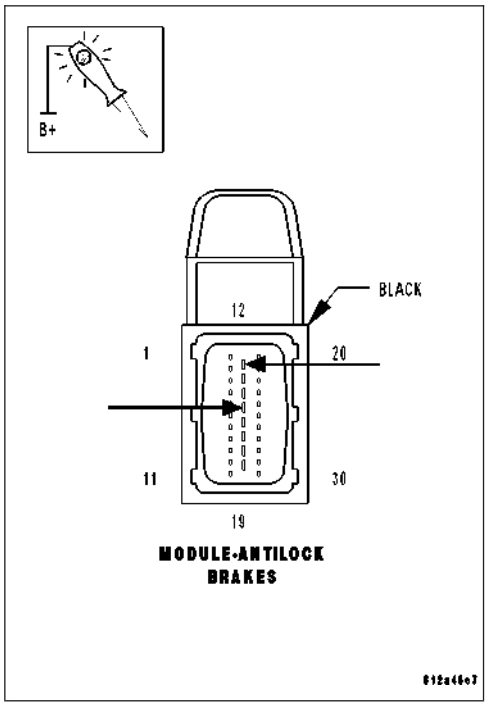
Does the test light illuminate brightly for each circuit?

Yes >> Go To 3

No >> Repair the Fused B(+) circuit for an open or short. Perform ABS VERIFICATION TEST - VER 1.

3. (Z107) (Z923) GROUND CIRCUIT OPEN

Using a 12-volt test light connected to 12-volts, check each (Z107) and (Z923) ground circuit.



Does the test light illuminate brightly for each circuit?

Yes >> Go To 4

No >> Repair the ground circuit for an open. Perform ABS VERIFICATION TEST - VER 1.

***NO RESPONSE FROM ABS (CONTINUED)**

4. (F500) FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN OR SHORTED

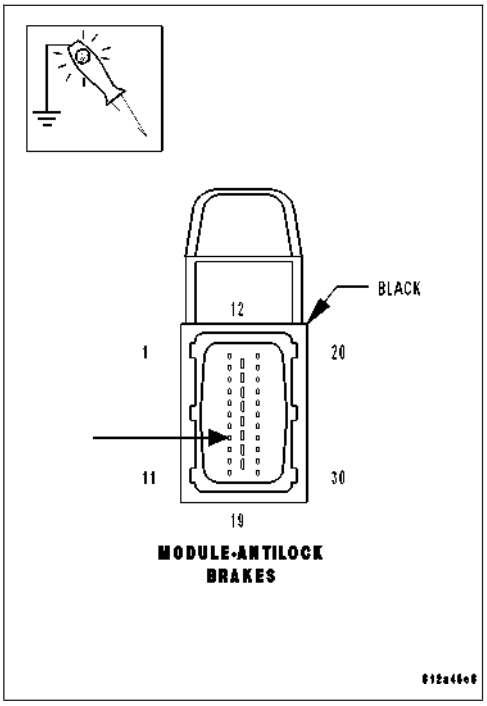
Turn the ignition on.

Using a 12-volt test light connected to ground, check the (F500) Fused Ignition Switch Output circuit.

Does the test light illuminate brightly?

Yes >> Go To 5

No >> Repair the Fused Ignition Switch Output circuit for an open or short.
Perform ABS VERIFICATION TEST - VER 1..



5. (D65) CAN C BUS (+) CIRCUIT OPEN

Turn the ignition off.

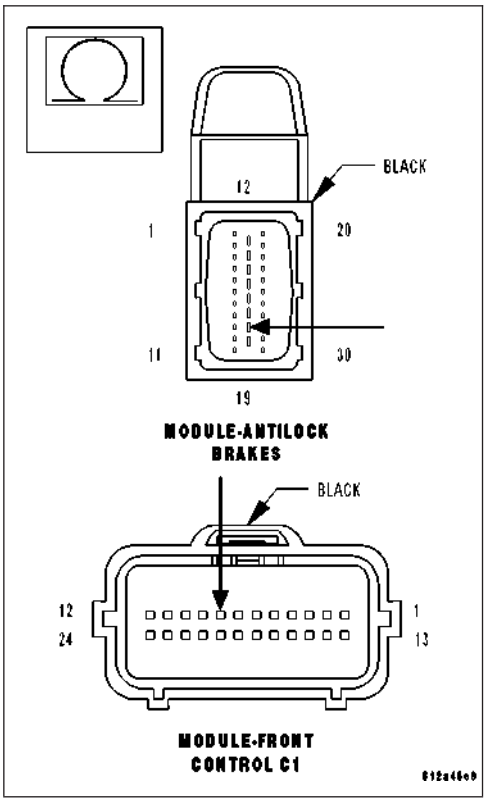
Disconnect the FCM C1 harness connector.

Measure the resistance of the (D65) CAN C Bus (+) circuit between the FCM connector and the Antilock Brake Module connector.

Is resistance below 5.0 ohms?

Yes >> Go To 6

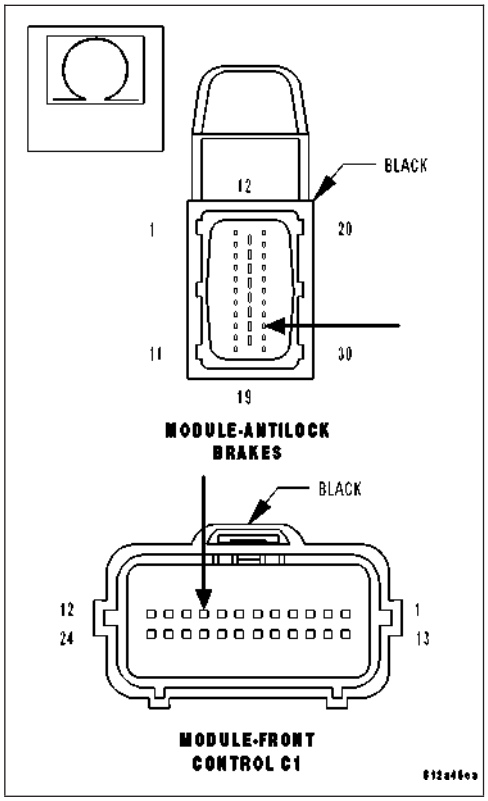
No >> Repair the (D65) CAN C Bus (+) circuit for an open.
Perform ABS VERIFICATION TEST - VER 1.



***NO RESPONSE FROM ABS (CONTINUED)**

6. (D64) CAN C BUS (-) CIRCUIT OPEN

Measure the resistance of the (D64) CAN C Bus (-) circuit between the FCM connector and the Antilock Brake Module connector.

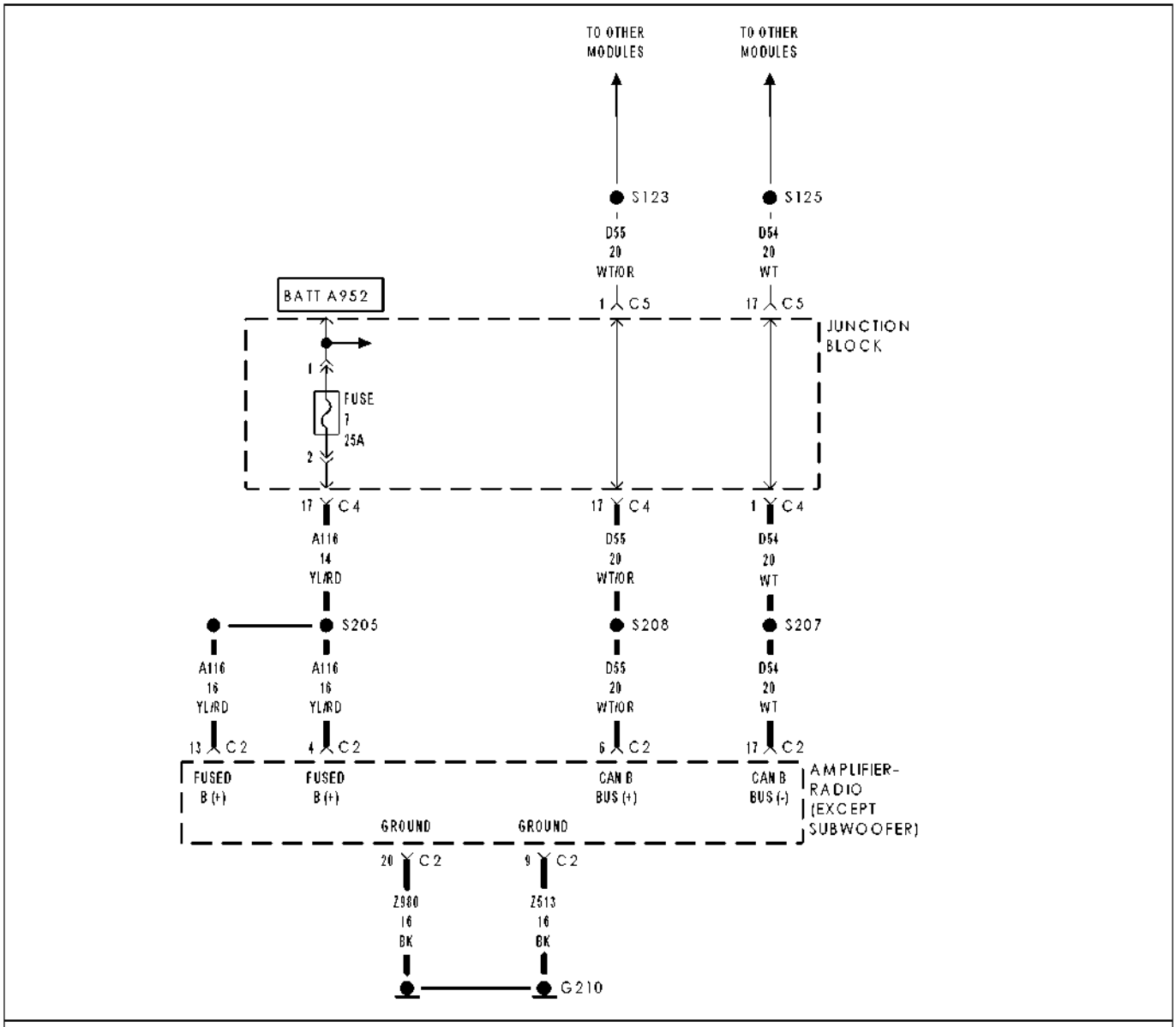


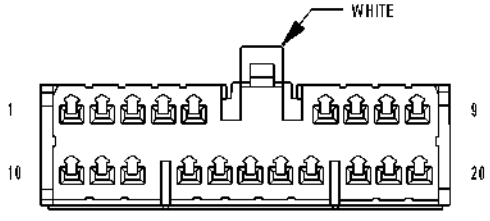
Is resistance below 5.0 ohms?

Yes >> Replace the Antilock Brake Module in accordance with the service information.
Perform ABS VERIFICATION TEST - VER 1.

No >> Repair the (D64) CAN C Bus (-) circuit for an open.
Perform ABS VERIFICATION TEST - VER 1.

*NO RESPONSE FROM AMP





AMPLIFIER-RADIO
C2
(EXCEPT SUBWOOFER)

81281369

***NO RESPONSE FROM AMP (CONTINUED)**
For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
(A116) FUSED B (+) CIRCUIT OPEN OR SHORTED
(Z513) OR (Z980) GROUND CIRCUIT OPEN
(D55) AND (D54) CAN B BUS CIRCUITS OPEN
AMPLIFIER

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.
With the scan tool, select ECU view.

NOTE: A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

Does the scan tool display a red X next to the module?

Yes >> Go To 2

No >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent , pushed out, and corroded terminals.

---

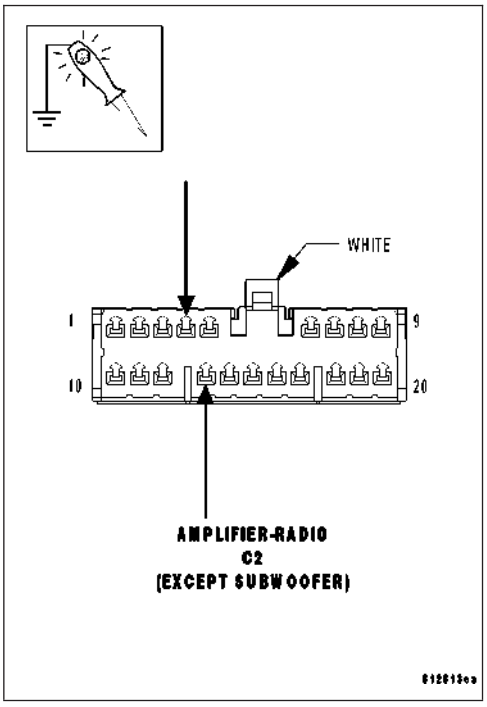
2. (A116) FUSED B(+) CIRCUIT OPEN OR SHORTED

Turn the ignition off.
Disconnect the Radio Amplifier C2 harness connector.
Using a 12-volt test light connected to ground, check each (A116) Fused B(+) circuit.

Does the test light illuminate brightly for each circuit?

Yes >> Go To 3

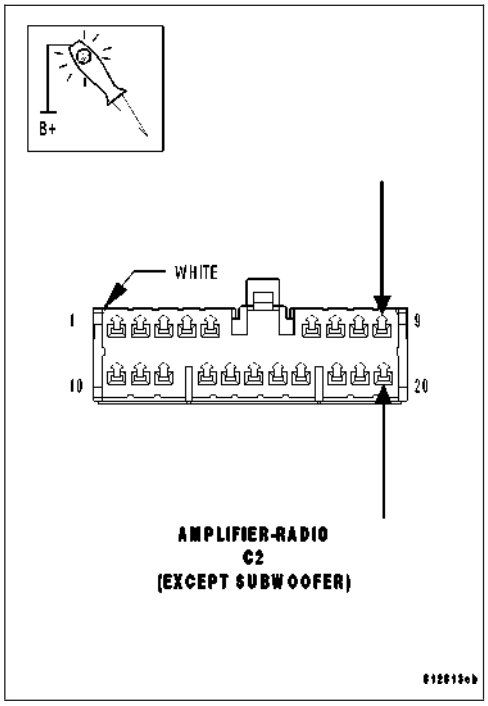
No >> Repair the (A116) Fused B(+) circuit for an open or short. Perform BODY VERIFICATION TEST - VER 1.



***NO RESPONSE FROM AMP (CONTINUED)**

3. (Z513) OR (Z980) GROUND CIRCUIT OPEN

Using a 12-volt test light connected to 12-volts, check the (Z513) and (Z939) ground circuits.



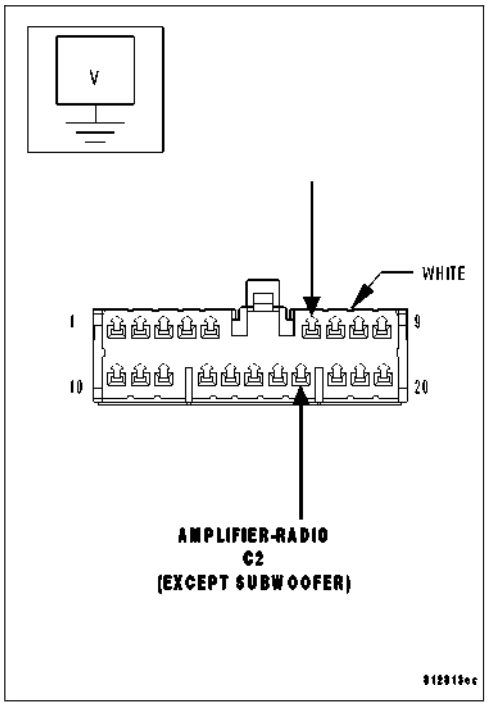
Does the test light illuminate brightly for each circuit?

Yes >> Go To 4

No >> Repair the (Z513) or the (Z939) ground circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

4. (D55) AND (D54) CAN B BUS CIRCUITS OPEN

NOTE: One open circuit will not cause this condition.
Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.
Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

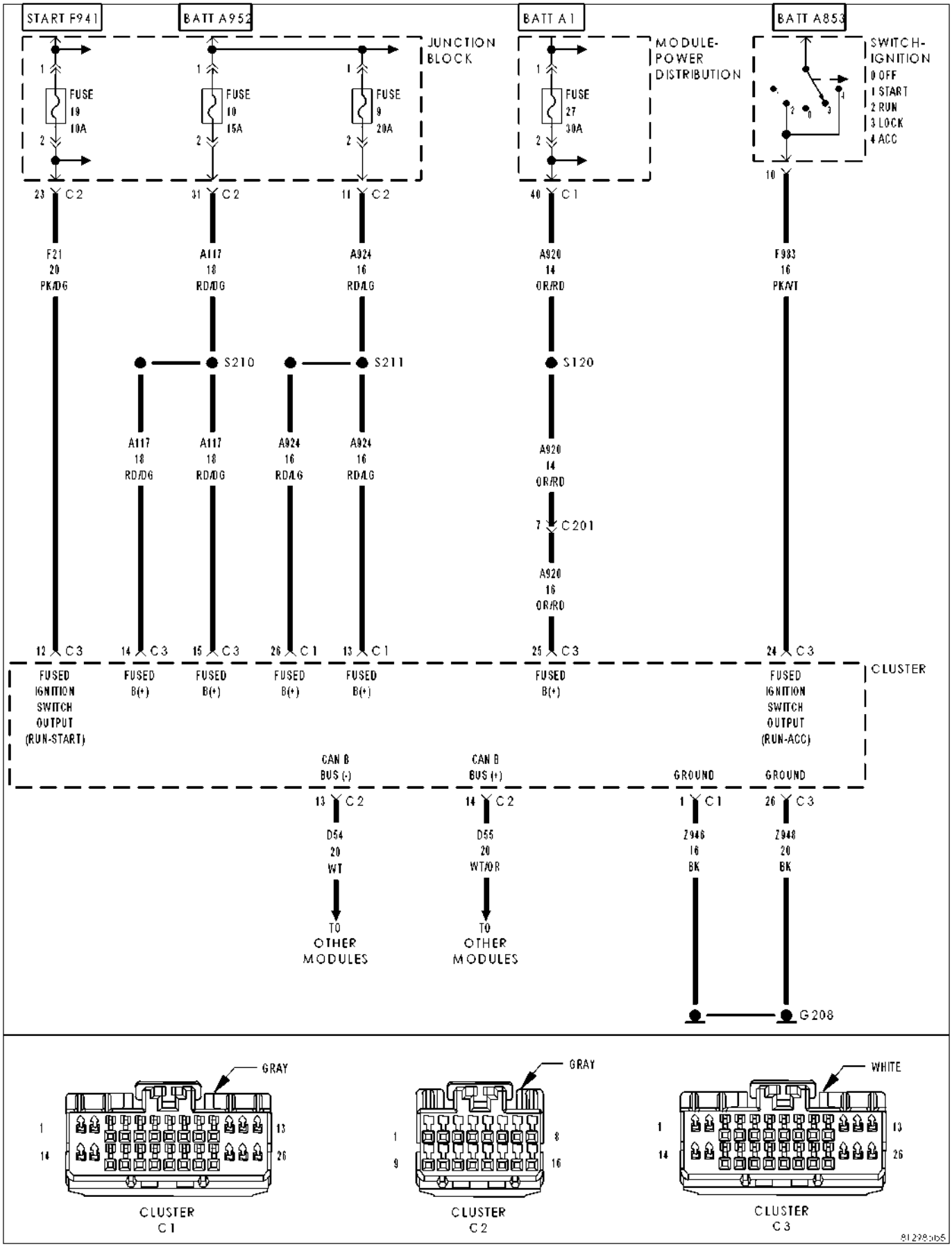


Is there any voltage present on either circuit?

Yes >> Replace the Radio Amplifier in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the (D55) and (D54) CAN B Bus circuits for an open. Inspect the connector for damage.
Perform BODY VERIFICATION TEST - VER 1.

*NO RESPONSE FROM CCN



***NO RESPONSE FROM CCN (CONTINUED)**
For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
(A924) (A920) (A117) FUSED B(+) CIRCUITS OPEN OR SHORTED
(Z946) (Z948) GROUND CIRCUITS OPEN
(F21) (F983) FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN OR SHORTED
(D55) AND (D54) CAN B BUS CIRCUITS OPEN
CLUSTER (CCN)

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.
With the scan tool, select ECU view.

NOTE: A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

Does the scan tool display a red X next to the module?

Yes >> Go To 2

No >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent , pushed out, and corroded terminals.

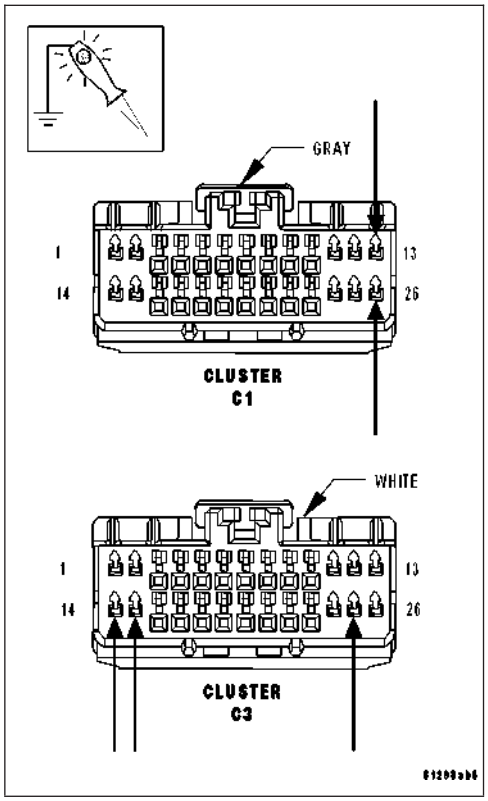
***NO RESPONSE FROM CCN (CONTINUED)**

2. (A924) (A920) (A117) FUSED B(+) CIRCUITS OPEN OR SHORTED

Turn the ignition off.

Disconnect the Cluster harness connectors.

Using a 12-volt test light connected to ground, check each (A924) (A920) (A117) Fused B(+) circuit.



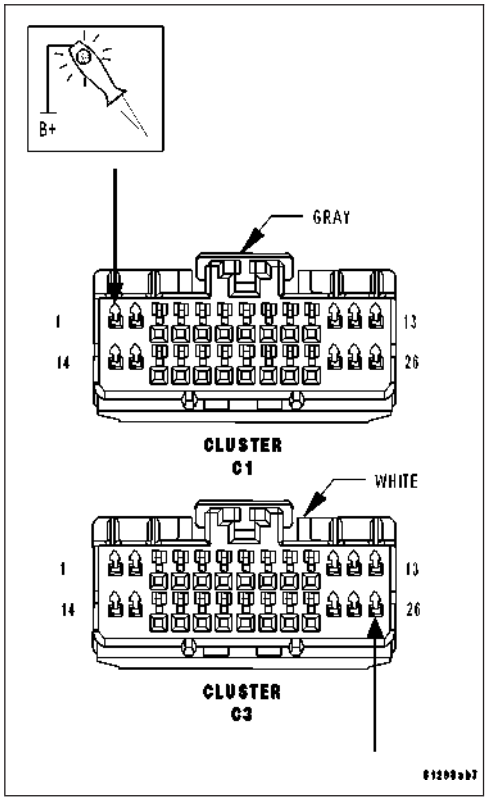
Does the test light illuminate brightly for each circuit?

Yes >> Go To 3

No >> Repair the (A924) (A920) (A117) Fused B(+) circuit for an open or short.
Perform BODY VERIFICATION TEST - VER 1.

3. (Z946) (Z948) GROUND CIRCUITS OPEN

Using a 12-volt test light connected to 12-volts, check each (Z946) (Z948) ground circuit.



Does the test light illuminate brightly for each circuit?

Yes >> Go To 4

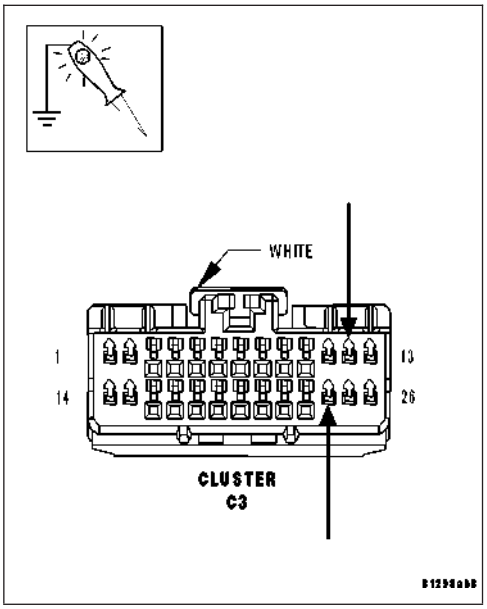
No >> Repair the (Z946) (Z948) ground circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

***NO RESPONSE FROM CCN (CONTINUED)**

4. (F21) (F983) FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN OR SHORTED

Turn the ignition on.

Using a 12-volt test light connected to ground, check each (F21) (F983) Fused Ignition Switch Output circuit.



Does the test light illuminate brightly for each circuit?

Yes >> Go To 5

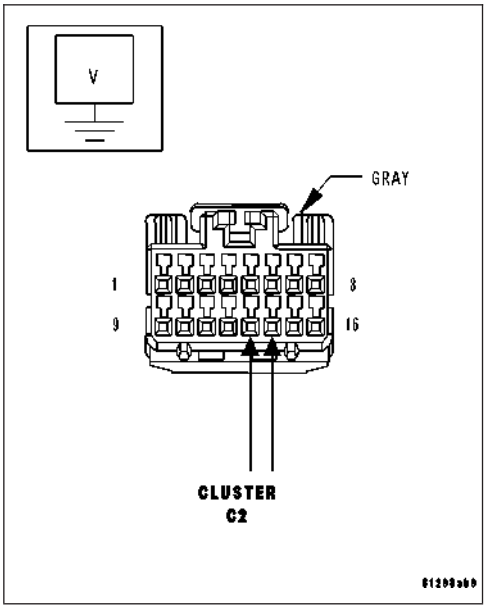
No >> Repair the (F21) (F983) Fused Ignition Switch Output circuit for an open or short.
Perform BODY VERIFICATION TEST - VER 1.

5. (D55) AND (D54) CAN B BUS CIRCUITS OPEN

NOTE: One open circuit will not cause this condition.

Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.

Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

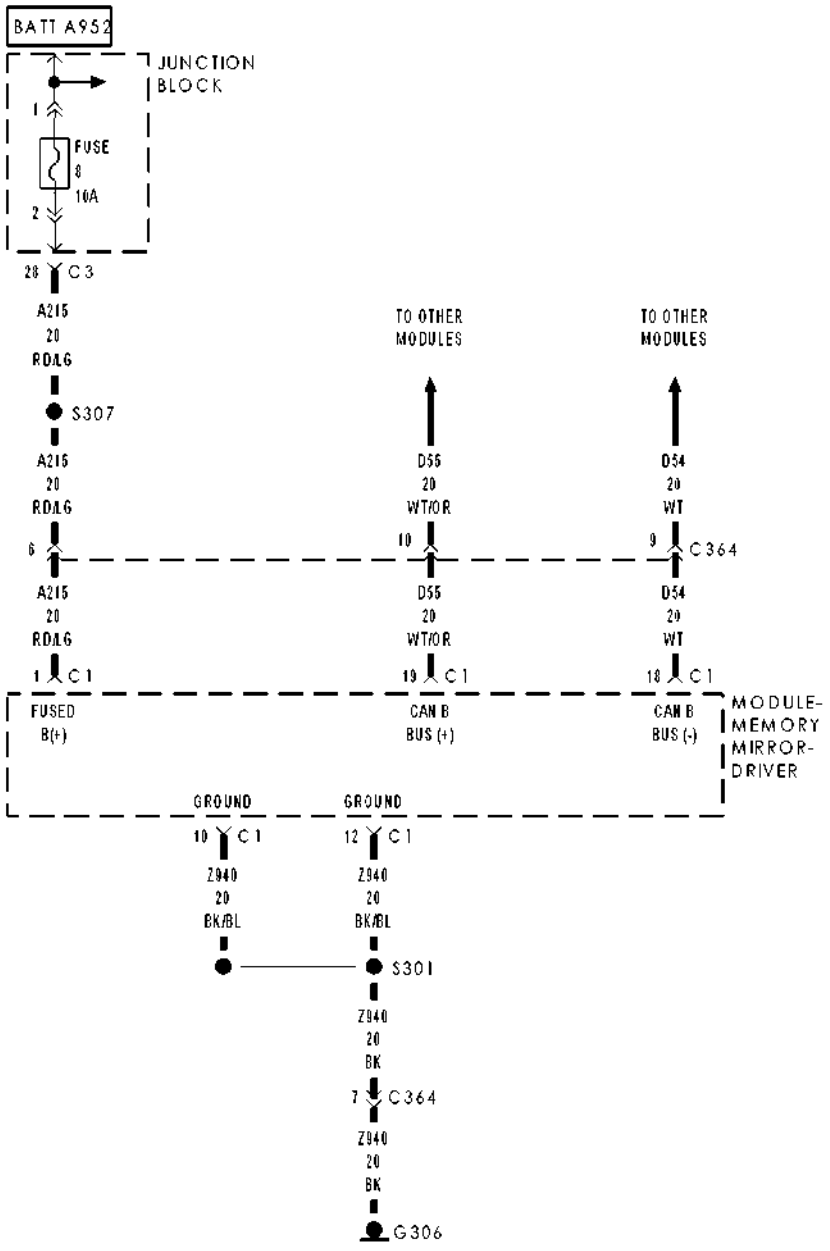


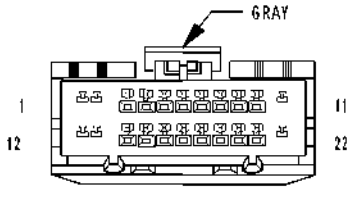
Is there any voltage present on either circuit?

Yes >> Replace the Cluster in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the (D55) and (D54) CAN B Bus circuits for an open. Inspect the connector for damage.
Perform BODY VERIFICATION TEST - VER 1.

*NO RESPONSE FROM DDM





MODULE-MEMORY MIRROR-DRIVER C1

81294C03

***NO RESPONSE FROM DDM (CONTINUED)**
For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
(A215) FUSED B (+) CIRCUIT OPEN OR SHORTED
(Z940) GROUND CIRCUIT OPEN
(D55) AND (D54) CAN B BUS CIRCUITS OPEN
DRIVER MEMORY MIRROR MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.
With the scan tool, select ECU view.

NOTE: A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

Does the scan tool display a red X next to the module?

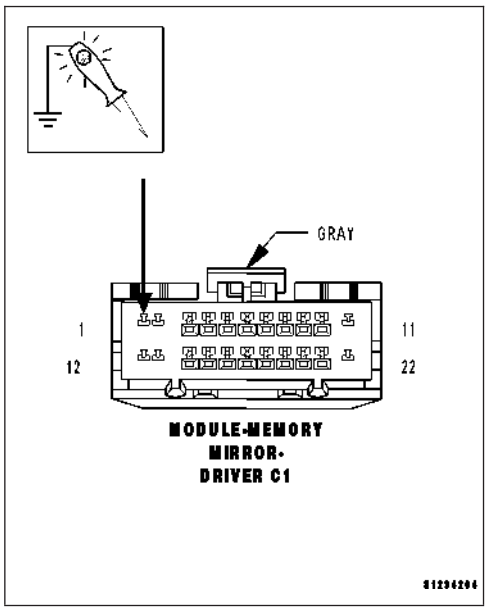
Yes >> Go To 2

No >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent , pushed out, and corroded terminals.

---

2. (A215) FUSED B(+) CIRCUIT OPEN OR SHORTED

Turn the ignition off.
Disconnect the Driver Memory Mirror Module C1 harness connector.
Using a 12-volt test light connected to ground, check the (A215) Fused B(+) circuit.



Does the test light illuminate brightly?

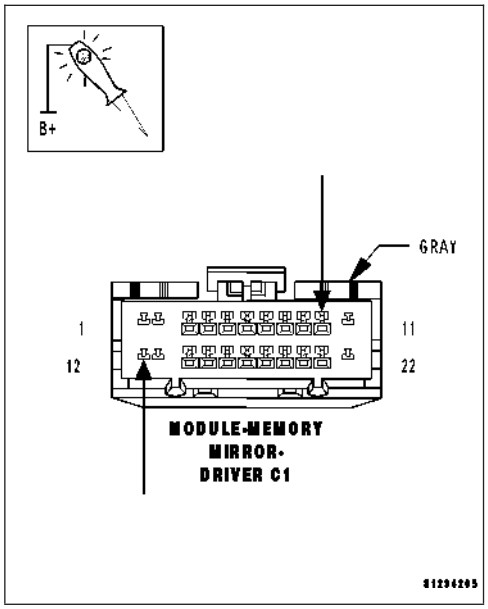
Yes >> Go To 3

No >> Repair the (A215) Fused B(+) circuit for an open or short. Perform BODY VERIFICATION TEST - VER 1.

***NO RESPONSE FROM DDM (CONTINUED)**

3. (Z940) GROUND CIRCUIT OPEN

Using a 12-volt test light connected to 12-volts, check each (Z940) ground circuit.



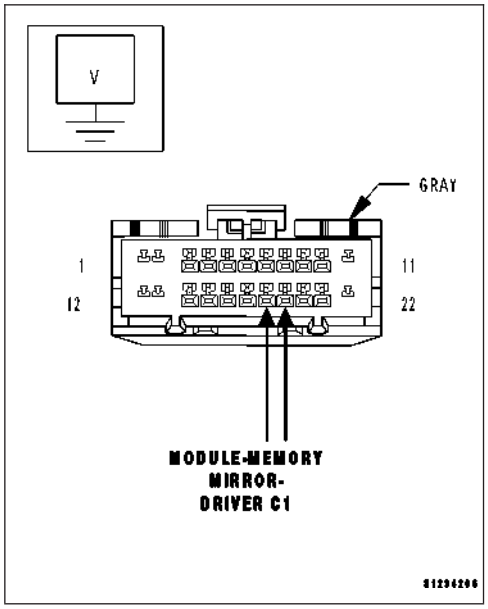
Does the test light illuminate brightly for each circuit?

Yes >> Go To 4

No >> Repair the (Z940) ground circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

4. (D55) AND (D54) CAN B BUS CIRCUITS OPEN

NOTE: One open circuit will not cause this condition.
Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.
Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

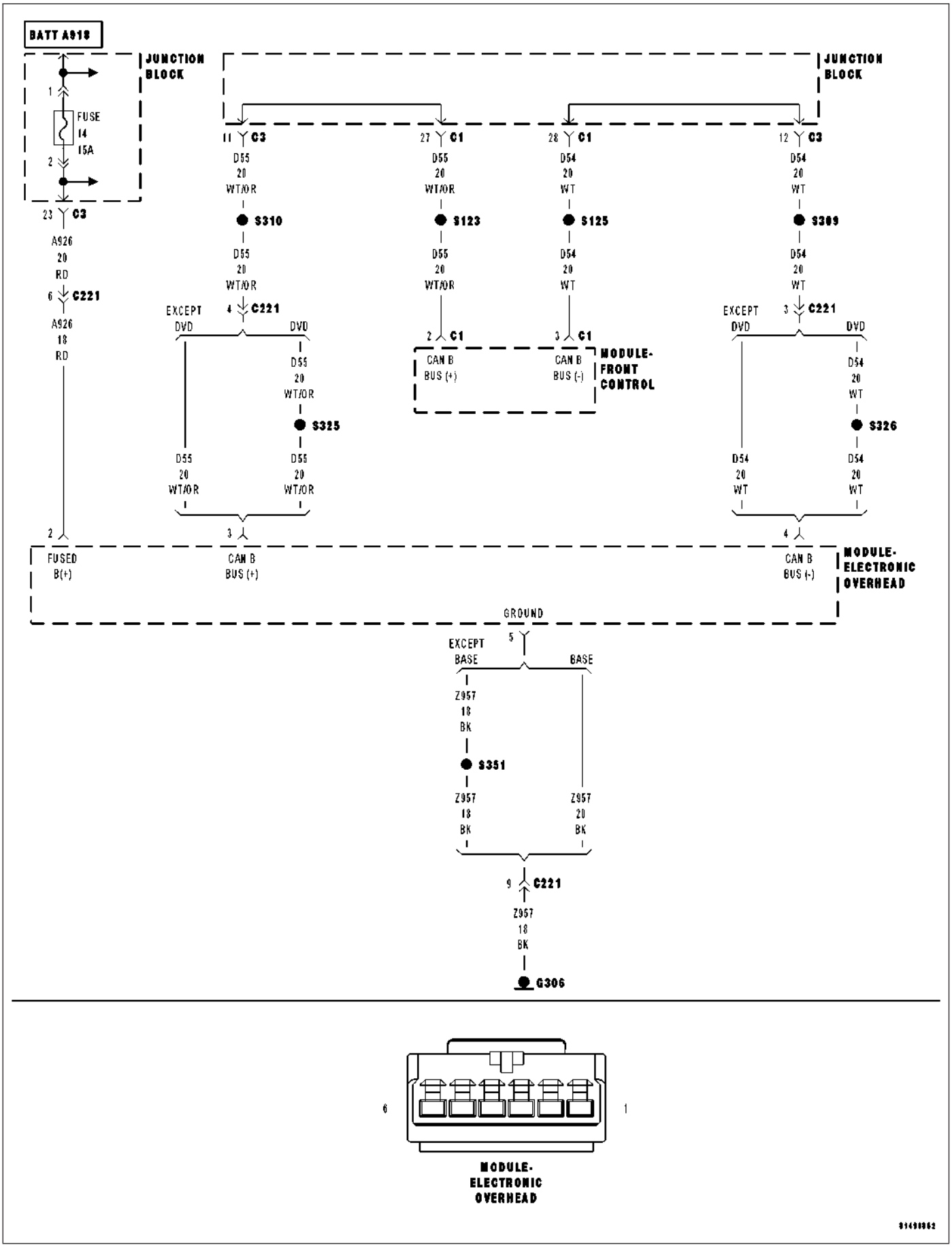


Is there any voltage present on either circuit?

Yes >> Replace the Driver Memory Mirror Module in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the (D55) and (D54) CAN B Bus circuits for an open. Inspect the connector for damage.
Perform BODY VERIFICATION TEST - VER 1.

*NO RESPONSE FROM EOM



***NO RESPONSE FROM EOM (CONTINUED)**
For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
(A926) FUSED B(+) CIRCUIT OPEN OR SHORTED
(Z957) GROUND CIRCUIT OPEN
(D55) AND (D54) CAN B BUS CIRCUITS OPEN
ELECTRONIC OVERHEAD MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.
With the scan tool, select ECU view.

NOTE: A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

Does the scan tool display a red X next to the module?

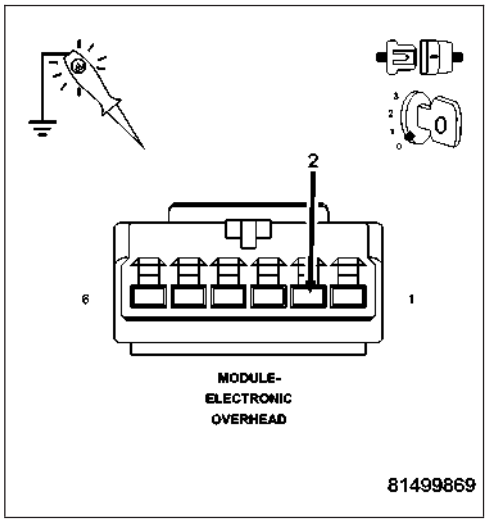
Yes >> Go To 2

No >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent , pushed out, and corroded terminals.

---

2. (A926) FUSED B(+) CIRCUIT OPEN OR SHORTED

Turn the ignition off.
Disconnect the Electronic Overhead Module harness connector.
Using a 12-volt test light connected to ground, check the (A926) Fused B(+) circuit.



Does the test light illuminate brightly?

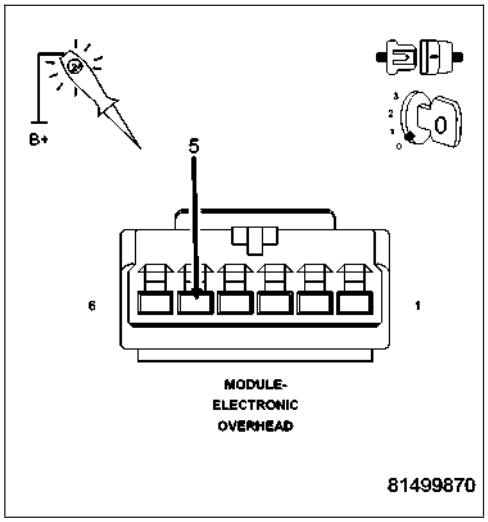
Yes >> Go To 3

No >> Repair the (A926) Fused B(+) circuit for an open or short. Perform BODY VERIFICATION TEST - VER 1.

***NO RESPONSE FROM EOM (CONTINUED)**

3. (Z957) GROUND CIRCUIT OPEN

Using a 12-volt test light connected to 12-volts, check the (Z957) ground circuit.



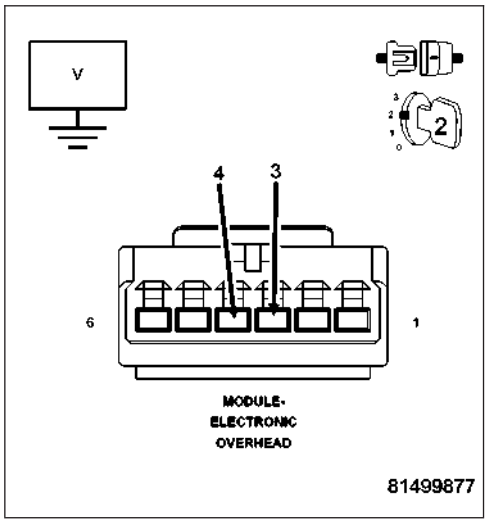
Does the test light illuminate brightly?

Yes >> Go To 4

No >> Repair the (Z957) ground circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

4. (D55) AND (D54) CAN B BUS CIRCUITS OPEN

NOTE: One open circuit will not cause this condition.
Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.
Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

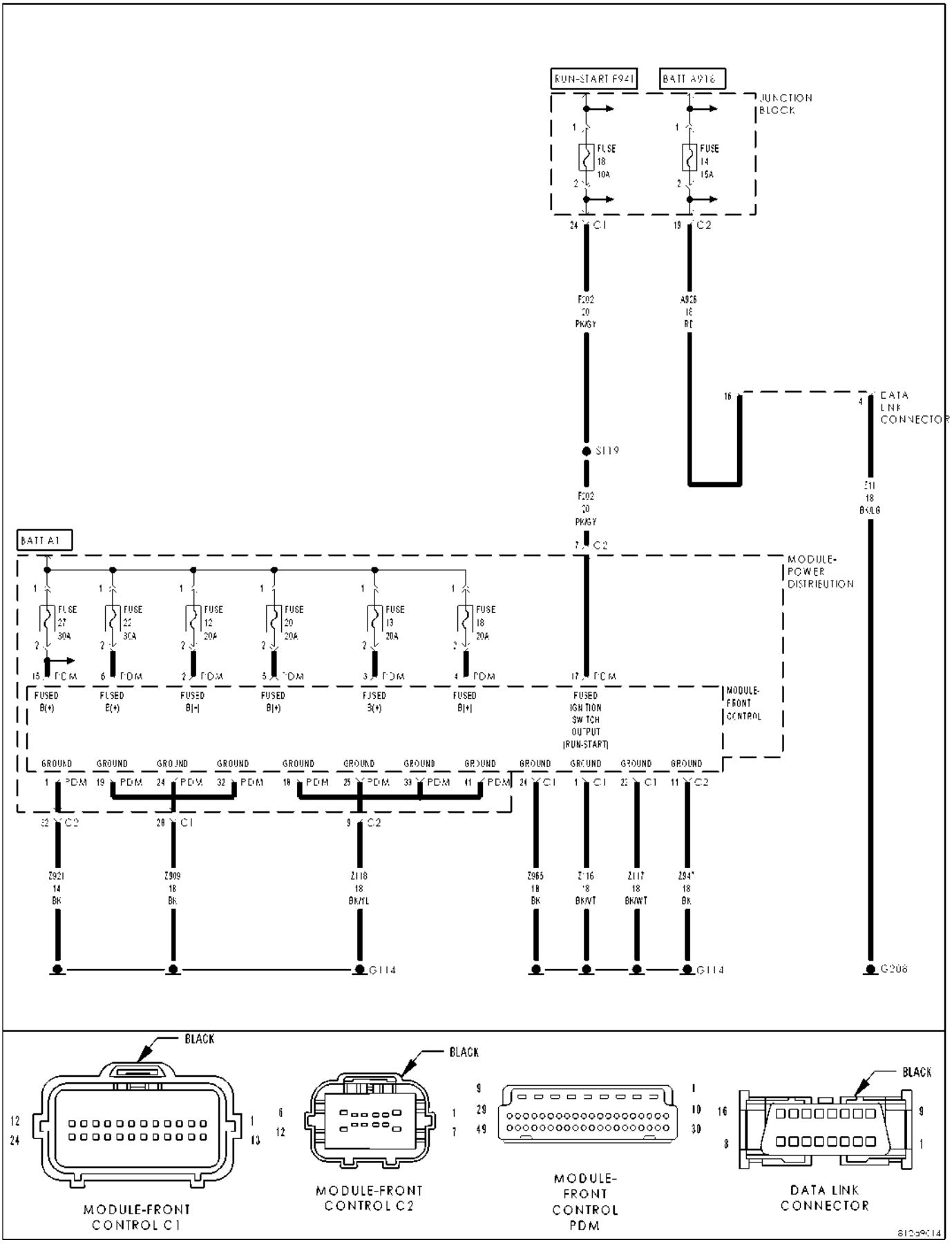


Is there any voltage present on either circuit?

Yes >> Replace the Electronic Overhead Module in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the (D55) and (D54) CAN B Bus circuits for an open. Inspect the connector for damage.
Perform BODY VERIFICATION TEST - VER 1.

*NO RESPONSE FROM FCM



***NO RESPONSE FROM FCM (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
(A926) FUSED B (+) CIRCUIT OPEN AT DLC
(Z11) GROUND CIRCUIT OPEN AT DLC
GROUND CIRCUITS OPEN AT FCM
FUSED B+ CIRCUITS OPEN AT FCM
(202) FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN AT FCM
FRONT CONTROL MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.

NOTE: Ensure the scan tool is updated to the latest software.

NOTE: If the scan tool displays any error messages involving the CAN C Diagnostic circuits, diagnose and repair the error message before proceeding. Refer to the Table of Contents.

NOTE: A loss of communication with the FCM can cause the ECU View button on the scan tool to be inoperative (not highlighted).

With the scan tool, attempt to select ECU view.

Can the scan tool communicate with the FCM?

Yes >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent , pushed out, and corroded terminals.

No >> Go To 2

---

2. (A926) FUSED B(+) CIRCUIT OPEN AT DLC

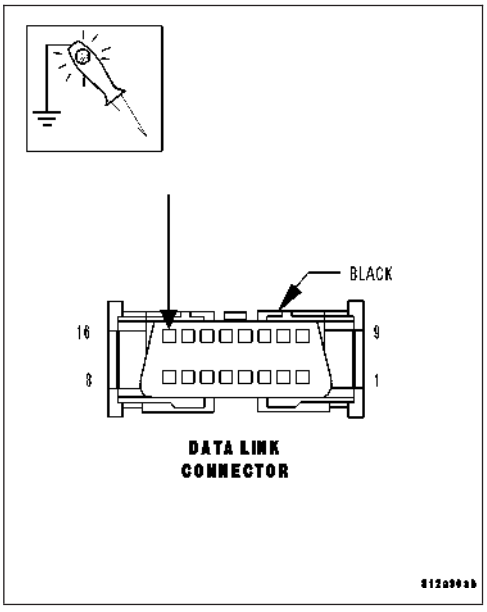
Disconnect the scan tool from the DLC.

Using a 12-volt test light connected to ground, check the (A926) Fused B(+) circuit.

Does the test light illuminate brightly?

Yes >> Go To 3

No >> Repair the (A926) Fused B(+) circuit for an open or short. Perform BODY VERIFICATION TEST - VER 1.



***NO RESPONSE FROM FCM (CONTINUED)**

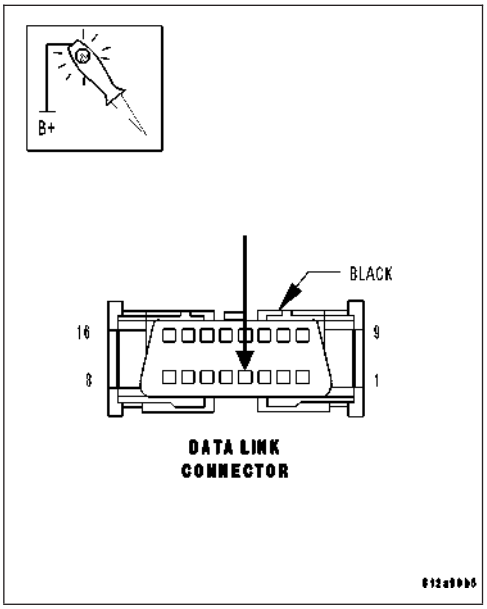
3. (Z11) GROUND CIRCUIT OPEN AT DLC

Using a 12-volt test light connected to 12-volts, check the (Z11) ground circuit.

Does the test light illuminate brightly?

Yes >> Go To 4

No >> Repair the (Z11) ground circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.



4. GROUND CIRCUITS OPEN AT FCM C1 AND C2 CONNECTORS

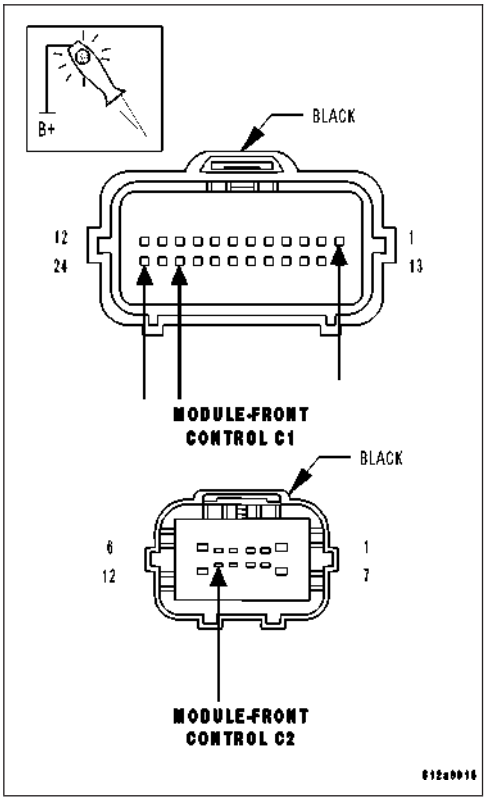
Disconnect the FCM C1 and C2 harness connectors.

Using a 12-volt test light connected to 12-volts, check each ground circuit.

Does the test light illuminate brightly for each circuit?

Yes >> Go To 5

No >> Repair the ground circuit for an open. Inspect the connector for damage.
Perform BODY VERIFICATION TEST - VER 1.

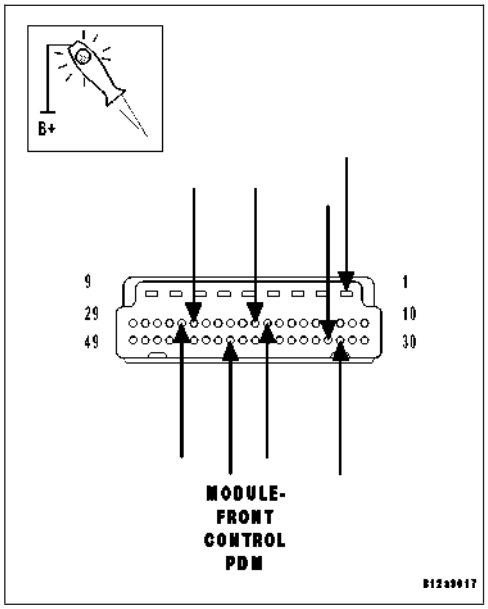


***NO RESPONSE FROM FCM (CONTINUED)**

5. GROUND CIRCUITS OPEN AT FCM PDM CONNECTOR

Remove the FCM from the PDM.

Using a 12-volt test light connected to 12-volts, check each ground circuit.



Does the test light illuminate brightly for each circuit?

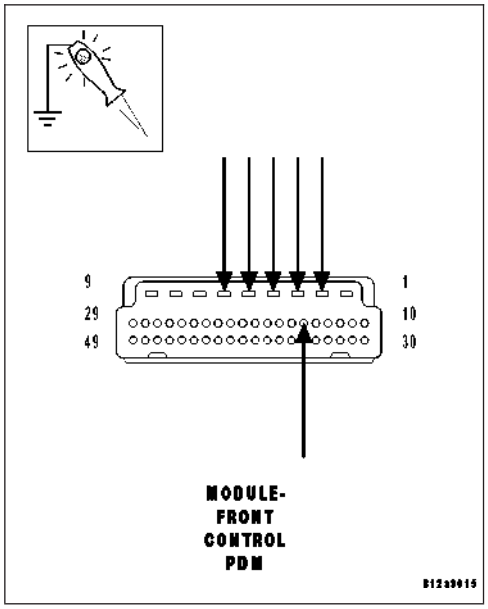
Yes >> Go To 6

No >> Repair the ground circuit for an open. Inspect the connector for damage.

Perform BODY VERIFICATION TEST - VER 1.

6. FUSED B(+) CIRCUITS OPEN AT FCM PDM CONNECTOR

Using a 12-volt test light connected to ground, check each Fused B(+) circuit.



Does the test light illuminate brightly for each circuit?

Yes >> Go To 7

No >> Repair the Fused B(+) circuit for an open. Inspect the connector for damage.

Perform BODY VERIFICATION TEST - VER 1.

***NO RESPONSE FROM FCM (CONTINUED)**

7. (F202) FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN AT FCM PDM CONNECTOR

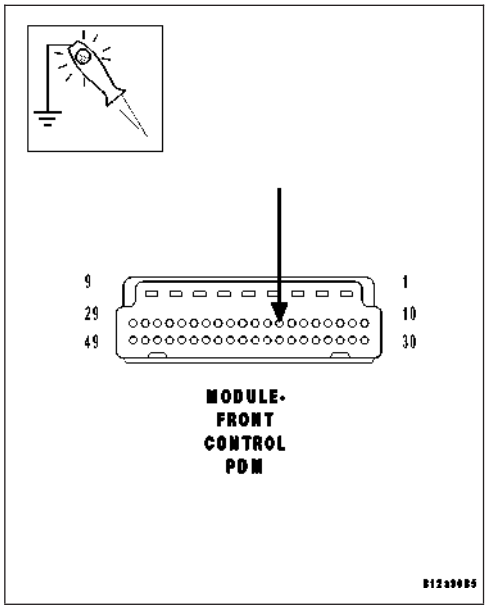
Turn the ignition on.

Using a 12-volt test light connected to ground, check the (F202) Fused Ignition Switch Output circuit.

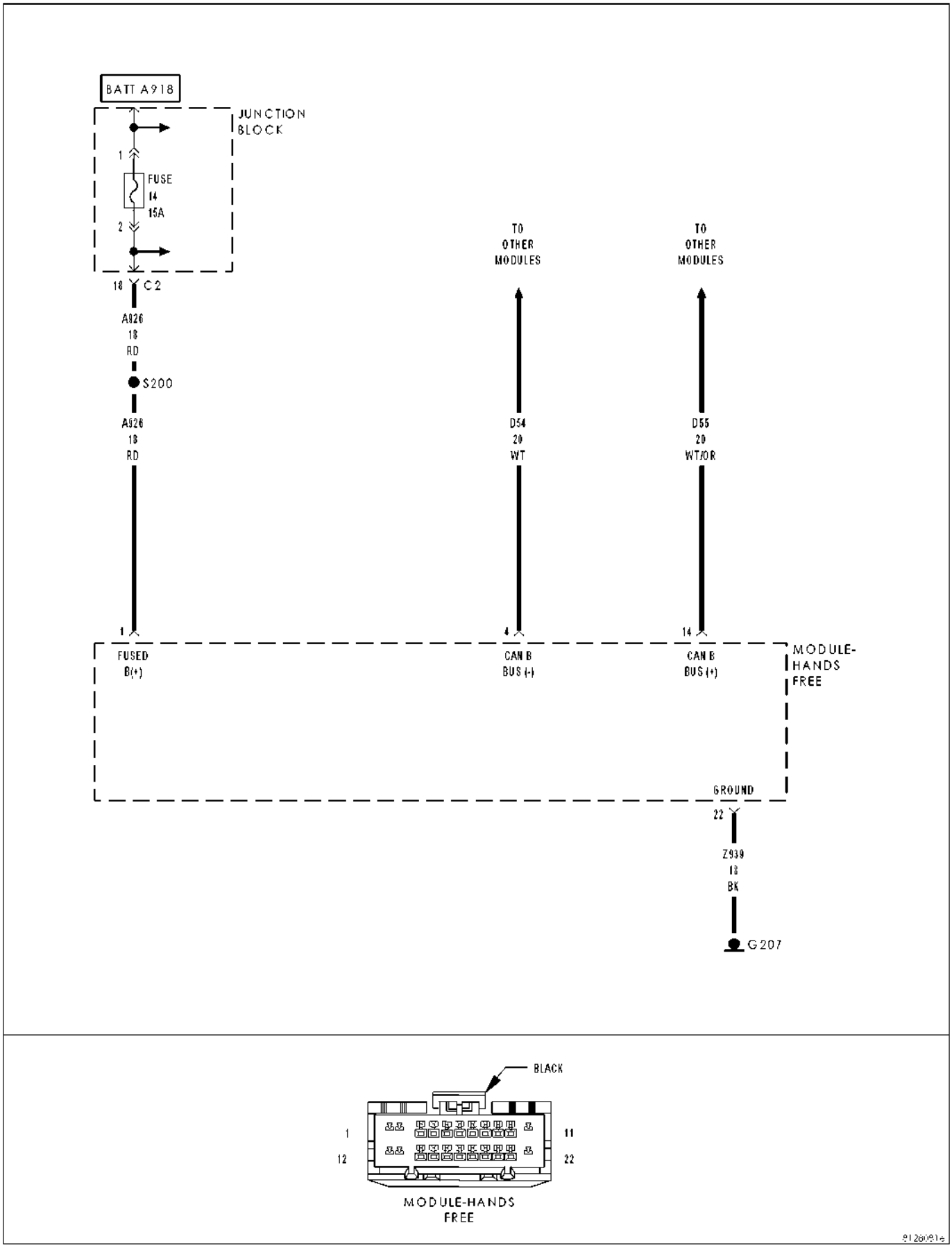
Does the test light illuminate brightly?

Yes >> Replace and program the Front Control Module in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the (F202) Fused Ignition Switch Output circuit for an open. Inspect the connector for damage.
Perform BODY VERIFICATION TEST - VER 1.



*NO RESPONSE FROM HFM



***NO RESPONSE FROM HFM (CONTINUED)**
For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
(A926) FUSED B(+) CIRCUIT OPEN OR SHORTED
(Z939) GROUND CIRCUIT OPEN
(D55) AND (D54) CAN B BUS CIRCUITS OPEN
HANDS FREE MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.
With the scan tool, select ECU view.

NOTE: A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

Does the scan tool display a red X next to the module?

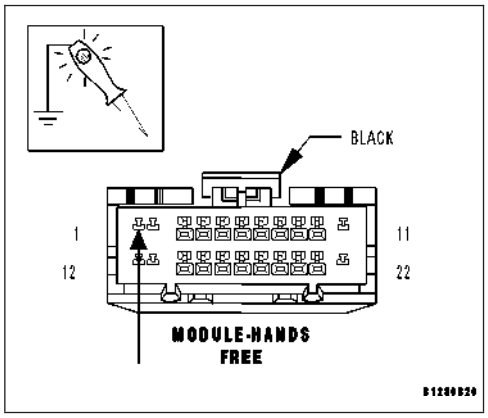
Yes >> Go To 2

No >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent , pushed out, and corroded terminals.

---

2. (A926) FUSED B(+) CIRCUIT OPEN OR SHORTED

Turn the ignition off.
Disconnect the Hands Free Module harness connector.
Using a 12-volt test light connected to ground, check the (A926) Fused B(+) circuit.



Does the test light illuminate brightly?

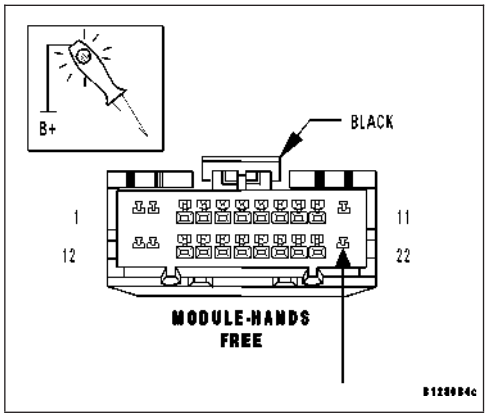
Yes >> Go To 3

No >> Repair the (A926) Fused B(+) circuit for an open or short. Perform BODY VERIFICATION TEST - VER 1.

***NO RESPONSE FROM HFM (CONTINUED)**

3. (Z939) GROUND CIRCUIT OPEN

Using a 12-volt test light connected to 12-volts, check the (Z939) ground circuit.



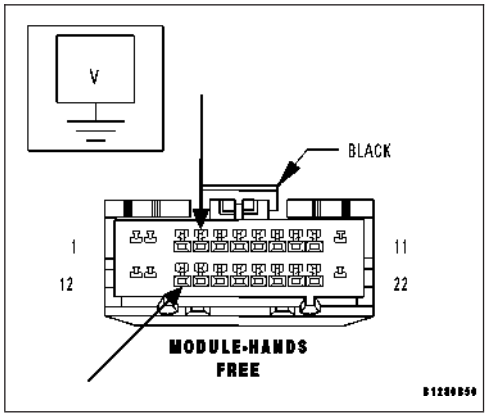
Does the test light illuminate brightly?

Yes >> Go To 4

No >> Repair the (Z939) ground circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

4. (D55) AND (D54) CAN B BUS CIRCUITS OPEN

NOTE: One open circuit will not cause this condition.
Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.
Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

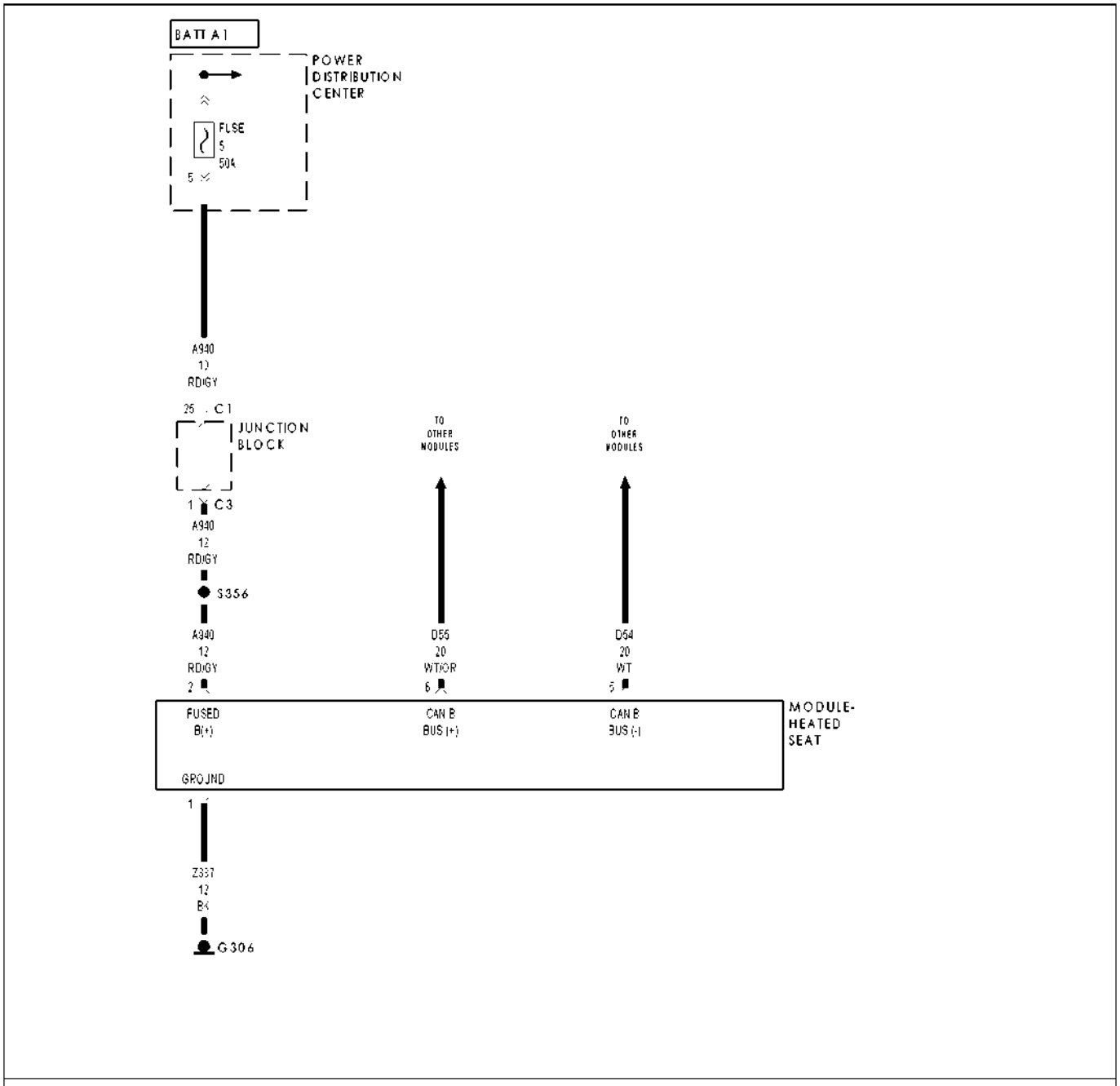


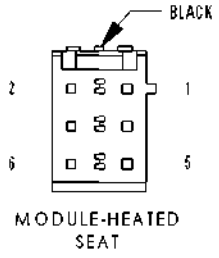
Is there any voltage present on either circuit?

Yes >> Replace the Hands Free Module in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the (D55) and (D54) CAN B Bus circuits for an open. Inspect the connector for damage.
Perform BODY VERIFICATION TEST - VER 1.

*NO RESPONSE FROM HSM





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***NO RESPONSE FROM HSM (CONTINUED)**
For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
(A940) FUSED B (+) CIRCUIT OPEN OR SHORTED
(Z387) GROUND CIRCUIT OPEN
(D55) AND (D54) CAN B BUS CIRCUITS OPEN
HEATED SEAT MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.
With the scan tool, select ECU view.

NOTE: A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

Does the scan tool display a red X next to the module?

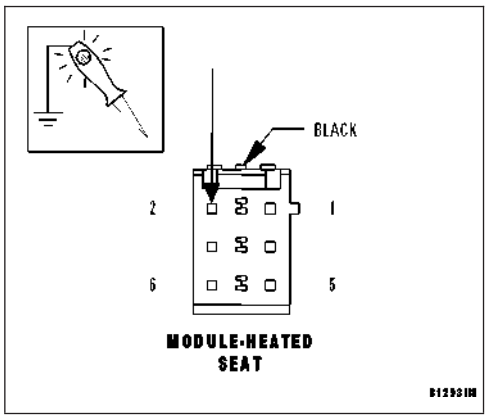
Yes >> Go To 2

No >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent , pushed out, and corroded terminals.

---

2. (A940) FUSED B(+) CIRCUIT OPEN OR SHORTED

Turn the ignition off.
Disconnect the Heated Seat Module harness connector.
Using a 12-volt test light connected to ground, check the (A940) Fused B(+) circuit.



Does the test light illuminate brightly?

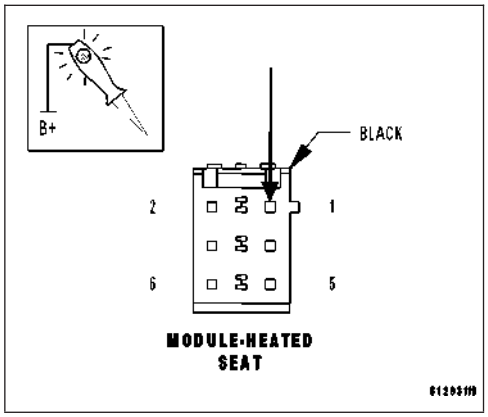
Yes >> Go To 3

No >> Repair the (A940) Fused B(+) circuit for an open or short. Perform BODY VERIFICATION TEST - VER 1.

***NO RESPONSE FROM HSM (CONTINUED)**

3. (Z387) GROUND CIRCUIT OPEN

Using a 12-volt test light connected to 12-volts, check the (Z387) ground circuit.



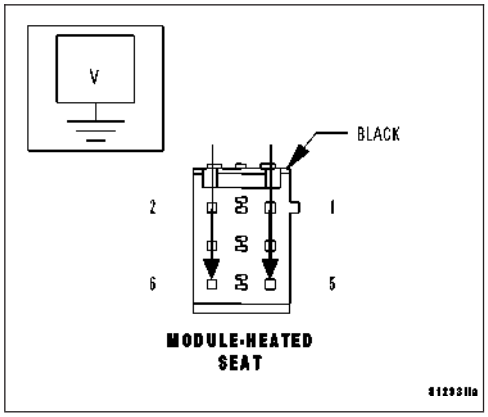
Does the test light illuminate brightly?

Yes >> Go To 4

No >> Repair the (Z387) ground circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

4. (D55) AND (D54) CAN B BUS CIRCUITS OPEN

NOTE: One open circuit will not cause this condition.
Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.
Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

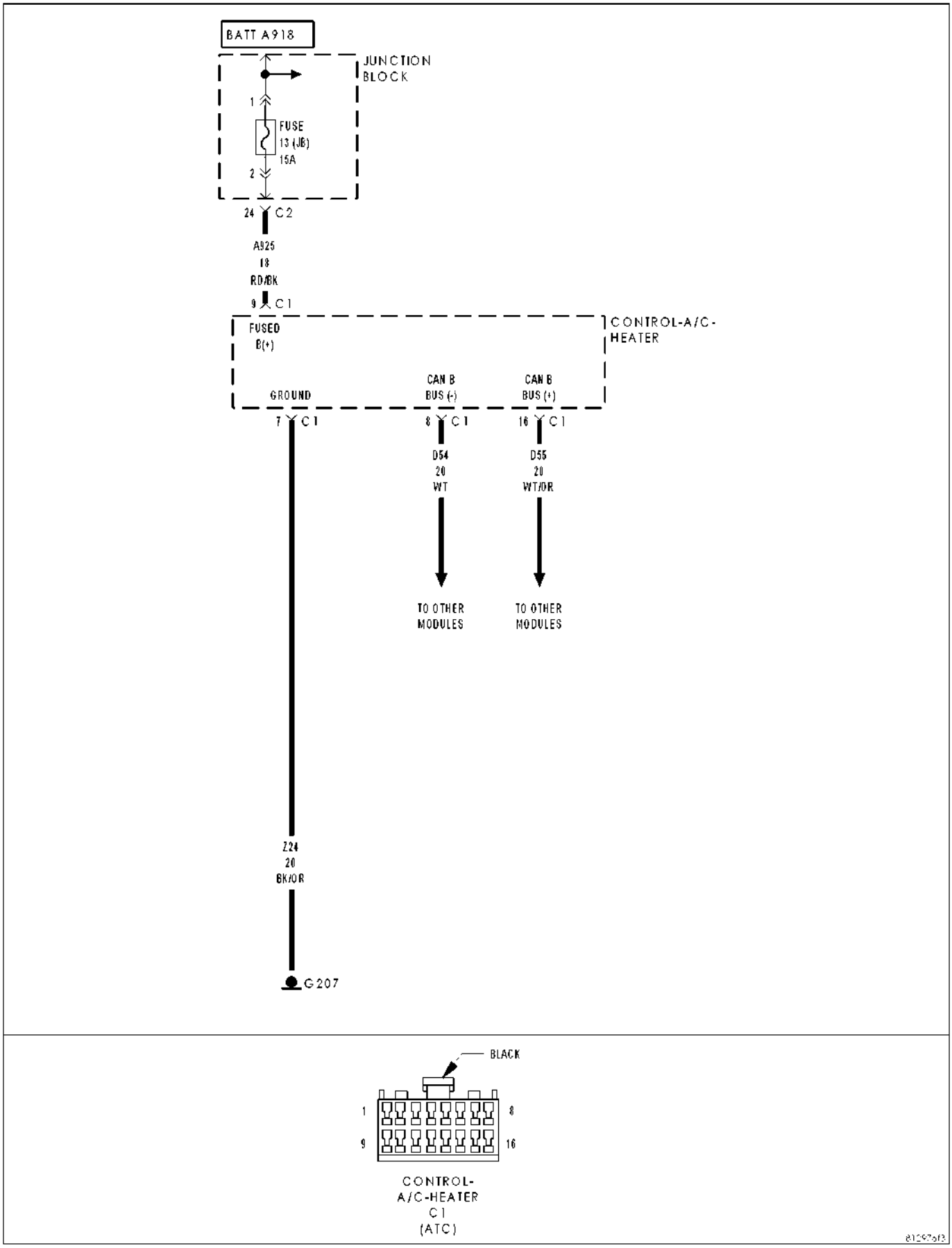


Is there any voltage present on either circuit?

Yes >> Replace the Heated Seat Module in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the (D55) and (D54) CAN B Bus circuits for an open. Inspect the connector for damage.
Perform BODY VERIFICATION TEST - VER 1.

*NO RESPONSE FROM HVAC (ATC)



***NO RESPONSE FROM HVAC (ATC) (CONTINUED)**
For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
(A925) FUSED B (+) CIRCUIT OPEN OR SHORTED
(Z24) GROUND CIRCUIT OPEN
(D55) AND (D54) CAN B BUS CIRCUITS OPEN
A/C HEATER CONTROL

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.
With the scan tool, select ECU view.

NOTE: A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

Does the scan tool display a red X next to the module?

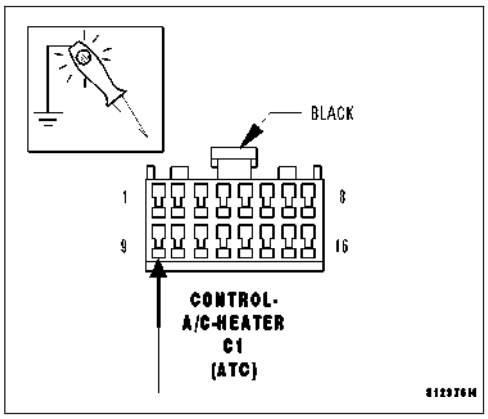
Yes >> Go To 2

No >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent , pushed out, and corroded terminals.

---

2. (A925) FUSED B(+) CIRCUIT OPEN OR SHORTED

Turn the ignition off.
Disconnect the A/C Heater Control C1 harness connector.
Using a 12-volt test light connected to ground, check the (A925) Fused B(+) circuit.



Does the test light illuminate brightly?

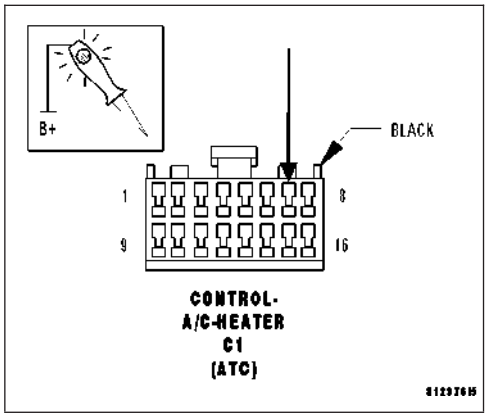
Yes >> Go To 3

No >> Repair the (A925) Fused B(+) circuit for an open or short. Perform BODY VERIFICATION TEST - VER 1.

***NO RESPONSE FROM HVAC (ATC) (CONTINUED)**

3. (Z24) GROUND CIRCUIT OPEN

Using a 12-volt test light connected to 12-volts, check the (Z24) ground circuit.



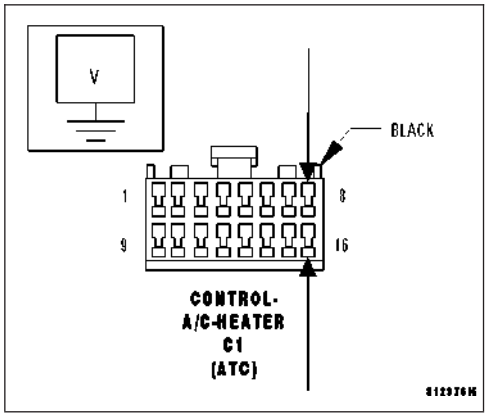
Does the test light illuminate brightly?

Yes >> Go To 4

No >> Repair the (Z24) ground circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

4. (D55) AND (D54) CAN B BUS CIRCUITS OPEN

NOTE: One open circuit will not cause this condition.
Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.
Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

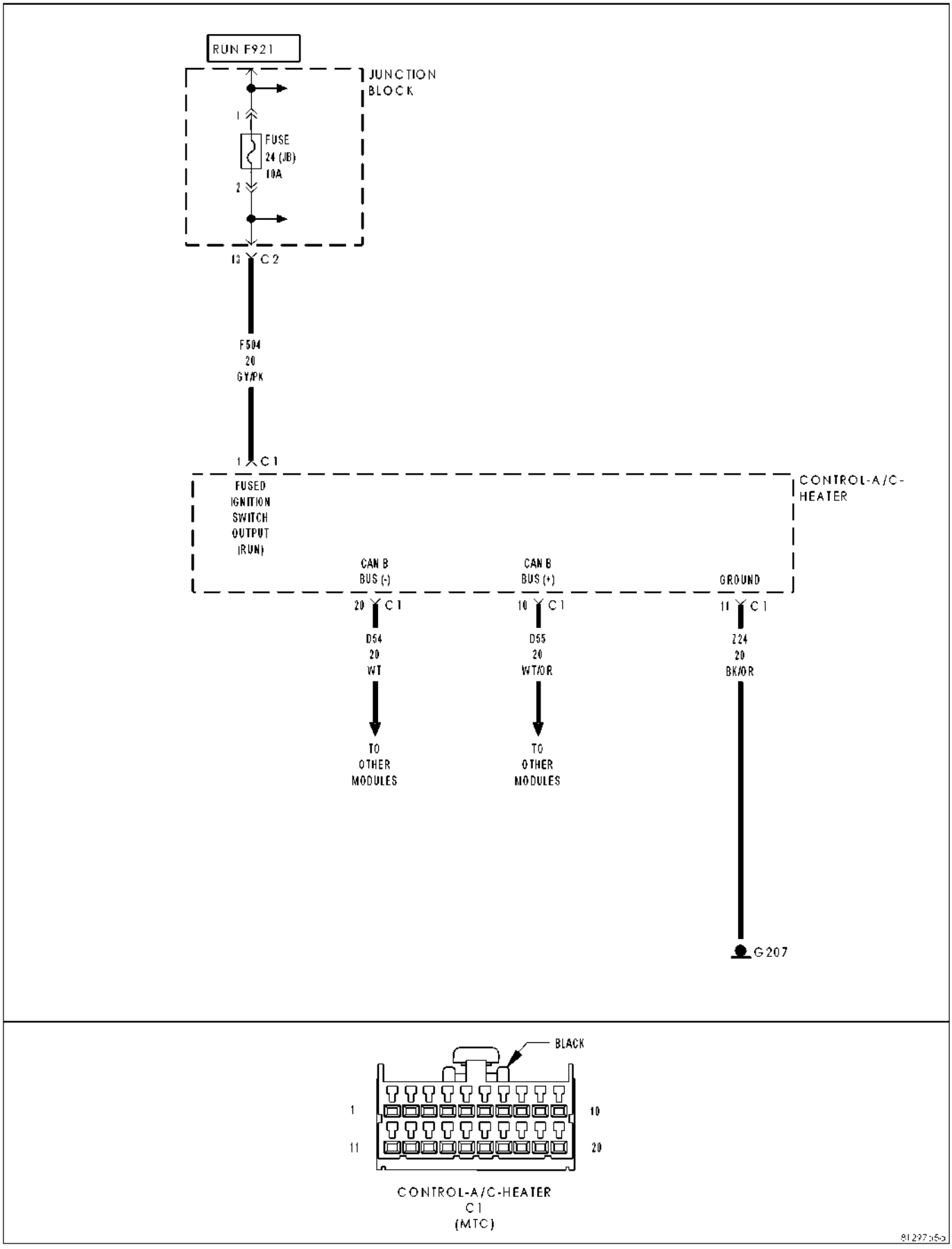


Is there any voltage present on either circuit?

Yes >> Replace the A/C Heater Control in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the (D55) and (D54) CAN B Bus circuits for an open. Inspect the connector for damage.
Perform BODY VERIFICATION TEST - VER 1.

*NO RESPONSE FROM HVAC (MTC)



***NO RESPONSE FROM HVAC (MTC) (CONTINUED)**
For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
(A504) FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN OR SHORTED
(Z24) GROUND CIRCUIT OPEN
(D55) AND (D54) CAN B BUS CIRCUITS OPEN
A/C HEATER CONTROL

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.
With the scan tool, select ECU view.

NOTE: A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

Does the scan tool display a red X next to the module?

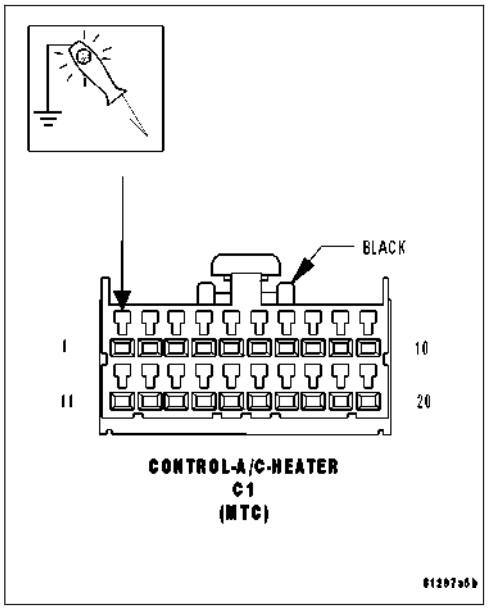
Yes >> Go To 2

No >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent , pushed out, and corroded terminals.

---

2. (A504) FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN OR SHORTED

Turn the ignition off.
Disconnect the A/C Heater Control C1 harness connector.
Turn the ignition on.
Using a 12-volt test light connected to ground, check the (A504) Fused Ignition Switch Output circuit.



Does the test light illuminate brightly?

Yes >> Go To 3

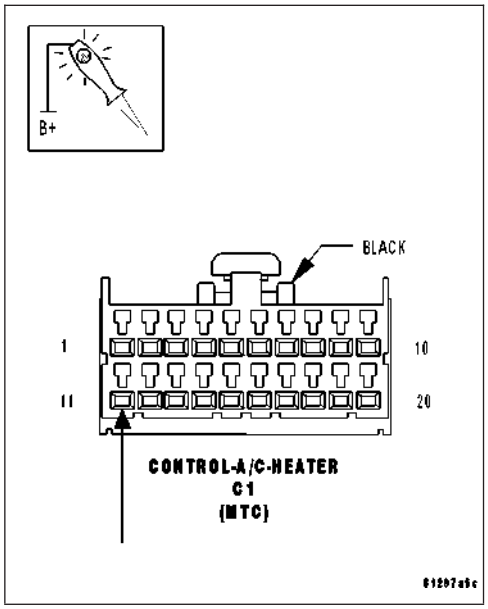
No >> Repair the (A504) Fused Ignition Switch Output circuit for an open or short.
Perform BODY VERIFICATION TEST - VER 1.

***NO RESPONSE FROM HVAC (MTC) (CONTINUED)**

3. (Z24) GROUND CIRCUIT OPEN

Turn the ignition off.

Using a 12-volt test light connected to 12-volts, check the (Z24) ground circuit.



Does the test light illuminate brightly?

Yes >> Go To 4

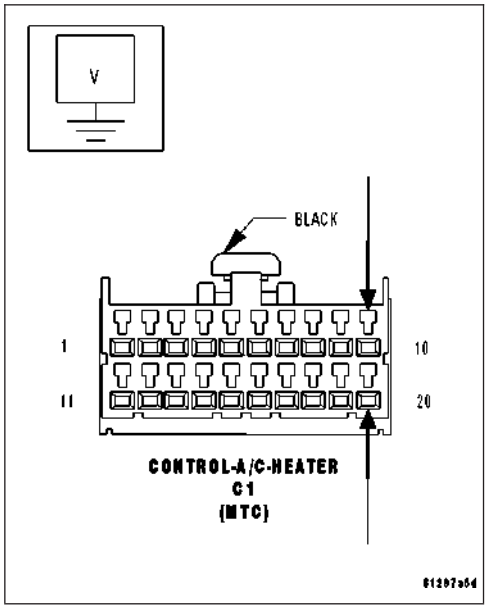
No >> Repair the (Z24) ground circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

4. (D55) AND (D54) CAN B BUS CIRCUITS OPEN

NOTE: One open circuit will not cause this condition.

Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.

Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

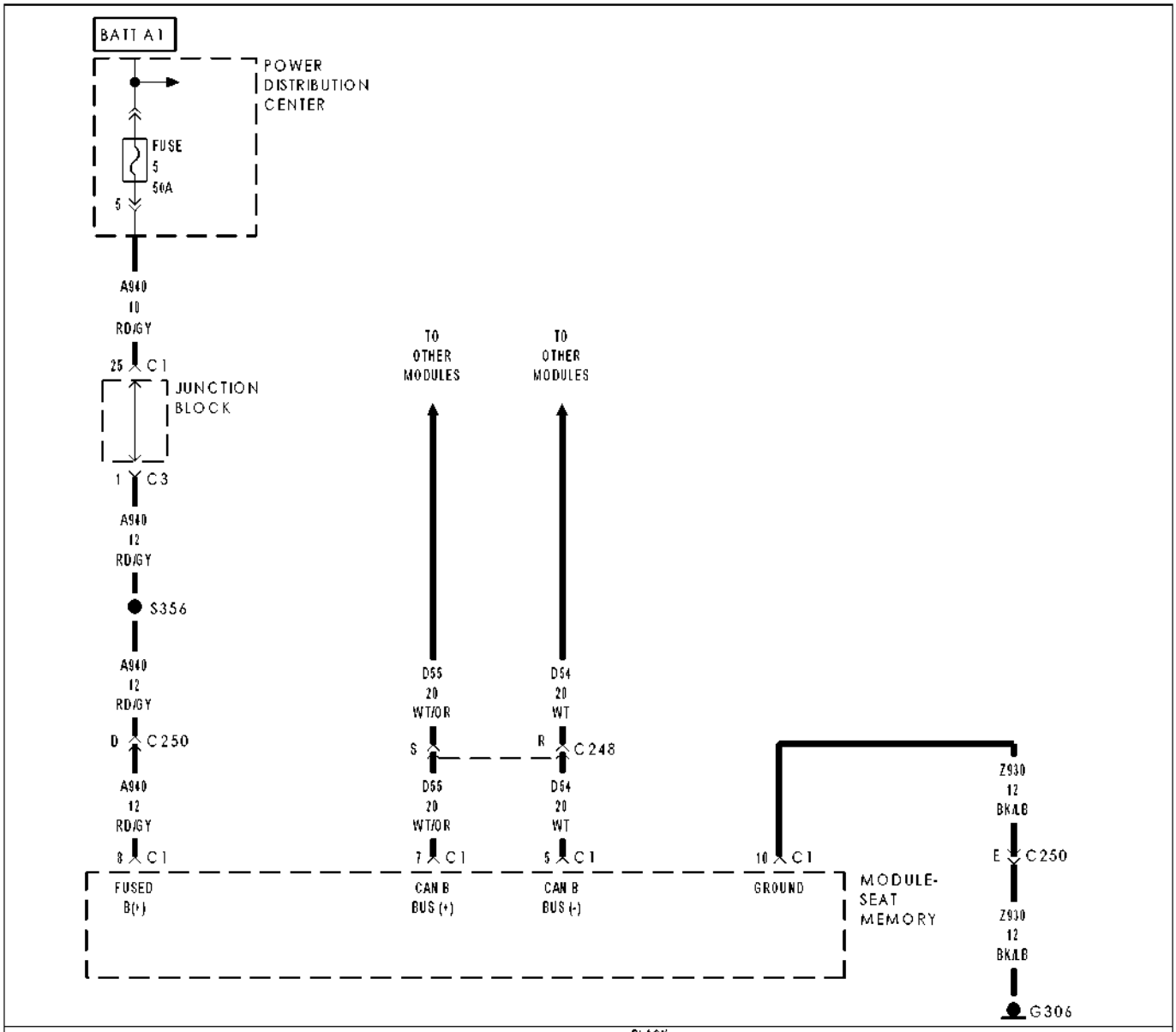


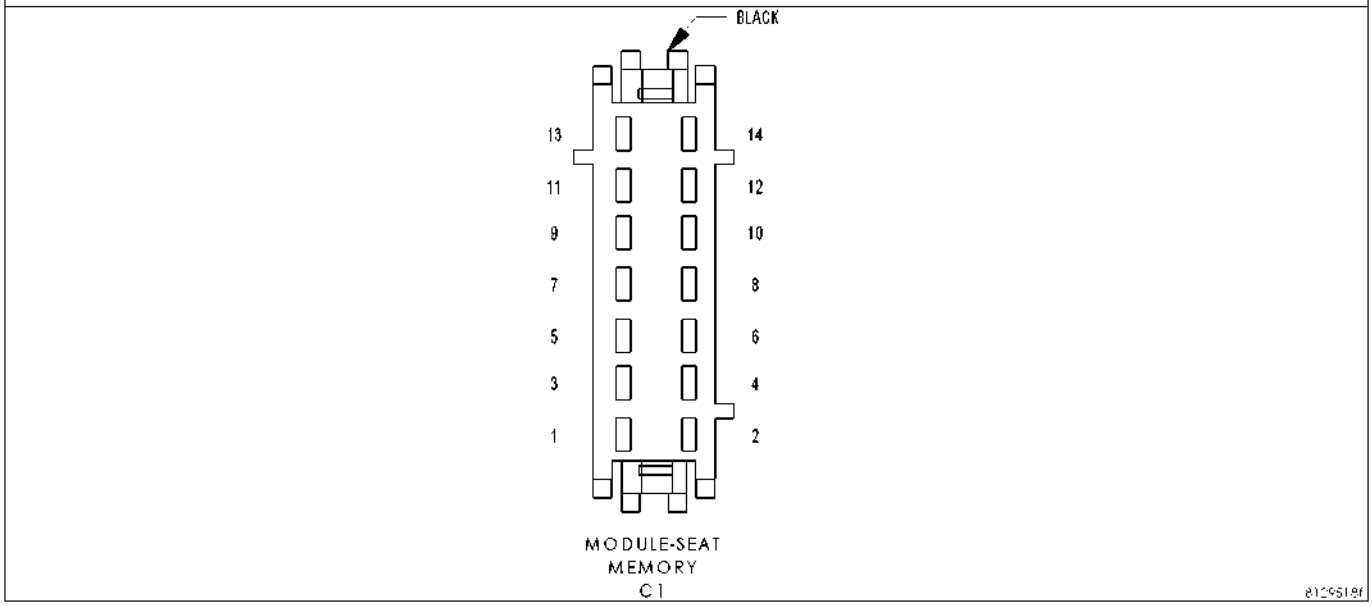
Is there any voltage present on either circuit?

Yes >> Replace the A/C Heater Control in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the (D55) and (D54) CAN B Bus circuits for an open. Inspect the connector for damage.
Perform BODY VERIFICATION TEST - VER 1.

*NO RESPONSE FROM MSMD





***NO RESPONSE FROM MSMD (CONTINUED)**
For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
(A940) FUSED B (+) CIRCUIT OPEN OR SHORTED
(Z930) GROUND CIRCUIT OPEN
(D55) AND (D54) CAN B BUS CIRCUITS OPEN
SEAT MEMORY MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.
With the scan tool, select ECU view.

NOTE: A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

Does the scan tool display a red X next to the module?

Yes >> Go To 2

No >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent , pushed out, and corroded terminals.

---

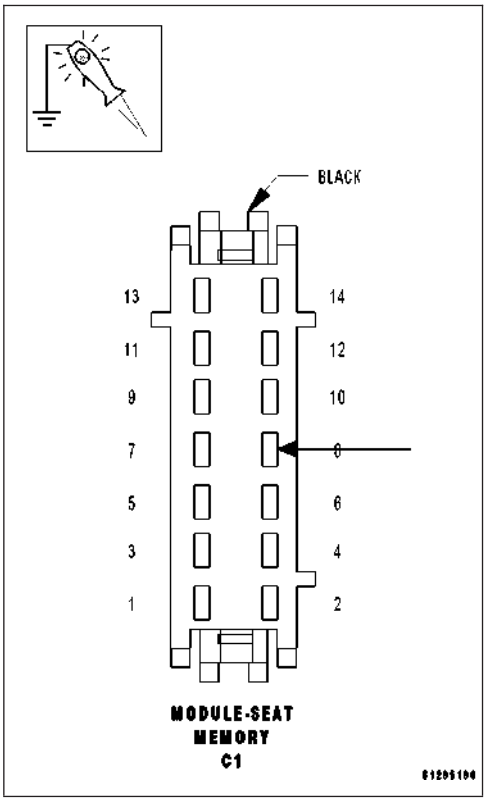
2. (A940) FUSED B(+) CIRCUIT OPEN OR SHORTED

Turn the ignition off.
Disconnect the Seat Memory Module C1 harness connector.
Using a 12-volt test light connected to ground, check the (A940) Fused B(+) circuit.

Does the test light illuminate brightly?

Yes >> Go To 3

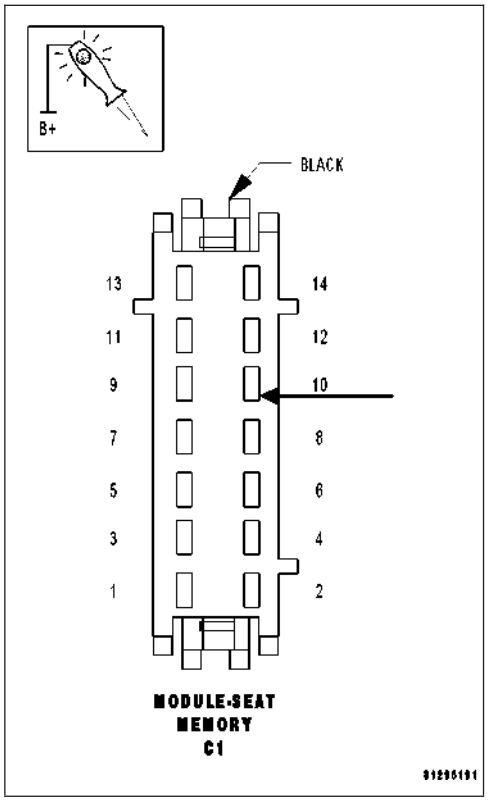
No >> Repair the (A940) Fused B(+) circuit for an open or short. Perform BODY VERIFICATION TEST - VER 1.



***NO RESPONSE FROM MSMD (CONTINUED)**

3. (Z930) GROUND CIRCUIT OPEN

Using a 12-volt test light connected to 12-volts, check the (Z930) ground circuit.



Does the test light illuminate brightly?

Yes >> Go To 4

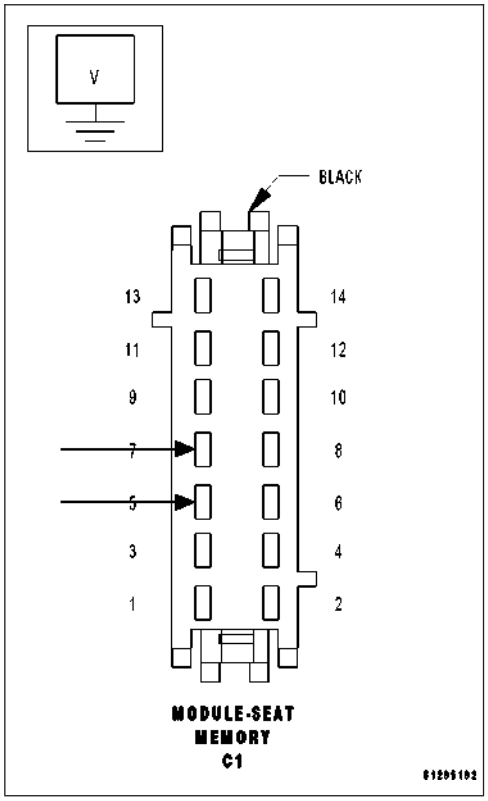
No >> Repair the (Z930) ground circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

4. (D55) AND (D54) CAN B BUS CIRCUITS OPEN

NOTE: One open circuit will not cause this condition.

Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.

Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

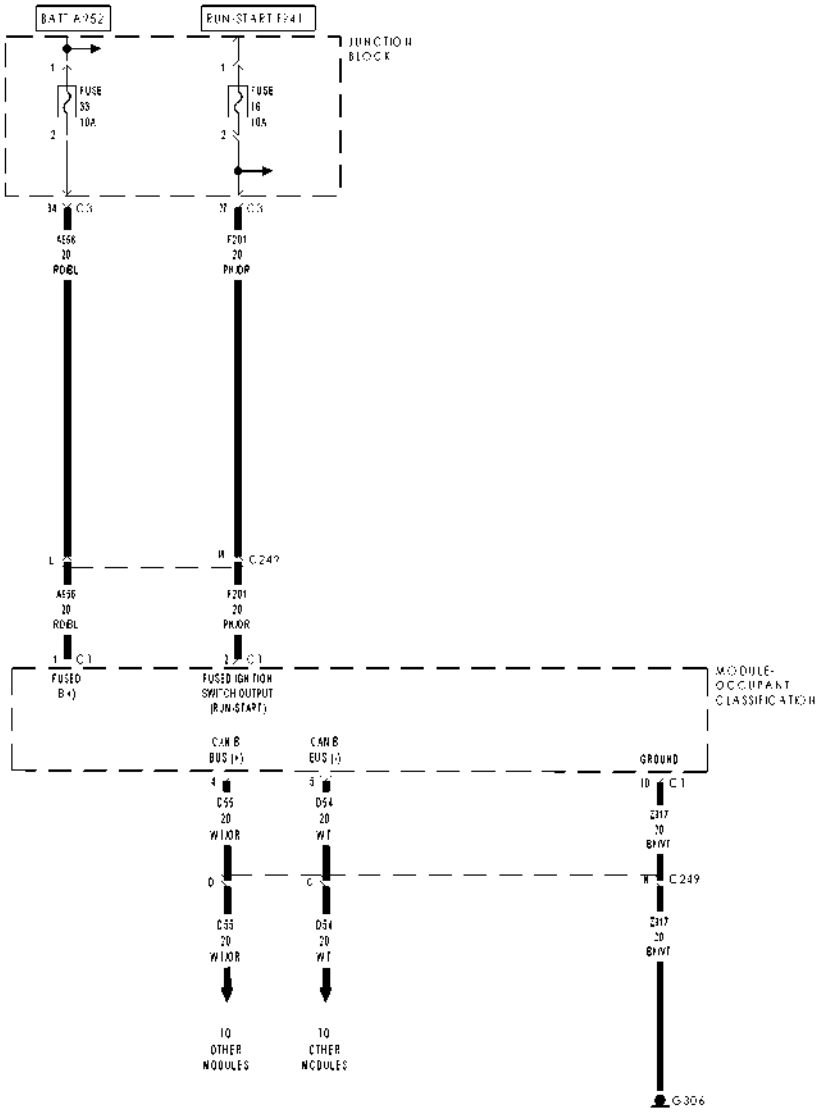


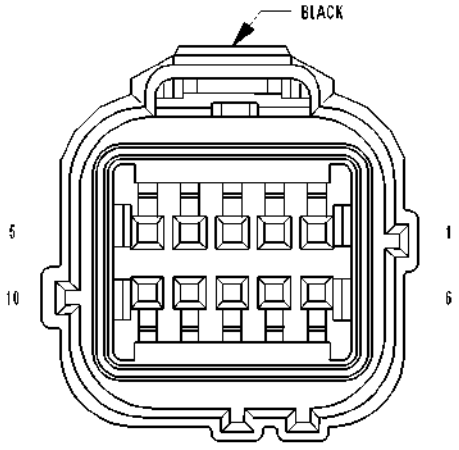
Is there any voltage present on either circuit?

Yes >> Replace the Seat Memory Module in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the (D55) and (D54) CAN B Bus circuits for an open. Inspect the connector for damage.
Perform BODY VERIFICATION TEST - VER 1.

*NO RESPONSE FROM OCM





MODULE-OCCUPANT CLASSIFICATION C1

81093b8

***NO RESPONSE FROM OCM (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
(A956) FUSED B(+) CIRCUIT OPEN OR SHORTED
(Z917) GROUND CIRCUIT OPEN
(F201) FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN OR SHORTED
(D55) AND (D54) CAN B BUS CIRCUITS OPEN
OCCUPANT CLASSIFICATION MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.
With the scan tool, select ECU view.

NOTE: A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

Does the scan tool display a red X next to the module?

Yes >> Go To 2

No >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent , pushed out, and corroded terminals.

***NO RESPONSE FROM OCM (CONTINUED)**

2. (A956) FUSED B(+) CIRCUIT OPEN OR SHORTED

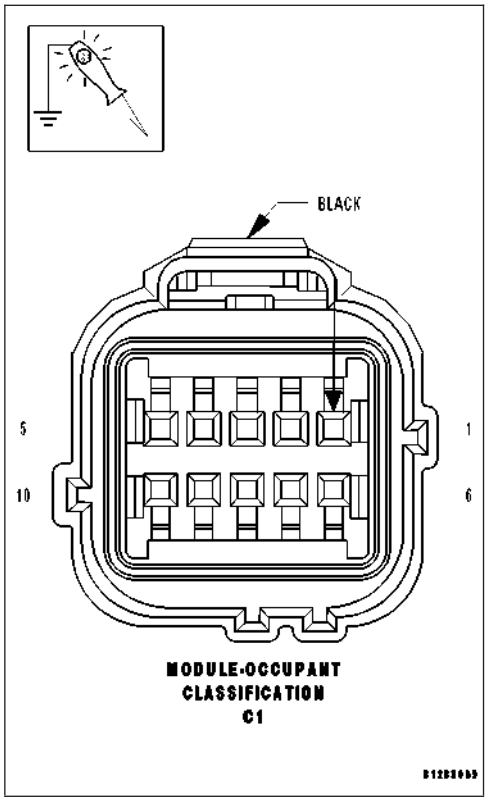
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Occupant Classification Module C1 harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
Using a 12-volt test light connected to ground, check the (A956) Fused B(+) circuit.

Does the test light illuminate brightly?

Yes >> Go To 3

No >> Repair the (A956) Fused B(+) circuit for an open or short. Perform AIRBAG VERIFICATION TEST - VER 1.



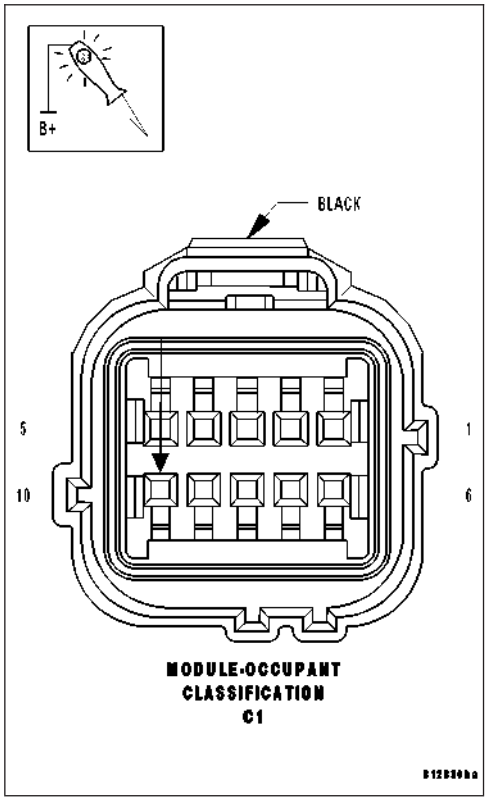
3. (Z917) GROUND CIRCUIT OPEN

Turn the ignition off.
Using a 12-volt test light connected to 12-volts, check the (Z917) ground circuit.

Does the test light illuminate brightly?

Yes >> Go To 4

No >> Repair the (Z917) ground circuit for an open. Perform AIRBAG VERIFICATION TEST - VER 1.



***NO RESPONSE FROM OCM (CONTINUED)**

4. (F201) FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN OR SHORTED

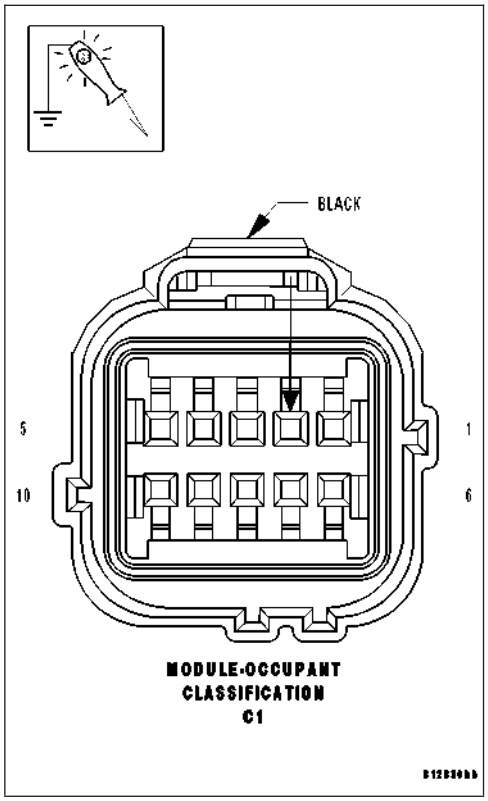
Turn the ignition on.

Using a 12-volt test light connected to ground, check the (F201) Fused Ignition Switch Output circuit.

Does the test light illuminate brightly?

Yes >> Go To 5

No >> Repair the (F201) Fused Ignition Switch Output circuit for an open or short.
Perform AIRBAG VERIFICATION TEST - VER 1.



5. (D55) AND (D54) CAN B BUS CIRCUITS OPEN

WARNING: If the Occupant Classification Module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

NOTE: One open circuit will not cause this condition.

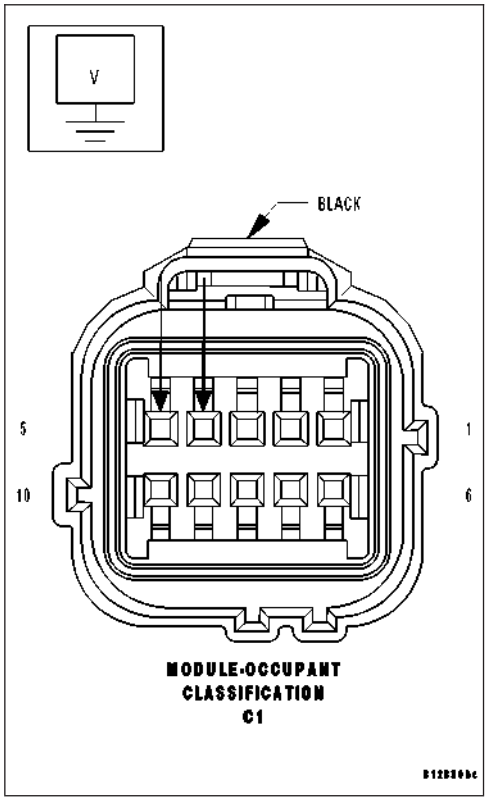
Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.

Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

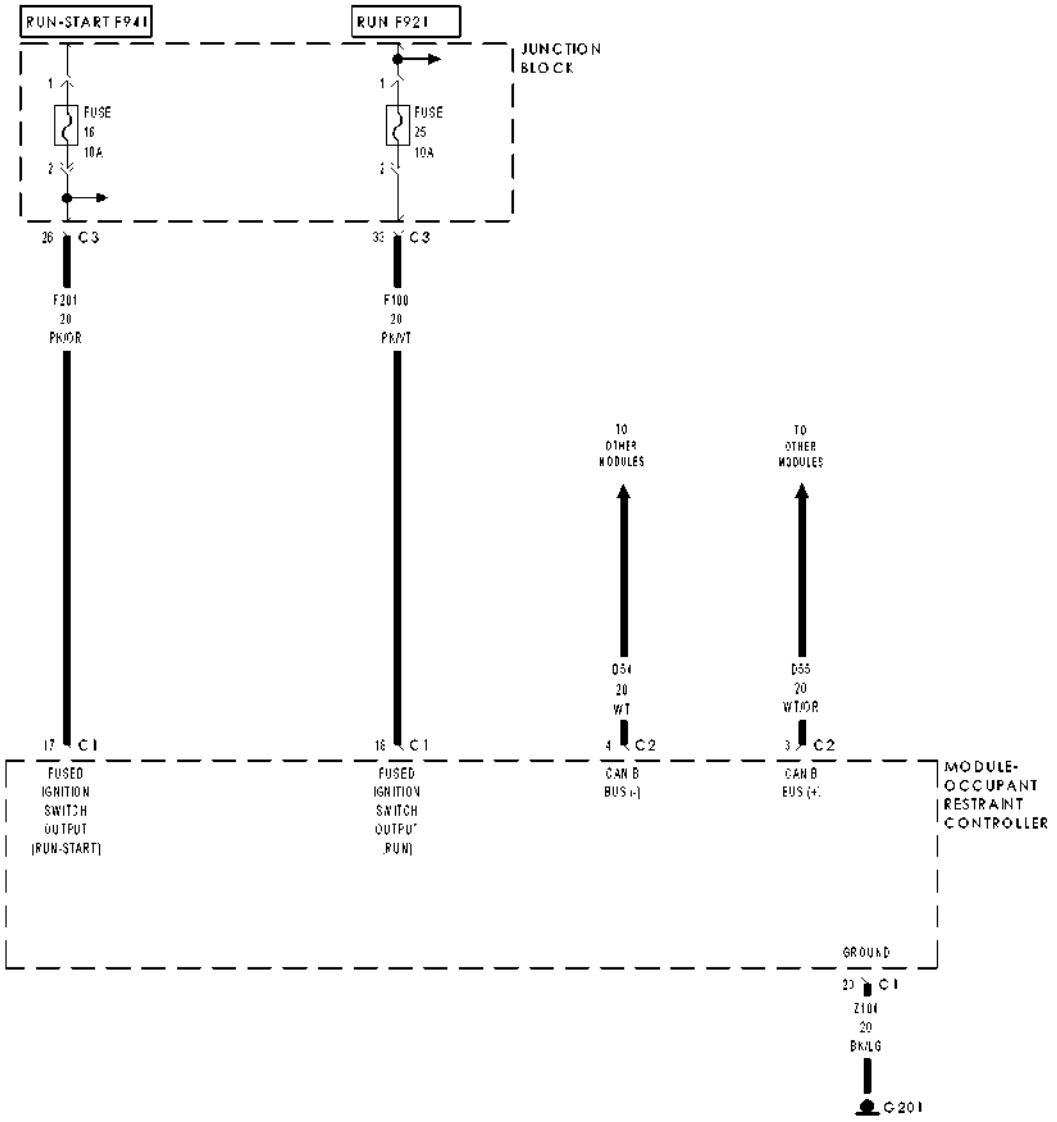
Is there any voltage present on either circuit?

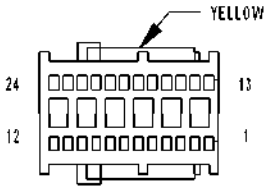
Yes >> Replace the Occupant Classification Module in accordance with the service information.
Perform AIRBAG VERIFICATION TEST - VER 1.

No >> Repair the (D55) and (D54) CAN B Bus circuits for an open. Inspect the connector for damage.
Perform AIRBAG VERIFICATION TEST - VER 1.

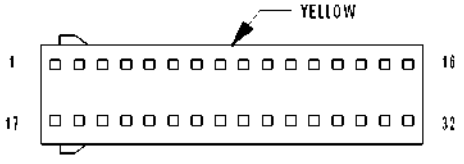


*NO RESPONSE FROM ORC





MODULE-OCCUPANT RESTRAINT CONTROLLER C2 (SAB)



MODULE-OCCUPANT RESTRAINT CONTROLLER C1

81097c53

***NO RESPONSE FROM ORC (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
(Z104) GROUND CIRCUIT OPEN
(F100) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT OPEN OR SHORTED
(F201) FUSED IGNITION SWITCH OUTPUT (RUN/START) CIRCUIT OPEN OR SHORTED
(D55) AND (D54) CAN B BUS CIRCUITS OPEN
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.
With the scan tool, select ECU view.

NOTE: A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

Does the scan tool display a red X next to the module?

Yes >> Go To 2

No >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent , pushed out, and corroded terminals.

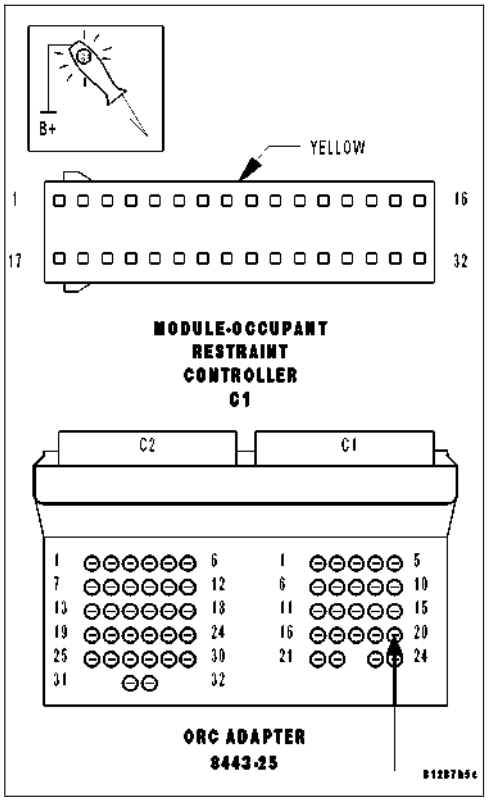
***NO RESPONSE FROM ORC (CONTINUED)**

2. (Z104) GROUND CIRCUIT OPEN

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Occupant Restraint Controller harness connectors.

Connect the appropriate Load Tool ACM Adaptor to the ORC connector.

Using a 12-volt test light connected to 12-volts, check the (Z104) ground circuit.



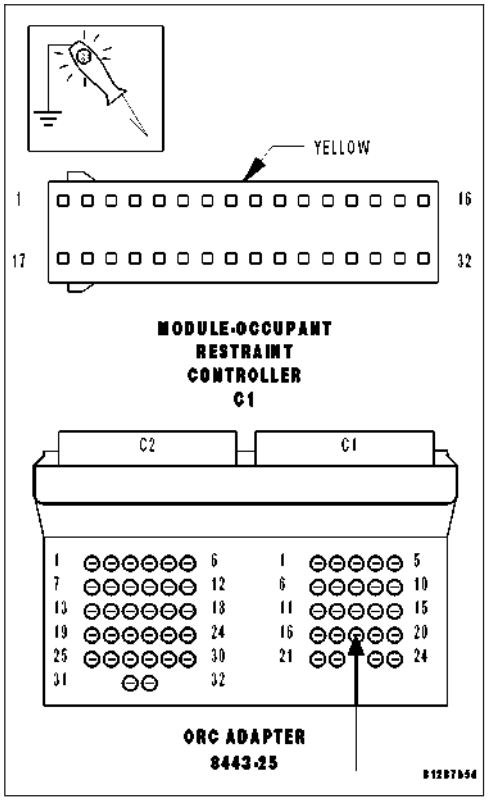
Does the test light illuminate brightly?

Yes >> Go To 3

No >> Repair the (Z104) ground circuit for an open.
Perform AIRBAG VERIFICATION TEST - VER 1.

3. (F100) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT OPEN OR SHORTED

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
Using a 12-volt test light connected to ground, check the (F100) Fused Ignition Switch Output (RUN) circuit.



Does the test light illuminate brightly?

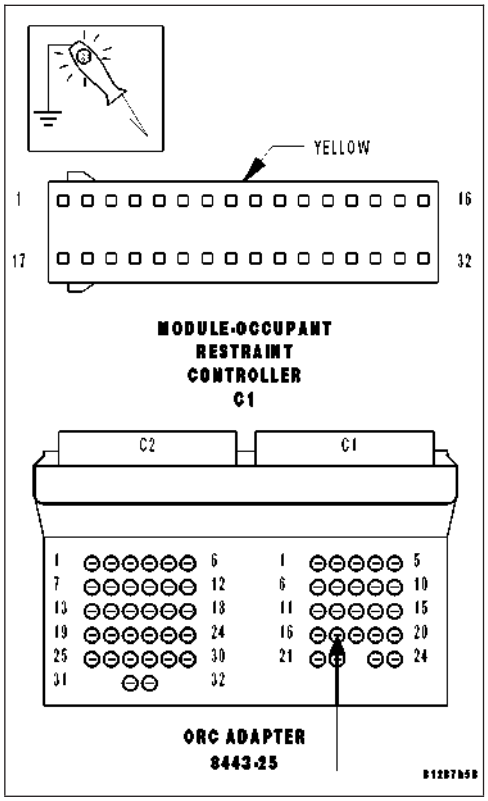
Yes >> Go To 4

No >> Repair the (F100) Fused Ignition Switch Output (RUN) circuit for an open or short.
Perform AIRBAG VERIFICATION TEST - VER 1.

***NO RESPONSE FROM ORC (CONTINUED)**

4. (F201) FUSED IGNITION SWITCH OUTPUT (RUN/START) CIRCUIT OPEN OR SHORTED

Using a 12-volt test light connected to ground, check the (F201) Fused Ignition Switch Output (RUN/START) circuit.



Does the test light illuminate brightly?

Yes >> Go To 5

No >> Repair the (F201) Fused Ignition Switch Output (RUN/START) circuit for an open or short.
Perform AIRBAG VERIFICATION TEST - VER 1.

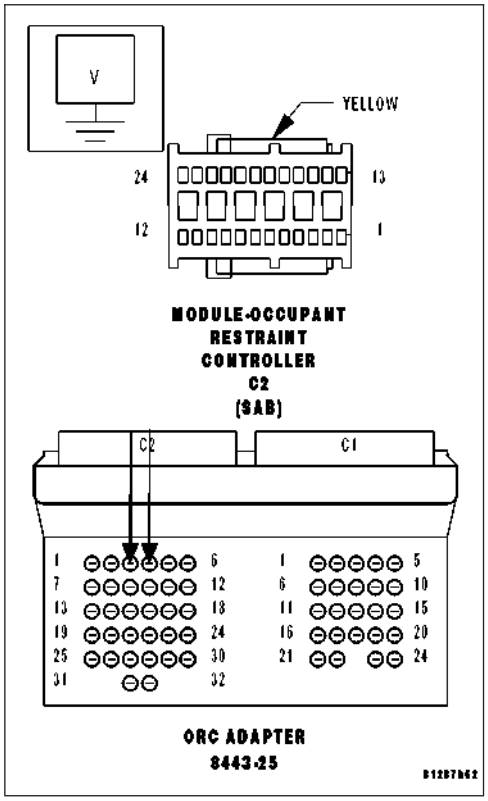
5. (D55) AND (D54) CAN B BUS CIRCUITS OPEN

WARNING: If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

NOTE: One open circuit will not cause this condition.

Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.

Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

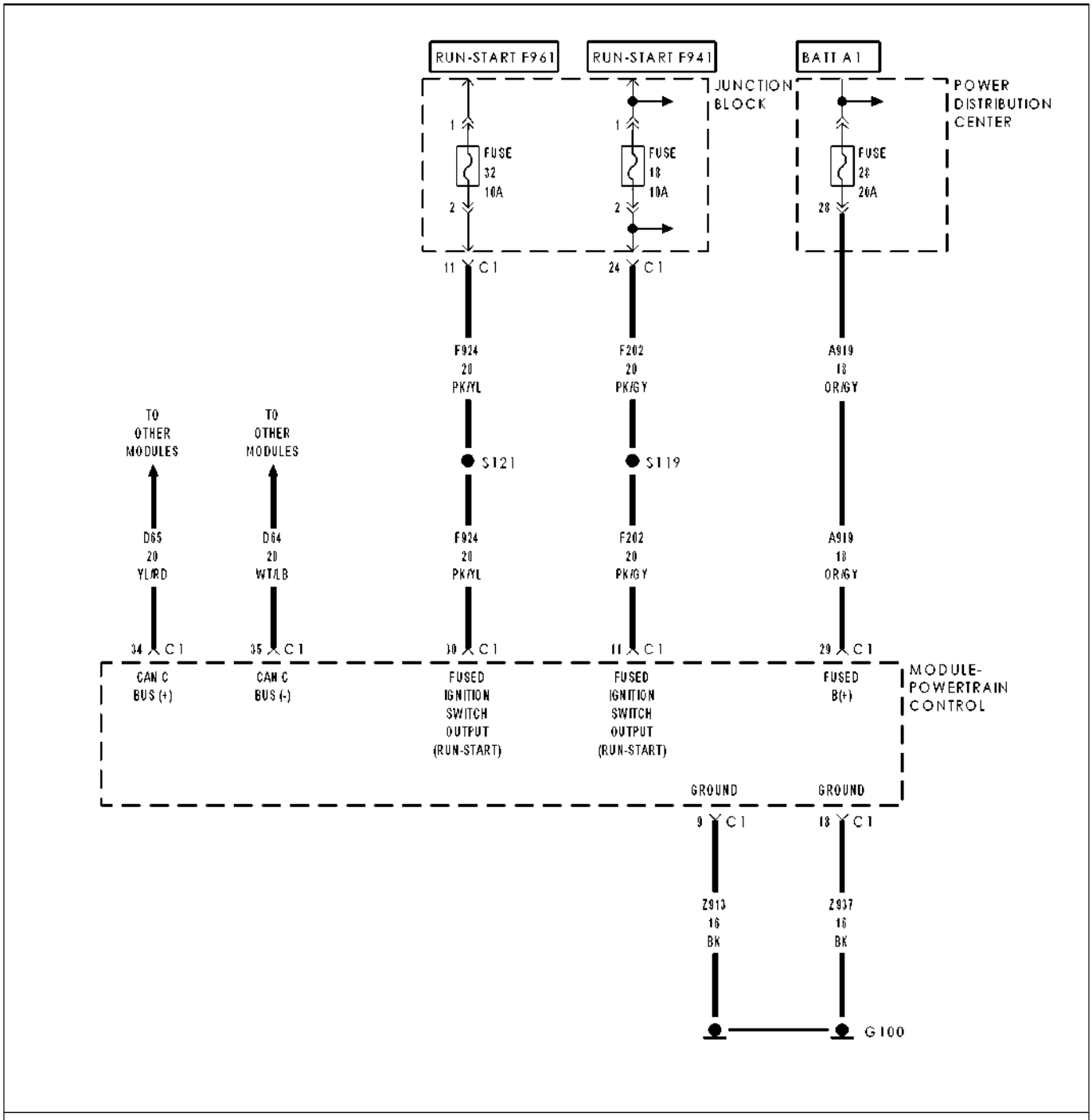


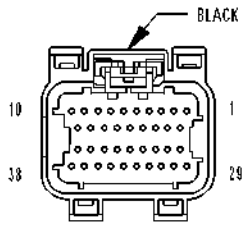
Is there any voltage present on either circuit?

Yes >> Replace the Occupant Restraint Controller in accordance with the service information.
Perform AIRBAG VERIFICATION TEST - VER 1.

No >> Repair the (D55) and (D54) CAN B Bus circuits for an open. Inspect the connector for damage.
Perform AIRBAG VERIFICATION TEST - VER 1.

*NO RESPONSE FROM PCM





MODULE-POWERTRAIN CONTROL C1

***NO RESPONSE FROM PCM (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
(A919) FUSED B(+) CIRCUIT OPEN OR SHORTED
(Z937) (Z913) GROUND CIRCUIT OPEN
(F202) (F924) FUSED IGNITION SW OUTPUT CIRCUIT OPEN OR SHORTED
(D65) CAN C BUS (+) CIRCUIT OPEN
(D64) CAN C BUS (-) CIRCUIT OPEN
POWERTRAIN CONTROL MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.

With the scan tool, select ECU view.

NOTE: A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

NOTE: Check the FCM for any active CAN C hardware DTCs, perform DTC before proceeding.

Does the scan tool display a red X next to the module?

Yes >> Go To 2

No >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent , pushed out, and corroded terminals.

***NO RESPONSE FROM PCM (CONTINUED)**

2. (A919) FUSED B(+) CIRCUIT OPEN OR SHORTED

Turn the ignition off.

Disconnect the PCM C1 harness connector.

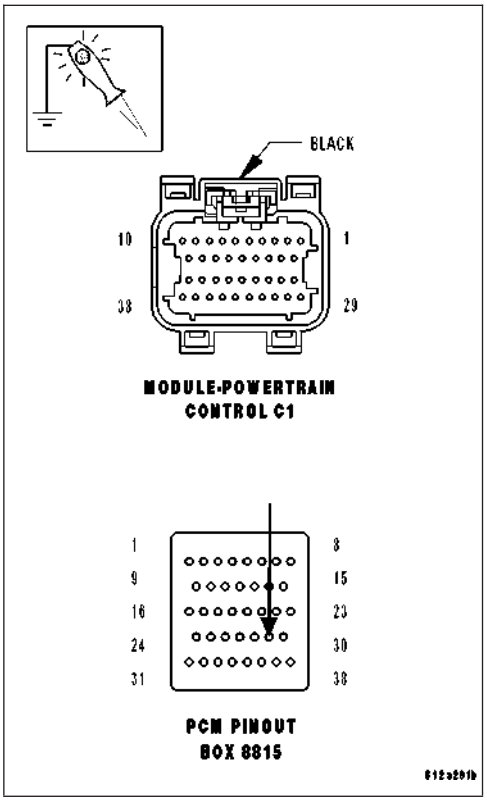
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Using a 12-volt test light connected to ground, check the (A919) Fused B(+) circuit.

Does the test light illuminate brightly?

Yes >> Go To 3

No >> Repair the (A919) Fused B(+) circuit for an open or short. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.



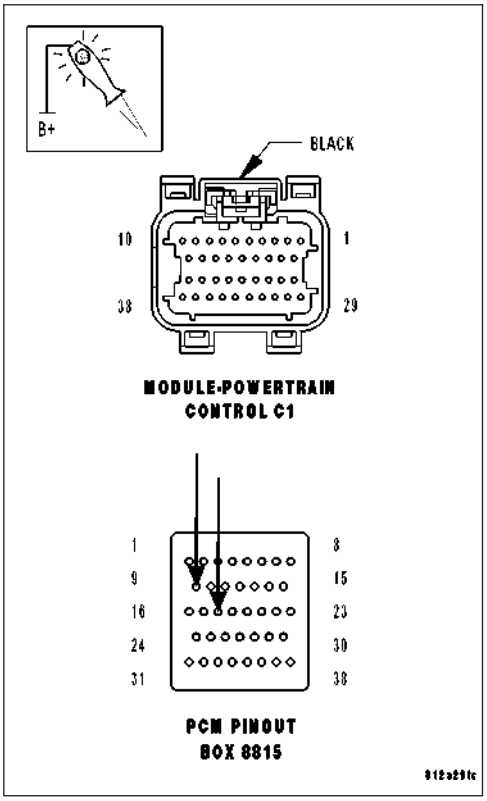
3. (Z913) (Z937) GROUND CIRCUIT OPEN

Using a 12-volt test light connected to 12-volts, check each (Z913) and (Z937) ground circuit.

Does the test light illuminate brightly for each circuit?

Yes >> Go To 4

No >> Repair the ground circuit for an open.
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.



***NO RESPONSE FROM PCM (CONTINUED)**

4. (F202) (F924) FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN OR SHORTED

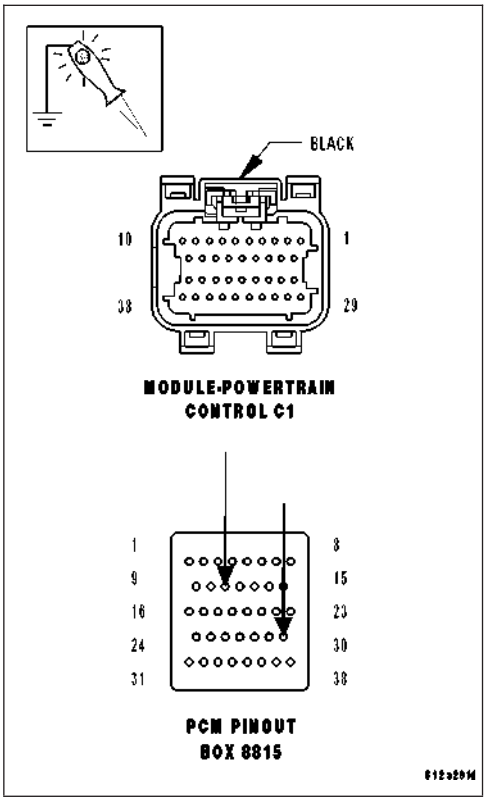
Turn the ignition on.

Using a 12-volt test light connected to ground, check each (F202) and (F924) Fused Ignition Switch Output circuit.

Does the test light illuminate brightly for each circuit?

Yes >> Go To 5

No >> Repair the Fused Ignition Switch Output circuit for an open or short.
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.



5. (D65) CAN C BUS (+) CIRCUIT OPEN

Turn the ignition off.

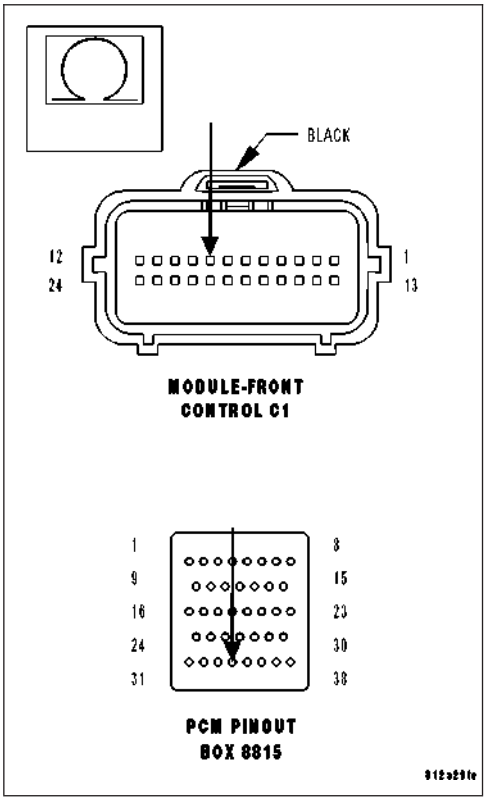
Disconnect the FCM C1 harness connector.

Measure the resistance of the (D65) CAN C Bus (+) circuit between the FCM connector and the appropriate terminal of the special tool #8815.

Is resistance below 5.0 ohms?

Yes >> Go To 6

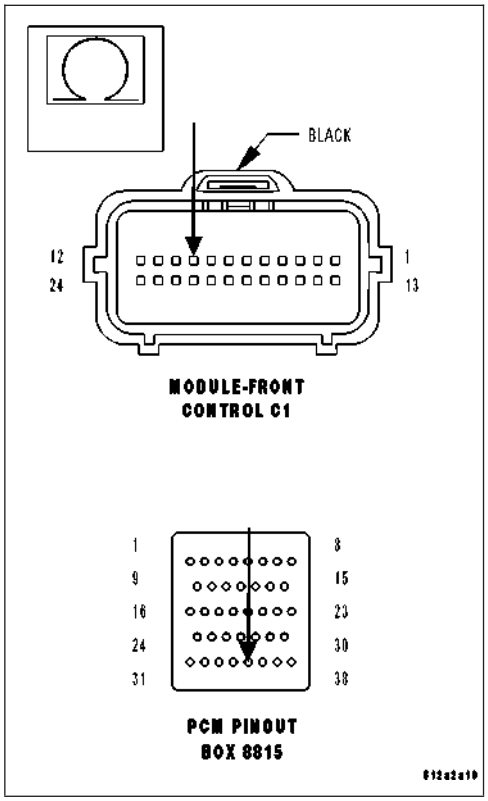
No >> Repair the (D65) CAN C Bus (+) circuit for an open.
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.



***NO RESPONSE FROM PCM (CONTINUED)**

6. (D64) CAN C BUS (-) CIRCUIT OPEN

Measure the resistance of the (D64) CAN C Bus (-) circuit between the FCM connector and the appropriate terminal of the special tool #8815.

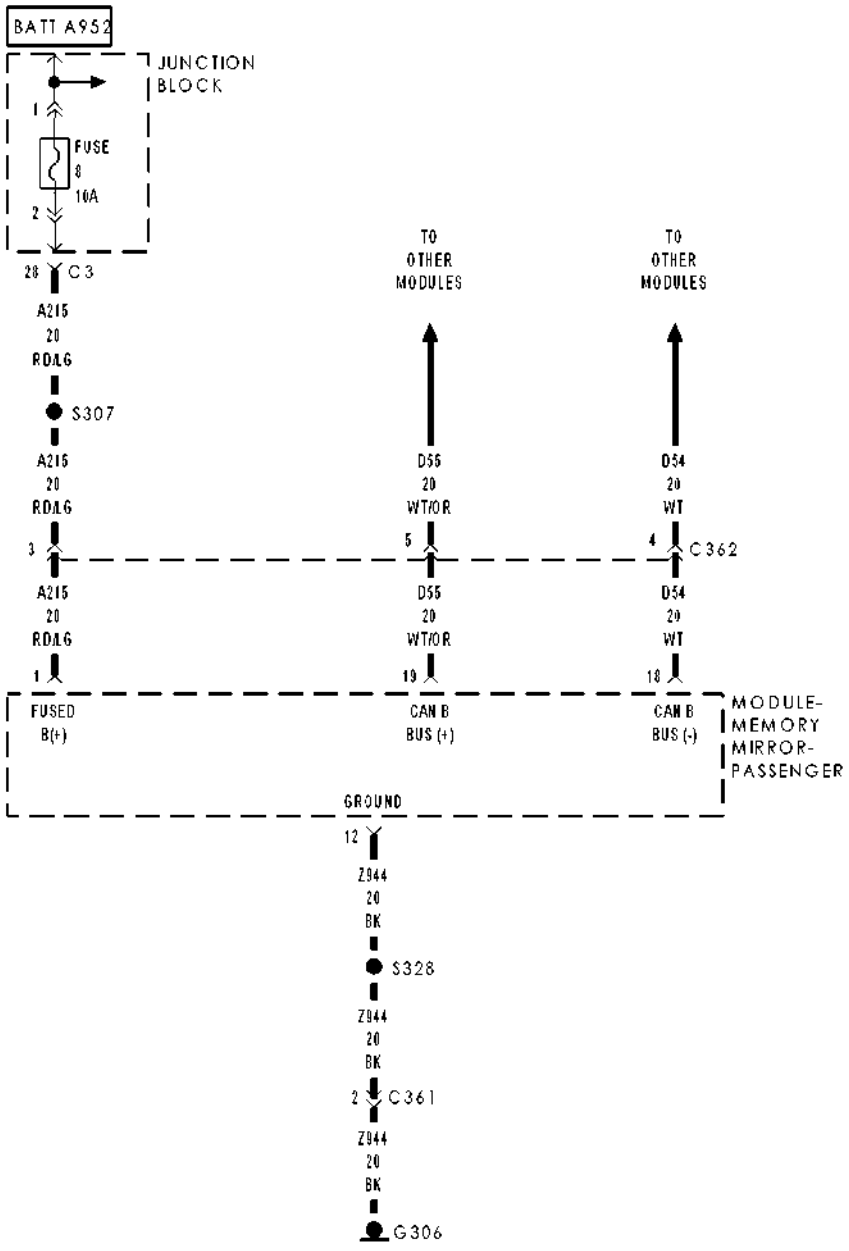


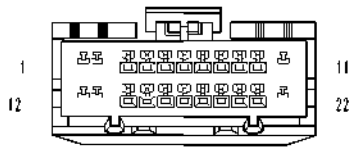
Is resistance below 5.0 ohms?

Yes >> Replace and program the Powertrain Control Module in accordance with the service information.
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

No >> Repair the (D64) CAN C Bus (-) circuit for an open.
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

*NO RESPONSE FROM PDM





MODULE-MEMORY MIRROR-PASSENGER

81294088

***NO RESPONSE FROM PDM (CONTINUED)**
For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
(A215) FUSED B (+) CIRCUIT OPEN OR SHORTED
(Z944) GROUND CIRCUIT OPEN
(D55) AND (D54) CAN B BUS CIRCUITS OPEN
PASSENGER MEMORY MIRROR MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.
With the scan tool, select ECU view.

NOTE: A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

Does the scan tool display a red X next to the module?

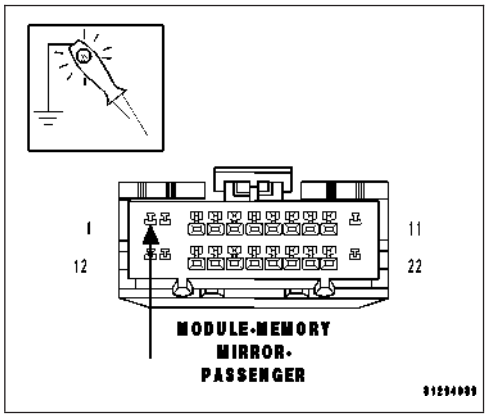
Yes >> Go To 2

No >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent , pushed out, and corroded terminals.

---

2. (A215) FUSED B(+) CIRCUIT OPEN OR SHORTED

Turn the ignition off.
Disconnect the Passenger Memory Mirror Module harness connector.
Using a 12-volt test light connected to ground, check the (A215) Fused B(+) circuit.



Does the test light illuminate brightly?

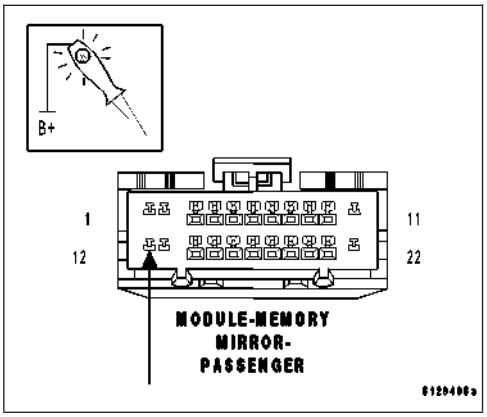
Yes >> Go To 3

No >> Repair the (A215) Fused B(+) circuit for an open or short. Perform BODY VERIFICATION TEST - VER 1.

***NO RESPONSE FROM PDM (CONTINUED)**

3. (Z944) GROUND CIRCUIT OPEN

Using a 12-volt test light connected to 12-volts, check the (Z944) ground circuit.



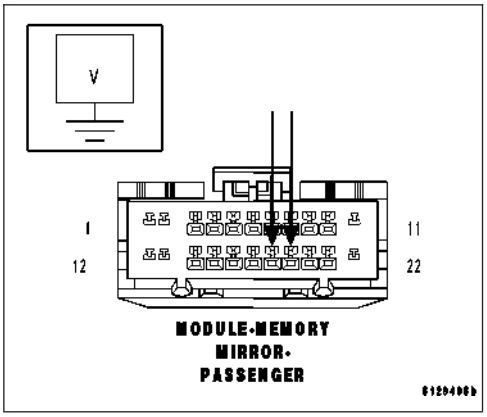
Does the test light illuminate brightly?

Yes >> Go To 4

No >> Repair the (Z944) ground circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

4. (D55) AND (D54) CAN B BUS CIRCUITS OPEN

NOTE: One open circuit will not cause this condition.
Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.
Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

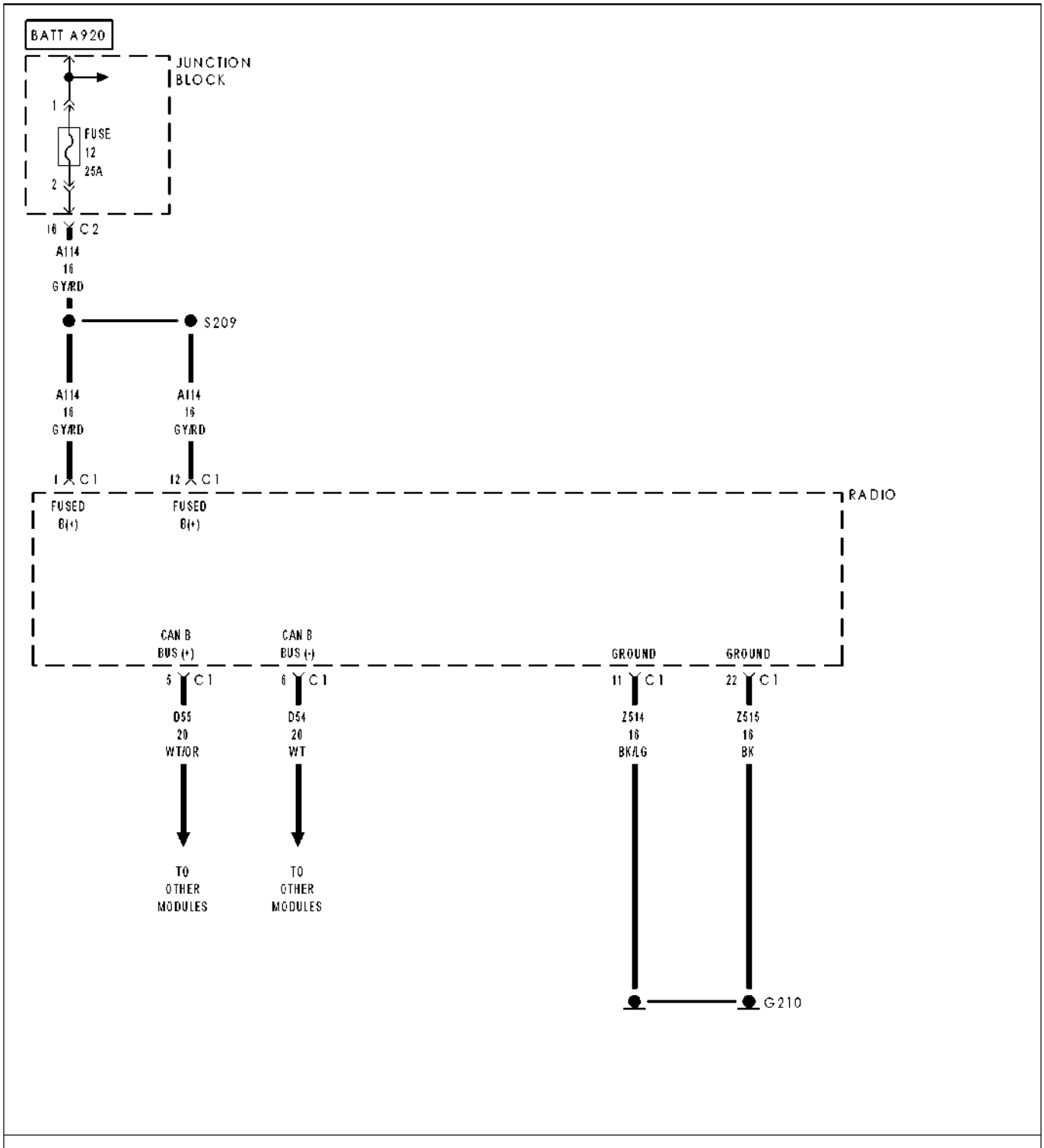


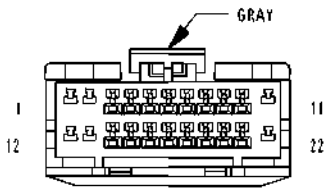
Is there any voltage present on either circuit?

Yes >> Replace the Passenger Memory Mirror Module in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the (D55) and (D54) CAN B Bus circuits for an open. Inspect the connector for damage.
Perform BODY VERIFICATION TEST - VER 1.

*NO RESPONSE FROM RADIO





RADIO C1

81261029

***NO RESPONSE FROM RADIO (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
(A114) FUSED B (+) CIRCUIT OPEN OR SHORTED
(Z514) OR (Z515) GROUND CIRCUIT OPEN
(D55) AND (D54) CAN B BUS CIRCUITS OPEN
RADIO

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.
With the scan tool, select ECU view.

NOTE: A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

Does the scan tool display a red X next to the module?

Yes >> Go To 2

No >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent , pushed out, and corroded terminals.

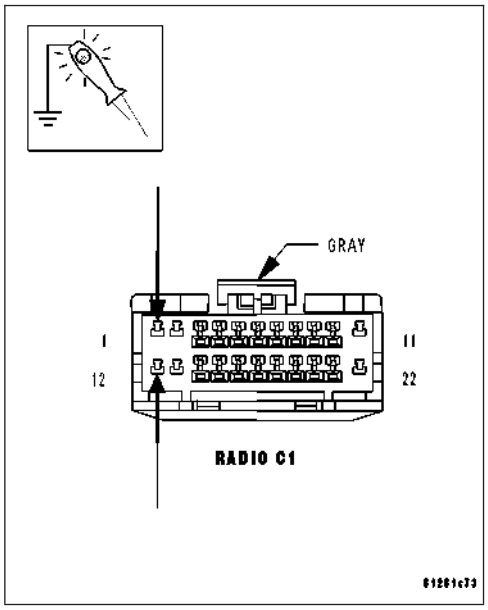
---

2. (A114) FUSED B(+) CIRCUIT OPEN OR SHORTED

Turn the ignition off.

Disconnect the Radio C1 harness connector.

Using a 12-volt test light connected to ground, check each (A114) Fused B(+) circuit.



Does the test light illuminate brightly for each circuit?

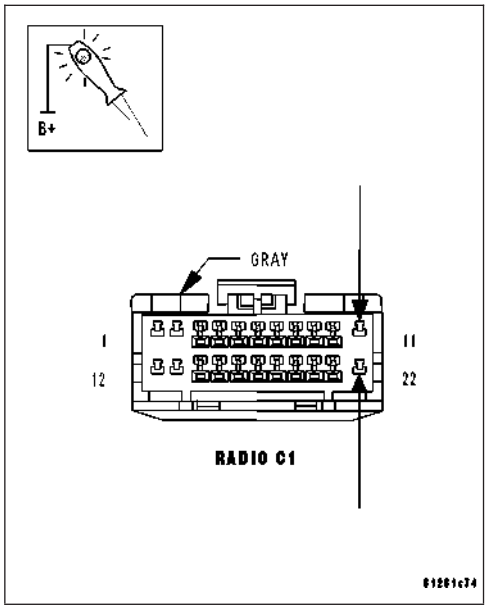
Yes >> Go To 3

No >> Repair the (A114) Fused B(+) circuit for an open or short. Perform BODY VERIFICATION TEST - VER 1.

***NO RESPONSE FROM RADIO (CONTINUED)**

3. (Z514) OR (Z515) GROUND CIRCUIT OPEN

Using a 12-volt test light connected to 12-volts, check the (Z514) and (Z515) ground circuits.



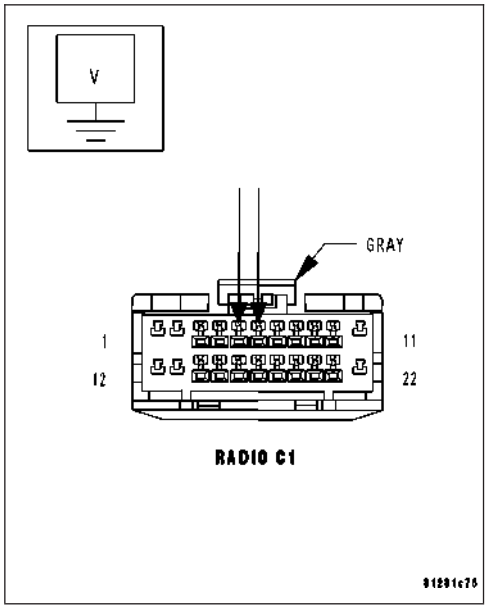
Does the test light illuminate brightly for each circuit?

Yes >> Go To 4

No >> Repair the (Z514) or the (Z515) ground circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

4. (D55) AND (D54) CAN B BUS CIRCUITS OPEN

NOTE: One open circuit will not cause this condition.
Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.
Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

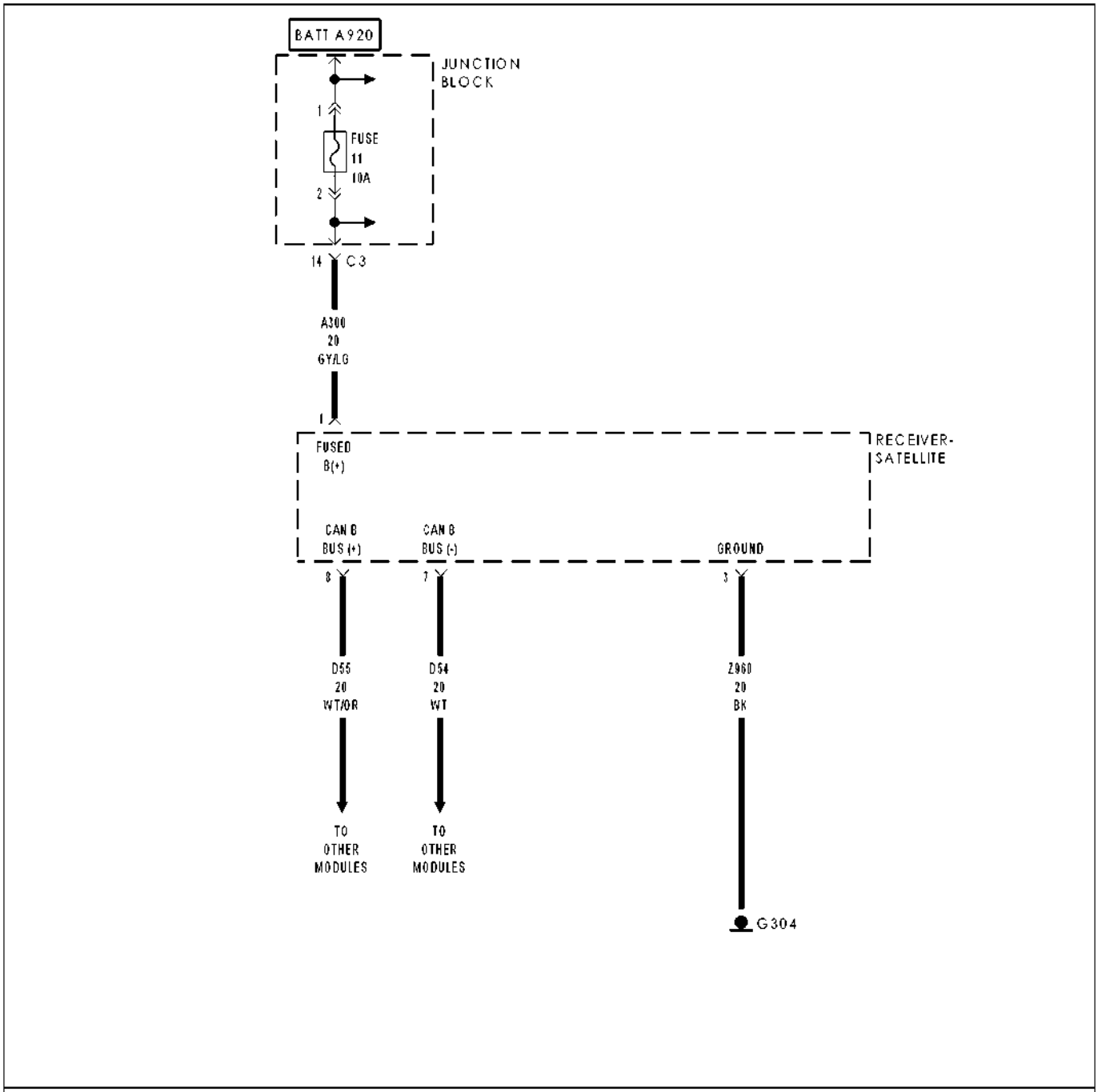


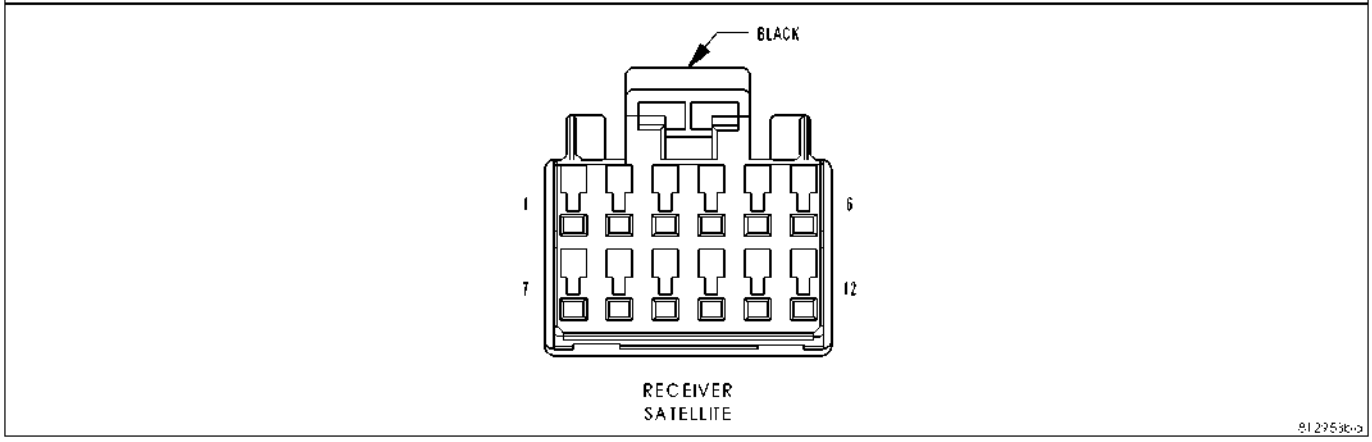
Is there any voltage present on either circuit?

Yes >> Replace the Radio in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the (D55) and (D54) CAN B Bus circuits for an open. Inspect the connector for damage.
Perform BODY VERIFICATION TEST - VER 1.

*NO RESPONSE FROM SDAR





***NO RESPONSE FROM SDAR (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
(A300) FUSED B (+) CIRCUIT OPEN OR SHORTED
(Z960) GROUND CIRCUIT OPEN
(D55) AND (D54) CAN B BUS CIRCUITS OPEN
SATELLITE RECEIVER

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.
With the scan tool, select ECU view.

NOTE: A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

Does the scan tool display a red X next to the module?

Yes >> Go To 2

No >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent , pushed out, and corroded terminals.

---

2. (A300) FUSED B(+) CIRCUIT OPEN OR SHORTED

Turn the ignition off.

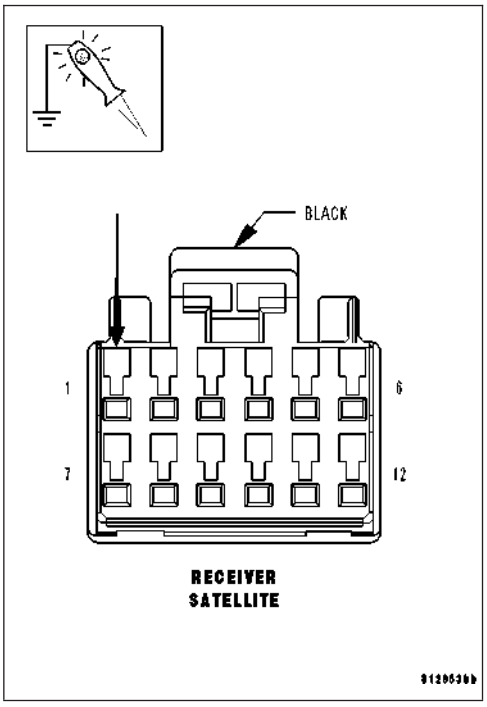
Disconnect the Satellite Receiver harness connector.

Using a 12-volt test light connected to ground, check the (A300) Fused B(+) circuit.

Does the test light illuminate brightly?

Yes >> Go To 3

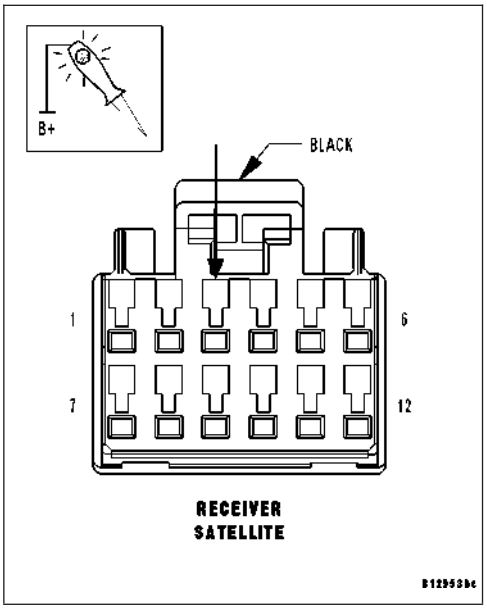
No >> Repair the (A300) Fused B(+) circuit for an open or short. Perform BODY VERIFICATION TEST - VER 1.



***NO RESPONSE FROM SDAR (CONTINUED)**

3. (Z960) GROUND CIRCUIT OPEN

Using a 12-volt test light connected to 12-volts, check the (Z960) ground circuit.



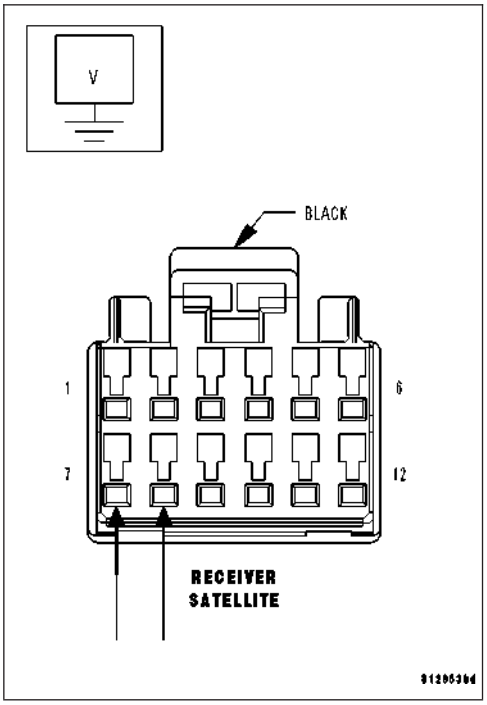
Does the test light illuminate brightly?

Yes >> Go To 4

No >> Repair the (Z960) ground circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

4. (D55) AND (D54) CAN B BUS CIRCUITS OPEN

NOTE: One open circuit will not cause this condition.
Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.
Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

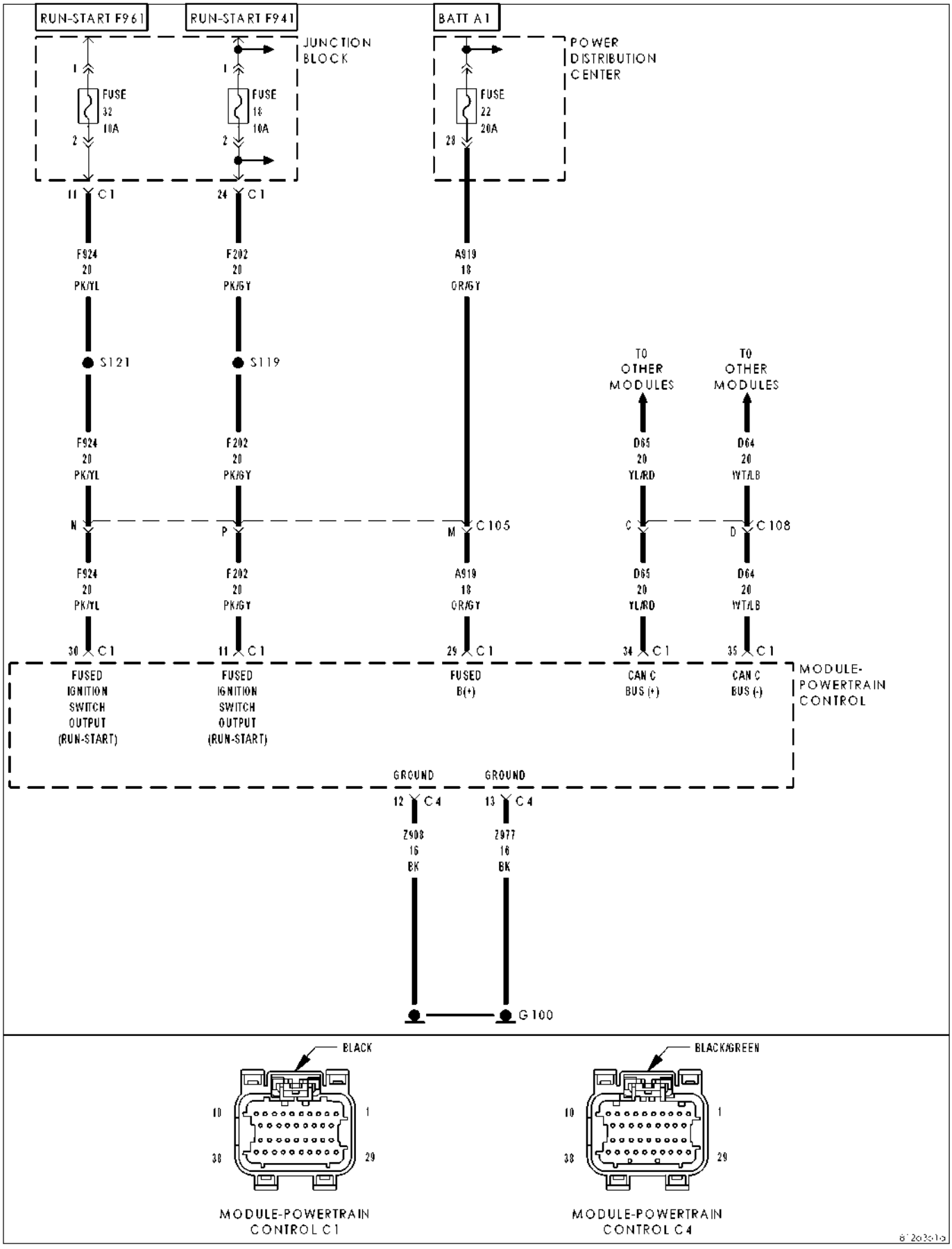


Is there any voltage present on either circuit?

Yes >> Replace the Satellite Receiver in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the (D55) and (D54) CAN B Bus circuits for an open. Inspect the connector for damage.
Perform BODY VERIFICATION TEST - VER 1.

*NO RESPONSE FROM TCM



***NO RESPONSE FROM TCM (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
(A919) FUSED B(+) CIRCUIT OPEN OR SHORTED
(Z908) (Z977) GROUND CIRCUIT OPEN
(F202) (F924) FUSED IGNITION SW OUTPUT CIRCUIT OPEN OR SHORTED
(D65) CAN C BUS (+) CIRCUIT OPEN
(D64) CAN C BUS (-) CIRCUIT OPEN
POWERTRAIN CONTROL MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.
With the scan tool, select ECU view.

NOTE: A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

NOTE: Check the FCM for any active CAN C hardware DTCs, perform DTC before proceeding.

Does the scan tool display a red X next to the module?

Yes >> Go To 2

No >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent , pushed out, and corroded terminals.

---

2. ATTEMPT TO COMMUNICATE WITH THE PCM

With the scan tool in ECU view, observe the status of the PCM.

Does the scan tool display a red X next to the PCM?

Yes >> Refer to the No Response From PCM test procedure. Refer to the table of contents in this section.

No >> Go To 3

***NO RESPONSE FROM TCM (CONTINUED)**

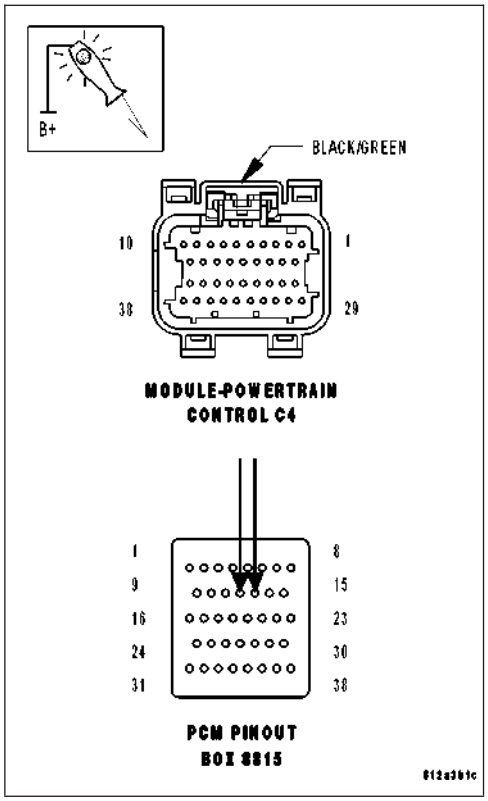
3. (Z908) (Z977) GROUND CIRCUIT OPEN

Turn the ignition off.

Disconnect the PCM C4 harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Using a 12-volt test light connected to 12-volts, check each (Z908) and (Z977) ground circuit.



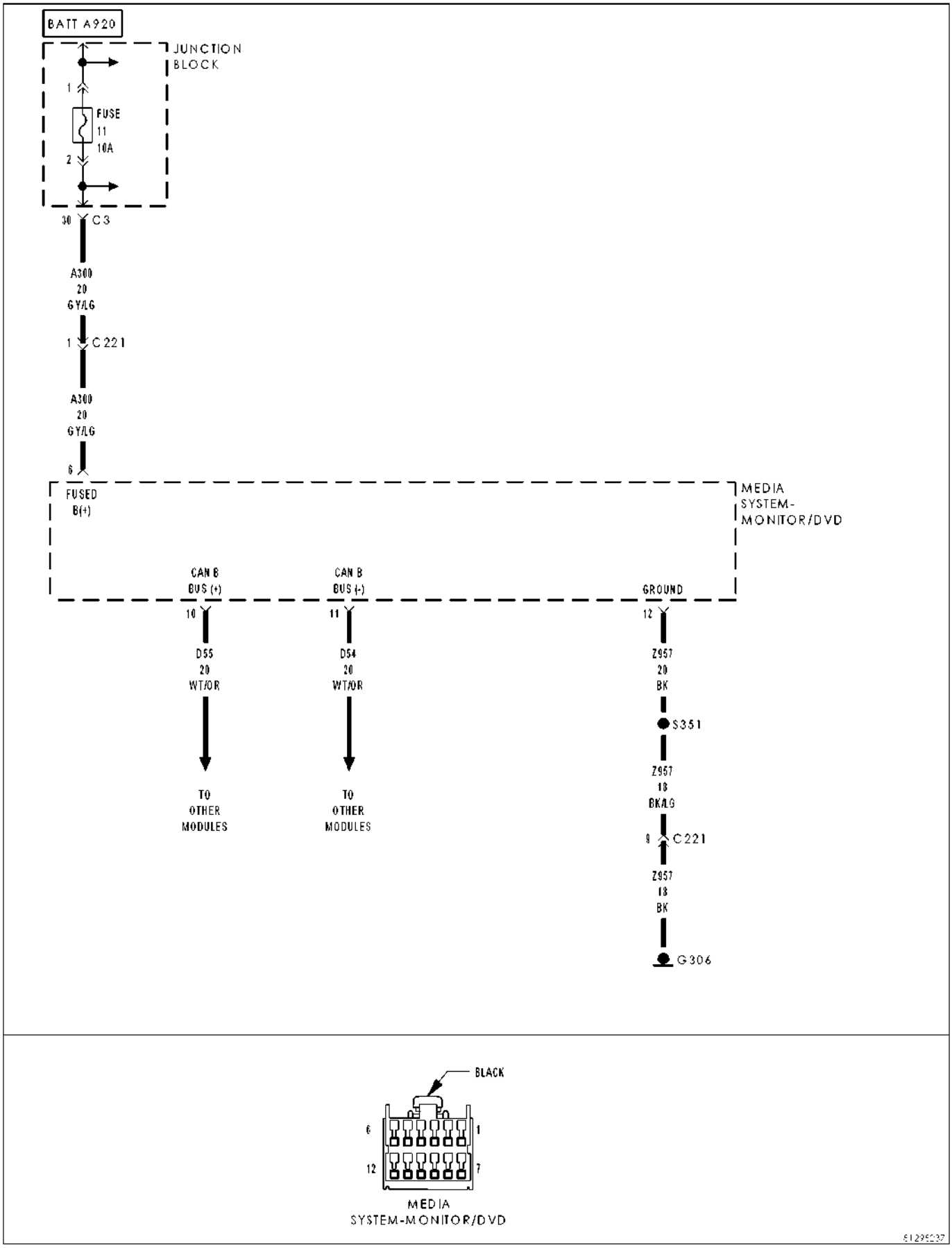
Does the test light illuminate brightly for each circuit?

Yes >> Replace and program the Powertrain Control Module in accordance with the service information.

No >> Repair the ground circuit for an open.

Perform the appropriate TRANSMISSION VERIFICATION TEST.

*NO RESPONSE FROM VES



***NO RESPONSE FROM VES (CONTINUED)**
For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
(A300) FUSED B (+) CIRCUIT OPEN OR SHORTED
(Z957) GROUND CIRCUIT OPEN
(D55) AND (D54) CAN B BUS CIRCUITS OPEN
MONITOR/DVD MEDIA SYSTEM (DVD PLAYER)

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.
With the scan tool, select ECU view.

NOTE: A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

Does the scan tool display a red X next to the module?

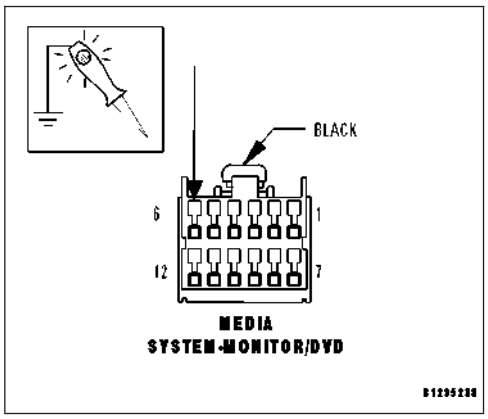
Yes >> Go To 2

No >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent , pushed out, and corroded terminals.

---

2. (A300) FUSED B(+) CIRCUIT OPEN OR SHORTED

Turn the ignition off.
Disconnect the Monitor/DVD Media System (DVD Player) harness connector.
Using a 12-volt test light connected to ground, check the (A300) Fused B(+) circuit.



Does the test light illuminate brightly?

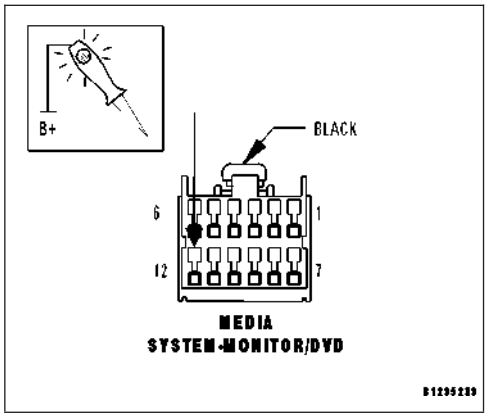
Yes >> Go To 3

No >> Repair the (A300) Fused B(+) circuit for an open or short. Perform BODY VERIFICATION TEST - VER 1.

***NO RESPONSE FROM VES (CONTINUED)**

3. (Z957) GROUND CIRCUIT OPEN

Using a 12-volt test light connected to 12-volts, check the (Z957) ground circuit.



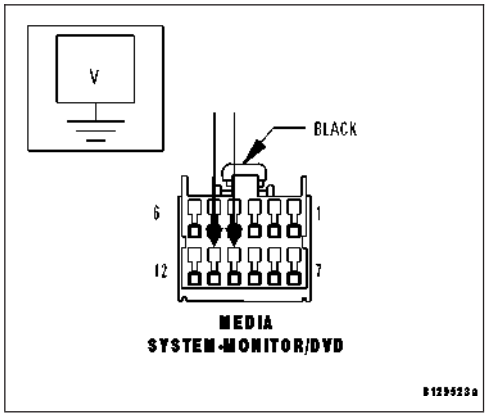
Does the test light illuminate brightly?

Yes >> Go To 4

No >> Repair the (Z957) ground circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

4. (D55) AND (D54) CAN B BUS CIRCUITS OPEN

NOTE: One open circuit will not cause this condition.
Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.
Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

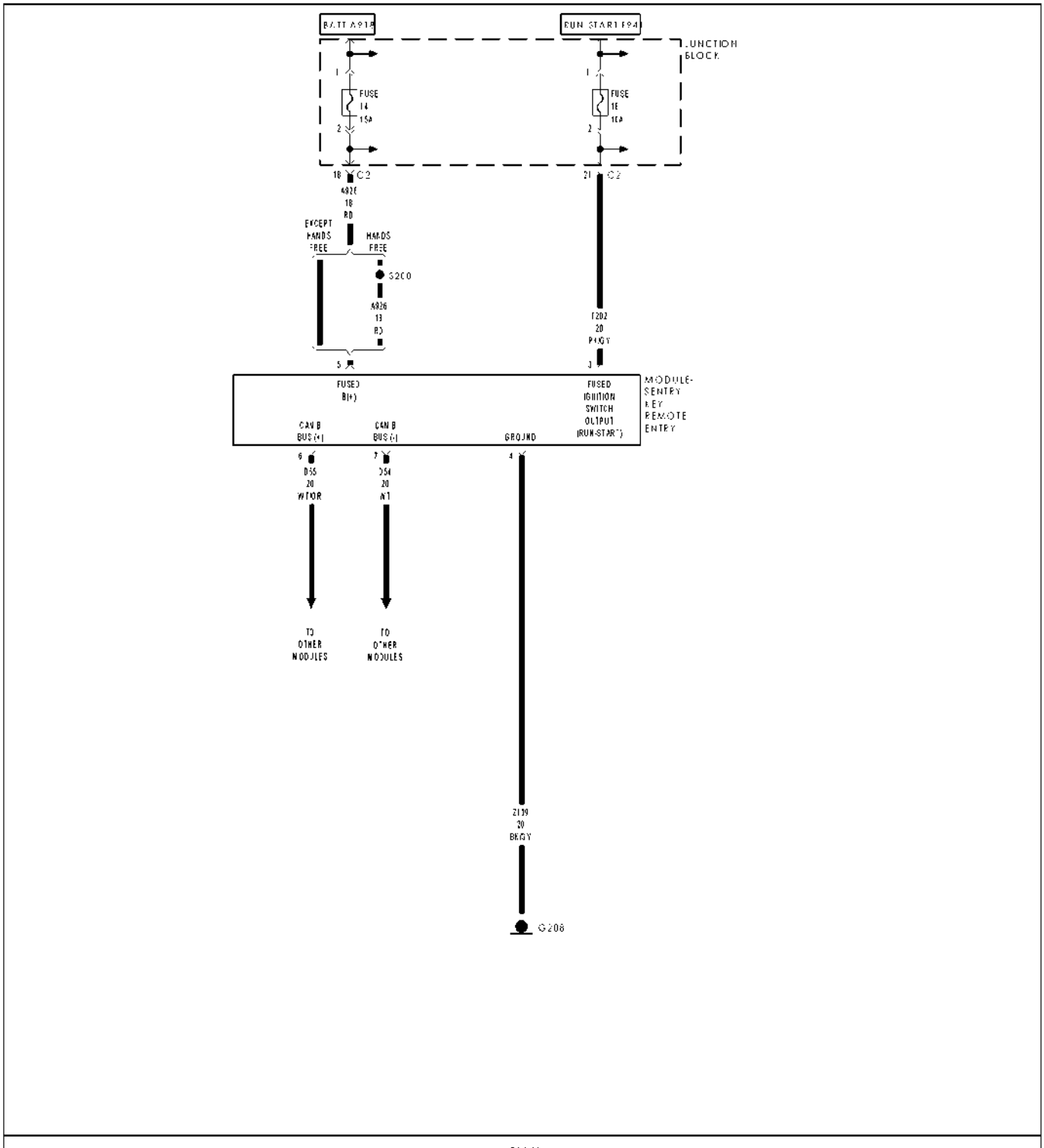


Is there any voltage present on either circuit?

Yes >> Replace the Monitor/DVD Media System (DVD Player) in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the (D55) and (D54) CAN B Bus circuits for an open. Inspect the connector for damage.
Perform BODY VERIFICATION TEST - VER 1.

*NO RESPONSE FROM WCM



***NO RESPONSE FROM WCM (CONTINUED)**
For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
(A926) FUSED B(+) CIRCUIT OPEN OR SHORTED
(Z109) GROUND CIRCUIT OPEN
(F202) FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN OR SHORTED
(D55) AND (D54) CAN B BUS CIRCUITS OPEN
SENTRY KEY REMOTE ENTRY MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.
With the scan tool, select ECU view.

NOTE: A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

Does the scan tool display a red X next to the module?

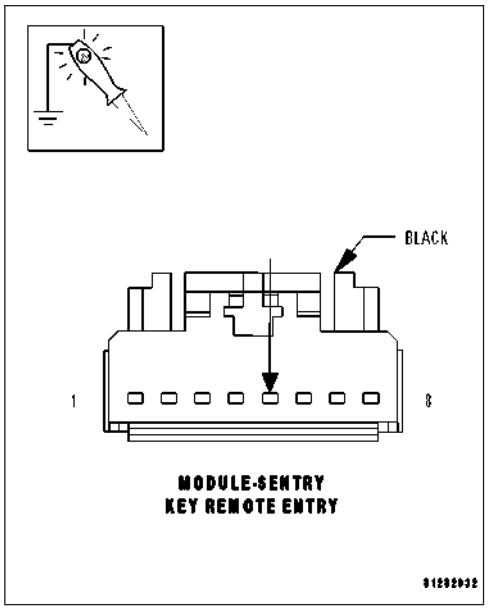
Yes >> Go To 2

No >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent , pushed out, and corroded terminals.

---

2. (A926) FUSED B(+) CIRCUIT OPEN OR SHORTED

Turn the ignition off.
Disconnect the Sentry Key Remote Entry Module harness connector.
Using a 12-volt test light connected to ground, check the (A926) Fused B(+) circuit.



Does the test light illuminate brightly?

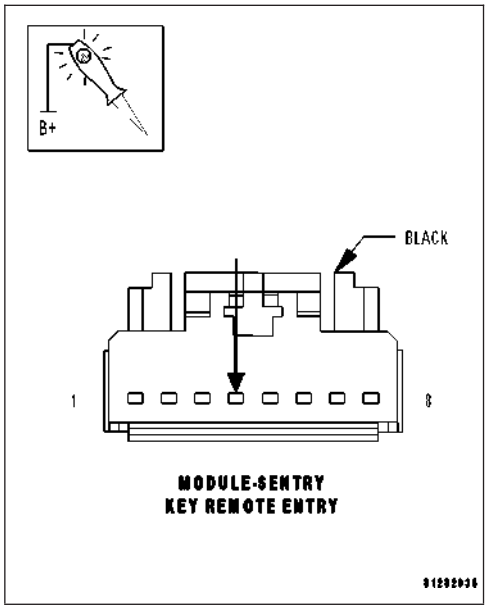
Yes >> Go To 3

No >> Repair the (A926) Fused B(+) circuit for an open or short. Perform BODY VERIFICATION TEST - VER 1.

***NO RESPONSE FROM WCM (CONTINUED)**

3. (Z109) GROUND CIRCUIT OPEN

Using a 12-volt test light connected to 12-volts, check the (Z109) ground circuit.



Does the test light illuminate brightly?

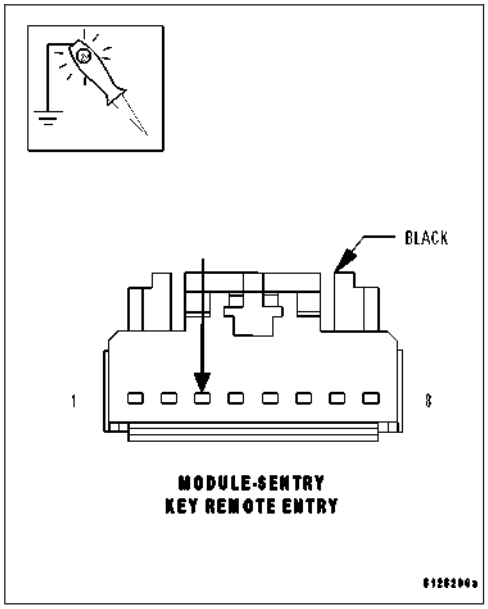
Yes >> Go To 4

No >> Repair the (Z109) ground circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

4. (F202) FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN OR SHORTED

Turn the ignition on.

Using a 12-volt test light connected to ground, check the (F202) Fused Ignition Switch Output circuit.



Does the test light illuminate brightly?

Yes >> Go To 5

No >> Repair the (F202) Fused Ignition Switch Output circuit for an open or short.
Perform BODY VERIFICATION TEST - VER 1.

*NO RESPONSE FROM WCM (CONTINUED)

5. (D55) AND (D54) CAN B BUS CIRCUITS OPEN

NOTE: One open circuit will not cause this condition.

Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.

Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

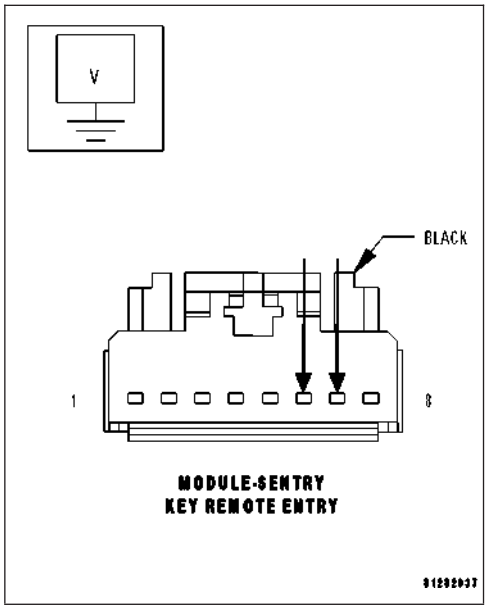
Is there any voltage present on either circuit?

Yes >> Replace the Sentry Key Remote Entry Module in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the (D55) and (D54) CAN B Bus circuits for an open. Inspect the connector for damage.

Perform BODY VERIFICATION TEST - VER 1.



ELECTRONIC CONTROL MODULES - SERVICE INFORMATION

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ELECTRONIC CONTROL MODULES - SERVICE INFORMATION

STANDARD PROCEDURE

PCM/SKREEM PROGRAMMING

NOTE: Before replacing the Powertrain Control Module (PCM), be certain to check the related component/ circuit integrity for failures not detected due to a double fault in the circuit. Most PCM driver/control circuit failures are caused by internal component failures (i.e. relays and solenoids) and shorted circuits (i.e. pull-ups, drivers, and switched circuits). These failures are difficult to detect when a double fault has occurred and only one DTC has been set.

When a Powertrain Control Module (PCM) and the Sentry Key REmote Entry Module (SKREEM) on vehicles equipped with the Sentry Key Immobilizer System (SKIS) are replaced at the same time, perform the following steps in order:

1. Program the new PCM.

2. Program the new SKREEM (also sometimes referred to as the Wireless Control Module or WCM).
3. Replace all ignition keys and program them into the new SKREEM/WCM.

PROGRAMMING THE PCM/SKREEM

The SKIS Secret Key is an ID code that is unique to each SKREEM/WCM. This code is programmed and stored in the SKREEM/WCM, the PCM, and each ignition key transponder chip. When the PCM or SKREEM/WCM is replaced, it is necessary to program the Secret Key into the new module using a diagnostic scan tool. Follow the programming steps outlined in the diagnostic scan tool for “PCM Replaced” or “WCM Replaced” under “Miscellaneous Functions” for the “WCM/Wireless Control Module” menu item as appropriate.

NOTE: Be certain to enter the correct country code for the SKREEM/WCM. If the incorrect country code is programmed into the SKREEM, it cannot be changed and the SKREEM must be replaced.

NOTE: If the PCM and the SKREEM/WCM are replaced at the same time, all vehicle ignition keys will need to be replaced and new keys programmed into the new SKREEM/WCM.

NOTE: Programming the PCM or SKREEM is done using a diagnostic scan tool and a PIN to enter secure access mode. If three attempts are made to enter secure access mode using an incorrect PIN, secure access mode will be locked out for one hour. To exit this lockout mode, turn the ignition to the RUN position for one hour then enter the correct PIN. (Ensure all accessories are turned OFF. Also monitor the battery state and connect a battery charger if necessary).

PROGRAMMING IGNITION KEYS TO THE SKREEM

Each ignition key transponder also has a unique ID code that is assigned at the time the key is manufactured. When a key is programmed into the SKREEM/WCM, the transponder ID code is learned by the module and the transponder acquires the unique Secret Key ID code from the SKREEM/WCM. To program ignition keys into the SKREEM/WCM, follow the programming steps outlined in the diagnostic scan tool for “Program Ignition Keys or Key FOBs” under “Miscellaneous Functions” for the “WCM/Wireless Control Module” menu item.

NOTE: A maximum of eight keys can be learned to each SKREEM. Once a key is learned to a SKREEM, that key has acquired the Secret Key for that SKREEM and cannot be transferred to any other SKREEM or vehicle.

If ignition key programming is unsuccessful, the scan tool will display one of the following error messages:

- **Programming Not Attempted** - The scan tool attempts to read the programmed key status and there are no keys programmed into SKREEM memory.
- **Programming Key Failed (Possible Used Key From Wrong Vehicle)** - SKREEM is unable to program an ignition key transponder due to one of the following:
  - The ignition key transponder is faulty.
  - The ignition key transponder is or has been already programmed to another vehicle.
- **8 Keys Already Learned, Programming Not Done** - The SKREEM transponder ID memory is full.
- **Learned Key In Ignition** - The ID for the ignition key transponder currently in the ignition lock cylinder is already programmed into SKREEM memory.

MODULE-ANTI-LOCK BRAKES

DESCRIPTION

The Antilock Brake Module (ABM) is a microprocessor which handles testing, monitoring and controlling the ABS brake system operation.

The ABM is mounted on the top of the hydraulic control unit (HCU). The ABM operates the ABS system and is separate from other vehicle electrical circuits. ABM voltage source is through CKT A111 (fused B+).

NOTE: If the ABM needs to be replaced, the rear axle type and tire revolutions per mile must be programed into the new ABM. For axle type refer to Group 3 Differential and Driveline. For tire revolutions per mile, (Refer to 22 - TIRES/WHEELS/TIRES - SPECIFICATIONS) . To program the ABM refer to the Appropriate Diagnostic Service Information.

OPERATION

SYSTEM SELF-TEST

When the ignition switch is turned-on the microprocessor is tested. If an error occurs during the test, a DTC will be set into the memory. However it is possible the DTC will not be stored in memory if the error has occurred in the module were the DTC's are stored.

The ABM contains a self check program that illuminates the ABS warning light when a system fault is detected. Faults are stored in memory and are accessible with the scan tool.

ABS faults remain in memory until cleared, or until after the vehicle is started approximately 50 times. Stored faults are **not** erased if the battery is disconnected.

ABM INPUTS

The ABM continuously monitors the speed of the vehicle by monitoring signals generated by the wheel speed sensors. The ABM determines a wheel locking tendency when it recognizes the axle is decelerating too rapidly. The ABM monitors the following inputs to determine when a wheel locking tendency may exists:

- Wheel Speed Sensors
- Brake Lamp Switch
- Brake Fluid Level Sensor
- G-Sensor (4X4 TCS)
- 4WD Switch (If equipped)

ABM OUTPUTS

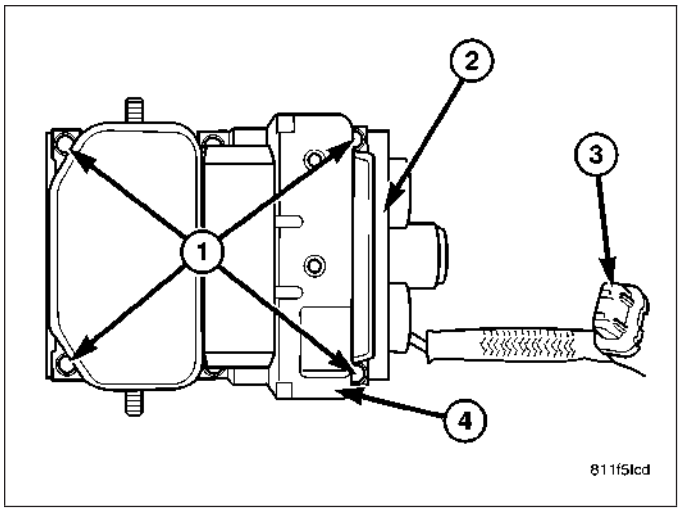
The ABM requests the following outputs for antilock braking and brake warning information from the CCN via CAN C Bus:

- ABS Warning Lamp
- Brake Warning Lamp

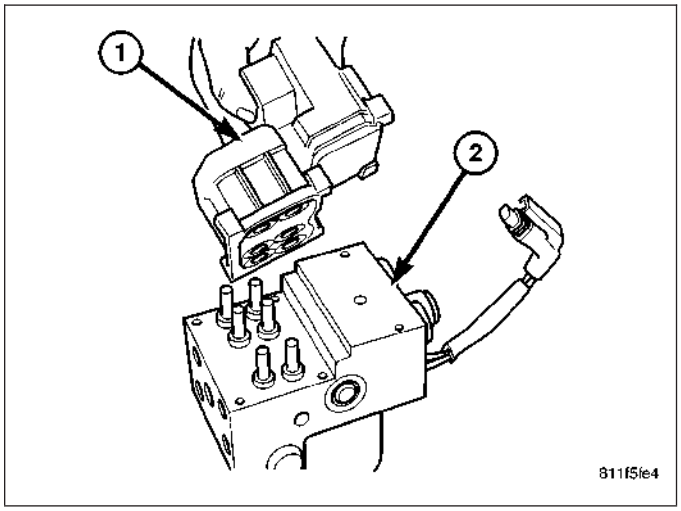
REMOVAL

NOTE: If the ABM needs to be replaced, the rear axle type and tire revolutions per mile must be programed into the new ABM. For axle type refer to Group 3 Differential and Driveline. For tire revolutions per mile, (Refer to 22 - TIRES/WHEELS/TIRES - SPECIFICATIONS). To program the ABM refer to the Appropriate Diagnostic Service Information.

1. Remove the HCU from the vehicle (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/HCU (HYDRAULIC CONTROL UNIT) - REMOVAL).
2. Remove the module mounting screws (1).
3. Disconnect the pump electrical connector (3) from the HCU (2).



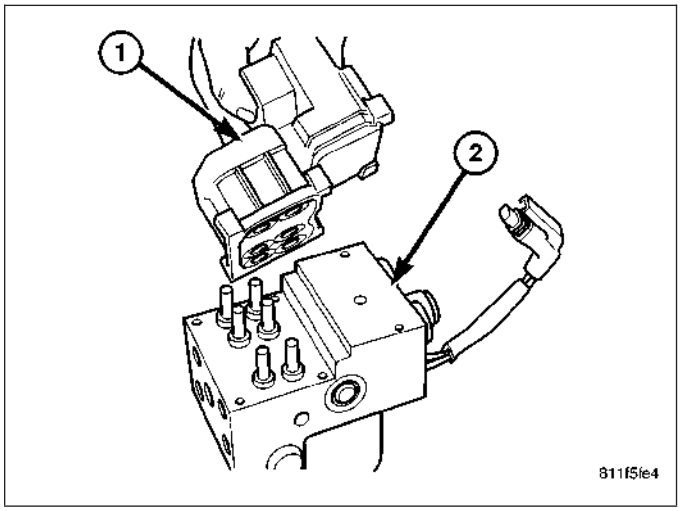
4. Remove the module (1) from the HCU (2).



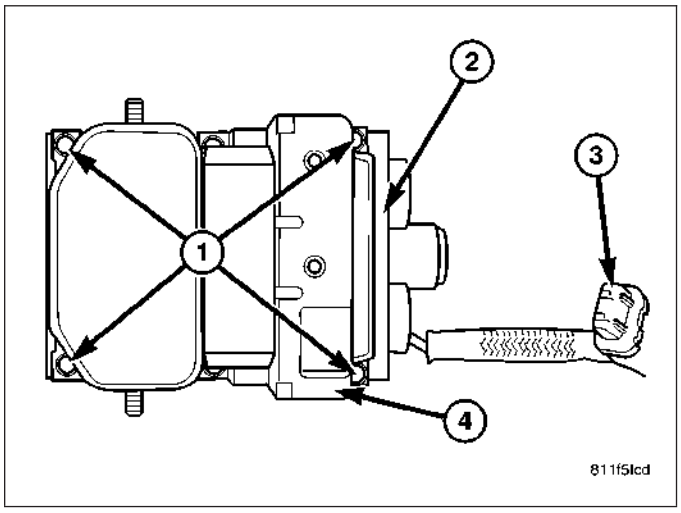
INSTALLATION

NOTE: If the ABM needs to be replaced, the rear axle type and tire revolutions per mile must be programed into the new ABM. For axle type refer to Group 3 Differential and Driveline. For tire revolutions per mile (Refer to 22 - TIRES/WHEELS/TIRES - SPECIFICATIONS). To program the ABM refer to the Appropriate Diagnostic Service Information.

1. Position the module (1) on the HCU (2).



2. Install the mounting screws (1) and tighten to 6 N·m (53 in. lbs).
3. Install the pump electrical connector (3) to the module (4).
4. Install the HCU to the vehicle (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/HCU (HYDRAULIC CONTROL UNIT) - INSTALLATION).



COMMUNICATION

DESCRIPTION

The Controller Area Network (CAN) is a serial data bus communication network used for interconnecting numerous electronic control modules throughout the vehicle in a two-wire multiplexed system. Within this context the term serial refers to electronic data that is transferred bit by bit, while bus refers to the shared wires through which that data is transferred. Multiplexing is any system that enables the transmission of multiple messages over a single channel or circuit. The communication protocol being used is a non-proprietary, open standard adopted from the Bosch CAN Specification 2.0b and uses an 11-bit message identifier.

There are actually three separate CAN bus systems used in the vehicle. They are designated: the CAN-B, the CAN-C and the Diagnostic CAN-C. The CAN-B and CAN-C systems provide on-board communication between all nodes in the vehicle. The CAN-C is the faster of the two systems providing near real-time communication (500 Kbps), but is less fault tolerant than the CAN-B system. The CAN-C is used exclusively for communications between critical powertrain and chassis nodes. The slower (83.3 Kbps), but more fault tolerant CAN-B system is

used for communications between body and interior nodes. The CAN-B fault tolerance comes from its ability to revert to a single wire communication mode if there is a fault in the bus wiring.

The Diagnostic CAN-C bus is also capable of 500 Kbps communication, and is sometimes informally referred to as the CAN-D system to differentiate it from the other high speed CAN-C bus. A central gateway or hub integral to the Front Control Module (FCM) physically and electrically isolates the three CAN buses from each other and coordinates the bi-directional transfer of messages between the three buses. The FCM is located on the Integrated Power Module (IPM), which is located in the engine compartment near the battery. The Diagnostic CAN-C is used exclusively for the transmission of diagnostic information between the FCM/gateway and a diagnostic scan tool connected to the industry-standard 16-way Data Link Connector (DLC) located beneath the instrument panel on the driver side of the vehicle.

Each node is connected in parallel to its CAN-B or CAN-C bus using a two-wire twisted pair. These wires are wrapped around each other to provide shielding from unwanted electromagnetic induction interfering with the relatively low voltage signals being carried through them. The twisted pairs have between 33 and 50 twists per meter. While the CAN bus is operating, one of the bus wires will carry a higher voltage and is referred to as the CAN High or CAN bus (+) wire, while the other bus wire will carry a lower voltage and is referred to as the CAN Low or CAN bus (–) wire. Each twisted pair terminates at the FCM/gateway.

The added speed of the CAN data bus is many times faster than previous data bus systems. This added speed facilitates the addition of more electronic control modules or nodes and the incorporation of many new electrical and electronic features in the vehicle. Like prior data bus systems, the CAN data bus minimizes redundant wiring connections; and, at the same time, reduces wire harness complexity, sensor current loads and controller hardware by allowing each sensing device to be connected to only one node. Each node reads, then broadcasts its sensor data over the bus for use by all other nodes requiring that data.

OPERATION

The Controller Area Network (CAN) data bus allows all electronic modules or nodes connected to the bus to share information with each other. Each node can both send and receive serial data simultaneously. The CAN bus signal lines have termination through a termination resistor within each node, either dominant or recessive. The serial data is made up of high and low voltage pulses strung together. Each string of voltage pulses forms a message.

Regardless of whether a message originates from a node on the medium speed CAN-B bus or on the high speed CAN-C bus, the message structure and layout is the same, which allows the Front Control Module (FCM)/Central GateWay (sometimes referred to as the FCMCGW) to process and transfer messages between the buses. The priority of each message is based upon the 11-bit message identifier. Each node uses arbitration to sort the message priority if two competing messages are attempting to be broadcast at the same time.

The FCM used in the CAN system has more control than a non-CAN FCM. Available options are configured into the FCM at the assembly plant, but additional options can be added in the field using the diagnostic scan tool. The configuration settings are stored in non-volatile memory. The FCM also has two 64-bit registers, which register each of the “as-built” and “currently responding” nodes on the CAN-B and CAN-C buses. The FCM stores a Diagnostic Trouble Code (DTC) in one of two caches for any detected active or stored faults in the order in which they occur. One cache stores powertrain (P-Code), chassis (C-Code) and body (B-Code) DTCs, while the second cache is dedicated to storing network (U-Code) DTCs.

If there are intermittent or active faults in the CAN network, a diagnostic scan tool connected to the Diagnostic CAN-C bus through the 16-way Data Link Connector (DLC) may only be able to communicate with the FCM. To aid in CAN network diagnosis, the FCM will provide CAN-B and CAN-C network status information to the scan tool using certain diagnostic signals. In addition, the transceiver in each node on the CAN-C bus will identify a “bus off hardware failure,” while the transceiver in each node on the CAN-B bus will identify a “general bus hardware failure.” The transceivers for some CAN-B nodes will also identify “bus shorted high,” “bus shorted low,” “bus open” or “bus shorted together” failures for both CAN-B bus signal wires.

In order to minimize the potential effects of Ignition-Off Draw (IOD), the CAN-B network employs a sleep strategy. However, a network sleep strategy should not be confused with the sleep strategy of the individual nodes on that network, as they may differ. For example: The CAN-C bus network is awake only when the ignition switch is in the On or Start positions; however, the FCM or the Transmission Control Module (TCM), which are on the CAN-C bus, may still be awake with the ignition switch in the Accessory or Unlock positions. The integrated circuitry of an individual node may be capable of processing certain sensor inputs and outputs without the need to utilize network resources.

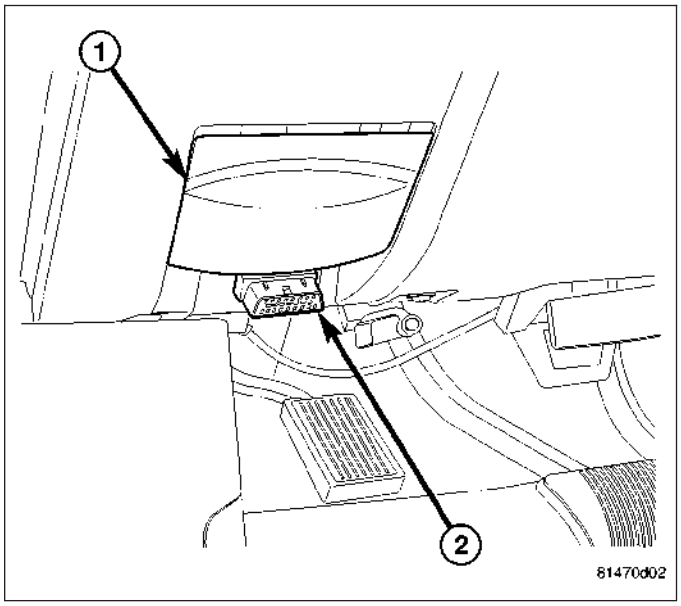
The CAN-B bus network remains active until all nodes on that network are ready for sleep. This is determined by the network using tokens in a manner similar to polling. When the last node that is active on the network is ready

for sleep, and it has already received a token indicating that all other nodes on the bus are ready for sleep, it broadcasts a “bus sleep acknowledgment” message that causes the network to sleep. Once the CAN-B bus network is asleep, any node on the bus can awaken it by transmitting a message on the network. The FCM will keep either the CAN-B or the CAN-C bus awake for a timed interval after it receives a diagnostic message for that bus over the Diagnostic CAN-C bus.

DATA LINK CONNECTOR

DESCRIPTION

The Data Link Connector (DLC) (2) is a 16-way molded plastic connector insulator on a dedicated take out of the instrument panel wire harness. This connector is located at the lower edge of the instrument panel, outboard of the steering column. The connector insulator is retained by integral snap features within a rectangular cutout in the lower instrument panel reinforcement, just below the park brake release handle (1).



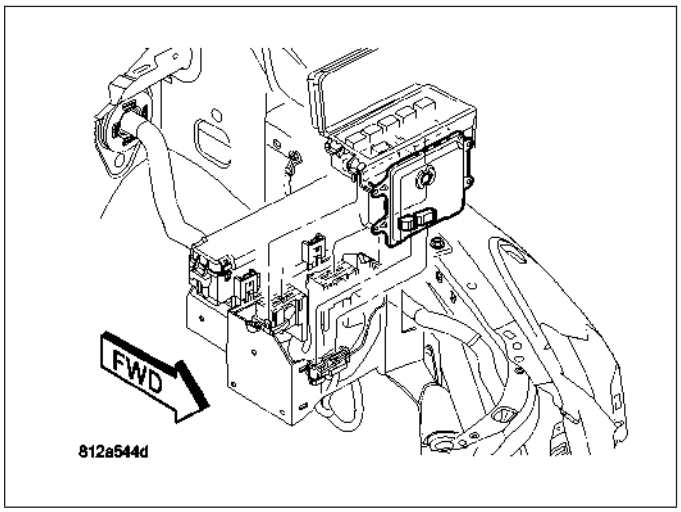
OPERATION

The Data Link Connector (DLC) is an industry-standard 16-way connector that permits the connection of a diagnostic scan tool to the Controller Area Network (CAN) for interfacing with, configuring, and retrieving Diagnostic Trouble Code (DTC) data from the electronic modules that reside on the data bus network of the vehicle.

MODULE-FRONT CONTROL

DESCRIPTION

The Front Control Module (FCM) is a micro controller based module located in the left front corner of the engine compartment. The front control module mates to the power distribution center to form the Integrated Power Module (IPM). The IPM connects directly to the battery and provides the primary means of circuit protection and power distribution for all vehicle electrical systems. The front control module controls power to some of these vehicle systems electrical and electromechanical loads based on inputs received from hard wired switch inputs and data received on the CAN bus circuit.



OPERATION

As messages are sent over the CAN bus circuit, the Front Control Module (FCM) reads these messages and controls power to some of the vehicles electrical systems by completing the circuit to ground (low side driver) or completing the circuit to 12 volt power (high side driver). The following functions are controlled by the FCM:

- Front turn signals
- Stop, turn signal and tail lamps
- Front and rear hazard warning lamps
- Headlamps
- Fog Lamps
- Daytime running lamps - if equipped
- Horn
- Windshield and liftgate wiper and washer systems
- Transfer case shifting
- Trailer tow wiring output
- Rear window defroster power and timing
- Air conditioning condenser cooling fan

The FCM provides the following features for the above function:

- It provides a illuminated approach feature that turns the headlamps on when the vehicle is unlocked with the Remote Keyless Entry (RKE) transmitter.
- It flashes lamps in response to turn signal, RKE and Vehicle Theft Security System (VTSS) inputs.
- It sounds the horn in response to RKE and VTSS inputs.
- It turns off the horn in the event of excessively long operation that could otherwise damage the horn.
- It turns off the windshield washer motor after 10 seconds of continuous operation to protect the motor.
- It minimizes voltage variations to the headlamps to extend bulb life and to equalize the light output from the lamps, which might otherwise differ due to variations in wiring resistance.
- If the headlamps are left on, it automatically turns them off after eight minutes to protect the battery from discharge.It monitors battery voltage and turns off non-essential functions such as the fog lamps, rear window defogger, and heated seats if necessary to conserve battery power.
- It operates the high-beam headlamps at reduced intensity by pulse-width modulation of the power supply to provide the daytime running lamps.
- It provides the variable delay intermittent windshield and liftgate wiper time delay features, and the vehicle speed sensitive windshield wiper delay variation.
- It acts as a link between the CAN bus network for critical powertrain and anti-lock brake systems and the network for body and interior modules.

DIAGNOSIS AND TESTING

BODY VERIFICATION TEST – VER 1

Diagnostic Test

1. **Perform Body Verification Test**

Disconnect all jumper wires and reconnect all previously disconnected components and connectors.

Ensure that all accessories are turned off.

Ensure that the battery is fully charged.

Turn the ignition on.

With the scan tool, record and erase DTCs from all modules.

If an electronic control module was replaced, select the applicable module from the scan tool menu and press “Misc. Functions”. If the module has programable features, program as necessary.

If repairs were made to any of the HVAC door actuator circuits, with the scan tool in HVAC, select System Tests and then select Actuator DTC Detection. The test must pass before proceeding to the next step.

If repairs were made to any of the HVAC doors, linkage, door actuators, or door actuator circuits, with the scan tool in HVAC, select System Tests and then select Actuator Calibration Test. The test must pass before proceeding to the next step.

Turn the ignition off, wait 10 seconds, and then turn the ignition on.

Operate all functions of the system that caused the original concern.

With the scan tool, select ECU View.

Check for DTCs in the modules.

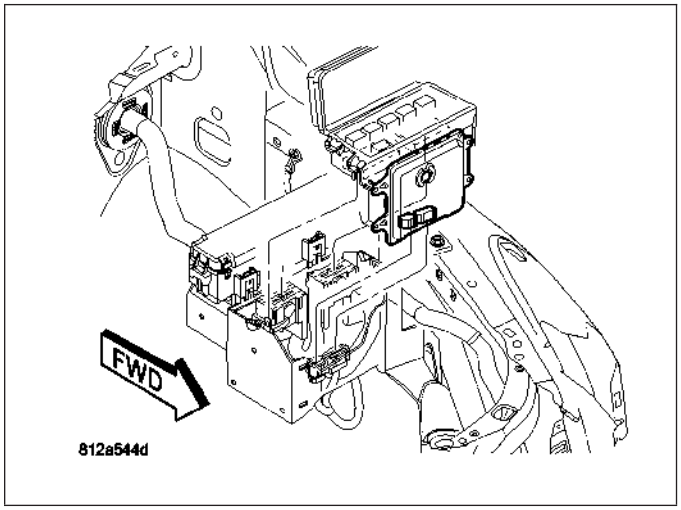
Are DTCs present in any of the modules or is the original condition still present?

Yes >> The repair is not complete. Refer to the related category for the DTC or symptom that is still present.

No >> The repair is complete.

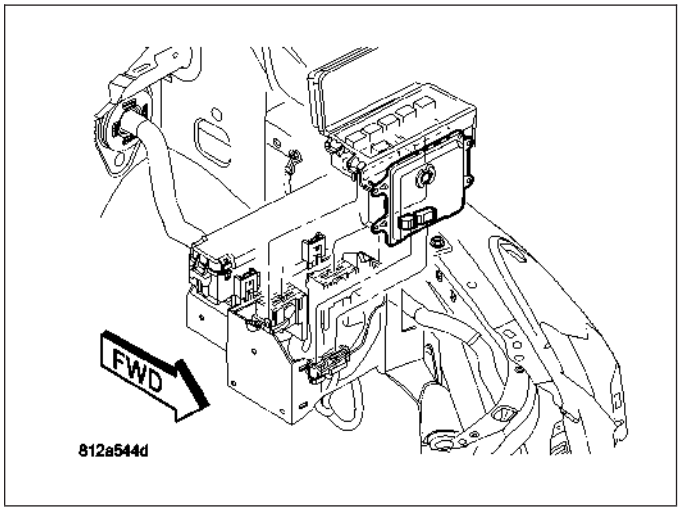
REMOVAL

1. Disconnect the positive and negative battery cables from the battery.
2. Partially remove the Integrated Power Module (IPM) from the engine compartment.
3. Remove the front control module retaining screws.
4. Pull the front control module straight from the IPM.



INSTALLATION

1. Press the Front Control Module (FCM) onto the Integrated Power Module (IPM).
2. Install the mounting fasteners.
3. Install the IPM.
4. Connect the positive and negative battery cables.



MODULE-MEMORY MIRROR

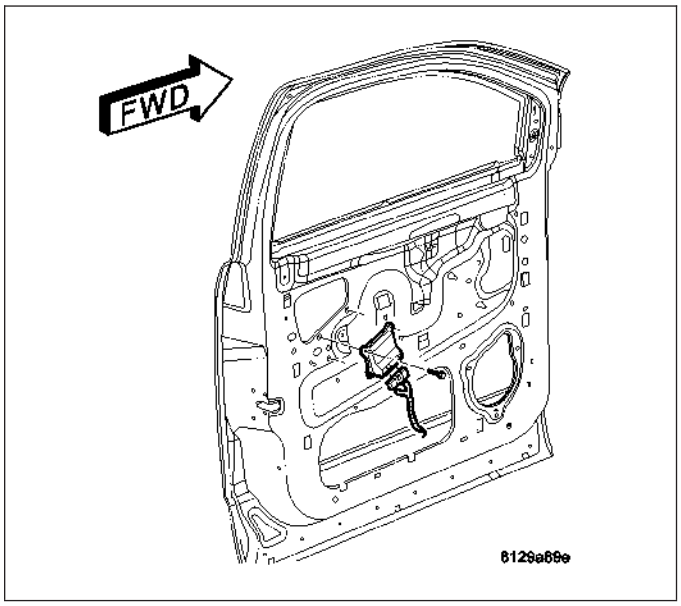
DESCRIPTION

There are two Memory Mirror Modules (these are sometimes referred to as Driver Door Modules (DDM) and Passenger Door Modules (PDM) within the memory system. One located in the driver door and one in the passenger door, just behind the door trim panel. The modules send a bus message to the power mirrors to adjust them to a preset position when a memory recall request has been made.

The memory mirror modules also act as an interface in each door for electrical functions (door lock switches and door ajar switches).

The **Memory System** makes available for immediate recall personalized preferences of the following:

- Automatic temperature control settings.
- Outside mirror positions.
- Power adjustable brake and accelerator pedal position.
- Power seat horizontal, vertical, recliner, and easy entry positions.
- Radio push button station selections.



The major components of the **Memory System** are:

- **Memory Selector Switch** - located in the driver door trim panel.
- **Driver Memory Mirror Module (DMMM)** - located in the driver door, behind the trim panel.
- **Passenger Memory Mirror Module (PMMM)** - located in the passenger door, behind the trim panel.
- **Sentry Key Remote Entry Module (SKREEM)** - located at ignition key cylinder.
- **Remote Keyless Entry (RKE) Transmitter** - located with ignition key.
- **Memory Seat Module (MSM)** - located underneath the driver seat and also controls the Adjustable Pedals.
- **Radio** - located in the instrument panel center stack.
- **Automatic Temperature Control (ATC)** - located in the instrument panel center stack.

The memory recall is available at the press of a button on the drivers door trim panel or, by using the Remote Keyless Entry (RKE) transmitter if it is programmed to trigger the recall.

Radio settings include up to 20 push button presets (10 AM and 10 FM), and the last station selection, even if it is not one of the 20 preset selections.

OPERATION

The memory mirror module receives input from the door lock switches and sends that message to the cluster for door lock operation (vehicles equipped with memory system only). It also controls the mirror adjustment by receiving input from the mirror switch on the door trim panel. Sensors in the mirrors act as inputs to the memory mirror module in order to position the mirrors to presets by the driver(s). The power supply to the mirrors is supplied by the mirror memory modules. On vehicles equipped with a memory system, the front door ajar switches are inputs to the memory mirror module. The modules use this information for door lock inhibit etc.

A memory setting is saved by pressing the “set” button, then pressing either the memory “1” or “2” button within 5 seconds of pressing the “set” button.

A memory setting is recalled by pressing either the memory “1” or “2” button, or by pressing the unlock button on a “linked” Remote Keyless Entry (RKE) transmitter.

For driver safety, memorized settings can not be recalled if the transmission is in a position other than Park or the seat belt is latched.

Both driver and passenger modules provide active and stored Diagnostic Trouble Codes (DTC’s) to aid in diagnosis.

Both modules are identical in appearance with the exception of an extra ground wire on the driver side memory mirror module.

DIAGNOSIS AND TESTING

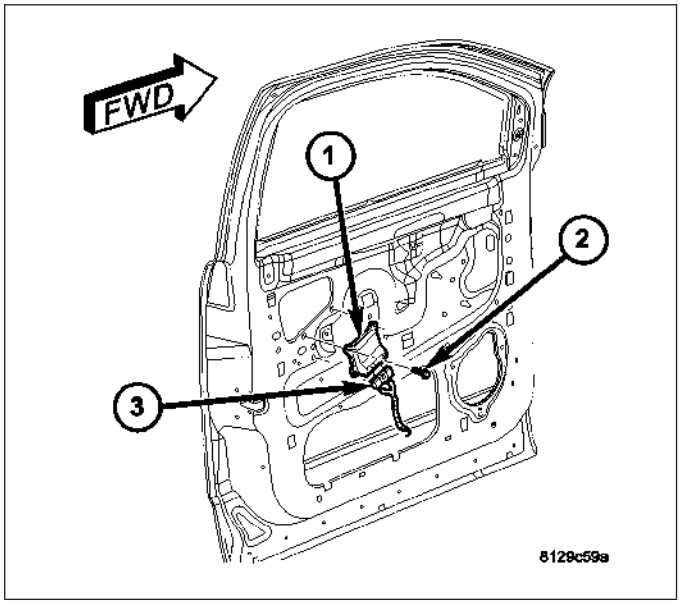
MEMORY MIRROR MODULE

Any diagnosis of the memory mirror module should begin with the use of a scan tool and the appropriate Diagnostic information.

Refer to the appropriate wiring information.

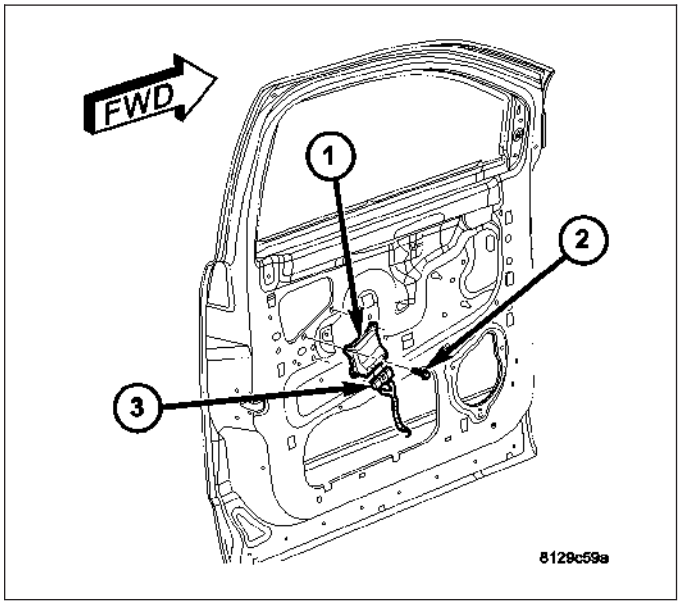
REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Remove the door trim panel (Refer to 23 - BODY/ DOOR - FRONT/TRIM PANEL - REMOVAL).
3. Disconnect the electrical connector (3) from module (1).
4. Remove fasteners (2) and module (1) from vehicle.



INSTALLATION

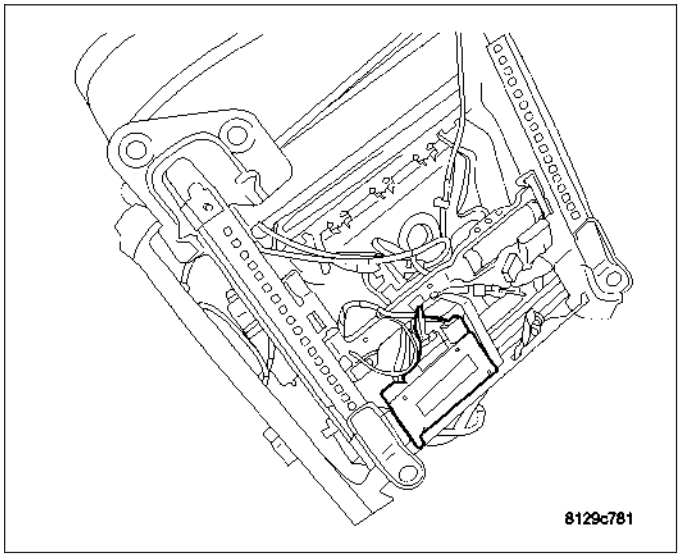
1. Position module (1) on door and install fasteners (2).
2. Connect the electrical connector (3) to module (1).
3. Install the door trim panel (Refer to 23 - BODY/ DOOR - FRONT/TRIM PANEL - INSTALLATION).
4. Connect the battery negative cable.
5. Verify system and vehicle operation.



MODULE-SEAT MEMORY

DESCRIPTION

The Memory Seat Module (MSM) is located underneath the driver seat, towards the front and on the outboard side. It is used in conjunction with the other modules in the memory system (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/MEMORY HEATED SEAT/MIRROR MODULE - DESCRIPTION) to recall the seat to one of two preset seat functional adjustments (horizontal, vertical, and recliner). The switch for the memory seat programming and selection mounts on the driver door trim panel. The MSM also controls the adjustable pedals, both for the memory and manual functionality. The adjustable accelerator and brake pedals are available on SLT and Limited models. On Limited, their positioning can be stored for recall by the memory system, allowing for two drivers to have unique, pre-programmed settings.



OPERATION

POWER/MEMORY SEAT

The memory seat module receives input from the 8-way power seat switch, the driver seat position sensors, adjustable pedal control circuits (switch, sensor, and motor), and the data bus circuit. The memory switch, is wired to the memory mirror module which sends the message over the data bus.

The memory seat module performs the following functions:

- Positions the driver seat (vertical, horizontal, and recliner positions) and adjustable pedals.
- Sends the memory save or recall (#1 or #2) command over the data bus circuit to the memory mirror modules, HVAC, and radio.
- Provides for “linking” the key FOBs to memory.

- Provides for the easy entry/exit feature.
- Provides the tilt mirrors in reverse feature

When a memory button is pressed (#1 or #2) on the memory switch, the driver door memory mirror module sends a recall message to the memory seat module (MSM). Then the MSM will position the driver seat and adjustable pedals to its preprogrammed location/setting. When the Remote Keyless Entry (RKE) Transmitter button is pressed, depending on which transmitter (#1 or #2), the SKREEM (RKE Receiver) sends the recall request and FOB number (#1 or #2) data message. This RKE transmitter function depends on if the MSM is programmed to trigger the recall (linked FOBs).

A memory setting is saved by pressing the “set “ button, then pressing either the memory “1” or “2” button within 5 seconds of pressing the “set” button.

A memory setting is recalled by pressing either the memory “1” or “2” button, or by pressing the unlock button on a “linked” Remote Keyless Entry (RKE) transmitter.

For driver safety, memorized settings can not be recalled if the transmission is in any position other than park or the seat belt is latched.

A key FOB is “linked” to a memory setting by pressing the “set” button and then pressing either the memory “1” or “2” button within 5 seconds of pressing the set button, then by pressing the “lock” button on the selected key FOB.

Easy Entry and Exit provides the driver with more room for entry or exit from the vehicle. The Easy Entry and Exit feature is disabled when the vehicle leaves the factory. An authorized dealer can enable this feature. Operation of the Easy Entry and Exit function is as follows:

- If the seat is in a memorized position, it will move back a predetermined distance when the driver removes the key from the ignition switch. This new position for the seat is the Easy Exit position for that driver. The seat may not move to an easy entry/exit position, if it is already position at or behind a predetermined point for the seat. This limited travel avoids obstructed customer exit/entry from behind the driver’s rear door post.
- The seat will move forward to a memory position when the driver turns the vehicle’s ignition switch out of the LOCK position.
- The tilt mirrors in reverse feature provides for tilting the sideview (outside) mirrors down a predetermined angle, providing a better view of the ground next to the rear portion of the vehicle. The tilt mirrors in reverse feature is disabled when the vehicle leaves the factory. An authorized dealer can enable this feature. Operation of the tilt mirrors is as follows:
  - − Sideview mirrors will tilt down when the vehicle transmission is shifted into Reverse.
  - − Sideview mirrors will return to the original position when the vehicle transmission is shifted out of Reverse.

ADJUSTABLE PEDALS

The pedals swing on a large arc, the radius and angle of which were selected on the basis of ergonomic studies, that puts them in the proper position for use by the smaller driver - higher and angled upward as well as rearward. Powered by the small electric motor driving a gear train at each pedal, adjustment is precise, quiet, and smooth throughout the range. A paddle-type switch on the instrument panel to the left of the steering column actuates the electric motor-driven mechanism through the memory seat module (MSM). Pushing up the paddle brings the pedals closer and vice versa. Movement stops when the switch is released. MSM logic prevents pedal adjustment when the automatic speed control (cruise control) is set (controlling speed), and when the transmission is in reverse. This feature protects against a loss of reference position when neither foot is on the pedal.

DIAGNOSIS AND TESTING

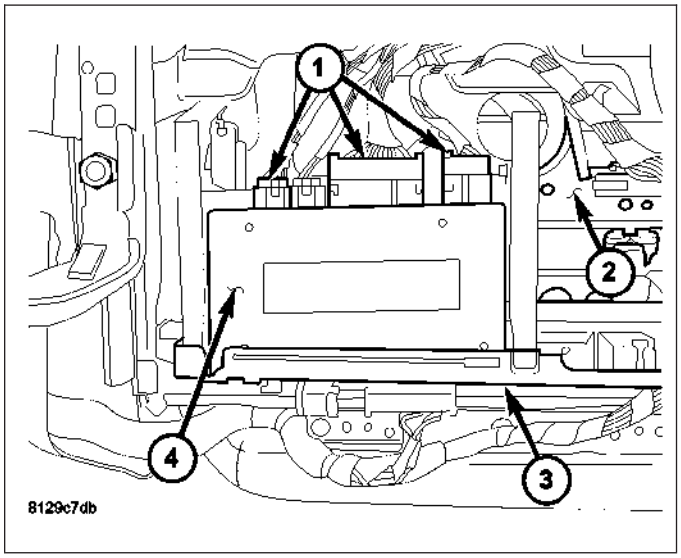
MEMORY SEAT MODULE

Any diagnosis of the memory seat system/module should begin with, the use of a scan tool and the appropriate diagnostic service information.

Refer to the appropriate wiring information.

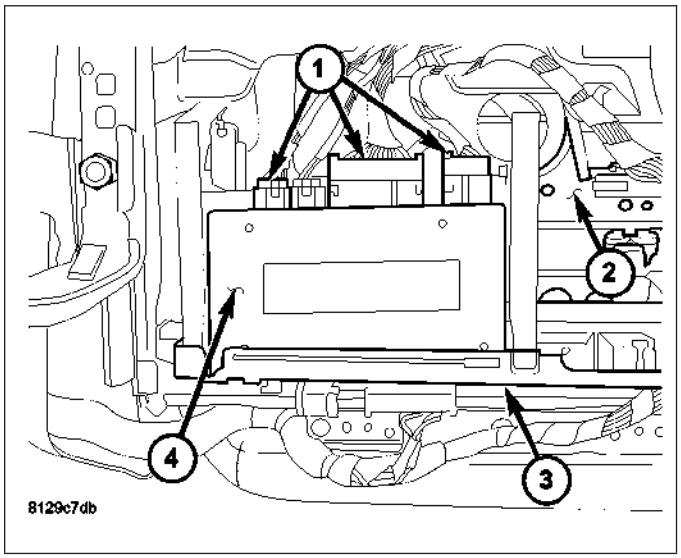
REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Remove the driver seat cushion/cover (2) (Refer to 23 - BODY/SEATS/SEAT CUSHION/COVER - FRONT - REMOVAL).
3. Unsnap the memory seat module (4) from the side brackets.
4. Pivot the module upward and disconnect the electrical connectors (1).
5. Pull the module rearward to remove it from the front of the seat frame (3).



INSTALLATION

1. Place the module (4) into position making sure the front snaps into the seat frame (3).
2. Connect the memory seat module harness connectors (1).
3. Pivot the module (4) downward and snap it into place in the side brackets.
4. Install the driver seat cushion/cover (2) (Refer to 23 - BODY/SEATS/SEAT CUSHION COVER - FRONT - INSTALLATION).
5. Connect the battery negative cable.
6. Verify system and vehicle operation.

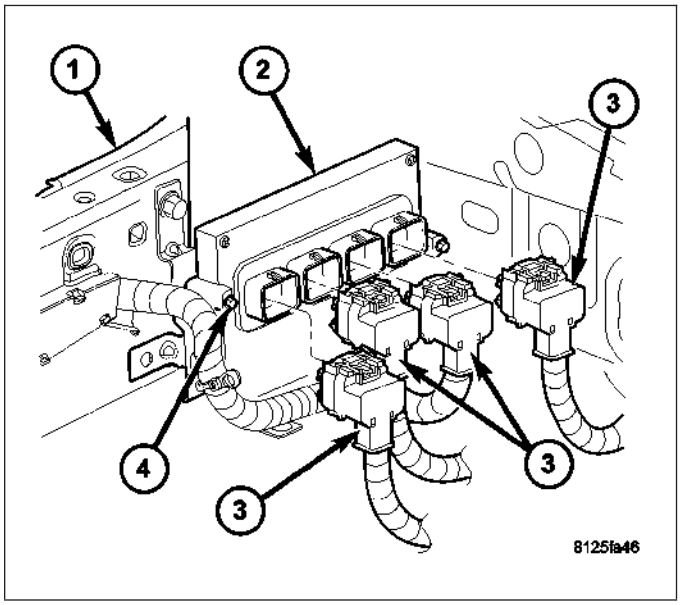


MODULE-POWERTRAIN CONTROL

DESCRIPTION

DESCRIPTION

The PCM (2) is attached to the right-front inner fender (1) located in the engine compartment.



MODES OF OPERATION

As input signals to the Powertrain Control Module (PCM) change, the PCM adjusts its response to the output devices.

The PCM will operate in two different modes: **Open Loop and Closed Loop**.

During Open Loop modes, the PCM receives input signals and responds only according to preset PCM programming. Input from the oxygen (O2S) sensors is not monitored during Open Loop modes.

During Closed Loop modes, the PCM will monitor the oxygen (O2S) sensors input. This input indicates to the PCM whether or not the calculated injector pulse width results in the ideal air-fuel ratio. This ratio is 14.7 parts air-to-1 part fuel. By monitoring the exhaust oxygen content through the O2S sensor, the PCM can fine tune the injector pulse width. This is done to achieve optimum fuel economy combined with low emission engine performance.

The fuel injection system has the following modes of operation:

- Ignition switch ON
- Engine start-up (crank)
- Engine warm-up
- Idle
- Cruise
- Acceleration
- Deceleration
- Wide open throttle (WOT)
- Ignition switch OFF

The ignition switch On, engine start-up (crank), engine warm-up, acceleration, deceleration and wide open throttle modes are Open Loop modes. The idle and cruise modes, (with the engine at operating temperature) are Closed Loop modes.

IGNITION SWITCH (KEY-ON) MODE

This is an Open Loop mode. When the fuel system is activated by the ignition switch, the following actions occur:

- The PCM pre-positions the idle air control (IAC) motor.
- The PCM determines atmospheric air pressure from the MAP sensor input to determine basic fuel strategy.
- The PCM monitors the engine coolant temperature sensor input. The PCM modifies fuel strategy based on this input.
- Intake manifold air temperature sensor input is monitored.
- Throttle position sensor (TPS) is monitored.
- The auto shutdown (ASD) relay is energized by the PCM for approximately three seconds.
- The fuel pump is energized through the fuel pump relay by the PCM. The fuel pump will operate for approximately three seconds unless the engine is operating or the starter motor is engaged.
- The O2S sensor heater element is energized via the ASD relay. The O2S sensor input is not used by the PCM to calibrate air-fuel ratio during this mode of operation.

ENGINE START-UP MODE

This is an Open Loop mode. The following actions occur when the starter motor is engaged.

The PCM receives inputs from:

- Battery voltage
- Engine coolant temperature sensor
- Crankshaft position sensor
- Intake manifold air temperature sensor
- Manifold absolute pressure (MAP) sensor
- Throttle position sensor (TPS)
- Starter motor relay
- Camshaft position sensor signal

The PCM monitors the crankshaft position sensor. If the PCM does not receive a crankshaft position sensor signal within 3 seconds of cranking the engine, it will shut down the fuel injection system.

The fuel pump is activated by the PCM through the fuel pump relay.

Voltage is applied to the fuel injectors with the ASD relay via the PCM. The PCM will then control the injection sequence and injector pulse width by turning the ground circuit to each individual injector on and off.

The PCM determines the proper ignition timing according to input received from the crankshaft position sensor.

ENGINE WARM-UP MODE

This is an Open Loop mode. During engine warm-up, the PCM receives inputs from:

- Battery voltage
- Crankshaft position sensor
- Engine coolant temperature sensor
- Intake manifold air temperature sensor
- Manifold absolute pressure (MAP) sensor
- Throttle position sensor (TPS)
- Camshaft position sensor signal
- Park/neutral switch (gear indicator signal—auto. trans. only)
- Air conditioning select signal (if equipped)
- Air conditioning request signal (if equipped)

Based on these inputs the following occurs:

- Voltage is applied to the fuel injectors with the ASD relay via the PCM. The PCM will then control the injection sequence and injector pulse width by turning the ground circuit to each individual injector on and off.
- The PCM adjusts engine idle speed through the idle air control (IAC) motor and adjusts ignition timing.
- The PCM operates the A/C compressor clutch through the clutch relay. This is done if A/C has been selected by the vehicle operator and requested by the A/C thermostat.

- When engine has reached operating temperature, the PCM will begin monitoring O2S sensor input. The system will then leave the warm-up mode and go into closed loop operation.

IDLE MODE

When the engine is at operating temperature, this is a Closed Loop mode. At idle speed, the PCM receives inputs from:

- Air conditioning select signal (if equipped)
- Air conditioning request signal (if equipped)
- Battery voltage
- Crankshaft position sensor
- Engine coolant temperature sensor
- Intake manifold air temperature sensor
- Manifold absolute pressure (MAP) sensor
- Throttle position sensor (TPS)
- Camshaft position sensor signal
- Battery voltage
- Park/neutral switch (gear indicator signal—auto. trans. only)
- Oxygen sensors

Based on these inputs, the following occurs:

- Voltage is applied to the fuel injectors with the ASD relay via the PCM. The PCM will then control injection sequence and injector pulse width by turning the ground circuit to each individual injector on and off.
- The PCM monitors the O2S sensor input and adjusts air-fuel ratio by varying injector pulse width. It also adjusts engine idle speed through the idle air control (IAC) motor.
- The PCM adjusts ignition timing by increasing and decreasing spark advance.
- The PCM operates the A/C compressor clutch through the clutch relay. This happens if A/C has been selected by the vehicle operator and requested by the A/C thermostat.

CRUISE MODE

When the engine is at operating temperature, this is a Closed Loop mode. At cruising speed, the PCM receives inputs from:

- Air conditioning select signal (if equipped)
- Air conditioning request signal (if equipped)
- Battery voltage
- Engine coolant temperature sensor
- Crankshaft position sensor
- Intake manifold air temperature sensor
- Manifold absolute pressure (MAP) sensor
- Throttle position sensor (TPS)
- Camshaft position sensor signal
- Park/neutral switch (gear indicator signal—auto. trans. only)
- Oxygen (O2S) sensors

Based on these inputs, the following occurs:

- Voltage is applied to the fuel injectors with the ASD relay via the PCM. The PCM will then adjust the injector pulse width by turning the ground circuit to each individual injector on and off.
- The PCM monitors the O2S sensor input and adjusts air-fuel ratio. It also adjusts engine idle speed through the idle air control (IAC) motor.
- The PCM adjusts ignition timing by turning the ground path to the coil on and off.
- The PCM operates the A/C compressor clutch through the clutch relay. This happens if A/C has been selected by the vehicle operator and requested by the A/C thermostat.

ACCELERATION MODE

This is an Open Loop mode. The PCM recognizes an abrupt increase in throttle position or MAP pressure as a demand for increased engine output and vehicle acceleration. The PCM increases injector pulse width in response to increased throttle opening.

DECELERATION MODE

When the engine is at operating temperature, this is an Open Loop mode. During hard deceleration, the PCM receives the following inputs.

- Air conditioning select signal (if equipped)
- Air conditioning request signal (if equipped)
- Battery voltage
- Engine coolant temperature sensor
- Crankshaft position sensor
- Intake manifold air temperature sensor
- Manifold absolute pressure (MAP) sensor
- Throttle position sensor (TPS)
- Camshaft position sensor signal
- Park/neutral switch (gear indicator signal—auto. trans. only)
- Vehicle speed sensor

If the vehicle is under hard deceleration with the proper rpm and closed throttle conditions, the PCM will ignore the oxygen sensor input signal. The PCM will enter a fuel cut-off strategy in which it will not supply a ground to the injectors. If a hard deceleration does not exist, the PCM will determine the proper injector pulse width and continue injection.

Based on the above inputs, the PCM will adjust engine idle speed through the idle air control (IAC) motor.

The PCM adjusts ignition timing by turning the ground path to the coil on and off.

WIDE OPEN THROTTLE MODE

This is an Open Loop mode. During wide open throttle operation, the PCM receives the following inputs.

- Battery voltage
- Crankshaft position sensor
- Engine coolant temperature sensor
- Intake manifold air temperature sensor
- Manifold absolute pressure (MAP) sensor
- Throttle position sensor (TPS)
- Camshaft position sensor signal

During wide open throttle conditions, the following occurs:

- Voltage is applied to the fuel injectors with the ASD relay via the PCM. The PCM will then control the injection sequence and injector pulse width by turning the ground circuit to each individual injector on and off. The PCM ignores the oxygen sensor input signal and provides a predetermined amount of additional fuel. This is done by adjusting injector pulse width.
- The PCM adjusts ignition timing by turning the ground path to the coil on and off.

IGNITION SWITCH OFF MODE

When ignition switch is turned to OFF position, the PCM stops operating the injectors, ignition coil, ASD relay and fuel pump relay.

5 VOLT SUPPLIES

Two different Powertrain Control Module (PCM) five volt supply circuits are used; primary and secondary.

IGNITION CIRCUIT SENSE

This circuit ties the ignition switch to the Powertrain Control Module (PCM). Battery voltage is supplied to the PCM through the ignition switch when the ignition is in the Run or Start position. This is referred to as the “ignition sense” circuit and is used to “wake up” the PCM.

POWER GROUNDS

The Powertrain Control Module (PCM) has 2 main grounds. Both of these grounds are referred to as power grounds. All of the high-current, noisy, electrical devices are connected to these grounds as well as all of the sensor returns. The sensor return comes into the sensor return circuit, passes through noise suppression, and is then connected to the power ground.

The power ground is used to control ground circuits for the following PCM loads:

- Generator field winding
- Fuel injectors
- Ignition coil(s)
- Certain relays/solenoids
- Certain sensors

SENSOR RETURN

The Sensor Return circuits are internal to the Powertrain Control Module (PCM).

Sensor Return provides a low–noise ground reference for all engine control system sensors. Refer to Power Grounds for more information.

SIGNAL GROUND

Signal ground provides a low noise ground to the data link connector.

OPERATION

POWERTRAIN CONTROL MODULE (PCM)

The PCM is a pre-programmed, microprocessor digital computer. It regulates ignition timing, air-fuel ratio, emission control devices, charging system, certain transmission features, speed control, air conditioning compressor clutch engagement and idle speed. The PCM can adapt its programming to meet changing operating conditions.

The PCM receives input signals from various switches and sensors. Based on these inputs, the PCM regulates various engine and vehicle operations through different system components. These components are referred to as Powertrain Control Module (PCM) Outputs. The sensors and switches that provide inputs to the PCM are considered Powertrain Control Module (PCM) Inputs.

The PCM adjusts ignition timing based upon inputs it receives from sensors that react to: engine rpm, manifold absolute pressure, engine coolant temperature, throttle position, transmission gear selection (automatic transmission), vehicle speed and the brake switch.

The PCM adjusts idle speed based on inputs it receives from sensors that react to: throttle position, vehicle speed, transmission gear selection, engine coolant temperature and from inputs it receives from the air conditioning clutch switch and brake switch.

Based on inputs that it receives, the PCM adjusts ignition coil dwell. The PCM also adjusts the generator charge rate through control of the generator field and provides speed control operation.

NOTE: PCM Inputs:

- Accelerator pedal position sensor (if equipped)
- A/C request (if equipped with factory A/C)
- A/C select (if equipped with factory A/C)
- Auto shutdown (ASD) sense
- Battery temperature
- Battery voltage

- Brake switch
- CAN bus (+) circuits
- CAN bus (-) circuits
- Camshaft position sensor signal
- Clutch Interlock Switch (if equipped)
- Crankshaft position sensor
- Data link connection for diagnostic scan tool
- EGR position sensor (if equipped)
- Engine coolant temperature sensor
- Fuel level
- Generator (battery voltage) output
- Ignition circuit sense (ignition switch in on/off/crank/run position)
- Intake manifold air temperature sensor
- Knock sensor(s) (if equipped)
- Leak detection pump (switch) sense (if equipped)
- Manifold absolute pressure (MAP) sensor
- Oil pressure sensor
- Output shaft speed sensor
- Overdrive/override switch
- Oxygen sensors
- Park/neutral switch (auto. trans. only)
- Power ground
- Power steering pressure switch (if equipped)
- Sensor return
- Signal ground
- Speed control multiplexed single wire input
- Throttle position sensor
- Transmission governor pressure sensor
- Transmission output speed sensor
- Transmission temperature sensor
- Vehicle speed inputs from ABS or RWAL system

NOTE: PCM Outputs:

- A/C clutch relay
- Auto shutdown (ASD) relay
- CAN bus (+/-) circuits for: speedometer, voltmeter, fuel gauge, oil pressure gauge/lamp, engine temp. gauge and speed control warn. lamp
- Data link connection for diagnostic scan tool
- Double start override (if equipped)
- EGR valve control solenoid (if equipped)
- Electronic throttle control
- EVAP canister purge solenoid
- Five volt sensor supply (primary)
- Five volt sensor supply (secondary)
- Fuel injectors
- Fuel pump relay
- Generator field driver (-)
- Generator field driver (+)
- Generator lamp (if equipped)
- Idle air control (IAC) motor
- Ignition coil(s)

- CAN bus circuits
- Leak detection pump (if equipped)
- Malfunction indicator lamp (Check engine lamp). Driven through CAN bus circuits.
- Overdrive indicator lamp (if equipped)
- Radiator cooling fan (if equipped)
- Speed control vacuum solenoid
- Speed control vent solenoid
- Starter relay
- Tachometer (if equipped). Driven through CAN bus circuits.
- Transmission convertor clutch circuit
- Transmission 3-4 shift solenoid
- Transmission relay
- Transmission temperature lamp (if equipped)
- Transmission variable force solenoid

5 VOLT SUPPLIES

Primary 5–volt supply:

- supplies the required 5 volt power source to the Crankshaft Position (CKP) sensor.
- supplies the required 5 volt power source to the Camshaft Position (CMP) sensor.
- supplies a reference voltage for the Manifold Absolute Pressure (MAP) sensor.
- supplies a reference voltage for the Throttle Position Sensor (TPS) sensor.

Secondary 5–volt supply:

- supplies the required 5 volt power source to the oil pressure sensor.
- supplies the required 5 volt power source for the Vehicle Speed Sensor (VSS) (if equipped).
- supplies the 5 volt power source to the transmission pressure sensor (if equipped with an RE automatic transmission).

IGNITION CIRCUIT SENSE

The ignition circuit sense input tells the PCM the ignition switch has energized the ignition circuit.

Battery voltage is also supplied to the PCM through the ignition switch when the ignition is in the RUN or START position. This is referred to as the ″ignition sense″ circuit and is used to ″wake up″ the PCM. Voltage on the ignition input can be as low as 6 volts and the PCM will still function. Voltage is supplied to this circuit to power the PCM’s 8-volt regulator and to allow the PCM to perform fuel, ignition and emissions control functions.

REMOVAL

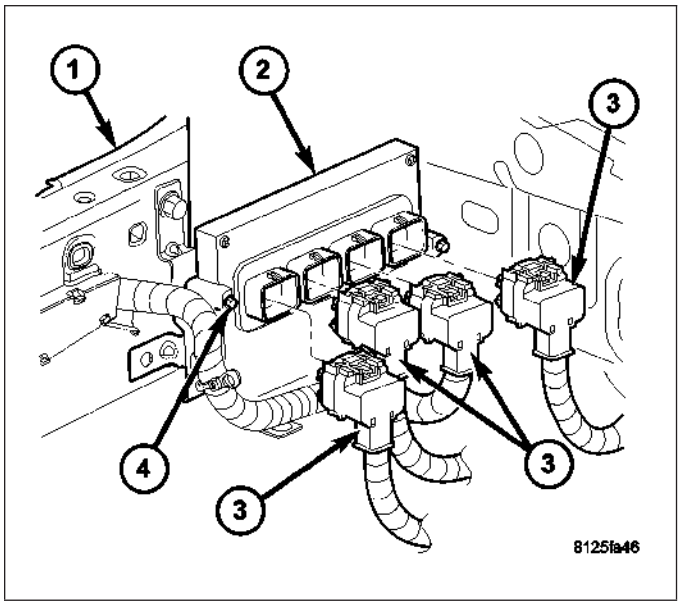
CAUTION: Certain ABS systems rely on having the Powertrain Control Module (PCM) broadcast the Vehicle Identification Number (VIN) over the bus network. To prevent problems of DTCs and other items related to the VIN broadcast, it is recommend that you disconnect the ABS CAB (controller) temporarily when replacing the PCM. Once the PCM is replaced, write the VIN to the PCM using the DRB scan tool. This is done from the engine main menu. Arrow over to the second page to “1. Miscellaneous”. Select “Check VIN” from the choices. Make sure it has the correct VIN entered before continuing. When the VIN is complete, turn off the ignition key and reconnect the ABS module connector. This will prevent the setting of DTCs and other items associated with the lack of a VIN detected when you turn the key ON after replacing the PCM.

CAUTION: Use the DRB scan tool to reprogram the new PCM with the vehicles original identification number (VIN) and the vehicles original mileage. If this step is not done, a Diagnostic Trouble Code (DTC) may be set.

The PCM (2) is attached to the right-front inner fender (1) located in the engine compartment.

To avoid possible voltage spike damage to the PCM, ignition key must be off, and negative battery cable must be disconnected before unplugging PCM connectors.

1. Disconnect and isolate the negative battery cable.
2. Remove both wiper arms. Refer to Wipers/Washers section.
3. Remove wiper cowl (two screws, four pins).
4. Remove wiper cowl support (three bolts).
5. Remove air intake tube (four nuts).
6. Carefully unplug the four 38-way connectors (3) from PCM.
7. Remove three PCM mounting bolts (4), and remove PCM from vehicle.

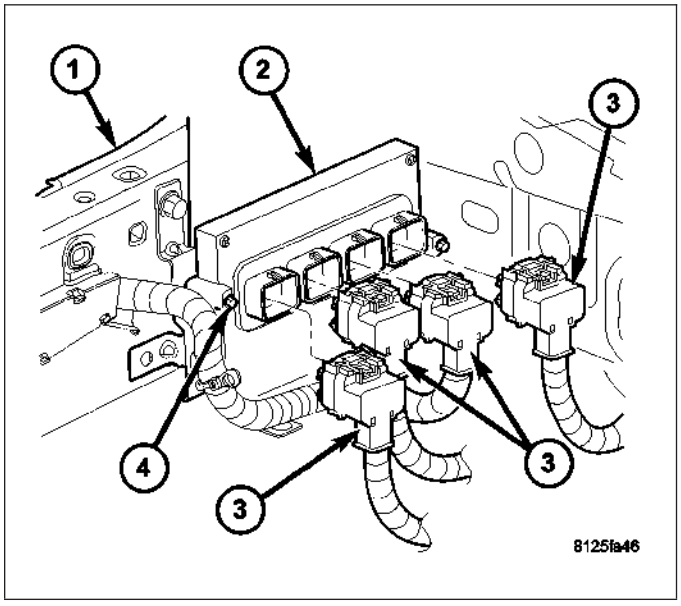


INSTALLATION

CAUTION: Certain ABS systems rely on having the Powertrain Control Module (PCM) broadcast the Vehicle Identification Number (VIN) over the bus network. To prevent problems of DTCs and other items related to the VIN broadcast, it is recommend that you disconnect the ABS CAB (controller) temporarily when replacing the PCM. Once the PCM is replaced, write the VIN to the PCM using the DRB scan tool. This is done from the engine main menu. Arrow over to the second page to "1. Miscellaneous". Select "Check VIN" from the choices. Make sure it has the correct VIN entered before continuing. When the VIN is complete, turn off the ignition key and reconnect the ABS module connector. This will prevent the setting of DTCs and other items associated with the lack of a VIN detected when you turn the key ON after replacing the PCM.

CAUTION: Use the DRB scan tool to reprogram the new PCM with the vehicles original identification number (VIN) and the vehicles original mileage. If this step is not done, a Diagnostic Trouble Code (DTC) may be set.

1. Position PCM (2) to vehicle.
2. Install three PCM mounting bolts (4).
3. Tighten bolts to 3–5 N·m (30–40 in. lbs.).
4. Check pin connectors in the PCM. Also check the four 38–way connectors (3) for corrosion or damage. Repair as necessary.
5. Install the four 38–way connectors (3) to PCM.
6. Install air intake tube (four nuts).
7. Install wiper cowl support (three bolts).
8. Install wiper cowl (two screws, four pins).
9. Install both wiper arms. Refer to Wipers/Washers section.
10. Connect negative battery cable.
11. **Use the diagnostic scan tool to reprogram new PCM with vehicles original Identification Number (VIN) and original vehicle mileage. If this step is not done, a Diagnostic Trouble Code (DTC) may be set.**

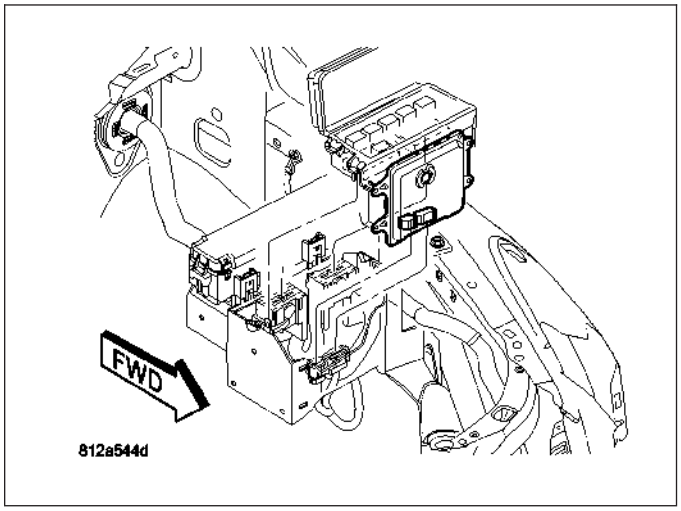


MODULE-TRANSFER CASE CONTROL

DESCRIPTION

The Front Control Module (FCM) contains the software to control the electric shift transfer cases in this vehicle. A separate Transfer Case Control Module (TCCM) is not used. The FCM is a microprocessor-based assembly, controlling the 4X4 transfer case shift functions via the actuation of a shift motor and utilizing the feedback of a mode sensor assembly. Communication is via the CAN bus. Inputs include user selectable 4X4 modes that include AWD, 4LOCK, 4LO, and Neutral.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DESCRIPTION) for additional information.



OPERATION

The Front Control Module (FCM) utilizes the input from the transfer case mounted mode sensor, the instrument panel mounted selector switch, and the following information from the vehicle's CAN bus to determine if a shift is allowed.

- Engine RPM and Vehicle Speed
- Diagnostic Requests
- Manual Transmission Clutch Switch
- Brake Applied
- PRNDL
- Ignition Status
- ABS Messages

Once the FCM determines that a requested shift is allowed, it actuates the bi-directional shift motor as necessary to achieve the desired transfer case operating mode. The FCM also monitors the mode sensor while controlling the shift motor to determine the status of the shift attempt.

Several items can cause the requested shift not to be completed. If the FCM has recognized a fault (DTC) of some variety, it will begin operation in one of four Functionality Levels. These levels are:

- **Level Zero** - Normal Operation.
- **Level One** - Only Mode Shifts Are Allowed.
- **Level Two** - Only Mode Shifts and Shifts Into LOW Are Allowed (No Neutral Shifts Are Allowed).
- **Level Three** - No Shifts Are Allowed

The FCM can also be operating in one of three possible power modes. These power modes are:

- **Full Power Mode** is the normal operational mode of the module. This mode is achieved by normal CAN bus traffic being present and the ignition being in the RUN position.
- **Reduced Power Mode** will be entered when the ignition has been powered off. In this state, the module will shut down power supplied to external devices, and to electronic interface inputs and outputs. From this state the module can enter either Sleep Mode or Full Power Mode. To enter this mode, the module must receive an ignition message denoting that the ignition is off, or not receive any messages for 5 ±0.5 seconds. To exit this mode, the module must receive one ignition message that denotes that the ignition is in the RUN position.
- **Sleep Mode** will be entered, from the Reduced Power Mode, when no CAN traffic has been sensed for 20 ±1 seconds. If during Sleep Mode the module detects CAN bus traffic, it will revert to the Reduced Power mode while monitoring for ignition messages. It will remain in this state as long as there is traffic other than run or start messages, and will return to Sleep mode if the bus goes without traffic for 20 ±1 seconds.

SHIFT REQUIREMENTS

If the FCM is in full power mode and at functionality level zero, it uses the following criteria to determine if a shift is allowed.

If any of the driver controllable conditions are not met once the shift request is recognized, the FCM may illuminate one or more of the 4WD system message icons in the instrument cluster display.

Mode shifts will be allowed regardless of transmission gear or vehicle speed, whenever the following conditions are met:

- Ignition key switch is in the RUN position.
- Front and rear wheel speed are within 21 km/hr (13 mph).
- A change in the Selector switch state indicates that a mode shift has been requested.
- A valid mode sensor signal is being sensed by the FCM.
- Proper transmit/receive messages are occurring on the CAN bus.
- An Anti-lock Brake System (ABS) event is not in progress.

Range shifts will be allowed only if all of the following conditions are met:

- Ignition key switch is in the RUN position.
- Front and rear wheel speed are within 21 km/hr (13 mph).
- A change in the Selector Switch state indicating a range shift has been requested.
- Transmission in NEUTRAL signal must be recognized for at least 1.5 seconds ±100 msec. (Automatic transmissions only)
- Proper transmit/receive messages are occurring on the CAN bus.
- Clutch signal is recognized for 500 msec ± 50 msec (Manual transmissions only).
- Vehicle speed is less than or equal to 4.8 km/hr (3 miles per hour).
- A valid mode sensor signal is being sensed by the FCM.
- An Anti-lock Brake System (ABS) event is not in progress.

A **shift into transfer case Neutral** will be allowed only if all of the following conditions are met:

- Ignition key switch is in the RUN position, engine off.
- Front and rear wheel speed are within 21 km/hr (13 mph).
- The recessed Neutral Selection switch has been depressed continuously for 4.0 seconds ±100 msec while all shift conditions have been continuously met.
- Transmission in NEUTRAL signal recognized from the bus. (Automatic transmissions only)
- Clutch signal is recognized from the bus (Manual transmissions only).
- Proper message transmissions/receptions are occurring on the CAN bus.
- Vehicle speed is less than or equal to 4.8 km/hr (3 miles per hour).
- Foot Brake is applied.
- A valid mode sensor signal is being sensed by the FCM.
- An Anti-lock Brake System (ABS) event is not in progress.

A **shift out of transfer case Neutral** will be allowed only if all of the following conditions are met:

- Ignition key switch is in the RUN position.
- Front and rear wheel speed are within 21 km/hr (13 mph).
- The recessed Neutral Selection switch has been depressed continuously for 1.0 seconds ±100 msec while all shift conditions have been continuously met.
- Transmission in NEUTRAL signal recognized from the bus. (Automatic transmissions only)
- Clutch signal is recognized from the bus (Manual transmissions only).
- Proper message transmissions/receptions are occurring on the CAN bus.
- Vehicle speed is less than or equal to 4.8 km/hr (3 miles per hour).
- A valid mode sensor signal is being sensed by the FCM.
- An Anti-lock Brake System (ABS) event is not in progress.

LAMP STRATEGY

The following strategy for the FCM controlled transfer case system uses the instrument cluster VF display's 4LOCK, 4LO, Service 4WD, and Mode Switch Transfer Case Neutral LED. Flashing any of the lamps or LED is accomplished at a 2Hz rate.

NOTE: There is no lamp for the AWD position. If no 4WD system message icons are illuminated in the instrument cluster, the operator is to assume that the transfer case is in the AWD position.

- AWD to 4LO - Successful shifts will flash 4LO during a shift, then after the 4LO position has been met, display the 4LO lamp solid. In the blocked condition, flash the 4LO lamp during the 5 Phase 1 shift attempts. After 5 unsuccessful attempts, the transfer case remains in AWD and no lamps are illuminated. When shift conditions are not met, no shift attempts are made and the 4LO lamp is flashing.
- AWD to 4LOCK - Successful shifts will flash 4LOCK during a shift, then after the 4LOCK position has been met, display the 4LOCK lamp solid. In the blocked condition, flash the 4LOCK lamp during the 5 Phase 1 shift attempts. After 5 unsuccessful attempts, the transfer case remains in AWD and no lamps are illuminated. When shift conditions are not met, no shift attempts are made and the 4LOCK lamp is flashing.
- 4LOCK to 4LO - Successful shifts will turn off the 4LOCK lamp and flash 4LO during a shift, then after the 4LO position has been met, display the 4LO lamp solid. In the blocked condition, turn off 4LOCK and flash the 4LO lamp during the 5 Phase 1 shift attempts. After 5 unsuccessful attempts, the transfer case remains in 4LOCK and the 4LOCK lamp turns on solid. When shift conditions are not met, the 4LOCK lamp remains illuminated solid and the 4LO lamp is flashing.
- 4LOCK to AWD - Successful shifts will flash the 4LOCK lamp during a shift, then after the AWD position has been met, turn off the 4LOCK lamp. In the blocked condition, flash the 4LOCK lamp during the 5 Phase 1 shift attempts. After 5 unsuccessful attempts, the transfer case remains in 4LOCK and the 4LOCK lamp turns on solid. When shift conditions are not met, no shift attempts are made and the 4LOCK lamp is flashing.
- 4LO to AWD - Successful shifts will flash the 4LO lamp during a shift, then after the AWD position has been met, turn off the 4LO lamp. In the blocked condition, flash the 4LO lamp during the 5 Phase 1 shift attempts. After 5 unsuccessful attempts, the transfer case remains in 4LO and the 4LO lamp turns on solid. When shift conditions are not met, no shift attempts are made and the 4LO lamp is flashing.
- 4LO to 4LOCK - Successful shifts will turn off the 4LO lamp and flash 4LOCK during a shift, then after the 4LOCK position has been met, display the 4LOCK lamp solid. In the blocked condition, turn off 4LO and flash the 4LOCK lamp during the 5 Phase 1 shift attempts. After 5 unsuccessful attempts, the transfer case remains in 4LO and the 4LO lamp turns on solid. When shift conditions are not met, the 4LO lamp remains illuminated solid and 4LOCK is flashing.
- AWD to NEUTRAL - Successful shifts have no lamps illuminated, then after the NEUTRAL position has been met, display the NEUTRAL LED solid. In the blocked condition, no lamps are illuminated during the 5 Phase 1 attempts. After 5 unsuccessful attempts, the transfer case remains in AWD and no lamps are illuminated. When shift conditions are not met, flash the NEUTRAL lamp while the push button is depressed.
- 4LOCK to NEUTRAL - Successful shifts have no lamps illuminated, then after the NEUTRAL position has been met, display the NEUTRAL LED solid. In the blocked condition, no lamps are illuminated during the 5 Phase 1 attempts. After 5 unsuccessful attempts, the transfer case remains in 4LOCK and the 4LOCK lamp is illuminated. When shift conditions are not met, flash the NEUTRAL lamp while the push button is depressed.
- 4LO to NEUTRAL - Successful shifts have no lamps illuminated, then after the NEUTRAL position has been met, display the NEUTRAL LED solid. In the blocked condition, no lamps are illuminated during the 5 Phase 1 attempts. After 5 unsuccessful attempts, the transfer case remains in 4LO and the 4LO lamp is illuminated. When shift conditions are not met, flash the NEUTRAL lamp while the push button is depressed.
- NEUTRAL to AWD - Successful shifts have no lamps illuminated, then after the AWD position has been met, no lamps are illuminated. In the blocked condition, no lamps are illuminated during the 5 Phase 1 attempts. After 5 unsuccessful attempts, Phase 2 shifting will continue until the transfer case is in the AWD or 4LO position. If the final position is AWD, no lamp is illuminated, if the final position is 4LO, illuminate the 4LO lamp. When shift conditions are not met, flash the 4LOCK and 4LO lamps and the NEUTRAL LED remains solid while the push button is depressed,
- Neutral to 4LOCK - Successful shifts will flash the 4LOCK lamp during a shift, then after the 4LOCK position has been met, display the 4LOCK lamp solid. In a blocked condition, the 4LOCK lamp will flash during the 5 Phase 1 attempts. After 5 unsuccessful attempts, continue to flash the 4LOCK, Phase 2 shifting will continue until the transfer case is in the AWD or 4LO position. If the final position is AWD, turn off the 4LOCK lamp, if

the final position is 4LO, illuminate the 4LO lamp. When shift conditions are not met, flash the 4LOCK and 4LO lamps and the NEUTRAL LED remains solid while the push button is depressed.

- NEUTRAL to 4LO - Successful shifts will flash the 4LO lamp during a shift, then after the 4LOCK position has been met, display the 4LO lamp solid. In a blocked condition, the 4LO lamp will flash during the 5 Phase 1 attempts. After 5 unsuccessful attempts, continue to flash 4LO, Phase 2 shifting will continue until transfer case is in the AWD or 4LO position. If the final position is AWD, turn off the 4LO lamp, if the final position is 4LO, illuminate the 4LO lamp solid. When shift conditions are not met, flash the 4LOCK and 4LO lamps and the NEUTRAL LED remains solid while push the button is depressed.

SHIFT SEQUENCES (PHASE 1 SHIFTS)

Once all the driver controllable conditions for the requested shift have been met, the FCM begins a shift timer with a maximum duration of 1 second per mode sensor target segment. If the shift timer expires before the FCM recognizes to correct mode sensor position, the shift is considered to have been blocked. The blocked shift will increment the blocked shift counter by one. The FCM strategy for handling blocked shifts will be described later. The process the FCM performs for the various shifts will be described first.

RANGE AND MODE SHIFTS

The process for performing all the range and mode shifts are the same. The following steps describe the process.

- Allow time for Selector Switch debounce; 250 msec ±50 msec.
- Activate/deactivate the 4WD system message icons in the instrument cluster as necessary.
- Engage the shift motor for a maximum of 1 second ±100 msec per mode sensor target segment in the destination gear's direction while monitoring the mode sensor.
- Disengage the shift motor when the correct mode sensor position is recognized.
- Solidly illuminate the achieved position's instrument panel icon, unless the target is AWD.
- Transmit a bus message that the transfer case shift is complete.
- If the desired mode sensor position is not reached after the shift timer expires (i.e.: a blocked shift motor or other condition exists), the FCM will stop driving the motor and wait for 200 msec ±50 msec. The shift motor is then reversed in the direction back toward the source gear for up to 1.0 seconds ±100 msec. per mode sensor target segment. The FCM waits for 2.0 seconds ±50 msec. and repeats the attempt to shift to the desired position.

The exception to the preceding sequence is when a shift from 4LO to AWD is requested. If AWD is requested from the 4LO position, the transfer case is first driven to the 4LOCK position. If the 4LOCK position is reached, the transfer case is then driven back to the AWD position and the shift is considered complete.

SHIFT OUT OF NEUTRAL

The following steps describe the process for a shift out of NEUTRAL.

- Extinguish the Neutral LED.
- Engage the shift motor for a maximum of 1 second ±100 msec toward the transfer case 4LOCK mode position while monitoring the mode sensor position.
- Disengage the shift motor when the correct mode sensor position is recognized.
- Extinguish the Neutral LED.
- Transmit a bus message that the transfer case shift is complete.
- If the desired mode sensor position is not received after the shift timer expires (i.e. a blocked or other condition exists), stop driving the motor and wait for 200 msec ±50 msec. The shift motor is then reversed in the direction back toward the source gear for up to 1.0 seconds 100 msec. The FCM waits for 2.0 seconds ±50 msec. and repeats the attempt to shift to the desired position.
- When the Neutral button is released, if the 4LOCK position is the desired position, the shift is complete. Illuminate the 4LOCK message icon.
- Otherwise when the Neutral button is released, if all of the shift requirements are being met then engage the shift motor towards the desired position for 1 second ±100 msec per 'D' channel. (if requirements for shifting are not met, illuminate the 4LOCK message icon and flash the destination message icon as an indication to the driver that all of the driver controllable shift conditions are not being met). If this requires another range or mode shift, begin the range/mode shift process.

- If the desired mode sensor position is not achieved after the shift timer expires (i.e. a blocked or other condition exists), refer to the section on Blocked Shift Strategy, also known as Phase 2 shifts.

NEUTRAL BLOCKED SHIFT STRATEGY (PHASE 2 SHIFTS)

When a shift is commanded out of neutral, the shift motor will be driven towards its destination position, except in the case of shifting out of NEUTRAL if 4LO was selected (the transfer case will shift to the 4LOCK position first, before proceeding to 4LO). If the shift is blocked on the way to the destination, the FCM may attempt to drive the motor back to the original position. This process will be allowed to occur 5 times. If the transfer case has reached a non-NEUTRAL position during the shift re-attempts, the message icon for the achieved gear position is illuminated and the shift attempts are stopped. To re-attempt the desired shift, the selector switch will need to be rotated to the current position until the switch debounce timer expires then a shift will need to be requested again.

At the end of the 5th blocked attempt, the shift motor is driven towards the last known mode sensor position. If this motor drive allows the transfer case to reach the AWD position, the shift is considered complete and the shift attempts are ended.

If the mode sensor is in the NEUTRAL region at the expiration of the shift timer, the FCM will continue to make the shift attempts according to the blocked shift strategy independent of whether or not the driver controlled conditions are met.

For shifts from NEUTRAL, if all 5 attempts fail to reach the desired position (which by default is 4LOCK), the motor will be driven to stall in the direction of 4LOCK or 4LO, depending on the achieved position. Otherwise, the transfer case will be driven in the direction opposite the last attempt with the desired target being 4LOCK or 4LO.

If the transfer case reaches the AWD position when being driven in the 4LOCK direction, then one final 1.0 second drive toward 4LOCK is attempted. If the transfer case then reaches the 4LOCK position, the shift is considered complete and the 4LOCK message icon is illuminated. If the transfer case is still the AWD position, the shift is considered complete and all message icons are extinguished.

NEUTRAL DRIFT SHIFT STRATEGY (PHASE 3 SHIFTS)

NOTE: If after the 5th blocked shift and reversal attempt, if the transfer case position is in the NEUTRAL or other undesired region, shift attempts will continue until a non-NEUTRAL or a desired position is reached.

Phase 3 is a series of shifts whose intent is to escape from an undesired position that has been reached outside of a shift. A perceived drift of the transfer case into a non-target region without the FCM driving the shift motor will initiate a phase III shift. Phase 3 will be initiated by any non-target region with the exception of a position greater then encoder_4LO_min or less then encoder_4LOCK_max. Whenever these encoder readings have been seen for defined period of time, Phase III shifting will begin.

The shifts in a given Phase 3 shifting event are always in a single-direction, toward the target region from which the drift occurred. These shifts are performed without regard to shift conditions. The timing of each shift should follow the outline of the Phase 1 forward attempts, allowing the shift timer to reach the target. Between each attempt, there is a calibrated delay. After each attempt the shift counter and the Phase 3 max shifts counter will be updated.

SHIFT REVERSAL TARGETS

If the shift timer expires (1.0 seconds per mode sensor position) and the transfer case has not reached the desired position, all shifts will attempt to return to their original position with the exceptions of:

- If the intended shift is going to the High rail from Low and can't make it, but it can make the AWD position, the motor stops at that position. The FCM will not attempt to cross back over NEUTRAL if it does not have to. This means that there was a block on the first attempt to go to 4LOCK and the transfer case has made it through NEUTRAL to a known good position, then the motor will go back only to the AWD position and execute the remainder of the attempts from there.
- For shifts out of NEUTRAL, any time a shift is commanded out of NEUTRAL, the system needs to get out. The FCM should never go to NEUTRAL unless the driver is commanding it and all required conditions are being met.

ENCODER DRIFT CORRECTION

Whenever a shift is completed, the FCM stores the position in memory as the transfer case's intended position. The FCM continuously monitors the mode sensor and if the mode sensor drifts toward into a NEUTRAL region sensor position for 2.0 seconds, the FCM will perform a motor drive to correct the drift. The transfer case will be driven

toward the intended position for 1.0 seconds ±100 msec. The FCM will wait for 2.0 seconds ±50 msec. and repeat the attempt to shift to the desired position. This will continue until the intended position is reached.

SHIFT MOTOR CONTROL

The FCM will have the ability to vary the speed of the transfer case motor through pulse width modulation (PWM). It is recommended to PWM from 0 to 100% at 100Hz.

The PWM will function as follows:

- Apply an initial duty cycle to shift motor control wires.
- Control the acceleration of the shift motor by increasing the applied duty cycle at a specified rate.
- Control the deceleration of the shift motor by updating the applied duty cycle to the shift motor control wires at a specified rate based upon the difference between the desired position and the current position.

SHIFT MOTOR BRAKING

Static shift motor braking is utilized under the following conditions:

- Whenever the transfer case is in the AWD or 4LO position.
- Whenever an invalid mode sensor code is present.

Static motor braking is achieved by applying +12V on both shift motor wires.

NOTE: Static Shift Motor Braking is independent of ignition key position.

SHIFT ATTEMPT LIMIT

To protect the transfer case system, the FCM will impose a limit on the number of shifts that can occur over a calibrated time period. The system will monitor the number of mode sensor position changes that occur in any 30 second time period. If the number of changes is 25 or greater, the system will go into a default mode. The default mode of operation for shifting is that the number of allowed changes permitted to occur will be 3 over each 15 second ±100 msec calibrated window of time. After 5 minutes ±100 msec, the motor can be assumed to have cooled down and the system will revert to normal operation. The following rules also apply to the shift limit:

- The attempt limit will not prevent shifts coming out of NEUTRAL, they will be allowed regardless of the counter/timer.
- Any shift that is in progress when the counter reaches a maximum count in time will be allowed to complete before the default mode is entered. Position changes during this period will not be counted towards the default mode limit.
- A block, regardless of the direction, whether towards destination or back towards reversal target (shift timer expiring), will count as a value of 2 position changes towards the 30 position changes to go into default mode as defined above. Current attempt limit values are 25 transitions in 30 seconds and default mode values are 3 transitions every 15 seconds for 5 minutes.

DIAGNOSIS AND TESTING

TRANSFER CASE VERIFICATION TEST VER 1

Diagnostic Test

1. **TRANSFER CASE VERIFICATION TEST— VER 1**

Disconnect all jumper wires and reconnect all previously disconnected components and connectors.

With the scan tool, Clear DTCs.

Make sure that all accessories are turned off and that the battery is fully charged.

Move the Transfer Case Selector Switch to the desired position.

Test drive the vehicle in each Transfer Case range and verify proper operation in each range.

NOTE: To select or deselect 2WD, AWD or 4HI mode, vehicle speed must be below 55 MPH (88 KM/H) with all wheels at vehicle speed.

NOTE: Shifts will not take place with a wheel speed difference of greater than 13 MPH between the front and rear wheels.

NOTE: To select or deselect 4LO (if equipped), vehicle speed must be below 3 MPH (5 KM/H) with the ignition ON and the transmission in neutral (auto trans) or the clutch pedal pressed (man trans).

NOTE: To select or deselect Transfer Case Neutral, vehicle speed must be 0 MPH with the ignition ON, engine OFF, the brake pedal applied, and the transmission in neutral (auto trans) or the clutch pedal pressed (man trans). Press the Neutral button (if equipped) on the Transfer Case Selector Switch until the Neutral Indicator is illuminated.

WARNING: Apply the parking brake. The vehicle may roll with the Transfer Case in neutral.

NOTE: To verify that the Transfer Case is in Neutral, shift the automatic transmission into reverse and release the brake pedal for three seconds or shift the manual transmission into gear and slowly release the clutch pedal. There should be no vehicle movement if the Transfer Case is in Neutral.

With the scan tool, read DTCs in the Front Control Module (FCM) and the Instrument Cluster Module (CCN).

Are there any Transfer Case DTCs present in the Front Control Module (FCM) or the Instrument Cluster Module (CCN)?

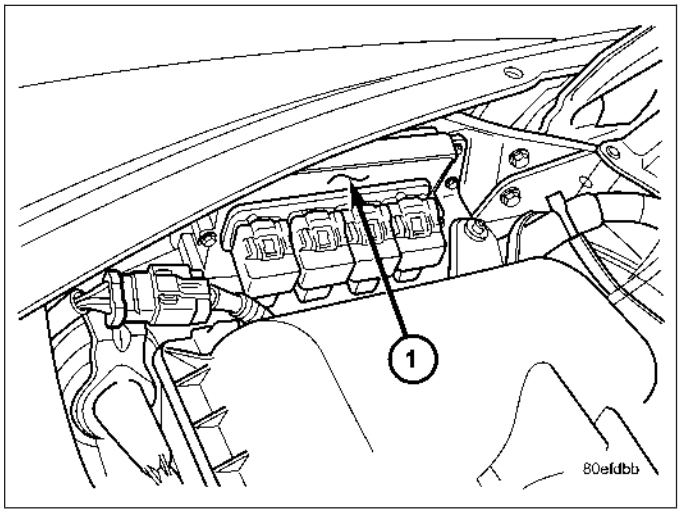
Yes >> Return to the symptom list and perform the appropriate diagnostic test.

No >> Repair is complete.

MODULE-TRANSMISSION CONTROL

DESCRIPTION

The Transmission Control Module (TCM) is a sub-module within the Powertrain Control Module (PCM). The PCM is located on the right inner fender.



OPERATION

The Transmission Control Module (TCM) controls all electronic operations of the transmission. The TCM receives information regarding vehicle operation from both direct and indirect inputs, and selects the operational mode of the transmission. Direct inputs are hard wired to, and used specifically by the TCM. Indirect inputs are shared with the TCM via the vehicle communication bus.

Some examples of **direct inputs** to the TCM are:

- Battery (B+) voltage
- Ignition “ON” voltage
- Transmission Control Relay (Switched B+)
- Throttle Position Sensor
- Crankshaft Position Sensor
- Transmission Range Sensor
- Pressure Switches
- Transmission Temperature Sensor
- Input Shaft Speed Sensor
- Output Shaft Speed Sensor
- Line Pressure Sensor

Some examples of **indirect inputs** to the TCM are:

- Engine/Body Identification
- Manifold Pressure
- Target Idle
- Torque Reduction Confirmation
- Engine Coolant Temperature
- Ambient/Battery Temperature
- Scan Tool Communication

Based on the information received from these various inputs, the TCM determines the appropriate shift schedule and shift points, depending on the present operating conditions and driver demand. This is possible through the control of various direct and indirect outputs.

Some examples of TCM **direct outputs** are:

- Transmission Control Relay
- Solenoids
- Torque Reduction Request

Some examples of TCM **indirect outputs** are:

- Transmission Temperature (to PCM)
- PRNDL Position (to cluster/CCN)

In addition to monitoring inputs and controlling outputs, the TCM has other important responsibilities and functions:

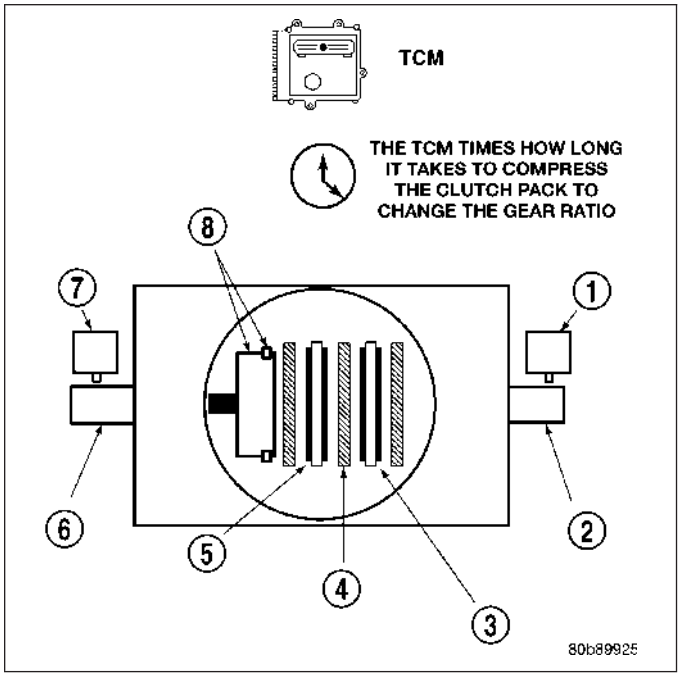
- Storing and maintaining Clutch Volume Indexes (CVI)
- Storing and selecting appropriate Shift Schedules
- System self-diagnostics
- Diagnostic capabilities (with scan tool)

NOTE: If the TCM has been replaced, the “Quick Learn Procedure” must be performed. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE)

BATTERY FEED

A fused, direct battery feed to the TCM is used for continuous power. This battery voltage is necessary to retain memory in the TCM. When the battery (B+) is disconnected, this memory is lost. When the battery (B+) is restored, this memory loss is detected by the TCM and a Diagnostic Trouble Code (DTC) is set.

CLUTCH VOLUME INDEXES (CVI)



An important function of the TCM is to monitor Clutch Volume Indexes (CVI). CVIs represent the volume of fluid needed to compress a clutch pack.

The TCM monitors gear ratio changes by monitoring the Input and Output Speed Sensors. The Input, or Turbine Speed Sensor sends an electrical signal to the TCM that represents input shaft rpm. The Output Speed Sensor provides the TCM with output shaft speed information.

By comparing the two inputs, the TCM can determine transmission gear position. This is important to the CVI calculation because the TCM determines CVIs by monitoring how long it takes for a gear change to occur.

Gear ratios can be determined by using the Scan Tool and reading the Input/Output Speed Sensor values in the “Monitors” display. Gear ratio can be obtained by dividing the Input Speed Sensor value by the Output Speed Sensor value.

For example, if the input shaft is rotating at 1000 rpm and the output shaft is rotating at 500 rpm, then the TCM can determine that the gear ratio is 2:1. In direct drive (3rd gear), the gear ratio changes to 1:1. The gear ratio changes as clutches are applied and released. By monitoring the length of time it takes for the gear ratio to change following a shift request, the TCM can determine the volume of fluid used to apply or release a friction element.

The volume of transmission fluid needed to apply the friction elements are continuously updated for adaptive controls. As friction material wears, the volume of fluid need to apply the element increases.

Certain mechanical problems within the input clutch assembly can cause inadequate or out-of-range element volumes. Also, defective Input/Output Speed Sensors and wiring can cause these conditions. The following charts identifies the appropriate clutch volumes and when they are monitored/updated:

42RLE

CLUTCH VOLUMES				
Clutch	When Updated			Proper Clutch Volume
	Shift Sequence	Oil Temperature	Throttle Angle	
L/R	2-1 or 3-1 coast downshift	> 70°	< 5°	35 to 83
2/4	1-2 shift	> 110°	5 - 54°	20 to 77
OD	2-3 shift			48 to 150
UD	4-3 or 4-2 shift		> 5°	24 to 70

545RFE

CLUTCH VOLUMES		
Clutch	When Updated	Proper Clutch Volume
L/R	2-1 or 3-1 downshift	45 to 134
2C	3-2 kickdown shift	25 to 85
OD	2-3 upshift	30 to 100
4C	3-4 upshift	30 to 85
UD	4-3 kickdown shift	30 to 100

SHIFT SCHEDULES

As mentioned earlier, the TCM has programming that allows it to select a variety of shift schedules. Shift schedule selection is dependent on the following:

- Shift lever position
- Throttle position
- Engine load
- Fluid temperature
- Software level

As driving conditions change, the TCM appropriately adjusts the shift schedule. Refer to the following chart to determine the appropriate operation expected, depending on driving conditions.

Schedule	Condition	Expected Operation
Extreme Cold	Oil temperature below -16° F	-Park, Reverse, Neutral and 1st and 3rd gear only in D position, 2nd gear only in Manual 2 or L -No EMCC
Super Cold	Oil temperature between -12° F and 10° F	- Delayed 2-3 upshift - Delayed 3-4 upshift - Early 4-3 coastdown shift - High speed 4-2, 3-2, 2-1 kickdown shifts are prevented -Shifts at high throttle openings willl be early. - No EMCC
Cold	Oil temperature between 10° F and 36° F	-Shift schedule is the same as Super Cold except that the 2-3 upshifts are not delayed.
Warm	Oil temperature between 40° F and 80° F	- Normal operation (upshift, kickdowns, and coastdowns) - No EMCC
Hot	Oil temperature between 80° F and 240° F	- Normal operation (upshift, kickdowns, and coastdowns) - Normal EMCC operation
Overheat	Oil temperature above 240° F or engine coolant temperature above 244° F	- Delayed 2-3 upshift - Delayed 3-4 upshift - 3rd gear FEMCC from 30-48 mph - 3rd gear PEMCC above 35 mph - Above 25 mph the torque converter will not unlock unless the throttle is closed or if a wide open throttle 2nd PEMCC to 1 kickdown is made

STANDARD PROCEDURE

TCM QUICK LEARN

The quick learn procedure requires the use of a scan tool.

This program allows the electronic transmission system to recalibrate itself. This will provide the proper transmission operation. The quick learn procedure should be performed if any of the following procedures are performed:

- Transmission Assembly Replacement
- Transmission Control Module Replacement
- Solenoid Pack Replacement
- Clutch Plate and/or Seal Replacement
- Valve Body Replacement or Recondition

To perform the Quick Learn Procedure, the following conditions must be met:

- The brakes must be applied
- The engine speed must be above 500 rpm
- The throttle angle (TPS) must be less than 3 degrees
- The shift lever position must stay in PARK until prompted to shift to overdrive
- The shift lever position must stay in overdrive after the Shift to Overdrive prompt until the DRB® indicates the procedure is complete
- The calculated oil temperature must be above 60° and below 200°

DRIVE LEARN

When a transmission is repaired and a Quick Learn procedure has been performed on the Transmission Control Module (TCM), the following Drive Learn procedure can be performed to fine tune any shifts which are particularly objectionable.

NOTE: It is not necessary to perform the complete Drive Learn procedure every time the TCM is Quick Learned. Perform only the portions which target the objectionable shift.

LEARN A SMOOTH 1ST NEUTRAL TO DRIVE SHIFT

Perform this procedure only if the complaint is for a delayed or harsh shift the first time the transmission is put into gear after the vehicle is allowed to set with the engine not running for at least 10 minutes. Use the following steps to have the TCM learn the 1st N-D UD CVI.

NOTE: The transmission oil temperature must be between 80 - 110°F (27 - 43°C).

1. Start the engine only when the engine and ignition have been off for at least ten (10) minutes.
2. With the vehicle at a stop and the service brake applied, record the 1st N-D UD CVI while performing a Neutral to Drive shift. The 1st N-D UD CVI accounts for air entrapment in the UD clutch that may occur after the engine has been off for a period of time.
3. Repeat Step 1 and Step 2 until the recorded 1st N-D UD CVI value stabilizes.

NOTE: It is important that this procedure be performed when the transmission temperature is between 80 - 110°F (27 - 43°C). If this procedure takes too long to complete fully for the allowed transmission oil temperature, the vehicle may be returned to the customer with an explanation that the shift will improve daily during normal vehicle usage. The TCM also learns at higher oil temperatures, but these values (line pressure correction values) are not available for viewing on the scan tool.

LEARN A SMOOTH NEUTRAL TO DRIVE GARAGE SHIFT

Perform this procedure if the complaint is for a delayed or harsh shift when the transmission is put into gear after the vehicle has had its first shift. Use the following steps to have the TCM learn the Norm N-D UD CVI.

NOTE: The transmission oil temperature must be between 80 - 110°F (27 - 43°C) to learn the UD CVI. Additional learning occurs at temperatures as low as 0°F and as high as 200°F. This procedure may be performed at any temperature that experiences poor shift quality. Although the UD CVI may not change, shift quality should improve.

1. Start the vehicle engine and shift to drive.
2. Move the vehicle forward to a speed of at least 16 km/h (10 MPH) and come to a stop. This ensures no air is present in the UD hydraulic circuit.
3. Perform repeated N-D shifts at a stop while pausing in Neutral for at least 2-3 seconds and monitor Norm N-D UD CVI volume until the value stabilizes. The value will change during the N-D shift. This is normal since the UD value is different for the N-D shift then the normal value shown which is used for 4-3 coastdown and kickdowns. Perform repeated shifts in this temperature range until the Norm N-D UD CVI value stabilizes and the N-D shifts become smooth.

LEARN THE 1ST 2-3 SHIFT AFTER A RESTART OR SHIFT TO REVERSE

Use the following steps to have the TCM learn the 1st 2-3 shift OD CVI.

NOTE: The transmission oil temperature must be above 80°F (27°C).

1. With the vehicle engine running, select reverse gear for over 2 seconds.
2. Shift the transmission to Drive and accelerate the vehicle from a stop at a steady 15 degree throttle opening and perform a 2-3 shift while noting the 1st 2-3 OD CVI.
3. Repeat Step 1 and Step 2 until the 1st 2-3 upshift becomes smooth and the 1st 2-3 OD CVI stabilizes.

LEARN A SMOOTH 2-3 AND 3-4 UPSHIFT

NOTE: The transmission oil temperature must be above 110°F (43°C).

Use the following steps to have the TCM learn the OD and 4C CVI's.

1. Accelerate the vehicle from a stop at a steady 15 degree throttle opening and perform multiple 1-2, 2-3, and 3-4 upshifts. The 2nd 2-3 shift following a restart or shift to reverse will be shown during the shift as a value between the 1st 2-3 OD CVI and the normal OD CVI. Updates to the normal OD CVI will occur after the 2nd shift into 3rd gear, following a restart or shift to reverse.
2. Repeat Step 1 until the 2-3 and 3-4 shifts become smooth and the OD and 4C CVI become stable.

LEARN A SMOOTH 4-3 COASTDOWN AND PART THROTTLE 4-3 KICKDOWN

NOTE: The transmission oil temperature must be above 110°F (43°C).

Use the following steps to have the TCM learn the UD shift volume.

1. At a vehicle speed between 64-97 km/h (40-60 MPH), perform repeated 4-3 kickdown shifts.
2. Repeat Step 1 until the UD volume becomes somewhat stable and the shift becomes smooth.

LEARN A SMOOTH 1-2 UPSHIFT AND 3-2 KICKDOWN

Use the following steps to have the TCM learn the 2C shift volume.

NOTE: The transmission oil temperature must be above 110°F (43°C).

1. With a vehicle speed below 48 km/h (30 MPH) and the transmission in 3rd gear, perform multiple 3-2 kickdowns.
2. Repeat Step 1 until the 3-2 kickdowns become smooth and the 2C CVI becomes stable.

LEARN A SMOOTH MANUAL 2-1 PULLDOWN SHIFT AS WELL AS A NEUTRAL TO REVERSE SHIFT

NOTE: The transmission oil temperature must be above 110°F (43°C).

Use the following steps to have the TCM learn the LR volume.

1. With the vehicle speed around 40-48 km/h (25-30 MPH) in Manual 2nd, perform manual pulldowns to Low or 1st gear at closed throttle.
2. Repeat Step 1 until the LR CVI becomes stable and the manual 2-1 becomes smooth.

LEARN A SMOOTH NEUTRAL TO REVERSE SHIFT

NOTE: The transmission oil temperature must be above 110°F (43°C).

1. With the vehicle at a stop, perform Neutral to Reverse shifts until the shift is smooth. An unlearned Neutral to Reverse shift may be harsh or exhibit a double bump.
2. If any of the shifts are still not smooth after the clutch volume stabilizes, an internal transmission problem may be present.

LEARN A SMOOTH 4-5 UPSHIFT

NOTE: The transmission oil temperature must be above 110°F (43°C).

Use the following steps to have the TCM learn the Alt 2C CVI.

1. Accelerate the vehicle through 88 km/h (55mph) at a steady 10-15 degree throttle opening and perform multiple 4-5 upshifts.
2. Repeat Step 1 until the 4-5 shift become smooth and theAlt 2C CVI become stable. There is a separate 2C volume used and learned for 4-5 shifts, 2CA. It is independent of the 2C CVI learned on 3-2 kickdowns.

ENGINE SYSTEMS

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BATTERY SYSTEM

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BATTERY SYSTEM

DESCRIPTION

This vehicle is equipped with a single 12-volt battery. All of the components of the battery system are located within the engine compartment of the vehicle. The battery system for this vehicle covers the following related components:

- **Battery** - A 12 volt storage battery provides a reliable means of storing a renewable source of electrical energy within the vehicle.
- **Battery Cables** - The battery cables connect the battery terminal posts to the vehicle electrical system.
- **Battery Hold down** - The battery hold down hardware secures the battery in the battery tray.
- **Battery Tray** - The battery tray provides a secure mounting location in the vehicle for the battery and an anchor point for the battery hold down hardware.

For battery jump starting procedures, refer to Lubrication and Maintenance.

OPERATION

The battery system is designed to provide a safe, efficient, reliable and mobile means of delivering and storing electrical energy. This electrical energy is required to operate the engine starting system, as well as to operate many of the other vehicle accessory systems for limited durations while the engine and/or the charging system are not operating. The battery system is also designed to provide a reserve of electrical energy to supplement the charging system for short durations while the engine is running and the electrical current demands of the vehicle exceed the output of the charging system. In addition to delivering, and storing electrical energy for the vehicle, the battery system serves as a capacitor and voltage stabilizer for the vehicle electrical system. It absorbs most abnormal or transient voltages caused by the switching of any of the electrical components or circuits in the vehicle.

DIAGNOSIS AND TESTING

BATTERY SYSTEM

The battery, starting, and charging systems in the vehicle operate with one another and must be tested as a complete system. In order for the engine to start and the battery to maintain its charge properly, all of the components that are used in these systems must perform within specifications. It is important that the battery, starting, and charging systems be thoroughly tested and inspected any time a battery needs to be charged or replaced. The cause of abnormal battery discharge, overcharging or early battery failure must be diagnosed and corrected before a battery is replaced and before a vehicle is returned to service.

The diagnostic procedures used for the battery, starting, and charging systems include the most basic conventional diagnostic methods, to the more sophisticated On-Board Diagnostics (OBD) built into the Powertrain Control Module (PCM). Use of an induction-type milliampere ammeter, a volt/ohmmeter, a battery charger, a carbon pile rheostat (load tester) and a 12-volt test lamp may be required. All OBD-sensed systems are monitored by the PCM. Each monitored circuit is assigned a Diagnostic Trouble Code (DTC). The PCM will store a DTC in electronic memory for any failure it detects.

MICRO 420 BATTERY TESTER

The Micro 420 automotive battery tester is designed to assist the technician diagnose a inoperative battery. Follow the instruction manual supplied with the tester to properly diagnose a battery. If the instruction manual is not available, (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - STANDARD PROCEDURE).

BATTERY SYSTEM DIAGNOSIS		
CONDITION	POSSIBLE CAUSES	CORRECTION
THE BATTERY SEEMS WEAK OR DEAD WHEN ATTEMPTING TO START THE ENGINE.	1. The electrical system ignition-off draw is excessive.	1. Refer to the IGNITION-OFF DRAW TEST Standard Procedure for the proper test procedures. Repair the excessive ignition-off draw, as required.
	2. The charging system is faulty.	2. Determine if the charging system is performing to specifications. Refer to Charging System for additional charging system diagnosis and testing procedures. Repair the faulty charging system, as required.
	3. The battery is discharged.	3. Determine the battery state-of-charge using the Micro 420 battery tester. Refer to the Standard Procedures in this section for additional test procedures. Charge the faulty battery, as required.
	4. The battery terminal connections are loose or corroded.	4. Refer to Battery Cables for the proper battery cable diagnosis and testing procedures. Clean and tighten the battery terminal connections, as required.
	5. The battery has an incorrect size or rating for this vehicle.	5. Refer to Battery System Specifications for the proper size and rating. Replace an incorrect battery, as required.
	6. The battery is faulty.	6. Determine the battery cranking capacity using the Micro 420 battery tester. Refer to the Standard Procedures in this section for additional test procedures. Replace the faulty battery, as required.
	7. The starting system is faulty.	7. Determine if the starting system is performing to specifications. Refer to Starting System for the proper starting system diagnosis and testing procedures. Repair the faulty starting system, as required.
	8. The battery is physically damaged.	8. Inspect the battery for loose terminal posts or a cracked and leaking case. Replace the damaged battery, as required.

BATTERY SYSTEM DIAGNOSIS		
CONDITION	POSSIBLE CAUSES	CORRECTION
THE BATTERY STATE OF CHARGE CANNOT BE MAINTAINED.	1. The battery has an incorrect size or rating for this vehicle.	1. Refer to Battery System Specifications for the proper specifications. Replace an incorrect battery, as required.
	2. The battery terminal connections are loose or corroded.	2. Refer to Battery Cable for the proper cable diagnosis and testing procedures. Clean and tighten the battery terminal connections, as required.
	3. The electrical system ignition-off draw is excessive.	3. Refer to the IGNITION-OFF DRAW TEST Standard Procedure for the proper test procedures. Repair the faulty electrical system, as required.
	4. The battery is faulty.	4. Test the battery using the Micro 420 battery tester. Refer to Standard Procedures for additional test procedures. Replace the faulty battery, as required.
	5. The starting system is faulty.	5. Determine if the starting system is performing to specifications. Refer to Starting System for the proper starting system diagnosis and testing procedures. Repair the faulty starting system, as required.
	6. The charging system is faulty.	6. Determine if the charging system is performing to specifications. Refer to Charging System for additional charging system diagnosis and testing procedures. Repair the faulty charging system, as required.
	7. Electrical loads exceed the output of the charging system.	7. Inspect the vehicle for aftermarket electrical equipment which might cause excessive electrical loads.
	8. Slow driving or prolonged idling with high-amperage draw systems in use.	8. Advise the vehicle operator, as required.
THE BATTERY WILL NOT ACCEPT A CHARGE.	1. The battery is faulty.	1. Test the battery using the Micro 420 battery tester. Charge or replace the faulty battery, as required.

ABNORMAL BATTERY DISCHARGING

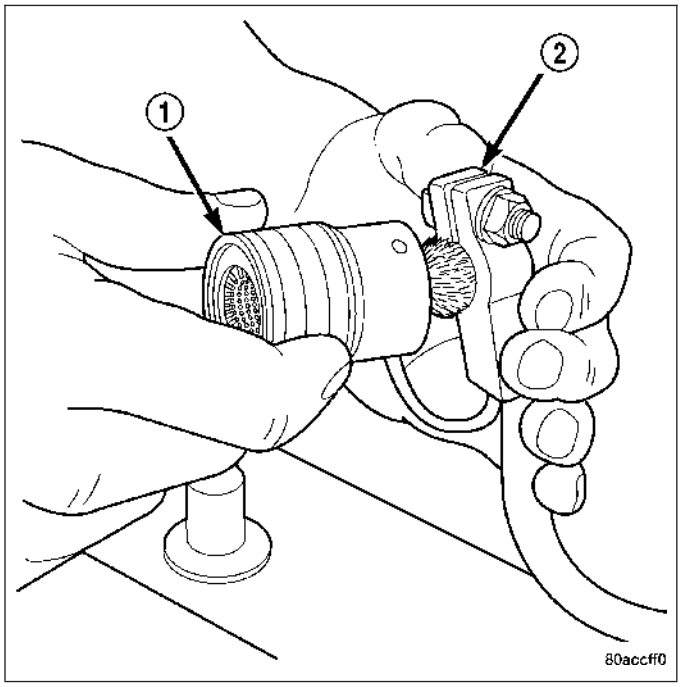
Any of the following conditions can result in abnormal battery discharging:

1. A faulty or incorrect charging system component. Refer to Charging System for additional charging system diagnosis and testing procedures.
2. A faulty or incorrect battery. Use Micro 420 battery tester and refer to Battery System for additional battery diagnosis and testing procedures.
3. A faulty circuit or component causing excessive ignition-off draw.
4. Electrical loads that exceed the output of the charging system. This can be due to equipment installed after manufacture, or repeated short trip use.
5. A faulty or incorrect starting system component. Refer to Starting System for the proper starting system diagnosis and testing procedures.
6. Corroded or loose battery posts and/or terminal clamps.
7. Slow driving speeds (heavy traffic conditions) or prolonged idling, with high-amperage draw systems in use.

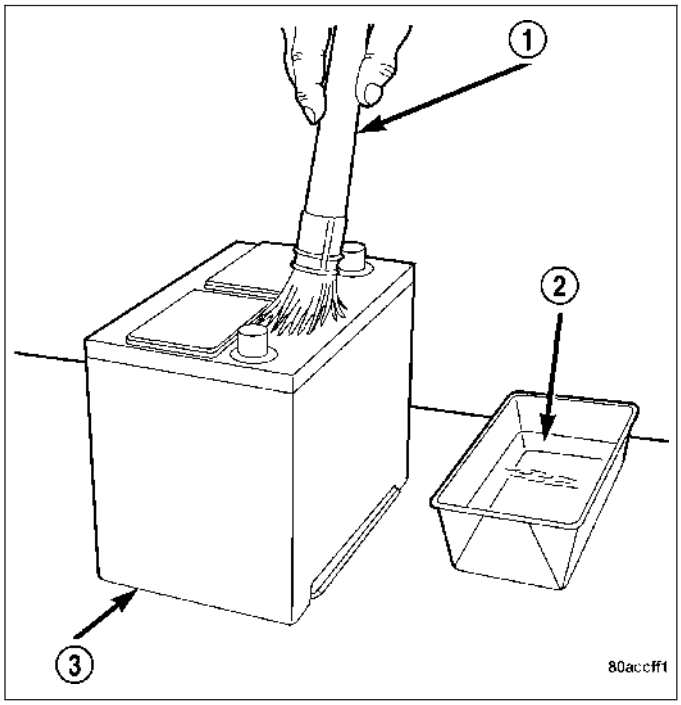
CLEANING

The following information details the recommended cleaning procedures for the battery and related components. It is recommended that these procedures be performed any time the battery or related components must be removed (if required).

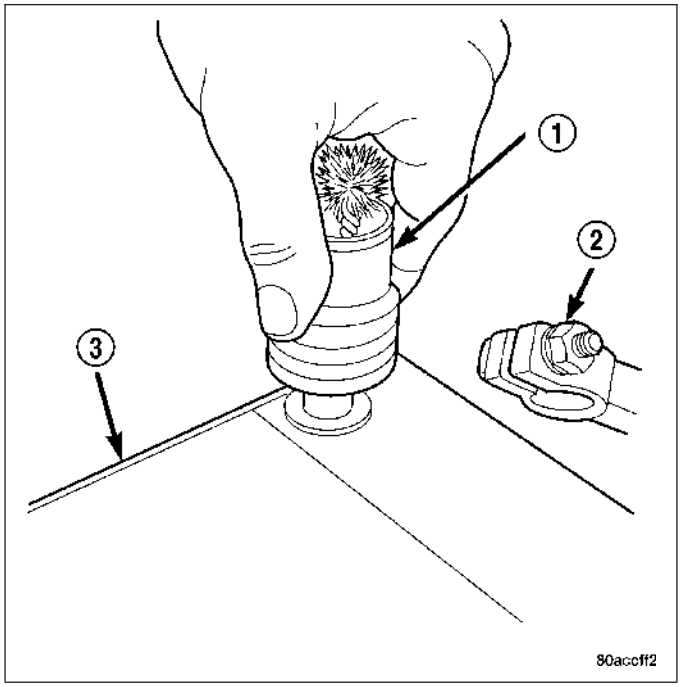
1. Clean the battery cable terminal clamps (2) of all corrosion. Remove any corrosion using a wire brush or a post and terminal cleaning tool (1), and a sodium bicarbonate (baking soda) and warm water cleaning solution.



2. Clean the battery tray and battery hold down hardware of all corrosion. Remove any corrosion using a wire brush (1) and a sodium bicarbonate (baking soda) and warm water cleaning solution (2). Paint any exposed bare metal.
3. If the removed battery is to be reinstalled, clean the outside of the battery case and the top cover with a sodium bicarbonate (baking soda) and warm water cleaning solution (2) using a stiff bristle parts cleaning brush (1) to remove any acid film. Rinse the battery with clean water. Ensure that the cleaning solution does not enter the battery cells through the vent holes. If the battery is being replaced, confirm that the replacement battery is the correct size and has the correct ratings for the vehicle.
4. Clean the battery thermal guard with a sodium bicarbonate (baking soda) and warm water cleaning solution (2) using a stiff bristle parts cleaning brush (1) to remove any acid film.



5. Clean any corrosion from the battery terminal posts (2) with a wire brush or a post and terminal cleaner (1) and a sodium bicarbonate (baking soda) and warm water cleaning solution.



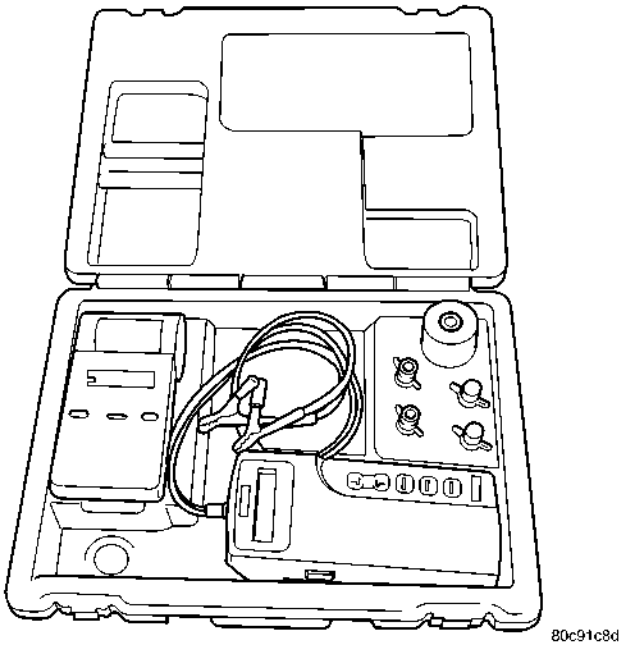
INSPECTION

The following information details the recommended inspection procedures for the battery and related components. It is recommended that these procedures be performed any time the battery or related components must be removed for vehicle service.

1. Inspect the battery cable terminal clamps for damage. Replace any battery cable that has a damaged or deformed terminal clamp.
2. Inspect the battery tray and battery hold down hardware for damage. Replace any damaged parts.
3. Slide the thermal guard off of the battery case, if equipped. Inspect the battery case for cracks or other damage that could result in electrolyte leaks. Also, check the battery terminal posts for looseness. Batteries with damaged cases or loose terminal posts must be replaced.
4. Inspect the battery thermal guard for tears, cracks, deformation or other damage. Replace any battery thermal guard that has been damaged.
5. Inspect the battery built-in test indicator sight glass (if equipped) for an indication of the battery condition. If the battery is discharged, charge as required.

SPECIAL TOOLS

BATTERY SYSTEM SPECIAL TOOLS

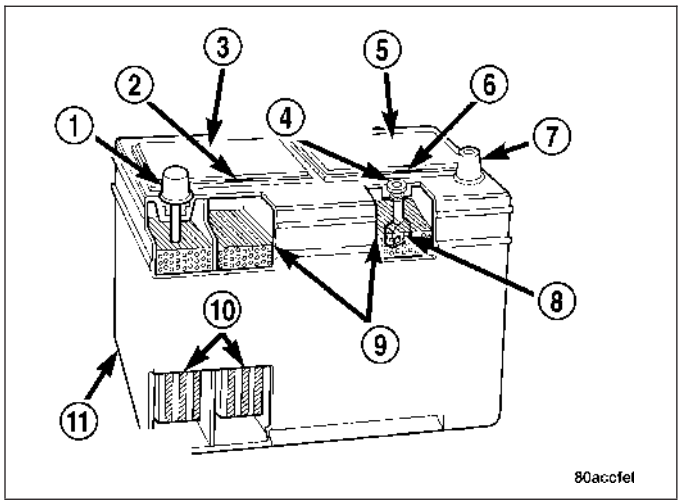


MICRO 420 BATTERY TESTER

BATTERY

DESCRIPTION

A large capacity, low-maintenance storage battery is installed on this vehicle. Male post type terminals (1&7) made of soft lead protrude from the top of the molded plastic battery case to provide the means for connecting the battery to the vehicle electrical system. The battery positive terminal post (1) is physically larger in diameter than the negative terminal post (7) to ensure proper battery connection. The letters **POS** and **NEG** are also molded into the top of the battery case adjacent to their respective positive and negative terminal posts for identification confirmation.



The battery is made up of six individual cells that are connected in series. Each cell contains positively charged plate groups (10) that are connected with lead straps to the positive terminal post (1), and negatively charged plate groups (10) that are connected with lead straps to the negative terminal post (7). Each plate consists of a stiff mesh framework or grid coated with lead dioxide (positive plate) or sponge lead (negative plate). Insulators or plate separators made of a non-conductive material are inserted between the positive and negative plates to prevent them from contacting or shorting against one another. These dissimilar metal plates are submerged in a sulfuric acid and water solution called an electrolyte (9).

The battery has a built-in test indicator (hydrometer) (4). The color visible in the sight glass of the indicator will reveal the battery condition. Water cannot be added to this battery. The battery is not sealed and has vent holes (2) and (6) in the cell caps (3) and (5). The chemical composition of the metal coated plates within the low-maintenance battery reduces battery gassing and water loss, at normal charge and discharge rates. Therefore, the battery should not require additional water in normal service.

OPERATION

The battery is designed to store electrical energy in a chemical form. When an electrical load is applied to the terminals of the battery, an electrochemical reaction occurs. This reaction causes the battery to discharge electrical current from its terminals. As the battery discharges, a gradual chemical change takes place within each cell. The sulfuric acid in the electrolyte combines with the plate materials, causing both plates to slowly change to lead sulfate. At the same time, oxygen from the positive plate material combines with hydrogen from the sulfuric acid, causing the electrolyte to become mainly water. The chemical changes within the battery are caused by the movement of excess or free electrons between the positive and negative plate groups. This movement of electrons produces a flow of electrical current through the load device attached to the battery terminals.

As the plate materials become more similar chemically, and the electrolyte becomes less acid, the voltage potential of each cell is reduced. However, by charging the battery with a voltage higher than that of the battery itself, the battery discharging process is reversed. Charging the battery gradually changes the sulfated lead plates back into sponge lead and lead dioxide, and the water back into sulfuric acid. This action restores the difference in the electron charges deposited on the plates, and the voltage potential of the battery cells. For a battery to remain useful, it must be able to produce high-amperage current over an extended period. A battery must also be able to accept a charge, so that its voltage potential may be restored.

The battery is vented to release excess hydrogen gas that is created when the battery is being charged or discharged. However, even with these vents, hydrogen gas can collect in or around the battery. If hydrogen gas is exposed to flame or sparks, it may ignite. If the electrolyte level is low, the battery may arc internally and explode. The battery must be replaced if the electrolyte level becomes low.

DIAGNOSIS AND TESTING

BATTERY

The battery must be completely charged and the terminals should be properly cleaned and inspected before diagnostic procedures are performed.

MICRO 420 BATTERY TESTER

The Micro 420 automotive battery tester is designed to assist the technician diagnose the cause of a defective battery. Follow the instruction manual supplied with the tester to properly diagnose a battery.

WARNING: IF THE BATTERY SHOWS SIGNS OF FREEZING, LEAKING OR LOOSE POSTS, DO NOT TEST, ASSIST-BOOST, OR CHARGE. THE BATTERY MAY ARC INTERNALLY AND EXPLODE. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT.

WARNING: EXPLOSIVE HYDROGEN GAS FORMS IN AND AROUND THE BATTERY. DO NOT SMOKE, USE FLAME, OR CREATE SPARKS NEAR THE BATTERY. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT.

WARNING: THE BATTERY CONTAINS SULFURIC ACID, WHICH IS POISONOUS AND CAUSTIC. AVOID CONTACT WITH THE SKIN, EYES, OR CLOTHING. IN THE EVENT OF CONTACT, FLUSH WITH WATER AND CALL A PHYSICIAN IMMEDIATELY. KEEP OUT OF THE REACH OF CHILDREN.

A battery that will not accept a charge is faulty, and must be replaced. Further testing is not required. A fully-charged battery must be checked with Micro 420 tester or load tested to determine its cranking capacity. A battery that is fully-charged, but does not pass the load test, is faulty and must be replaced.

Note: Completely discharged batteries may take several hours to accept a charge. Refer to Standard Procedures for the proper battery charging procedures.

STANDARD PROCEDURE

BATTERY CHARGING

Battery charging is the means by which the battery can be restored to its full voltage potential. A battery is fully-charged when:

- Micro 420 electrical system tester indicates battery is OK.
- Three hydrometer tests, taken at one-hour intervals, indicate no increase in the temperature-corrected specific gravity of the battery electrolyte.
- Passes Load test.
- Open-circuit voltage of the battery is 12.65 volts or above.

WARNING: IF THE BATTERY SHOWS SIGNS OF FREEZING, LEAKING OR LOOSE POSTS, DO NOT TEST, ASSIST-BOOST, OR CHARGE. THE BATTERY MAY ARC INTERNALLY AND EXPLODE. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT.

WARNING: EXPLOSIVE HYDROGEN GAS FORMS IN AND AROUND THE BATTERY. DO NOT SMOKE, USE FLAME, OR CREATE SPARKS NEAR THE BATTERY. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT.

WARNING: THE BATTERY CONTAINS SULFURIC ACID, WHICH IS POISONOUS AND CAUSTIC. AVOID CONTACT WITH THE SKIN, EYES, OR CLOTHING. IN THE EVENT OF CONTACT, FLUSH WITH WATER AND CALL A PHYSICIAN IMMEDIATELY. KEEP OUT OF THE REACH OF CHILDREN.

WARNING: IF THE BATTERY IS EQUIPPED WITH REMOVABLE CELL CAPS, BE CERTAIN THAT EACH OF THE CELL CAPS IS IN PLACE AND TIGHT BEFORE THE BATTERY IS RETURNED TO SERVICE. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT FROM LOOSE OR MISSING CELL CAPS.

CAUTION: Always disconnect and isolate the battery negative cable before charging a battery. Do not exceed sixteen volts while charging a battery. Damage to the vehicle electrical system components may result.

CAUTION: Battery electrolyte will bubble inside the battery case during normal battery charging. Electrolyte boiling or being discharged from the battery vents indicates a battery overcharging condition. Immediately reduce the charging rate or turn off the charger to evaluate the battery condition. Damage to the battery may result from overcharging.

CAUTION: The battery should not be hot to the touch. If the battery feels hot to the touch, turn off the charger and let the battery cool before continuing the charging operation. Damage to the battery may result.

Some battery chargers are equipped with polarity-sensing circuitry. This circuitry protects the battery charger and the battery from being damaged if they are improperly connected. If the battery state-of-charge is too low for the polarity-sensing circuitry to detect, the battery charger will not operate. This makes it appear that the battery will not accept charging current. See the instructions provided by the manufacturer of the battery charger for details on how to bypass the polarity-sensing circuitry.

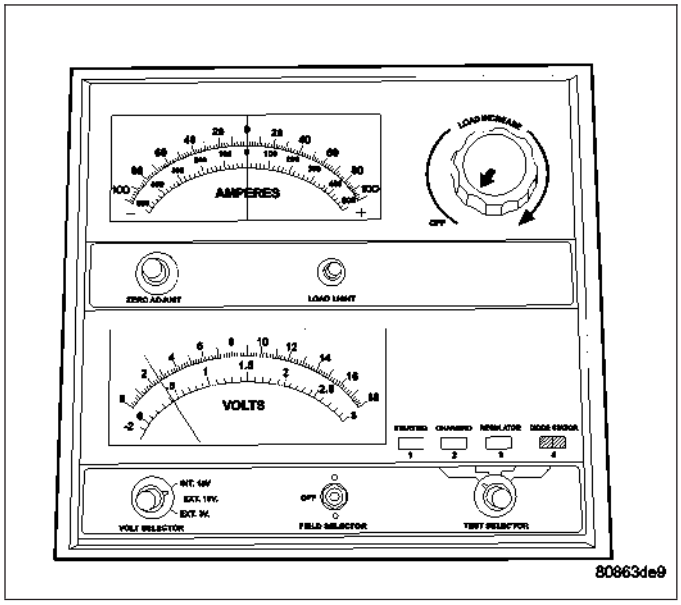
After the battery has been charged to 12.4 volts or greater, retest the battery using the Micro 420 tester or perform a load test to determine the battery cranking capacity. If the battery will endure a load test, return the battery to service. If the battery will not endure a load test, it is faulty and must be replaced.

Clean and inspect the battery hold downs, tray, terminals, posts, and top before completing battery service.

CHARGING A COMPLETELY DISCHARGED BATTERY

The following procedure should be used to recharge a completely discharged battery. Unless this procedure is properly followed, a good battery may be needlessly replaced.

1. Measure the voltage at the battery posts with a voltmeter, accurate to 1/10 (0.10) volt. If the reading is below ten volts, the battery charging current will be low. It could take some time before the battery accepts a current greater than a few milliamperes. Such low current may not be detectable on the ammeters built into many battery chargers.



2. Disconnect and isolate the battery negative cable. Connect the battery charger leads. Some battery chargers are equipped with polarity-sensing circuitry. This circuitry protects the battery charger and the battery from being damaged if they are improperly connected. If the battery state-of-charge is too low for the polarity-sensing circuitry to detect, the battery charger will not operate. This makes it appear that the battery will not accept charging current. See the instructions provided by the manufacturer of the battery charger for details on how to bypass the polarity-sensing circuitry.
3. Battery chargers vary in the amount of voltage and current they provide. The amount of time required for a battery to accept measurable charging current at various voltages is shown in the Charge Rate Table. If the charging current is still not measurable at the end of the charging time, the battery is faulty and must be replaced. If the charging current is measurable during the charging time, the battery may be good and the charging should be completed in the normal manner.

CHARGE RATE TABLE	
Voltage	Hours
16.0 volts maximum	up to 4 hours
14.0 to 15.9 volts	up to 8 hours
13.9 volts or less	up to 16 hours

CHARGING TIME REQUIRED

The time required to charge a battery will vary, depending upon the following factors:

- **Battery Capacity** - A completely discharged heavy-duty battery requires twice the charging time of a small capacity battery.
- **Temperature** - A longer time will be needed to charge a battery at -18° C (0° F) than at 27° C (80° F). When a fast battery charger is connected to a cold battery, the current accepted by the battery will be very low at first. As the battery warms, it will accept a higher charging current rate (amperage).
- **Charger Capacity** - A battery charger that supplies only five amperes will require a longer charging time. A battery charger that supplies twenty amperes or more will require a shorter charging time.
- **State-Of-Charge** - A completely discharged battery requires more charging time than a partially discharged battery. Electrolyte is nearly pure water in a completely discharged battery. At first, the charging current (amperage) will be low. As the battery charges, the specific gravity of the electrolyte will gradually rise.

The Battery Charging Time Table gives an indication of the time required to charge a typical battery at room temperature based upon the battery state-of-charge and the charger capacity.

BATTERY CHARGING TIME TABLE			
Charging Amperage	5 Amps	10 Amps	20 Amps
Open Circuit Voltage	Hours Charging @ 21° C (70° F)		
12.25 to 12.49	6 hours	3 hours	1.5 hours
12.00 to 12.24	10 hours	5 hours	2.5 hours
10.00 to 11.99	14 hours	7 hours	3.5 hours
Below 10.00	18 hours	9 hours	4.5 hours

IGNITION-OFF DRAW TEST

The term Ignition-Off Draw (IOD) identifies a normal condition where power is being drained from the battery with the ignition switch in the Off position. A normal vehicle electrical system will draw from five to thirty-five milliamperes (0.005 to 0.035 ampere) with the ignition switch in the Off position, and all non-ignition controlled circuits in proper working order. Up to thirty-five milliamperes are needed to enable the memory functions for the Powertrain Control Module (PCM), digital clock, electronically tuned radio, and other modules which may vary with the vehicle equipment.

A vehicle that has not been operated for approximately twenty days, may discharge the battery to an inadequate level. When a vehicle will not be used for twenty days or more (stored), remove the IOD fuse from the Junction Block (JB). This will reduce battery discharging.

Excessive IOD can be caused by:

- Electrical items left on.
- Faulty or improperly adjusted switches.
- Faulty or shorted electronic modules and components.
- An internally shorted generator.
- Intermittent shorts in the wiring.

If the IOD is over thirty-five milliamperes, the problem must be found and corrected before replacing a battery. In most cases, the battery can be charged and returned to service after the excessive IOD condition has been corrected.

1. Verify that all electrical accessories are off. Turn off all lamps, remove the ignition key, and close all doors. If the vehicle is equipped with an illuminated entry system or an electronically tuned radio, allow the electronic timer function of these systems to automatically shut off (time out). This may take up to three minutes. See the Electronic Module Ignition-Off Draw Table for more information.

ELECTRONIC MODULE IGNITION-OFF DRAW (IOD) TABLE			
Module	Time Out? (If Yes, Interval And Wake-Up Input)	IOD	IOD After Time Out
Radio	No	1 to 3 milliamperes	N/A
Audio Power Amplifier	No	up to 1 milliampere	N/A
Central Timer Module (CTM)	No	4.75 milliamperes (max.)	N/A
Powertrain Control Module (PCM)	No	0.95 milliampere	N/A
ElectroMechanical Instrument Cluster (EMIC)	No	0.44 milliampere	N/A
Combination Flasher	No	0.08 milliampere	N/A

2. Determine that the underhood lamp is operating properly, then disconnect the lamp wire harness connector or remove the lamp bulb.
3. Disconnect the battery negative cable.

4. Set an electronic digital multi-meter to its highest amperage scale. Connect the multi-meter between the disconnected battery negative cable terminal clamp and the battery negative terminal post. Make sure that the doors remain closed so that the illuminated entry system is not activated. The multi-meter amperage reading may remain high for up to three minutes, or may not give any reading at all while set in the highest amperage scale, depending upon the electrical equipment in the vehicle. The multi-meter leads must be securely clamped to the battery negative cable terminal clamp and the battery negative terminal post. If continuity between the battery negative terminal post and the negative cable terminal clamp is lost during any part of the IOD test, the electronic timer function will be activated and all of the tests will have to be repeated.
5. After about three minutes, the high-amperage IOD reading on the multi-meter should become very low or nonexistent, depending upon the electrical equipment in the vehicle. If the amperage reading remains high, remove and replace each fuse or circuit breaker in the Power Distribution Center (PDC) and then in the Junction Block (JB), one at a time until the amperage reading becomes very low, or nonexistent. Refer to the appropriate wiring information in this service manual for complete PDC and JB fuse, circuit breaker, and circuit identification. This will isolate each circuit and identify the circuit that is the source of the high-amperage IOD. If the amperage reading remains high after removing and replacing each fuse and circuit breaker, disconnect the wire harness from the generator. If the amperage reading now becomes very low or nonexistent, refer to Charging System for the proper charging system diagnosis and testing procedures. After the high-amperage IOD has been corrected, switch the multi-meter to progressively lower amperage scales and, if necessary, repeat the fuse and circuit breaker remove-and-replace process to identify and correct all sources of excessive IOD. It is now safe to select the lowest milliampere scale of the multi-meter to check the low-amperage IOD.

CAUTION: Do not open any doors, or turn on any electrical accessories with the lowest milliampere scale selected, or the multi-meter may be damaged.

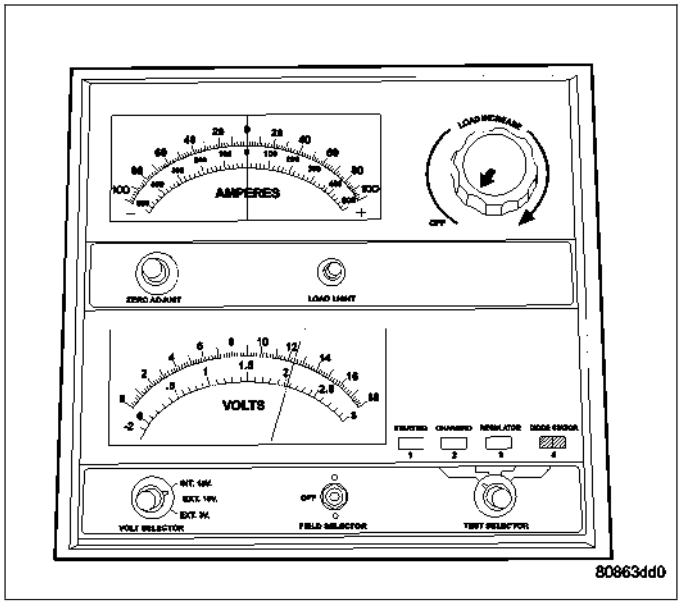
6. Observe the multi-meter reading. The low-amperage IOD should not exceed thirty-five milliamperes (0.035 ampere). If the current draw exceeds thirty-five milliamperes, isolate each circuit using the fuse and circuit breaker remove-and-replace process in Step 5. The multi-meter reading will drop to within the acceptable limit when the source of the excessive current draw is disconnected. Repair this circuit as required; whether a wiring short, incorrect switch adjustment, or a component failure is at fault.

OPEN-CIRCUIT VOLTAGE TEST

A battery open-circuit voltage (no load) test will show the approximate state-of-charge of a battery. This test can be used in place of the hydrometer test when a hydrometer is not available, or for maintenance-free batteries with non-removable cell caps.

Before proceeding with this test, completely charge the battery (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - STANDARD PROCEDURE).

1. Before measuring the open-circuit voltage, the surface charge must be removed from the battery. Turn on the headlamps for fifteen seconds, then allow up to five minutes for the battery voltage to stabilize.
2. Disconnect and isolate both battery cables, negative cable first.
3. Using a voltmeter connected to the battery posts (see the instructions provided by the manufacturer of the voltmeter), measure the open-circuit voltage.

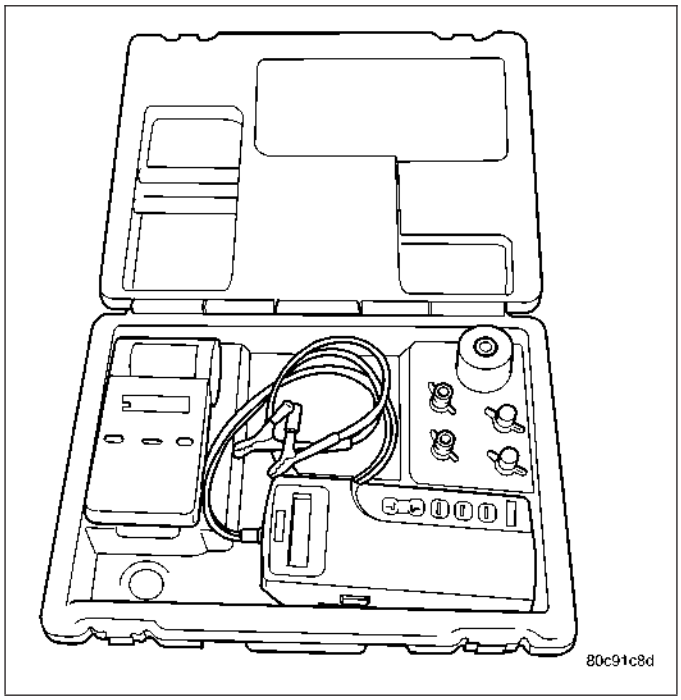


See the Open-Circuit Voltage Table. This voltage reading will indicate the battery state-of-charge, but will not reveal its cranking capacity. If a battery has an open-circuit voltage reading of 12.4 volts or greater, it may be load tested to reveal its cranking capacity (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - STANDARD PROCEDURE).

OPEN CIRCUIT VOLTAGE TABLE	
Open Circuit Voltage	Charge Percentage
11.7 volts or less	0%
12.0 volts	25%
12.2 volts	50%
12.4 volts	75%
12.6 volts or more	100%

MICRO 420 BATTERY TESTER

Always use the Micro 420 Instruction Manual that was supplied with the tester as a reference. If the Instruction Manual is not available the following procedure can be used:



WARNING: ALWAYS WEAR APPROPRIATE EYE PROTECTION AND USE EXTREME CAUTION WHEN WORKING WITH BATTERIES.

BATTERY TESTING

1. If testing the battery OUT-OF-VEHICLE, clean the battery terminals with a wire brush before testing. If the battery is equipped with side post terminals, install and tighten the supplied lead terminal stud adapters. Do not use steel bolts. Failure to properly install the stud adapters, or using stud adapters that are dirty or worn-out may result in false test readings.
2. If testing the battery IN-THE-VEHICLE, make certain all of the vehicle accessory loads are OFF, including the ignition. **The preferred test position is at the battery terminal**. If the battery is not accessible, you may test using both the positive and negative jumper posts. Select TESTING AT JUMPER POST when connecting to that location.
3. Connect the tester to the battery or jumper posts, the red clamp to positive (+) and the black clamp to negative (–).

Note: Multiple batteries connected in parallel must have the ground cable disconnected to perform a battery test. Failure to disconnect may result in false battery test readings.

4. Using the ARROW key select **in** or **out** of vehicle testing and press ENTER to make a selection.
5. If not selected, choose the Cold Cranking Amp (CCA) battery rating. Or select the appropriate battery rating for your area (see menu). The tester will then run its self programmed test of the battery and display the results. Refer to the test result table noted below.

CAUTION: If REPLACE BATTERY is the result of the test, this may mean a poor connection between the vehicle's cables and battery exists. After disconnecting the vehicle's battery cables from the battery, retest the battery using the OUT-OF-VEHICLE test before replacing.

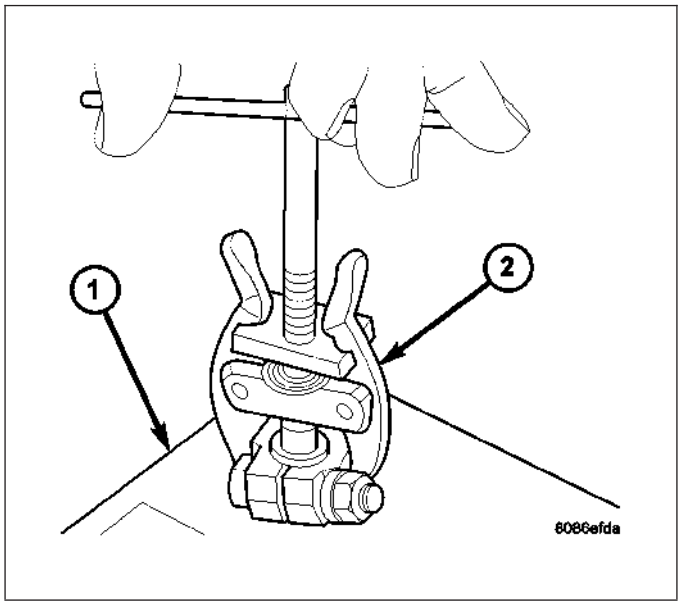
6. While viewing the battery test result, press the CODE button and the tester will prompt you for the last 4 digits of the VIN. Use the UP/DOWN arrow buttons to scroll to the correct character; then press ENTER to select and move to the next digit. Then press the ENTER button to view the SERVICE CODE. Pressing the CODE button a second time will return you to the test results.

BATTERY TEST RESULTS	
GOOD BATTERY	Return to service
GOOD - RECHARGE	Fully charge battery and return to service
CHARGE & RETEST	Fully charge battery and retest battery
REPLACE BATTERY	Replace the battery and retest complete system
BAD-CELL REPLACE	Replace the battery and retest complete system

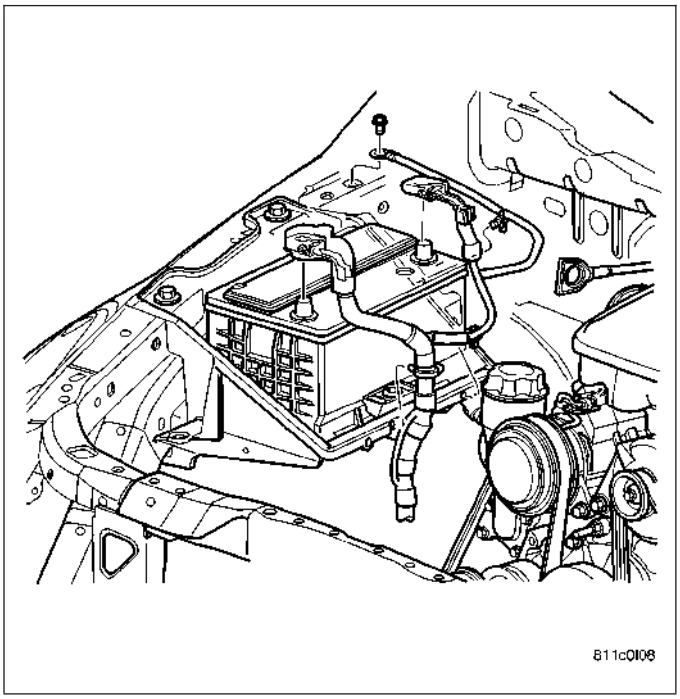
Note: The SERVICE CODE is required on every warranty claim submitted for battery replacement.

REMOVAL

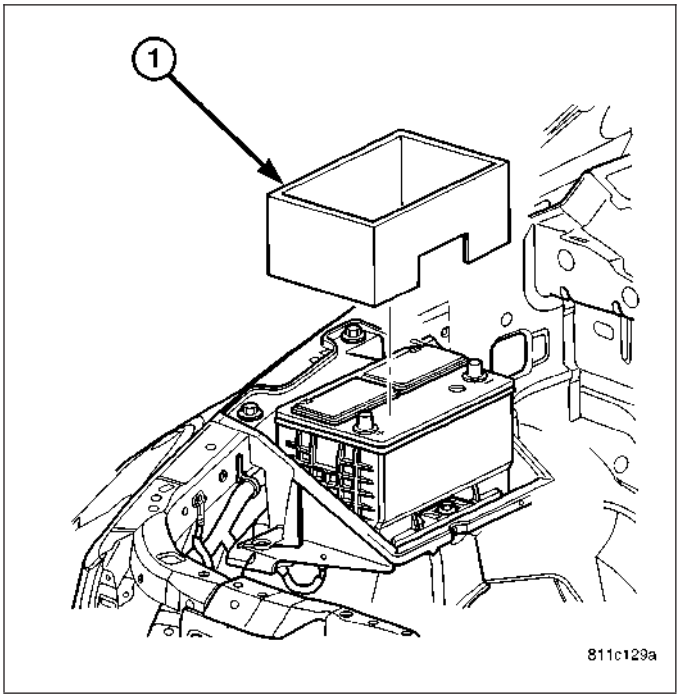
1. Turn the ignition switch to the Off position. Be certain that all electrical accessories are turned off.
2. Loosen the battery negative cable terminal clamp pinch-bolt hex nut.
3. Disconnect the battery negative cable terminal clamp from the battery negative terminal post. If necessary, use a battery terminal puller (2) to remove the terminal clamp from the battery post.
4. Loosen the battery positive cable terminal clamp pinch-bolt hex nut.
5. Disconnect the battery positive cable terminal clamp from the battery positive terminal post. If necessary, use a battery terminal puller (2) to remove the terminal clamp from the battery post.



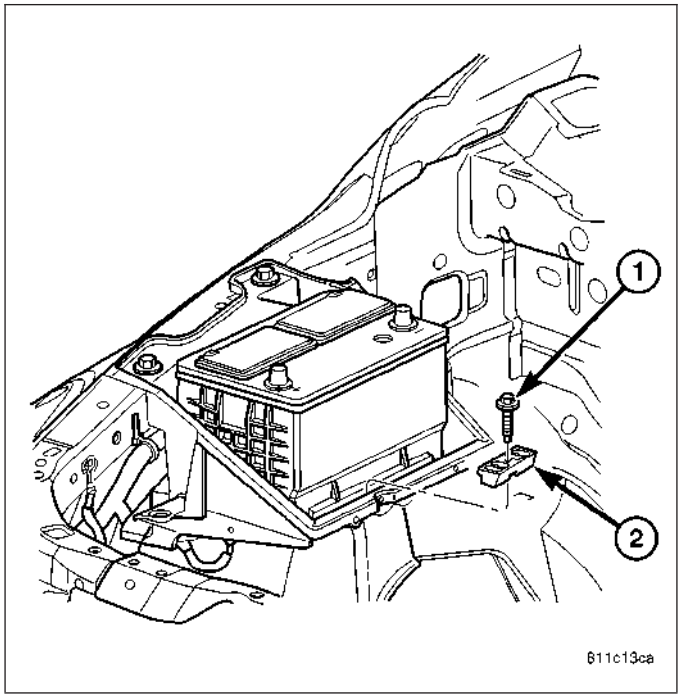
6. Remove the battery cables from the battery.



7. Remove the battery thermal guard (1).

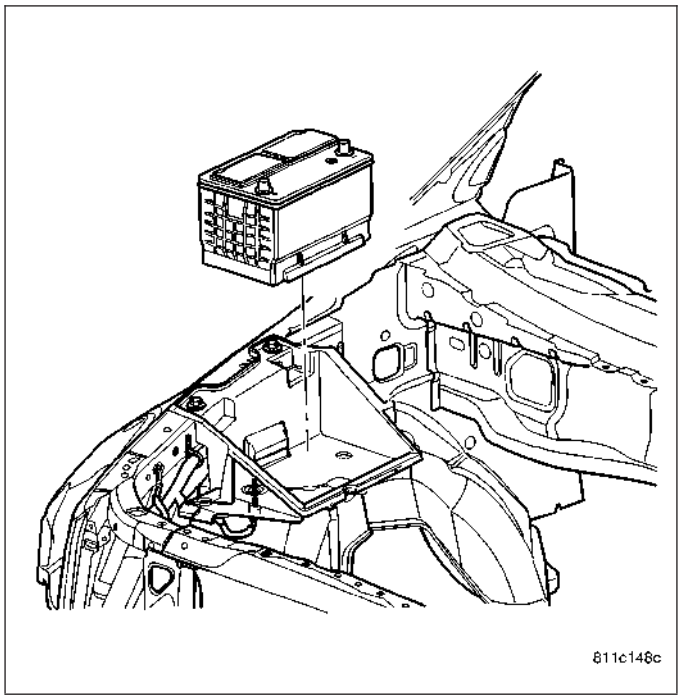


8. Remove the battery hold down (1) and bolt (2) from the battery.



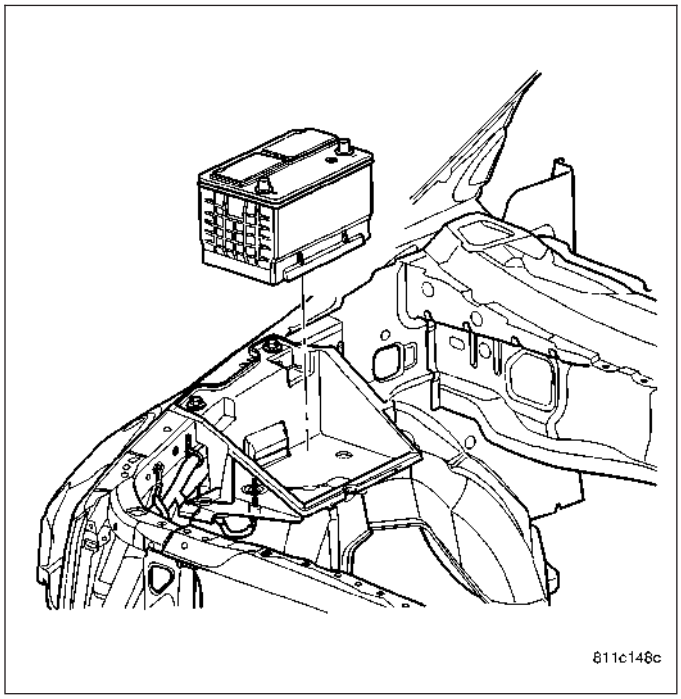
WARNING: WEAR A SUITABLE PAIR OF RUBBER GLOVES (NOT THE HOUSEHOLD TYPE) WHEN REMOVING A BATTERY BY HAND. SAFETY GLASSES SHOULD ALSO BE WORN. IF THE BATTERY IS CRACKED OR LEAKING, THE ELECTROLYTE CAN BURN THE SKIN AND EYES.

9. Remove the battery from the battery tray.

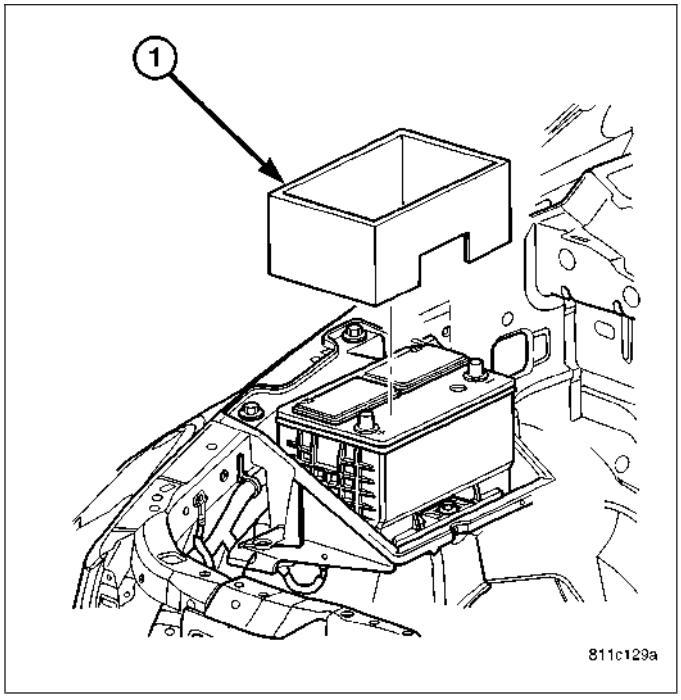


INSTALLATION

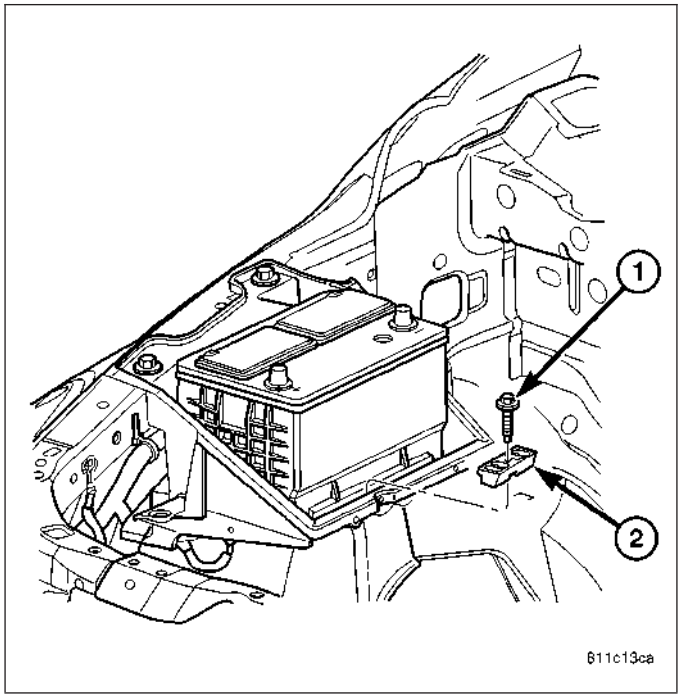
1. Clean and inspect the battery.
2. Position the battery onto the battery tray. Ensure that the battery positive and negative terminal posts are correctly positioned. The battery cable terminal clamps must reach the correct battery terminal post without stretching the cables.



3. Install the thermal guard (1) and slide battery toward fender.

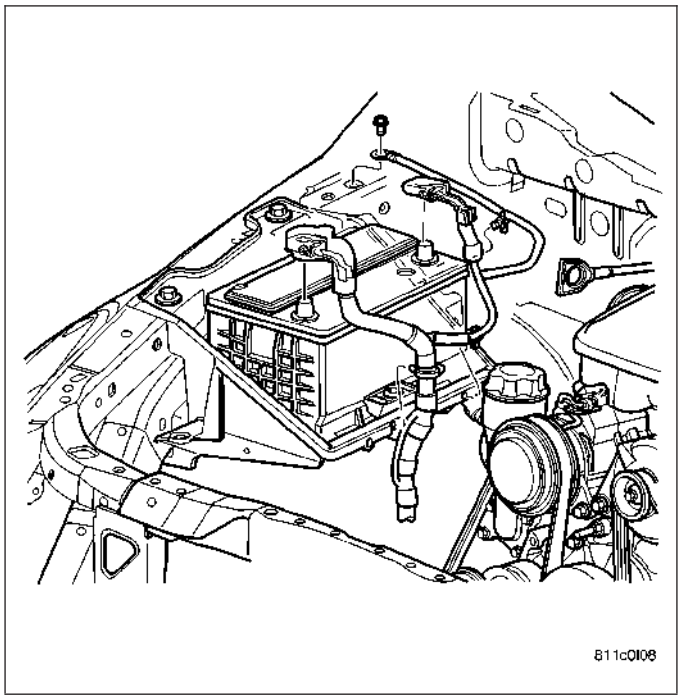


4. Install the battery hold down (1) and bolt (2) onto the battery.



CAUTION: Be certain that the battery cable terminal clamps are connected to the correct battery terminal posts. Reverse battery polarity may damage electrical components of the vehicle.

5. Clean the battery cable terminal clamps and the battery terminal posts.
6. Connect the battery positive cable terminal clamp to the battery positive terminal post.
7. Connect the battery negative cable terminal clamp to the battery negative terminal post.
8. Apply a thin coating of petroleum jelly or chassis grease to the exposed surfaces of the battery cable terminal clamps and the battery terminal posts.



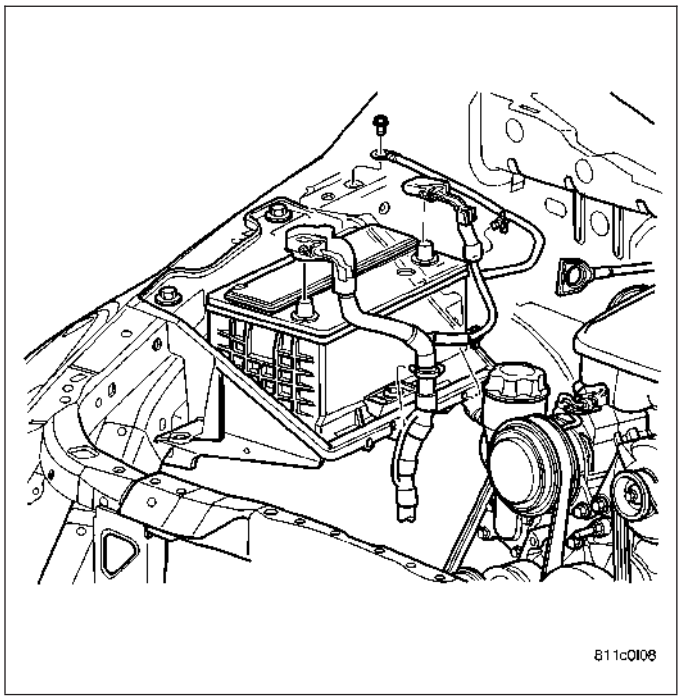
BATTERY CABLES

DESCRIPTION

The battery cables are large gauge, stranded copper wires sheathed within a heavy plastic or synthetic rubber insulating jacket. The wire used in the battery cables combines excellent flexibility and reliability with high electrical current carrying capacity.

The battery cables cannot be repaired and, if damaged or inoperative, they must be replaced.

The battery cables feature a stamped brass clamping type female battery terminal crimped onto one end of the battery cable wire and then solder-dipped. A square headed pinch-bolt and hex nut are installed at the open end of the female battery terminal clamp. The battery positive cable also includes a red molded rubber protective cover for the female battery terminal clamp. Large eyelet type terminals are crimped onto the opposite end of the battery cable wire and then solder-dipped. The battery positive cable wires have a red insulating jacket to provide visual identification and feature a larger female battery terminal clamp to allow connection to the larger battery positive terminal post. The battery negative cable wires have a black insulating jacket and a smaller female battery terminal clamp.



OPERATION

The battery cables connect the battery terminal posts to the vehicle electrical system. These cables also provide a return path for electrical current generated by the charging system for restoring the voltage potential of the battery. The female battery terminal clamps on the ends of the battery cable wires provide a strong and reliable connection of the battery cable to the battery terminal posts. The terminal pinch bolts allow the female terminal clamps to be tightened around the male terminal posts on the top of the battery. The eyelet terminals secured to the ends of the battery cable wires opposite the female battery terminal clamps provide secure and reliable connection of the battery to the vehicle electrical system.

DIAGNOSIS AND TESTING

BATTERY CABLES

A voltage drop test will determine if there is excessive resistance in the battery cable terminal connections or the battery cables. If excessive resistance is found in the battery cable connections, the connection point should be disassembled, cleaned of all corrosion or foreign material, then reassembled. Following reassembly, check the voltage drop for the battery cable connection and the battery cable again to confirm repair.

When performing the voltage drop test, it is important to remember that the voltage drop is giving an indication of the resistance between the two points at which the voltmeter probes are attached. **EXAMPLE:** When testing the resistance of the battery positive cable, touch the voltmeter leads to the battery positive cable terminal clamp and to the battery positive cable eyelet terminal at the starter solenoid B(+) terminal stud. If you probe the battery positive terminal post and the battery positive cable eyelet terminal at the starter solenoid B(+) terminal stud, you are reading the combined voltage drop in the battery positive cable terminal clamp-to-terminal post connection and the battery positive cable.

TESTING

VOLTAGE DROP TEST

WARNING: IF THE BATTERY SHOWS SIGNS OF FREEZING, LEAKING, LOOSE POSTS, OR LOW ELECTROLYTE LEVEL, DO NOT TEST, ASSIST-BOOST, OR CHARGE. THE BATTERY MAY ARC INTERNALLY AND EXPLODE. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT.

WARNING: EXPLOSIVE HYDROGEN GAS FORMS IN AND AROUND THE BATTERY. DO NOT SMOKE, USE FLAME, OR CREATE SPARKS NEAR THE BATTERY. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT.

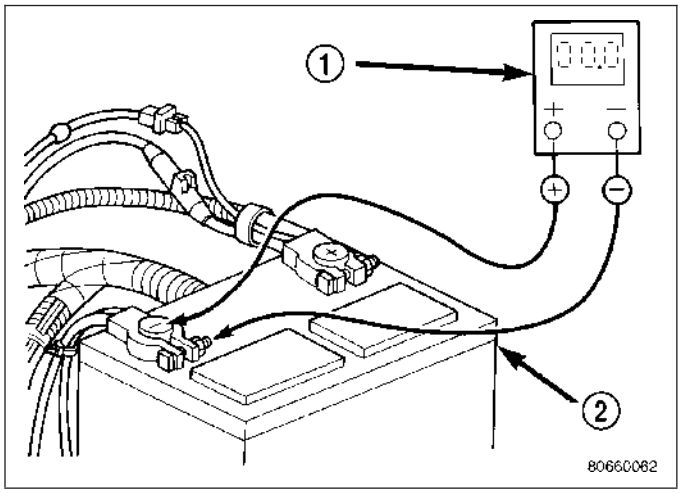
WARNING: THE BATTERY CONTAINS SULFURIC ACID, WHICH IS POISONOUS AND CAUSTIC. AVOID CONTACT WITH THE SKIN, EYES, OR CLOTHING. IN THE EVENT OF CONTACT, FLUSH WITH WATER AND CALL A PHYSICIAN IMMEDIATELY. KEEP OUT OF THE REACH OF CHILDREN.

WARNING: IF THE BATTERY IS EQUIPPED WITH REMOVABLE CELL CAPS, BE CERTAIN THAT EACH OF THE CELL CAPS IS IN PLACE AND TIGHT BEFORE THE BATTERY IS RETURNED TO SERVICE. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT FROM LOOSE OR MISSING CELL CAPS.

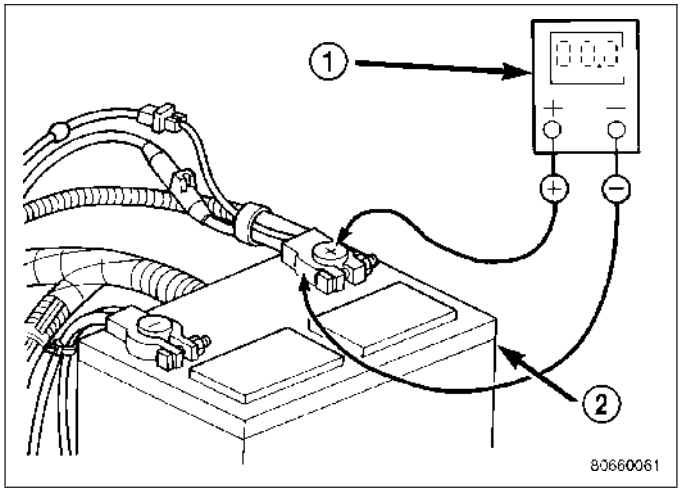
The following operation will require a voltmeter accurate to 1/10 (0.10) volt. Before performing this test, be certain that the following procedures are accomplished:

- The battery is fully-charged and tested.
- Fully engage the parking brake.
- If the vehicle is equipped with an automatic transmission, place the gearshift selector lever in the Park position. If the vehicle is equipped with a manual transmission, place the gearshift selector lever in the Neutral position and block the clutch pedal in the fully depressed position.
- Verify that all lamps and accessories are turned off.
- To prevent the engine from starting, remove the proper fuse in the PDC.

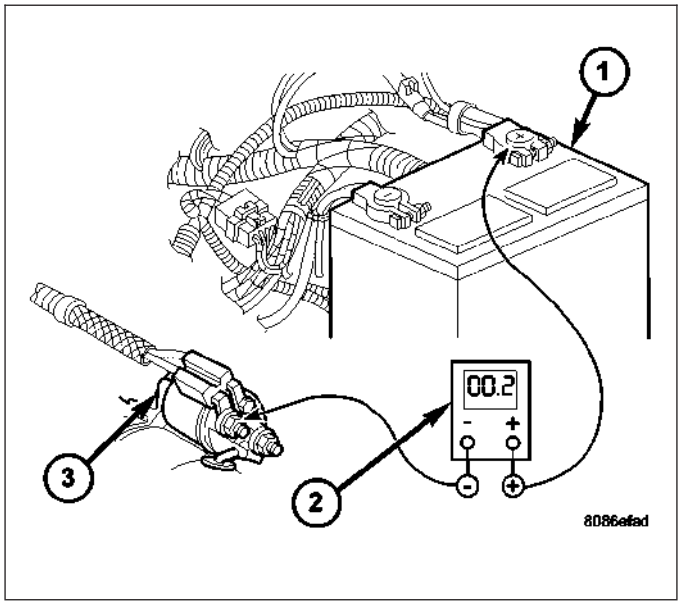
1. Connect the positive lead of the voltmeter (1) to the battery negative terminal post. Connect the negative lead of the voltmeter (1) to the battery negative cable terminal clamp. Rotate and hold the ignition switch in the Start position. Observe the voltmeter. If voltage is detected, correct the poor connection between the battery negative cable terminal clamp and the battery negative terminal post.



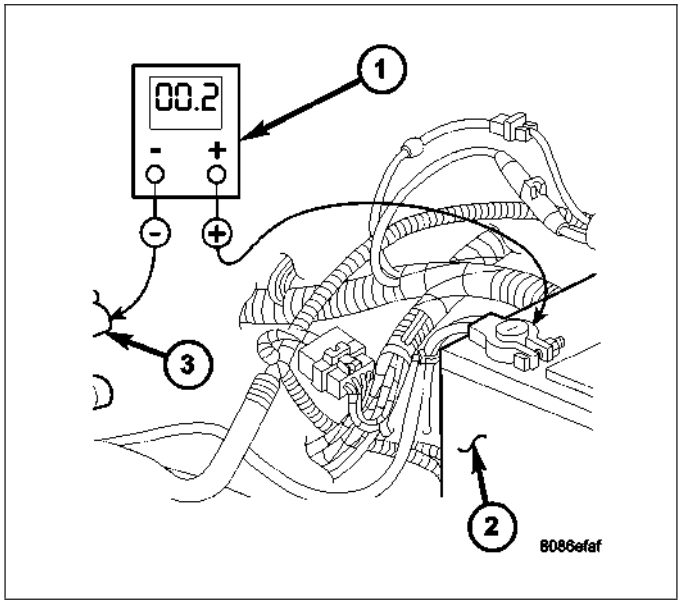
2. Connect the positive lead of the voltmeter (1) to the battery positive terminal post. Connect the negative lead of the voltmeter to the battery positive cable terminal clamp. Rotate and hold the ignition switch in the Start position. Observe the voltmeter. If voltage is detected, correct the poor connection between the battery positive cable terminal clamp and the battery positive terminal post.



3. Connect the voltmeter (2) to measure between the battery positive cable terminal clamp (1) and the starter solenoid (3) B(+) terminal stud. Rotate and hold the ignition switch in the Start position. Observe the voltmeter. If the reading is above 0.2 volt, clean and tighten the battery positive cable eyelet terminal connection at the starter solenoid B(+) terminal stud. Repeat the test. If the reading is still above 0.2 volt, replace the faulty battery positive cable.



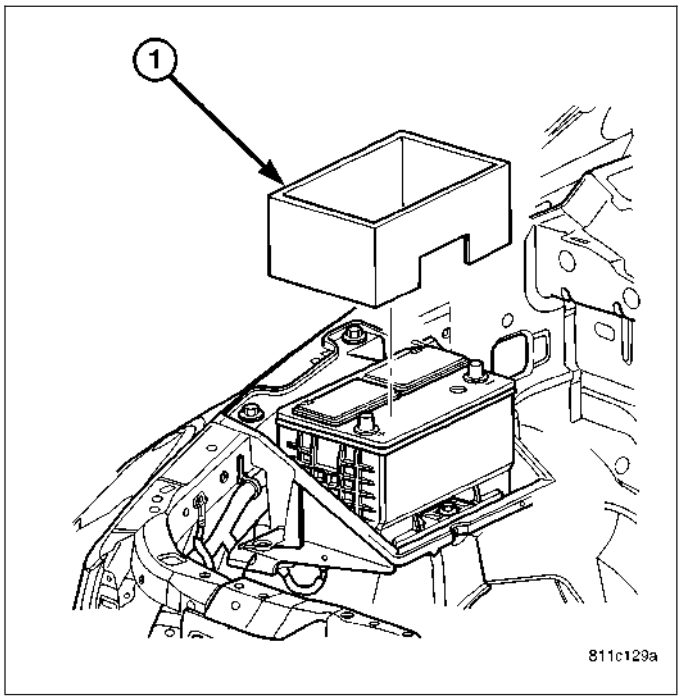
4. Connect the voltmeter (1) to measure between the battery (2) negative cable terminal clamp and a good clean ground (3) on the engine block. Rotate and hold the ignition switch in the Start position. Observe the voltmeter. If the reading is above 0.2 volt, clean and tighten the battery negative cable eyelet terminal connection to the engine block. Repeat the test. If the reading is still above 0.2 volt, replace the faulty battery negative cable.



THERMAL GUARD - BATTERY

DESCRIPTION

A flexible plastic bubble-wrap style thermal guard wraps around the battery case to enclose the sides of the battery. The thermal guard (1) consists of a heavy black plastic outer skin and two lighter plies of plastic that have been formed into a sheet with hundreds of small air pockets entrapped between them.



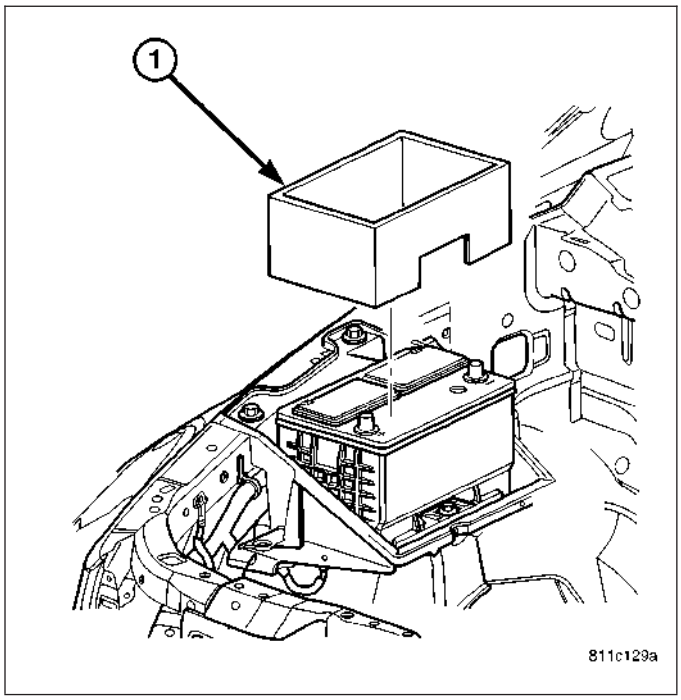
OPERATION

The thermal guard protects the battery from engine compartment temperature extremes. The temperature of the battery can affect battery performance. The air trapped between the plastic plies of the thermal guard create a dead air space, which helps to insulate the sides of the battery case from the air temperature found in the surrounding engine compartment.

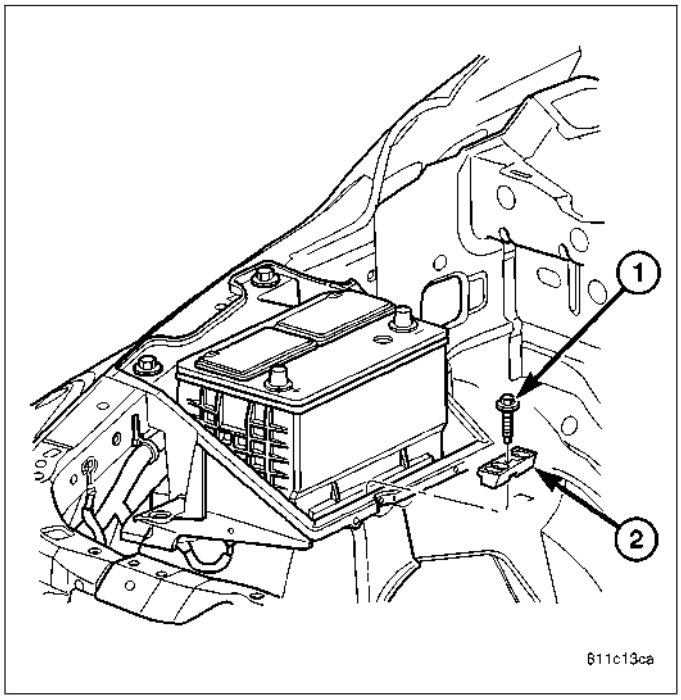
BATTERY TRAY

REMOVAL

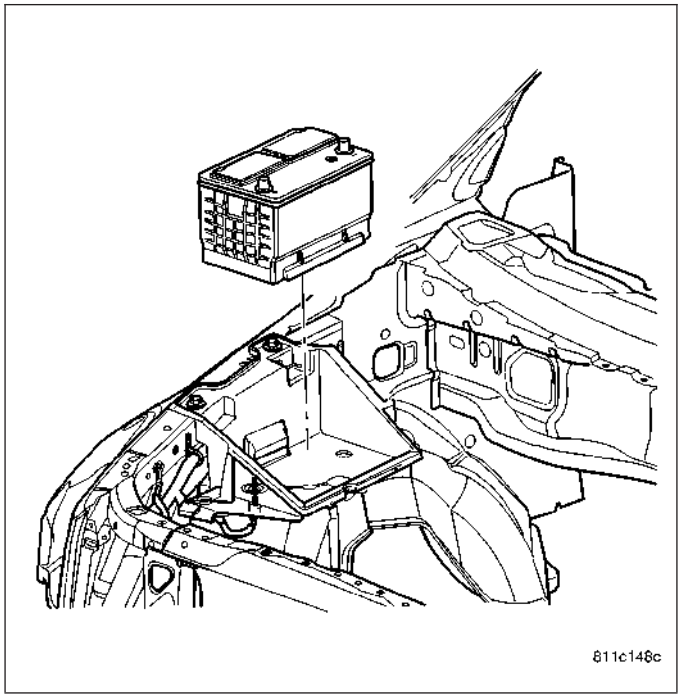
1. Disconnect the battery cables.
2. Remove the battery thermal guard (1).



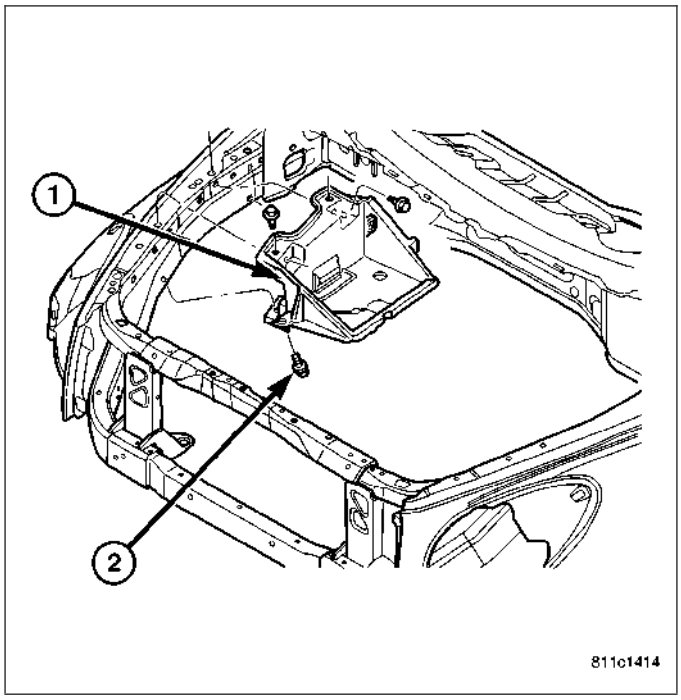
3. Remove the battery hold down (2) and bolt (1).



4. Remove the battery from the battery tray.

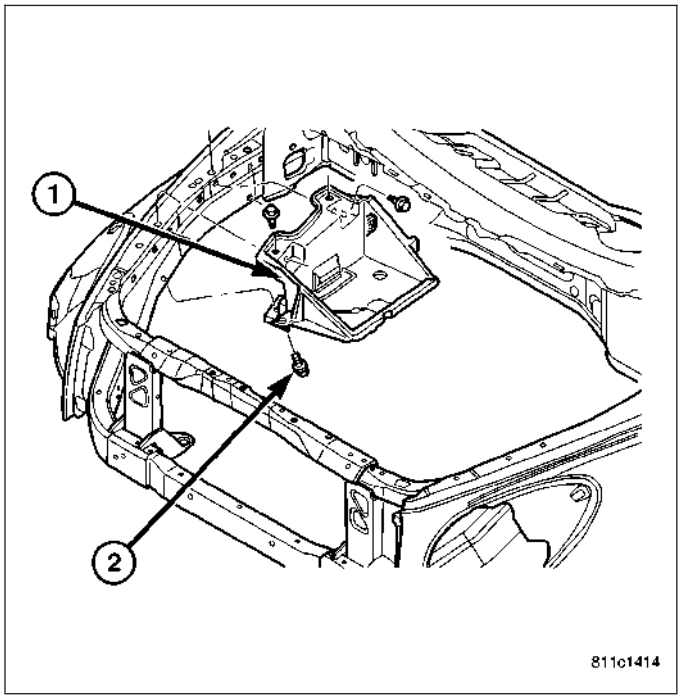


5. Remove the two upper bolts for the battery tray (1).
6. Remove the right front tire and wheel assembly (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).
7. Remove the right front wheelhouse splash shield (Refer to 23 - BODY/EXTERIOR/LF WHEELHOUSE SPLASH SHIELD - DESCRIPTION).
8. Remove the lower battery tray (1) mounting bolts (2).
9. Remove the electrical routing clips at the battery tray.
10. Remove the battery temperature sensor from the battery tray (1). (Refer to 8 - ELECTRICAL/CHARGING/BATTERY TEMPERATURE SENSOR - REMOVAL).
11. Remove the battery tray (1) from the vehicle.

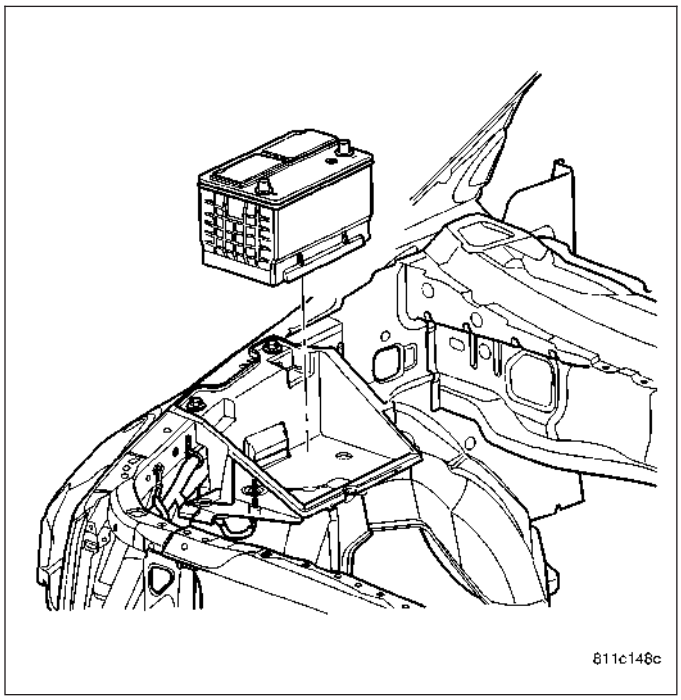


INSTALLATION

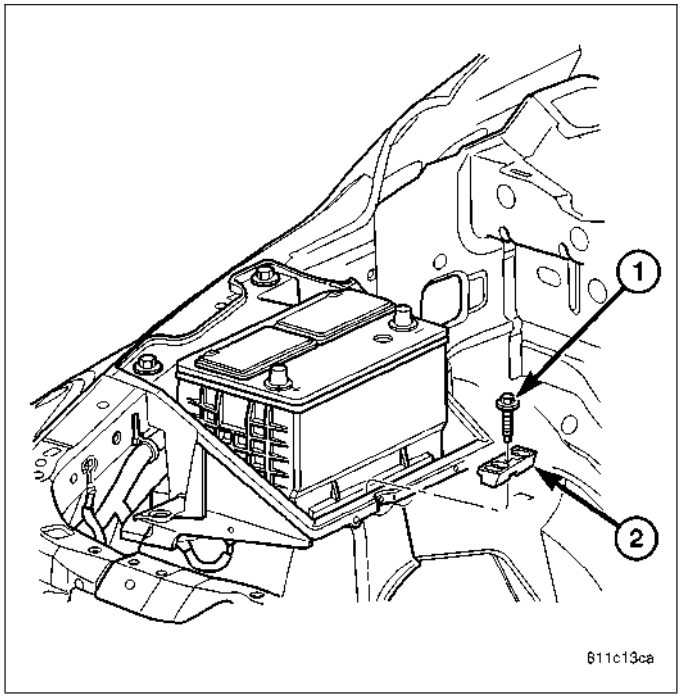
1. Clean and inspect the battery tray (1). Refer to Battery System for battery tray cleaning and inspection procedures.
2. Position the battery tray (1) into the vehicle.
3. Install and tighten the lower bolts (2) that secure the battery tray (1). Tighten the screws to 12.4 N·m (110 in. lbs.).
4. Install the right front wheelhouse splash shield (Refer to 23 - BODY/EXTERIOR/LF WHEELHOUSE SPLASH SHIELD - DESCRIPTION).
5. Install the right front tire and wheel assembly (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).
6. Install the battery temperature sensor onto the battery tray (1). (Refer to 8 - ELECTRICAL/CHARGING/BATTERY TEMPERATURE SENSOR - INSTALLATION).
7. Install and tighten upper bolts that secure the battery tray to fender frame. Tighten the screws to 12.4 N·m (110 in. lbs.).



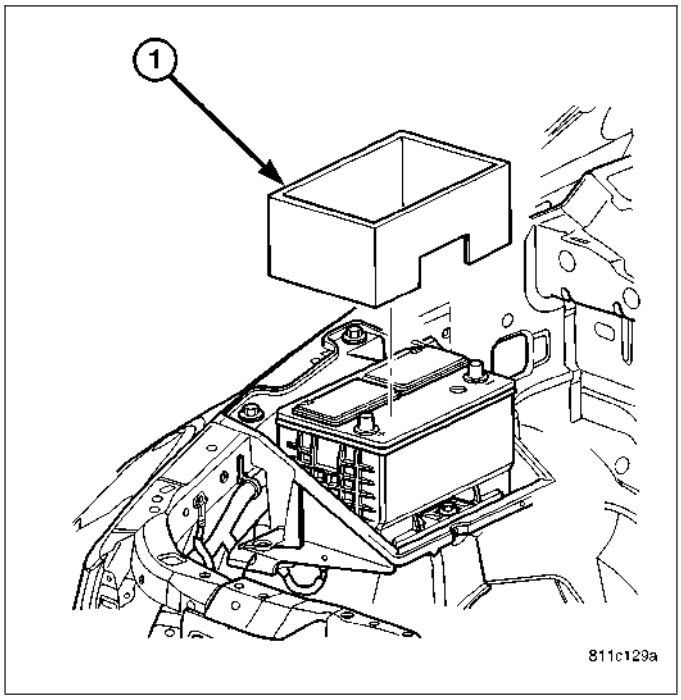
8. Install the battery onto the battery tray (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - INSTALLATION).



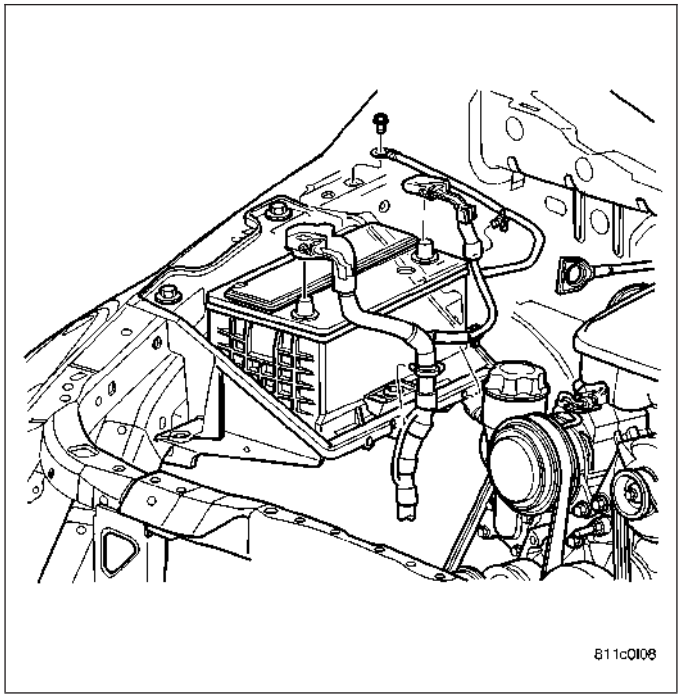
9. Install and tighten the battery holddown (1) and bolt (2).



10. Install the battery thermal guard (1).



11. Reconnect the battery cables.



CHARGING

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CHARGING

DESCRIPTION

The charging system consists of:

- Generator
- Generator decoupler pulley (if equipped)
- Electronic Voltage Regulator (EVR) circuitry within the Powertrain Control Module (PCM)
- Ignition switch
- Battery (refer to Battery for information)
- Battery temperature sensor
- Generator lamp (if equipped)
- Check gauges lamp (if equipped)
- Voltmeter (refer to Instrument Cluster for information)
- Wiring harness and connections (refer to Wiring for information)

OPERATION

The charging system is turned on and off with the ignition switch. The system is on when the engine is running and the ASD relay is energized. When the ASD relay is on, voltage is supplied to the ASD relay sense circuit at the PCM. This voltage is connected through the PCM and supplied to one of the generator field terminals (Gen. Source +) at the back of the generator.

The amount of DC current produced by the generator is controlled by the EVR (field control) circuitry contained within the PCM. This circuitry is connected in series with the second rotor field terminal and ground.

A battery temperature sensor, located in the battery tray housing, is used to sense battery temperature. This temperature data, along with data from monitored line voltage, is used by the PCM to vary the battery charging rate. This is done by cycling the ground path to control the strength of the rotor magnetic field. The PCM then compensates and regulates generator current output accordingly.

All vehicles are equipped with On-Board Diagnostics (OBD). All OBD-sensed systems, including EVR (field control) circuitry, are monitored by the PCM. Each monitored circuit is assigned a Diagnostic Trouble Code (DTC). The PCM will store a DTC in electronic memory for certain failures it detects.

The Check Gauges Lamp (if equipped) monitors: **charging system voltage,** engine coolant temperature and engine oil pressure. If an extreme condition is indicated, the lamp will be illuminated. This is done as a reminder to check the three gauges. The signal to activate the lamp is sent via the CAN bus circuits. The lamp is located on the instrument panel. Refer to Instrument Cluster for additional information.

DIAGNOSIS AND TESTING - CHARGING SYSTEM

The following procedures may be used to diagnose the charging system if:

- the check gauges lamp (if equipped) is illuminated with the engine running
- the voltmeter (if equipped) does not register properly
- an undercharged or overcharged battery condition occurs.

Remember that an undercharged battery is often caused by:

- accessories being left on with the engine not running
- a faulty or improperly adjusted switch that allows a lamp to stay on. Refer to Ignition-Off Draw Test in the Battery section for more information.

INSPECTION

The Powertrain Control Module (PCM) monitors critical input and output circuits of the charging system, making sure they are operational. A Diagnostic Trouble Code (DTC) is assigned to each input and output circuit monitored by the On-Board Diagnostic (OBD) system. Some charging system circuits are checked continuously, and some are checked only under certain conditions.

Refer to Diagnostic Trouble Codes in; Powertrain Control Module; Electronic Control Modules for more DTC information. This will include a complete list of DTC's including DTC's for the charging system.

To perform a complete test of the charging system, refer to the appropriate Diagnostic Test Procedures and use a diagnostic scan tool. Perform the following inspections before attaching the scan tool.

1. Inspect the battery condition. Refer to Battery for procedures.
2. Inspect condition of battery cable terminals, battery posts, connections at engine block, starter solenoid and relay. They should be clean and tight. Repair as required.
3. Inspect all fuses in both the fuseblock and Power Distribution Center (PDC) for tightness in receptacles. They should be properly installed and tight. Repair or replace as required.
4. Inspect generator mounting bolts for tightness. Replace or tighten bolts if required. Refer to the Generator Removal/Installation section of this group for torque specifications.
5. Inspect generator drive belt condition and tension. Tighten or replace belt as required. Refer to Belt Tension Specifications in Cooling System.
6. Inspect automatic belt tensioner (if equipped). Refer to Cooling System for information.
7. Inspect generator electrical connections at generator field, battery output, and ground terminal (if equipped). Also check generator ground wire connection at engine (if equipped). They should all be clean and tight. Repair as required.

SPECIFICATIONS

GENERATOR RATINGS

TYPE	PART NUMBER	RATED SAE AMPS	ENGINES
DENSO	56029700AA	136	3.7L / 4.7L
DENSO	56029914AA	160	3.7L / 4.7L
BOSCH	56041120AC	136	3.7L / 4.7L
DENSO	56028696AA	136	5.7L
BOSCH	56028699AA	136	5.7L
DENSO	56028697AA	160	5.7L

TORQUE - CHARGING SYSTEM

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Generator Mounting Bolts - 5.7L	41	30	-
Generator Support Bracket Bolt/Nuts - 5.7L	41	30	-
Generator Vertical Mounting Bolt - 3.7L / 4.7L Engines	55	40	-
Generator (long) Horizontal Mounting Bolt - 3.7L / 4.7L Engines	55	40	-
Generator (short) Horizontal Mounting Bolt - 3.7L / 4.7L Engines	74	55	-
Generator B+ Output Cable Terminal Nut	12	-	108

SENSOR-BATTERY TEMPERATURE

DESCRIPTION

The Battery Temperature Sensor (BTS) is attached to the battery tray located under the battery.

OPERATION

The Battery Temperature Sensor (BTS) is used to determine the battery temperature and control battery charging rate. This temperature data, along with data from monitored line voltage, is used by the Powertrain Control Module (PCM) to vary the battery charging rate. System voltage will be higher at colder temperatures and is gradually reduced at warmer temperatures.

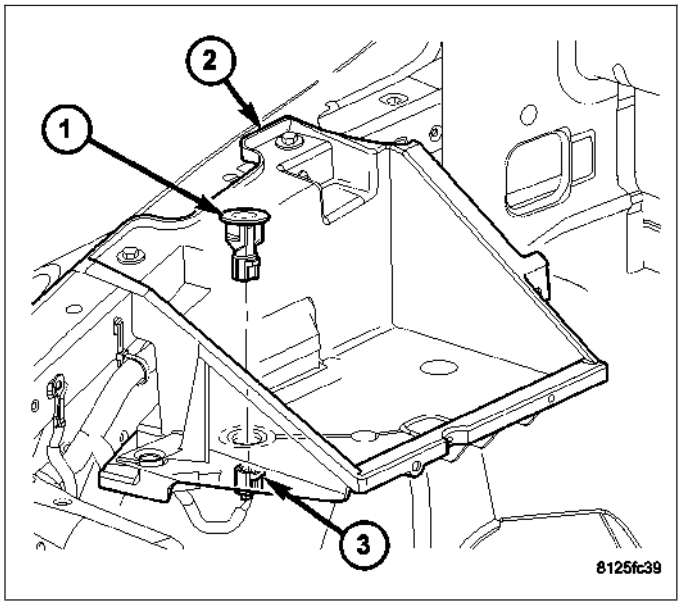
The PCM sends 5 volts to the sensor and is grounded through the sensor return line. As temperature increases, resistance in the sensor decreases and the detection voltage at the PCM increases.

The BTS is also used for OBD II diagnostics. Certain faults and OBD II monitors are either enabled or disabled, depending upon BTS input (for example, disable purge and enable Leak Detection Pump (LDP) and O2 sensor heater tests). Most OBD II monitors are disabled below 20 degrees F.

REMOVAL

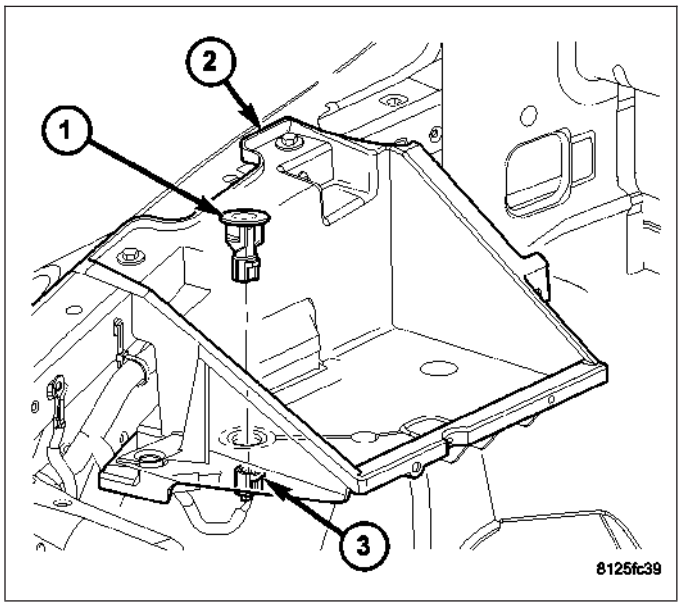
The battery temperature sensor (1) is located under vehicle battery and is attached to a mounting hole on battery tray (2).

1. Remove battery. Refer to Battery for procedures.
2. Disconnect sensor from engine wire harness (3).
3. Pry sensor straight up from battery tray mounting hole.



INSTALLATION

1. Feed engine wire harness (3) through hole in top of battery tray and attach sensor (1).
2. Press sensor (1) into hole of battery tray (2).
3. Install battery. Refer to Battery for procedures.



GENERATOR

DESCRIPTION

The generator is belt-driven by the engine using a serpentine type drive belt. It is serviced only as a complete assembly. If the generator fails for any reason, the entire assembly must be replaced.

OPERATION

As the energized rotor begins to rotate within the generator, the spinning magnetic field induces a current into the windings of the stator coil. Once the generator begins producing sufficient current, it also provides the current needed to energize the rotor.

The stator winding connections deliver the induced alternating current to 3 positive and 3 negative diodes for rectification. From the diodes, rectified direct current is delivered to the vehicle electrical system through the generator battery terminal.

Although the generators appear the same externally, different generators with different output ratings are used on this vehicle. Be certain that the replacement generator has the same output rating and part number as the original unit. Refer to Generator Ratings for amperage ratings and part numbers.

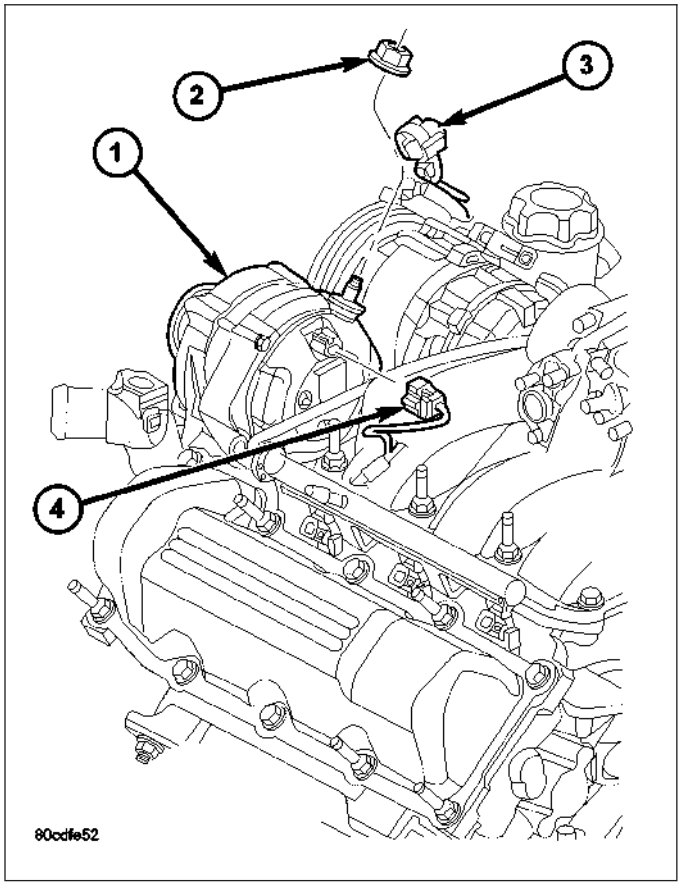
Noise emitting from the generator may be caused by: worn, loose or defective bearings; a loose or defective drive pulley; incorrect, worn, damaged or misadjusted fan drive belt; loose mounting bolts; a misaligned drive pulley or a defective stator or diode.

REMOVAL

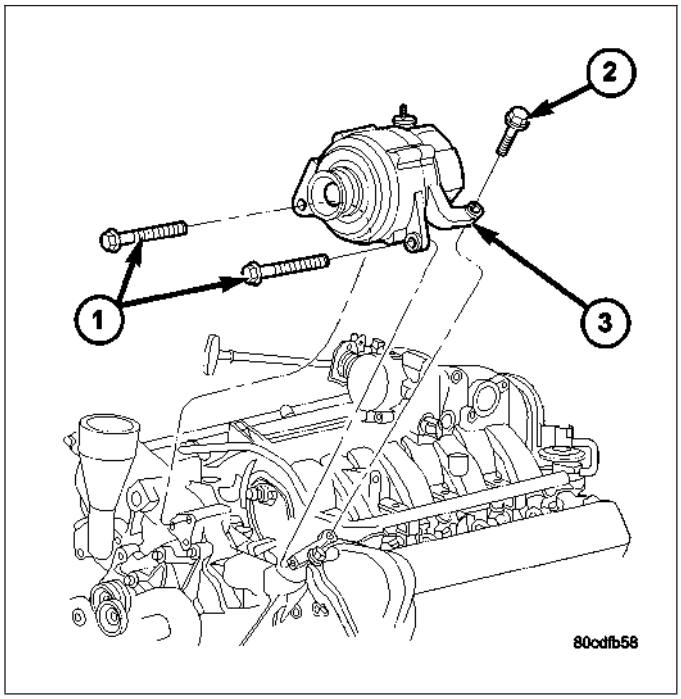
3.7L / 4.7L

WARNING: DISCONNECT NEGATIVE CABLE FROM BATTERY BEFORE REMOVING BATTERY OUTPUT WIRE (B+ WIRE) FROM GENERATOR. FAILURE TO DO SO CAN RESULT IN INJURY OR DAMAGE TO ELECTRICAL SYSTEM.

1. Disconnect negative battery cable at battery.
2. Remove generator drive belt. Refer to 7, Cooling System for procedure.
3. Unsnap plastic insulator cap (3) from B+ output terminal.
4. Remove B+ terminal mounting nut (2) at rear of generator. Disconnect terminal from generator.
5. Disconnect field wire connector (4) at rear of generator by pushing on connector tab.



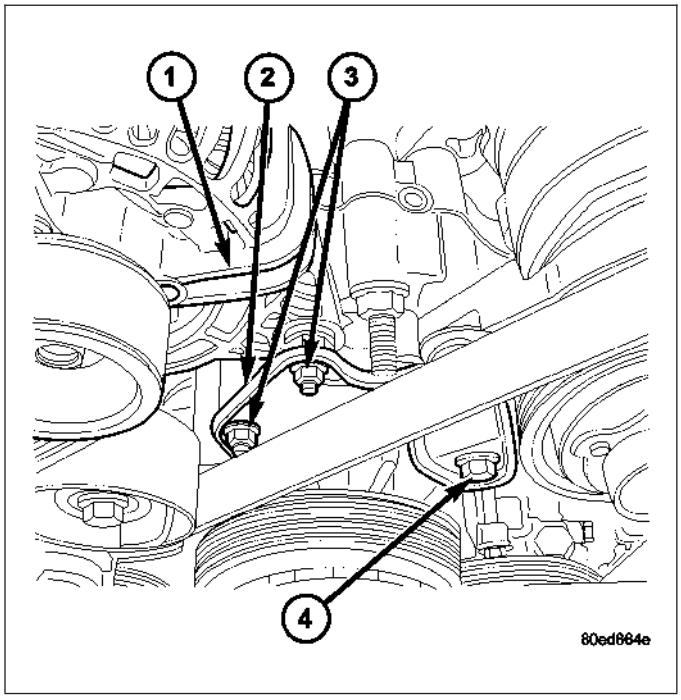
6. Remove 1 rear vertical generator mounting bolt (2).
7. Remove 2 front horizontal generator mounting bolts (1).
8. Remove generator from vehicle.



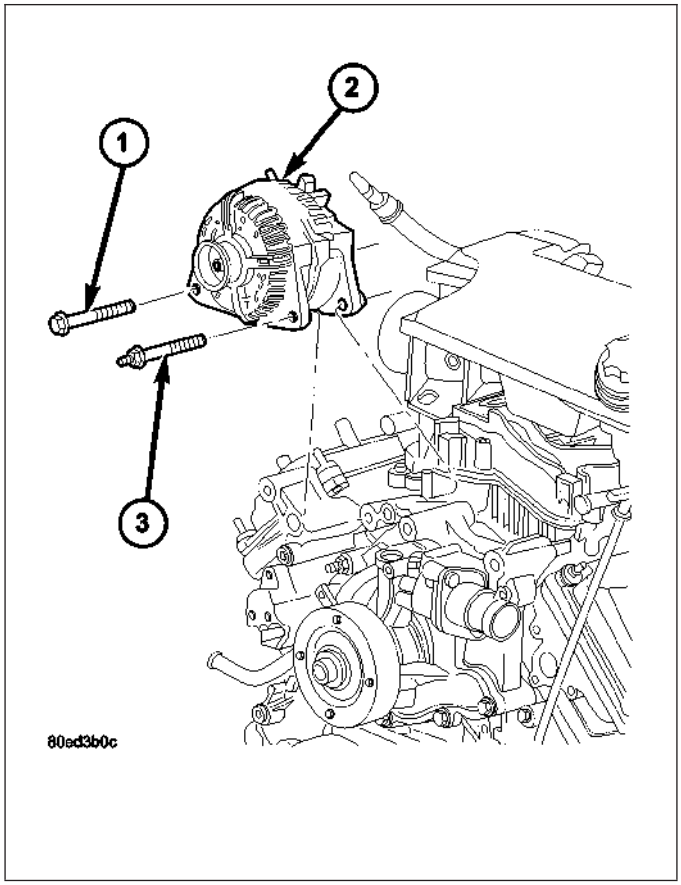
5.7L

WARNING: DISCONNECT NEGATIVE CABLE FROM BATTERY BEFORE REMOVING BATTERY OUTPUT WIRE (B+ WIRE) FROM GENERATOR. FAILURE TO DO SO CAN RESULT IN INJURY OR DAMAGE TO ELECTRICAL SYSTEM.

1. Disconnect negative battery cable at battery.
2. Remove generator drive belt. Refer to 7, Cooling System for procedure.
3. Unsnap plastic insulator cap from B+ output terminal.
4. Remove B+ terminal mounting nut at rear of generator. Disconnect terminal from generator.
5. Disconnect field wire connector at rear of generator by pushing on connector tab.
6. Remove generator support bracket nuts and bolt (3) and (4) and remove support bracket (2).



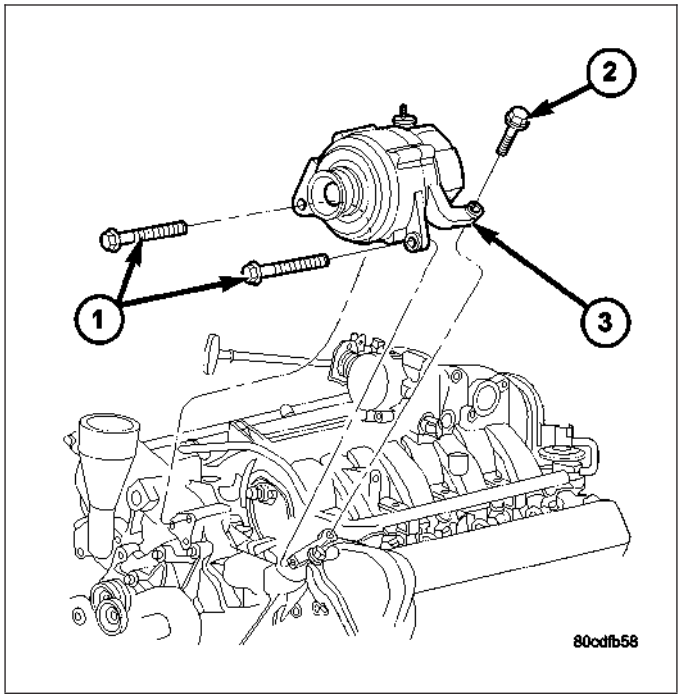
7. Remove 2 generator mounting bolts (1) and (3).
8. Remove generator (2) from vehicle.



INSTALLATION

3.7L / 4.7L

1. Position generator (3) to engine and install 2 horizontal bolts (1) and 1 vertical bolt (2).
2. Tighten all 3 bolts. Refer to Torque Specifications.

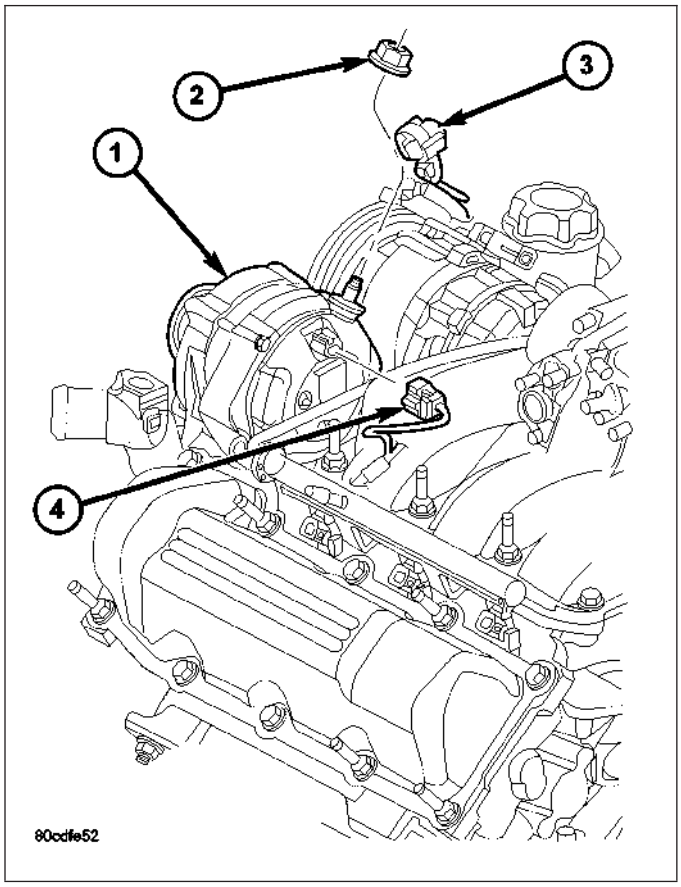


3. Snap field wire connector (4) into rear of generator.
4. Install B+ terminal eyelet to generator output stud. Tighten mounting nut (2). Refer to Torque Specifications.

CAUTION: Never force a belt over a pulley rim using a screwdriver. The synthetic fiber of the belt can be damaged.

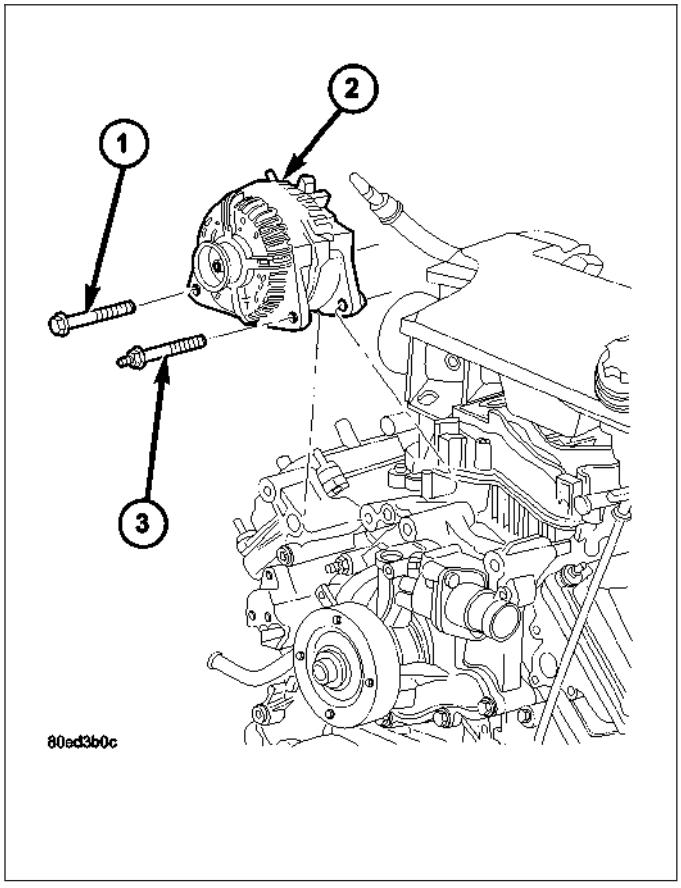
CAUTION: When installing a serpentine accessory drive belt, the belt MUST be routed correctly. The water pump may be rotating in the wrong direction if the belt is installed incorrectly, causing the engine to overheat. Refer to belt routing label in engine compartment, or refer to Belt Schematics in 7, Cooling System.

5. Install generator drive belt. Refer to 7, Cooling System for procedure.
6. Install negative battery cable to battery.



5.7L

1. Position generator (2) to engine and install 2 mounting bolts (1) and (2).
2. Tighten bolts. Refer to Torque Specifications.

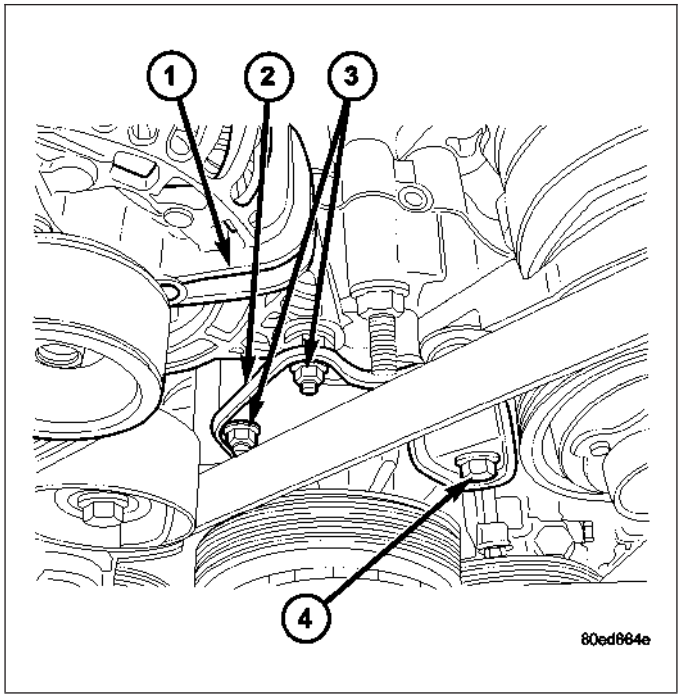


3. Position support bracket (2) to front of generator and install bolt and nuts (3). Tighten bolt / nuts. Refer to Torque Specifications.
4. Snap field wire connector into rear of generator.
5. Install B+ terminal eyelet to generator output stud. Tighten mounting nut. Refer to Torque Specifications.

CAUTION: Never force a belt over a pulley rim using a screwdriver. The synthetic fiber of the belt can be damaged.

CAUTION: When installing a serpentine accessory drive belt, the belt MUST be routed correctly. The water pump may be rotating in the wrong direction if the belt is installed incorrectly, causing the engine to overheat. Refer to belt routing label in engine compartment, or refer to Belt Schematics in 7, Cooling System.

6. Install generator drive belt. Refer to 7, Cooling System for procedure.
7. Install negative battery cable to battery.



REGULATOR, VOLTAGE

DESCRIPTION

The Electronic Voltage Regulator (EVR) is not a separate component. It is actually a voltage regulating circuit located within the Powertrain Control Module (PCM). The EVR is not serviced separately. If replacement is necessary, the PCM must be replaced.

OPERATION

The amount of DC current produced by the generator is controlled by EVR circuitry contained within the PCM. This circuitry is connected in series with the generators second rotor field terminal and its ground.

Voltage is regulated by cycling the ground path to control the strength of the rotor magnetic field. The EVR circuitry monitors system line voltage (B+) and battery temperature (refer to Battery Temperature Sensor for more information). It then determines a target charging voltage. If sensed battery voltage is 0.5 volts or lower than the target voltage, the PCM grounds the field winding until sensed battery voltage is 0.5 volts above target voltage. A circuit in the PCM cycles the ground side of the generator field up to 100 times per second (100Hz), but has the capability to ground the field control wire 100% of the time (full field) to achieve the target voltage. If the charging rate cannot be monitored (limp-in), a duty cycle of 25% is used by the PCM in order to have some generator output.

STARTING

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STARTING

DESCRIPTION

The starting system consists of:

- Starter relay
- Starter motor (including an integral starter solenoid)

Other components to be considered as part of starting system are:

- Battery
- Battery cables
- Ignition switch and key lock cylinder
- Clutch pedal position switch (manual transmission)
- Park/neutral position switch (automatic transmission)
- Wire harnesses and connections.

The Battery, Starting, and Charging systems operate in conjunction with one another, and must be tested as a complete system. For correct operation of starting/charging systems, all components used in these 3 systems must perform within specifications. When attempting to diagnose any of these systems, it is important that you keep their interdependency in mind.

The diagnostic procedures used in each of these groups include the most basic conventional diagnostic methods, to the more sophisticated On-Board Diagnostics (OBD) built into the Powertrain Control Module (PCM). Use of an induction-type milliampere ammeter, volt/ohmmeter, battery charger, carbon pile rheostat (load tester), and 12-volt test lamp may be required.

Certain starting system components are monitored by the PCM and may produce a Diagnostic Trouble Code (DTC).

OPERATION

The starting system components form two separate circuits. A high-amperage feed circuit that feeds the starter motor between 150 and 350 amperes (700 amperes - diesel engine), and a low-amperage control circuit that operates on less than 20 amperes. The high-amperage feed circuit components include the battery, the battery cables, the contact disc portion of the starter solenoid, and the starter motor. The low-amperage control circuit components include the ignition switch, the clutch pedal position switch (manual transmission), the park/neutral position switch (automatic transmission), the starter relay, the electromagnetic windings of the starter solenoid, and the connecting wire harness components.

If the vehicle is equipped with a manual transmission, it has a clutch pedal position switch installed in series between the ignition switch and the coil battery terminal of the starter relay. This normally open switch prevents the starter relay from being energized when the ignition switch is turned to the Start position, unless the clutch pedal is depressed. This feature prevents starter motor operation while the clutch disc and the flywheel are engaged. The starter relay coil ground terminal is always grounded on vehicles with a manual transmission.

If the vehicle is equipped with an automatic transmission, battery voltage is supplied through the low-amperage control circuit to the coil battery terminal of the starter relay when the ignition switch is turned to the Start position. The park/neutral position switch is installed in series between the starter relay coil ground terminal and ground. This normally open switch prevents the starter relay from being energized and the starter motor from operating unless the automatic transmission gear selector is in the Neutral or Park positions.

When the starter relay coil is energized, the normally open relay contacts close. The relay contacts connect the relay common feed terminal to the relay normally open terminal. The closed relay contacts energize the starter solenoid coil windings.

The energized solenoid pull-in coil pulls in the solenoid plunger. The solenoid plunger pulls the shift lever in the starter motor. This engages the starter overrunning clutch and pinion gear with the starter ring gear.

As the solenoid plunger reaches the end of its travel, the solenoid contact disc completes the high-amperage starter feed circuit and energizes the solenoid plunger hold-in coil. Current now flows between the solenoid battery terminal and the starter motor, energizing the starter.

Once the engine starts, the overrunning clutch protects the starter motor from damage by allowing the starter pinion gear to spin faster than the pinion shaft. When the ignition switch is released to the On position, the starter relay coil is de-energized. This causes the relay contacts to open. When the relay contacts open, the starter solenoid plunger hold-in coil is de-energized.

When the solenoid plunger hold-in coil is de-energized, the solenoid plunger return spring returns the plunger to its relaxed position. This causes the contact disc to open the starter feed circuit, and the shift lever to disengage the overrunning clutch and pinion gear from the starter ring gear.

DIAGNOSIS AND TESTING - STARTING SYSTEM

The battery, starting, and charging systems operate in conjunction with one another, and must be tested as a complete system. For correct starting/charging system operation, all of the components involved in these 3 systems must perform within specifications.

Starting System Diagnosis		
CONDITION	POSSIBLE CAUSE	CORRECTION
STARTER FAILS TO OPERATE.	1. Battery discharged or faulty.	1. Refer to Battery. Charge or replace battery, if required.
	2. Starting circuit wiring faulty.	2. Refer to 8, Wiring Diagrams. Test and repair starter feed and/or control circuits, if required.
	3. Starter relay faulty.	3. Refer to Starter Relay in Diagnosis and Testing. Replace starter relay if required.
	4. Ignition switch faulty.	4. Refer to Ignition Switch and Key Lock Cylinder. Replace ignition switch if required.
	5. Clutch pedal position switch faulty.	5. Refer to Clutch Pedal Position Switch.
	6. Park/Neutral position switch faulty or misadjusted.	6. Refer to Park/Neutral Position Switch. Replace park/neutral position switch if required.
	7. Starter solenoid faulty.	7. Refer to Starter Motor. Replace starter motor assembly if required.
	8. Starter motor faulty.	8. If all other starting system components and circuits test OK, replace starter motor.

Starting System Diagnosis		
CONDITION	POSSIBLE CAUSE	CORRECTION
STARTER ENGAGES, FAILS TO TURN ENGINE.	1. Battery discharged or faulty.	1. Refer to Battery. Charge or replace battery if required.
	2. Starting circuit wiring faulty.	2. Refer to 8, Wiring Diagrams. Test and repair starter feed and/or control circuits if required.
	3. Starter motor faulty.	3. If all other starting system components and circuits test OK, replace starter motor assembly.
	4. Engine seized.	4. Refer to Engine Diagnosis in the Diagnosis and Testing section of 9, Engine.
STARTER ENGAGES, SPINS OUT BEFORE ENGINE STARTS.	1. Starter ring gear faulty.	1. Refer to Starter Motor Removal and Installation. Remove starter motor to inspect starter ring gear. Replace starter ring gear if required.
	2. Starter motor faulty.	2. If all other starting system components and circuits test OK, replace starter motor assembly.
STARTER DOES NOT DISENGAGE.	1. Starter motor improperly installed.	1. Refer to Starter Motor Removal and Installation. Tighten starter mounting hardware to correct torque specifications.
	2. Starter relay faulty.	2. Refer to Starter Relay Diagnosis and Testing. Replace starter relay if required.
	3. Ignition switch faulty.	3. Refer to Ignition Switch and Key Lock Cylinder. Replace ignition switch if required.
	4. Starter motor faulty.	4. If all other starting system components and circuits test OK, replace starter motor.

INSPECTION

For complete starter wiring circuit diagrams, refer to 8, Wiring Diagrams. Before removing any unit from starting system for repair or diagnosis, perform the following inspections:

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO 8, PASSIVE RESTRAINT SYSTEMS, BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

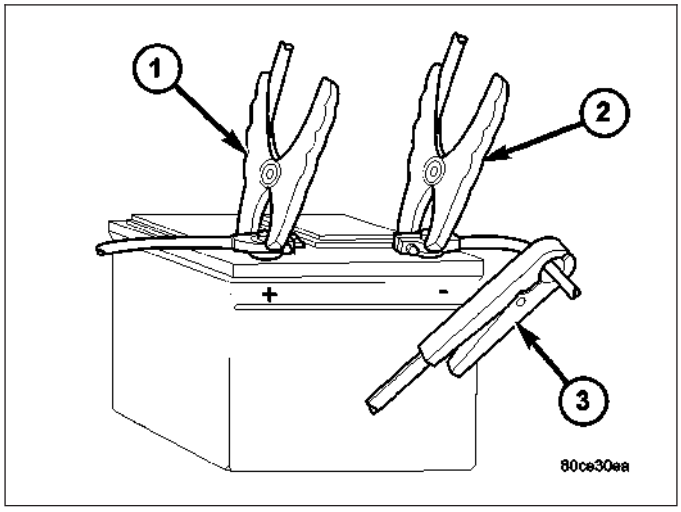
- **Battery** - Visually inspect battery for indications of physical damage and loose or corroded cable connections. Determine state-of-charge and cranking capacity of battery. Charge or replace battery if required. Refer to **Battery** in 8, Battery. **Note: If equipped with diesel engine, a dual battery system may be used, and both batteries must be inspected.**
- **Ignition Switch** - Visually inspect ignition switch for indications of physical damage and loose or corroded wire harness connections. Refer to **Ignition Switch and Key Lock Cylinder.**
- **Clutch Pedal Position Switch** - If equipped with manual transmission, visually inspect clutch pedal position switch for indications of physical damage and loose or corroded wire harness connections. Refer to **Clutch Pedal Position Switch** in 6, Clutch.
- **Park/Neutral Position Switch** - If equipped with automatic transmission, visually inspect park/neutral position switch for indications of physical damage and loose or corroded wire harness connections. Refer to **Park/Neutral Position Switch** in 21, Transmission.
- **Starter Relay** - Visually inspect starter relay for indications of physical damage and loose or corroded wire harness connections.
- **Starter Motor** - Visually inspect starter motor for indications of physical damage and loose or corroded wire harness connections.

- **Starter Solenoid** - Visually inspect starter solenoid for indications of physical damage and loose or corroded wire harness connections.
- **Wiring** - Visually inspect wire harnesses for damage. Repair or replace any faulty wiring, as required. Refer to 8, Wiring Diagrams.

TESTING

COLD CRANKING TEST

For complete starter wiring circuit diagrams, refer to 8, Wiring Diagrams. The battery must be fully-charged and load-tested before proceeding. Refer to **Battery** in Battery.



1. Connect volt-ampere tester to battery terminals (1), (2) and (3). See instructions provided by manufacturer of volt-ampere tester being used. **Note: Certain diesel equipped models use dual batteries. If equipped with dual battery system, tester should be connected to battery on left side of vehicle only. Also, tester current reading must be taken from positive battery cable lead that connects to starter motor.**
2. Fully engage parking brake.
3. If equipped with manual transmission, place gearshift selector lever in Neutral position and block clutch pedal in fully depressed position. If equipped with automatic transmission, place gearshift selector lever in Park position.
4. Verify that all lamps and accessories are turned off.
5. To prevent a gasoline engine from starting, remove Automatic ShutDown (ASD) relay. To prevent a diesel engine from starting, remove Fuel Pump Relay. These relays are located in Power Distribution Center (PDC). Refer to label on PDC cover for relay location.

WARNING: IF EQUIPPED WITH DIESEL ENGINE, ATTEMPT TO START ENGINE A FEW TIMES BEFORE PROCEEDING WITH FOLLOWING STEP.

6. Rotate and hold ignition switch in Start position. Note cranking voltage and current (amperage) draw readings shown on volt-ampere tester.
   a. If voltage reads below 9.6 volts, refer to **Starter Motor** in Diagnosis and Testing. If starter motor is OK, refer to **Engine Diagnosis** in 9, Engine for further testing of engine. If starter motor is not OK, replace faulty starter motor.
   b. If voltage reads above 9.6 volts and current (amperage) draw reads below specifications, refer to **Feed Circuit Test** in this section.
   c. If voltage reads 12.5 volts or greater and starter motor does not turn, refer to **Control Circuit Testing** in this section.
   d. If voltage reads 12.5 volts or greater and starter motor turns very slowly, refer to **Feed Circuit Test** in this section.

Note: A cold engine will increase starter current (amperage) draw reading, and reduce battery voltage reading.

FEED CIRCUIT TEST

The starter feed circuit test (voltage drop method) will determine if there is excessive resistance in high-amperage feed circuit. For complete starter wiring circuit diagrams, refer 8, Wiring Diagrams.

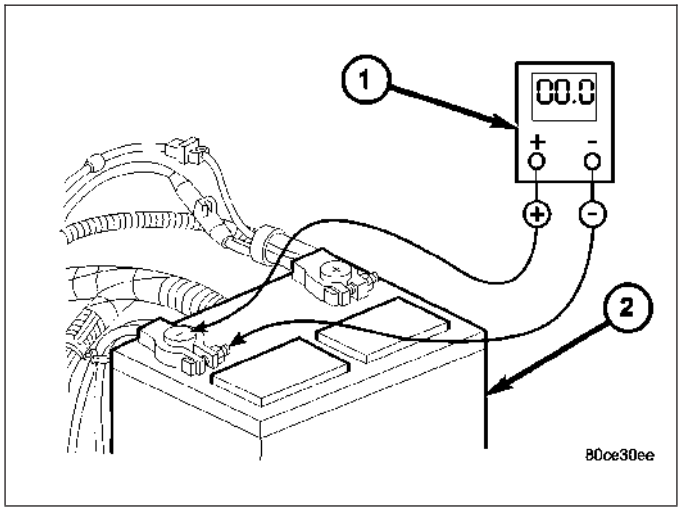
When performing these tests, it is important to remember that voltage drop is giving an indication of resistance between two points at which voltmeter probes are attached.

Example: When testing resistance of positive battery cable, touch voltmeter leads to positive battery cable clamp and cable connector at starter solenoid. If you probe positive battery terminal post and cable connector at starter solenoid, you are reading combined voltage drop in positive battery cable clamp-to-terminal post connection and positive battery cable.

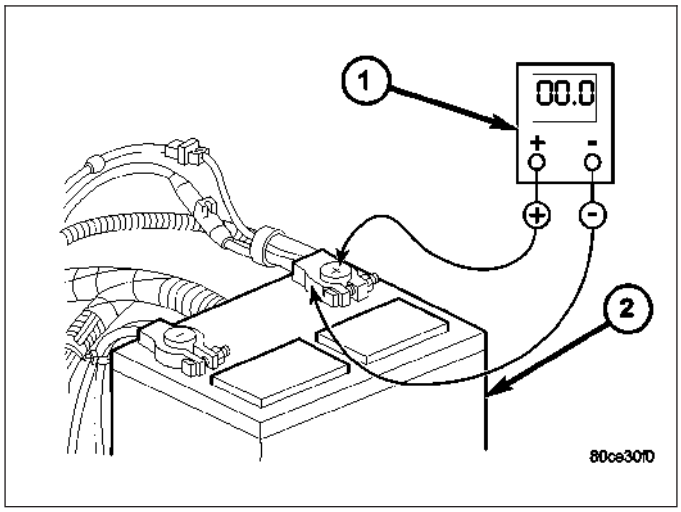
The following operation will require a voltmeter accurate to 1/10 (0.10) volt. Before performing tests, be certain that following procedures are accomplished:

- Battery is fully-charged and load-tested. Refer to **Battery** in 8, Battery.
- Fully engage parking brake.
- If equipped with manual transmission, place gearshift selector lever in Neutral position and block clutch pedal in fully depressed position. If equipped with automatic transmission, place gearshift selector lever in Park position.
- Verify that all lamps and accessories are turned off.
- To prevent a gasoline engine from starting, remove Automatic ShutDown (ASD) relay. To prevent a diesel engine from starting, remove Fuel Pump Relay. These relays are located in Power Distribution Center (PDC). Refer to label on PDC cover for relay location.

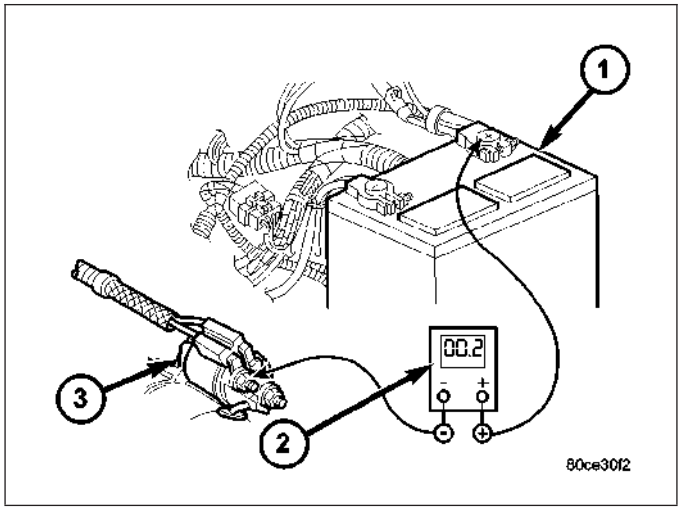
1. Connect positive lead of voltmeter (1) to negative battery cable terminal post. Connect negative lead of voltmeter to negative battery cable clamp. Rotate and hold ignition switch in Start position. Observe voltmeter (1). If voltage is detected, correct poor contact between cable clamp and terminal post. **Note: Certain diesel equipped models use dual batteries. If equipped with dual battery system, procedure must be performed twice, once for each battery.**



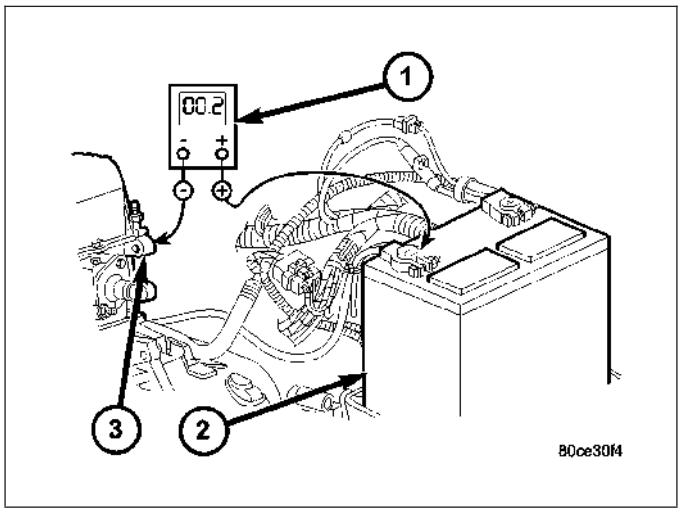
2. Connect positive lead of voltmeter (1) to positive battery terminal post. Connect negative lead of voltmeter to battery positive cable clamp. Rotate and hold ignition switch in Start position. Observe voltmeter (1). If voltage is detected, correct poor contact between cable clamp and terminal post. **Note: Certain diesel equipped models use dual batteries. If equipped with dual battery system, this procedure must be performed twice, once for each battery.**



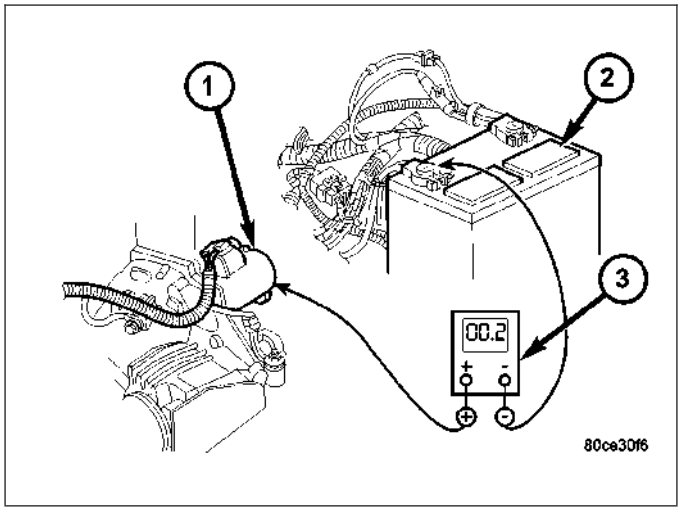
3. Connect voltmeter (2) to measure between battery positive terminal post and starter solenoid battery terminal stud (3). Rotate and hold ignition switch in Start position. Observe voltmeter. If reading is above 0.2 volt, clean and tighten battery cable connection at solenoid. Repeat test. If reading is still above 0.2 volt, replace faulty positive battery cable. **Note: Certain diesel equipped models use dual batteries. If equipped with dual battery system, this procedure must be performed on driver side battery only.**



4. Connect voltmeter (1) to measure between negative battery terminal post and a good clean ground on engine block (3). Rotate and hold ignition switch in Start position. Observe voltmeter. If reading is above 0.2 volt, clean and tighten negative battery cable attachment on engine block. Repeat test. If reading is still above 0.2 volt, replace faulty negative battery cable. **Note: Certain diesel equipped models use dual batteries. If equipped with dual battery system, this procedure must be performed twice, once for each battery.**



5. Connect positive lead of voltmeter (3) to starter housing (1). Connect negative lead of voltmeter to negative battery terminal post. Rotate and hold ignition switch in Start position. Observe voltmeter. If reading is above 0.2 volt, correct poor starter to engine block ground contact. **Note: Certain diesel equipped models use dual batteries. If equipped with dual battery system, this procedure must be performed on driver side battery only.**
6. If equipped with dual battery system (certain diesel equipped models), connect positive lead of voltmeter to positive battery cable clamp on battery located on left side of vehicle. Connect negative lead of voltmeter to positive battery terminal post on battery located on right side of vehicle. Rotate and hold ignition switch in Start position. Observe voltmeter. If reading is above 0.2 volt, clean and tighten battery cables at both batteries. Repeat test. If reading is still above 0.2 volt, replace faulty positive battery cable.



If resistance tests detect no feed circuit problems, refer to **Starter Motor** in the Diagnosis and Testing.

CONTROL CIRCUIT TESTING

The starter control circuit components should be tested in the order in which they are listed, as follows:

- **Starter Relay** - Refer to **Starter Relay** Diagnosis and Testing.
- **Starter Solenoid** - Refer to **Starter Motor** Diagnosis and Testing.
- **Ignition Switch** - Refer to **Ignition Switch and Key Lock Cylinder**
- **Clutch Pedal Position Switch** - If equipped with manual transmission, refer to **Clutch Pedal Position Switch** in 6, Clutch.
- **Park/Neutral Position Switch** - If equipped with automatic transmission, refer to **Park/Neutral Position Switch** in 21, Transmission.
- **Wire harnesses and connections** - Refer to 8, Wiring Diagrams.

SPECIFICATIONS

STARTING SYSTEM

Starter Motor and Solenoid	
Manufacturer	Denso
Part Number	56028715AD
Engine Application	3.7L / 4.7L / 5.7L
Power Rating	1.4 Kilowatt / 1.9 Horsepower
Voltage	12 Volts
Number of Brushes	4
Drive Type	Gear Reduction
Free Running Test Voltage	11 Volts
Free Running Test Amperage Draw	73 Amperes
Free Running Test Minimum Speed	3601 rpm
Solenoid Closing Maximum Voltage Required	7.5 Volts
* Cranking Amperage Draw Test	125 - 250 Amperes
* Test at operating temperature. Cold engine, tight (new) engine, or heavy oil will increase starter amperage draw.	

SPECIFICATIONS - TORQUE - STARTING SYSTEM

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Battery Cable Eyelet Nut at Solenoid (large nut)	25	19	221
Starter Solenoid Nut (small nut)	6	-	55
Starter Mounting Bolts	68	50	-
Starter Mounting Nut	68	50	-

STARTER

DIAGNOSIS AND TESTING - STARTER MOTOR

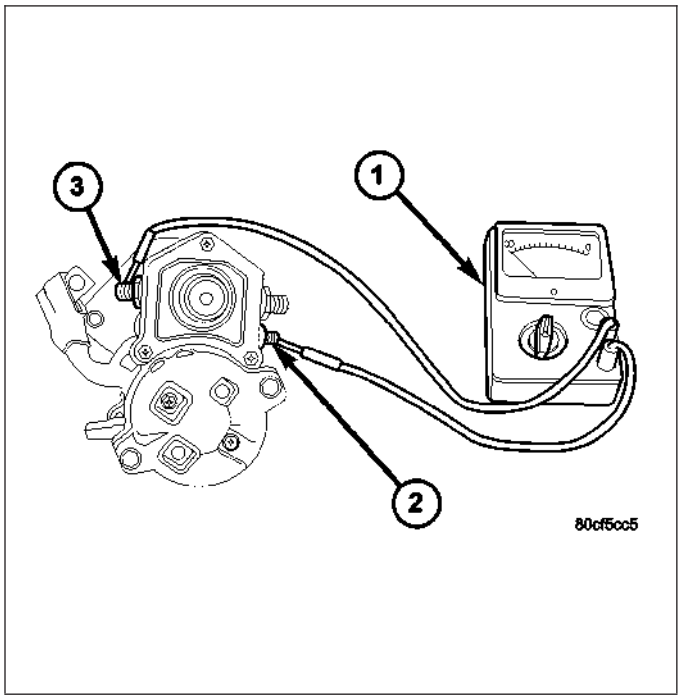
Correct starter motor operation can be confirmed by performing the following free running bench test. This test can only be performed with starter motor removed from vehicle. Refer to Specifications for starter motor specifications.

1. Remove starter motor from vehicle. Refer to Starter Motor Removal and Installation.
2. Mount starter motor securely in a soft-jawed bench vise. The vise jaws should be clamped on the mounting flange of starter motor. Never clamp on starter motor by field frame.
3. Connect a suitable volt-ampere tester and a 12-volt battery to starter motor in series, and set ammeter to 100 ampere scale. See instructions provided by manufacturer of volt-ampere tester being used.
4. Install jumper wire from solenoid terminal to solenoid battery terminal. The starter motor should operate. If starter motor fails to operate, replace faulty starter motor assembly.
5. Adjust carbon pile load of tester to obtain free running test voltage. Refer to Specifications for starter motor free running test voltage specifications.
6. Note reading on ammeter and compare reading to free running test maximum amperage draw. Refer to Specifications for starter motor free running test maximum amperage draw specifications.
7. If ammeter reading exceeds maximum amperage draw specification, replace faulty starter motor assembly.

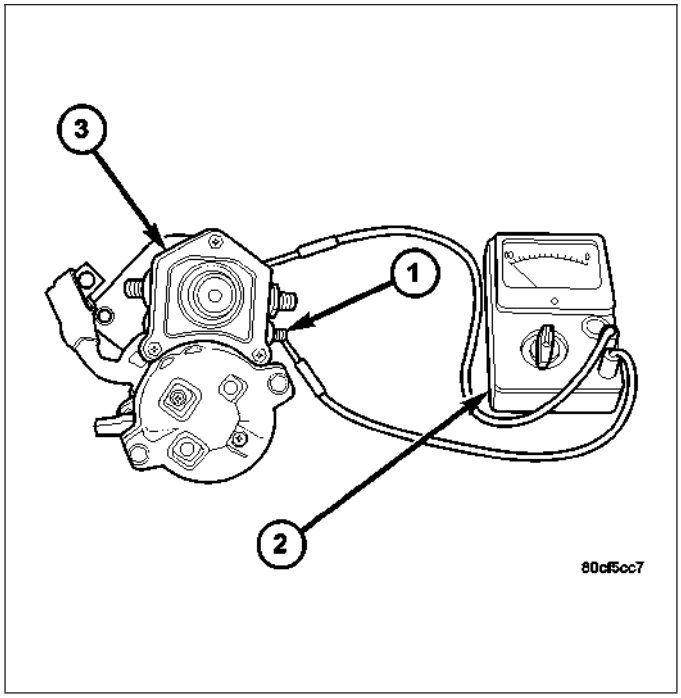
STARTER SOLENOID

This test can only be performed with starter motor removed from vehicle.

1. Remove starter motor from vehicle. Refer to Starter Motor Removal and Installation.
2. Disconnect wire from solenoid field coil terminal.
3. Check for continuity between solenoid terminal (3) and solenoid field coil terminal (2) with a continuity tester (1). There should be continuity. If OK, go to Step 4. If not OK, replace faulty starter motor assembly.



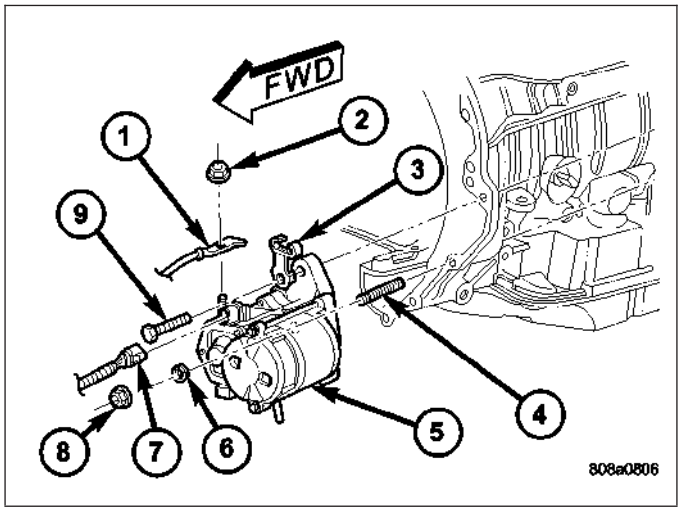
4. Check for continuity between solenoid terminal (1) and solenoid case. There should be continuity. If not OK, replace faulty starter motor assembly.



REMOVAL

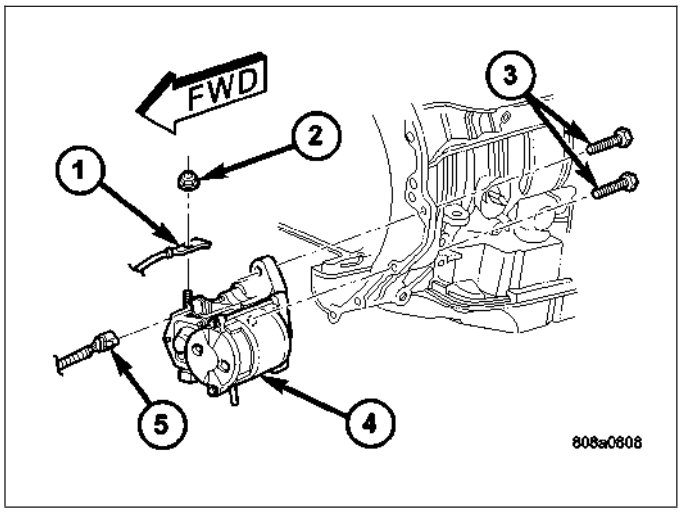
3.7L / 4.7L With Manual Trans.

1. Disconnect and isolate negative battery cable.
2. Raise and support vehicle.
3. Note: If equipped with 4WD and certain transmissions, a support bracket is used between front axle and side of transmission. Remove 2 support bracket bolts at transmission. Pry support bracket slightly to gain access to lower starter mounting bolt.
4. Remove one bolt (9) and one nut (8) if equipped with a manual transmission.
5. Move starter motor (5) towards front of vehicle far enough for nose of starter pinion housing to clear housing. Always support starter motor during this process, do not let starter motor hang from wire harness.
6. Tilt nose downwards and lower starter motor far enough to access and remove nut (2) that secures battery positive cable wire harness connector eyelet to solenoid battery terminal stud. Do not let starter motor hang from wire harness.



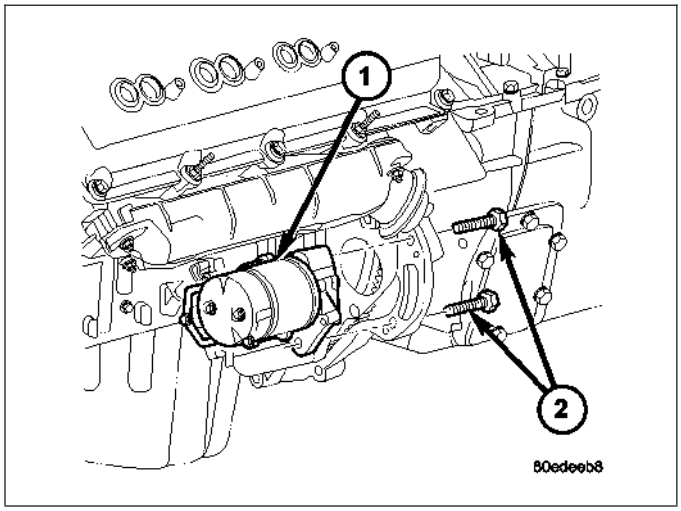
7. Remove battery positive cable wire harness connector eyelet (1) from solenoid battery terminal stud.
8. Disconnect battery positive cable wire harness connector (7) from solenoid terminal connector receptacle.
9. Remove starter motor.

3.7L / 4.7L With Auto. Trans.



1. Disconnect and isolate negative battery cable.
2. Raise and support vehicle.
3. Note: If equipped with 4WD and certain transmissions, a support bracket is used between front axle and side of transmission. Remove 2 support bracket bolts at transmission. Pry support bracket slightly to gain access to lower starter mounting bolt.
4. Remove two bolts (3) if equipped with an automatic transmission.
5. Move starter motor (4) towards front of vehicle far enough for nose of starter pinion housing to clear housing. Always support starter motor during this process, do not let starter motor hang from wire harness.
6. Tilt nose downwards and lower starter motor far enough to access and remove nut (2) that secures battery positive cable wire harness connector eyelet (1) to solenoid battery terminal stud. Do not let starter motor hang from wire harness.
7. Remove battery positive cable wire harness connector eyelet (5) from solenoid battery terminal stud.
8. Disconnect battery positive cable wire harness connector from solenoid terminal connector receptacle.
9. Remove starter motor.

5.7L V-8

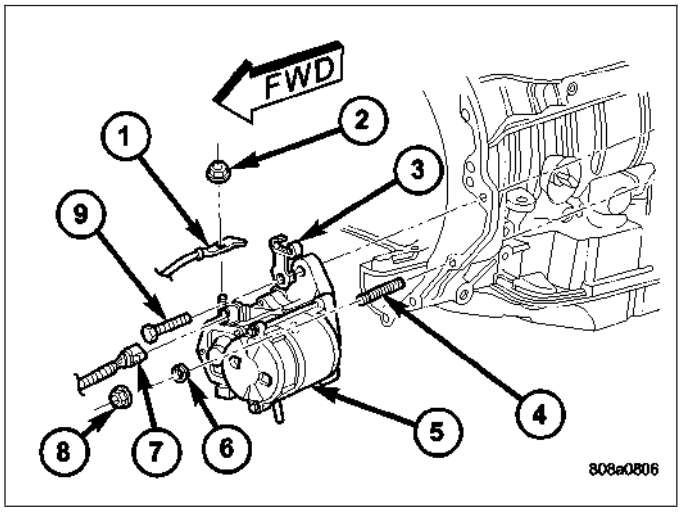


1. Disconnect and isolate negative battery cable.
2. Raise and support vehicle.
3. Note: If equipped with 4WD and certain transmissions, a support bracket is used between front axle and side of transmission. Remove 2 support bracket bolts at transmission. Pry support bracket slightly to gain access to lower starter mounting bolt.
4. Remove two mounting bolts (2).
5. Move starter motor towards front of vehicle far enough for nose of starter pinion housing to clear housing. Always support starter motor (1) during this process, do not let starter motor hang from wire harness.
6. Tilt nose downwards and lower starter motor far enough to access and remove nut that secures battery positive cable wire harness connector eyelet to solenoid battery terminal stud. Do not let starter motor hang from wire harness.
7. Remove battery positive cable wire harness connector eyelet from solenoid battery terminal stud.
8. Disconnect battery positive cable wire harness connector from solenoid terminal connector receptacle.
9. Remove starter motor.

INSTALLATION

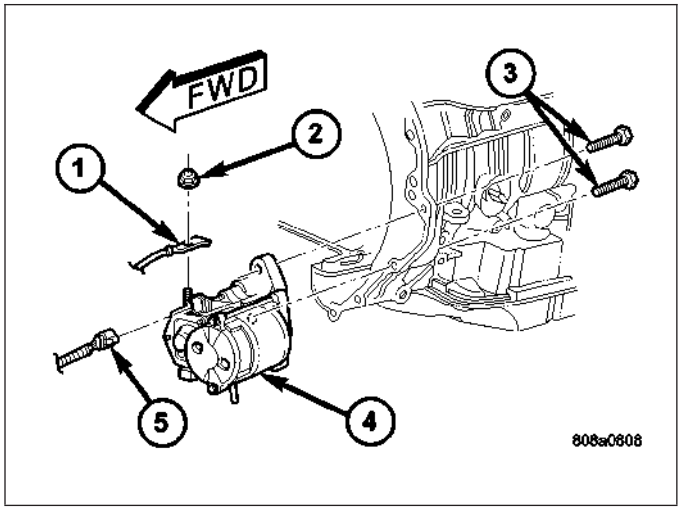
3.7L / 4.7L With Manual Trans.

1. Connect solenoid wire to starter motor (snaps on).
2. Position battery cable (1) to solenoid stud. Install and tighten battery cable eyelet nut (2). Refer to Torque Specifications. Do not allow starter motor to hang from wire harness.
3. Position starter motor (5) to transmission.
4. Install and tighten lockwasher (6) nut (8) and bolt (9). Refer to Torque Specifications.
5. Lower vehicle.
6. Connect negative battery cable.



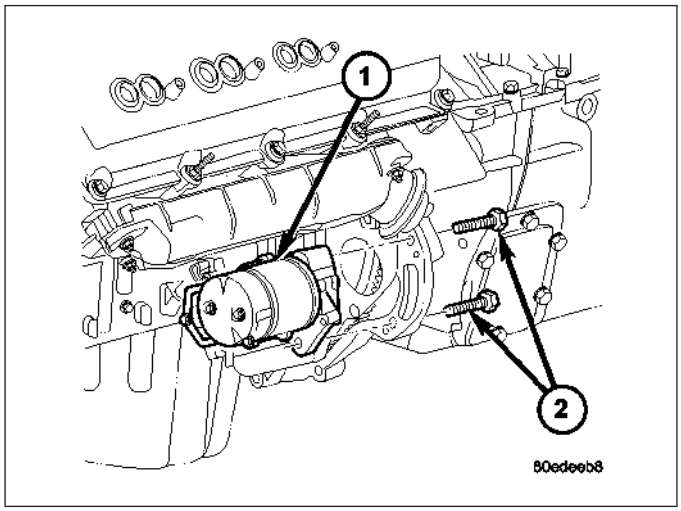
3.7L / 4.7L With Auto. Trans.

1. Connect solenoid wire to starter motor (snaps on).
2. Position battery cable (1) to solenoid stud. Install and tighten battery cable eyelet nut (2). Refer to Torque Specifications. Do not allow starter motor to hang from wire harness.
3. Position starter motor (4) to transmission.
4. If equipped with automatic transmission, slide cooler tube bracket into position.
5. Install and tighten both bolts (3). Refer to Torque Specifications.
6. Lower vehicle.
7. Connect negative battery cable.



5.7L V-8

1. Connect solenoid wire to starter motor (snaps on).
2. Position battery cable to solenoid stud. Install and tighten battery cable eyelet nut. Refer to Torque Specifications. Do not allow starter motor to hang from wire harness.
3. Position starter motor (1) to engine.
4. If equipped with automatic transmission, slide cooler tube bracket into position.
5. Install and tighten both mounting bolts (2). Refer to Torque Specifications.
6. Lower vehicle.
7. Connect negative battery cable.



RELAY-STARTER MOTOR

DESCRIPTION

The starter relay is an electromechanical device that switches battery current to the pull-in coil of the starter solenoid when the ignition switch is turned to the Start position. The starter relay is located in the Power Distribution Center (PDC) in the engine compartment. See the PDC cover for relay identification and location.

The starter relay is a International Standards Organization (ISO) relay. Relays conforming to ISO specifications have common physical dimensions, current capacities, terminal patterns, and terminal functions.

The starter relay cannot be repaired or adjusted. If faulty or damaged, it must be replaced.

OPERATION

The ISO relay consists of an electromagnetic coil, a resistor or diode, and three (two fixed and one movable) electrical contacts. The movable (common feed) relay contact is held against one of the fixed contacts (normally closed) by spring pressure. When electromagnetic coil is energized, it draws the movable contact away from normally closed fixed contact, and holds it against the other (normally open) fixed contact.

When electromagnetic coil is de-energized, spring pressure returns movable contact to normally closed position. The resistor or diode is connected in parallel with electromagnetic coil within relay, and helps to dissipate voltage spikes produced when coil is de-energized.

REMOVAL

The starter relay is located in the Power Distribution Center (PDC). Refer to label on PDC cover for relay location.

1. Disconnect and isolate negative battery cable.
2. Remove cover from Power Distribution Center (PDC) for relay identification and location.
3. Remove starter relay from PDC.
4. Check condition of relay terminals and PDC connector terminals for damage or corrosion. Repair if necessary before installing relay.
5. Check for pin height (pin height should be the same for all terminals within the PDC connector). Repair if necessary before installing relay.

INSTALLATION

1. Push down firmly on starter relay until terminals are fully seated into PDC receptacle.
2. Install PDC cover.
3. Connect battery cable.

HEATED SYSTEMS

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HEATED GLASS - ELECTRICAL DIAGNOSTICS

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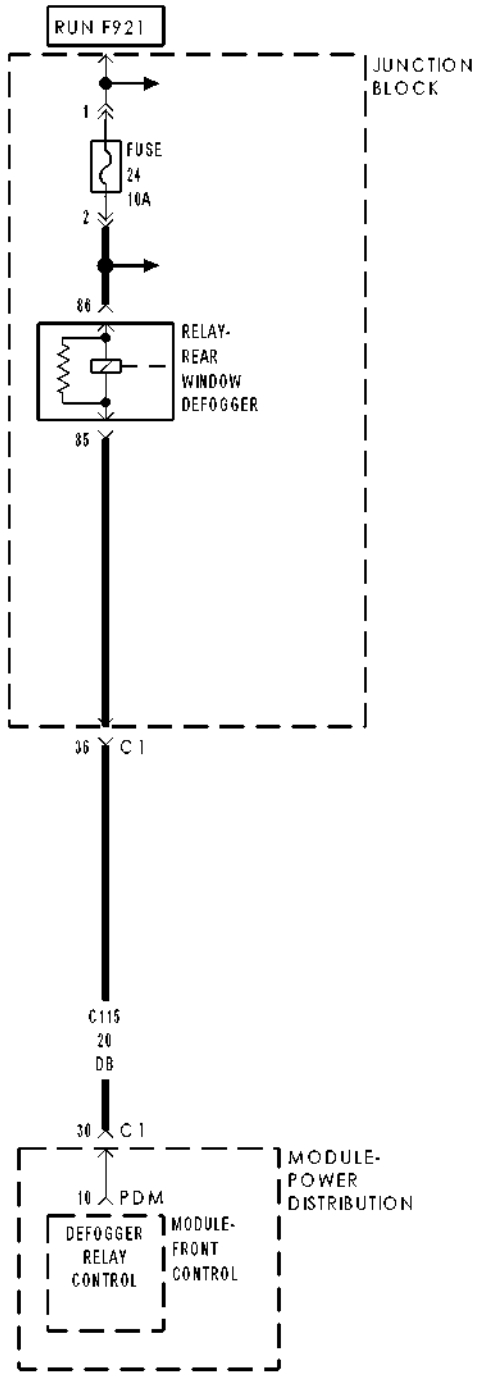
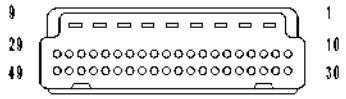
HEATED GLASS - ELECTRICAL DIAGNOSTICS

DIAGNOSIS AND TESTING

B106B,B106D–REAR DEFROST CONTROL CIRCUIT LOW/OPEN – FCM





MODULE-FRONT CONTROL PDM

812c66ca

B106B,B106D–REAR DEFROST CONTROL CIRCUIT LOW/OPEN – FCM — (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

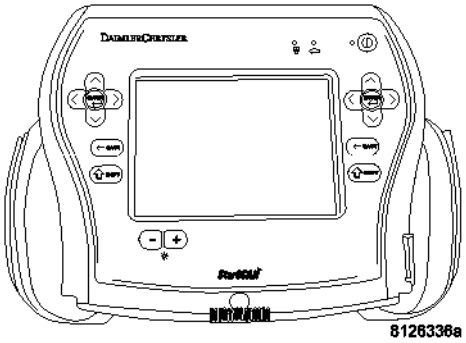
- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Front Control Module does not detect voltage on the Defogger Relay Control circuit.1

Possible Causes
REAR DEFOGGER J/B FUSE
REAR WINDOW DEFOGGER RELAY
IGNITION SWITCH OUTPUT OPEN
DEFOGGER RELAY CONTROL CIRCUIT SHORTED TO GROUND
DEFOGGER RELAY CONTROL CIRCUIT OPEN
FRONT CONTROL MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase DTC's
Operate the Rear Defogger Switch several times.
Cycle the ignition from on to off 3 times and leave on.
With the scan tool, read DTC's.



Does the scan tool display the same DTC?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST - VER 1.

---

2. JUNCTION BLOCK FUSE

Turn the ignition on.
Using a 12-volt test light connected to ground, check the Rear Window Defogger fuse in the Junction Block.

Does the test light illuminate and was the fuse OK?

No >> Repair the Ignition Switch Output (Run) circuit for an open or replace the fuse if open and check for a shorted Defogger Relay.
Perform BODY VERIFICATION TEST - VER 1.

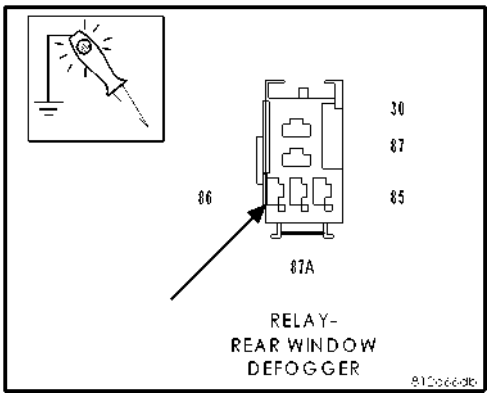
Yes >> Go To 3

B106B,B106D–REAR DEFROST CONTROL CIRCUIT LOW/OPEN – FCM — (CONTINUED)

3. OPEN IGNITION SWITCH OUTPUT (RUN) TO RELAY

Remove the Rear Defogger Relay from the Junction Block.

Using a 12-volt test light connected to ground, check the Ignition Switch Output circuit at the relay connector.



Does the test light illuminate?

No >> Replace the Junction Block.
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Go To 4

---

4. REAR WINDOW DEFOGGER RELAY

Install a known good relay in place of the Rear Window Defogger Relay.

With the scan tool erase DTC's

Operate the Rear Window Defogger several times.

Cycle the ignition from on to off 3 times and leave on.

With the scan tool, read DTC's.

Does the scan tool display the same DTC?

No >> Replace the original Rear Window Defogger Relay.
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Go To 5

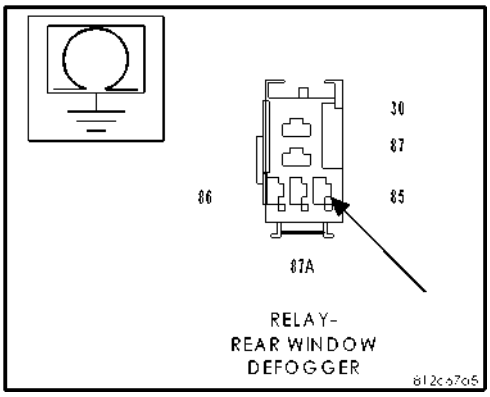
---

5. CHECK THE (C115)DEFOGGER RELAY CONTROL CIRCUIT FOR A SHORT TO GROUND

Remove the Rear Window Defogger Relay from the junction block.

Disconnect the Front Control Module from the PDC 49 – way connector.

Measure the resistance between ground and the (C115) Defogger Relay Control circuit at the relay.



Is the resistance below 1000.0 ohms?

Yes >> Repair the (C115) Defogger Relay Control circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 6

B106B,B106D–REAR DEFROST CONTROL CIRCUIT LOW/OPEN – FCM — (CONTINUED)

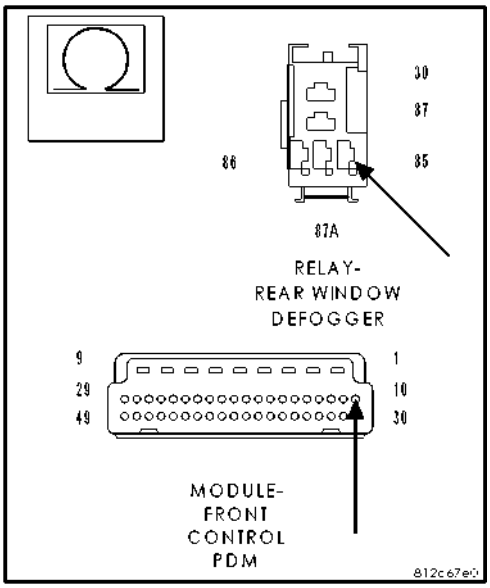
6. CHECK THE (C115)DEFOGGER RELAY CONTROL CIRCUIT FOR AN OPEN

Measure the resistance of the (C115) Defogger Relay Control circuit from the relay connector to FCM connector.

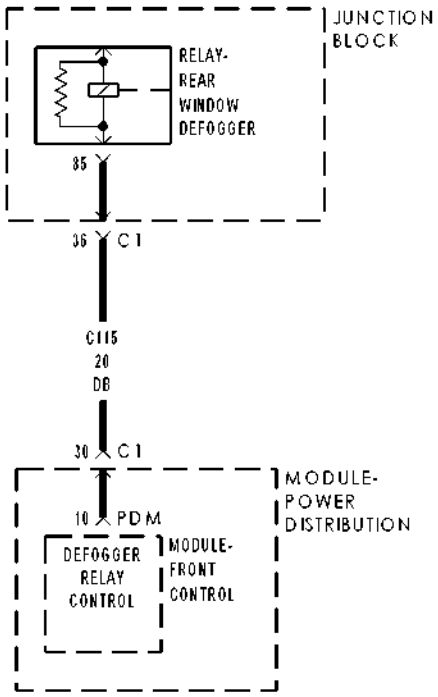
Is the resistance below 3.0 ohms?

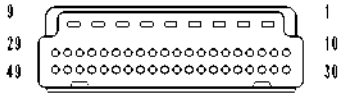
Yes >> Replace the Front Control Module.
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the (C115) Defogger Relay Control circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.



B106C–REAR DEFROST CONTROL CIRCUIT HIGH – FCM





MODULE-FRONT CONTROL PDM

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B106C–REAR DEFROST CONTROL CIRCUIT HIGH – FCM — (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Front Control Module detects a short to battery on the Defogger Relay Control circuit.

Possible Causes
REAR WINDOW DEFOGGER RELAY
(C115) DEFOGGER RELAY CONTROL
FRONT CONTROL MODULE

Diagnostic Test

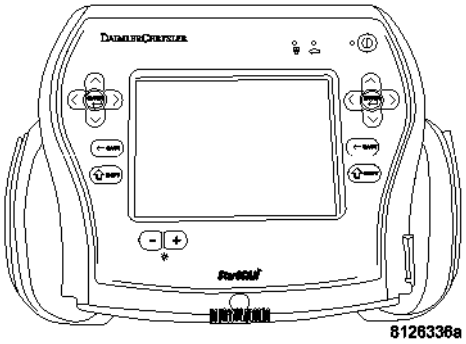
1. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase DTC's
Operate the Rear Window Defogger switch several times.
Cycle the ignition from on to off 3 times and leave on.
With the scan tool, read DTC's.

Does the scan tool display B106C – REAR DEFROST CONTROL CIRCUIT HIGH?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST - VER 1.



---

2. REAR DEFOGGER RELAY

Turn the ignition off.
Install a known good relay in place of the Rear Window Defogger Relay.
With the scan tool erase DTC's
Operate the Rear Window Defogger Switch several times.
Cycle the ignition from on to off 3 times and leave on.
With the scan tool, read DTC's.

Does the scan tool display B106C – REAR DEFROST CONTROL CIRCUIT HIGH?

No >> Replace the original Rear Window Defogger Relay.
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Go To 3

B106C–REAR DEFROST CONTROL CIRCUIT HIGH – FCM — (CONTINUED)

3. (C115)–DEFOGGER RELAY CONTROL CIRCUIT

Remove the Rear Window Defogger Relay.

Disconnect the Front Control Module from the PDC 49 – way connector.

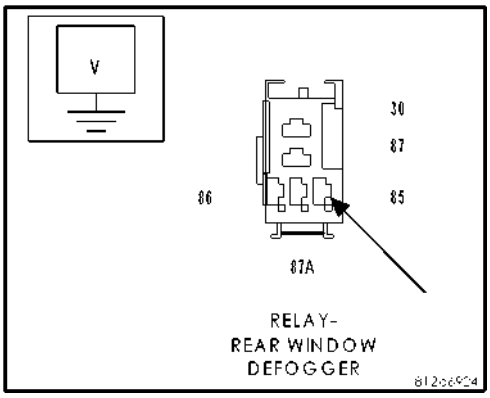
Turn the ignition on.

Measure the voltage between (C115) Defogger Relay Control circuit and ground.

Is there any voltage present?

Yes >> Repair the (C115) Defogger Relay Control circuit for a short to voltage.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Front Control Module.
Perform BODY VERIFICATION TEST - VER 1.



BODY VERIFICATION TEST – VER 1

Diagnostic Test

1. Perform Body Verification Test

Disconnect all jumper wires and reconnect all previously disconnected components and connectors.

Ensure that all accessories are turned off.

Ensure that the battery is fully charged.

Turn the ignition on.

With the scan tool, record and erase DTCs from all modules.

If repairs were made to any of the HVAC door actuator circuits, with the scan tool in HVAC, select System Tests and then select Actuator DTC Detection. The test must pass before proceeding to the next step.

If repairs were made to any of the HVAC doors, linkage, door actuators, or door actuator circuits, with the scan tool in HVAC, select System Tests and then select Actuator Calibration Test. The test must pass before proceeding to the next step.

Turn the ignition off, wait 10 seconds, and then turn the ignition on.

Operate all functions of the system that caused the original concern.

With the scan tool, select ECU View.

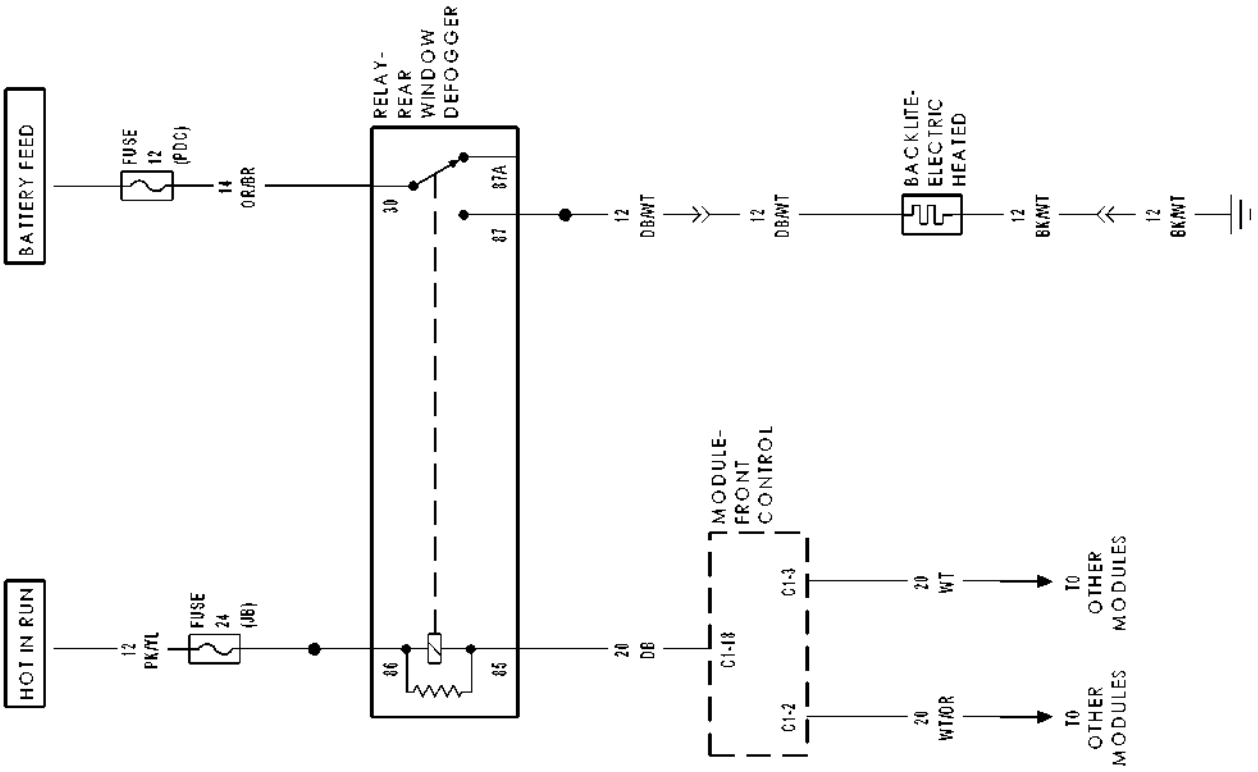
Check for DTCs in the modules.

Are DTCs present in any of the modules or is the original condition still present?

Yes >> The repair is not complete. Refer to the related category for the DTC or symptom that is still present.

No >> The repair is complete.

SCHEMATICS AND DIAGRAMS



REAR DEFOGGER SYSTEM SCHEMATIC

HEATED GLASS - SERVICE INFORMATION

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HEATED GLASS - SERVICE INFORMATION

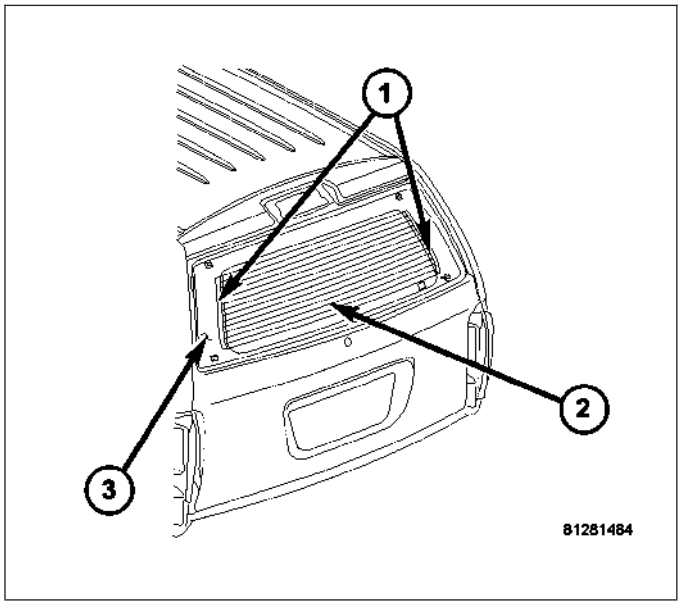
DESCRIPTION

CAUTION: Grid lines can be damaged or scraped off with sharp instruments. Care should be taken in cleaning glass or removing foreign materials, decals or stickers. Normal glass cleaning solvents or hot water used with rags or toweling is recommended.

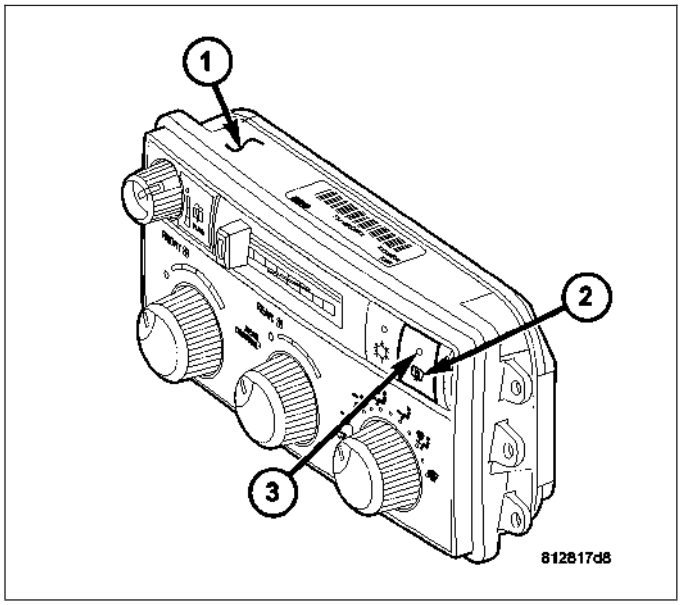
The rear window defogger system, also known as electrical backlight (EBL), consists of two vertical bus bars (1) linked by a series of grid lines (2) fired onto the inside surface of the rear window (3).

The EBL system is turned ON or OFF by a control switch located on the A/C-heater control at the center of the instrument panel and by a rear window defogger relay timing circuit integral to the front control module (FCM) (Refer to 8 - ELECTRICAL/HEATED GLASS/REAR WINDOW DEFOGGER SWITCH - DESCRIPTION).

Circuit protection is provided by a fuse located in the junction block (JB) and a fuse located in the power distribution center (PDC).



OPERATION



The electric backlight (EBL) system is controlled by a momentary switch (2) located in the A/C-heater control (1) on the instrument panel. When the defogger switch for the EBL system is pressed to the On position, current is directed to the rear defogger grid lines and the heated power mirrors (if equipped). The heated grid lines heat the glass to help clear the rear window and side mirror surfaces of fog or frost.

A yellow indicator (3) in the defogger switch will illuminate to indicate when the EBL system is turned on. The front control module (FCM) contains the EBL system control circuitry.

Note: The EBL system turns off automatically after approximately 15 minutes of initial operation. Each following activation cycle of the EBL system will last approximately 10 minutes.

The EBL system will be automatically turned off after a programmed time interval of about 15 minutes. After the initial time interval has expired, if the defogger switch is turned on again during the same ignition cycle, the defogger system will automatically turn off after about 10 minutes.

The EBL system will automatically shut off if the ignition switch is turned to the Off position, or it can be turned off manually by depressing the defogger switch a second time.

DIAGNOSIS AND TESTING

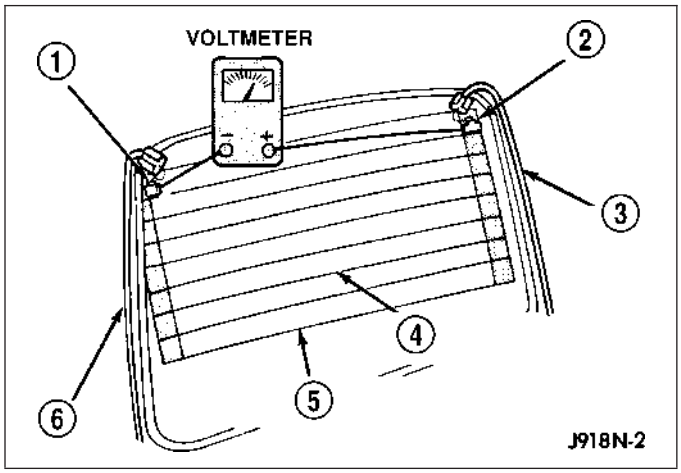
REAR WINDOW DEFOGGER SYSTEM

Note: Illumination of the defogger switch indicator lamp means that there is electrical current available at the output of the rear window defogger logic circuitry, but does not confirm that the electrical current is reaching the rear glass heating grid lines.

Note: For circuit descriptions and diagrams of the rear window defogger system, refer to 8W - WIRING DIAGRAM INFORMATION.

Operation of the electrical backlight (EBL) system can be confirmed by the following:

1. Using a scan tool, check for diagnostic trouble codes (DTCs) related to the A/C-heater control and the front control module (FCM). If no DTCs are found, go to Step 2. If any DTCs are found, repair as required, then proceed to Step 2
2. Turn the ignition switch to the On position. Set the defogger switch in the On position. The rear window defogger operation can be checked by feeling the rear window or outside rear view mirror glass. A distinct difference in temperature between the grid lines (4 and 5) and the adjacent clear glass or the mirror glass can be detected within three to four minutes of operation.
3. If a temperature difference is not detected, use a 12-volt DC voltmeter and contact the rear glass heating grid terminal A (1) with the negative lead, and terminal B (2) with the positive lead. The voltmeter should read battery voltage. If the voltmeter does not read battery voltage, check the following:
   - Confirm that the ignition switch is in the On position.
   - Make sure that the rear glass heating grid feed wire (3) and ground wire (6) are connected to the terminals. Confirm that the ground wire has continuity to ground.
   - Check the EBL relay and fuse located in the junction block (JB). The relay and fuse must be tight in their receptacles and all electrical connections must be secure.
   - Check the fuse located in the power distribution center (PDC). The fuse must be tight in its receptacle and all electrical connections must be secure.



When the above steps have been completed and the rear glass heating grid is still inoperative, one or more of the following is faulty:

- Rear window defogger control switch in the A/C-heater control.
- Rear window defogger grid lines (all grid lines would have to be broken, or the power feed or the ground wire disconnected, for the entire heating grid to be inoperative).

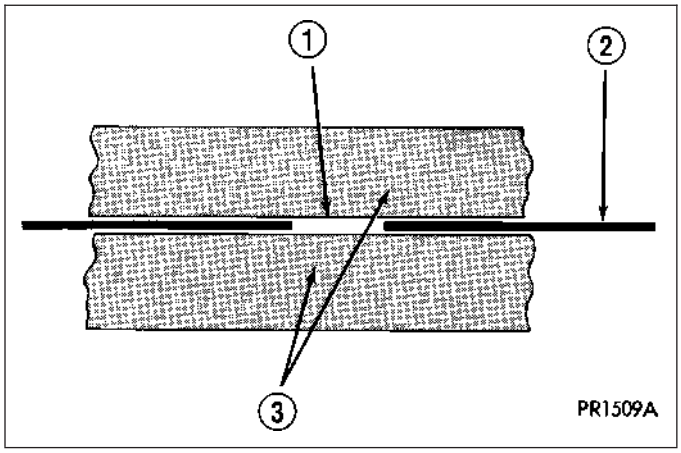
GRID-REAR WINDOW DEFOGGER

STANDARD PROCEDURE

GRID REPAIR PROCEDURE

WARNING: Materials contained in the Repair Kit (Part Number 04549275) may cause skin or eye irritation. The kit contains epoxy resin and amine type hardener, which are harmful if swallowed. Avoid contact with the skin and eyes. For skin contact, wash the affected areas with soap and water. For contact with the eyes, flush with plenty of water. Do not take internally. If taken internally, induce vomiting and call a physician immediately. Use with adequate ventilation. Do not use near fire or flame. Contains flammable solvents. Keep out of the reach of children. Failure to follow the warnings could result in possible personal injury or death.

Repair of the rear glass heating grid lines, bus bars, terminals or pigtail wires can be accomplished using the Mopar Rear Window Defogger Repair Kit (Part Number 04549275) or equivalent.



1. Mask the repair area with masking tape (3) so that the conductive epoxy can be applied neatly. Extend the epoxy application onto the grid line (2) or the bus bar on each side of the break (1).
2. Follow the instructions in the repair kit for preparing the damaged area.
3. Remove the package separator clamp and mix the two conductive epoxy components thoroughly within the packaging. Fold the package in half and cut the center corner to dispense the epoxy.
4. For grid line repairs, mask the area to be repaired with masking tape or use a template.
5. Apply the epoxy through the slit in the masking tape or template. Overlap both ends of the break by at least 19 millimeters (0.75 inch).
6. For a terminal or pigtail wire replacement, mask the adjacent areas so the epoxy can be extended onto the adjacent grid line as well as the bus bar. Apply a thin layer of epoxy to the area where the terminal or pigtail wire was fastened and onto the adjacent grid line.
7. Apply a thin layer of conductive epoxy to the terminal or bare wire end of the pigtail and place it in the proper location on the bus bar. To prevent the terminal or pigtail wire from moving while the epoxy is curing, it must be wedged or clamped.
8. Carefully remove the masking tape or template.

CAUTION: Do not allow the glass surface to exceed 204° C (400° F) or the glass may fracture.

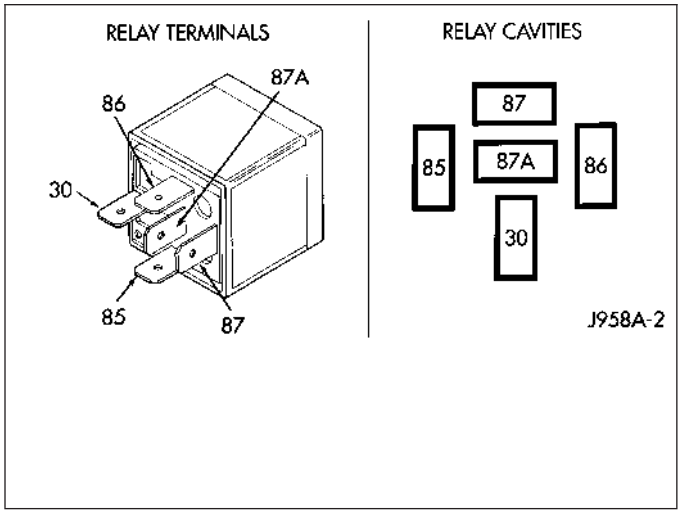
9. Allow the epoxy to cure 24 hours at room temperature, or use a heat gun with a 260° to 371° C (500° to 700° F) range for fifteen minutes. Hold the heat gun approximately 25.4 centimeters (10 inches) from the repair.
10. After the conductive epoxy is properly cured, remove the wedge or clamp from the terminal or pigtail wire. Do not attach the wire harness connectors until the curing process is complete.
11. Check the operation of the rear window defogger glass heating grid.

RELAY-REAR WINDOW DEFOGGER

DESCRIPTION

The rear window defogger (EBL) relay is a International Standards Organization (ISO)-type relay. Relays conforming to the ISO specifications have common physical dimensions, current capacities, terminal patterns, and terminal functions. The EBL relay is a electromechanical device that switches battery current through a fuse in the power distribution center (PDC) to the rear window defogger grid and to the outside mirror heating grids. The EBL relay is energized when the relay coil is provided a ground path by the rear window defogger relay control in the front control module (FCM).

The EBL relay is located in the junction block (JB) in the passenger compartment.



OPERATION

The ISO-standard rear window defogger (EBL) relay consists of an electromagnetic coil, a resistor or diode, and three (two fixed and one movable) electrical contacts. The movable (common feed) relay contact is held against one of the fixed contacts (normally closed) by spring pressure. When the electromagnetic coil is energized, it draws the movable contact away from the normally closed fixed contact, and holds it against the other (normally open) fixed contact.

When the electromagnetic coil is de-energized, spring pressure returns the movable contact to the normally closed position. The resistor is connected in parallel with the electromagnetic coil in the relay, and helps to dissipate voltage spikes that are produced when the coil is de-energized.

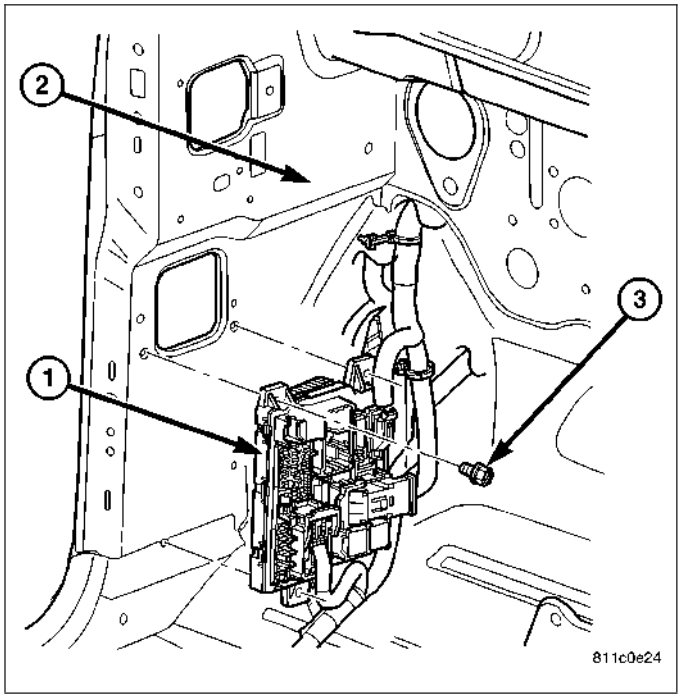
Refer to the appropriate wiring information for diagnosis and testing of the EBL relay and for complete EBL system wiring diagrams.

REMOVAL

1. Disconnect and isolate the negative battery cable.
2. Remove the trim cover from the cowl (2) on the driver side of the vehicle (Refer to 23 - BODY/INTERIOR/COWL TRIM COVER - DESCRIPTION).
3. Locate the junction block (JB) (1).

Note: Refer to the fuse and relay layout map on the inner surface of the JB cover for EBL relay identification and location.

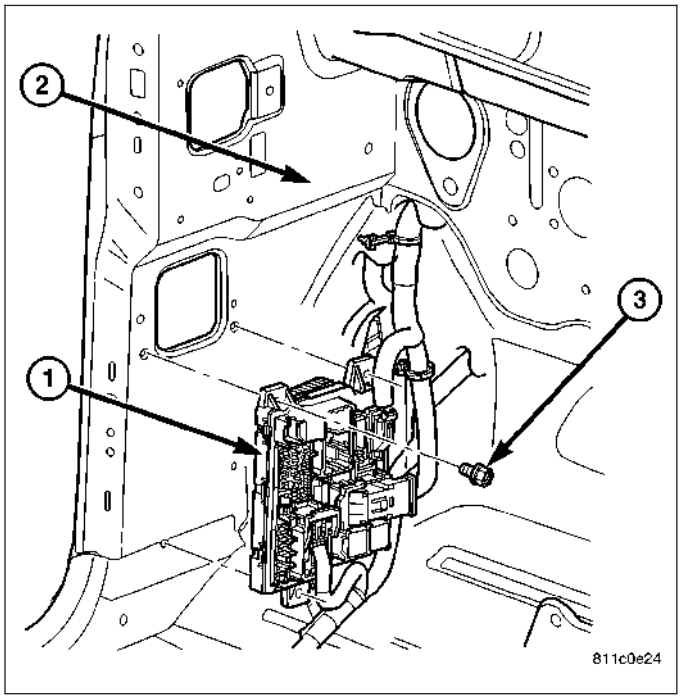
4. Remove the EBL relay from the JB.



INSTALLATION

Note: Refer to the fuse and relay layout map on the inner surface of the junction block (JB) cover for EBL relay identification and location.

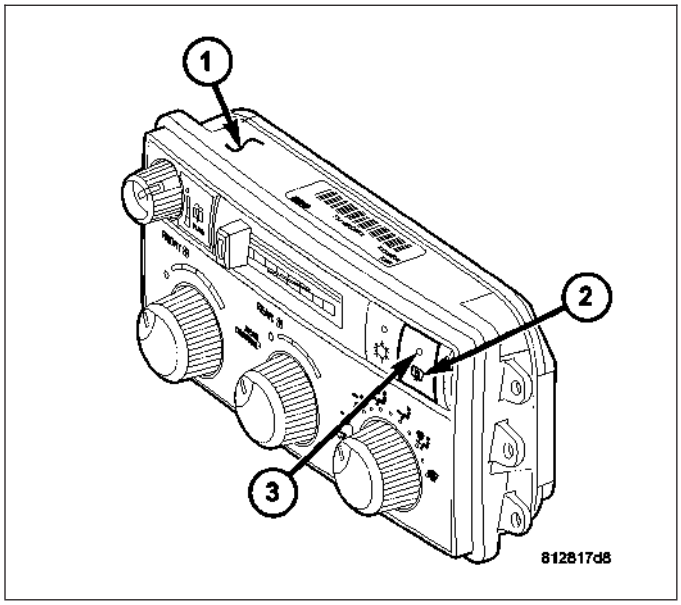
1. Position the EBL relay into the proper receptacle of the JB (1).
2. Align the EBL relay terminals with the terminal cavities in the JB receptacle and push down firmly on the relay until the terminals are fully seated.
3. Install the trim cover onto the driver side cowl (2).(Refer to 8 - ELECTRICAL/POWER DISTRIBUTION/JUNCTION BLOCK - DESCRIPTION).
4. Reconnect the negative battery cable.



SWITCH-REAR WINDOW DEFOGGER

DESCRIPTION

The rear window defogger switch (2) is integrated into the A/C-heater control (1) which is mounted to the center of the instrument panel. The rear window defogger switch and the rear window defogger LED indicator (3) cannot be repaired and, if faulty or damaged, the A/C-heater control must be replaced.



OPERATION

An LED indicator will illuminate when the rear window defogger control switch is activated. When the control switch is activated, the A/C-heater control requests the front control module (FCM) to operated the rear window defogger (EBL) relay via the controller area network (CAN) B bus. The EBL relay controls the current flow to the grids of the rear window defogger and to the heated power side view mirrors, when equipped. The EBL relay will be on for approximately 15 minutes or until the control switch or the ignition switch is turned off.

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HEATED MIRRORS - ELECTRICAL DIAGNOSTICS

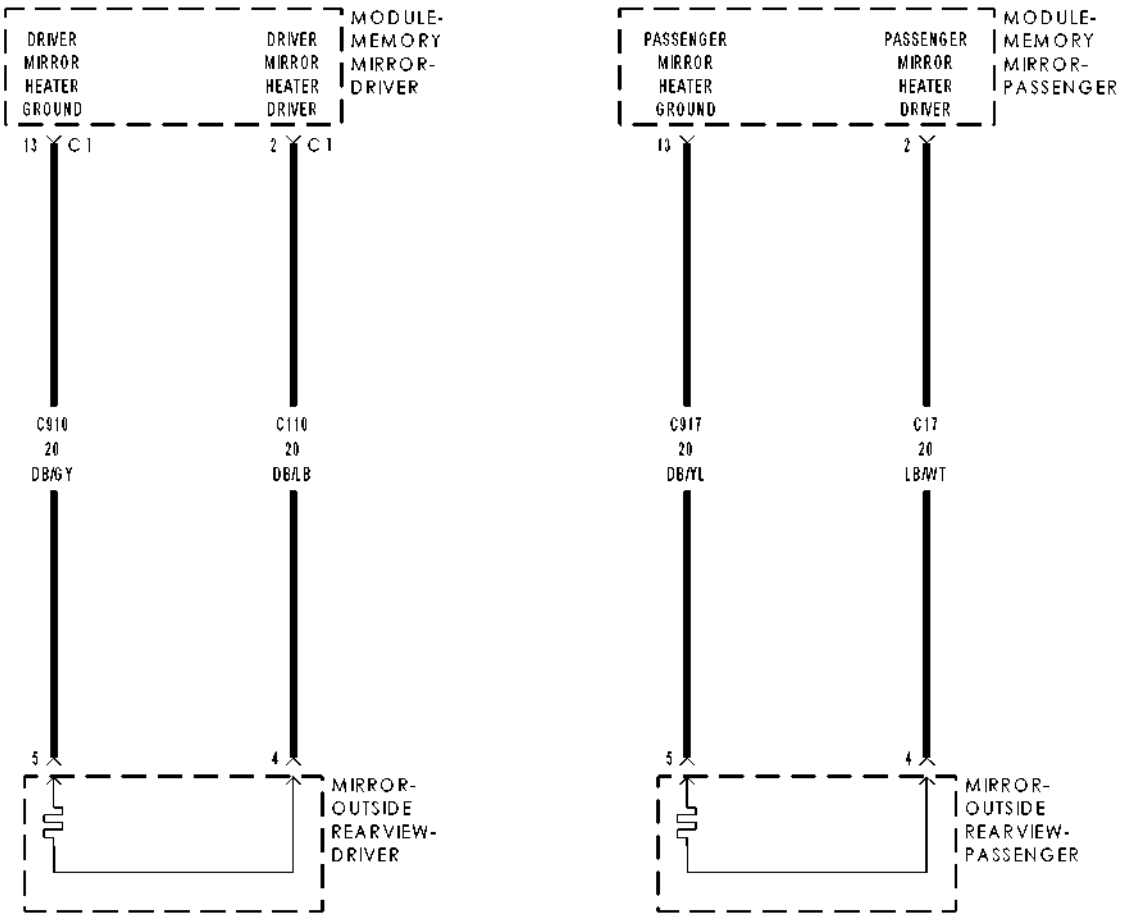
DIAGNOSIS AND TESTING

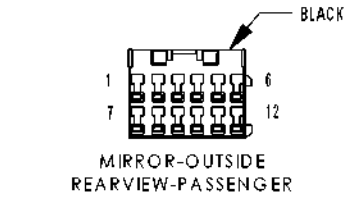
B1D35,B1D39–MIRROR HEATER CONTROL CIRCUIT OPEN – MEMORY MIRROR MODULE

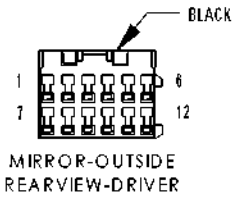
For the Power Memory Mirror System circuit diagram(Refer to 8 - ELECTRICAL/POWER MIRRORS - SCHEMATICS AND DIAGRAMS)

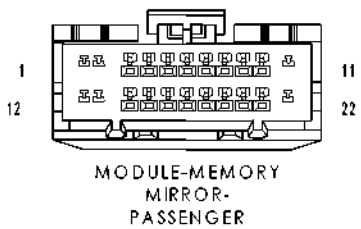
For a complete wiring diagram **Refer to Section 8W**.

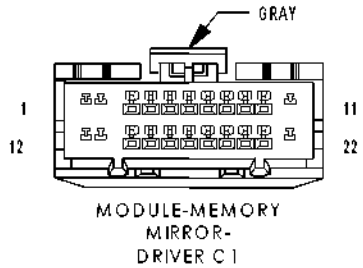
B1D35,B1D39–MIRROR HEATER CONTROL CIRCUIT OPEN – MEMORY MIRROR MODULE — (CONTINUED)











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B1D35,B1D39–MIRROR HEATER CONTROL CIRCUIT OPEN – MEMORY MIRROR MODULE — (CONTINUED)

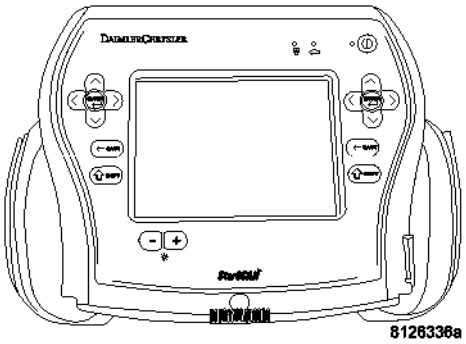
- **When Monitored:**
  Ignition on, during the heated mirror operation.
- **Set Condition:**
  This code is set 10 seconds after the Memory Mirror Module detects an open in the control circuit.**Note: This test covers both the Driver and Passenger code depending on the side the code appeared in.**

Possible Causes
(C110) OR (C17) MIRROR HEATER DRIVER CIRCUIT OPEN
(C910) OR (C917) MIRROR HEATER GROUND CIRCUIT OPEN
MIRROR HEATER OPEN
DRIVER/PASSENGER MEMORY MIRROR MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase DTC's
Turn the Rear Defogger Switch On.
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read DTC's.



Does the scan tool display B1D35 or B1D39–MIRROR HEATER CONTROL CIRCUIT OPEN?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST - VER 1.

B1D35,B1D39–MIRROR HEATER CONTROL CIRCUIT OPEN – MEMORY MIRROR MODULE — (CONTINUED)

2. TEST FOR A OPEN MIRROR HEATER ELEMENT

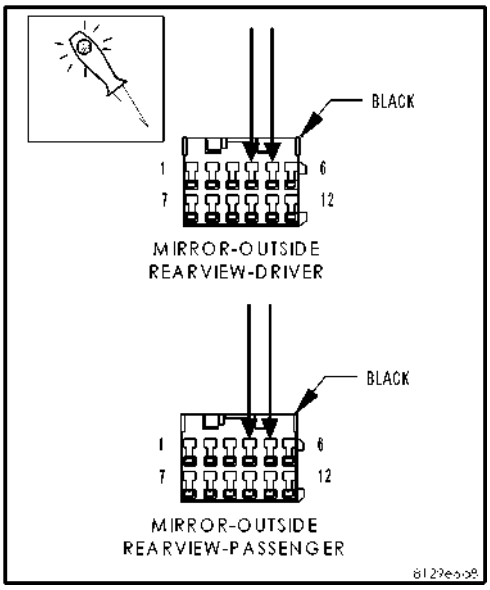
Turn the ignition off.

Disconnect the appropriate mirror connector.

Using a 12-volt test light, connect between the (C110) or (C17) Driver Mirror Heater Driver circuit and the (C910) or (C917) Mirror Heater Ground circuit in the mirror connector.

Turn the ignition on

Turn the Rear Defogger Switch on.



Does the test light illuminate brightly?

Yes >> Check the mirror/pigtail harness for an open, repair or replace as necessary.
Perform BODY VERIFICATION TEST - VER 1.

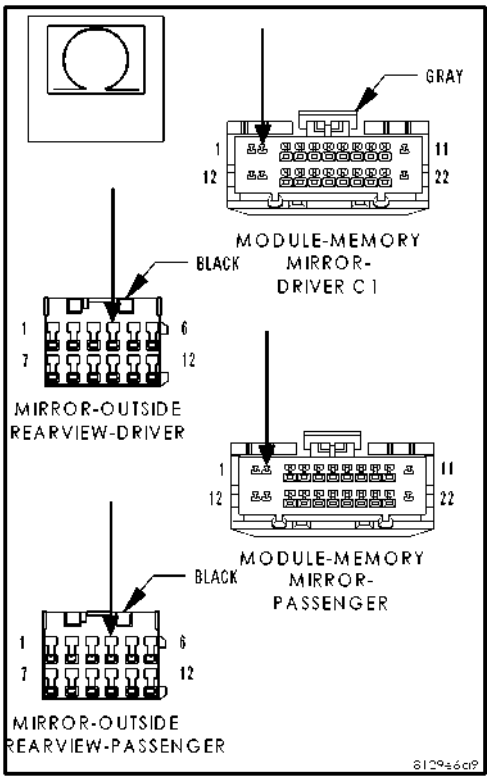
No >> Go To 3

3. TEST THE (C110) OR (C17) MIRROR HEATER DRIVER WIRE FOR AN OPEN

Turn the ignition off.

Disconnect the appropriate memory mirror module connector.

Note: Note: Check connectors - Clean and repair as necessary.
Measure the resistance of the (C110) or (C17) Mirror Heater Driver circuit from the Module connector to the Mirror connector.



Is the resistance below 2.0 ohms?

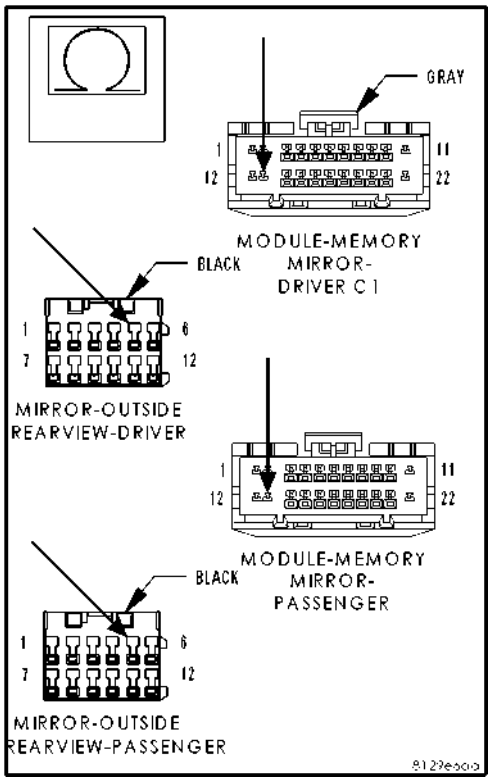
No >> Repair the (C110) or (C17) Mirror Heater Driver circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Go To 4

B1D35,B1D39–MIRROR HEATER CONTROL CIRCUIT OPEN – MEMORY MIRROR MODULE — (CONTINUED)

4. TEST THE (C910) OR (C917) MIRROR HEATER GROUND WIRE FOR AN OPEN

Measure the resistance of the (C910) or (C917) Mirror Heater Ground circuit between the Module connector and the Mirror connector.



Is the resistance below 2.0 ohms?

No >> Repair the (C910) or (C917) Mirror Heater Ground circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Replace the appropriate Memory Mirror Module.
Perform BODY VERIFICATION TEST - VER1.

BODY VERIFICATION TEST – VER 1

Diagnostic Test

1. Perform Body Verification Test

Disconnect all jumper wires and reconnect all previously disconnected components and connectors.

Ensure that all accessories are turned off.

Ensure that the battery is fully charged.

Turn the ignition on.

With the scan tool, record and erase DTCs from all modules.

If repairs were made to any of the HVAC door actuator circuits, with the scan tool in HVAC, select System Tests and then select Actuator DTC Detection. The test must pass before proceeding to the next step.

If repairs were made to any of the HVAC doors, linkage, door actuators, or door actuator circuits, with the scan tool in HVAC, select System Tests and then select Actuator Calibration Test. The test must pass before proceeding to the next step.

Turn the ignition off, wait 10 seconds, and then turn the ignition on.

Operate all functions of the system that caused the original concern.

With the scan tool, select ECU View.

Check for DTCs in the modules.

Are DTCs present in any of the modules or is the original condition still present?

Yes >> The repair is not complete. Refer to the related category for the DTC or symptom that is still present.

No >> The repair is complete.

HEATED MIRRORS - SERVICE INFORMATION

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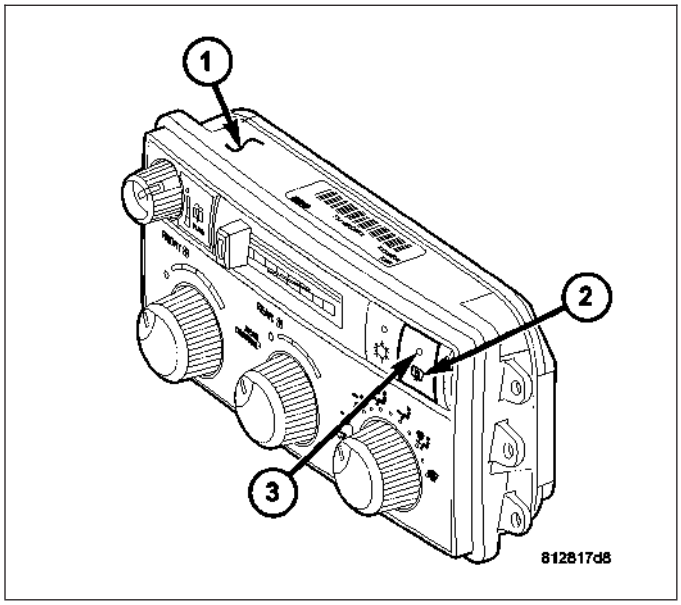
HEATED MIRRORS - SERVICE INFORMATION

DESCRIPTION

The optional heated mirror system is controlled by the momentary rear window defogger switch (2) on the A/C-heater control (1). An amber indicator lamp (3) in the switch will illuminate to indicate when the rear window defogger (EBL) system is turned on.

The heated mirror system only operates in concert with the EBL system, and will be automatically shut off after a programmed time interval of about 15 minutes. After the initial time interval has expired, if the defogger switch is turned on again during the same ignition cycle, the heated mirror system will automatically shut off after about 10 minutes.

The heated mirror system will automatically shut off if the ignition switch is turned to the Off position, or it can be shut off manually by pressing the rear window defogger switch a second time.



OPERATION

When the rear window defogger switch is in the On position, an electric heater grid located behind the glass of each of the outside rear view mirrors is energized. When energized, each of these heater grids produce heat to help clear the outside rear view mirrors of ice, snow, or fog.

If the outside mirror heating grids are both inoperative, refer to DIAGNOSIS AND TESTING - REAR WINDOW DEFOGGER SYSTEM in his group. If only one of the outside mirror heating grids is inoperative, Refer to 8 - ELECTRICAL/POWER MIRRORS - DIAGNOSIS AND TESTING.

The heating grid behind each outside mirror glass cannot be repaired and, if faulty or damaged, the entire power mirror assembly must be replaced.

HEATED SEATS - ELECTRICAL DIAGNOSTICS

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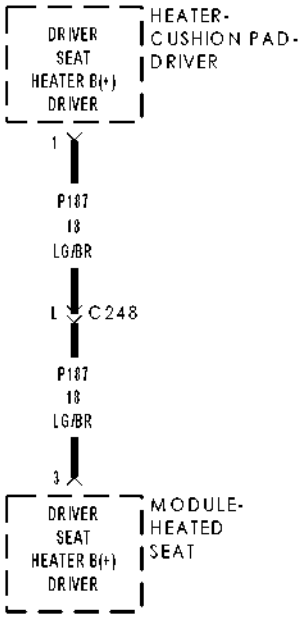
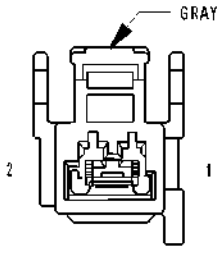
HEATED SEATS - ELECTRICAL DIAGNOSTICS

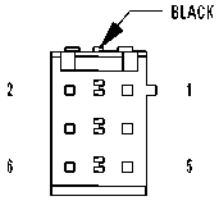
DIAGNOSIS AND TESTING

B1092-FRONT LEFT SEAT HEATER CONTROL CIRCUIT LOW





HEATER-CUSHION PAD-DRIVER



MODULE-HEATED SEAT

81254688

B1092-FRONT LEFT SEAT HEATER CONTROL CIRCUIT LOW — (CONTINUED)

For the Heated Seat System circuit diagram (Refer to 8 - ELECTRICAL/HEATED SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**Ignition on, during the heated seat operation.
- **Set Condition:**This code is set immediately after the Heated Seat Module detects the control circuit shorted to ground.

Possible Causes
(P187) DRIVER SEAT HEATER B(+) DRIVER SHORTED TO GROUND
SEAT HEATER ELEMENT PIGTAIL HARNESS SHORTED
SEAT CUSHION HEATER ELEMENT SHORTED
SEAT BACK HEATER ELEMENT SHORTED
HEATED SEAT MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

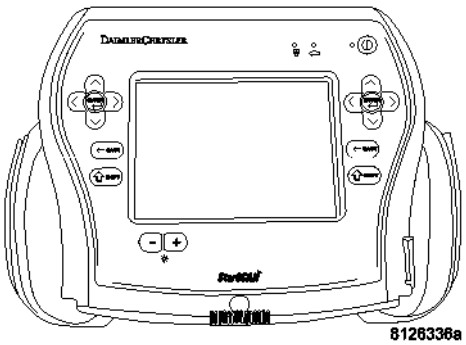
1. VERIFY THAT DTC B1092-FRONT LEFT SEAT HEATER CONTROL CIRCUIT LOW IS ACTIVE

With the scan tool, record and erase DTC's
Operate the Heated Seat Switch in both positions several times.
With the scan tool, read DTC's.

Does the DTC B1092 FRONT LEFT SEAT HEATER CONTROL CIRCUIT LOW reset?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST – VER 1.

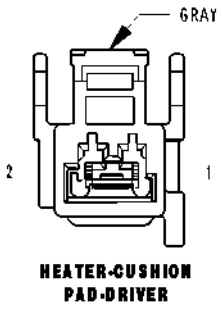


B1092-FRONT LEFT SEAT HEATER CONTROL CIRCUIT LOW — (CONTINUED)

2. DISCONNECT DRIVER CUSHION PAD HEATER 2-WAY CONNECTOR AND READ DTC'S

Disconnect the Driver Cushion Pad Heater connector.

Note: Check connectors - Clean and repair as necessary.
With the scan tool, erase HSM DTC's
Operate the Heated Seat Switch in both positions several times.
With the scan tool, read DTC's.



Does the scan tool display the same DTC?

Yes >> Go To 7

No >> Go To 3

---

3. CHECK THE DRIVER SEAT BACK PAD HEATER RESISTANCE

Disconnect the Driver Seat Back Pad Heater connector.

Note: Check connectors - Clean and repair as necessary.
Check the resistance of the seat back heater element by measuring between the (P187) Driver Seat Heater B(+) Driver and the Ground circuit at the driver seat back pad connector.

Is the resistance below 4.0 ohms?

No >> Go To 4

Yes >> Replace the seat back heater element as necessary.
Perform BODY VERIFICATION TEST – VER 1

---

4. CHECK THE DRIVER SEAT BACK PAD HEATER FOR A SHORT TO GROUND

Measure between the (P187) Driver Seat Heater B(+) Driver circuit at the Driver Seat Back Pad Heater connector and the seat frame for a short to ground.

Is the resistance below 1000 ohms?

Yes >> Repair the pigtail harness for a short to ground condition or replace the seat back heater element as necessary.
Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 5

B1092-FRONT LEFT SEAT HEATER CONTROL CIRCUIT LOW — (CONTINUED)

5. CHECK THE DRIVER CUSHION PAD HEATER RESISTANCE

Check the resistance of the cushion heater element by measuring between the (P187) Driver Seat Heater B(+) Driver and the Ground circuit at the driver cushion pad connector.

Was the resistance below 3.5 ohms?

No >> Go To 6

Yes >> Replace the heater element as necessary.
Perform BODY VERIFICATION TEST – VER 1.

---

6. CHECK THE DRIVER CUSHION PAD HEATER FOR A SHORT TO GROUND

Measure between the (P187) Driver Seat Heater B(+) Driver circuit at the Driver Cushion Pad Heater connector and the seat frame for a short to ground.

Is the resistance below 1000 ohms?

Yes >> Repair the pigtail harness or replace the heater element as necessary.
Perform BODY VERIFICATION TEST – VER 1.

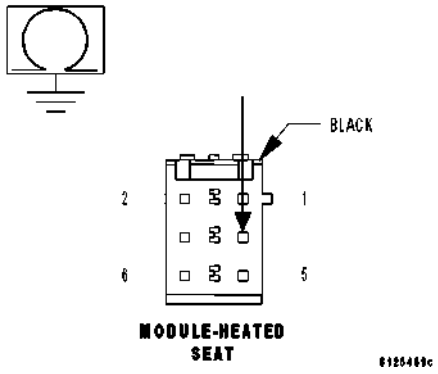
No >> Using the wiring diagram/schematic as a guide, inspect the wiring and connectors for an intermittent short to ground.
Perform BODY VERIFICATION TEST – VER 1.

---

7. Check the (P187) Driver Seat Heater B(+) Driver circuit for a short to ground

Disconnect the Heat Seat Module connector.

Note: Check connectors - Clean and repair as necessary.
Measure the (P187) Driver Seat Heater B(+) Driver circuit to ground at the HSM connector.

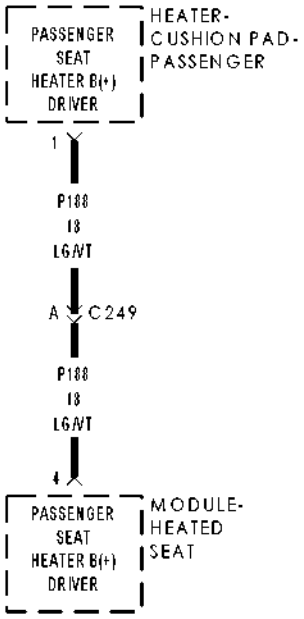


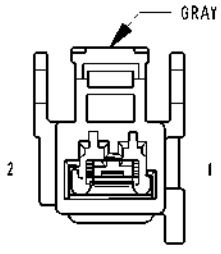
Is the resistance below 5.0 ohms?

Yes >> Repair the (P187) Driver Seat Heater B(+) Driver circuit for a short to ground.
Perform BODY VERIFICATION TEST – VER 1.

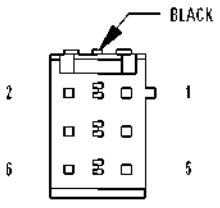
No >> Replace the Heated Seat Module.
Perform BODY VERIFICATION TEST – VER 1.

B1096-FRONT RIGHT SEAT HEATER CONTROL CIRCUIT LOW





HEATER-CUSHION PAD-PASSENGER



MODULE-HEATED SEAT

81269F62

B1096-FRONT RIGHT SEAT HEATER CONTROL CIRCUIT LOW — (CONTINUED)

For the Heated Seat System circuit diagram (Refer to 8 - ELECTRICAL/HEATED SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**Ignition on, during the heated seat operation.
- **Set Condition:**This code is set immediately after the Heated Seat Module detects the seat heater B(+) circuit shorted to ground.

Possible Causes
(P188) PASSENGER SEAT HEATER B(+) DRIVER SHORTED TO GROUND
SEAT HEATER ELEMENT PIGTAIL HARNESS SHORTED
SEAT CUSHION HEATER ELEMENT SHORTED
SEAT BACK HEATER ELEMENT SHORTED
HEATED SEAT MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

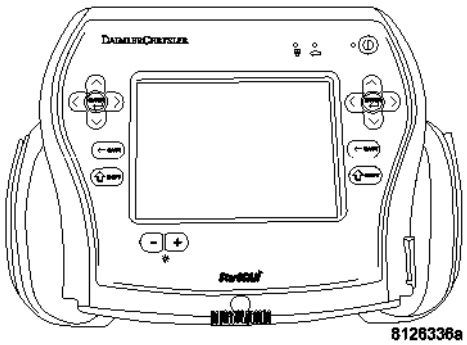
1. VERIFY THAT DTC B1096-FRONT RIGHT SEAT HEATER CONTROL CIRCUIT LOW IS ACTIVE

With the scan tool, record and erase DTC's
Operate the Heated Seat Switch in both positions several times.
With the scan tool, read DTC's.

Does the DTC B1096-FRONT RIGHT SEAT HEATER CONTROL CIRCUIT LOW reset?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST – VER 1.



B1096-FRONT RIGHT SEAT HEATER CONTROL CIRCUIT LOW — (CONTINUED)

2. DISCONNECT PASSENGER CUSHION PAD HEATER 2-WAY CONNECTOR AND READ DTC'S

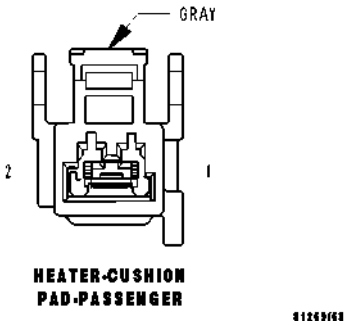
Disconnect the Passenger Cushion Pad Heater connector.

Note: Check connectors - Clean and repair as necessary.
With the scan tool, erase HSM DTC's
Operate the Heated Seat Switch in both positions several times.
With the scan tool, read DTC's.

Does the scan tool display the same DTC?

Yes >> Go To 7

No >> Go To 3



---

3. CHECK THE PASSENGER SEAT BACK PAD HEATER RESISTANCE

Disconnect the Passenger Seat Back Pad Heater connector.

Note: Check connectors - Clean and repair as necessary.
Check the resistance of the seat back heater element by measuring between the (P188) Passenger Seat Heater B(+) Driver and the Ground circuit at the Passenger Seat Back Pad connector.

Is the resistance below 4.0 ohms?

No >> Go To 4

Yes >> Replace the seat back heater element as necessary.
Perform BODY VERIFICATION TEST – VER 1.

---

4. CHECK THE PASSENGER SEAT BACK PAD HEATER FOR A SHORT TO GROUND

Measure between the (P188) Passenger Seat Heater B(+) Driver circuit at the Passenger Seat Back Pad Heater connector and the seat frame for a short to ground.

Is the resistance below 1000 ohms?

Yes >> Repair the pigtail harness for a short to ground condition or replace the seat back heater element as necessary.
Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 5

B1096-FRONT RIGHT SEAT HEATER CONTROL CIRCUIT LOW — (CONTINUED)

5. CHECK THE PASSENGER CUSHION PAD HEATER RESISTANCE

Check the resistance of the cushion heater element by measuring between the (P188) Passenger Seat Heater B(+) Driver and the Ground circuit at the Passenger Cushion Pad Heater connector.

Was the resistance below 3.5 ohms?

No >> Go To 6

Yes >> Replace the heater element as necessary.
Perform BODY VERIFICATION TEST – VER 1.

---

6. CHECK THE PASSENGER CUSHION PAD HEATER FOR A SHORT TO GROUND

Measure between the (P188) Passenger Seat Heater B(+) Driver circuit at the Passenger Cushion Pad Heater connector and the seat frame for a short to ground.

Is the resistance below 1000 ohms?

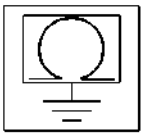
Yes >> Repair the pigtail harness or replace the heater element as necessary.
Perform BODY VERIFICATION TEST – VER 1.

No >> Using the wiring diagram/schematic as a guide, inspect the wiring and connectors for an intermittent short to ground.
Perform BODY VERIFICATION TEST – VER 1.

---

7. Check the (P188) Passenger Seat Heater B(+) Driver circuit for a short to ground

Disconnect the Heated Seat Module connector.

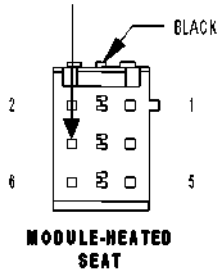


Note: Check connectors - Clean and repair as necessary.
Measure the (P188) Passenger Seat Heater B(+) Driver circuit to ground at the HSM connector.

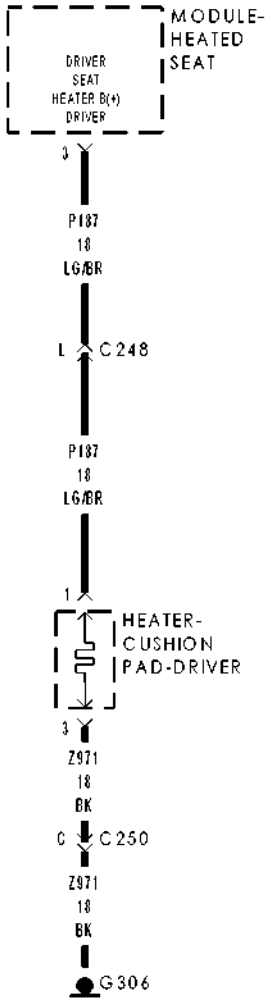
Is the resistance below 5.0 ohms?

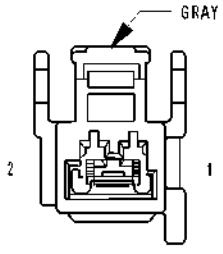
Yes >> Repair the (P188) Passenger Seat Heater B(+) Driver circuit for a short to ground.
Perform BODY VERIFICATION TEST – VER 1.

No >> Replace the Heated Seat Module.
Perform BODY VERIFICATION TEST – VER 1.

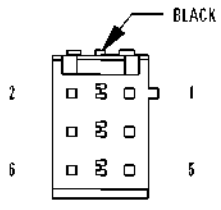


B1094-FRONT LEFT SEAT HEATER CONTROL CIRCUIT OPEN





HEATER-CUSHION
PAD-DRIVER



MODULE-HEATED
SEAT

8126e199

B1094-FRONT LEFT SEAT HEATER CONTROL CIRCUIT OPEN — (CONTINUED)

For the Heated Seat System circuit diagram (Refer to 8 - ELECTRICAL/HEATED SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**Ignition on, during the heated seat operation.
- **Set Condition:**This code is set immediately after the Heated Seat Module detects an open in the seat heater B(+) driver circuit.

Possible Causes
(P187) DRIVER SEAT HEATER B(+) DRIVER WIRE OPEN
(Z971) GROUND WIRE OPEN
SEAT CUSHION HEATER ELEMENT OPEN
SEAT BACK HEATER ELEMENT OPEN
HEATED SEAT MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

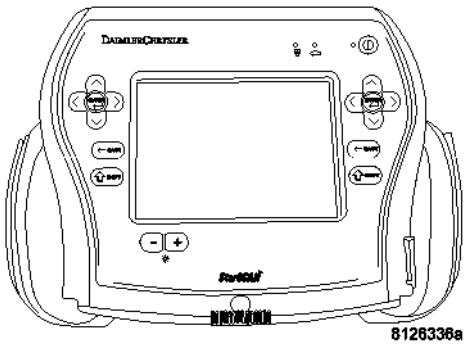
1. VERIFY THAT DTC B1094-FRONT LEFT SEAT HEATER CONTROL CIRCUIT OPEN IS ACTIVE

With the scan tool, record and erase DTC's
Operate the Heated Seat Switch in both positions several times.
With the scan tool, read DTC's.

Does the DTC B1094 FRONT LEFT SEAT HEATER CONTROL CIRCUIT OPEN reset?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST – VER 1.

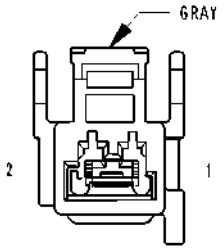


B1094-FRONT LEFT SEAT HEATER CONTROL CIRCUIT OPEN — (CONTINUED)

2. CHECK FOR AN OPEN SEAT HEATER ELEMENT

Disconnect the Driver Cushion Pad Heater 2 – way connector.

Note: Check connectors - Clean and repair as necessary.
Measure the total resistance of the cushion and seat back heater elements at the Driver Cushion Pad 2 – way connector (seat side).



Is the total resistance 2.5 ohms + or – .5 ohms?

Yes >> Go To 4

No >> Go To 3

---

3. CHECK THE DRIVER SEAT BACK PAD HEATER RESISTANCE

Disconnect the Driver Seat Back Pad Heater 2 – way connector.

Note: Check connectors - Clean and repair as necessary.
Check the resistance of the seat back heater element by measuring between the (P187) Driver Seat Heater B(+) Driver and the Ground circuit at the connector.

Is the resistance above 5.8 ohms?

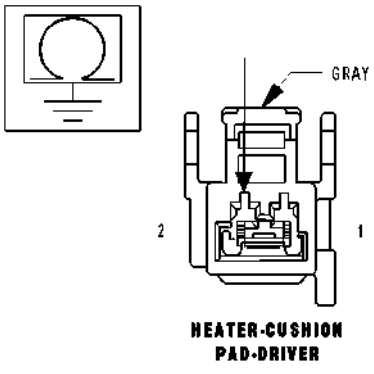
Yes >> Repair the open pigtail harness or replace the seat back heater element as necessary.
Perform BODY VERIFICATION TEST – VER 1.

No >> Repair the open pigtail harness or replace the seat cushion heater element as necessary.
Perform BODY VERIFICATION TEST – VER 1.

---

4. CHECK THE DRIVER SEAT HEATER GROUND CIRCUIT RESISTANCE

Measure the resistance of the Ground circuit at the Heater Cushion Pad 2 – way connector.



Was the resistance below 5.0 ohms?

Yes >> Go To 5

No >> Repair the open ground circuit.
Perform BODY VERIFICATION TEST – VER 1.

B1094-FRONT LEFT SEAT HEATER CONTROL CIRCUIT OPEN — (CONTINUED)

5. Check the (P187) Driver Seat Heater B(+) Driver circuit for an open.

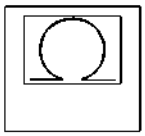
Disconnect the Heated Seat Module connector.

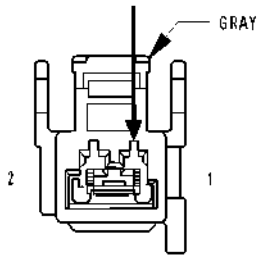
Note: Check connectors - Clean and repair as necessary.
Measure the (P187) Driver Seat Heater B(+) Driver circuit from the Driver Cushion Pad connector to the HSM connector.

Is the resistance below 5.0 ohms?

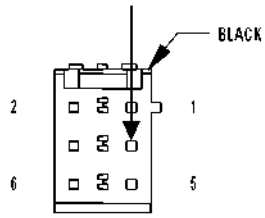
Yes >> Replace the Heated Seat Module.
Perform BODY VERIFICATION TEST – VER 1.

No >> Repair the (P187) Driver Seat Heater B(+) Driver circuit for an open.
Perform BODY VERIFICATION TEST – VER 1.





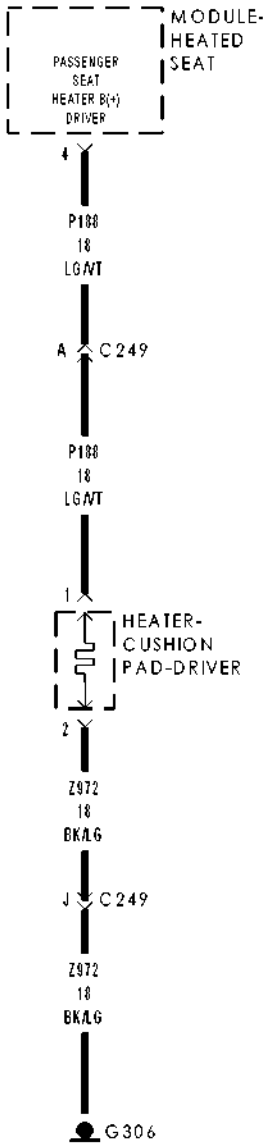
HEATER-CUSHION PAD-DRIVER

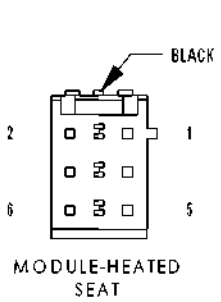


MODULE-HEATED SEAT

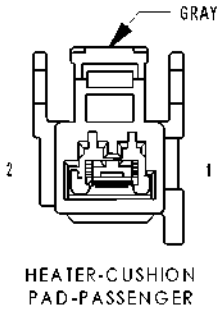
8126c19b

B1098-FRONT RIGHT SEAT HEATER CONTROL CIRCUIT OPEN





MODULE-HEATED
SEAT



HEATER-CUSHION
PAD-PASSENGER

812710fb

B1098-FRONT RIGHT SEAT HEATER CONTROL CIRCUIT OPEN — (CONTINUED)

For the Heated Seat System circuit diagram (Refer to 8 - ELECTRICAL/HEATED SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**Ignition on, during the heated seat operation.
- **Set Condition:**This code is set immediately after the Heated Seat Module detects an open in the seat heat B(+) driver circuit.

Possible Causes
(P188) PASSENGER SEAT HEATER B(+) DRIVER WIRE OPEN
(Z971) GROUND WIRE OPEN
SEAT CUSHION HEATER ELEMENT OPEN
SEAT BACK HEATER ELEMENT OPEN
HEATED SEAT MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

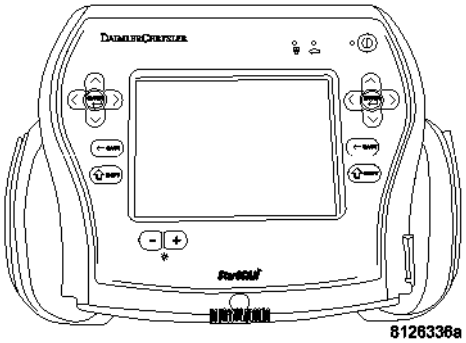
1. VERIFY THAT DTC B1098-FRONT RIGHT SEAT HEATER CONTROL CIRCUIT OPEN IS ACTIVE

With the scan tool, record and erase DTC's
Operate the Heated Seat Switch in both positions several times.
With the scan tool, read DTC's.

Does the DTC B1098 FRONT RIGHT SEAT HEATER CONTROL CIRCUIT OPEN reset?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST – VER 1.

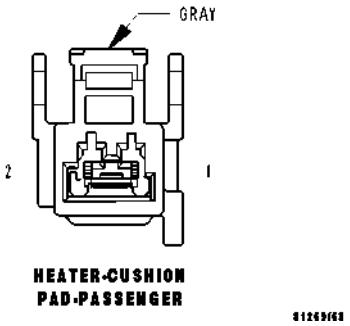


B1098-FRONT RIGHT SEAT HEATER CONTROL CIRCUIT OPEN — (CONTINUED)

2. CHECK FOR AN OPEN SEAT HEATER ELEMENT

Disconnect the Passenger Cushion Pad Heater 2 – way connector.

Note: Check connectors - Clean and repair as necessary.
Measure the total resistance of the cushion and seat back heater elements at the Passenger Cushion Pad 2 – way connector (seat side).



Is the total resistance 2.5 ohms + or – .5 ohms?

Yes >> Go To 4

No >> Go To 3

---

3. CHECK THE PASSENGER SEAT BACK PAD HEATER RESISTANCE

Disconnect the Passenger Seat Back Pad Heater 2 – way connector.

Note: Check connectors - Clean and repair as necessary.
Check the resistance of the seat back heater element by measuring between the (P188) Passenger Seat Heater B(+) Driver and the Ground circuit at the passenger seat back pad connector.

Is the resistance above 5.8 ohms?

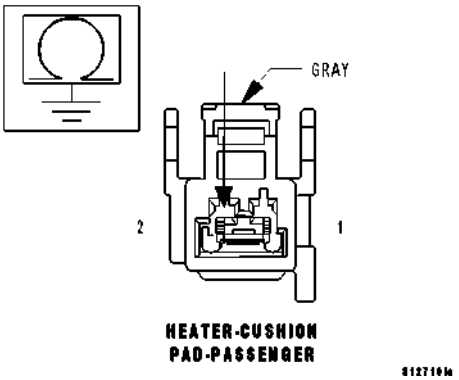
Yes >> Repair the open pigtail harness or replace the seat back heater element as necessary.
Perform BODY VERIFICATION TEST – VER 1.

No >> Repair the open pigtail harness or replace the seat cushion heater element as necessary.
Perform BODY VERIFICATION TEST – VER 1.

---

4. CHECK THE PASSENGER SEAT HEATER GROUND CIRCUIT RESISTANCE

Measure the resistance of the Ground circuit at the Heater Cushion Pad 2 – way connector.



Was the resistance below 5.0 ohms?

Yes >> Go To 5

No >> Repair the open ground circuit.
Perform BODY VERIFICATION TEST – VER 1.

B1098-FRONT RIGHT SEAT HEATER CONTROL CIRCUIT OPEN — (CONTINUED)

5. Check the (P188) Passenger Seat Heater B(+) Driver circuit for an open.

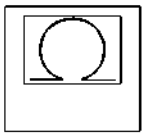
Disconnect the Heated Seat Module connector.

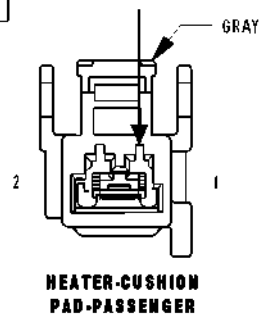
Note: Check connectors - Clean and repair as necessary.
Measure the (P188) Passenger Seat Heater B(+) Driver circuit from the Passenger Cushion Pad connector to the HSM connector.

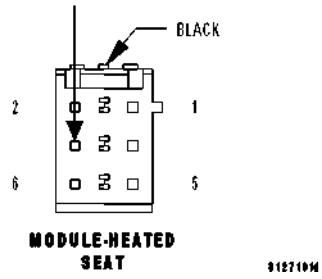
Is the resistance below 5.0 ohms?

Yes >> Replace the Heated Seat Module.
Perform BODY VERIFICATION TEST – VER 1.

No >> Repair the (P188) Passenger Seat Heater B(+) Driver circuit for an open.
Perform BODY VERIFICATION TEST – VER 1.







B210D-BATTERY VOLTAGE LOW

For the Heated Seat System circuit diagram (Refer to 8 - ELECTRICAL/HEATED SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**Engine running, during heated seat operation.
- **Set Condition:**This code is set immediately after the Heated Seat Module receives a low charging system voltage message over the CAN B Bus or detects voltage under 11.3 volts on the (A940) Fused B(+) circuit.

Possible Causes
CHARGING SYSTEM VOLAGE LOW
(A940) FUSED B(+) CIRCUIT
HEATED SEAT MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

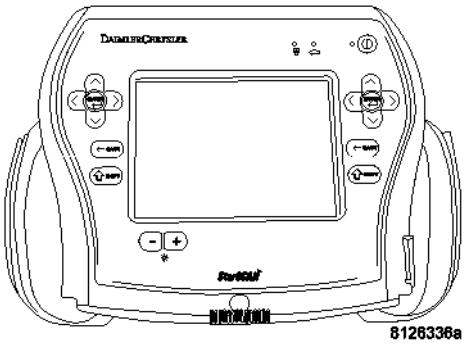
1. CHECK PCM FOR CHARGING SYSTEM DTC

With the scan tool, read Powertrain Control Module DTC's.

Are there any Charging System DTC's set in the Powertrain Control Module?

Yes >> (Refer to 8 - ELECTRICAL/CHARGING - DIAGNOSIS AND TESTING) for Charging System diagnostic procedures.

No >> Go To 2
Perform BODY VERIFICATION TEST – VER 1.



B210D-BATTERY VOLTAGE LOW — (CONTINUED)

2. VERIFY THAT DTC B210D-BATTERY VOLTAGE LOW IS ACTIVE

With the scan tool, record and erase DTC's

Turn the ignition switch to the Off position then start the engine and let run for one minute.

With the scan tool, read DTC's.

Does the DTC B210D-BATTERY VOLTAGE LOW reset?

Yes >> Go To 3

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST – VER 1.

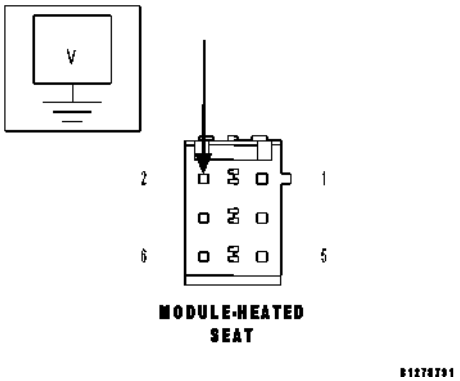
---

3. CHECK THE VOLTAGE ON THE (A940) FUSED B(+) CIRCUIT

Disconnect the Heated Seat Module connector.

Note: Check connectors - Clean and repair as necessary.
Start the engine and let idle.

Measure the voltage on the (A940) Fused B(+) circuit at the HSM connector and compare to voltage at the vehicle battery.



Is the voltage at the HSM connector the same as measured at the battery?

Yes >> Replace the Heated Seat Module in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Repair the (A940) Fused B(+) circuit as necessary.
Perform BODY VERIFICATION TEST – VER 1.

B221A-HEATED SEAT MODULE INTERNAL

For the Heated Seat System circuit diagram (Refer to 8 - ELECTRICAL/HEATED SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**Ignition on.
- **Set Condition:**This code is set immediately if the Heated Seat Module internal self test fails.

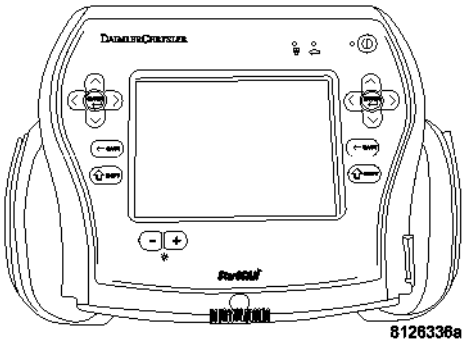
Possible Causes
HEATED SEAT MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. VERIFY THAT DTC B221A-HEATED SEAT MODULE INTERNAL IS ACTIVE

With the scan tool, record and erase DTC's
Cycle the ignition switch off then back on.
With the scan tool, read DTC's.



Does the DTC B221A-HEATED SEAT MODULE INTERNAL reset?

Yes >> Replace the Heated Seat Module.
Perform BODY VERIFICATION TEST – VER 1.

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST – VER 1.

B210E-BATTERY VOLTAGE HIGH

For the Heated Seat System circuit diagram (Refer to 8 - ELECTRICAL/HEATED SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**Engine running, during heated seat operation.
- **Set Condition:**This code is set immediately after the Heated Seat Module receives a high charging system voltage message over the CAN B Bus or detects voltage over 15 volts on the (A940) Fused B(+) circuit.

Possible Causes
CHARGING SYSTEM VOLAGE HIGH
(A940) FUSED B(+) CIRCUIT
HEATED SEAT MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

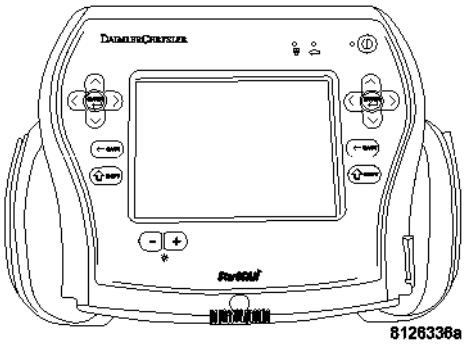
1. CHECK PCM FOR CHARGING SYSTEM DTC

With the scan tool, read Powertrain Control Module DTC's.

Are there any Charging System DTC's set in the Powertrain Control Module?

Yes >> (Refer to 8 - ELECTRICAL/CHARGING - DIAGNOSIS AND TESTING) for Charging System diagnostic procedures.

No >> Go To 2



B210E-BATTERY VOLTAGE HIGH — (CONTINUED)

2. VERIFY THAT DTC B210E-BATTERY VOLTAGE HIGH IS ACTIVE

With the scan tool, record and erase DTC's

Turn the ignition switch to the Off position then start the engine and let run for one minute.

Attempt to operate the heated seats.

With the scan tool, read DTC's.

Does the DTC B210E-BATTERY VOLTAGE HIGH reset?

Yes >> Go To 3

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST – VER 1.

---

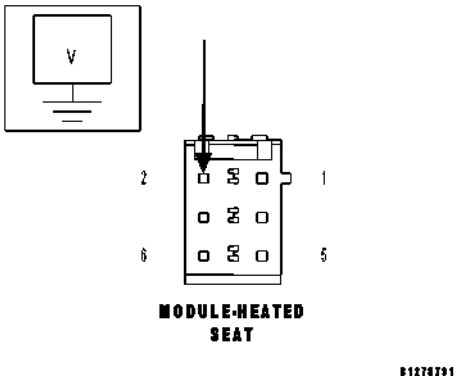
3. CHECK THE VOLTAGE ON THE (A940) FUSED B(+) CIRCUIT

Disconnect the Heated Seat Module connector.

Note: Check connectors - Clean and repair as necessary.

Start the engine and let idle.

Measure the voltage on the (A940) Fused B(+) circuit at the HSM connector and compare to voltage at the vehicles battery.

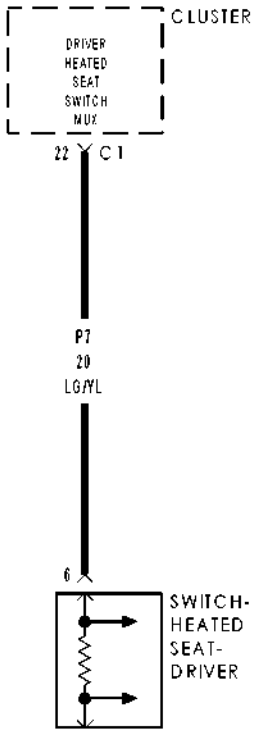


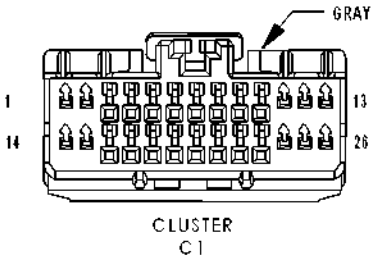
Is the voltage at the HSM connector the same as measured at the battery?

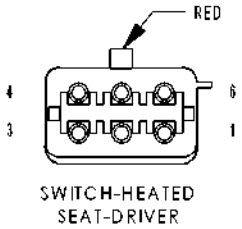
Yes >> Replace the Heated Seat Module in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Repair the (A940) Fused B(+) circuit as necessary.
Perform BODY VERIFICATION TEST – VER 1.

B1085-LEFT HEATED SEAT SWITCH INPUT CIRCUIT LOW







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B1085-LEFT HEATED SEAT SWITCH INPUT CIRCUIT LOW — (CONTINUED)

For the Heated Seat System circuit diagram (Refer to 8 - ELECTRICAL/HEATED SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**Ignition on, during the heated seat operation.
- **Set Condition:**This code is set immediately after the Cluster detects the heated seat switch MUX circuit low.

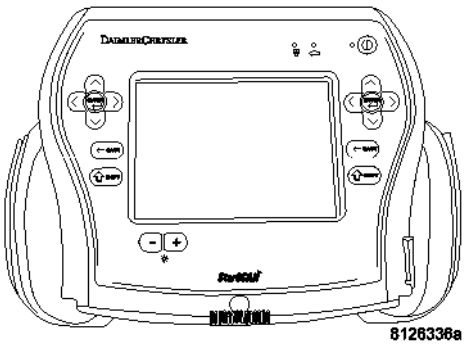
Possible Causes
JUNCTION BLOCK FUSE #2
(F21) FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN
(P7) DRIVER HEATED SEAT SWITCH MUX OPEN/SHORTED TO GROUND
DRIVER HEATED SEAT SWITCH
CLUSTER

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. VERIFY THAT DTC B1085-LEFT HEATED SEAT SWITCH INPUT CIRCUIT LOW IS ACTIVE

With the scan tool, record and erase DTC's
Operate the Heated Seat Switch in both positions several times.
With the scan tool, read DTC's.



Does the DTC B1085 LEFT HEATED SEAT SWITCH INPUT CIRCUIT LOW reset?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST – VER 1.

---

2. INSPECT JUNCTION BLOCK FUSE #2

Check the Junction Block Fuse #2.

Is the fuse open?

Yes >> Check for a possible short to ground on the (F21) Fused Ignition Switch Output Circuit and replace the fuse as necessary.
Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 3

B1085-LEFT HEATED SEAT SWITCH INPUT CIRCUIT LOW — (CONTINUED)

3. DISCONNECT THE CLUSTER C–1 CONNECTOR AND CHECK FOR VOLTAGE

Reinstall the fuse if removed in previous test.

Disconnect the Cluster C-1 connector.

Note: Check connectors - Clean and repair as necessary.

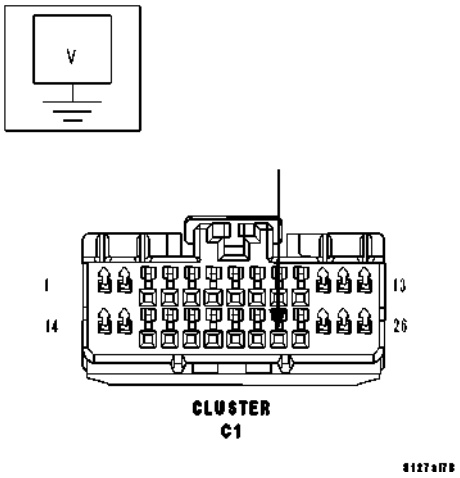
Turn the ignition on.

Measure the voltage at the (P7) Driver Heated Seat Switch MUX circuit at the Cluster C-1 connector.

Is the voltage above 10.0 volts?

Yes >> Replace the Cluster in accordance with the Service Information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 4



---

4. CHECK THE (F21) FUSED IGNITION SWITCH OUTPUT (RUN-START)

Disconnect the Driver Heated Seat switch connector.

Note: Check connectors - Clean and repair as necessary.

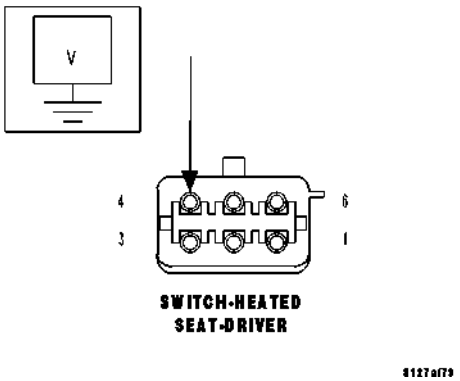
Turn the ignition on.

Measure the voltage of the (F21) Fused Ignition Switch Output circuit at the Driver Heated Seat Switch connector.

Is the voltage above 10.0 volts ?

Yes >> Go To 5

No >> Repair the (F21) Fused Ignition Switch Output circuit for an open.
Perform BODY VERIFICATION TEST – VER 1.



---

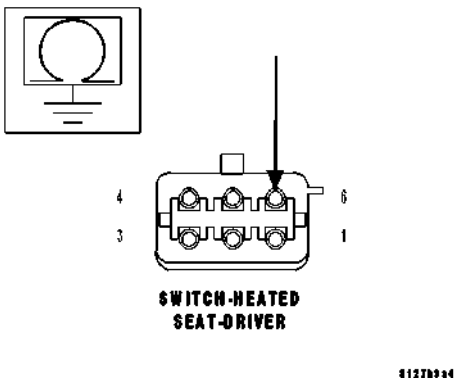
5. CHECK THE (P7) DRIVER HEATED SEAT SWITCH MUX CIRCUIT FOR A SHORT TO GROUND

Measure the resistance between ground and the (P7) Driver Heated Seat Switch MUX circuit.

Was the resistance below 5.0 ohms?

Yes >> Repair the (P7) Driver Heated Seat Switch MUX circuit for a short to ground
Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 6



B1085-LEFT HEATED SEAT SWITCH INPUT CIRCUIT LOW — (CONTINUED)

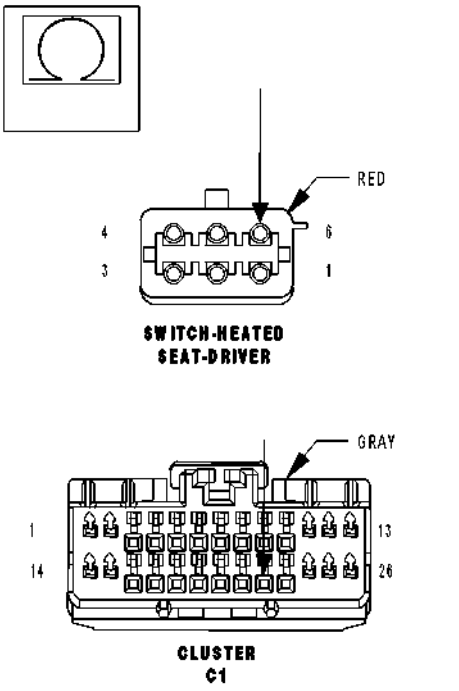
6. CHECK THE (P7) DRIVER HEATED SEAT SWITCH MUX CIRCUIT FOR AN OPEN

Measure the resistance of the (P7) Driver Heated Seat Switch MUX circuit between the Cluster C-1 connector and the Driver Heated Seat Switch connector.

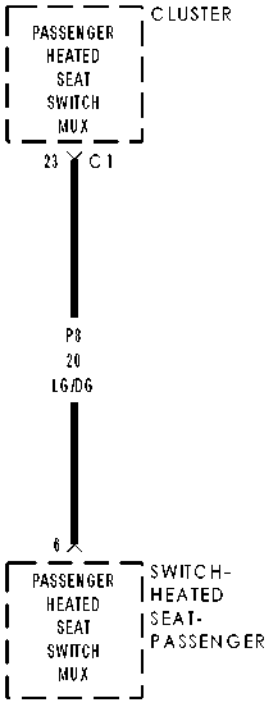
Is the resistance below 5.0 ohms?

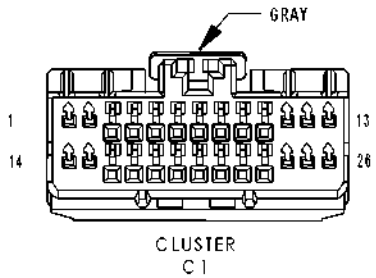
Yes >> Replace the Driver Heated Seat Switch.
Perform BODY VERIFICATION TEST – VER 1.

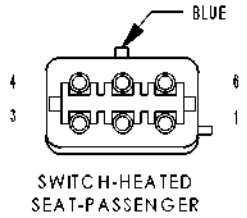
No >> Repair the (P7) Driver Heated Seat Switch MUX circuit for an open.
Perform BODY VERIFICATION TEST – VER 1.



B1088-RIGHT HEATED SEAT SWITCH INPUT CIRCUIT LOW







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B1088-RIGHT HEATED SEAT SWITCH INPUT CIRCUIT LOW — (CONTINUED)

For the Heated Seat System circuit diagram (Refer to 8 - ELECTRICAL/HEATED SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**Ignition on, during the heated seat operation.
- **Set Condition:**This code is set immediately after the Cluster detects the heated seat switch MUX circuit low.

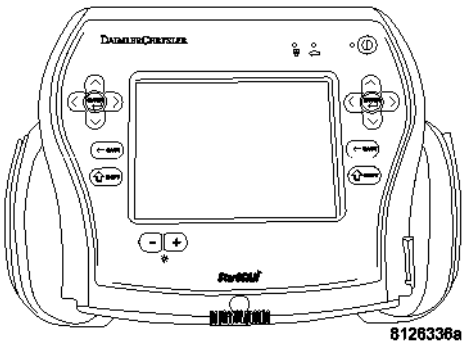
Possible Causes
JUNCTION BLOCK FUSE #2
(F21) FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN
(P8) PASSENGER HEATED SEAT SWITCH MUX OPEN/SHORTED TO GROUND
PASSENGER HEATED SEAT SWITCH
CLUSTER

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. VERIFY THAT DTC B1088-RIGHT HEATED SEAT SWITCH INPUT CIRCUIT LOW IS ACTIVE

With the scan tool, record and erase DTC's
Operate the Heated Seat Switch in both positions several times.
With the scan tool, read DTC's.



Does the DTC B1088 RIGHT HEATED SEAT SWITCH INPUT CIRCUIT LOW reset?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST – VER 1.

---

2. INSPECT JUNCTION BLOCK FUSE #2

Check the Junction Block Fuse #2.

Is the fuse open?

Yes >> Check for a possible short to ground on the (F21) Fused Ignition Switch Output Circuit and replace the fuse as necessary.
Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 3

B1088-RIGHT HEATED SEAT SWITCH INPUT CIRCUIT LOW — (CONTINUED)

3. DISCONNECT THE CLUSTER C–1 CONNECTOR AND CHECK FOR VOLTAGE

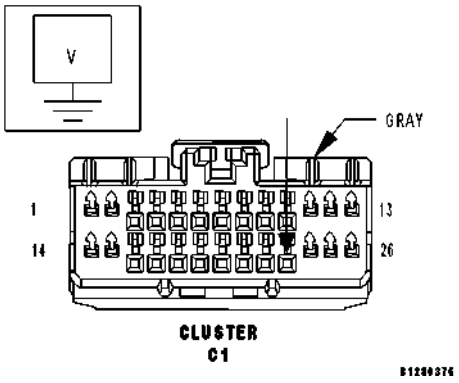
Reinstall the fuse if removed in previous test.
Disconnect the Cluster C-1 connector.

Note: Check connectors - Clean and repair as necessary.
Turn the ignition on.
Measure the voltage at the (P8) Passenger Heated Seat Switch MUX circuit at the Cluster C-1 connector.

Is the voltage above 10.0 volts?

Yes >> Replace the Cluster in accordance with the Service Information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 4



---

4. CHECK THE (F21) FUSED IGNITION SWITCH OUTPUT (RUN-START)

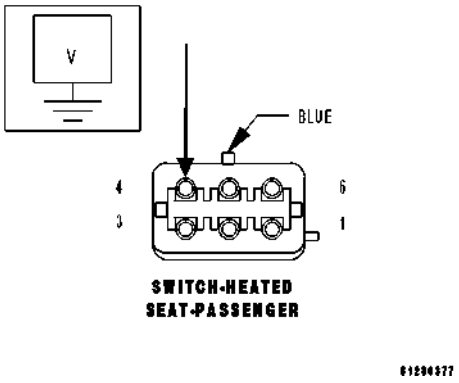
Disconnect the Passenger Heated Seat switch connector.

Note: Check connectors - Clean and repair as necessary.
Turn the ignition on.
Measure the voltage of the (F21) Fused Ignition Switch Output circuit at the Passenger Heated Seat Switch connector.

Is the voltage above 10.0 volts ?

Yes >> Go To 5

No >> Repair the (F21) Fused Ignition Switch Output circuit for an open.
Perform BODY VERIFICATION TEST – VER 1.



---

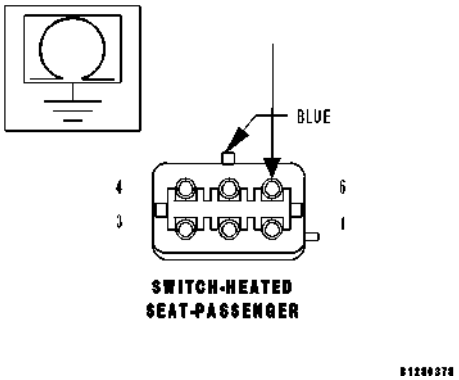
5. CHECK THE (P8) PASSENGER HEATED SEAT SWITCH MUX CIRCUIT FOR A SHORT TO GROUND

Measure the resistance between ground and the (P8) Passenger Heated Seat Switch MUX circuit.

Was the resistance below 5.0 ohms?

Yes >> Repair the (P8) Passenger Heated Seat Switch MUX circuit for a short to ground
Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 6



B1088-RIGHT HEATED SEAT SWITCH INPUT CIRCUIT LOW — (CONTINUED)

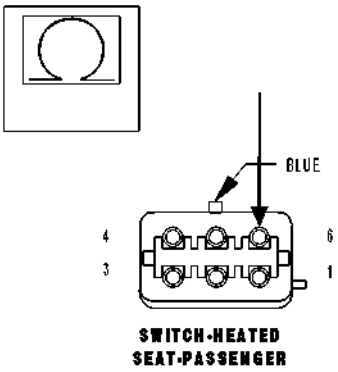
6. CHECK THE (P8) PASSENGER HEATED SEAT SWITCH MUX CIRCUIT FOR AN OPEN

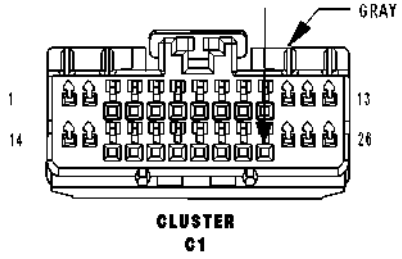
Measure the resistance of the (P8) Passenger Heated Seat Switch MUX circuit between the Cluster C-1 connector and the Passenger Heated Seat Switch connector.

Is the resistance below 5.0 ohms?

Yes >> Replace the Passenger Heated Seat Switch.
Perform BODY VERIFICATION TEST – VER 1.

No >> Repair the (P8) Passenger Heated Seat Switch MUX circuit for an open.
Perform BODY VERIFICATION TEST – VER 1.





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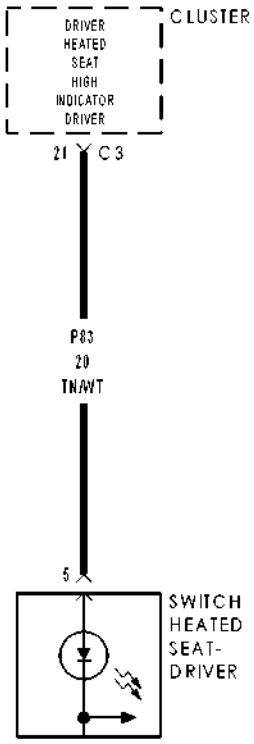
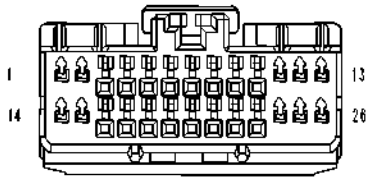
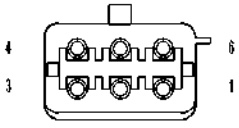
B120D-LEFT HEATED SEAT HI INDICATOR CONTROL CIRCUIT LOW





CLUSTER
C3



SWITCH-HEATED SEAT-DRIVER

8103034f

B120D-LEFT HEATED SEAT HI INDICATOR CONTROL CIRCUIT LOW — (CONTINUED)

For the Heated Seat System circuit diagram (Refer to 8 - ELECTRICAL/HEATED SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**Continously with the ignition on.
- **Set Condition:**This code is set immediately when the Cluster detects low voltage on the heated seat indicator control circuit.

Possible Causes
JUNCTION BLOCK FUSE #2
(F21) FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN
(P83) DRIVER HEATED SEAT HIGH INDICATOR DRIVER CIRCUIT OPEN/SHORTED TO GROUND
DRIVER HEATED SEAT SWITCH
CLUSTER

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

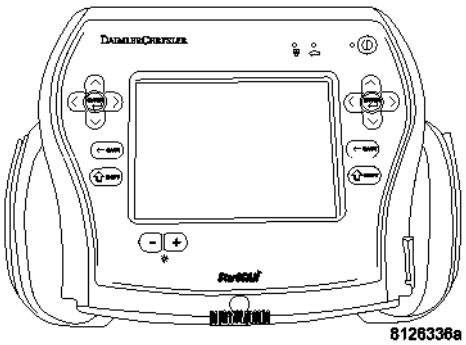
1. VERIFY THAT DTC B120D-LEFT HEATED SEAT HI INDICATOR CONTROL CIRCUIT LOW IS ACTIVE

With the scan tool, record and erase DTC's
Operate the Heated Seat Switch in both positions several times.
With the scan tool, read DTC's.

Does the DTC B120D-LEFT HEATED SEAT HI INDICATOR CONTROL CIRCUIT LOW reset?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST – VER 1.



---

2. INSPECT JUNCTION BLOCK FUSE #2

Check Junction Block fuse #2.

Is the fuse open?

Yes >> Check for a possible short to ground on the (F21) Fused Ignition Switch Output Circuit and replace the fuse as necessary.
Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 3

B120D-LEFT HEATED SEAT HI INDICATOR CONTROL CIRCUIT LOW — (CONTINUED)

3. DISCONNECT THE CLUSTER C–3 CONNECTOR AND CHECK FOR VOLTAGE

Reinstall fuse if removed in previous test.

Disconnect the Cluster C-3 connector.

Note: Check connectors - Clean and repair as necessary.

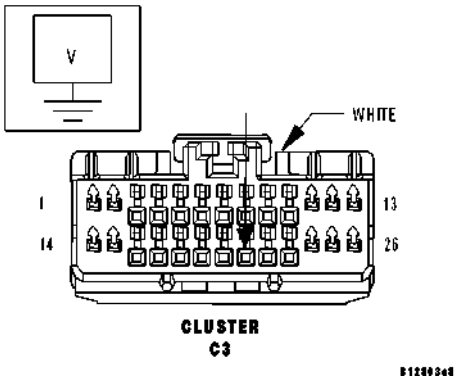
Turn the ignition on.

Measure the voltage at the (P83) Driver Heated Seat High Indicator Driver circuit at the Cluster C-3 connector.

Is the voltage above 10.0 volts?

Yes >> Replace the Cluster in accordance with the Service Information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 4



---

4. CHECK THE (F21) FUSED IGNITION SWITCH OUTPUT (RUN-START)

Disconnect the Driver Heated Seat switch connector.

Note: Check connectors - Clean and repair as necessary.

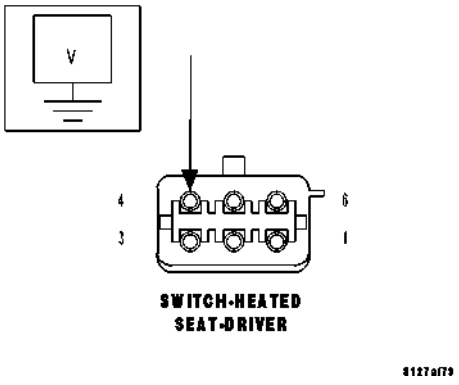
Turn the ignition on.

Measure the voltage of the (F21) Fused Ignition Switch Output circuit at the Driver Heated Seat Switch connector.

Is the voltage above 10.0 volts ?

Yes >> Go To 5

No >> Repair the (F21) Fused Ignition Switch Output circuit for an open.
Perform BODY VERIFICATION TEST – VER 1.



---

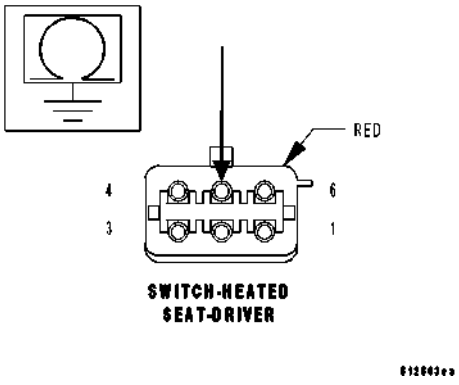
5. CHECK THE (P83) DRIVER HEATED SEAT HIGH INDICATOR DRIVER CIRCUIT FOR A SHORT TO GROUND

Measure the resistance between ground and the (P83) Driver Heated Seat High Indicator Driver circuit.

Was the resistance below 5.0 ohms?

Yes >> Repair the (P83) Driver Heated Seat High Indicator Driver circuit for a short to ground
Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 6



B120D-LEFT HEATED SEAT HI INDICATOR CONTROL CIRCUIT LOW — (CONTINUED)

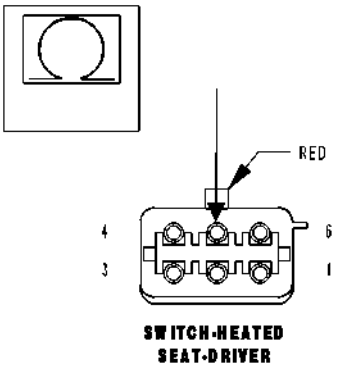
6. CHECK THE (P83) DRIVER HEATED SEAT HIGH INDICATOR DRIVER CIRCUIT FOR AN OPEN

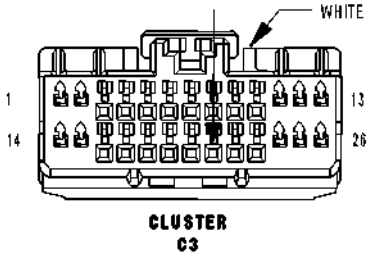
Measure the resistance of the (P83) Driver Heated Seat High Indicator Driver circuit between the Cluster C-3 connector and the Driver Heated Seat Switch connector.

Is the resistance below 5.0 ohms?

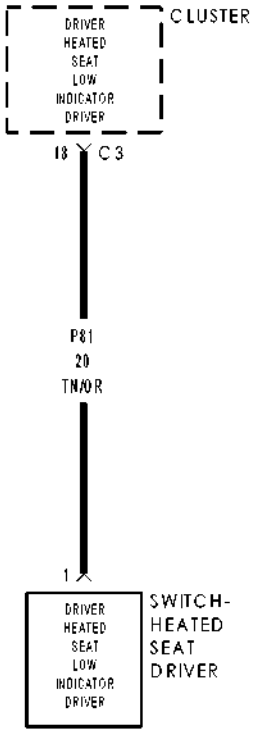
Yes >> Replace the Driver Heated Seat Switch.
Perform BODY VERIFICATION TEST – VER 1.

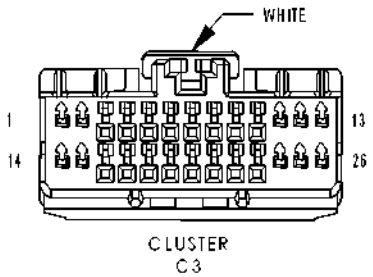
No >> Repair the (P83) Driver Heated Seat High Indicator Driver circuit for an open.
Perform BODY VERIFICATION TEST – VER 1.

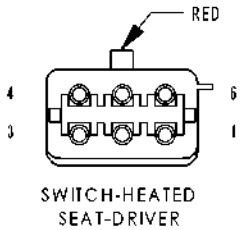




B1215-LEFT HEATED SEAT LO INDICATOR CONTROL CIRCUIT LOW







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B1215-LEFT HEATED SEAT LO INDICATOR CONTROL CIRCUIT LOW — (CONTINUED)

For the Heated Seat System circuit diagram (Refer to 8 - ELECTRICAL/HEATED SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**Continously with the ignition on.
- **Set Condition:**This code is set immediately when the Cluster detects low voltage on the heated seat indicator control circuit.

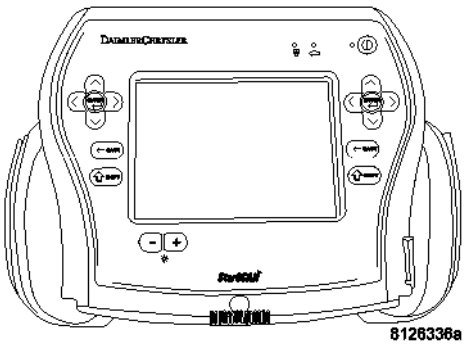
Possible Causes
JUNCTION BLOCK FUSE #2
(F21) FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN
(P81) DRIVER HEATED SEAT LOW INDICATOR DRIVER CIRCUIT OPEN/SHORTED TO GROUND
DRIVER HEATED SEAT SWITCH
CLUSTER

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. VERIFY THAT DTC B1215-LEFT HEATED SEAT LO INDICATOR CONTROL CIRCUIT LOW IS ACTIVE

With the scan tool, record and erase DTC's
Operate the Heated Seat Switch in both positions several times.
With the scan tool, read DTC's.



Does the DTC B1215-LEFT HEATED SEAT LO INDICATOR CONTROL CIRCUIT LOW reset?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST – VER 1.

---

2. INSPECT JUNCTION BLOCK FUSE #2

Check Junction Block fuse #2.

Is the fuse open?

Yes >> Check for a possible short to ground on the (F21) Fused Ignition Switch Output Circuit and replace the fuse as necessary.
Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 3

B1215-LEFT HEATED SEAT LO INDICATOR CONTROL CIRCUIT LOW — (CONTINUED)

3. DISCONNECT THE CLUSTER C–3 CONNECTOR AND CHECK FOR VOLTAGE

Reinstall fuse if removed in previous test.

Disconnect the Cluster C-3 connector.

Note: Check connectors - Clean and repair as necessary.

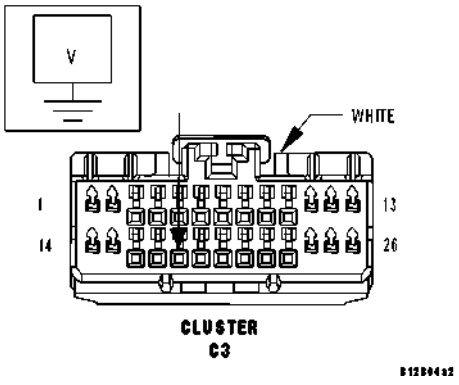
Turn the ignition on.

Measure the voltage at the (P81) Driver Heated Seat Low Indicator Driver circuit at the Cluster C-3 connector.

Is the voltage above 10.0 volts?

Yes >> Replace the Cluster in accordance with the Service Information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 4



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4. CHECK THE (F21) FUSED IGNITION SWITCH OUTPUT (RUN-START)

Disconnect the Driver Heated Seat switch connector.

Note: Check connectors - Clean and repair as necessary.

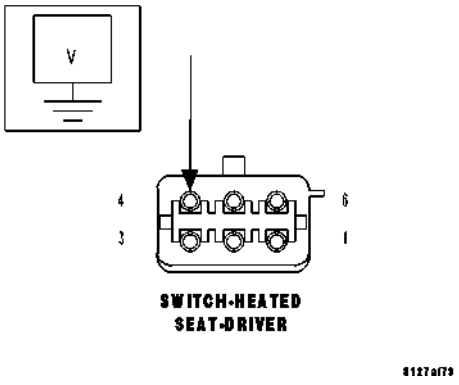
Turn the ignition on.

Measure the voltage of the (F21) Fused Ignition Switch Output circuit at the Driver Heated Seat Switch connector.

Is the voltage above 10.0 volts ?

Yes >> Go To 5

No >> Repair the (F21) Fused Ignition Switch Output circuit for an open.
Perform BODY VERIFICATION TEST – VER 1.



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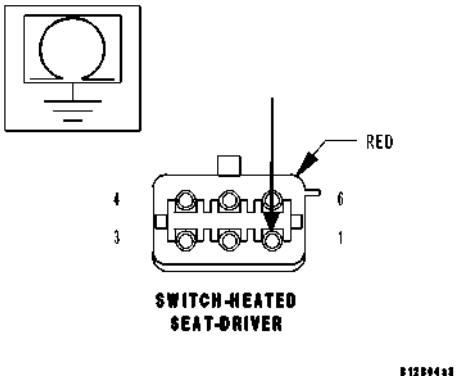
5. CHECK THE (P81) DRIVER HEATED SEAT LO INDICATOR DRIVER CIRCUIT FOR A SHORT TO GROUND

Measure the resistance between ground and the (P81) Driver Heated Seat Lo Indicator Driver circuit.

Was the resistance below 5.0 ohms?

Yes >> Repair the (P81) Driver Heated Seat Lo Indicator Driver circuit for a short to ground
Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 6



B1215-LEFT HEATED SEAT LO INDICATOR CONTROL CIRCUIT LOW — (CONTINUED)

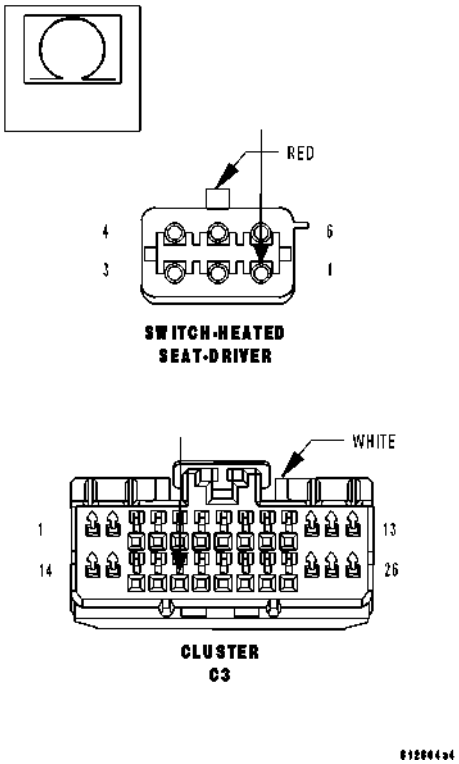
6. CHECK THE (P81) DRIVER HEATED SEAT LO INDICATOR DRIVER CIRCUIT FOR AN OPEN

Measure the resistance of the (P81) Driver Heated Seat Lo Indicator Driver circuit between the Cluster C-3 connector and the Driver Heated Seat Switch connector.

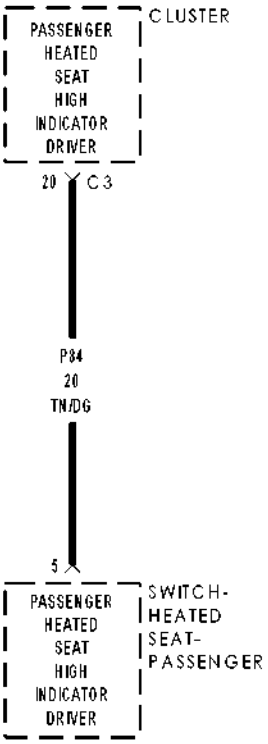
Is the resistance below 5.0 ohms?

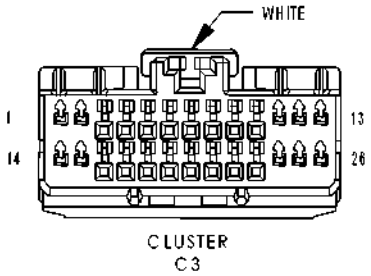
Yes >> Replace the Driver Heated Seat Switch.
Perform BODY VERIFICATION TEST – VER 1.

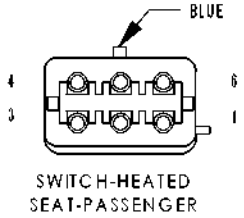
No >> Repair the (P81) Driver Heated Seat Lo Indicator Driver circuit for an open.
Perform BODY VERIFICATION TEST – VER 1.



B1219-RIGHT HEATED SEAT HI INDICATOR CONTROL CIRCUIT LOW







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B1219-RIGHT HEATED SEAT HI INDICATOR CONTROL CIRCUIT LOW — (CONTINUED)

For the Heated Seat System circuit diagram (Refer to 8 - ELECTRICAL/HEATED SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**Continously with the ignition on.
- **Set Condition:**This code is set immediately when the Cluster detects low voltage on the heated seat indicator control circuit.

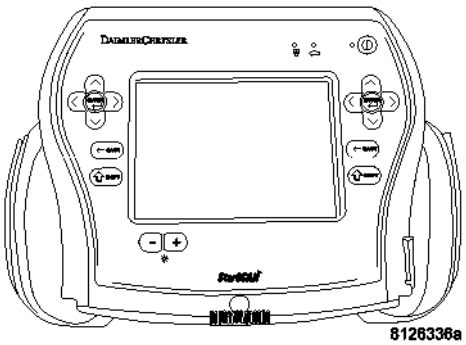
Possible Causes
JUNCTION BLOCK FUSE #2
(F21) FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN
(P84) PASSENGER HEATED SEAT HIGH INDICATOR DRIVER CIRCUIT OPEN/SHORTED TO GROUND
PASSENGER HEATED SEAT SWITCH
CLUSTER

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. VERIFY THAT DTC B1219-RIGHT HEATED SEAT HI INDICATOR CONTROL CIRCUIT LOW IS ACTIVE

With the scan tool, record and erase DTC's
Operate the Heated Seat Switch in both positions several times.
With the scan tool, read DTC's.



Does the DTC B1219-RIGHT HEATED SEAT HI INDICATOR CONTROL CIRCUIT LOW reset?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST – VER 1.

---

2. INSPECT JUNCTION BLOCK FUSE #2

Check Junction Block fuse #2.

Is the fuse open?

Yes >> Check for a possible short to ground on the (F21) Fused Ignition Switch Output Circuit and replace the fuse as necessary.
Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 3

B1219-RIGHT HEATED SEAT HI INDICATOR CONTROL CIRCUIT LOW — (CONTINUED)

3. DISCONNECT THE CLUSTER C–3 CONNECTOR AND CHECK FOR VOLTAGE

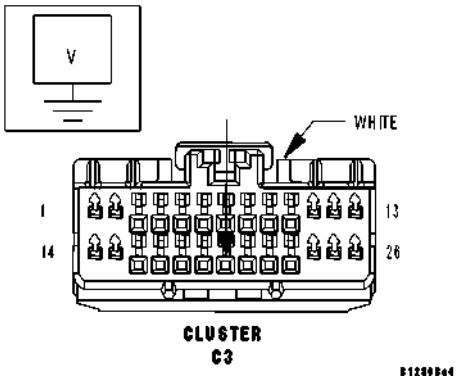
Reinstall fuse if removed in previous test.
Disconnect the Cluster C-3 connector.

Note: Check connectors - Clean and repair as necessary.
Turn the ignition on.
Measure the voltage at the (P84) Passenger Heated Seat High Indicator Driver circuit at the Cluster C-3 connector.

Is the voltage above 10.0 volts?

Yes >> Replace the Cluster in accordance with the Service Information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 4



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4. CHECK THE (F21) FUSED IGNITION SWITCH OUTPUT (RUN-START)

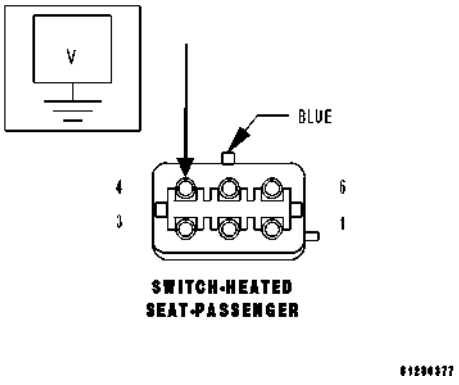
Disconnect the Passenger Heated Seat switch connector.

Note: Check connectors - Clean and repair as necessary.
Turn the ignition on.
Measure the voltage of the (F21) Fused Ignition Switch Output circuit at the Passenger Heated Seat Switch connector.

Is the voltage above 10.0 volts ?

Yes >> Go To 5

No >> Repair the (F21) Fused Ignition Switch Output circuit for an open.
Perform BODY VERIFICATION TEST – VER 1.



---

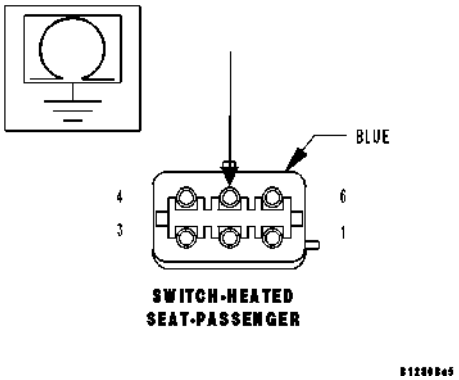
5. CHECK THE (P84) PASSENGER HEATED SEAT HIGH INDICATOR DRIVER CIRCUIT FOR A SHORT TO GROUND

Measure the resistance between ground and the (P84) Passenger Heated Seat High Indicator Driver circuit.

Was the resistance below 5.0 ohms?

Yes >> Repair the (P84) Passenger Heated Seat High Indicator Driver circuit for a short to ground
Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 6



B1219-RIGHT HEATED SEAT HI INDICATOR CONTROL CIRCUIT LOW — (CONTINUED)

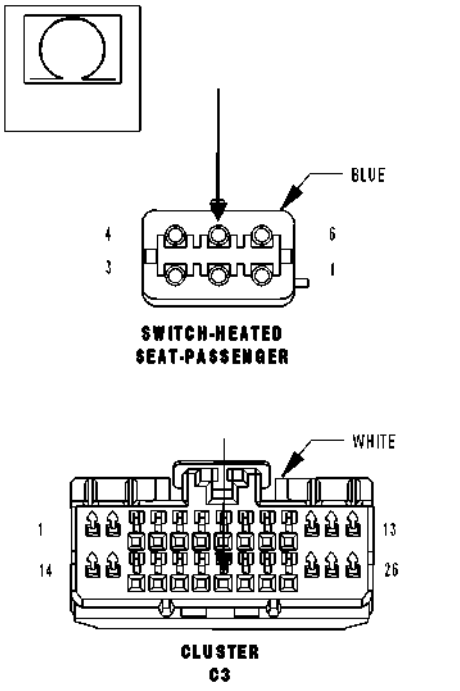
6. CHECK THE (P84) PASSENGER HEATED SEAT HIGH INDICATOR DRIVER CIRCUIT FOR AN OPEN

Measure the resistance of the (P84) Passenger Heated Seat High Indicator Driver circuit between the Cluster C-3 connector and the Passenger Heated Seat Switch connector.

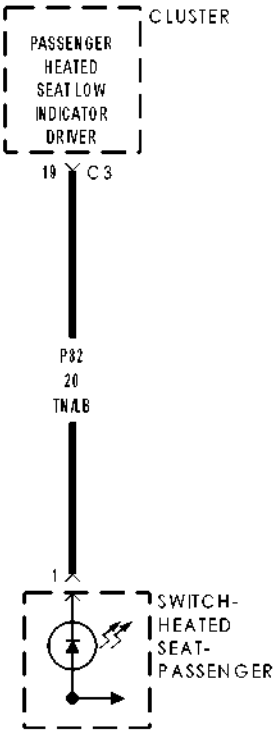
Is the resistance below 5.0 ohms?

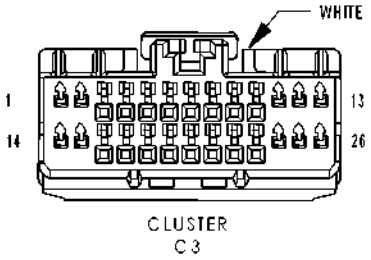
Yes >> Replace the Passenger Heated Seat Switch.
Perform BODY VERIFICATION TEST – VER 1.

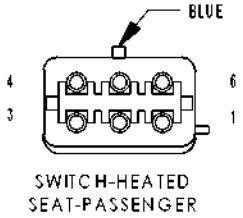
No >> Repair the (P84) Passenger Heated Seat High Indicator Driver circuit for an open.
Perform BODY VERIFICATION TEST – VER 1.



B1221-RIGHT HEATED SEAT LO INDICATOR CONTROL CIRCUIT LOW







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B1221-RIGHT HEATED SEAT LO INDICATOR CONTROL CIRCUIT LOW — (CONTINUED)

For the Heated Seat System circuit diagram (Refer to 8 - ELECTRICAL/HEATED SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**Continously with the ignition on.
- **Set Condition:**This code is set immediately when the Cluster detects low voltage on the heated seat indicator control circuit.

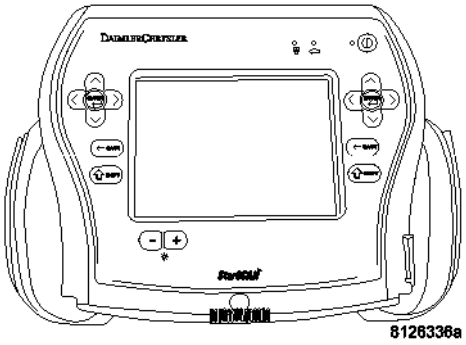
Possible Causes
JUNCTION BLOCK FUSE #2
(F21) FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN
(P82) PASSENGER HEATED SEAT LOW INDICATOR DRIVER CIRCUIT OPEN/SHORTED TO GROUND
PASSENGER HEATED SEAT SWITCH
CLUSTER

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. VERIFY THAT DTC B1221-RIGHT HEATED SEAT LO INDICATOR CONTROL CIRCUIT LOW IS ACTIVE

With the scan tool, record and erase DTC's
Operate the Heated Seat Switch in both positions several times.
With the scan tool, read DTC's.



Does the DTC B1221-RIGHT HEATED SEAT LO INDICATOR CONTROL CIRCUIT LOW reset?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST – VER 1.

---

2. INSPECT JUNCTION BLOCK FUSE #2

Check Junction Block fuse #2.

Is the fuse open?

Yes >> Check for a possible short to ground on the (F21) Fused Ignition Switch Output Circuit and replace the fuse as necessary.
Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 3

B1221-RIGHT HEATED SEAT LO INDICATOR CONTROL CIRCUIT LOW — (CONTINUED)

3. DISCONNECT THE CLUSTER C–3 CONNECTOR AND CHECK FOR VOLTAGE

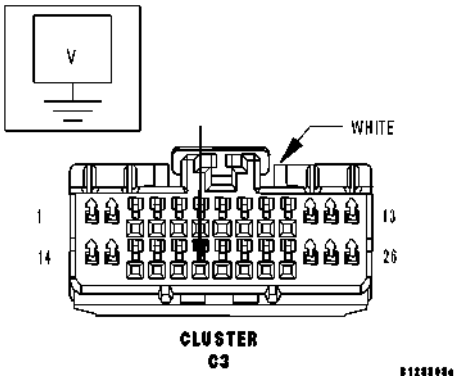
Reinstall fuse if removed in previous test.
Disconnect the Cluster C-3 connector.

Note: Check connectors - Clean and repair as necessary.
Turn the ignition on.
Measure the voltage at the (P82) Passenger Heated Seat Low Indicator Driver circuit at the Cluster C-3 connector.

Is the voltage above 10.0 volts?

Yes >> Replace the Cluster in accordance with the Service Information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 4



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4. CHECK THE (F21) FUSED IGNITION SWITCH OUTPUT (RUN-START)

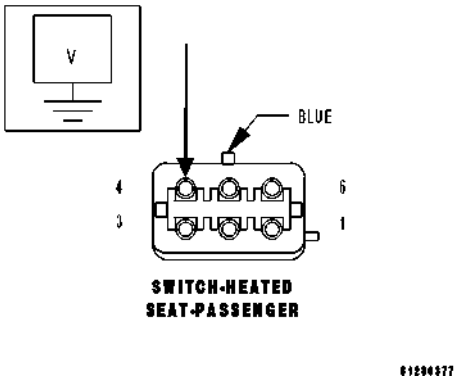
Disconnect the Passenger Heated Seat switch connector.

Note: Check connectors - Clean and repair as necessary.
Turn the ignition on.
Measure the voltage of the (F21) Fused Ignition Switch Output circuit at the Passenger Heated Seat Switch connector.

Is the voltage above 10.0 volts ?

Yes >> Go To 5

No >> Repair the (F21) Fused Ignition Switch Output circuit for an open.
Perform BODY VERIFICATION TEST – VER 1.



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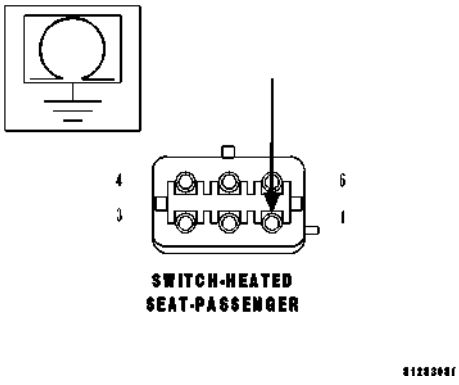
5. CHECK THE (P82) PASSENGER HEATED SEAT LO INDICATOR DRIVER CIRCUIT FOR A SHORT TO GROUND

Measure the resistance between ground and the (P82) Passenger Heated Seat Lo Indicator Driver circuit.

Was the resistance below 5.0 ohms?

Yes >> Repair the (P82) Passenger Heated Seat Lo Indicator Driver circuit for a short to ground
Perform BODY VERIFICATION TEST – VER 1.

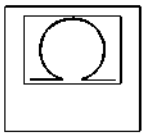
No >> Go To 6



B1221-RIGHT HEATED SEAT LO INDICATOR CONTROL CIRCUIT LOW — (CONTINUED)

6. CHECK THE (P82) PASSENGER HEATED SEAT LO INDICATOR DRIVER CIRCUIT FOR AN OPEN

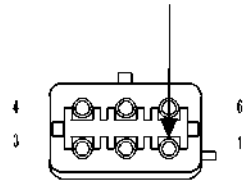
Measure the resistance of the (P82) Passenger Heated Seat Lo Indicator Driver circuit between the Cluster C-3 connector and the Passenger Heated Seat Switch connector.



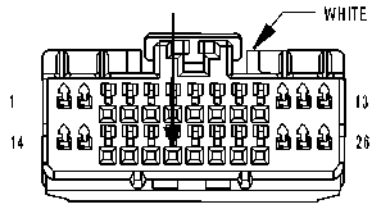
Is the resistance below 5.0 ohms?

Yes >> Replace the Passenger Heated Seat Switch.
Perform BODY VERIFICATION TEST – VER 1.

No >> Repair the (P82) Passenger Heated Seat Lo Indicator Driver circuit for an open.
Perform BODY VERIFICATION TEST – VER 1.

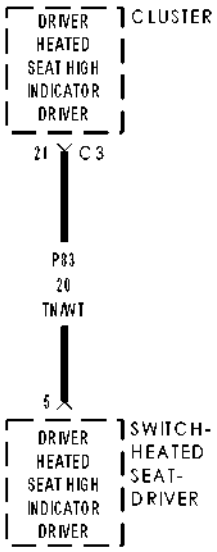


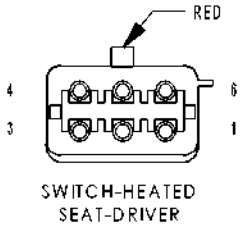
SWITCH-HEATED SEAT-PASSENGER

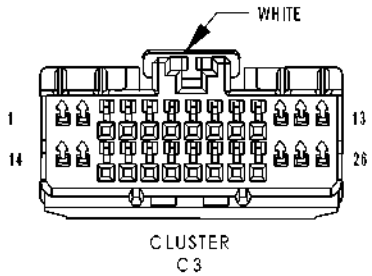


CLUSTER C3

B120E-LEFT HEATED SEAT HI INDICATOR CONTROL CIRCUIT HIGH







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B120E-LEFT HEATED SEAT HI INDICATOR CONTROL CIRCUIT HIGH — (CONTINUED)

For the Heated Seat System circuit diagram (Refer to 8 - ELECTRICAL/HEATED SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**Continously with the ignition on.
- **Set Condition:**This code is set immediately when the Cluster detects excessive voltage on the heated seat indicator control circuit.

Possible Causes
(P83) DRIVER HEATED SEAT HIGH INDICATOR DRIVER CIRCUIT SHORTED TO BATTERY
DRIVER HEATED SEAT SWITCH
CLUSTER

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

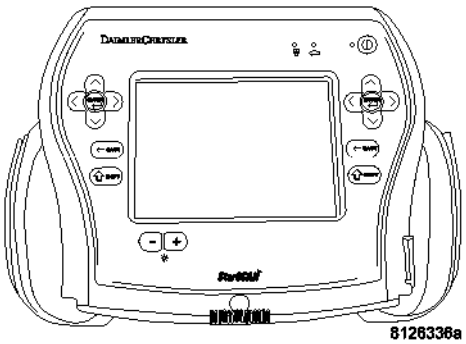
1. VERIFY THAT DTC B120E-LEFT HEATED SEAT SWITCH HI INDICATOR CONTROL CIRCUIT HIGH IS ACTIVE

With the scan tool, record and erase DTC's
Operate the Heated Seat Switch in both positions several times.
With the scan tool, read DTC's.

Does the DTC B120E-LEFT HEATED SEAT HI INDICATOR CONTROL CIRCUIT HIGH reset?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST – VER 1.



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2. DISCONNECT THE DRIVER HEATED SEAT SWITCH AND RE-READ DTC

Disconnect the Driver Heated Seat Switch connector.
With the scan tool erase DTC's
Cycle the ignition switch off then back on.
With the scan tool, read DTC's.

Does the DTC B120E-LEFT HEATED SEAT HI INDICATOR CONTROL CIRCUIT HIGH reset?

Yes >> Go To 3

No >> Replace the Driver Heated Seat switch.
Perform BODY VERIFICATION TEST – VER 1.

B120E-LEFT HEATED SEAT HI INDICATOR CONTROL CIRCUIT HIGH — (CONTINUED)

3. DISCONNECT THE CLUSTER C–3 CONNECTOR AND CHECK FOR VOLTAGE

Disconnect the Cluster C-3 connector.

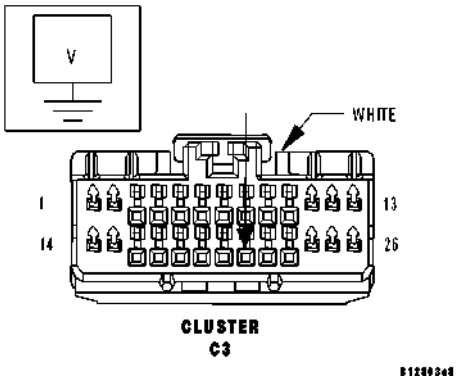
Note: Check connectors - Clean and repair as necessary.
Turn the ignition on.

Measure the voltage at the (P83) Driver Heated Seat High Indicator Driver circuit at the Cluster C-3 connector.

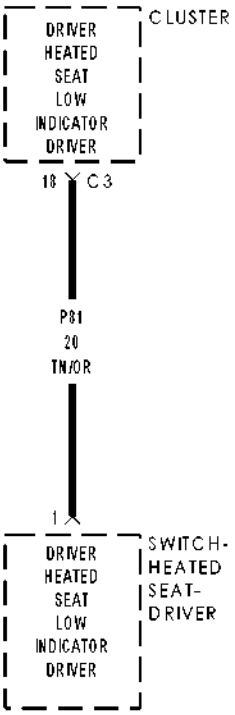
Is there any voltage present?

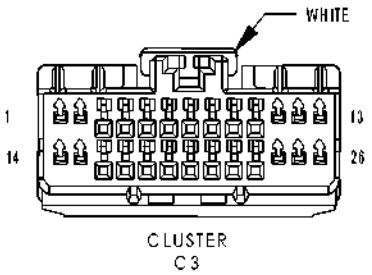
Yes >> Repair the (P83) Driver Heated Seat High Indicator Driver circuit for a short to battery.
Perform BODY VERIFICATION TEST – VER 1.

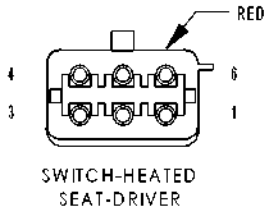
No >> Replace the Cluster in accordance with the Service Information.
Perform BODY VERIFICATION TEST – VER 1.



B1216-LEFT HEATED SEAT LO INDICATOR CONTROL CIRCUIT HIGH







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B1216-LEFT HEATED SEAT LO INDICATOR CONTROL CIRCUIT HIGH — (CONTINUED)

For the Heated Seat System circuit diagram (Refer to 8 - ELECTRICAL/HEATED SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**Continously with the ignition on.
- **Set Condition:**This code is set immediately when the Cluster detects excessive voltage on the heated seat indicator control circuit.

Possible Causes
(P81) DRIVER HEATED SEAT LO INDICATOR DRIVER CIRCUIT SHORTED TO BATTERY
DRIVER HEATED SEAT SWITCH
CLUSTER

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

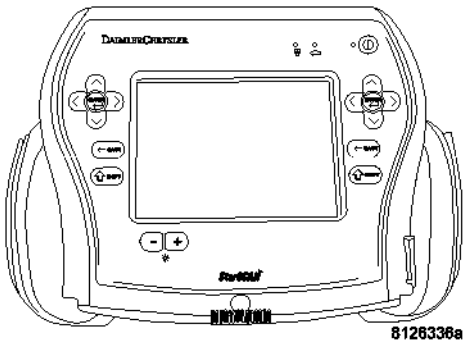
1. VERIFY THAT DTC B1216-LEFT HEATED SEAT SWITCH LO INDICATOR CONTROL CIRCUIT HIGH IS ACTIVE

With the scan tool, record and erase DTC's
Operate the Heated Seat Switch in both positions several times.
With the scan tool, read DTC's.

Does the DTC B1216-LEFT HEATED SEAT LO INDICATOR CONTROL CIRCUIT HIGH reset?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST – VER 1.



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2. DISCONNECT THE DRIVER HEATED SEAT SWITCH AND RE-READ DTC

Disconnect the Driver Heated Seat Switch connector.
With the scan tool erase DTC's
Cycle the ignition switch off then back on.
With the scan tool, read DTC's.

Does the DTC B1216-LEFT HEATED SEAT LO INDICATOR CONTROL CIRCUIT HIGH reset?

Yes >> Go To 3

No >> Replace the Driver Heated Seat switch.
Perform BODY VERIFICATION TEST – VER 1.

B1216-LEFT HEATED SEAT LO INDICATOR CONTROL CIRCUIT HIGH — (CONTINUED)

3. DISCONNECT THE CLUSTER C–3 CONNECTOR AND CHECK FOR VOLTAGE

Disconnect the Cluster C-3 connector.

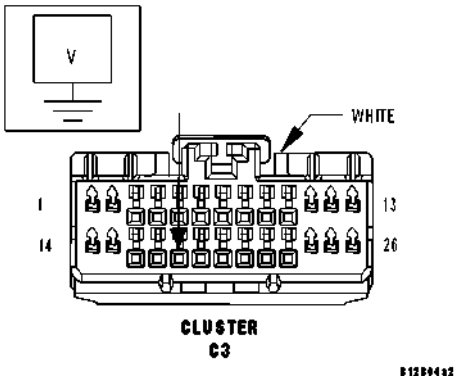
Note: Check connectors - Clean and repair as necessary.
Turn the ignition on.

Measure the voltage at the (P81) Driver Heated Seat Low Indicator Driver circuit at the Cluster C-3 connector.

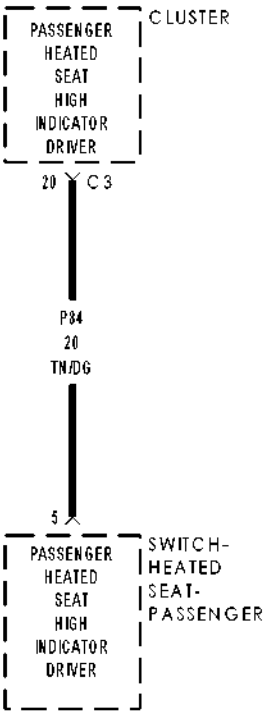
Is there any voltage present?

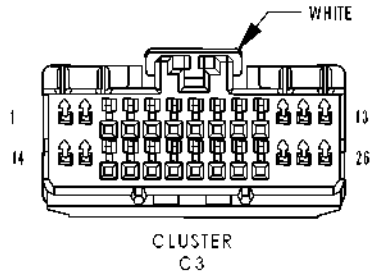
Yes >> Repair the (P81) Driver Heated Seat Low Indicator Driver circuit for a short to battery.
Perform BODY VERIFICATION TEST – VER 1.

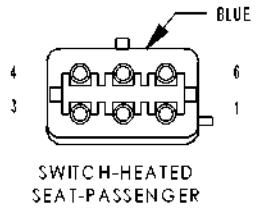
No >> Replace the Cluster in accordance with the Service Information.
Perform BODY VERIFICATION TEST – VER 1.



B121A-RIGHT HEATED SEAT HI INDICATOR CONTROL CIRCUIT HIGH







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B121A-RIGHT HEATED SEAT HI INDICATOR CONTROL CIRCUIT HIGH — (CONTINUED)

For the Heated Seat System circuit diagram (Refer to 8 - ELECTRICAL/HEATED SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**Continously with the ignition on.
- **Set Condition:**This code is set immediately when the Cluster detects excessive voltage on the heated seat indicator control circuit.

Possible Causes
(P84) PASSENGER HEATED SEAT HIGH INDICATOR DRIVER CIRCUIT SHORTED TO BATTERY
PASSENGER HEATED SEAT SWITCH
CLUSTER

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

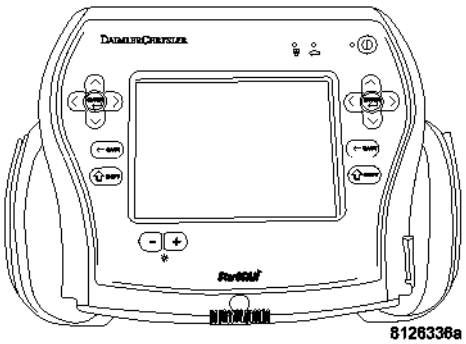
1. VERIFY THAT DTC B121A-RIGHT HEATED SEAT SWITCH HI INDICATOR CONTROL CIRCUIT HIGH IS ACTIVE

With the scan tool, record and erase DTC's
Operate the Heated Seat Switch in both positions several times.
With the scan tool, read DTC's.

Does the DTC B121A-RIGHT HEATED SEAT HI INDICATOR CONTROL CIRCUIT HIGH reset?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST – VER 1.



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2. DISCONNECT THE PASSENGER HEATED SEAT SWITCH AND RE-READ DTC

Disconnect the Passenger Heated Seat Switch connector.
With the scan tool erase DTC's
Cycle the ignition switch off then back on.
With the scan tool, read DTC's.

Does the DTC B121A-RIGHT HEATED SEAT HI INDICATOR CONTROL CIRCUIT HIGH reset?

Yes >> Go To 3

No >> Replace the Passenger Heated Seat switch.
Perform BODY VERIFICATION TEST – VER 1.

B121A-RIGHT HEATED SEAT HI INDICATOR CONTROL CIRCUIT HIGH — (CONTINUED)

3. DISCONNECT THE CLUSTER C–3 CONNECTOR AND CHECK FOR VOLTAGE

Disconnect the Cluster C-3 connector.

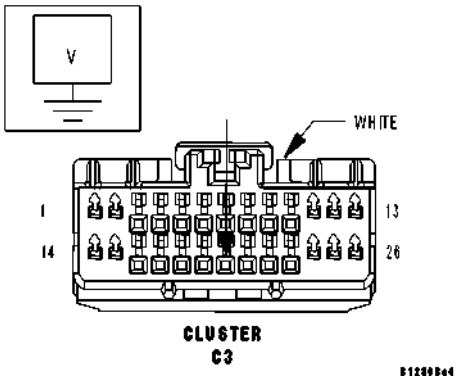
Note: Check connectors - Clean and repair as necessary.
Turn the ignition on.

Measure the voltage at the (P84) Passenger Heated Seat High Indicator Driver circuit at the Cluster C-3 connector.

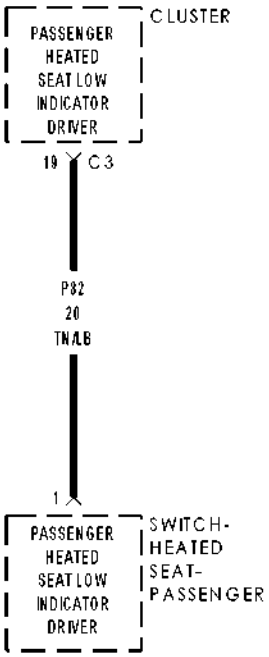
Is there any voltage present?

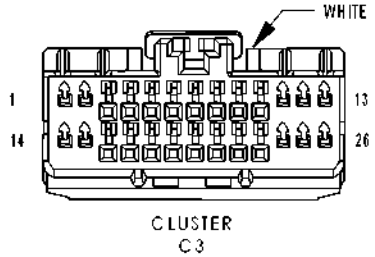
Yes >> Repair the (P84) Passenger Heated Seat High Indicator Driver circuit for a short to battery.
Perform BODY VERIFICATION TEST – VER 1.

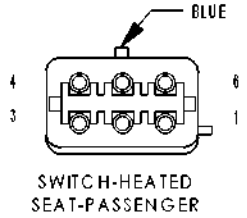
No >> Replace the Cluster in accordance with the Service Information.
Perform BODY VERIFICATION TEST – VER 1.



B1222-RIGHT HEATED SEAT LO INDICATOR CONTROL CIRCUIT HIGH







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B1222-RIGHT HEATED SEAT LO INDICATOR CONTROL CIRCUIT HIGH — (CONTINUED)

For the Heated Seat System circuit diagram (Refer to 8 - ELECTRICAL/HEATED SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**Continously with the ignition on.
- **Set Condition:**This code is set immediately when the Cluster detects excessive voltage on the heated seat indicator control circuit.

Possible Causes
(P82) PASSENGER HEATED SEAT LOW INDICATOR DRIVER CIRCUIT SHORTED TO BATTERY
PASSENGER HEATED SEAT SWITCH
CLUSTER

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

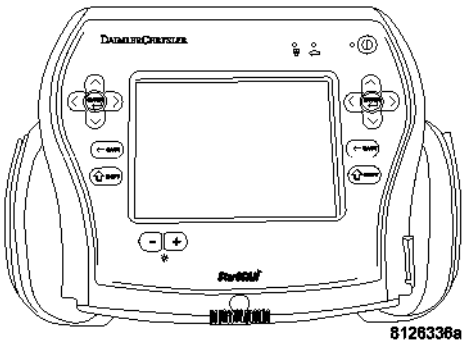
1. VERIFY THAT DTC B1222-RIGHT HEATED SEAT SWITCH LO INDICATOR CONTROL CIRCUIT HIGH IS ACTIVE

With the scan tool, record and erase DTC's
Operate the Heated Seat Switch in both positions several times.
With the scan tool, read DTC's.

Does the DTC B1222-RIGHT HEATED SEAT LO INDICATOR CONTROL CIRCUIT HIGH reset?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST – VER 1.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2. DISCONNECT THE PASSENGER HEATED SEAT SWITCH AND RE-READ DTC

Disconnect the Passenger Heated Seat Switch connector.
With the scan tool erase DTC's
Cycle the ignition switch off then back on.
With the scan tool, read DTC's.

Does the DTC B1222-RIGHT HEATED SEAT LO INDICATOR CONTROL CIRCUIT HIGH reset?

Yes >> Go To 3

No >> Replace the Passenger Heated Seat switch.
Perform BODY VERIFICATION TEST – VER 1.

B1222-RIGHT HEATED SEAT LO INDICATOR CONTROL CIRCUIT HIGH — (CONTINUED)

3. DISCONNECT THE CLUSTER C–3 CONNECTOR AND CHECK FOR VOLTAGE

Disconnect the Cluster C-3 connector.

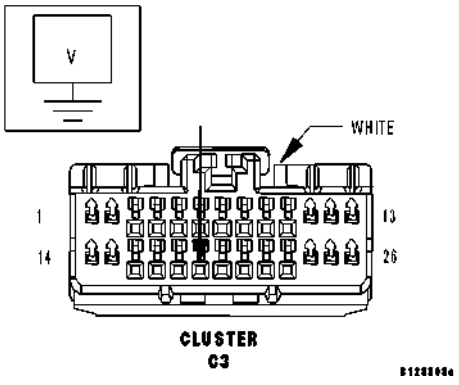
Note: Check connectors - Clean and repair as necessary.
Turn the ignition on.

Measure the voltage at the (P82) Passenger Heated Seat Low Indicator Driver circuit at the Cluster C-3 connector.

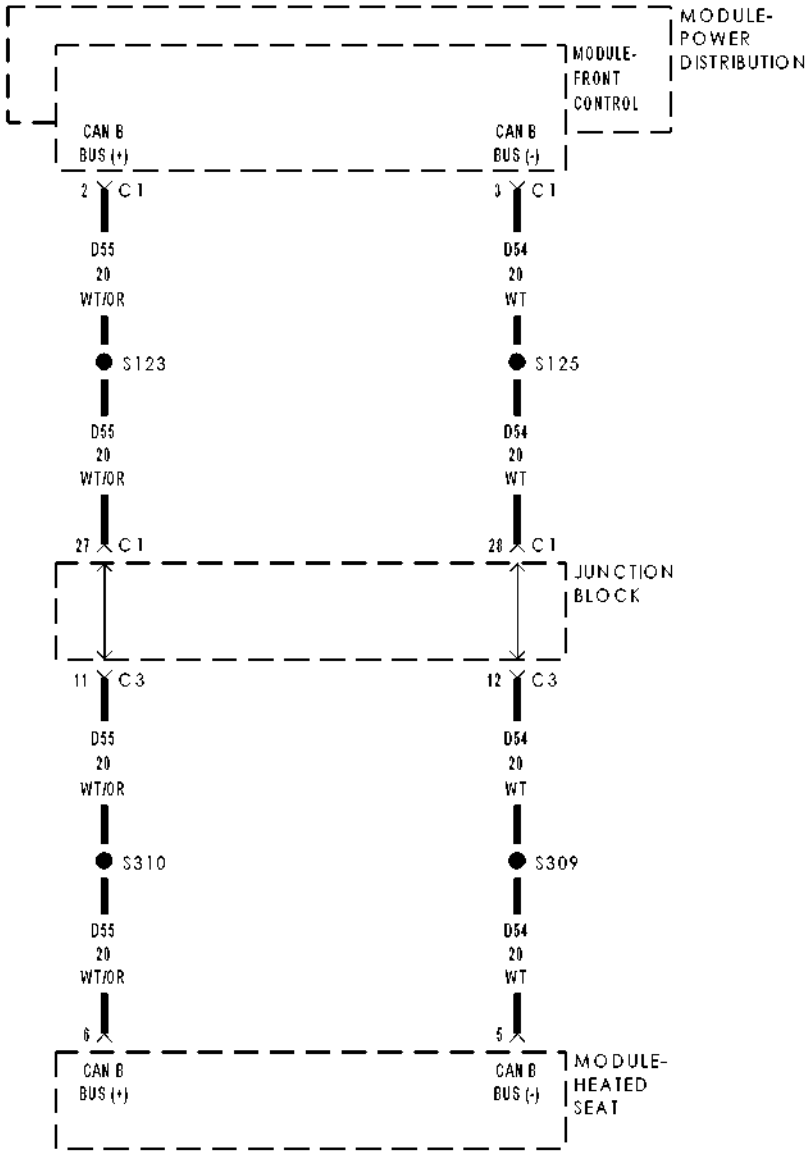
Is there any voltage present?

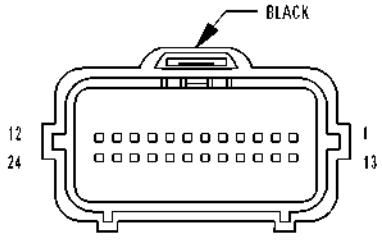
Yes >> Repair the (P82) Passenger Heated Seat Low Indicator Driver circuit for a short to battery.
Perform BODY VERIFICATION TEST – VER 1.

No >> Replace the Cluster in accordance with the Service Information.
Perform BODY VERIFICATION TEST – VER 1.

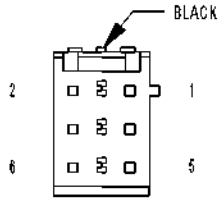


U0019–CAN B BUS – HSM





MODULE-FRONT
CONTROL C1



MODULE-HEATED
SEAT

81297271

U0019–CAN B BUS – HSM — (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

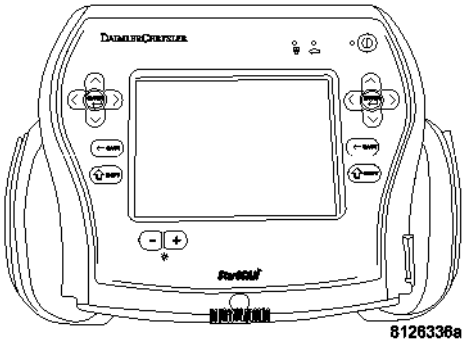
- **When Monitored:**
  Continuously
- **Set Condition:**
  Whenever the Can B Bus (+) or B Bus (–) circuit is open, shorted to voltage or shorted to ground, this code will set.

Possible Causes
CAN B BUS DTC's IN FRONT CONTROL MODULE
(D54) CAN B BUS (–) CIRCUIT OPEN
(D55) CAN B BUS (+) CIRCUIT OPEN
HEATED SEAT MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase DTC's
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read DTC's.



Does the scan tool display U0019 CAN B BUS CIRCUIT?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

---

2. CHECK FRONT CONTROL MODULE DTC's

With the scan tool, read Front Control Module DTC's

Does the scan tool display any CAN B BUS DTC's – ACTIVE?

Yes >> Refer to the symptom list for problems related to Communication in the ELECTRICAL.– ELECTRONIC CONTROL MODULES – ELECTRICAL DIAGNOSES section.

No >> Go to 3

U0019–CAN B BUS – HSM — (CONTINUED)

3. CAN B BUS (+) CIRCUIT OPEN

Turn the ignition off.

Disconnect the Heated Seat Module connector.

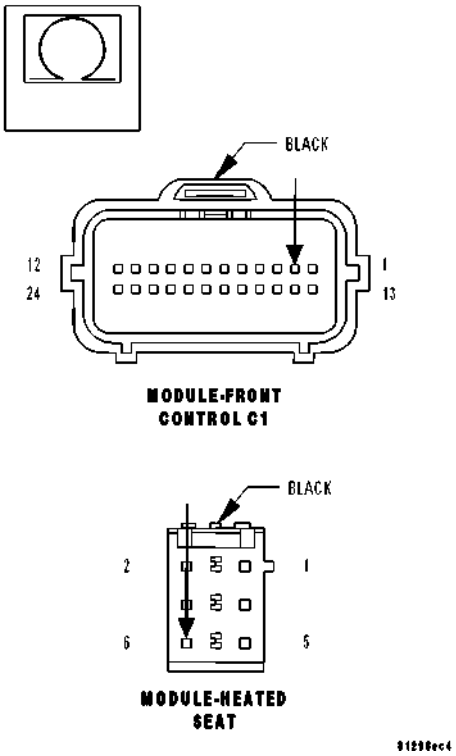
Disconnect the Front Control Module C1 connector.

Measure the resistance of the (D55) Can B Bus (+) circuit between the Front Control Module C1 connector and the Heated Seat Module connector.

Is the resistance below 2.0 ohms?

Yes >> Go To 4

No >> Repair the Can B Bus (+) circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.



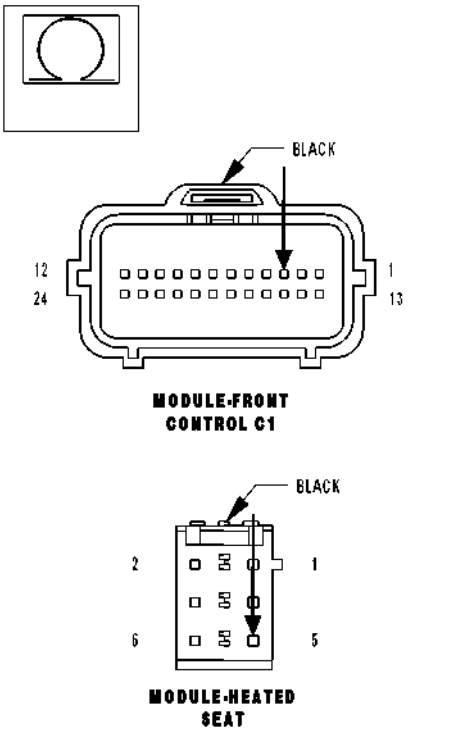
4. CAN B BUS (–) CIRCUIT OPEN

Measure the resistance of the (D54) Can B Bus (–) circuit between the Front Control Module C1 connector and the Heated Seat Module connector.

Is the resistance below 2.0 ohms?

Yes >> Replace the Heated Seat Module.
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the Can B Bus (–) circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.



BODY VERIFICATION TEST – VER 1

Diagnostic Test

1. Perform Body Verification Test

Disconnect all jumper wires and reconnect all previously disconnected components and connectors.

Ensure that all accessories are turned off.

Ensure that the battery is fully charged.

Turn the ignition on.

With the scan tool, record and erase DTCs from all modules.

If repairs were made to any of the HVAC door actuator circuits, with the scan tool in HVAC, select System Tests and then select Actuator DTC Detection. The test must pass before proceeding to the next step.

If repairs were made to any of the HVAC doors, linkage, door actuators, or door actuator circuits, with the scan tool in HVAC, select System Tests and then select Actuator Calibration Test. The test must pass before proceeding to the next step.

Turn the ignition off, wait 10 seconds, and then turn the ignition on.

Operate all functions of the system that caused the original concern.

With the scan tool, select ECU View.

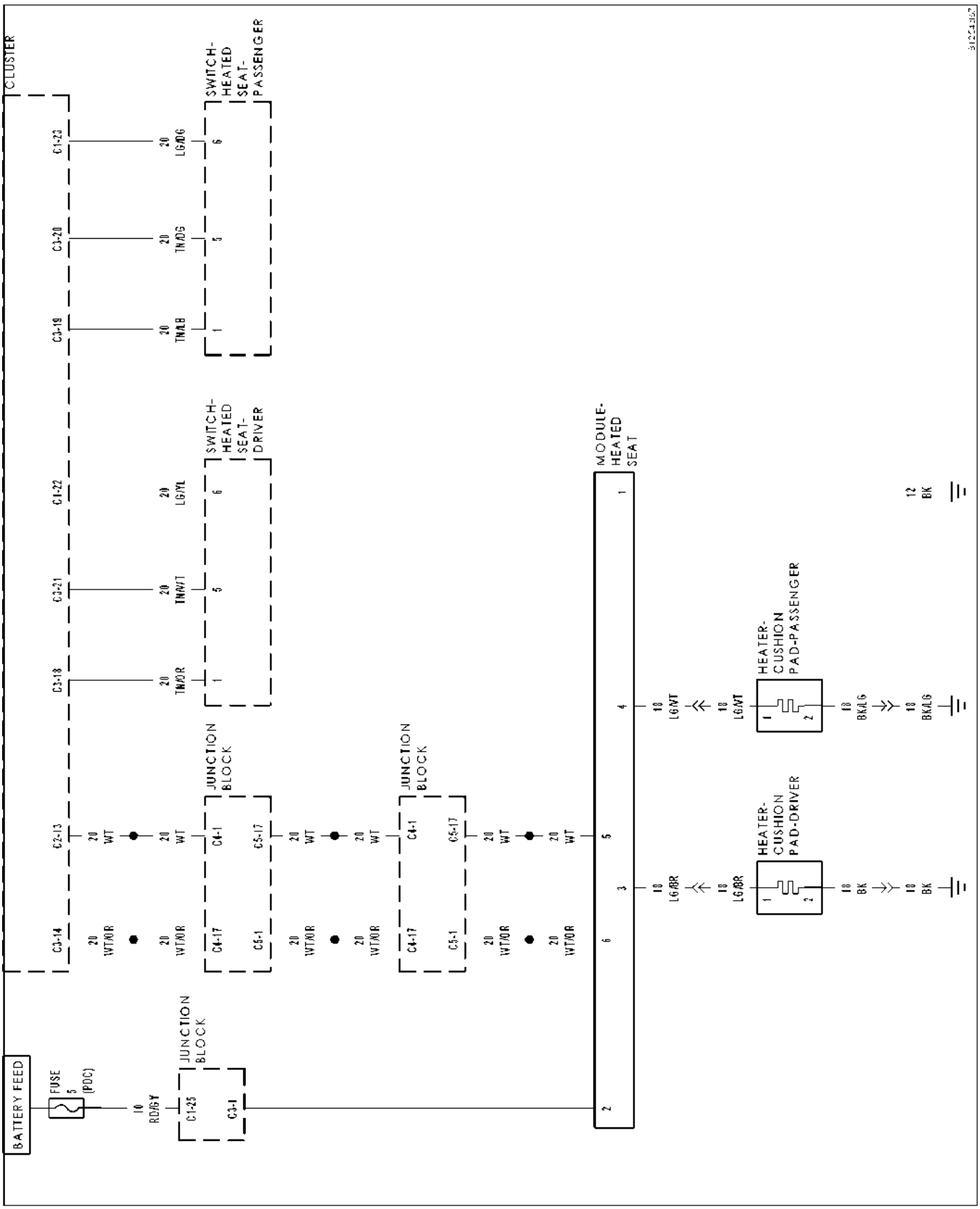
Check for DTCs in the modules.

Are DTCs present in any of the modules or is the original condition still present?

Yes >> The repair is not complete. Refer to the related category for the DTC or symptom that is still present.

No >> The repair is complete.

SCHEMATICS AND DIAGRAMS



HEATED SEAT SYSTEM SCHEMATIC

HEATED SEATS - SERVICE INFORMATION

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HEATED SEATS - SERVICE INFORMATION

DESCRIPTION

HEATED SEAT SYSTEM

Vehicles with the heated seat option can be visually identified by the two heated seat switches located in the center stack of the instrument panel. The heated seat system allows the driver and front seat passenger to select from two different levels of electrical seat heating (HI/LO). The heated seat system for this vehicle includes the following major components, which are described in further detail later in this section:

- **Heated Seat Elements** - Four heated seat elements are used per vehicle. Two heated seat elements are integral to each seat, one in the seat back and the other in the seat cushion.
- **Heated Seat Module** - One heated seat module is used per vehicle. The Heated Seat Module is mounted behind the right rear D-pillar trim panel. This module contains the control logic and software for the front heated seat system. The module also communicates on the CAN data bus network.
- **Heated Seat Switches** - Two heated seat switches are used per vehicle, one for each heated seat. Both switches are mounted in the instrument panel center stack.
- **Instrument Cluster (CCN)** - A Cab Compartment Node (CCN) is part of the instrument cluster on this vehicle. The CCN utilizes integrated software and information carried on the CAN data bus network. The Cab Compartment Node (CCN) serves as the link between the heated seat switches and the heated seat module.

OPERATION

HEATED SEAT SYSTEM

The heated seat system operates on battery current received through a fuse in the Integrated Power Module (IPM). Fused ignition switch output (run-acc) circuits are used, so that the heated seat system will only operate when the ignition switch is in the On or Accessory positions. The heated seat system will turn Off automatically whenever the ignition switch is turned to any position except On or Accessory.

A Heated Seat Module is used to control the heated seat system. The module responds to heated seat switch messages and ignition switch status inputs by controlling the 12v output to the front seat heating elements through integral solid-state relays.

When either of the heated seat switches are depressed a resistance signal is sent to the Cab Compartment Node (CCN) or instrument cluster. The Cab Compartment Node (CCN) then sends a CAN bus message to the heated seat module, signaling the module to energize the heating element for the selected seat. The Cab Compartment Node (CCN) also turns on the HI and LO LED indicators on each of the heated seat switches.

The heated seat module energizes an integral solid-state relay, which supplies battery current to the heating elements. When the pre-programmed duty-cycle has been achieved (approx. 2 hours), the module de-energizes the solid-state relay. The module will continue to cycle the solid-state relay as needed to maintain the temperature set point. No heated seat sensors are used with the heated seat system option.

The module will automatically turn off the heating elements if it detects an OPEN or LOW short in the heating element circuit. See the owner's manual in the vehicle glove box for more information on the features, use and operation of the heated seat system.

DIAGNOSIS AND TESTING

HEATED SEAT SYSTEM

In order to obtain conclusive testing of the heated seat system, the Controller Area Network (CAN) data bus system must be checked.

The most reliable, efficient, and accurate means to diagnose the heated seat system requires the use of a Scan Tool and the Service and Body Diagnostic Information. The Scan Tool can provide vital information to the technician trying to find a problem with the heated seat system. Diagnostic logic is built into the heated seat module and the instrument cluster (CCN) to help the person trying to locate the problem by the most efficient means possible. Anytime a problem is suspected, a Scan Tool should be obtained and used to retrieve any stored fault codes in the heated seat module and/or instrument cluster.

If diagnostic fault codes are present in the module, record them on a piece of paper immediately before proceeding any further. Then, use these fault codes to identify the problem by verifying the fault code. Example, If the module records "DRIVER SEAT HEAT OUTPUT OPEN" fault code, locate the diagnostic procedure for this code in the appropriate Body Diagnostic information and follow the steps until the specific problem is located and resolved. Once the problem is thought to be corrected, erase the stored fault code using the Scan Tool and verify correct system operation. If the heated seat system is functioning correctly, verify that there are no other stored codes in the module and return the vehicle to service.

If the fault code could not be verified, such as not finding anything wrong when following the diagnostic steps in the Body Diagnostic information. This is a good indication that a INTERMITTENT problem may be present. You must than attempt to find the intermittent problem, such as moving the heating element within the seat while testing continuity or wiggling the wire harness/electrical connectors under the seat while testing continuity. Always, eliminate all other potential problems before attempting to replace module.

PRELIMINARY TEST

Before testing the individual components in the heated seat system, check the following:

- Using Scan Tool, check the heated seat module for any stored fault codes. Record these codes on paper for reference and resolve using the appropriate Body Diagnostic information.
- Check the vehicles battery open-circuit voltage and charging system performance. If the vehicles electrical system is defective or weak it may not be suppling sufficient energy to operate the heated seat system.
- If the heated seat switch backlighting does not light with the ignition switch in the On position, check the fused ignition switch fuse in the integrated power module. If OK, (Refer to 8 - ELECTRICAL/HEATED SEATS/SEAT SWITCH - DIAGNOSIS AND TESTING). If not OK, repair the shorted circuit or component as required and replace the faulty fuse or repair the open ground circuit as required.
- If the heated seat switch HI/LO LED indicators do not light with the ignition switch in the On position and the heated seat switch in the Low or High position, check the fused ignition switch fuse in the integrated power module. If OK, (Refer to 8 - ELECTRICAL/HEATED SEATS/SEAT SWITCH - DIAGNOSIS AND TESTING). If not OK, repair the shorted circuit or component as required and replace the faulty fuse.

HEATER-CUSHION PAD

DESCRIPTION

Vehicles equipped with the optional heated seat system have two heated seat element located in each front seat. One heating element is used for each seat cushion and another for each seat back.

Each of the heated seat element consists of a single length of resistor wire that is routed in a zigzag pattern and captured between the leather trim cover and the seat cushion assembly. Short pigtail wires with connectors are soldered to each end of each resistor wire element grid, which connect all of the element grids to each other in series with the heated seat module through the wire harness.

The heated seat elements cannot be repaired. If found to be damaged or faulty, a new heating element assembly must be installed.

OPERATION

One end of the heated seat element resistor wire is connected to ground at all times through a splice under the seat. Battery current is directed to the other end of the heated seat element resistor wire by the energized N-channel Field Effect Transistor located within the heated seat module. The heated seat module will energize the N-FET when the heated seat switch is depressed in the Low or High position.

As electrical current passes through the heating element grid, the resistance of the wire used in the element disperses some of that electrical current in the form of heat. The heat produced by the heated seat element grid then radiates through the underside of the seat cushion and seat back trim covers, warming the seat cover and its occupant.

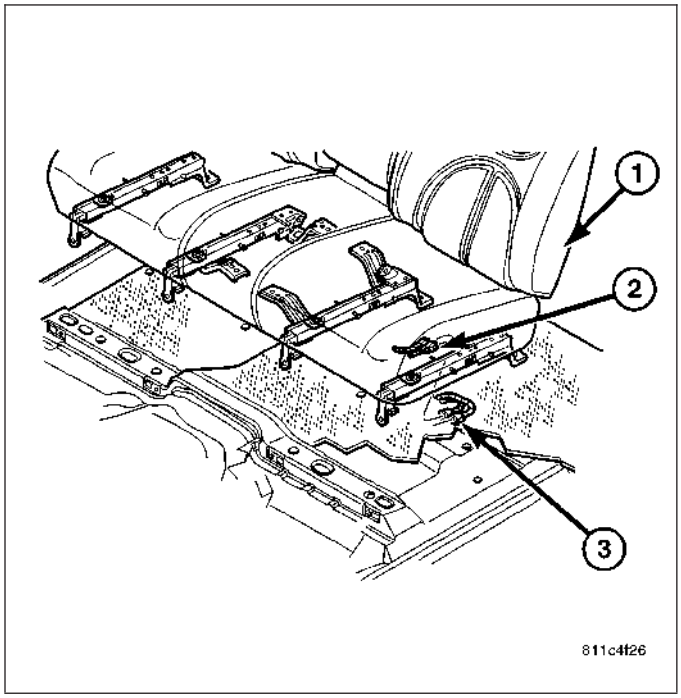
DIAGNOSIS AND TESTING

HEATED SEAT ELEMENT

The wire harness connectors (2&3) for the heating elements are located under the seat (1).

Note: When checking heated seat elements for continuity, be certain to move the heating element being checked. Moving the element, such as sitting in the seat will eliminate the possibility of an intermittent open in the element which would only be evident if the element was in a certain position. Failure to check the element in various positions could result in an incomplete test.

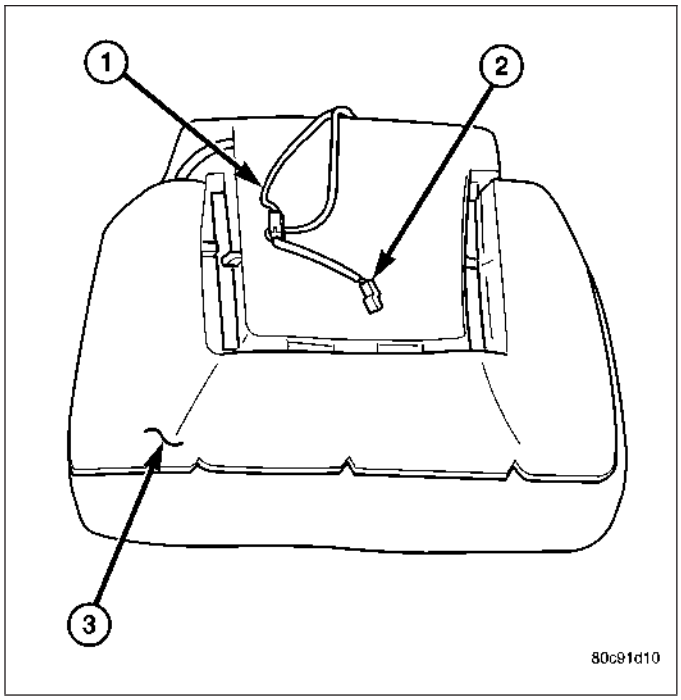
1. Locate and disconnect the seat electrical connector.
2. Check for continuity between the circuit leading in and out of the appropriate heated seat element. There should be continuity (less than 6 ohms). If OK, (Refer to 8 - ELECTRICAL/HEATED SEATS/ HEATED SEAT MODULE - DIAGNOSIS AND TESTING). If not OK, replace the heated seat element.



REMOVAL

Do not remove the OEM heating elements (3) from the seat or seat back cushions. The original element is permanently attached and cannot be removed without permanent damage. The replacement heating element is designed to be applied directly on the seat cushion.

1. Disconnect and isolate the negative battery cable.
2. Remove the appropriate seat cushion or seat back trim cover.(Refer to 23 - BODY/SEATS/SEAT BACK CUSHION / COVER - REMOVAL).
3. Disconnect the inoperative heated seat cushion or seat back element electrical connectors (2).
4. Locate the wires leading from the inoperative heating element and cut them off flush with the edge of the original heating element.

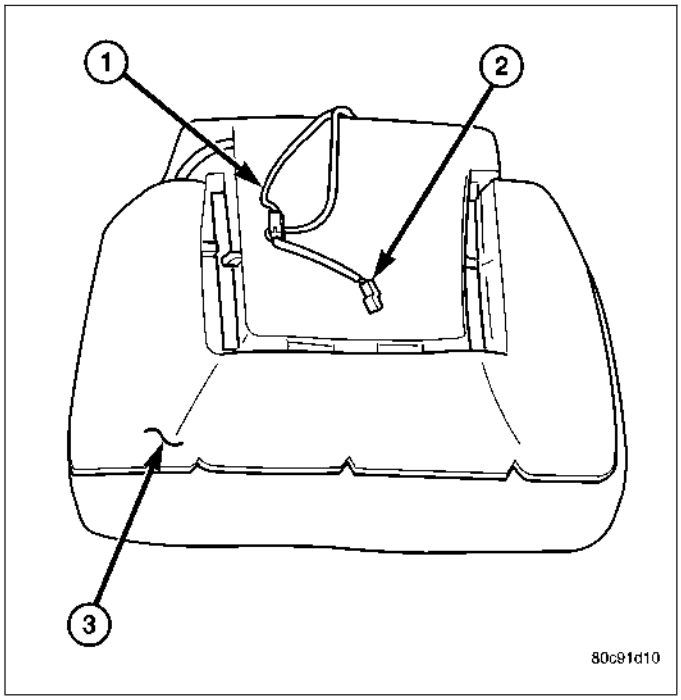


INSTALLATION

1. Peel off the adhesive backing on the back of the replacement heating element and stick directly on the foam cushion or directly on top of the original heating element.

CAUTION: During the installation of the replacement heating element, be careful not to fold or crease the element assembly. Folds or creases will cause premature failure.

2. Connect the new heating element electrical connectors (1&2).
3. Connect the battery negative cable.
4. Verify heated seat system operation.
5. Install the appropriate seat cushion or seat back trim cover. Make certain the seat wire harness is correctly routed through the seat and seat back. The excess wire between the cushion and back elements should be securely tucked between the rear of the cushion foam and the rear carpet flap of the trim cover.

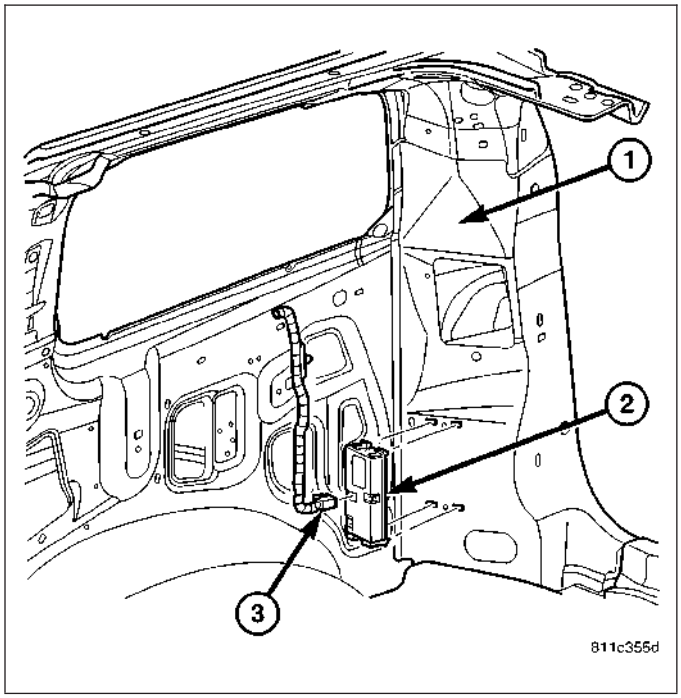


MODULE-HEATED SEAT

DESCRIPTION

The heated seat module (2) is located behind the right rear D-pillar trim (1). The heated seat module has a single electrical connector (3).

The heated seat module is an microprocessor designed to use CAN bus messages from the cluster Cabin compartment Node (CCN) to operate the heated seat elements in both front seats.



OPERATION

The heated seat module operates on fused battery current received from the ignition switch. The module is grounded at all times through a ground lug on the right rear D-pillar. Inputs to the module include CAN bus messages and standard hardwired 12volt power and ground. In response to those inputs the heated seat module controls the battery current to the heated seat elements.

When a heated seat switch CAN bus signal is received by the heated seat module, the module energizes the selected heated seat element. The Low heat set point is about 38C (100.4°F), and the High heat set point is about 42C (107.6°F).

If the heated seat module detects a heated seat element OPEN or SHORT circuit, it will record and store an diagnostic trouble code (DTC).

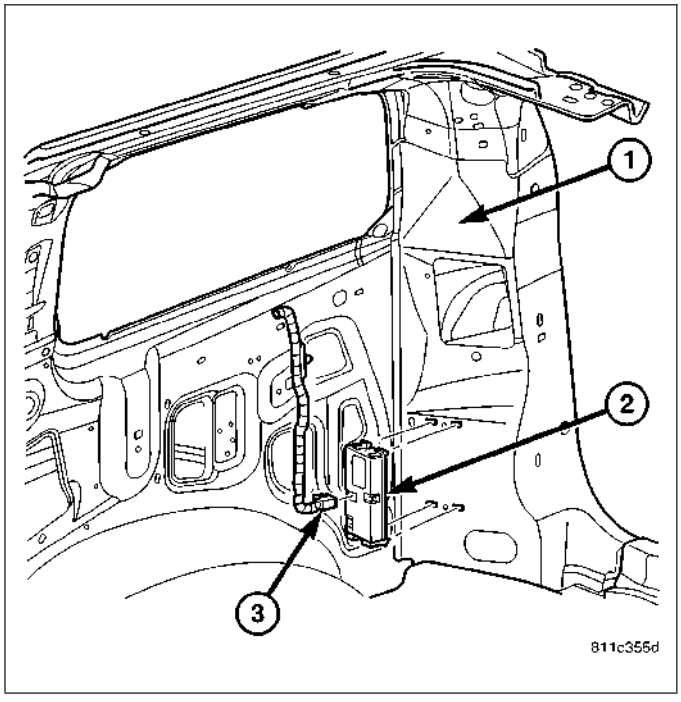
DIAGNOSIS AND TESTING

HEATED SEAT MODULE

1. Test the appropriate heated seat element (Refer to 8 - ELECTRICAL/HEATED SEATS/HEATED SEAT ELEMENT - DIAGNOSIS AND TESTING).
2. Test the appropriate heated seat switch.
3. Using a voltmeter, backprobe the heated seat module connector, do not disconnect. Check for voltage at the appropriate pin cavities. 12v should be present. If OK go to Step 4, if Not, repair the open or shorted voltage supply circuit as required.
4. Using a ohmmeter, backprobe the appropriate heated seat module connector, do not disconnect. Check for proper continuity to ground on the ground pin cavities. Continuity should be present. If OK test the Cabin compartment Node (CCN) cluster using a scan tool for proper heated seat system function. If Not OK, Repair the open or shorted ground circuit as required.

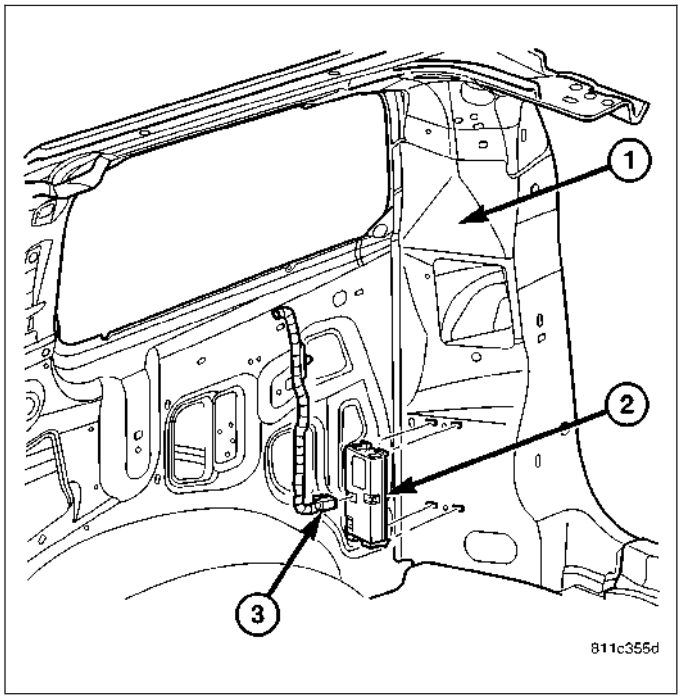
REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Open the liftgate and remove the upper D-pillar trim (1) from the vehicle. (Refer to 23 - BODY/INTERIOR/D-PILLAR TRIM - REMOVAL).
3. Remove the lower D-pillar trim (2) from the vehicle. (Refer to 23 - BODY/INTERIOR/D-PILLAR TRIM - REMOVAL).
4. Disconnect the wire harness connector from the back of the heated seat module (2).
5. Unsnap the heated seat module (2) from the D-pillar (1).
6. Remove the heated seat module (2) from the vehicle.



INSTALLATION

1. Install the heated seat module on the D-pillar (1).
2. Connect the wire harness connector (3) to the heated seat module (2).
3. Reconnect the negative battery cable.
4. Check for proper heated seat system operation.
5. Install the upper and lower D-pillar trim to the vehicle. (Refer to 23 - BODY/INTERIOR/D-PILLAR TRIM - INSTALLATION).
6. Connect the battery negative cable.

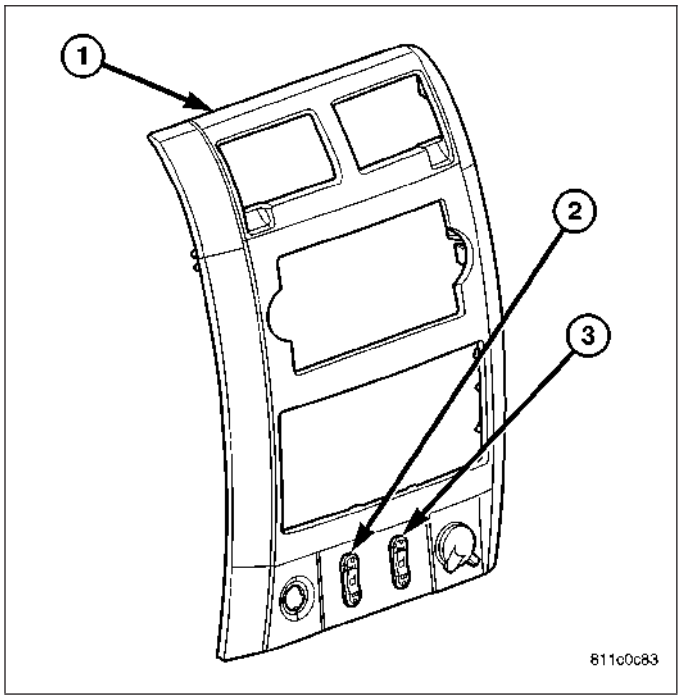


SWITCH-HEATED SEAT

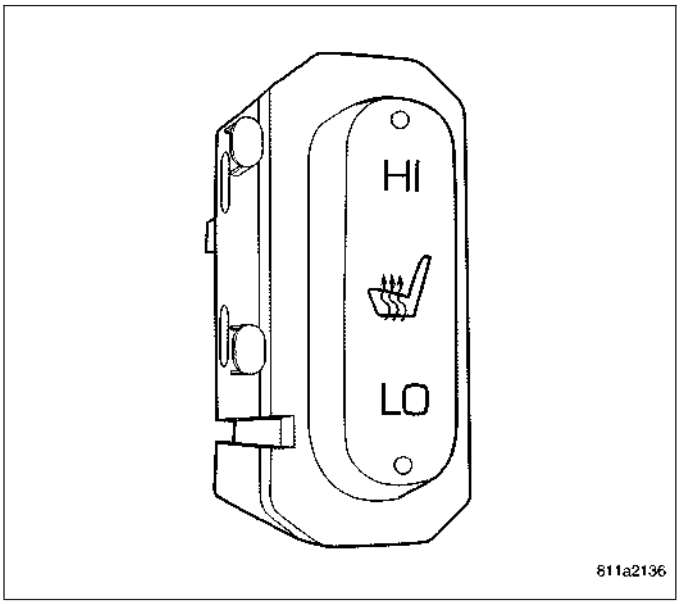
DESCRIPTION

HEATED SEAT SWITCH

The heated seat switches are both mounted in the instrument panel. The two switches are snapped into mounting holes in the instrument panel center bezel (1). The two heated seat switches (2) and (3) are identical in appearance and construction, except for the location of a keyway in the connector receptacle on the back of each switch. The instrument panel wire harness connectors for the heated seat switches are keyed to match the connector receptacles so that the two heated seat switches can only be connected to the proper heated seat.



Each momentary, bidirectional rocker-type heated seat switch provides a resistor-multiplexed signal to the Cab Compartment Node (CCN). Each switch has a center neutral position and momentary Low and High positions so that the driver and the front seat passenger can select a preferred seat heating level. Each heated seat switch has two Light-Emitting Diode (LED) indicator lamps, which indicate the selected level (Low or High) of the seat heater. Each switch also has one indicator lamp for back lighting of the switch when the ignition switch is in the Run position.



The five LED indicator lamps in each heated seat switch cannot be repaired. If the LED lamps are faulty or damaged, or the switch is faulty or damaged the individual heated seat switch assembly must be replaced.

OPERATION

HEATED SEAT SWITCH

The heated seat switches receive battery current through a fused ignition switch output (run) circuit when the ignition switch is in the On position. Depressing the heated seat switch rocker to its momentary High or Low position provides a hard-wired resistor multiplexed signal to the Cabin Compartment Node (CCN). The CCN is responsible for supplying the CAN bus message to the heated seat module, signaling the module to power the heated seat element of the selected seat and maintain the temperature setting.

If the heated seat switch is depressed to a different position (Low or High) than the currently selected state, the CCN will go through the process again to change the temperature setting. If a heated seat switch is depressed a second time to the same position as the currently selected state, the CCN and heated seat module interprets the second input as a request to turn the seat heater OFF. The CCN will then signal the heated seat module to turn the heated seat elements for that seat off.

The backlighting LED's in each of the heated seat switches receive battery current through a fused ignition switch output (run) circuit when the ignition switch is in the On position. The ground side of the indicator lamp is divided by a separate lamp driver circuit in the CCN.

DIAGNOSIS AND TESTING

HEATED SEAT SWITCH

Refer to the **Wiring** section for complete heated seat system wiring diagrams.

WARNING: DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

1. If the problem being diagnosed involves inoperative heated seat switch back lighting and the heated seat elements do heat, disconnect the inoperative switch and check for continuity between the ground pin at the heated seat switch connector and ground. If there is no continuity, repair an open wire between ground and the heated seat switch connector. If there is continuity, replace the inoperative heated seat switch. If the problem being diag-

nosed involves a heated seat switch indicator lamp that remains illuminated after the heated seat has been turned Off, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). Also refer to the Body Diagnostic Information for additional diagnosis and testing procedures.

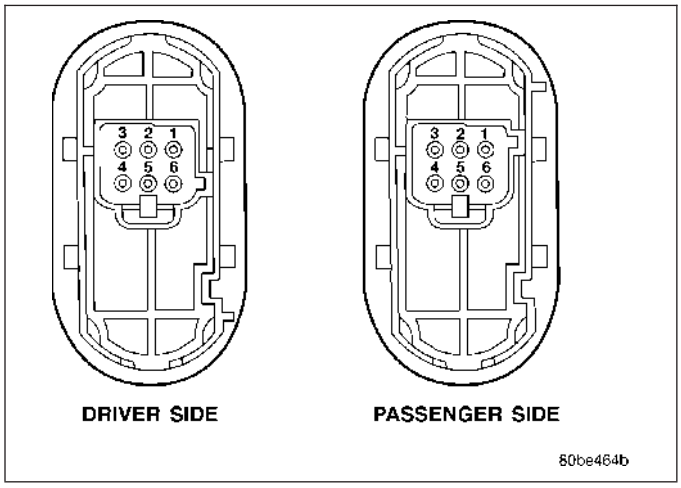
2. Check the fused ignition switch output (run) fuse in the Power Distribution Center (PDC). If OK, go to Step 3. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.
3. Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output (run) fuse in the PDC. If OK, go to Step 4. If not OK, repair the open fused ignition switch output (run) circuit to the ignition switch as required.
4. Disconnect and isolate the battery negative cable. Disconnect the wire harness connector from the connector receptacle on the back of the heated seat switch to be tested. Reconnect the battery negative cable. Turn the ignition switch to the Run position. Check for battery voltage at the fused ignition switch output (run) circuit cavity of the heated seat switch. If OK, go to Step 5. If not OK, repair the open fused ignition switch output (run) circuit to the PDC fuse as required.
5. Check the continuity and resistance values of the heated seat switch in the Neutral, Low and High positions as shown in the Heated Seat Switch Continuity chart below. If OK, (Refer to 8 - ELECTRICAL/HEATED SEATS/ HEATED SEAT MODULE - DIAGNOSIS AND TESTING). Also refer to the Body Diagnostic Information for additional diagnosis and testing procedures. If not OK, replace the faulty heated seat switch.

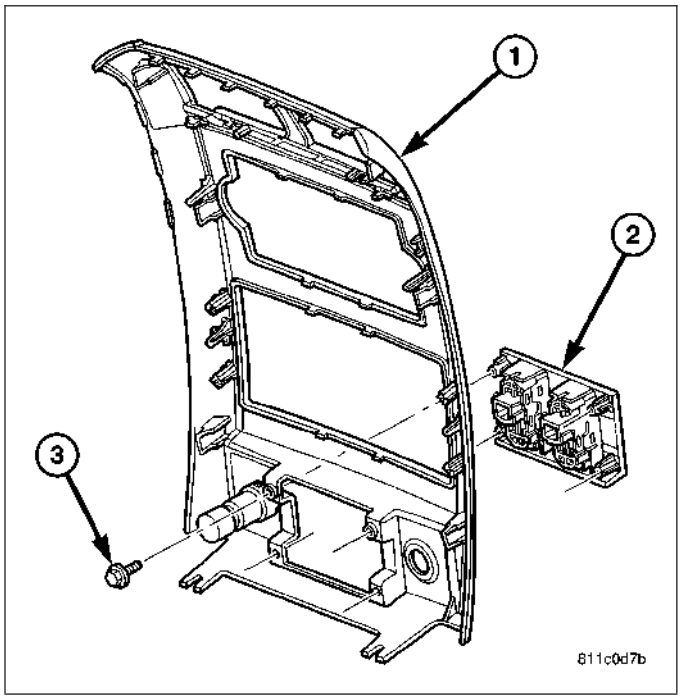
HEATED SEAT SWITCH CONTINUITY CHART

Switch Position	Continuity Between	Resistance
Neutral	4 & 6	2.2 Kilohms
Low	4 & 6	415 Ohms
High	4 & 6	33 Ohms

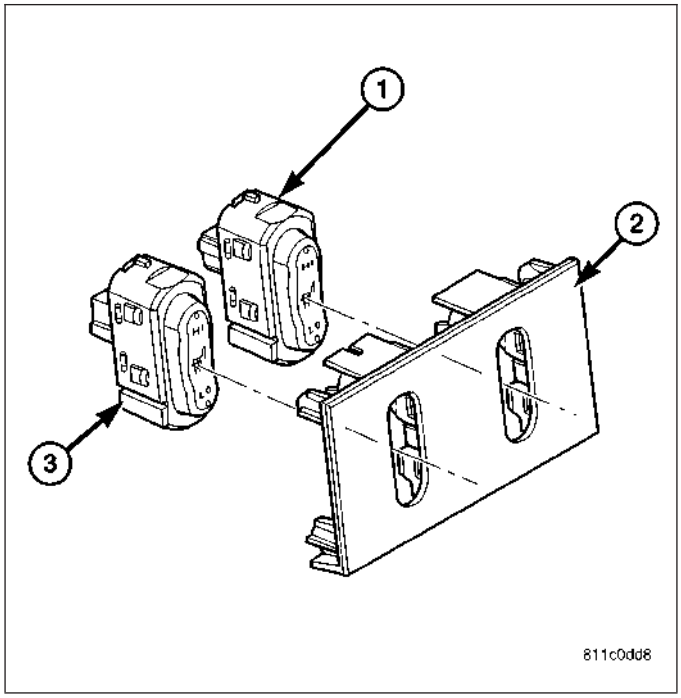
REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Remove the center bezel (1) from the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/ INSTRUMENT PANEL CENTER BEZEL - REMOVAL).
3. Remove the heated seat switch bezel and both switches from the center bezel as a unit.





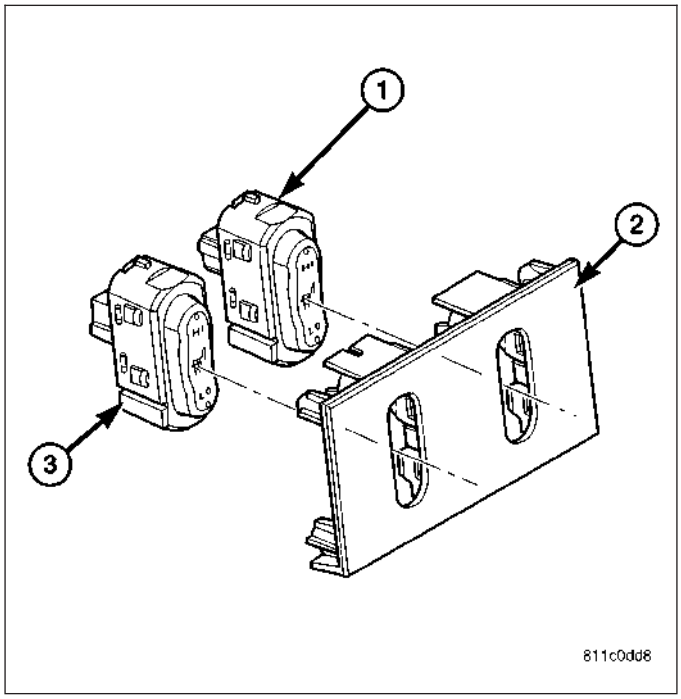
4. From the back of the heated seat switch bezel (2), gently pry the switch free and push the heated seat switch out through the rear of the bezel.



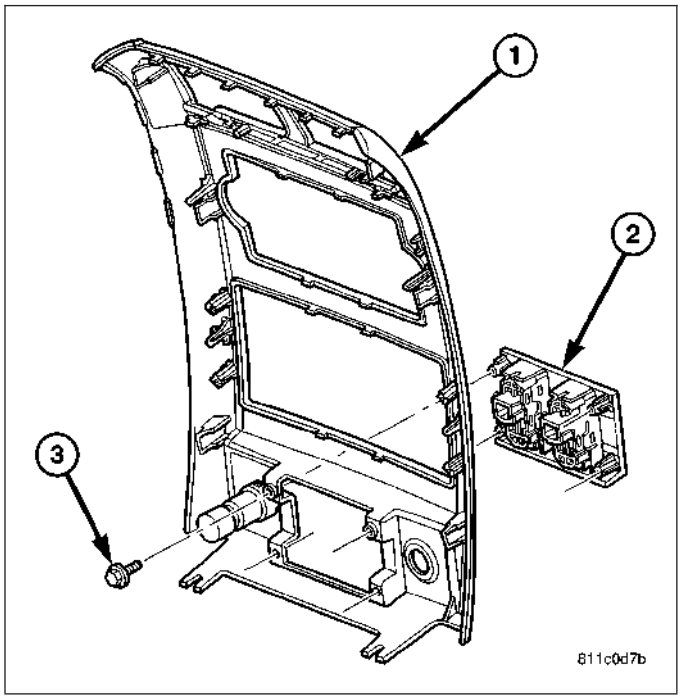
INSTALLATION

Note: When installing the heated seat switches, be certain they are installed in the proper mounting holes of the heated seat switch bezel (2). The heated seat switches are identified by a keyway in the connector receptacle on the back of each switch.

1. From the back of the heated seat switch bezel, gently push the heated seat switch in through the rear of the bezel.



2. Install the center bezel on the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - INSTALLATION).
3. Connect the battery negative cable.
4. Verify heated seat system operation.



HORN

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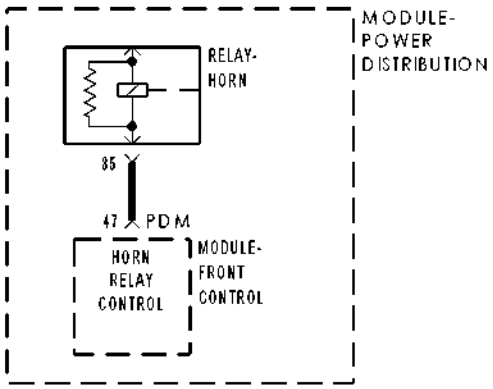
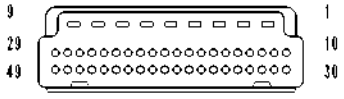
HORN SYSTEM - ELECTRICAL DIAGNOSTICS

DIAGNOSIS AND TESTING

B2336,B2338–HORN CONTROL CIRCUIT LOW/OPEN – FCM





MODULE-
FRONT
CONTROL
PDM

812c64e0

B2336,B2338–HORN CONTROL CIRCUIT LOW/OPEN – FCM — (CONTINUED)

For the Horn System circuit diagram (Refer to 8 - ELECTRICAL/HORN SYSTEM - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Front Control Module does not detect voltage on the Horn Relay Control circuit.

Possible Causes
HORN FUSE
B(+) OPEN
RELAY
POWER DISTRIBUTION CENTER
FRONT CONTROL MODULE

Diagnostic Test

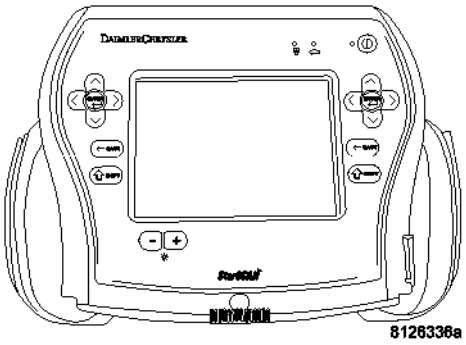
1. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase DTC's
Operate the Horn Switch several times.
Cycle the ignition from on to off 3 times and leave on.
With the scan tool, read DTC's.

Does the scan tool display the same DTC?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST - VER 1.



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2. HORN FUSE

Using a 12-volt test light connected to ground, check the Horn fuse.

Does the test light illuminate and was the fuse OK?

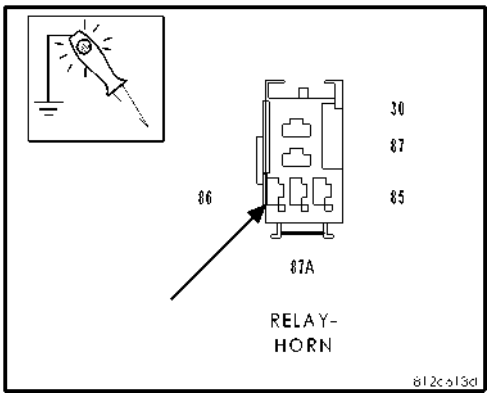
No >> Replace the horn fuse if open and check for a short to ground on the Horn Relay Output circuit or correct the open B(+) circuit to the fuse.
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Go To 3

B2336,B2338–HORN CONTROL CIRCUIT LOW/OPEN – FCM — (CONTINUED)

3. OPEN FUSED B(+) TO RELAY

Remove the Horn Relay from the PDC.
Using a 12-volt test light connected to ground, check the Fused B(+) circuit at the relay connector.



Does the test light illuminate?

No >> Replace the Power Distribution Center.
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Go To 4

---

4. HORN RELAY

Install a known good relay in place of the Horn Relay.
With the scan tool erase DTC's
Operate the Horn Switch several times.
Cycle the ignition from on to off 3 times and leave on.
With the scan tool, read DTC's.

Does the scan tool display the same DTC?

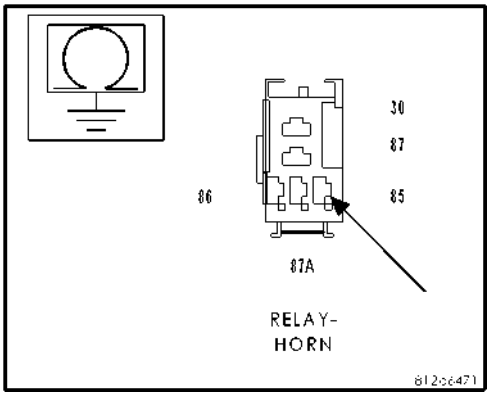
No >> Replace the original Horn Relay.
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Go To 5

---

5. (X4) HORN RELAY CONTROL SHORTED

Remove the Horn Relay.
Disconnect the Front Control Module from the PDC 49 – way connector.
Measure the resistance between ground and the (X4) Horn Relay Control circuit at the relay.



Is the resistance below 1000.0 ohms?

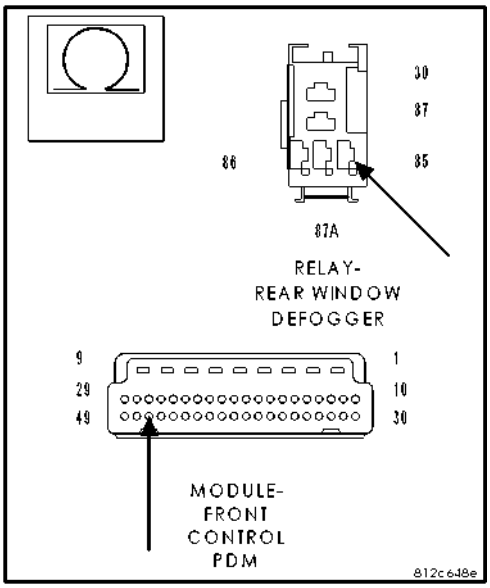
Yes >> Replace the Power Distribution Center.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 6

B2336,B2338–HORN CONTROL CIRCUIT LOW/OPEN – FCM — (CONTINUED)

6. (X4)HORN RELAY CONTROL OPEN

Measure the resistance of the (X4)Horn Relay Control circuit from the relay connector to FCM connector.

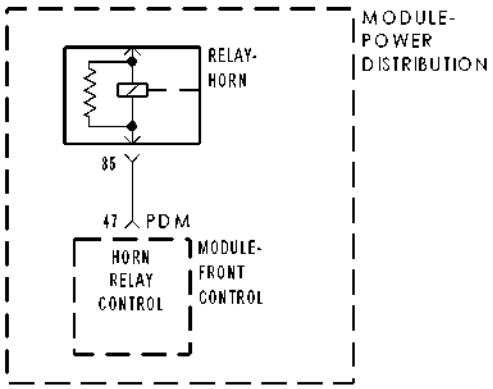


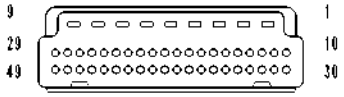
Is the resistance below 3.0 ohms?

Yes >> Replace the Front Control Module.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Power Distribution Center.
Perform BODY VERIFICATION TEST - VER 1.

B2337–HORN CONTROL CIRCUIT HIGH – FCM





MODULE-
FRONT
CONTROL
PDM

B2337–HORN CONTROL CIRCUIT HIGH – FCM — (CONTINUED)

For the Horn System circuit diagram (Refer to 8 - ELECTRICAL/HORN SYSTEM - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Front Control Module detects a short to battery on the Horn Relay Control circuit.

Possible Causes
HORN RELAY
POWER DISTRIBUTION CENTER
FRONT CONTROL MODULE

Diagnostic Test

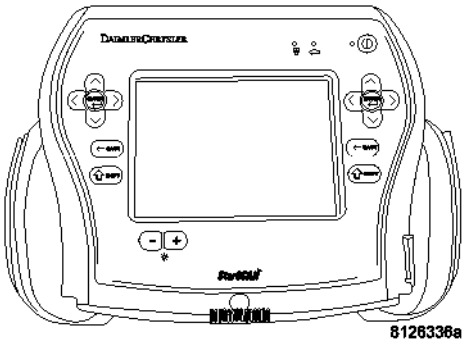
1. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase DTC's
Operate the Horn Switch several times.
Cycle the ignition from on to off 3 times and leave on.
With the scan tool, read DTC's.

Does the scan tool display B2337 – HORN CONTROL CIRCUIT HIGH?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST - VER 1.



---

2. HORN RELAY

Turn the ignition off.
Install a known good relay in place of the Horn Relay.
With the scan tool erase DTC's
Operate the Horn Switch several times.
Cycle the ignition from on to off 3 times and leave on.
With the scan tool, read DTC's.

Does the scan tool display B2337 – HORN CONTROL CIRCUIT HIGH?

No >> Replace the original Horn Relay.
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Go To 3

B2337–HORN CONTROL CIRCUIT HIGH – FCM — (CONTINUED)

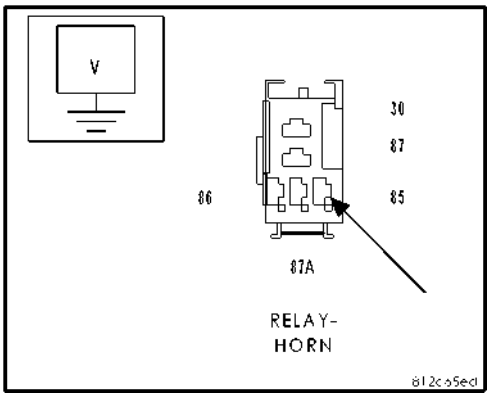
3. SHORTED POWER DISTRIBUTION CENTER

Remove the Horn Relay.

Disconnect the Front Control Module from the PDC 49 – way connector.

Turn the ignition on.

Measure the voltage between (X4) Horn Relay Control circuit and ground.

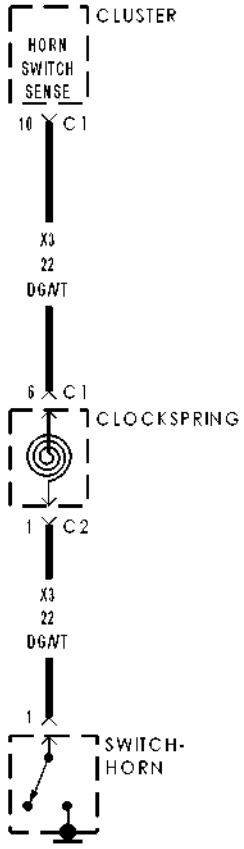


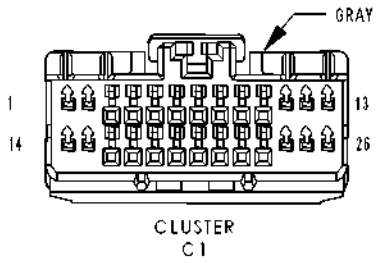
Is there any voltage present?

Yes >> Replace the Power Distribution Center.
Perform BODY VERIFICATION TEST - VER 1.

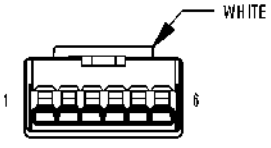
No >> Replace the Front Control Module.
Perform BODY VERIFICATION TEST - VER 1.

B2339–HORN SWITCH STUCK – CLUSTER

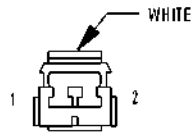




CLUSTER
C1



CLOCKSPRING C1



SWITCH-HORN

812c665c

B2339–HORN SWITCH STUCK – CLUSTER — (CONTINUED)

For the Horn System circuit diagram (Refer to 8 - ELECTRICAL/HORN SYSTEM - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

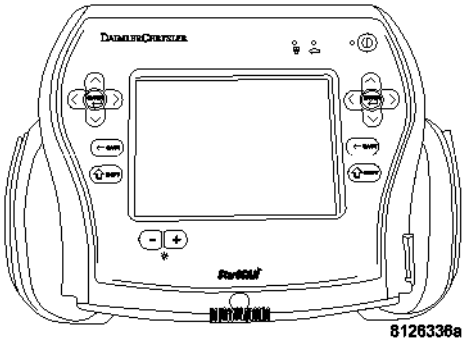
- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Cluster senses the Horn Switch input for over 30 seconds, this code will set.

Possible Causes
HORN SWITCH
CLOCKSPRING
(X3)HORN SWITCH SENSE CIRCUIT SHORTED TO GROUND
INSTRUMENT CLUSTER

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase DTC's
Operate the Horn Switch several times.
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read DTC's.



Does the scan tool display HORN SWITCH STUCK?

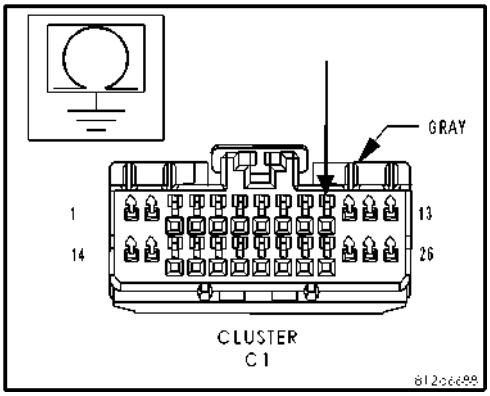
Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST - VER 1.

---

2. (X3)HORN SWITCH SENSE SHORTED

Turn the ignition off.
Disconnect the Cluster C1connector.
Measure the resistance between ground and the (X3) Horn Switch Sense circuit.



Is the resistance below 1000.0 ohms?

No >> Replace the Cluster.
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Go To 3

B2339–HORN SWITCH STUCK – CLUSTER — (CONTINUED)

3. HORN SWITCH SHORTED

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Horn switch connector.

Measure the resistance between ground and the (X3) Horn Switch Sense circuit.

Is the resistance below 1000.0 ohms?

Yes >> Go To 4
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Horn Switch.
Perform BODY VERIFICATION TEST - VER 1.

---

4. CLOCKSPRING SHORTED

Disconnect the Clockspring C1connector.

Measure the resistance between ground and the (X3) Horn Switch Sense circuit.

Is the resistance below 1000.0 ohms?

Yes >> Repair the Horn Switch Sense circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Clockspring.
Perform BODY VERIFICATION TEST - VER 1.

BODY VERIFICATION TEST – VER 1

Diagnostic Test

1. Perform Body Verification Test

Disconnect all jumper wires and reconnect all previously disconnected components and connectors.

Ensure that all accessories are turned off.

Ensure that the battery is fully charged.

Turn the ignition on.

With the scan tool, record and erase DTCs from all modules.

If repairs were made to any of the HVAC door actuator circuits, with the scan tool in HVAC, select System Tests and then select Actuator DTC Detection. The test must pass before proceeding to the next step.

If repairs were made to any of the HVAC doors, linkage, door actuators, or door actuator circuits, with the scan tool in HVAC, select System Tests and then select Actuator Calibration Test. The test must pass before proceeding to the next step.

Turn the ignition off, wait 10 seconds, and then turn the ignition on.

Operate all functions of the system that caused the original concern.

With the scan tool, select ECU View.

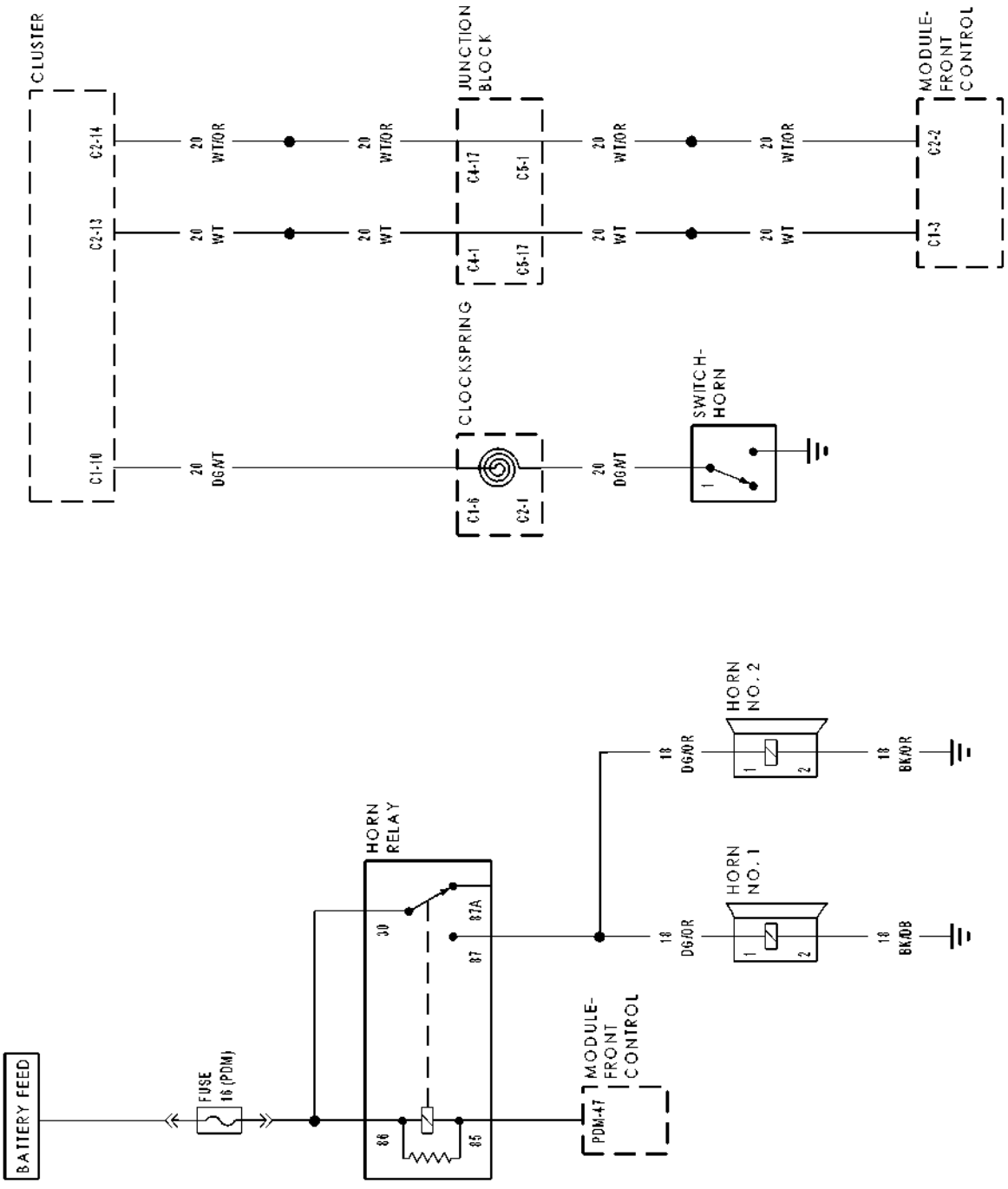
Check for DTCs in the modules.

Are DTCs present in any of the modules or is the original condition still present?

Yes >> The repair is not complete. Refer to the related category for the DTC or symptom that is still present.

No >> The repair is complete.

SCHEMATICS AND DIAGRAMS



HORN SYSTEM SCHEMATIC

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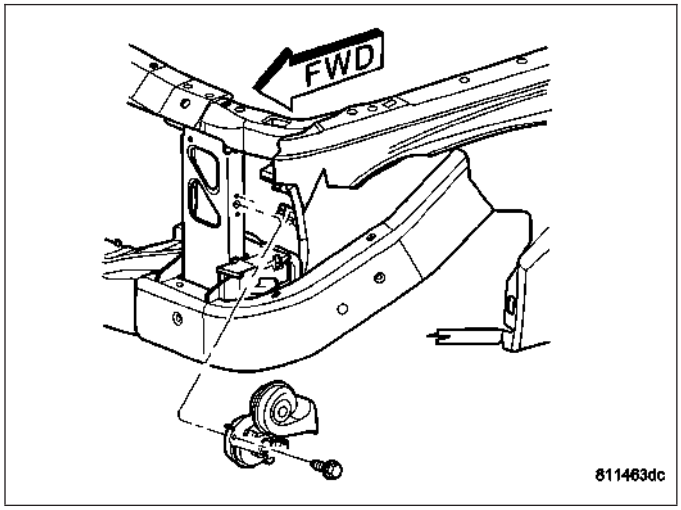
HORN SYSTEM - SERVICE INFORMATION

DESCRIPTION

The dual-note horn system features dual electromagnetic horn units. The horn system includes the following major components:

- **Horn** - The two horns are located on the left side of the engine compartment behind the grille.
- **Horn Switch** - The horn switch is molded into the driver airbag trim cover.



OPERATION

The horn system operates on battery current received through a fuse in the Integrated Power Module (IPM). The horn system circuit is designed so that the system will remain operational, regardless of the ignition switch position.

DIAGNOSIS AND TESTING - HORN SYSTEM

The most reliable, efficient, and accurate means to diagnose the horn system requires the use of a scan tool and the proper Diagnostic Procedures information.

Refer to the appropriate wiring information.

In most cases, any problem involving continually sounding horns can be quickly alleviated by removing the horn fuse from the Integrated Power Module (IPM).

WARNING: DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, SIDE AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

HORN

DIAGNOSIS AND TESTING

HORN

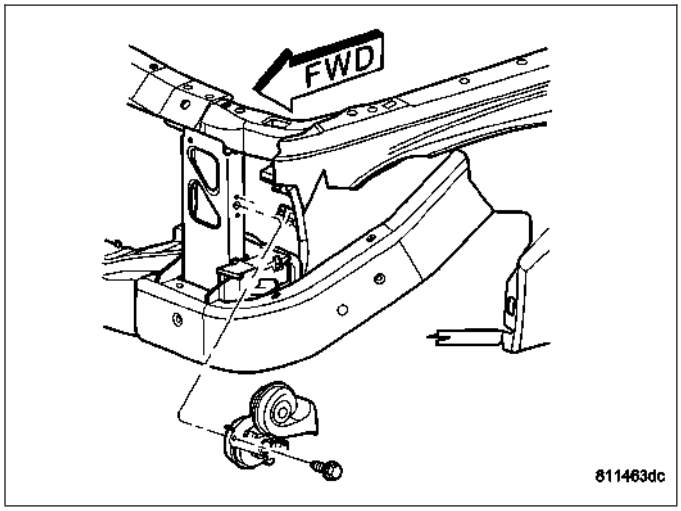
The most reliable, efficient, and accurate means to diagnose the horn system requires the use of a scan tool and the proper Diagnostic Procedures information.

Refer to the appropriate wiring information.

WARNING: DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, SIDE AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

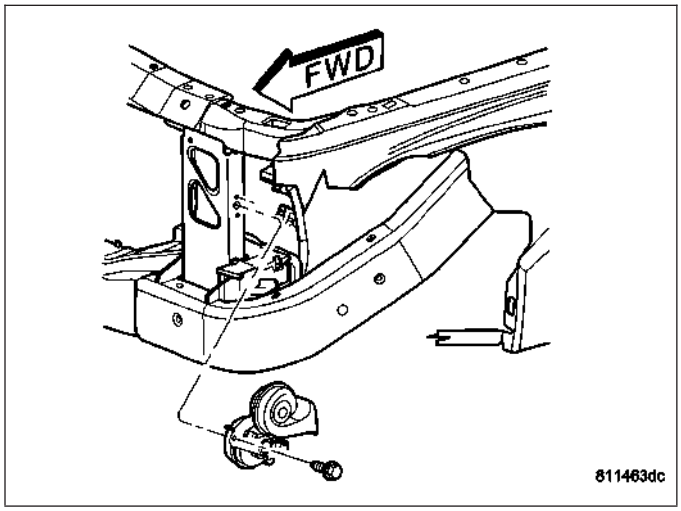
REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Remove the grille (Refer to 23 - BODY/EXTERIOR/GRILLE - REMOVAL).
3. Remove the horn mounting fasteners.
4. Disconnect the electrical harness connector and remove the horns.



INSTALLATION

1. Connect the electrical harness connector to the horns.
2. Position horns and install mounting fastener. Tighten fastener.
3. Install grille (Refer to 23 - BODY/EXTERIOR/GRILLE - INSTALLATION).
4. Connect battery negative cable.



SWITCH-HORN

DESCRIPTION

The horn switch is molded into the driver airbag cover. The horn switch can not be serviced separately. (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - DISASSEMBLY).

DIAGNOSIS AND TESTING

HORN SWITCH

The most reliable, efficient, and accurate means to diagnose the horn system requires the use of a scan tool and the proper Diagnostic Procedures information.

For complete circuit diagrams, refer to the appropriate wiring information.

WARNING: DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, SIDE AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

IGNITION CONTROL

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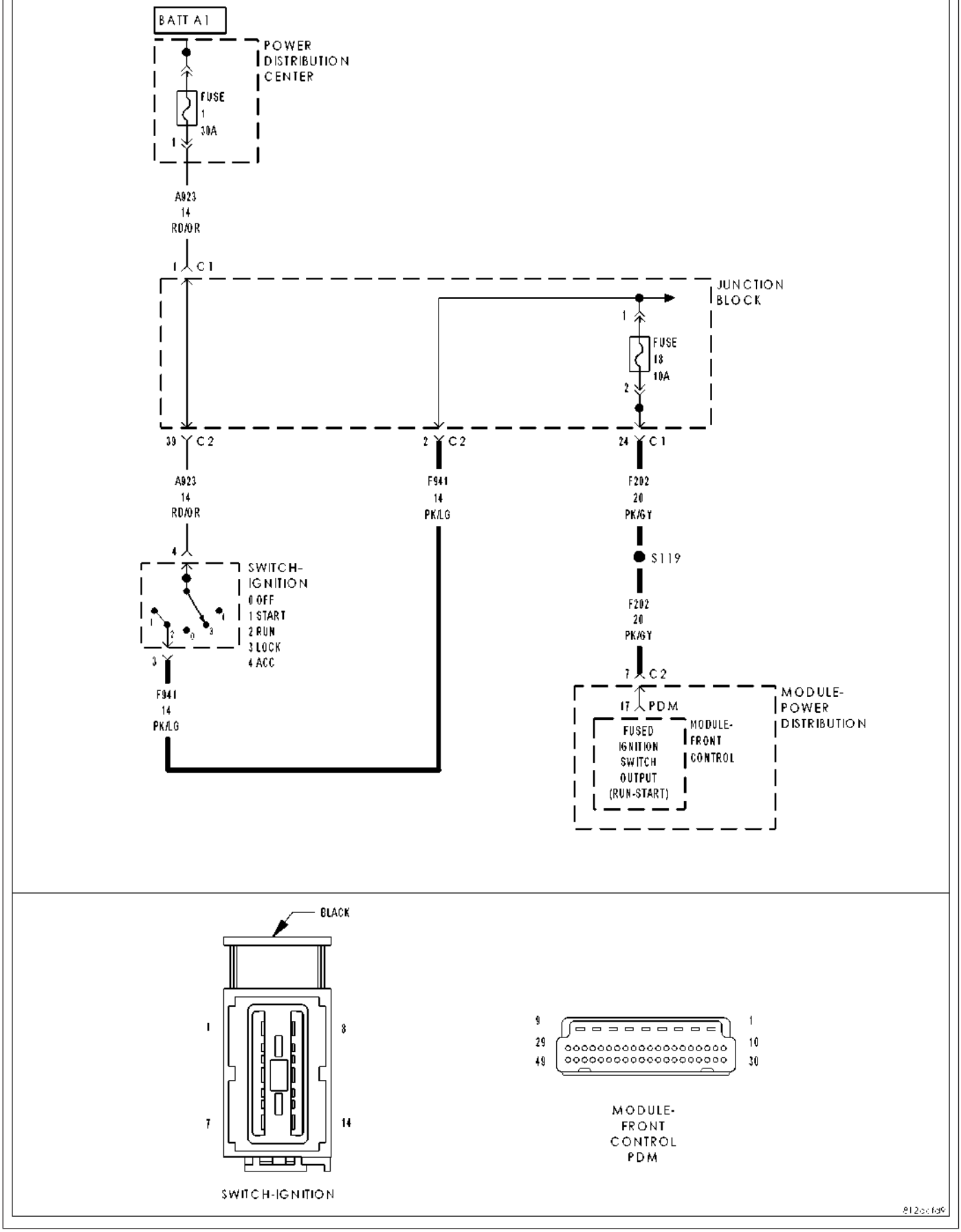
DIAGNOSIS AND TESTING

B2100-IGNITION RUN/START INPUT CIRCUIT PERFORMANCE



B2100-IGNITION RUN/START INPUT CIRCUIT PERFORMANCE (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Front Control Module will set this DTC if the CAN bus message and the hardwired ignition switch circuit do not match the position of the ignition switch.

Possible Causes
JUNCTION BLOCK FUSE #18
(F202) FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN
(F202) FUSED IGNITION SWITCH OUTPUT CIRCUIT SHORTED TO GROUND
FRONT CONTROL MODULE

Diagnostic Test

1. CHECK FOR ACTIVE DTC

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on, leaving the ignition on for a minimum of 90 seconds.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

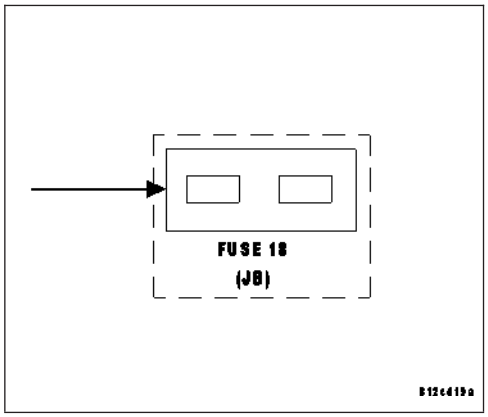
No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

---

2. INSPECT JUNCTION BLOCK FUSE #18

Turn the ignition off.

Remove and inspect Junction Block Fuse #18.



Is the fuse open?

Yes >> Replace fuse and retest. If fuse continues to fail inspect the wiring between the Junction Block and the Front Control Module for a short to ground.

Perform BODY VERIFICATION TEST – VER 1.

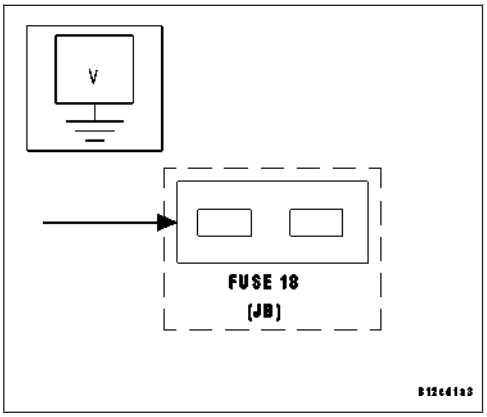
No >> Go To 3

B2100-IGNITION RUN/START INPUT CIRCUIT PERFORMANCE (CONTINUED)

3. (F941) IGNITION SWITCH OUTPUT CIRCUIT OPEN

Turn the ignition on.

Measure the voltage of the (F941) Ignition Switch Output circuit at the fuse input terminal.



Is the voltage above 10.0 volts?

Yes >> Go To 4

No >> Repair the (F941) Ignition Switch Output circuit for an open. Refer to the wiring diagrams located in 8W.
Perform BODY VERIFICATION TEST – VER 1.

4. (F202) FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN

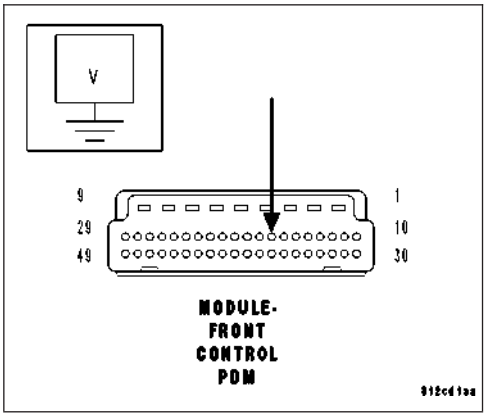
Turn the ignition off.

Install Fuse #18 in the Junction Block.

Remove the FCM from the Power Distribution Module.

Turn the ignition on.

Measure the voltage of the (F202) Fused Ignition Switch output circuit.



Is the voltage above 10.0 volts?

Yes >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Front Control Module in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Repair the (F202) Fused Ignition Switch Output circuit for an open.
Perform BODY VERIFICATION TEST – VER 1.

IGNITION SYSTEM - SERVICE INFORMATION

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IGNITION SYSTEM - SERVICE INFORMATION

DESCRIPTION

The ignition system is controlled by the Powertrain Control Module (PCM) on all engines.

3.7L V-6 ENGINE

The 3.7L V-6 engine uses a separate ignition coil for each cylinder. The one-piece coil bolts directly to the cylinder head. Rubber boots seal the secondary terminal ends of the coils to the top of all 6 spark plugs. A separate electrical connector is used for each coil.

Because of coil design, spark plug cables (secondary cables) are not used. A distributor is not used with the 3.7L engine.

Two knock sensors (one for each cylinder bank) are used to help control spark knock.

The Auto Shutdown (ASD) relay provides battery voltage to each ignition coil.

The ignition system consists of:

- 6 Spark Plugs
- 6 Separate Ignition Coils
- 2 Knock Sensors
- Powertrain Control Module (PCM)

- Also to be considered part of the ignition system are certain inputs from the Crankshaft Position, Camshaft Position, Throttle Position, 2 knock and MAP Sensors

4.7L V-8 ENGINE

The 4.7L V-8 engine uses a separate ignition coil for each cylinder. The one-piece coil bolts directly to the cylinder head. Rubber boots seal the secondary terminal ends of the coils to the top of all 8 spark plugs. A separate electrical connector is used for each coil.

Because of coil design, spark plug cables (secondary cables) are not used. A distributor is not used with the 4.7L engine.

Two knock sensors (one for each cylinder bank) are used to help control spark knock.

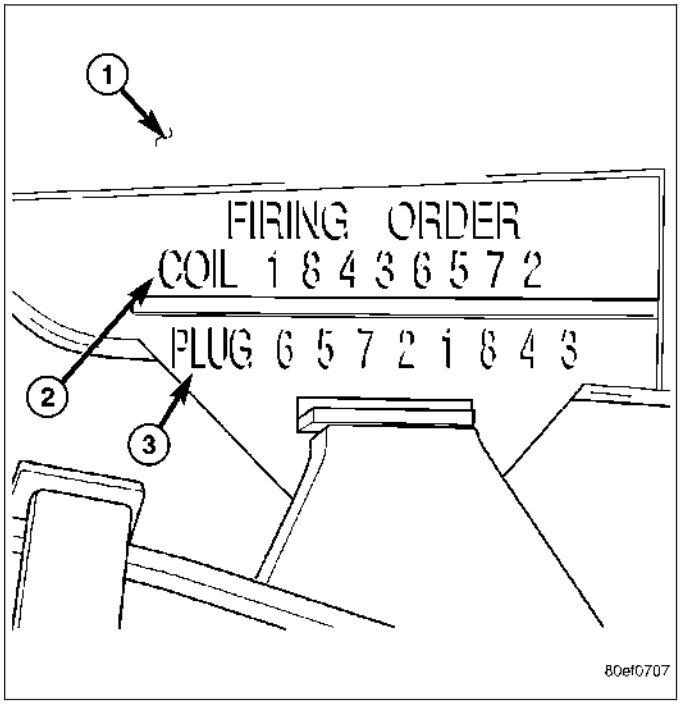
The Auto Shutdown (ASD) relay provides battery voltage to each ignition coil.

The ignition system consists of:

- 8 Spark Plugs
- 8 Separate Ignition Coils
- 2 Knock Sensors
- Powertrain Control Module (PCM)
- Also to be considered part of the ignition system are certain inputs from the Crankshaft Position, Camshaft Position, Throttle Position, 2 knock and MAP Sensors

5.7L V-8 ENGINE

For additional information, also refer to Ignition Coil Description and Operation.



The 5.7L V-8 engine is equipped with 16 spark plugs. Two plugs are used for each cylinder. The 5.7L is also equipped with 8 separate and independent ignition coils. The one-piece coil bolts directly to the cylinder head cover and attaches the coils secondary output terminal directly to a spark plug using a rubber boot seal. Each coil is also equipped with a second output terminal. This second terminal connects a conventional spark plug cable directly to a spark plug on the opposite cylinder bank. A separate primary electrical connector is used for each coil.

Eight conventional spark plug cables are used with the 5.7L. These cables connect a coil on one cylinder bank, directly to a spark plug on the opposite cylinder bank. The cables are placed and routed in a special plastic loom to keep them separated. This loom is clipped to the intake manifold. To prevent a miss-match of cables, a corresponding spark plug / coil number is displayed on each plug cable: 1/6, 2/3, 4/7 and 5/8. These numbers (2) and (3) can also be found on the top of the intake manifold (1) to the right of the throttle body.

Two knock sensors (one for each cylinder bank) are used to help control spark knock.

The 5.7L engine will not use a conventional distributor.

The ignition system consists of:

- 16 Spark Plugs (2 per cylinder)
- 8 Separate, Dual-Secondary Output, Ignition Coils
- 2 Knock Sensors
- 8 Secondary Ignition Cables
- Powertrain Control Module (PCM)
- Also to be considered part of the ignition system are certain inputs from the Crankshaft Position, Camshaft Position, Throttle Position, 2 knock and MAP Sensors

SPECIFICATIONS

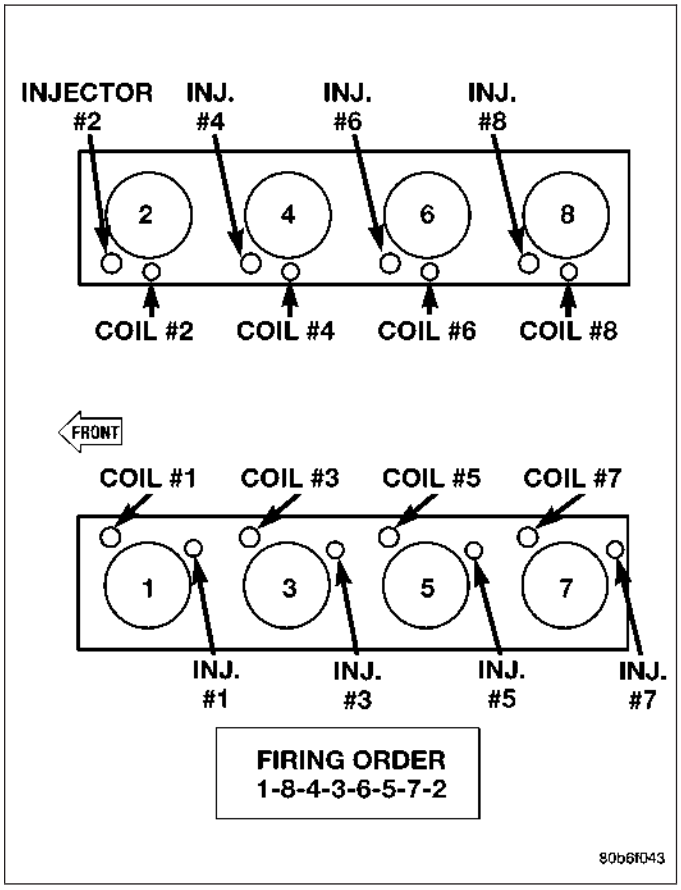
SPECIFICATIONS - TORQUE - IGNITION

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Camshaft Position Sensor - 3.7L V-6 Engine	12	-	106
Camshaft Position Sensor - 4.7L V-8 Engine	12	-	106
Camshaft Position Sensor - 5.7L V-8 Engine	12	9	105
Crankshaft Position Sensor - 3.7L V-6 Engine	28	21	205
Crankshaft Position Sensor - 4.7L V-8 Engine	28	21	205
Crankshaft Position Sensor - 5.7L V-8 Engine	12	9	105
Ignition Coil Mounting - 3.7L V-6 Engine	8	-	70
Ignition Coil Mounting - 4.7L V-8 Engine	8	-	70
Ignition Coil Mounting - 5.7L V-8 Engine	12	9	105 (± 20)
* Knock Sensor - 3.7L V-6 Engine	20	15	176
* Knock Sensor - 4.7L V-8 Engine	20	15	176
* Knock Sensor - 5.7L V-8 Engine	20	15	176
Spark Plugs - 3.7L V-6 Engine	27	20	-
Spark Plugs - 4.7L V-8 Engine	27	20	-
** Spark Plugs - 5.7L V-8 Engine	18 (± 3)	13 (± 2)	-
* Do not apply any sealant, thread-locker or adhesive to bolts. Poor sensor performance may result.			
** Torque critical tapered design. Do not exceed 15 ft. lbs.			

ENGINE FIRING ORDER - 3.7L V-6

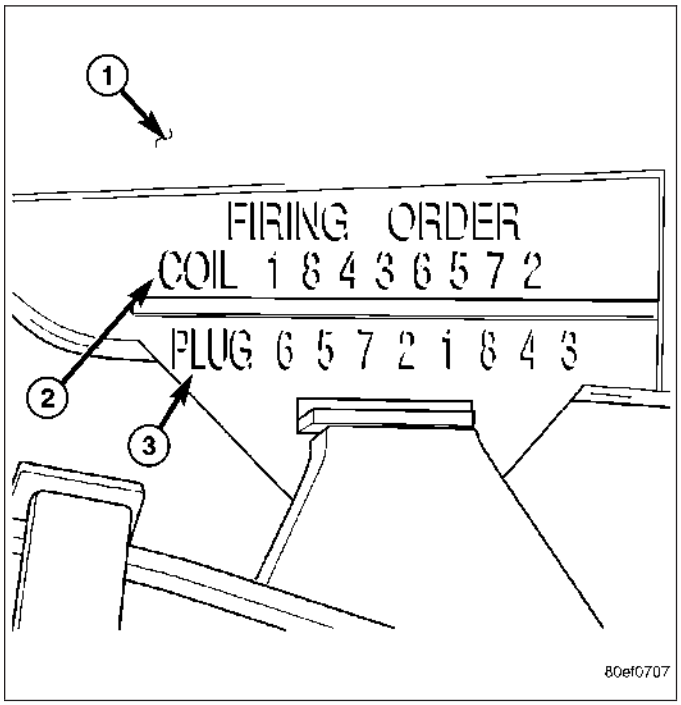
1 - 6 - 5 - 4 - 3 - 2

ENGINE FIRING ORDER – 4.7L V-8



FIRING ORDER / CABLE ROUTING – 5.7L V-8 ENGINE

Eight conventional spark plug cables are used with the 5.7L. These cables connect a coil on one cylinder bank, directly to a spark plug on the opposite cylinder bank. The cables are placed and routed in a special plastic loom to keep them separated. This loom is clipped to the intake manifold. To prevent a miss-match of cables, a corresponding spark plug / coil number is displayed on each plug cable: 1/6, 2/3, 4/7 and 5/8. These numbers (2) and (3) can also be found on the top of the intake manifold (1) to the right of the throttle body.



SPARK PLUG CABLE RESISTANCE

MINIMUM	MAXIMUM
250 Ohms Per Inch	1000 Ohms Per Inch
3000 Ohms Per Foot	12,000 Ohms Per Foot

SPARK PLUGS

ENGINE	PLUG TYPE	ELECTRODE GAP
3.7L V-6	ZFR6F - 11G (NGK)	1.1 (0.042 in.)
4.7L V-8	RC12MCC4	1.01 mm (.040 in.)
5.7L V-8	Champion - RE14MCC4	1.14 mm (.045 in.)

IGNITION COIL RESISTANCE - 3.7L V-6

PRIMARY RESISTANCE 21-27°C (70-80°F)	SECONDARY RESISTANCE 21-27°C (70-80°F)
0.6 - 0.9 Ohms	6,000 - 9,000 Ohms

IGNITION COIL RESISTANCE - 4.7L V-8

PRIMARY RESISTANCE 21-27°C (70-80°F)	SECONDARY RESISTANCE 21-27°C (70-80°F)
0.6 - 0.9 Ohms	6,000 - 9,000 Ohms

IGNITION COIL RESISTANCE - 5.7L V-8

PRIMARY RESISTANCE @ 21-27°C (70-80°F)
0.558 - 0.682 Ohms (Plus or Minus 10% @ 70-80° F)

IGNITION TIMING

Ignition timing is not adjustable on any engine.

RELAY-AUTO SHUT DOWN

DESCRIPTION - PCM OUTPUT

The 5–pin, 12–volt, Automatic Shutdown (ASD) relay is located in the Power Distribution Center (PDC). Refer to label on PDC cover for relay location.

OPERATION

OPERATION - PCM OUTPUT

The ASD relay supplies battery voltage (12+ volts) to the fuel injectors and ignition coil(s). With certain emissions packages it also supplies 12–volts to the oxygen sensor heating elements.

The ground circuit for the coil within the ASD relay is controlled by the Powertrain Control Module (PCM). The PCM operates the ASD relay by switching its ground circuit on and off.

The ASD relay will be shut–down, meaning the 12–volt power supply to the ASD relay will be de-activated by the PCM if:

- the ignition key is left in the ON position. This is if the engine has not been running for approximately 1.8 seconds.
- there is a crankshaft position sensor signal to the PCM that is lower than pre-determined values.

OPERATION - ASD SENSE - PCM INPUT

A 12 volt signal at this input indicates to the PCM that the ASD has been activated. The relay is used to connect the oxygen sensor heater element, ignition coil and fuel injectors to 12 volt + power supply.

This input is used only to sense that the ASD relay is energized. If the Powertrain Control Module (PCM) does not see 12 volts at this input when the ASD should be activated, it will set a Diagnostic Trouble Code (DTC).

REMOVAL

The ASD relay is located in the engine compartment within the Power Distribution Center (PDC). Refer to label on PDC cover for relay location.

1. Remove PDC cover.
2. Remove relay from PDC.
3. Check condition of relay terminals and PDC connector terminals for damage or corrosion. Repair if necessary before installing relay.
4. Check for pin height (pin height should be the same for all terminals within the PDC connector). Repair if necessary before installing relay.

INSTALLATION

The ASD relay is located in the Power Distribution Center (PDC). Refer to label on PDC cover for relay location.

1. Install relay to PDC.
2. Install cover to PDC.

SENSOR-CAMSHAFT POSITION

DESCRIPTION

3.7L V-6

The Camshaft Position Sensor (CMP) on the 3.7L 6-cylinder engine is bolted to the right-front side of the right cylinder head.

4.7L V-8

The Camshaft Position Sensor (CMP) on the 4.7L V-8 engine is bolted to the right-front side of the right cylinder head.

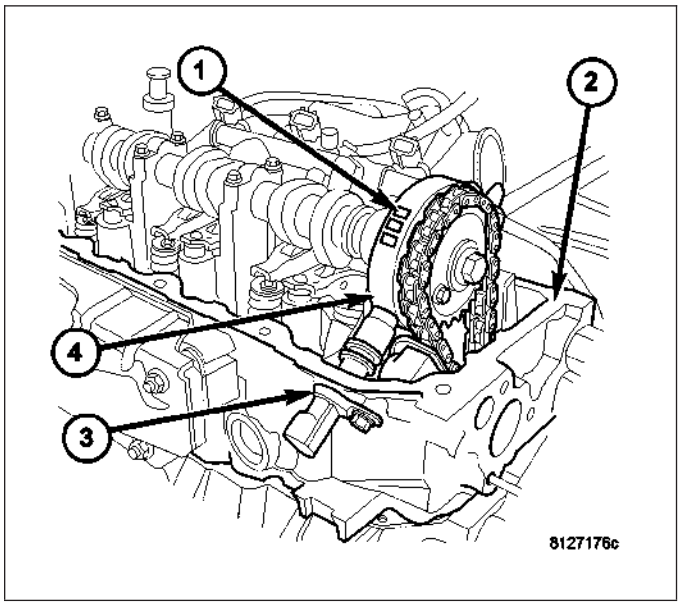
5.7L V-8

The Camshaft Position Sensor (CMP) on the 5.7L V-8 engine is located below the generator on the timing chain / case cover on the right/front side of engine.

OPERATION

3.7L V-6

The Camshaft Position Sensor (CMP) sensor on the 3.7L V-6 engine (3) contains a hall effect device referred to as a sync signal generator. A rotating target wheel (tonewheel) for the CMP is located (4) at the front of the camshaft for the right cylinder head (2). This sync signal generator detects notches (1) located on a tonewheel. As the tonewheel rotates, the notches pass through the sync signal generator. The signal from the CMP sensor is used in conjunction with the Crankshaft Position Sensor (CKP) to differentiate between fuel injection and spark events. It is also used to synchronize the fuel injectors with their respective cylinders.

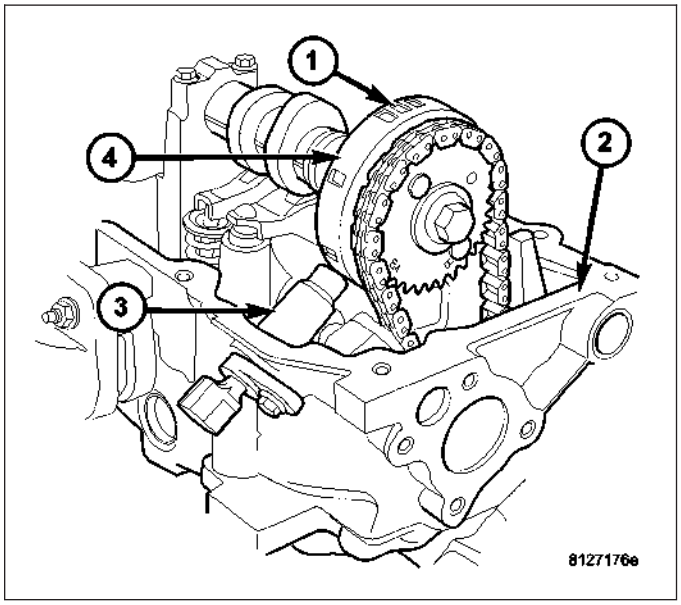


When the leading edge of the tonewheel notch enters the tip of the CMP, the interruption of magnetic field causes the voltage to switch high, resulting in a sync signal of approximately 5 volts.

When the trailing edge of the tonewheel notch leaves then tip of the CMP, the change of the magnetic field causes the sync signal voltage to switch low to 0 volts.

4.7L V-8

The CMP sensor on the 4.7L engine contains a hall effect device called a sync signal generator to generate a fuel sync signal. This sync signal generator detects notches located on a tonewheel. The tonewheel (4) is located at the front of the camshaft for the right cylinder head (2). As the tonewheel rotates, the notches (1) pass through the sync signal generator. The pattern of the notches (viewed counter-clockwise from front of engine) is: 1 notch, 2 notches, 3 notches, 3 notches, 2 notches 1 notch, 3 notches and 1 notch. The signal from the CMP sensor is used in conjunction with the crankshaft position sensor to differentiate between fuel injection and spark events. It is also used to synchronize the fuel injectors with their respective cylinders.

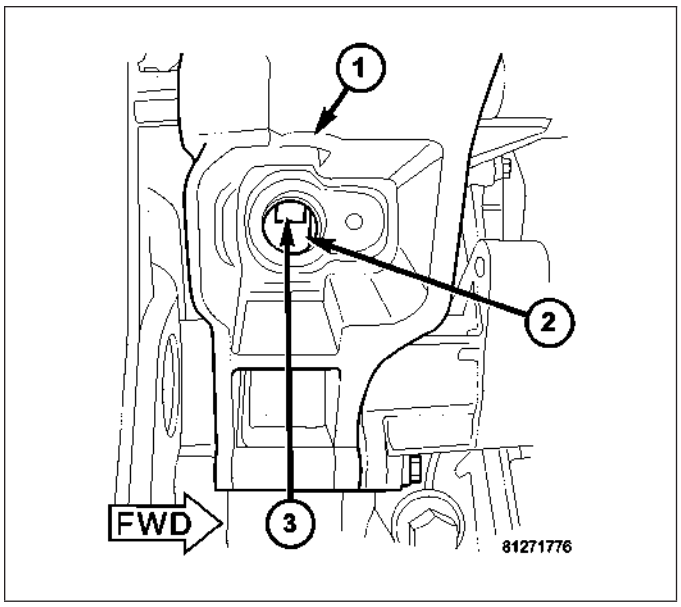


5.7L V-8

The CMP sensor is used in conjunction with the crankshaft position sensor to differentiate between fuel injection and spark events. It is also used to synchronize the fuel injectors with their respective cylinders. The sensor generates electrical pulses. These pulses (signals) are sent to the Powertrain Control Module (PCM). The PCM will then determine crankshaft position from both the camshaft position sensor and crankshaft position sensor.

The tonewheel is located at the front of the camshaft (2). As the tonewheel rotates, notches (3) pass through the sync signal generator.

When the cam gear is rotating, the sensor will detect the notches. Input voltage from the sensor to the PCM will then switch from a low (approximately 0.3 volts) to a high (approximately 5 volts). When the sensor detects a notch has passed, the input voltage switches back low to approximately 0.3 volts.

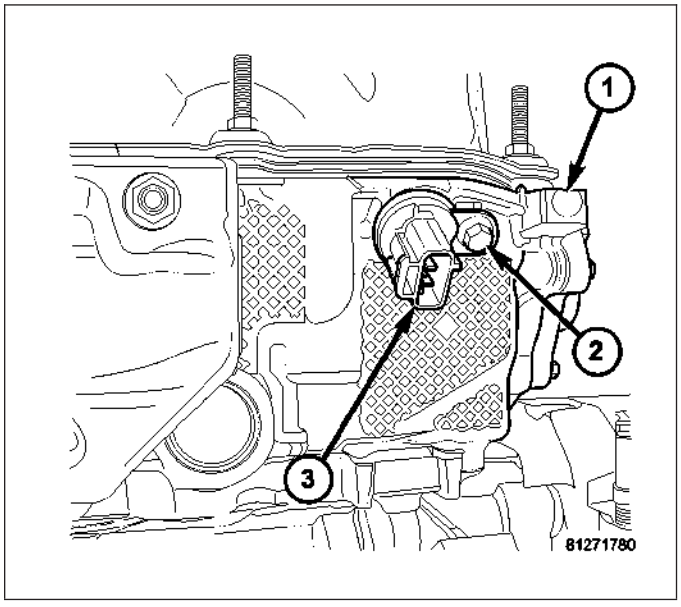


REMOVAL

3.7L V-6

The Camshaft Position Sensor (CMP) on the 3.7L V-6 engine (3) is bolted to the front/top of the right cylinder head (1).

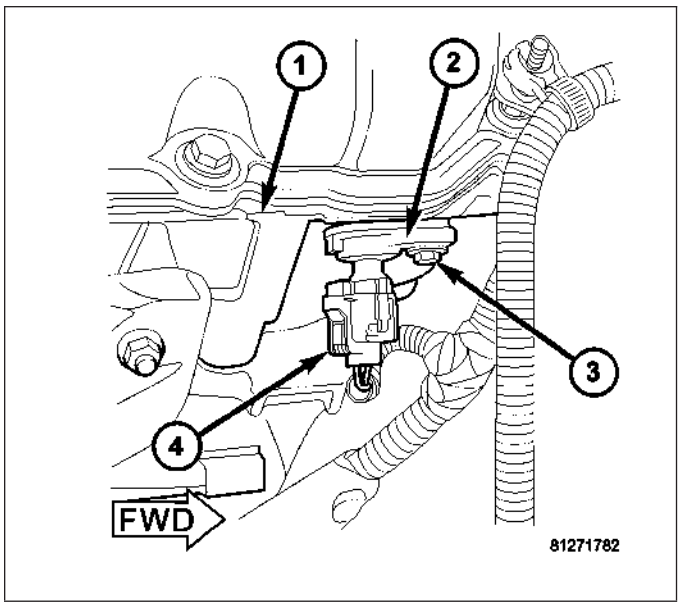
1. Disconnect electrical connector at CMP sensor.
2. Remove sensor mounting bolt (2).
3. Carefully twist sensor from cylinder head.
4. Check condition of sensor o-ring.



4.7L V-8

The Camshaft Position Sensor (CMP) on the 4.7L V–8 engine (2) is bolted to the front/top of the right cylinder head (1).

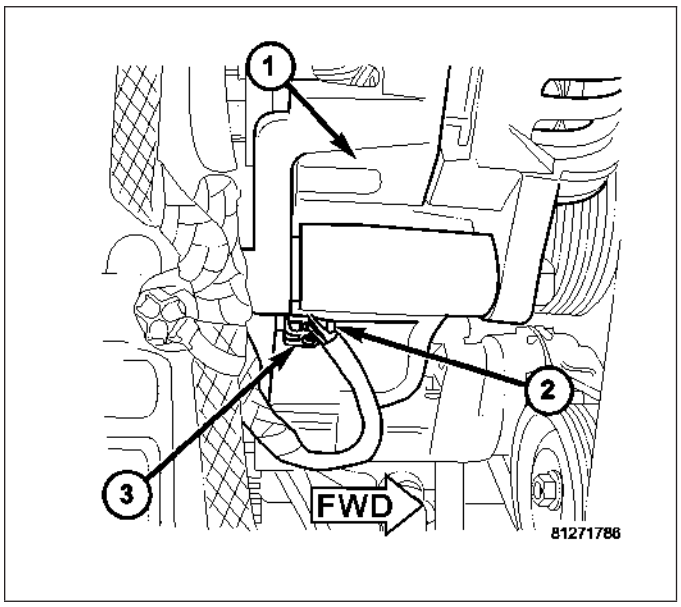
1. Raise and support vehicle.
2. Disconnect electrical connector (4) at CMP sensor.
3. Remove sensor mounting bolt (3).
4. Carefully twist sensor from cylinder head.
5. Check condition of sensor o-ring.



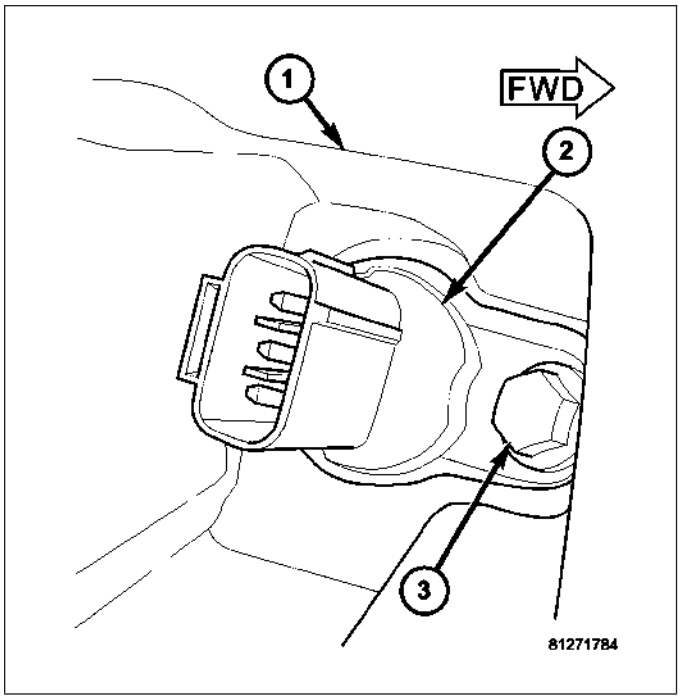
5.7L V-8

The Camshaft Position Sensor (CMP) on the 5.7L V-8 engine is located on right side of timing chain cover below generator (1).

1. Disconnect electrical connector (3) at CMP sensor.



2. Remove sensor mounting bolt (3).
3. Carefully twist sensor (2) from cylinder head.
4. Check condition of sensor o-ring.



INSTALLATION

3.7L V-6

1. Clean out machined hole in cylinder head.
2. Apply a small amount of engine oil to sensor o-ring.
3. Install sensor into cylinder head with a slight rocking and twisting action.

CAUTION: Before tightening sensor mounting bolt, be sure sensor is completely flush to cylinder head. If sensor is not flush, damage to sensor mounting tang may result.

4. Install mounting bolt and tighten. Refer to torque specifications.
5. Connect electrical connector to sensor.

4.7L V-8

1. Clean out machined hole in cylinder head.
2. Apply a small amount of engine oil to sensor o-ring.
3. Install sensor into cylinder head with a slight rocking action. Do not twist sensor into position as damage to o-ring may result.

CAUTION: Before tightening sensor mounting bolt, be sure sensor is completely flush to cylinder head. If sensor is not flush, damage to sensor mounting tang may result.

4. Install mounting bolt and tighten. Refer to Torque Specifications.
5. Connect electrical connector to sensor.

5.7L V-8

1. Clean out machined hole in cylinder head.
2. Apply a small amount of engine oil to sensor o-ring.
3. Install sensor into cylinder head with a slight rocking action. Do not twist sensor into position as damage to o-ring may result.

CAUTION: Before tightening sensor mounting bolt, be sure sensor is completely flush to timing chain cover. If sensor is not flush, damage to sensor mounting tang may result.

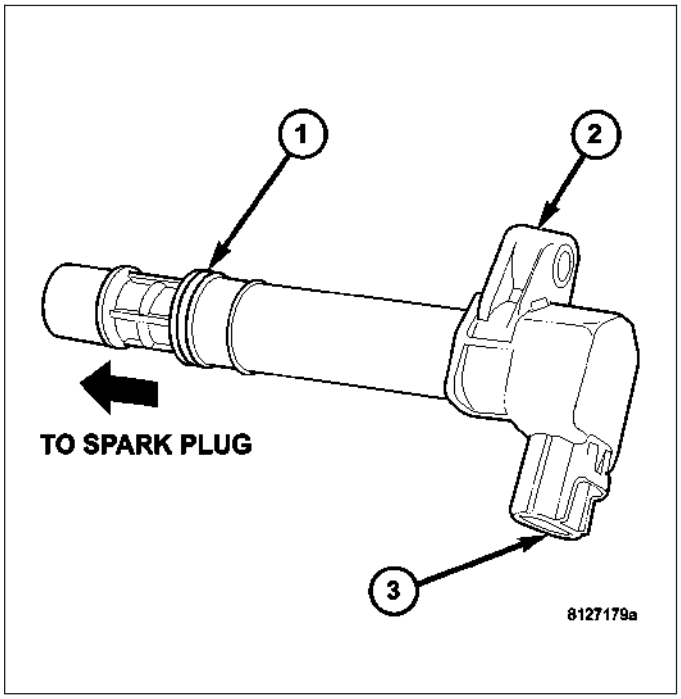
4. Install mounting bolt and tighten. Refer to Torque Specifications.
5. Connect electrical connector to sensor.

COIL-IGNITION

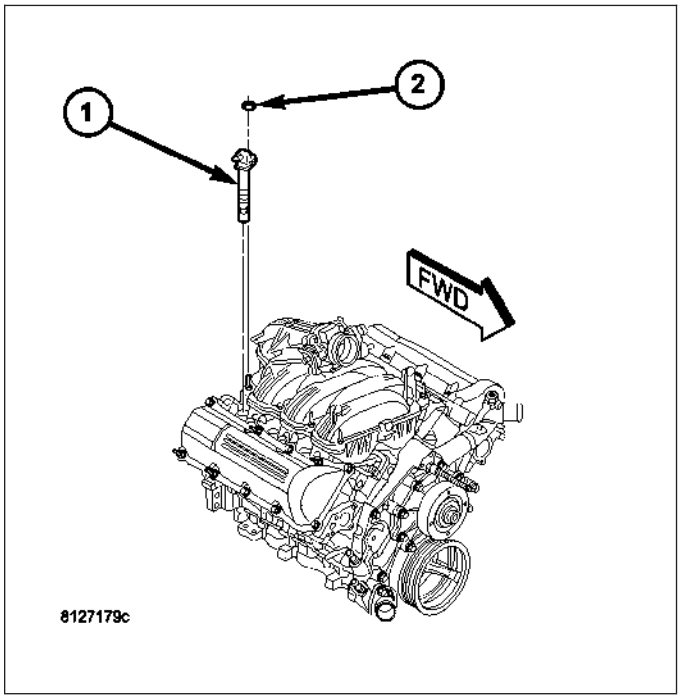
DESCRIPTION

3.7L V-6

The 3.7L V-6 engine uses 6 dedicated, and individually fired coil for each spark plug (2).

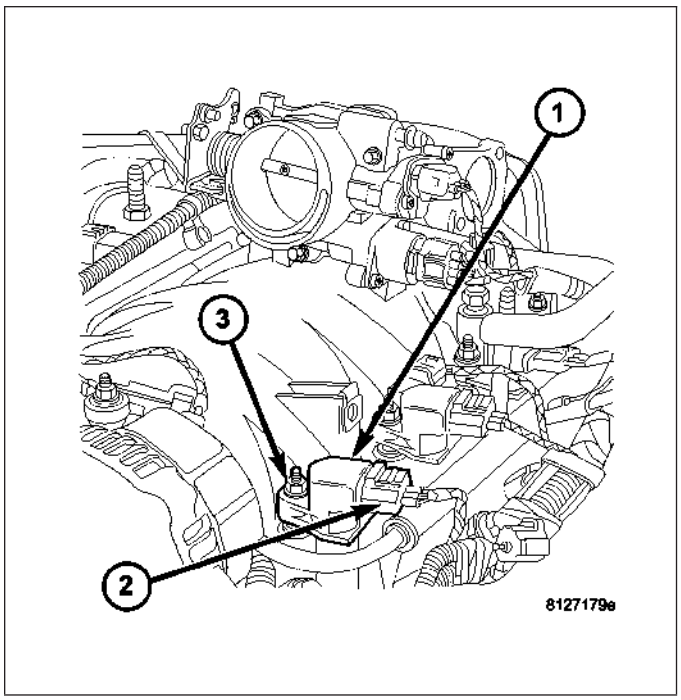


Each coil (1) is mounted directly into the cylinder head and onto the top of each spark plug.



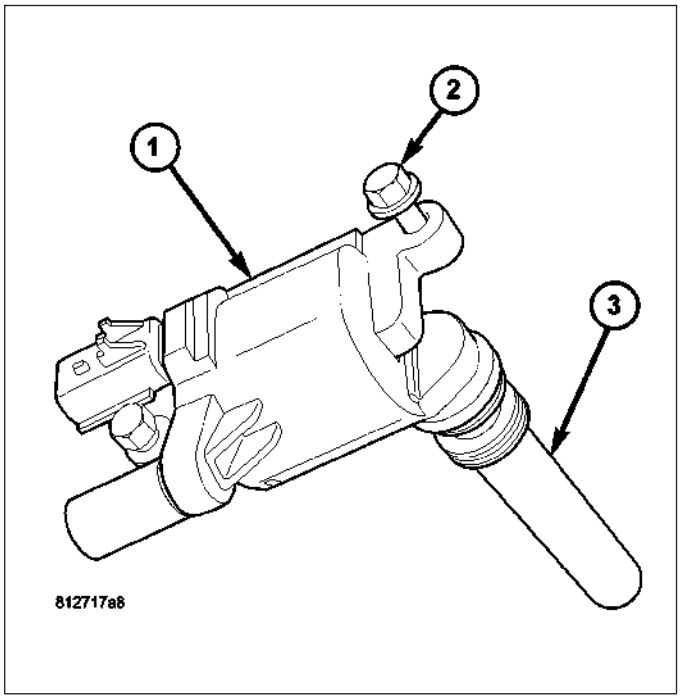
4.7L V-8

The 4.7L V–8 engine uses 8 dedicated, and individually fired coil (1) for each spark plug. Each coil is mounted directly to the top of each spark plug.

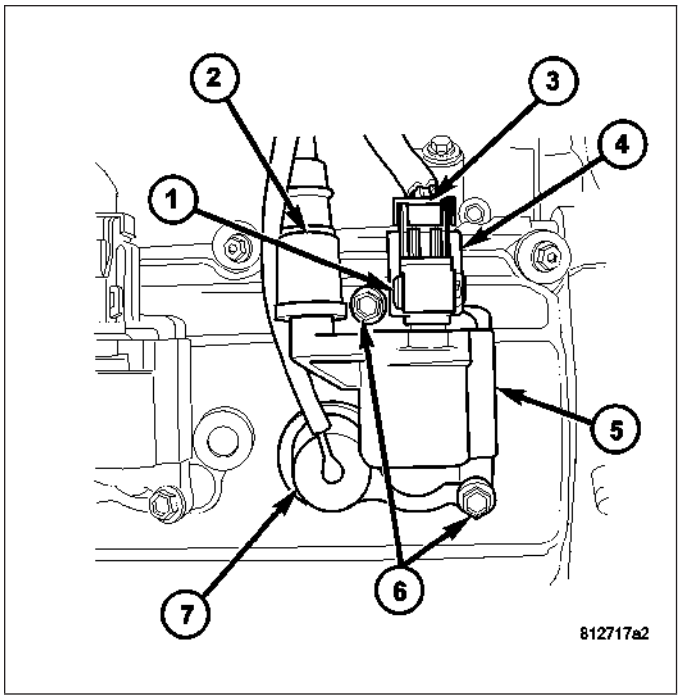


5.7L V-8

The 5.7L V–8 engine uses 8 dedicated, and individually fired coil (1) for each pair of spark plugs.



Each coil (5) is mounted directly to the top of each spark plug. Each coil is bolted (6) to the valve cover.



OPERATION

3.7L V-6

Battery voltage is supplied to the 6 individual ignition coils from the ASD relay. The Powertrain Control Module (PCM) opens and closes each ignition coil ground circuit at a determined time for ignition coil operation.

Base ignition timing is not adjustable. By controlling the coil ground circuit, the PCM is able to set the base timing and adjust the ignition timing advance. This is done to meet changing engine operating conditions.

The ignition coil is not oil filled. The windings are embedded in an epoxy compound. This provides heat and vibration resistance that allows the ignition coil to be mounted on the engine.

Because of coil design, spark plug cables (secondary cables) are not used with the 3.7L V-6 engine.

4.7L V-8

Battery voltage is supplied to the 8 individual ignition coils from the ASD relay. The Powertrain Control Module (PCM) opens and closes each ignition coil ground circuit at a determined time for ignition coil operation.

Base ignition timing is not adjustable. By controlling the coil ground circuit, the PCM is able to set the base timing and adjust the ignition timing advance. This is done to meet changing engine operating conditions.

The ignition coil is not oil filled. The windings are embedded in an epoxy compound. This provides heat and vibration resistance that allows the ignition coil to be mounted on the engine.

Because of coil design, spark plug cables (secondary cables) are not used with the 4.7L V-8 engine.

5.7L V-8

The ignition system is controlled by the Powertrain Control Module (PCM) on all engines.

A “wasted spark” system is used on the 5.7L engine combining paired, or dual-firing coils, and 2 spark plugs per cylinder. The coils and spark plugs are connected with paired, secondary high-voltage cables.

Each cylinder is equipped with 1 dual-output coil. Meaning one coil mounts directly over one of the dual spark plugs for 1 high-voltage output. A second high-voltage output is supplied directly from the same coil (using a plug cable) to one of the dual spark plugs on a corresponding (paired) cylinder on the opposite cylinder bank.

Each coil fires 2 spark plugs simultaneously on each of the cylinder banks (one cylinder on compression stroke and one cylinder on exhaust stroke). **EXAMPLE :** When the #1 cylinder is on compression stroke and ready for spark, the #1 coil will fire one of the dual spark plugs on the #1 cylinder (directly below the coil). The other dual spark plug on the #1 cylinder will be fired by the #6 coil. At the same time, the #1 coil will fire a “wasted spark” to one of the dual spark plugs at the #6 cylinder as coil #6 also fires a “wasted spark” to one of the dual spark plugs at the #6 cylinder.

The firing order is paired at cylinders 1/6, 2/3, 4/7, 5/8. Basic cylinder firing order is 1–8–4–3–6–5–7–2.

Battery voltage is supplied to all of the ignition coils positive terminals from the ASD relay. If the PCM does not see a signal from the crankshaft and camshaft sensors (indicating the ignition key is ON but the engine is not running), it will shut down the ASD circuit.

Base ignition timing is not adjustable on the 5.7L V-8 engine. By controlling the coil ground circuits, the PCM is able to set the base timing and adjust the ignition timing advance. This is done to meet changing engine operating conditions.

The PCM adjusts ignition timing based on inputs it receives from:

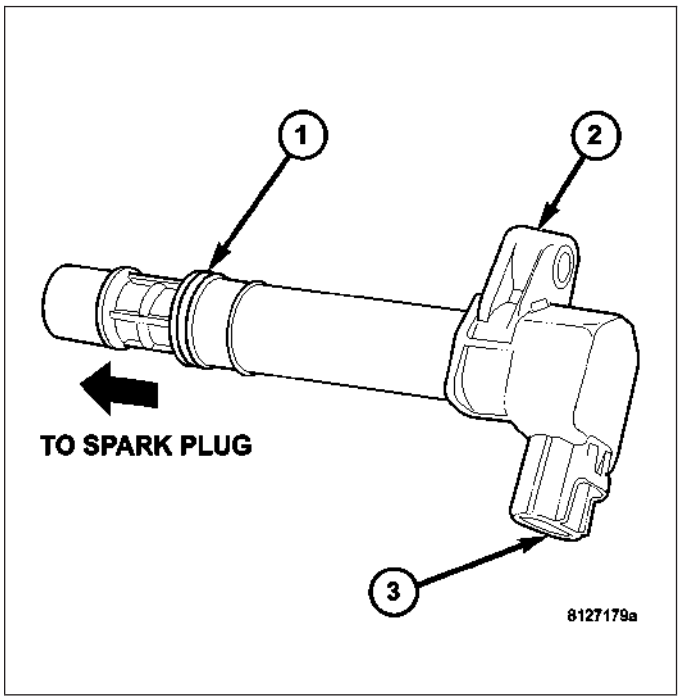
- The engine coolant temperature sensor
- The crankshaft position sensor (engine speed)
- The camshaft position sensor (crankshaft position)
- The manifold absolute pressure (MAP) sensor
- The throttle position sensor
- Transmission gear selection

REMOVAL

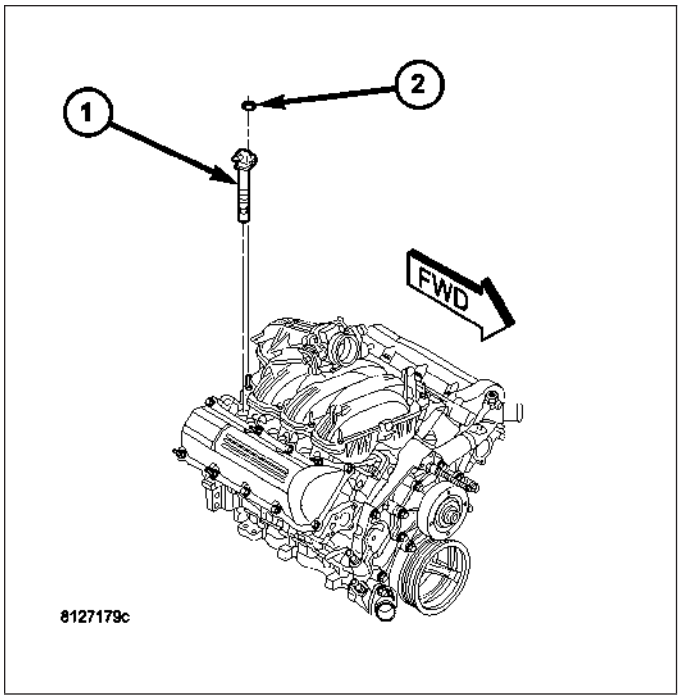
3.7L V-6

An individual ignition coil is used for each spark plug (2). The coil fits into machined holes in the cylinder head. A mounting stud/nut secures each coil to the top of the intake manifold. The bottom of the coil is equipped with a rubber boot to seal the spark plug to the coil. Inside each rubber boot is a spring. The spring is used for a mechanical contact between the coil and the top of the spark plug. These rubber boots and springs are a permanent part of the coil and are not serviced separately. An o-ring (1) is used to seal the coil at the opening into the cylinder head.

1. Depending on which coil is being removed, the throttle body air intake tube or intake box may need to be removed to gain access to coil.
2. Disconnect electrical connector from coil by pushing downward on release lock on top of connector and pull connector from coil.
3. Clean area at base of coil with compressed air before removal.



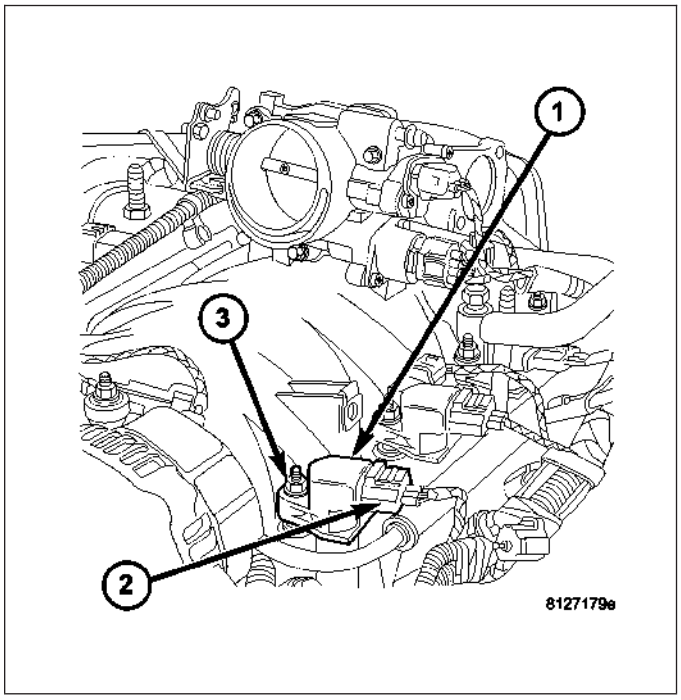
4. Remove coil mounting nut (2) from mounting stud.
5. Carefully pull up coil from cylinder head opening with a slight twisting action.
6. Remove coil from vehicle.



4.7L V-8

An individual ignition coil (1) is used for each spark plug. The coil fits into machined holes in the cylinder head. A mounting stud/nut (3) secures each coil to the top of the intake manifold . The bottom of the coil is equipped with a rubber boot to seal the spark plug to the coil. Inside each rubber boot is a spring. The spring is used for a mechanical contact between the coil and the top of the spark plug. These rubber boots and springs are a permanent part of the coil and are not serviced separately. An o-ring is used to seal the coil at the opening into the cylinder head.

1. Depending on which coil is being removed, the throttle body air intake tube or intake box may need to be removed to gain access to coil.
2. Disconnect electrical connector (2) from coil by pushing downward on release lock on top of connector and pull connector from coil.
3. Clean area at base of coil with compressed air before removal.
4. Remove coil mounting nut (3) from mounting stud.
5. Carefully pull up coil from cylinder head opening with a slight twisting action.
6. Remove coil from vehicle.

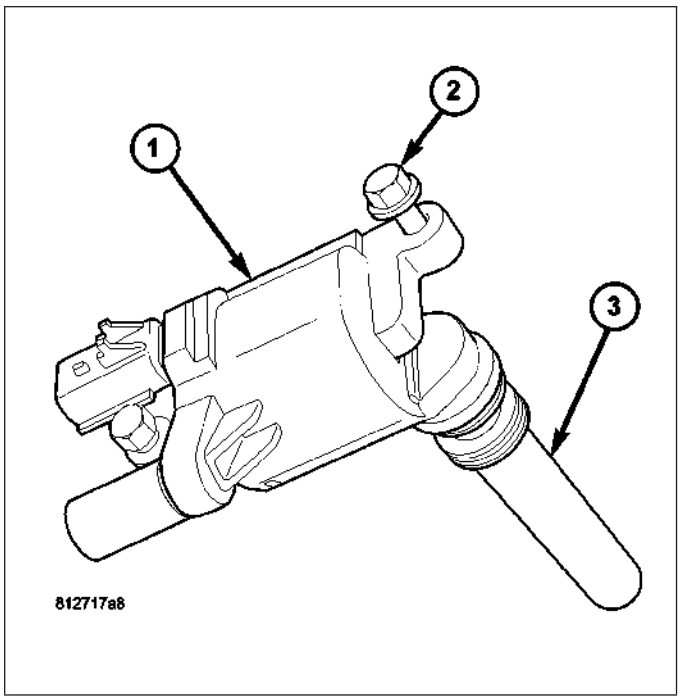


5.7L V-8

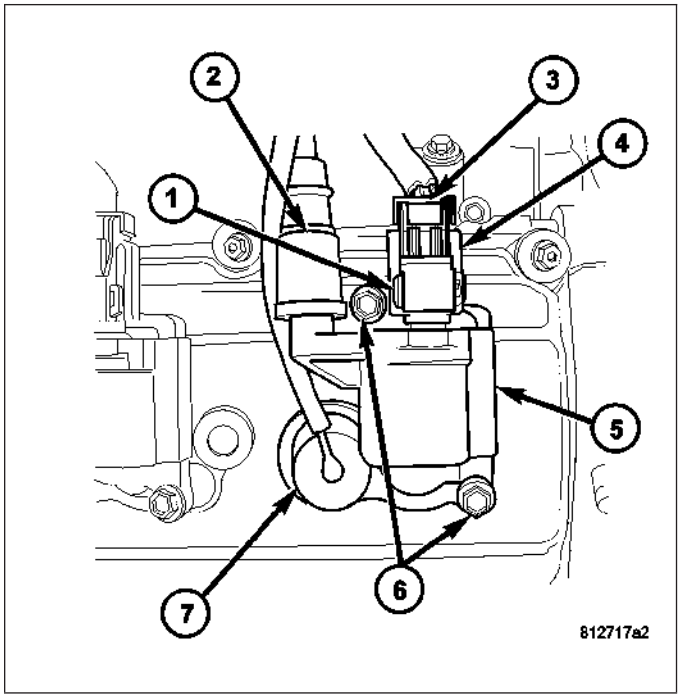
Before removing or disconnecting any spark plug cables, note their original position. Remove cables one-at-a-time. To prevent ignition crossfire, spark plug cables **MUST** be placed in cable tray (routing loom) into their original position.

An individual ignition coil (1) is used at each cylinder. The coil mounts to the top of the valve cover with two bolts (2). The bottom of the coil is equipped with a rubber boot (3) to seal the spark plug to the coil. Inside each rubber boot is a spring. The spring is used for a mechanical contact between the coil and the top of the spark plug.

1. Depending on which coil is being removed, the throttle body air intake tube or intake box may need to be removed to gain access to coil.



2. Unlock electrical connector (4) by moving slide lock (1) first. Press on release lock (3) while pulling electrical connector from coil.
3. Disconnect secondary high-voltage cable (2) from coil with a twisting action.
4. Clean area at base of coil with compressed air before removal.
5. Remove two mounting bolts (6) (note that mounting bolts are retained to coil).
6. Carefully pull up coil from cylinder head opening with a slight twisting action.
7. Remove coil from vehicle.
8. Before installing spark plug cables to either the spark plugs or coils, or before installing a coil to a spark plug, apply dielectric grease to inside of boots.



INSTALLATION

3.7L V-6

1. Using compressed air, blow out any dirt or contaminants from around top of spark plug.
2. Check condition of coil o-ring and replace as necessary. To aid in coil installation, apply silicone to coil o-ring.
3. Position ignition coil into cylinder head opening and push onto spark plug. Do this while guiding coil base over mounting stud.
4. Install coil mounting stud nut. Refer to torque specifications.

5. Connect electrical connector to coil by snapping into position.
6. If necessary, install throttle body air tube.

4.7L V-8

1. Using compressed air, blow out any dirt or contaminants from around top of spark plug.
2. Check condition of coil o-ring and replace as necessary. To aid in coil installation, apply silicone to coil o-ring.
3. Position ignition coil into cylinder head opening and push onto spark plug. Do this while guiding coil base over mounting stud.
4. Install coil mounting stud nut. Refer to torque specifications.
5. Connect electrical connector to coil by snapping into position.
6. If necessary, install throttle body air tube.

5.7L V-8

1. Using compressed air, blow out any dirt or contaminants from around top of spark plug.
2. Before installing spark plug cables to either the spark plugs or coils, or before installing a coil to a spark plug, apply dielectric grease to inside of boots.
3. Position ignition coil into cylinder head opening and push onto spark plug. Twist coil into position.
4. Install 2 coil mounting bolts. Refer to torque specifications.
5. Connect electrical connector to coil by snapping into position.
6. Install cable to coil. To prevent ignition crossfire, spark plug cables **MUST** be placed in cable tray (routing loom) into their original position. Refer to Spark Plug Cable Removal for a graphic.
7. If necessary, install throttle body air tube.

SENSOR-KNOCK

DESCRIPTION

The sensors are used only with 3.7L V-6, 4.7L V-8 and 5.7L V-8 engines. On 3.7L V-6 and 4.7L V-8 engines, the 2 knock sensors are bolted into the cylinder block under the intake manifold.

On 5.7L V-8 engines, 2 knock sensors are also used. These are bolted into each side of the cylinder block (outside) under the exhaust manifold.

OPERATION

3.7L V-6 / 4.7L V-8 / 5.7L V-8 Engines Only

Two knock sensors are used; one for each cylinder bank. When the knock sensor detects a knock in one of the cylinders on the corresponding bank, it sends an input signal to the Powertrain Control Module (PCM). In response, the PCM retards ignition timing for all cylinders by a scheduled amount.

Knock sensors contain a piezoelectric material which constantly vibrates and sends an input voltage (signal) to the PCM while the engine operates. As the intensity of the crystal's vibration increases, the knock sensor output voltage also increases.

The voltage signal produced by the knock sensor increases with the amplitude of vibration. The PCM receives the knock sensor voltage signal as an input. If the signal rises above a predetermined level, the PCM will store that value in memory and retard ignition timing to reduce engine knock. If the knock sensor voltage exceeds a preset value, the PCM retards ignition timing for all cylinders. It is not a selective cylinder retard.

The PCM ignores knock sensor input during engine idle conditions. Once the engine speed exceeds a specified value, knock retard is allowed.

Knock retard uses its own short term and long term memory program.

Long term memory stores previous detonation information in its battery-backed RAM. The maximum authority that long term memory has over timing retard can be calibrated.

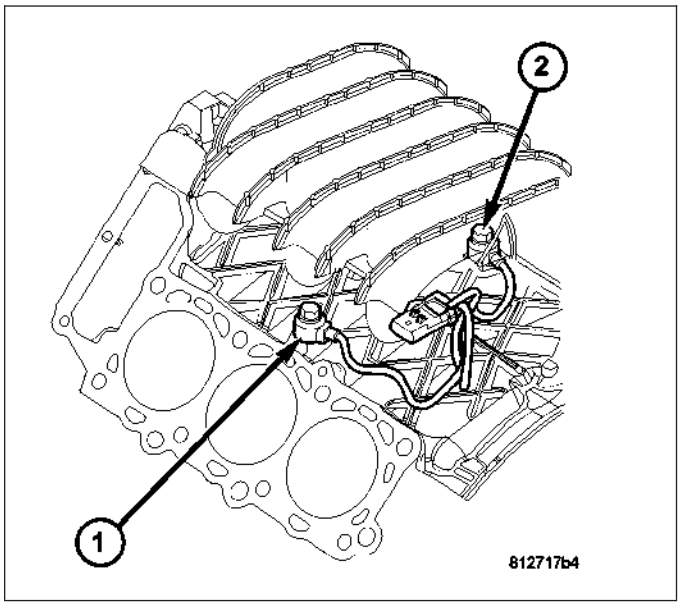
Short term memory is allowed to retard timing up to a preset amount under all operating conditions (as long as rpm is above the minimum rpm) except at Wide Open Throttle (WOT). The PCM, using short term memory, can respond quickly to retard timing when engine knock is detected. Short term memory is lost any time the ignition key is turned off.

NOTE: Over or under tightening the sensor mounting bolts will affect knock sensor performance, possibly causing improper spark control. Always use the specified torque when installing the knock sensors.

REMOVAL

3.7L V-6

The 2 knock sensors are bolted into the cylinder block under the intake manifold (1) and (2).

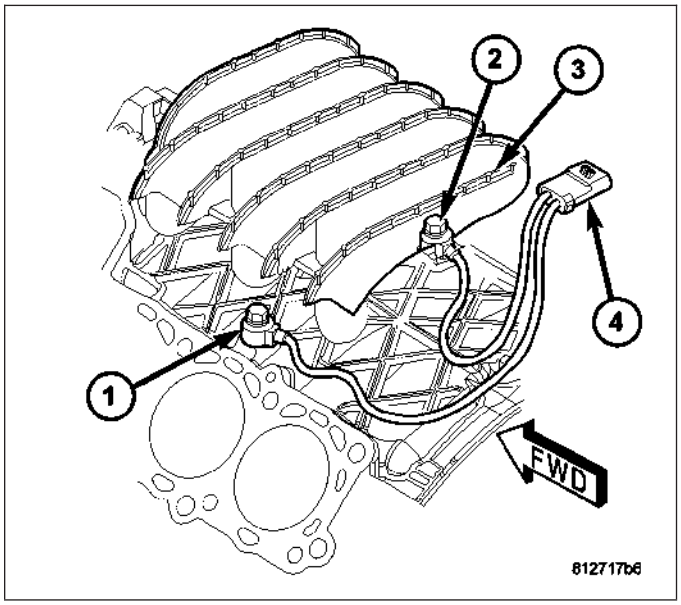


NOTE: The left sensor is identified by an identification tag (LEFT). It is also identified by a larger bolt head. The Powertrain Control Module (PCM) must have and know the correct sensor left/right positions. Do not mix the sensor locations.

1. Disconnect knock sensor dual pigtail harness from engine wiring harness. This connection is made near rear of engine.
2. Remove intake manifold. Refer to Engine section.
3. Remove sensor mounting bolts (2). Note foam strip on bolt threads. This foam is used only to retain the bolts to sensors for plant assembly. It is not used as a sealant. Do not apply any adhesive, sealant or thread locking compound to these bolts.
4. Remove sensors from engine.

4.7L V-8

The two knock sensors (1) are bolted into the cylinder block under the intake manifold (3).



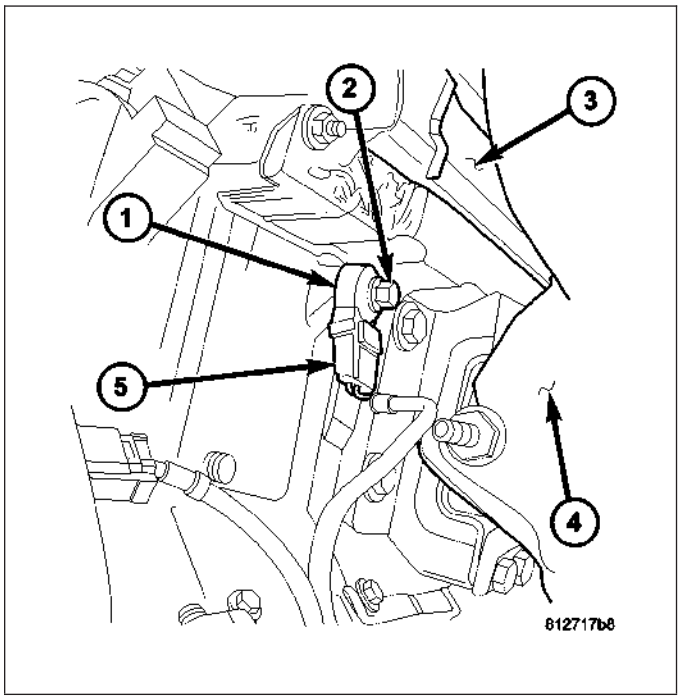
NOTE: The left sensor is identified by an identification tag (LEFT). It is also identified by a larger bolt head. The Powertrain Control Module (PCM) must have and know the correct sensor left/right positions. Do not mix the sensor locations.

1. Disconnect knock sensor dual pigtail harness from engine wiring harness. This connection is made near rear of engine.
2. Remove intake manifold. Refer to Engine section.
3. Remove sensor mounting bolts (2). Note foam strip on bolt threads. This foam is used only to retain the bolts to sensors for plant assembly. It is not used as a sealant. Do not apply any adhesive, sealant or thread locking compound to these bolts.
4. Remove sensors from engine.

5.7L V8

Two sensors (1) are used. Each sensor is bolted into the outside of cylinder block below the exhaust manifold (3).

1. Raise vehicle.
2. Disconnect knock sensor electrical connector (5).
3. Remove sensor mounting bolt (2). Note foam strip on bolt threads. This foam is used only to retain the bolts to sensors for plant assembly. It is not used as a sealant. Do not apply any adhesive, sealant or thread locking compound to these bolts.
4. Remove sensor from engine.



INSTALLATION

3.7L V-6 / 4.7L V-8

NOTE: The left sensor is identified by an identification tag (LEFT). It is also identified by a larger bolt head. The Powertrain Control Module (PCM) must have and know the correct sensor left/right positions. Do not mix the sensor locations.

1. Thoroughly clean knock sensor mounting holes.
2. Install sensors into cylinder block.

NOTE: Over or under tightening the sensor mounting bolts will affect knock sensor performance, possibly causing improper spark control. Always use the specified torque when installing the knock sensors. The torque for the knock senor bolt is relatively light for an 8mm bolt.

NOTE: Note foam strip on bolt threads. This foam is used only to retain the bolts to sensors for plant assembly. It is not used as a sealant. Do not apply any adhesive, sealant or thread locking compound to these bolts.

3. Install and tighten mounting bolts. Refer to torque specification.
4. Install intake manifold. Refer to Engine section.
5. Connect knock sensor wiring harness to engine harness at rear of intake manifold.

5.7L V-8

1. Thoroughly clean knock sensor mounting hole.
2. Install sensor into cylinder block.

NOTE: Over or under tightening the sensor mounting bolts will affect knock sensor performance, possibly causing improper spark control. Always use the specified torque when installing the knock sensors. The torque for the knock senor bolt is relatively light for an 8mm bolt.

NOTE: Note foam strip on bolt threads. This foam is used only to retain the bolts to sensors for plant assembly. It is not used as a sealant. Do not apply any adhesive, sealant or thread locking compound to these bolts.

3. Install and tighten mounting bolt. Refer to torque specification.
4. Install electrical connector to sensor.

SPARK PLUG

DESCRIPTION

Resistor type spark plugs are used on all engines.

Sixteen spark plugs (2 per cylinder) are used with 5.7L V-8 engines.

REMOVAL

3.7L V-6

Each individual spark plug is located under each ignition coil. Each individual ignition coil must be removed to gain access to each spark plug. Refer to Ignition Coil Removal/Installation.

1. Remove necessary air filter tubing at throttle body.
2. Prior to removing ignition coil, spray compressed air around coil base at cylinder head.
3. Prior to removing spark plug, spray compressed air into cylinder head opening. This will help prevent foreign material from entering combustion chamber.
4. Remove spark plug from cylinder head using a quality socket with a rubber or foam insert. Also check condition of ignition coil o-ring and replace as necessary.
5. Inspect spark plug condition.

4.7L V-8

Each individual spark plug is located under each ignition coil. Each individual ignition coil must be removed to gain access to each spark plug. Refer to Ignition Coil Removal/Installation.

1. Remove necessary air filter tubing at throttle body.
2. Prior to removing ignition coil, spray compressed air around coil base at cylinder head.
3. Prior to removing spark plug, spray compressed air into cylinder head opening. This will help prevent foreign material from entering combustion chamber.
4. Remove spark plug from cylinder head using a quality socket with a rubber or foam insert. Also check condition of ignition coil o-ring and replace as necessary.
5. Inspect spark plug condition..

5.7L V-8

Eight of the 16 spark plugs are located under an ignition coil; the other 8 are not. If spark plug being removed is under coil, coil must be removed to gain access to spark plug. Refer to Ignition Coil Removal/Installation and observe all CAUTIONS and WARNINGS.

Before removing or disconnecting any spark plug cables, note their original position. Remove cables one-at-a-time. To prevent ignition crossfire, spark plug cables **MUST** be placed in cable tray (routing loom) into their original position. Refer to Spark Plug Cable Removal for a graphic.

Before installing spark plug cables to either the spark plugs or coils, apply dielectric grease to inside of boots.

1. Remove necessary air filter tubing at throttle body.
2. Prior to removing ignition coil (if coil removal is necessary), spray compressed air around coil base at cylinder head cover.
3. Prior to removing spark plug, spray compressed air into cylinder head opening. This will help prevent foreign material from entering combustion chamber.
4. Remove spark plug from cylinder head using a quality socket with a rubber or foam insert.
5. Inspect spark plug condition.

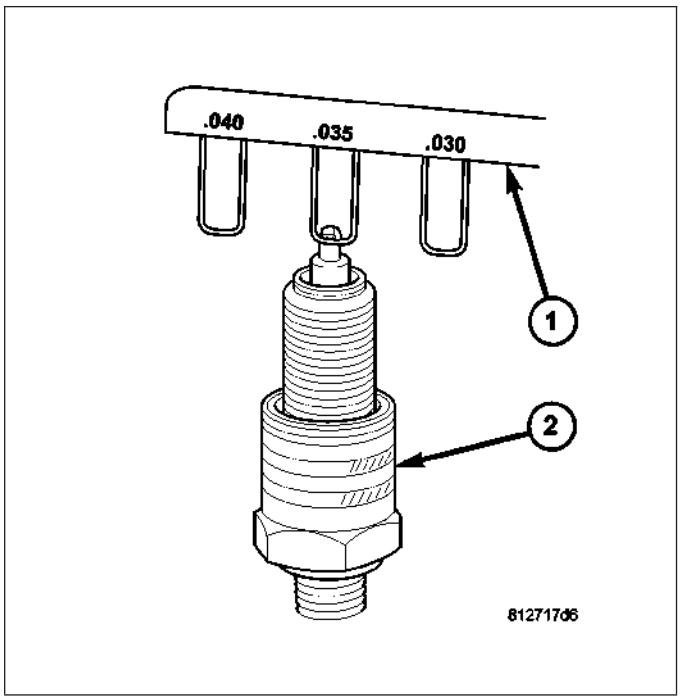
CLEANING

CLEANING AND ADJUSTMENT

The plugs may be cleaned using commercially available spark plug cleaning equipment. After cleaning, file center electrode flat with a small point file or jewelers file before adjusting gap.

CAUTION: Never use a motorized wire wheel brush to clean spark plugs. Metallic deposits will remain on spark plug insulator and will cause plug misfire.

Adjust spark plug gap with a gap gauging tool (1).



INSTALLATION

3.7L V-6

Special care should be taken when installing spark plugs into the cylinder head spark plug wells. Be sure the plugs do not drop into the plug wells as electrodes can be damaged.

Always tighten spark plugs to the specified torque. Over tightening can cause distortion resulting in a change in the spark plug gap or a cracked porcelain insulator.

1. Start the spark plug into the cylinder head by hand to avoid cross threading.
2. Tighten spark plugs. Refer to torque specifications.
3. Before installing ignition coil(s), check condition of coil o-ring and replace as necessary. To aid in coil installation, apply silicone to coil o-ring.
4. Install ignition coil(s). Refer to Ignition Coil Removal/Installation.

4.7L V-8

CAUTION: The 4.7L V–8 engine is equipped with copper core ground electrode spark plugs. They must be replaced with the same type/number spark plug as the original. If another spark plug is substituted, pre-ignition will result.

Special care should be taken when installing spark plugs into the cylinder head spark plug wells. Be sure the plugs do not drop into the plug wells as electrodes can be damaged.

Always tighten spark plugs to the specified torque. Over tightening can cause distortion resulting in a change in the spark plug gap or a cracked porcelain insulator.

1. Start the spark plug into the cylinder head by hand to avoid cross threading.
2. Tighten spark plugs. Refer to torque specifications.
3. Before installing ignition coil(s), check condition of coil o-ring and replace as necessary. To aid in coil installation, apply silicone to coil o-ring.
4. Install ignition coil(s). Refer to Ignition Coil Removal/Installation.

5.7L V-8

1. Special care should be taken when installing spark plugs into the cylinder head spark plug wells. Be sure the plugs do not drop into the plug wells as electrodes can be damaged.
2. Start the spark plug into cylinder head by hand to avoid cross threading aluminum threads. To aid in installation, attach a piece of rubber hose, or an old spark plug boot to spark plug.
3. The 5.7L V-8 is equipped with torque critical design spark plugs. Do not exceed 15 ft. lbs. torque. Tighten spark plugs. Refer to torque specifications.
4. Before installing spark plug cables to either the spark plugs or coils, apply dielectric grease to inside of boots.
5. To prevent ignition crossfire, spark plug cables **MUST** be placed in cable tray (routing loom) into their original position. Refer to Spark Plug Cable Removal for a graphic.
6. Install ignition coil(s) to necessary spark plugs. Refer to Ignition Coil Installation.
7. Install spark plug cables to remaining spark plugs. Remember to apply dielectric grease to inside of boots.

CABLE-SPARK PLUG

DESCRIPTION

Spark plug cables are sometimes referred to as secondary ignition wires, or secondary ignition cables.

Plug cables are used only on the 5.7L V-8 engine.

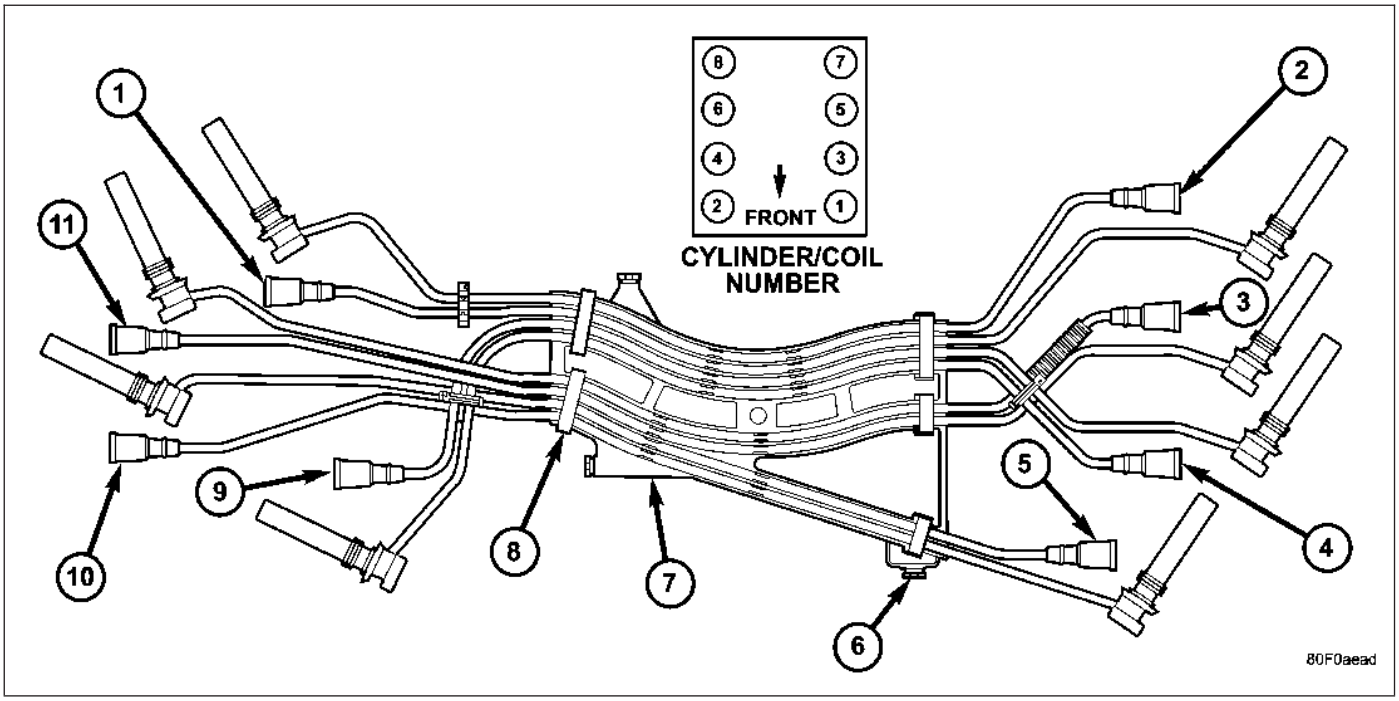
OPERATION

The spark plug cables transfer electrical current from the ignition coil(s) and/or distributor, to individual spark plugs at each cylinder. The resistive spark plug cables are of nonmetallic construction. The cables provide suppression of radio frequency emissions from the ignition system.

Plug cables are used only on the 5.7L V-8 engine.

REMOVAL

5.7L V-8



1 - #8 COIL-TO- #5 SPARK PLUG (MARKED 5/8)
2 - #5 COIL-TO- #8 SPARK PLUG (MARKED 5/8)
3 - #7 COIL-TO- #4 SPARK PLUG (MARKED 4/7)
4 - #3 COIL-TO- #2 SPARK PLUG (MARKED 2/3)
5 - #1 COIL-TO- #6 SPARK PLUG (MARKED 1/6)
6 - CLIPS (TRAY-TO-MANIFOLD RETENTION)
7 - CABLE TRAY
8 - CLIPS (SPARK PLUG CABLE-TO-TRAY- RETENTION)
9 - #2 COIL-TO- #3 SPARK PLUG (MARKED 2/3)
10 - #6 COIL-TO- #1 SPARK PLUG (MARKED 1/6)
11 - #4 COIL-TO- #7 SPARK PLUG (MARKED 4/7)

Spark plug cables on the 5.7L engine are paired on cylinders 1/6, 2/3, 4/7 and 5/8. Before removing or disconnecting any spark plug cables, note their original position. Remove cables one-at-a-time. To prevent ignition crossfire, spark plug cables **MUST** be placed in cable tray (routing loom) into their original position. The cable retention clips (6) and (8) must also be securly locked.

Before installing spark plug cables to either the spark plugs or coils, apply dielectric grease to inside of boots.

If cable tray removal is necessary, release the 4 tray-to-manifold retention clips.

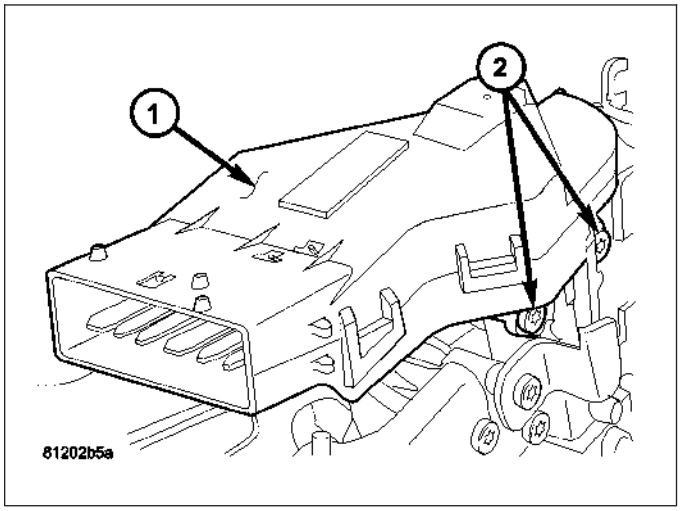
INSTALLATION

1. Install cables into the proper engine cylinder firing order sequence.
2. When replacing the spark plug and coil cables, route the cables correctly and secure them in the proper retainers. Failure to route the cables properly may cause the radio to reproduce ignition noise. It could also cause cross-ignition of the plugs, or, may short-circuit the cables to ground.
3. When installing new cables, make sure a positive connection is made. A snap should be felt when a good connection is made.
4. Refer to Spark Plug Cable Removal for additional information.

SWITCH-IGNITION

DESCRIPTION

The ignition switch (1) is located on the steering column. It is used as the main on/off switching device for most electrical components. The mechanical key cylinder is used to engage/disengage the electrical ignition switch.



OPERATION

Vehicles equipped with an automatic transmission and a steering column mounted shifter: an interlock device is located within the shift cable. This interlock device is used to lock the transmission shifter in the PARK position when the key cylinder is in any position and the brake pedal is not depressed.

DIAGNOSIS AND TESTING

IGNITION SWITCH

TEST AND REPAIR

If the key removal effort is excessive on a vehicle with a automatic transmission first adjust the shift linkage, (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 46RE/GEAR SHIFT CABLE - ADJUSTMENTS).

If the ignition switch effort is excessive remove the ignition key cylinder from the steering column. (Refer to 19 - STEERING/COLUMN/LOCK CYLINDER HOUSING - REMOVAL). Check the turning effort of the key cylinder. If the ignition key cylinder effort is excessive replace the key cylinder. If the ignition key cylinder operates properly look for the following conditions.

REMOVAL

SERVICE PRECAUTIONS

Safety goggles should be worn at all times when working on steering columns.

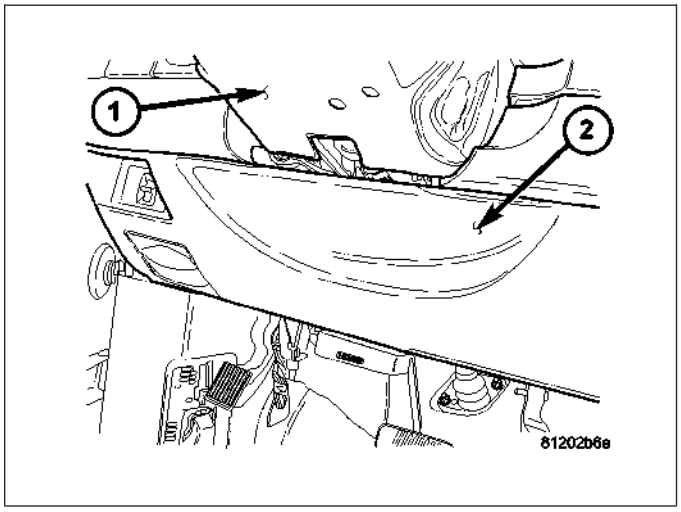
To service the steering wheel, switches or airbag, Refer to Electrical Restraints and follow all WARNINGS and CAUTIONS.

WARNING: THE AIRBAG SYSTEM IS A SENSITIVE, COMPLEX ELECTRO-MECHANICAL UNIT. BEFORE ATTEMPTING TO DIAGNOSE, REMOVE OR INSTALL THE AIRBAG SYSTEM COMPONENTS YOU MUST FIRST DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE. THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE. FAILURE TO DO SO COULD RESULT IN ACCIDENTAL DEPLOYMENT OF THE AIRBAG AND POSSIBLE PERSONAL INJURY. THE FASTENERS, SCREWS, AND BOLTS, ORIGINALLY USED FOR THE AIRBAG COMPONENTS, HAVE SPECIAL COATINGS AND ARE SPECIFICALLY DESIGNED FOR THE AIRBAG SYSTEM. THEY MUST NEVER BE REPLACED WITH ANY SUBSTITUTES. ANYTIME A NEW FASTENER IS NEEDED, REPLACE WITH THE CORRECT FASTENERS PROVIDED IN THE SERVICE PACKAGE OR FASTENERS LISTED IN THE PARTS BOOKS.

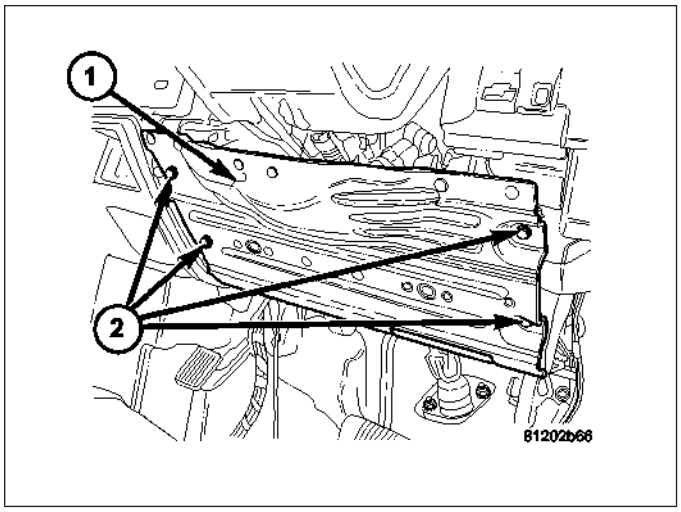
CAUTION: Do not hammer on steering column shaft. This may cause damage to the shaft or bearing.

CAUTION: Do not attempt to remove the pivot bolts to disassemble the tilting mechanism.

1. Remove the steering column opening cover (2).

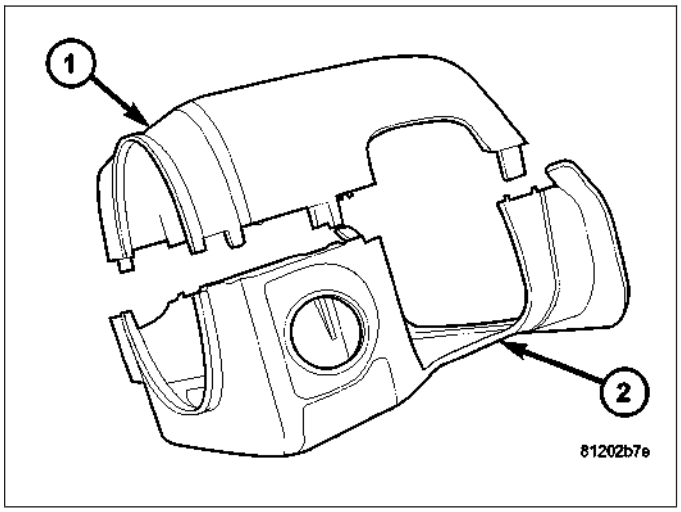


2. Remove the steering column opening reinforcement (1).



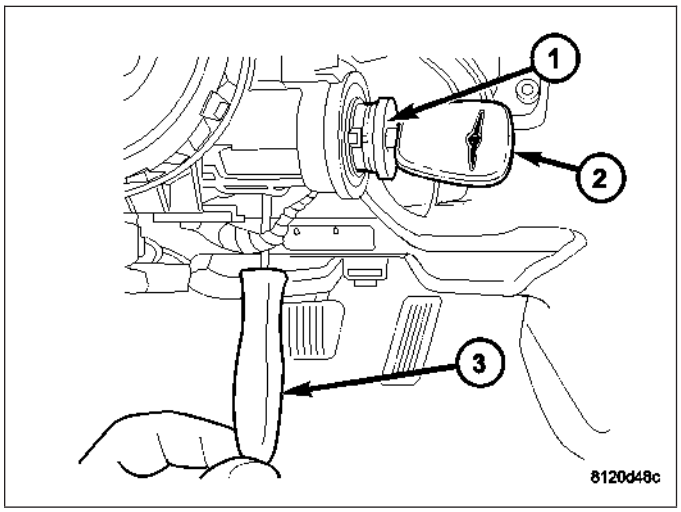
The ignition key must be in the key cylinder for cylinder removal. The key cylinder must be removed first before removing ignition switch.

3. Remove the negative (ground) cable from the battery.
4. Disable the airbag, (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - REMOVAL).

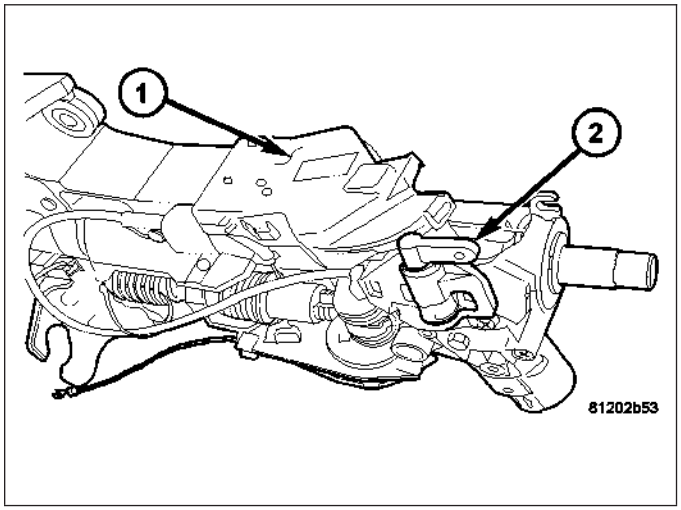


5. Remove the lower and upper shrouds (1&2).

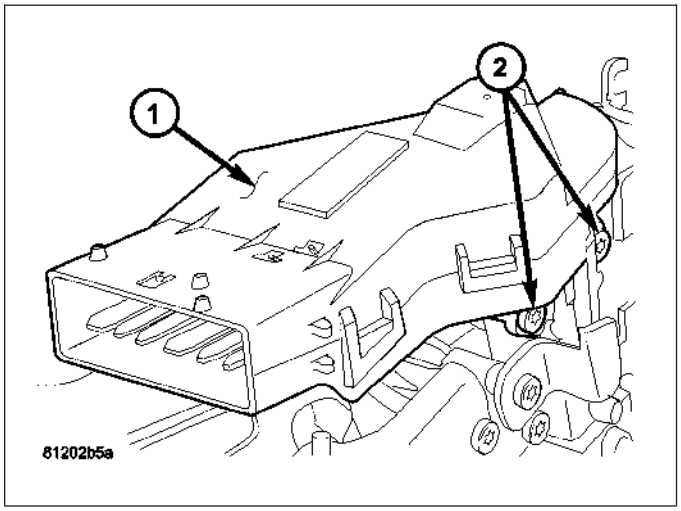
6. Remove key cylinder. (Refer to 19 - STEERING/ COLUMN/LOCK CYLINDER HOUSING - REMOVAL).



7. Disconnect the lower clockspring connectors.
8. Remove the wire retainer from the tilt lever bracket (2).
9. Remove the tilt lever mounting screws to gain access to the ignition switch mounting screws.

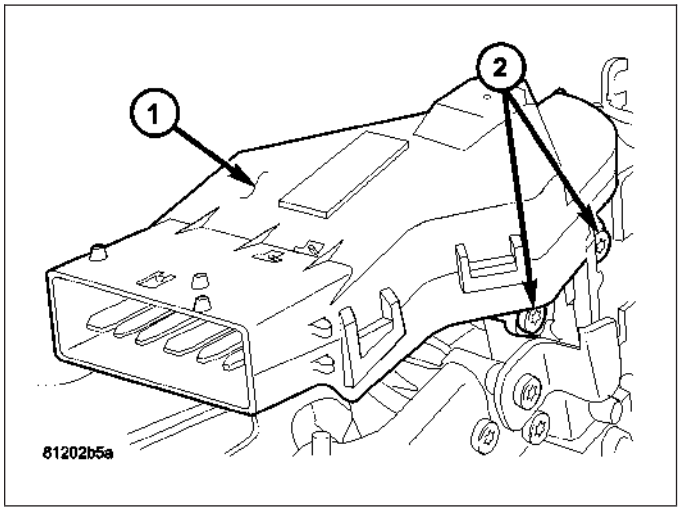


10. Disconnect the electrical connector at rear of ignition switch (1).
11. Remove ignition switch mounting screws (2).
12. Using a small screwdriver, push on locking tab and remove switch from steering column.

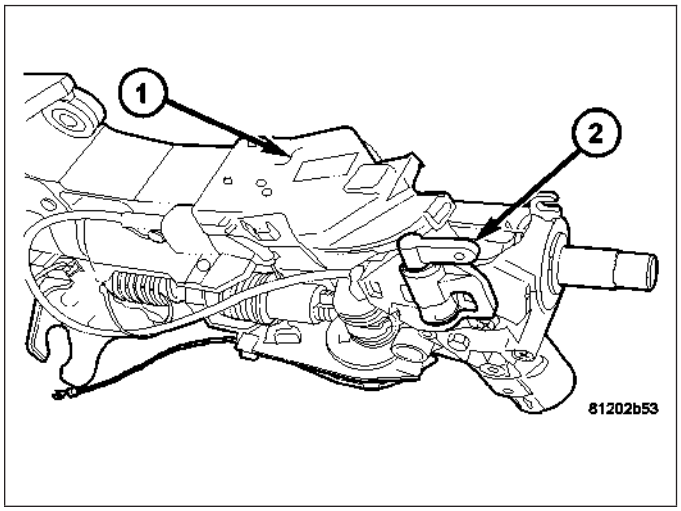


INSTALLATION

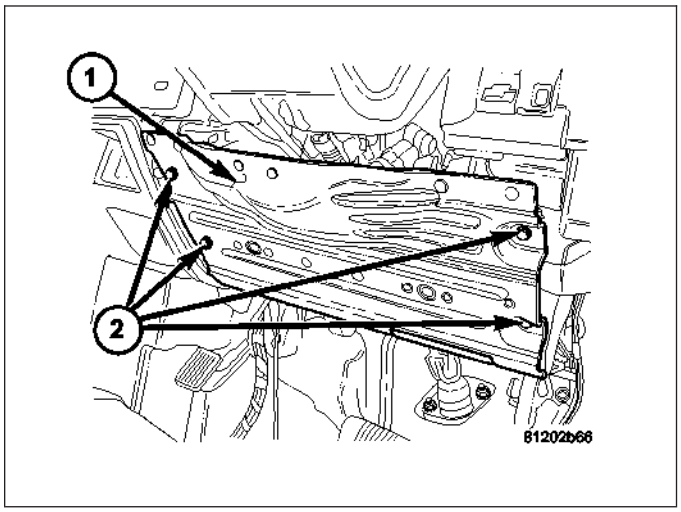
1. Before installing ignition switch (1), rotate the slot in the switch to the ON position.
2. Connect the electrical connector to rear of the ignition switch. Make sure that locking tabs are fully seated into wiring connector.
3. Position switch to column and install the mounting screws (2). Tighten screw to 3 N·m (26 in. lbs.).



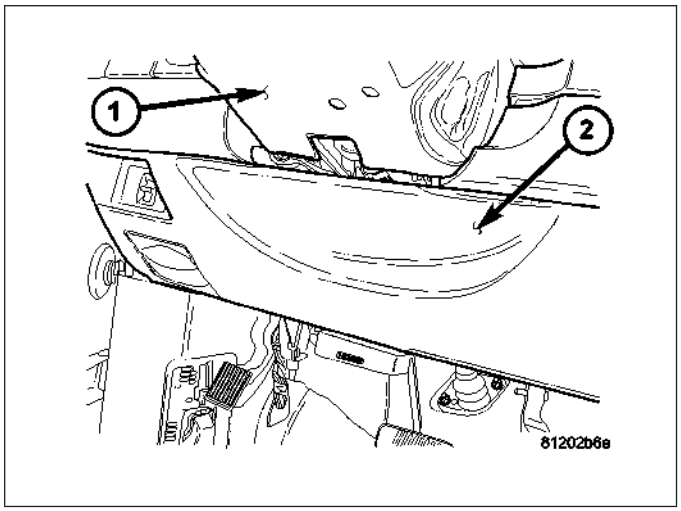
4. Install the tilt lever bracket (2) mounting screws. Tighten screws to 4.5 N·m (40 in. lbs.).
5. Position the wire retainer into the tilt lever bracket.
6. Reconnect the lower clockspring connectors.



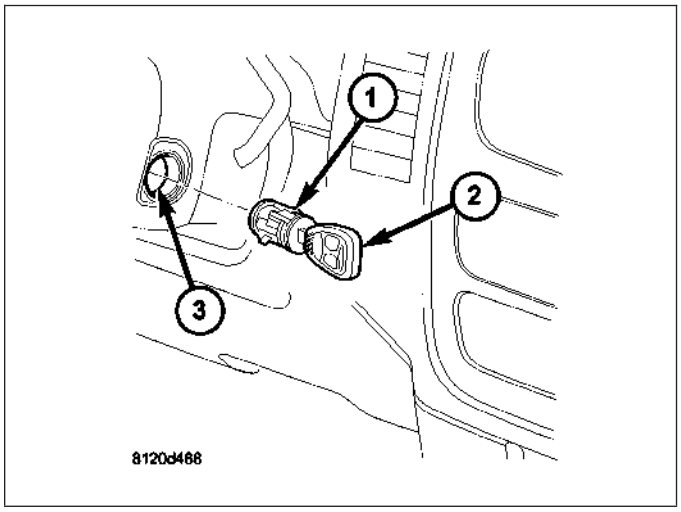
7. Install the steering column opening reinforcement (1).



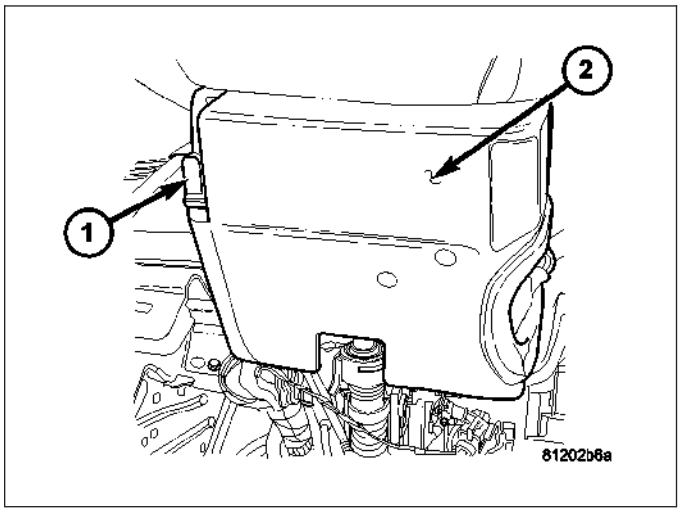
8. Install the steering column opening cover (2).



9. Install the key cylinder (1) with the key (2) in the cylinder (1).



10. Install steering column upper and lower shrouds (2).
11. Install the tilt lever knob (1).
12. Enable the airbag system. (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - INSTALLATION).



SWITCH-KEY-IN IGNITION

DESCRIPTION

The key-in ignition switch is integral to the ignition switch, which is mounted on the left side of the steering column. It closes a path to ground for the Central Timer Module (CTM) when the ignition key is inserted in the ignition key cylinder and the driver door ajar switch is closed (driver door is open). The key-in ignition switch opens the ground path when the key is removed from the ignition key cylinder. The ground path is also opened when the driver door ajar switch is open (driver door is closed).

The key-in ignition switch cannot be repaired and, if faulty or damaged, the entire ignition switch must be replaced, (Refer to 19 - STEERING/COLUMN/IGNITION SWITCH - REMOVAL).

DIAGNOSIS AND TESTING

IGNITION SWITCH AND KEY LOCK CYLINDER

ELECTRICAL DIAGNOSIS

For ignition switch electrical schematics, refer to the appropriate section in Wiring Diagrams.

MECHANICAL DIAGNOSIS (KEY DIFFICULT TO ROTATE)

Vehicles equipped with an automatic transmission and a steering column mounted shifter: an interlock device is located within the steering column. This interlock device is used to lock the transmission shifter in the PARK position when the key cylinder is in any position and the brake pedal is not depressed.

Vehicles equipped with a manual transmission and a floor mounted shifter: on certain models, a lever is located on the steering column behind the ignition key cylinder. The lever must be manually operated to allow rotation of the ignition key cylinder to any position. If it is difficult to rotate the key to any position, the lever mechanism may be defective. This mechanism is not serviceable. If repair is necessary, the steering column assembly must be replaced. (Refer to 19 - STEERING/COLUMN - REMOVAL).

INSTRUMENT CLUSTER

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INSTRUMENT CLUSTER - ELECTRICAL DIAGNOSTICS

DIAGNOSIS AND TESTING

B1200-AIRBAG WARNING INDICATOR CIRCUIT LOW

For a complete wiring diagram **Refer to section 8W**.

- **When Monitored:**
  With the ignition on and when requested to turn on by the Occupant Restraint Controller (ORC).
- **Set Condition:**
  The Instrument Cluster software detects the voltage across the Airbag Lamp is below 0.3 volts when ON.

Possible Causes
INSTRUMENT CLUSTER

Diagnostic Test

1. CHECK THE INSTRUMENT CLUSTER FOR DTC B1200-AIRBAG WARNING INDICATOR CIRCUIT LOW

NOTE: The Instrument Cluster performs internal tests on the Airbag Lamp during each ignition cycle.

With the scan tool, erase DTCs.

Turn the ignition off, wait 10 seconds, then turn the ignition on.

Wait for the Instrument Cluster to perform the bulb check.

With the scan tool, read DTCs.

Did the DTC B1200-AIRBAG WARNING INDICATOR CIRCUIT LOW reset?

Yes >> Replace and program the Instrument Cluster in accordance with the Service Information.
Perform the BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Test complete.

B1201-AIRBAG WARNING INDICATOR CIRCUIT HIGH

For a complete wiring diagram **Refer to section 8W**.

- **When Monitored:**
  With the ignition on and when requested to turn on by the Occupant Restraint Controller (ORC).
- **Set Condition:**
  The Instrument Cluster software detects the voltage across the Airbag Lamp is above 5.0 volts when ON.

Possible Causes
INSTRUMENT CLUSTER

Diagnostic Test

1. CHECK THE INSTRUMENT CLUSTER FOR DTC B1201-AIRBAG WARNING INDICATOR CIRCUIT HIGH

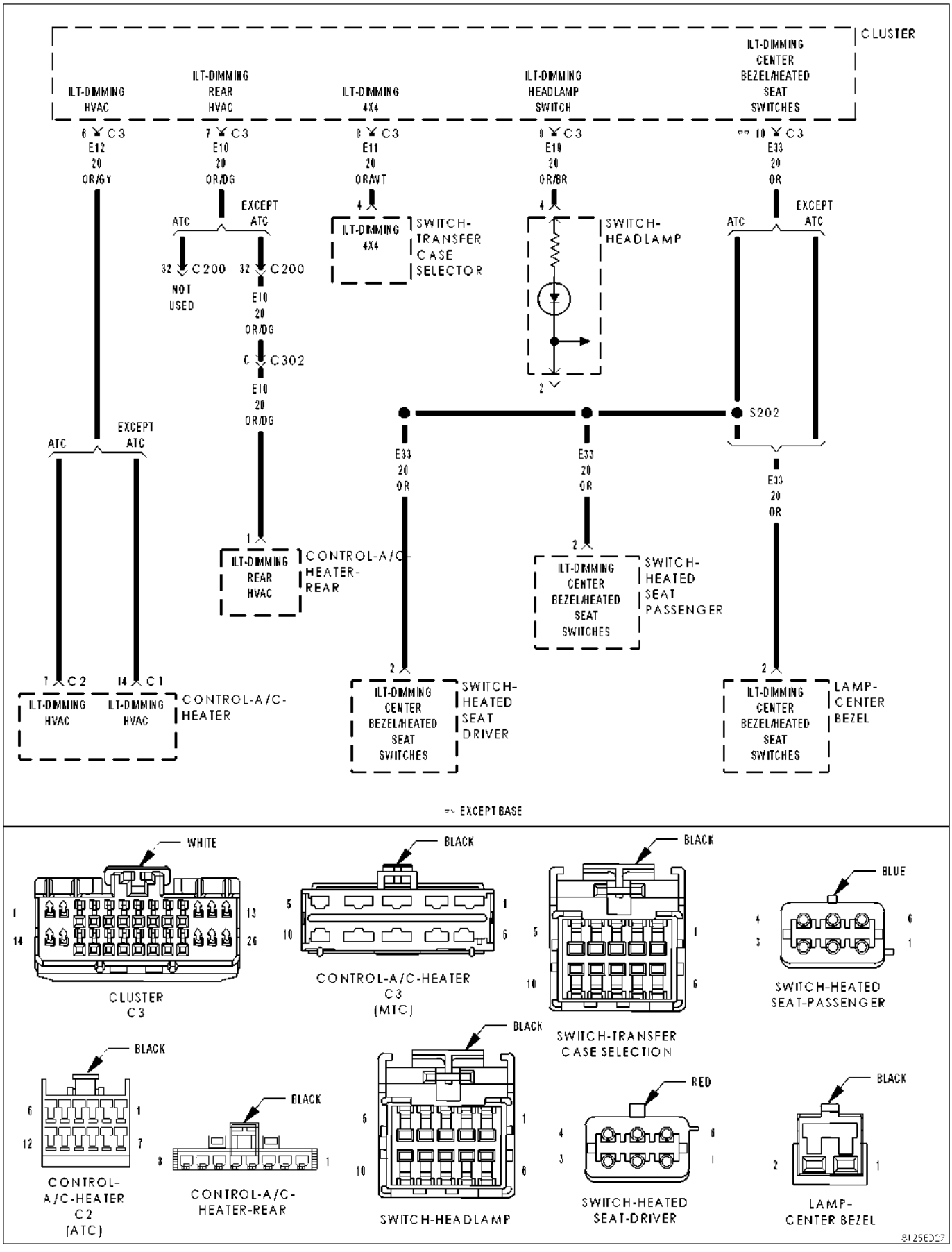
NOTE: The Instrument Cluster performs internal tests on the Airbag Lamp during each ignition cycle.
With the scan tool, erase DTCs.
Turn the ignition off, wait 10 seconds, then turn the ignition on.
Wait for the Instrument Cluster to perform the bulb check.
With the scan tool, read DTCs.

Did the DTC B1201-AIRBAG WARNING INDICATOR CIRCUIT HIGH reset?

Yes >> Replace and program the Instrument Cluster in accordance with the Service Information.
Perform the BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Test complete.

B1613-PANEL ILLUMINATION CONTROL CIRCUIT LOW



B1613-PANEL ILLUMINATION CONTROL CIRCUIT LOW (CONTINUED)

For the Instrument Cluster circuit diagram (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Instrument Cluster detects a short to ground condition on the Panel Illumination circuit.

Possible Causes
PANEL LAMPS DIMMER CIRCUIT SHORTED TO GROUND
DIMMED COMPONENT INTERNALLY SHORTED
INSTRUMENT CLUSTER

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase DTCs.

Turn the ignition off, wait 10 seconds then turn the ignition on.

Turn the headlamps on.

With the scan tool, read DTCs.

Does the scan tool display: B1613-PANEL ILLUMINATION CONTROL CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused this code to set is not present at this time. Using the wiring diagram as a guide, inspect the wiring and connectors for an intermittent condition. Operate the system several times and recheck for active DTCs.

Perform the BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

---

2. INTERNALLY SHORTED DIMMED COMPONENT

Turn the ignition on.

With the scan tool, erase Instrument Cluster DTCs.

Turn the ignition off.

Using the wiring diagrams as a guide, disconnect each dimmed component one at a time while checking for the DTC to reset.

Turn the ignition on.

Turn the headlamps on.

With the scan tool, read DTCs.

Does the scan tool display B1613-PANEL ILLUMINATION CONTROL CIRCUIT LOW?

Yes >> Go To 3

No >> Replace the shorted component as necessary.

Perform the BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

B1613-PANEL ILLUMINATION CONTROL CIRCUIT LOW (CONTINUED)

3. PANEL LAMPS DIMMING CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Instrument Cluster C3 harness connector.

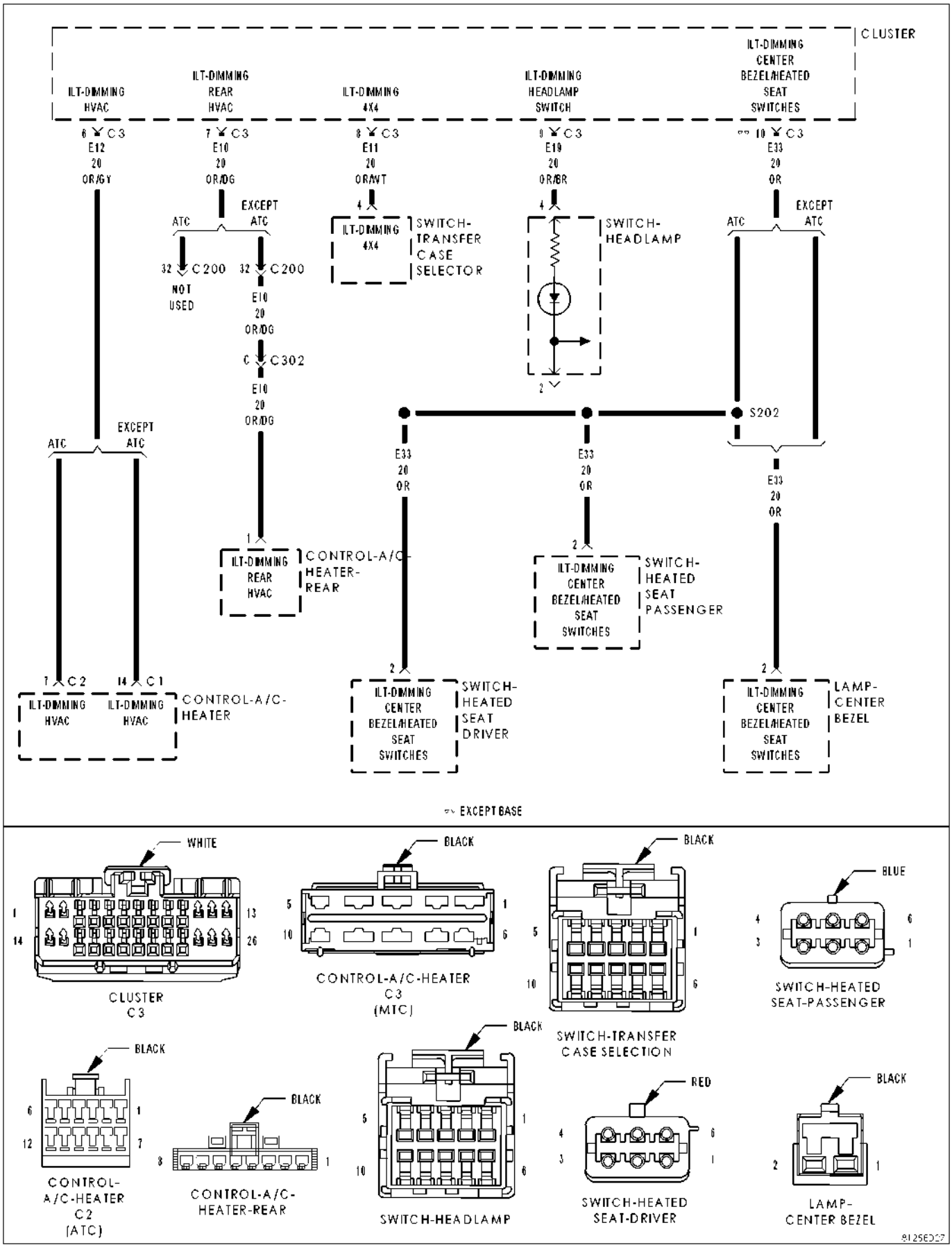
Using the wiring diagram as a guide, disconnect each dimmed component and measure the resistance of the Panel Illumination Control Circuits from the Cluster C3 harness connector to ground.

Was there a short to ground condition found?

Yes >> Repair the correct Panel Illumination Circuit for a short to ground.
Perform the BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Replace the Instrument Cluster in accordance with the Service Information.
Perform the BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

B1615-PANEL ILLUMINATION CONTROL CIRCUIT OPEN



B1615-PANEL ILLUMINATION CONTROL CIRCUIT OPEN (CONTINUED)

For the Instrument Cluster circuit diagram (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Instrument Cluster detects an all open condition on the Panel Illumination Control circuits.

Possible Causes
ALL PANEL ILLUMINATON CIRCUITS OPEN
INSTRUMENT CLUSTER

Theory of Operation

The Panel Illumination Control Circuits share a common 12 volt driver from the Instrument Cluster. In order for this DTC to be set, ALL Panel Illumination circuits must be open.

Diagnostic Test

1. TEST FOR AN INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase DTCs.

Turn the ignition off, wait 10 seconds then turn the ignition on.

Turn the headlamps on.

With the scan tool, read DTCs.

Does the scan tool display: B1615-PANEL ILLUMINATION CONTROL CIRCUIT OPEN?

Yes >> Go To 2

No >> The condition that caused this code to set is not present at this time. Using the wiring diagram as a guide, inspect the wiring and connectors for an intermittent condition. Operate the system several times and recheck for active DTCs.

Perform the BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

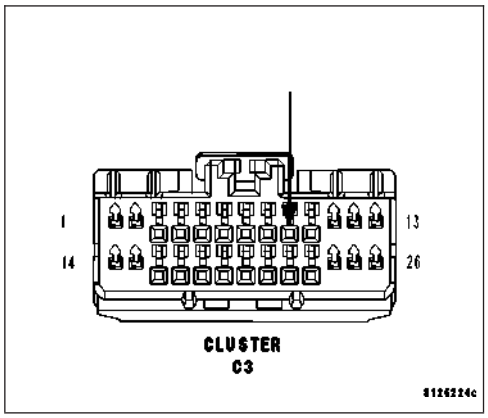
B1615-PANEL ILLUMINATION CONTROL CIRCUIT OPEN (CONTINUED)

2. CHECK CONDITION OF THE WIRING AND CONNECTORS ASSOCIATED WITH THE PANEL ILLUMINATION OUTPUT CIRCUITS

Turn the ignition off.

Disconnect the Instrument Cluster C3 harness connector and inspect the connector and associated wiring for the Panel Illumination System.

Using a fused jumper wire, probe cavity 9 of the Instrument Cluster C3 connector.



Did the illumination of the Headlamp Switch illuminate?

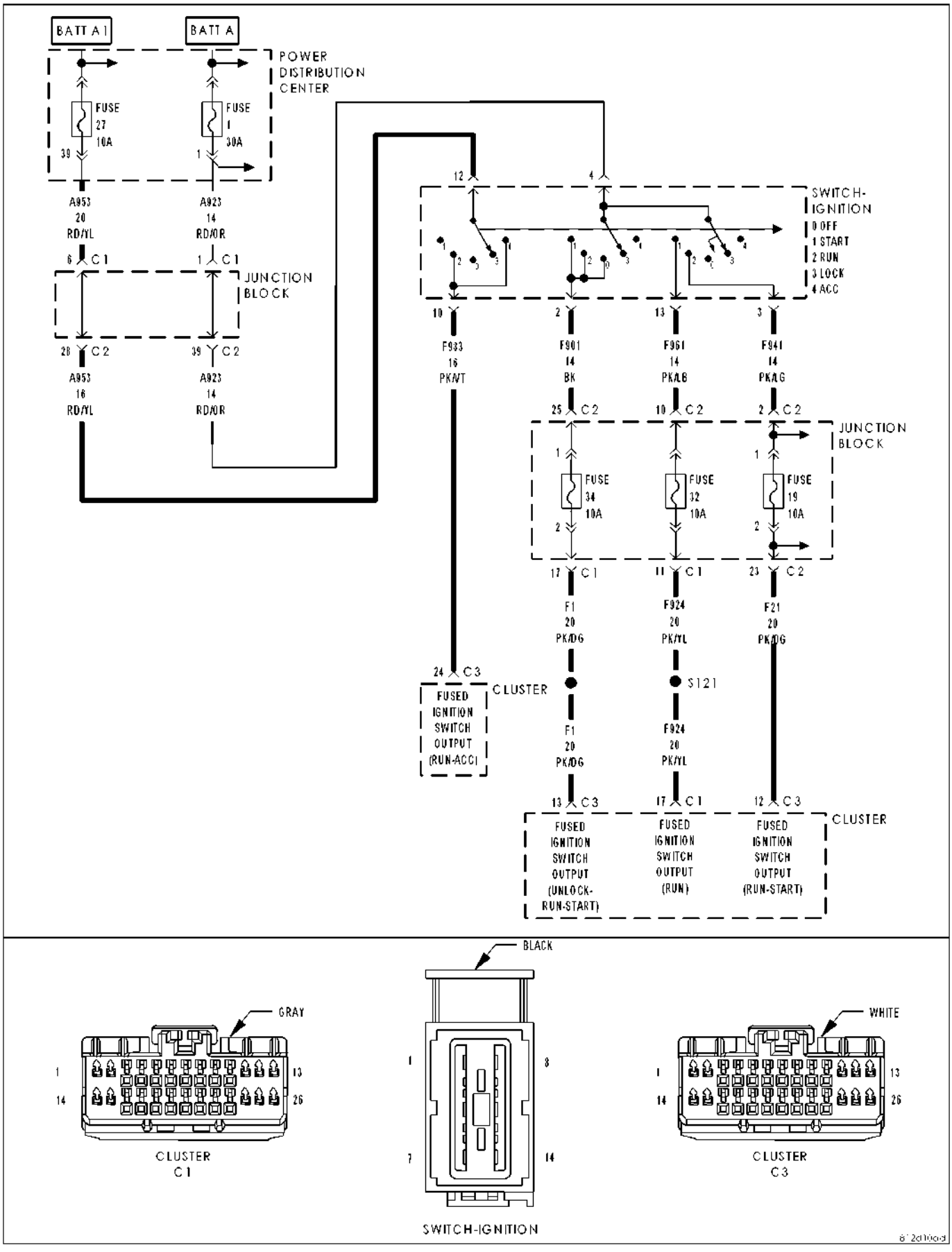
Yes >> Replace the Instrument Cluster in accordance with the Service Information.

Perform the BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Repair the faulty wire(s)/connector(s).

Perform the BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

B2107–IGNITION SWITCH SENSE INPUT CIRCUIT/PERFORMANCE



B2107–IGNITION SWITCH SENSE INPUT CIRCUIT/PERFORMANCE (CONTINUED)

For the Instrument Cluster circuit diagram (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Cluster detects an Ignition Switch performance fault.

Possible Causes
OPEN IGNITION SWITCH OUTPUT FUSE(S)
(F21) IGNITION SWITCH OUTPUT (OFF/RUN/START) CIRCUIT OPEN OR SHORTED TO GROUND
(F1) IGNITION SWITCH OUTPUT (UNLOCK/RUN/START) CIRCUIT OPEN OR SHORTED TO GROUND
(F924) IGNITION SWITCH OUTPUT (RUN) CIRCUIT OPEN OR SHORTED TO GROUND
(F983) IGNITION SWITCH OUTPUT (RUN/ACC) CIRCUIT OPEN OR SHORTED TO GROUND
(A953) IGNITION (RUN/ACC) CIRCUIT OPEN OR SHORTED TO GROUND
IGNITION SWITCH
INSTRUMENT CLUSTER

Diagnostic Test

1. TEST FOR AN INTERMITTENT CONDITION

NOTE: Troubleshoot any Ignition, Battery, or Cluster DTCs before proceeding.

Turn the ignition on.

Using the scan tool, record and erase DTCs.

Turn the ignition off, wait 10 seconds then turn the ignition on.

Using the scan tool, read DTCs.

Does the scan tool display: B2107–IGNITION SWITCH SENSE INPUT CIRCUIT/PERFORMANCE?

Yes >> Go To 2

No >> The condition that caused this code to set is not present at this time. Using the wiring diagram as a guide, inspect the wiring and connectors for an intermittent condition. Operate the system several times and recheck for active DTCs.

Perform the BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

B2107–IGNITION SWITCH SENSE INPUT CIRCUIT/PERFORMANCE (CONTINUED)

2. CHECK FOR OPEN IGNITION SWITCH OUTPUT FUSES

Turn the ignition off.

Using the wiring/circuit diagrams, check the following fuses for an open:

- PDC fuse #27
- PDC fuse # 1
- JB fuse #9
- JB fuse #19
- JB fuse #34

Are any of the fuses open?

Yes >> Go To 3

No >> Go To 4

---

3. CHECK FOR OPEN IGNITION SWITCH OUTPUT FUSES

Replace the open fuse(s).

Cycle the ignition through ALL positions.

Turn the ignition off.

Check each fuse that was replaced for an open.

NOTE: Perform the diagnostic procedure for each fuse that is open before making any repairs. Doing so will identify all possible conditions causing this DTC to set.

Was any replaced fuse open? (Select from the following)

PDC fuse #27
Go To 9

JB fuse #19
Go To 12

JB fuse #34
Go To 13

JB fuse #9
Go To 14

PDC fuse #1
Go To 15

No fuses open
The condition that caused the fuse(s) to open is not present at this time. Using the wiring diagram as a guide, inspect the wiring and connectors for an intermittent condition. Operate the system several times and recheck for active DTCs.

Perform the BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

B2107–IGNITION SWITCH SENSE INPUT CIRCUIT/PERFORMANCE (CONTINUED)

4. CHECK VOLTAGE OF THE IGNITION SWITCH OUTPUT CIRCUITS AT THE INSTRUMENT CLUSTER C1 AND C3 CONNECTORS

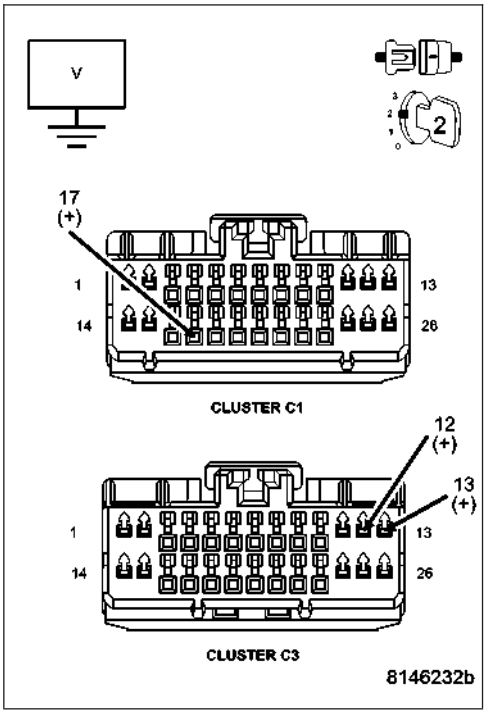
NOTE: Remove the starter relay.
Disconnect the Instrument Cluster C1 and C3 harness connectors.
Turn the ignition on.
Measure the voltage of the following circuits:

- (F21) Ignition Switch Output (RUN/START) circuit with the ignition in the RUN, and START positions.
- (F1) Ignition Switch Output (UNLOCK/RUN/START) circuit with the ignition in the RUN and START positions.
- (F924) Ignition Switch Output (RUN) circuit with the ignition in the RUN position.

Is the voltage above 10.0 volts on each circuit?

Yes >> Go To 5

No >> Go To 5



5. CHECK VOLTAGE OF THE (F983) IGNITION SWITCH OUTPUT (RUN/ACC) CIRCUIT AT THE INSTRUMENT CLUSTER C3 HARNESS CONNECTOR

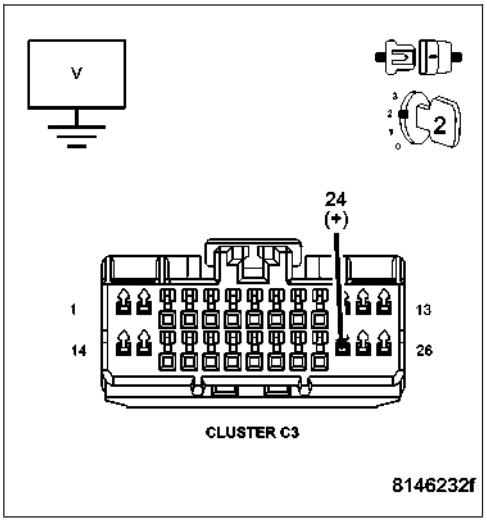
NOTE: Reinstall the Starter Relay.
Measure the voltage of the (F983) Ignition Switch Output (RUN/ACC) circuit.

Is the voltage above 10.0 volts on all the circuits tested in steps 4 and 5?

Yes >> Replace the Instrument Cluster in accordance with the service information.
Perform the BODY VERIFICATION TEST-VER 1.

No: (F21) (F924) or (F1) below 10.0 volts
Go To 6

No: (F983) below 10.0 volts
Go To 7



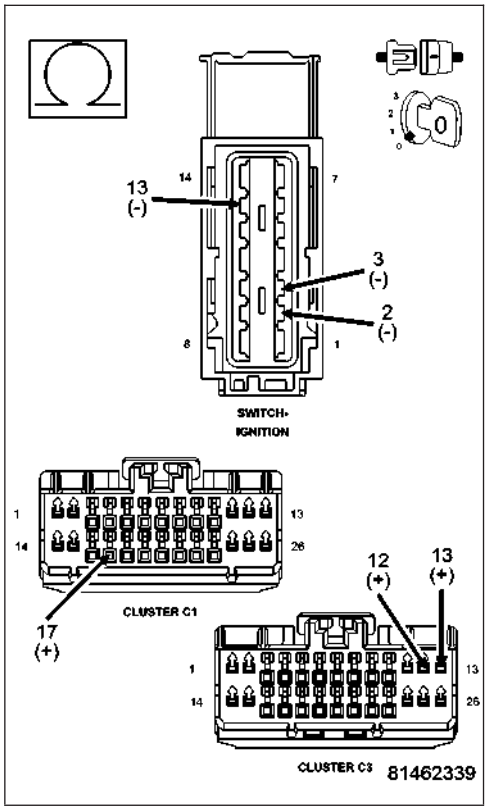
B2107–IGNITION SWITCH SENSE INPUT CIRCUIT/PERFORMANCE (CONTINUED)

6. CHECK THE IGNITION SWITCH OUTPUT CIRCUITS WITH VOLTAGE BELOW 10.0 VOLTS FOR AN OPEN

Turn the ignition off.

Disconnect the Ignition Switch harness connector.

Measure the resistance of the Ignition Switch Output circuit(s) (F21), (F924), (F1) (from step 5, the circuit(s) below 10.0 volts) between the Ignition Switch harness connector and the Instrument Cluster C1/C3 harness connector.



Is the resistance below 5.0 ohms?

Yes >> Replace the Ignition Switch in accordance with the service information.

Perform the BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Repair the circuit(s) with a resistance above 5.0 ohms.

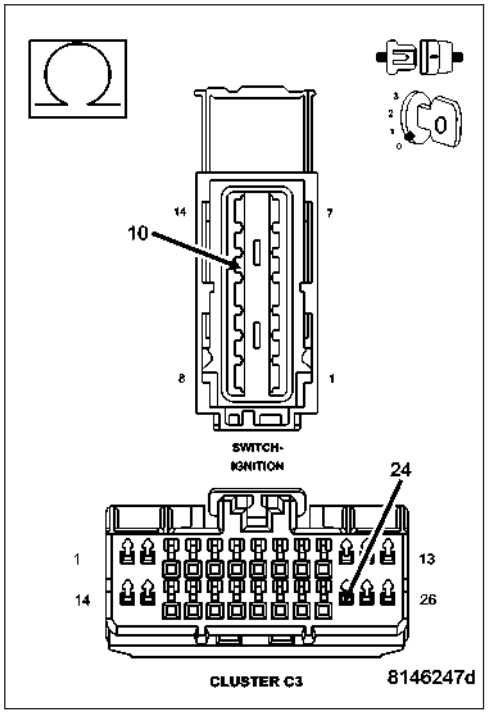
Perform the BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

7. CHECK THE (F983) IGNITION SWITCH OUTPUT (RUN/ACC) CIRCUIT FOR AN OPEN

Turn the ignition off.

Disconnect the Ignition Switch harness connector.

Measure the resistance of the (F983) Ignition Switch Output (RUN/ ACC) circuit between the Ignition Switch harness connector and the Instrument Cluster C3 harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go To 8

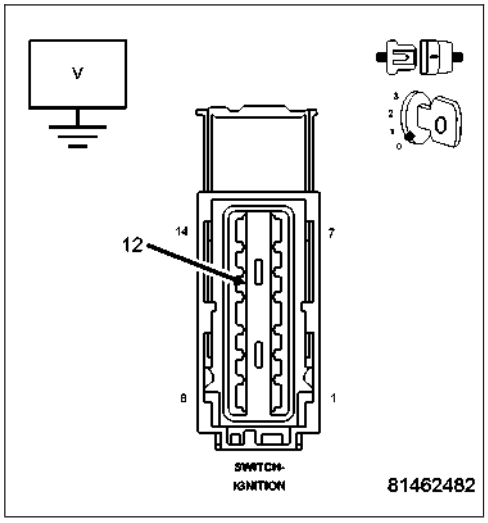
No >> Repair the (F983) Ignition Switch Output (RUN/ACC) circuit for an open.

Perform the BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

B2107–IGNITION SWITCH SENSE INPUT CIRCUIT/PERFORMANCE (CONTINUED)

8. CHECK VOLTAGE OF THE (A953) IGNITION (RUN/ACC) CIRCUIT AT THE IGNITION SWITCH HARNESS CONNECTOR

Measure the voltage of the (A953) Ignition (RUN/ACC) circuit.



Is the voltage above 10.0 volts?

Yes >> Replace the Ignition Switch in accordance with the service information.
Perform the BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

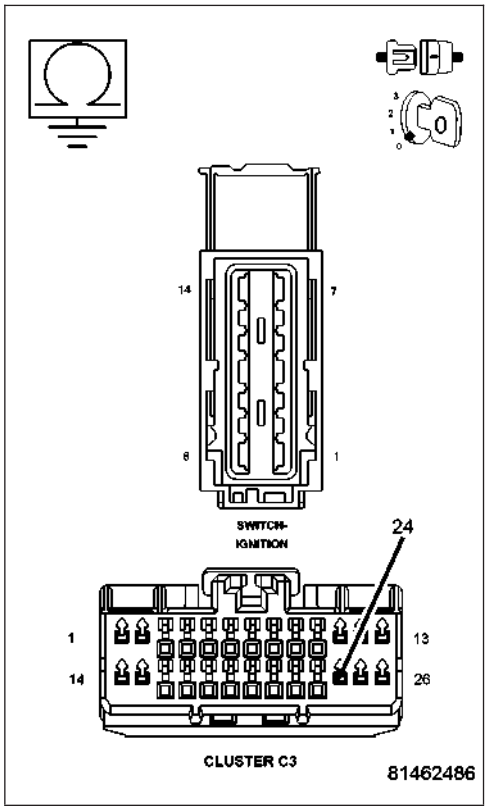
No >> Repair the (A953) Ignition (RUN/ACC) circuit for an open.
Perform the BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

9. CHECK (F983) IGNITION SWITCH OUTPUT (RUN/ACC) CIRCUIT FOR A SHORT TO GROUND

Disconnect the Ignition Switch harness connector.

Disconnect the Instrument Cluster C3 harness connector.

Measure the resistance between ground and the (F983) Ignition Switch Output (RUN/ACC) circuit at the Ignition Switch harness connector.



Is the resistance below 10K ohms?

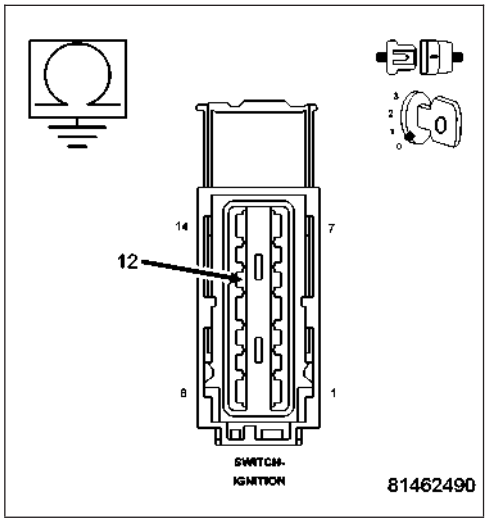
YES >> Repair the (F983) Ignition Switch Output (RUN/ACC) circuit for a short to ground.
Perform the BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

NO >> Go To 10

B2107–IGNITION SWITCH SENSE INPUT CIRCUIT/PERFORMANCE (CONTINUED)

10. CHECK (A953) IGNITION SWITCH OUTPUT (RUN/ACC) CIRCUIT FOR A SHORT TO GROUND

Measure the resistance between ground and the (A953) Ignition Switch Output (RUN/ACC) circuit at the Ignition Switch harness connector.



Is the resistance below 10K ohms?

YES >> Repair the (A953) Ignition Switch Output (RUN/ACC) circuit for a short to ground.

Perform the BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

NO >> Go To 11

11. CHECK THE INSTRUMENT CLUSTER FOR A SHORT TO GROUND

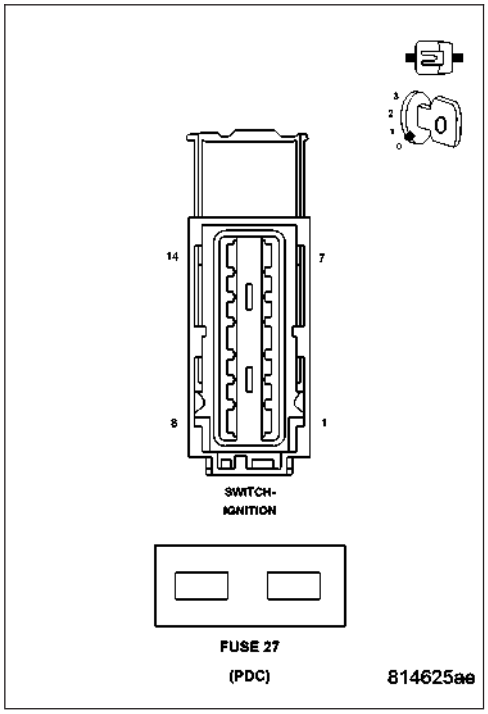
Reconnect the Ignition Switch harness connector.

Replace PDC fuse #27 for the (A953) Ignition Switch Output (RUN/ ACC) circuit.

Cycle the ignition switch through all positions.

Turn the ignition off.

Check the PDC fuse #27 for the (A953) Ignition Switch Output (RUN/ ACC) circuit.



Is the fuse open?

YES >> Replace the Ignition Switch in accordance with the service information.

Perform the BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

NO >> Replace the Instrument Cluster in accordance with the service information

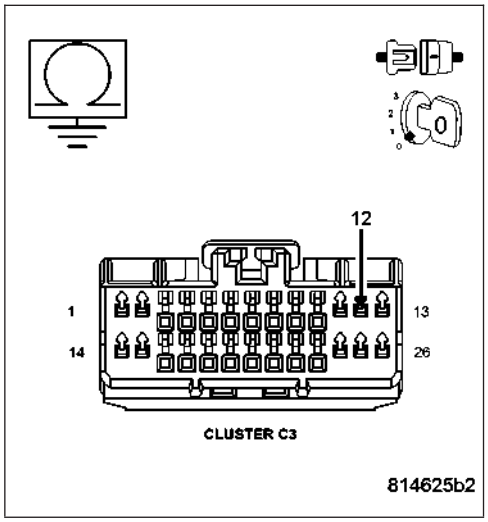
Perform the BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

B2107–IGNITION SWITCH SENSE INPUT CIRCUIT/PERFORMANCE (CONTINUED)

12. CHECK (F21) IGNITION SWITCH OUTPUT (RUN/START) CIRCUIT FOR A SHORT TO GROUND

Disconnect the Instrument Cluster C3 harness connector.

Measure the resistance between ground and the (F21) Ignition Switch Output (RUN/START) circuit.



Is the resistance below 10K ohms?

YES >> Repair the (F21) Ignition Switch Output (RUN/START) circuit for a short to ground.

Perform the BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

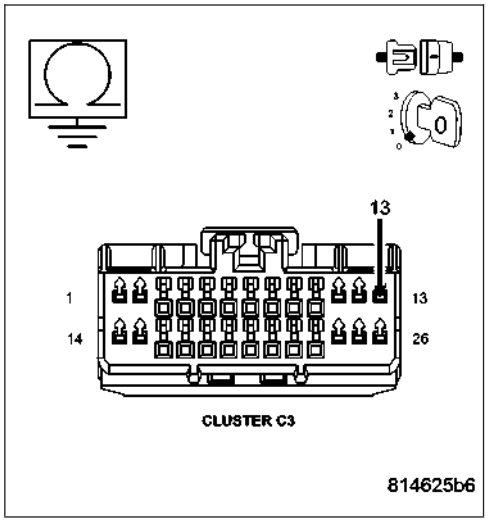
NO >> Replace the Instrument Cluster in accordance with the service information.

Perform the BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

13. CHECK (F1) IGNITION SWITCH OUTPUT (OFF/RUN/START) CIRCUIT FOR A SHORT TO GROUND

Disconnect the Instrument Cluster C3 harness connector.

Measure the resistance between ground and the (F1) Ignition Switch Output (OFF/RUN/START) circuit.



Is the resistance below 10K ohms?

YES >> Repair the (F1) Ignition Switch Output (OFF/RUN/START) for a short to ground.

Perform the BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

NO >> Replace the Instrument Cluster in accordance with the service information.

Perform the BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

B2107–IGNITION SWITCH SENSE INPUT CIRCUIT/PERFORMANCE (CONTINUED)

14. CHECK (F924) IGNITION SWITCH OUTPUT (RUN) CIRCUIT FOR A SHORT TO GROUND

Disconnect the Instrument Cluster C1 harness connector.

Measure the resistance between ground and the (F924) Ignition Switch Output (RUN) circuit.

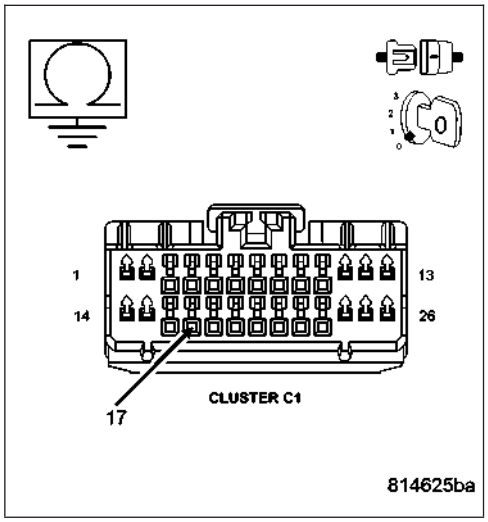
Is the resistance below 10K ohms?

YES >> Repair the (F924) Ignition Switch Output (RUN) circuit for a short to ground.

Perform the BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

NO >> Replace the Instrument Cluster in accordance with the service information.

Perform the BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)



15. CHECK (A923) FUSED B+ CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

Disconnect the Ignition Switch harness connector.

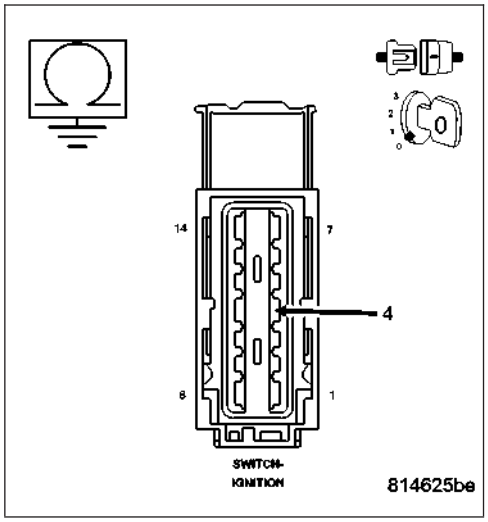
Measure the resistance between ground and the (A923) Fused B+ circuit.

Is the resistance below 10K ohms?

YES >> Repair the (A923) Fused B+ circuit for a short to ground.

Perform the BODY VERIFICATION TEST-VER 1.

NO >> Go To 16

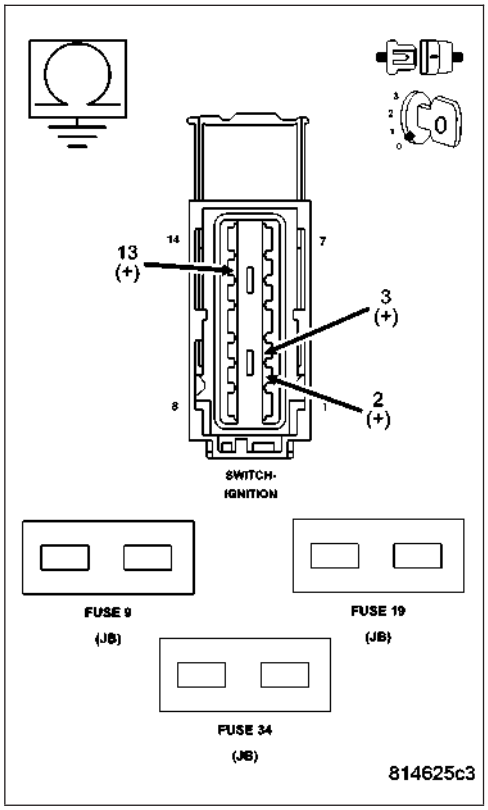


B2107–IGNITION SWITCH SENSE INPUT CIRCUIT/PERFORMANCE (CONTINUED)

16. CHECK CIRCUITS F901, F941, F961 FOR A SHORT TO GROUND

Remove JB fuses: 9, 19, 34.

Using the wiring diagrams, measure the resistance between ground and the F901, F941, F961 circuits.



Is the resistance below 10K ohms on any one of these circuits?

YES >> Repair the appropriate circuit for a short to ground.

Perform the BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

NO >> Replace the Ignition Switch in accordance with the service information.

Perform the BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

B2213–CABIN COMPARTMENT NODE/CLUSTER INTERNAL

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Instrument Cluster detects an internal failure.

Possible Causes
INSTRUMENT CLUSTER

Diagnostic Test

1. VERIFY INSTRUMENT CLUSTER OPERATION

NOTE: When this DTC is active and the Instrument Cluster Backlighting is inoperative, the Instrument Cluster must be replaced.

Is DTC: B2213–CABIN COMPARTMENT NODE/CLUSTER INTERNAL active AND the Instrument Cluster Backlighting inoperative?

YES >> Replace the Instrument Cluster in accordance with the service information.
Perform the BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

NO >> Disregard DTC, test complete.

B222C-VEHICLE CONFIGURATION NOT PROGRAMMED

For the Instrument Cluster circuit diagram (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  Vehicle configuration information not programmed into the Instrument Cluster.

POSSIBLE CAUSES
NO COMMUNICATION WITH FRONT CONTROL MODULE
ACTIVE FCM DTCs
INSTRUMENT CLUSTER
FRONT CONTROL MODULE

Diagnostic Test

1. TEST FOR AN INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase any Instrument Cluster DTCs.
Turn the ignition off, wait 10 seconds then turn the ignition on.
With the scan tool, read DTCs.

Does the scan tool display: B222C-VEHICLE CONFIGURATION NOT PROGRAMMED?

Yes >> Go To 2

No >> The condition that caused this code to set is not present at this time. Using the wiring diagram as a guide, inspect the wiring and connectors for an intermittent condition. Operate the system several times and recheck for active DTCs.
Perform the BODY VERIFICATION TEST VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

---

2. VERIFY COMMUNICATION WITH FRONT CONTROL MODULE

With the scan tool in ECU VIEW, read active modules on the bus.

Does the scan tool show the Front Control Module active on the bus?

Yes >> Go To 3

No >> Refer to the Communication category for the related symptoms.
Perform the BODY VERIFICATION TEST VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

B222C-VEHICLE CONFIGURATION NOT PROGRAMMED (CONTINUED)

3. CHECK FRONT CONTROL MODULE FOR ACTIVE DTCS

With the scan tool, erase FCM DTCs.

Turn the ignition off. Wait approximately 10 seconds.

Turn the ignition on.

With the scan tool, read FCM DTCs.

Are any active DTCs present?

Yes >> Refer to symptom list for problems related to the Front Control Module.
Perform the BODY VERIFICATION TEST VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go To 4

---

4. CHECK CLUSTER VEHICLE INFORMATION WITH SCAN TOOL

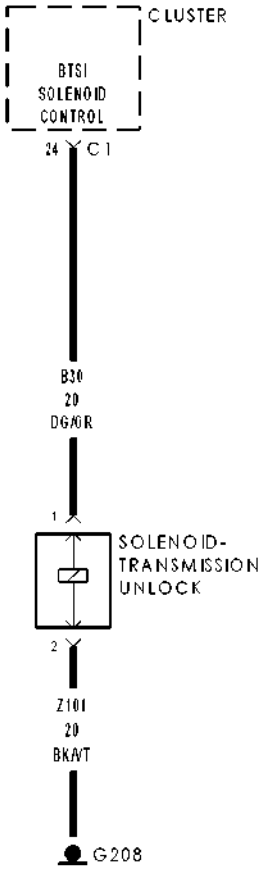
With the scan tool in Cluster ECU Identification, read the Original and Current VINs, and the Body Style of the vehicle.

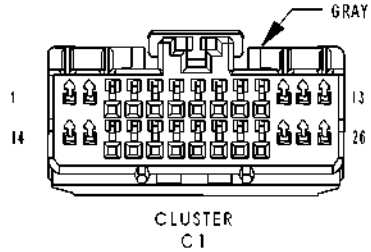
Does the information displayed match the vehicle?

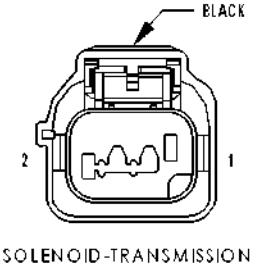
Yes >> Replace the Instrument Cluster in accordance with the Service Information.
Perform the BODY VERIFICATION TEST VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Replace the Front Control Module in accordance with the Service Information.
Perform the BODY VERIFICATION TEST VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

P0930-BTSI CONTROL CIRCUIT LOW







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P0930-BTSI CONTROL CIRCUIT LOW (CONTINUED)

For the Instrument Cluster circuit diagram (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition in the Unlock or Run position and the driver's foot applied to the brake pedal.
- **Set Condition:**
  The Instrument Cluster detects a low value on the BTSI Solenoid Control circuit.

Possible Causes
(B30) BTSI SOLENOID CONTROL CIRCUIT SHORTED TO THE (Z101) BTSI SOLENOID GROUND CIRCUIT
(B30) BTSI SOLENOID CONTROL CIRCUIT SHORTED TO GROUND
TRANSMISSION UNLOCK SOLENOID (BTSI)
INSTRUMENT CLUSTER

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase DTCs.

Turn the ignition off, wait 10 seconds then turn the ignition on.

Apply and release the brakes.

With the scan tool, read DTCs.

Does the scan tool display: P0930-BTSI CONTROL CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused this code to set is not present at this time. Using the wiring diagram as a guide, inspect the wiring and connectors for an intermittent condition. Operate the system several times and recheck for active DTCs.

Perform the BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

---

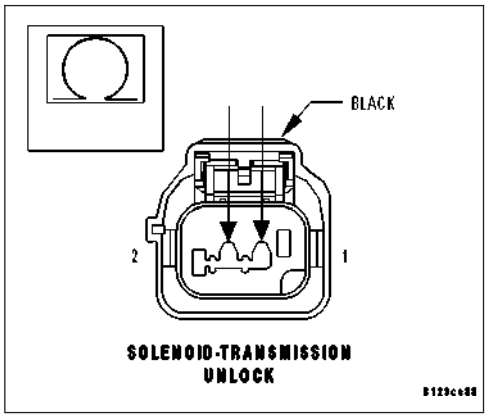
2. CHECK THE (B30) BTSI SOLENOID CONTROL CIRCUIT FOR A SHORT TO THE (Z101) BTSI SOLENOID GROUND CIRCUIT.

Turn the ignition off.

Disconnect the BTSI solenoid harness connector.

Disconnect the Instrument Cluster C1 harness connector.

Measure the resistance between the (B30) BTSI Solenoid Control Circuit and the (Z101) BTSI Solenoid Ground Circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (B30) BTSI Solenoid Control circuit for a short to the (Z101) BTSI Solenoid Ground Circuit.

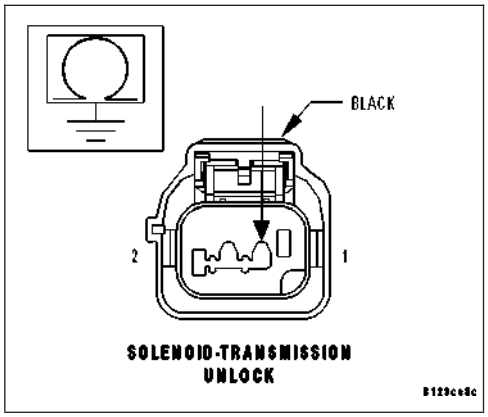
Perform the BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go To 3

P0930-BTSI CONTROL CIRCUIT LOW (CONTINUED)

3. CHECK THE (B30) BTSI SOLENOID CONTROL CIRCUIT FOR A SHORT TO GROUND

Measure the resistance between ground and the (B30) BTSI Solenoid Control circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (B30) BTSI Solenoid Control circuit for a short to ground.

Perform the BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go To 4

---

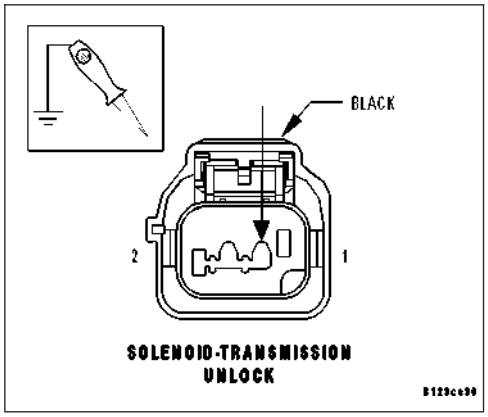
4. CHECK OPERATION OF THE BTSI SOLENOID

Reconnect the Instrument Cluster C1 harness connector.

Turn the ignition on.

Using a 12–volt test light connected to ground, check the BTSI Solenoid Control circuit.

With the scan tool, actuate the BTSI Solenoid.



Does the test light illuminate brightly?

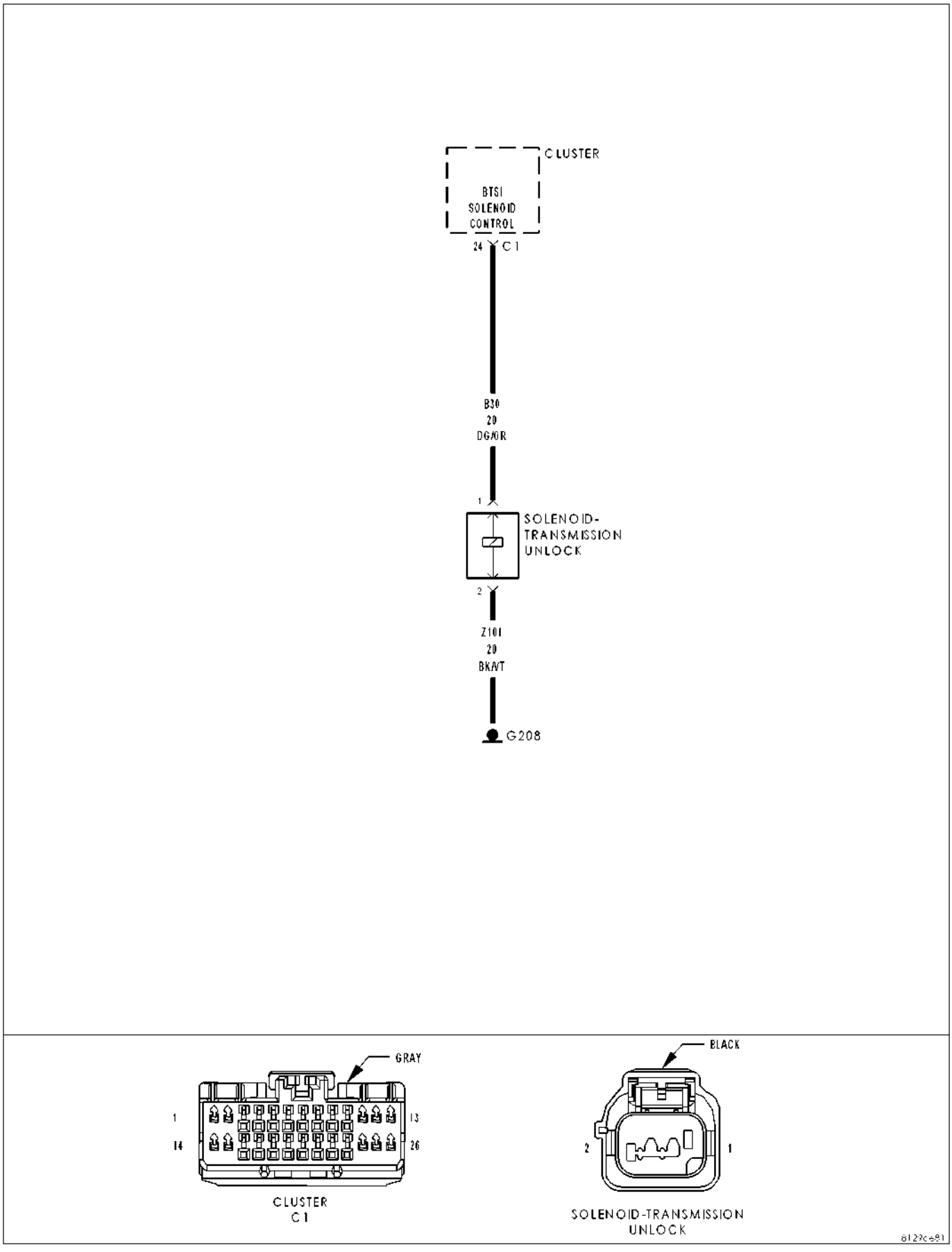
Yes >> Replace the Transmission Unlock (BTSI) Solenoid in accordance with the Service Information.

Perform the BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Replace the Instrument Cluster in accordance with the Service Information.

Perform the BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

P0931-BTSI CONTROL CIRCUIT HIGH



P0931-BTSI CONTROL CIRCUIT HIGH (CONTINUED)

For the Instrument Cluster Solenoid circuit diagram (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition in the Unlock or Run position and the driver's foot applied to the brake pedal.
- **Set Condition:**
  The Instrument Cluster detects a high value on the BTSI Solenoid Control circuit.

Possible Causes
(Z101) BTSI SOLENOID GROUND CIRCUIT OPEN
(B30) BTSI SOLENOID CONTROL CIRCUIT OPEN
TRANSMISSION UNLOCK SOLENOID (BTSI)
INSTRUMENT CLUSTER

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase DTCs.

Turn the ignition off, wait 10 seconds then turn the ignition on.

Apply and release the brakes.

With the scan tool, read DTCs.

Does the scan tool display: P0930-BTSI CONTROL CIRCUIT HIGH?

Yes >> Go To 2

No >> The condition that caused this code to set is not present at this time. Using the wiring diagram as a guide, inspect the wiring and connectors for an intermittent condition. Operate the system several times and recheck for active DTCs.

Perform the BODY VERIFICATION TEST VER-1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

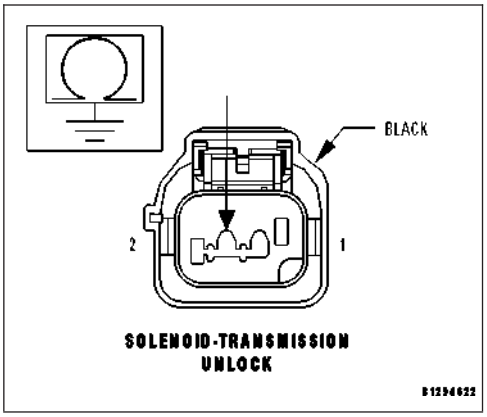
---

2. CHECK THE (Z101) BTSI SOLENOID GROUND CIRCUIT FOR AN OPEN

Turn the ignition off.

Disconnect the BTSI Solenoid harness connector.

Measure the resistance between ground and the (Z101) BTSI Solenoid Ground circuit.



Is the resistance above 5.0 ohms?

Yes >> Repair the (Z101) BTSI Solenoid Ground circuit for an open.

Perform the BODY VERIFICATION TEST VER-1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

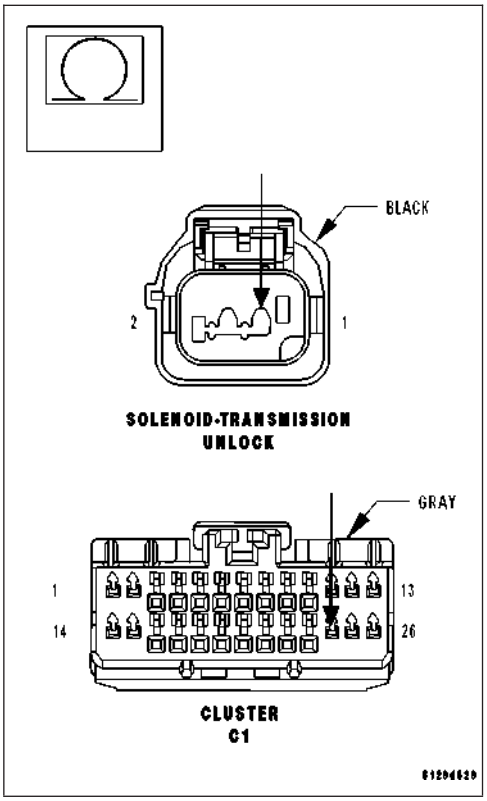
No >> Go To 3

P0931-BTSI CONTROL CIRCUIT HIGH (CONTINUED)

3. CHECK THE (B30) BTSI SOLENOID CONTROL CIRCUIT FOR AN OPEN

Disconnect the Instrument Cluster C1 harness connector.

Measure the resistance of the (B30) BTSI Solenoid Control circuit between the BTSI Solenoid harness connector and the Instrument Cluster C1 harness connector.



Is the resistance above 5.0 ohms?

Yes >> Repair the (B30) BTSI Solenoid Control circuit for an open.

Perform the BODY VERIFICATION TEST VER-1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go To 4

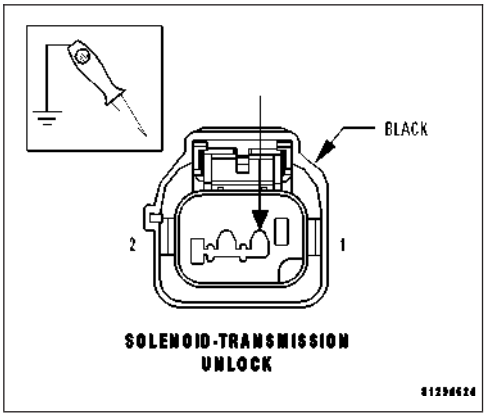
4. CHECK THE OPERATION OF THE BTSI SOLENOID

Reconnect the Instrument Cluster C1 harness connector.

Turn the ignition on.

Using a 12–volt test light connected to ground, check the (B30) BTSI Solenoid Control circuit.

With the scan tool, actuate the BTSI Solenoid.



Does the test light illuminate brightly?

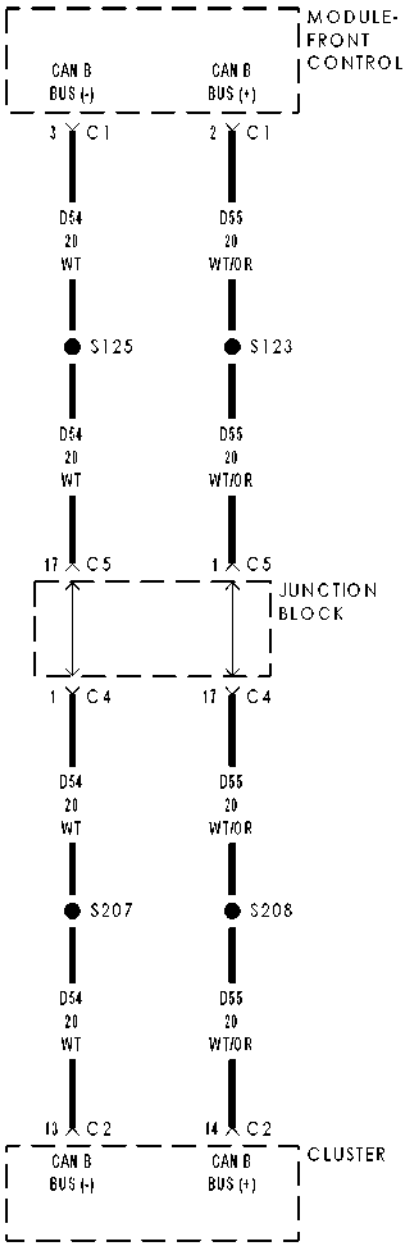
Yes >> Replace the Transmission Unlock (BTSI)Solenoid in accordance with the Service Information.

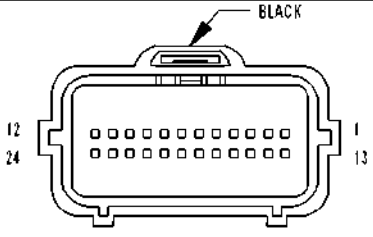
Perform the BODY VERIFICATION TEST VER-1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Replace the Instrument Cluster in accordance with the Service Information.

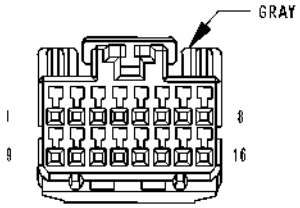
Perform the BODY VERIFICATION TEST VER-1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

U0019–CAN B BUS





MODULE-FRONT
CONTROL C1



CLUSTER
C2

U0019–CAN B BUS (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  Whenever the Can B Bus (+) or B Bus (–) circuit is open, shorted to voltage or shorted to ground, this code will set.

Possible Causes
CAN B BUS DTCs IN FRONT CONTROL MODULE
(D54) CAN B BUS (–) CIRCUIT OPEN
(D55) CAN B BUS (+) CIRCUIT OPEN
INSTRUMENT CLUSTER

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase DTCs
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read DTCs.

Does the scan tool display U0019–CAN B BUS CIRCUIT?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

---

2. CHECK FRONT CONTROL MODULE DTCs

With the scan tool, read Front Control Module DTCs

Does the scan tool display any CAN B BUS DTCs – ACTIVE?

Yes >> Refer to the symptom list for problems related to Communication in the ELECTRICAL.– ELECTRONIC CONTROL MODULES – ELECTRICAL DIAGNOSES section. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go to 3

U0019–CAN B BUS (CONTINUED)

3. CAN B BUS (+) CIRCUIT OPEN

Turn the ignition off.

Disconnect the Instrument Cluster C2 harness connector.

Disconnect the Front Control Module C1 harness connector.

Measure the resistance of the (D55) Can B Bus (+) circuit between the Front Control Module C1 harness connector and the Instrument Cluster C2 harness connector.

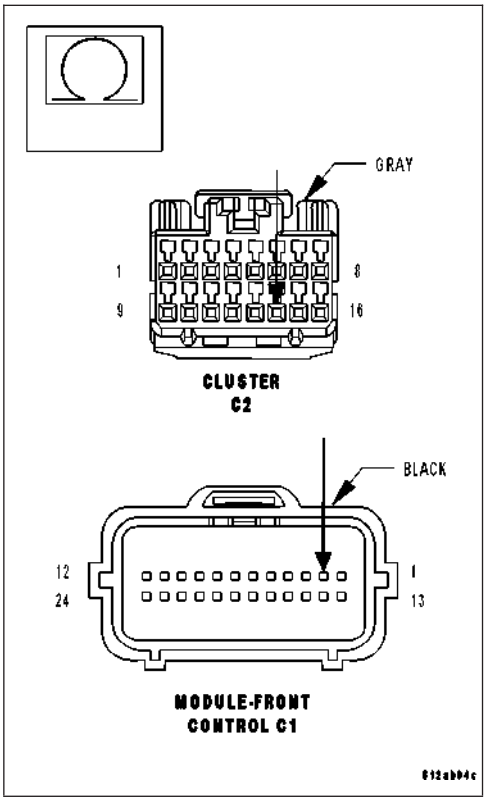
Is the resistance below 2.0 ohms?

Yes >> Go To 4

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Repair the Can B Bus (+) circuit for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)



4. CAN B BUS (–) CIRCUIT OPEN

Measure the resistance of the (D54) Can B Bus (–) circuit between the Front Control Module C1 harness connector and the Instrument Cluster C2 harness connector.

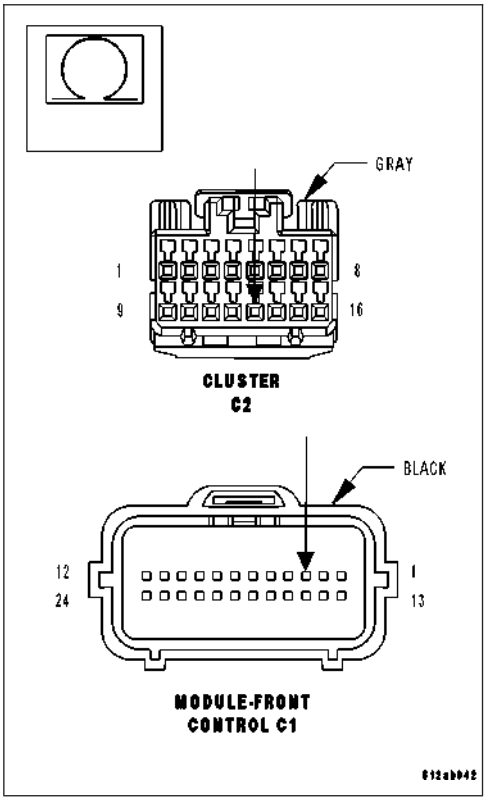
Is the resistance below 2.0 ohms?

Yes >> Replace the Instrument Cluster in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Repair the Can B Bus (–) circuit for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)



U0141–LOST COMMUNICATION WITH FRONT CONTROL MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0151-LOST COMMUNICATION WITH OCCUPANT RESTRAINT CONTROLLER

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0156-LOST COMMUNICATION WITH EOM

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0168-LOST COMMUNICATION WITH VEHICLE SECURITY CONTROL MODULE (SKREEM/WCM)

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0184-LOST COMMUNICATION WITH RADIO

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0199-LOST COMMUNICATION WITH DRIVER DOOR MODULE

For a complete wiring diagram **Refer to Section 8W**.

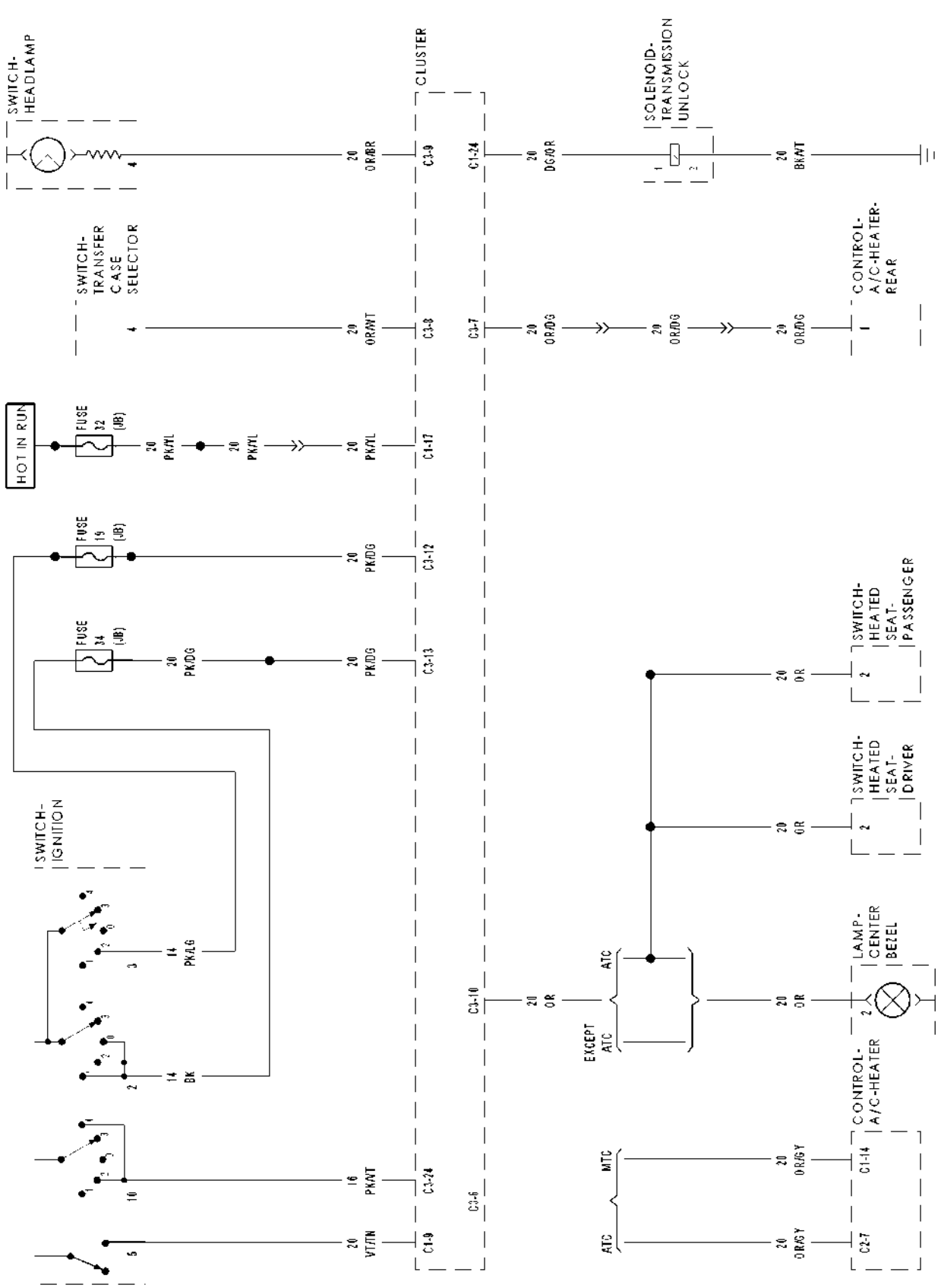
(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0208-LOST COMMUNICATION WITH HEATED SEAT CONTROL MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

SCHEMATICS AND DIAGRAMS



INSTRUMENT CLUSTER SYSTEM SCHEMATIC

CLUSTER

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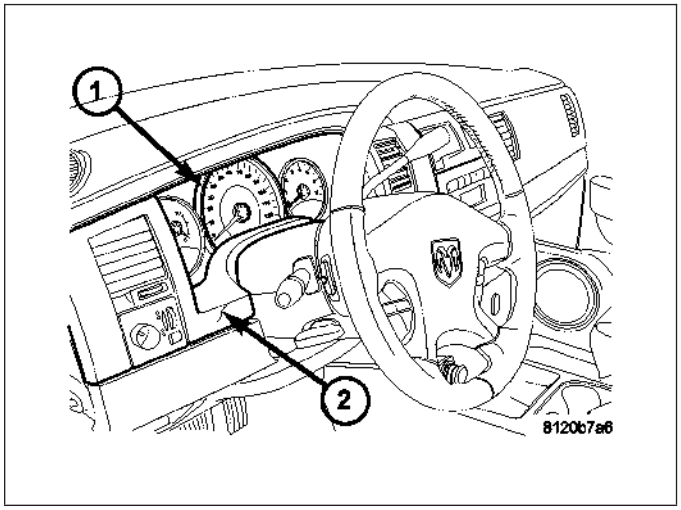
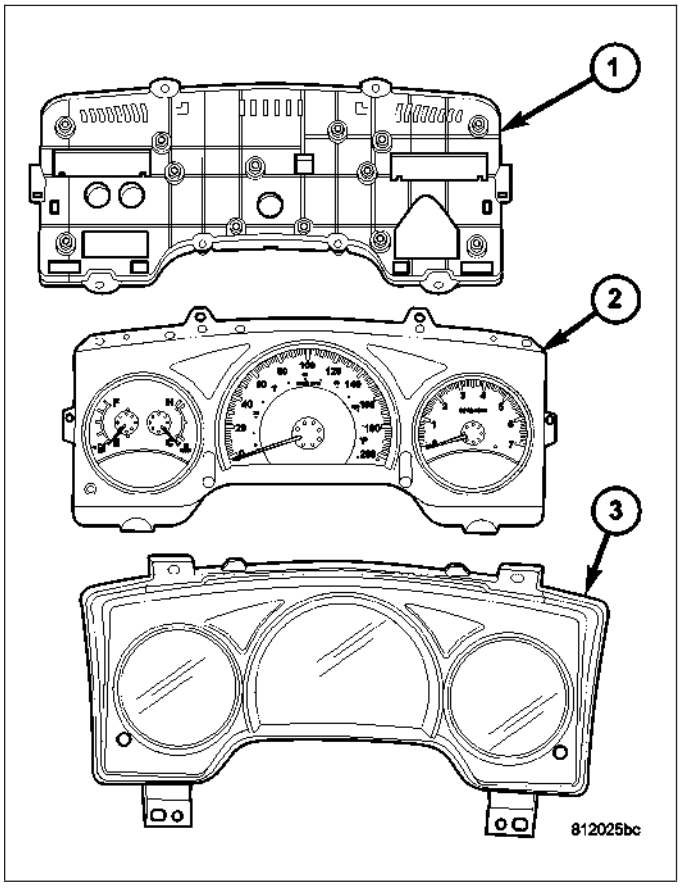
CLUSTER

DESCRIPTION

The instrument cluster (1) for this model is an Electro-Mechanical Instrument Cluster (EMIC) that is located in the instrument panel above the steering column opening, directly in front of the driver. The remainder of the EMIC, including the mounts and the electrical connections, are concealed within the instrument panel behind the cluster bezel (2). Besides analog gauges and indicators, the EMIC module incorporates a single blue-green digital Vacuum Fluorescent Display (VFD) unit for displaying odometer/trip odometer information, engine hours, automatic transmission gear selector position (PRNDL), several warning or reminder indications and certain diagnostic information. The instrument cluster for this model also includes the hardware and software necessary to serve as the electronic body control module and is sometimes referred to as the Cab Compartment Node or CCN.



The EMIC gauges and indicators are visible through a dedicated opening in the cluster bezel on the instrument panel and are protected by a clear plastic cluster lens that is integral to a cluster lens, hood and mask unit (3). Just behind the cluster lens is the cluster hood and an integral cluster mask, which are constructed of molded black plastic. Two different masks are used, one with silver rings and one with chrome rings around the gauge openings. The cluster hood serves as a visor and shields the face of the cluster from ambient light and reflections to reduce glare, while the cluster mask serves to separate and define the individual gauges and indicators of the EMIC. A black plastic odometer/trip odometer switch button protrudes through dedicated holes in the cluster mask and the cluster lens, located near the lower edge of the cluster just to the left of the fuel gauge. The molded plastic EMIC lens, hood and mask unit has four integral mounting tabs, two each on the upper and lower edges of the unit. These mounting tabs are used to secure the EMIC to the molded plastic instrument panel cluster carrier with four screws.



The rear of the cluster housing and the EMIC electronic circuitry are protected by a molded plastic rear cover (1), which is secured to the cluster housing with fourteen screws, while eight screws installed around the outside perimeter of the rear cover secure it to the cluster lens, hood and mask unit. The rear cover includes clearance holes for the cluster connector receptacles. The connector receptacles on the back of the cluster

electronic circuit board connect the EMIC to the vehicle electrical system through three take outs with connectors from the instrument panel wire harness.

Sandwiched between the rear cover and the lens, hood and mask unit is the cluster housing (2). The molded plastic cluster housing serves as the carrier for the cluster circuit board and circuitry, the cluster connector receptacles, the gauges, a Light Emitting Diode (LED) for each cluster indicator, the VFD unit, an audible tone transducer, an electro-luminescent lamp for general cluster illumination, the cluster overlay, the gauge pointers, the odometer/trip odometer switch and the switch button.

The cluster overlay is a laminated plastic unit. The dark, visible, outer surface of the overlay is marked with all of the gauge dial faces and graduations, but this layer is also translucent. The darkness of this outer layer prevents the cluster from appearing cluttered or busy by concealing the cluster indicators that are not illuminated, while the translucence of this layer allows those indicators and icons that are illuminated to be readily visible. The underlying layer of the overlay is opaque and allows light from the LED for each of the various indicators and an electro-luminescent lamp behind it to be visible through the outer layer of the overlay only through predetermined stencil-like cutouts. A rectangular opening in the overlay at the base of the tachometer dial faces has a smoked clear lens through which the illuminated VFD unit can be viewed.

Several versions of the EMIC module are offered on this model. These versions accommodate all of the variations of optional equipment and regulatory requirements for the various markets in which the vehicle will be offered. The microprocessor-based EMIC utilizes integrated circuitry and information carried on the Controller Area Network (CAN) data bus along with several hard wired analog and multiplexed inputs to monitor sensors and switches throughout the vehicle. In response to those inputs, the internal circuitry and programming of the EMIC allow it to control and integrate many electronic functions and features of the vehicle through both hard wired outputs and the transmission of electronic message outputs to other electronic modules in the vehicle over the CAN data bus. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/COMMUNICATION - DESCRIPTION - CAN BUS).

Besides typical instrument cluster gauge and indicator support, the electronic functions and features that the EMIC supports or controls include the following:

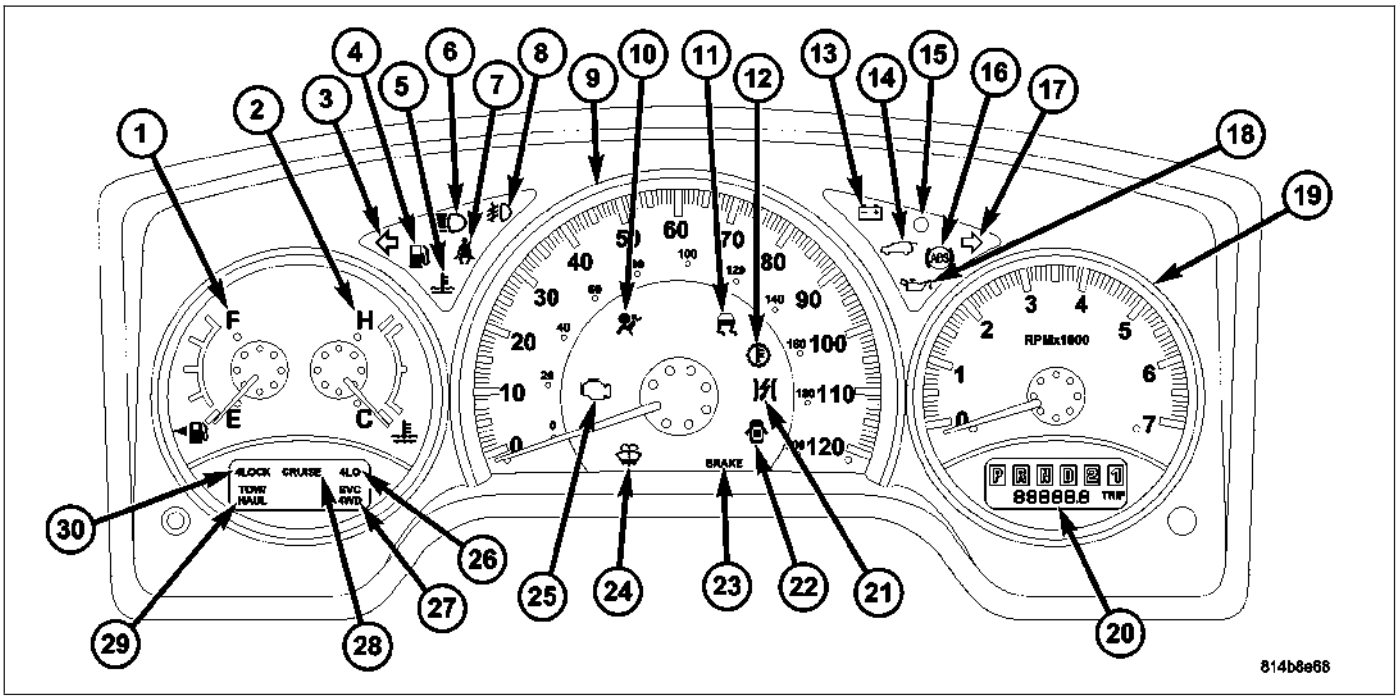
- **Audible Warnings** - The EMIC electronic circuit board is equipped with an audible tone transducer and programming that allows it to provide various audible alerts to the vehicle operator, including chime tones and beep tones. An electromechanical relay is also soldered onto the circuit board to produce audible clicks that emulate the sound of a conventional turn signal or hazard warning flasher. (Refer to 8 - ELECTRICAL/CHIME/BUZZER - DESCRIPTION).
- **Automatic Headlamps Control** - On models equipped with optional automatic headlamps, the EMIC monitors inputs from both the headlamp switch and a sun load sensor located on the top of the instrument panel to provide automatic headlamps.
- **Brake Lamp Control** - The EMIC provides electronic brake lamp request messages to the Front Control Module (FCM) located on the Integrated Power Module (IPM) for brake lamp control, excluding control of the Center High Mounted Stop Lamp (CHMSL), which remains controlled by a direct hard wired output of the brake lamp switch.
- **Brake Transmission Shift Interlock Control** - The EMIC monitors inputs from the brake lamp switch, ignition switch, and the Transmission Range Sensor (TRS), then controls a high-side driver output to operate the Brake Transmission Shift Interlock (BTSI) solenoid that locks and unlocks the automatic transmission gearshift selector lever on the steering column.
- **Compass Mini Trip Computer Support** - The EMIC provides support for the optional Compass Mini Trip Computer (CMTC) by calculating average fuel economy, distance to empty and outside temperature values and storing trip odometer and elapsed ignition on time data. The EMIC receives data and reset requests from the CMTC and transmits the appropriate information for the CMTC to display using electronic messaging.
- **Electronic Transfer Case Interface** - On vehicles equipped with an electronic four-wheel drive transfer case, the EMIC monitors a hard wired multiplex input from the transfer case mode switch and then provides the appropriate electronic data bus messages to the Front Control Module (FCM) located on the Integrated Power Module (IPM) for transfer case control. After the transfer case shift is completed, the FCM provides an electronic message to the EMIC and the EMIC responds by activating the appropriate 4WD indicators within the cluster or in the transfer case switch.
- **Enhanced Accident Response Support** - The EMIC monitors an input from the Occupant Restraint Controller (ORC) and, following an airbag deployment, will immediately disable the power lock output, unlock all doors by activating the power unlock output, then enables the power lock output if the power lock switch input remains inactive for two seconds. The EMIC also monitors an input from the Powertrain Control Module (PCM) to automatically turn on the interior lighting after an airbag deployment event, ten seconds after the vehicle speed is

zero. The interior lighting remains illuminated until the ignition switch is turned to the Off position, at which time the interior lighting returns to normal operation and control. These Enhanced Accident Response System (EARS) features are each dependent upon a functional vehicle electrical system following the vehicle impact event.

- **Exterior Lighting Control** - The EMIC provides electronic head lamp and/or park lamp request messages to the Front Control Module (FCM) located on the Integrated Power Module (IPM) for the appropriate exterior lamp control of standard head and park lamps, as well as optional front fog lamps. This includes support for headlamp beam selection and the optical horn feature, also known as flash-to-pass.
- **Exterior Lighting Fail-safe** - In the absence of a headlamp switch input, the EMIC will turn on the cluster illumination lamp and provide electronic headlamp low beam and park lamp request messages to the Front Control Module (FCM) located on the Integrated Power Module (IPM) for default exterior lamp operation. The FCM will also provide default park lamp and headlamp low beam operation and the EMIC will turn on the cluster general illumination lighting at full intensity if there is a failure of the electronic data bus communication between the EMIC and the FCM.
- **Fuel Level Data Support** - The EMIC provides a current source for and receives a hard wired analog input from the fuel level sending unit located on the fuel pump module in the fuel tank. The EMIC uses this input to calculate the proper fuel gauge needle position and low fuel indicator operation. Based upon this input, the EMIC also calculates fuel level, average fuel economy and distance to empty data, then uses electronic messaging to transmit this data over the CAN data bus for use by other electronic modules in the vehicle.
- **Heated Seat Control** - The EMIC monitors inputs from the ignition switch and electronic engine speed messages from the Powertrain Control Module (PCM) to control a high side driver output to the heated seat switch Light Emitting Diode (LED) indicators. This input allows the heated seat switches to wake up the heated seat module if the switch is actuated. The EMIC will de-energize the heated seat switch LED indicators, which deactivates the heated seat system, if the ignition switch is turned to any position except On or Start, or if the engine speed message indicates zero. (Refer to 8 - ELECTRICAL/HEATED SEATS - DESCRIPTION).
- **Horn Control** - The EMIC monitors an input from the horn switch and provides electronic horn request messages to the Front Control Module (FCM) located on the Integrated Power Module (IPM) for horn relay control.
- **Interior Lamp Load Shedding** - The EMIC provides a battery saver feature which will automatically turn off all interior lamps if they remain on after a timed interval of about five minutes.
- **Interior Lighting Control** - The EMIC monitors inputs from the interior lighting switch, the door ajar switches, the reading lamp switches, and the Sentry Key Remote Entry Module (SKREEM) to provide courtesy lamp control. This includes support for timed illuminated entry with theater-style fade-to-off and courtesy illumination defeat features.
- **Panel Lamps Dimming Control** - The EMIC monitors hard wired multiplexed inputs from the headlamp switch on the instrument panel, then provides a hard wired 12-volt Pulse-Width Modulated (PWM) output that synchronizes the dimming level of all panel lamps dimmer controlled lamps with that of the cluster illumination lighting.
- **Power Locks** - The EMIC monitors inputs from the power lock switches and the Sentry Key REmote Entry Module (SKREEM) to provide control of the power lock motors through high side driver outputs to the motors. This includes support for rolling door locks (also known as automatic door locks), automatic door unlock, briefcase lock mode, and a door lock inhibit mode. (Refer to 8 - ELECTRICAL/POWER LOCKS - DESCRIPTION).
- **Remote Keyless Entry** - The EMIC supports the standard Remote Keyless Entry (RKE) system features, including support for the RKE Lock, Unlock (with optional driver-door-only unlock, and unlock-all-doors), Panic, audible chirp, optical chirp, illuminated entry modes, an RKE programming mode, as well as optional Vehicle Theft Security System (VTSS) arming (when the proper VTSS arming conditions are met) and disarming.
- **Remote Radio Switch Interface** - The EMIC monitors inputs from the optional remote radio switches and then provides the appropriate electronic data bus messages to the radio to select the radio or optional hands-free cellular system operating mode, volume control, preset station scan and station seek features.
- **Turn Signal & Hazard Warning Lamp Control** - The EMIC monitors hard wired multiplexed inputs from the multi-function switch on the steering column, then provides electronic turn and hazard lamp request messages to the Front Control Module (FCM) located on the Integrated Power Module (IPM) for turn and hazard lamp control. The EMIC also provides an audible click at one of two rates to emulate normal and bulb out turn or hazard flasher operation based upon electronic lamp outage messages from the FCM, and provides an audible turn signal on chime warning if a turn is signalled continuously for more than about 1.6 kilometers (one mile) and the vehicle speed remains greater than about twenty-four kilometers-per-hour (fifteen miles-per-hour).
- **Vacuum Fluorescent Display Synchronization** - The EMIC monitors hard wired multiplexed inputs from the headlamp switch on the instrument panel, then transmits electronic panel lamp dimming level messages which

allows all other electronic modules on the CAN data bus with Vacuum Fluorescent Display (VFD) units to coordinate their illumination intensity with that of the EMIC VFD unit. This includes a parade mode (also known as funeral mode) that allows all VFD units in the vehicle to be illuminated at full (daytime) intensity while driving during daylight hours with the exterior lamps turned On.

- **Vehicle Theft Security System Control** - The EMIC monitors inputs from the door ajar switches, the liftgate ajar switch, the ignition switch, and the Sentry Key REmote Entry Module (SKREEM), then provides electronic horn and lighting request messages to the Front Control Module (FCM) located on the Integrated Power Module (IPM) for the appropriate VTSS alarm output features.
- **Wiper/Washer System Control** - The EMIC monitors both hard wired multiplexed inputs from the front wiper and washer switches in the multi-function switch on the steering column and electronic messages from the rear wiper and washer switches in the heater and air conditioner control on the instrument panel. The EMIC then provides electronic wiper and/or washer request messages to the Front Control Module (FCM) located on the Integrated Power Module (IPM) for the appropriate front or rear wiper and washer system features. (Refer to 8 - ELECTRICAL/WIPERS/WASHERS - DESCRIPTION).



The EMIC houses four analog gauges and has provisions for up to twenty-five indicators. Some of the EMIC indicators are automatically configured when the EMIC is connected to the vehicle electrical system for compatibility with certain optional equipment or equipment required for regulatory purposes in certain markets. While each EMIC may have provisions for indicators to support every available option, the configurable indicators will not be functional in a vehicle that does not have the equipment that an indicator supports.

The EMIC includes the following analog gauges:

- **Engine Temperature Gauge (2)**
- **Fuel Gauge (1)**
- **Speedometer (9)**
- **Tachometer (19)**

The EMIC includes the following VFD unit:

- **Gear Selector/Odometer/Trip Indicator (20)**

The EMIC includes provisions for the following indicators:

- **Airbag Indicator (10)**
- **Antilock Brake System (ABS) Indicator (16)**
- **Brake Indicator (23)**
- **Charging Indicator (13)**
- **Cruise Indicator (28)**
- **Door Ajar Indicator (22)**

- **Electronic Throttle Control (ETC) Indicator (21)**
- **Engine Temperature Indicator (5)**
- **Fog Lamp Indicator (8)**
- **Four-Wheel Drive Low Indicator (26)**
- **Four-Wheel Drive Lock Indicator (30)**
- **Gate Ajar Indicator (14)**
- **High Beam Indicator (6)**
- **Low Fuel Indicator (4)**
- **Low Oil Pressure Indicator (18)**
- **Malfunction Indicator Lamp (MIL) (25)**
- **Seatbelt Indicator (7)**
- **Security Indicator (15)**
- **Service Four-Wheel Drive Indicator (27)**
- **Tow/Haul Indicator (29)**
- **Traction Control Indicator (11)**
- **Transmission Overtemp Indicator (12)**
- **Turn Signal (Right and Left) Indicators (3 & 17)**
- **Washer Fluid Indicator (24)**

Each indicator in the EMIC, except those located within a VFD unit, is illuminated by a dedicated LED that is soldered onto the EMIC electronic circuit board. Cluster illumination is accomplished by a dimmable electro-luminescent lamp, which illuminates each of the gauge dial faces for visibility when the exterior lighting is turned on. The LED units and the electro-luminescent lamp unit are not available for service replacement and, if damaged or faulty, the entire EMIC must be replaced.

Hard wired circuitry connects the EMIC to the electrical system of the vehicle. These hard wired circuits are integral to several wire harnesses, which are routed throughout the vehicle and retained by many different methods. These circuits may be connected to each other, to the vehicle electrical system and to the EMIC through the use of a combination of soldered splices, splice block connectors, and many different types of wire harness terminal connectors and insulators. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, further details on wire harness routing and retention, as well as pin-out and location views for the various wire harness connectors, splices and grounds.

The EMIC module for this model is serviced only as a complete unit. The EMIC module cannot be adjusted or repaired. If a gauge, an LED indicator, a VFD unit, the electronic circuit board, the circuit board hardware, the cluster overlay, or the EMIC housing are damaged or faulty, the entire EMIC module must be replaced. The cluster lens, hood and mask unit is available for separate service replacement.

OPERATION

The ElectroMechanical Instrument Cluster (EMIC) in this model also includes the hardware and software necessary to serve as the electronic body control module and is sometimes referred to as the Cab Compartment Node or CCN. The following information deals primarily with the instrument cluster functions of this unit. Additional details of the electronic body control functions of this unit may be found within the service information for the system or component that the EMIC controls. For example: Additional details of the audible warning functions of the EMIC are found within the Chime/Buzzer service information.

The EMIC is designed to allow the vehicle operator to monitor the conditions of many of the vehicle components and operating systems. The gauges and indicators in the EMIC provide valuable information about the various standard and optional powertrains, fuel and emissions systems, cooling systems, lighting systems, safety systems and many other convenience items. The EMIC is installed in the instrument panel so that all of these monitors can be easily viewed by the vehicle operator when driving, while still allowing relative ease of access for service.

The microprocessor-based EMIC hardware and software uses various inputs to control the gauges and indicators visible on the face of the cluster. Some of these inputs are hard wired, but most are in the form of electronic messages that are transmitted by other electronic modules over the Controller Area Network (CAN) data bus. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/COMMUNICATION - OPERATION).

The EMIC microprocessor smooths the input data using algorithms to provide gauge readings that are accurate, stable and responsive to operating conditions. These algorithms are designed to provide gauge readings during

normal operation that are consistent with customer expectations. However, when abnormal conditions exist such as high coolant temperature, the algorithm can drive the gauge pointer to an extreme position and the microprocessor can sound a chime through the on-board audible tone transducer to provide distinct visual and audible indications of a problem to the vehicle operator. The EMIC may also produce audible warnings for other electronic modules in the vehicle based upon electronic tone request messages received over the CAN data bus. Each audible warning is intended to provide the vehicle operator with an audible alert to supplement a visual indication.

The EMIC circuitry operates on battery current received through a fused B(+) fuse on a non-switched fused B(+) circuit, and on battery current received through a fused ignition switch output (run-start) fuse on a fused ignition switch output (run-start) circuit. This arrangement allows the EMIC to provide some features regardless of the ignition switch position, while other features will operate only with the ignition switch in the On or Start positions. The EMIC circuitry is grounded through a ground circuit and take out of the instrument panel wire harness with an eyelet terminal connector that is secured by a ground screw to a ground location near the center of the instrument panel structural support.

The EMIC also has a self-diagnostic actuator test capability, which will test each of the CAN bus message-controlled functions of the cluster by lighting the appropriate indicators, positioning the gauge needles at several predetermined calibration points across the gauge faces, and illuminating all segments of the gear selector/odometer/trip odometer Vacuum-Fluorescent Display (VFD) unit. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

GAUGES

All gauges receive battery current through the EMIC circuitry only when the ignition switch is in the On or Start positions. With the ignition switch in the Off position battery current is not supplied to any gauges, and the EMIC circuitry is programmed to move all of the gauge needles back to the low end of their respective scales. Therefore, the gauges do not accurately indicate any vehicle condition unless the ignition switch is in the On or Start positions.

All of the EMIC gauges are air core magnetic units. Two fixed electromagnetic coils are located within each gauge. These coils are wrapped at right angles to each other around a movable permanent magnet. The movable magnet is suspended within the coils on one end of a pivot shaft, while the gauge needle is attached to the other end of the shaft. One of the coils has a fixed current flowing through it to maintain a constant magnetic field strength. Current flow through the second coil changes, which causes changes in its magnetic field strength. The current flowing through the second coil is changed by the EMIC circuitry in response to messages received over the CAN data bus. The gauge needle moves as the movable permanent magnet aligns itself to the changing magnetic fields created around it by the electromagnets.

The gauges are diagnosed using the EMIC self-diagnostic actuator test. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). Proper testing of the CAN data bus and the electronic data bus message inputs to the EMIC that control each gauge require the use of a diagnostic scan tool. Refer to the appropriate diagnostic information. Specific operation details for each gauge may be found elsewhere in this service information.

VACUUM-FLUORESCENT DISPLAY

The Vacuum-Fluorescent Display (VFD) unit is soldered to the EMIC electronic circuit board. With the ignition switch in the Off or Accessory positions, the odometer display is activated when the driver door is opened (Rental Car mode) and is deactivated when the driver door is closed. Otherwise, the display unit is active when the ignition switch is in the On or Start positions, and inactive when the ignition switch is in the Off or Accessory positions.

The illumination intensity of the VFD unit is controlled by the EMIC circuitry based upon an input from the headlamp switch and a dimming level input received from the panel dimmer switch. The EMIC synchronizes the illumination intensity of other VFD units with that of the unit in the EMIC by sending electronic dimming level messages to other electronic modules in the vehicle over the CAN data bus.

The EMIC VFD unit has several display capabilities including odometer, trip odometer, engine hours, gear selector indication (PRNDL), several warning or reminder indications, and various diagnostic information when certain fault conditions exist. An odometer/trip odometer switch on the EMIC circuit board is used to control some of the display modes. This switch is actuated manually by depressing the odometer/trip odometer switch button that extends through the lower edge of the cluster lens, just left of the minor gauge set. Actuating this switch momentarily with the ignition switch in the On position will toggle the VFD between the odometer and trip odometer modes. Depressing the switch button for about two seconds while the VFD is in the trip odometer mode will reset the trip odometer value to zero.

While in the odometer mode with the ignition switch in the On position and the engine not running, depressing the odometer/trip odometer switch for about six seconds will display the engine hours information. Holding this switch depressed while turning the ignition switch from the Off position to the On position will initiate the EMIC self-diagnostic actuator test. Refer to the instrument cluster diagnosis and testing service information for additional details on this cluster function. The EMIC microprocessor remembers which display mode is active when the ignition switch is turned to the Off position, and returns the VFD display to that mode when the ignition switch is turned On again.

The VFD unit is diagnosed using the EMIC self-diagnostic actuator test. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). Proper testing of the CAN data bus and the electronic data bus message inputs to the EMIC that control some of the VFD functions requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information. Specific operation details for the odometer, the trip odometer, the gear selector indicator and the various warning and reminder indicator functions of the VFD unit may be found elsewhere in this service information.

INDICATORS

Indicators are located in various positions within the EMIC and are all connected to the EMIC electronic circuit board. The door ajar indicator, gate ajar indicator, high beam indicator, and turn signal indicators operate based upon hard wired inputs to the EMIC. The brake indicator is controlled by CAN data bus messages from the Controller Antilock Brake (CAB) as well as by hard wired park brake switch inputs to the EMIC. The seatbelt indicator is controlled by the EMIC programming, CAN data bus messages from the Occupant Restraint Controller (ORC), and a hard wired seat belt switch input to the EMIC. The Malfunction Indicator Lamp (MIL) is normally controlled by CAN data bus messages from the Powertrain Control Module (PCM); however, if the EMIC loses CAN data bus communication, the EMIC circuitry will automatically turn the MIL on until CAN data bus communication is restored. The EMIC uses CAN data bus messages from the Front Control Module (FCM), the PCM, the ORC, the CAB, and the Sentry Key REmote Entry Module (SKREEM) to control all of the remaining indicators.

The various EMIC indicators are controlled by different strategies; some receive fused ignition switch output from the EMIC circuitry and have a switched ground, while others are grounded through the EMIC circuitry and have a switched battery feed. However, all indicators are completely controlled by the EMIC microprocessor based upon various hard wired and electronic message inputs. The cruise, four low, four lock and tow/haul indicators and those located within the VFD unit are dimmable. All other indicators are illuminated at a fixed intensity, which is not affected by the selected illumination intensity of the electro-luminescent EMIC general illumination lamp. The illumination intensity of the dimmable indicators is synchronized with that of the EMIC general illumination lamp.

In addition, certain indicators in this instrument cluster are automatically configured or self-configured. This feature allows the configurable indicators to be enabled by the EMIC circuitry for compatibility with certain optional equipment. The EMIC defaults for the ABS indicator and airbag indicator are enabled, and these configuration settings must be programmatically disabled in the EMIC using a diagnostic scan tool for vehicles that do not have this equipment. The automatically configured or self-configured indicators remain latent in each EMIC at all times and will be active only when the EMIC receives the appropriate CAN message inputs for that optional system or equipment.

The hard wired indicator inputs may be diagnosed using conventional diagnostic methods. However, the EMIC circuitry and CAN bus message controlled indicators are diagnosed using the EMIC self-diagnostic actuator test. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). Proper testing of the CAN data bus and the electronic message inputs to the EMIC that control an indicator requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information. Specific details of the operation for each indicator may be found elsewhere in this service information.

CLUSTER ILLUMINATION

The EMIC has a single electro-luminescent lamp that provides cluster back lighting whenever the exterior lighting is turned On. The illumination intensity of this lamp is adjusted when the interior lighting thumbwheel on the headlamp switch is rotated (down to dim, up to brighten) to one of six available minor detent positions. The EMIC monitors a resistor multiplexed input from the headlamp switch on a dimmer input circuit. In response to that input, the EMIC electronic circuitry converts a fused 12-volt input it receives on a hard wired panel lamps dimmer switch signal circuit into a 12-volt Pulse Width Modulated (PWM) output.

The EMIC uses this PWM output to control the illumination intensity of the electro-luminescent cluster illumination lamp and the VFD unit on the EMIC circuit board, then provides a synchronized PWM output on various hard wired fused panel lamps dimmer switch signal circuits to control and synchronize the illumination intensity of other incandescent illumination lamps in the vehicle. The EMIC also transmits electronic dimming level messages over the CAN

data bus to other electronic modules in the vehicle to control and synchronize the illumination intensity of their VFD units to that of the EMIC VFD unit.

In addition, the thumbwheel on the headlamp switch has a Parade Mode position to provide a parade or funeral mode. The EMIC monitors the request for this mode from the headlamp switch, then transmits an electronic dimming level message to illuminate all VFD units in the vehicle at full (daytime) intensity for easier visibility when driving in daylight with the exterior lighting turned On.

The electro-luminescent lamp unit consists of layers of phosphor, carbon, idium tin oxide, and dielectric applied by a silk-screen process between two polyester membranes and includes a short pigtail wire and connector. The lamp pigtail wire is connected to a connector receptacle on the EMIC circuit board. The EMIC powers this lamp with an Alternating Current (AC) rated at 80 volts rms (root mean squared) and 415 Hertz produced by a transformer on the circuit board, which excites the phosphor particles causing them to luminesce.

The hard wired headlamp switch and panel lamps dimmer inputs to and outputs from the EMIC may be diagnosed using conventional diagnostic methods. However, proper testing of the PWM processing of the EMIC and the electronic dimming level messages sent by the EMIC over the CAN data bus requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

DIAGNOSIS AND TESTING

INSTRUMENT CLUSTER

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

If all of the instrument cluster gauges and indicators are inoperative, be certain to check the instrument cluster fused B(+) fuse and the instrument cluster fused B(+) and ground circuits for shorts or opens. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

If an individual hard wired gauge or indicator is inoperative, refer to the diagnosis and testing service information for that specific gauge or indicator. If an individual Controller Area Network (CAN) data bus message-controlled gauge or indicator is inoperative, perform the Actuator Test as follows:

CAUTION: Instrument clusters used in this model automatically configure themselves for compatibility with the features and optional equipment in the vehicle in which they are initially installed. The instrument cluster is programmed to do this by embedding the Vehicle Identification Number (VIN) and other information critical to proper cluster operation into electronic memory. This embedded information is learned through electronic messages received from other electronic modules in the vehicle over the Controller Area Network (CAN) data bus, and through certain hard wired inputs received when the cluster is connected to the vehicle electrically. Once configured, the instrument cluster memory may be irreparably damaged and certain irreversible configuration errors may occur if the cluster is connected electrically to another vehicle; or, if an electronic module from another vehicle is connected that provides data to the instrument cluster (including odometer values) that conflicts with that which was previously learned and stored. Therefore, the practice of exchanging (swapping) instrument clusters and other electronic modules in this vehicle with those removed from another vehicle must always be avoided. Failure to observe this caution may result in instrument cluster damage, which is not reimbursable under the terms of the product warranty. Service replacement instrument clusters are provided with the correct VIN, and the certified odometer and engine hours values embedded into cluster memory, but will otherwise be automatically configured for compatibility with the features and optional equipment in the vehicle in which they are initially installed.

NOTE: Certain indicators in this instrument cluster are automatically configured. This feature allows those indicators to be activated or deactivated for compatibility with certain optional equipment. If the problem being diagnosed involves improper illumination of the cruise indicator, the electronic throttle control indicator, the tow/haul indicator, the service four-wheel drive indicator, the four-wheel drive low indicator, the four-wheel drive lock indicator, the transmission overtemp indicator, the security indicator or the gear selector indicator, disconnect and isolate the battery negative cable. After about five minutes, reconnect the battery negative cable and turn the ignition switch to the On position. The instrument cluster should automatically relearn the equipment in the vehicle and properly configure the configurable indicators accordingly.

ACTUATOR TEST

The instrument cluster actuator test will put the instrument cluster into its self-diagnostic mode. In this mode the instrument cluster can perform a self-diagnostic test that will confirm that the instrument cluster circuitry, the gauges, and the indicators are capable of operating as designed. During the actuator test the instrument cluster circuitry will position each of the gauge needles at various calibration points and illuminate all of the segments in the Vacuum Fluorescent Display (VFD) unit.

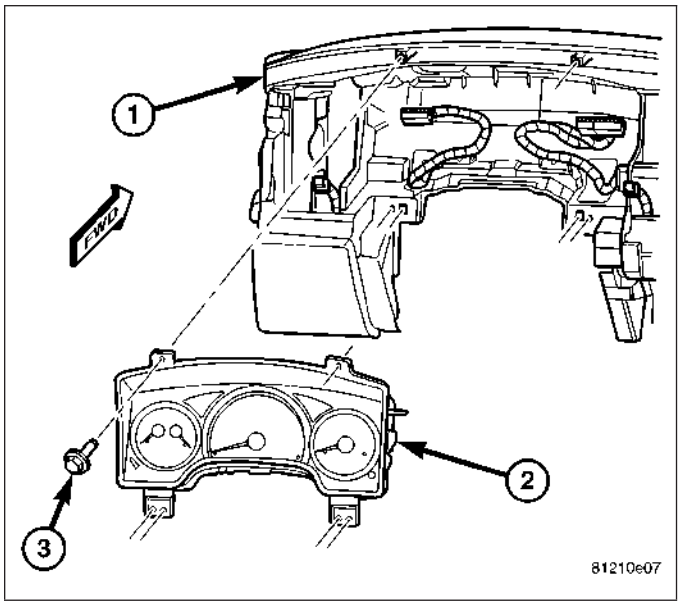
Successful completion of the actuator test will confirm that the instrument cluster is operational. However, there may still be a problem with the CAN data bus, the Powertrain Control Module (PCM), the Front Control Module (FCM), the Transmission Control Module (TCM), the Occupant Restraint Controller (ORC), the Controller Anti-lock Brake (CAB), or the hard wired inputs to one of these electronic control modules. Use a diagnostic scan tool to diagnose these components. Refer to the appropriate diagnostic information.

1. Begin the test with the ignition switch in the Off position.
2. Depress the odometer/trip odometer switch button.
3. While still holding the odometer/trip odometer switch button depressed, turn the ignition switch to the On position, but do not start the engine.
4. Release the odometer/trip odometer switch button.
5. The instrument cluster will simultaneously begin to illuminate all of the operational segments in the VFD unit, and perform a bulb check of each operational LED indicator. The VFD segments and LED indicators remain illuminated as each gauge needle is swept to several calibration points and back. If a VFD segment or an LED indicator fails to illuminate, or if a gauge needle fails to sweep through the calibration points and back during this test, the instrument cluster must be replaced.
6. The actuator test is now completed. The instrument cluster will automatically exit the self-diagnostic mode and return to normal operation at the completion of the test. The actuator test will be aborted if the ignition switch is turned to the Off position, or if a vehicle speed message indicating that the vehicle is moving is received from the PCM over the CAN data bus during the test.
7. Go back to Step 1 to repeat the test, if necessary.

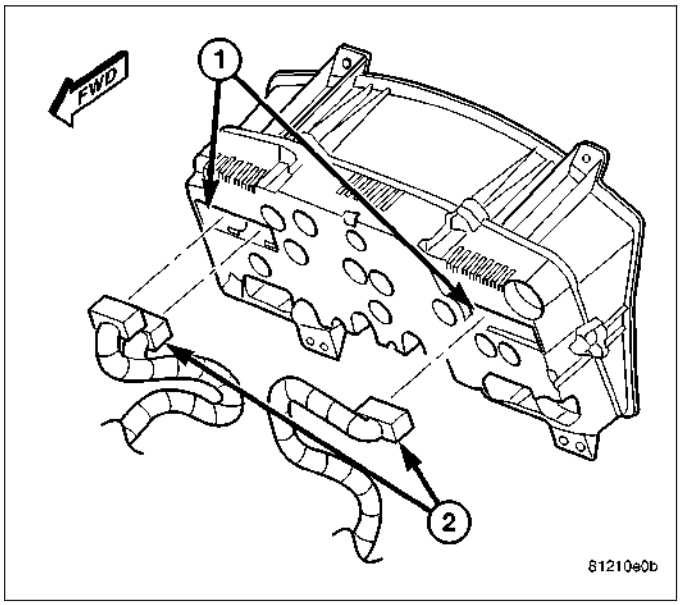
REMOVAL

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

1. Disconnect and isolate the battery negative cable.
2. Remove the cluster bezel from the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/ CLUSTER BEZEL - REMOVAL).
3. Remove the four screws (3) that secure the instrument cluster (2) to the instrument panel structural support (1).



4. Pull the instrument cluster rearward far enough to access and disconnect the instrument panel wire harness connectors (2) from the connector receptacles (1) on the back of the cluster housing.
5. Remove the instrument cluster from the instrument panel.



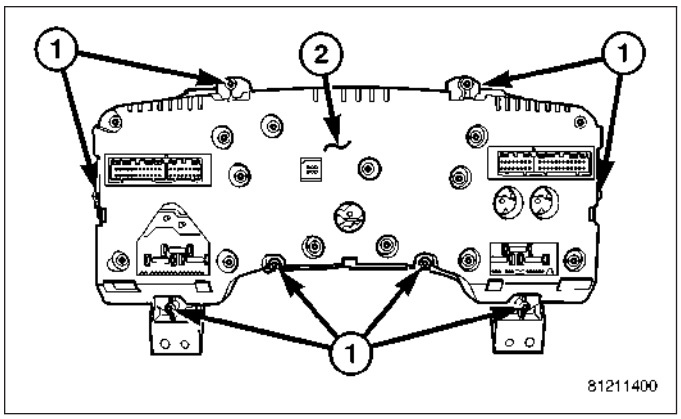
DISASSEMBLY

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

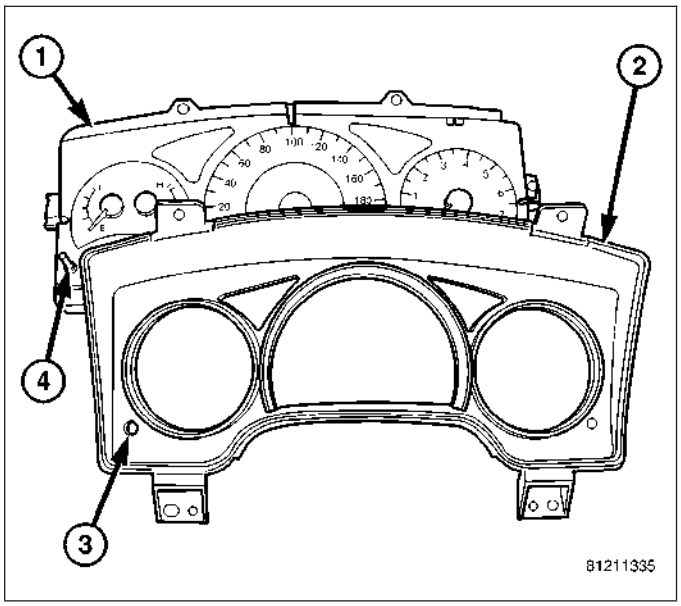
NOTE: The cluster lens, hood and mask unit is the only component of the instrument cluster used in this vehicle that is serviced separately. Following is the procedure for disassembling this component from the instrument cluster.

CLUSTER LENS, HOOD, AND MASK

1. Disconnect and isolate the battery negative cable.
2. Remove the instrument cluster from the instrument panel. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - REMOVAL).
3. From the back of the instrument cluster (2), remove the eight screws (1) around the outer perimeter of the rear cover that secure the lens, hood, and mask unit to the cluster housing.



4. Remove the lens, hood, and mask unit (2) from the face of the instrument cluster (1).



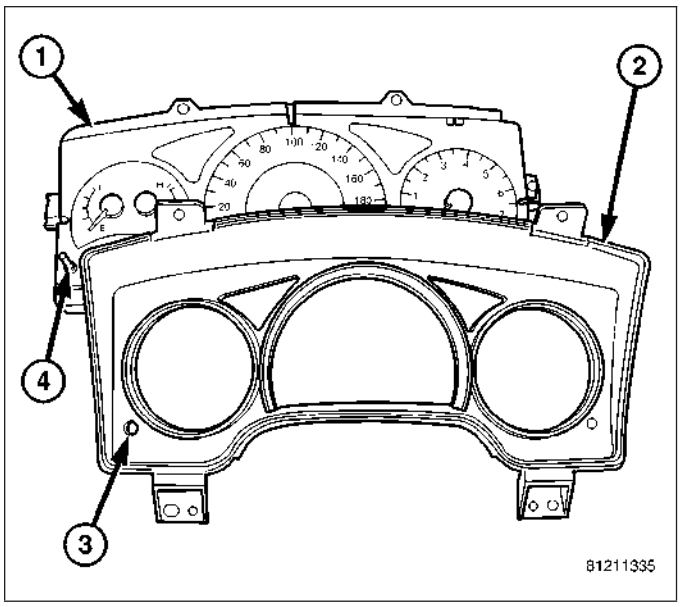
ASSEMBLY

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

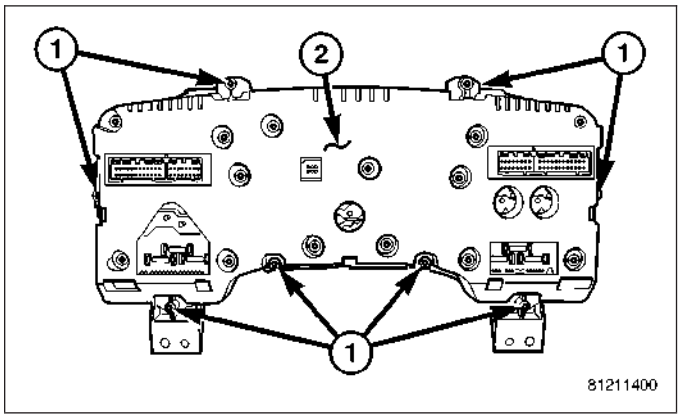
NOTE: The cluster lens, hood and mask unit is the only component of the instrument cluster used in this vehicle that is serviced separately. Following is the procedure for assembling this component to the instrument cluster.

CLUSTER LENS, HOOD, AND MASK

1. Position the cluster lens, hood, and mask unit (2) over the face of the instrument cluster (1). Be certain that the odometer/trip odometer switch button (4) is inserted through the proper clearance holes (3) in the mask and the lens.



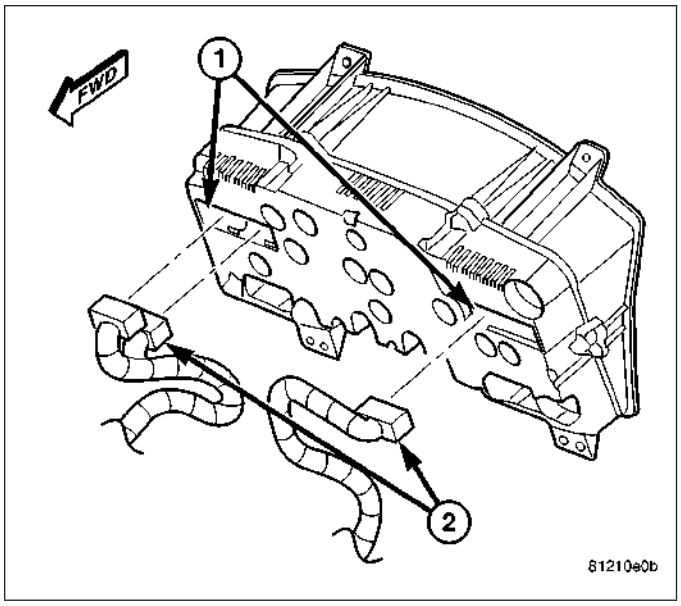
2. From the back of the instrument cluster (2), install and tighten the eight screws (1) around the outer perimeter of the rear cover that secure the lens, hood, and mask unit to the cluster housing. Tighten the screws to 1 N·m (10 in. lbs.).
3. Reinstall the instrument cluster onto the instrument panel. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - INSTALLATION).
4. Reconnect the battery negative cable.



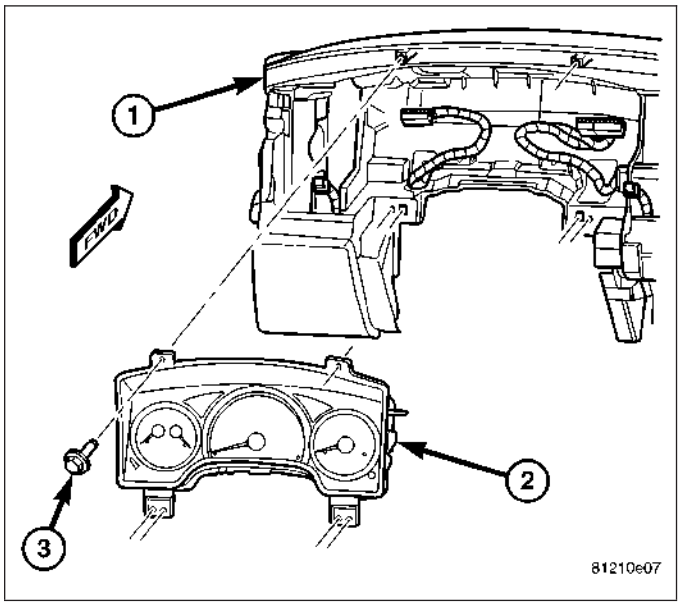
INSTALLATION

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

1. Position the instrument cluster close enough to the instrument panel to reconnect the instrument panel wire harness connectors (2) to the connector receptacles (1) on the back of the cluster housing.



2. Position the instrument cluster (2) into the instrument panel (1).
3. Install and tighten the four screws (3) that secure the instrument cluster to the instrument panel. Tighten the screws to 2 N·m (17 in. lbs.).
4. Reinstall the cluster bezel onto the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/ CLUSTER BEZEL - INSTALLATION).
5. Reconnect the battery negative cable.



NOTE: Certain indicators in this instrument cluster are automatically configured. This feature allows those indicators to be activated or deactivated for compatibility with certain optional equipment. If a problem is noted that involves improper illumination of the cruise indicator, the electronic throttle control indicator, the tow/haul indicator, the service four-wheel drive indicator, the four-wheel drive low indicator, the four-wheel drive lock indicator, the transmission overtemp indicator, the security indicator or the gear selector indicator, disconnect and isolate the battery negative cable. After about five minutes, reconnect the battery negative cable and turn the ignition switch to the On position. The instrument cluster should automatically relearn the equipment in the vehicle and properly configure the configurable indicators accordingly.

ABS INDICATOR

DESCRIPTION

An Antilock Brake System (ABS) indicator is standard equipment on all instrument clusters. This indicator serves both the standard equipment Rear Wheel Anti-Lock (RWAL) and optional equipment 4-Wheel Anti-Lock (4WAL) brake systems. This indicator is located near the upper edge of the instrument cluster, between the tachometer and the speedometer.

The ABS indicator consists of a stencil-like cutout of the International Control and Display Symbol icon for “Failure of Anti-lock Braking System” in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. An amber Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the icon to appear in amber through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The ABS indicator is serviced as a unit with the instrument cluster.

OPERATION

The ABS indicator gives an indication to the vehicle operator when the ABS system is faulty or inoperative. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Controller Antilock Brake (CAB) over the Controller Area Network (CAN) data bus.

The ABS indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the ABS indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the ABS indicator is illuminated for about four seconds as a bulb test. The entire bulb test is a function of the CAB.
- **ABS Lamp-On Message** - Each time the cluster receives a lamp-on message from the CAB, the ABS indicator will be illuminated. The indicator remains illuminated until the cluster receives a lamp-off message from the CAB, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Communication Error** - If the cluster receives no lamp-on or lamp-off messages from the CAB for five consecutive message cycles, the ABS indicator is illuminated. The indicator remains illuminated until the cluster receives a valid message from the CAB, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Actuator Test** - Each time the instrument cluster is put through the actuator test, the ABS indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.
- **ABS Diagnostic Test** - The ABS indicator is blinked on and off by lamp-on and lamp-off messages from the CAB during the performance of the ABS diagnostic tests.

The CAB continually monitors the ABS circuits and sensors to decide whether the system is in good operating condition. The CAB then sends the proper lamp-on or lamp-off messages to the instrument cluster. If the CAB sends a lamp-on message after the bulb test, it indicates that the CAB has detected a system malfunction and/or that the ABS system has become inoperative. The CAB will store a Diagnostic Trouble Code (DTC) for any malfunction it detects. Each time the ABS indicator fails to light due to an open or short in the cluster ABS indicator circuit, the cluster sends a message notifying the CAB of the condition, then the instrument cluster and the CAB will each store a DTC.

For proper diagnosis of the antilock brake system, the CAB, the CAN data bus, or the electronic message inputs to the instrument cluster that control the ABS indicator, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

AIRBAG INDICATOR

DESCRIPTION

An airbag indicator is standard equipment on all instrument clusters. However, the instrument cluster can be programmed to disable this indicator on vehicles that are not equipped with the airbag system, which is not available in some markets. This indicator is located in the center of the speedometer, in the area above and left of the speedometer needle hub.

The airbag indicator consists of a stencil-like cutout of the International Control and Display Symbol icon for “Airbag” in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from

being clearly visible when it is not illuminated. A red Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the icon to appear in red through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The airbag indicator is serviced as a unit with the instrument cluster.

OPERATION

The airbag indicator gives an indication to the vehicle operator when the airbag system is faulty or inoperative. The airbag indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Occupant Restraint Controller (ORC) over the Controller Area Network (CAN) data bus.

The airbag indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the airbag indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the airbag indicator is illuminated for about six to eight seconds. The entire bulb test is a function of the ORC.
- **ORC Lamp-On Message** - Each time the cluster receives a lamp-on message from the ORC, the airbag indicator will be illuminated. The indicator remains illuminated for about twelve seconds or until the cluster receives a lamp-off message from the ORC, whichever is longer.
- **Communication Error** - If the cluster receives no airbag messages for ten consecutive message cycles, the airbag indicator is illuminated. The indicator remains illuminated until the cluster receives a single lamp-off message from the ORC.
- **Actuator Test** - Each time the cluster is put through the actuator test, the airbag indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry. The actuator test illumination of the airbag indicator is a function of the instrument cluster.

The ORC continually monitors the airbag system circuits and sensors to decide whether the system is in good operating condition. The ORC then sends the proper lamp-on or lamp-off messages to the instrument cluster. If the ORC sends a lamp-on message after the bulb test, it indicates that the ORC has detected a system malfunction and/or that the airbags and seat belt tensioners may not deploy when required, or may deploy when not required. The ORC will store a Diagnostic Trouble Code (DTC) for any malfunction it detects. Each time the airbag indicator fails to illuminate due to an open or short in the cluster airbag indicator circuit, the cluster sends a message notifying the ORC of the condition, the instrument cluster and the ORC will each store a DTC, and the cluster will flash the seatbelt indicator on and off as a backup to notify the vehicle operator.

For proper diagnosis of the airbag system, the ORC, the CAN data bus, or the electronic message inputs to the instrument cluster that control the airbag indicator, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

BRAKE/PARK BRAKE INDICATOR

DESCRIPTION

A brake indicator is standard equipment on all instrument clusters. This indicator is located in the center of the speedometer, in the area below and right of the speedometer needle hub.

The brake indicator consists of a stencil-like cutout of the word “BRAKE” (all clusters with a miles-per-hour primary speedometer scale), or the International Control and Display Symbol icon for “Brake Failure” (all clusters with a kilometers-per-hour primary scale) in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. A red Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the “BRAKE” text or the icon to appear in red through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The brake indicator is serviced as a unit with the instrument cluster.

OPERATION

The brake indicator gives an indication to the vehicle operator when the parking brake is applied, when there are certain brake hydraulic system malfunctions as indicated by a low brake hydraulic fluid level condition, or when the brake fluid level switch is disconnected. The brake indicator can also give an indication when certain faults are detected in the Antilock Brake System (ABS). This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming, electronic messages received by the cluster from the Controller Antilock Brake (CAB) over the Controller Area Network (CAN) data bus, and a hard wired input from the park brake switch.

The brake indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the brake indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the brake indicator is illuminated for about four seconds as a bulb test. The entire bulb test is a function of the CAB.
- **Brake Lamp-On Message** - Each time the cluster receives a lamp-on message from the CAB, the brake indicator will be illuminated. The CAB can also send brake lamp-on messages as feedback during ABS diagnostic procedures. The indicator remains illuminated until the cluster receives a lamp-off message from the CAB, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Park Brake Switch Input** - Each time the cluster detects ground on the park brake switch sense circuit (park brake switch closed = park brake applied or not fully released) while the ignition switch is in the On position, the brake indicator flashes on and off. The indicator continues to flash until the park brake switch sense input to the cluster is an open circuit (park brake switch open = park brake fully released), or until the ignition switch is turned to the Off position, whichever occurs first.
- **Actuator Test** - Each time the instrument cluster is put through the actuator test, the brake indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The park brake switch on the park brake pedal mechanism provides a hard wired ground input to the instrument cluster circuitry through the park brake switch sense circuit whenever the park brake is applied or not fully released. The CAB continually monitors the ABS system circuits and sensors, including the brake fluid level switch on the brake master cylinder reservoir, to decide whether the system is in good operating condition. The CAB then sends the proper lamp-on or lamp-off messages to the instrument cluster. If the CAB sends a lamp-on message after the bulb test, it indicates that the CAB has detected a brake hydraulic system malfunction and/or that the ABS system has become inoperative. The CAB will store a Diagnostic Trouble Code (DTC) for any malfunction it detects.

For further diagnosis of the brake indicator or the instrument cluster circuitry that controls the LED, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). The park brake switch input to the instrument cluster may be diagnosed using conventional diagnostic tools and methods. Refer to the appropriate wiring information. For proper diagnosis of the brake fluid level switch, the ABS, the CAB, the CAN data bus, or the electronic message inputs to the instrument cluster that control the brake indicator, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

DIAGNOSIS AND TESTING

BRAKE INDICATOR

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

The hard wired park brake switch input to the EMIC may be diagnosed and tested using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

However, conventional diagnostic methods may not prove conclusive in the diagnosis of the EMIC, the Controller Antilock Brake (CAB), the Controller Area Network (CAN) data bus, or the electronic message inputs also used by the EMIC to provide brake indicator operation. The most reliable, efficient, and accurate means to diagnose the EMIC, the CAB, the CAN data bus, and the electronic message inputs for the brake indicator operation requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

CHARGING INDICATOR

DESCRIPTION

A charging indicator is standard equipment on all instrument clusters. This indicator is located near the upper edge of the instrument cluster, between the tachometer and the speedometer.

The charging indicator consists of a stencil-like cutout of the International Control and Display Symbol icon for “Battery Charging Condition” in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. A red Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the icon to appear in red through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The charging indicator is serviced as a unit with the instrument cluster.

OPERATION

The charging indicator gives an indication to the vehicle operator when the electrical system voltage is too low or too high. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Controller Area Network (CAN) data bus.

The charging indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the charging indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the charging indicator is illuminated by the instrument cluster for about two seconds as a bulb test.
- **Voltage Low Message** - Each time the cluster receives a message from the PCM indicating the electrical system voltage is low (less than about 11.5 volts is a charge fail condition), the charging indicator will be illuminated. The indicator remains illuminated until the cluster receives a message from the PCM indicating the electrical system voltage is normal (greater than about 12.0 volts, but less than 16.0 volts), or until the ignition switch is turned to the Off position, whichever occurs first.
- **Voltage High Message** - Each time the cluster receives a message from the PCM indicating the electrical system voltage is high (greater than about 16.0 volts), the charging indicator will be illuminated. The indicator remains illuminated until the cluster receives a message from the PCM indicating the electrical system voltage is normal (less than about 15.5 volts, but greater than 11.5 volts), or until the ignition switch is turned to the Off position, whichever occurs first.
- **Actuator Test** - Each time the cluster is put through the actuator test, the charging indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The PCM continually monitors the electrical system voltage to control the generator output. The PCM then sends the proper system voltage messages to the instrument cluster. If the instrument cluster turns on the charging indicator due to a charge fail or voltage high condition, it may indicate that the charging system requires service. For further diagnosis of the charging indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

For proper diagnosis of the charging system, the PCM, the CAN data bus, or the electronic message inputs to the instrument cluster that control the charging indicator, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

CRUISE INDICATOR

DESCRIPTION

A cruise indicator is standard equipment on all instrument clusters. However, on vehicles not equipped with the optional speed control system, this indicator is electronically disabled. The cruise indicator is located below the minor gauge set on the left side of the cluster.

The cruise indicator consists of a stencil-like cutout of the word “CRUISE” in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. A green Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the “CRUISE” text to appear in green through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board.

When the exterior lighting is turned On, the illumination intensity of the cruise indicator is dimmable, which is adjusted along with the cluster illumination lamp using the panel lamps dimmer thumbwheel on the headlamp switch. The cruise indicator is serviced as a unit with the instrument cluster.

OPERATION

The cruise indicator gives an indication to the vehicle operator when the speed control system is turned On, regardless of whether the speed control is engaged. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Controller Area Network (CAN) data bus.

The cruise indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the cruise indicator for the following reasons:

- **Cruise Lamp-On Message** - Each time the cluster receives a cruise lamp-on message from the PCM indicating the speed control system has been turned On, the cruise indicator is illuminated. The indicator remains illuminated until the cluster receives a cruise lamp-off message from the PCM or until the ignition switch is turned to the Off position, whichever occurs first.
- **Actuator Test** - Each time the cluster is put through the actuator test, the cruise indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The PCM continually monitors the speed control switches to determine the proper outputs to the speed control servo. The PCM then sends the proper cruise indicator lamp-on and lamp-off messages to the instrument cluster. For further diagnosis of the cruise indicator or the instrument cluster circuitry that controls the LED, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

For proper diagnosis of the speed control system, the PCM, the CAN data bus, or the electronic message inputs to the instrument cluster that control the cruise indicator, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

DOOR AJAR INDICATOR

DESCRIPTION

A door ajar indicator is standard equipment on all instrument clusters. This indicator is located in the center of the speedometer, in the area below and right of the speedometer needle hub.

The door ajar indicator consists of a stencil-like cutout of the International Control and Display Symbol icon for “Door(s) Ajar” in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the

indicator from being clearly visible when it is not illuminated. A red Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the icon to appear in red through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The door ajar indicator is serviced as a unit with the instrument cluster.

OPERATION

The door ajar indicator gives an indication to the vehicle operator that one or more of the passenger compartment doors may be open or not completely latched. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and hard wired inputs received by the cluster from the door ajar switches located in each door latch unit.

The door ajar indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will allow this indicator to operate whenever the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the door ajar indicator for the following reasons:

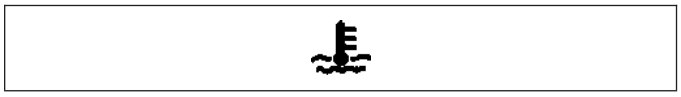
- **Door Ajar Switch Input** - Each time the cluster detects ground on any one of the door ajar switch sense circuits (door ajar switch closed = door is open or not completely latched) the door ajar indicator will be illuminated. The indicator remains illuminated until all of the door ajar switch sense inputs to the cluster are an open circuit (door ajar switch open = door fully closed), until the cluster has completed an interior lamps load shed (about five minutes), or until the ignition switch is turned to the Off position, whichever occurs first.
- **Actuator Test** - Each time the cluster is put through the actuator test, the door ajar indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The instrument cluster continually monitors the door ajar switches to determine the status of the doors. For further diagnosis of the door ajar indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

For proper diagnosis of the door ajar switches and circuits, refer to the appropriate wiring information.

ENGINE TEMPERATURE GAUGE

DESCRIPTION



An engine coolant temperature gauge is standard equipment on all instrument clusters. This gauge is part of the minor gauge set with the fuel gauge located on the left side of the instrument cluster, just left of the speedometer. The gauge consists of a movable gauge needle or pointer controlled by the instrument cluster circuitry and a fixed 90 degree gauge scale on the cluster overlay that reads bottom-to-top from “C” (or Cold) to “H” (or Hot). An International Control and Display Symbol icon for “Engine Coolant Temperature” is located on the cluster overlay, directly below the bottom end of the scale.

The engine coolant temperature gauge graphics are black against a white field except for a single red graduation at the high end of the gauge scale, making them clearly visible within the instrument cluster in daylight. When illuminated from behind by the panel lamps dimmer controlled cluster illumination lighting with the exterior lamps turned On, the white gauge dial face appears blue-green with the black graphics silhouetted against the illuminated background and the red graphics and the red gauge needle still appear red. Gauge illumination is provided by an integral electro-luminescent lamp that is serviced as a unit with the instrument cluster. The engine coolant temperature gauge is serviced as a unit with the instrument cluster.

OPERATION

The engine coolant temperature gauge gives an indication to the vehicle operator of the engine coolant temperature. This gauge is controlled by the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Controller Area Network (CAN) data bus.

The engine coolant temperature gauge is an air core magnetic unit that receives battery current on the instrument cluster electronic circuit board through the fused ignition switch output (run-start) circuit whenever the ignition switch is in the On or Start positions. The cluster is programmed to move the gauge needle back to the low end of the scale after the ignition switch is turned to the Off position. The instrument cluster circuitry controls the gauge needle position and provides the following features:

- **Engine Temperature Message** - Each time the cluster receives a message from the PCM indicating the engine coolant temperature is between the low end of normal [about 54° C (130° F)] and the high end of normal [about 122° C (252° F)], the gauge needle is moved to the actual relative temperature position on the gauge scale.
- **Engine Temperature Low Message** - Each time the cluster receives a message from the PCM indicating the engine coolant temperature is below the low end of normal [about 54° C (130° F)], the gauge needle is held at the “C” increment at low end of the gauge scale. The gauge needle remains at the low end of the gauge scale until the cluster receives a message from the PCM indicating that the engine temperature is above about 54° C (130° F), or until the ignition switch is turned to the Off position, whichever occurs first.
- **Engine Temperature High Message** - Each time the cluster receives a message from the PCM indicating the engine coolant temperature is above about 122° C (252° F), the gauge needle is moved into the red zone on the gauge scale, the engine temperature indicator is illuminated, and a single chime tone is sounded. The gauge needle remains in the red zone and the engine temperature indicator remains illuminated until the cluster receives a message from the PCM indicating that the engine temperature is below about 122° C (252° F), or until the ignition switch is turned to the Off position, whichever occurs first. The chime tone feature will only repeat during the same ignition cycle if the engine temperature indicator is cycled off and then on again by the appropriate engine temperature messages from the PCM.
- **Communication Error** - If the cluster fails to receive an engine temperature message, it will hold the gauge needle at the last indication for about five seconds or until the ignition switch is turned to the Off position, whichever occurs first. After five seconds, the cluster will move the gauge needle to the low end of the gauge scale.
- **Actuator Test** - Each time the cluster is put through the actuator test, the engine coolant temperature gauge needle will be swept to several calibration points on the gauge scale in a prescribed sequence in order to confirm the functionality of the gauge and the cluster control circuitry.

The PCM continually monitors the engine coolant temperature sensor to determine the engine operating temperature. The PCM then sends the proper engine coolant temperature messages to the instrument cluster. For further diagnosis of the engine coolant temperature gauge or the instrument cluster circuitry that controls the gauge, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). If the instrument cluster turns on the engine temperature indicator due to a high engine temperature gauge reading, it may indicate that the engine or the engine cooling system requires service.

For proper diagnosis of the engine coolant temperature sensor, the PCM, the CAN data bus, or the electronic message inputs to the instrument cluster that control the engine coolant temperature gauge, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

ENGINE TEMPERATURE INDICATOR

DESCRIPTION

An engine temperature indicator is standard equipment only on all instrument clusters. This indicator is located near the upper edge of the instrument cluster, between the minor gauge set and the speedometer.

The engine temperature indicator consists of a stencil-like cutout of the International Control and Display Symbol icon for “Engine Coolant Temperature” in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. A red Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the icon to appear in red through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The engine temperature indicator is serviced as a unit with the instrument cluster.

OPERATION

The engine temperature indicator gives an indication to the vehicle operator when the engine temperature gauge reading reflects a condition requiring immediate attention. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Controller Area Network (CAN) data bus.

The engine temperature indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the engine temperature indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the engine temperature indicator is illuminated for about two seconds as a bulb test. The entire bulb test is a function of the PCM.
- **Engine Temperature High Message** - Each time the cluster receives a message from the PCM indicating the engine coolant temperature is above about 122° C (252° F), the engine temperature indicator will be illuminated and a single chime tone is sounded. The indicator remains illuminated until the cluster receives a message from the PCM indicating that the engine coolant temperature is below about 119° C (246° F), or until the ignition switch is turned to the Off position, whichever occurs first. The chime tone feature will only repeat during the same ignition cycle if the engine temperature indicator is cycled off and then on again by the appropriate engine temperature messages from the PCM.
- **Actuator Test** - Each time the cluster is put through the actuator test, the engine temperature indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The PCM continually monitors the engine coolant temperature sensor to determine the engine operating temperature. The PCM then sends the proper engine coolant temperature messages to the instrument cluster. For further diagnosis of the engine temperature indicator or the instrument cluster circuitry that controls the LED, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). If the instrument cluster turns on the engine temperature indicator due to a high engine temperature gauge reading, it may indicate that the engine or the engine cooling system requires service.

For proper diagnosis of the engine coolant temperature sensor, the PCM, the CAN data bus, or the electronic message inputs to the instrument cluster that control the engine temperature indicator, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

ETC INDICATOR

DESCRIPTION

An Electronic Throttle Control (ETC) indicator is standard equipment on all instrument clusters. However, on vehicles not equipped with the optional 5.7 liter engine, this indicator is electronically disabled. This indicator is located in the center of the speedometer, in the area to the right of the speedometer needle hub.

The ETC indicator consists of a stencil-like cutout of the International Control and Display Symbol icon for “Electronic Throttle Control” in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. A red Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the icon to appear in red through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The ETC indicator is serviced as a unit with the instrument cluster.

OPERATION

The Electronic Throttle Control (ETC) indicator gives an indication to the vehicle operator when the ETC system is faulty or inoperative. The ETC indicator is controlled by a transistor on the instrument cluster circuit board based

upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Controller Area Network (CAN) data bus.

The ETC indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the ETC indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the ETC indicator is illuminated for about fifteen seconds. The entire bulb test is a function of the PCM.
- **ETC Lamp-On Message** - Each time the cluster receives a lamp-on message from the PCM, the ETC indicator will be illuminated. The indicator can be flashed on and off, or illuminated solid, as dictated by the PCM message. The indicator remains illuminated solid or continues to flash for about twelve seconds or until the cluster receives a lamp-off message from the PCM, whichever is longer. If the indicator is illuminated solid with the engine running the vehicle will usually remain drivable. If the indicator is flashing with the engine running the vehicle may require towing. A flashing indicator means the ETC system requires immediate service.
- **Actuator Test** - Each time the cluster is put through the actuator test, the ETC indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry. The actuator test illumination of the ETC indicator is a function of the PCM.

The PCM continually monitors the ETC system circuits and sensors to decide whether the system is in good operating condition. The PCM then sends the proper lamp-on or lamp-off messages to the instrument cluster. If the PCM sends a lamp-on message after the bulb test, it indicates that the PCM has detected an ETC system malfunction and/or that the ETC system is inoperative. The PCM will store a Diagnostic Trouble Code (DTC) for any malfunction it detects. Each time the ETC indicator fails to illuminate due to an open or short in the cluster ETC indicator circuit, the cluster sends a message notifying the PCM of the condition, the instrument cluster and the PCM will each store a DTC.

For proper diagnosis of the ETC system, the PCM, the CAN data bus, or the electronic message inputs to the instrument cluster that control the ETC indicator, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

FOG LAMP INDICATOR

DESCRIPTION

A fog lamp indicator is standard equipment on all instrument clusters. However, on vehicles not equipped with optional fog lamps, this indicator is electronically disabled. This indicator is located near the upper edge of the instrument cluster, between the minor gauge set and the speedometer.

The fog lamp indicator consists of a stencil-like cutout of the International Control and Display Symbol icon for “Front Fog Light” in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. A green Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the icon to appear in green through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The fog lamp indicator is serviced as a unit with the instrument cluster.

OPERATION

The fog lamp indicator gives an indication to the vehicle operator whenever the optional fog lamps are illuminated. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Front Control Module (FCM) (also known as the Integrated Power Module/IPM) over the Controller Area Network (CAN) data bus.

The fog lamp indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will allow this indicator to operate whenever the instrument cluster receives a battery current input on the fused B(+) circuit. Therefore, the LED can be illuminated regardless of the ignition switch position. The LED only

illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the fog lamp indicator for the following reasons:

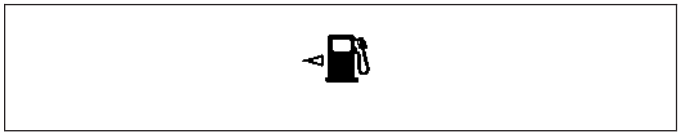
- **Fog Lamp-On Message** - Each time the cluster receives a fog lamp-on message from the FCM indicating the fog lamp relay is energized, the fog lamp indicator will be illuminated. The indicator remains illuminated until the cluster receives a fog lamp-off message from the FCM.
- **Actuator Test** - Each time the cluster is put through the actuator test, the fog lamp indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The instrument cluster continually monitors a hard wired input from the headlamp switch to determine the selected fog lamp switch status. The instrument cluster then sends the proper fog lamp-on and lamp-off messages to the FCM over the CAN data bus. The FCM activates the fog lamp relay then sends the proper fog lamp indicator lamp-on and lamp-off messages to the instrument cluster. For further diagnosis of the fog lamp indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

For proper diagnosis of the fog lamp system, the FCM, the CAN data bus, or the electronic message inputs to the instrument cluster that control the fog lamp indicator, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

FUEL GAUGE

DESCRIPTION



A fuel gauge is standard equipment on all instrument clusters. This gauge is part of the minor gauge set with the engine coolant temperature gauge located on the left side of the instrument cluster, just left of the speedometer. This gauge consists of a movable gauge needle or pointer controlled by the instrument cluster circuitry and a fixed 90 degree gauge scale on the cluster overlay that reads bottom-to-top from “E” (or Empty) to “F” (or Full). An International Control and Display Symbol icon for “Fuel” is located on the cluster overlay, in the center of the gauge directly below the bottom end of the scale. An arrowhead pointed to the left side of the vehicle is imprinted on the cluster overlay next to the “Fuel” icon on the gauge to provide the driver with a reminder as to the location of the fuel filler access.

The fuel gauge graphics are black against a white field except for a single red graduation at the low end of the gauge scale, making them clearly visible within the instrument cluster in daylight. When illuminated from behind by the panel lamps dimmer controlled cluster illumination lighting with the exterior lamps turned On, the white gauge dial face appears blue-green with the black graphics silhouetted against the illuminated background and the red graphics and the red gauge needle still appear red. Gauge illumination is provided by an integral electro-luminescent lamp that is serviced as a unit with the instrument cluster. The fuel gauge is serviced as a unit with the instrument cluster.

OPERATION

The fuel gauge gives an indication to the vehicle operator of the level of fuel in the fuel tank. This gauge is controlled by the instrument cluster circuit board based upon cluster programming and a hard wired input received by the cluster from the fuel level sending unit on the fuel pump module in the fuel tank.

The fuel gauge is an air core magnetic unit that receives battery current on the instrument cluster electronic circuit board through the fused ignition switch output (run-start) circuit whenever the ignition switch is in the On or Start positions. The cluster is programmed to move the gauge needle back to the low end of the scale after the ignition switch is turned to the Off position. The instrument cluster circuitry controls the gauge needle position and provides the following features:

- **Fuel Level Sending Unit Input** - The cluster provides a constant current source to the fuel level sending unit and monitors a return input on a fuel level sense circuit. The resistance through the fuel level sending unit increases as the fuel level falls and decreases as the fuel level rises causing changes in the sense input voltage. The cluster programming applies an algorithm to calculate the proper fuel gauge needle position based upon the fuel level sense input, then moves the gauge needle to the proper relative position on the gauge

scale. This algorithm is used to dampen gauge needle movement against the negative effect that fuel sloshing within the fuel tank can have on accurate inputs from the fuel tank sending unit to the cluster.

- **Less Than 12.5 Percent Tank Full Input** - Each time the fuel level sense input to the cluster indicates the fuel tank is about 12.5 percent full or less for ten consecutive seconds and the vehicle speed is zero, or for sixty consecutive seconds and the vehicle speed is greater than zero, the gauge needle is moved to about the one-sixteenth graduation on the gauge scale, the low fuel indicator is illuminated, and a single chime tone is sounded. The low fuel indicator remains illuminated until the fuel level sense input indicates that the fuel tank is greater than about 15.5 percent full for ten consecutive seconds and the vehicle speed is zero, or for sixty consecutive seconds and the vehicle speed is greater than zero, or until the ignition switch is turned to the Off position, whichever occurs first. The chime tone feature will only repeat during the same ignition cycle if the low fuel indicator is cycled off and then on again by the appropriate inputs from the fuel level sending unit.
- **Less Than Empty Stop Input** - Each time the cluster receives a fuel level sense input that indicates the fuel level in the fuel tank is less than the Empty gauge needle stop position, the gauge needle is moved to the low end of the gauge scale and the low fuel indicator is illuminated immediately. This input would indicate that the fuel level sense input to the cluster is a short circuit.
- **More Than Full Stop Input** - Each time the cluster receives a fuel level sense input that indicates the fuel level in the fuel tank is more than the Full gauge needle stop position, the gauge needle is moved to the low end of the gauge scale and the low fuel indicator is illuminated immediately. This input would indicate that the fuel level sense input to the cluster is an open circuit.
- **Actuator Test** - Each time the cluster is put through the actuator test, the fuel gauge needle will be swept to several calibration points on the gauge scale in a prescribed sequence in order to confirm the functionality of the gauge and the cluster control circuitry.

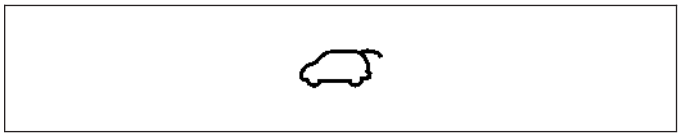
The instrument cluster continually monitors the fuel tank sending unit to determine the level of fuel in the fuel tank. The cluster then sends the proper fuel level messages to other electronic modules in the vehicle over the Controller Area Network (CAN) data bus. For further diagnosis of the fuel gauge or the instrument cluster circuitry that controls the gauge, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

For proper diagnosis of the fuel tank sending unit, the CAN data bus, or the electronic fuel level message outputs of the instrument cluster, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

GATE AJAR INDICATOR

DESCRIPTION

A gate ajar indicator is standard equipment on all instrument clusters. This indicator is located near the upper edge of the instrument cluster, between the tachometer and the speedometer.



The gate ajar indicator consists of a stencil-like cutout of the International Control and Display Symbol icon for “Gate Ajar” in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. A red Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the icon to appear in red through the translucent outer layer of the overlay when it is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The gate ajar indicator is serviced as a unit with the instrument cluster.

OPERATION

The gate ajar indicator gives an indication to the vehicle operator that the passenger compartment liftgate may be open or not completely latched. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and a hard wired input received by the cluster from the liftgate ajar switch integral to the liftgate latch unit.

The gate ajar indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will allow this indicator to operate whenever the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the gate ajar indicator for the following reasons:

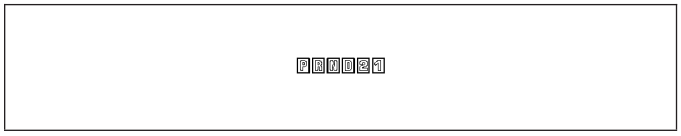
- **Liftgate Ajar Switch Input** - Each time the cluster detects ground on the liftgate ajar switch sense circuit (liftgate ajar switch closed = gate is open or not completely latched) the gate ajar indicator will be illuminated. The indicator remains illuminated until the liftgate ajar switch sense input to the cluster is an open circuit (liftgate ajar switch open = liftgate fully closed), or until the ignition switch is turned to the Off position, whichever occurs first.
- **Actuator Test** - Each time the cluster is put through the actuator test, the gate ajar indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The instrument cluster continually monitors the liftgate ajar switch to determine the status of the liftgate. For further diagnosis of the liftgate ajar indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

For proper diagnosis of the liftgate ajar switch and circuits, refer to the appropriate wiring information.

GEAR SELECTOR INDICATOR

DESCRIPTION



An electronic automatic transmission gear selector indicator is standard factory-installed equipment on this model. The gear selector indicator information is displayed in an electronic, blue-green odometer/trip odometer Vacuum-Fluorescent Display (VFD) unit. This VFD unit is soldered onto the cluster electronic circuit board and is visible through a window with a smoked clear lens located below the tachometer in the lower right area of the cluster overlay. The dark lens over the VFD prevents the indicator from being clearly visible when it is not illuminated.

The odometer/trip odometer VFD displays the following gear selector indicator characters from left to right: “P,” “R,” “N,” “D,” “2,” and “1.” Respectively, these characters represent the park, reverse, neutral, drive, second gear, and first gear positions of the transmission gear selector lever on the steering column. The VFD illuminates a rectangular box around the character that represents the currently selected lever position.

During daylight hours (exterior lamps are Off) the odometer/trip odometer VFD is illuminated at full brightness for clear visibility. At night (exterior lamps are On), the VFD lighting level is adjusted with the other cluster illumination lamps using the panel lamps dimmer thumbwheel on the headlamp switch. However, a “Parade” mode position of the panel lamps dimmer thumbwheel allows the VFD to be illuminated at full brightness if the exterior lamps are turned On during daylight hours. The odometer/trip odometer VFD is serviced as a unit with the instrument cluster.

OPERATION

The electronic gear selector indicator gives an indication to the vehicle operator of the transmission gear that has been selected with the automatic transmission gear selector lever. This indicator is controlled by the instrument cluster circuit board based upon cluster programming and electronic messages received from the Powertrain Control Module (PCM) over the Controller Area Network (CAN) data bus.

The gear selector indicator information is displayed by the odometer/trip odometer Vacuum Fluorescent Display (VFD) unit soldered onto the instrument cluster electronic circuit board, and the VFD will not display the gear selector indicator information after the ignition switch is turned to the Off position. Each time the cluster is disconnected from battery current for more than about five minutes, it must configure itself for the automatic transmission model that is in the vehicle once it is reconnected to battery current. The instrument cluster circuitry operates the gear selector indicator to provide the following features:

- **Selected Gear Message** - Each time the cluster receives a selected gear message from the PCM, a box will be illuminated around the appropriate character in the gear selector indicator. The box will remain illuminated until the cluster receives a different selected gear message, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Communication Error** - If the cluster fails to receive a selected gear message from the PCM within three seconds, the instrument cluster circuitry will display all gear selector positions boxed (selected) until a valid selected gear message is received or until the ignition switch is turned to the Off position, whichever occurs first.

- **Actuator Test** - Each time the cluster is put through the actuator test, the odometer/trip odometer VFD will display all of its characters at once, then step through each character segment individually during the VFD portion of the test to confirm the functionality of the VFD and the cluster control circuitry.

The PCM continually monitors a hard wired multiplex input from the Transmission Range Sensor (TRS), then sends the proper selected gear messages to the instrument cluster. For further diagnosis of the gear selector indicator or the instrument cluster circuitry that controls this function, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

For proper diagnosis of the TRS, the PCM, the CAN data bus, or the electronic message inputs to the instrument cluster that control the gear selector indicator, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

HIGH BEAM INDICATOR

DESCRIPTION

A high beam indicator is standard equipment on all instrument clusters. This indicator is located near the upper edge of the instrument cluster, between the minor gauge set and the speedometer.

The high beam indicator consists of a stencil-like cutout of the International Control and Display Symbol icon for “High Beam” in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. A blue Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the icon to appear in blue through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The high beam indicator is serviced as a unit with the instrument cluster.

OPERATION

The high beam indicator gives an indication to the vehicle operator whenever the headlamp high beams are illuminated. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and a hard wired multiplex input received by the cluster from the headlamp beam select switch circuitry of the multi-function switch on the washer/beam select switch mux circuit.

The high beam indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will allow this indicator to operate whenever the instrument cluster receives a battery current input on the fused B(+) circuit. Therefore, the LED can be illuminated regardless of the ignition switch position. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the high beam indicator for the following reasons:

- **High Beam Headlamps-On Input** - Each time the cluster detects a high beam headlamps-on input from the headlamp beam select switch circuitry of the multi-function switch on the washer/beam select switch mux circuit, the headlamp high beams and the high beam indicator will be illuminated. The headlamp high beams and the high beam indicator remain illuminated until the cluster receives a high beam headlamps-off input from the multi-function switch, or until the exterior lamp load shedding (battery saver) timed interval expires, whichever occurs first.
- **Actuator Test** - Each time the cluster is put through the actuator test, the high beam indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The instrument cluster continually monitors the headlamp switch and the multi-function switch to determine the proper headlamp low beam and high beam control. The instrument cluster then sends the proper low beam and high beam lamp-on and lamp-off messages to the Front Control Module (FCM) over the Controller Area Network (CAN) data bus and turns the high beam indicator on or off accordingly. For further diagnosis of the high beam indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

For proper diagnosis of the headlamps, or the headlamp switch and multi-function switch inputs to the instrument cluster that control the high beam indicator, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

LOW FUEL INDICATOR

DESCRIPTION

A low fuel indicator is standard equipment on all instrument clusters. This indicator is located near the upper edge of the instrument cluster, between the minor gauge set and the speedometer.

The low fuel indicator consists of a stencil-like cutout of the International Control and Display Symbol icon for “Fuel” in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. An amber Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the icon to appear in amber through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The low fuel indicator is serviced as a unit with the instrument cluster.

OPERATION

The low fuel indicator gives an indication to the vehicle operator when the level of fuel in the fuel tank becomes low. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and a hard wired input received by the cluster from the fuel level sending unit on the fuel pump module in the fuel tank.

The low fuel indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the low fuel indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the low fuel indicator is illuminated for about two seconds as a bulb test.
- **Less Than 12.5 Percent Tank Full Input** - The cluster provides a constant current source to the fuel level sending unit and monitors a return input on a fuel level sense circuit. The resistance through the fuel level sending unit increases as the fuel level falls and decreases as the fuel level rises causing changes in the sense input voltage. Each time the fuel level sense input to the cluster indicates the fuel tank is about 12.5 percent full or less for ten consecutive seconds and the vehicle speed is zero, or for sixty consecutive seconds and the vehicle speed is greater than zero, the fuel gauge needle is moved to about the one-sixteenth graduation on the gauge scale, the low fuel indicator is illuminated, and a single chime tone is sounded. The low fuel indicator remains illuminated until the fuel level sense input indicates that the fuel tank is greater than about 15.5 percent full for ten consecutive seconds and the vehicle speed is zero, or for sixty consecutive seconds and the vehicle speed is greater than zero, or until the ignition switch is turned to the Off position, whichever occurs first. The chime tone feature will only repeat during the same ignition cycle if the low fuel indicator is cycled off and then on again by the appropriate inputs from the fuel level sending unit.
- **Less Than Empty Stop Input** - Each time the cluster receives a fuel level sense input that indicates the fuel level in the fuel tank is less than the Empty gauge needle stop position, the gauge needle is moved to the low end of the gauge scale and the low fuel indicator is illuminated immediately. This input would indicate that the fuel level sense input to the cluster is a short circuit.
- **More Than Full Stop Input** - Each time the cluster receives a fuel level sense input that indicates the fuel level in the fuel tank is more than the Full gauge needle stop position, the gauge needle is moved to the low end of the gauge scale and the low fuel indicator is illuminated immediately. This input would indicate that the fuel level sense input to the cluster is an open circuit.
- **Actuator Test** - Each time the cluster is put through the actuator test, the low fuel indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The instrument cluster continually monitors the fuel tank sending unit to determine the level of fuel in the fuel tank. The cluster then sends the proper fuel level messages to other electronic modules in the vehicle over the Controller Area Network (CAN) data bus. For further diagnosis of the low fuel indicator or the instrument cluster circuitry that controls the LED, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

For proper diagnosis of the fuel tank sending unit, the CAN data bus, or the electronic fuel level message outputs of the instrument cluster, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

LOW OIL PRESSURE INDICATOR

DESCRIPTION

A low oil pressure indicator is standard equipment on all instrument clusters. This indicator is located near the upper edge of the instrument cluster, between the tachometer and the speedometer.

The low oil pressure indicator consists of a stencil-like cutout of the International Control and Display Symbol icon for “Engine Oil” in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. A red Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the icon to appear in red through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The low oil pressure indicator is serviced as a unit with the instrument cluster.

OPERATION

The low oil pressure indicator gives an indication to the vehicle operator when the engine oil pressure reading reflects a condition requiring immediate attention. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Controller Area Network (CAN) data bus.

The low oil pressure indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the low oil pressure indicator for the following reasons:

- **Engine Oil Pressure Low Message** - Each time the cluster receives a message from the PCM indicating the engine oil pressure is about 6.9 kPa (1 psi) or lower, the low oil pressure indicator will be illuminated. The indicator remains illuminated until the cluster receives a message from the PCM indicating that the engine oil pressure is above about 6.9 kPa (1 psi), or until the ignition switch is turned to the Off position, whichever occurs first. The cluster will only turn the indicator on in response to an engine oil pressure low message if the engine speed is greater than zero.
- **Actuator Test** - Each time the cluster is put through the actuator test, the low oil pressure indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The PCM continually monitors the engine oil pressure sensor to determine the engine oil pressure. The PCM then sends the proper engine oil pressure messages to the instrument cluster. For further diagnosis of the low oil pressure indicator or the instrument cluster circuitry that controls the LED, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

For proper diagnosis of the engine oil pressure sensor, the PCM, the CAN data bus, or the electronic message inputs to the instrument cluster that control the low oil pressure indicator, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

MALFUNCTION INDICATOR LAMP (MIL)

DESCRIPTION

A Malfunction Indicator Lamp (MIL) is standard equipment on all instrument clusters. This indicator is

located in the center of the speedometer, in the area to the left of the speedometer needle hub.

The MIL consists of a stencil-like cutout of the International Control and Display Symbol icon for “Engine” in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. An amber Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the icon to appear in amber through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The MIL is serviced as a unit with the instrument cluster.

OPERATION

The Malfunction Indicator Lamp (MIL) gives an indication to the vehicle operator when the Powertrain Control Module (PCM) has recorded a Diagnostic Trouble Code (DTC) for an On-Board Diagnostics II (OBDII) emissions-related circuit or component malfunction. The MIL is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the PCM over the Controller Area Network (CAN) data bus.

The MIL Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the MIL for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the indicator is illuminated for about fifteen seconds as a bulb test. The entire bulb test is a function of the PCM.
- **MIL Lamp-On Message** - Each time the cluster receives a MIL lamp-on message from the PCM, the indicator will be illuminated. The indicator can be flashed on and off, or illuminated solid, as dictated by the PCM message. For some DTC’s, if a problem does not recur, the PCM will send a lamp-off message automatically. Other DTC’s may require that a fault be repaired and the PCM be reset before a lamp-off message will be sent. For more information on the PCM, and the DTC set and reset parameters, (Refer to 25 - EMISSIONS CONTROL - OPERATION).
- **Communication Error** - If the cluster receives no messages from the PCM for ten consecutive message cycles, the MIL is illuminated by the instrument cluster to indicate a loss of bus communication. The indicator remains controlled and illuminated by the cluster until a valid message is received from the PCM.
- **Actuator Test** - Each time the cluster is put through the actuator test, the MIL indicator will be turned on during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The PCM continually monitors the fuel and emissions system circuits and sensors to decide whether the system is in good operating condition. The PCM then sends the proper lamp-on or lamp-off messages to the instrument cluster. For further diagnosis of the MIL or the instrument cluster circuitry that controls the LED, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). If the instrument cluster turns on the MIL after the bulb test, it may indicate that a malfunction has occurred and that the fuel and emissions systems may require service.

For proper diagnosis of the fuel and emissions systems, the PCM, the CAN data bus, or the electronic message inputs to the instrument cluster that control the MIL, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

ODOMETER

DESCRIPTION

An odometer and trip odometer are standard equipment in all instrument clusters. The odometer, trip odometer, and engine hours information are displayed in a common electronic, blue-green Vacuum-Fluorescent Display (VFD) unit. This VFD unit is soldered onto the cluster electronic circuit board and is visible through a window with a smoked clear lens located below the tachometer in the lower right area of the cluster overlay. The dark lens over the VFD prevents the indicator from being clearly visible when it is not illuminated.

The odometer, trip odometer, and engine hours information are not displayed simultaneously. The trip odometer reset switch on the instrument cluster circuit board toggles the display between odometer and trip odometer modes by depressing the odometer/trip odometer switch button that extends through the lower edge of the cluster lens, just left of the minor gauge set. When the trip odometer information is displayed, the word “TRIP” is also illuminated in the lower right corner of the odometer/trip odometer VFD in a blue-green color and at the same lighting level as the trip odometer information. The engine hours information replaces the selected odometer or trip odometer information whenever the ignition switch is in the On position and the engine is not running.

The odometer, trip odometer, and engine hours information is stored in the instrument cluster memory. This information can be increased when the proper inputs are provided to the instrument cluster, but the information cannot be decreased. The odometer can display values up to 999,999 kilometers (999,999 miles). The odometer latches at these values, and will not roll over to zero. The trip odometer can display values up to 999.9 kilometers (999.9 miles) before it rolls over to zero. Engine hours are displayed in the format, “hr9999”. The cluster will accumulate values up to 9,999 hours before the display rolls over to zero.

The odometer display does not have a decimal point and will not show values less than a full unit (kilometer or mile), while the trip odometer display does have a decimal point and will show tenths of a unit (kilometer or mile). The unit of measure (kilometers or miles) for the odometer and trip odometer display is not shown in the VFD. The unit of measure for the instrument cluster odometer/trip odometer is selected at the time that it is manufactured, and cannot be changed. The odometer also has a “Rental Car” mode, which will illuminate the odometer information in the VFD whenever the driver side front door is opened with the ignition switch in the Off or Accessory positions.

During daylight hours (exterior lamps are Off) the odometer VFD is illuminated at full brightness for clear visibility. At night (exterior lamps are On), the VFD lighting level is adjusted with the other cluster illumination lamps using the panel lamps dimmer thumbwheel on the headlamp switch. However, a “Parade” mode position of the panel lamps dimmer thumbwheel allows the VFD to be illuminated at full brightness if the exterior lamps are turned On during daylight hours.

The odometer/trip odometer VFD, the trip odometer switch, and the trip odometer switch button are serviced as a unit with the instrument cluster.

OPERATION

The odometer and trip odometer give an indication to the vehicle operator of the distance the vehicle has traveled. The engine hours give an indication of the cumulative engine-on time. This indicator is controlled by the instrument cluster circuitry based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Controller Area Network (CAN) data bus.

The odometer, trip odometer and engine hours information is displayed by the instrument cluster odometer/trip odometer Vacuum Fluorescent Display (VFD). The VFD will display the odometer information whenever any door is opened with the ignition switch in the Off or Accessory positions, and will display the last previously selected odometer or trip odometer information when the ignition switch is turned to the On or Start positions. The instrument cluster circuitry controls the VFD and provides the following features:

- **Odometer/Trip Odometer Display Toggling** - Actuating the trip odometer reset switch button momentarily with the VFD illuminated will toggle the display between the odometer and trip odometer information. Each time the VFD is illuminated with the ignition switch in the On or Start positions, the display will automatically return to the last mode previously selected (odometer or trip odometer).
- **Engine Hours Display Toggling** - When the trip odometer reset switch button is pressed and held for longer than about six seconds with the ignition switch in the On position and the engine speed message from the PCM is zero, the trip odometer information will be momentarily displayed, then the engine hours information will be displayed. The VFD must be displaying the odometer information when the trip odometer reset switch button is pressed in order to toggle to the engine hours display. The engine hours will remain displayed for about thirty seconds, until the engine speed message is greater than zero, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Trip Odometer Reset** - When the trip odometer reset switch button is pressed and held for longer than about two seconds with the ignition switch in the On or Start positions, the trip odometer will be reset to 0.0 kilometers (miles). The VFD must be displaying the trip odometer information in order for the trip odometer information to be reset.
- **“GASCAP” Message Display** - On vehicles manufactured with a United States country code, each time the cluster receives an electronic message from the PCM indicating a monitored leak in the evaporative emissions system, the cluster replaces the displayed odometer/trip odometer value with the text message “GASCAP.” This message serves as a reminder to the vehicle operator to check that the gas cap is properly installed and

tightened, but could also indicate another source of air leakage in the on-board evaporative and vapor recovery emissions systems. Unless the leak is corrected, this message will latch and remain displayed during the current and each subsequent ignition cycle until the trip odometer reset button is pressed and released momentarily, which will revert the display to the odometer/trip odometer information that was last displayed for the remainder of that ignition cycle. Once the source of a leak has been corrected, either momentarily pressing the trip odometer reset button or cycling the ignition switch will unlatch the message and return the odometer/trip odometer to normal operation.

- **Communication Error** - If the cluster fails to receive a distance message during normal operation, it will hold and display the last data received until the ignition switch is turned to the Off position. If the cluster does not receive a distance message within one second after the ignition switch is turned to the On position, it will display the last distance message stored in the cluster memory. If the cluster is unable to display distance information due to an error internal to the cluster, the VFD will display “Error.”
- **Actuator Test** - Each time the cluster is put through the actuator test, the odometer VFD will display all of its segments simultaneously, then step through each character segment individually during the VFD portion of the test to confirm the functionality of the VFD and the cluster control circuitry.

The PCM continually monitors the vehicle speed pulse information received from the vehicle speed sensor and engine speed pulse information received from the crankshaft position sensor, then sends the proper distance and engine speed messages to the instrument cluster. For further diagnosis of the odometer/trip odometer or the instrument cluster circuitry that controls these functions, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

For proper diagnosis of the vehicle speed sensor, the crankshaft position sensor, the PCM, the CAN data bus, or the electronic message inputs to the instrument cluster that control the odometer/trip odometer, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

SEATBELT INDICATOR

DESCRIPTION

A seatbelt indicator is standard equipment on all instrument clusters. This indicator is located near the upper edge of the instrument cluster, between the minor gauge set and the speedometer.

The seatbelt indicator consists of a stencil-like cutout of the International Control and Display Symbol icon for “Seat Belt” in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. A red Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the icon to appear in red through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The seatbelt indicator is serviced as a unit with the instrument cluster.

OPERATION

The seatbelt indicator gives an indication to the vehicle operator of the status of the driver side front seatbelt. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and a hard wired input from the seatbelt switch in the driver side front seatbelt retractor through the seat belt indicator driver circuit.

The seatbelt indicator also includes a programmable enhanced seatbelt reminder or “beltminder” feature that is enabled when the vehicle is shipped from the factory. This beltminder feature can be disabled and enabled by the customer using a specific programming event sequence, or by the dealer using a diagnostic scan tool.

The seatbelt indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the seatbelt indicator for the following reasons:

- **Seatbelt Reminder Function** - Each time the cluster receives a battery current input on the fused ignition switch output (run-start) circuit, the indicator will be illuminated as a seatbelt reminder for about six seconds, or

until the ignition switch is turned to the Off position, whichever occurs first. This reminder function will occur regardless of the status of the seatbelt switch input to the cluster.

- **Driver Side Front Seatbelt Not Buckled - Beltminder Active** - Following the seatbelt reminder function, each time the cluster detects an open circuit on the seat belt indicator driver circuit (seatbelt switch open = seatbelt unbuckled) with the ignition switch in the Start or On positions, the indicator will be illuminated. In addition, if the driver side front seat belt remains unbuckled about sixty seconds after the conclusion of the seatbelt reminder function with the vehicle speed greater than about 8 kilometers-per-hour (5 miles-per-hour), the seatbelt indicator will begin to cycle between flashing on and off for three seconds, then lighting solid for two seconds. The seatbelt indicator will continue to cycle between flashing and solid illumination for thirteen complete cycles, until the seat belt indicator driver input to the cluster is closed to ground (seatbelt switch closed = seatbelt buckled), or until the ignition switch is turned to the Off position, whichever occurs first.
- **Driver Side Front Seatbelt Not Buckled - Beltminder Inactive** - Following the seatbelt reminder function, each time the cluster detects an open circuit on the seat belt indicator driver circuit (seatbelt switch open = seatbelt unbuckled) with the ignition switch in the Start or On positions, the indicator will be illuminated. The seatbelt indicator remains illuminated until the seat belt indicator driver input to the cluster is closed to ground (seatbelt switch closed = seatbelt buckled), or until the ignition switch is turned to the Off position, whichever occurs first.
- **Airbag Indicator Backup** - If the instrument cluster detects a fault in the airbag indicator circuit it will send a message indicating the fault to the Occupant Restraint Controller (ORC), then flash the seatbelt indicator on and off. The cluster will continue to flash the seatbelt indicator until the airbag indicator circuit fault is resolved, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Actuator Test** - Each time the cluster is put through the actuator test, the seatbelt indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The seatbelt switch is connected in series between ground and the seat belt indicator driver input to the instrument cluster. The seatbelt switch input to the instrument cluster circuitry may be diagnosed using conventional diagnostic tools and methods. Refer to the appropriate wiring information.

For further diagnosis of the seatbelt indicator or the instrument cluster circuitry that controls the LED, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

STANDARD PROCEDURE

ENHANCED SEATBELT REMINDER PROGRAMMING

The seatbelt indicator also includes a programmable enhanced seatbelt reminder or “beltminder” feature that is enabled when the vehicle is shipped from the factory. This beltminder feature provides extended and modified visual seatbelt indicator and audible chime warning responses to an unbuckled driver side front seat belt. The beltminder feature may be disabled or enabled by the customer using the programming sequence that follows, or by the dealer using a diagnostic scan tool.

CUSTOMER PROGRAMMING SEQUENCE

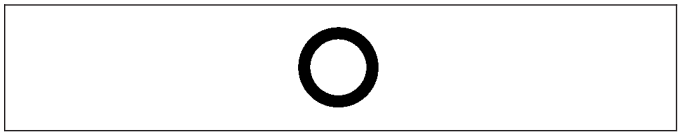
NOTE: The following sequence of events must occur within sixty (60) seconds of the ignition switch being placed in the On position in order for the programming to be completed successfully.

1. With the ignition switch in any position except On or Start, buckle the driver side front seat belt.
2. Turn the ignition switch to the On position and wait for the seatbelt indicator reminder function to conclude (about six seconds).
3. Unbuckle and buckle the driver side front seat belt three or more times, ending with the belt buckled.
4. Turn the ignition switch to any position except On or Start to toggle the beltminder feature from its current setting (from active to inactive, or from inactive to active). A single chime tone will provide an audible confirmation that the programming sequence has been successfully completed.

SECURITY INDICATOR

DESCRIPTION

A security indicator is standard equipment on all instrument clusters. However, on vehicles not equipped with the optional Vehicle Theft Security System (VTSS), this indicator is electronically disabled. This indicator is located near the upper edge of the instrument cluster, between the tachometer and the speedometer.



The security indicator consists of a small round cutout in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. A red Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the indicator to appear in red through the translucent outer layer of the overlay when it is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The security indicator is serviced as a unit with the instrument cluster.

OPERATION

The security indicator gives an indication to the vehicle operator when the Vehicle Theft Security System (VTSS) is arming or is armed. On models equipped with the Sentry Key Immobilizer System (SKIS), the security indicator also gives an indication to the vehicle operator of the status of the SKIS. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming, hard wired inputs to the cluster from the various security system components, and electronic messages received by the cluster from the Sentry Key REmote Entry Module (SKREEM) over the Controller Area Network (CAN) data bus.

The security indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will allow this indicator to operate whenever the instrument cluster receives a battery current input on the fused B(+) circuit. Therefore, the LED can be illuminated regardless of the ignition switch position. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the security indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the security indicator illuminates for about two seconds as a bulb test. The entire bulb test is a function of the SKREEM.
- **VTSS Indication** - During the sixteen second VTSS arming function, the cluster will flash the security indicator on and off repeatedly at a steady, fast rate to indicate that the VTSS is in the process of arming. Following successful VTSS arming, the cluster flashes the security indicator on and off continuously at a slower rate to indicate that the VTSS is armed. The security indicator continues flashing at the slower rate until the VTSS is disarmed or triggered. If the VTSS has alarmed and rearmed, the cluster will flash the security indicator at a steady, slow rate for about thirty seconds after the VTSS is disarmed.
- **SKIS Lamp-On Message** - Each time the cluster receives a SKIS lamp-on message from the SKREEM, the security indicator will be illuminated. The indicator can be flashed on and off, or illuminated solid, as dictated by the SKREEM message. The indicator remains illuminated solid or continues to flash until the cluster receives a SKIS lamp-off message from the SKREEM, or until the ignition switch is turned to the Off position, whichever occurs first. For more information on the SKIS and the security indicator control parameters, (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY/SENTRY KEY IMMOBILIZER SYSTEM - OPERATION).
- **Communication Error** - If the cluster receives no SKIS lamp-on or lamp-off messages from the SKREEM for ten consecutive message cycles, the security indicator is illuminated by the instrument cluster. The indicator remains controlled and illuminated by the cluster until a valid SKIS lamp-on or lamp-off message is received from the SKREEM.
- **Actuator Test** - Each time the instrument cluster is put through the actuator test, the security indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The instrument cluster circuitry controls the security indicator whenever the ignition switch is in the Off position and the VTSS is arming, armed, or alarming. Whenever the ignition switch is in the On or Start positions, the SKREEM performs a self-test to decide whether the SKIS is in good operating condition and whether a valid key is present in the ignition lock cylinder. The SKREEM then sends the proper lamp-on or lamp-off messages to the instrument cluster. For further diagnosis of the security indicator or the instrument cluster circuitry that controls the indicator,

(Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). If the instrument cluster flashes the security indicator upon ignition On, or turns on the security indicator solid after the bulb test, it indicates that a SKIS malfunction has occurred or that the SKIS is inoperative.

For proper diagnosis of the VTSS, the SKIS, the SKREEM, the CAN data bus, or the electronic message inputs to the instrument cluster that control the security indicator, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

SERVICE 4WD INDICATOR

DESCRIPTION

A service 4WD indicator is standard equipment on all instrument clusters. However, on vehicles not equipped with the optional four-wheel drive system and electronically shifted transfer case, this indicator is electronically disabled. The service 4WD indicator is located below the minor gauge set on the left side of the cluster.

The service 4WD indicator consists of a stencil-like cutout of the text “SVC 4WD” in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. An amber Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the “SVC 4WD” text to appear in amber through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The service 4WD indicator is serviced as a unit with the instrument cluster.

OPERATION

The service 4WD indicator gives an indication to the vehicle operator when the Front Control Module (FCM) (also known as the Integrated Power Module/IPM) has recorded a Diagnostic Trouble Code (DTC) for an electronic transfer case circuit or component malfunction. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the FCM over the Controller Area Network (CAN) data bus.

The service 4WD indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the service 4WD indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the service 4WD indicator is illuminated for about two seconds as a bulb test.
- **Service 4WD Lamp-On Message** - Each time the cluster receives a service 4WD lamp-on message from the FCM, the service 4WD indicator will be illuminated. The indicator remains illuminated until the cluster receives a service 4WD lamp-off message from the FCM, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Communication Error** - If the cluster receives no messages from the FCM for ten seconds, the service 4WD indicator is illuminated by the instrument cluster to indicate a loss of FCM communication. The indicator remains controlled and illuminated by the cluster until a valid message is received from the FCM.
- **Actuator Test** - Each time the cluster is put through the actuator test, the service 4WD indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The FCM continually monitors the electronic transfer case control circuits and transfer case shift motor/mode sensor assembly to determine the condition of the system. The FCM then sends the proper lamp-on or lamp-off messages to the instrument cluster. For further diagnosis of the service 4WD indicator or the instrument cluster circuitry that controls the LED, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

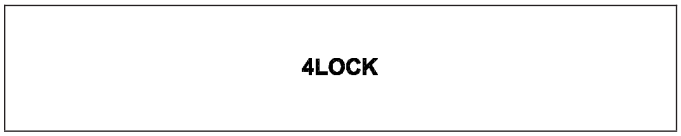
For proper diagnosis of the FCM, the CAN data bus, or the electronic message inputs to the instrument cluster that control the service 4WD indicator, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

SHIFT INDICATOR (TRANSFER CASE)

DESCRIPTION

4WD LOCK INDICATOR

A 4WD lock indicator is standard equipment on all instrument clusters. However, on vehicles not equipped with the optional four-wheel drive system and electronically shifted transfer case, this indicator is electronically disabled. The 4WD lock indicator is located below the minor gauge set on the left side of the cluster.



The 4WD lock indicator consists of a stencil-like cutout of the text “4LOCK” in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. An amber Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the “4LOCK” text to appear in amber through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board.

When the exterior lighting is turned On, the illumination intensity of the 4WD lock indicator is dimmable, which is adjusted along with the cluster illumination lamp using the panel lamps dimmer thumbwheel on the headlamp switch. The 4WD lock indicator is serviced as a unit with the instrument cluster.

4WD LOW INDICATOR

A 4WD low indicator is standard equipment on all instrument clusters. However, on vehicles not equipped with the optional four-wheel drive system and electronically shifted transfer case, this indicator is electronically disabled. The 4WD low indicator is located below the minor gauge set on the left side of the cluster.

The 4WD low indicator consists of a stencil-like cutout of the text “4LO” in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. An amber Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the “4LO” text to appear in amber through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board.

When the exterior lighting is turned On, the illumination intensity of the 4WD low indicator is dimmable, which is adjusted along with the cluster illumination lamp using the panel lamps dimmer thumbwheel on the headlamp switch. The 4WD low indicator is serviced as a unit with the instrument cluster.

OPERATION

4WD LOCK INDICATOR

The 4WD lock indicator gives an indication to the vehicle operator when the electronic transfer case has been shifted into the 4WD lock mode. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Front Control Module (FCM) (also known as the Integrated Power Module/IPM) over the Controller Area Network (CAN) data bus.

The 4WD lock indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the 4WD lock indicator for the following reasons:

- **4WD Lock Lamp-On Message** - Each time the cluster receives a 4WD lock lamp-on message from the FCM, the indicator will be illuminated. The indicator remains illuminated until the cluster receives a 4WD lock lamp-off message from the FCM, or until the ignition switch is turned to the Off position, whichever occurs first.

- **Actuator Test** - Each time the cluster is put through the actuator test, the 4WD lock indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The FCM continually monitors the electronic transfer case through the transfer case shift motor/mode sensor assembly to determine when the 4WD lock mode is engaged. The FCM then sends the proper lamp-on or lamp-off messages to the instrument cluster. For further diagnosis of the 4WD lock indicator or the instrument cluster circuitry that controls the LED, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

For proper diagnosis of the transfer case shift motor/mode sensor, the FCM, the CAN data bus, or the electronic message inputs to the instrument cluster that control the 4WD lock indicator, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

4WD LOW INDICATOR

The 4WD low indicator gives an indication to the vehicle operator when the electronic transfer case has been shifted into the 4WD low mode. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Front Control Module (FCM) (also known as the Integrated Power Module/IPM) over the Controller Area Network (CAN) data bus.

The 4WD low indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the 4WD low indicator for the following reasons:

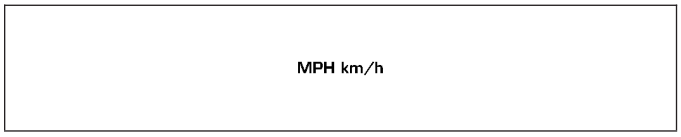
- **4WD Low Lamp-On Message** - Each time the cluster receives a 4WD low lamp-on message from the FCM, the indicator will be illuminated. The indicator remains illuminated until the cluster receives a 4WD low lamp-off message from the FCM, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Actuator Test** - Each time the cluster is put through the actuator test, the 4WD low indicator will be turned on, then off again during the LED portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The FCM continually monitors the electronic transfer case through the transfer case shift motor/mode sensor assembly to determine when the 4WD low mode is engaged. The FCM then sends the proper lamp-on or lamp-off messages to the instrument cluster. For further diagnosis of the 4WD low indicator or the instrument cluster circuitry that controls the LED, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

For proper diagnosis of the transfer case shift motor/mode sensor, the FCM, the CAN data bus, or the electronic message inputs to the instrument cluster that control the 4WD low indicator, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

SPEEDOMETER

DESCRIPTION



A speedometer is standard equipment on all instrument clusters. The speedometer is located in the center of the instrument cluster, between the tachometer and the minor gauge set. The speedometer consists of a movable gauge needle or pointer controlled by the instrument cluster circuitry and a fixed 210 degree primary scale on the gauge dial face that reads left-to-right either from “0” to “120” mph, or from “0” to “200” km/h, depending upon the market for which the vehicle is manufactured. Each version also has a secondary inner scale on the gauge dial face that provides the equivalent opposite units from the primary scale. Text appearing on the cluster overlay above the hub of the speedometer needle abbreviates the unit of measure for the primary scale (i.e.: MPH or km/h), followed by the unit of measure for the secondary scale.

The speedometer graphics are black (primary scale) and blue (secondary scale) against a white field, making them clearly visible within the instrument cluster in daylight. When illuminated from behind by the panel lamps dimmer controlled cluster illumination lighting with the exterior lamps turned On, the white gauge dial face appears blue-green with the black and blue graphics silhouetted against the illuminated background and the red gauge needle still

appears red. Gauge illumination is provided by an integral electro-luminescent lamp that is serviced as a unit with the instrument cluster. The speedometer is serviced as a unit with the instrument cluster.

OPERATION

The speedometer gives an indication to the vehicle operator of the vehicle road speed. This gauge is controlled by the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Controller Area Network (CAN) data bus.

The speedometer is an air core magnetic unit that receives battery current on the instrument cluster electronic circuit board through the fused ignition switch output (run-start) circuit whenever the ignition switch is in the On or Start positions. The cluster is programmed to move the gauge needle back to the low end of the scale after the ignition switch is turned to the Off position. The instrument cluster circuitry controls the gauge needle position and provides the following features:

- **Vehicle Speed Message** - Each time the cluster receives a vehicle speed message from the PCM it will calculate the correct vehicle speed reading and position the gauge needle at that relative speed position on the gauge scale. The cluster will receive a new vehicle speed message and reposition the gauge pointer accordingly about every 88 milliseconds. The gauge needle will continually be positioned at the relative vehicle speed position on the gauge scale until the vehicle stops moving, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Communication Error** - If the cluster fails to receive a speedometer message, it will hold the gauge needle at the last indication for about three seconds, or until the ignition switch is turned to the Off position, whichever occurs first. After three seconds, the gauge needle will return to the left end of the gauge scale.
- **Actuator Test** - Each time the cluster is put through the actuator test, the speedometer needle will be swept to several calibration points on the gauge scale in a prescribed sequence in order to confirm the functionality of the gauge and the cluster control circuitry.

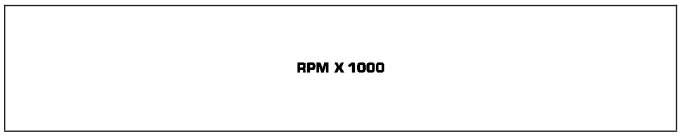
The PCM continually monitors the vehicle speed sensor to determine the vehicle road speed. The PCM then sends the proper vehicle speed messages to the instrument cluster. For further diagnosis of the speedometer or the instrument cluster circuitry that controls the gauge, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

For proper diagnosis of the vehicle speed sensor, the PCM, the CAN data bus, or the electronic message inputs to the instrument cluster that control the speedometer, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

TACHOMETER

DESCRIPTION

A tachometer is standard equipment on all instrument clusters. The tachometer is located to the right side of the instrument cluster, just right of the speedometer. The tachometer consists of a movable gauge needle or pointer controlled by the instrument cluster circuitry and a fixed 210 degree scale on the gauge dial face that reads left-to-right from “0” to “7”. The text “RPM X 1000” imprinted on the cluster overlay directly above the hub of the tachometer needle identifies that each number on the tachometer scale is to be multiplied by 1000 rpm.



The tachometer graphics are black against a white field, making them clearly visible within the instrument cluster in daylight. When illuminated from behind by the panel lamps dimmer controlled cluster illumination lighting with the exterior lamps turned On, the white gauge dial face appears blue-green with the black graphics silhouetted against the illuminated background and the red gauge needle still appears red. Gauge illumination is provided by an integral electro-luminescent lamp that is serviced as a unit with the instrument cluster. The tachometer is serviced as a unit with the instrument cluster.

OPERATION

The tachometer gives an indication to the vehicle operator of the engine speed. This gauge is controlled by the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Controller Area Network (CAN) data bus.

The tachometer is an air core magnetic unit that receives battery current on the instrument cluster electronic circuit board through the fused ignition switch output (run-start) circuit whenever the ignition switch is in the On or Start positions. The cluster is programmed to move the gauge needle back to the low end of the scale after the ignition switch is turned to the Off position. The instrument cluster circuitry controls the gauge needle position and provides the following features:

- **Engine Speed Message** - Each time the cluster receives an engine speed message from the PCM it will calculate the correct engine speed reading and position the gauge needle at that relative speed position on the gauge scale. The cluster will receive a new engine speed message and reposition the gauge pointer accordingly about every 88 milliseconds. The gauge needle will continually be repositioned at the relative engine speed position on the gauge scale until the engine stops running, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Communication Error** - If the cluster fails to receive an engine speed message, it will hold the gauge needle at the last indication for about three seconds, or until the ignition switch is turned to the Off position, whichever occurs first. After three seconds, the gauge needle will return to the left end of the gauge scale.
- **Actuator Test** - Each time the cluster is put through the actuator test, the tachometer needle will be swept to several calibration points on the gauge scale in a prescribed sequence in order to confirm the functionality of the gauge and the cluster control circuitry.

The PCM continually monitors the crankshaft position sensor to determine the engine speed. The PCM then sends the proper engine speed messages to the instrument cluster. For further diagnosis of the tachometer or the instrument cluster circuitry that controls the gauge, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

For proper diagnosis of the crankshaft position sensor, the PCM, the CAN data bus, or the electronic message inputs to the instrument cluster that control the tachometer, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

TOW/HAUL INDICATOR

DESCRIPTION

A tow/haul indicator is standard equipment on all instrument clusters. The tow/haul indicator is located below the minor gauge set on the left side of the cluster.

The tow/haul indicator consists of a stencil-like cutout of the text “TOW/HAUL” in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. An amber Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the “TOW/HAUL” text to appear in amber through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board.

When the exterior lighting is turned On, the illumination intensity of the tow/haul indicator is dimmable, which is adjusted along with the cluster illumination lamp using the panel lamps dimmer thumbwheel on the headlamp switch. The tow/haul indicator is serviced as a unit with the instrument cluster.

OPERATION

The tow/haul indicator gives an indication to the vehicle operator when the Off position of the tow/haul switch has been selected, disabling the electronically controlled overdrive feature of the automatic transmission. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Controller Area Network (CAN) data bus.

The tow/haul indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the tow/haul indicator for the following reasons:

- **Tow/Haul Lamp-On Message** - Each time the cluster receives a tow/haul lamp-on message from the PCM indicating that the Off position of the tow/haul switch has been selected, the indicator will be illuminated. The indicator remains illuminated until the cluster receives a tow/haul lamp-off message from the PCM, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Actuator Test** - Each time the cluster is put through the actuator test, the tow/haul indicator will be turned on, then off again during the LED portion of the test to confirm the functionality of the LED and the cluster control circuitry.

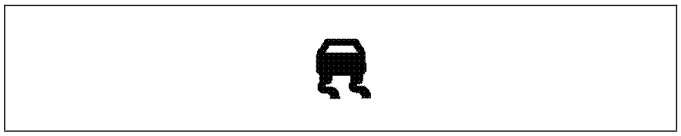
The PCM continually monitors the tow/haul switch to determine the proper outputs to the automatic transmission. The PCM then sends the proper lamp-on and lamp-off messages to the instrument cluster. For further diagnosis of the tow/haul indicator or the instrument cluster circuitry that controls the LED, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

For proper diagnosis of the overdrive control system, the PCM, the CAN data bus, or the electronic message inputs to the instrument cluster that control the tow/haul indicator, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

TRACTION CONTROL INDICATOR

DESCRIPTION

A traction control indicator is standard equipment on all instrument clusters. However, on vehicles not equipped with the optional Traction Control System (TCS), this indicator is electronically disabled. This indicator is located in the center of the speedometer, in the area above and to the right of the speedometer needle hub.



The traction control indicator consists of a stencil-like cutout of the International Control and Display Symbol icon for “Stability - Anti-Spin” in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. An amber Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the icon to appear in amber through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The traction control indicator is serviced as a unit with the instrument cluster.

OPERATION

The traction control indicator gives an indication to the vehicle operator when the electronic Traction Control System (TCS) has been activated. This indicator is controlled by the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Controller Antilock Brake (CAB) over the Controller Area Network (CAN) data bus.

The traction control indicator is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the indicator will always be off when the ignition switch is in any position except On or Start. The indicator only illuminates when it is switched to ground by the instrument cluster circuitry. The instrument cluster will turn on the traction control indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the traction control indicator is illuminated for about four seconds as a bulb test. The entire bulb test is a function of the CAB.
- **Traction Control Lamp-On Message** - Each time the cluster receives a traction control lamp-on message from the CAB indicating that the TCS has been activated, the traction control indicator will be illuminated. The indicator remains illuminated until the cluster receives a traction control lamp-off message from the CAB, or until the ignition switch is turned to the Off position, whichever occurs first.

- **Actuator Test** - Each time the cluster is put through the actuator test, the traction control indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

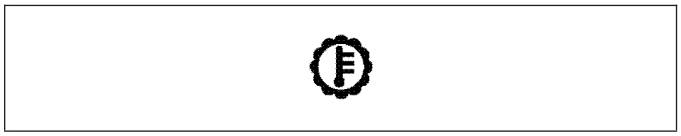
The CAB continually monitors the traction control switch to determine the proper outputs to the components of the Antilock Brake System (ABS). The CAB then sends the proper traction control lamp-on and lamp-off messages to the instrument cluster. For further diagnosis of the traction control indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

For proper diagnosis of the traction control switch, the ABS, the CAB, the CAN data bus, or the electronic message inputs to the instrument cluster that control the traction control indicator, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

TRANS TEMP INDICATOR

DESCRIPTION

A transmission over-temperature indicator is standard equipment on all instrument clusters. This indicator is located in the center of the speedometer, in the area above and to the right of the speedometer needle hub.



The transmission over-temperature indicator consists of a stencil-like cutout of the International Control and Display Symbol icon for “Transmission Temperature” in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. A red Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the icon to appear in red through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The transmission over-temperature indicator is serviced as a unit with the instrument cluster.

OPERATION

The transmission over-temperature indicator gives an indication to the vehicle operator when the transmission fluid temperature is excessive, which may lead to accelerated transmission component wear or failure. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Controller Area Network (CAN) data bus.

The transmission over-temperature indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the transmission over-temperature indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the transmission over-temperature indicator is illuminated for about two seconds as a bulb test.
- **Trans Over-Temp Lamp-On Message** - Each time the cluster receives a trans over-temp lamp-on message from the PCM indicating that the transmission fluid temperature is 135° C (275° F) or higher, the indicator will be illuminated and a single chime tone is sounded. The indicator remains illuminated until the cluster receives a trans over-temp lamp-off message from the PCM, or until the ignition switch is turned to the Off position, whichever occurs first. The chime tone feature will only repeat during the same ignition cycle if the transmission over-temperature indicator is cycled off and then on again by the appropriate trans over-temp messages from the PCM.
- **Actuator Test** - Each time the cluster is put through the actuator test, the transmission over-temperature indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The PCM continually monitors the transmission temperature sensor to determine the transmission operating condition. The PCM then sends the proper trans over-temp lamp-on or lamp-off messages to the instrument cluster. If the

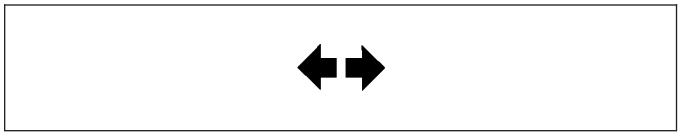
instrument cluster turns on the transmission over-temperature indicator due to a high transmission oil temperature condition, it may indicate that the transmission and/or the transmission cooling system are being overloaded or that they require service. For further diagnosis of the transmission over-temperature indicator or the instrument cluster circuitry that controls the LED, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

For proper diagnosis of the transmission temperature sensor, the PCM, the CAN data bus, or the electronic message inputs to the instrument cluster that control the transmission over-temperature indicator, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

TURN SIGNAL INDICATOR

DESCRIPTION

Two turn signal indicators, one right and one left, are standard equipment on all instrument clusters. The turn signal indicators are located near the upper edge of the instrument cluster, the right one is between the speedometer and the tachometer, and the left one is between the speedometer and the minor gauge set.



Each turn signal indicator consists of a stencil-like cutout of the International Control and Display Symbol icon for “Turn Warning” in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents these icons from being clearly visible when they are not illuminated. A green Light Emitting Diode (LED) behind each cutout in the opaque layer of the overlay causes the icon to appear in green through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The turn signal indicators are serviced as a unit with the instrument cluster.

OPERATION

The turn signal indicators give an indication to the vehicle operator that the turn signal (left or right indicator flashing) or hazard warning (both left and right indicators flashing) have been selected and are operating. These indicators are controlled by transistors on the instrument cluster electronic circuit board based upon the cluster programming, a hard wired multiplex input received by the cluster from the turn signal and hazard warning switch circuitry of the multi-function switch on the turn/hazard switch mux circuit, and electronic messages received from the Front Control Module (FCM) (also known as the Integrated Power Module/IPM) over the Controller Area Network (CAN) data bus.

Each turn signal indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will allow this indicator to operate whenever the instrument cluster receives a battery current input on the fused B(+) circuit. Therefore, each LED can be illuminated regardless of the ignition switch position. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the turn signal indicators for the following reasons:

- **Turn Signal-On Input** - Each time the cluster detects a turn signal-on input from the turn signal switch circuitry of the multi-function switch on the turn/hazard switch mux circuit, it sends the appropriate electronic turn signal switch status messages to the FCM over the CAN data bus. The FCM responds to these messages by controlling a battery voltage output and the flash rate for either the right or left turn signal lamps. The FCM also sends the appropriate electronic messages back to the EMIC to control the illumination and flash rate of the right or left turn signal indicators, as well as to control the click rate of an electromechanical relay soldered onto the EMIC electronic circuit board that emulates the sound emitted by a conventional turn signal flasher. The turn signals and the turn signal indicators continue to flash on and off until the cluster receives a turn signal-off input from the multi-function switch, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Hazard Warning-On Input** - Each time the cluster detects a hazard warning-on input from the hazard warning switch circuitry of the multi-function switch on the turn/hazard switch mux circuit, it sends the appropriate electronic hazard switch status messages to the FCM over the CAN data bus. The FCM responds to these messages by controlling a battery voltage output and the flash rate for each of the right and left turn signal lamps. The FCM also sends the appropriate electronic messages back to the EMIC to control the illumination and flash rate of the right and left turn signal indicators, as well as to control the click rate of an electromechanical relay soldered onto the EMIC electronic circuit board that emulates the sound emitted by a conventional haz-

ard warning flasher. The turn signals and the turn signal indicators continue to flash on and off until the cluster receives a hazard warning-off input from the multi-function switch.

- **Lamp Out Mode** - The instrument cluster also sends electronic turn signal on and off messages to the FCM over the CAN data bus, and the FCM flashes the appropriate exterior turn signal lamps. If the FCM detects an inoperative turn signal lamp or circuit, it increases the flash rate for the remaining operative turn signals and sends an electronic message back to the instrument cluster. The instrument cluster then increases the flash rate of the turn signal indicator(s) and the clicking rate of the electromechanical relay to provide an indication of the problem to the vehicle operator.
- **Actuator Test** - Each time the cluster is put through the actuator test, the turn signal indicators will be turned on, then off again during the bulb check portion of the test to confirm the functionality of each LED and the cluster control circuitry.

The instrument cluster continually monitors the multi-function switch and electronic messages from the FCM to determine the proper turn signal and hazard warning system control. For further diagnosis of the turn signal indicators or the instrument cluster circuitry that controls the indicators, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

For proper diagnosis of the turn signal and hazard warning system, the multi-function switch, the FCM, the CAN data bus, or the electronic message inputs to the instrument cluster that control the turn signal indicators, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

WASHER FLUID INDICATOR

DESCRIPTION

A washer fluid indicator is standard equipment on all instrument clusters. This indicator is located in the center of the speedometer, in the area below and to the left of the speedometer needle hub.

The washer fluid indicator consists of a stencil-like cutout of the International Control and Display Symbol Icon for “Windscreen Washer Fluid Level” in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. An amber Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the icon to appear in amber through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The washer fluid indicator is serviced as a unit with the instrument cluster.

OPERATION

The washer fluid indicator gives an indication to the vehicle operator that the fluid level in the washer reservoir is low. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Front Control Module (FCM) (also known as the Integrated Power Module/IPM or Power Distribution Center/PDC) over the Controller Area Network (CAN) data bus.

The washer fluid indicator is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the indicator will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the washer fluid indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the washer fluid indicator is illuminated for about two seconds as a bulb test.
- **Washer Fluid Indicator Lamp-On Message** - Each time the cluster receives a washer fluid indicator lamp-on message from the FCM indicating that a low washer condition has been detected for sixty consecutive seconds, the washer fluid indicator is illuminated and a single chime tone is sounded. The indicator remains illuminated until the cluster receives a washer fluid indicator lamp-off message for sixty consecutive seconds from the FCM or until the ignition switch is turned to the Off position, whichever occurs first. The chime tone feature will only repeat during the same ignition cycle if the washer fluid indicator is cycled off and then on again by the appropriate washer fluid lamp messages from the FCM.

- **Actuator Test** - Each time the cluster is put through the actuator test, the washer fluid indicator will be turned on, then off again during the LED portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The FCM continually monitors the washer fluid level switch in the washer reservoir to determine the level of the washer fluid. The FCM then sends the proper lamp-on and lamp-off messages to the instrument cluster. For further diagnosis of the washer fluid indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

For proper diagnosis of the washer fluid level switch, the FCM, the CAN data bus, or the electronic message inputs to the instrument cluster that control the washer fluid indicator, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

LAMPS

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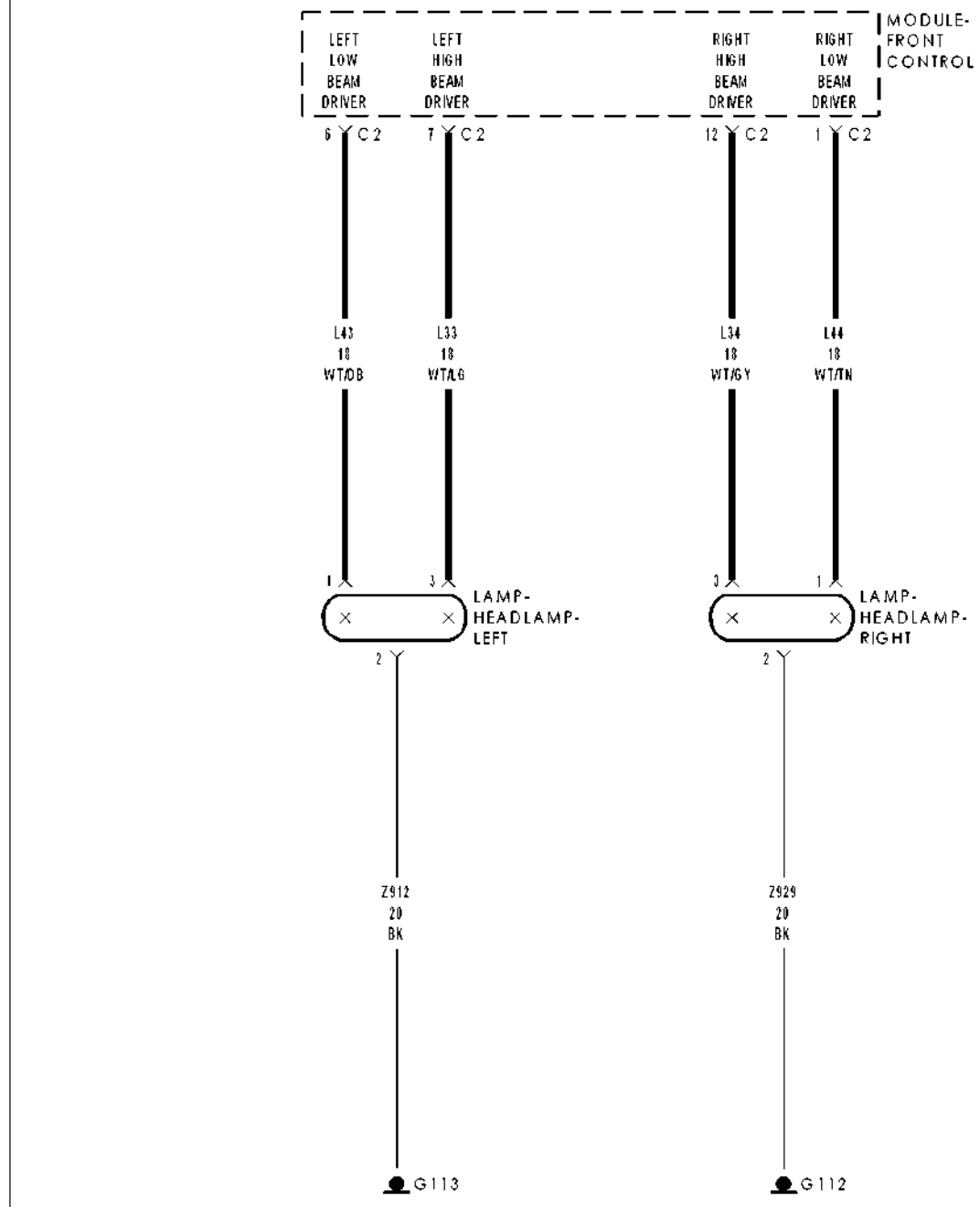
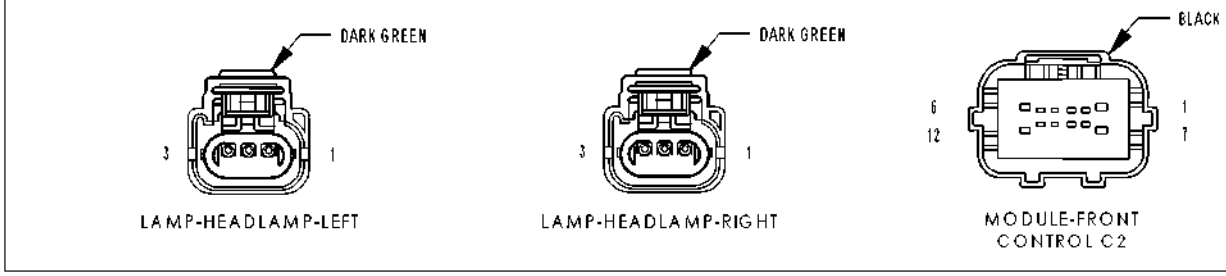
LAMPS/LIGHTING - EXTERIOR - ELECTRICAL DIAGNOSTICS

DIAGNOSIS AND TESTING

B162B-LEFT LOW BEAM CONTROL CIRCUIT LOW





B162B-LEFT LOW BEAM CONTROL CIRCUIT LOW (CONTINUED)

For the Exterior Lighting system circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Headlamps activated.
- **Set Condition:**
- When the FCM detects a LOW condition.

Possible Causes
(L43) LEFT LOW BEAM CONTROL CIRCUIT
FRONT CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.
With the Scan Tool, clear all FCM DTC's.
Turn the Headlamps on.
With the Scan Tool read the DTC information.

Does the Scan Tool read: B162B-LEFT LOW BEAM CONTROL CIRCUIT LOW?

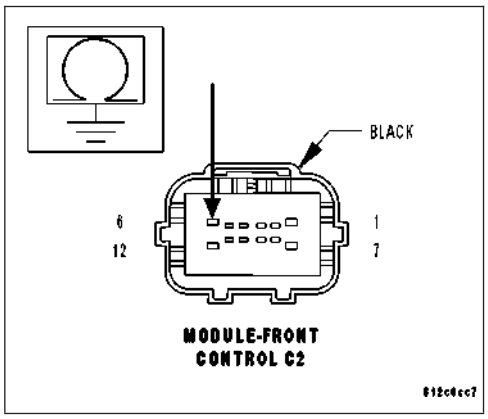
Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST - VER 1.

---

2. (L43) LEFT LOW BEAM CONTROL CIRCUIT

Turn the ignition off.
Disconnect the FCM C2 harness connector.
Measure the resistance between ground and the (L43) Left Low Beam Control circuit.

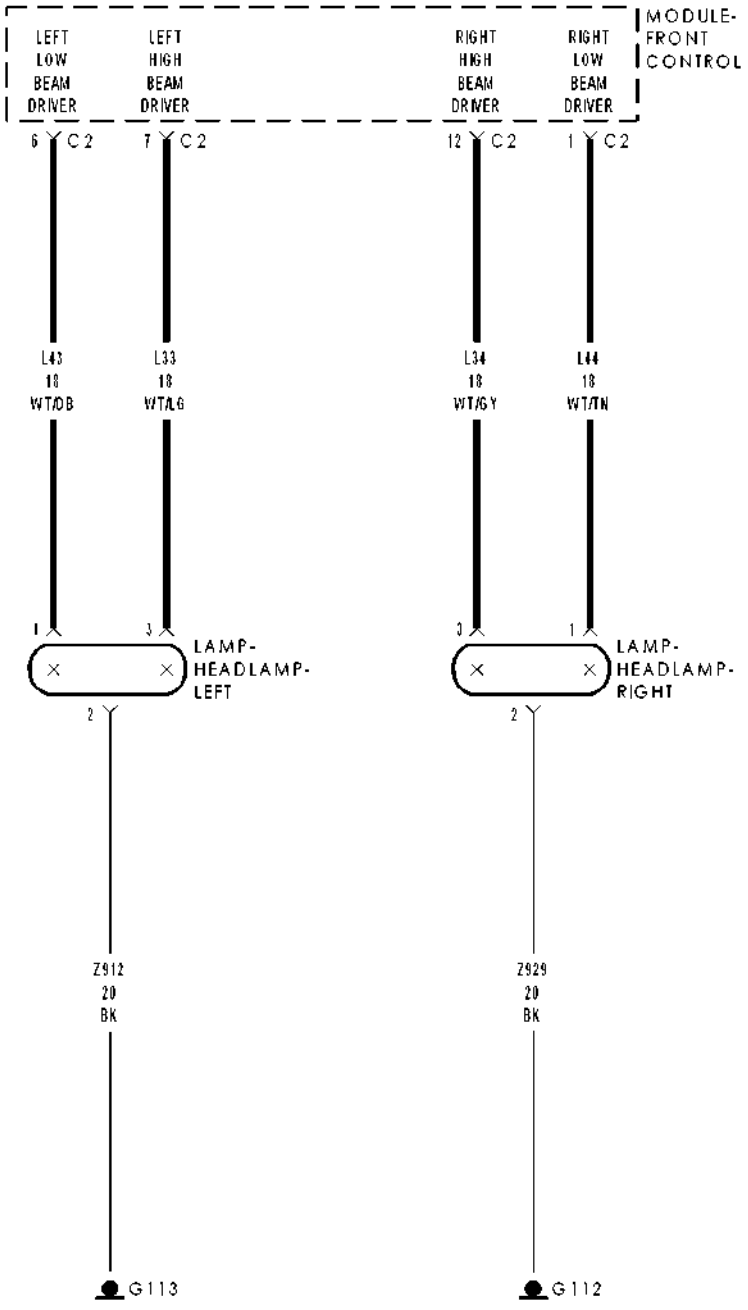


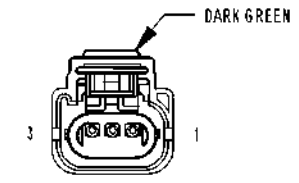
Is the resistance below 5.0 ohms?

Yes >> Replace the Front Control Module (FCM) in accordance with the service information.
Perform the BODY VERIFICATION TEST - VER 1.

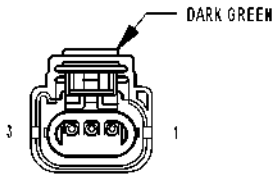
No >> Repair the (L43) Left Low Beam Control circuit for a short to ground condition.
Perform the BODY VERIFICATION TEST - VER 1.

B162F-RIGHT LOW BEAM CONTROL CIRCUIT LOW

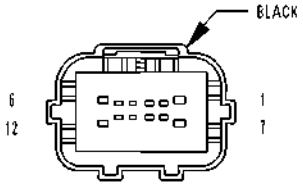




LAMP-HEADLAMP-LEFT



LAMP-HEADLAMP-RIGHT



MODULE-FRONT
CONTROL C2

812c8091

B162F-RIGHT LOW BEAM CONTROL CIRCUIT LOW (CONTINUED)

For the Exterior Lighting system circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Headlamps activated.
- **Set Condition:**
- When the FCM detects a LOW condition.

Possible Causes
(L44) RIGHT LOW BEAM CONTROL CIRCUIT
FRONT CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all FCM DTC's.

Turn the Headlamps on.

With the Scan Tool read the DTC information.

Does the Scan Tool read: B162F-RIGHT LOW BEAM CONTROL CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST - VER 1.

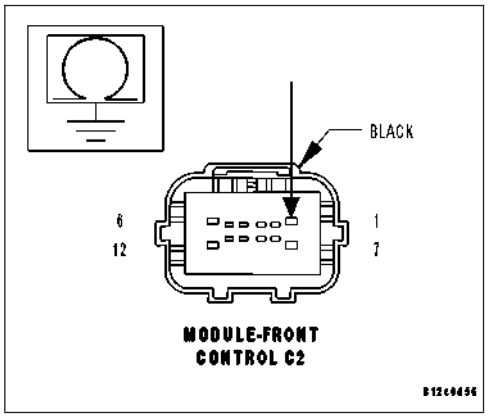
---

2. (L44) RIGHT LOW BEAM CONTROL CIRCUIT

Turn the ignition off.

Disconnect the FCM C2 harness connector.

Measure the resistance between ground and the (L44) Right Low Beam Control circuit.

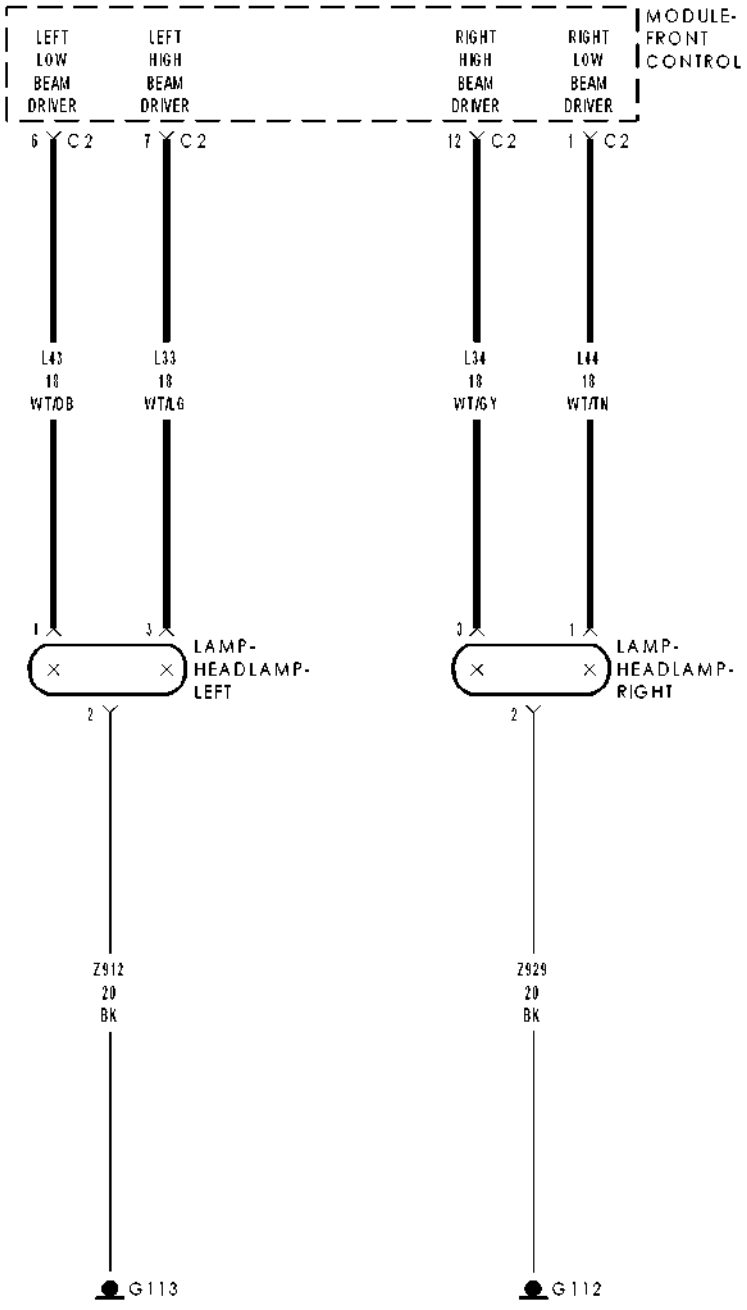


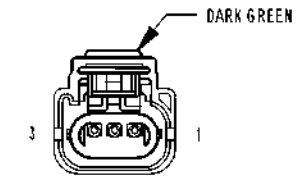
Is the resistance below 5.0 ohms?

Yes >> Replace the Front Control Module (FCM) in accordance with the service information.
Perform the BODY VERIFICATION TEST - VER 1.

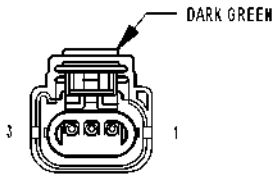
No >> Repair the (L44) Right Low Beam Control circuit for a short to ground condition.
Perform the BODY VERIFICATION TEST - VER 1.

B1630-RIGHT LOW BEAM CONTROL CIRCUIT HIGH

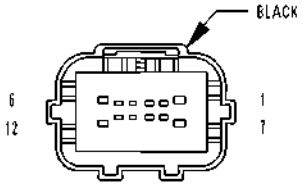




LAMP-HEADLAMP-LEFT



LAMP-HEADLAMP-RIGHT



MODULE-FRONT
CONTROL C2

812c8091

B1630-RIGHT LOW BEAM CONTROL CIRCUIT HIGH (CONTINUED)

For the Exterior Lighting system circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Headlamps activated.
- **Set Condition:**
- When the FCM detects a LOW condition.

Possible Causes
(L44) RIGHT LOW BEAM CONTROL CIRCUIT
FRONT CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.
With the Scan Tool, clear all FCM DTC's.
Turn the Headlamps on.
With the Scan Tool read the DTC information.

Does the Scan Tool read: B1630-RIGHT LOW BEAM CONTROL CIRCUIT HIGH?

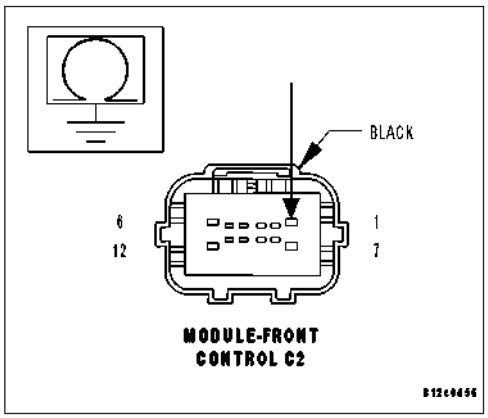
Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST - VER 1.

---

2. (L44) RIGHT LOW BEAM CONTROL CIRCUIT

Turn the ignition off.
Disconnect the FCM C2 harness connector.
Measure the resistance of the (L44) Right Low Beam Control circuit.

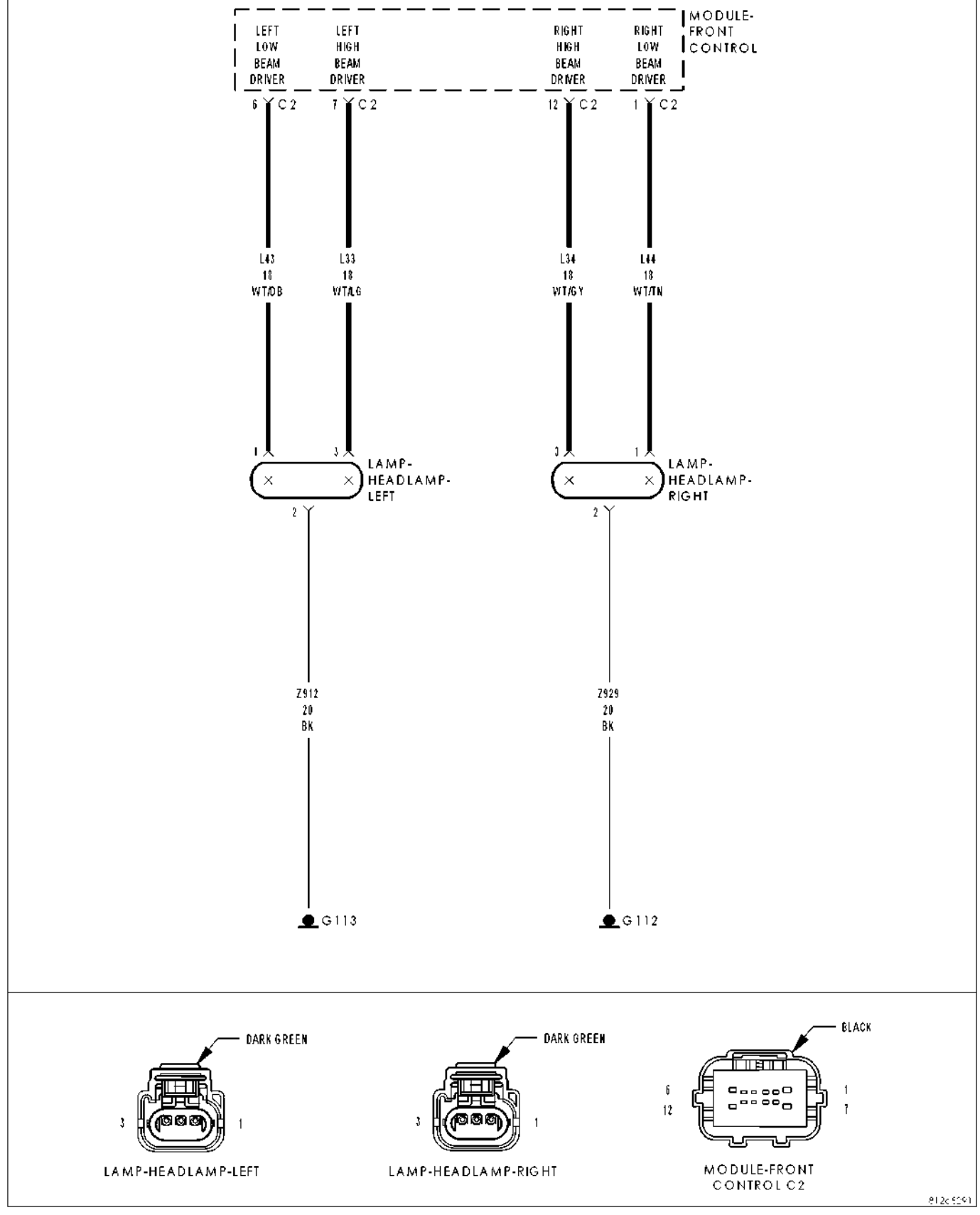


Is the resistance above 5.0 ohms?

Yes >> Repair the (L44) Right Low Beam Control circuit for a short to battery condition.
Perform the BODY VERIFICATION TEST - VER 1.

No >> Replace the Front Control Module (FCM) in accordance with the service information.
Perform the BODY VERIFICATION TEST - VER 1.

B1633-LEFT HI BEAM CONTROL CIRCUIT LOW



B1633-LEFT HI BEAM CONTROL CIRCUIT LOW (CONTINUED)

For the Exterior Lighting system circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Headlamps activated.
- **Set Condition:**
- When the FCM detects a LOW condition.

Possible Causes
(L33) LEFT HIGHBEAM OUTPUT CIRCUIT
FRONT CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all FCM DTC's.

Turn the Highbeam Headlamps on.

With the Scan Tool read the DTC information.

Does the Scan Tool read: B1633-LEFT HI BEAM CONTROL CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST - VER 1.

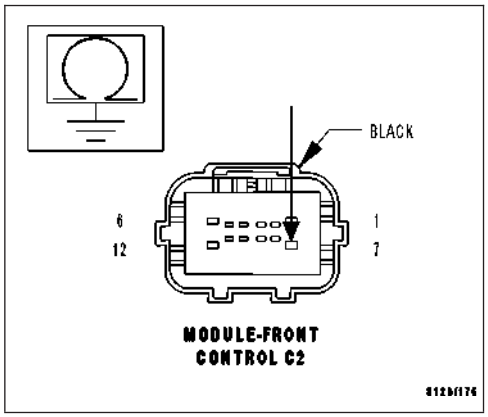
---

2. (L33) LEFT HIGHBEAM OUTPUT CIRCUIT

Turn the ignition off.

Disconnect the FCM C2 harness connector.

Measure the resistance between ground and the Left Highbeam Output circuit.

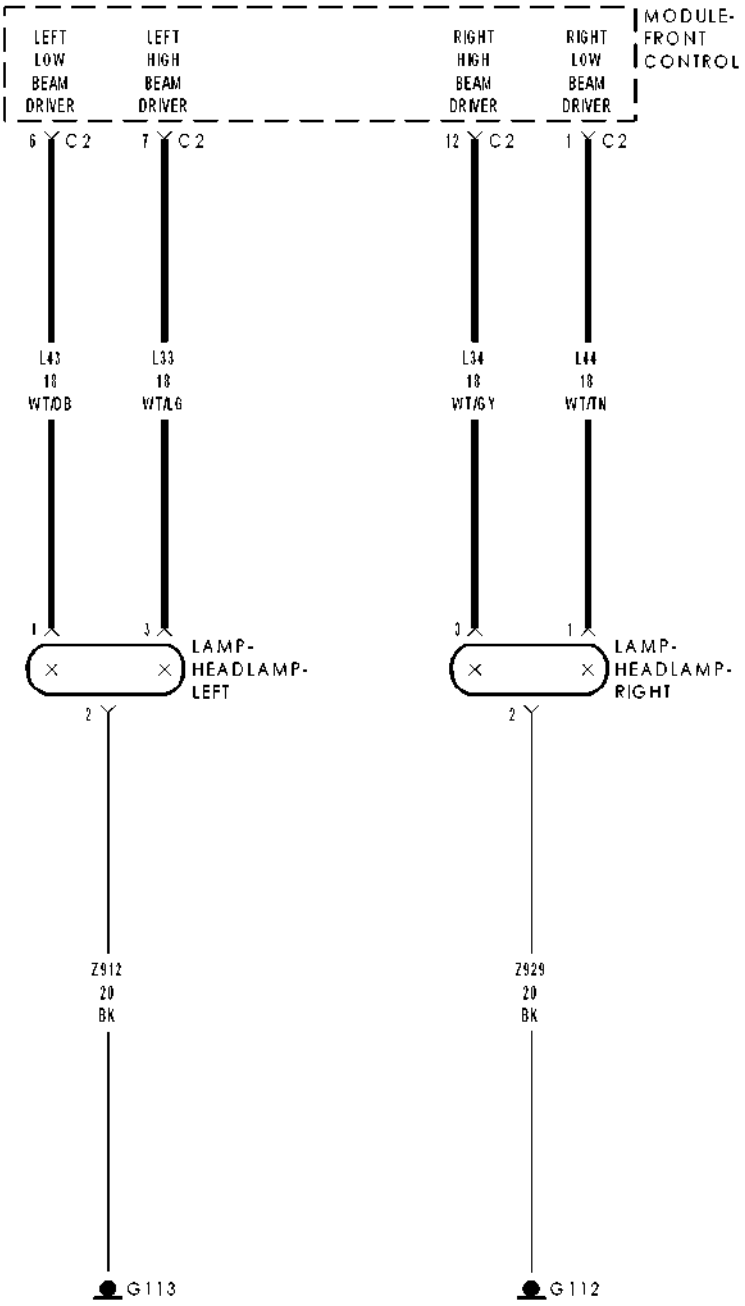


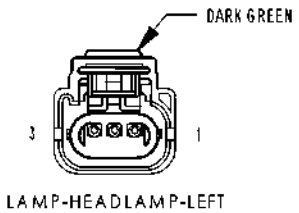
Is the resistance below 5.0 ohms?

Yes >> Replace the Front Control Module (FCM) in accordance with the service information.
Perform the BODY VERIFICATION TEST - VER 1.

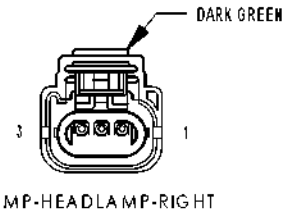
No >> Repair the (L33) Left Highbeam Output circuit for a short to ground condition.
Perform the BODY VERIFICATION TEST - VER 1.

B1634-LEFT HI BEAM CONTROL CIRCUIT HIGH

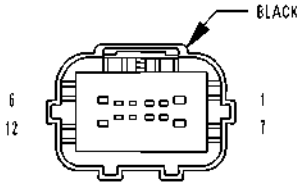




LAMP-HEADLAMP-LEFT



LAMP-HEADLAMP-RIGHT



MODULE-FRONT CONTROL C2

812c8091

B1634-LEFT HI BEAM CONTROL CIRCUIT HIGH (CONTINUED)

For the Exterior Lighting system circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Headlamps activated.
- **Set Condition:**
- When the FCM detects a HIGH condition.

Possible Causes
(L33) HIGH BEAM CONTROL CIRCUIT
FRONT CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all FCM DTC's.

Turn the Headlamps on.

With the Scan Tool read the DTC information.

Does the Scan Tool read: B1634-LEFT HI BEAM CONTROL CIRCUIT HIGH?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST - VER 1.

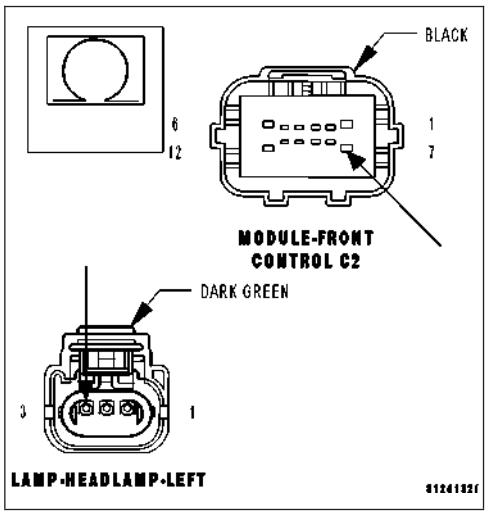
---

2. (L33) HIGH BEAM CONTROL CIRCUIT

Turn the ignition off.

Disconnect the FCM C2 harness connector.

Measure the resistance of the (L33) High Beam Control circuit.

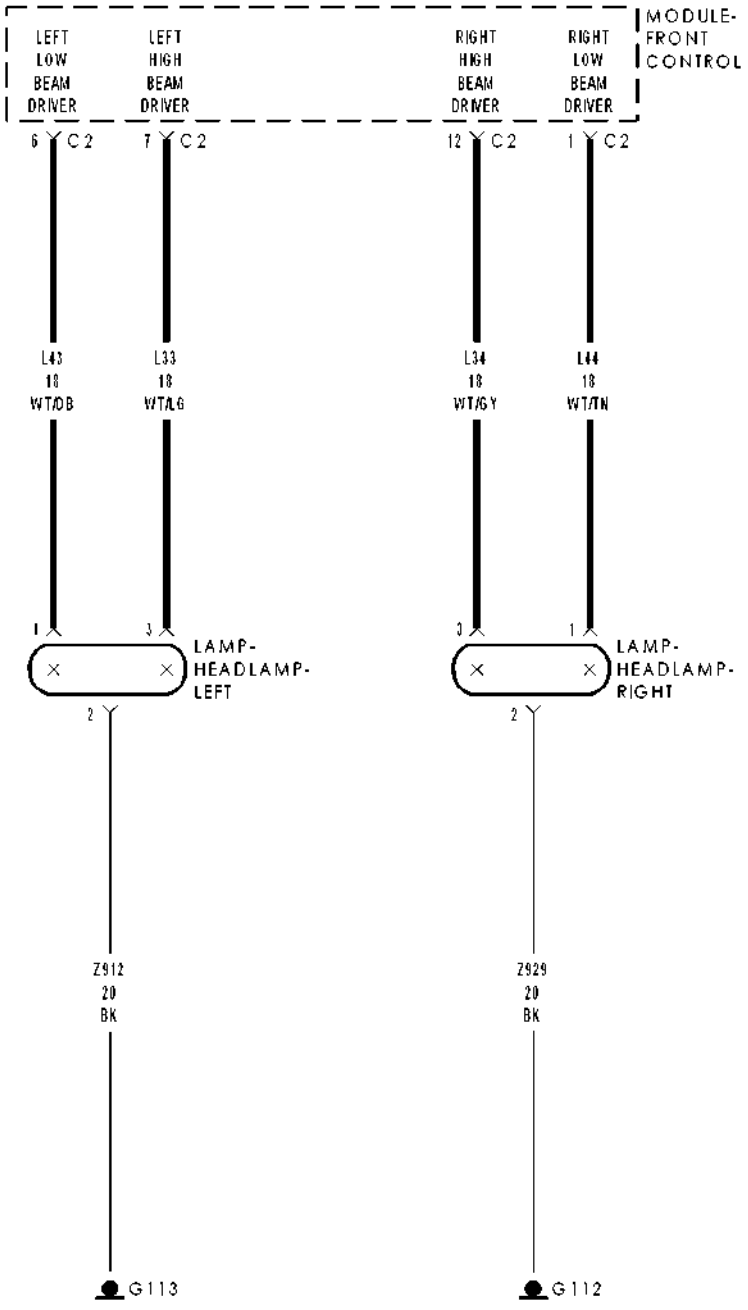


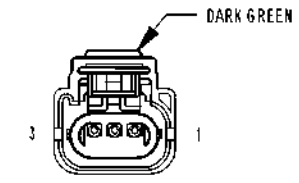
Is the resistance above 5.0 ohms?

Yes >> Repair the (L33) High Beam Control circuit for a short to battery condition.
Perform the BODY VERIFICATION TEST - VER 1.

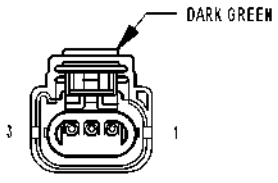
No >> Replace the Front Control Module (FCM) in accordance with the service information.
Perform the BODY VERIFICATION TEST - VER 1.

B1637-RIGHT HI BEAM CONTROL CIRCUIT LOW

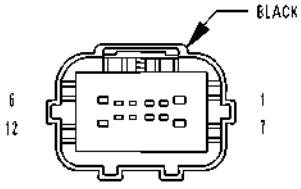




LAMP-HEADLAMP-LEFT



LAMP-HEADLAMP-RIGHT



MODULE-FRONT CONTROL C2

812c8091

B1637-RIGHT HI BEAM CONTROL CIRCUIT LOW (CONTINUED)

For the Exterior Lighting system circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Highbeam Headlamps activated.
- **Set Condition:**
- When the FCM detects a High condition.

Possible Causes
(L34) RIGHT HIGHBEAM OUTPUT CIRCUIT
FRONT CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all FCM DTC's.

Turn the Highbeam Headlamps on.

With the Scan Tool read the DTC information.

Does the Scan Tool read: B1637-RIGHT HI BEAM CONTROL CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST - VER 1.

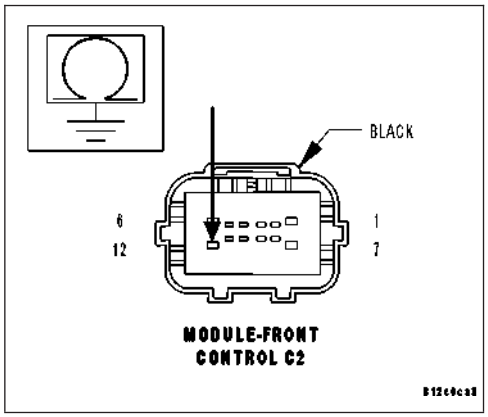
---

2. (L34) RIGHT HIGHBEAM OUTPUT CIRCUIT

Turn the ignition off.

Disconnect the FCM C2 harness connector.

Measure the resistance between ground and the Right Highbeam Output circuit.

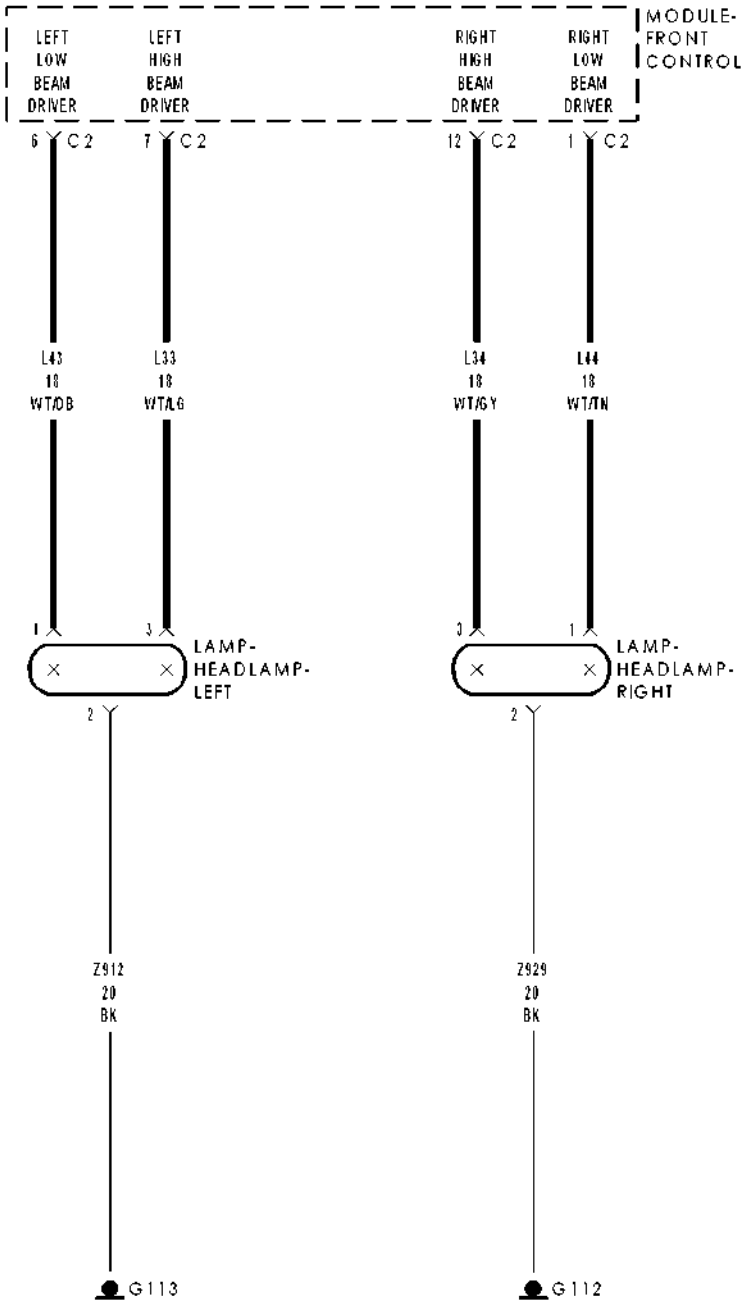


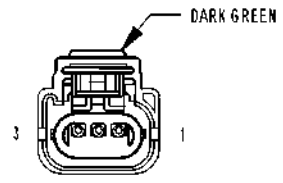
Is the resistance below 5.0 ohms?

Yes >> Replace the Front Control Module (FCM) in accordance with the service information.
Perform the BODY VERIFICATION TEST - VER 1.

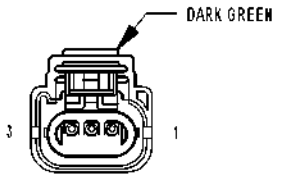
No >> Repair the (L34) Right Highbeam Output circuit for a short to ground condition.
Perform the BODY VERIFICATION TEST - VER 1.

B1638-RIGHT HI BEAM CONTROL CIRCUIT HIGH

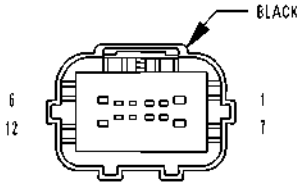




LAMP-HEADLAMP-LEFT



LAMP-HEADLAMP-RIGHT



MODULE-FRONT CONTROL C2

812c8091

B1638-RIGHT HI BEAM CONTROL CIRCUIT HIGH (CONTINUED)

For the Exterior Lighting system circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Headlamps activated.
- **Set Condition:**
- When the FCM detects a HIGH condition.

Possible Causes
(L34) HIGH BEAM CONTROL CIRCUIT
FRONT CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all FCM DTC's.

Turn the Headlamps on.

With the Scan Tool read the DTC information.

Does the Scan Tool read: B1638-RIGHT HI BEAM CONTROL CIRCUIT HIGH?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST - VER 1.

---

2. (L34) HIGH BEAM CONTROL CIRCUIT

Turn the ignition off.

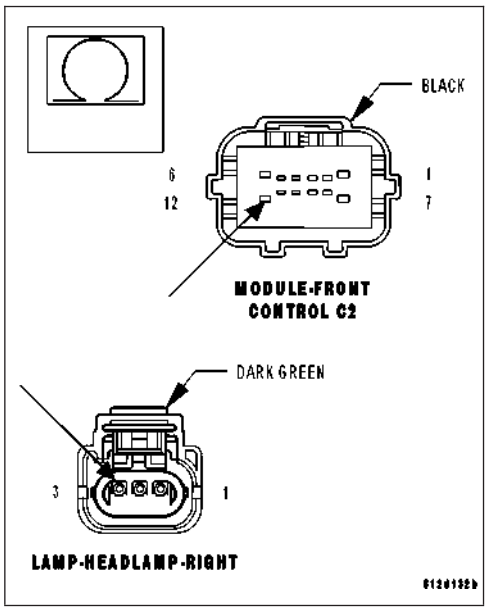
Disconnect the FCM C2 harness connector.

Measure the resistance of the (L34) High Beam Control circuit.

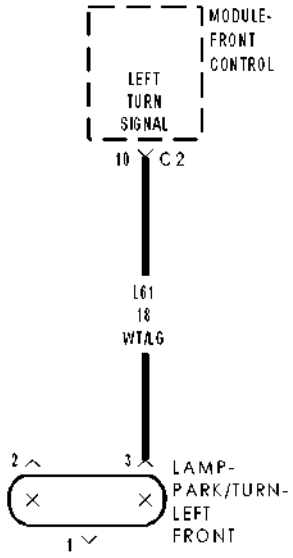
Is the resistance above 5.0 ohms?

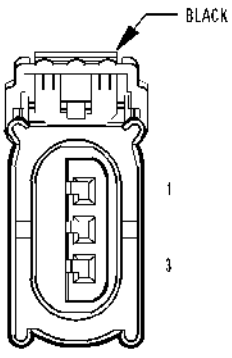
Yes >> Repair the (L34) High Beam Control circuit for a short to battery condition.
Perform the BODY VERIFICATION TEST - VER 1.

No >> Replace the Front Control Module (FCM) in accordance with the service information.
Perform the BODY VERIFICATION TEST - VER 1.

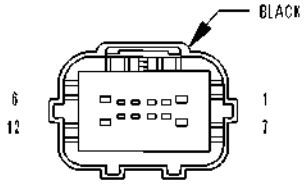


B163B-FRONT LEFT TURN CONTROL CIRCUIT LOW





LAMP-PARK/TURN-LEFT FRONT



MODULE-FRONT CONTROL C2

B163B-FRONT LEFT TURN CONTROL CIRCUIT LOW (CONTINUED)

For the Exterior Lighting circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- **Set Condition:**

Possible Causes
(L61) FRONT LEFT TURN SIGNAL CONTROL CIRCUIT
POWER DISTRIBUTION CENTER
FRONT CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all FCM DTC's.

Turn the Left Turn Signals on.

With the Scan Tool read the DTC information.

Does the Scan Tool read: B163B-FRONT LEFT TURN CONTROL CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST - VER 1.

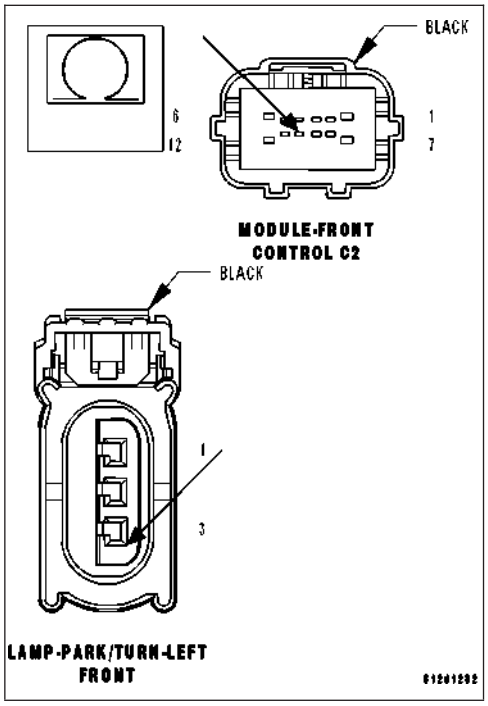
B163B-FRONT LEFT TURN CONTROL CIRCUIT LOW (CONTINUED)

2. L61 FRONT LEFT TURN SIGNAL CONTROL CIRCUIT

Turn the ignition off.

Disconnect the FCM C2 connector.

Measure the resistance between ground and the (L61) Front Left Turn Signal Control circuit.



Is the resistance below 5.0 ohms?

Yes >> Go To 3

No >> Repair the (L61) Front Left Turn Signal Control circuit for a short to ground.
Perform the BODY VERIFICATION TEST - VER 1.

3. FRONT CONTROL MODULE

Turn the ignition off.

Disconnect the FCM C2 connector.

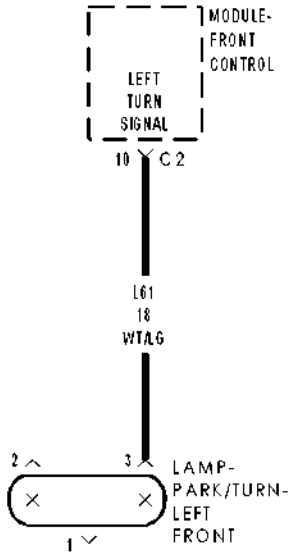
Measure the resistance between ground and the (L61) Front Left Turn Signal Control circuit in the FCM.

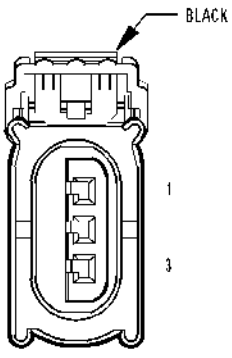
Is the resistance below 5.0 ohms?

Yes >> Replace the Power Distribution Center in accordance with the service information.
Perform the BODY VERIFICATION TEST - VER 1.

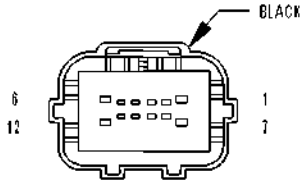
No >> Replace the Front Control Module in accordance with the service information.
Perform the BODY VERIFICATION TEST - VER 1.

B163C-FRONT LEFT TURN CONTROL CIRCUIT HIGH





LAMP-PARK/TURN-LEFT
FRONT



MODULE-FRONT
CONTROL C2

B163C-FRONT LEFT TURN CONTROL CIRCUIT HIGH (CONTINUED)

For the Exterior Lighting circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Front Control Module detects a short to battery on the Control circuit.

Possible Causes
(L61) TURN SIGNAL CONTROL CIRCUIT
POWER DISTRIBUTION CENTER
FRONT CONTROL MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
Clear all FCM DTC's
Turn the Left Turn Signal on.
With the scan tool, read DTC's.

Does the scan tool read: B163C-FRONT LEFT TURN CONTROL CIRCUIT HIGH?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST - VER 1.

B163C-FRONT LEFT TURN CONTROL CIRCUIT HIGH (CONTINUED)

2. L61 LEFT TURN SIGNAL CONTROL CIRCUIT

Turn the ignition off.

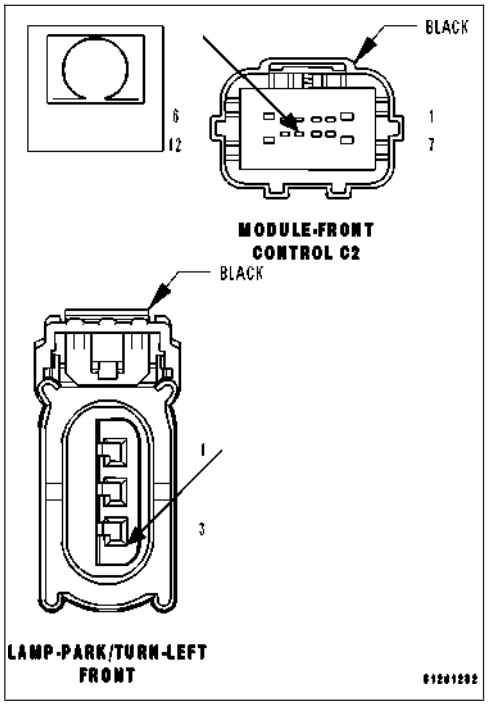
Disconnect the FCM C2 connector.

Measure the resistance of the (L61) Front Left Turn Signal Control circuit.

Is the resistance above 5.0 ohms?

No >> Repair the (L61) Turn Signal Control circuit.
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Go To 3



3. FRONT CONTROL MODULE

Turn the ignition off.

Disconnect the Front Control Module from the PDC 49-way connector.

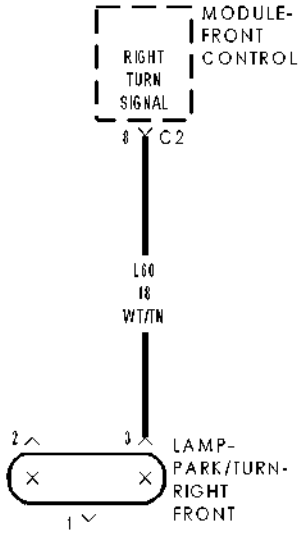
Measure the voltage between (L61) Front Left Turn Signal Control circuit and ground.

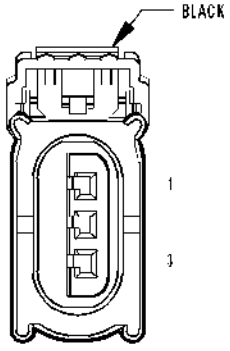
Is there any voltage present?

Yes >> Replace the Power Distribution Center in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1.

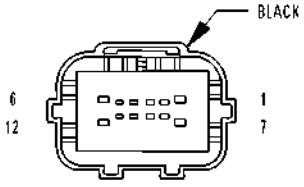
No >> Replace the Front Control Module in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1.

B163F-FRONT RIGHT TURN CONTROL CIRCUIT LOW





LAMP-PARK/TURN-RIGHT
FRONT



MODULE-FRONT
CONTROL C2

8l2a1286

B163F-FRONT RIGHT TURN CONTROL CIRCUIT LOW (CONTINUED)

For the Exterior Lighting circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- **Set Condition:**

Possible Causes
(L60) FRONT RIGHT TURN SIGNAL CONTROL CIRCUIT
FRONT CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all FCM DTC's.

Turn the Right Turn Signals on.

With the Scan Tool read the DTC information.

Does the Scan Tool read: B163F-FRONT RIGHT TURN CONTROL CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST - VER 1.

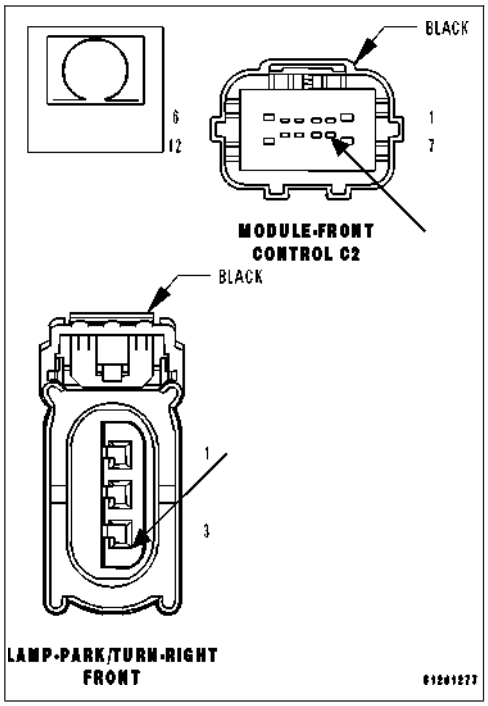
---

2. L60 FRONT RIGHT TURN SIGNAL CONTROL CIRCUIT

Turn the ignition off.

Disconnect the FCM C2 harness connector.

Measure the resistance between ground and the (L60) Front Turn Signal Control circuit.



Is the resistance below 5.0 ohms?

Yes >> Go To 3

No >> Repair the (L60) Front Right Turn Signal Control circuit for a short to ground.
Perform the BODY VERIFICATION TEST - VER 1.

B163F-FRONT RIGHT TURN CONTROL CIRCUIT LOW (CONTINUED)

3. FRONT CONTROL MODULE

Turn the ignition off.

Disconnect the FCM connector.

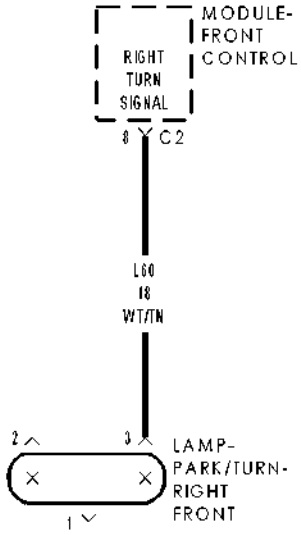
Measure the resistance between ground and the (L60) Front Right Turn Signal Control circuit in the FCM.

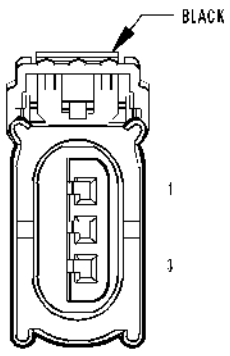
Is the resistance below 5.0 ohms?

Yes >> Replace the Power Distribution Center in accordance with the service information.
Perform the BODY VERIFICATION TEST - VER 1.

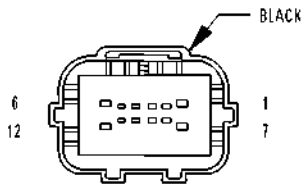
No >> Replace the Front Control Module in accordance with the service information.
Perform the BODY VERIFICATION TEST - VER 1.

B1640-FRONT RIGHT TURN CONTROL CIRCUIT HIGH





LAMP-PARK/TURN-RIGHT
FRONT



MODULE-FRONT
CONTROL C2

8l2a1286

B1640-FRONT RIGHT TURN CONTROL CIRCUIT HIGH (CONTINUED)

For the Exterior Lighting circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Front Control Module detects a short to battery on the Control circuit.

Possible Causes
(L60) TURN SIGNAL CONTROL CIRCUIT
POWER DISTRIBUTION CENTER
FRONT CONTROL MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
Clear all FCM DTC's
Turn the Right Turn Signal on.
With the scan tool, read DTC's.

Does the scan tool read: B1640-FRONT RIGHT TURN CONTROL CIRCUIT HIGH?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST - VER 1.

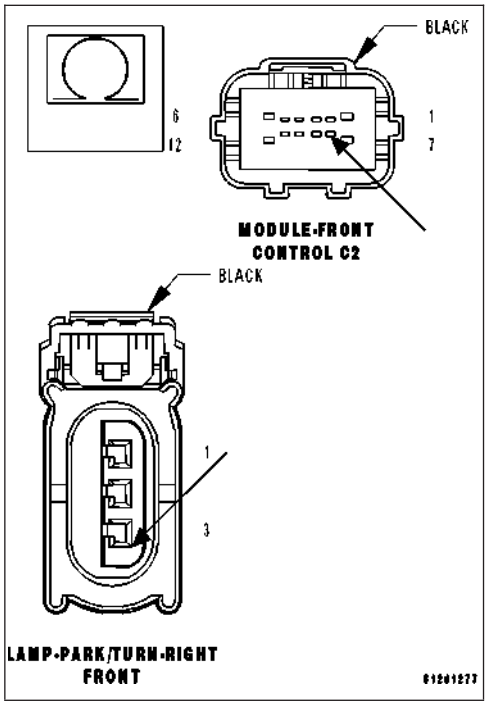
B1640-FRONT RIGHT TURN CONTROL CIRCUIT HIGH (CONTINUED)

2. L60 RIGHT TURN SIGNAL CONTROL CIRCUIT

Turn the ignition off.

Disconnect the PDC connector from the FCM.

Measure the resistance of the (L60) Front Right Turn Signal Control circuit.



Is the resistance above 5.0 ohms?

No >> Repair the (L60) Turn Signal Control circuit.
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Go To 3

---

3. FRONT CONTROL MODULE

Turn the ignition off.

Disconnect the Front Control Module from the PDC 49 way connector.

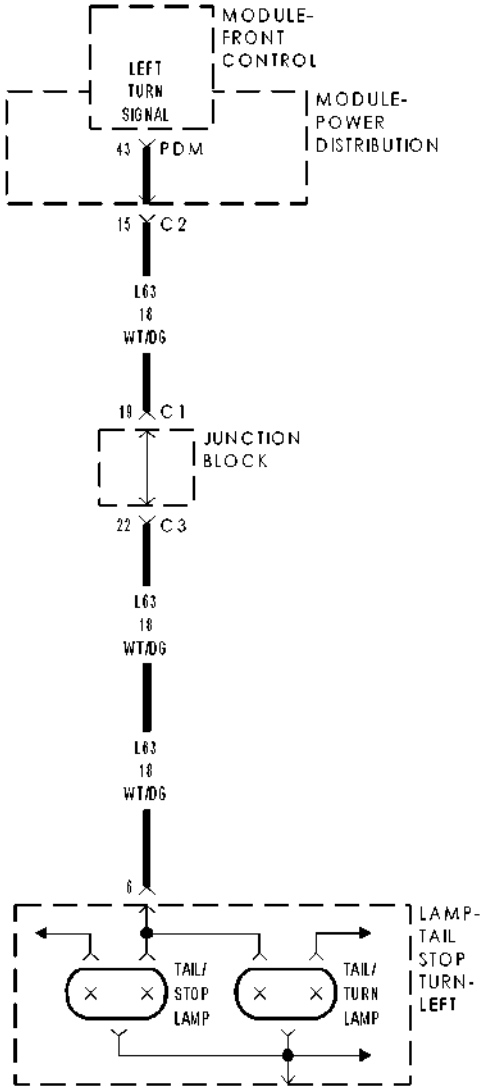
Measure the voltage between (L60) Front Right Turn Signal Control circuit and ground.

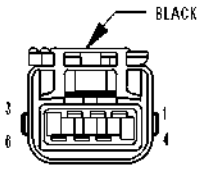
Is there any voltage present?

Yes >> Replace the Power Distribution Center.
Perform BODY VERIFICATION TEST - VER 1.

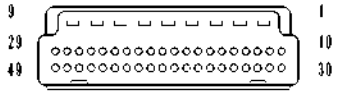
No >> Replace the Front Control Module.
Perform BODY VERIFICATION TEST - VER 1.

B1643-REAR LEFT TURN CONTROL CIRCUIT LOW





LAMP-TAIL
STOP
TURN-LEFT



MODULE-
FRONT
CONTROL
PDM

8l2a117b

B1643-REAR LEFT TURN CONTROL CIRCUIT LOW (CONTINUED)

For the Exterior Lighting circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- **Set Condition:**

Possible Causes
(L63) REAR LEFT TURN SIGNAL CONTROL CIRCUIT
MODULE POWER DISTRIBUTION CENTER
FRONT CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all FCM DTC's.

Turn the Left Turn Signals on.

With the Scan Tool read the DTC information.

Does the Scan Tool read: B1643-REAR LEFT TURN CONTROL CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST-VER1.

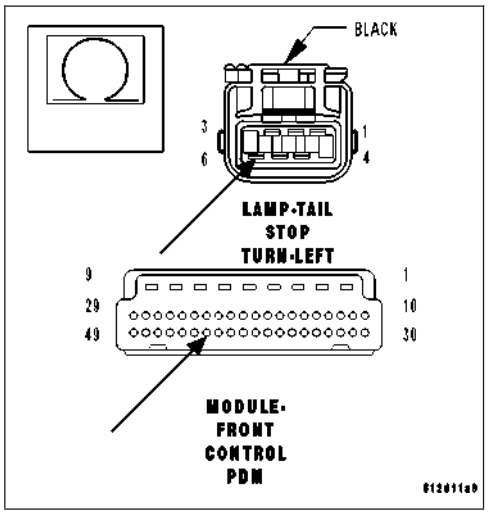
---

2. L63 LEFT TURN SIGNAL CONTROL CIRCUIT

Turn the ignition off.

Disconnect the FCM PDM connector.

Measure the resistance between ground and the (L63) Rear Left Turn Signal Control circuit.



Is the resistance below 5.0 ohms?

Yes >> Go To 3

No >> Repair the (L63) Rear Left Turn Signal Control circuit for a short to ground.
Perform the BODY VERIFICATION TEST-VER1.

B1643-REAR LEFT TURN CONTROL CIRCUIT LOW (CONTINUED)

3. **FRONT CONTROL MODULE**

Turn the ignition off.

Disconnect the FCM connector.

Disconnect the PDM connector.

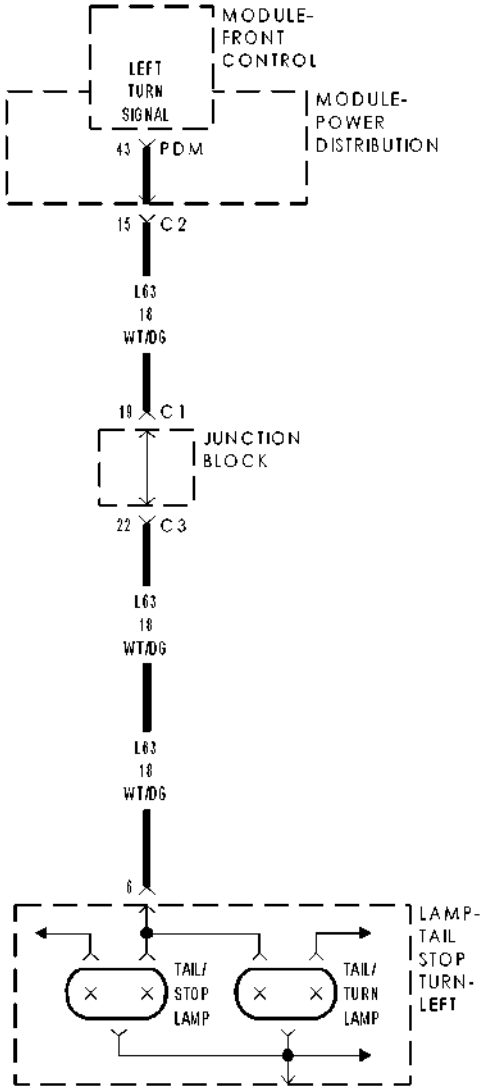
Measure the resistance between ground and the (L63) Left Turn Signal Control circuit in the PDM.

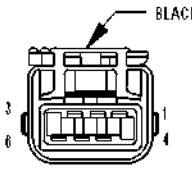
Is the resistance below 5.0 ohms?

Yes >> Replace the Module Power Distribution Center in accordance with the service information. Perform the BODY VERIFICATION TEST-VER1.

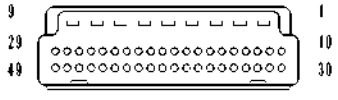
No >> Replace the Front Control Module in accordance with the service information. Perform the BODY VERIFICATION TEST-VER1.

B1644-REAR LEFT TURN CONTROL CIRCUIT HIGH





LAMP-TAIL
STOP
TURN-LEFT



MODULE-
FRONT
CONTROL
PDM

812d117b

B1644-REAR LEFT TURN CONTROL CIRCUIT HIGH (CONTINUED)

For the Exterior Lighting System circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Front Control Module detects a short to battery on the Control circuit.

Possible Causes
(L63) TURN SIGNAL CONTROL CIRCUIT
POWER DISTRIBUTION CENTER
FRONT CONTROL MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
Clear all FCM DTC's
Turn the Left Turn Signal on.
With the scan tool, read DTC's.

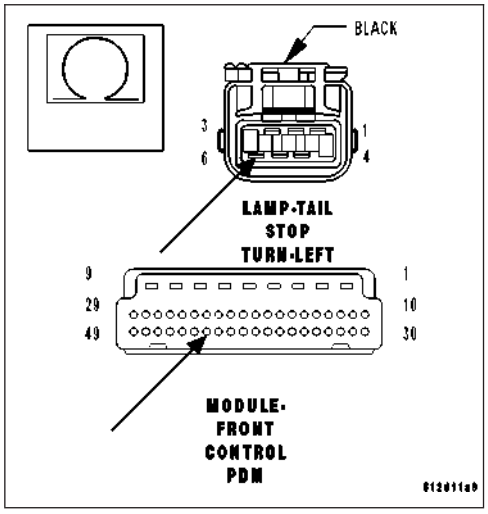
Does the scan tool read: B1644-REAR LEFT TURN CONTROL CIRCUIT HIGH?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST - VER 1.

2. L63 LEFT TURN SIGNAL CONTROL CIRCUIT

Turn the ignition off.
Disconnect the PDM connector from the FCM.
Measure the resistance of the (L63) Left Rear Turn Signal Control circuit.



Is the resistance above 5.0 ohms?

No >> Repair the (L63) Turn Signal Control circuit.
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Go To 3

B1644-REAR LEFT TURN CONTROL CIRCUIT HIGH (CONTINUED)

3. FRONT CONTROL MODULE

Turn the ignition off.

Disconnect the Front Control Module from the PDM 49 way connector.

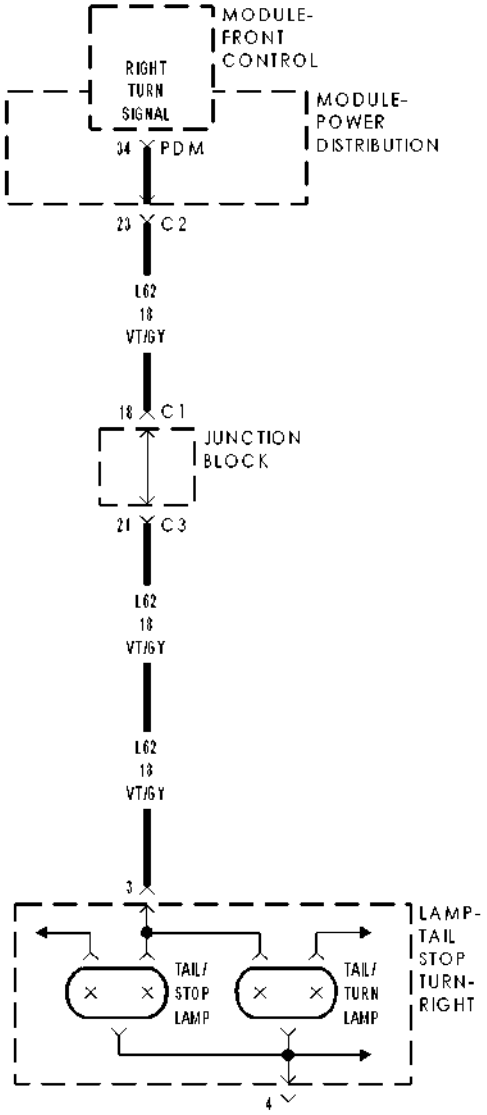
Measure the voltage between (L63) Left Rear Turn Signal Control circuit and ground.

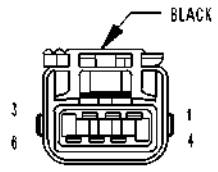
Is there any voltage present?

Yes >> Replace the Power Distribution Center.
Perform BODY VERIFICATION TEST - VER 1.

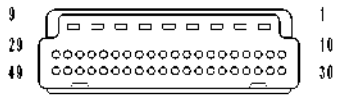
No >> Replace the Front Control Module.
Perform BODY VERIFICATION TEST - VER 1.

B1647-REAR RIGHT TURN CONTROL CIRCUIT LOW





LAMP-TAIL
STOP
TURN-RIGHT



MODULE-
FRONT
CONTROL
PDM

B1647-REAR RIGHT TURN CONTROL CIRCUIT LOW (CONTINUED)

For the Exterior Lighting circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- **Set Condition:**

Possible Causes
(L62) REAR RIGHT TURN SIGNAL CONTROL CIRCUIT
MODULE POWER DISTRIBUTION CENTER
FRONT CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all FCM DTC's.

Turn the Right Turn Signals on.

With the Scan Tool read the DTC information.

Does the Scan Tool read: B1647-REAR RIGHT TURN CONTROL CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST-VER1.

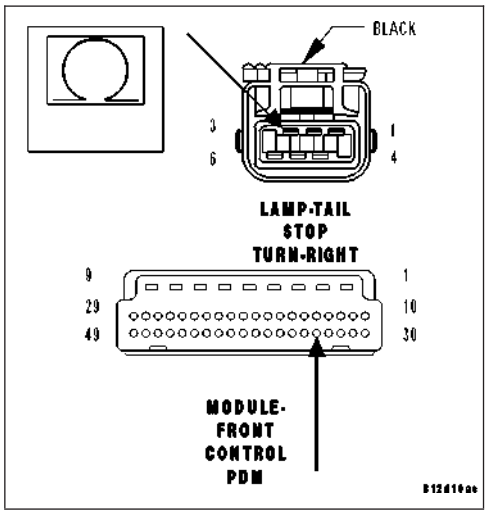
---

2. L62 RIGHT TURN SIGNAL CONTROL CIRCUIT

Turn the ignition off.

Disconnect the FCM PDM connector.

Measure the resistance between ground and the (L62) Rear Turn Signal Control circuit.



Is the resistance below 5.0 ohms?

Yes >> Go To 3

No >> Repair the (L62) Rear Right Turn Signal Control circuit for a short to ground.
Perform the BODY VERIFICATION TEST-VER1.

B1647-REAR RIGHT TURN CONTROL CIRCUIT LOW (CONTINUED)

3. FRONT CONTROL MODULE

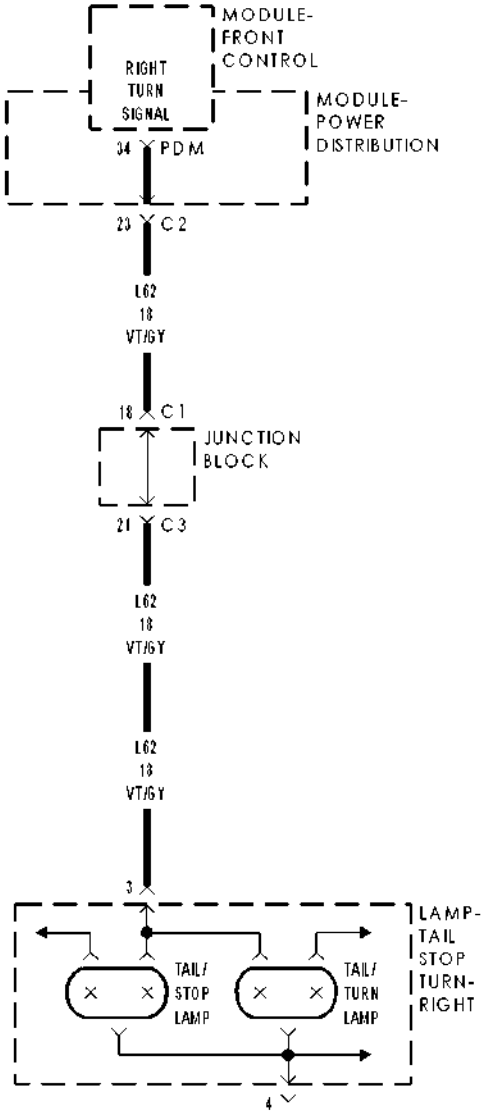
Turn the ignition off.
Disconnect the FCM connector.
Disconnect the PDM connector.
Measure the resistance between ground and the (L62) Right Turn Signal Control circuit in the PDM.

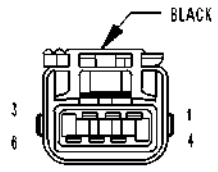
Is the resistance below 5.0 ohms?

Yes >> Replace the Module Power Distribution Center in accordance with the service information. Perform the BODY VERIFICATION TEST-VER1.

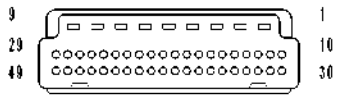
No >> Replace the Front Control Module in accordance with the service information. Perform the BODY VERIFICATION TEST-VER1.

B1648-REAR RIGHT TURN CONTROL CIRCUIT HIGH





LAMP-TAIL
STOP
TURN-RIGHT



MODULE-
FRONT
CONTROL
PDM

B1648-REAR RIGHT TURN CONTROL CIRCUIT HIGH (CONTINUED)

For the Exterior Lighting System circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Front Control Module detects a short to battery on the Control circuit.

Possible Causes
(L62) TURN SIGNAL CONTROL CIRCUIT
POWER DISTRIBUTION CENTER
FRONT CONTROL MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
Clear all FCM DTC's
Turn the Right Turn Signal on.
With the scan tool, read DTC's.

Does the scan tool read: B1648-REAR RIGHT TURN CONTROL CIRCUIT HIGH?

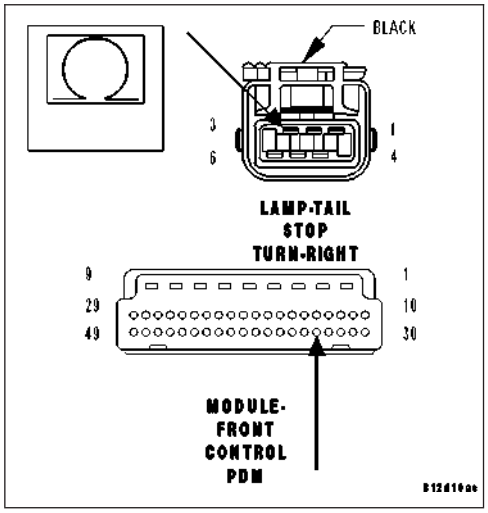
Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST - VER 1.

---

2. L62 RIGHT TURN SIGNAL CONTROL CIRCUIT

Turn the ignition off.
Disconnect the PDM connector from the FCM.
Measure the resistance of the (L62) Right Rear Turn Signal Control circuit.



Is the resistance above 5.0 ohms?

No >> Repair the (L62) Turn Signal Control circuit.
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Go To 3

B1648-REAR RIGHT TURN CONTROL CIRCUIT HIGH (CONTINUED)

3. FRONT CONTROL MODULE

Turn the ignition off.

Disconnect the Front Control Module from the PDM 49 way connector.

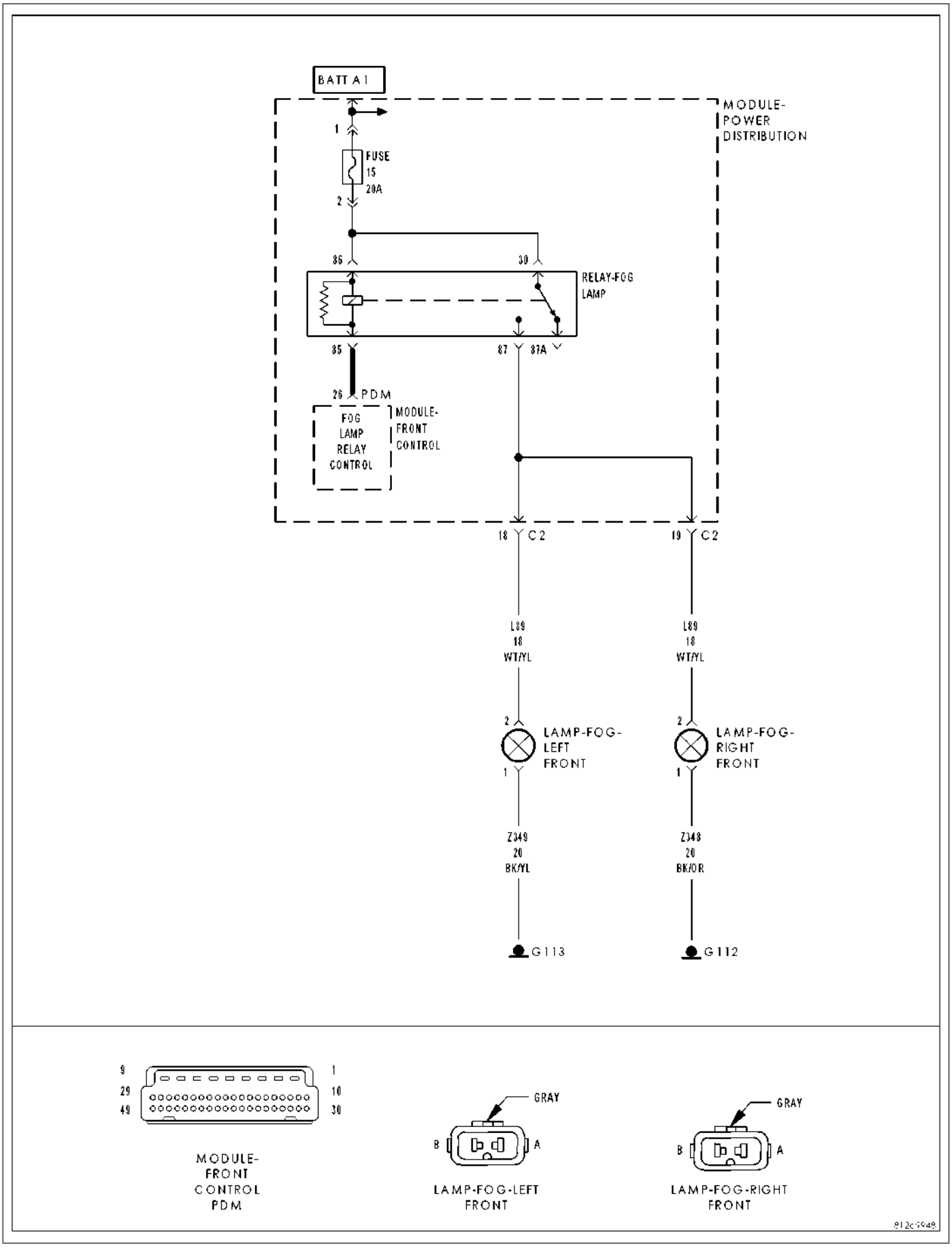
Measure the voltage between (L62) Right Rear Turn Signal Control circuit and ground.

Is there any voltage present?

Yes >> Replace the Power Distribution Center.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Front Control Module.
Perform BODY VERIFICATION TEST - VER 1.

B1659-FRONT FOG LAMP CONTROL CIRCUIT LOW



B1659-FRONT FOG LAMP CONTROL CIRCUIT LOW (CONTINUED)

For the Exterior Lighting system circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Fog Lamps activated.
- **Set Condition:**
- When the FCM detects a LOW condition.

Possible Causes
(L139) FOG LAMP CONTROL CIRCUIT
FRONT CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all FCM DTC's.

Turn the Fog Lamps on.

With the Scan Tool read the DTC information.

Does the Scan Tool read: B1659-FRONT FOG LAMP CONTROL CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST-VER1.

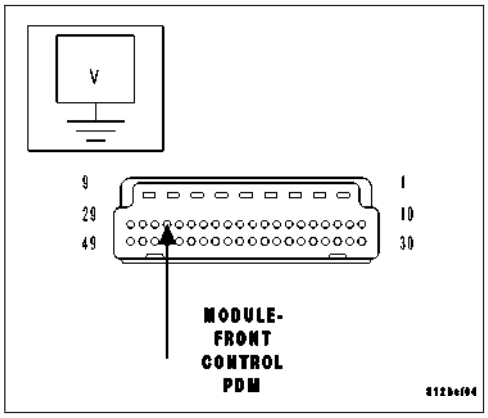
---

2. (L139) FOG LAMP CONTROL CIRCUIT

Turn the ignition off.

Disconnect the FCM PDM harness connector.

Measure the resistance between ground and the (L139) Fog Lamp Control circuit.

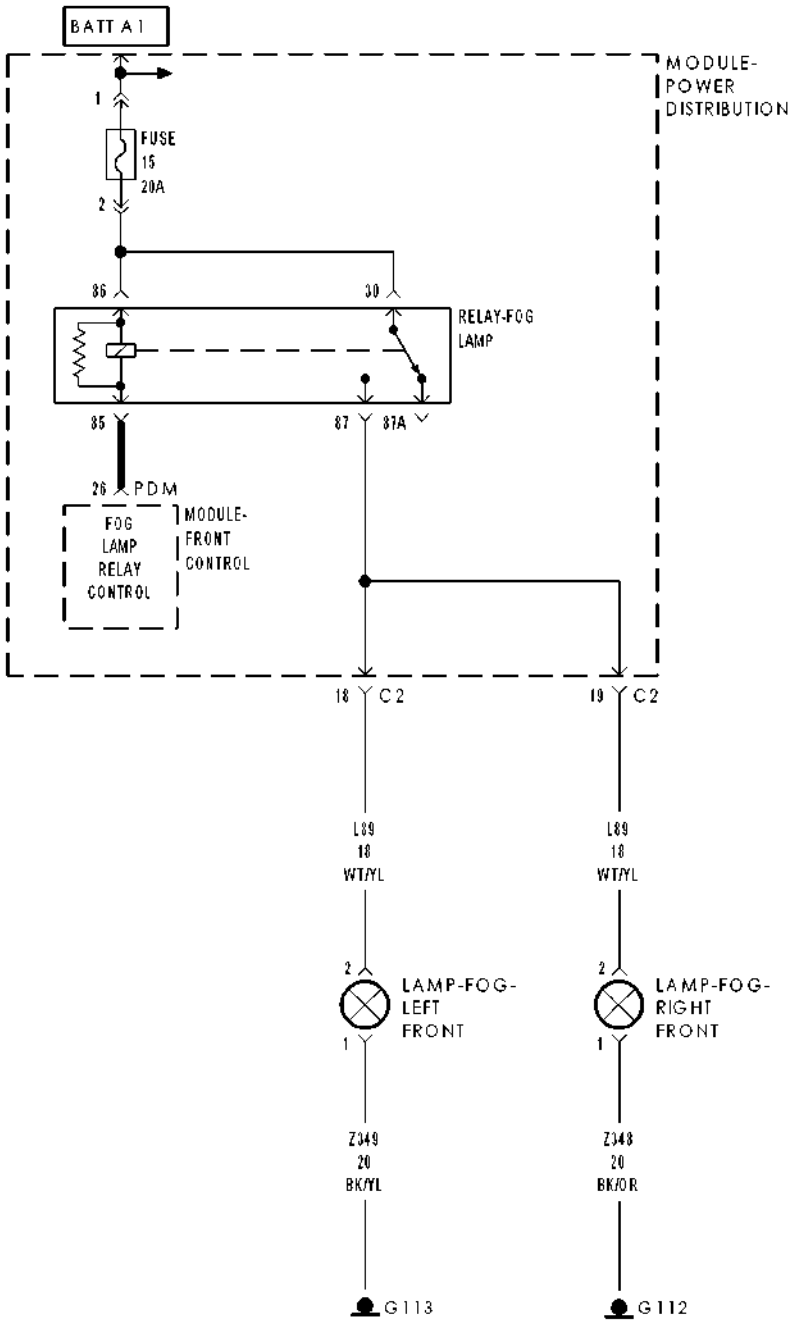


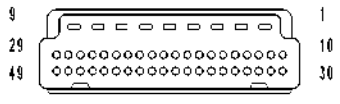
Is the resistance below 5.0 ohms?

Yes >> Replace the Front Control Module (FCM) in accordance with the service information.
Perform the BODY VERIFICATION TEST VER1.

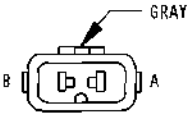
No >> Repair the (L139) Fog Lamp Control circuit for a short to ground condition.
Perform the BODY VERIFICATION TEST VER1.

B1660-FRONT FOG LAMP CONTROL CIRCUIT HIGH

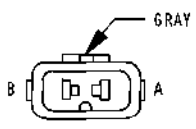




MODULE-
FRONT
CONTROL
PDM



LAMP-FOG-LEFT
FRONT



LAMP-FOG-RIGHT
FRONT

812c5948

B1660-FRONT FOG LAMP CONTROL CIRCUIT HIGH (CONTINUED)

For the Exterior Lighting system circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Front Fog Lamps activated.
- **Set Condition:**
- When the FCM detects a HIGH condition.

Possible Causes
FRONT FOG LAMP RELAY
MODULE-POWER DISTRIBUTION
FRONT CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all FCM DTC's.

Actuate the Front Fog Lamps.

With the Scan Tool read the DTC information.

Does the Scan Tool read: B1660-FRONT FOG LAMP CONTROL CIRCUIT HIGH?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST-VER1.

---

2. FRONT FOG LAMP RELAY

Turn the ignition off.

Remove and install a known good relay in place of the Front Fog Lamp Relay.

Do the Front Fog Lamps operate normally?

Yes >> Replace the Front Fog Lamp Relay in accordance with the service information.
Perform the BODY VERIFICATION TEST VER1.

No >> Go To 3

B1660-FRONT FOG LAMP CONTROL CIRCUIT HIGH (CONTINUED)

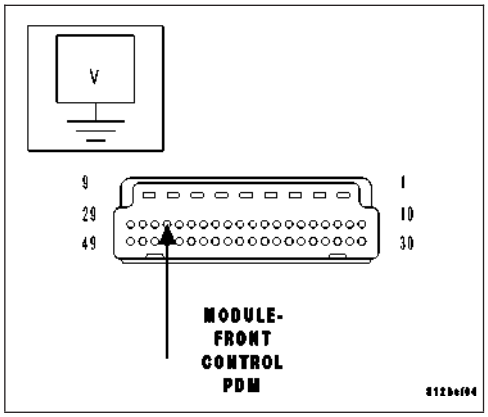
3. FRONT CONTROL MODULE

Turn the ignition off.

Remove the Front Fog Lamp Relay from the MPD.

Remove the FCM from the Module Power Distribution.

Measure the voltage of the (L139) Front Fog Lamp Relay Output circuit and ground.

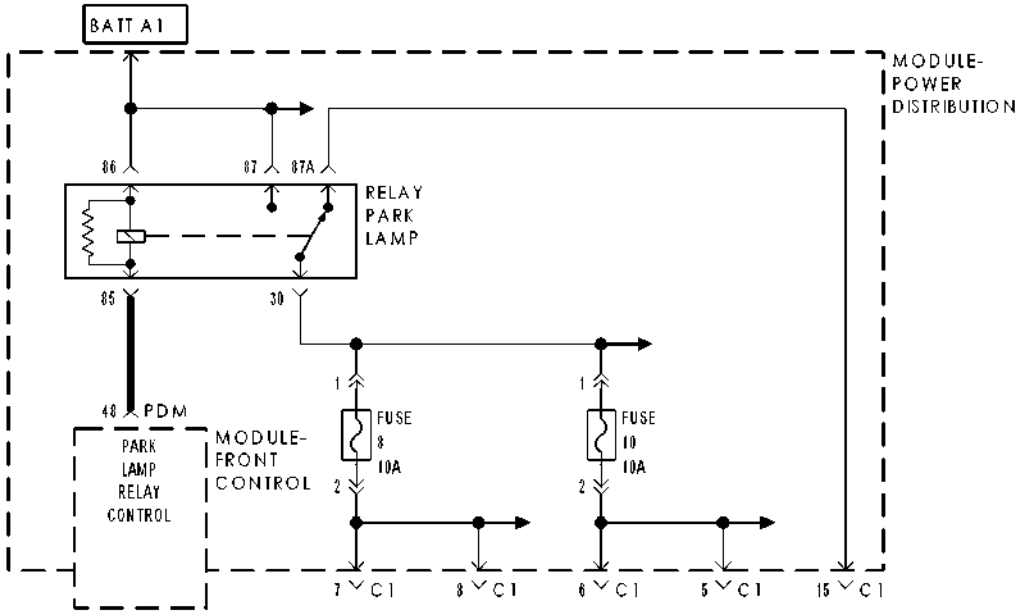


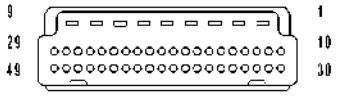
Is the voltage above 1.0 volts?

Yes >> Replace the Module Power Distribution center in accordance with the service information.
Perform the BODY VERIFICATION TEST-VER1.

No >> Replace the Module Front Control in accordance with the service information.
Perform the BODY VERIFICATION TEST-VER1.

B165C-PARK LAMP CONTROL CIRCUIT LOW





MODULE-
FRONT
CONTROL
PDM

B165C-PARK LAMP CONTROL CIRCUIT LOW (CONTINUED)

For the Exterior Lighting system circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Park Lamps activated.
- **Set Condition:**
- When the FCM detects a LOW condition.

Possible Causes
(L779) PARK LAMP CONTROL CIRCUIT
FRONT CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all FCM DTC's.

Turn the Park Lamps on.

With the Scan Tool read the DTC information.

Does the Scan Tool read: B165C-PARK LAMP CONTROL CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST-VER1.

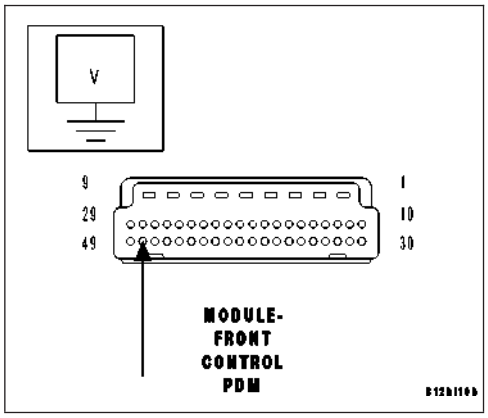
---

2. (L779) PARK LAMP CONTROL CIRCUIT

Turn the ignition off.

Disconnect the FCM PDM harness connector.

Measure the resistance between ground and the (L779) Park Lamp Control circuit.

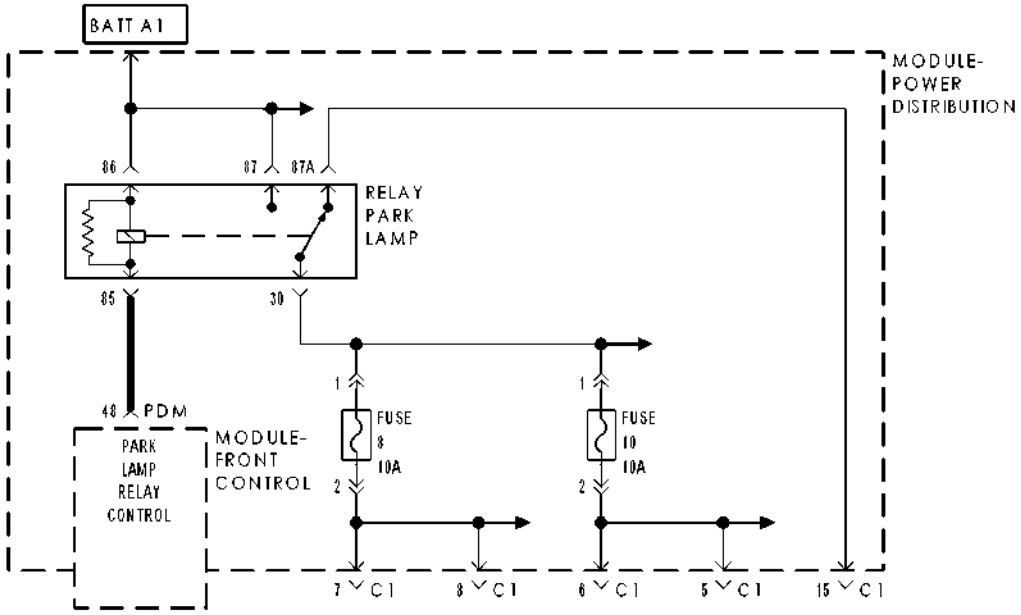


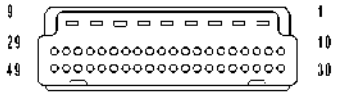
Is the resistance below 5.0 ohms?

Yes >> Replace the Front Control Module (FCM) in accordance with the service information.
Perform the BODY VERIFICATION TEST VER1.

No >> Repair the (L779) Park Lamp Control circuit for a short to ground condition.
Perform the BODY VERIFICATION TEST VER1.

B165D-PARK LAMP CONTROL CIRCUIT HIGH





MODULE-
FRONT
CONTROL
PDM

B165D-PARK LAMP CONTROL CIRCUIT HIGH (CONTINUED)

For the Exterior Lighting system circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Front Fog Lamps activated.
- **Set Condition:**
- When the FCM detects a HIGH condition.

Possible Causes
PARK LAMP RELAY
MODULE-POWER DISTRIBUTION
FRONT CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all FCM DTC's.

Actuate the Park Lamps.

With the Scan Tool read the DTC information.

Does the Scan Tool read: B165D-PARK LAMP CONTROL CIRCUIT HIGH?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST-VER1.

---

2. PARK LAMP RELAY

Turn the ignition off.

Remove and install a known good relay in place of the Park Lamp Relay.

Do the Front Fog Lamps operate normally?

Yes >> Replace the Park Lamp Relay in accordance with the service information.
Perform the BODY VERIFICATION TEST VER1.

No >> Go To 3

B165D-PARK LAMP CONTROL CIRCUIT HIGH (CONTINUED)

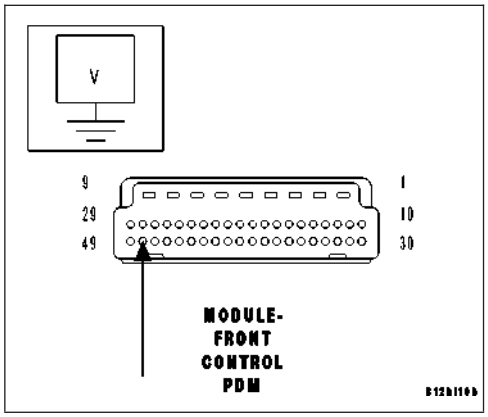
3. FRONT CONTROL MODULE

Turn the ignition off.

Remove the Park Lamp Relay from the MPD.

Remove the FCM from the Module Power Distribution.

Measure the voltage of the (L779) Park Lamp Relay Output circuit and ground.

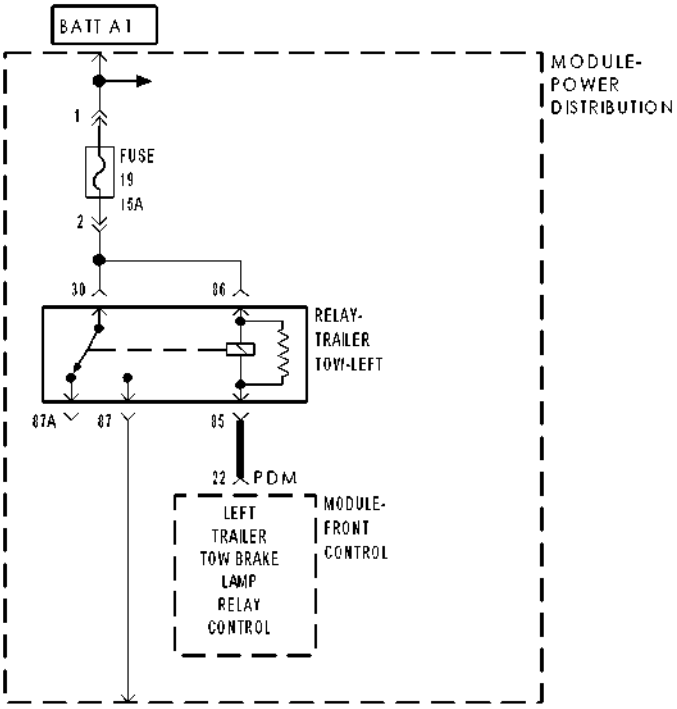


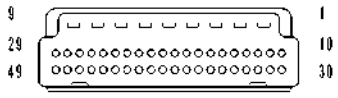
Is the voltage above 1.0 volts?

Yes >> Replace the Module Power Distribution center in accordance with the service information.
Perform the BODY VERIFICATION TEST-VER1.

No >> Replace the Module Front Control in accordance with the service information.
Perform the BODY VERIFICATION TEST-VER1.

B166B-LEFT TRAILER TOW LAMP CONTROL CIRCUIT LOW





MODULE-
FRONT
CONTROL
PDM

81ccc183

B166B-LEFT TRAILER TOW LAMP CONTROL CIRCUIT LOW (CONTINUED)

For the Exterior Lighting system circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Trailer Tow Lamps activated.
- **Set Condition:**
- When the FCM detects a LOW condition.

Possible Causes
(L655) TRAILER TOW CONTROL CIRCUIT
FRONT CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all FCM DTC's.

Turn the Trailer Tow Lamps on.

With the Scan Tool read the DTC information.

Does the Scan Tool read: B166B-LEFT TRAILER TOW LAMP CONTROL CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST-VER1.

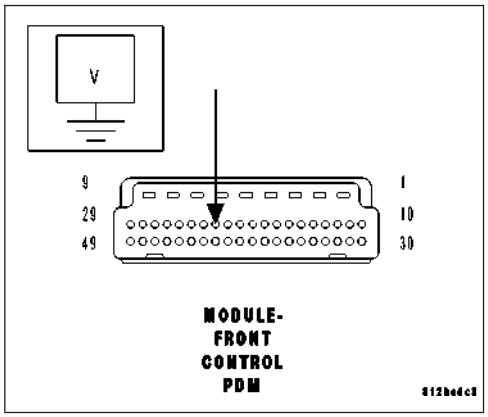
---

2. (L655) TRAILER TOW CONTROL CIRCUIT

Turn the ignition off.

Disconnect the FCM PDM harness connector.

Measure the resistance between ground and the (L655) Left Trailer Tow Control circuit.

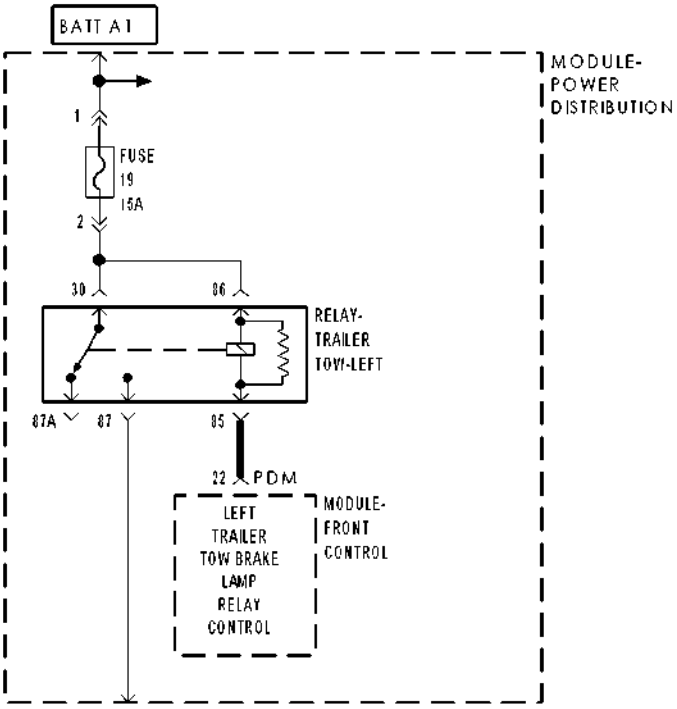


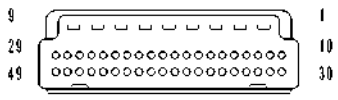
Is the resistance below 5.0 ohms?

Yes >> Replace the Front Control Module (FCM) in accordance with the service information.
Perform the BODY VERIFICATION TEST VER1.

No >> Repair the (L655) Left Trailer Tow Control circuit for a short to ground condition.
Perform the BODY VERIFICATION TEST VER1.

B166C-LEFT TRAILER TOW LAMP CONTROL CIRCUIT HIGH





MODULE-
FRONT
CONTROL
PDM

8l2oo183

B166C-LEFT TRAILER TOW LAMP CONTROL CIRCUIT HIGH (CONTINUED)

For the Exterior Lighting system circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Trailer Tow Lamps activated.
- **Set Condition:**
- When the FCM detects a LOW condition.

Possible Causes
LEFT TRAILER TOW RELAY
MODULE-POWER DISTRIBUTION
FRONT CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all FCM DTC's.

Actuate the Trailer Tow Lamps.

With the Scan Tool read the DTC information.

Does the Scan Tool read: B166C-LEFT TRAILER TOW LAMP CONTROL CIRCUIT HIGH?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST-VER1.

---

2. LEFT TRAILER TOW RELAY

Turn the ignition off.

Remove and install a known good relay in place of the Left Trailer Tow Relay.

Do the Trailer Tow Lamps operate normally?

Yes >> Replace the Left Trailer Tow Relay in accordance with the service information.
Perform the BODY VERIFICATION TEST VER1.

No >> Go To 3

B166C-LEFT TRAILER TOW LAMP CONTROL CIRCUIT HIGH (CONTINUED)

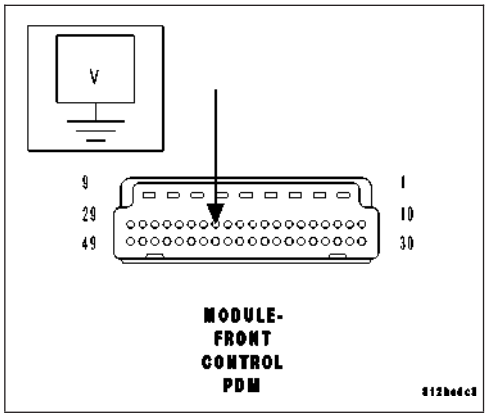
3. FRONT CONTROL MODULE

Turn the ignition off.

Remove the Left Trailer Tow Relay from the MPD.

Remove the FCM from the Module Power Distribution.

Measure the voltage of the (L655) Left Trailer Tow Relay Output circuit and ground.

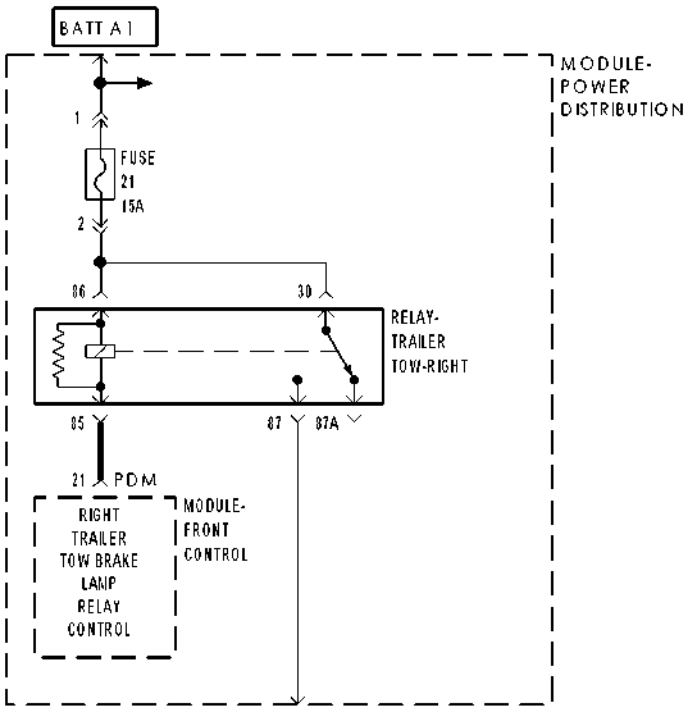


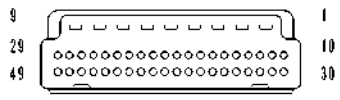
Is the voltage above 1.0 volts?

Yes >> Replace the Module Power Distribution center in accordance with the service information.
Perform the BODY VERIFICATION TEST-VER1.

No >> Replace the Module Front Control in accordance with the service information.
Perform the BODY VERIFICATION TEST-VER1.

B166F-RIGHT TRAILER TOW LAMP CONTROL CIRCUIT LOW





MODULE-
FRONT
CONTROL
PDM

8l2col b4

B166F-RIGHT TRAILER TOW LAMP CONTROL CIRCUIT LOW (CONTINUED)

For the Exterior Lighting System circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Front Control Module does not detect voltage on the Trailer Tow Relay Control circuit.

Possible Causes
PDM FUSE 21
B(+) OPEN
RIGHT TRAILER TOW RELAY
POWER DISTRIBUTION CENTER
FRONT CONTROL MODULE

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, clear all FCM DTC's
Actuate the Trailer Tow Lamps.
With the scan tool, read DTC's.

Does the scan tool read: B166F-RIGHT TRAILER TOW LAMP CONTROL CIRCUIT LOW?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST - VER 1.

---

2. PDM FUSE 21

Using a 12-volt test light connected to ground, check the PDM Fuse 21.

Does the test light illuminate and was the fuse OK?

No >> Replace the PDM Fuse 21 if open and check for a short to ground on the Relay Output circuit or correct the open B(+) circuit to the fuse.
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Go To 3

---

3. OPEN FUSED B(+) TO RELAY

Remove the Trailer Tow Relay from the PDC.
Using a 12-volt test light connected to ground, check the Fused B(+) circuit at the relay connector.

Does the test light illuminate?

No >> Replace the Power Distribution Center.
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Go To 4

B166F-RIGHT TRAILER TOW LAMP CONTROL CIRCUIT LOW (CONTINUED)

4. RIGHT TRAILER TOW RELAY

Install a known good relay in place of the Trailer Tow Relay.
With the scan tool erase DTC's
Cycle the ignition from on to off 3 times and leave on.
With the scan tool, read DTC's.

Does the scan tool display the same DTC?

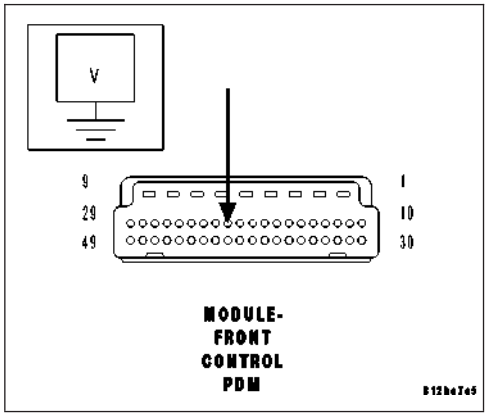
No >> Replace the original Trailer Tow Relay.
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Go To 5

---

5. (L656) TRAILER TOW RELAY CONTROL SHORTED

Remove the Right Trailer Tow Relay.
Disconnect the Front Control Module from the PDC 49 – way connector.
Measure the resistance between ground and the (L656) Trailer Tow Relay Control circuit at the relay.



Is the resistance below 1000.0 ohms?

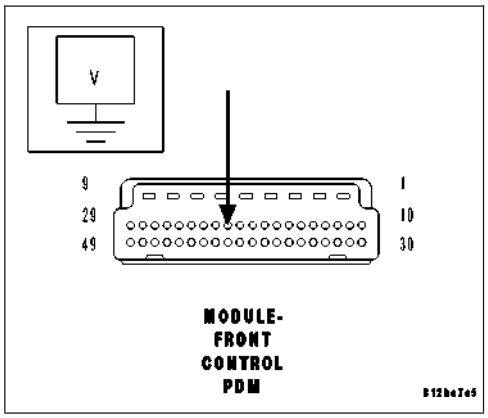
Yes >> Replace the Power Distribution Center.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 6

---

6. (L656) TRAILER TOW RELAY CONTROL OPEN

Measure the resistance of the (L656) Trailer Tow Relay Control circuit from the relay connector to FCM connector.

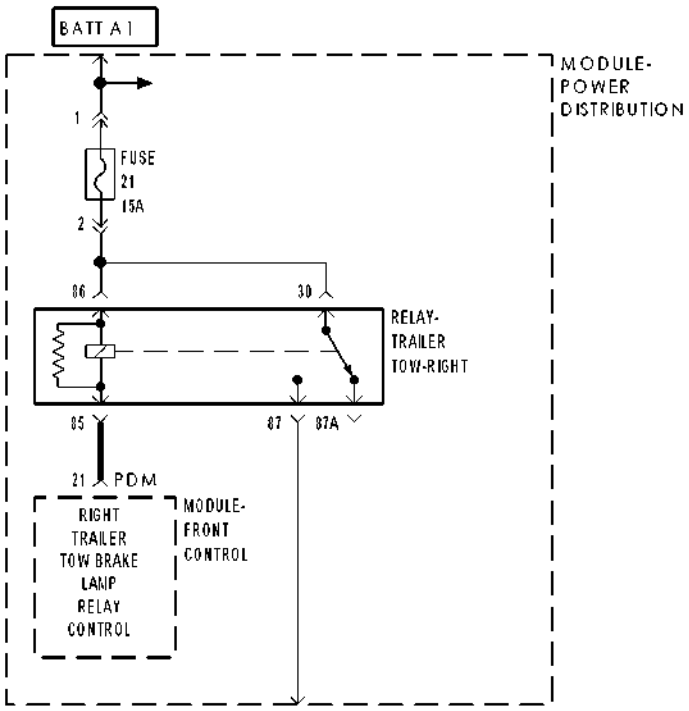


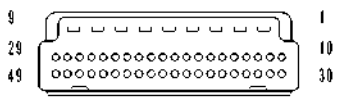
Is the resistance below 3.0 ohms?

Yes >> Replace the Front Control Module.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Power Distribution Center.
Perform BODY VERIFICATION TEST - VER 1.

B1670-RIGHT TRAILER TOW LAMP CONTROL CIRCUIT HIGH





MODULE-
FRONT
CONTROL
PDM

8l2col04

B1670-RIGHT TRAILER TOW LAMP CONTROL CIRCUIT HIGH (CONTINUED)

For the Exterior Lighting system circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the Trailer Tow Lamps activated.
- **Set Condition:**
- When the FCM detects a HIGH condition.

Possible Causes
RIGHT TRAILER TOW RELAY
MODULE-POWER DISTRIBUTION
FRONT CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all FCM DTC's.

Actuate the Trailer Tow Lamps.

With the Scan Tool read the DTC information.

Does the Scan Tool read: B1670-RIGHT TRAILER TOW LAMP CONTROL CIRCUIT HIGH?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST-VER1.

---

2. TRAILER TOW RELAY

Turn the ignition off.

Remove and install a known good relay in place of the Right Trailer Tow Relay.

Do the Trailer Tow Lamps operate normally?

Yes >> Replace the Right Trailer Tow Relay in accordance with the service information.
Perform the BODY VERIFICATION TEST VER1.

No >> Go To 3

B1670-RIGHT TRAILER TOW LAMP CONTROL CIRCUIT HIGH (CONTINUED)

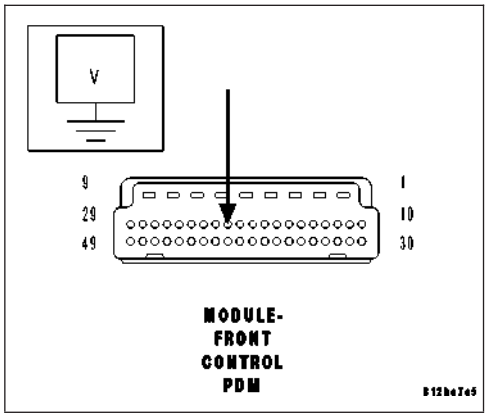
3. FRONT CONTROL MODULE

Turn the ignition off.

Remove the Right Trailer Tow Relay from the MPD.

Remove the FCM from the Module Power Distribution.

Measure the voltage of the (L656) Right Trailer Tow Relay Output circuit and ground.

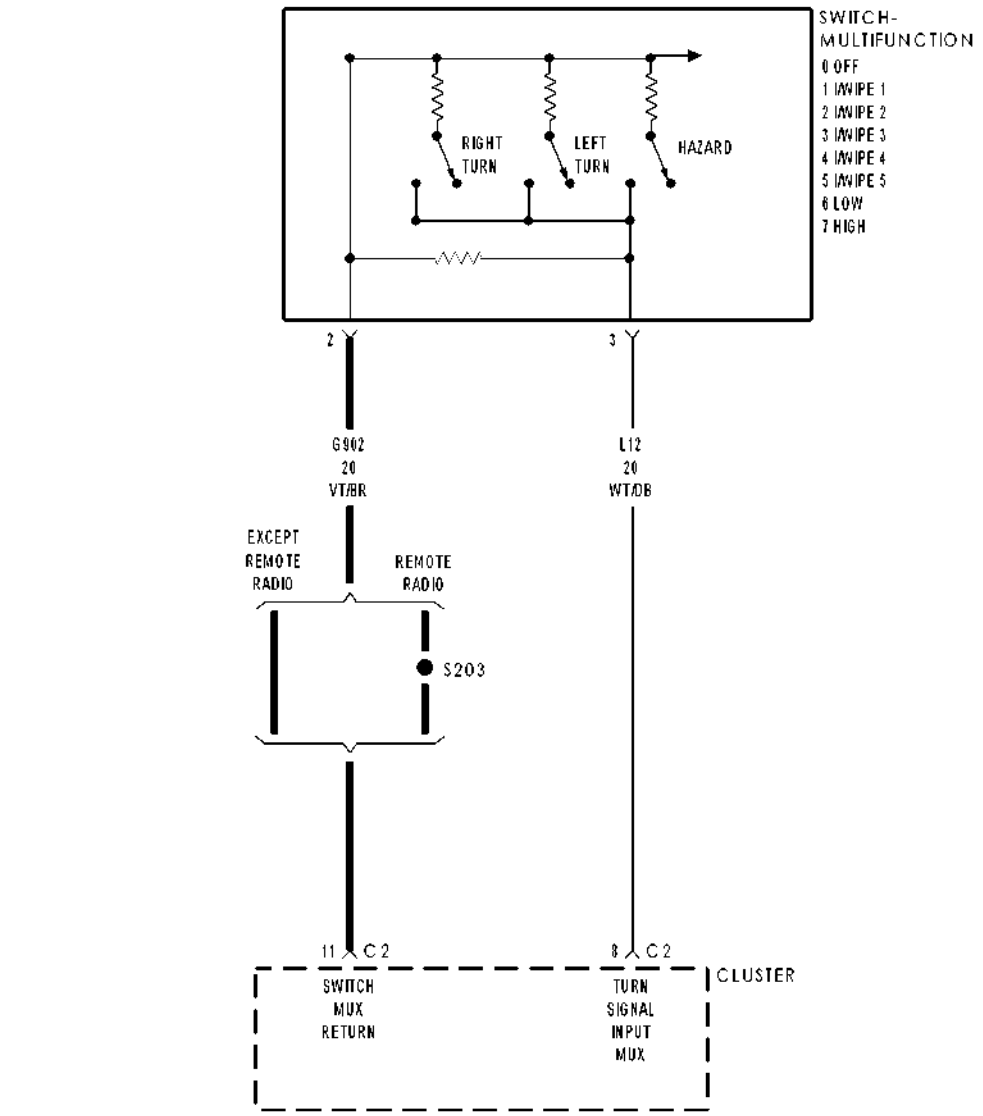


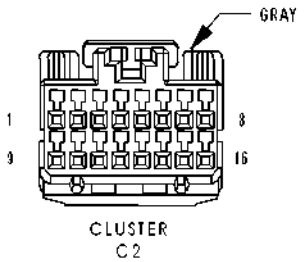
Is the voltage above 1.0 volts?

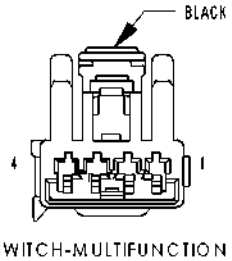
Yes >> Replace the Module Power Distribution center in accordance with the service information.
Perform the BODY VERIFICATION TEST-VER1.

No >> Replace the Module Front Control in accordance with the service information.
Perform the BODY VERIFICATION TEST-VER1.

B160D-TURN/HAZARD SWITCH INPUT CIRCUIT LOW







B160D-TURN/HAZARD SWITCH INPUT CIRCUIT LOW (CONTINUED)

For the Exterior Lighting system circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- **Set Condition:**

Possible Causes
MULTIFUNCTION SWITCH
(G902) MUX RETURN CIRCUIT
INSTRUMENT CLUSTER

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all CCN DTC's.

Actuate the Hazard Lamps.

With the Scan Tool, read the DTC information.

Does the Scan Tool read: B160D-TURN/HAZARD SWITCH INPUT CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST — VER 1.

---

2. MULTIFUNCTION SWITCH

Disconnect the Multifunction Switch connector.

Turn the ignition on.

Measure the voltage of the (G902) MUX Return circuit.

Does the voltage read 5.0 volts?

Yes >> Go To 3
Perform the BODY VERIFICATION TEST — VER 1.

No >> Replace the Multifunction Switch in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.

B160D-TURN/HAZARD SWITCH INPUT CIRCUIT LOW (CONTINUED)

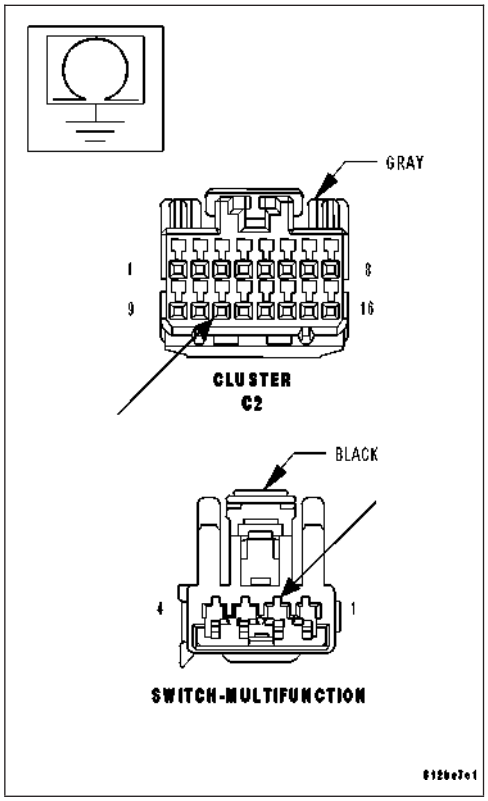
3. (G902) MUX RETURN CIRCUIT

Turn the ignition off.
Disconnect the Multifunction Switch connector.
Disconnect the Instrument Cluster C2 connector.
Measure the resistance of the (G902) MUX Return circuit to ground.

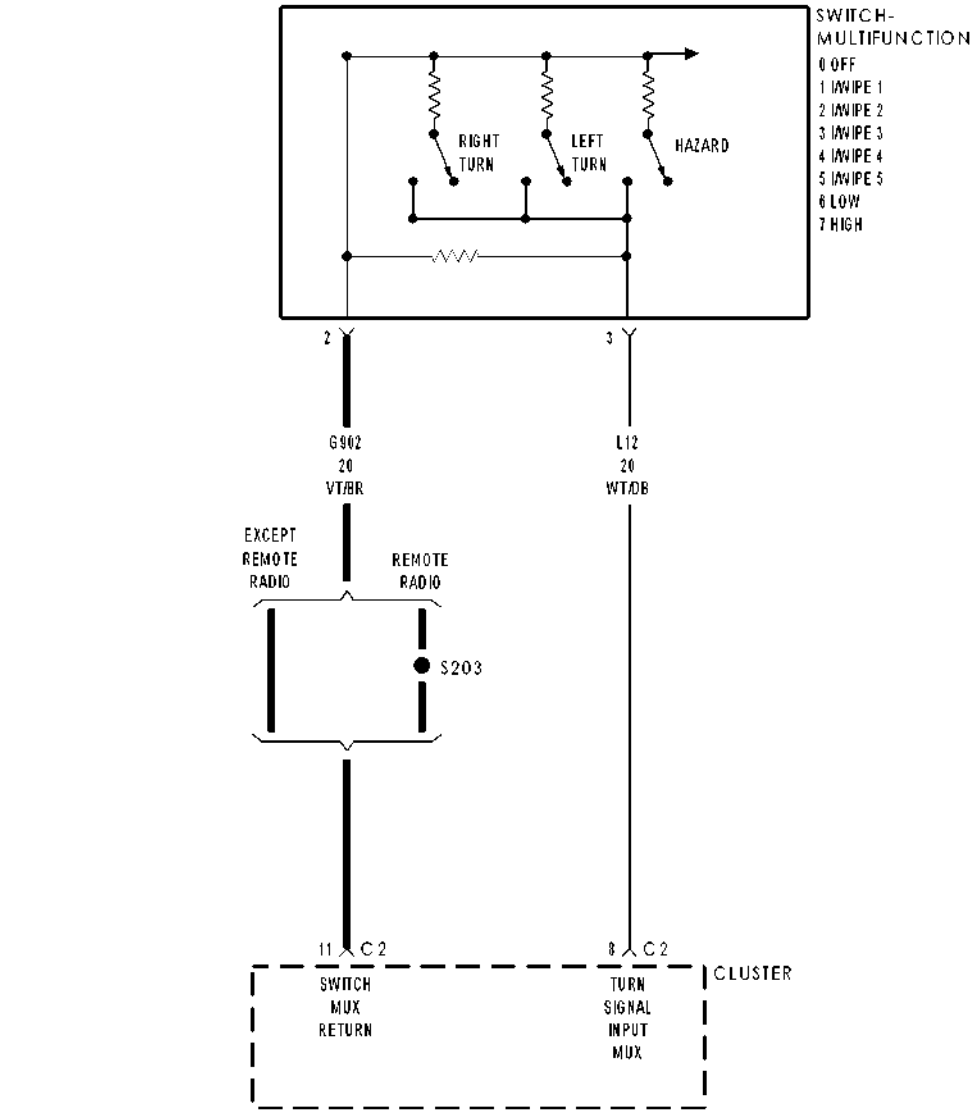
Is the resistance below 5.0 ohms?

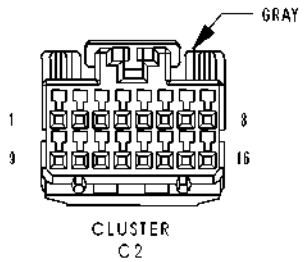
Yes >> Repair the (G902) MUX return circuit.
Perform the BODY VERIFICATION TEST — VER 1.

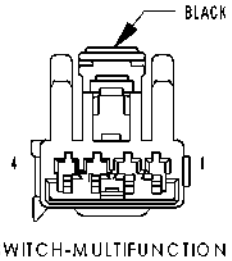
No >> Replace the Instrument Cluster in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.



B160E-TURN/HAZARD SWITCH INPUT CIRCUIT HIGH







B160E-TURN/HAZARD SWITCH INPUT CIRCUIT HIGH (CONTINUED)

For the Exterior Lighting system circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- **Set Condition:**

Possible Causes
MULTIFUNCTION SWITCH
(G902) MUX RETURN CIRCUIT
(L12) MUX INPUT CIRCUIT
INSTRUMENT CLUSTER

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all CCN DTC's.

Actuate the Hazard Lamps.

With the Scan Tool, read the DTC information.

Does the Scan Tool read: B160E-TURN/HAZARD SWITCH INPUT CIRCUIT HIGH?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST — VER 1.

---

2. MULTIFUNCTION SWITCH

Disconnect the Multifunction Switch connector.

Turn the ignition on.

Measure the voltage between the (G902) MUX Return circuit and (L12) Turn Signal Input MUX circuit.

Does the voltage read 0.0 volts?

Yes >> Replace the Multifunction Switch in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.

No >> Go To 3

B160E-TURN/HAZARD SWITCH INPUT CIRCUIT HIGH (CONTINUED)

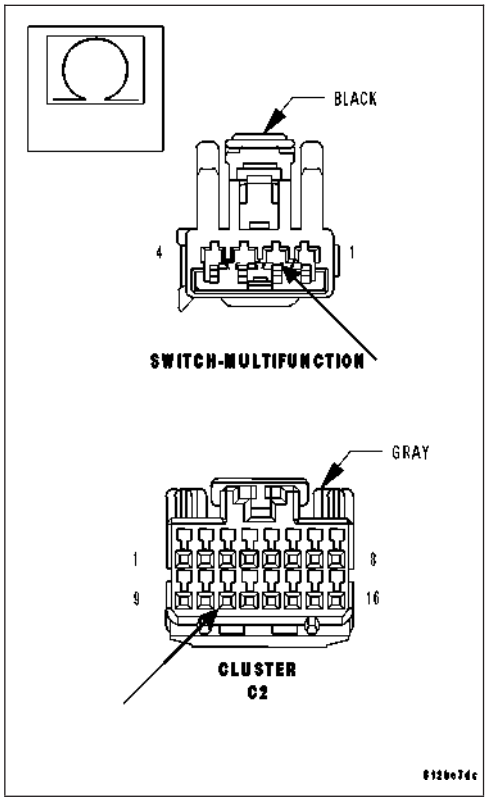
3. (G902) MUX RETURN CIRCUIT

Turn the ignition off.
Disconnect the Multifunction Switch connector.
Disconnect the Instrument Cluster C2 connector.
Measure the resistance of the (G902) MUX Return circuit.

Is the resistance below 5.0 ohms?

Yes >> Go To 4

No >> Repair the (G902) MUX Return circuit.
Perform the BODY VERIFICATION TEST — VER 1.



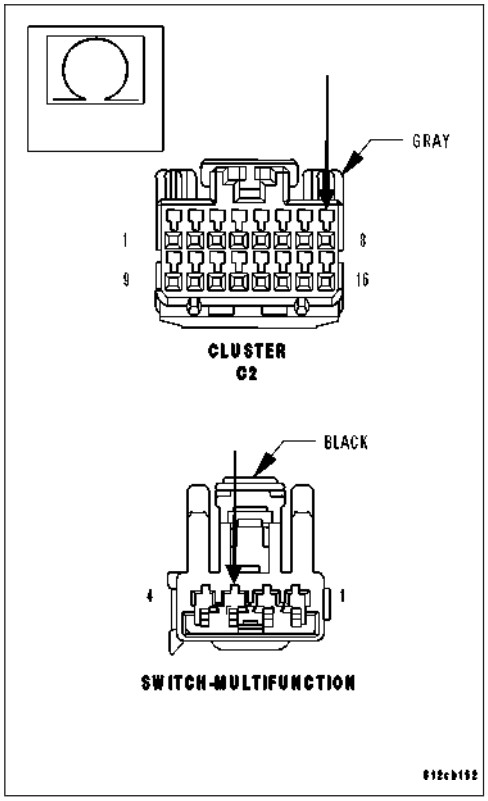
4. INSTRUMENT CLUSTER

Turn the ignition off.
Disconnect the Multifunction Switch connector.
Disconnect the Instrument Cluster C2 connector.
Measure the resistance of the (L12) Turn Signal Input MUX circuit.

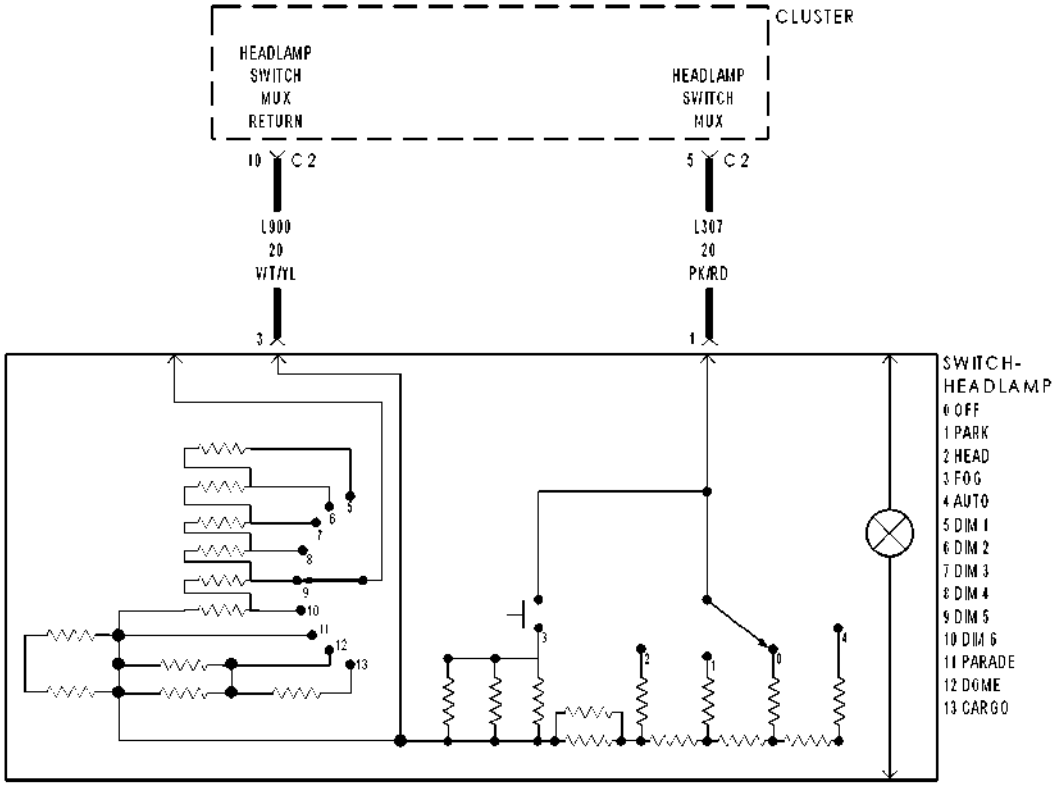
Is the resistance below 5.0 ohms?

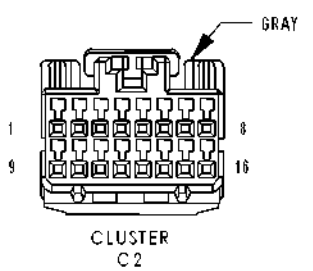
Yes >> Replace the instrument Cluster in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.

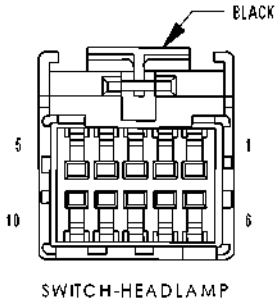
No >> Repair the (L12) Turn Signal Input MUX circuit.
Perform the BODY VERIFICATION TEST — VER 1.



B1607-HEADLAMP SWITCH INPUT CIRCUIT LOW







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B1607-HEADLAMP SWITCH INPUT CIRCUIT LOW (CONTINUED)

For the Exterior Lighting system circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- **Set Condition:**

Possible Causes
HEADLAMP SWITCH
(L900) MUX RETURN CIRCUIT
INSTRUMENT CLUSTER

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all CCN DTC's.

Turn the Headlamps on.

With the Scan Tool, read the DTC information.

Does the Scan Tool read: B1607-HEADLAMP SWITCH INPUT CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST — VER 1.

---

2. HEADLAMP SWITCH

Disconnect the Headlamp Switch connector.

Turn the ignition on.

Measure the voltage of the (L900) MUX Return circuit.

Does the voltage read 5.0 volts?

Yes >> Go To 3
Perform the BODY VERIFICATION TEST — VER 1.

No >> Replace the Headlamp Switch in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.

B1607-HEADLAMP SWITCH INPUT CIRCUIT LOW (CONTINUED)

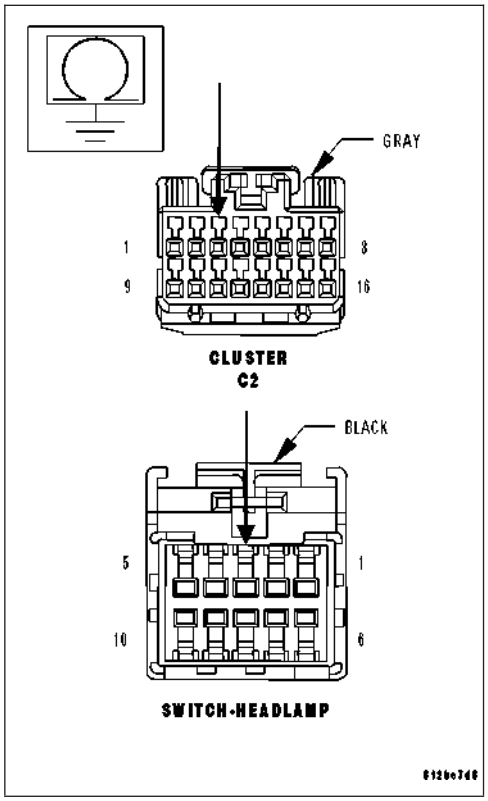
3. (L900) MUX RETURN CIRCUIT

Turn the ignition off.
Disconnect the Headlamp Switch connector.
Disconnect the Instrument Cluster C2 connector.
Measure the resistance of the (L900) MUX Return circuit to ground.

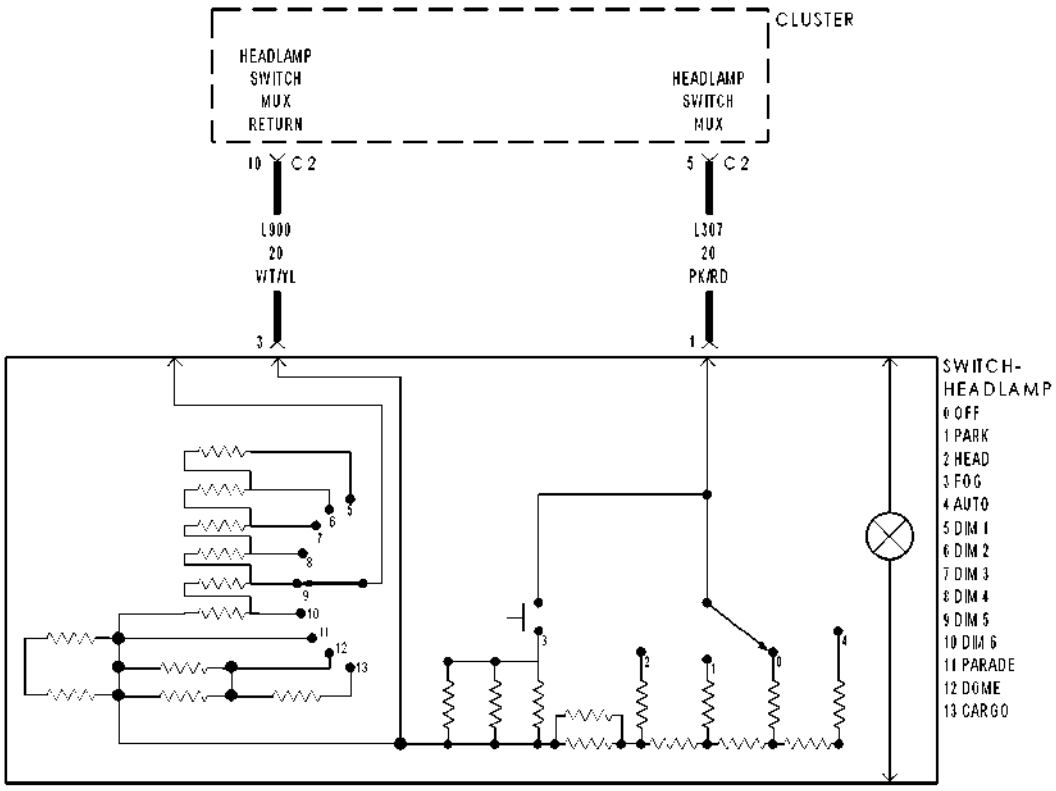
Is the resistance below 5.0 ohms?

Yes >> Repair the (L900) Headlamp MUX return circuit.
Perform the BODY VERIFICATION TEST — VER 1.

No >> Replace the Instrument Cluster in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.



B1608-HEADLAMP SWITCH INPUT CIRCUIT HIGH



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B1608-HEADLAMP SWITCH INPUT CIRCUIT HIGH (CONTINUED)

For the Exterior Lighting system circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- **Set Condition:**

Possible Causes
HEADLAMP SWITCH
(L900) HEADLAMP MUX RETURN CIRCUIT
(L307) HEADLAMP MUX INPUT CIRCUIT
INSTRUMENT CLUSTER

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all CCN DTC's.

Turn the Headlamps on.

With the Scan Tool, read the DTC information.

Does the Scan Tool read: B1608-HEADLAMP SWITCH INPUT CIRCUIT HIGH?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST — VER 1.

---

2. HEADLAMP SWITCH

Disconnect the Headlamp Switch connector.

Turn the ignition on.

Measure the voltage between the (L900) Headlamp MUX Return circuit and (L307) Headlamp Input MUX circuit.

Does the voltage read 0.0 volts?

Yes >> Replace the Headlamp Switch in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.

No >> Go To 3

B1608-HEADLAMP SWITCH INPUT CIRCUIT HIGH (CONTINUED)

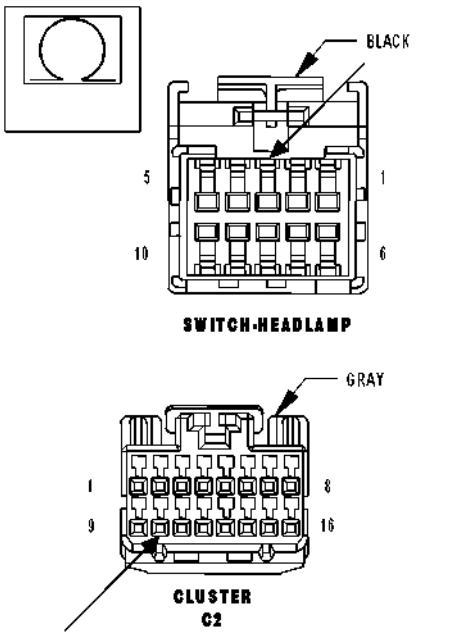
3. (L900) MUX RETURN CIRCUIT

Turn the ignition off.
Disconnect the Headlamp Switch connector.
Disconnect the Instrument Cluster C2 connector.
Measure the resistance of the (L900) Headlamp MUX Return circuit.

Is the resistance below 5.0 ohms?

Yes >> Go To 4

No >> Repair the (L900) Headlamp MUX Return circuit.
Perform the BODY VERIFICATION TEST — VER 1.



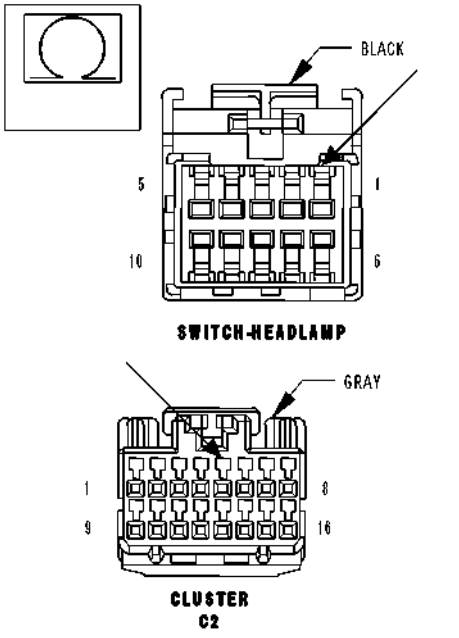
4. INSTRUMENT CLUSTER

Turn the ignition off.
Disconnect the Headlamp Switch connector.
Disconnect the Instrument Cluster C2 connector.
Measure the resistance of the (L307) Headlamp MUX circuit.

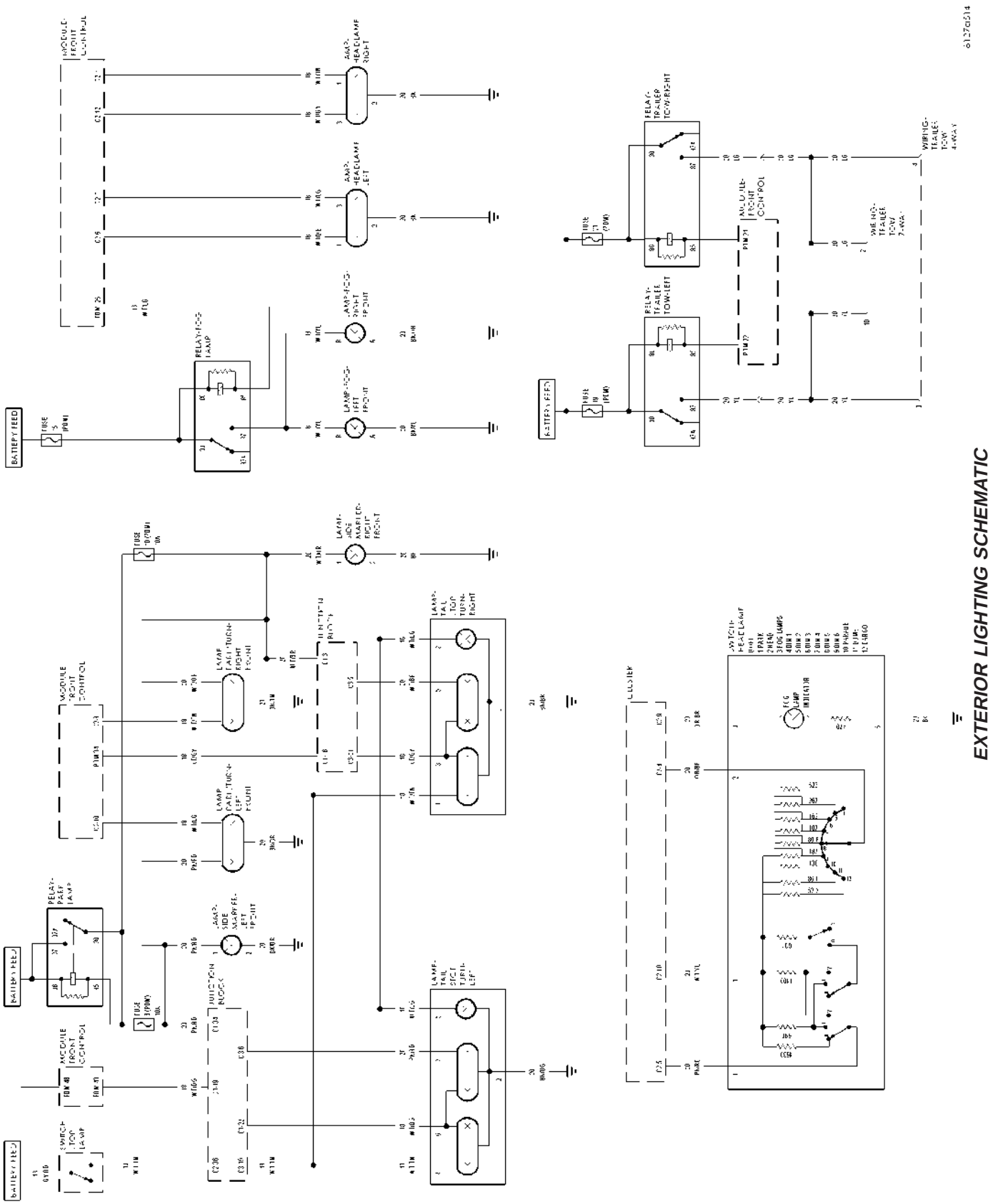
Is the resistance below 5.0 ohms?

Yes >> Replace the instrument Cluster in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.

No >> Repair the (L307) Headlamp MUX circuit.
Perform the BODY VERIFICATION TEST — VER 1.



SCHEMATICS AND DIAGRAMS



EXTERIOR LIGHTING SCHEMATIC

LAMPS/LIGHTING - EXTERIOR - SERVICE INFORMATION

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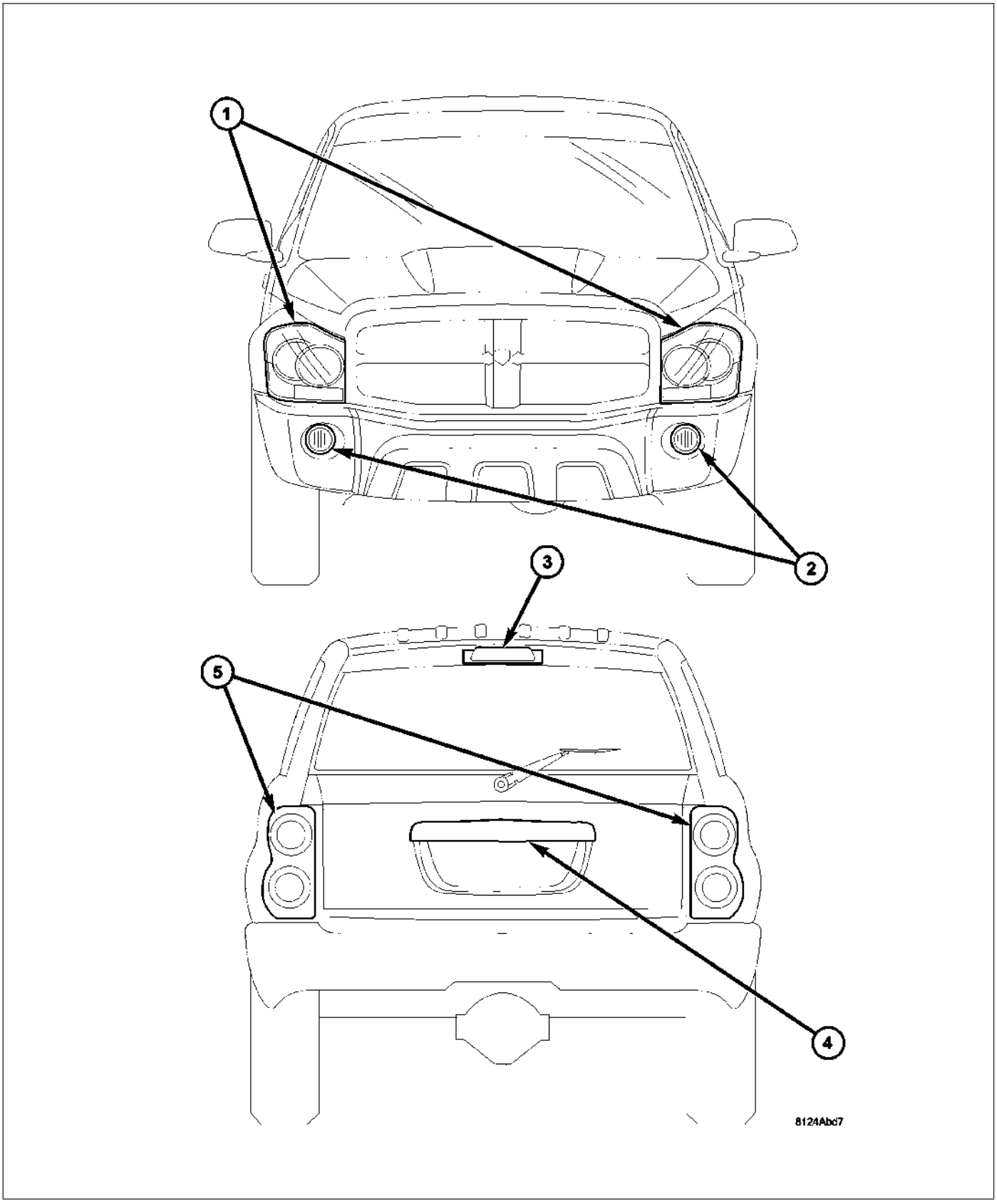
LAMPS/LIGHTING - EXTERIOR - SERVICE INFORMATION

DESCRIPTION



The exterior lighting system for this model includes the following exterior lamp units:

- **Center High Mounted Stop Lamp (3)** - A standard equipment Center High Mounted Stop Lamp (CHMSL) is centered on the liftgate header panel just above the liftgate glass opening at the rear of the vehicle.
- **Front Fog Lamps (2)** - Vehicles equipped with this option have a fog lamp unit mounted near each outboard end of the front bumper support, behind the lower portion of the front fascia.
- **Front Lamp Units (1)** - A standard equipment front lamp unit is mounted to the front of each front fender panel on either side of the grille opening.
- **License Plate Lamp (4)** - A standard equipment rear license plate lamp unit is mounted to the underside of the liftgate handle, just above the license plate tub on the outer liftgate panel.
- **Rear Lamp Units (5)** - A standard equipment rear lamp unit is mounted to the rear of each quarter panel on either side of the liftgate opening.

These exterior lighting lamp units and their controls are combined to provide the following exterior lighting features:

- **Automatic Headlamps** - Vehicles with the automatic headlamps option are equipped with a unique headlamp switch that includes an automatic position and a sun load sensor located on the top of the instrument panel to sense ambient light levels. When the Auto position of the headlamp switch is selected, the headlamps are turned On automatically when ambient light levels are low.
- **Backup Lamps** - The backup (or reverse) lamps include a bulb, reflector and lens that are integral to each rear lamp unit.
- **Brake Lamps** - The brake (or stop) lamps include a bulb, reflector and lens that are integral to each rear lamp unit, and the CHMSL bulb and lens.
- **Daytime Running Lamps** - Vehicles manufactured for sale in Canada illuminate the high beam filament of the headlamp bulb in each front lamp unit to serve as the Daytime Running Lamps (DRL). Fleet vehicles manufactured for sale in the United States illuminate the low beam filament of the headlamp bulb in each front lamp unit to serve as the DRL.
- **Exterior Lamp Fail-Safe Operation** - The EMIC provides a fail-safe feature which will automatically turn on the low beam headlamps and all park lamps when the ignition switch is in the On position and there is no detected input from the headlamp switch.
- **Exterior Lamp Load Shedding** - The Front Control Module (FCM) provides a battery saver feature which will automatically turn off all exterior lamps that remain on with the ignition switch in the Lock position after a timed interval of about eight minutes.
- **Front Fog Lamps** - The optional front fog lamps include the bulb, reflector and lens of each adjustable front fog lamp unit.
- **Hazard Warning Lamps** - The hazard warning lamps include the right and left turn signal bulbs, reflectors and lenses of each front and rear lamp unit.
- **Headlamps** - The headlamps include a single, dual filament halogen bulb, an adjustable reflector and a clear lens integral to each front lamp unit.
- **Optical Horn** - Also known as flash-to-pass, the beam selection function of the multi-function switch control stalk has a momentary intermediate position that allows the headlamp high beams to be flashed momentarily, without changing the headlamp beam selection.
- **Park Lamps** - The park lamps include the park and side marker bulbs, reflectors and lenses integral to each front and rear lamp unit as well as the bulb and lens of the rear license plate lamp.
- **Turn Signal Lamps** - The turn signal lamps include the turn signal bulbs, reflectors and lenses that are integral to the right and left front and rear lamp units.

Other components of the exterior lighting system for this model include:

- **Backup Lamp Switch** - A Transmission Range Sensor (TRS) integral to the solenoid pack on the valve body of the electronic automatic transmission performs the backup lamp switch function for this model.
- **Brake Lamp Switch** - A plunger-type brake lamp switch is located on the steering column support bracket under the instrument panel and is actuated by the brake pedal arm when the brake pedal is depressed.
- **Front Control Module** - The Front Control Module (FCM) is integral to the Integrated Power Module (IPM). The FCM/IPM is located in the engine compartment, near the battery and the Power Distribution Center (PDC). (Refer to 8 - ELECTRICAL/POWER DISTRIBUTION - DESCRIPTION).
- **Front Fog Lamp Relay** - Vehicles equipped with optional front fog lamps have a front fog lamp relay located in the Power Distribution Center (PDC).
- **Headlamp Switch** - A headlamp switch is located on the left side of the instrument panel, below and outboard of the steering column. The headlamp switch includes a rotary knob for the park lamps and headlamps On or

Off, and a push button switch for selecting the optional front fog lamps on vehicles so equipped. The headlamp switch also features a vertical thumbwheel for selecting the panel lamps dimming level, a Parade mode to illuminate all Vacuum Fluorescent Display (VFD) units at full brightness for visibility when driving in daylight with the exterior lighting turned On, and for interior lighting control.

- **Instrument Cluster** - The ElectroMechanical Instrument Cluster (EMIC) is also known as the Cab Control Node (CCN) in this vehicle. The EMIC/CCN is located in the instrument panel above the steering column opening, directly in front of the driver. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DESCRIPTION).
- **Multi-Function Switch** - The multi-function switch is located on the steering column, just below the steering wheel. A control stalk that extends from the left side of the switch is used to select the turn signal lamps (right or left) and to select the headlamp beam (low, high or optical horn). A push button that extends from the top of the switch is used to select the hazard warning lamps.
- **Park Brake Switch** - A park brake switch is located on the park brake lever mechanism on the cowl side inner panel below the instrument panel, to the left of the steering column.
- **Park Lamp Relay** - A park lamp relay is located in the Power Distribution Center (PDC) of all vehicles.
- **Trailer Tow Relays** - Vehicles equipped with a factory-installed trailer towing package have two trailer tow relays installed in the Power Distribution Center (PDC) in the engine compartment, one for the trailer right turn and brake lamps and the other for the trailer left turn and brake lamps.
- **Trailer Tow Wiring** - Vehicles equipped with a factory-installed trailer towing package have a trailer tow wire harness and both a 4-way and a heavy duty 7-way trailer tow connector installed on a bracket on the trailer hitch receiver. This package also includes an electric trailer brake wiring provision that terminates at a connector located on top of the large body harness connection under the instrument panel to the left of the brake pedal, as well as an electric trailer brake pigtail harness and an instruction card that are stored in the glove box when the vehicle is shipped from the factory.

Hard wired circuitry connects the exterior lighting system components to the electrical system of the vehicle. These hard wired circuits are integral to several wire harnesses, which are routed throughout the vehicle and retained by many different methods. These circuits may be connected to each other, to the vehicle electrical system and to the exterior lighting components through the use of a combination of soldered splices, splice block connectors, and many different types of wire harness terminal connectors and insulators. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, further details on wire harness routing and retention, as well as pin-out and location views for the various wire harness connectors, splices and grounds.

OPERATION

Following are paragraphs that briefly describe the operation of each of the major exterior lighting systems. The hard wired circuits and components of the exterior lighting systems may be diagnosed and tested using conventional diagnostic tools and procedures. Refer to the appropriate wiring information.

However, conventional diagnostic methods may not prove conclusive in the diagnosis of the ElectroMechanical Instrument Cluster (EMIC) (also known as the Cab Control Node/CCN), the Front Control Module (FCM) (also known as the Integrated Power Module/IPM), the Powertrain Control Module (PCM) or the Controller Area Network (CAN) data bus. The most reliable, efficient, and accurate means to diagnose the EMIC, the FCM, the PCM, the CAN data bus or the electronic bus message inputs and outputs related to the various exterior lighting systems requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

BACKUP LAMPS

The backup (or reverse) lamps have a path to ground at all times through a takeout and eyelet terminal of the body wire harness that is secured by a ground screw to the left inner D-pillar behind the quarter trim panel. The PCM continually monitors a hard wired multiplex input from the Transmission Range Sensor (TRS), then sends the proper transmission gear selector status messages to other electronic modules over the CAN data bus. When the FCM receives an electronic message indicating the status of the transmission gear selector is Reverse, it provides a battery voltage output to the backup lamps on the backup lamp feed circuit.

BRAKE LAMPS

The brake (or stop) lamps and the Center High Mounted Stop Lamp (CHMSL) each have a path to ground at all times through a takeout and eyelet terminal of the body wire harness that is secured by a ground screw to the left inner D-pillar behind the quarter trim panel. The brake lamps and CHMSL receive battery voltage on the brake lamp

switch feed circuit when the brake lamp switch is closed by the brake pedal arm. The CHMSL is connected to a hard wired output from the brake lamp switch, while the brake lamps are controlled by an output from the Front Control Module (FCM) based upon an input from the brake lamp switch.

DAYTIME RUNNING LAMPS

Vehicles manufactured for sale in Canada illuminate the high beam filament of both headlamp bulbs at a reduced intensity when the engine is running and the exterior lamps are turned off. Fleet vehicles manufactured for sale in the United States illuminate the low beam filament of both headlamp bulbs at a reduced intensity when the engine is running, the parking brakes are released and the exterior lamps are turned off. The FCM must be programmed appropriately for this feature to be enabled. Once enabled, anytime the FCM receives electronic messages over the CAN data bus from the PCM indicating the engine is running and from the EMIC indicating the status of the headlamp switch exterior lighting input is Off and that the parking brakes are released, the FCM provides a pulse width modulated voltage output to the proper headlamp bulb filaments through the right and left beam feed circuits to produce illumination at a reduced intensity.

FRONT FOG LAMPS

Vehicles equipped with optional front fog lamps include a front fog lamp relay installed in the PDC, and a front fog lamp switch integral to the headlamp switch on the instrument panel. The front fog lamps have a path to ground at all times through their connection to the headlamp and dash wire harness. The headlamp and dash wire harness has takeouts with eyelet terminals that are secured by ground screws to the right (right fog lamp) and left (left fog lamp) inboard sides of the hydroform within the engine compartment. The EMIC monitors a hard wired multiplex input from the headlamp switch to determine whether the fog lamps are selected, then sends electronic fog lamp switch status messages to the FCM over the CAN data bus.

When the FCM receives a fog lamp status message it then controls front fog lamp operation by energizing or de-energizing the front fog lamp relay control coil. The FCM also sends the appropriate electronic message back to the EMIC to illuminate or extinguish the front fog lamp indicator. When the front fog lamp relay is energized, it provides battery voltage from a fused B(+) fuse in the PDC to the fog lamps through the fog lamp relay output circuit. The FCM will automatically de-energize the front fog lamps relay any time the headlamp high beams are selected. The FCM also provides a battery saver (load shedding) feature for the front fog lamps, which will turn these lamps off if they are left on for more than about eight minutes with the ignition switch in the Lock position. Each front fog lamp includes an integral adjustment screw to be used for static aiming of the fog lamp beams.

HAZARD WARNING LAMPS

The hazard warning system includes the EMIC, the FCM and the multi-function switch on the steering column. The EMIC monitors a hard wired multiplex input from the multi-function switch to determine the status of the hazard warning switch, then sends the appropriate electronic hazard switch status messages to the FCM over the CAN data bus. The FCM responds to these messages by controlling a battery voltage output and the flash rate for each of the right and left turn signal lamps. The FCM also sends the appropriate electronic messages back to the EMIC to control the illumination and flash rate of the right and left turn signal indicators, as well as to control the click rate of an electromechanical relay soldered onto the EMIC electronic circuit board that emulates the sound emitted by a conventional hazard warning flasher.

HEADLAMPS

The headlamp system includes the EMIC, the FCM, the multi-function switch on the steering column and the headlamp switch on the instrument panel. The headlamp bulbs have a path to ground at all times through their connection to the headlamp and dash wire harness. The headlamp and dash wire harness has takeouts with eyelet terminals that are secured by ground screws to the right (right headlamp bulb) and left (left headlamp bulb) inboard sides of the hydroform within the engine compartment.

The EMIC monitors a hard wired multiplex input to determine the status of the headlamp switch, and a hard wired multiplex input from the multi-function switch to determine whether the high or low beams are selected. The EMIC then sends the appropriate electronic headlamp switch and headlamp beam select switch status messages to the FCM over the CAN data bus. The FCM responds to these messages by providing a pulse width modulated voltage output to the proper headlamp bulb through the right and left low and high beam feed circuits to illuminate the selected headlamp filaments.

The FCM also remembers which beams (low or high) were selected when the headlamps were last turned Off, and energizes those beams again the next time the headlamps are turned On. The FCM provides a battery saver (load shedding) feature for the headlamps, which will turn these lamps off if they are left on for more than about eight

minutes with the ignition switch in the Lock position. The EMIC provides a fail-safe feature for the headlamps, which will send an electronic message to the FCM to turn the low beam headlamps On automatically if it detects no input from the headlamp switch. Each headlamp includes an integral reflector adjustment screw to be used for static aiming of the headlamps.

PARK LAMPS

The park lamps system includes the EMIC, the FCM, a park lamp relay installed in the PDC, and the headlamp switch on the instrument panel. The front park lamp and side marker lamp bulbs each have a path to ground at all times through their connection to the headlamp and dash wire harness. The headlamp and dash wire harness has takeouts with eyelet terminals that are secured by ground screws to the right (right park lamp and side marker lamp bulbs) and left (left park lamp and side marker lamp bulbs) inboard sides of the hydroform within the engine compartment. The rear park lamp, side marker lamp and license plate lamp bulbs have a path to ground at all times through a takeout and eyelet terminal of the body wire harness that is secured by a ground screw to the left inner D-pillar behind the quarter trim panel.

The EMIC monitors a hard wired multiplex input from the headlamp switch, then sends the appropriate electronic headlamp switch status messages to the FCM over the CAN data bus. The FCM responds to these messages by energizing or de-energizing the park lamp relay. When the park lamp relay is energized, it provides battery voltage from a fuse in the PDC through a park lamp relay output circuit to the appropriate lamp bulbs. The FCM provides a battery saver (load shedding) feature for the park lamps, which will turn these lamps off if they are left on for more than about eight minutes with the ignition switch in the Lock position. The EMIC provides a fail-safe feature for the park lamps, which will send an electronic message to the FCM to turn these lamps on automatically if it detects no input from the headlamp switch.

TRAILER TOW WIRING

In addition to the trailer tow wiring provisions, vehicles equipped with an optional trailer tow package include right and left trailer tow stop/turn relays installed in the PDC. When the FCM receives the appropriate inputs for normal turn signal, hazard warning or brake lamp operation, it responds by also energizing or de-energizing these trailer tow relays. When a trailer tow relay is energized, it provides battery voltage from a fused B(+) fuse to the trailer lamps through the trailer tow wiring to synchronize the illumination and flash rate of the trailer brake and turn signal lamps with those of the tow vehicle.

TURN SIGNAL LAMPS

The turn signal lamps system includes the EMIC, the FCM and the multi-function switch on the steering column. The front turn signal lamp bulbs each have a path to ground at all times through their connection to the headlamp and dash wire harness. The headlamp and dash wire harness has takeouts with eyelet terminals that are secured by ground screws to the right (right front turn signal lamp bulb) and left (left front turn signal lamp bulb) inboard sides of the hydroform within the engine compartment. The rear turn signal lamp bulbs have a path to ground at all times through a takeout and eyelet terminal of the body wire harness that is secured by a ground screw to the left inner D-pillar behind the quarter trim panel.

The EMIC monitors a hard wired multiplex input from the multi-function switch to determine the status of the turn signal switch, then sends the appropriate electronic turn signal switch status messages to the FCM over the CAN data bus. The FCM responds to these messages by controlling a battery voltage output and the flash rate for either the right or left turn signal lamps. The FCM also sends the appropriate electronic messages back to the EMIC to control the illumination and flash rate of the right or left turn signal indicators, as well as to control the click rate of an electromechanical relay soldered onto the EMIC electronic circuit board that emulates the sound emitted by a conventional turn signal flasher.

The EMIC also provides a “turn signal on warning” that will generate repetitive chimes to indicate that a turn signal has been active continuously for 1.6 kilometers (1 mile) with the vehicle speed greater than 22 kilometers-per-hour (15 miles-per hour). Vehicles built for markets other than the United States and Canada have a revised distance threshold of 4 kilometers for this feature. The chime will continue until the turn signal input becomes inactive or until the vehicle speed message indicates that the speed is less than 22 kilometers-per-hour (15 miles-per-hour), whichever occurs first.

WARNING

WARNINGS - LAMPS/LIGHTING - EXTERIOR

WARNING:: To avoid personal injury or death, eye protection should be used when servicing any glass components.

CAUTION: Do not contaminate the glass of halogen bulbs with fingerprints or allow contact with other possibly oily surfaces. Reduced bulb life will result.

CAUTION: Do not use bulbs with higher candle power than indicated in the Bulb Application table (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SPECIFICATIONS). In addition, do not use fuses, circuit breakers or relays having greater amperage value than indicated on the fuse panel or in the Owner's Manual. Damage to lamps, lenses, wiring and other related electrical components can result.

DIAGNOSIS AND TESTING

LAMPS/LIGHTING - EXTERIOR

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

NOTE: When diagnosing the exterior lighting circuits, remember that high generator output can burn out bulbs rapidly and repeatedly; and, that dim or flickering bulbs can be caused by low generator output or poor battery condition. If one of these symptoms is a problem on the vehicle, be certain to diagnose the battery and charging system, then repair as necessary.

NOTE: A good ground is necessary for proper lighting operation. If a lighting problem is being diagnosed that involves multiple symptoms, systems, or components, the problem can often be traced to a loose, corroded, or open ground.

The hard wired exterior lamp and lighting circuits may be diagnosed and tested using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

However, conventional diagnostic methods may not prove conclusive in the diagnosis of the ElectroMechanical Instrument Cluster (EMIC), the Front Control Module (FCM), the Integrated Power Module (IPM), the Power Distribution Center (PDC), the Powertrain Control Module (PCM), the Controller Area Network (CAN) data bus, or the electronic message inputs used to provide exterior lamp and lighting service or many of the electronic features of the exterior lamp and lighting systems. The most reliable, efficient, and accurate means to diagnose the EMIC, the FCM, the IPM, the PDC, the PCM, the CAN data bus, and the electronic message inputs for the exterior lamps and lighting system requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

BACKUP LAMPS

CONDITION	POSSIBLE CAUSES	CORRECTION
BACKUP LAMP DOES NOT ILLUMINATE	1. Faulty or missing fuse.	1. Test and replace backup lamp fuse as required.
	2. Faulty or missing bulb.	2. Test and replace backup lamp bulb as required.
	3. Faulty ground circuit.	3. Test and repair backup lamp ground circuit as required.
	4. Faulty supply circuit.	4. Test and repair open back-up lamp supply circuit as required.
	5. Faulty switch.	5. Test and replace transmission range sensor as required.
	6. Faulty FCM inputs or outputs.	6. Use a diagnostic scan tool to test the FCM inputs and outputs. Refer to the appropriate diagnostic information.
BACKUP LAMP DOES NOT EXTINGUISH	1. Faulty supply circuit.	1. Test and repair shorted back-up lamp supply circuit as required.
	2. Faulty switch.	2. Test and replace transmission range sensor as required.
	3. Faulty FCM inputs or outputs.	3. Use a diagnostic scan tool to test the FCM inputs and outputs. Refer to the appropriate diagnostic information.

BRAKE LAMPS

CONDITION	POSSIBLE CAUSES	CORRECTION
BRAKE LAMP DOES NOT ILLUMINATE	1. Faulty or missing fuse.	1. Test and replace brake lamp fuse as required.
	2. Faulty or missing bulb.	2. Test and replace brake lamp bulb as required.
	3. Faulty ground circuit.	3. Test and repair brake lamp ground circuit as required.
	4. Faulty supply circuit.	4. Test and repair open brake lamp switch output circuit as required.
	5. Faulty switch.	5. Test and replace brake lamp switch as required.
BRAKE LAMP DOES NOT EXTINGUISH	1. Faulty supply circuit.	1. Test and repair shorted brake lamp switch output circuit as required.
	2. Faulty switch.	2. Test and replace brake lamp switch as required.

DAYTIME RUNNING LAMPS

NOTE: Before performing the following tests, determine whether the headlamp low and high beams operate. If the headlamp low and high beams are also inoperative, diagnose and repair that problem before attempting to repair the Daytime Running Lamps.

CONDITION	POSSIBLE CAUSES	CORRECTION
DAYTIME RUNNING LAMPS WILL NOT ILLUMINATE	1. Incorrect FCM programming.	1. Use a diagnostic scan tool to check and correct the FCM programming as required. Refer to the appropriate diagnostic information.
	2. Faulty FCM inputs or outputs.	2. Use a diagnostic scan tool to test the FCM inputs and outputs. Refer to the appropriate diagnostic information.

FRONT FOG LAMPS

CONDITION	POSSIBLE CAUSES	CORRECTION
FRONT FOG LAMP DOES NOT ILLUMINATE	1. Faulty or missing fuse.	1. Test and replace front fog lamp fuse as required.
	2. Faulty or missing bulb.	2. Test and replace front fog lamp bulb as required.
	3. Faulty ground circuit.	3. Test and repair front fog lamp ground circuit as required.
	4. Faulty supply circuit.	4. Test and repair open front fog lamp relay output circuit as required.
	5. Faulty or missing relay.	5. Test and replace front fog lamp relay as required.
	6. Faulty switch.	6. Test and replace headlamp switch as required.
FRONT FOG LAMP DOES NOT EXTINGUISH	1. Faulty supply circuit.	1. Test and repair shorted front fog lamp relay output circuit as required.
	2. Faulty relay.	2. Test and replace front fog lamp relay as required.
	3. Faulty switch.	3. Test and replace headlamp switch as required.

HAZARD WARNING LAMPS

NOTE: Before performing the following tests, confirm whether the left and right turn signals operate satisfactorily. If the turn signals are inoperative or operate improperly, diagnose and repair that problem before attempting to repair the Hazard Warning Lamps.

CONDITION	POSSIBLE CAUSES	CORRECTION
HAZARD WARNING LAMPS DO NOT FLASH	1. Faulty switch.	1. Test and replace multi-function switch as required.
HAZARD WARNING LAMPS DO NOT STOP FLASHING	1. Faulty switch.	1. Test and replace multi-function switch as required.

HEADLAMPS

NOTE: As part of the exterior lighting failsafe feature, upon ignition On the park lamps and the headlamp low beams will illuminate regardless of the headlamp switch position if the instrument cluster cannot detect an input from the headlamp switch, or if there is a loss of data bus communication.

CONDITION	POSSIBLE CAUSES	CORRECTION
HEADLAMP DOES NOT ILLUMINATE	1. Faulty or missing bulb.	1. Test and replace headlamp bulb as required.
	2. Faulty ground circuit.	2. Test and repair open headlamp ground circuit as required.
	3. Faulty supply circuit.	3. Test and repair open headlamp low beam or high beam circuit as required.
	4. Faulty switch.	4. Test and replace headlamp switch as required.
HEADLAMP DOES NOT EXTINGUISH	1. Faulty supply circuit.	1. Test and repair shorted headlamp low beam or high beam circuit as required.
	2. Faulty switch.	2. Test and replace headlamp switch as required.
HEADLAMPS ILLUMINATE WITH IGNITION ON AND HEADLAMP SWITCH OFF (FAIL-SAFE OPERATION)	1. Faulty circuits between headlamp switch and instrument cluster.	1. Test and repair headlamp switch mux and return circuits as required.
	2. Loss of data bus communication.	2. Use a diagnostic scan tool to test the data bus. Refer to the appropriate diagnostic information.
	3. Faulty switch.	3. Test and replace headlamp switch as required.
HEADLAMPS WILL NOT SWITCH FROM HIGH TO LOW BEAMS, OR FROM LOW TO HIGH BEAMS	1. Faulty circuits between multi-function switch and instrument cluster.	1. Test and repair wash/beam select mux and multi-function switch return circuits as required.
	2. Faulty switch.	2. Test and replace multi-function switch as required.
AUTO HEADLAMPS INOPERATIVE	1. Faulty circuits between sun load sensor and instrument cluster.	1. Test and repair sun sensor and sun sensor return circuits as required.
	2. Faulty sun load sensor.	2. Test and replace sun load sensor as required.

PARK LAMPS

NOTE: As part of the exterior lighting failsafe feature, upon ignition On the exterior park lamps and the headlamp low beams will illuminate regardless of the headlamp switch position if the instrument cluster cannot detect an input from the headlamp switch, or if there is a loss of data bus communication.

CONDITION	POSSIBLE CAUSES	CORRECTION
PARK LAMP DOES NOT ILLUMINATE	1. Faulty or missing fuse.	1. Test and replace park lamp fuse as required.
	2. Faulty or missing bulb.	2. Test and replace park lamp bulb as required.
	3. Faulty or missing relay.	3. Test and replace park lamp relay as required.
	4. Faulty ground circuit.	4. Test and repair open park lamp ground circuit as required.
	5. Faulty supply circuit.	5. Test and repair open park lamp relay output circuit as required.
	6. Faulty switch.	6. Test and replace headlamp switch as required.
PARK LAMP DOES NOT EXTINGUISH	1. Faulty supply circuit.	1. Test and repair shorted park lamp relay output circuit as required.
	2. Faulty relay.	2. Test and replace park lamp relay as required.
	3. Faulty switch.	3. Test and replace headlamp switch as required.

TURN SIGNAL LAMPS

CONDITION	POSSIBLE CAUSES	CORRECTION
ONE TURN SIGNAL LAMP DOES NOT ILLUMINATE	1. Faulty or missing bulb.	1. Test and replace turn signal bulb as required.
	2. Faulty ground circuit.	2. Test and repair open ground circuit as required.
	3. Faulty supply circuit.	3. Test and repair open right or left turn signal circuit as required.
ALL RIGHT SIDE AND/OR ALL LEFT SIDE TURN SIGNAL LAMPS DO NOT FLASH	1. Faulty switch.	1. Test and replace multi-function switch as required.
	2. Faulty signal circuit.	2. Test and repair open right or left turn signal circuit as required.
ALL RIGHT SIDE OR ALL LEFT SIDE TURN SIGNALS FLASH TOO RAPIDLY (MORE THAN 100 FLASHES PER MINUTE)	1. Faulty or missing bulb.	1. Test and replace faulty bulb as required.
	2. Faulty ground circuit.	2. Test and repair open ground circuit as required.
	3. Faulty signal circuit.	3. Test and repair open right or left turn signal circuit as required.

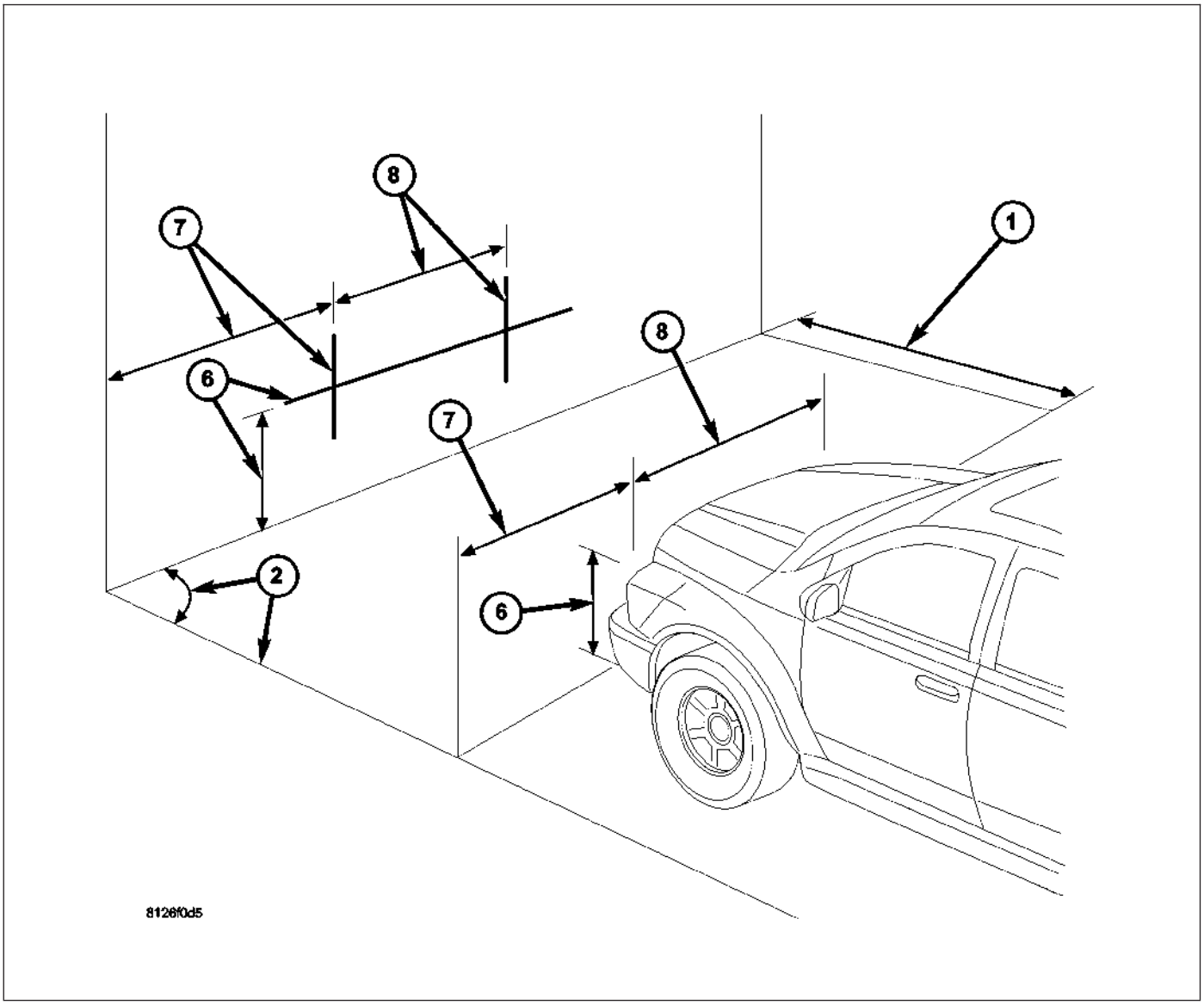
STANDARD PROCEDURE

FRONT LAMP AIMING

VEHICLE PREPARATION FOR LAMP ALIGNMENT

1. Check for and correct any burnt out bulbs.
2. Repair or replace any faulty, worn or damaged body or suspension components that could hinder proper lamp alignment.
3. Verify proper tire inflation pressures.
4. Remove any accumulations of mud, snow or ice from the vehicle underbody and clean the front lamp lenses.
5. Verify that there is no load in the vehicle (cargo or passengers), except for the driver.
6. The fuel tank should be Full. Add 2.94 kilograms (6.5 pounds) of weight over the fuel tank for each estimated gallon of missing fuel.
7. Verify correct vehicle suspension height.

LAMP ALIGNMENT SCREEN PREPARATION



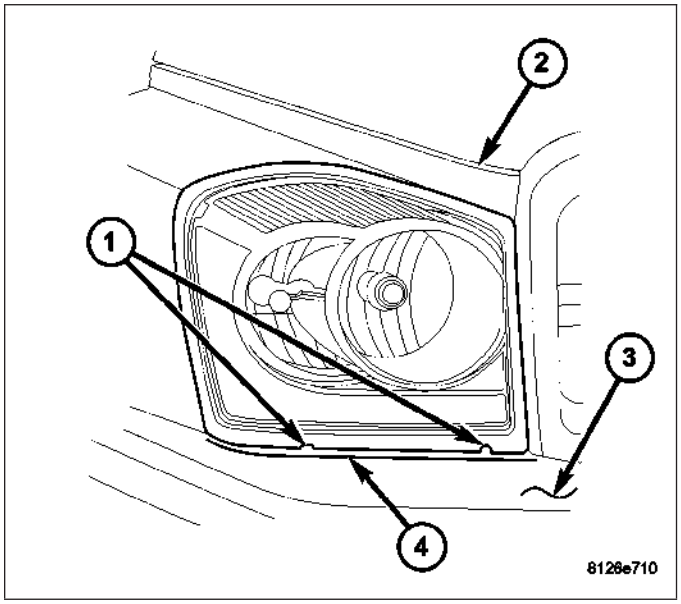
The procedure that follows will prepare a suitable front lamp alignment screen.

1. Tape a line on a level floor 7.62 meters (25 feet) away from and parallel to the flat wall that will be used as the lamp alignment screen. The level floor will be used as the horizontal zero reference.
2. An adjacent wall or floor member that is perpendicular to the alignment screen can be used as the vertical zero reference. If there is no adjacent wall or floor member that is perpendicular to the screen, tape a second line on the floor perpendicular to both the alignment screen and the first line, and outboard of either side of where the vehicle will be positioned. This will be used as the vertical zero reference.
3. Position the vehicle so that the side of the vehicle is parallel to the vertical zero reference, and so that the front of the lamp lenses are in the vertical plane of the parallel line taped on the floor 7.62 meters (25 feet) away from the screen.
4. Rock the vehicle side-to-side three times to allow the suspension to stabilize.
5. Jounce the front suspension three times by pushing downward on the front bumper and releasing.
6. Measure the distance between the optical center of one of the lamps being aimed (head or fog) and the floor (horizontal zero reference). Transfer this measurement to the alignment screen with a piece of tape placed horizontally to the floor. This line will be used as the lamp horizontal reference.
7. Measure the distance between the vertical zero reference and the optical center of the nearest lamp being aimed (head or fog). Transfer this measurement to the alignment screen with a piece of tape placed vertically across the appropriate (head or fog) lamp horizontal reference. This is the centerline reference for the first lamp.
8. Measure the distance on center between the first and the second lamp being aimed. Transfer this measurement to the alignment screen with a second piece of tape placed vertically across the appropriate (head or fog) lamp horizontal reference. This is the centerline reference for the second lamp.

HEADLAMP ALIGNMENT

NOTE: Due to the linear nature of the headlamp cutoff, a properly aimed low beam headlamp will project the top edge of the high intensity pattern on the alignment screen from the horizontal line to 50 millimeters (2 inches) below the horizontal line. No horizontal (right/left) adjustment is required for this headlamp beam pattern. The high beam pattern will be correct when the low beams are properly aimed.

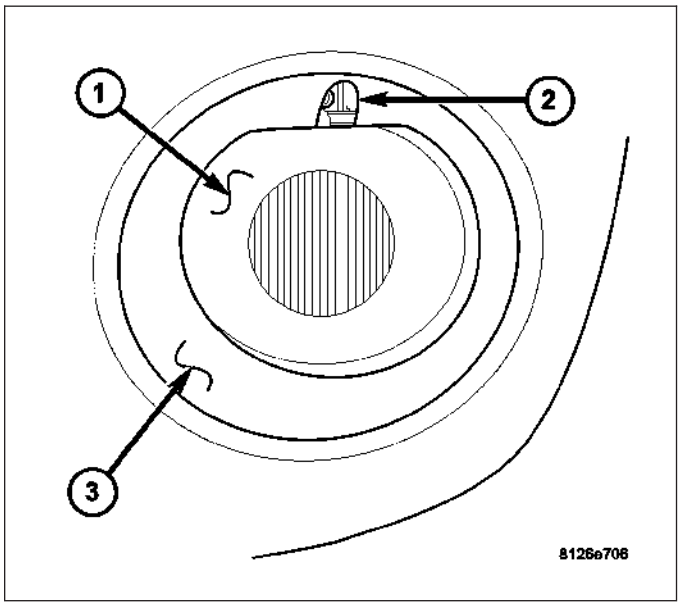
1. Turn the headlamps On and select the Low beams.
2. Rotate the headlamp vertical adjustment screw (4) on each lamp to adjust the beam height as required.



FOG LAMP ALIGNMENT

NOTE: A properly aimed front fog lamp will project a pattern on the alignment screen 100 millimeters (4 inches) below the fog lamp centerline and straight ahead of the lamp.

1. Turn the fog lamps On.
2. Rotate the fog lamp vertical adjustment screw (2) on each lamp to adjust the beam height as required.



SPECIFICATIONS

LAMPS/LIGHTING - EXTERIOR

BULB APPLICATION TABLE	
LAMP	**BULB**
BACKUP	3057K
BRAKE	3057K
CENTER HIGH MOUNTED STOP	921
FRONT FOG	9145
FRONT PARK	3457AK
FRONT SIDE MARKER	194
FRONT TURN SIGNAL	3457AK
HEADLAMP	H13
LICENSE PLATE	168
REAR PARK	3057K
REAR SIDE MARKER	168
REAR TAIL	3057K
REAR TURN SIGNAL	3057K

BACKUP LAMP SWITCH

DESCRIPTION

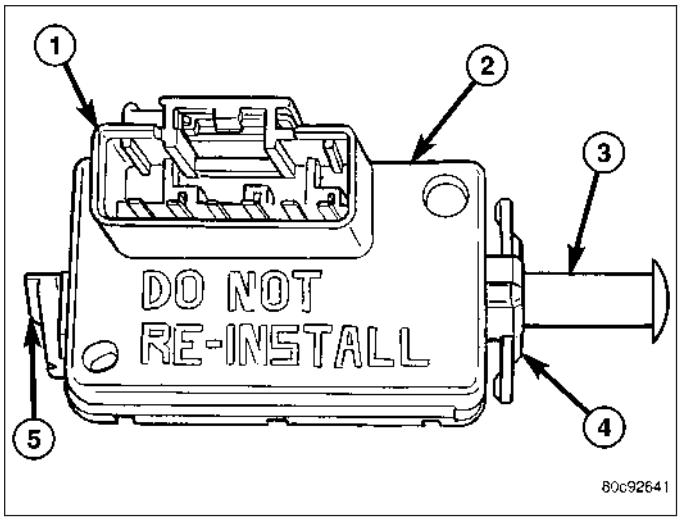
Vehicles with an electronic automatic transmission have a Transmission Range Sensor (TRS) that is used to perform several functions, including that of the backup lamp switch. The TRS is described in further detail elsewhere in this service information.

SWITCH-STOP LAMP

DESCRIPTION

The brake lamp switch (2) is a three circuit, spring-loaded plunger actuated switch that is secured to the steering column support bracket under the instrument panel on the driver side of the vehicle. The molded plastic switch housing has an integral connector receptacle (1) containing six terminal pins and featuring a Connector Position Assurance (CPA) lock. The switch is connected to the vehicle electrical system through a dedicated take out of the instrument panel wire harness.

The switch plunger (3) extends through a mounting collar (4) on one end of the switch housing. The plunger has a one time telescoping self-adjustment feature that is activated after the switch is installed by moving an adjustment release lever (5) on the opposite end of the switch housing clockwise, until it locks into a position that is horizontal and parallel to the connector receptacle.



An installed brake lamp switch cannot be readjusted or repaired. If the switch is damaged, faulty, or removed from its mounting position for any reason, it must be replaced with a new unit.

OPERATION

The brake lamp switch controls three independent circuits. These circuits are described as follows:

- **Brake Lamp Switch Circuit** - A normally open brake lamp switch circuit receives a battery voltage input, and supplies this battery voltage to the brake lamps and the Controller Antilock Brake (CAB) on a brake lamp switch output circuit only when the brake pedal is depressed (brake lamp switch plunger released).
- **Brake Lamp Switch Signal Circuit** - A normally closed brake lamp switch signal circuit receives a direct path to ground, and supplies this ground input to the Powertrain Control Module (PCM) on a brake lamp switch sense circuit only when the brake pedal is released (brake lamp switch plunger is depressed).
- **Speed Control Circuit** - A normally closed speed control circuit receives a battery voltage input from the Powertrain Control Module on a speed control supply circuit, and supplies this battery voltage to the speed control servo solenoids (dump, vacuum, and vent) on a speed control brake switch output circuit only when the speed control system is turned On and the brake pedal is released (brake lamp switch plunger is depressed).

The components of the self-adjusting brake switch plunger consist of a two-piece telescoping plunger, a split plunger locking collar, and a release wedge. The release lever has a shaft with a wedge that spreads the plunger locking collar to an open or released position. After the switch is installed and the brake pedal is released, the plunger telescopes to the correct adjustment position. When the release lever is moved to the release position, the wedge is disengaged from the locking collar causing the collar to apply a clamping pressure to the two plunger halves, fixing the plunger length.

The brake lamp switch is diagnosed using conventional diagnostic tools and methods.

DIAGNOSIS AND TESTING

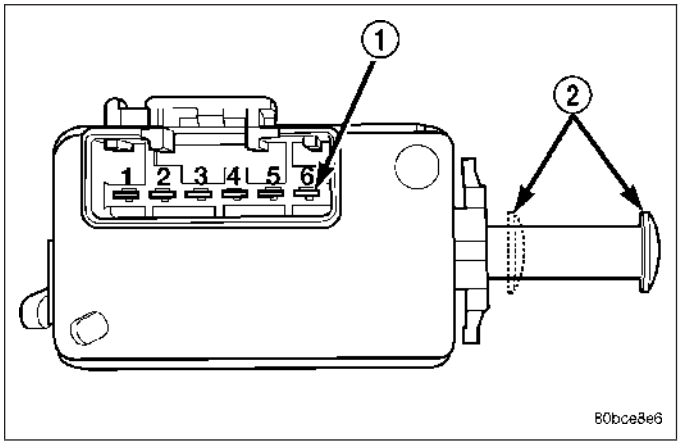
BRAKE LAMP SWITCH

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

1. Disconnect and isolate the battery negative cable.

CAUTION: Do not remove the brake lamp switch from the mounting bracket. The self-adjusting switch plunger is a one time only feature. If the switch is removed from the mounting bracket, it MUST be replaced with a new switch.

2. Disconnect the wire harness connector from the brake lamp switch.
3. Using an ohmmeter, perform the continuity tests at the terminal pins (1) in the brake lamp switch connector receptacle as shown in the Brake Lamp Switch Tests table.



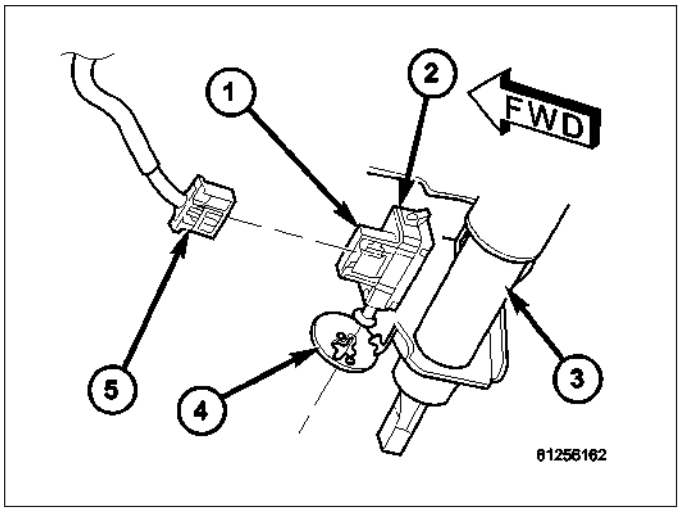
BRAKE LAMP SWITCH TESTS	
PLUNGER POSITION (2)	**CONTINUITY BETWEEN**
Released (Extended)	Pins 1 & 2
Compressed (Depressed)	Pins 3 & 4, 5 & 6

4. If the switch fails any of the continuity tests, replace the faulty brake lamp switch as required.

REMOVAL

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

1. Disconnect and isolate the battery negative cable.
2. Locate the brake lamp switch (1) near the support bracket on the lower steering column (3).
3. Disconnect the wire harness connector (5) from the brake lamp switch.
4. Rotate the brake lamp switch housing clockwise about 30 degrees to align the tabs on the switch locking collar with the keyed hole in the switch mounting bracket (4).
5. Pull the switch straight back from the keyed hole to remove it from the bracket.



CAUTION: The brake lamp switch self-adjusting switch plunger is a one time only feature. If the switch is removed from the mounting bracket, it MUST be replaced with a new switch.

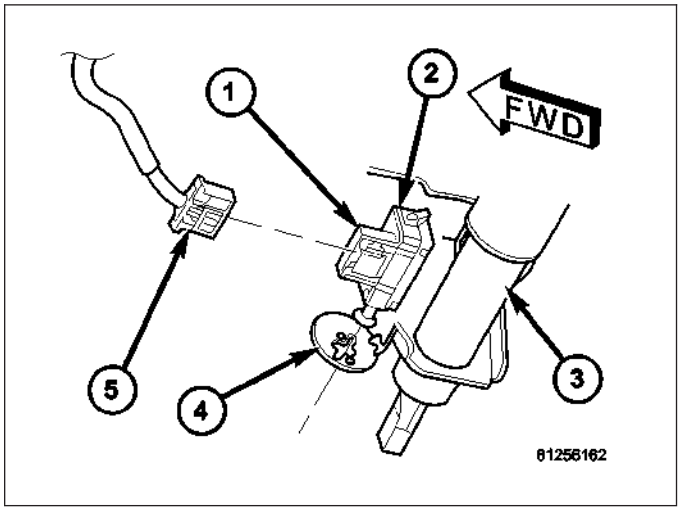
6. Discard the removed brake lamp switch
.

INSTALLATION

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

CAUTION: The brake lamp switch self-adjusting switch plunger is a one time only feature. If the switch is removed from the mounting bracket, it MUST be replaced with a new switch.

1. Depress and hold the brake pedal in the depressed position.
2. Align the tabs on the brake lamp switch locking collar with the keyed hole in the switch mounting bracket (4) on the lower steering column (3).
3. Insert the tabs on the brake lamp switch locking collar through the keyed hole in the switch mounting bracket until the switch housing (1) is firmly seated against the bracket.
4. Rotate the switch housing counterclockwise about 30 degrees to engage the tabs on the locking collar with the switch mounting bracket.



CAUTION: Do not release or pull up on the brake pedal before the switch plunger adjustment has been completed.

5. Release the brake pedal, but do not pull it upward.
6. Rotate the plunger adjustment release lever (2) clockwise until it locks into place. The lever should be parallel to the brake lamp switch connector receptacle. This action will set the switch plunger length to a final adjustment position and cannot be undone. If not performed properly the first time, a new brake lamp switch **must** be installed.
7. Reconnect the wire harness connector (5) to the brake lamp switch.

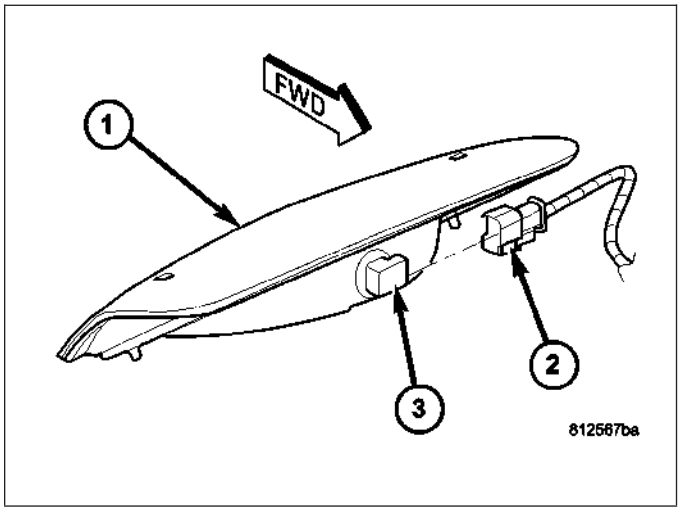
8. Reconnect the battery negative cable.

LAMP-HIGH MOUNTED STOP

REMOVAL

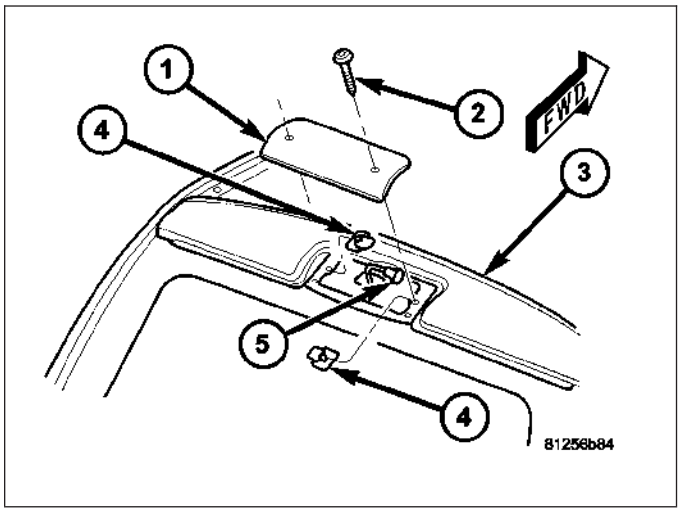
BULB

1. Disconnect and isolate the battery negative cable.
2. Remove the Center High Mounted Stop Lamp (CHMSL) (1) from the liftgate header panel. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/CENTER HIGH MOUNTED STOP LAMP - REMOVAL).
3. Disconnect the wire harness connector (2) from the socket (3) on the back of the CHMSL housing.
4. Firmly grasp the socket on the back of the housing and rotate it counterclockwise about 30 degrees to unlock it.
5. Pull the socket and bulb straight out from the keyed opening in the housing.
6. Pull the base of the bulb straight out of the socket.



LAMP

1. Disconnect and isolate the battery negative cable.
2. Remove the two screws (2) that secure the Center High Mounted Stop Lamp (CHMSL) (1) to the liftgate header panel (3).
3. Pull the CHMSL away from the liftgate far enough to access and disconnect the wire harness connector (5) from the lamp socket.
4. Remove the CHMSL from the liftgate.

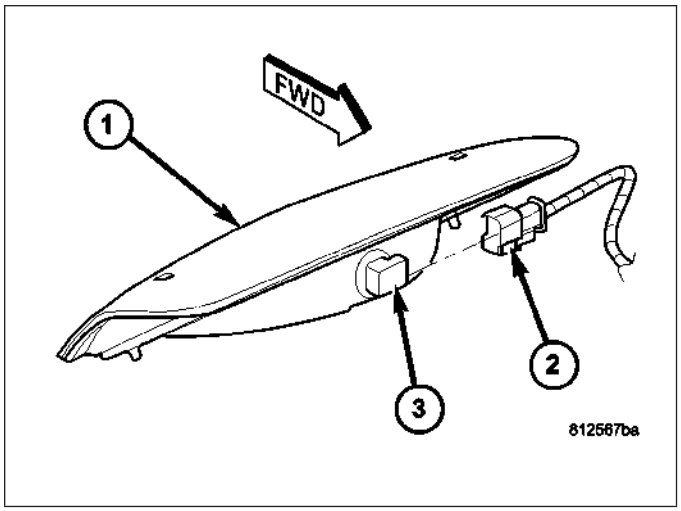


INSTALLATION

BULB

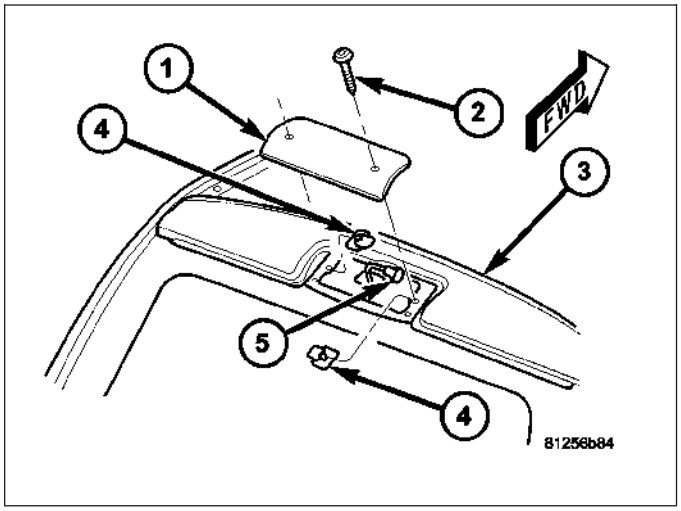
CAUTION: Always use the correct bulb size and type for replacement. An incorrect bulb size or type may overheat and cause damage to the lamp, the socket and/or the lamp wiring.

1. Align the base of the bulb with the CHMSL socket (3).
2. Push the bulb straight into the socket until the base is firmly seated.
3. Align the socket and bulb with the keyed opening on the back of CHMSL housing (1).
4. Insert the socket and bulb into the housing until the socket is firmly seated.
5. Rotate the socket clockwise about 30 degrees to lock it into place.
6. Reconnect the wire harness connector (2) to the socket.
7. Reinstall the CHMSL onto the liftgate header panel. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/CENTER HIGH MOUNTED STOP LAMP - INSTALLATION).
8. Reconnect the battery negative cable.



LAMP

1. Check to be certain that the two J-nuts (4) are properly positioned on the liftgate header inner panel.
2. Position the Center High Mounted Stop Lamp (CHMSL) (1) near the liftgate header panel (3) opening.
3. Reconnect the wire harness connector (5) to the CHMSL socket.
4. Install and tighten the two screws (2) that secure the CHMSL to the liftgate header panel. Tighten the screws to 2 N·m (20 in. lbs.).
5. Reconnect the battery negative cable.



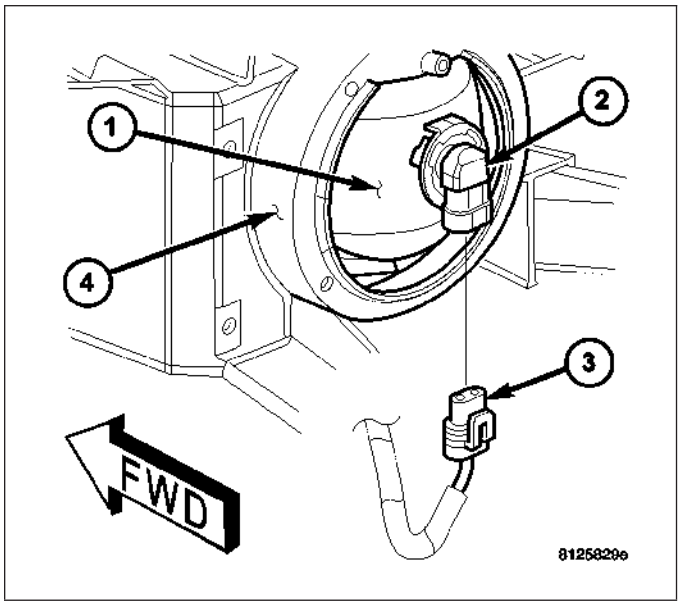
FRONT FOG LAMP

REMOVAL

BULB

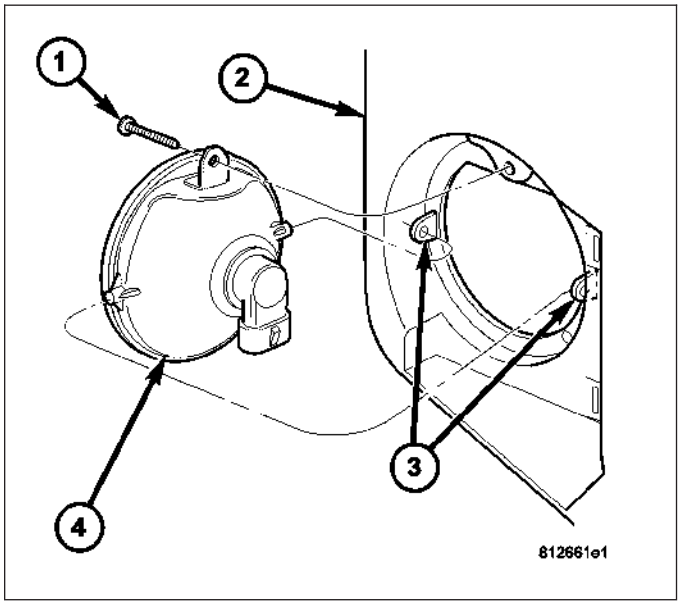
CAUTION: Do not contaminate the bulb glass by touching it with your fingers or by allowing it to contact other oily surfaces. Shortened bulb life will result.

1. Disconnect and isolate the battery negative cable.
2. Reach under and behind the front fascia to access the front fog lamp housing (1) on the back of the front bumper support (4).
3. Disconnect the wire harness connector (3) from the fog lamp socket (2).
4. Firmly grasp the socket on the back of the housing and rotate it counterclockwise about 30 degrees to unlock it.
5. Pull the socket and bulb straight out from the keyed opening in the housing.
6. Pull the base of the bulb straight out of the socket.



LAMP

1. Disconnect and isolate the battery negative cable.
2. Reach under and behind the front fascia to access the front fog lamp housing (4) on the back of the front bumper support (2).
3. Disconnect the wire harness connector from the fog lamp bulb socket.
4. Remove the front fascia from the front bumper support. (Refer to 13 - FRAME & BUMPERS/ BUMPERS/FRONT FASCIA - REMOVAL).
5. Unscrew the adjustment screw (1) at the top of the fog lamp until it is disengaged from the bumper support.
6. Insert a trim stick or another suitable wide flat-bladed tool, between either side of the lamp and the side of the lamp seat in the bumper support.
7. Carefully pry the pivot pin on either side of the lamp out of its receptacle in the stanchion (3) within the seat of the bumper support.
8. Remove the lamp from the bumper support.



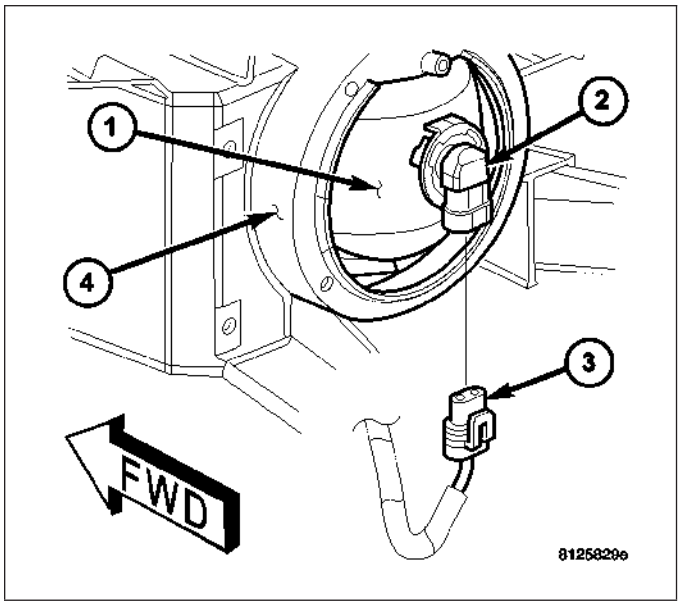
INSTALLATION

BULB

CAUTION: Always use the correct bulb size and type for replacement. An incorrect bulb size or type may overheat and cause damage to the lamp, the socket and/or the lamp wiring.

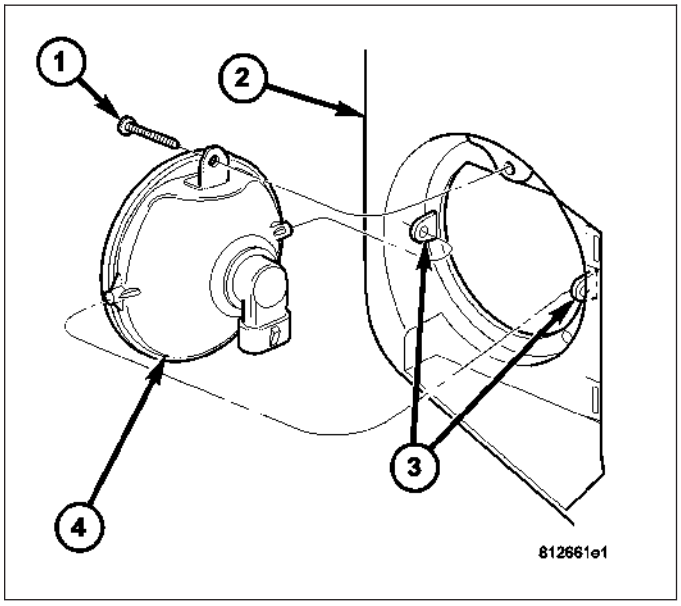
CAUTION: Do not contaminate the bulb glass by touching it with your fingers or by allowing it to contact other oily surfaces. Shortened bulb life will result.

1. Align the base of the bulb with the front fog lamp socket (2).
2. Push the bulb straight into the socket until the base is firmly seated.
3. Align the socket and bulb with the keyed opening on the back of the front fog lamp housing (1).
4. Insert the socket and bulb into the housing until the socket is firmly seated.
5. Rotate the socket clockwise about 30 degrees to lock it into place. The socket connector receptacle should be pointed straight downward.
6. Reconnect the wire harness connector (3) to the socket.
7. Reconnect the battery negative cable.



LAMP

1. Position the front fog lamp (4) to the front bumper support (2).
2. Engage the pivot pin on either side of the lamp into its receptacle in the stanchion (3) within the lamp seat of the bumper support.
3. Insert a trim stick or another suitable wide flat-bladed tool, between the opposite side of the lamp and the side of the lamp seat in the bumper support.
4. Carefully pry between the side of the lamp and the seat of the bumper support far enough for the loose pivot pin to be snapped into place within its stanchion.
5. Screw in the adjustment screw (1) at the top of the fog lamp until it is engaged in the bumper support.
6. Reinstall the front fascia onto the bumper support. (Refer to 13 - FRAME & BUMPERS/BUMPERS/FRONT FASCIA - INSTALLATION).



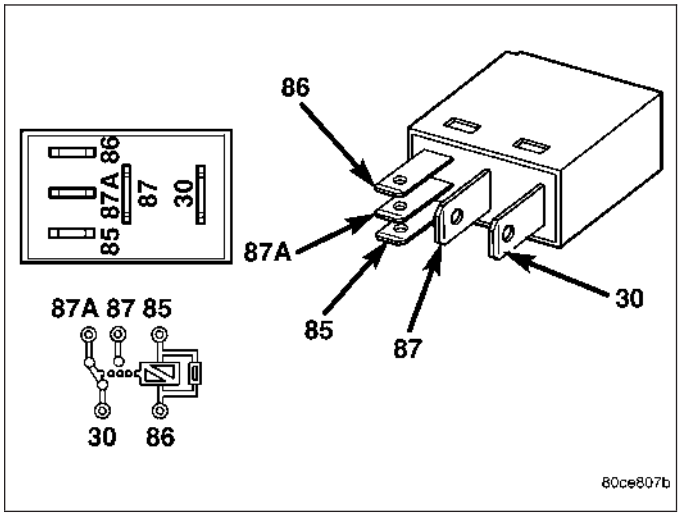
7. Reach under and behind the front fascia to access the lamp housing on the back of the bumper support.
8. Reconnect the wire harness connector to the fog lamp bulb socket.
9. Reconnect the battery negative cable.
10. Confirm proper front fog lamp alignment. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - STANDARD PROCEDURE - FRONT LAMP AIMING).

RELAY-FRONT FOG LAMP

DESCRIPTION

The front fog lamp relay is a conventional International Standards Organization (ISO) micro relay. Relays conforming to the ISO specifications have common physical dimensions, current capacities, terminal patterns, and terminal functions. This relay is contained within a small, rectangular, molded plastic housing and is connected to all of the required inputs and outputs through five integral male spade-type terminals that extend from the relay base plate.

The front fog lamp relay is located in the Power Distribution Center (PDC) in the engine compartment near the battery. Refer to the layout label on the underside of the PDC cover for specific relay cavity assignment information. The front fog lamp relay cannot be adjusted or repaired and, if faulty or damaged, the unit must be replaced.



OPERATION

The front fog lamp relay is an electromechanical switch that uses a low current input from the Front Control Module (FCM) (also referred to as the Integrated Power Module/IPM) to control a high current output to the front fog lamps. Within the relay are an electromagnetic coil, a movable contact and two fixed contact points. A resistor is connected in parallel with the coil, and helps to dissipate voltage spikes and electromagnetic interference that can be generated as the field of the relay coil collapses.

The movable common supply contact point is held against the fixed normally closed contact point by spring pressure. When the relay coil is energized, an electromagnetic field is produced by the coil windings. This field draws the movable contact away from the normally closed contact, and holds it against the normally open contact. When the relay coil is de-energized, spring pressure returns the movable contact back against the normally closed contact.

The inputs and outputs of the front fog lamp relay include:

- **Common Supply Terminal (30)** - The common feed terminal is connected to a fused B(+) circuit at all times.
- **Coil Ground Terminal (85)** - The coil ground terminal is connected to a fused B(+) circuit at all times.
- **Coil Battery Terminal (86)** - The coil battery terminal is connected to a control output of the FCM through a fog lamp relay control circuit. The FCM controls front fog lamp operation by controlling a ground path through this circuit.
- **Normally Open Terminal (87)** - The normally open terminal is connected to the front fog lamps through a fog lamp relay output circuit and provides battery voltage to the front fog lamps whenever the relay is energized.
- **Normally Closed Terminal (87A)** - The normally closed terminal is not connected to any circuit in this application, but will have battery voltage present whenever the relay is de-energized.

The front fog lamp relay can be diagnosed using conventional diagnostic tools and methods. Refer to the appropriate wiring information.

FRONT LAMP UNIT

STANDARD PROCEDURE

FRONT LAMP UNIT MOISTURE CLEARING

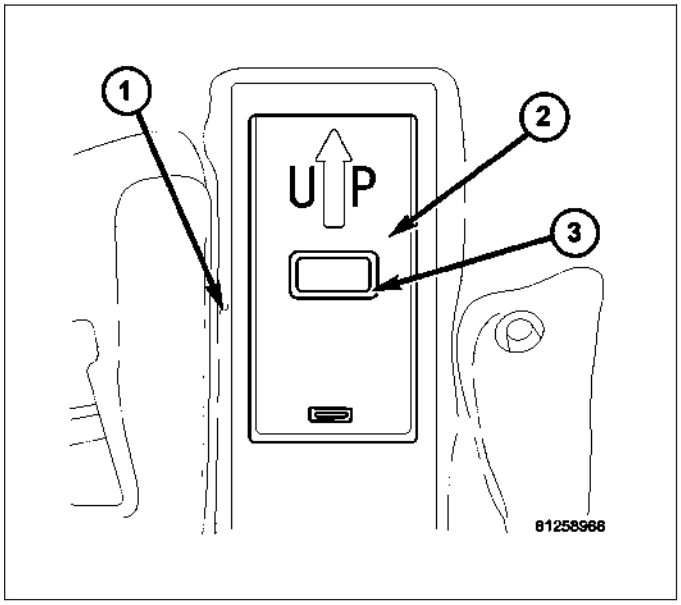
Some moisture accumulation inside a vented front lamp unit is normal. This normal moisture will appear as a fogging on the inside of the lamp lens, similar to the fog that sometimes appears on the inside of a windshield. This moisture may be removed by activating the headlamps on high beam for 15 minutes.

If water droplets larger than 1 millimeter in size have accumulated on the inside of the lamp lens, the front lamp unit should be replaced.

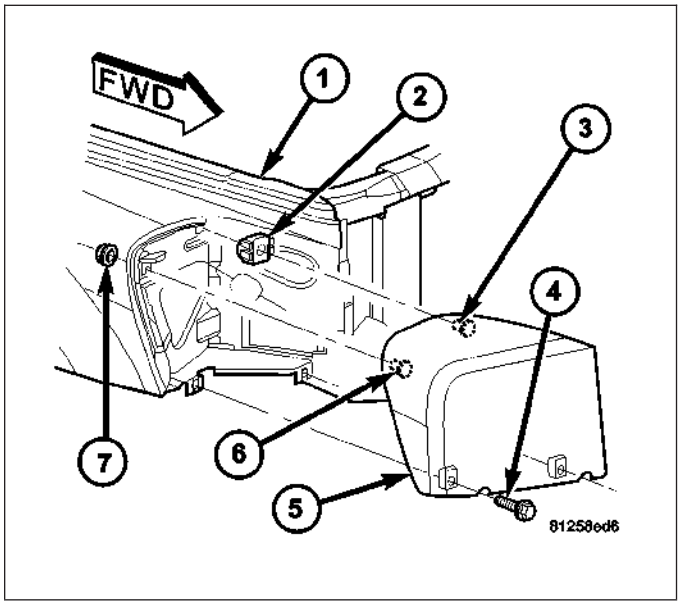
REMOVAL

LAMP

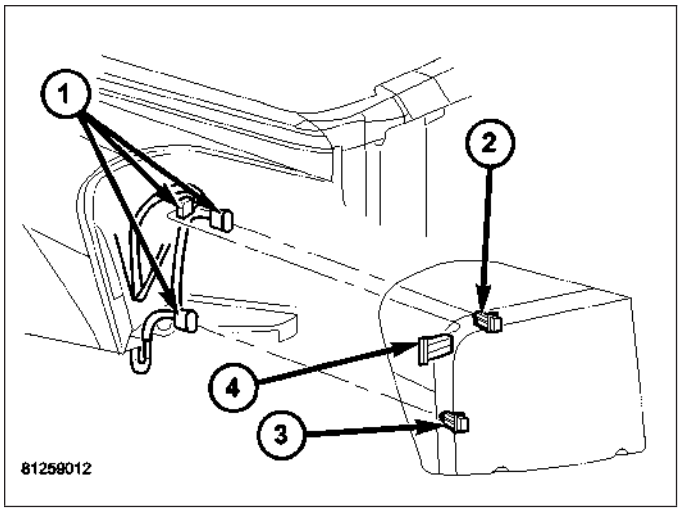
1. Disconnect and isolate the battery negative cable.
2. Remove the access panel (2) from the access opening in the front of the front fender liner (1). To remove the panel:
   a. Pull the lower edge of the panel rearward until it disengages from the lower edge of the hole.
   b. Slide the panel upward to its travel limit using the recessed pull cup (3) for leverage.
   c. Slide the panel downward far enough to disengage it from the upper edge of the hole.



3. Reach through the fender liner access opening to remove the nut (7) that secures the stud (6) on the back of the front lamp unit (5) to the upper reinforcement of the fender (1).
4. From the front of the vehicle, remove the two screws (4) that secure the lower edge of the lamp to the lower reinforcement of the fender.
5. Grasp the lamp firmly and pull straight forward to disengage the ball stud (3) on the back of the lamp from the plastic grommet (2) in the upper fender reinforcement.

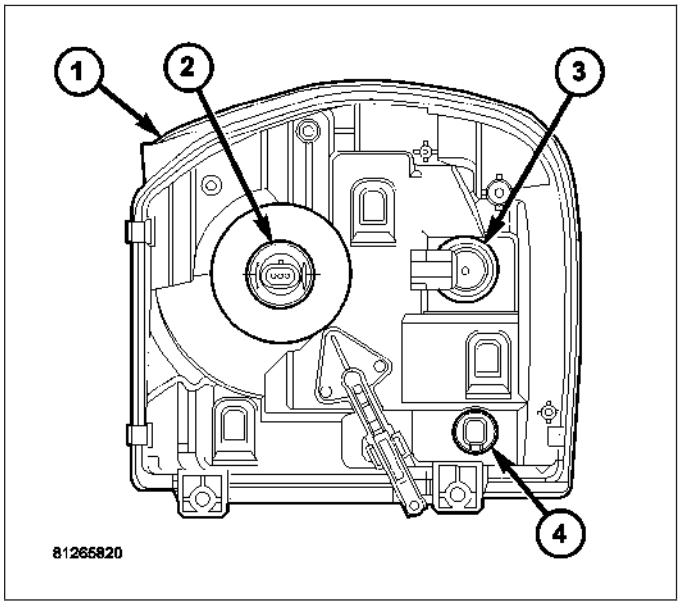


6. Pull the lamp away from the front fender far enough to access and disconnect three wire harness connections (1) from the following bulb sockets on the back of the lamp:
   a. headlamp bulb socket (2)
   b. front park/turn signal bulb socket (4)
   c. front side marker bulb socket (3)
7. Remove the front lamp unit from the fender.



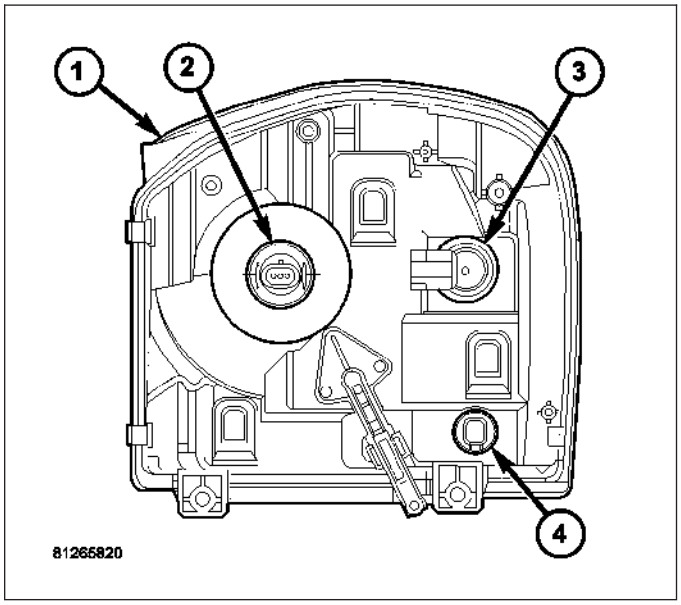
BULB - PARK/TURN SIGNAL

1. Disconnect and isolate the battery negative cable.
2. Remove the front lamp unit (1) from the front fender. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/FRONT LAMP UNIT - REMOVAL).
3. Firmly grasp the park/turn signal bulb socket (3) on the back of the front lamp unit housing and rotate it counterclockwise about 30 degrees to unlock it.
4. Pull the socket and bulb straight out from the keyed opening in the housing.
5. Pull the base of the bulb straight out of the socket.



BULB - SIDE MARKER

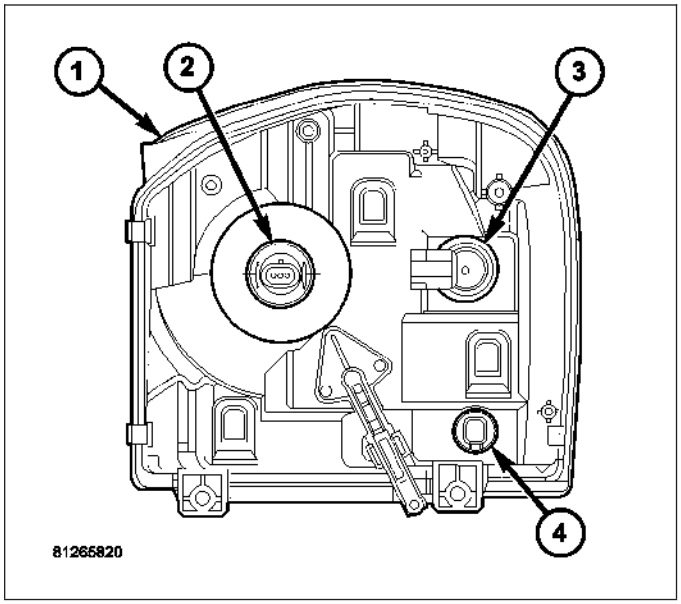
1. Disconnect and isolate the battery negative cable.
2. Remove the front lamp unit (1) from the front fender. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/FRONT LAMP UNIT - REMOVAL).
3. Firmly grasp the front side marker bulb socket (4) on the back of the front lamp unit housing and rotate it counterclockwise about 30 degrees to unlock it.
4. Pull the socket and bulb straight out from the keyed opening in the housing.
5. Pull the base of the bulb straight out of the socket.



BULB - HEADLAMP

CAUTION: Do not contaminate the bulb glass by touching it with your fingers or by allowing it to contact other oily surfaces. Shortened bulb life will result.

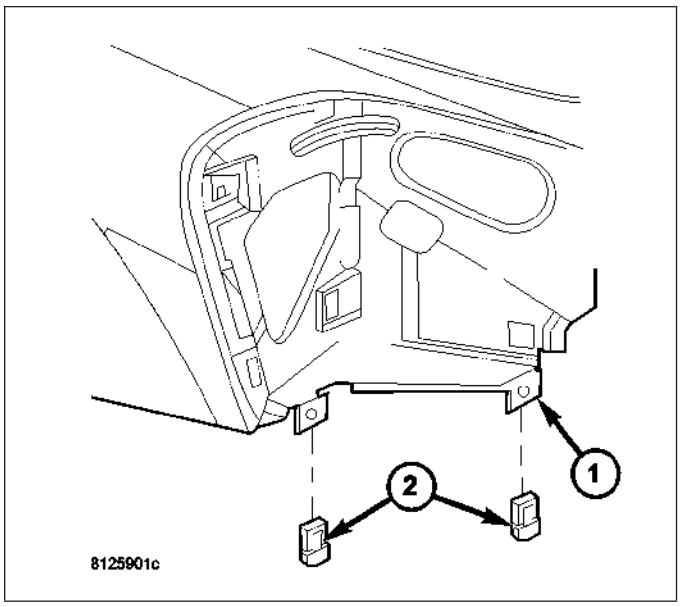
1. Disconnect and isolate the battery negative cable.
2. Remove the front lamp unit (1) from the front fender. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/FRONT LAMP UNIT - REMOVAL).
3. Firmly grasp the headlamp bulb socket (2) on the back of the front lamp unit housing and rotate it counterclockwise about 30 degrees to unlock it.
4. Pull the socket and bulb straight out from the keyed opening in the housing.
5. Pull the base of the bulb straight out of the socket.



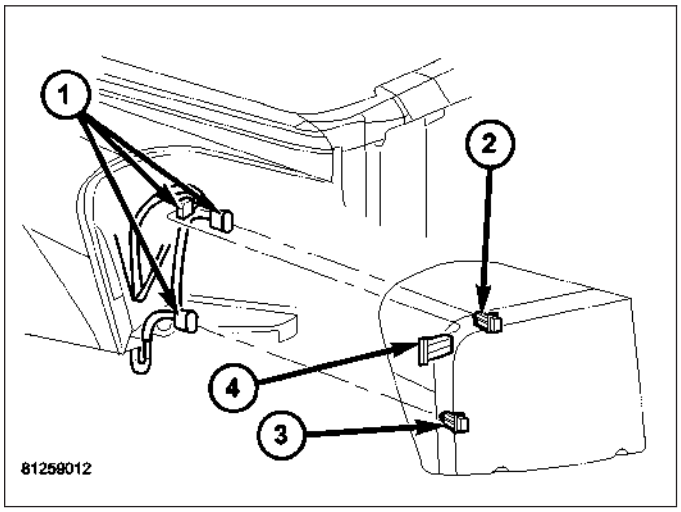
INSTALLATION

LAMP

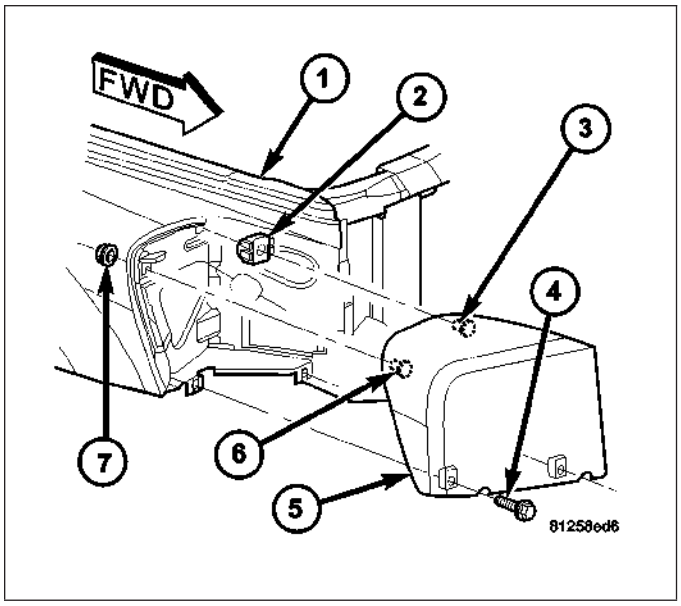
1. Check to be certain that the two front lamp unit U-nuts (2) are properly positioned on the fender lower reinforcement (1).



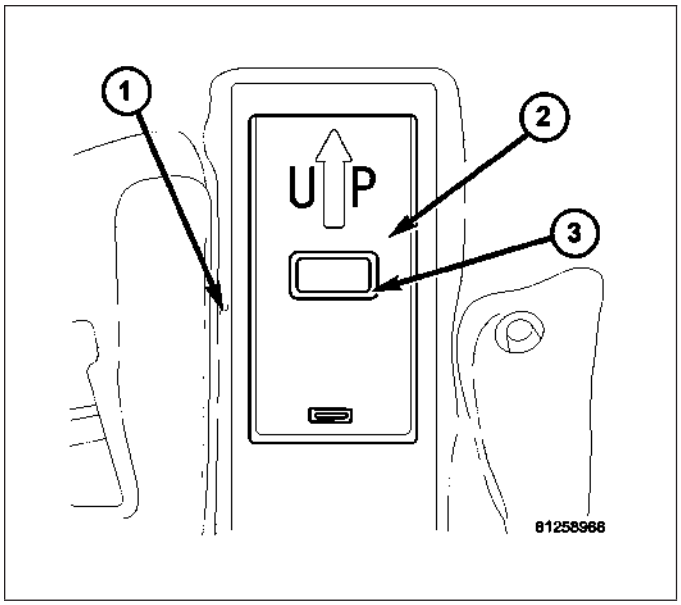
2. Position the lamp close enough to the front fender to access and reconnect three wire harness connections (1) to the following bulb sockets on the back of the lamp:
   a. headlamp bulb socket (2)
   b. front park/turn signal bulb socket (4)
   c. front side marker bulb socket (3)
3. Rearrange the wire harnesses as necessary to prevent them from becoming pinched between the back of the lamp housing and the fender.



4. Insert the stud (6) on the back of the lamp (5) into the hole in the upper reinforcement of the fender (1).
5. Align the ball stud (3) on the back of the lamp with the plastic grommet (2) in the upper fender reinforcement.
6. Using hand pressure, press the lamp firmly and evenly rearward until the ball stud snaps into the grommet.
7. Install and tighten the two screws (4) that secure the lower edge of the lamp to the U-nuts on the lower fender reinforcement. Tighten the screws to 7 N·m (65 in. lbs.)
8. Reach through the front fender liner access opening to install and tighten the nut (7) that secures the stud on the back of the lamp to the upper fender reinforcement. Tighten the nut to 5 N·m (45 in. lbs.).



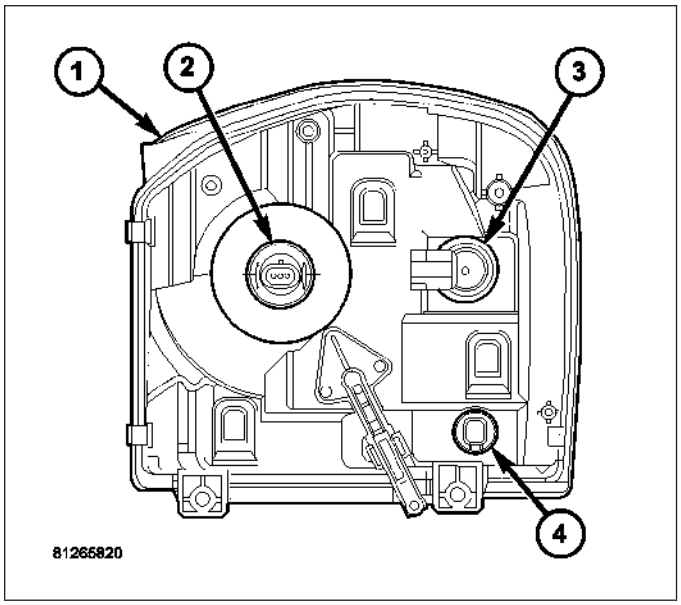
9. Reinstall the access panel (2) into the access opening in the front fender liner (1). To install the panel:
   a. Engage the long slotted tabs on the back of the upper edge of the panel with the upper edge of the hole.
   b. Slide the panel upward to its travel limit then push the lower edge of the panel forward until the short slotted tabs on the back of the panel engage the lower edge of the hole.
   c. Using the recessed pull cup (3) for leverage, slide the panel downward to its travel limit.
10. Reconnect the battery negative cable.
11. Confirm proper headlamp alignment. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - STANDARD PROCEDURE - FRONT LAMP AIMING).



BULB - PARK/TURN SIGNAL

CAUTION: Always use the correct bulb size and type for replacement. An incorrect bulb size or type may overheat and cause damage to the lamp, the socket and/or the lamp wiring.

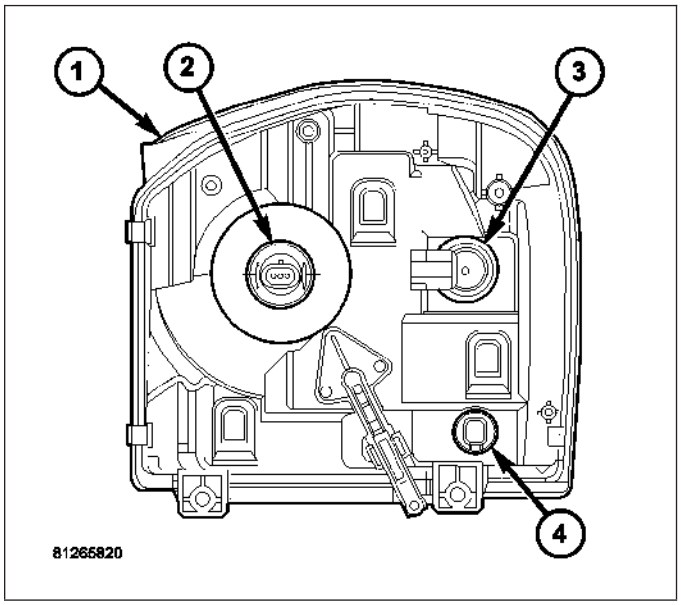
1. Align the base of the bulb with the park/turn signal bulb socket (3).
2. Push the bulb straight into the socket until the base is firmly seated.
3. Align the socket and bulb with the keyed opening on the back of the front lamp unit housing (1).
4. Insert the socket and bulb into the housing until the socket is firmly seated.
5. Rotate the socket clockwise about 30 degrees to lock it into place.
6. Reinstall the front lamp unit onto the front fender. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/FRONT LAMP UNIT - INSTALLATION).
7. Reconnect the battery negative cable.



BULB - SIDE MARKER

CAUTION: Always use the correct bulb size and type for replacement. An incorrect bulb size or type may overheat and cause damage to the lamp, the socket and/or the lamp wiring.

1. Align the base of the bulb with the front side marker bulb socket (4).
2. Push the bulb straight into the socket until the base is firmly seated.
3. Align the socket and bulb with the keyed opening on the back of the front lamp unit housing (1).
4. Insert the socket and bulb into the housing until the socket is firmly seated.
5. Rotate the socket clockwise about 30 degrees to lock it into place.
6. Reinstall the front lamp unit onto the front fender. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/FRONT LAMP UNIT - INSTALLATION).
7. Reconnect the battery negative cable.

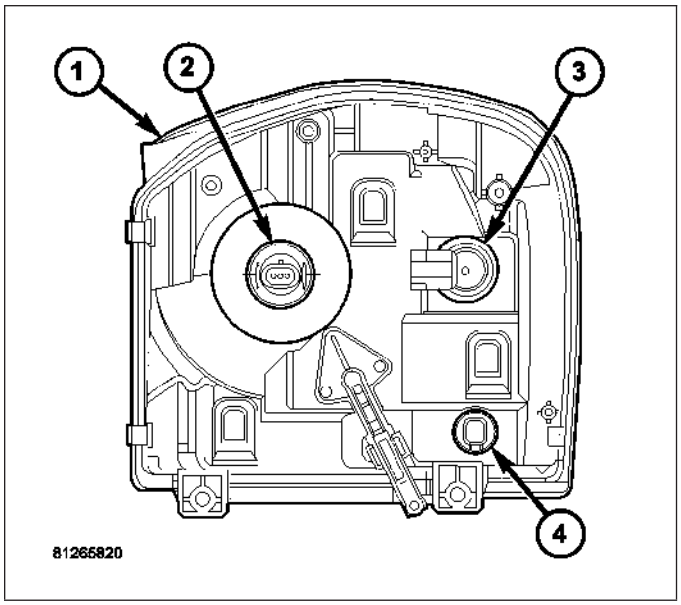


BULB - HEADLAMP

CAUTION: Always use the correct bulb size and type for replacement. An incorrect bulb size or type may overheat and cause damage to the lamp, the socket and/or the lamp wiring.

CAUTION: Do not contaminate the bulb glass by touching it with your fingers or by allowing it to contact other oily surfaces. Shortened bulb life will result.

1. Align the base of the bulb with the headlamp bulb socket (2).
2. Push the bulb straight into the socket until the base is firmly seated.
3. Align the socket and bulb with the keyed opening on the back of the front lamp unit housing (1).
4. Insert the socket and bulb into the housing until the socket is firmly seated.
5. Rotate the socket clockwise about 30 degrees to lock it into place.
6. Reinstall the front lamp unit onto the front fender. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/FRONT LAMP UNIT - INSTALLATION).
7. Reconnect the battery negative cable.

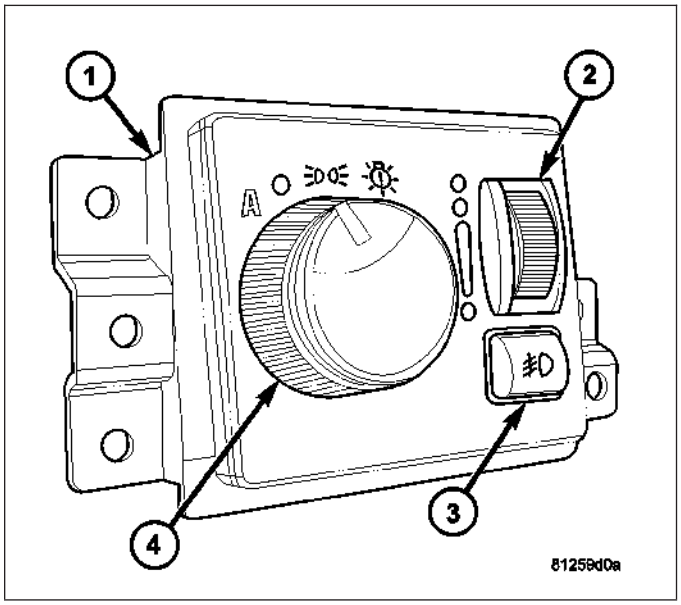


SWITCH-HEADLAMP

DESCRIPTION

The headlamp switch (1) is located on the instrument panel, to the left of the steering column. Three different switches are used. The standard switch features a three-position rotary knob (4) for exterior lighting control and a thumbwheel (2) for panel lamps dimming and interior lighting control. An optional switch has a momentary push button (3) added for front fog lamp control. A second optional switch has the same thumbwheel and momentary push button, but has a fourth position added to the rotary knob for selecting the optional automatic headlamps feature.

Each of these switches is constructed of molded plastic. The rotary knob is molded plastic and knurled around its circumference to ease operator control. The thumbwheel is also plastic and knurled. The optional front fog lamp push button is plastic with a smooth finish and an International Control and Display Symbol icon for “Front Fog Light” applied to it. The switch face plate is also labeled with graphics and icons to clearly identify the many functions of the rotary knob and thumbwheel.



Three screws secure the switch to the back of the cluster bezel through integral mounting flanges that are molded to each side of the switch housing. The back of the switch housing has an integral connector receptacle containing terminal pins that connect the switch to the vehicle electrical system through a dedicated take out and connector of the instrument panel wire harness. A panel dimmer controlled incandescent bulb soldered to the circuit board within the switch provides back lighting for visibility at night, but is not serviceable. The headlamp switch cannot be repaired and, if faulty or damaged, it must be replaced.

OPERATION

The headlamp switch uses two resistor multiplexed outputs to control the many functions and features it provides. The switch receives a clean ground from the ElectroMechanical Instrument Cluster (EMIC) (also sometimes referred to as the Cab Control Node/CCN) on a headlamp switch return circuit. It then provides outputs to the EMIC on a

headlamp switch signal circuit to control exterior lighting functions, and on a panel lamps dimmer signal circuit to control panel dimmer and interior lighting functions.

The switch illumination circuit receives a path to ground at all times through the left instrument panel ground circuit. The illumination level is controlled by a Pulse-Width Modulated (PWM) output received from the EMIC on a headlamp switch illumination control circuit. The EMIC controls this output based upon the dimmer signal select mux input from the headlamp switch.

The headlamp switch operates as follows:

- **Front Fog Lamps Control** - For vehicles so equipped, the fog lamp push button on the headlamp switch is depressed to activate or deactivate the optional front fog lamps. The headlamp switch provides an output to the EMIC, and the EMIC responds by sending electronic fog lamp switch status messages to the Front Control Module (FCM) over the Controller Area Network (CAN) data bus. The FCM responds by energizing or de-energizing the front fog lamp relay in the Power Distribution Center (PDC).
- **Exterior Lighting Control** - The rotary knob on the headlamp switch is rotated to a detent position to activate or deactivate the exterior lighting. The headlamp switch provides an output to the EMIC, and the EMIC responds by sending electronic exterior lighting switch status messages to the FCM over the CAN data bus. The FCM responds by energizing or de-energizing the park lamp relay in the PDC and the high or low beam headlamp circuits. The FCM remembers which headlamp beams were last selected using the multi-function switch, and energizes those beams by default the next time the headlamps are turned On. If the vehicle is equipped with optional automatic headlamps and the Auto position is selected, the EMIC also monitors an input from a sun load sensor on the instrument panel and, based upon the monitored ambient light levels, responds by automatically sending appropriate messages to the FCM to turn the exterior lighting On or Off while the ignition switch is in the On position.
- **Interior Lighting Control** - The thumbwheel on the headlamp switch is rotated to the dome defeat, dome on, parade/funeral mode, or one of the six panel dimmer detent positions to control the interior courtesy/dome and panel lamps. The headlamp switch provides an output to the EMIC, and the EMIC responds by providing the appropriate interior lighting control outputs through its internal courtesy lamp driver circuits, electronic dimming level messages to other modules over the CAN data bus, and/or the proper PWM outputs to control dimming levels through several panel dimmer illumination control driver circuits.

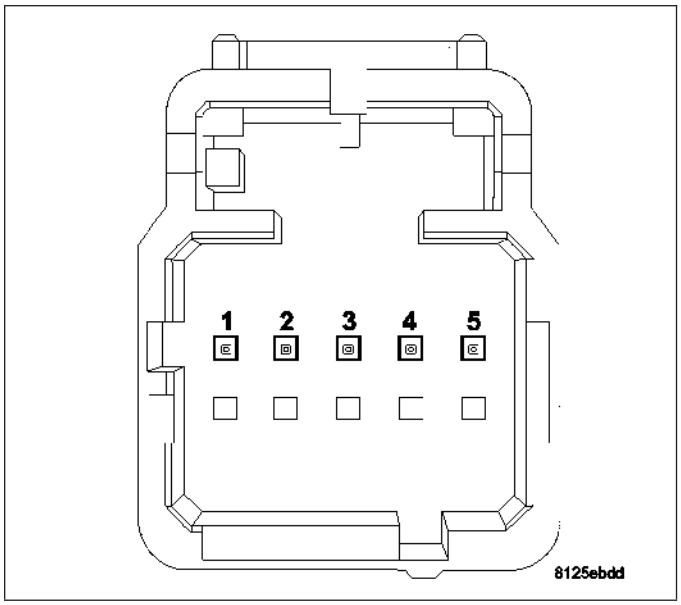
The headlamp switch can be diagnosed using conventional diagnostic tools and methods. However, proper testing of the multiplexed inputs to and PWM processing of the EMIC requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

DIAGNOSIS AND TESTING

HEADLAMP SWITCH

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

1. Remove the cluster bezel from the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/ CLUSTER BEZEL - REMOVAL).
2. Disconnect the wire harness connector from the back of the headlamp switch.
3. Using an ohmmeter, test the resistance or continuity between the terminals of the switch as shown in the Headlamp Switch Tests table.



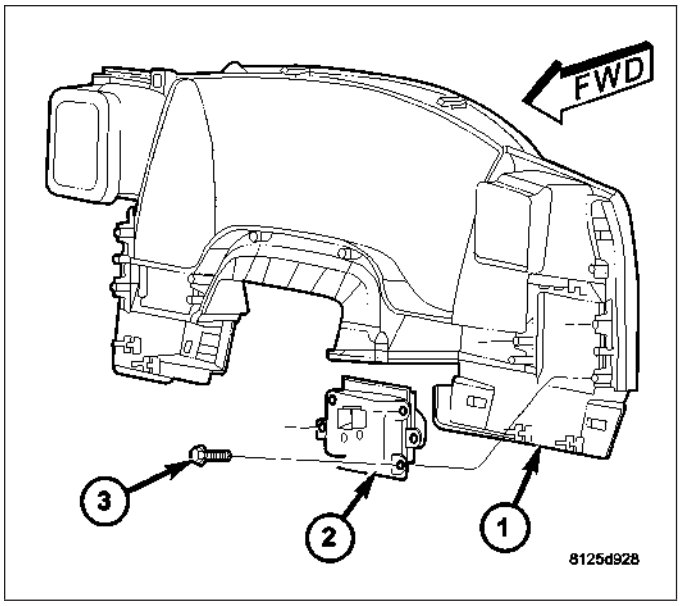
HEADLAMP SWITCH TESTS	
SWITCH POSITION (PINS)	**RESISTANCE RANGE (OHMS)**
AUTO (1 & 3)	4028.0 - 4457.0
OFF (1 & 3)	1938.0 - 2147.0
PARK (1 & 3)	1073.0 - 1191.5
HEADLAMP (1 & 3)	627.0 - 698.0
FOG LAMP - AUTO (1 & 3)	347.2 - 388.8
FOG LAMP - OFF (1 & 3)	317.7 - 356.1
FOG LAMP - PARK (1 & 3)	280.7 - 315.2
FOG LAMP - HEADLAMP (1 & 3)	236.6 - 266.5
DOME DEFEAT (2 & 3)	14143.6 - 15610.4
PANEL DIMMER 1 (2 & 3)	5498.6 - 6055.4
PANEL DIMMER 2 (2 & 3)	2933.6 - 3220.4
PANEL DIMMER 3 (2 & 3)	1793.6 - 1960.4
PANEL DIMMER 4 (2 & 3)	1147.6 - 1246.4
PANEL DIMMER 5 (2 & 3)	739.1 - 794.9
PANEL DIMMER 6 (2 & 3)	482.6 - 511.4
PARADE/FUNERAL MODE (2 & 3)	301.9 - 327.1
DOME ON (2 & 3)	166.3 - 188.8
SWITCH ILLUMINATION (4 & 5)	CONTINUITY AT ALL TIMES

4. If the switch fails any of the tests, replace the faulty headlamp switch as required.

REMOVAL

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

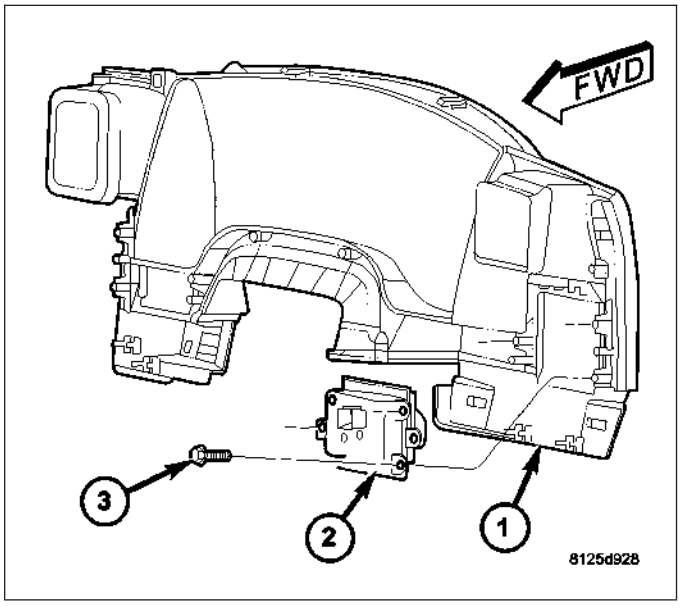
1. Disconnect and isolate the battery negative cable.
2. Remove the cluster bezel (1) from the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/ CLUSTER BEZEL - REMOVAL).
3. Disconnect the wire harness connector from the back of the headlamp switch (2).
4. Remove the three screws (3) that secure the headlamp switch to the back of the cluster bezel.
5. Remove the headlamp switch from the cluster bezel.



INSTALLATION

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

1. Position the headlamp switch (2) to the back of the cluster bezel (1).
2. Install and tighten the three screws (3) that secure the headlamp switch to the cluster bezel. Tighten the screws to 2 N·m (17 in. lbs.).
3. Reconnect the wire harness connector to the back of the headlamp switch.
4. Reinstall the cluster bezel onto the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/ CLUSTER BEZEL - INSTALLATION).
5. Reconnect the battery negative cable.

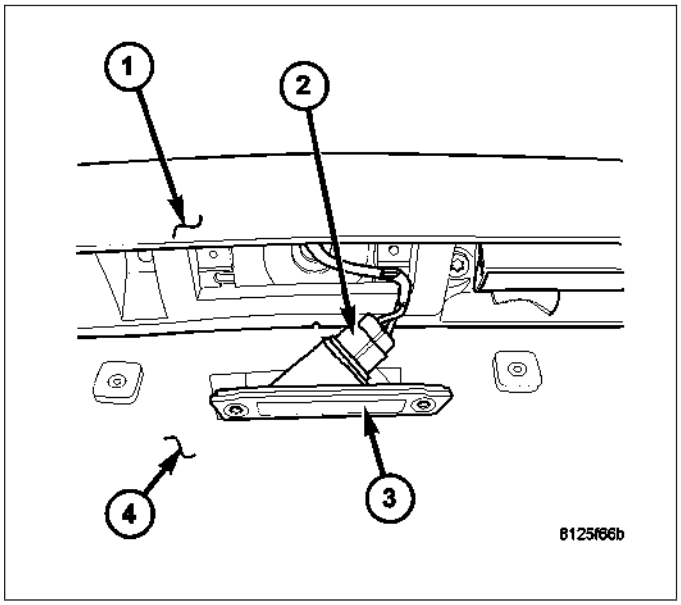


LICENSE PLATE LAMP

REMOVAL

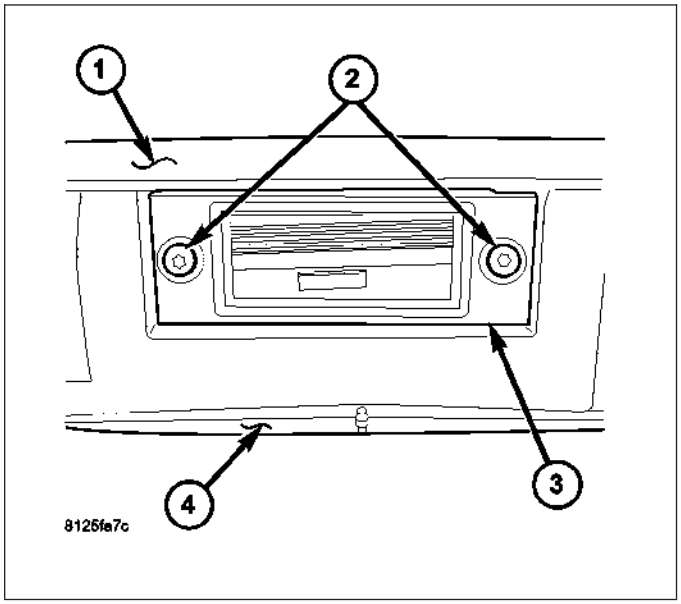
BULB

1. Disconnect and isolate the battery negative cable.
2. Remove the two screws that secure the license plate lamp (3) to the underside of the exterior liftgate handle (1).
3. Lower the lamp from the handle far enough to access the top of the lamp housing.
4. Firmly grasp the socket (2) on the top of the housing and rotate it counterclockwise about 30 degrees to unlock it.
5. Pull the socket and bulb straight out from the keyed opening in the housing.
6. Pull the base of the bulb straight out of the socket.



LAMP

1. Disconnect and isolate the battery negative cable.
2. Remove the two screws that secure the license plate lamp (3) to the underside of the exterior liftgate handle (1).
3. Lower the lamp from the handle far enough to access the socket on the top of the lamp housing.
4. Rotate the socket on the top of the lamp housing counterclockwise about 30 degrees to unlock it.
5. Pull the socket and bulb straight out of the top of the lamp housing.
6. Remove the license plate lamp unit from the liftgate handle.

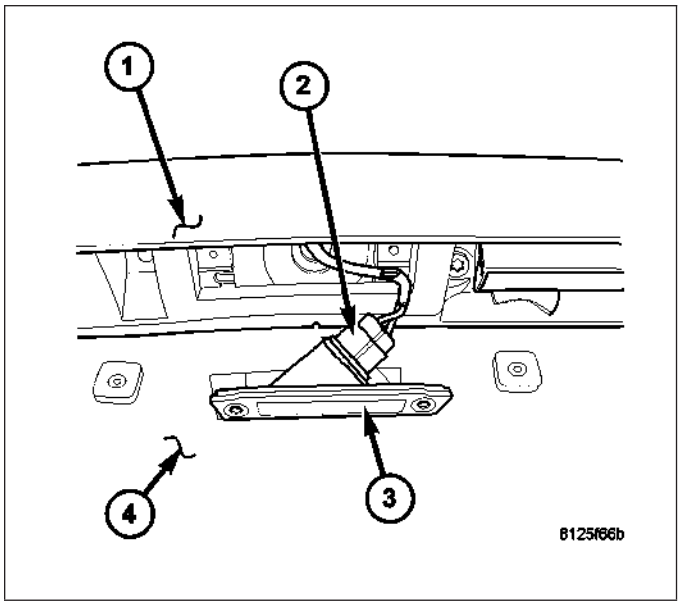


INSTALLATION

BULB

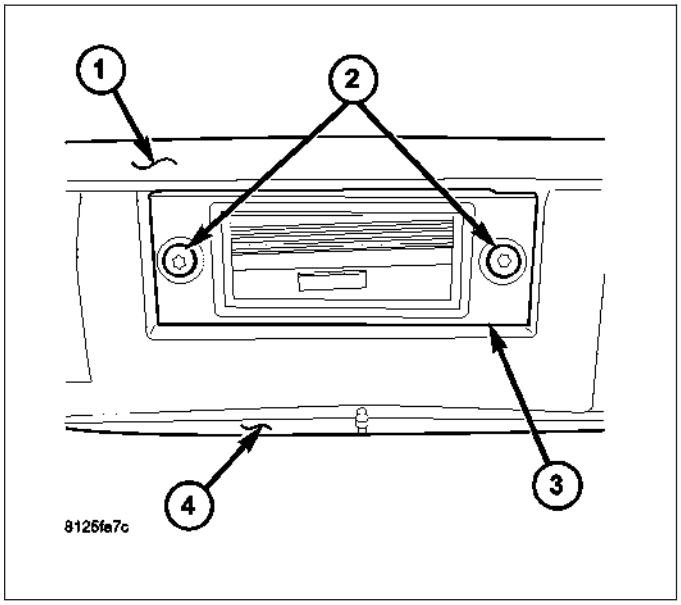
CAUTION: Always use the correct bulb size and type for replacement. An incorrect bulb size or type may overheat and cause damage to the lamp, the socket and/or the lamp wiring.

1. Align the base of the bulb with the license plate lamp socket (2).
2. Push the bulb straight into the socket until the base is firmly seated.
3. Align the socket and bulb with the keyed opening on the top of the license plate lamp housing (3).
4. Insert the socket and bulb into the housing until the socket is firmly seated.
5. Rotate the socket clockwise about 30 degrees to lock it into place.
6. Position the lamp to the underside of the exterior liftgate handle (1).
7. Install and tighten the two screws that secure the lamp to the underside of the handle. Tighten the screws to 2 N·m (17 in. lbs.).
8. Reconnect the battery negative cable.



LAMP

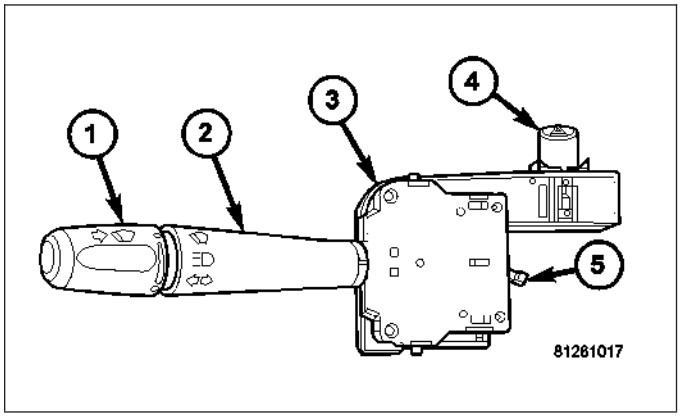
1. Position the license plate lamp unit (3) to the underside of the exterior liftgate handle (1).
2. Position the socket and bulb unit into the keyed socket opening on the top of the lamp housing.
3. Push the socket and bulb straight into the lamp until firmly seated.
4. Rotate the socket about 30 degrees clockwise to lock it into place.
5. Position the lamp to the underside of the exterior liftgate handle.
6. Install and tighten the two screws (2) that secure the lamp to the underside of the handle. Tighten the screws to 2 N·m (17 in. lbs.).
7. Reconnect the battery negative cable.



SWITCH-MULTIFUNCTION

DESCRIPTION

The multi-function switch (3) is located on the steering column, just below the steering wheel. The only visible components of the multi-function switch are the control stalk (2) and control knob (1) that extend through the steering column shrouds on the left side of the column, and the hazard warning push button (4) that extends through the shroud on the top of the column. The remainder of the switch including its mounting provisions, its electrical connection, and the turn signal cancel actuator (5) are concealed beneath the shrouds.



The switch housing and controls are constructed of molded black plastic. Each of the switch controls has white International Control and Display Symbol graphics applied to it, which clearly identify its many functions. Three integral locating posts on the switch housing, one on the top and two on the bottom, slide into channels in a receptacle on the left side of the multi-function switch mounting housing near the top of the steering column to ensure proper positioning of the switch. Then two screws secure the switch to the mounting housing. A single integral connector receptacle containing four terminal pins on the back of the switch housing connects the switch to the vehicle electrical system through a dedicated take out and connector of the instrument panel wire harness.

The multi-function switch provides the vehicle operator with a control interface for the following functions:

- **Front Washer Control** - The multi-function switch control knob provides a momentary position for front washer system operation.
- **Front Wiper Control** - The multi-function switch control knob provides two continuous front wipe switch positions, low speed or high speed; and, an intermittent front wipe mode with five delay interval positions.
- **Hazard Warning Control** - The multi-function switch hazard warning push button provides two detent positions (On and Off) to control the hazard warning lamps.
- **Headlamp Beam Selection** - The multi-function switch control stalk provides detent switching for selection of the headlamp high or low beams. There is also an intermediate momentary position that allows the headlamp high beam circuits to be momentarily flashed to provide an optical horn feature (sometimes referred to as flash-to-pass) as an optical signalling device.
- **Turn Signal Control** - The multi-function switch control stalk provides momentary non-detent (lane change) switching or detent switching with automatic cancellation for both the left and right turn signal lamps.

The multi-function switch cannot be adjusted or repaired. If any function of the switch is faulty, or if the switch is damaged, the entire switch must be replaced as a unit.

OPERATION

The multi-function switch uses resistor multiplexing to control the many functions and features it provides using only three hard wired output circuits. The switch receives a clean ground from the ElectroMechanical Instrument Cluster (EMIC) (also sometimes referred to as the Cab Control Node/CCN) on a multi-function switch return circuit. It then provides outputs to the EMIC on a wash/beam select switch signal circuit to control front washer and headlamp beam selection, on an intermittent wiper switch signal circuit to control front wipers, and on a turn lamps switch signal circuit to control turn signal and hazard warning functions.

The multi-function switch operates as follows:

- **Front Washer Control** - The control knob on the end of the multi-function switch control stalk is depressed towards the steering column to momentarily activate the washer pump in the front washer mode. The washer pump will continue to operate in the front washer mode until the control knob is released. The multi-function switch provides an output to the EMIC, and the EMIC responds by sending electronic front washer switch status messages to the Front Control Module (FCM) over the Controller Area Network (CAN) data bus. The FCM responds by energizing or de-energizing the washer pump in the front washer mode.

- **Front Wiper Control** - The control knob on the end of the multi-function switch control stalk is rotated to one of the continuous front wiper detents, to one of five intermittent wiper detents, or to the Off position to select the front wiper mode. The multi-function switch provides an output to the EMIC, and the EMIC responds by sending electronic front wiper switch status messages to the FCM over the CAN data bus. The FCM responds by energizing or de-energizing the wiper on/off and high/low relays in the Power Distribution Center (PDC) for front wiper system control.
- **Hazard Warning Control** - The hazard warning push button of the multi-function switch is depressed to activate the hazard warning system, and depressed again to turn the system Off. When the push button is actuated, the multi-function switch provides an output to the EMIC, and the EMIC responds by sending electronic hazard switch status messages to the FCM over the CAN data bus. The FCM then energizes and flashes or de-energizes both the left and right turn signal circuits to provide the visual hazard warning.
- **Headlamp Beam Selection** - The control stalk of the multi-function switch is pulled towards the steering wheel past a detent to actuate the integral beam select switch circuitry, or to an intermediate, momentary position before the detent to actuate the optical horn feature. Each time the control stalk is actuated to a detent position, the opposite headlamp beam from what is currently selected will be energized. Each time the control stalk is actuated to the momentary position with the headlamps turned off, the headlamp high beams will be illuminated for as long as the control stalk is held in this position. The multi-function switch provides an output to the EMIC, and the EMIC responds by sending electronic beam select switch status messages to the FCM over the CAN data bus. The FCM energizes or de-energizes the selected low or high beam circuits.
- **Turn Signal Control** - The control stalk of the multi-function switch is moved upward to activate the right turn signal circuitry, and, downward to activate the left turn signal circuitry. The turn signal switch has a detent position in each direction that provides turn signals with automatic cancellation, and an intermediate, momentary position in each direction that provides turn signals only until the control stalk is released. When the control stalk is moved to a detent turn signal switch position, the cancel actuator extends toward the center of the steering column. A turn signal cancel cam that is integral to the clockspring rotates with the steering wheel and the cam lobes contact the cancel actuator when it is extended from the multi-function switch. When the steering wheel is rotated during a turning maneuver, one of the two turn signal cancel cam lobes will contact the turn signal cancel actuator. The cancel actuator latches against the cancel cam rotation in the direction opposite that which is signaled. If the left turn signal detent is selected, the lobes of the cancel cam will ratchet past the cancel actuator when the steering wheel is rotated to the left, but will unlatch the cancel actuator as the steering wheel rotates to the right and returns to center, which will cancel the turn signal event and release the control stalk from the detent so it returns to the neutral Off position. When a turn signal is activated, the multi-function switch provides an output to the EMIC, and the EMIC responds by sending electronic turn signal switch status messages to the FCM over the CAN data bus. The FCM energizes and flashes or de-energizes the selected left or right turn signal circuits.

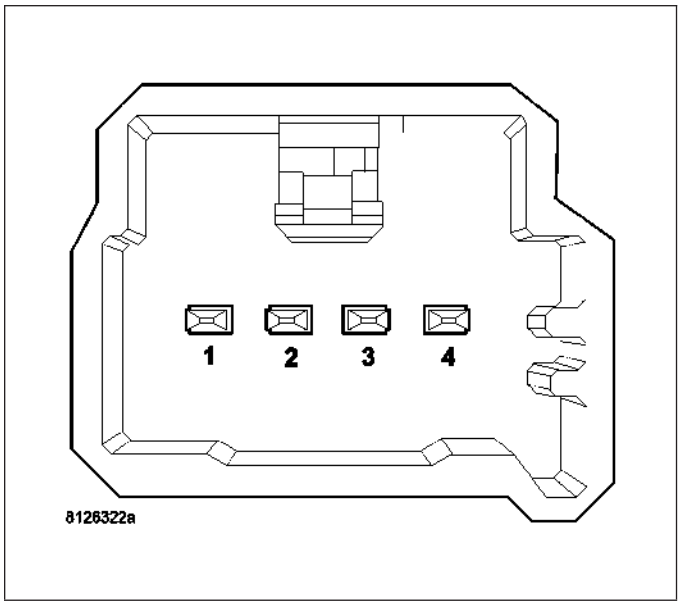
The multi-function switch can be diagnosed using conventional diagnostic tools and methods. However, proper testing of the multiplexed inputs to the EMIC requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

DIAGNOSIS AND TESTING

MULTI-FUNCTION SWITCH

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

1. Remove the multi-function switch from the switch mounting housing on the steering column. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/ MULTI-FUNCTION SWITCH - REMOVAL).
2. Disconnect the wire harness connector from the back of the multi-function switch.
3. Using an ohmmeter, test the resistance between the terminals of the switch as shown in the Multi-Function Switch Tests table.



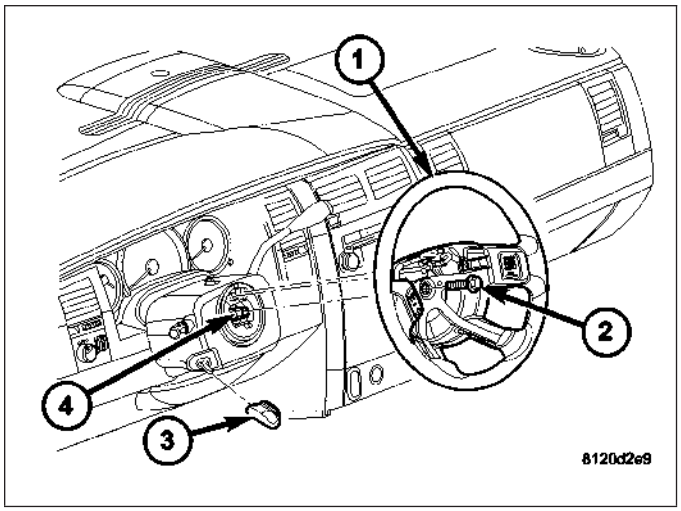
MULTI-FUNCTION SWITCH TESTS	
SWITCH POSITION (PINS)	***RESISTANCE RANGE (OHMS)**
BEAM SELECT/WASHER NEUTRAL (1 & 2)	OPEN CIRCUIT
BEAM SELECT ON (1 & 2)	518 - 575
OPTICAL HORN ON (1 & 2)	1257 - 1397
FRONT WASHER ON (1 & 2)	2584 - 2871
TURN/HAZARD OFF (2 & 3)	2643 - 2937
HAZARD ON (2 & 3)	115 - 128
LEFT TURN SIGNAL ON (2 & 3)	345 - 384
RIGHT TURN SIGNAL ON (2 & 3)	786 - 873
FRONT WIPER OFF (2 & 4)	6910 - 7678
FRONT WIPER DELAY 1 (2 & 4)	2128 - 2365
FRONT WIPER DELAY 2 (2 & 4)	1089 - 1210
FRONT WIPER DELAY 3 (2 & 4)	627 - 697
FRONT WIPER DELAY 4 (2 & 4)	388 - 431
FRONT WIPER DELAY 5 (2 & 4)	234 - 261
FRONT WIPER LOW (2 & 4)	125 - 140
FRONT WIPER HIGH (2 & 4)	50 - 56
*** All Resistance Values Given Are ±10 Percent**	

4. If the switch fails any of the tests, replace the faulty multi-function switch as required.

REMOVAL

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

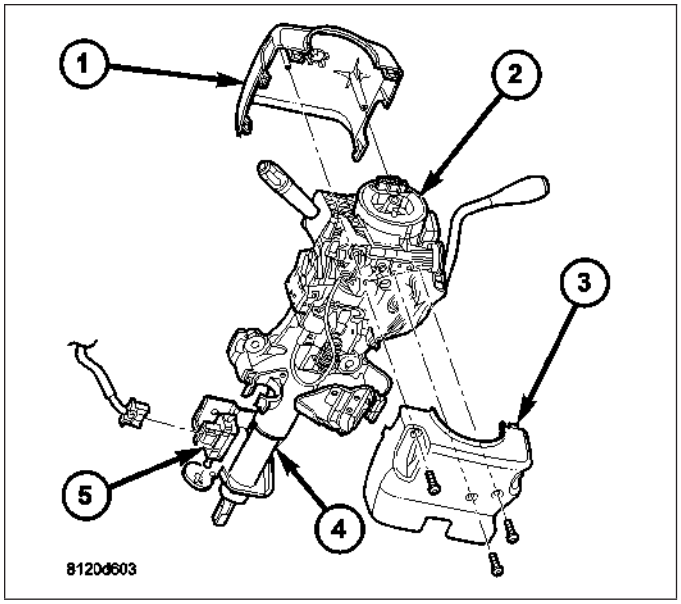
1. Disconnect and isolate the battery negative cable.
2. Remove the driver airbag from the steering wheel. (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - REMOVAL).
3. Disconnect the steering wheel wire harness connectors from the upper clockspring connector receptacles.



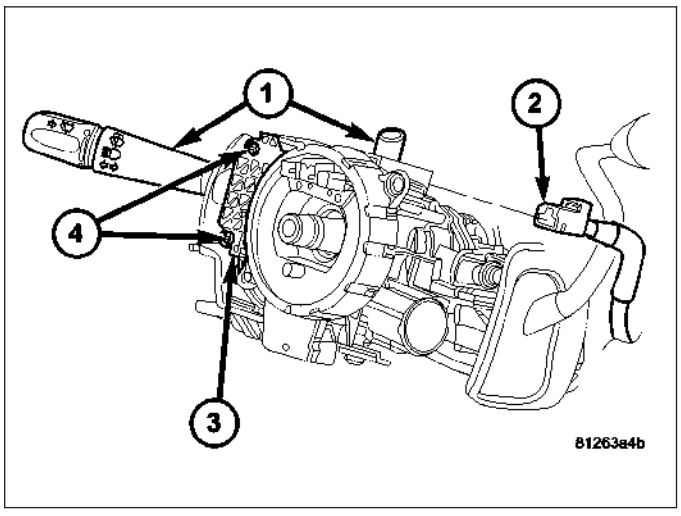
CAUTION: Be certain that the screws that secure the steering wheel puller to the steering wheel are fully engaged in the steering wheel armature without passing through the steering wheel and damaging the clockspring.

4. Remove the steering wheel (1) from the steering column. (Refer to 19 - STEERING/COLUMN/ STEERING WHEEL - REMOVAL).
5. Grasp the tilt steering column knob (3) firmly and pull it straight rearward to remove it from the tilt adjuster lever on the left side of the column.

6. From below the steering column, remove the two outboard screws that secure the upper column shroud (1) to the lower shroud (3).
7. Using hand pressure, press inward on both sides of the upper shroud above the parting line of the lower shroud to release the snap features that secure the two shroud halves to each other.
8. Remove the upper shroud from the lower shroud and the steering column.
9. Remove the one center screw that secures the lower shroud to the steering column (4).
10. Remove the lower shroud from the steering column.



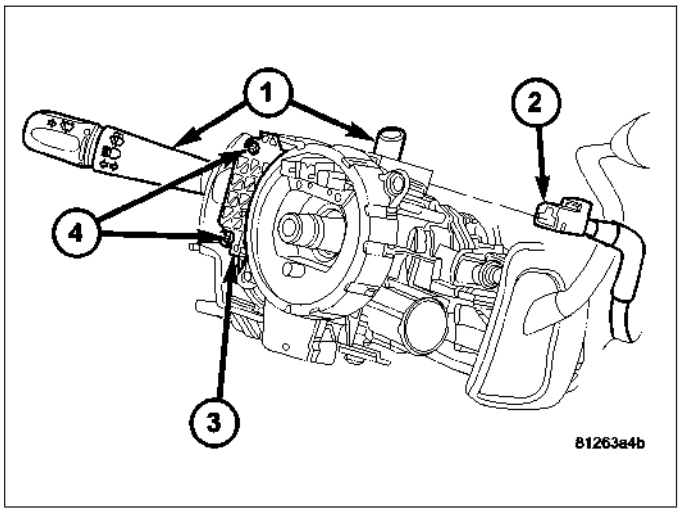
11. Disconnect the wire harness connector (2) from the back of the multi-function switch housing (1).
12. Remove the two screws (4) that secure the switch to the multi-function switch mounting housing (3).
13. Grasp the switch control stalk and pull it toward the left side of the vehicle to remove the switch from the mounting housing.



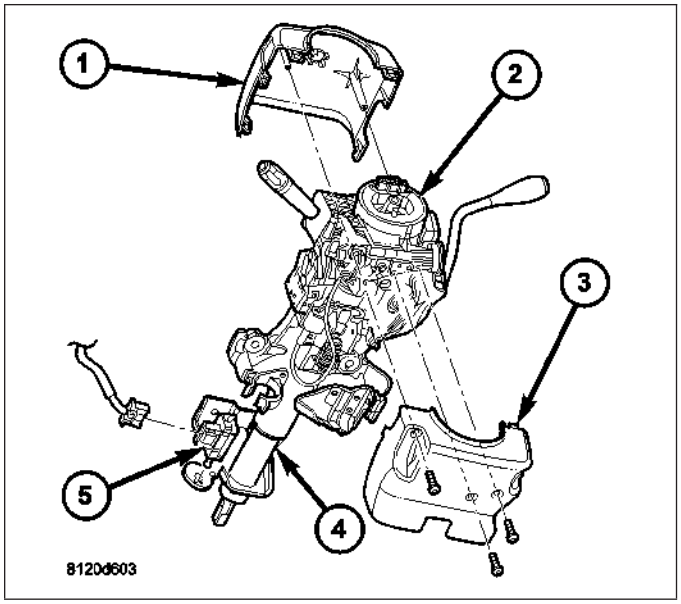
INSTALLATION

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

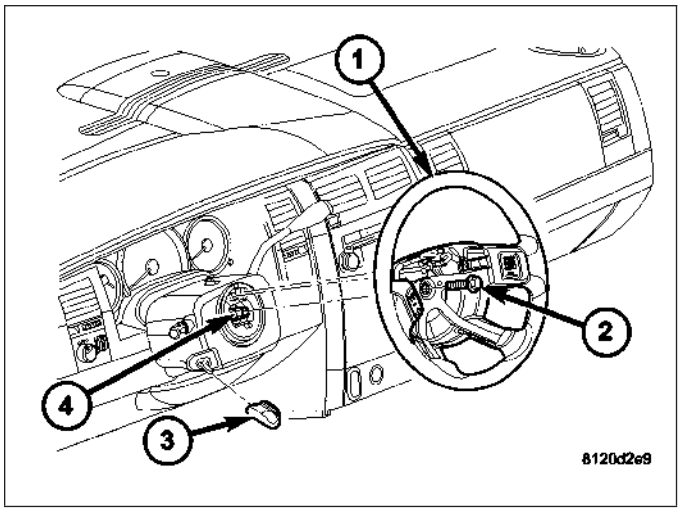
1. Slide the multi-function switch (1) into the multi-function switch mounting housing (3) from the left side. Be certain that the alignment pins on the top and bottom of the switch are properly engaged in the channels of the mounting housing.
2. Install and tighten the two screws (4) that secure the switch to the mounting housing. Tighten the screws to 2 N·m (20 in. lbs.).
3. Reconnect the wire harness connector (2) to the back of the switch.



4. Position the lower shroud (3) onto the steering column (4).
5. From below the steering column, install and tighten the one center screw that secures the lower shroud to the steering column. Tighten the screw to 2 N·m (20 in. lbs.).
6. Position the upper shroud (1) onto the steering column over the lower shroud. Be certain to engage the gearshift lever gap hider into the opening in the right side of both shroud halves.
7. Align the snap features on the upper shroud with the receptacles in the lower shroud and apply hand pressure to snap them together.
8. Install and tighten the two outboard screws that secure the upper shroud to the lower shroud. Tighten the screws to 2 N·m (20 in. lbs.).



9. Align the tilt steering column knob (3) with the tilt adjuster lever on the left side of the steering column and use hand pressure to snap it back into place.



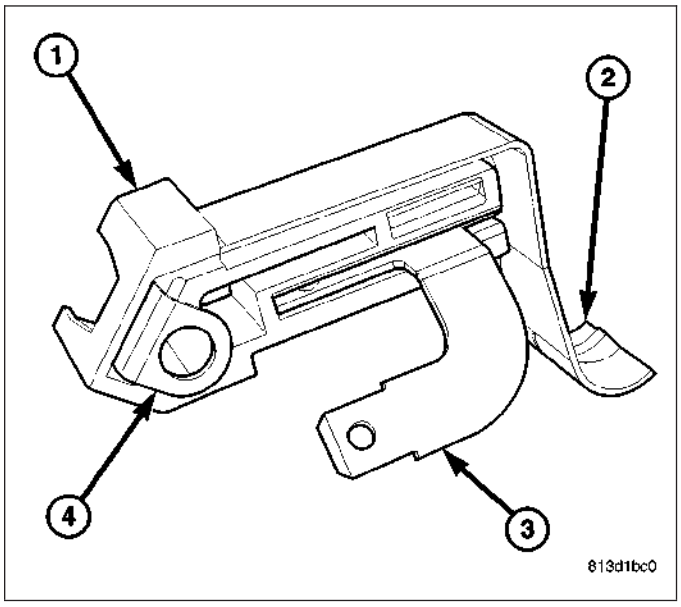
NOTE: When reinstalling the steering wheel, be certain to index the yellow rubber booted engagement dowel on the upper surface of the clockspring rotor between the two fins cast into the lower surface of the steering wheel armature hub.

10. Reinstall the steering wheel (1) onto the steering column. (Refer to 19 - STEERING/COLUMN/ STEERING WHEEL - INSTALLATION).
11. Reconnect the steering wheel wire harness connectors to the upper clockspring connector receptacles. Be certain that the steering wheel wire harness is routed between the steering wheel back trim cover and the steering wheel armature.
12. Reinstall the driver airbag onto the steering wheel. (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - INSTALLATION).
13. Reconnect the battery negative cable.

SWITCH-PARKING BRAKE

DESCRIPTION

The park brake switch (1) is located on the park brake lever mechanism on the cowl side inner panel below the instrument panel, to the left of the steering column. This switch includes a spade-type output terminal (3) that connects the switch to the vehicle electrical system through a dedicated take out and connector of the body wire harness. The output terminal is integral to the stationary contact within a molded plastic insulator.



A locating tab on the insulator engages a slot in the park brake lever mechanism for positive switch location. External to the insulator is a movable leaf contact with an integral grounding lug (4) on one end and an integral actuating lever and follower (2) on the opposite end. The switch is secured to and grounded by a single screw to the park brake lever mechanism. The park brake switch cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

OPERATION

The park brake switch is a normally closed, mechanically actuated leaf contact switch that is operated by the park brake lever mechanism. The switch is grounded through its mounting to the park brake lever mechanism and pro-

vides a ground input to the ElectroMechanical Instrument Cluster (EMIC) (also sometimes referred to as the Cab Control Node/CCN) on a park brake switch sense circuit whenever the park brake is applied, and opens this circuit whenever the park brake is released. The park brake switch sense input to the EMIC is used for control of the brake indicator and may also be used as a logic input for other electronic features in the vehicle.

The park brake switch can be diagnosed using conventional diagnostic tools and methods. However, proper testing of the EMIC processing of the park brake switch sense input requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

DIAGNOSIS AND TESTING

PARK BRAKE SWITCH

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

NOTE: If the brake indicator stays on with the ignition switch in the On position and the park brake released, or comes on while driving, the brake system must be diagnosed and repaired prior to performing the following tests. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING). If no brake system problem is found, the following procedures will help to locate a shorted or open park brake switch sense circuit, or a faulty park brake switch.

INDICATOR ILLUMINATES DURING BULB TEST, BUT DOES NOT WHEN PARK BRAKE APPLIED

1. Disconnect and isolate the battery negative cable. Disconnect the body wire harness connector for the park brake switch from the switch terminal. Apply the parking brake. Check for continuity between the park brake switch terminal and a good ground. There should be continuity. If OK, go to Step 2. If not OK, replace the faulty park brake switch.
2. Disconnect the instrument panel wire harness connector (Connector C1) for the instrument cluster from the cluster connector receptacle. Check for continuity between the park brake switch sense circuit cavities of the body wire harness connector for the park brake switch and the instrument panel wire harness connector for the instrument cluster. There should be continuity. If not OK, repair the open park brake switch sense circuit between the park brake switch and the instrument cluster as required.

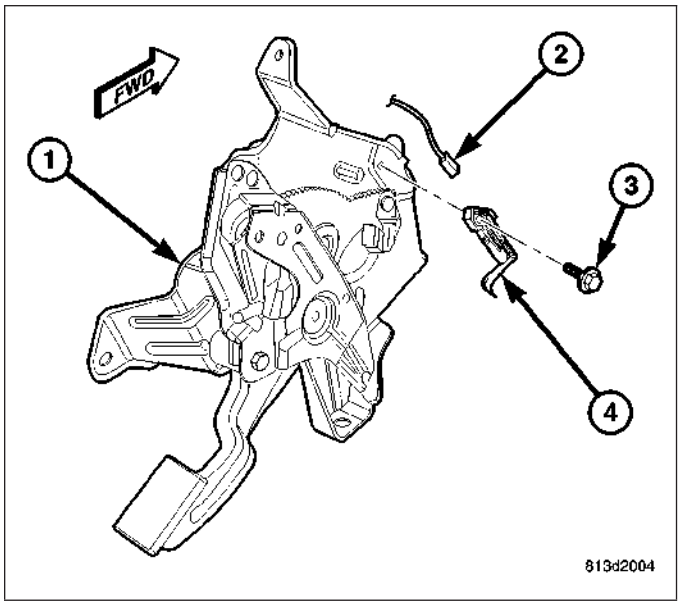
INDICATOR REMAINS ILLUMINATED - BRAKE SYSTEM CHECKS OK

1. Disconnect and isolate the battery negative cable. Disconnect the body wire harness connector for the park brake switch from the switch terminal. Check for continuity between the terminal of the park brake switch and a good ground. There should be no continuity with the park brake released, and continuity with the park brake applied. If OK, go to Step 2. If not OK, replace the faulty park brake switch.
2. Disconnect the instrument panel wire harness connector (Connector C1) for the instrument cluster from the cluster connector receptacle. Check for continuity between the park brake switch sense circuit cavity of the body wire harness connector for the park brake switch and a good ground. There should be no continuity. If not OK, repair the shorted park brake switch sense circuit between the park brake switch and the instrument cluster as required.

REMOVAL

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

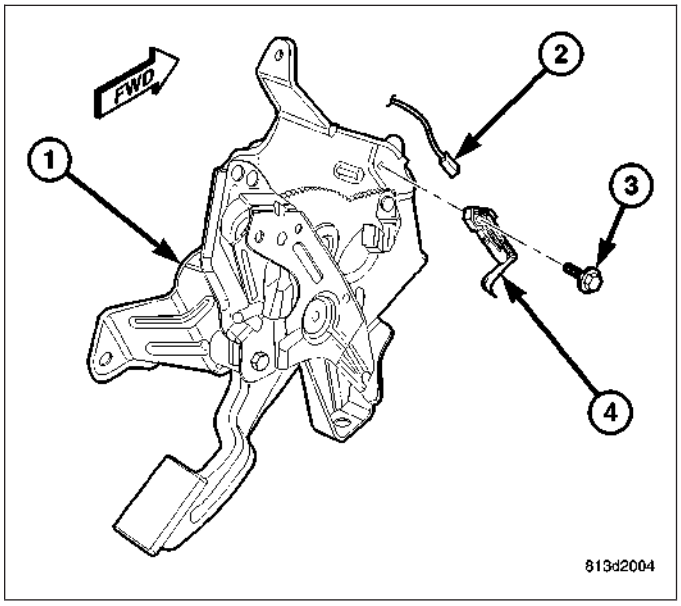
1. Disconnect and isolate the battery negative cable.
2. Apply the parking brake.
3. Reach under the left end of the instrument panel to access and disconnect the body wire harness connector (2) from the terminal of the park brake switch (4) located on the park brake lever mechanism (1) on the left cowl side inner panel.
4. Remove the screw (3) that secures the park brake switch to the park brake lever mechanism.
5. Remove the switch from the park brake lever mechanism.



INSTALLATION

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

1. Reach under the left end of the instrument panel to position park brake switch (4) onto the park brake lever mechanism (1) on the left cowl side inner panel. Be certain to engage the locating pin on the back of the switch insulator into the locating slot in the lever mechanism bracket.
2. Install and tighten the screw (3) that secures the park brake switch to the park brake lever mechanism. Tighten the screw to 3 N·m (24 in. lbs.).
3. Reconnect the body wire harness connector (2) to the terminal of the park brake switch.
4. Reconnect the battery negative cable.
5. Turn the ignition switch to the On position and check for proper brake indicator operation with the parking brake applied, then release the parking brake and check that the brake indicator extinguishes.

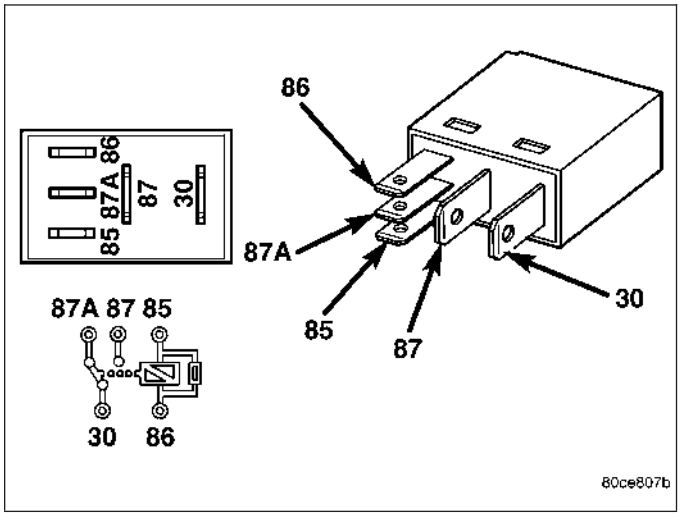


RELAY-PARK LAMP

DESCRIPTION

The park lamp relay is a conventional International Standards Organization (ISO) micro relay. Relays conforming to the ISO specifications have common physical dimensions, current capacities, terminal patterns, and terminal functions. This relay is contained within a small, rectangular, molded plastic housing and is connected to all of the required inputs and outputs through five integral male spade-type terminals that extend from the relay base plate.

The park lamp relay is located in the Power Distribution Center (PDC) in the engine compartment near the battery. Refer to the layout label on the underside of the PDC cover for specific relay cavity assignment information. The park lamp relay cannot be adjusted or repaired and, if faulty or damaged, the unit must be replaced.



OPERATION

The park lamp relay is an electromechanical switch that uses a low current input from the Front Control Module (FCM) (also referred to as the Integrated Power Module/IPM) to control a high current output to the park lamps. Within the relay are an electromagnetic coil, a movable contact and two fixed contact points. A resistor is connected in parallel with the coil, and helps to dissipate voltage spikes and electromagnetic interference that can be generated as the field of the relay coil collapses.

The movable common supply contact point is held against the fixed normally closed contact point by spring pressure. When the relay coil is energized, an electromagnetic field is produced by the coil windings. This field draws the movable contact away from the normally closed contact, and holds it against the normally open contact. When the relay coil is de-energized, spring pressure returns the movable contact back against the normally closed contact.

The inputs and outputs of the park lamp relay include:

- **Common Supply Terminal (30)** - The common feed terminal is connected to a fused B(+) circuit at all times.
- **Coil Ground Terminal (85)** - The coil ground terminal is connected to a fused B(+) circuit at all times.
- **Coil Battery Terminal (86)** - The coil battery terminal is connected to a control output of the FCM through a park lamp relay control circuit. The FCM controls park lamp operation by controlling a ground path through this circuit.
- **Normally Open Terminal (87)** - The normally open terminal is connected to the park lamps through a park lamp relay output circuit and provides battery voltage to the park lamps whenever the relay is energized.
- **Normally Closed Terminal (87A)** - The normally closed terminal is not connected to any circuit in this application, but will have battery voltage present whenever the relay is de-energized.

The park lamp relay can be diagnosed using conventional diagnostic tools and methods. Refer to the appropriate wiring information.

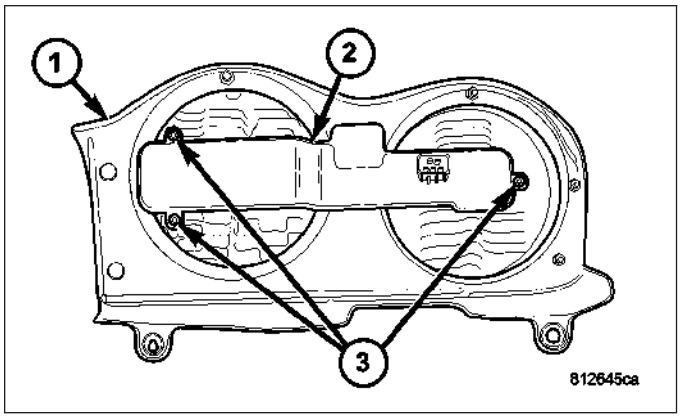
REAR LAMP UNIT

REMOVAL

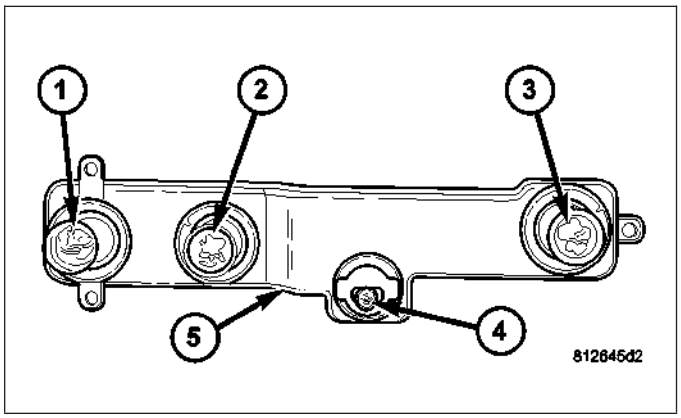
BULB

NOTE: The rear lamp unit contains four bulbs: side marker, park/brake, park/turn, and backup. The service procedures for each bulb are the same, only the bulb sizes and types may differ.

1. Disconnect and isolate the battery negative cable.
2. Remove the rear lamp unit (1) from the end of the quarter panel. (Refer to 8 - ELECTRICAL/LAMPS/ LIGHTING - EXTERIOR/REAR LAMP UNIT - REMOVAL).
3. Remove the three screws (3) that secure the socket plate (2) to the back of the rear lamp unit housing.
4. Remove the socket plate from the rear lamp.

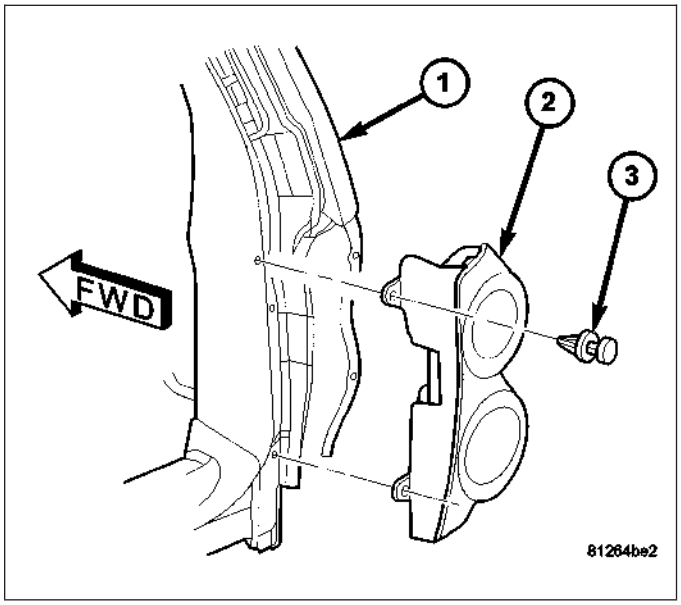


5. Pull the base of the backup (1), park/turn (2), park/ brake (3), or side marker (4) lamp bulb straight out of the appropriate socket in the socket plate (5).

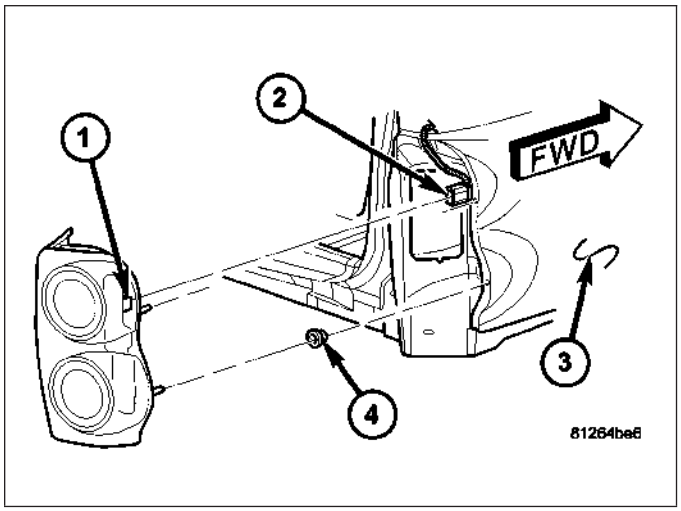


LAMP

1. Disconnect and isolate the battery negative cable.
2. Open the liftgate to access and remove the two plastic push-pin fasteners (3) that secure the rear lamp unit (2) to the side jamb of the liftgate opening pillar (1).



3. Pull the outboard side of the rear lamp unit rearward far enough to unsnap the two ball studs on the outboard side of the lamp housing from the two rubber grommets (4) in the quarter panel (3).
4. Disengage the lock feature and disconnect the wire harness connector (2) from the lamp socket plate connector (1).
5. Remove the lamp from the quarter panel.



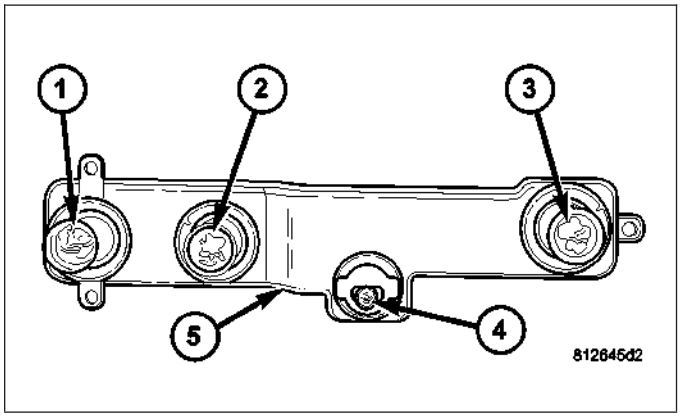
INSTALLATION

BULB

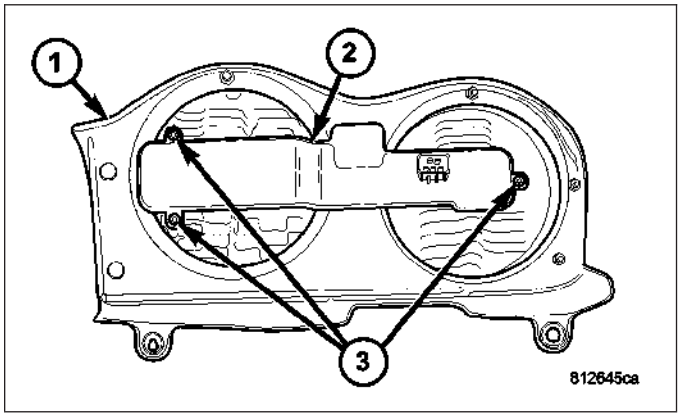
CAUTION: Always use the correct bulb size and type for replacement. An incorrect bulb size or type may overheat and cause damage to the lamp, the socket and/or the lamp wiring.

NOTE: The rear lamp unit contains four bulbs: side marker, park/brake, park/turn, and backup. The service procedures for each bulb are the same, only the bulb sizes and types may differ.

1. Align the base of the backup (1), park/turn (2), park/brake (3), or side marker (4) lamp bulb with the appropriate socket in the socket plate (5).
2. Push the bulb straight into the socket until the base is firmly seated.

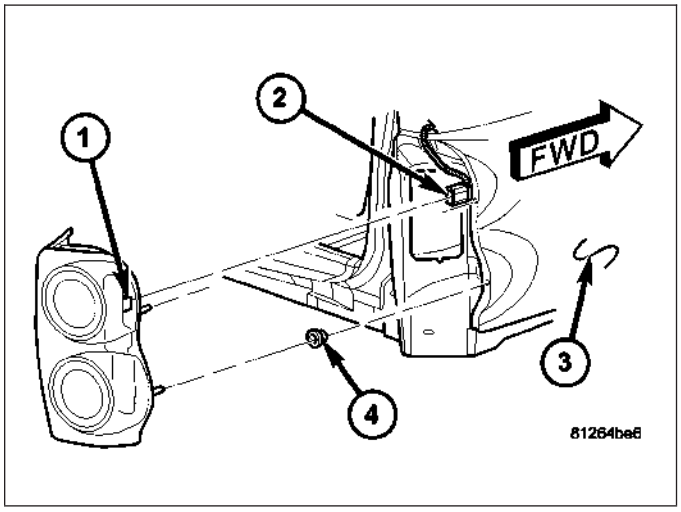


3. Align the socket plate (2) and bulbs with the openings on the back of the rear lamp unit housing (1).
4. Insert the socket plate and bulbs straight into the housing until the plate is firmly seated.
5. Install and tighten the three screws (3) that secure the socket plate to the housing. Tighten the screws to 1 N·m (12 in. lbs.).
6. Reinstall the rear lamp unit onto the end of the quarter panel. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/REAR LAMP UNIT - INSTALLATION).
7. Reconnect the battery negative cable.

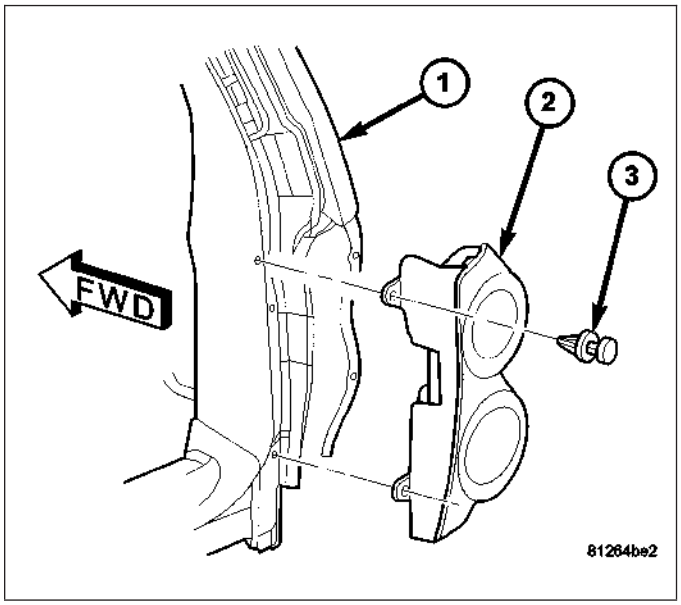


LAMP

1. Check to be certain that the two rubber grommets (4) are in good condition and properly installed in the quarter panel (3).
2. Position the rear lamp unit to the quarter panel.
3. Reconnect the wire harness connector (2) to the lamp socket plate connector (1) and engage the lock feature.
4. Align the two ball studs on the outboard side of the rear lamp housing with the two rubber grommets in the quarter panel.
5. Using hand pressure, push firmly and evenly on the outboard side of the lamp until both ball studs snap into the rubber grommets.



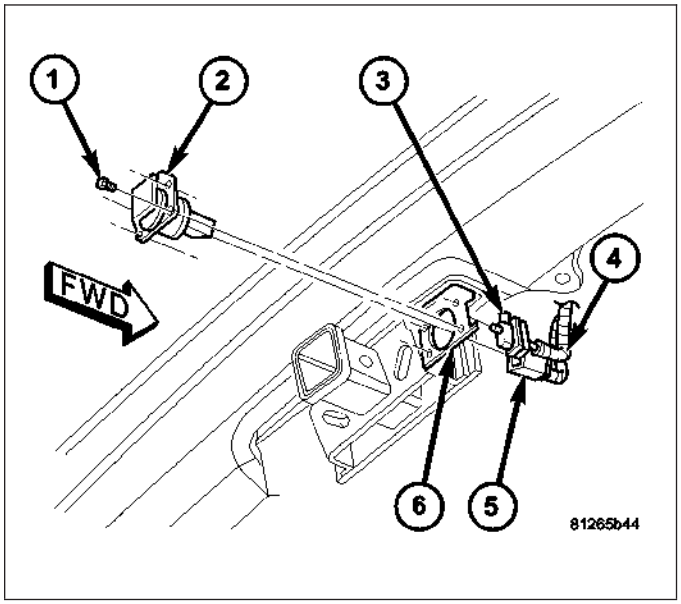
6. Install the two plastic push-pin fasteners (3) that secure the rear lamp unit (2) to the side jamb of the liftgate opening pillar (1).
7. Reconnect the battery negative cable.



WIRING-TRAILER TOW

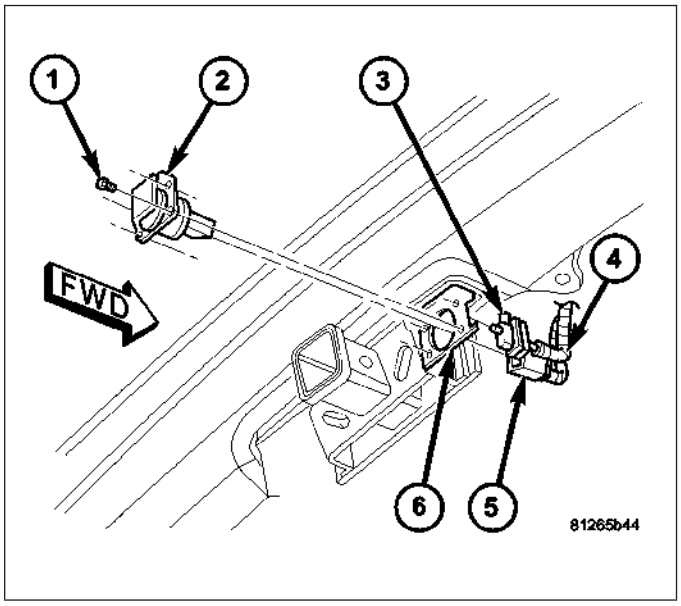
REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Reach behind the bracket (6) on the trailer hitch receiver to access and disconnect the connector (5) of the chassis wire harness (4) from the 7-way trailer tow connector (2), or to disengage the 4-way trailer tow connector (3) from the bracket.
3. Remove the four screws (1) that secure the 7-way trailer tow connector to the bracket.
4. Remove the 7-way trailer tow connector from the bracket.



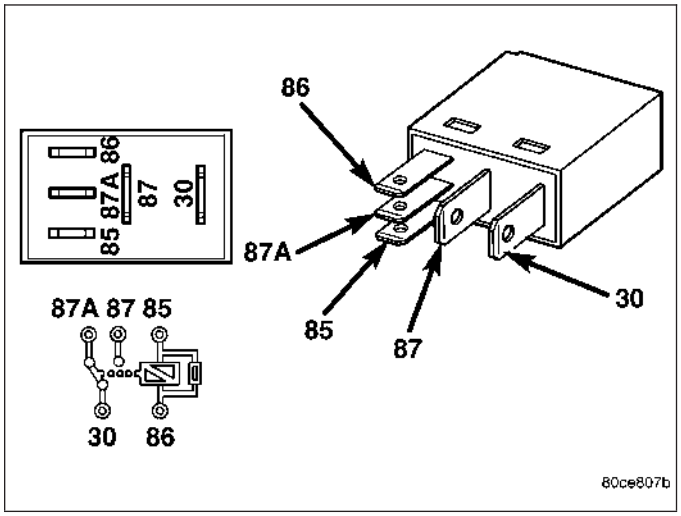
INSTALLATION

1. Position the 7-way trailer tow connector (2) into the bracket (6) on the trailer hitch receiver.
2. Install and tighten the four screws (1) that secure the 7-way trailer tow connector to the bracket. Tighten the screws to 4 N·m (35 in. lbs.).
3. Reach behind the bracket to access and reconnect the connector (5) of the chassis wire harness (4) from the 7-way trailer tow connector, or to engage the 4-way trailer tow connector (3) to the bracket.
4. Reconnect the battery negative cable.



RELAY-TRAILER TOW

DESCRIPTION



Vehicles equipped with an optional factory-installed trailer towing package have two trailer tow relays, one for the trailer right turn and brake lamps and the other for the trailer left turn and brake lamps. The trailer tow relays are conventional International Standards Organization (ISO) micro relays. Relays conforming to the ISO specifications have common physical dimensions, current capacities, terminal patterns, and terminal functions. Each relay is contained within a small, rectangular, molded plastic housing and is connected to all of the required inputs and outputs through five integral male spade-type terminals that extend from the relay base plate.

The trailer tow relays are located in the Power Distribution Center (PDC) in the engine compartment near the battery. Refer to the layout label on the underside of the PDC cover for specific relay cavity assignment information. A trailer tow relay cannot be adjusted or repaired and, if faulty or damaged, the unit must be replaced.

OPERATION

The trailer tow relays are electromechanical switches that use a low current input from the Front Control Module (FCM) (also referred to as the Integrated Power Module/IPM) to control a high current output to trailer brake and turn signal lamps. Within each relay are an electromagnetic coil, a movable contact and two fixed contact points. A resistor is connected in parallel with the coil, and helps to dissipate voltage spikes and electromagnetic interference that can be generated as the field of the relay coil collapses.

The movable common supply contact point is held against the fixed normally closed contact point by spring pressure. When the relay coil is energized, an electromagnetic field is produced by the coil windings. This field draws the movable contact away from the normally closed contact, and holds it against the normally open contact. When the relay coil is de-energized, spring pressure returns the movable contact back against the normally closed contact.

The inputs and outputs of the trailer tow relays include:

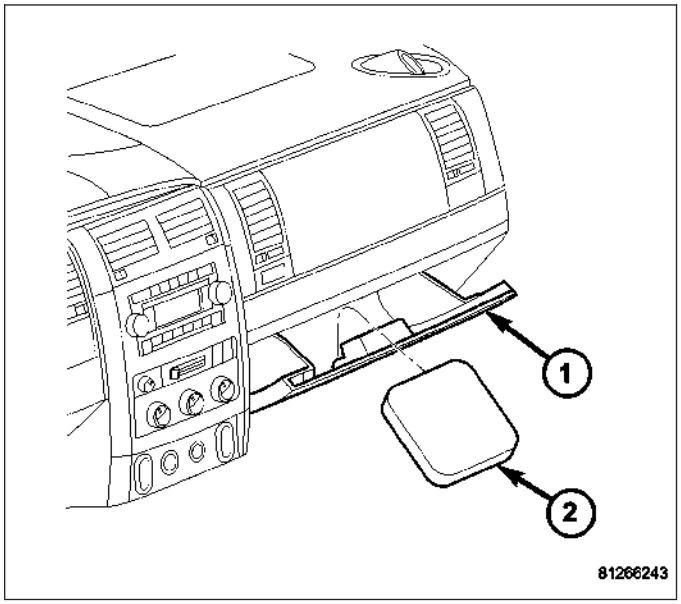
- **Common Supply Terminal (30)** - The common feed terminal is connected to a fused B(+) circuit at all times.
- **Coil Ground Terminal (85)** - The coil ground terminal is connected to a fused B(+) circuit at all times.
- **Coil Battery Terminal (86)** - The coil battery terminal is connected to a control output of the FCM through a right or left trailer tow turn relay control circuit. The FCM controls trailer brake and turn lamp operation by controlling a ground path through this circuit.
- **Normally Open Terminal (87)** - The normally open terminal is connected to the trailer lamps through a right or left trailer tow turn relay output circuit and provides battery voltage to the right or left trailer brake and turn lamps whenever the relay is energized.
- **Normally Closed Terminal (87A)** - The normally closed terminal is not connected to any circuit in this application, but will have battery voltage present whenever the relay is de-energized.

The trailer tow relays can be diagnosed using conventional diagnostic tools and methods. Refer to the appropriate wiring information.

WIRING-TRAILER TOW

DESCRIPTION

Vehicles equipped with a factory-installed trailer tow package include an electric trailer brake wiring provision that terminates at a connector located on top of the large body harness connection under the instrument panel to the left of the brake pedal, as well as an electric trailer brake pigtail harness and an instruction card (2) that are stored in the glove box (1) when the vehicle is shipped from the factory.



OPERATION

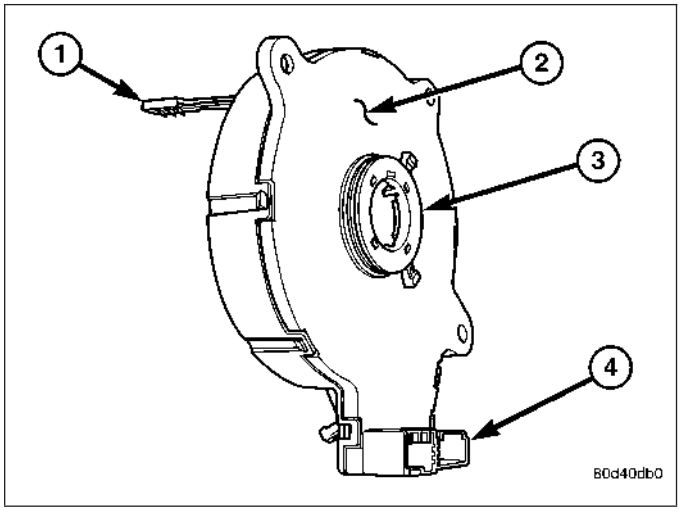
If an aftermarket electric brake controller is used, the electric brake pigtail harness supplied will make installation easier. The connection (blue 4-way connector) for the harness is located under the instrument panel to the left of the brake pedal on top of the large body harness connection. Refer to the appropriate wiring information.

The battery line of this harness may be used to charge the trailer battery. However, a battery isolation unit is not supplied and the trailer battery may discharge the truck battery when the engine is not running. The battery line is protected by a fuse or a circuit breaker. Refer to the owner's manual in the vehicle glove box for type, location, and ampere rating.

CAM-TURN SIGNAL CANCEL

DESCRIPTION

The turn signal cancel cam (3) is concealed within the steering column. The turn signal cancel cam consists of two lobes on a molded plastic ring that is snapped into the lower hub of the clockspring rotor. The clockspring mechanism provides turn signal cancellation as well as a constant electrical connection between the horn switch, driver airbag, speed control switches, and remote radio switches on the steering wheel and the instrument panel wire harness on the steering column. The housing of the clockspring (2) is secured to the multi-function switch mounting housing on the steering column and remains stationary. The rotor of the clockspring, including the turn signal cancel cam lobes rotate with the steering wheel.



The turn signal cancel cam is serviced as a unit with the clockspring and cannot be repaired. If faulty or damaged, the entire clockspring unit must be replaced. (Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCKSPRING - REMOVAL).

OPERATION

When the multi-function switch control stalk is moved to a latched turn signal position, a turn signal cancel actuator is extended from the inside surface of the switch housing toward the turn signal cancel cam. As the steering wheel is rotated to complete the turn, one of the two cam lobes will contact the actuator, automatically cancelling the turn signal event and releasing the latched multi-function switch control stalk to the neutral position.

LAMPS/LIGHTING - INTERIOR - ELECTRICAL DIAGNOSTICS

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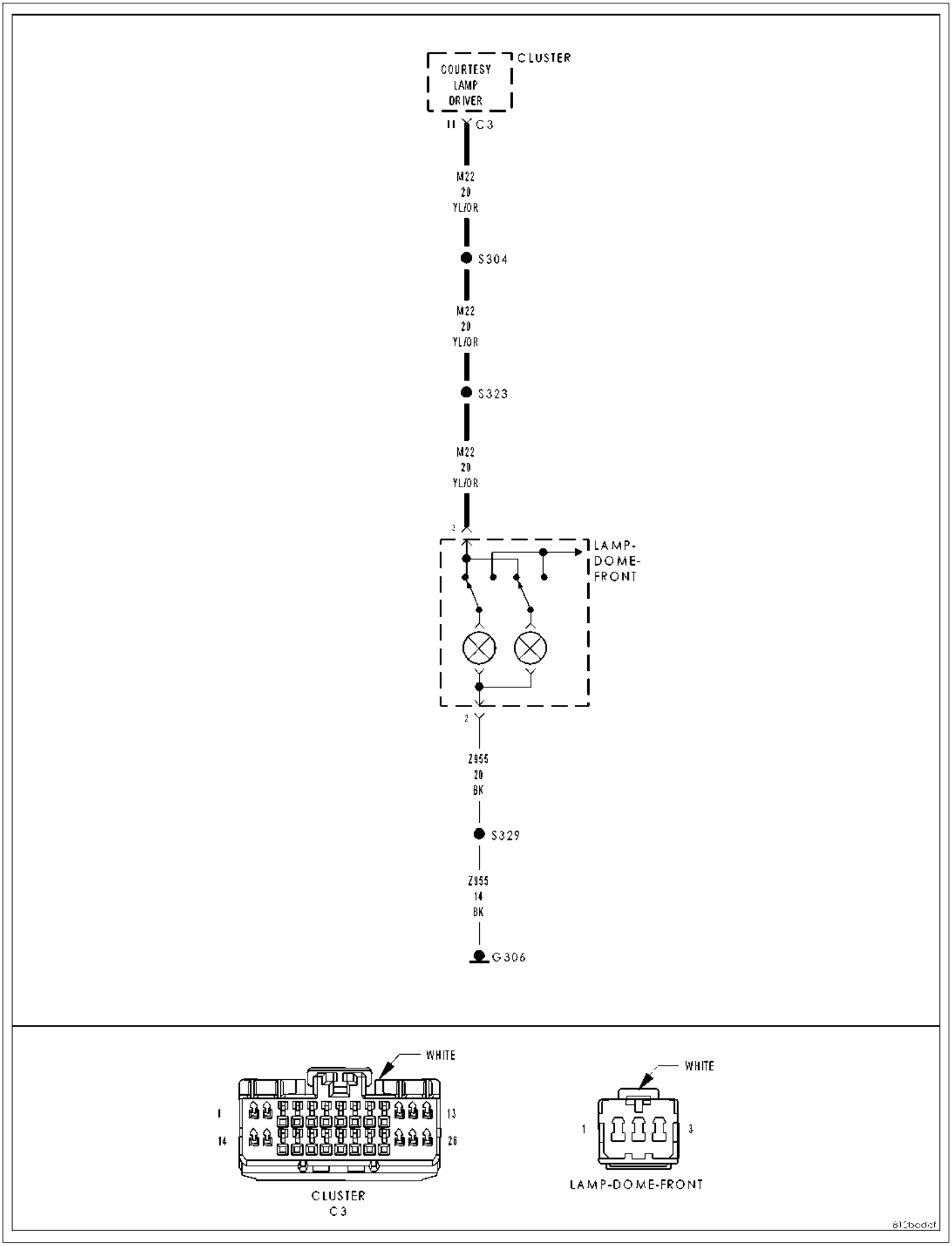
LAMPS/LIGHTING - INTERIOR - ELECTRICAL DIAGNOSTICS

DIAGNOSIS AND TESTING

B161B-COURTESY/DOME LAMP OUTPUT CIRCUIT SHORT TO GROUND



B161B-COURTESY/DOME LAMP OUTPUT CIRCUIT SHORT TO GROUND (CONTINUED)

For the Interior Lighting circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - INTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- **Set Condition:**

Possible Causes
HEADLAMP SWITCH
(M22) COURTESY LAMP OUTPUT CIRCUIT SHORT TO GROUND
INSTRUMENT CLUSTER

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.
With the Scan Tool, clear all CCN DTC's.
Turn the Dome Lamps on.
With the Scan Tool, read the DTC information.

Does the Scan Tool read: B161B-COURTESY/DOME LAMP OUTPUT CIRCUIT SHORT TO GROUND?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present.
Inspect the related wiring for a possible intermittent condition.
Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST — VER 1.

---

2. HEADLAMP SWITCH

Disconnect the Headlamp Switch connector.
Turn the Ignition on.
Using the Scan Tool.

Does the Scan Tool display Headlamp Switch 5.0 volts?

Yes >> Go To 3

No >> Replace the Headlamp Switch in accordance with the service information.

B161B-COURTESY/DOME LAMP OUTPUT CIRCUIT SHORT TO GROUND (CONTINUED)

3. INSTRUMENT CLUSTER/OUTPUT CIRCUIT SHORT

Turn the ignition on.

Disconnect the Headlamp Switch connector.

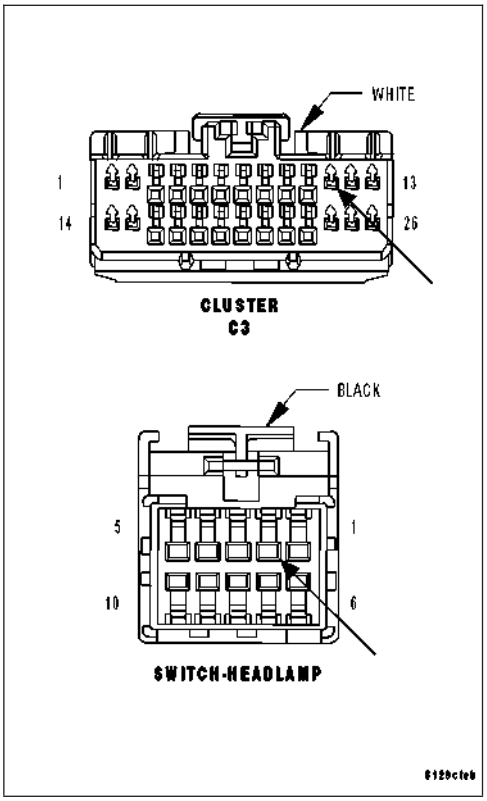
Disconnect the Instrument Cluster C3 connector.

Measure the resistance of the (M22) Courtesy Lamp Output circuit to ground.

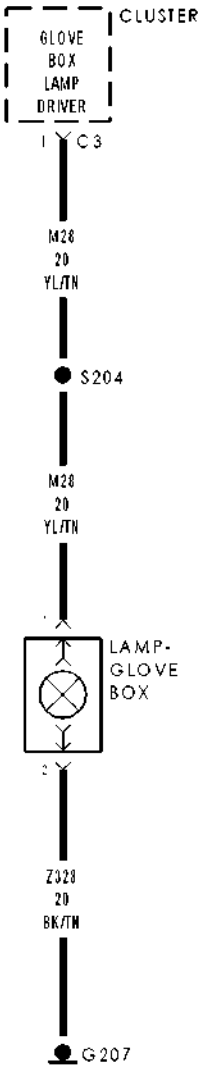
Is the resistance below 5.0 ohms?

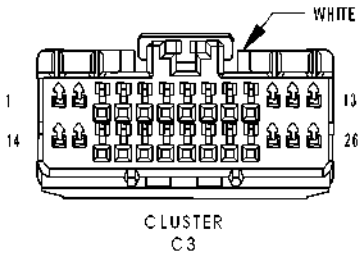
Yes >> Repair the (M22) Courtesy lamp Output circuit.
Perform the BODY VERIFICATION TEST — VER 1.

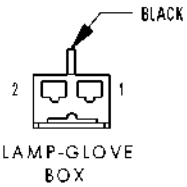
No >> Replace the Instrument Cluster in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.



B1623-GLOVEBOX/MAP LAMP OUTPUT CIRCUIT SHORT TO GROUND







B1623-GLOVEBOX/MAP LAMP OUTPUT CIRCUIT SHORT TO GROUND (CONTINUED)

For the Interior Lighting circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - INTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- **Set Condition:**

Possible Causes
(M28) GLOVE BOX/MAP LAMP OUTPUT CIRCUIT SHORT TO GROUND
INSTRUMENT CLUSTER

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all CCN DTC's.

Turn the Glove Box lamps on.

With the Scan Tool, read the DTC information.

Does the Scan Tool read: B1623-GLOVEBOX/MAP LAMP OUTPUT CIRCUIT SHORT TO GROUND?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST — VER 1.

---

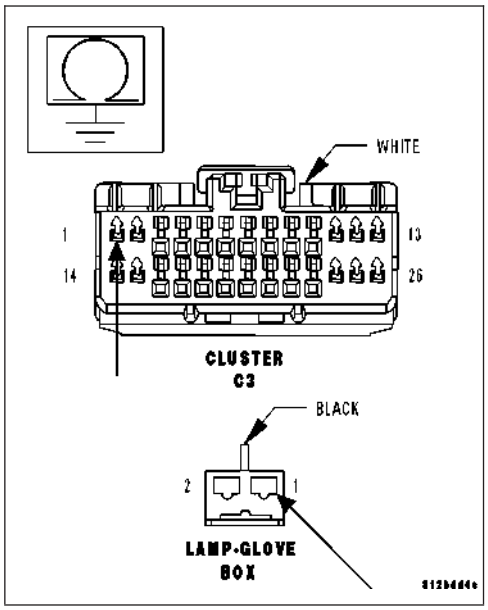
2. INSTRUMENT CLUSTER

Turn the ignition off.

Disconnect the Glovebox Lamp Switch harness connector.

Disconnect the Instrument Cluster C3 connector.

Measure the resistance of the (M28) Glovebox Lamp Output circuit to ground.

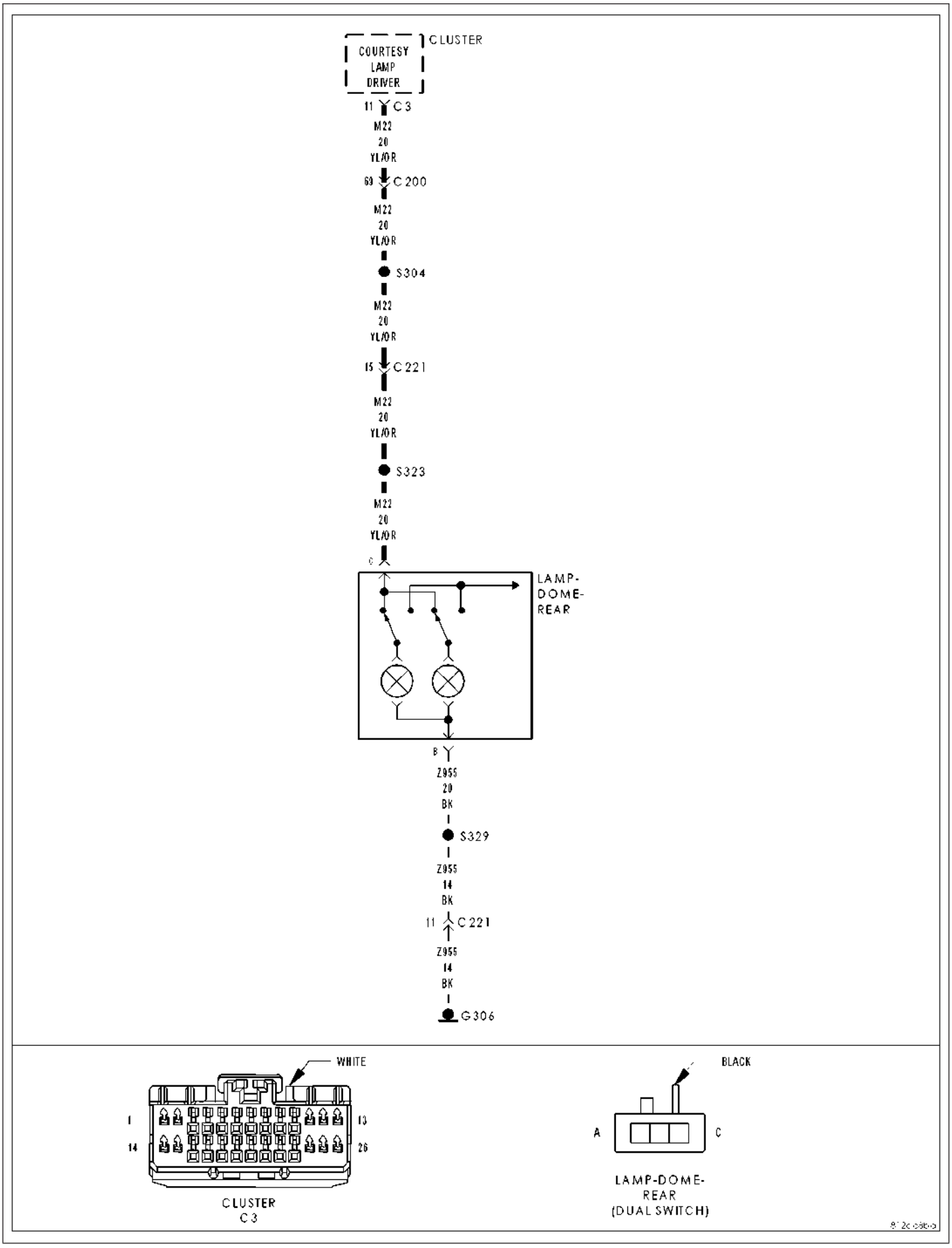


Is the resistance below 5.0 ohms?

Yes >> Repair the (M28) Glovebox-Map Lamp Output circuit.
Perform the BODY VERIFICATION TEST — VER 1.

No >> Replace the Instrument Cluster in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.

B1627-CARGO LAMP OUTPUT CIRCUIT SHORT TO GROUND



B1627-CARGO LAMP OUTPUT CIRCUIT SHORT TO GROUND (CONTINUED)

For the Interior Lighting circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - INTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- **Set Condition:**

Possible Causes
Headlamp Switch
(M22) Cargo Lamp Output Circuit Short to Ground
Instrument Cluster

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. Intermittent Condition

turn the ignition on.

With the Scan Tool, clear all CCN DTC's.

Turn the Cargo Lamps on.

With the Scan Tool, read the DTC information.

Does the SCan Tool read: B1627-CARGO LAMP OUTPUT CIRCUIT SHORT TO GROUND?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST — VER 1.

---

2. Headlamp Switch

Disconnect the Headlamp Switch connector.

Turn the ignition on.

Using the Scan Tool, read DTC's.

Does the Scan Tool display Headlamp Switch 5.0 volts?

Yes >> Go To 3

No >> Replace the Headlamp Switch.
Perform the BODY VERIFICATION TEST VER — 1.

B1627-CARGO LAMP OUTPUT CIRCUIT SHORT TO GROUND (CONTINUED)

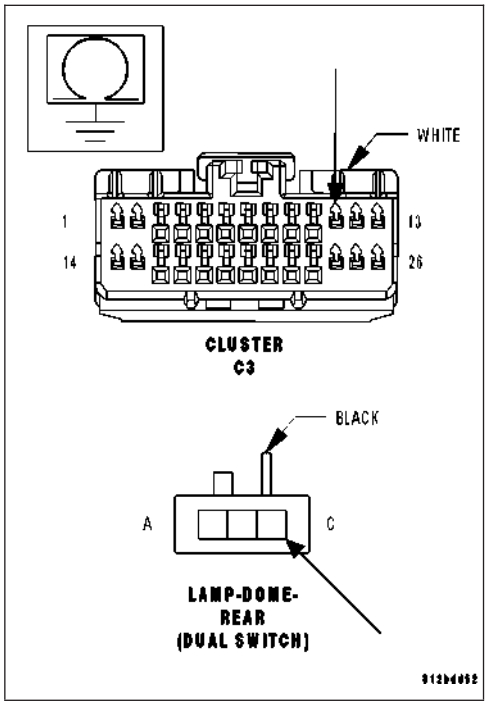
3. Instrument Cluster

Turn the ignition off.

Disconnect the Headlamp Switch connector.

Disconnect the Instrument Cluster C3 connector.

Measure the resistance of the of the (M22) Cargo Lamp Output circuit to ground.

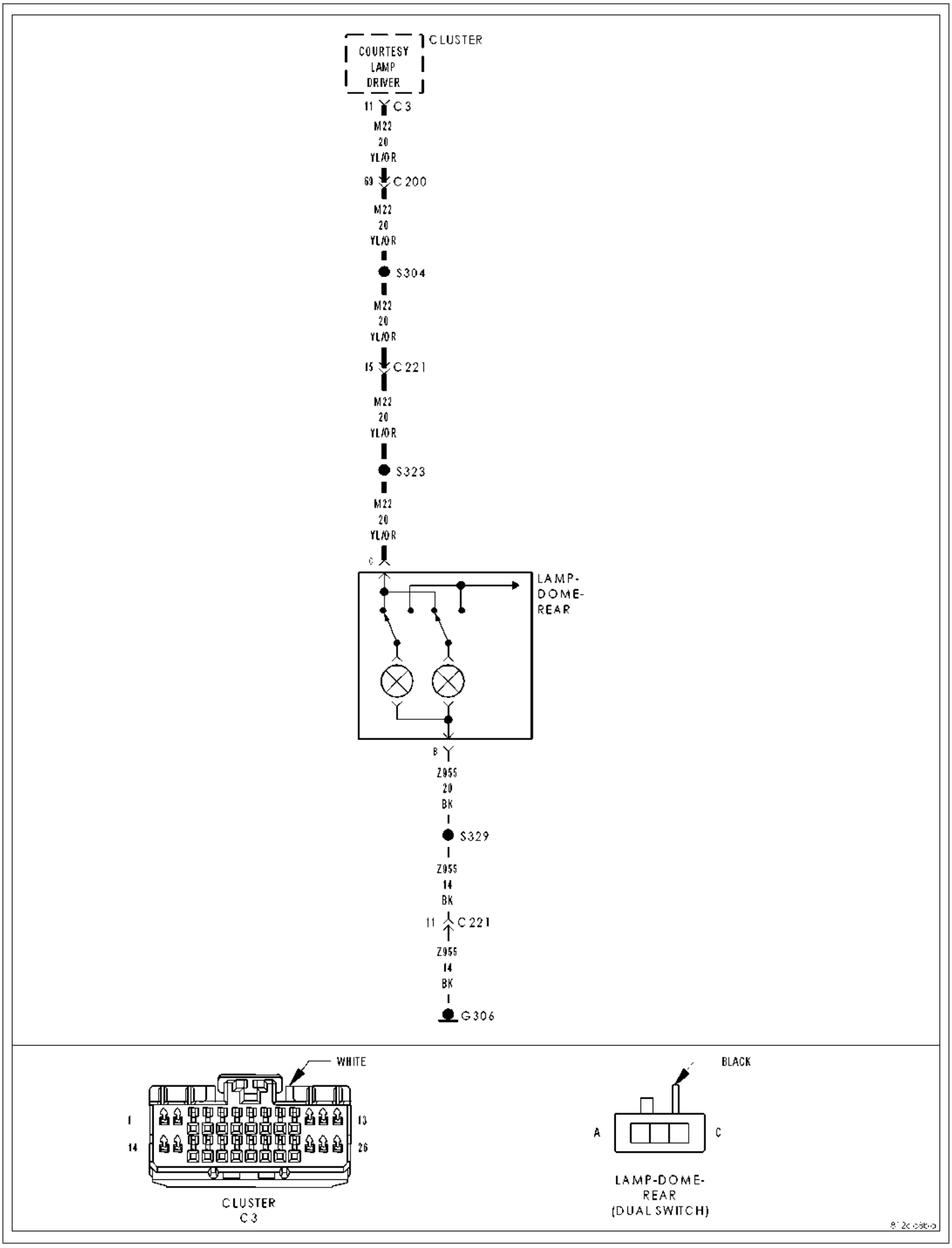


Is the resistance below 5.0 ohms?

Yes >> Repair the Cargo Lamp Output circuit.
Perform the BODY VERIFICATION TEST VER — 1.

No >> Replace the Instrument Cluster in accordance with the service information.
Perform the BODY VERIFICATION TEST VER — 1.

B1629-CARGO LAMP OUTPUT CIRCUIT OPEN



B1629-CARGO LAMP OUTPUT CIRCUIT OPEN (CONTINUED)

For the Interior Lighting circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - INTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- **Set Condition:**

Possible Causes
HEADLAMP SWITCH
(M22) CARGO LAMP OUTPUT CIRCUIT OPEN
INSTRUMENT CLUSTER

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. INTERMITTENT CONDITION

turn the ignition on.

With the Scan Tool, clear all CCN DTC's.

Turn the Cargo Lamps on.

With the Scan Tool, read the DTC information.

Does the SCan Tool read: B1629-CARGO LAMP OUTPUT CIRCUIT OPEN?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST — VER 1.

---

2. HEADLAMP SWITCH

Disconnect the Headlamp Switch connector.

Turn the ignition on.

Using the Scan Tool, read DTC's.

Does the Scan Tool display Headlamp Switch 5.0 volts?

Yes >> Go To 3

No >> Replace the Headlamp Switch.
Perform the BODY VERIFICATION TEST VER — 1.

B1629-CARGO LAMP OUTPUT CIRCUIT OPEN (CONTINUED)

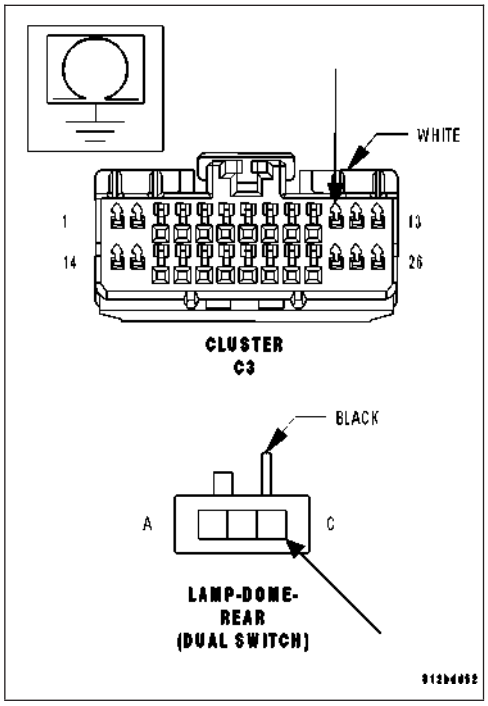
3. INSTRUMENT CLUSTER

Turn the ignition off.
Disconnect the Headlamp Switch connector.
Disconnect the Instrument Cluster C3 connector.
Measure the resistance of the of the (M22) Cargo Lamp Output circuit.

Is the resistance above 5.0 ohms?

Yes >> Repair the (M22) Cargo Lamp Output circuit.
Perform the BODY VERIFICATION TEST VER — 1.

No >> Replace the Instrument Cluster in accordance with the service information.
Perform the BODY VERIFICATION TEST VER — 1.



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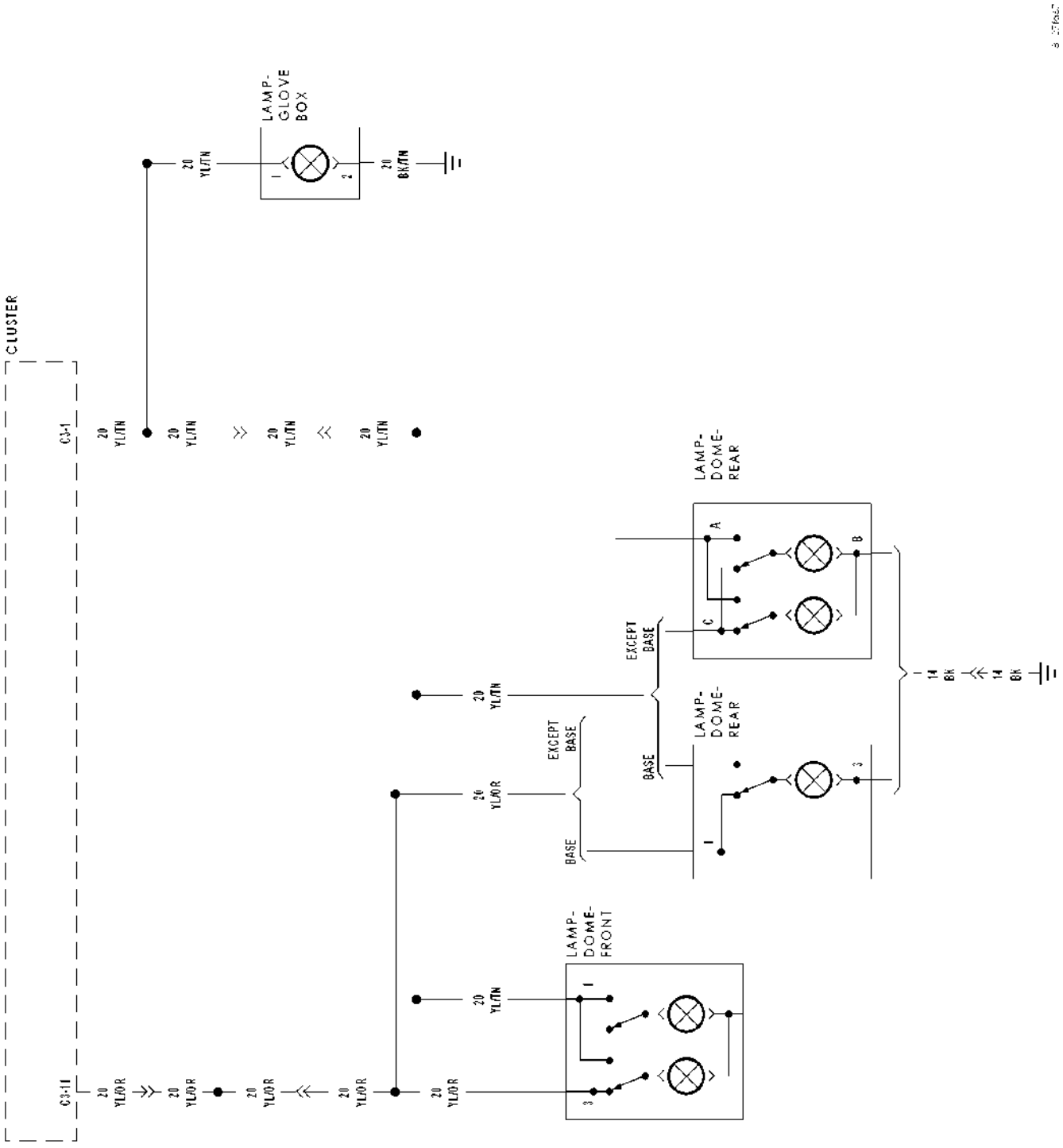

INTERIOR LIGHTING SCHEMATIC

LAMPS/LIGHTING - INTERIOR - SERVICE INFORMATION

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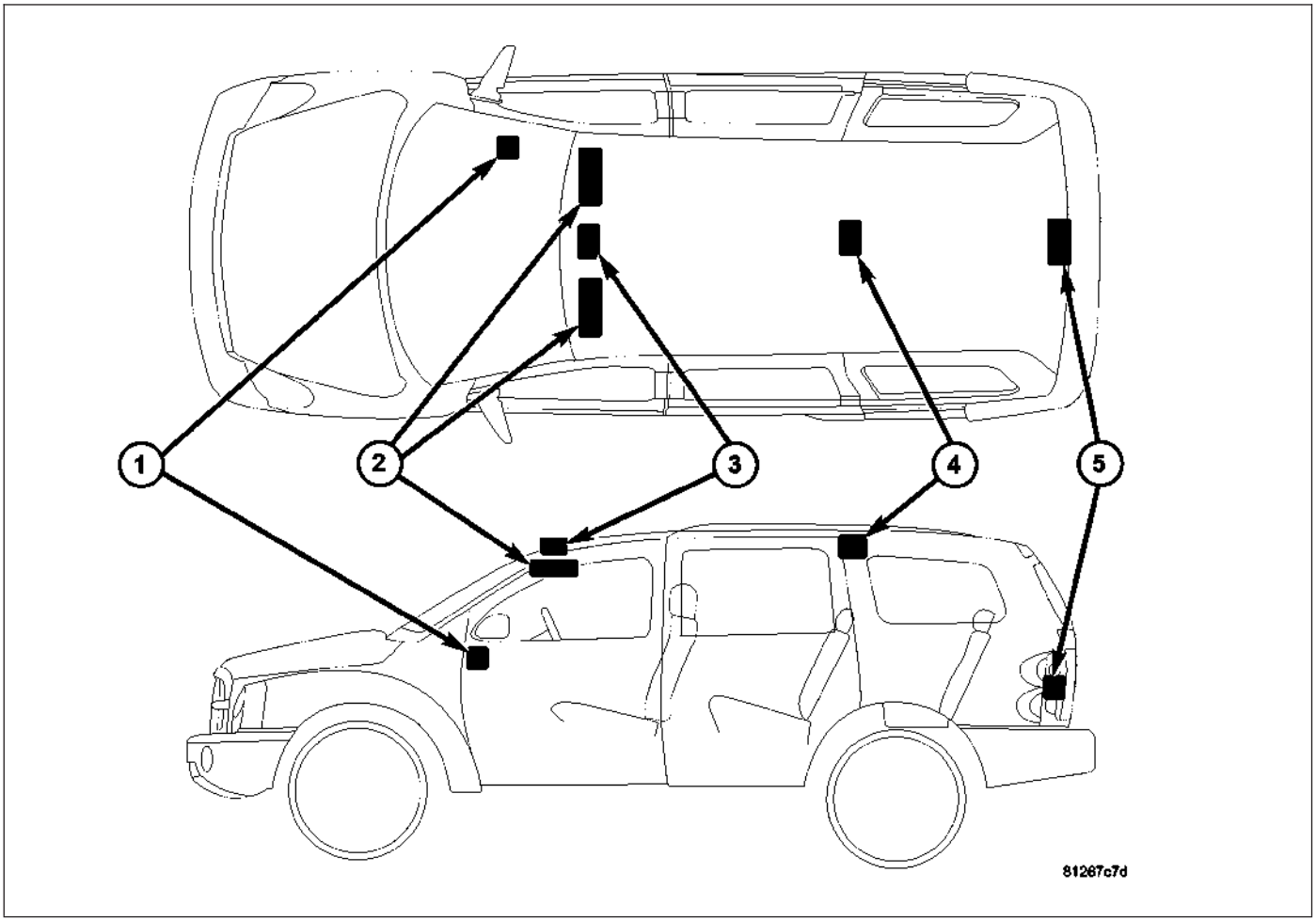
LAMPS/LIGHTING - INTERIOR - SERVICE INFORMATION

DESCRIPTION



The interior lighting system for this model includes incandescent lighting on two separate circuits: the dome/courtesy lamp circuit and the panel lamps dimmer circuit. The lamps on the dome/courtesy circuit include:

- **Glove Box Lamp (1)** - A standard glove box lamp with an integral switch is located at the upper right corner of the instrument panel glove box opening and illuminates whenever the glove box is opened.
- **Liftgate Lamp (5)** - A standard liftgate lamp is located in the lower liftgate trim panel and is activated automatically whenever the liftgate is opened to illuminate the rear cargo area of the vehicle.
- **Front Dome/Reading Lamps (3)** - The standard front dome/reading lamp includes two bulbs and two integral push button actuated switches. This lamp is located in the center of the headliner near the windshield header. In vehicles with an optional overhead console these lamps are replaced by two dome/reading lamps that are integral to the overhead console. The overhead console lamps have switches that are actuated by depressing the lamp lenses.
- **Rear Dome/Reading Lamps (4)** - The standard rear dome/reading lamp includes a single bulb and a switch that is actuated by depressing the lamp lens. In vehicles with an optional overhead console, the rear dome/reading lamp includes two bulbs and two integral push button actuated switches. Either lamp is located in the center of the headliner between the second and third row seating.
- **Vanity Lamps (3)** - Optional single intensity vanity lamps are located on each side of a covered mirror on both the right and left sun visors, and are controlled by an integral vanity mirror cover-actuated switch.

Most controls on the instrument panel and other controls located elsewhere on the interior of the vehicle are illuminated for night visibility. Some have miniature incandescent bulbs or Light-Emitting Diode (LED) units that are soldered to internal circuit boards and are not serviceable. The replaceable incandescent bulbs or bulb/bulb holder units in this vehicle include:

- **Center Bezel Lamp** - An optional center bezel lamp with a replaceable bulb is located on the instrument panel structure below and behind the center bezel to illuminate the center console forward storage bin and cup holders.
- **Compass Mini-Trip Control Illumination Lamps** - The optional Compass Mini-Trip Computer (CMTC) has three replaceable bulb/bulb holder units to illuminate its controls.
- **Front Heater-Air Conditioner Control Illumination Lamps** - The heater-air conditioner control panel has two replaceable bulb/bulb holder units to illuminate its controls.
- **Rear Heater-Air Conditioner Control Illumination Lamp** - The optional rear heater-air conditioner control panel has a replaceable bulb/bulb holder unit to illuminate its controls.

Other components of the interior lighting system for this model include:

- **Door Ajar Switches** - A door ajar switch is integral to the door latch mechanism of each front and rear door.
- **Headlamp Switch** - A headlamp switch is located on the left side of the instrument panel, below and outboard of the steering column. The headlamp switch includes a vertical thumbwheel for selecting the panel lamps dimming level and for interior lighting control. A Parade position of the thumbwheel illuminates all Vacuum Fluorescent Display (VFD) units at full brightness for visibility when driving in daylight with the exterior lighting turned On. There are also detent positions to turn on all interior courtesy lighting, and a Defeat position that overrides door/liftgate ajar switch control of interior lighting. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HEADLAMP SWITCH - DESCRIPTION).
- **Instrument Cluster** - The ElectroMechanical Instrument Cluster (EMIC) is also known as the Cab Control Node (CCN) in this vehicle. The EMIC/CCN is located in the instrument panel above the steering column opening, directly in front of the driver. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DESCRIPTION).
- **Liftgate Ajar Switch** - A liftgate ajar switch is integral to the latch mechanism of the liftgate.

Hard wired circuitry connects the interior lighting system components to the electrical system of the vehicle. These hard wired circuits are integral to several wire harnesses, which are routed throughout the vehicle and retained by many different methods. These circuits may be connected to each other, to the vehicle electrical system and to the interior lighting components through the use of a combination of soldered splices, splice block connectors, and many different types of wire harness terminal connectors and insulators. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, further details on wire harness routing and retention, as well as pin-out and location views for the various wire harness connectors, splices and grounds.

OPERATION

The interior lighting systems can be divided into two general classifications based upon the circuit that controls their operation: The courtesy lamp circuit, or the panel lamps dimmer circuit. The hard wired circuits and components of the interior lighting systems may be diagnosed and tested using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. However, conventional diagnostic methods may not prove conclusive in the diagnosis of the ElectroMechanical Instrument Cluster (EMIC), or the Controller Area Network (CAN) data bus. The most reliable, efficient, and accurate means to diagnose the EMIC, the CAN data bus, or the electronic bus message inputs and outputs related to the various interior lighting systems requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

COURTESY LAMP CIRCUIT

Depending upon the selected vehicle options the courtesy lamp circuit may include the dome or map/reading lamps located in the headliner near the windshield and between the second and third row seating, the liftgate lamp located near the center of the liftgate trim panel, the glove box lamp in the top of the glove box opening in the instrument panel, and the vanity lamps located in the sun visors. The lamps in the courtesy lamp circuit are provided with a path to ground at all times. The EMIC controls the output of battery voltage for the courtesy lamps in this circuit based upon hard wired inputs from the door ajar switches, the liftgate ajar switch, the headlamp switch and the ignition switch.

After all of the ajar switch inputs to the EMIC transition to open, the EMIC will keep the courtesy lamps illuminated for about 30 seconds, then fade the lamps to off (theater dimming) over about three seconds. The EMIC also provides courtesy lamp operation based upon a resistor multiplexed input from the vertical thumbwheel on the headlamp switch, and provides an illuminated entry feature in response to certain electronic message inputs received from the Sentry Key REmote Entry Module (SKREEM) and the Occupant Restraint Controller (ORC) over the CAN

data bus. A resistor multiplexed courtesy lamp defeat input from the vertical thumbwheel of the headlamp switch will cause the EMIC to override normal courtesy lamp operation based upon inputs from all of the ajar switches.

For those lamps on the courtesy lamp circuit with independent switching such as the optional map/reading lamps and vanity lamps, and for the glove box lamp the EMIC provides a battery voltage output to the switches through a separate circuit. The EMIC provides a battery saver (load shedding) feature for all courtesy lamps, which will automatically turn these lamps off if they are left on for more than about eight minutes with the ignition switch in the Off position.

PANEL LAMPS DIMMER CIRCUIT

The panel lamps dimmer circuit actually includes several circuits. These circuits control the illumination and dimming level of the headlamp switch, the front and rear heater-air conditioner controls, the four-wheel drive selector switch and the center bezel lamp. All lamps in the panel lamps dimmer circuits are provided a path to ground at all times through a hard wired ground circuit. These lamps illuminate based upon inputs to the EMIC from the rotary control knob and vertical thumbwheel of the headlamp switch. The control knob on the headlamp switch selects the exterior lights, while the thumbwheel selects the panel lamps intensity (dimming) level.

When the exterior lighting is turned On, the EMIC provides electronic dimming level messages to the radio and the Compass Mini-Trip Computer (CMTC) over the CAN data bus. The EMIC also supplies a 12-volt Pulse Width Modulated (PWM) output to all of the incandescent lamps in the panel lamps dimmer circuits over the several panel lamps dimmer circuits. This shared PWM output synchronizes the selected illumination intensity level of all of the lamps in the panel lamps dimmer circuit.

The radio and the CMTC each use the dimming level messages to control the illumination intensity of both their Vacuum Fluorescent Display (VFD) units and their control lighting. In addition, when the thumbwheel of the headlamp switch is moved to the Parade/Funeral Mode detent position, all of the VFD units are illuminated at their full intensity levels for increased visibility when the vehicle is driven during daylight hours with the exterior lights turned On.

WARNING

WARNINGS - LAMPS/LIGHTING - INTERIOR

WARNING:: To avoid personal injury or death, eye protection should be used when servicing any glass components.

CAUTION: Do not use bulbs with higher candle power than indicated in the Bulb Application table (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - INTERIOR - SPECIFICATIONS). In addition, do not use fuses, circuit breakers or relays having greater amperage value than indicated on the fuse panel or in the Owner's Manual. Damage to lamps, lenses, wiring and other related electrical components can result.

DIAGNOSIS AND TESTING

LAMPS/LIGHTING - INTERIOR

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

NOTE: When diagnosing the interior lighting circuits, remember that high generator output can burn out bulbs rapidly and repeatedly; and, that dim or flickering bulbs can be caused by low generator output or poor battery condition. If one of these symptoms is a problem on the vehicle, be certain to diagnose the battery and charging system, then repair as necessary.

NOTE: A good ground is necessary for proper lighting operation. If a lighting problem is being diagnosed that involves multiple symptoms, systems, or components, the problem can often be traced to a loose, corroded, or open ground.

The hard wired interior lamp and lighting circuits may be diagnosed and tested using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

However, conventional diagnostic methods may not prove conclusive in the diagnosis of the ElectroMechanical Instrument Cluster (EMIC), the Controller Area Network (CAN) data bus, or the electronic message inputs used to provide interior lamp and lighting service or many of the electronic features of the interior lamp and lighting systems. The most reliable, efficient, and accurate means to diagnose the EMIC, the CAN data bus, and the electronic message inputs for the interior lamps and lighting system requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

COURTESY LAMP CIRCUIT

CONDITION	POSSIBLE CAUSES	CORRECTION
A SINGLE LAMP IN THE COURTESY LAMP CIRCUIT DOES NOT ILLUMINATE	1. Faulty or missing bulb.	1. Test and replace the courtesy lamp bulb as required.
	2. Faulty lamp switch.	2. Test and replace a faulty map/reading lamp switch, cargo lamp switch, or sunvisor (vanity lamp switch) as required.
	3. Faulty ground circuit.	3. Test and repair the open ground circuit as required.
	4. Faulty feed circuit.	4. Test and repair the open feed circuit as required.
ALL LAMPS IN THE COURTESY LAMP CIRCUIT DO NOT ILLUMINATE	1. Faulty or missing fuse.	1. Test and replace the fuse as required.
	2. Faulty ground circuit.	2. Test and repair the open ground circuit as required.
	3. Courtesy defeat feature turned On.	3. Turn courtesy defeat feature Off.
	4. Faulty courtesy lamp control circuit.	4. Test and repair the courtesy lamp control circuit as required.
	5. Faulty headlamp switch.	5. Test and replace the headlamp switch as required.
	6. Faulty ElectroMechanical Instrument Cluster (EMIC), EMIC input, or EMIC output.	6. Use a diagnostic scan tool to test the EMIC, its inputs, and its outputs. Refer to the appropriate diagnostic information.
A SINGLE LAMP IN THE COURTESY LAMP CIRCUIT DOES NOT EXTINGUISH	1. Faulty lamp switch.	1. Test and replace a faulty map/reading lamp switch, glove box lamp switch, or sunvisor (vanity lamp switch) as required.
ALL LAMPS IN THE COURTESY LAMP CIRCUIT DO NOT EXTINGUISH	1. Faulty ajar switch.	1. Test and replace a faulty door, or liftgate ajar switch as required.
	2. Faulty ajar switch sense circuit.	2. Test and repair the shorted ajar switch sense circuit as required.
	3. Faulty ElectroMechanical Instrument Cluster (EMIC), EMIC input, or EMIC output.	3. Use a diagnostic scan tool to test the EMIC, its inputs, and its outputs. Refer to the appropriate diagnostic information.

PANEL LAMPS DIMMER CIRCUIT

NOTE: As part of the exterior lighting failsafe feature, upon ignition On all of the panel lamps dimmer circuit lamps will illuminate at full intensity and the exterior park lamps and headlamp low beams will illuminate regardless of the headlamp switch position if the instrument cluster cannot detect an input from the headlamp switch, or if there is a loss of data bus communication.

CONDITION	POSSIBLE CAUSES	CORRECTION
A SINGLE LAMP DOES NOT ILLUMINATE	1. Faulty or missing bulb.	1. Test and replace lamp bulb as required.
	2. Faulty ground circuit.	2. Test and repair lamp ground circuit as required.
	3. Faulty feed circuit.	3. Test and repair open feed circuit as required.
A SINGLE LAMP DOES NOT EXTINGUISH	1. Faulty feed circuit.	1. Test and repair shorted feed circuit as required.
ALL LAMPS DO NOT ILLUMINATE	1. Faulty headlamp switch.	1. Test and replace the headlamp switch as required.
	2. Faulty ElectroMechanical Instrument Cluster (EMIC), EMIC input, or EMIC output.	2. Use a diagnostic scan tool to test the EMIC, its inputs, and its outputs. Refer to the appropriate diagnostic information.
ALL LAMPS ILLUMINATE AT FULL INTENSITY AT IGNITION ON	1. Loss of data bus communication.	1. Use a diagnostic scan tool to test the data bus. Refer to the appropriate diagnostic information.

SPECIFICATIONS

LAMPS/LIGHTING - INTERIOR

COURTESY LAMPS

BULB APPLICATION TABLE	
LAMP	**BULB**
FRONT DOME/READING EXCEPT WITH OVERHEAD CONSOLE	578
FRONT DOME/READING WITH OVERHEAD CONSOLE	214-2
GLOVE BOX LAMP	194
LIFTGATE LAMP	567
REAR DOME/READING	578
VANITY LAMP	37

PANEL LAMPS

BULB APPLICATION TABLE	
LAMP	**BULB**
CENTER BEZEL LAMP	37
COMPASS MINI-TRIP CONTROL	MOPAR 04437661
FRONT A/C-HEAT CONTROL	MOPAR 05135537AA
REAR A/C-HEAT CONTROL	MOPAR 05019519AA

AJAR SWITCH

DESCRIPTION

DOOR

This vehicle has four door ajar switches, one for each door. Each switch is concealed within and integral to its respective door latch unit. The switches are momentary leaf contact-type units that are actuated by the mechanisms internal to the door latch. A short pigtail wire and connector on each door latch connects the door ajar switch to the vehicle electrical system through its respective door wire harness. The door ajar switches cannot be adjusted or repaired and, if faulty or damaged, the door latch unit must be replaced. (Refer to 23 - BODY/DOOR - FRONT/LATCH - REMOVAL) or (Refer to 23 - BODY/DOOR - REAR/LATCH - REMOVAL).

LIFTGATE

A liftgate ajar switch is standard equipment on this vehicle. The switch is concealed within and integral to the liftgate latch unit. The switch is a momentary leaf contact-type unit that is actuated by the liftgate latch mechanisms. An integral connector receptacle on the liftgate latch connects the liftgate ajar switch to the vehicle electrical system through the liftgate wire harness. The liftgate ajar switch cannot be adjusted or repaired and, if faulty or damaged, the liftgate latch unit must be replaced. (Refer to 23 - BODY/LIFTGATE/LATCH - REMOVAL).

OPERATION

DOOR

The door ajar switches are actuated by the mechanisms internal to the door latch. When a door is closed and properly latched, its door ajar switch is an open circuit. When a door is open or only partially latched, the door ajar switch is a closed circuit. The rear door ajar switches are hard wired in series between a body ground and the ElectroMechanical Instrument Cluster (EMIC). On vehicles not equipped with the optional memory system, the front door ajar switches are also hard wired in series between ground and the EMIC.

On vehicles equipped with the optional memory system each front door ajar switch is hard wired in series between ground and its respective driver or passenger Memory Mirror Module (MMM) located in the front door. The MMM then sends electronic door ajar switch status messages to the EMIC over the Controller Area Network (CAN) data bus. Both the EMIC and the MMM read the hard wired door ajar switch inputs through internal pull-ups, then use these inputs to control many electronic functions and features of the vehicle.

The door ajar switches can be diagnosed and tested using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. However, conventional diagnostic methods may not prove conclusive in the diagnosis of the EMIC, the driver or passenger MMM, the CAN data bus, or the electronic messaging used to convey door ajar switch status to other modules in the vehicle. The most reliable, efficient, and accurate means to diagnose the EMIC, the driver or passenger MMM, the CAN data bus, and both the hard wired and electronic message inputs and outputs affected by the door ajar switch inputs requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

LIFTGATE

The liftgate ajar switch is actuated by the liftgate latch mechanism. When the liftgate is closed and properly latched, its liftgate ajar switch is an open circuit. When the liftgate is open or only partially latched, the liftgate ajar switch is a closed circuit. The liftgate ajar switch is hard wired in series between a body ground and the ElectroMechanical Instrument Cluster (EMIC). The EMIC reads the hard wired liftgate ajar switch input through an internal pull-up, then uses this input to control many electronic functions and features of the vehicle.

The liftgate ajar switch can be diagnosed and tested using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. However, conventional diagnostic methods may not prove conclusive in the diagnosis of the EMIC, the Controller Area Network (CAN) data bus, or the electronic messaging used to convey liftgate ajar switch status to other modules in the vehicle. The most reliable, efficient, and accurate means to diagnose the EMIC, the CAN data bus, and both the hard wired and electronic message inputs and outputs affected by the liftgate ajar switch inputs requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

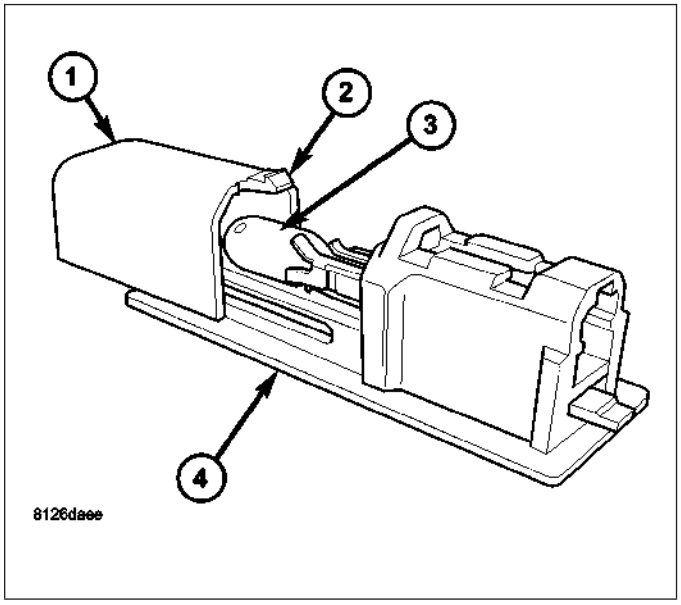
CENTER BEZEL LAMP

REMOVAL

BULB

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

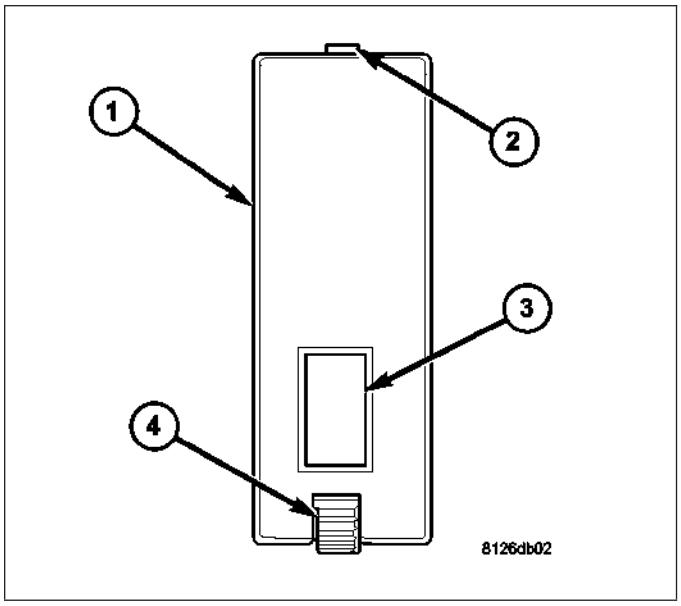
1. Disconnect and isolate the battery negative cable.
2. Remove the center bezel lamp unit (4) from the instrument panel. (Refer to 8 - ELECTRICAL/ LAMPS/LIGHTING - INTERIOR/CENTER BEZEL LAMP UNIT - REMOVAL).
3. Depress the latch tab (2) and slide the hood (1) off of the end of the lamp housing.
4. Pull the base of the bulb (3) straight out of the bulb holder within the lamp housing.



LAMP

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

1. Disconnect and isolate the battery negative cable.
2. The center bezel lamp unit (1) is located on the instrument panel center support structure, which forms the roof of the center floor console forward storage bin. Reach into the storage compartment and use a small thin-bladed screwdriver to depress the lamp retaining latch (4) on the end of the lamp housing nearest the lens (3).
3. Pull the lamp down and rearward to disengage the fixed retainer (2) from the mounting hole.
4. Disconnect the wire harness connector from the lamp connector.
5. Remove the lamp unit from the storage bin.



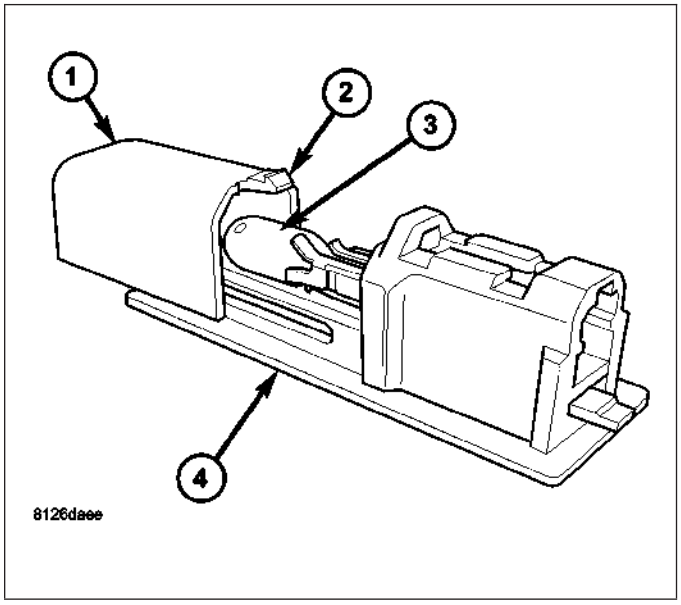
INSTALLATION

BULB

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

CAUTION: Always use the correct bulb size and type for replacement. An incorrect bulb size or type may overheat and cause damage to the lamp, the socket and/or the lamp wiring.

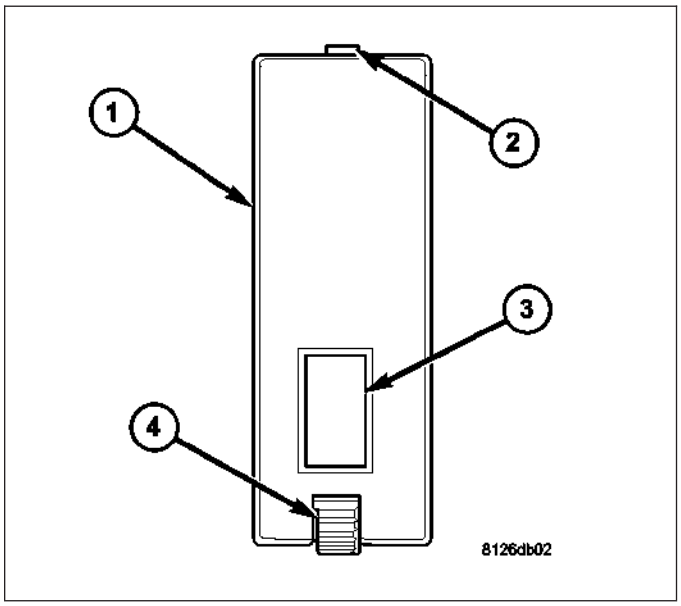
1. Align the base of the center bezel lamp bulb (3) with the bulb holder within the lamp housing (4).
2. Push the bulb straight into the bulb holder until the base is firmly seated.
3. Slide the hood (1) over the end of the lamp housing until the latch tab (2) snaps into place.
4. Reinstall the lamp unit into the instrument panel. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - INTERIOR/CENTER BEZEL LAMP UNIT - INSTALLATION).
5. Reconnect the battery negative cable.



LAMP

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

1. Position the center bezel lamp unit (1) into the forward storage bin of the center floor console.
2. Reconnect the wire harness connector to the lamp connector.
3. Engage the fixed retainer (2) of the lamp with the forward edge of the mounting hole in the instrument panel support structure.
4. Push the rearward end of the lamp upward until the retaining latch (4) snaps into the mounting hole.
5. Reconnect the battery negative cable.

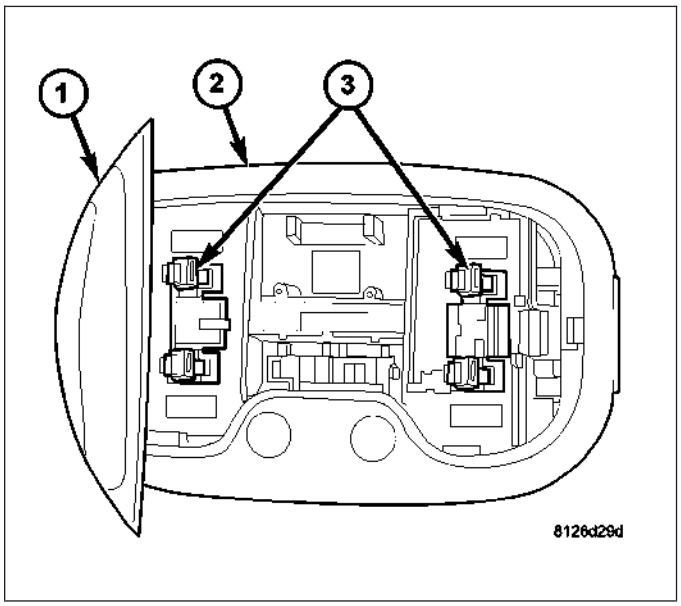


DOME LAMP

REMOVAL

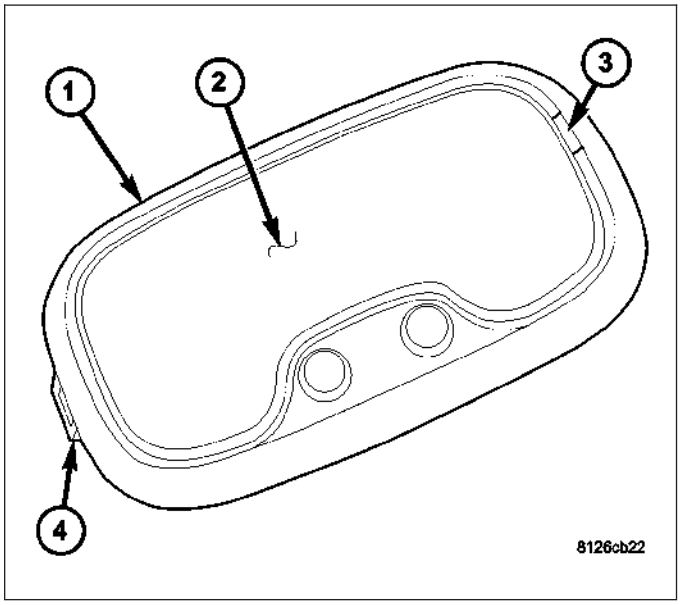
BULB - FRONT

1. Disconnect and isolate the battery negative cable.
2. Remove the front dome lamp unit (2) from the headliner. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - INTERIOR/FRONT DOME LAMP UNIT - REMOVAL).
3. With the lamp lens (1) in the open position, carefully unsnap the bulb (3) from the two bulb holders within the front dome lamp housing.



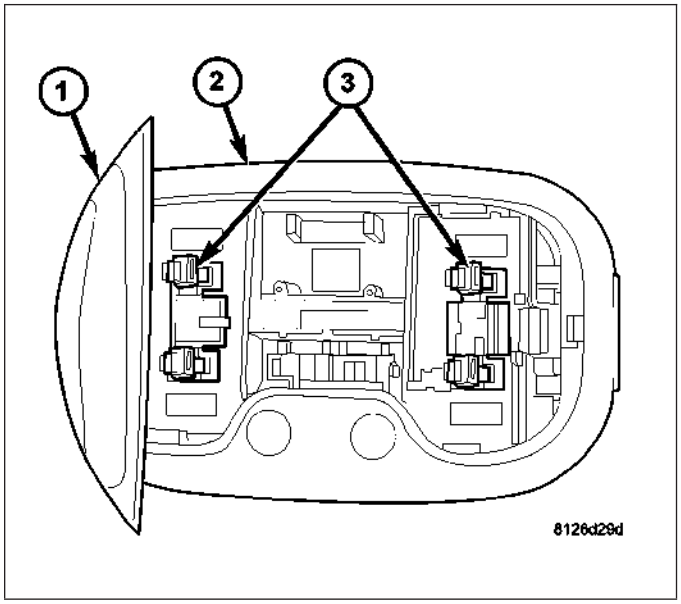
LAMP - FRONT

1. Disconnect and isolate the battery negative cable.
2. Insert the tip of a small flat bladed screwdriver into the notch (3) between the lens (2) and the housing (1) on one side of the dome lamp unit.
3. Gently pry the end of the lens downward until it unsnaps from the housing.
4. Swing the lens downward until it is perpendicular to the housing.
5. Pull the lens hinge/retainer end (4) of the housing downward slightly from the headliner, then slide the lowered end of the housing away from the mounting hole far enough to disengage the fixed retainer on the notched end from the headliner.
6. Pull the lamp away from the headliner mounting hole far enough to disconnect the wire harness connector from the back of the lamp.
7. Remove the lamp from the vehicle.



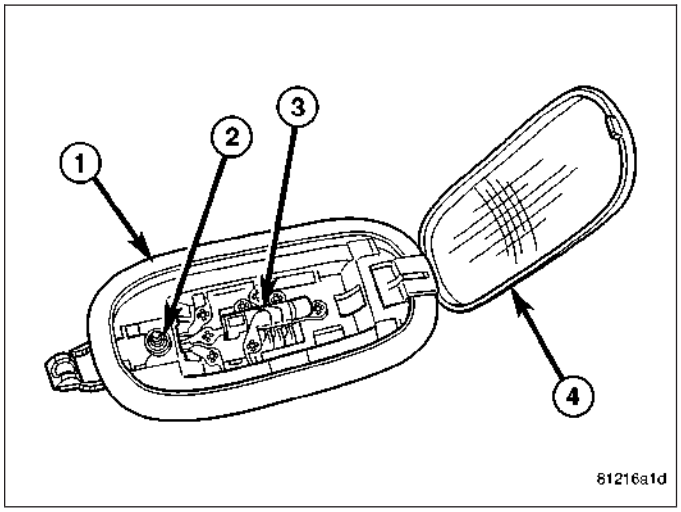
BULB - REAR WITH OVERHEAD CONSOLE

1. Disconnect and isolate the battery negative cable.
2. Remove the rear dome lamp unit (2) from the headliner. (Refer to 8 - ELECTRICAL/LAMPS/ LIGHTING - INTERIOR/REAR DOME LAMP UNIT - REMOVAL).
3. With the lamp lens (1) in the open position, carefully unsnap the bulb (3) from the two bulb holders within the rear dome lamp housing.



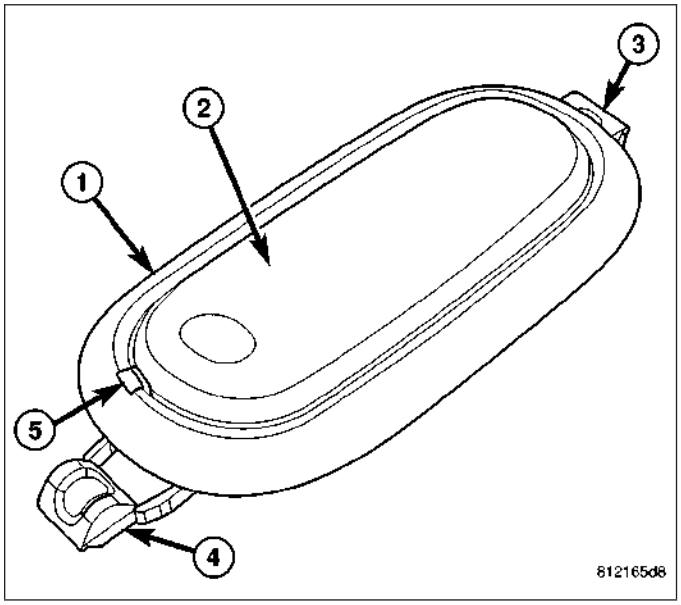
BULB - REAR EXCEPT WITH OVERHEAD CONSOLE

1. Disconnect and isolate the battery negative cable.
2. Insert the tip of a small flat-bladed screwdriver into the notch on one side of the rear dome lamp between the lens (4) and the lamp housing (1).
3. Gently pry the notched edge of the lens downward until it unsnaps from the housing.
4. Swing the notched end of the lens downward far enough to access the bulb (3).
5. Carefully unsnap the bulb from the two bulb holders within the rear dome lamp housing.



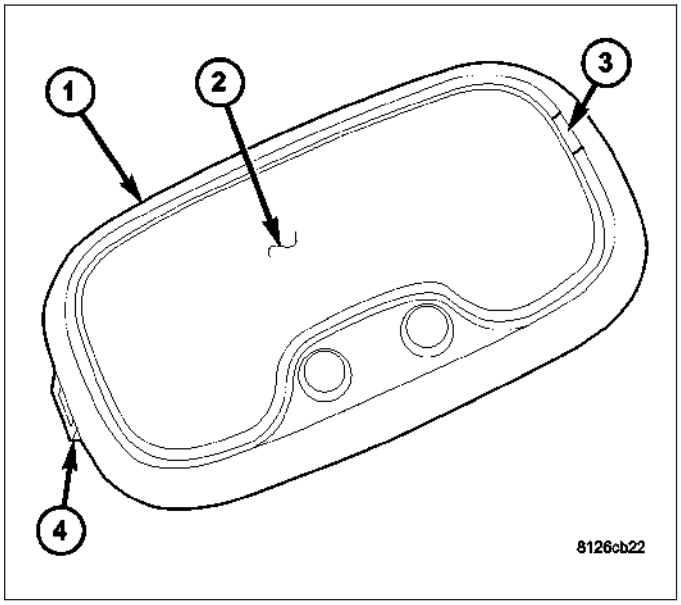
LAMP - REAR EXCEPT WITH OVERHEAD CONSOLE

1. Disconnect and isolate the battery negative cable.
2. Insert the tip of a small flat bladed screwdriver into the notch (5) between the lens (2) and the housing (1) on one side of the dome lamp unit.
3. Gently pry the end of the lens outward until it unsnaps from the housing.
4. Swing the lens outward until it is perpendicular to the housing.
5. Pull the lens hinge/retainer end (3) of the housing outward slightly from the headliner, then slide the exposed end of the housing away from the mounting hole far enough to disengage the fixed retainer (4) on the notched end from the headliner.
6. Pull the lamp away from the headliner mounting hole far enough to access and disconnect the wire harness connector from the back of the lamp.
7. Remove the lamp from the vehicle.



LAMP - REAR WITH OVERHEAD CONSOLE

1. Disconnect and isolate the battery negative cable.
2. Insert the tip of a small flat bladed screwdriver into the notch (3) between the lens (2) and the housing (1) on one side of the dome lamp unit.
3. Gently pry the end of the lens downward until it unsnaps from the housing.
4. Swing the lens downward until it is perpendicular to the housing.
5. Pull the lens hinge/retainer end (4) of the housing downward slightly from the headliner, then slide the lowered end of the housing away from the mounting hole far enough to disengage the fixed retainer on the notched end from the headliner.
6. Pull the lamp away from the headliner mounting hole far enough to disconnect the wire harness connector from the back of the lamp.
7. Remove the lamp from the vehicle.

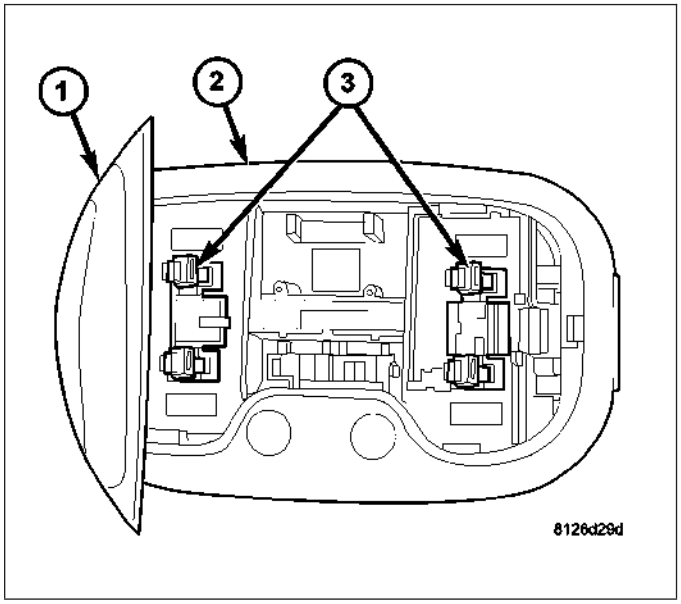


INSTALLATION

BULB - FRONT

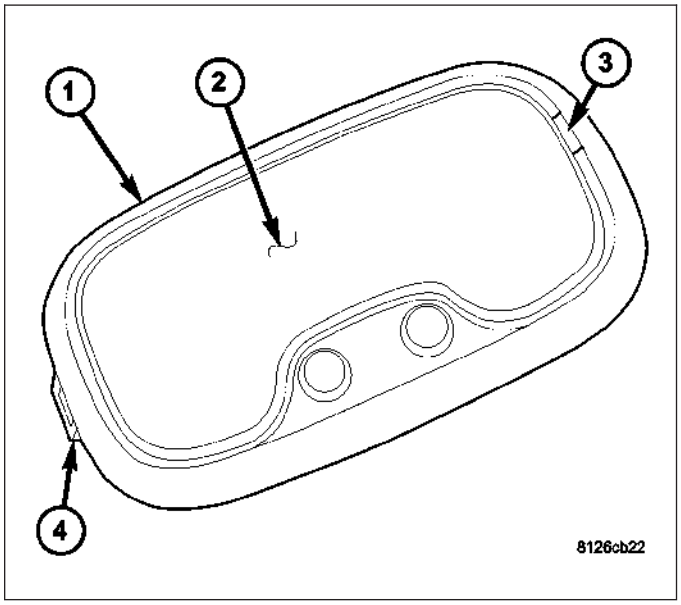
CAUTION: Always use the correct bulb size and type for replacement. An incorrect bulb size or type may overheat and cause damage to the lamp, the socket and/or the lamp wiring.

1. With the dome lamp lens (1) in the open position, align the ends of the bulb (3) with the two bulb holders within the front dome lamp housing (2).
2. Carefully press the bulb firmly and evenly into the bulb holders until it snaps into place.
3. Reinstall the lamp into the headliner. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - INTERIOR/ FRONT DOME LAMP UNIT - INSTALLATION).
4. Reconnect the battery negative cable.



LAMP - FRONT

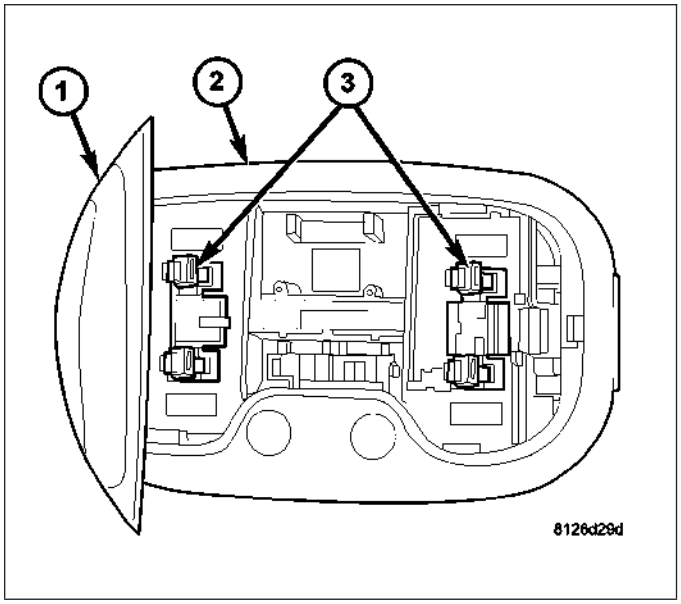
1. Position the dome lamp unit (1) to the mounting hole in the headliner.
2. Reconnect the wire harness connector to the connector on the back of the lamp.
3. Insert the fixed retainer on the notched end (3) of the lamp housing up into one side of the mounting hole in the headliner.
4. Slide the notched end of the housing into the mounting hole far enough to engage the lens hinge/retainer (4) into the opposite side of the hole in the headliner.
5. Gently and evenly press the lens hinge/retainer end of the lamp upward into the mounting hole until the bezel of the lamp housing is flush with the headliner.
6. Swing the notched end of the lamp lens (2) up into position against the lamp housing, then press upward on the lens firmly and evenly until it snaps into the housing.
7. Reconnect the battery negative cable.



BULB - REAR WITH OVERHEAD CONSOLE

CAUTION: Always use the correct bulb size and type for replacement. An incorrect bulb size or type may overheat and cause damage to the lamp, the socket and/or the lamp wiring.

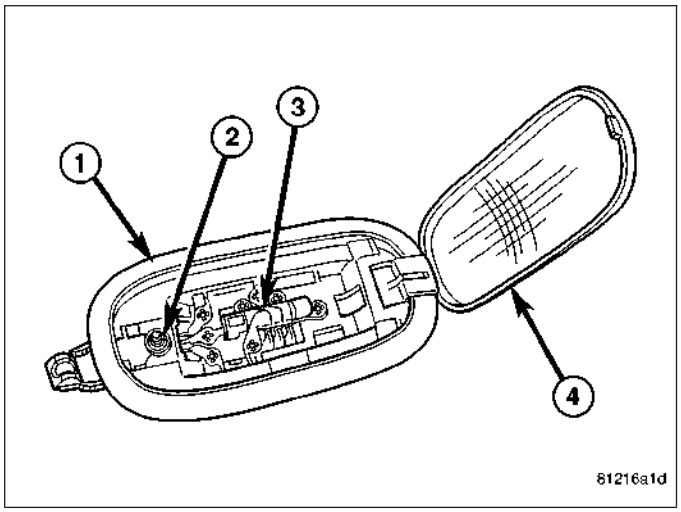
1. With the dome lamp lens (1) in the open position, align the ends of the bulb (3) with the two bulb holders within the rear dome lamp housing (2).
2. Carefully press the bulb firmly and evenly into the bulb holders until it snaps into place.
3. Reinstall the rear dome lamp unit into the headliner. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - INTERIOR/REAR DOME LAMP UNIT - INSTALLATION).
4. Reconnect the battery negative cable.



BULB - REAR EXCEPT WITH OVERHEAD CONSOLE

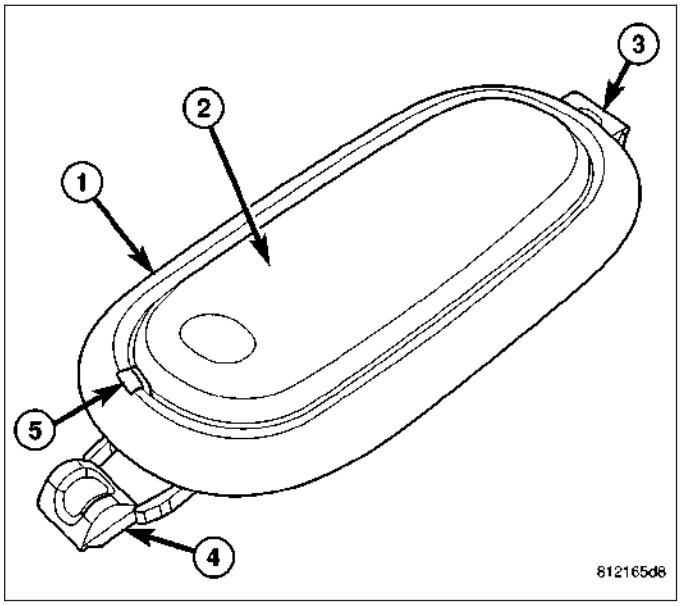
CAUTION: Always use the correct bulb size and type for replacement. An incorrect bulb size or type may overheat and cause damage to the lamp, the socket and/or the lamp wiring.

1. Align the ends of the bulb (3) with the two bulb holders within the rear dome lamp housing (1).
2. Carefully press the bulb firmly and evenly into the bulb holders until it snaps into place.
3. Swing the notched end of the lens (4) up into position against the housing, then press upward on the lens firmly and evenly until it snaps into the housing.
4. Reconnect the battery negative cable.



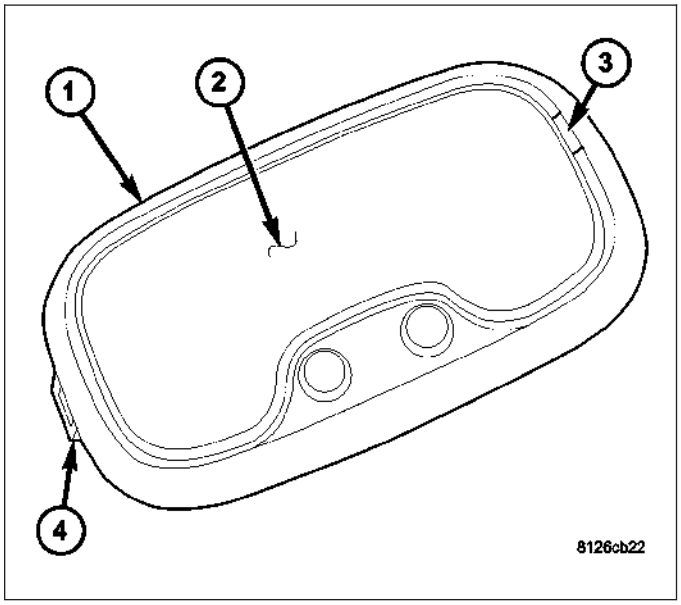
LAMP - REAR EXCEPT WITH OVERHEAD CONSOLE

1. Position the dome lamp unit (1) to the mounting hole in the headliner.
2. Reconnect the wire harness connector to the connector on the back of the lamp.
3. Insert the fixed retainer on the notched end (4) of the lamp housing up into one side of the mounting hole in the headliner.
4. Slide the notched end of the housing into the mounting hole far enough to engage the lens hinge/retainer (3) into the opposite side of the hole in the headliner.
5. Gently and evenly press the lens hinge/retainer end of the lamp into the mounting hole until the bezel of the lamp housing is flush with the headliner.
6. Swing the notched end of the lamp lens (2) into position against the lamp housing, then press on the lens firmly and evenly until it snaps into the housing.
7. Reconnect the battery negative cable.



LAMP - REAR WITH OVERHEAD CONSOLE

1. Position the dome lamp unit (1) to the mounting hole in the headliner.
2. Reconnect the wire harness connector to the connector on the back of the lamp.
3. Insert the fixed retainer on the notched end (3) of the lamp housing up into one side of the mounting hole in the headliner.
4. Slide the notched end of the housing into the mounting hole far enough to engage the lens hinge/retainer (4) into the opposite side of the hole in the headliner.
5. Gently and evenly press the lens hinge/retainer end of the lamp upward into the mounting hole until the bezel of the lamp housing is flush with the headliner.
6. Swing the notched end of the lamp lens (2) up into position against the lamp housing, then press upward on the lens firmly and evenly until it snaps into the housing.
7. Reconnect the battery negative cable.



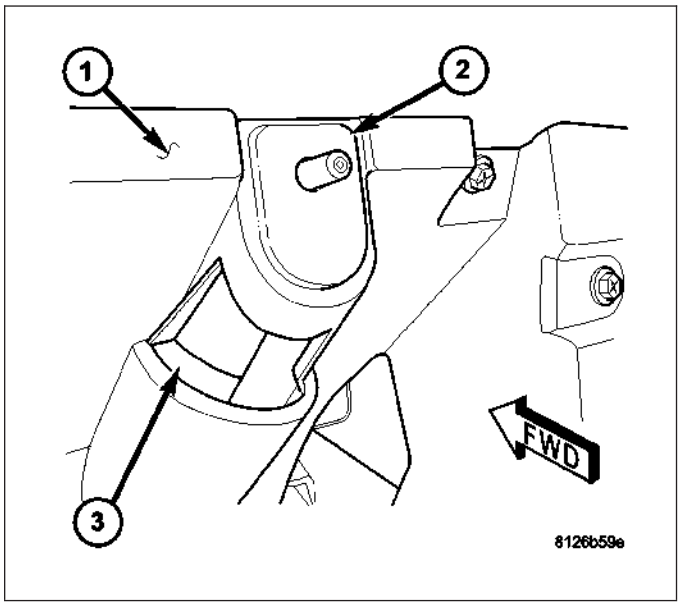
GLOVE BOX LAMP/SWITCH

REMOVAL

BULB

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

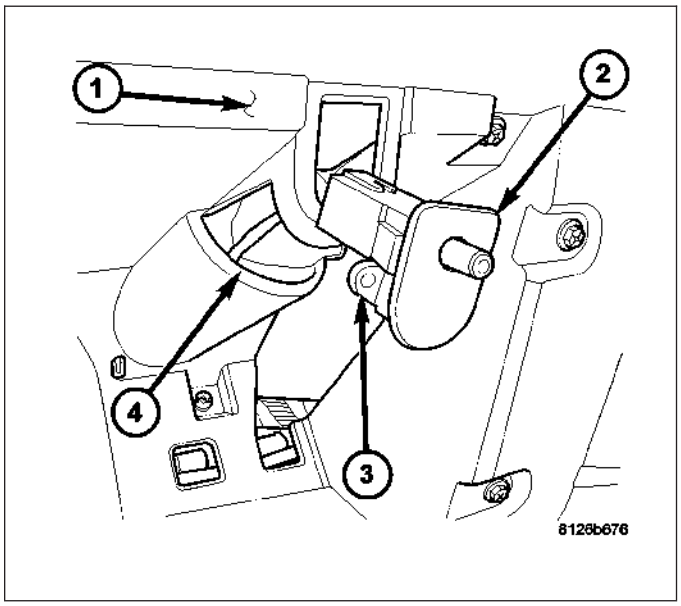
1. Disconnect and isolate the battery negative cable.
2. Remove the glove box from the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/ GLOVE BOX - REMOVAL).
3. Reach through the window (3) in the instrument panel glove box opening (1) to access the bulb on the lower side of the glove box lamp and switch unit (2).
4. Pull the base of the bulb straight out of the bulb holder.



LAMP/SWITCH

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

1. Disconnect and isolate the battery negative cable.
2. Remove the glove box from the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/ GLOVE BOX - REMOVAL).
3. Reach through the window (4) in the instrument panel (1) to access and depress the retaining latch on either side of the glove box lamp and switch unit (2).
4. While holding the retaining latch depressed, push the glove box lamp and switch unit out through the mounting hole in the face of the instrument panel.
5. Disconnect the wire harness connector from the glove box lamp and switch.
6. Remove the lamp and switch unit from the instrument panel.



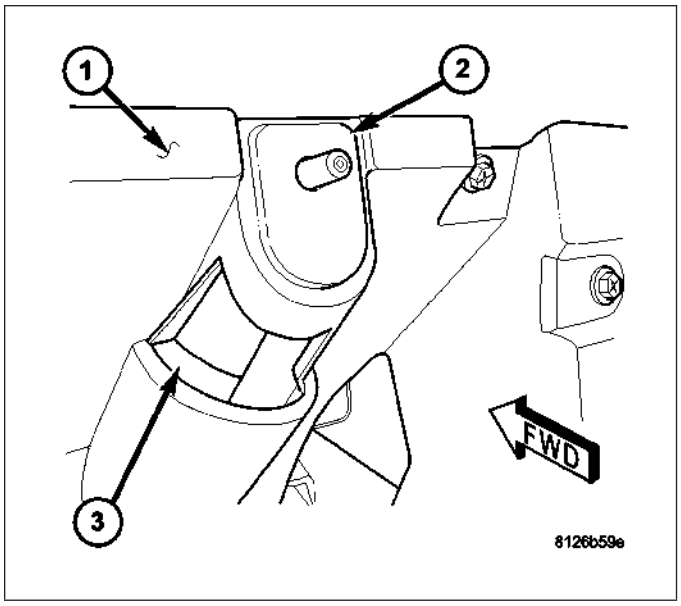
INSTALLATION

BULB

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

CAUTION: Always use the correct bulb size and type for replacement. An incorrect bulb size or type may overheat and cause damage to the lamp, the socket and/or the lamp wiring.

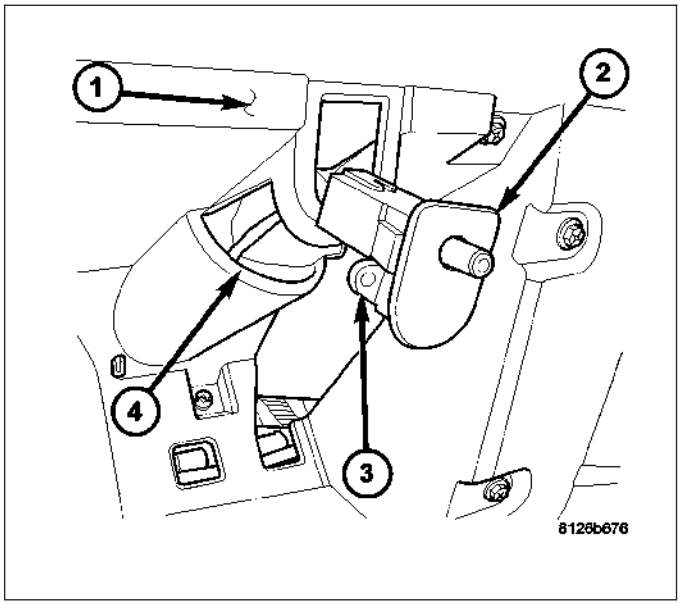
1. Reach through the window (3) in the instrument panel glove box opening (1) to align the base of the bulb with the bulb holder on the lower side of the glove box lamp and switch unit (2).
2. Push the bulb straight into the bulb holder until the base is firmly seated.
3. Reinstall the glove box into the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/ GLOVE BOX - INSTALLATION).
4. Reconnect the battery negative cable.



LAMP/SWITCH

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

1. Position the glove box lamp and switch unit (2) to the instrument panel (1).
2. Reconnect the wire harness connector to the lamp and switch unit.
3. Feed the wire harness back through the switch mounting hole.
4. Align the lamp and switch unit with the mounting hole in the instrument panel.
5. Using hand pressure, push the lamp and switch unit firmly and evenly into the mounting hole until it is fully seated.
6. Reinstall the glove box into the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/ GLOVE BOX - INSTALLATION).
7. Reconnect the battery negative cable.



ILLUMINATION LAMP

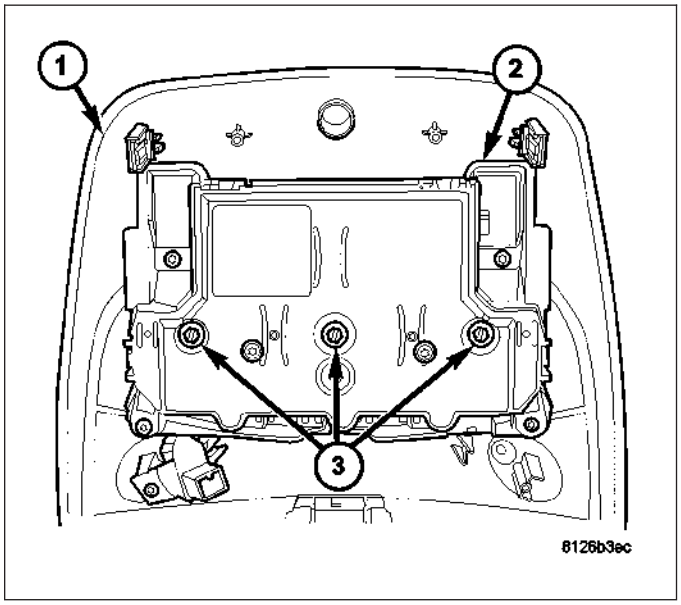
REMOVAL

BULB - CMTC CONTROL

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

NOTE: There are provisions for three bulb/bulb holder units on the Compass Mini-Trip Computer (CMTC) circuit board. The two outboard bulbs illuminate the CMTC push buttons, while the center bulb illuminates the optional universal transmitter push buttons. Therefore, the center bulb location is only populated on vehicles equipped with the optional universal transmitter.

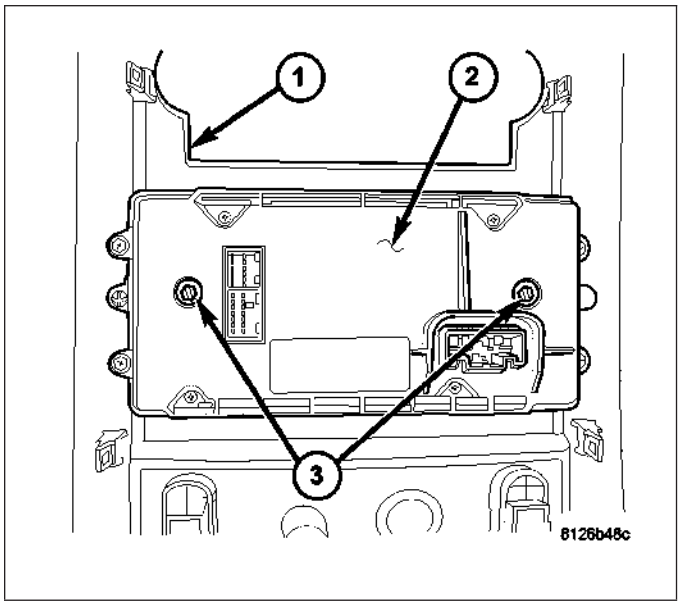
1. Disconnect and isolate the battery negative cable.
2. Remove the overhead console (1) from the headliner. (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - REMOVAL).
3. Use a small thin-bladed screwdriver to rotate the bulb holder (3) counterclockwise about 30 degrees to unlock it from the keyed opening in the Compass Mini-Trip Computer (CMTC) unit (2) circuit board.
4. Pull the bulb holder and bulb straight out of the circuit board.



BULB - FRONT A/C-HEAT CONTROL

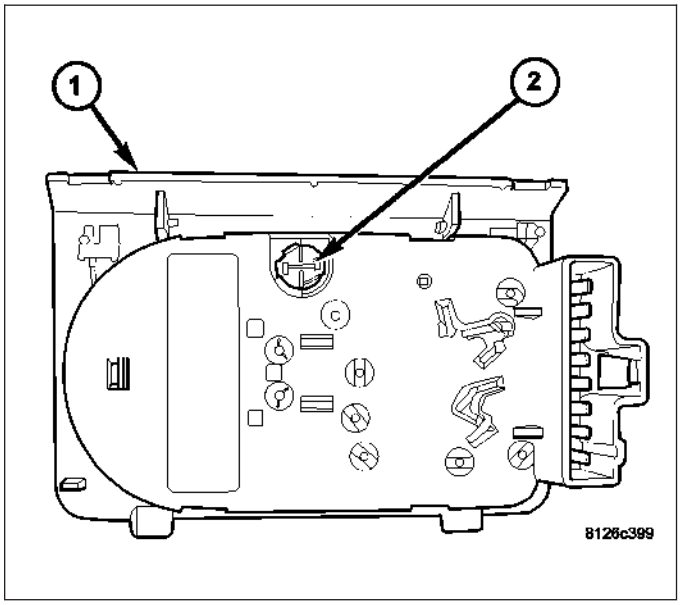
WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

1. Disconnect and isolate the battery negative cable.
2. Remove the center bezel (1) from the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/ INSTRUMENT PANEL CENTER BEZEL - REMOVAL).
3. Use a small thin-bladed screwdriver to rotate the bulb holder (3) counterclockwise about 30 degrees to unlock it from the keyed opening in the front A/C-heater control (2) circuit board.
4. Pull the bulb holder and bulb straight out of the circuit board.



BULB - REAR A/C-HEAT CONTROL

1. Disconnect and isolate the battery negative cable.
2. Remove the rear A/C-heater control from the center floor console. (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS - REAR/A/C-HEATER CONTROL - REMOVAL).
3. Use a small thin-bladed screwdriver to rotate the bulb holder (2) counterclockwise about 30 degrees to unlock it from the keyed opening in rear A/C-heater control (1) circuit board.
4. Pull the bulb holder and bulb straight out of the circuit board.



INSTALLATION

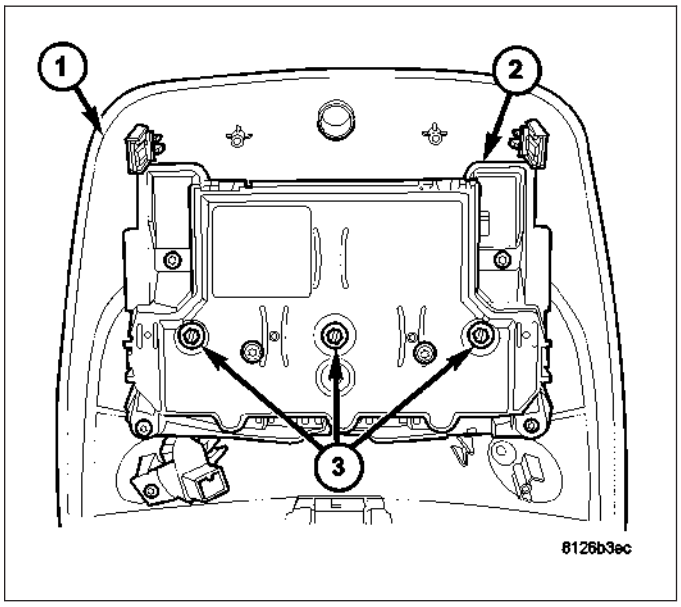
BULB - CMTC CONTROL

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

CAUTION: Always use the correct bulb size and type for replacement. An incorrect bulb size or type may overheat and cause damage to the lamp, the socket and/or the lamp wiring.

NOTE: There are provisions for three bulb/bulb holder units on the Compass Mini-Trip Computer (CMTC) circuit board. The two outboard bulbs illuminate the CMTC push buttons, while the center bulb illuminates the optional universal transmitter push buttons. Therefore, the center bulb location is only populated on vehicles equipped with the optional universal transmitter.

1. Align the bulb holder and bulb (3) with the keyed opening in the circuit board of the Compass Mini-Trip Computer (CMTC) (2).
2. Insert the bulb holder and bulb straight into the circuit board until the bulb holder is firmly seated.
3. Using a small thin-bladed screwdriver, rotate the bulb holder clockwise about 30 degrees on the circuit board to lock it into place.
4. Reinstall the overhead console (1) onto the headliner. (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - INSTALLATION).
5. Reconnect the battery negative cable.

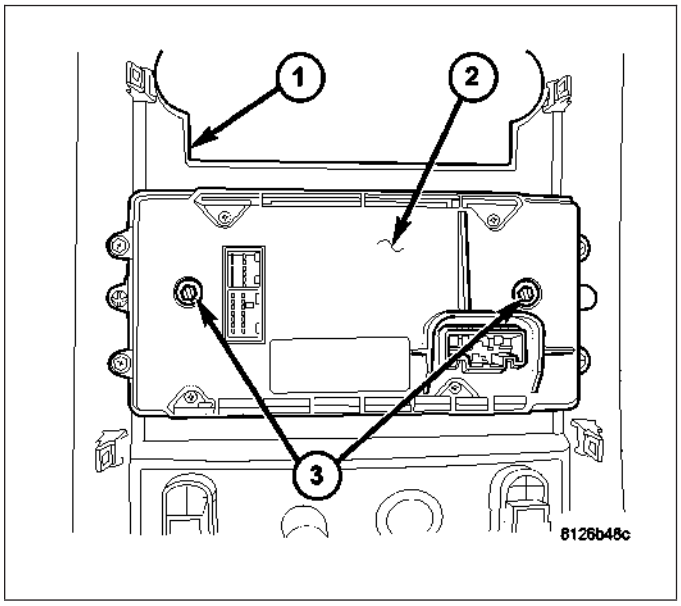


BULB - FRONT A/C-HEAT CONTROL

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

CAUTION: Always use the correct bulb size and type for replacement. An incorrect bulb size or type may overheat and cause damage to the lamp, the socket and/or the lamp wiring.

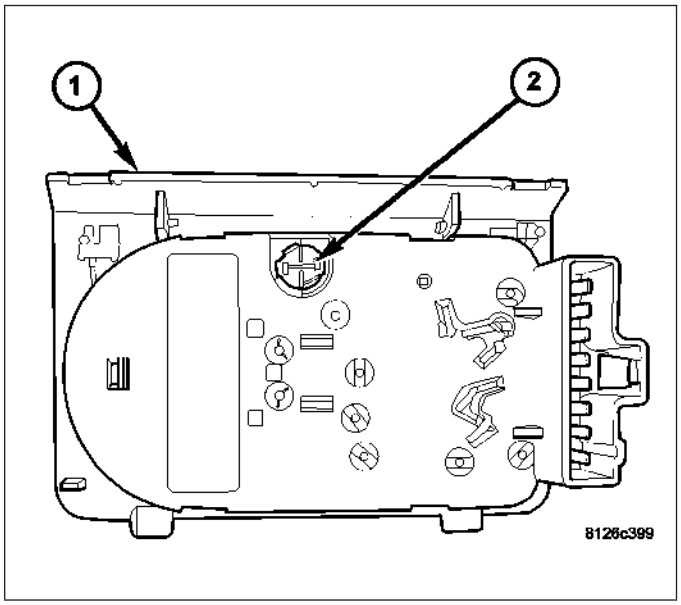
1. Align the bulb holder and bulb (3) with the keyed opening in the circuit board of the front A/C-heater control (2).
2. Insert the bulb holder and bulb straight into the circuit board until the bulb holder is firmly seated.
3. Using a small thin-bladed screwdriver, rotate the bulb holder clockwise about 30 degrees on the circuit board to lock it into place.
4. Reinstall the center bezel (1) onto the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/ INSTRUMENT PANEL CENTER BEZEL - INSTALLATION).
5. Reconnect the battery negative cable.



BULB - REAR A/C-HEAT CONTROL

CAUTION: Always use the correct bulb size and type for replacement. An incorrect bulb size or type may overheat and cause damage to the lamp, the socket and/or the lamp wiring.

1. Align the bulb holder and bulb (2) with the keyed opening in the circuit board of the rear A/C-heater control (1).
2. Insert the bulb holder and bulb straight into the circuit board until the bulb holder is firmly seated.
3. Using a small thin-bladed screwdriver, rotate the bulb holder clockwise about 30 degrees on the circuit board to lock it into place.
4. Reinstall the rear A/C-heater control onto the center floor console. (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS - REAR/A/C-HEATER CONTROL - INSTALLATION).
5. Reconnect the battery negative cable.

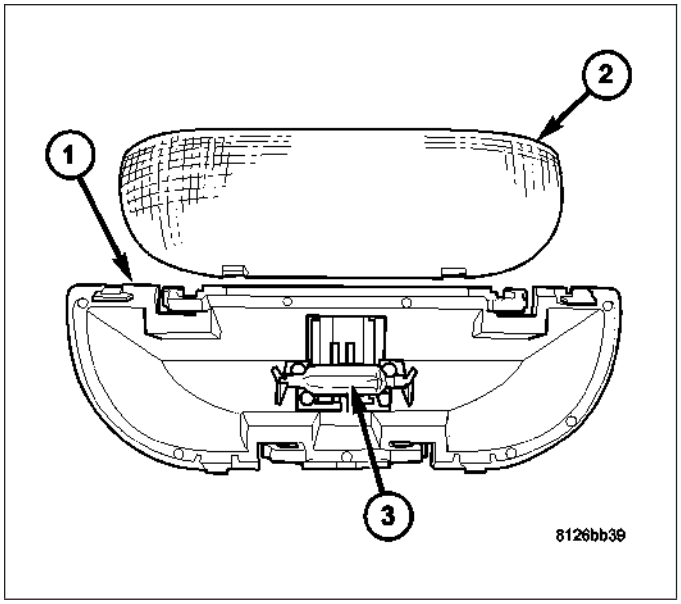


LIFTGATE LAMP

REMOVAL

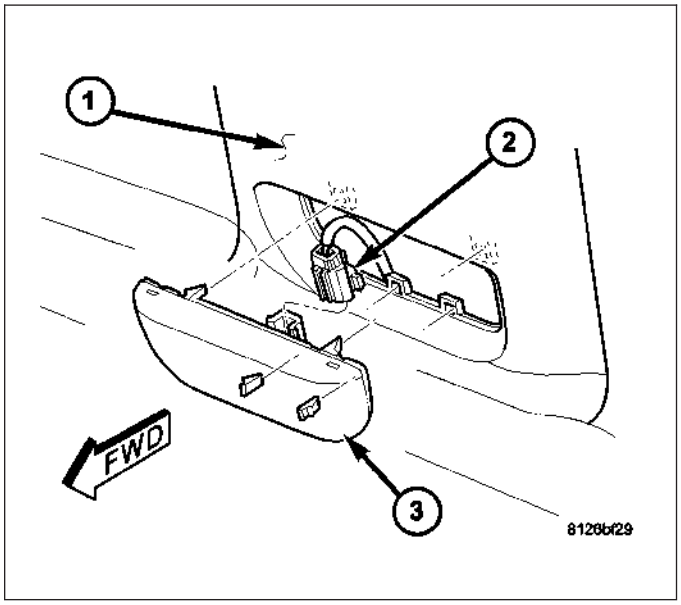
BULB

1. Disconnect and isolate the battery negative cable.
2. Remove the liftgate lamp unit from the liftgate trim panel. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - INTERIOR/LIFTGATE LAMP UNIT - REMOVAL).
3. Using a small thin-bladed screwdriver, gently pry between the lamp lens (2) and the lamp housing (1) at the two upper or lower snap features to remove the lens from the housing.
4. Disengage the ends of the bulb (3) from the two bulb holders within the lamp housing.



LAMP

1. Disconnect and isolate the battery negative cable.
2. Insert a trim stick or another suitable wide flat-bladed tool, between the liftgate lamp housing (3) and the lamp seat in the liftgate trim panel (1).
3. Carefully pry the liftgate lamp unit outward from the trim panel.
4. Disconnect the wire harness connector (2) from the back of the lamp housing.
5. Remove the lamp from the liftgate.

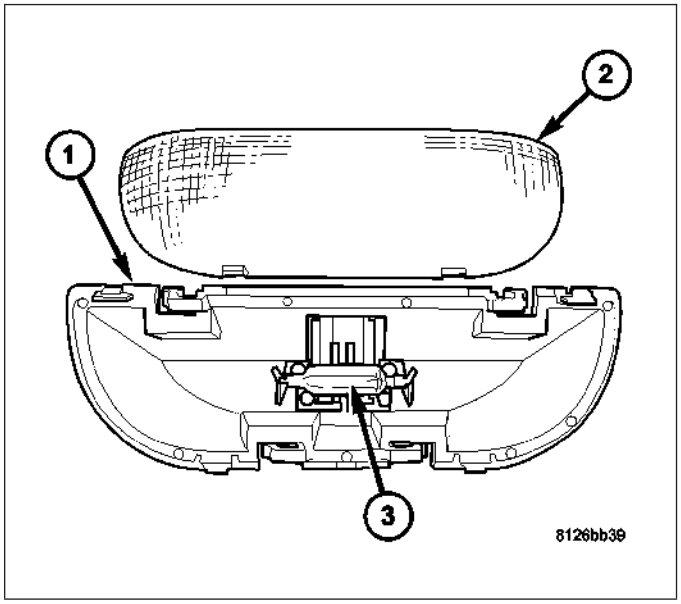


INSTALLATION

BULB

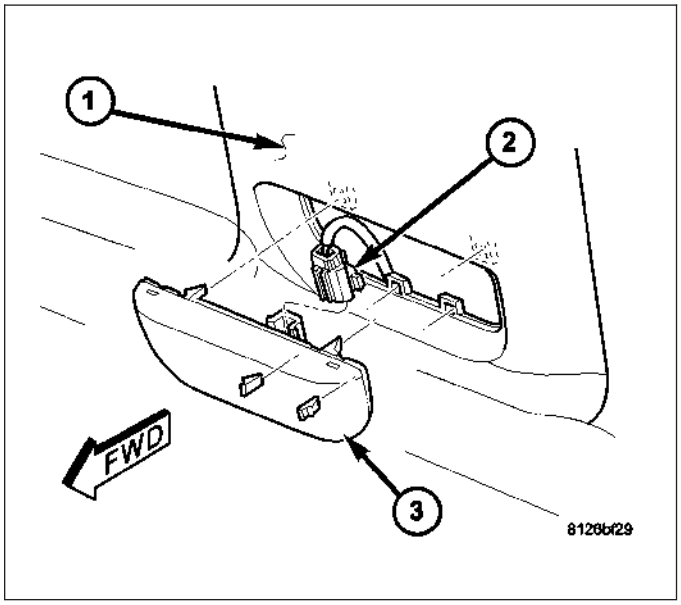
CAUTION: Always use the correct bulb size and type for replacement. An incorrect bulb size or type may overheat and cause damage to the lamp, the socket and/or the lamp wiring.

1. Install the ends of the bulb (3) onto the two bulb holders within the liftgate lamp housing (1).
2. Align the lamp lens (2) with the lamp housing, then use firm and even hand pressure to snap the lens onto the housing.
3. Reinstall the lamp onto the liftgate trim panel. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - INTERIOR/LIFTGATE LAMP UNIT - INSTALLATION).
4. Reconnect the battery negative cable.



LAMP

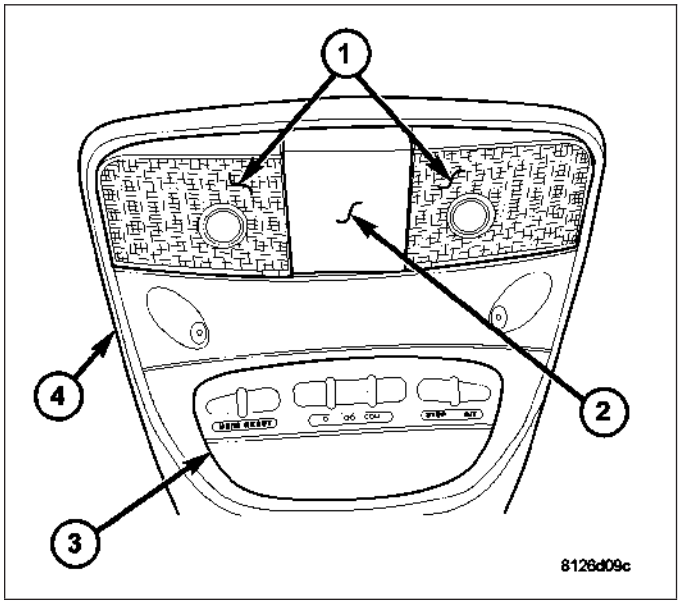
1. Position the liftgate lamp unit (3) to the lamp seat in the liftgate trim panel (1).
2. Reconnect the wire harness connector (2) to the back of the lamp housing.
3. Align the latch tabs on the back of the lamp housing with the receptacles in the trim panel.
4. Using hand pressure, press firmly and evenly on the lamp lens until the lamp snaps into the trim panel.
5. Reconnect the battery negative cable.



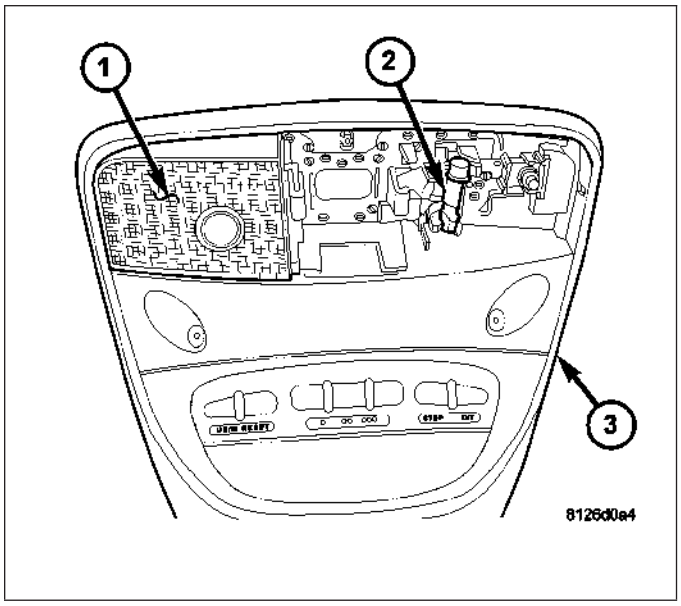
READING LAMP

REMOVAL - BULB

1. Disconnect and isolate the battery negative cable.
2. Using a small thin-bladed screwdriver, gently pry the rear edge of the bezel (2) and the overhead console housing (4) to unsnap the bezel from the housing.
3. Using a small thin-bladed screwdriver, gently pry between the outboard edge of the lens (1) being removed toward the center of the vehicle until it unsnaps from the housing.
4. Remove the lens from the housing.



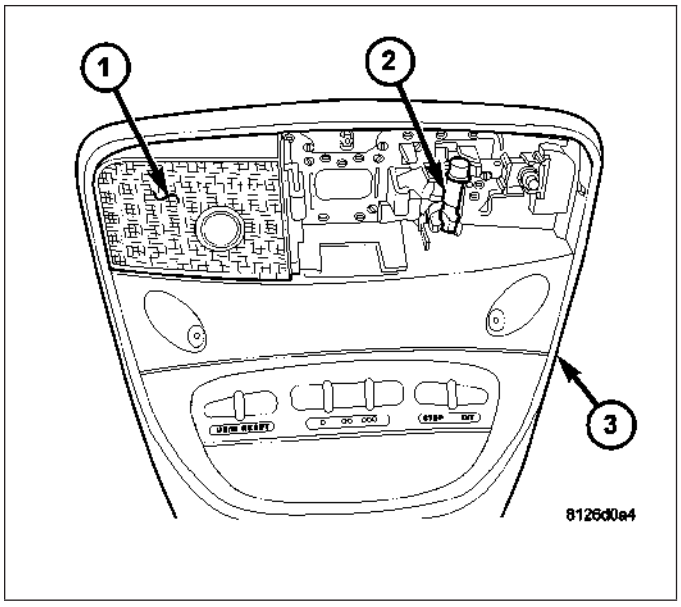
5. Carefully unsnap the bulb (2) from the two bulb holders within the overhead console lamp housing.



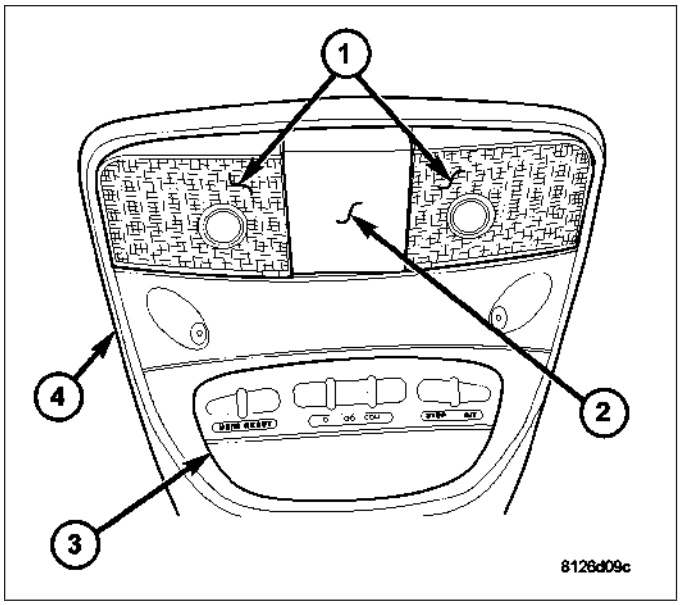
INSTALLATION - BULB

CAUTION: Always use the correct bulb size and type for replacement. An incorrect bulb size or type may overheat and cause damage to the lamp, the socket and/or the lamp wiring.

1. Align the ends of the bulb (2) with the two bulb holders within the overhead console lamp housing.
2. Carefully press the bulb firmly and evenly into the bulb holders until it snaps into place.



3. Position the lens (1) to the overhead console housing (4) and snap the outboard edge back into place.
4. Position the forward edge of the bezel (2) between the two lenses, then press the rear edge of the bezel firmly and evenly until it snaps back into the housing.
5. Reconnect the battery negative cable.

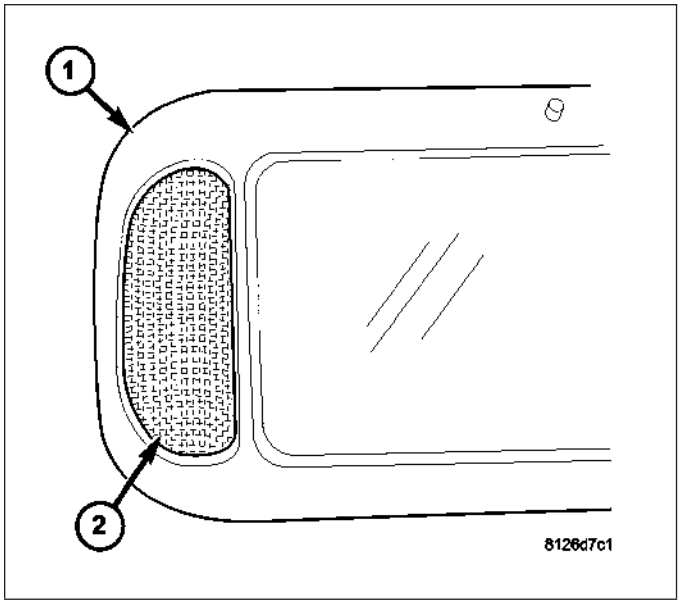


VANITY LAMP

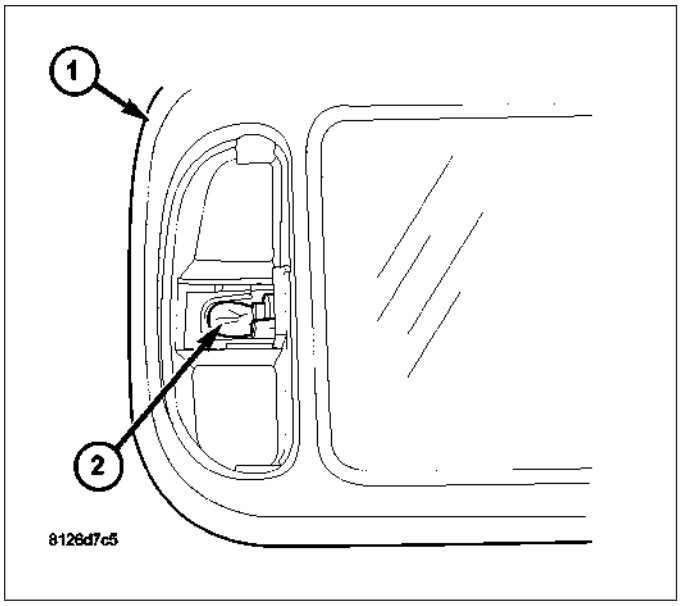
REMOVAL - BULB

NOTE: Vehicles equipped with optional vanity lamps have a mirror with a lamp that is integral to each sun visor. Each lamp is independently controlled by an integral switch that is automatically actuated by the mirror cover. The bulb types and service procedures are identical for both of these lamps.

1. Disconnect and isolate the battery negative cable.
2. Insert a small flat-bladed screwdriver on either side near the top or the bottom between the vanity lamp lens (2) and the lamp housing of the sun visor (1).
3. Carefully pry the lens outward until it unsnaps from the lamp housing.



4. Using small needle-nose pliers, carefully grasp the bulb (2) and pull the base out of the lamp socket.

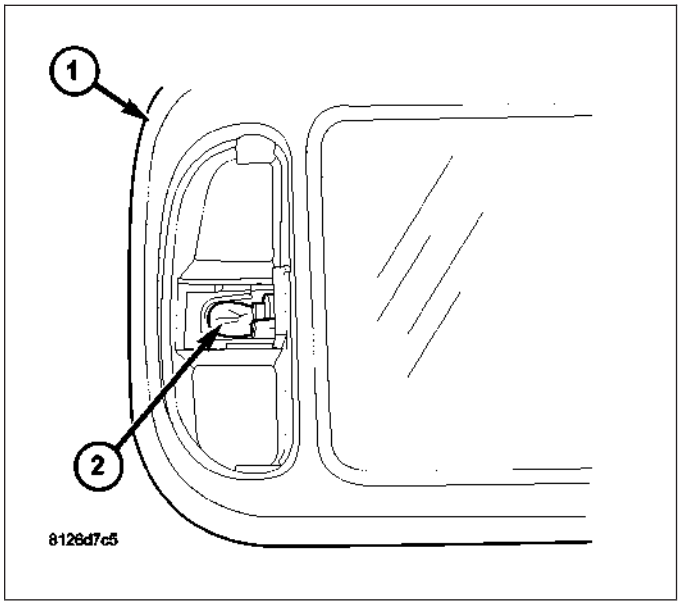


INSTALLATION - BULB

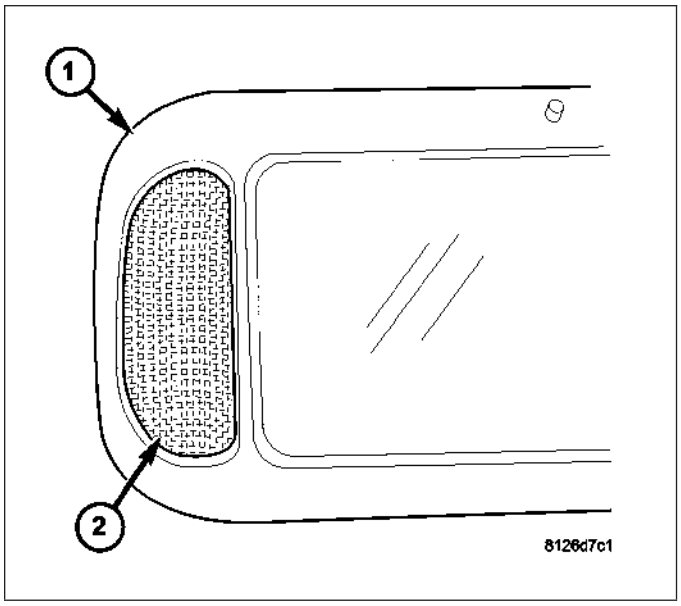
CAUTION: Always use the correct bulb size and type for replacement. An incorrect bulb size or type may overheat and cause damage to the lamp, the socket and/or the lamp wiring.

NOTE: Vehicles equipped with optional vanity lamps have a mirror with a lamp that is integral to each sun visor. Each lamp is independently controlled by an integral switch that is automatically actuated by the mirror cover. The bulb types and service procedures are identical for both of these lamps.

1. Using small needle-nose pliers, carefully grasp the vanity lamp bulb (2) and align the base of the bulb with the socket in the lamp housing of the sun visor (1).
2. Push the bulb straight into the socket until the base is fully seated.



3. Insert one tab on the top or the bottom of the lens (2) into the appropriate slot at the top or bottom of the lamp housing.
4. Flex the lens far enough to engage the loose tab into its slot in the lamp housing.
5. Reconnect the battery negative cable.



MESSAGE SYSTEMS

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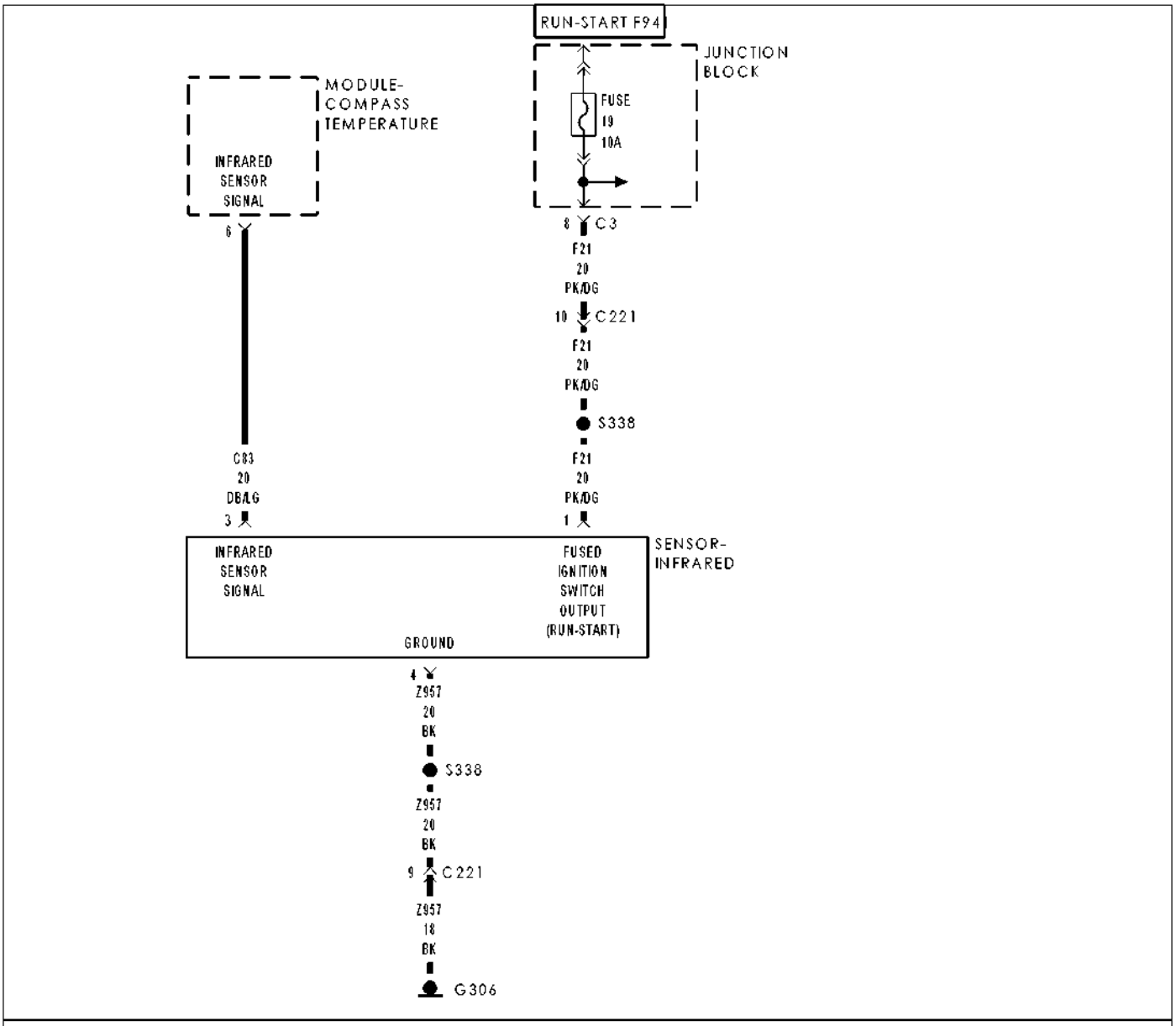
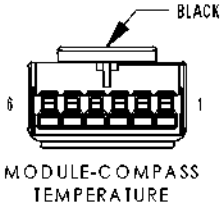
OVERHEAD CONSOLE - ELECTRICAL DIAGNOSTICS

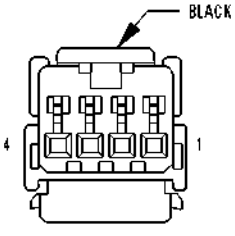
DIAGNOSIS AND TESTING

B1034 - INFRARED TEMPERATURE SENSOR INPUT CIRCUIT LOW





MODULE-COMPASS TEMPERATURE



SENSOR-INFRARED

81IE5248

B1034 - INFRARED TEMPERATURE SENSOR INPUT CIRCUIT LOW — (CONTINUED)

For the Compass Temperature Module circuit diagram (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - SCHEMATIC - ELECTRICAL).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Compass Temperature Module detects a short to ground condition on the (C83) Infrared Sensor Signal circuit.

POSSIBLE CAUSES
(C83) INFRARED SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
INFRARED TEMPERATURE SENSOR
COMPASS TEMPERATURE MODULE

Diagnostic Test

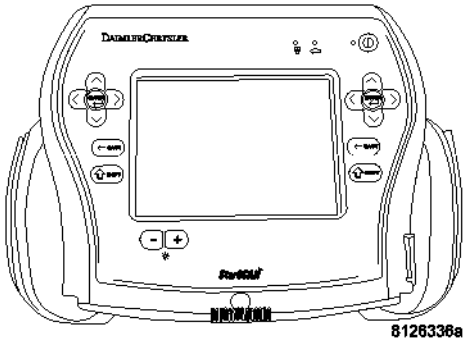
1. TEST FOR AN INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase DTCs.
Turn the ignition off, wait 10 seconds then turn the ignition on.
With the scan tool, read DTCs.

Does the scan tool display: B1034 - INFRARED TEMPERATURE SENSOR INPUT CIRCUIT LOW?

Yes >> Go To 2

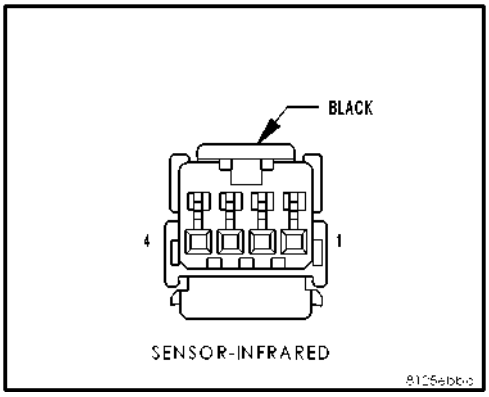
No >> The condition that caused this code to set is not present at this time. Using the wiring diagram as a guide, inspect the wiring and connectors for an intermittent condition. Operate the system several times and recheck for active DTCs.
Perform the BODY VERIFICATION TEST-VER 1.



B1034 - INFRARED TEMPERATURE SENSOR INPUT CIRCUIT LOW — (CONTINUED)

2. CHECK FOR ACTIVE DTC B1034 - INFRARED TEMPERATURE SENSOR INPUT CIRCUIT LOW WITH INFRARED SENSOR DISCONNECTED

Turn the ignition off.
Disconnect the Infrared Temperature Sensor harness connector.
Turn the ignition on.
With the scan tool, read DTCs.



Does the scan tool display B1034 - INFRARED TEMPERATURE SENSOR INPUT CIRCUIT LOW?

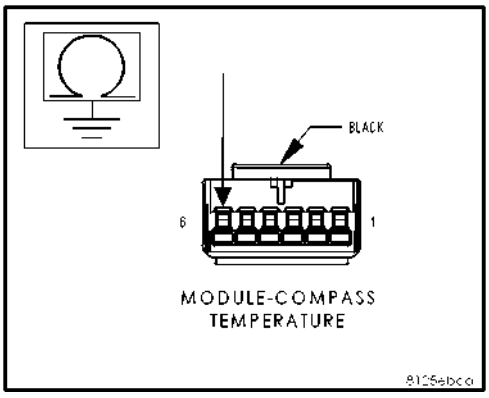
YES >> Go To 3

NO >> Replace the Infrared Temperature Sensor in accordance with the Service Information.
Perform the BODY VERIFICATION TEST-VER 1.

---

3. CHECK (C83) INFRARED SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.
Disconnect the Compass Temperature Module harness connector.
Measure the resistance between the (C83) Infrared Sensor Signal circuit and ground.

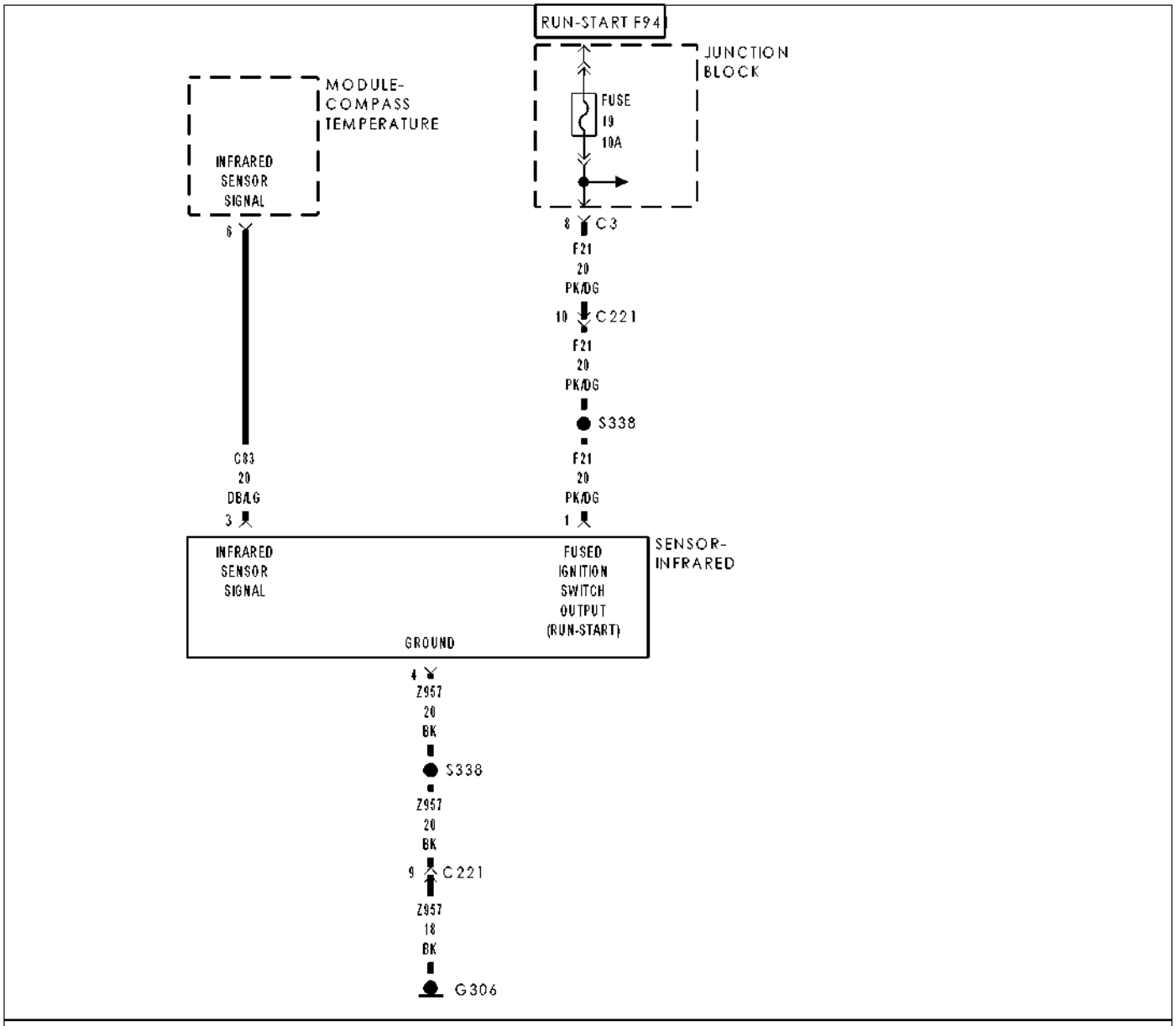


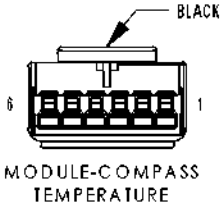
Is the resistance below 10K ohms?

YES >> Repair the (C83) Infrared Sensor Signal circuit for a short to ground.
Perform the BODY VERIFICATION TEST-VER 1.

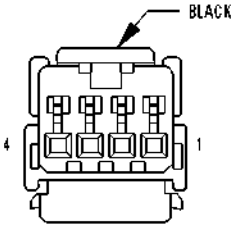
NO >> Replace the Compass Temperature Module in accordance with the Service Information.
Perform the BODY VERIFICATION TEST-VER 1.

B1035 - INFRARED TEMPERATURE SENSOR INPUT CIRCUIT HIGH





MODULE-COMPASS TEMPERATURE



SENSOR-INFRARED

81IE5248

B1035 - INFRARED TEMPERATURE SENSOR INPUT CIRCUIT HIGH — (CONTINUED)

For the Compass Temperature Module circuit diagram (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - SCHEMATIC - ELECTRICAL).

For a complete wiring diagram **Refer to Section 8W**.

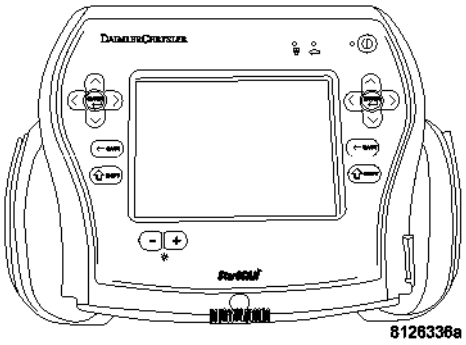
- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Compass Temperature Module detects an open condition on the Infrared Sensor Signal circuit.

POSSIBLE CAUSES
(C83) INFRARED SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE
(Z957) INFRARED SENSOR GROUND CIRCUIT OPEN
(C83) INFRARED SENSOR SIGNAL CIRCUIT OPEN
INFRARED TEMPERATURE SENSOR
COMPASS TEMPERATURE MODULE

Diagnostic Test

1. TEST FOR AN INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase DTCs.
Turn the ignition off, wait 10 seconds then turn the ignition on.
With the scan tool, read DTCs.



Does the scan tool display: B1035 - INFRARED TEMPERATURE SENSOR INPUT CIRCUIT HIGH?

Yes >> Go To 2

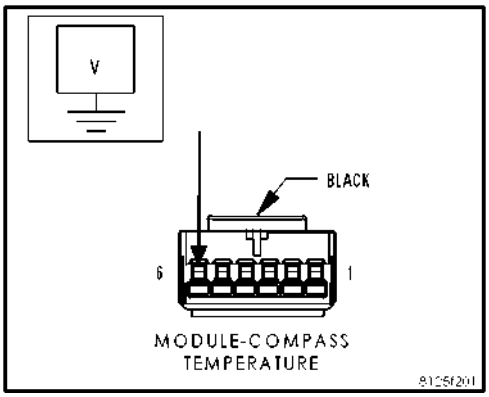
No >> The condition that caused this code to set is not present at this time. Using the wiring diagram as a guide, inspect the wiring and connectors for an intermittent condition. Operate the system several times and recheck for active DTCs.

Perform the BODY VERIFICATION TEST-VER 1.

B1035 - INFRARED TEMPERATURE SENSOR INPUT CIRCUIT HIGH — (CONTINUED)

2. CHECK THE (C83) INFRARED SENSOR SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

Disconnect the Compass Temperature Module harness connector.
Disconnect the Infrared Temperature Sensor harness connector.
Measure the voltage between the (C83) Infrared Sensor Signal circuit and ground.



Is there any voltage present?

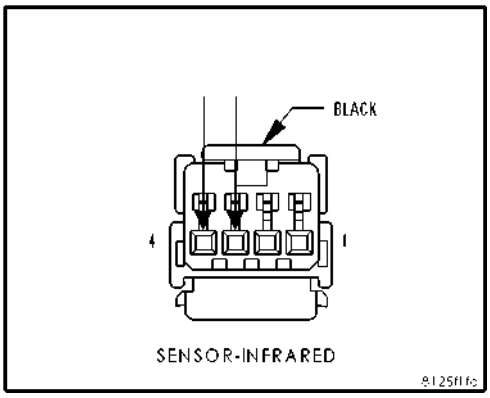
YES >> Repair the (C83) Infrared Sensor Signal circuit for a short to voltage.
Perform the BODY VERIFICATION TEST-VER 1.

NO >> Go To 3

---

3. CHECK FOR ACTIVE DTC B1035 - INFRARED TEMPERATURE SENSOR INPUT CIRCUIT HIGH, WITH JUMPER WIRE CONNECTED BETWEEN THE (C83) INFRARED SENSOR SIGNAL CIRCUIT AND THE (Z957) GROUND CIRCUIT

Turn the ignition off.
Connect a jumper wire between the (C83) Infrared Sensor Signal circuit and the (Z957) ground circuit.
Turn the ignition on.
With the scan tool, read DTCs.



Does the scan tool display B1035 - INFRARED TEMPERATURE SENSOR INPUT CIRCUIT LOW?

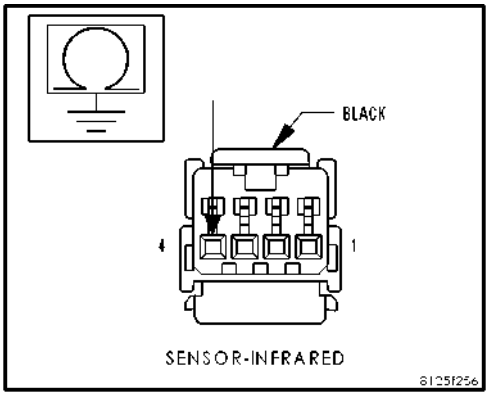
YES >> Replace the Infrared Temperature Sensor in accordance with the Service Information.
Perform the BODY VERIFICATION TEST-VER 1.

NO >> Go To 4

---

4. CHECK THE (Z957) INFRARED SENSOR GROUND CIRCUIT FOR AN OPEN

Measure the resistance of the (Z957) Infrared Sensor Ground circuit between the Infrared Temperature Sensor harness connector and ground.



Is the resistance above 5.0 ohms?

YES >> Repair the (Z957) Infrared Sensor Ground circuit for an open.
Perform the BODY VERIFICATION TEST-VER 1.

NO >> Go To 5

B1035 - INFRARED TEMPERATURE SENSOR INPUT CIRCUIT HIGH — (CONTINUED)

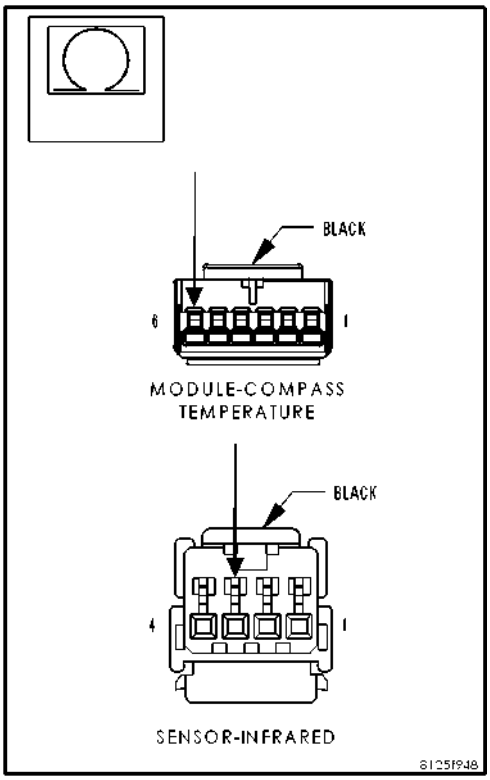
5. CHECK THE (C83) INFRARED SENSOR SIGNAL CIRCUIT FOR AN OPEN

Measure the resistance of the (C83) Infrared Sensor Signal circuit between the Compass Temperature Module harness connector and the Infrared Temperature Sensor harness connector.

Is the resistance above 5.0 ohms?

YES >> Repair the (C83) Infrared Sensor Signal circuit for an open.
Perform the BODY VERIFICATION TEST-VER 1.

NO >> Replace the Compass Temperature Module in accordance with the Service Information.
Perform the BODY VERIFICATION TEST-VER 1.



B1A32-UNIVERSAL GARAGE DOOR SWITCH 1 STUCK

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Compass Temperature Module detects an internal switch failure.

Possible Causes
COMPASS TEMPERATURE MODULE

Diagnostic Test

1. REPLACE THE COMPASS TEMPERATURE MODULE

When this code is set, the Compass Temperature Module must be replaced.

Repair

Replace the Compass Temperature Module in accordance with the Service Information.

Perform the BODY VERIFICATION TEST-VER 1.

B1A33-UNIVERSAL GARAGE DOOR SWITCH 2 STUCK

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Compass Temperature Module detects an internal switch failure.

Refer to B1A32-UNIVERSAL GARAGE DOOR SWITCH 1 STUCK for the diagnostic procedure.

B1A34-UNIVERSAL GARAGE DOOR SWITCH 3 STUCK

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Compass Temperature Module detects an internal switch failure.

Refer to B1A32-UNIVERSAL GARAGE DOOR SWITCH 1 STUCK for the diagnostic test procedure.

B2217 - EVIC/EOM/CMTC INTERNAL

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Compass Temperature Module detects an internal failure.

Possible Causes
COMPASS TEMPERATURE MODULE

Diagnostic Test

1. VERIFY OPERATION OF THE COMPASS TEMPERATURE MODULE

Turn the ignition on.

With the scan tool, erase Compass Temperature Module DTCs.

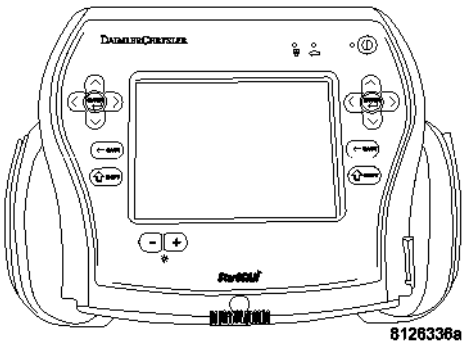
With the scan tool, activate the Compass Temperature Module self test.

With the scan tool, read Compass Temperature Module DTCs.

Does the scan tool display DTC B2217–EVIC/EOM/CMTC INTERNAL?

YES >> Replace the Compass Temperature Module in accordance with the service information.
Perform the BODY VERIFICATION TEST-VER 1.

NO >> Test complete.



B222D - ECU UNABLE TO CONFIGURE / CONFIGURATION NOT LEARNED

For the Compass Temperature Module circuit diagram (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Compass Temperature Module does not receive the configuration information from the Front Control Module.

POSSIBLE CAUSES
NO COMMUNICATION WITH FRONT CONTROL MODULE
ACTIVE FCM DTCs
COMPASS TEMPERATURE MODULE

Diagnostic Test

1. TEST FOR AN INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase any Compass Temperature Module DTCs.

Turn the ignition off, wait 10 seconds then turn the ignition on.

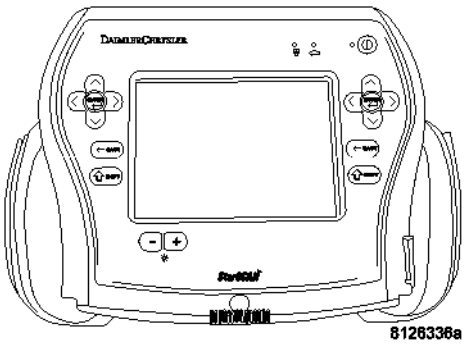
With the scan tool, read DTCs.

Does the scan tool display: B222D - ECU UNABLE TO CONFIGURE / CONFIGURATION NOT LEARNED?

Yes >> Go To 2

No >> The condition that caused this code to set is not present at this time. Using the wiring diagram as a guide, inspect the wiring and connectors for an intermittent condition. Operate the system several times and recheck for active DTCs.

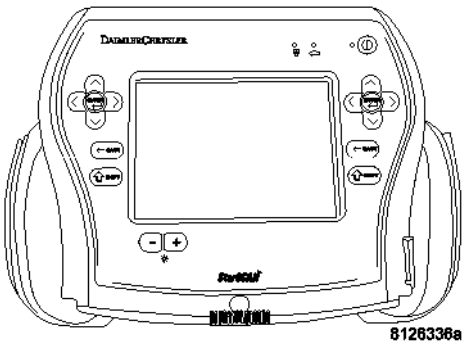
Perform the BODY VERIFICATION TEST-VER 1.



B222D - ECU UNABLE TO CONFIGURE / CONFIGURATION NOT LEARNED — (CONTINUED)

2. CHECK COMPASS TEMPERATURE MODULE BUSSED INPUTS

If equipped with Automatic Temperature Control, use the scan tool in Data Display and check the Automatic Temperature Control State in the Compass Temperature Module.



Does the scan tool display "Automatic Temperature Control-ON" in the Compass Temperature Module Data Display?

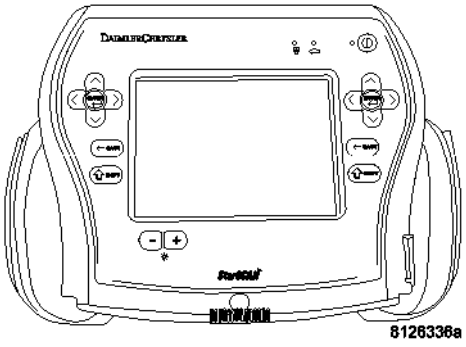
Yes >> Replace the Compass Temperature Module in accordance to the Service Information.
Perform the BODY VERIFICATION TEST-VER 1.

No >> Go To 3

---

3. VERIFY COMMUNICATION WITH FRONT CONTROL MODULE

With the scan tool in ECU VIEW, read active modules on the bus.



Does the scan tool show the Front Control Module active on the bus?

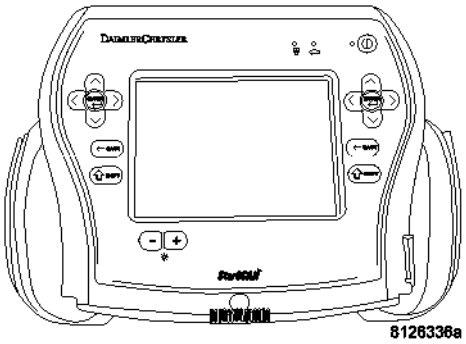
Yes >> Go To 4

No >> Refer to the Communication category for the related symptoms.
Perform the BODY VERIFICATION TEST VER 1.

B222D - ECU UNABLE TO CONFIGURE / CONFIGURATION NOT LEARNED — (CONTINUED)

4. CHECK FRONT CONTROL MODULE FOR ACTIVE DTCs

With the scan tool, erase FCM DTCs.
Turn the ignition off. Wait approximately 10 seconds.
Turn the ignition on.
With the scan tool, read FCM DTCs.



Are any active DTCs present?

Yes >> Refer to symptom list for problems related to the Front Control Module.
Perform the BODY VERIFICATION TEST VER 1.

No >> Replace the Front Control Module in accordance with the Service Information.
Perform the BODY VERIFICATION TEST-VER.1

B2331–VEHICLE NEEDS DEGAUSSED

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  TBD

Diagnostic Test

1. PERFORM THE VEHICLE DEMAGNITIZING PROCEDURE

Note: A blank compass display indicates that vehicle degaussing is required.

Note: After demagnitizing, the vehicle will enter Auto Fast-Cal when the ignition is turned on.

Note: Ensure that the correct compass variance is stored in the compass memory. See "Setting Compass Variance in the Service Information."

Refer to the Service Information for the Compass Demagnitizing Standard Procedure.

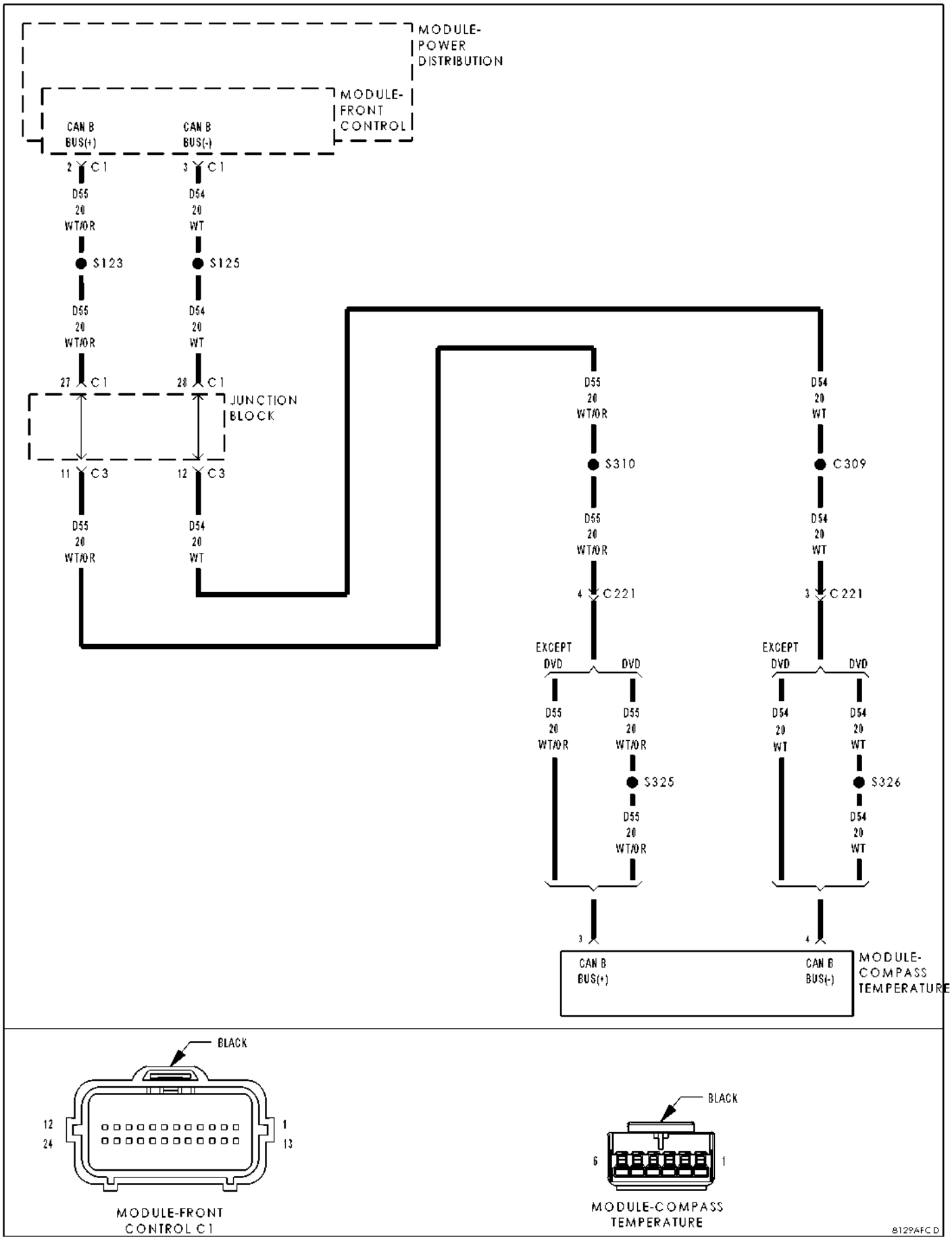
View repair.

Repair

When the Demagnitizing Procedure is complete, perform the Verification Test.

Perform the BODY VERIFICATION TEST-VER1.

U0019–CAN B BUS



U0019–CAN B BUS — (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

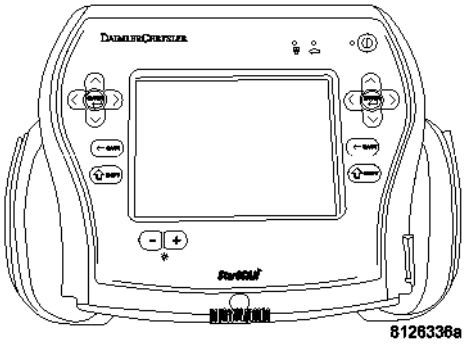
- **When Monitored:**
  Continuously
- **Set Condition:**
  Whenever the Can B Bus (+) or B Bus (–) circuit is open, shorted to voltage or shorted to ground, this code will set.

Possible Causes
CAN B BUS DTCs IN FRONT CONTROL MODULE
(D54) CAN B BUS (–) CIRCUIT OPEN
(D55) CAN B BUS (+) CIRCUIT OPEN
COMPASS TEMPERATURE MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase DTCs
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read DTCs.



Does the scan tool display U0019–CAN B BUS CIRCUIT?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST - VER 1.

---

2. CHECK FRONT CONTROL MODULE DTCs

With the scan tool, read Front Control Module DTCs

Does the scan tool display any CAN B BUS DTCs – ACTIVE?

Yes >> Refer to the symptom list for problems related to Communication in the ELECTRICAL.– ELECTRONIC CONTROL MODULES – ELECTRICAL DIAGNOSES section.

No >> Go to 3

U0019–CAN B BUS — (CONTINUED)

3. CAN B BUS (+) CIRCUIT OPEN

Turn the ignition off.

Disconnect the Compass Temperature Module harness connector.

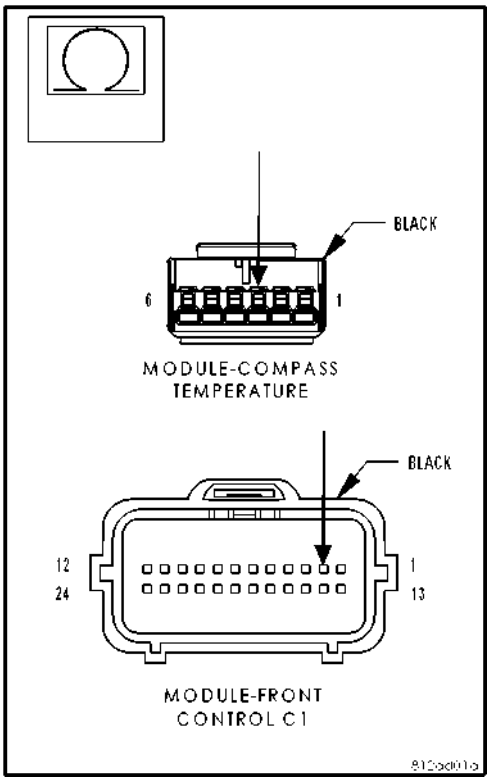
Disconnect the Front Control Module C1 harness connector.

Measure the resistance of the (D55) Can B Bus (+) circuit between the Front Control Module C1 harness connector and the Compass Temperature Module harness connector.

Is the resistance below 2.0 ohms?

Yes >> Go To 4
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the Can B Bus (+) circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.



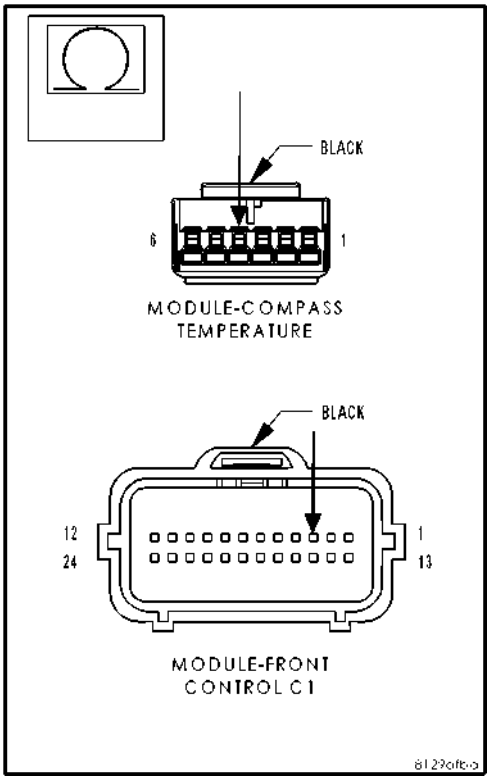
4. CAN B BUS (–) CIRCUIT OPEN

Measure the resistance of the (D54) Can B Bus (–) circuit between the Front Control Module C1 harness connector and the Compass Temperature Module harness connector.

Is the resistance below 2.0 ohms?

Yes >> Replace the Compass Temperature Module.
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the Can B Bus (–) circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.



U0141–LOST COMMUNICATION WITH FRONT CONTROL MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0155-LOST COMMUNICATION WITH CLUSTER/CCN

For a complete wiring diagram **Refer to Section 8W**.

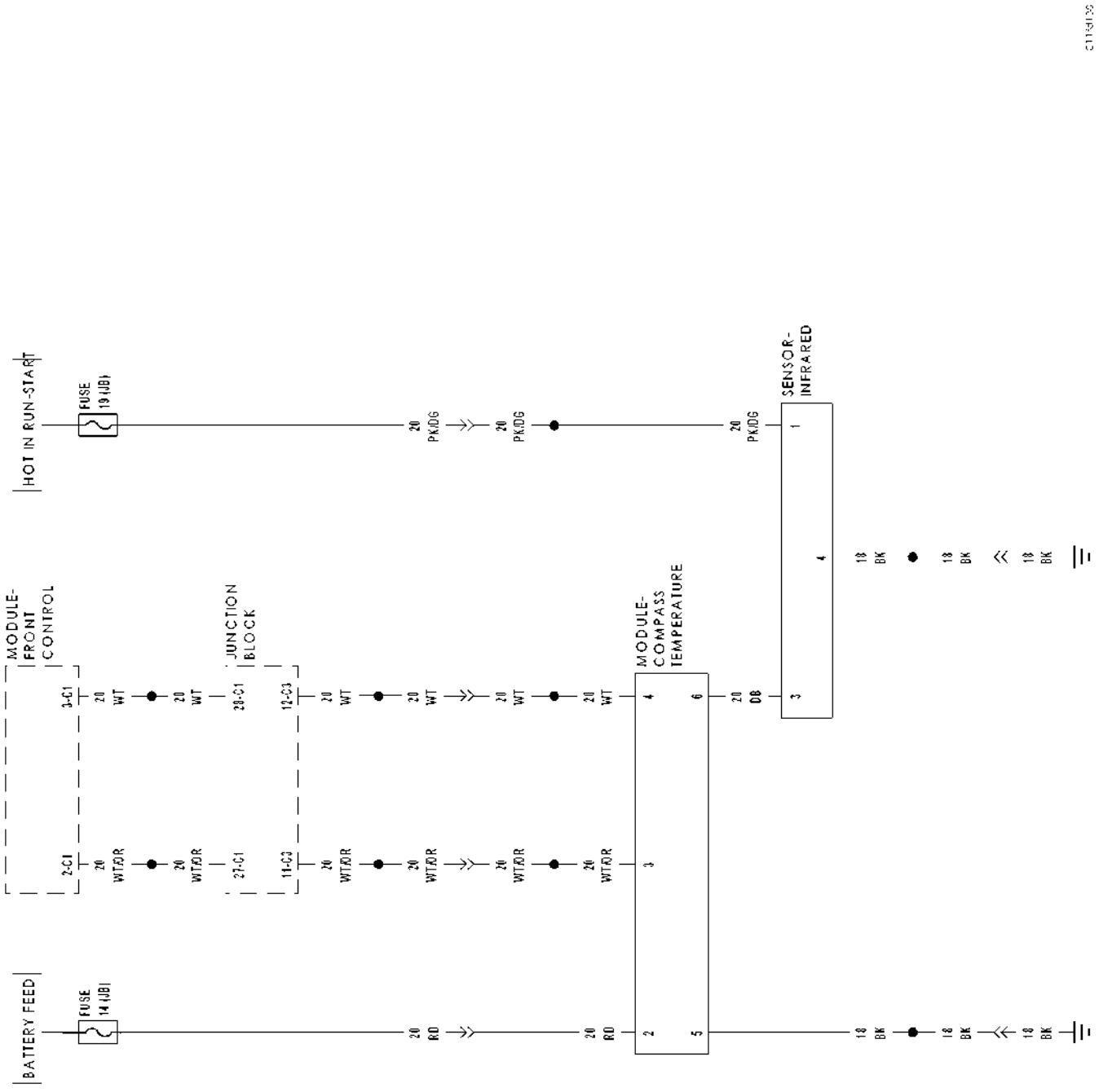
(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0212-LOST COMMUNICATION WITH SCCM

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

SCHEMATICS AND DIAGRAMS



OVERHEAD CONSOLE - SERVICE INFORMATION

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OVERHEAD CONSOLE - SERVICE INFORMATION

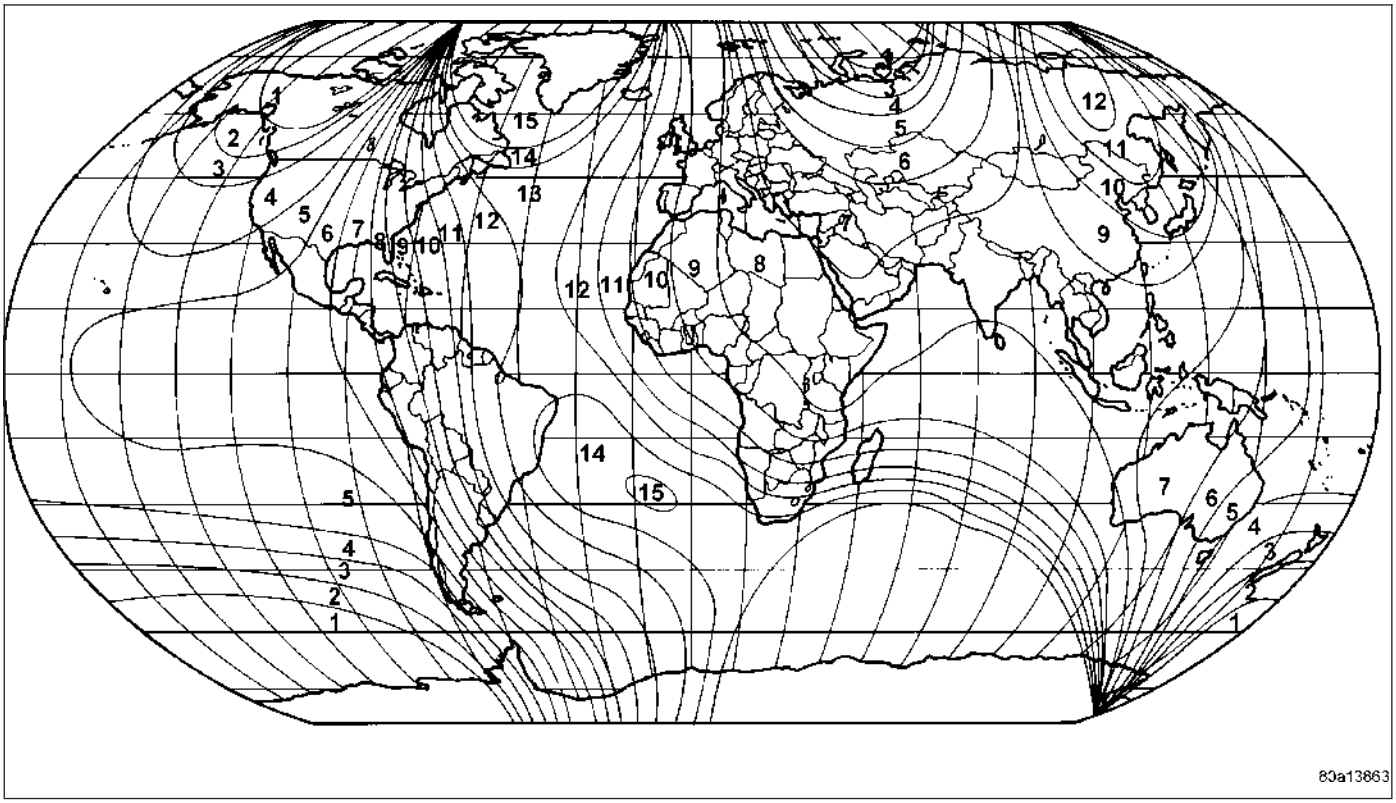
DESCRIPTION

OVERHEAD CONSOLE

The overhead console includes two front-mounted reading and courtesy lamps, optional compass mini-trip computer, with or without the universal transmitter option.

STANDARD PROCEDURE

COMPASS VARIATION ADJUSTMENT



Compass variance, also known as magnetic declination, is the difference in angle between magnetic north and true geographic north. In some geographic locations, the difference between magnetic and geographic north is great enough to cause the compass to give false readings. If this problem occurs, the compass variance must be set.

To set the compass variance:

1. Using the Variance Settings map, find your geographic location and note the zone number.
2. Turn the ignition switch to the On/Run position. If the compass/temperature data is not currently being displayed, momentarily depress and release the C/T push button to step through the display options until you have reached the compass/temperature display.
3. Press and hold the Reset push button down until “VAR” appears in the display. This takes about five seconds.
4. Momentarily depress and release the STEP push button to step through the zone numbers (1-15), until the zone number for your geographic location appears in the display.
5. Momentarily depress and release the Reset push button to enter the displayed zone number into the compass unit memory.
6. Confirm that the correct directions are now indicated by the compass.

COMPASS CALIBRATION

CAUTION: Do not place any external magnets, such as magnetic roof mount antennas, in the vicinity of the compass. Do not use magnetic tools when servicing the overhead console.

The electronic compass unit features a self-calibrating design, which simplifies the calibration procedure. This feature automatically updates the compass calibration while the vehicle is being driven. This allows the compass unit to compensate for small changes in the residual magnetism that the vehicle may acquire during normal use. If the compass readings appear to be erratic or out of calibration, perform the following calibration procedure. Also, new service replacement compass mini-trip computer modules must have their compass calibrated using this procedure.

Do not attempt to calibrate the compass near large metal objects such as other vehicles, large buildings, or bridges; or, near overhead or underground power lines.

Note: Whenever the compass is calibrated manually, the variation number must also be reset. See Compass Variation Adjustment in the Service Procedures section of this group.

Calibrate the compass manually as follows:

1. Turn the ignition switch to the On position. If the compass/temperature data is not currently being displayed, momentarily depress and release the C/T push button to step through the display options until you have reached the compass/temperature display.
2. Depress and hold the RESET push button. Hold the push buttons down until “CAL” appears in the display. This takes about ten seconds.
3. Drive the vehicle on a level surface, away from large metal objects and power lines, through one or two**complete** circles in not less than 16 seconds. The “CAL” message will disappear from the display to indicate that the compass is now calibrated.

Note: A blank compass display indicates that vehicle degaussing (demagnetizing) is necessary.

Note: If the “CAL” message remains in the display, either there is excessive magnetism near the compass, or the unit is faulty. Repeat the calibration procedure at least one more time.

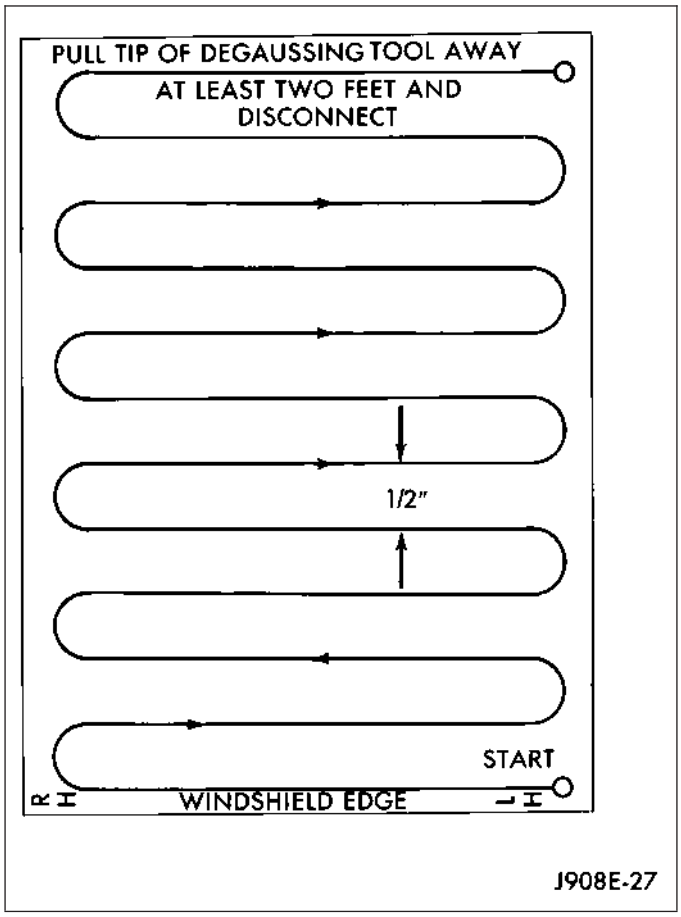
Note: If the wrong direction is still indicated in the compass display, the area selected for calibration may be too close to a strong magnetic field. Repeat the calibration procedure in another location.

COMPASS DEMAGNETIZING

A degaussing tool (Special Tool 6029) is used to demagnetize, or degauss, the overhead console forward mounting screw and the roof panel above the overhead console. Equivalent units must be rated as continuous duty for 110/115 volts and 60 Hz. They must also have a field strength of over 350 gauss at 7 millimeters (0.25 inch) beyond the tip of the probe.

To demagnetize the roof panel and the overhead console forward mounting screw, proceed as follows:

1. Be certain that the ignition switch is in the Off position, before you begin the demagnetizing procedure.
2. Connect the degaussing tool to an electrical outlet, while keeping the tool at least 61 centimeters (2 feet) away from the compass unit.
3. Slowly approach the head of the overhead console forward mounting screw with the degaussing tool connected.
4. Contact the head of the screw with the plastic coated tip of the degaussing tool for about two seconds.
5. With the degaussing tool still energized, slowly back it away from the screw. When the tip of the tool is at least 61 centimeters (2 feet) from the screw head, disconnect the tool.

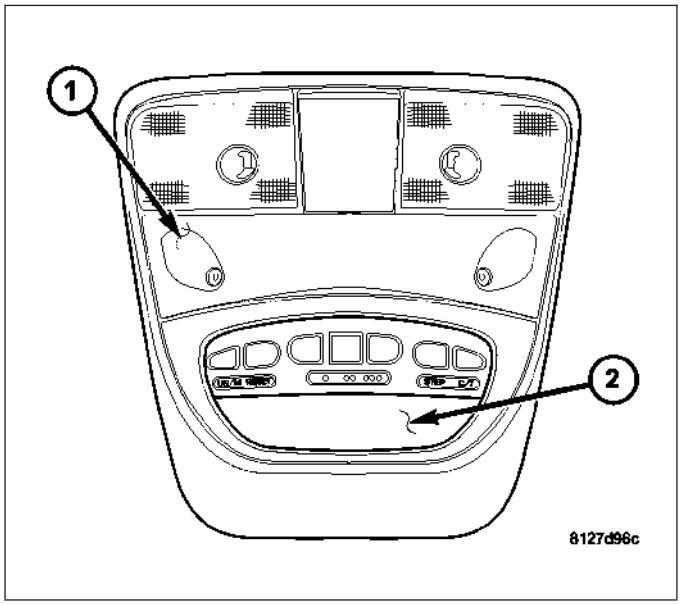


6. Place a piece of paper approximately 22 by 28 centimeters (8.5 by 11 inches), oriented on the vehicle lengthwise from front to rear, on the center line of the roof at the windshield header. The purpose of the paper is to protect the roof panel from scratches, and to define the area to be demagnetized.
7. Connect the degaussing tool to an electrical outlet, while keeping the tool at least 61 centimeters (2 feet) away from the compass unit.
8. Slowly approach the center line of the roof panel at the windshield header, with the degaussing tool connected.
9. Contact the roof panel with the plastic coated tip of the degaussing tool. Be sure that the template is in place to avoid scratching the roof panel. Using a slow, back-and-forth sweeping motion, and allowing 13 millimeters (0.50 inch) between passes, move the tool at least 11 centimeters (4 inches) to each side of the roof center line, and 28 centimeters (11 inches) back from the windshield header.
10. With the degaussing tool still energized, slowly back it away from the roof panel. When the tip of the tool is at least 61 centimeters (2 feet) from the roof panel, disconnect the tool.
11. Calibrate the compass and adjust the compass variance. Refer to **Compass Variation Adjustment** and **Compass Calibration** in the Service Procedures section of this group for the procedures.

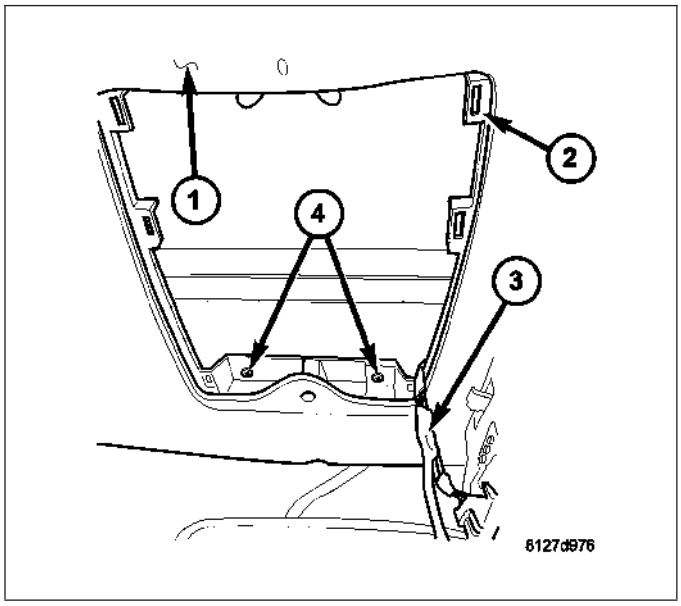
REMOVAL

OVERHEAD CONSOLE

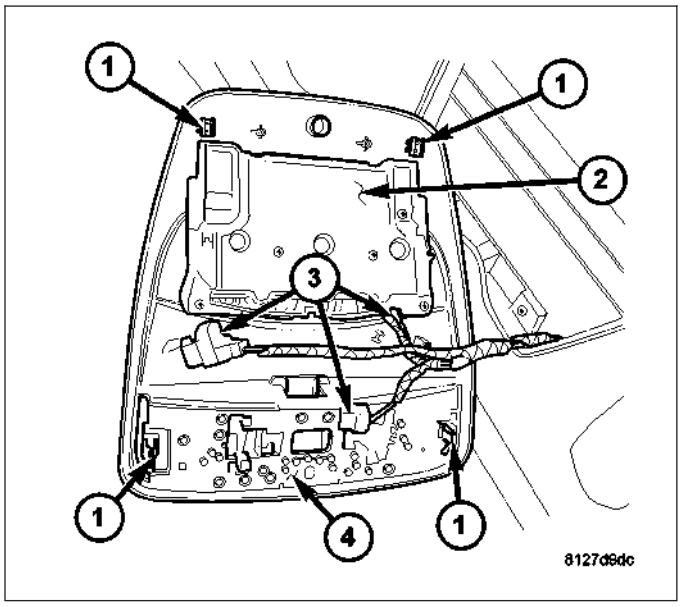
1. Disconnect and isolate the battery negative cable.
2. Insert the fingertips of both hands between the headliner and the sides of the overhead console housing (1).



3. Pull downward on the sides of the overhead console housing firmly and evenly to disengage the snap clips from the overhead console bracket (2).

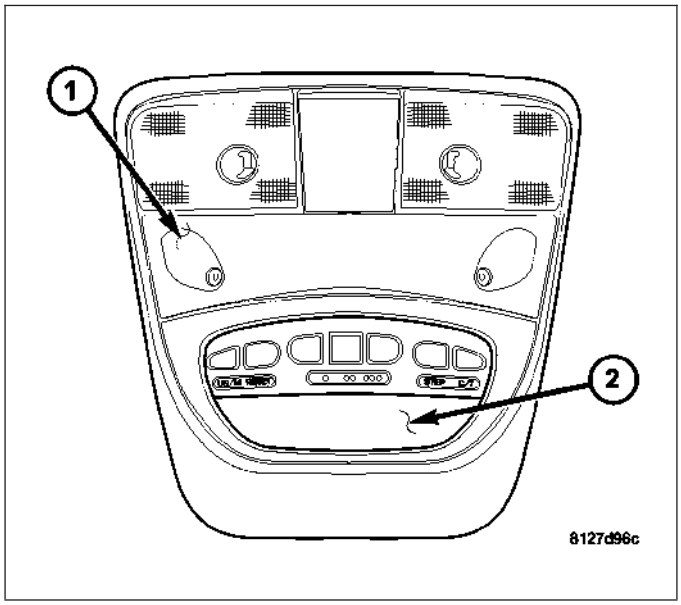


4. Lower the overhead console (4) from the headliner far enough to access the wire harness connectors (3).
5. Disconnect the roof wire harness connectors (3) from the overhead console wire harness connector.
6. Remove the overhead console (4) from the headliner.

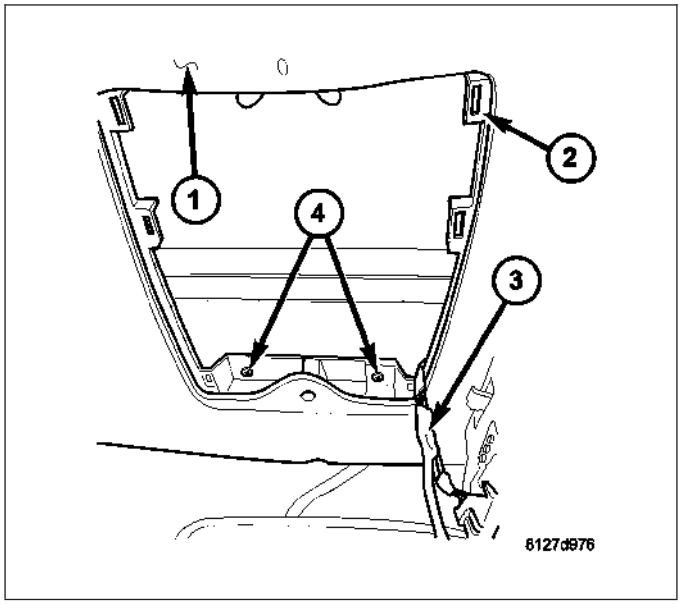


OVERHEAD CONSOLE BRACKET

1. Disconnect and isolate the battery negative cable.
2. Remove the overhead console (1) from the overhead console bracket.(Refer to 8 - ELECTRICAL/ OVERHEAD CONSOLE - REMOVAL).



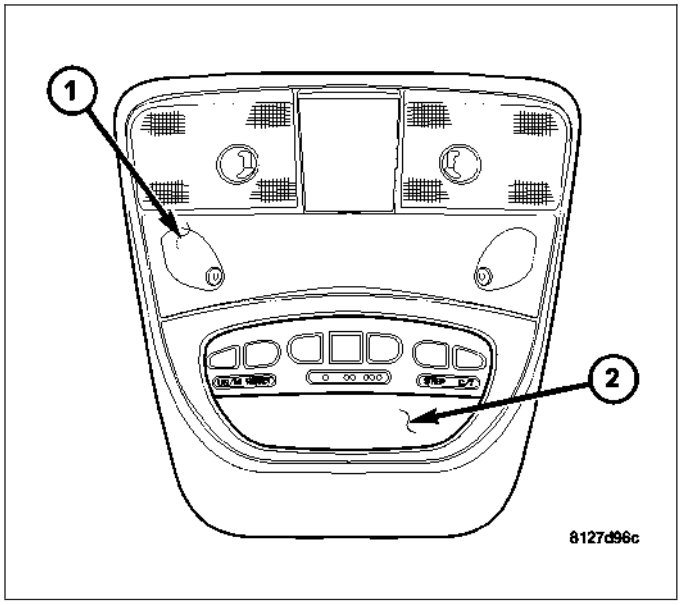
3. Remove the two screws (4) that secure the front of the overhead console bracket (2) to the roof front header.
4. Remove the overhead console bracket (2) from the headliner (1) by moving it back and forth to free it from it's seat.



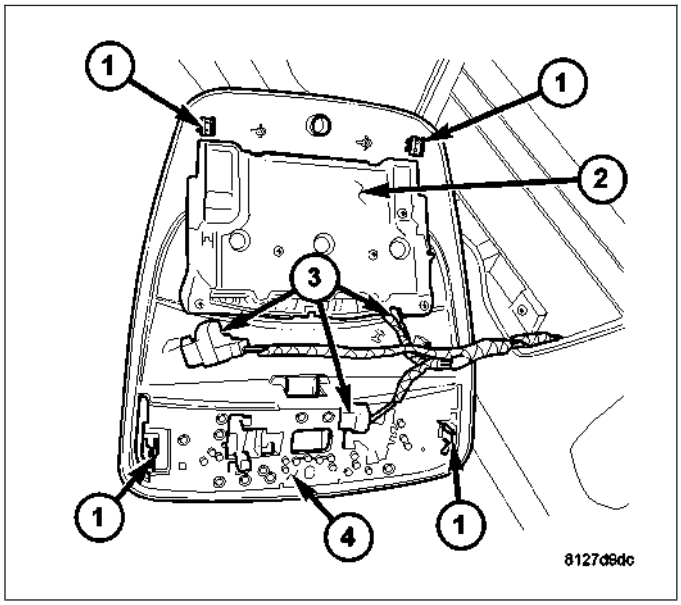
INSTALLATION

OVERHEAD CONSOLE

1. Position the overhead console (1) near the mounting location on the headliner.

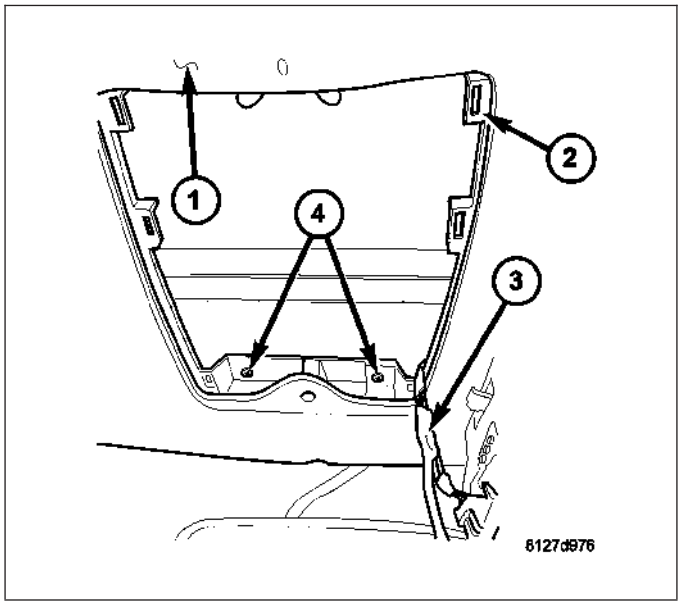


2. Reconnect the roof wire harness connector (3) to the overhead console wire harness connector.
3. Align the snap clips (1) on the overhead console housing with their receptacles in the overhead console bracket.
4. Push upward firmly and evenly on the sides of the overhead console housing over the snap clip locations until the snap clip is fully engaged with its receptacle in the overhead console bracket.
5. Reconnect the battery negative cable.

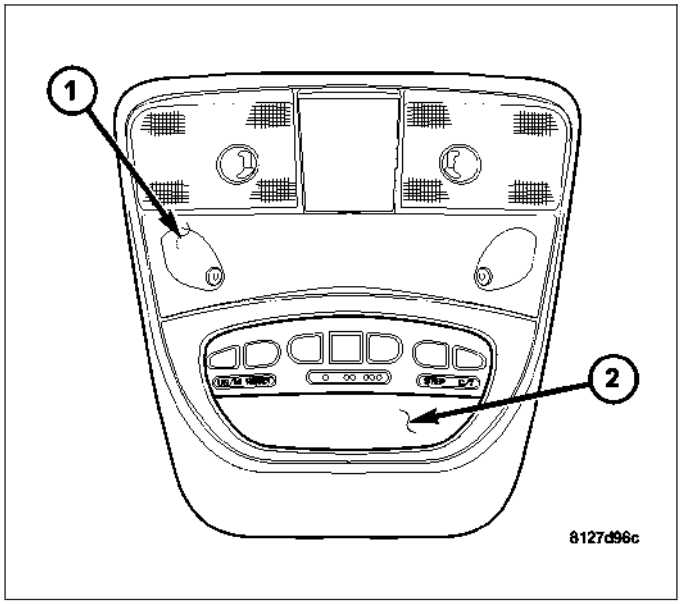


OVERHEAD CONSOLE BRACKET

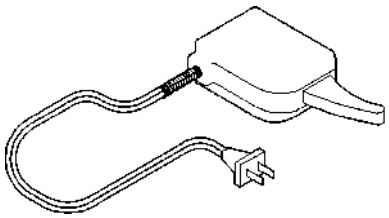
1. Install the overhead console bracket (2) to the headliner (1) and roof front header.
2. Install and tighten the two screws (4) that secure the front of the overhead console bracket (2) to the roof front header. Tighten the screws to 1.9 N·m (17 in. lbs.).



3. Install the overhead console (1) onto the overhead console bracket. (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - INSTALLATION).
4. Reconnect the battery negative cable.



SPECIAL TOOLS

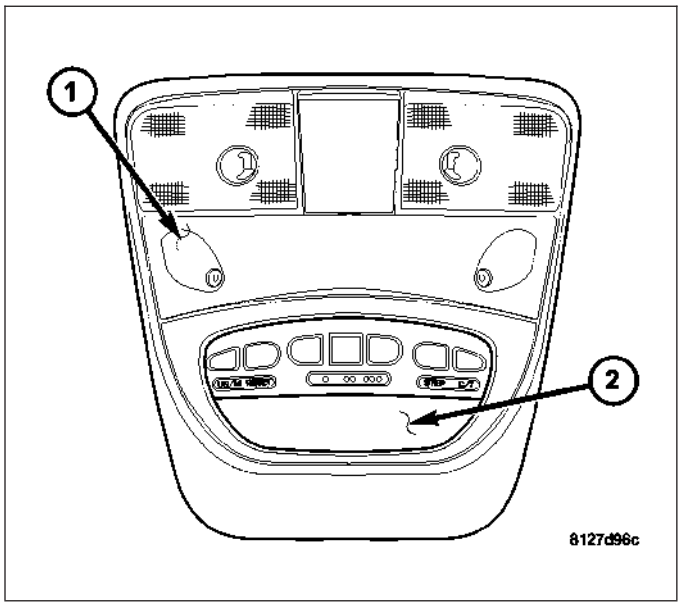


DEGAUSSING TOOL #6029

MODULE-COMPASS TEMPERATURE

DESCRIPTION

The compass mini-trip computer (2) is located in the overhead console (1) on models equipped with this option. The compass mini-trip computer units include the electronic control module, a Vacuum-Fluorescent Display (VFD), a compass sensor unit and two push button function switches.



The compass mini-trip computer module contains a central processing unit and interfaces with other electronic modules in the vehicle on the Programmable Communication Interface (J1850) data bus network. The J1850 data bus network allows the sharing of sensor information. This helps to reduce wire harness complexity, reduce internal controller hardware, and reduce component sensor current loads. At the same time, this system provides increased reliability, enhanced diagnostics, and allows the addition of many new feature capabilities.

The compass mini-trip computer provides several electronic functions and features. Some of the functions and features that the compass mini-trip computer module supports and/or controls, include the following display options:

- **Compass and temperature** - provides the outside temperature and one of eight compass readings to indicate the direction the vehicle is facing.
- **Trip odometer (TRIP ODO)** - shows the distance travelled since the last trip computer reset.
- **Average fuel economy (AVG ECO)** - shows the average fuel economy since the last trip computer reset.
- **Distance to empty (DTE)** - shows the estimated distance that can be travelled with the fuel remaining in the fuel tank. This estimated distance is computed using the level of the fuel in the tank and a weighted average of long term and recent Average Fuel Economy.
- **Elapsed time (ET)** - shows the accumulated ignition-on time since the last trip computer reset.
- **Blank screen** - the compass mini-trip VFD is turned off.

The ambient temperature sensor is hard wired to the HVAC control head (4.7L equipped vehicles are hard wired to the Next Generation Controller). Data input for all other compass mini-trip computer functions, including VFD dimming level, is received through J1850 data bus messages. The compass mini-trip computer uses its internal programming and all of these inputs to calculate and display the requested data. If the data displayed is incorrect, perform the self-diagnostic tests as described in this group. If these tests prove inconclusive, the use of a DRB scan tool and the proper Diagnostic Procedures manual are recommended for further testing of the compass mini-trip computer module and the J1850 data bus.

The compass mini-trip computer module cannot be repaired, and is available for service only as a unit. This unit includes the push button switches and the plastic module and display lens. If any of these components is faulty or damaged, the complete compass mini-trip computer module must be replaced.

COMPASS

While in the compass/temperature mode, the compass will display the direction in which the vehicle is pointed using the eight major compass headings (Examples: north is N, northeast is NE). The self-calibrating compass unit requires no adjusting in normal use. The only calibration that may prove necessary is to drive the vehicle in one or two complete circles, on level ground, in not less than 16 seconds. This will reorient the compass unit to its vehicle.

The compass unit also will compensate for magnetism the body of the vehicle may acquire during normal use. However, avoid placing anything magnetic directly on the roof of the vehicle. Magnetic mounts for an antenna, a repair order hat, or a funeral procession flag can exceed the compensating ability of the compass unit if placed on the roof panel. Magnetic bit drivers used on the fasteners that hold the overhead console assembly to the roof header can also affect compass operation. If the vehicle roof should become magnetized, the demagnetizing and calibration procedures found in this group may be required to restore proper compass operation.

TEMPERATURE

The temperature displays the outside ambient temperature in whole degrees. The temperature display can be changed from Fahrenheit to Celsius using the U.S./Metric push button. The displayed temperature is not an instant reading of conditions, but an average temperature. It may take the temperature display several minutes to respond to a major temperature change, such as driving out of a heated garage into winter temperatures.

When the ignition switch is turned to the Off position, the last displayed temperature reading stays in the temperature unit memory. When the ignition switch is turned to the On position again, the temperature will display the memory temperature if the engine OFF time is less than 90 minutes. If the engine OFF time is more than 90 minutes, the temperature will display the actual temperature sensed by the ambient temperature sensor. The temperature display update interval varies with the vehicle speed.

The temperature function is supported by an ambient temperature sensor. The sensor is mounted outside the passenger compartment near the front and center of the vehicle, and is hard wired to the HVAC control head (4.7L equipped vehicles are hard wired to the Next Generation Controller), which sends temperature on J1850 data bus circuit. The ambient temperature sensor is available as a separate service item.

Note: The compass mini-trip computer will display min and max temperatures of -40° C (-40° F) and 54°C (130° F).

OPERATION

The compass mini-trip computer only operates with the ignition switch in the On position. When the ignition switch is turned to the On position, all of the segments in the compass mini-trip computer VFD will be turned off for one second, then the display will return to the last function being displayed before the ignition was turned to the Off position. With the ignition switch in the On position, momentarily depressing and releasing the Step push button switch will cause the compass-mini-trip computer to change its mode of operation, and momentarily depressing and releasing the U.S./Metric push button will cause the unit to toggle between U.S. and Metric measurements.

This compass mini-trip computer features several functions that can be reset. If the RESET push button is depressed for more than one second with the ignition switch in the On position, the trip computer information that can be reset is reset. However, the reset will only occur if the function currently displayed is a function that can be reset. The functions that can be reset are: TRIP ODO, AVG ECO, and ET. All three of these functions can be reset at once by pressing the RESET button twice within 3 seconds while any one of the three functions is selected.

For more information on the features and control functions of the compass mini-trip computer, see the owner's manual in the vehicle glove box.

DIAGNOSIS AND TESTING

COMPASS MINI-TRIP COMPUTER

If the problem with the compass mini-trip computer module is an inaccurate or scrambled display, refer to **Self-Diagnostic Test** below. If the problem with the compass mini-trip computer module is incorrect Vacuum Fluorescent Display (VFD) dimming levels, use a scan tool and the proper Diagnostic Procedures information to test for the correct dimming message inputs being received from the instrument cluster over the CAN data bus. If the problem is a no-display condition, use the following procedures.

1. Check the fused ignition switch output (run/start) fuse in the junction block. If OK, go to Step 2. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.
2. Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output (run/start) fuse in the junction block. If OK, go to Step 3. If not OK, repair the open fused ignition switch output (run/start) circuit to the ignition switch as required.

3. Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Remove the overhead console. Check for continuity between the ground circuit cavities of the roof wire harness connector for the overhead console and a good ground. There should be continuity. If OK, go to Step 4. If not OK, repair the open ground circuit to ground as required.
4. Connect the battery negative cable. Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output (run/start) circuit cavity of the roof wire harness connector for the overhead console. If OK, refer to **Self-Diagnostic Test** below, for further diagnosis of the compass mini-trip computer module and the J1850 data bus. If not OK, repair the open fused ignition switch output (run/start) circuit to the junction block as required.

SELF- DIAGNOSTIC TEST

A self-diagnostic test is used to determine that the compass mini-trip computer module is operating properly electrically. Initiate the self-diagnostic test as follows:

Note: The compass mini-trip computer self - test can also be performed using a scan tool. Refer to Auto Self Test under the System Tests.

1. With the ignition switch in the Off position, simultaneously depress and hold the STEP and RESET buttons while rotating the ignition switch to the Run/On position.
2. Continue to hold both buttons depressed until the compass mini-trip computer module enters the display segment test. In this test, all of the Vacuum Fluorescent Display (VFD) segments are lighted while the compass mini-trip computer module performs the following checks:
   - Non-Volatile Memory Status (NVM)
   - RAM Status
   - ROM Status
   - ASIC Communication Test Status
   - Compass Test Status
   - DC Status
   - CAN data bus Communications Test

Note: If module is equipped with the Universal Transmitter, the module also checks “Universal Transmitter Communication Test Status”

3. Following completion of these tests, the compass mini-trip computer will display one of two messages: “FAIL” or “PASS.” Press RESET or STEP to exit and enter normal mode. Respond to these test results as follows:
   - If no test result message is displayed, but compass mini-trip computer operation is still improper, the use of a DRB III® scan tool and the proper Diagnostic Procedures manual are required for further diagnosis.
   - If the “FAIL” message is displayed, the compass mini-trip computer module is faulty and must be replaced.
   - If the “PASS” message is displayed, the compass mini-trip computer module is OK, no faults are present.
   - If any VFD segment should fail to light during the display segment test, the compass mini-trip computer module is faulty and must be replaced.
4. If the first seven tests pass, the Compass mini-trip computer shall verify that all the required CAN bus messages are present on the CAN bus. If all required messages are present on the CAN bus, or if the ignition switch is turned to the Off position, the compass mini-trip computer module will automatically return to normal operation. The required CAN bus messages are:
   - Dimming message
   - Fuel Used message
   - Distance Pulses message
   - Percentage Fuel Tank Full message
   - Fuel Type message
   - VIN (Vehicle Identification Number)
   - Vehicle Speed message
   - Last Engine Off Duration message

- Ambient Air Temperature message

Note: The Fuel Used message shall be ignored if the engine type is Diesel or Compressed Natural Gas.

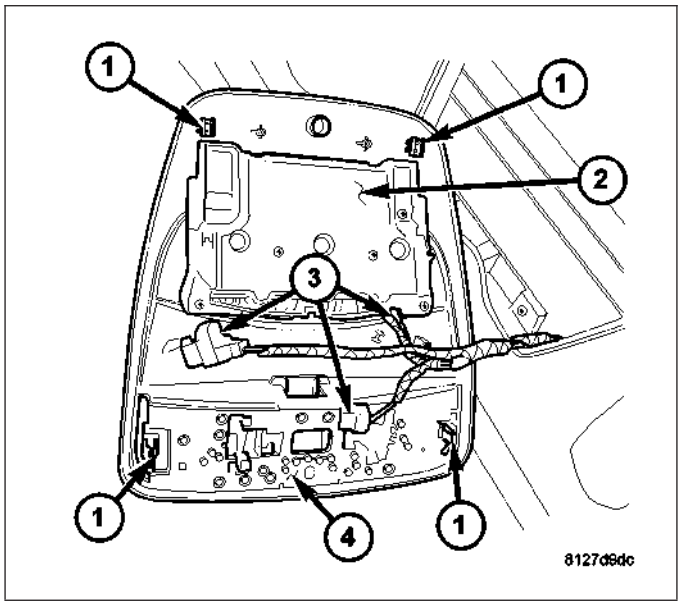
Note: Pressing the STEP or RESET switches during any portion of the testing procedure will cause the compass mini-trip computer to exit diagnostics and return to compass/temperature mode.

Note: If the compass functions, but accuracy is suspect, it may be necessary to perform a variation adjustment. This procedure allows the compass unit to accommodate variations in the earth's magnetic field strength, based on geographic location.

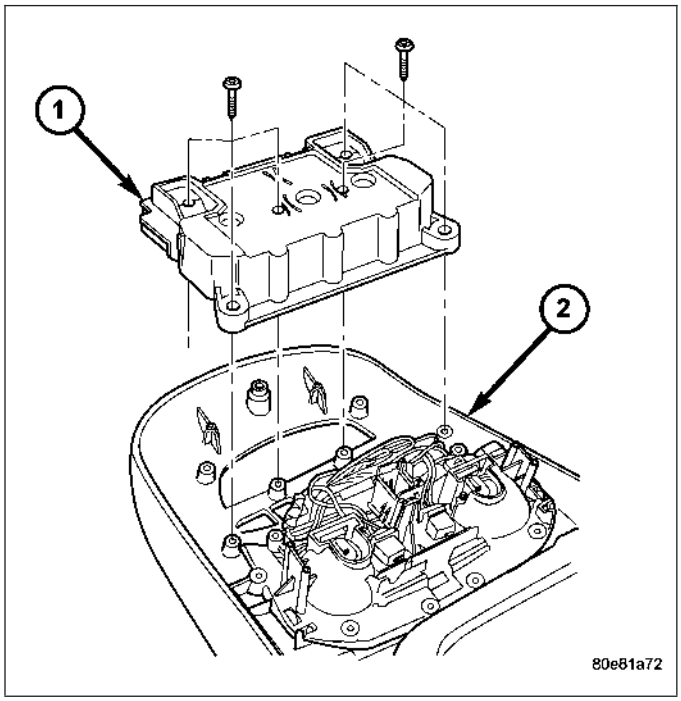
Note: If the compass reading has blanked out, and only "CAL" appears in the display, demagnetizing may be necessary to remove excessive residual magnetic fields from the vehicle.

REMOVAL

1. Disconnect and isolate the negative battery cable.
2. Remove the overhead console (4) from the headliner (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - REMOVAL).



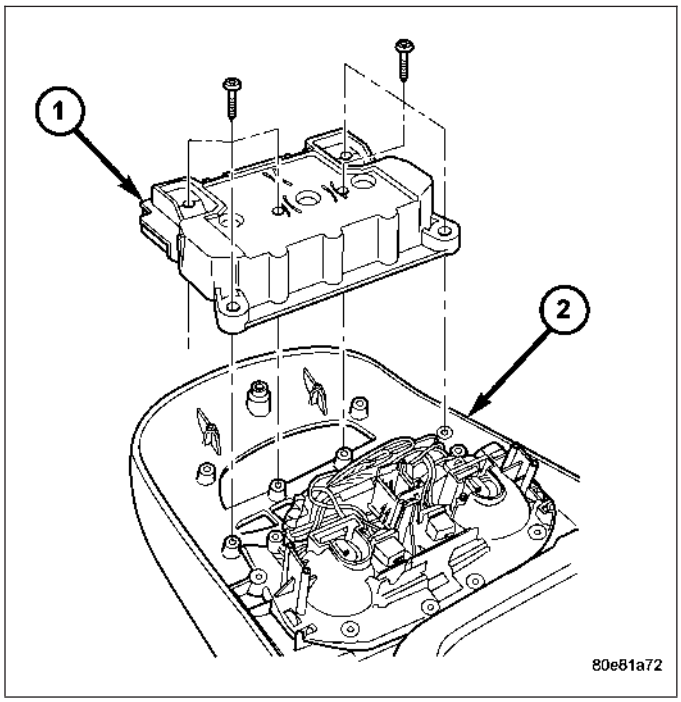
3. Remove the screws that secure the compass mini-trip computer module (1) to the overhead console housing.
4. Disconnect the overhead console wire harness connector from the compass mini-trip computer module connector receptacle.
5. Remove the compass mini-trip computer module (1) from the overhead console housing.



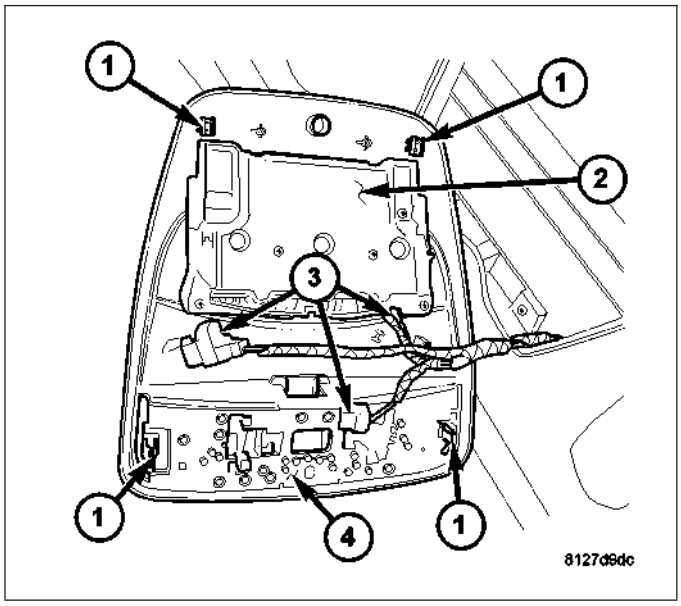
INSTALLATION

Note: If a new compass mini-trip computer has been installed, the compass will have to be calibrated and the variance set. Refer to Compass Variation Adjustment and Compass Calibration in the Service Procedures section of this group for the procedures.

1. Position the compass mini-trip computer module (1) onto the overhead console housing (2).
2. Reconnect the overhead console wire harness connector to the compass mini-trip computer module connector receptacle.
3. Install and tighten the screws that secure the compass mini-trip computer module to the overhead console housing. Tighten the screws to 2.2 N·m (20 in. lbs.).



4. Install the overhead console (4) onto the headliner (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - INSTALLATION).
5. Reconnect the negative battery cable.

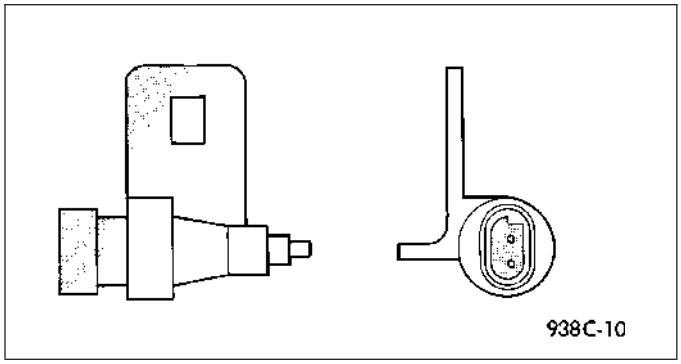


SENSOR-AMBIENT AIR TEMPERATURE

DESCRIPTION

The ambient temperature sensor is a variable resistor mounted to a bracket that is secured with a screw to the right side of the radiator yoke, behind the radiator grille and in front of the engine compartment.

For complete circuit diagrams refer to Wiring. The ambient temperature sensor cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.



OPERATION

The ambient temperature sensor is a variable resistor that operates on a five-volt reference signal sent to it by the A/C-heater control. The resistance in the sensor changes as temperature changes, changing the temperature sensor signal circuit voltage to the A/C-heater control. Based upon the resistance in the sensor, the A/C-heater control senses a specific voltage on the temperature sensor signal circuit, which it is programmed to correspond to a specific temperature.

DIAGNOSIS AND TESTING

AMBIENT TEMPERATURE SENSOR

The temperature function is supported by the ambient temperature sensor, a wiring circuit, and a portion of the A/C-heater control. If any portion of the ambient temperature sensor circuit fails or if PCI Bus information is missing, a (– –) will appear in the display in place of the temperature. When the sensor is exposed to temperatures above 55° C (130° F), or if the sensor circuit is shorted, 55° C (130° F) will appear in the display in place of the temperature, when the sensor is exposed to temperatures below - 40° C (- 40° F) or if the sensor circuit is open, - 40° C (- 40° F) will appear in the display.

The ambient temperature sensor circuit can also be diagnosed using the following Sensor Test, and Sensor Circuit Test. If the temperature sensor and circuit are confirmed to be OK, but the temperature display is inoperative or incorrect, test the mini-trip computer (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE/COMPASS/MINI-TRIP COMPUTER - DIAGNOSIS AND TESTING).

SENSOR TEST

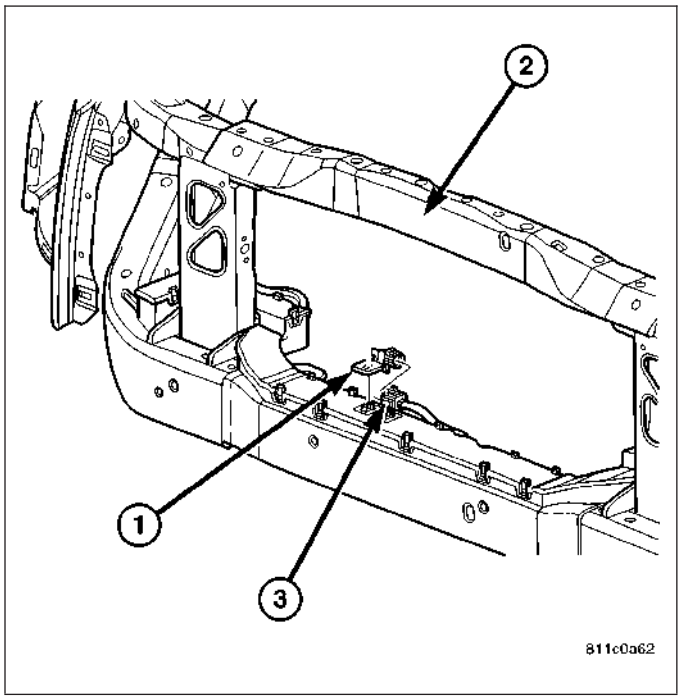
1. Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Disconnect the ambient temperature sensor harness connector.
2. Measure the resistance of the ambient temperature sensor. At - 40° C (- 40° F), the sensor resistance is 336 kilohms. At 55° C (130° F), the sensor resistance is 2.488 kilohms. The sensor resistance should read between these two values. If OK, refer to Sensor Circuit Test in this group. If not OK, replace the faulty ambient temperature sensor.

SENSOR CIRCUIT TEST

1. Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Disconnect the wire harness connectors from the ambient temperature sensor and the A/C-heater control.
2. Connect a jumper wire between the two terminals in the body half of the ambient temperature sensor harness connector.
3. Check for continuity between the sensor return circuit and the ambient temperature sensor signal circuit cavities of the A/C-heater control harness connector. There should be continuity. If OK, go to Step 4. If not OK, repair the open sensor return circuit or ambient temperature sensor signal circuit to the ambient temperature sensor as required.
4. Check for continuity between the ambient temperature sensor signal circuit cavity of the A/C-heater control harness connector and a good ground. There should be no continuity. If OK, test the mini-trip computer (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE/COMPASS/MINI-TRIP COMPUTER - DIAGNOSIS AND TESTING). If not OK, repair the shorted ambient temperature sensor signal circuit as required.

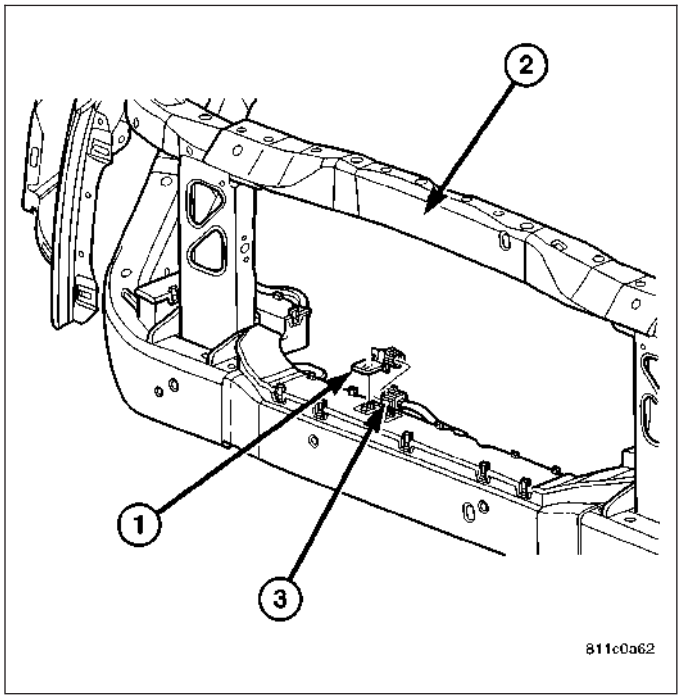
REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Locate the ambient temperature sensor (1), on the right side of the radiator yoke (2) behind the grille.
3. Disconnect the wire harness connector (3) from the ambient temperature sensor connector receptacle.
4. Remove the one screw that secures the ambient temperature sensor bracket to the radiator yoke.
5. Remove the ambient temperature sensor from the radiator yoke.



INSTALLATION

1. Position the ambient temperature sensor (1) onto the radiator yoke (2).
2. Install the screw that secures the ambient temperature sensor to the radiator yoke. Tighten the screw to 5.6 N·m (50 in. lbs.).
3. Connect the wire harness connector (3) to the ambient temperature sensor (1).
4. Reconnect the negative battery cable.



UNIVERSAL TRANSMITTER

DESCRIPTION

On some models a Universal Transmitter transceiver is standard factory-installed equipment. The universal transmitter transceiver is integral to the overhead console. The only visible component of the universal transmitter are the three transmitter push buttons at the rear of the CMTC. The three universal transmitter push buttons can be easily identified by sight.

Each of the three universal transmitter push buttons controls an independent radio transmitter channel. Each of these three channels can be trained to transmit a different radio frequency signal for the remote operation of garage door openers, motorized gate openers, home or office lighting, security systems or just about any other device that can be equipped with a radio receiver in the 286 to 399 MegaHertz (MHz) frequency range for remote operation. The universal transmitter is capable of operating systems using either rolling code or non-rolling code technology.

The universal transmitter cannot be repaired, and is available for service only as a unit. This unit includes the push button switches and the plastic module.

DIAGNOSIS AND TESTING

UNIVERSAL TRANSMITTER

If the Universal Transmitter is inoperative, but the Electronic Vehicle Information Center (EVIC) is operating normally, see the owner's manual in the vehicle glove box for instructions on training the Transmitter. Retrain the Transmitter with a known good transmitter as instructed in the owner's manual and test the Transmitter operation again. If the unit is still inoperative, test the universal transmitter with Radio Frequency Detector special tool. If both the Transmitter and the EVIC module are inoperative, refer to **Electronic Vehicle Information Center Diagnosis and Testing** in this group for further diagnosis. For complete circuit diagrams, refer to **Wiring Diagrams**. as described below:

1. Turn the Radio Frequency (RF) Detector ON. A "chirp" will sound and the green power LED will light. If the green LED does not light, replace the battery.
2. Hold the RF detector within one inch of the TRAINED universal transmitter and press any of the transmitters buttons.

3. The red signal detection LEDs will light and the tool will beep if a radio signal is detected. Repeat this test three times.

STANDARD PROCEDURE

PROGRAMMING TRANSMITER CODES

CAUTION: Vehicle exhaust contains carbon monoxide, a dangerous gas. Do not run the vehicle's exhaust while training the transceiver. Exhaust gas can cause serious injury or death.

CAUTION: Your motorized door or gate will open and close while you are training the Universal Transceiver. Do not train the transceiver if people or pets are in the path of the door or gate. A moving door or gate can cause serious injury or death to people and pets or damage to objects.

1. Press and hold the two outer HomeLink buttons, and release only when the indicator light begins to flash (after 20 seconds). **Do not** hold the buttons for longer than 30 seconds and **do not** repeat step one to program a second and/or third hand-held transmitter to the remaining two HomeLink buttons.
2. Position the end of your hand-held transmitter 1-3 inches (3-8 cm) away from the HomeLink buttons while keeping the indicator light in view.
3. Simultaneously press and hold both the HomeLink button that you want to train and the hand-held transmitter buttons. **Do not release the buttons until step 4 has been completed.**
4. The HomeLink indicator light will flash slowly and then rapidly after HomeLink successfully receives the frequency signal from the hand-held transmitter. Release both buttons after the indicator light changes from the slow to the rapid flash.
5. Release the buttons.
6. Press and hold the just trained HomeLink button and observe the indicator light. If the indicator light **stays on constantly, programming is complete** and your device should activate when the HomeLink button is pressed and released.
7. To program the remaining two HomeLink buttons, begin with ″Programming″ **step two. Do not repeat step one.**
8. If the indicator light blinks **rapidly for two seconds and then turns to a constant light, continue with ″Programming″ steps 6-8** to complete the programming of a rolling code equipped device (most commonly a garage door opener).
9. At the garage door opener receiver (motor-head unit) in the garage, locate the ″learn″ or ″smart″ button. This can usually be found where the hanging antenna wire is attached to the motor-head unit.
10. Firmly press and release the ″learn″ or ″smart″ button. (The name and color of the button may vary by manufacturer.)
11. There are 30 seconds in which to initiate step eight.
12. Return to the vehicle and firmly **press, hold for two seconds and release** the programmed HomeLink button. Repeat the **″press/hold/release″** sequence a second time, and, depending on the brand of the garage door opener (or other rolling code equipped device), repeat this sequence a third time to complete the programming.
13. HomeLink should now activate your rolling code equipped device.

ERASING TRANSMITTER CODES

Note: Individual channels cannot be erased. Erasing the transmitter codes will erase ALL programmed codes.

To erase programming from the three buttons (individual buttons cannot be erased but can be ″reprogrammed″ - note below), follow the step noted:

- Press and hold the two outer HomeLink buttons until the indicator light begins to flash-after 20 seconds. Release both buttons. Do not hold for longer that 30 seconds. HomeLink is now in the train (or learning) mode and can be programmed at any time beginning with ″Programming″ (Refer to 8 - ELECTRICAL/ OVERHEAD CONSOLE/UNIVERSAL TRANSMITTER - STANDARD PROCEDURE).

REPROGAMMING TRANSMITTER CODES

CAUTION: Vehicle exhaust contains carbon monoxide, a dangerous gas. Do not run the vehicle's exhaust while training the transceiver. Exhaust gas can cause serious injury or death.

CAUTION: Your motorized door or gate will open and close while you are training the Universal Transceiver. Do not train the transceiver if people or pets are in the path of the door or gate. A moving door or gate can cause serious injury or death to people and pets or damage to objects.

To program a device to HomeLink using a HomeLink button previously trained, follow these steps:

1. Press and hold the desired HomeLink button. **Do NOT** release the button.
2. The indicator light will begin to flash after 20 seconds. Without releasing the HomeLink button, proceed with ″Programming″ step 3
3. Press and hold the two outer HomeLink buttons, and release only when the indicator light begins to flash (after 20 seconds). **Do not** hold the buttons for longer than 30 seconds and **do not** repeat step one to program a second and/or third hand-held transmitter to the remaining two HomeLink buttons.
4. Position the end of your hand-held transmitter 1-3 inches (3-8 cm) away from the HomeLink buttons while keeping the indicator light in view.
5. Simultaneously press and hold both the HomeLink button that you want to train and the hand-held transmitter buttons. **Do not release the buttons until step 4 has been completed.**
6. The HomeLink indicator light will flash slowly and then rapidly after HomeLink successfully receives the frequency signal from the hand-held transmitter. Release both buttons after the indicator light changes from the slow to the rapid flash.
7. Release the buttons.
8. Press and hold the just trained HomeLink button and observe the indicator light. If the indicator light **stays on constantly, programming is complete** and your device should activate when the HomeLink button is pressed and released.
9. To program the remaining two HomeLink buttons, begin with ″Programming″ **step two. Do not repeat step one.**
10. If the indicator light blinks **rapidly for two seconds and then turns to a constant light, continue with ″Programming″ steps 6-8** to complete the programming of a rolling code equipped device (most commonly a garage door opener).
11. At the garage door opener receiver (motor-head unit) in the garage, locate the ″learn″ or ″smart″ button. This can usually be found where the hanging antenna wire is attached to the motor-head unit.
12. Firmly press and release the ″learn″ or ″smart″ button. (The name and color of the button may vary by manufacturer.)
13. There are 30 seconds in which to initiate step eight.
14. Return to the vehicle and firmly **press, hold for two seconds and release** the programmed HomeLink button. Repeat the **″press/hold/release″** sequence a second time, and, depending on the brand of the garage door opener (or other rolling code equipped device), repeat this sequence a third time to complete the programming.
15. HomeLink should now activate your rolling code equipped device.

POWER SYSTEMS

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POWER LOCKS - ELECTRICAL DIAGNOSTICS

DIAGNOSIS AND TESTING

B210D-BATTERY VOLTAGE LOW – MEMORY MIRROR MODULE

For the Power Door Lock circuit diagram (Refer to 8 - ELECTRICAL/POWER LOCKS - SCHEMATICS AND DIAGRAMS)
For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  At all times.
- **Set Condition:**
  Anytime the module senses voltage input below 9.5 volts, this code will set.

POSSIBLE CAUSES
LOW VOLTAGE ENGINE DTC
MEMORY MIRROR MODULE

Diagnostic Test

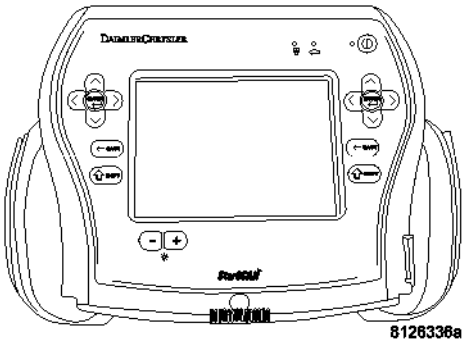
1. CHECK ENGINE DTC's

With the scan tool, read ENGINE DTC's

Are there any ENGINE DTC's present?

No >> Go to 2

Yes >> Refer to symptom list for problems related to ENGINE.



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2. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase DTC's
Start the engine and run for 2 minutes.
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read DTC's.

Does the scan tool display BATTERY VOLTAGE LOW?

Yes >> Replace the Memory Mirror Module.
Perform BODY VERIFICATION TEST - VER 1.

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST - VER 1.

B210E-BATTERY VOLTAGE HIGH – MEMORY MIRROR MODULE

For the Power Door Lock circuit diagram (Refer to 8 - ELECTRICAL/POWER LOCKS - SCHEMATICS AND DIAGRAMS) For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  At all times.
- **Set Condition:**
  Anytime the module senses voltage input above 15.9 volts, this code will set.

POSSIBLE CAUSES
HIGH VOLTAGE ENGINE DTC
MEMORY MIRROR MODULE

Diagnostic Test

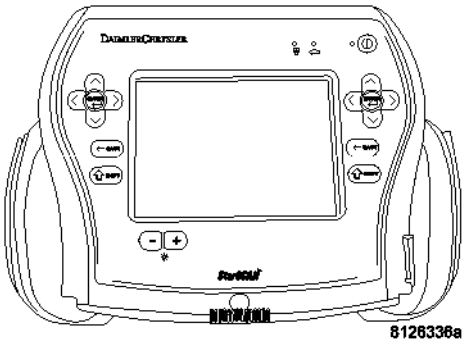
1. CHECK ENGINE DTC's

With the scan tool, read ENGINE DTC's

Are there any ENGINE DTC's present?

No >> Go to 2

Yes >> Refer to symptom list for problems related to ENGINE.



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2. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase DTC's
Start the engine and run for 2 minutes.
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read DTC's.

Does the scan tool display BATTERY VOLTAGE HIGH?

Yes >> Replace the Memory Mirror Module.
Perform BODY VERIFICATION TEST - VER 1.

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST - VER 1.

B2218, B2219–DOOR MODULE INTERNAL – MEMORY MIRROR MODULE

For the Power DoorLock circuit diagram (Refer to 8 - ELECTRICAL/POWER LOCKS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  At all times
- **Set Condition:**
  Whenever the module detects an EEPROM failure

POSSIBLE CAUSES
MEMORY MIRROR MODULE

Diagnostic Test

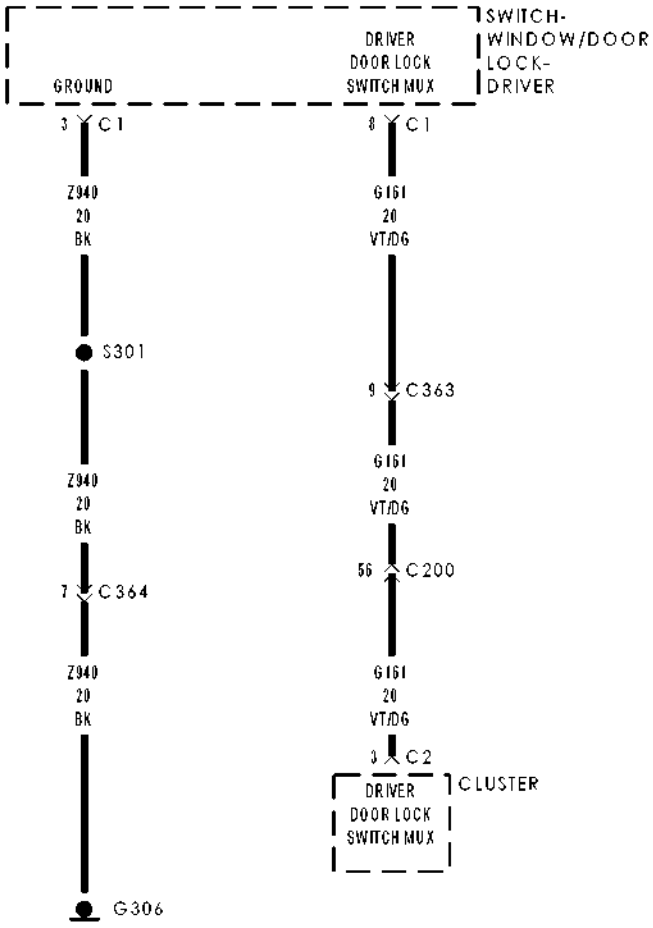
1. Replace the Memory Mirror Module

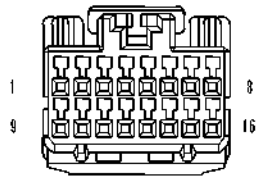
Note: Anytime this code is logged, the module must be replaced.

Repair

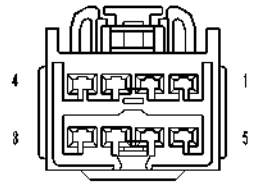
Replace the Memory Mirror Module.
Perform the Body Verification Test 1A

B1801 DRIVER DOOR LOCK/UNLOCK SWITCH INPUT CIRCUIT LOW — CLUSTER





CLUSTER
C2



SWITCH-WINDOW/DOOR
LOCK-DRIVER C1

81FF193

B1801 DRIVER DOOR LOCK/UNLOCK SWITCH INPUT CIRCUIT LOW — CLUSTER — (CONTINUED)

For the Power Door Lock circuit diagram (Refer to 8 - ELECTRICAL/POWER LOCKS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Driver Door Lock Switch Mux circuit is below 1.5 volts for over 5 seconds.

Possible Causes
(G161) DRIVER DOOR LOCK SWITCH MUX CIRCUIT SHORT TO GROUND
DOOR LOCK SWITCH SWITCH SHORT TO GROUND
INSTRUMENT CLUSTER

Theory of Operation

This code will only set in vehicles that do not have the Memory System.

Diagnostic Test

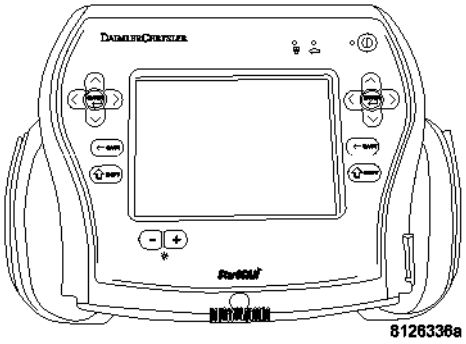
1. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase DTC's
Operate the Driver Door Lock Switch in all positions several times.
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read DTC's.

Does the scan tool display DRIVER DOOR LOCK/UNLOCK SWITCH INPUT CIRCUIT LOW?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST - VER 1.



B1801 DRIVER DOOR LOCK/UNLOCK SWITCH INPUT CIRCUIT LOW — CLUSTER — (CONTINUED)

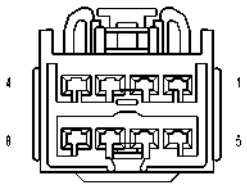
2. DOOR LOCK SWITCH SHORTED

With the scan tool, erase DTC's.
Disconnect the Driver Window/Door Lock Switch connector.
With the scan tool, read DTC's.

Does the scan tool display DRIVER DOOR LOCK/UNLOCK SWITCH INPUT CIRCUIT LOW?

No >> Replace the Driver Window/Door Lock Switch.
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Go To 3



SWITCH-WINDOW/DOOR LOCK-DRIVER C1

81264984

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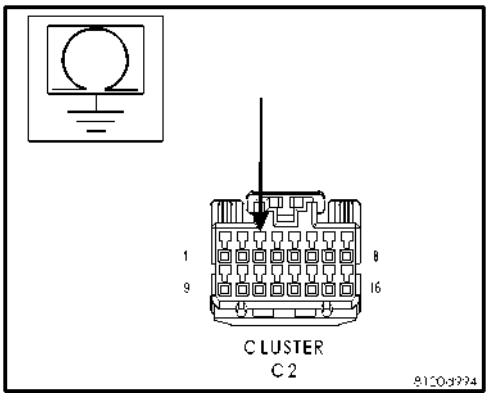
3. DRIVER DOOR LOCK SWITCH MUX CIRCUIT SHORT TO GROUND

Disconnect the Cluster C2 connector.
Measure the resistance between ground and the (G161) Driver Door Lock Switch Mux circuit.

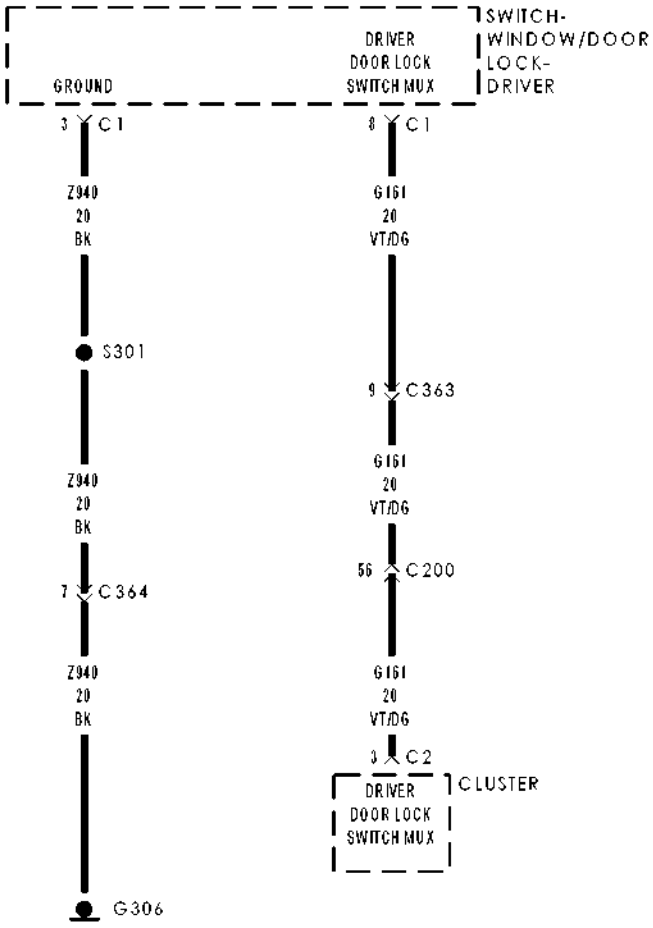
Is the resistance below 10000.0 ohms?

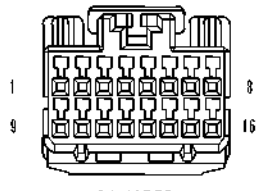
Yes >> Repair the(G161) Driver Door Lock Switch Mux circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Instrument Cluster.
Perform BODY VERIFICATION TEST - VER 1.

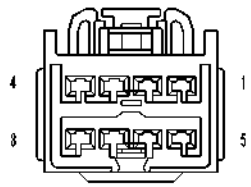


B1803–DRIVER DOOR LOCK/UNLOCK SWITCH INPUT STUCK LOCK— CLUSTER





CLUSTER
C2



SWITCH-WINDOW/DOOR LOCK-DRIVER C1

81FF193

B1803–DRIVER DOOR LOCK/UNLOCK SWITCH INPUT STUCK LOCK— CLUSTER — (CONTINUED)

For the Power Door Lock circuit diagram (Refer to 8 - ELECTRICAL/POWER LOCKS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Cluster senses a Lock input on the Driver Door Lock Switch Mux circuit for over 30 seconds, this code will set.

Possible Causes
(G161) DRIVER DOOR LOCK SWITCH MUX CIRCUIT PARTIAL SHORT TO GROUND
DOOR LOCK SWITCH STUCK
INSTRUMENT CLUSTER

Theory of Operation

This code will only set in Cluster in vehicles that do not have the Memory System.

Diagnostic Test

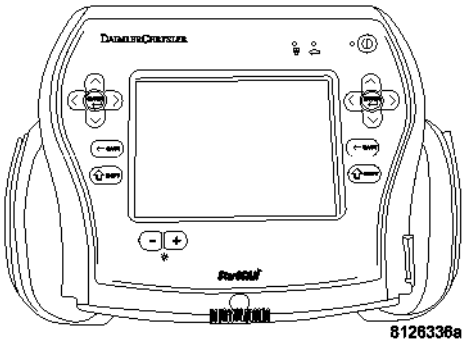
1. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase DTC's
Operate the Driver Door Lock Switch in all positions several times.
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read DTC's.

Does the scan tool display DRIVER DOOR LOCK/UNLOCK SWITCH INPUT STUCK LOCK?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST - VER 1.



B1803–DRIVER DOOR LOCK/UNLOCK SWITCH INPUT STUCK LOCK— CLUSTER — (CONTINUED)

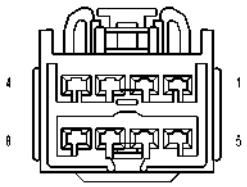
2. DOOR LOCK SWITCH SHORTED

With the scan tool, erase DTC's.
Disconnect the Driver Window/Door Lock Switch connector.
With the scan tool, read DTC's.

Does the scan tool display DRIVER DOOR LOCK/UNLOCK SWITCH INPUT STUCK LOCK?

No >> Replace the Driver Window/Door Lock Switch.
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Go To 3



SWITCH-WINDOW/DOOR LOCK-DRIVER C1

81264984

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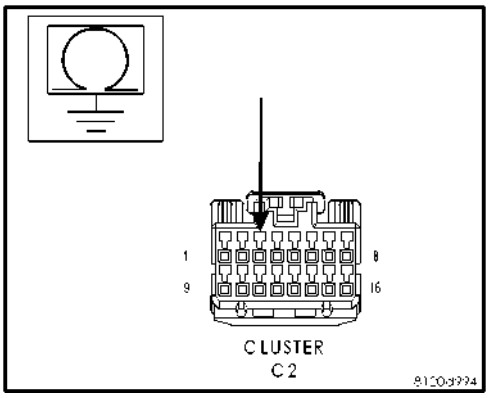
3. DRIVER DOOR LOCK SWITCH MUX CIRCUIT PARTIAL SHORT TO GROUND

Disconnect the Cluster C2 connector.
Measure the resistance between ground and the Driver Door Lock Switch Mux circuit.

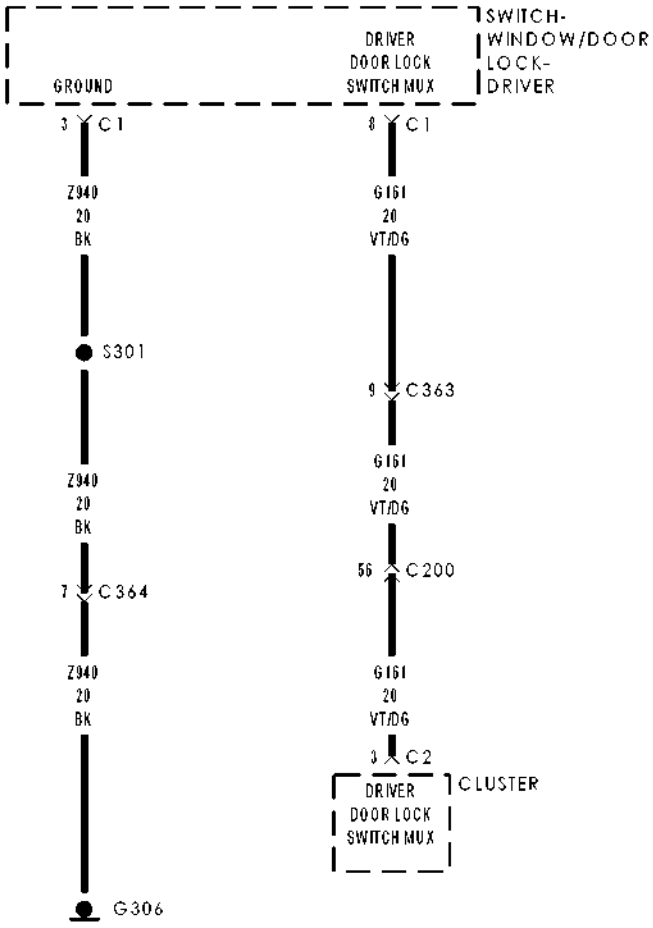
Is the resistance below 10000.0 ohms?

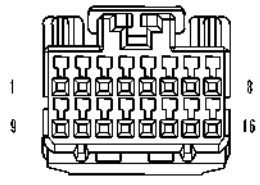
Yes >> Repair the Driver Door Lock Switch Mux circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Instrument Cluster.
Perform BODY VERIFICATION TEST - VER 1.

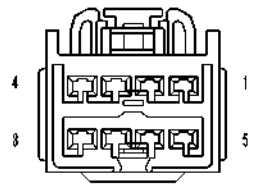


B1804–DRIVER DOOR LOCK/UNLOCK SWITCH INPUT STUCK UNLOCK— CLUSTER





CLUSTER
C2



SWITCH-WINDOW/DOOR
LOCK-DRIVER C1

81FF193

B1804–DRIVER DOOR LOCK/UNLOCK SWITCH INPUT STUCK UNLOCK— CLUSTER — (CONTINUED)

For the Power Door Lock circuit diagram (Refer to 8 - ELECTRICAL/POWER LOCKS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Cluster senses an Unlock input on the Driver Door Lock Switch Mux circuit for over 30 seconds, this code will set.

Possible Causes
(G161) DRIVER DOOR LOCK SWITCH MUX CIRCUIT PARTIAL SHORT TO GROUND
DRIVER DOOR LOCK SWITCH STUCK
INSTRUMENT CLUSTER

Theory of Operation

This code will only set in Cluster in vehicles that do not have the Memory System.

Diagnostic Test

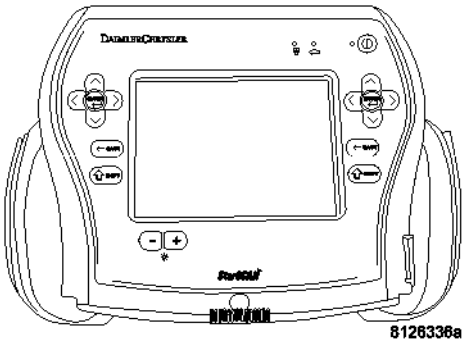
1. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase DTC's
Operate the Driver Door Lock Switch in all positions several times.
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read DTC's.

Does the scan tool display DRIVER DOOR LOCK/UNLOCK SWITCH INPUT STUCK UNLOCK?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST - VER 1.



B1804–DRIVER DOOR LOCK/UNLOCK SWITCH INPUT STUCK UNLOCK— CLUSTER — (CONTINUED)

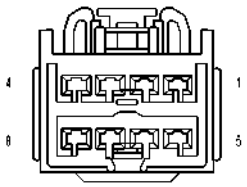
2. DOOR LOCK SWITCH SHORTED

With the scan tool, erase DTC's.
Disconnect the Driver Window/Door Lock Switch connector.
With the scan tool, read DTC's.

Does the scan tool display DRIVER DOOR LOCK/UNLOCK SWITCH INPUT STUCK UNLOCK?

No >> Replace the Driver Window/Door Lock Switch.
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Go To 3



SWITCH-WINDOW/DOOR LOCK-DRIVER C1

81204B4

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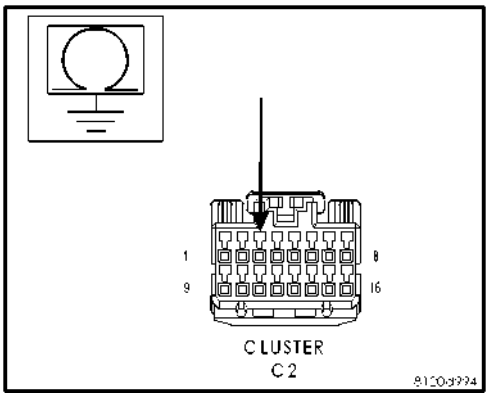
3. (G161) DRIVER DOOR LOCK SWITCH MUX CIRCUIT PARTIAL SHORT TO GROUND

Disconnect the Cluster C2 connector.
Measure the resistance between ground and the (G161) Driver Door Lock Switch Mux circuit.

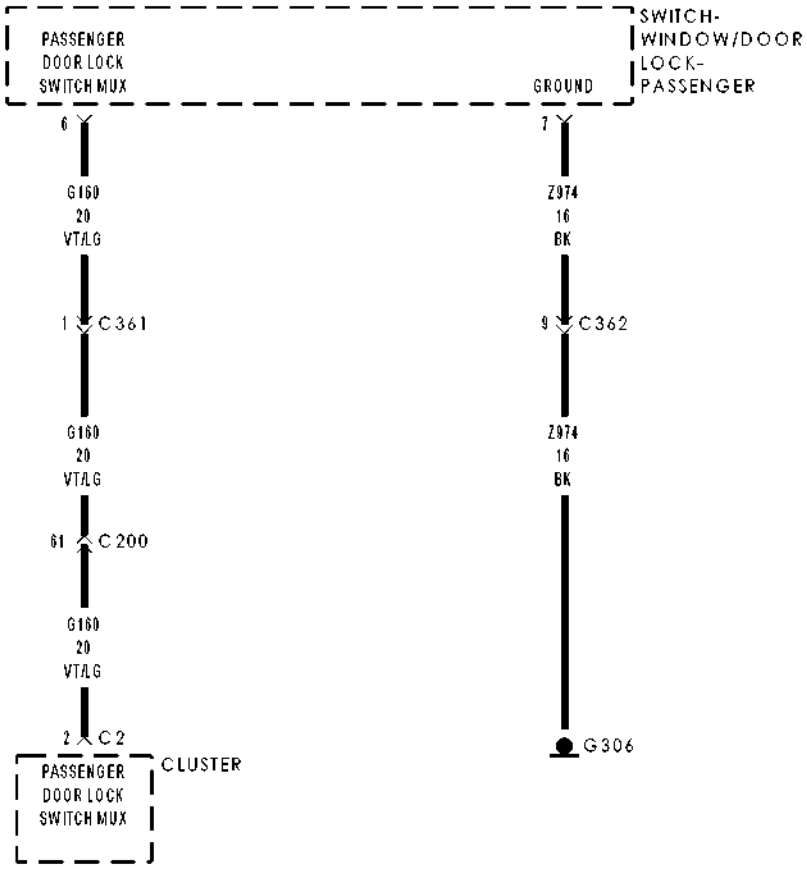
Is the resistance below 10000.0 ohms?

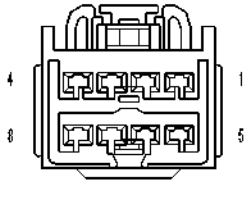
Yes >> Repair the (G161) Driver Door Lock Switch Mux circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Instrument Cluster.
Perform BODY VERIFICATION TEST - VER 1.

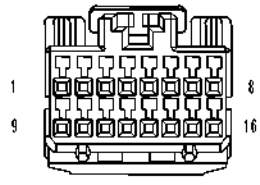


B1806–PASSENGER DOOR LOCK/UNLOCK SWITCH INPUT CIRCUIT LOW — CLUSTER





SWITCH-WINDOW/DOOR LOCK-PASSENGER



CLUSTER C2

812570D4

B1806–PASSENGER DOOR LOCK/UNLOCK SWITCH INPUT CIRCUIT LOW — CLUSTER — (CONTINUED)

For the Power Door Lock circuit diagram (Refer to 8 - ELECTRICAL/POWER LOCKS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Driver Door Lock Switch Mux circuit is below 0.7 volts for over 5 seconds.

Possible Causes
DOOR LOCK SWITCH SHORT TO GROUND
(G160) PASSENGER DOOR LOCK SWITCH MUXCIRCUIT SHORT TO GROUND
INSTRUMENT CLUSTER

Theory of Operation

This code will only set in vehicles that do not have the Memory System.

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase DTC's

Operate the Passenger Door Lock Switch in all positions several times.

Cycle the ignition from on to off 3 times.

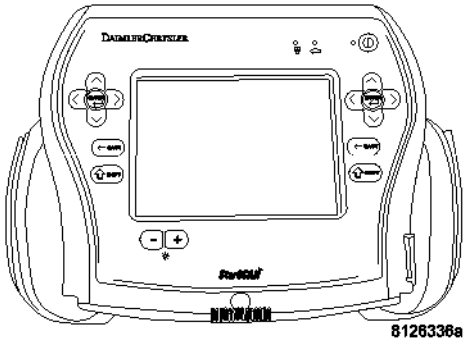
Turn the ignition on.

With the scan tool, read DTC's.

Does the scan tool display PASSENGER DOOR LOCK/UNLOCK SWITCH INPUT CIRCUIT LOW?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST - VER 1.



B1806–PASSENGER DOOR LOCK/UNLOCK SWITCH INPUT CIRCUIT LOW — CLUSTER — (CONTINUED)

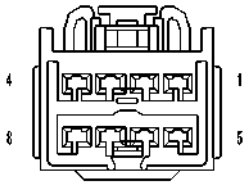
2. DOOR LOCK SWITCH SHORTED

With the scan tool, erase DTC's.
Diconnect the Passenger Window/Door Lock Switch connector.
With the scan tool, read DTC's.

Does the scan tool display PASSENGER DOOR LOCK/UNLOCK SWITCH INPUT CIRCUIT LOW?

No >> Replace the Passenger Window/Door Lock Switch.
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Go To 3



SWITCH-WINDOW/DOOR LOCK-PASSENGER

B1257046

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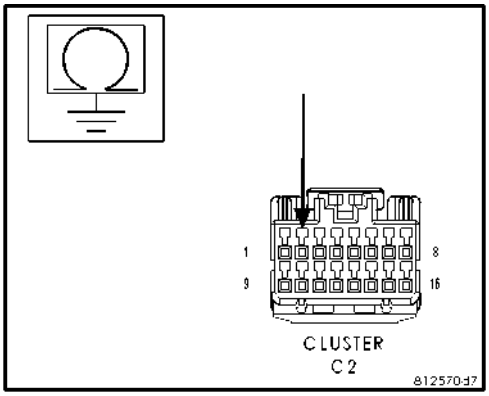
3. DRIVER DOOR LOCK SWITCH MUX CIRCUIT SHORT TO GROUND

Disconnect the Cluster C2 connector.
Measure the resistance between ground and the Passenger Door Lock Switch Mux circuit.

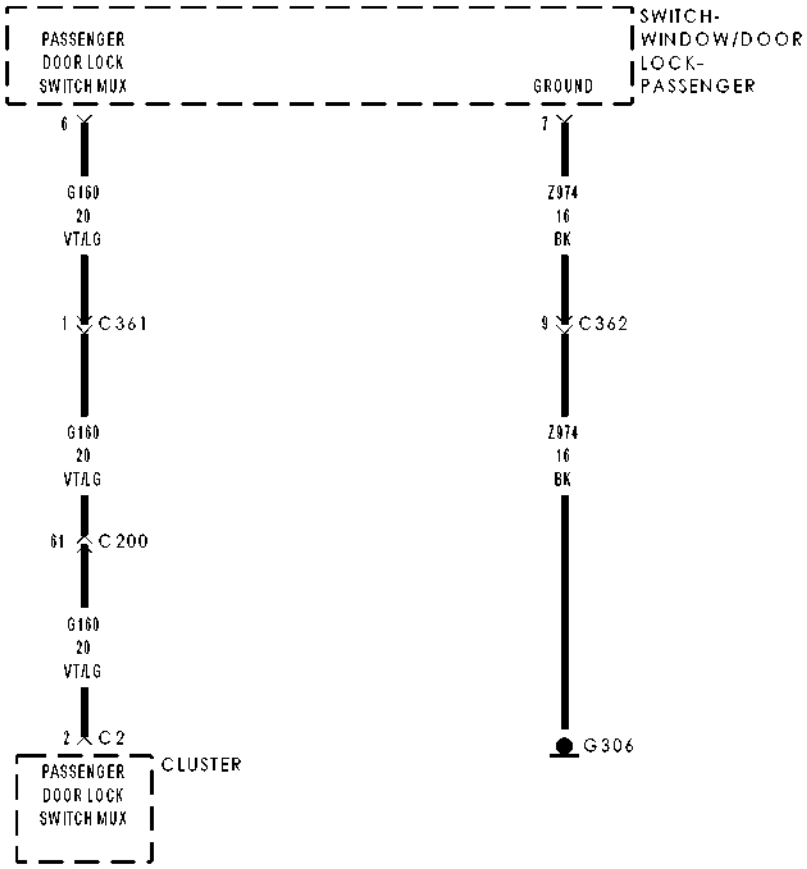
Is the resistance below 10000.0 ohms?

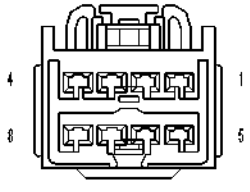
Yes >> Repair the Passenger Door Lock Switch Mux circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Instrument Cluster.
Perform BODY VERIFICATION TEST - VER 1.

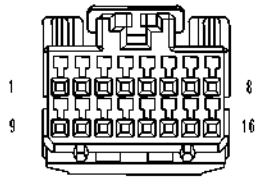


B1808–PASSENGER DOOR LOCK/UNLOCK SWITCH INPUT STUCK LOCK – CLUSTER





SWITCH-WINDOW/DOOR LOCK-PASSENGER



CLUSTER C2

812570D4

B1808–PASSENGER DOOR LOCK/UNLOCK SWITCH INPUT STUCK LOCK – CLUSTER — (CONTINUED)

For the Power Door Lock circuit diagram (Refer to 8 - ELECTRICAL/POWER LOCKS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Cluster senses a Lock input on the Passenger Door Lock Switch Mux circuit for over 30 seconds, this code will set.

Possible Causes
DOOR LOCK SWITCH STUCK
(G160) PASSENGER DOOR LOCK SWITCH MUX CIRCUIT PARTIAL SHORT TO GROUND
INSTRUMENT CLUSTER

Theory of Operation

This code will only set in Cluster in vehicles that do not have the Memory System.

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase DTC's

Operate the Passenger Door Lock Switch in all positions several times.

Cycle the ignition from on to off 3 times.

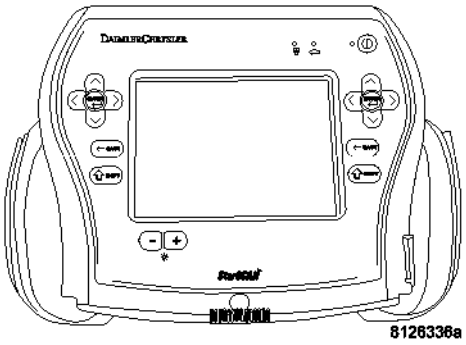
Turn the ignition on.

With the scan tool, read DTC's.

Does the scan tool display PASSENGER DOOR LOCK/UNLOCK SWITCH INPUT STUCK LOCK?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST - VER 1.



B1808–PASSENGER DOOR LOCK/UNLOCK SWITCH INPUT STUCK LOCK – CLUSTER — (CONTINUED)

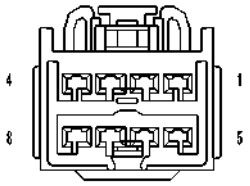
2. DOOR LOCK SWITCH SHORTED

With the scan tool, erase DTC's.
Disconnect the Passenger Window/Door Lock Switch connector.
With the scan tool, read DTC's.

Does the scan tool display PASSENGER DOOR LOCK/UNLOCK SWITCH INPUT STUCK LOCK?

No >> Replace the Passenger Window/Door Lock Switch.
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Go To 3



SWITCH-WINDOW/DOOR LOCK-PASSENGER

B1257046

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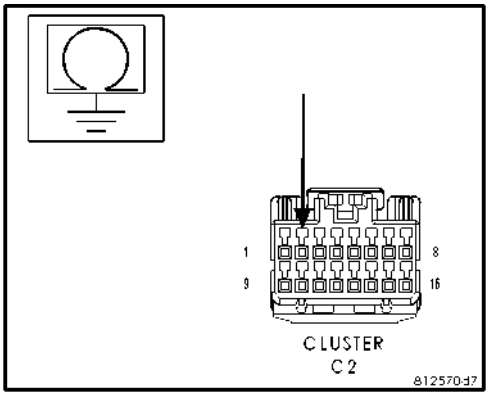
3. (G160) PASSENGER DOOR LOCK SWITCH MUX CIRCUIT PARTIAL SHORT TO GROUND

Disconnect the Cluster C2 connector.
Measure the resistance between ground and the (G160) Passenger Door Lock Switch Mux circuit.

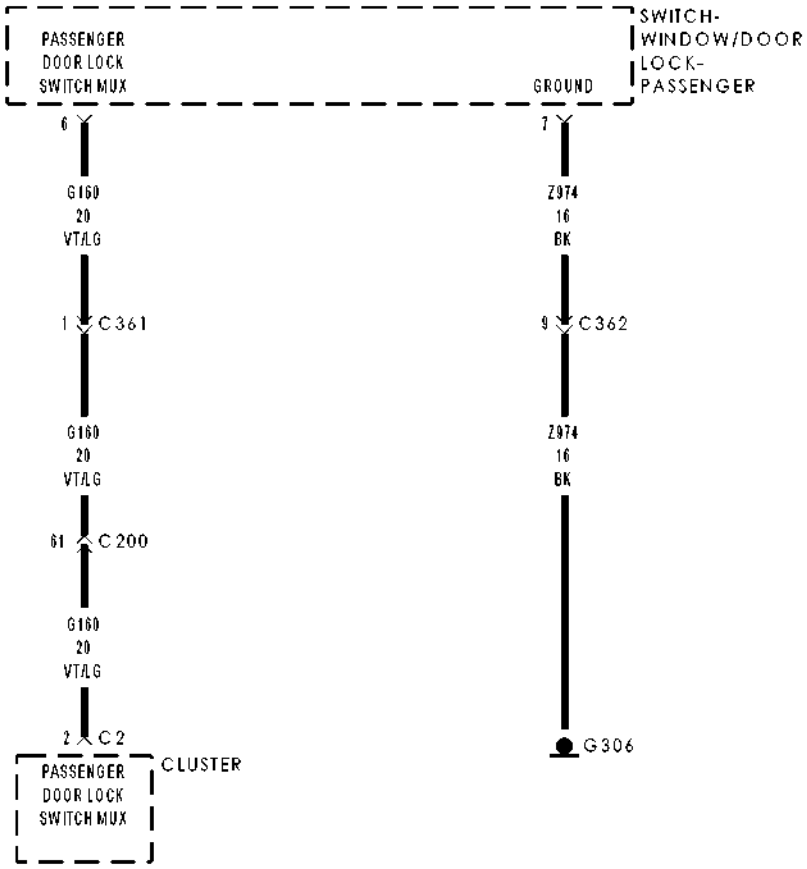
Is the resistance below 10000.0 ohms?

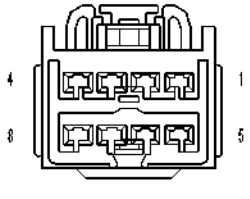
Yes >> Repair the (G160) Passenger Door Lock Switch Mux circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Instrument Cluster.
Perform BODY VERIFICATION TEST - VER 1.

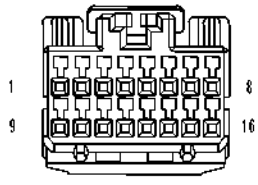


B1809–PASSENGER DOOR LOCK/UNLOCK SWITCH INPUT STUCK LOCK— CLUSTER





SWITCH-WINDOW/DOOR LOCK-PASSENGER



CLUSTER C2

812570D4

B1809–PASSENGER DOOR LOCK/UNLOCK SWITCH INPUT STUCK LOCK— CLUSTER — (CONTINUED)

For the Power Door Lock circuit diagram (Refer to 8 - ELECTRICAL/POWER LOCKS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Cluster senses an Unlock input on the Passeenger Door Lock Switch Mux circuit for over 30 seconds, this code will set.

Possible Causes
DOOR LOCK SWITCH STUCK
(G160) PASSENGER DOOR LOCK SWITCH MUX CIRCUIT PARTIAL SHORT TO GROUND
INSTRUMENT CLUSTER

Theory of Operation

This code will only set in Cluster in vehicles that do not have the Memory System.

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase DTC's

Operate the Passenger Door Lock Switch in all positions several times.

Cycle the ignition from on to off 3 times.

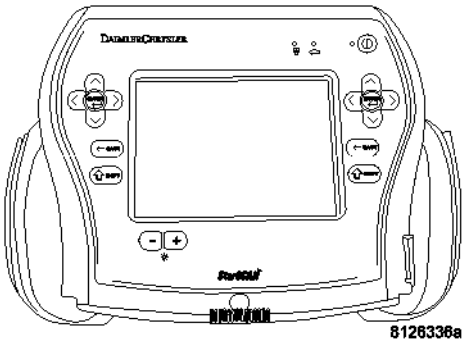
Turn the ignition on.

With the scan tool, read DTC's.

Does the scan tool display PASSENGER DOOR LOCK/UNLOCK SWITCH INPUT STUCK LOCK?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST - VER 1.



B1809–PASSENGER DOOR LOCK/UNLOCK SWITCH INPUT STUCK LOCK— CLUSTER — (CONTINUED)

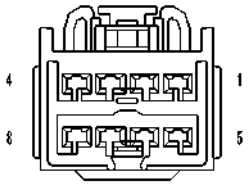
2. DOOR LOCK SWITCH SHORTED

With the scan tool, erase DTC's.
Disconnect the Passenger Window/Door Lock Switch connector.
With the scan tool, read DTC's.

Does the scan tool display PASSENGER DOOR LOCK/UNLOCK SWITCH INPUT STUCK UNLOCK?

No >> Replace the Passenger Window/Door Lock Switch.
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Go To 3



SWITCH-WINDOW/DOOR LOCK-PASSENGER

B1257046

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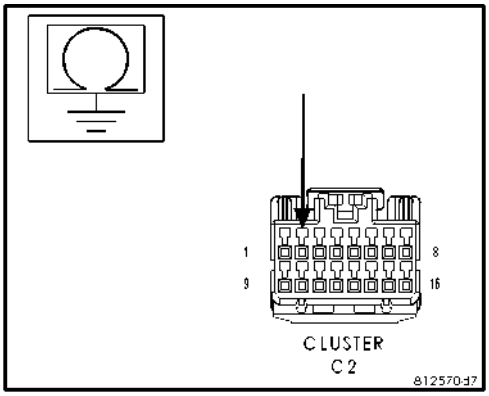
3. (G160) PASSENGER DOOR LOCK SWITCH MUX CIRCUIT PARTIAL SHORT TO GROUND

Disconnect the Cluster C2 connector.
Measure the resistance between ground and the (G160) Passenger Door Lock Switch Mux circuit.

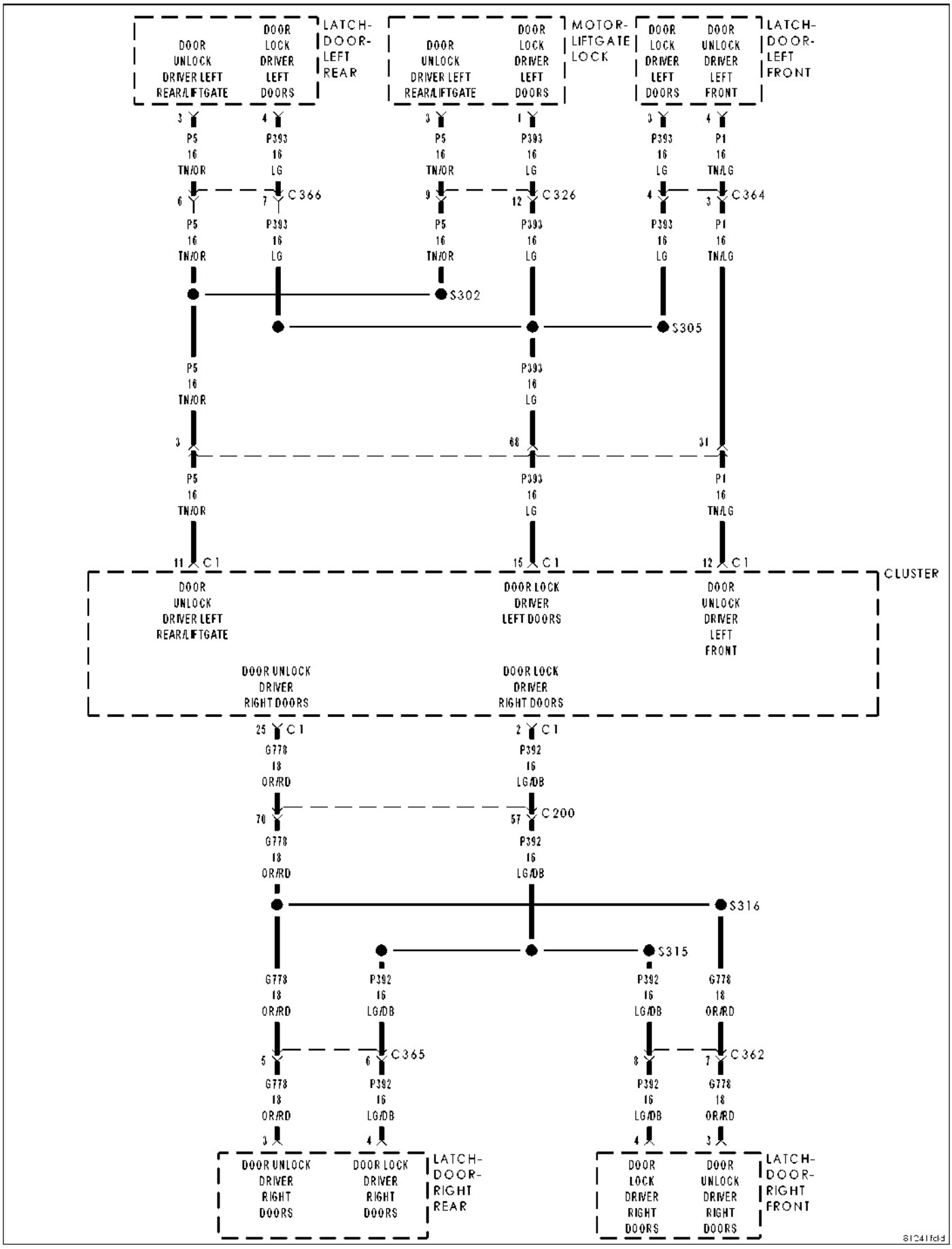
Is the resistance below 10000.0 ohms?

Yes >> Repair the (G160) Passenger Door Lock Switch Mux circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Instrument Cluster.
Perform BODY VERIFICATION TEST - VER 1.



B182D-ALL DOOR LOCK OUTPUT CIRCUIT SHORTED TO GROUND — CLUSTER



B182D-ALL DOOR LOCK OUTPUT CIRCUIT SHORTED TO GROUND — CLUSTER — (CONTINUED)

For the Power Door Lock circuit diagram (Refer to 8 - ELECTRICAL/POWER LOCKS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Whenever the cluster is awake.
- **Set Condition:**
  The cluster monitors the door lock output circuits and when one of them is shorted to ground, this code will set. This DTC will only set when the door locks are actuated.

Possible Causes
(P392) DOOR LOCK DRIVER RIGHT DOORS CIRCUIT SHORT TO GROUND
(P393) DOOR LOCK DRIVER LEFT DOORS CIRCUIT SHORT TO GROUND
(P392) DOOR LOCK DRIVER RIGHT DOORS SHORT TO (G778) DOOR UNLOCK DRIVER RIGHT DOORS
(P393) DOOR LOCK DRIVER LEFT DOORS SHORT TO (P5) DOOR UNLOCK DRIVER LEFT REAR/LIFTGATE
(P393) DOOR LOCK DRIVER LEFT DOORS SHORT TO (P1) DOOR UNLOCK DRIVER LEFT FRONT CLUSTER

Theory of Operation

The Door Lock Driver Right Doors circuit and the Door Lock Driver Left Doors circuits are connected together inside the module. Therefore any circuit that is connected to either one can set this code.

Diagnostic Test

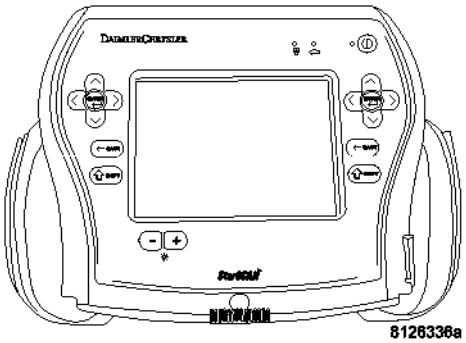
1. CHECK FOR ACTIVE DTC B182D-ALL DOOR LOCK OUTPUT CIRCUIT SHORTED TO GROUND

Turn the ignition on.
With the scan tool, record and erase DTC's.
Turn the ignition off, wait 10 seconds then turn the ignition on.
Try to operate the door locks several times.
With the scan tool, read active DTC's.

Does the scan tool display: B182D-ALL DOOR LOCK OUTPUT CIRCUIT SHORTED TO GROUND

Yes >> Go To 2

No >> The condition that caused this code to set is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors for an intermittent condition. Operate the system several times and recheck for active DTC's.



B182D-ALL DOOR LOCK OUTPUT CIRCUIT SHORTED TO GROUND — CLUSTER — (CONTINUED)

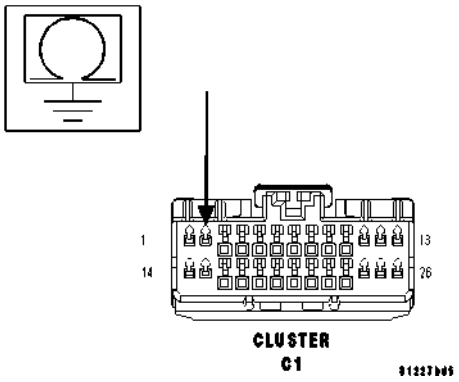
2. CHECK (P392) DOOR LOCK DRIVER RIGHT DOORS FOR SHORT TO GROUND

Note: If only one motor is inoperative when the door locks are actuated, disconnect that motor and retest to see if the DTC is still present. If it is not, replace the defective motor.

Turn the ignition off.

Disconnect the Cluster C1 connector.

Measure the resistance between ground and the (P392) Door Lock Driver Right Doors circuit.



Is the resistance below 1000.0 ohms?

No >> Go To 3

Yes >> Repair the (P392) Door Lock Driver Right Doors circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

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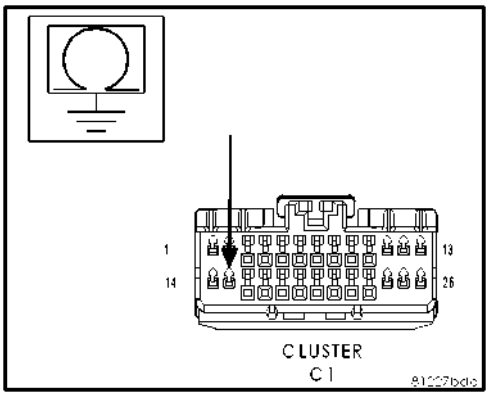
3. CHECK (P393) DOOR LOCK DRIVER LEFT DOORS CIRUIT FOR A SHORT TO GROUND

Measure the resistance between ground and the (P393) Door Lock Driver Left Doors circuit.



Is the resistance below 1000.0 ohms?

No >> Go To 4

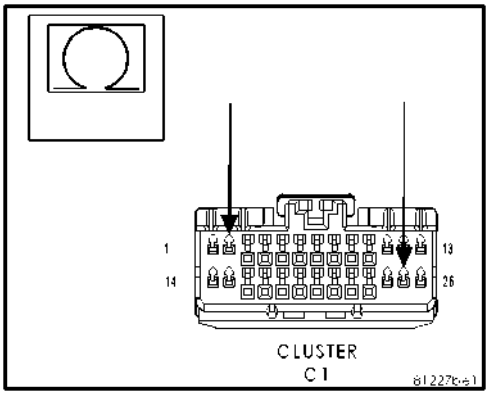
Yes >> Repair the (P393) Door Lock Driver Left Doors circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

---

4. CHECK THE (P392) DOOR LOCK DRIVER RIGHT DOORS CIRCUIT FOR A SHORT TO THE (G778) DOOR UNLOCK DRIVER RIGHT DOORS CIRCUIT

Measure the resistance between the (P392) Door Lock Driver Right Doors circuit and the (G778) Door Unlock Driver Right Doors circuit.

Is the resistance below 1.6 ohms?



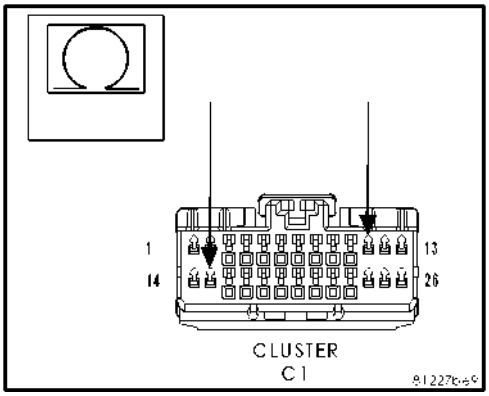
No >> Go To 5

Yes >> Repair the (P392) Door Lock Driver Right Doors circuit for a short to the (G778) Door Unlock Driver Right Doors circuit.
Perform BODY VERIFICATION TEST - VER 1.

B182D-ALL DOOR LOCK OUTPUT CIRCUIT SHORTED TO GROUND — CLUSTER — (CONTINUED)

5. CHECK THE (P393) DOOR LOCK DRIVER LEFT DOORS CIRCUIT FOR A SHORT TO THE (P5) DOOR UNLOCK DRIVER LEFT REAR/LIFTGATE CIRCUIT

Measure the resistance between the (P393) Door Lock Driver Left Doors circuit and the (P5) Door Unlock Driver Left Rear/Liftgate circuit.



Is the resistance below 1.6 ohms?

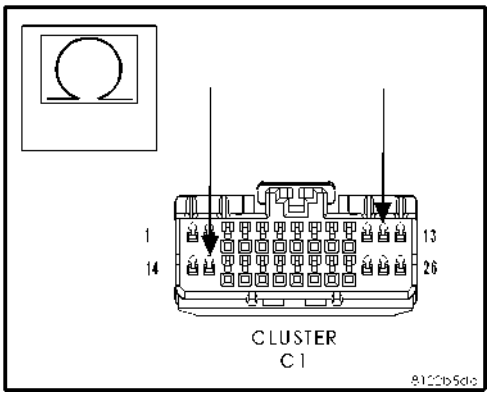
No >> Go To 6

Yes >> Repair the (P393) Door Lock Driver Left Doors circuit for a short to the (P5) Door Unlock Driver Left Rear/Liftgate circuit.
Perform BODY VERIFICATION TEST - VER 1

---

6. CHECK THE (P393) DOOR LOCK DRIVER LEFT DOORS CIRCUIT FOR A SHORT TO THE (P1) DOOR UNLOCK DRIVER LEFT FRONT CIRCUIT

Measure the resistance between the (P393) Door Lock Driver Left Doors circuit and the (P1) Door Unlock Driver Left Front circuit.

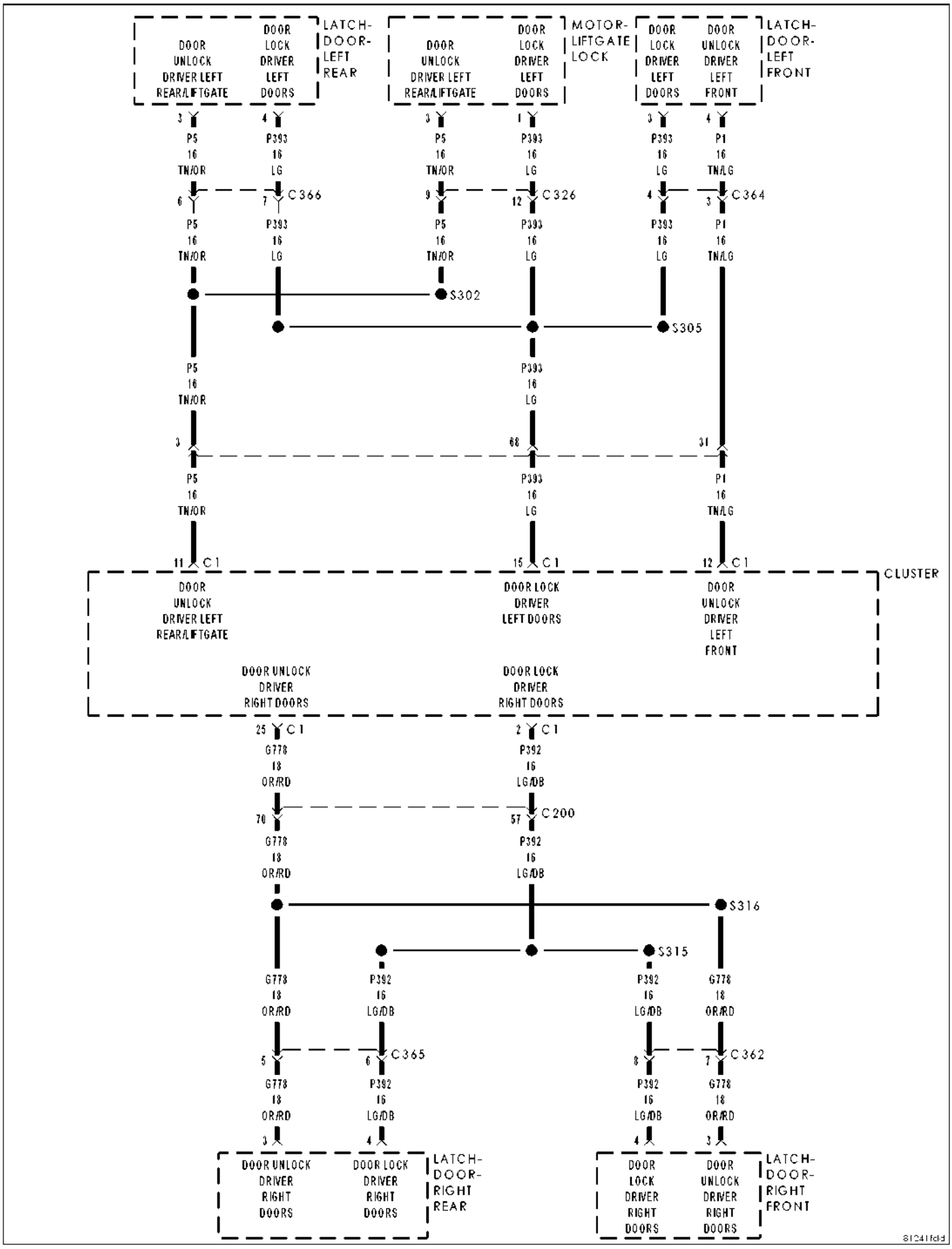


Is the resistance below 2.5 ohms?

No >> Replace the Cluster in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1

Yes >> Repair the (P393) Door Lock Driver Left Doors circuit for a short to the (P1) Door Unlock Driver Left Front circuit.
Perform BODY VERIFICATION TEST - VER 1

B1831-ALL DOOR UNLOCK OUTPUT CIRCUIT SHORTED TO GROUND — CLUSTER



B1831-ALL DOOR UNLOCK OUTPUT CIRCUIT SHORTED TO GROUND — CLUSTER — (CONTINUED)

For the Power Door Lock circuit diagram (Refer to 8 - ELECTRICAL/POWER LOCKS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Whenever the cluster is awake.
- **Set Condition:**
  The cluster monitors the door unlock output circuits and when one of them is shorted to ground, this code will set. This DTC will only set when the door locks are unlocked.

Possible Causes
(G778) DOOR UNLOCK DRIVER RIGHT DOORS CIRCUIT SHORTED TO GROUND
(P5) DOOR UNLOCK DRIVER LEFT REAR/LIFTGATE CIRCUIT SHORTED TO GROUND
(G778) DOOR UNLOCK DRIVER RIGHT DOORS SHORT TO (P392) DOOR LOCK DRIVER RIGHT DOORS
(P393) DOOR LOCK DRIVER LEFT DOORS SHORT TO (P5) DOOR UNLOCK DRIVER LEFT REAR/LIFTGATE
CLUSTER

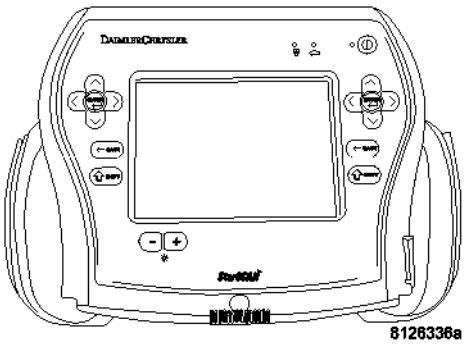
Theory of Operation

The Door Unlock Driver Right Doors circuit and the Door Unlock Driver Left Rear/Liftgate circuits are connected together inside the module. Therefore any circuit that is connected to either one can set this code.

Diagnostic Test

1. CHECK FOR ACTIVE DTC B1831-ALL DOOR UNLOCK OUTPUT CIRCUIT SHORTED TO GROUND

Turn the ignition on.
With the scan tool, record and erase DTC's.
Turn the ignition off, wait 10 seconds then turn the ignition on.
Try to operate the door locks several times.
With the scan tool, read active DTC's.



Does the scan tool display: B1831-ALL DOOR UNLOCK OUTPUT CIRCUIT SHORTED TO GROUND

Yes >> Go To 2

No >> The condition that caused this code to set is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors for an intermittent condition. Operate the system several times and recheck for active DTC's.

B1831-ALL DOOR UNLOCK OUTPUT CIRCUIT SHORTED TO GROUND — CLUSTER — (CONTINUED)

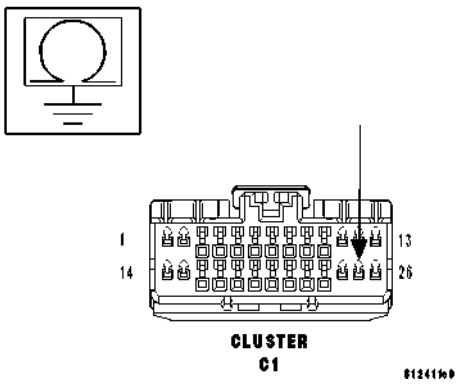
2. CHECK (G778) DOOR UNLOCK DRIVER RIGHT DOORS FOR SHORT TO GROUND

Note: If only one motor is inoperative when the door locks are actuated, disconnect that motor and retest to see if the DTC is still present. If it is not, replace the defective motor.

Turn the ignition off.

Disconnect the Cluster C1 connector.

Measure the resistance between ground and the (G778) Door Unlock Driver Right Doors circuit.



Is the resistance below 1000.0 ohms?

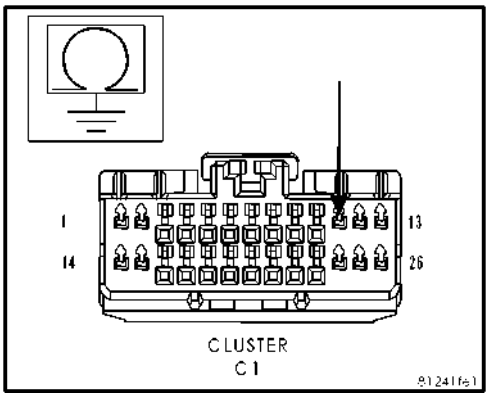
No >> Go To 3

Yes >> Repair the (G778) Door Unlock Driver Right Doors circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

---

3. CHECK THE (P5) DOOR UNLOCK DRIVER LEFT REAR/ LIFTGATE FOR A SHORT TO GROUND

Measure the resistance between ground and the (P5) Door Unlock Driver Left Rear/Liftgate circuit.



Is the resistance below 1000.0 ohms?

No >> Go To 4

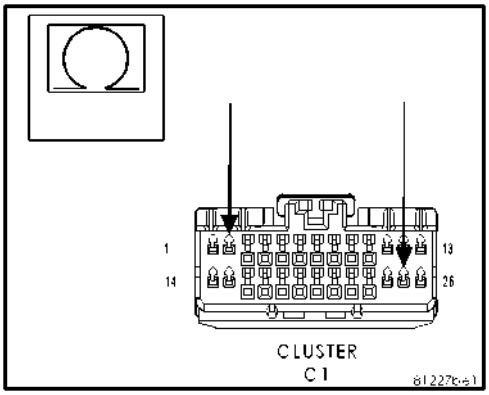
Yes >> Repair the (P5) Door Unock Driver Left Rear/Liftgate circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

B1831-ALL DOOR UNLOCK OUTPUT CIRCUIT SHORTED TO GROUND — CLUSTER — (CONTINUED)

4. CHECK THE (P392) DOOR LOCK DRIVER RIGHT DOORS CIRCUIT FOR A SHORT TO THE (G778) DOOR UNLOCK DRIVER RIGHT DOORS CIRCUIT

Measure the resistance between the (P392) Door Lock Driver Right Doors circuit and the (G778)Door Unlock Driver Right Doors circuit.

Is the resistance below 1.6 ohms?



No >> Go To 5

Yes >> Repair the (P392) Door Lock Driver Right Doors circuit for a short to the (G778) Door Unlock Driver Right Doors circuit.

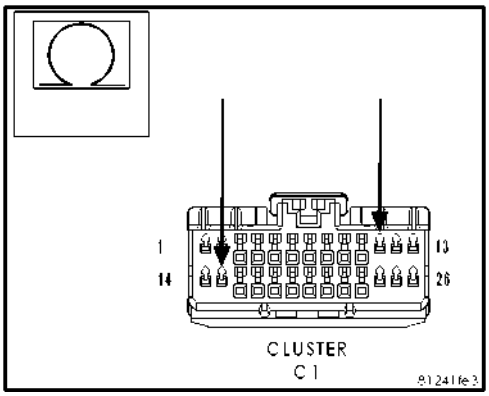
Perform BODY VERIFICATION TEST - VER 1.

---

5. CHECK THE (P393) DOOR LOCK DRIVER LEFT DOORS CIRCUIT FOR A SHORT TO THE (P5) DOOR UNLOCK DRIVER LEFT REAR/LIFTGATE CIRCUIT

Measure the resistance between the (P393) Door Lock Driver Left Doors circuit and the (P5) Door Unlock Driver Left Rear/Liftgate circuit.

Is the resistance below 1.6 ohms?



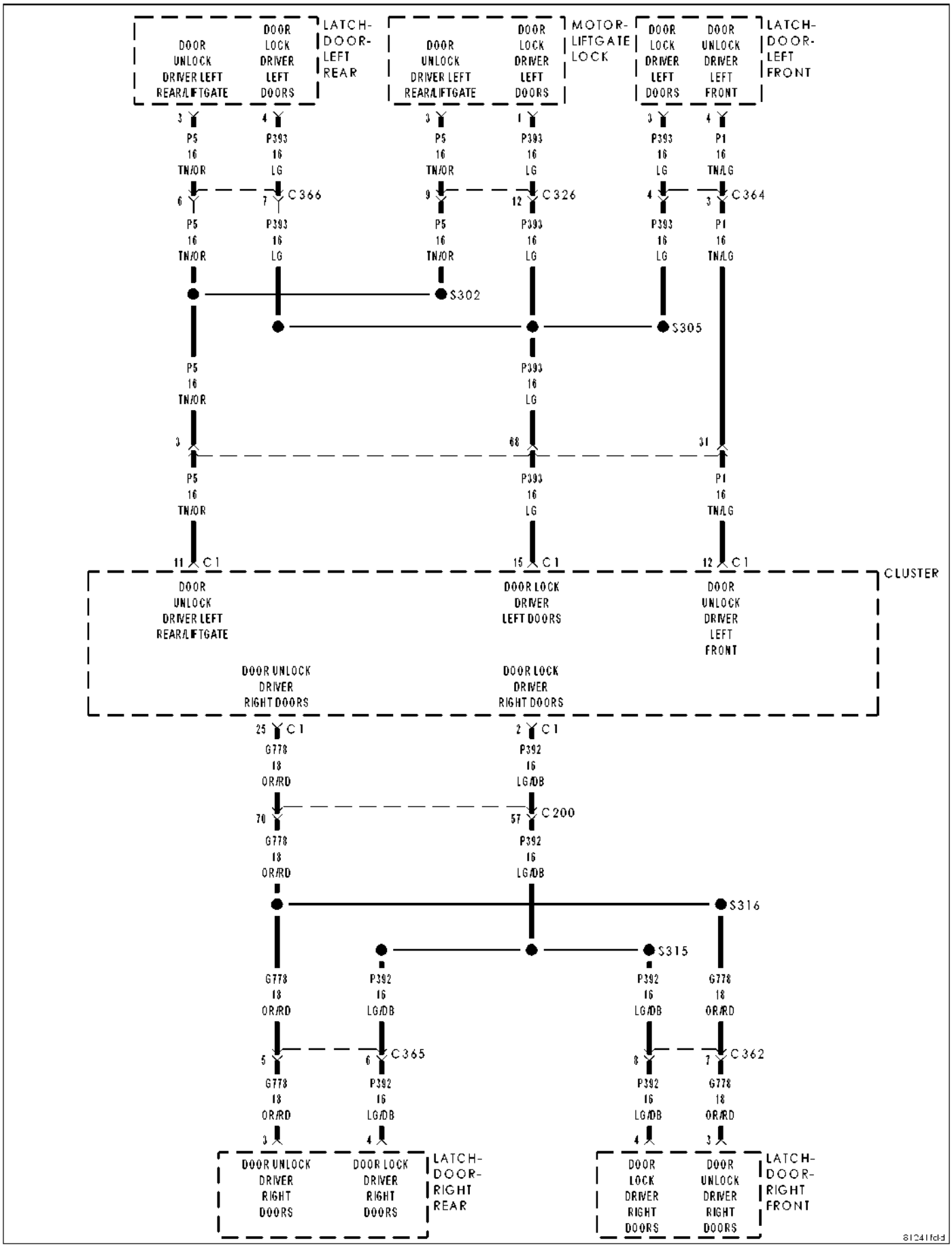
No >> Replace the Cluster in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1

Yes >> Repair the (P393) Door Lock Driver Left Doors circuit for a short to the (P5) Door Unlock Driver Left Rear/Liftgate circuit.

Perform BODY VERIFICATION TEST - VER 1

B1835-DRIVER DOOR UNLOCK OUTPUT CIRCUIT SHORTED TO GROUND — CLUSTER



B1835-DRIVER DOOR UNLOCK OUTPUT CIRCUIT SHORTED TO GROUND — CLUSTER — (CONTINUED)

For the Power Door Lock circuit diagram (Refer to 8 - ELECTRICAL/POWER LOCKS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

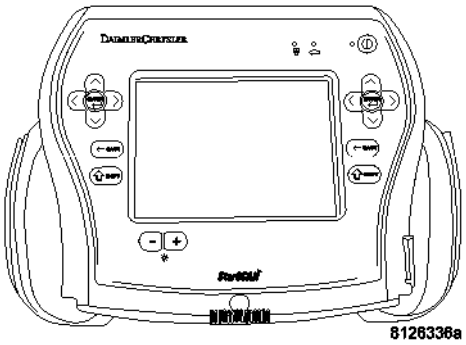
- **When Monitored:**
  Whenever the cluster is awake.
- **Set Condition:**
  The cluster monitors the driver door unlock output circuit and when it is shorted to ground, this code will set. This DTC will only set when the door locks are unlocked.

Possible Causes
(P1) DOOR UNLOCK DRIVER LEFT FRONT CIRCUIT SHORTED TO GROUND
(P1) DOOR UNLOCK DRIVER LEFT FRONT CIRCUIT SHORTED TO (P5) DOOR UNLOCK DRIVER LEFT REAR/LIFTGATE CIRCUIT
(P1) DOOR UNLOCK DRIVER LEFT FRONT SHORTED TO (P393) DOOR LOCK DRIVER LEFT DOORS
INSTRUMENT CLUSTER

Diagnostic Test

1. CHECK FOR ACTIVE DTC B1835- DRIVER DOOR UNLOCK OUTPUT CIRCUIT SHORTED TO GROUND

Turn the ignition on.
With the scan tool, record and erase DTC's.
Turn the ignition off, wait 10 seconds then turn the ignition on.
Try to operate the door locks several times.
With the scan tool, read active DTC's.



Does the scan tool display: B1835-DRIVER DOOR UNLOCK OUTPUT CIRCUIT SHORTED TO GROUND

Yes >> Go To 2

No >> The condition that caused this code to set is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors for an intermittent condition. Operate the system several times and recheck for active DTC's.

B1835-DRIVER DOOR UNLOCK OUTPUT CIRCUIT SHORTED TO GROUND — CLUSTER — (CONTINUED)

2. CHECK (P1) DOOR UNLOCK DRIVER LEFT FRONT FOR SHORT TO GROUND

Note: If only one motor is inoperative when the door locks are actuated, disconnect that motor and retest to see if the DTC is still present. If it is not, replace the defective motor.

Turn the ignition off.

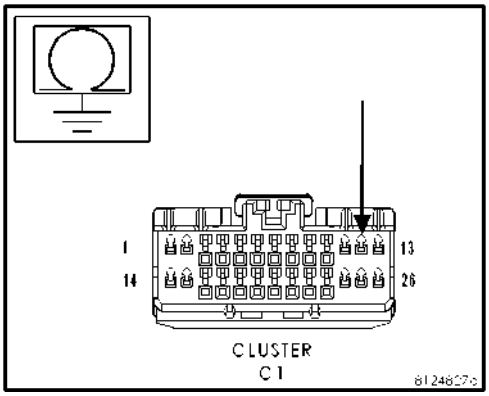
Disconnect the Cluster C1 connector.

Measure the resistance between ground and the (P1) Door Unlock Driver Left Front circuit.

Is the resistance below 1000.0 ohms?

No >> Go To 3

Yes >> Repair the (P1) Door Unlock Driver Left Front circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.



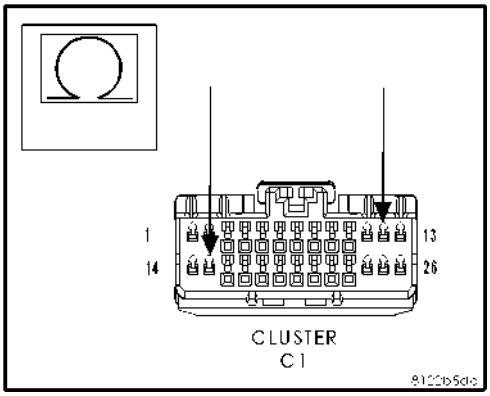
3. CHECK THE (P1) DOOR UNLOCK DRIVER LEFT FRONT FOR A SHORT TO THE (P393) DOOR LOCK DRIVER LEFT DOORS

Measure the resistance between the (P1) Door Unlock Driver Left Front and the (P393) Door Lock Driver Left Doors circuits.

Is the resistance below 2.0 ohms?

No >> Go To 4

Yes >> Repair the (P1) Door Unlock Driver Left Front circuit for a short to the (P393) Door Lock Driver Left Doors circuit.
Perform BODY VERIFICATION TEST - VER 1.

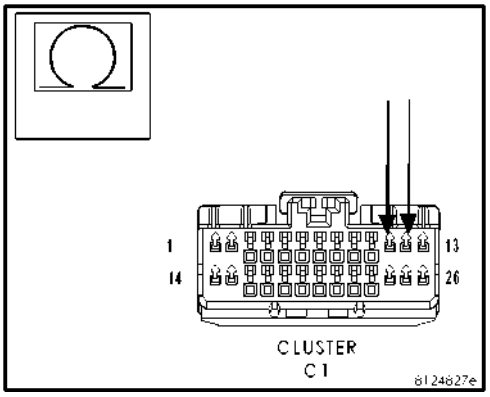


4. CHECK THE (P1) DOOR UNLOCK DRIVER LEFT FRONT CIRCUIT FOR A SHORT TO THE (P5) DOOR UNLOCK DRIVER LEFT REAR/LIFTGATE CIRCUIT

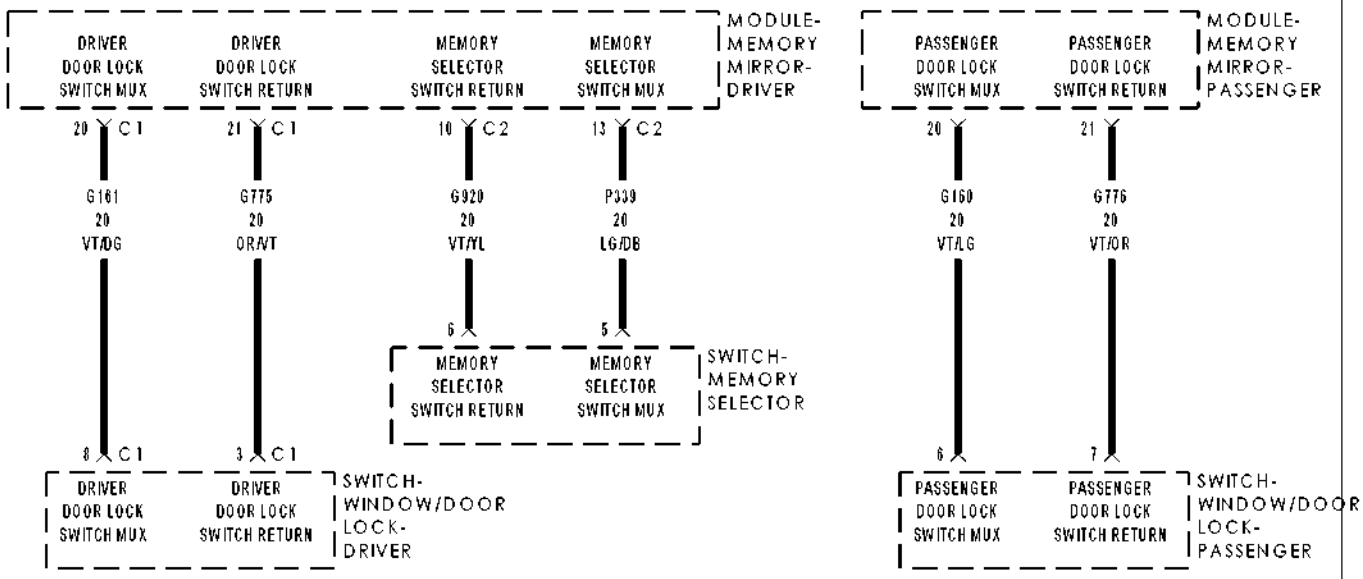
Measure the resistance between the (P1) Door Unlock Driver Left Front circuit and the (P5) Door Unlock Driver Left Rear/Liftgate circuit.
Is the resistance below 3.0 ohms?

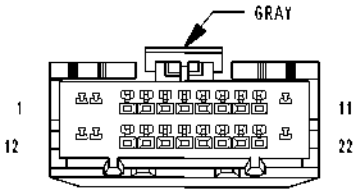
No >> Replace the Instrument Cluster in accordance with service information.Perform BODY VERIFICATION TEST - VER 1.

Yes >> Repair the (P1) Door Unlock Driver Left Front circuit for a short to the (P5) Door Unlock Driver Left Rear/Liftgate circuit.
Perform BODY VERIFICATION TEST - VER 1.

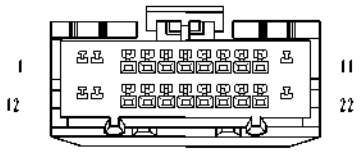


B1802, B1807 DOOR LOCK/UNLOCK SWITCH CIRCUIT HIGH – MEMORY MIRROR MODULE

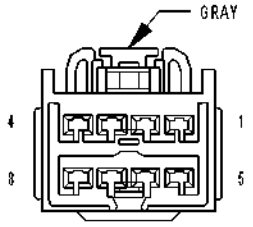




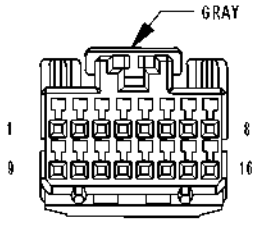
MODULE-MEMORY MIRROR-DRIVER C1



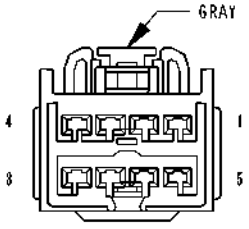
MODULE-MEMORY MIRROR-PASSENGER



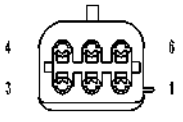
SWITCH-WINDOW/DOOR LOCK-PASSENGER



MODULE-MEMORY MIRROR-DRIVER C2



SWITCH-WINDOW/DOOR LOCK-DRIVER C1



SWITCH-MEMORY SELECTOR

8125f4b-a

B1802, B1807 DOOR LOCK/UNLOCK SWITCH CIRCUIT HIGH – MEMORY MIRROR MODULE — (CONTINUED)

For the Power Door Lock circuit diagram (Refer to 8 - ELECTRICAL/POWER LOCKS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Door Lock Switch Mux circuit is above 5.25 volts for over 30 msec.

Possible Causes
(G160, G161) DOOR LOCK SWITCH MUX WIRE SHORT TO VOLTAGE
(P339) MEMORY SELECT SWITCH MUX WIRE SHORT TO VOLTAGE
WINDOW/DOOR LOCK SWITCH
MEMORY MIRROR MODULE

Theory of Operation

This code will only set in vehicles that have the Memory System. The supply circuit for the Memory Mirrors are supplied by the Memory Mirror Module, therefore both the Memory Select Switch Mux or the Door Lock Switch Mux circuits can cause this DTC.

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase DTC's

Operate the Door Lock Switch from the side this DTC was set in. Put the switch in both positions several times.

Cycle the ignition from on to off 3 times.

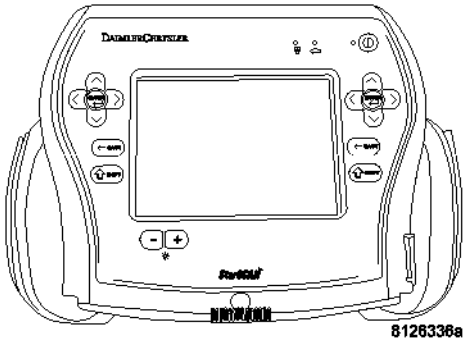
Turn the ignition on.

With the scan tool, read DTC's.

Does the scan tool display DOOR LOCK/UNLOCK SWITCH CIRCUIT HIGH?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST - VER 1.



B1802, B1807 DOOR LOCK/UNLOCK SWITCH CIRCUIT HIGH – MEMORY MIRROR MODULE — (CONTINUED)

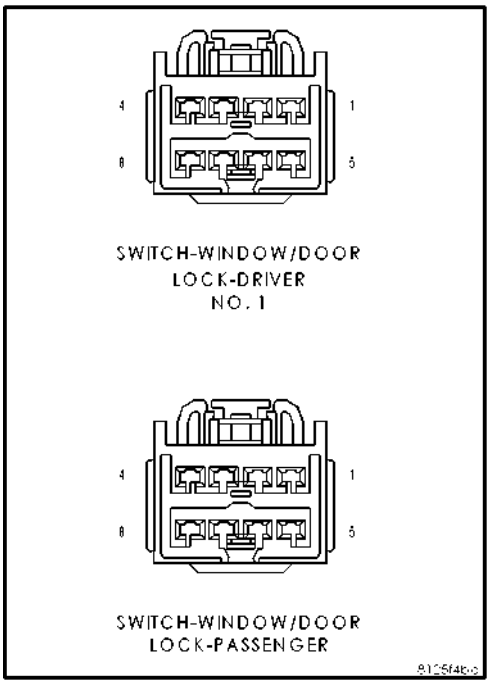
2. DOOR LOCK SWITCH SHORTED TO VOLTAGE

With the scan tool, erase DTC's.
Disconnect the appropriate Window/Door Lock Switch connector.
Turn the ignition on.
With the scan tool, read DTC's.

Does the scan tool display DOOR LOCK/UNLOCK SWITCH CIRCUIT HIGH?

No >> Replace the Window/Door Lock Switch.
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Go to 3



3. DRIVER MODULE OR PASSENGER MODULE

Is this DTC in the Driver or Passenger module?

Passenger
Go to 4

Driver
Go to 5

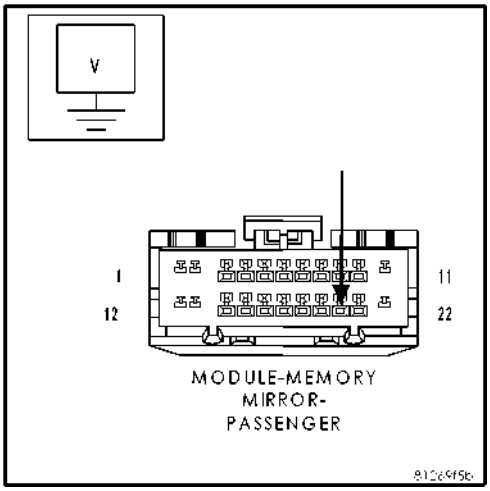
4. (G160) PASSENGER DOOR LOCK SWITCH MUX CIRCUIT SHORT TO VOLTAGE

Disconnect the Passenger Memory Mirror Module connector.
Measure the voltage of the (G160) Passenger Door Lock Switch Mux circuit in the Passenger Memory Mirror Module connector.

Is there any voltage present?

Yes >> Repair the (G160) Passenger Door Lock Switch Mux circuit for a short to voltage.
Perform BODY VERIFICATION TEST - VER 1.

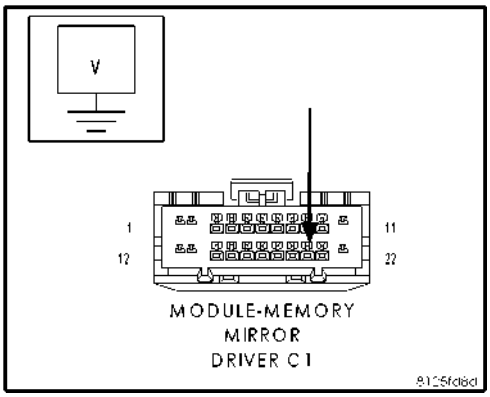
No >> Replace the Passenger Memory Mirror Module.
Perform BODY VERIFICATION TEST - VER 1.



B1802, B1807 DOOR LOCK/UNLOCK SWITCH CIRCUIT HIGH – MEMORY MIRROR MODULE — (CONTINUED)

5. (G161) DRIVER DOOR LOCK SWITCH MUX WIRE SHORT TO VOLTAGE

Disconnect the Driver Memory Mirror Module C1 connector.
Measure the voltage of the (G161) Driver Door Lock Switch Mux circuit in the Memory Mirror Module connector.



Is there any voltage present?

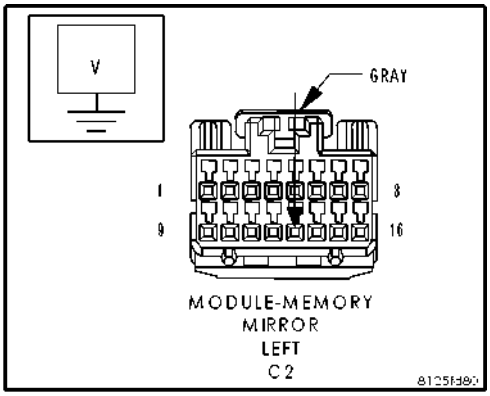
Yes >> Repair the (G161) Driver Door Lock Switch Mux circuit for a short to voltage.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go to 6

---

6. MEMORY SELECT MUX WIRE SHORT TO VOLTAGE

Disconnect the Driver Memory Mirror Module C2 connector.
Measure the voltage of the Memory Select Switch Mux circuit.

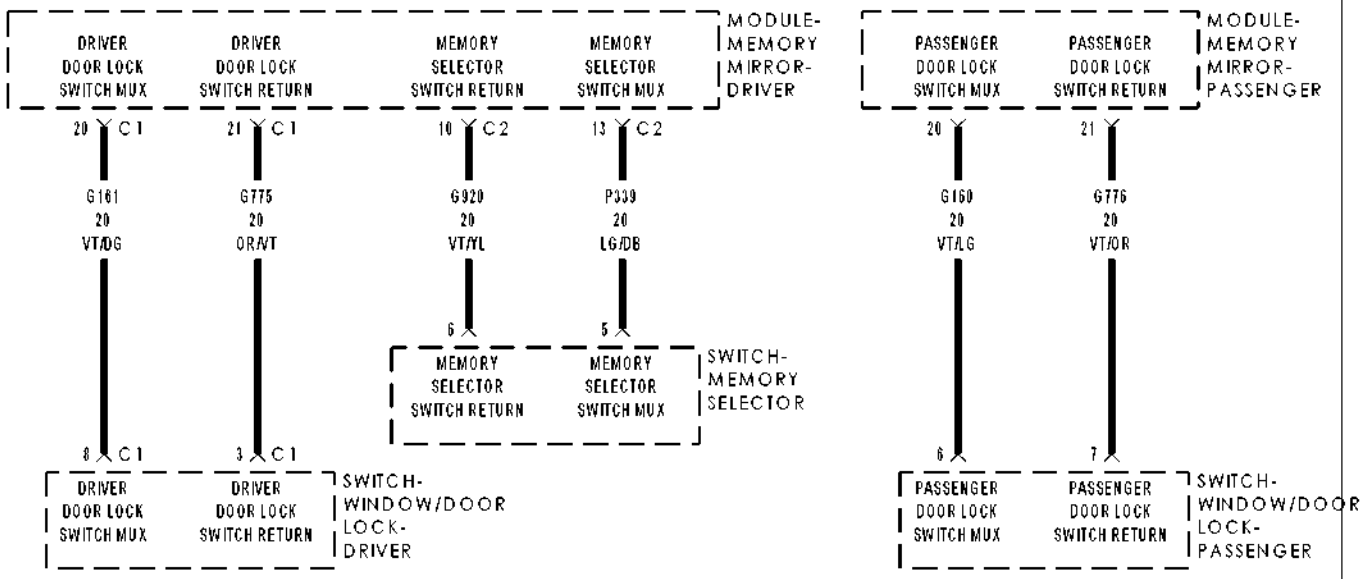


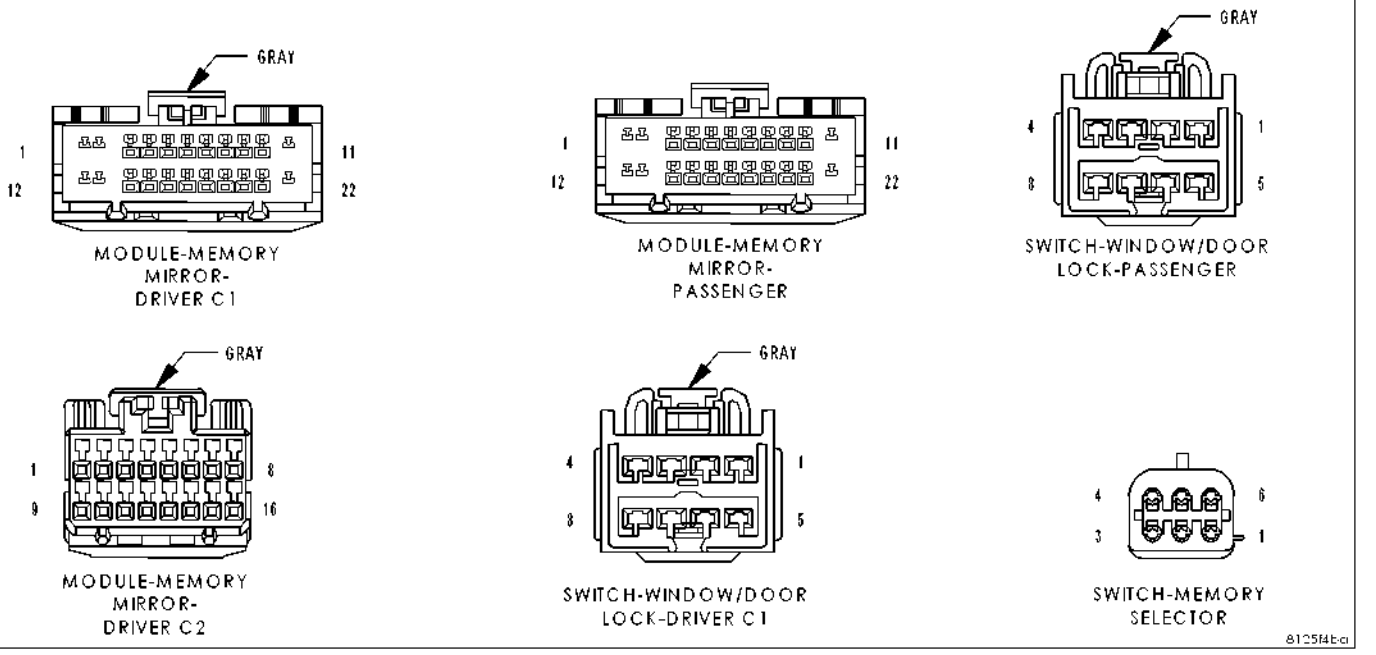
Is there any voltage present?

Yes >> Repair the Memory Select Switch Mux wire for a short to voltage.
Perform the BODY VERIFICATION TEST - VER 1.

No >> Replace the Driver Memory Mirror Module.
Perform BODY VERIFICATION TEST - VER 1.

B1803, B1808 DOOR LOCK/UNLOCK SWITCH CIRCUIT STUCK LOCK – MEMORY MIRROR MODULE





B1803, B1808 DOOR LOCK/UNLOCK SWITCH CIRCUIT STUCK LOCK – MEMORY MIRROR MODULE — (CONTINUED)

For the Power Door Lock circuit diagram (Refer to 8 - ELECTRICAL/POWER LOCKS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Door Lock Switch Mux circuit is under 2.6 volts for over 30 seconds.

Possible Causes
(G161) DRIVER DOOR LOCK SWITCH MUX WIRE PARTIAL SHORT TO GROUND
(P339) MEMORY SELECT SWITCH MUX WIRE PARTIAL SHORT TO GROUND
(P339) MEMORY SELECT SWITCH MUX CIRCUIT SHORTED TO THE (G920) MEMORY SELECT SWITCH RETURN CIRCUIT
MEMORY SELECTOR SWITCH
WINDOW/DOOR LOCK SWITCH STUCK
MEMORY MIRROR MODULE

Theory of Operation

This code will only set in vehicles that have the Memory System. The supply circuit for the Memory Mirrors are supplied by the Memory Mirror Module, therefore both the Memory Select Switch Mux or the Door Lock Switch Mux circuits can cause this DTC.

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

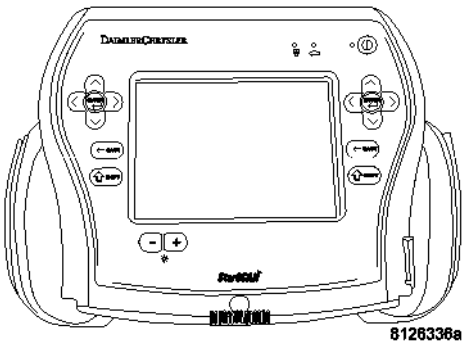
With the scan tool, record and erase DTC's

Operate the Door Lock Switch from the side this DTC was set in. Put the switch in both positions several times.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read DTC's.



Does the scan tool display DOOR LOCK/UNLOCK SWITCH CIRCUIT STUCK LOCK?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform BODY VERIFICATION TEST - VER 1.

B1803, B1808 DOOR LOCK/UNLOCK SWITCH CIRCUIT STUCK LOCK – MEMORY MIRROR MODULE — (CONTINUED)

2. DRIVER MODULE OR PASSENGER MODULE

Is this DTC in the Driver or Passenger module?

Passenger

Go to 3

Driver

Go to 5

---

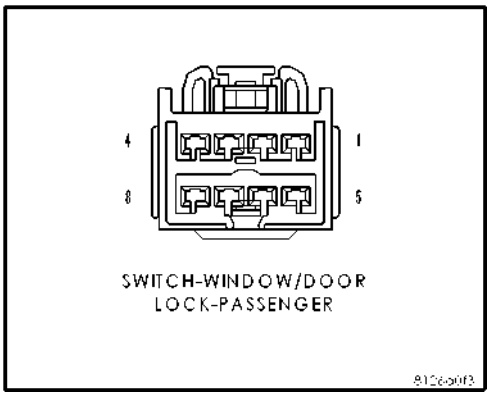
3. PASSENGER DOOR LOCK SWITCH SHORTED TO GROUND

With the scan tool, erase DTC's.
Disconnect the Passenger Window/Door Lock Switch connector.
Turn the ignition on.
With the scan tool, read DTC's.

Does the scan tool display DOOR LOCK/UNLOCK SWITCH CIRCUIT STUCK LOCK?

No >> Replace the Passenger Window/Door Lock Switch.
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Go to 4



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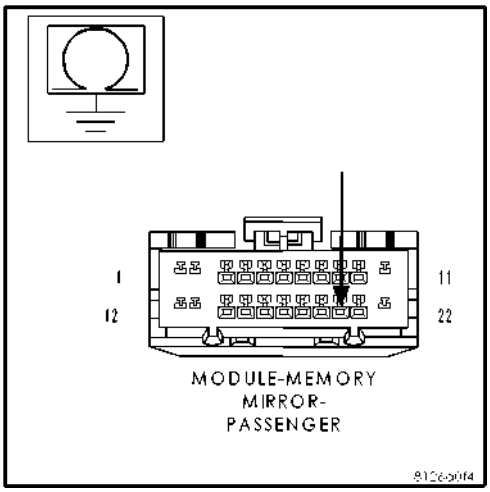
4. (G160) PASSENGER DOOR LOCK SWITCH MUX CIRCUIT SHORT TO GROUND

Disconnect the Passenger Memory Mirror Module connector.
Measure the resistance between ground and the (G160) Passenger Door Lock Switch Mux circuit in the Passenger Memory Mirror Module connector.

Is the resistance below 10000.0 ohms?

Yes >> Repair the (G160) Passenger Door Lock Switch Mux circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Passenger Memory Mirror Module.
Perform BODY VERIFICATION TEST - VER 1.



B1803, B1808 DOOR LOCK/UNLOCK SWITCH CIRCUIT STUCK LOCK – MEMORY MIRROR MODULE — (CONTINUED)

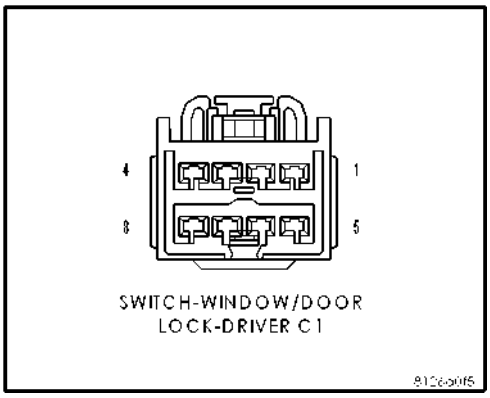
5. DRIVER DOOR LOCK SWITCH SHORTED TO GROUND

With the scan tool, erase DTC's.
Disconnect the Driver Window/Door Lock Switch connector.
Turn the ignition on.
With the scan tool, read DTC's.

Does the scan tool display DOOR LOCK/UNLOCK SWITCH CIRCUIT STUCK LOCK?

No >> Replace the Driver Window/Door Lock Switch.
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Go to 6



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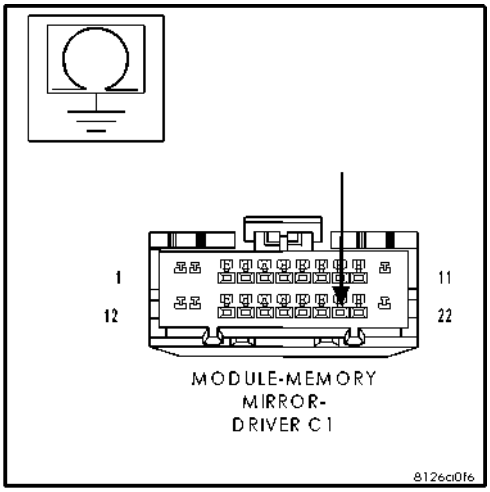
6. (G161) DRIVER DOOR LOCK SWITCH MUX WIRE SHORT TO GROUND

Disconnect the Driver Memory Mirror Module C1 connector.
Measure the resistance between ground and the (G161) Driver Door Lock Switch Mux circuit in the Memory Mirror Module connector.

Is the resistance below 10000.0 ohms?

Yes >> Repair the (G161) Driver Door Lock Switch Mux circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go to 7



---

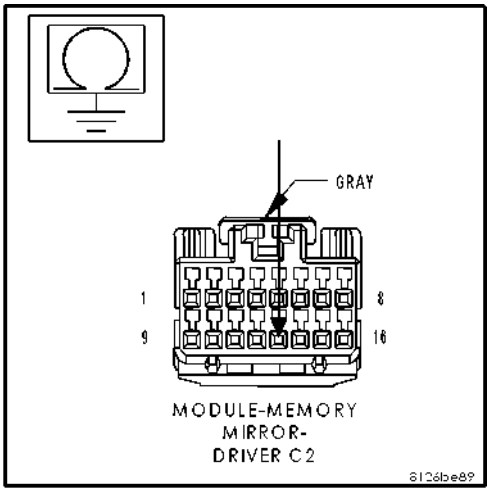
7. MEMORY SELECT MUX WIRE SHORT TO GROUND

Disconnect the Driver Memory Mirror Module C2 connector.
Measure the resistance between ground and the Memory Select Switch Mux circuit.

Is the resistance below 10000.0 ohms?

Yes >> Repair the Memory Select Switch Mux wire for a short to ground.
Perform the BODY VERIFICATION TEST - VER 1.

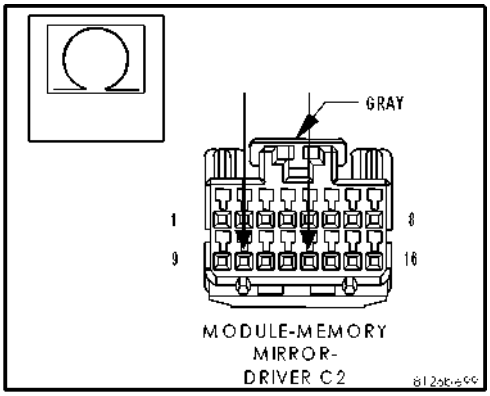
No >> Go to 8



B1803, B1808 DOOR LOCK/UNLOCK SWITCH CIRCUIT STUCK LOCK – MEMORY MIRROR MODULE — (CONTINUED)

8. MEMORY SELECT SWITCH MUX CIRCUIT SHORTED

Measure the resistance between the Memory Select Switch Mux circuit and the Memory Select Switch Return circuit in the Driver Memory Mirror Module C2 connector.



Is the resistance below 10000.0 ohms?

Yes >> Go to 9

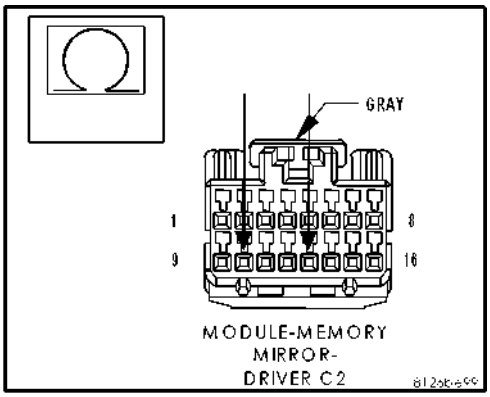
No >> Replace the Driver Memory Mirror Module.
Perform BODY VERIFICATION TEST - VER 1.

---

9. MEMORY SELECTOR SWITCH SHORTED

Disconnect the Memory Selector Switch connector.

Measure the resistance between the (P339) Memory Select Switch Mux circuit and the (G920) Memory Select Switch Return circuit in the Driver Memory Mirror Module C2 connector.

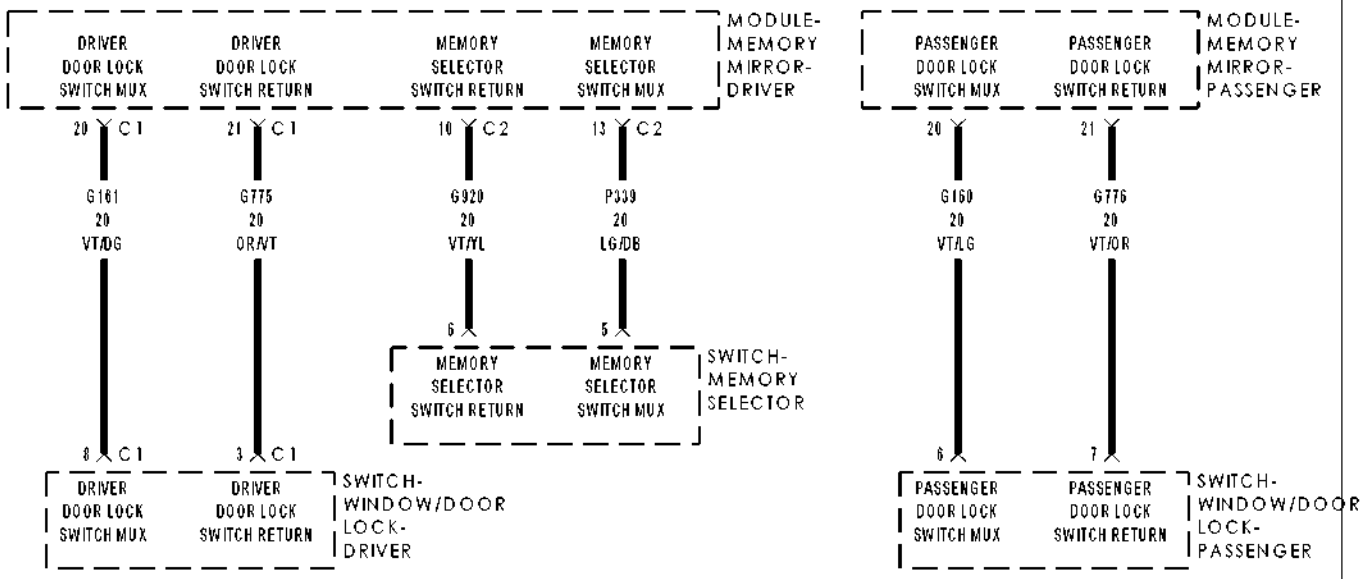


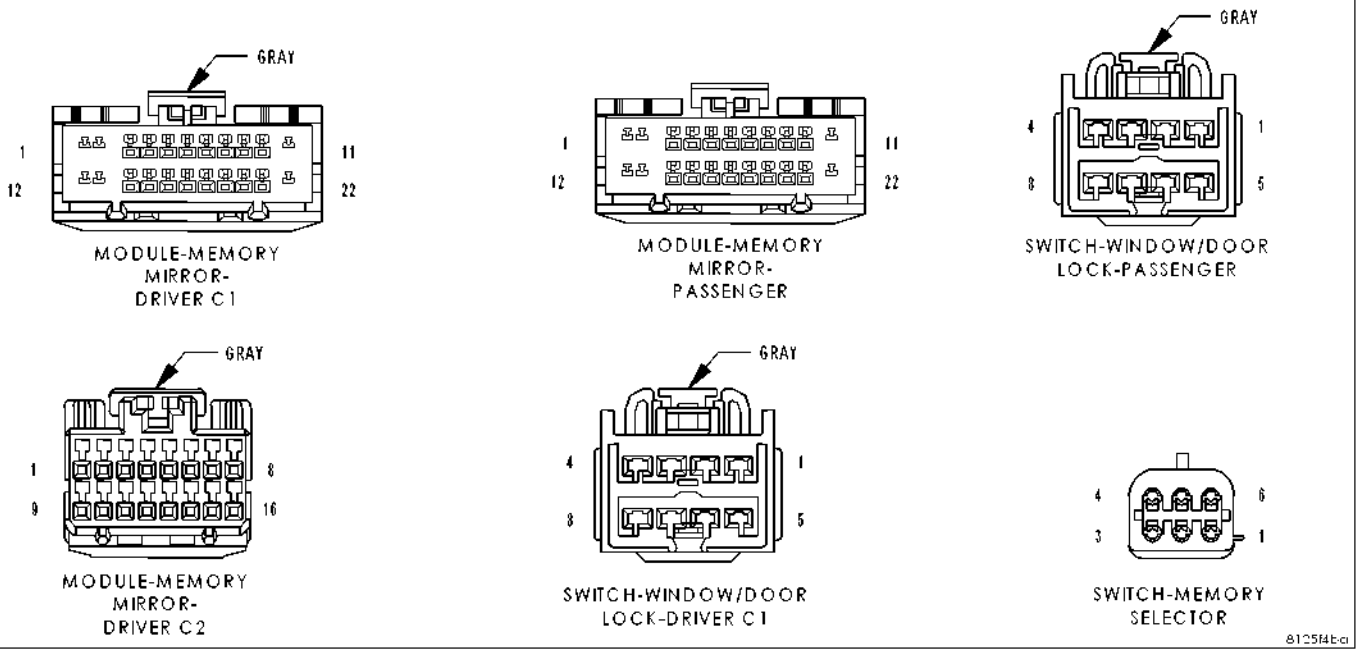
Is the resistance below 10000.0 ohms?

Yes >> Repair the (P339) Memory Select Switch Mux circuit for a short to the (G920) Memory Select Switch Return circuit.
Perform the BODY VERIFICATION TEST - VER 1.

No >> Replace the Memory Selector Switch.
Perform BODY VERIFICATION TEST - VER 1.

B1804, B1809 DOOR LOCK/UNLOCK SWITCH CIRCUIT STUCK UNLOCK – MEMORY MIRROR MODULE





B1804, B1809 DOOR LOCK/UNLOCK SWITCH CIRCUIT STUCK UNLOCK – MEMORY MIRROR MODULE — (CONTINUED)

For the Power Door Lock circuit diagram (Refer to 8 - ELECTRICAL/POWER LOCKS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Door Lock Switch Mux circuit is under 1.5 volts for over 30 seconds.

Possible Causes
(G161) DRIVER DOOR LOCK SWITCH MUX WIRE PARTIAL SHORT TO GROUND
(P339) MEMORY SELECT SWITCH MUX WIRE PARTIAL SHORT TO GROUND
(P339) MEMORY SELECT SWITCH MUX CIRCUIT SHORTED TO THE (G920) MEMORY SELECT SWITCH RETURN CIRCUIT
MEMORY SELECTOR SWITCH
WINDOW/DOOR LOCK SWITCH STUCK
MEMORY MIRROR MODULE

Theory of Operation

This code will only set in vehicles that have the Memory System. The supply circuit for the Memory Mirrors are supplied by the Memory Mirror Module, therefore both the Memory Select Switch Mux or the Door Lock Switch Mux circuits can cause this DTC.

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

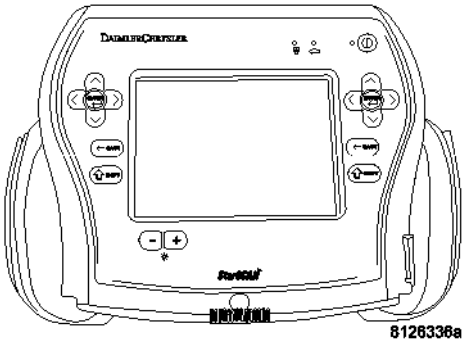
With the scan tool, record and erase DTC's

Operate the Door Lock Switch from the side this DTC was set in. Put the switch in both positions several times.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read DTC's.



Does the scan tool display DOOR LOCK/UNLOCK SWITCH CIRCUIT STUCK UNLOCK?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform BODY VERIFICATION TEST - VER 1.

B1804, B1809 DOOR LOCK/UNLOCK SWITCH CIRCUIT STUCK UNLOCK – MEMORY MIRROR MODULE — (CONTINUED)

2. DRIVER MODULE OR PASSENGER MODULE

Is this DTC in the Driver or Passenger module?

Passenger

Go to 3

Driver

Go to 5

---

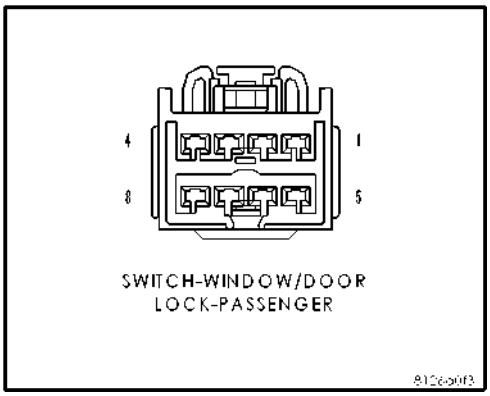
3. PASSENGER DOOR LOCK SWITCH SHORTED TO GROUND

With the scan tool, erase DTC's.
Disconnect the Passenger Window/Door Lock Switch connector.
Turn the ignition on.
With the scan tool, read DTC's.

Does the scan tool display DOOR LOCK/UNLOCK SWITCH CIRCUIT STUCK UNLOCK?

No >> Replace the Passenger Window/Door Lock Switch.
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Go to 4



---

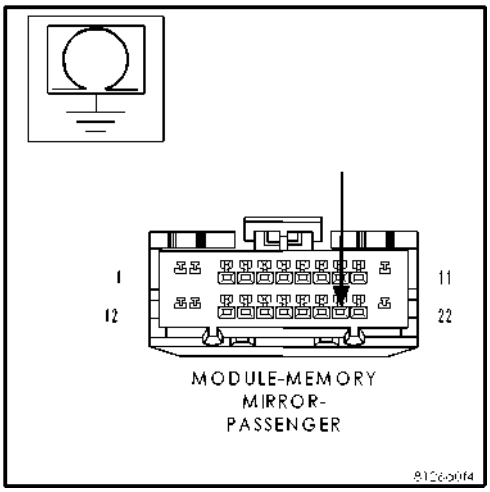
4. (G160) PASSENGER DOOR LOCK SWITCH MUX CIRCUIT SHORT TO GROUND

Disconnect the Passenger Memory Mirror Module connector.
Measure the resistance between ground and the (G160) Passenger Door Lock Switch Mux circuit in the Passenger Memory Mirror Module connector.

Is the resistance below 10000.0 ohms?

Yes >> Repair the (G160) Passenger Door Lock Switch Mux circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Passenger Memory Mirror Module.
Perform BODY VERIFICATION TEST - VER 1.



B1804, B1809 DOOR LOCK/UNLOCK SWITCH CIRCUIT STUCK UNLOCK – MEMORY MIRROR MODULE — (CONTINUED)

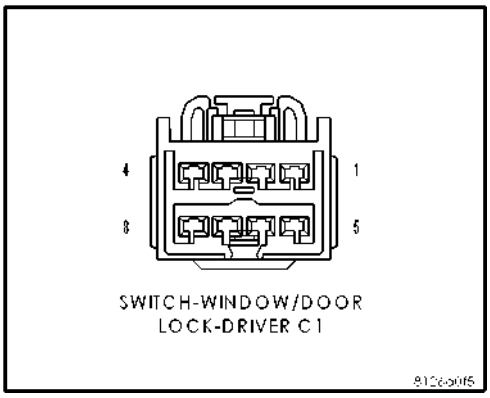
5. DRIVER DOOR LOCK SWITCH SHORTED TO GROUND

With the scan tool, erase DTC's.
Disconnect the Driver Window/Door Lock Switch connector.
Turn the ignition on.
With the scan tool, read DTC's.

Does the scan tool display DOOR LOCK/UNLOCK SWITCH CIRCUIT STUCK UNLOCK?

No >> Replace the Driver Window/Door Lock Switch.
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Go to 6



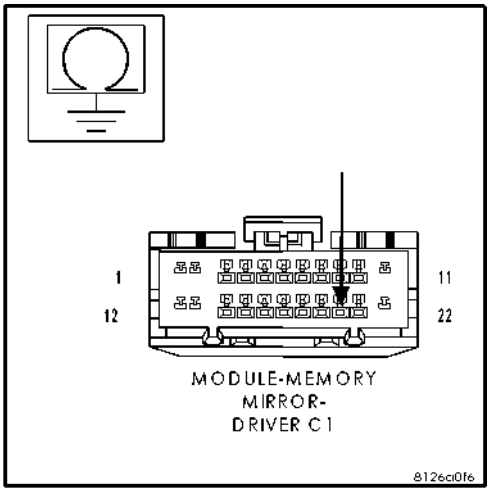
6. (G161) DRIVER DOOR LOCK SWITCH MUX WIRE SHORT TO GROUND

Disconnect the Driver Memory Mirror Module C1 connector.
Measure the resistance between ground and the (G161) Driver Door Lock Switch Mux circuit in the Memory Mirror Module connector.

Is the resistance below 10000.0 ohms?

Yes >> Repair the (G161) Driver Door Lock Switch Mux circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go to 7



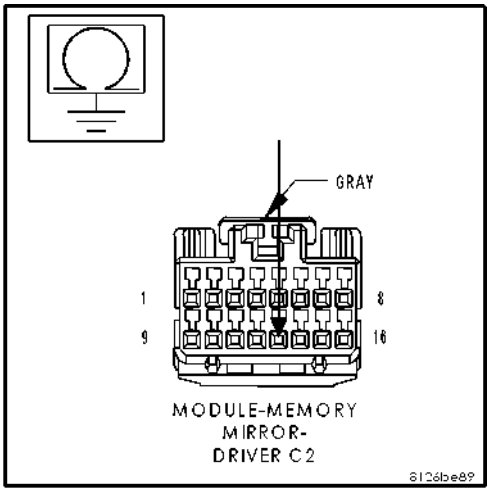
7. MEMORY SELECT MUX WIRE SHORT TO GROUND

Disconnect the Driver Memory Mirror Module C2 connector.
Measure the resistance between ground and the Memory Select Switch Mux circuit.

Is the resistance below 10000.0 ohms?

Yes >> Repair the Memory Select Switch Mux wire for a short to ground.
Perform the BODY VERIFICATION TEST - VER 1.

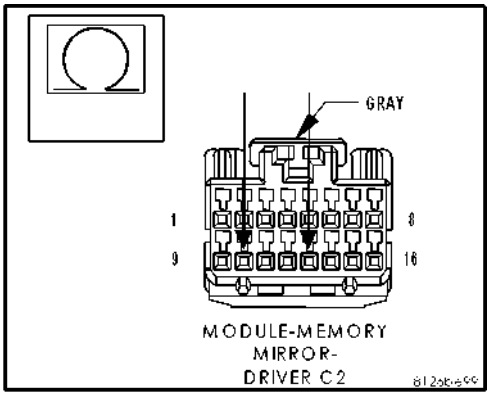
No >> Go to 8



B1804, B1809 DOOR LOCK/UNLOCK SWITCH CIRCUIT STUCK UNLOCK – MEMORY MIRROR MODULE — (CONTINUED)

8. MEMORY SELECT SWITCH MUX CIRCUIT SHORTED

Measure the resistance between the Memory Select Switch Mux circuit and the Memory Select Switch Return circuit in the Driver Memory Mirror Module C2 connector.



Is the resistance below 10000.0 ohms?

Yes >> Go to 9

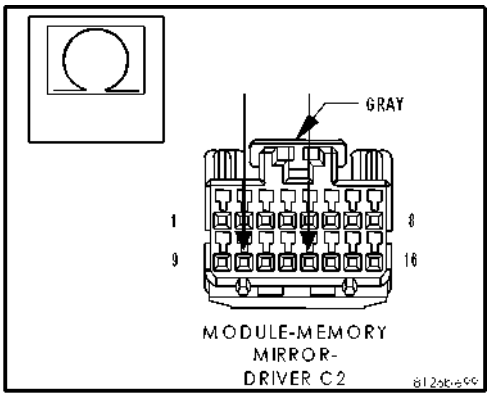
No >> Replace the Driver Memory Mirror Module.
Perform BODY VERIFICATION TEST - VER 1.

---

9. MEMORY SELECTOR SWITCH SHORTED

Disconnect the Memory Selector Switch connector.

Measure the resistance between the (P339) Memory Select Switch Mux circuit and the (G920) Memory Select Switch Return circuit in the Driver Memory Mirror Module C2 connector.



Is the resistance below 10000.0 ohms?

Yes >> Repair the (P339) Memory Select Switch Mux circuit for a short to the (G920) Memory Select Switch Return circuit.
Perform the BODY VERIFICATION TEST - VER 1.

No >> Replace the Memory Selector Switch.
Perform BODY VERIFICATION TEST - VER 1.

BODY VERIFICATION TEST – VER 1

Diagnostic Test

1. Perform Body Verification Test

Disconnect all jumper wires and reconnect all previously disconnected components and connectors.

Ensure that all accessories are turned off.

Ensure that the battery is fully charged.

Turn the ignition on.

With the scan tool, record and erase DTCs from all modules.

If repairs were made to any of the HVAC door actuator circuits, with the scan tool in HVAC, select System Tests and then select Actuator DTC Detection. The test must pass before proceeding to the next step.

If repairs were made to any of the HVAC doors, linkage, door actuators, or door actuator circuits, with the scan tool in HVAC, select System Tests and then select Actuator Calibration Test. The test must pass before proceeding to the next step.

Turn the ignition off, wait 10 seconds, and then turn the ignition on.

Operate all functions of the system that caused the original concern.

With the scan tool, select ECU View.

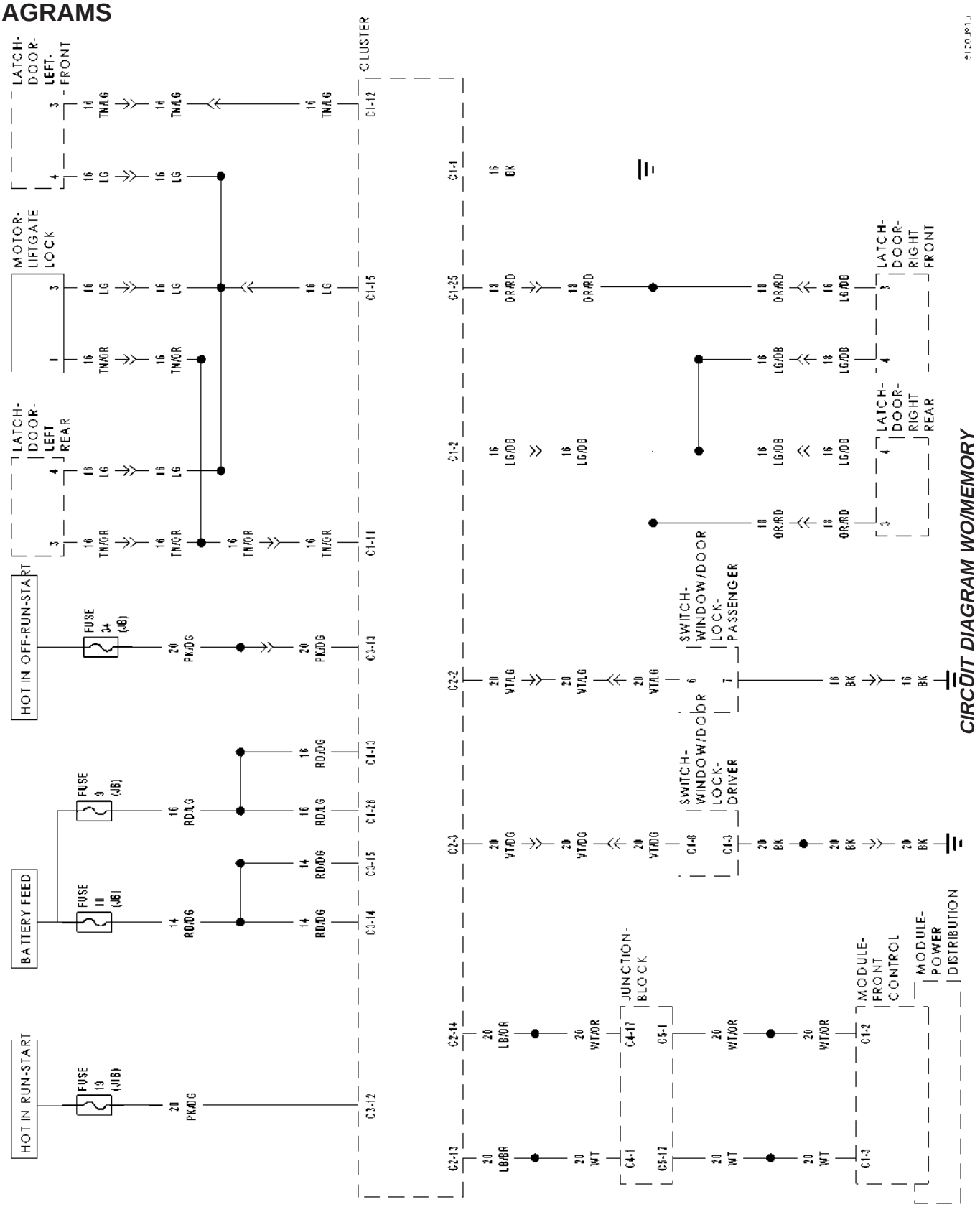
Check for DTCs in the modules.

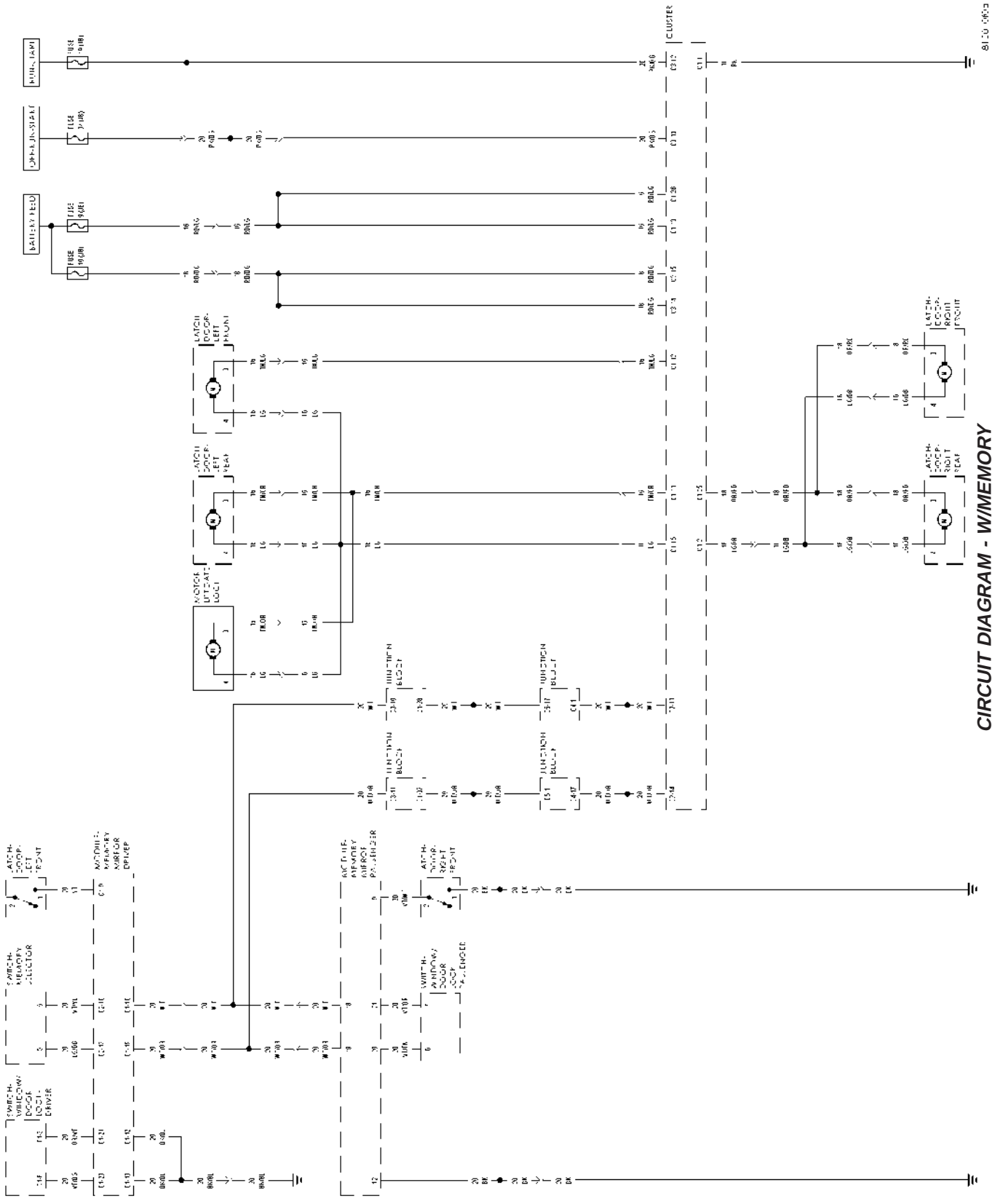
Are DTCs present in any of the modules or is the original condition still present?

Yes >> The repair is not complete. Refer to the related category for the DTC or symptom that is still present.

No >> The repair is complete.

SCHEMATICS AND DIAGRAMS





CIRCUIT DIAGRAM - W/MEMORY

POWER LOCKS - SERVICE INFORMATION

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POWER LOCKS - SERVICE INFORMATION

DESCRIPTION

POWER LOCKS

The power lock system allows all of the doors and liftgate to be locked or unlocked electrically by operating a switch on either front door trim panel. The power lock system receives non-switched battery current through a fuse in the Junction Block (JB), so that the power locks remain operational, regardless of the ignition switch position.

The instrument cluster locks the doors automatically when the vehicle is driven beyond the speed of 25.7 Km/h (15 mph), all doors are closed, and the accelerator pedal is depressed. The rolling door lock feature can be disabled if desired.

This vehicle also offers several customer programmable features, which allows the selection of several optional electronic features to suit individual preferences.

The power lock system for this vehicle can also be operated remotely using the Remote Keyless Entry (RKE) transmitters.

DOOR LOCK MOTORS

The lock mechanisms are actuated by a reversible electric motor mounted within each door. The power lock motors are integral to the door latch units.

The power lock motors cannot be adjusted or repaired and, if faulty or damaged, the door latch unit must be replaced.

CENTRAL LOCKING/UNLOCKING

The central locking system controls powered operation of the door and liftgate locks and the illuminated entry system. Central locking included the following features:

- Automatic locking of the doors and liftgate when the vehicle speed exceeds 13 km/h (8 mph).
- Locking prevention with a door lock switch or the RKE transmitter if the key is in the ignition switch and the driver's door is open.

- Driver selectable unlocking mode: unlock only the driver's door or all doors and the liftgate with one press of the RKE transmitter unlock button.
- Automatic illumination of interior courtesy lamps when the vehicle is unlocked.
- Locking all doors and the liftgate by pressing the lock button on the RKE transmitter, or by pressing a lock switch on one of the front doors.

ENHANCED ACCIDENT RESPONSE

In the event of an impact that causes airbag deployment, the Enhanced Accident Response System switches on the interior lamps and unlocks the doors after the vehicle has stopped. This helps emergency personnel render appropriate assistance. The lamps remain on as long as the battery has power or until the ignition key is removed.

REMOTE KEYLESS ENTRY

Remote Keyless Entry (RKE) is standard on this vehicle. It locks and unlocks doors and liftgate, turns on interior lamps, and arms and disarms the Vehicle Theft Security System (if equipped). The RKE system operates on non-switched battery current through a fuse in the Integrated Power Module (IPM), so that the system remains operational, regardless of the ignition switch position.

The RKE transmitters are also equipped with a Panic button. If the Panic button on the RKE transmitter is depressed, the horn will sound and the exterior lights will flash on the vehicle for about three minutes, or until the Panic button is depressed a second time. A vehicle speed of about 25.7 kilometers-per-hour (15 miles-per-hour) will also cancel the panic event.

The RKE system can also perform other functions on this vehicle. If the vehicle is equipped with the optional Vehicle Theft Security System (VTSS), the RKE transmitter will arm the VTSS when the Lock button is depressed, and disarm the VTSS when the Unlock button is depressed.

The RKE system includes two transmitters when the vehicle is shipped from the factory, but the system can retain the vehicle access codes of up to a total of four transmitters. The transmitter codes are retained in the RKE module memory, even if the battery is disconnected. If an RKE transmitter is faulty or lost, new transmitter vehicle access codes can be programmed into the system using a scan tool.

This vehicle also offers several customer programmable features, which allows the selection of several optional electronic features to suit individual preferences. Customer programmable feature options affecting the RKE system include:

- **Remote Unlock Sequence** - Allows the option of having only the driver side front door unlock when the RKE transmitter Unlock button is depressed the first time. The remaining doors unlock when the button is depressed a second time within 5 seconds of the first unlock press. Another option is having all doors and liftgate unlock upon the first depression of the RKE transmitter Unlock button.
- **Sound Horn on Lock** - Allows the option of having the horn sound a short chirp as an audible verification that the RKE system received a valid Lock request from the RKE transmitter, or having no audible verification.
- **Flash Lights with Lock and Unlock** - Allows the option of having the park lamps flash as an optical verification that the RKE system received a valid Lock request or Unlock request from the RKE transmitter, or having no optical verification.
- **Programming Additional Transmitters** - Allows up to a total of four transmitter vehicle access codes to be stored in the receiver memory.

Certain functions and features of the RKE system rely upon resources shared with other electronic modules in the vehicle over the CAN data bus network. For diagnosis of these electronic modules or of the data bus network, the use of a scan tool and the appropriate diagnostic information are required.

OPERATION

POWER LOCKS

The instrument cluster locks or unlocks the doors when an actuation input signal from a door lock switch or Memory Mirror Module is received. The instrument cluster turns on the output drivers and provides a voltage level to the door lock motor for a specified time. All passenger doors can be locked or unlocked using a mechanical button mounted on the door trim panel. The drivers door can be locked or unlocked by using the key cylinder.

DOOR LOCK MOTORS

The door lock motors are controlled by the instrument cluster. A positive and negative battery connection to the two motor terminals will cause the motor to move in one direction. Reversing the current will cause the motor to move in the opposite direction.

REMOTE KEYLESS ENTRY

- **LOCK**: Pressing the LOCK button locks all doors, sounds horn (chirp) once if enabled, flashes the park lamps once if enabled, and arms the Vehicle Theft Security System (VTSS), if enabled. The chirp verifies that the instrument cluster has sent a message for door lock operation. If a door has not been closed before pressing the LOCK button, the vehicle may not be secured and the VTSS (if equipped) will not arm until the door is closed.
- **UNLOCK**: Pressing the UNLOCK button once will unlock the driver's door first if enabled, flashes the park lamps twice if enabled, activates the illuminated entry system, and disarms the Vehicle Theft Security System (VTSS), if equipped. Pressing the UNLOCK button twice within five seconds will unlock all doors, if driver's door first is enabled.
- **PANIC**: Pressing the PANIC button sounds the horns at half second intervals, flashes the exterior lamps, and turns ON the interior lamps. The panic alarm will remain on for three minutes, or until the PANIC button is actuated again or the vehicle speed exceeds 25.7 Km/h (15 mph) will cancel the panic event.

DIAGNOSIS AND TESTING

POWER LOCK MOTOR

The most reliable, efficient, and accurate means to diagnose the power lock system requires the use of a scan tool and the proper Diagnostic Procedures information.

Refer to the appropriate wiring information.

POWER LOCKS

The most reliable, efficient, and accurate means to diagnose the power lock system requires the use of a scan tool and the proper Diagnostic Procedures information.

Following are tests that will help to diagnose the hard wired components and circuits of the power lock system. However, these tests may not prove conclusive in the diagnosis of this system. In order to obtain conclusive testing of the power lock system, the CAN data bus network must be checked.

Refer to the appropriate wiring information.

PRELIMINARY DIAGNOSIS

As a preliminary diagnosis for the power lock system, note the system operation while you actuate both the Lock and Unlock functions with the power lock switches and with the Remote Keyless Entry (RKE) transmitter. Then, proceed as follows:

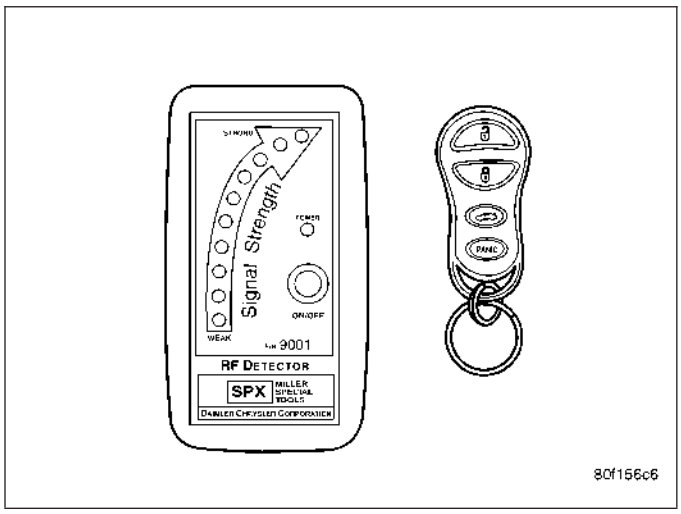
- If the entire power lock system fails to function with either the power lock switches or the RKE transmitter, check the fuse in the Junction Block (JB).
- If the power lock system functions with both power lock switches, but not with the RKE transmitter, proceed to diagnosis of the Remote Keyless Entry (RKE) system.
- If the power lock system functions with the RKE transmitter, but not with one or both power lock switches, proceed to diagnosis of the door lock switches.
- If the driver side power lock switch operates only the driver side front door power lock motor, but all other power lock motors operate with the passenger side power lock switch or the RKE transmitter, use a scan tool and the appropriate diagnostic information to diagnose the CAN data bus.
- If only one power lock motor fails to operate with both power lock switches and the RKE transmitter, use a scan tool and the appropriate diagnostic information to diagnose the CAN data bus.

REMOTE KEYLESS ENTRY TRANSMITTER

DIAGNOSIS AND TESTING

REMOTE KEYLESS ENTRY TRANSMITTER

Using special tool 9001, first test to ensure that the transmitter is functioning. Typical testing distance is 2.5 centimeters (1 inch) for Asian transmitters and 30.5 centimeters (12 inches) for all others. To test, position the transmitter as shown. Press any transmitter button, then test each button individually. The tool will beep if a radio signal strength that lights five or more LED's is detected. Repeat this test three times. If transmitter fails any of the test refer to the proper Diagnostic Procedures information.



STANDARD PROCEDURE

REMOTE KEYLESS ENTRY CUSTOMER PREFERENCES

HORN CHIRP DISABLING/ENABLING

The horn chirp can be toggled using a scan tool or by using the Remote Keyless Entry (RKE) transmitter.

To DISABLE (cancel) the horn chirp feature: With the ignition in the ON position, press and hold the transmitter LOCK button for four seconds. While pressing the LOCK button in, press the PANIC button within 6 seconds. Release both buttons when a single chime is heard.

To ENABLE the horn chirp feature, repeat the above procedure.

UNLOCK SEQUENCE

The unlock sequence can be toggled using a scan tool or by using the following procedure.

1. Place the key in the ignition.
2. Within 10 seconds, cycle the key from the OFF position to the ON position four times, ending in the ON position (Do not start the engine).
3. Within 30 seconds, press the driver's door lock switch in the UNLOCK direction. A single chime will be heard to indicate the feature has been disabled.

This will toggle between Driver door first and Unlock all doors function.

To ENABLE this feature, repeat the above procedure.

REMOTE KEYLESS ENTRY TRANSMITTER BATTERIES

The Remote Keyless Entry (RKE) transmitter case snaps open and shut for battery access. To replace the RKE transmitter batteries:

1. Using a trim stick or a thin coin, gently pry at the notch in the center seam of the RKE transmitter case halves located near the key ring until the two halves unsnap.
2. Lift the back half of the transmitter case off of the RKE transmitter.
3. Remove the two batteries from the RKE transmitter.

4. Replace the battery with a new CR2032. Be certain that the battery is installed with the polarity correctly oriented.
5. Align the two RKE transmitter case halves with each other, and squeeze them firmly and evenly together using hand pressure until they snap back into place.

REMOTE KEYLESS ENTRY TRANSMITTER PROGRAMMING

If vehicle is not equipped with Sentry Key Theft Deterrent, new Remote Keyless Entry (RKE) transmitters can be programed using a scan tool and the proper Diagnostic Procedures manual. If vehicle is equipped with Sentry Key Theft Deterrent, (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE).

SPECIFICATIONS

REMOTE KEYLESS ENTRY TRANSMITTER

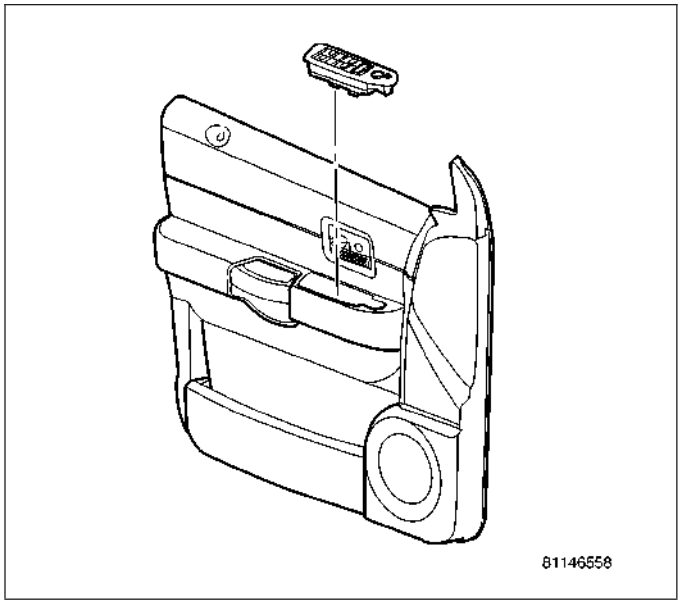
Normal operation range is up to 20 meters (60 feet) of the vehicle. Range may be better or worse depending on the environment around the vehicle.

SWITCH-WINDOW/DOOR LOCK

DESCRIPTION

A window/lock switch located in each front door trim panel. The driver's side window/lock switch includes the following:

- **Power Lock Switch** - A two-way, momentary, resistor multiplexed switch to control the power lock system.
- **Power Window Lockout Switch** - A two-way, latching, push-button switch allows the vehicle operator to lock out the power window switches on each passenger door so that the passenger door power windows may be operated only from the master switches.
- **Power Window Switches** - A two-way, momentary power window switch for the driver side front door also has a second detent in the Down direction and internal circuitry to provide an Auto-Down feature for the driver side front door power window. In addition to the power window switch for its own door, the window/lock switch houses individual master switches for each passenger door power window.



The passenger side window/lock switch includes the following:

- **Power Lock Switch** - A two-way, momentary, resistor multiplexed switch to control the power lock system.
- **Power Window Switch** - A two-way, momentary power window switch for the passenger side front door.

OPERATION

The driver side window/lock switch combines a power lock switch, a driver power window switch with an Auto-down feature, master switches for each passenger door power window, a power window lockout switch, a power mirror selector switch, and four power mirror adjustment switches in a single assembly. The switches in the window/lock switch can be diagnosed using conventional diagnostic tools and methods.

Power Lock Switch

The power lock switch circuitry is connected in series between ground and the driver door switch mux input of the instrument cluster (without memory). If equipped with the memory system, the circuitry is connected to the memory mirror module. Each power lock switch position (Lock, Unlock, and Neutral) provides a different resistance value to the instrument cluster or memory mirror input, which allows the instrument cluster or memory module to sense the switch position. Based upon the power lock switch input, the instrument cluster or memory module controls the battery and ground feed outputs to the individual power lock motors to lock or unlock the door latches. The Light-Emitting Diode (LED) in the power lock switch is connected to battery current through the power window circuit breaker in the Integrated Power Module (IPM) on a fused ignition switch output (run-acc) circuit so that the switch will be illuminated whenever the ignition switch is in the On or Accessory positions.

Power Window Switches

The power window switch circuitry is connected to battery current through a circuit breaker in the Integrated Power Module (IPM) on a fused ignition switch output (run-acc) circuit so that the power windows will operate whenever the ignition switch is in the On or Accessory positions. Each two-way, momentary master passenger power window switch in the window/lock switch provides battery current and ground to the individual power window switches on each passenger door so that the power window switch controls the battery current and ground feeds to its respective power window motor. The switch for the driver side front door power window includes an auto-down feature. When this switch is depressed to a second momentary detent position and released, the driver door power window is automatically operated through an internal circuit and relay to its fully lowered position. The Auto-down event is cancelled if the switch paddle is depressed a second time in either the Up or Down direction. When the two position window lockout switch in the window/lock switch is depressed and latched in the lockout position, the battery current feed to each of the individual passenger power window switches is interrupted so that the passenger door power windows can only be operated from the switches in the window/lock switch. The window lockout switch also controls the battery current feed for the LED in each passenger power window switch so that the switch will not be illuminated when it is locked out.

DIAGNOSIS AND TESTING

WINDOW/DOOR LOCK SWITCH

The Light-Emitting Diode (LED) illumination lamps for all of the window/lock switch power window and power lock switches receive battery current through the circuit breaker in the Integrated Power Module (IPM). If only one LED in the door module is inoperative, replace the faulty door module. If the driver side front door power window operates in a normal manner, but the Auto-Down feature is inoperative, replace the faulty window/lock switch. Refer to the appropriate wiring information.

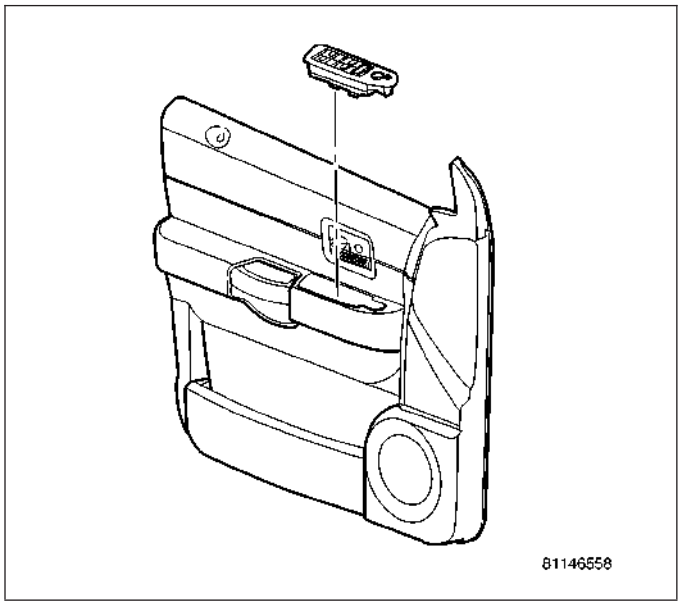
1. Disconnect and isolate the battery negative cable. Remove the window/lock switch from the door trim panel. Disconnect the door wire harness connectors from the switch.
2. Test the switch continuity. See the Switch Tests chart to determine if the continuity is correct for the suspect switches in each switch position. If not OK, replace the faulty window/lock switch as required.

WINDOW/DOOR LOCK SWITCH TEST

POWER LOCK SWITCH	
SWITCH POSITION	**RESISTANCE BETWEEN C-1 PINS 8 & 3**
LOCK	330 OHMS ± 5%
UNLOCK	100 OHMS ± 5%
POWER WINDOW SWITCHES - DRIVER DOOR	
SWITCH POSITION	**CONTINUITY BETWEEN PINS OF C-1**
NEUTRAL	PINS 4 (C1) & 6 (C2) PINS 4 (C1) & 5 (C2) PINS 4 (C1) & 1 (C2) PINS 4 (C1) & 4 (C2) PINS 4 (C1) & 2 (C2)
LEFT FRONT UP	PINS 2 & 7 (C1)
LEFT FRONT DOWN	PINS 2 & 6 (C1)
RIGHT FRONT UP	PINS 2 (C1) & 6 (C2)
RIGHT FRONT DOWN	PINS 2 (C1) & 5 (C2)
LEFT REAR UP	PINS 2 (C1) & 1 (C2)
LEFT REAR DOWN	PINS 2 (C1) & 4 (C2)
RIGHT REAR UP	PINS 2 (C1) & 2 (C2)
RIGHT REAR DOWN	PINS 2 (C1) & 3 (C2)
POWER WINDOW SWITCH - PASSENGER DOOR	
UP	PINS 4 & 3
DOWN	PINS 4 & 2
NEUTRAL	PINS 1 & 2 AND 3 & 8
POWER WINDOW LOCKOUT SWITCH	
SWITCH POSITION	**CONTINUITY BETWEEN**
OFF (SWITCH BUTTON RAISED - NOT DEPRESSED)	PINS 2 AND 5 OF C-1

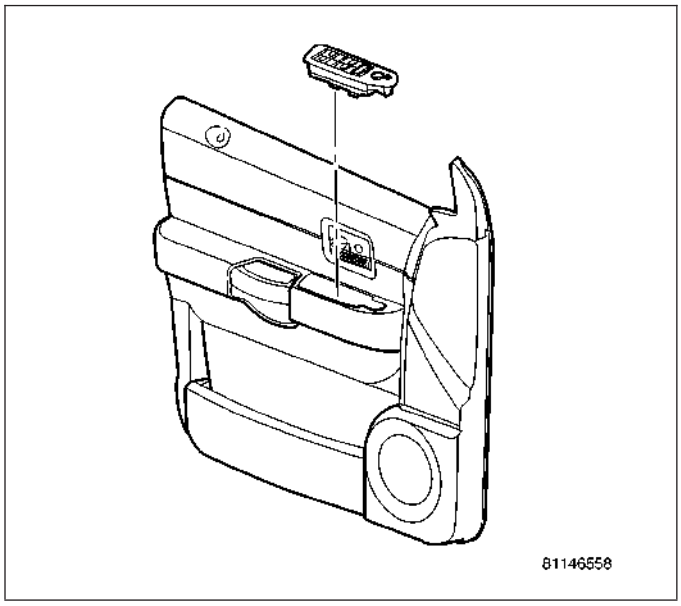
REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Using a trim stick, start at the rear of the switch and pry up to remove from door trim panel.
3. Disconnect electrical harness connectors from switch.



INSTALLATION

1. Connect electrical harness connectors to switch.
2. Insert front end of switch into door trim panel opening. Press into place.
3. Connect battery negative cable.



POWER MIRRORS - ELECTRICAL DIAGNOSTICS

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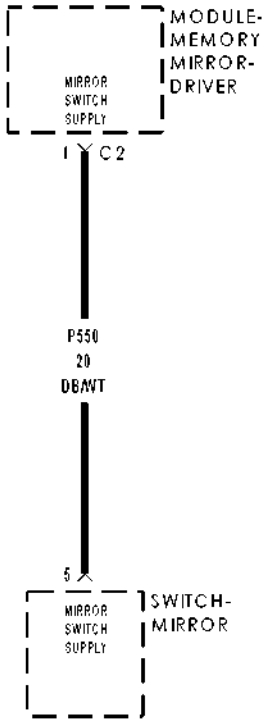
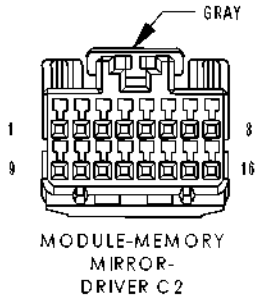
POWER MIRRORS - ELECTRICAL DIAGNOSTICS

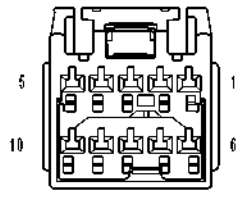
DIAGNOSIS AND TESTING

B1D53,B1DA7–SWITCH POWER SUPPLY CIRCUIT LOW — MMM





MODULE-MEMORY MIRROR-DRIVER C2



SWITCH-MIRROR

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B1D53,B1DA7–SWITCH POWER SUPPLY CIRCUIT LOW — MMM — (CONTINUED)

For the Memory Mirror System circuit diagram (Refer to 8 - ELECTRICAL/POWER MIRRORS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  Whenever the Mirror Switch Supply circuit is below 6.8 volts for over 2 seconds, this code will set.

Possible Causes
PCM BATTERY VOLTAGE LOW DTC
(P550) MIRROR SWITCH SUPPLY CIRCUIT PARTIAL SHORT TO GROUND
MIRROR SWITCH
DRIVER MEMORY MIRROR MODULE

Theory of Operation

On vehicles with the memory system, the Mirror Switch receives its power supply from the Driver Memory Mirror Module. When this code is logged in the Passenger Memory Mirror Module, it has received a bus message from the Driver Module that the power supply for the mirror switch is low. There are no repairs for the passenger side. All repairs are done to the driver side.

Diagnostic Test

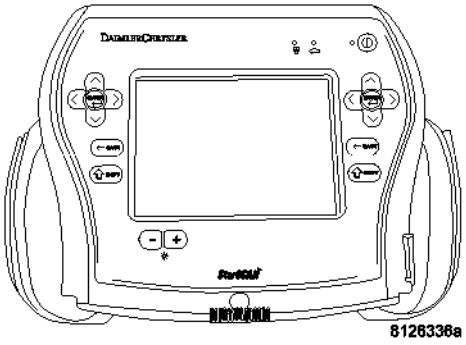
1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase DTC's
Operate the driver mirror several times from the mirror switch
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read DTC's.

Does the scan tool display SWITCH POWER SUPPLY CIRCUIT LOW?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.



B1D53,B1DA7–SWITCH POWER SUPPLY CIRCUIT LOW — MMM — (CONTINUED)

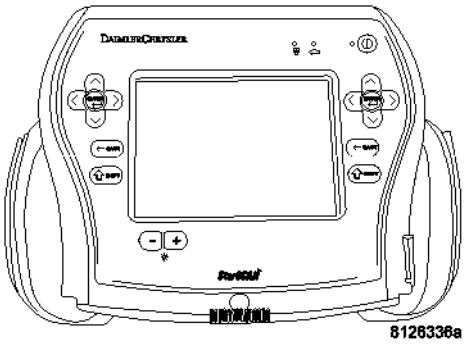
2. CHECK ENGINE DTC's

With the scan tool, read engine DTC's

Does the scan tool display any BATTERY VOLTAGE LOW related DTC's?

Yes >> Refer to the symptom list for problems related to ENGINE.

No >> Go to 3



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3. MIRROR SWITCH SHORTED

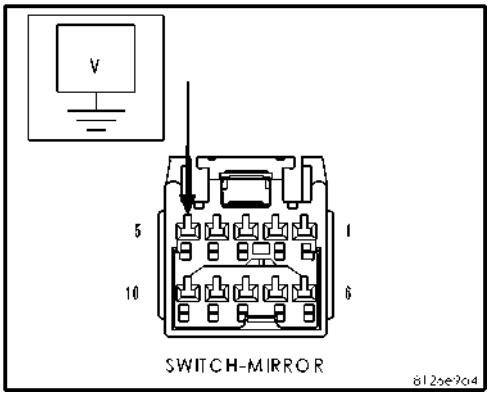
Disconnect the Mirror Switch connector.

Measure the voltage between the (P550) Mirror Switch Supply circuit and ground.

Is the voltage above 10.0 volts?

Yes >> Replace the Mirror Switch.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go to 4



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4. (P550) MIRROR SWITCH SUPPLY CIRCUIT PARTIAL SHORT TO GROUND

Turn the ignition off.

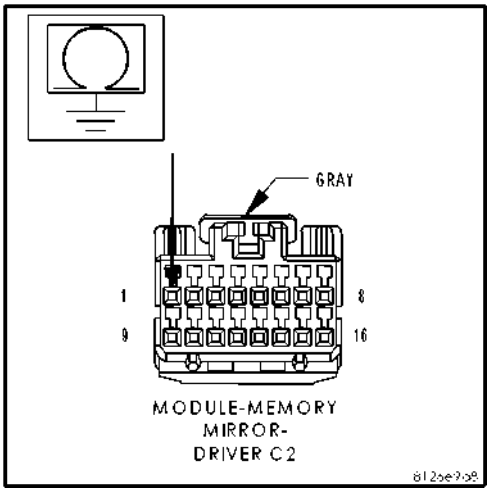
Disconnect the Driver Memory Mirror Module connector.

Measure the resistance between ground and the (P550) Mirror Switch Supply circuit.

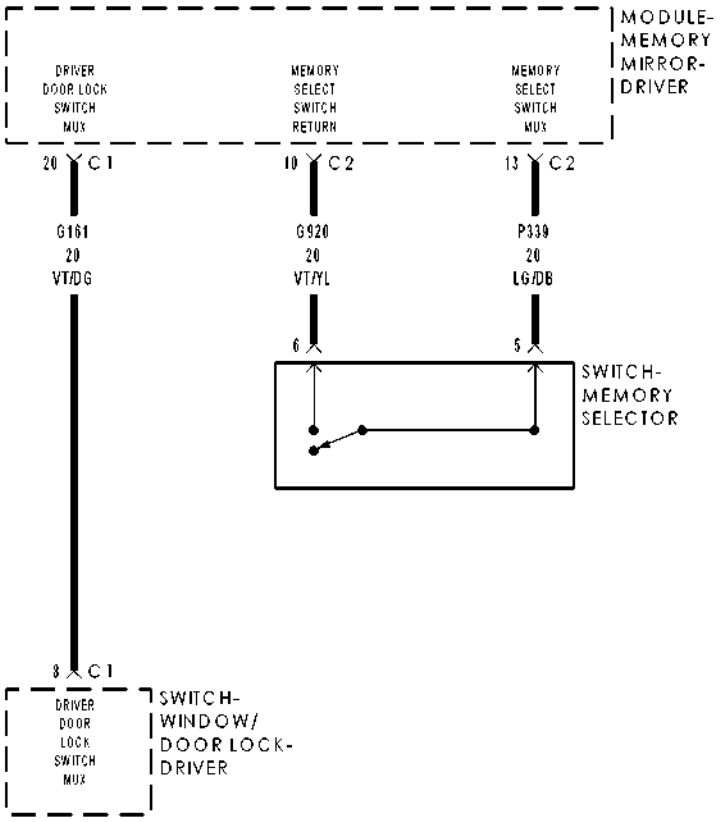
Is the resistance below 5000.0 ohms?

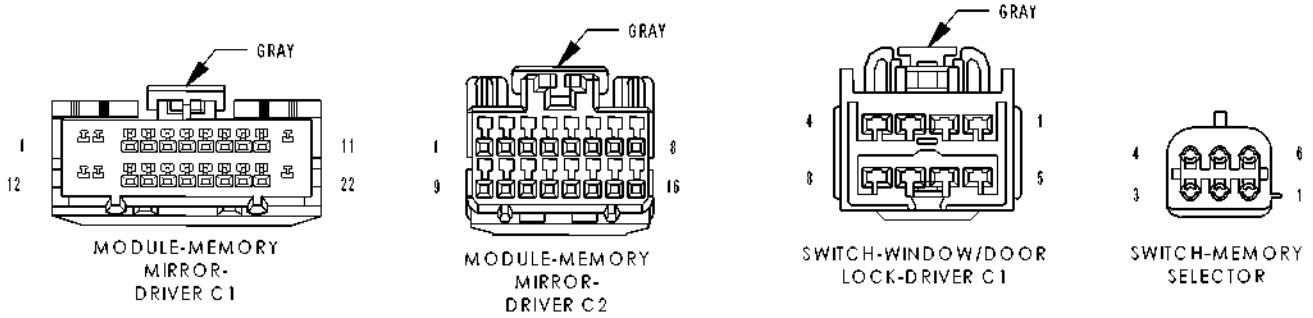
Yes >> Repair the (P550) Mirror Switch Supply circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Driver Memory Mirror Module.
Perform BODY VERIFICATION TEST - VER 1.



B1D4C-MEMORY SWITCH INPUT CIRCUIT HIGH – MEMORY MIRROR MODULE





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B1D4C-MEMORY SWITCH INPUT CIRCUIT HIGH – MEMORY MIRROR MODULE — (CONTINUED)

For the Power Memory Mirror System circuit diagram(Refer to 8 - ELECTRICAL/POWER MIRRORS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Door Lock Switch Mux circuit or the Memory Select Switch Mux circuit is above 5.25 volts for over 30 msec.

Possible Causes
(G161) DRIVER DOOR LOCK SWITCH MUX WIRE SHORT TO VOLTAGE
(P339) MEMORY SELECT SWITCH MUX WIRE SHORT TO VOLTAGE
WINDOW/DOOR LOCK SWITCH
DRIVER MEMORY MIRROR MODULE

Theory of Operation

This code will only set in vehicles that have the Memory System. The supply circuit for the Memory Mirrors are supplied by the Driver Memory Mirror Module, therefore both the Memory Select Switch Mux or the Door Lock Switch Mux circuits can cause this DTC.

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase DTC's

Press the Memory Selector Switch several time in all positions.Cycle the ignition from on to off 3 times.

Turn the ignition on.

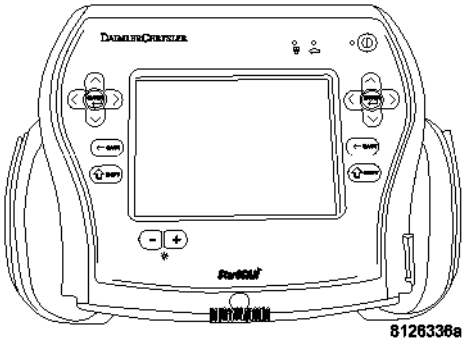
With the scan tool, read DTC's.

Does the scan tool display MEMORY SWITCH INPUT CIRCUIT HIGH?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform BODY VERIFICATION TEST - VER 1.



B1D4C-MEMORY SWITCH INPUT CIRCUIT HIGH – MEMORY MIRROR MODULE — (CONTINUED)

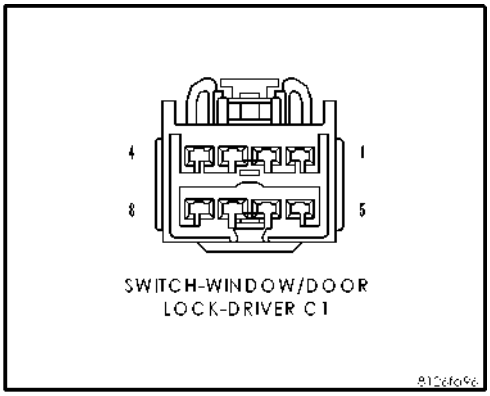
2. DOOR LOCK SWITCH SHORTED TO VOLTAGE

With the scan tool, erase DTC's.
Disconnect the Driver Window/Door Lock Switch connector.
Turn the ignition on.
With the scan tool, read DTC's.

Does the scan tool display MEMORY SWITCH INPUT CIRCUIT HIGH?

No >> Replace the Driver Window/Door Lock Switch.
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Go to 3



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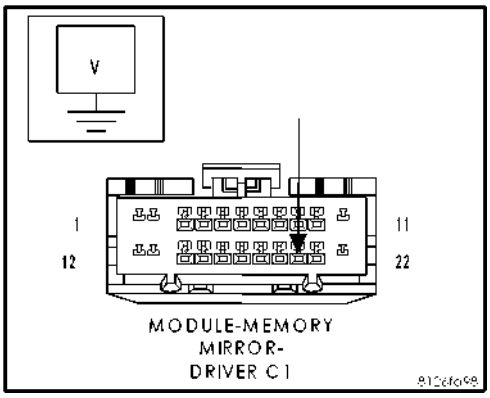
3. (G161) DRIVER DOOR LOCK SWITCH MUX WIRE SHORT TO VOLTAGE

Disconnect the Driver Memory Mirror Module C1 connector.
Measure the voltage of the (G161) Driver Door Lock Switch Mux circuit in the Driver Memory Mirror Module connector.

Is there any voltage present?

Yes >> Repair the (G161) Driver Door Lock Switch Mux circuit for a short to voltage.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go to 4



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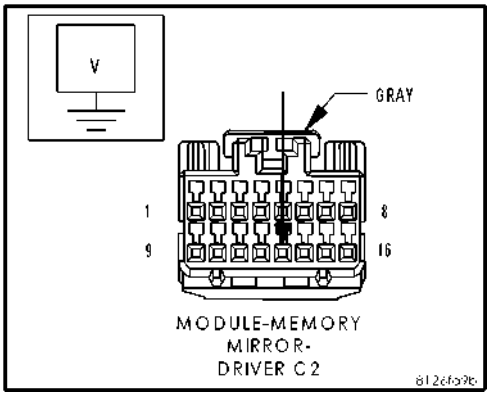
4. (P339) MEMORY SELECT SWITCH MUX WIRE SHORT TO VOLTAGE

Disconnect the Driver Memory Mirror Module C2 connector.
Measure the voltage of the (P339) Memory Select Switch Mux circuit.

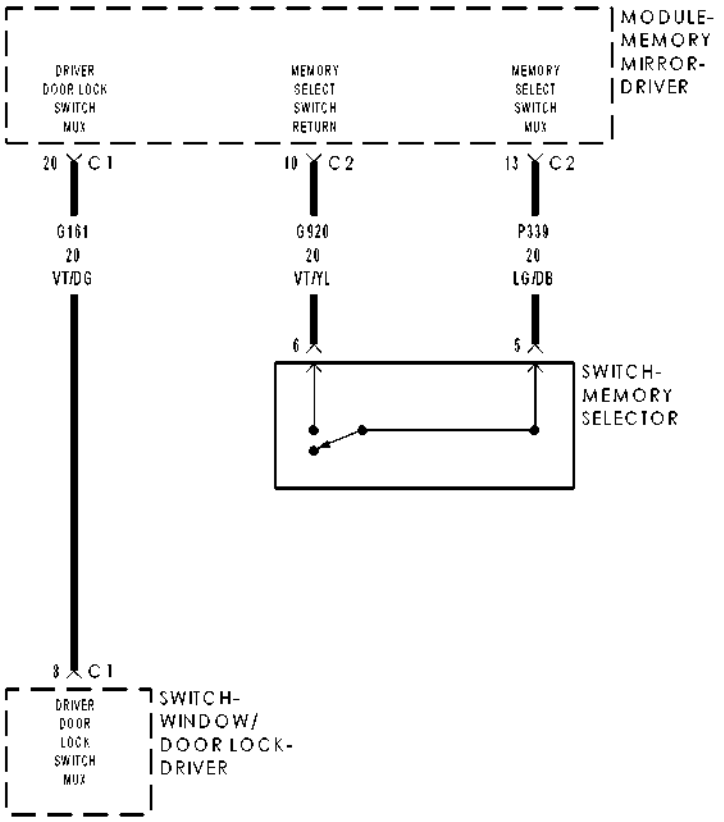
Is there any voltage present?

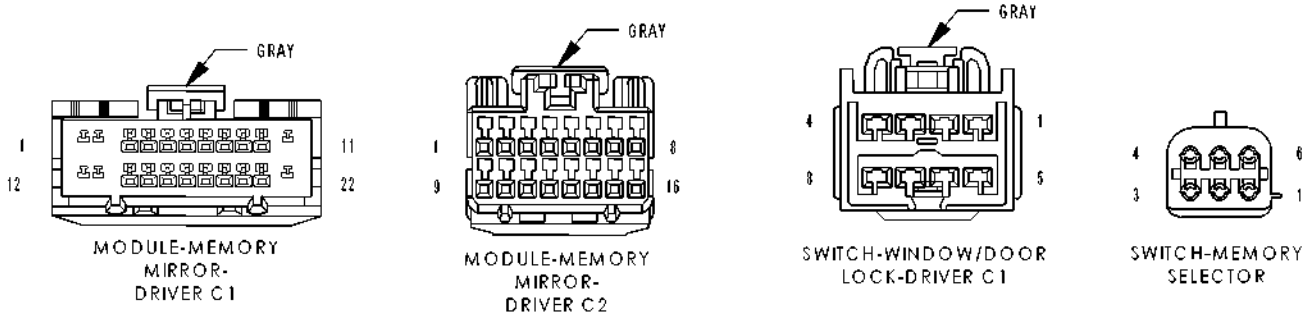
Yes >> Repair the (P339) Memory Select Switch Mux wire for a short to voltage.
Perform the BODY VERIFICATION TEST - VER 1.

No >> Replace the Driver Memory Mirror Module.
Perform BODY VERIFICATION TEST - VER 1.



B1D4D–MEMORY SWITCH INPUT CIRCUIT STUCK – MEMORY MIRROR MODULE





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B1D4D–MEMORY SWITCH INPUT CIRCUIT STUCK – MEMORY MIRROR MODULE — (CONTINUED)

For the Power Memory Mirror System circuit diagram (Refer to 8 - ELECTRICAL/POWER MIRRORS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Door Lock Switch Mux circuit or the Memory Select Switch Mux is under 2.6 volts for over 30 seconds.

Possible Causes
(G161) DRIVER DOOR LOCK SWITCH MUX WIRE PARTIAL SHORT TO GROUND
(G161) DRIVER DOOR LOCK SWITCH MUX CIRCUIT SHORTED TO THE (G775) DRIVER DOOR LOCK SWITCH RETURN CIRCUIT
(P339) MEMORY SELECT SWITCH MUX WIRE PARTIAL SHORT TO GROUND
(P339) MEMORY SELECT SWITCH MUX CIRCUIT SHORTED TO THE (G920) MEMORY SELECT SWITCH RETURN CIRCUIT
MEMORY SELECTOR SWITCH
DRIVER WINDOW/DOOR LOCK SWITCH STUCK
DRIVER MEMORY MIRROR MODULE

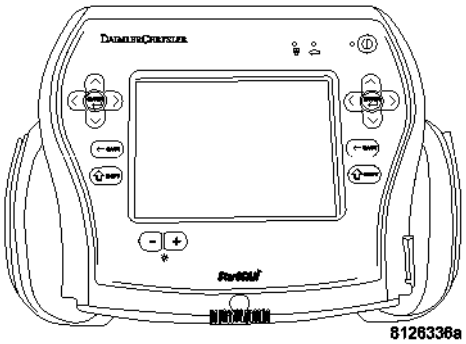
Theory of Operation

This code will only set in vehicles that have the Memory System. The supply circuit for the Memory Mirrors are supplied by the Memory Mirror Module, therefore both the Memory Select Switch Mux or the Door Lock Switch Mux circuits can cause this DTC.

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase DTC's
Press the Memory Selector Switch several times in all positions.
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read DTC's.



Does the scan tool display MEMORY SWITCH INPUT CIRCUIT STUCK?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST - VER 1.

B1D4D–MEMORY SWITCH INPUT CIRCUIT STUCK – MEMORY MIRROR MODULE — (CONTINUED)

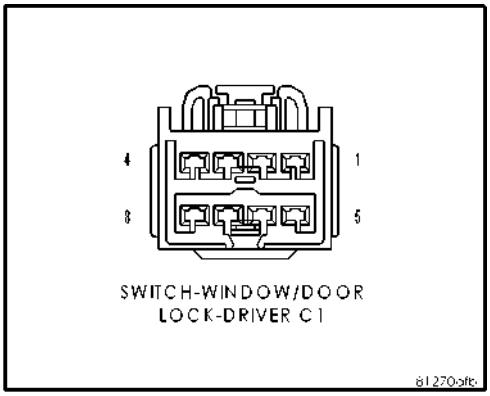
2. DRIVER DOOR LOCK SWITCH SHORTED TO GROUND

With the scan tool, erase DTC's.
Cycle the ignition from on to off 3 times.
Disconnect the Driver Window/Door Lock Switch C1 connector.
Turn the ignition on.
With the scan tool, read DTC's.

Does the scan tool display MEMORY SWITCH INPUT CIRCUIT STUCK?

No >> Replace the Driver Window/Door Lock Switch.
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Go to 3



---

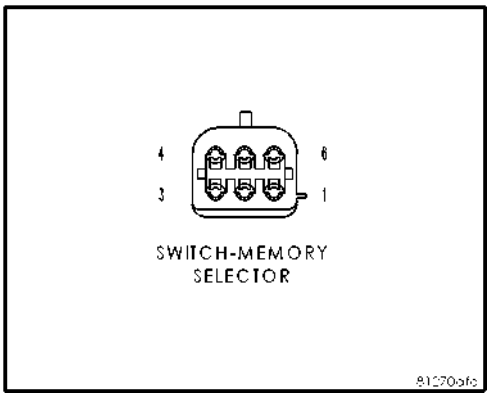
3. MEMORY SELECTOR SWITCH SHORTED TO GROUND

With the scan tool, erase DTC's.
Disconnect the Memory Selector Switch connector.
Turn the ignition on.
With the scan tool, read DTC's.

Does the scan tool display MEMORY SWITCH INPUT CIRCUIT STUCK?

No >> Replace the Memory Selector Switch.
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Go to 4



---

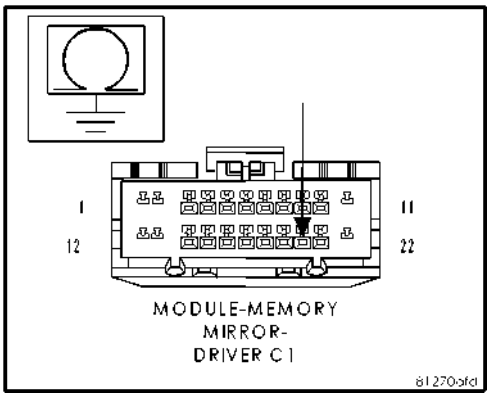
4. (G161) DRIVER DOOR LOCK SWITCH MUX WIRE SHORT TO GROUND

Disconnect the Driver Memory Mirror Module C1 connector.
Measure the resistance between ground and the (G161) Driver Door Lock Switch Mux circuit in the Memory Mirror Module connector.

Is the resistance below 10000.0 ohms?

Yes >> Repair the (G161) Driver Door Lock Switch Mux circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

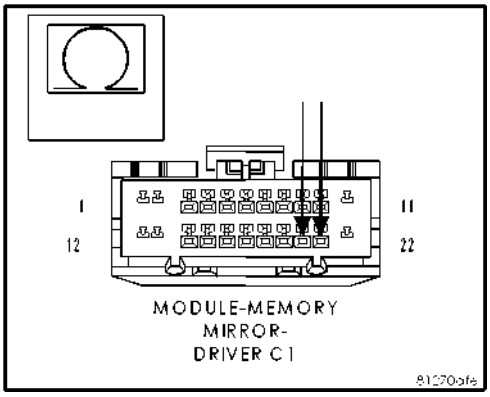
No >> Go to 5



B1D4D–MEMORY SWITCH INPUT CIRCUIT STUCK – MEMORY MIRROR MODULE — (CONTINUED)

5. (G161) DRIVER DOOR LOCK SWITCH MUX CIRCUIT SHORTED TO THE (G775) DRIVER DOOR LOCK SWITCH RETURN CIRCUIT

Measure the resistance between the (G161) Driver Door Lock Switch Mux circuit and the (G775) Driver Door Lock Switch Return circuit in the Memory Mirror Module connector.



Is the resistance below 10000.0 ohms?

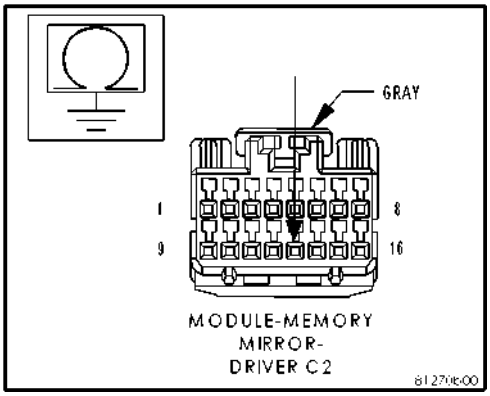
Yes >> Repair the (G161) Driver Door Lock Switch Mux circuit for a short to the (G775) Driver Door Lock Switch Return circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go to 6

---

6. (P339) MEMORY SELECT SWITCH MUX CIRCUIT SHORT TO THE GROUND

Disconnect the Driver Memory Mirror Module C2 connector.
Measure the resistance between ground and the (P339) Memory Select Switch Mux circuit.



Is the resistance below 10000.0 ohms?

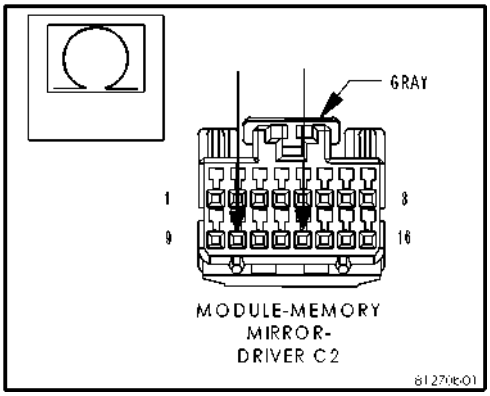
Yes >> Repair the Memory Select Switch Mux wire for a short to ground.
Perform the BODY VERIFICATION TEST - VER 1.

No >> Go to 7

---

7. (P339) MEMORY SELECT SWITCH MUX CIRCUIT SHORT TO THE (G920) MEMORY SELECT SWITCH RETURN CIRCUIT

Measure the resistance between the (P339) Memory Select Switch Mux circuit and the (G920) Memory Select Switch Return circuit in the Driver Memory Mirror Module C2 connector.

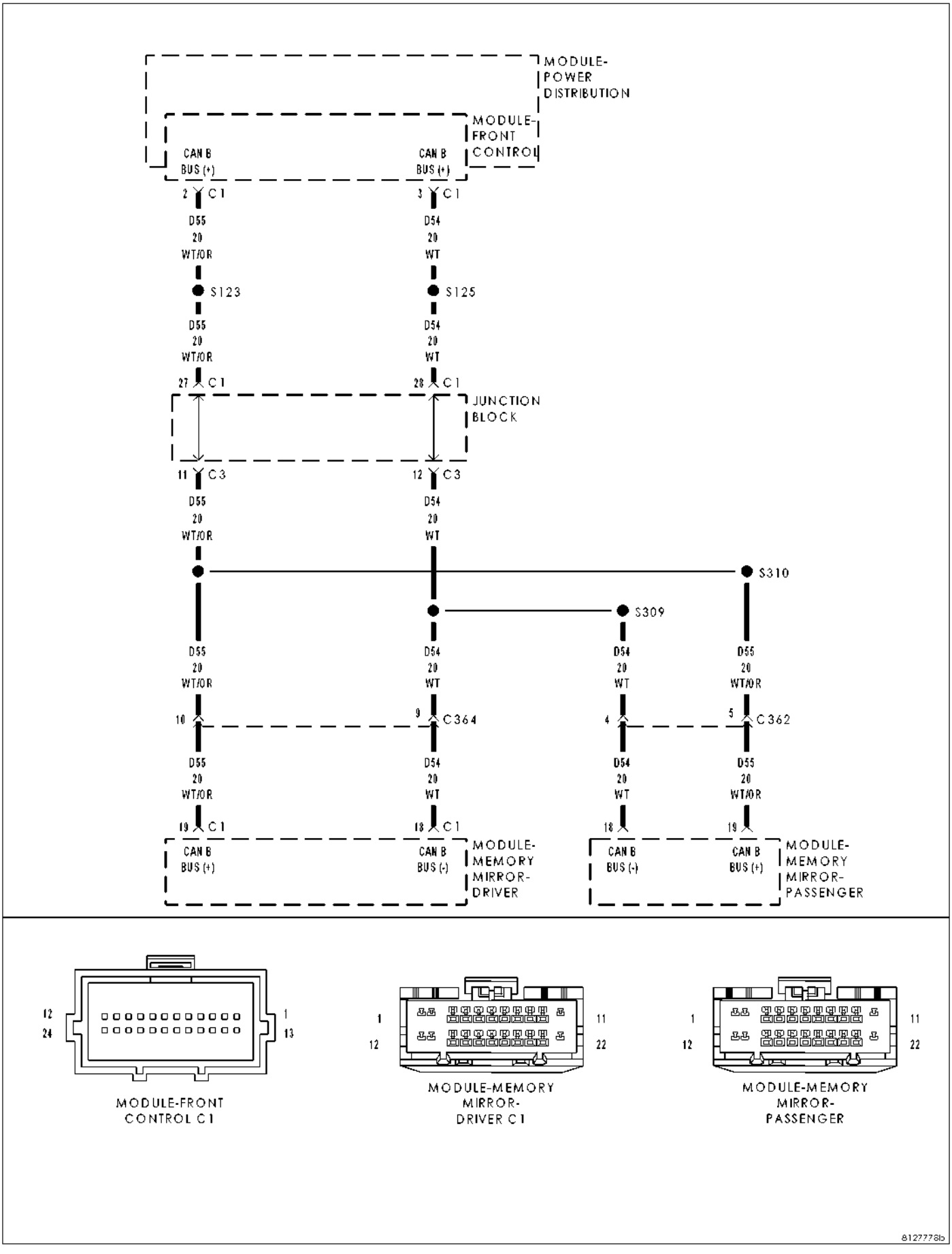


Is the resistance below 10000.0 ohms?

Yes >> Repair the (P339) Memory Select Switch Mux circuit for a short to the (G920) Memory Select Switch return circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Driver Memory Mirror Module.
Perform BODY VERIFICATION TEST - VER 1.

U1000–CAN B BUS (+) CIRCUIT– MEMORY MIRROR MODULE



U1000–CAN B BUS (+) CIRCUIT– MEMORY MIRROR MODULE — (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  Whenever the Can B Bus (+) circuit is open, shorted to voltage or shorted to ground, this code will set.

Possible Causes
CAN B BUS (+) DTC's IN FRONT CONTROL MODULE
(D55) CAN B BUS (+) CIRCUIT OPEN
MEMORY MIRROR MODULE

Diagnostic Test

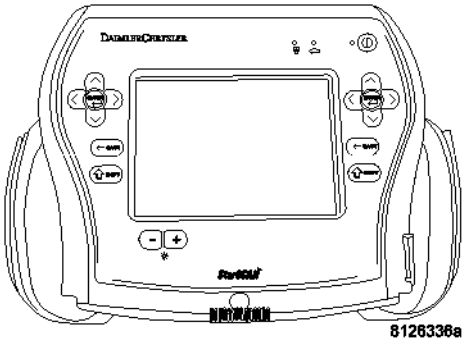
1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase DTC's
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read DTC's.

Does the scan tool display U1000 CAN B BUS (+) CIRCUIT?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.



---

2. CHECK FRONT CONTROL MODULE DTC's

With the scan tool, read Front Control Module DTC's

Does the scan tool display any CAN B BUS DTC's – ACTIVE?

Yes >> Refer to the symptom list for problems related to Communication in the ELECTRICAL.– ELECTRONIC CONTROL MODULES – ELECTRICAL DIAGNOSES section.

No >> Go to 3

U1000–CAN B BUS (+) CIRCUIT– MEMORY MIRROR MODULE — (CONTINUED)

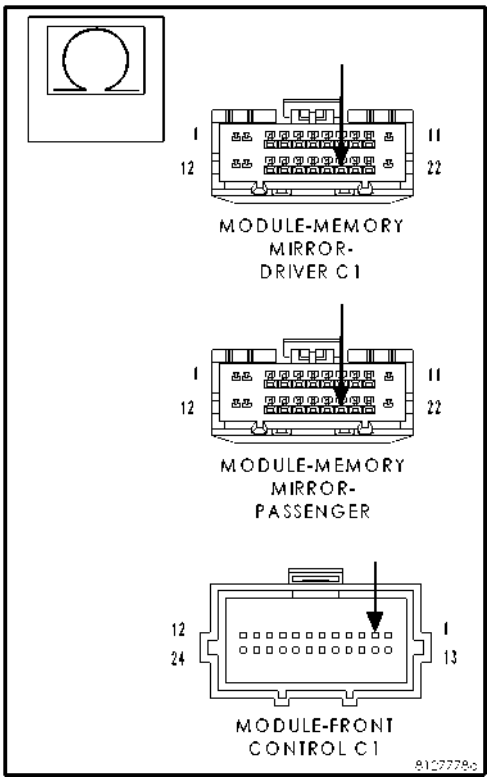
3. CAN B BUS (+) CIRCUIT OPEN

Turn the ignition off.

Disconnect the appropriate Memory Mirror Module C1 connector.

Disconnect the Front Control Module C1 connector.

Measure the resistance of the (D55) Can B Bus (+) circuit between the Front Control Module C1 connector and the Memory Mirror Module connector.

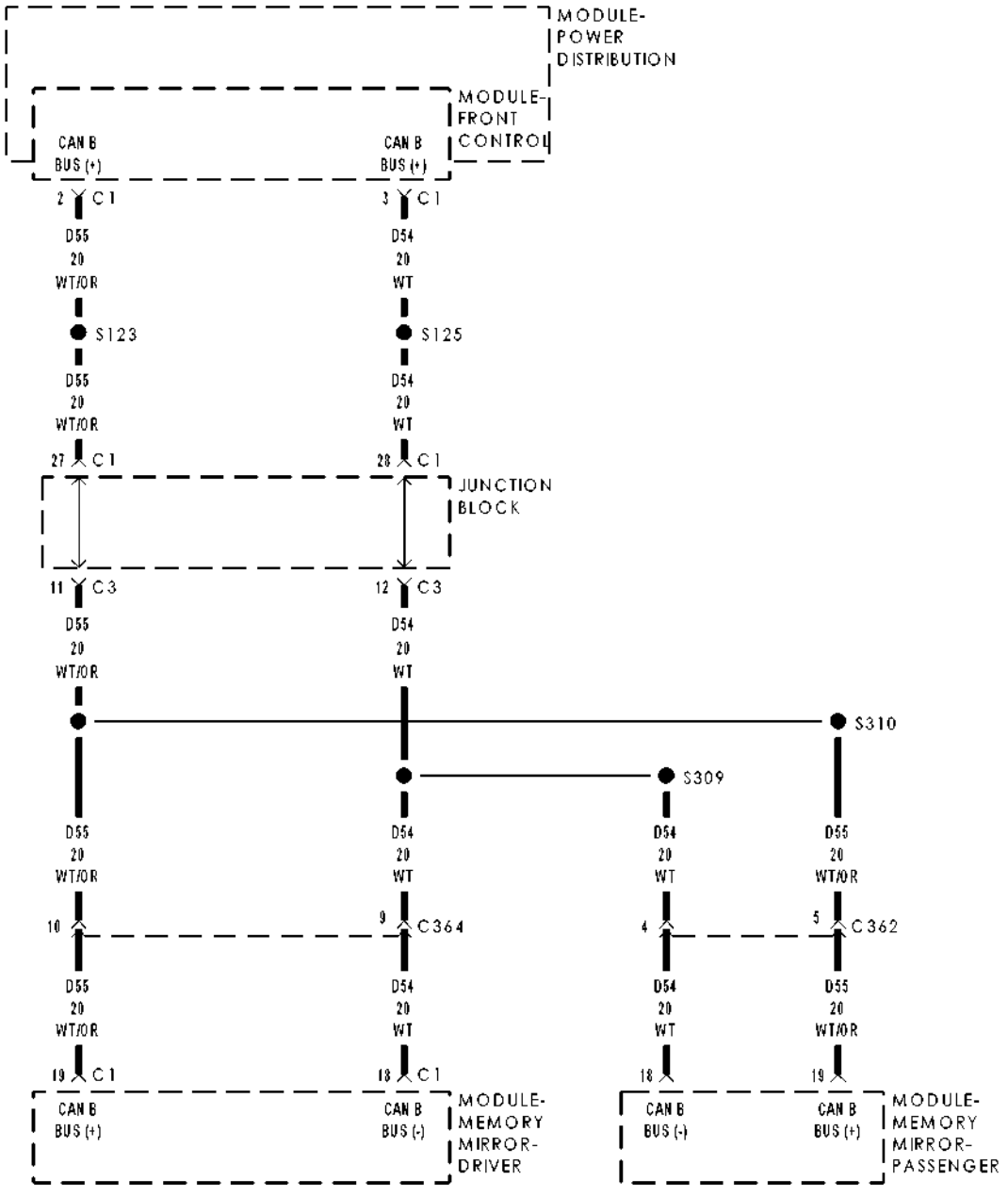


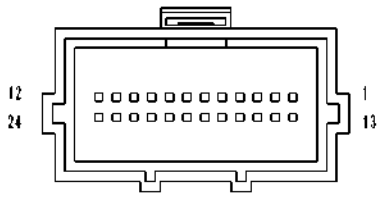
Is the resistance below 2.0 ohms?

Yes >> Replace the Memory Mirror Module.
Perform BODY VERIFICATION TEST - VER 1.

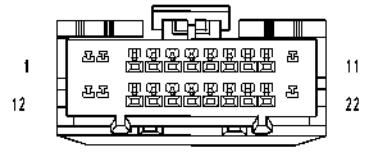
No >> Repair the Can B Bus (+) circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

U1001–CAN B BUS (-) CIRCUIT– MEMORY MIRROR MODULE

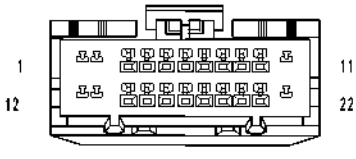




MODULE-FRONT
CONTROL C1



MODULE-MEMORY
MIRROR-
DRIVER C1



MODULE-MEMORY
MIRROR-
PASSENGER

8127778b

U1001–CAN B BUS (-) CIRCUIT– MEMORY MIRROR MODULE — (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

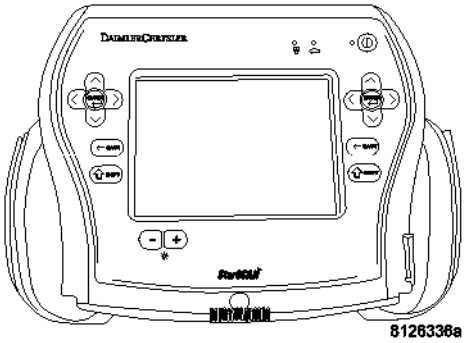
- **When Monitored:**
  Continuously
- **Set Condition:**
  Whenever the Can B Bus (-) circuit is open, shorted to voltage or shorted to ground, this code will set.

Possible Causes
CAN B BUS (-) DTC's IN FRONT CONTROL MODULE
(D54) CAN B BUS (-) CIRCUIT OPEN
MEMORY MIRROR MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase DTC's
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read DTC's.



Does the scan tool display U1001 CAN B BUS (-) CIRCUIT?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

---

2. CHECK FRONT CONTROL MODULE DTC's

With the scan tool, read Front Control Module DTC's

Does the scan tool display any CAN B BUS DTC's – ACTIVE?

Yes >> Refer to the symptom list for problems related to Communication in the ELECTRICACL – ELECTRONIC CONTROL MODULES – ELECTRICAL DIAGNOSES section.

No >> Go to 3

U1001–CAN B BUS (-) CIRCUIT– MEMORY MIRROR MODULE — (CONTINUED)

3. CAN B BUS (-) CIRCUIT OPEN

Turn the ignition off.

Disconnect the Front Control Module C1 connector.

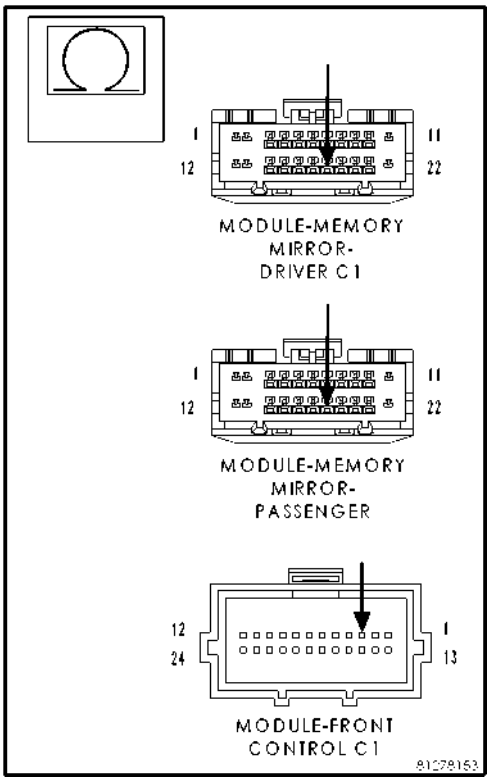
Disconnect the appropriate Memory Mirror Module C1 connector.

Measure the resistance of the (D54) Can B Bus (-) circuit between the Front Control Module connector and the Memory Mirror Module connector.

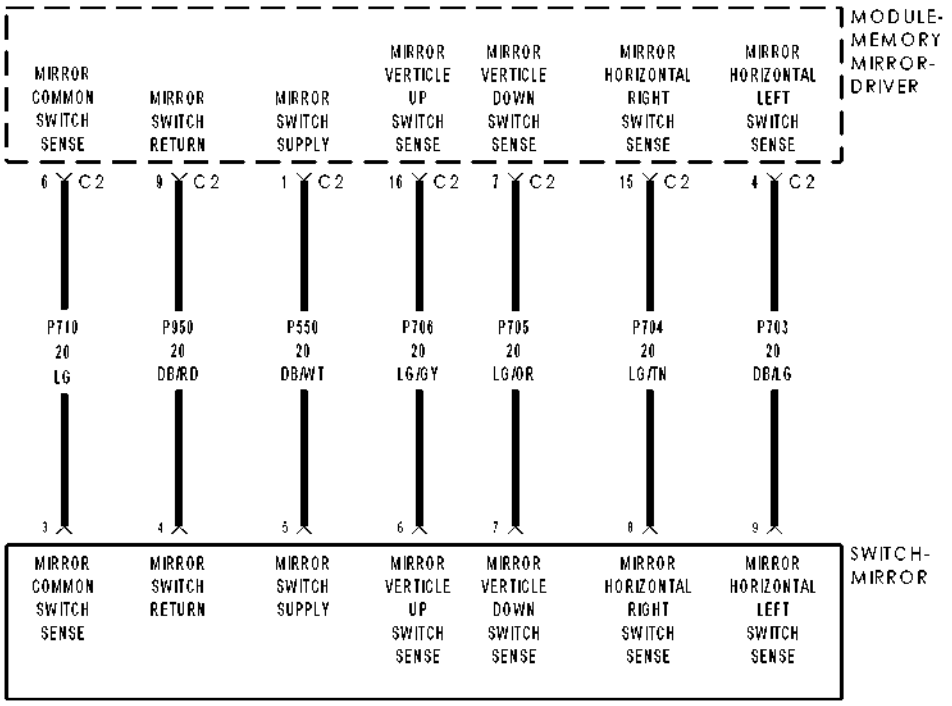
Is the the resistance below 2.0 ohms?

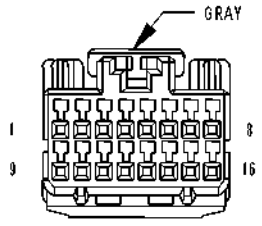
Yes >> Replace the Memory Mirror Module.
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the Can B Bus (-) circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

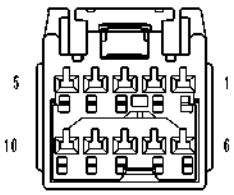


B1D04–MIRROR ADJUST SWITCH INPUT CIRCUIT/PERFORMANCE – MEMORY MIRROR MODULE





MODULE-MEMORY MIRROR-DRIVER C2



SWITCH-MIRROR

81279205

B1D04–MIRROR ADJUST SWITCH INPUT CIRCUIT/PERFORMANCE – MEMORY MIRROR MODULE — (CONTINUED)

For the Power Memory Mirror System circuit diagram(Refer to 8 - ELECTRICAL/POWER MIRRORS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Memory Mirror Module receives a mirror movement comand from the switch but then senses an open or shorted circuit on one of the switch sense circuits for over 100 ms., this code will set.

Possible Causes
(P703) MIRROR HORIZONTAL LEFT SWITCH SENSE OPEN
(P703) MIRROR HORIZONTAL LEFT SWITCH SENSE SHORT TO GROUND
(P703) MIRROR HORIZONTAL LEFT SWITCH SENSE CIRCUIT SHORTED TO ANOTHER SWITCH SENSE CIRCUIT
(P704) MIRROR HORIZONTAL RIGHT SWITCH SENSE OPEN
(P704) MIRROR HORIZONTAL RIGHT SWITCH SENSE SHORT TO GROUND
(P704) MIRROR HORIZONTAL RIGHT SWITCH SENSE CIRCUIT SHORTED TO ANOTHER SWITCH SENSE CIRCUIT
(P705) MIRROR VERTICAL DOWN SWITCH SENSE OPEN
(P705) MIRROR VERTICAL DOWN SWITCH SENSE SHORT TO GROUND
(P705) MIRROR VERTICAL DOWN SWITCH SENSE CIRCUIT SHORTED TO ANOTHER SWITCH SENSE CIRCUIT
(P706) MIRROR VERTICAL UP SWITCH SENSE OPEN
(P706) MIRROR VERTICAL UP SWITCH SENSE SHORT TO GROUND
(P706) MIRROR VERTICAL UP SWITCH SENSE CIRCUIT SHORTED TO ANOTHER SWITCH SENSE CIRCUIT
(P710) MIRROR COMMON SWITCH SENSE OPEN
(P710) MIRROR COMMON SWITCH SENSE SHORT TO GROUND
(P710) MIRROR COMMON SWITCH SENSE CIRCUIT SHORTED TO ANOTHER SWITCH SENSE CIRCUIT
MIRROR SWITCH
DRIVER MEMORY MIRROR MODULE

Theory of Operation

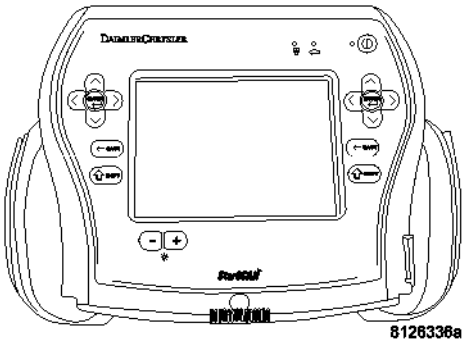
This code will only set in vehicles that have the Memory System. The supply circuit for the Memory Mirrors are supplied by the Driver Memory Mirror Module.

B1D04–MIRROR ADJUST SWITCH INPUT CIRCUIT/PERFORMANCE – MEMORY MIRROR MODULE — (CONTINUED)

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase DTC's
Press the Mirror Switch in all directions several times.
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read DTC's.



Does the scan tool display B1D04–MIRROR ADJUST SWITCH INPUT CIRCUIT/PERFORMANCE?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. If the conditions returns, replace the switch.
Perform BODY VERIFICATION TEST - VER 1.

---

2. TEST THE SWITCH

Turn the ignition off.
Remove the Driver Window/Door Lock Switch assembly.
Test the Mirror Switch in all positions by using the procedure in SERVICE INFORMATION / POWER LOCKS / WINDOW/LOCK SWITCH / DIAGNOSING & TESTING / WINDOW/LOCK SWITCH.

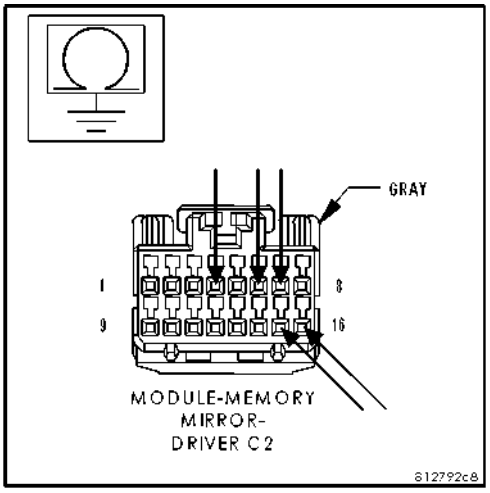
Does the switch pass the test in all positions

No >> Replace the Mirror Switch..
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Go to 3

B1D04–MIRROR ADJUST SWITCH INPUT CIRCUIT/PERFORMANCE – MEMORY MIRROR MODULE — (CONTINUED)

3. TEST FOR SWITCH SENSE WIRE SHORT TO GROUND



Disconnect the Driver Memory Mirror Module C2 connector.

Measure the resistance between Ground and the (P703) Mirror Horizontal Left Switch Sense circuit in the Driver Memory Mirror Module connector.

Measure the resistance between Ground and the (P704) Mirror Horizontal Right Switch Sense circuit in the Driver Memory Mirror Module connector.

Measure the resistance between Ground and the (P705) Mirror Vertical Down Switch Sense circuit in the Driver Memory Mirror Module connector.

Measure the resistance between Ground and the (P706) Mirror Vertical Up Switch Sense circuit in the Driver Memory Mirror Module connector.

Measure the resistance between Ground and the (P710) Mirror Common Switch Sense circuit in the Driver Memory Mirror Module connector.

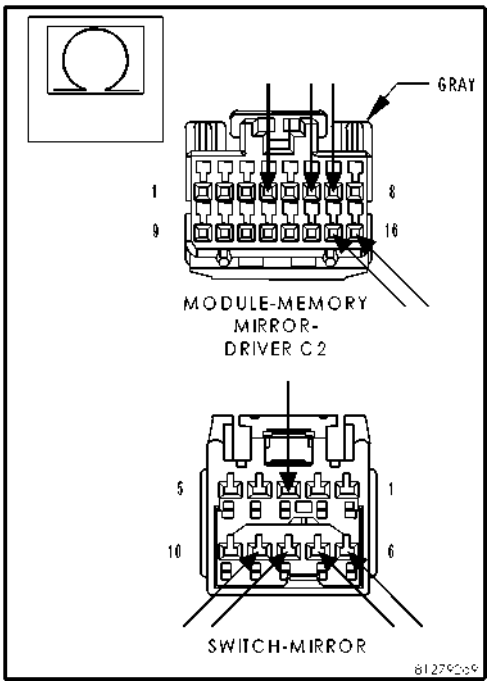
Is the resistance below 5000.0 ohms in any of the circuits?

Yes >> Repair the Appropriate Switch Sense circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go to 4

---

4. TEST FOR SWITCH SENSE CIRCUIT OPEN



Disconnect the Mirror Switch connector.

Measure the resistance of the (P703) Mirror Horizontal Left Switch Sense circuit between the Driver Memory Mirror Module connector and the Mirror Switch connector.

Measure the resistance of the (P704) Mirror Horizontal Right Switch Sense circuit between the Driver Memory Mirror Module connector and the Mirror Switch connector.

Measure the resistance of the (P705) Mirror Vertical Down Switch Sense circuit between the Driver Memory Mirror Module connector and the Mirror Switch connector.

Measure the resistance of the (P706) Mirror Vertical Up Switch Sense circuit between the Driver Memory Mirror Module connector and the Mirror Switch connector.

Measure the resistance of the (P710) Mirror Common Switch Sense circuit between the Driver Memory Mirror Module connector and the Mirror Switch connector.

Is the resistance below 2.0 ohms in all of the Switch Sense circuits?

No >> Repair the Appropriate Switch Sense circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Go to 5

B1D04–MIRROR ADJUST SWITCH INPUT CIRCUIT/PERFORMANCE – MEMORY MIRROR MODULE — (CONTINUED)

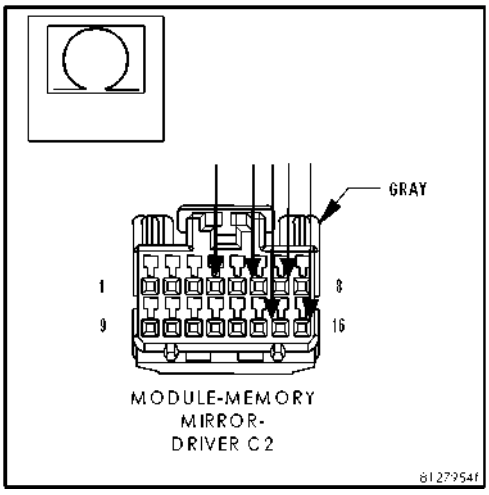
5. TEST FOR A SWITCH SENSE CIRCUIT SHORTED TO ANOTHER SWITCH SENSE CIRCUIT

Measure the resistance between each of the switch sense circuits to each of the other switch sense circuits.

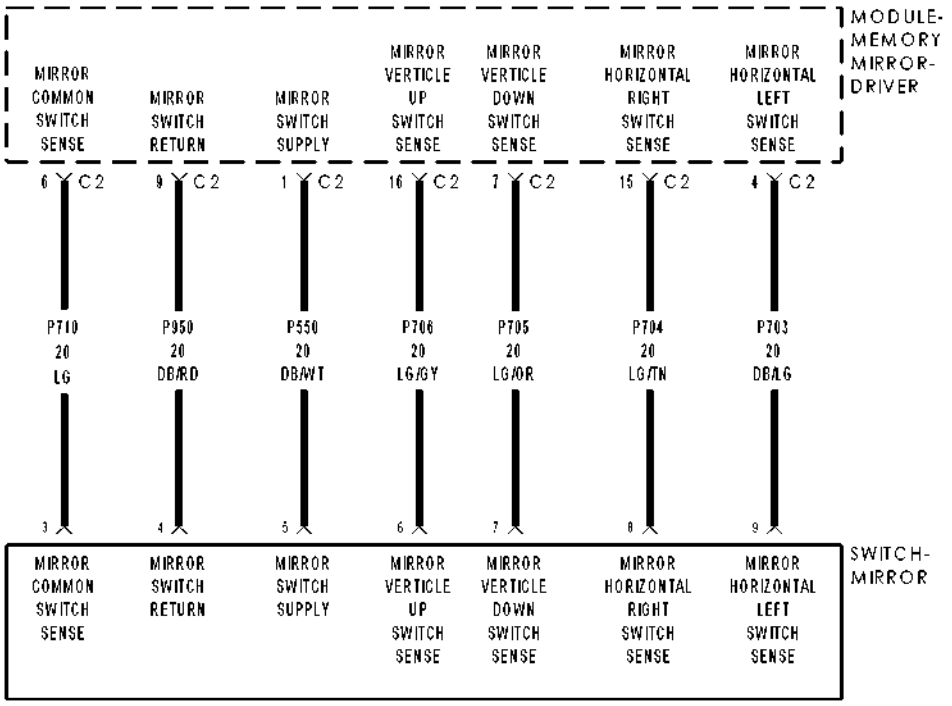
Is the resistance below 10000.0 ohms between any of the switch sense circuits?

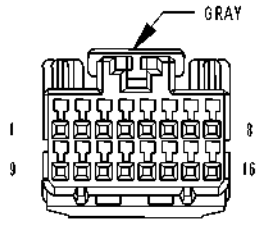
Yes >> Repair the appropriate switch sense circuit for a short to the other switch sense circuits.
Perform the BODY VERIFICATION TEST - VER 1.

No >> Replace the Driver Memory Mirror Module.
Perform BODY VERIFICATION TEST - VER 1.

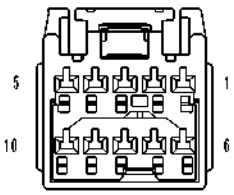


B1D07–MIRROR ADJUST SWITCH INPUT CIRCUIT STUCK– MEMORY MIRROR MODULE





MODULE-MEMORY MIRROR-DRIVER C2



SWITCH-MIRROR

81279205

B1D07–MIRROR ADJUST SWITCH INPUT CIRCUIT STUCK– MEMORY MIRROR MODULE — (CONTINUED)

For the Power Memory Mirror System circuit diagram(Refer to 8 - ELECTRICAL/POWER MIRRORS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

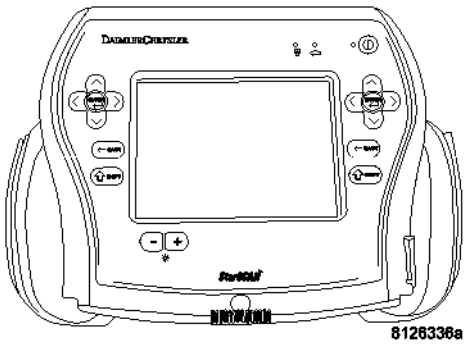
- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Memory Mirror Module receives a mirror movement comand from the switch for over 30 seconds., this code will set.

Possible Causes
MIRROR SWITCH
DRIVER MEMORY MIRROR MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase DTC's
Press the Mirror Switch in all directions several times.
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read DTC's.



Does the scan tool display B1D04–MIRROR ADJUST SWITCH INPUT CIRCUIT STUCK?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. If the conditions returns, replace the switch.
Perform BODY VERIFICATION TEST - VER 1.

---

2. TEST THE SWITCH

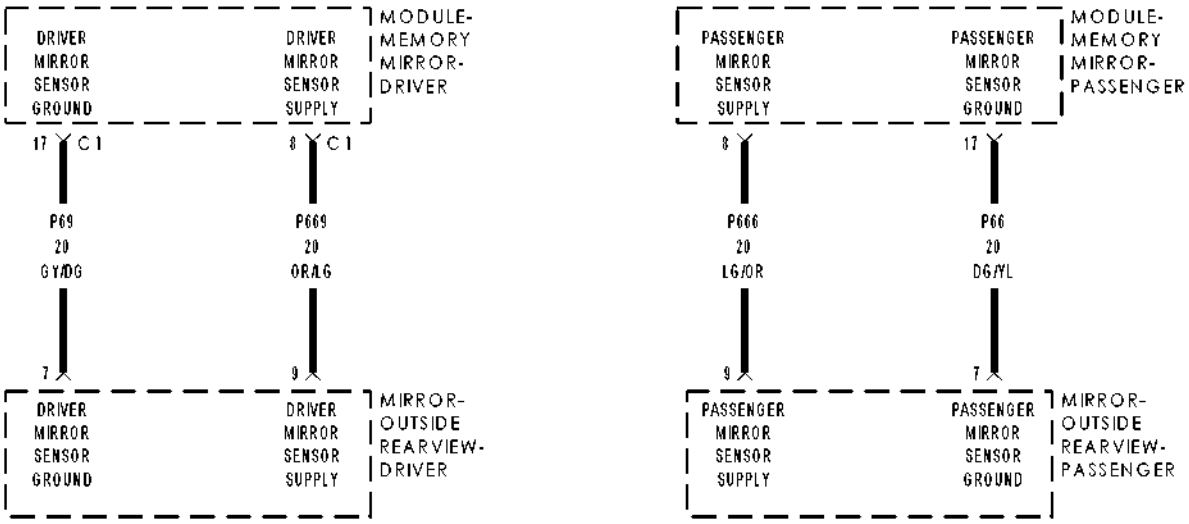
Turn the ignition off.
Remove the Driver Window/Door Lock Switch assembly.
Remove the Mirror Switch.
Test the Mirror Switch in all positions by using the procedure in SERVICE INFORMATION / POWER LOCKS / WINDOW/LOCK SWITCH / DIAGNOSING & TESTING / WINDOW/LOCK SWITCH.

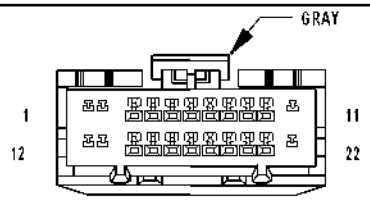
Does the switch pass the test in all positions

No >> Replace the Mirror Switch..
Perform BODY VERIFICATION TEST - VER 1.

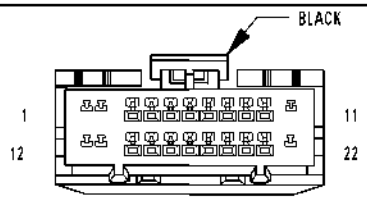
Yes >> Replace the Driver Memory Mirror Module.
Perform BODY VERIFICATION TEST - VER 1

B1D09,B1D12–MIRROR POSITION SENSOR POWER SUPPLY CIRCUIT LOW – MEMORY MIRROR MODULE

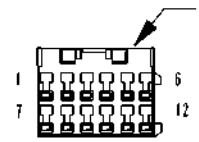




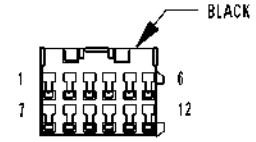
MODULE-MEMORY MIRROR-DRIVER C1



MODULE-MEMORY MIRROR-PASSENGER



MIRROR-OUTSIDE REARVIEW-DRIVER



MIRROR-OUTSIDE REARVIEW-PASSENGER

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B1D09,B1D12–MIRROR POSITION SENSOR POWER SUPPLY CIRCUIT LOW – MEMORY MIRROR MODULE — (CONTINUED)

For the Power Memory Mirror System circuit diagram(Refer to 8 - ELECTRICAL/POWER MIRRORS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

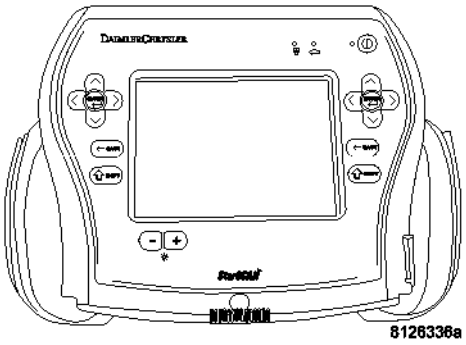
- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Memory Mirror Module senses voltage below 4.3 volts on the Mirror Sensor Supply circuit for over 30ms., this code will set.**Note: This test covers both the Driver and Passenger code depending on the side the code appeared in.**

Possible Causes
(P669) OR (P666) MIRROR SENSOR SUPPLY CIRCUIT SHORT TO GROUND
(P669) OR (P666) MIRROR SENSOR SUPPLY CIRCUIT SHORTED TO (P69) OR (P66) MIRROR SENSOR GROUND CIRCUIT.
MIRROR SHORTED
DRIVER MEMORY MIRROR MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase DTC's
Operate the Mirror Switch in all directions several times.
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read DTC's.



Does the scan tool display B1D09 or B1d12–MIRROR POSITION SENSOR POWER SUPPLY CIRCUIT LOW?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST - VER 1.

B1D09,B1D12–MIRROR POSITION SENSOR POWER SUPPLY CIRCUIT LOW – MEMORY MIRROR MODULE — (CONTINUED)

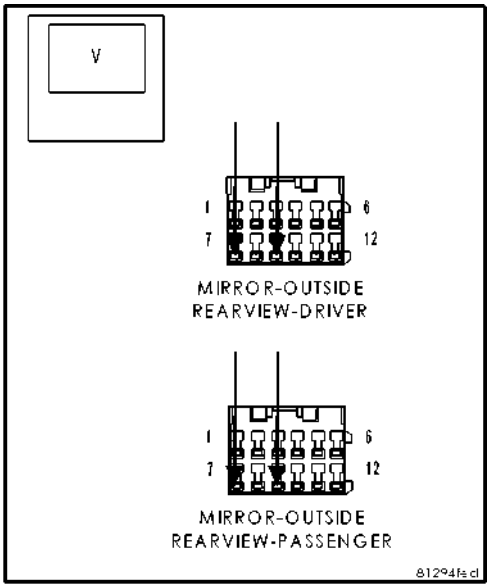
2. TEST FOR A SHORTED MIRROR

Turn the ignition off.

Disconnect the appropriate mirror connector.

Turn the ignition on.

Measure the voltage between the (P669) or (P666) Mirror Sensor Supply circuit and the ((P69) or (P66) Mirror Sensor Ground circuit.



Is the voltage above 4.6 volts?

Yes >> Replace the Mirror.
Perform BODY VERIFICATION TEST - VER 1.

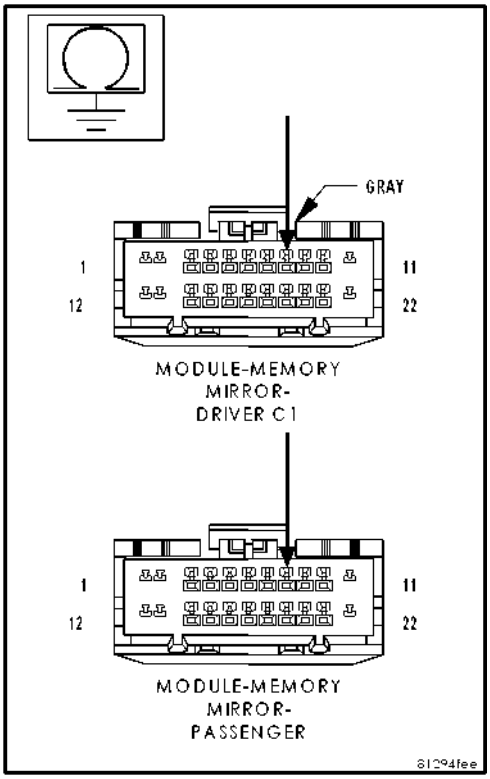
No >> Go to 3

3. TEST THE (P669) OR (P666) MIRROR SENSOR SUPPLY WIRE

Turn the ignition off.

Disconnect the appropriate Memory Mirror Module connector.

Measure the resistance between ground and the (P669) or (P666) Mirror Sensor Supply circuit.



Is the resistance below 5000.0 ohms?

Yes >> Repair the (P669) or (P666) Mirror Sensor Supply circuit for a short to ground..
Perform BODY VERIFICATION TEST - VER 1.

No >> Go to 4

B1D09,B1D12–MIRROR POSITION SENSOR POWER SUPPLY CIRCUIT LOW – MEMORY MIRROR MODULE — (CONTINUED)

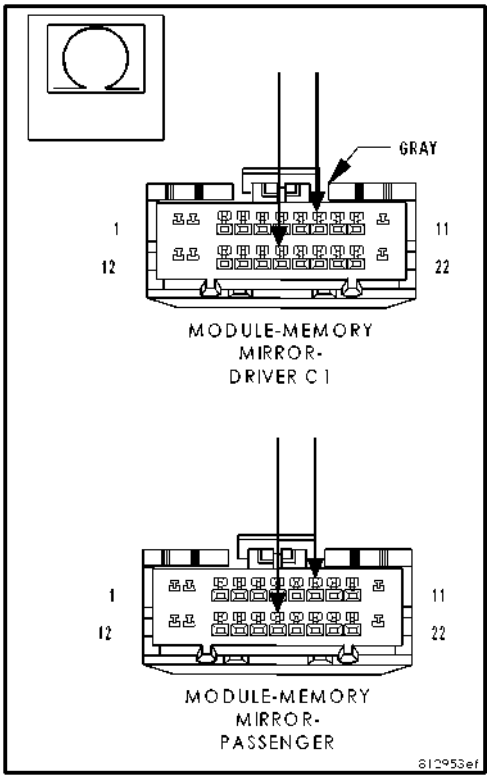
4. TEST THE (P669) OR (P666) MIRROR SENSOR SUPPLY WIRE SHORTED TO THE (P69) OR (P66) MIRROR SENSEOR GROUND CIRCUIT.

Measure the resistance between the (P669) or (P666) Mirror Sensor Supply circuit and the (P69) or (P66) Mirror Sensor Ground circuit.

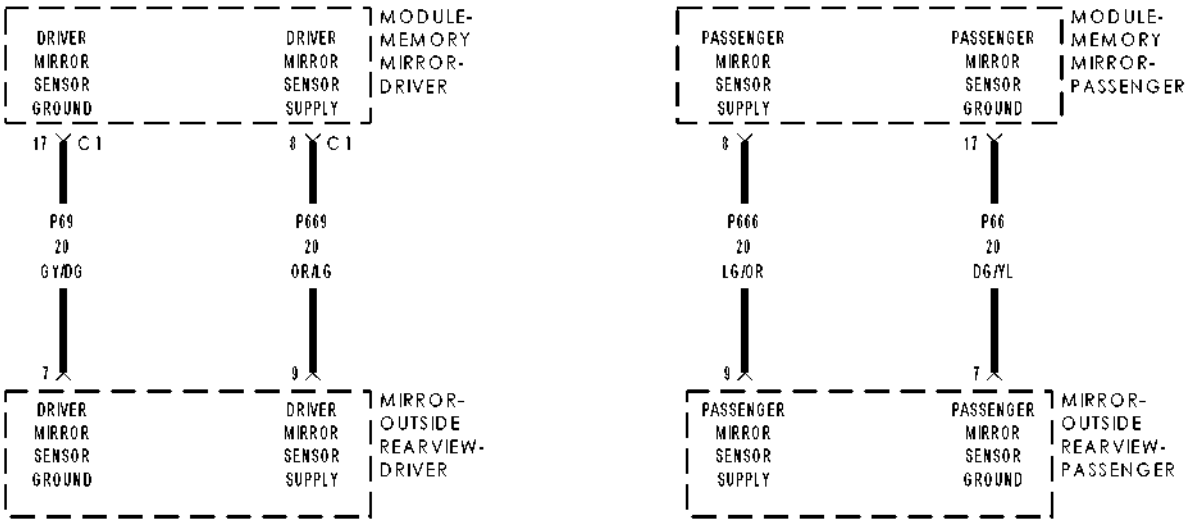
Is the resistance below 5000.0 ohms?

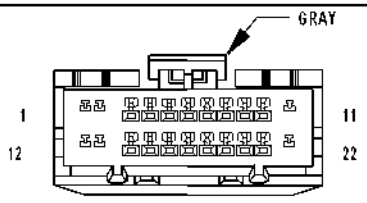
Yes >> Repair the (P669) or (P666) Mirror Sensor Supply circuit for a short to the (P69) or (P66) Sensor Ground Circuit..
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the appropriate Memory Mirror Module.
Perform BODY VERIFICATION TEST - VER 1.

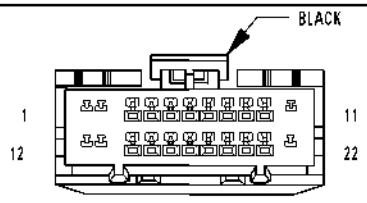


B1D0A,B1D13–MIRROR POSITION SENSOR POWER SUPPLY CIRCUIT HIGH – MEMORY MIRROR MODULE

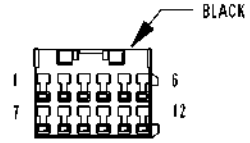




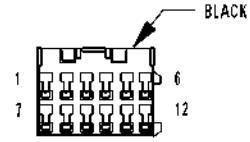
MODULE-MEMORY MIRROR-DRIVER C1



MODULE-MEMORY MIRROR-PASSENGER



MIRROR-OUTSIDE REARVIEW-DRIVER



MIRROR-OUTSIDE REARVIEW-PASSENGER

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B1D0A,B1D13–MIRROR POSITION SENSOR POWER SUPPLY CIRCUIT HIGH – MEMORY MIRROR MODULE — (CONTINUED)

For the Power Memory Mirror System circuit diagram(Refer to 8 - ELECTRICAL/POWER MIRRORS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

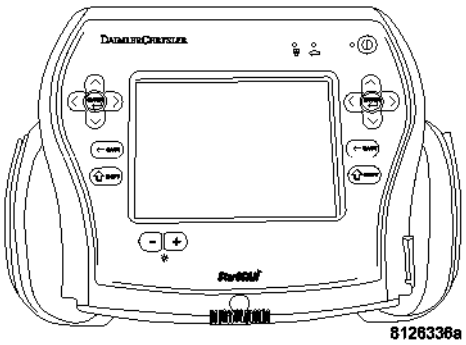
- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Memory Mirror Module senses voltage above 5.5 volts on the Mirror Sensor Supply circuit for over 30ms., this code will set.**Note: This test covers both the Driver and Passenger code depending on the side the code appeared in.**

Possible Causes
(P669) OR (P666) MIRROR SENSOR SUPPLY CIRCUIT OPEN
(P669) OR (P666) MIRROR SENSOR SUPPLY CIRCUIT SHORT TO VOLTAGE
(P69) R (P66) MIRROR SENSOR GROUND CIRCUIT OPEN
MIRROR OPEN
DRIVER MEMORY MIRROR MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase DTC's
Operate the Mirror Switch in all directions several times.
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read DTC's.



Does the scan tool display B1D0A or B1d13–MIRROR POSITION SENSOR POWER SUPPLY CIRCUIT HIGH?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST - VER 1.

B1D0A,B1D13–MIRROR POSITION SENSOR POWER SUPPLY CIRCUIT HIGH – MEMORY MIRROR MODULE — (CONTINUED)

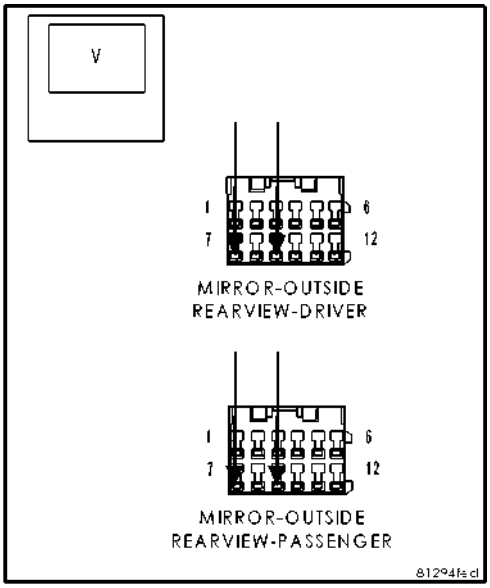
2. TEST FOR A SHORTED MIRROR

Turn the ignition off.

Disconnect the appropriate mirror connector.

Turn the ignition on.

Measure the voltage between the (P669) or (P666) Mirror Sensor Supply circuit and the ((P69) or (P66) Mirror Sensor Ground circuit.



Is the voltage between 4.8 and 5.2 volts?

Yes >> Replace the Mirror.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go to 3

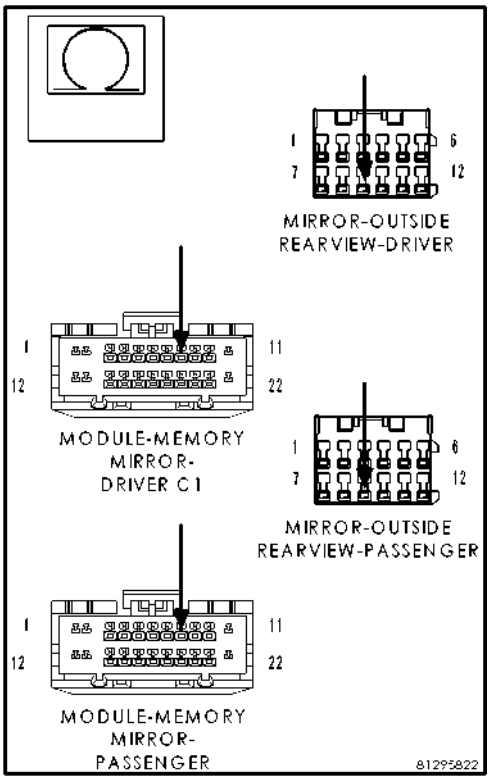
---

3. TEST THE (P669) OR (P666) MIRROR SENSOR SUPPLY WIRE FOR AN OPEN

Turn the ignition off.

Disconnect the appropriate Memory Mirror Module connector.

Measure the resistance between of the (P669) or (P666) Mirror Sensor Supply circuit between the Module connector and the Mirror connector..



Is the resistance below 2.0 ohms?

No >> Repair the (P669) or (P666) Mirror Sensor Supply circuit for an open..
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Go to 4

B1D0A,B1D13–MIRROR POSITION SENSOR POWER SUPPLY CIRCUIT HIGH – MEMORY MIRROR MODULE — (CONTINUED)

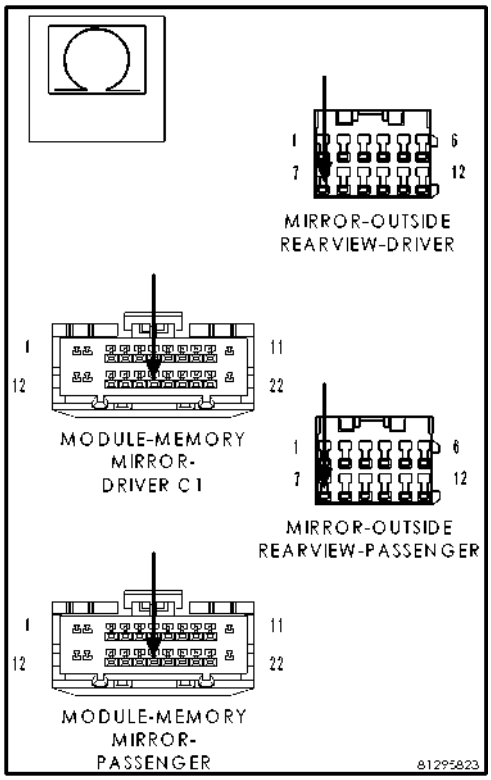
4. TEST THE (P69) OR (P66) MIRROR SENSOR GROUND WIRE FOR AN OPEN

Measure the resistance of the ((P69) or (P66) Mirror Sensor Ground circuit between the Module connector and the Mirror connector.

Is the resistance below 2.0 ohms?

No >> Repair the (P69) or (P66) Mirror Sensor Ground circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Go to 5
Perform BODY VERIFICATION TEST - VER 1.



B1D0A,B1D13–MIRROR POSITION SENSOR POWER SUPPLY CIRCUIT HIGH – MEMORY MIRROR MODULE — (CONTINUED)

5. TEST THE (P669) OR (P666) MIRROR SENSOR SUPPLY WIRE SHORTED TO VOLTAGE

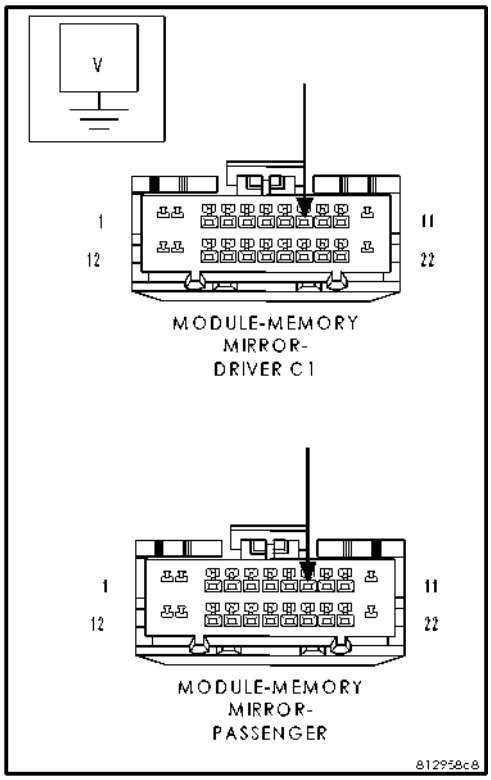
Turn the ignition on.

Measure the voltage between ground and the (P669) or (P666) Mirror Sensor Supply circuit.

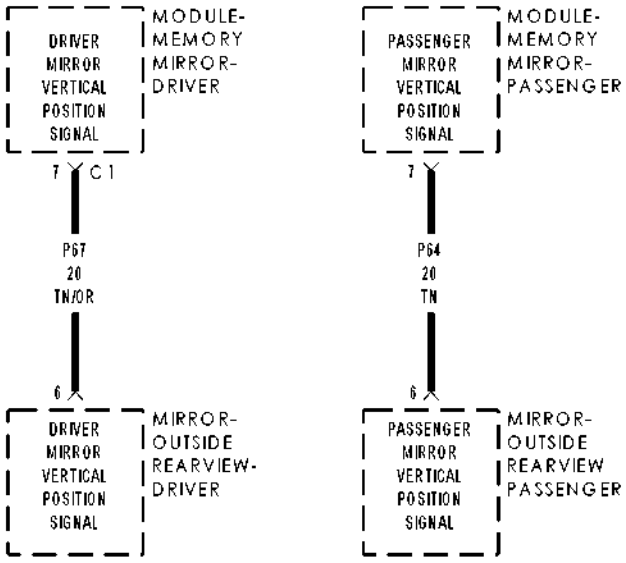
Is there any voltage present?

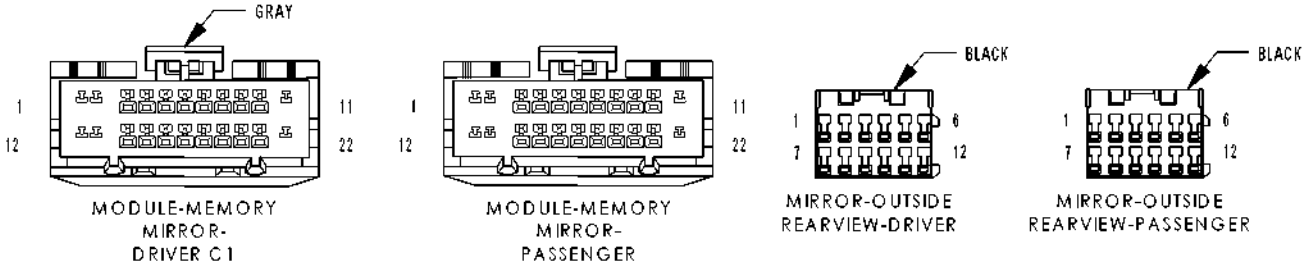
Yes >> Repair the (P669) or (P666) Mirror Sensor Supply circuit for a short to voltage.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the appropriate Memory Mirror Module.
Perform BODY VERIFICATION TEST - VER 1.



B1D0C,B1D15–MIRROR VERTICAL POSITION SENSOR INPUT CIRCUIT LOW – MEMORY MIRROR MODULE





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B1D0C,B1D15–MIRROR VERTICAL POSITION SENSOR INPUT CIRCUIT LOW – MEMORY MIRROR MODULE — (CONTINUED)

For the Power Memory Mirror System circuit diagram(Refer to 8 - ELECTRICAL/POWER MIRRORS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

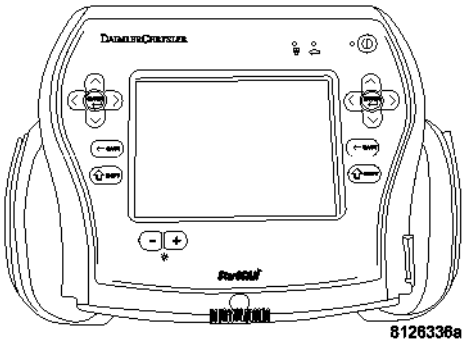
- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Memory Mirror Module senses a value below the parameter of the mirror sensor on the Mirror Vertical Position Signal circuit for over 60ms., this code will set.**Note: This test covers both the Driver and Passenger code depending on the side the code appeared in.**

Possible Causes
(P67) OR (P64) MIRROR VERTICAL POSITION SIGNAL CIRCUIT SHORT TO GROUND
(P67) OR (P64) MIRROR VERTICAL POSITION SIGNAL CIRCUIT SHORTED TO (P69) OR (P66) MIRROR SENSOR GROUND CIRCUIT.
MIRROR SHORTED
DRIVER MEMORY MIRROR MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase DTC's
Operate the Mirror Switch in all directions several times.
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read DTC's.



Does the scan tool display B1D0C or B1D15–MIRROR VERTICAL POSITION SENSOR INPUT CIRCUIT LOW?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST - VER 1.

B1D0C,B1D15–MIRROR VERTICAL POSITION SENSOR INPUT CIRCUIT LOW – MEMORY MIRROR MODULE — (CONTINUED)

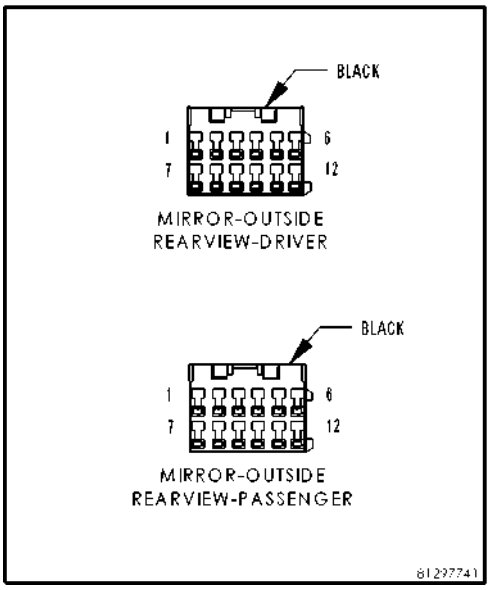
2. TEST FOR A SHORTED MIRROR

Disconnect the appropriate mirror connector.
With the scan tool, erase DTC's.
Operate the Mirror Switch in all directions several times.
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read DTC's.

Does the scan tool display B1D0C or B1D15–MIRROR VERTICAL POSITION SENSOR INPUT CIRCUIT LOW?

No >> Replace the Mirror.
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Go to 3



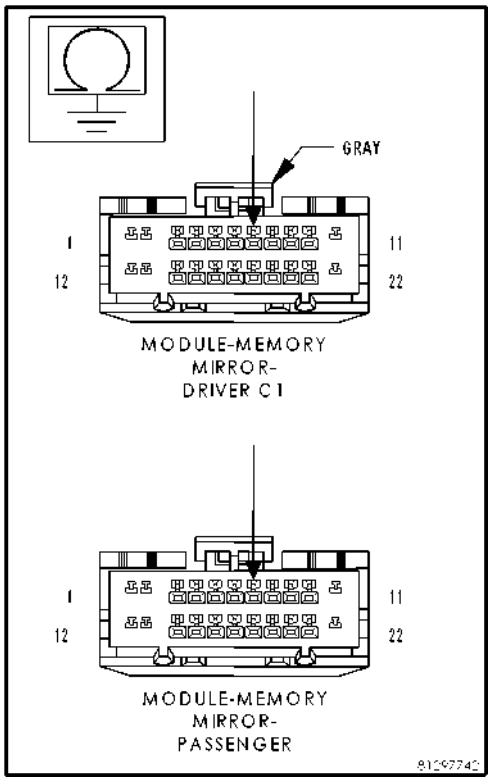
3. TEST THE (P67) OR (P64) MIRROR VERTICAL POSITION SIGNAL WIRE FOR A SHORT TO GROUND

Turn the ignition off.
Disconnect the appropriate Memory Mirror Module connector.
Measure the resistance between ground and the (P67) or (P64) Mirror Vertical Position Signal circuit.

Is the resistance below 5000.0 ohms?

Yes >> Repair the (P67) or (P64) Mirror Vertical Position Signal circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go to 4



B1D0C,B1D15–MIRROR VERTICAL POSITION SENSOR INPUT CIRCUIT LOW – MEMORY MIRROR MODULE — (CONTINUED)

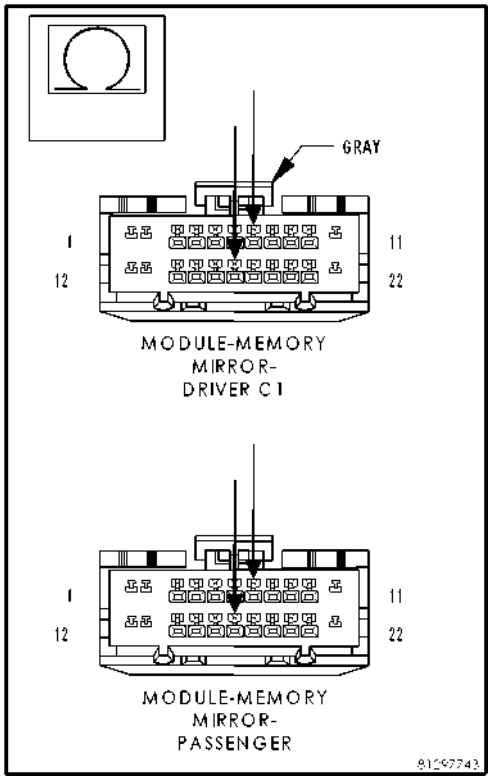
4. TEST THE (P67) OR (P64) MIRROR VERTICAL POSITION SIGNAL CIRCUIT SHORTED TO THE (P69) OR (P66) MIRROR SENSOR GROUND CIRCUIT.

Measure the resistance between the (P67) or (P64) Mirror Vertical Position Signal circuit and the (P69) or (P66) Mirror Sensor Ground circuit.

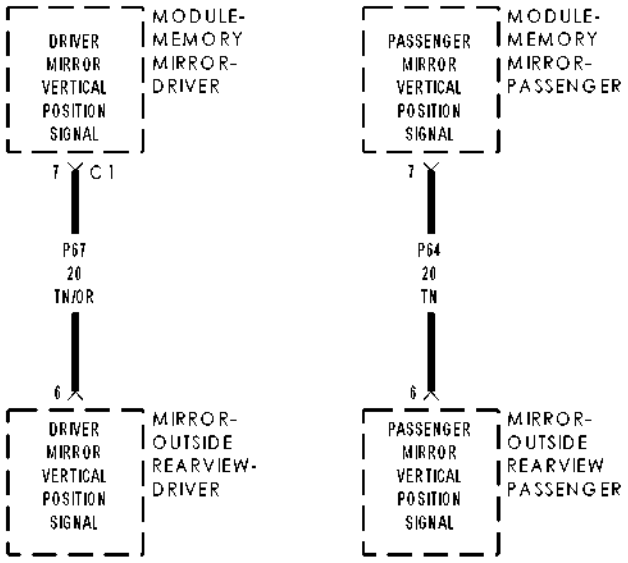
Is the resistance below 5000.0 ohms?

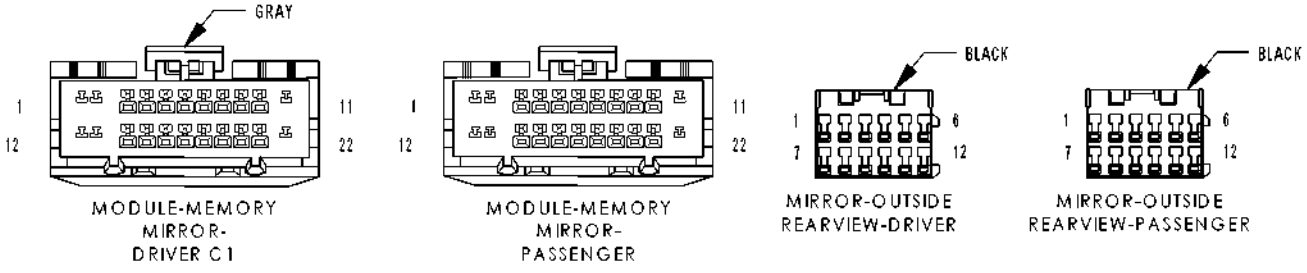
Yes >> Repair the (P67) or (P64) Mirror Vertical Position Signal circuit for a short to the (P69) or (P66) Sensor Ground Circuit..
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the appropriate Memory Mirror Module.
Perform BODY VERIFICATION TEST - VER 1.



B1D0D,B1D16–MIRROR VERTICAL POSITION SENSOR INPUT CIRCUIT HIGH – MEMORY MIRROR MODULE





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B1D0D,B1D16–MIRROR VERTICAL POSITION SENSOR INPUT CIRCUIT HIGH – MEMORY MIRROR MODULE — (CONTINUED)

For the Power Memory Mirror System circuit diagram(Refer to 8 - ELECTRICAL/POWER MIRRORS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

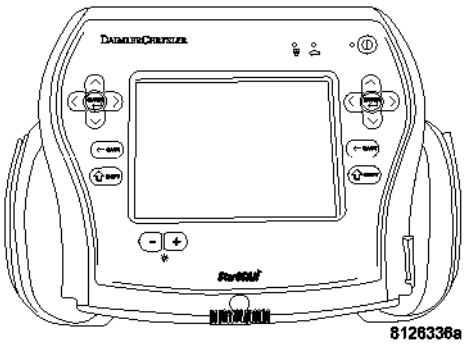
- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Memory Mirror Module senses a value above the parameter of the mirror sensor on the Mirror Vertical Position Signal circuit for over 60ms., this code will set.**Note: This test covers both the Driver and Passenger code depending on the side the code appeared in.**

Possible Causes
(P67) OR (P64) MIRROR VERTICAL POSITION SIGNAL CIRCUIT SHORT TO VOLTAGE
(P67) OR (P64) MIRROR VERTICAL POSITION SIGNAL CIRCUIT OPEN
(P69) OR (P66) MIRROR SENSOR GROUND CIRCUIT OPEN
MIRROR SHORTED
DRIVER MEMORY MIRROR MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase DTC's
Operate the Mirror Switch in all directions several times.
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read DTC's.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Does the scan tool display B1D0C or B1D15–MIRROR VERTICAL POSITION SENSOR INPUT CIRCUIT HIGH?

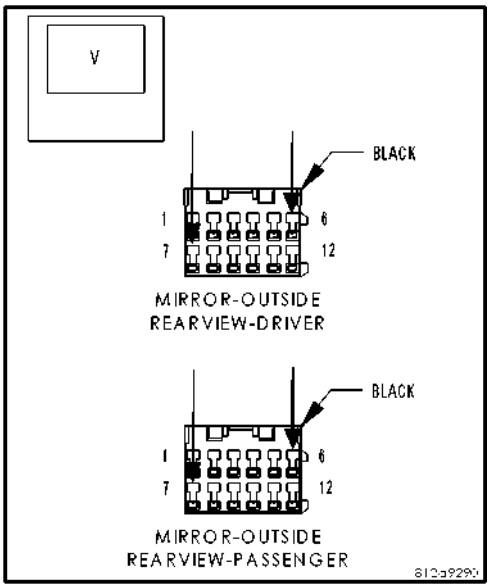
Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST - VER 1.

B1D0D,B1D16–MIRROR VERTICAL POSITION SENSOR INPUT CIRCUIT HIGH – MEMORY MIRROR MODULE — (CONTINUED)

2. TEST FOR A SHORTED MIRROR

Disconnect the appropriate mirror connector.
With the scan tool, erase DTC's.
Operate the Mirror Switch in all directions several times.
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read DTC's.



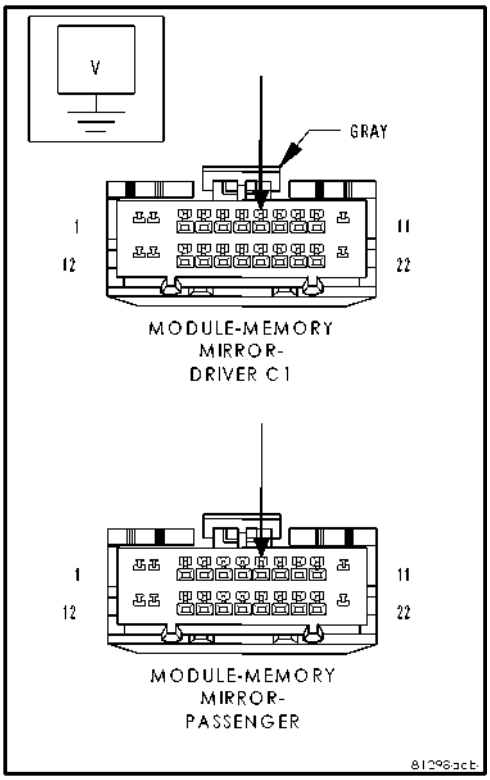
Does the scan tool display B1D0C or B1D15–MIRROR VERTICAL POSITION SENSOR INPUT CIRCUIT HIGH?

No >> Replace the Mirror.
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Go to 3

3. TEST THE (P67) OR (P64) MIRROR VERTICAL POSITION SIGNAL WIRE FOR A SHORT TO VOLTAGE

Turn the ignition off.
Disconnect the appropriate Memory Mirror Module connector.
Measure the voltage between the (P67) or (P64) Mirror Vertical Position Signal circuit and ground.



Is there any voltage present?

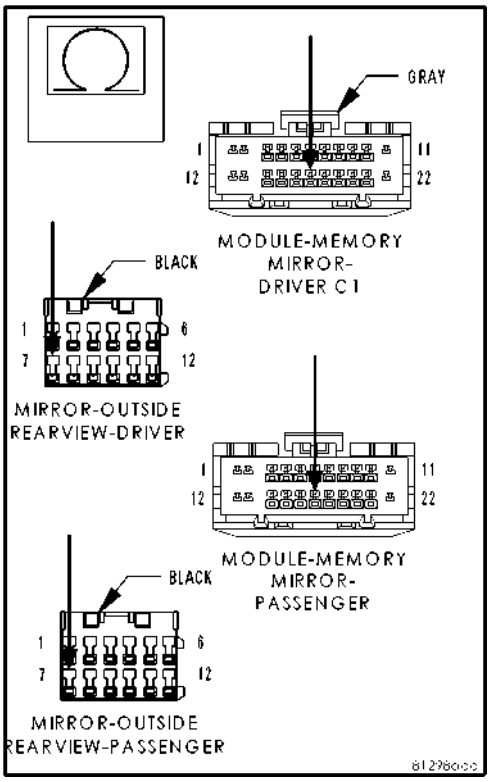
Yes >> Repair the (P67) or (P64) Mirror Vertical Position Signal circuit for a short to voltage.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go to 4

B1D0D,B1D16–MIRROR VERTICAL POSITION SENSOR INPUT CIRCUIT HIGH – MEMORY MIRROR MODULE — (CONTINUED)

4. TEST THE (P69) OR (P66) MIRROR SENSOR GROUND WIRE FOR AN OPEN

Measure the resistance of the (P69) or (P66) Mirror Sensor Ground circuit between the Module connector and the Mirror connector.



Is the resistance below 2.0 ohms?

No >> Repair the (P69) or (P66) Mirror Sensor Ground circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Go to 5

B1D0D,B1D16–MIRROR VERTICAL POSITION SENSOR INPUT CIRCUIT HIGH – MEMORY MIRROR MODULE — (CONTINUED)

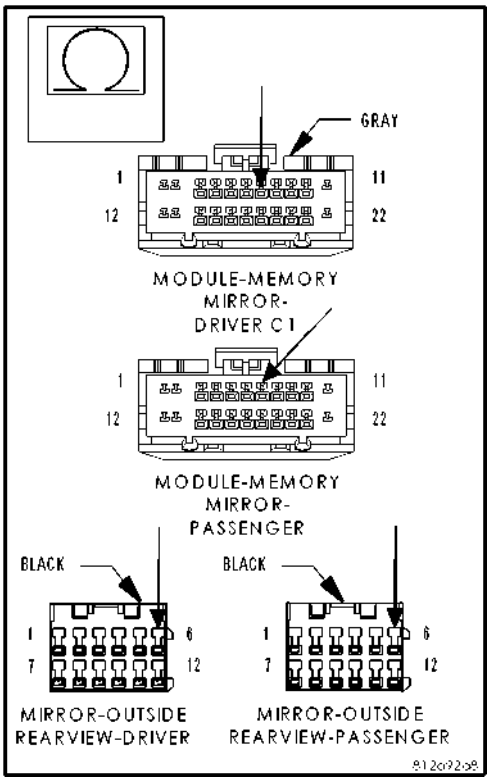
5. TEST THE (P67) OR (P64) MIRROR VERTICAL POSITION SIGNAL WIRE FOR AN OPEN

Measure the resistance of the (P67) or (P65) Mirror Vertical Position Signal circuit between the Module connector and the Mirror connector.

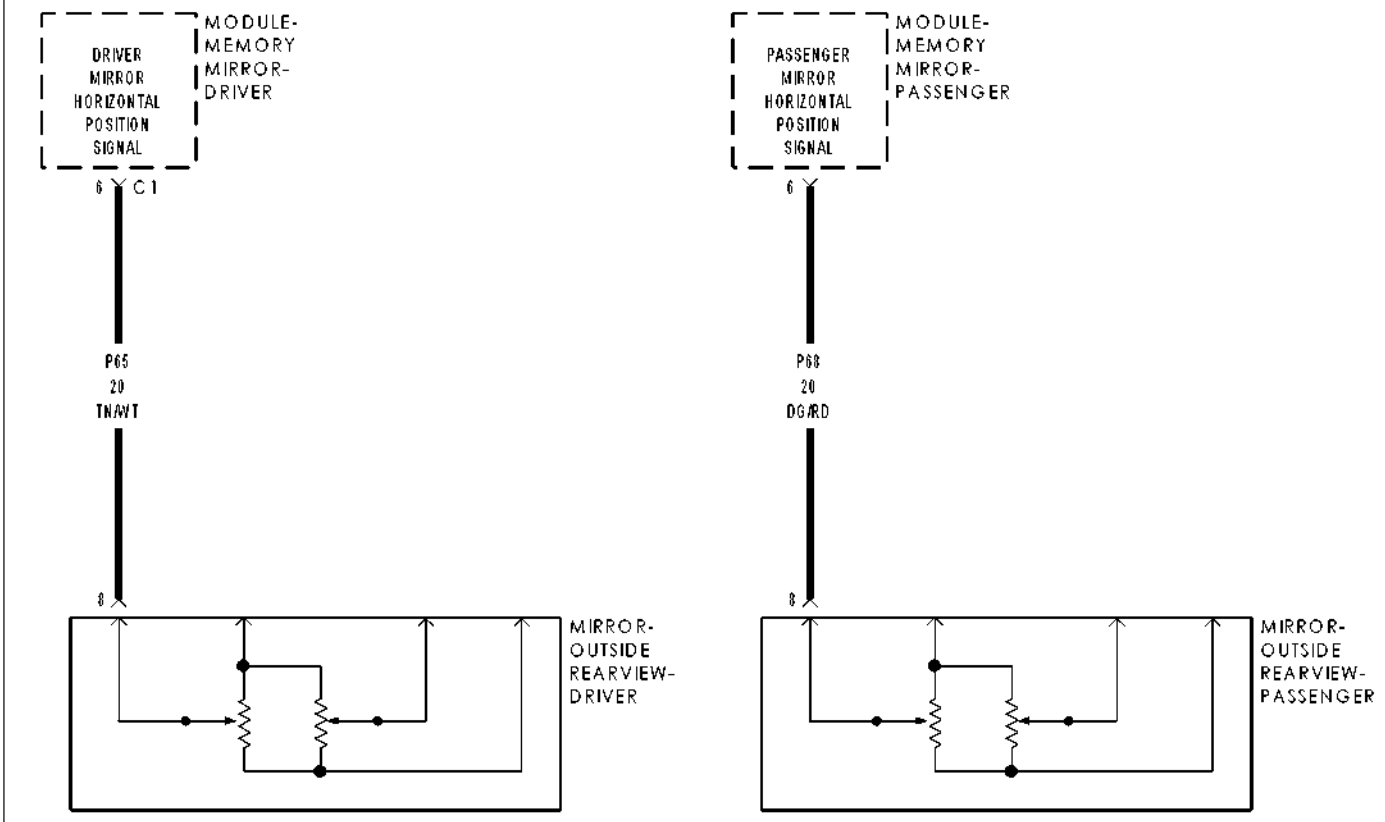
Is the resistance below 2.0 ohms?

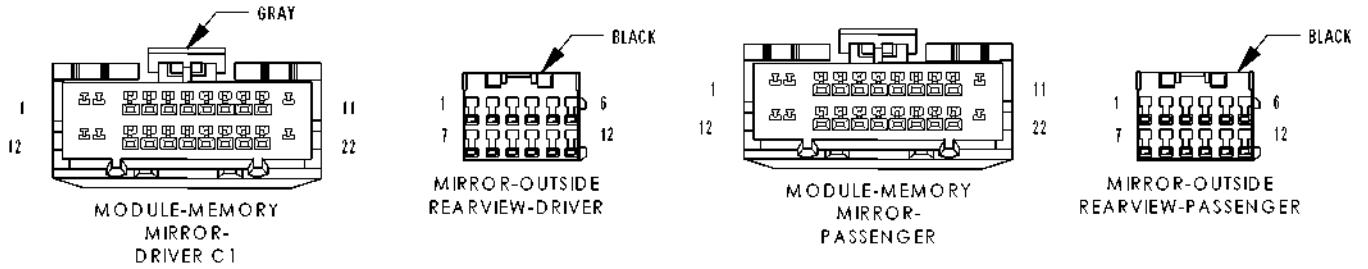
No >> Repair the (P67) or (P64) Mirror Vertical Position Signal circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Replace the appropriate Memory Mirror Module.
Perform BODY VERIFICATION TEST - VER 1.



B1D0F,B1D18–MIRROR HORIZONTAL POSITION SENSOR INPUT CIRCUIT LOW – MEMORY MIRROR MODULE





B1D0F,B1D18–MIRROR HORIZONTAL POSITION SENSOR INPUT CIRCUIT LOW – MEMORY MIRROR MODULE — (CONTINUED)

For the Power Memory Mirror System circuit diagram(Refer to 8 - ELECTRICAL/POWER MIRRORS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

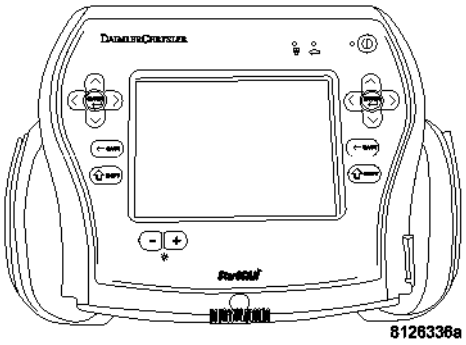
- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Memory Mirror Module senses a value below the parameter of the mirror sensor on the Mirror Horizontal Position Signal circuit for over 60ms., this code will set.**Note: This test covers both the Driver and Passenger code depending on the side the code appeared in.**

Possible Causes
(P65) OR (P68) MIRROR HORIZONTAL POSITION SIGNAL CIRCUIT SHORT TO GROUND
(P65) OR (P68) MIRROR HORIZONTAL POSITION SIGNAL CIRCUIT SHORTED TO (P69) OR (P66) MIRROR SENSOR GROUND CIRCUIT.
MIRROR SHORTED
DRIVER MEMORY MIRROR MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase DTC's
Operate the Mirror Switch in all directions several times.
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read DTC's.



Does the scan tool display B1D0F or B1D18–MIRROR HORIZONTAL POSITION SENSOR INPUT CIRCUIT LOW?

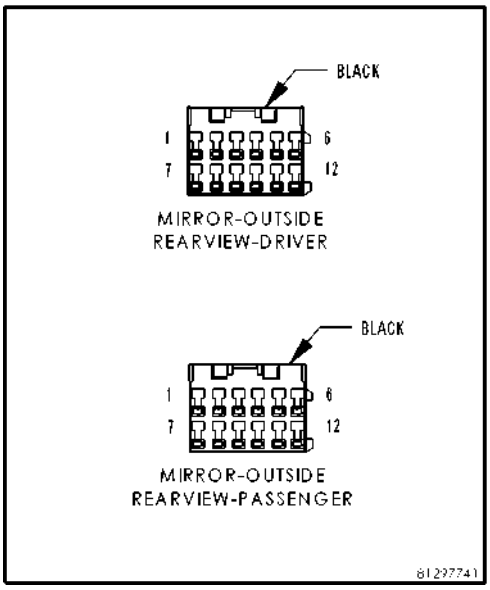
Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST - VER 1.

B1D0F,B1D18–MIRROR HORIZONTAL POSITION SENSOR INPUT CIRCUIT LOW – MEMORY MIRROR MODULE — (CONTINUED)

2. TEST FOR A SHORTED MIRROR

Disconnect the appropriate mirror connector.
With the scan tool, erase DTC's.
Operate the Mirror Switch in all directions several times.
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read DTC's.



Does the scan tool display B1D0F or B1D18–MIRROR HORIZONTAL POSITION SENSOR INPUT CIRCUIT LOW?

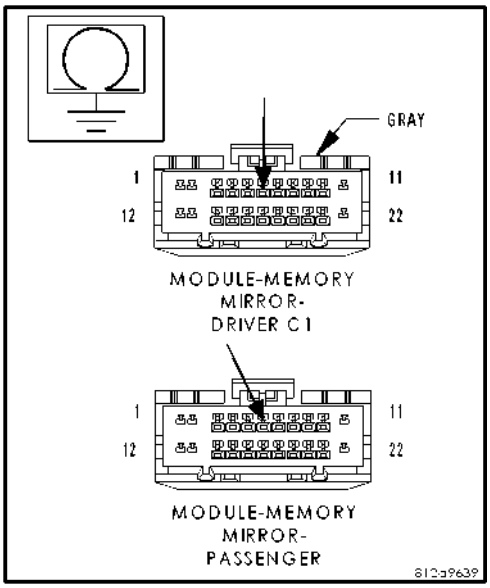
No >> Replace the Mirror.
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Go to 3

---

3. TEST THE (P65) OR (P68) MIRROR HORIZONTAL POSITION SIGNAL WIRE FOR A SHORT TO GROUND

Turn the ignition off.
Disconnect the appropriate Memory Mirror Module connector.
Measure the resistance between ground and the (P65) or (P68) Mirror Horizontal Position Signal circuit.



Is the resistance below 5000.0 ohms?

Yes >> Repair the (P65) or (P68) Mirror Horizontal Position Signal circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go to 4

B1D0F,B1D18–MIRROR HORIZONTAL POSITION SENSOR INPUT CIRCUIT LOW – MEMORY MIRROR MODULE — (CONTINUED)

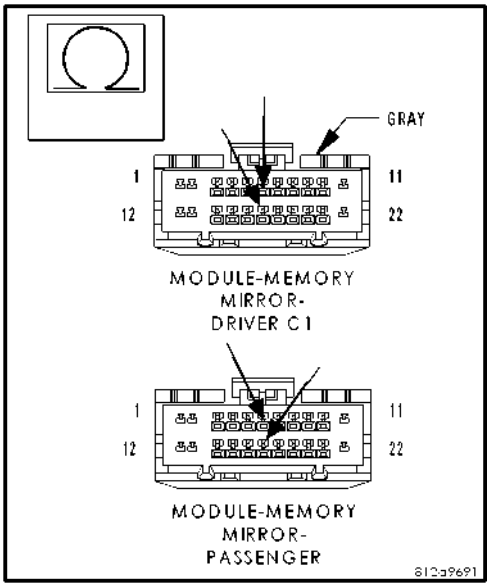
4. TEST THE (P65) OR (P68) MIRROR HORIZONTAL POSITION SIGNAL CIRCUIT SHORTED TO THE (P69) OR (P66) MIRROR SENSOR GROUND CIRCUIT.

Measure the resistance between the (P65) or (P68) Mirror Horizontal Position Signal circuit and the (P69) or (P66) Mirror Sensor Ground circuit.

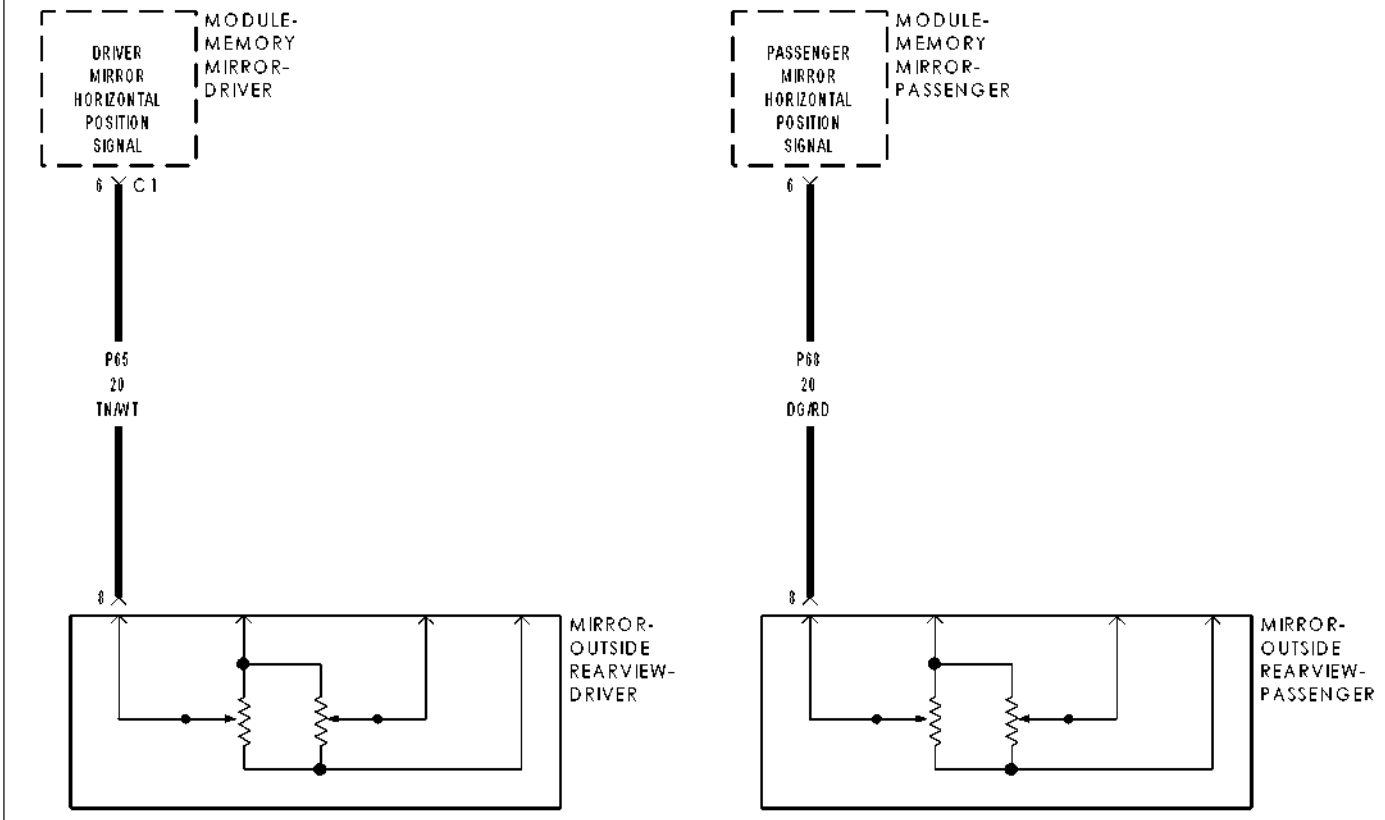
Is the resistance below 5000.0 ohms?

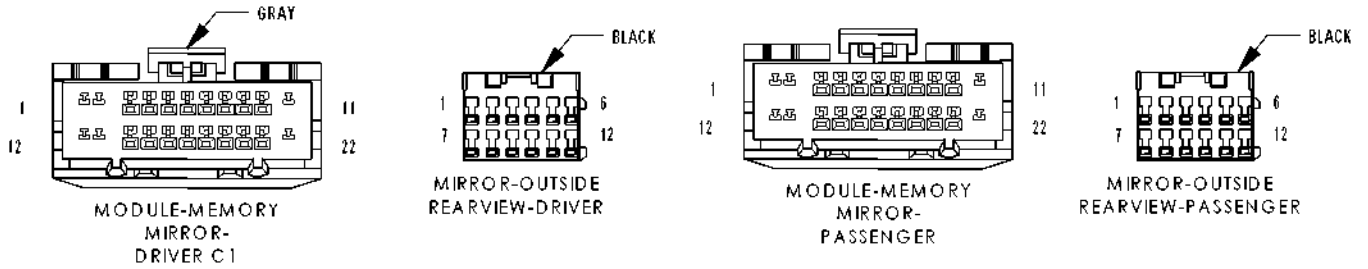
Yes >> Repair the (P65) or (P68) Mirror Horizontal Position Signal circuit for a short to the (P69) or (P66) Sensor Ground Circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the appropriate Memory Mirror Module.
Perform BODY VERIFICATION TEST - VER 1.



B1D10,B1D19–MIRROR HORIZONTAL POSITION SENSOR INPUT CIRCUIT HIGH – MEMORY MIRROR MODULE





B1D10,B1D19–MIRROR HORIZONTAL POSITION SENSOR INPUT CIRCUIT HIGH – MEMORY MIRROR MODULE — (CONTINUED)

For the Power Memory Mirror System circuit diagram(Refer to 8 - ELECTRICAL/POWER MIRRORS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

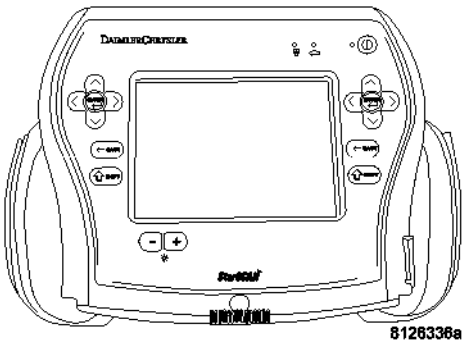
- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Memory Mirror Module senses a value above the parameter of the mirror sensor on the Mirror Horizontal Position Signal circuit for over 60ms., this code will set.**Note: This test covers both the Driver and Passenger code depending on the side the code appeared in.**

Possible Causes
(P65) OR (P68) MIRROR HORIZONTAL POSITION SIGNAL CIRCUIT SHORT TO VOLTAGE
(P65) OR (P68) MIRROR HORIZONTAL POSITION SIGNAL CIRCUIT OPEN
(P69) OR (P66) MIRROR SENSOR GROUND CIRCUIT OPEN
MIRROR OPEN
MEMORY MIRROR MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase DTC's
Operate the Mirror Switch in all directions several times.
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read DTC's.



Does the scan tool display B1D10 or B1D19–MIRROR HORIZONTAL POSITION SENSOR INPUT CIRCUIT HIGH?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST - VER 1.

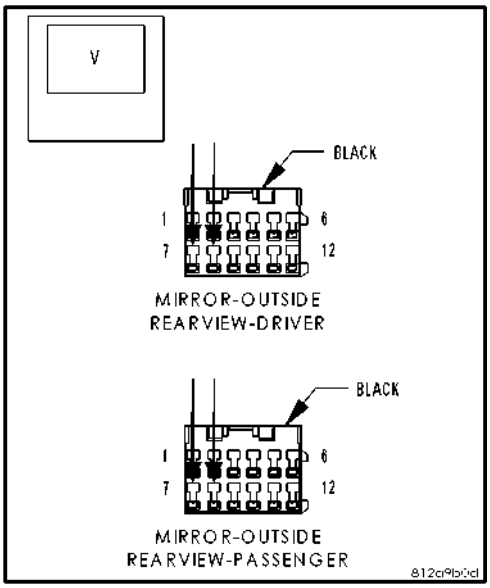
B1D10,B1D19–MIRROR HORIZONTAL POSITION SENSOR INPUT CIRCUIT HIGH – MEMORY MIRROR MODULE — (CONTINUED)

2. TEST FOR AN OPEN MIRROR

Disconnect the appropriate mirror connector.

Turn the ignition on.

Measure the voltage between the (P65) or (p68) Mirror Horizontal Position Signal circuit and the (P69) or (P66) Mirror Sensor Ground circuit.



Is the voltage between 4.8 and 5.2 volts?

Yes >> Replace the Mirror.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go to 3

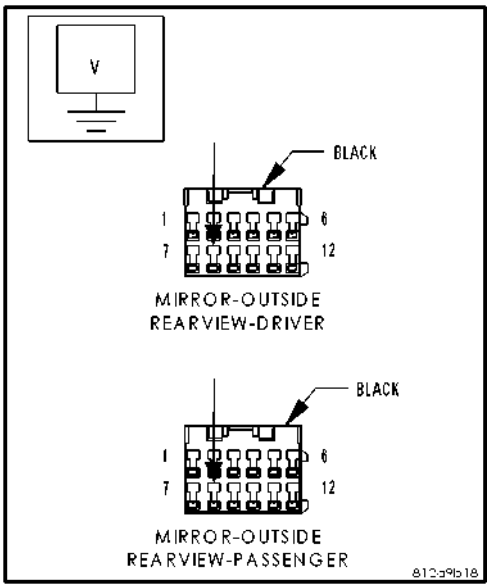
3. TEST THE (P65) OR (P68) MIRROR HORIZONTAL POSITION SIGNAL WIRE FOR A SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the appropriate Memory Mirror Module connector.

Turn the ignition on.

Measure the voltage between the (P65) or (P68) Mirror Horizontal Position Signal circuit and ground.



Is there any voltage present?

Yes >> Repair the (P65) or (P68) Mirror Horizontal Position Signal circuit for a short to voltage.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go to 4

B1D10,B1D19–MIRROR HORIZONTAL POSITION SENSOR INPUT CIRCUIT HIGH – MEMORY MIRROR MODULE — (CONTINUED)

4. TEST THE (P69) OR (P66) MIRROR SENSOR GROUND WIRE FOR AN OPEN

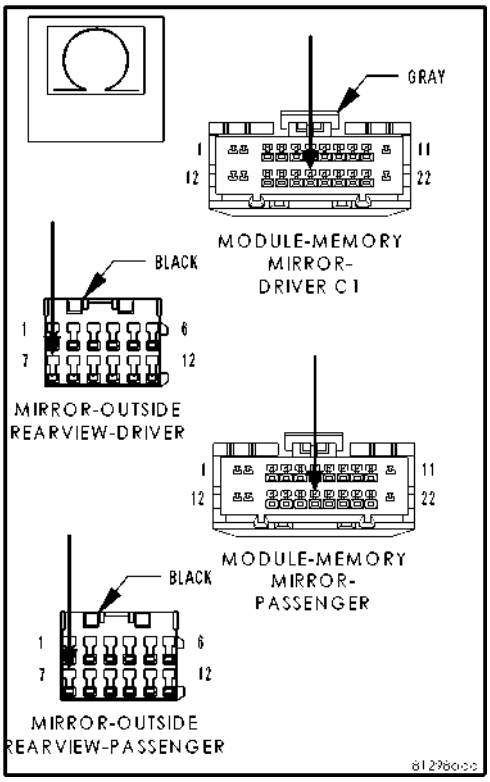
Turn the ignition off.

Measure the resistance of the (P69) or (P66) Mirror Sensor Ground circuit between the Module connector and the Mirror connector.

Is the resistance below 2.0 ohms?

No >> Repair the (P69) or (P66) Mirror Sensor Ground circuit for an open..
Perform BODY VERIFICATION TEST - VER 1.

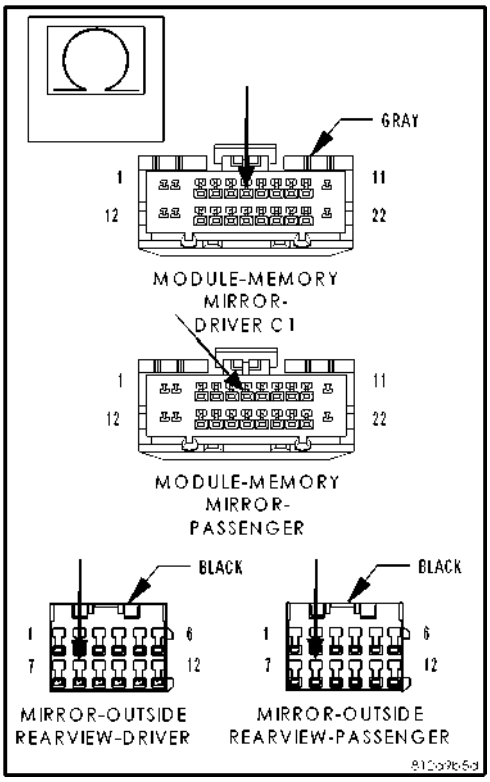
Yes >> Go to 5



B1D10,B1D19–MIRROR HORIZONTAL POSITION SENSOR INPUT CIRCUIT HIGH – MEMORY MIRROR MODULE — (CONTINUED)

5. TEST THE (P65) OR (P68) MIRROR HORIZONTAL POSITION SIGNAL WIRE FOR AN OPEN

Measure the resistance of the (P65) or (P68) Mirror Horizontal Position Signal circuit between the Module connector and the Mirror connector.

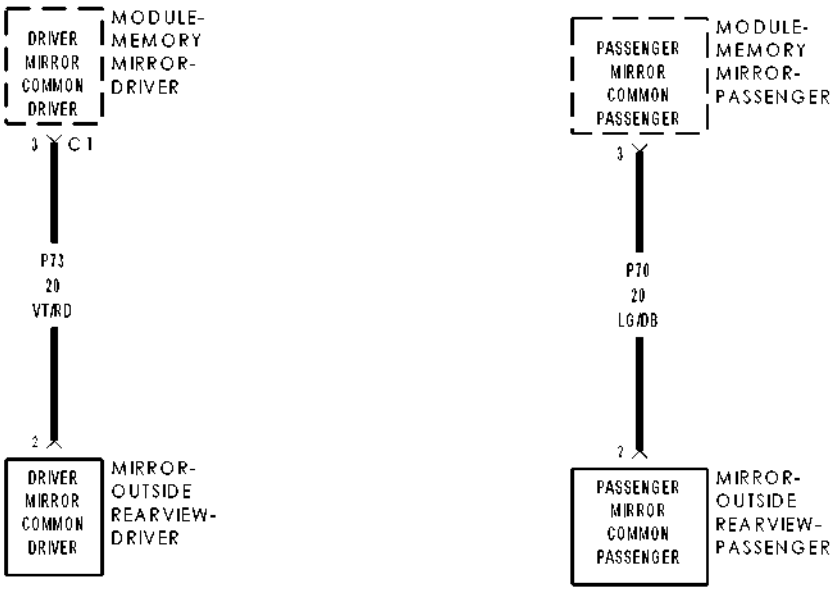


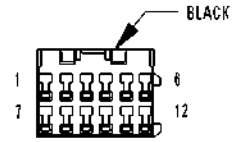
Is the resistance below 2.0 ohms?

No >> Repair the (P65) or (P68) Mirror Horizontal Position Signal circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

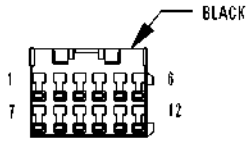
Yes >> Replace the appropriate Memory Mirror Module.
Perform BODY VERIFICATION TEST - VER 1.

B1D1B,B1D27–MIRROR MOTOR COMMON CONTROL CIRCUIT LOW – MEMORY MIRROR MODULE

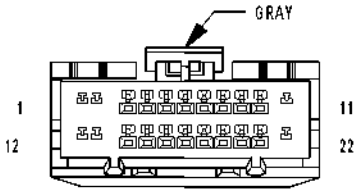




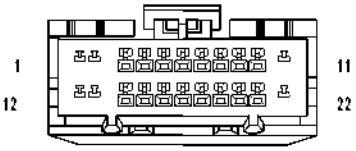
MIRROR-OUTSIDE REARVIEW-DRIVER



MIRROR-OUTSIDE REARVIEW-PASSENGER



MODULE-MEMORY MIRROR-DRIVER C1



MODULE-MEMORY MIRROR-PASSENGER

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B1D1B,B1D27–MIRROR MOTOR COMMON CONTROL CIRCUIT LOW – MEMORY MIRROR MODULE — (CONTINUED)

For the Power Memory Mirror System circuit diagram(Refer to 8 - ELECTRICAL/POWER MIRRORS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

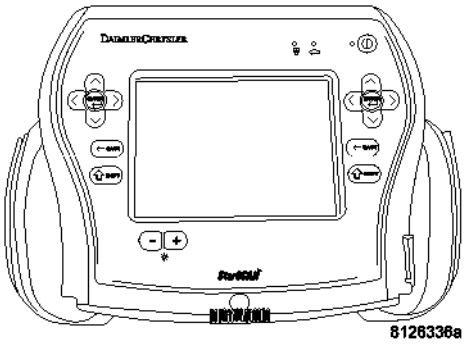
- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Memory Mirror Module senses a value below the tolerance of the mirror motor on the Mirror Motor Common Control circuit for over 10ms., this code will set.**Note: This test covers both the Driver and Passenger code depending on the side the code appeared in.**

Possible Causes
(P73) OR (P70) MIRROR MOTOR COMMON DRIVER CIRCUIT SHORT TO GROUND
(P73) OR (P70) MIRROR MOTOR COMMON DRIVER CIRCUIT SHORTED TO (C910) OR (C917) MIRROR HEATER GROUND CIRCUIT.
MIRROR SHORTED
MEMORY MIRROR MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase DTC's
Operate the Mirror Switch in all directions several times.
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read DTC's.



Does the scan tool display B1D1B or B1D27–MIRROR MOTOR COMMON CONTROL CIRCUIT LOW?

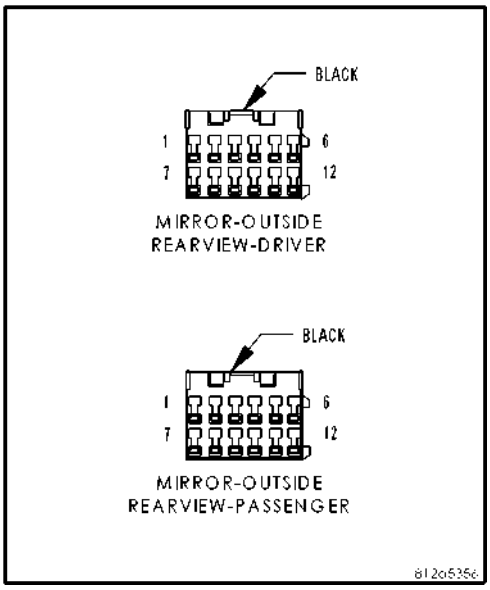
Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST - VER 1.

B1D1B,B1D27–MIRROR MOTOR COMMON CONTROL CIRCUIT LOW – MEMORY MIRROR MODULE — (CONTINUED)

2. TEST FOR A SHORTED MIRROR

Disconnect the appropriate mirror connector.
With the scan tool, erase DTC's.
Operate the Mirror Switch in all directions several times.
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read DTC's.



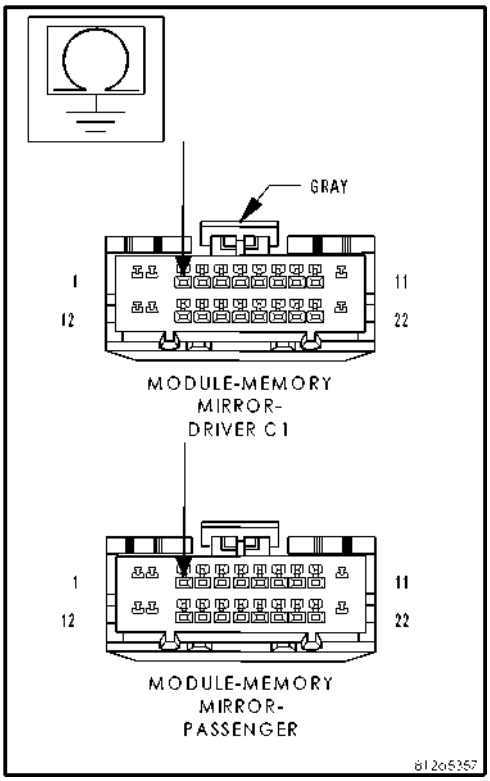
Does the scan tool display B1D1B or B1D27–MIRROR MOTOR COMMON CONTROL CIRCUIT LOW?

No >> Replace the Mirror.
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Go to 3

3. TEST THE (P73) OR (P70) MIRROR MOTOR COMMON DRIVER WIRE FOR A SHORT TO GROUND

Turn the ignition off.
Disconnect the appropriate Memory Mirror Module connector.
Measure the resistance between ground and the (P73) or (P70) Mirror Motor Common Driver circuit.



Is the resistance below 5000.0 ohms?

Yes >> Repair the (P73) or (P70) Mirror Motor Common Driver circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go to 4

B1D1B,B1D27–MIRROR MOTOR COMMON CONTROL CIRCUIT LOW – MEMORY MIRROR MODULE — (CONTINUED)

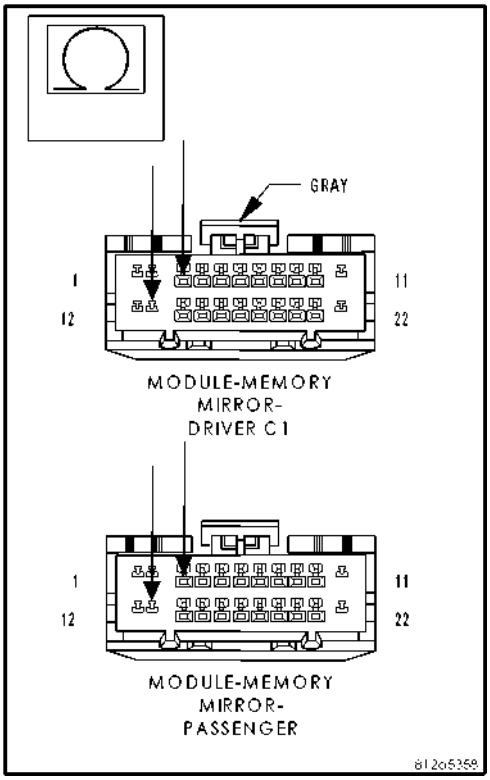
4. TEST THE (P73) OR (P70) MIRROR MOTOR COMMON DRIVER CIRCUIT SHORTED TO THE (C910) OR (C917) MIRROR HEATER GROUND CIRCUIT.

Measure the resistance between the (P73) or (P70) Mirror Motor Common Driver circuit and the (C910) or (C917) Mirror Heater Ground circuit.

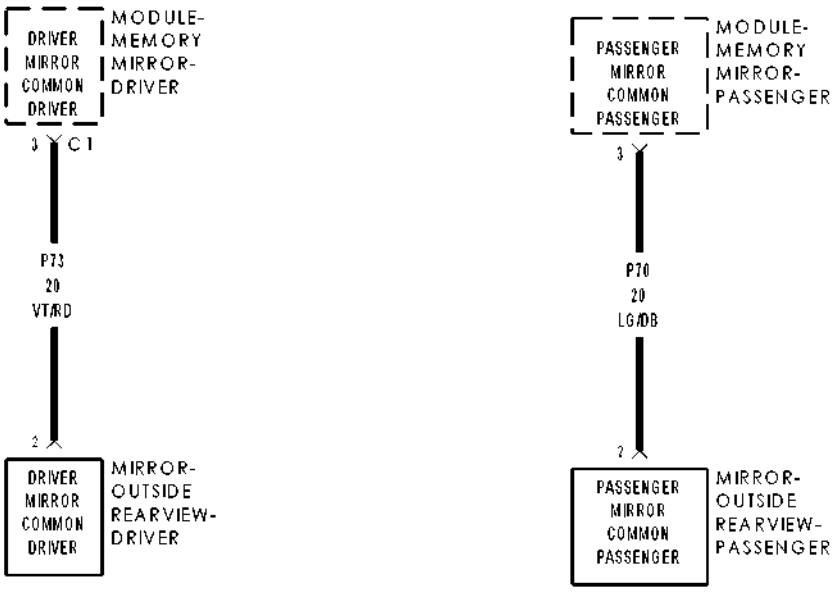
Is the resistance below 5000.0 ohms?

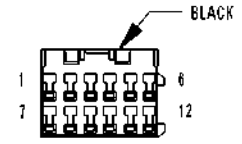
Yes >> Repair the (P73) or (P70) Mirror Motor Common Driver circuit for a short to the (C910) or (C917) Mirror Heater Ground Circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the appropriate Memory Mirror Module.
Perform BODY VERIFICATION TEST - VER 1.

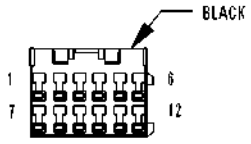


B1D1C,B1D28–MIRROR MOTOR COMMON CONTROL CIRCUIT HIGH – MEMORY MIRROR MODULE

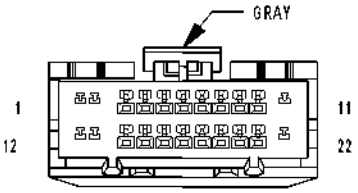




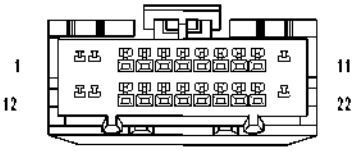
MIRROR-OUTSIDE REARVIEW-DRIVER



MIRROR-OUTSIDE REARVIEW-PASSENGER



MODULE-MEMORY MIRROR-DRIVER C1



MODULE-MEMORY MIRROR-PASSENGER

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B1D1C,B1D28–MIRROR MOTOR COMMON CONTROL CIRCUIT HIGH – MEMORY MIRROR MODULE — (CONTINUED)

For the Power Memory Mirror System circuit diagram(Refer to 8 - ELECTRICAL/POWER MIRRORS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

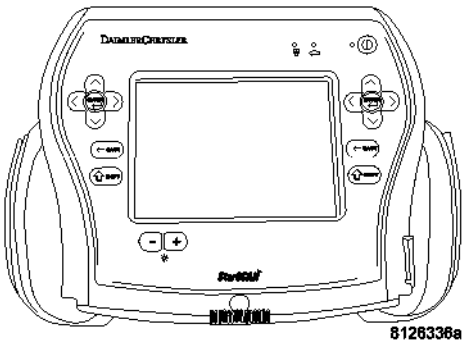
- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Memory Mirror Module senses voltage present on the Mirror Motor Common Control circuit, when there should not be, for over 10ms., this code will set.**Note: This test covers both the Driver and Passenger code depending on the side the code appeared in.**

Possible Causes
(P73) OR (P70) MIRROR MOTOR COMMON DRIVER CIRCUIT SHORT TO VOLTAGE
MIRROR SHORTED
MEMORY MIRROR MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase DTC's
Operate the Mirror Switch in all directions several times.
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read DTC's.



Does the scan tool display B1D1C or B1D28–MIRROR MOTOR COMMON CONTROL CIRCUIT HIGH?

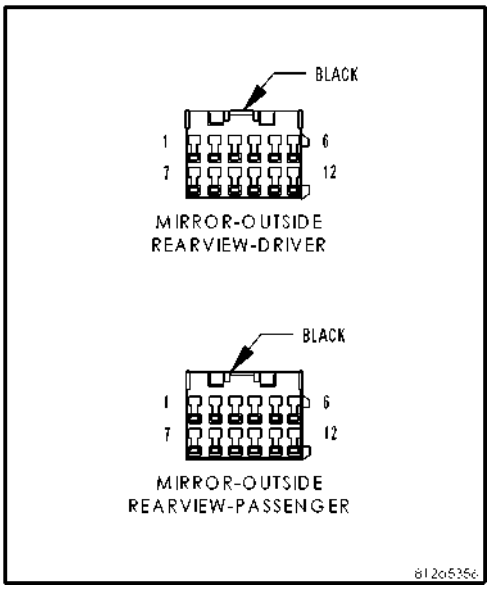
Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST - VER 1.

B1D1C,B1D28–MIRROR MOTOR COMMON CONTROL CIRCUIT HIGH – MEMORY MIRROR MODULE — (CONTINUED)

2. TEST FOR AN OPEN MIRROR

Turn the ignition off.
Disconnect the appropriate mirror connector.
Turn the ignition on.
With the scan tool, record and erase DTC's
Operate the Mirror Switch in all directions several times.
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read DTC's.



Does the scan tool display B1D1C or B1D28–MIRROR MOTOR COMMON CONTROL CIRCUIT HIGH?

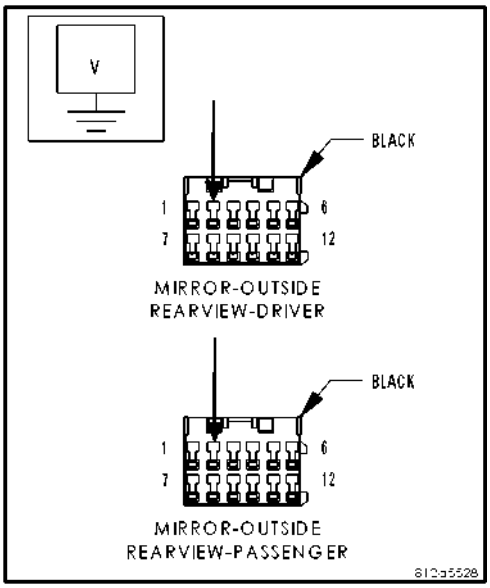
No >> Replace the Mirror.
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Go to 3

---

3. TEST THE (P73) OR (P70) MIRROR MOTOR COMMON DRIVER WIRE FOR A SHORT TO VOLTAGE

Measure the voltage between the (P73) or (P70) Mirror Motor Common Driver circuit and ground.

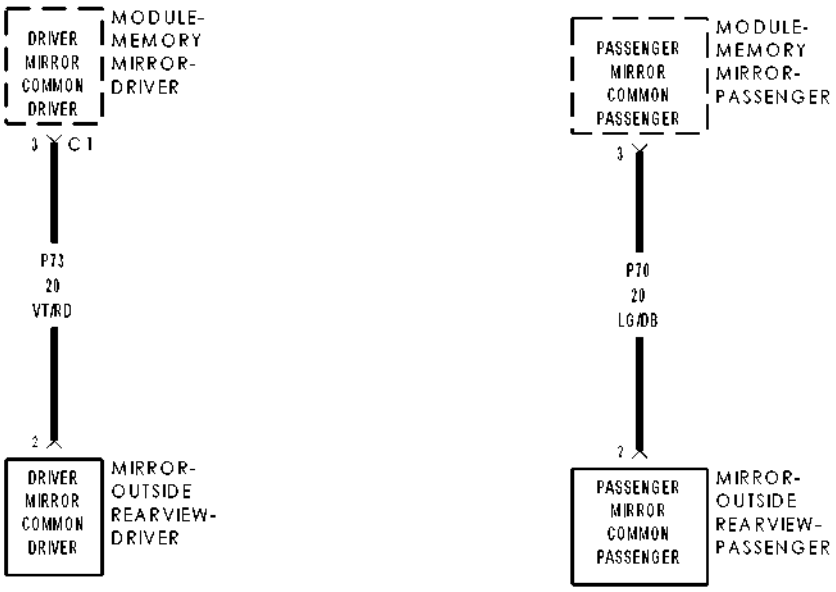


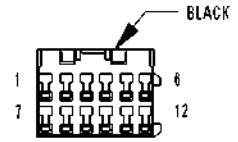
Is the voltage above 0.5 volts?

Yes >> Repair the (P73) or (P70) Mirror Motor Common Driver circuit for a short to voltage.
Perform BODY VERIFICATION TEST - VER 1.

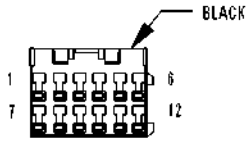
No >> Replace the appropriate Memory Mirror Module.
Perform BODY VERIFICATION TEST - VER 1.

B1D1D,B1D29–MIRROR MOTOR COMMON CONTROL CIRCUIT OPEN – MEMORY MIRROR MODULE

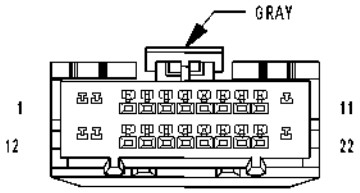




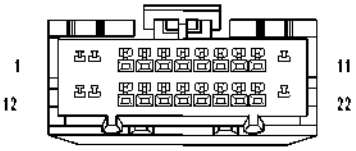
MIRROR-OUTSIDE REARVIEW-DRIVER



MIRROR-OUTSIDE REARVIEW-PASSENGER



MODULE-MEMORY MIRROR-DRIVER C1



MODULE-MEMORY MIRROR-PASSENGER

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B1D1D,B1D29–MIRROR MOTOR COMMON CONTROL CIRCUIT OPEN – MEMORY MIRROR MODULE — (CONTINUED)

For the Power Memory Mirror System circuit diagram(Refer to 8 - ELECTRICAL/POWER MIRRORS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Memory Mirror Module senses an open condition on the Mirror Motor Common Driver circuit during a mirror opeation, for over 10ms., this code will set.**Note: This test covers both the Driver and Passenger code depending on the side the code appeared in.**

Possible Causes
(P73) OR (P70) MIRROR MOTOR COMMON DRIVER CIRCUIT OPEN
MIRROR OPEN
MEMORY MIRROR MODULE

Diagnostic Test

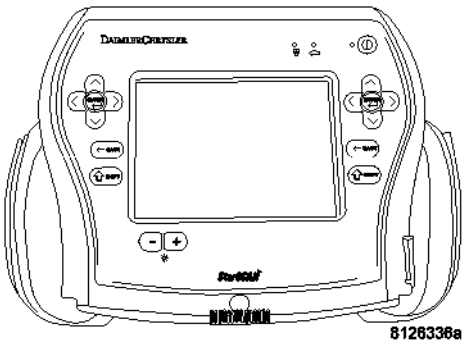
1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase DTC's
Operate the Mirror Switch in all directions several times.
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read DTC's.

Does the scan tool display B1D1B or B1D27–MIRROR MOTOR COMMON CONTROL CIRCUIT OPEN?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST - VER 1.



B1D1D,B1D29–MIRROR MOTOR COMMON CONTROL CIRCUIT OPEN – MEMORY MIRROR MODULE — (CONTINUED)

2. TEST FOR AN OPEN MIRROR

Disconnect the appropriate mirror connector.

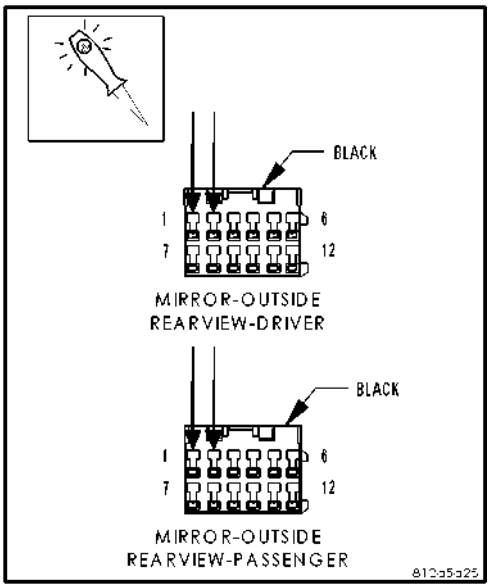
Connect a test light between the (P73) or (P70) Mirror Common Driver circuit and the (P71) or (P72) Mirror Vertical Driver circuit.

Operate the mirror switch Up and Down several times.

Does the testlight illuminate when the switch is operated?

Yes >> Replace the Mirror.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go to 3



3. TEST THE (P73) OR (P70) MIRROR MOTOR COMMON DRIVER WIRE FOR AN OPEN

Turn the ignition off.

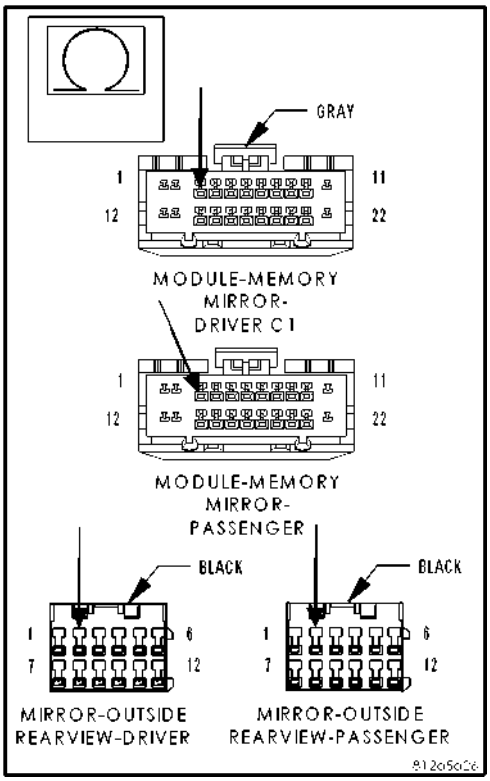
Disconnect the appropriate Memory Mirror Module connector.

Measure the resistance of the (P73) or (P70) Mirror Motor Common Driver circuit between the mirror connector and the module connector.

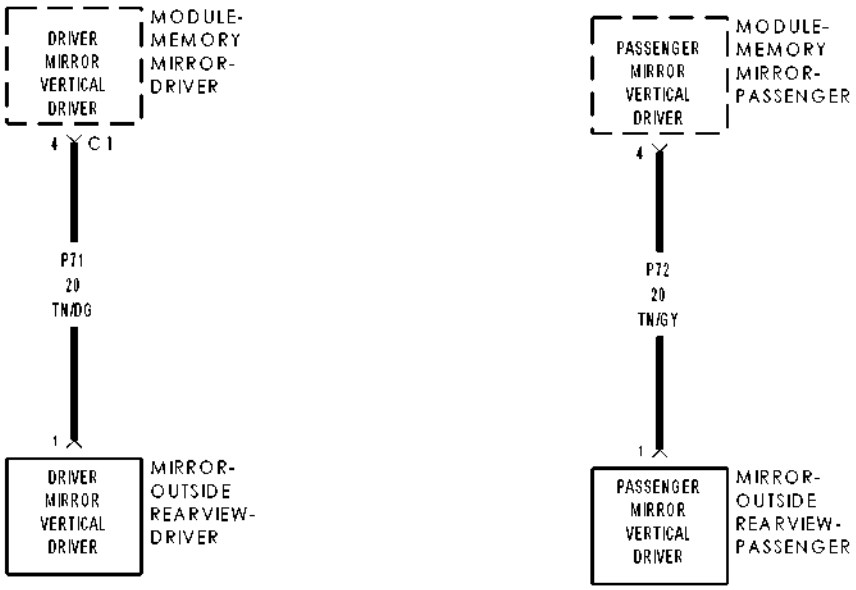
Is the resistance below 2.0 ohms?

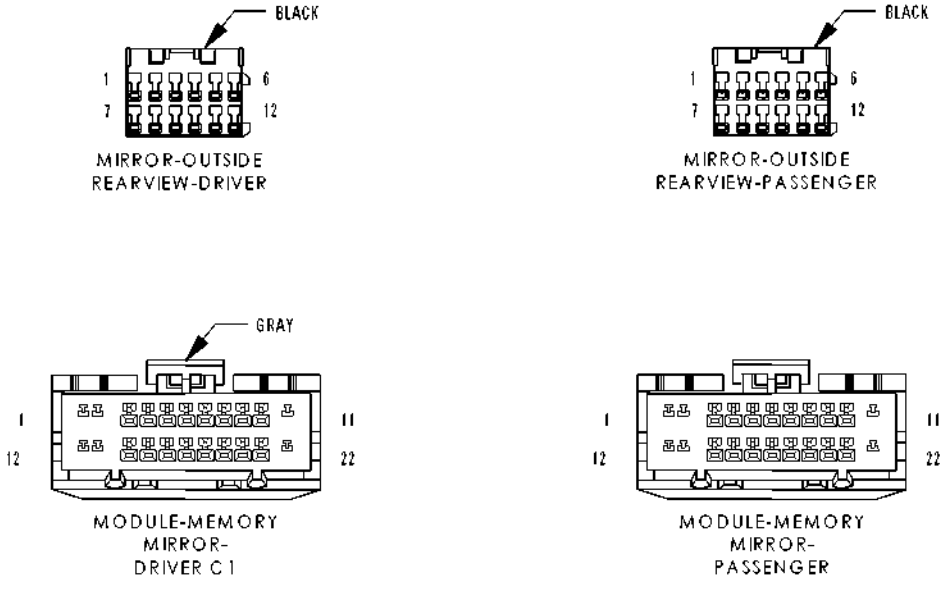
No >> Repair the (P73) or (P70) Mirror Motor Common Driver circuit for an open..
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Replace the appropriate Memory Mirror Module.
Perform BODY VERIFICATION TEST - VER 1.



B1D1F,B1D2B–MIRROR VERTICAL MOTOR CONTROL CIRCUIT LOW – MEMORY MIRROR MODULE





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B1D1F,B1D2B–MIRROR VERTICAL MOTOR CONTROL CIRCUIT LOW – MEMORY MIRROR MODULE — (CONTINUED)

For the Power Memory Mirror System circuit diagram(Refer to 8 - ELECTRICAL/POWER MIRRORS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

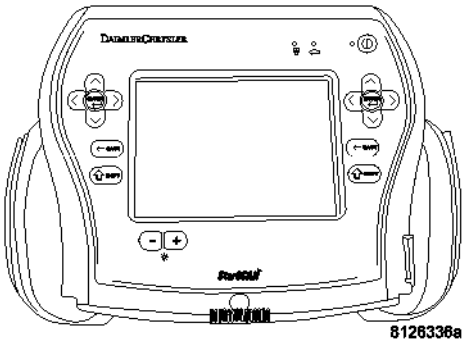
- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Memory Mirror Module senses a value below the tolerance of the mirror motor on the Mirror Vertical Motor Control circuit for over 10ms., this code will set.**Note: This test covers both the Driver and Passenger code depending on the side the code appeared in.**

Possible Causes
(P71) OR (P72) MIRROR VERTICAL DRIVER CIRCUIT SHORT TO GROUND
(P71) OR (P72) MIRROR VERTICAL DRIVER CIRCUIT SHORTED TO THE (C910) OR (C917) MIRROR HEATER GROUND CIRCUIT.
MIRROR SHORTED
MEMORY MIRROR MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase DTC's
Operate the Mirror Switch in all directions several times.
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read DTC's.



Does the scan tool display B1D1F or B1D2B–MIRROR VERTICAL MOTOR CONTROL CIRCUIT LOW?

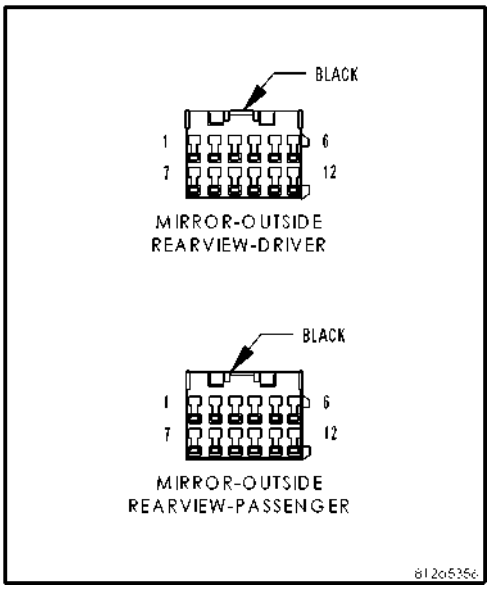
Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST - VER 1.

B1D1F,B1D2B–MIRROR VERTICAL MOTOR CONTROL CIRCUIT LOW – MEMORY MIRROR MODULE — (CONTINUED)

2. TEST FOR A SHORTED MIRROR

Disconnect the appropriate mirror connector.
With the scan tool, erase DTC's.
Operate the Mirror Switch in all directions several times.
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read DTC's.



Does the scan tool display B1D1F or B1D2B–MIRROR VERTICAL MOTOR CONTROL CIRCUIT LOW?

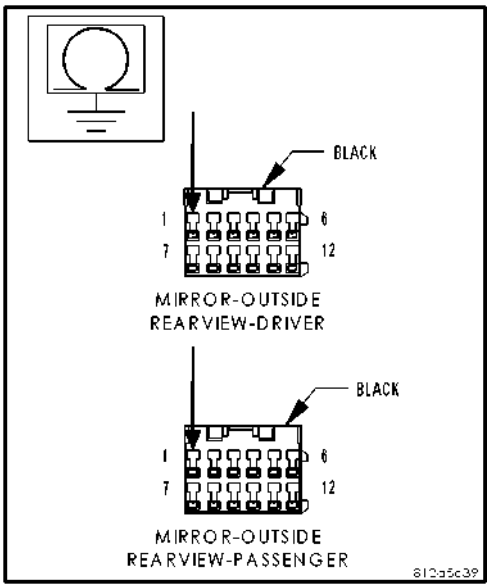
No >> Replace the Mirror.
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Go to 3

---

3. TEST THE (P71) OR (P72) MIRROR VERTICAL MOTOR DRIVER WIRE FOR A SHORT TO GROUND

Turn the ignition off.
Disconnect the appropriate Memory Mirror Module connector.
Measure the resistance between ground and the (P71) or (P72) Mirror Vertical Motor Driver circuit.



Is the resistance below 5000.0 ohms?

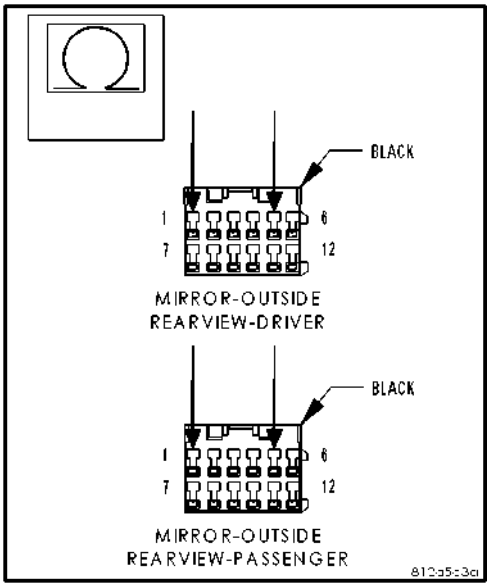
Yes >> Repair the (P71) or (P72) Mirror Vertical Motor Driver circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go to 4

B1D1F,B1D2B–MIRROR VERTICAL MOTOR CONTROL CIRCUIT LOW – MEMORY MIRROR MODULE — (CONTINUED)

4. TEST THE (P71) OR (P72) MIRROR VERTICAL MOTOR DRIVER CIRCUIT SHORTED TO THE (C910) OR (C917) MIRROR HEATER GROUND CIRCUIT.

Measure the resistance between the (P71) or (P72) Mirror Vertical Motor Driver circuit and the (C910) or (C917) Mirror Heater Ground circuit.

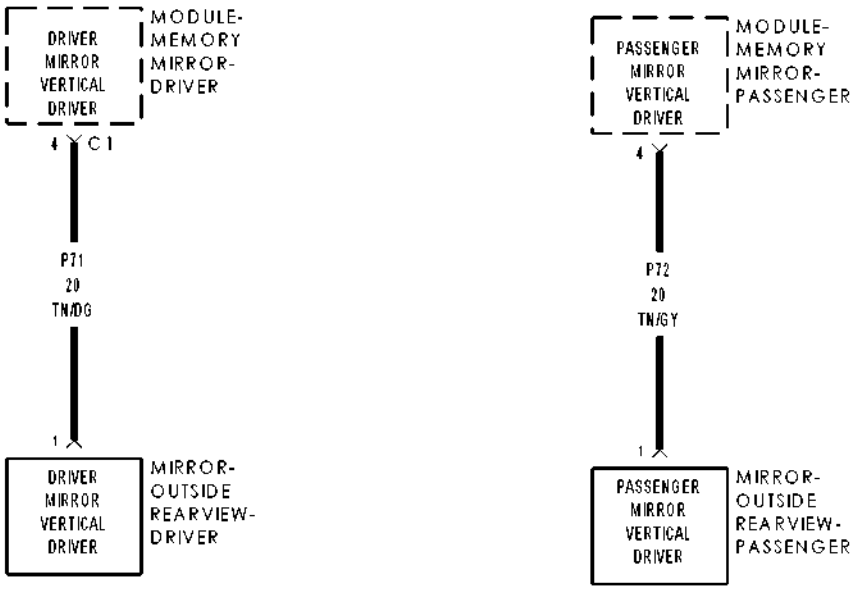


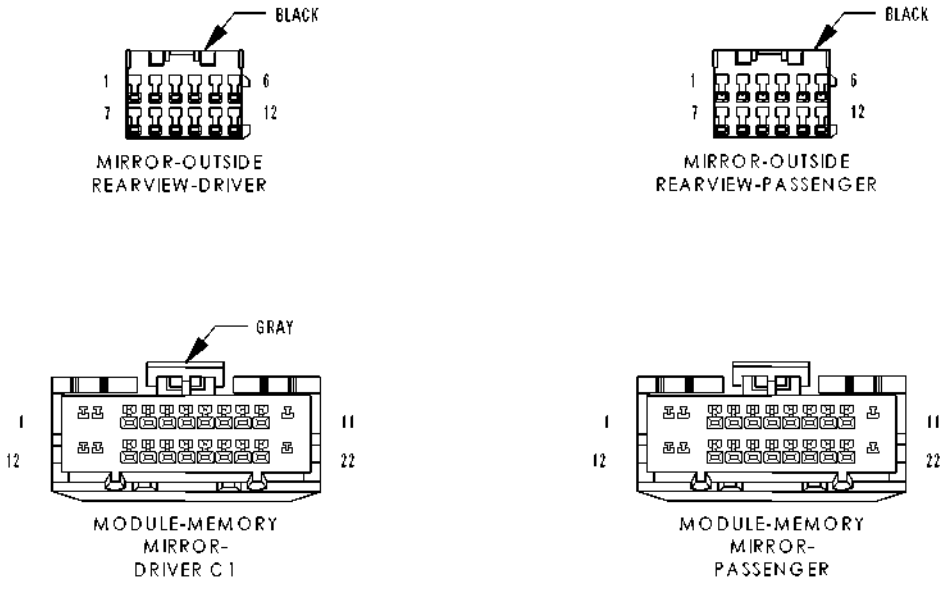
Is the resistance below 5000.0 ohms?

Yes >> Repair the (P71) or (P72) Mirror Vertical Motor Driver circuit for a short to the (C910) or (C917) Mirror Heater Ground Circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the appropriate Memory Mirror Module.
Perform BODY VERIFICATION TEST - VER 1.

B1D20,B1D2C–MIRROR VERTICAL MOTOR CONTROL CIRCUIT HIGH – MEMORY MIRROR MODULE





B1D20,B1D2C–MIRROR VERTICAL MOTOR CONTROL CIRCUIT HIGH – MEMORY MIRROR MODULE — (CONTINUED)

For the Power Memory Mirror System circuit diagram(Refer to 8 - ELECTRICAL/POWER MIRRORS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

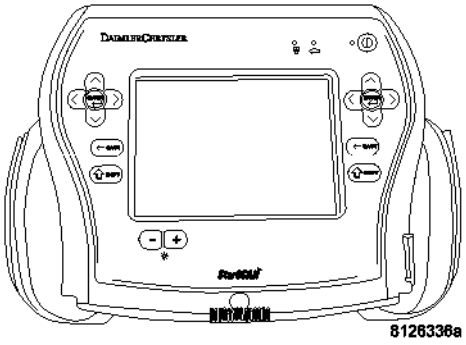
- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Memory Mirror Module senses voltage present on the Mirror Vertical Motor Driver circuit, when there should not be, for over 10ms., this code will set.**Note: This test covers both the Driver and Passenger code depending on the side the code appeared in.**

Possible Causes
(P71) OR (P72) MIRROR VERTICAL MOTOR DRIVER CIRCUIT SHORT TO VOLTAGE
MIRROR SHORTED
MEMORY MIRROR MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase DTC's
Operate the Mirror Switch in all directions several times.
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read DTC's.



Does the scan tool display B1D20 or B1D2C–MIRROR VERTICAL MOTOR CONTROL CIRCUIT HIGH?

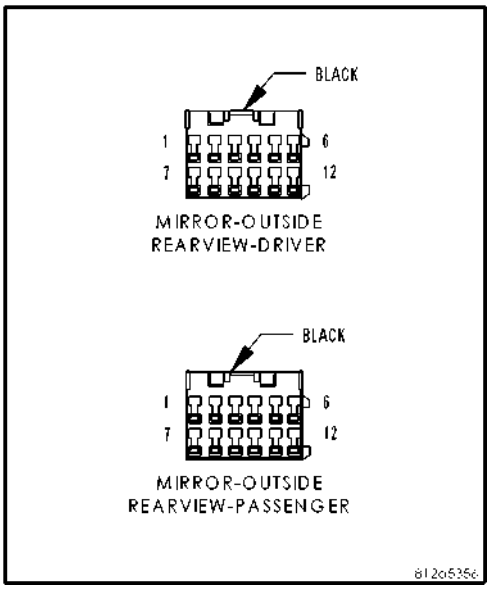
Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST - VER 1.

B1D20,B1D2C–MIRROR VERTICAL MOTOR CONTROL CIRCUIT HIGH – MEMORY MIRROR MODULE — (CONTINUED)

2. TEST FOR A SHORTED MIRROR

Turn the ignition off.
Disconnect the appropriate mirror connector.
Turn the ignition on.
With the scan tool, record and erase DTC's
Operate the Mirror Switch in all directions several times.
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read DTC's.



Does the scan tool display B1D20 or B1D2C–MIRROR VERTICAL MOTOR CONTROL CIRCUIT HIGH?

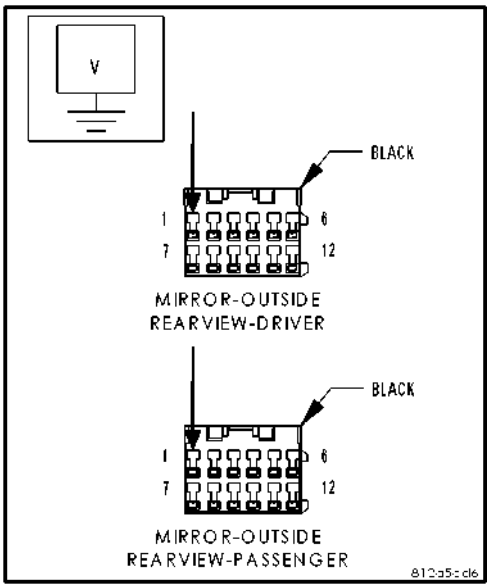
No >> Replace the Mirror.
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Go to 3

---

3. TEST THE (P713) OR (P72) MIRROR VERTICAL MOTOR DRIVER WIRE FOR A SHORT TO VOLTAGE

Measure the voltage between the (P71) or (P72) Mirror Vertical Motor Driver circuit and ground.

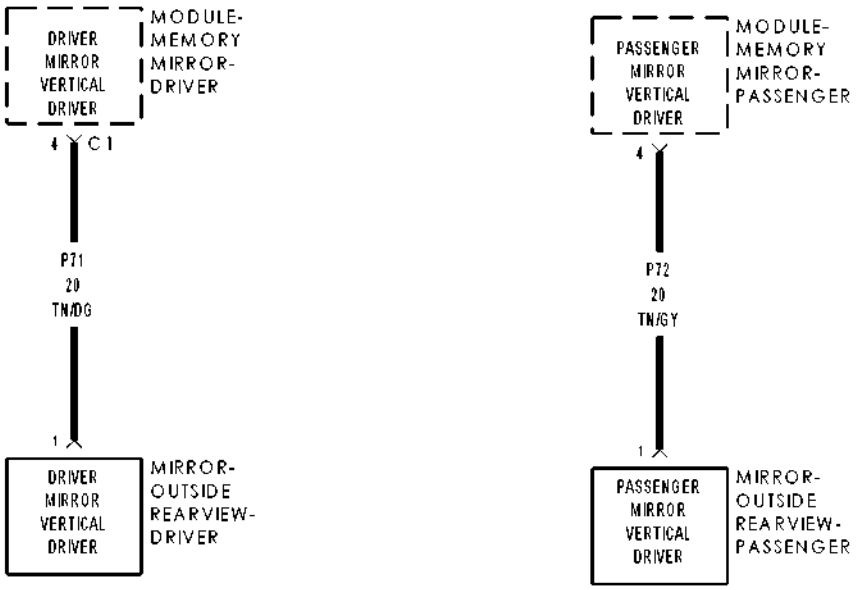


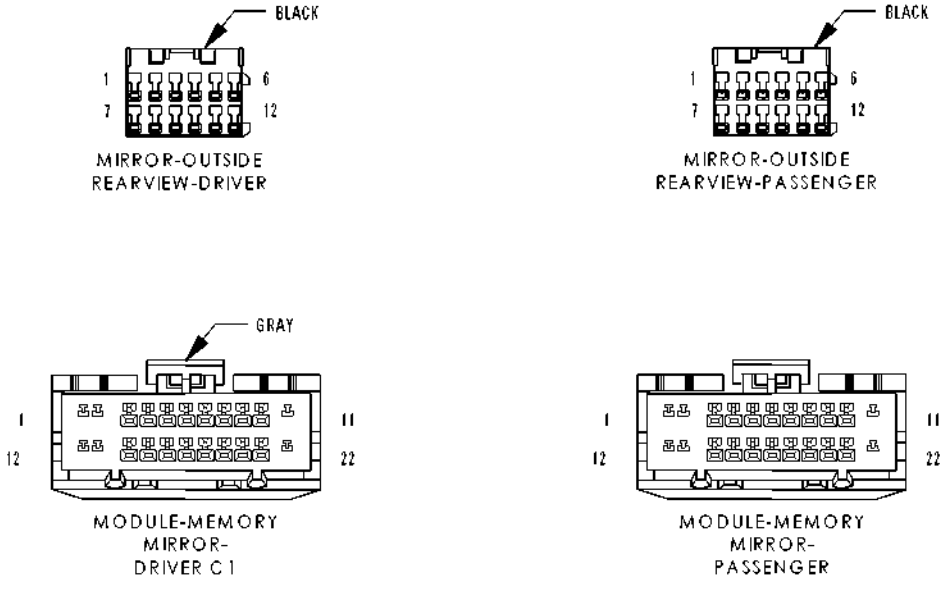
Is the voltage above 0.5 volts?

Yes >> Repair the (P71) or (P72) Mirror Vertical Motor Driver circuit for a short to voltage.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the appropriate Memory Mirror Module.
Perform BODY VERIFICATION TEST - VER 1.

B1D21,B1D2D–MIRROR VERTICAL MOTOR CONTROL CIRCUIT OPEN – MEMORY MIRROR MODULE





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B1D21,B1D2D–MIRROR VERTICAL MOTOR CONTROL CIRCUIT OPEN – MEMORY MIRROR MODULE — (CONTINUED)

For the Power Memory Mirror System circuit diagram(Refer to 8 - ELECTRICAL/POWER MIRRORS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

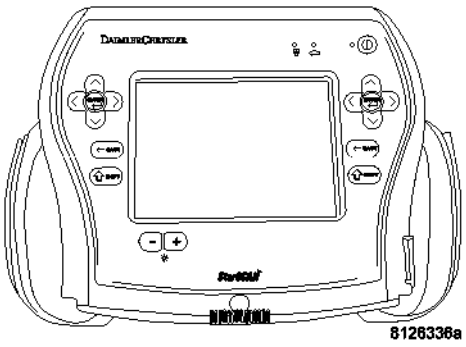
- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Memory Mirror Module senses an open condition on the Mirror Vertical Motor Driver circuit during a mirror opeation, for over 10ms., this code will set.**Note: This test covers both the Driver and Passenger code depending on the side the code appeared in.**

Possible Causes
(P71) OR (P72) MIRROR MOTOR DRIVER CIRCUIT OPEN
MIRROR OPEN
MEMORY MIRROR MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase DTC's
Operate the Mirror Switch in all directions several times.
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read DTC's.



Does the scan tool display B1D21 or B1D2d–MIRROR VERTICAL MOTOR CONTROL CIRCUIT OPEN?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST - VER 1.

B1D21,B1D2D–MIRROR VERTICAL MOTOR CONTROL CIRCUIT OPEN – MEMORY MIRROR MODULE — (CONTINUED)

2. TEST FOR AN OPEN MIRROR

Disconnect the appropriate mirror connector.

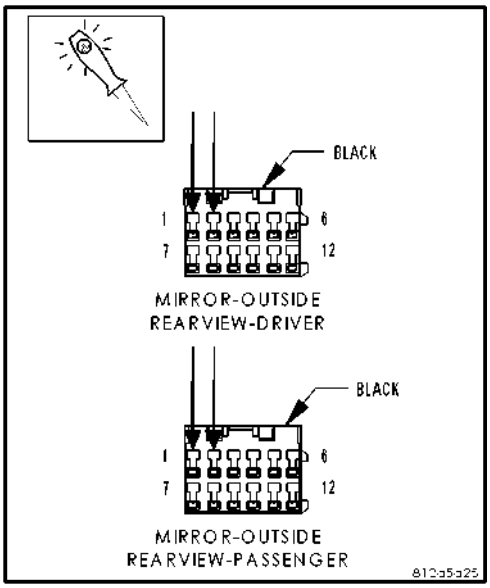
Connect a test light between the (P73) or (P70) Mirror Common Driver circuit and the (P71) or (P72) Mirror Vertical Driver circuit.

Operate the mirror switch Up and Down several times.

Does the testlight illuminate when the switch is operated?

Yes >> Replace the Mirror.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go to 3



3. TEST THE (P71) OR (P72) MIRROR VERTICAL MOTOR DRIVER WIRE FOR AN OPEN

Turn the ignition off.

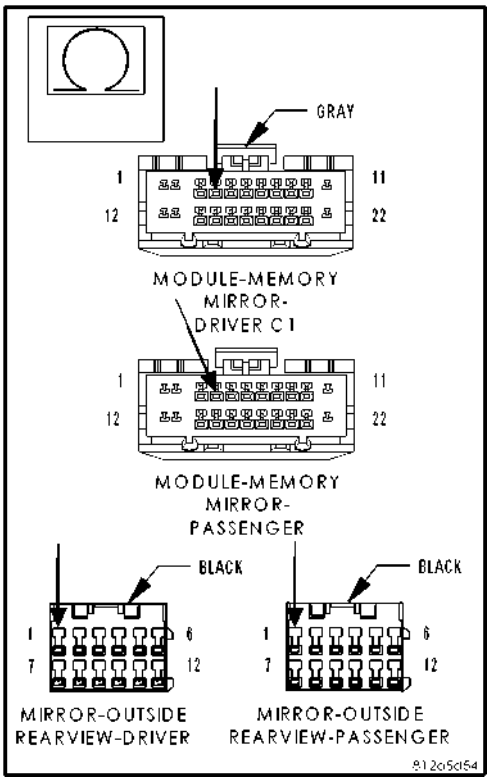
Disconnect the appropriate Memory Mirror Module connector.

Measure the resistance of the (P71) or (P72) Mirror Vertical Motor Driver circuit between the mirror connector and the module connector.

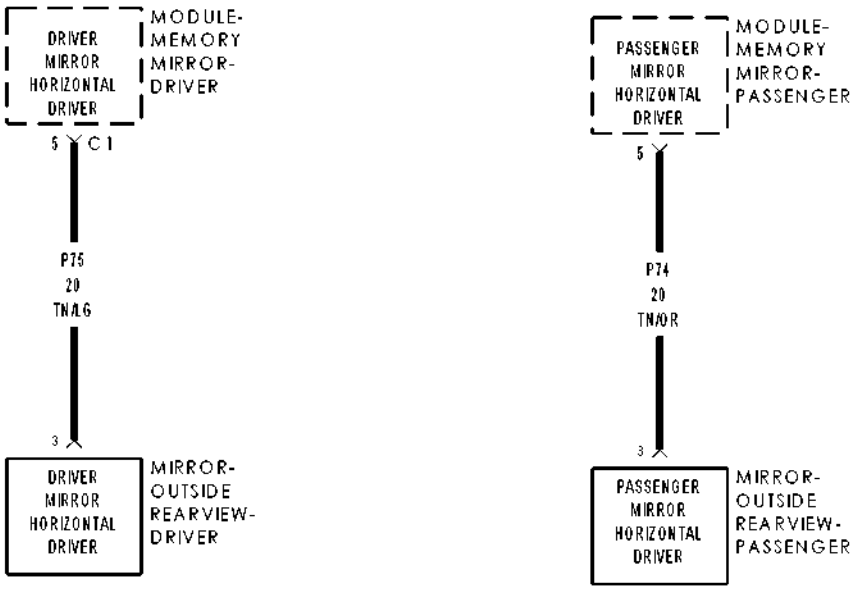
Is the resistance below 2.0 ohms?

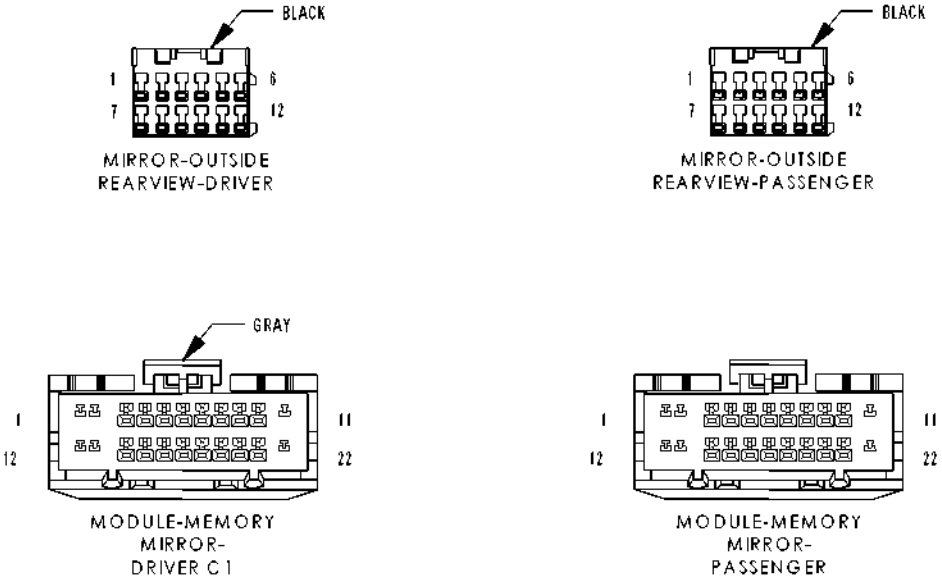
No >> Repair the (P71) or (P72) Mirror Vertical Motor Driver circuit for an open..
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Replace the appropriate Memory Mirror Module.
Perform BODY VERIFICATION TEST - VER 1.



B1D23,B1D2F–MIRROR HORIZONTAL MOTOR CONTROL CIRCUIT LOW – MEMORY MIRROR MODULE





B1D23,B1D2F–MIRROR HORIZONTAL MOTOR CONTROL CIRCUIT LOW – MEMORY MIRROR MODULE — (CONTINUED)

For the Power Memory Mirror System circuit diagram(Refer to 8 - ELECTRICAL/POWER MIRRORS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

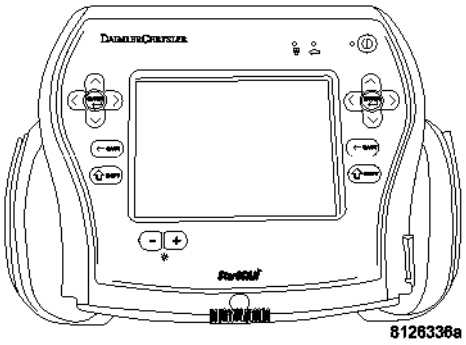
- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Memory Mirror Module senses a value below the tolerance of the mirror motor on the Mirror Horizontal Motor Driver circuit for over 10ms., this code will set.**Note: This test covers both the Driver and Passenger code depending on the side the code appeared in.**

Possible Causes
(P75) OR (P74) MIRROR HORIZONTAL DRIVER CIRCUIT SHORT TO GROUND
(P75) OR (P74) MIRROR HORIZONTAL DRIVER CIRCUIT SHORTED TO THE (C910) OR (C917) MIRROR HEATER GROUND CIRCUIT.
MIRROR SHORTED
MEMORY MIRROR MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase DTC's
Operate the Mirror Switch in all directions several times.
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read DTC's.



Does the scan tool display B1D23 or B1D2F–MIRROR HORIZONTAL MOTOR CONTROL CIRCUIT LOW?

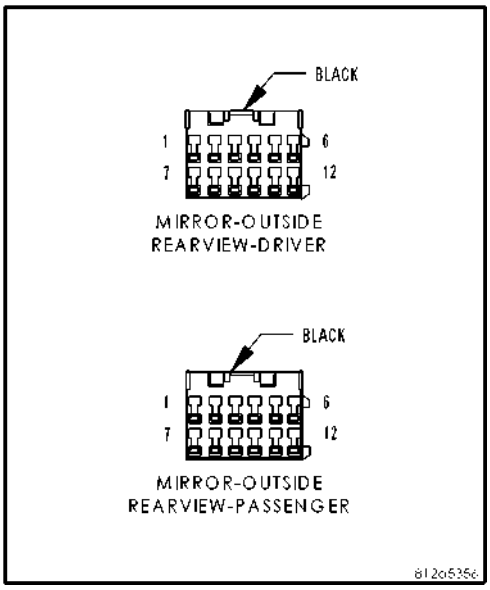
Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST - VER 1.

B1D23,B1D2F–MIRROR HORIZONTAL MOTOR CONTROL CIRCUIT LOW – MEMORY MIRROR MODULE — (CONTINUED)

2. TEST FOR A SHORTED MIRROR

Disconnect the appropriate mirror connector.
With the scan tool, erase DTC's.
Operate the Mirror Switch in all directions several times.
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read DTC's.



Does the scan tool display B1D23 or B1D2F–MIRROR HORIZONTAL MOTOR CONTROL CIRCUIT LOW?

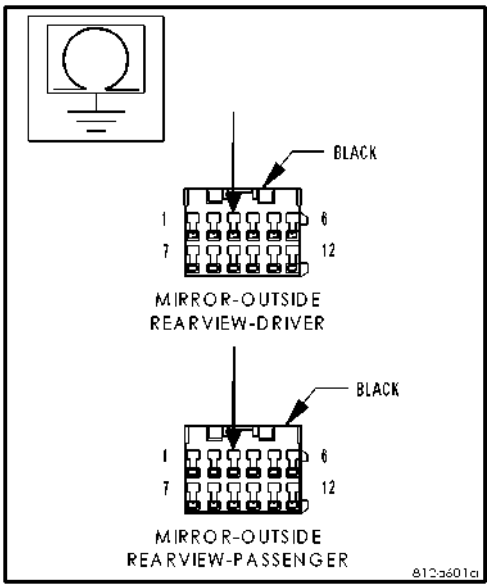
No >> Replace the Mirror.
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Go to 3

---

3. TEST THE (P75) OR (P74)) MIRROR HORIZONTAL MOTOR DRIVER WIRE FOR A SHORT TO GROUND

Turn the ignition off.
Disconnect the appropriate Memory Mirror Module connector.
Measure the resistance between ground and the (P75) or (P74) Mirror Horizontal Motor Driver circuit.



Is the resistance below 5000.0 ohms?

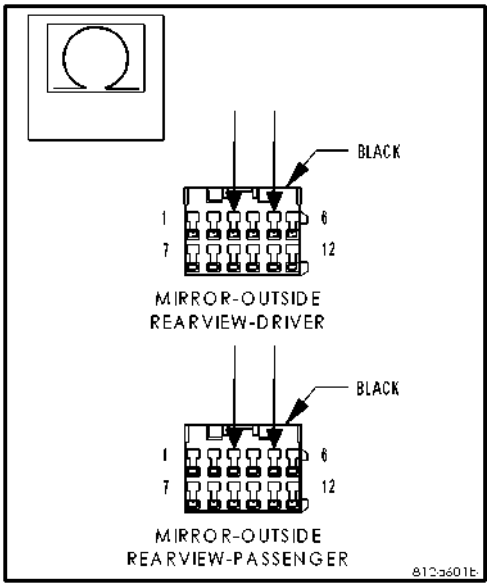
Yes >> Repair the (P75) or (P74) Mirror Horizontal Motor Driver circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go to 4

B1D23,B1D2F–MIRROR HORIZONTAL MOTOR CONTROL CIRCUIT LOW – MEMORY MIRROR MODULE — (CONTINUED)

4. TEST THE (P75) OR (P74) MIRROR HORIZONTAL MOTOR DRIVER CIRCUIT SHORTED TO THE (C910) OR (C917) MIRROR HEATER GROUND CIRCUIT.

Measure the resistance between the (P75) or (P74) Mirror Horizontal Driver circuit and the (C910) or (C917) Mirror Heater Ground circuit.

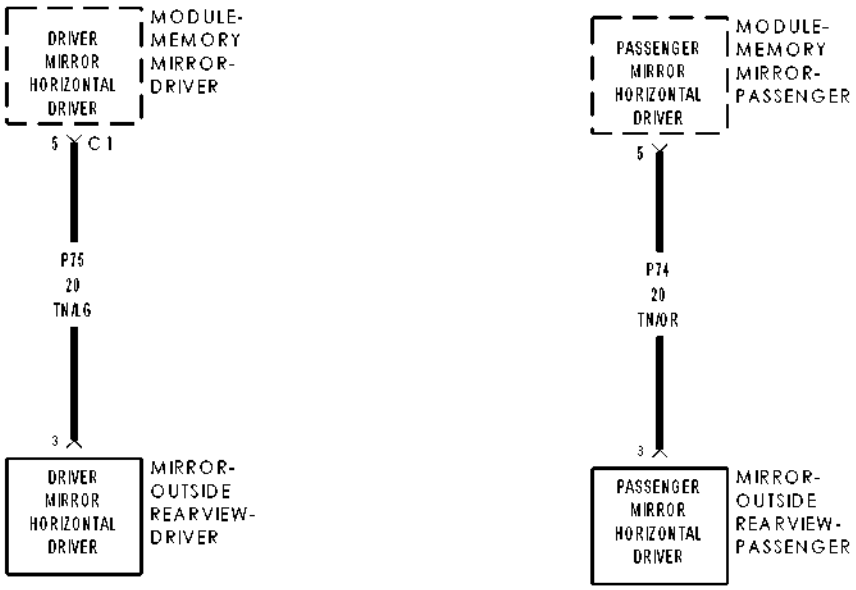


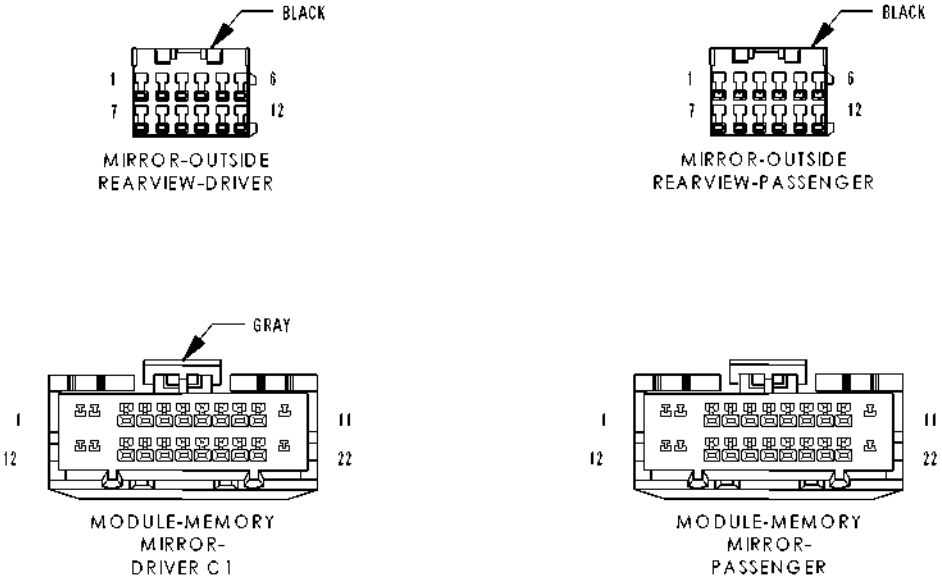
Is the resistance below 5000.0 ohms?

Yes >> Repair the (P75) or (P74) Mirror Horizontal Motor Driver circuit for a short to the (C910) or (C917) Mirror Heater Ground Circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the appropriate Memory Mirror Module.
Perform BODY VERIFICATION TEST - VER 1.

B1D24,B1D30–MIRROR HORIZONTAL MOTOR CONTROL CIRCUIT HIGH – MEMORY MIRROR MODULE





B1D24,B1D30–MIRROR HORIZONTAL MOTOR CONTROL CIRCUIT HIGH – MEMORY MIRROR MODULE — (CONTINUED)

For the Power Memory Mirror System circuit diagram(Refer to 8 - ELECTRICAL/POWER MIRRORS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Memory Mirror Module senses voltage present on the Mirror Horizontal Motor Driver circuit, when there should not be, for over 10ms., this code will set.**Note: This test covers both the Driver and Passenger code depending on the side the code appeared in.**

Possible Causes
(P75) OR (P74) MIRROR HORIZONTAL MOTOR DRIVER CIRCUIT SHORT TO VOLTAGE
MIRROR SHORTED
MEMORY MIRROR MODULE

Diagnostic Test

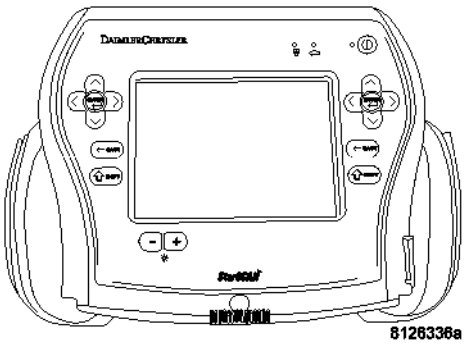
1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase DTC's
Operate the Mirror Switch in all directions several times.
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read DTC's.

Does the scan tool display B1D24 or B1D30–MIRROR HORIZONTAL MOTOR CONTROL CIRCUIT HIGH?

Yes >> Go To 2

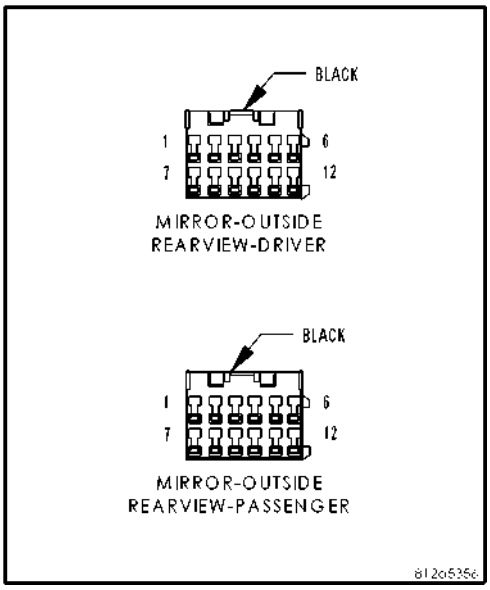
No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST - VER 1.



B1D24,B1D30–MIRROR HORIZONTAL MOTOR CONTROL CIRCUIT HIGH – MEMORY MIRROR MODULE — (CONTINUED)

2. TEST FOR A SHORTED MIRROR

Turn the ignition off.
Disconnect the appropriate mirror connector.
Turn the ignition on.
With the scan tool, record and erase DTC's
Operate the Mirror Switch in all directions several times.
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read DTC's.



Does the scan tool display B1D24 or B1D30–MIRROR HORIZONTAL MOTOR CONTROL CIRCUIT HIGH?

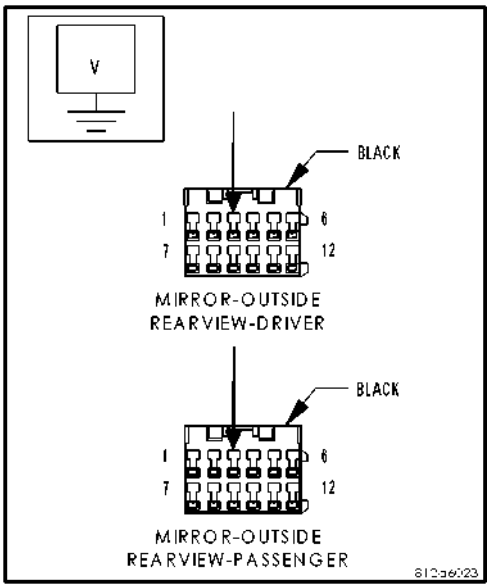
No >> Replace the Mirror.
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Go to 3

---

3. TEST THE (P75) OR (P74) MIRROR HORIZONTALL MOTOR DRIVER WIRE FOR A SHORT TO VOLTAGE

Measure the voltage between the (P75) or (P74) Mirror Horizontal Motor Driver circuit and ground.

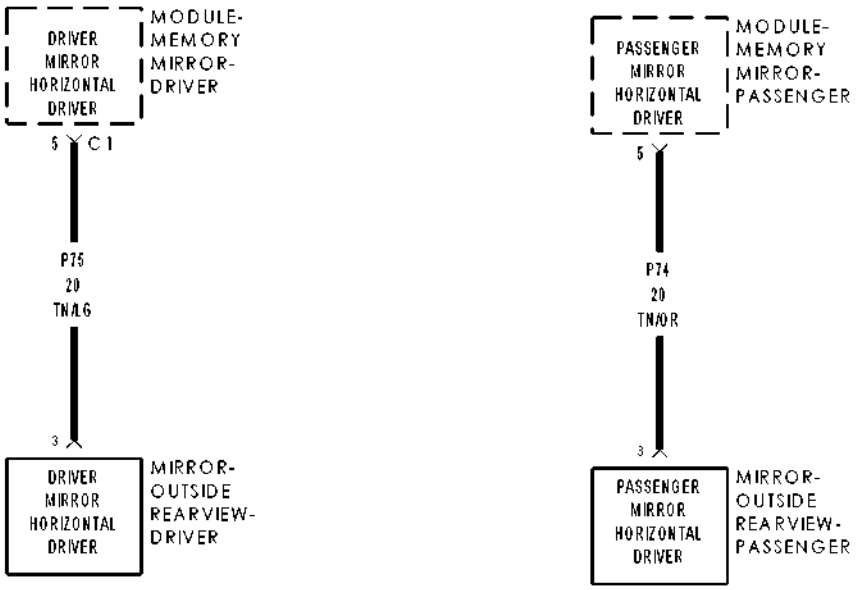


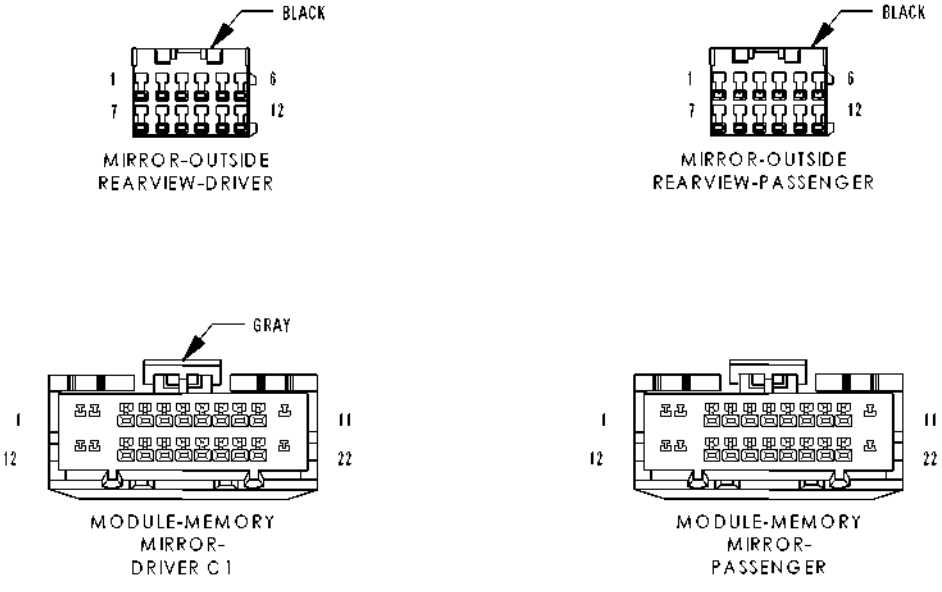
Is the voltage above 0.5 volts?

Yes >> Repair the (P75) or (P74) Mirror Horizontal Motor Driver circuit for a short to voltage.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the appropriate Memory Mirror Module.
Perform BODY VERIFICATION TEST - VER 1.

B1D25,B1D31–MIRROR HORIZONTAL MOTOR CONTROL CIRCUIT OPEN – MEMORY MIRROR MODULE





B1D25,B1D31–MIRROR HORIZONTAL MOTOR CONTROL CIRCUIT OPEN – MEMORY MIRROR MODULE — (CONTINUED)

For the Power Memory Mirror System circuit diagram(Refer to 8 - ELECTRICAL/POWER MIRRORS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

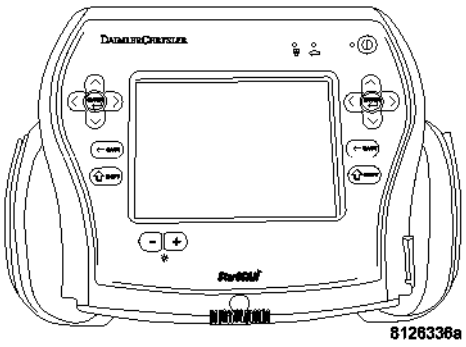
- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Memory Mirror Module senses an open condition on the Mirror Horizontal Motor Driver circuit during a mirror opeation, for over 10ms., this code will set.**Note: This test covers both the Driver and Passenger code depending on the side the code appeared in.**

Possible Causes
(P75) OR (P74) MIRROR HORIZONTAL MOTOR DRIVER CIRCUIT OPEN
MIRROR OPEN
MEMORY MIRROR MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase DTC's
Operate the Mirror Switch in all directions several times.
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read DTC's.



Does the scan tool display B1D25 or B1D31–MIRROR HORIZONTAL MOTOR CONTROL CIRCUIT OPEN?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform BODY VERIFICATION TEST - VER 1.

B1D25,B1D31–MIRROR HORIZONTAL MOTOR CONTROL CIRCUIT OPEN – MEMORY MIRROR MODULE — (CONTINUED)

2. TEST FOR AN OPEN MIRROR

Disconnect the appropriate mirror connector.

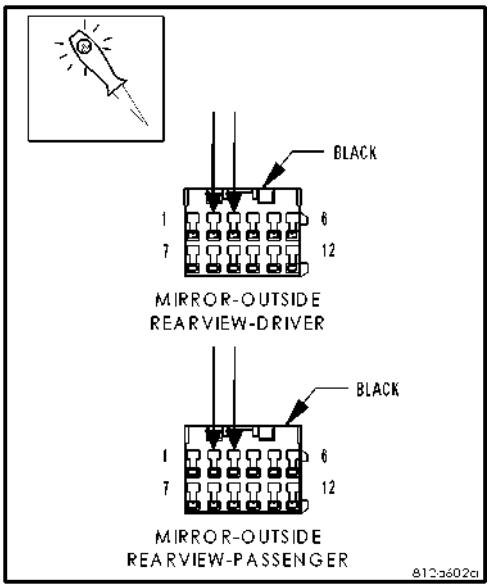
Connect a test light between the (P73) or (P70) Mirror Common Driver circuit and the (P75) or (P74) Mirror Horizontal Driver circuit.

Operate the mirror switch Left and Right several times.

Does the testlight illuminate when the switch is operated?

Yes >> Replace the Mirror.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go to 3



3. TEST THE (P75) OR (P74) MIRROR HORIZONTAL MOTOR DRIVER WIRE FOR AN OPEN

Turn the ignition off.

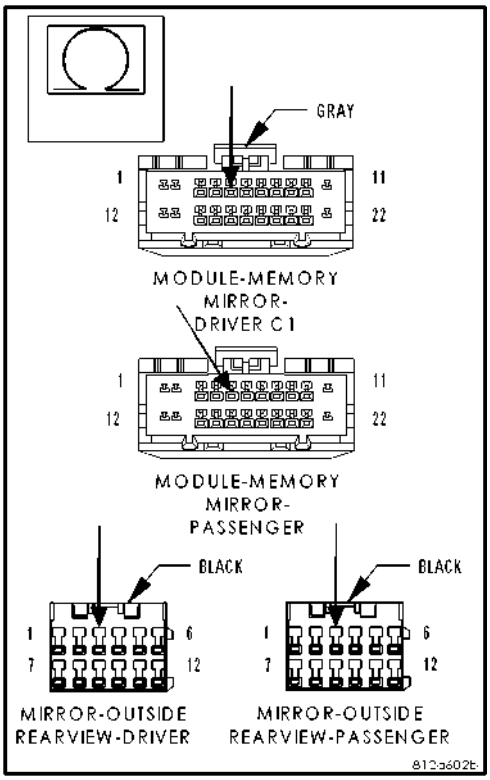
Disconnect the appropriate Memory Mirror Module connector.

Measure the resistance of the (P75) or (P74) Mirror Horizontal Motor Driver circuit between the mirror connector and the module connector.

Is the resistance below 2.0 ohms?

No >> Repair the (P75) or (P74) Mirror Horizontal Motor Driver circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

Yes >> Replace the appropriate Memory Mirror Module.
Perform BODY VERIFICATION TEST - VER 1.



BODY VERIFICATION TEST – VER 1

Diagnostic Test

1. Perform Body Verification Test

Disconnect all jumper wires and reconnect all previously disconnected components and connectors.

Ensure that all accessories are turned off.

Ensure that the battery is fully charged.

Turn the ignition on.

With the scan tool, record and erase DTCs from all modules.

If repairs were made to any of the HVAC door actuator circuits, with the scan tool in HVAC, select System Tests and then select Actuator DTC Detection. The test must pass before proceeding to the next step.

If repairs were made to any of the HVAC doors, linkage, door actuators, or door actuator circuits, with the scan tool in HVAC, select System Tests and then select Actuator Calibration Test. The test must pass before proceeding to the next step.

Turn the ignition off, wait 10 seconds, and then turn the ignition on.

Operate all functions of the system that caused the original concern.

With the scan tool, select ECU View.

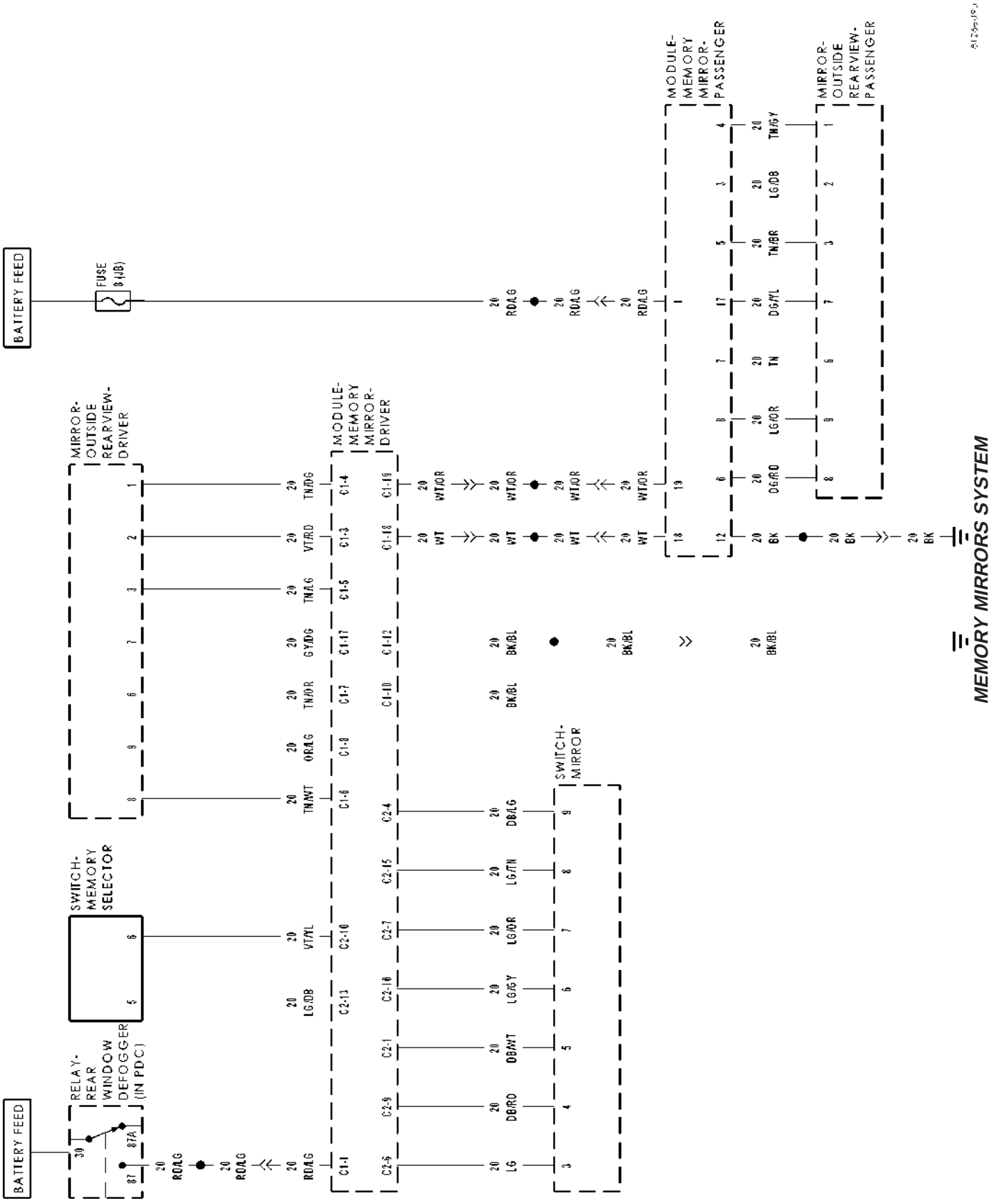
Check for DTCs in the modules.

Are DTCs present in any of the modules or is the original condition still present?

Yes >> The repair is not complete. Refer to the related category for the DTC or symptom that is still present.

No >> The repair is complete.

SCHEMATICS AND DIAGRAMS



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POWER MIRRORS - SERVICE INFORMATION

DESCRIPTION

AUTOMATIC DAY/NIGHT MIRROR

The automatic day/night mirror system is able to automatically change the reflectance of the inside rear view mirror in order to reduce the glare of headlamps approaching the vehicle from the rear. The automatic day/night rear view mirror receives battery current through a fuse in the junction block only when the ignition switch is in the On position.

OUTSIDE REAR VIEW MIRROR

The power operated rear view mirrors allow the driver to adjust both outside mirrors electrically from the driver side front seat position by operating a switch on the driver side front door trim panel. The power mirrors receive a non-switched battery feed through a fuse in the junction block so that the system will remain operational, regardless of the ignition switch position.

OPERATION

AUTOMATIC DAY/NIGHT MIRROR

A switch located on the bottom of the automatic day/night mirror housing allows the vehicle operator to select whether the automatic dimming feature is operational. When the automatic day/night mirror is turned on, the mirror switch is lighted by an integral Light-Emitting Diode (LED). The mirror will automatically disable its self-dimming feature whenever the vehicle is being driven in reverse.

DIAGNOSIS AND TESTING

POWER MIRRORS

For complete circuit diagrams, refer to the appropriate wiring information.

1. Check the fuses in the Power Distribution Center (PDC) and the junction block. If OK, go to Step 2. If not OK, repair the shorted circuit or component as required and replace the faulty fuse(s).
2. Check for battery voltage at the fuse in the junction block. If OK, go to Step 3. If not OK, repair the open circuit to the PDC as required.

3. Disconnect and isolate the battery negative cable. Remove the driver side power window switch and bezel assembly and unplug the wire harness connector from the power mirror switch. Connect the battery negative cable. Check for battery voltage at the fused B(+) circuit cavity in the door wire harness half of the power mirror switch wire harness connector. If OK, go to Step 4. If not OK, repair the open circuit to the junction block as required.
4. Disconnect and isolate the battery negative cable. Check for continuity between the ground circuit cavity in the door wire harness half of the power mirror switch wire harness connector and a good ground. There should be continuity. If OK, (Refer to 8 - ELECTRICAL/POWER MIRRORS/SIDEVIEW MIRROR - DIAGNOSIS AND TESTING). If not OK, repair open in the ground circuit.

MIRROR-INSIDE REARVIEW

DESCRIPTION

The automatic day/night mirror uses a thin layer of electrochromic material between two pieces of conductive glass to make up the face of the mirror. When the mirror switch is in the On position, two photocell sensors are used by the mirror circuitry to monitor external light levels and adjust the reflectance of the mirror.

OPERATION

The ambient photocell sensor is located on the forward-facing (windshield side) of the rear view mirror housing, and detects the ambient light levels outside of the vehicle. The headlamp photocell sensor is located inside the rear view mirror housing behind the mirror glass and faces rearward, to detect the level of the light being received at the rear window side of the mirror. When the circuitry of the automatic day/night mirror detects that the difference between the two light levels is too great (the light level received at the rear of the mirror is much higher than that at the front of the mirror), it begins to darken the mirror.

The automatic day/night mirror circuitry also monitors the transmission using an input from the backup lamp circuit. The mirror circuitry is programmed to automatically disable its self-dimming feature whenever it senses that the transmission backup lamp circuit is energized.

The automatic day/night mirror is a completely self-contained unit and cannot be repaired. If faulty or damaged, the entire mirror assembly must be replaced.

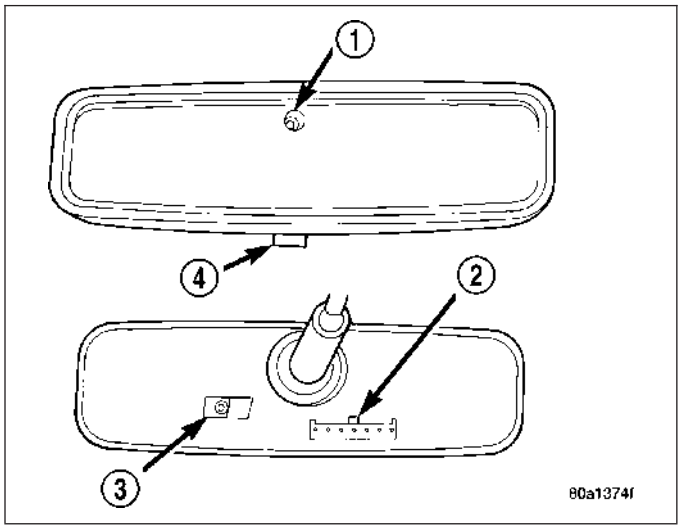
DIAGNOSIS AND TESTING

AUTOMATIC DAY/NIGHT MIRROR

For complete circuit diagrams, refer to the appropriate wiring information.

1. Check the fuse in the junction block. If OK, go to Step 2. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.
2. Turn the ignition switch to the On position. Check for battery voltage at the fuse in the junction block. If OK, go to Step 3. If not OK, repair the open circuit to the ignition switch as required.
3. Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Unplug the wire harness connector from the automatic day/night mirror. Connect the battery negative cable. Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output (run/start) circuit cavity of the automatic day/night mirror wire harness connector. If OK, go to Step 4. If not OK, repair the open circuit to the junction block as required.

4. Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Check for continuity between the ground circuit cavity of the automatic day/night mirror wire harness connector and a good ground. There should be continuity. If OK, go to Step 5. If not OK, repair the circuit to ground as required.
5. Connect the battery negative cable. Turn the ignition switch to the On position. Apply the parking brake. Place the transmission gear selector lever in the Reverse position. Check for battery voltage at the backup lamp switch output circuit cavity of the automatic day/night mirror wire harness connector. If OK, go to Step 6. If not OK, repair the open circuit as required.



6. Turn the ignition switch to the Off position. Disconnect the battery negative cable. Plug in the automatic day/night mirror wire harness connector. Connect the battery negative cable. Turn the ignition switch to the On position. Place the transmission gear selector lever in the Neutral position. Place the mirror switch in the On (the LED in the mirror switch is lighted) position. Cover the forward facing ambient photocell sensor to keep out any ambient light.

Note: The ambient photocell sensor must be covered completely, so that no light reaches the sensor. Use a finger pressed tightly against the sensor, or cover the sensor completely with electrical tape.

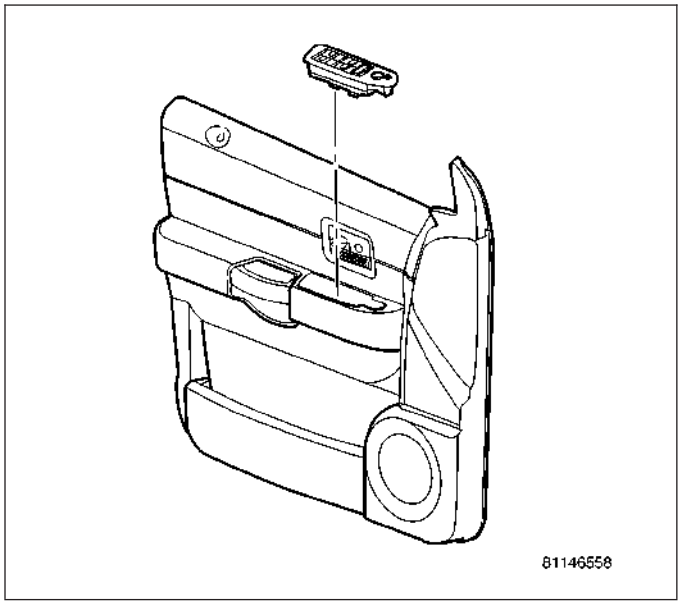
7. Shine a light into the rearward facing headlamp photocell sensor. The mirror glass should darken. If OK, go to Step 8. If not OK, replace the faulty automatic day/night mirror unit.
8. With the mirror glass darkened, place the transmission gear selector lever in the Reverse position. The mirror should return to its normal reflectance. If not OK, replace the faulty automatic day/night mirror.

SWITCH-MIRROR

DESCRIPTION

A power mirror switch is located on the driver's door trim panel, attached to the window/lock switch. The power mirror switch includes the following:

- **Power Mirror Selector Switch -** A three-position rotary joystick switch selects the right or left power mirror for adjustment, or turns the power mirror system Off in the center position.
- **Power Mirror Adjustment Switch -** A momentary joystick directional switch allows the driver to adjust the selected power mirror in the Up, Down, Right or Left directions.



OPERATION

The power mirror switch circuitry is connected to battery current through a fuse in the IPM on a fused B(+) circuit so that the power mirrors remain operational regardless of the ignition switch position. A rotary joystick selector switch has three positions, one to select the right mirror, one to select the left mirror, and a center Off position. After the right or left mirror is selected, the joystick is moved to move the selected mirror Up, Down, Right or Left. In vehicles without Memory Mirrors the power mirror switch circuitry controls the battery current and ground feeds to each of the four (two in each mirror head) power mirror motors. In vehicles with Memory Mirrors the mirror switch connects to the driver power mirror module. The driver memory mirror module uses the mirror switch inputs to control the battery current and ground feeds to driver mirror motor and sends a CAN Bus message to the passenger mirror module. The passenger mirror module controls the battery current and ground feeds to passenger mirror motors based on the CAN bus message from the driver memory module.

DIAGNOSIS AND TESTING

POWER MIRROR SWITCH

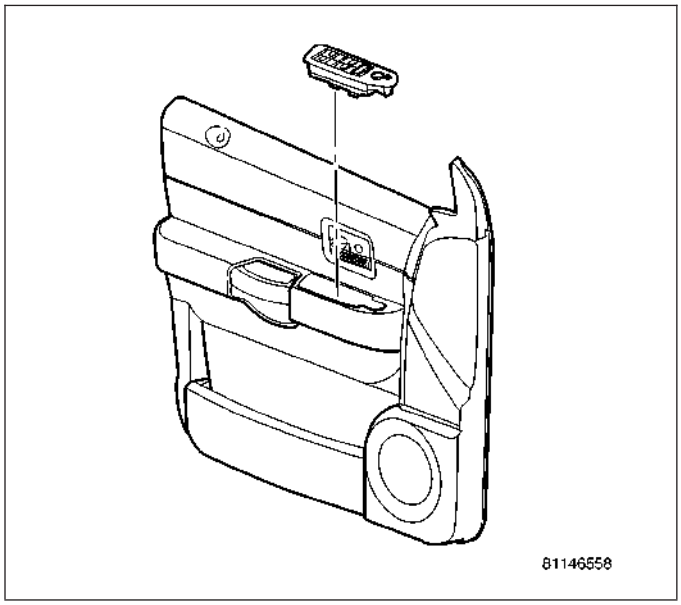
1. Disconnect and isolate the battery negative cable. Remove the power mirror switch. Disconnect the wire harness connector from the switch.
2. Test the switch continuity. See the Switch Tests chart to determine if the continuity is correct for the suspect switch in each switch position. If not OK, replace the inoperative switch as required.

POWER MIRROR SWITCH TEST

SWITCH POSITION	CONTINUITY BETWEEN PINS OF MIRROR SWITCH
LEFT MIRROR SELECTED	
UP	PINS 5 & 7, PINS 4 & 3
DOWN	PINS 4 & 7, PINS 5 & 3
RIGHT	PINS 4 & 9, PINS 5 & 3
LEFT	PINS 4 & 3, PINS 5 & 9
RIGHT MIRROR SELECTED	
UP	PINS 4 & 3, PINS 5 & 6
DOWN	PINS 4 & 6, PINS 5 & 3
RIGHT	PINS 4 & 8, PINS 5 & 3
LEFT	PINS 4 & 3, PINS 5 & 8

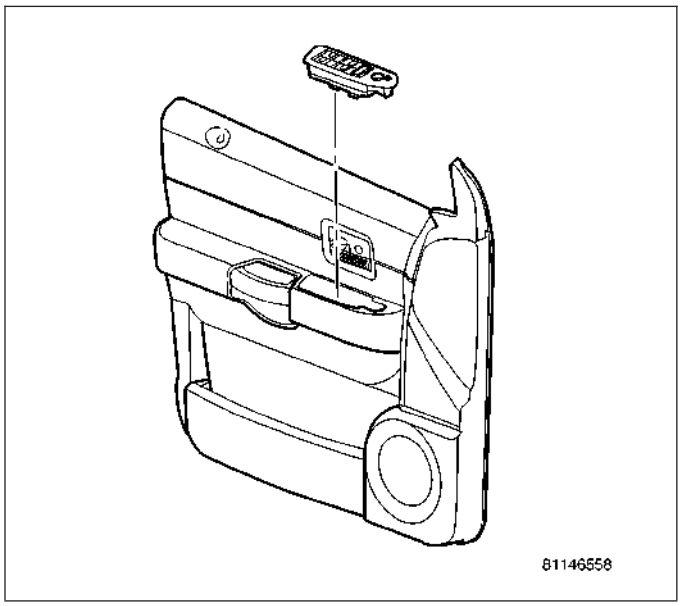
REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Remove the window/lock switch (Refer to 8 - ELECTRICAL/POWER LOCKS/POWER LOCK SWITCH - REMOVAL).
3. Remove the power mirror switch from the window/ lock switch assembly.



INSTALLATION

1. Install power mirror switch to window/lock switch assembly.
2. Connect wire harness connectors to switches.
3. Install window/lock switch assembly (Refer to 8 - ELECTRICAL/POWER LOCKS/POWER LOCK SWITCH - INSTALLATION).
4. Connect battery negative cable.



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POWER SEATS - ELECTRICAL DIAGNOSTICS

DIAGNOSIS AND TESTING

B1D62–POWER SEAT SWITCH STUCK

For the Power Seat System circuit diagram(Refer to 8 - ELECTRICAL/POWER SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

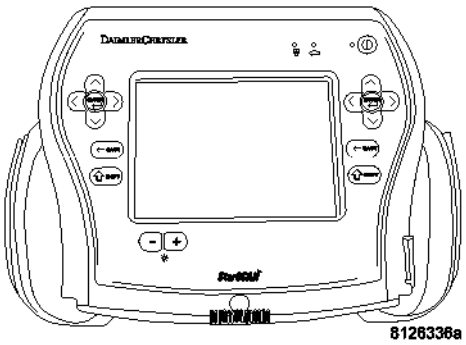
- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Seat Memory Module detects the switch engaged in an active position for over 50 seconds, this code will set.

Possible Causes
DRIVER SEAT SWITCH

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase DTC's
Press the Seat Switch in all directions several times.
Wait one minute.
With the scan tool, read DTC's.

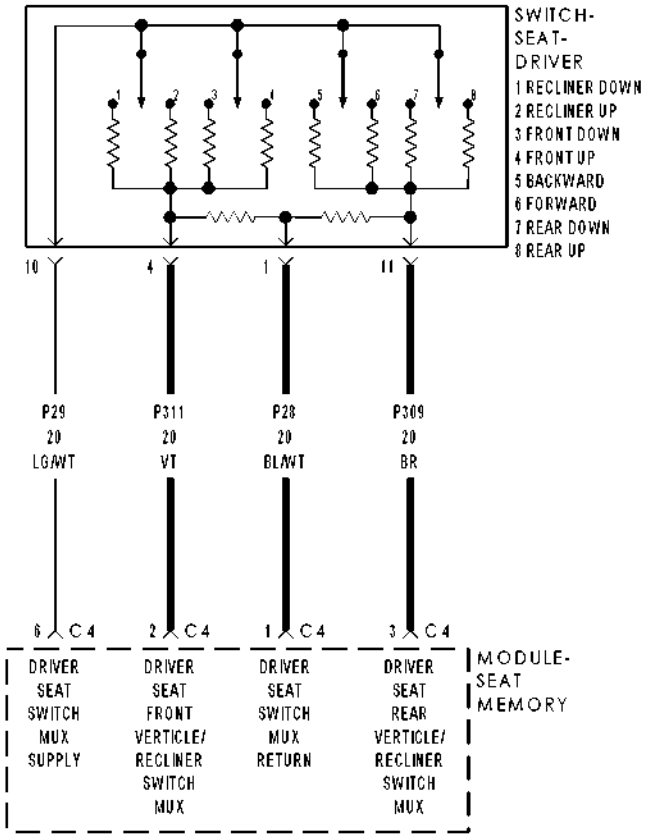


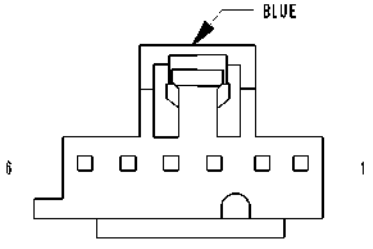
Does the scan tool display B1D62–POWER SEAT SWITCH STUCK?

Yes >> Replace the Driver Seat Switch as necessary.
Perform POWER SEAT SYSTEM VERIFICATION TEST - VER 1.

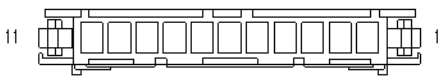
No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform POWER SEAT SYSTEM VERIFICATION TEST - VER 1.

B1D63–POWER SEAT SWITCH OPEN





MODULE-SEAT MEMORY C4



SWITCH-SEAT-DRIVER

8129d78c

B1D63–POWER SEAT SWITCH OPEN — (CONTINUED)

For the Power Seat System circuit diagram(Refer to 8 - ELECTRICAL/POWER SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

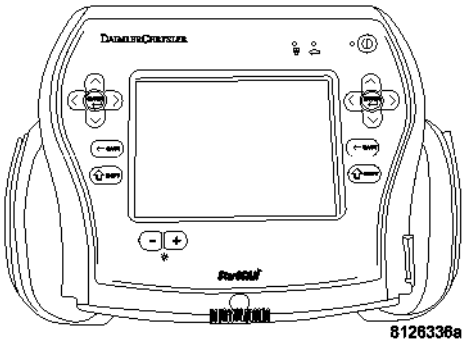
- **When Monitored:**
  Continuously
- **Set Condition:**
  When the Seat Memory Module detects an open driver seat switch MUX circuit this code will set.

Possible Causes
(P309) DRIVER SEAT REAR VERTICAL/HORIZONTAL SWITCH MUX OPEN
(P311) DRIVER SEAT FRONT VERTICAL/RECLINER SWITCH MUX OPEN
(P28) DRIVER SEAT SWITCH MUX RETURN OPEN
DRIVER SEAT SWITCH
SEAT MEMORY MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase DTC's
Press the Seat Switch in all directions several times.
Wait one minute.
With the scan tool, read DTC's.



Does the scan tool display B1D63–POWER SEAT SWITCH OPEN?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform POWER SEAT SYSTEM VERIFICATION TEST - VER 1.

---

2. CHECK THE (P309) DRIVER SEAT REAR VERTICAL/ HORIZONTAL SWITCH MUX CIRCUIT RESISTANCE

Disconnect the Seat Memory Module C4 connector.

Note: Check connectors - Clean and repair as necessary.
Measure the resistance between the (P309) Driver Seat Rear Vertical/ Horizontal Switch MUX circuit and the (P28) Driver Seat Switch MUX Return circuit in the C4 connector.

Is the resistance 47.0 ohms + or – 1.0?

Yes >> Go To 3

No >> Go To 5

B1D63–POWER SEAT SWITCH OPEN — (CONTINUED)

3. CHECK THE (P311) DRIVER SEAT FRONT VERTICAL/ RECLINER SWITCH MUX CIRCUIT RESISTANCE

Measure the resistance between the (P311) Driver Seat Front Vertical/ Recliner Switch MUX circuit and the (P28) Driver Seat Switch MUX Return circuit in the C4 connector.

Is the resistance 47.0 ohms + or – 1.0?

Yes >> Replace the Seat Memory Module.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

No >> Go To 4

---

4. CHECK THE (P311) DRIVER SEAT FRONT VERTICAL/ RECLINER SWITCH MUX WIRE RESISTANCE Disconnect the Driver Seat Switch.

Note: Note:Check connectors - Clean and repair as necessary.
Measure the resistance of the (P311) Driver Seat Front Vertical/Recliner Switch MUX circuit between the C4 connector and the Driver Seat Switch connector.

Is the resistance below 1.0 ohm?

Yes >> Replace the Driver Seat Switch.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

No >> Repair the (P311) Driver Seat Front Vertical/Recliner Switch MUX circuit for an open.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

---

5. CHECK THE (P309) DRIVER SEAT REAR VERTICAL/ HORIZONTAL SWITCH MUX WIRE RESISTANCE

Measure the resistance of the (P309) Driver Seat Rear Vertical/Horizontal Switch MUX circuit between the C4 connector and the Driver Seat Switch connector.

Is the resistance below 1.0 ohm?

Yes >> Go To 6

No >> Repair the (P309) Driver Seat Rear Vertical/Horizontal Switch MUX circuit for an open.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

B1D63–POWER SEAT SWITCH OPEN — (CONTINUED)

6. CHECK THE (P28) DRIVER SEAT SWITCH MUX RETURN WIRE RESISTANCE

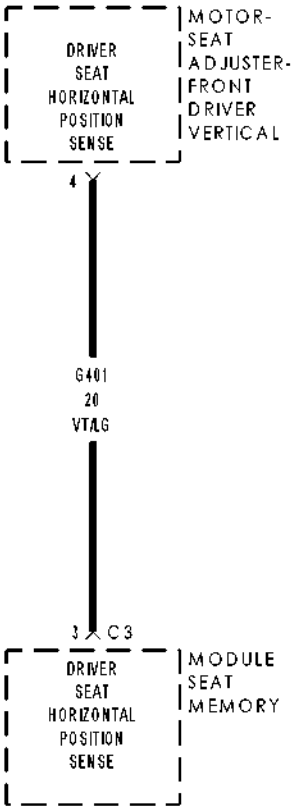
Measure the resistance of the (P28) Driver Seat Switch MUX Return circuit between the C4 connector and the Driver Seat Switch connector.

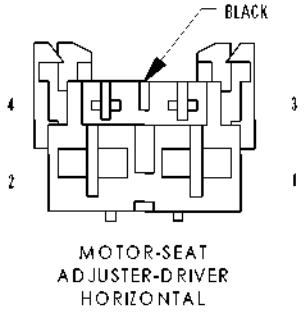
Is the resistance below 1.0 ohm?

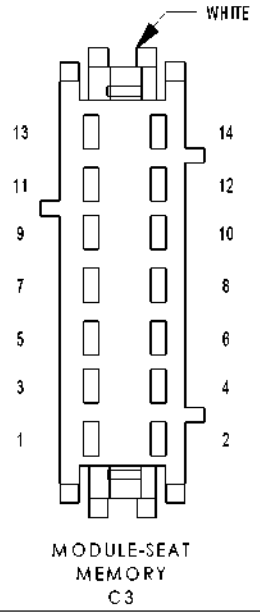
Yes >> Replace the Driver Seat Switch.
Perform BODY VERIFICATION TEST – VER 1

No >> Repair the (P28) Driver Seat Switch MUX Return circuit for an open.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

B1D6D–SEAT HORIZONTAL POSITION SENSOR CIRCUIT LOW







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B1D6D–SEAT HORIZONTAL POSITION SENSOR CIRCUIT LOW — (CONTINUED)

For the Power Seat System circuit diagram(Refer to 8 - ELECTRICAL/POWER SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the seat motor is activated (sensor supply voltage is switched on whenever motor is activated).
- **Set Condition:**
  If sensor voltage is not within a specified range this DTC will set. This DTC will only set when the seat switch is moved in the same direction three consecutive times.

Possible Causes
(G401) DRIVER SEAT HORIZONTAL POSITION SENSE CIRCUIT SHORTED TO GROUND
DRIVER HORIZONTAL SEAT ADJUSTER MOTOR
SEAT MEMORY MODULE

Diagnostic Test

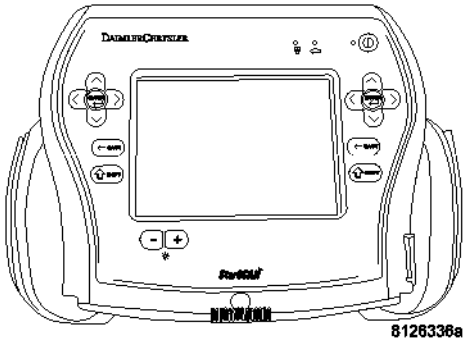
1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase DTC's
Move the Seat Switch in the Horizontal position 3 times.
With the scan tool, read DTC's.

Does the scan tool display B1D6D–SEAT HORIZONTAL POSITION SENSOR CIRCUIT LOW?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform POWER SEAT SYSTEM VERIFICATION TEST - VER 1.



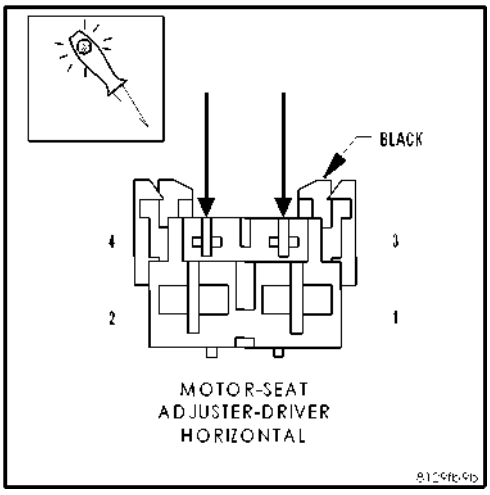
B1D6D–SEAT HORIZONTAL POSITION SENSOR CIRCUIT LOW — (CONTINUED)

2. CHECK THE (G401) DRIVER SEAT HORIZONTAL POSITION SENSE VOLTAGE

Disconnect the Driver Horizontal Seat Adjuster Motor.

Note: Check connectors – Clean and repair as necessary.
Move the Seat Switch in the Horizontal position during the next step.

Using a 12-volt test light connect one lead to the (G401) Driver Seat Horizontal Position Sense circuit and the other lead to Driver Seat Horizontal Sensor Ground at the Driver Horizontal Seat Adjuster Motor connector.



Does the test light illuminate for approximately 2 seconds then turn off with the seat switch engaged?

Yes >> Replace the seat track horizontal motor assembly.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

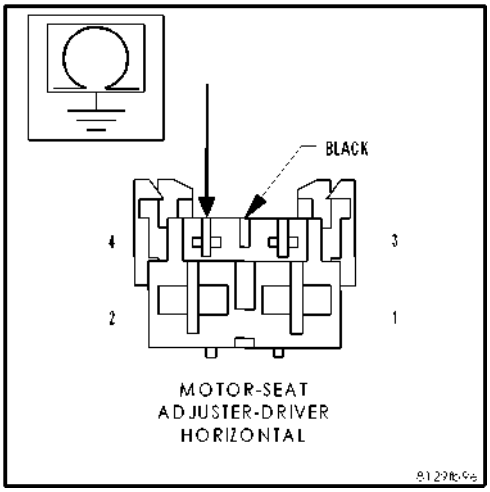
No >> Go To 3

---

3. CHECK THE (G401) DRIVER SEAT HORIZONTAL POSITION SENSE WIRE FOR A SHORT TO GROUND

Disconnect the Seat Memory Module C3 connector.

Note: Check connectors – Clean and repair as necessary.
Measure the resistance of the (G401) Driver Seat Horizontal Position Sense wire at the Driver Horizontal Seat Adjuster Motor connector to ground.

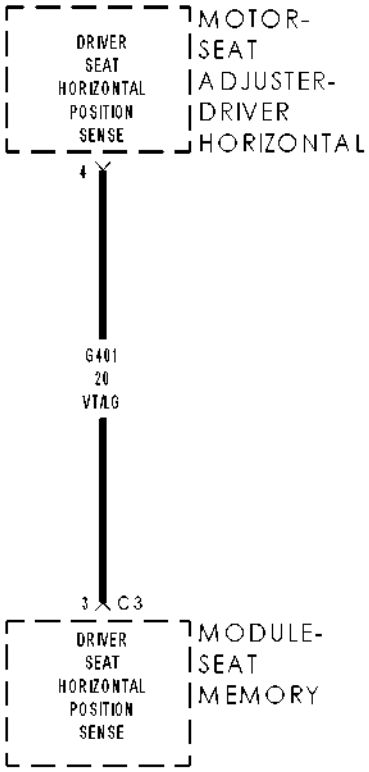


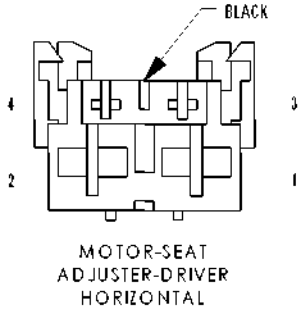
Is the resistance below 1000.0 ohm?

Yes >> Repair the (G401) Driver Seat Horizontal Position Sense circuit for a short to ground.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

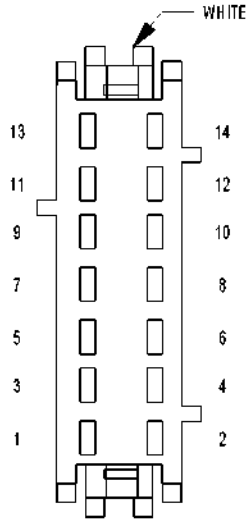
No >> Replace the Seat Memory Module.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

B1D6E–SEAT HORIZONTAL POSITION SENSOR CIRCUIT HIGH





MOTOR-SEAT
ADJUSTER-DRIVER
HORIZONTAL



MODULE-SEAT
MEMORY
C3

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B1D6E–SEAT HORIZONTAL POSITION SENSOR CIRCUIT HIGH — (CONTINUED)

For the Power Seat System circuit diagram(Refer to 8 - ELECTRICAL/POWER SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the seat motor is activated (sensor supply voltage is switched on whenever motor is activated).
- **Set Condition:**
  If during motor operation the sensor voltage is not within a specified range this code will set. This DTC will only set when the seat switch is moved in the same direction three consecutive times.

Possible Causes
(G401) DRIVER SEAT HORZONTAL POSITION SENSE CIRCUIT SHORTED TO VOLTAGE
DRIVER RECLINER SEAT ADJUSTER MOTOR
SEAT MEMORY MODULE

Diagnostic Test

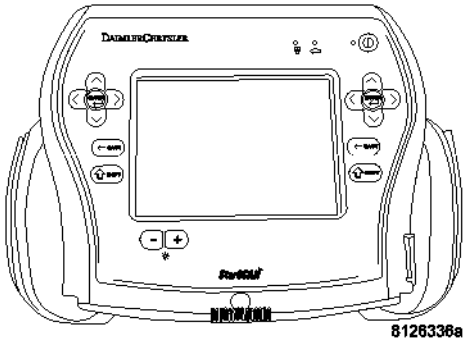
1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase DTC's
Move the seat switch in the horizontal position 3 times.
With the scan tool, read DTC's.

Does the scan tool display B1D6E–SEAT HORIZONTAL POSITION SENSOR CIRCUIT HIGH?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform POWER SEAT SYSTEM VERIFICATION TEST - VER 1.



B1D6E–SEAT HORIZONTAL POSITION SENSOR CIRCUIT HIGH — (CONTINUED)

2. CHECK THE (G401) DRIVER SEAT HORIZONTAL POSITION SENSE VOLTAGE

Disconnect the Driver Horizontal Seat Adjuster Motor.

Note: Check connectors – Clean and repair as necessary.

With the scan tool erase DTC's

Move the seat switch in the horizontal positions 3 times.

With the scan tool, read DTC's.

Does the same DTC reset?

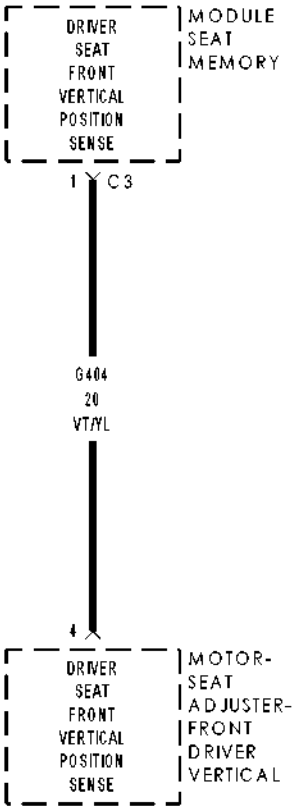
No >> Inspect the position sense wire for a possible intermittent short to voltage from another circuit, if OK replace the Driver Horizontal Seat Adjuster Motor assembly.

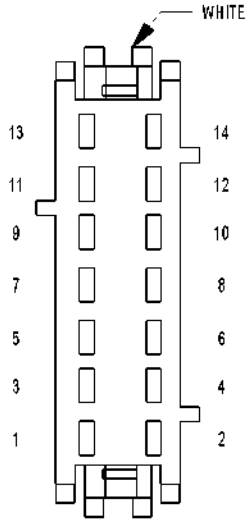
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

Yes >> Inspect the position sense wire for a possible short to voltage from another circuit, if OK replace the Seat Memory Module.

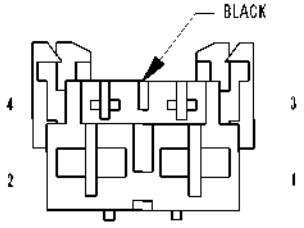
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

B1D71–SEAT FRONT VERTICAL POSITION SENSOR CIRCUIT LOW





MODULE-SEAT MEMORY C3



MOTOR-SEAT ADJUSTER-FRONT DRIVER VERTICAL

812a2a27

B1D71–SEAT FRONT VERTICAL POSITION SENSOR CIRCUIT LOW — (CONTINUED)

For the Power Seat System circuit diagram(Refer to 8 - ELECTRICAL/POWER SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the seat motor is activated (sensor supply voltage is switched on whenever motor is activated).
- **Set Condition:**
  If sensor voltage is not within a specified range this DTC will set. This DTC will only set when the seat switch is moved in the same direction three consecutive times.

Possible Causes
(G404) DRIVER SEAT FRONT VERTICAL POSITION SENSE CIRCUIT SHORTED TO GROUND
FRONT DRIVER VERTICAL SEAT ADJUSTER MOTOR
SEAT MEMORY MODULE

Diagnostic Test

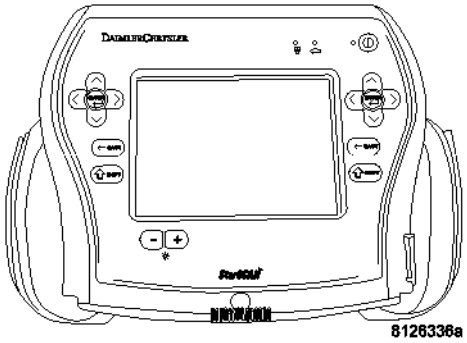
1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase DTC's
Move the Seat Switch in the Front Vertical position 3 times.
With the scan tool, read DTC's.

Does the scan tool display B1D71–SEAT FRONT VERTICAL POSITION SENSOR CIRCUIT LOW?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform POWER SEAT SYSTEM VERIFICATION TEST - VER 1.



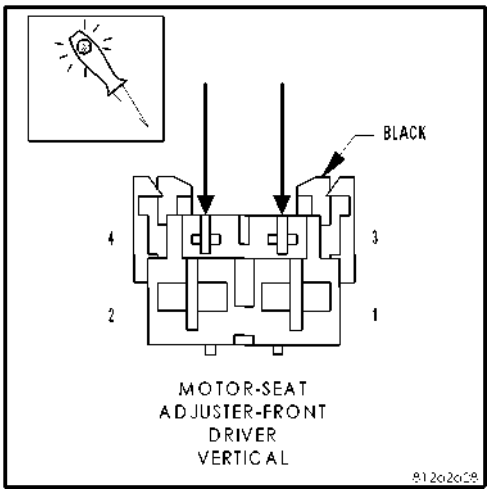
B1D71–SEAT FRONT VERTICAL POSITION SENSOR CIRCUIT LOW — (CONTINUED)

2. CHECK THE (G404) DRIVER SEAT FRONT VERTICAL POSITION SENSE VOLTAGE

Disconnect the Front Driver Vertical Seat Adjuster Motor.

Note: Check connectors – Clean and repair as necessary.
Move the seat switch in the front vertical position during the next step.

Using a 12-volt test light connect one lead to the (G404) Driver Seat Front Vertical Position Sense circuit and the other lead to the Driver Seat Front Vertical Sensor Ground at the Front Driver Seat Adjuster Motor connector.



Does the test light illuminate for approximately 2 seconds then turn off with the seat switch engaged?

Yes >> Replace the Front Driver Seat Adjuster Motor assembly.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

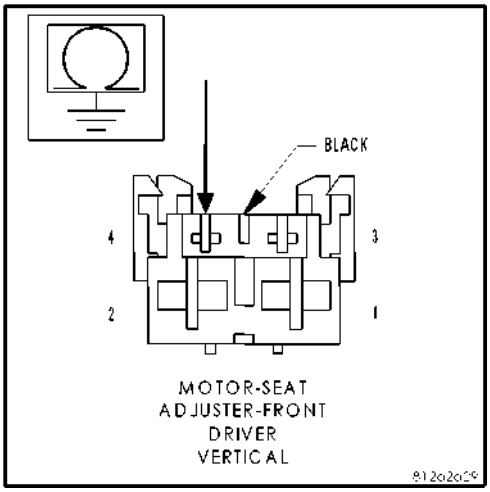
No >> Go To 3

---

3. CHECK THE (G404) DRIVER SEAT FRONT VERTICAL POSITION SENSE WIRE FOR A SHORT TO GROUND

Disconnect the Seat Memory Module C3 connector.

Note: Check connectors – Clean and repair as necessary.
Measure the resistance of the (G404) Driver Seat Front Vertical Position Sense wire at the Front Driver Vertical Seat Adjuster Motor connector to ground.

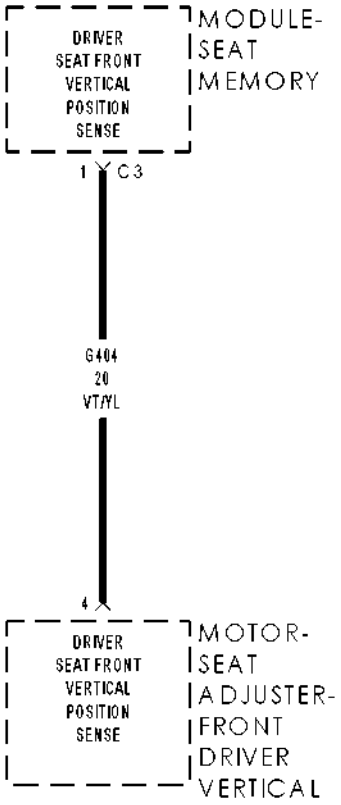


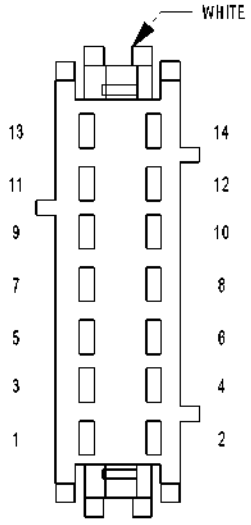
Is the resistance below 1000.0 ohm?

Yes >> Repair the (G404) Driver Seat Front Vertical Position Sense circuit for a short to ground.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

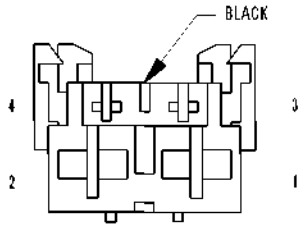
No >> Replace the Seat Memory Module.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

B1D72–SEAT FRONT VERTICAL POSITION SENSOR CIRCUIT HIGH





MODULE-SEAT MEMORY C3



MOTOR-SEAT ADJUSTER-FRONT DRIVER VERTICAL

812ci7a-c4

B1D72–SEAT FRONT VERTICAL POSITION SENSOR CIRCUIT HIGH — (CONTINUED)

For the Power Seat System circuit diagram(Refer to 8 - ELECTRICAL/POWER SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the seat motor is activated (sensor supply voltage is switched on whenever motor is activated).
- **Set Condition:**
  If during motor operation the sensor voltage is not within a specified range this code will set. This DTC will only set when the seat switch is moved in the same direction three consecutive times.

Possible Causes
(G404) DRIVER SEAT FRONT VERTICAL POSITION SENSE CIRCUIT SHORTED TO VOLTAGE
REAR DRIVER VERTICAL SEAT ADJUSTER MOTOR
SEAT MEMORY MODULE

Diagnostic Test

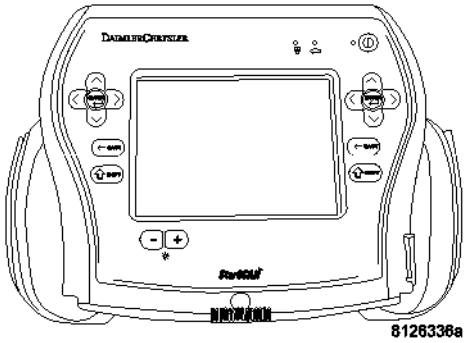
1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase DTC's
Move the seat switch front vertical position 3 times.
With the scan tool, read DTC's.

Does the scan tool display B1D72–SEAT FRONT VERTICAL POSITION SENSOR CIRCUIT HIGH?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform POWER SEAT SYSTEM VERIFICATION TEST - VER 1.



B1D72–SEAT FRONT VERTICAL POSITION SENSOR CIRCUIT HIGH — (CONTINUED)

2. CHECK THE (G404) DRIVER SEAT FRONT VERTICAL POSITION SENSE VOLTAGE

Disconnect the Front Driver Vertical Seat Adjuster Motor.

Note: Check connectors – Clean and repair as necessary.

With the scan tool erase DTC's

Move the seat switch in the both front vertical positions 3 times.

With the scan tool, read DTC's.

Does the same DTC reset?

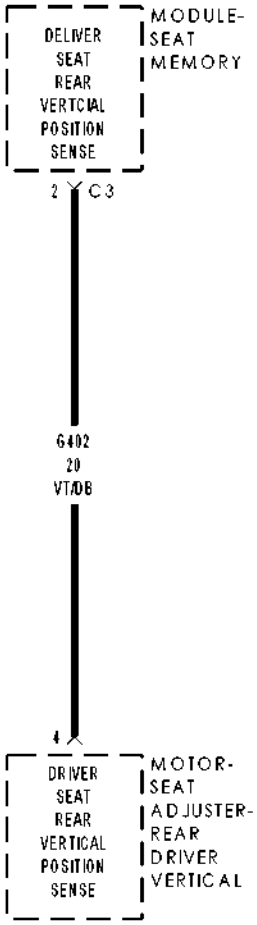
No >> Inspect the position sense wire for a possible intermittent short to another circuit, if OK replace the Front Driver Vertical Seat Adjuster Motor assembly.

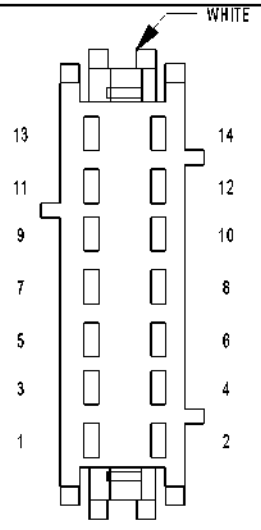
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

Yes >> Inspect the position sense wire for a possible short to another circuit, if OK replace the Seat Memory Module.

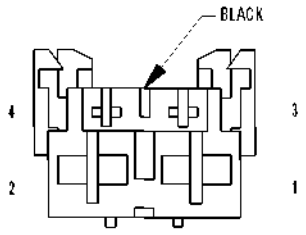
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

B1D75–SEAT REAR VERTICAL POSITION SENSOR CIRCUIT LOW





MODULE-SEAT MEMORY C3



MOTOR-SEAT ADJUSTER-REAR DRIVER VERTICAL

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B1D75–SEAT REAR VERTICAL POSITION SENSOR CIRCUIT LOW — (CONTINUED)

For the Power Seat System circuit diagram(Refer to 8 - ELECTRICAL/POWER SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the seat motor is activated (sensor supply voltage is switched on whenever motor is activated).
- **Set Condition:**
  If sensor voltage is not within a specified range this DTC will set. This DTC will only set when the seat switch is moved in the same direction three consecutive times.

Possible Causes
(G402) DRIVER SEAT REAR VERTICAL POSITION SENSE CIRCUIT SHORTED TO GROUND
REAR DRIVER VERTICAL SEAT ADJUSTER MOTOR
SEAT MEMORY MODULE

Diagnostic Test

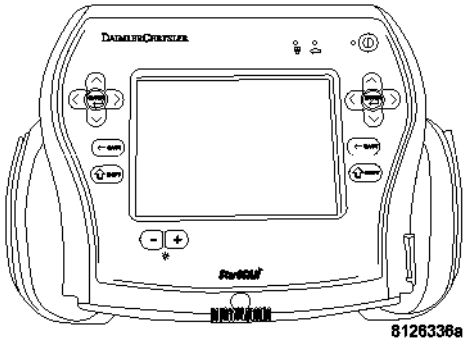
1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase DTC's
Move the Seat Switch in the Rear Vertical position 3 times.
With the scan tool, read DTC's.

Does the scan tool display B1D75–SEAT REAR VERTICAL POSITION SENSOR CIRCUIT LOW?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform POWER SEAT SYSTEM VERIFICATION TEST - VER 1.



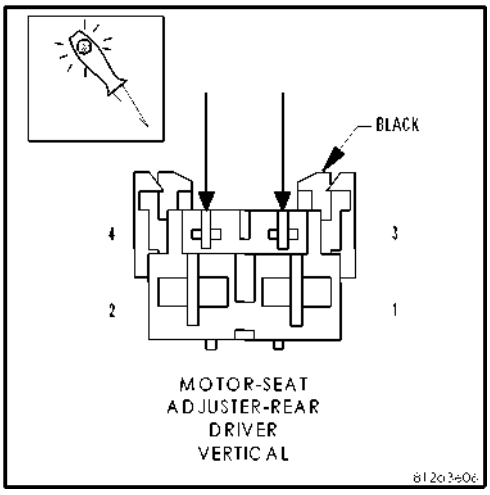
B1D75–SEAT REAR VERTICAL POSITION SENSOR CIRCUIT LOW — (CONTINUED)

2. CHECK THE (G402) DRIVER SEAT REAR VERTICAL POSITION SENSE VOLTAGE

Disconnect the Rear Driver Vertical Seat Adjuster Motor.

Note: Check connectors – Clean and repair as necessary.
Move the seat switch in the rear vertical position during the next step.

Using a 12-volt test light connect one lead to the (G402) Driver Seat Rear Vertical Position Sense circuit and the other lead to Driver Seat Rear Vertical Sensor Ground at the Rear Driver Seat Adjuster Motor connector.



Does the test light illuminate for approximately 2 seconds then turn off with the seat switch engaged?

Yes >> Replace the Rear Driver Vertical Seat Adjuster Motor assembly.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

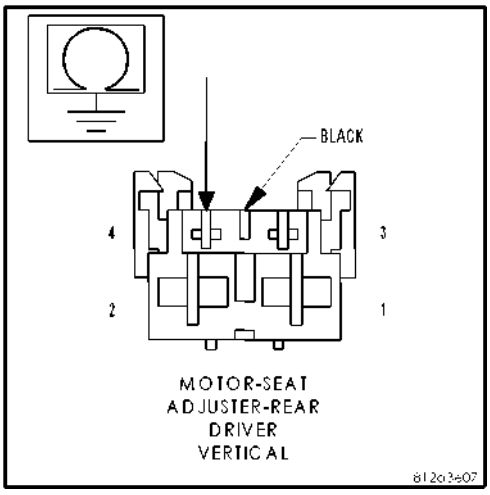
No >> Go To 3

---

3. CHECK THE (G402) DRIVER SEAT REAR VERTICAL POSITION SENSE WIRE FOR A SHORT TO GROUND

Disconnect the Seat Memory Module C3 connector.

Note: Check connectors – Clean and repair as necessary.
Measure the resistance of the (G402) Driver Seat Rear Vertical Position Sense wire at the Rear Driver Vertical Seat Adjuster Motor connector to ground.

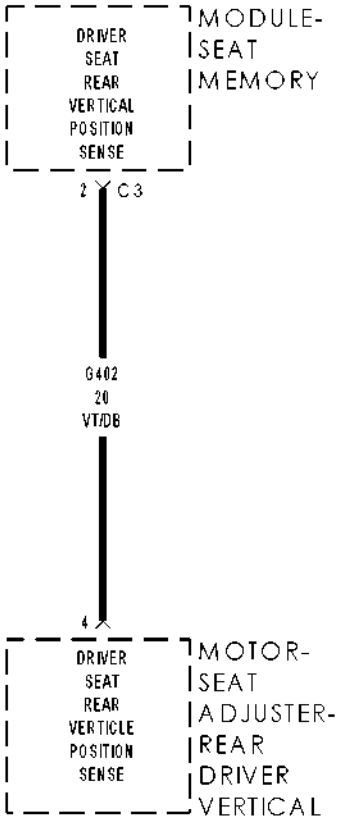


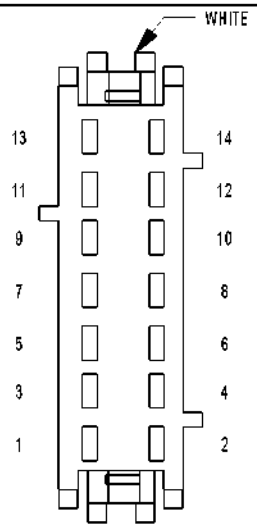
Is the resistance below 1000.0 ohm?

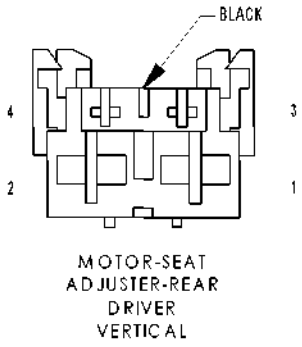
Yes >> Repair the (G402) Driver Seat Rear Vertical Position Sense circuit for a short to ground.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

No >> Replace the Seat Memory Module.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

B1D76–SEAT REAR VERTICAL POSITION SENSOR CIRCUIT HIGH







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B1D76–SEAT REAR VERTICAL POSITION SENSOR CIRCUIT HIGH — (CONTINUED)

For the Power Seat System circuit diagram(Refer to 8 - ELECTRICAL/POWER SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the seat motor is activated (sensor supply voltage is switched on whenever motor is activated).
- **Set Condition:**
  If during motor operation the sensor voltage is not within a specified range this code will set. This DTC will only set when the seat switch is moved in the same direction three consecutive times.

Possible Causes
(G402) DRIVER SEAT REAR VERTICAL POSITION SENSE CIRCUIT SHORTED TO VOLTAGE
REAR DRIVER VERTICAL SEAT ADJUSTER MOTOR
SEAT MEMORY MODULE

Diagnostic Test

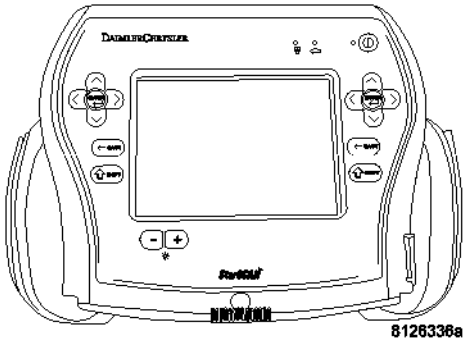
1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase DTC's
Move the seat switch rear vertical position 3 times.
With the scan tool, read DTC's.

Does the scan tool display B1D76–SEAT REAR VERTICAL POSITION SENSOR CIRCUIT HIGH?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform POWER SEAT SYSTEM VERIFICATION TEST - VER 1.



B1D76–SEAT REAR VERTICAL POSITION SENSOR CIRCUIT HIGH — (CONTINUED)

2. CHECK THE (G402) DRIVER SEAT REAR VERTICAL POSITION SENSE VOLTAGE

Disconnect the Rear Driver Vertical Seat Adjuster Motor.

Note: Check connectors – Clean and repair as necessary.

With the scan tool erase DTC's

Move the seat switch in the both rear vertical positions 3 times.

With the scan tool, read DTC's.

Does the same DTC reset?

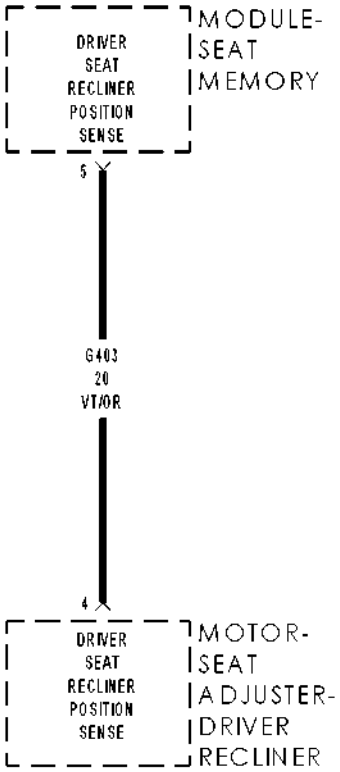
No >> Inspect the position sense wire for a possible intermittent short to voltage from another circuit, if OK replace the Rear Driver Vertical Seat Adjuster Motor assembly.

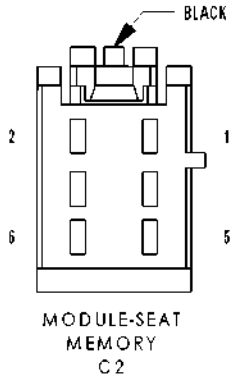
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

Yes >> Inspect the position sense wire for a possible short to voltage from another circuit, if OK replace the Seat Memory Module.

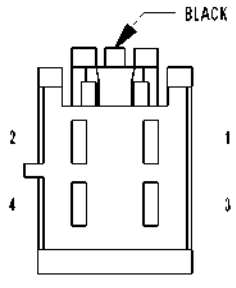
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

B1D79–SEAT BACKREST POSITION SENSOR CIRCUIT LOW





MODULE-SEAT MEMORY C2



MOTOR-SEAT ADJUSTER-DRIVER RECLINER

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B1D79–SEAT BACKREST POSITION SENSOR CIRCUIT LOW — (CONTINUED)

For the Power Seat System circuit diagram(Refer to 8 - ELECTRICAL/POWER SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the seat motor is activated (sensor supply voltage is switched on whenever motor is activated).
- **Set Condition:**
  If sensor voltage is not within a specified range this DTC will set. This DTC will only set when the seat switch is moved in the same direction three consecutive times.

Possible Causes
(G403) DRIVER SEAT RECLINER POSITION SENSE CIRCUIT SHORTED TO GROUND
DRIVER RECLINER SEAT ADJUSTER MOTOR
SEAT MEMORY MODULE

Diagnostic Test

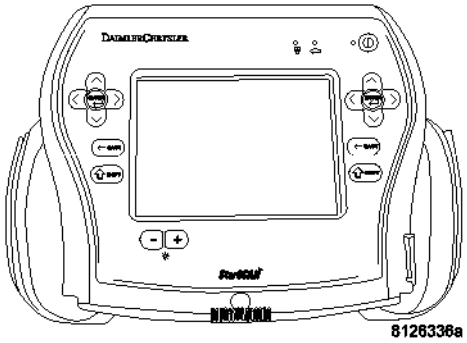
1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase DTC's
Move the Seat Switch recliner position 3 times.
With the scan tool, read DTC's.

Does the scan tool display B1D79–SEAT BACKREST POSITION SENSOR CIRCUIT LOW?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform POWER SEAT SYSTEM VERIFICATION TEST - VER 1.



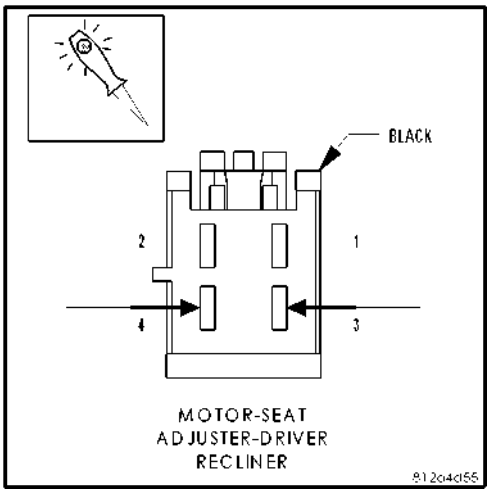
B1D79–SEAT BACKREST POSITION SENSOR CIRCUIT LOW — (CONTINUED)

2. CHECK THE (G403) DRIVER SEAT RECLINER POSITION SENSE VOLTAGE

Disconnect the Driver Recliner Seat Adjuster Motor.

Note: Check connectors – Clean and repair as necessary.
Move the seat switch in the recliner position during the next step.

Using a 12-volt test light connect one lead to the (G403) Driver Seat Recliner Position Sense circuit and the other lead to Driver Seat Recliner Position Sensor Ground at the Driver Recliner Seat Adjuster Motor connector.



Does the test light illuminate for approximately 2 seconds then turn off with the seat switch engaged?

Yes >> Replace the Driver Recliner Seat Adjuster Motor assembly.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

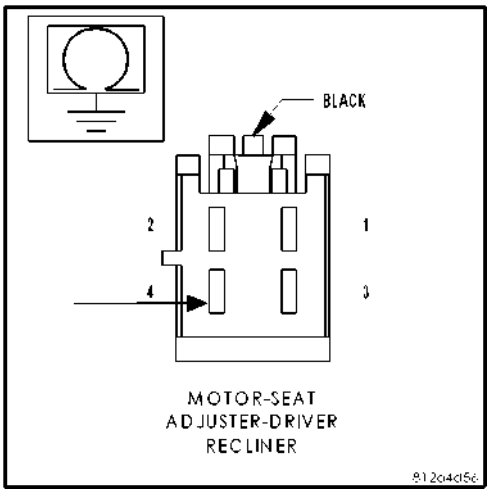
No >> Go To 3

---

3. CHECK THE (G403) DRIVER SEAT RECLINER POSITION SENSE WIRE FOR A SHORT TO GROUND

Disconnect the Seat Memory Module C2 connector.

Note: Check connectors – Clean and repair as necessary.
Measure the resistance of the (G403) Driver Seat Recliner Position Sense wire at the Driver Recliner Seat Adjuster Motor connector to ground.

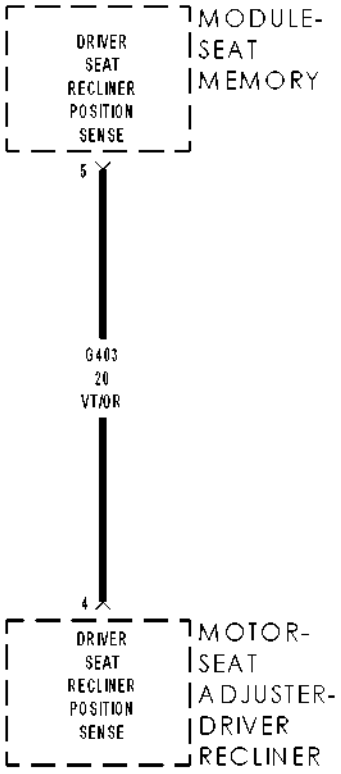


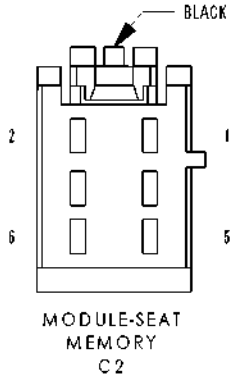
Is the resistance below 1000.0 ohm?

Yes >> Repair the (G403) Driver Seat Recliner Position Sense circuit for a short to ground.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

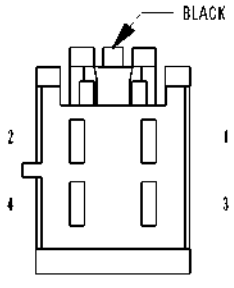
No >> Replace the Seat Memory Module.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

B1D7A–SEAT BACKREST POSITION SENSOR CIRCUIT HIGH





MODULE-SEAT MEMORY C2



MOTOR-SEAT ADJUSTER-DRIVER RECLINER

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B1D7A–SEAT BACKREST POSITION SENSOR CIRCUIT HIGH — (CONTINUED)

For the Power Seat System circuit diagram(Refer to 8 - ELECTRICAL/POWER SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the seat motor is activated (sensor supply voltage is switched on whenever motor is activated).
- **Set Condition:**
  If during motor operation the sensor voltage is not within a specified range this code will set. This DTC will only set when the seat switch is moved in the same direction three consecutive times.

Possible Causes
(G403) DRIVER SEAT RECLINER POSITION SENSE CIRCUIT SHORTED TO VOLTAGE
DRIVER RECLINER SEAT ADJUSTER MOTOR
SEAT MEMORY MODULE

Diagnostic Test

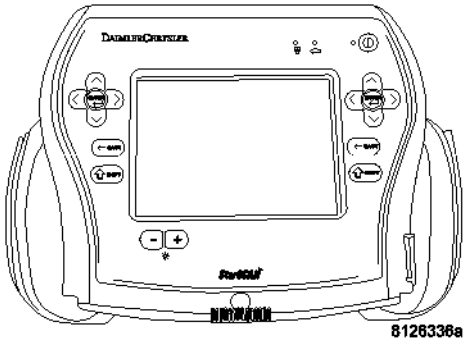
1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase DTC's
Move the seat switch recliner position 3 times.
With the scan tool, read DTC's.

Does the scan tool display B1D7A–SEAT BACKREST POSITION SENSOR CIRCUIT HIGH?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform POWER SEAT SYSTEM VERIFICATION TEST - VER 1.



B1D7A–SEAT BACKREST POSITION SENSOR CIRCUIT HIGH — (CONTINUED)

2. CHECK THE (G403) DRIVER SEAT RECLINER POSITION SENSE VOLTAGE

Disconnect the Driver Recliner Seat Adjuster Motor.

Note: Check connectors – Clean and repair as necessary.

With the scan tool erase DTC's

Move the seat switch in the both recliner positions 3 times.

With the scan tool, read DTC's.

Does the same DTC reset?

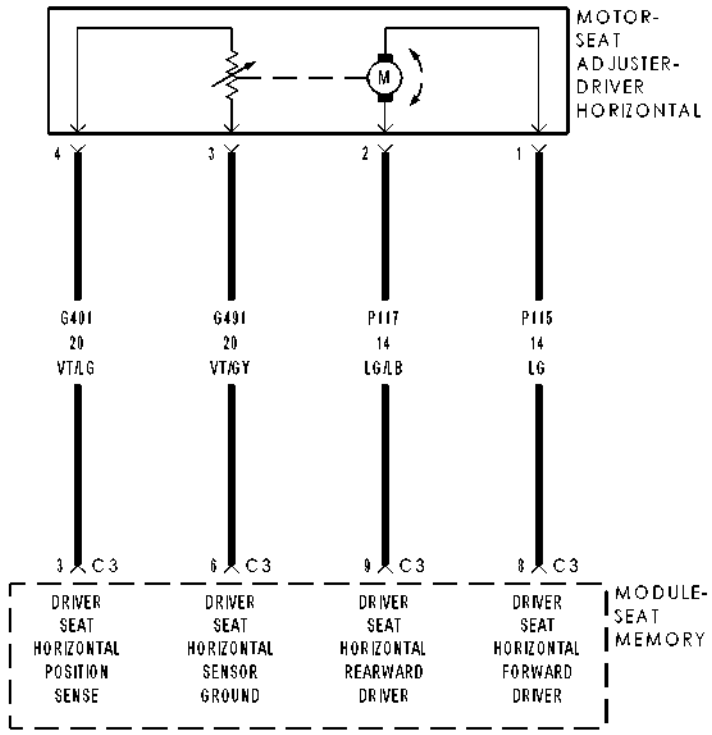
No >> Inspect the position sense wire for a possible intermittent short to voltage from another circuit, if OK replace the Driver Recliner Seat Adjuster Motor assembly.

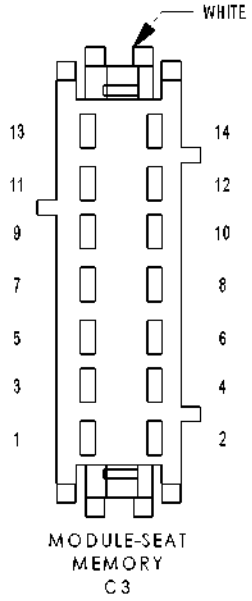
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

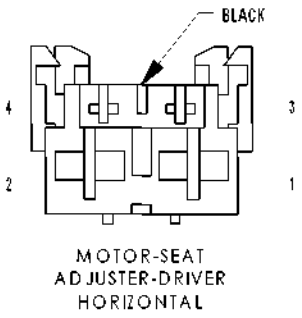
Yes >> Inspect the position sense wire for a possible short to voltage from another circuit, if OK replace the Seat Memory Module.

Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

B1D7B–SEAT HORIZONTAL MOTOR CONTROL CIRCUIT PERFORMANCE







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B1D7B–SEAT HORIZONTAL MOTOR CONTROL CIRCUIT PERFORMANCE — (CONTINUED)

For the Power Seat System circuit diagram(Refer to 8 - ELECTRICAL/POWER SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Whenever the seat motor is activated.
- **Set Condition:**
  If the Seat Memory Module does not detect the rotation of the seat motor this DTC will set. This DTC will only set when the seat switch is moved in the same direction three consecutive times.

Possible Causes
SEAT POSITION SENSOR CIRCUIT DIAGNOSTIC TROUBLE CODES
(G401) DRIVER SEAT HORIZONTAL POSITION SENSE CIRCUIT OPEN
(G491) DRIVER SEAT HORIZONTAL SENSOR GROUND CIRCUIT OPEN
(P115) DRIVER SEAT HORIZONTAL FORWARD DRIVER
(P117) DRIVER SEAT HORIZONTAL REARWARD DRIVER
DRIVER HORIZONTAL SEAT ADJUSTER MOTOR
SEAT MEMORY MODULE

Diagnostic Test

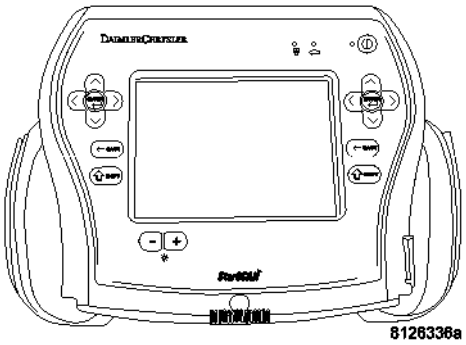
1. CHECK FOR RELATED DIAGNOSTIC TROUBLE CODES

Turn the ignition on.
With the scan tool, read DTC's.

Does the scan tool display any seat position sensor DTC's?

Yes >> Diagnose and repair the other DTC(s) first. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Go To 2



B1D7B–SEAT HORIZONTAL MOTOR CONTROL CIRCUIT PERFORMANCE — (CONTINUED)

2. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase DTC's
Move the Seat Switch in the Horizontal position 3 times.
With the scan tool, read DTC's.

Does the scan tool display B1D7B–SEAT HORIZONTAL MOTOR CONTROL CIRCUIT PERFORMANCE?

Yes >> Go To 3

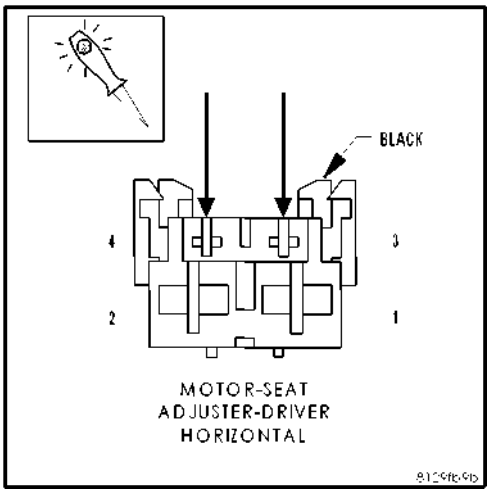
No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform POWER SEAT SYSTEM VERIFICATION TEST - VER 1.

---

3. CHECK THE (G401) DRIVER SEAT HORIZONTAL POSITION SENSE VOLTAGE

Disconnect the Driver Horizontal Seat Adjuster Motor.

Note: Check connectors – Clean and repair as necessary.
Move the Seat Switch in the Horizontal position during the next step.
Using a 12-volt test light connect one lead to the (G401) Driver Seat Horizontal Position Sense circuit and the other lead to Driver Seat Horizontal Sensor Ground at the Driver Horizontal Seat Adjuster Motor connector.



Does the test light illuminate for approximately 2 seconds then turn off with the seat switch engaged?

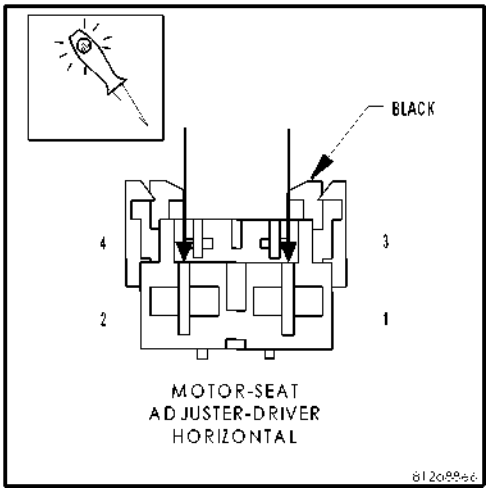
Yes >> Go To 4

No >> Go To 5

---

4. CHECK THE DRIVER SEAT HORIZONTAL FORWARD/ REARWARD DRIVER VOLTAGE

Move the Seat Switch in the Horizontal position during the next step.
Using a 12-volt test light connect one lead to the (P115) Driver Seat Horizontal Forward Driver circuit and the other lead to (P117) Driver Seat Horizontal Rearward Driver circuit at the Driver Horizontal Seat Adjuster Motor connector.



Does the test light illuminate with the seat switch engaged?

Yes >> Replace the track/horizontal motor assembly.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

No >> Go To 7

B1D7B–SEAT HORIZONTAL MOTOR CONTROL CIRCUIT PERFORMANCE — (CONTINUED)

5. CHECK THE (G401) DRIVER SEAT HORIZONTAL POSITION SENSE WIRE FOR AN OPEN

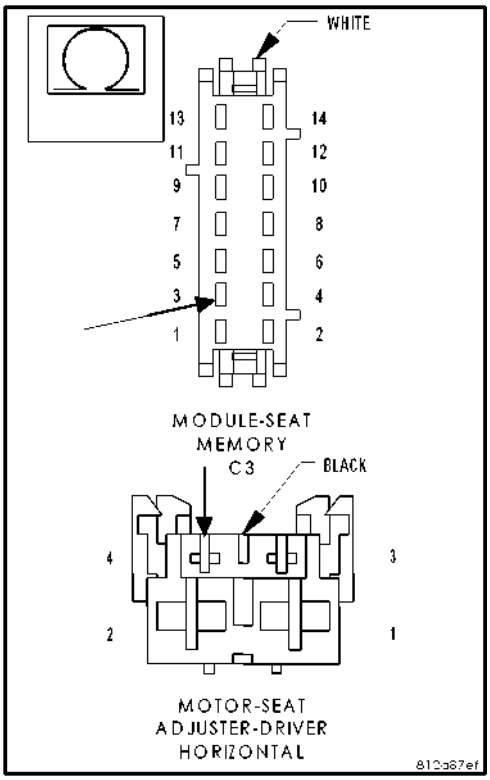
Disconnect the Seat Memory Module C3 connector.

Note: Check connectors – Clean and repair as necessary.
Measure the resistance of the (G401) Driver Seat Horizontal Position Sense circuit at the Driver Horizontal Seat Adjuster Motor connector to the C3 connector.

Is the resistance above 1.0 ohm?

Yes >> Repair the (G401) Driver Seat Horizontal Position Sense circuit for an open.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

No >> Go To 6



B1D7B–SEAT HORIZONTAL MOTOR CONTROL CIRCUIT PERFORMANCE — (CONTINUED)

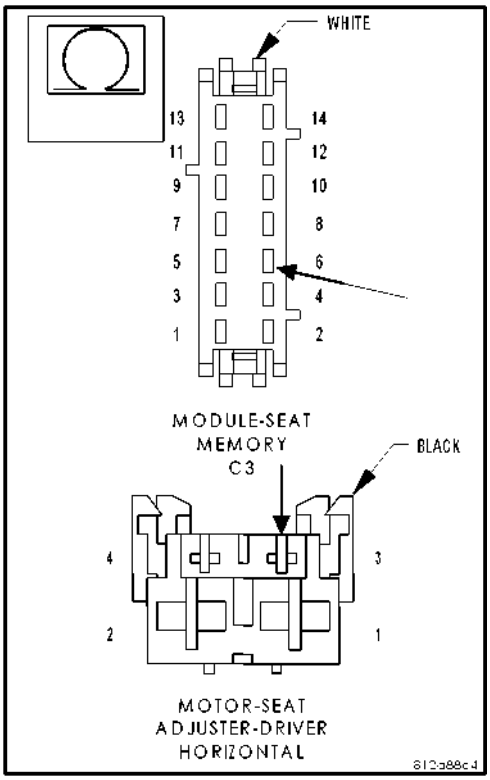
6. CHECK THE (G491) DRIVER SEAT HORIZONTAL SENSOR GROUND FOR AN OPEN

Measure the resistance of the (G491) Driver Seat Horizontal Sensor Ground circuit at the Driver Horizontal Seat Adjuster Motor connector to the C3 connector.

Is the resistance above 1.0 ohm?

Yes >> Repair the (G491) Driver Seat Horizontal Senor Ground circuit for an open.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

No >> Replace the Seat Memory Module.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1



B1D7B–SEAT HORIZONTAL MOTOR CONTROL CIRCUIT PERFORMANCE — (CONTINUED)

7. CHECK THE (P115) DRIVER SEAT HORIZONTAL FORWARD DRIVER WIRE FOR AN OPEN

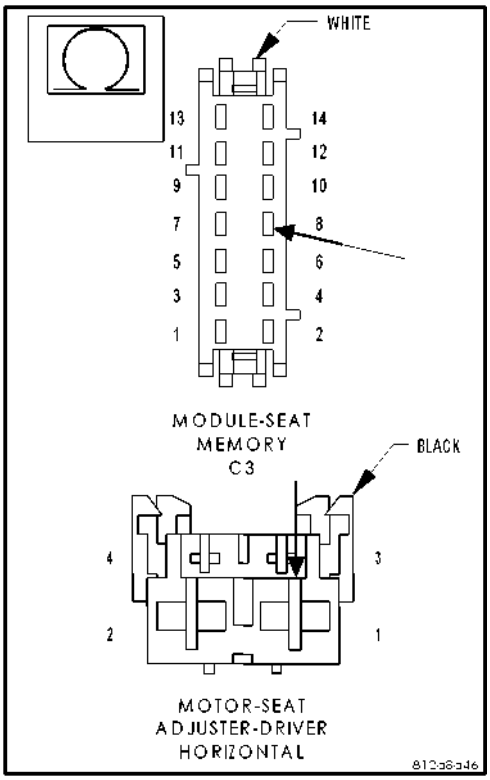
Disconnect the Seat Memory Module C3 connector.

Note: Check connectors – Clean and repair as necessary.
Measure the resistance of the (P115) Driver Seat Horizontal Forward Driver circuit at the Driver Horizontal Seat Adjuster Motor connector to the C3 connector.

Is the resistance above 1.0 ohm?

Yes >> Repair the (P115) Driver Seat Horizontal Forward Driver circuit for an open.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

No >> Go To 8



B1D7B–SEAT HORIZONTAL MOTOR CONTROL CIRCUIT PERFORMANCE — (CONTINUED)

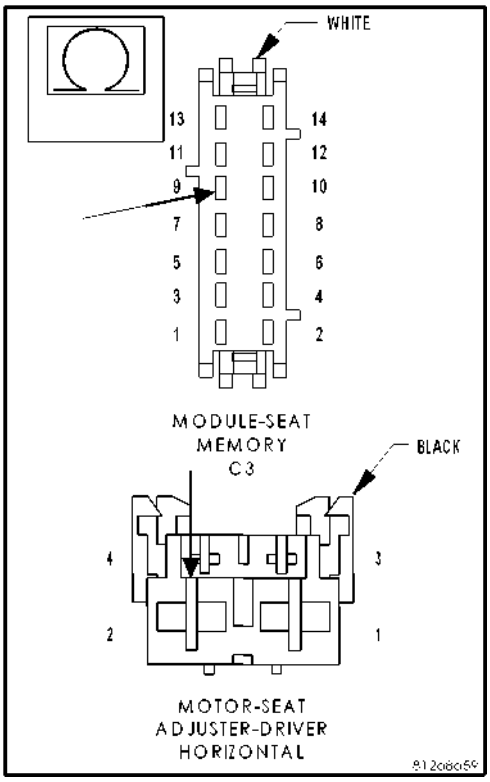
8. CHECK THE (P117) DRIVER SEAT HORIZONTAL REARWARD DRIVER AN OPEN

Measure the resistance of the (P117) Driver Seat Horizontal Rearward Driver circuit at the Driver Horizontal Seat Adjuster Motor connector to the C3 connector.

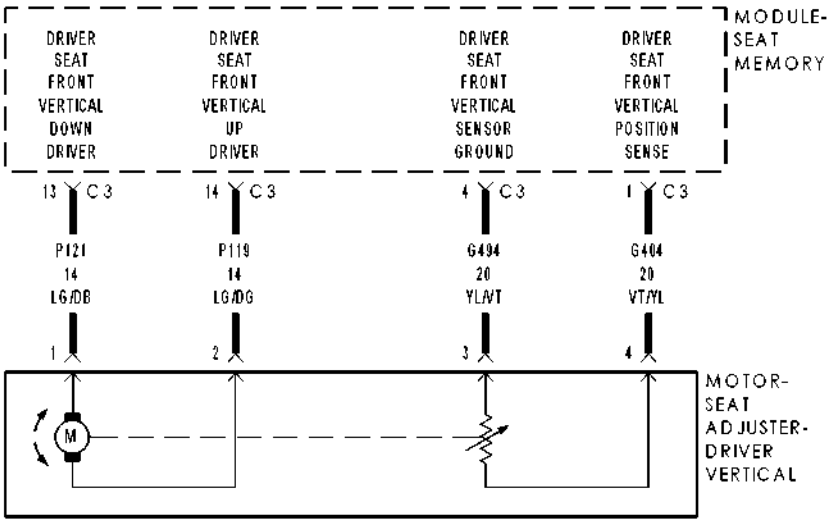
Is the resistance above 1.0 ohm?

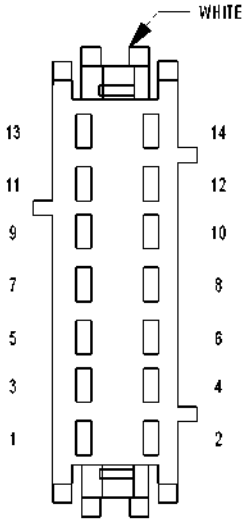
Yes >> Repair the (P117) Driver Seat Horizontal Rearward Driver circuit for an open.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

No >> Replace the Seat Memory Module.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

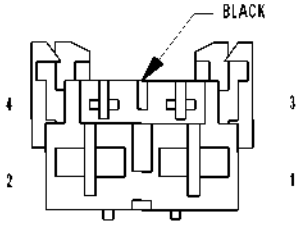


B1D7F–SEAT FRONT VERTICAL MOTOR CONTROL CIRCUIT PERFORMANCE





MODULE-SEAT MEMORY C3



MOTOR-SEAT ADJUSTER-FRONT DRIVER VERTICAL

812ac07d

B1D7F–SEAT FRONT VERTICAL MOTOR CONTROL CIRCUIT PERFORMANCE — (CONTINUED)

For the Power Seat System circuit diagram(Refer to 8 - ELECTRICAL/POWER SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Whenever the seat motor is activated.
- **Set Condition:**
  If the Seat Memory Module does not detect the rotation of the seat motor this DTC will set. This DTC will only set when the seat switch is moved in the same direction three consecutive times.

Possible Causes
SEAT POSITION SENSOR CIRCUIT DIAGNOSTIC TROUBLE CODES
(G404) DRIVER SEAT FRONT VERTICAL POSITION SENSE CIRCUIT OPEN
(G494) DRIVER SEAT FRONT VERTICAL SENSOR GROUND CIRCUIT OPEN
(P119) DRIVER SEAT FRONT VERTICAL UP DRIVER
(P121) DRIVER SEAT FRONT VERTICAL DOWN DRIVER
FRONT DRIVER VERTICAL SEAT ADJUSTER MOTOR
SEAT MEMORY MODULE

Diagnostic Test

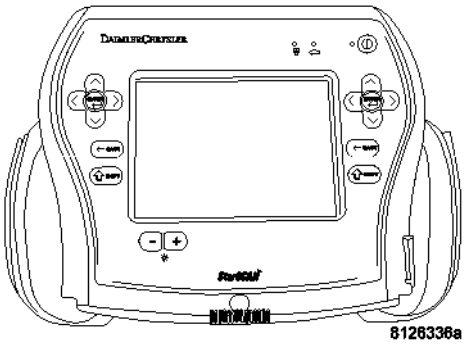
1. CHECK FOR RELATED DIAGNOSTIC TROUBLE CODES

Turn the ignition on.
With the scan tool, read DTC's.

Does the scan tool display any seat position sensor DTC's?

Yes >> Diagnose and repair other DTC(s) first. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Go To 2



B1D7F–SEAT FRONT VERTICAL MOTOR CONTROL CIRCUIT PERFORMANCE — (CONTINUED)

2. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase DTC's

Move the Seat Switch in the Front Vertical position 3 times.

With the scan tool, read DTC's.

Does the scan tool display B1D7F–SEAT FRONT VERTICAL MOTOR CONTROL CIRCUIT PERFORMANCE?

Yes >> Go To 3

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform POWER SEAT SYSTEM VERIFICATION TEST - VER 1.

---

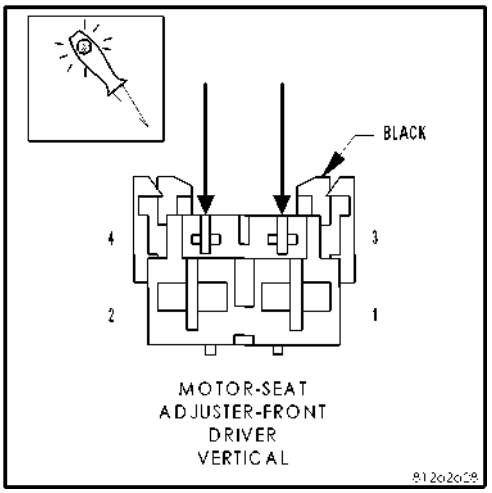
3. CHECK THE (G404) DRIVER SEAT FRONT VERTICAL POSITION SENSE VOLTAGE

Disconnect the Front Driver Vertical Seat Adjuster Motor.

Note: Check connectors – Clean and repair as necessary.

Move the Seat Switch in the front vertical position during the next step.

Using a 12-volt test light connect one lead to the (G404) Driver Seat Front Vertical Position Sense circuit and the other lead to Driver Seat Front Vertical Sensor Ground at the Driver Front Vertical Seat Adjuster Motor connector.



Does the test light illuminate for approximately 2 seconds then turn off with the seat switch engaged?

Yes >> Go To 4

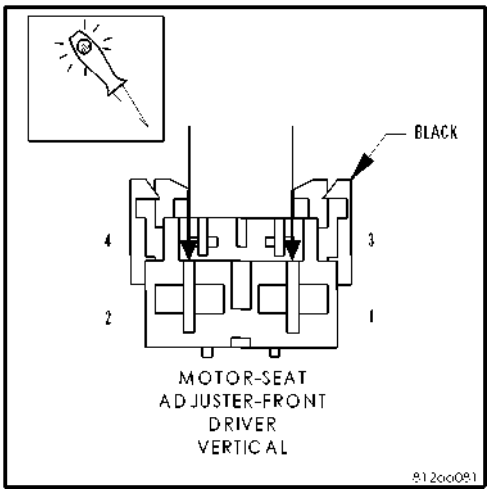
No >> Go To 5

B1D7F–SEAT FRONT VERTICAL MOTOR CONTROL CIRCUIT PERFORMANCE — (CONTINUED)

4. CHECK THE DRIVER SEAT FRONT VERTICAL UP/DOWN DRIVER VOLTAGE

Move the Seat Switch in the front vertical position during the next step.

Using a 12-volt test light connect one lead to the (G119) Driver Seat Front Vertical Up Driver circuit and the other lead to (P121) Driver Seat Front Vertical Down Driver circuit at the Front Driver Vertical Seat Adjuster Motor connector.



Does the test light illuminate with the seat switch engaged?

Yes >> Replace the Front Driver Vertical Seat Adjuster motor assembly.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

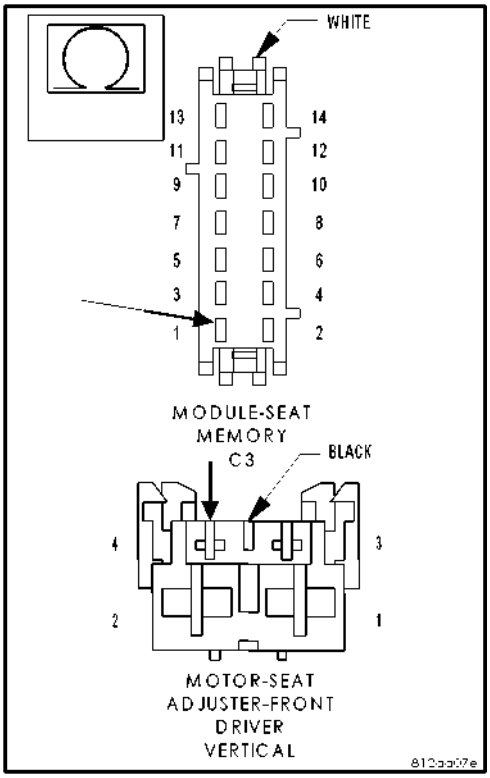
No >> Go To 7

---

5. CHECK THE (G404) DRIVER SEAT FRONT VERTICAL POSITION SENSE WIRE FOR AN OPEN

Disconnect the Seat Memory Module C3 connector.

Note: Check connectors – Clean and repair as necessary.
Measure the resistance of the (G404) Driver Seat Front Vertical Position Sense circuit at the Front Driver Vertical Seat Adjuster Motor connector to the C3 connector.



Is the resistance above 1.0 ohm?

Yes >> Repair the (G404) Driver Seat Front Vertical Position Sense circuit for an open.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

No >> Go To 6

B1D7F–SEAT FRONT VERTICAL MOTOR CONTROL CIRCUIT PERFORMANCE — (CONTINUED)

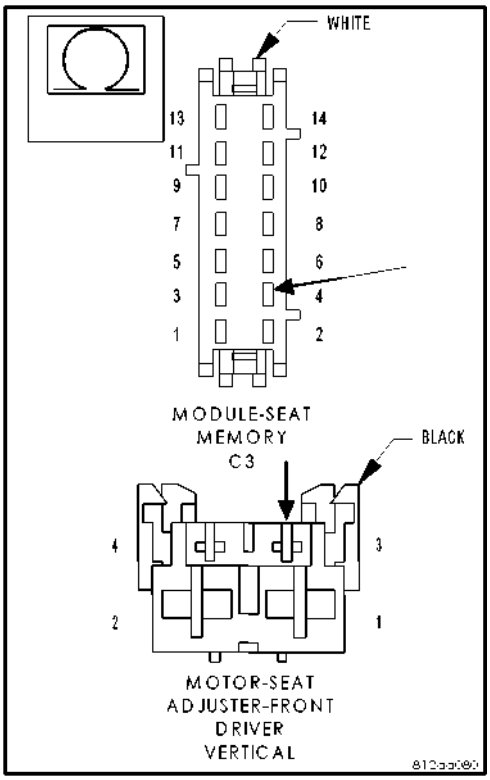
6. CHECK THE (G494) DRIVER SEAT FRONT VERTICAL SENSOR GROUND FOR AN OPEN

Measure the resistance of the (G494) Driver Seat Front Vertical Sensor Ground circuit at the Driver Front Vertical Seat Adjuster Motor connector to the C3 connector.

Is the resistance above 1.0 ohm?

Yes >> Repair the (G494) Driver Seat Front Vertical Senor Ground circuit for an open.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

No >> Replace the Seat Memory Module.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1



B1D7F–SEAT FRONT VERTICAL MOTOR CONTROL CIRCUIT PERFORMANCE — (CONTINUED)

7. CHECK THE (P119) DRIVER SEAT FRONT VERTICAL UP DRIVER WIRE FOR AN OPEN

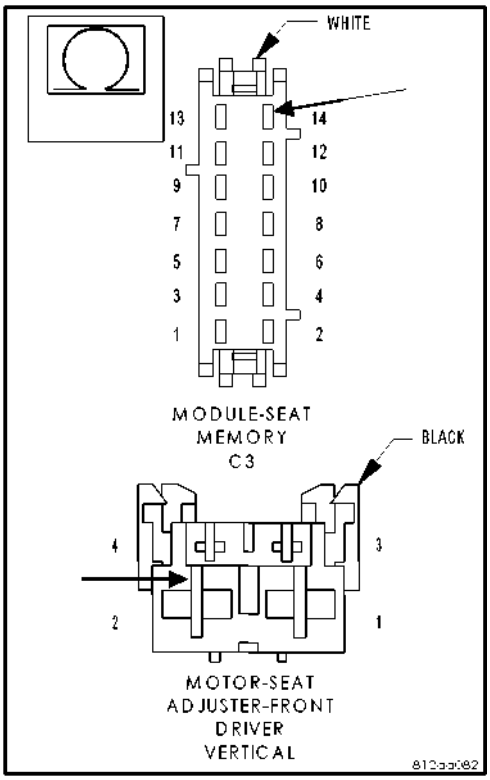
Disconnect the Seat Memory Module C3 connector.

Note: Check connectors – Clean and repair as necessary.
Measure the resistance of the (P119) Driver Seat Front Vertical Up Driver circuit at the Driver Front Vertical Seat Adjuster Motor connector to the C3 connector.

Is the resistance above 1.0 ohm?

Yes >> Repair the (P119) Driver Seat Front Vertical Up Driver circuit for an open.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

No >> Go To 8



B1D7F–SEAT FRONT VERTICAL MOTOR CONTROL CIRCUIT PERFORMANCE — (CONTINUED)

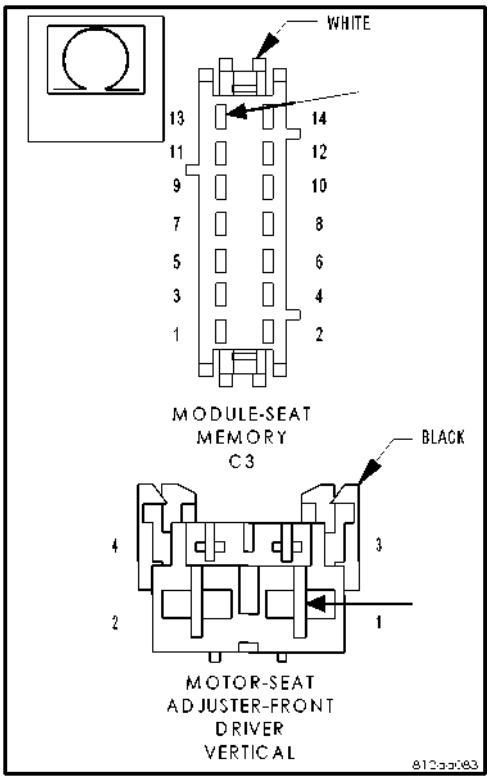
8. CHECK THE (P121) DRIVER SEAT FRONT VERTICAL DOWN DRIVER AN OPEN

Measure the resistance of the (P121) Driver Seat Front Vertical Down Driver circuit at the Driver Front Vertical Seat Adjuster Motor connector to the C3 connector.

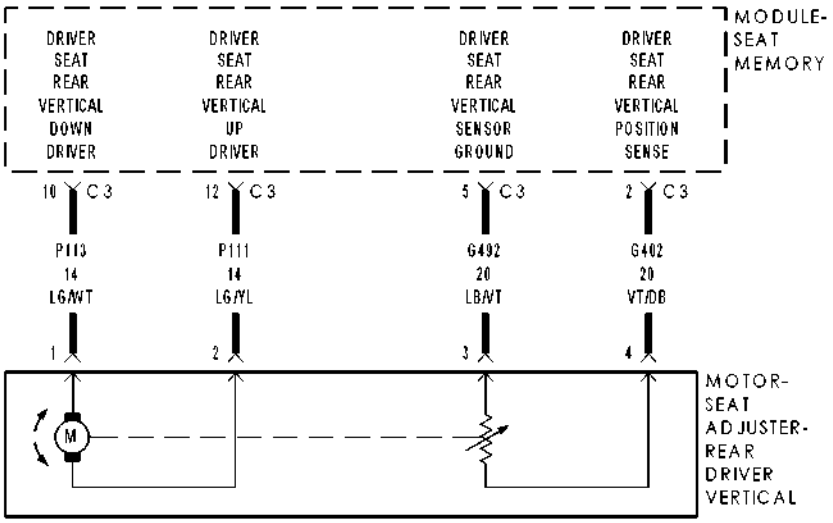
Is the resistance above 1.0 ohm?

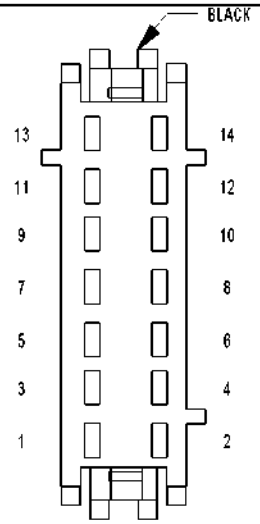
Yes >> Repair the (P121) Driver Seat Front Vertical Down Driver circuit for an open.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

No >> Replace the Seat Memory Module.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

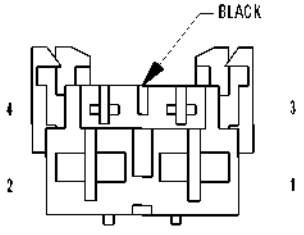


B1D83–SEAT REAR VERTICAL MOTOR CONTROL CIRCUIT PERFORMANCE





MODULE-SEAT MEMORY C1



MOTOR-SEAT ADJUSTER-REAR DRIVER VERTICAL

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B1D83–SEAT REAR VERTICAL MOTOR CONTROL CIRCUIT PERFORMANCE — (CONTINUED)

For the Power Seat System circuit diagram(Refer to 8 - ELECTRICAL/POWER SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Whenever the seat motor is activated.
- **Set Condition:**
  If the Seat Memory Module does not detect the rotation of the seat motor this DTC will set. This DTC will only set when the seat switch is moved in the same direction three consecutive times.

Possible Causes
SEAT POSITION SENSOR CIRCUIT DIAGNOSTIC TROUBLE CODES
(G402) DRIVER SEAT REAR VERTICAL POSITION SENSE CIRCUIT OPEN
(G492) DRIVER SEAT REAR VERTICAL SENSOR GROUND CIRCUIT OPEN
(P111) DRIVER SEAT REAR VERTICAL UP DRIVER
(P113) DRIVER SEAT REAR VERTICAL DOWN DRIVER
REAR DRIVER VERTICAL SEAT ADJUSTER MOTOR
SEAT MEMORY MODULE

Diagnostic Test

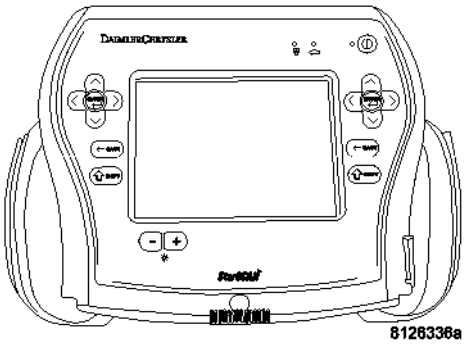
1. CHECK FOR RELATED DIAGNOSTIC TROUBLE CODES

Turn the ignition on.
With the scan tool, read DTC's.

Does the scan tool display any seat position sensor DTC's?

Yes >> Diagnose and repair other DTC(s) first. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Go To 2



B1D83–SEAT REAR VERTICAL MOTOR CONTROL CIRCUIT PERFORMANCE — (CONTINUED)

2. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase DTC's

Move the Seat Switch in the Rear Vertical position 3 times.

With the scan tool, read DTC's.

Does the scan tool display B1D83–SEAT REAR VERTICAL MOTOR CONTROL CIRCUIT PERFORMANCE?

Yes >> Go To 3

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform POWER SEAT SYSTEM VERIFICATION TEST - VER 1.

---

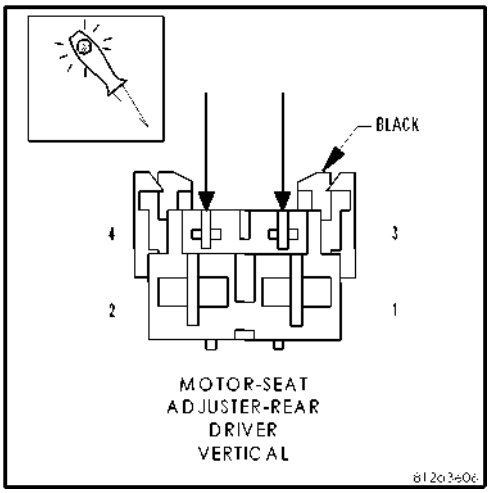
3. CHECK THE (G402) DRIVER SEAT REAR VERTICAL POSITION SENSE VOLTAGE

Disconnect the Rear Driver Vertical Seat Adjuster Motor.

Note: Check connectors – Clean and repair as necessary.

Move the Seat Switch in the rear vertical position during the next step.

Using a 12-volt test light connect one lead to the (G402) Driver Seat Rear Vertical Position Sense circuit and the other lead to Driver Seat Rear Vertical Sensor Ground at the Driver Rear Vertical Seat Adjuster Motor connector.



Does the test light illuminate for approximately 2 seconds then turn off with the seat switch engaged?

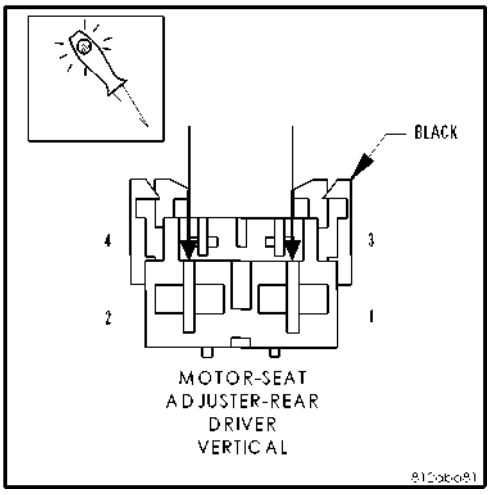
Yes >> Go To 4

No >> Go To 5

B1D83–SEAT REAR VERTICAL MOTOR CONTROL CIRCUIT PERFORMANCE — (CONTINUED)

4. CHECK THE DRIVER SEAT REAR VERTICAL UP/DOWN DRIVER VOLTAGE

Move the Seat Switch in the rear vertical position during the next step. Using a 12-volt test light connect one lead to the (P111) Driver Seat Rear Vertical Up Driver circuit and the other lead to (P113) Driver Seat Rear Vertical Down Driver circuit at the Rear Driver Vertical Seat Adjuster Motor connector.



Does the test light illuminate with the seat switch engaged?

Yes >> Replace the Rear Driver Vertical Seat Adjuster motor assembly.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

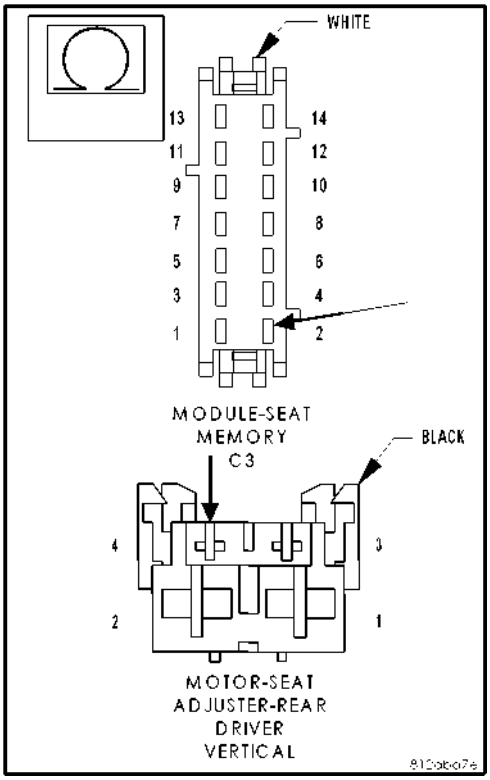
No >> Go To 7

---

5. CHECK THE (G402) DRIVER SEAT REAR VERTICAL POSITION SENSE WIRE FOR AN OPEN

Disconnect the Seat Memory Module C3 connector.

Note: Check connectors – Clean and repair as necessary.
Measure the resistance of the (G402) Driver Seat Rear Vertical Position Sense circuit at the Rear Driver Vertical Seat Adjuster Motor connector to the C3 connector.



Is the resistance above 1.0 ohm?

Yes >> Repair the (G402) Driver Seat Rear Vertical Position Sense circuit for an open.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

No >> Go To 6

B1D83–SEAT REAR VERTICAL MOTOR CONTROL CIRCUIT PERFORMANCE — (CONTINUED)

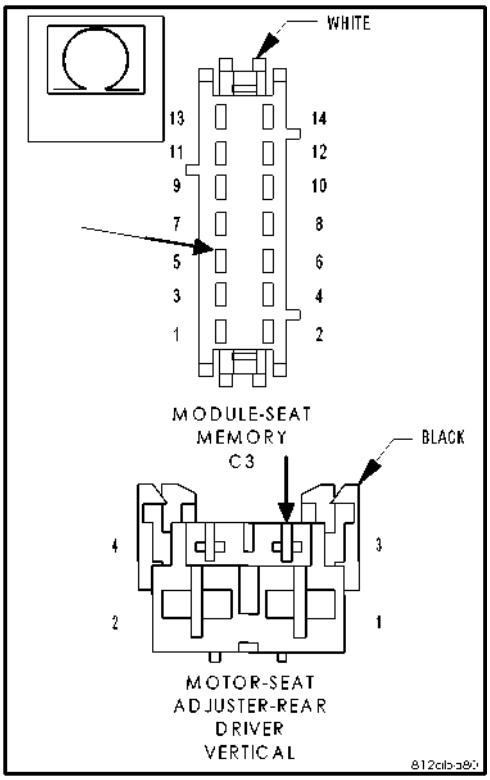
6. CHECK THE (G492) DRIVER SEAT REAR VERTICAL SENSOR GROUND FOR AN OPEN

Measure the resistance of the (G492) Driver Seat Rear Vertical Sensor Ground circuit at the Driver Rear Vertical Seat Adjuster Motor connector to the C3 connector.

Is the resistance above 1.0 ohm?

Yes >> Repair the (G492) Driver Seat Rear Vertical Senor Ground circuit for an open.
Perform MEMORY SYSTEM VERIFICATION TEST – VER 1

No >> Replace the Seat Memory Module.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1



B1D83–SEAT REAR VERTICAL MOTOR CONTROL CIRCUIT PERFORMANCE — (CONTINUED)

7. CHECK THE (P111) DRIVER SEAT REAR VERTICAL UP DRIVER WIRE FOR AN OPEN

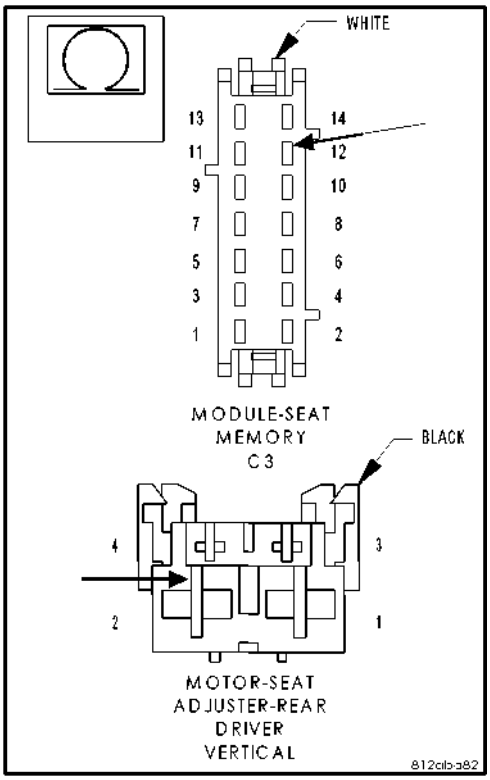
Disconnect the Seat Memory Module C3 connector.

Note: Check connectors – Clean and repair as necessary.
Measure the resistance of the (P111) Driver Seat Rear Vertical Up Driver circuit at the Driver Rear Vertical Seat Adjuster Motor connector to the C3 connector.

Is the resistance above 1.0 ohm?

Yes >> Repair the (P111) Driver Seat Rear Vertical Up Driver circuit for an open.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

No >> Go To 8



B1D83–SEAT REAR VERTICAL MOTOR CONTROL CIRCUIT PERFORMANCE — (CONTINUED)

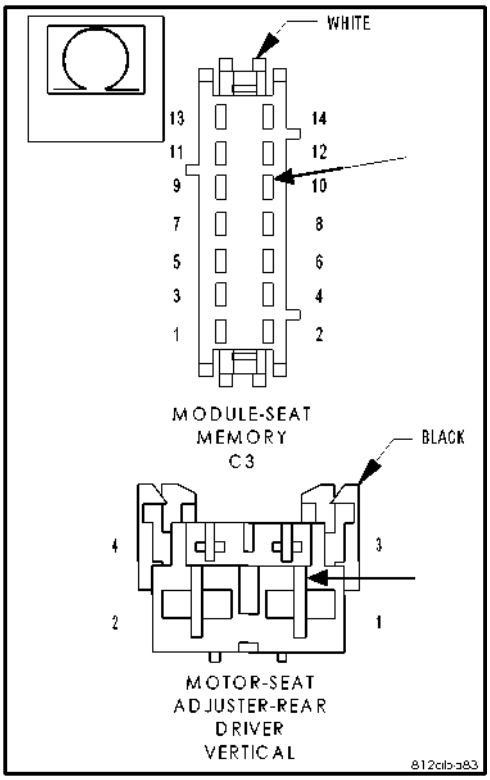
8. CHECK THE (P113) DRIVER SEAT REAR VERTICAL DOWN DRIVER AN OPEN

Measure the resistance of the (P113) Driver Seat Rear Vertical Down Driver circuit at the Driver Rear Vertical Seat Adjuster Motor connector to the C3 connector.

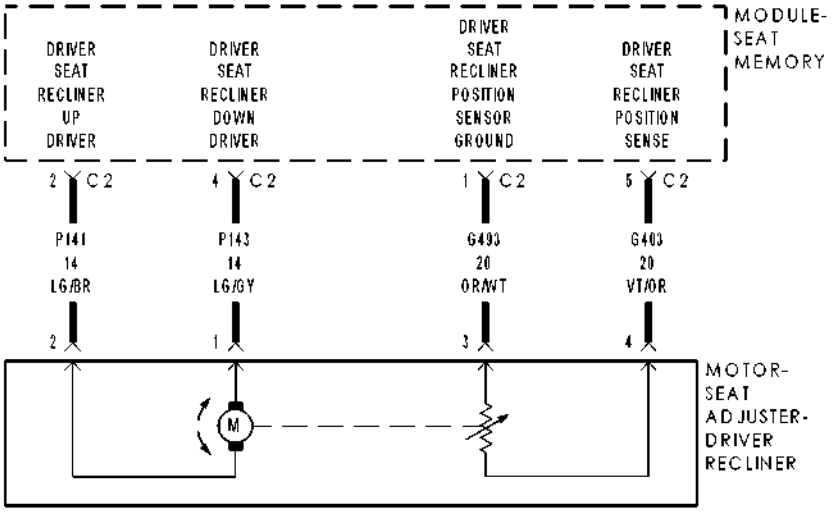
Is the resistance above 1.0 ohm?

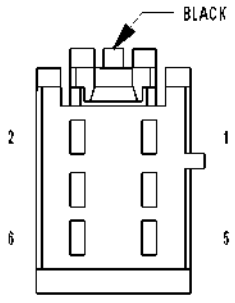
Yes >> Repair the (P113) Driver Seat Rear Vertical Down Driver circuit for an open.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

No >> Replace the Seat Memory Module.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

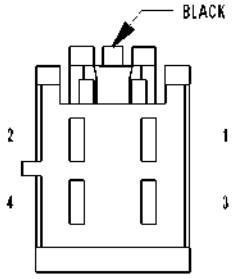


B1D87–SEAT BACKREST MOTOR CONTROL CIRCUIT PERFORMANCE





MODULE-SEAT
MEMORY
C2



MOTOR-SEAT
ADJUSTER-DRIVER
RECLINER

812ac585

B1D87–SEAT BACKREST MOTOR CONTROL CIRCUIT PERFORMANCE — (CONTINUED)

For the Power Seat System circuit diagram(Refer to 8 - ELECTRICAL/POWER SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Whenever the seat motor is activated.
- **Set Condition:**
  If the Seat Memory Module does not detect the rotation of the seat motor this DTC will set. This DTC will only set when the seat switch is moved in the same direction three consecutive times.

Possible Causes
SEAT POSITION SENSOR CIRCUIT DIAGNOSTIC TROUBLE CODES
(G403) DRIVER SEAT RECLINER POSITION SENSE CIRCUIT OPEN
(G493) DRIVER SEAT RECLINER POSITION SENSOR GROUND CIRCUIT OPEN
(P141) DRIVER SEAT RECLINER UP DRIVER
(P143) DRIVER SEAT RECLINER DOWN DRIVER
DRIVER RECLINER SEAT ADJUSTER MOTOR
SEAT MEMORY MODULE

Diagnostic Test

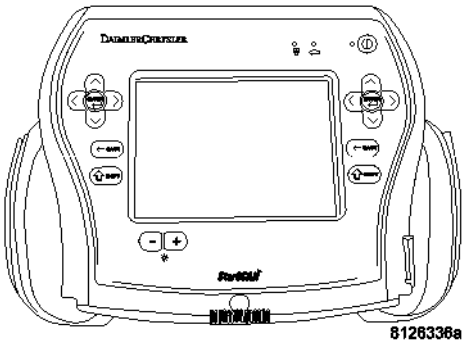
1. CHECK FOR RELATED DIAGNOSTIC TROUBLE CODES

Turn the ignition on.
With the scan tool, read DTC's.

Does the scan tool display any seat position sensor DTC's?

Yes >> Diagnose and repair the other DTC(s) first. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Go To 2



B1D87–SEAT BACKREST MOTOR CONTROL CIRCUIT PERFORMANCE — (CONTINUED)

2. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase DTC's

Move the Seat Switch in the Recliner position 3 times.

With the scan tool, read DTC's.

Does the scan tool display B1D7B–SEAT BACKREST MOTOR CONTROL CIRCUIT PERFORMANCE?

Yes >> Go To 3

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform POWER SEAT SYSTEM VERIFICATION TEST - VER 1.

---

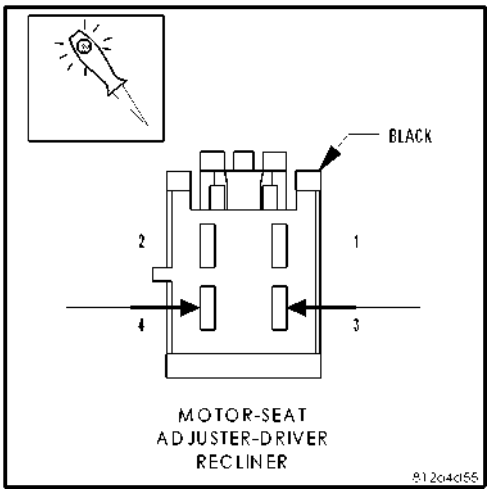
3. CHECK THE (G403) DRIVER SEAT RECLINER POSITION SENSE VOLTAGE

Disconnect the Driver Recliner Seat Adjuster Motor.

Note: Check connectors – Clean and repair as necessary.

Move the Seat Switch in the Recliner position during the next step.

Using a 12-volt test light connect one lead to the (G403) Driver Seat Recliner Position Sense circuit and the other lead to Driver Seat Recliner Position Sensor Ground at the Driver Recliner Seat Adjuster Motor connector.



Does the test light illuminate for approximately 2 seconds then turn off with the seat switch engaged?

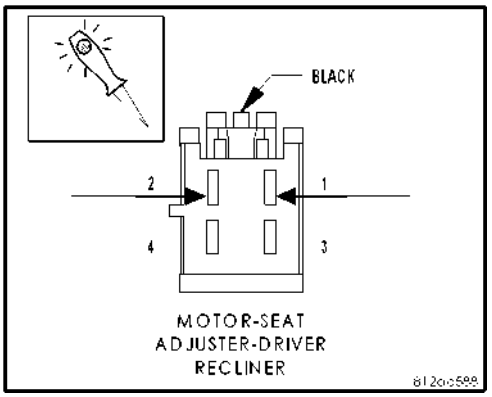
Yes >> Go To 4

No >> Go To 5

B1D87–SEAT BACKREST MOTOR CONTROL CIRCUIT PERFORMANCE — (CONTINUED)

4. CHECK THE DRIVER SEAT RECLINER FORWARD/ REARWARD DRIVER VOLTAGE

Move the Seat Switch in the Recliner position during the next step.
Using a 12-volt test light connect one lead to the (P141) Driver Seat Recliner Up Driver circuit and the other lead to (P143) Driver Seat Recliner Down Driver circuit at the Driver Recliner Seat Adjuster Motor connector.



Does the test light illuminate with the seat switch engaged?

Yes >> Replace the Recliner motor assembly.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

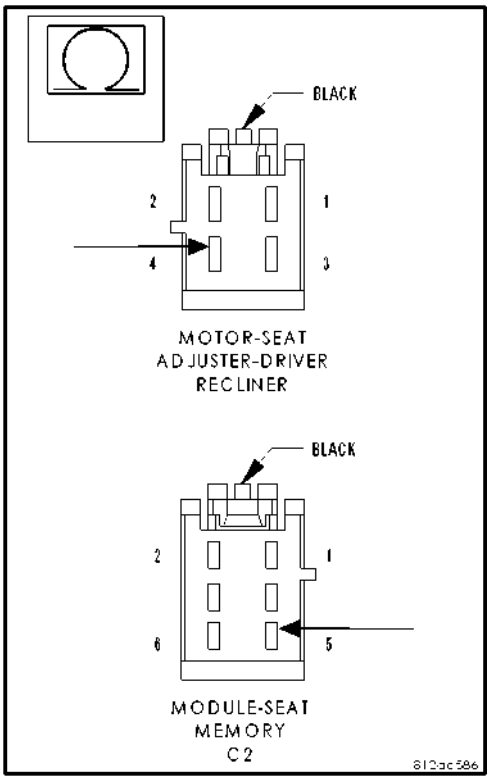
No >> Go To 7

---

5. CHECK THE (G403) DRIVER SEAT RECLINER POSITION SENSE WIRE FOR AN OPEN

Disconnect the Seat Memory Module C2 connector.

Note: Check connectors – Clean and repair as necessary.
Measure the resistance of the (G403) Driver Seat Recliner Position Sense circuit at the Driver Recliner Seat Adjuster Motor connector to the C2 connector.



Is the resistance above 1.0 ohm?

Yes >> Repair the (G403) Driver Seat Recliner Position Sense circuit for an open.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

No >> Go To 6

B1D87–SEAT BACKREST MOTOR CONTROL CIRCUIT PERFORMANCE — (CONTINUED)

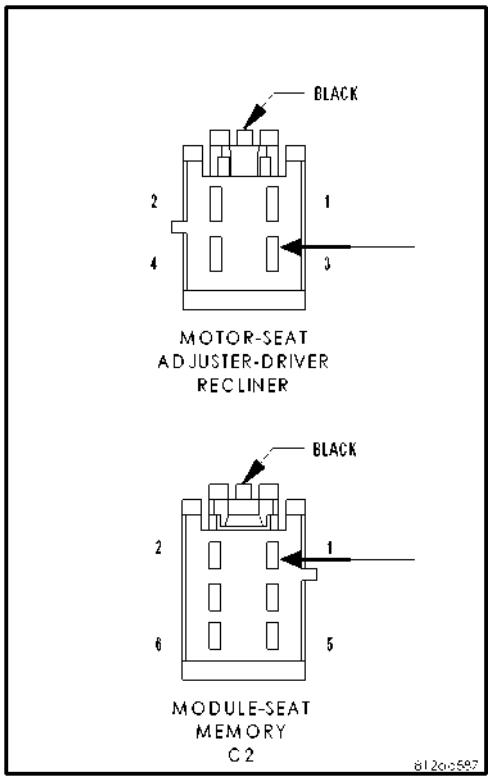
6. CHECK THE (G493) DRIVER SEAT RECLINER POSTION SENSOR GROUND FOR AN OPEN

Measure the resistance of the (G493) Driver Seat Recliner Position Sensor Ground circuit at the Driver Recliner Seat Adjuster Motor connector to the C2 connector.

Is the resistance above 1.0 ohm?

Yes >> Repair the (G493) Driver Seat Recliner Position Senor Ground circuit for an open.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

No >> Replace the Seat Memory Module.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1



B1D87–SEAT BACKREST MOTOR CONTROL CIRCUIT PERFORMANCE — (CONTINUED)

7. CHECK THE (P141) DRIVER SEAT RECLINER UP DRIVER WIRE FOR AN OPEN

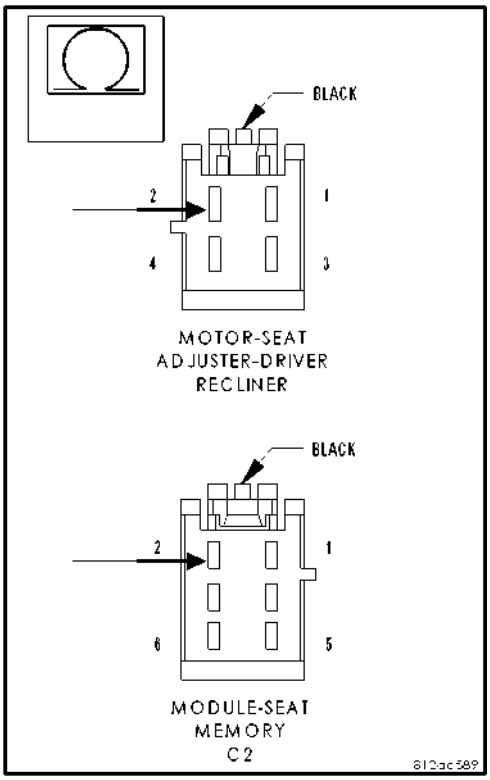
Disconnect the Seat Memory Module C2 connector.

Note: Check connectors – Clean and repair as necessary.
Measure the resistance of the (P141) Driver Seat Recliner Up Driver circuit at the Driver Recliner Seat Adjuster Motor connector to the C2 connector.

Is the resistance above 1.0 ohm?

Yes >> Repair the (P141) Driver Seat Recliner Up Driver circuit for an open.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

No >> Go To 8



B1D87–SEAT BACKREST MOTOR CONTROL CIRCUIT PERFORMANCE — (CONTINUED)

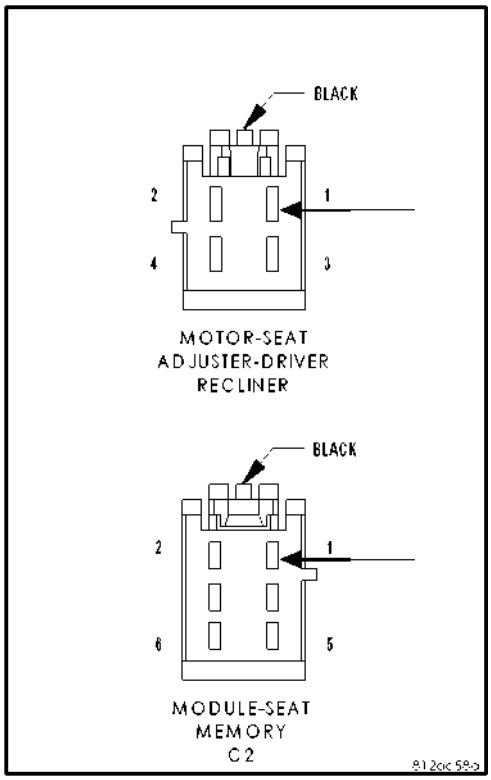
8. CHECK THE (P143) DRIVER SEAT RECLINER DOWN DRIVER AN OPEN

Measure the resistance of the (P143) Driver Seat Recliner Down Driver circuit at the Driver Recliner Seat Adjuster Motor connector to the C2 connector.

Is the resistance above 1.0 ohm?

Yes >> Repair the (P143) Driver Seat Recliner Down Driver circuit for an open.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

No >> Replace the Seat Memory Module.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1



B1D9B–SEAT HORIZONTAL FRONT STOP NOT LEARNED

For the Power Seat System circuit diagram(Refer to 8 - ELECTRICAL/POWER SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Whenever the seat motor is activated.
- **Set Condition:**
  Seat becomes de-standardized. If the seat is not standardized, an Easy Exit/Entry function can not be performed. If seat is standardized (learn seat cushion horizontal front hardstop) and then becomes de-standardized (conditions are: seat cushion motor is 5% past the expected hard stop position or seat cushion hall sensor failure is occured), a DTC is logged.

Possible Causes
OTHER DIAGNOSTIC TROUBLE CODES SET IN THE SEAT MEMORY MODULE
SEAT STANDERDIZATION ROUTINE NOT PERFORMED

Diagnostic Test

1. CHECK FOR RELATED DIAGNOSTIC TROUBLE CODES

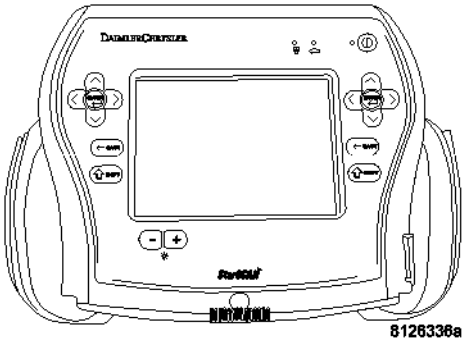
Turn the ignition on.

With the scan tool, read DTC's.

Does the scan tool display any seat position sensor or circuit performance DTC's?

Yes >> Diagnose and repair the other DTC(s) first. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Go To 2



B1D9B–SEAT HORIZONTAL FRONT STOP NOT LEARNED — (CONTINUED)

2. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase DTC's
Move the seat in the full forward horizontal position.
With the scan tool, read DTC's.

Does the scan tool display B1D9B–SEAT HORIZONTAL FRONT STOP NOT LEARNED?

Yes >> With the scan tool, perform the MSM Standard Routine.
Perform POWER SEAT SYSTEM VERIFICATION TEST - VER 1.

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform POWER SEAT SYSTEM VERIFICATION TEST - VER 1.

B210D-BATTERY VOLTAGE LOW

For the Power Seat System circuit diagram(Refer to 8 - ELECTRICAL/POWER SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**Engine running, during seat motor operation.
- **Set Condition:**This code is set immediately after the Seat Memory Module receives a low charging system voltage message over the CAN B Bus or detects voltage under 9.5 volts on the (A940) Fused B(+) circuit.

Possible Causes
CHARGING SYSTEM VOLAGE LOW
(A940) FUSED B(+) CIRCUIT
SEAT MEMORY MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. CHECK PCM FOR CHARGING SYSTEM DTC

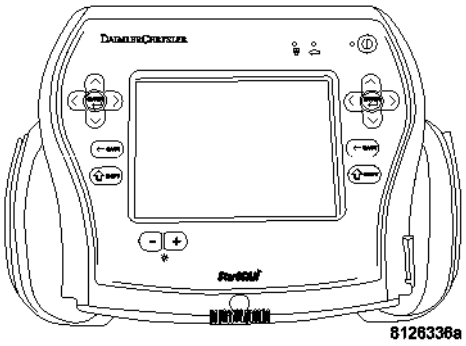
With the scan tool, read Powertrain Control Module DTC's.

Are there any Charging System DTC's set in the Powertrain Control Module?

Yes >> (Refer to 8 - ELECTRICAL/CHARGING - DIAGNOSIS AND TESTING) for Charging System diagnostic procedures.

No >> Go To 2

Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1.



B210D-BATTERY VOLTAGE LOW — (CONTINUED)

2. VERIFY THAT DTC B210D-BATTERY VOLTAGE LOW IS ACTIVE

With the scan tool, record and erase DTC's

Turn the ignition switch to the Off position then start the engine and operate the driver power seat.

With the scan tool, read DTC's.

Does the DTC B210D-BATTERY VOLTAGE LOW reset?

Yes >> Go To 3

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1.

---

3. CHECK THE VOLTAGE ON THE (A940) FUSED B(+) CIRCUIT

Disconnect the Seat Memory Module connector.

Note: Check connectors - Clean and repair as necessary.

Start the engine and let idle.

Measure the voltage on the (A940) Fused B(+) circuit at the SMM connector and compare to voltage at the vehicle battery.

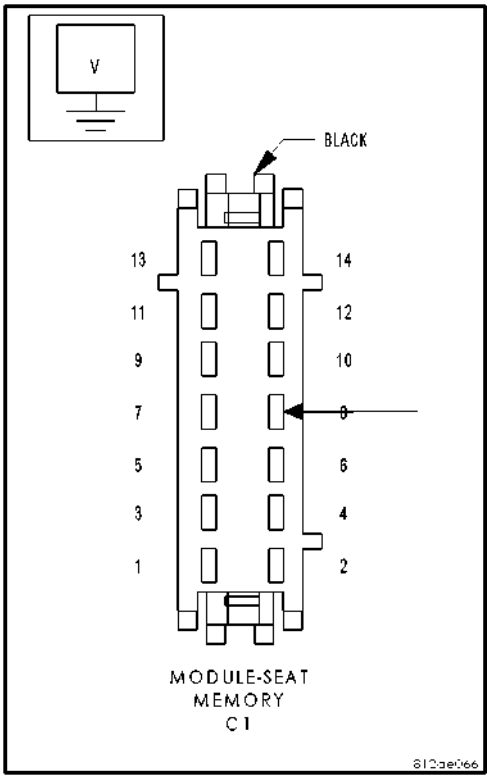
Is the voltage at the SMM connector the same as measured at the battery?

Yes >> Replace the Seat Memory Module in accordance with the service information.

Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1.

No >> Repair the (A940) Fused B(+) circuit as necessary.

Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1.



B210E-BATTERY VOLTAGE HIGH

For the Heated Seat System circuit diagram (Refer to 8 - ELECTRICAL/HEATED SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**Engine running, during seat operation.
- **Set Condition:**This code is set immediately after the Seat Memory Module receives a high charging system voltage message over the CAN B Bus or detects voltage over 16.5 volts on the (A940) Fused B(+) circuit.

Possible Causes
CHARGING SYSTEM VOLAGE HIGH
(A940) FUSED B(+) CIRCUIT
SEAT MEMORY MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

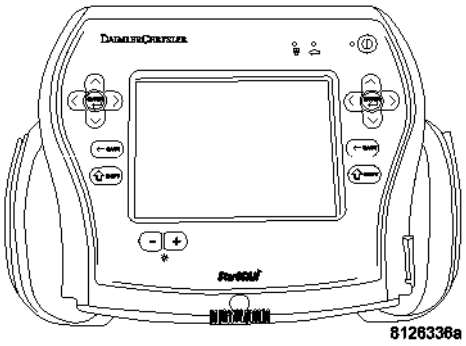
1. CHECK PCM FOR CHARGING SYSTEM DTC

With the scan tool, read Powertrain Control Module DTC's.

Are there any Charging System DTC's set in the Powertrain Control Module?

Yes >> (Refer to 8 - ELECTRICAL/CHARGING - DIAGNOSIS AND TESTING) for Charging System diagnostic procedures.

No >> Go To 2



B210E-BATTERY VOLTAGE HIGH — (CONTINUED)

2. VERIFY THAT DTC B210E-BATTERY VOLTAGE HIGH IS ACTIVE

With the scan tool, record and erase DTC's

Turn the ignition switch to the Off position then start the engine and let run for one minute.

Attempt to operate the driver power seat.

With the scan tool, read DTC's.

Does the DTC B210E-BATTERY VOLTAGE HIGH reset?

Yes >> Go To 3

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1.

---

3. CHECK THE VOLTAGE ON THE (A940) FUSED B(+) CIRCUIT

Disconnect the Seat Memory Module connector.

Note: Check connectors - Clean and repair as necessary.

Start the engine and let idle.

Measure the voltage on the (A940) Fused B(+) circuit at the SMM connector and compare to voltage at the vehicles battery.

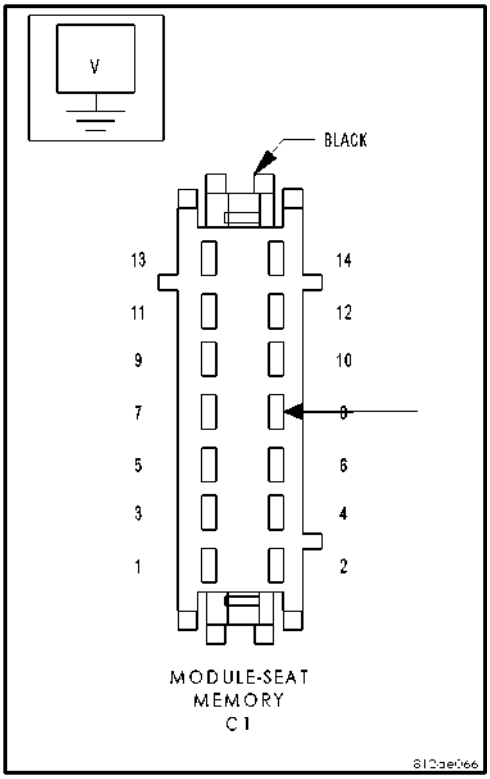
Is the voltage at the SMM connector the same as measured at the battery?

Yes >> Replace the Seat Memory Module in accordance with the service information.

Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1.

No >> Repair the (A940) Fused B(+) circuit as necessary.

Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1.



B221C- MEMORY SEAT MODULE INTERNAL

For the Heated Seat System circuit diagram (Refer to 8 - ELECTRICAL/HEATED SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**Ignition on.
- **Set Condition:**This code is set immediately if the Seat Memory Module internal self test fails.

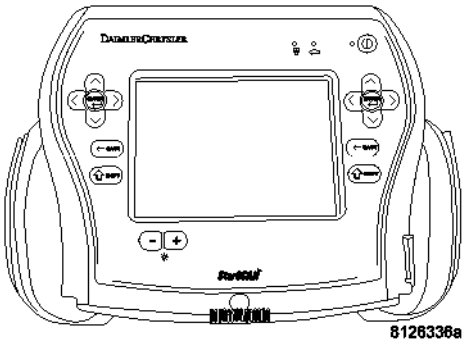
Possible Causes
SEAT MEMORY MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. VERIFY THAT DTC B221C- MEMORY SEAT MODULE INTERNAL IS ACTIVE

With the scan tool, record and erase DTC's
Cycle the ignition switch off then back on.
With the scan tool, read DTC's.

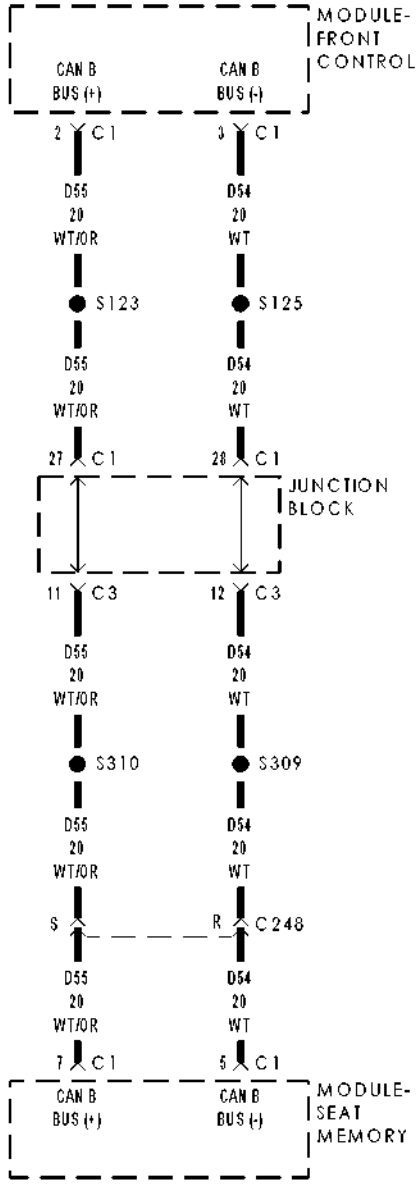


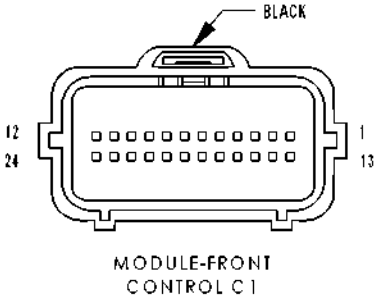
Does the DTC B221C-MEMORY SEAT MODULE INTERNAL reset?

Yes >> Replace the Seat Memory Module.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1.

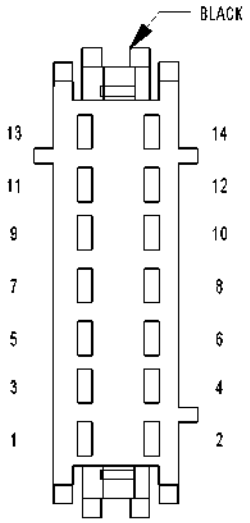
No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1.

U0020-CAN B BUS OFF PERFORMANCE





MODULE-FRONT
CONTROL C1



MODULE-SEAT
MEMORY
C1

812af68f

U0020-CAN B BUS OFF PERFORMANCE — (CONTINUED)

For the Power Seat System circuit diagram(Refer to 8 - ELECTRICAL/POWER SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  The Seat Memory Module detects the (D55) CAN B Bus (+) circuit or (D54) CAN B Bus (-) circuit open.

Possible Causes
(D55) CAN B BUS (+) CIRCUIT OPEN
(D54) CAN B BUS (-) CIRCUIT OPEN
SEAT MEMORY MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase MSM DTC's
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read active MSM DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

U0020-CAN B BUS OFF PERFORMANCE — (CONTINUED)

2. (D55) CAN B BUS (+) CIRCUIT OPEN

Turn the ignition off.

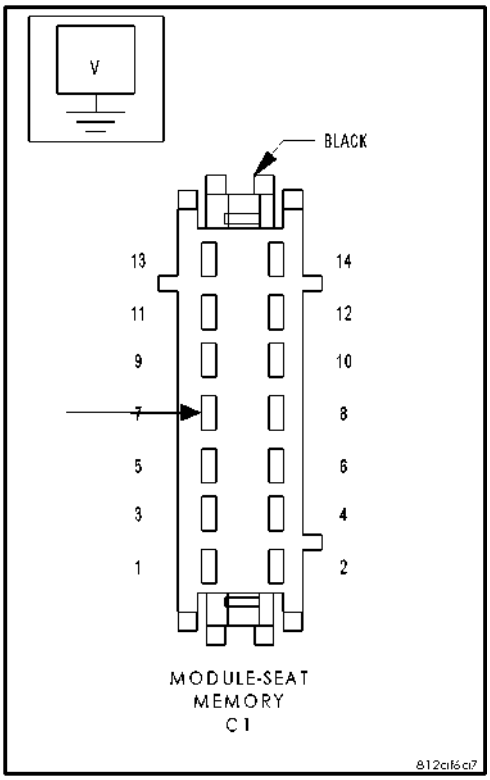
Disconnect the Seat Memory Module C1 harness connector.

Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

Is there any voltage present?

Yes >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Seat Memory Module in accordance with the service information.
Perform POWER SEAT SYSTEM VERIFICATION TEST - VER 1.

No >> Repair the (D55) CAN B Bus (+) circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.



3.

(D54) CAN B BUS (-) CIRCUIT OPEN

Turn the ignition off.

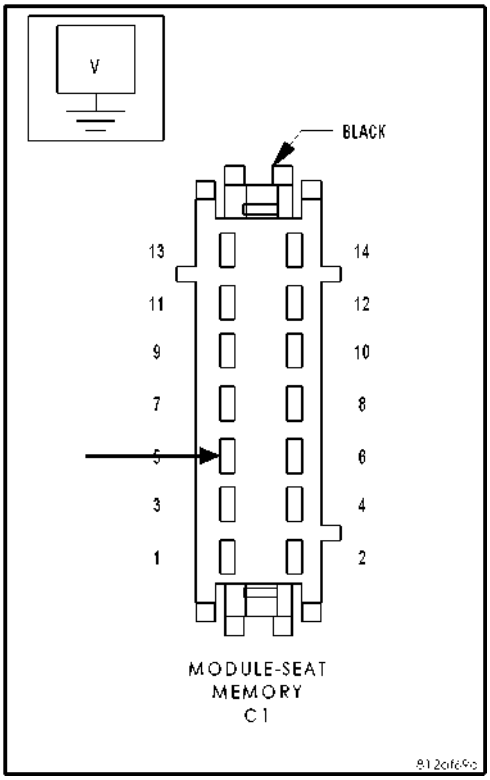
Disconnect the Seat Memory Module C1 harness connector.

Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.

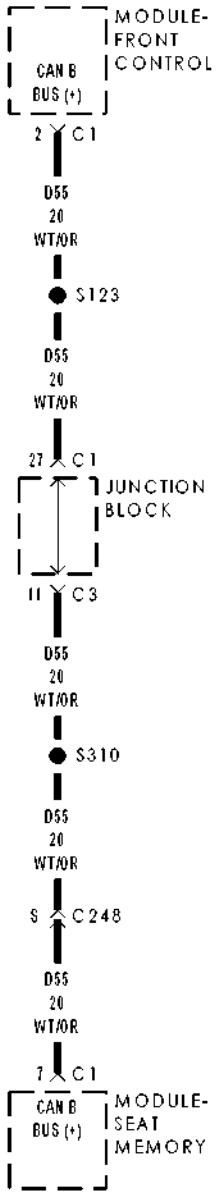
Is there any voltage present?

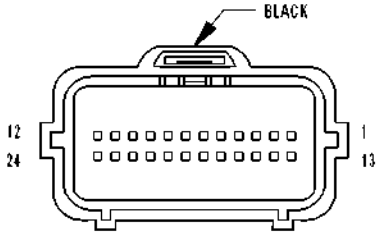
Yes >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Seat Memory Module in accordance with the service information.
Perform POWER SEAT SYSTEM VERIFICATION TEST - VER 1.

No >> Repair the (D54) CAN B Bus (-) circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

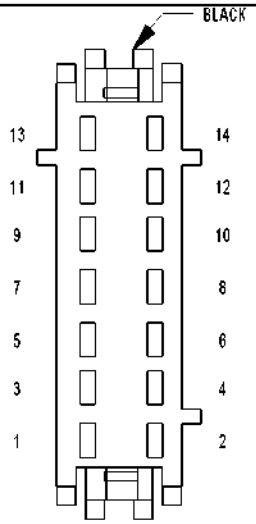


U0021-CAN B BUS (+) CIRCUIT OPEN





MODULE-FRONT
CONTROL C1



MODULE-SEAT
MEMORY
C1

812af6a6

U0021-CAN B BUS (+) CIRCUIT OPEN — (CONTINUED)

For the Power Seat System circuit diagram(Refer to 8 - ELECTRICAL/POWER SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  The Seat Memory Module detects the (D55) CAN B Bus (+) circuit is open.

Possible Causes
(D55) CAN B BUS (+) CIRCUIT OPEN
SEAT MEMORY MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase MSM DTC's
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read active MSM DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

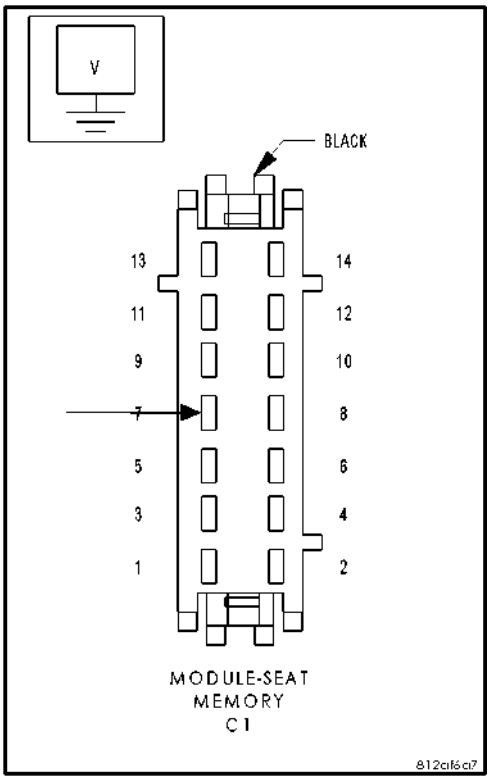
U0021-CAN B BUS (+) CIRCUIT OPEN — (CONTINUED)

2. (D55) CAN B BUS (+) CIRCUIT OPEN

Turn the ignition off.

Disconnect the Seat Memory Module C1 harness connector.

Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.



Is there any voltage present?

Yes >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Seat Memory Module in accordance with the service information.
Perform POWER SEAT SYSTEM VERIFICATION TEST - VER 1.

No >> Repair the (D55) CAN B Bus (+) circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

U0022-CAN B BUS (+) CIRCUIT LOW

For a complete wiring diagram **Refer to Section 8W**.

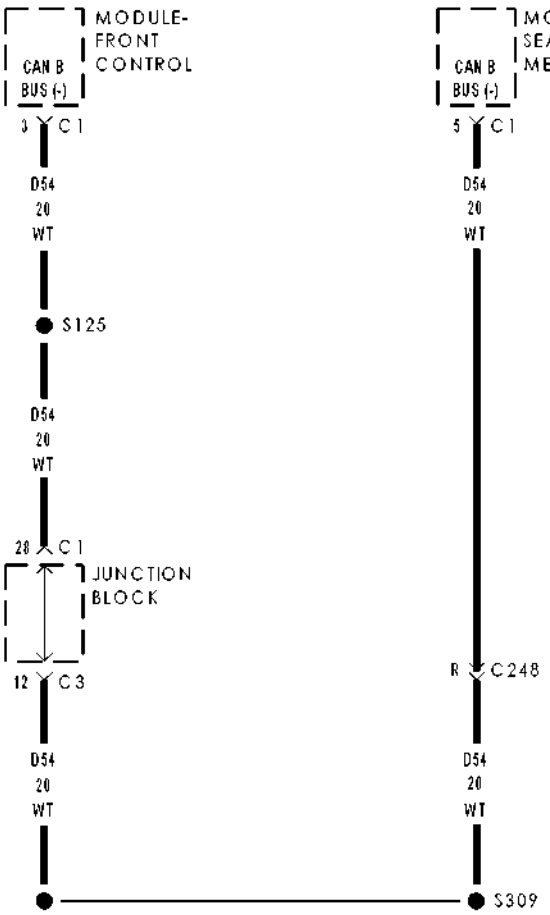
(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

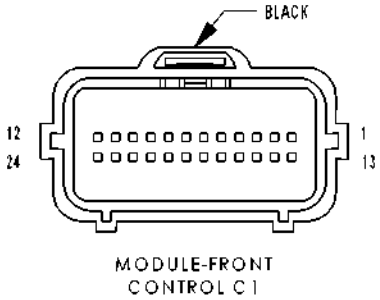
U0023-CAN B BUS (+) CIRCUIT HIGH

For a complete wiring diagram **Refer to Section 8W**.

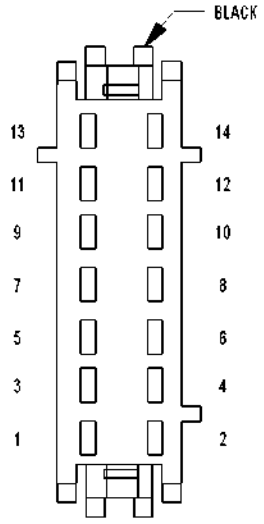
(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0024-CAN B BUS (-) CIRCUIT OPEN





MODULE-FRONT
CONTROL C1



MODULE-SEAT
MEMORY
C1

812af69b

U0024-CAN B BUS (-) CIRCUIT OPEN — (CONTINUED)

For the Power Seat System circuit diagram(Refer to 8 - ELECTRICAL/POWER SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  The Seat Memory Module detects the (D54) CAN B Bus (-) circuit is open.

Possible Causes
(D54) CAN B BUS (-) CIRCUIT OPEN
SEAT MEMORY MODULE

Theory of Operation

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.
With the scan tool, record and erase MSM DTC's
Cycle the ignition from on to off 3 times.
Turn the ignition on.
With the scan tool, read active MSM DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

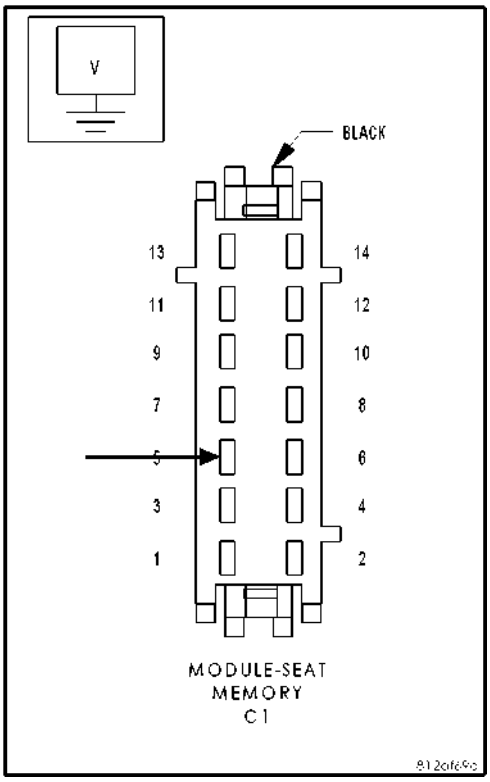
U0024-CAN B BUS (-) CIRCUIT OPEN — (CONTINUED)

2. (D54) CAN B BUS (-) CIRCUIT OPEN

Turn the ignition off.

Disconnect the Seat Memory Module C1 harness connector.

Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.



Is there any voltage present?

Yes >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Seat Memory Module in accordance with the service information.
Perform POWER SEAT SYSTEM VERIFICATION TEST - VER 1.

No >> Repair the (D54) CAN B Bus (-) circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

U0025-CAN B BUS (-) CIRCUIT LOW

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0026-CAN B BUS (-) CIRCUIT HIGH

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0141–LOST COMMUNICATION WITH FRONT CONTROL MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0151-LOST COMMUNICATION WITH OCCUPANT RESTRAINT CONTROLLER

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0154-LOST COMMUNICATION WITH OCCUPANT CLASSIFICATION MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0155-LOST COMMUNICATION WITH CLUSTER/CCN

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0156-LOST COMMUNICATION WITH EOM

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0164-LOST COMMUNICATION WITH HVAC CONTROL MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0168-LOST COMMUNICATION WITH VEHICLE SECURITY CONTROL MODULE (SKREEM/WCM)

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0184-LOST COMMUNICATION WITH RADIO

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0186-LOST COMMUNICATION WITH AUDIO AMPLIFIER

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0195-LOST COMMUNICATION WITH SDARS

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0196-LOST COMMUNICATION WITH VEHICLE ENTERTAINMENT CONTROL MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0199-LOST COMMUNICATION WITH DRIVER DOOR MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0200-LOST COMMUNICATION WITH PASSENGER DOOR MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0208-LOST COMMUNICATION WITH HEATED SEAT CONTROL MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

BODY VERIFICATION TEST – VER 1

Diagnostic Test

1. Perform Body Verification Test

Disconnect all jumper wires and reconnect all previously disconnected components and connectors.

Ensure that all accessories are turned off.

Ensure that the battery is fully charged.

Turn the ignition on.

With the scan tool, record and erase DTCs from all modules.

If repairs were made to any of the HVAC door actuator circuits, with the scan tool in HVAC, select System Tests and then select Actuator DTC Detection. The test must pass before proceeding to the next step.

If repairs were made to any of the HVAC doors, linkage, door actuators, or door actuator circuits, with the scan tool in HVAC, select System Tests and then select Actuator Calibration Test. The test must pass before proceeding to the next step.

Turn the ignition off, wait 10 seconds, and then turn the ignition on.

Operate all functions of the system that caused the original concern.

With the scan tool, select ECU View.

Check for DTCs in the modules.

Are DTCs present in any of the modules or is the original condition still present?

Yes >> The repair is not complete. Refer to the related category for the DTC or symptom that is still present.

No >> The repair is complete.

POWER SEAT SYSTEM VERIFICATION TEST – VER 1

Diagnostic Test

1. Perform Power Seat System Verification Test

Disconnect all jumper wires and reconnect all previously disconnected components and connectors.

Ensure that all accessories are turned off.

Ensure that the battery is fully charged.

Turn the ignition on.

If either the Seat Memory Module or the Driver Horizontal Seat Adjuster Motor/Seat Track was replaced, the MSM Standard Routine must be performed using the scan tool.

With the scan tool, record and erase DTCs from all modules.

Operate the driver seat in all positions.

With the Memory Switch on the Driver's Door, program the Driver's Seat #1 Button to a desired position and Driver #2 Button to a different position.

Verify that both Memory positions can be recalled from the RKE transmitter and the Memory Switch on the Driver's Door.

Turn the ignition off, wait 10 seconds, and then turn the ignition on.

With the scan tool, select ECU View.

Check for DTCs in the modules.

Are DTCs present in any of the modules or is the original condition still present?

Yes >> The repair is not complete. Refer to the related category for the DTC or symptom that is still present.

No >> The repair is complete.

SCHEMATICS AND DIAGRAMS

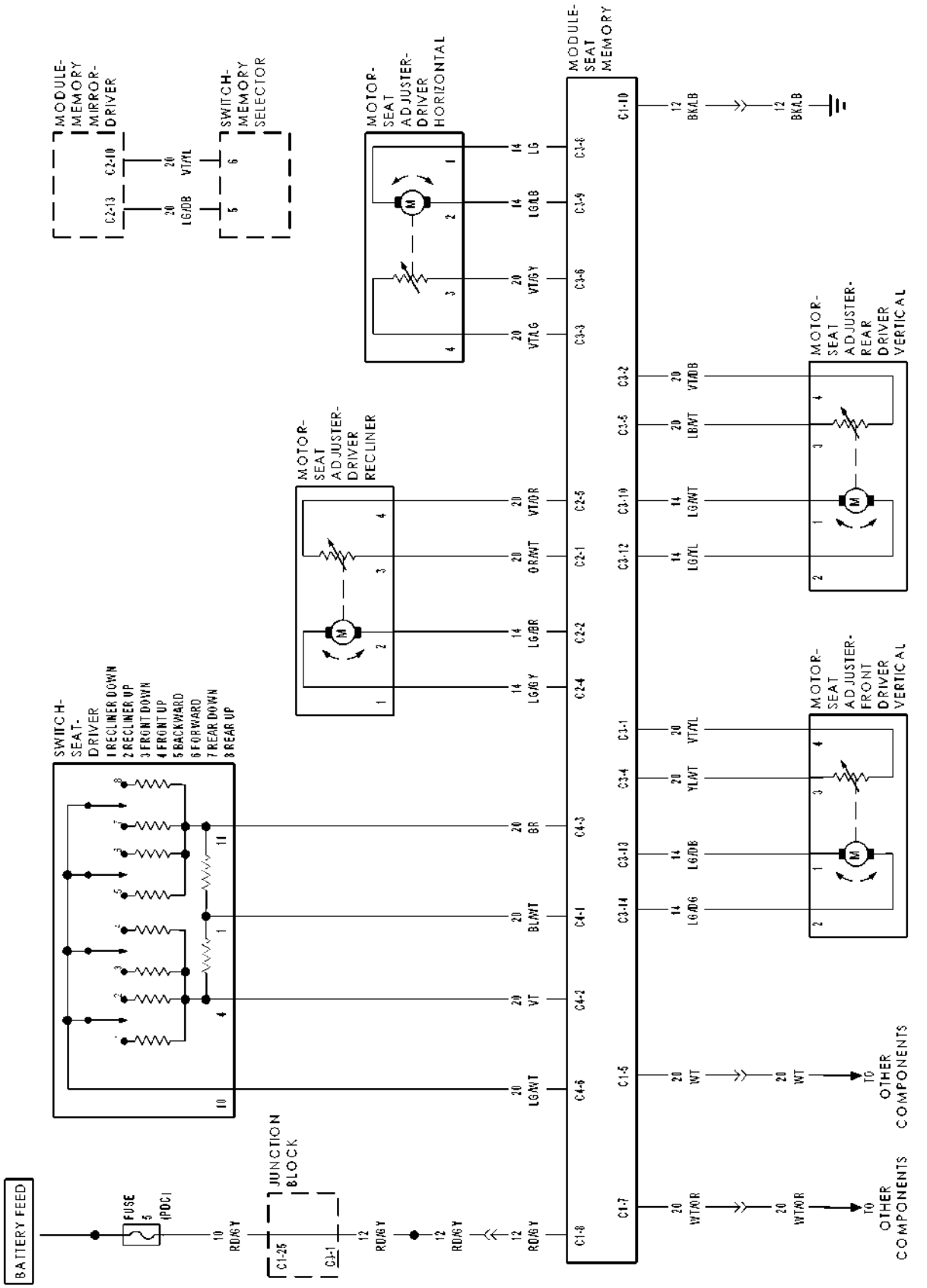


Fig. 1 POWER SEAT SYSTEM

POWER SEATS - SERVICE INFORMATION

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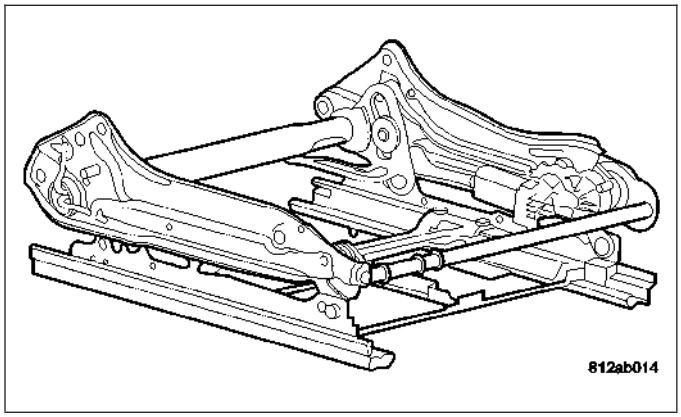
POWER SEATS - SERVICE INFORMATION

DESCRIPTION

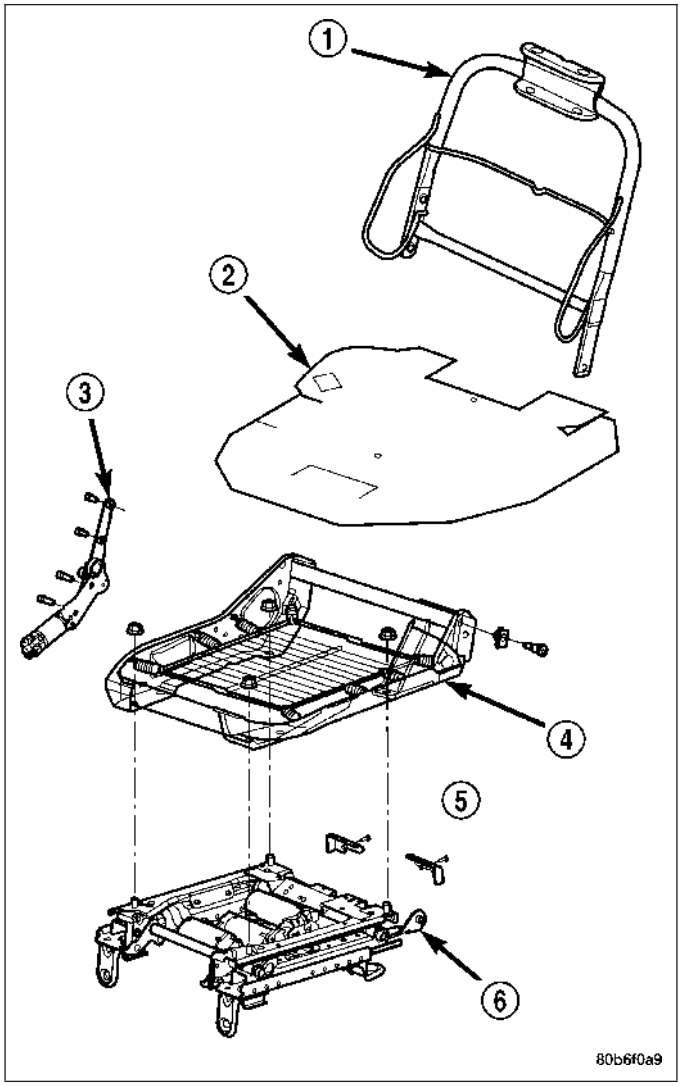
POWER SEAT SYSTEM

The power seat system allows the driver and front seat passenger to electrically adjust their seating positions using the power seat switches located on the outboard seat cushion side shield of each front seat.

A driver side eight-way power seat is standard on highline models and optional on others. The power seat includes a six-way adjustable seat cushion track and a two-way power seat back. The eight-way power seat is also available with the heated seat and memory seat system that automatically positions the power seat for two different drivers (Refer to 8 - ELECTRICAL/HEATED SEATS - DESCRIPTION) and MEMORY SEAT SYSTEM below.



The power seat system for this vehicle includes the following major components:



- **Power Seat Adjuster** - Depending on the seat, four-way or eight-way power, the adjuster (6) may be equipped with up to four electric motors.
  There are three reversible motors that operate the power seat adjuster. The motors are connected to worm-drive gearboxes that move the seat adjuster through a combination of screw-type drive units.
  The front and rear of a seat are operated by different motors. They can be raised or lowered independently of each other. When the center seat switch is pushed in the Up or Down direction, both the front and rear motors operate in unison. The forward/rearward motor is operated by pushing the center seat switch in the Forward or Rearward direction, which moves the entire seat in the selected direction on all models.
  Each motor contains a self-resetting circuit breaker to protect it from overload. Consecutive or frequent resetting of the circuit breakers must not be allowed to continue, or the motors may be damaged.
  The power seat adjuster cannot be repaired, and is serviced only as a complete unit (Refer to 23 - BODY/SEATS/SEAT ADJUSTERS - REMOVAL).
- **Power Seat Recliner** - The power seat recliner (3) replaces the manual seat recliner.
  The power seat option includes an electrically operated power seat back recliner mechanism. The power seat recliner switch is integral to the power seat switch assembly, but is actuated with a separate switch knob.
  The power seat recliner motor assembly is mounted in the place of a seat hinge on the outboard side of the seat. The upper hinge plate of the power seat recliner mechanism is secured with two screws to the seat back frame and is concealed beneath the seat back trim cover and padding. The lower hinge plate and the motor and drive unit of the power seat recliner mechanism is secured with two screws to the seat cushion frame, and is concealed by the outboard seat cushion side shield.
  The power seat recliner motor cannot be repaired. If the unit is faulty or damaged, it must be replaced.
- **Power Seat Switches** - Two power seat switches are used per vehicle if equipped with power seats. One seat switch is used for each front seat. Each switch is mounted in the appropriate seat cushion side shield. Refer to the appropriate power seat switch later in this section for additional information.

MEMORY SEAT SYSTEM

An electronic memory seat system is available on certain models. The memory system is able to store and recall all driver side power seat positions, and the drivers side view mirror positions. The system can be set for two different drivers. On vehicles with a factory installed radio connected to the Programmable Communications Interface (PCI) data bus network, the memory system is also able to store and recall up to twenty radio station presets (ten AM and ten FM), also for two drivers. The memory system also will store and recall the last station listened to for each driver, even if it is not one of the twenty preset stations.

The memory system will automatically recall all of these settings when a button of the memory switch is depressed, or when the doors are unlocked using the Remote Keyless Entry (RKE) transmitter (if enabled). If the vehicle has more than two drivers the RKE transmitter recall of memory features can be disabled. This is a customer programmable feature of the overhead console. Refer to the Overhead Console section of this manual for additional information.

The memory system also has a easy exit feature that will move the driver seat rearward 55 millimeters or to the end of its travel, whichever occurs first, when the key is removed from the ignition switch lock cylinder. This is a customer programmable feature of the overhead console. Refer to the Overhead Console section of this manual for additional information.

The memory system includes the following components:

- **Memory Selector Switch** - located in the driver door trim panel.
- **Driver Memory Mirror Module (DMMM)** - located in the driver door, behind the trim panel.
- **Passenger Memory Mirror Module (PMMM)** - located in the passenger door, behind the trim panel.
- **Position Potentiometers - Drivers Mirror** - The potentiometer is permanently installed on the drivers side view mirror motor. This potentiometer is used to provide a reference signal to the memory heated seat mirror module, letting the module know the exact position of the mirror.
- **Sentry Key Remote Entry Module (SKREEM)** - located at ignition key cylinder.
- **Remote Keyless Entry (RKE) Transmitter** - located with ignition key.
- **Memory Seat Module (MSM)** - located underneath the driver seat and also controls the Adjustable Pedals.
- **Position Potentiometers - Seat Track** - These potentiometers are permanently installed in each of the power seat track motors. They are used to provide a reference signal to the memory heated seat mirror module, letting the module know the exact position of the seat cushion and recliner.
- **Radio** - located in the instrument panel center stack.
- **Automatic Temperature Control (ATC)** - located in the instrument panel center stack.

Certain functions and features of the memory system rely upon resources shared with other electronic modules in the vehicle over the Controller Area Network (CAN) bus. The CAN bus allows the sharing of sensor information. This helps to reduce wire harness complexity, internal controller hardware, and component sensor current loads. At the same time, this system provides increased reliability, enhanced diagnostics, and allows the addition of many new feature capabilities. For diagnosis of these electronic modules or of the CAN bus, the use of a scan tool and the proper diagnostic information are needed.

OPERATION

POWER SEAT SYSTEM

The power seat system receives battery current through a 40 amp fuse in the Power Distribution Center (PDC) and a 20 amp circuit breaker in the junction block so that the power seats remain operational, regardless of the ignition switch position.

When a power seat switch is actuated, a battery feed and a ground path are applied through the power seat switch contacts to the appropriate motor or motors. The motor and drive unit operate to move the seat in the selected direction until the switch is released, or until the travel limit of the power seat track is reached. When the switch is moved in the opposite direction, the battery feed and ground path to the motor is reversed through the switch contacts. This causes the motor to run in the opposite direction.

When the recliner switch control knob is actuated, a resistance signal is sent to the appropriate Door Module via hard wired connections. The door module then sends the request to the Memory Seat Module (MSM) via the Controller Area Network (CAN) bus circuit. The MHSAPM is responsible for the 12v battery feed and ground path to the

power seat recliner adjuster motor. The adjuster motor operates to move the recliner mechanism through its drive unit in the selected direction until the switch is released, or until the travel limit of the adjuster is reached.

The driver side power seat recliner motor used on models equipped with the memory system also has a position potentiometer integral to the motor assembly, which electronically monitors the motor position.

MEMORY SEAT SYSTEM

The Memory Seat Module (MSM) receives hard wired inputs from the memory set/position switch and the potentiometers, mounted on each of the driver power seat adjuster motors and the driver side view mirror motor. The programmed software in the module allows it to know where the seat/mirror is located in its designed travel by a resistance reading generated from the seat adjuster or mirror mounted potentiometer. This way, when the memory switch is depressed the module will power the seat adjuster or mirror motors until the correct preset location is achieved. The module will prevent the seat memory recall function from being initiated, if the transmission gear selector lever is not in the Park or Neutral positions, or if the vehicle is moving. These inputs are monitored over the Controller Area Network (CAN) bus circuit by the MSM.

A memory setting is saved by pressing the “set” button, then pressing either the memory “1” or “2” button within 5 seconds of pressing the “set” button.

A memory setting is recalled by pressing either the memory “1” or “2” button, or by pressing the unlock button on a “linked” Remote Keyless Entry (RKE) transmitter.

For driver safety, memorized settings can not be recalled if the transmission is in a position other than Park or the seat belt is latched.

DIAGNOSIS AND TESTING

MEMORY SEAT SYSTEM

In order to obtain conclusive testing of the power seats with and without the memory system option, the Controller Area Network (CAN) bus, and all of the electronic modules that provide inputs to, or receive outputs from the memory system components must be checked. Use a scan tool and the proper diagnostic information to accurately diagnose the power seat/memory seat systems.

Note: Vehicles equipped with the memory/heated seat option utilize a low voltage cut-off feature. This feature turns off the 12v power to the power seat system anytime vehicle voltage is below 11.7v. Be certain to check the vehicle electrical system for proper voltage anytime the power seat system appears inoperative.

Before any testing of the power seat system is attempted, the battery should be fully-charged.

POWER SEAT ADJUSTER

Operate the power seat switch and move the seat in all direction. The seat should move in each of the selected directions.

If the power seat adjuster fails to operate in more than one direction, proceed as follows:

1. Check the power seat fuse in the power distribution center. If OK, go to Step 2. If not OK, replace the faulty fuse.
2. Remove the power seat switch from the seat cushion side panel. Check for battery voltage at the fused B(+) circuit cavity of the power seat switch wire harness connector. If OK, go to Step 3. If not OK, repair the open circuit to the power distribution center as required.
3. Check for continuity between the ground circuit cavity of the power seat switch wire harness connector and a good ground. There should be continuity. If OK, go to Step 4. If not OK, repair the open circuit to ground as required.
4. (Refer to 8 - ELECTRICAL/POWER SEATS/SEAT SWITCH - DIAGNOSIS AND TESTING). If the switch tests OK, check the wire harness between the power seat switch and the motor. If the circuits check OK, replace the faulty power seat adjuster assembly. If the circuits are not OK, repair the wire harness as required.

POWER SEAT RECLINER

1. Using a scan tool, check for any stored Diagnostic Trouble Codes (DTC's) in the memory seat module. If DTC's are present, use the proper diagnostic information to correct the DTC(s).
2. If the power seat recliner is not operational in any direction, check the power seat circuit breaker, located in the Integrated Power Module. If OK, go to Step 3.
3. Check for proper battery or electrical system voltage. If the electrical system voltage drops below a predetermined set-point (approximately 11.5v), the power seat system will not function until the proper system voltage has been restored. If OK, go to Step 4.
4. If the recliner motor is inoperative, apply 12v and a good ground source to the inoperative motor. If the motor does not operate in either direction replace the recliner motor assembly,

STANDARD PROCEDURE

MEMORY SYSTEM PROGRAMMING

The Memory Heated Seat Mirror Module (MHSMM) interfaces with the RKE vial the Programmable Communication Interface (PCI) bus. The proper procedure of setting and recalling a memory position using the RKE is as follows:

1. Press memory switch 1 and release to recall memory position 1.
2. Adjust the seat, recliner, set radio station presets and side view mirrors to the desired position.
3. Press momentarily and release memory switch S.
4. Press momentarily and release memory switch 1 or 2.
5. Press and release the **LOCK** button on one of the RKE transmitters. Do NOT press any switch for 10 seconds.

To program the second driver's position, repeat the above procedure using memory switch 2. The second RKE transmitter can be programmed in the same fashion.

Note: The module will abort a recall if the transmission is moved out of park or if any seat movement is activated whether manually or by memory recall.

To recall either of the programmed positions momentarily press and release either memory selector switch 1 or 2. If using RKE, just press and release the UNLOCK button on the proper transmitter for either position 1 or 2.

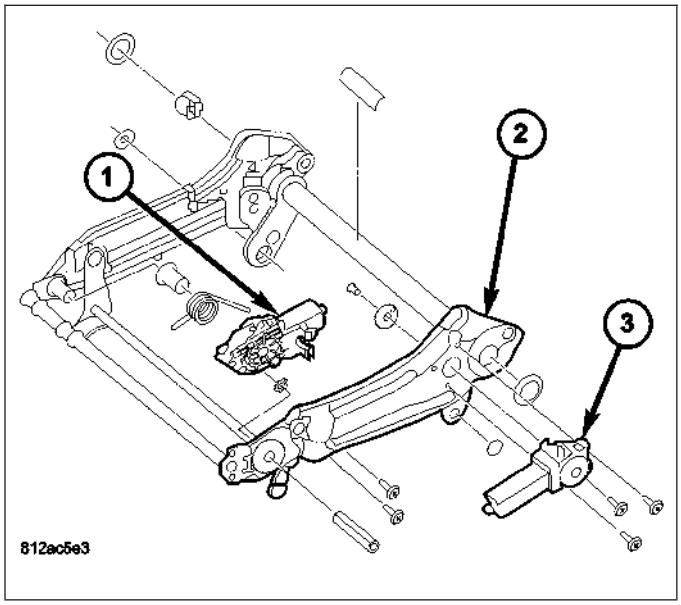
A recall is possible any time the vehicle transmission is in PARK. This condition is monitored by the MHSMM.

MOTOR-SEAT ADJUSTER

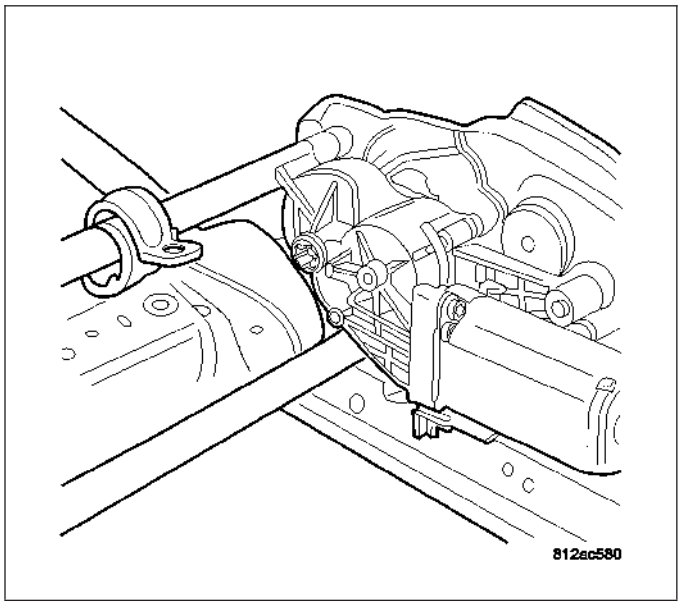
REMOVAL

FRONT TILT MOTOR

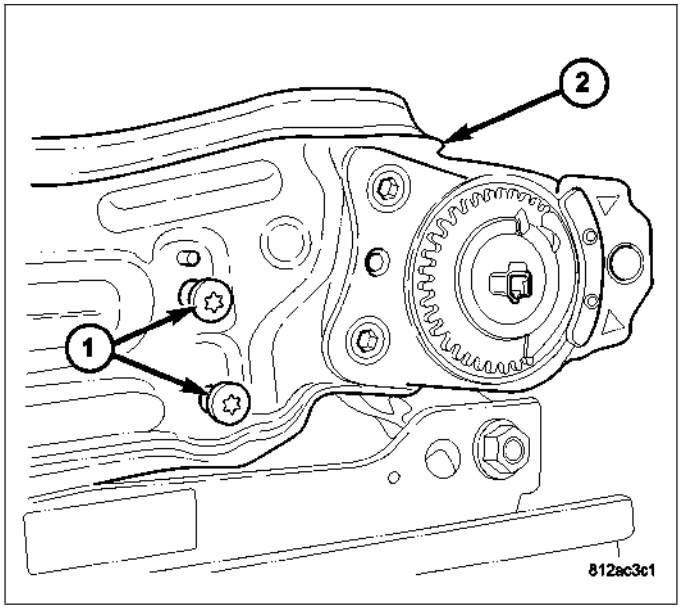
1. Disconnect and isolate the battery negative cable.
2. Remove the affected seat with the inoperative motor (1) (Refer to 23 - BODY/SEATS/SEAT - FRONT - REMOVAL).
3. Remove the seat cushion and pan (Refer to 23 - BODY/SEATS/SEAT CUSHION COVER - REMOVAL).



4. Disconnect the motor electrical connector.

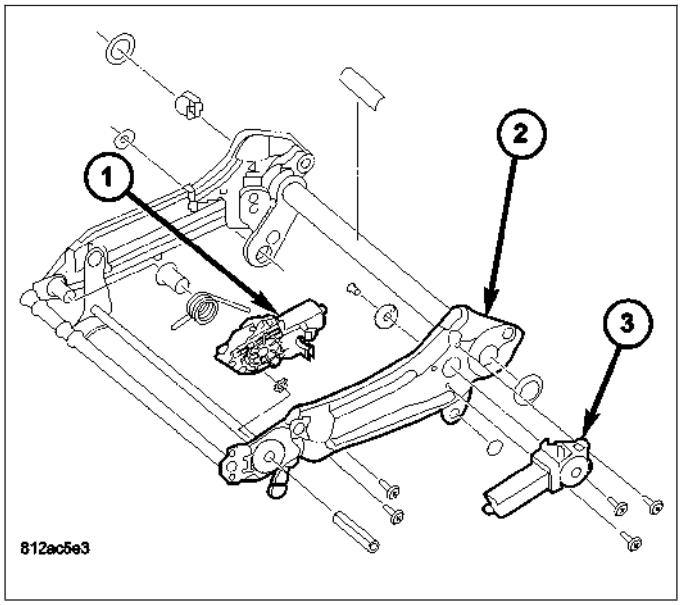


5. Remove the fasteners holding the motor to the seat adjuster (1).
6. Remove motor from seat adjuster (2).

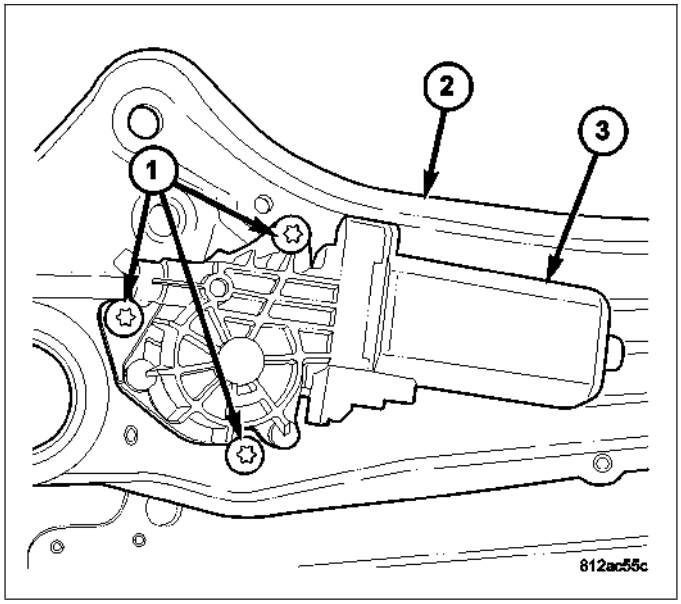


REAR TILT MOTOR

1. Disconnect and isolate the battery negative cable.
2. Remove the affected seat with the inoperative motor (3) (Refer to 23 - BODY/SEATS/SEAT - FRONT - REMOVAL).
3. Remove the seat cushion and pan (Refer to 23 - BODY/SEATS/SEAT CUSHION COVER - REMOVAL).



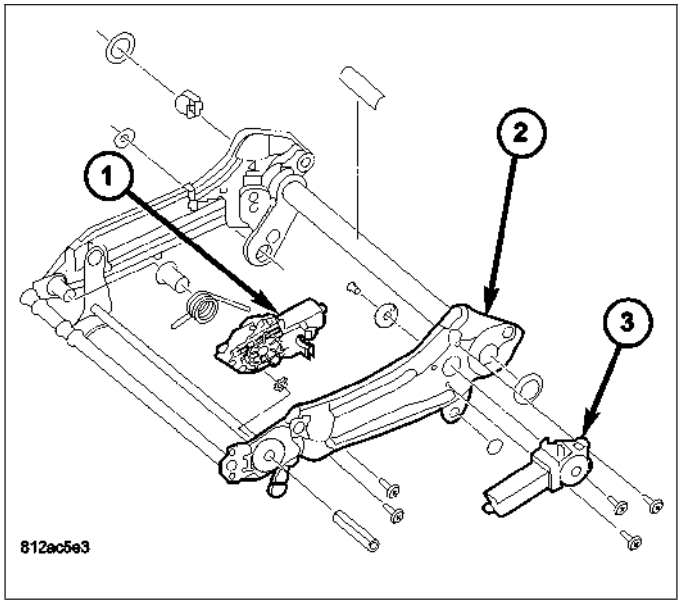
4. Disconnect the motor (3) electrical connector.
5. Remove the fasteners holding the motor (3) to the seat adjuster (1).
6. Remove motor (3) from seat adjuster (2).



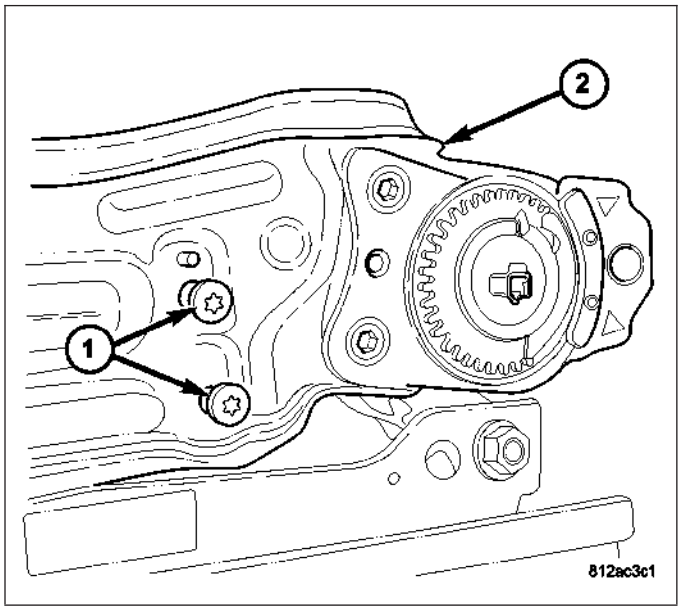
INSTALLATION

FRONT TILT MOTOR

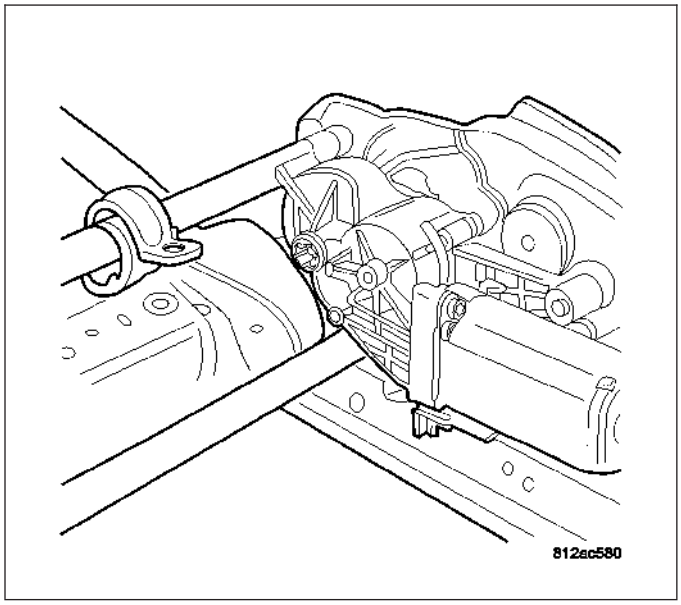
1. Position motor (1) on seat adjuster (2).



2. Install the fasteners (1) holding the motor to the seat adjuster (2).

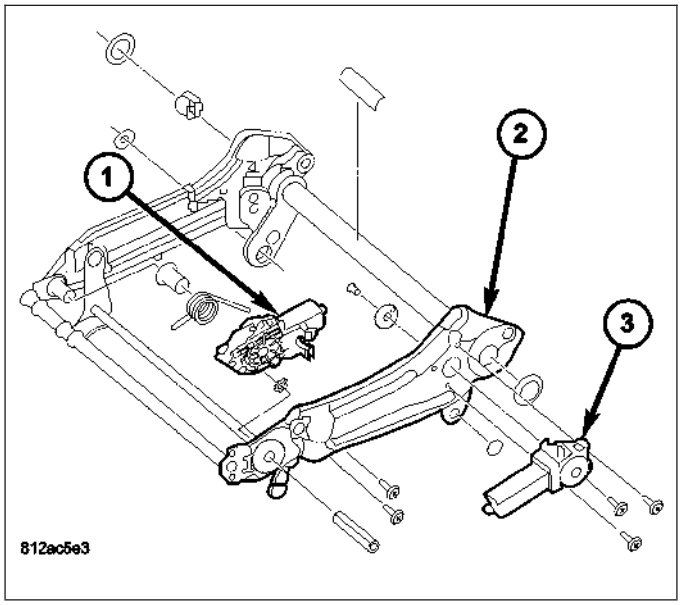


3. Connect the motor electrical connector.
4. Install the seat cushion (Refer to 23 - BODY/ SEATS/SEAT CUSHION COVER - INSTALLATION).
5. Clip the wire harness to cushion pan.
6. Install the seat assembly (Refer to 23 - BODY/ SEATS/SEAT - INSTALLATION).
7. Connect the battery negative cable.
8. Verify system and vehicle operation.

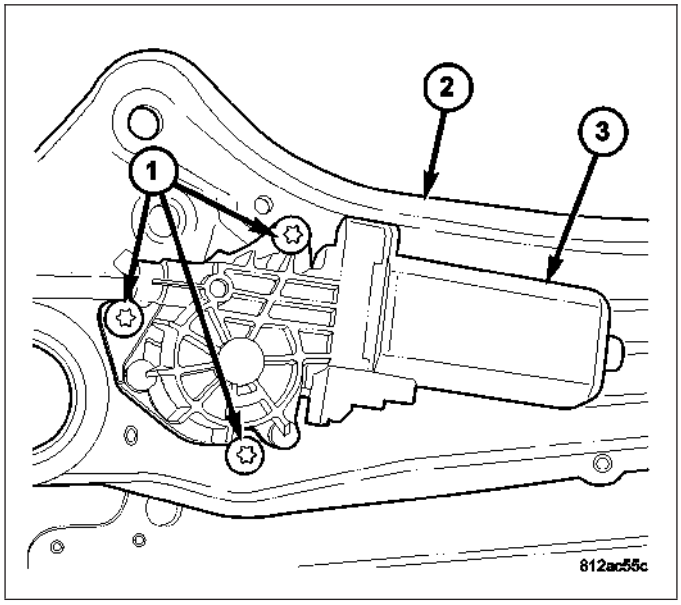


REAR TILT MOTOR

1. Position motor (3) on seat adjuster (2).



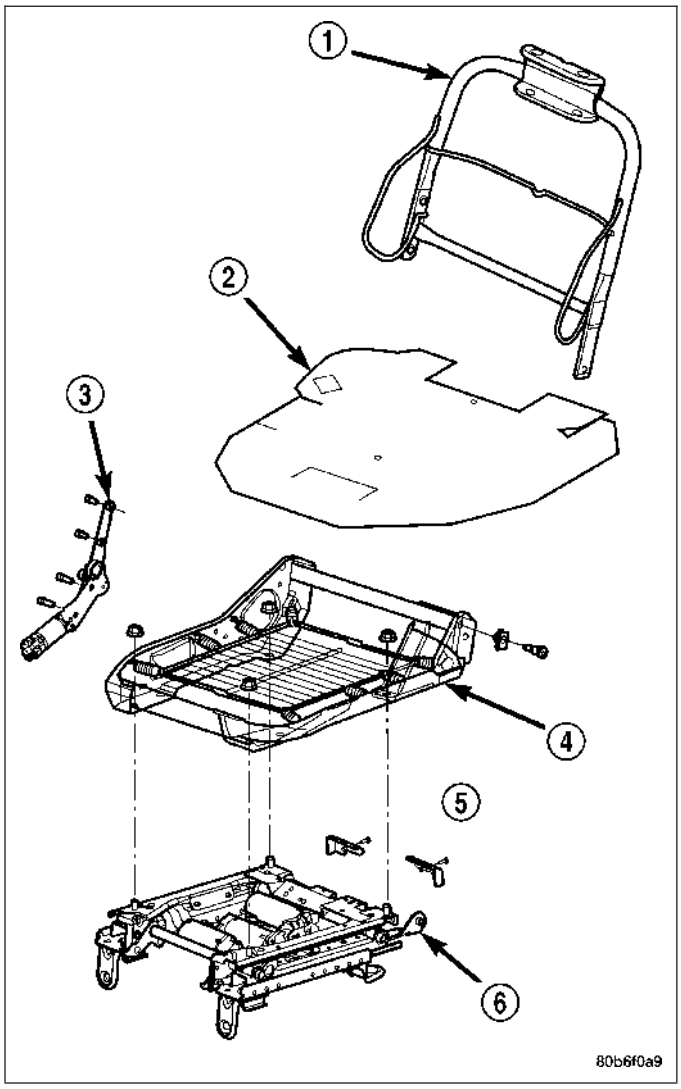
2. Install the fasteners (1) holding the motor (3) to the seat adjuster (2).
3. Connect the motor electrical connector.
4. Install the seat cushion (Refer to 23 - BODY/ SEATS/SEAT CUSHION COVER - INSTALLATION).
5. Clip the wire harness to cushion pan.
6. Install the seat assembly (Refer to 23 - BODY/ SEATS/SEAT - INSTALLATION).
7. Connect the battery negative cable.
8. Verify system and vehicle operation.



POWER SEAT RECLINER

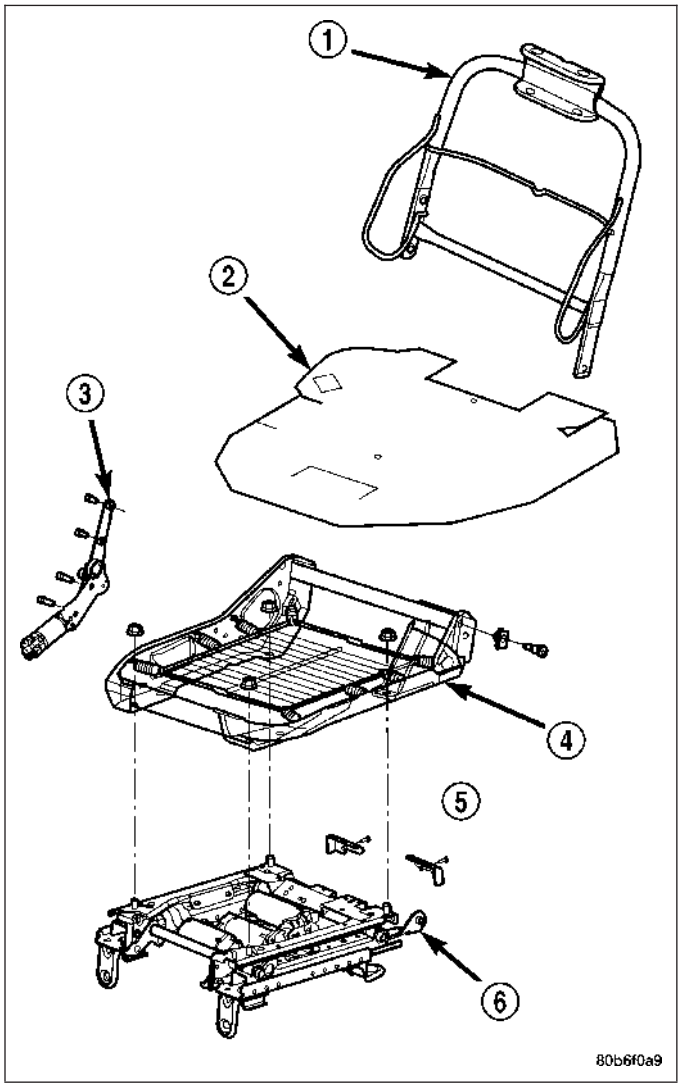
REMOVAL

1. Remove the seat back (1) (Refer to 23 - BODY/ SEATS/SEAT BACK CUSHION/COVER - REMOVAL).
2. Disengage J-strap at base of seat cushion (4).
3. Roll seat cushion cover upward to access bolts attaching recliner (3) to seat back frame (1).
4. Remove bolts attaching recliner to seat back frame (1).
5. Separate recliner (3) from seat (4).



INSTALLATION

1. Position recliner (3) assembly on seat frame (4).
2. Install bolts attaching recliner (3) to seat back frame (1) and tighten to 28 N·m (20 ft. lbs.).
3. Roll seat cover downward.
4. Engage J-strap at base of seat cushion (4).
5. Install the seat back (1) (Refer to 23 - BODY/ SEATS/SEAT BACK CUSHION/COVER - INSTALLATION).



SWITCH-SEAT

DESCRIPTION

The power seat can be adjusted in six different ways using the power seat switch. The switch is located on the lower outboard side of the seat cushion on the seat cushion side shield on all models.

The individual switches in the power seat switch assembly cannot be repaired. If one switch is damaged or faulty, the entire power seat switch must be replaced.

OPERATION

When a power seat switch is actuated, a battery feed and a ground path are applied through the switch contacts to the power seat adjuster or recliner adjuster motor. The selected adjuster motor operates to move the seat or recliner through its drive unit in the selected direction until the switch is released, or until the travel limit of the adjuster is reached. When the switch is moved in the opposite direction, the battery feed and ground path to the motor are reversed through the switch contacts. This causes the adjuster motor to run in the opposite direction.

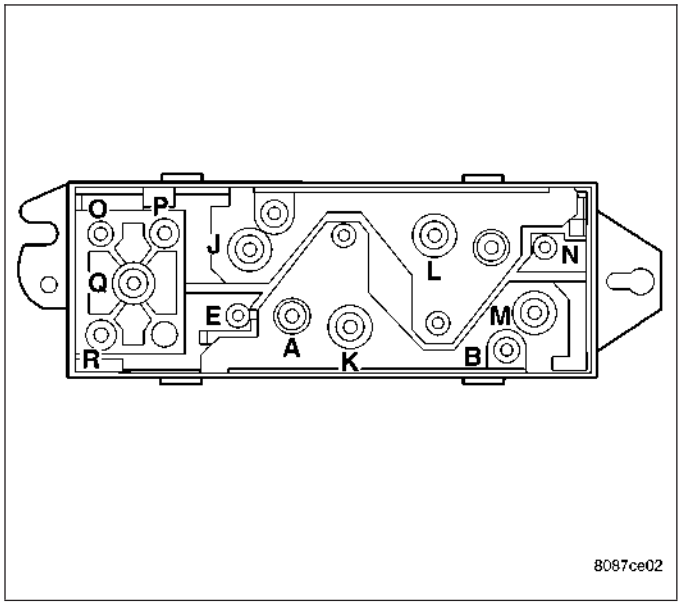
No power seat switch should be held applied in any direction after the adjuster has reached its travel limit. The power seat adjuster motors each contain a self-resetting circuit breaker to protect them from overload. However, consecutive or frequent resetting of the circuit breaker may cause damage.

DIAGNOSIS AND TESTING

POWER SEAT SWITCH

1. Disconnect and isolate the battery negative cable.
2. Remove the power seat switch from the power seat (Refer to 8 - ELECTRICAL/POWER SEATS/ SEAT SWITCH - REMOVAL).
3. Use an ohmmeter to test the continuity of the power seat switch. Refer to POWER SEAT SWITCH CONTINUITY table. If not OK, replace the faulty power seat switch. If switch tests OK (Refer to 8 - ELECTRICAL/POWER SEATS/ POWER SEAT ADJUSTER - DIAGNOSIS AND TESTING).

CAUTION: Be certain the two halves of the power seat switch assembly are completely snapped together. Failure to do so could result in a misdiagnosed power seat switch.



POWER SEAT SWITCH CONTINUITY

SWITCH POSITION	CONTINUITY BETWEEN
OFF	B-N, B-J, B-M, B-E, B-L, B-K
VERTICAL UP	A-E, A-M, B-N, B-J
VERTICAL DOWN	A-J, A-N, B-M, B-E
HORIZONTAL FORWARD	A-K, B-L
HORIZONTAL REARWARD	A-L, B-K
FRONT TILT DOWN	A-J, B-E
FRONT TILT UP	A-E, B-J
REAR TILT DOWN	A-N, B-M
REAR TILT UP	A-M, B-N

REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Remove the seat cushion side panel from the seat and disconnect the electrical harness connector.
3. Remove the screws that secure the power seat switch and seperate switch from trim panel.

INSTALLATION

1. Position the power seat switch on the seat cushion side panel install the two screws.
2. Connect the power seat switch electrical connector.
3. Install the seat cushion side panel on the seat.
4. Connect the battery negative cable.
5. Verify system and vehicle operation.

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POWER WINDOWS

DESCRIPTION

The power window system allows each of the door windows to be raised and lowered electrically by actuating a switch on the trim panel of each respective door. A master switch on the driver side front door trim panel allows the driver to raise or lower each of the passenger door windows and to lock out the individual switches on the passenger doors from operation. The power window system receives battery feed through a circuit breaker in the Junction Block (JB), only when the ignition switch is in the On position.

The power window system includes the power window switches on each door trim panel, the circuit breaker, and the power window motors inside each door.

The power window motor and mechanism is integral to the power window regulator unit. If the power window motor or mechanism is inoperative or damaged, the entire power window regulator unit must be replaced. (Refer to 23 - BODY/DOOR - FRONT/WINDOW REGULATOR - REMOVAL) or (Refer to 23 - BODY/DOORS - REAR/WINDOW REGULATOR - REMOVAL) for the window regulator service procedures.

OPERATION

POWER WINDOW SWITCH

The power windows are controlled by a window/lock switch on the trim panel of each front door. Switches in the driver door window/lock switch allows the driver to control the passenger windows.

The power window switch for the driver side front door window has a second detent position beyond the normal Down position that provides an automatic one-touch window down feature. This feature is controlled by the window/lock switch.

The power window switches control the battery and ground feeds to the power window motors. All of the passenger door power window switches receive their battery and ground feeds through the circuitry of the window/lock switch. When the power window lockout switch is in the Lock position, the battery feed for the individual passenger door power window switches is interrupted.

POWER WINDOW MOTOR

A permanent magnet reversible motor moves the window regulator through an integral gearbox mechanism. A positive and negative battery connection to the two motor terminals will cause the motor to rotate in one direction. Reversing the current through these same two connections will cause the motor to rotate in the opposite direction.

In addition, each power window motor is equipped with an integral self-resetting circuit breaker to protect the motor from overloads. The power window motor and gearbox assembly cannot be repaired and, if inoperative or damaged, the power window regulator must be replaced.

DIAGNOSIS AND TESTING

WINDOW MOTOR

For complete circuit diagrams, refer to the appropriate wiring information.

1. Disconnect and isolate the battery negative cable. Remove the trim panel from the door with the inoperative power window.
2. Unplug the power window motor wire harness connector. Apply 12 volts across the motor terminals to check its operation in one direction. Reverse the connections across the motor terminals to check the operation in the other direction. If the window is in the full up or full down position, the motor will not operate in that direction by design. If OK, repair the circuits from the power window motor to the power window switch as required. If not OK, replace the inoperative motor.
3. If the motor operates in both directions, check the operation of the window glass and lift mechanism through its complete up and down travel. There should be no binding or sticking of the window glass or lift mechanism through the entire travel range. If not OK, check the window glass, tracks, and regulator for sticking, binding, or improper adjustment.

POWER WINDOWS

For complete circuit diagrams, refer to the appropriate wiring information.

ALL WINDOWS INOPERATIVE

1. Check the circuit breaker. If OK, go to Step 2. If not OK, replace the inoperative circuit breaker.
2. Disconnect and isolate the battery negative cable. Remove the window/lock switch from the driver side front door trim panel. Unplug the wire harness connector.
3. Check for continuity between the ground circuit cavity of the door module wire harness connector and a good ground. If OK, go to Step 4. If not OK, repair the circuit to ground as required.
4. Connect the battery negative cable. Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output (run) circuit cavity of the window/lock switch wire harness connector. If OK, (Refer to 8 - ELECTRICAL/POWER LOCKS/POWER LOCK SWITCH - DIAGNOSIS AND TESTING). If not OK, repair the circuit as required.

ONE WINDOW INOPERATIVE

The window glass must be free to slide up and down for the power window motor to function properly. If the glass is not free to move up and down, the motor will overload and trip the integral circuit breaker. To determine if the glass is free, disconnect the regulator from the glass. Then slide the window up and down by hand.

There is an alternate method to check if the glass is free. Position the glass between the up and down stops. Then, shake the glass in the door. Check that the glass can be moved slightly from side to side, front to rear, and up and down. Then check that the glass is not bound tight in the tracks. If the glass is free, proceed with the diagnosis that follows. If the glass is not free, determine the cause of the condition.

If the only inoperative window is in the driver or passenger side front door and the preceding checks have not identified a problem, (Refer to 8 - ELECTRICAL/POWER WINDOWS/WINDOW MOTOR - DIAGNOSIS AND TESTING). If the problem being diagnosed involves only the Auto-down feature for the driver side front door window, but all of the power windows are operational, replace the driver's side window/lock switch. For diagnosis of the window/lock switch, (Refer to 8 - ELECTRICAL/POWER LOCKS/POWER LOCK SWITCH - DIAGNOSIS AND TESTING). For a rear power window problem proceed with the following:

1. Disconnect and isolate the battery negative cable. Unplug the wire harness connector from the power window switch unit on the door with the inoperative power window. Check for continuity between the ground circuit cavity of the power window switch wire harness connector and a good ground. There should be continuity. If OK, go to Step 2. If not OK, repair the open circuit to the power window and door lock master switch as required.
2. Connect the battery negative cable. Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output (run) circuit cavity in the body half of the power window switch unit wire harness connector. If OK, go to Step 3. If not OK, repair the open circuit to the power window and door lock master switch as required.

3. Test the power window switch continuity (Refer to 8 - ELECTRICAL/POWER WINDOWS/POWER WINDOW SWITCH - DIAGNOSIS AND TESTING). If OK, go to Step 4. If not OK, replace the power window switch.
4. Check the continuity in each circuit between the inoperative power window switch wire harness connector cavities and the corresponding power window motor wire harness connector cavities. If OK, (Refer to 8 - ELECTRICAL/POWER WINDOWS/WINDOW MOTOR - DIAGNOSIS AND TESTING). If not OK, repair the open circuit(s) as required.

Note: All passenger door power window switches receive their battery and ground feed for operating the passenger door power window motors through the driver side power window and lock master switch and wire harness connector.

SWITCH-WINDOW

DIAGNOSIS AND TESTING

POWER WINDOW SWITCH

The front door power window switches are included in the window/lock switch (Refer to 8 - ELECTRICAL/POWER LOCKS/POWER LOCK SWITCH - DIAGNOSIS AND TESTING).

The Light-Emitting Diode (LED) illumination lamps for all of the power window switch knobs receive battery current through the power window circuit breaker in the junction block. If all of the LEDs are inoperative in the power window switch and the power windows are inoperative, (Refer to 8 - ELECTRICAL/POWER WINDOWS - DIAGNOSIS AND TESTING). If the power windows operate, but any or all of the LEDs are inoperative, the power window and lock switch units with the inoperative LED(s) must be replaced. For complete circuit diagrams, refer to the appropriate wiring information.

1. Check the fuse and the circuit breaker. If OK, go to Step 2. If not OK, replace the fuse or circuit breaker.
2. Turn the ignition switch to the On position. Check for battery voltage at the fuse in the Integrated Power Module (IPM). If OK, turn the ignition switch to the Off position and go to Step 3. If not OK, check circuit breaker and repair the circuit to the ignition switch as required.
3. Disconnect and isolate the battery negative cable. Remove the power window switch from the door trim panel. Unplug the wire harness connector from the switch.
4. Test the power window switch continuity. See the Power Window Switch Continuity chart to determine if the continuity is correct in the Neutral, Up and Down switch positions. If OK, (Refer to 8 - ELECTRICAL/POWER WINDOWS - DIAGNOSIS AND TESTING). If not OK, replace the inoperative switch.

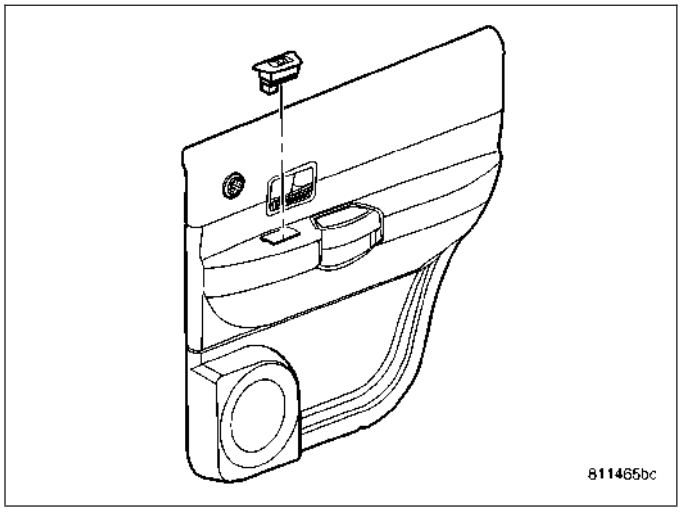
REAR POWER WINDOW SWITCH CONTINUITY CHART

SWITCH POSITION	CONTINUITY BETWEEN
NEUTRAL	PIN 3 & 4, PIN 1 & 2
UP	PIN 6 & 3, PIN 1 & 2
DOWN	PIN 6 & 2, PIN 3 & 4

REMOVAL

The driver and front passenger side power window switch is included in the window/lock switch. (Refer to 8 - ELECTRICAL/POWER LOCKS/POWER LOCK SWITCH - REMOVAL) for the service procedures.

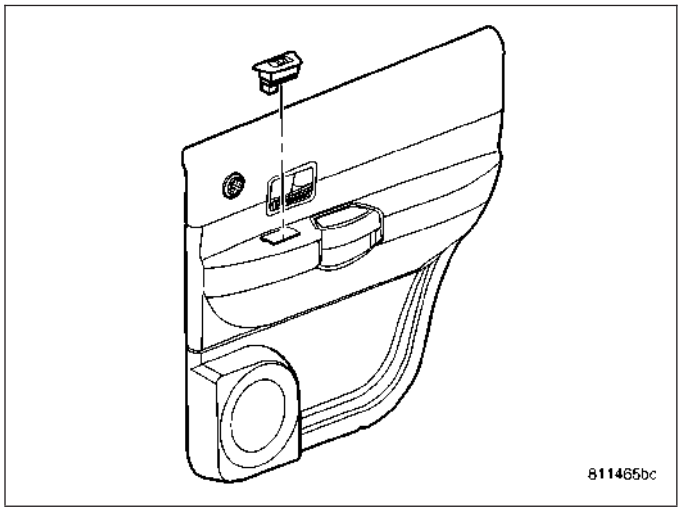
1. Disconnect and isolate the battery negative cable.
2. Remove the door trim panel (Refer to 23 - BODY/ DOORS - REAR/TRIM PANEL - REMOVAL).
3. Remove switch from door trim panel.



INSTALLATION

The driver and front passenger side power window switch is included in the window/lock switch. (Refer to 8 - ELECTRICAL/POWER LOCKS/POWER LOCK SWITCH - INSTALLATION).

1. Install the switch to the door trim panel.
2. Install the door trim panel (Refer to 23 - BODY/ DOORS - REAR/TRIM PANEL - INSTALLATION).
3. Connect the battery negative cable.



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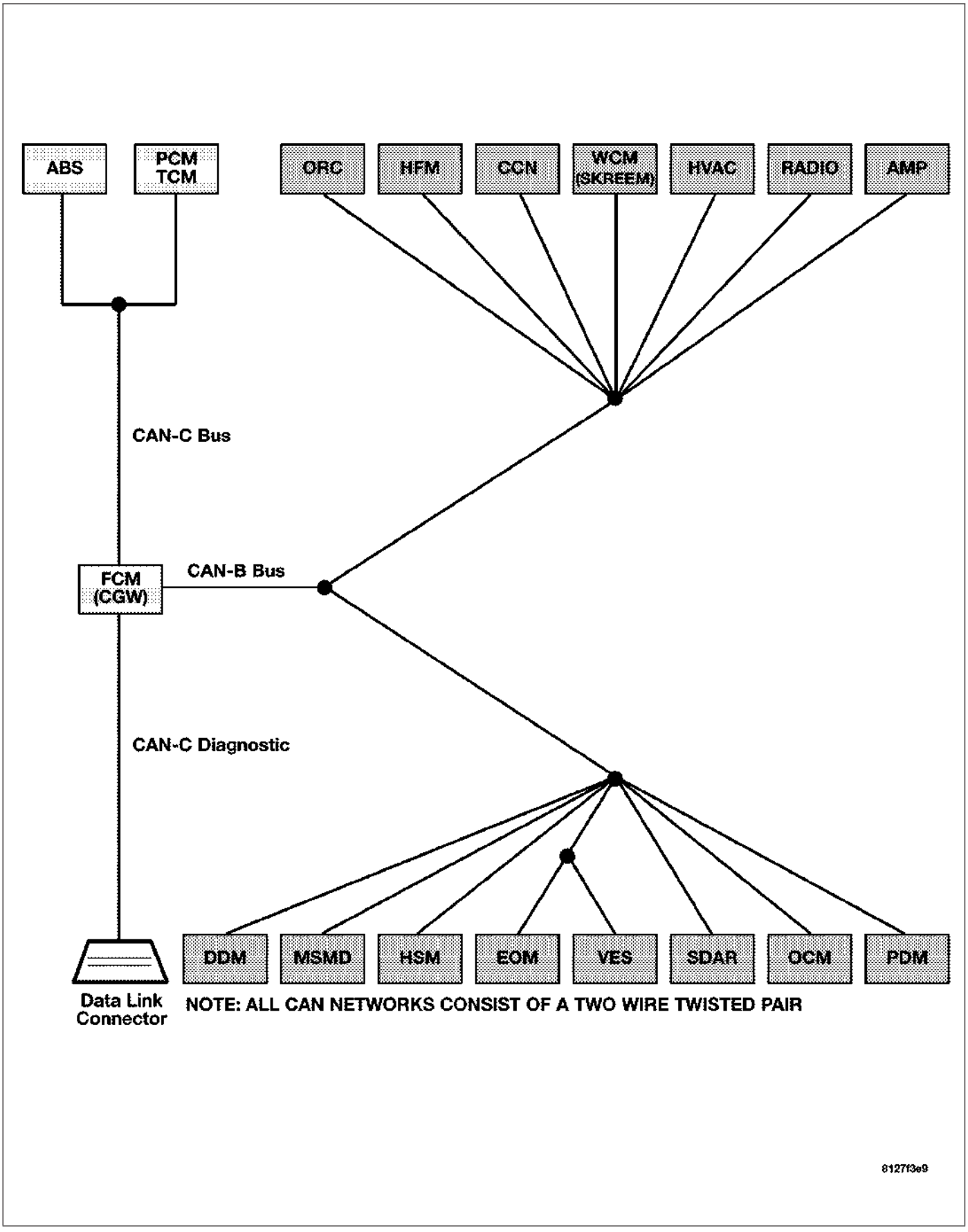
DIAGNOSIS AND TESTING

B1203-SRS WARNING INDICATOR CIRCUIT/PERFORMANCE



B1203-SRS WARNING INDICATOR CIRCUIT/PERFORMANCE (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the ORC monitors the CAN B bus for a message from the Instrument Cluster containing the airbag warning indicator status. The ORC requests the warning lamp status from the Instrument Cluster once every second.
- **Set Condition:**
  This DTC will set immediately if the indicator status is LOW or HIGH.

Possible Causes
INSTRUMENT CLUSTER ACTIVE DTCs
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. CHECK FOR AN ACTIVE DTC

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Restraint Controller (ORC) DTCs.

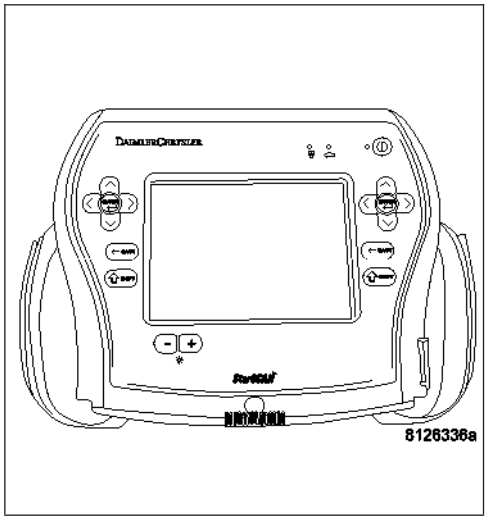
Select DTC type.

Active

Go To 2

Stored

Go To 4



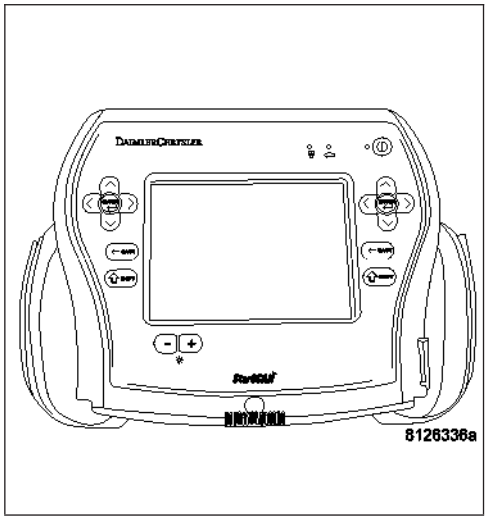
2. CHECK FOR INSTRUMENT CLUSTER DTCs

With the scan tool, read Instrument Cluster DTCs.

Does the scan tool display any Instrument Cluster DTCs?

Yes >> Refer to the symptom list for problems related to the Instrument Cluster.
Perform the ORC VERIFICATION TEST-VER 1.

No >> Go To 3
Perform the ORC VERIFICATION TEST-VER 1.



B1203-SRS WARNING INDICATOR CIRCUIT/PERFORMANCE (CONTINUED)

3. REPLACE THE OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

View repair.

Repair

Replace the Occupant Restraint Controller in accordance with the service information.

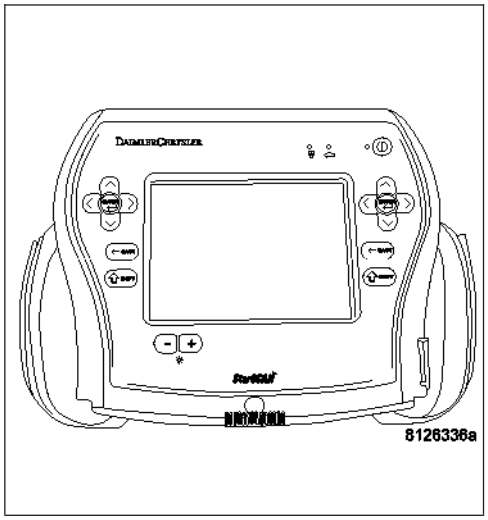
Perform the ORC VERIFICATION TEST-VER 1.

---

4. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase all DTCs from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return, continue the test until the problem area has been isolated.

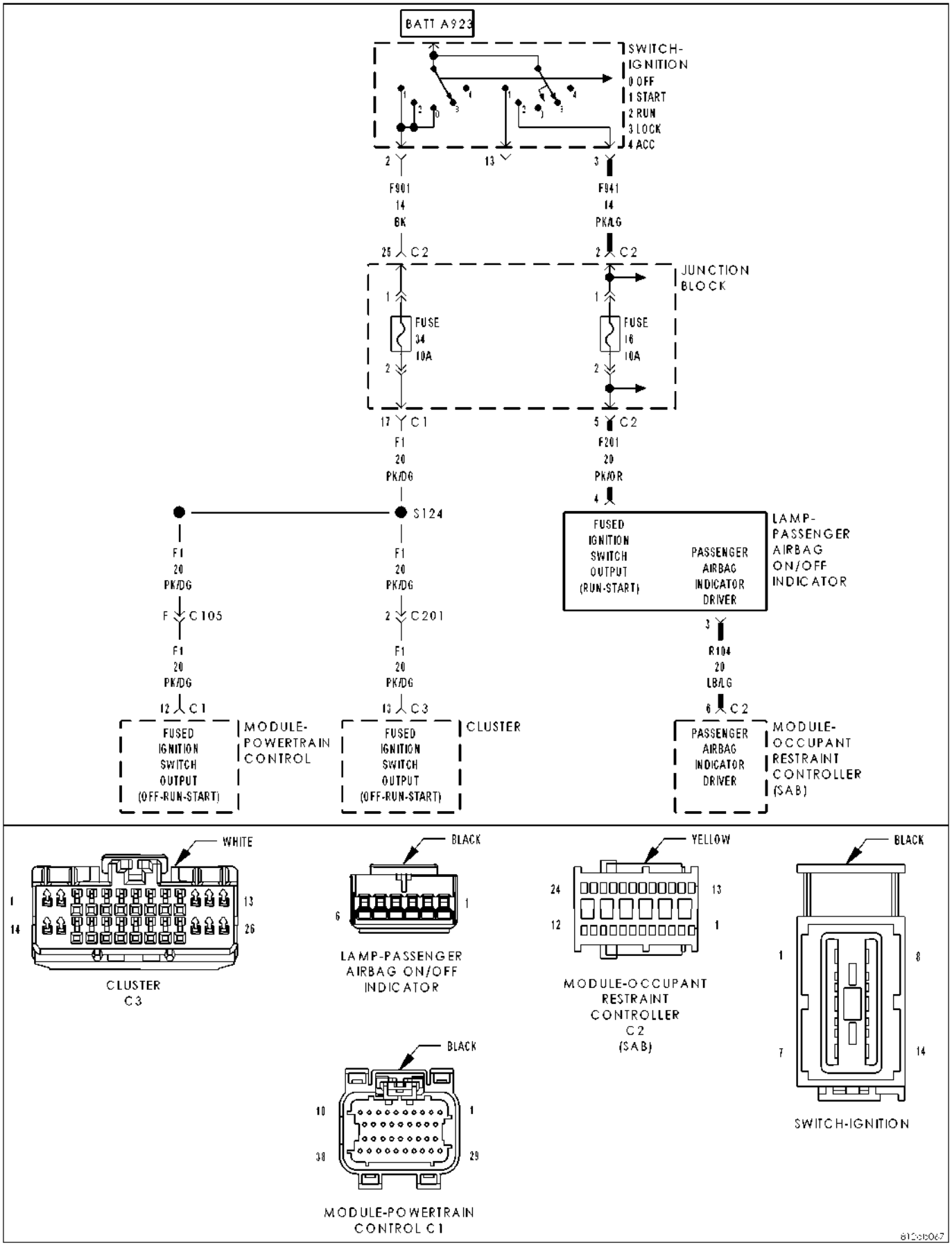
In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

Does the scan tool display any ACTIVE DTCs?

Yes >> Select appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1204-PASSENGER AIRBAG INDICATOR CIRCUIT LOW



B1204-PASSENGER AIRBAG INDICATOR CIRCUIT LOW (CONTINUED)

For the Airbag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Occupant Restraint Controller (ORC) cannot detect voltage on the (R104) Passenger Airbag Indicator Driver circuit.

Possible Causes
(R104) PASSENGER AIRBAG INDICATOR DRIVER CIRCUIT SHORTED TO GROUND
PASSENGER AIRBAG ON/OFF INDICATOR LAMP
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. VERIFY THAT DTC B1204 PASSENGER AIRBAG INDICATOR CIRCUIT LOW IS ACTIVE

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

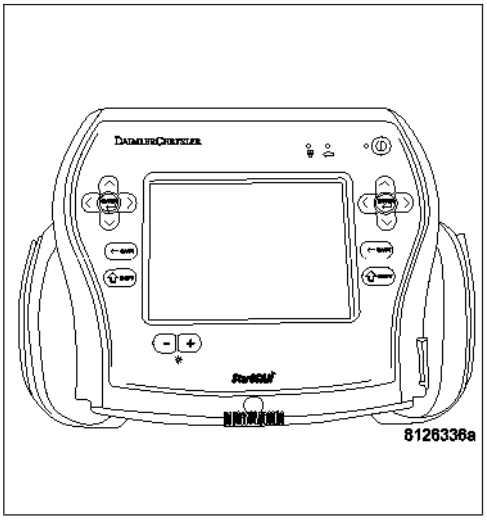
Turn the ignition on.

With the scan tool, read Occupant Restraint Controller (ORC) DTCs.

Does the scan tool display active: B1204 PASSENGER AIRBAG INDICATOR CIRCUIT LOW?

Yes >> Go To 2

No >> Go To 4



B1204-PASSENGER AIRBAG INDICATOR CIRCUIT LOW (CONTINUED)

2. CHECK FOR ACTIVE DTC B1204 PASSENGER AIRBAG INDICATOR CIRCUIT LOW WITH PASSENGER AIRBAG ON/OFF INDICATOR LAMP DISCONNECTED

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Passenger Airbag On/Off Indicator Lamp connector.

NOTE: Check connectors - Clean and repair as necessary.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, erase ORC DTCs.

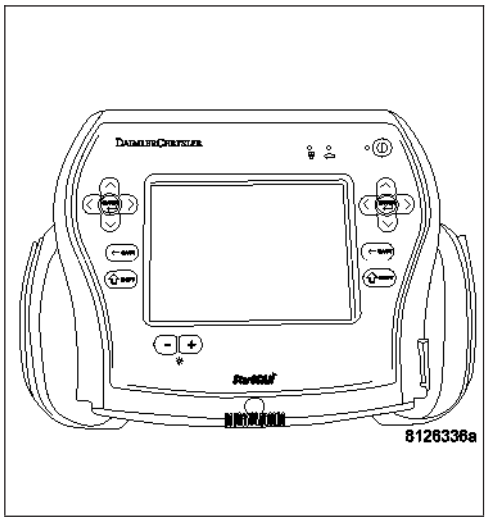
Turn the ignition off, wait 10 seconds, and then turn the ignition on.

With the scan tool, read ORC DTCs.

Does the scan tool display active: B1204 PASSENGER AIRBAG INDICATOR CIRCUIT LOW?

Yes >> Go To 3

No >> Replace the Passenger Airbag On/Off Indicator Lamp in accordance with the Service Information.
Perform ORC VERIFICATION TEST - VER 1.



3. CHECK (R104) PASSENGER AIRBAG INDICATOR DRIVER CIRCUIT FOR A SHORT TO GROUND

WARNING: If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the ORC C2 connector.

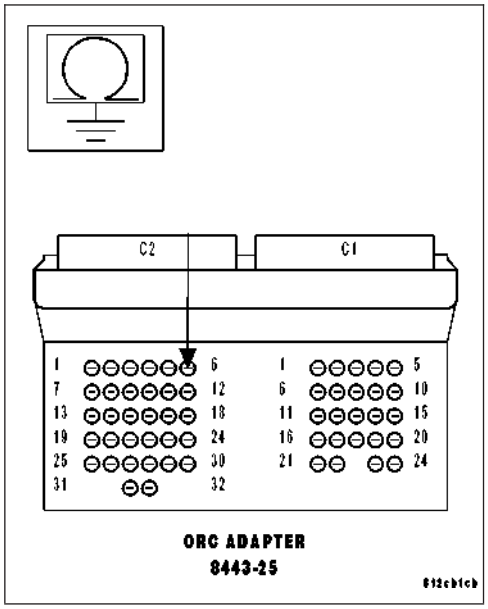
NOTE: Check connectors - Clean and repair as necessary.
Connect the appropriate Load Tool ORC Adaptor to the ORC connector.

Measure the resistance of the (R104) Passenger Airbag Indicator Driver circuit between ground and the ORC Adaptor.

Is the resistance below 100.0 ohms?

Yes >> Repair the (R104) Passenger Airbag Indicator Driver circuit for a short to ground.
Perform ORC VERIFICATION TEST - VER 1.

No >> Replace the ORC in accordance with the Service Information.
Perform ORC VERIFICATION TEST - VER 1.



B1204-PASSENGER AIRBAG INDICATOR CIRCUIT LOW (CONTINUED)

4. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase all DTCs from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

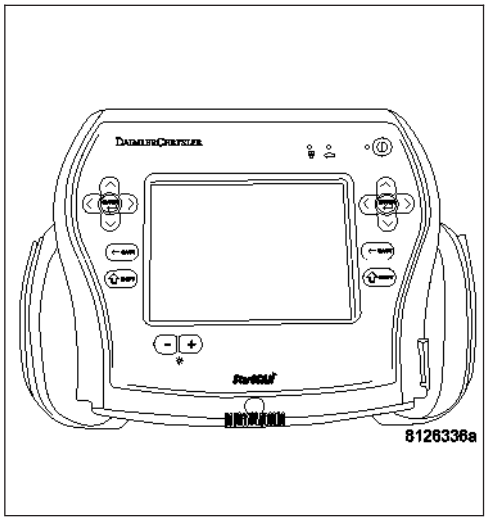
Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor active codes as you work through the following steps.



WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return, continue the test until the problem area has been isolated.

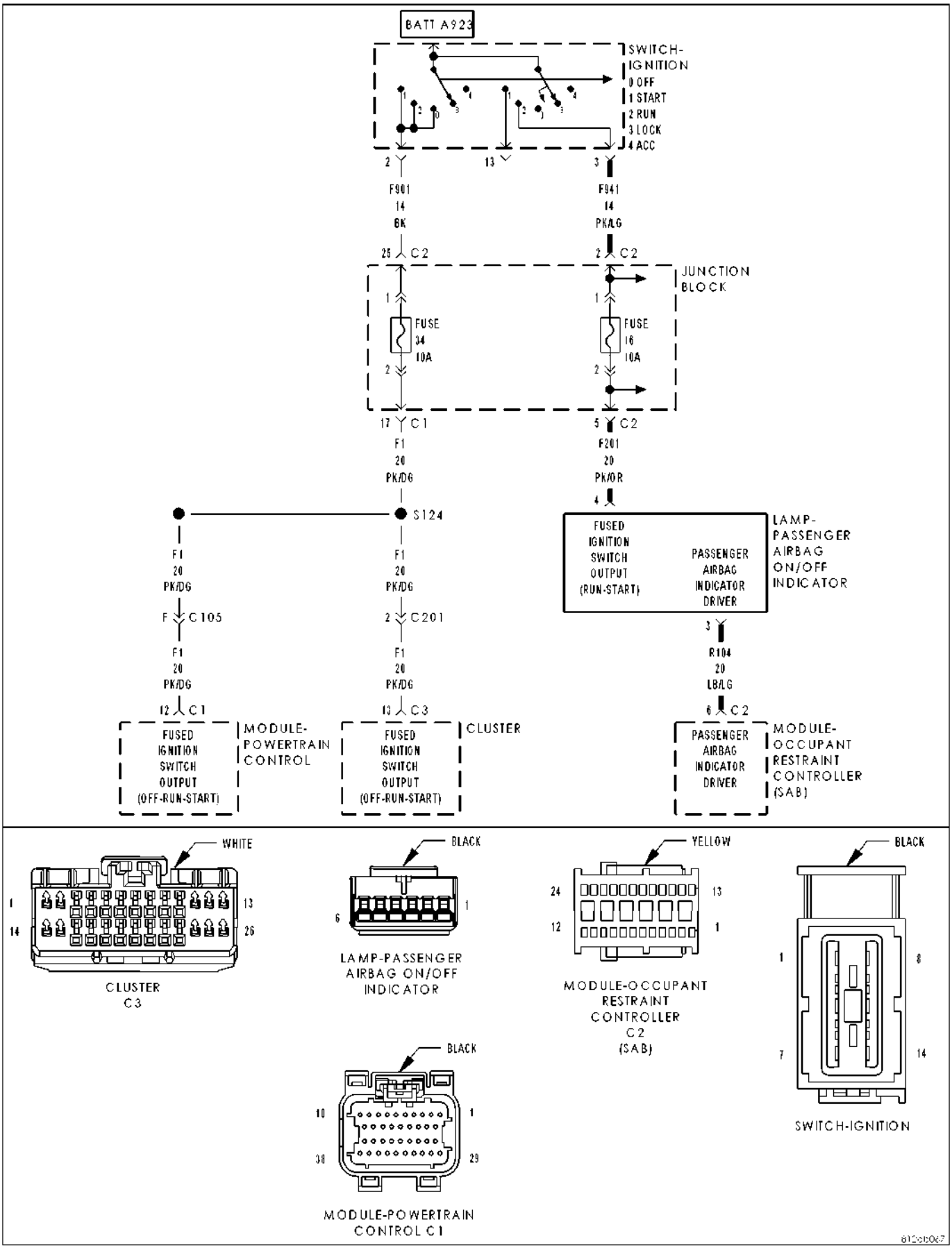
In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

Does the scan tool display any ACTIVE DTCs?

Yes >> Select appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1205-PASSENGER AIRBAG INDICATOR CIRCUIT HIGH



B1205-PASSENGER AIRBAG INDICATOR CIRCUIT HIGH (CONTINUED)

For the Airbag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Occupant Restraint Controller (ORC) senses a low resistance to battery voltage on the (R104) Passenger Airbag Indicator Driver circuit.

Possible Causes
(R104) PASSENGER AIRBAG INDICATOR DRIVER CIRCUIT SHORTED TO (F201) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT
(R104) PASSENGER AIRBAG INDICATOR DRIVER CIRCUIT SHORTED TO VOLTAGE
PASSENGER AIRBAG ON/OFF INDICATOR LAMP
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. VERIFY THAT DTC B1205 PASSENGER AIRBAG INDICATOR CIRCUIT HIGH IS ACTIVE

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

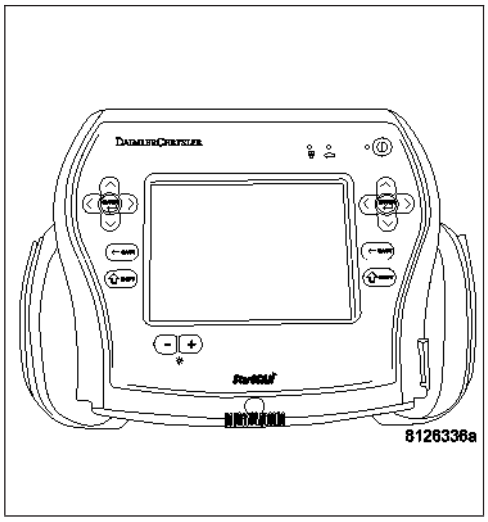
Turn the ignition on.

With the scan tool, read Occupant Restraint Controller (ORC) DTCs.

Does the scan tool display active: B1205 PASSENGER AIRBAG INDICATOR CIRCUIT HIGH?

Yes >> Go To 2

No >> Go To 5



B1205-PASSENGER AIRBAG INDICATOR CIRCUIT HIGH (CONTINUED)

2. CHECK (R104) PASSENGER AIRBAG INDICATOR DRIVER CIRCUIT FOR A SHORT TO (F201) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT

WARNING: If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

WARNING: If the Occupant Classification Module (OCM) is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

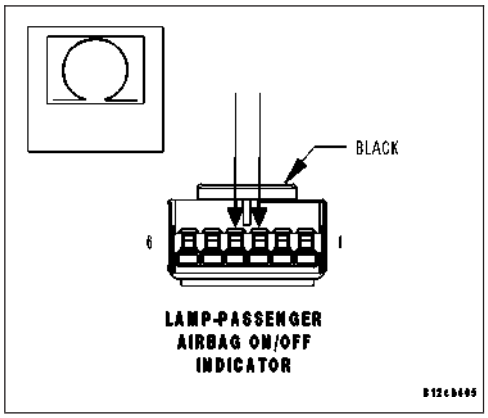
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Remove the Passenger Airbag (PAB) Indicator Run-Start Fuse from the Junction Block.

Disconnect the ORC C1 and C2 connectors.

Disconnect the Occupant Classification Module (OCM) C1 connector.

Disconnect the Passenger Airbag On/Off Indicator Lamp connector.



NOTE: Check connectors - Clean and repair as necessary.

Connect the appropriate Load Tool ORC Adaptor to the ORC connectors.

Measure the resistance between the (R104) Passenger Airbag Indicator Driver circuit and the (F201) Fused Ignition Switch Output (Run-Start) circuit in the Passenger Airbag On/Off Indicator Lamp connector.

Is the resistance below 100.0 ohms?

Yes >> Repair the (R104) Passenger Airbag Indicator Driver circuit for a short to the (F201) Fused Ignition Switch Output (Run-Start) circuit.
Perform ORC VERIFICATION TEST - VER 1.

No >> Go To 3

---

3. CHECK (R104) PASSENGER AIRBAG INDICATOR DRIVER CIRCUIT FOR A SHORT TO VOLTAGE

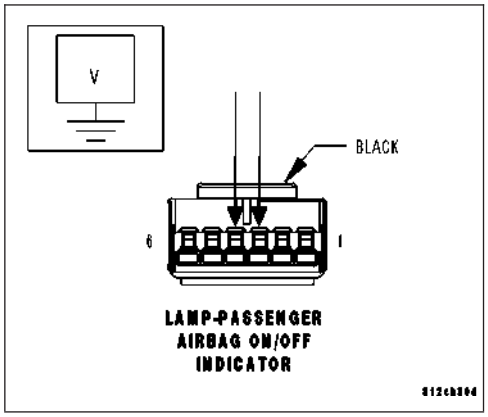
WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Measure the voltage of the (R104) Passenger Airbag Indicator Driver circuit.

Is there any voltage present?

Yes >> Repair the (R104) Passenger Airbag Indicator Driver circuit for a short to voltage.
Perform ORC VERIFICATION TEST - VER 1.

No >> Go To 4

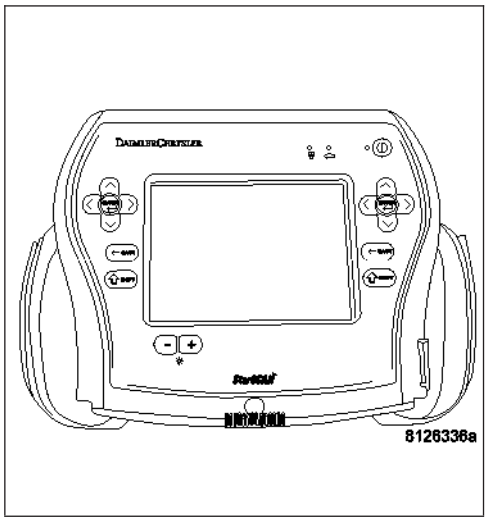


B1205-PASSENGER AIRBAG INDICATOR CIRCUIT HIGH (CONTINUED)

4. CHECK FOR ACTIVE DTC B1205 PASSENGER AIRBAG INDICATOR CIRCUIT HIGH WITH PASSENGER AIRBAG ON/OFF INDICATOR LAMP DISCONNECTED

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Remove the Load Tool ORC Adaptor from the ORC connectors.
Reconnect the ORC C1 and C2 connectors.
Reconnect the OCM C1 connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, erase ORC DTCs.
Turn the ignition off, wait 10 seconds, and then turn the ignition on.
With the scan tool, read ORC DTCs.



Does the scan tool display active: B1205 PASSENGER AIRBAG INDICATOR CIRCUIT HIGH?

Yes >> Replace the ORC in accordance with the Service Information.
Perform ORC VERIFICATION TEST - VER 1.

No >> Replace the Passenger Airbag On/Off Indicator Lamp in accordance with the Service Information.
Perform ORC VERIFICATION TEST - VER 1.

B1205-PASSENGER AIRBAG INDICATOR CIRCUIT HIGH (CONTINUED)

5. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase all DTCs from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

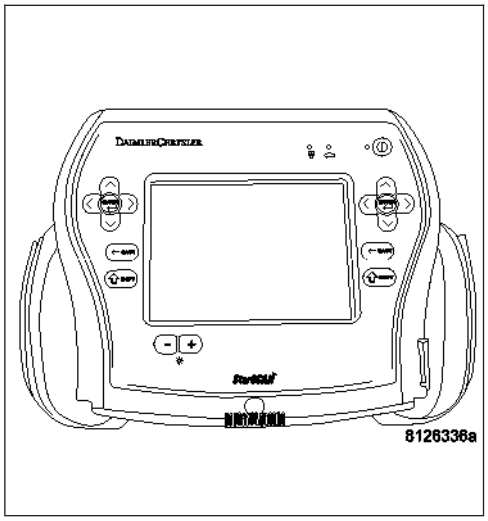
Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor active codes as you work through the following steps.



WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return, continue the test until the problem area has been isolated.

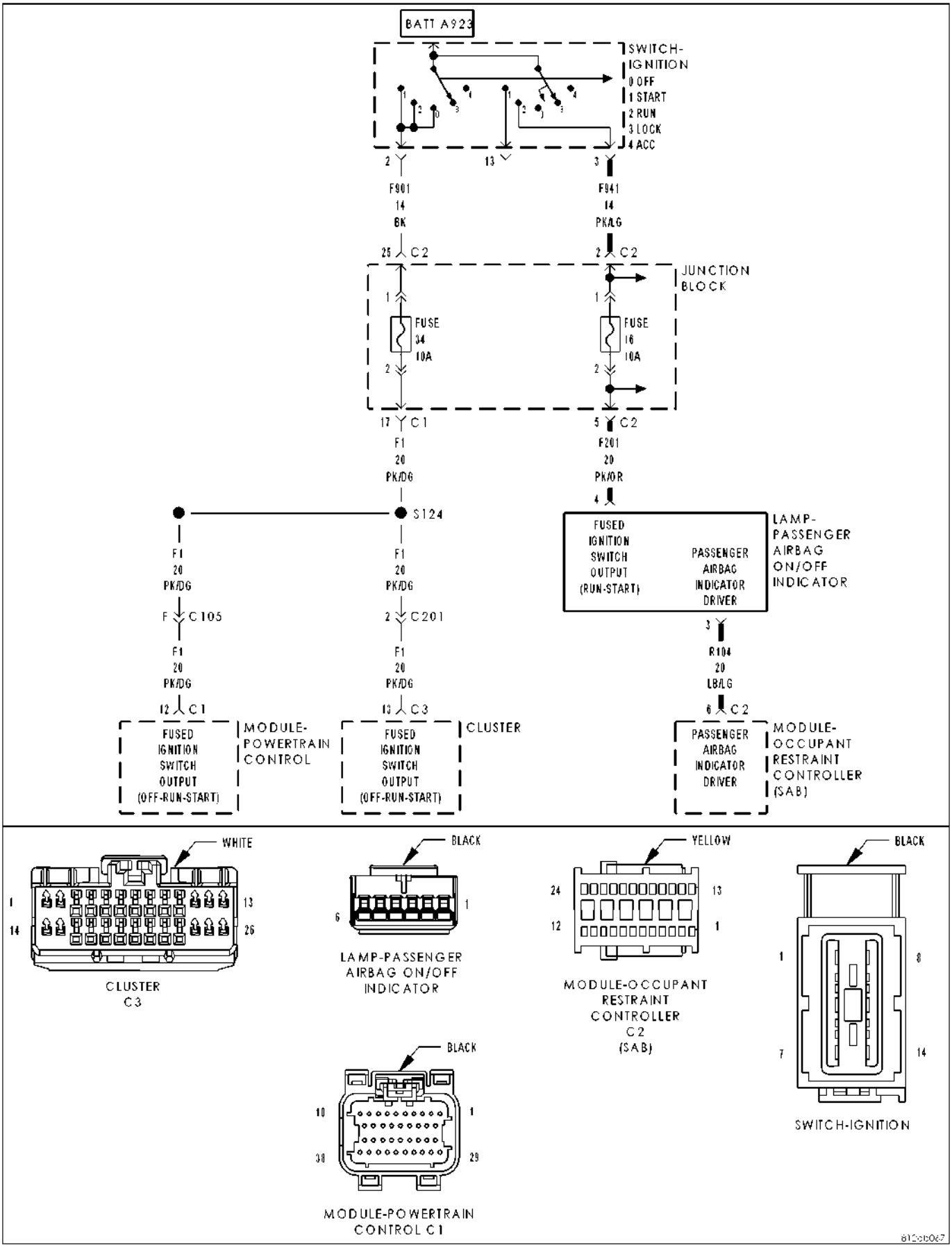
In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

Does the scan tool display any ACTIVE DTCs?

Yes >> Select appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1206-PASSENGER AIRBAG INDICATOR CIRCUIT OPEN



B1206-PASSENGER AIRBAG INDICATOR CIRCUIT OPEN (CONTINUED)

For the Airbag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Occupant Restraint Controller (ORC) cannot detect voltage on the (R104) Passenger Airbag Indicator Driver circuit.

Possible Causes
PASSENGER AIRBAG ON/OFF INDICATOR LAMP DISCONNECTED
(R104) PASSENGER AIRBAG INDICATOR DRIVER CIRCUIT OPEN
PASSENGER AIRBAG ON/OFF INDICATOR LAMP
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. VERIFY THAT DTC B1206 PASSENGER AIRBAG INDICATOR CIRCUIT OPEN IS ACTIVE

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

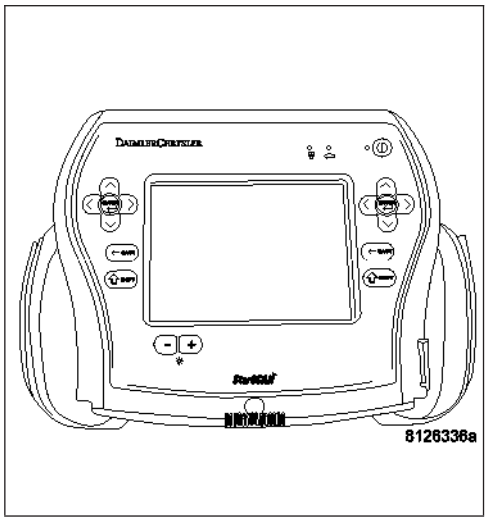
Turn the ignition on.

With the scan tool, read Occupant Restraint Controller (ORC) DTCs.

Does the scan tool display active: B1206 PASSENGER AIRBAG INDICATOR CIRCUIT OPEN?

Yes >> Go To 2

No >> Go To 5



2. VERIFY THAT PASSENGER AIRBAG ON/OFF INDICATOR LAMP IS CONNECTED

Turn the ignition off.

Gain access to the Passenger Airbag On/Off Indicator Lamp connector.

Is the Passenger Airbag On/Off Indicator Lamp connected to the dash harness?

Yes >> Go To 3

No >> Connect the Passenger Airbag On/Off Indicator Lamp to the dash harness. Perform ORC VERIFICATION TEST - VER 1.

B1206-PASSENGER AIRBAG INDICATOR CIRCUIT OPEN (CONTINUED)

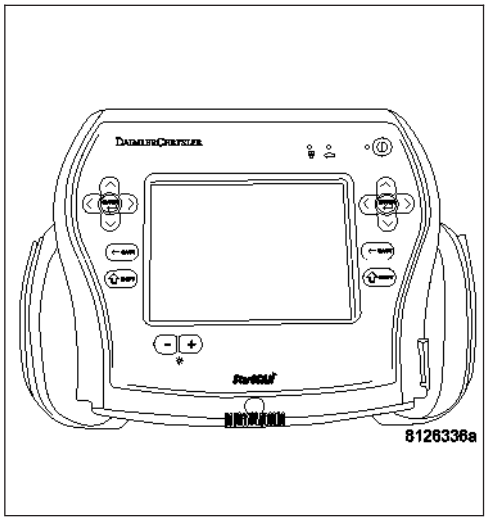
3. CHECK (R104) PASSENGER AIRBAG INDICATOR DRIVER CIRCUIT OPERATION

Disconnect the Passenger Airbag On/Off Indicator Lamp connector.

Connect a Test Light between the (R104) Passenger Airbag Indicator Driver circuit and the (F201) Fused Ignition Switch Output (Run-Start) circuit in the Passenger Airbag On/Off Indicator Lamp connector.

Turn the ignition on.

With the scan tool, read ORC DTCs.



Does the scan tool display active: B1206 PASSENGER AIRBAG INDICATOR CIRCUIT OPEN?

Yes >> Go To 4

No >> Replace the Passenger Airbag On/Off Indicator Lamp in accordance with the Service Information.

Perform ORC VERIFICATION TEST - VER 1.

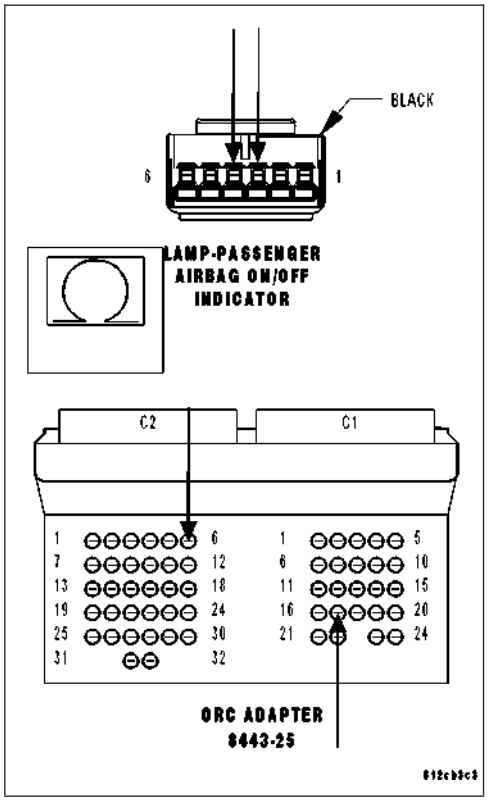
4. CHECK (R104) PASSENGER AIRBAG INDICATOR DRIVER CIRCUIT FOR AN OPEN

WARNING: If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the ORC C2 connector.

NOTE: Check connectors - Clean and repair as necessary. Connect the appropriate Load Tool ORC Adaptor to the ORC connector.

Measure the resistance of the (R104) Passenger Airbag Indicator Driver circuit between the ORC Adaptor and the Passenger Airbag On/Off Indicator Lamp connector.



Is the resistance below 5.0 ohms?

Yes >> Replace the ORC in accordance with the Service Information.

Perform ORC VERIFICATION TEST - VER 1.

No >> Repair the (R104) Passenger Airbag Indicator Driver circuit for an open.

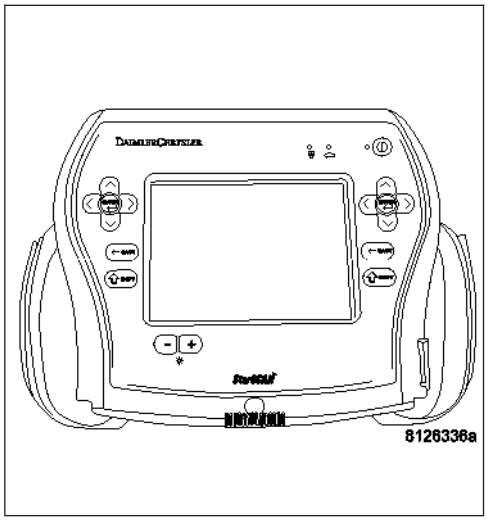
Perform ORC VERIFICATION TEST - VER 1.

B1206-PASSENGER AIRBAG INDICATOR CIRCUIT OPEN (CONTINUED)

5. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase all DTCs from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return, continue the test until the problem area has been isolated.

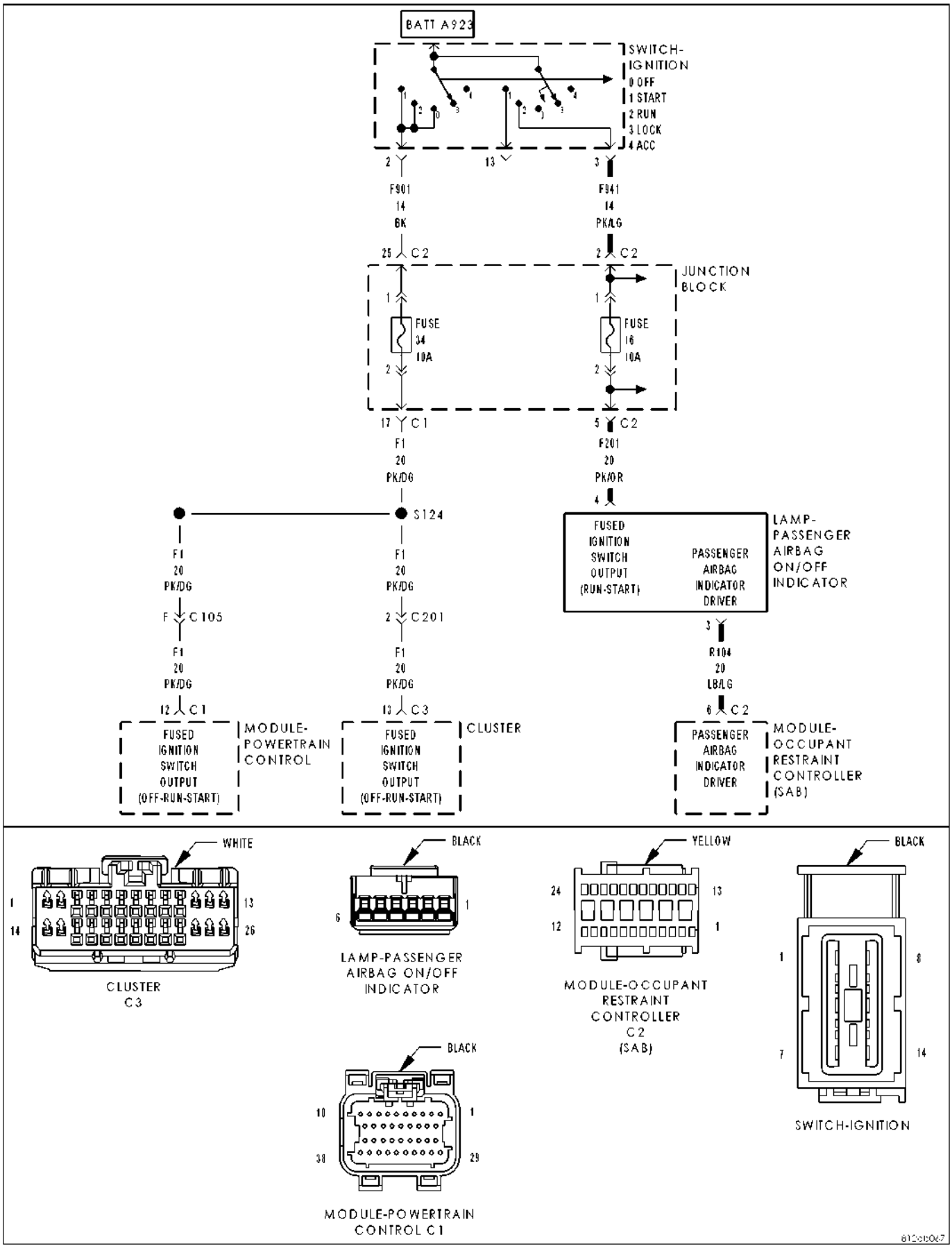
In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

Does the scan tool display any ACTIVE DTCs?

Yes >> Select appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1207-PASSENGER AIRBAG INDICATOR CIRCUIT SHORTED TOGETHER



B1207-PASSENGER AIRBAG INDICATOR CIRCUIT SHORTED TOGETHER (CONTINUED)

For the Airbag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  When the ORC detects over current on the Indicator Driver circuit.

Possible Causes
(R104) PASSENGER AIRBAG INDICATOR DRIVER CIRCUIT SHORTED TO (F201) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT
(R104) PASSENGER AIRBAG INDICATOR DRIVER CIRCUIT SHORTED TO VOLTAGE
PASSENGER AIRBAG ON/OFF INDICATOR LAMP
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. VERIFY THAT DTC B1207 PASSENGER AIRBAG INDICATOR CIRCUIT SHORTED TOGETHER IS ACTIVE

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

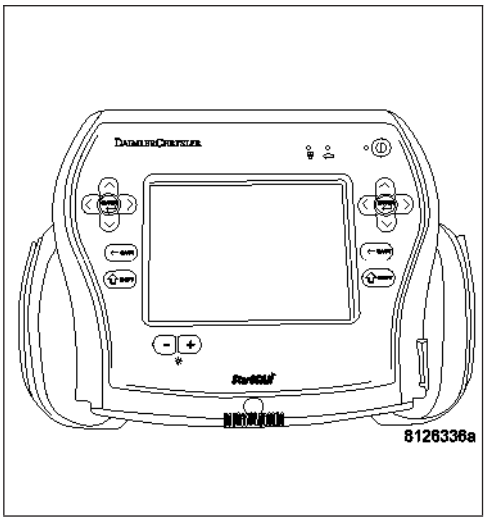
Turn the ignition on.

With the scan tool, read Occupant Restraint Controller (ORC) DTCs.

Does the scan tool display active: B1207 PASSENGER AIRBAG INDICATOR CIRCUIT SHORTED TOGETHER?

Yes >> Go To 2

No >> Go To 5



B1207-PASSENGER AIRBAG INDICATOR CIRCUIT SHORTED TOGETHER (CONTINUED)

2. CHECK (R104) PASSENGER AIRBAG INDICATOR DRIVER CIRCUIT FOR A SHORT TO (F201) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT

WARNING: If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

WARNING: If the Occupant Classification Module (OCM) is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

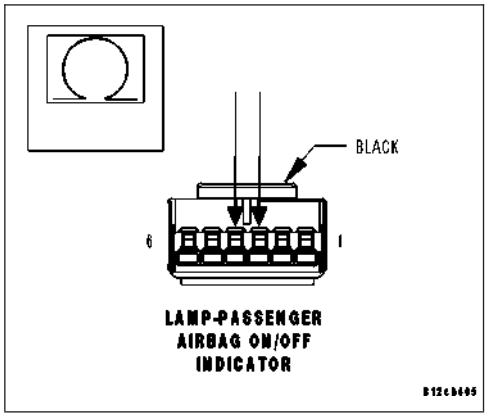
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Remove the Passenger Airbag (PAB) Indicator Run-Start Fuse from the Junction Block.

Disconnect the ORC C1 and C2 connectors.

Disconnect the Occupant Classification Module (OCM) C1 connector.

Disconnect the Passenger Airbag On/Off Indicator Lamp connector.



NOTE: Check connectors - Clean and repair as necessary.

Connect the appropriate Load Tool ORC Adaptor to the ORC connectors.

Measure the resistance between the (R104) Passenger Airbag Indicator Driver circuit and the (F201) Fused Ignition Switch Output (Run-Start) circuit in the Passenger Airbag On/Off Indicator Lamp connector.

Is the resistance below 100.0 ohms?

Yes >> Repair the (R104) Passenger Airbag Indicator Driver circuit for a short to the (F201) Fused Ignition Switch Output (Run-Start) circuit.
Perform ORC VERIFICATION TEST - VER 1.

No >> Go To 3

---

3. CHECK (R104) PASSENGER AIRBAG INDICATOR DRIVER CIRCUIT FOR A SHORT TO VOLTAGE

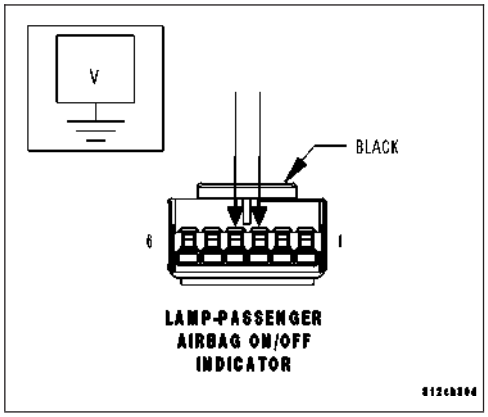
WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Measure the voltage of the (R104) Passenger Airbag Indicator Driver circuit.

Is there any voltage present?

Yes >> Repair the (R104) Passenger Airbag Indicator Driver circuit for a short to voltage.
Perform ORC VERIFICATION TEST - VER 1.

No >> Go To 4

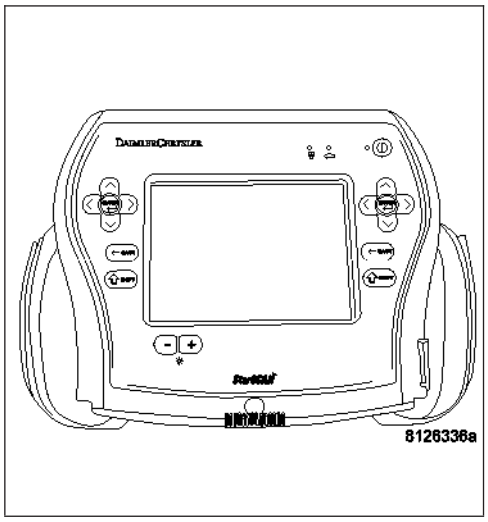


B1207-PASSENGER AIRBAG INDICATOR CIRCUIT SHORTED TOGETHER (CONTINUED)

4. CHECK FOR ACTIVE DTC B1207 PASSENGER AIRBAG INDICATOR CIRCUIT SHORTED TOGETHER WITH PASSENGER AIRBAG ON/OFF INDICATOR LAMP DISCONNECTED

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Remove the Load Tool ORC Adaptor from the ORC connectors.
Reconnect the ORC C1 and C2 connectors.
Reconnect the OCM C1 connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, erase ORC DTCs.
Turn the ignition off, wait 10 seconds, and then turn the ignition on.
With the scan tool, read ORC DTCs.



Does the scan tool display active: B1207 PASSENGER AIRBAG INDICATOR CIRCUIT SHORTED TOGETHER?

Yes >> Replace the ORC in accordance with the Service Information.
Perform ORC VERIFICATION TEST - VER 1.

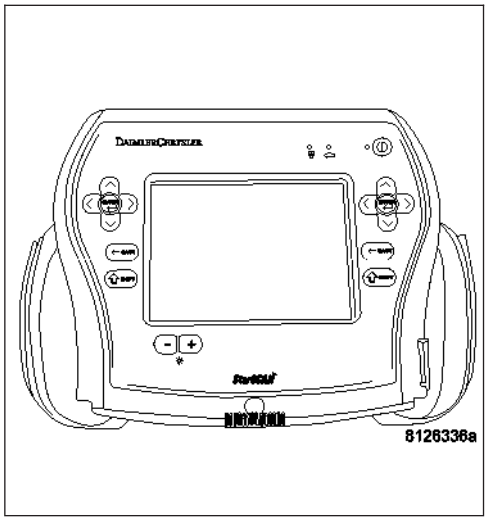
No >> Replace the Passenger Airbag On/Off Indicator Lamp in accordance with the Service Information.
Perform ORC VERIFICATION TEST - VER 1.

B1207-PASSENGER AIRBAG INDICATOR CIRCUIT SHORTED TOGETHER (CONTINUED)

5. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase all DTCs from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return, continue the test until the problem area has been isolated.

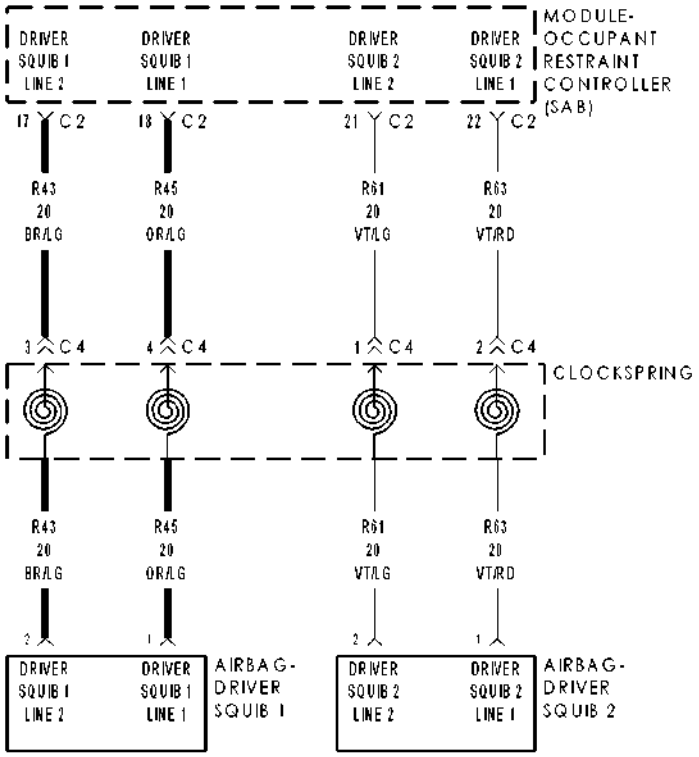
In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

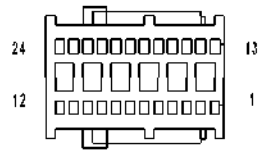
Does the scan tool display any ACTIVE DTCs?

Yes >> Select appropriate symptom from Symptom List.

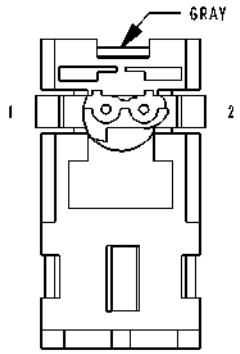
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B00-DRIVER AIRBAG SQUIB 1 CIRCUIT LOW

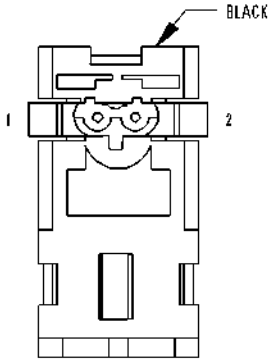




MODULE-OCCUPANT RESTRAINT CONTROLLER C2 (SAB)



AIRBAG-DRIVER SQUIB 1



AIRBAG-DRIVER SQUIB 2

51262FF4

B1B00-DRIVER AIRBAG SQUIB 1 CIRCUIT LOW (CONTINUED)

- **When Monitored:**
  With the ignition on, the ORC monitors the resistance of the Driver Squib 1 circuits.
- **Set Condition:**
  The ORC has detected low resistance on the Driver Squib 1 circuits.

Possible Causes
(R43)-DRIVER SQUIB 1 LINE 1 OR (R45)- DRIVER SQUIB 1 LINE 2 SHORTED TO GROUND
CLOCKSPRING
DRIVER AIRBAG
OCCUPANT RESTRAINT CONTROLLER

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure the battery is fully charged.

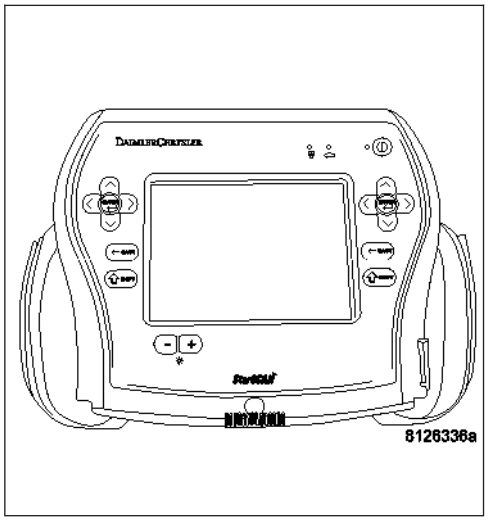
NOTE: The Scan Tool, SRS Airbag Load Tool MRL 8443 and DVOM are required to perform the following test.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.
Select Active or Stored DTC.

Is the DTC active or stored?

ORC - ACTIVE DTC
Go To 2

ORC - STORED DTC
Go To 6



B1B00-DRIVER AIRBAG SQUIB 1 CIRCUIT LOW (CONTINUED)

2. DRIVER AIRBAG SHORTED

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Driver Airbag connector(s).

WARNING: To avoid personal injury or death, do not place an intact undeployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

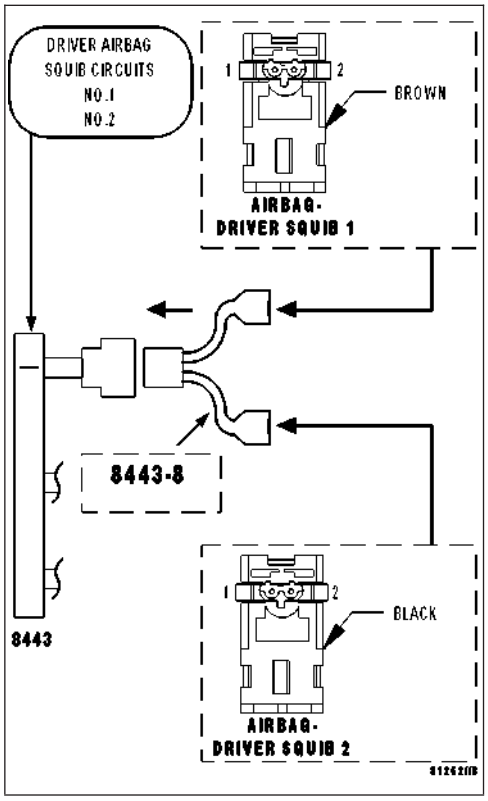
NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool and appropriate Jumper to the Driver Airbag connector(s).

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, read the active Occupant Restraint Controller DTC's.

Does the scan tool display DRIVER AIRBAG SQUIB 1 CIRCUIT LOW?

Yes >> Go to 3

No >> Replace the Driver Airbag in accordance with Service Information.
Perform ORC VERIFICATION TEST - VER 1



3. CLOCKSPRING SQUIB CIRCUITS

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Clockspring harness connector(s).

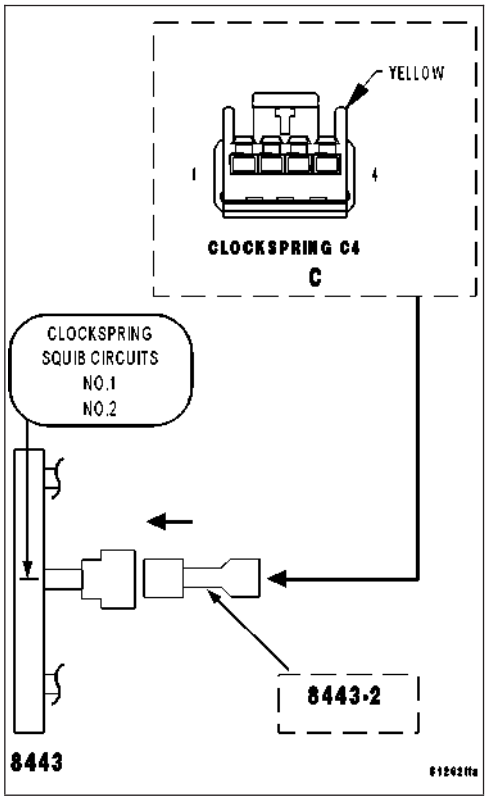
NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool and appropriate Jumper to the Clockspring harness connector(s).

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, read the active Occupant Restraint Controller DTC's.

Does the scan tool display DRIVER AIRBAG SQUIB 1 CIRCUIT LOW?

Yes >> Go to 4

No >> Replace the Clockspring in accordance with the Service Information.
Perform ORC VERIFICATION TEST - VER 1

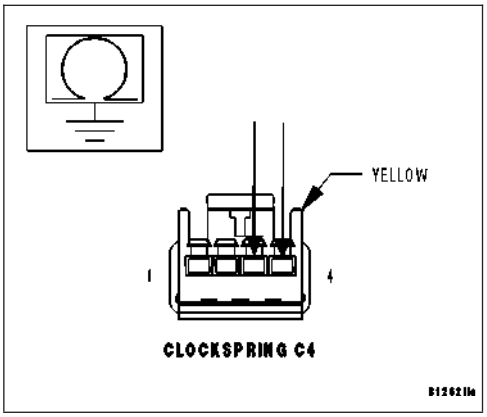


B1B00-DRIVER AIRBAG SQUIB 1 CIRCUIT LOW (CONTINUED)

4. (R43)-DRIVER SQUIB 1 LINE 1 OR (R45)-DRIVER SQUIB 1 LINE 2 SHORTED TO GROUND

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool and Jumper
Disconnect the ORC harness connector(s).

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool ORC Adaptor to the ORC harness connector.
Measure the resistance of the (R43)-Driver Squib 1 Line 1 and (R45)-Driver Squib 1 Line 2 circuits between the Clockspring C4 harness connector and Ground.



Is the resistance below 10K ohms?

Yes >> Repair (R43)-Driver Squib 1 Line 1 or (R45)-Driver Squib 1 Line 2 circuits shorted to ground
Perform ORC VERIFICATION TEST - VER 1

No >> Go to 5

---

5. OCCUPANT RESTRAINT CONTROLLER

WARNING: If the Airbag Control Module is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

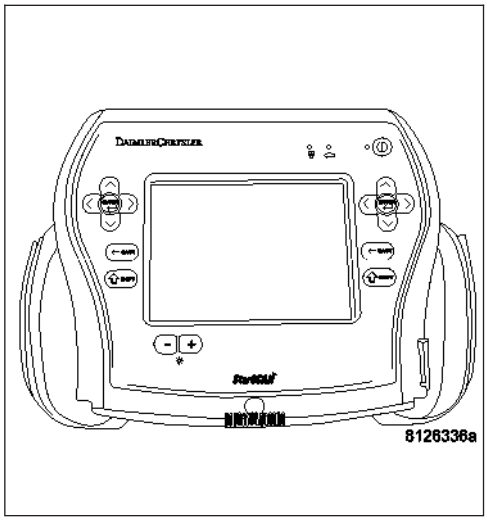
If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Information.
Perform ORC VERIFICATION TEST - VER 1

B1B00-DRIVER AIRBAG SQUIB 1 CIRCUIT LOW (CONTINUED)

6. STORED ORC DTC



With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

IF only stored codes return continue the test until the problem area has been isolated.

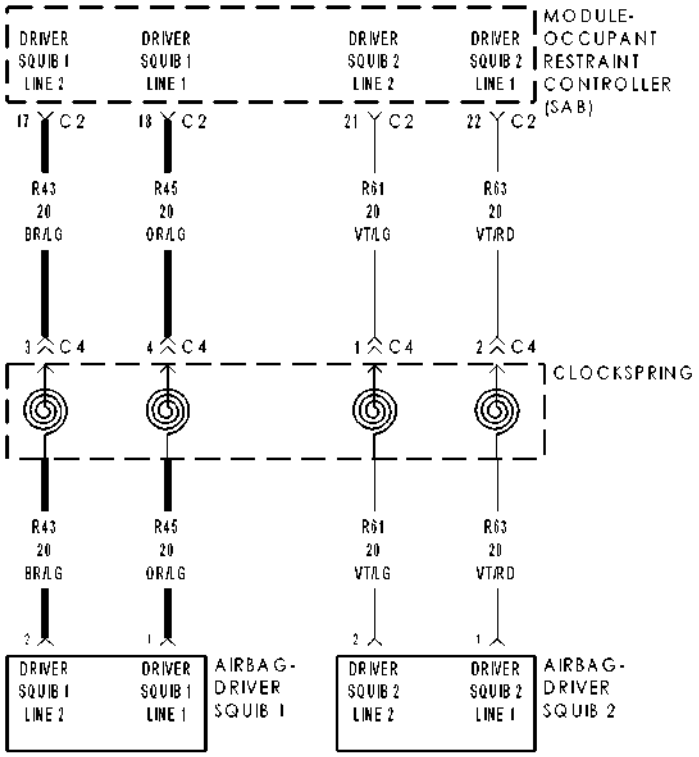
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

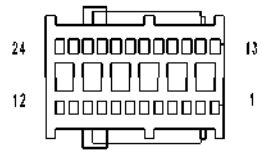
Are any ACTIVE DTCs present?

Yes >> Select appropriate symptom from Symptom List.

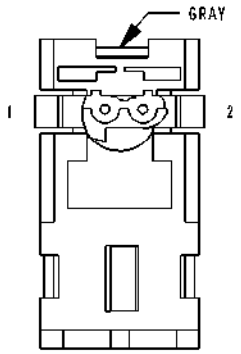
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B01-DRIVER AIRBAG SQUIB 1 CIRCUIT TO BATTERY

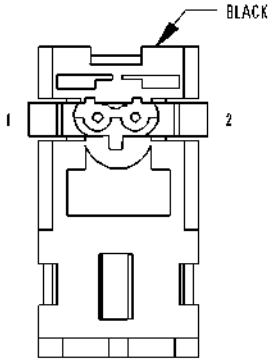




MODULE-OCCUPANT RESTRAINT CONTROLLER C2 (SAB)



AIRBAG-DRIVER SQUIB 1



AIRBAG-DRIVER SQUIB 2

51262FF4

B1B01-DRIVER AIRBAG SQUIB 1 CIRCUIT TO BATTERY (CONTINUED)

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the ORC monitors the voltage on the Driver Squib 1 circuits.
- **Set Condition:**
  The ORC has detected voltage on Driver Squib 1 circuits.

Possible Causes
(R43)-DRIVER SQUIB 1 LINE 1 OR (R45)-DRIVER SQUIB 1 LINE 2 SHORTED TO BATTERY
CLOCKSPRING
DRIVER AIRBAG
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure the battery is fully charged.

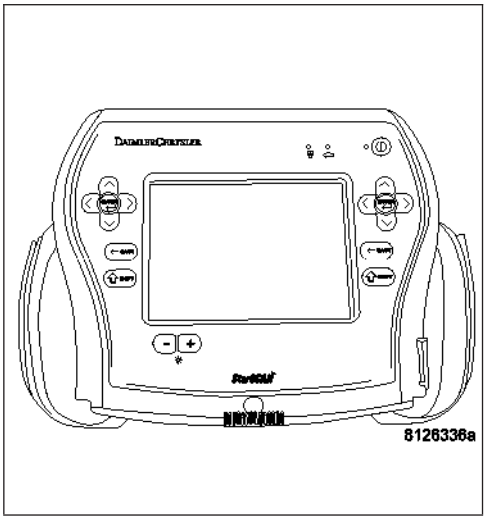
NOTE: The Scan Tool, SRS Airbag Load Tool MRL 8443 and DVOM are required to perform the following test.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.
Select Active or Stored DTC.

Is the DTC active or stored?

ORC - ACTIVE DTC
Go To 2

ORC - STORED DTC
Go To 6



B1B01-DRIVER AIRBAG SQUIB 1 CIRCUIT TO BATTERY (CONTINUED)

2. DRIVER AIRBAG SHORTED

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Driver Airbag connector(s).

WARNING: To avoid personal injury or death, do not place an intact undeployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

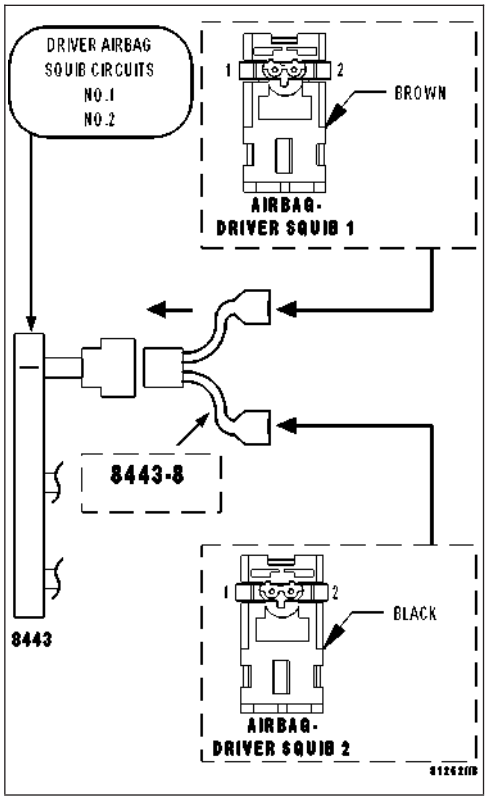
NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool and appropriate Jumper to the Driver Airbag connector(s).

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, read the active Occupant Restraint Controller DTC's.

Does the scan tool display DRIVER AIRBAG SQUIB 1 CIRCUIT SHORT TOGETHER?

Yes >> Go to 3

No >> Replace the Driver Airbag in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1



3. CLOCKSPRING SQUIB CIRCUITS SHORT TO BATTERY

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Clockspring harness connector(s).

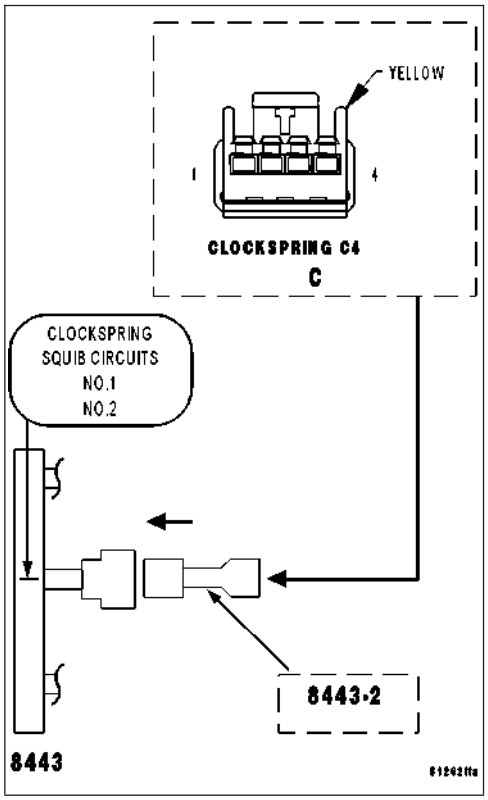
NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool and appropriate Jumper to the Clockspring harness connector(s).

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, read the active Occupant Restraint Controller DTC's.

Does the scan tool display DRIVER AIRBAG SQUIB 1 CIRCUIT SHORT TO BATTERY?

Yes >> Go to 4

No >> Replace the Clockspring in accordance with the Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1



B1B01-DRIVER AIRBAG SQUIB 1 CIRCUIT TO BATTERY (CONTINUED)

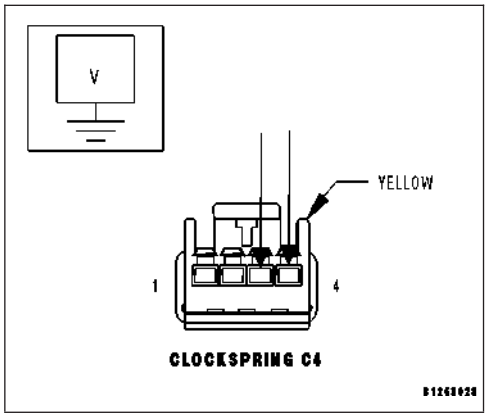
4. (R43)-Driver Squib 1 Line 1 or (R45)-Driver Squib 1 Line 2 circuits shorted to battery

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool and Jumper from the Clockspring connector.

Disconnect the ORC harness connector(s).

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool ORC Adaptor to the ORC harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
Measure the voltage on the (R43)-Driver Squib 1 Line 1 and (R45)-Driver Squib 1 Line 2 circuits between the Clockspring C2 harness connector and ground.



Is there any voltage present?

Yes >> Repair (R43)-Driver Squib 1 Line 1 or (R45)-Driver Squib 1 Line 2 Shorted to Battery
Perform AIRBAG VERIFICATION TEST - VER 1

No >> Go to 5

---

5. OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the Airbag Control Module is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1

B1B01-DRIVER AIRBAG SQUIB 1 CIRCUIT TO BATTERY (CONTINUED)

6. STORED ORC DTC

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

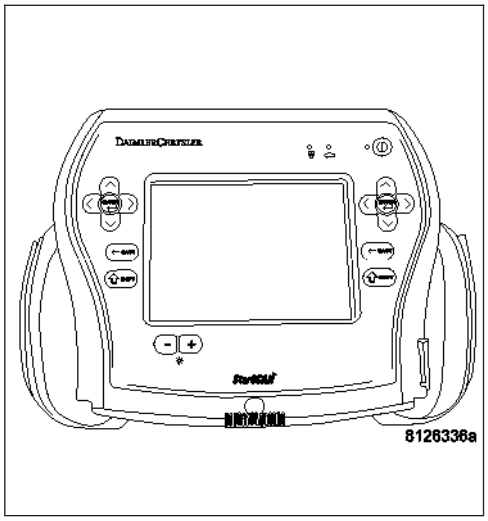
Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.



Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

IF only stored codes return continue the test until the problem area has been isolated.

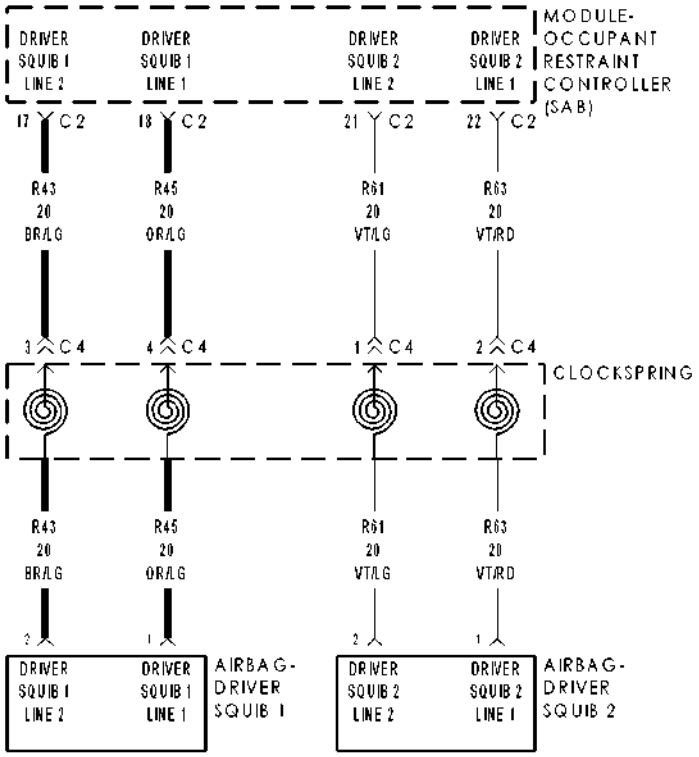
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC's in question.

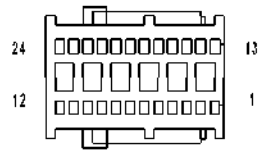
Are any ACTIVE DTC's present?

Yes >> Select appropriate symptom from Symptom List.

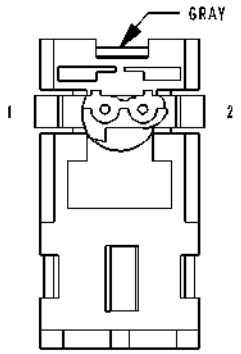
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B02-DRIVER AIRBAG SQUIB 1 CIRCUIT OPEN

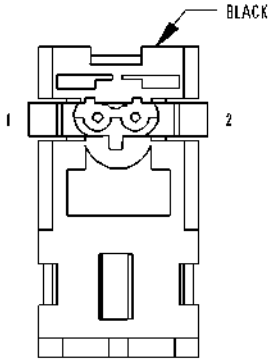




MODULE-OCCUPANT RESTRAINT CONTROLLER C2 (SAB)



AIRBAG-DRIVER SQUIB 1



AIRBAG-DRIVER SQUIB 2

51262FF4

B1B02-DRIVER AIRBAG SQUIB 1 CIRCUIT OPEN (CONTINUED)

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the ORC monitors the resistance of the Driver Squib 1 circuits.
- **Set Condition:**
  The ORC has detected open circuit or high resistance in the Driver Squib 1 circuits.

Possible Causes
(R43)-DRIVER SQUIB 1 LINE 1 OR (R45)-DRIVER SQUIB 1 LINE 2 CIRCUIT OPEN
CLOCKSPRING
DRIVER AIRBAG
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure the battery is fully charged.

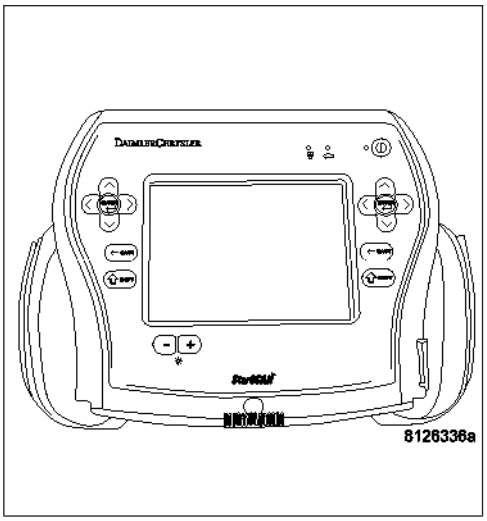
NOTE: The Scan Tool, SRS Airbag Load Tool MRL 8443 and DVOM are required to perform the following test.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.
Select Active or Stored DTC.

Is the DTC active or stored?

ORC - ACTIVE DTC
Go To 2

ORC - STORED DTC
Go To 6



B1B02-DRIVER AIRBAG SQUIB 1 CIRCUIT OPEN (CONTINUED)

2. DRIVER AIRBAG OPEN

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Driver Airbag connector(s).

WARNING: To avoid personal injury or death, do not place an intact undeployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

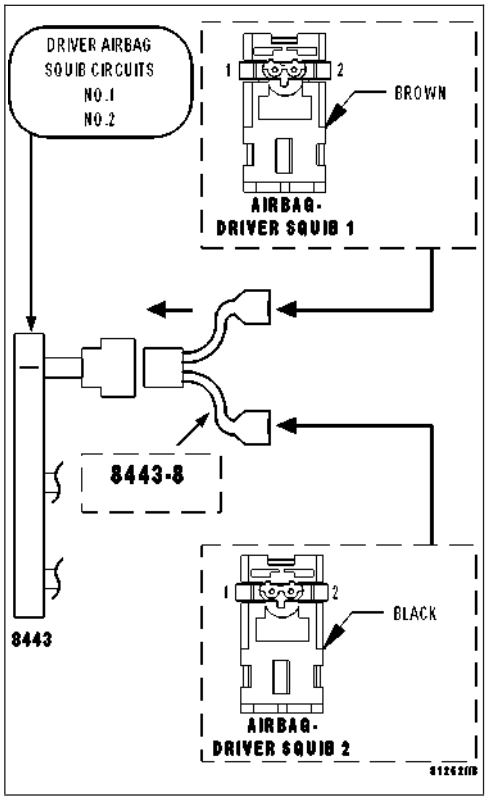
NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool and appropriate Jumper to the Driver Airbag connector(s).

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, read the active Occupant Restraint Controller DTC's.

Does the scan tool display DRIVER AIRBAG SQUIB 1 CIRCUIT OPEN?

Yes >> Go to 3

No >> Replace the Driver Airbag in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1



3. CLOCKSPRING SQUIB CIRCUITS OPEN

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool and Jumper from the Driver Airbag harness connector.

Disconnect the Clockspring harness connector(s).

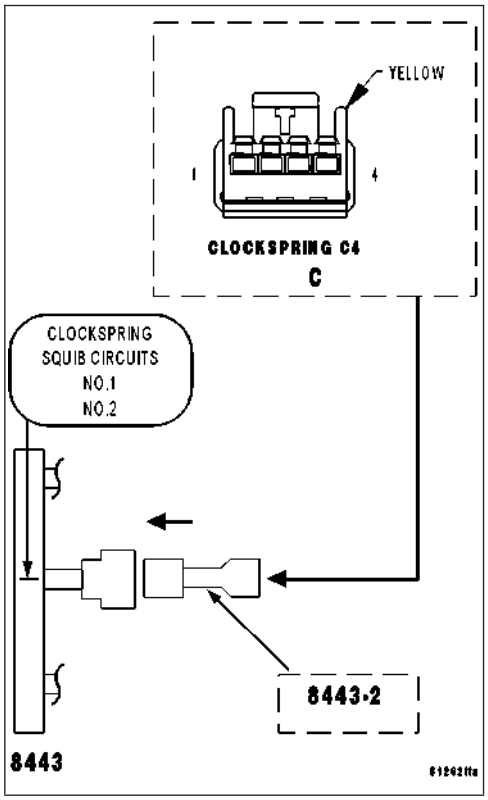
NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool and appropriate Jumper to the Clockspring harness connector(s).

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, read the active Occupant Restraint Controller DTC's.

Does the scan tool display DRIVER AIRBAG SQUIB 1 CIRCUIT OPEN?

Yes >> Go to 4

No >> Replace the Clockspring in accordance with the Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1



B1B02-DRIVER AIRBAG SQUIB 1 CIRCUIT OPEN (CONTINUED)

4. (R43)-DRIVER SQUIB 1 LINE 1 OR (R45)-DRIVER SQUIB 1 LINE 2 CIRCUIT OPEN

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the 8443 Load Tool and Jumper from the Clockspring connector.

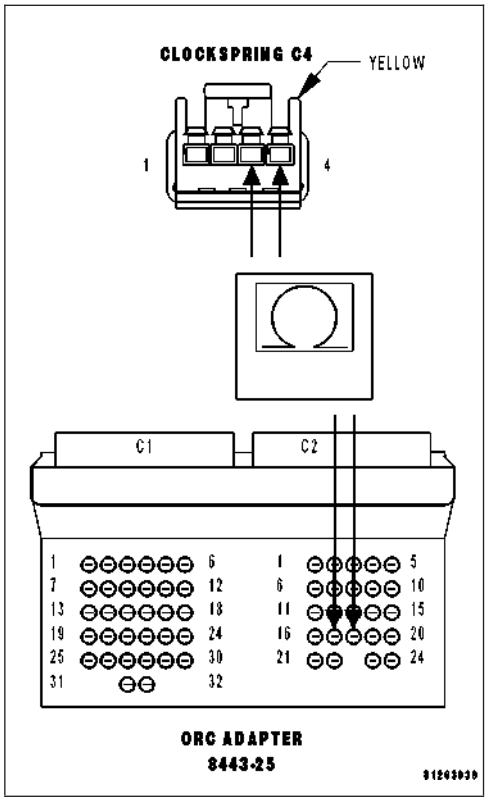
Disconnect the ORC harness connector(s).

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool ORC Adaptor to the ORC harness connector.

Measure the resistance of the Driver Squib 1 Line 1 between the Clockspring C4 harness connector and ORC Load Tool Adaptor.

Measure the resistance of the Driver Squib 1 Line 2 between the Clockspring C4 harness connector and ORC Load Tool Adaptor.



Is the resistance below 1.0 ohms?

Yes >> Go to 5

No >> Repair the (R43)-Driver Squib 1 Line 1 and/or (R45)-Driver Squib 1 Line 2 circuits for an open or high resistance.
Perform AIRBAG VERIFICATION TEST - VER 1

---

5. OCCUPANT RESTRAINT CONTROLLER

WARNING: If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

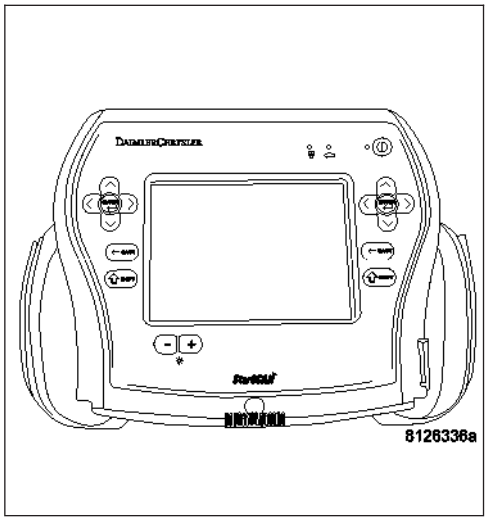
If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1

B1B02-DRIVER AIRBAG SQUIB 1 CIRCUIT OPEN (CONTINUED)

6. STORED ORC DTC



With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

IF only stored codes return continue the test until the problem area has been isolated.

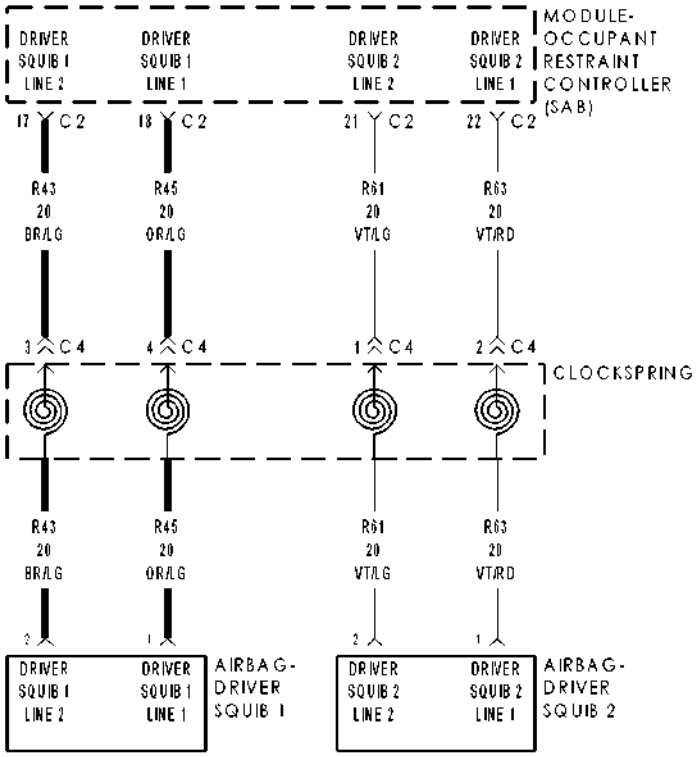
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

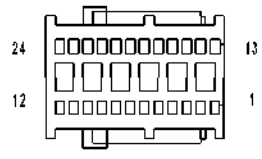
Are any ACTIVE DTC's present?

Yes >> Select appropriate symptom from Symptom List.

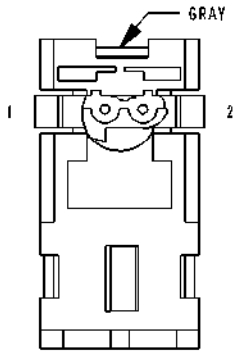
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B03-DRIVER AIRBAG SQUIB 1 CIRCUIT SHORT TOGETHER

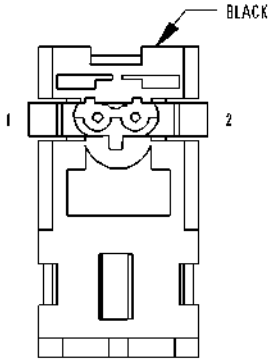




MODULE-OCCUPANT RESTRAINT CONTROLLER C2 (SAB)



AIRBAG-DRIVER SQUIB 1



AIRBAG-DRIVER SQUIB 2

51262FF4

B1B03-DRIVER AIRBAG SQUIB 1 CIRCUIT SHORT TOGETHER (CONTINUED)

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the ORC monitors the resistance of the Driver Squib 1 circuits.
- **Set Condition:**
  The ORC has detected low resistance between the Driver Squib 1 circuits.

Possible Causes
(R43)-DRIVER SQUIB 1 LINE 1 SHORTED TO (R45)-DRIVER SQUIB 1 LINE 2
CLOCKSPRING
DRIVER AIRBAG
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure the battery is fully charged.

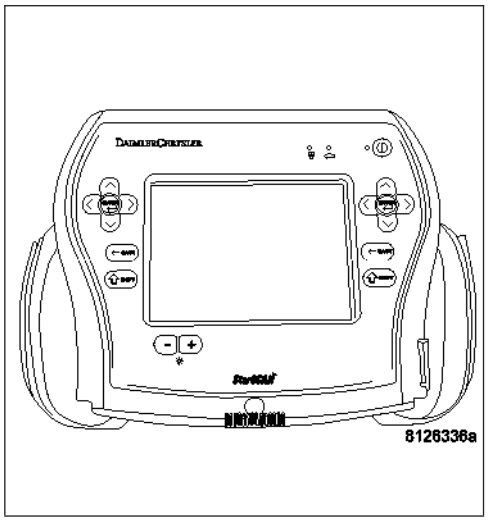
NOTE: The Scan Tool, SRS Airbag Load Tool MRL 8443 and DVOM are required to perform the following test.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.
Select Active or Stored DTC.

Is the DTC active or stored?

ORC - ACTIVE DTC
Go To 2

ORC - STORED DTC
Go To 6



B1B03-DRIVER AIRBAG SQUIB 1 CIRCUIT SHORT TOGETHER (CONTINUED)

2. DRIVER AIRBAG SHORTED

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: To avoid personal injury or death, do not place an intact undeployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.
Disconnect the Driver Airbag connector(s).

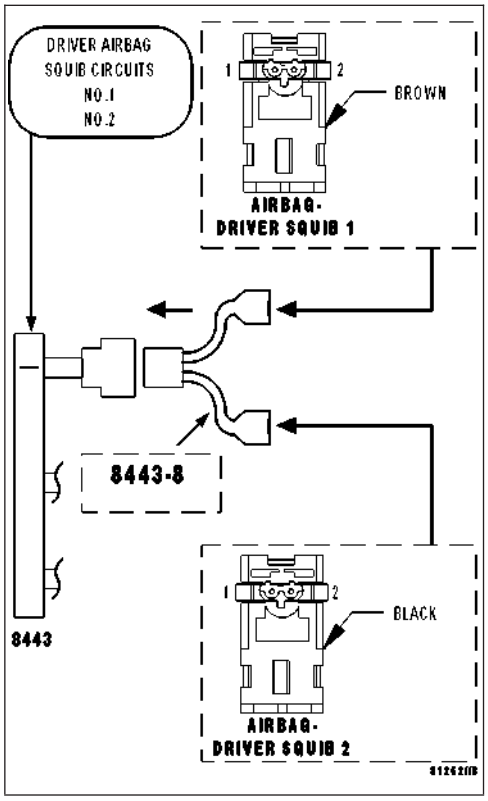
NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool and appropriate Jumper to the Driver Airbag connector(s).

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, read the active Occupant Restraint Controller DTC's.

Does the scan tool display DRIVER AIRBAG SQUIB 1 CIRCUIT SHORT TOGETHER?

Yes >> Go to 3

No >> Replace the Driver Airbag in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1



3. CLOCKSPRING SQUIB CIRCUITS SHORTED TOGETHER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Clockspring harness connector(s).

Disconnect the 8443 Load Tool ORC from the DAB connectors.

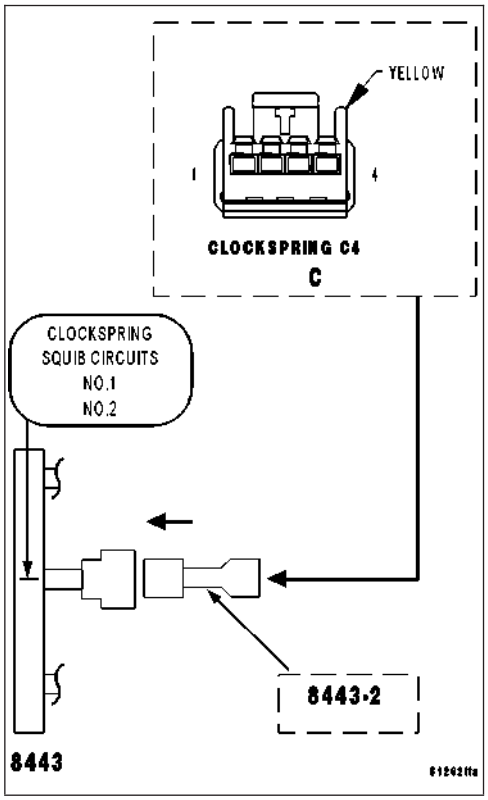
NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool and appropriate Jumper to the Clockspring harness connector(s).

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, read the active Occupant Restraint Controller DTC's.

Does the scan tool display DRIVER AIRBAG SQUIB 1 CIRCUIT SHORT TOGETHER?

Yes >> Go to 4

No >> Replace the Clockspring in accordance with the Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1



B1B03-DRIVER AIRBAG SQUIB 1 CIRCUIT SHORT TOGETHER (CONTINUED)

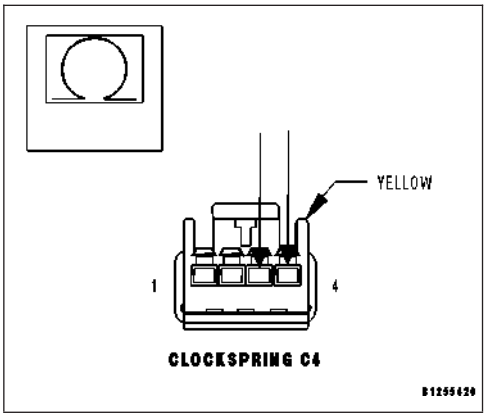
4. (R43)-DRIVER SQUIB 1 LINE 1 SHORTED TO (R45)-DRIVER SQUIB 1 LINE 2

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool and Jumper from the clockspring harness connector(s).

Disconnect the ORC harness connector(s).

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool ORC Adaptor to the ORC harness connector.

Measure the resistance between (R43)-Driver Squib 1 Line 1 and (R45)-Line 2 circuits at the Clockspring C4 harness connector.



Is the resistance below 10K ohms?

Yes >> Repair (R43)-Driver Squib 1 Line 1 shorted to (R45)-Driver Squib 1 Line 2
Perform AIRBAG VERIFICATION TEST - VER 1

No >> Go to 5

---

5. OCCUPANT RESTRAINT CONTROLLER

WARNING: If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

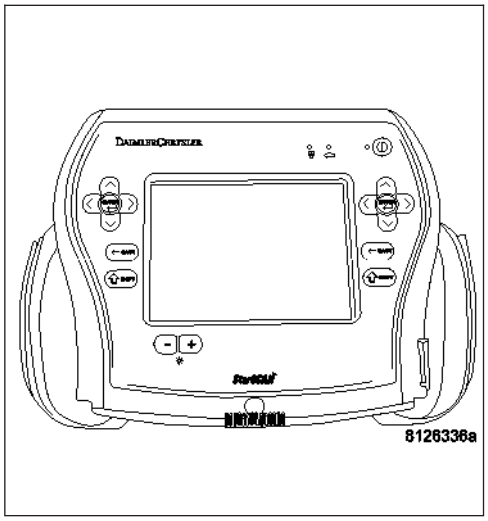
If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1

B1B03-DRIVER AIRBAG SQUIB 1 CIRCUIT SHORT TOGETHER (CONTINUED)

6. STORED ORC DTC



With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

IF only stored codes return continue the test until the problem area has been isolated.

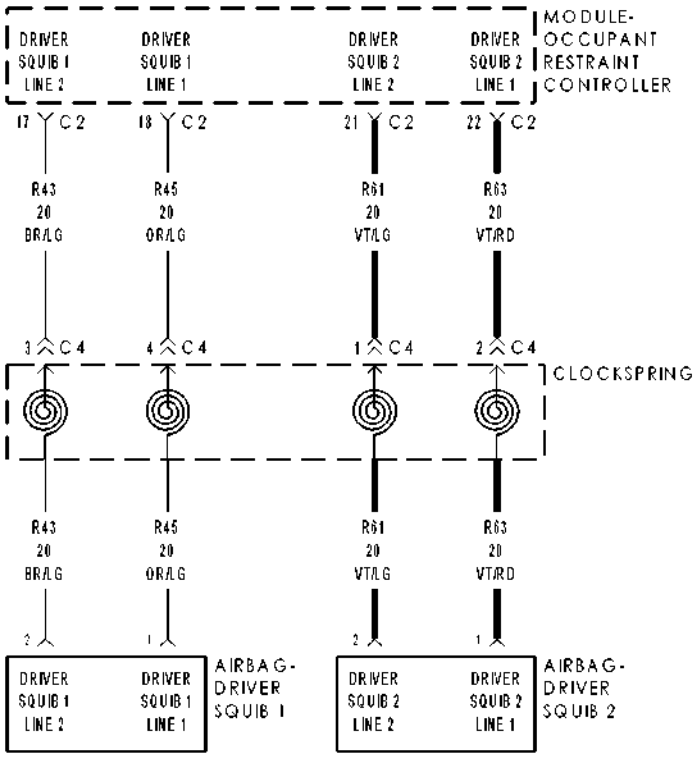
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

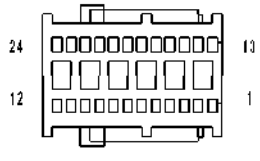
Are any ACTIVE DTCs present?

Yes >> Select appropriate symptom from Symptom List.

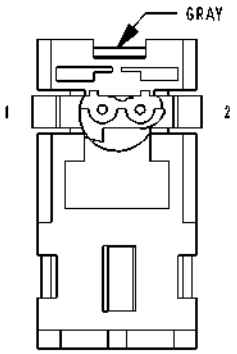
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B04-DRIVER AIRBAG SQUIB 2 CIRCUIT LOW

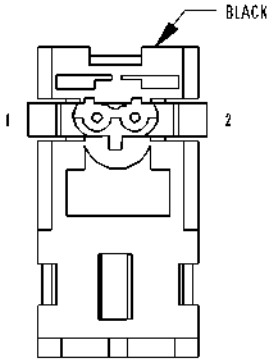




MODULE-OCCUPANT
RESTRAINT
CONTROLLER
C2
(SAB)



AIRBAG-
DRIVER SQUIB 1



AIRBAG-
DRIVER SQUIB 2

8126C043

B1B04-DRIVER AIRBAG SQUIB 2 CIRCUIT LOW (CONTINUED)

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the ORC monitors the resistance of the Driver Squib 1 circuits.
- **Set Condition:**
  The ORC has detected low resistance between the Driver Squib 1 circuits.

Possible Causes
R63 DRIVER SQUIB 2 LINE 1 OR R61 DRIVER SQUIB 2 LINE 2 SHORTED TO GROUND
CLOCKSPRING
DRIVER AIRBAG
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure the battery is fully charged.

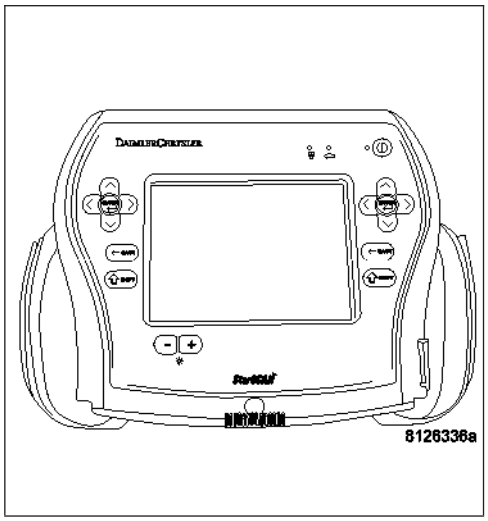
NOTE: The Scan Tool, SRS Airbag Load Tool MRL 8443 and DVOM are required to perform the following test.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.
Select Active or Stored DTC.

Is the DTC active or stored?

ORC - ACTIVE DTC
Go To 2

ORC - STORED DTC
Go To 6



B1B04-DRIVER AIRBAG SQUIB 2 CIRCUIT LOW (CONTINUED)

2. DRIVER AIRBAG SHORTED

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Driver Airbag connector(s).

WARNING: To avoid personal injury or death, do not place an intact undeployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

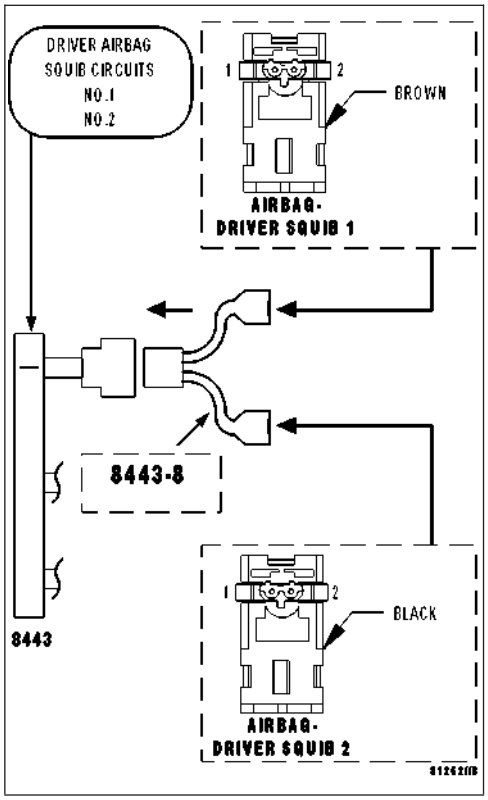
NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool and appropriate Jumper to the Driver Airbag connector(s).

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, read the active Occupant Restraint Controller DTC's.

Does the scan tool display DRIVER AIRBAG SQUIB 2 CIRCUIT LOW?

Yes >> Go to 3

No >> Replace the Driver Airbag in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1



3. CLOCKSPRING SQUIB CIRCUITS SHORTED

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool and Jumper from the Driver Airbag connector(s).

Disconnect the Clockspring harness connector(s).

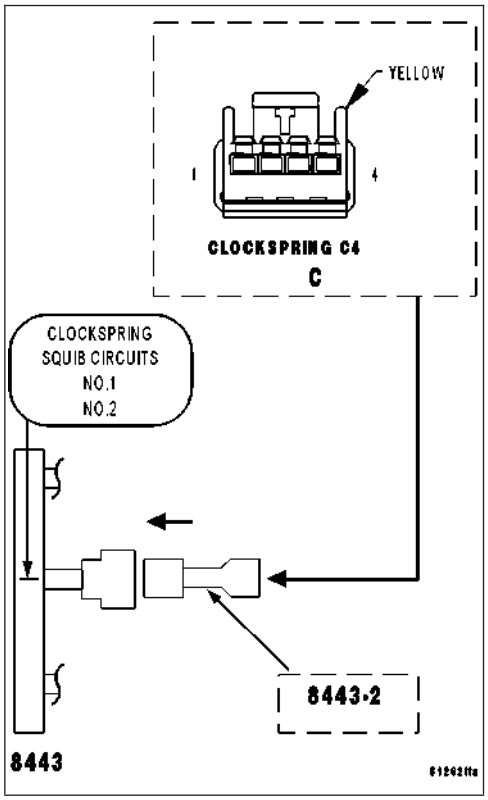
NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool and appropriate Jumper to the Clockspring harness connector(s).

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, read the active Occupant Restraint Controller DTC's.

Does the scan tool display DRIVER AIRBAG SQUIB 2 CIRCUIT LOW?

Yes >> Go to 4

No >> Replace the Clockspring in accordance with the Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1



B1B04-DRIVER AIRBAG SQUIB 2 CIRCUIT LOW (CONTINUED)

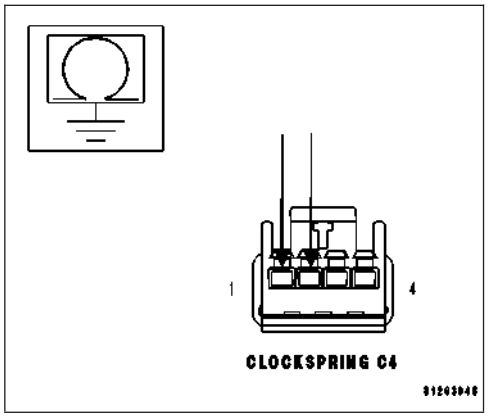
4. (R63) DRIVER SQUIB 2 LINE 1 OR (R61 DRIVER SQUIB 2 LINE 2 SHORTED TO GROUND

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool and Jumper from the Clockspring harness connector(s).

Disconnect the ORC harness connector(s).

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool ORC Adaptor to the ORC harness connector.

Measure the resistance of the (R63) Driver Squib 2 Line 1 and (R61) Driver Squib 2 Line 2 circuits between the Clockspring C2 harness connector and ground.



Is the resistance below 10K ohms?

Yes >> Repair the (R63) Driver Squib 2 Line 1 and/or (R61) Driver Squib 2 Line 2 circuits shorted to ground. Perform AIRBAG VERIFICATION TEST - VER 1

No >> Go to 5

---

5. OCCUPANT RESTRAINT CONTROLLER

WARNING: If the Airbag Control Module is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

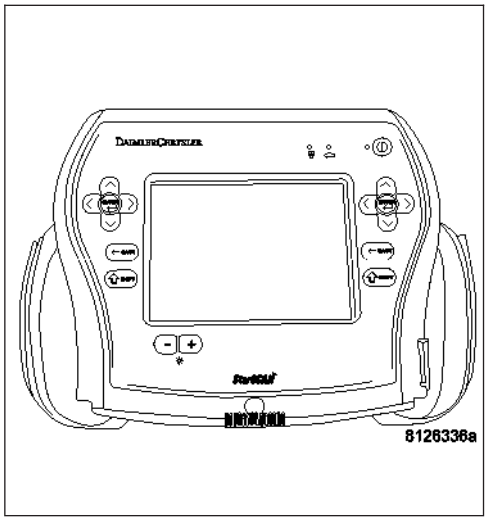
If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1

B1B04-DRIVER AIRBAG SQUIB 2 CIRCUIT LOW (CONTINUED)

6. STORED ORC DTC



With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

IF only stored codes return continue the test until the problem area has been isolated.

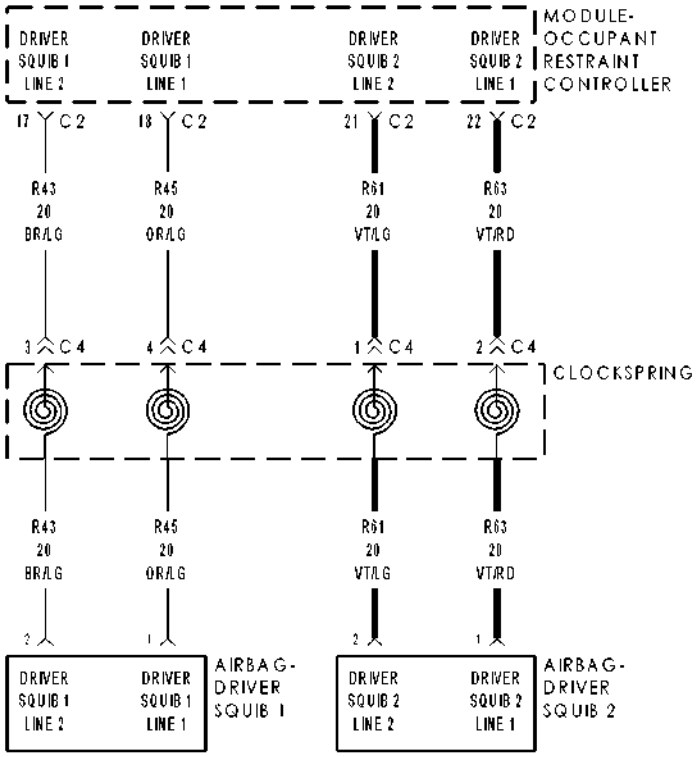
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

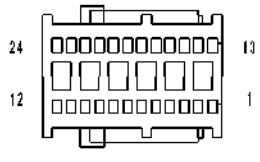
Are any ACTIVE DTCs present?

Yes >> Select appropriate symptom from Symptom List.

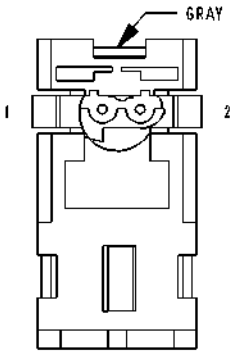
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B05-DRIVER AIRBAG SQUIB 2 CIRCUIT HIGH

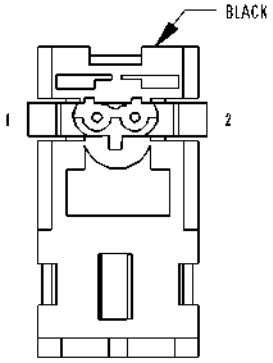




MODULE-OCCUPANT
RESTRAINT
CONTROLLER
C2
(SAB)



AIRBAG-
DRIVER SQUIB 1



AIRBAG-
DRIVER SQUIB 2

81265043

B1B05-DRIVER AIRBAG SQUIB 2 CIRCUIT HIGH (CONTINUED)

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the ORC monitors the voltage of the Driver Squib 2 circuits.
- **Set Condition:**
  The ORC has detects high voltage the Driver Squib 2 circuits.

Possible Causes
(R63) DRIVER SQUIB 2 LINE 1 OR (R61) DRIVER SQUIB 2 LINE SHORTED TO BATTERY2
CLOCKSPRING
DRIVER AIRBAG
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure the battery is fully charged.

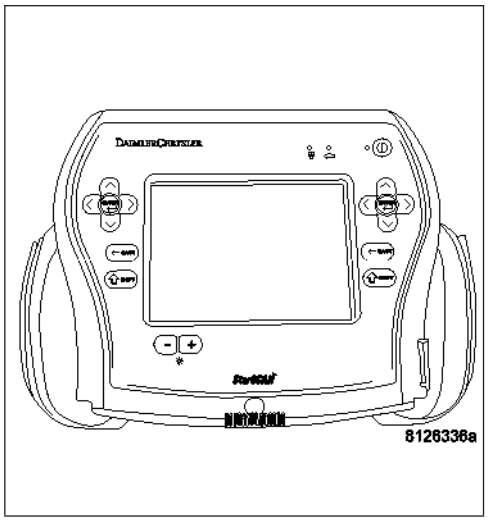
NOTE: The Scan Tool, SRS Airbag Load Tool MRL 8443 and DVOM are required to perform the following test.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.
Select Active or Stored DTC.

Is the DTC active or stored?

ORC - ACTIVE DTC
Go To 2

ORC - STORED DTC
Go To 6



B1B05-DRIVER AIRBAG SQUIB 2 CIRCUIT HIGH (CONTINUED)

2. DRIVER AIRBAG SHORTED

WARNING: TO AVOID PERSONAL INJURY OR DEATH, TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.
Disconnect the Driver Airbag connector(s).

WARNING: TO AVOID PERSONAL INJURY OR DEATH, DO NOT PLACE AN INTACT UNDEPLOYED AIRBAG FACE DOWN ON A HARD SURFACE, THE AIRBAG WILL PROPEL INTO THE AIR IF ACCIDENTALLY DEPLOYED.

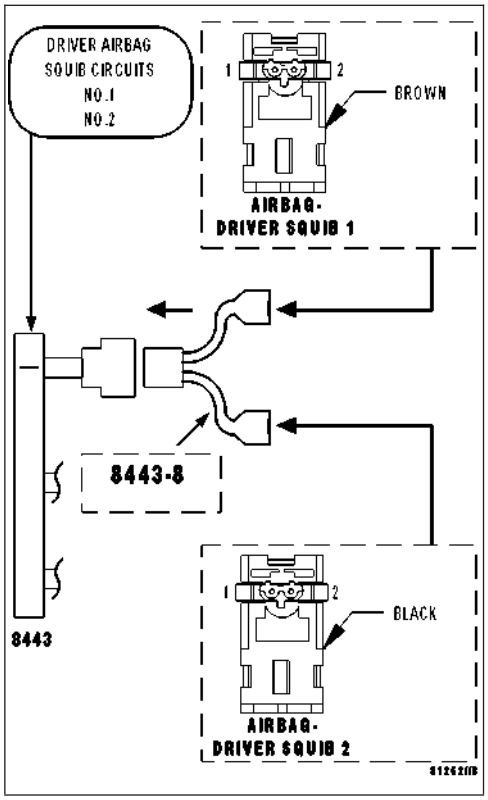
NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool and appropriate Jumper to the Driver Airbag connector(s).

WARNING: TO AVOID PERSONAL INJURY OR DEATH, TURN THE IGNITION ON, THEN RECONNECT THE BATTERY.
With the scan tool, read the active Occupant Classification Module DTC's.

Does the scan tool display DRIVER AIRBAG SQUIB 2 CIRCUIT HIGH?

Yes >> Go to 3

No >> Replace the Driver Airbag in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1



3. CLOCKSPRING SQUIB CIRCUIT HIGH

WARNING: TO AVOID PERSONAL INJURY OR DEATH, TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.
Disconnect the 8443 Load Tool and Jumper from the Driver Airbag connector(s).

Disconnect the Clockspring harness connector(s).

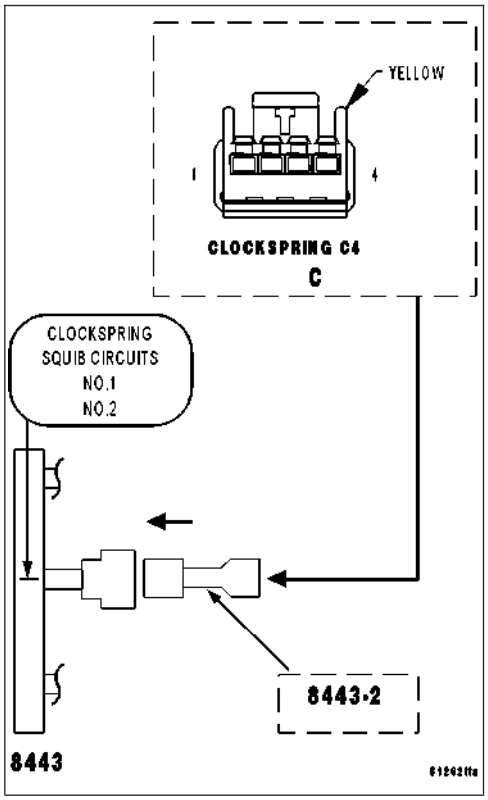
NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool and appropriate Jumper to the Clockspring harness connector(s).

WARNING: TO AVOID PERSONAL INJURY OR DEATH, TURN THE IGNITION ON, THEN RECONNECT THE BATTERY.
With the scan tool, read the active Occupant Classification Module DTC's.

Does the scan tool display DRIVER AIRBAG SQUIB 2 CIRCUIT HIGH?

Yes >> Go to 4

No >> Replace the Clockspring in accordance with the Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1



B1B05-DRIVER AIRBAG SQUIB 2 CIRCUIT HIGH (CONTINUED)

4. (R63) DRIVER SQUIB 2 LINE 1 OR (R61) DRIVER SQUIB 2 LINE 2 SHORTED TO BATTERY

WARNING: TO AVOID PERSONAL INJURY OR DEATH, TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.

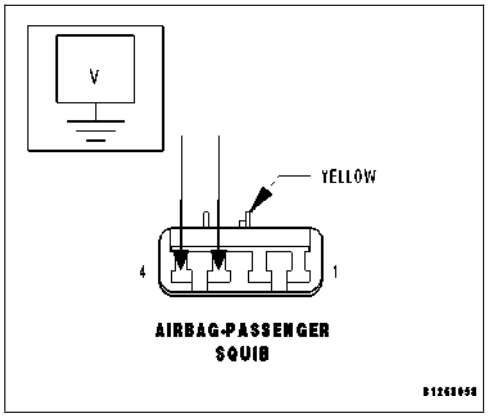
Disconnect the 8443 Load Tool and Jumper from the Clockspring C4 harness connector.

Disconnect the ORC harness connector(s).

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool ORC Adaptor to the ORC harness connector.

Measure the voltage of the (R63) Driver Squib 2 Line 1 and (R61) Driver Squib 2 Line 2 circuits between the Clockspring C4 harness connector and ground.



Is the resistance below 10K ohms?

Yes >> Repair (R63) Driver Squib 2 Line 1 or (R61) Driver Squib 2 Line 2 shorted to battery.
Perform AIRBAG VERIFICATION TEST - VER 1

No >> Go to 5

---

5. OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the Occupant Classification Module is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1

B1B05-DRIVER AIRBAG SQUIB 2 CIRCUIT HIGH (CONTINUED)

6. STORED ORC DTC

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

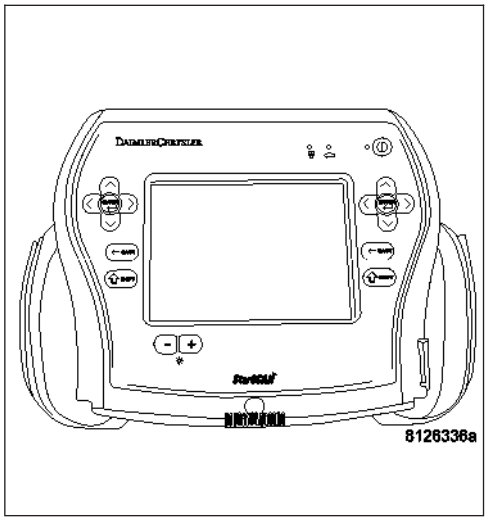
WARNING: TO AVOID PERSONAL INJURY OR DEATH, TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.



WARNING: TO AVOID PERSONAL INJURY OR DEATH, TURN THE IGNITION ON, THEN RECONNECT THE BATTERY.

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

IF only stored codes return continue the test until the problem area has been isolated.

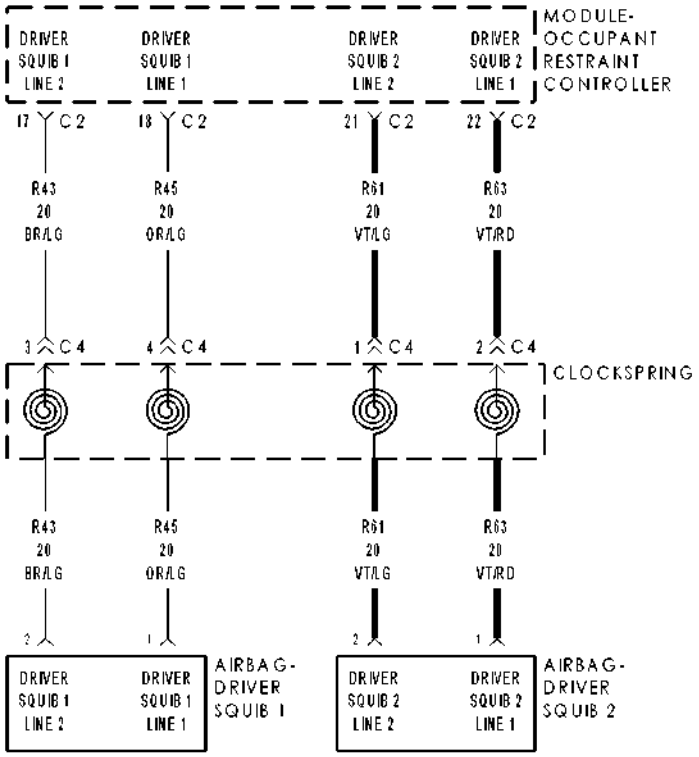
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

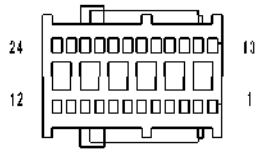
Are any ACTIVE DTC's present?

Yes >> Select appropriate symptom from Symptom List.

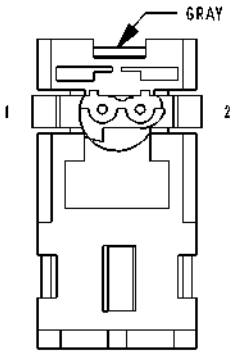
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B06-DRIVER AIRBAG SQUIB 2 CIRCUIT OPEN

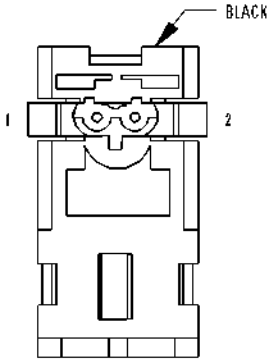




MODULE-OCCUPANT
RESTRAINT
CONTROLLER
C2
(SAB)



AIRBAG-
DRIVER SQUIB 1



AIRBAG-
DRIVER SQUIB 2

81265043

B1B06-DRIVER AIRBAG SQUIB 2 CIRCUIT OPEN (CONTINUED)

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the ORC monitors the resistance of the Driver Squib 2 circuits.
- **Set Condition:**
  The ORC has detected an open or high resistance in the Driver Squib 2 circuits.

Possible Causes
(R61) DRIVER SQUIB 2 LINE 1 OR (R63) DRIVER SQUIB 2 LINE 2 CIRCUIT OPEN
CLOCKSPRING
DRIVER AIRBAG
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure the battery is fully charged.

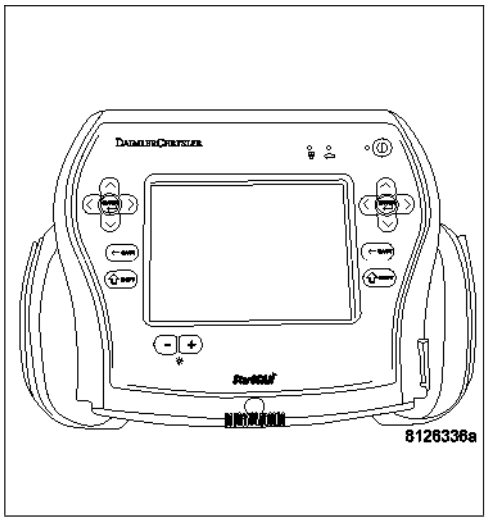
NOTE: The Scan Tool, SRS Airbag Load Tool MRL 8443 and DVOM are required to perform the following test.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.
Select Active or Stored DTC.

Is the DTC active or stored?

ORC - ACTIVE DTC
Go To 2

ORC - STORED DTC
Go To 6



B1B06-DRIVER AIRBAG SQUIB 2 CIRCUIT OPEN (CONTINUED)

2. DRIVER AIRBAG OPEN

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Driver Airbag connector(s).

WARNING: To avoid personal injury or death, do not place an intact undeployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

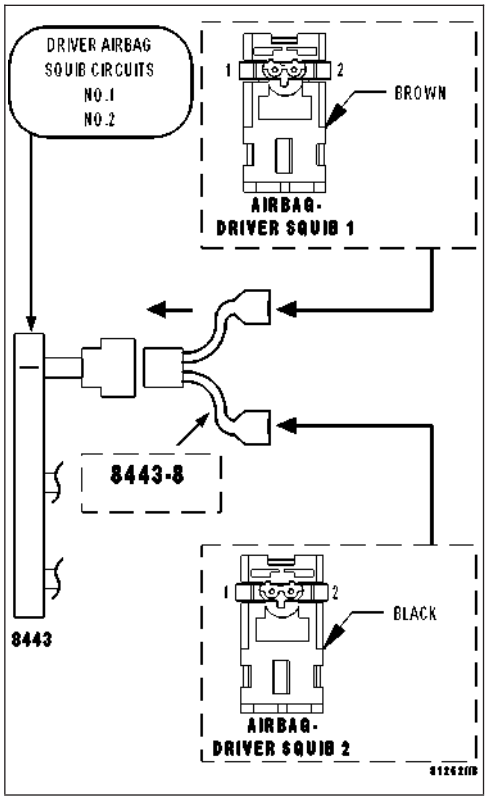
NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool and appropriate Jumper to the Driver Airbag connector(s).

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, read the active Occupant Restraint Controller DTC's.

Does the scan tool display DRIVER AIRBAG SQUIB 2 CIRCUIT OPEN?

Yes >> Go to 3

No >> Replace the Driver Airbag in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1



3. CLOCKSPRING SQUIB CIRCUITS OPEN

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool and Jumper from the Driver Airbag connector(s).

Disconnect the Clockspring harness connector(s).

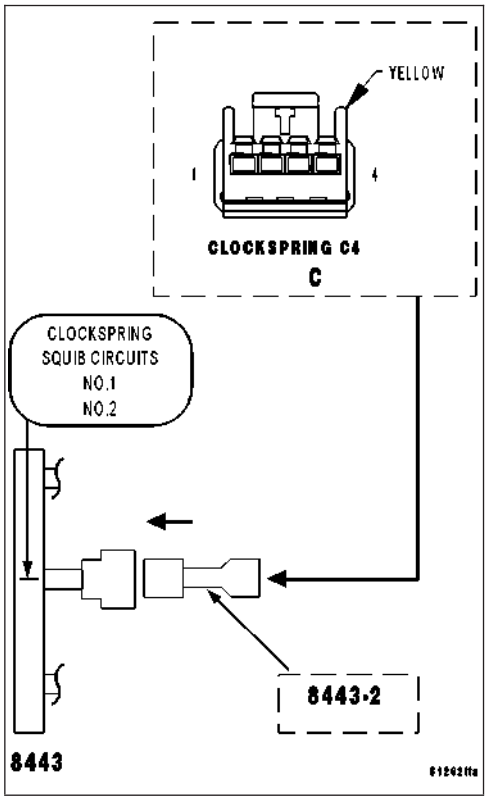
NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool and appropriate Jumper to the Clockspring C4 harness connector(s).

WARNING: TO AVOID PERSONAL INJURY OR DEATH, TURN THE IGNITION ON, THEN RECONNECT THE BATTERY.
With the scan tool, read the active Occupant Restraint Controller DTC's.

Does the scan tool display DRIVER AIRBAG SQUIB 2 CIRCUIT OPEN?

Yes >> Go to 4

No >> Replace the Clockspring in accordance with the Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1



B1B06-DRIVER AIRBAG SQUIB 2 CIRCUIT OPEN (CONTINUED)

4. (R61) DRIVER SQUIB 2 LINE 1 OR (R63) DRIVER SQUIB 2 LINE 2 CIRCUIT OPEN

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the 8443 Load Tool and Jumper from the Clockspring C4 harness connector.

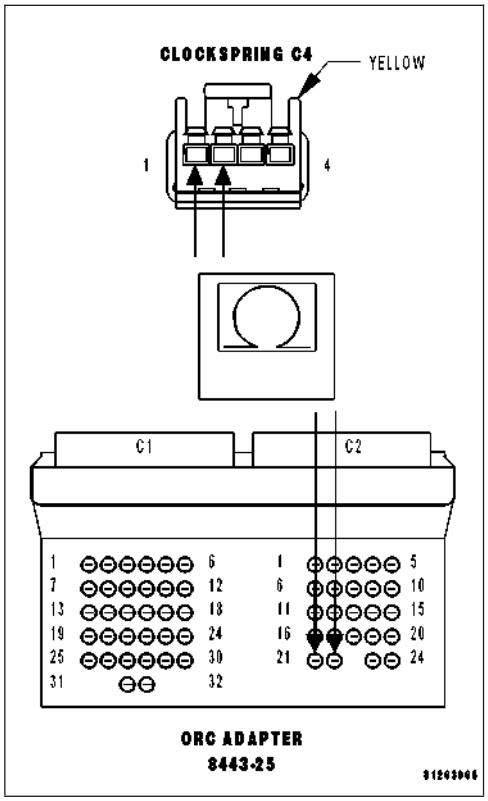
Disconnect the ORC harness connector(s).

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool ORC Adaptor to the ORC C2 harness connector.

Measure the resistance of the (R61) Driver Squib 2 Line 1 circuit between the Clockspring C4 harness connector and the 8443 ORC Adaptor.

Measure the resistance of the (R63) Driver Squib 2 Line 2 circuit between the Clockspring C4 harness connector and the 8443 ORC Adaptor.



Is the resistance below 1.0 ohms on either circuit?

Yes >> Go to 5

No >> Repair (R61) Driver Squib 2 Line 1 or (R63) Driver Squib 2 Circuit Open.
Perform AIRBAG VERIFICATION TEST - VER 1

5. OCCUPANT RESTRAINT CONTROLLER

WARNING: If the Airbag Control Module is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

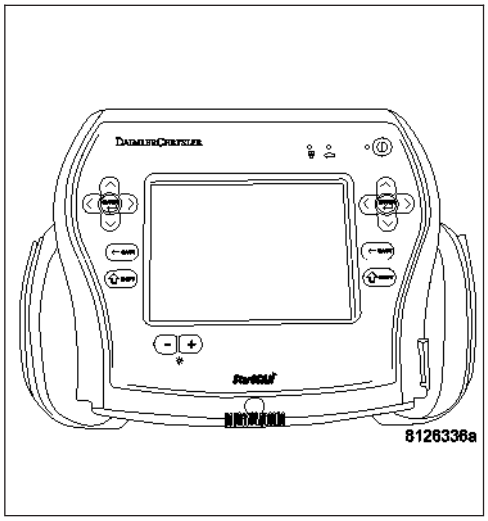
If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1

B1B06-DRIVER AIRBAG SQUIB 2 CIRCUIT OPEN (CONTINUED)

6. STORED ORC DTC



With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

IF only stored codes return continue the test until the problem area has been isolated.

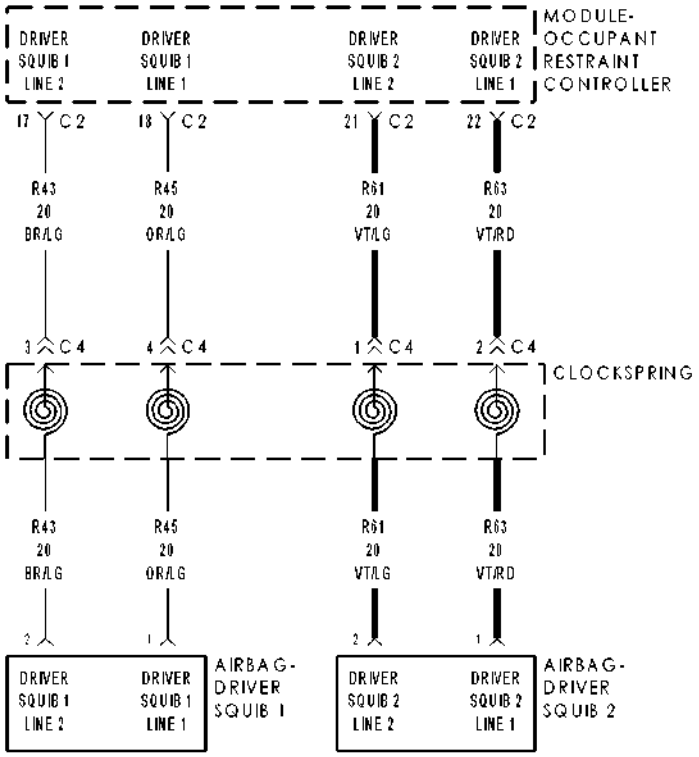
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

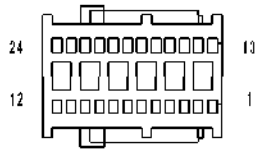
Are any ACTIVE DTCs present?

Yes >> Select appropriate symptom from Symptom List.

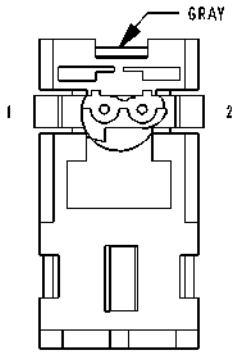
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B07-DRIVER AIRBAG SQUIB 2 CIRCUIT SHORT TOGETHER

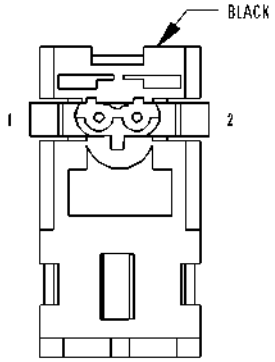




MODULE-OCCUPANT
RESTRAINT
CONTROLLER
C2
(SAB)



AIRBAG-
DRIVER SQUIB 1



AIRBAG-
DRIVER SQUIB 2

8126S043

B1B07-DRIVER AIRBAG SQUIB 2 CIRCUIT SHORT TOGETHER (CONTINUED)

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the ORC monitors the resistance of the Driver Squib 2 circuits.
- **Set Condition:**
  The ORC has detected low resistance between the Driver Squib 2 circuits.

Possible Causes
(R61) DRIVER SQUIB 2 LINE 1 SHORTED TO (R63) DRIVER SQUIB 2 LINE 2
CLOCKSPRING
DRIVER AIRBAG
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure the battery is fully charged.

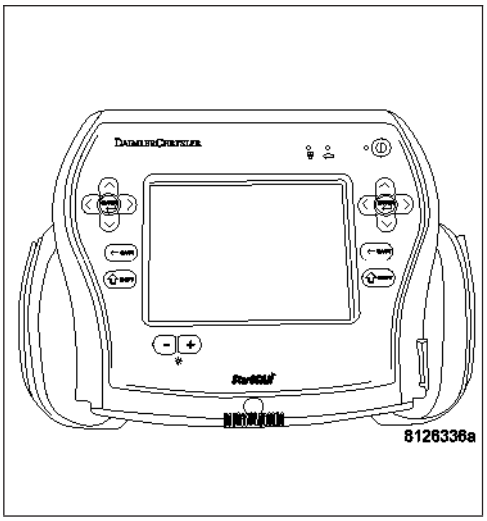
NOTE: The Scan Tool, SRS Airbag Load Tool MRL 8443 and DVOM are required to perform the following test.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.
Select Active or Stored DTC.

Is the DTC active or stored?

ORC - ACTIVE DTC
Go To 2

ORC - STORED DTC
Go To 6



B1B07-DRIVER AIRBAG SQUIB 2 CIRCUIT SHORT TOGETHER (CONTINUED)

2. DRIVER AIRBAG SHORTED

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Driver Airbag connector(s).

WARNING: To avoid personal injury or death, do not place an intact undeployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

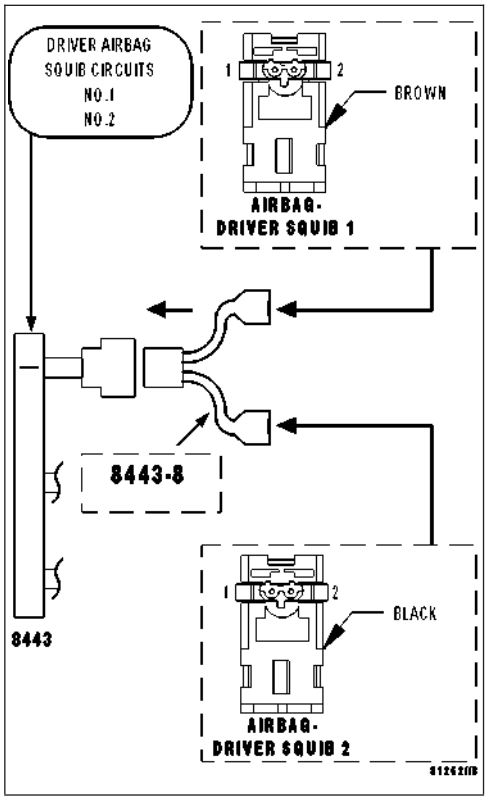
NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool and appropriate Jumper to the Driver Airbag connector(s).

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, read the active Occupant Restraint Controller DTC's.

Does the scan tool display DRIVER AIRBAG SQUIB 2 CIRCUIT SHORT TOGETHER?

Yes >> Go to 3

No >> Replace the Driver Airbag in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1



3. CLOCKSPRING SQUIB CIRCUITS SHORTED TOGETHER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool and Jumper to the Driver Airbag connector(s).

Disconnect the Clockspring harness connector(s).

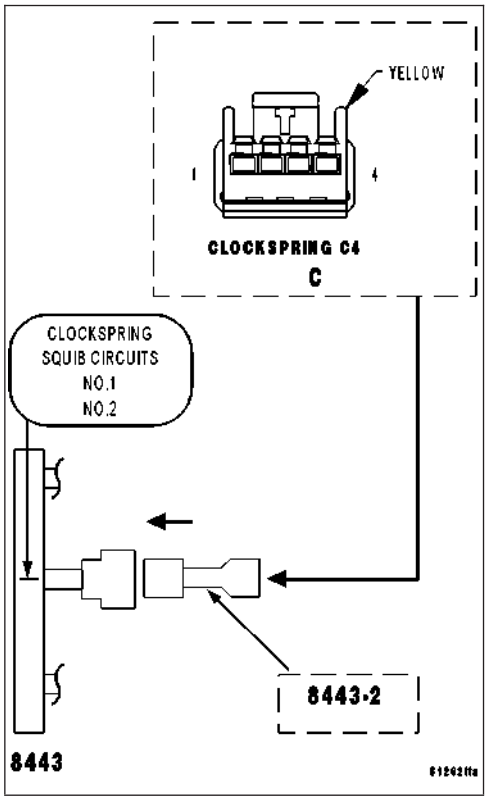
NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool and appropriate Jumper to the Clockspring harness connector(s).

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery
With the scan tool, read the active Occupant Restraint Controller DTC's.

Does the scan tool display DRIVER AIRBAG SQUIB 2 CIRCUIT SHORT TOGETHER?

Yes >> Go to 4

No >> Replace the Clockspring in accordance with the Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1



B1B07-DRIVER AIRBAG SQUIB 2 CIRCUIT SHORT TOGETHER (CONTINUED)

4. (R61) DRIVER SQUIB 2 LINE 1 SHORTED TO (R63) DRIVER SQUIB 2 LINE 2

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

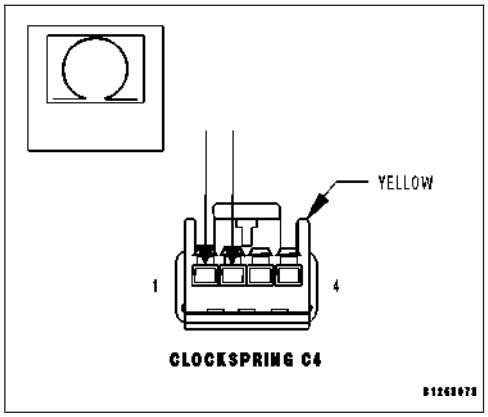
Disconnect the 8443 Load Tool and Jumper form the Clockspring C4 harness connector.

Disconnect the ORC harness connector(s).

NOTE: Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool ORC Adaptor to the ORC harness connector.

Measure the resistance between (R61) Driver Squib 2 Line 1 and (R63) Driver Squib 2 Line 2 circuits at the Clockspring C4 harness connector.



Is the resistance below 10K ohms?

Yes >> Repair (R61) Driver Squib 2 Line 1 shorted to (R63) Driver Squib 2 Line 2. Perform AIRBAG VERIFICATION TEST - VER 1

No >> Go to 5

---

5. OCCUPANT RESTRAINT CONTROLLER

WARNING: If the Airbag Control Module is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

If there are no possible causes remaining, view repair.

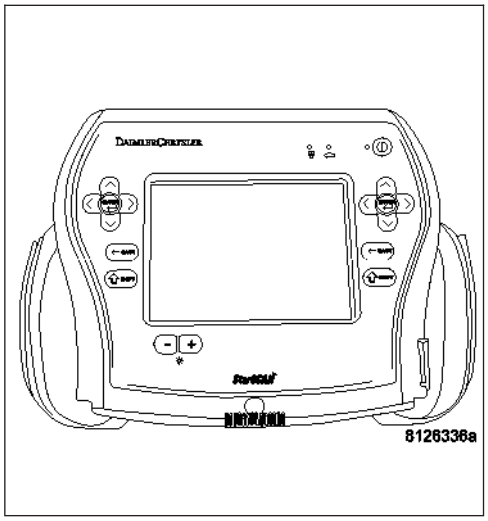
Repair

Replace the Occupant Restraint Controller in accordance with Service Information.

Perform AIRBAG VERIFICATION TEST - VER 1

B1B07-DRIVER AIRBAG SQUIB 2 CIRCUIT SHORT TOGETHER (CONTINUED)

6. STORED ORC DTC



With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

IF only stored codes return continue the test until the problem area has been isolated.

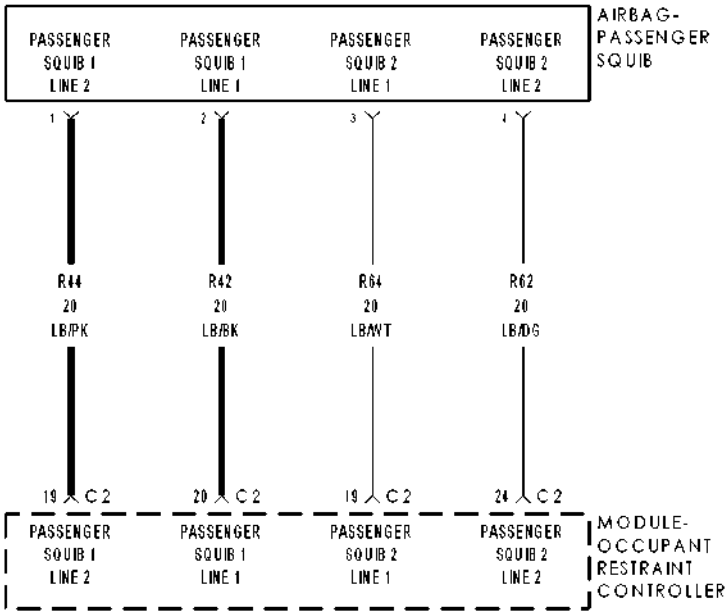
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

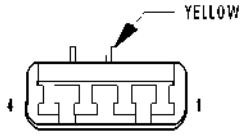
Are any ACTIVE DTCs present?

Yes >> Select appropriate symptom from Symptom List.

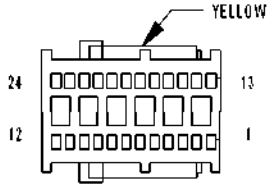
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B08-PASSENGER AIRBAG SQUIB 1 CIRCUIT LOW





AIRBAG-PASSENGER SQUIB



MODULE-OCCUPANT RESTRAINT CONTROLLER C2 (SAB)

81263078

B1B08-PASSENGER AIRBAG SQUIB 1 CIRCUIT LOW (CONTINUED)

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the ORC monitors the resistance of the Passenger Squib 1 circuits.
- **Set Condition:**
  The ORC has detected low resistance of the Passenger Squib 1 circuits.

Possible Causes
(R42) PASSENGER SQUIB 1 LINE 1 OR (R44) PASSENGER SQUIB 1 LINE 2 SHORTED TO GROUND
PASSENGER AIRBAG
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure the battery is fully charged.

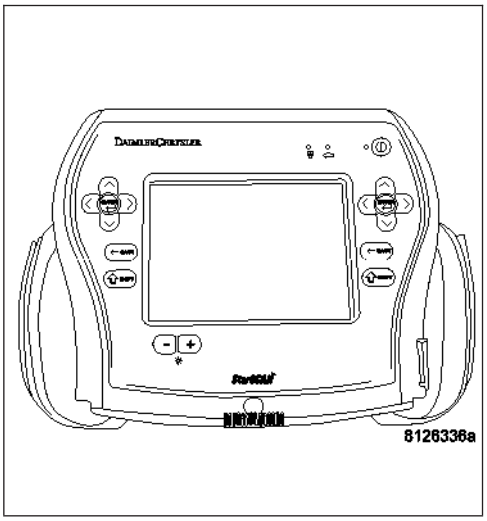
NOTE: The Scan Tool, SRS Airbag Load Tool MRL 8443 and DVOM are required to perform the following test.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.
Select Active or Stored DTC.

Is the DTC active or stored?

ORC - ACTIVE DTC
Go To 2

ORC - STORED DTC
Go To 5



B1B08-PASSENGER AIRBAG SQUIB 1 CIRCUIT LOW (CONTINUED)

2. PASSENGER AIRBAG SHORTED TO GROUND

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Passenger Airbag connector(s).

WARNING: To avoid personal injury or death, do not place an intact undeployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

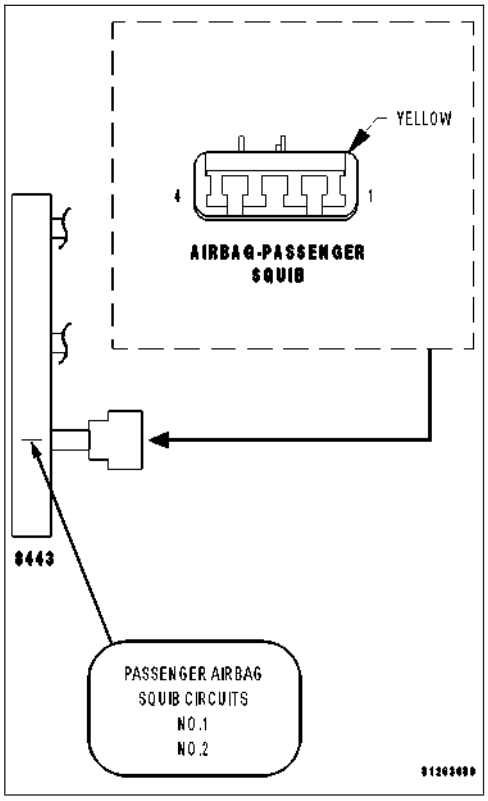
NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool and appropriate Jumper to the Passenger Airbag connector(s).

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, read the active Occupant Restraint Controller DTC's.

Does the scan tool display PASSENGER AIRBAG SQUIB 1 CIRCUIT LOW?

Yes >> Go To 3

No >> Replace the Passenger Airbag in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1



3. (R42) PASSENGER SQUIB LINE 1 OR (R44) PASSENGER SQUIB 1 LINE 2 SHORTED TO GROUND

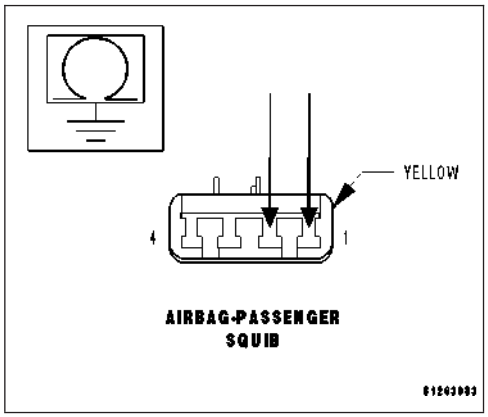
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool and Jumper from the Passenger Airbag harness connector.

Disconnect the ORC harness connector(s).

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool ORC Adaptor to the ORC harness connector.

Measure the resistance of the (R42) Passenger Squib 1 Line 1 circuit between the Passenger Airbag Connector and ground.

Measure the resistance of the (R44) Passenger Squib 1 Line 2 circuit between the Passenger Airbag Connector and ground.



Is the resistance below 10K ohms on either circuit?

Yes >> Repair (R42) Passenger Squib 1 Line 1 and/or (R44) Passenger Squib 1 Line 2 shorted to ground.
Perform AIRBAG VERIFICATION TEST - VER 1

No >> Go to 4

B1B08-PASSENGER AIRBAG SQUIB 1 CIRCUIT LOW (CONTINUED)

4. OCCUPANT RESTRAINT CONTROLLER

WARNING: If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1

---

5. STORED ORC DTC

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

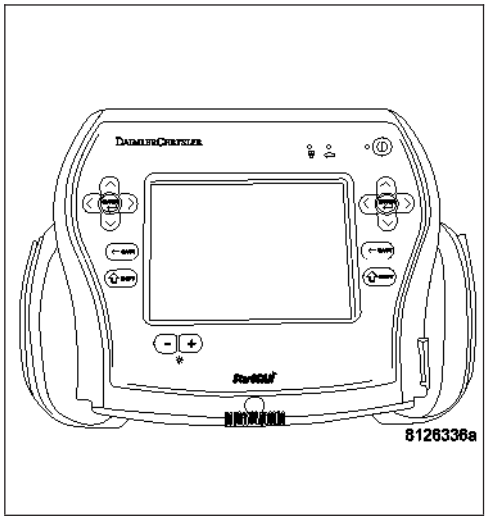
Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.



Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

IF only stored codes return continue the test until the problem area has been isolated.

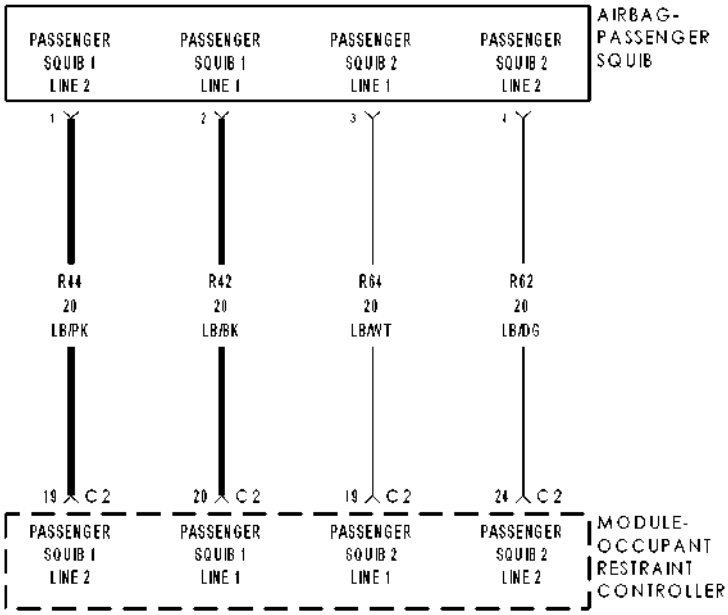
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

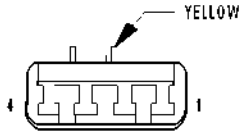
Are any ACTIVE DTC's present?

Yes >> Select appropriate symptom from Symptom List.

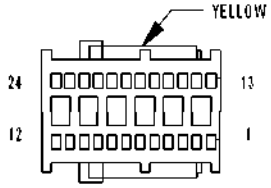
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B09-PASSENGER AIRBAG SQUIB 1 CIRCUIT HIGH





AIRBAG-PASSENGER SQUIB



MODULE-OCCUPANT RESTRAINT CONTROLLER C2 (SAB)

81263078

B1B09-PASSENGER AIRBAG SQUIB 1 CIRCUIT HIGH (CONTINUED)

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the ORC monitors the voltage on the Passenger Squib 1 circuits.
- **Set Condition:**
  When the ORC detects voltage on the Passenger Squib 1 circuits.

Possible Causes
(R42) PASSENGER SQUIB 1 LINE 1 OR (R44) PASSENGER SQUIB 1 LINE 2 SHORTED TO BATTERY
PASSENGER AIRBAG
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure the battery is fully charged.

NOTE: The Scan Tool, SRS Airbag Load Tool MRL 8443 and DVOM are required to perform the following test.

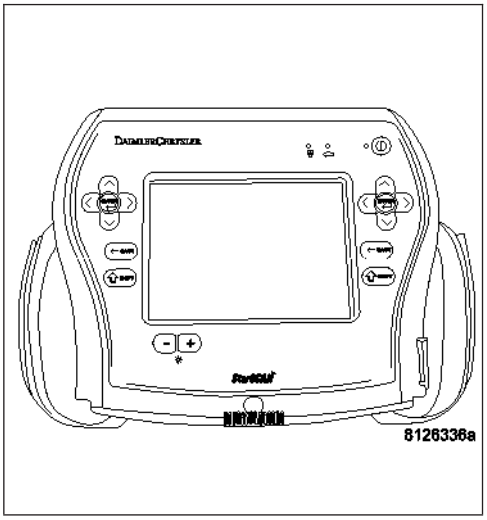
NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

Select Active or Stored DTC.

Is the DTC active or stored?

ORC - ACTIVE DTC
Go To 2

ORC - STORED DTC
Go To 5



B1B09-PASSENGER AIRBAG SQUIB 1 CIRCUIT HIGH (CONTINUED)

2. PASSENGER AIRBAG SHORTED TO BATTERY

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Passenger Airbag connector(s).

WARNING: To avoid personal injury or death, do not place an intact undeployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

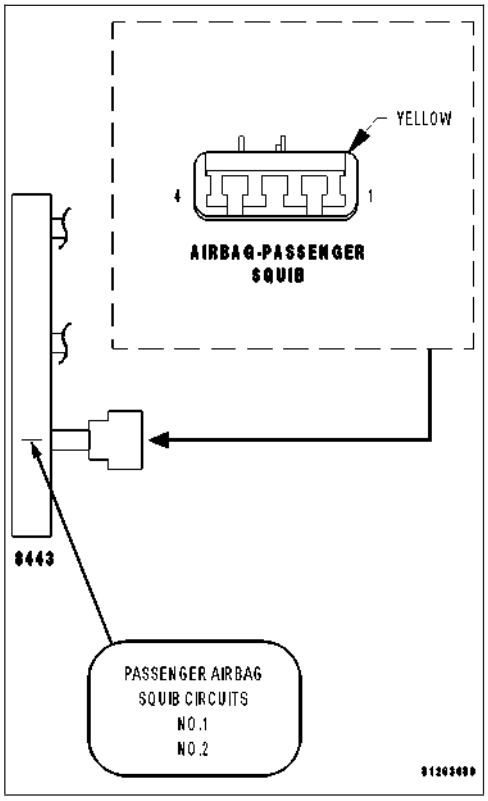
NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool and appropriate Jumper to the Passenger Airbag connector(s).

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, read the active Occupant Restraint Controller DTC's.

Does the scan tool display PASSENGER AIRBAG SQUIB 1 CIRCUIT HIGH?

Yes >> Go To 3

No >> Replace the Passenger Airbag in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1



3. (R42) PASSENGER SQUIB 1 LINE 1 AND/OR (R44)PASSENGER SQUIB 1 LINE 2 SHORTED TO BATTERY.

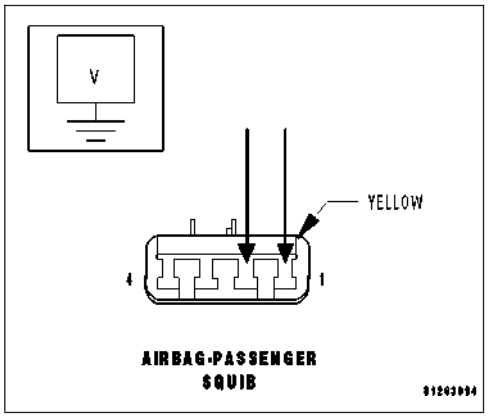
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool and Jumper from the Passenger Airbag Squib Harness connector.

Disconnect the ORC harness connector(s).

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool ORC Adaptor to the ORC harness connector.

Measure the voltage on the (R42) Passenger Squib 1 Line 1 circuit between the Passenger Airbag Squib harness connector and ground.

Measure the voltage on the (R44) Passenger Squib 1 Line 2 circuits between the Passenger Airbag Squib harness connector and ground.



Is there any voltage on either circuit?

Yes >> Repair (R42) Passenger Squib 1 Line 1 or (R44) Passenger Squib 1 Line 2 shorted to battery.
Perform AIRBAG VERIFICATION TEST - VER 1

No >> Go to 4

B1B09-PASSENGER AIRBAG SQUIB 1 CIRCUIT HIGH (CONTINUED)

4. OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1

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5. STORED ORC DTC

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

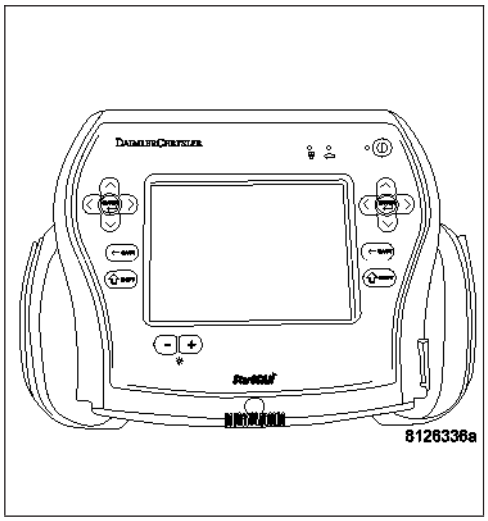
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool monitor active codes as you work through the following steps.



Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

IF only stored codes return continue the test until the problem area has been isolated.

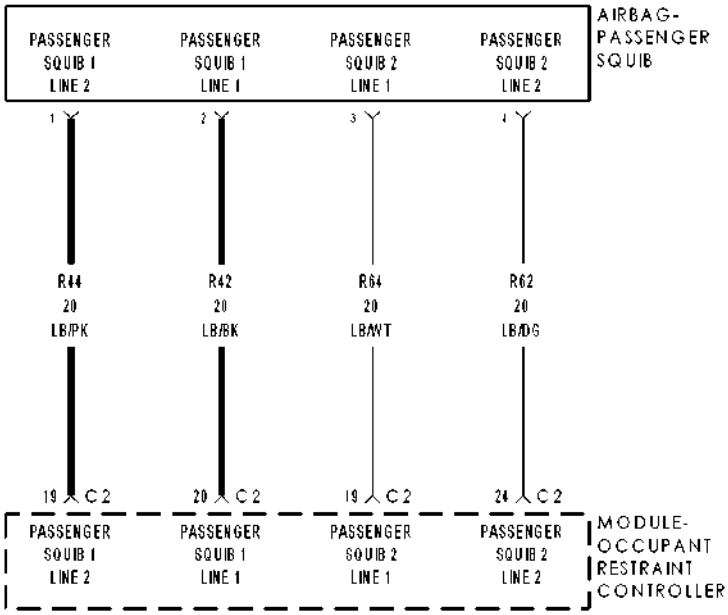
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

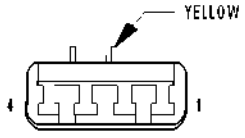
Are any ACTIVE DTCs present?

Yes >> Select appropriate symptom from Symptom List.

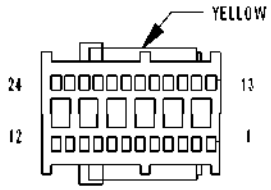
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B0A-PASSENGER AIRBAG SQUIB 1 CIRCUIT OPEN





AIRBAG-PASSENGER SQUIB



MODULE-OCCUPANT RESTRAINT CONTROLLER C2 (SAB)

81263078

B1B0A-PASSENGER AIRBAG SQUIB 1 CIRCUIT OPEN (CONTINUED)

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the ORC monitors the resistance of the Passenger Squib 1 circuits.
- **Set Condition:**
  The ORC has detected open circuit or high resistance in the Passenger Squib 1 circuits.

Possible Causes
(R42) PASSENGER SQUIB 1 LINE 1 OR (R44) PASSENGER SQUIB 1 LINE 2 LINE 2 CIRCUIT OPEN
PASSENGER AIRBAG
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure the battery is fully charged.

NOTE: The Scan Tool and SRS Airbag Load Tool MRL 8443 are required to perform the following test.

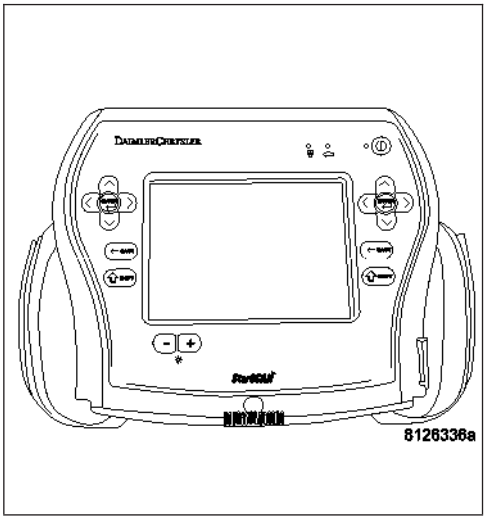
NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

Select Active or Stored DTC.

Is the DTC active or stored?

ORC - ACTIVE DTC
Go To 2

ORC - STORED DTC
Go To 5



B1B0A-PASSENGER AIRBAG SQUIB 1 CIRCUIT OPEN (CONTINUED)

2. PASSENGER AIRBAG OPEN

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Passenger Airbag connector(s).

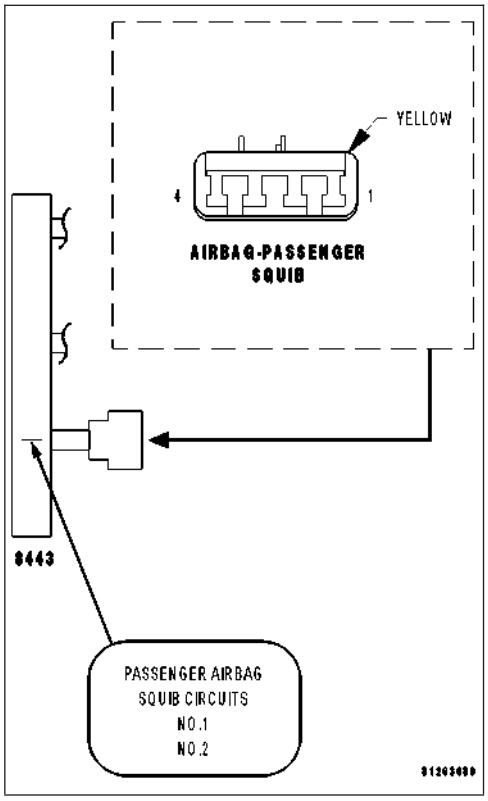
NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool and appropriate Jumper to the Passenger Airbag connector(s).

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, read the active Occupant Restraint Controller DTC's.

Does the scan tool display PASSENGER AIRBAG SQUIB 1 CIRCUIT OPEN?

Yes >> Go to 3

No >> Replace the Passenger Airbag in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1



3. (R42) PASSENGER SQUIB 1 LINE 1 OR (R44) PASSENGER SQUIB 1 LINE 2 CIRCUIT OPEN

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool and Jumper from the Passenger Airbag harness connector(s).

Disconnect the ORC harness connector(s).

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool ORC Adaptor to the ORC harness connector.

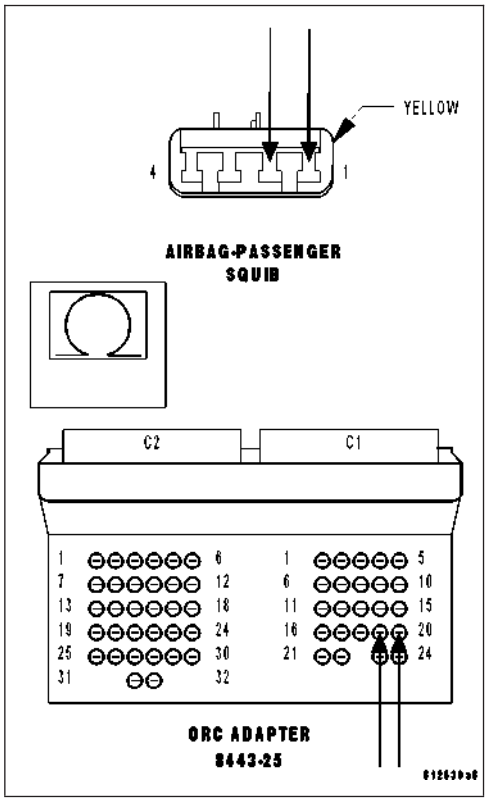
Measure the resistance of the (R42) Passenger Squib 1 Line 1 between the Passenger Airbag harness connector and the 8443 ORC Adaptor.

Measure the resistance of the (R44) Passenger Squib 1 Line 2 between the Passenger Airbag harness connector and the 8443 ORC Adaptor.

Is the resistance below 1.0 ohm on both circuits?

Yes >> Go to 4

No >> Repair open or high resistance in (R42) Passenger Squib 1 Line 1 and/or (R44) Passenger Squib 1 Line 2.
Perform AIRBAG VERIFICATION TEST - VER 1



B1B0A-PASSENGER AIRBAG SQUIB 1 CIRCUIT OPEN (CONTINUED)

4. OCCUPANT RESTRAINT CONTROLLER

WARNING: If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1

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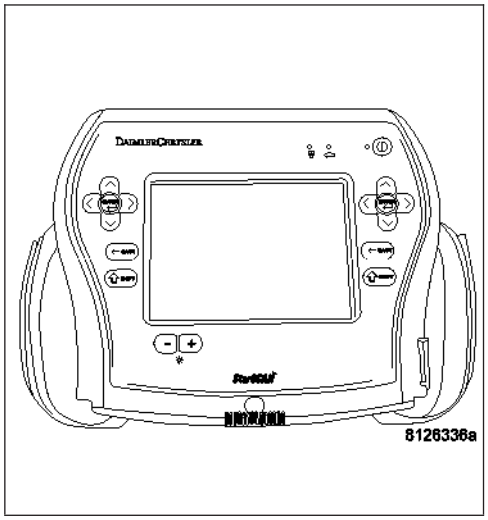
5. STORED ORC DTC

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

IF only stored codes return continue the test until the problem area has been isolated.

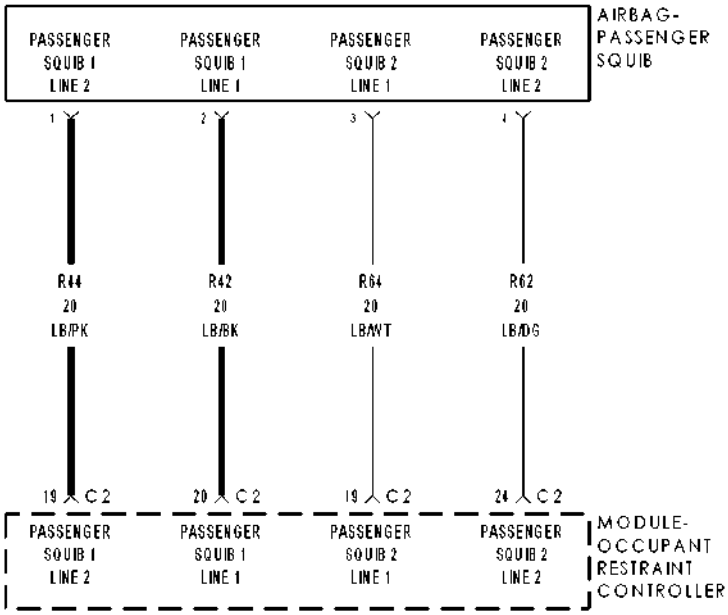
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

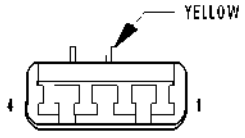
Are any ACTIVE DTCs present?

Yes >> Select appropriate symptom from Symptom List.

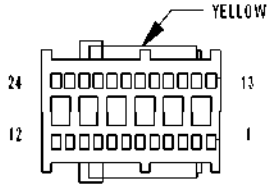
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B0B-PASSENGER AIRBAG SQUIB 1 CIRCUIT SHORT TOGETHER





AIRBAG-PASSENGER SQUIB



MODULE-OCCUPANT RESTRAINT CONTROLLER C2 (SAB)

8126307d

B1B0B-PASSENGER AIRBAG SQUIB 1 CIRCUIT SHORT TOGETHER (CONTINUED)

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the ORC monitors the resistance of the Passenger Squib 1 circuits.
- **Set Condition:**
  The ORC has detected low resistance between the Passenger Squib 1 circuits.

Possible Causes
(R42) PASSENGER SQUIB 1 LINE 1 SHORTED TO (R44) PASSENGER SQUIB 1 LINE 2
PASSENGER AIRBAG
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure the battery is fully charged.

NOTE: The Scan Tool, SRS Airbag Load Tool MRL 8443 and DVOM are required to perform the following test.

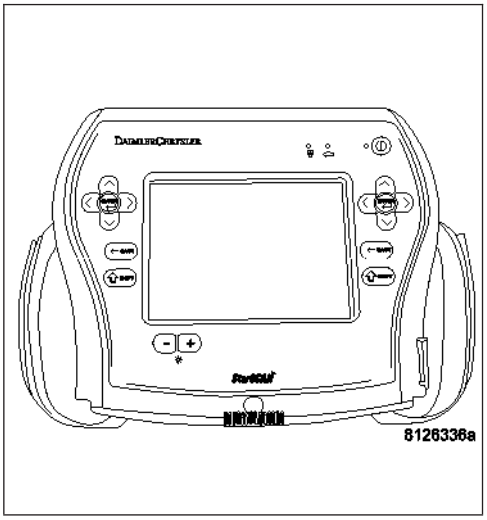
NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

Select Active or Stored DTC.

Is the DTC active or stored?

ORC - ACTIVE DTC
Go To 2

ORC - STORED DTC
Go To 5



B1B0B-PASSENGER AIRBAG SQUIB 1 CIRCUIT SHORT TOGETHER (CONTINUED)

2. DRIVER AIRBAG SHORTED

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Driver Airbag connector(s).

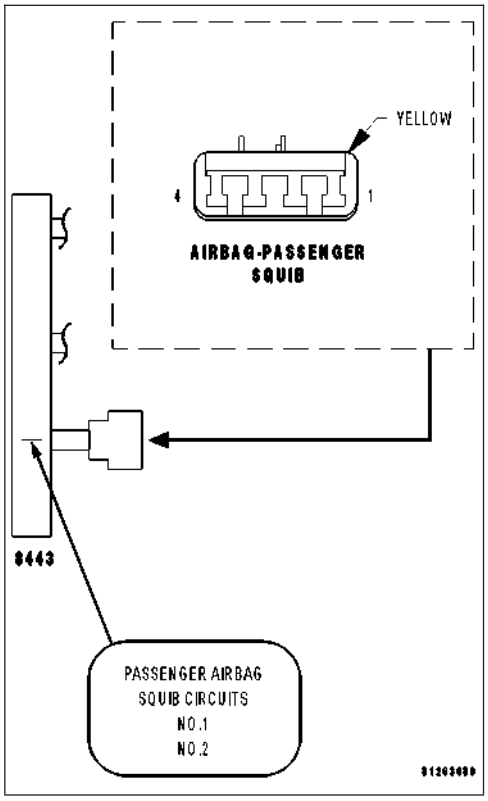
NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool and appropriate Jumper to the Passenger Airbag connector(s).

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, read the active Occupant Restraint Controller DTC's.

Does the scan tool display PASSENGER AIRBAG SQUIB 1 CIRCUIT SHORT TOGETHER?

Yes >> Go to 3

No >> Replace the Passenger Airbag in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1



3. (R42) PASSENGER SQUIB 1 LINE 1 SHORTED TO (R44) PASSENGER SQUIB 1 LINE 2

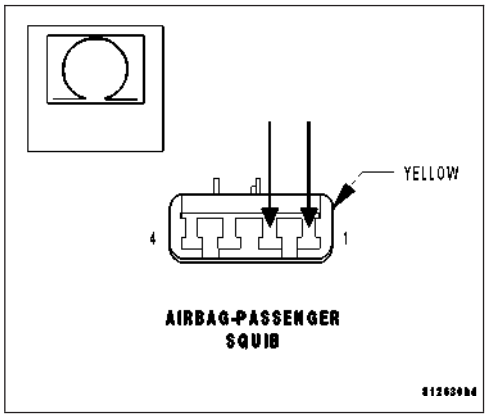
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool and Jumper from the Passenger Airbag Squib connector(s).

Disconnect the ORC harness connector(s).

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool ORC Adaptor to the ORC harness connector.

Measure the resistance between the (R42) Passenger Squib 1 Line 1 and (R42) Passenger Squib 1 Line 2 at the Passenger Airbag Squib harness connector.

Is the resistance below 10K ohms?



Yes >> Repair the (R42) Passenger Squib 1 Line 1 shorted to the (R42) Passenger Squib 1 Line 2 circuit.
Perform AIRBAG VERIFICATION TEST - VER 1

No >> Go to 4

B1B0B-PASSENGER AIRBAG SQUIB 1 CIRCUIT SHORT TOGETHER (CONTINUED)

4. OCCUPANT RESTRAINT CONTROLLER

WARNING: If the Airbag Control Module is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

If there are no possible causes remaining, view repair.

Repair

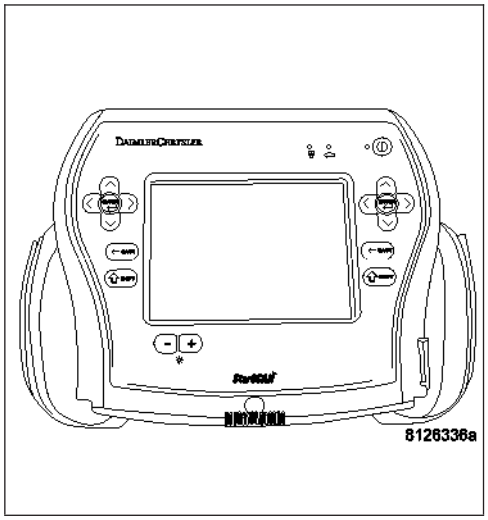
Replace the Occupant Restraint Controller in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1

---

5. STORED ORC DTC

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

IF only stored codes return continue the test until the problem area has been isolated.

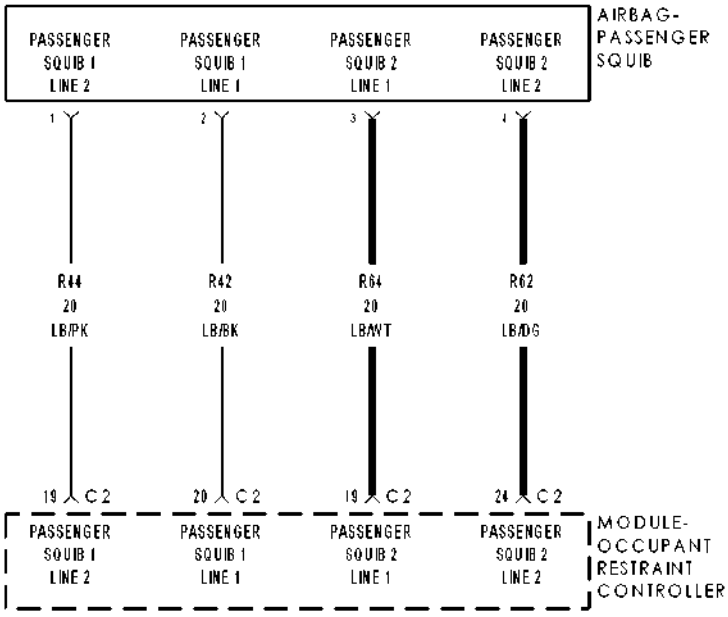
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

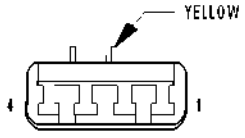
Are any ACTIVE DTC's present?

Yes >> Select appropriate symptom from Symptom List.

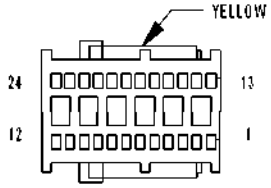
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B0C-PASSENGER AIRBAG SQUIB 2 CIRCUIT LOW





AIRBAG-PASSENGER SQUIB



MODULE-OCCUPANT RESTRAINT CONTROLLER C2 (SAB)

B1B0C-PASSENGER AIRBAG SQUIB 2 CIRCUIT LOW (CONTINUED)

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the ORC monitors the resistance of the Passenger Squib 2 circuits.
- **Set Condition:**
  The ORC has detected low resistance between the Passenger Squib 2 circuits.

Possible Causes
(R64) PASSENGER SQUIB 2 LINE 1 OR TO (R62) PASSENGER SQUIB 2 LINE 2 SHORTED TO GROUND
PASSENGER AIRBAG
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure the battery is fully charged.

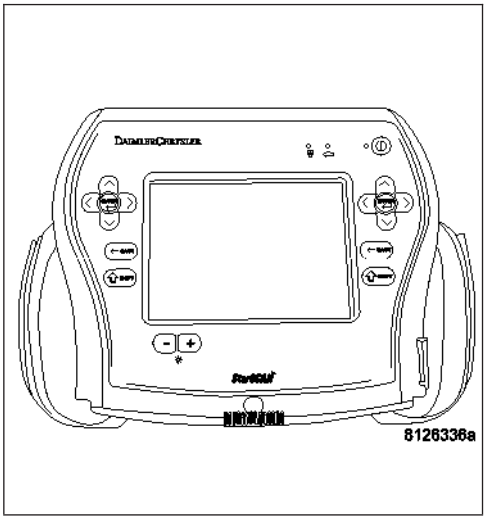
NOTE: The Scan Tool, SRS Airbag Load Tool MRL 8443 and DVOM are required to perform the following test.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.
Select Active or Stored DTC.

Is the DTC active or stored?

ORC - ACTIVE DTC
Go To 2

ORC - STORED DTC
Go To 5



B1B0C-PASSENGER AIRBAG SQUIB 2 CIRCUIT LOW (CONTINUED)

2. PASSENGER AIRBAG SHORTED

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Passenger Airbag Squib connector(s).

WARNING: To avoid personal injury or death, do not place an intact undeployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

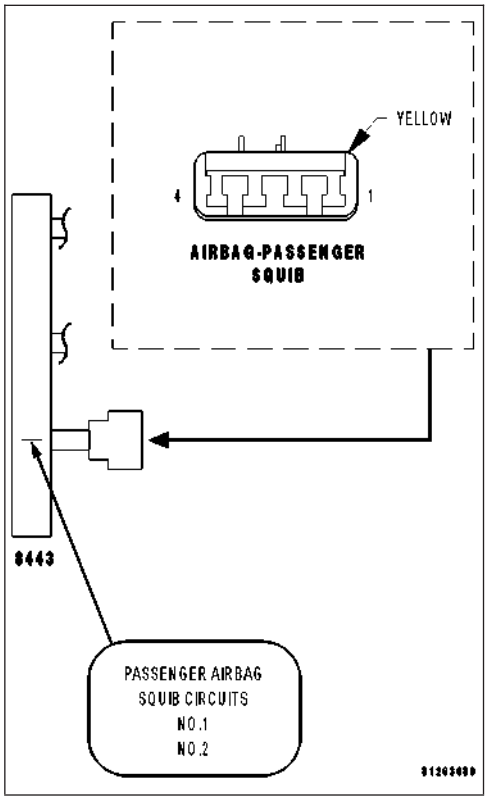
NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool and appropriate Jumper to the Passenger Airbag connector(s).

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, read the active Occupant Restraint Controller DTC's.

Does the scan tool display PASSENGER AIRBAG SQUIB 2 CIRCUIT LOW?

Yes >> Go to 3

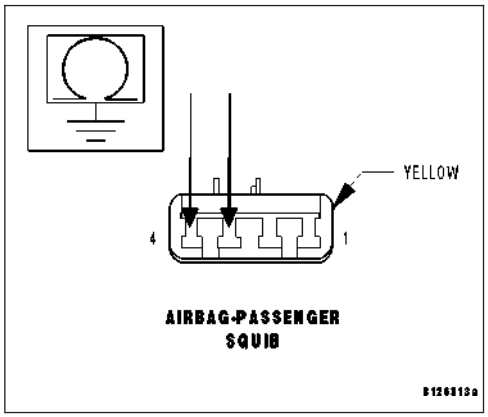
No >> Replace the Passenger Airbag in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1



3. (R64) PASSENGER SQUIB 2 LINE 1 OR (R62) PASSENGER SQUIB 2 LINE 2

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool and Jumper from the Passenger Airbag harness connector(s).
Disconnect the ORC harness connector(s).

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool ORC Adaptor to the ORC harness connector.
Measure the resistance of the (R64) Passenger Squib 2 Line 1 circuit between the Passenger Airbag Squib harness connector and ground.
Measure the resistance of the (R62) Passenger Squib 2 Line 2 circuits between the Passenger Airbag Squib harness connector and ground.



Is the resistance below 10K ohms on either circuit?

Yes >> Repair the Passenger Squib 2 Line 1 and/or Passenger Squib 2 Line 2 shorted to ground.
Perform AIRBAG VERIFICATION TEST - VER 1

No >> Go to 4

B1B0C-PASSENGER AIRBAG SQUIB 2 CIRCUIT LOW (CONTINUED)

4. OCCUPANT RESTRAINT CONTROLLER

WARNING: If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1

---

5. STORED ORC DTC

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

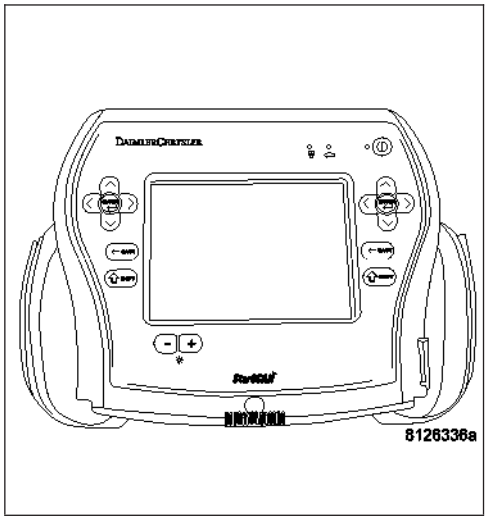
Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.



Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

IF only stored codes return continue the test until the problem area has been isolated.

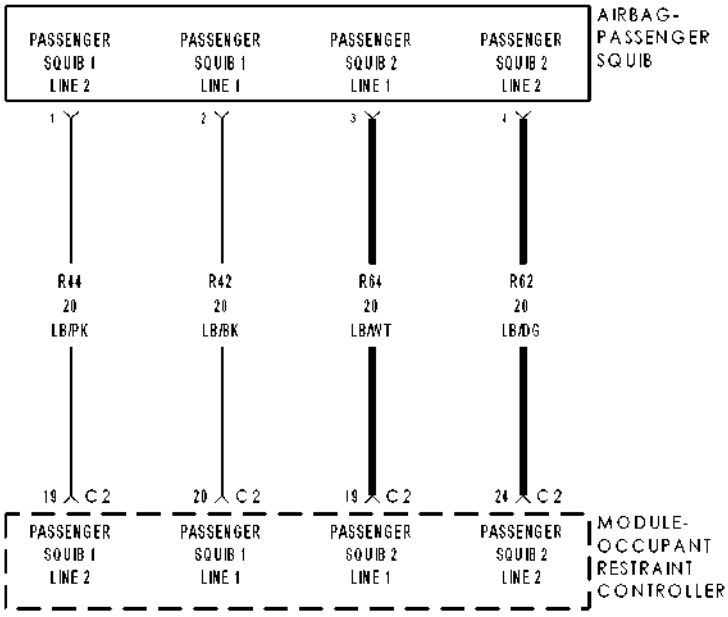
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

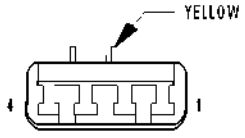
Are any ACTIVE DTCs present?

Yes >> Select appropriate symptom from Symptom List.

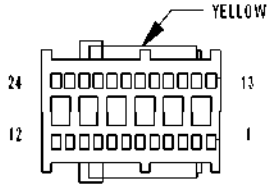
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B0D-PASSENGER AIRBAG SQUIB 2 CIRCUIT HIGH





AIRBAG-PASSENGER SQUIB



MODULE-OCCUPANT RESTRAINT CONTROLLER C2 (SAB)

B1B0D-PASSENGER AIRBAG SQUIB 2 CIRCUIT HIGH (CONTINUED)

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the ORC monitors the resistance of the Passenger Squib 2 circuits.
- **Set Condition:**
  The ORC has detected voltage on the Passenger Squib 2 circuits.

Possible Causes
(R64) PASSENGER SQUIB 2 LINE 1 OR (R62) PASSENGER SQUIB 2 LINE 2 SHORTED TO BATTERY
PASSENGER AIRBAG
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure the battery is fully charged.

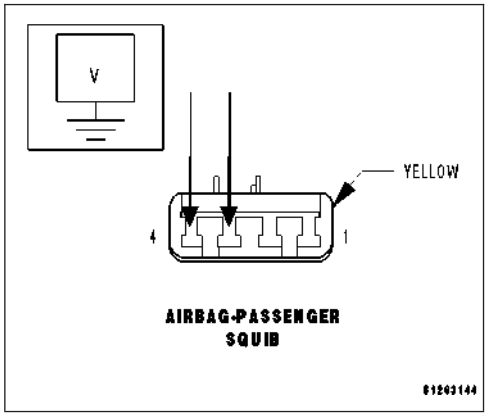
NOTE: The Scan Tool, SRS Airbag Load Tool MRL 8443 and DVOM are required to perform the following test.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.
Select Active or Stored DTC.

Is the DTC active or stored?

ORC - ACTIVE DTC
Go To 2

ORC - STORED DTC
Go To 5



B1B0D-PASSENGER AIRBAG SQUIB 2 CIRCUIT HIGH (CONTINUED)

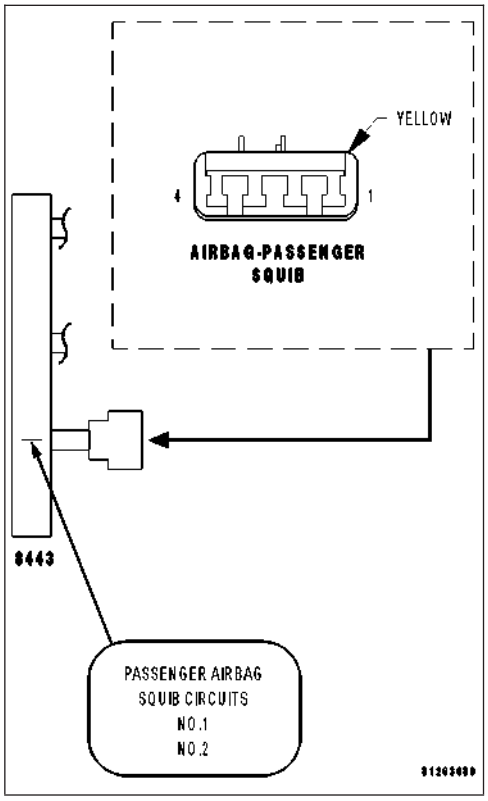
2. PASSENGER AIRBAG SHORTED

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Passenger Airbag Squib connector(s).

WARNING: To avoid personal injury or death, do not place an intact undeployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool and appropriate Jumper to the Passenger Airbag Squib connector(s).

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, read the active Occupant Restraint Controller DTC's.



Does the scan tool display PASSENGER AIRBAG SQUIB 2 CIRCUIT HIGH?

Yes >> Go to 3

No >> Replace the Passenger Airbag in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1

---

3. (R64) PASSENGER SQUIB 2 LINE 1 OR (R62) PASSENGER SQUIB 2 LINE 2

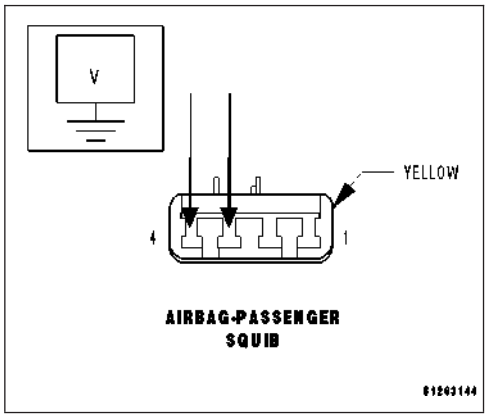
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool and Jumper from the Passenger Airbag Squib harness connector(s).

Disconnect the ORC harness connector(s).

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool ORC Adaptor to the ORC harness connector.

Measure the voltage of the (R64) Passenger Squib 2 Line 1 circuit between the Passenger Airbag Squib harness connector and ground.

Measure the voltage of the (R62) Passenger Squib 2 Line 2 circuit between the Passenger Airbag Squib harness connector and ground.



Is there any voltage on either circuit?

Yes >> Repair the (R64) Passenger Squib 2 Line 1 and/or (R62) Passenger Squib 2 Line 2 shorted to battery.
Perform AIRBAG VERIFICATION TEST - VER 1

No >> Go to 4

B1B0D-PASSENGER AIRBAG SQUIB 2 CIRCUIT HIGH (CONTINUED)

4. OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1

---

5. STORED ORC DTC

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

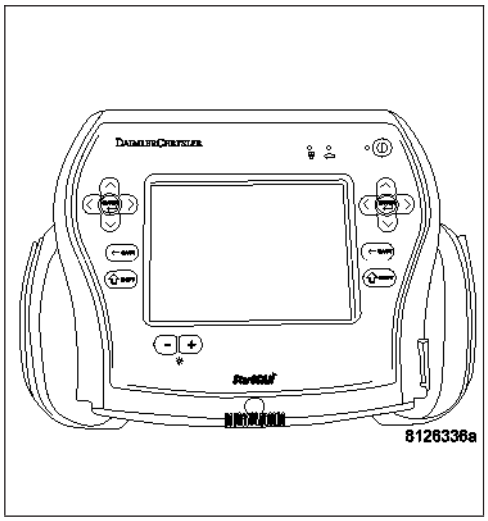
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool monitor active codes as you work through the following steps.



Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

IF only stored codes return continue the test until the problem area has been isolated.

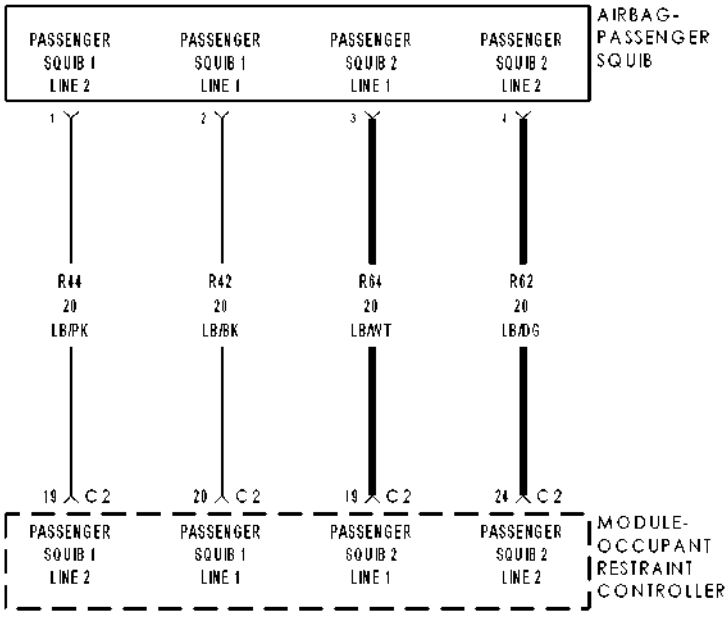
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

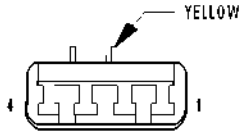
Are any ACTIVE DTCs present?

Yes >> Select appropriate symptom from Symptom List.

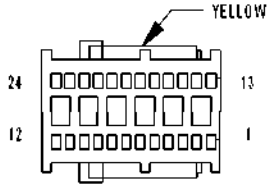
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B0E-PASSENGER AIRBAG SQUIB 2 CIRCUIT OPEN





AIRBAG-PASSENGER SQUIB



MODULE-OCCUPANT RESTRAINT CONTROLLER C2 (SAB)

B1B0E-PASSENGER AIRBAG SQUIB 2 CIRCUIT OPEN (CONTINUED)

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the ORC monitors the resistance of the Passenger Squib 2 circuits.
- **Set Condition:**
  The ORC has detected open circuit or high resistance between the Passenger Squib 2 circuits.

Possible Causes
(R64) PASSENGER SQUIB 2 LINE 1 OR (R62) PASSENGER SQUIB 2 LINE 2
PASSENGER AIRBAG
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure the battery is fully charged.

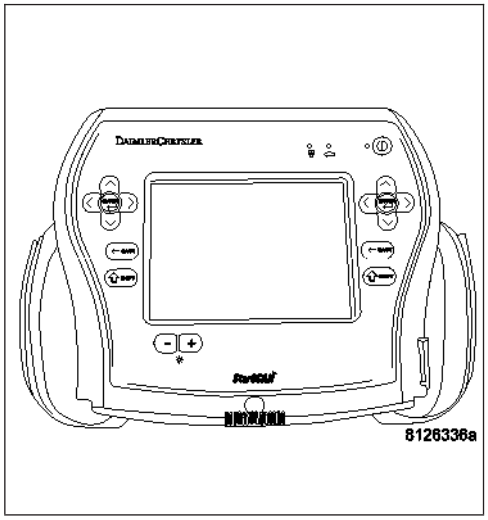
NOTE: The Scan Tool, SRS Airbag Load Tool MRL 8443 and DVOM are required to perform the following test.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.
Select Active or Stored DTC.

Is the DTC active or stored?

ORC - ACTIVE DTC
Go To 2

ORC - STORED DTC
Go To 5



B1B0E-PASSENGER AIRBAG SQUIB 2 CIRCUIT OPEN (CONTINUED)

2. PASSENGER AIRBAG OPEN

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Passenger Airbag Squib harness connector(s).

WARNING: To avoid personal injury or death, do not place an intact undeployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

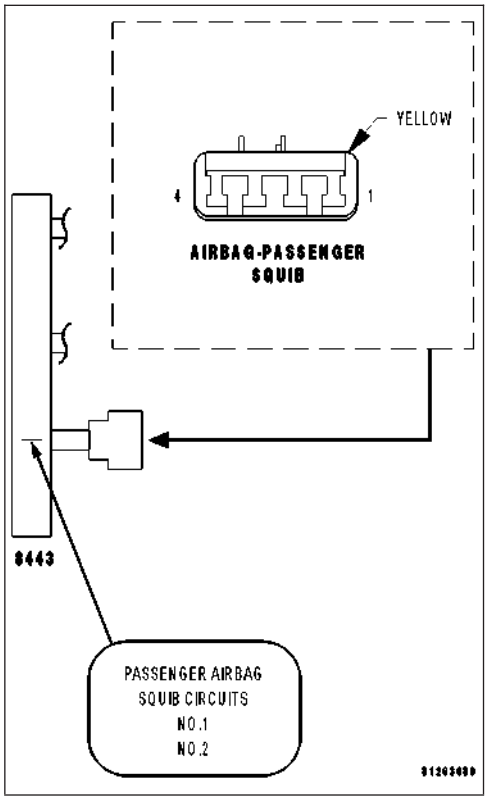
NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool and appropriate Jumper to the Passenger Airbag Squib connector(s).

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, read the active Occupant Restraints Controller DTC's.

Does the scan tool display PASSENGER AIRBAG SQUIB CIRCUIT OPEN?

Yes >> Go to 3

No >> Replace the Passenger Airbag in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1



3. (R64) PASSENGER SQUIB 2 LINE 1 OR (R62) PASSENGER SQUIB 2 LINE 2

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool and Jumper from the Passenger Airbag Squib harness connector(s).

Disconnect the ORC harness connector(s).

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool ORC Adaptor to the ORC harness connector.

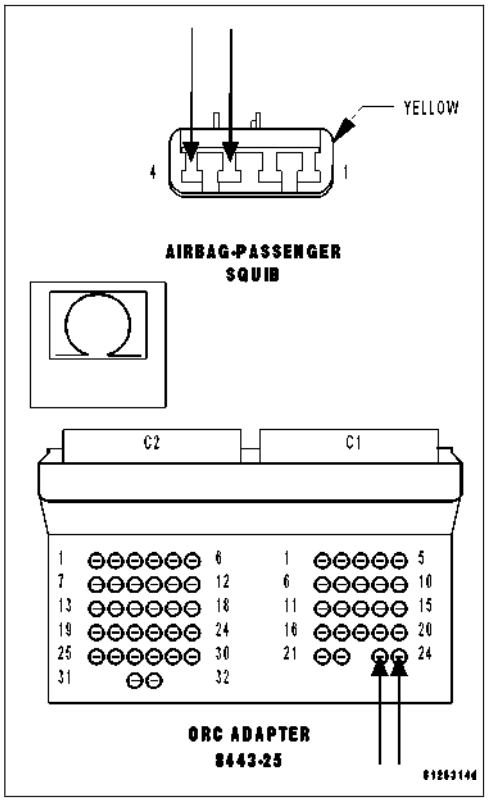
Measure the resistance of the (R64) Passenger Squib 2 Line 1 Passenger Airbag Squib harness connector and the 8443 Load Tool ORC Adaptor.

Measure the resistance of the (R62) Passenger Squib 2 Line 2 circuits between the Passenger Airbag Squib harness connector and the 8443 Load Tool ORC Adaptor.

Is the resistance below 1.0 ohms on both circuits?

Yes >> Go to 4

No >> Repair the open or high resistance of the (R64) Passenger Squib 2 Line 1 and/or (R62) Passenger Squib 2 Line 2.
Perform AIRBAG VERIFICATION TEST - VER 1



B1B0E-PASSENGER AIRBAG SQUIB 2 CIRCUIT OPEN (CONTINUED)

4. OCCUPANT RESTRAINT CONTROLLER

WARNING: If the Airbag Control Module is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1

---

5. STORED ORC DTC

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

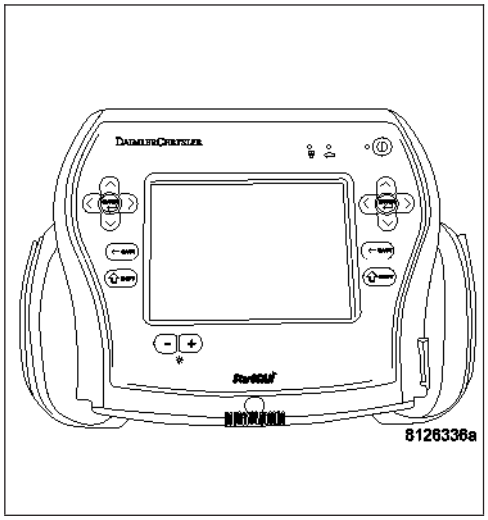
Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.



Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Passenger Airbag circuits, rotate the steering wheel from stop to stop.

IF only stored codes return continue the test until the problem area has been isolated.

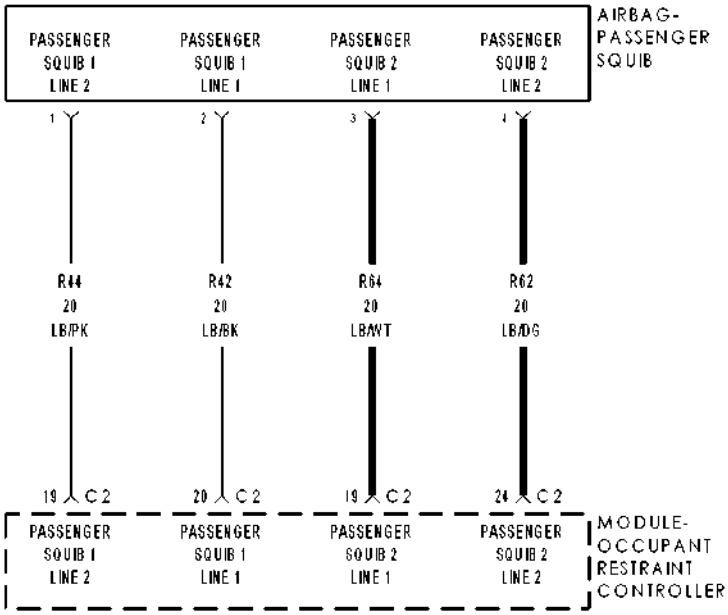
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

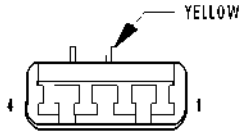
Are any ACTIVE DTCs present?

Yes >> Select appropriate symptom from Symptom List.

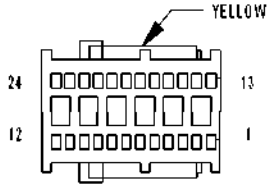
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B0F-PASSENGER AIRBAG SQUIB 2 CIRCUIT SHORT TOGETHER





AIRBAG-PASSENGER SQUIB



MODULE-OCCUPANT RESTRAINT CONTROLLER C2 (SAB)

B1B0F-PASSENGER AIRBAG SQUIB 2 CIRCUIT SHORT TOGETHER (CONTINUED)

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the ORC monitors the resistance of the Passenger Squib 2 circuits.
- **Set Condition:**
  The ORC has detected low resistance between the Passenger Squib 2 circuits.

Possible Causes
(R64) PASSENGER SQUIB 2 LINE 1 OR (R62) PASSENGER SQUIB 2 LINE 2 CIRCUIT OPEN
PASSENGER AIRBAG
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure the battery is fully charged.

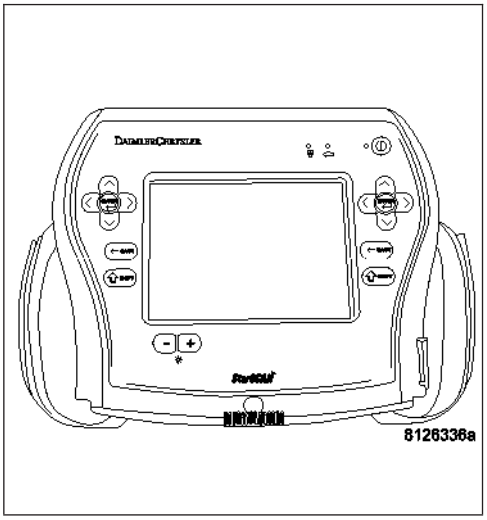
NOTE: The Scan Tool, SRS Airbag Load Tool MRL 8443 and DVOM are required to perform the following test.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.
Select Active or Stored DTC.

Is the DTC active or stored?

ORC - ACTIVE DTC
Go To 2

ORC - STORED DTC
Go To 5



B1B0F-PASSENGER AIRBAG SQUIB 2 CIRCUIT SHORT TOGETHER (CONTINUED)

2. PASSENGER AIRBAG OPEN

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Passenger Airbag Squib connector(s).

WARNING: To avoid personal injury or death, do not place an intact undeployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

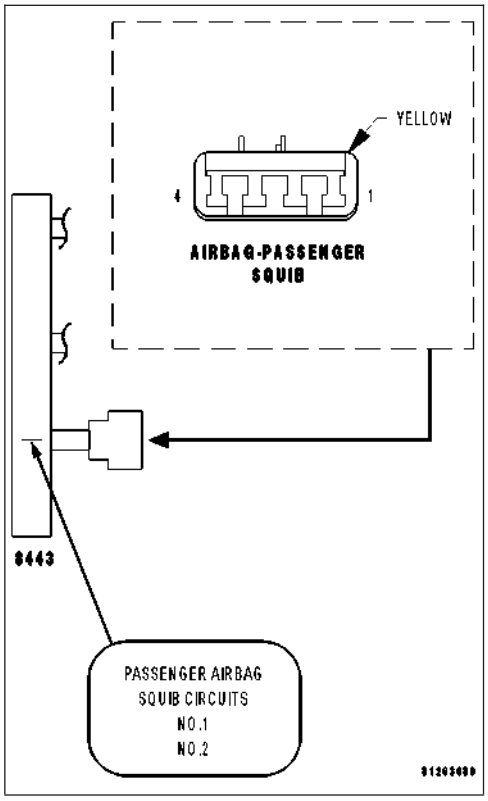
NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool and appropriate Jumper to the Passenger Airbag Squib connector(s).

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery
With the scan tool, read the active Occupant Restraint Controller DTC's.

Does the scan tool display PASSENGER AIRBAG SQUIB 2 CIRCUIT SHORT TOGETHER?

Yes >> Go to 3

No >> Replace the Passenger Airbag in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1

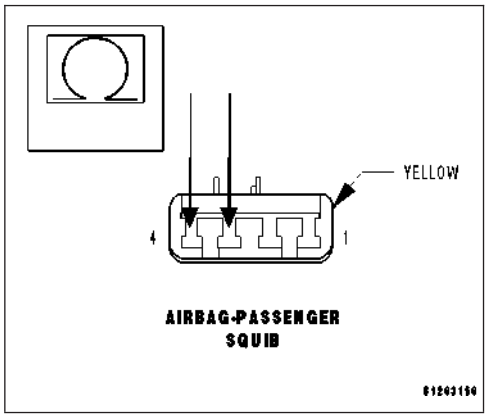


3. (R64) PASSENGER SQUIB 2 LINE 1 OR (R62) PASSENGER SQUIB 2 LINE 2

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool and Jumper from the Passenger Airbag Squib harness connector(s).
Disconnect the ORC harness connector(s).

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool ORC Adaptor to the ORC harness connector.
Measure the resistance between (R64) Passenger Squib 2 Line 1 and (R62) Passenger Squib 2 Line 2 at the Passenger Airbag Squib harness connector(s).

Is the resistance below 10K ohms?



Yes >> Repair (R64) Passenger Squib 2 Line 1 and (R62) Passenger Squib 2 Line 2 shorted together.
Perform AIRBAG VERIFICATION TEST - VER 1

No >> Go to 4

B1B0F-PASSENGER AIRBAG SQUIB 2 CIRCUIT SHORT TOGETHER (CONTINUED)

4. OCCUPANT RESTRAINT CONTROLLER

WARNING: If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1

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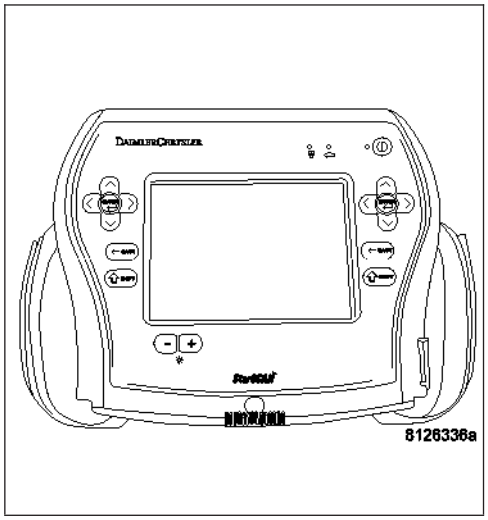
5. STORED ORC DTC

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

IF only stored codes return continue the test until the problem area has been isolated.

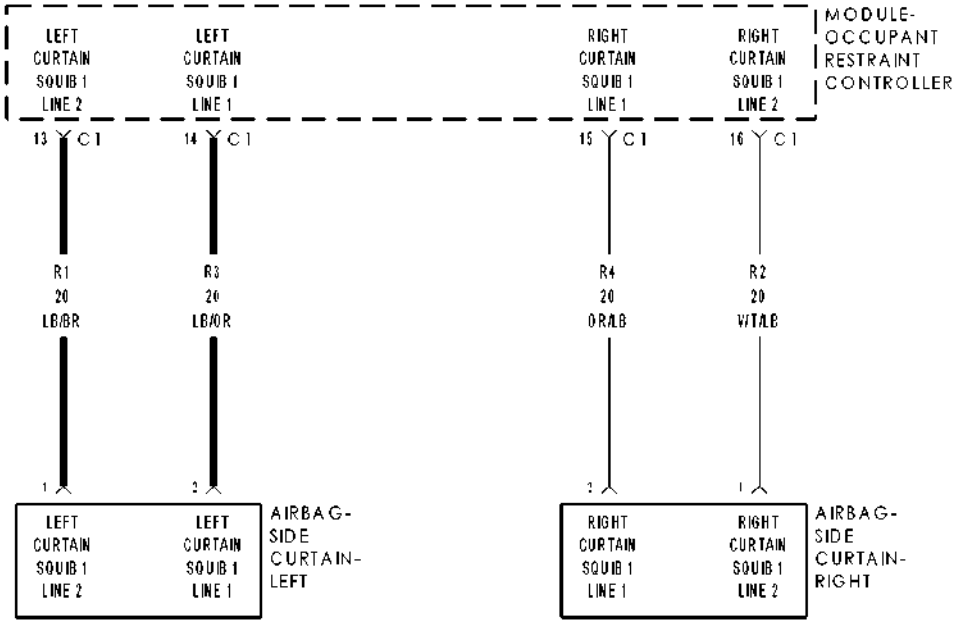
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

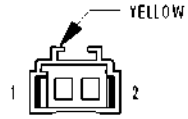
Are any ACTIVE DTCs present?

Yes >> Select appropriate symptom from Symptom List.

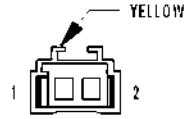
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B18-DRIVER SIDE CURTAIN SQUIB 1 CIRCUIT LOW

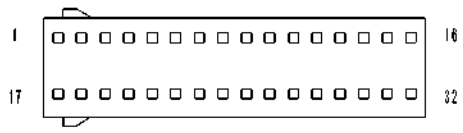




AIRBAG-SIDE CURTAIN-LEFT



AIRBAG-SIDE CURTAIN-RIGHT



MODULE-OCCUPANT RESTRAINT CONTROLLER C1

8126d69b

B1B18-DRIVER SIDE CURTAIN SQUIB 1 CIRCUIT LOW (CONTINUED)

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the ORC monitors the resistance of the Left Side Curtain Squib 1 circuits.
- **Set Condition:**
  The ORC has detected low resistance of the Left Side Curtain Squib 1 circuits.

Possible Causes
(R2) LEFT CURTAIN SQUIB 1 LINE 1 OR (R1) LEFT CURTAIN SQUIB 1 LINE 2 SHORTED TO GROUND
LEFT SIDE CURTAIN AIRBAG
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure the battery is fully charged.

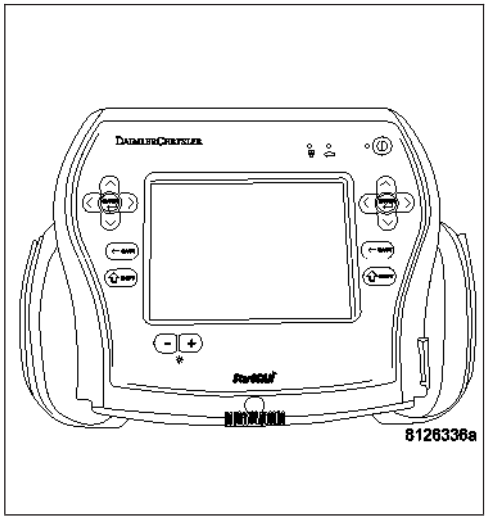
NOTE: The Scan Tool, SRS Airbag Load Tool MRL 8443 and DVOM are required to perform the following test.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.
Select Active or Stored DTC.

Is the DTC active or stored?

ORC - ACTIVE DTC
Go To 2

ORC - STORED DTC
Go To 5



B1B18-DRIVER SIDE CURTAIN SQUIB 1 CIRCUIT LOW (CONTINUED)

2. PASSENGER AIRBAG SHORTED TO GROUND

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Left Side Curtain harness connector(s).

WARNING: To avoid personal injury or death, do not place an intact undeployed curtain airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

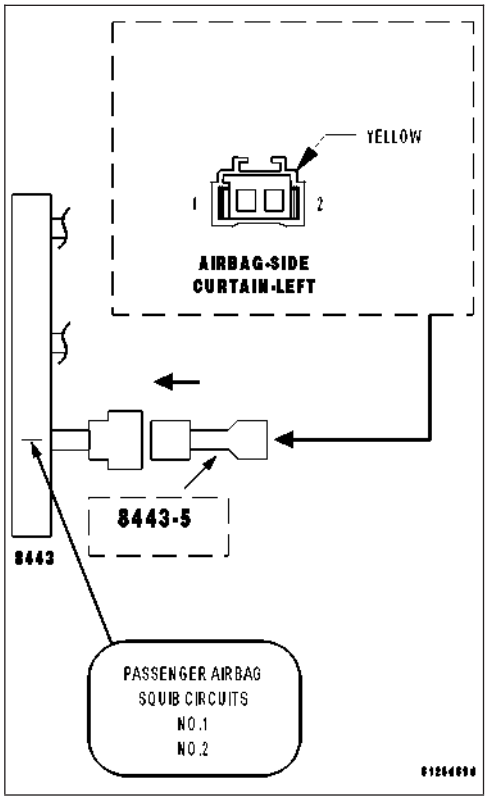
NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool and appropriate Jumper to the Left Side Curtain Airbag harness connector(s).

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, read the active Occupant Restraint Controller DTC's.

Does the scan tool display DRIVER SIDE CURTAIN SQUIB 1 CIRCUIT LOW?

Yes >> Go To 3

No >> Replace the Left Side Curtain Airbag in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1



3. (R3) LEFT CURTAIN SQUIB 1 LINE 1 OR (R1) LEFT CURTAIN SQUIB 1 LINE 2 SHORTED TO GROUND

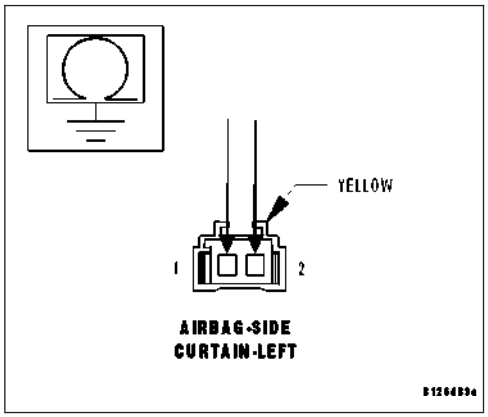
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool and Jumper from the Left Side Curtain Airbag harness connector.

Disconnect the ORC harness connector(s).

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool ORC Adaptor to the ORC harness connector.

Measure the resistance of the (R3) Left Curtain Squib 1 Line 1 circuit between the Left Side Curtain Airbag Connector and ground.

Measure the resistance of the (R1) Left Curtain Squib 1 Line 2 circuit between the Left Side Curtain Airbag Connector and ground.



Is the resistance below 10K ohms on either circuit?

Yes >> Repair (R3) Left Curtain Squib 1 Line 1 and/or (R1) Left Curtain Squib 1 Line 2 shorted to ground.
Perform AIRBAG VERIFICATION TEST - VER 1

No >> Go to 4

B1B18-DRIVER SIDE CURTAIN SQUIB 1 CIRCUIT LOW (CONTINUED)

4. OCCUPANT RESTRAINT CONTROLLER

WARNING: If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1

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5. STORED ORC DTC

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

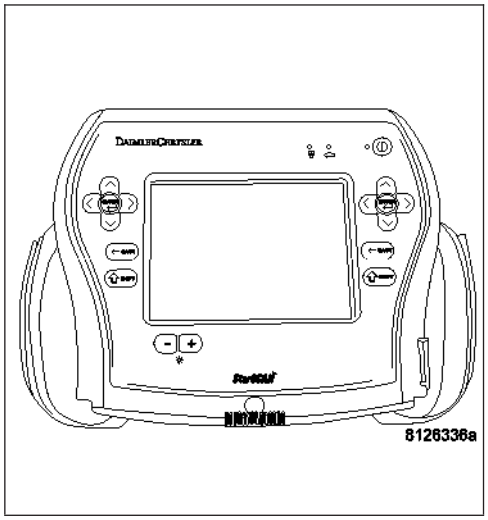
Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.



Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

IF only stored codes return continue the test until the problem area has been isolated.

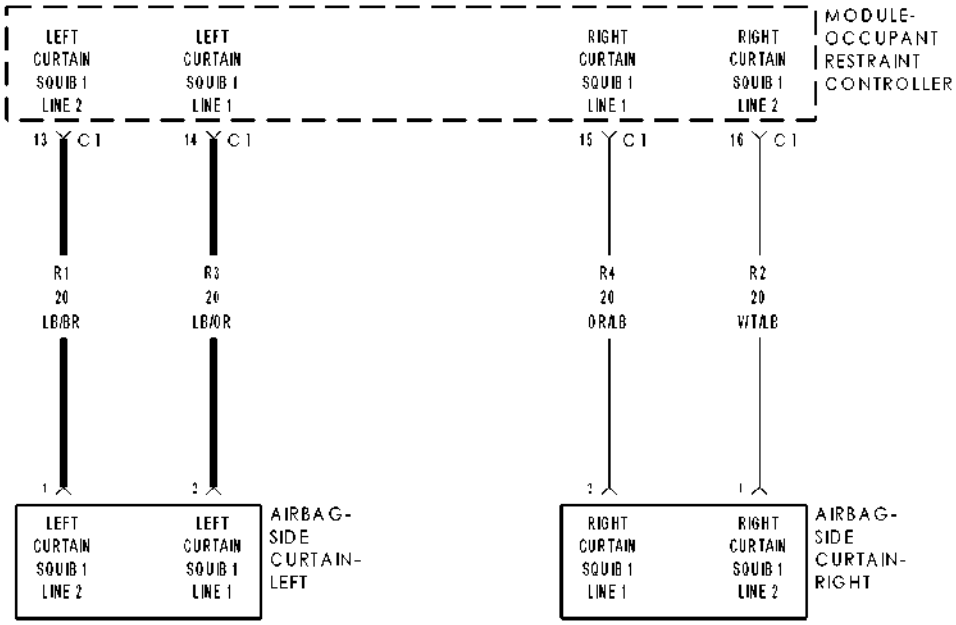
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

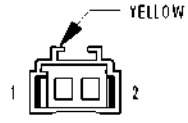
Are any ACTIVE DTC's present?

Yes >> Select appropriate symptom from Symptom List.

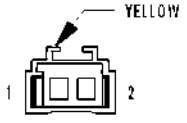
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B19-DRIVER SIDE CURTAIN SQUIB 1 CIRCUIT HIGH

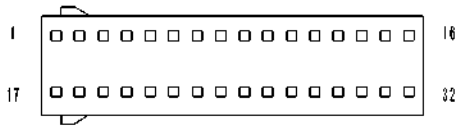




AIRBAG-SIDE CURTAIN-LEFT



AIRBAG-SIDE CURTAIN-RIGHT



MODULE-OCCUPANT RESTRAINT CONTROLLER C1

81b6d69b

B1B19-DRIVER SIDE CURTAIN SQUIB 1 CIRCUIT HIGH (CONTINUED)

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the ORC monitors the voltage on the Left Curtain Squib 1 circuits.
- **Set Condition:**
  The ORC detects high voltage on the Left Curtain Squib 1 circuits.

Possible Causes
(R3) LEFT CURTAIN 1 LINE 1 OR (R1) LEFT CURTAIN SQUIB 1 LINE 2 SHORTED TO BATTERY
LEFT SIDE CURTAIN AIRBAG
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure the battery is fully charged.

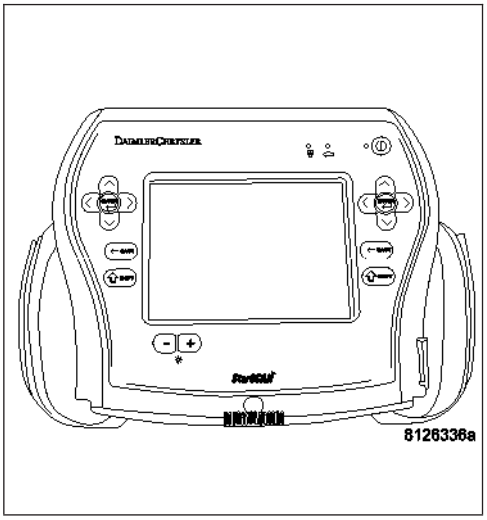
NOTE: The Scan Tool, SRS Airbag Load Tool MRL 8443 and DVOM are required to perform the following test.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.
Select Active or Stored DTC.

Is the DTC active or stored?

ORC - ACTIVE DTC
Go To 2

ORC - STORED DTC
Go To 5



B1B19-DRIVER SIDE CURTAIN SQUIB 1 CIRCUIT HIGH (CONTINUED)

2. PASSENGER AIRBAG SHORTED TO BATTERY

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Passenger Airbag connector(s).

WARNING: To avoid personal injury or death, do not place an intact undeployed curtain airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

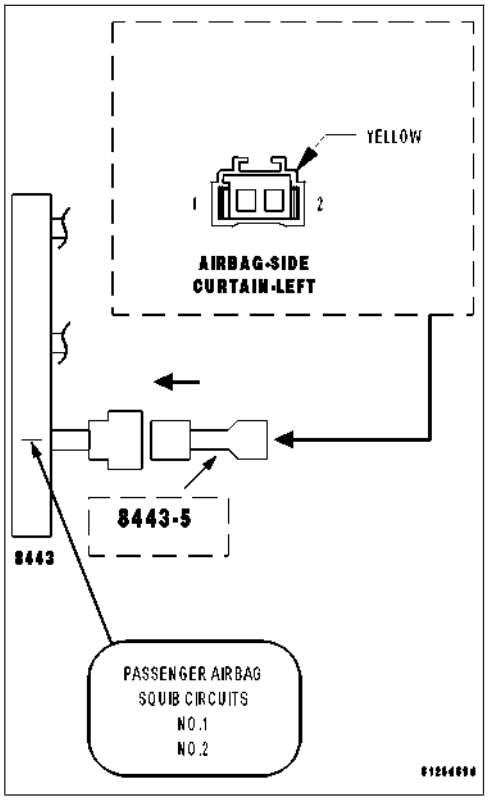
NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool and appropriate Jumper to the Left Side Curtain Airbag harness connector(s).

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, read the active Occupant Restraint Controller DTC's.

Does the scan tool display DRIVER SIDE CURTAIN SQUIB 1 CIRCUIT HIGH?

Yes >> Go To 3

No >> Replace the Left Side Curtain Airbag in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1



3. (R3) LEFT CURTAIN SQUIB 1 LINE 1 AND/OR (R1) LEFT CURTAIN SQUIB 1 LINE 2SHORTED TO BATTERY.

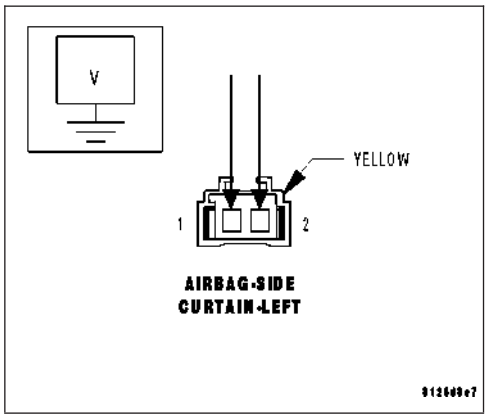
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool and Jumper from the Left Side Curtain Airbag harness connector.

Disconnect the ORC harness connector(s).

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool ORC Adaptor to the ORC harness connector.

Measure the voltage on the (R3) Left Curtain Squib 1 Line 1 circuit between the Left Side Curtain Airbag harness connector and ground.

Measure the voltage on the (R1) Left Curtain Squib 1 Line 2 circuit between the Left Side Curtain Airbag harness connector and ground.



Is there any voltage on either circuit?

Yes >> Repair (R3) Left Curtain Squib 1 Line 1 and/or (R1) Left Side Curtain Squib 1 Line 2 shorted to battery.
Perform AIRBAG VERIFICATION TEST - VER 1

No >> Go to 4

B1B19-DRIVER SIDE CURTAIN SQUIB 1 CIRCUIT HIGH (CONTINUED)

4. OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1

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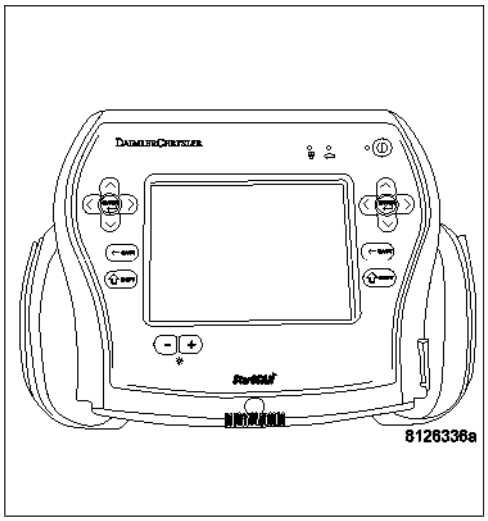
5. STORED ORC DTC

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.



WARNING: To avoid personal injury or death, turn the ignition off then disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

IF only stored codes return continue the test until the problem area has been isolated.

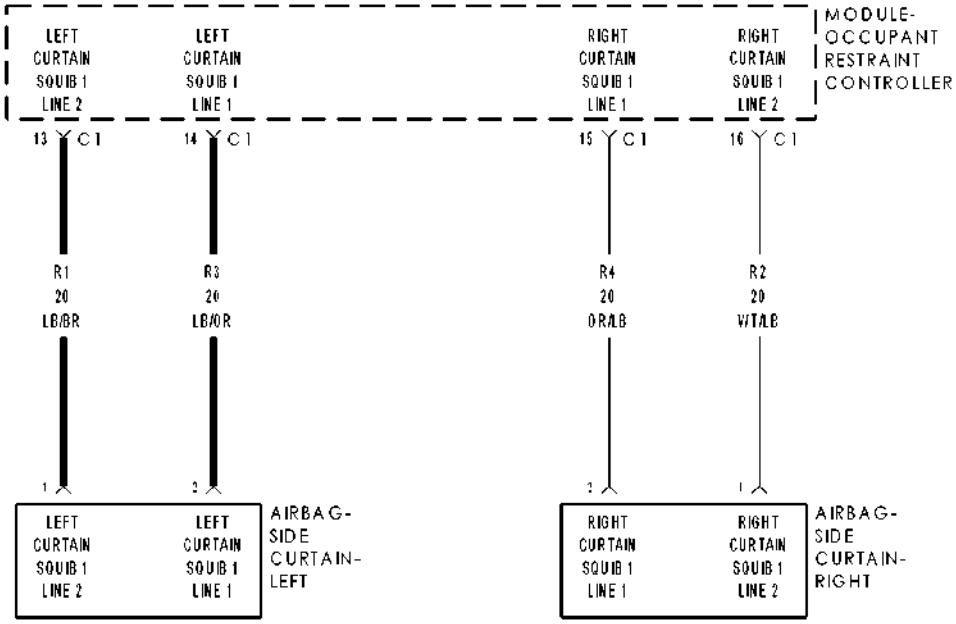
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

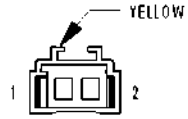
Are any ACTIVE DTCs present?

Yes >> Select appropriate symptom from Symptom List.

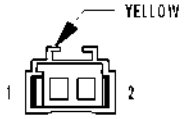
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B1A-DRIVER SIDE CURTAIN SQUIB 1 CIRCUIT OPEN

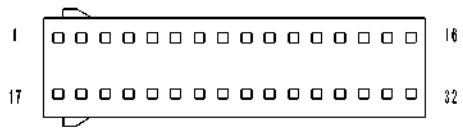




AIRBAG-SIDE CURTAIN-LEFT



AIRBAG-SIDE CURTAIN-RIGHT



MODULE-OCCUPANT RESTRAINT CONTROLLER C1

8126d69b

B1B1A-DRIVER SIDE CURTAIN SQUIB 1 CIRCUIT OPEN (CONTINUED)

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the ORC monitors the resistance of the Left Curtain Squib 1 circuits.
- **Set Condition:**
  The ORC has detected open circuit or high resistance in the Left Curtain Squib 1 circuits.

Possible Causes
(R3) LEFT CURTAIN SQUIB 1 LINE 1 OR (R1) LEFT CURTAIN SQUIB 1 LINE 1LINE 2 CIRCUIT OPEN
LEFT SIDE CURTAIN AIRBAG
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure the battery is fully charged.

NOTE: The Scan Tool and SRS Airbag Load Tool MRL 8443 are required to perform the following test.

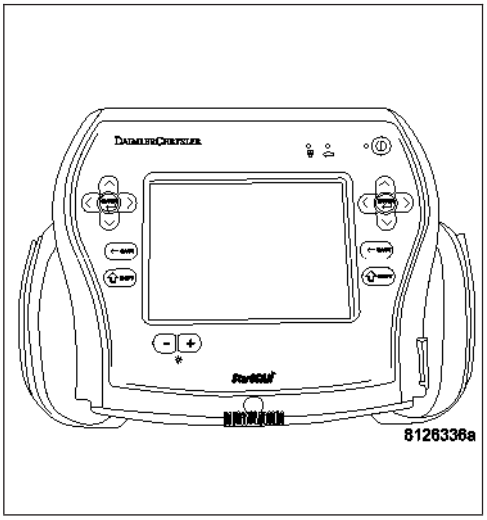
NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

Select Active or Stored DTC.

Is the DTC active or stored?

ORC - ACTIVE DTC
Go To 2

ORC - STORED DTC
Go To 5



B1B1A-DRIVER SIDE CURTAIN SQUIB 1 CIRCUIT OPEN (CONTINUED)

2. PASSENGER AIRBAG OPEN

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Left Side Curtain Airbag connector(s).

WARNING: To avoid personal injury or death, do not place an intact undeployed curtain airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

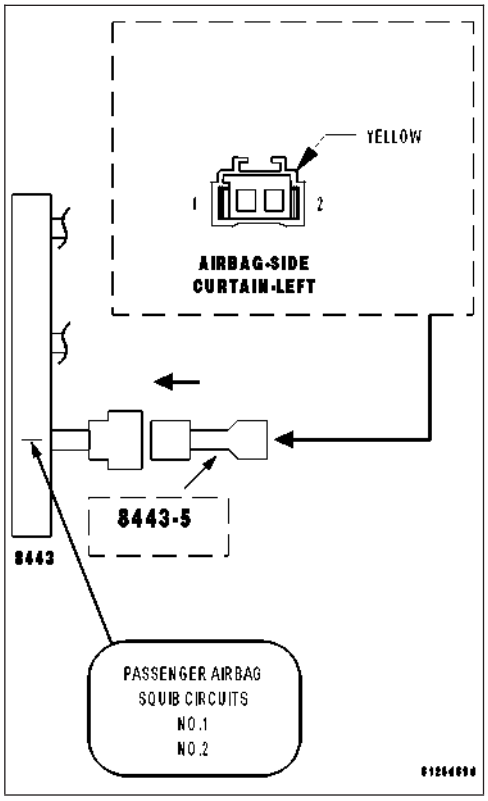
NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool and appropriate Jumper to the Left Side Curtain Airbag connector(s).

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, read the active Occupant Restraint Controller DTC's.

Does the scan tool display DRIVER SIDE CURTAIN SQUIB 1 CIRCUIT OPEN?

Yes >> Go to 3

No >> Replace the Left Side Curtain Airbag in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1



3. (R3) LEFT CURTAIN SQUIB 1 LINE 1 OR (R1) LEFT CURTAIN SQUIB 1 LINE 2 CIRCUIT OPEN

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool and Jumper from the Left Side Curtain Airbag harness connector(s).

Disconnect the ORC harness connector(s).

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool ORC Adaptor to the ORC harness connector.

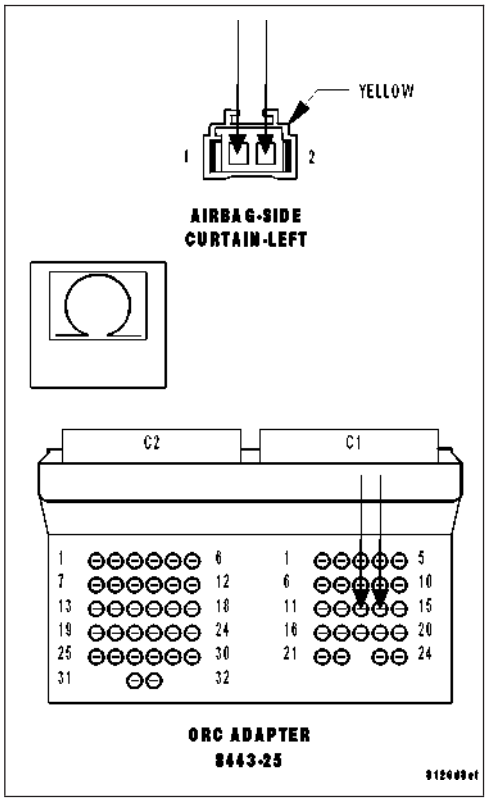
Measure the resistance of the (R3) Left Curtain Squib 1 Line 1 between the Left Side Curtain Airbag harness connector and the ORC Adaptor.

Measure the resistance of the (R1) Left Curtain Squib 1 Line 2 between the Left Side Curtain Airbag harness connector and the ORC Adaptor

Is the resistance below 1.0 ohm?

Yes >> Go to 4

No >> Repair open or high resistance in (R3) Left Curtain Squib 1 Line 1 and/or (R1) Left Curtain Squib 1 Line 2.
Perform AIRBAG VERIFICATION TEST - VER 1



B1B1A-DRIVER SIDE CURTAIN SQUIB 1 CIRCUIT OPEN (CONTINUED)

4. OCCUPANT RESTRAINT CONTROLLER

WARNING: If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1

---

5. STORED ORC DTC

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

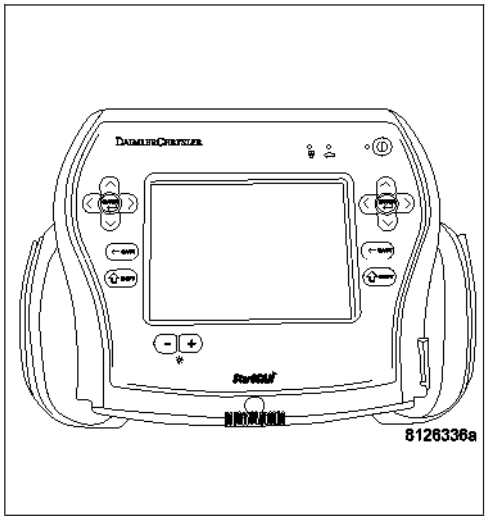
Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.



Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

IF only stored codes return continue the test until the problem area has been isolated.

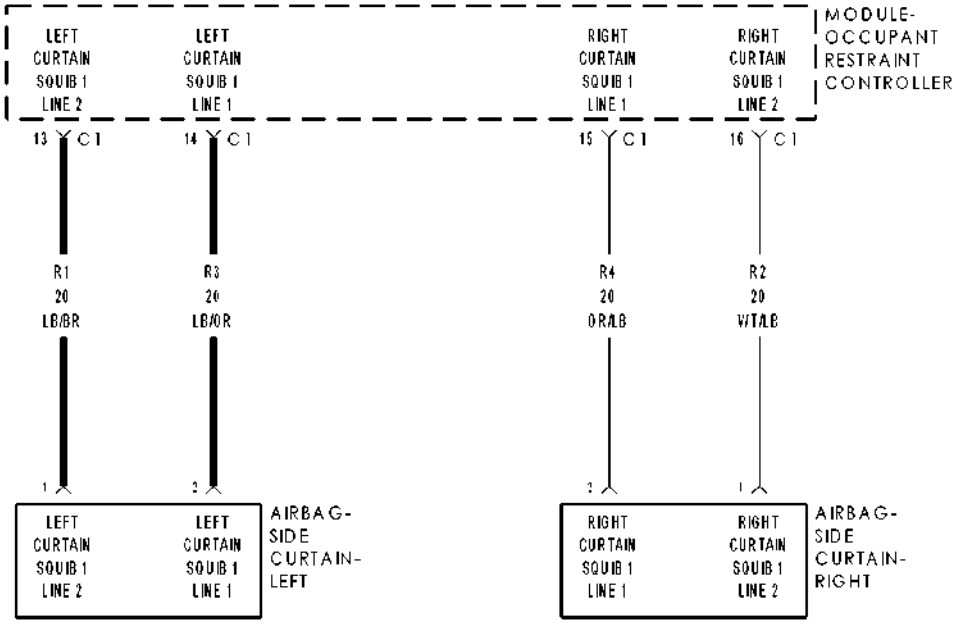
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

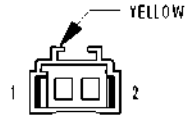
Are any ACTIVE DTCs present?

Yes >> Select appropriate symptom from Symptom List.

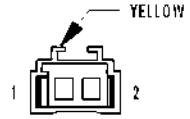
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B0B-PASSENGER AIRBAG SQUIB 1 CIRCUIT SHORT TOGETHER

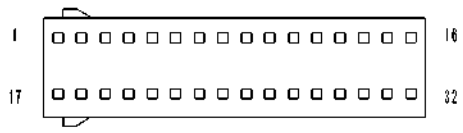




AIRBAG-SIDE CURTAIN-LEFT



AIRBAG-SIDE CURTAIN-RIGHT



MODULE-OCCUPANT RESTRAINT CONTROLLER C1

8126d69b

B1B0B-PASSENGER AIRBAG SQUIB 1 CIRCUIT SHORT TOGETHER (CONTINUED)

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the ORC monitors the resistance of the Left Curtain Squib 1 circuits.
- **Set Condition:**
  The ORC has detected low resistance between the Left Curtain Squib 1 circuits.

Possible Causes
(R3) LEFT CURTAIN SQUIB 1 LINE 1 SHORTED TO (R1) LEFT CURTAIN SQUIB 1 LINE 2
LEFT SIDE CURTAIN AIRBAG
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure the battery is fully charged.

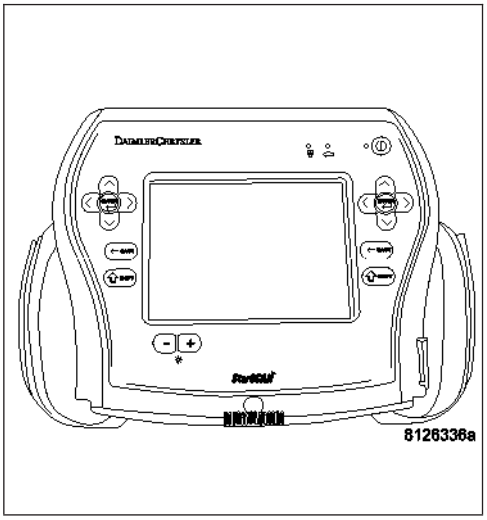
NOTE: The Scan Tool, SRS Airbag Load Tool MRL 8443 and DVOM are required to perform the following test.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.
Select Active or Stored DTC.

Is the DTC active or stored?

ORC - ACTIVE DTC
Go To 2

ORC - STORED DTC
Go To 5



B1B0B-PASSENGER AIRBAG SQUIB 1 CIRCUIT SHORT TOGETHER (CONTINUED)

2. LEFT SIDE CURTAIN AIRBAG SHORTED

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Left Side Curtain Airbag connector(s).

WARNING: To avoid personal injury or death, do not place an intact undeployed curtain airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

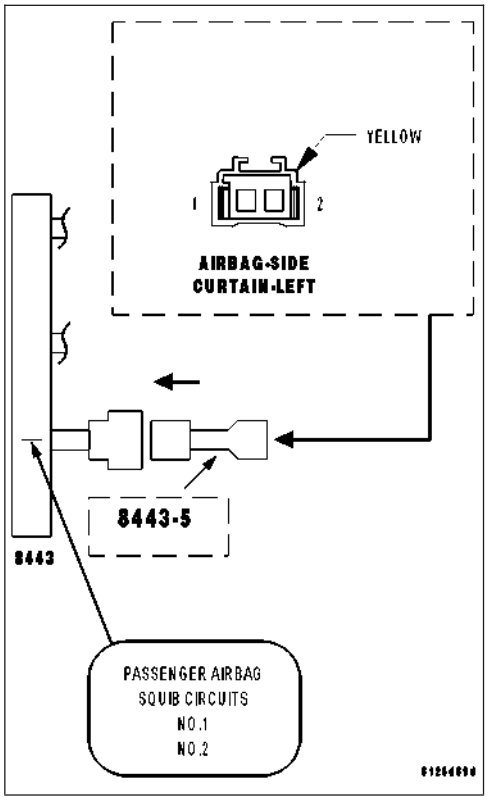
NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool and appropriate Jumper to the Left Side Curtain Airbag connector(s).

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, read the active Occupant Restraint Controller DTC's.

Does the scan tool display DRIVER SIDE CURTAIN AIRBAG SQUIB 1 CIRCUIT SHORT TOGETHER?

Yes >> Go to 33

No >> Replace the Left Side Curtain Airbag in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1



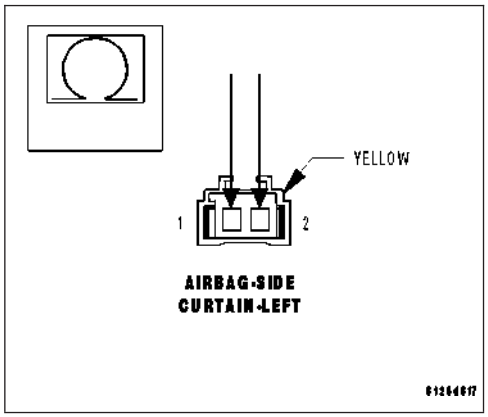
3. (R3) LEFT CURTAIN SQUIB 1 LINE 1 SHORTED TO (R1) LEFT CURTAIN SQUIB 1 LINE 2

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool and Jumper from the Left Side Curtain Airbag connector(s).

Disconnect the ORC harness connector(s).

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool ORC Adaptor to the ORC harness connector.

Measure the resistance between the (R3) Left Curtain Squib 1 Line 1 and (R1) Left Curtain Squib 1 Line 2 at the Left Side Curtain Airbag harness connector.



Is the resistance below 10K ohms?

Yes >> Repair the (R3) Left Curtain Squib 1 Line 1 shorted to the (R2) Left Curtain Squib 1 Line 2 circuit.
Perform AIRBAG VERIFICATION TEST - VER 1

No >> Go to 4

B1B0B-PASSENGER AIRBAG SQUIB 1 CIRCUIT SHORT TOGETHER (CONTINUED)

4. OCCUPANT RESTRAINT CONTROLLER

WARNING: If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1

---

5. STORED ORC DTC

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

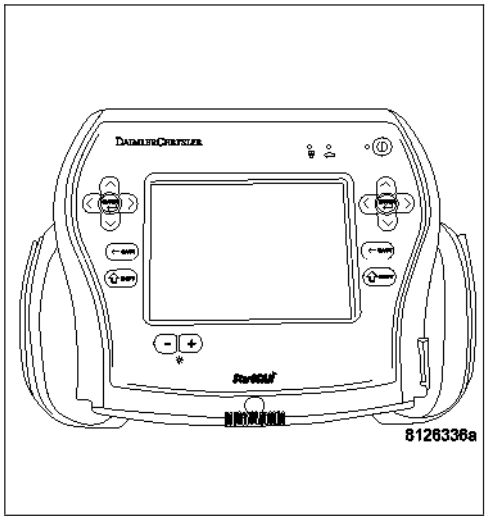
Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.



Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

IF only stored codes return continue the test until the problem area has been isolated.

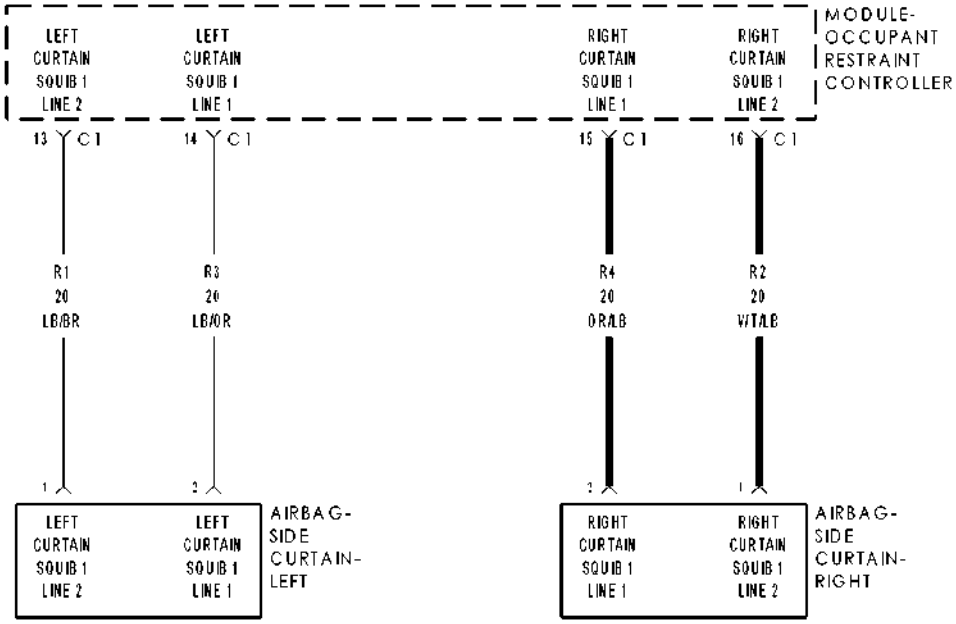
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

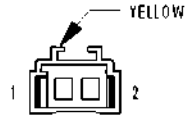
Are any ACTIVE DTC's present?

Yes >> Select appropriate symptom from Symptom List.

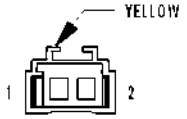
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B20-PASSENGER SIDE CURTAIN SQUIB 1 CIRCUIT LOW

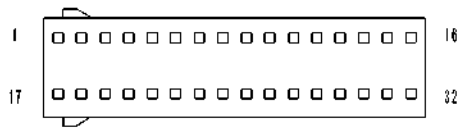




AIRBAG-SIDE CURTAIN-LEFT



AIRBAG-SIDE CURTAIN-RIGHT



MODULE-OCCUPANT RESTRAINT CONTROLLER C1

B1B20-PASSENGER SIDE CURTAIN SQUIB 1 CIRCUIT LOW (CONTINUED)

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the ORC monitors the resistance of the Right Curtain Squib 1 circuits.
- **Set Condition:**
  The ORC has detected low resistance of the Right Curtain Squib 1 circuits.

Possible Causes
(R4) RIGHT CURTAIN SQUIB 1 LINE 1 OR (R2) RIGHT CURTAIN SQUIB 1 LINE 2 SHORTED TO GROUND
RIGHT SIDE CURTAIN AIRBAG
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure the battery is fully charged.

NOTE: The Scan Tool, SRS Airbag Load Tool MRL 8443 and DVOM are required to perform the following test.

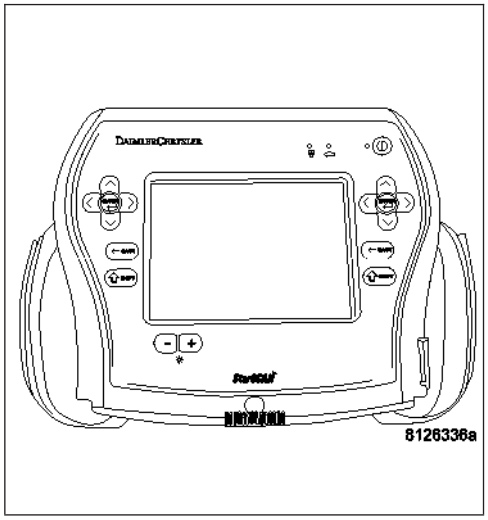
NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

Select Active or Stored DTC.

Is the DTC active or stored?

ORC - ACTIVE DTC
Go To 2

ORC - STORED DTC
Go To 5



B1B20-PASSENGER SIDE CURTAIN SQUIB 1 CIRCUIT LOW (CONTINUED)

2. RIGHT SIDE CURTAIN AIRBAG SHORTED TO GROUND

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Right Side Curtain Airbag connector(s).

WARNING: To avoid personal injury or death, do not place an intact undeployed curtain airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

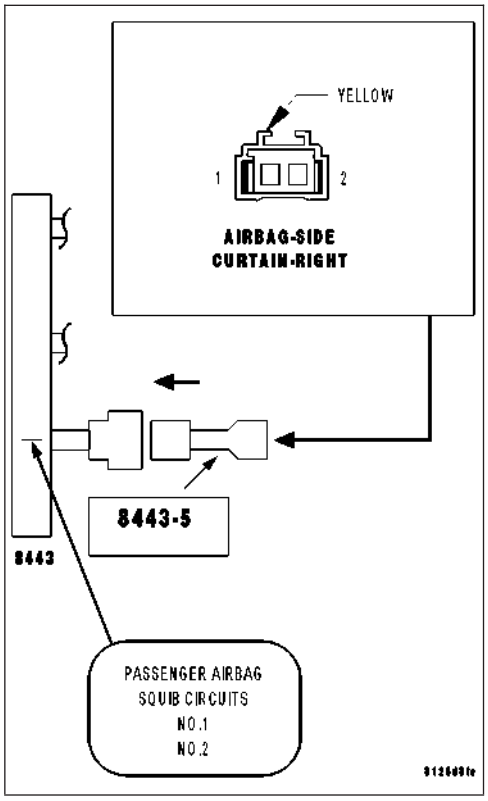
NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool and appropriate Jumper to the Right Side Curtain Airbag connector(s).

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, read the active Occupant restraint Controller DTC's.

Does the scan tool display PASSENGER SIDE CURTAIN SQUIB 1 CIRCUIT LOW?

Yes >> Go To 3

No >> Replace the Right Side Curtain Airbag in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1



3. (R4) RIGHT CURTAIN SQUIB LINE 1 OR (R2) RIGHT CURTAIN SQUIB 1 LINE 2 SHORTED TO GROUND

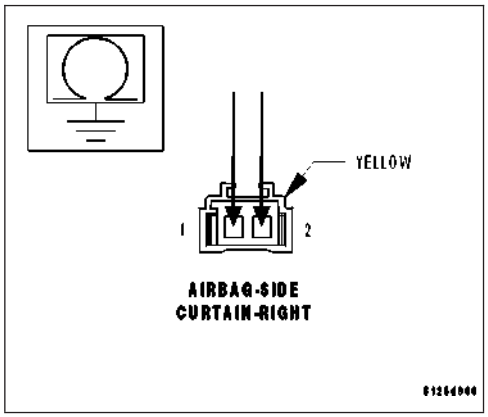
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool and Jumper from the Right Side Curtain Airbag harness connector.

Disconnect the ORC harness connector(s).

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool ORC Adaptor to the ORC harness connector.

Measure the resistance of the (R4) Right Curtain Squib 1 Line 1 circuit between the Right Side Curtain Airbag Connector and ground.

Measure the resistance of the (R2) Right Curtain Squib 1 Line 2 circuit between the Right Side Curtain Airbag Connector and ground.



Is the resistance below 10K ohms on either circuit?

Yes >> Repair (R4) Right Curtain Squib 1 Line 1 or (R2) Right Curtain Squib 1 Line 2 shorted to ground.
Perform AIRBAG VERIFICATION TEST - VER 1

No >> Go to 4

B1B20-PASSENGER SIDE CURTAIN SQUIB 1 CIRCUIT LOW (CONTINUED)

4. OCCUPANT RESTRAINT CONTROLLER

WARNING: If the Occupant Restraints Controller is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1

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5. STORED ORC DTC

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

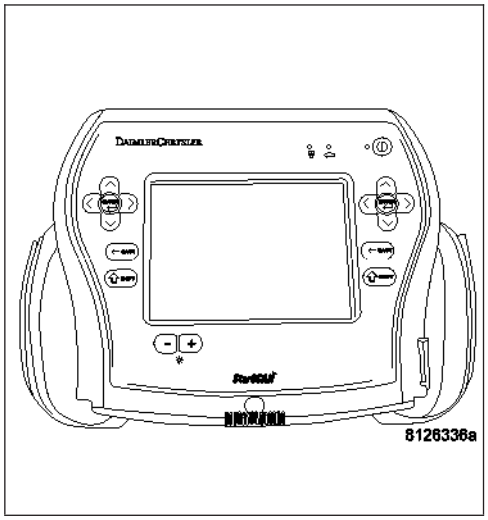
Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.



Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

IF only stored codes return continue the test until the problem area has been isolated.

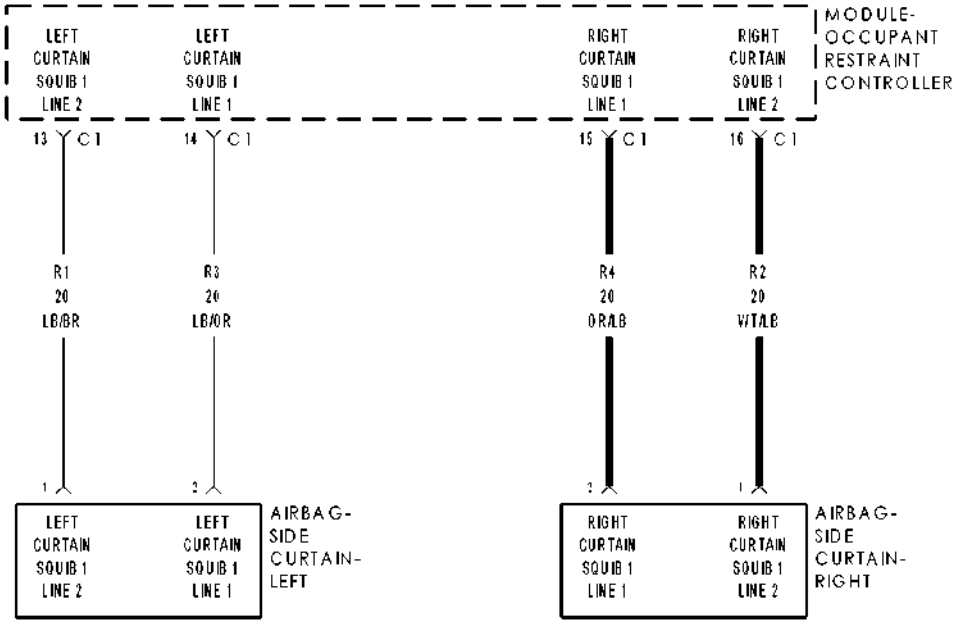
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

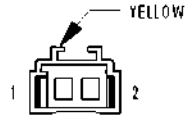
Are any ACTIVE DTC's present?

Yes >> Select appropriate symptom from Symptom List.

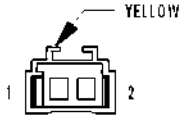
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B21-PASSENGER SIDE CURTAIN AIRBAG SQUIB 1 CIRCUIT HIGH

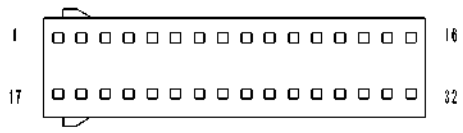




AIRBAG-SIDE CURTAIN-LEFT



AIRBAG-SIDE CURTAIN-RIGHT



MODULE-OCCUPANT RESTRAINT CONTROLLER C1

B1B21-PASSENGER SIDE CURTAIN AIRBAG SQUIB 1 CIRCUIT HIGH (CONTINUED)

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the ORC monitors the voltage on the Right Curtain Squib 1 circuits.
- **Set Condition:**
  When the ORC detects voltage on the Right Curtain Squib 1 circuits.

Possible Causes
(R4) RIGHT CURTAIN 1 LINE 1 OR (R2) RIGHT CURTAIN SQUIB 1 LINE 2 SHORTED TO BATTERY
RIGHT SIDE CURTAIN AIRBAG
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure the battery is fully charged.

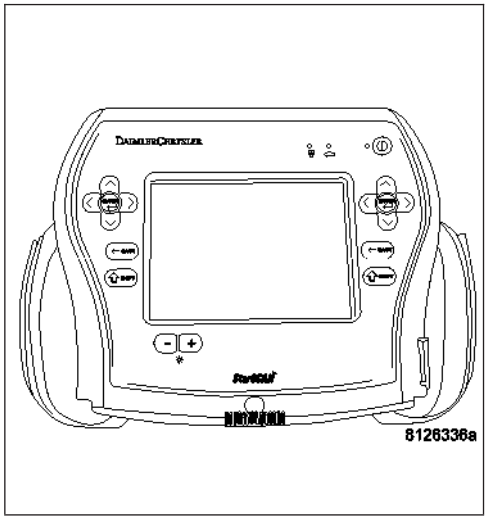
NOTE: The Scan Tool, SRS Airbag Load Tool MRL 8443 and DVOM are required to perform the following test.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.
Select Active or Stored DTC.

Is the DTC active or stored?

ORC - ACTIVE DTC
Go To 2

ORC - STORED DTC
Go To 5



B1B21-PASSENGER SIDE CURTAIN AIRBAG SQUIB 1 CIRCUIT HIGH (CONTINUED)

2. RIGHT SIDE CURTAIN AIRBAG SHORTED TO BATTERY

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Right Side Curtain Airbag connector(s).

WARNING: To avoid personal injury or death, do not place an intact uncoupled curtain airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

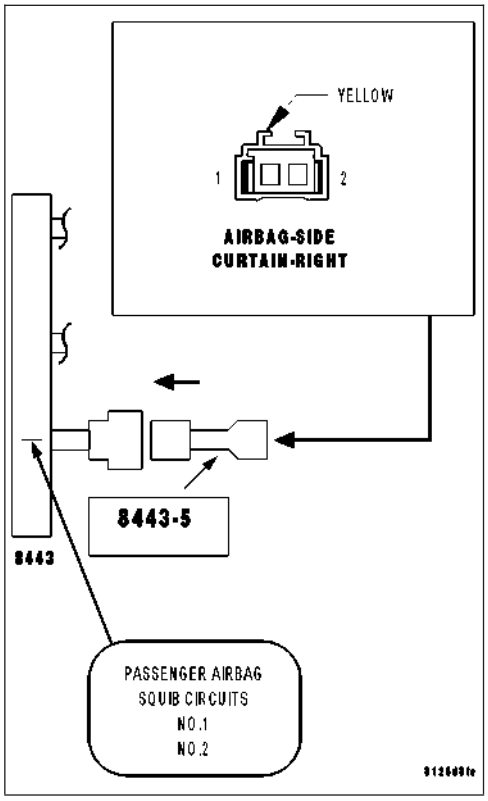
NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool and appropriate Jumper to the Right Side Curtain Airbag connector(s).

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, read the active Occupant Restraint Controller DTC's.

Does the scan tool display PASSENGER SIDE CURTAIN SQUIB 1 CIRCUIT HIGH?

Yes >> Go To 3

No >> Replace the Right Side Curtain Airbag in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1



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3. (R4) RIGHT CURTAIN SQUIB 1 LINE 1 AND/OR (R2) RIGHT CURTAIN SQUIB 1 LINE 2 SHORTED TO BATTERY.

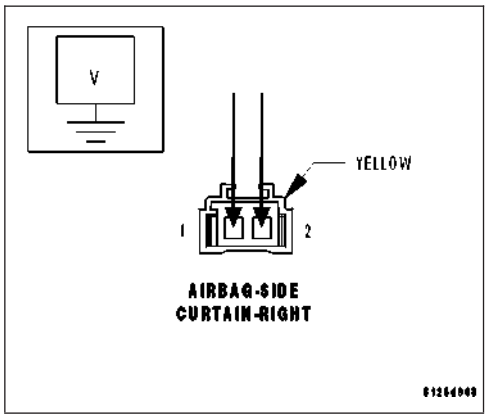
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool and Jumper from the Right Side Curtain Airbag harness connector.

Disconnect the ORC harness connector(s).

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool ORC Adaptor to the ORC harness connector.

Measure the voltage on the (R4) Right Curtain Squib 1 Line 1 circuit between the Right Side Curtain Airbag harness connector and ground.

Measure the voltage on the (R2) Right Curtain Squib 1 Line 2 circuits between the Right Side Curtain Airbag harness connector and ground.



Is there any voltage on either circuit?

Yes >> Repair (R4) Right Curtain Squib 1 Line 1 and/or (R2) Right Curtain Squib 1 Line 2 shorted to battery. Perform AIRBAG VERIFICATION TEST - VER 1

No >> Go to 4

B1B21-PASSENGER SIDE CURTAIN AIRBAG SQUIB 1 CIRCUIT HIGH (CONTINUED)

4. OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the Airbag Control Module is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

If there are no possible causes remaining, view repair.

Repair

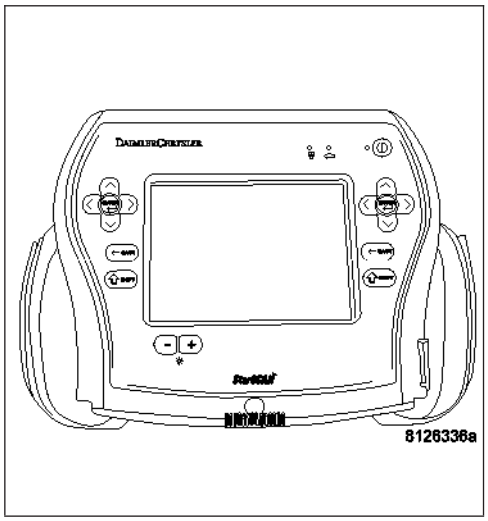
Replace the Occupant Restraint Controller in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1

---

5. STORED ORC DTC

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

IF only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

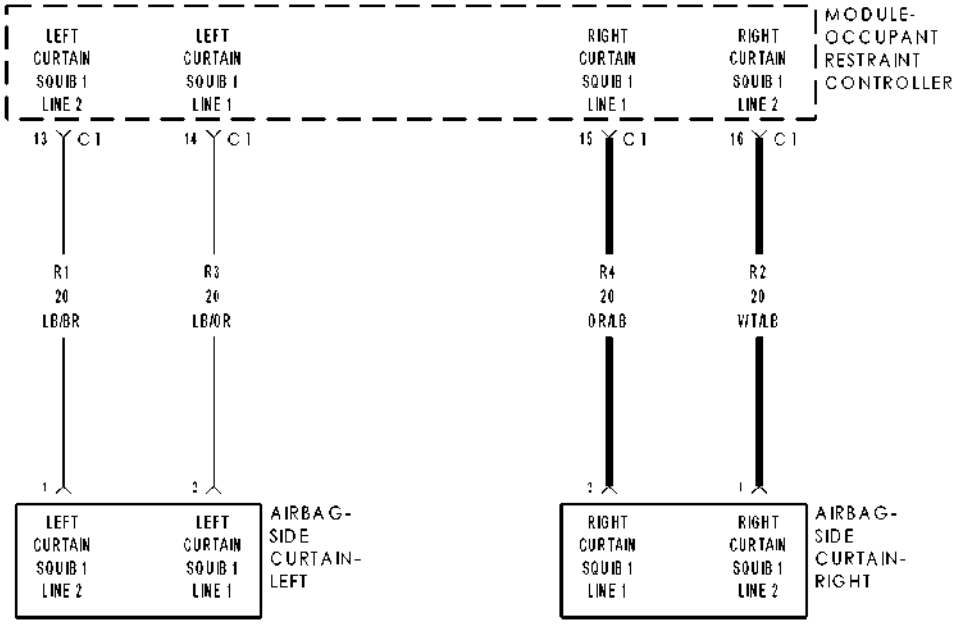
Are any ACTIVE DTCs present?

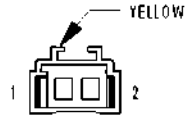
Yes >> Select appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer

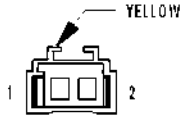
---

B1B22-RIGHT SIDE CURTAIN AIRBAG SQUIB 1 CIRCUIT OPEN

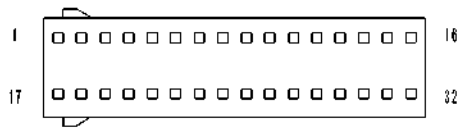




AIRBAG-SIDE CURTAIN-LEFT



AIRBAG-SIDE CURTAIN-RIGHT



MODULE-OCCUPANT RESTRAINT CONTROLLER C1

B1B22-RIGHT SIDE CURTAIN AIRBAG SQUIB 1 CIRCUIT OPEN (CONTINUED)

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the ORC monitors the resistance of the Right Curtain Squib 1 circuits.
- **Set Condition:**
  When the ORC has detects an open circuit or high resistance in the Right Curtain Squib 1 circuits.

Possible Causes
(R4) RIGHT CURTAIN SQUIB 1 LINE 1 OR (R2) RIGHT CURTAIN SQUIB 1 LINE 1LINE 2 CIRCUIT OPEN
RIGHT SIDE CURTAIN AIRBAG
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure the battery is fully charged.

NOTE: The Scan Tool and SRS Airbag Load Tool MRL 8443 are required to perform the following test.

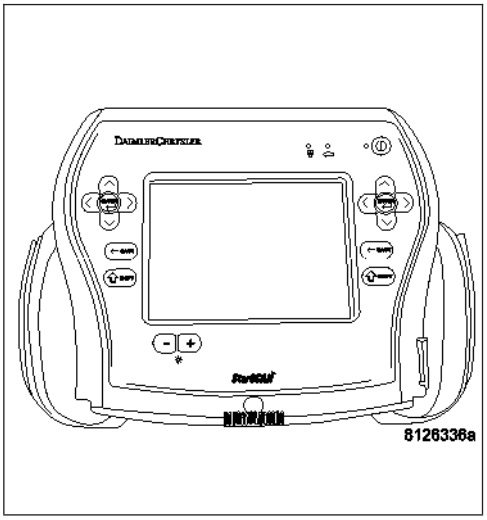
NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

Select Active or Stored DTC.

Is the DTC active or stored?

ORC - ACTIVE DTC
Go To 2

ORC - STORED DTC
Go To 5



B1B22-RIGHT SIDE CURTAIN AIRBAG SQUIB 1 CIRCUIT OPEN (CONTINUED)

2. RIGHT SIDE CURTAIN AIRBAG OPEN

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Right Side Curtain Airbag connector(s).

WARNING: To avoid personal injury or death, do not place an intact uncoupled curtain airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

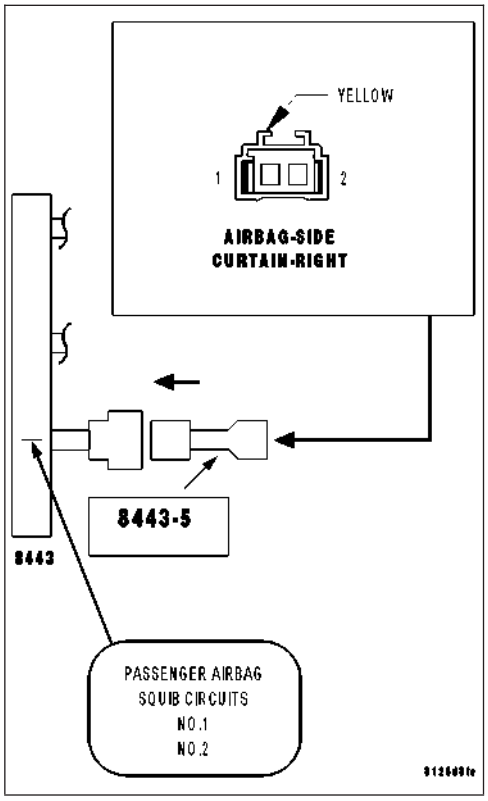
NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool and appropriate Jumper to the Right Side Curtain Airbag connector(s).

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, read the active Occupant Restraints Controller DTC's.

Does the scan tool display RIGHT SIDE CURTAIN SQUIB 1 CIRCUIT OPEN?

Yes >> Go to 3

No >> Replace the Right Side Curtain Airbag in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1



3. (R4) RIGHT CURTAIN SQUIB 1 LINE 1 OR (R2) RIGHT CURTAIN SQUIB 1 LINE 2 CIRCUIT OPEN

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool and Jumper from the Right Side Curtain Airbag harness connector(s).

Disconnect the ORC harness connector(s).

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool ORC Adaptor to the ORC harness connector.

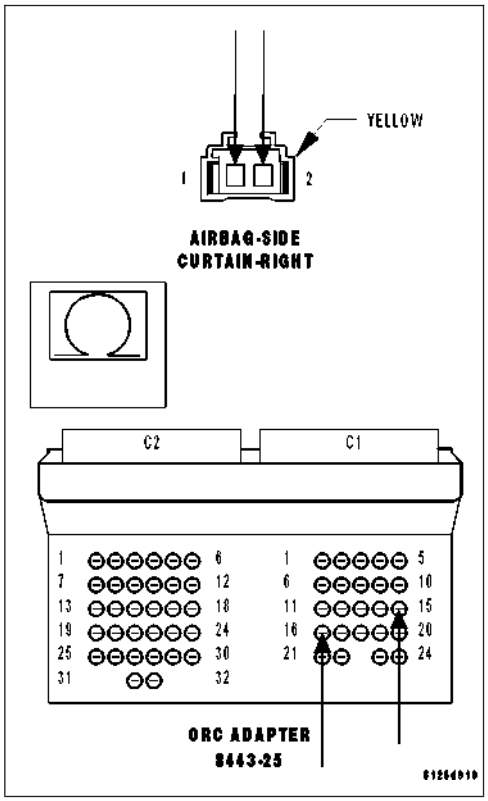
Measure the resistance of the (R4) Right Curtain Squib 1 Line 1 between the Right Side Curtain Airbag harness connector and the 8443 ORC Adaptor.

Measure the resistance of the (R2) Right Curtain Squib 1 Line 2 between the Right Side Curtain Airbag harness connector and the 8443 ORC Adaptor.

Is the resistance below 1.0 ohm on both circuits?

Yes >> GO to 4

No >> Repair open or high resistance in (R4) Right Curtain Squib 1 Line 1 and/or (R2) Right Curtain Squib 1 Line 2.
Perform AIRBAG VERIFICATION TEST - VER 1



B1B22-RIGHT SIDE CURTAIN AIRBAG SQUIB 1 CIRCUIT OPEN (CONTINUED)

4. OCCUPANT RESTRAINT CONTROLLER

WARNING: If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1

---

5. STORED ORC DTC

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

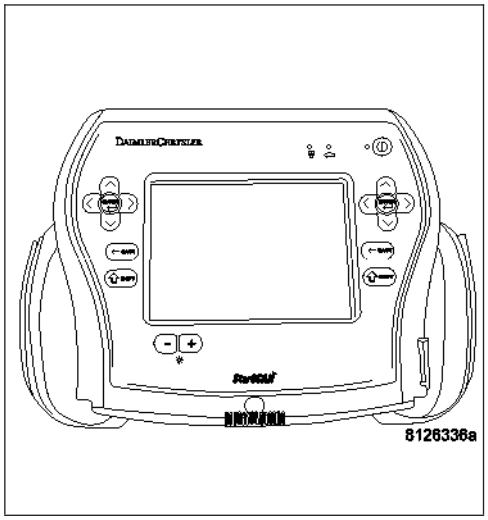
Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.



Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

IF only stored codes return continue the test until the problem area has been isolated.

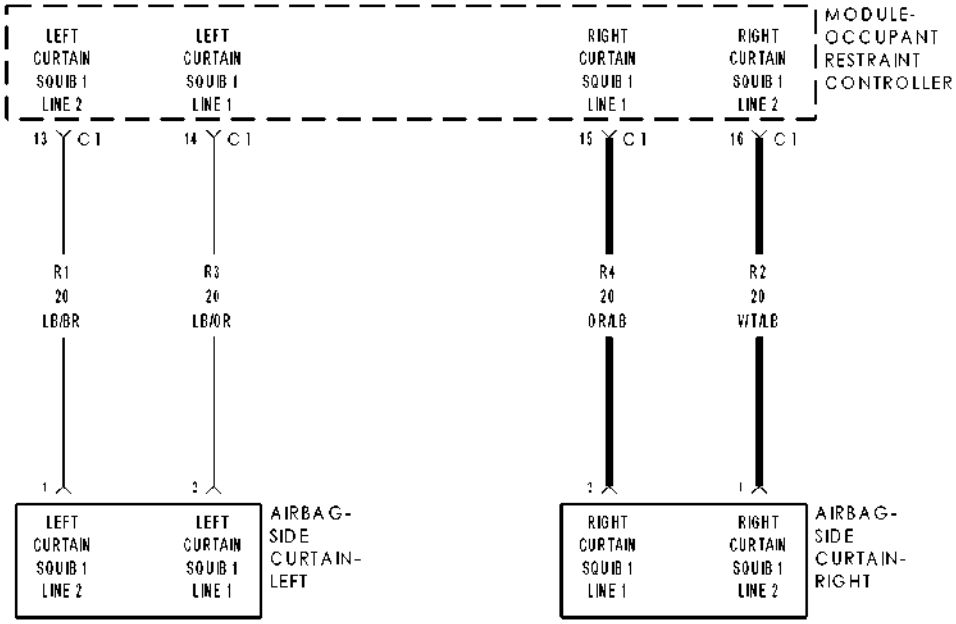
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

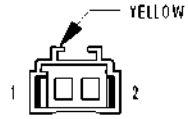
Are any ACTIVE DTCs present?

Yes >> Select appropriate symptom from Symptom List.

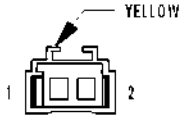
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B23-RIGHT SIDE CURTAIN SQUIB 1 CIRCUIT SHORT TOGETHER

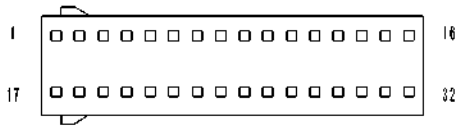




AIRBAG-SIDE CURTAIN-LEFT



AIRBAG-SIDE CURTAIN-RIGHT



MODULE-OCCUPANT RESTRAINT CONTROLLER C1

B1B23-RIGHT SIDE CURTAIN SQUIB 1 CIRCUIT SHORT TOGETHER (CONTINUED)

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the ORC monitors the resistance of the Right Curtain Squib 1 circuits.
- **Set Condition:**
  The ORC has detected low resistance between the Right Curtain Squib 1 circuits.

Possible Causes
(R4) RIGHT CURTAIN SQUIB 1 LINE 1 SHORTED TO (R2) RIGHT CURTAIN SQUIB 1 LINE 2
RIGHT SIDE CURTAIN AIRBAG
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure the battery is fully charged.

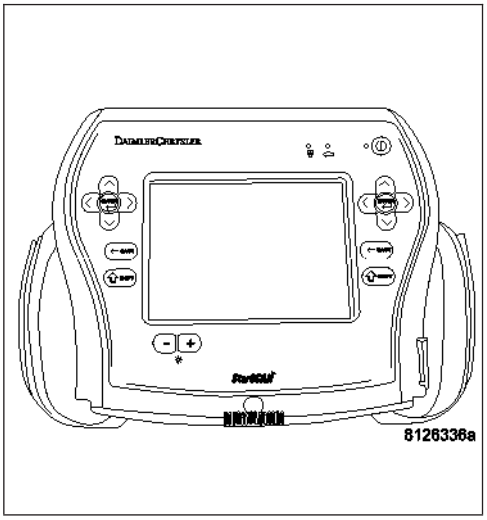
NOTE: The Scan Tool, SRS Airbag Load Tool MRL 8443 and DVOM are required to perform the following test.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.
Select Active or Stored DTC.

Is the DTC active or stored?

ORC - ACTIVE DTC
Go To 2

ORC - STORED DTC
Go To 5



B1B23-RIGHT SIDE CURTAIN SQUIB 1 CIRCUIT SHORT TOGETHER (CONTINUED)

2. RIGHT SIDE CURTAIN AIRBAG SHORTED

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Right Side Curtain Airbag connector(s).

WARNING: To avoid personal injury or death, do not place an intact uncoupled curtain airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

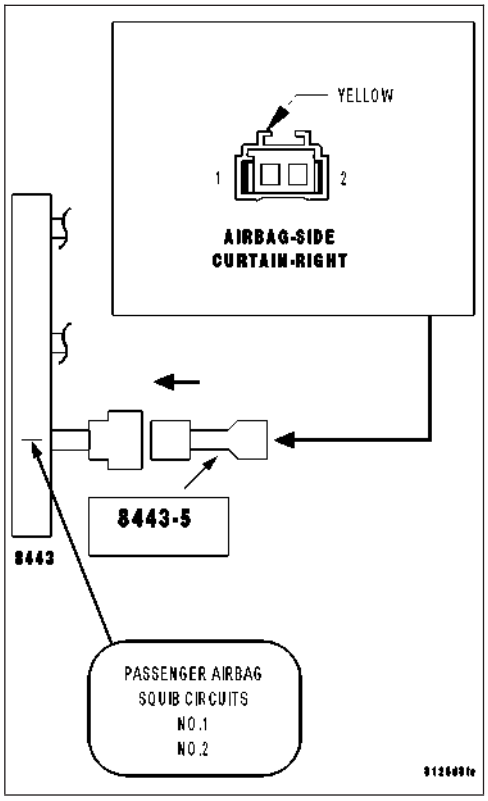
NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool and appropriate Jumper to the Right Side Curtain Airbag connector(s).

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, read the active Occupant Restraint Controller DTC's.

Does the scan tool display RIGHT SIDE CURTAIN SQUIB 1 CIRCUIT SHORT TOGETHER?

Yes >> Go to 3

No >> Replace the Right Side Curtain Airbag in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1



3. (R4) RIGHT CURTAIN SQUIB 1 LINE 1 SHORTED TO (R2) RIGHT CURTAIN SQUIB 1 LINE 2

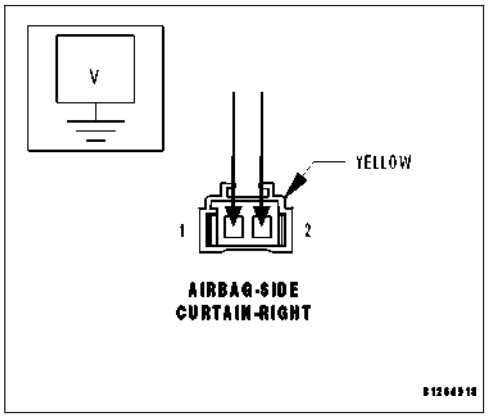
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool and Jumper from the Right Side Curtain Airbag connector(s).

Disconnect the ORC harness connector(s).

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool ORC Adaptor to the ORC harness connector.

Measure the resistance between the (R4) Right Curtain Squib 1 Line 1 and (R2) Right Curtain Squib 1 Line 2 at the Right Side Curtain Airbag harness connector.

Is the resistance below 10K ohms?



Yes >> Repair the (R4) Right Curtain Squib 1 Line 1 shorted to the (R2) Right Curtain Squib 1 Line 2 circuit.
Perform AIRBAG VERIFICATION TEST - VER 1

No >> Go to 4

B1B23-RIGHT SIDE CURTAIN SQUIB 1 CIRCUIT SHORT TOGETHER (CONTINUED)

4. OCCUPANT RESTRAINT CONTROLLER

WARNING: If the Airbag Control Module is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.
Disconnect the 8443 Load Tool ORC Adaptor from the ORC harness connector.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1

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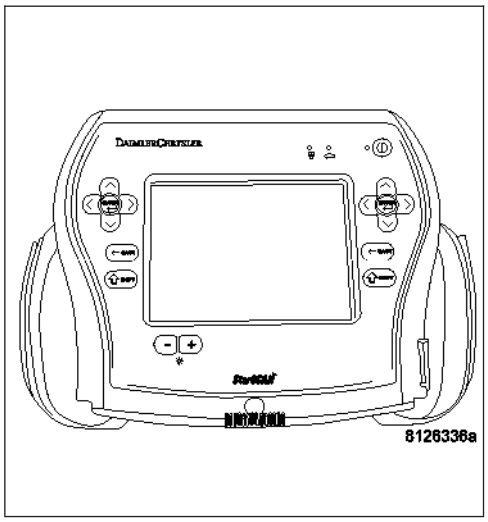
5. STORED ORC DTC

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

IF only stored codes return continue the test until the problem area has been isolated.

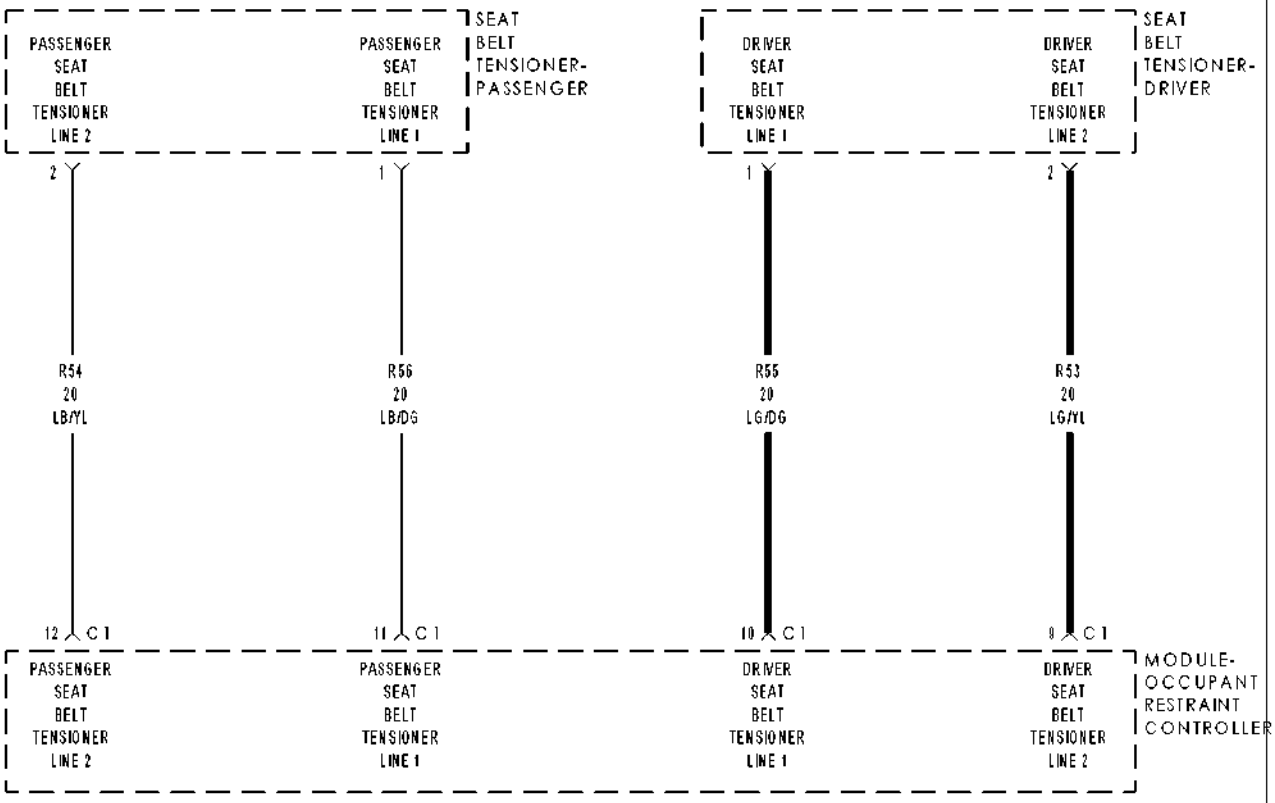
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

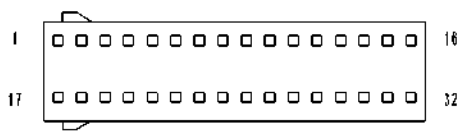
Are any ACTIVE DTC's present?

Yes >> Select appropriate symptom from Symptom List.

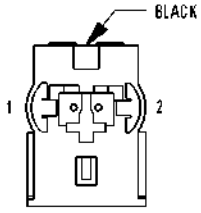
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B28-1st ROW DRIVER SEAT BELT PRETENSIONER CIRCUIT LOW

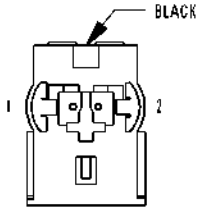




MODULE-OCCUPANT RESTRAINT CONTROLLER C1



SEAT BELT-TENSIONER-DRIVER



SEAT BELT-TENSIONER-PASSENGER

81270186

B1B28-1st ROW DRIVER SEAT BELT PRETENSIONER CIRCUIT LOW (CONTINUED)

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the ORC monitors the resistance of the Driver Seat Belt Tensioner circuits.
- **Set Condition:**
  The ORC has detected low resistance of the Driver Seat Belt Tensioner circuits.

Possible Causes
(R55) DRIVER SEAT BELT TENSIONER LINE 1 OR (R53) DRIVER SEAT BELT TENSIONER LINE 1 SHORTED TO GROUND
DRIVER SEAT BELT TENSIONER
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure the battery is fully charged.

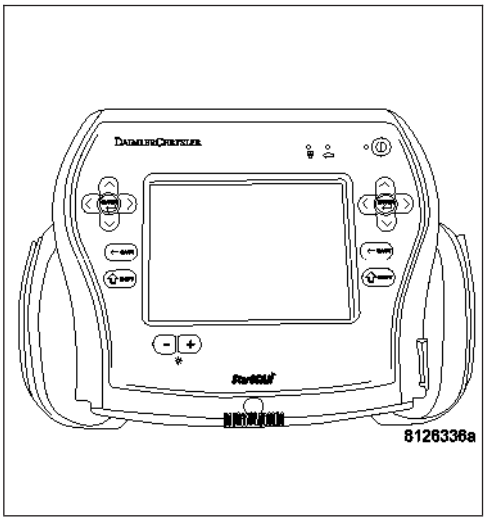
NOTE: The Scan Tool, SRS Airbag Load Tool MRL 8443 and DVOM are required to perform the following test.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.
Select Active or Stored DTC.

Is the DTC active or stored?

ORC - ACTIVE DTC
Go To 2

ORC - STORED DTC
Go To 5



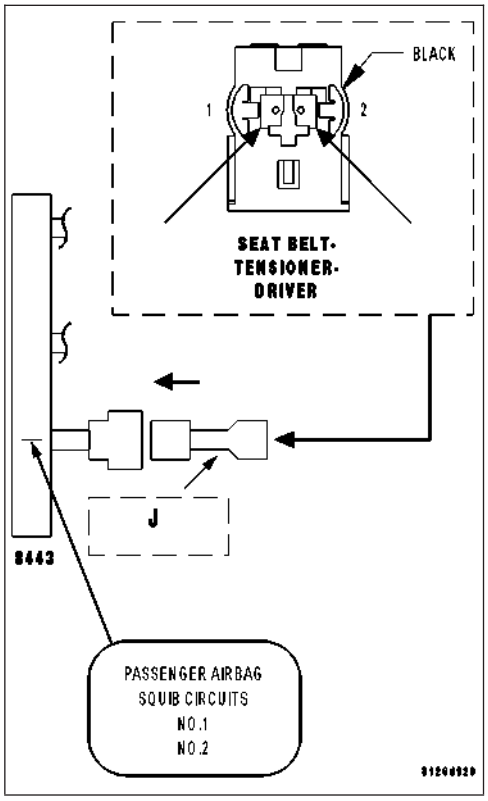
B1B28-1st ROW DRIVER SEAT BELT PRETENSIONER CIRCUIT LOW (CONTINUED)

2. DRIVER SEAT BELT TENSIONER SHORTED TO GROUND

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Driver Seat Belt Tensioner connector(s).

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool and appropriate Jumper to the Driver Seat Belt Tensioner connector(s).

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, read the active Occupant Restraint Controller DTC's.



Does the scan tool display 1st ROW DRIVER SEAT BELT PRE-TENSIONER CIRCUIT LOW?

Yes >> Go To 3

No >> Replace the Driver Seat Belt Tensioner in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1

---

3. (R55) DRIVER SEAT BELT TENSIONER LINE 1 OR (R53) DRIVER SEAT BELT TENSIONER LINE 1 SHORTED TO GROUND

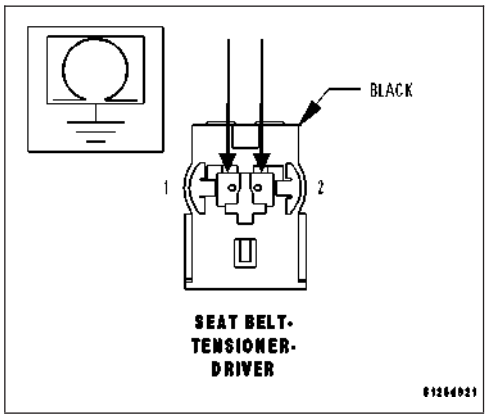
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool and Jumper from the Driver Seat Belt Tensioner harness connector.

Disconnect the ORC harness connector(s).

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool ORC Adaptor to the ORC harness connector.

Measure the resistance of the (R55) Driver Seat Belt Tensioner Line 1 circuit between the Driver Seat Belt Tensioner connector and ground.

Measure the resistance of the (R53) Driver Seat Belt Tensioner Line 2 circuit between the Driver Seat Belt Tensioner connector and ground.



Is the resistance below 10K ohms on either circuit?

Yes >> Repair (R55) Driver Seat Belt Tensioner Line 1 or (R53) Driver Seat Belt Tensioner Line 2 shorted to ground.
Perform AIRBAG VERIFICATION TEST - VER 1

No >> Go to 4

B1B28-1st ROW DRIVER SEAT BELT PRETENSIONER CIRCUIT LOW (CONTINUED)

4. OCCUPANT RESTRAINT CONTROLLER

WARNING: If the Occupant Classification Module is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1

---

5. STORED ORC DTC

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

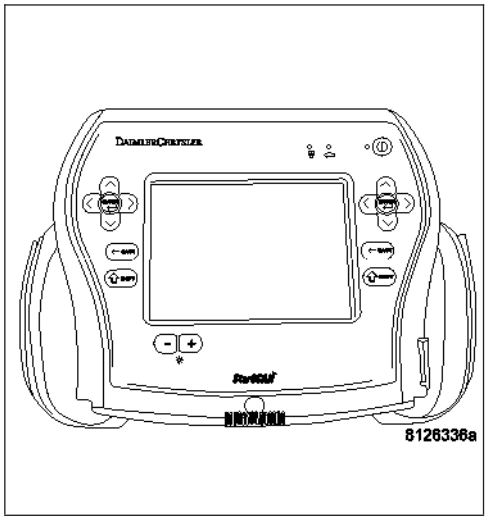
Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.



Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

IF only stored codes return continue the test until the problem area has been isolated.

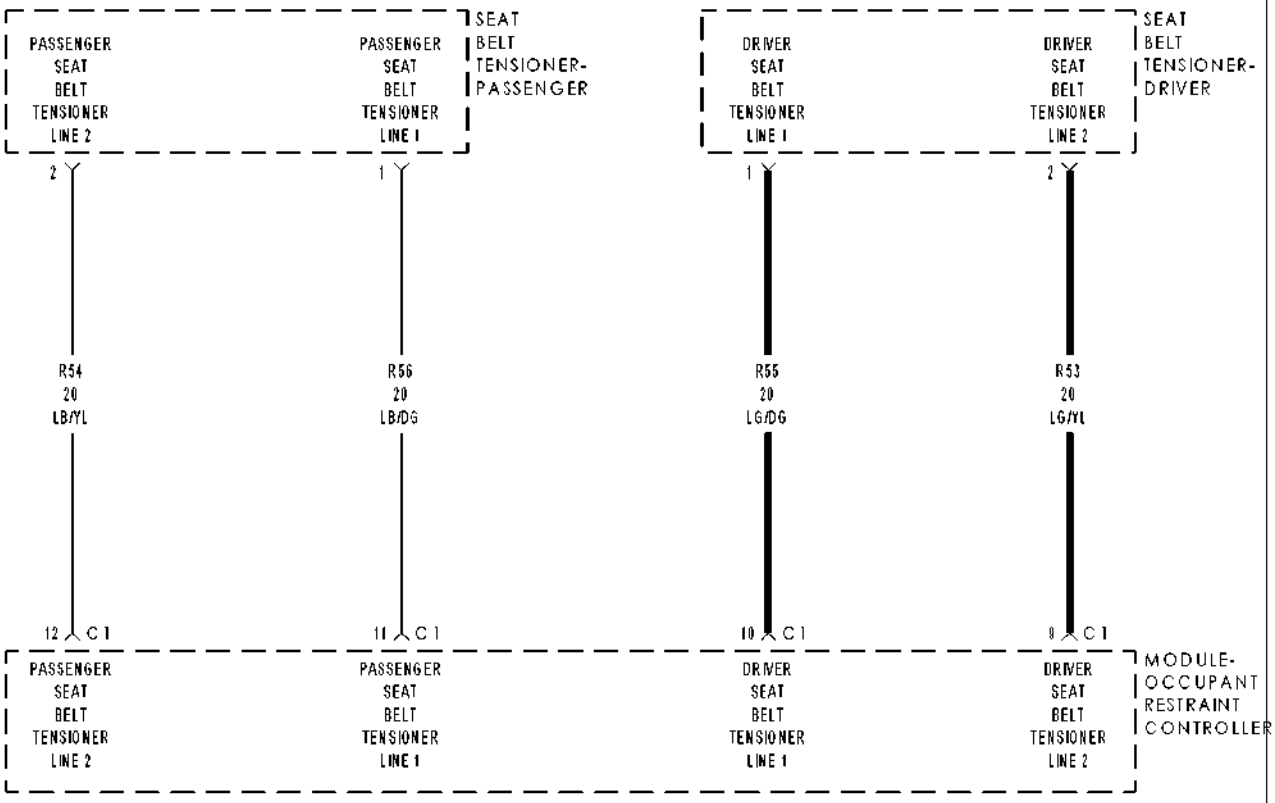
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

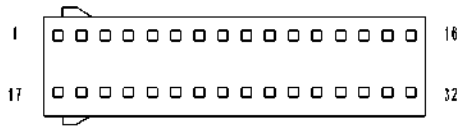
Are any ACTIVE DTC's present?

Yes >> Select appropriate symptom from Symptom List.

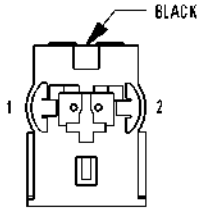
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B29-1ST ROW SEAT BELT PRETENSIONER CIRCUIT HIGH

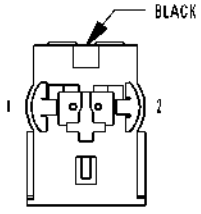




MODULE-OCCUPANT RESTRAINT CONTROLLER C1



SEAT BELT-TENSIONER-DRIVER



SEAT BELT-TENSIONER-PASSENGER

81270186

B1B29-1ST ROW SEAT BELT PRETENSIONER CIRCUIT HIGH (CONTINUED)

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the ORC monitors the voltage on the Driver Seat Belt Tensioner circuits.
- **Set Condition:**
  The ORC detects high voltage on the Driver Seat Belt Tensioner circuits.

Possible Causes
(R55) DRIVER SEAT BELT TENSIONER LINE 1 OR (R53) DRIVER SEAT BELT TENSIONER LINE 1 SHORTED TO BATTERY
DRIVER SEAT BELT TENSIONER
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure the battery is fully charged.

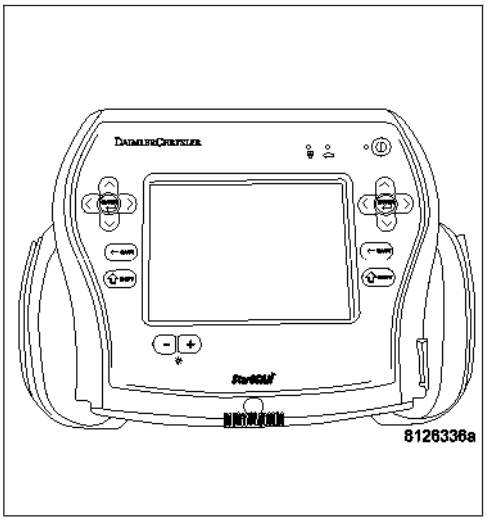
NOTE: The Scan Tool, SRS Airbag Load Tool MRL 8443 and DVOM are required to perform the following test.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.
Select Active or Stored DTC.

Is the DTC active or stored?

ORC - ACTIVE DTC
Go To 2

ORC - STORED DTC
Go To 5



B1B29-1ST ROW SEAT BELT PRETENSIONER CIRCUIT HIGH (CONTINUED)

2. DRIVER SEAT BELT TENSIONER SHORTED TO BATTERY

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Driver Seat Belt Tensioner connector(s).

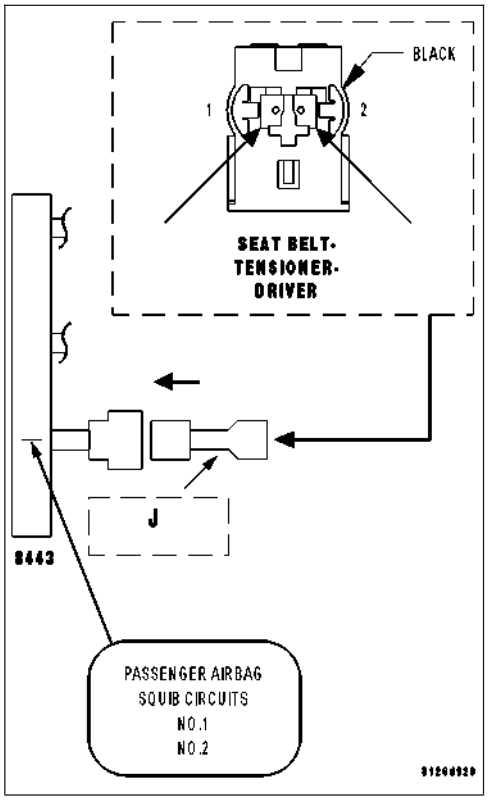
NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool and appropriate Jumper to the Driver Seat Belt Tensioner connector(s).

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, read the active Occupant Restraint Controller DTC's.

Does the scan tool display 1st ROW DRIVER SEAT BELT PRE-TENSIONER CIRCUIT HIGH?

Yes >> Go To 3

No >> Replace the Driver Seat Belt Tensioner in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1



3. (R55) DRIVER SEAT BELT TENSIONER LINE 1 OR (R53) DRIVER SEAT BELT TENSIONER LINE SHORTED TO BATTERY

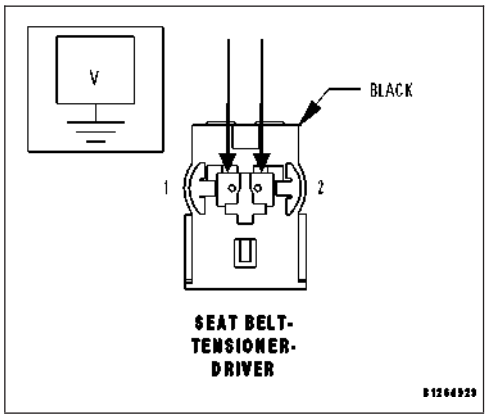
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool and Jumper from the Driver Seat Belt Tensioner harness connector.

Disconnect the ORC harness connector(s).

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool ORC Adaptor to the ORC harness connector.

Measure the voltage on the (R55) Driver Seat Belt Tensioner Line 1 circuit between the Driver Seat Belt Tensioner harness connector and ground.

Measure the voltage on the (R53) Driver Seat Belt Tensioner Line 2 circuits between the Driver Seat Belt Tensioner harness connector and ground.



Is there any voltage on either circuit?

Yes >> Repair (R55) Driver Seat Belt Tensioner Line 1 or (R53) Driver Seat Belt Tensioner Line 2 shorted to battery.
Perform AIRBAG VERIFICATION TEST - VER 1

No >> Go to 4

B1B29-1ST ROW SEAT BELT PRETENSIONER CIRCUIT HIGH (CONTINUED)

4. OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the Airbag Control Module is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1

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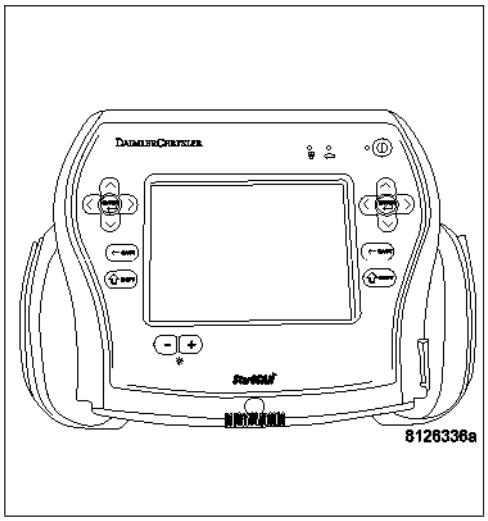
5. STORED ORC DTC

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

IF only stored codes return continue the test until the problem area has been isolated.

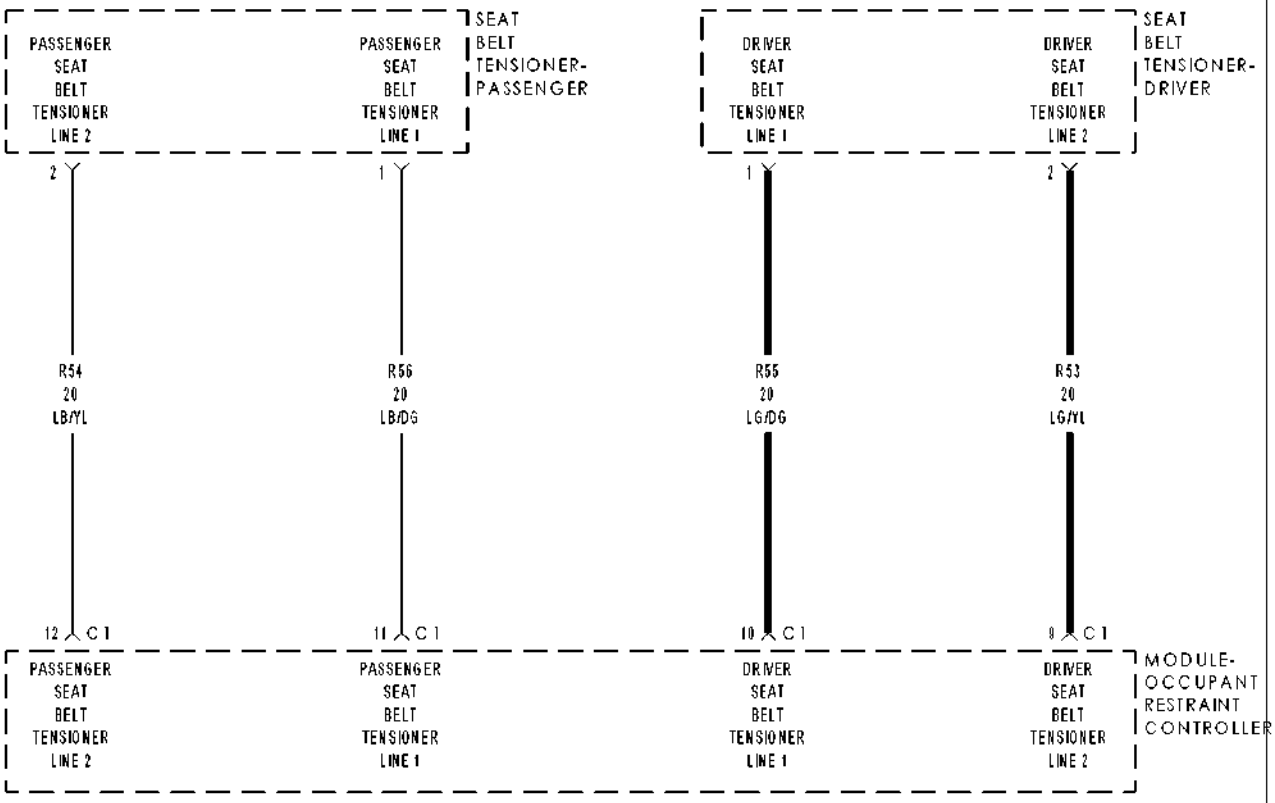
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

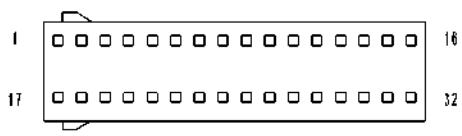
Are any ACTIVE DTCs present?

Yes >> Select appropriate symptom from Symptom List.

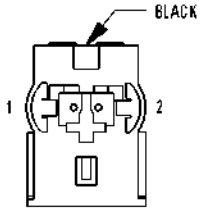
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B2A-1st ROW DRIVER SEAT BELT PRETENSIONER CIRCUIT OPEN

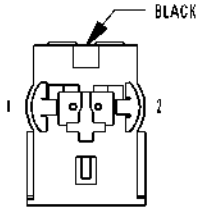




MODULE-OCCUPANT RESTRAINT CONTROLLER C1



SEAT BELT-TENSIONER-DRIVER



SEAT BELT-TENSIONER-PASSENGER

81270186

B1B2A-1st ROW DRIVER SEAT BELT PRETENSIONER CIRCUIT OPEN (CONTINUED)

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the ORC monitors the resistance of the Driver Seat Belt Tensioner circuits.
- **Set Condition:**
  The ORC has detected open circuit or high resistance in the Driver Seat Belt Tensioner circuits.

Possible Causes
(R55) DRIVER SEAT BELT TENSIONER LINE 1 OR (R53) DRIVER SEAT BELT TENSIONER LINE 2 CIRCUIT OPEN
DRIVER SEAT BELT TENSIONER
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure the battery is fully charged.

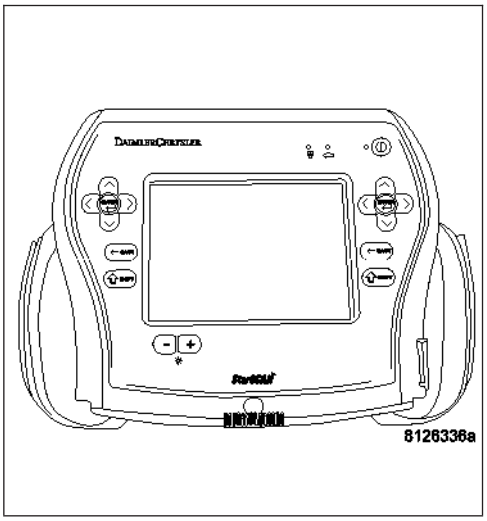
NOTE: The Scan Tool and SRS Airbag Load Tool MRL 8443 are required to perform the following test.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.
Select Active or Stored DTC.

Is the DTC active or stored?

ORC - ACTIVE DTC
Go to 2

ORC - STORED DTC
Go To 5



B1B2A-1st ROW DRIVER SEAT BELT PRETENSIONER CIRCUIT OPEN (CONTINUED)

2. DRIVER SEAT BELT TENSIONER CIRCUIT OPEN

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Right Side Curtain Airbag connector(s).

WARNING: To avoid personal injury or death, do not place an intact uncoupled curtain airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

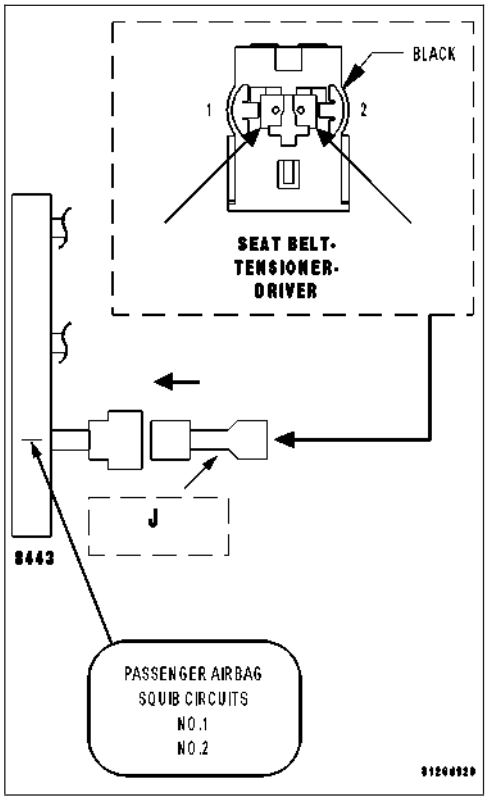
NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool and appropriate Jumper to the Driver Seat Belt Tensioner harness connector(s).

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, read the active Occupant Restraints Controller DTC's.

Does the scan tool display 1st ROW DRIVER SEAT BELT PRETENSIONER CIRCUIT OPEN?

Yes >> Go to 3

No >> Replace the Driver Seat Belt Tensioner in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1



3. (R55) DRIVER SEAT BELT PRETENSIONER LINE 1 OR (R53) DRIVER SEAT BELT PRETENSIONER LINE 2 CIRCUIT OPEN

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool and Jumper from the Driver Seat Belt Tensioner harness connector(s).

Disconnect the ORC harness connector(s).

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool ORC Adaptor to the ORC harness connector.

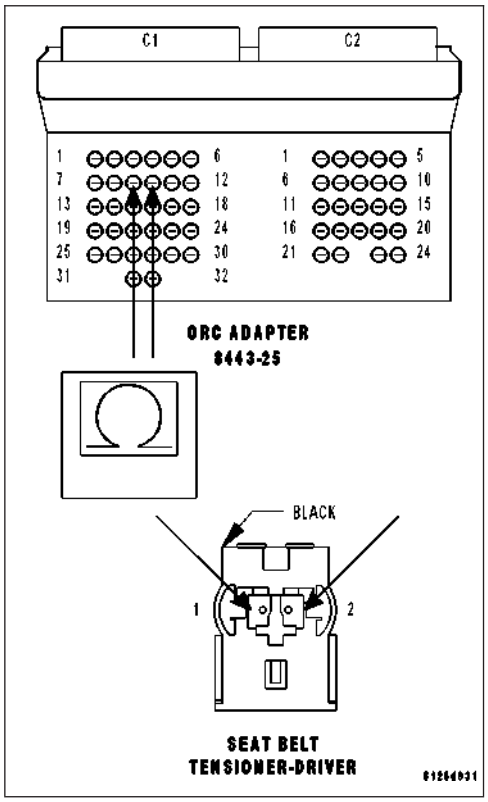
Measure the resistance of the (R55) Driver Seat Belt Tensioner Line 1 between the Driver Seat Belt Tensioner harness connector and the 8443 ORC Adaptor.

Measure the resistance of the (R53) Driver Seat Belt Tensioner Line 2 between the Driver Seat Belt Tensioner harness connector and the 8443 ORC Adaptor.

Is the resistance below 1.0 ohm on both circuits?

Yes >> Repair open or high resistance in (R55) Driver Seat Belt Tensioner Line 1 or (R53) Driver Seat Belt Tensioner Line 2.
Perform AIRBAG VERIFICATION TEST - VER 1

No >> Go to 4



B1B2A-1st ROW DRIVER SEAT BELT PRETENSIONER CIRCUIT OPEN (CONTINUED)

4. OCCUPANT RESTRAINT CONTROLLER

WARNING: If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.
Disconnect the 8443 Load Tool ORC Adaptor from the ORC harness connector.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1

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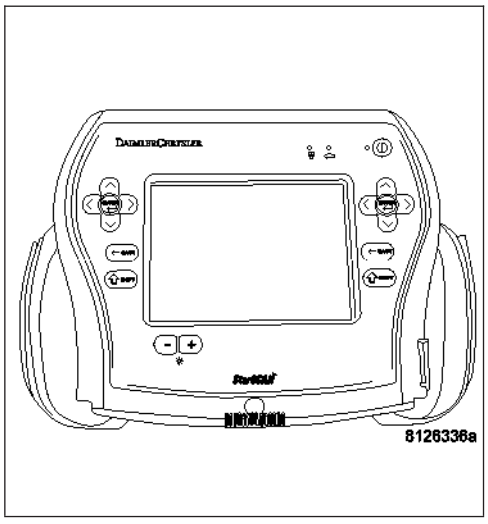
5. STORED ORC DTC

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.



WARNING: TO AVOID PERSONAL INJURY OR DEATH, TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.
Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: TO AVOID PERSONAL INJURY OR DEATH, TURN THE IGNITION ON, THEN RECONNECT THE BATTERY.
With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

IF only stored codes return continue the test until the problem area has been isolated.

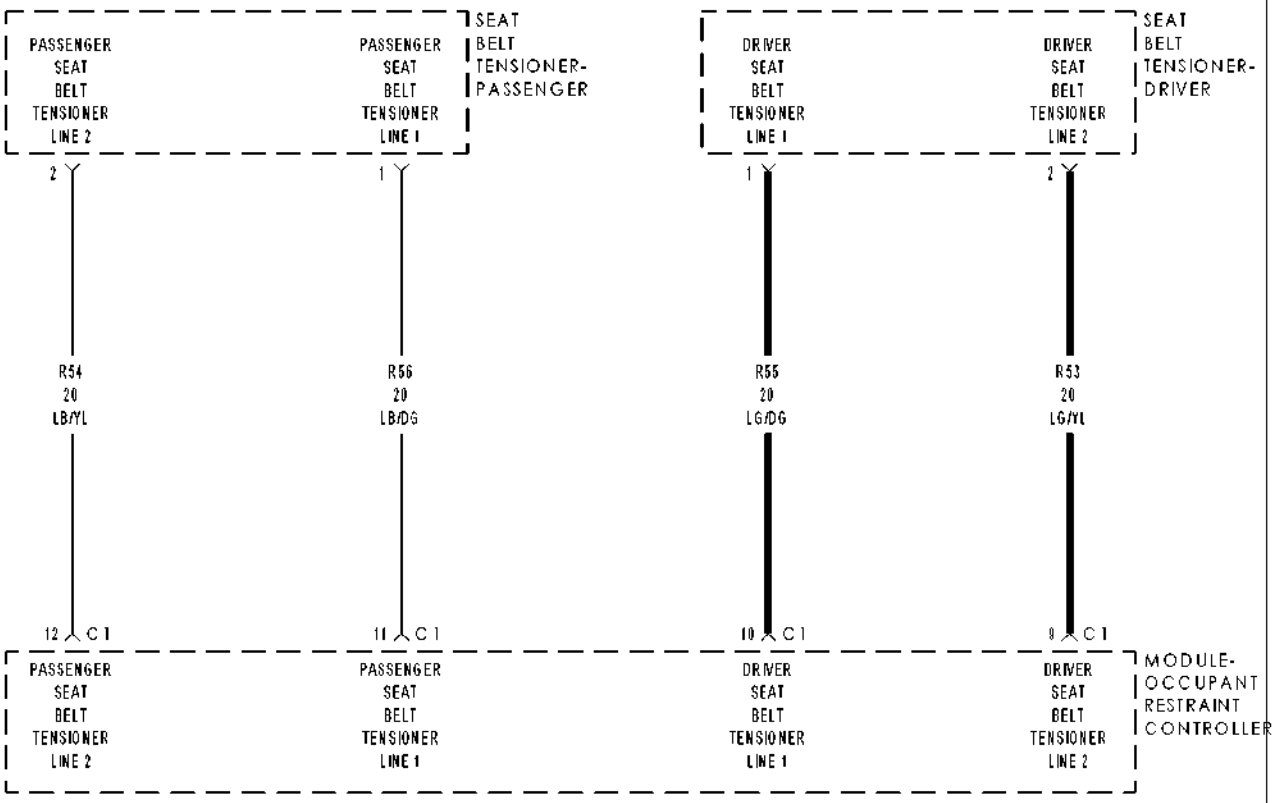
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

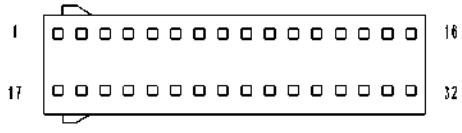
Are any ACTIVE DTCs present?

Yes >> Select appropriate symptom from Symptom List.

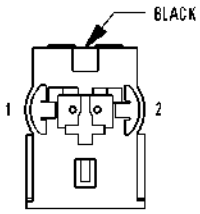
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B2B-1st ROW DRIVER SEAT BELT PRETENSIONER CIRCUIT SHORT TOGETHER

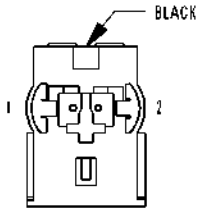




MODULE-OCCUPANT RESTRAINT CONTROLLER C1



SEAT BELT-TENSIONER-DRIVER



SEAT BELT-TENSIONER-PASSENGER

81270186

B1B2B-1st ROW DRIVER SEAT BELT PRETENSIONER CIRCUIT SHORT TOGETHER (CONTINUED)

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the ORC monitors the resistance of the Driver Seat Belt Tensioner circuits.
- **Set Condition:**
  The ORC has detected low resistance between the Driver Seat Belt Tensioner circuits.

Possible Causes
(R55) DRIVER SEAT BELT TENSIONER LINE 1 SHORTED TO (R53) DRIVER SEAT BELT TENSIONER LINE 2
DRIVER SEAT BELT TENSIONER
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. SELECT ACTIVE OR STORED DTC

NOTE: Ensure the battery is fully charged.

NOTE: The Scan Tool, SRS Airbag Load Tool MRL 8443 and DVOM are required to perform the following test.

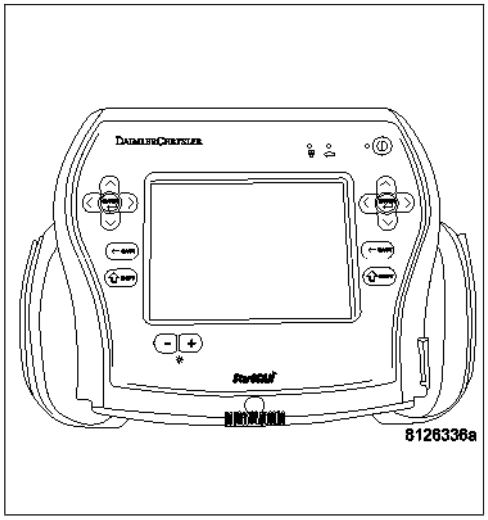
NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

Select Active or Stored DTC.

Is the DTC active or stored?

ORC - ACTIVE DTC
Go To 2

ORC - STORED DTC
Go To 5



B1B2B-1st ROW DRIVER SEAT BELT PRETENSIONER CIRCUIT SHORT TOGETHER (CONTINUED)

2. DRIVER SEAT BELT TENSIONER SHORTED TOGETHER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Driver Airbag connector(s).

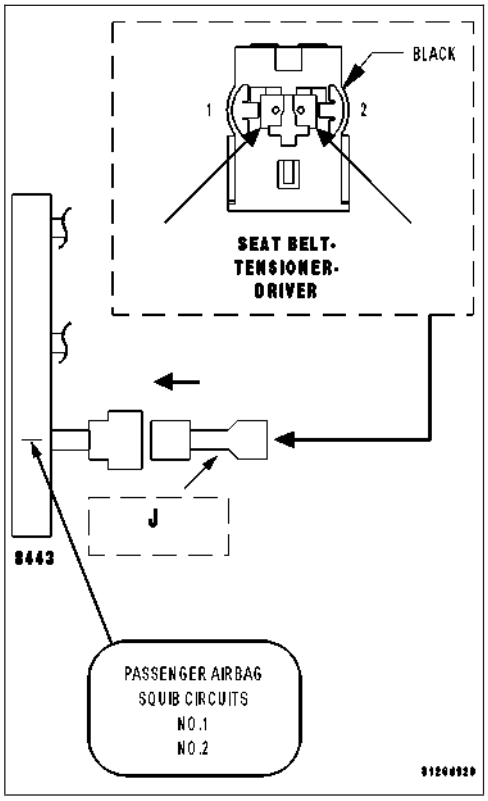
NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool and appropriate Jumper to the Driver Seat Belt Tensioner connector(s).

WARNING: To avoid personal injury or death, turn the ignition on then reconnect the battery.
With the scan tool, read the active Occupant Classification Module DTC's.

Does the scan tool display 1st ROW DRIVER SEAT BELT PRE-TENSIONER CIRCUIT SHORT TOGETHER?

Yes >> Go to 3

No >> Replace the Driver Seat Belt Tensioner in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1



3. (R55) DRIVER SEAT BELT TENSIONER LINE 1 SHORTED TO (R53) DRIVER SEAT BELT TENSIONER LINE 2

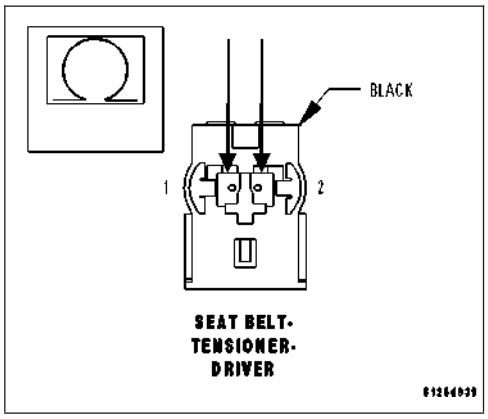
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool and Jumper from the Passenger Airbag Squib connector(s).

Disconnect the ORC harness connector(s).

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool ORC Adaptor to the ORC harness connector.

Measure the resistance between the (R55) Driver Seat Belt Tensioner Line 1 and (R53) Driver Seat Belt Tensioner Line 2 at the Driver Seat Belt Tensioner harness connector.

Is the resistance below 10K ohms?



Yes >> Repair the (R55) Driver Seat Belt Tensioner Line 1 shorted to the (R53) Driver Seat Belt Tensioner Line 2 circuit.
Perform AIRBAG VERIFICATION TEST - VER 1

No >> Go to 4

B1B2B-1st ROW DRIVER SEAT BELT PRETENSIONER CIRCUIT SHORT TOGETHER (CONTINUED)

4. OCCUPANT RESTRAINT CONTROLLER

WARNING: If the Occupant Restraint Controller dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.
Disconnect the 8443 Load Tool ORC Adaptor From the ORC harness connector.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

If there are no possible causes remaining, view repair.

Repair

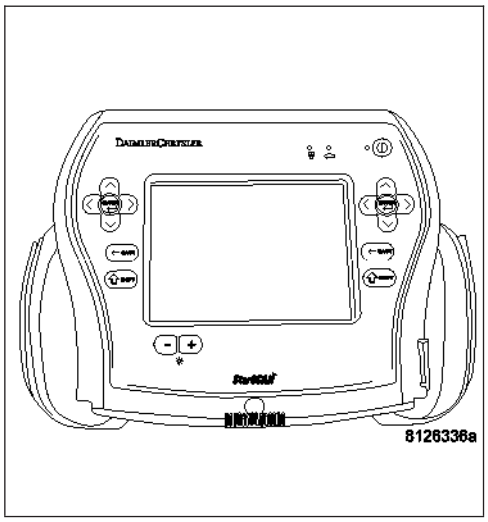
Replace the Occupant Restraint Controller in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1

---

5. STORED ORC DTC

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

IF only stored codes return continue the test until the problem area has been isolated.

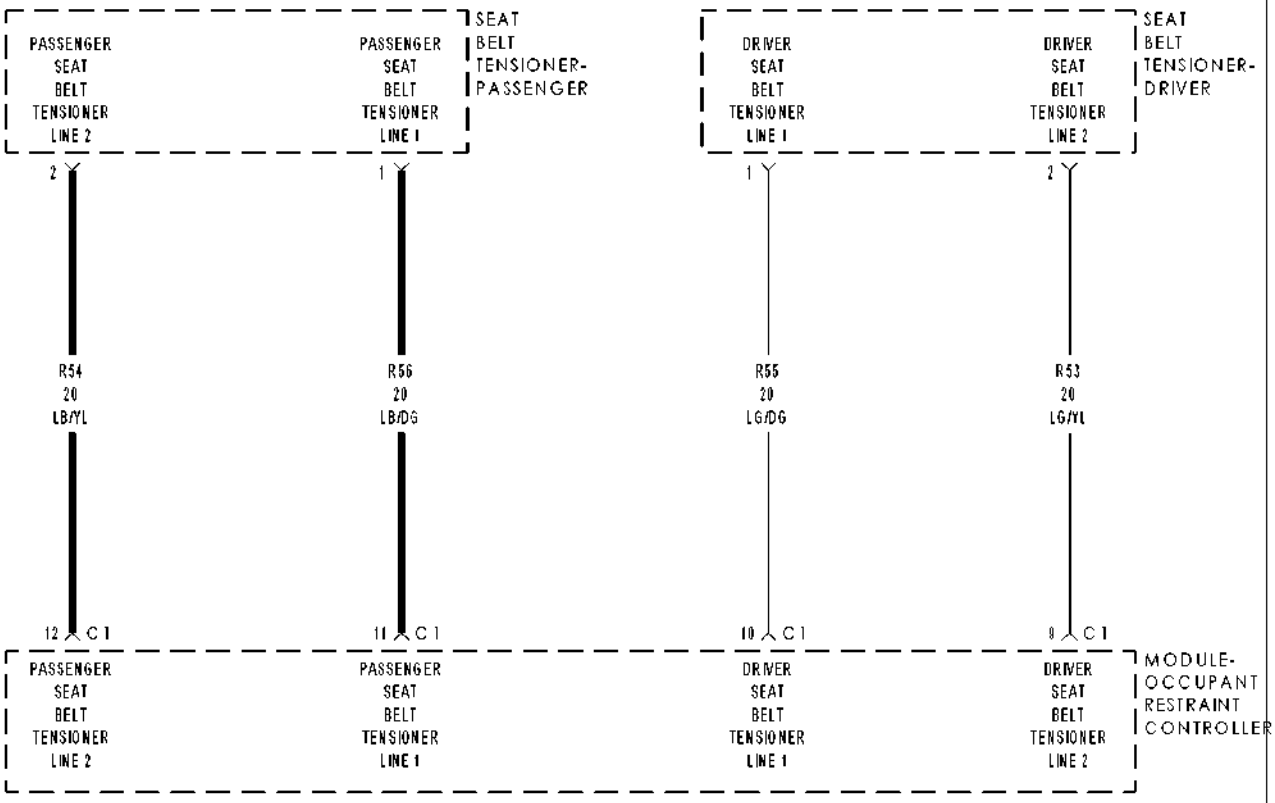
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

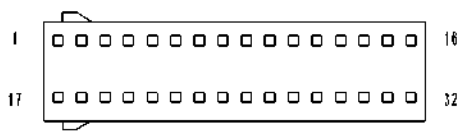
Are any ACTIVE DTC's present?

Yes >> Select appropriate symptom from Symptom List.

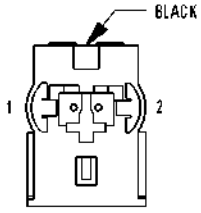
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B2C-1st ROW PASSENGER SEAT BELT PRETENSIONER CIRCUIT LOW

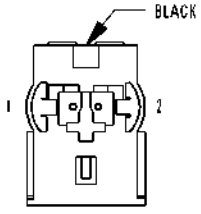




MODULE-OCCUPANT RESTRAINT CONTROLLER C1



SEAT BELT-TENSIONER-DRIVER



SEAT BELT-TENSIONER-PASSENGER

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B1B2C-1st ROW PASSENGER SEAT BELT PRETENSIONER CIRCUIT LOW (CONTINUED)

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the ORC monitors the resistance of the Passenger Seat Belt Tensioner circuits.
- **Set Condition:**
  The ORC has detected low resistance of the Passenger Seat Belt Tensioner circuits.

Possible Causes
(R56) PASSENGER SEAT BELT TENSIONER LINE 1 OR (R54) PASSENGER SEAT BELT TENSIONER LINE 2 SHORTED TO GROUND
PASSENGER SEAT BELT TENSIONER
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure the battery is fully charged.

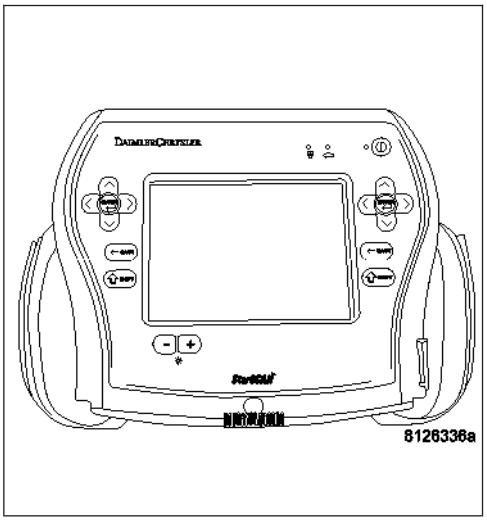
NOTE: The Scan Tool, SRS Airbag Load Tool MRL 8443 and DVOM are required to perform the following test.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.
Select Active or Stored DTC.

Is the DTC active or stored?

ORC - ACTIVE DTC
Go To 2

ORC - STORED DTC
Go To 5



B1B2C-1st ROW PASSENGER SEAT BELT PRETENSIONER CIRCUIT LOW (CONTINUED)

2. PASSENGER SEAT BELT TENSIONER CIRCUIT SHORTED TO GROUND

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Passenger Seat Belt Tensioner harness connector(s).

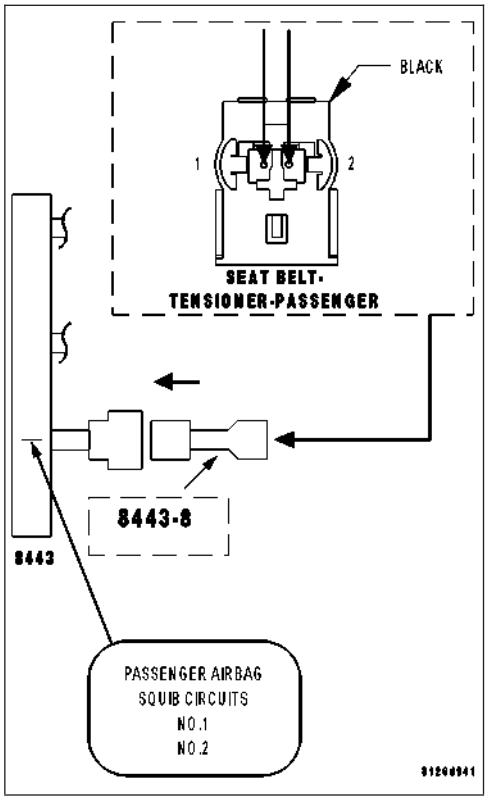
NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool and appropriate Jumper to the Passenger Seat Belt Tensioner harness connector(s).

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, read the active Occupant Restraint Controller DTC's.

Does the scan tool display 1st ROW PASSENGER SEAT BELT PRETENSIONER CIRCUIT LOW?

Yes >> Go To 3

No >> Replace the Passenger Seat Belt Tensioner in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1



3. (R56) PASSENGER SEAT BELT TENSIONER LINE 1 OR (R54) PASSENGER SEAT BELT TENSIONER LINE 2 SHORTED TO GROUND

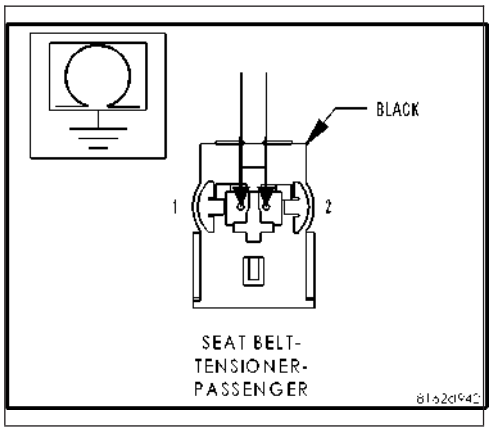
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool and Jumper from the Passenger Seat Belt Tensioner harness connector.

Disconnect the Occupant Restraint Controller harness connector(s).

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool ORC Adaptor to the ORC harness connector.

Measure the resistance of the (R56) Passenger Seat Belt Tensioner Line 1 circuit between the Passenger Seat Belt Tensioner harness connector and ground.

Measure the resistance of the (R54) Passenger Seat Belt Tensioner Line 2 circuit between the Passenger Seat Belt Tensioner harness connector and ground.



Is the resistance below 10K ohms on either circuit?

Yes >> Repair (R56) Passenger Seat Belt Tensioner Line 1 or (R54) Passenger Seat Belt Tensioner Line 2 shorted to ground.
Perform AIRBAG VERIFICATION TEST - VER 1

No >> Go to 4

B1B2C-1st ROW PASSENGER SEAT BELT PRETENSIONER CIRCUIT LOW (CONTINUED)

4. OCCUPANT RESTRAINT CONTROLLER

WARNING: If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death. Disconnect the 8443 Load Tool ORC Adaptor from the ORC harness connector.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1

---

5. STORED ORC DTC

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

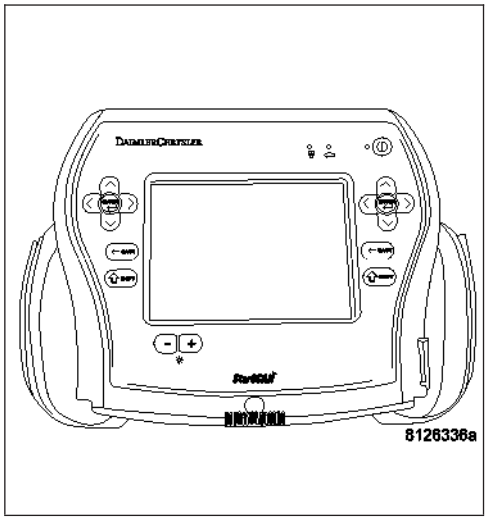
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool monitor active codes as you work through the following steps.



Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

IF only stored codes return continue the test until the problem area has been isolated.

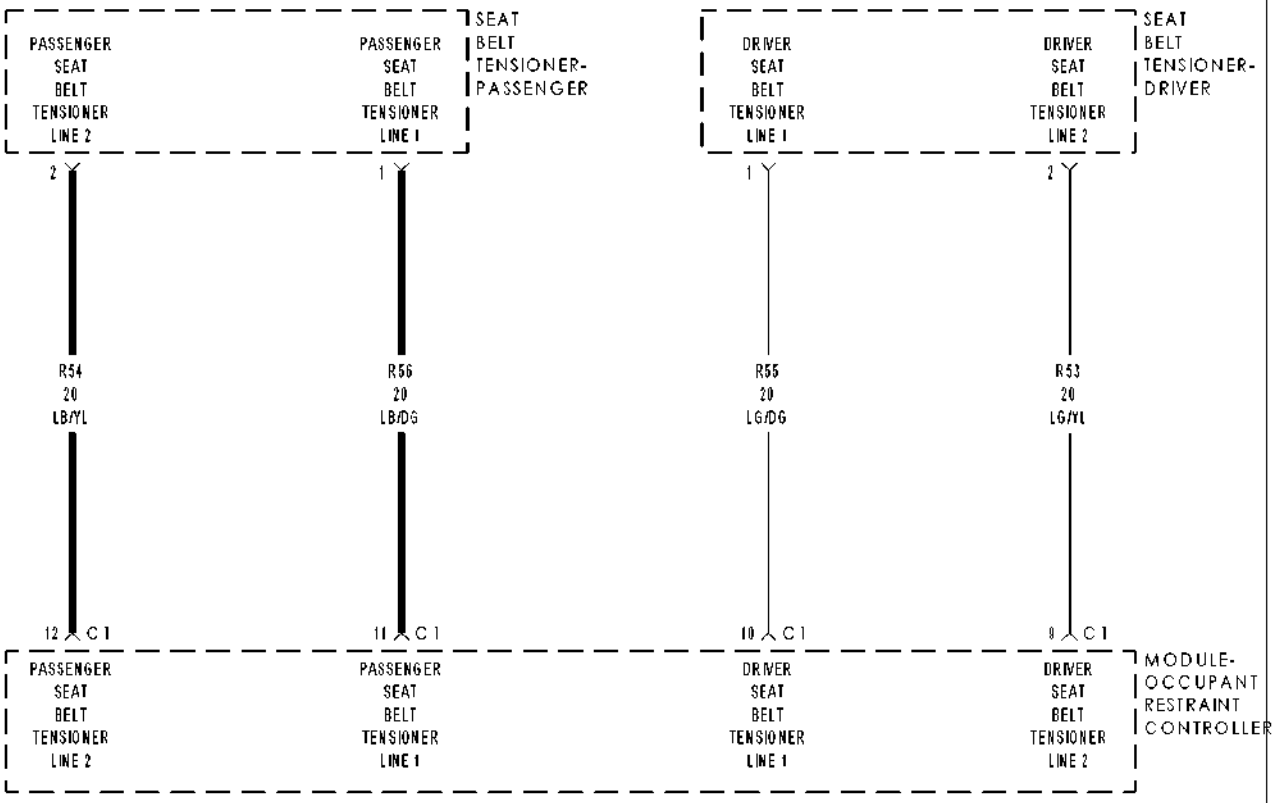
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

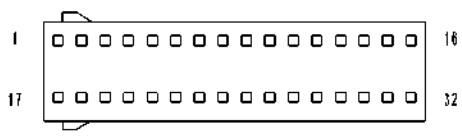
Are any ACTIVE DTC's present?

Yes >> Select appropriate symptom from Symptom List.

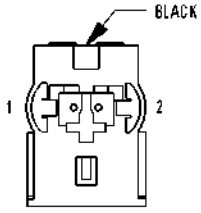
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B2D-1st ROW PASSENGER SEAT BELT PRETENSIONER CIRCUIT HIGH

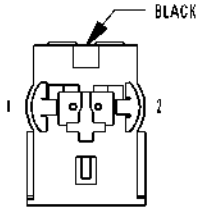




MODULE-OCCUPANT RESTRAINT CONTROLLER C1



SEAT BELT-TENSIONER-DRIVER



SEAT BELT-TENSIONER-PASSENGER

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B1B2D-1st ROW PASSENGER SEAT BELT PRETENSIONER CIRCUIT HIGH (CONTINUED)

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the ORC monitors the voltage on the Passenger Seat Belt Tensioner circuits.
- **Set Condition:**
  The ORC detects high voltage on the Passenger Seat Belt Tensioner circuits.

Possible Causes
(R56) PASSENGER SEAT BELT TENSIONER LINE 1 OR (R54) PASSENGER SEAT BELT TENSIONER LINE 2 SHORTED TO BATTERY
PASSENGER SEAT BELT TENSIONER
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure the battery is fully charged.

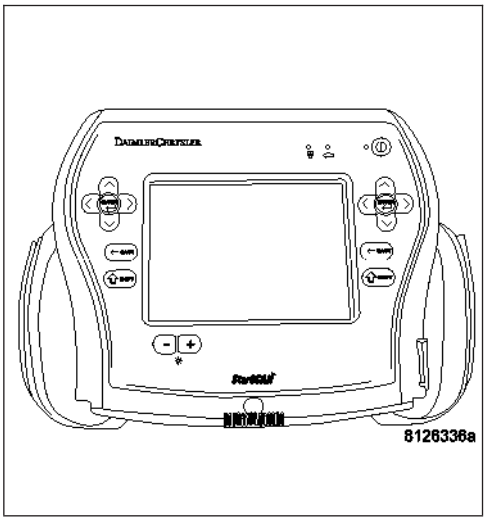
NOTE: The Scan Tool, SRS Airbag Load Tool MRL 8443 and DVOM are required to perform the following test.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.
Select Active or Stored DTC.

Is the DTC active or stored?

ORC - ACTIVE DTC
Go To 2

ORC - STORED DTC
Go To 5



B1B2D-1st ROW PASSENGER SEAT BELT PRETENSIONER CIRCUIT HIGH (CONTINUED)

2. PASSENGER SEAT BELT TENSIONER SHORTED TO BATTERY

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Passenger Airbag connector(s).

WARNING: To avoid personal injury or death, do not place an intact uncoupled airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

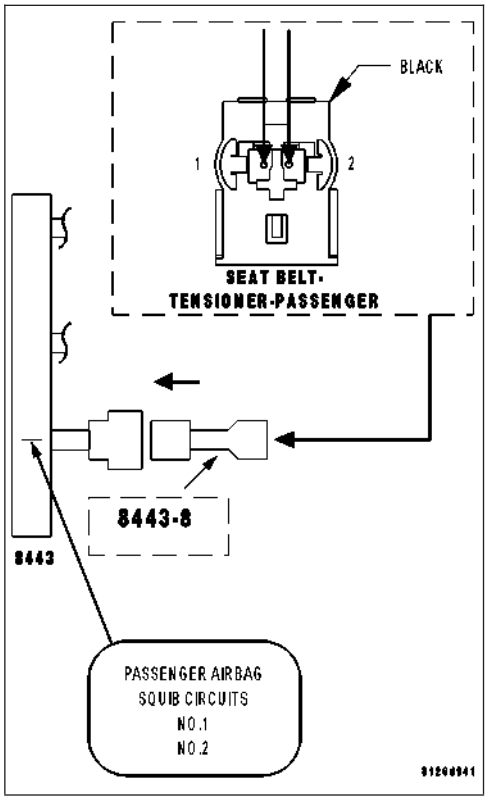
NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool and appropriate Jumper to the Passenger Seat Belt Tensioner connector(s).

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, read the active Occupant Restraint Controller DTC's.

Does the scan tool display 1st ROW PASSENGER SEAT BELT TENSIONER CIRCUIT HIGH?

Yes >> Go To 3

No >> Replace the Passenger Seat Belt Tensioner in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1



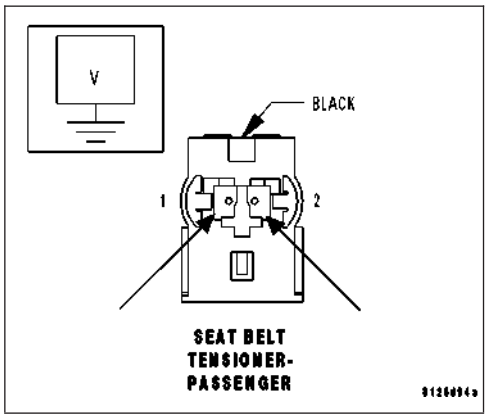
3. (R56) PASSENGER SEAT BELT TENSIONER LINE 1 OR (R54) PASSENGER SEAT BELT TENSIONER LINE SHORTED TO BATTERY.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool and Jumper from the Passenger Seat Belt Tensioner Harness connector.

Disconnect the Occupant Restraint Controller harness connector(s).

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool ORC Adaptor to the ORC harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
Measure the voltage on the (R56) Passenger Seat Belt Tensioner Line 1 circuit between the Passenger Seat Belt Tensioner harness connector and ground.



Measure the voltage on the (R54) Passenger Seat Belt Tensioner Line 2 circuits between the Passenger Seat Belt Tensioner harness connector and ground.

Is there any voltage on either circuit?

Yes >> Repair (R56) Passenger Seat Belt Tensioner Line 1 or (R54) Passenger Seat Belt Tensioner Line 2 shorted to battery.
Perform AIRBAG VERIFICATION TEST - VER 1

No >> Go to 4

B1B2D-1st ROW PASSENGER SEAT BELT PRETENSIONER CIRCUIT HIGH (CONTINUED)

4. OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the Airbag Control Module is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1

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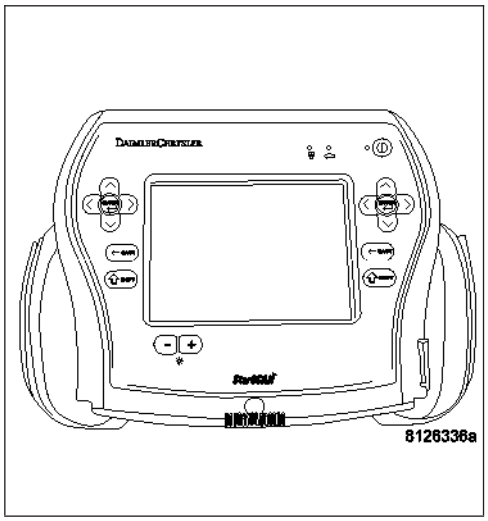
5. STORED ORC DTC

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

IF only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

Are any ACTIVE DTCs present?

Yes >> Select appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer

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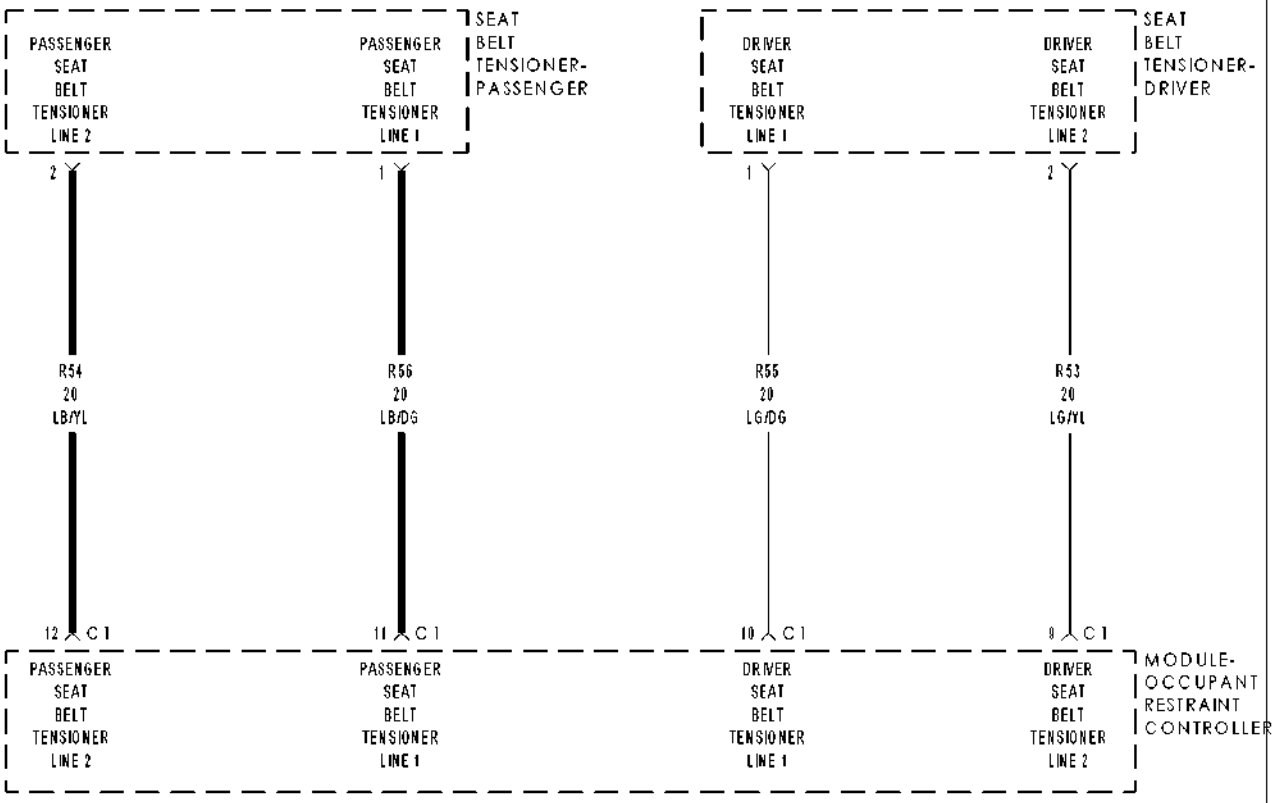
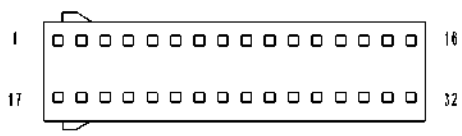
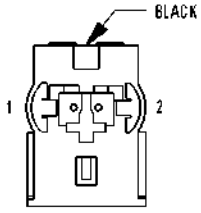
B1B2E-1st ROW PASSENGER SEAT BELT PRETENSIONER CIRCUIT OPEN

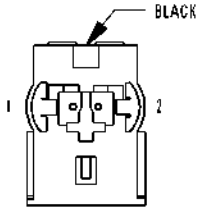




MODULE-OCCUPANT RESTRAINT CONTROLLER C1



SEAT BELT-TENSIONER-DRIVER



SEAT BELT-TENSIONER-PASSENGER

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B1B2E-1st ROW PASSENGER SEAT BELT PRETENSIONER CIRCUIT OPEN (CONTINUED)

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the ORC monitors the resistance of the Passenger Seat Belt Tensioner circuits.
- **Set Condition:**
  The ORC has detected open circuit or high resistance in the Passenger Seat Belt Tensioner circuits.

Possible Causes
(R56) PASSENGER SEAT BELT TENSIONER LINE 1 OR (R54) PASSENGER SEAT BELT TENSIONER LINE 1 CIRCUIT OPEN
PASSENGER SEAT BELT TENSIONER
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure the battery is fully charged.

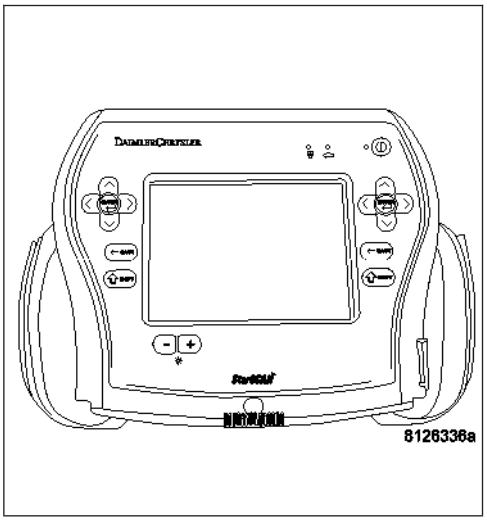
NOTE: The Scan Tool and SRS Airbag Load Tool MRL 8443 are required to perform the following test.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.
Select Active or Stored DTC.

Is the DTC active or stored?

ORC - ACTIVE DTC
Go To 2

ORC - STORED DTC
Go To 5



B1B2E-1st ROW PASSENGER SEAT BELT PRETENSIONER CIRCUIT OPEN (CONTINUED)

2. PASSENGER SEAT BELT PRETENSIONER CIRCUIT OPEN

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Passenger Airbag connector(s).

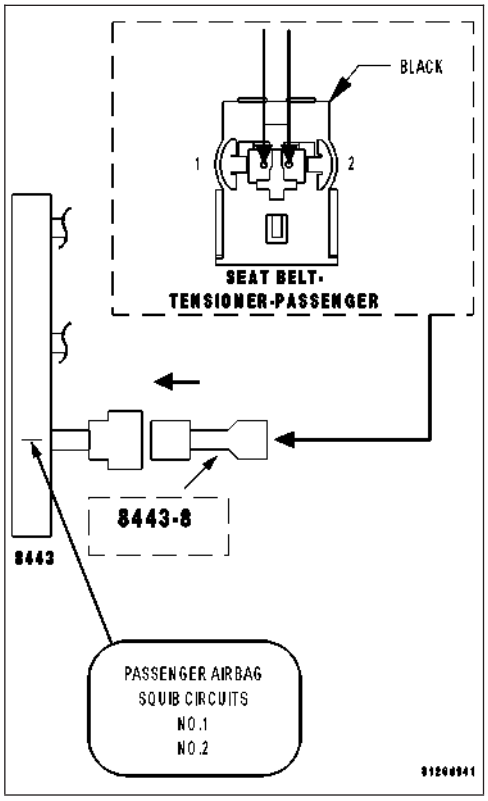
NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool and appropriate Jumper to the Passenger Seat Belt Tensioner harness connector(s).

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, read the active Occupant Restraint Controller DTC's.

Does the scan tool display 1st ROW PASSENGER SEAT BELT PRETENSIONER CIRCUIT OPEN?

Yes >> Go to 3

No >> Replace the Passenger Seat Belt Tensioner in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1



3. (R56) PASSENGER SEAT BELT TENSIONER LINE 1 OR (R54) PASSENGER SEAT BELT TENSIONER LINE 2 CIRCUIT OPEN

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool and Jumper from the Passenger Seat Belt Tensioner harness connector(s).

Disconnect the Occupant Restraint Controller harness connector(s).

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool ORC Adaptor to the ORC harness connector.

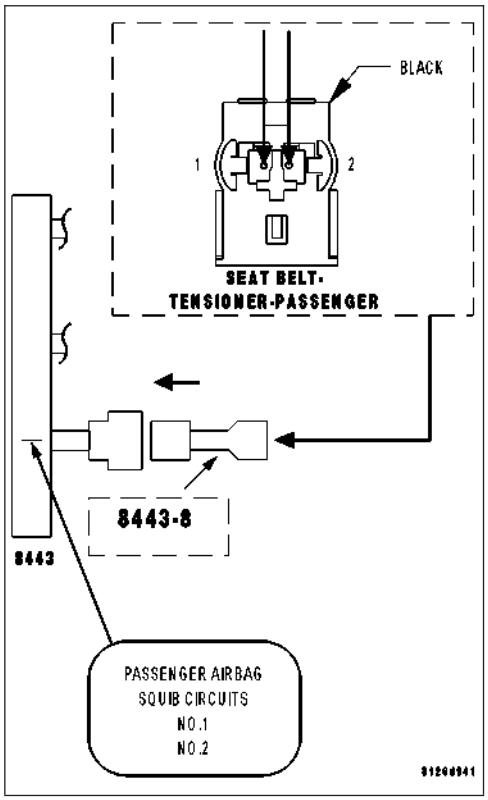
Measure the resistance of the (R56) Passenger Seat Belt Tensioner Line 1 between the Passenger Seat Belt Tensioner harness connector and the 8443 ORC Adaptor.

Measure the resistance of the (R54) Passenger Seat Belt Tensioner Line 2 between the Passenger Seat Belt Tensioner harness connector and the 8443 ORC Adaptor.

Is the resistance below 1.0 ohm on both circuits?

Yes >> Repair open or high resistance in (R56) Passenger Seat Belt Tensioner Line 1 or (R54) Passenger Seat Belt Tensioner Line 2.
Perform AIRBAG VERIFICATION TEST - VER 1

No >> Go to 4



B1B2E-1st ROW PASSENGER SEAT BELT PRETENSIONER CIRCUIT OPEN (CONTINUED)

4. OCCUPANT RESTRAINT CONTROLLER

WARNING: If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.
Disconnect the 8443 Load Tool ORC Adaptor from the ORC harness connector.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1

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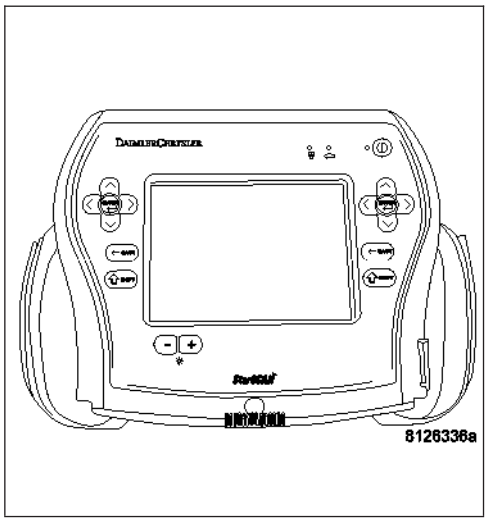
5. STORED ORC DTC

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

IF only stored codes return continue the test until the problem area has been isolated.

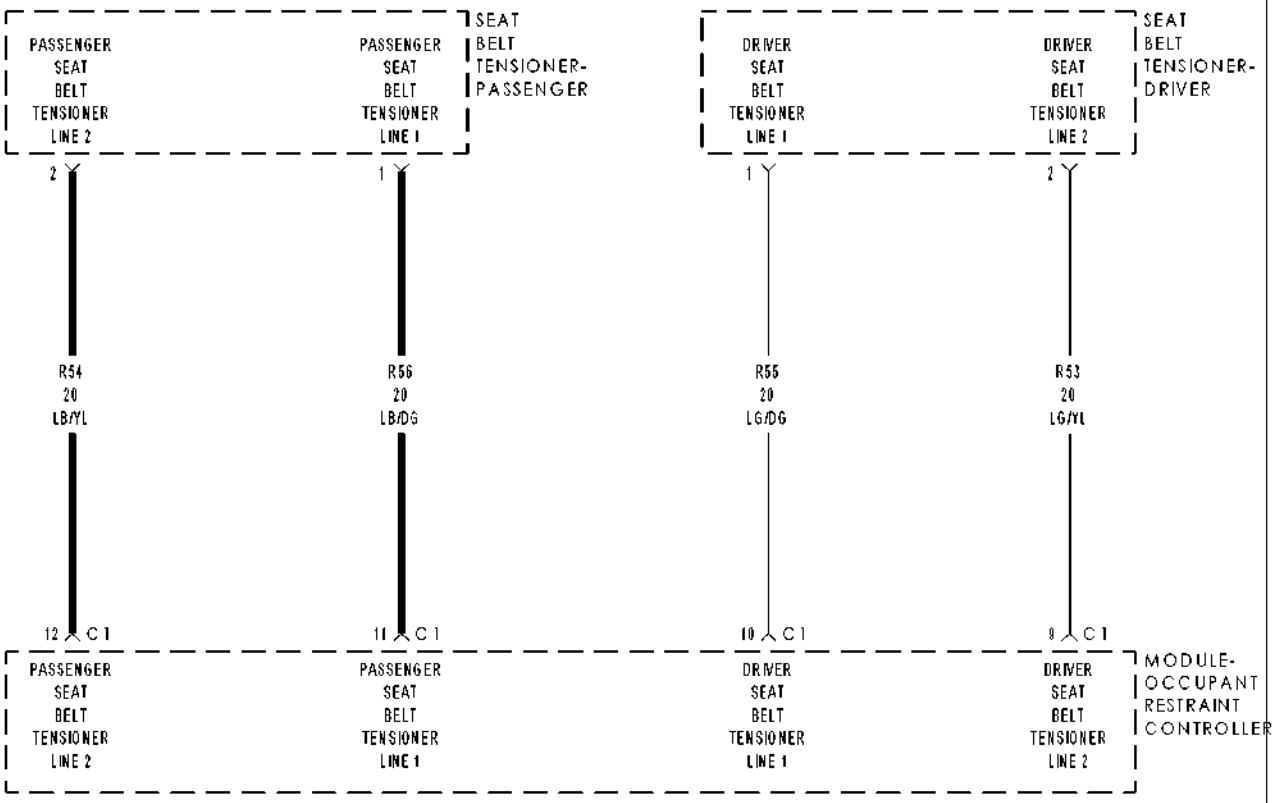
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

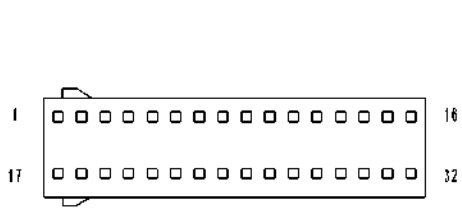
Are any ACTIVE DTCs present?

Yes >> Select appropriate symptom from Symptom List.

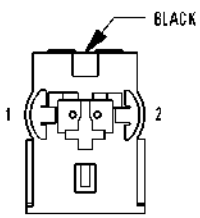
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B2F-1st ROW PASSENGER SEAT BELT PRETENSIONS CIRCUIT SHORT TOGETHER

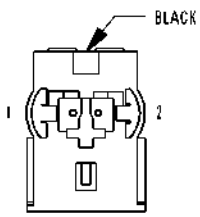




MODULE-OCCUPANT RESTRAINT CONTROLLER C1



SEAT BELT-TENSIONER-DRIVER



SEAT BELT-TENSIONER-PASSENGER

812adf93e

B1B2F-1st ROW PASSENGER SEAT BELT PRETENSIONS CIRCUIT SHORT TOGETHER (CONTINUED)

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the ORC monitors the resistance of the Passenger Seat Belt Tensioner circuits.
- **Set Condition:**
  The ORC has detected low resistance between the Passenger Seat Belt Tensioner circuits.

Possible Causes
(R56) PASSENGER SEAT BELT TENSIONER LINE 1 SHORTED TO (R54) PASSENGER SEAT BELT TENSIONER LINE 2
PASSENGER SEAT BELT TENSIONER
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. DETERMINE ACTIVE OR STORED DTC

NOTE: Ensure the battery is fully charged.

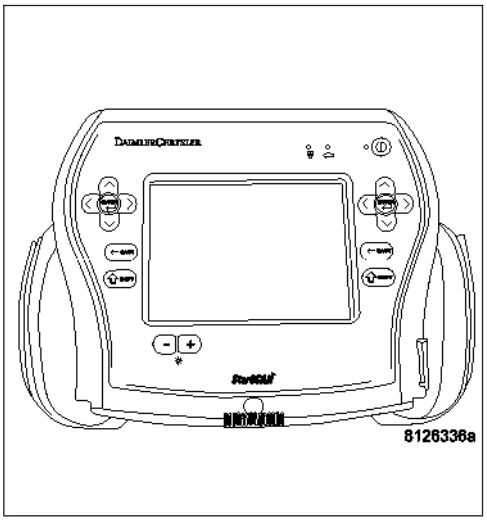
NOTE: The Scan Tool, SRS Airbag Load Tool MRL 8443 and DVOM are required to perform the following test.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.
Select Active or Stored DTC.

Is the DTC active or stored?

ORC - ACTIVE DTC
Go To 2

ORC - STORED DTC
Go To 5



B1B2F-1st ROW PASSENGER SEAT BELT PRETENSIONS CIRCUIT SHORT TOGETHER (CONTINUED)

2. PASSENGER SEAT BELT TENSIONER SHORTED TOGETHER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Passenger Seat Belt Tensioner harness connector(s).

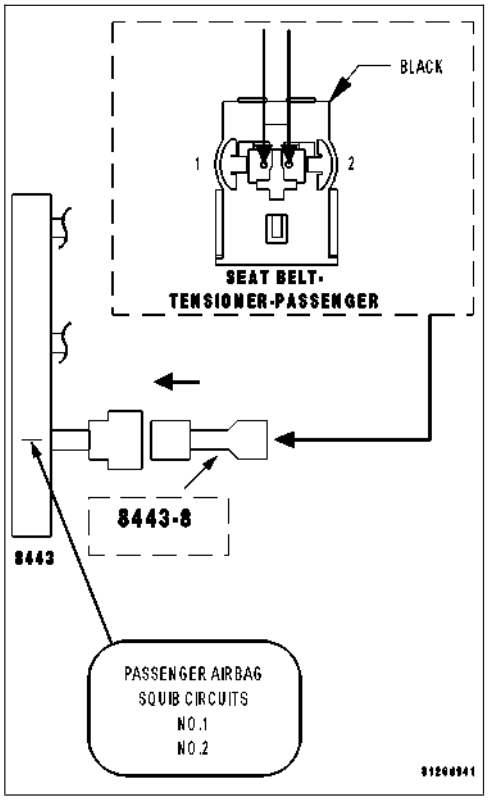
NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool and appropriate Jumper to the Passenger Airbag connector(s).

WARNING: To avoid personal injury or death, turn the ignition on then reconnect the battery.
With the scan tool, read the active Occupant Restraint Controller DTC's.

Does the scan tool display 1st ROW PASSENGER SEAT BELT PRETENSIONER CIRCUIT SHORT TOGETHER?

Yes >> Go to 3

No >> Replace the Passenger Seat Belt Tensioner in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1



3. (R56) PASSENGER SEAT BELT TENSIONER LINE 1 SHORTED TO (R54) PASSENGER SEAT BELT TENSIONER LINE 2

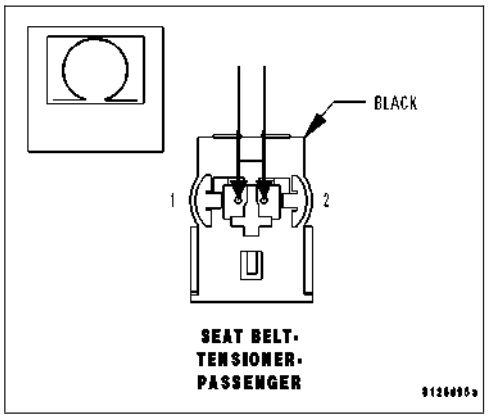
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the 8443 Load Tool and Jumper from the Passenger Seat Belt Tensioner harness connector(s).

Disconnect the Occupant Restraint Controller harness connector(s).

NOTE: Check connectors - Clean and repair as necessary.
Connect the 8443 Load Tool ORC Adaptor to the ORC harness connector.

Measure the resistance between the (R56) Passenger Seat Belt Tensioner Line 1 and (R54) Passenger Seat Belt Tensioner Line 2 at the Passenger Seat Belt Tensioner harness connector.

Is the resistance below 10K ohms?



Yes >> Repair the (R56) Passenger Seat Belt Tensioner Line 1 shorted to the (R54) Passenger Seat Belt Tensioner Line 2 circuit.
Perform AIRBAG VERIFICATION TEST - VER 1

No >> Go to 4

B1B2F-1st ROW PASSENGER SEAT BELT PRETENSIONS CIRCUIT SHORT TOGETHER (CONTINUED)

4. OCCUPANT RESTRAINT CONTROLLER

WARNING: If the Airbag Control Module is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

If there are no possible causes remaining, view repair.

Repair

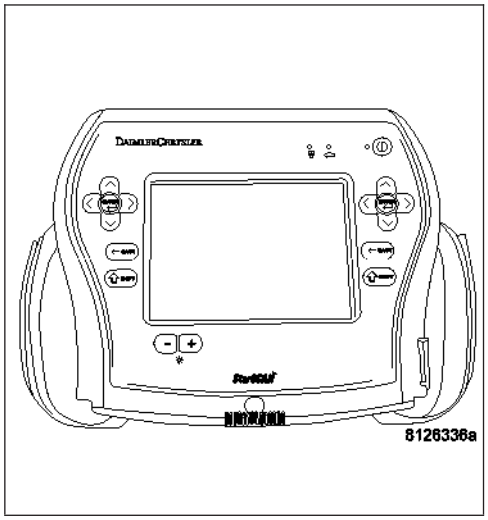
Replace the Occupant Restraint Controller in accordance with Service Information.
Perform AIRBAG VERIFICATION TEST - VER 1

---

5. STORED ORC DTC

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

IF only stored codes return continue the test until the problem area has been isolated.

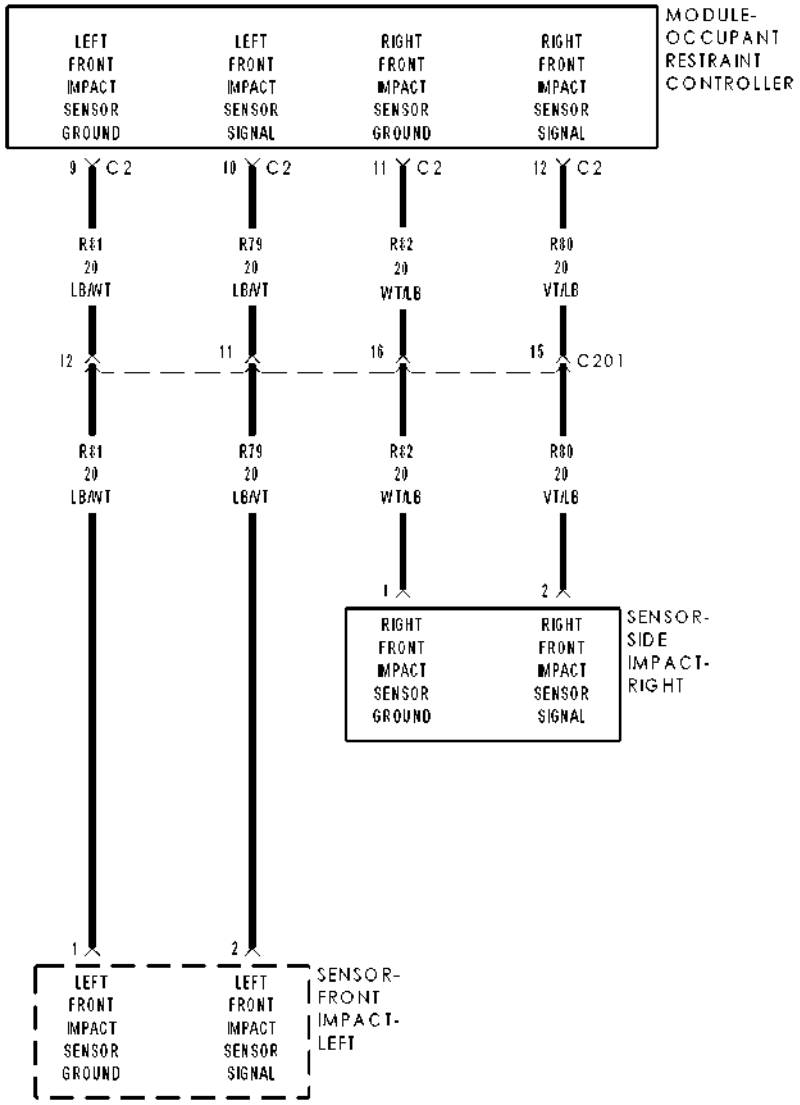
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

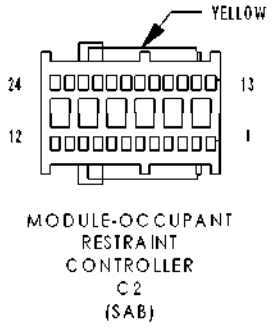
Are any ACTIVE DTC's present?

Yes >> Select appropriate symptom from Symptom List.

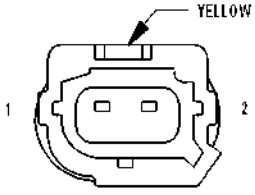
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B70-UP-FRONT LEFT SATELLITE ACCELERATION SENSOR INTERNAL

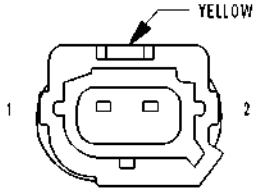




MODULE-OCCUPANT
RESTRAINT
CONTROLLER
C2
(SAB)



SENSOR-FRONT
IMPACT-LEFT



SENSOR-FRONT
IMPACT-RIGHT

812cb7fb

B1B70-UP-FRONT LEFT SATELLITE ACCELERATION SENSOR INTERNAL (CONTINUED)

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the Front Left Impact Sensor is equipped with on board diagnostics to monitor to sensor's internal circuits. If a problem is identified, the sensor sends the Front Left Impact Sensor Internal message to the Occupant Restraint Controller (ORC).
- **Set Condition:**
  This DTC will set if the ORC receives an internal DTC from the Front Left Impact Sensor.

Possible Causes
FRONT LEFT IMPACT SENSOR
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. DETERMINE ACTIVE OR STORED FAULT CODE

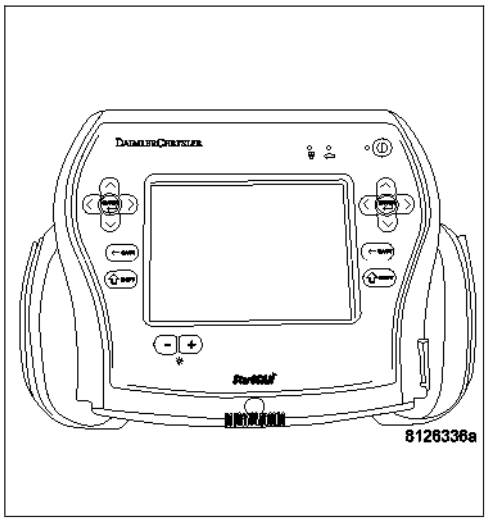
NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.
Turn the ignition on.

Select the appropriate module and DTC type combination:

ORC - ACTIVE DTC
Go To 2

ORC - STORED DTC
Go To 4



B1B70-UP-FRONT LEFT SATELLITE ACCELERATION SENSOR INTERNAL (CONTINUED)

2. VERIFY OPERATION OF THE FRONT LEFT IMPACT SENSOR

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Replace the Front Left Impact Sensor.

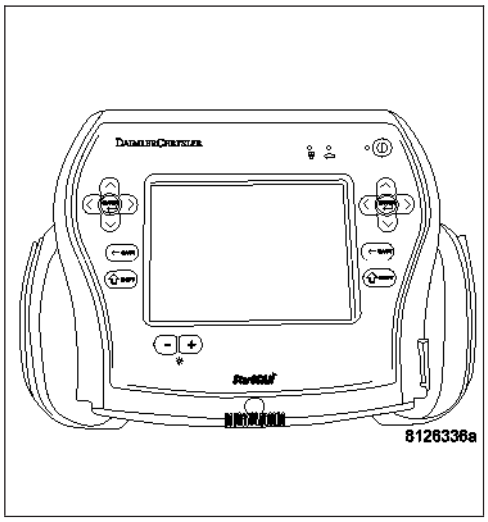
Reconnect the vehicle wire harness to the sensor.

Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
Use the scan tool and erase the stored codes in all airbag system modules.

Turn the Ignition Off, and wait 15 seconds before turning the Ignition On.

Wait one minute, and read active codes.



Did the active Front Left Impact Sensor Internal DTC return?

Yes >> Go To 3

No >> Repair is complete.
Perform the ORC VERIFICATION TEST - VER 1.

---

3. REPLACE THE OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Instructions.
Perform the ORC VERIFICATION TEST - VER 1.

B1B70-UP-FRONT LEFT SATELLITE ACCELERATION SENSOR INTERNAL (CONTINUED)

4. TEST FOR AN INTERMITTENT CONDITION

With the scan tool, record and erase all DTC's from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

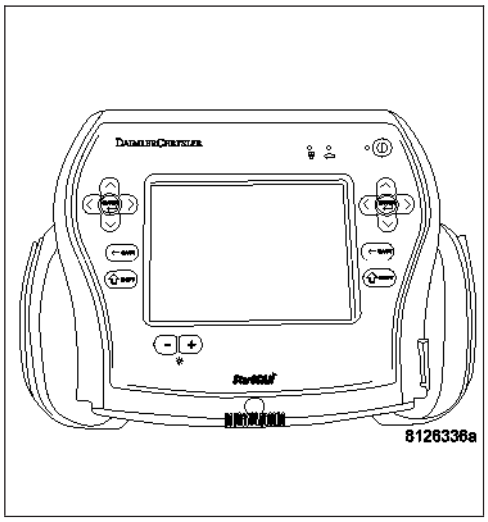
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.



WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return continue the test until the problem area has been isolated.

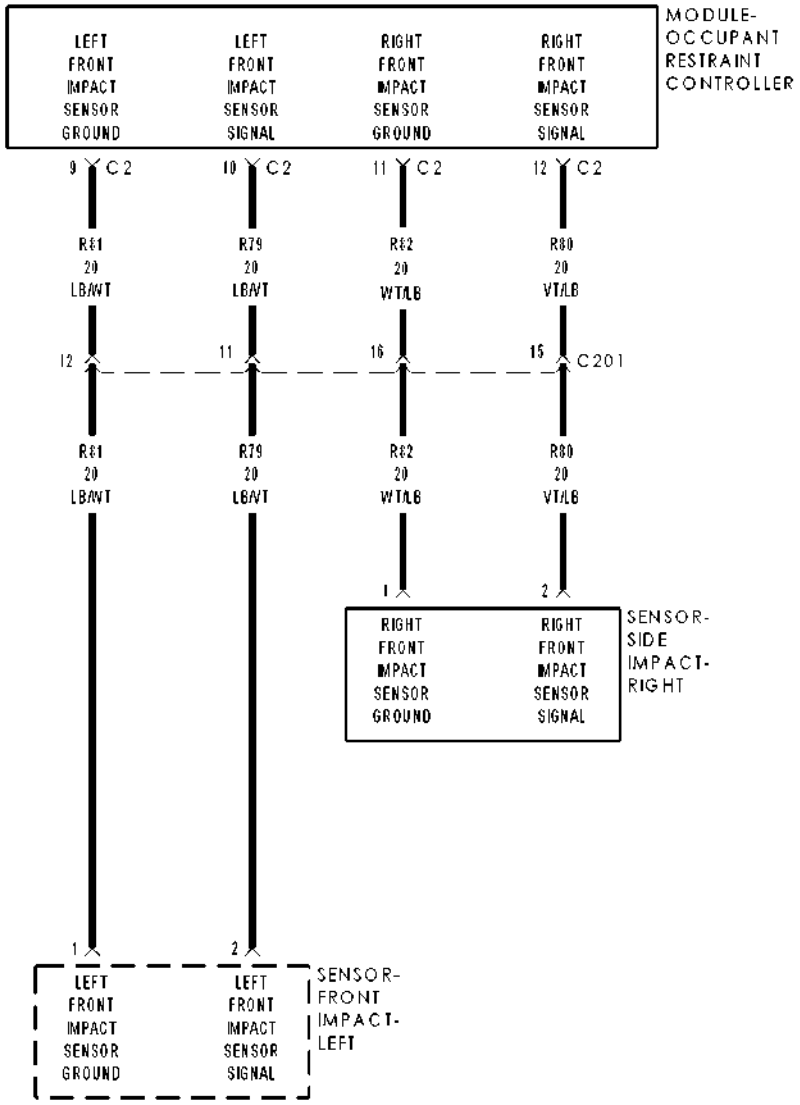
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

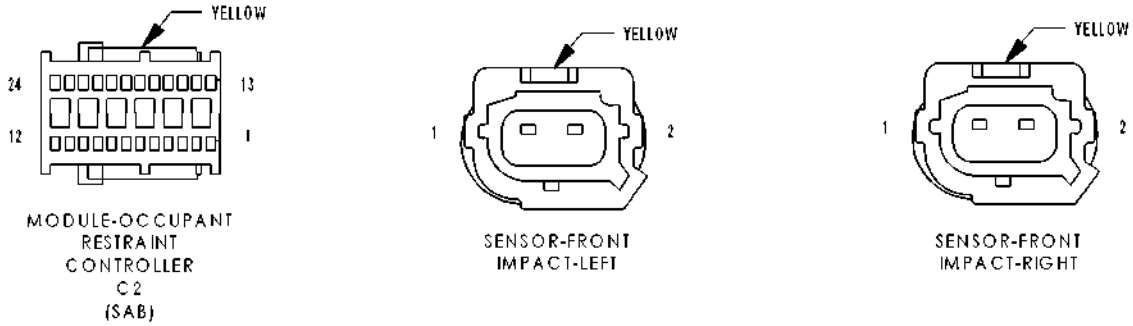
Are any ACTIVE DTCs present?

Yes >> Select appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B71-UP-FRONT RIGHT SATELLITE ACCELERATION SENSOR INTERNAL





B1B71-UP-FRONT RIGHT SATELLITE ACCELERATION SENSOR INTERNAL (CONTINUED)

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the Front Right Impact Sensor is equipped with on board diagnostics to monitor to sensor's internal circuits. If a problem is identified, the sensor sends the Front Right Impact Sensor Internal message to the Occupant Restraint Controller (ORC).
- **Set Condition:**
  This DTC will set if the ORC receives an internal DTC from the Front Right Impact Sensor.

Possible Causes
FRONT RIGHT IMPACT SENSOR
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. DETERMINE ACTIVE OR STORED FAULT CODE

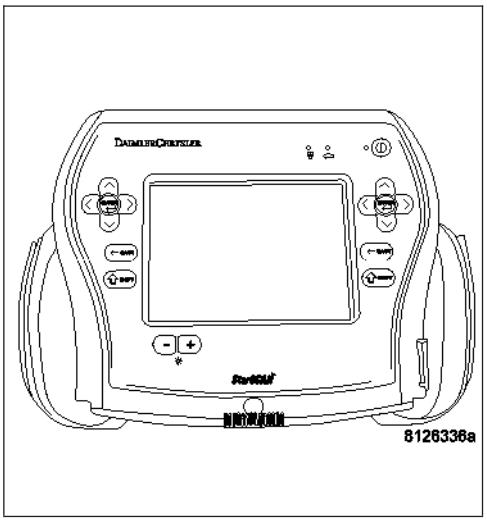
NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.
Turn the ignition on.

Select the appropriate module and DTC type combination:

ORC - ACTIVE DTC
Go To 2

ORC - STORED DTC
Go To 4



B1B71-UP-FRONT RIGHT SATELLITE ACCELERATION SENSOR INTERNAL (CONTINUED)

2. VERIFY OPERATION OF THE FRONT RIGHT IMPACT SENSOR

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Replace the Front Right Impact Sensor.

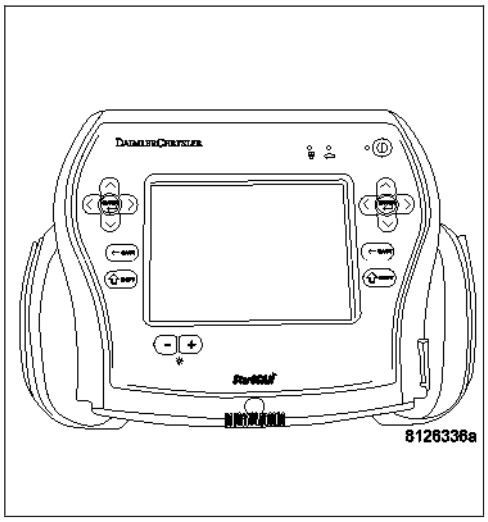
Reconnect the vehicle wire harness to the sensor.

Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
Use the scan tool and erase the stored codes in all airbag system modules.

Turn the Ignition Off, and wait 15 seconds before turning the Ignition On.

Wait one minute, and read active codes.



Did the active Front Right Impact Sensor Internal DTC return?

Yes >> Go To 3

No >> Repair is complete.
Perform the ORC VERIFICATION TEST - VER 1.

---

3. REPLACE THE OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Instructions.
Perform the ORC VERIFICATION TEST - VER 1.

B1B71-UP-FRONT RIGHT SATELLITE ACCELERATION SENSOR INTERNAL (CONTINUED)

4. TEST FOR AN INTERMITTENT CONDITION

With the scan tool, record and erase all DTC's from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

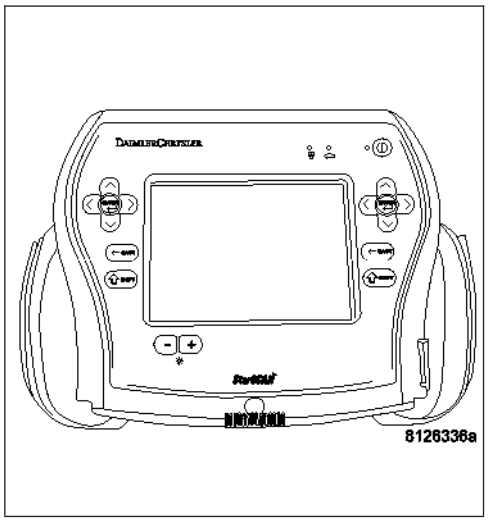
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.



WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return continue the test until the problem area has been isolated.

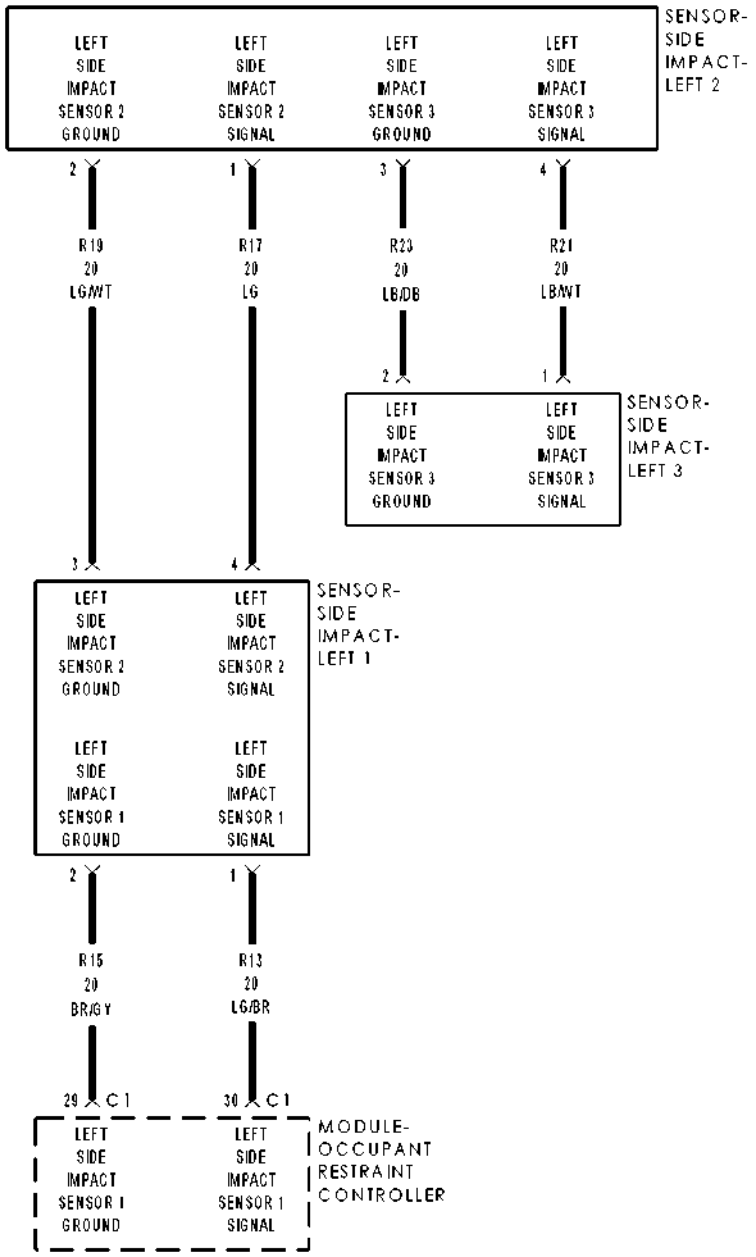
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

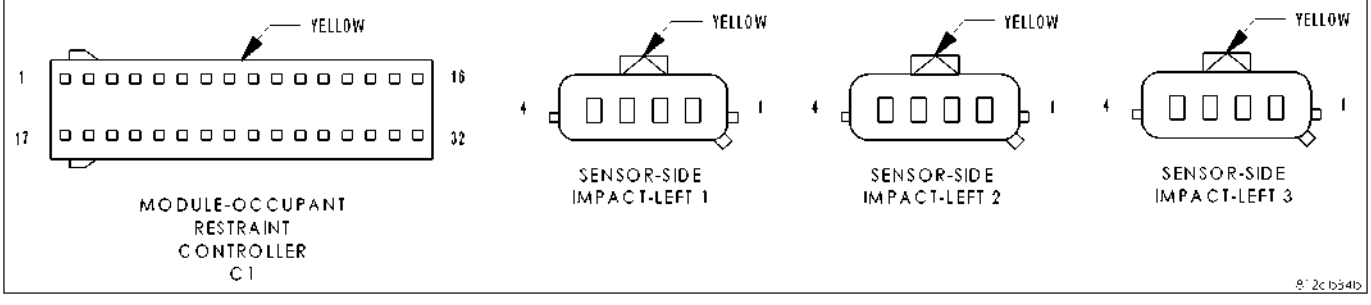
Are any ACTIVE DTCs present?

Yes >> Select appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B72-LEFT SIDE SATELLITE ACCELERATION SENSOR 1 INTERNAL





B1B72-LEFT SIDE SATELLITE ACCELERATION SENSOR 1 INTERNAL (CONTINUED)

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the Left Side Impact Sensor 1 is equipped with on board diagnostics to monitor to sensor's internal circuits. If a problem is identified, the sensor sends the Left Side Impact Sensor 1 Internal message to the Occupant Restraint Controller (ORC).
- **Set Condition:**
  This DTC will set if the ORC receives an internal DTC from the Left Side Impact Sensor 1.

Possible Causes
LEFT SIDE IMPACT SENSOR 1
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. DETERMINE ACTIVE OR STORED FAULT CODE

Turn the ignition on.

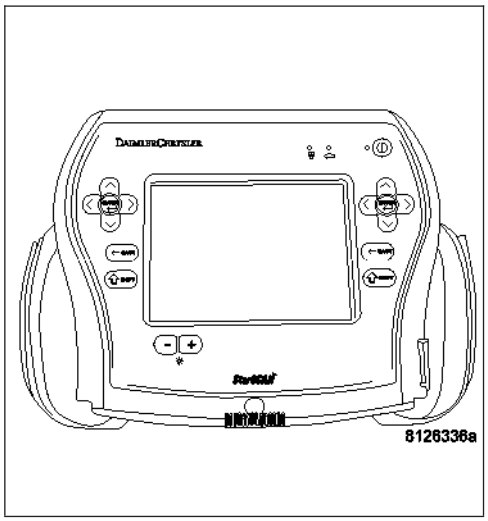
NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

Select the appropriate module and DTC type combination:

ORC - ACTIVE DTC
Go To 2

ORC - STORED DTC
Go To 4



B1B72-LEFT SIDE SATELLITE ACCELERATION SENSOR 1 INTERNAL (CONTINUED)

2. VERIFY OPERATION OF THE LEFT SIDE IMPACT SENSOR 1.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Replace the Left Side Impact Sensor 1.

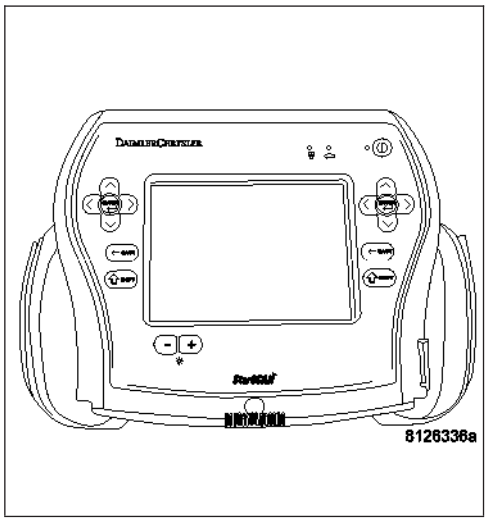
Reconnect the vehicle wire harness to the sensor.

Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
Use the scan tool and erase the stored codes in all airbag system modules.

Turn the Ignition Off, and wait 15 seconds before turning the Ignition On.

Wait one minute, and read active codes.



Did the active Left Side Impact Sensor 1 DTC return?

Yes >> Go To 3

No >> Repair is complete.
Perform the ORC VERIFICATION TEST - VER 1.

---

3. REPLACE THE OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Instructions.
Perform the ORC VERIFICATION TEST - VER 1.

B1B72-LEFT SIDE SATELLITE ACCELERATION SENSOR 1 INTERNAL (CONTINUED)

4. TEST FOR AN INTERMITTENT CONDITION

With the scan tool, record and erase all DTC's from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

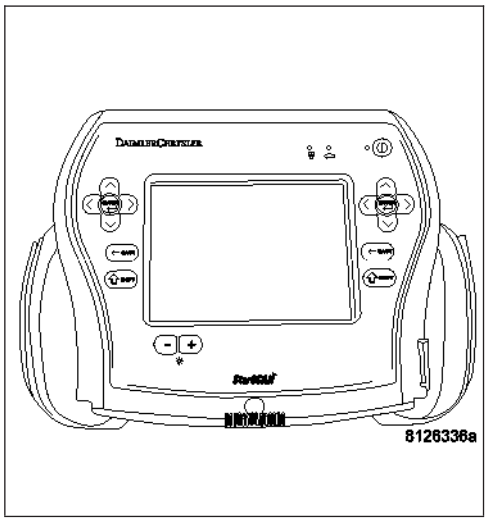
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.



WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return continue the test until the problem area has been isolated.

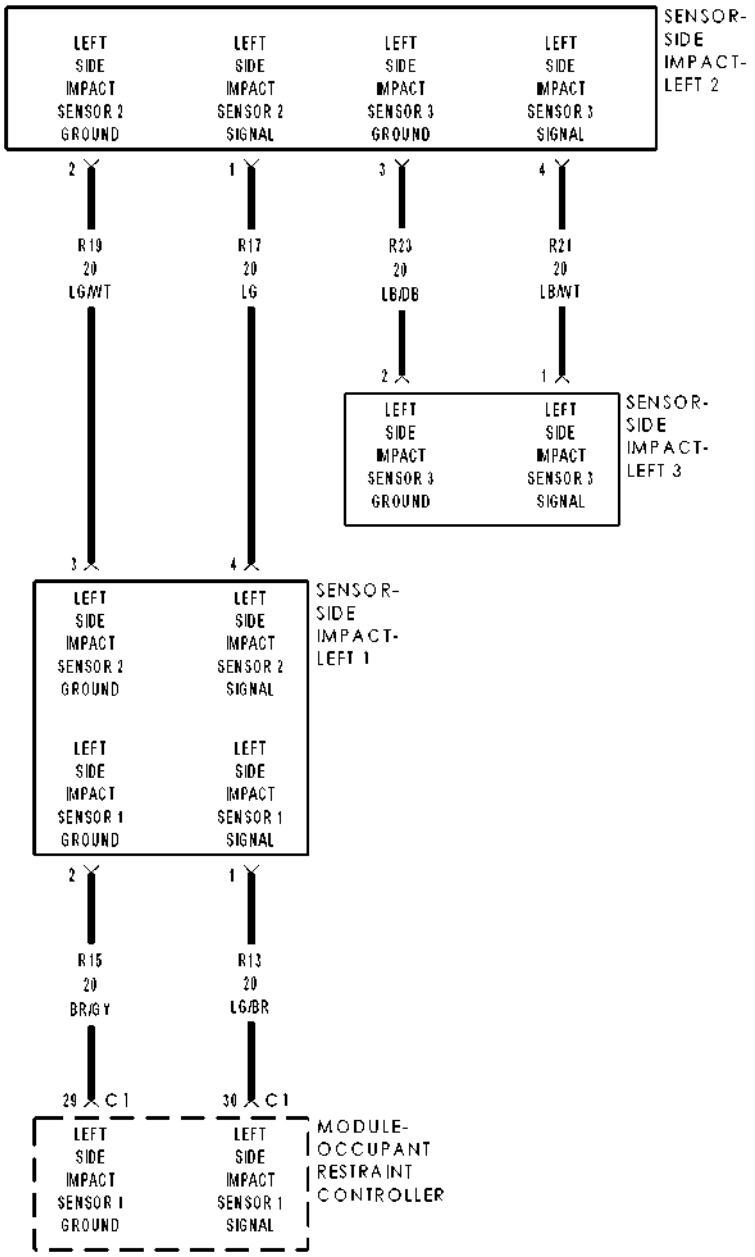
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

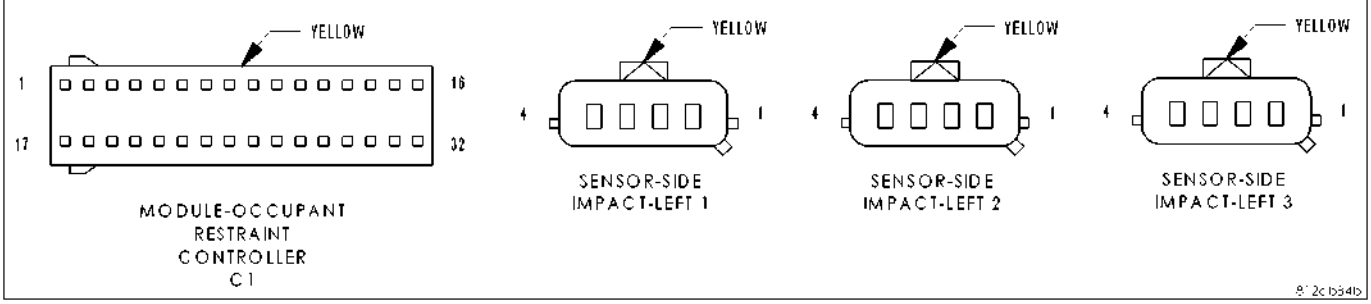
Are any ACTIVE DTCs present?

Yes >> Select appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B73-LEFT SIDE SATELLITE ACCELERATION SENSOR 2 INTERNAL





B1B73-LEFT SIDE SATELLITE ACCELERATION SENSOR 2 INTERNAL (CONTINUED)

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the Left Side Impact Sensor 2 is equipped with on board diagnostics to monitor to sensor's internal circuits. If a problem is identified, the sensor sends the Left Side Impact Sensor 2 Internal message to the Occupant Restraint Controller (ORC).
- **Set Condition:**
  This DTC will set if the ORC receives an internal DTC from the Left Side Impact Sensor 2.

Possible Causes
LEFT SIDE IMPACT SENSOR 2
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. DETERMINE ACTIVE OR STORED FAULT CODE

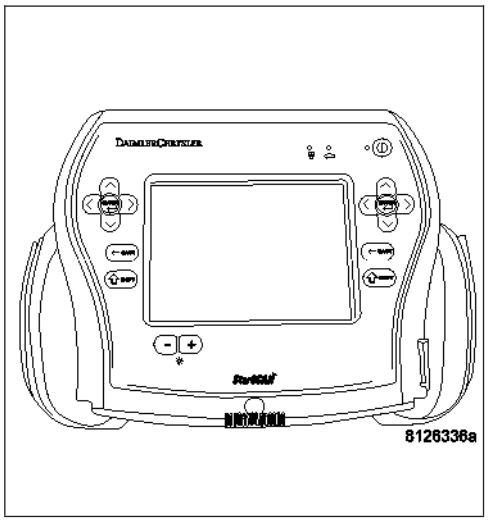
NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.
Turn the ignition on.

Select the appropriate module and DTC type combination:

ORC - ACTIVE DTC
Go To 2

ORC - STORED DTC
Go To 4



B1B73-LEFT SIDE SATELLITE ACCELERATION SENSOR 2 INTERNAL (CONTINUED)

2. VERIFY OPERATION OF THE LEFT SIDE IMPACT SENSOR 2

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Replace the Left Side Impact Sensor 2.

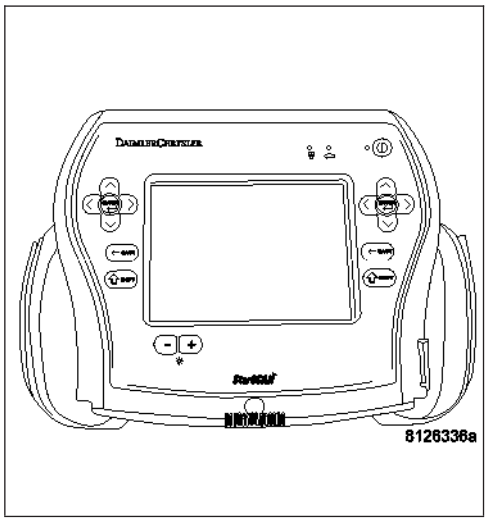
Reconnect the vehicle wire harness to the sensor.

Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
Use the scan tool and erase the stored codes in all airbag system modules.

Turn the Ignition Off, and wait 15 seconds before turning the Ignition On.

Wait one minute, and read active codes.



Did the active Left Side Impact Sensor 2 DTC return?

Yes >> Go To 3

No >> Repair is complete.
Perform the ORC VERIFICATION TEST - VER 1.

---

3. REPLACE THE OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Instructions.
Perform the ORC VERIFICATION TEST - VER 1.

B1B73-LEFT SIDE SATELLITE ACCELERATION SENSOR 2 INTERNAL (CONTINUED)

4. TEST FOR AN INTERMITTENT CONDITION

With the scan tool, record and erase all DTC's from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

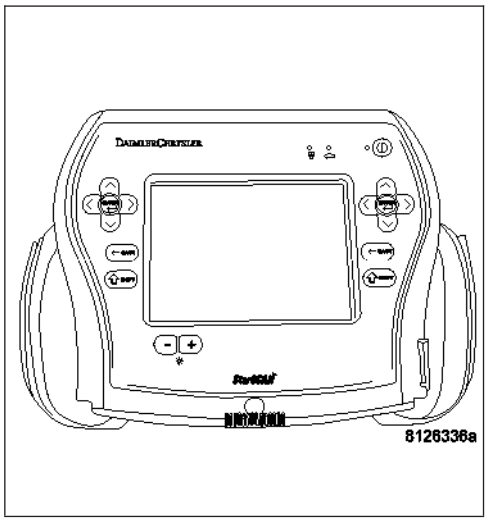
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.



WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return continue the test until the problem area has been isolated.

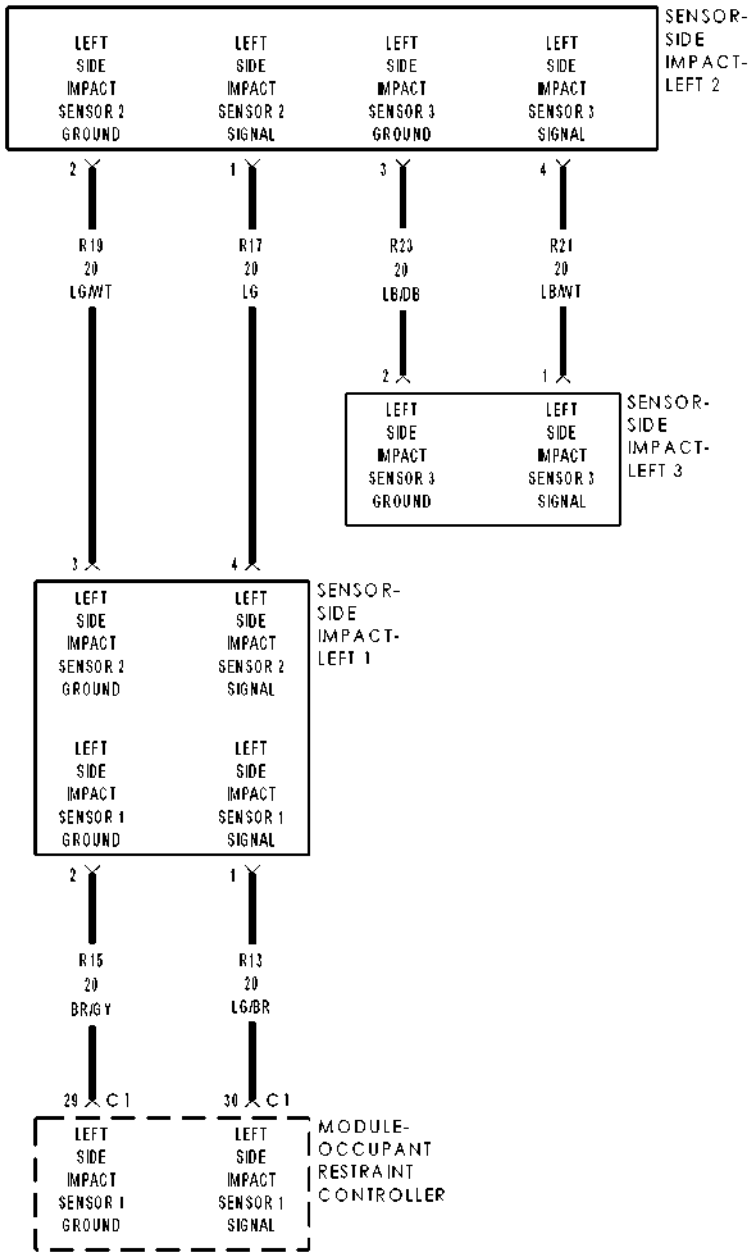
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

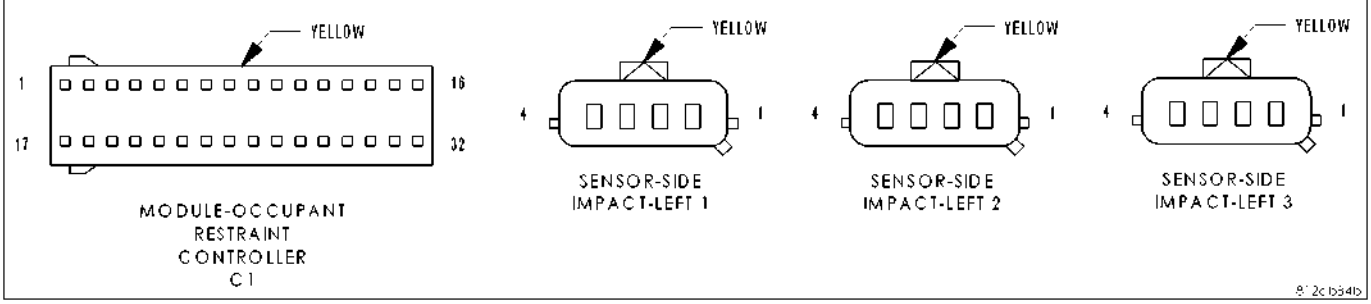
Are any ACTIVE DTCs present?

Yes >> Select appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B74-LEFT SIDE SATELLITE ACCELERATION SENSOR 3 INTERNAL





B1B74-LEFT SIDE SATELLITE ACCELERATION SENSOR 3 INTERNAL (CONTINUED)

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the Left Side Impact Sensor 3 is equipped with on board diagnostics to monitor to sensor's internal circuits. If a problem is identified, the sensor sends the Left Side Impact Sensor 3 Internal message to the Occupant Restraint Controller (ORC).
- **Set Condition:**
  This DTC will set if the ORC receives an internal DTC from the Left Side Impact Sensor 3.

Possible Causes
LEFT SIDE IMPACT SENSOR 3
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. DETERMINE ACTIVE OR STORED FAULT CODE

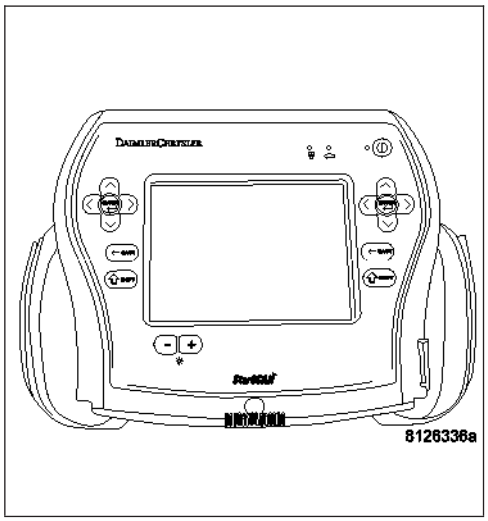
NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.
Turn the ignition on.

Select the appropriate module and DTC type combination:

ORC - ACTIVE DTC
Go To 2

ORC - STORED DTC
Go To 4



B1B74-LEFT SIDE SATELLITE ACCELERATION SENSOR 3 INTERNAL (CONTINUED)

2. VERIFY OPERATION OF THE LEFT SIDE IMPACT SENSOR 3

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Replace the Left Side Impact Sensor 3.

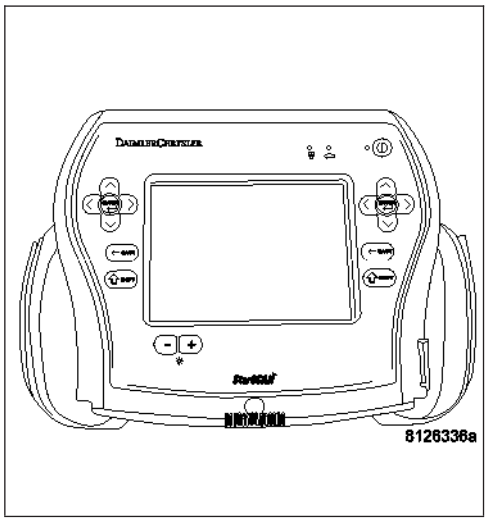
Reconnect the vehicle wire harness to the sensor.

Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
Use the scan tool and erase the stored codes in all airbag system modules.

Turn the Ignition Off, and wait 15 seconds before turning the Ignition On.

Wait one minute, and read active codes.



Did the active Left Side Impact Sensor 3 DTC return?

Yes >> Go To 3

No >> Repair is complete.
Perform the ORC VERIFICATION TEST - VER 1.

---

3. REPLACE THE OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Instructions.
Perform the ORC VERIFICATION TEST - VER 1.

B1B74-LEFT SIDE SATELLITE ACCELERATION SENSOR 3 INTERNAL (CONTINUED)

4. TEST FOR AN INTERMITTENT CONDITION

With the scan tool, record and erase all DTC's from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

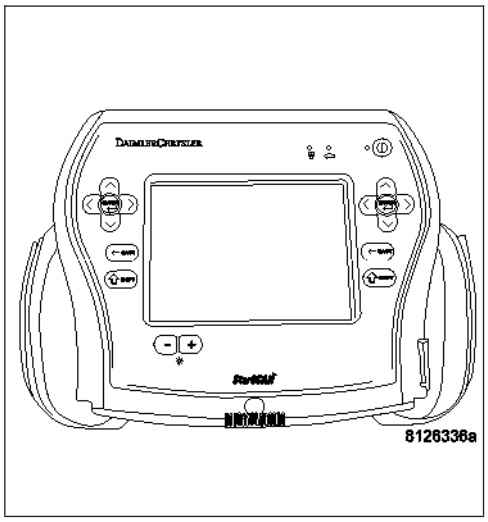
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.



WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return continue the test until the problem area has been isolated.

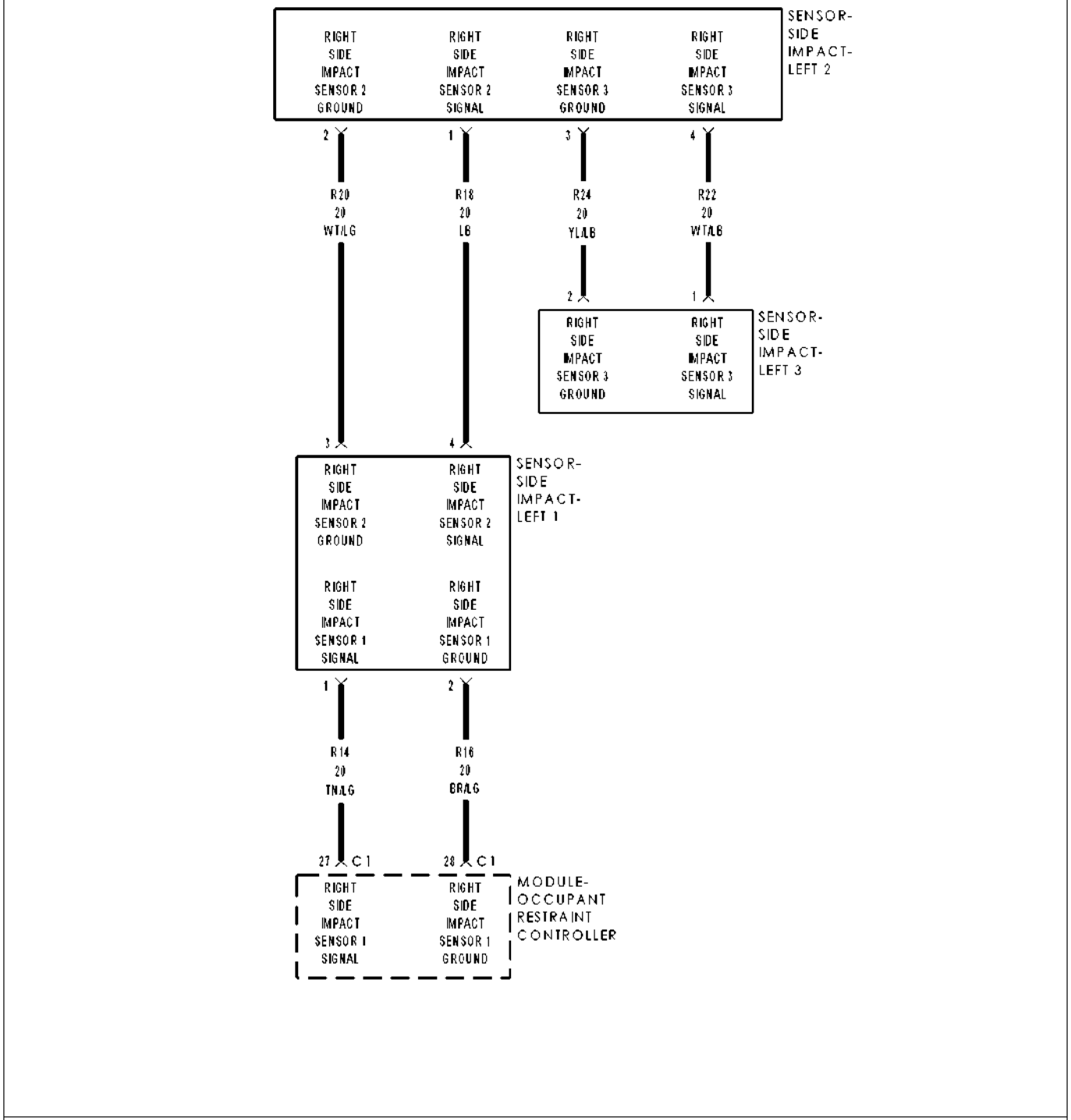
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

Are any ACTIVE DTCs present?

Yes >> Select appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B75-RIGHT SIDE SATELLITE ACCELERATION SENSOR 1 INTERNAL



B1B75-RIGHT SIDE SATELLITE ACCELERATION SENSOR 1 INTERNAL (CONTINUED)

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the Right Side Impact Sensor 1 is equipped with on board diagnostics to monitor to sensor's internal circuits. If a problem is identified, the sensor sends the Right Side Impact Sensor 1 Internal message to the Occupant Restraint Controller (ORC).
- **Set Condition:**
  This DTC will set if the ORC receives an internal DTC from the Right Side Impact Sensor 1.

Possible Causes
RIGHT SIDE IMPACT SENSOR 1
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. DETERMINE ACTIVE OR STORED FAULT CODE

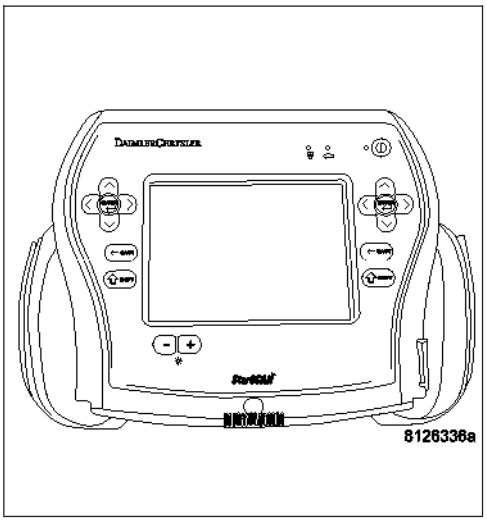
NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.
Turn the ignition on.

Select the appropriate module and DTC type combination:

ORC - ACTIVE DTC
Go To 2

ORC - STORED DTC
Go To 4



B1B75-RIGHT SIDE SATELLITE ACCELERATION SENSOR 1 INTERNAL (CONTINUED)

2. VERIFY OPERATION OF THE RIGHT SIDE IMPACT SENSOR 1

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Replace the Right Side Impact Sensor 1.

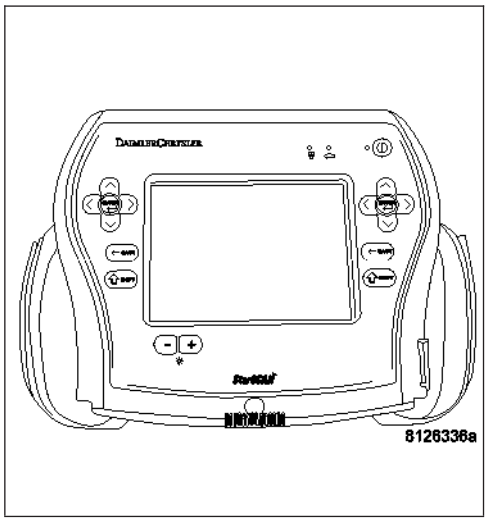
Reconnect the vehicle wire harness to the sensor.

Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
Use the scan tool and erase the stored codes in all airbag system modules.

Turn the Ignition Off, and wait 15 seconds before turning the Ignition On.

Wait one minute, and read active codes.



Did the active Right Side Impact Sensor 1 DTC return?

Yes >> Go To 3

No >> Repair is complete.
Perform the ORC VERIFICATION TEST - VER 1.

---

3. REPLACE THE OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Instructions.
Perform the ORC VERIFICATION TEST - VER 1.

B1B75-RIGHT SIDE SATELLITE ACCELERATION SENSOR 1 INTERNAL (CONTINUED)

4. TEST FOR AN INTERMITTENT CONDITION

With the scan tool, record and erase all DTC's from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

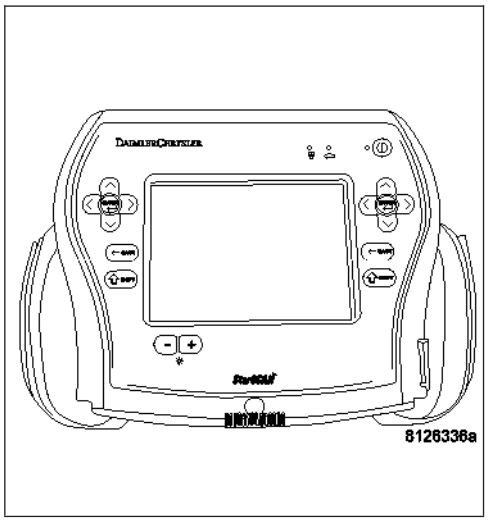
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.



WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return continue the test until the problem area has been isolated.

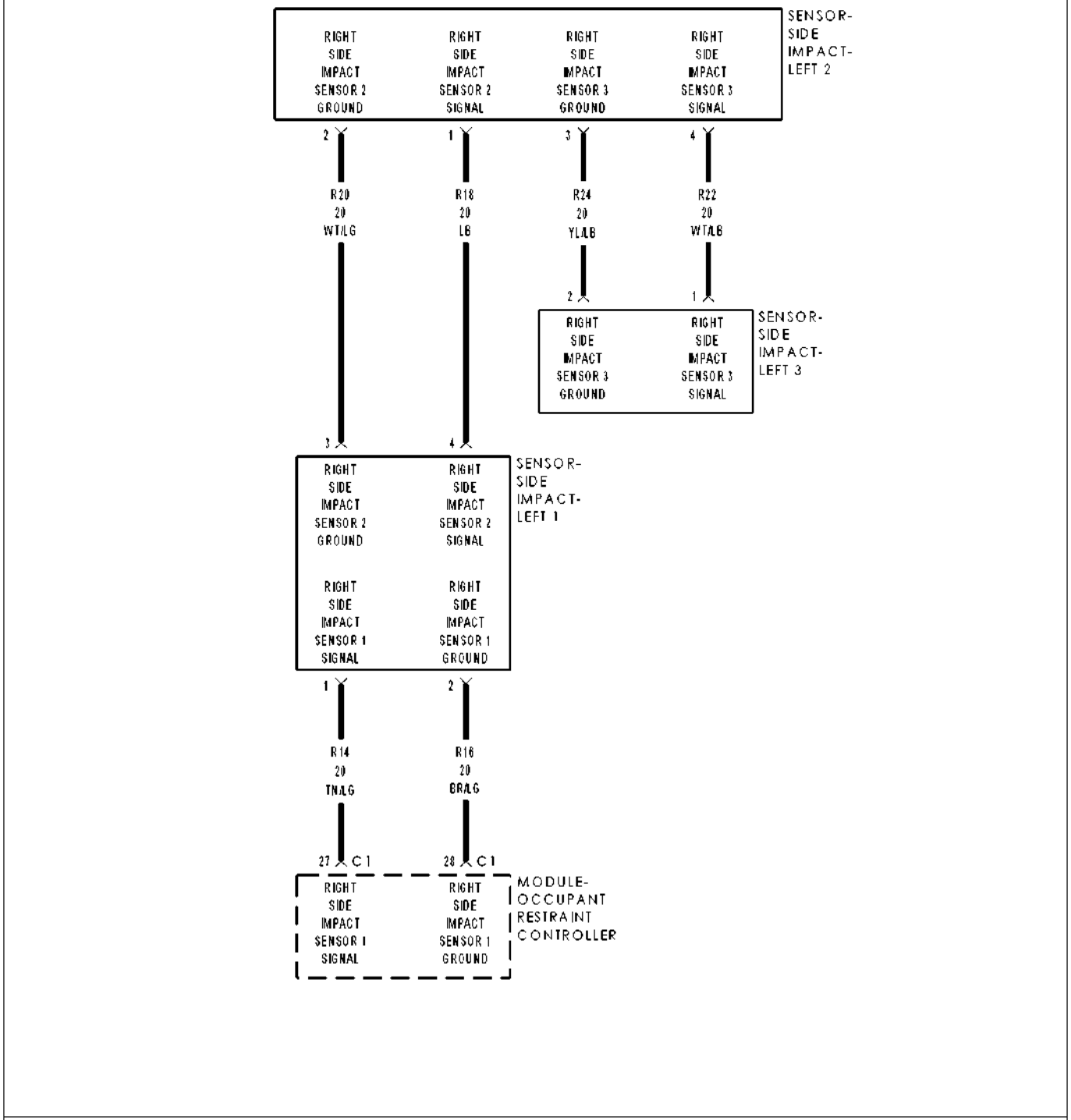
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

Are any ACTIVE DTCs present?

Yes >> Select appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B76-RIGHT SIDE SATELLITE ACCELERATION SENSOR 2 INTERNAL



B1B76-RIGHT SIDE SATELLITE ACCELERATION SENSOR 2 INTERNAL (CONTINUED)

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the Right Side Impact Sensor 2 is equipped with on board diagnostics to monitor to sensor's internal circuits. If a problem is identified, the sensor sends the Right Side Impact Sensor 2 Internal message to the Occupant Restraint Controller (ORC).
- **Set Condition:**
  This DTC will set if the ORC receives an internal DTC from the Right Side Impact Sensor 2.

Possible Causes
RIGHT SIDE IMPACT SENSOR 2
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. DETERMINE ACTIVE OR STORED FAULT CODE

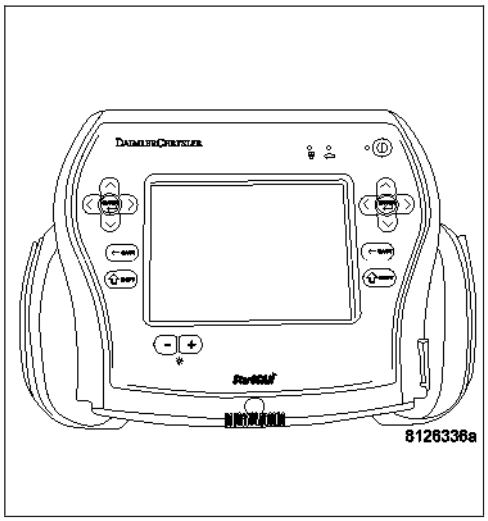
NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.
Turn the ignition on.

Select the appropriate module and DTC type combination:

ORC - ACTIVE DTC
Go To 2

ORC - STORED DTC
Go To 4



B1B76-RIGHT SIDE SATELLITE ACCELERATION SENSOR 2 INTERNAL (CONTINUED)

2. VERIFY OPERATION OF THE RIGHT SIDE IMPACT SENSOR 2

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Replace the Right Side Impact Sensor 2.

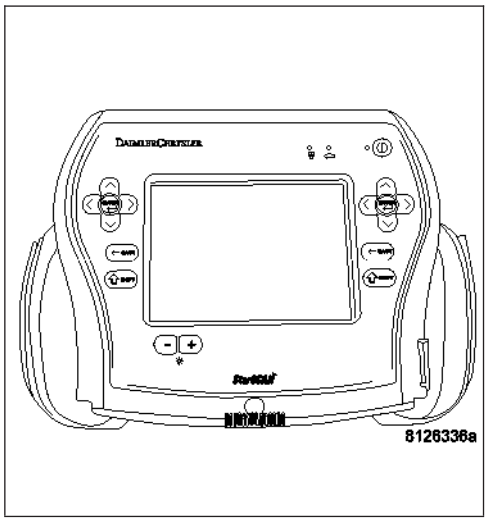
Reconnect the vehicle wire harness to the sensor.

Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
Use the scan tool and erase the stored codes in all airbag system modules.

Turn the Ignition Off, and wait 15 seconds before turning the Ignition On.

Wait one minute, and read active codes.



Did the active Right Side Impact Sensor 2 DTC return?

Yes >> Go To 3

No >> Repair is complete.
Perform the ORC VERIFICATION TEST - VER 1.

---

3. REPLACE THE OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Instructions.
Perform the ORC VERIFICATION TEST - VER 1.

B1B76-RIGHT SIDE SATELLITE ACCELERATION SENSOR 2 INTERNAL (CONTINUED)

4. TEST FOR AN INTERMITTENT CONDITION

With the scan tool, record and erase all DTC's from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

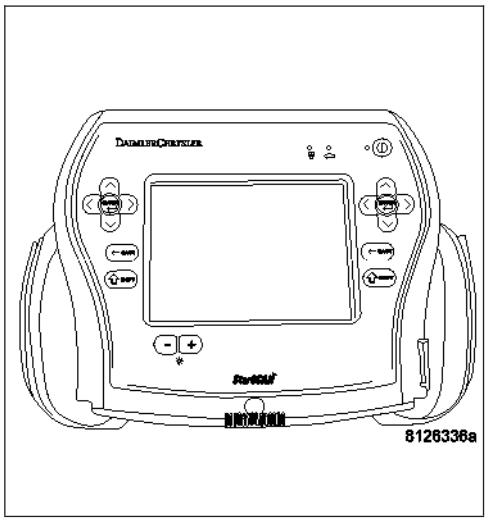
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.



WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return continue the test until the problem area has been isolated.

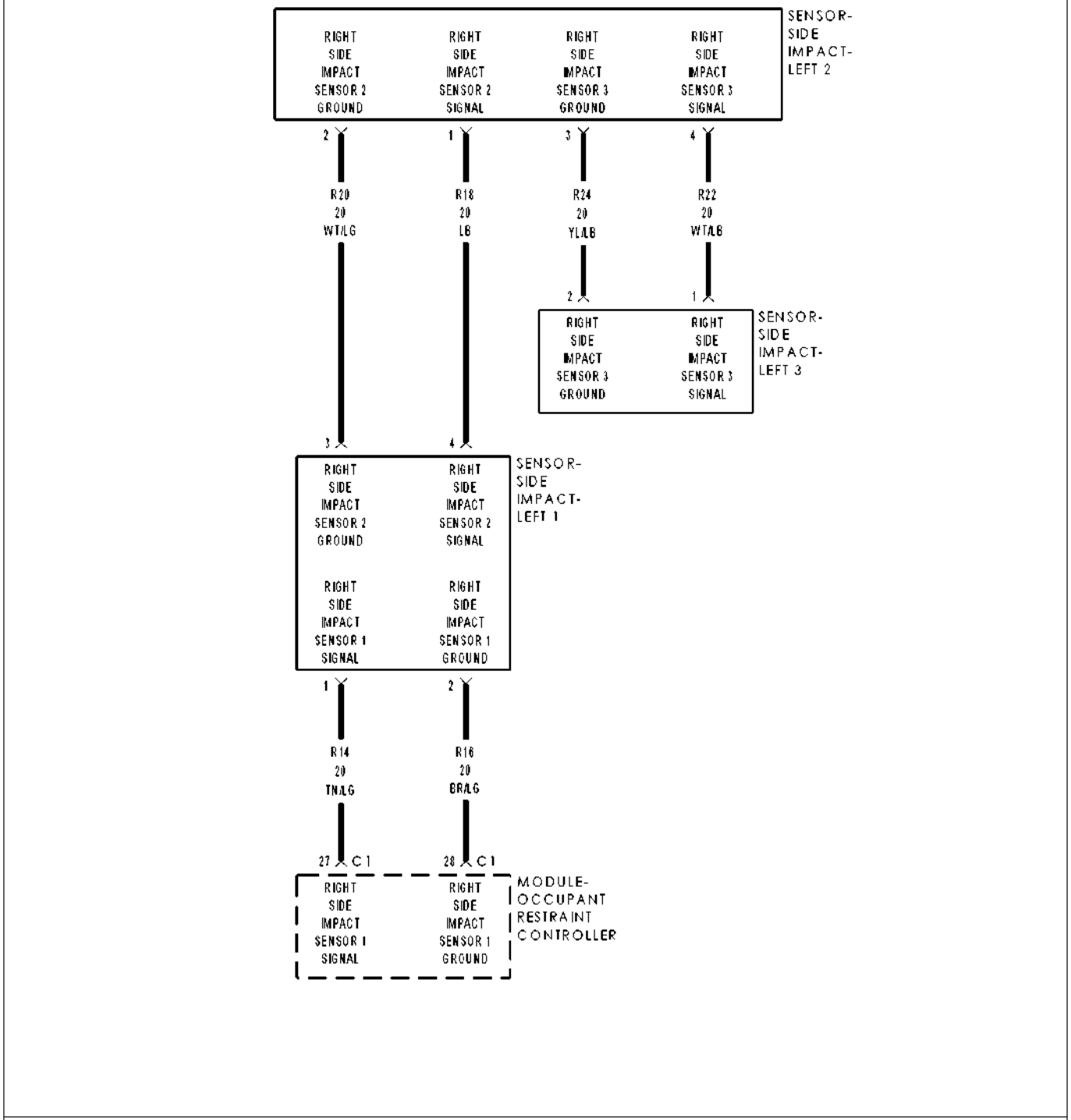
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

Are any ACTIVE DTCs present?

Yes >> Select appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B77-RIGHT SIDE SATELLITE ACCELERATION SENSOR 3 INTERNAL



B1B77-RIGHT SIDE SATELLITE ACCELERATION SENSOR 3 INTERNAL (CONTINUED)

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on, the Right Side Impact Sensor 3 is equipped with on board diagnostics to monitor to sensor's internal circuits. If a problem is identified, the sensor sends the Right Side Impact Sensor 3 Internal message to the Occupant Restraint Controller (ORC).
- **Set Condition:**
  This DTC will set if the ORC receives an internal DTC from the Right Side Impact Sensor 3.

Possible Causes
RIGHT SIDE IMPACT SENSOR 3
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. DETERMINE ACTIVE OR STORED FAULT CODE

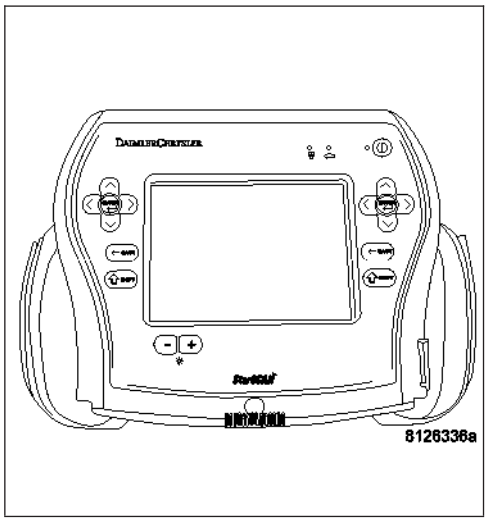
NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.
Turn the ignition on.

Select the appropriate module and DTC type combination:

ORC - ACTIVE DTC
Go To 2

ORC - STORED DTC
Go To 4



B1B77-RIGHT SIDE SATELLITE ACCELERATION SENSOR 3 INTERNAL (CONTINUED)

2. VERIFY OPERATION OF THE RIGHT SIDE IMPACT SENSOR 3

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Replace the Right Side Impact Sensor 3.

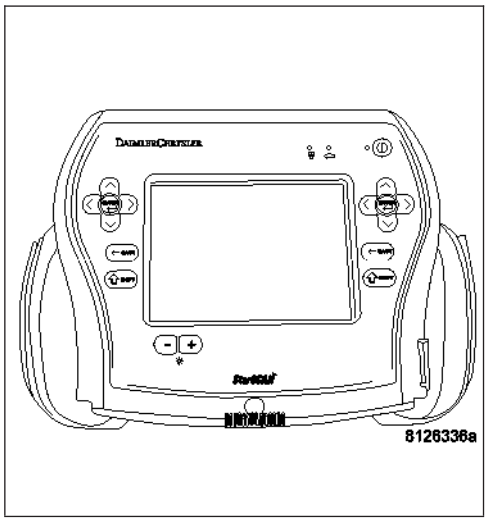
Reconnect the vehicle wire harness to the sensor.

Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
Use the scan tool and erase the stored codes in all airbag system modules.

Turn the Ignition Off, and wait 15 seconds before turning the Ignition On.

Wait one minute, and read active codes.



Did the active Right Side Impact Sensor 3 DTC return?

Yes >> Go To 3

No >> Repair is complete.
Perform the ORC VERIFICATION TEST - VER 1.

---

3. REPLACE THE OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Instructions.
Perform the ORC VERIFICATION TEST - VER 1.

B1B77-RIGHT SIDE SATELLITE ACCELERATION SENSOR 3 INTERNAL (CONTINUED)

4. TEST FOR AN INTERMITTENT CONDITION

With the scan tool, record and erase all DTC's from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

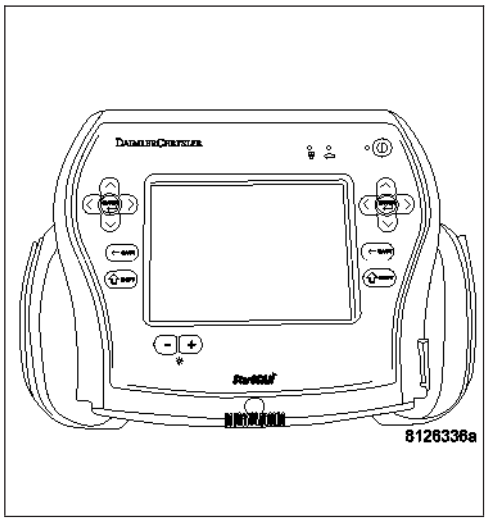
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.



WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return continue the test until the problem area has been isolated.

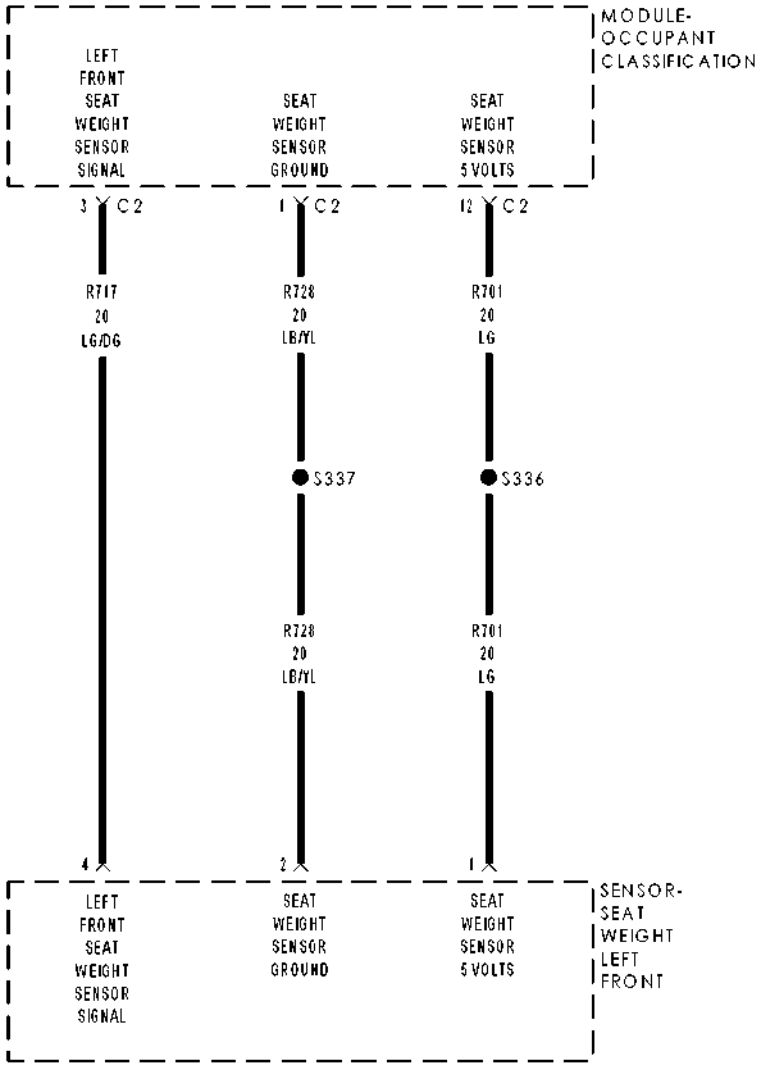
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

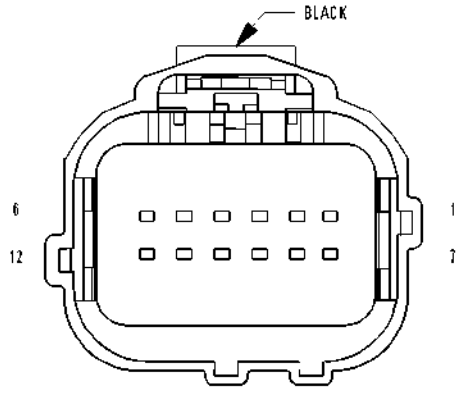
Are any ACTIVE DTCs present?

Yes >> Select appropriate symptom from Symptom List.

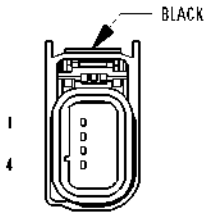
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B78-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT PERFORMANCE





MODULE-OCCUPANT
CLASSIFICATION
C2



SENSOR-SEAT
WEIGHT-LEFT
FRONT

8l2c919c

B1B78-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT PERFORMANCE (CONTINUED)

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When CAN ignitions status is Run or SNA, during auto zero and while performing the Occupant Classification Module System Verification Test.
- **Set Condition:**
  During the occupant classification verification test: if the module detects that the sensor input is less than 1.4 volts or greater than 3.6 volts. During auto zero: if the module detects that the sensor input is less than 1 volt or greater than 4 volts.

Possible Causes
PASSENGER SEAT HARNESS WIRES CHAFFED, PIERCED, PINCHED, PARTIALLY BROKEN
PASSENGER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT PUSHED OUT, SPREAD, CORRODED, CONTAMINATED
LEFT-FRONT PASSENGER SEAT WEIGHT SENSOR
DAMAGE TO THE PASSENGER SEAT STRUCTURE, RISER ASSEMBLY, CROSSMEMBERS, SEAT TRACKS, FLOOR PAN
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

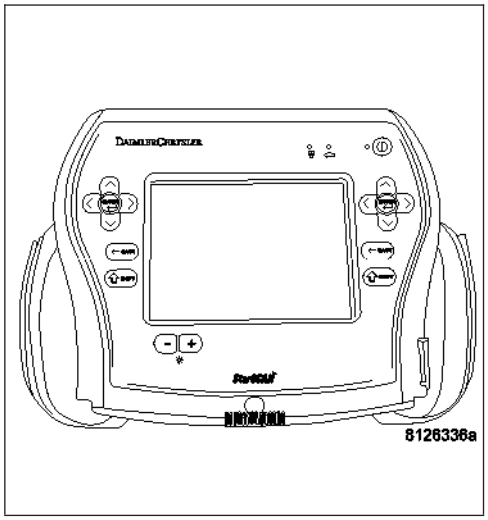
1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, & BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.



Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

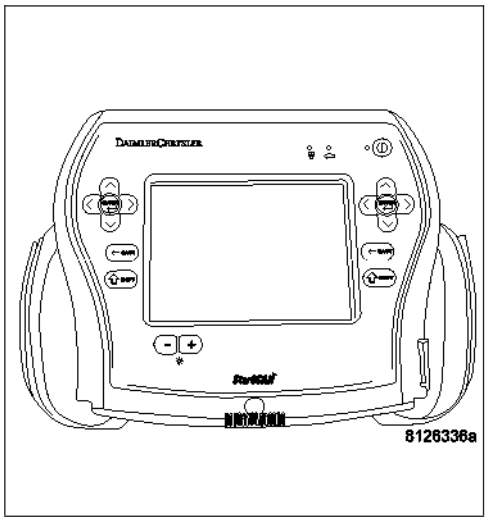
No >> Go To 2

B1B78-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT PERFORMANCE (CONTINUED)

2. VERIFY THAT DTC B1B78–PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT PERFORMANCE IS ACTIVE

With the scan tool, read OCM DTCs.

Does the scan tool display active: B1B78–PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT PERFORMANCE?



Yes >> Go To 3

No >> Go To 5

---

3. INSPECT PASSENGER SEAT HARNESS WIRES & CONNECTORS

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

Are any of these conditions present?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

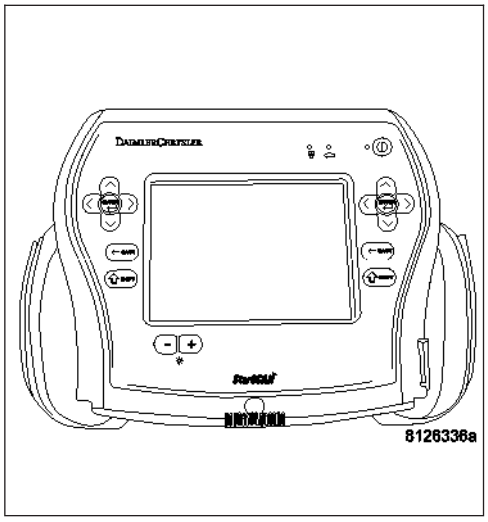
Perform OCS VERIFICATION TEST - VER 1.

No >> Go To 4

B1B78-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT PERFORMANCE (CONTINUED)

4. PERFORM OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST

Verify that all of the Seat Weight Sensor mounting screws are torqued to specification. Refer to 23 - BODY/SEATS.



WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

NOTE: Failure to follow test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: Verify That All Tests Steps That Led You Here Were Performed As Directed; Verify That The Ignition Is In Run; Wait 30 Seconds After Changing The Seat Weight Before Proceeding To Allow The System To Stabilize; Only Press Scan Tool Buttons When Directed To Do So; & Perform The Occupant Classification Module System Verification Test To Completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, wait two minutes, and then proceed as follows.

With the scan tool, read OCM DTCs.

Does the scan tool display any active PASSENGER SEAT WEIGHT SENSOR PERFORMANCE DTCs?

Yes >> Perform the *Diagnosis/Checkout Procedure For Seat Weight Sensors.
Perform OCS VERIFICATION TEST - VER 1.

No - But Other DTCs Present
Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No Active DTCs Present
Perform OCS VERIFICATION TEST - VER 1.

B1B78-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT PERFORMANCE (CONTINUED)

5. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase all DTCs from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

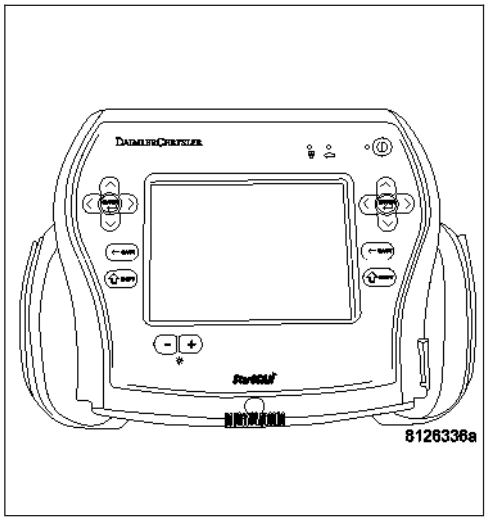
Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor active codes as you work through the following steps.



WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return, continue the test until the problem area has been isolated.

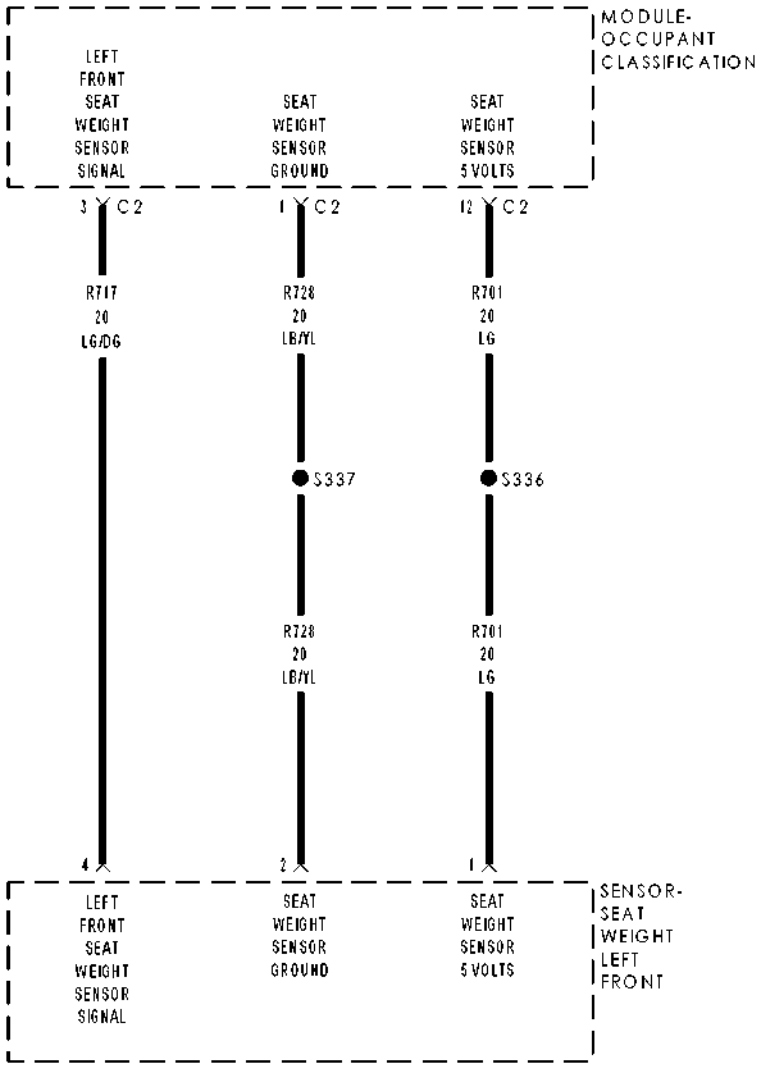
In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

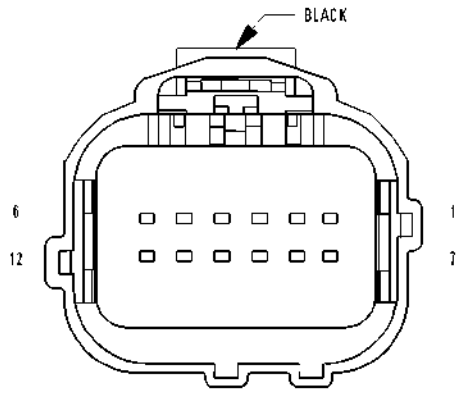
Does the scan tool display any ACTIVE DTCs?

Yes >> Select appropriate symptom from Symptom List.

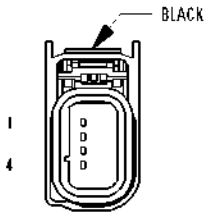
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B79-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT LOW





MODULE-OCCUPANT
CLASSIFICATION
C2



SENSOR-SEAT
WEIGHT-LEFT
FRONT

8l2c919c

B1B79-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT LOW (CONTINUED)

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  While the CAN bus ignition status is in IGN_RUN, the module checks the sensor input ranges.
- **Set Condition:**
  If the module detects that the sensor input is less than .2 ± .035 volts. This DTC will also set if the (R701) Seat Weight Sensor 5 Volt circuit is shorted to ground. However, this condition would prevent communication with the OCM and cause a Lost Communication With OCM DTC to set in other modules.

Possible Causes
PASSENGER SEAT HARNESS IMPROPERLY ROUTED
PASSENGER SEAT HARNESS WIRES CHAFFED, PIERCED, PINCHED, PARTIALLY BROKEN
PASSENGER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT PUSHED OUT, SPREAD, CORRODED, CONTAMINATED
(R717) LT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
(R717) LT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT OPEN
(R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT OPEN
LEFT-FRONT SEAT WEIGHT SENSOR
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, & BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

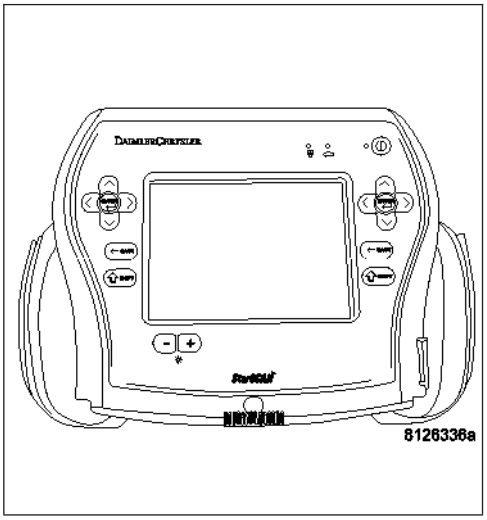
Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

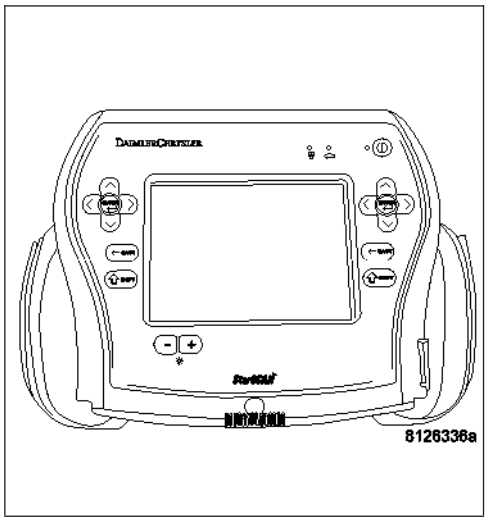
No >> Go To 2



B1B79-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT LOW (CONTINUED)

2. VERIFY THAT DTC B1B79–PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT LOW IS ACTIVE

With the scan tool, read OCM DTCs.



Does the scan tool display active: B1B79–PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT LOW?

Yes >> Go To 3

No >> Go To 10

3. INSPECT PASSENGER SEAT HARNESS WIRES & CONNECTORS

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

Are any of these conditions present?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

No >> Go To 4

4. VERIFY THAT PASSENGER SEAT HARNESS IS ROUTED CORRECTLY

Verify that the Passenger Seat Harness is routed correctly.

Is the Passenger Seat Harness routed correctly?

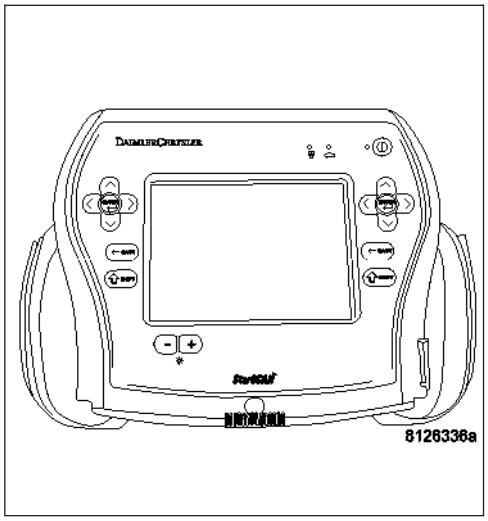
Yes >> Go To 5

No >> Reroute the Passenger Seat Harness as necessary. Then, Go To 5

B1B79-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT LOW (CONTINUED)

5. CHECK IF MORE THAN ONE PASSENGER SEAT WEIGHT SENSOR DTC IS ACTIVE

Verify that all of the Seat Weight Sensor mounting screws are torqued to specification. Refer to 23 - BODY/SEATS.



WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

NOTE: Failure to follow test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: Verify That All Tests Steps That Led You Here Were Performed As Directed; Verify That The Ignition Is In Run; Wait 30 Seconds After Changing The Seat Weight Before Proceeding To Allow The System To Stabilize; Only Press Scan Tool Buttons When Directed To Do So; & Perform The Occupant Classification Module System Verification Test To Completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, wait two minutes, and then proceed as follows.

With the scan tool, read OCM DTCs.

Does the scan tool display any active PASSENGER SEAT WEIGHT SENSOR DTCs?

Yes - More Than One PASSENGER SEAT WEIGHT SENSOR DTC Is Active.
Perform the Diagnosis/Checkout Procedure For Seat Weight Sensors.
Perform OCS VERIFICATION TEST - VER 1

Yes - Only DTC B1B79 Is Active.
Go To 6

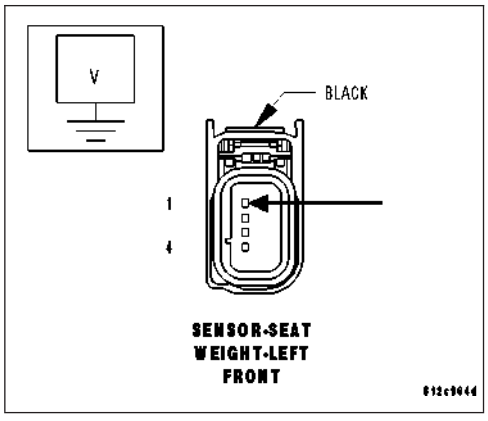
No - But Other DTCs Present.
Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No - No Active DTCs Present.
Perform OCS VERIFICATION TEST - VER 1.

---

6. CHECK VOLTAGE OF (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Left-Front Seat Weight Sensor connector.



WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
Measure the voltage of the (R701) Seat Weight Sensor 5 Volt circuit.

Is the voltage above 4.8 volts?

Yes >> Go To 7

No >> Go To 9

B1B79-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT LOW (CONTINUED)

7. CHECK (R717) LT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the OCM C2 connector.
Measure the resistance of the (R717) LT-FT Seat Weight Sensor Signal circuit between ground and the OCM C2 connector.

Is the resistance below 10k ohms?

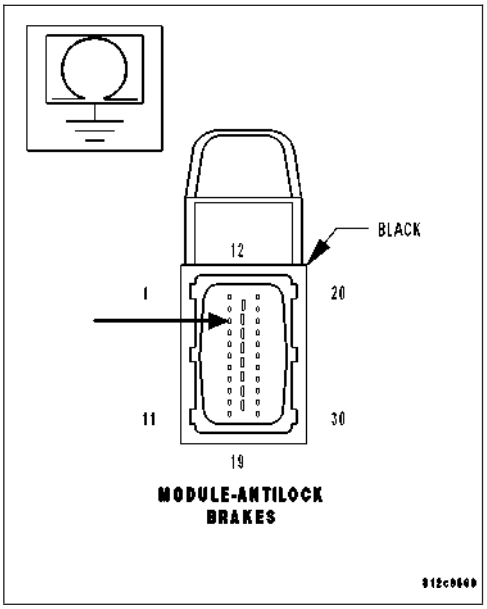
Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

No >> Go To 8



8. CHECK (R717) LT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR AN OPEN

Measure the resistance of the (R717) LT-FT Seat Weight Sensor Signal circuit between the OCM C2 connector and the Left-Front Seat Weight Sensor connector.

Is the resistance below 5.0 ohms?

Yes >> Replace the Left-Front Seat Weight Sensor in accordance with the Service Information. Perform OCS VERIFICATION TEST - VER 1. If DTC B1B79–PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT LOW returns active, replace the OCM in accordance with the Service Information.

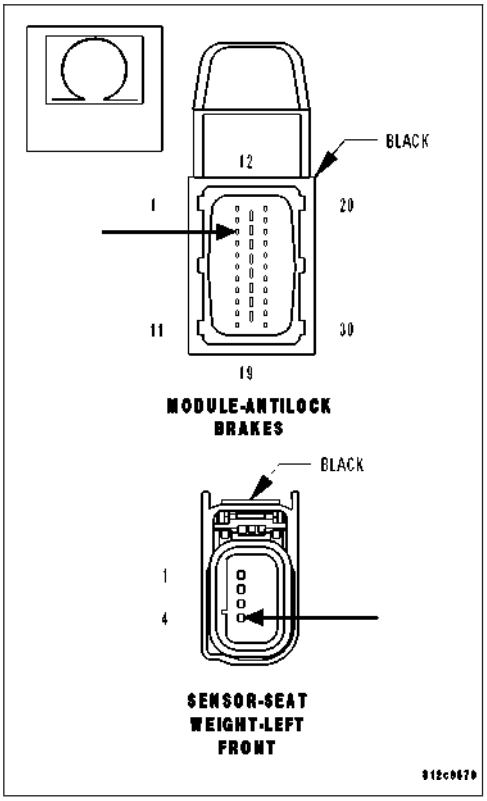
Perform OCS VERIFICATION TEST - VER 1.

No >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.



B1B79-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT LOW (CONTINUED)

9. CHECK (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT FOR AN OPEN

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the OCM C2 connector.

Measure the resistance of the (R701) Seat Weight Sensor 5 Volt circuit between the OCM C2 connector and the Left-Front Seat Weight Sensor connector.

Is the resistance below 5.0 ohms?

Yes >> Replace the OCM in accordance with the Service Information.

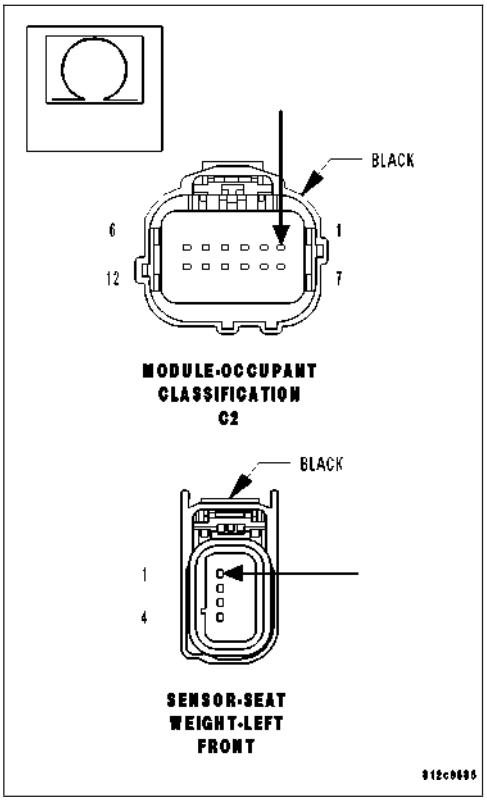
Perform OCS VERIFICATION TEST - VER 1.

No >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.



B1B79-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT LOW (CONTINUED)

10. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase all DTCs from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

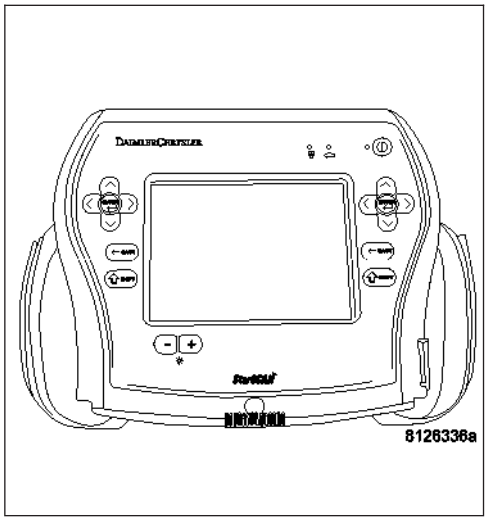
Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor active codes as you work through the following steps.



WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return, continue the test until the problem area has been isolated.

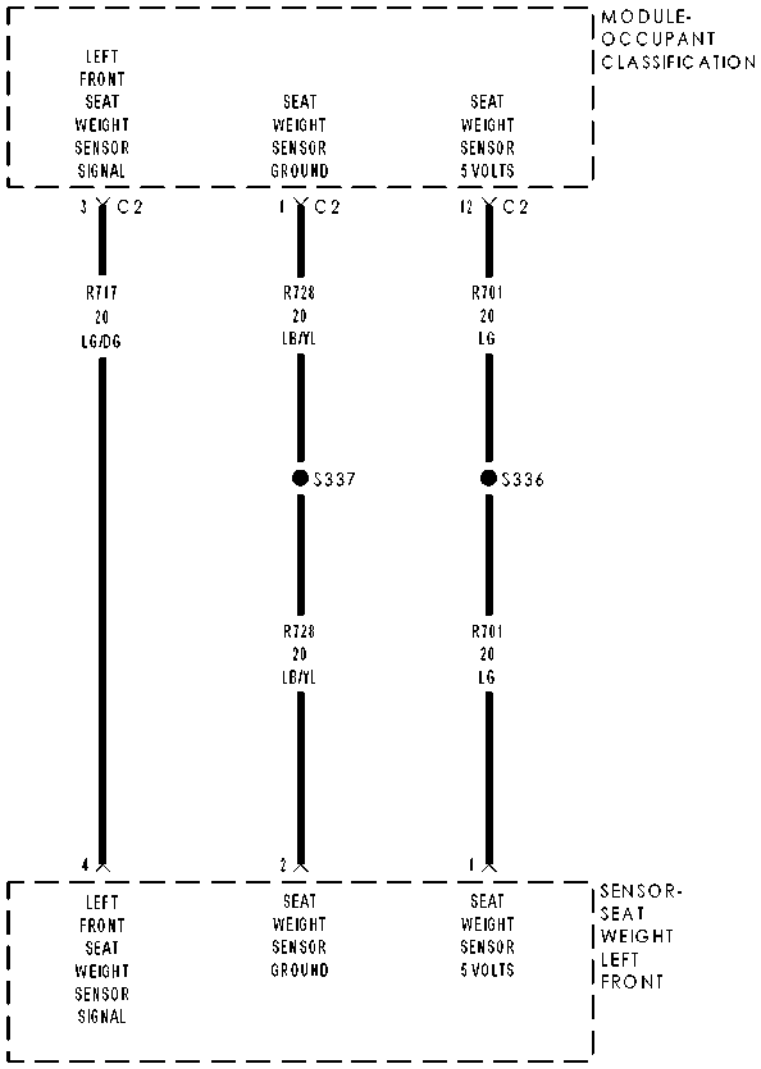
In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

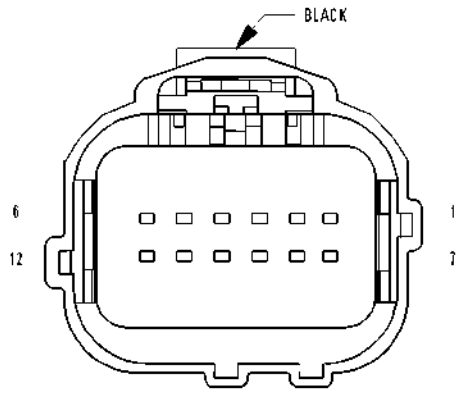
Does the scan tool display any ACTIVE DTCs?

Yes >> Select appropriate symptom from Symptom List.

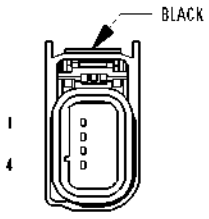
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B7A- PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT HIGH





MODULE-OCCUPANT
CLASSIFICATION
C2



SENSOR-SEAT
WEIGHT-LEFT
FRONT

8l2c919c

B1B7A- PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT HIGH (CONTINUED)

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  While the CAN bus ignition status is in IGN_RUN, the module checks the sensor input ranges.
- **Set Condition:**
  If the module detects that the sensor input is greater than 96 ± 0.6% of the (R701) Seat Weight Sensor 5 Volt circuit voltage.

Possible Causes
PASSENGER SEAT HARNESS IMPROPERLY ROUTED
PASSENGER SEAT HARNESS WIRES CHAFFED, PIERCED, PINCHED, PARTIALLY BROKEN
PASSENGER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT PUSHED OUT, SPREAD, CORRODED, CONTAMINATED
(R717) LT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
(R717) LT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT SHORTED TO (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT
(R728) SEAT WEIGHT SENSOR GROUND CIRCUIT OPEN
LEFT-FRONT SEAT WEIGHT SENSOR
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, & BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

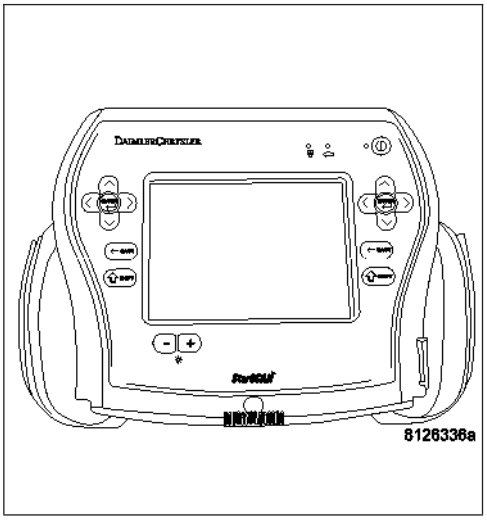
Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

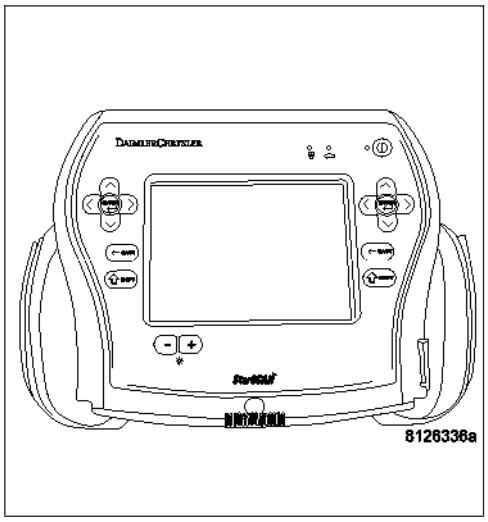
No >> Go To 2



B1B7A- PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT HIGH (CONTINUED)

2. VERIFY THAT DTC B1B7A–PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT HIGH IS ACTIVE

With the scan tool, read OCM DTCs.



Does the scan tool display active: B1B7A–PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT HIGH?

Yes >> Go To 3

No >> Go To 9

---

3. INSPECT PASSENGER SEAT HARNESS WIRES & CONNECTORS

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

Are any of these conditions present?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

No >> Go To 4

---

4. VERIFY THAT PASSENGER SEAT HARNESS IS ROUTED CORRECTLY

Verify that the Passenger Seat Harness is routed correctly.

Is the Passenger Seat Harness routed correctly?

Yes >> Go To 5

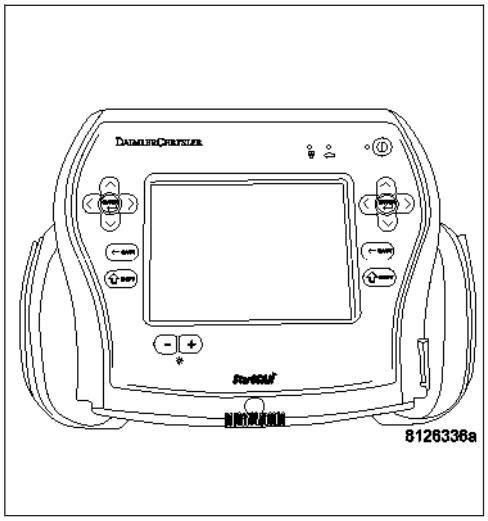
No >> Reroute the Passenger Seat Harness as necessary.

Perform OCS VERIFICATION TEST - VER 1.

B1B7A- PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT HIGH (CONTINUED)

5. CHECK IF MORE THAN ONE PASSENGER SEAT WEIGHT SENSOR DTC IS ACTIVE

Verify that all of the Seat Weight Sensor mounting screws are torqued to specification. Refer to 23 - BODY/SEATS.



WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

NOTE: Failure to follow test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: Verify That All Tests Steps That Led You Here Were Performed As Directed; Verify That The Ignition Is In Run; Wait 30 Seconds After Changing The Seat Weight Before Proceeding To Allow The System To Stabilize; Only Press Scan Tool Buttons When Directed To Do So; & Perform The Occupant Classification Module System Verification Test To Completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, wait two minutes, and then proceed as follows.

With the scan tool, read OCM DTCs.

Does the scan tool display any active PASSENGER SEAT WEIGHT SENSOR DTCs?

Yes - More Than One PASSENGER SEAT WEIGHT SENSOR DTC Is Active

Perform the *Diagnosis/Checkout Procedure For Seat Weight Sensors.

Perform OCS VERIFICATION TEST - VER 1.

Yes - Only DTC B1B7A Is Active

Go To 6

No - But Other DTCs Present

Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No - No Active DTCs Present

Perform OCS VERIFICATION TEST - VER 1.

B1B7A- PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT HIGH (CONTINUED)

6. CHECK (R717) LT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the OCM C2 connector.

Measure the voltage of the (R717) LT-FT Seat Weight Sensor Signal circuit.

Is the voltage above 0.2 volts?

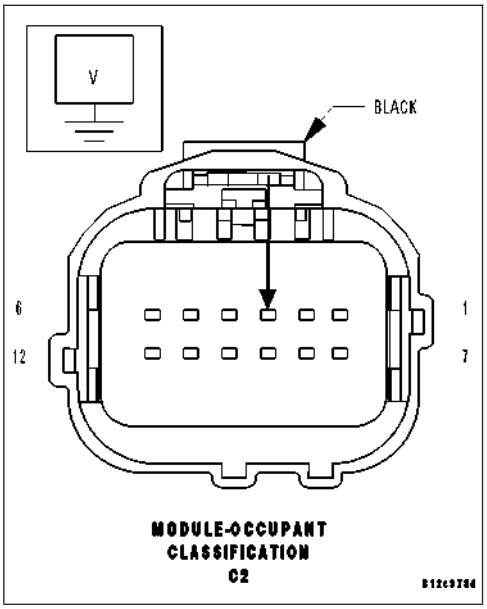
Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

No >> Go To 7



7. CHECK (R717) LT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR A SHORT TO (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT

Disconnect the Left-Front Seat Weight Sensor connector.

Measure the resistance between the (R717) LT-FT Seat Weight Sensor Signal circuit and the (R701) Seat Weight Sensor 5 Volt circuit.

Is the resistance below 10K ohms?

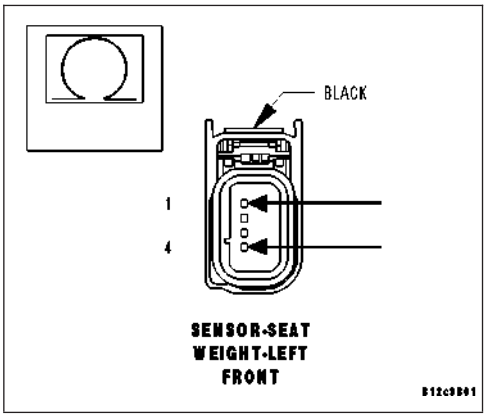
Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

No >> Go To 8



B1B7A- PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT HIGH (CONTINUED)

8. CHECK (R728) SEAT WEIGHT SENSOR GROUND CIRCUIT FOR AN OPEN

Measure the resistance of the (R728) Seat Weight Sensor Ground circuit between the OCM C2 connector and the Left-Front Seat Weight Sensor connector.

Is the resistance below 5.0 ohms?

Yes >> Replace the OCM in accordance with the Service Information.

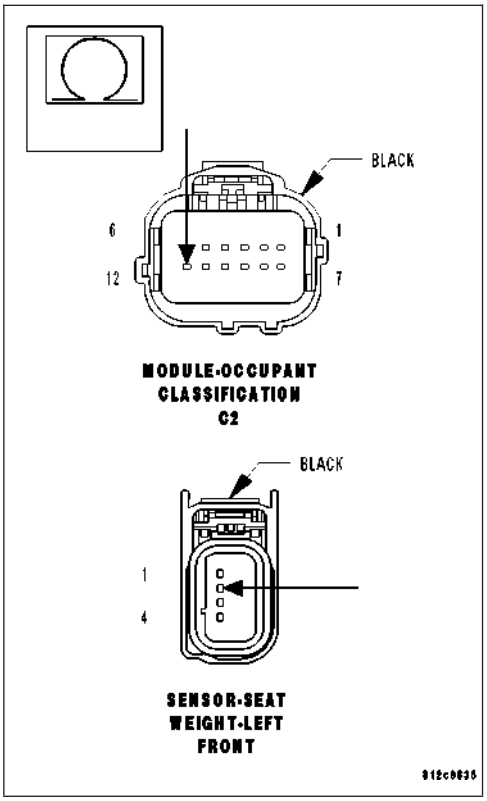
Perform OCS VERIFICATION TEST - VER 1.

No >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.



B1B7A- PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT HIGH (CONTINUED)

9. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase all DTCs from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

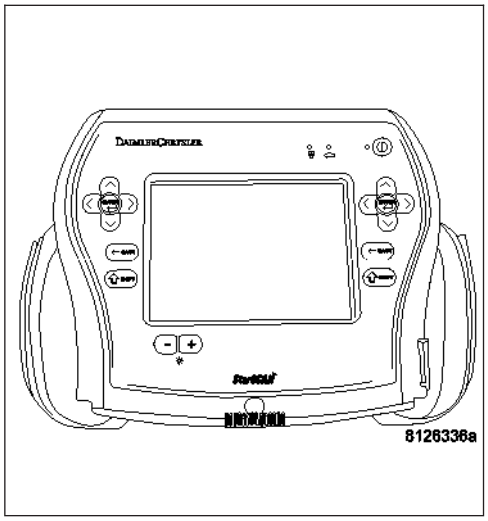
Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor active codes as you work through the following steps.



WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return, continue the test until the problem area has been isolated.

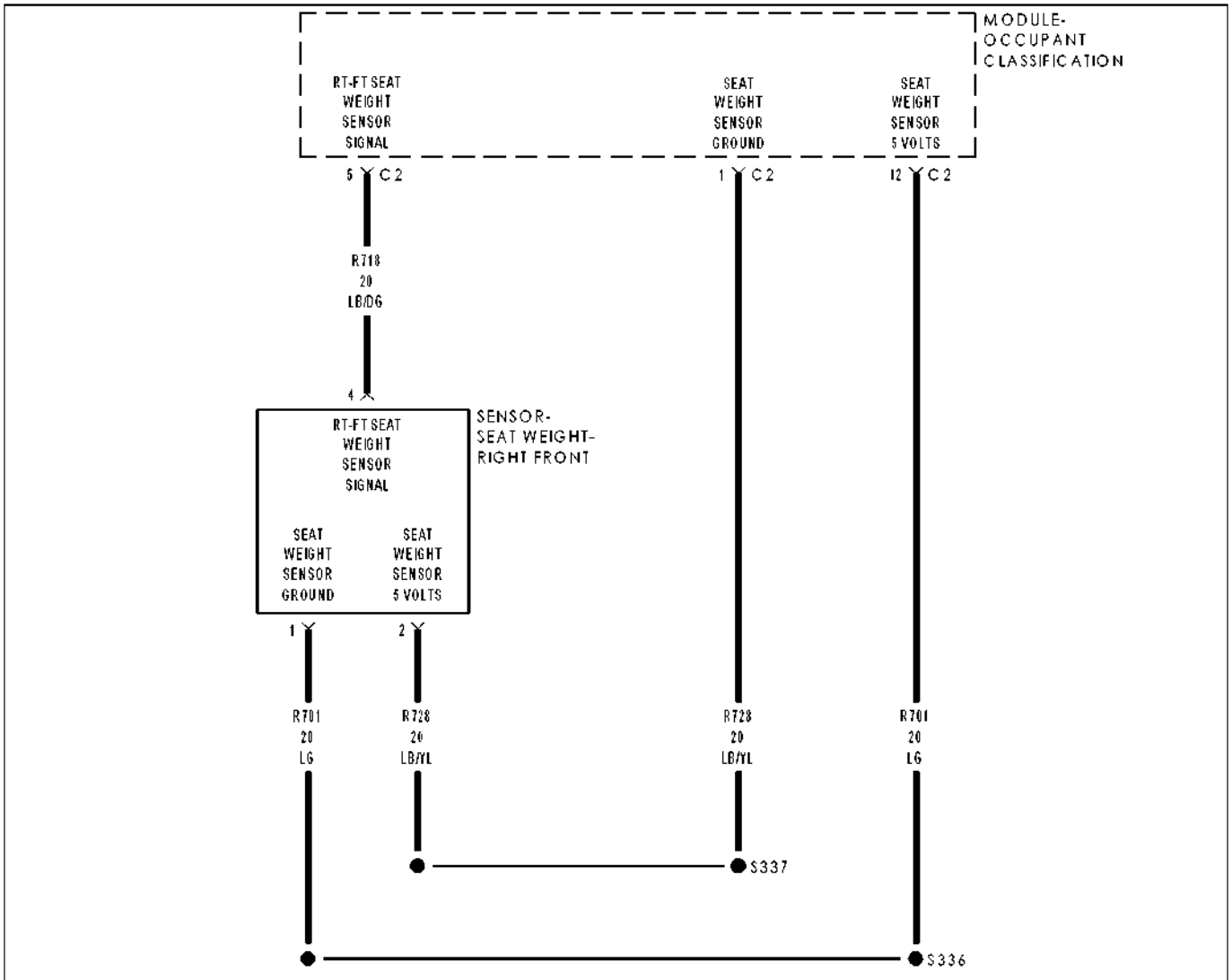
In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

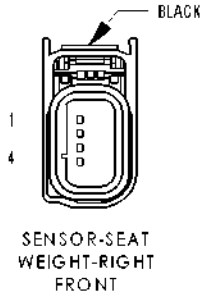
Does the scan tool display any ACTIVE DTCs?

Yes >> Select appropriate symptom from Symptom List.

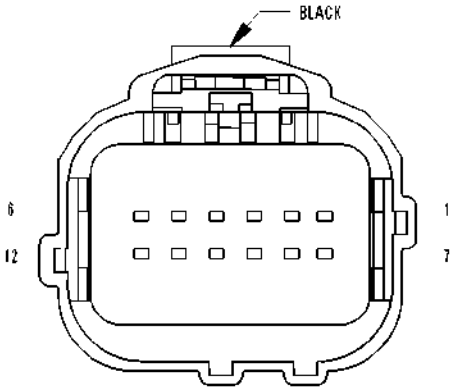
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B7D-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT PERFORMANCE





SENSOR-SEAT
WEIGHT-RIGHT
FRONT



MODULE-OCCUPANT
CLASSIFICATION C2

8f2c9860

B1B7D-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT PERFORMANCE (CONTINUED)

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When CAN ignitions status is Run or SNA, during auto zero and while performing the Occupant Classification Module System Verification Test.
- **Set Condition:**
  During the occupant classification verification test: if the module detects that the sensor input is less than 1.4 volts or greater than 3.6 volts. During auto zero: if the module detects that the sensor input is less than 1 volt or greater than 4 volts.

Possible Causes
PASSENGER SEAT HARNESS WIRES CHAFFED, PIERCED, PINCHED, PARTIALLY BROKEN
PASSENGER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT PUSHED OUT, SPREAD, CORRODED, CONTAMINATED
RIGHT-FRONT PASSENGER SEAT WEIGHT SENSOR
DAMAGE TO THE PASSENGER SEAT STRUCTURE, RISER ASSEMBLY, CROSSMEMBERS, SEAT TRACKS, FLOOR PAN
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, & BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

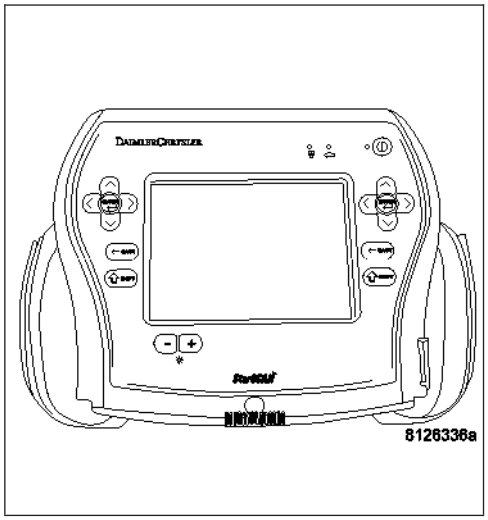
Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Go To 2



B1B7D-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT PERFORMANCE (CONTINUED)

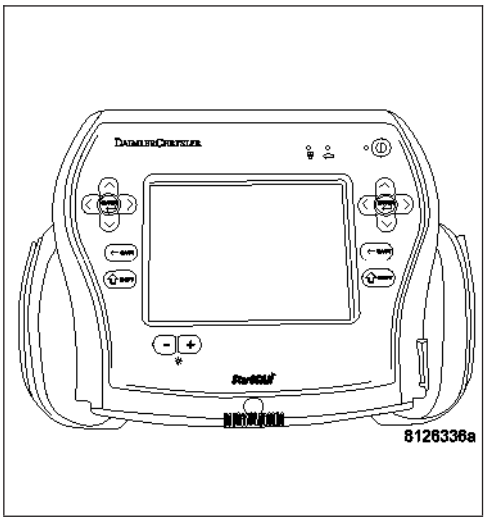
2. VERIFY THAT DTC B1B7D–PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT PERFORMANCE IS ACTIVE

With the scan tool, read OCM DTCs.

Does the scan tool display active: B1B7D–PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT PERFORMANCE?

Yes >> Go To 3

No >> Go To 5



3. INSPECT PASSENGER SEAT HARNESS WIRES & CONNECTORS

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Using the wiring diagram/schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

Are any of these conditions present?

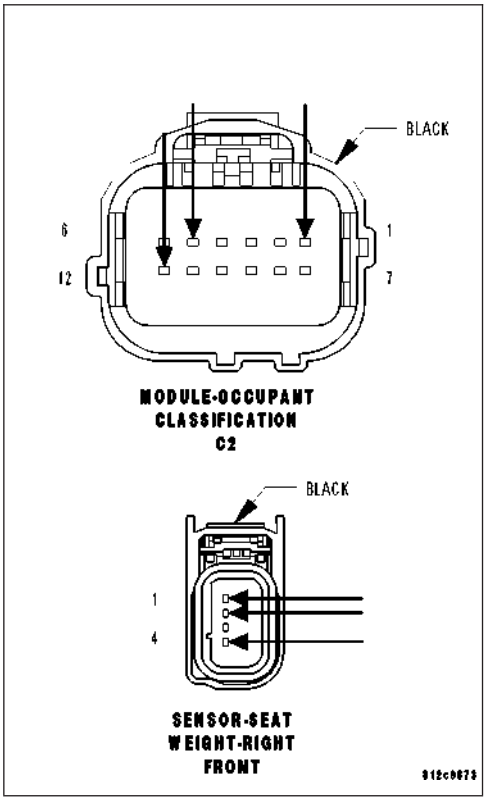
Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

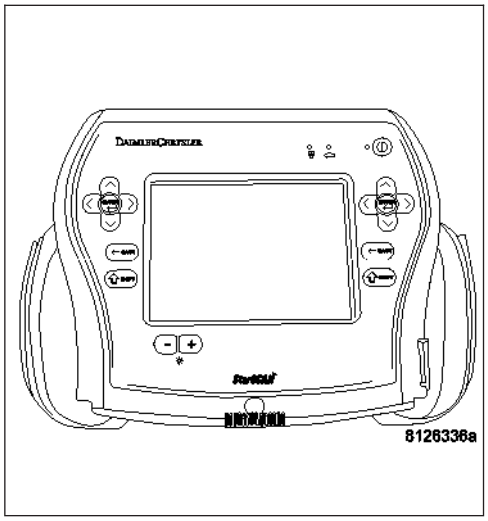
No >> Go To 4



B1B7D-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT PERFORMANCE (CONTINUED)

4. PERFORM OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST

Verify that all of the Seat Weight Sensor mounting screws are torqued to specification. Refer to 23 - BODY/SEATS.



WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

NOTE: Failure to follow test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: Verify That All Tests Steps That Led You Here Were Performed As Directed; Verify That The Ignition Is In Run; Wait 30 Seconds After Changing The Seat Weight Before Proceeding To Allow The System To Stabilize; Only Press Scan Tool Buttons When Directed To Do So; & Perform The Occupant Classification Module System Verification Test To Completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, wait two minutes, and then proceed as follows.

With the scan tool, read OCM DTCs.

Does the scan tool display any active PASSENGER SEAT WEIGHT SENSOR PERFORMANCE DTCs?

Yes >> Perform the *Diagnosis/Checkout Procedure For Seat Weight Sensors.
Perform OCS VERIFICATION TEST - VER 1.

No, But Other DTCs Present
Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No Active DTCs Present
Perform OCS VERIFICATION TEST - VER 1.

B1B7D-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT PERFORMANCE (CONTINUED)

5. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase all DTCs from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

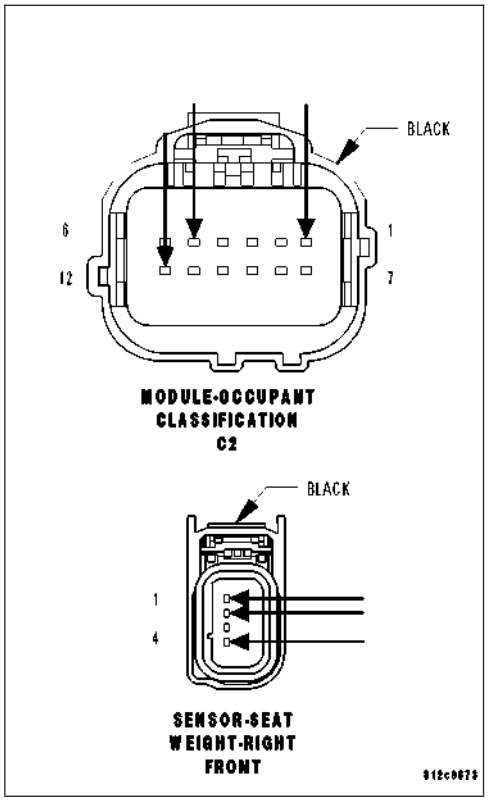
With the scan tool, monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return, continue the test until the problem area has been isolated.



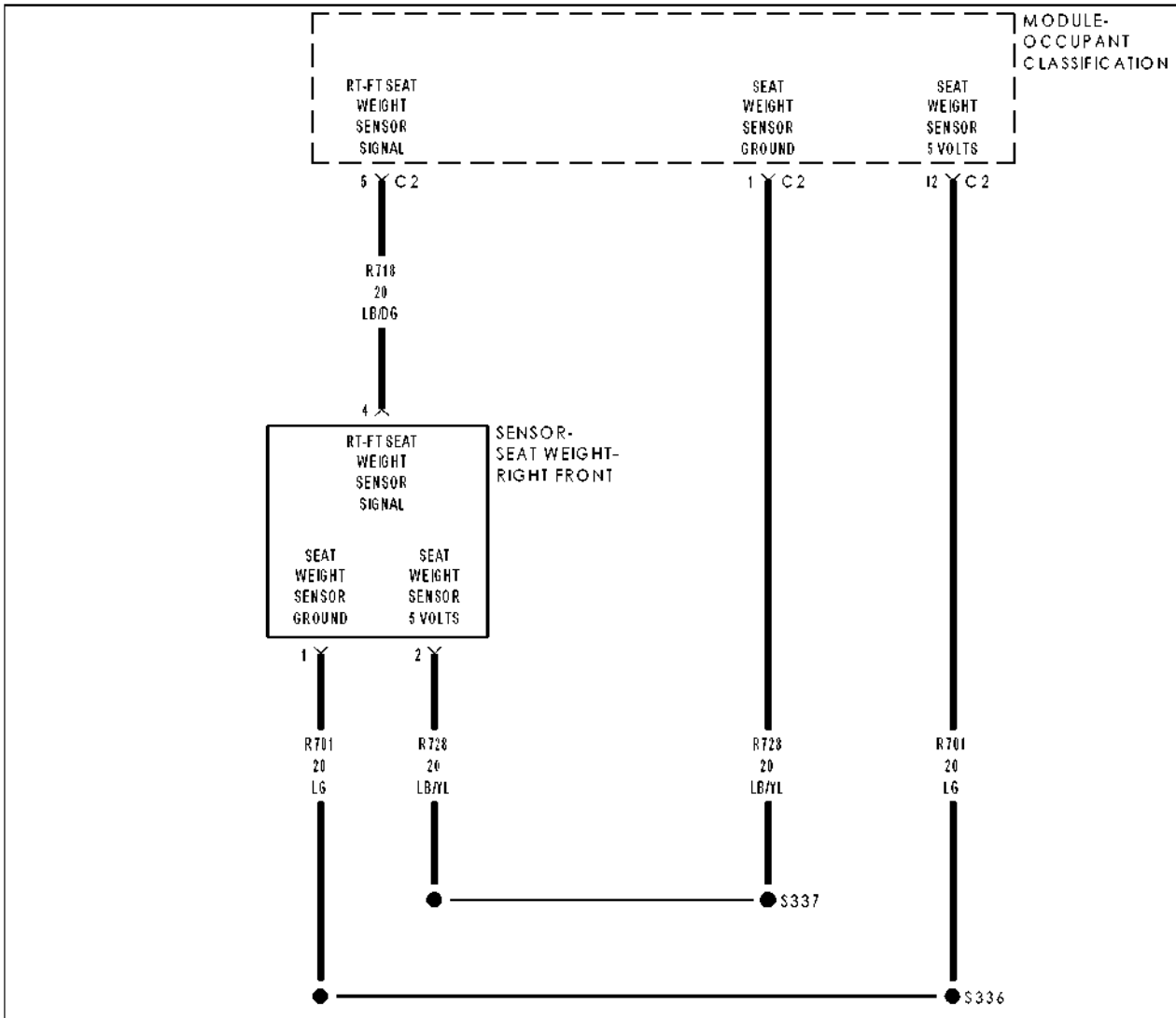
In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

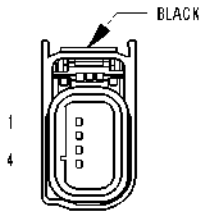
Does the scan tool display any ACTIVE DTCs?

Yes >> Select appropriate symptom from Symptom List.

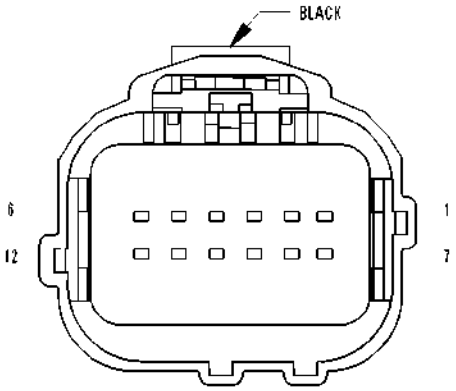
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B7E-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT LOW





SENSOR-SEAT
WEIGHT-RIGHT
FRONT



MODULE-OCCUPANT
CLASSIFICATION C2

B1B7E-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT LOW (CONTINUED)

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  While the CAN bus ignition status is in IGN_RUN, the module checks the sensor input ranges.
- **Set Condition:**
  If the module detects that the sensor input is less than 4.0 ± 0.7% of the (R701) Seat Weight Sensor 5 Volt circuit voltage. This DTC will also set if the (R701) Seat Weight Sensor 5 Volt circuit is shorted to ground. However, this condition would prevent communication with the OCM and cause a Lost Communication With OCM DTC to set in other modules.

Possible Causes
PASSENGER SEAT HARNESS IMPROPERLY ROUTED
PASSENGER SEAT HARNESS WIRES CHAFFED, PIERCED, PINCHED, PARTIALLY BROKEN
PASSENGER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT PUSHED OUT, SPREAD, CORRODED, CONTAMINATED
(R718) RT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
(R718) RT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT OPEN
(R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT OPEN
RIGHT-FRONT SEAT WEIGHT SENSOR
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, & BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

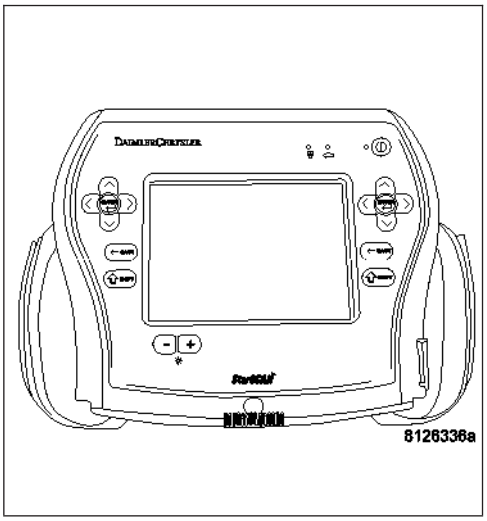
Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Go To 2



B1B7E-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT LOW (CONTINUED)

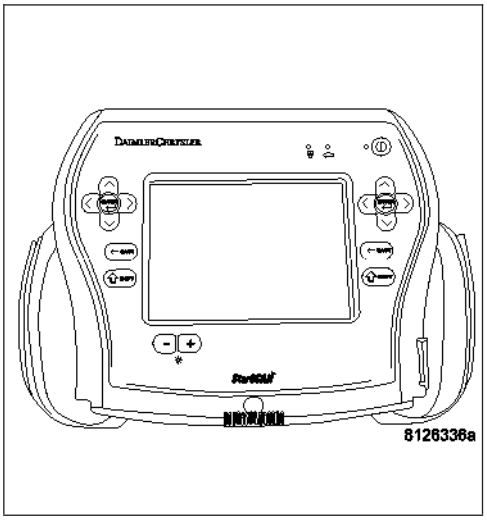
2. VERIFY THAT DTC B1B7E–PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT LOW IS ACTIVE

With the scan tool, read OCM DTCs.

Does the scan tool display active: B1B7E–PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT LOW?

Yes >> Go To 3

No >> Go To 10



3. INSPECT PASSENGER SEAT HARNESS WIRES & CONNECTORS

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Using the wiring diagram/schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

Are any of these conditions present?

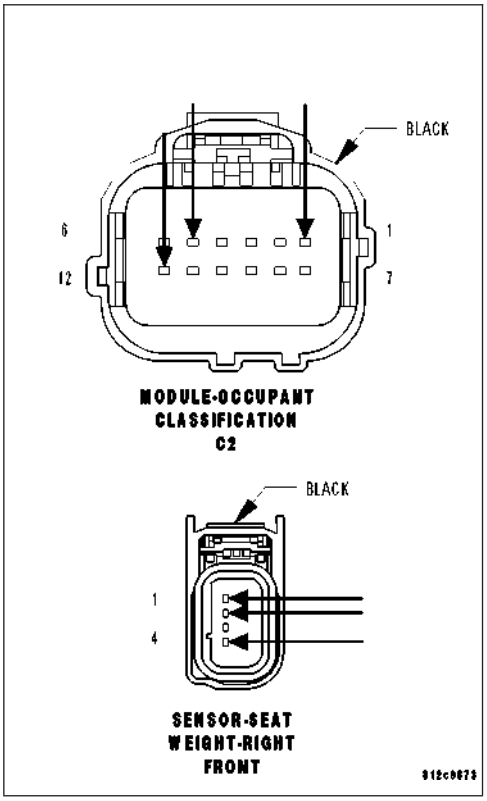
Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

No >> Go To 4



B1B7E-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT LOW (CONTINUED)

4. VERIFY THAT PASSENGER SEAT HARNESS IS ROUTED CORRECTLY

Verify that the Passenger Seat Harness is routed correctly.

Is the Passenger Seat Harness routed correctly?

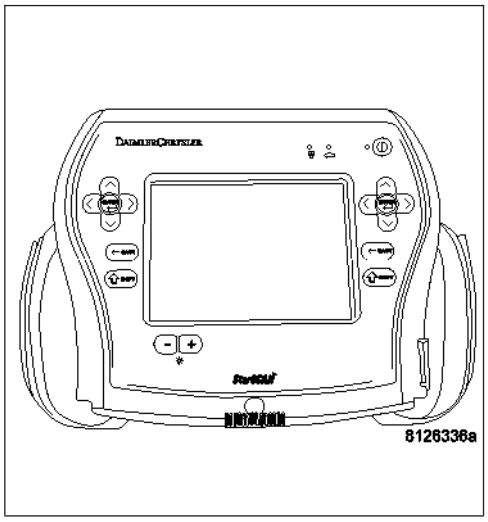
Yes >> Go To 5

No >> Reroute the Passenger Seat Harness as necessary. Then, Go To 5.

---

5. CHECK IF MORE THAN ONE PASSENGER SEAT WEIGHT SENSOR DTC IS ACTIVE

Verify that all of the Seat Weight Sensor mounting screws are torqued to specification. Refer to 23 - BODY/SEATS.



WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

NOTE: Failure to follow test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: Verify That All Tests Steps That Led You Here Were Performed As Directed; Verify That The Ignition Is In Run; Wait 30 Seconds After Changing The Seat Weight Before Proceeding To Allow The System To Stabilize; Only Press Scan Tool Buttons When Directed To Do So; & Perform The Occupant Classification Module System Verification Test To Completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, wait two minutes, and then proceed as follows.

With the scan tool, read OCM DTCs.

Does the scan tool display any active PASSENGER SEAT WEIGHT SENSOR DTCs?

Yes - More Than One PASSENGER SEAT WEIGHT SENSOR DTC Is Active
Perform the *Diagnosis/Checkout Procedure For Seat Weight Sensors.
Perform OCS VERIFICATION TEST - VER 1.

Yes - Only DTC B1B7E Is Active
Go To 6

No - But Other DTCs Present
Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No - No Active DTCs Present
Perform OCS VERIFICATION TEST - VER 1.

B1B7E-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT LOW (CONTINUED)

6. CHECK VOLTAGE OF (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT

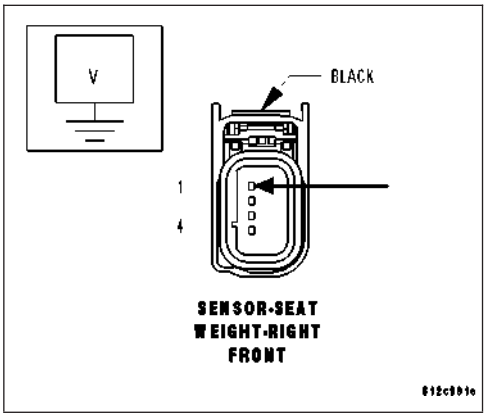
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Right-Front Seat Weight Sensor connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
Measure the voltage of the (R701) Seat Weight Sensor 5 Volt circuit.

Is the voltage above 4.8 volts?

Yes >> Go To 7

No >> Go To 9



7. CHECK (R718) RT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the OCM C2 connector.

Measure the resistance of the (R718) RT-FT Seat Weight Sensor Signal circuit between ground and the OCM C2 connector.

Is the resistance below 10k ohms?

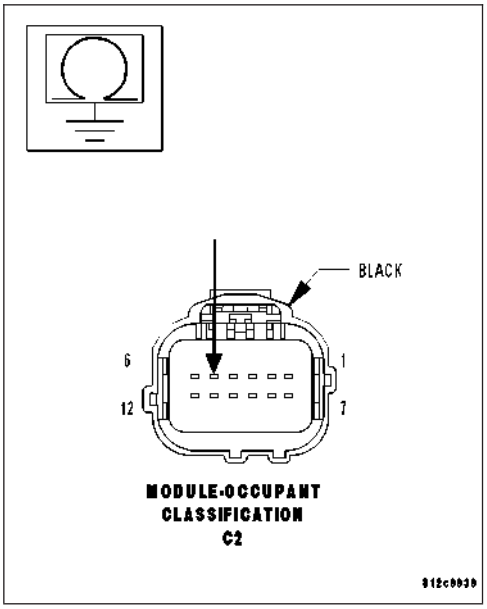
Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

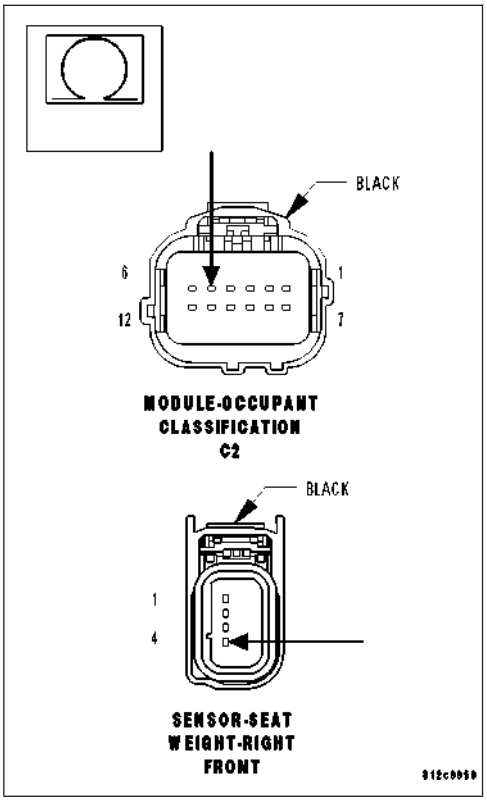
No >> Go To 8



B1B7E-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT LOW (CONTINUED)

8. CHECK (R718) RT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR AN OPEN

Measure the resistance of the (R718) RT-FT Seat Weight Sensor Signal circuit between the OCM C2 connector and the Right-Front Seat Weight Sensor connector.



Is the resistance below 5.0 ohms?

Yes >> Replace the Right-Front Seat Weight Sensor in accordance with the Service Information. Perform OCS VERIFICATION TEST - VER 1. If DTC B1B7E–PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT LOW returns active, replace the OCM in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

No >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

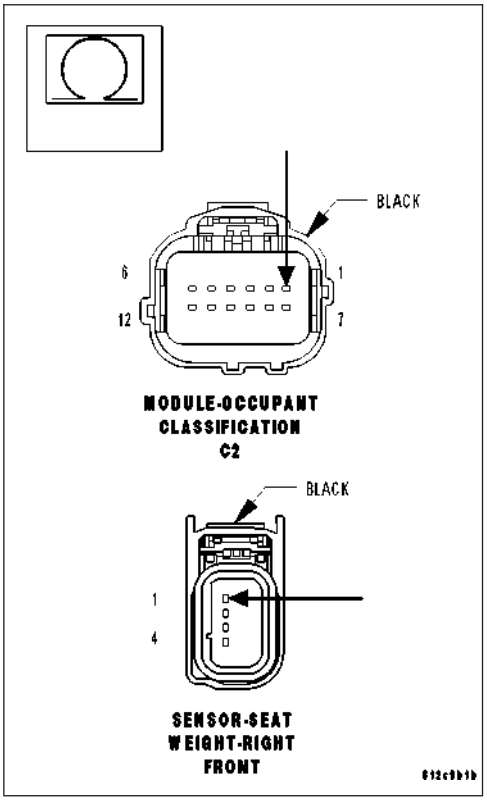
Perform OCS VERIFICATION TEST - VER 1.

---

9. CHECK (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT FOR AN OPEN

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the OCM C2 connector.

Measure the resistance of the (R701) Seat Weight Sensor 5 Volt circuit between the OCM C2 connector and the Right-Front Seat Weight Sensor connector.



Is the resistance below 5.0 ohms?

Yes >> Replace the OCM in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

No >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

B1B7E-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT LOW (CONTINUED)

10. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase all DTCs from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

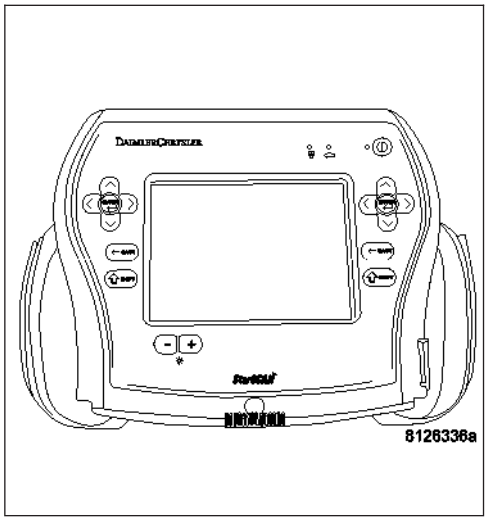
Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor active codes as you work through the following steps.



WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return, continue the test until the problem area has been isolated.

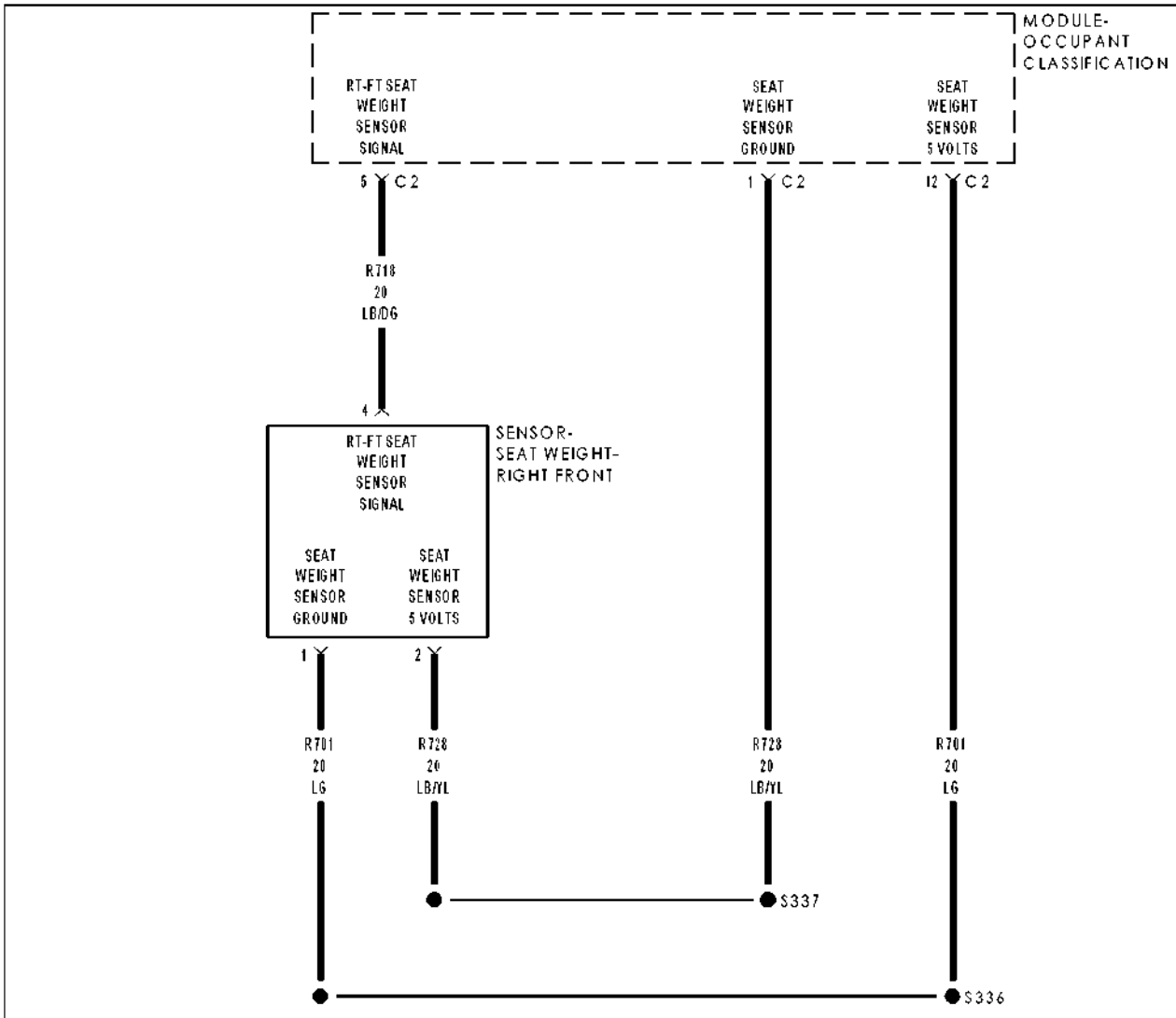
In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

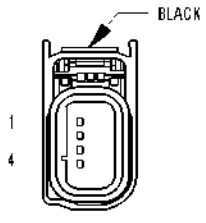
Does the scan tool display any ACTIVE DTCs?

Yes >> Select appropriate symptom from Symptom List.

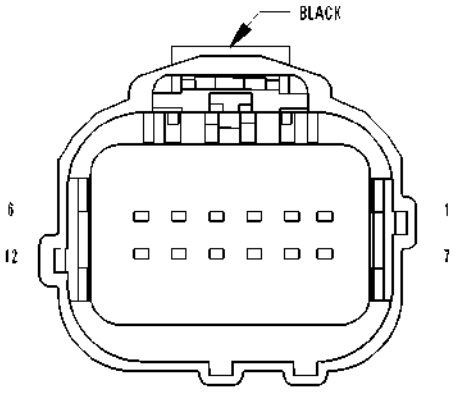
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B7F-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT HIGH





SENSOR-SEAT
WEIGHT-RIGHT
FRONT



MODULE-OCCUPANT
CLASSIFICATION C2

812c9860

B1B7F-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT HIGH (CONTINUED)

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  While the CAN bus ignition status is in IGN_RUN, the module checks the sensor input ranges.
- **Set Condition:**
  If the module detects that the sensor input is greater than 96 ± 0.6% of the (R701) Seat Weight Sensor 5 Volt circuit voltage.

Possible Causes
PASSENGER SEAT HARNESS IMPROPERLY ROUTED
PASSENGER SEAT HARNESS WIRES CHAFFED, PIERCED, PINCHED, PARTIALLY BROKEN
PASSENGER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT PUSHED OUT, SPREAD, CORRODED, CONTAMINATED
(R718) RT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
(R718) RT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT SHORTED TO (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT
(R728) SEAT WEIGHT SENSOR GROUND CIRCUIT OPEN
RIGHT-FRONT SEAT WEIGHT SENSOR
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, & BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

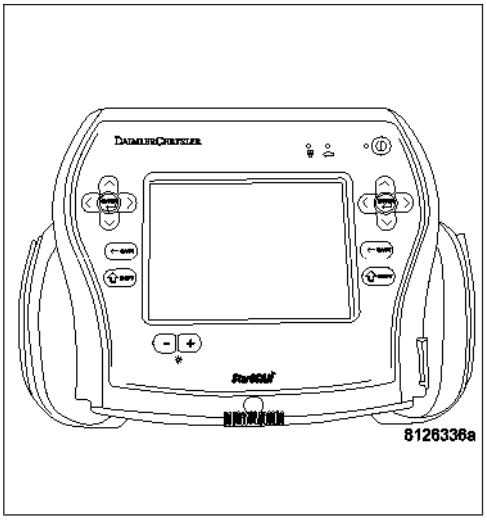
Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

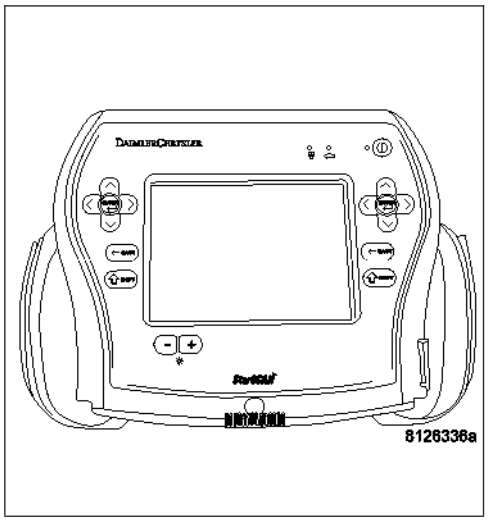
No >> Go To 2



B1B7F-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT HIGH (CONTINUED)

2. VERIFY THAT DTC B1B7F–PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT HIGH IS ACTIVE

With the scan tool, read OCM DTCs.



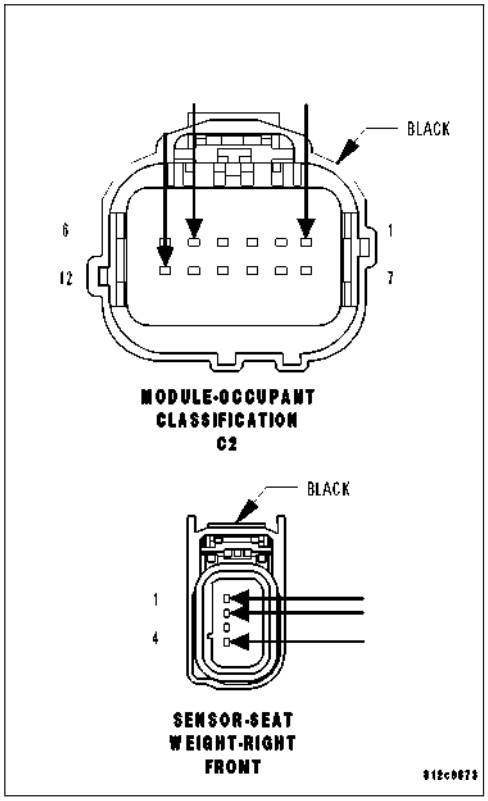
Does the scan tool display active: B1B7F–PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT HIGH?

Yes >> Go To 3

No >> Go To 9

3. INSPECT PASSENGER SEAT HARNESS WIRES & CONNECTORS

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Using the wiring diagram/schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.



Are any of these conditions present?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

No >> Go To 4

B1B7F-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT HIGH (CONTINUED)

4. VERIFY THAT PASSENGER SEAT HARNESS IS ROUTED CORRECTLY

Verify that the Passenger Seat Harness is routed correctly.

Is the Passenger Seat Harness routed correctly?

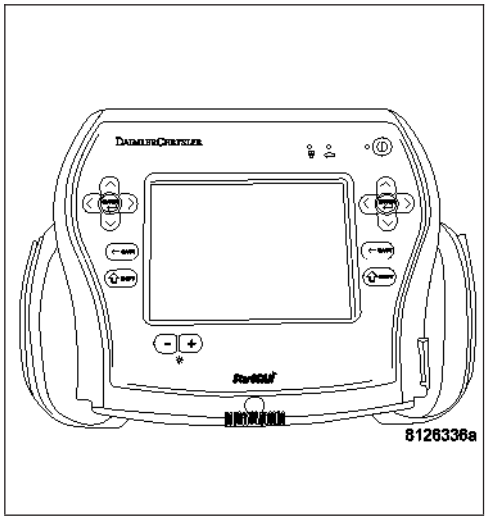
Yes >> Go To 5

No >> Reroute the Passenger Seat Harness as necessary.
Perform OCS VERIFICATION TEST - VER 1.

---

5. CHECK IF MORE THAN ONE PASSENGER SEAT WEIGHT SENSOR DTC IS ACTIVE

Verify that all of the Seat Weight Sensor mounting screws are torqued to specification. Refer to 23 - BODY/SEATS.



WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

NOTE: Failure to follow test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: Verify That All Tests Steps That Led You Here Were Performed As Directed; Verify That The Ignition Is In Run; Wait 30 Seconds After Changing The Seat Weight Before Proceeding To Allow The System To Stabilize; Only Press Scan Tool Buttons When Directed To Do So; & Perform The Occupant Classification Module System Verification Test To Completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, wait two minutes, and then proceed as follows.

With the scan tool, read OCM DTCs.

Does the scan tool display any active PASSENGER SEAT WEIGHT SENSOR DTCs?

Yes, More Than One PASSENGER SEAT WEIGHT SENSOR DTC Is Active
Perform the *Diagnosis/Checkout Procedure For Seat Weight Sensors.
Perform OCS VERIFICATION TEST - VER 1.

Yes, Only DTC B1B7F Is Active
Go To 6

No, But Other DTCs Present
Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No Active DTCs Present
Perform OCS VERIFICATION TEST - VER 1.

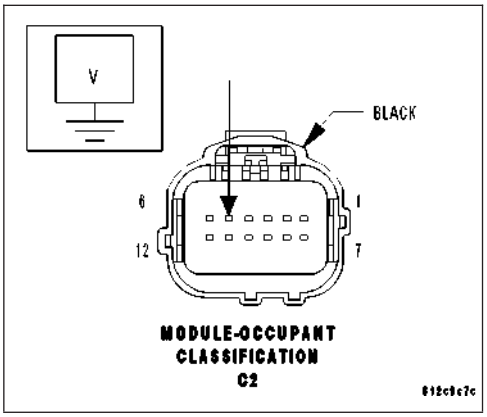
B1B7F-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT HIGH (CONTINUED)

6. CHECK (R718) RT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the OCM C2 connector.

Measure the voltage of the (R718) RT-FT Seat Weight Sensor Signal circuit.



Is the voltage above 0.2 volts?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

No >> Go To 7

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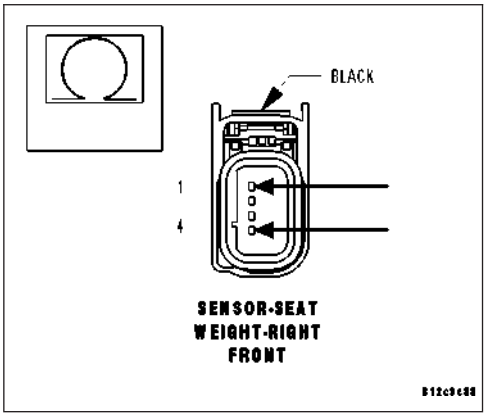
7. CHECK (R718) RT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR A SHORT TO (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT

Disconnect the Right-Front Seat Weight Sensor connector.

Measure the resistance between the (R718) RT-FT Seat Weight Sensor Signal circuit and the (R701) Seat Weight Sensor 5 Volt circuit.



Is the resistance below 10K ohms?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

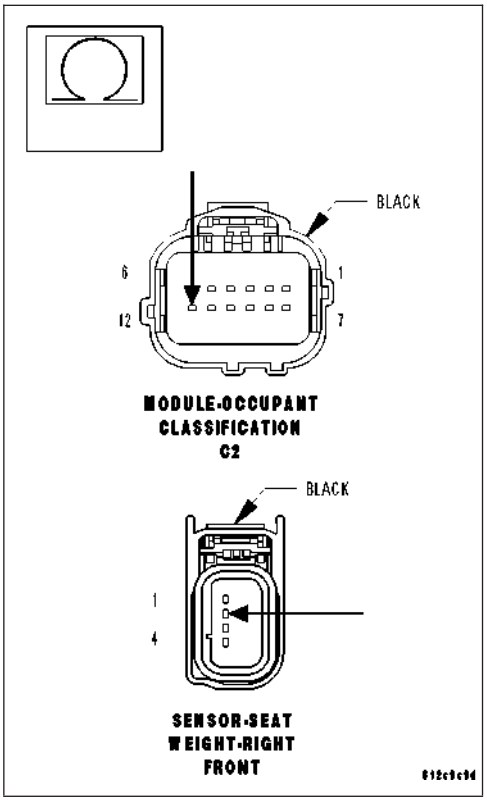
Perform OCS VERIFICATION TEST - VER 1.

No >> Go To 8

B1B7F-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT HIGH (CONTINUED)

8. CHECK (R728) SEAT WEIGHT SENSOR GROUND CIRCUIT FOR AN OPEN

Measure the resistance of the (R728) Seat Weight Sensor Ground circuit between the OCM C2 connector and the Right-Front Seat Weight Sensor connector.



Is the resistance below 5.0 ohms?

Yes >> Replace the OCM in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

No >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

B1B7F-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT HIGH (CONTINUED)

9. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase all DTCs from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

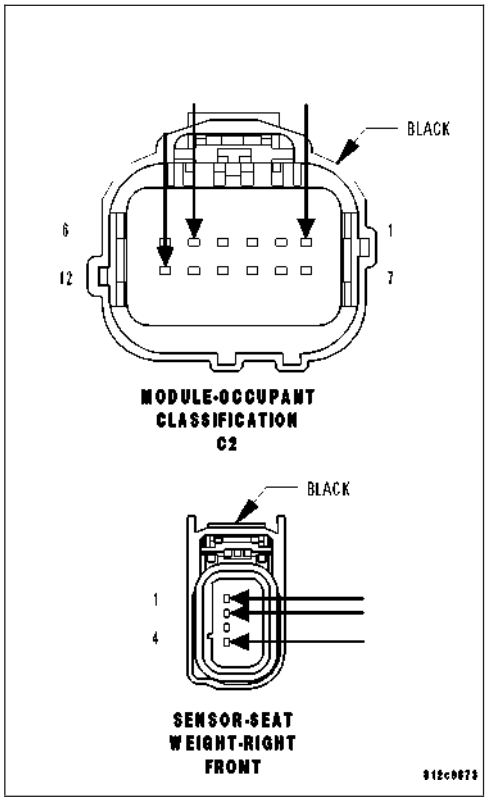
With the scan tool, monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return, continue the test until the problem area has been isolated.



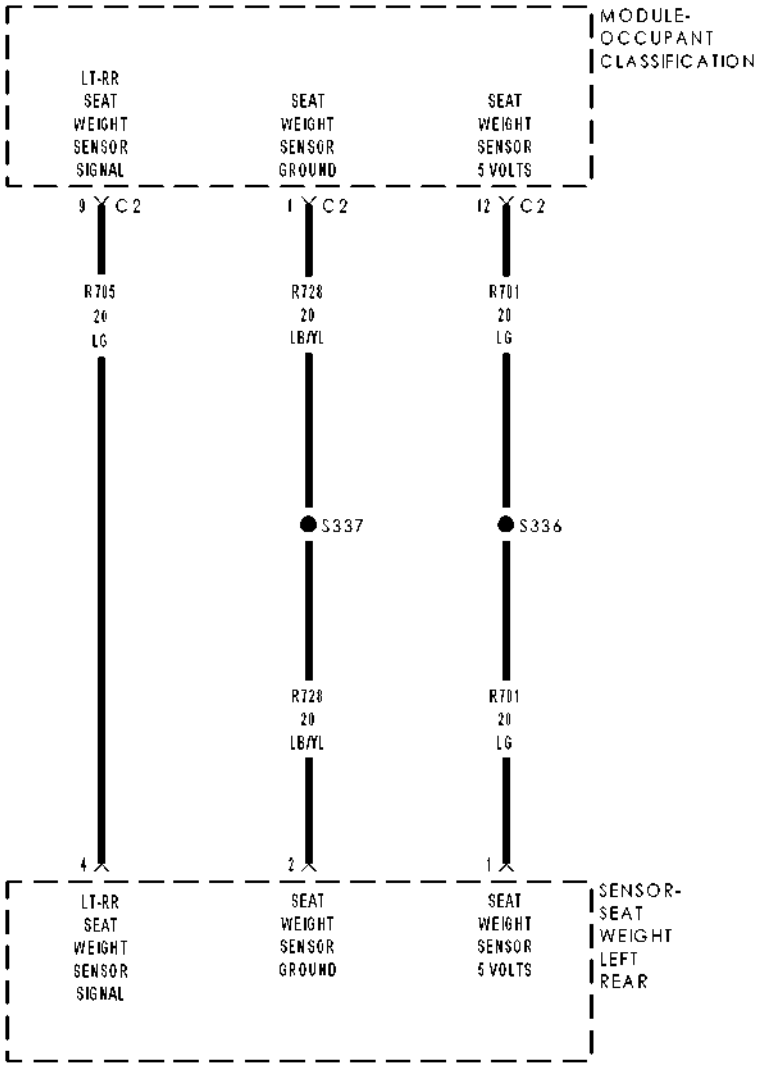
In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

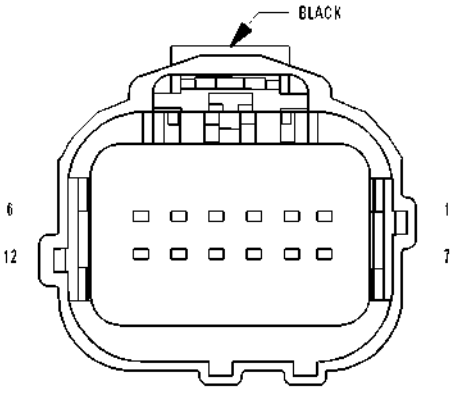
Does the scan tool display any ACTIVE DTCs?

Yes >> Select appropriate symptom from Symptom List.

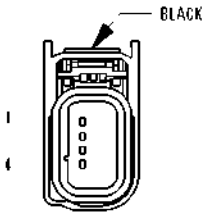
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B82-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR PERFORMANCE





MODULE-OCCUPANT
CLASSIFICATION
C2



SENSOR-SEAT
WEIGHT-LEFT
REAR

B1B82-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR PERFORMANCE (CONTINUED)

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When CAN ignitions status is Run or SNA, during auto zero and while performing the Occupant Classification Module System Verification Test.
- **Set Condition:**
  During the occupant classification verification test: if the module detects that the sensor input is less than 1.4 volts or greater than 3.6 volts. During auto zero: if the module detects that the sensor input is less than 1 volt or greater than 4 volts.

Possible Causes
PASSENGER SEAT HARNESS WIRES CHAFFED, PIERCED, PINCHED, PARTIALLY BROKEN
PASSENGER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT PUSHED OUT, SPREAD, CORRODED, CONTAMINATED
LEFT-REAR PASSENGER SEAT WEIGHT SENSOR
DAMAGE TO THE PASSENGER SEAT STRUCTURE, RISER ASSEMBLY, CROSSMEMBERS, SEAT TRACKS, FLOOR PAN
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, & BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

NOTE: Ensure the battery is fully charged.

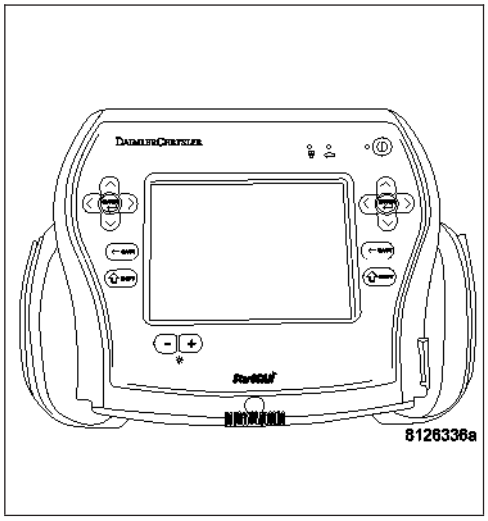
NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.
Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Go To 2



B1B82-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR PERFORMANCE (CONTINUED)

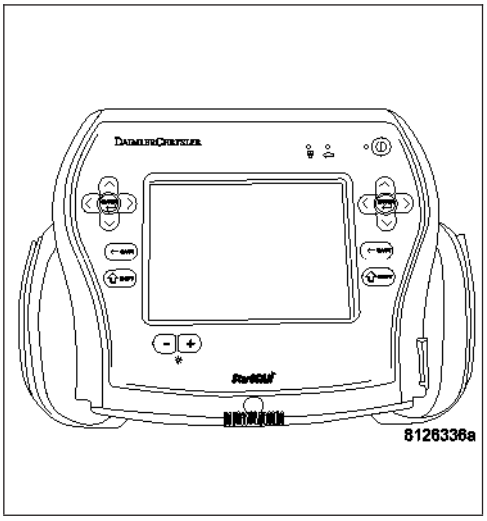
2. VERIFY THAT DTC B1B82–PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR PERFORMANCE IS ACTIVE

With the scan tool, read OCM DTCs.

Does the scan tool display active: B1B82–PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR PERFORMANCE?

Yes >> Go To 3

No >> Go To 5



3. INSPECT PASSENGER SEAT HARNESS WIRES & CONNECTORS

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Using the wiring diagram/schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

Are any of these conditions present?

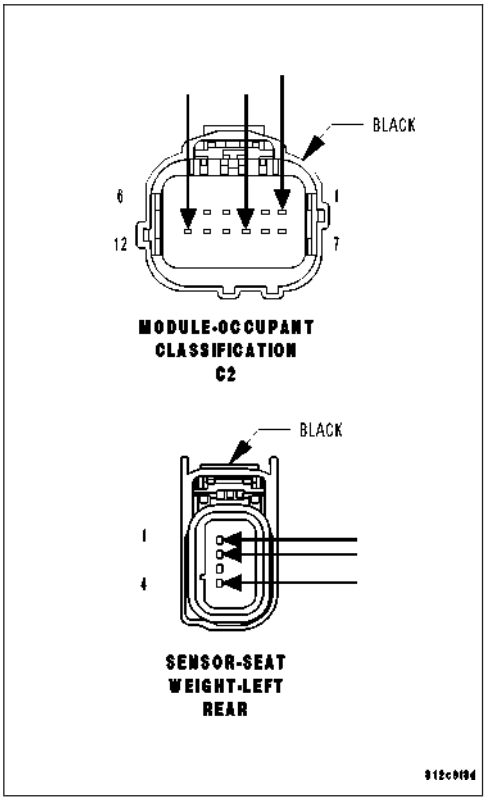
Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

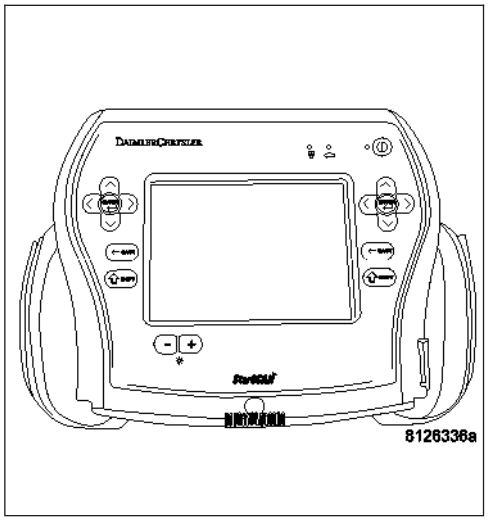
No >> Go To 4



B1B82-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR PERFORMANCE (CONTINUED)

4. PERFORM OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST

Verify that all of the Seat Weight Sensor mounting screws are torqued to specification. Refer to 23 - BODY/SEATS.



WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

NOTE: Failure to follow test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: Verify That All Tests Steps That Led You Here Were Performed As Directed; Verify That The Ignition Is In Run; Wait 30 Seconds After Changing The Seat Weight Before Proceeding To Allow The System To Stabilize; Only Press Scan Tool Buttons When Directed To Do So; & Perform The Occupant Classification Module System Verification Test To Completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, wait two minutes, and then proceed as follows.

With the scan tool, read OCM DTCs.

Does the scan tool display any active PASSENGER SEAT WEIGHT SENSOR PERFORMANCE DTCs?

Yes >> Perform the *Diagnosis/Checkout Procedure For Seat Weight Sensors.

No - But Other DTCs Present

Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No - No Active DTCs Present

Perform OCS VERIFICATION TEST - VER 1.

B1B82-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR PERFORMANCE (CONTINUED)

5. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase all DTCs from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

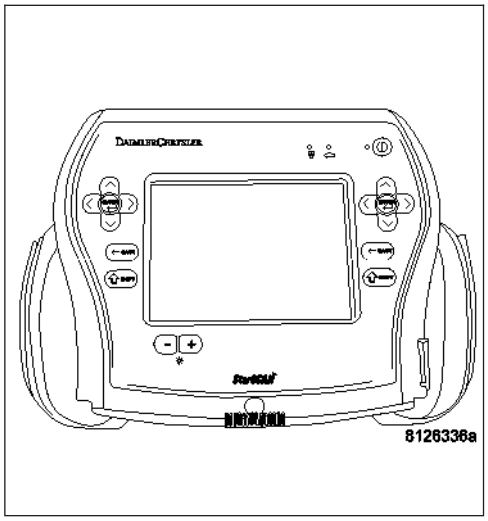
Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor active codes as you work through the following steps.



WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return, continue the test until the problem area has been isolated.

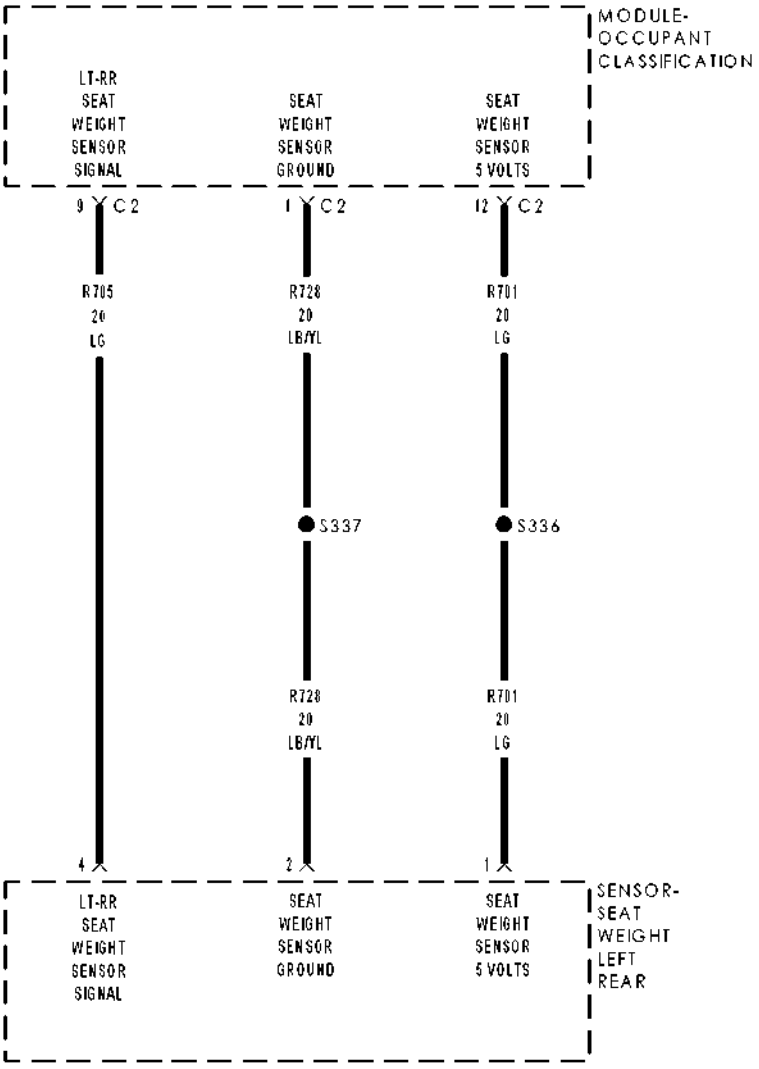
In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

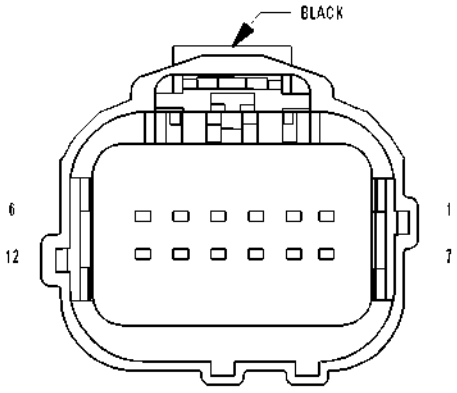
Does the scan tool display any ACTIVE DTCs?

Yes >> Select appropriate symptom from Symptom List.

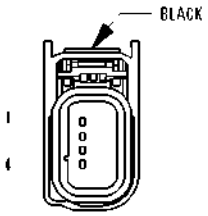
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B83-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT LOW





MODULE-OCCUPANT
CLASSIFICATION
C2



SENSOR-SEAT
WEIGHT-LEFT
REAR

B1B83-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT LOW (CONTINUED)

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  While the CAN bus ignition status is in IGN_RUN, the module checks the sensor input ranges.
- **Set Condition:**
  If the module detects that the sensor input is less than 4.0 ± 0.7% of the (R701) Seat Weight Sensor 5 Volt circuit voltage. This DTC will also set if the (R701) Seat Weight Sensor 5 Volt circuit is shorted to ground. However, this condition would prevent communication with the OCM and cause a Lost Communication With OCM DTC to set in other modules.

Possible Causes
PASSENGER SEAT HARNESS IMPROPERLY ROUTED
PASSENGER SEAT HARNESS WIRES CHAFFED, PIERCED, PINCHED, PARTIALLY BROKEN
PASSENGER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT PUSHED OUT, SPREAD, CORRODED, CONTAMINATED
(R705) LT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
(R705) LT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT OPEN
(R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT OPEN
LEFT-REAR SEAT WEIGHT SENSOR
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, & BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

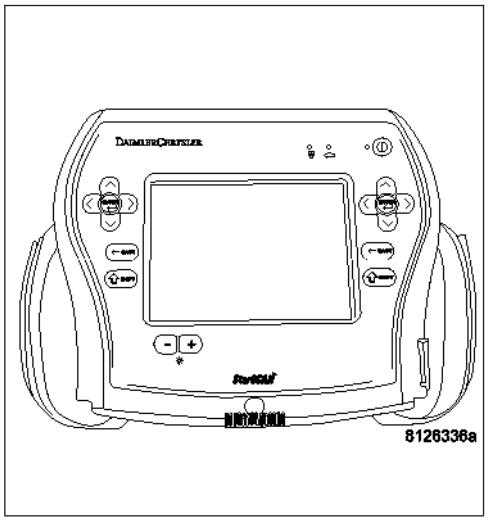
Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Go To 2



B1B83-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT LOW (CONTINUED)

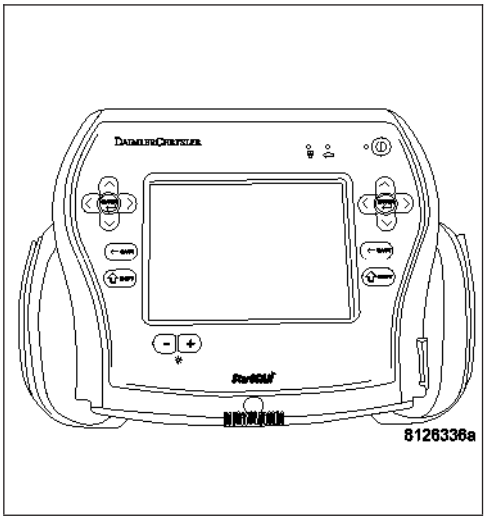
2. VERIFY THAT DTC B1B83–PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT LOW IS ACTIVE

With the scan tool, read OCM DTCs.

Does the scan tool display active: B1B83–PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT LOW?

Yes >> Go To 3

No >> Go To 10



3. INSPECT PASSENGER SEAT HARNESS WIRES & CONNECTORS

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Using the wiring diagram/schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

Are any of these conditions present?

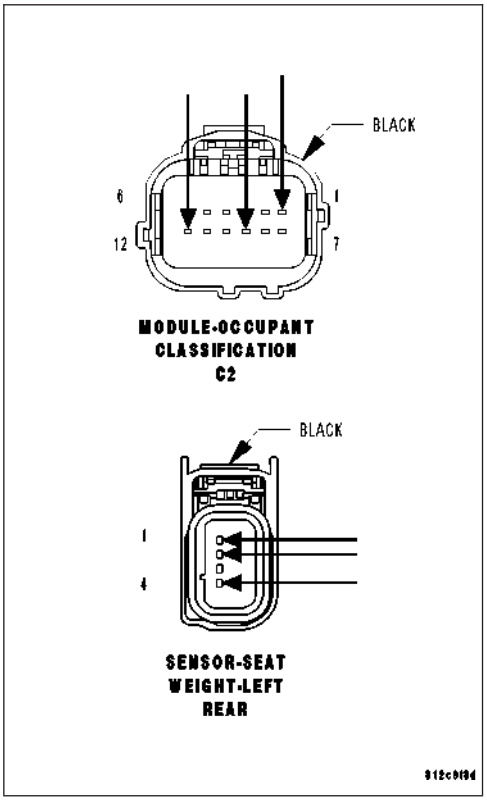
Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

No >> Go To 4



B1B83-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT LOW (CONTINUED)

4. VERIFY THAT PASSENGER SEAT HARNESS IS ROUTED CORRECTLY

Verify that the Passenger Seat Harness is routed correctly.

Is the Passenger Seat Harness routed correctly?

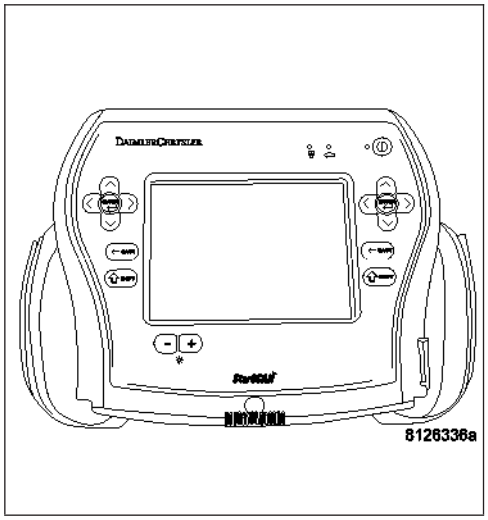
Yes >> Go To 5

No >> Reroute the Passenger Seat Harness as necessary.
Perform OCS VERIFICATION TEST - VER 1.

---

5. CHECK IF MORE THAN ONE PASSENGER SEAT WEIGHT SENSOR DTC IS ACTIVE

Verify that all of the Seat Weight Sensor mounting screws are torqued to specification. Refer to 23 - BODY/SEATS.



WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

NOTE: Failure to follow test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: Verify That All Tests Steps That Led You Here Were Performed As Directed; Verify That The Ignition Is In Run; Wait 30 Seconds After Changing The Seat Weight Before Proceeding To Allow The System To Stabilize; Only Press Scan Tool Buttons When Directed To Do So; & Perform The Occupant Classification Module System Verification Test To Completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, wait two minutes, and then proceed as follows.

With the scan tool, read OCM DTCs.

Does the scan tool display any active PASSENGER SEAT WEIGHT SENSOR DTCs?

Yes - More Than One PASSENGER SEAT WEIGHT SENSOR DTC Is Active
Perform the *Diagnosis/Checkout Procedure For Seat Weight Sensors.
Perform OCS VERIFICATION TEST - VER 1.

Yes - Only DTC B1B83 Is Active
Go To 6

No - But Other DTCs Present
Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No - No Active DTCs Present
Perform OCS VERIFICATION TEST - VER 1.

B1B83-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT LOW (CONTINUED)

6. CHECK VOLTAGE OF (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT

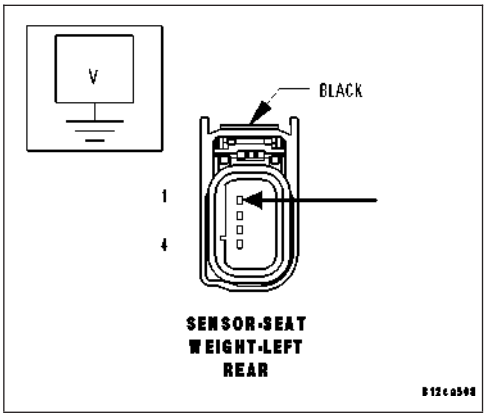
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Left-Rear Seat Weight Sensor connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
Measure the voltage of the (R701) Seat Weight Sensor 5 Volt circuit.

Is the voltage above 4.8 volts?

Yes >> Go To 7

No >> Go To 9



7. CHECK (R705) LT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the OCM C2 connector.

Measure the resistance of the (R705) LT-RR Seat Weight Sensor Signal circuit between ground and the OCM C2 connector.

Is the resistance below 10k ohms?

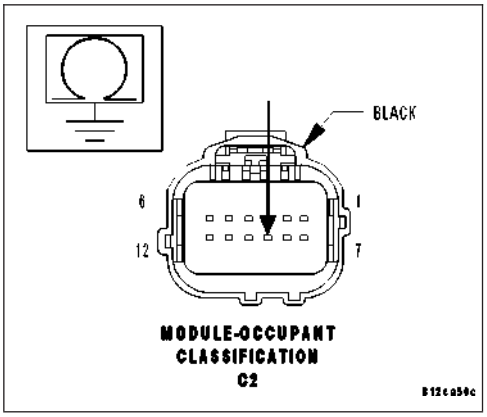
Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

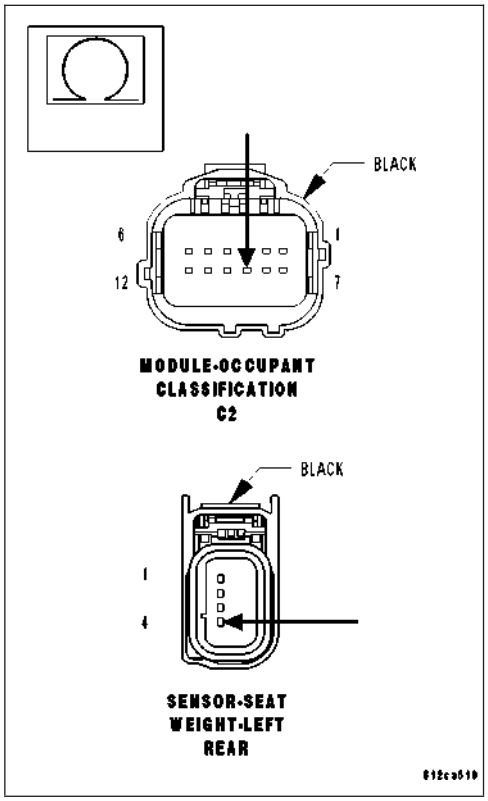
No >> Go To 8



B1B83-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT LOW (CONTINUED)

8. CHECK (R705) LT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR AN OPEN

Measure the resistance of the (R705) LT-RR Seat Weight Sensor Signal circuit between the OCM C2 connector and the Left-Rear Seat Weight Sensor connector.



Is the resistance below 5.0 ohms?

Yes >> Replace the Left-Rear Seat Weight Sensor in accordance with the Service Information. Perform OCS VERIFICATION TEST - VER 1. If DTC B1B83-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT LOW returns active, replace the OCM in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

No >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

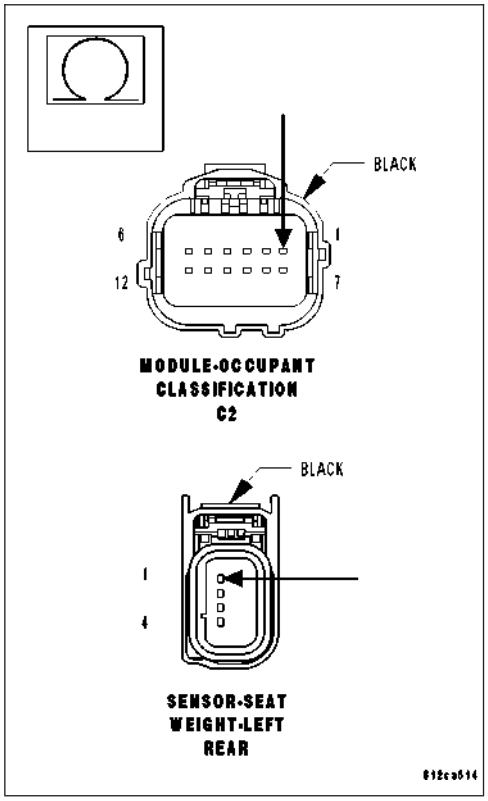
Perform OCS VERIFICATION TEST - VER 1.

9. CHECK (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT FOR AN OPEN

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the OCM C2 connector.

Measure the resistance of the (R701) Seat Weight Sensor 5 Volt circuit between the OCM C2 connector and the Left-Rear Seat Weight Sensor connector.



Is the resistance below 5.0 ohms?

Yes >> Replace the OCM in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

No >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

B1B83-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT LOW (CONTINUED)

10. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase all DTCs from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

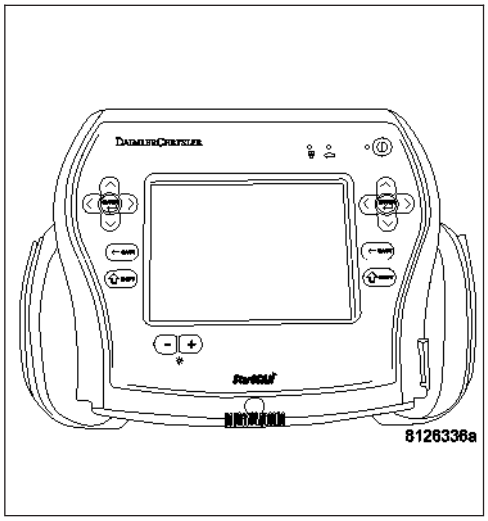
Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor active codes as you work through the following steps.



WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return, continue the test until the problem area has been isolated.

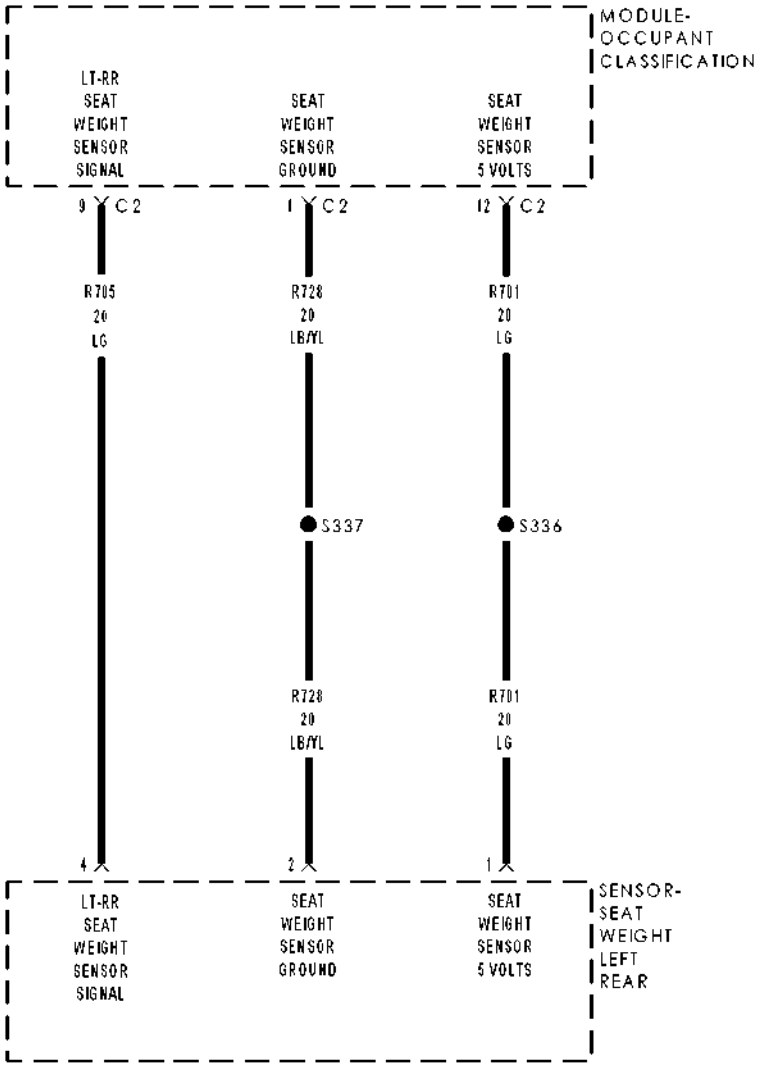
In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

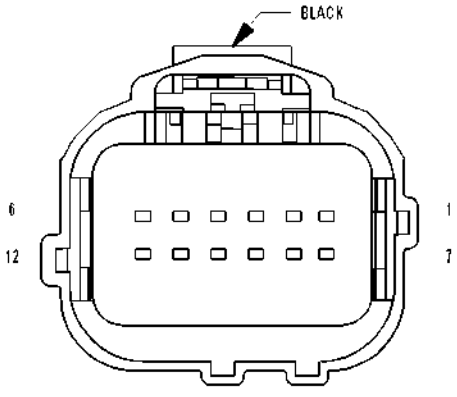
Does the scan tool display any ACTIVE DTCs?

Yes >> Select appropriate symptom from Symptom List.

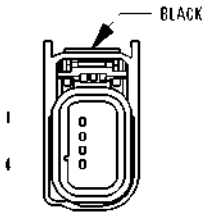
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B84-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT HIGH





MODULE-OCCUPANT
CLASSIFICATION
C2



SENSOR-SEAT
WEIGHT-LEFT
REAR

B1B84-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT HIGH (CONTINUED)

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  While the CAN bus ignition status is in IGN_RUN, the module checks the sensor input ranges.
- **Set Condition:**
  If the module detects that the sensor input is greater than 96 ± 0.6% of the (R701) Seat Weight Sensor 5 Volt circuit voltage.

Possible Causes
PASSENGER SEAT HARNESS IMPROPERLY ROUTED
PASSENGER SEAT HARNESS WIRES CHAFFED, PIERCED, PINCHED, PARTIALLY BROKEN
PASSENGER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT PUSHED OUT, SPREAD, CORRODED, CONTAMINATED
(R705) LT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
(R705) LT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT SHORTED TO (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT
(R728) SEAT WEIGHT SENSOR GROUND CIRCUIT OPEN
LEFT-REAR SEAT WEIGHT SENSOR
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, & BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

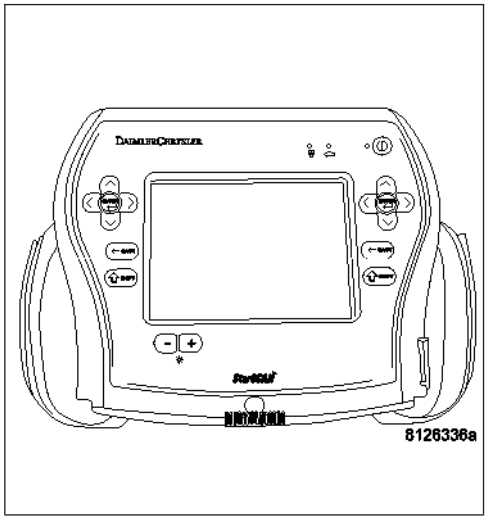
Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Go To 2

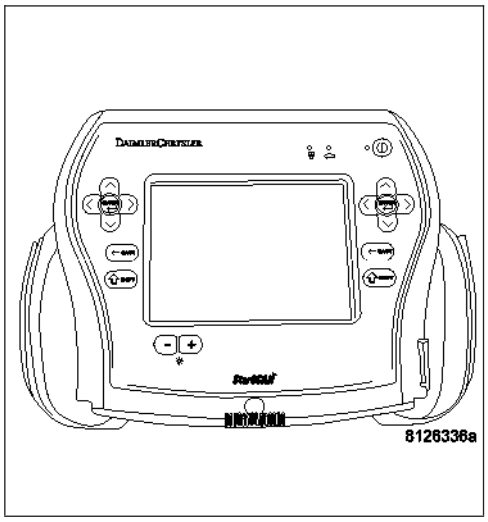


B1B84-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT HIGH (CONTINUED)

2. VERIFY THAT DTC B1B84–PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT HIGH IS ACTIVE

With the scan tool, read OCM DTCs.

Does the scan tool display active: B1B84–PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT HIGH?



Yes >> Go To 3

No >> Go To 9

3. INSPECT PASSENGER SEAT HARNESS WIRES & CONNECTORS

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

Are any of these conditions present?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

No >> Go To 4

4. VERIFY THAT PASSENGER SEAT HARNESS IS ROUTED CORRECTLY

Verify that the Passenger Seat Harness is routed correctly.

Is the Passenger Seat Harness routed correctly?

Yes >> Go To 5

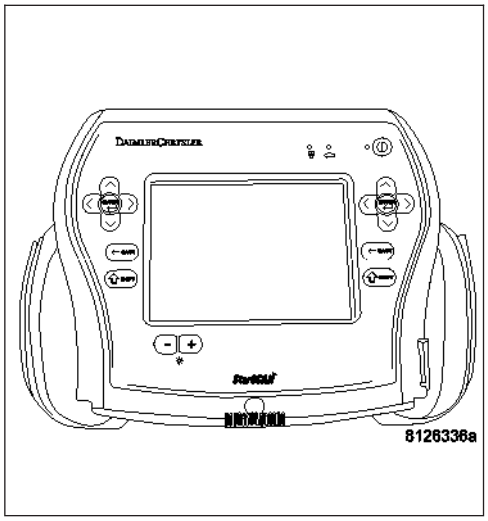
No >> Reroute the Passenger Seat Harness as necessary.

Perform OCS VERIFICATION TEST - VER 1.

B1B84-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT HIGH (CONTINUED)

5. CHECK IF MORE THAN ONE PASSENGER SEAT WEIGHT SENSOR DTC IS ACTIVE

Verify that all of the Seat Weight Sensor mounting screws are torqued to specification. Refer to 23 - BODY/SEATS.



WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

NOTE: Failure to follow test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: Verify That All Tests Steps That Led You Here Were Performed As Directed; Verify That The Ignition Is In Run; Wait 30 Seconds After Changing The Seat Weight Before Proceeding To Allow The System To Stabilize; Only Press Scan Tool Buttons When Directed To Do So; & Perform The Occupant Classification Module System Verification Test To Completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, wait two minutes, and then proceed as follows.

With the scan tool, read OCM DTCs.

Does the scan tool display any active PASSENGER SEAT WEIGHT SENSOR DTCs?

Yes - More Than One PASSENGER SEAT WEIGHT SENSOR DTC Is Active
Perform the *Diagnosis/Checkout Procedure For Seat Weight Sensors.
Perform OCS VERIFICATION TEST - VER 1.

Yes - Only DTC B1B84 Is Active
Go To 6

No - But Other DTCs Present
Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No - Active DTCs Present
Perform OCS VERIFICATION TEST - VER 1.

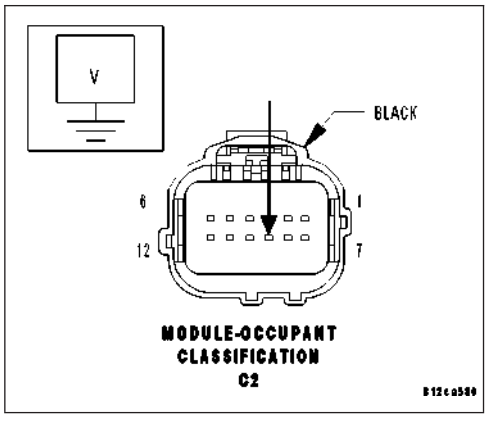
---

6. CHECK (R705) LT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the OCM C2 connector.

Measure the voltage of the (R705) LT-RR Seat Weight Sensor Signal circuit.



Is the voltage above 0.2 volts?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.
Perform OCS VERIFICATION TEST - VER 1.

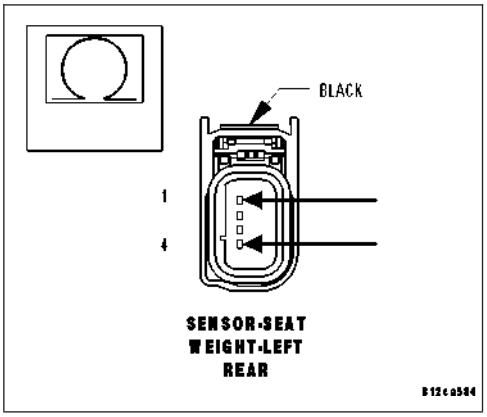
No >> Go To 7

B1B84-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT HIGH (CONTINUED)

7. CHECK (R705) LT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR A SHORT TO (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT

Disconnect the Left-Rear Seat Weight Sensor connector.

Measure the resistance between the (R705) LT-RR Seat Weight Sensor Signal circuit and the (R701) Seat Weight Sensor 5 Volt circuit.



Is the resistance below 10K ohms?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

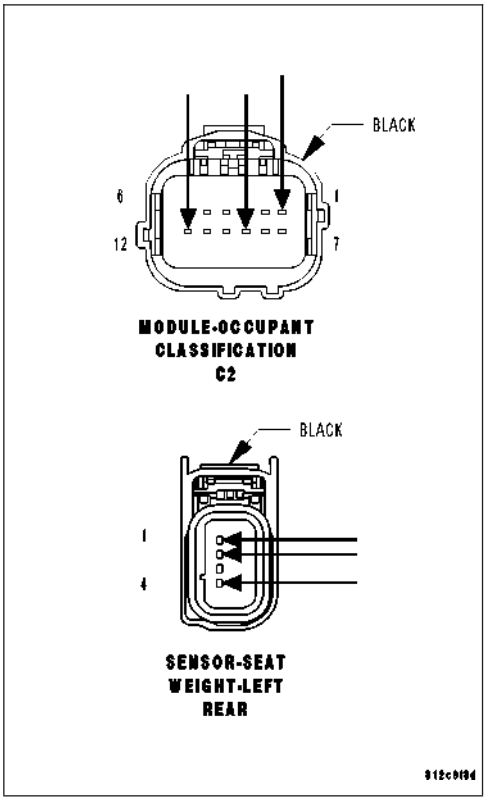
Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

No >> Go To 8

8. CHECK (R728) SEAT WEIGHT SENSOR GROUND CIRCUIT FOR AN OPEN

Measure the resistance of the (R728) Seat Weight Sensor Ground circuit between the OCM C2 connector and the Left-Rear Seat Weight Sensor connector.



Is the resistance below 5.0 ohms?

Yes >> Replace the OCM in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

No >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

B1B84-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT HIGH (CONTINUED)

9. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase all DTCs from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

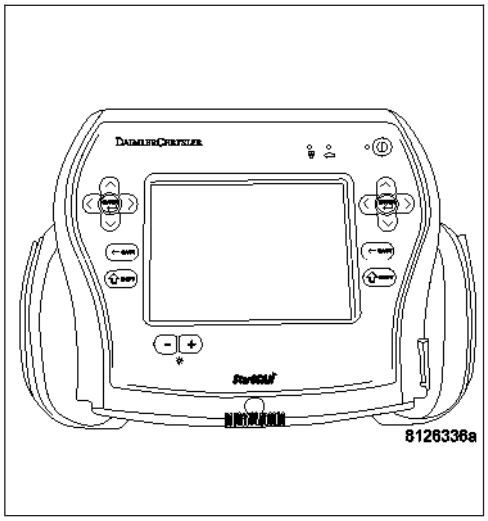
Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor active codes as you work through the following steps.



WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return, continue the test until the problem area has been isolated.

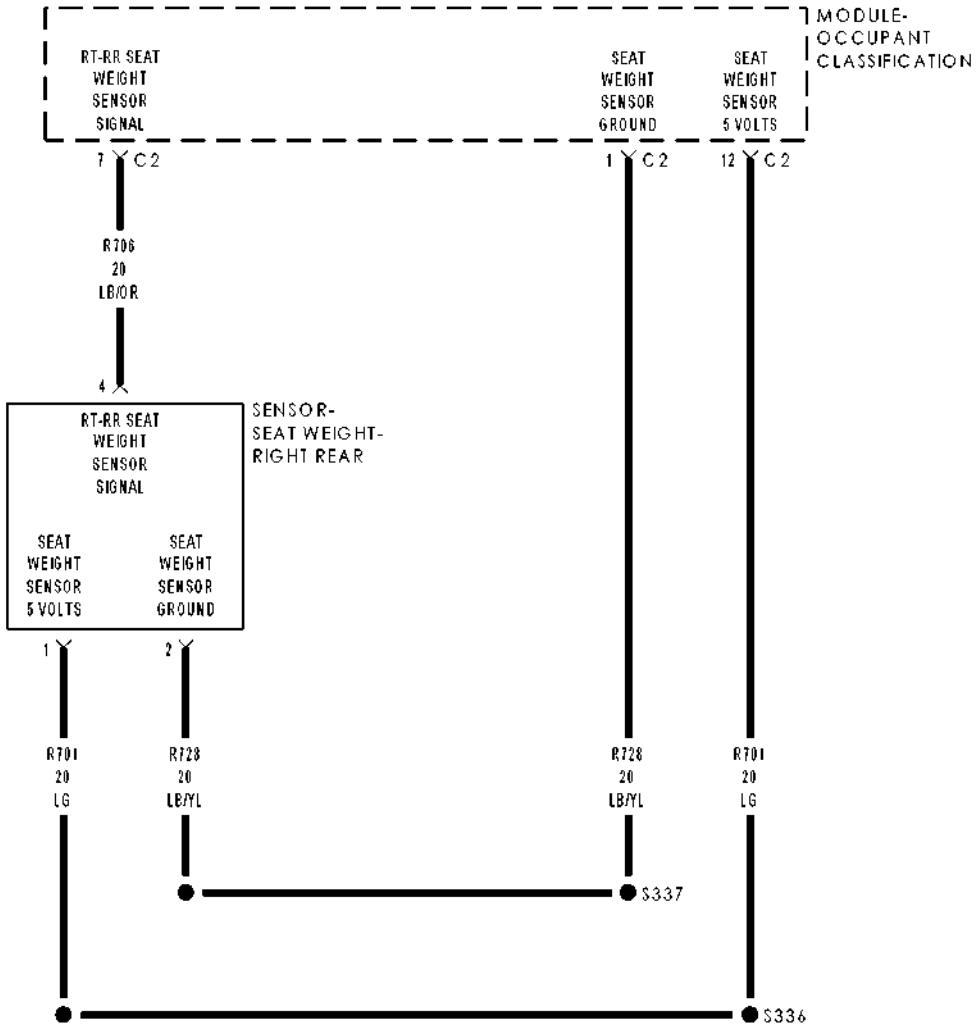
In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

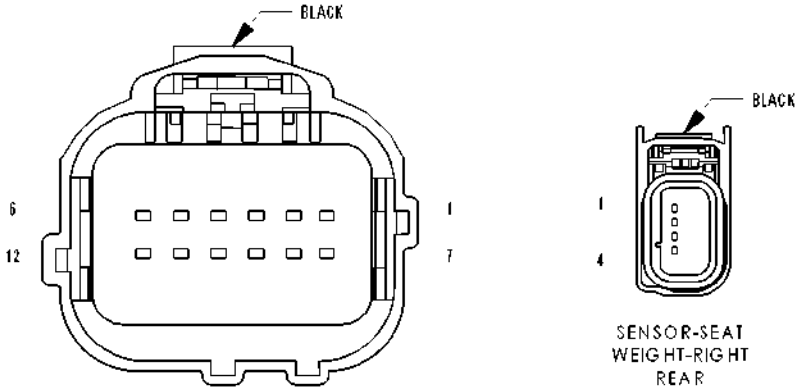
Does the scan tool display any ACTIVE DTCs?

Yes >> Select appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B87-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR PERFORMANCE





B1B87-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR PERFORMANCE (CONTINUED)

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When CAN ignitions status is Run or SNA, during auto zero and while performing the Occupant Classification Module System Verification Test.
- **Set Condition:**
  During the occupant classification verification test: if the module detects that the sensor input is less than 1.4 volts or greater than 3.6 volts. During auto zero: if the module detects that the sensor input is less than 1 volt or greater than 4 volts.

Possible Causes
PASSENGER SEAT HARNESS WIRES CHAFFED, PIERCED, PINCHED, PARTIALLY BROKEN
PASSENGER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT PUSHED OUT, SPREAD, CORRODED, CONTAMINATED
RIGHT-REAR PASSENGER SEAT WEIGHT SENSOR
DAMAGE TO THE PASSENGER SEAT STRUCTURE, RISER ASSEMBLY, CROSSMEMBERS, SEAT TRACKS, FLOOR PAN
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, & BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

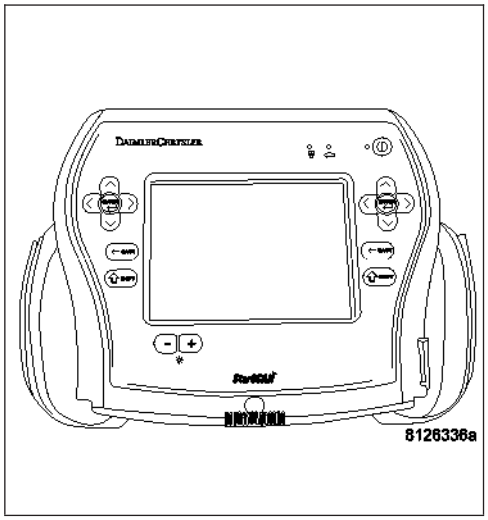
Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Go To 2



B1B87-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR PERFORMANCE (CONTINUED)

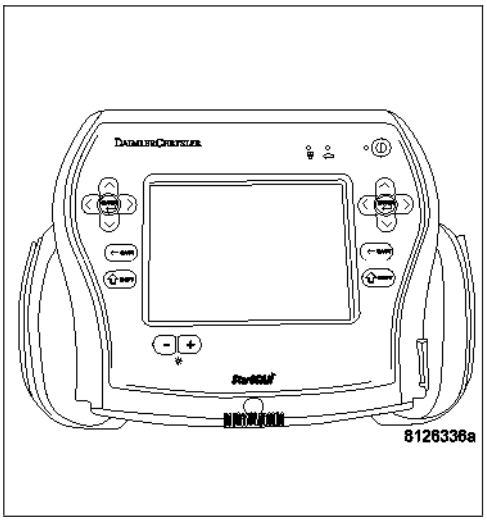
2. VERIFY THAT DTC B1B87–PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR PERFORMANCE IS ACTIVE

With the scan tool, read OCM DTCs.

Does the scan tool display active: B1B87–PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR PERFORMANCE?

Yes >> Go To 3

No >> Go To 5



3. INSPECT PASSENGER SEAT HARNESS WIRES & CONNECTORS

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Using the wiring diagram/schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

Are any of these conditions present?

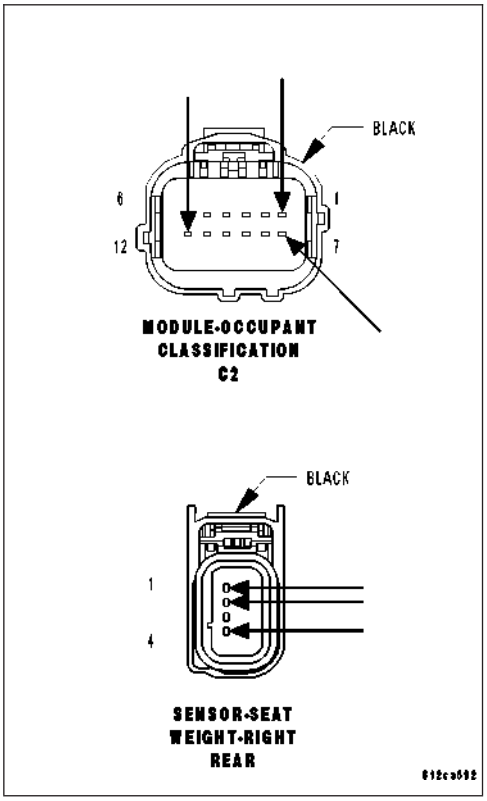
Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

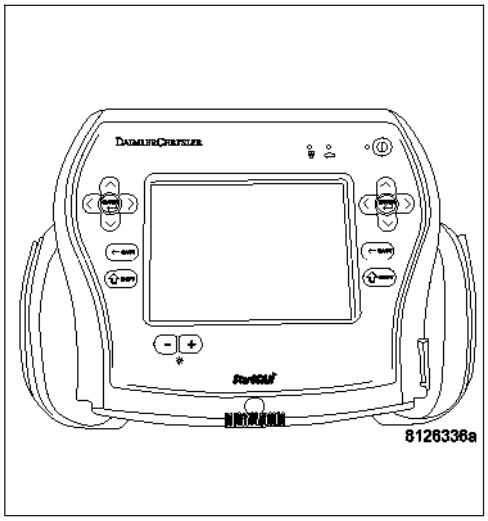
No >> Go To 4



B1B87-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR PERFORMANCE (CONTINUED)

4. PERFORM OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST

Verify that all of the Seat Weight Sensor mounting screws are torqued to specification. Refer to 23 - BODY/SEATS.



WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

NOTE: Failure to follow test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: Verify That All Tests Steps That Led You Here Were Performed As Directed; Verify That The Ignition Is In Run; Wait 30 Seconds After Changing The Seat Weight Before Proceeding To Allow The System To Stabilize; Only Press Scan Tool Buttons When Directed To Do So; & Perform The Occupant Classification Module System Verification Test To Completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, wait two minutes, and then proceed as follows.

With the scan tool, read OCM DTCs.

Does the scan tool display any active PASSENGER SEAT WEIGHT SENSOR PERFORMANCE DTCs?

Yes >> Perform the *Diagnosis/Checkout Procedure For Seat Weight Sensors.
Perform OCS VERIFICATION TEST - VER 1.

No - But Other DTCs Present
Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No - No Active DTCs Present
Perform OCS VERIFICATION TEST - VER 1.

B1B87-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR PERFORMANCE (CONTINUED)

5. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase all DTCs from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

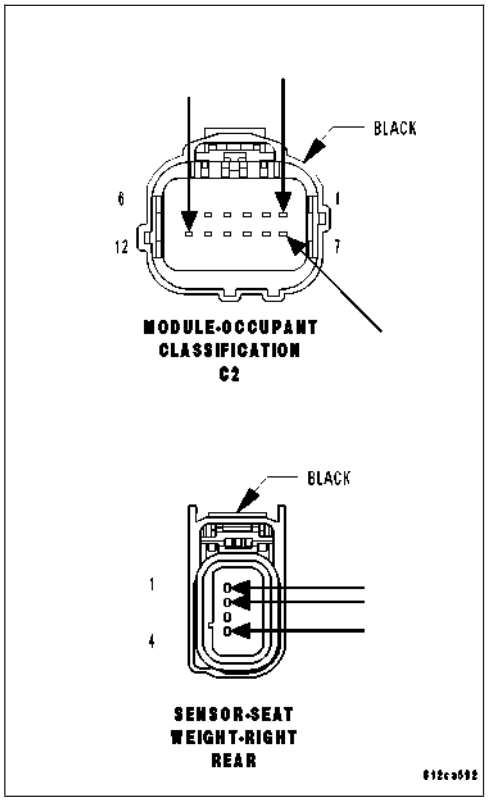
With the scan tool, monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return, continue the test until the problem area has been isolated.



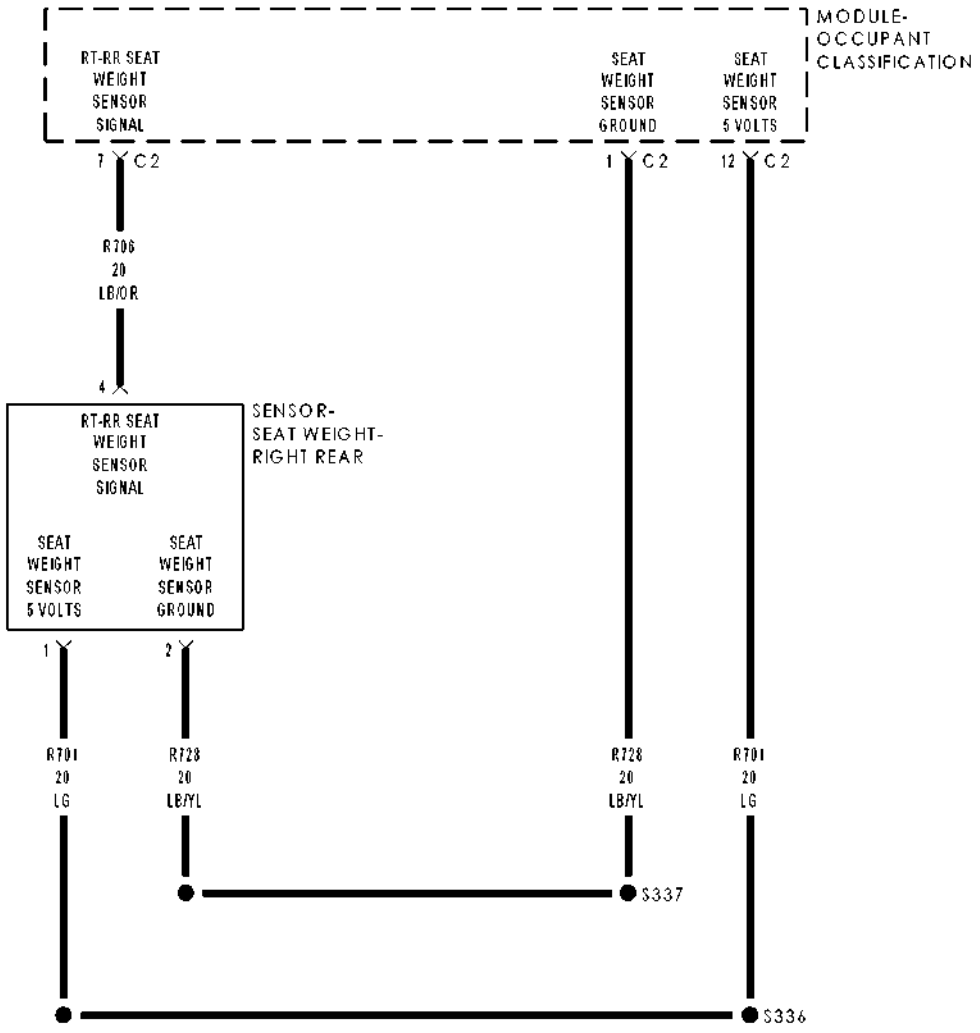
In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

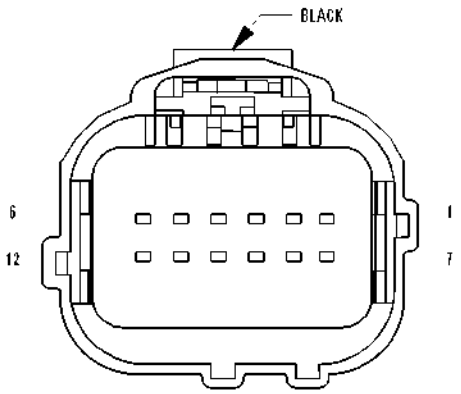
Does the scan tool display any ACTIVE DTCs?

Yes >> Select appropriate symptom from Symptom List.

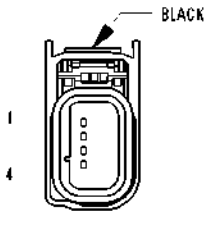
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B88-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT LOW





MODULE-OCCUPANT
CLASSIFICATION
C2



SENSOR-SEAT
WEIGHT-RIGHT
REAR

81bca59e

B1B88-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT LOW (CONTINUED)

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  While the CAN bus ignition status is in IGN_RUN, the module checks the sensor input ranges.
- **Set Condition:**
  If the module detects that the sensor input is less than 4.0 ± 0.7% of the (R701) Seat Weight Sensor 5 Volt circuit voltage. This DTC will also set if the (R701) Seat Weight Sensor 5 Volt circuit is shorted to ground. However, this condition would prevent communication with the OCM and cause a Lost Communication With OCM DTC to set in other modules.

Possible Causes
PASSENGER SEAT HARNESS IMPROPERLY ROUTED
PASSENGER SEAT HARNESS WIRES CHAFFED, PIERCED, PINCHED, PARTIALLY BROKEN
PASSENGER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT PUSHED OUT, SPREAD, CORRODED, CONTAMINATED
(R706) RT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
(R706) RT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT OPEN
(R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT OPEN
RIGHT-REAR SEAT WEIGHT SENSOR
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, & BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

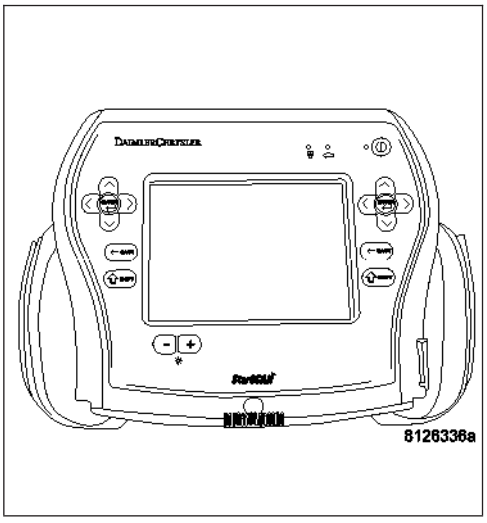
Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Go To 2



B1B88-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT LOW (CONTINUED)

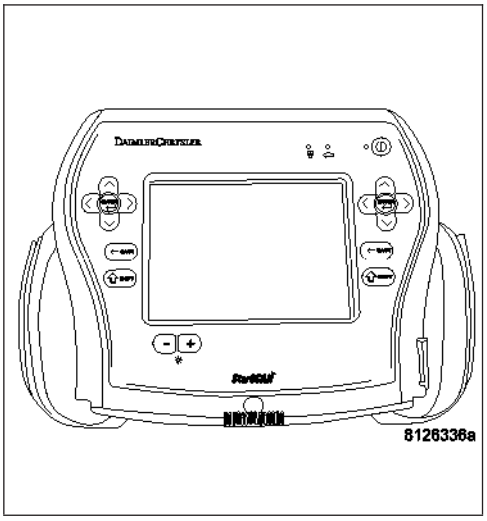
2. VERIFY THAT DTC B1B88–PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT LOW IS ACTIVE

With the scan tool, read OCM DTCs.

Does the scan tool display active: B1B88–PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT LOW?

Yes >> Go To 3

No >> Go To 10



3. INSPECT PASSENGER SEAT HARNESS WIRES & CONNECTORS

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Using the wiring diagram/schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

Are any of these conditions present?

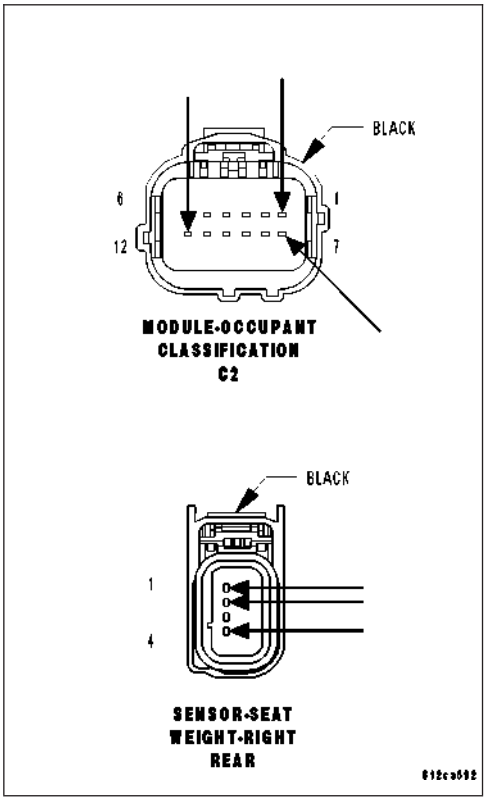
Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

No >> Go To 4



B1B88-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT LOW (CONTINUED)

4. VERIFY THAT PASSENGER SEAT HARNESS IS ROUTED CORRECTLY

Verify that the Passenger Seat Harness is routed correctly.

Is the Passenger Seat Harness routed correctly?

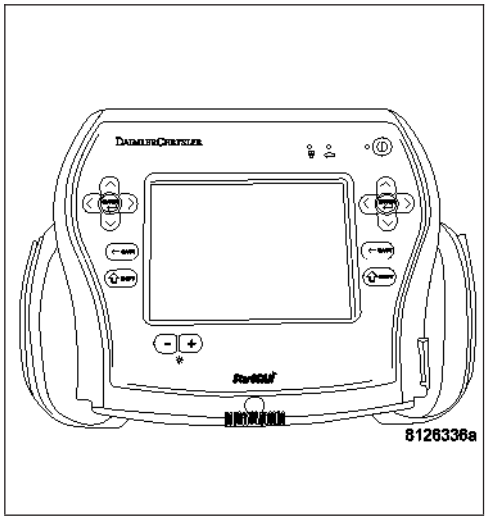
Yes >> Go To 5

No >> Reroute the Passenger Seat Harness as necessary.
Perform OCS VERIFICATION TEST - VER 1.

---

5. CHECK IF MORE THAN ONE PASSENGER SEAT WEIGHT SENSOR DTC IS ACTIVE

Verify that all of the Seat Weight Sensor mounting screws are torqued to specification. Refer to 23 - BODY/SEATS.



WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

NOTE: Failure to follow test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: Verify That All Tests Steps That Led You Here Were Performed As Directed; Verify That The Ignition Is In Run; Wait 30 Seconds After Changing The Seat Weight Before Proceeding To Allow The System To Stabilize; Only Press Scan Tool Buttons When Directed To Do So; & Perform The Occupant Classification Module System Verification Test To Completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, wait two minutes, and then proceed as follows.

With the scan tool, read OCM DTCs.

Does the scan tool display any active PASSENGER SEAT WEIGHT SENSOR DTCs?

Yes, More Than One PASSENGER SEAT WEIGHT SENSOR DTC Is Active
Perform the *Diagnosis/Checkout Procedure For Seat Weight Sensors.
Perform OCS VERIFICATION TEST - VER 1.

Yes - Only DTC B1B88 Is Active
Go To 6

No - But Other DTCs Present
Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No - No Active DTCs Present
Perform OCS VERIFICATION TEST - VER 1.

B1B88-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT LOW (CONTINUED)

6. CHECK VOLTAGE OF (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT

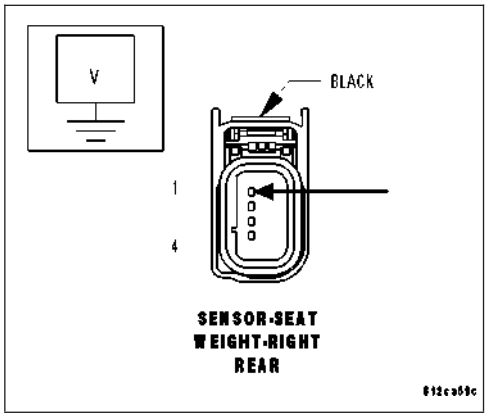
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Right-Rear Seat Weight Sensor connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
Measure the voltage of the (R701) Seat Weight Sensor 5 Volt circuit.

Is the voltage above 4.8 volts?

Yes >> Go To 7

No >> Go To 9



7. CHECK (R706) RT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the OCM C2 connector.

Measure the resistance of the (R706) RT-RR Seat Weight Sensor Signal circuit between ground and the OCM C2 connector.

Is the resistance below 10k ohms?

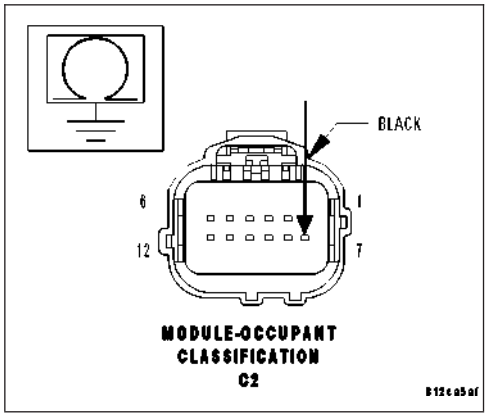
Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

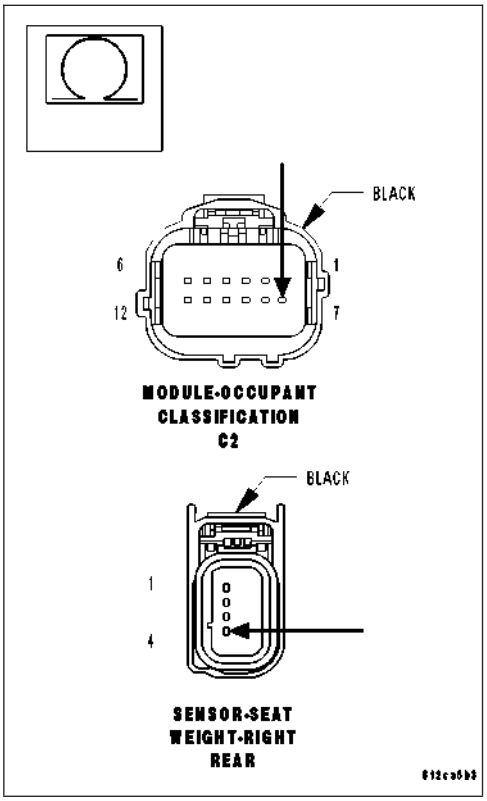
No >> Go To 8



B1B88-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT LOW (CONTINUED)

8. CHECK (R706) RT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR AN OPEN

Measure the resistance of the (R706) RT-RR Seat Weight Sensor Signal circuit between the OCM C2 connector and the Right-Rear Seat Weight Sensor connector.



Is the resistance below 5.0 ohms?

Yes >> Replace the Right-Rear Seat Weight Sensor in accordance with the Service Information. Perform OCS VERIFICATION TEST - VER 1. If DTC B1B88–PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT LOW returns active, replace the OCM in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

No >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

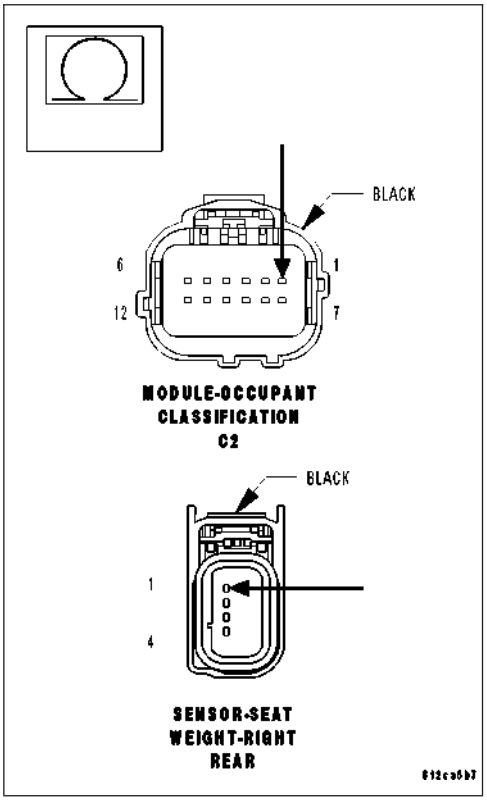
Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

9. CHECK (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT FOR AN OPEN

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the OCM C2 connector.

Measure the resistance of the (R701) Seat Weight Sensor 5 Volt circuit between the OCM C2 connector and the Right-Rear Seat Weight Sensor connector.



Is the resistance below 5.0 ohms?

Yes >> Replace the OCM in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

No >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

B1B88-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT LOW (CONTINUED)

10. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase all DTCs from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

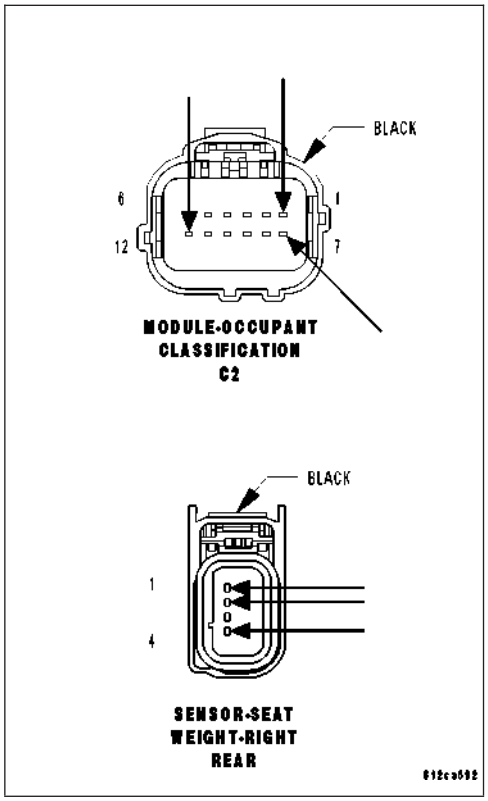
With the scan tool, monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return, continue the test until the problem area has been isolated.



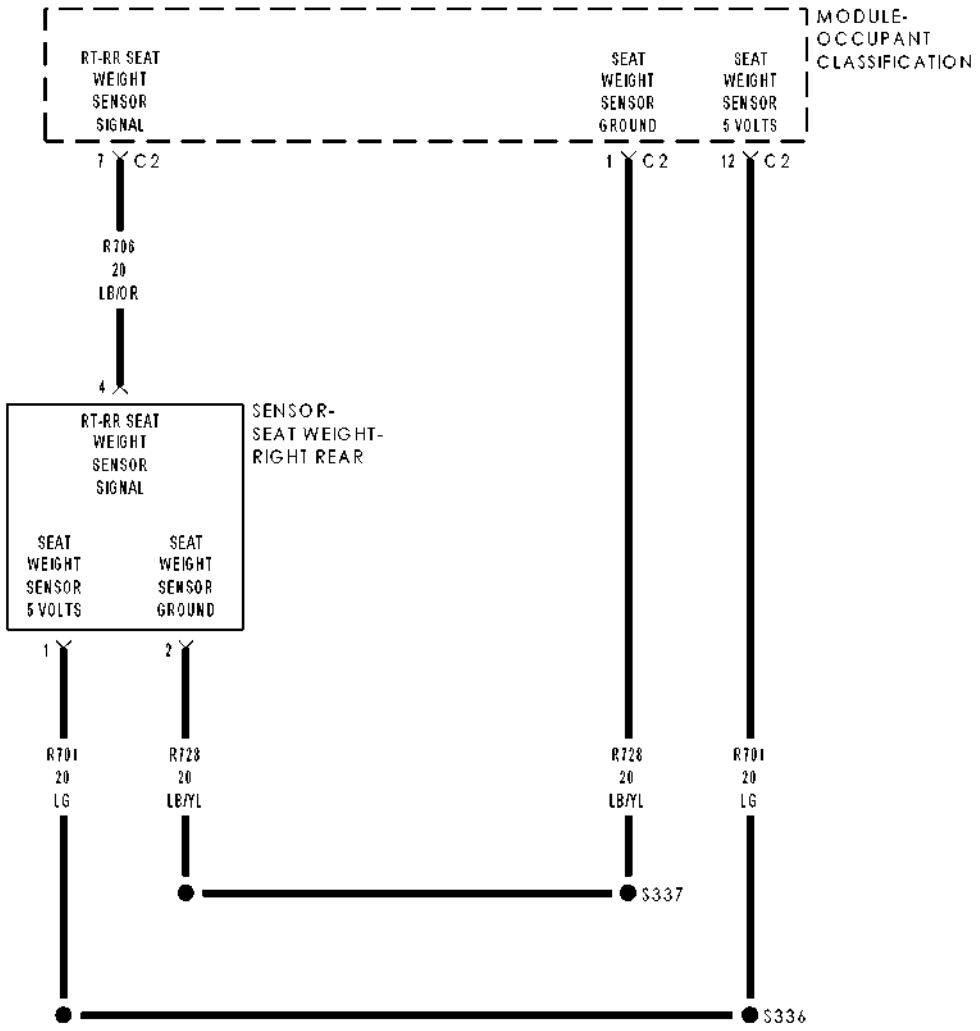
In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

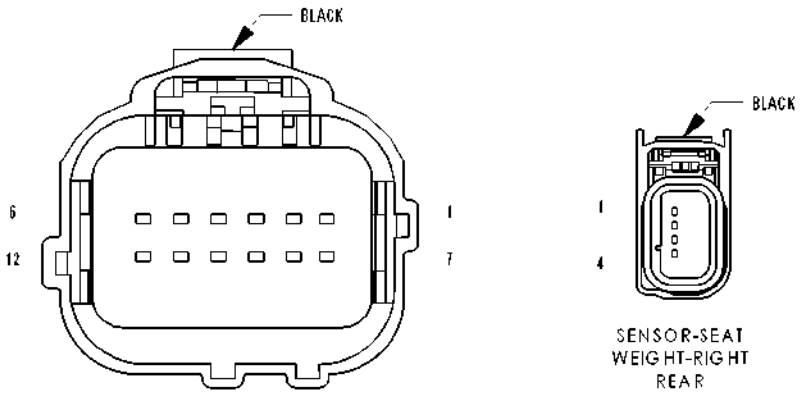
Does the scan tool display any ACTIVE DTCs?

Yes >> Select appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B89-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT HIGH





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B1B89-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT HIGH (CONTINUED)

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  While the CAN bus ignition status is in IGN_RUN, the module checks the sensor input ranges.
- **Set Condition:**
  If the module detects that the sensor input is greater than 96 ± 0.6% of the (R701) Seat Weight Sensor 5 Volt circuit voltage.

Possible Causes
PASSENGER SEAT HARNESS IMPROPERLY ROUTED
PASSENGER SEAT HARNESS WIRES CHAFFED, PIERCED, PINCHED, PARTIALLY BROKEN
PASSENGER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT PUSHED OUT, SPREAD, CORRODED, CONTAMINATED
(R706) RT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
(R706) RT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT SHORTED TO (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT
(R728) SEAT WEIGHT SENSOR GROUND CIRCUIT OPEN
RIGHT-REAR SEAT WEIGHT SENSOR
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, & BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

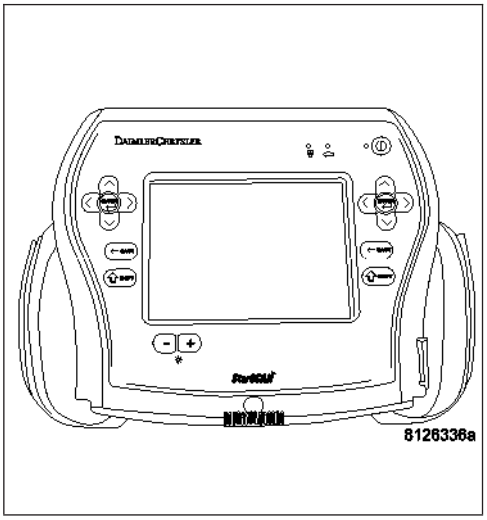
Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Go To 2



B1B89-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT HIGH (CONTINUED)

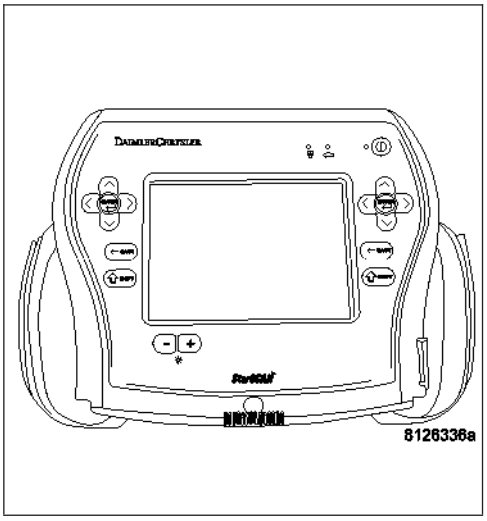
2. VERIFY THAT DTC B1B89–PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT HIGH IS ACTIVE

With the scan tool, read OCM DTCs.

Does the scan tool display active: B1B89–PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT HIGH?

Yes >> Go To 3

No >> Go To 9



3. INSPECT PASSENGER SEAT HARNESS WIRES & CONNECTORS

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Using the wiring diagram/schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

Are any of these conditions present?

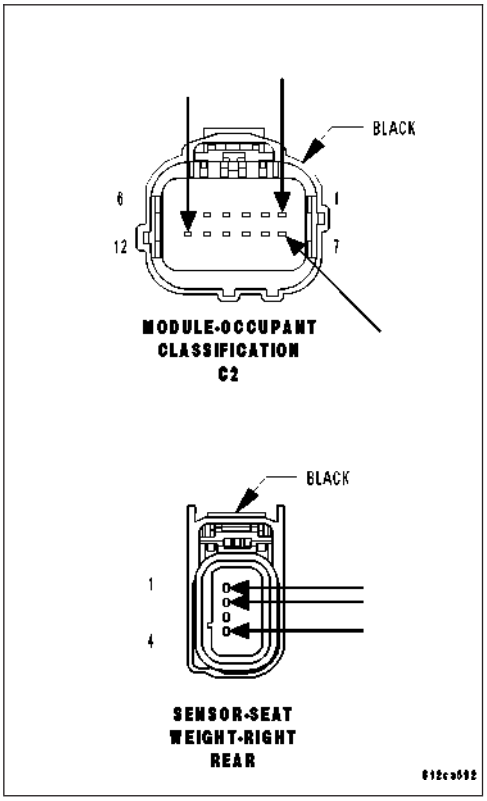
Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

No >> Go To 4



B1B89-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT HIGH (CONTINUED)

4. VERIFY THAT PASSENGER SEAT HARNESS IS ROUTED CORRECTLY

Verify that the Passenger Seat Harness is routed correctly.

Is the Passenger Seat Harness routed correctly?

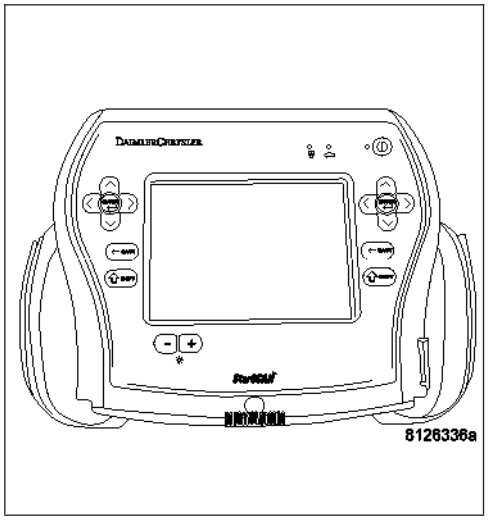
Yes >> Go To 5

No >> Reroute the Passenger Seat Harness as necessary.
Perform OCS VERIFICATION TEST - VER 1.

---

5. CHECK IF MORE THAN ONE PASSENGER SEAT WEIGHT SENSOR DTC IS ACTIVE

Verify that all of the Seat Weight Sensor mounting screws are torqued to specification. Refer to 23 - BODY/SEATS.



WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

NOTE: Failure to follow test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: Verify That All Tests Steps That Led You Here Were Performed As Directed; Verify That The Ignition Is In Run; Wait 30 Seconds After Changing The Seat Weight Before Proceeding To Allow The System To Stabilize; Only Press Scan Tool Buttons When Directed To Do So; & Perform The Occupant Classification Module System Verification Test To Completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, wait two minutes, and then proceed as follows.

With the scan tool, read OCM DTCs.

Does the scan tool display any active PASSENGER SEAT WEIGHT SENSOR DTCs?

Yes - More Than One PASSENGER SEAT WEIGHT SENSOR DTC Is Active
Perform the *Diagnosis/Checkout Procedure For Seat Weight Sensors.
Perform OCS VERIFICATION TEST - VER 1.

Yes - Only DTC B1B89 Is Active
Go To 6

No - But Other DTCs Present
Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No - No Active DTCs Present
Perform OCS VERIFICATION TEST - VER 1.

B1B89-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT HIGH (CONTINUED)

6. CHECK (R706) RT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the OCM C2 connector.

Measure the voltage of the (R706) RT-RR Seat Weight Sensor Signal circuit.

Is the voltage above 0.2 volts?

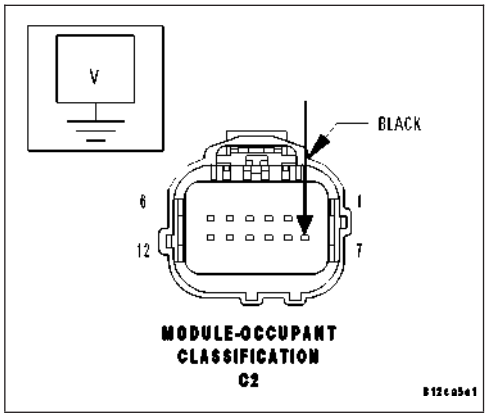
Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

No >> Go To 7



7. CHECK (R706) RT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR A SHORT TO (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT

Disconnect the Right-Rear Seat Weight Sensor connector.

Measure the resistance between the (R706) RT-RR Seat Weight Sensor Signal circuit and the (R701) Seat Weight Sensor 5 Volt circuit.

Is the resistance below 10K ohms?

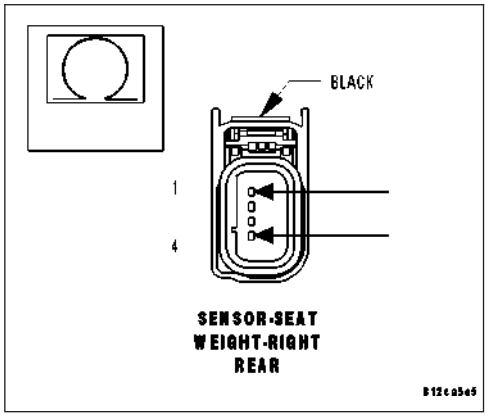
Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

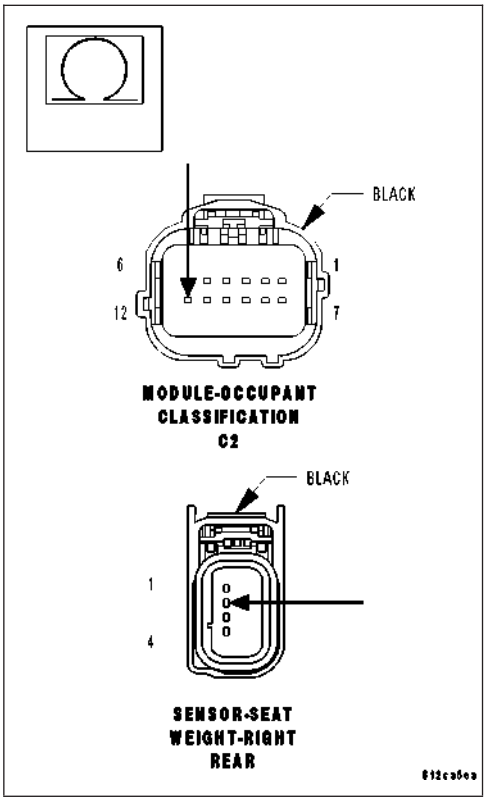
No >> Go To 8



B1B89-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT HIGH (CONTINUED)

8. CHECK (R728) SEAT WEIGHT SENSOR GROUND CIRCUIT FOR AN OPEN

Measure the resistance of the (R728) Seat Weight Sensor Ground circuit between the OCM C2 connector and the Right-Rear Seat Weight Sensor connector.



Is the resistance below 5.0 ohms?

Yes >> Replace the OCM in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

No >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

B1B89-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT HIGH (CONTINUED)

9. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase all DTCs from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

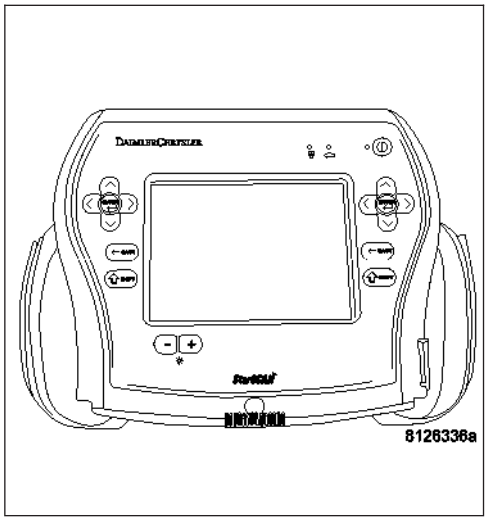
Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor active codes as you work through the following steps.



WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return, continue the test until the problem area has been isolated.

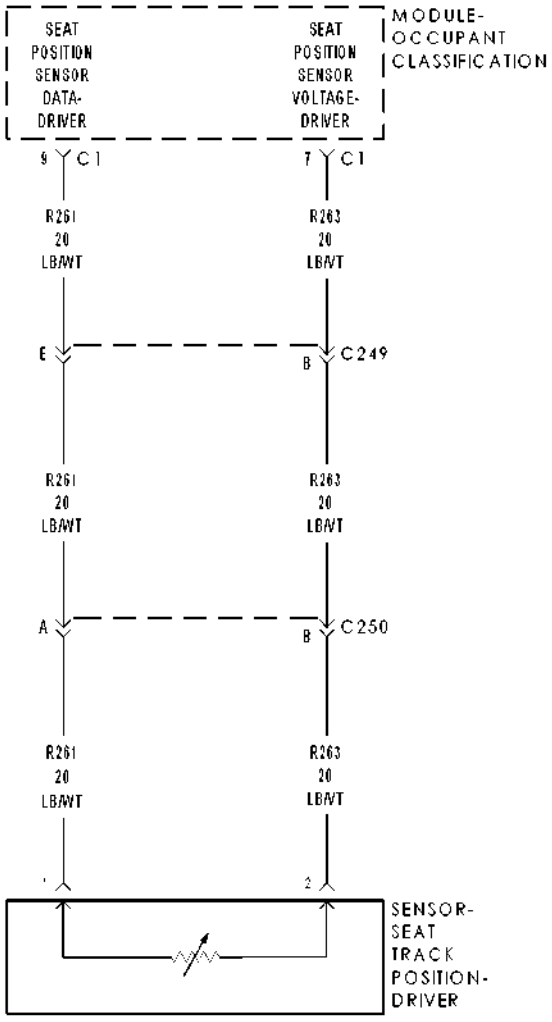
In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

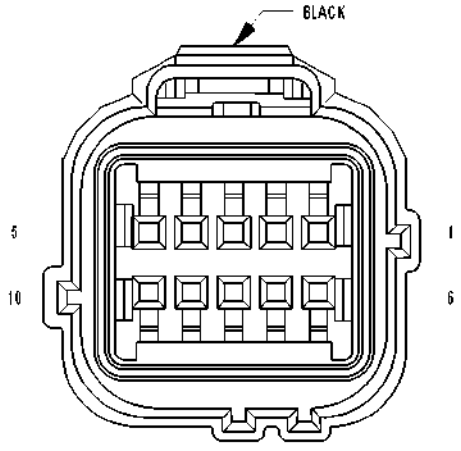
Does the scan tool display any ACTIVE DTCs?

Yes >> Select appropriate symptom from Symptom List.

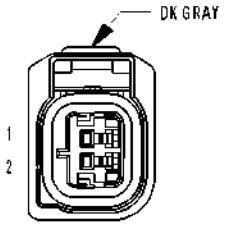
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B8C-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT PERFORMANCE





MODULE-OCCUPANT CLASSIFICATION C1



SENSOR-SEAT TRACK POSITION-DRIVER

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B1B8C-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT PERFORMANCE (CONTINUED)

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  While the CAN bus ignition status is in IGN_RUN, the module checks the sensor input ranges.
- **Set Condition:**
  If the module detects that the sensor input is between 8 and 12 mA.

Possible Causes
DRIVER SEAT TRACK POSITION SENSOR
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, BATTERY FAULTS, & SEAT TRACK POSITION SENSOR CIRCUIT HIGH OR LOW FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

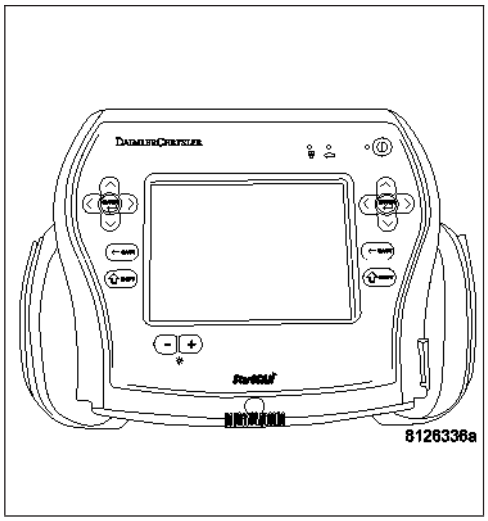
Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display any active DTCs relating to internal faults, ignition faults, battery faults, or Seat Track Position Sensor Circuit High or Low faults?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

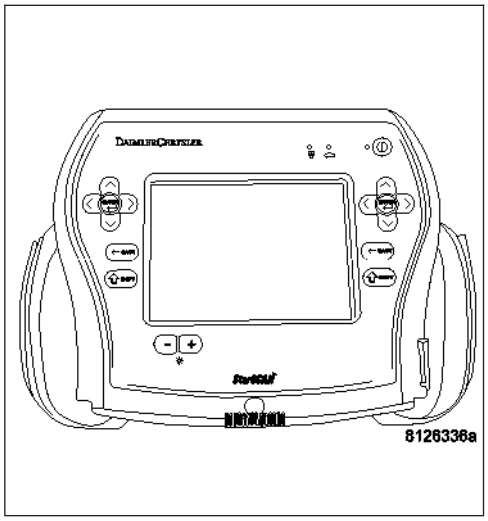
No >> Go To 2



B1B8C-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT PERFORMANCE (CONTINUED)

2. VERIFY THAT B1B8C-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT PERFORMANCE IS ACTIVE

With the scan tool, read OCM DTCs.



Does the scan tool display active: B1B8C-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT PERFORMANCE?

Yes >> Go To 3

No >> Go To 4

---

3. PERFORM SEAT TRACK POSITION SENSOR PERFORMANCE TEST

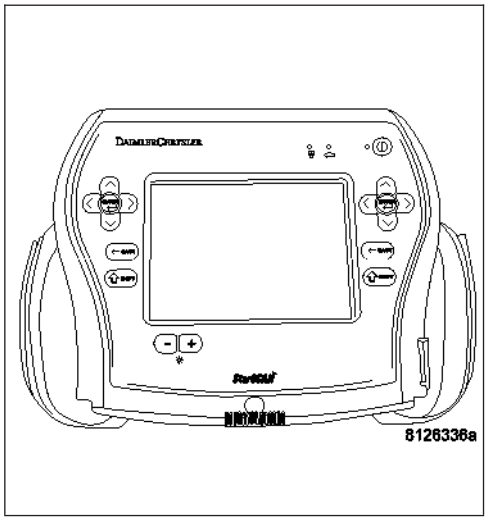
With the scan tool, erase OCM DTCs.

Turn the ignition off, wait 10 seconds and then turn the ignition on.

Cycle the driver seat to the full forward position and then to the full rearward position.

Return the driver seat to its approximate original position.

Wait two minutes, and then with the scan tool, read OCM DTCs.



Does the scan tool display active: B1B8C-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT PERFORMANCE?

Yes >> Replace the Driver Seat Track Position Sensor in accordance with the Service Information.

Perform the OCS VERIFICATION TEST-VER 1. If DTC B1B8C-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT PERFORMANCE returns active, replace the OCM in accordance with the Service Information.

No >> Perform the OCS VERIFICATION TEST-VER 1.

B1B8C-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT PERFORMANCE (CONTINUED)

4. TEST FOR AN INTERMITTENT CONDITION

With the scan tool, record and erase all DTC's from the OCM.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

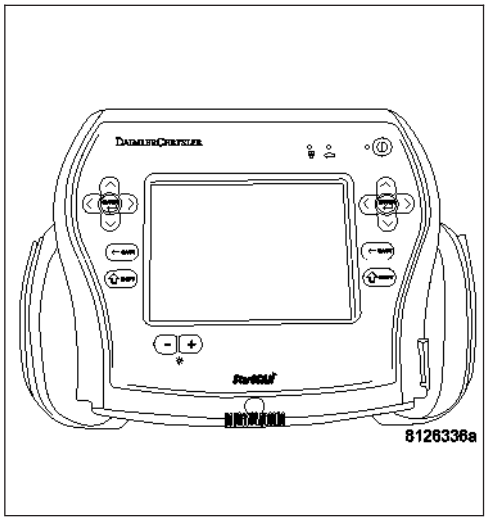
Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.



WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If only stored codes return continue the test until the problem area has been isolated.

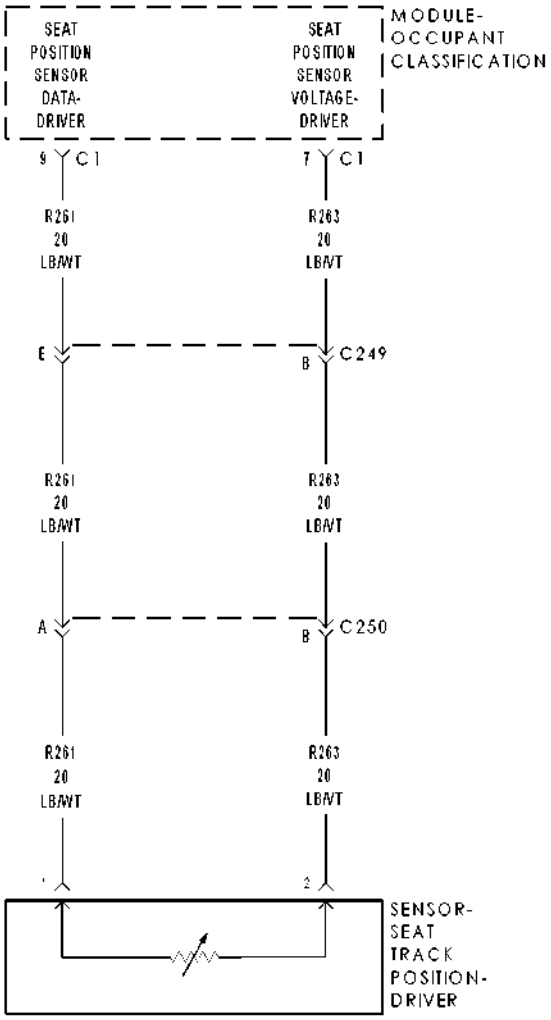
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

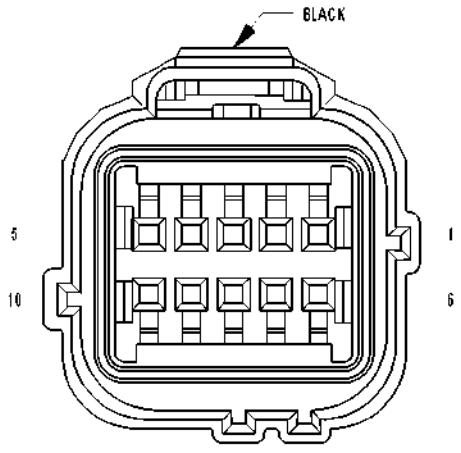
Are any ACTIVE DTCs present?

Yes >> Select the appropriate symptom from Symptom List.

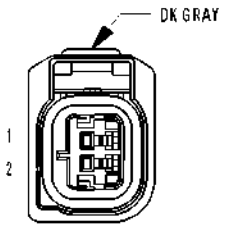
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B8D-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT LOW





MODULE-OCCUPANT CLASSIFICATION C1



SENSOR-SEAT TRACK POSITION-DRIVER

B1B8D-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT LOW (CONTINUED)

For the Occupant Classification circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  While the CAN bus ignition status is in IGN_RUN and the module is configured for a Seat Track Position Sensor, the module checks the sensor input current ranges.
- **Set Condition:**
  If the module detects that the sensor input is less than or equal to 0.3 ma. This DTC may set when the current is between 0.3 mA and 2.0 mA.

Possible Causes
DRIVER SEAT HARNESS IMPROPERLY ROUTED
DRIVER SEAT HARNESS WIRES CHAFFED, PIERCED, PINCHED, PARTIALLY BROKEN
DRIVER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT, PUSHED OUT, SPREAD, CORRODED, CONTAMINATED
(R261) SEAT POSITION SENSOR DATA-DRIVER CIRCUIT SHORTED TO GROUND
(R263) SEAT POSITION SENSOR VOLTAGE-DRIVER CIRCUIT SHORTED TO GROUND
(R261) SEAT POSITION SENSOR DATA-DRIVER CIRCUIT OPEN
(R263) SEAT POSITION SENSOR VOLTAGE-DRIVER CIRCUIT OPEN
DRIVER SEAT TRACK POSITION SENSOR
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, & BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

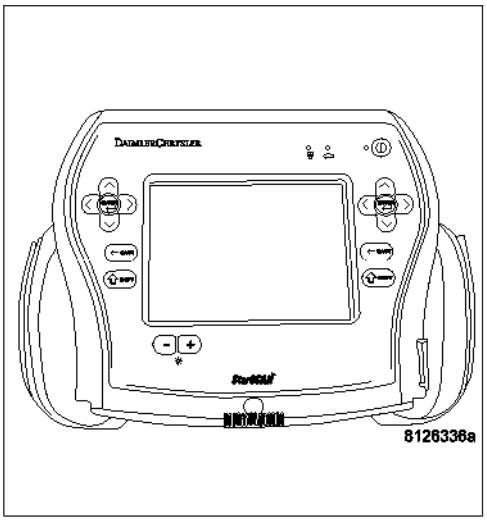
Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

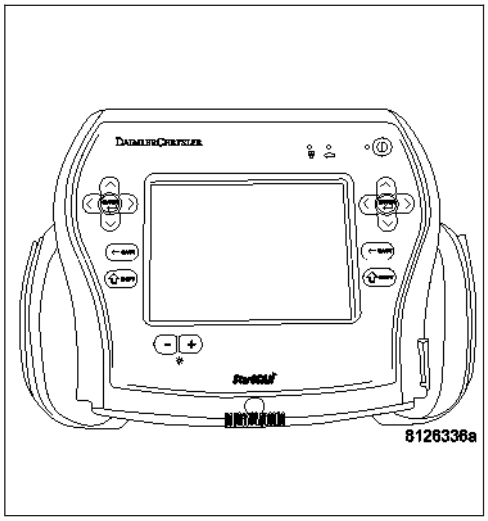
No >> Go To 2



B1B8D-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT LOW (CONTINUED)

2. VERIFY THAT DTC B1B8D-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT LOW IS ACTIVE

With the scan tool, read OCM DTCs.



Does the scan tool display active: B1B8D-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT LOW?

Yes >> Go To 3

No >> Go To 7

---

3. INSPECT DRIVER SEAT HARNESS WIRES & CONNECTORS

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the Driver Seat Harness wiring and connectors. Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

Are any of these conditions present?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Driver Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

No >> Go To 4

---

4. VERIFY THAT DRIVER SEAT HARNESS IS ROUTED CORRECTLY

Verify that the Driver Seat Harness is routed correctly.

Is the Driver Seat Harness routed correctly?

Yes >> Go To 5

No >> Reroute the Driver Seat Harness as necessary..

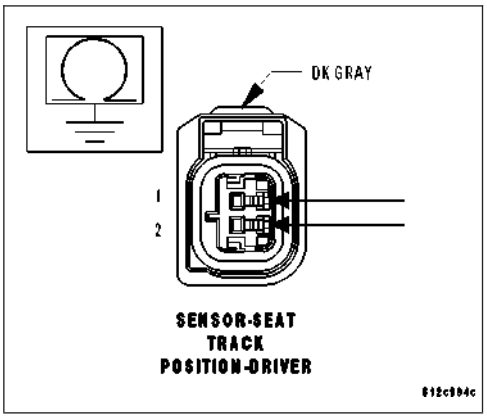
Perform OCS VERIFICATION TEST - VER 1.

B1B8D-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT LOW (CONTINUED)

5. CHECK (R261) SEAT POSITION SENSOR DATA-DRIVER CIRCUIT & (R263) SEAT POSITION SENSOR VOLTAGE-DRIVER CIRCUIT FOR A SHORT TO GROUND

Measure the resistance between ground and the (R261) Seat Position Sensor Data-Driver circuit.

Measure the resistance between ground and the (R263) Seat Position Sensor Voltage-Driver circuit.



Is the resistance below 10k ohms on either circuit?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Driver Seat Harness in accordance with the service information.

Perform the OCS VERIFICATION TEST-VER 1.

No >> Go To 6

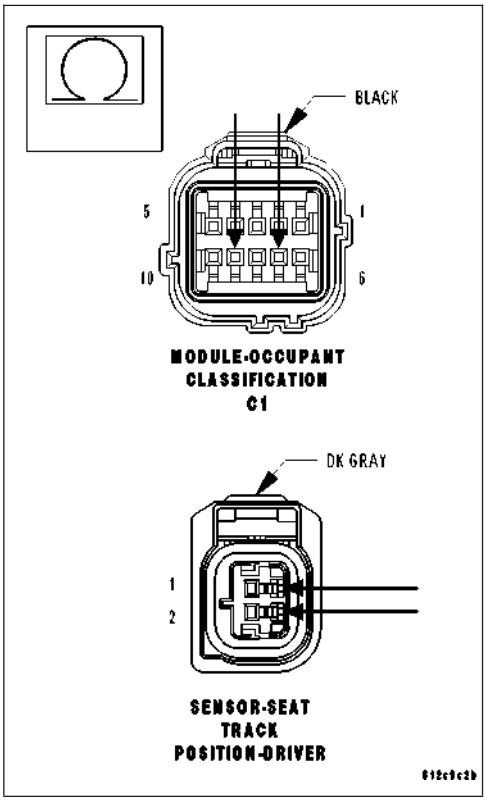
---

6. CHECK (R261) SEAT POSITION SENSOR DATA-DRIVER CIRCUIT & (R263) SEAT POSITION SENSOR VOLTAGE-DRIVER CIRCUIT FOR AN OPEN

Disconnect the OCM C1 connector.

Measure the resistance of the (R261) Seat Position Sensor Data-Driver circuit between the OCM C1 connector and the Driver Seat Track Position Sensor connector.

Measure the resistance of the (R263) Seat Position Sensor Voltage-Driver circuit between the OCM C1 connector and the Driver Seat Track Position Sensor connector.



Is the resistance of either circuit above 5.0 ohms?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Driver Seat Harness in accordance with the Service Information.

Perform the OCS VERIFICATION TEST-VER 1.

No >> Replace the OCM in accordance with the service information.

Perform the OCS VERIFICATION TEST-VER 1.

B1B8D-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT LOW (CONTINUED)

7. TEST FOR AN INTERMITTENT CONDITION

With the scan tool, record and erase all DTC's from the OCM.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

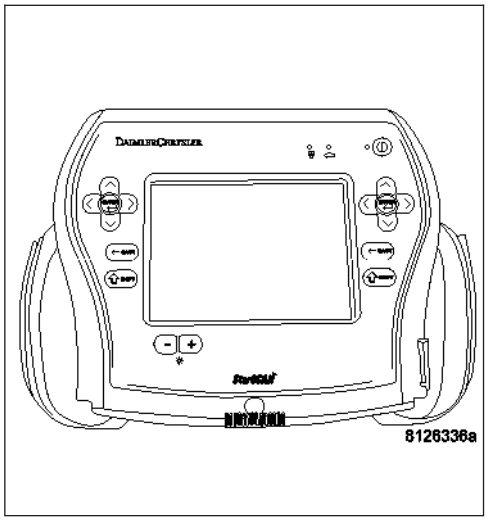
Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.



WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If only stored codes return continue the test until the problem area has been isolated.

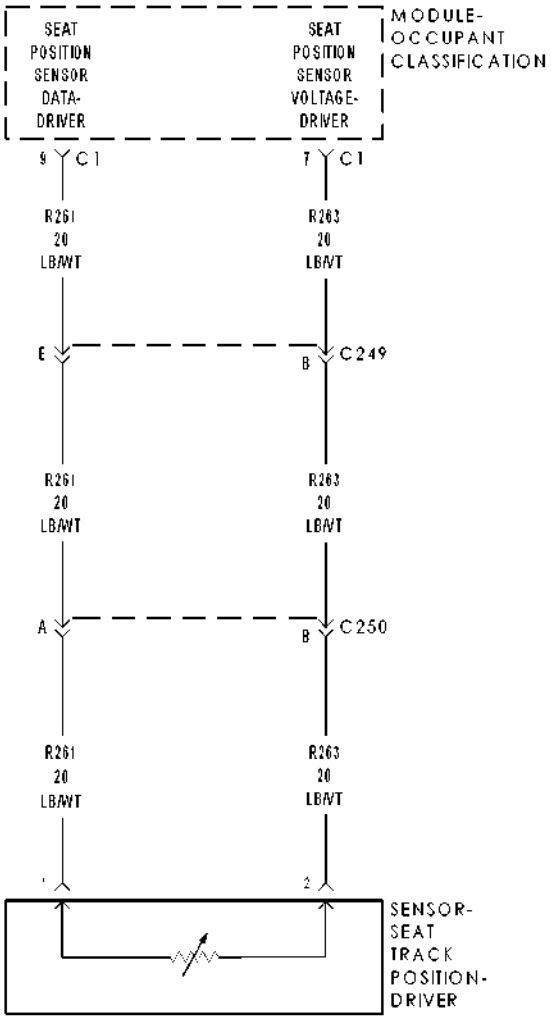
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

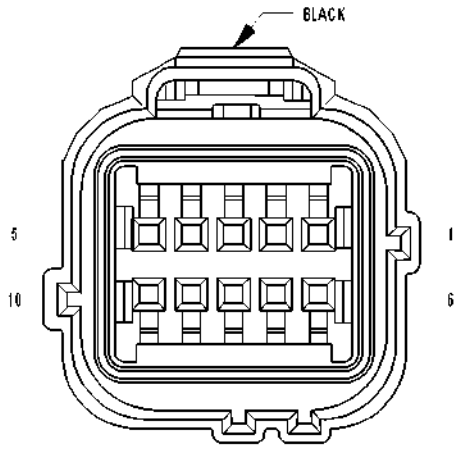
Are any ACTIVE DTCs present?

Yes >> Select the appropriate symptom from Symptom List.

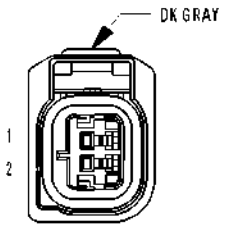
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B8E-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT HIGH





MODULE-OCCUPANT CLASSIFICATION C1



SENSOR-SEAT TRACK POSITION-DRIVER

B1B8E-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT HIGH (CONTINUED)

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  While the CAN bus ignition status is in IGN_RUN and the module is configured for a Seat Track Position Sensor, the module checks the sensor input current ranges.
- **Set Condition:**
  If the module detects that the sensor input is greater than or equal to 20.5 mA. This DTC may set when the current is between 17 mA and 20.5 mA.

Possible Causes
DRIVER SEAT HARNESS IMPROPERLY ROUTED
DRIVER SEAT HARNESS WIRES CHAFFED, PIERCED, PINCHED, PARTIALLY BROKEN
DRIVER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT, PUSHED OUT, SPREAD, CORRODED, CONTAMINATED
(R261) SEAT POSITION SENSOR DATA-DRIVER CIRCUIT SHORTED TO VOLTAGE
(R263) SEAT POSITION SENSOR VOLTAGE-DRIVER CIRCUIT SHORTED TO VOLTAGE
(R261) SEAT POSITION SENSOR DATA-DRIVER CIRCUIT SHORTED TO (R263) SEAT POSITION SENSOR VOLTAGE-DRVER CIRCUIT
DRIVER SEAT TRACK POSITION SENSOR
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, & BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

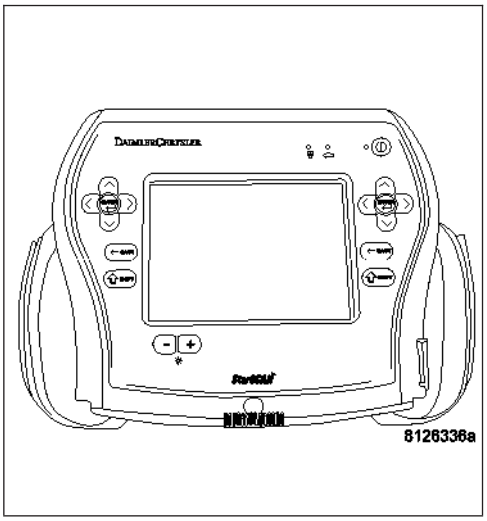
Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

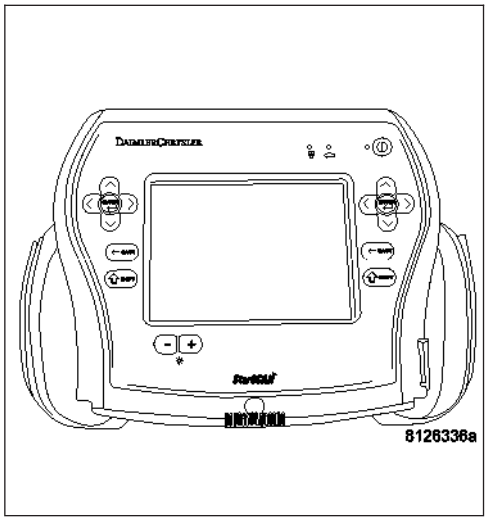
No >> Go To 2



B1B8E-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT HIGH (CONTINUED)

2. VERIFY THAT DTC B1B8E-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT HIGH IS ACTIVE

With the scan tool, read OCM DTCs.



Does the scan tool display active: B1B8E-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT HIGH?

Yes >> Go To 3

No >> Go To 8

---

3. INSPECT DRIVER SEAT HARNESS WIRES & CONNECTORS

With the scan tool, erase OCM DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the Driver Seat Harness wiring and connectors. Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

Are any of these conditions present?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Driver Seat Harness in accordance with the Service Information.
Perform OCS VERIFICATION TEST - VER 1.

No >> Go To 4

---

4. VERIFY THAT DRIVER SEAT HARNESS IS ROUTED CORRECTLY

Verify that the Driver Seat Harness is routed correctly.

Is the Driver Seat Harness routed correctly?

Yes >> Go To 5

No >> Reroute the Driver Seat Harness as necessary.
Perform OCS VERIFICATION TEST - VER 1.

B1B8E-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT HIGH (CONTINUED)

5. CHECK FOR DTC B1B8E-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT HIGH WITH DRIVER SEAT TRACK POSITION SENSOR DISCONNECTED

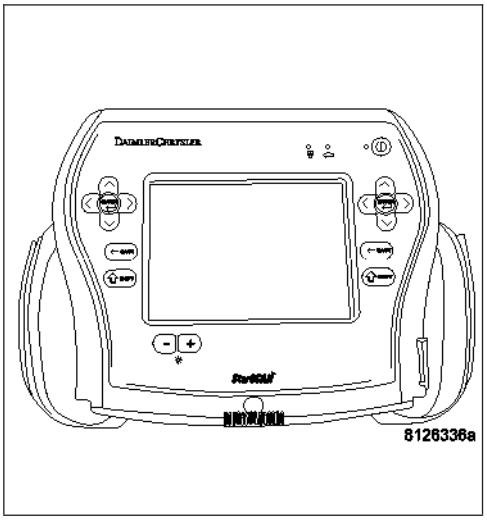
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Driver Seat Track Position Sensor connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
Wait two minutes, and then with the scan tool, read OCM DTCs.

Does the scan tool display: B1B8E-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT HIGH?

Yes >> Go To 6

No >> Replace the Driver Seat Track Position Sensor in accordance with the service information.
Perform the OCS VERIFICATION TEST-VER 1.



6. CHECK (R261) SEAT POSITION SENSOR DATA-DRIVER CIRCUIT & (R263) SEAT POSITION SENSOR VOLTAGE-DRIVER CIRCUIT FOR A SHORT TO VOLTAGE

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the OCM C1 connector.

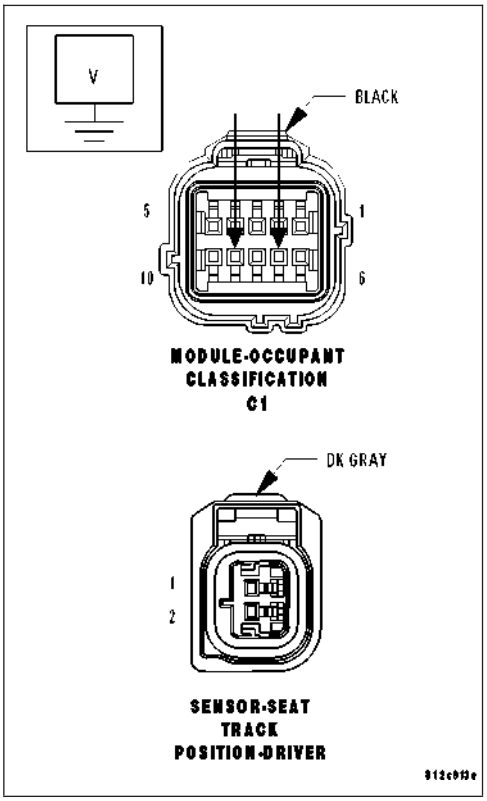
WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
Measure the voltage of the (R261) Seat Position Sensor Data-Driver circuit.
Measure the voltage of the (R263) Seat Position Sensor Voltage-Driver circuit.

Is the voltage above 0.2 volts on either circuit?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.
Replace the Driver Seat Harness in accordance with the Service Information.
Perform the OCS VERIFICATION TEST-VER 1.

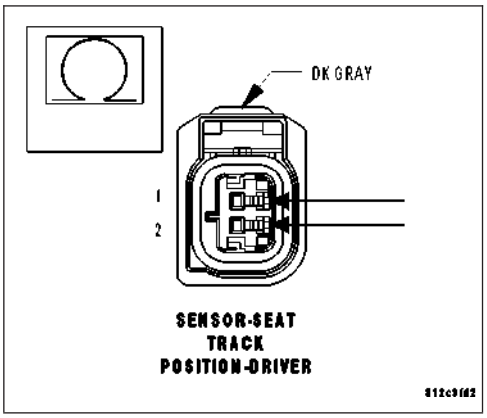
No >> Go To 7



B1B8E-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT HIGH (CONTINUED)

7. CHECK (R261) SEAT POSITION SENSOR DATA-DRIVER CIRCUIT FOR A SHORT TO (R263) SEAT POSITION SENSOR VOLTAGE-DRIVER CIRCUIT

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Measure the resistance between the (R261) Seat Position Sensor Data-Driver circuit and the (R263) Seat Position Sensor Voltage-Driver circuit.



Is the resistance below 10k ohms?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Driver Seat Harness in accordance with the service information.

Perform the OCS VERIFICATION TEST-VER 1.

No >> Replace the OCM in accordance with the Service information.

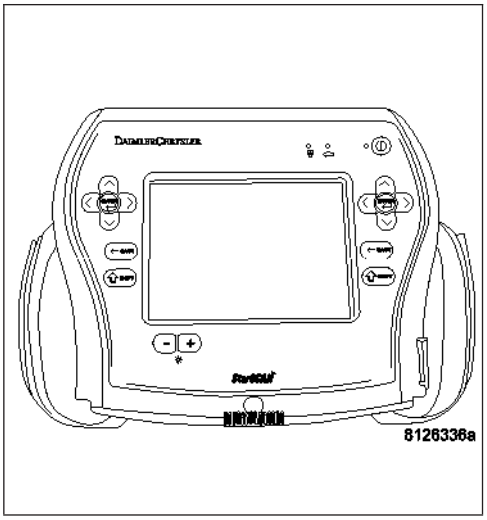
Perform the OCS VERIFICATION TEST-VER 1.

---

8. TEST FOR AN INTERMITTENT CONDITION

With the scan tool, record and erase all DTC's from the OCM.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.
Wiggle the wiring harness and connectors of the related airbag circuit or component.

If only stored codes return continue the test until the problem area has been isolated.

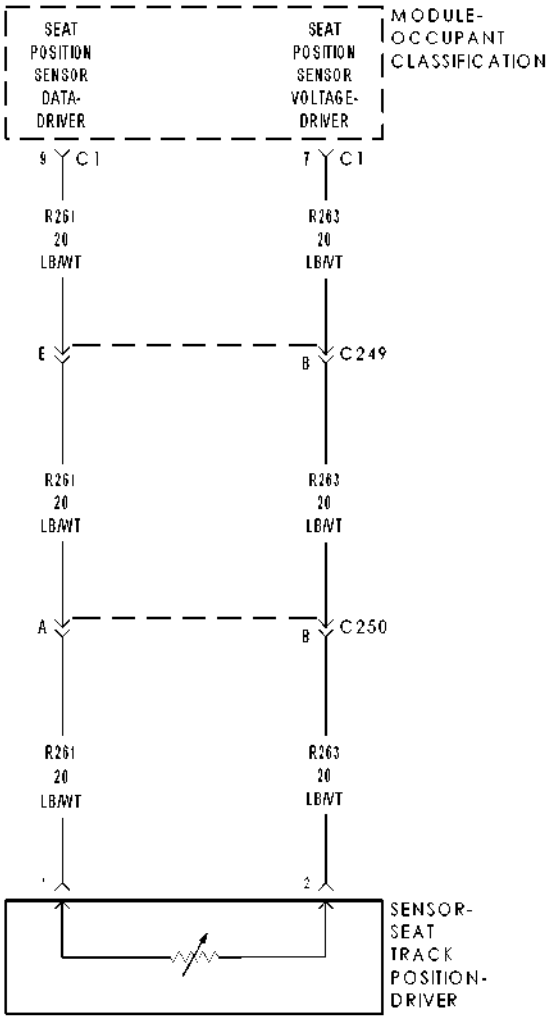
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

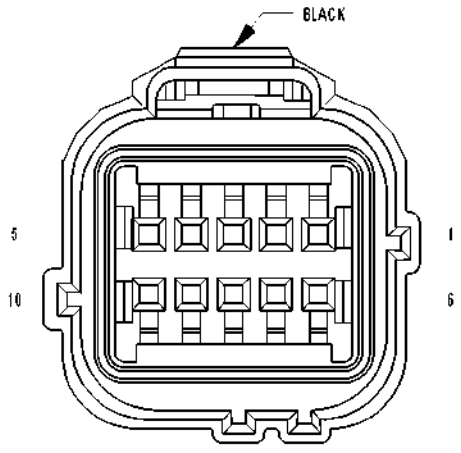
Are any ACTIVE DTCs present?

Yes >> Select the appropriate symptom from Symptom List.

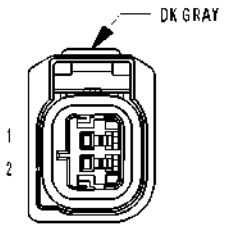
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B91-DRIVER SEAT TRACK POSITION SENSOR CONFIGURATION MISMATCH





MODULE-OCCUPANT CLASSIFICATION C1



SENSOR-SEAT TRACK POSITION-DRIVER

B1B91-DRIVER SEAT TRACK POSITION SENSOR CONFIGURATION MISMATCH (CONTINUED)

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on the OCM monitors the Seat Track Position Sensors circuits.
- **Set Condition:**
  If the module detects current on the Seat Track Position Sensors circuits and the module is not configured for STPS.

Possible Causes
SENSORS
WIRING
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, & BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

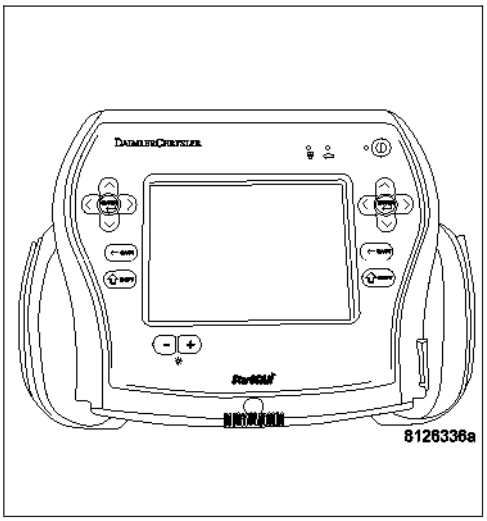
Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

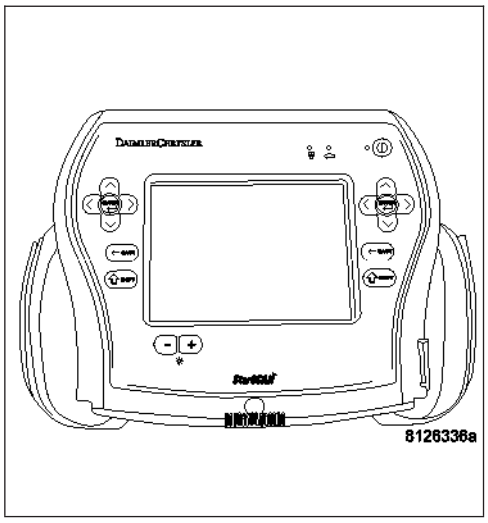
No >> Go To 2



B1B91-DRIVER SEAT TRACK POSITION SENSOR CONFIGURATION MISMATCH (CONTINUED)

2. VERIFY THAT B1B91-DRIVER SEAT TRACK POSITION SENSOR CONFIGURATION MISMATCH IS ACTIVE

With the scan tool, erase OCM DTCs.
Turn the ignition off, wait 10 seconds and then turn the ignition on.
Wait 2 minutes, and then with the scan tool, read OCM DTCs.



Does the scan tool display active: B1B91-DRIVER SEAT TRACK POSITION SENSOR CONFIGURATION MISMATCH?

Yes >> Go To 3

No >> Perform the OCS VERIFICATION TEST-VER. 1

---

3. VERIFY WIRING

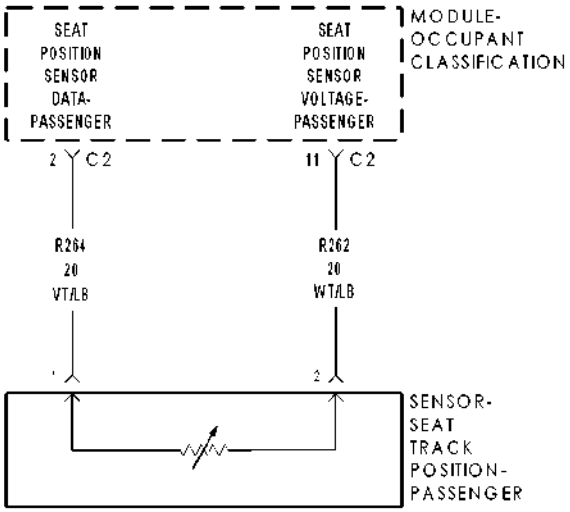
Turn the ignition off.
Inspect the driver and passenger seat wiring for Seat Position Sensors.

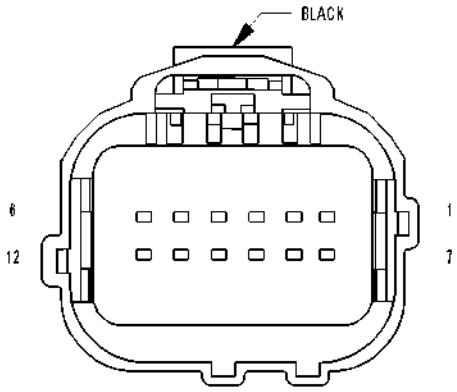
Are Seat Position Sensor(s) present?

Yes >> Replace the OCM in accordance with the Service Information.
Perform the OCS VERIFICATION TEST-VER. 1

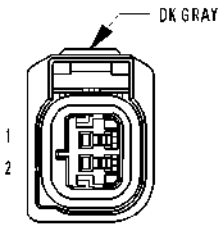
No >> Perform the OCS VERIFICATION TEST-VER. 1

B1B92-PASSENGER SEAT TRACK POSITION SENSOR CIRCUIT PERFORMANCE





MODULE-OCCUPANT CLASSIFICATION C2



SENSOR-SEAT TRACK POSITION-PASSENGER

812cabee

B1B92-PASSENGER SEAT TRACK POSITION SENSOR CIRCUIT PERFORMANCE (CONTINUED)

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  While the CAN bus ignition status is in IGN_RUN, the module checks the sensor input ranges.
- **Set Condition:**
  If the module detects that the sensor input is between 8 and 12 mA.

Possible Causes
PASSENGER SEAT TRACK POSITION SENSOR
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

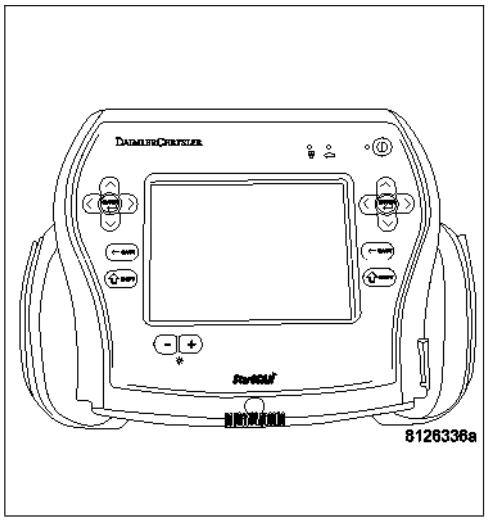
1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, BATTERY FAULTS, & SEAT TRACK POSITION SENSOR CIRCUIT HIGH OR LOW FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.



Does the scan tool display any active DTCs relating to internal faults, ignition faults, battery faults, or Seat Track Position Sensor Circuit High or Low faults?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Go To 2

B1B92-PASSENGER SEAT TRACK POSITION SENSOR CIRCUIT PERFORMANCE (CONTINUED)

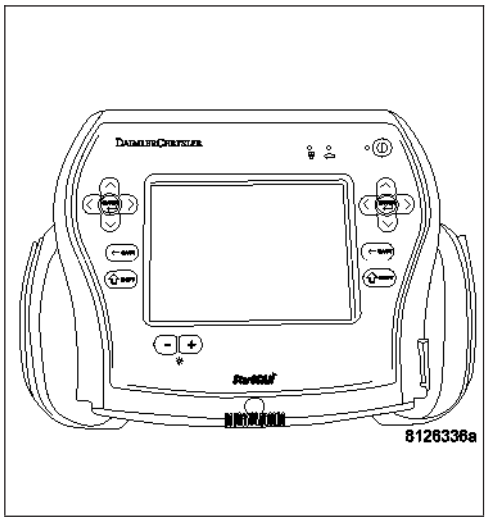
2. VERIFY THAT B1B92-PASSENGER SEAT TRACK POSITION SENSOR CIRCUIT PERFORMANCE IS ACTIVE

With the scan tool, read OCM DTCs.

Does the scan tool display active: B1B92-PASSENGER SEAT TRACK POSITION SENSOR CIRCUIT PERFORMANCE?

Yes >> Go To 3

No >> Go To 4



3. PERFORM SEAT TRACK POSITION SENSOR PERFORMANCE TEST

With the scan tool, erase OCM DTCs.

Turn the ignition off, wait 10 seconds and then turn the ignition on.

Cycle the passenger seat to full forward position and then to the full rearward position.

Return the passenger seat to its approximate original position.

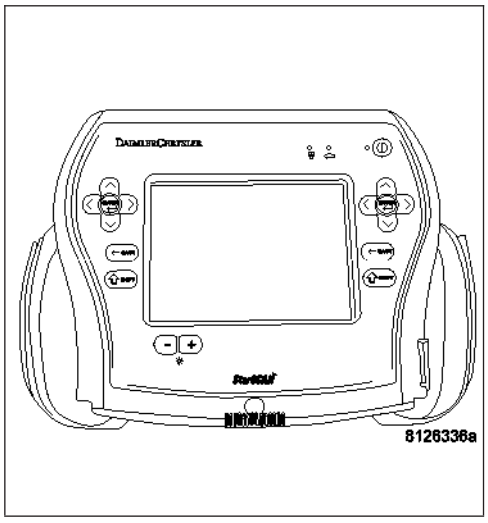
Wait two minutes, and then with the scan tool, read OCM DTCs.

Does the scan tool display active: B1B92-PASSENGER SEAT TRACK POSITION SENSOR CIRCUIT PERFORMANCE?

Yes >> Replace the Passenger Seat Track Position Sensor in accordance with the Service Information.

Perform the OCS VERIFICATION TEST-VER 1. If DTC B1B92-PASSENGER SEAT TRACK POSITION SENSOR CIRCUIT PERFORMANCE returns active, replace the OCM in accordance with the Service Information.

No >> Perform the OCS VERIFICATION TEST-VER 1.



B1B92-PASSENGER SEAT TRACK POSITION SENSOR CIRCUIT PERFORMANCE (CONTINUED)

4. TEST FOR AN INTERMITTENT CONDITION

With the scan tool, record and erase all DTC's from the OCM.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

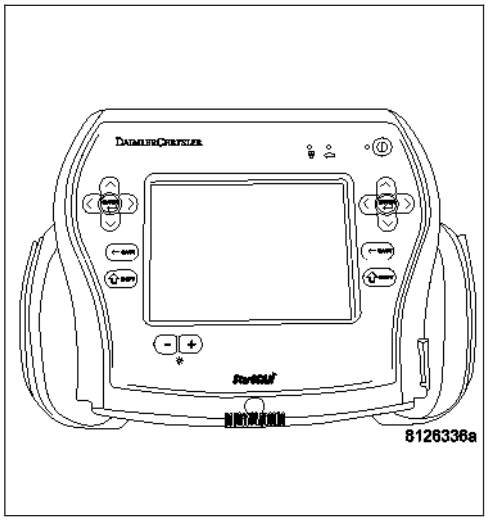
Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.



WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If only stored codes return continue the test until the problem area has been isolated.

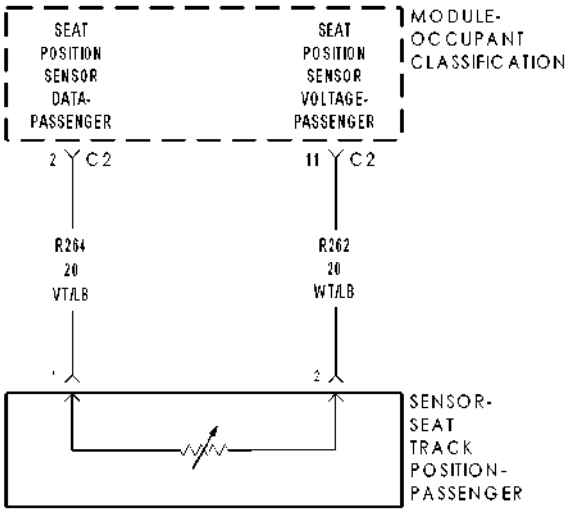
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

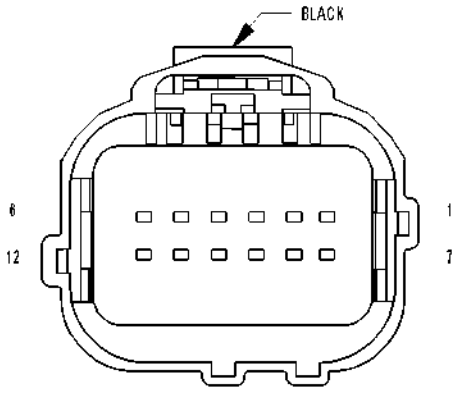
Are any ACTIVE DTCs present?

Yes >> Select the appropriate symptom from Symptom List.

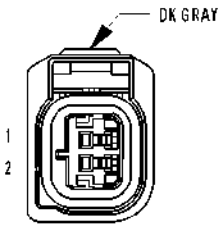
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B93-PASSENGER SEAT TRACK POSITION SENSOR CIRCUIT LOW





MODULE-OCCUPANT CLASSIFICATION C2



SENSOR-SEAT TRACK POSITION-PASSENGER

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B1B93-PASSENGER SEAT TRACK POSITION SENSOR CIRCUIT LOW (CONTINUED)

For the Occupant Classification circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  While the CAN bus ignition status is in IGN_RUN and the module is configured for a Seat Track Position Sensor, the module checks the sensor input current ranges.
- **Set Condition:**
  If the module detects that the sensor input is less than or equal to 0.3 mA. This DTC may set when the current is between 0.3 mA and 2.0 mA.

Possible Causes
PASSENGER SEAT HARNESS IMPROPERLY ROUTED
PASSENGER SEAT HARNESS WIRES CHAFFED, PIERCED, PINCHED, PARTIALLY BROKEN
PASSENGER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT, PUSHED OUT, SPREAD, CORRODED, CONTAMINATED
(R262) SEAT POSTION SENSOR DATA-PASS CIRCUIT SHORTED TO GROUND
(R264) SEAT POSITION SENSOR VOLTAGE-PASS CIRCUIT SHORTED TO GROUND
(R262) SEAT POSITION SENSOR DATA-PASS CIRCUIT OPEN
(R264) SEAT POSITION SENSOR VOLTAGE-PASS CIRCUIT OPEN
PASSENGER SEAT TRACK POSITION SENSOR
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, & BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

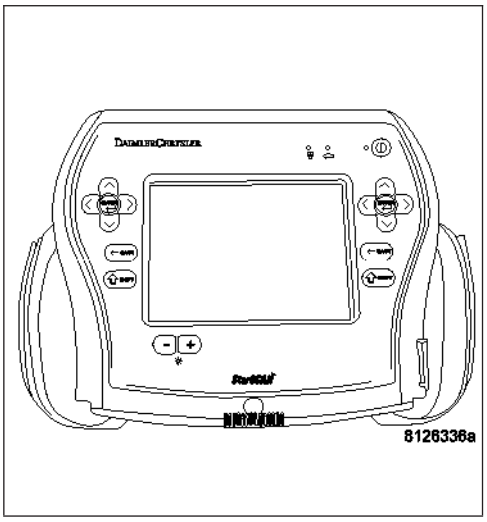
Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

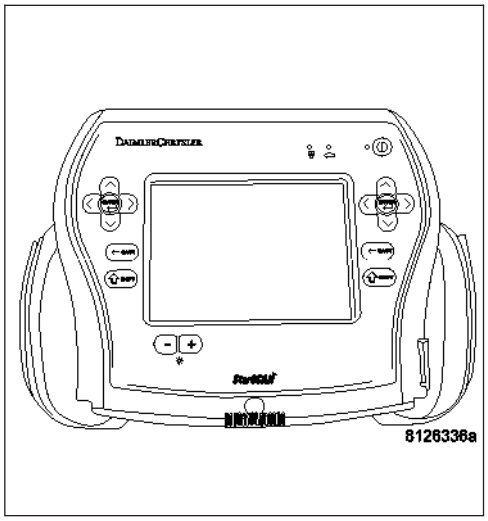
No >> Go To 2



B1B93-PASSENGER SEAT TRACK POSITION SENSOR CIRCUIT LOW (CONTINUED)

2. VERIFY THAT DTC B1B93-PASSENGER SEAT TRACK POSITION SENSOR CIRCUIT LOW IS ACTIVE

With the scan tool, read OCM DTCs.



Does the scan tool display active: B1B93-PASSENGER SEAT TRACK POSITION SENSOR CIRCUIT LOW?

Yes >> Go To 3

No >> Go To 7

---

3. INSPECT PASSENGER SEAT HARNESS WIRES & CONNECTORS

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

Are any of these conditions present?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

No >> Go To 4

---

4. VERIFY THAT PASSENGER SEAT HARNESS IS ROUTED CORRECTLY

Verify that the Passenger Seat Harness is routed correctly.

Is the Passenger Seat Harness routed correctly?

Yes >> Go To 5

No >> Reroute the Passenger Seat Harness as necessary.

Perform OCS VERIFICATION TEST - VER 1.

B1B93-PASSENGER SEAT TRACK POSITION SENSOR CIRCUIT LOW (CONTINUED)

5. CHECK (R264) SEAT POSITION SENSOR VOLTAGE-PASS CIRCUIT & (R262) SEAT POSITION SENSOR DATA-PASS CIRCUIT FOR A SHORT TO GROUND

Measure the resistance between ground and the (R264) Seat Position Sensor Voltage-Pass circuit.

Measure the resistance between ground and the (R262) Seat Position Sensor Data-Pass circuit.

Is the resistance below 10k ohms on either circuit?

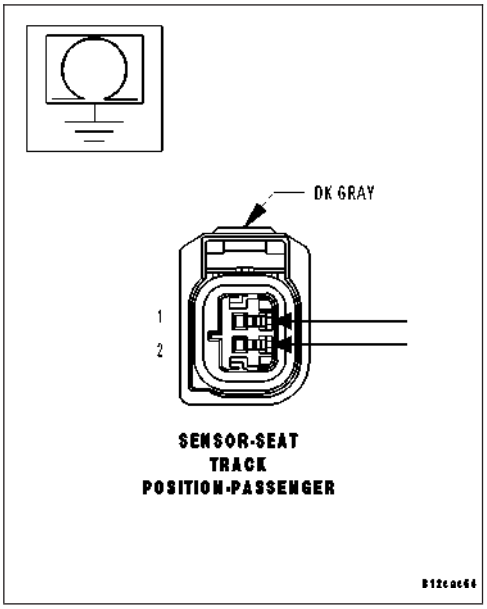
Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the service information.

Perform the OCS VERIFICATION TEST-VER 1.

No >> Go To 6



6. CHECK (R262) SEAT POSITION SENSOR DATA-PASS CIRCUIT & (R264) SEAT POSITION SENSOR VOLTAGE-PASS CIRCUIT FOR AN OPEN

Disconnect the OCM C2 connector.

Measure the resistance of the (R262) Seat Position Sensor Data-Pass circuit between the OCM C2 connector and the Passenger Seat Track Position Sensor connector.

Measure the resistance of the (R264) Seat Position Sensor Voltage-Pass circuit between the OCM C2 connector and the Passenger Seat Track Position Sensor connector.

Is the resistance of either circuit above 5.0 ohms?

Yes >>

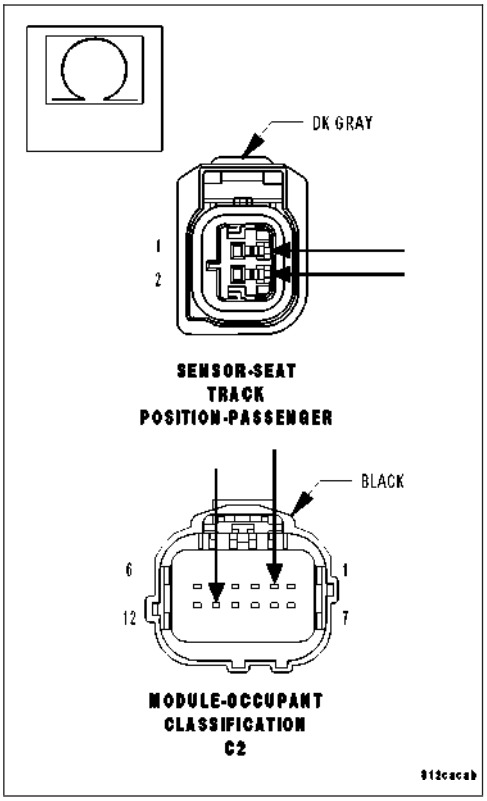
NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the service information.

Perform the OCS VERIFICATION TEST-VER 1.

No >> Replace the OCM in accordance with the service information.

Perform the OCS VERIFICATION TEST-VER 1.



B1B93-PASSENGER SEAT TRACK POSITION SENSOR CIRCUIT LOW (CONTINUED)

7. TEST FOR AN INTERMITTENT CONDITION

With the scan tool, record and erase all DTC's from the OCM.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

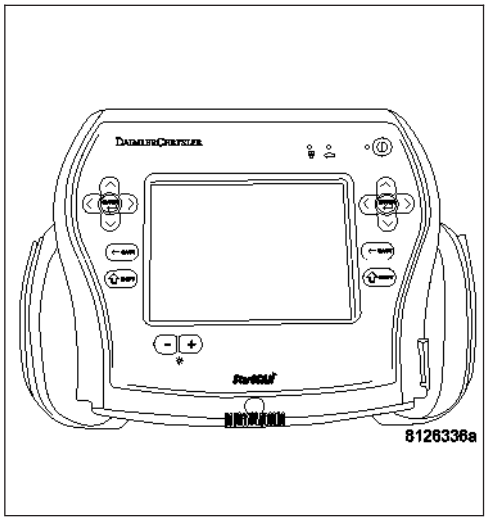
Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.



WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If only stored codes return continue the test until the problem area has been isolated.

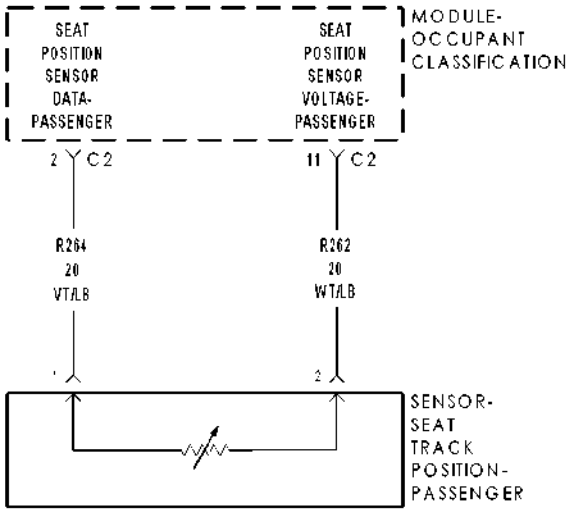
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

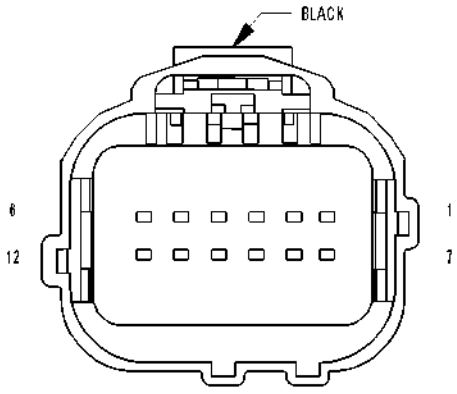
Are any ACTIVE DTCs present?

Yes >> Select the appropriate symptom from Symptom List.

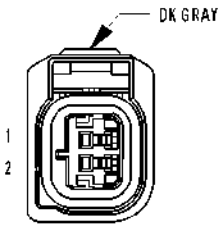
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B94-PASSENGER SEAT TRACK POSITION SENSOR CIRCUIT HIGH





MODULE-OCCUPANT CLASSIFICATION C2



SENSOR-SEAT TRACK POSITION-PASSENGER

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B1B94-PASSENGER SEAT TRACK POSITION SENSOR CIRCUIT HIGH (CONTINUED)

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  While the CAN bus ignition status is in IGN_RUN and the module is configured for a Seat Track Position Sensor, the module checks the sensor input current ranges.
- **Set Condition:**
  If the module detects that the sensor input is greater than or equal to 20.5 mA. This DTC may set when the current is between 17 mA and 20.5 mA.

Possible Causes
PASSENGER SEAT HARNESS IMPROPERLY ROUTED
PASSENGER SEAT HARNESS WIRES CHAFFED, PIERCED, PINCHED, PARTIALLY BROKEN
PASSENGER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT, PUSHED OUT, SPREAD, CORRODED, CONTAMINATED
(R262) SEAT POSITION SENSOR DATA-PASS CIRCUIT SHORTED TO VOLTAGE
(R264) SEAT POSITION SENSOR VOLTAGE-PASS CIRCUIT SHORTED TO VOLTAGE
(R262) SEAT POSITION SENSOR DATA-PASS CIRCUIT SHORTED TO (R264) SEAT POSITION SENSOR VOLTAGE-PASS CIRCUIT
PASSENGER SEAT TRACK POSITION SENSOR
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, & BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

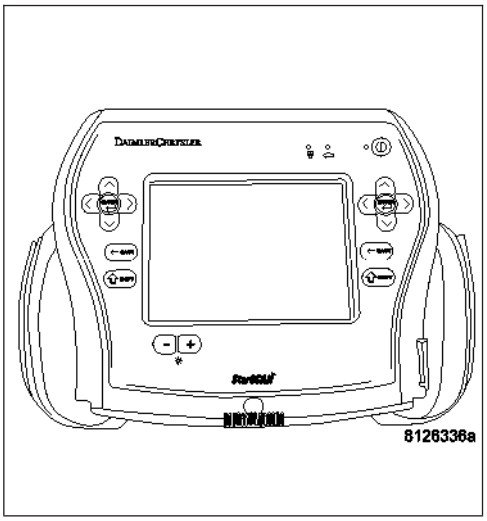
Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

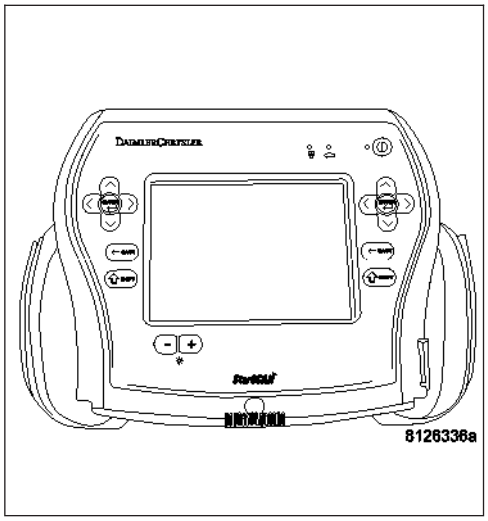
No >> Go To 2



B1B94-PASSENGER SEAT TRACK POSITION SENSOR CIRCUIT HIGH (CONTINUED)

2. VERIFY THAT DTC B1B94-PASSENGER SEAT TRACK POSITION SENSOR CIRCUIT HIGH IS ACTIVE

With the scan tool, read OCM DTCs.



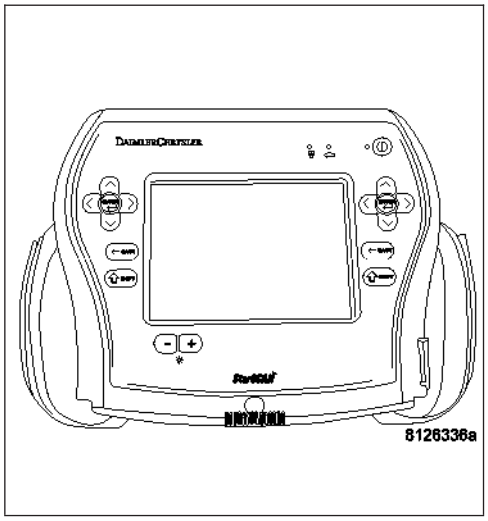
Does the scan tool display active: B1B94-PASSENGER SEAT TRACK POSITION SENSOR CIRCUIT HIGH?

Yes >> Go To 3

No >> Go To 8

3. INSPECT PASSENGER SEAT HARNESS WIRES & CONNECTORS

With the scan tool, erase OCM DTCs.



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Using the wiring diagram/schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

Are any of these conditions present?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

No >> Go To 4

4. VERIFY THAT PASSENGER SEAT HARNESS IS ROUTED CORRECTLY

Verify that the Passenger Seat Harness is routed correctly.

Is the Passenger Seat Harness routed correctly?

Yes >> Go To 5

No >> Reroute the Passenger Seat Harness as necessary.
Perform OCS VERIFICATION TEST - VER 1.

B1B94-PASSENGER SEAT TRACK POSITION SENSOR CIRCUIT HIGH (CONTINUED)

5. CHECK FOR DTC B1B94-PASSENGER SEAT TRACK POSITION SENSOR HIGH WITH PASSENGER SEAT TRACK POSITION SENSOR DISCONNECTED

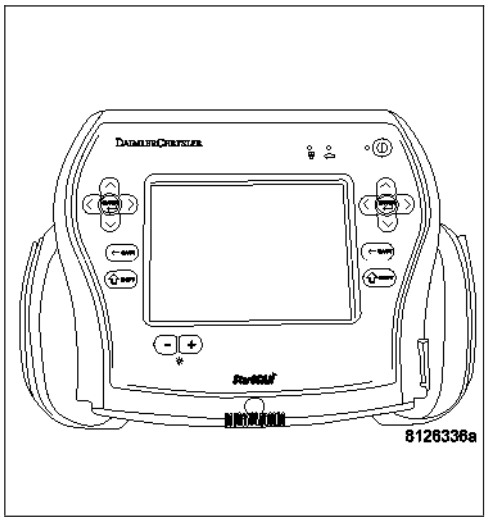
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Passenger Seat Track Position Sensor connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
Wait two minutes, and then with the scan tool, read OCM DTCs.

Does the scan tool display: B1B94-PASSENGER SEAT TRACK POSITION SENSOR HIGH?

Yes >> Go To 6

No >> Replace the Passenger Seat Track Position Sensor in accordance with the service information.
Perform the OCS VERIFICATION TEST-VER 1.



6. CHECK (R262) SEAT POSITION SENSOR DATA-PASS CIRCUIT & (R264) SEAT POSITION SENSOR VOLTAGE-PASS CIRCUIT FOR A SHORT TO VOLTAGE

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the OCM C2 connector.

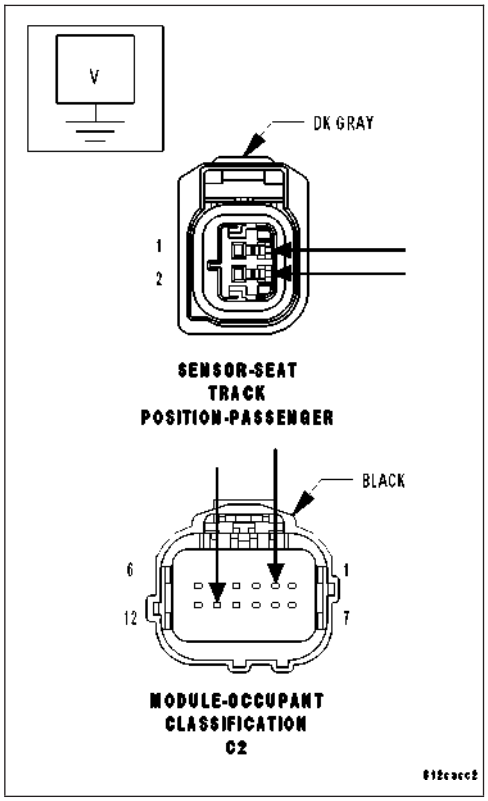
WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
Measure the voltage of the (R261) Seat Position Sensor Data-Pass circuit.
Measure the voltage of the (R264) Seat Position Sensor Voltage-Pass circuit.

Is the voltage above 0.2 volts on either circuit?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.
Replace the Passenger Seat Harness in accordance with the service information.
Perform the OCS VERIFICATION TEST-VER 1.

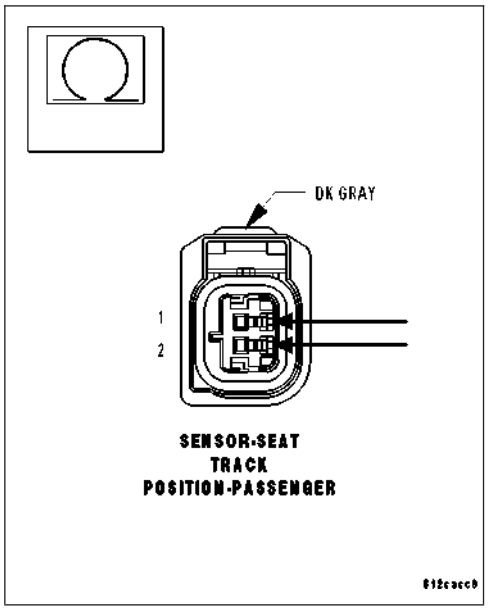
No >> Go To 7



B1B94-PASSENGER SEAT TRACK POSITION SENSOR CIRCUIT HIGH (CONTINUED)

7. CHECK (R262) SEAT POSITION SENSOR DATA-PASS CIRCUIT FOR A SHORT TO (R264) SEAT POSITION SENSOR VOLTAGE-PASS CIRCUIT

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Measure the resistance between the (R261) Seat Position Sensor Data-Pass circuit and the (R264) Seat Position Sensor Voltage-Pass circuit.



Is the resistance below 10k ohms?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the service information.

Perform the OCS VERIFICATION TEST-VER 1.

No >> Replace the OCM in accordance with the Service information.

Perform the OCS VERIFICATION TEST-VER 1.

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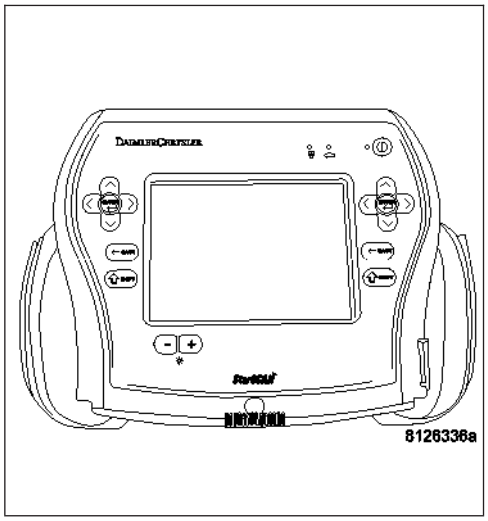
8. TEST FOR AN INTERMITTENT CONDITION

With the scan tool, record and erase all DTC's from the OCM.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If only stored codes return continue the test until the problem area has been isolated.

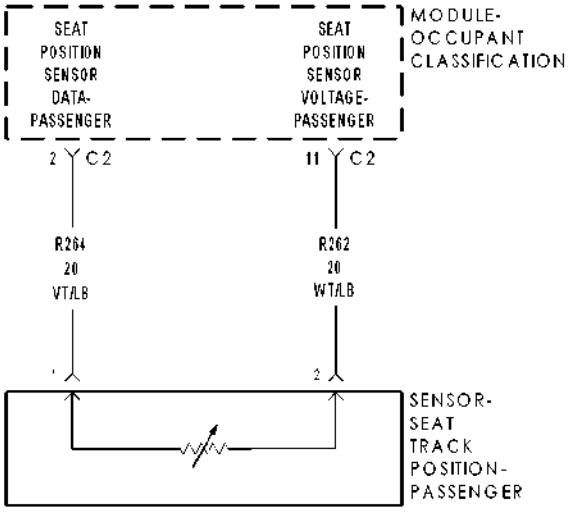
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

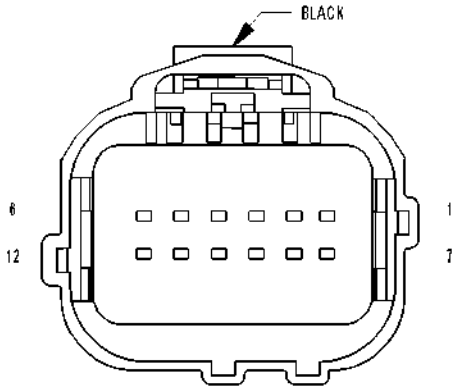
Are any ACTIVE DTCs present?

Yes >> Select the appropriate symptom from Symptom List.

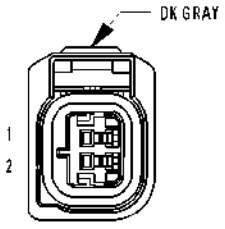
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1B97-PASSENGER SEAT TRACK POSITION SENSOR CONFIGURATION MISMATCH





MODULE-OCCUPANT CLASSIFICATION C2



SENSOR-SEAT TRACK POSITION-PASSENGER

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B1B97-PASSENGER SEAT TRACK POSITION SENSOR CONFIGURATION MISMATCH (CONTINUED)

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on the OCM monitors the Seat Track Position Sensors circuits.
- **Set Condition:**
  If the module detects current on the Seat Track Position Sensors circuits and the module is not configured for STPS.

Possible Causes
SENSORS
WIRING
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, & BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

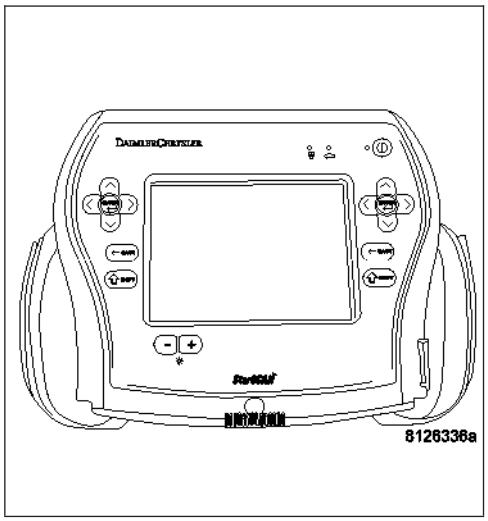
Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

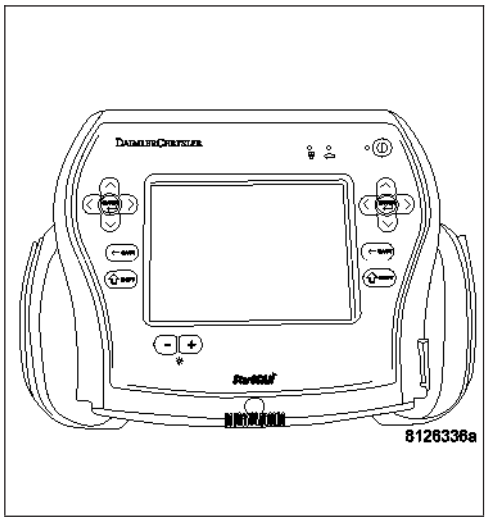
No >> Go To 2



B1B97-PASSENGER SEAT TRACK POSITION SENSOR CONFIGURATION MISMATCH (CONTINUED)

2. VERIFY THAT B1B96-PASSENGER SEAT TRACK POSITION SENSOR CONFIGURATION MISMATCH IS ACTIVE

With the scan tool, erase OCM DTCs.
Turn the ignition off, wait 10 seconds and then turn the ignition on.
Wait 2 minutes, and then with the scan tool, read OCM DTCs.



Does the scan tool display active: B1B96-PASSENGER SEAT TRACK POSITION SENSOR CONFIGURATION MISMATCH?

Yes >> Go To 3

No >> Perform the OCS VERIFICATION TEST-VER. 1

3. VERIFY WIRING

Turn the ignition off.
Inspect the driver and passenger seat wiring for Seat Position Sensors.
Inspect the driver and passenger seat wiring for Seat Position Sensors.

Are Seat Position Sensor(s) present?

Yes >> Replace the OCM in accordance with the Service Information.
Perform the OCS VERIFICATION TEST-VER. 1

No >> Perform the OCS VERIFICATION TEST-VER. 1

B1BA5-AIRBAG SQUIB CONFIGURATION MISMATCH

For the Airbag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If an Occupant Restraint Controller (ORC) configured for vehicles without side airbags is installed in a vehicle with side airbags.

Possible Causes
POWERTRAIN CONTROL MODULE (PCM)
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. VERIFY THAT DTC B1BA5 AIRBAG SQUIB CONFIGURATION MISMATCH IS ACTIVE

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

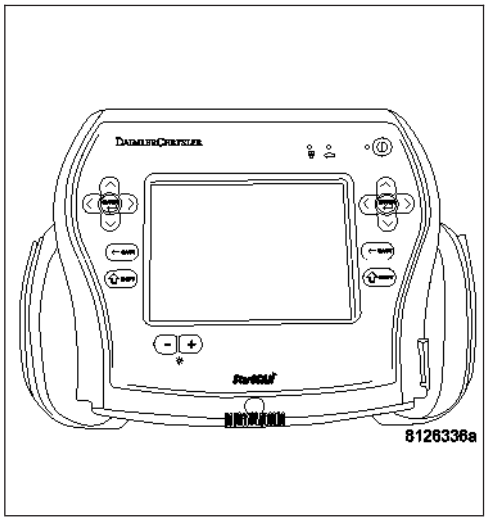
Turn the ignition on.

With the scan tool, read ORC DTCs.

Does the scan tool display active: B1BA5 AIRBAG SQUIB CONFIGURATION MISMATCH?

Yes >> Go To 2

No >> Go To 5



---

2. VERIFY THAT VEHICLE IS EQUIPPED WITH OCCUPANT CLASSIFICATION SYSTEM (OCS)

Vehicles equipped with a Occupant Classification System (OCS) will have a Passenger Airbag On/Off Indicator Lamp mounted to the dashboard. Verify that the vehicle is equipped with this indicator lamp.

With the scan tool, select ECU View and check that the Occupant Classification Module (OCM) is active on the bus.

Is the vehicle equipped with an Occupant Classification System (OCS)?

Yes >> Go To 3

No >> Replace the ORC in accordance with Service Information.
Perform ORC VERIFICATION TEST - VER 1.

B1BA5-AIRBAG SQUIB CONFIGURATION MISMATCH (CONTINUED)

3. CHECK ORC PART NUMBER WITH SCAN TOOL

With the scan tool, select ECU View, select ORC, select ECU Details, and read the ORC part number.

Is the part number correct for the vehicle?

Yes >> Go To 4

No >> Replace the ORC in accordance with Service Information.
Perform ORC VERIFICATION TEST - VER 1.

---

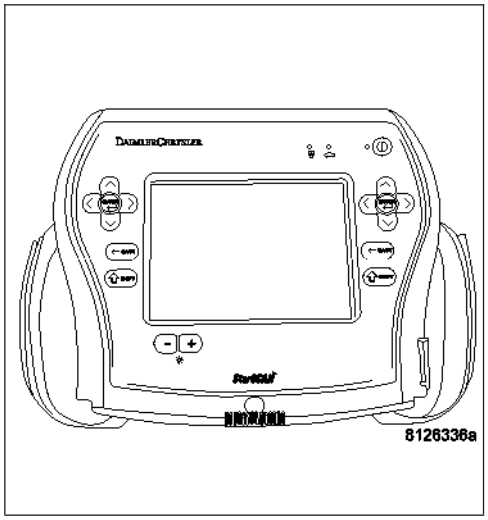
4. CHECK VIN WITH SCAN TOOL

With the scan tool, read the VIN.

Is the correct VIN displayed?

Yes >> Replace the ORC in accordance with Service Information.
Perform ORC VERIFICATION TEST - VER 1.

No >> Replace the Powertrain Control Module (PCM) in accordance with Service Information.
Perform ORC VERIFICATION TEST - VER 1.



B1BA5-AIRBAG SQUIB CONFIGURATION MISMATCH (CONTINUED)

5. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase all DTCs from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

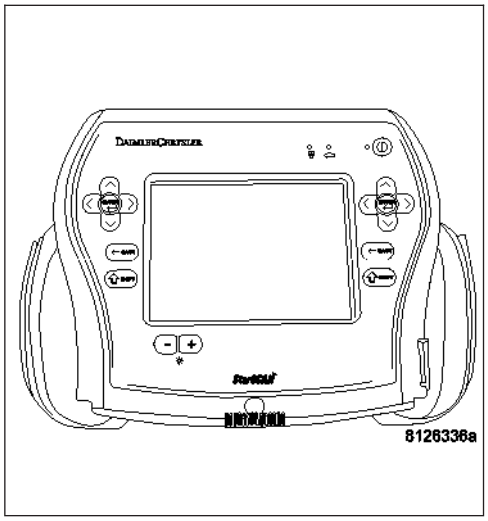
Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor active codes as you work through the following steps.



WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return, continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

Does the scan tool display any ACTIVE DTCs?

Yes >> Select appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1BA6-OCCUPANT CLASSIFICATION UNDETERMINED

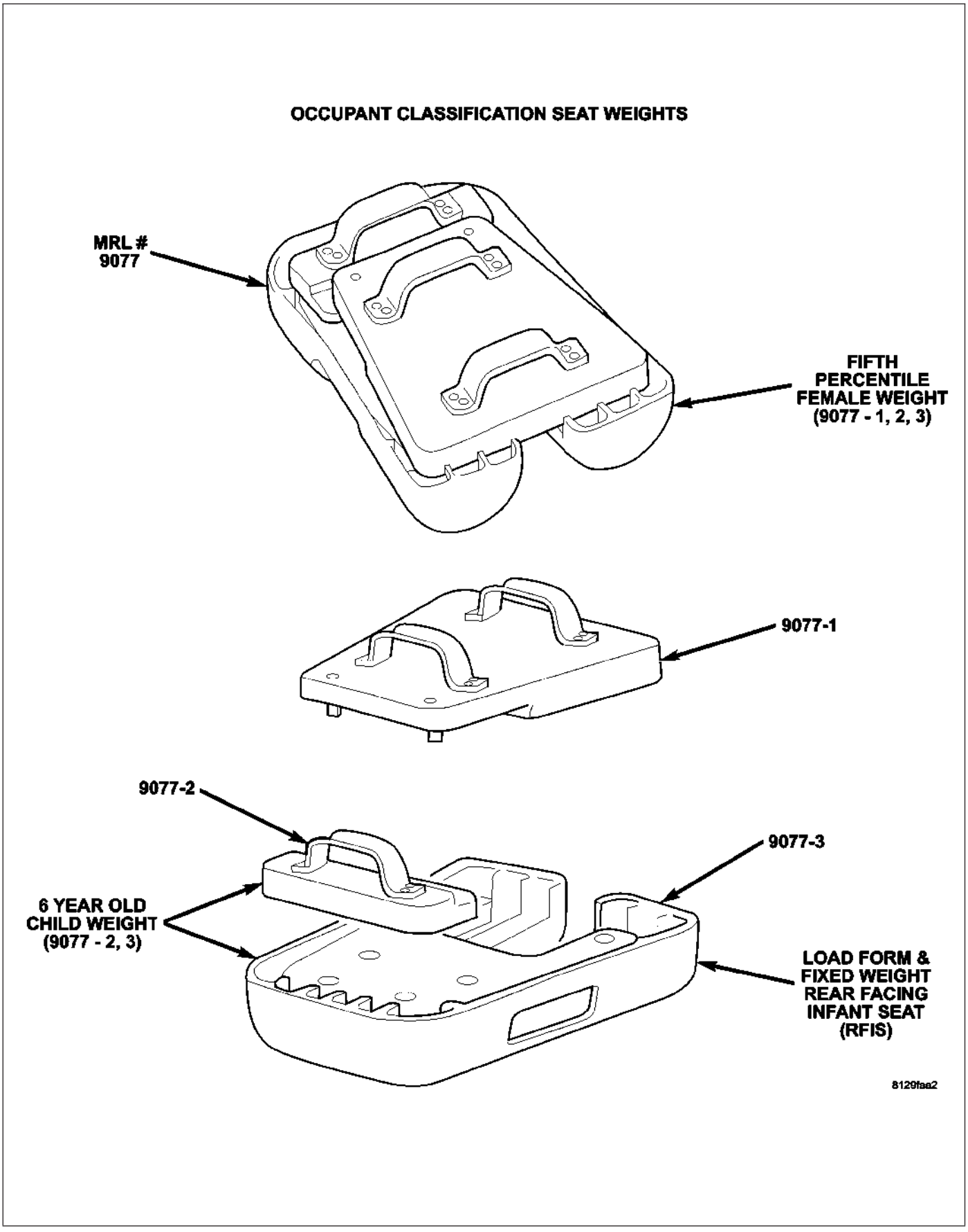
For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on or off.
- **Set Condition:**
  Because other DTCs have made occupant detect impossible. This DTC will set in addition to all sensor and module DTCs and will be erased when the repairs are completed.

Refer to **B1BA7–OCCUPANT CLASSIFICATION SYSTEM VERIFICATION REQUIRED** for the diagnostic test procedure.

B1BA7-OCCUPANT CLASSIFICATION SYSTEM VERIFICATION REQUIRED



OCS SEAT WEIGHTS MRL #9077

B1BA7-OCCUPANT CLASSIFICATION SYSTEM VERIFICATION REQUIRED (CONTINUED)

- **When Monitored:**
  With the CAN ignition status as IGN_RUN, the module tries to detect potentially damaging events and monitors the CAN Bus for the X Impact messages (crash event causing one or more airbag or pretensioner to deploy) or upon detecting an Offset Event (if equipped).
- **Set Condition:**
  This DTC will set if the module detects a potentially damaging event or the X Impact messages from the CAN Bus input.

Possible Causes
B1BA7-OCS VERIFICATION REQUIRED DTC ACTIVE

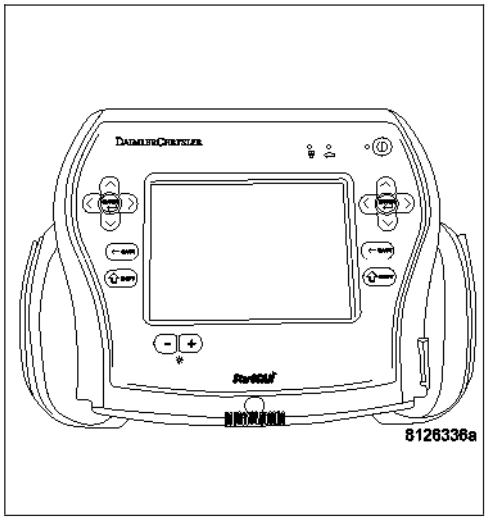
Diagnostic Test

1. CHECK FOR OCCUPANT CLASSIFICATION MODULE (OCM) ACTIVE DTCs:

- ACTIVE INTERNAL FAULTS
- IGNITION FAULTS
- BATTERY FAULT
- SEAT WEIGHT SENSOR DTCZ

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.
Turn the ignition on, then off, and then on again.
With the scan tool, read Occupant Classification Module (OCM) DTCs.



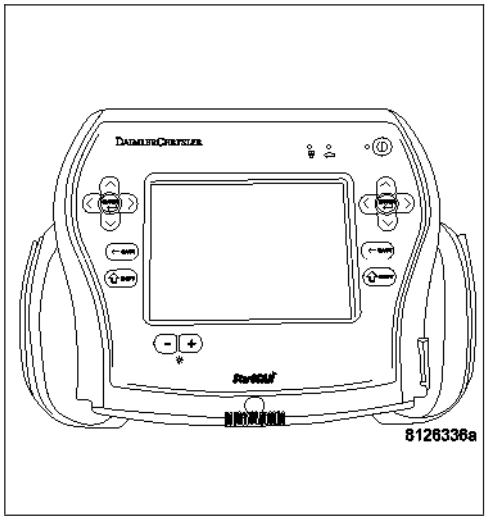
Does the scan tool display any active DTCs listed above?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Go To 2

2. VERIFY THAT DTC B1BA7–OCCUPANT CLASSIFICATION SYSTEM VERIFICATION REQUIRED IS ACTIVE

With the scan tool, read OCM DTCs.



Does the scan tool display active: B1BA7–OCCUPANT CLASSIFICATION SYSTEM VERIFICATION REQUIRED?

Yes >> Go To 3

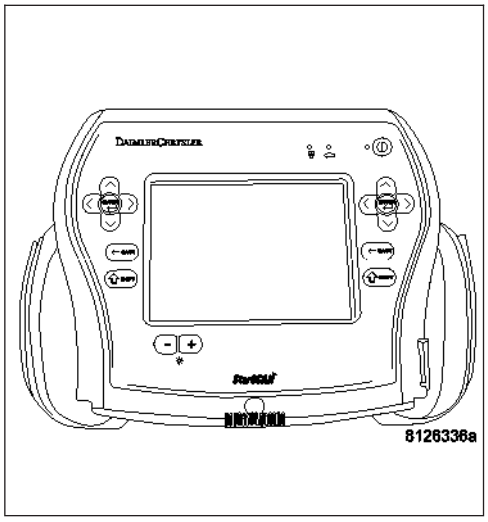
No >> Go To 4

B1BA7-OCCUPANT CLASSIFICATION SYSTEM VERIFICATION REQUIRED (CONTINUED)

3. PERFORM OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST

Verify that the passenger seat is empty.

Verify that all of the Seat Weight Sensor mounting screws are torqued to specification. Refer to 23 - BODY/SEATS.



NOTE: Failure to follow the test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: Verify That All Tests Steps That Led You Here Were Performed As Directed; Verify That The Ignition Is In Run; Wait 30 Seconds After Changing The Seat Weight Before Proceeding To Allow The System To Stabilize; Only Press Scan Tool Buttons When Directed To Do So; & Perform The Occupant Classification Module System Verification Test To Completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, proceed as follows.

With the scan tool, read OCM DTCs.

Does the scan tool display active: B1BA7–OCCUPANT CLASSIFICATION SYSTEM VERIFICATION REQUIRED?

Yes >> Perform the *Diagnosis/Checkout Procedure For Seat Weight Sensors.
Perform OCS VERIFICATION TEST - VER 1.

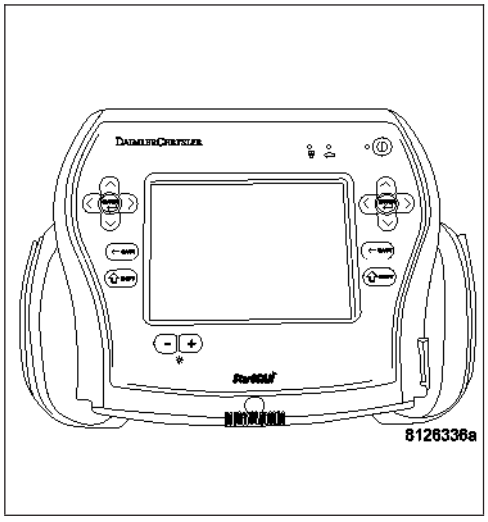
No, But Other DTCs Present
Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No Active DTCs Present
Perform OCS VERIFICATION TEST - VER 1.

---

4. CHECK FOR ACTIVE DTC B1BA8–OCM SYSTEM OUT OF CALIBRATION/NOT CALIBRATED

With the scan tool, read OCM DTCs.



Does the scan tool display active: B1BA8–OCM SYSTEM OUT OF CALIBRATION/NOT CALIBRATED?

Yes >> Diagnose and repair the DTC. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Perform OCS VERIFICATION TEST - VER 1.

B1BA8-OCM SYSTEM OUT OF CALIBRATION/NOT CALIBRATED

For a complete wiring diagram **Refer to Section 8W**.

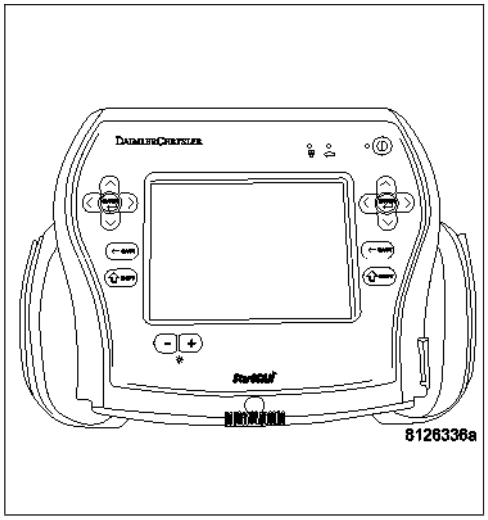
- **When Monitored:**
  While the CAN bus ignition status is IGN_RUN or SNA.
- **Set Condition:**
  This DTC will set if the module has initiated a rezero and did not successfully complete the system verification.

Diagnostic Test

1. PERFORM OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST

Verify that the passenger seat is empty.

Verify that all of the Seat Weight Sensor mounting screws are torqued to specification. Refer to 23 - BODY/SEATS.



NOTE: Failure to follow the test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: Verify That All Tests Steps That Led You Here Were Performed As Directed; Verify That The Ignition Is In Run; Wait 30 Seconds After Changing The Seat Weight Before Proceeding To Allow The System To Stabilize; Only Press Scan Tool Buttons When Directed To Do So; & Perform The Occupant Classification Module System Verification Test To Completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, proceed as follows.

With the scan tool, read OCM DTCs.

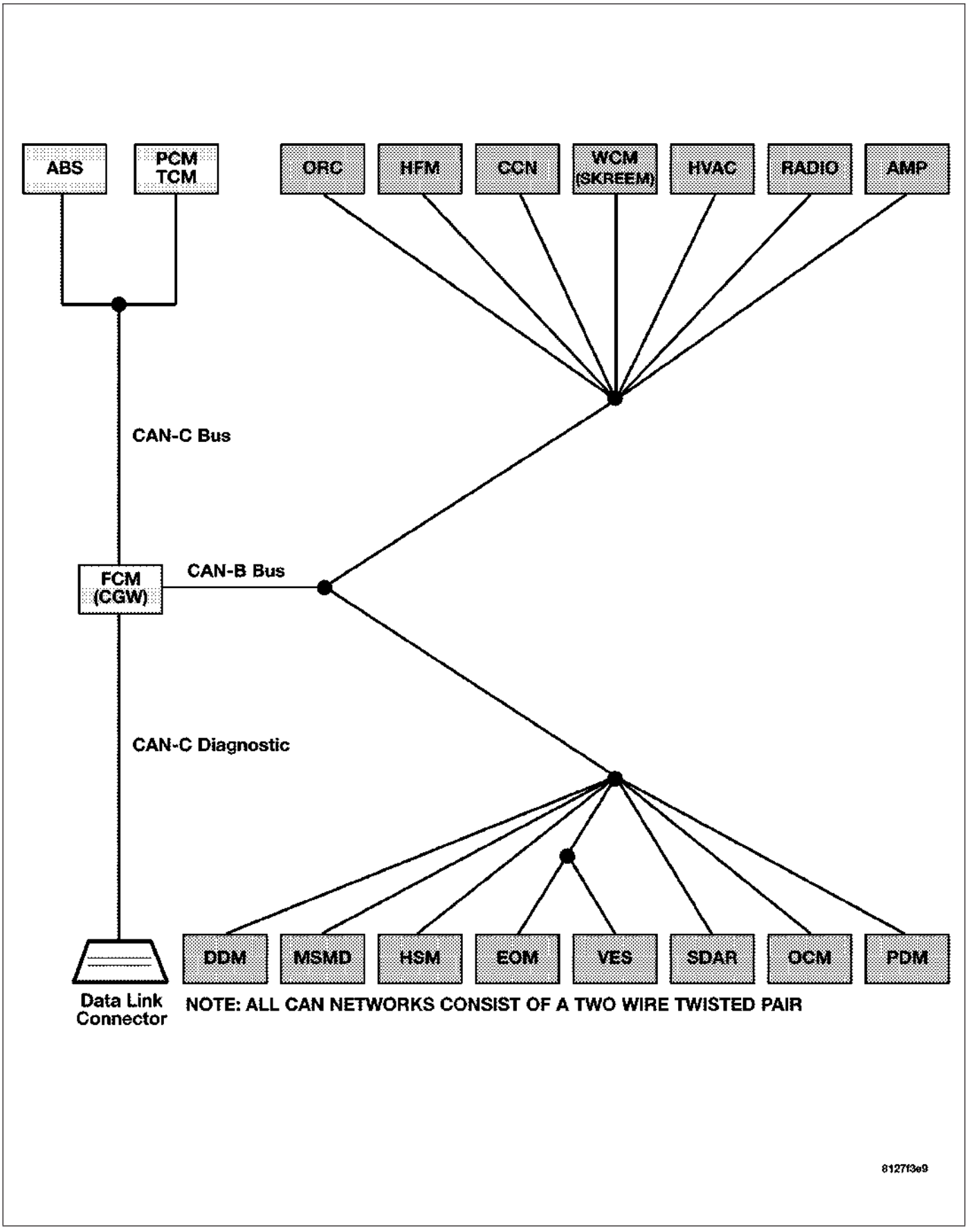
Does the scan tool display any active DTCs?

Yes - B1BA8 DTC Returned
Perform the *Diagnosis/Checkout Procedure For Seat Weight Sensors.

Yes - But Other DTCs Present
Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No - Active DTCs Present
Perform OCS VERIFICATION TEST - VER 1.

B1BB8-SRS WARNING INDICATOR STATUS MISMATCH



B1BB8-SRS WARNING INDICATOR STATUS MISMATCH (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  After the Instrument Cluster bulb check is completed, the ORC compares the lamp request by the ORC (On or Off) and the Lamp On request by the Instrument Cluster (On or Off) Can bus messages. Each message is transmitted one time per second or when a change in the lap state occurs.
- **Set Condition:**
  If the lamp request by the ORC (On or Off), and the Lamp On by the Instrument Cluster (On or Off), messages do not match, this code will set.

Possible Causes
OCCUPANT RESTRAINT CONTROLLER, INSTRUMENT CLUSTER MESSAGE MISMATCH
INSTRUMENT CLUSTER
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. CHECK FOR AN ACTIVE DTC

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Restraint Controller (ORC) DTCs.

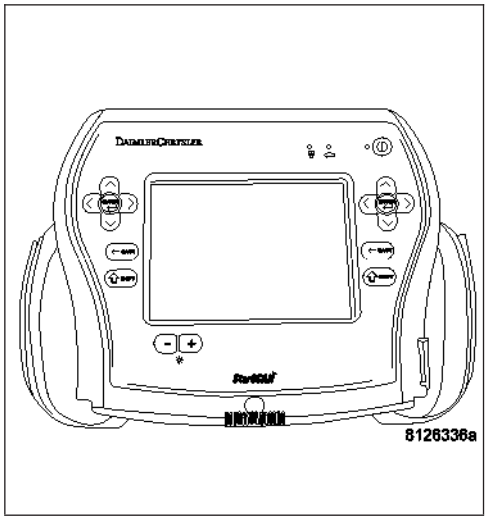
Select DTC type.

Active

Go To 2

Stored

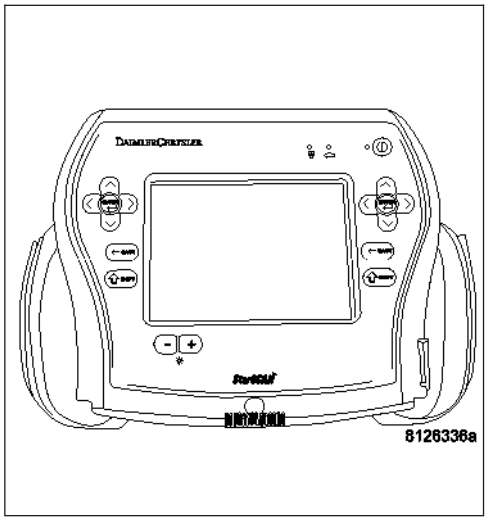
Go To 5



B1BB8-SRS WARNING INDICATOR STATUS MISMATCH (CONTINUED)

2. CHECK FOR ACTIVE INSTRUMENT CLUSTER DTCs

With the scan tool, read Instrument Cluster DTCs.



Does the scan tool display and active Instrument Cluster DTCs?

Yes >> Refer to symptom list for problems related to the Instrument Cluster.
Perform the ORC VERIFICATION TEST-VER 1.

No >> Go To 3

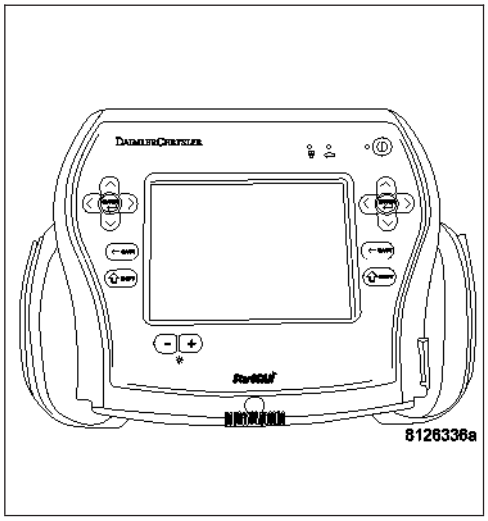
3. CHECK THE ORC AND INSTRUMENT CLUSTER FOR LAMP STATUS

With the scan tool view the Instrument Cluster Data Display.

Cycle the ignition key and observe the SRS Indicator Lamp Request status (Set/Not Set) during the Instrument Cluster bulb check.

With the scan tool view the ORC Data Display.

Cycle the ignition key and observe the SRS Indicator Lamp Status (Lamp On/Lamp Off) during the Instrument Cluster bulb check.



Did the Data Display information match the operation of the lamp?

Yes >> Go To 4

No >> Replace the Instrument Cluster in accordance with the service information.
Perform the ORC VERIFICATION TEST-VER 1.

4. REPLACE THE OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with the service information.
Perform the ORC VERIFICATION TEST-VER 1.

B1BB8-SRS WARNING INDICATOR STATUS MISMATCH (CONTINUED)

5. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase all DTCs from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

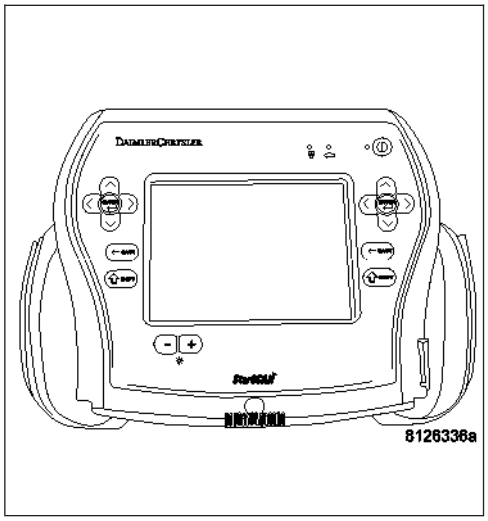
Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor active codes as you work through the following steps.



WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return, continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

Does the scan tool display any ACTIVE DTCs?

Yes >> Select appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1BBA-PASSENGER SEAT WEIGHT SENSOR SUPPLY CIRCUIT

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

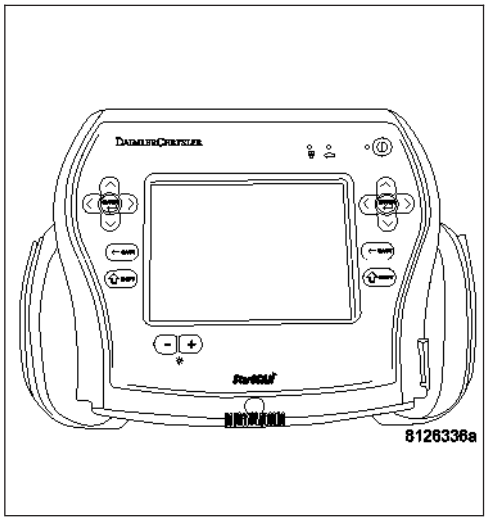
- **When Monitored:**
  While the CAN bus ignition status is in IGN_RUN, the module checks the sensor supply.
- **Set Condition:**
  If the OCM detects that the sensor supply shorted. **NOTE: A shorted supply circuit will cause a 'NO RESPONSE FROM OCM" condition.**

Possible Causes
OCS SUPPLY CIRCUIT SHORTED
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. VERIFY THAT B1BBA-PASSENGER SEAT WEIGHT SENSOR SUPPLY CIRCUIT IS ACTIVE

With the scan tool, read OCM DTCs.



Does the scan tool display active: B1BBA-PASSENGER SEAT WEIGHT SENSOR SUPPLY CIRCUIT?

Yes >> Replace the OCM in accordance with the Service Information.
Perform the OCS VERIFICATION REQUIRED procedure.

No >> Go To 2

---

2. INSPECT PASSENGER SEAT HARNESS WIRES & CONNECTORS

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Using the wiring diagram/schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

Are any of these conditions present?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.
Replace the Passenger Seat Harness in accordance with the Service Information.
Perform OCS VERIFICATION TEST - VER 1.

No >> Go To 3

B1BBA-PASSENGER SEAT WEIGHT SENSOR SUPPLY CIRCUIT (CONTINUED)

3. TEST FOR AN INTERMITTENT CONDITION

With the scan tool, record and erase all DTC's from the OCM.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

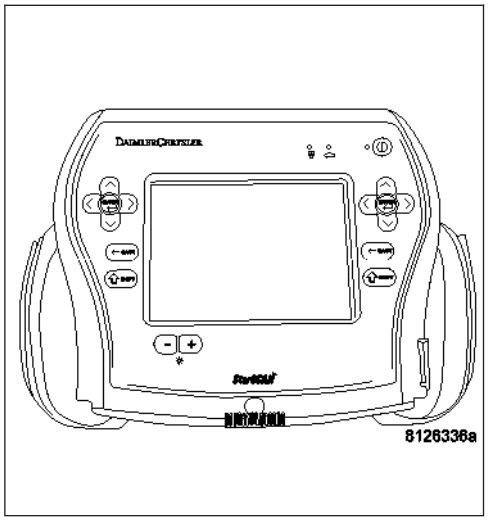
Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.



WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If only stored codes return continue the test until the problem area has been isolated.

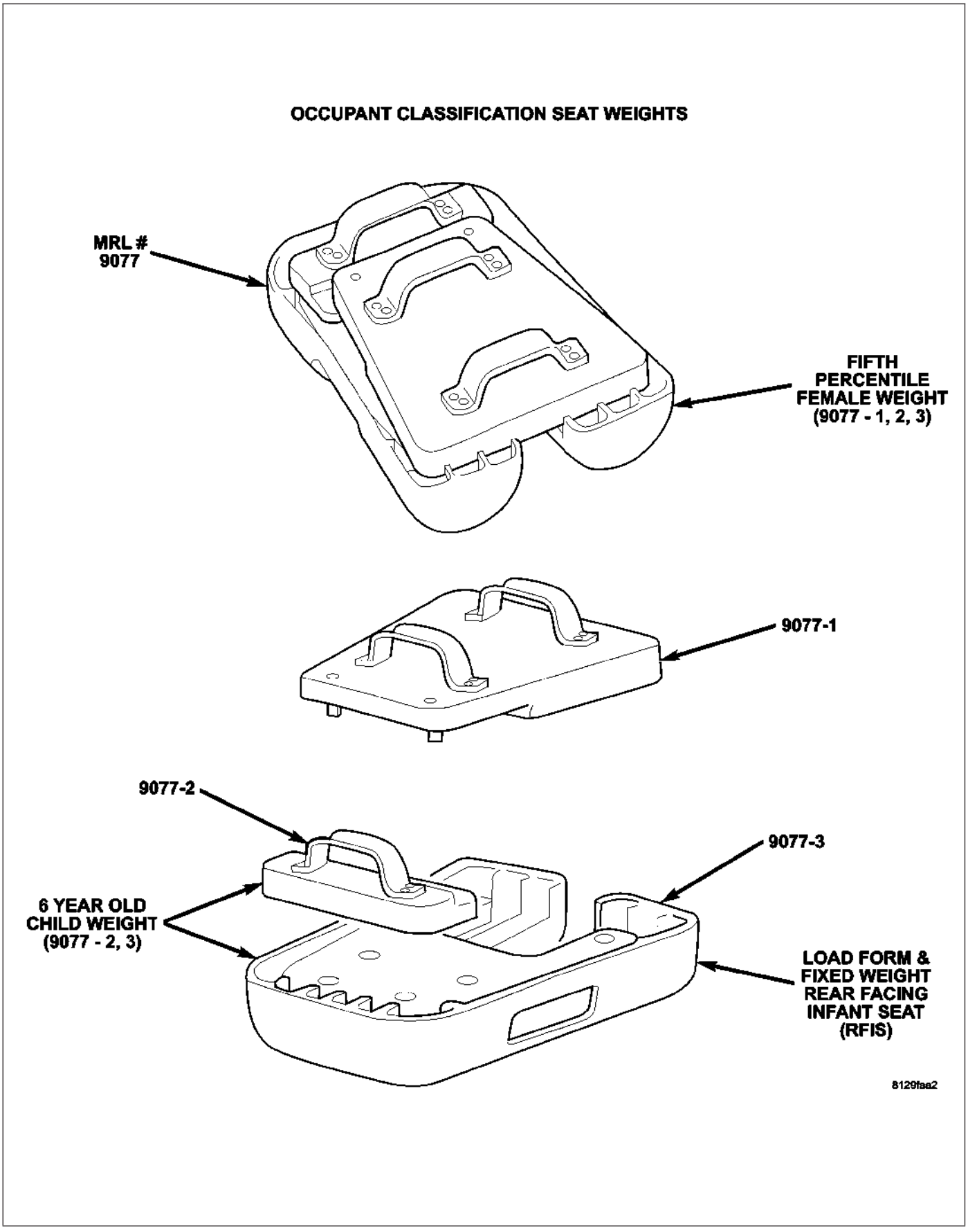
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1BBC-OCS NEGATIVE SYSTEM WEIGHT



OCS SEAT WEIGHTS MRL #9077

B1BBC-OCS NEGATIVE SYSTEM WEIGHT (CONTINUED)

- **When Monitored:**
  While the CAN bus ignition status is in IGN_RUN, the module checks the sensor input ranges.
- **Set Condition:**
  If the module detects a seat weight sensor input with the total seat weight below -6.5 kg +/- 1kg.

Possible Causes
DAMAGE TO THE PASSENGER SEAT STRUCTURE, RISER ASSEMBLY, CROSSMEMBERS, SEAT TRACKS, FLOOR PAN
OBJECT UNDER SEAT OR REAR SEAT FOLDED DOWN AND RESTING AGAINST PASSENGER SEAT
OCCUPANT CLASSIFICATION MODULE (OCM)

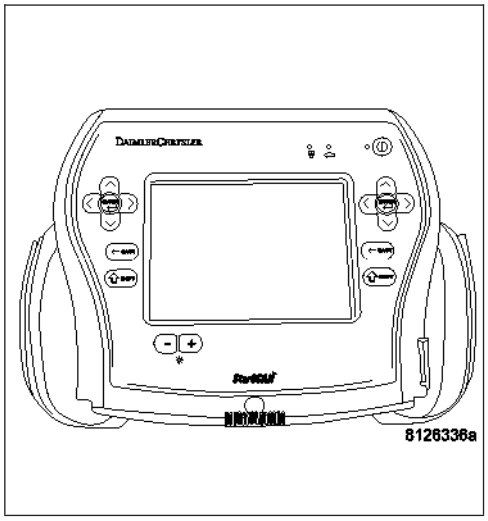
Diagnostic Test

1. TEST CONDITIONS

- ACTIVE INTERNAL FAULTS
- IGNITION FAULTS
- BATTERY FAULT
- SEAT WEIGHT SENSOR DTC

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.
Turn the ignition on, then off, and then on again.
With the scan tool, read Occupant Classification Module (OCM) DTCs.



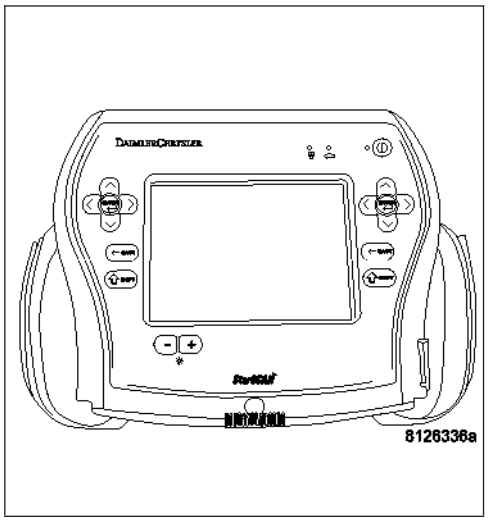
Does the scan tool display any active DTCs listed above?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Go To 2

2. ACTIVE OR STORED DTC

With the scan tool, read OCM DTCs.



Does the scan tool display active: B1BBC–NEGATIVE SYSTEM WEIGHT?

Yes >> Go To 3

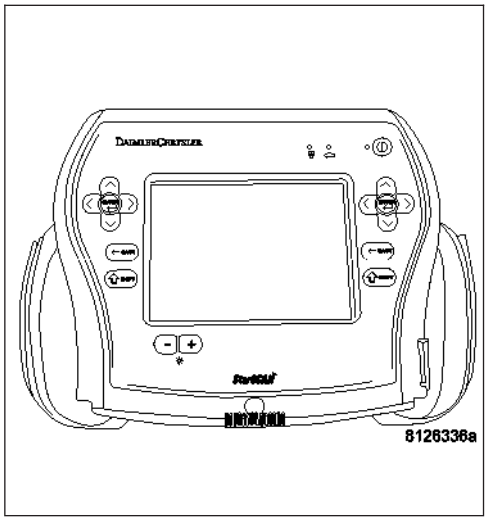
No >> Go To 4

B1BBC-OCS NEGATIVE SYSTEM WEIGHT (CONTINUED)

3. PERFORM OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST

Verify that the passenger seat is empty.

Verify that all of the Seat Weight Sensor mounting screws are torqued to specification. Refer to 23 - BODY/SEATS.



NOTE: Failure to follow the test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: Verify That All Tests Steps That Led You Here Were Performed As Directed; Verify That The Ignition Is In Run; Wait 30 Seconds After Changing The Seat Weight Before Proceeding To Allow The System To Stabilize; Only Press Scan Tool Buttons When Directed To Do So; & Perform The Occupant Classification Module System Verification Test To Completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, proceed as follows.

With the scan tool, read OCM DTCs.

Does the scan tool display active: B1BA8–OCS NOT CALIBRATED DTC?

Yes >> Perform the *Diagnosis/Checkout Procedure For Seat Weight Sensors.
Perform OCS VERIFICATION TEST - VER 1.

No - But Other DTCs Present
Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

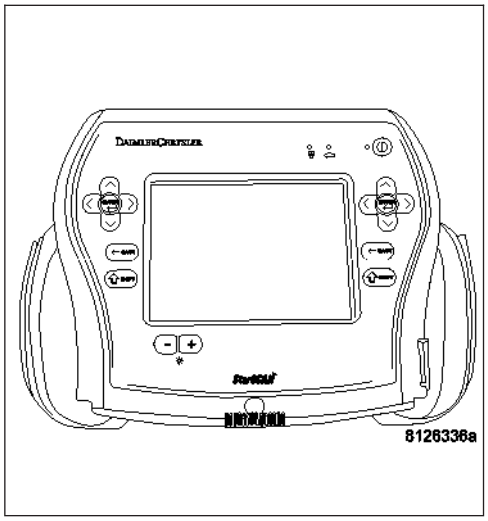
No - No Active DTCs Present
Perform OCS VERIFICATION TEST - VER 1.

B1BBC-OCS NEGATIVE SYSTEM WEIGHT (CONTINUED)

4. STORED B1BBC-OCS NEGATIVE SYSTEM WEIGHT DTC

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

IF only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

Are any ACTIVE DTC's present?

Yes >> Select appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B1BBD-OCM CURRENT CONFIGURATION TABLE UNPROGRAMMED

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  If the Configuration Table is not programmed at the supplier or when the checksum is invalid.
- **Set Condition:**
  This DTC will set if the module was received unprogrammed from the supplier, the vehicle line was not identified correctly or if the flash procedure was not completed successfully

Possible Causes
NEW OCCUPANT CLASSIFICATION MODULE
INTERNAL CHECKSUM FAILURE

Diagnostic Test

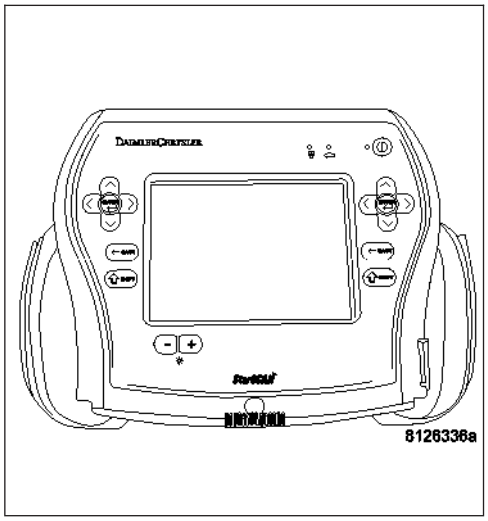
1. MODULE CONFIGURATION

Does the scan tool display B1BBD-OCM CURRENT CONFIGURATION TABLE UNPROGRAMMED?

Yes >> Perform the B1BA7–OCS VERIFICATION REQUIRED diagnostic procedure.

No >> Replace the Occupant Classification Module in accordance with the service information.

With the scan tool, perform the OCM SYSTEM VERIFICATION procedure.



B1BC7-DEPLOYMENT DATA RECORD FULL

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. The module's on board diagnostics continuously performs internal circuit tests.
- **Set Condition:**
  This DTC will set if the module identifies an out of range internal circuit.

Possible Causes
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

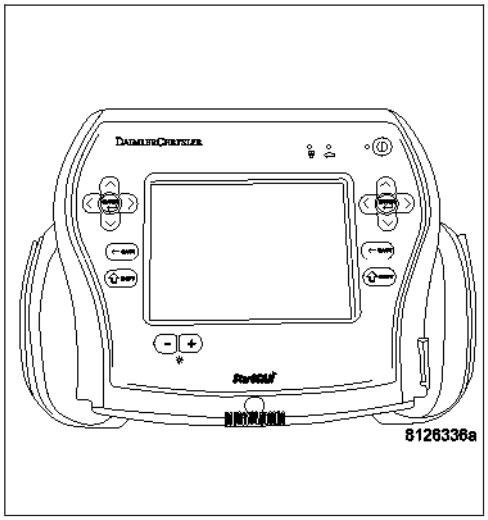
1. CHECK FOR ACTIVE DTC

Turn the ignition on.
With the scan tool, read ORC DTCs.

Is the Deployment Data Record Full DTC active?

Yes >> Go To 2

No >> Perform the ORC VERIFICATION TEST-VER. 1.



2. REPLACE THE OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

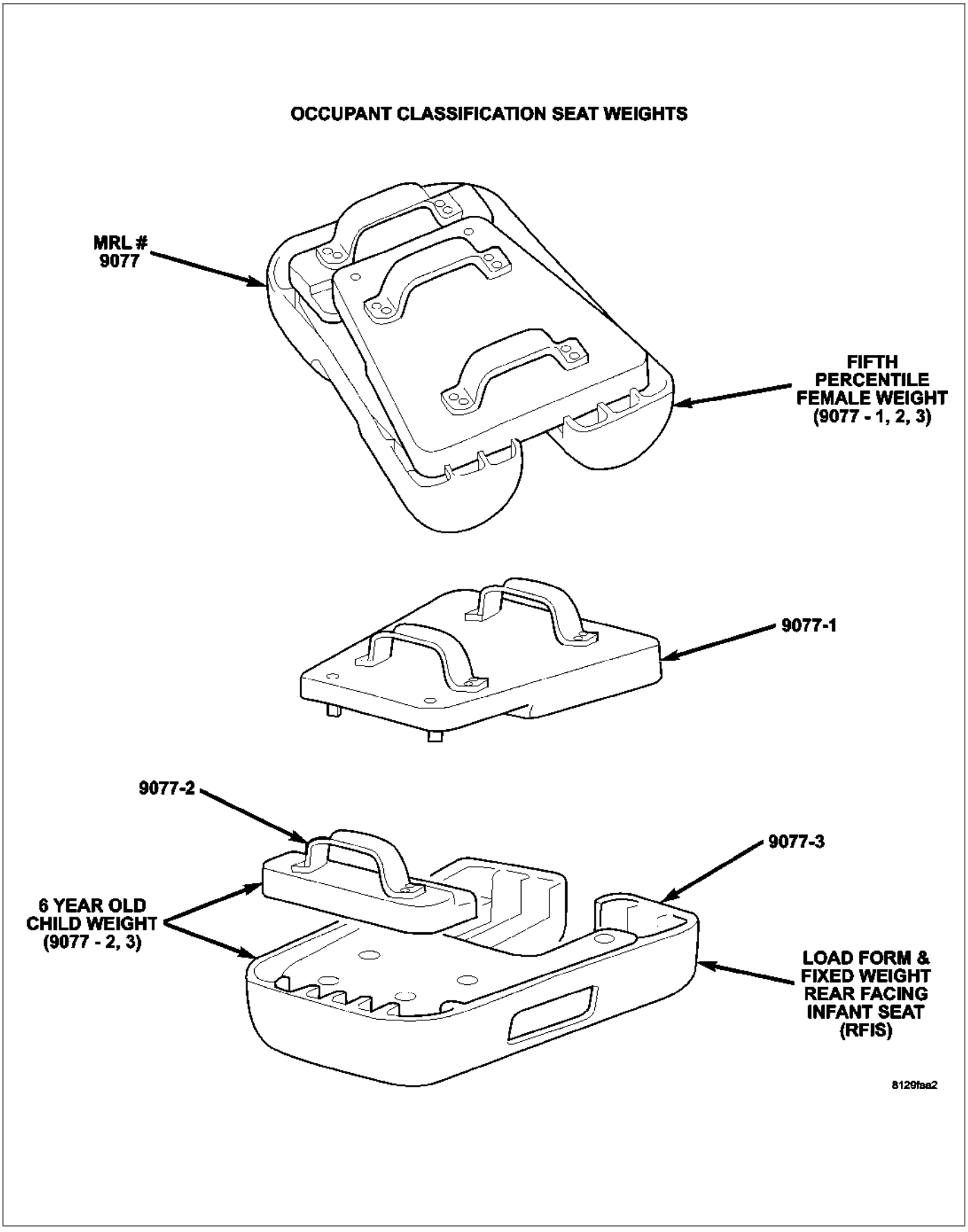
WARNING: If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

View repair.

Repair

Replace the Occupant Restraint Controller in accordance with the service information.
Perform the ORC VERIFICATION TEST-VER 1.

B1BC8-PASSENGER SEAT WEIGHT SENSORS PERFORMANCE



B1BC8-PASSENGER SEAT WEIGHT SENSORS PERFORMANCE (CONTINUED)

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  While the CAN bus ignition status is in IGN_RUN, the module checks the sensor input ranges.
- **Set Condition:**
  If the module detects that the sensor input remains within 4 raw A/D counts for 10 consecutive minutes while at least one sensor changes greater than 8 raw A/D counts per minute.

Possible Causes
OTHER SEAT WEIGHT SENSOR FAULTS ACTIVE IN THE OCM
PASSENGER SEAT HARNESS WIRES CHAFFED, PIERCED, PINCHED, PARTIALLY BROKEN
PASSENGER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT PUSHED OUT, SPREAD, CORRODED, CONTAMINATED
PASSENGER SEAT WEIGHT SENSORS
DAMAGE TO THE PASSENGER SEAT STRUCTURE, RISER ASSEMBLY, CROSSMEMBERS, SEAT TRACKS, FLOOR PAN
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, & BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

NOTE: Ensure the battery is fully charged.

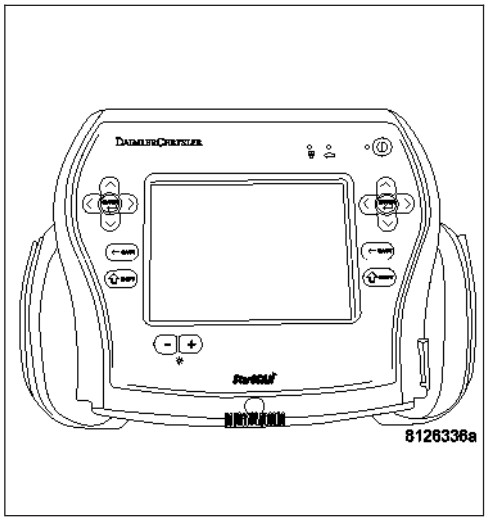
NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.
Turn the ignition on, then off, and then on again.

NOTE: This DTC will take 10 minutes to mature, allow plenty of time for the code to mature between as you work through the test steps.
With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Go To 2



B1BC8-PASSENGER SEAT WEIGHT SENSORS PERFORMANCE (CONTINUED)

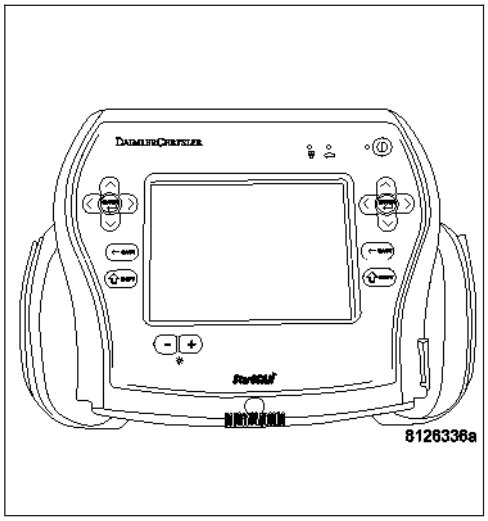
2. VERIFY THAT DTC B1BC8–PASSENGER SEAT WEIGHT SENSORS PERFORMANCE IS ACTIVE

With the scan tool, read OCM DTCs.

Does the scan tool display active: B1BC8–PASSENGER SEAT WEIGHT SENSORS PERFORMANCE?

Yes >> Go To 3

No >> Go To 6



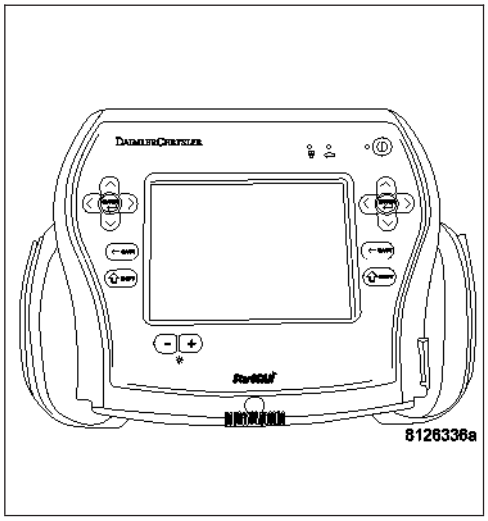
3. CHECK FOR OTHER ACTIVE PASSENGER SEAT WEIGHT SENSOR FAULTS IN THE OCM

With the scan tool, read OCM DTCs.

Does the scan tool display any other active Seat Weight Sensor DTCs?

Yes >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Go To 4



B1BC8-PASSENGER SEAT WEIGHT SENSORS PERFORMANCE (CONTINUED)

4. INSPECT PASSENGER SEAT HARNESS WIRES & CONNECTORS

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

Are any of these conditions present?

Yes >>

NOTE: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

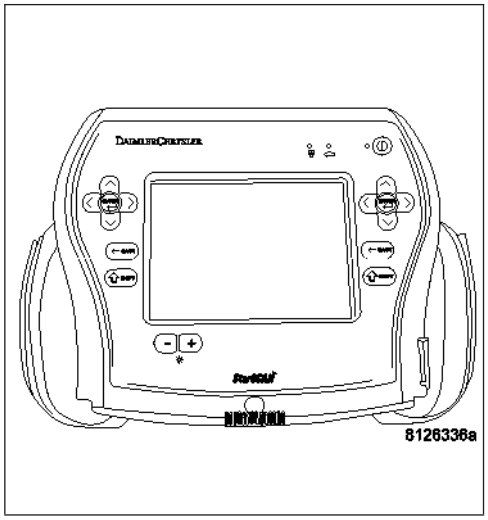
Perform OCS VERIFICATION TEST - VER 1.

No >> Go To 5

---

5. PERFORM OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST

Verify that all of the Seat Weight Sensor mounting screws are torqued to specification. Refer to 23 - BODY/SEATS.



WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

NOTE: Failure to follow test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: Verify That All Tests Steps That Led You Here Were Performed As Directed; Verify That The Ignition Is In Run; Wait 30 Seconds After Changing The Seat Weight Before Proceeding To Allow The System To Stabilize; Only Press Scan Tool Buttons When Directed To Do So; & Perform The Occupant Classification Module System Verification Test To Completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, wait two minutes, and then proceed as follows.

With the scan tool, read OCM DTCs.

Does the scan tool display any active PASSENGER SEAT WEIGHT SENSOR PERFORMANCE DTCs?

Yes >> Perform the *Diagnosis/Checkout Procedure For Seat Weight Sensors.

Perform OCS VERIFICATION TEST - VER 1.

No - But Other DTCs Present

Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No - No Active DTCs Present

Perform OCS VERIFICATION TEST - VER 1.

B1BC8-PASSENGER SEAT WEIGHT SENSORS PERFORMANCE (CONTINUED)

6. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase all DTCs from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

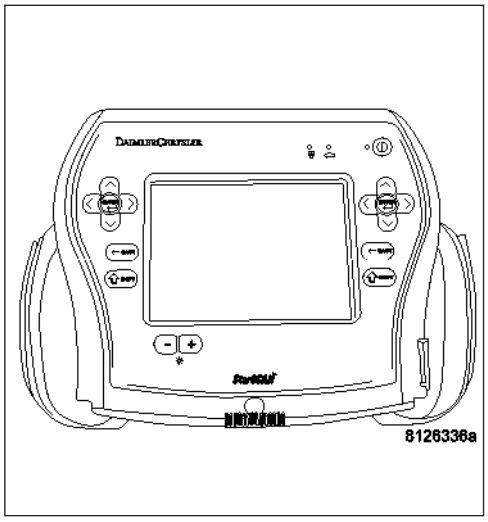
Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor active codes as you work through the following steps.



NOTE: This DTC will take 10 minutes to mature, allow plenty of time for the code to mature between as you work through the test steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return, continue the test until the problem area has been isolated.

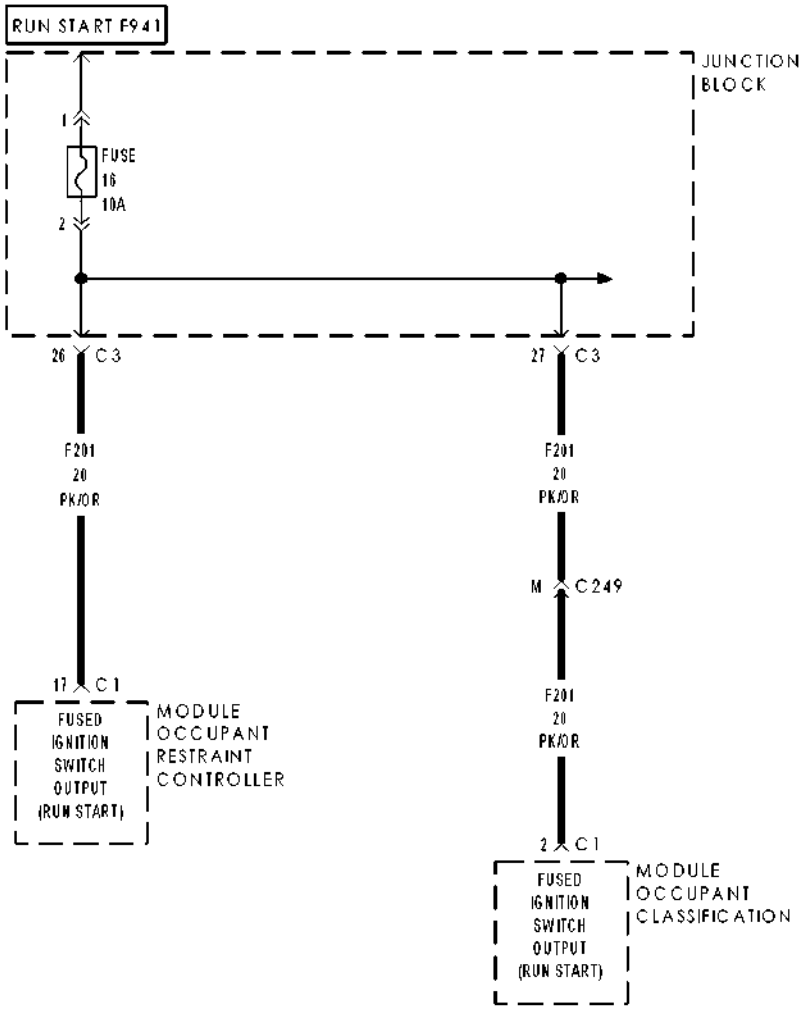
In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

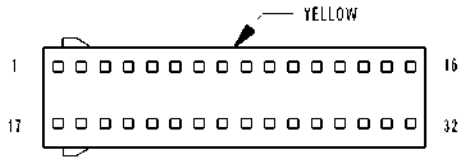
Does the scan tool display any ACTIVE DTCs?

Yes >> Select appropriate symptom from Symptom List.

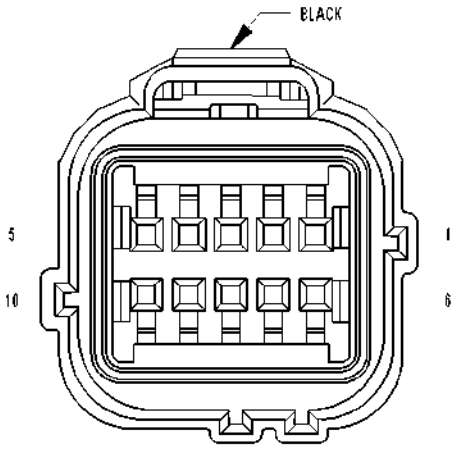
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B2101-IGNITION RUN/START INPUT CIRCUIT LOW





MODULE-OCCUPANT RESTRAINT CONTROLLER C1



MODULE-OCCUPANT CLASSIFICATION C1

B2101-IGNITION RUN/START INPUT CIRCUIT LOW (CONTINUED)

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  While the CAN bus ignition status is RUN or SNA, the module checks the (F201) Fused Ignition Switch Output (Run-Start) circuit voltage input range.
- **Set Condition:**
  With the ignition on, if voltage on the (F201) Fused Ignition Switch Output (Run-Start) circuit is equal to or below 6.25 volts ±0.25 volts. Within 60 seconds of turning the ignition off, if voltage on the (F201) Fused Ignition Switch Output (Run-Start) circuit is 2.4 to 5.0 volts.

Possible Causes
PASSENGER AIRBAG (PAB) INDICATOR RUN-START FUSE OPEN
(F201) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT SHORTED TO GROUND
(F201) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN
(F941) IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN
PASSENGER AIRBAG ON/OFF INDICATOR LAMP
OCCUPANT CLASSIFICATION MODULE (OCM)
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. VERIFY THAT DTC B2101 IGNITION RUN/START INPUT CIRCUIT LOW IS ACTIVE

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

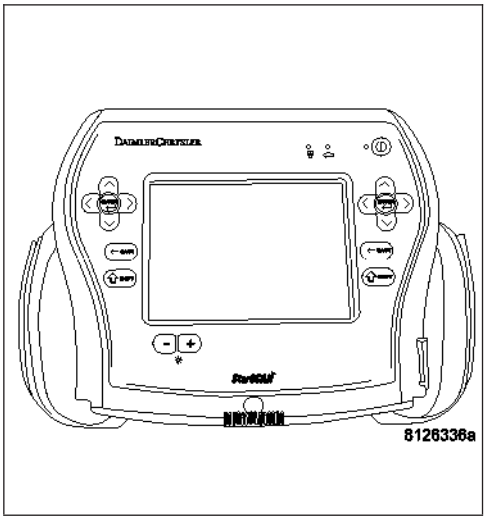
Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display active: B2101 IGNITION RUN/START INPUT CIRCUIT LOW?

Yes >> Go To 2

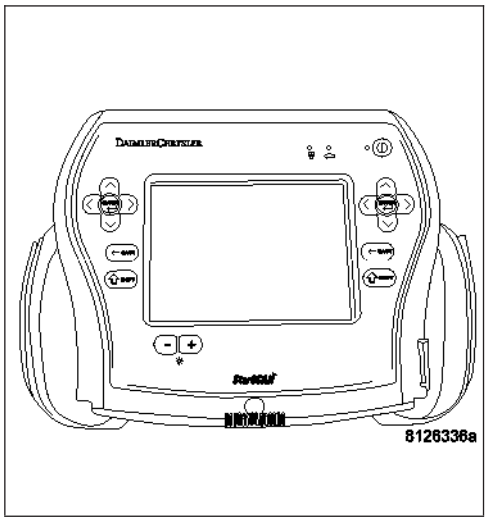
No >> Go To 10



B2101-IGNITION RUN/START INPUT CIRCUIT LOW (CONTINUED)

2. CHECK FOR ACTIVE DTC B212C IGNITION RUN/START INPUT CIRCUIT OPEN IN OCCUPANT RESTRAINT CONTROLLER (ORC)

With the scan tool, read Occupant Restraint Controller (ORC) DTCs.



Does the scan tool display active: B212C IGNITION RUN/START INPUT CIRCUIT OPEN?

Yes >> Go To 3

No >> Go To 9

---

3. INSPECT PASSENGER AIRBAG (PAB) INDICATOR RUN-START FUSE

Turn the ignition off.

Remove the PAB Indicator Run-Start Fuse from the Junction Block and inspect the fuse.

NOTE: Check connectors - Clean and repair as necessary.

Is the fuse open?

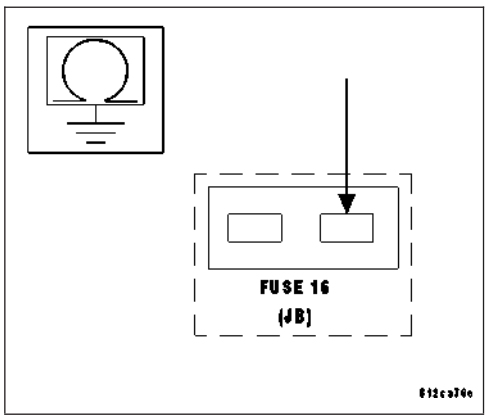
Yes >> Go To 4

No >> Go To 8

---

4. CHECK (F201) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT RESISTANCE

Measure the resistance of the (F201) Fused Ignition Switch Output (Run-Start) circuit between ground and the PAB Indicator Run-Start fuse terminal (output side).



Is the resistance below 100.0 ohms?

Yes >> Go To 5

No >> Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors. Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

Replace PAB Indicator Run-Start Fuse.

Perform OCS VERIFICATION TEST - VER 1.

Perform ORC VERIFICATION TEST - VER 1.

B2101-IGNITION RUN/START INPUT CIRCUIT LOW (CONTINUED)

5. CHECK (F201) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT RESISTANCE WITH ORC C1 CONNECTOR DISCONNECTED

WARNING: If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

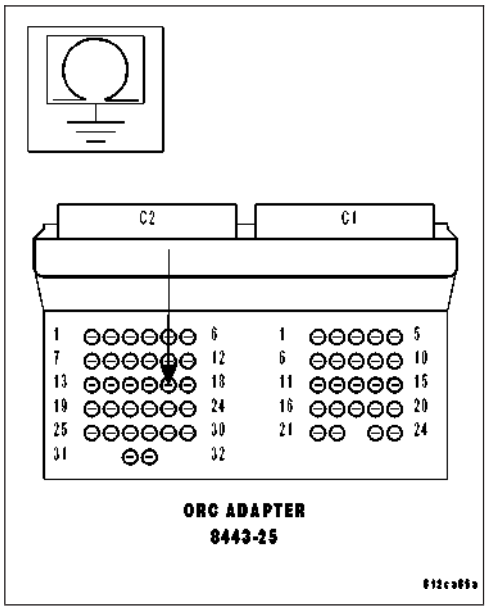
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the ORC C1 connector.

NOTE: Check connectors - Clean and repair as necessary.

Connect the appropriate Load Tool ORC Adaptor to the ORC connector.

Measure the resistance of the (F201) Fused Ignition Switch Output (Run-Start) circuit between ground and the PAB Indicator Run-Start fuse terminal (output side).



Is the resistance below 100.0 ohms?

Yes >> Go To 6

No >> Replace the ORC in accordance with the Service Information.
Replace the PAB Indicator Run-Start Fuse.
Perform OCS VERIFICATION TEST - VER 1.
Perform ORC VERIFICATION TEST - VER 1.

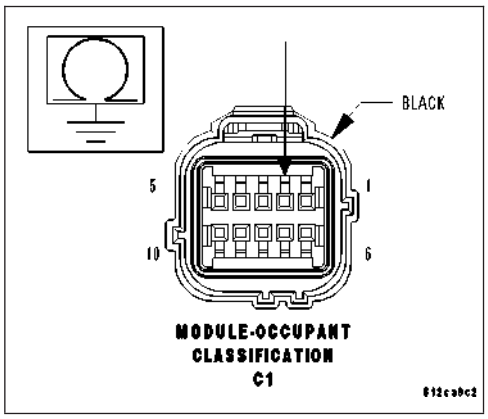
---

6. CHECK (F201) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT RESISTANCE WITH OCM C1 CONNECTOR DISCONNECTED

WARNING: If the Occupant Classification Module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

Disconnect the OCM C1 connector.

Measure the resistance of the (F201) Fused Ignition Switch Output (Run-Start) circuit between ground and the PAB Indicator Run-Start fuse terminal (output side).



Is the resistance below 100.0 ohms?

Yes >> Go To 7

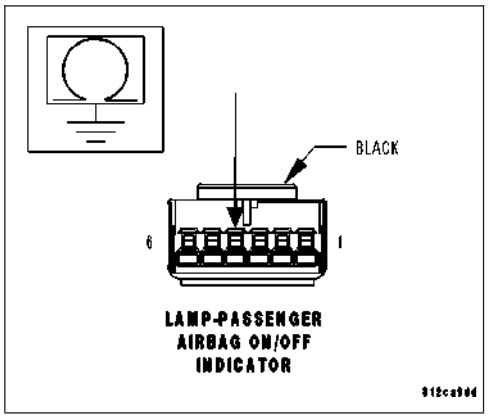
No >> Replace the OCM in accordance with the Service Information.
Replace the PAB Indicator Run-Start Fuse.
Perform OCS VERIFICATION TEST - VER 1.
Perform ORC VERIFICATION TEST - VER 1.

B2101-IGNITION RUN/START INPUT CIRCUIT LOW (CONTINUED)

7. CHECK (F201) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT RESISTANCE WITH PASSENGER AIRBAG ON/OFF INDICATOR LAMP CONNECTOR DISCONNECTED

Disconnect the Passenger Airbag On/Off Indicator Lamp connector.

Measure the resistance of the (F201) Fused Ignition Switch Output (Run-Start) circuit between ground and the PAB Indicator Run-Start fuse terminal (output side).



Is the resistance below 100.0 ohms?

Yes >> Repair the (F201) Fused Ignition Switch Output (Run-Start) circuit for a short to ground.
Replace the PAB Indicator Run-Start Fuse.
Perform OCS VERIFICATION TEST - VER 1.
Perform ORC VERIFICATION TEST - VER 1.

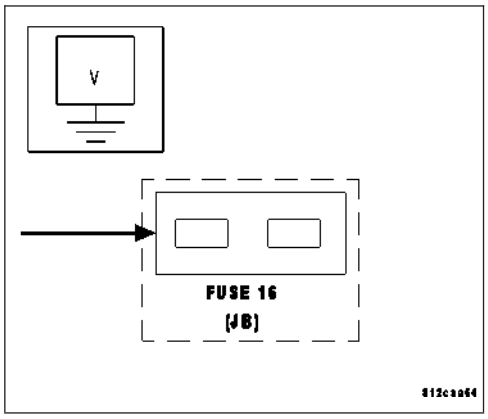
No >> Replace the Passenger Airbag On/Off Indicator Lamp in accordance with the Service Information.
Replace the PAB Indicator Run-Start Fuse.
Perform OCS VERIFICATION TEST - VER 1.
Perform ORC VERIFICATION TEST - VER 1.

---

8. CHECK (F941) IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT FOR AN OPEN

Turn the ignition on.

Measure the voltage of the (F941) Ignition Switch Output (Run-Start) circuit at the PAB Indicator Run-Start fuse terminal (supply side).



Is the voltage above 6.0 volts?

Yes >> Go To 9

No >> Repair the (F941) Ignition Switch Output (Run-Start) circuit for an open.
Perform OCS VERIFICATION TEST - VER 1.
Perform ORC VERIFICATION TEST - VER 1.

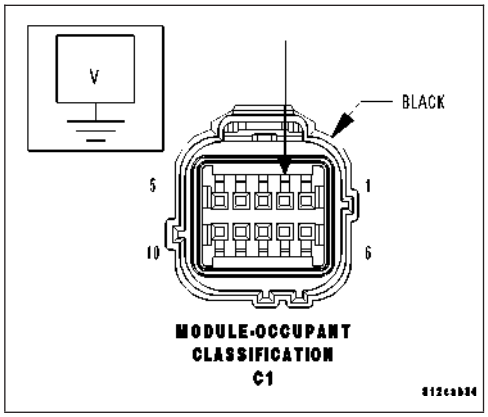
B2101-IGNITION RUN/START INPUT CIRCUIT LOW (CONTINUED)

9. CHECK (F201) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT FOR AN OPEN

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Reinstall the PAB Indicator Run-Start Fuse.

Disconnect the OCM C1 connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
Measure the voltage of the (F201) Fused Ignition Switch Output (Run-Start) Circuit.



Is the voltage above 6.0 volts?

Yes >> Replace the OCM in accordance with the Service Information.
Perform OCS VERIFICATION TEST - VER 1.
Perform ORC VERIFICATION TEST - VER 1 if B212C IGNITION RUN/START INPUT CIRCUIT OPEN was Active in the ORC.

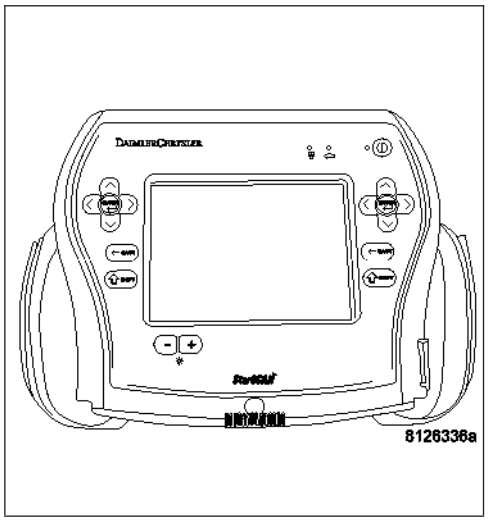
No >> Repair (F201) Fused Ignition Switch Output (Run-Start) circuit for an open.
Perform OCS VERIFICATION TEST - VER 1.
Perform ORC VERIFICATION TEST - VER 1 if B212C IGNITION RUN/START INPUT CIRCUIT OPEN was Active in the ORC.

---

10. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase all DTCs from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
With the scan tool, monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.
Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return, continue the test until the problem area has been isolated.

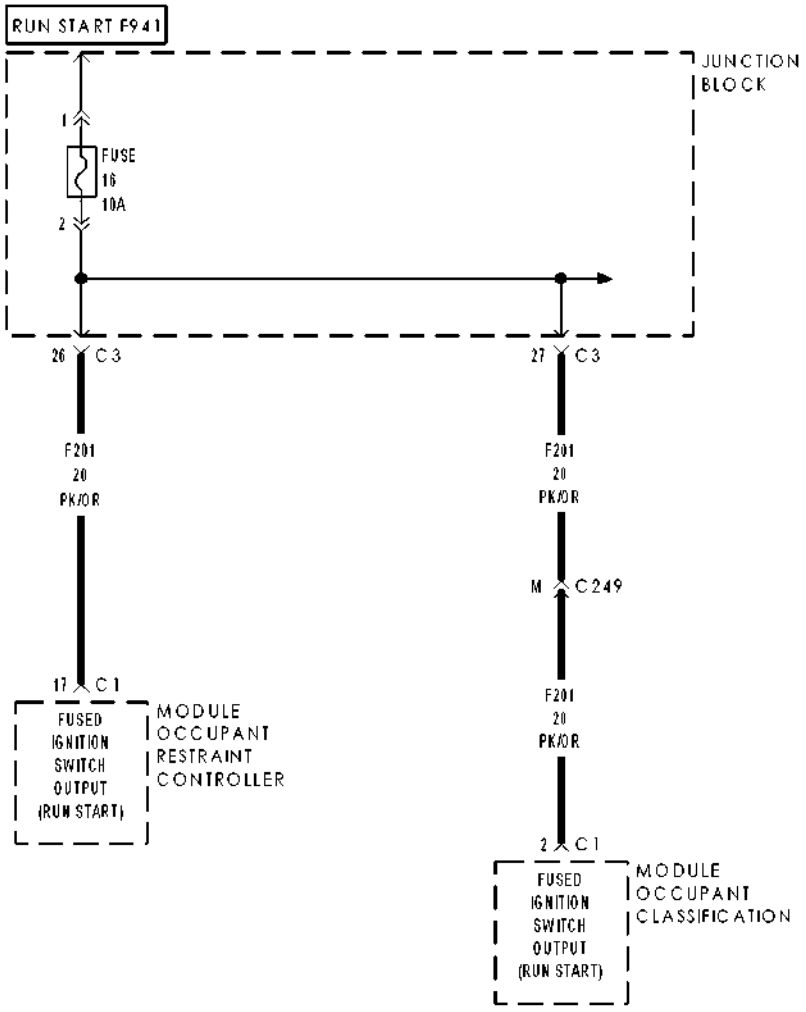
In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

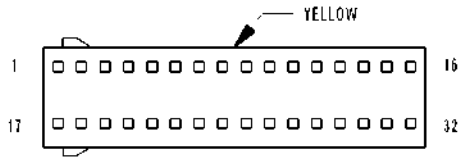
Does the scan tool display any ACTIVE DTCs?

Yes >> Select appropriate symptom from Symptom List.

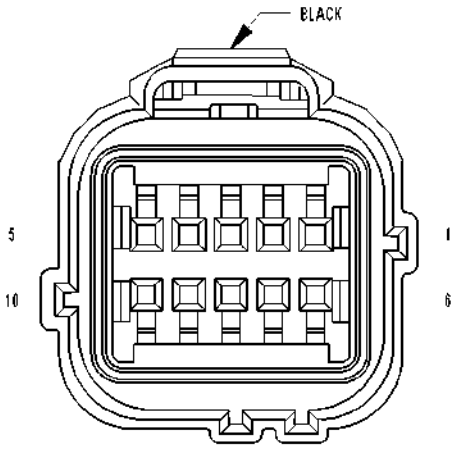
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

B2102-IGNITION RUN/START INPUT CIRCUIT HIGH





MODULE-OCCUPANT RESTRAINT CONTROLLER C1



MODULE-OCCUPANT CLASSIFICATION C1

B2102-IGNITION RUN/START INPUT CIRCUIT HIGH (CONTINUED)

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  While the CAN bus ignition status is RUN or SNA, the module checks the (F201) Fused Ignition Switch Output (Run-Start) circuit voltage input range.
- **Set Condition:**
  If the module detects that the ignition voltage is greater than 24.25 volts ±0.25 volts for 10 seconds.

Possible Causes
VEHICLE CHARGING SYSTEM
VEHICLE WIRING & HARNESS CONNECTORS
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. VERIFY THAT DTC B2102-IGNITION RUN/START INPUT CIRCUIT HIGH IS ACTIVE

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

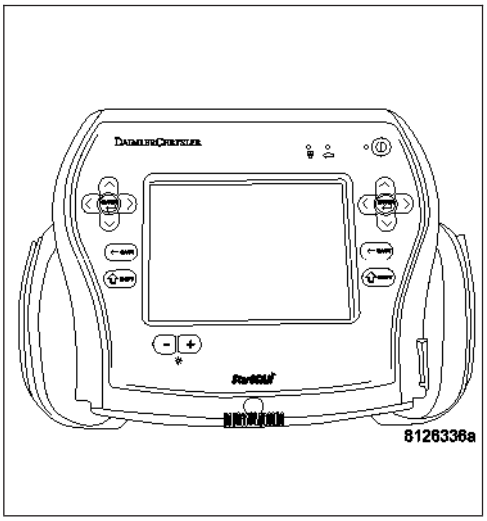
Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display active: B2102-IGNITION RUN/START INPUT CIRCUIT HIGH?

Yes >> Go To 2

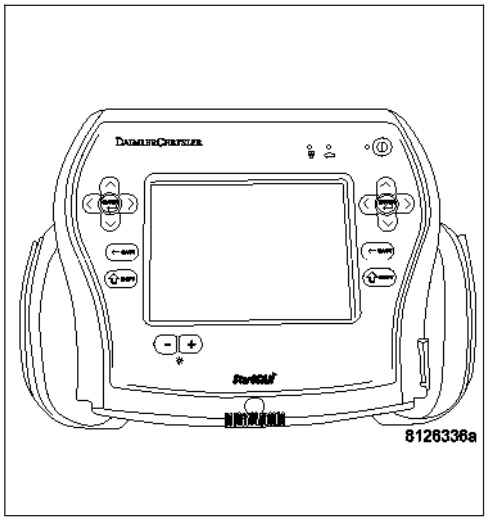
No >> Go To 3



B2102-IGNITION RUN/START INPUT CIRCUIT HIGH (CONTINUED)

2. CHECK FOR CHARGING SYSTEM RELATED DTCs IN THE POWERTRAIN CONTROL MODULE (PCM)

With the scan tool in ECU View, select PCM and check for any Charging System related DTCs.



Does the scan tool display any Charging System related DTCs?

Yes >> Diagnose and repair the DTCs. Refer to (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the ORC in accordance with the Service Information.

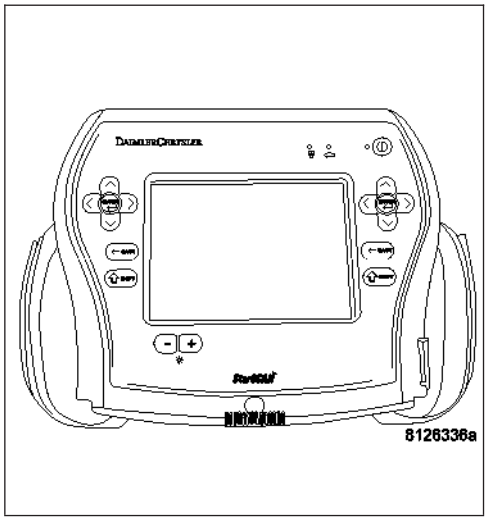
Perform OCS VERIFICATION TEST - VER 1.

---

3. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase all DTCs from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return, continue the test until the problem area has been isolated.

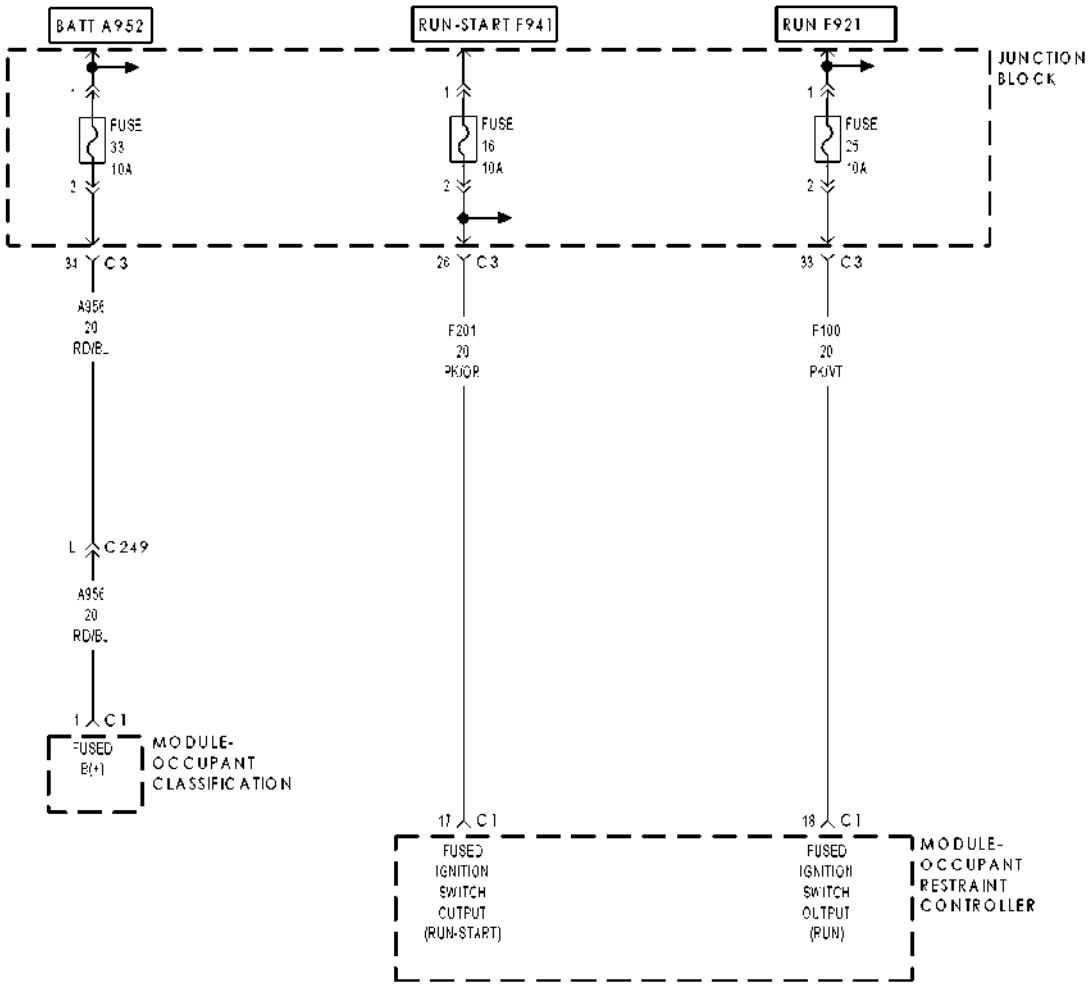
In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

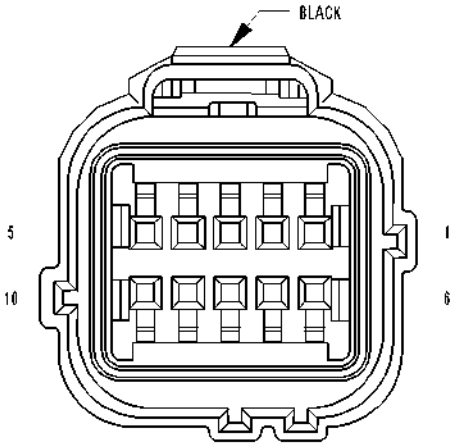
Does the scan tool display any ACTIVE DTCs?

Yes >> Select appropriate symptom from Symptom List.

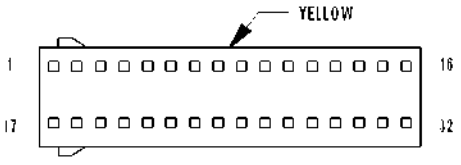
No >> No problem found Erase all codes before returning vehicle to customer.

B210D-BATTERY VOLTAGE LOW





MODULE-OCCUPANT CLASSIFICATION C1



MODULE-OCCUPANT RESTRAINT CONTROLLER C1

812cdcdc

B210D-BATTERY VOLTAGE LOW (CONTINUED)

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  OCM-While the CAN bus ignition status received is RUN or SNA, the module checks the (A956) Fused B+ circuit voltage input range.
- **Set Condition:**
  OCM-If the module detects that the battery voltage is less than or equal to 6.25 volts ±0.25 volts.
- **When Monitored:**
  ORC-While the CAN bus ignition status received is RUN or SNA, the module checks the (F201) Fused Ignition Switch Output (RUN/START) circuit and the (F100) Fused Ignition Switch Output (RUN only) circuit voltage input range.
- **Set Condition:**
  ORC-If the module detects that the battery voltage is less than or equal to 6.25 volts ±0.25 volts on either the F201 or F100 circuits.

Possible Causes
OCM (A956) FUSED B(+) CIRCUIT
ORC (F201) FUSED IGNITION SWITCH OUTPUT (RUN/START) CIRCUIT OPEN
ORC (F100) FUSED IGNITION SWITCH OUTPUT (RUN ONLY) CIRCUIT OPEN
VEHICLE CHARGING SYSTEM
OCCUPANT CLASSIFICATION MODULE
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. CHECK FOR AN ACTIVE DTC

NOTE: Troubleshoot any PCM charging/cranking DTCs before proceeding.

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Restraint Controller (ORC) DTCs.

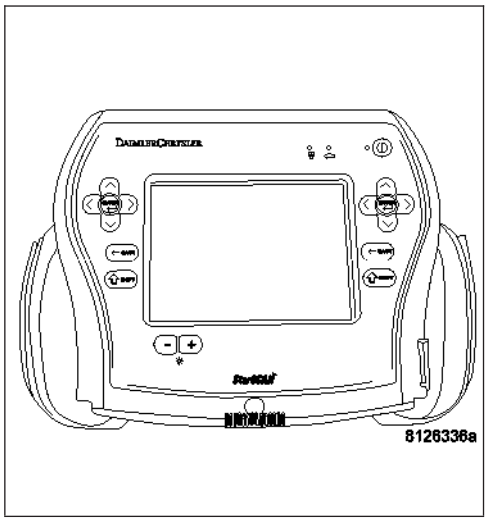
Select module and DTC type.

OCM Active
Go To 2

OCM Stored
Go To 4

ORC Active
Go To 3

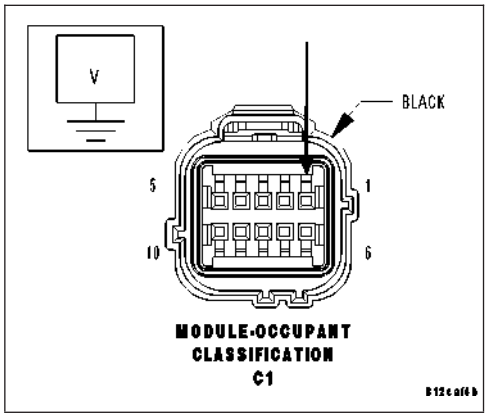
ORC Stored
Go To 4



B210D-BATTERY VOLTAGE LOW (CONTINUED)

2. MEASURE VOLTAGE OF OCM (A956) FUSED B(+) CIRCUIT

Disconnect the OCM C1 connector.
Measure the voltage of the (A956) Fused B+ circuit.



Is the voltage above 6.50 volts?

Yes >> Replace the OCM in accordance with the service information. Perform the Occupant Classification Module System Verification Test.
Perform OCS VERIFICATION TEST - VER 1.

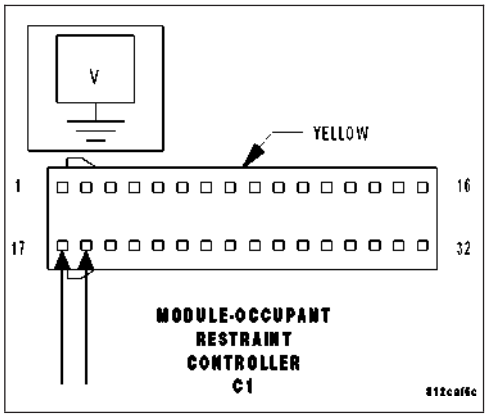
No >> Repair the (A956) FUSED B(+) CIRCUIT for an open.
Perform OCS VERIFICATION TEST - VER 1.

---

3. MEASURE THE VOLTAGE OF ORC (F201) FUSED IGNITION SWITCH OUTPUT (RUN/START) AND (F100) FUSED IGNITION SWITCH OUTPUT (RUN/START) CIRCUITS

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the ORC C1 connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
Measure the voltage of the F201 and F100 circuits.



Is the voltage above 6.50 volts on both circuits?

Yes >> Replace the ORC in accordance with the Service Information.
Perform ORC VERIFICATION TEST - VER 1.

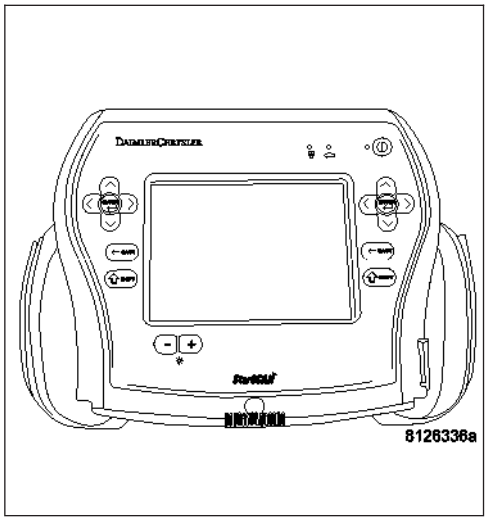
No >> Repair the appropriate circuit for an open.
Perform ORC VERIFICATION TEST - VER 1.

B210D-BATTERY VOLTAGE LOW (CONTINUED)

4. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase all DTCs from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.



WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return, continue the test until the problem area has been isolated.

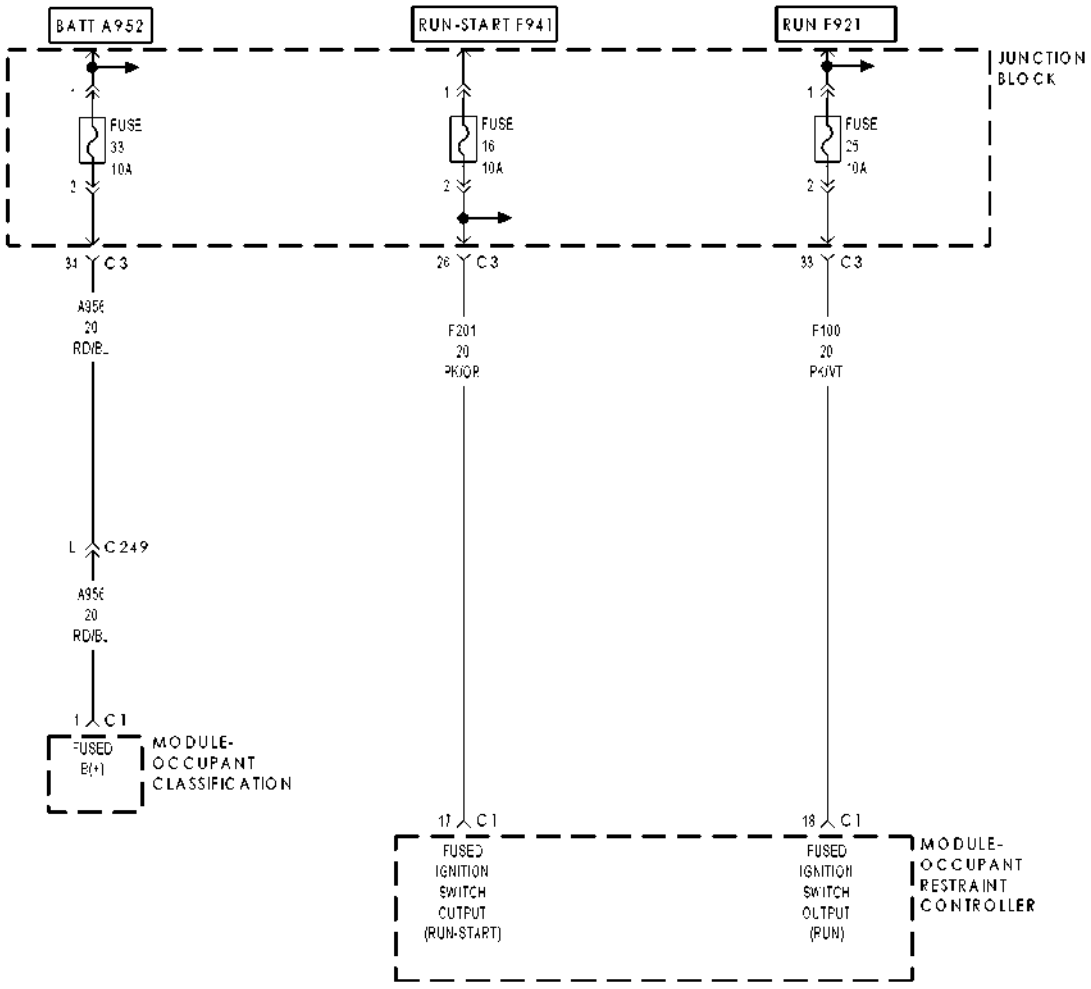
In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

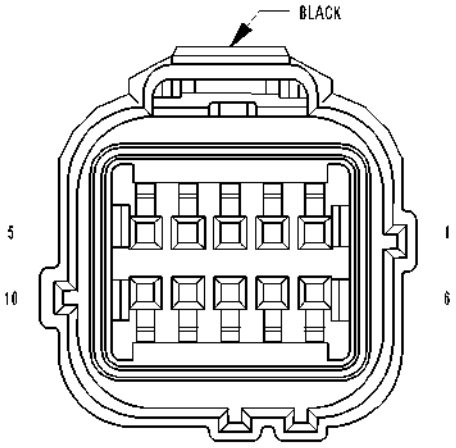
Does the scan tool display any ACTIVE DTCs?

Yes >> Select appropriate symptom from Symptom List.

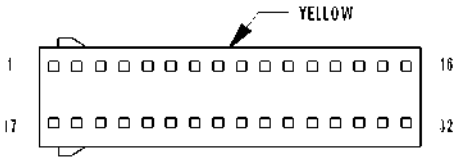
No >> No problem found Erase all codes before returning vehicle to customer.

B210E-BATTERY VOLTAGE HIGH





MODULE-OCCUPANT CLASSIFICATION C1



MODULE-OCCUPANT RESTRAINT CONTROLLER C1

812cadda

B210E-BATTERY VOLTAGE HIGH (CONTINUED)

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  While the CAN bus ignition status received is RUN or SNA, the module checks the (A956) Fused B+ circuit voltage input range.
- **Set Condition:**
  If the module detects that the battery voltage is greater than or equal to 24.25 volts ±0.25 volts for 10 seconds.

Possible Causes
VEHICLE CHARGING SYSTEM
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

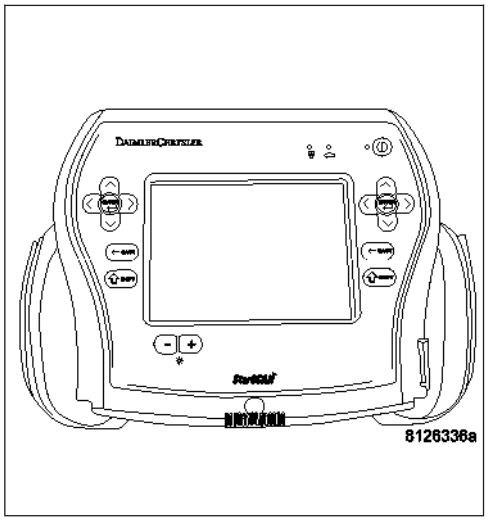
1. CHECK FOR AN ACTIVE DTC

Turn the ignition on, then off, and then on again.
With the scan tool, read OCM DTCs.

Does the scan tool display active: B210E-BATTERY VOLTAGE HIGH?

Yes >> Go To 2

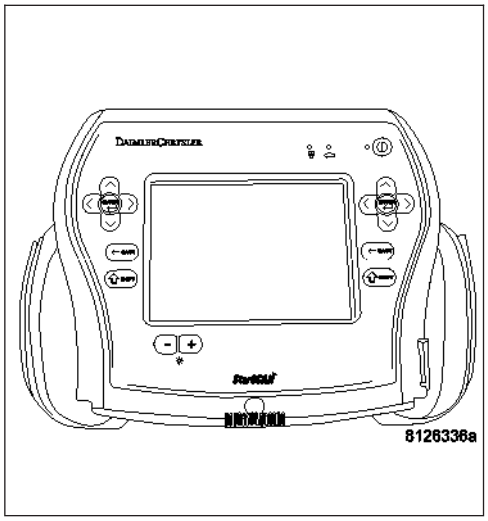
No >> Go To 4



B210E-BATTERY VOLTAGE HIGH (CONTINUED)

2. CHECK THE BATTERY VOLTAGE TO THE OCCUPANT CLASSIFICATION MODULE

With the scan tool in Data Display, read OCM battery voltage.



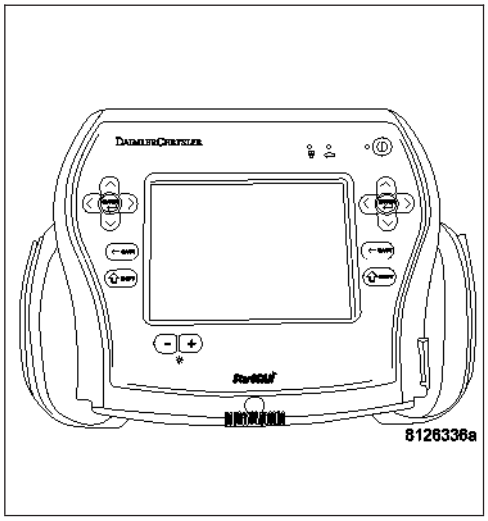
Is the battery voltage greater than 24.25 volts ±0.25 volts?

Yes >> Go To 3

No >> Replace the OCM in accordance with the Service Information.
Perform OCS VERIFICATION TEST - VER 1.

3. CHECK FOR CHARGING SYSTEM RELATED DTCs IN THE POWERTRAIN CONTROL MODULE (PCM)

With the scan tool in ECU View, select PCM and check for any Charging System related DTCs.



Does the scan tool display any Charging System related DTCs?

Yes >> Diagnose and repair the DTCs. Refer to (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

No >> Replace the OCM in accordance with the Service Information.
Perform OCS VERIFICATION TEST - VER 1.

B210E-BATTERY VOLTAGE HIGH (CONTINUED)

4. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase all DTCs from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

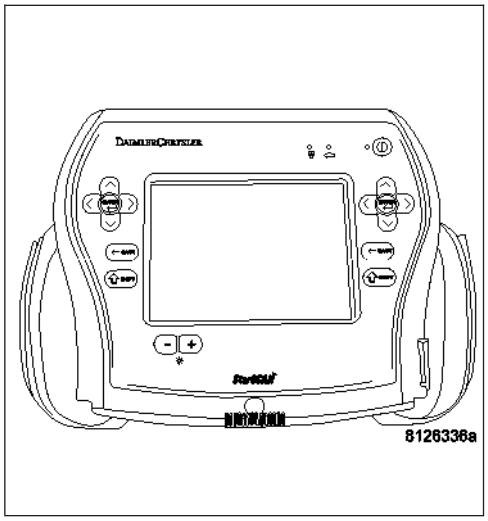
Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor active codes as you work through the following steps.



WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return, continue the test until the problem area has been isolated.

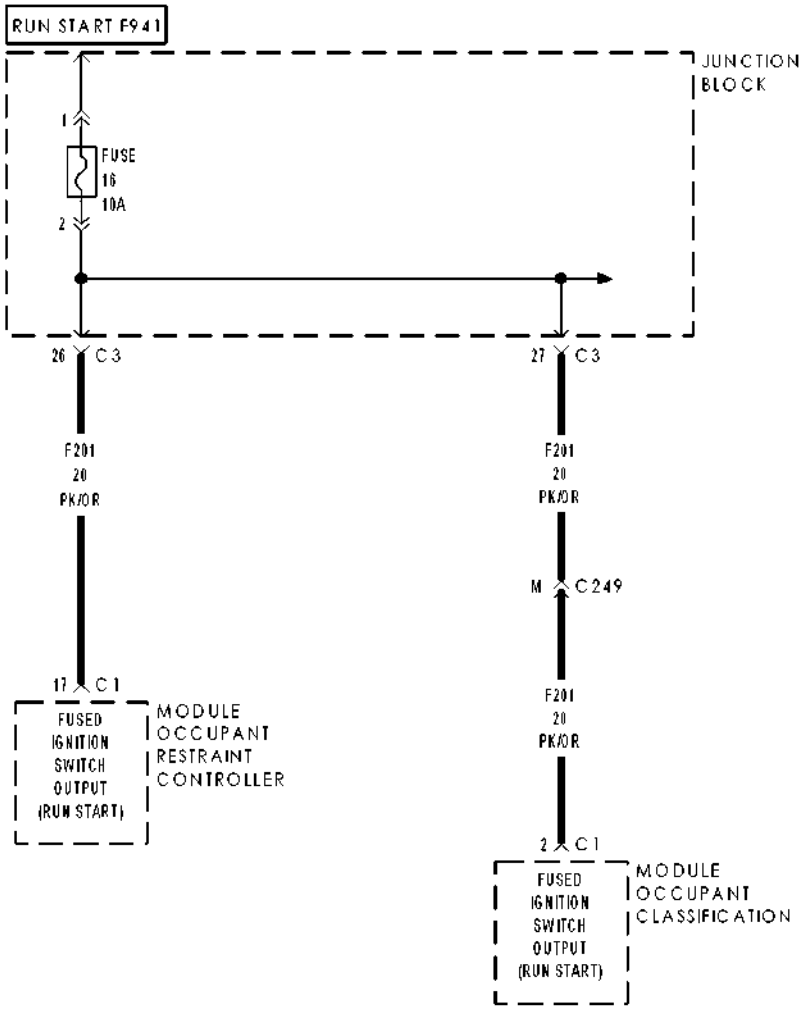
In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

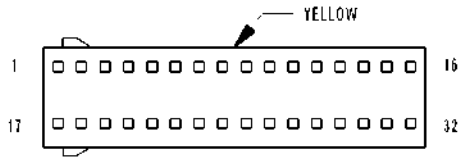
Does the scan tool display any ACTIVE DTCs?

Yes >> Select appropriate symptom from Symptom List.

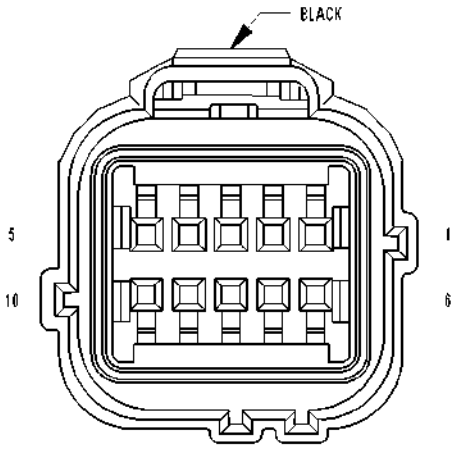
No >> No problem found Erase all codes before returning vehicle to customer.

B212C-IGNITION RUN/START INPUT CIRCUIT OPEN





MODULE-OCCUPANT RESTRAINT CONTROLLER C1



MODULE-OCCUPANT CLASSIFICATION C1

B212C-IGNITION RUN/START INPUT CIRCUIT OPEN (CONTINUED)

For the Airbag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition in the Run-Start position.
- **Set Condition:**
  If voltage on the (F201) Fused Ignition Switch Output (Run-Start) circuit drops below 6.0 volts.

Possible Causes
PASSENGER AIRBAG (PAB) INDICATOR RUN-START FUSE OPEN
(F201) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT SHORTED TO GROUND
(F201) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN
(F941) IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN
PASSENGER AIRBAG ON/OFF INDICATOR LAMP
OCCUPANT CLASSIFICATION MODULE (OCM)
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. VERIFY THAT DTC B212C IGNITION RUN/START INPUT CIRCUIT OPEN IS ACTIVE

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

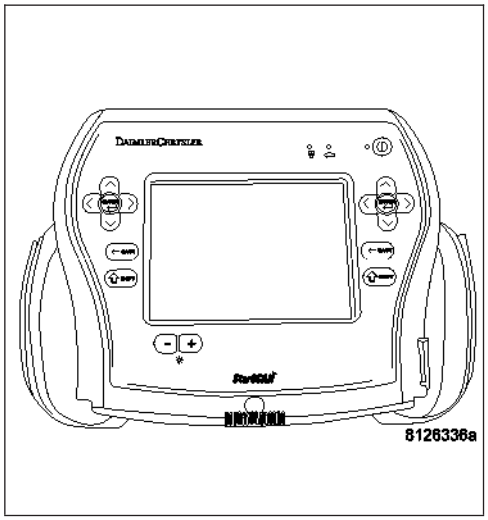
Turn the ignition on.

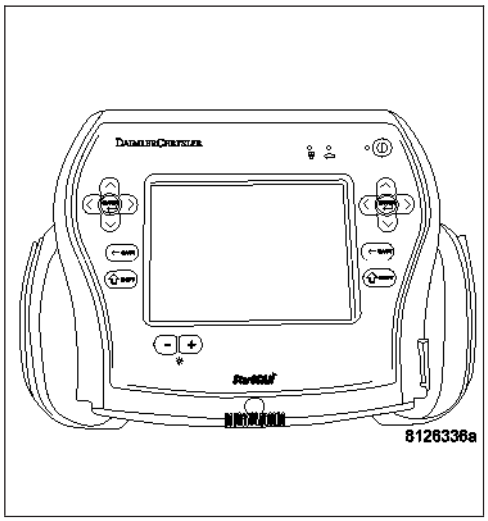
With the scan tool, read Occupant Restraint Controller (ORC) DTCs.

Does the scan tool display active: B212C IGNITION RUN/START INPUT CIRCUIT OPEN?

Yes >> Go To 2

No >> Go To 10

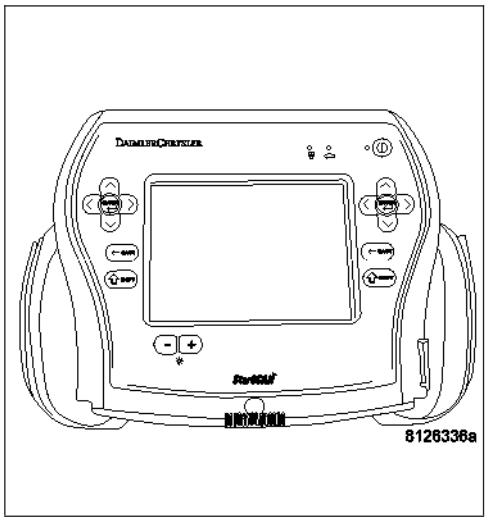




B212C-IGNITION RUN/START INPUT CIRCUIT OPEN (CONTINUED)

2. CHECK FOR ACTIVE DTC B2101 IGNITION RUN/START INPUT CIRCUIT LOW IN OCCUPANT CLASSIFICATION MODULE (OCM)

With the scan tool, read Occupant Classification Module (OCM) DTCs.



Does the scan tool display active: B2101 IGNITION RUN/START INPUT CIRCUIT LOW?

Yes >> Go To 3

No >> Go To 9

---

3. INSPECT PASSENGER AIRBAG (PAB) INDICATOR RUN-START FUSE

Turn the ignition off.

Remove the PAB Indicator Run-Start Fuse from the Junction Block and inspect the fuse.

NOTE: Check connectors - Clean and repair as necessary.

Is the fuse open?

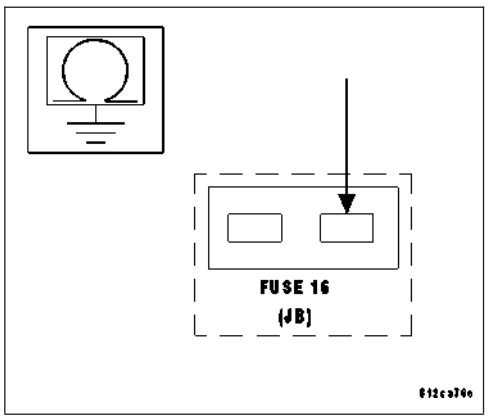
Yes >> Go To 4

No >> Go To 8

---

4. CHECK (F201) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT RESISTANCE

Measure the resistance of the (F201) Fused Ignition Switch Output (Run-Start) circuit between ground and the PAB Indicator Run-Start fuse terminal (output side).



Is the resistance below 100.0 ohms?

Yes >> Go To 5

No >> Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors. Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

Replace PAB Indicator Run-Start Fuse.

Perform ORC VERIFICATION TEST - VER 1.

Perform OCS VERIFICATION TEST - VER 1.

B212C-IGNITION RUN/START INPUT CIRCUIT OPEN (CONTINUED)

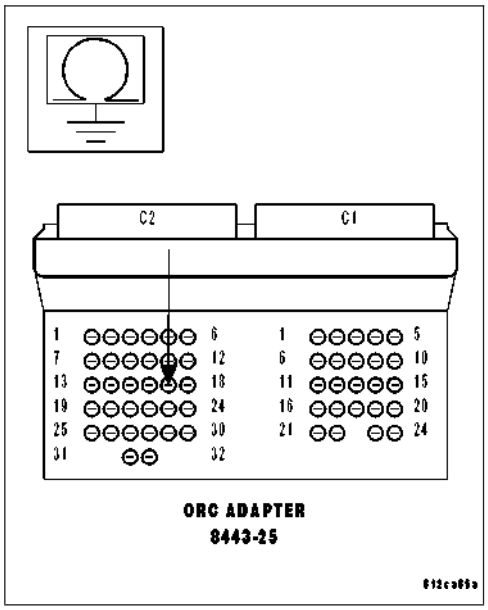
5. CHECK (F201) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT RESISTANCE WITH ORC C1 CONNECTOR DISCONNECTED

WARNING: If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the ORC C1 connector.

NOTE: Check connectors - Clean and repair as necessary.
Connect the appropriate Load Tool ORC Adaptor to the ORC connector.

Measure the resistance of the (F201) Fused Ignition Switch Output (Run-Start) circuit between ground and the PAB Indicator Run-Start fuse terminal (output side).



Is the resistance below 100.0 ohms?

Yes >> Go To 6

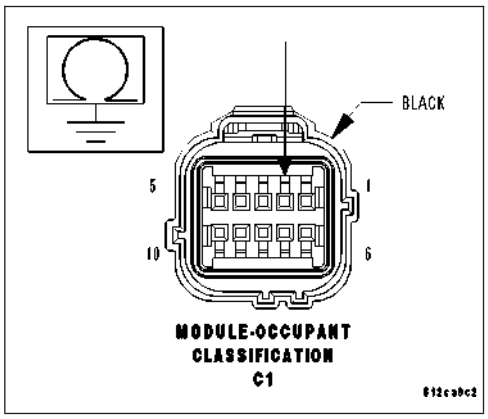
No >> Replace the ORC in accordance with the Service Information.
Replace the PAB Indicator Run-Start Fuse.
Perform ORC VERIFICATION TEST - VER 1.
Perform OCS VERIFICATION TEST - VER 1.

---

6. CHECK (F201) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT RESISTANCE WITH OCM C1 CONNECTOR DISCONNECTED

WARNING: If the Occupant Classification Module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.
Disconnect the OCM C1 connector.

Measure the resistance of the (F201) Fused Ignition Switch Output (Run-Start) circuit between ground and the PAB Indicator Run-Start fuse terminal (output side).



Is the resistance below 100.0 ohms?

Yes >> Go To 7

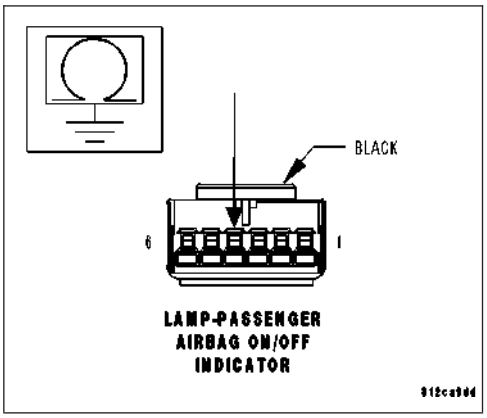
No >> Replace the OCM in accordance with the Service Information.
Replace the PAB Indicator Run-Start Fuse.
Perform ORC VERIFICATION TEST - VER 1.
Perform OCS VERIFICATION TEST - VER 1.

B212C-IGNITION RUN/START INPUT CIRCUIT OPEN (CONTINUED)

7. CHECK (F201) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT RESISTANCE WITH PASSENGER AIRBAG ON/OFF INDICATOR LAMP CONNECTOR DISCONNECTED

Disconnect the Passenger Airbag On/Off Indicator Lamp connector.

Measure the resistance of the (F201) Fused Ignition Switch Output (Run-Start) circuit between ground and the PAB Indicator Run-Start fuse terminal (output side).



Is the resistance below 100.0 ohms?

Yes >> Repair the (F201) Fused Ignition Switch Output (Run-Start) circuit for a short to ground.
Replace the PAB Indicator Run-Start Fuse.
Perform ORC VERIFICATION TEST - VER 1.
Perform OCS VERIFICATION TEST - VER 1.

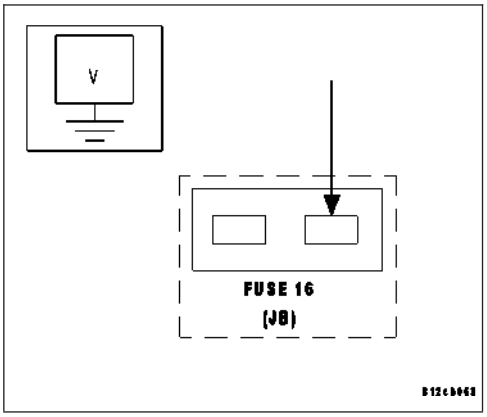
No >> Replace the Passenger Airbag On/Off Indicator Lamp in accordance with the Service Information.
Replace the PAB Indicator Run-Start Fuse.
Perform ORC VERIFICATION TEST - VER 1.
Perform OCS VERIFICATION TEST - VER 1.

---

8. CHECK (F941) IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT FOR AN OPEN

Turn the ignition on.

Measure the voltage of the (F941) Ignition Switch Output (Run-Start) circuit at the PAB Indicator Run-Start fuse terminal (supply side).



Is the voltage above 6.0 volts?

Yes >> Go To 9

No >> Repair the (F941) Ignition Switch Output (Run-Start) circuit for an open.
Perform ORC VERIFICATION TEST - VER 1.
Perform OCS VERIFICATION TEST - VER 1.

B212C-IGNITION RUN/START INPUT CIRCUIT OPEN (CONTINUED)

9. CHECK (F201) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT FOR AN OPEN

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Reinstall the PAB Indicator Run-Start Fuse.
Disconnect the ORC C1 connector.

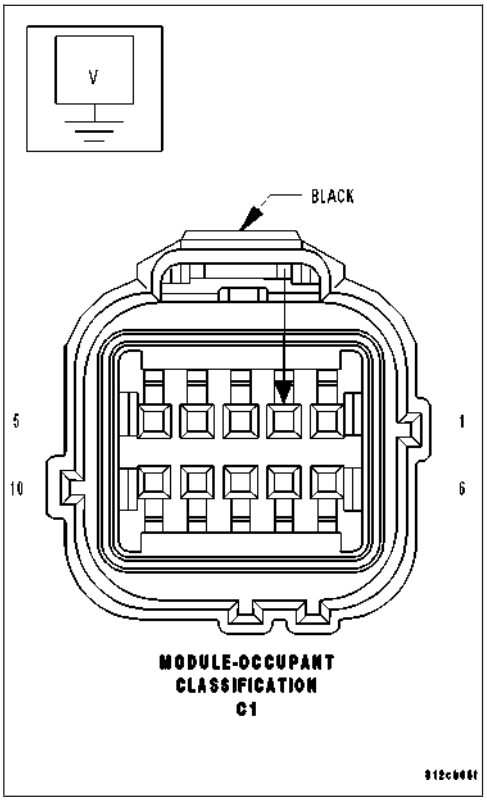
NOTE: Check connectors - Clean and repair as necessary.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
Measure the voltage of the (F201) Fused Ignition Switch Output (Run-Start) Circuit.

Is the voltage above 6.0 volts?

Yes >> Replace the ORC in accordance with the Service Information.
Perform ORC VERIFICATION TEST - VER 1.
Perform OCS VERIFICATION TEST - VER 1 if DTC B2101 IGNITION RUN/START INPUT CIRCUIT LOW was Active in the OCM.

No >> Repair (F201) Fused Ignition Switch Output (Run-Start) circuit for an open.
Perform ORC VERIFICATION TEST - VER 1.
Perform OCS VERIFICATION TEST - VER 1 if DTC B2101 IGNITION RUN/START INPUT CIRCUIT LOW was Active in the OCM.



B212C-IGNITION RUN/START INPUT CIRCUIT OPEN (CONTINUED)

10. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase all DTCs from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

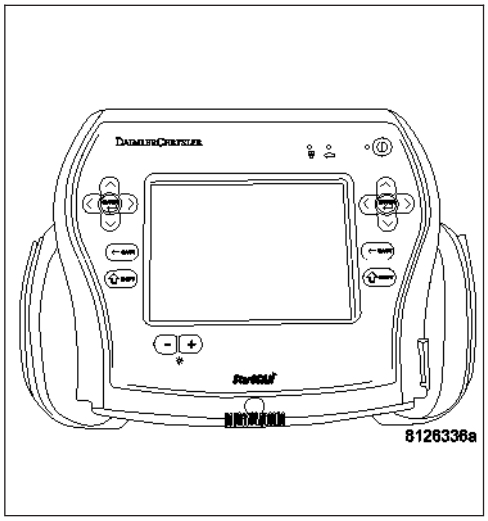
Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor active codes as you work through the following steps.



WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return, continue the test until the problem area has been isolated.

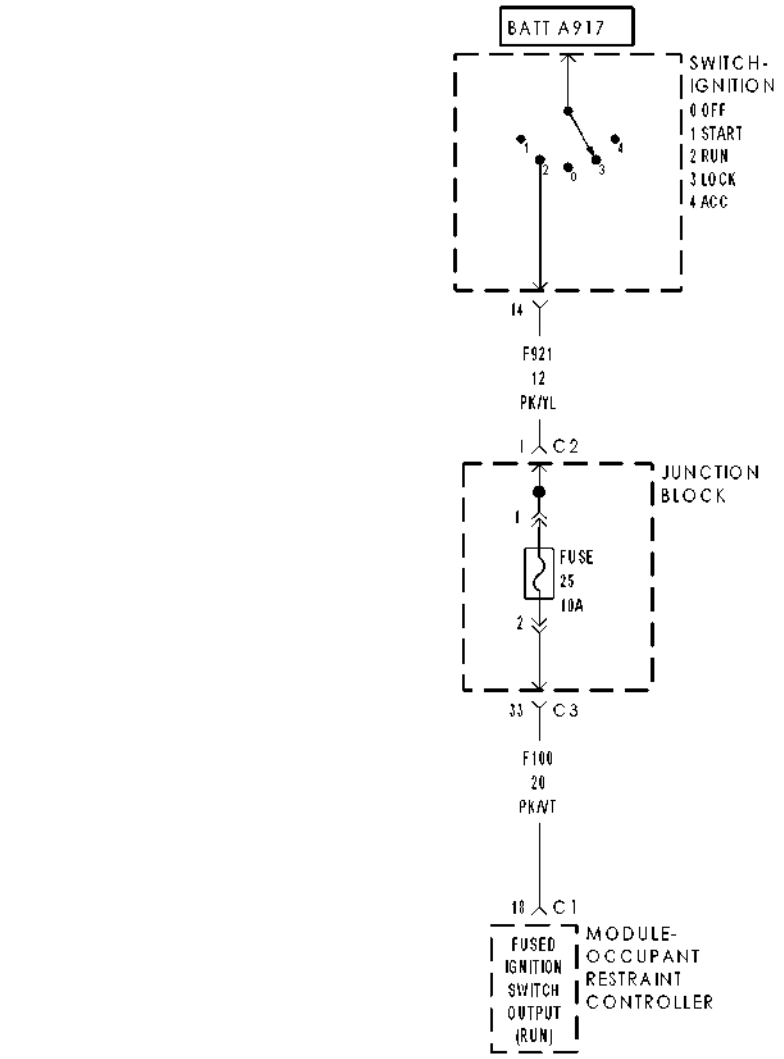
In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

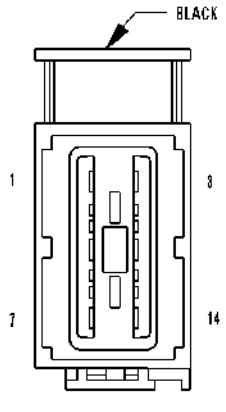
Does the scan tool display any ACTIVE DTCs?

Yes >> Select appropriate symptom from Symptom List.

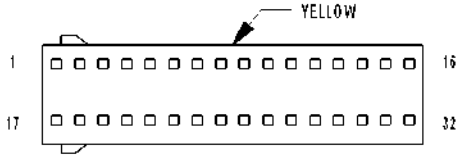
No >> No problem found Erase all codes before returning vehicle to customer.

B212D-IGNITION RUN ONLY INPUT CIRCUIT OPEN





SWITCH-IGNITION



MODULE-OCCUPANT RESTRAINT CONTROLLER C1

81cab10c

B212D-IGNITION RUN ONLY INPUT CIRCUIT OPEN (CONTINUED)

For the Airbag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition in the Run position.
- **Set Condition:**
  If voltage on the (F100) Fused Ignition Switch Output (Run) circuit drops below 6.0 volts.

Possible Causes
AIRBAG RUN CIRCUIT FUSE OPEN
(F100) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT SHORTED TO GROUND
(F100) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT OPEN
(F921) IGNITION SWITCH OUTPUT (RUN) CIRCUIT OPEN
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. VERIFY THAT DTC B212D IGNITION RUN ONLY INPUT CIRCUIT OPEN IS ACTIVE

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

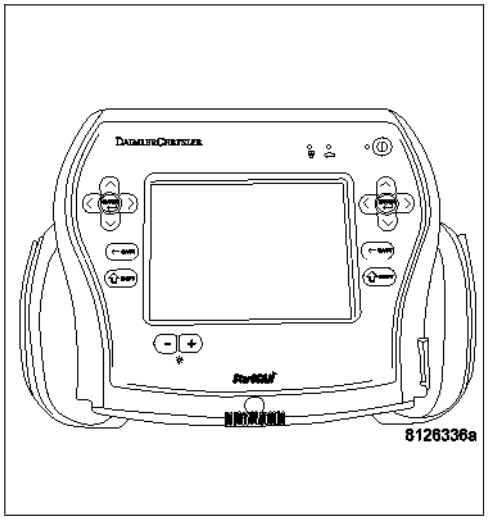
Turn the ignition on.

With the scan tool, read Occupant Restraint Controller (ORC) DTCs.

Does the scan tool display active: B212D IGNITION RUN ONLY INPUT CIRCUIT OPEN?

Yes >> Go To 2

No >> Go To 7



2. INSPECT AIRBAG RUN CIRCUIT FUSE

Turn the ignition off.

Remove the Airbag Run Circuit Fuse from the Junction Block and inspect the fuse.

NOTE: Check connectors - Clean and repair as necessary.

Is the fuse open?

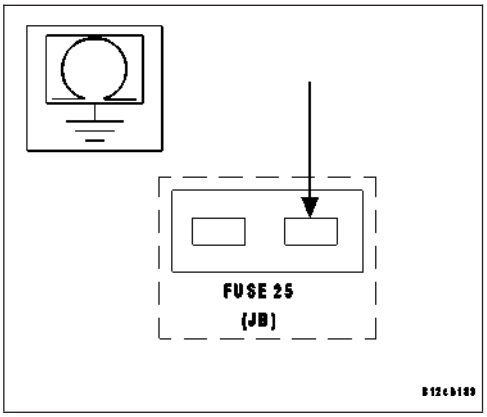
Yes >> Go To 3

No >> Go To 5

B212D-IGNITION RUN ONLY INPUT CIRCUIT OPEN (CONTINUED)

3. CHECK (F100) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT RESISTANCE

Measure the resistance of the (F100) Fused Ignition Switch Output (Run) circuit between ground and the Airbag Run Circuit fuse terminal (output side).



Is the resistance below 100.0 ohms?

Yes >> Go To 4

No >> Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors. Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.
Replace Airbag Run Circuit Fuse.
Perform ORC VERIFICATION TEST - VER 1.

---

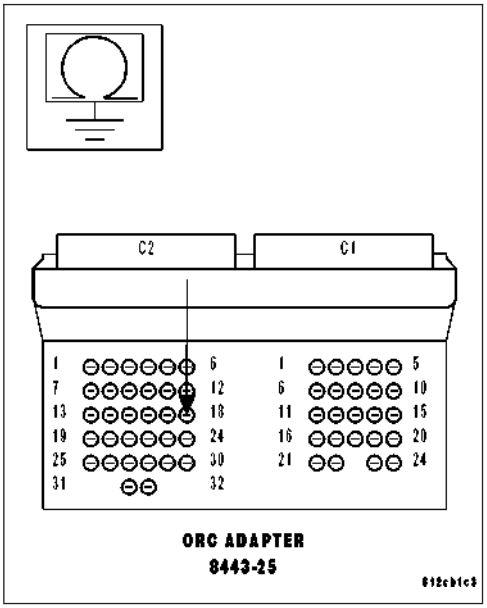
4. CHECK (F100) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT RESISTANCE WITH ORC C1 CONNECTOR DISCONNECTED

WARNING: If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the ORC C1 connector.

NOTE: Check connectors - Clean and repair as necessary.
Connect the appropriate Load Tool ORC Adaptor to the ORC connector.

Measure the resistance of the (F100) Fused Ignition Switch Output (Run) circuit between ground and the Airbag Run Circuit fuse terminal (output side).



Is the resistance below 100.0 ohms?

Yes >> Repair the (F100) Fused Ignition Switch Output (Run) circuit for a short to ground.
Replace the Airbag Run Circuit Fuse.
Perform ORC VERIFICATION TEST - VER 1.

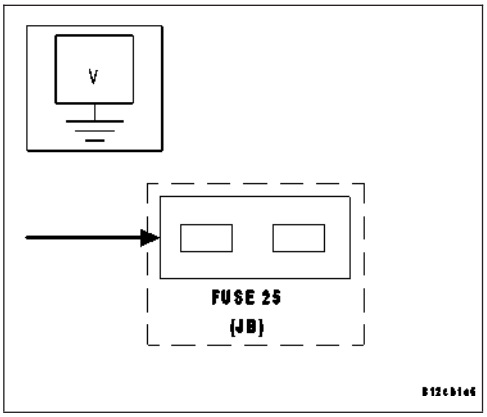
No >> Replace the ORC in accordance with the Service Information.
Replace the Airbag Run Circuit Fuse.
Perform ORC VERIFICATION TEST - VER 1.

B212D-IGNITION RUN ONLY INPUT CIRCUIT OPEN (CONTINUED)

5. CHECK (F921) IGNITION SWITCH OUTPUT (RUN) CIRCUIT FOR AN OPEN

Turn the ignition on.

Measure the voltage of the (F921) Ignition Switch Output (Run) circuit at the Airbag Run Circuit fuse terminal (supply side).



Is the voltage above 6.0 volts?

Yes >> Go To 6

No >> Repair the (F921) Ignition Switch Output (Run) circuit for an open.
Perform ORC VERIFICATION TEST - VER 1.

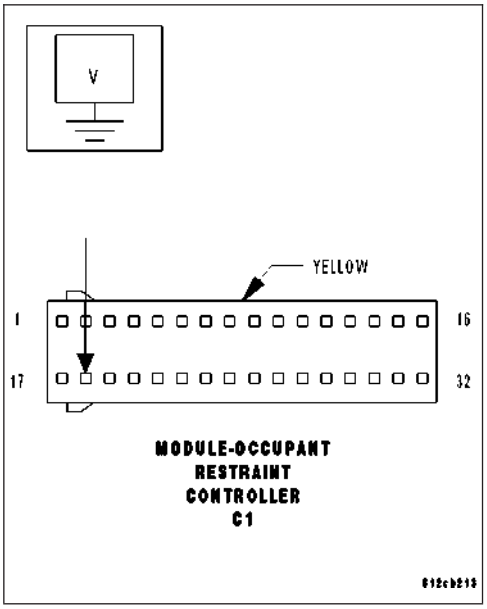
6. CHECK (F100) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT FOR AN OPEN

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Reinstall the Airbag Run Circuit Fuse.

Disconnect the ORC C1 connector.

NOTE: Check connectors - Clean and repair as necessary.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
Measure the voltage of the (F100) Fused Ignition Switch Output (Run) Circuit.



Is the voltage above 6.0 volts?

Yes >> Replace the ORC in accordance with the Service Information.
Perform ORC VERIFICATION TEST - VER 1.

No >> Repair (F100) Fused Ignition Switch Output (Run) circuit for an open.
Perform ORC VERIFICATION TEST - VER 1.

B212D-IGNITION RUN ONLY INPUT CIRCUIT OPEN (CONTINUED)

7. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase all DTCs from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

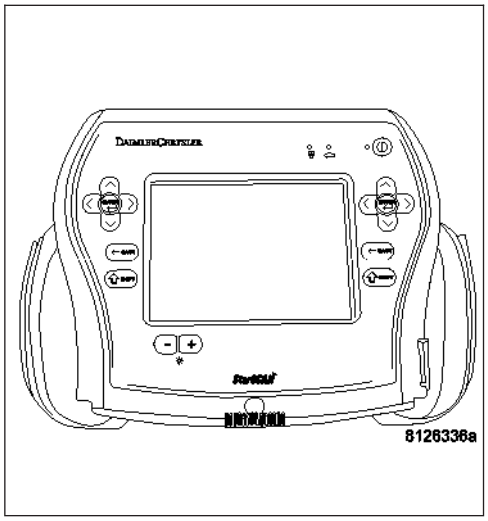
Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor active codes as you work through the following steps.



WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return, continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

Does the scan tool display any ACTIVE DTCs?

Yes >> Select appropriate symptom from Symptom List.

No >> No problem found Erase all codes before returning vehicle to customer.

B2201-CALIBRATION MISMATCH

- **When Monitored:**
  With the Ignition on.
- **Set Condition:**
  This DTC will be set when the VIN stored in the PCM does not match the VIN stored in the Occupant Restraint Controller (ORC). The ORC does not support a stored B2201 DTC.

Possible Causes
INCORRECT PCM
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. VERIFY THAT DTC B2201-CALIBRATION MISMATCH IS ACTIVE

Turn the ignition on.
With the scan tool, read ORC DTCs.

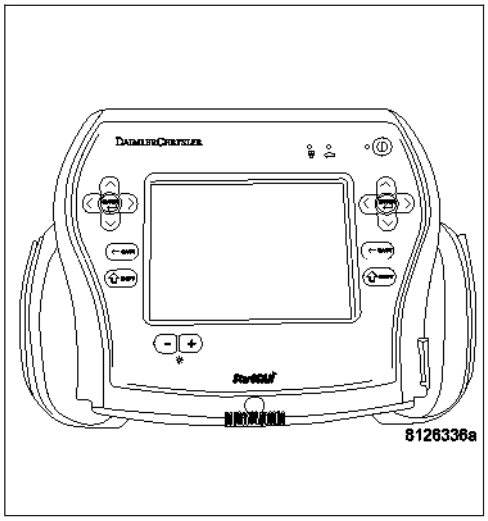
NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

Does the scan tool display active: B2201-CALIBRATION MISMATCH?

Yes >> Go To 2

No >> Test Complete.



2. CHECK VIN IN PCM

With the scan tool compare the VIN that is programmed into the PCM to the VIN stored in the ORC.

Does the VIN programmed into the PCM match the VIN stored in the ORC?

Yes >> Go To 3

No >> Replace and program the Powertrain Control Module in accordance with the service information. Ensure the PCM is replaced with the correct vehicle line PCM.
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

B2201-CALIBRATION MISMATCH (CONTINUED)

3. REPLACE THE OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

View repair.

Repair

Replace the Occupant Restraint Controller in accordance with the service information.
Perform the ORC VERIFICATION TEST-VER 1.

B2205-ORIGINAL VIN MISSING/MISMATCH

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Occupant Restraint Controller will receive and monitor the VIN message from the PCM and record the VIN if different from the last VIN.

Possible Causes
INCORRECT VIN PROGRAMMED IN PCM
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. VERIFY THAT DTC B2205-ORIGINAL VIN MISSING/MISMATCH

Turn the ignition on.

With the scan tool, read ORC DTCs.

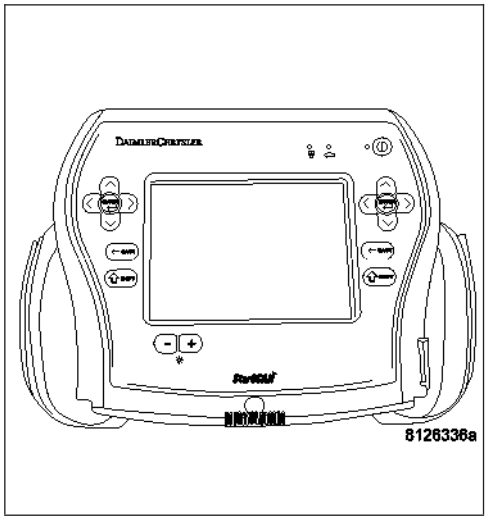
NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

Does the scan tool display active :B2205-ORIGINAL VIN MISSING/MISMATCH?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.



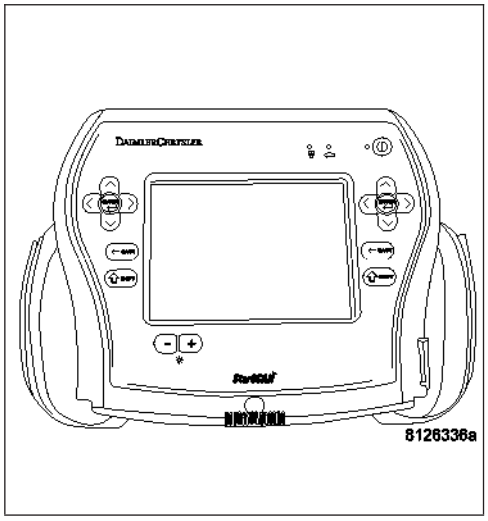
2. CHECK VIN IN PCM

With the scan tool compare the VIN that is programmed into the PCM to the VIN on the vehicle.

Does the VIN programmed into the PCM match the vehicles VIN?

Yes >> Go To 3

No >> Replace the Powertrain Control Module in accordance with Service Information.
Perform the (NGC) POWERTRAIN VERIFICATION TEST-VER. 1



B2205-ORIGINAL VIN MISSING/MISMATCH (CONTINUED)

3. REPLACE THE OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

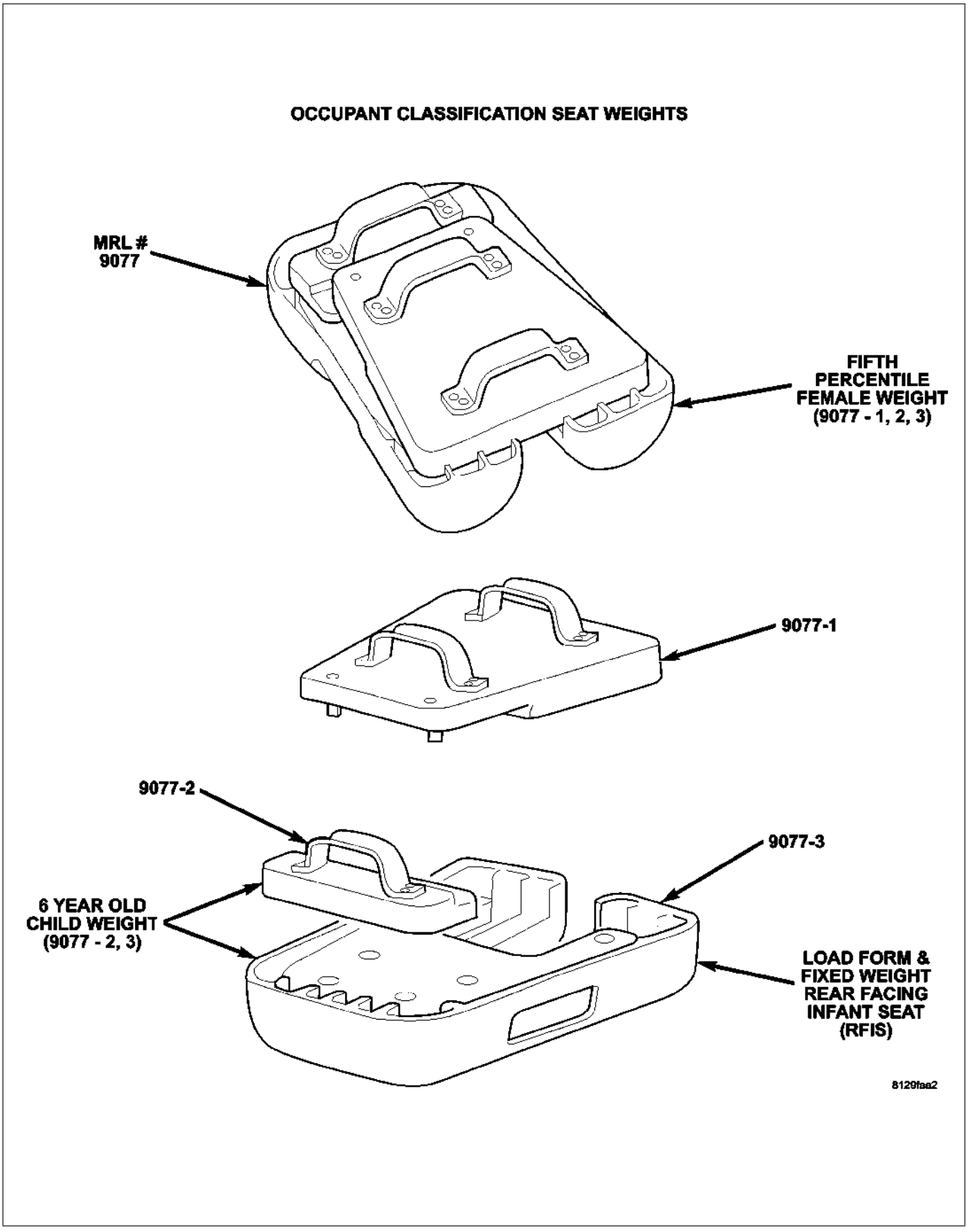
WARNING: If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

View repair.

Repair

Replace the Occupant Restraint Controller in accordance with the service information.
Perform the ORC VERIFICATION TEST-VER 1.

B2206-CURRENT VIN MISSING/MISMATCH



B2206-CURRENT VIN MISSING/MISMATCH (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  During power-up, the ORC/OCM monitors the CAN bus for the VIN message.
- **Set Condition:**
  This DTC will set if the VIN information received from the PCM is different from the stored VIN.

Possible Causes
INCORRECT VIN PROGRAMMED INTO THE PCM
OCCUPANT CLASSIFICATION MODULE (OCM)
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. CHECK FOR ACTIVE DTC

NOTE: Troubleshoot any Ignition, Battery, Seat Weight Sensor, or OCM Internal DTCs BEFORE proceeding

NOTE: Ensure that the battery is fully charged.

With the scan tool, read DTCs.

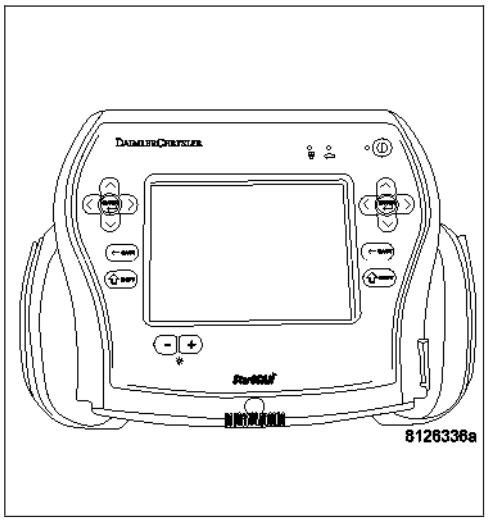
Select the module and DTC type.

OCM-Active
Go To 2

OCM-Stored
Erase code with scan tool, test complete.

ORC-Active
Go To 4

ORC-Stored
Erase code with scan tool, test complete.



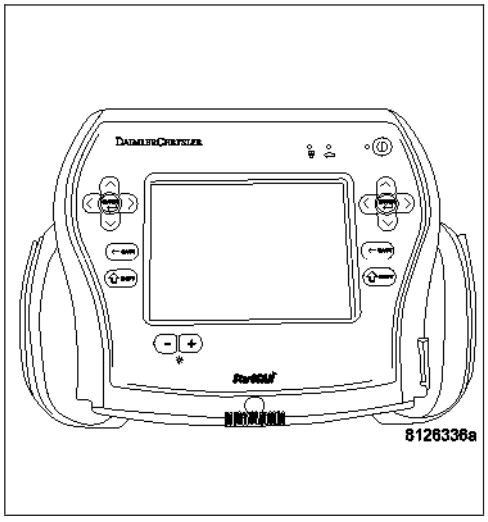
2. CHECK THE VIN STORED IN THE PCM

With the scan tool, compare the VIN that is stored in the PCM to the VIN of the vehicle's VIN plate.

Does the VIN that is stored in the PCM match the vehicle's VIN?

Yes >> Go To 3

No >> Replace and Configure the Powertrain Control Module in accordance with the service information.
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5. Refer to (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

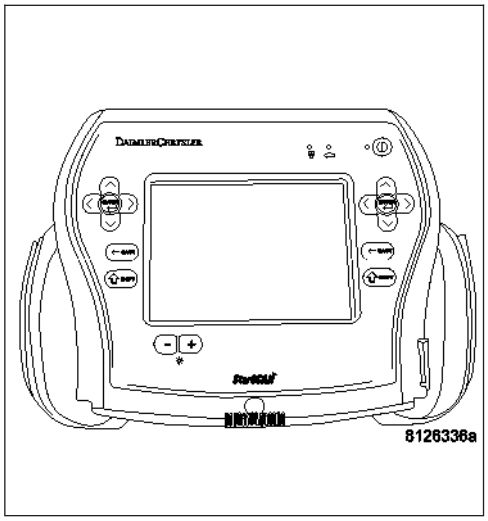


B2206-CURRENT VIN MISSING/MISMATCH (CONTINUED)

3. PERFORM OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST

Verify that the passenger seat is empty.

Verify that all of the Seat Weight Sensor mounting screws are torqued to specification. Refer to 23 - BODY/SEATS.



NOTE: Failure to follow the test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: Verify That All Tests Steps That Led You Here Were Performed As Directed; Verify That The Ignition Is In Run; Wait 30 Seconds After Changing The Seat Weight Before Proceeding To Allow The System To Stabilize; Only Press Scan Tool Buttons When Directed To Do So; & Perform The Occupant Classification Module System Verification Test To Completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, proceed as follows.

With the scan tool, read OCM DTCs.

Does the scan tool display active: B2206-CURRENT VIN MISSING/MISMATCH?

Yes >> Replace the OCM in accordance with the Service Information.
Perform OCS VERIFICATION TEST - VER 1.

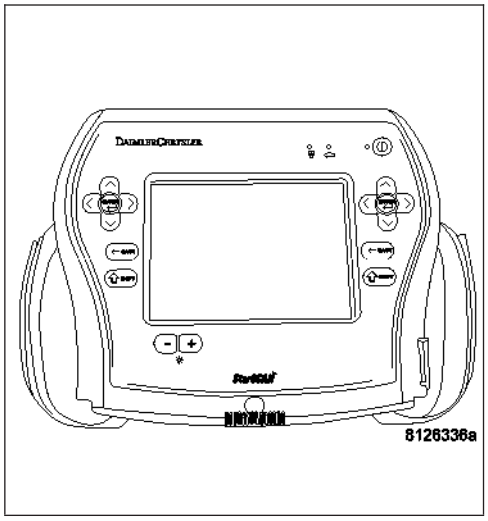
No - But Other DTCs Present
Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No - No Active DTCs Present
Perform OCS VERIFICATION TEST - VER 1.

---

4. CHECK THE VIN STORED IN THE PCM

With the scan tool, compare the VIN that is stored in the PCM to the VIN of the vehicle's VIN plate.



Does the VIN that is stored in the PCM match the vehicle's VIN?

Yes >> Go To 5

No >> Replace and Configure the Powertrain Control Module in accordance with the service information.
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5. Refer to (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

B2206-CURRENT VIN MISSING/MISMATCH (CONTINUED)

5. REPLACE THE OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

View repair.

Repair

Replace the Occupant Restraint Controller in accordance with the service information.
Perform the ORC VERIFICATION TEST-VER 1.

B2207-OCCUPANT RESTRAINT CONTROLLER INTERNAL 1

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. The module's on board diagnostics continuously performs internal circuit tests.
- **Set Condition:**
  This DTC will set if the module identifies an out of range internal circuit.

Possible Causes
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. REPLACE OCCUPANT RESTRAINT CONTROLLER

Turn the ignition on.

With the scan tool, erase and read ORC DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

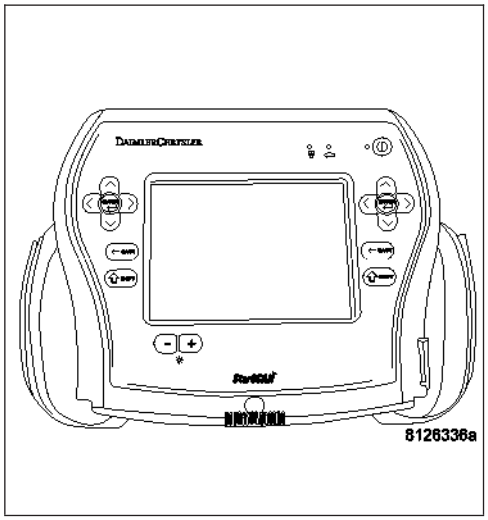
WARNING: If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take proper precautions could result in accidental airbag deployment and personal injury or death.

When this code is set, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with the Service Information.

Perform the ORC VERIFICATION TEST-VER. 1



B2208-OCCUPANT RESTRAINT CONTROLLER INTERNAL 2

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. The module's on board diagnostics continuously performs internal circuit tests.
- **Set Condition:**
  This DTC will set if the module identifies an out of range internal circuit.

Possible Causes
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. REPLACE OCCUPANT RESTRAINT CONTROLLER

Turn the ignition on.

With the scan tool, erase and read ORC DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

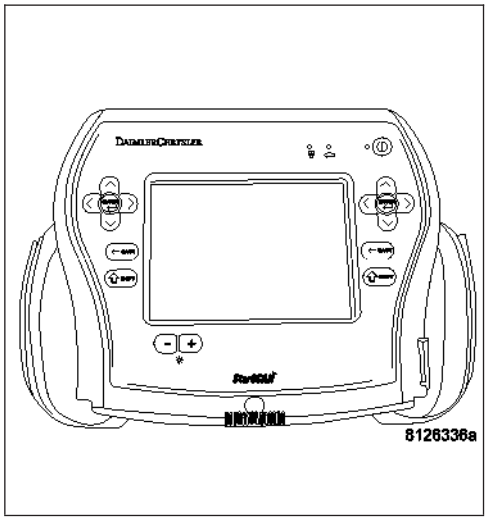
WARNING: If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take proper precautions could result in accidental airbag deployment and personal injury or death.

When this code is set, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with the Service Information.

Perform the ORC VERIFICATION TEST-VER. 1



B2209-OCCUPANT RESTRAINT CONTROLLER INTERNAL 3

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. The module's on board diagnostics continuously performs internal circuit tests.
- **Set Condition:**
  This DTC will set if the module identifies an out of range internal circuit.

Possible Causes
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. REPLACE OCCUPANT RESTRAINT CONTROLLER

Turn the ignition on.

With the scan tool, erase and read ORC DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

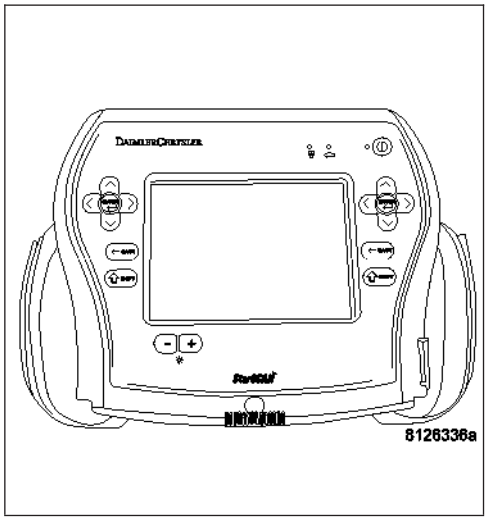
WARNING: If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take proper precautions could result in accidental airbag deployment and personal injury or death.

When this code is set, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with the Service Information.

Perform the ORC VERIFICATION TEST-VER. 1



B220A-OCCUPANT RESTRAINT CONTROLLER INTERNAL 4

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. The module's on board diagnostics continuously performs internal circuit tests.
- **Set Condition:**
  This DTC will set if the module identifies an out of range internal circuit.

Possible Causes
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. REPLACE OCCUPANT RESTRAINT CONTROLLER

Turn the ignition on.

With the scan tool, erase and read ORC DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

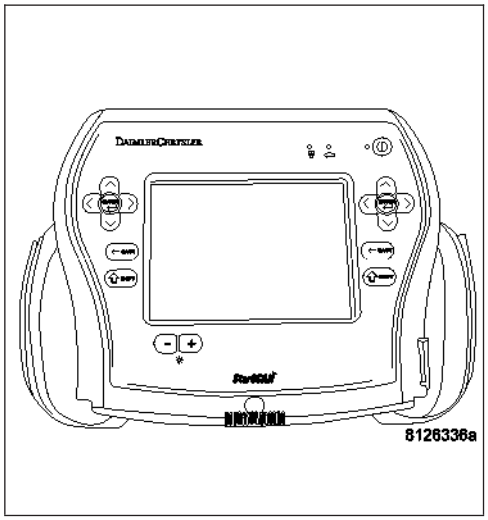
WARNING: If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take proper precautions could result in accidental airbag deployment and personal injury or death.

When this code is set, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with the Service Information.

Perform the ORC VERIFICATION TEST-VER. 1



B220B-OCCUPANT RESTRAINT CONTROLLER FIRING STORED ENERGY

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. The module's on board diagnostics continuously performs internal circuit tests.
- **Set Condition:**
  This DTC will set if the module identifies an out of range internal circuit.

Possible Causes
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. REPLACE OCCUPANT RESTRAINT CONTROLLER

Turn the ignition on.

With the scan tool, erase and read ORC DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

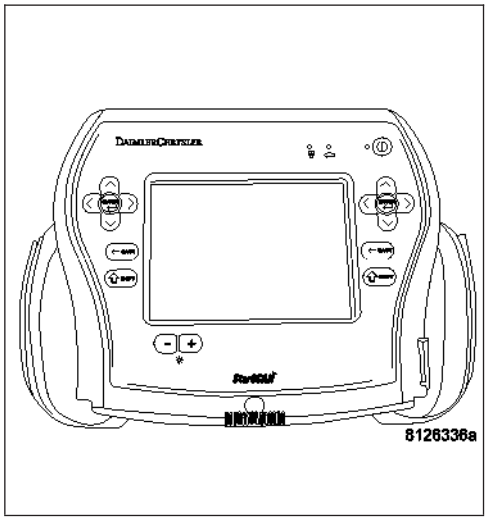
WARNING: If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take proper precautions can result in accidental airbag deployment and personal injury or death.

When this code is set, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with the Service Information.

Perform the ORC VERIFICATION TEST-VER. 1



B220C-OCCUPANT RESTRAINT CONTROLLER ACCELEROMETER 1 INTERNAL

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. The module's on board diagnostics continuously performs internal circuit tests.
- **Set Condition:**
  This DTC will set if the module identifies an out of range internal circuit.

Possible Causes
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. REPLACE OCCUPANT RESTRAINT CONTROLLER

Turn the ignition on.

With the scan tool, erase and read ORC DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

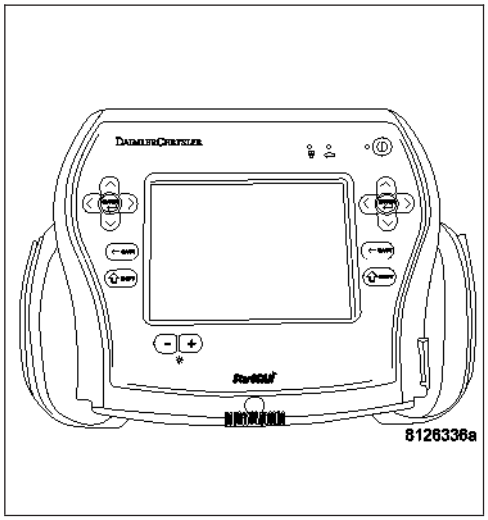
WARNING: If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take proper precautions can result in accidental airbag deployment and personal injury or death.

When this code is set, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with the Service Information.

Perform the ORC VERIFICATION TEST-VER. 1



B220D-OCCUPANT RESTRAINT CONTROLLER ACCELEROMETER 2 INTERNAL

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. The module's on board diagnostics continuously performs internal circuit tests.
- **Set Condition:**
  This DTC will set if the module identifies an out of range internal circuit.

Possible Causes
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. REPLACE OCCUPANT RESTRAINT CONTROLLER

Turn the ignition on.

With the scan tool, erase and read ORC DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take proper precautions can result in accidental airbag deployment and personal injury or death.

When this code is set, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with the Service Information.

Perform the ORC VERIFICATION TEST-VER. 1

B220F-OCCUPANT RESTRAINT CONTROLLER CONTROL DRIVER 1

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. The module's on board diagnostics continuously performs internal circuit tests.
- **Set Condition:**
  This DTC will set if the module identifies an out of range internal circuit.

Possible Causes
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. REPLACE OCCUPANT RESTRAINT CONTROLLER

Turn the ignition on.

With the scan tool, erase and read ORC DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

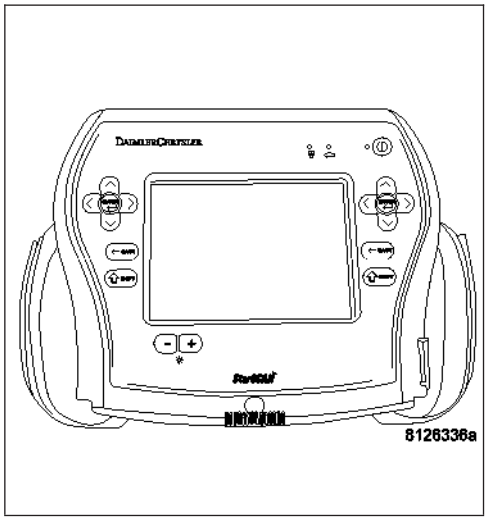
WARNING: If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take proper precautions can result in accidental airbag deployment and personal injury or death.

When this code is set, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with the Service Information.

Perform the ORC VERIFICATION TEST-VER. 1



B2210-OCCUPANT RESTRAINT CONTROLLER CONTROL DRIVER 2

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. The module's on board diagnostics continuously performs internal circuit tests.
- **Set Condition:**
  This DTC will set if the module identifies an out of range internal circuit.

Possible Causes
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. REPLACE OCCUPANT RESTRAINT CONTROLLER

Turn the ignition on.

With the scan tool, erase and read ORC DTCs.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

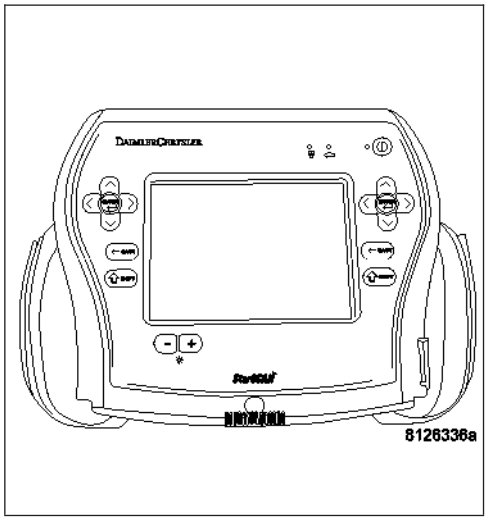
WARNING: If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take proper precautions can result in accidental airbag deployment and personal injury or death.

When this code is set, view repair.

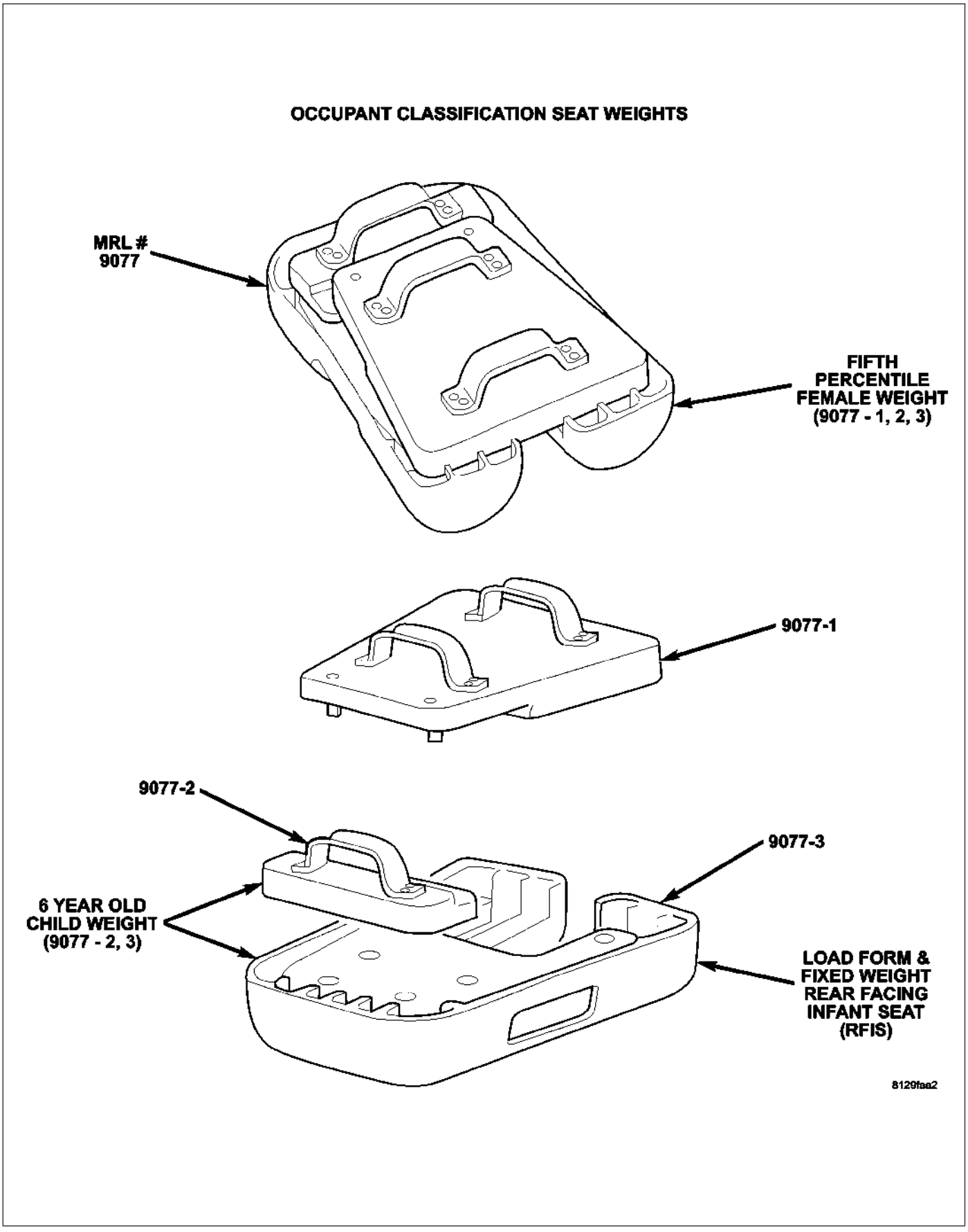
Repair

Replace the Occupant Restraint Controller in accordance with the Service Information.

Perform the ORC VERIFICATION TEST-VER. 1



B2212-OCCUPANT CLASSIFICATION MODULE INTERNAL



OCS SEAT WEIGHTS MRL #9077

B2212-OCCUPANT CLASSIFICATION MODULE INTERNAL (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  While the IGN status is RUN or SNA, while the CAN bus system voltage is between 10 and 16 volts, and during the OCS Verification Test.
- **Set Condition:**
  This DTC will set if the module detects an internal failure.

Possible Causes
OCCUPANT CLASSIFICATION MODULE

Diagnostic Test

1. PERFORM THE OCCUPANT CLASSIFICATION MODULE VERIFICATION TEST

NOTE: Ensure that the passenger seat is empty.

NOTE: Ensure that all seat and strain gauge sensor bolts are properly torqued.

With the scan tool, erase OCM DTCs.

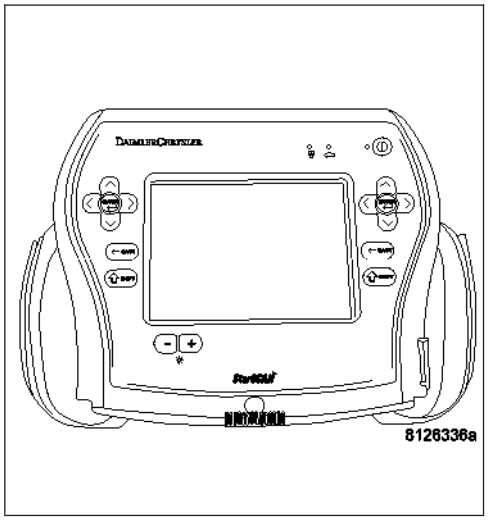
Turn the ignition off, wait 10 seconds and turn ignition on.

With the scan tool, read OCM DTCs.

Did the DTC: B2212-OCCUPANT CLASSIFICATION MODULE INTERNAL reset?

Yes >> Go To 2

No >> Perform the OCS VERIFICATION TEST-VER 1.

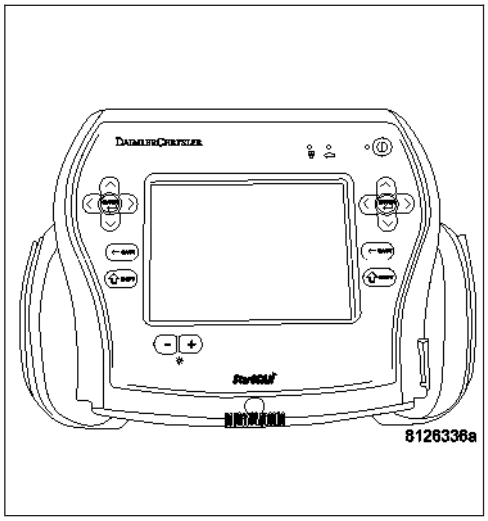


B2212-OCCUPANT CLASSIFICATION MODULE INTERNAL (CONTINUED)

2. PERFORM OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST

Verify that the passenger seat is empty.

Verify that all of the Seat Weight Sensor mounting screws are torqued to specification. Refer to 23 - BODY/SEATS.



NOTE: Failure to follow the test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: Verify That All Tests Steps That Led You Here Were Performed As Directed; Verify That The Ignition Is In Run; Wait 30 Seconds After Changing The Seat Weight Before Proceeding To Allow The System To Stabilize; Only Press Scan Tool Buttons When Directed To Do So; & Perform The Occupant Classification Module System Verification Test To Completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, proceed as follows.

With the scan tool, read OCM DTCs.

Does the scan tool display any active DTCs?

Yes - B2212 is ACTIVE

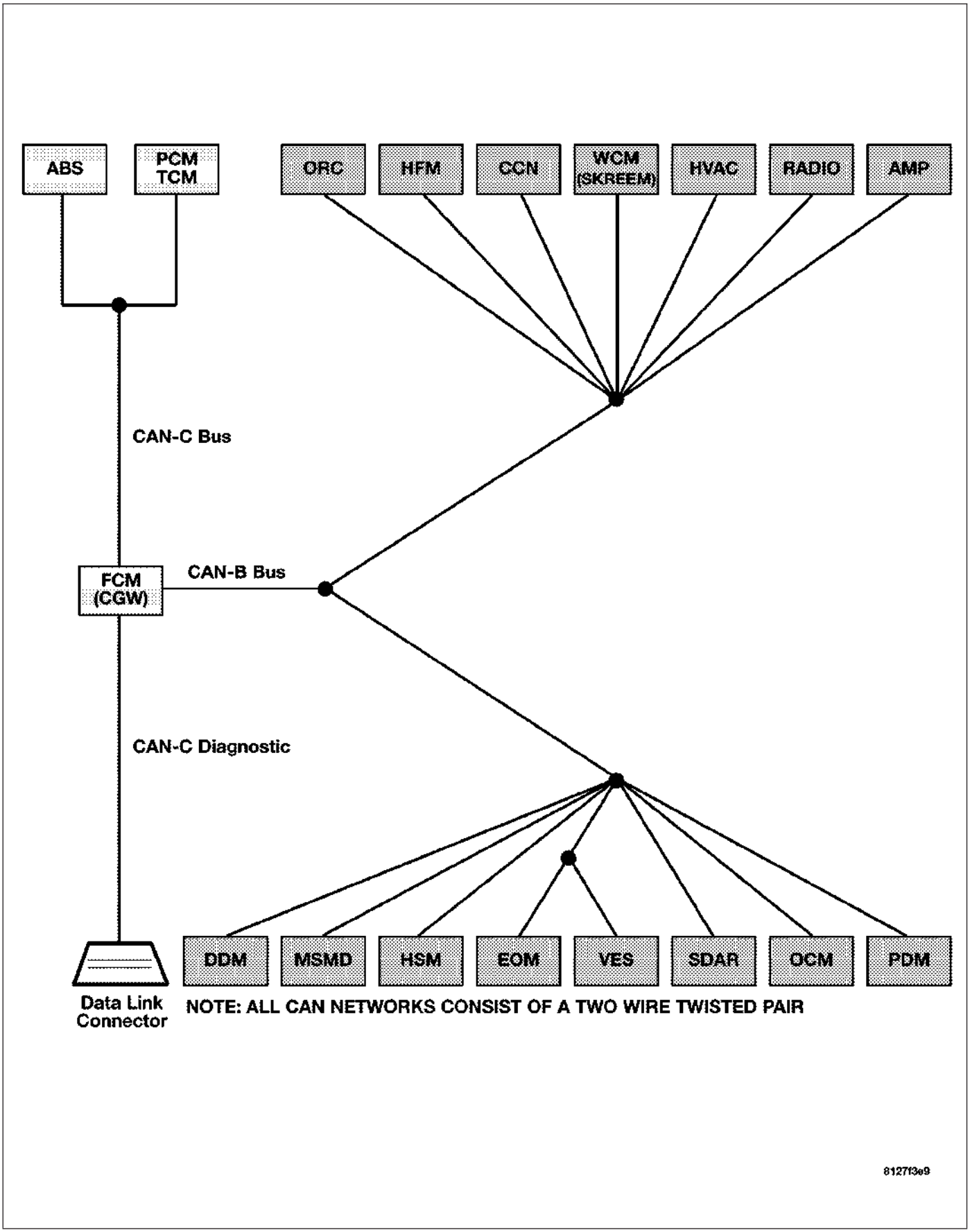
Replace the Occupant Classification Module in accordance with the service information.

Yes - other DTCs ACTIVE

Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

No >> Perform OCS VERIFICATION TEST - VER 1.

B223B-VEHICLE CONFIGURATION MISMATCH



B223B-VEHICLE CONFIGURATION MISMATCH (CONTINUED)

For the Airbag circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Front Control Module sends a message to the Occupant Restraint Controller (ORC) that the vehicle is not equipped with an Occupant Classification Module (OCM) but the ORC is receiving OCM messages over the Can B bus.

Possible Causes
INCORRECT PCM
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. VERIFY THAT DTC B223B-VEHICLE CONFIGURATION MISMATCH IS ACTIVE

Turn the ignition on.

With the scan tool, read ORC DTCs.

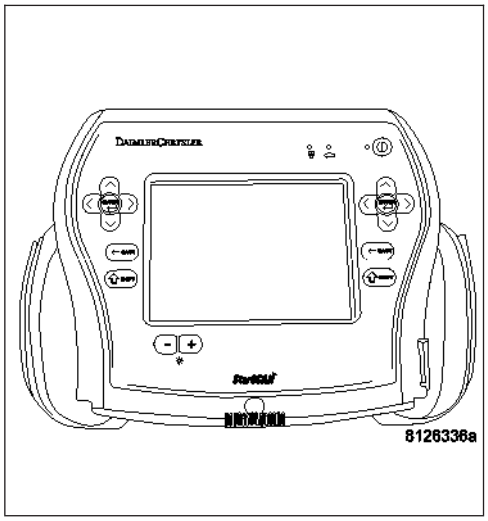
NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

Does the scan tool display active: B223B-VEHICLE CONFIGURATION MISMATCH?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Perform the ORC VERIFICATION TEST-VER. 1



B223B-VEHICLE CONFIGURATION MISMATCH (CONTINUED)

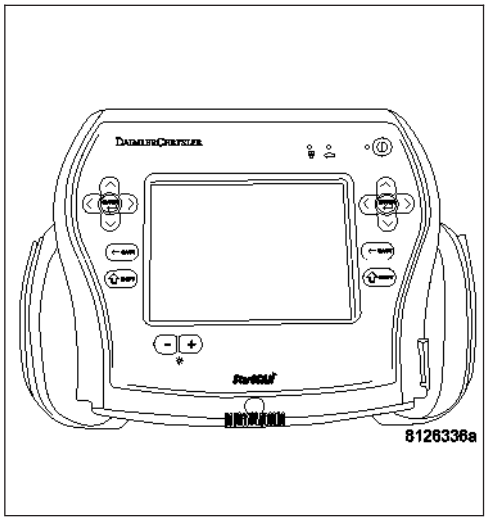
2. COMPARE STORED VINS IN THE PCM AND ORC

With the scan tool, read and record the VIN that is stored in the PCM.
With the scan tool, read and record the VIN that is stored in the ORC.

Do the VINs stored in the PCM and ORC match?

Yes >> Go To 3

No >> Replace and program the Powertrain Control Module in accordance with the Service Information. Ensure the PCM is replaced with the correct VIN.



3. REPLACE THE OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

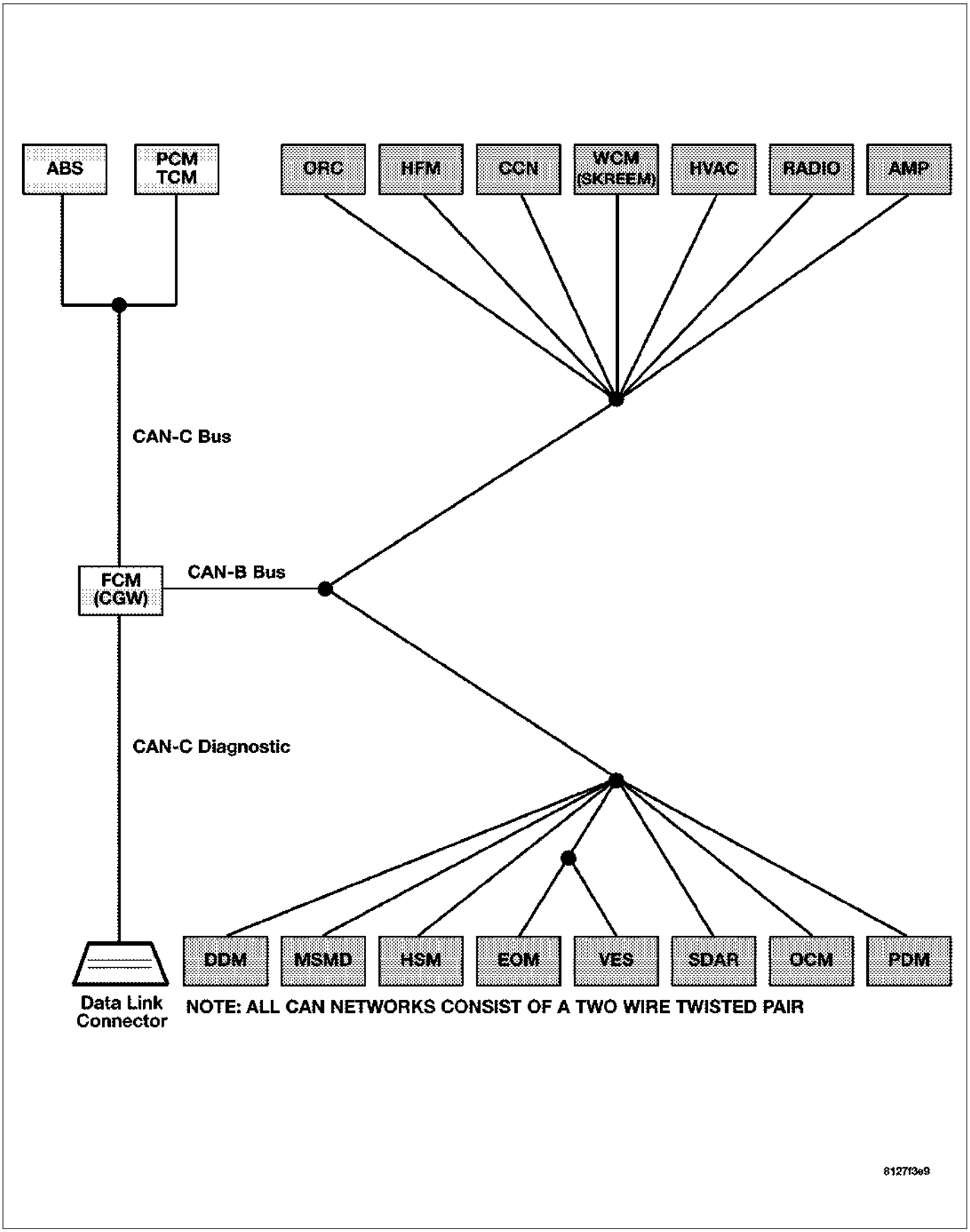
WARNING: If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

View repair.

Repair

Replace the Occupant Restraint Controller in accordance with the service information.
Perform the ORC VERIFICATION TEST-VER 1.

B223D-OCCUPANT CLASSIFICATION MODULE DTC PRESENT



B223D-OCCUPANT CLASSIFICATION MODULE DTC PRESENT (CONTINUED)

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  This DTC will set if the ORC receives a bus message with the active OCM DTC Present bit set.

Possible Causes
ACTIVE DTC IN OCCUPANT CLASSIFICATION MODULE
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

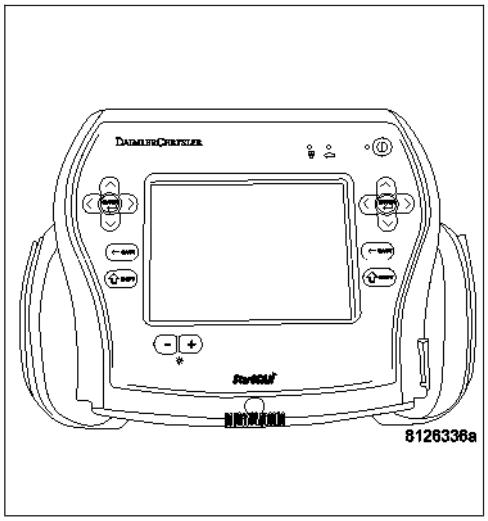
1. ACTIVE OR STORED DTC

With the scan tool, read the OCCUPANT RESTRAINT CONTROLLER active DTCs.

Is the B223D-OCCUPANT CLASSIFICATION MODULE DTC active?

Yes >> Go To 2

No >> With the scan tool, perform the ORC VERIFICATION TEST VER-1



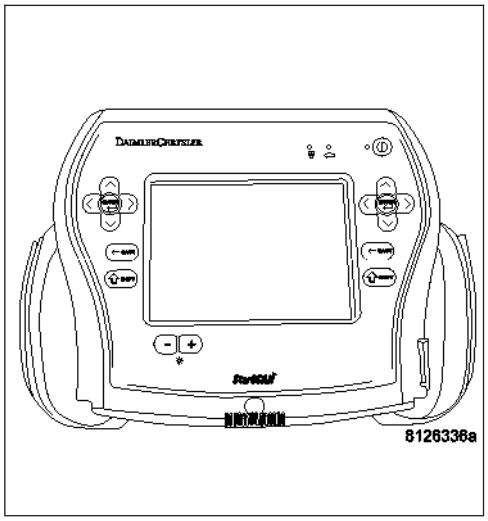
2. ACTIVE DTC IN OCCUPANT CLASSIFICATION MODULE

With the scan tool, read the OCCUPANT CLASSIFICATION MODULE active DTCs.

Are there any active DTC present?

Yes >> Refer to the symptom list for problems related to the OCCUPANT CLASSIFICATION MODULE (OCM).

No >> Go To 3



B223D-OCCUPANT CLASSIFICATION MODULE DTC PRESENT (CONTINUED)

3. REPLACE THE OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

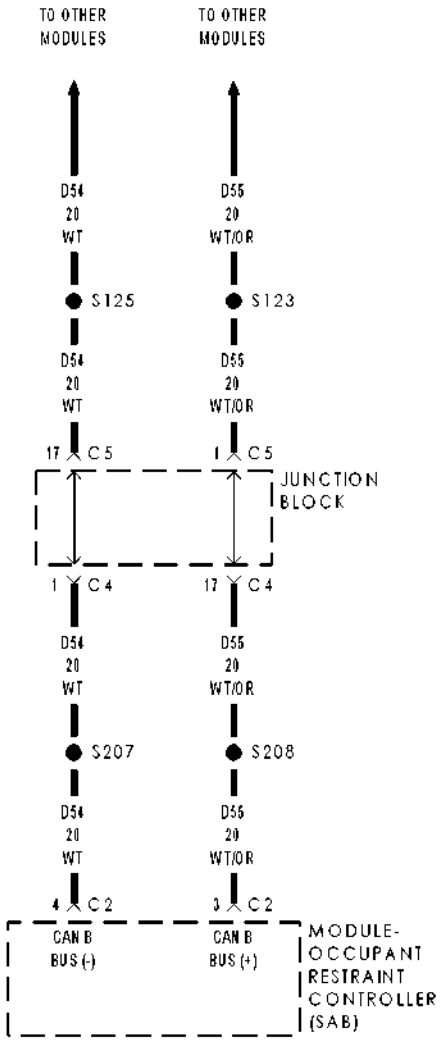
If there are no possible causes remaining, view repair.

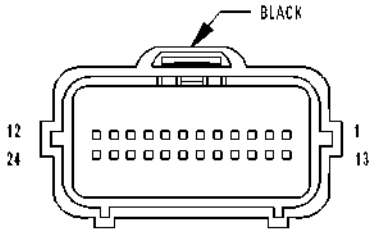
Repair

Replace the Occupant Restraint Controller in accordance with Service Instructions.

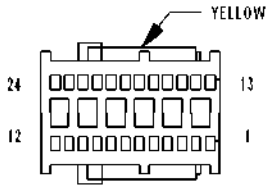
Perform the ORC VERIFICATION TEST - VER 1.

U0019–CAN B BUS





MODULE-FRONT CONTROL C1



MODULE-OCCUPANT RESTRAINT CONTROLLER C2 (SAB)

8l2cc009

U0019–CAN B BUS (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  Whenever the CAN B Bus (+) or CAN B Bus (-) circuit is open, shorted to voltage, or shorted to ground.

Possible Causes
ACTIVE U0019 CAN B BUS DTC IN FRONT CONTROL MODULE
(D55) CAN B BUS (+) CIRCUIT OPEN
(D54) CAN B BUS (-) CIRCUIT OPEN
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. VERIFY DTC U0019–CAN B BUS IS ACTIVE

Turn the ignition on.

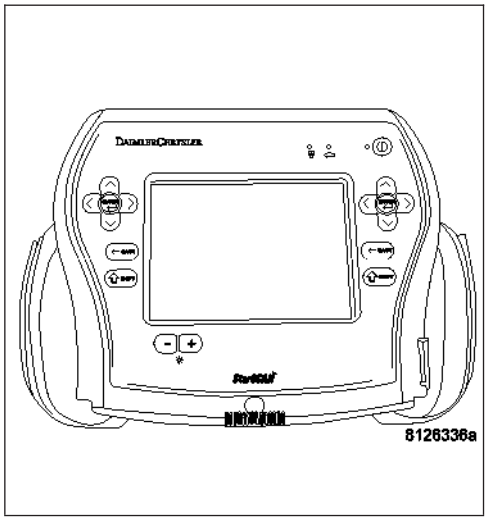
With the scan tool, read Occupant Restraint Controller (ORC) DTCs.

Does the scan tool display active: U0019–CAN B BUS?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also, inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.

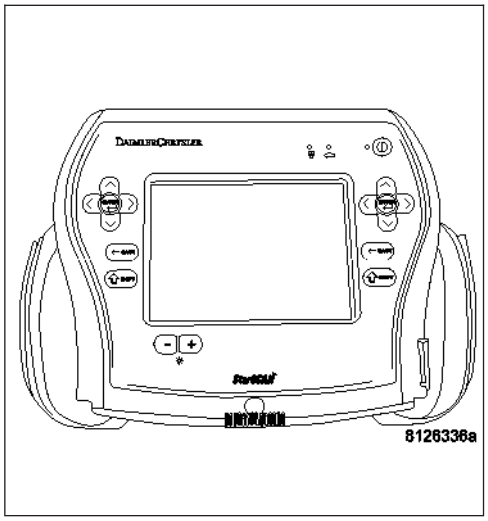
Perform ORC VERIFICATION TEST – VER 1.



U0019–CAN B BUS (CONTINUED)

2. CHECK FOR ACTIVE CAN B BUS RELATED DTCS IN THE FRONT CONTROL MODULE (FCM)

With the scan tool, read Front Control Module (FCM) DTCs



Does the scan tool display any active CAN B BUS related DTCs?

Yes >> Diagnose and repair the DTC(s). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)

No >> Go To 3

3. CHECK (D55) CAN B BUS (+) CIRCUIT FOR AN OPEN

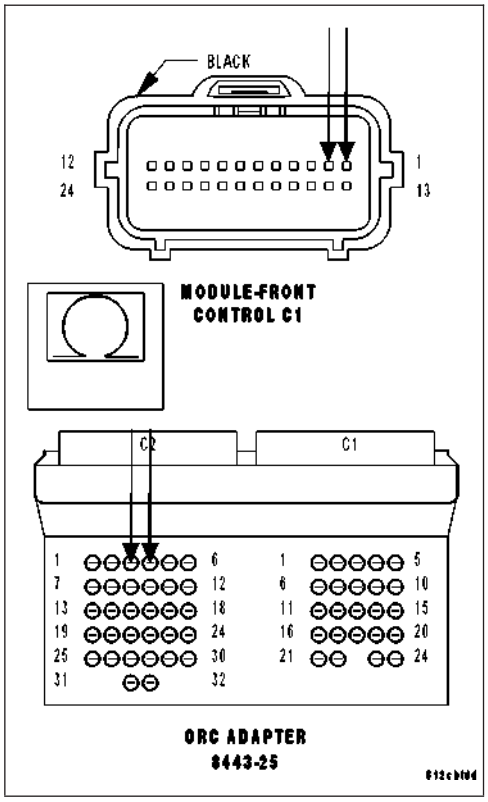
Turn the ignition off.

Disconnect the negative battery cable.

Disconnect the ORC C2 connector.

Disconnect the Front Control Module (FCM) C1 connector.

Measure the resistance of the (D55) CAN B Bus (+) circuit between the Front Control Module C1 connector and the ORC C2 connector.



Is the resistance below 2.0 ohms?

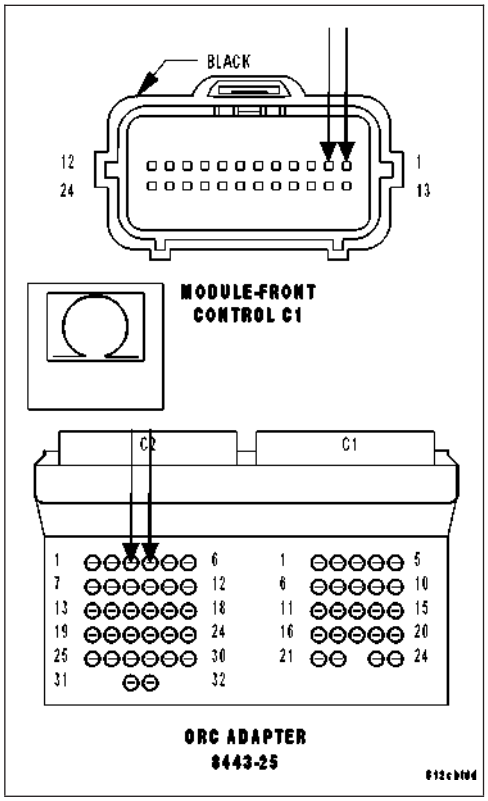
Yes >> Go To 4

No >> Repair the (D55) CAN B Bus (+) circuit for an open. Perform ORC VERIFICATION TEST - VER 1.

U0019–CAN B BUS (CONTINUED)

4. CHECK (D54) CAN B BUS (–) CIRCUIT FOR AN OPEN

Measure the resistance of the (D54) CAN B Bus (–) circuit between the Front Control Module C1 connector and the ORC C2 connector.

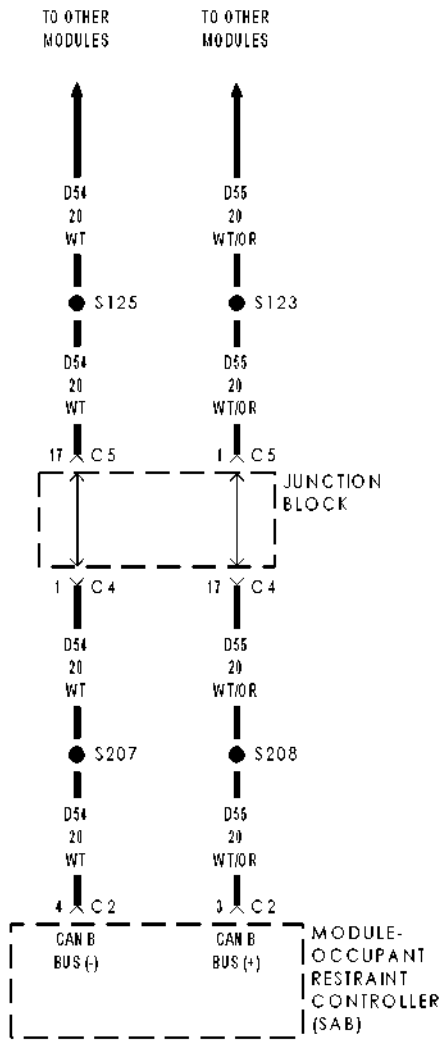


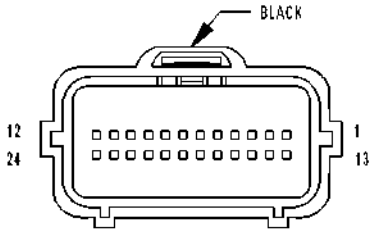
Is the resistance below 2.0 ohms?

Yes >> Replace the ORC in accordance with the Service Information.
Perform ORC VERIFICATION TEST - VER 1.

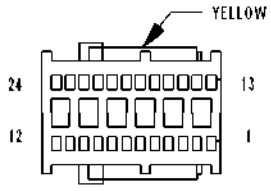
No >> Repair the (D54) CAN B Bus (–) circuit for an open.
Perform ORC VERIFICATION TEST - VER 1.

U0020-CAN B BUS OFF PERFORMANCE





MODULE-FRONT CONTROL C1



MODULE-OCCUPANT RESTRAINT CONTROLLER C2 (SAB)

a12cc009

MS-CAN B D54 AND D55

U0020-CAN B BUS OFF PERFORMANCE (CONTINUED)

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  Whenever the CAN B Bus (+) or CAN B Bus (-) circuit is open, shorted to voltage, or shorted to ground.

Possible Causes
ACTIVE U0020 CAN B BUS DTC IN OCCUPANT CLASSIFICATION MODULE
(D55) CAN B BUS (+) CIRCUIT OPEN
(D54) CAN B BUS (-) CIRCUIT OPEN
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. VERIFY DTC U0020–CAN B BUS IS ACTIVE

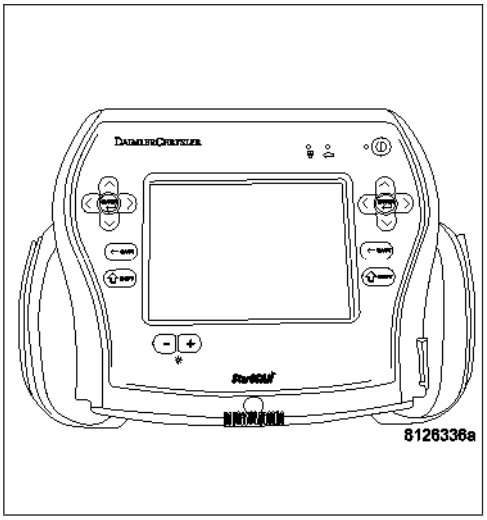
Turn the ignition on.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

Does the scan tool display active: U0019–CAN B BUS?

Yes >> Go To 2

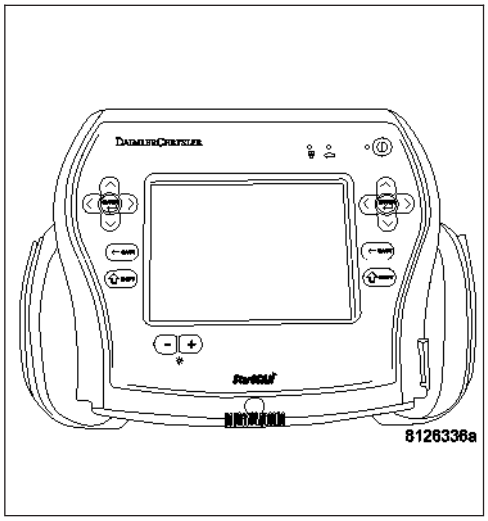
No >> If the DTC is stored, check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also, inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.
Perform ORC VERIFICATION TEST – VER 1.



U0020-CAN B BUS OFF PERFORMANCE (CONTINUED)

2. CHECK FOR ACTIVE CAN B BUS RELATED DTCS IN THE FRONT CONTROL MODULE (FCM)

With the scan tool, read Front Control Module (FCM) DTCs



Does the scan tool display any active CAN B BUS related DTCs?

Yes >> Diagnose and repair the DTC(s). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING).

No >> Go To 3

3. CHECK (D55) CAN B BUS (+) CIRCUIT FOR AN OPEN

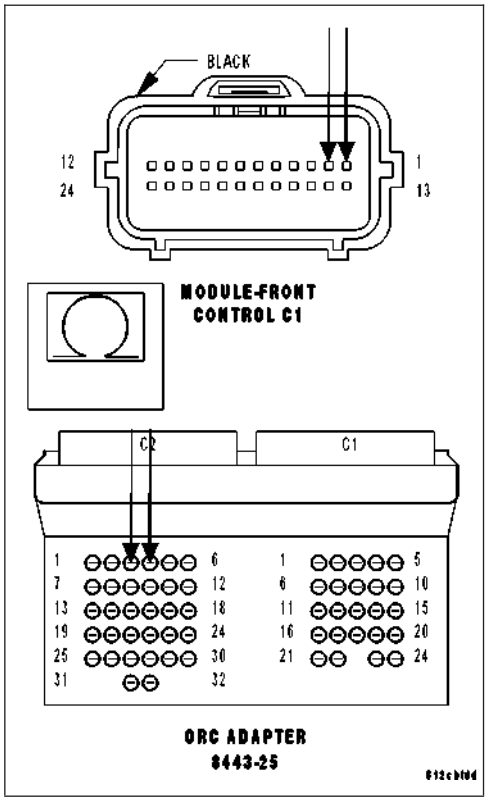
Turn the ignition off.

Disconnect the negative battery cable.

Disconnect the OCM C1 connector.

Disconnect the Front Control Module (FCM) C1 connector.

Measure the resistance of the (D55) CAN B Bus (+) circuit between the Front Control Module C1 connector and the OCM C1 connector.



Is the resistance below 2.0 ohms?

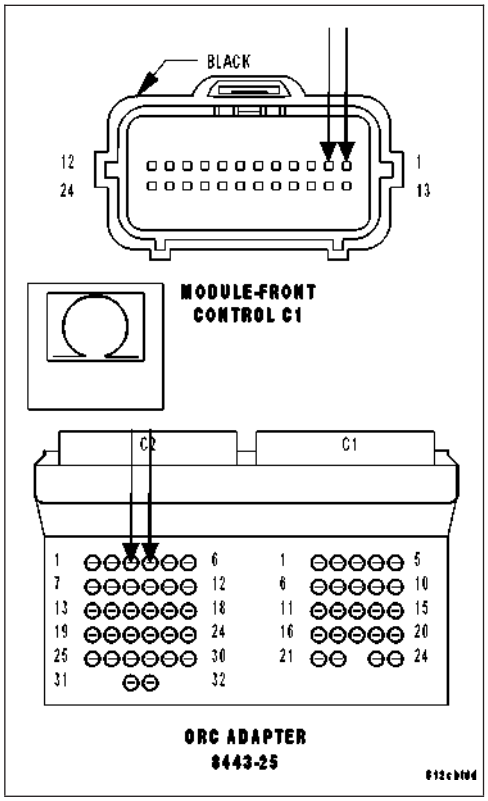
Yes >> Go To 4

No >> Repair the (D55) CAN B Bus (+) circuit for an open. Perform ORC VERIFICATION TEST - VER 1.

U0020-CAN B BUS OFF PERFORMANCE (CONTINUED)

4. CHECK (D54) CAN B BUS (–) CIRCUIT FOR AN OPEN

Measure the resistance of the (D54) CAN B Bus (–) circuit between the Front Control Module C1 connector and the OCM C1 connector.



Is the resistance below 2.0 ohms?

Yes >> Replace the OCM in accordance with the Service Information.
Perform OCS VERIFICATION TEST - VER 1.

No >> Repair the (D54) CAN B Bus (–) circuit for an open.
Perform ORC VERIFICATION TEST - VER 1.

U0022-CAN B BUS (+) CIRCUIT LOW

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0023-CAN B BUS (+) CIRCUIT HIGH

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0026-CAN B BUS (-) CIRCUIT HIGH

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0121-LOST COMMUNICATION WITH ANTI-LOCK BRAKE SYSTEM (ABS) CONTROL MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0151-LOST COMMUNICATION WITH OCCUPANT RESTRAINT CONTROLLER (ORC)

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0154-LOST COMMUNICATION WITH OCCUPANT CLASSIFICATION MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0155-LOST COMMUNICATION WITH CLUSTER/CCN

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0156-LOST COMMUNICATION WITH EOM

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0164-LOST COMMUNICATION WITH HVAC CONTROL MODULE

For a complete wiring diagram **Refer to Section 8W**.

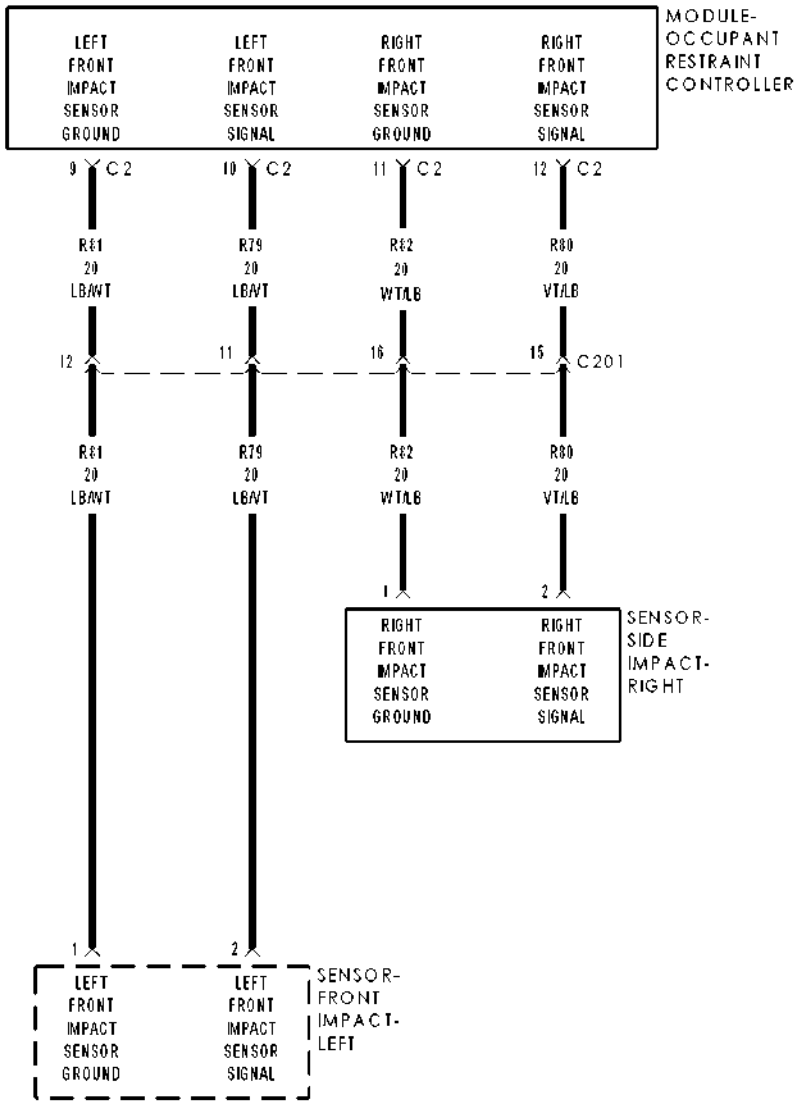
(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

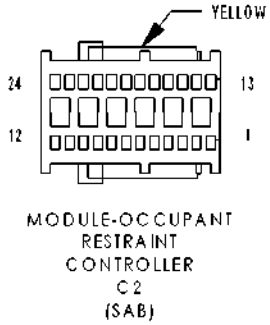
U0168-LOST COMMUNICATION WITH VEHICLE SECURITY CONTROL MODULE (SKREEM/WCM)

For a complete wiring diagram **Refer to Section 8W**.

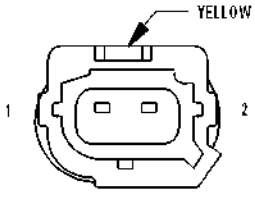
(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0170-LOST COMMUNICATION W/UP-FRONT LEFT SATELLITE ACCELERATION SENSOR

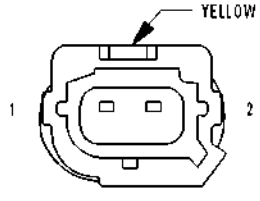




MODULE-OCCUPANT RESTRAINT CONTROLLER C2 (SAB)



SENSOR-FRONT IMPACT-LEFT



SENSOR-FRONT IMPACT-RIGHT

812cb7fb

U0170-LOST COMMUNICATION W/UP-FRONT LEFT SATELLITE ACCELERATION SENSOR (CONTINUED)

For the Airbag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  The Occupant Restraint Controller (ORC) continuously communicates with the Front Left Impact Sensor over the sensor signal circuit. The sensor communication and on board diagnostics are powered by the ORC signal.
- **Set Condition:**
  This code will set, if the ORC and the Front Left Impact Sensor do not establish and maintain valid data communications.

Possible Causes
(R79) SIGNAL CIRCUIT SHORTED TO BATTERY
(R79) SIGNAL CIRCUIT SHORTED TO GROUND
(R79, R81) FRONT LEFT IMPACT SENSOR CIRCUITS SHORTED TOGETHER
(R81) FRONT LEFT IMPACT SENSOR GROUND CIRCUIT OPEN
(R79) FRONT LEFT IMPACT SENSOR SIGNAL CIRCUIT OPEN
ORC, FRONT LEFT IMPACT SENSOR

Diagnostic Test

1. VERIFY THAT DTC U0170-LOST COMMUNICATION W/UP-FRONT LEFT SATELLITE ACCELERATION SENSOR IS ACTIVE

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

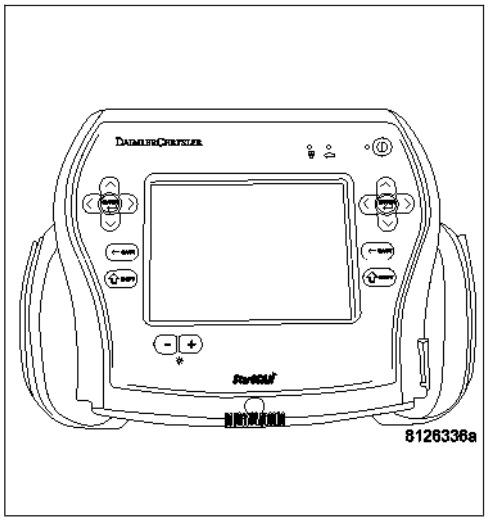
Turn the ignition on.

With the scan tool, read ORC DTCs.

Does the scan tool display active: U0170-LOST COMMUNICATION W/UP-FRONT LEFT SATELLITE ACCELERATION SENSOR?

Yes >> Go To 2

No >> Go To 9

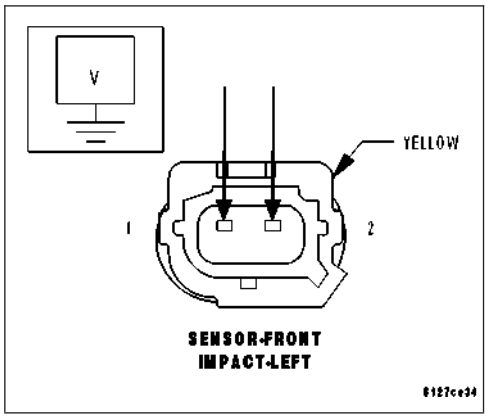


U0170-LOST COMMUNICATION W/UP-FRONT LEFT SATELLITE ACCELERATION SENSOR (CONTINUED)

2. CHECK THE (R79, R81) FRONT LEFT IMPACT SENSOR SIGNAL AND GROUND CIRCUITS FOR A SHORT TO BATTERY

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Front Left Impact Sensor connector.
Disconnect the ORC connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
Measure the voltage of the (R79) Front Left Impact Sensor Signal circuit and (R81) Sensor Ground circuit at the Front Left Impact Sensor connector and ground.



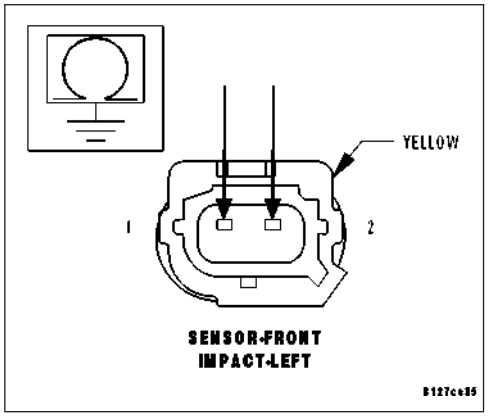
Is there any voltage present?

Yes >> Repair the (R79, R81) Front Left Impact Sensor circuits for a short to battery.
Perform the ORC VERIFICATION TEST - VER 1.

No >> Go To 3

3. CHECK THE (R79) FRONT LEFT IMPACT SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Measure the resistance of the (R79) Front Left Impact Sensor Signal circuit between the Front Left Impact Sensor connector and ground.



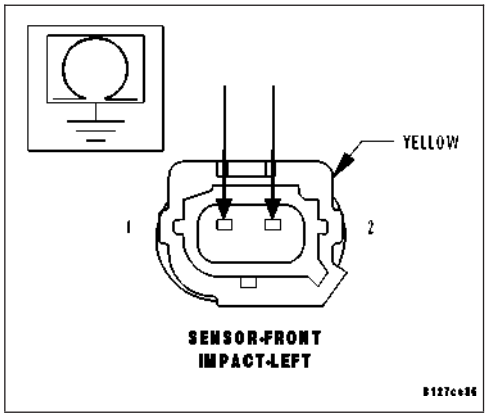
Is the resistance below 100K ohms?

Yes >> Repair the (R79) Front Left Impact Sensor Signal circuit for a short to ground.
Perform the ORC VERIFICATION TEST - VER 1.

No >> Go To 4

4. CHECK THE (R79, R81) FRONT LEFT IMPACT SENSOR CIRCUITS FOR A SHORT TOGETHER

Measure the resistance between the (R79) Front Left Impact Sensor Signal and (R81) Sensor Ground circuits at the Front Left Impact Sensor connector.



Is the resistance below 100K ohms?

Yes >> Repair the (R79, R81) Front Left Impact Sensor circuits shorted together.
Perform the ORC VERIFICATION TEST - VER 1.

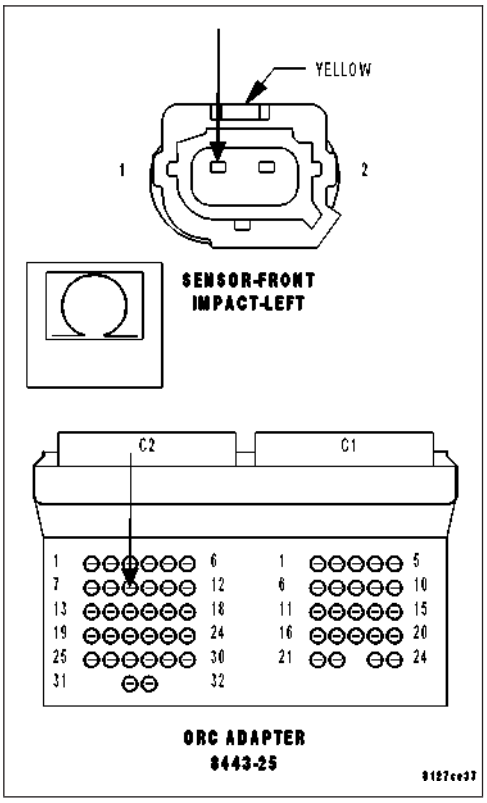
No >> Go To 5

U0170-LOST COMMUNICATION W/UP-FRONT LEFT SATELLITE ACCELERATION SENSOR (CONTINUED)

5. CHECK THE (R81) FRONT LEFT IMPACT SENSOR GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

Connect the 8443 Load Tool ORC Adaptor to the Occupant Restraint Control Module connector.

Measure the resistance of the (R81) Front Left Impact Sensor Ground circuit between the Front Left Impact Sensor connector and the 8443 Load Tool ORC Adaptor.

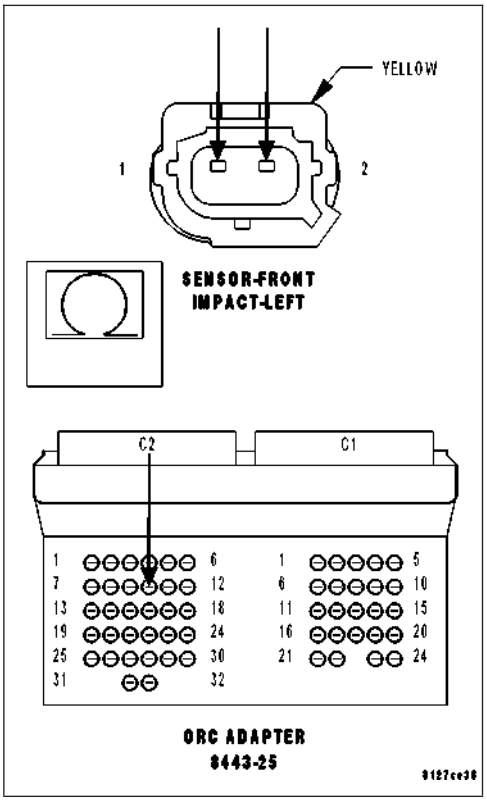


Is the resistance below 1 ohm?

Yes >> Go To 6

No >> Repair the (R81) Front Left Impact Sensor 1 Ground circuit for an open or high resistance.
Perform the ORC VERIFICATION TEST - VER 1.

6. CHECK THE (R79) FRONT LEFT IMPACT SENSOR CIRCUIT FOR AN OPEN OR HIGH RESISTANCE



Is the resistance below 1 ohm?

Yes >> Go To 7

No >> Repair the (R79) Front Left Impact Sensor Signal circuit for an open or high resistance.
Perform the ORC VERIFICATION TEST - VER 1.

U0170-LOST COMMUNICATION W/UP-FRONT LEFT SATELLITE ACCELERATION SENSOR (CONTINUED)

7. CHECK OPERATION OF THE FRONT LEFT IMPACT SENSOR

Replace the Front Left Impact Sensor.

Reconnect the vehicle body harness to the impact sensor.

Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery.

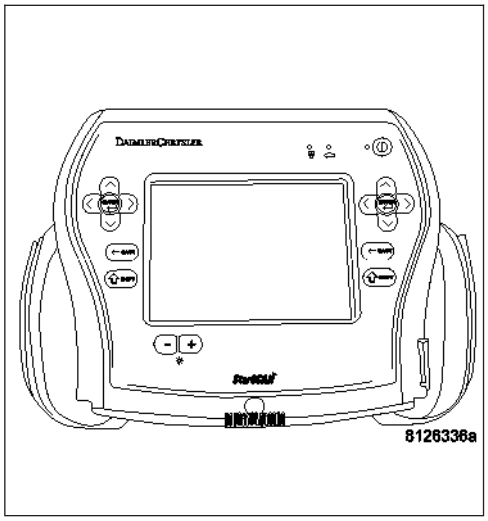
WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Connect the scan tool to the Data Link Connector - use the most current software available.

Use the scan tool and erase the stored codes in all airbag system modules.

Turn the Ignition Off, and wait 15 seconds before turning the Ignition On.

Wait one minute, and read active codes and if there are none present read the stored codes.



Did the active Front Left Impact Sensor DTC return?

Yes >> Go To 8

No >> Repair is complete.
Perform the ORC VERIFICATION TEST - VER 1.

---

8. REPLACE THE OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Information.
Perform the ORC VERIFICATION TEST - VER 1.

U0170-LOST COMMUNICATION W/UP-FRONT LEFT SATELLITE ACCELERATION SENSOR (CONTINUED)

9. TEST FOR AN INTERMITTENT CONDITION

With the scan tool, record and erase all DTC's from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

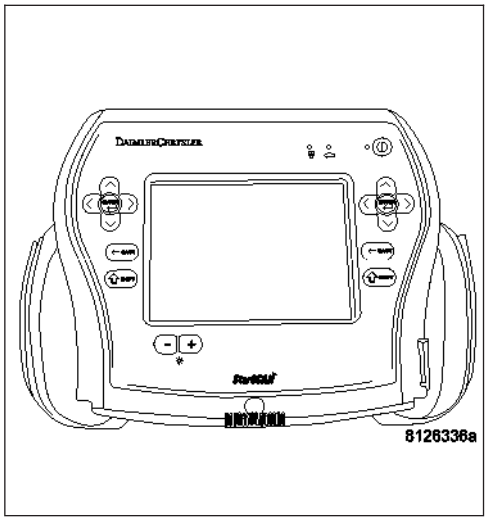
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.



WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return continue the test until the problem area has been isolated.

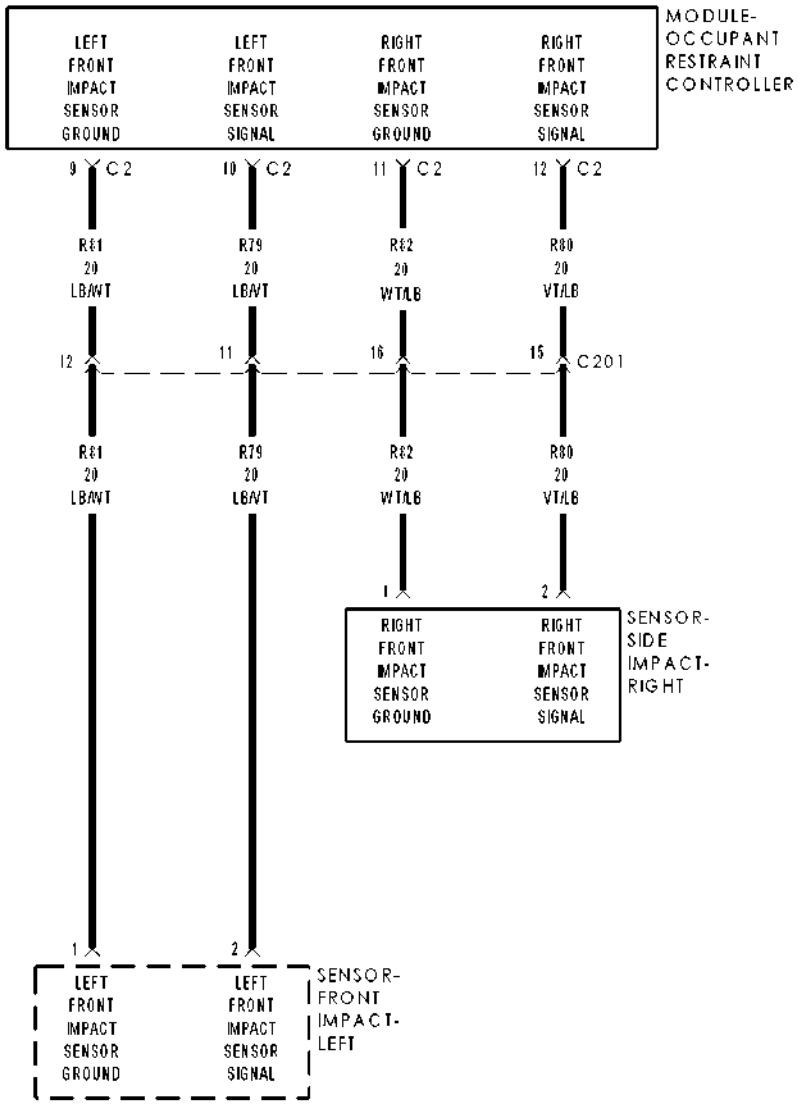
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

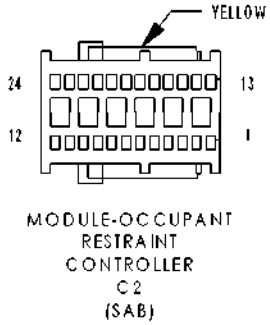
Are any ACTIVE DTCs present?

Yes >> Select the appropriate symptom from Symptom List.

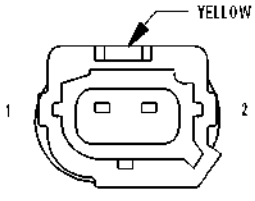
No >> No problem found at this time. Erase all codes before returning vehicle to customer.

U0171-LOST COMMUNICATION W/UP-FRONT RIGHT SATELLITE ACCELERATION SENSOR

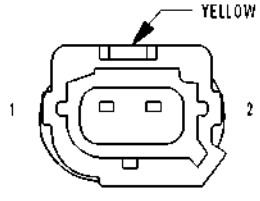




MODULE-OCCUPANT RESTRAINT CONTROLLER C2 (SAB)



SENSOR-FRONT IMPACT-LEFT



SENSOR-FRONT IMPACT-RIGHT

812cb7fb

U0171-LOST COMMUNICATION W/UP-FRONT RIGHT SATELLITE ACCELERATION SENSOR (CONTINUED)

For the Airbag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  The Occupant Restraint Controller (ORC) continuously communicates with the Front Right Impact Sensor over the sensor signal circuit. The sensor communication and on board diagnostics are powered by the ORC signal.
- **Set Condition:**
  This code will set, if the ORC and the Front Right Impact Sensor do not establish and maintain valid data communications.

Possible Causes
(R80) SIGNAL CIRCUIT SHORTED TO BATTERY
(R80) SIGNAL CIRCUIT SHORTED TO GROUND
(R80, R82) FRONT RIGHT IMPACT SENSOR CIRCUITS SHORTED TOGETHER
(R82) FRONT RIGHT IMPACT SENSOR GROUND CIRCUIT OPEN
(R80) FRONT RIGHT IMPACT SENSOR SIGNAL CIRCUIT OPEN
ORC, FRONT RIGHT IMPACT SENSOR

Diagnostic Test

1. VERIFY THAT DTC U0171-LOST COMMUNICATION W/UP-FRONT RIGHT SATELLITE ACCELERATION SENSOR IS ACTIVE

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

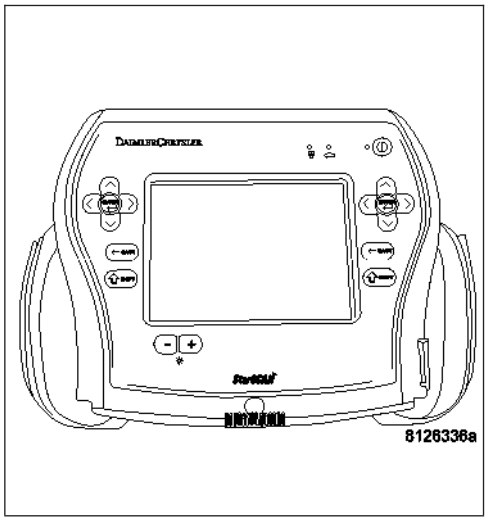
Turn the ignition on.

With the scan tool, read ORC DTCs.

Does the scan tool display active: U0171-LOST COMMUNICATION W/UP-FRONT RIGHT SATELLITE ACCELERATION SENSOR?

Yes >> Go To 2

No >> Go To 9

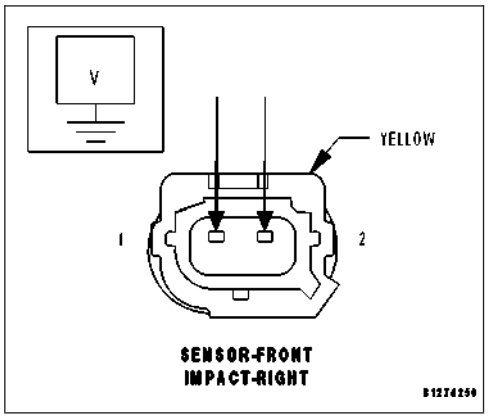


U0171-LOST COMMUNICATION W/UP-FRONT RIGHT SATELLITE ACCELERATION SENSOR (CONTINUED)

2. CHECK THE (R80, R82) FRONT RIGHT IMPACT SENSOR SIGNAL AND GROUND CIRCUITS FOR A SHORT TO BATTERY

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Front Right Impact Sensor connector.
Disconnect the ORC connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
Measure the voltage of the (R80) Front Right Impact Sensor Signal circuit and (R82) Sensor Ground circuit at the Front Right Impact Sensor connector and ground.



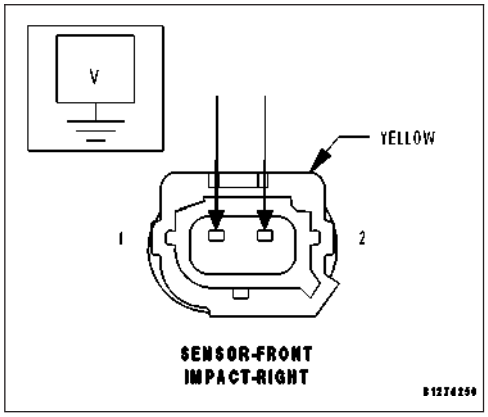
Is there any voltage present?

Yes >> Repair the (R80, R82) Front Right Impact Sensor circuits for a short to battery.
Perform the ORC VERIFICATION TEST - VER 1.

No >> Go To 3

3. CHECK THE (R80) FRONT RIGHT IMPACT SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND

WARNING: To avoid personal injury or death, turn ignition on, then reconnect the battery.
Measure the resistance of the (R80) Front Right Impact Sensor Signal circuit between the Front Right Impact Sensor connector and ground.



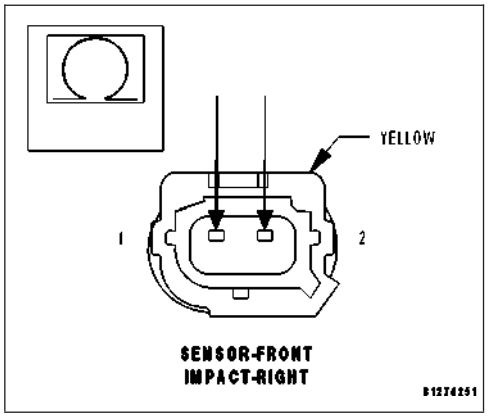
Is the resistance below 100K ohms?

Yes >> Repair the (R80) Front Right Impact Sensor Signal circuit for a short to ground.
Perform the ORC VERIFICATION TEST - VER 1.

No >> Go To 4

4. CHECK THE (R80, R82) FRONT RIGHT IMPACT SENSOR CIRCUITS FOR A SHORT TOGETHER

Measure the resistance between the (R80) Front Right Impact Sensor Signal and (R82) Sensor Ground circuits at the Front Right Impact Sensor connector.



Is the resistance below 100K ohms?

Yes >> Repair the (R80, R82) Front Right Impact Sensor circuits shorted together.
Perform the ORC VERIFICATION TEST - VER 1.

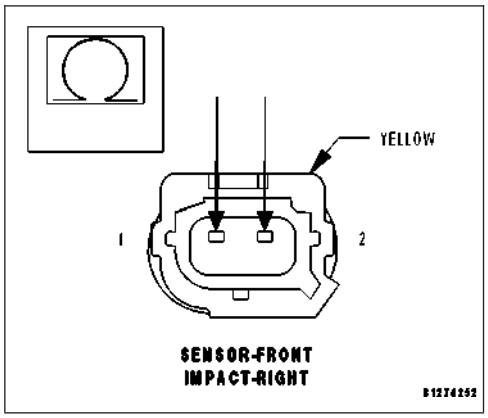
No >> Go To 5

U0171-LOST COMMUNICATION W/UP-FRONT RIGHT SATELLITE ACCELERATION SENSOR (CONTINUED)

5. CHECK THE (R82) FRONT RIGHT IMPACT SENSOR GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

Connect the 8443 Load Tool ORC Adaptor to the Occupant Control Module connector.

Measure the resistance of the (R82) Front Right Impact Sensor Ground circuit between the Front Right Impact Sensor connector and the 8443 Load Tool ORC Adaptor.



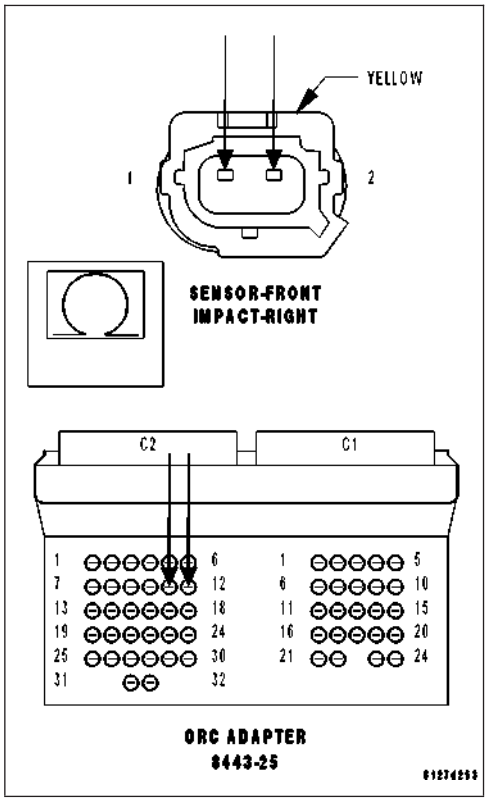
Is the resistance below 1 ohm?

Yes >> Go To 6

No >> Repair the (R82) Front Right Impact Sensor 2 Ground circuit for an open or high resistance.
Perform the ORC VERIFICATION TEST - VER 1.

6. CHECK THE (R80) FRONT RIGHT IMPACT SENSOR CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

Measure the resistance of the (R80) Front Right Impact Sensor Signal circuit between the Front Right Impact Sensor connector and the 8443 Load Tool ORC Adaptor.



Is the resistance below 1 ohm?

Yes >> Go To 7

No >> Repair the (R80) Front Right Impact Sensor Signal circuit for an open or high resistance.
Perform the ORC VERIFICATION TEST - VER 1.

U0171-LOST COMMUNICATION W/UP-FRONT RIGHT SATELLITE ACCELERATION SENSOR (CONTINUED)

7. CHECK OPERATION OF THE FRONT RIGHT IMPACT SENSOR

Replace the Front Right Impact Sensor.

Reconnect the vehicle body harness to the impact sensor.

Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery.

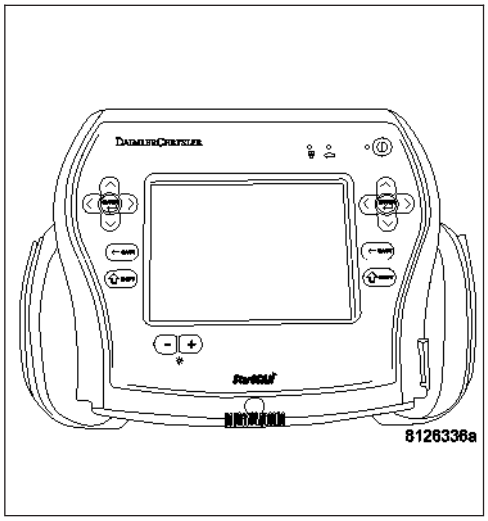
WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Connect the scan tool to the Data Link Connector - use the most current software available.

Use the scan tool and erase the stored codes in all airbag system modules.

Turn the Ignition Off, and wait 15 seconds before turning the Ignition On.

Wait one minute, and read active codes and if there are none present read the stored codes.



Did the active Front Right Impact Sensor DTC return?

Yes >> Go To 8

No >> Repair is complete.
Perform the ORC VERIFICATION TEST - VER 1.

---

8. REPLACE THE OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Instructions.
Perform the ORC VERIFICATION TEST - VER 1.

U0171-LOST COMMUNICATION W/UP-FRONT RIGHT SATELLITE ACCELERATION SENSOR (CONTINUED)

9. TEST FOR AN INTERMITTENT CONDITION

With the scan tool, record and erase all DTC's from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

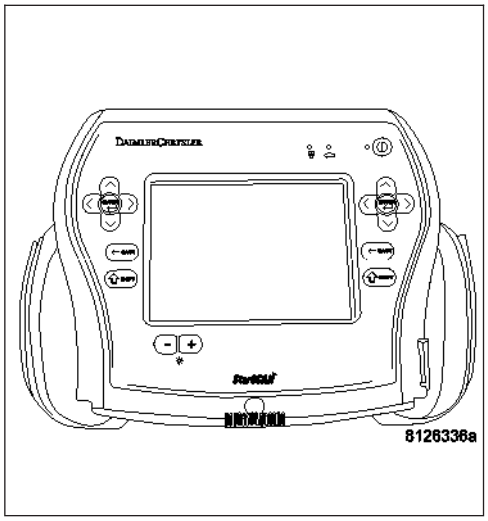
Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.



WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return continue the test until the problem area has been isolated.

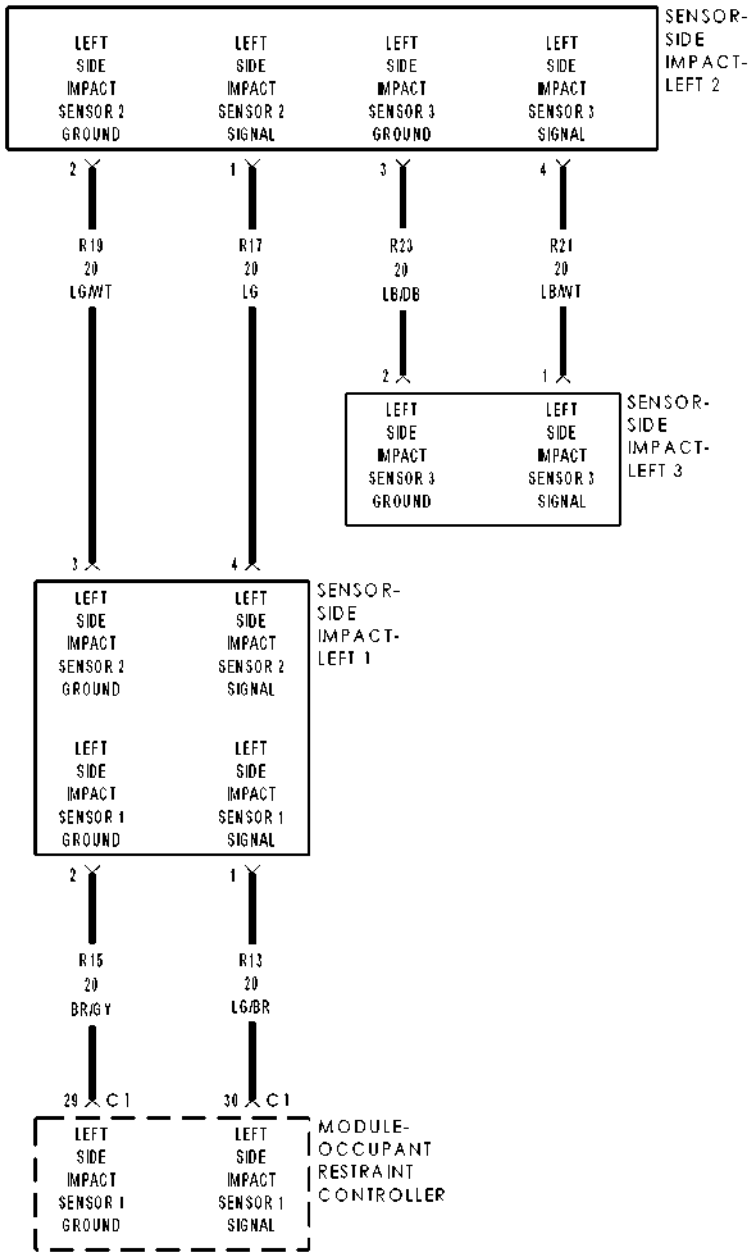
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

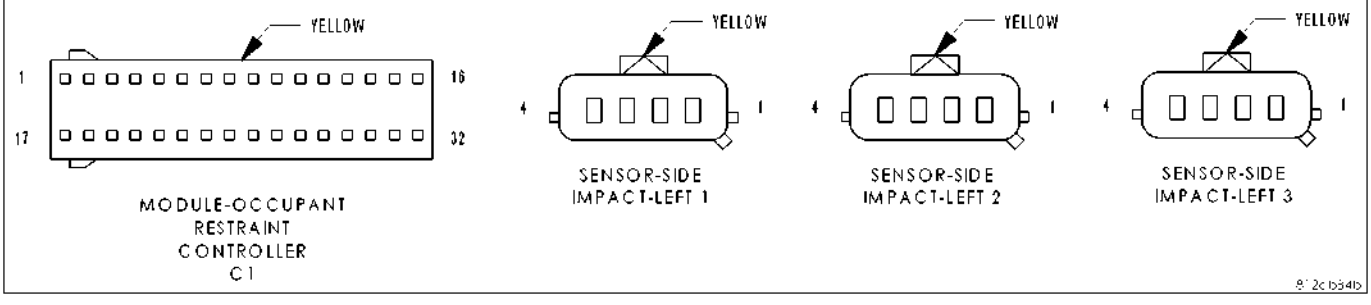
Are any ACTIVE DTCs present?

Yes >> Select the appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer.

U0172-LOST COMMUNICATION W/LEFT SIDE SATELLITE ACCELERATION SENSOR 1





U0172-LOST COMMUNICATION W/LEFT SIDE SATELLITE ACCELERATION SENSOR 1 (CONTINUED)

For the Airbag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  The Occupant Restraint Controller (ORC) continuously communicates with the Left Side Impact Sensor 1 over the sensor signal circuit. The sensor communication and on board diagnostics are powered by the ORC signal.
- **Set Condition:**
  This code will set, if the ORC and the Left Side Impact Sensor 1 do not establish and maintain valid data communications.

Possible Causes
(R13) SIGNAL CIRCUIT SHORTED TO BATTERY
(R13) SIGNAL CIRCUIT SHORTED TO GROUND
(R13, R15) LEFT SIDE IMPACT SENSOR 1 CIRCUITS SHORTED TOGETHER
(R15) LEFT SIDE IMPACT SENSOR 1 GROUND CIRCUIT OPEN
(R13) LEFT SIDE IMPACT SENSOR 1 SIGNAL CIRCUIT OPEN
ORC, LEFT SIDE IMPACT SENSOR 1

Diagnostic Test

1. VERIFY THAT DTC U0172-LOST COMMUNICATION W/LEFT SIDE SATELLITE ACCELERATION SENSOR 1 IS ACTIVE

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

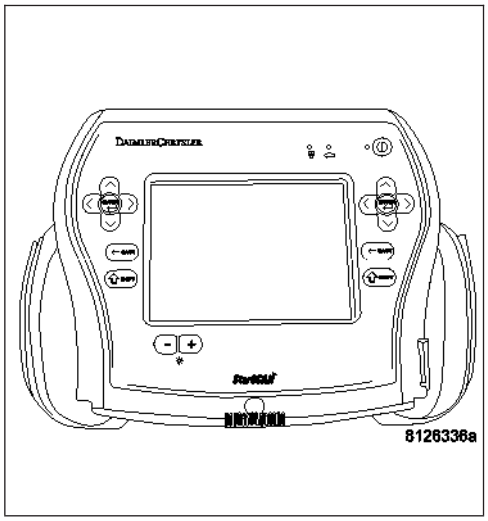
Turn the ignition on.

With the scan tool, read ORC DTCs.

Does the scan tool display active: U0172-LOST COMMUNICATION W/LEFT SIDE IMPACT SENSOR 1?

Yes >> Go To 2

No >> Go To 9

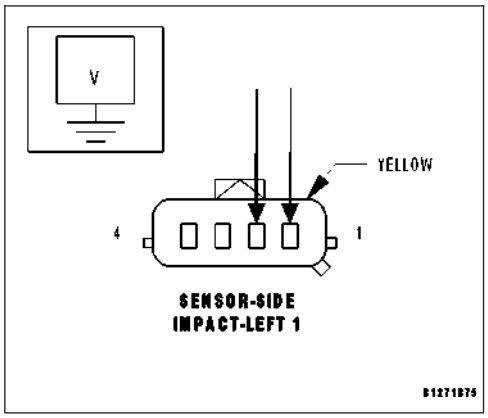


U0172-LOST COMMUNICATION W/LEFT SIDE SATELLITE ACCELERATION SENSOR 1 (CONTINUED)

2. CHECK THE (R13, R15) LEFT SIDE IMPACT SENSOR 1 SIGNAL AND GROUND CIRCUITS FOR A SHORT TO BATTERY

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Left front Impact Sensor 1 connector.
Disconnect the ORC connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
Measure the voltage of the (R13) Left Side Impact Sensor 1 Signal circuit and (R15) Sensor Ground circuit at the Left Side Impact Sensor 1 connector and ground.



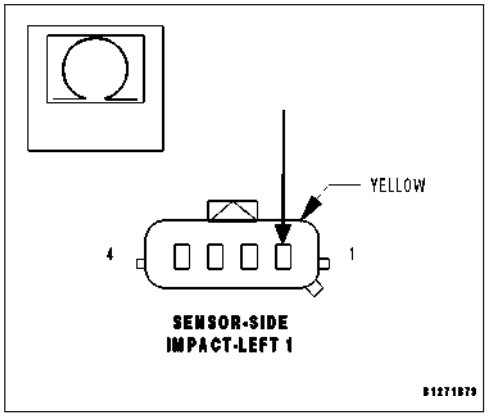
Is there any voltage present?

Yes >> Repair the (R13, R15) Left Side Impact Sensor 1 circuits for a short to battery.
Perform the ORC VERIFICATION TEST - VER 1.

No >> Go To 3

3. CHECK THE (R13) LEFT SIDE IMPACT SENSOR 1 SIGNAL CIRCUIT FOR A SHORT TO GROUND

WARNING: To avoid personal injury or death, turn ignition on, then reconnect the battery.
Measure the resistance of the (R13) Left Side Impact Sensor 1 Signal circuit between the Left Side Impact Sensor 1 connector and ground.



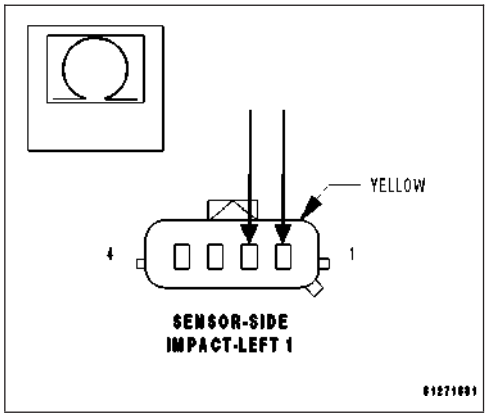
Is the resistance below 100K ohms?

Yes >> Repair the (R13) Left Side Impact Sensor 1 Signal circuit for a short to ground.
Perform the ORC VERIFICATION TEST - VER 1.

No >> Go To 4

4. CHECK THE (R13, R15) LEFT SIDE IMPACT SENSOR CIRCUITS FOR A SHORT TOGETHER

Measure the resistance between the (R13) Left Side Impact Sensor 1 Signal and (R15) Sensor Ground circuits at the Left Side Impact Sensor 1 connector.



Is the resistance below 100K ohms?

Yes >> Repair the (R13, R15) Left Side Impact Sensor 1 circuits shorted together.
Perform the ORC VERIFICATION TEST - VER 1.

No >> Go To 5

U0172-LOST COMMUNICATION W/LEFT SIDE SATELLITE ACCELERATION SENSOR 1 (CONTINUED)

5. CHECK THE (R15) LEFT SIDE IMPACT SENSOR 1 GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

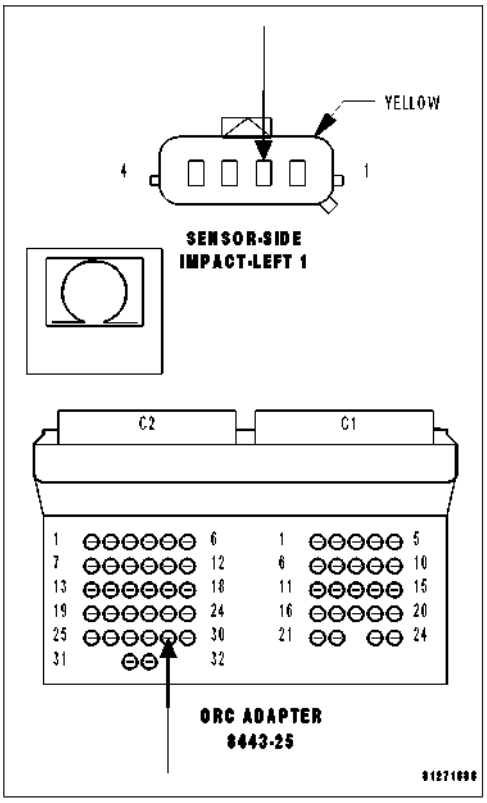
Connect the 8443 Load Tool ORC Adaptor to the Occupant Control Module connector.

Measure the resistance of the (R15) Left Side Impact Sensor 1 Ground circuit between the Left Side Impact Sensor 1 connector and the 8443 Load Tool ORC Adaptor.

Is the resistance below 1 ohm?

Yes >> Go To 6

No >> Repair the (R15) Left Side Impact Sensor 1 Ground circuit for an open or high resistance.
Perform the ORC VERIFICATION TEST - VER 1.



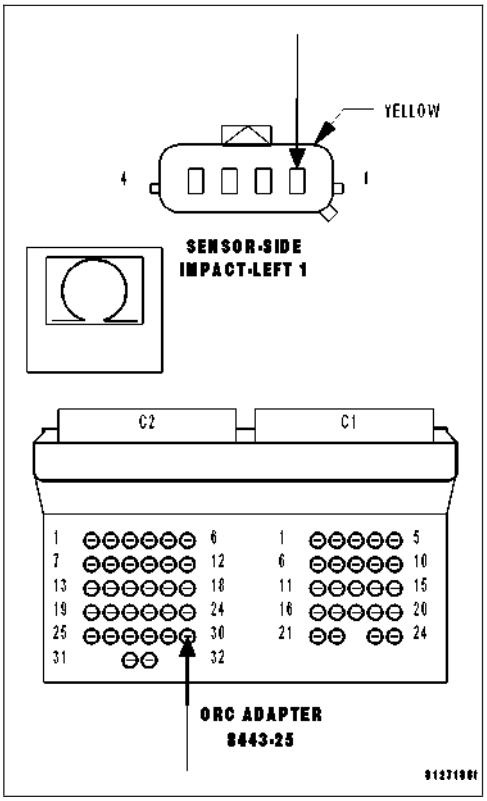
6. CHECK THE (R13) LEFT SIDE IMPACT SENSOR 1 CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

Measure the resistance of the (R13) Left Side Impact Sensor 1 Signal circuit between the Left Side Impact Sensor 1 connector and the 8443 Load Tool ORC Adaptor.

Is the resistance below 1 ohm?

Yes >> Go To 7

No >> Repair the (R13) Left Side Impact Sensor 1 Signal circuit for an open or high resistance.
Perform the ORC VERIFICATION TEST - VER 1.



U0172-LOST COMMUNICATION W/LEFT SIDE SATELLITE ACCELERATION SENSOR 1 (CONTINUED)

7. CHECK OPERATION OF THE LEFT SIDE IMPACT SENSOR 1

Replace the Left Side Impact Sensor 1.

Reconnect the vehicle body harness to the impact sensor.

Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery.

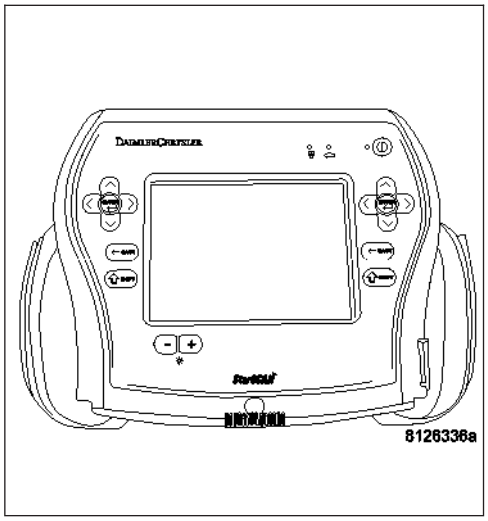
WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Connect the scan tool to the Data Link Connector - use the most current software available.

Use the scan tool and erase the stored codes in all airbag system modules.

Turn the Ignition Off, and wait 15 seconds before turning the Ignition On.

Wait one minute, and read active codes and if there are none present read the stored codes.



Did the active Left Side Impact Sensor 1 DTC return?

Yes >> Go To 8

No >> Repair is complete.
Perform the ORC VERIFICATION TEST - VER 1.

---

8. REPLACE THE OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Instructions.
Perform the ORC VERIFICATION TEST - VER 1.

U0172-LOST COMMUNICATION W/LEFT SIDE SATELLITE ACCELERATION SENSOR 1 (CONTINUED)

9. TEST FOR AN INTERMITTENT CONDITION

With the scan tool, record and erase all DTC's from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

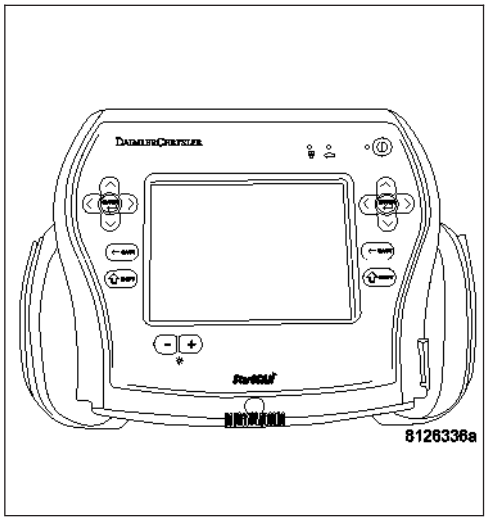
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.



WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return continue the test until the problem area has been isolated.

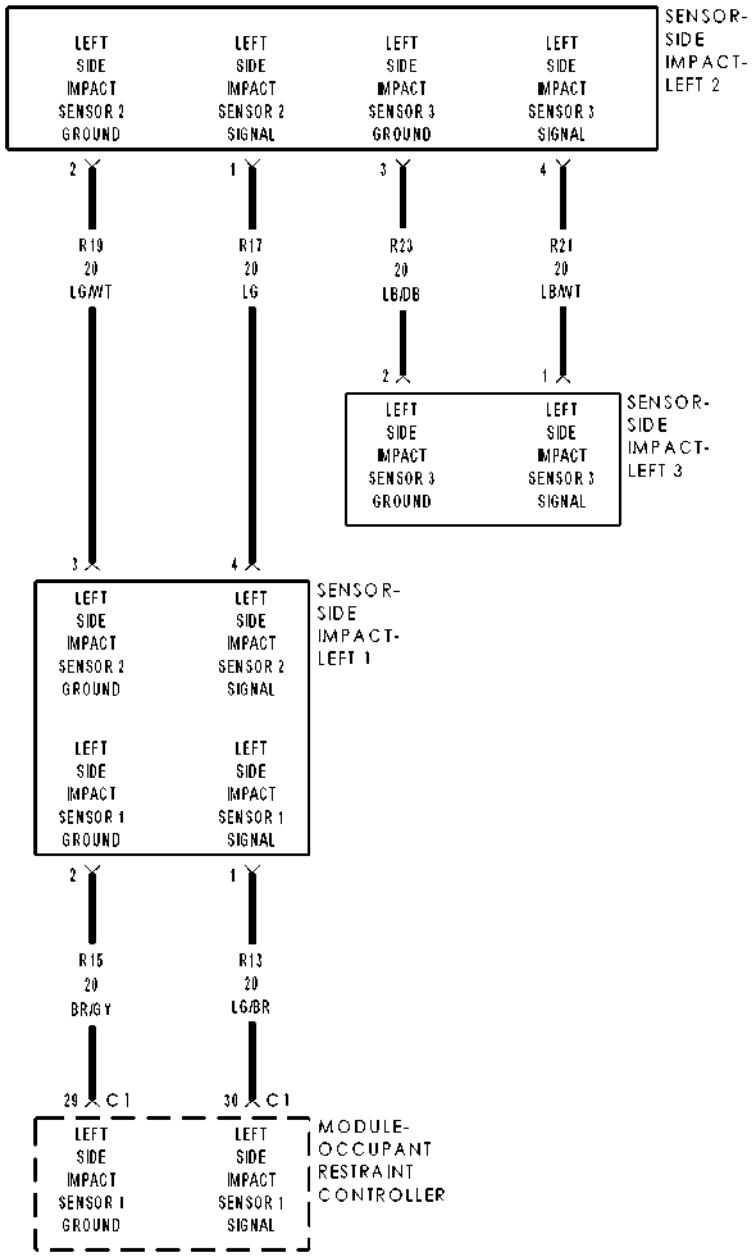
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

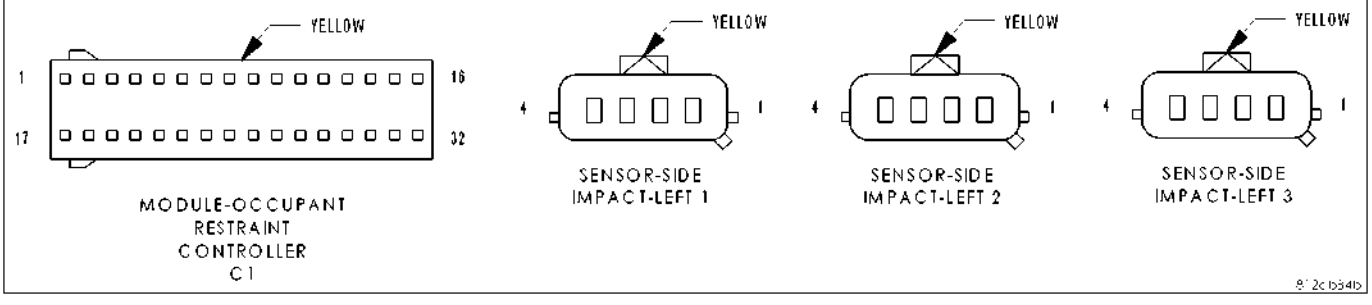
Are any ACTIVE DTCs present?

Yes >> Select the appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer.

U0173-LOST COMMUNICATION W/LEFT SIDE SATELLITE ACCELERATION SENSOR 2





U0173-LOST COMMUNICATION W/LEFT SIDE SATELLITE ACCELERATION SENSOR 2 (CONTINUED)

For the Airbag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  The Occupant Restraint Controller (ORC) continuously communicates with the Left Side Impact Sensor 2 over the sensor signal circuit. The sensor communication and on board diagnostics are powered by the ORC signal.
- **Set Condition:**
  This code will set, if the ORC and the Left Side Impact Sensor 2 do not establish and maintain valid data communications.

Possible Causes
(R17) SIGNAL CIRCUIT SHORTED TO BATTERY
(R17) SIGNAL CIRCUIT SHORTED TO GROUND
(R17, R19) LEFT SIDE IMPACT SENSOR 2 CIRCUITS SHORTED TOGETHER
(R19) LEFT SIDE IMPACT SENSOR 2 GROUND CIRCUIT OPEN
(R17) LEFT SIDE IMPACT SENSOR 2 SIGNAL CIRCUIT OPEN
ORC, LEFT SIDE IMPACT SENSOR 2

Diagnostic Test

1. VERIFY THAT DTC U0173-LOST COMMUNICATION W/LEFT SIDE SATELLITE ACCELERATION SENSOR 2 IS ACTIVE

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

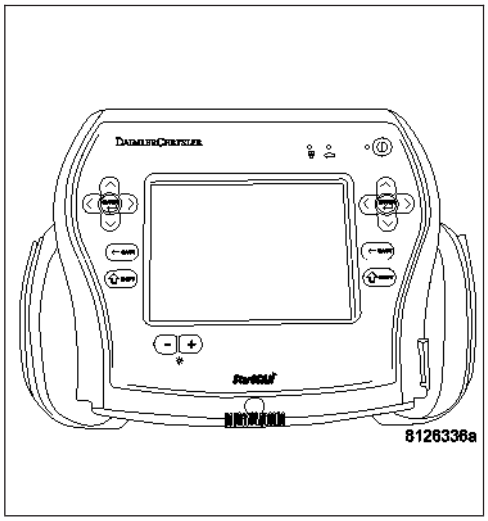
Turn the ignition on.

With the scan tool, read ORC DTCs.

Does the scan tool display active: U0173-LOST COMMUNICATION W/LEFT SIDE SATELLITE ACCELERATION SENSOR 1?

Yes >> Go To 2

No >> Go To 9

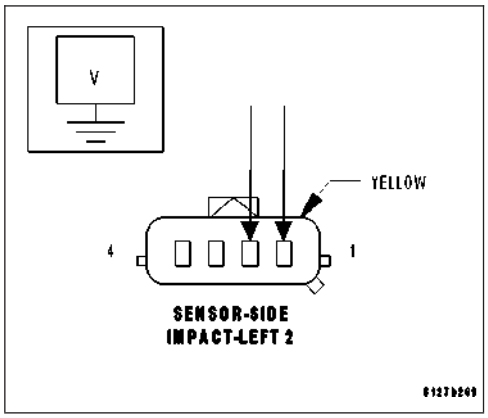


U0173-LOST COMMUNICATION W/LEFT SIDE SATELLITE ACCELERATION SENSOR 2 (CONTINUED)

2. CHECK THE (R17, R19) LEFT SIDE IMPACT SENSOR 2 SIGNAL AND GROUND CIRCUITS FOR A SHORT TO BATTERY

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Left front Impact Sensor 2 connector.
Disconnect the ORC connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
Measure the voltage of the (R17) Left Side Impact Sensor 2 Signal circuit and (R19) Sensor Ground circuit at the Left Side Impact Sensor 2 connector and ground.



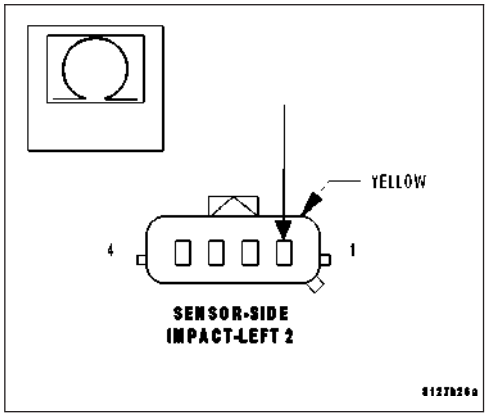
Is there any voltage present?

Yes >> Repair the (R17, R19) Left Side Impact Sensor 2 circuits for a short to battery.
Perform the ORC VERIFICATION TEST - VER 1.

No >> Go To 3

3. CHECK THE (R17) LEFT SIDE IMPACT SENSOR 2 SIGNAL CIRCUIT FOR A SHORT TO GROUND

WARNING: To avoid personal injury or death, turn ignition on, then reconnect the battery.
Measure the resistance of the (R17) Left Side Impact Sensor 2 Signal circuit between the Left Side Impact Sensor 2 connector and ground.



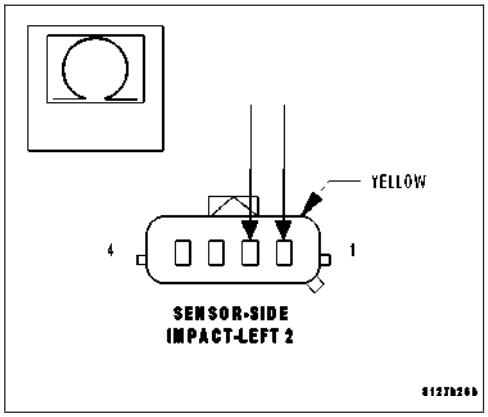
Is the resistance below 100K ohms?

Yes >> Repair the (R17) Left Side Impact Sensor 2 Signal circuit for a short to ground.
Perform the ORC VERIFICATION TEST - VER 1.

No >> Go To 4

4. CHECK THE (R17, R19) LEFT SIDE IMPACT SENSOR 2 CIRCUITS FOR A SHORT TOGETHER

Measure the resistance between the (R17) Left Side Impact Sensor 2 Signal and (R19) Sensor Ground circuits at the Left Side Impact Sensor 2 connector.



Is the resistance below 100K ohms?

Yes >> Repair the (R17, R19) Left Side Impact Sensor 2 circuits shorted together.
Perform the ORC VERIFICATION TEST - VER 1.

No >> Go To 5

U0173-LOST COMMUNICATION W/LEFT SIDE SATELLITE ACCELERATION SENSOR 2 (CONTINUED)

5. CHECK THE (R19) LEFT SIDE IMPACT SENSOR 2 GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

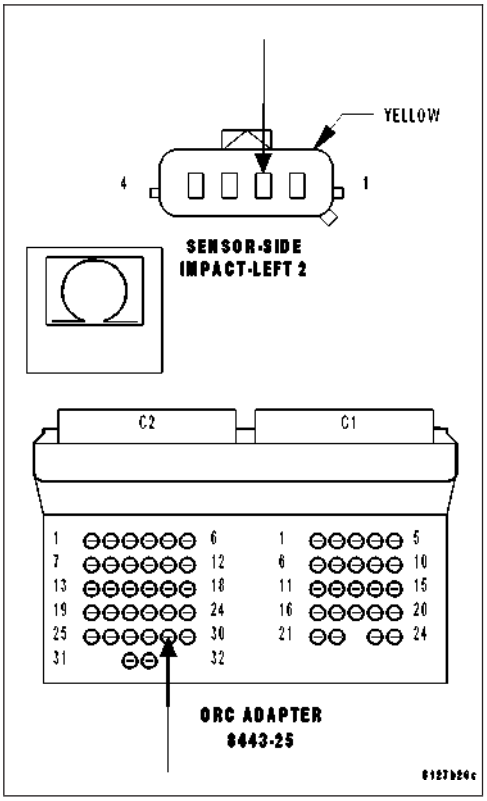
Connect the 8443 Load Tool ORC Adaptor to the Occupant Control Module connector.

Measure the resistance of the (R19) Left Side Impact Sensor 2 Ground circuit between the Left Side Impact Sensor 2 connector and the 8443 Load Tool ORC Adaptor.

Is the resistance below 1 ohm?

Yes >> Go To 6

No >> Repair the (R19) Left Side Impact Sensor 2 Ground circuit for an open or high resistance.
Perform the ORC VERIFICATION TEST - VER 1.



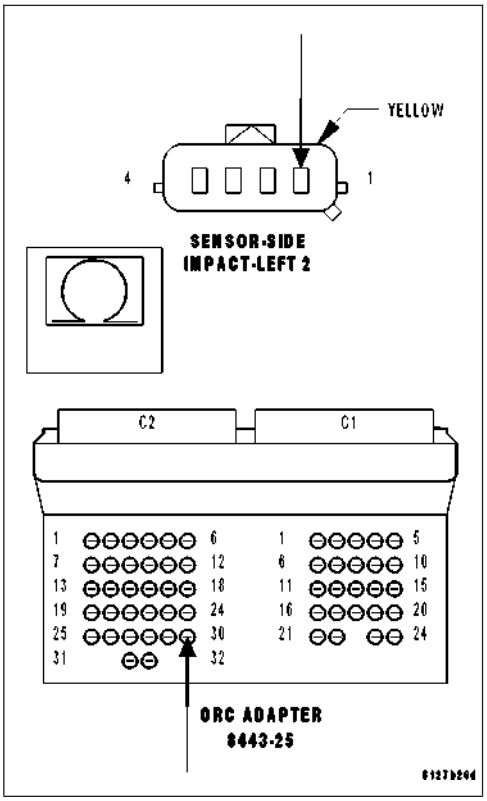
6. CHECK THE (R17) LEFT SIDE IMPACT SENSOR 2 CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

Measure the resistance of the (R17) Left Side Impact Sensor 2 Signal circuit between the Left Side Impact Sensor 2 connector and the 8443 Load Tool ORC Adaptor.

Is the resistance below 1 ohm?

Yes >> Go To 7

No >> Repair the (R17) Left Side Impact Sensor 2 Signal circuit for an open or high resistance.
Perform the ORC VERIFICATION TEST - VER 1.



U0173-LOST COMMUNICATION W/LEFT SIDE SATELLITE ACCELERATION SENSOR 2 (CONTINUED)

7. CHECK OPERATION OF THE LEFT SIDE IMPACT SENSOR 2

Replace the Left Side Impact Sensor 2.

Reconnect the vehicle body harness to the impact sensor.

Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery.

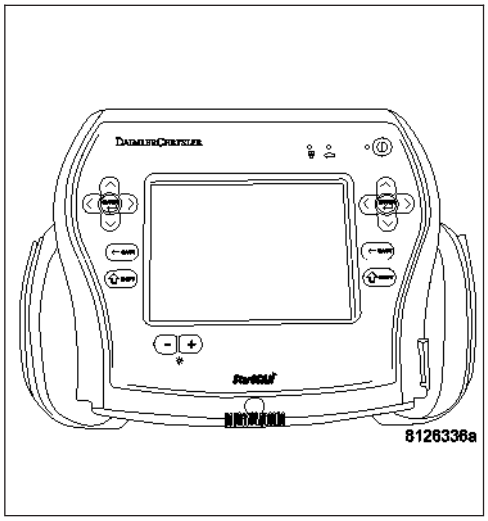
WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Connect the scan tool to the Data Link Connector - use the most current software available.

Use the scan tool and erase the stored codes in all airbag system modules.

Turn the Ignition Off, and wait 15 seconds before turning the Ignition On.

Wait one minute, and read active codes and if there are none present read the stored codes.



Did the active Left Side Impact Sensor 2 DTC return?

Yes >> Go To 8

No >> Repair is complete.
Perform the ORC VERIFICATION TEST - VER 1.

---

8. REPLACE THE OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Instructions.
Perform the ORC VERIFICATION TEST - VER 1.

U0173-LOST COMMUNICATION W/LEFT SIDE SATELLITE ACCELERATION SENSOR 2 (CONTINUED)

9. TEST FOR AN INTERMITTENT CONDITION

With the scan tool, record and erase all DTC's from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

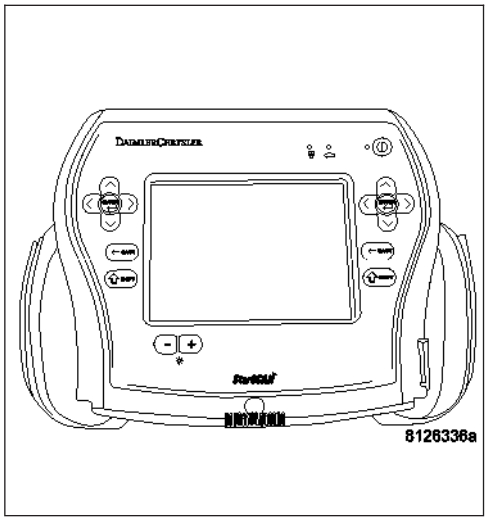
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.



WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return continue the test until the problem area has been isolated.

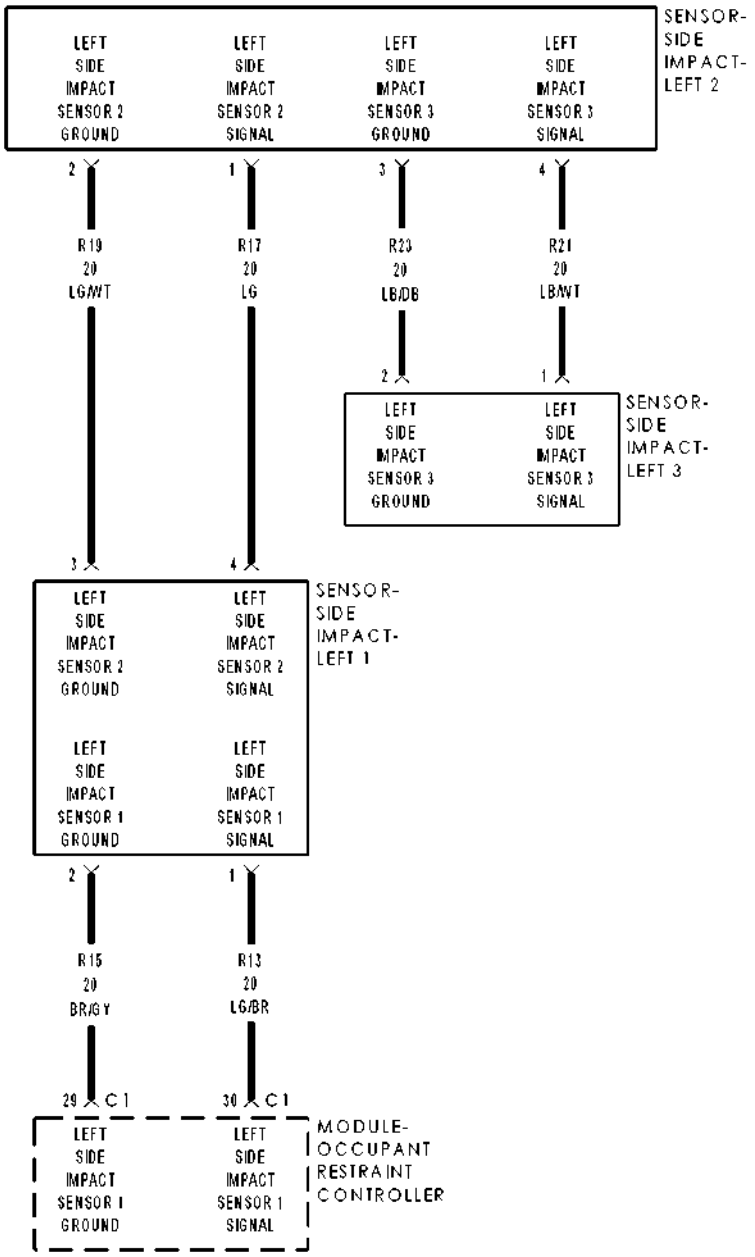
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

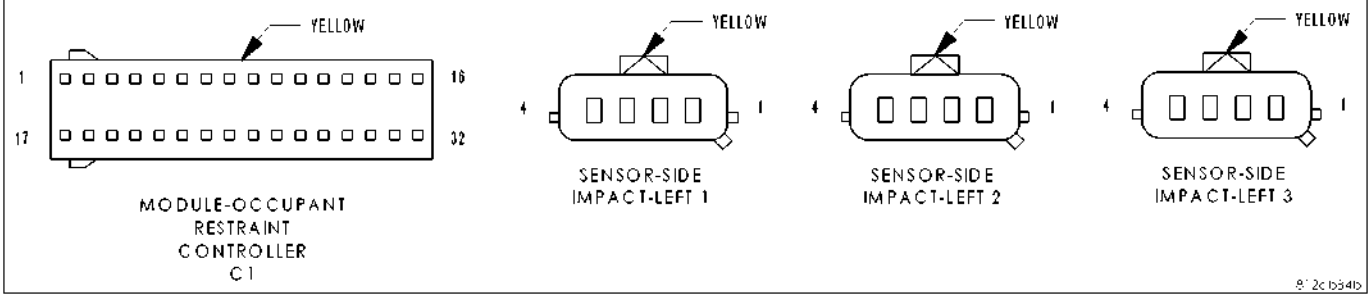
Are any ACTIVE DTCs present?

Yes >> Select the appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer.

U0174-LOST COMMUNICATION W/LEFT SIDE SATELLITE ACCELERATION SENSOR 3





U0174-LOST COMMUNICATION W/LEFT SIDE SATELLITE ACCELERATION SENSOR 3 (CONTINUED)

For the Airbag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  The Occupant Restraint Controller (ORC) continuously communicates with the Left Side Impact Sensor 3 over the sensor signal circuit. The sensor communication and on board diagnostics are powered by the ORC signal.
- **Set Condition:**
  This code will set, if the ORC and the Left Side Impact Sensor 3 do not establish and maintain valid data communications.

Possible Causes
(R21) SIGNAL CIRCUIT SHORTED TO BATTERY
(R21) SIGNAL CIRCUIT SHORTED TO GROUND
(R21, R23) LEFT SIDE IMPACT SENSOR 3 CIRCUITS SHORTED TOGETHER
(R23) LEFT SIDE IMPACT SENSOR 3 GROUND CIRCUIT OPEN
(R21) LEFT SIDE IMPACT SENSOR 3 SIGNAL CIRCUIT OPEN
ORC, LEFT SIDE IMPACT SENSOR 3

Diagnostic Test

1. VERIFY THAT DTC U0174- LOST COMMUNICATION W/LEFT SIDE SATELLITE ACCELERATION SENSOR 3 IS ACTIVE

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

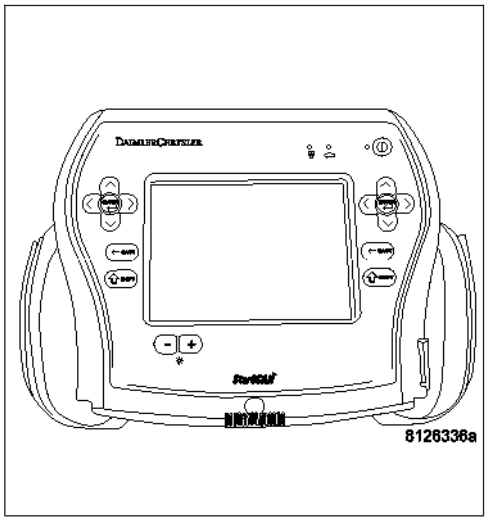
Turn the ignition on.

With the scan tool, read ORC DTCs.

Does the scan tool display active: U0174- LOST COMMUNICATION W/LEFT SIDE SATELLITE ACCELERATION SENSOR 3?

Yes >> Go To 2

No >> Go To 9

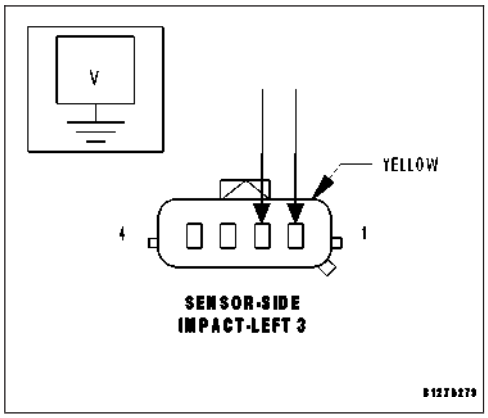


U0174-LOST COMMUNICATION W/LEFT SIDE SATELLITE ACCELERATION SENSOR 3 (CONTINUED)

2. CHECK THE (R21, R23) LEFT SIDE IMPACT SENSOR 3 SIGNAL AND GROUND CIRCUITS FOR A SHORT TO BATTERY

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Left front Impact Sensor 3 connector.
Disconnect the ORC connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
Measure the voltage of the (R21) Left Side Impact Sensor 3 Signal circuit and (R23) Sensor Ground circuit at the Left Side Impact Sensor 3 connector and ground.



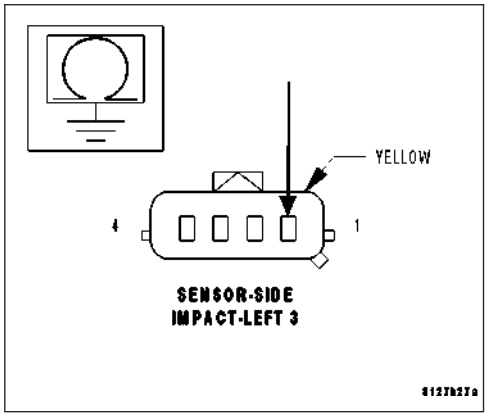
Is there any voltage present?

Yes >> Repair the (R21, R23) Left Side Impact Sensor 3 circuits for a short to battery.
Perform the ORC VERIFICATION TEST - VER 1.

No >> Go To 3

3. CHECK THE (R21) LEFT SIDE IMPACT SENSOR 3 SIGNAL CIRCUIT FOR A SHORT TO GROUND

WARNING: To avoid personal injury or death, turn ignition on, then reconnect the battery.
Measure the resistance of the (R21) Left Side Impact Sensor 3 Signal circuit between the Left Side Impact Sensor 3 connector and ground.



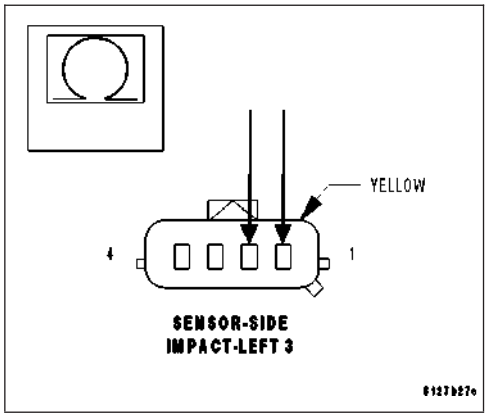
Is the resistance below 100K ohms?

Yes >> Repair the (R21) Left Side Impact Sensor 3 Signal circuit for a short to ground.
Perform the ORC VERIFICATION TEST - VER 1.

No >> Go To 4

4. CHECK THE (R21, R23) LEFT SIDE IMPACT SENSOR CIRCUITS FOR A SHORT TOGETHER

Measure the resistance between the (R21) Left Side Impact Sensor 3 Signal and (R23) Sensor Ground circuits at the Left Side Impact Sensor 3 connector.



Is the resistance below 100K ohms?

Yes >> Repair the (R21, R23) Left Side Impact Sensor 3 circuits shorted together.
Perform the ORC VERIFICATION TEST - VER 1.

No >> Go To 5

U0174-LOST COMMUNICATION W/LEFT SIDE SATELLITE ACCELERATION SENSOR 3 (CONTINUED)

5. CHECK THE (R23) LEFT SIDE IMPACT SENSOR 3 GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

Connect the 8443 Load Tool ORC Adaptor to the Occupant Control Module connector.

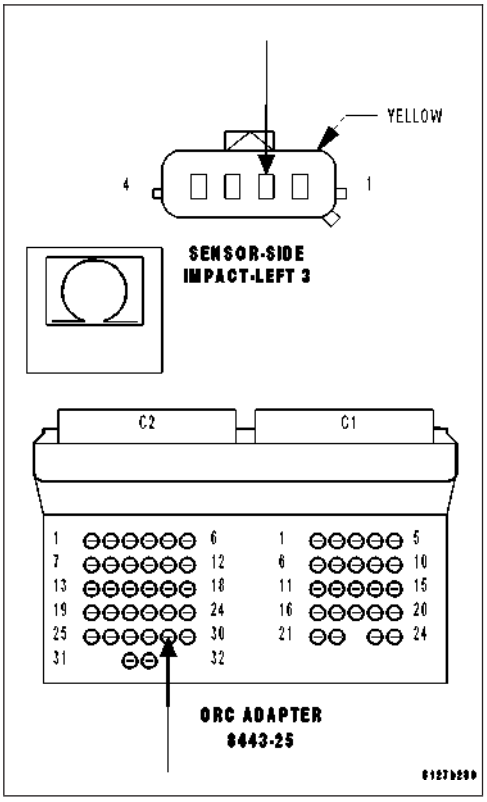
Measure the resistance of the (R23) Left Side Impact Sensor 3 Ground circuit between the Left Side Impact Sensor 3 connector and the 8443 Load Tool ORC Adaptor.

Is the resistance below 1 ohm?

Yes >> Go To 6

No >> Repair the (R23) Left Side Impact Sensor 3 Ground circuit for an open or high resistance.

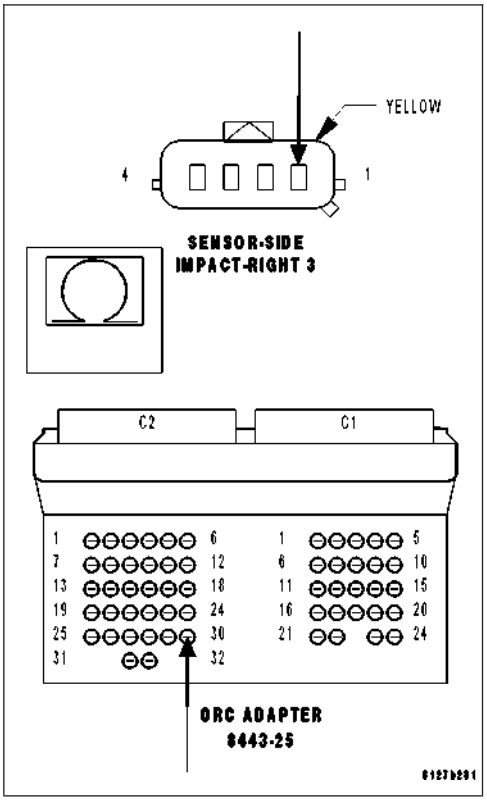
Perform the ORC VERIFICATION TEST - VER 1.



U0174-LOST COMMUNICATION W/LEFT SIDE SATELLITE ACCELERATION SENSOR 3 (CONTINUED)

6. CHECK THE (R21) LEFT SIDE IMPACT SENSOR 3 SIGNAL CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

Measure the resistance of the (R21) Left Side Impact Sensor 3 Signal circuit between the Left Side Impact Sensor 3 connector and the 8443 Load Tool ORC Adaptor.



Is the resistance below 1 ohm?

Yes >> Go To 7

No >> Repair the (R21) Left Side Impact Sensor 3 Signal circuit for an open or high resistance.
Perform the ORC VERIFICATION TEST - VER 1.

7. CHECK OPERATION OF THE LEFT SIDE IMPACT SENSOR 3

Replace the Left Side Impact Sensor 3.

Reconnect the vehicle body harness to the impact sensor.

Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery.

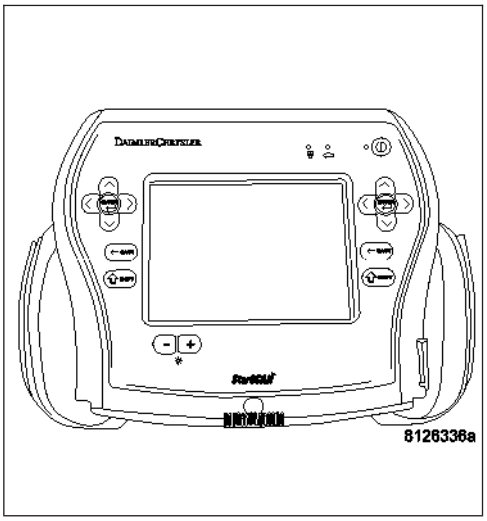
WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Connect the scan tool to the Data Link Connector - use the most current software available.

Use the scan tool and erase the stored codes in all airbag system modules.

Turn the Ignition Off, and wait 15 seconds before turning the Ignition On.

Wait one minute, and read active codes and if there are none present read the stored codes.



Did the active Left Side Impact Sensor 3 DTC return?

Yes >> Go To 8

No >> Repair is complete.
Perform the ORC VERIFICATION TEST - VER 1.

U0174-LOST COMMUNICATION W/LEFT SIDE SATELLITE ACCELERATION SENSOR 3 (CONTINUED)

8. REPLACE THE OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Instructions.
Perform the ORC VERIFICATION TEST - VER 1.

---

9. TEST FOR AN INTERMITTENT CONDITION

With the scan tool, record and erase all DTC's from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

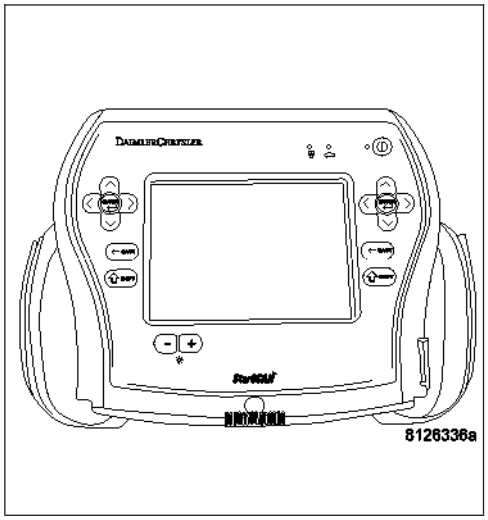
Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.



WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return continue the test until the problem area has been isolated.

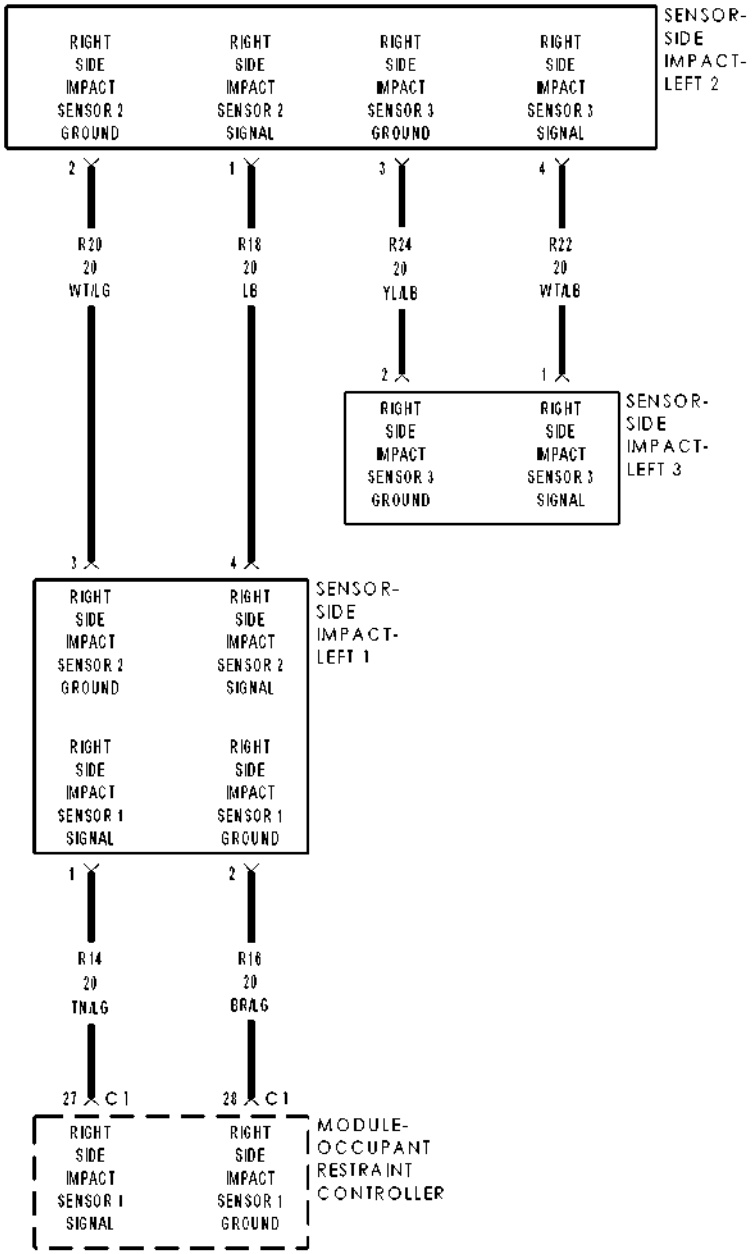
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

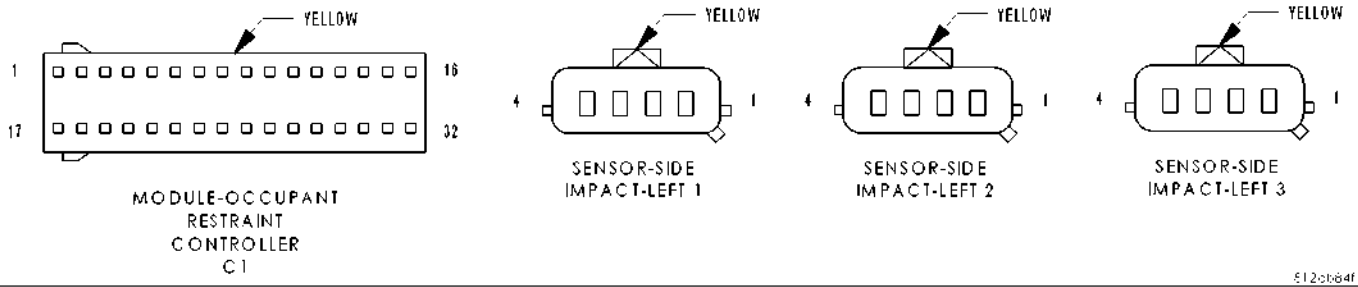
Are any ACTIVE DTCs present?

Yes >> Select the appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer.

U0175-LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 1





U0175-LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 1 (CONTINUED)

For the Airbag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  The Occupant Restraint Controller (ORC) continuously communicates with the Right Side Impact Sensor 1 over the sensor signal circuit. The sensor communication and on board diagnostics are powered by the ORC signal.
- **Set Condition:**
  This code will set, if the ORC and the Right Side Impact Sensor 1 do not establish and maintain valid data communications.

Possible Causes
(R14) SIGNAL CIRCUIT SHORTED TO BATTERY
(R14) SIGNAL CIRCUIT SHORTED TO GROUND
(R14, R16) RIGHT SIDE IMPACT SENSOR 1 CIRCUITS SHORTED TOGETHER
(R16) RIGHT SIDE IMPACT SENSOR 1 GROUND CIRCUIT OPEN
(R14) RIGHT SIDE IMPACT SENSOR 1 SIGNAL CIRCUIT OPEN
ORC, RIGHT SIDE IMPACT SENSOR 1

Diagnostic Test

1. VERIFY THAT DTC U0175- LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 1

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

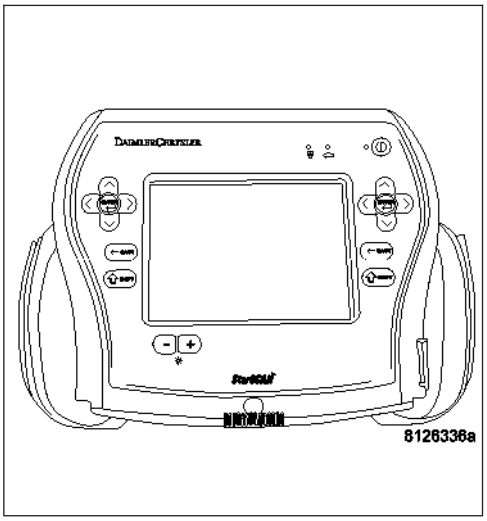
Turn the ignition on.

With the scan tool, read ORC DTCs.

Does the scan tool display active: U0175- LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 1?

Yes >> Go To 2

No >> Go To 9

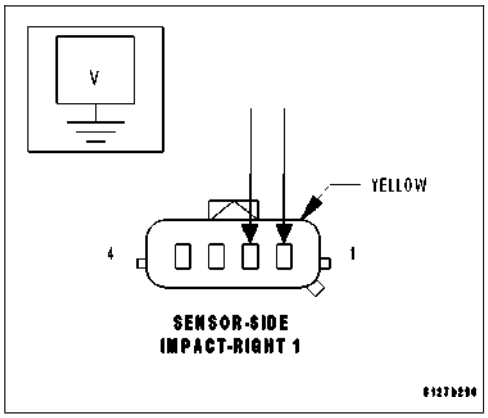


U0175-LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 1 (CONTINUED)

2. CHECK THE (R14, R16) RIGHT SIDE IMPACT SENSOR 1 SIGNAL AND GROUND CIRCUITS FOR A SHORT TO BATTERY

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Right front Impact Sensor 1 connector.
Disconnect the ORC connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
Measure the voltage of the (R14) Right Side Impact Sensor 1 Signal circuit and (R16) Sensor Ground circuit at the Right Side Impact Sensor 1 connector and ground.



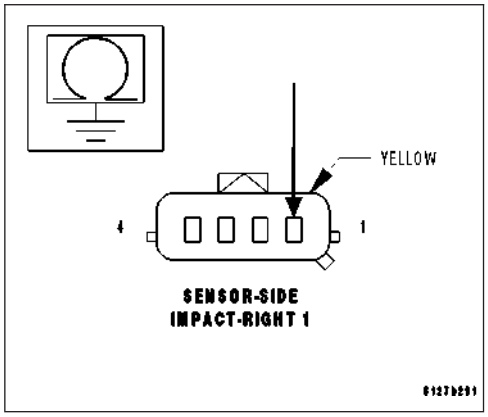
Is there any voltage present?

Yes >> Repair the (R14, R16) Right Side Impact Sensor 1 circuits for a short to battery.
Perform the ORC VERIFICATION TEST - VER 1.

No >> Go To 3

3. CHECK THE (R14) RIGHT SIDE IMPACT SENSOR 1 SIGNAL CIRCUIT FOR A SHORT TO GROUND

WARNING: To avoid personal injury or death, turn ignition on, then reconnect the battery.
Measure the resistance of the (R14) Right Side Impact Sensor 1 Signal circuit between the Right Side Impact Sensor 1 connector and ground.



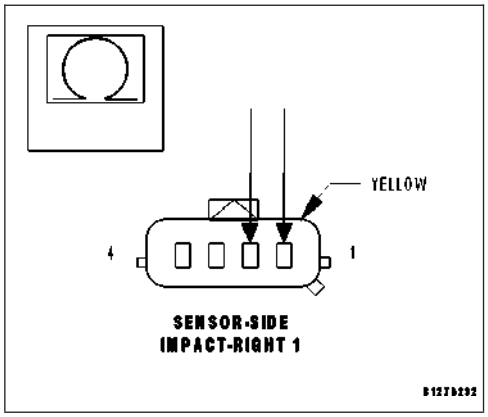
Is the resistance below 100K ohms?

Yes >> Repair the (R14) Right Side Impact Sensor 1 Signal circuit for a short to ground.
Perform the ORC VERIFICATION TEST - VER 1.

No >> Go To 4

4. CHECK THE (R14, R16) RIGHT SIDE IMPACT SENSOR CIRCUITS FOR A SHORT TOGETHER

Measure the resistance between the (R14) Right Side Impact Sensor 1 Signal and (R16) Sensor Ground circuits at the Right Side Impact Sensor 1 connector.



Is the resistance below 100K ohms?

Yes >> Repair the (R14, R16) Right Side Impact Sensor 1 circuits shorted together.
Perform the ORC VERIFICATION TEST - VER 1.

No >> Go To 5

U0175-LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 1 (CONTINUED)

5. CHECK THE (R16) RIGHT SIDE IMPACT SENSOR 1 GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

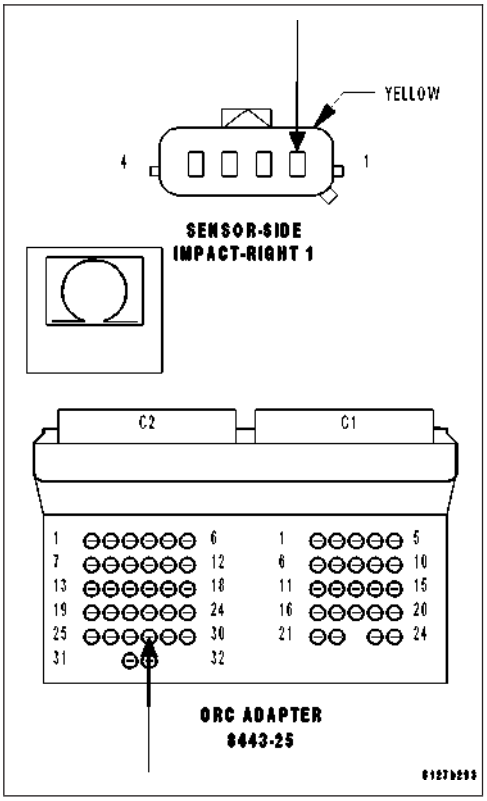
Connect the 8443 Load Tool ORC Adaptor to the Occupant Control Module connector.

Measure the resistance of the (R16) Right Side Impact Sensor 1 Ground circuit between the Right Side Impact Sensor 1 connector and the 8443 Load Tool ORC Adaptor.

Is the resistance below 1 ohm?

Yes >> Go To 6

No >> Repair the (R16) Right Side Impact Sensor 1 Ground circuit for an open or high resistance.
Perform the ORC VERIFICATION TEST - VER 1.



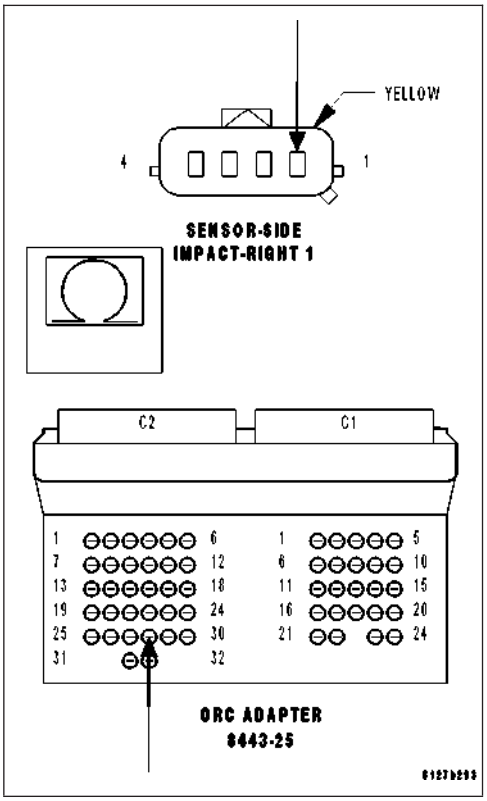
6. CHECK THE (R14) RIGHT SIDE IMPACT SENSOR 1 CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

Measure the resistance of the (R14) Right Side Impact Sensor 1 Signal circuit between the Right Side Impact Sensor 1 connector and the 8443 Load Tool ORC Adaptor.

Is the resistance below 1 ohm?

Yes >> Go To 7

No >> Repair the (R14) Right Side Impact Sensor 1 Signal circuit for an open or high resistance.
Perform the ORC VERIFICATION TEST - VER 1.



U0175-LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 1 (CONTINUED)

7. CHECK OPERATION OF THE RIGHT SIDE IMPACT SENSOR 1

Replace the Right Side Impact Sensor 1.

Reconnect the vehicle body harness to the impact sensor.

Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery.

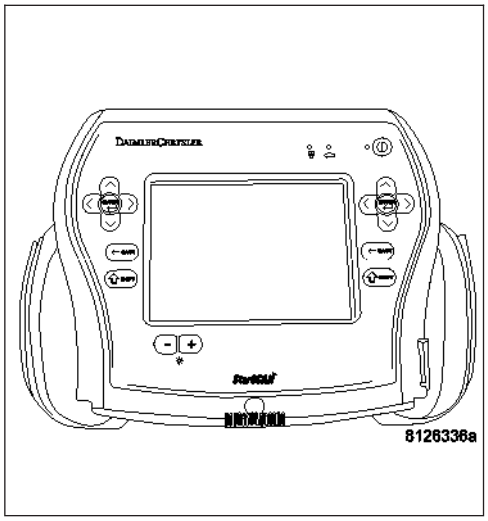
WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Connect the scan tool to the Data Link Connector - use the most current software available.

Use the scan tool and erase the stored codes in all airbag system modules.

Turn the Ignition Off, and wait 15 seconds before turning the Ignition On.

Wait one minute, and read active codes and if there are none present read the stored codes.



Did the active Right Side Impact Sensor 1 DTC return?

Yes >> Go To 8

No >> Repair is complete.
Perform the ORC VERIFICATION TEST - VER 1.

---

8. REPLACE THE OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Instructions.
Perform the ORC VERIFICATION TEST - VER 1.

U0175-LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 1 (CONTINUED)

9. TEST FOR AN INTERMITTENT CONDITION

With the scan tool, record and erase all DTC's from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

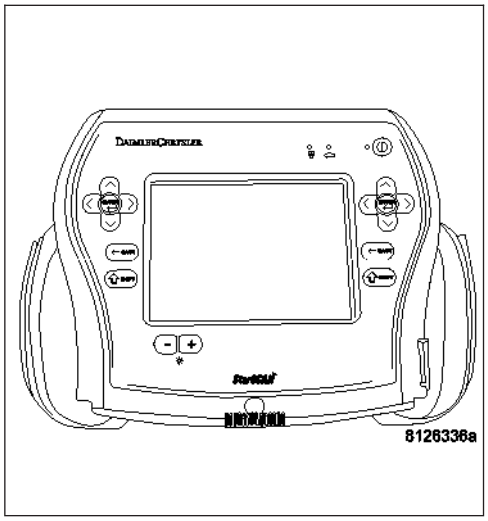
Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.



WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return continue the test until the problem area has been isolated.

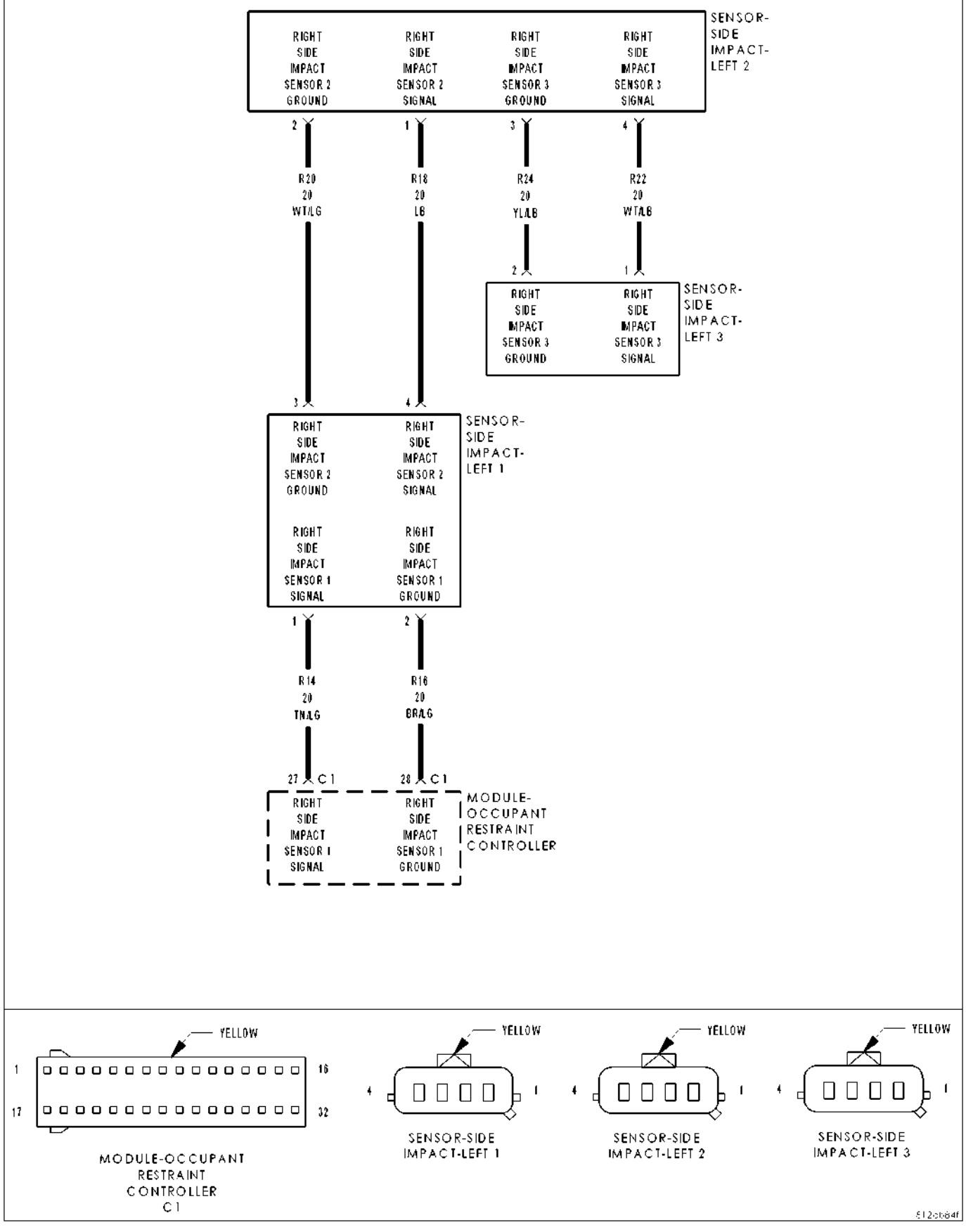
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer.

U0176-LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 2



U0176-LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 2 (CONTINUED)

For the Airbag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  The Occupant Restraint Controller (ORC) continuously communicates with the Right Side Impact Sensor 2 over the sensor signal circuit. The sensor communication and on board diagnostics are powered by the ORC signal.
- **Set Condition:**
  This code will set, if the ORC and the Right Side Impact Sensor 2 do not establish and maintain valid data communications.

Possible Causes
(R18) SIGNAL CIRCUIT SHORTED TO BATTERY
(R18) SIGNAL CIRCUIT SHORTED TO GROUND
(R18, R20) RIGHT SIDE IMPACT SENSOR 2 CIRCUITS SHORTED TOGETHER
(R20) RIGHT SIDE IMPACT SENSOR 2 GROUND CIRCUIT OPEN
(R18) RIGHT SIDE IMPACT SENSOR 2 SIGNAL CIRCUIT OPEN
ORC, RIGHT SIDE IMPACT SENSOR 2

Diagnostic Test

1. VERIFY THAT DTC U0176- LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 2

Turn the ignition on.

With the scan tool, read ORC DTCs.

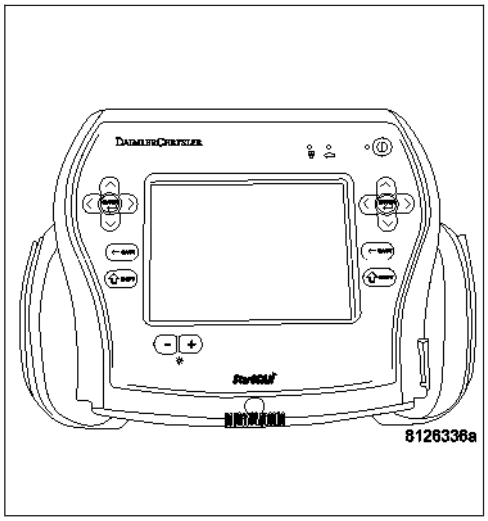
NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

Does the scan tool display active: U0176- LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 2?

Yes >> Go To 2

No >> Go To 9

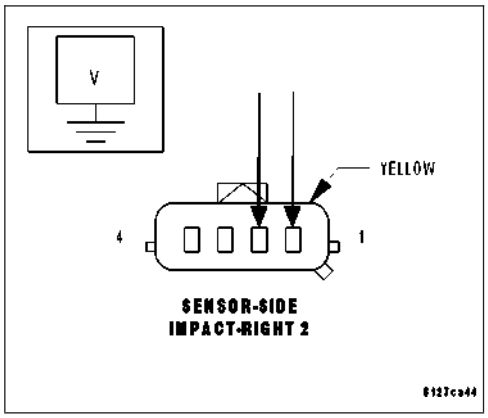


U0176-LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 2 (CONTINUED)

2. CHECK THE (R18, R20) RIGHT SIDE IMPACT SENSOR 2 SIGNAL AND GROUND CIRCUITS FOR A SHORT TO BATTERY

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Right front Impact Sensor 2 connector.
Disconnect the ORC connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
Measure the voltage of the (R18) Right Side Impact Sensor 2 Signal circuit and (R20) Sensor Ground circuit at the Right Side Impact Sensor 2 connector and ground.



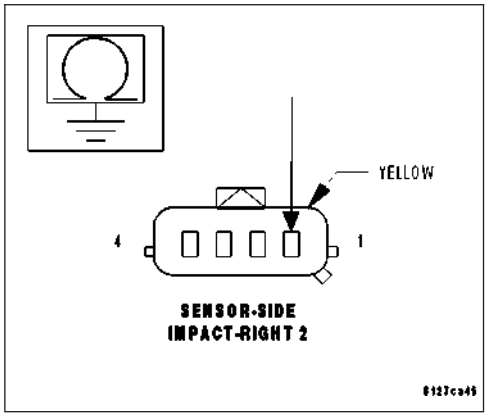
Is there any voltage present?

Yes >> Repair the (R18, R20) Right Side Impact Sensor 2 circuits for a short to battery.
Perform the ORC VERIFICATION TEST - VER 1.

No >> Go To 3

3. CHECK THE (R18) RIGHT SIDE IMPACT SENSOR 2 SIGNAL CIRCUIT FOR A SHORT TO GROUND

WARNING: To avoid personal injury or death, turn ignition on, then reconnect the battery.
Measure the resistance of the (R18) Right Side Impact Sensor 2 Signal circuit between the Right Side Impact Sensor 2 connector and ground.



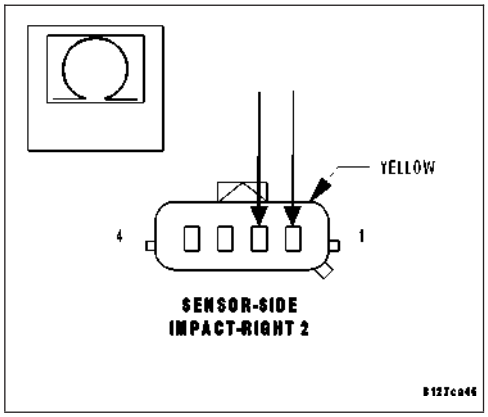
Is the resistance below 100K ohms?

Yes >> Repair the (R18) Right Side Impact Sensor 2 Signal circuit for a short to ground.
Perform the ORC VERIFICATION TEST - VER 1.

No >> Go To 4

4. CHECK THE (R18, R20) RIGHT SIDE IMPACT SENSOR CIRCUITS FOR A SHORT TOGETHER

Measure the resistance between the (R18) Right Side Impact Sensor 2 Signal and (R20) Sensor Ground circuits at the Right Side Impact Sensor 2 connector.



Is the resistance below 100K ohms?

Yes >> Repair the (R18, R20) Right Side Impact Sensor 2 circuits shorted together.
Perform the ORC VERIFICATION TEST - VER 1.

No >> Go To 5

U0176-LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 2 (CONTINUED)

5. CHECK THE (R18) RIGHT SIDE IMPACT SENSOR 2 GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

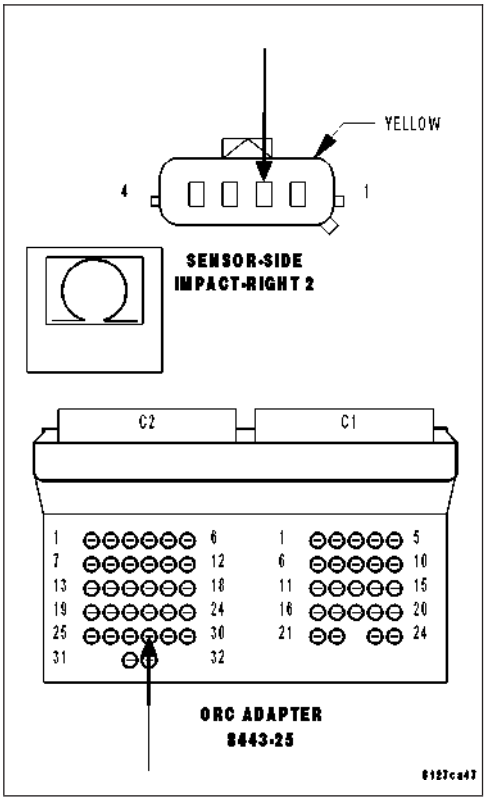
Connect the 8443 Load Tool ORC Adaptor to the Occupant Control Module connector.

Measure the resistance of the (R20) Right Side Impact Sensor 2 Ground circuit between the Right Side Impact Sensor 2 connector and the 8443 Load Tool ORC Adaptor.

Is the resistance below 1 ohm?

Yes >> Go To 6

No >> Repair the (R20) Right Side Impact Sensor 2 Ground circuit for an open or high resistance.
Perform the ORC VERIFICATION TEST - VER 1.



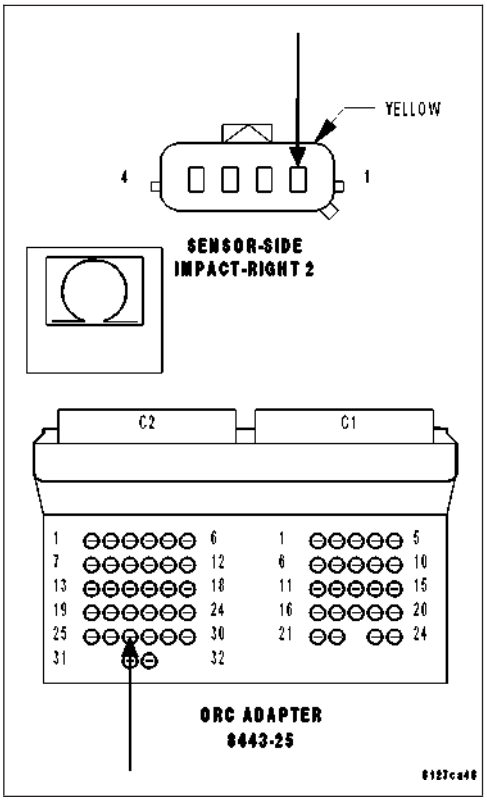
6. CHECK THE (R18) RIGHT SIDE IMPACT SENSOR 2 CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

Measure the resistance of the (R18) Right Side Impact Sensor 2 Signal circuit between the Right Side Impact Sensor 2 connector and the 8443 Load Tool ORC Adaptor.

Is the resistance below 1 ohm?

Yes >> Go To 7

No >> Repair the (R18) Right Side Impact Sensor 2 Signal circuit for an open or high resistance.
Perform the ORC VERIFICATION TEST - VER 1.



U0176-LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 2 (CONTINUED)

7. CHECK OPERATION OF THE RIGHT SIDE IMPACT SENSOR 2

Replace the Right Side Impact Sensor 2.

Reconnect the vehicle body harness to the impact sensor.

Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery.

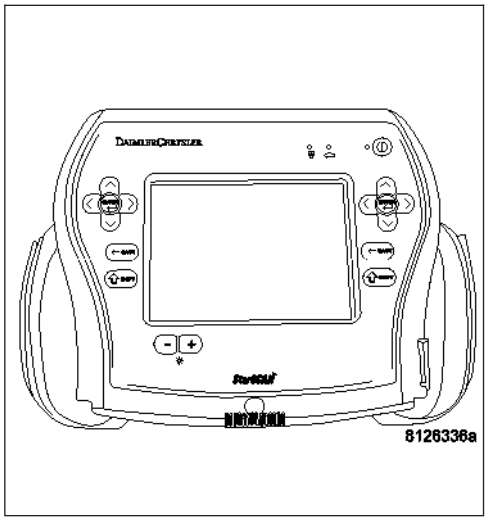
WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Connect the scan tool to the Data Link Connector - use the most current software available.

Use the scan tool and erase the stored codes in all airbag system modules.

Turn the Ignition Off, and wait 15 seconds before turning the Ignition On.

Wait one minute, and read active codes and if there are none present read the stored codes.



Did the active Right Side Impact Sensor 2 DTC return?

Yes >> Go To 8

No >> Repair is complete.
Perform the ORC VERIFICATION TEST - VER 1.

---

8. REPLACE THE OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Instructions.
Perform the ORC VERIFICATION TEST - VER 1.

U0176-LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 2 (CONTINUED)

9. TEST FOR AN INTERMITTENT CONDITION

With the scan tool, record and erase all DTC's from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

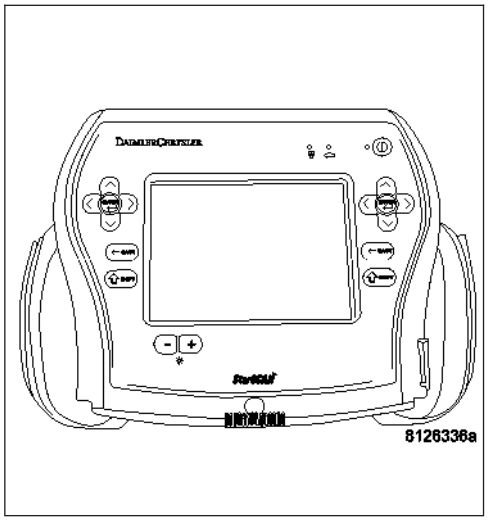
WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.



WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return continue the test until the problem area has been isolated.

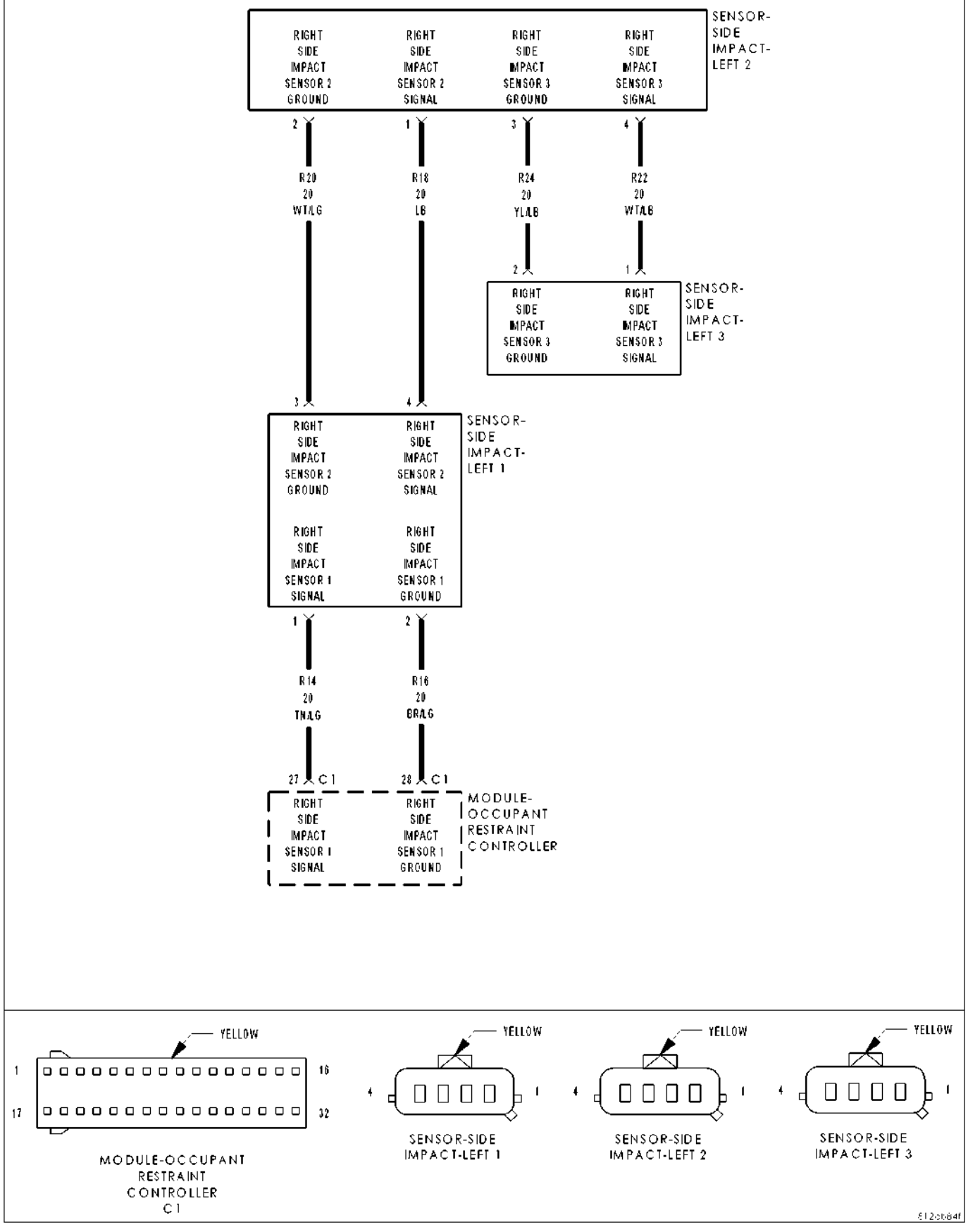
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer.

U0177-LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 3



U0177-LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 3 (CONTINUED)

For the Airbag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  The Occupant Restraint Controller (ORC) continuously communicates with the Right Side Impact Sensor 3 over the sensor signal circuit. The sensor communication and on board diagnostics are powered by the ORC signal.
- **Set Condition:**
  This code will set, if the ORC and the Right Side Impact Sensor 3 do not establish and maintain valid data communications.

Possible Causes
(R22) SIGNAL CIRCUIT SHORTED TO BATTERY
(R22) SIGNAL CIRCUIT SHORTED TO GROUND
(R22, R24) RIGHT SIDE IMPACT SENSOR 3 CIRCUITS SHORTED TOGETHER
(R22) RIGHT SIDE IMPACT SENSOR 3 GROUND CIRCUIT OPEN
(R22) RIGHT SIDE IMPACT SENSOR 3 SIGNAL CIRCUIT OPEN
ORC, RIGHT SIDE IMPACT SENSOR 3

Diagnostic Test

1. VERIFY THAT DTC U0177- LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 3

NOTE: Ensure the battery is fully charged.

NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

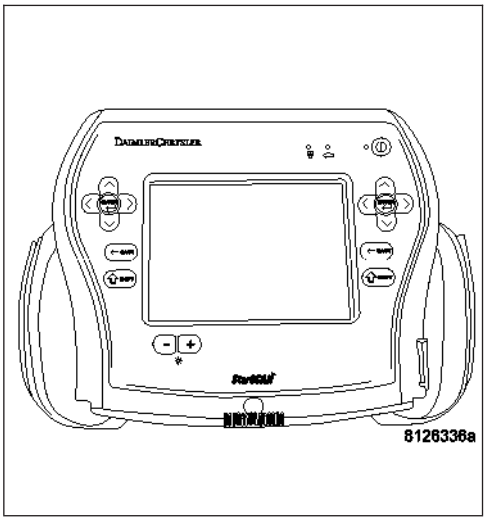
Turn the ignition on.

With the scan tool, read ORC DTCs.

Does the scan tool display active: U0177- LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 3?

Yes >> Go To 2

No >> Go To 9

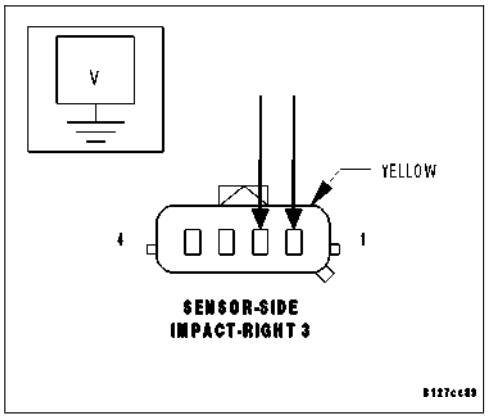


U0177-LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 3 (CONTINUED)

2. CHECK THE (R22, R24) RIGHT SIDE IMPACT SENSOR 3 SIGNAL AND GROUND CIRCUITS FOR A SHORT TO BATTERY

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.
Disconnect the Right front Impact Sensor 3 connector.
Disconnect the ORC connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.
Measure the voltage of the (R22) Right Side Impact Sensor 3 Signal circuit and (R24) Sensor Ground circuit at the Right Side Impact Sensor 3 connector and ground.



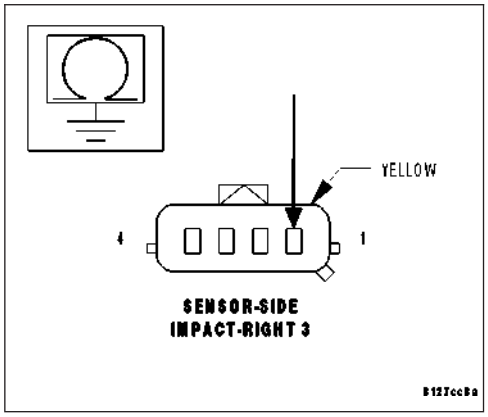
Is there any voltage present?

Yes >> Repair the (R22, R24) Right Side Impact Sensor 3 circuits for a short to battery.
Perform the ORC VERIFICATION TEST - VER 1.

No >> Go To 3

3. CHECK THE (R22) RIGHT SIDE IMPACT SENSOR 3 SIGNAL CIRCUIT FOR A SHORT TO GROUND

WARNING: To avoid personal injury or death, turn ignition on, then reconnect the battery.
Measure the resistance of the (R22) Right Side Impact Sensor 3 Signal circuit between the Right Side Impact Sensor 3 connector and ground.



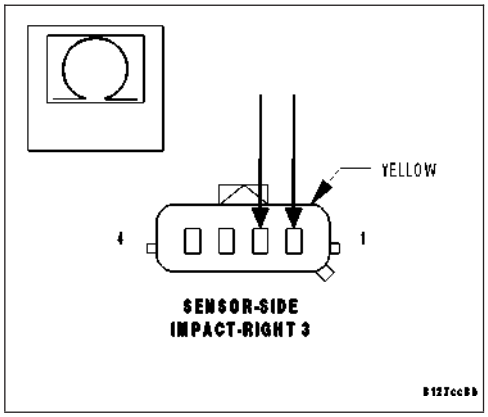
Is the resistance below 100K ohms?

Yes >> Repair the (R22) Right Side Impact Sensor 3 Signal circuit for a short to ground.
Perform the ORC VERIFICATION TEST - VER 1.

No >> Go To 4

4. CHECK THE (R22, R24) RIGHT SIDE IMPACT SENSOR CIRCUITS FOR A SHORT TOGETHER

Measure the resistance between the (R22) Right Side Impact Sensor 3 Signal and (R24) Sensor Ground circuits at the Right Side Impact Sensor 3 connector.



Is the resistance below 100K ohms?

Yes >> Repair the (R22, R24) Right Side Impact Sensor 3 circuits shorted together.
Perform the ORC VERIFICATION TEST - VER 1.

No >> Go To 5

U0177-LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 3 (CONTINUED)

5. CHECK THE (R24) RIGHT SIDE IMPACT SENSOR 3 GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

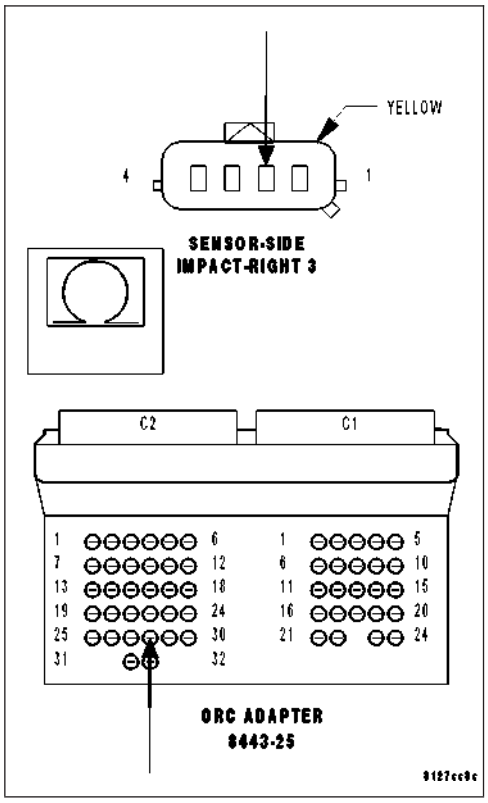
Connect the 8443 Load Tool ORC Adaptor to the Occupant Control Module connector.

Measure the resistance of the (R24) Right Side Impact Sensor 3 Ground circuit between the Right Side Impact Sensor 3 connector and the 8443 Load Tool ORC Adaptor.

Is the resistance below 1 ohm?

Yes >> Go To 6

No >> Repair the (R24) Right Side Impact Sensor 3 Ground circuit for an open or high resistance.
Perform the ORC VERIFICATION TEST - VER 1.



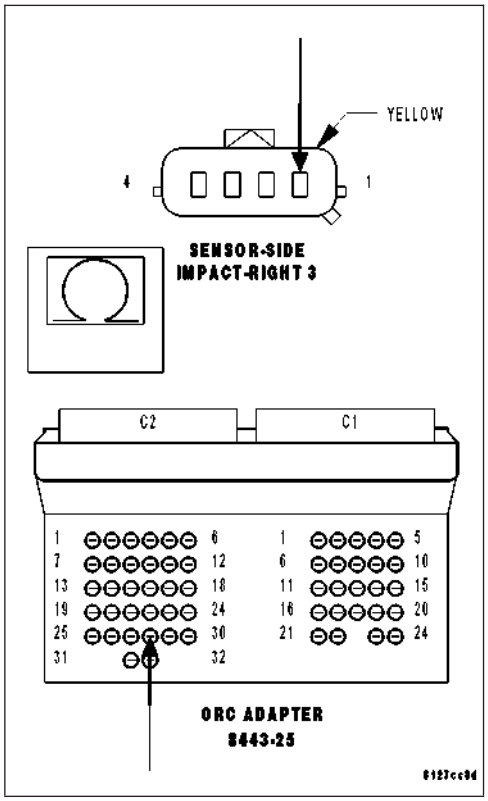
6. CHECK THE (R22) RIGHT SIDE IMPACT SENSOR 3 CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

Measure the resistance of the (R22) Right Side Impact Sensor 3 Signal circuit between the Right Side Impact Sensor 3 connector and the 8443 Load Tool ORC Adaptor.

Is the resistance below 1 ohm?

Yes >> Go To 7

No >> Repair the (R22) Right Side Impact Sensor 3 Signal circuit for an open or high resistance.
Perform the ORC VERIFICATION TEST - VER 1.



U0177-LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 3 (CONTINUED)

7. CHECK OPERATION OF THE RIGHT SIDE IMPACT SENSOR 3

Replace the Right Side Impact Sensor 3.

Reconnect the vehicle body harness to the impact sensor.

Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery.

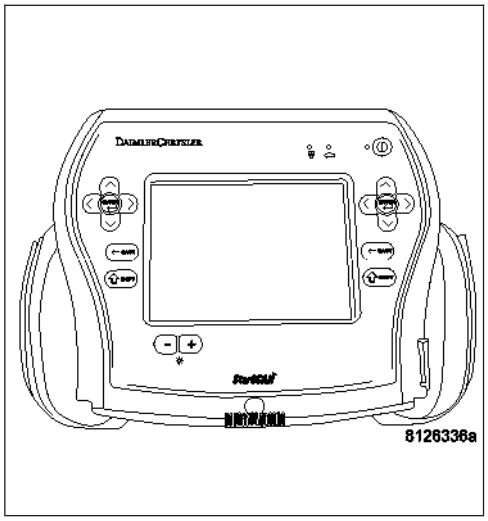
WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Connect the scan tool to the Data Link Connector - use the most current software available.

Use the scan tool and erase the stored codes in all airbag system modules.

Turn the Ignition Off, and wait 15 seconds before turning the Ignition On.

Wait one minute, and read active codes and if there are none present read the stored codes.



Did the active Right Side Impact Sensor 3 DTC return?

Yes >> Go To 8

No >> Repair is complete.
Perform the ORC VERIFICATION TEST - VER 1.

---

8. REPLACE THE OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

If there are no possible causes remaining, view repair.

Repair

Replace the Occupant Restraint Controller in accordance with Service Instructions.
Perform the ORC VERIFICATION TEST - VER 1.

U0177-LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 3 (CONTINUED)

9. TEST FOR AN INTERMITTENT CONDITION

With the scan tool, record and erase all DTC's from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

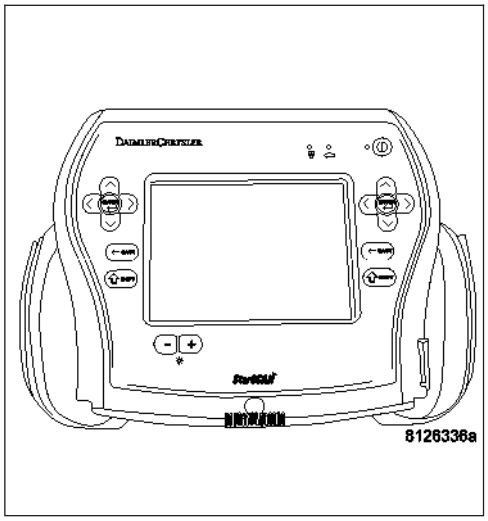
Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.



WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

Are any ACTIVE DTCs present?

Yes >> Select the appropriate symptom from Symptom List.

No >> No problem found at this time. Erase all codes before returning vehicle to customer.

U0184-LOST COMMUNICATION WITH RADIO

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0186-LOST COMMUNICATION WITH AUDIO AMPLIFIER

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0195-LOST COMMUNICATION WITH SDARS

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0196-LOST COMMUNICATION WITH VEHICLE ENTERTAINMENT CONTROL MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0197-LOST COMMUNICATION WITH HANDS FREE PHONE MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0199-LOST COMMUNICATION WITH DRIVER DOOR MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0200-LOST COMMUNICATION WITH PASSENGER DOOR MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0208-LOST COMMUNICATION WITH HEATED SEAT CONTROL MODULE

For a complete wiring diagram **Refer to Section 8W**.

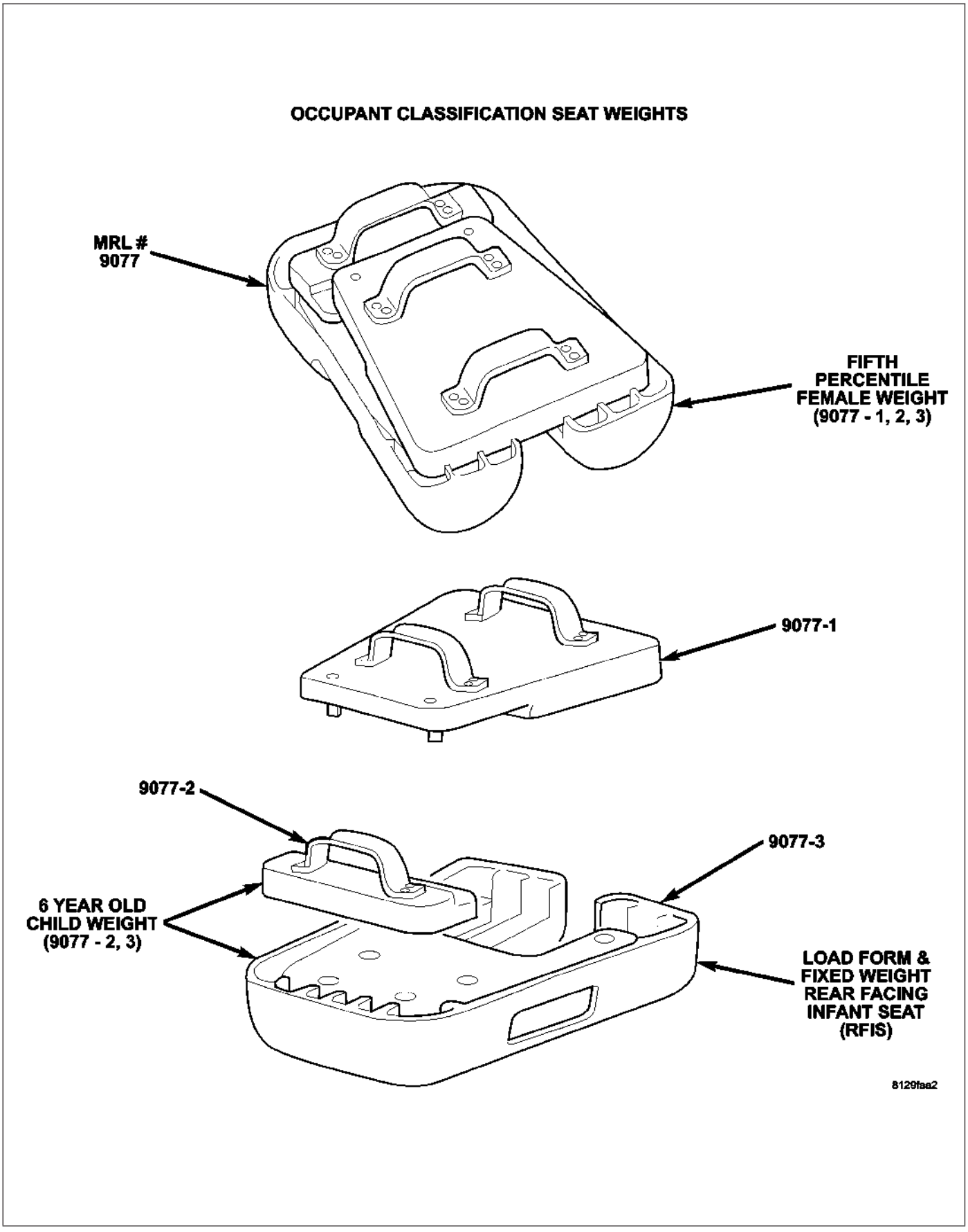
(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0209-LOST COMMUNICATION WITH MEMORY SEAT CONTROL MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

*DIAGNOSIS AND CHECKOUT PROCEDURE FOR SEAT WEIGHT SENSORS



OCS SEAT WEIGHTS MRL #9077

***DIAGNOSIS AND CHECKOUT PROCEDURE FOR SEAT WEIGHT SENSORS (CONTINUED)**

1. VERIFY COMPLAINT

Turn the ignition off.

Move the front passenger seat to the full rear position. Verify that the seat is empty, the seat back is in the normal upright position, and that the seat is not interfering with any interior components.

Verify that all related connectors are properly seated and locked.

Turn the ignition on.

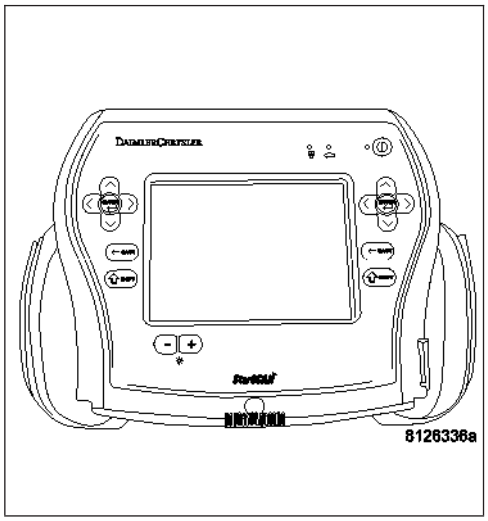
With the scan tool in OCM, select Data Display and note the Passenger Seat Weight Sensor voltage for all four sensors (Left Front, Right Front, Left Rear and Right Rear).

Move the front passenger seat to the mid track position.

Using the scan tool, note the Passenger Seat Weight Sensor voltage for all four sensors.

Move the front passenger seat to the full forward position.

Using the scan tool, note the Passenger Seat Weight Sensor voltage for all four sensors. The voltage should be from 1.4 to 3.6 volts for each sensor in each position (full rear, mid track, and full forward).



Is any sensor's voltage reading out of the acceptable range in any position?

Yes >> Go To 2

No >> Perform test B1BA7 Occupant Classification System Verification Required. If the test passes, the seat weight sensing system is working properly. Return to the procedure that directed you to this procedure.

---

2. BENT FLOOR PAN

Turn the ignition off.

Loosen all of the mounting screws retaining the front passenger seat to the vehicle crossmembers, but do not remove them. Verify that the seat is loose and that no binding exists between the seat and the crossmembers.

Move the front passenger seat to the full rear position and then to the full forward position.

Tighten all of the mounting screws to specification. Refer to 23 - BODY/SEATS.

Move the front passenger seat to the full rear position.

Turn the ignition on.

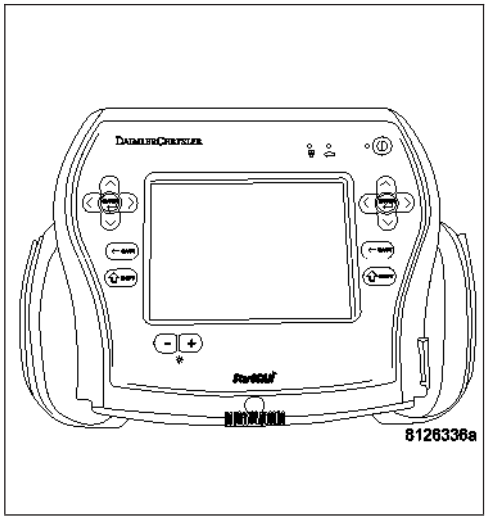
Using the scan tool, note the Passenger Seat Weight Sensor voltage for all four sensors.

Move the front passenger seat to the mid track position.

Using the scan tool, note the Passenger Seat Weight Sensor voltage for all four sensors.

Move the front passenger seat to the full forward position.

Using the scan tool, note the Passenger Seat Weight Sensor voltage for all four sensors. The voltage should be from 1.4 to 3.6 volts for each sensor in each position.



Is any sensor's voltage reading out of the acceptable range in any position?

Yes >> Go To 3

No >> Perform test B1BA7 Occupant Classification System Verification Required. If the test passes, the seat weight sensing system is working properly. Return to the procedure that directed you to this procedure.

***DIAGNOSIS AND CHECKOUT PROCEDURE FOR SEAT WEIGHT SENSORS (CONTINUED)**

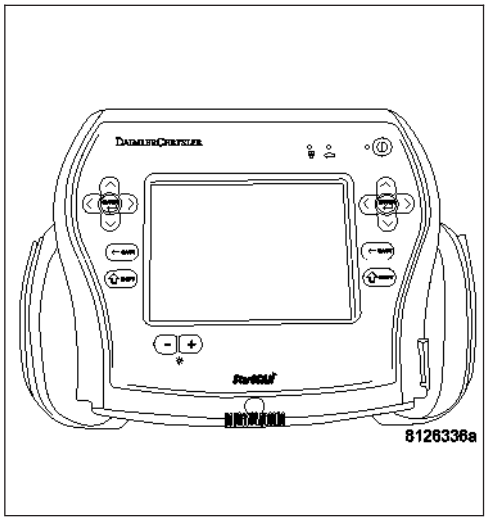
3. SEAT TO RISER STRESS

Turn the ignition off.

Loosen all of the mounting screws retaining the front passenger seat track to the riser, but do not remove them. Verify that the seat track is loose and that no binding exists between the seat track and the risers.

Turn the ignition on.

Using the scan tool, note the Passenger Seat Weight Sensor voltage for all four sensors. The voltage should be from 1.5 to 3.5 volts for each sensor.



Is any sensor's voltage reading out of the acceptable range?

Yes >> Go To 4

No >> Visually inspect for damaged or bent risers and crossmembers. Also, verify that the riser holes line up with the seat mounts in the crossmembers.

If riser damage is apparent, replace the risers in accordance with the Service Information. Then, reinstall the Seat Weight Sensors, and Go To 6.

NOTE: Failure to follow test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: Verify That All Tests Steps That Led You Here Were Performed As Directed; Verify That The Ignition Is In Run; Wait 30 Seconds After Changing The Seat Weight Before Proceeding To Allow The System To Stabilize; Only Press Scan Tool Buttons When Directed To Do So; & Perform The Occupant Classification Module System Verification Test To Completion.

If crossmember or floorpan damage is present, repair or replace the components as necessary in accordance with the Service Information. Reinstall the seat in the vehicle in accordance with the Service Information. Turn the ignition on. With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the directions displayed on the scan tool. When the test is complete, Go To 1.

---

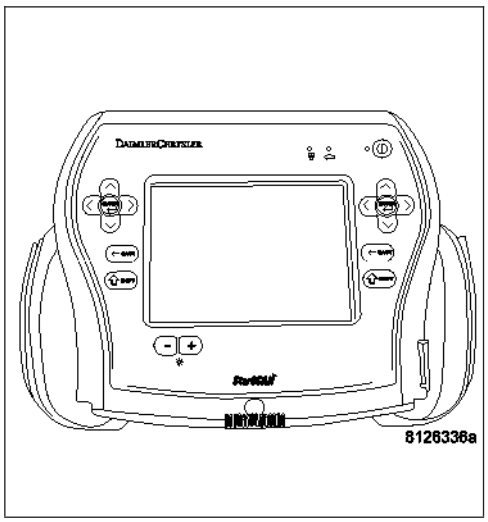
4. SEAT FRAME

Turn the ignition off.

Remove the front passenger seat from the risers in accordance with the Service Information. Return the risers to their normal mounting position.

Turn the ignition on.

Using the scan tool, note the Passenger Seat Weight Sensor voltage for all four sensors. The voltage should be from 1.4 to 3.6 volts for each sensor.



Is any sensor's voltage reading out of the acceptable range?

Yes >> Go To 5

No >> Visually inspect for damaged or bent risers, a damaged or bent seat and seat structure, and damaged or bent seat tracks. Also, verify that the holes in the center of the sensors line up with the seat track holes.

If riser damage is apparent, replace the risers in accordance with the Service Information. Then, reinstall the Seat Weight Sensors, and Go To 6.

If seat or seat track damage is present, replace the components as necessary in accordance with the Service Information. Then, Go To 7.

***DIAGNOSIS AND CHECKOUT PROCEDURE FOR SEAT WEIGHT SENSORS (CONTINUED)**

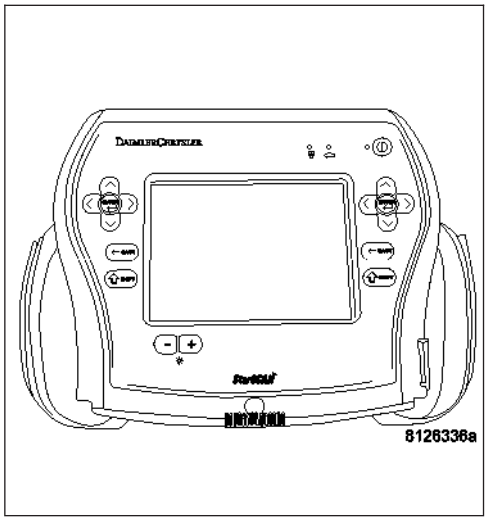
5. SENSOR TEST

Turn the ignition off.

Loosen the mounting screws of all of the Seat Weight Sensors, but do not remove them. Verify that the sensors are loose and that no binding exists between the sensors and the risers.

Turn the ignition on.

Using the scan tool, note the Passenger Seat Weight Sensor voltage for all four sensors. The voltage should be from 1.4 to 3.6 volts for each sensor.



Is any sensor's voltage reading out of the acceptable range?

Yes >> Replace any Seat Weight Sensors that have an unacceptable voltage reading in accordance with the Service Information. Then, Go To 6.

No >> Replace the risers in accordance with the Service Information. Then, reinstall the Seat Weight Sensors, and Go To 6.

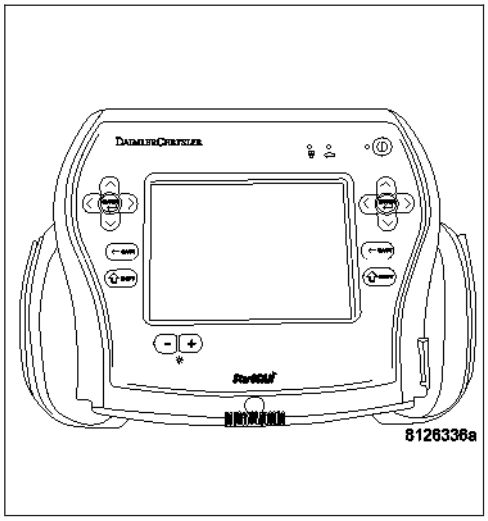
6. TORQUE SEAT WEIGHT SENSORS

Turn the ignition off.

Tighten all of the Seat Weight Sensor mounting screws to specification. Refer to 23 - BODY/SEATS.

Turn the ignition on.

Using the scan tool, note the Passenger Seat Weight Sensor voltage for all four sensors. The voltage should be from 1.4 to 3.6 volts for each sensor.



Is any sensor's voltage reading out of the acceptable range?

Yes >> Loosen the mounting screws of all Seat Weight Sensors with an unacceptable voltage reading, and repeat Steps 5 and 6.

No >> Go To 7

***DIAGNOSIS AND CHECKOUT PROCEDURE FOR SEAT WEIGHT SENSORS (CONTINUED)**

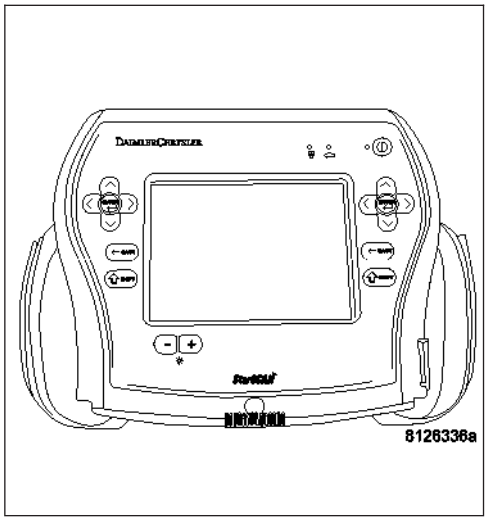
7. SEAT TRACKS

Turn the ignition off.

Mount the front passenger seat on the risers in accordance with service information.

Turn the ignition on.

Using the scan tool, note the Passenger Seat Weight Sensor voltage for all four sensors. The voltage should be from 1.4 to 3.6 volts for each sensor.



Is any sensor's voltage reading out of the acceptable range?

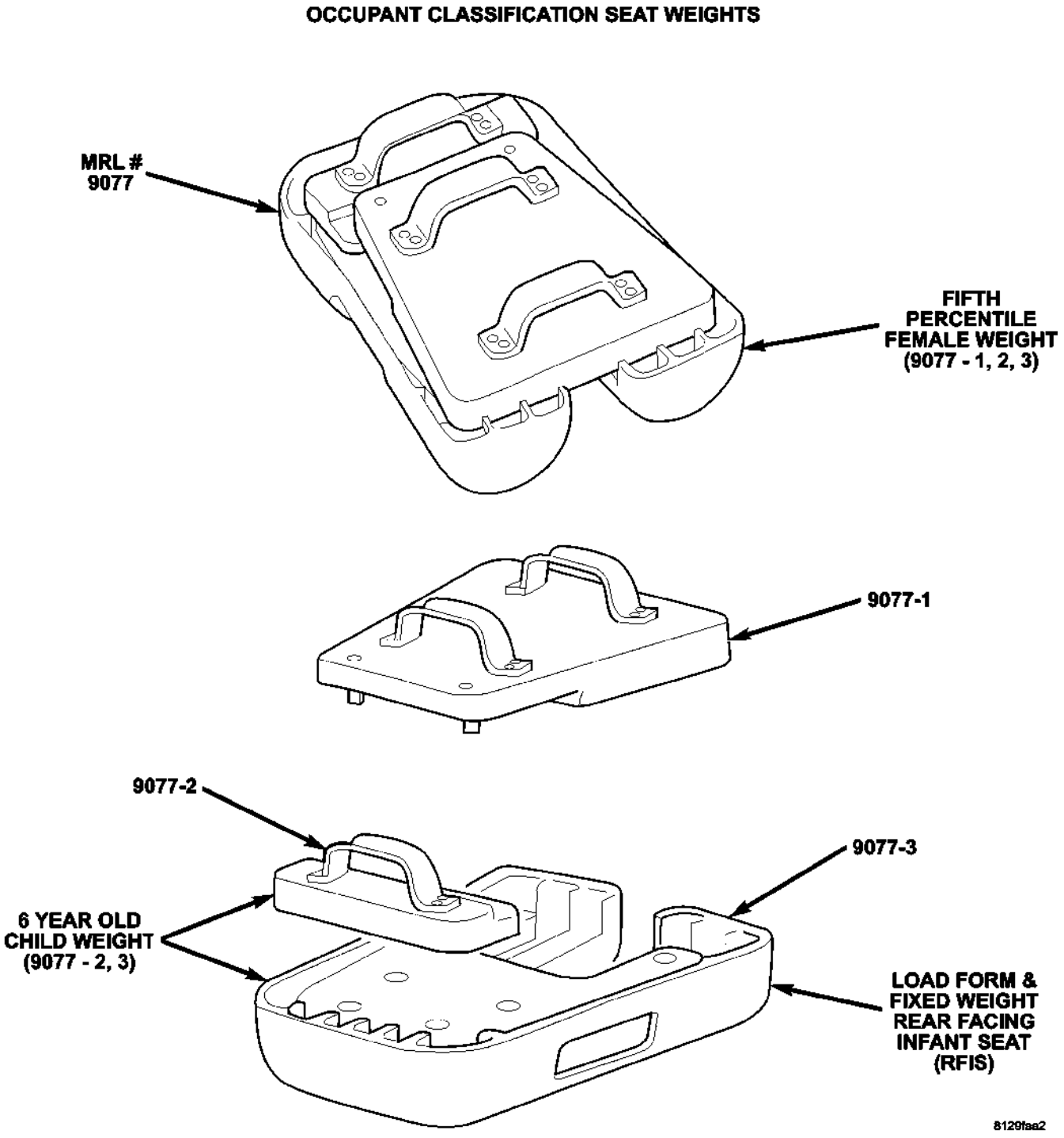
Yes >> Replace the seat track in accordance with the Service Information. Verify that no binding exists between the seat and risers. Then, repeat Steps 6 and 7.

No >>

NOTE: Failure to follow test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: Verify That All Tests Steps That Led You Here Were Performed As Directed; Verify That The Ignition Is In Run; Wait 30 Seconds After Changing The Seat Weight Before Proceeding To Allow The System To Stabilize; Only Press Scan Tool Buttons When Directed To Do So; & Perform The Occupant Classification Module System Verification Test To Completion.

Reinstall the seat in the vehicle in accordance with the Service Information. Turn the ignition on. With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed by the scan tool. When the test is complete, Go To 1.

*OCS VERIFICATION TEST - VER 1



***OCS VERIFICATION TEST - VER 1 (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W**.

1.

1. Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery.

WARNING: TO AVOID PERSONAL INJURY OR DEATH, TURN THE IGNITION ON THEN RECONNECT THE BATTERY.

2. Connect the scan tool to the Data Link Connector - use the most current software available.

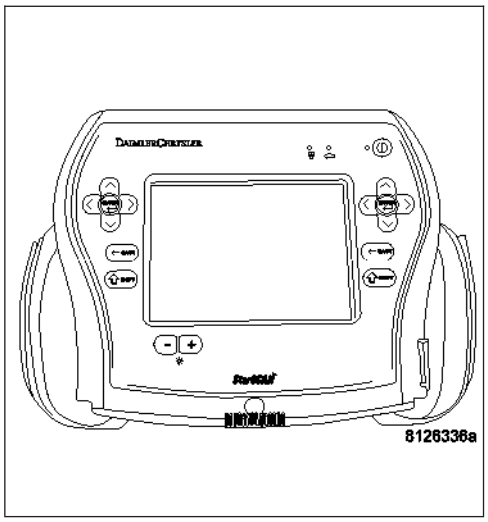
3. With the scan tool to erase stored DTCs in all airbag system modules.

4. Turn the ignition off, and wait 15 seconds, then turn the ignition on.

5. Wait one minute, and read active codes and if there are none present read the stored codes.

6. Note: Read the DTC's in all airbag system related modules.

7. If the scan tool shows any active or stored codes, return to the Table of Content and follow path specified for that trouble code. If no active or stored codes are present, the repair is complete.



Are any DTC's present or is the original condition still present?

Yes >> Repair is not complete, refer to appropriate symptom list.

No >> Repair is complete.

*ORC VERIFICATION TEST - VER 1

For a complete wiring diagram **Refer to Section 8W**.

1.

1. Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery.

WARNING: TO AVOID PERSONAL INJURY OR DEATH, TURN THE IGNITION ON THEN RECONNECT THE BATTERY.

2. Connect the scan tool to the Data Link Connector - use the most current software available.

3. With the scan tool to erase stored DTCs in all airbag system modules.

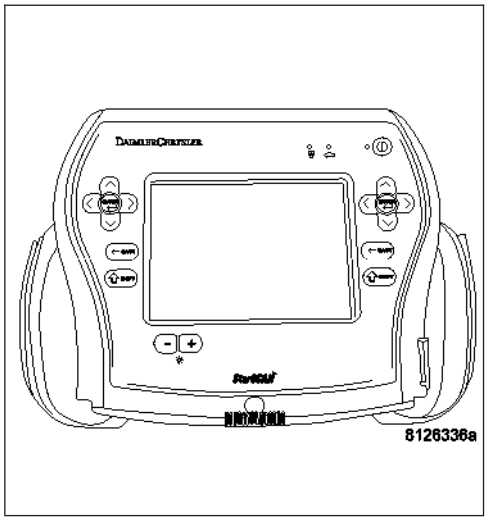
4. Turn the ignition off, and wait 15 seconds, then turn the ignition on.

5. Wait one minute, and read active codes and if there are none present read the stored codes.

6. Note: If equipped with Airbag On - Off switch, read the DTC's in all switch positions.

7. Note: Read the DTC's in all airbag system related modules.

8. If the scan tool shows any active or stored codes, return to the Table of Contents and follow path specified for that trouble code. If no active or stored codes are present, the repair is complete.



Are any DTC's present or is the original condition still present?

Yes >> Repair is not complete, refer to appropriate symptom list.

No >> Repair is complete.

U1414-IMPLAUSIBLE/MISSING ECU CONFIGURATION DATA

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. The ORC on board diagnostics continuously monitors the CAN Bus message from the FCM containing the ORC Configuration Data.
- **Set Condition:**
  This DTC will set if the appropriate CAN Bus message is not received by the ORC.

Possible Causes
FRONT CONTROL MODULE

Diagnostic Test

1. FRONT CONTROL MODULE FAILURE

Turn the ignition on.

With the scan tool, read FCM DTCs.

Does the scan tool display any Front Control Module DTCs?

Yes >> Select appropriate symptom from Symptom List. Repair all FCM active DTCs and before diagnosing the ORC DTCs.

No >> Replace the Front Control Module in accordance with the Service Information.
Perform the ORC VERIFICATION TEST-VER. 1

U1415-IMPLAUSIBLE/MISSING VEHICLE CONFIGURATION DATA

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. The ORC on board diagnostics loads the ORC Configuration Data from the FCM CAN Bus message.
- **Set Condition:**
  This DTC will set if the CAN Bus message was received but the information is invalid or corrupt.

Possible Causes
OCCUPANT RESTRAINT CONTROLLER (ORC)

Diagnostic Test

1. OCCUPANT RESTRAINT CONTROLLER

WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

WARNING: If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

Disconnect the ORC harness connector(s).

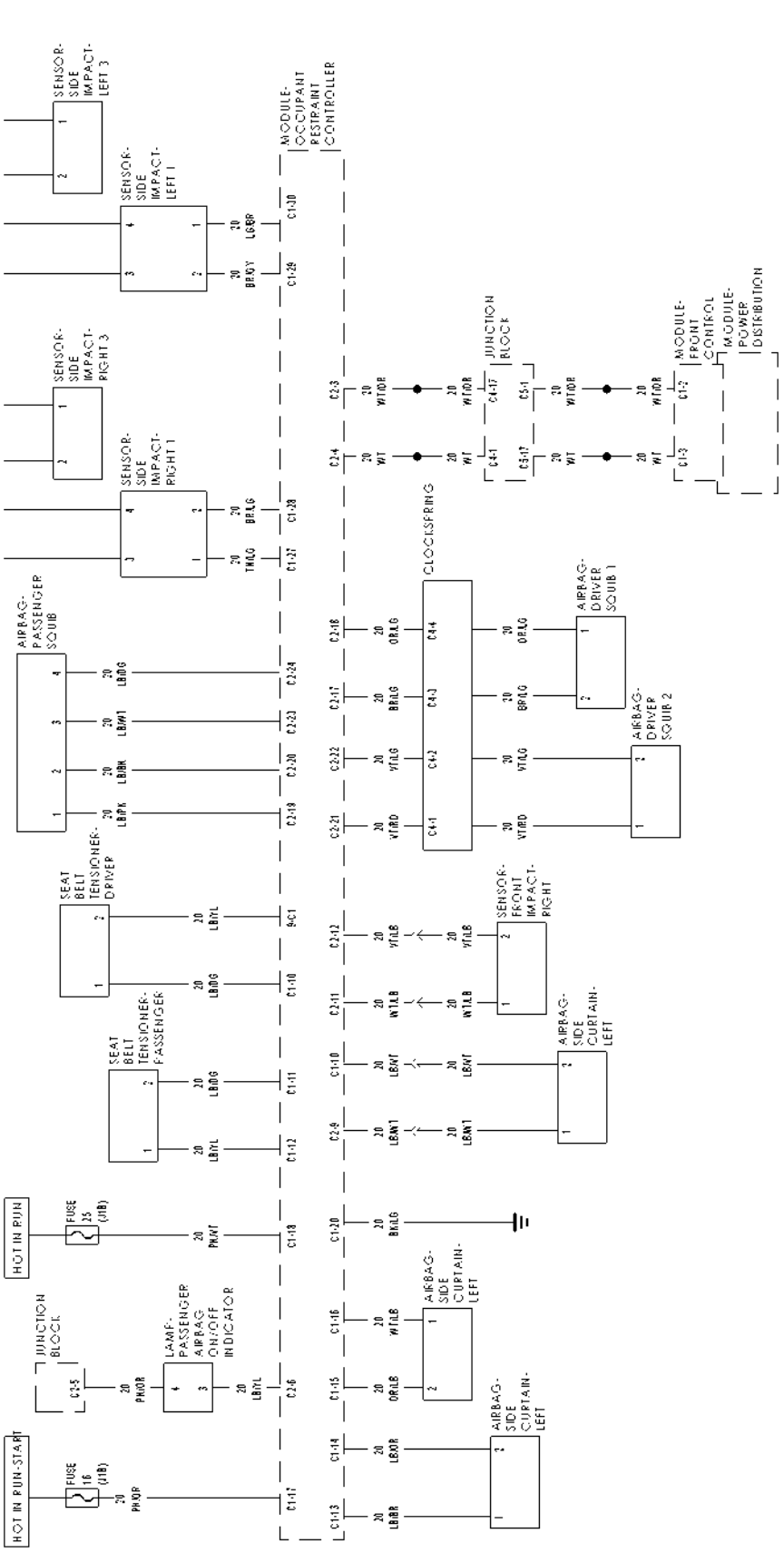
NOTE: Check connectors - Clean and repair as necessary.

NOTE: When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

Repair

Replace the Occupant Restraint Controller in accordance with Service Information.Perform the ORC VERIFICATION TEST-VER. 1

SCHEMATICS AND DIAGRAMS



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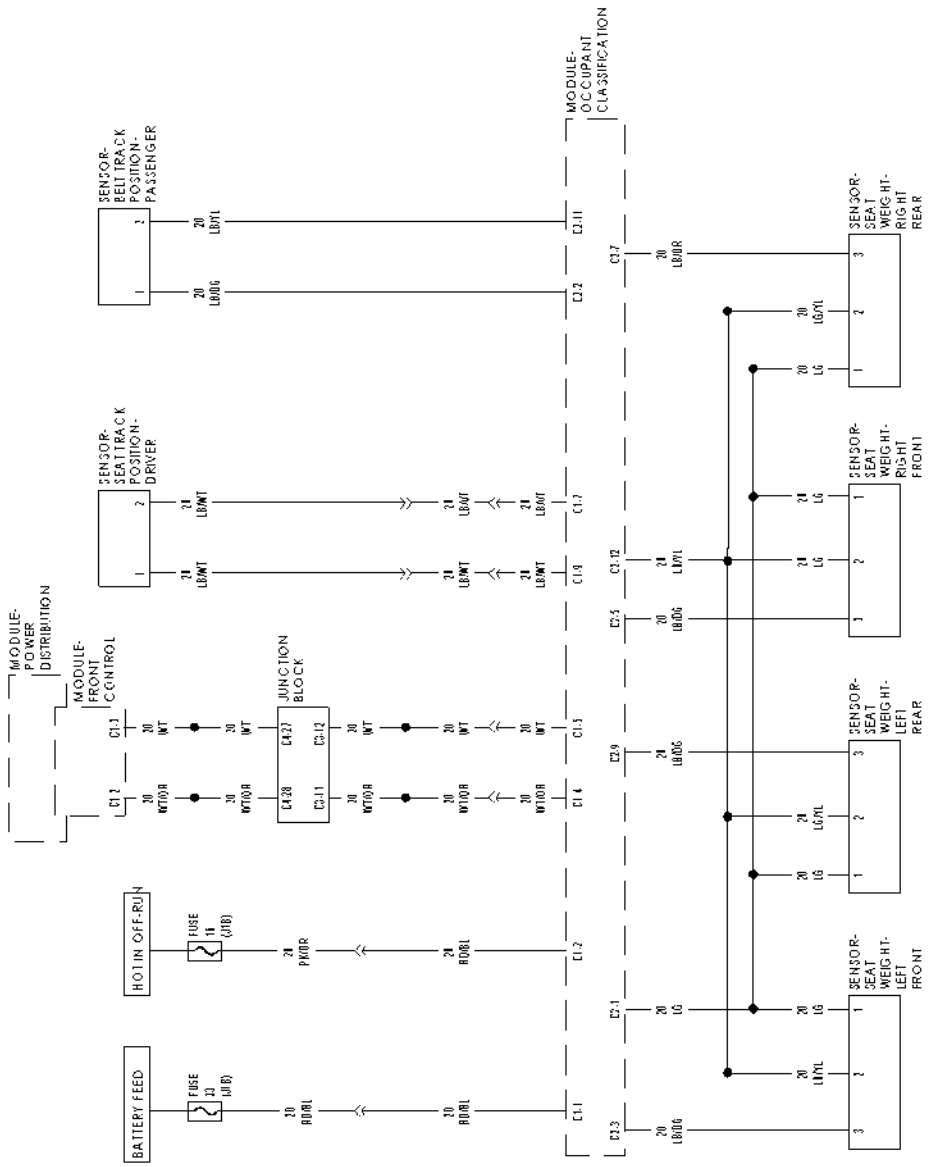
OCCUPANT RESTRAINT CONTROLLER SYSTEM



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OCCUPANT CLASSIFICATION SYSTEM

RESTRAINTS - SERVICE INFORMATION

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RESTRAINTS - SERVICE INFORMATION

DESCRIPTION

An occupant restraint system is standard factory-installed safety equipment on this model. Available occupant restraints for this model include both active and passive types. Active restraints are those which require the vehicle occupants to take some action to employ, such as fastening a seat belt; while passive restraints require no action by the vehicle occupants to be employed.

ACTIVE RESTRAINTS

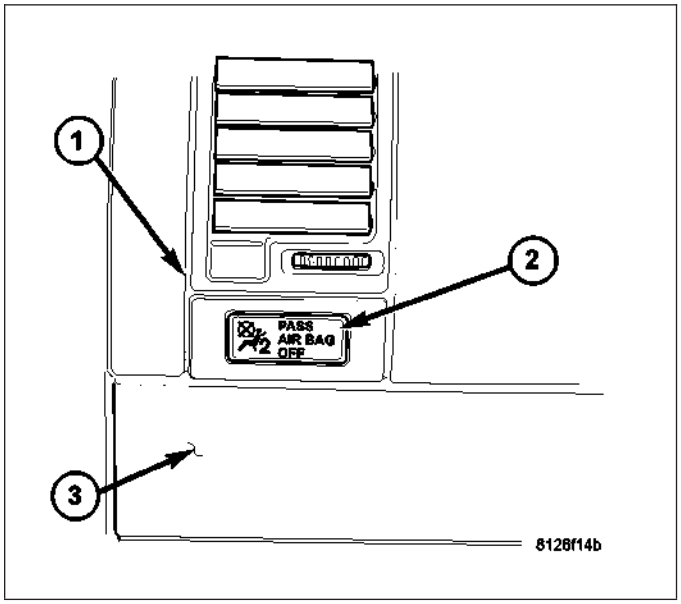
The active restraints for this model include:

- **Front Seat Belts** - Both front seating positions are equipped with three-point seat belt systems employing lower B-pillar mounted inertia latch-type emergency locking retractors, height-adjustable upper B-pillar mounted turning loops, a traveling lower seat belt anchor secured to the outboard side of the seat frame, and a traveling end-release seat belt buckle secured to the inboard side of the seat frame. The driver side front seat belt retractor includes an integral seat belt switch that detects whether the driver side front seat belt has been fastened.
- **Second Row Seat Belts** - All three second row seating positions are equipped with three-point seat belt systems. The outboard seating position belts employ lower C-pillar mounted inertia latch-type emergency locking retractors, height-adjustable upper C-pillar mounted turning loops, self-cinching latch plates for compatibility with child seats, fixed lower seat belt anchors secured to the floor panel and fixed end-release buckles secured to the inboard sides of the two outboard seat cushion frames. The rear seat center seating position belt has an inertia latch-type emergency locking retractor that is switchable to an automatic locking retractor for child seat compatibility. The center position retractor is secured within the center rear seat back panel, and the fixed lower seat belt anchor and the fixed end-release buckle are both secured to opposite sides of the center rear seat cushion frame.
- **Third Row Seat Belts** - In vehicles equipped with the optional third row seat, both third row seating positions are equipped with three-point seat belt systems. These belts employ lower D-pillar mounted inertia latch-type emergency locking retractors, fixed position upper D-pillar mounted turning loops, self-cinching latch plates for compatibility with child seats, fixed lower seat belt anchors secured to the quarter inner panels, and fixed position end-release buckles secured to the floor panel.
- **Child Restraint Anchors** - All vehicles are equipped with three, fixed-position, child seat upper tether anchors for the second row seating. These anchors are integral to the back of each second row seat cushion frame. Two lower anchors are also provided for each outboard second row seating position. These lower anchors are accessed from the front of the rear seat where the seat back meets the seat cushion. Two lower anchors are integral to each outboard second row seat cushion frame.

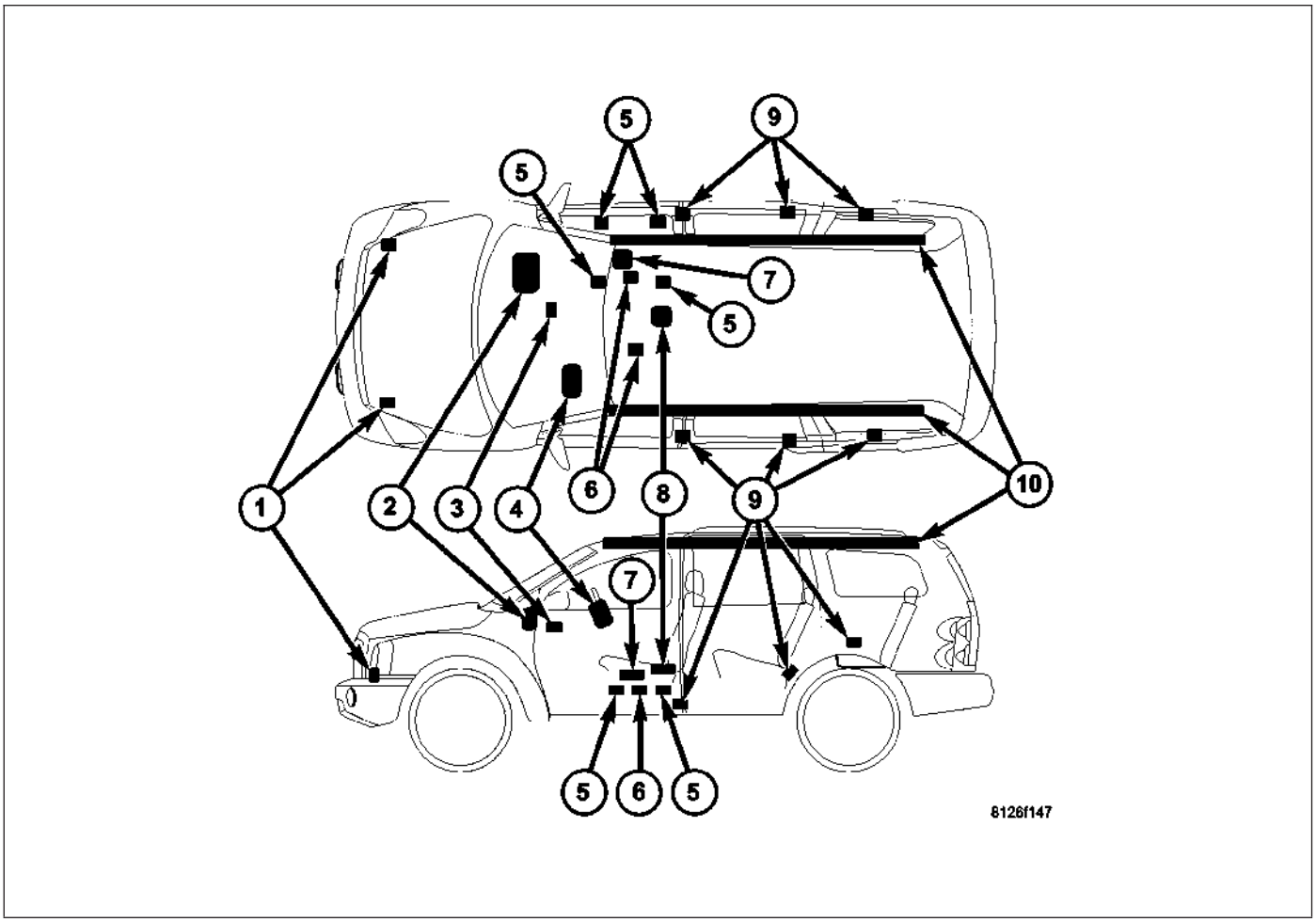
PASSIVE RESTRAINTS

The passive restraints available for this model include the following:

- **Dual Front Airbags** - Multistage driver and front passenger airbags are used in this model. This airbag system is a passive, inflatable, Supplemental Restraint System (SRS) and vehicles with this equipment can be readily identified by the “SRS - AIRBAG” logo molded into the driver airbag trim cover in the center of the steering wheel and also into the passenger airbag door on the top of the instrument panel above the glove box. Vehicles with the airbag system can also be identified by the airbag indicator, which will illuminate in the Electro-Mechanical Instrument Cluster (EMIC) for about seven seconds as a bulb test each time the ignition switch is turned to the On position. A pyrotechnic-type seat belt tensioner is also integral to the driver and passenger front seat belt retractors to work in conjunction with the dual front airbags.



- **Occupant Classification System** - Vehicles manufactured for sale in North America (except Mexico) also include an Occupant Classification System (OCS) with components that are located on the front seats. These components include an Occupant Classification Module (OCM) and four seat weight sensors on the passenger seat, and seat track position sensors on both the driver and passenger seats. Vehicles equipped with the OCS components can be readily identified by a passenger airbag on/off indicator (2) located below the passenger side inboard air outlet on the instrument panel above the glove box.
- **Side Curtain Airbags** - Optional side curtain airbags are available for this model when it is also equipped with dual front airbags. This airbag system is a passive, inflatable, Supplemental Restraint System (SRS) and vehicles with this equipment can be readily identified by a molded identification trim button with the “SRS - AIRBAG” logo located on the headliner above each B-pillar.



The supplemental restraint system includes the following major components, which are described in further detail elsewhere in this service information:

- **Airbag Indicator** - The airbag indicator is integral to the ElectroMechanical Instrument Cluster (EMIC), which is located on the instrument panel in front of the driver.
- **Clockspring** - The clockspring is located near the top of the steering column, directly beneath the steering wheel.
- **Driver Airbag (4)** - The driver airbag is located in the center of the steering wheel, beneath the driver airbag trim cover.
- **Driver Knee Blocker** - The driver knee blocker is a structural unit secured to the back side of and integral to the instrument panel steering column opening cover.
- **Front Impact Sensor (1)** - Two front impact sensors are used on vehicles equipped with dual front airbags, one left side and one right side. One sensor is located on the back side of each vertical member of the radiator support.
- **Occupant Classification Module (7)** - Vehicles equipped with the Occupant Classification System (OCS) include an Occupant Classification Module (OCM) which is secured to the underside of the passenger side front seat cushion frame.
- **Occupant Restraint Controller (8)** - The Occupant Restraint Controller (ORC) is located on a mount on the floor panel transmission tunnel behind the transmission gear selector, and is concealed below the center floor console.
- **Passenger Airbag (2)** - The passenger airbag is located in the instrument panel, beneath the passenger airbag door on the top of the instrument panel above the glove box on the passenger side of the vehicle.
- **Passenger Airbag On/Off Indicator (3)** - The Occupant Classification System (OCS) includes a passenger airbag on/off indicator which is located below the inboard passenger side air outlet on the instrument panel above the glove box.
- **Passenger Knee Blocker** - The passenger knee blocker is a structural reinforcement that is integral to and concealed within the glove box door.

- **Seat Belt Tensioner** - A seat belt tensioner is integral to both front seat belt retractor units on vehicles equipped with dual front airbags. The seat belt retractor and tensioner units are secured to the right and left inner B-pillars and concealed beneath the lower B-pillar trim.
- **Seat Track Position Sensor (6)** - The Occupant Classification System (OCS) includes two seat track position sensors. One sensor is located on the inboard side of one of the seat adjuster tracks on both the driver and the passenger front seats.
- **Seat Weight Sensor (5)** - Vehicles equipped with the Occupant Classification System (OCS) include four seat weight sensors, one on each corner of the passenger side front seat between the seat cushion frame and the seat track.
- **Side Curtain Airbag (10)** - In vehicles equipped with this option, a side curtain airbag is secured to each inside roof side rail, and extends from the A-pillar to the D-pillar. The side curtain airbags are concealed above the headliner trim.
- **Side Impact Sensor (9)** - Six side impact sensors are used on vehicles equipped with the optional side curtain airbags, three on each side of the vehicle. One sensor is located near each right and left side lower B-pillar, C-pillar and D-pillar concealed behind the interior trim.

The ORC, the OCM, and the EMIC each contain a microprocessor and programming that allow them to communicate with each other using the Controller Area Network (CAN) data bus. This method of communication is used by the ORC for control of the airbag indicator in the EMIC. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/COMMUNICATION - DESCRIPTION).

Hard wired circuitry connects the supplemental restraint system components to each other through the electrical system of the vehicle. These hard wired circuits are integral to several wire harnesses, which are routed throughout the vehicle and retained by many different methods. These circuits may be connected to each other, to the vehicle electrical system, and to the supplemental restraint system components through the use of a combination of soldered splices, splice block connectors, and many different types of wire harness terminal connectors and insulators. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, further details on wire harness routing and retention, as well as pin-out and location views for the various wire harness connectors, splices and grounds.

OPERATION

ACTIVE RESTRAINTS

The primary passenger restraints in this or any other vehicle are the standard equipment factory-installed seat belts and child restraint anchors. Seat belts and child restraint anchors are referred to as an active restraint because the vehicle occupants are required to physically fasten and properly adjust these restraints in order to benefit from them. See the owner's manual in the vehicle glove box for more information on the features, use and operation of all of the factory-installed active restraints.

PASSIVE RESTRAINTS

The passive restraints are referred to as a supplemental restraint system because they were designed and are intended to enhance the protection for the occupants of the vehicle **only** when used in conjunction with the seat belts. They are referred to as passive restraints because the vehicle occupants are not required to do anything to make them operate; however, the vehicle occupants must be wearing their seat belts in order to obtain the maximum safety benefit from the factory-installed supplemental restraint system.

The supplemental restraint system electrical circuits are continuously monitored and controlled by a microprocessor and software contained within the Occupant Restraint Controller (ORC). An airbag indicator in the ElectroMechanical Instrument Cluster (EMIC) illuminates for about seven seconds as a bulb test each time the ignition switch is turned to the On or Start positions. Following the bulb test, the airbag indicator is turned on or off by the ORC to indicate the status of the supplemental restraint system. If the airbag indicator comes on at any time other than during the bulb test, it indicates that there is a problem in the supplemental restraint system electrical circuits. Such a problem may cause airbags not to deploy when required, or to deploy when not required.

Deployment of the supplemental restraints depends upon the angle and severity of an impact. Deployment is not based upon vehicle speed; rather, deployment is based upon the rate of deceleration as measured by the forces of gravity (G force) upon the impact sensors. When an impact is severe enough, the microprocessor in the ORC signals the inflator of the appropriate airbag units to deploy their airbag cushions. The front seat belt tensioners are provided with a deployment signal by the ORC in conjunction with the front airbags.

During a frontal vehicle impact, the knee blockers work in concert with properly fastened and adjusted seat belts to restrain both the driver and the front seat passenger in the proper position for an airbag deployment. The knee blockers also absorb and distribute the crash energy from the driver and the front seat passenger to the structure of the instrument panel. The seat belt tensioners remove the slack from the front seat belts to provide further assurance that the driver and front seat passenger are properly positioned and restrained for an airbag deployment.

Typically, the vehicle occupants recall more about the events preceding and following a collision than they do of an airbag deployment itself. This is because the airbag deployment and deflation occur very rapidly. In a typical 48 kilometer-per-hour (30 mile-per-hour) barrier impact, from the moment of impact until the airbags are fully inflated takes about 40 milliseconds. Within one to two seconds from the moment of impact, the airbags are almost entirely deflated. The times cited for these events are approximations, which apply only to a barrier impact at the given speed. Actual times will vary somewhat, depending upon the vehicle speed, impact angle, severity of the impact, and the type of collision.

When the ORC monitors a problem in any of the dual front airbag system circuits or components, including the seat belt tensioners, it stores a fault code or Diagnostic Trouble Code (DTC) in its memory circuit and sends an electronic message to the EMIC to turn on the airbag indicator. Proper testing of the supplemental restraint system components, the Controller Area Network (CAN) data bus, the electronic message inputs to and outputs from the EMIC or the ORC, as well as the retrieval or erasure of a DTC from the ORC or the EMIC requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

See the owner's manual in the vehicle glove box for more information on the features, use and operation of all of the factory-installed passive restraints.

OCCUPANT CLASSIFICATION SYSTEM

In vehicles equipped with the Occupant Classification System (OCS), the OCS automatically suppresses or enables passenger airbag and seat belt tensioner operation based upon whether or not the passenger side front seat is occupied and, if the seat is occupied, classifies the size of the occupant and whether the seat is occupied by a child seat.

The OCS has an Occupant Classification Module (OCM) that monitors inputs from the seat weight sensors under the passenger side front seat cushion and from the seat track position sensors on the passenger side and driver side seat adjuster tracks. Based upon those inputs the microprocessor within the OCM classifies the occupant of the passenger side front seat, and the proximity of each front seat to the front airbags. The OCM then sends electronic occupant classification messages to the Occupant Restraint Controller (ORC). The microprocessor and programming of the ORC determines whether to enable or disable the deployment circuits for the passenger airbag and seat belt tensioner; and, if enabled, what force level should be used to deploy each front airbag.

The OCS electrical circuits and components are continuously monitored by the OCM, and the OCM is continuously monitored by the ORC. A passenger airbag on/off indicator is located below the inboard passenger side air outlet. This indicator receives battery current whenever the ignition switch is in the On or Start positions, and illuminates only when the ORC pulls the indicator control circuit to ground. The indicator illuminates for about seven seconds as a bulb test each time the ignition switch is turned to the On or Start positions. Following the bulb test, the indicator is turned on or off by the ORC based upon the electronic occupant classification messages received from the OCM. This indicator is illuminated whenever the seat is occupied and passenger airbag and seat belt tensioner operation has been suppressed, and is turned off whenever the seat is empty or when the seat is occupied and the passenger airbag and seat belt tensioner are enabled.

When the OCM monitors a problem in any of the OCS circuits or components, it stores a fault code or DTC in its memory circuit and sends an electronic message to the ORC. The ORC then sends an electronic message to the ElectroMechanical Instrument Cluster (EMIC) to turn on the airbag indicator. If for any reason the OCM is unable to classify the occupant it sends an electronic message to the ORC, and the ORC suppresses passenger airbag and seat belt tensioner operation. Proper testing of the OCS components, the Controller Area Network (CAN) data bus, the electronic message inputs to and outputs from the OCM, the EMIC or the ORC, as well as the retrieval or erasure of a DTC from the OCM, the ORC or the EMIC requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

See the owner's manual in the vehicle glove box for more information on the features, use and operation of the OCS.

WARNING

WARNINGS - RESTRAINT SYSTEM

WARNING: To avoid personal injury or death, during and following any seat belt or child restraint anchor service, carefully inspect all seat belts, buckles, mounting hardware, retractors, tether straps, and anchors for proper installation, operation, or damage. Replace any belt that is cut, frayed, or torn. Straighten any belt that is twisted. Tighten any loose fasteners. Replace any belt that has a damaged or inoperative buckle or retractor. Replace any belt that has a bent or damaged latch plate or anchor plate. Replace any child restraint anchor or the unit to which the anchor is integral that has been bent or damaged. Never attempt to repair a seat belt or child restraint component. Always replace damaged or faulty seat belt and child restraint components with the correct, new and unused replacement parts listed in the DaimlerChrysler Mopar Parts Catalog.

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

WARNING: To avoid personal injury or death on vehicles equipped with airbags, before performing any welding operations disconnect and isolate the battery negative (ground) cable and disconnect all wire harness connectors from the Occupant Restraint Controller (ORC). Failure to take the proper precautions could result in accidental airbag deployment and other possible damage to the supplemental restraint system circuits and components.

WARNING: To avoid personal injury or death, do not attempt to dismantle an airbag unit or tamper with its inflator. Do not puncture, incinerate, or bring into contact with electricity. Do not store at temperatures exceeding 93° C (200° F). An airbag inflator unit may contain sodium azide and potassium nitrate. These materials are poisonous and extremely flammable. Contact with acid, water, or heavy metals may produce harmful and irritating gases (sodium hydroxide is formed in the presence of moisture) or combustible compounds. An airbag inflator unit may also contain a gas canister pressurized to over 2500 psi.

WARNING: To avoid personal injury or death, when handling a seat belt tensioner retractor, proper care should be exercised to keep fingers out from under the retractor cover and away from the seat belt webbing where it exits from the retractor cover.

WARNING: To avoid personal injury or death, replace all restraint system components only with parts specified in the DaimlerChrysler Mopar Parts Catalog. Substitute parts may appear interchangeable, but internal differences may result in inferior occupant protection.

WARNING: To avoid personal injury or death, the fasteners, screws, and bolts originally used for the restraint system components must never be replaced with any substitutes. These fasteners have special coatings and are specifically designed for the restraint system. Any time a new fastener is needed, replace it with the correct fasteners provided in the service package or specified in the DaimlerChrysler Mopar Parts Catalog.

WARNING: To avoid personal injury or death, when a steering column has an airbag unit attached, never place the column on the floor or any other surface with the steering wheel or airbag unit face down.

DIAGNOSIS AND TESTING

SUPPLEMENTAL RESTRAINT SYSTEM

Proper diagnosis and testing of the supplemental restraint system components, the Controller Area Network (CAN) data bus, the data bus electronic message inputs to and outputs from the ElectroMechanical Instrument Cluster (EMIC), the Occupant Restraint Controller (ORC), or the Occupant Classification Module (OCM) as well as the retrieval or erasure of a Diagnostic Trouble Code (DTC) from the ORC or OCM requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

STANDARD PROCEDURE

HANDLING NON-DEPLOYED SUPPLEMENTAL RESTRAINTS

At no time should any source of electricity be permitted near the inflator on the back of a non-deployed airbag or seat belt tensioner. When carrying a non-deployed airbag, the trim cover or airbag cushion side of the unit should be pointed away from the body to minimize injury in the event of an accidental deployment. If the airbag unit is placed on a bench or any other surface, the trim cover or airbag cushion side of the unit should be face up to minimize movement in the event of an accidental deployment.

When handling a non-deployed seat belt tensioner, take proper care to keep fingers out from under the retractor cover and away from the seat belt webbing where it exits from the retractor cover. In addition, the supplemental restraint system should be disarmed whenever any steering wheel, steering column, seat belt tensioner, airbag, impact sensor, Occupant Classification System (OCS), or instrument panel components require diagnosis or service. Failure to observe this warning could result in accidental airbag deployment and possible personal injury.

All damaged, faulty or non-deployed airbags and seat belt tensioners which are replaced on vehicles are to be handled and disposed of properly. If an airbag or seat belt tensioner unit is faulty or damaged and non-deployed, refer to the Hazardous Substance Control System for proper disposal. Dispose of all non-deployed and deployed airbags and seat belt tensioners in a manner consistent with state, provincial, local and federal regulations.

SUPPLEMENTAL RESTRAINT STORAGE

Airbags and seat belt tensioners must be stored in their original, special container until they are used for service. Also, they must be stored in a clean, dry environment; away from sources of extreme heat, sparks, and high electrical energy. Always place or store any airbag on a surface with its trim cover or airbag cushion side facing up, to minimize movement in case of an accidental deployment.

SERVICE AFTER A SUPPLEMENTAL RESTRAINT DEPLOYMENT

Any vehicle which is to be returned to use following a supplemental restraint deployment, must have the deployed restraints replaced. In addition, if the driver airbag has been deployed, the clockspring must be replaced. If the passenger airbag is deployed, the passenger airbag door must be replaced. The seat belt tensioners are deployed by the same signal that deploys the driver and passenger airbags and must also be replaced if either front airbag has been deployed. If a side curtain airbag has been deployed, the complete airbag unit, the headliner, as well as the upper A, B, C and D-pillar trim must be replaced. These components are not intended for reuse and will be damaged or weakened as a result of a supplemental restraint deployment, which may or may not be obvious during a visual inspection.

On vehicles with an optional sunroof, the sunroof drain tubes and hoses must be closely inspected following a side curtain airbag deployment. It is also critical that the mounting surfaces and/or mounting brackets for the Occupant Restraint Controller (ORC), side impact sensors, and front impact sensors be closely inspected and restored to their original conditions following any vehicle impact damage. Because the ORC and each front and side impact sensor

are used by the supplemental restraint system to monitor or confirm the direction and severity of a vehicle impact, improper orientation or insecure fastening of these components may cause airbags not to deploy when required, or to deploy when not required.

All other vehicle components should be closely inspected following any supplemental restraint deployment, but are to be replaced only as required by the extent of the visible damage incurred.

AIRBAG SQUIB STATUS

Multistage airbags with multiple initiators (squibs) must be checked to determine that all squibs were used during the deployment event. The driver and passenger airbags in this model are deployed by electrical signals generated by the Occupant Restraint Controller (ORC) through the driver or passenger squib 1 and squib 2 circuits to the two initiators in the airbag inflators. Typically, both initiators are used and all potentially hazardous chemicals are burned during an airbag deployment event. However, it is possible for only one initiator to be used due to an airbag system fault; therefore, it is always necessary to confirm that both initiators have been used in order to avoid the improper handling or disposal of potentially live pyrotechnic or hazardous materials. The following procedure should be performed using a diagnostic scan tool to verify the status of both airbag squibs before either deployed airbag is removed from the vehicle for disposal.

CAUTION: Deployed front airbags having two initiators (squibs) in the airbag inflator may or may not have live pyrotechnic material within the inflator. Do not dispose of these airbags unless you are sure of complete deployment. Refer to the Hazardous Substance Control System for proper disposal procedures. Dispose of all non-deployed and deployed airbags and seat belt tensioners in a manner consistent with state, provincial, local, and federal regulations.

1. Be certain that the diagnostic scan tool contains the latest version of the proper diagnostic software. Connect the scan tool to the 16-way Data Link Connector (DLC). The DLC is located on the driver side lower edge of the instrument panel, outboard of the steering column.
2. Turn the ignition switch to the On position.
3. Using the scan tool, read and record the active (current) Diagnostic Trouble Code (DTC) data.

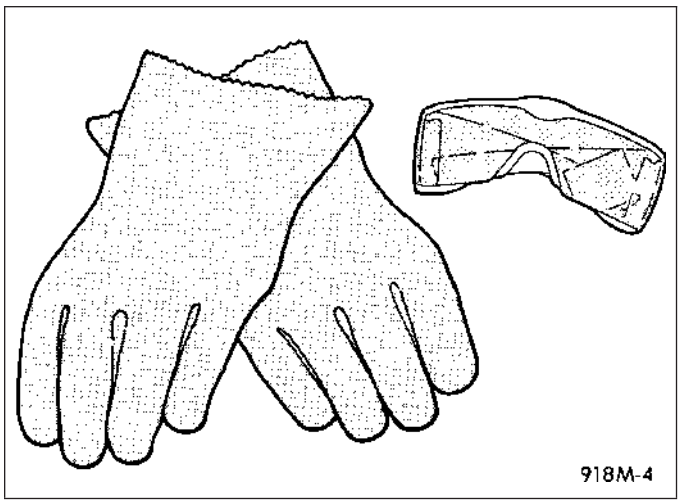
Using the active DTC information, refer to the **Airbag Squib Status** table to determine the status of both driver and/or passenger airbag squibs.

AIRBAG SQUIB STATUS		
IF the Active DTC is:	**Conditions**	**Squib Status**
Driver or Passenger Squib 1 open Driver or Passenger Squib 2 open	**AND** the stored DTC minutes for both Driver or Passenger squibs are within 15 minutes of each other	Both Squib 1 and 2 were used.
Driver or Passenger Squib 1 open Driver or Passenger Squib 2 open	**AND** the stored DTC minutes for Driver or Passenger Squib 2 open is GREATER than the stored DTC minutes for Driver or Passenger Squib 1 by 15 minutes or more	Squib 1 was used; Squib 2 is live.
Driver or Passenger Squib 1 open Driver or Passenger Squib 2 open	**AND** the stored DTC minutes for Driver or Passenger Squib 1 open is GREATER than the stored DTC minutes for Driver or Passenger Squib 2 by 15 minutes or more	Squib 1 is live; Squib 2 was used.
Driver or Passenger Squib 1 open	**AND** Driver or Passenger Squib 2 open is NOT an active code	Squib 1 was used; Squib 2 is live.
Driver or Passenger Squib 2 open	**AND** Driver or Passenger Squib 1 open is NOT an active code	Squib 1 is live; Squib 2 was used.

If none of the Driver or Passenger Squib 1 or 2 open are active codes, the status of the airbag squibs is unknown. In this case the airbag should be handled and disposed of as if the squibs were both live.

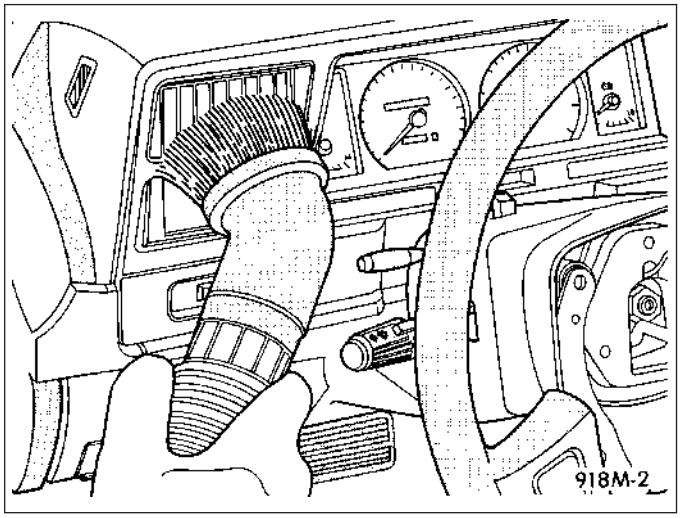
CLEANUP PROCEDURE

Following a supplemental restraint deployment, the vehicle interior will contain a powdery residue. This residue consists primarily of harmless particulate by-products of the small pyrotechnic charge that initiates the propellant used to deploy a supplemental restraint. However, this residue may also contain traces of sodium hydroxide powder, a chemical by-product of the propellant material that is used to generate the inert gas that inflates the airbag. Since sodium hydroxide powder can irritate the skin, eyes, nose, or throat, be certain to wear safety glasses, rubber gloves, and a long-sleeved shirt during cleanup.



WARNING: To avoid personal injury or death, if you experience skin irritation during cleanup, run cool water over the affected area. Also, if you experience irritation of the nose or throat, exit the vehicle for fresh air until the irritation ceases. If irritation continues, see a physician.

1. Begin the cleanup by using a vacuum cleaner to remove any residual powder from the vehicle interior. Clean from outside the vehicle and work your way inside, so that you avoid kneeling or sitting on a non-cleaned area.
2. Be certain to vacuum the heater and air conditioning outlets as well. Run the heater and air conditioner blower on the lowest speed setting and vacuum any powder expelled from the outlets.



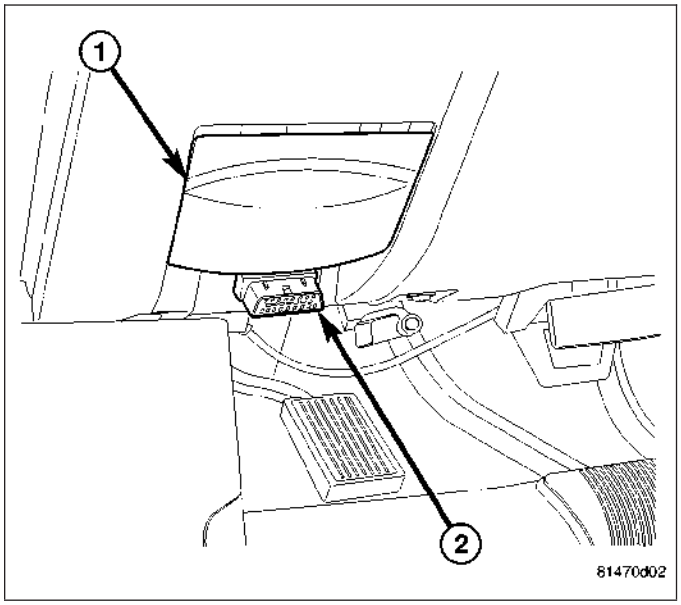
CAUTION: Deployed front airbags having two initiators (squibs) in the airbag inflator may or may not have live pyrotechnic material within the inflator. Do not dispose of these airbags unless you are sure of complete deployment. Refer to AIRBAG SQUIB STATUS . All damaged, faulty, or non-deployed supplemental restraints which are replaced on vehicles are to be handled and disposed of properly. If an airbag or seat belt tensioner unit is faulty or damaged and non-deployed, refer to the Hazardous Substance Control System for proper disposal. Be certain to dispose of all non-deployed and deployed supplemental restraints in a manner consistent with state, provincial, local and federal regulations.

3. Next, remove the deployed supplemental restraints from the vehicle. Refer to the appropriate service removal procedures.
4. You may need to vacuum the interior of the vehicle a second time to recover all of the powder.

SUPPLEMENTAL RESTRAINTS VERIFICATION TEST

The following procedure should be performed using a diagnostic scan tool to verify proper supplemental restraint system operation following the service or replacement of any supplemental restraint system component. In addition, if the vehicle is equipped with the Occupant Classification System and one of the passenger front seat supplemental restraint components has been replaced, following successful completion of the supplemental restraint system verification test procedure, perform the Occupant Classification System Verification Test using a diagnostic scan tool. Refer to the appropriate diagnostic procedures.

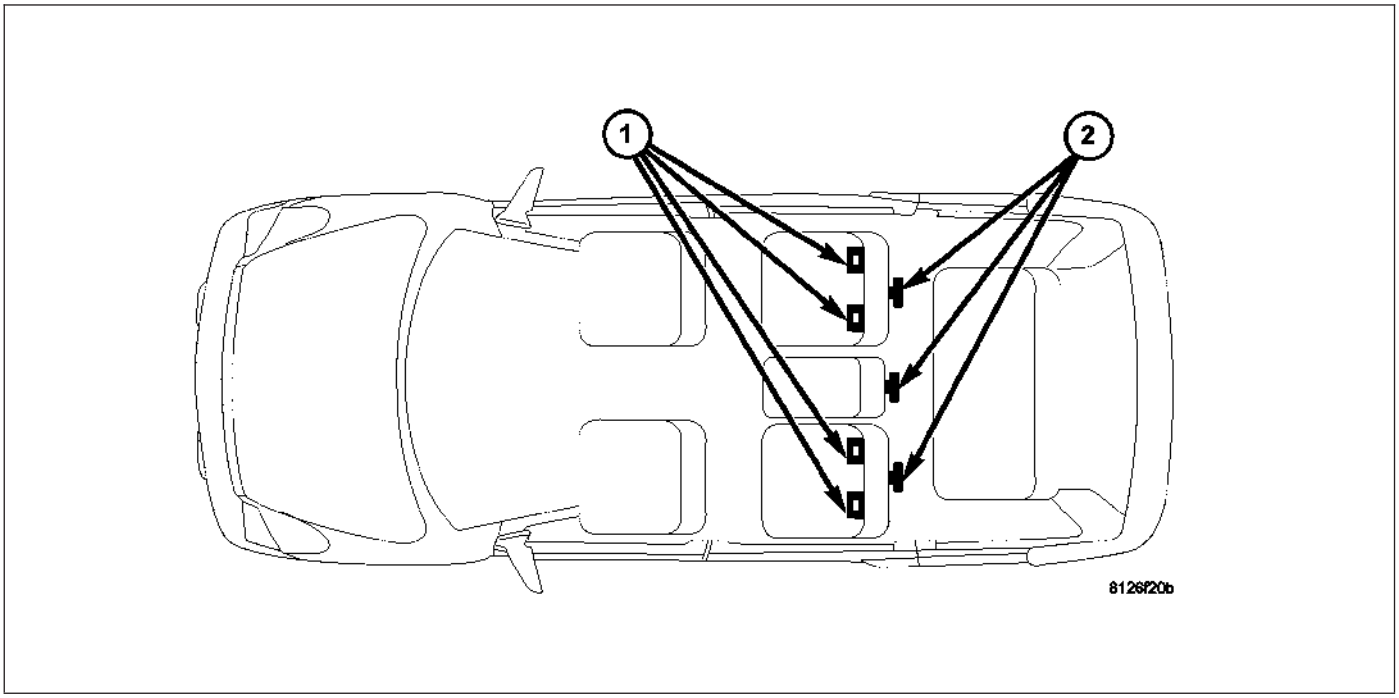
WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.



1. During the following test, the battery negative cable remains disconnected and isolated, as it was during the supplemental restraint system component removal and installation procedures.
2. Be certain that the diagnostic scan tool contains the latest version of the proper diagnostic software. Connect the scan tool to the 16-way Data Link Connector (DLC) (1). The DLC is located on the driver side lower edge of the instrument panel (2), outboard of the steering column.
3. Turn the ignition switch to the On position and exit the vehicle with the scan tool.
4. Check to be certain that nobody is in the vehicle, then reconnect the battery negative cable.
5. Using the scan tool, read and record the active (current) Diagnostic Trouble Code (DTC) data.
6. Next, use the scan tool to read and record any stored (historical) DTC data.
7. If any DTC is found in Step 5 or Step 6, refer to the appropriate diagnostic information.
8. Use the scan tool to erase the stored DTC data. If any problems remain, the stored DTC data will not erase. Refer to the appropriate diagnostic information to diagnose any stored DTC that will not erase. If the stored DTC information is successfully erased, go to Step 9.
9. Turn the ignition switch to the Off position for about fifteen seconds, and then back to the On position. Observe the airbag indicator in the instrument cluster. It should illuminate for six to eight seconds, and then go out. This indicates that the supplemental restraint system is functioning normally and that the repairs are complete. If the airbag indicator fails to light, or lights and stays on, there is still an active supplemental restraint system fault or malfunction. Refer to the appropriate diagnostic information to diagnose the problem.

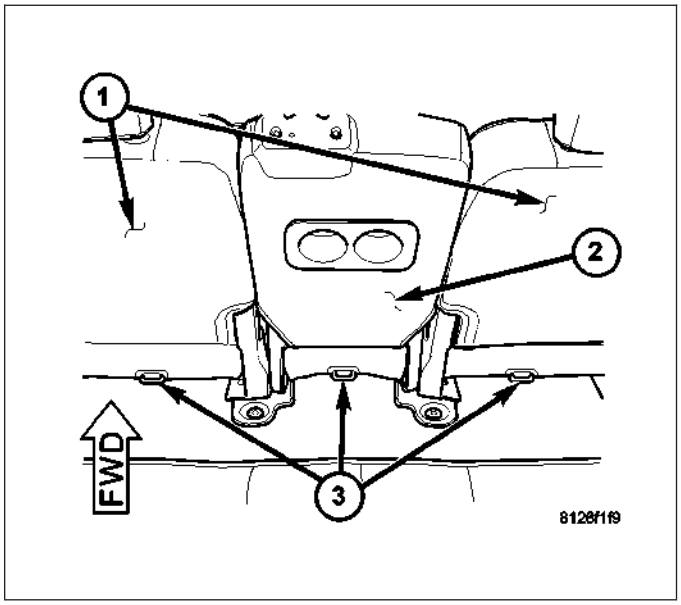
CHILD RESTRAINT ANCHOR

DESCRIPTION

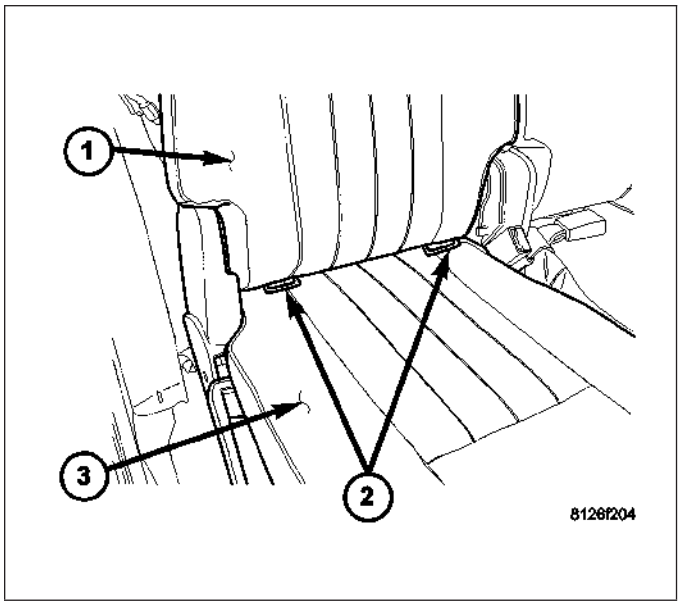


This model is equipped with a Lower Anchors and Tether for CHildren, or LATCH child restraint anchorage system. The LATCH system provides for the installation of suitable child restraints in certain seating positions without using the standard equipment seat belt provided for that seating position. The second row seats in this model are equipped with a fixed-position child restraint upper tether anchor (2) for both the center and the two outboard seating positions, and child restraint lower anchors (1) for the two outboard seating positions only.

The three upper tether anchors (3) are integral to the second row seat cushion frames. One anchor is integral to the cushion frame of the center seat section (2), and one is integral to cushion frames of each outboard seat section (1). These anchors are each constructed from a heavy-gauge steel wire loop that is chrome plated and securely welded to the seat cushion frame. The child restraint upper tether anchors cannot be adjusted or repaired and, if faulty or damaged, they must be replaced as a unit with their respective second row seat cushion frame unit.



The lower anchors (2) for this model are also integral to their respective second row outboard seat cushion frame. These anchors are also constructed from a heavy-gauge steel wire loop that is chrome plated and securely welded to the seat cushion frame. They are each accessed from the front of their respective seats, at each side where the seat back (1) meets the seat cushion (3). These lower anchors cannot be adjusted or repaired and, if faulty or damaged, they must be replaced as a unit with the second row seat cushion frame unit.



WARNING: To avoid personal injury or death, during and following any seat belt or child restraint anchor service, carefully inspect all seat belts, buckles, mounting hardware, retractors, tether straps, and anchors for proper installation, operation, or damage. Replace any belt that is cut, frayed, or torn. Straighten any belt that is twisted. Tighten any loose fasteners. Replace any belt that has a damaged or inoperative buckle or retractor. Replace any belt that has a bent or damaged latch plate or anchor plate. Replace any child restraint anchor or the unit to which the anchor is integral that has been bent or damaged. Never attempt to repair a seat belt or child restraint component. Always replace damaged or faulty seat belt and child restraint components with the correct, new and unused replacement parts listed in the DaimlerChrysler Mopar Parts Catalog.

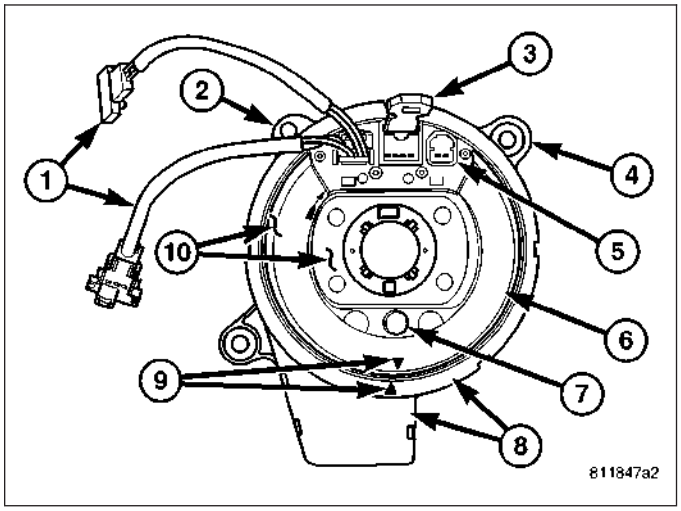
OPERATION

See the owner's manual in the vehicle glove box for more information on the proper use of all of the factory-installed child restraint anchors.

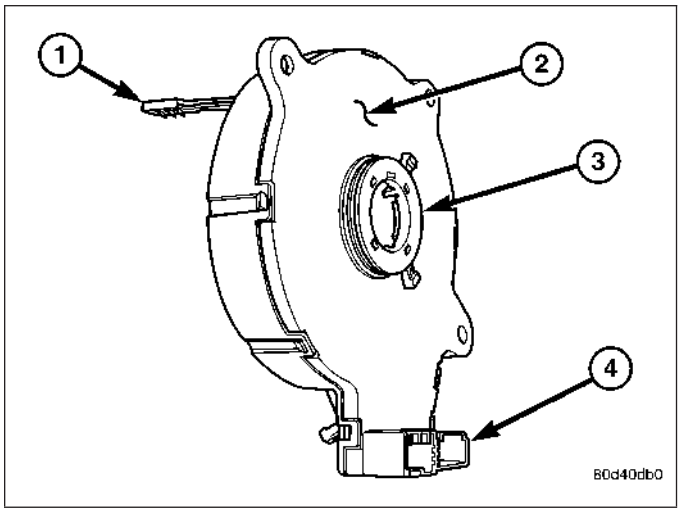
CLOCKSPRING

DESCRIPTION

The clockspring assembly is secured with two screws onto the multi-function switch mounting housing near the top of the steering column behind the steering wheel. The clockspring consists of a flat, round molded plastic case (8) with a stubby tail that hangs below the steering column. The tail contains two connector receptacles that face toward the instrument panel. Within the plastic case is a spool-like molded plastic rotor (10) with a large exposed hub. The upper surface of the rotor hub has a large center hole, two large flats, an engagement dowel with a yellow rubber boot (7), two short pigtail wires with connectors (1), and two connector receptacles (5) that face toward the steering wheel.



The lower surface of the rotor hub has a molded plastic turn signal cancel cam (3) with two lobes that is keyed to the rotor and is secured there with four integral snap features. Within the plastic case and wound around the rotor spool is a long ribbon-like tape that consists of several thin copper wire leads sandwiched between two thin plastic membranes. The outer end of the tape terminates at the connector receptacles (4) that face the instrument panel, while the inner end of the tape terminates at the pigtail wires and connector receptacles on the hub of the clockspring rotor that face the steering wheel.



Service replacement clocksprings are shipped pre-centered and with a molded plastic locking pin (1) that snaps into a receptacle on the rotor and is engaged between two tabs on the upper surface of the rotor case. The locking pin secures the centered clockspring rotor to the clockspring case during shipment and handling, but must be removed from the clockspring after it is installed on the steering column. (Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCKSPRING - STANDARD PROCEDURE - CLOCKSPRING CENTERING).

The clockspring cannot be repaired. If the clockspring is faulty, damaged, or if the driver airbag has been deployed, the clockspring must be replaced.

OPERATION

The clockspring is a mechanical electrical circuit component that is used to provide continuous electrical continuity between the fixed instrument panel wire harness and the electrical components mounted on or in the rotating steering wheel. On this model the rotating electrical components include the driver airbag, the horn switch, the speed control switches, and the remote radio switches, if the vehicle is so equipped. The clockspring case is positioned and secured to the multi-function switch mounting housing near the top of the steering column. The connector receptacles on the tail of the fixed clockspring case connect the clockspring to the vehicle electrical system through two take outs with connectors from the instrument panel wire harness.

The clockspring rotor is movable and is keyed by an engagement dowel that is molded onto the rotor hub between two fins that are cast into the lower surface of the steering wheel armature. A yellow rubber boot is installed over the engagement dowel to eliminate contact noise between the dowel and the steering wheel. The two lobes on the turn signal cancel cam on the lower surface of the clockspring rotor hub contact a turn signal cancel actuator of the multi-function switch to provide automatic turn signal cancellation.

Two short, yellow-sleeved pigtail wires on the upper surface of the clockspring rotor connect the clockspring to the multistage driver airbag, while a steering wheel wire harness connects the two connector receptacles on the upper surface of the clockspring rotor to the horn switch feed pigtail wire connector and, if the vehicle is so equipped, to the optional speed control and remote radio switches on the steering wheel.

Like the clockspring in a timepiece, the clockspring tape has travel limits and can be damaged by being wound too tightly during full stop-to-stop steering wheel rotation. To prevent this from occurring, the clockspring is centered when it is installed on the steering column. Centering the clockspring indexes the clockspring tape to the movable steering components so that the tape can operate within its designed travel limits. However, if the clockspring is removed from the steering column or if the steering shaft is disconnected from the steering gear, the clockspring spool can change position relative to the movable steering components. The clockspring must be re-centered following completion of this service or the tape may be damaged.

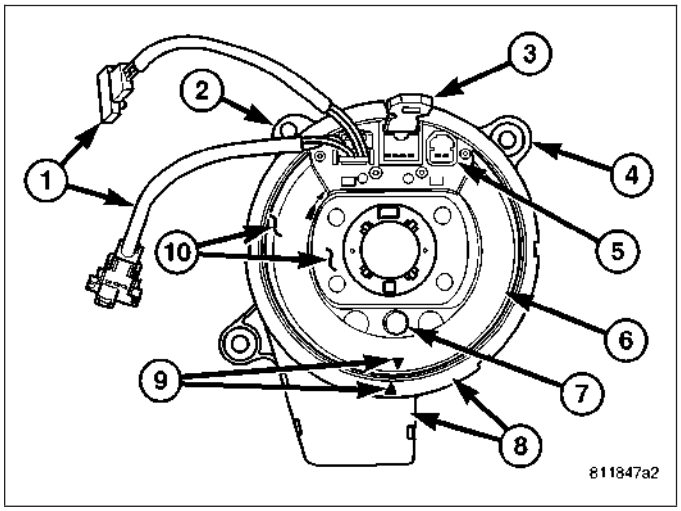
Service replacement clocksprings are shipped pre-centered and with a plastic locking pin installed. This locking pin should not be removed until the clockspring has been installed on the steering column. If the locking pin is removed before the clockspring is installed on a steering column, the clockspring centering procedure must be performed. (Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCKSPRING - STANDARD PROCEDURE - CLOCKSPRING CENTERING).

STANDARD PROCEDURE

CLOCKSPRING CENTERING

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

NOTE: Before starting this procedure, be certain to turn the steering wheel until the front wheels are in the straight-ahead position.



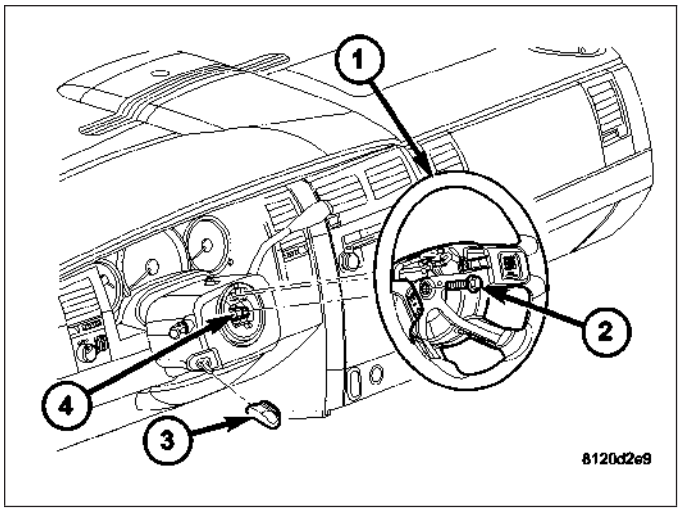
1. Place the front wheels in the straight-ahead position.
2. Remove the clockspring from the steering column. (Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCKSPRING - REMOVAL).
3. Rotate the clockspring rotor (10) clockwise to the end of its travel. **Do not apply excessive torque.**
4. From the end of the clockwise travel, rotate the rotor about two and one-half turns counterclockwise. The engagement dowel and yellow rubber boot (7) should end up at the bottom, and the arrows on the clockspring rotor and case (9) should be in alignment.
5. The clockspring is now centered. Secure the clockspring rotor to the clockspring case to maintain clockspring centering until it is reinstalled on the steering column.
6. The front wheels should still be in the straight-ahead position. Reinstall the clockspring onto the steering column. (Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCKSPRING - INSTALLATION).

REMOVAL

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

NOTE: Before starting this procedure, be certain to turn the steering wheel until the front wheels are in the straight-ahead position.

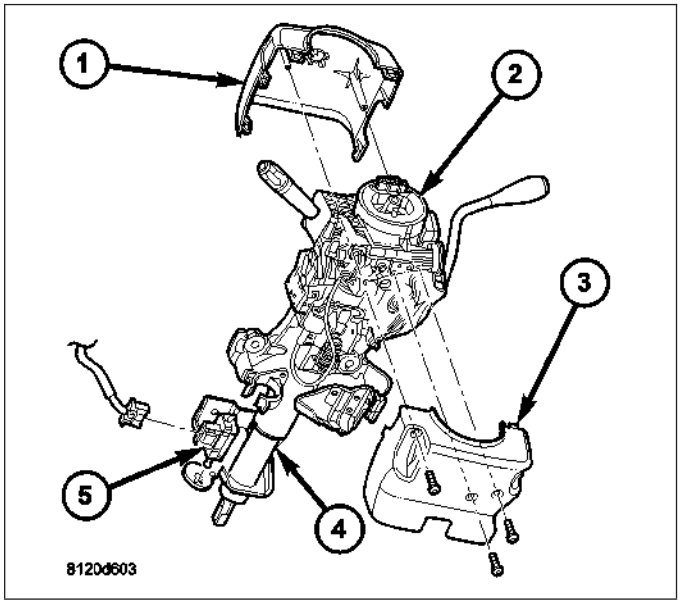
1. Place the front wheels in the straight ahead position.
2. Disconnect and isolate the battery negative cable.
3. Remove the driver airbag from the steering wheel. (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - REMOVAL).
4. Disconnect the steering wheel wire harness connectors from the upper clockspring connector receptacles.



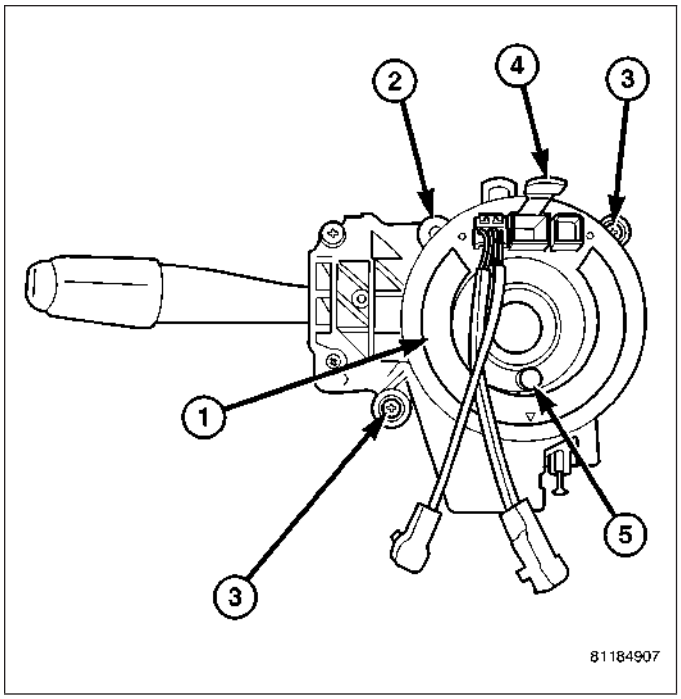
CAUTION: Be certain that the screws that secure the steering wheel puller to the steering wheel are fully engaged in the steering wheel armature without passing through the steering wheel and damaging the clockspring.

5. Remove the steering wheel (1) from the steering column. (Refer to 19 - STEERING/COLUMN/STEERING WHEEL - REMOVAL).
6. Grasp the tilt steering column knob (3) firmly and pull it straight rearward to remove it from the tilt adjuster lever on the left side of the column.

7. From below the steering column, remove the two outboard screws that secure the upper column shroud (1) to the lower shroud (3).
8. Using hand pressure, push gently inward on both sides of the upper shroud above the parting line of the lower shroud to release the snap features that secure the two shroud halves to each other.
9. Remove the upper shroud from the lower shroud and the steering column.
10. Remove the one center screw that secures the lower shroud to the steering column (4).
11. Remove the lower shroud from the steering column.
12. Disconnect the two instrument panel wire harness connectors from the two connector receptacles located below the steering column on the back of the clockspring housing.



13. Remove the two screws (3) that secure the clockspring to the multi-function switch mounting housing.
14. Remove the clockspring from the multi-function switch mounting housing. The clockspring cannot be repaired. It must be replaced if faulty or damaged, or if the driver airbag has been deployed.
15. If the removed clockspring is to be reused, be certain to secure the clockspring rotor to the clockspring case to maintain clockspring centering until it is reinstalled on the steering column. If clockspring centering is not maintained, the clockspring must be centered again before it is reinstalled. (Refer to 8 - ELECTRICAL/RESTRAINTS/ CLOCKSPRING - STANDARD PROCEDURE - CLOCKSPRING CENTERING).



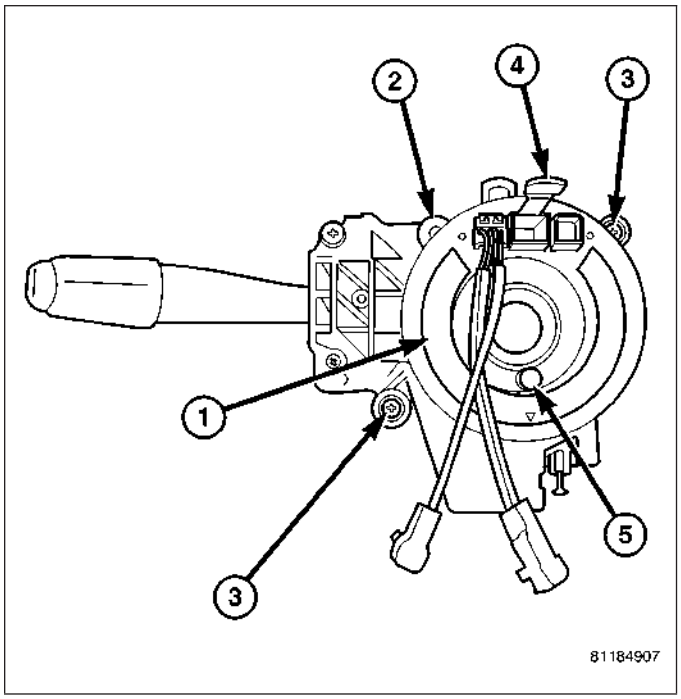
INSTALLATION

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

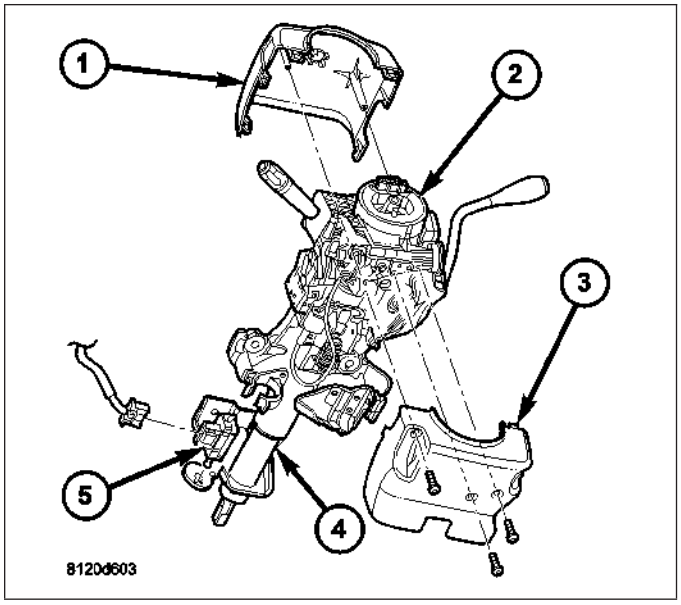
CAUTION: If the clockspring is not properly centered in relation to the steering wheel, steering shaft and steering gear, it may be damaged. (Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCKSPRING - STANDARD PROCEDURE - CLOCKSPRING CENTERING). Service replacement clocksprings are shipped pre-centered and with a locking pin installed. This locking pin should not be removed until the clockspring has been installed on the steering column. If the locking pin is removed before the clockspring is installed on a steering column, the clockspring centering procedure must be performed.

NOTE: Before starting this procedure, be certain that the front wheels are still in the straight-ahead position.

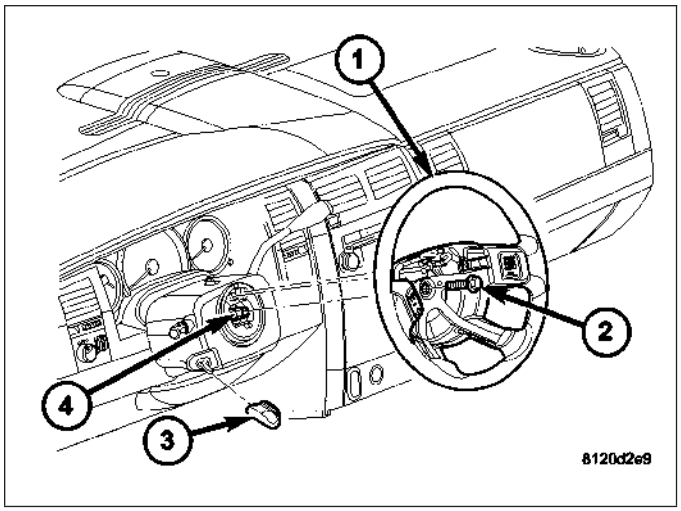
1. While holding the centered clockspring rotor and case stationary in relation to each other, carefully slide the clockspring down over the steering column upper shaft.
2. Align and seat the hole in the locating tab (2) on the clockspring case over the locating pin on the multi-function switch mounting housing.
3. Install and tighten the two screws (3) that secure the clockspring to the multi-function switch mounting housing. Tighten the screws to 2 N·m (20 in. lbs.).
4. Reconnect the two instrument panel wire harness connectors to the two connector receptacles located below the steering column on the back of the clockspring housing.



5. Position the lower shroud (3) onto the steering column (4).
6. From below the steering column, install and tighten the one center screw that secures the lower shroud to the steering column. Tighten the screw to 2 N·m (20 in. lbs.).
7. Position the upper shroud (1) onto the steering column over the lower shroud. Be certain to engage the gearshift lever gap hider into the opening in the right side of both shroud halves.
8. Align the snap features on the upper shroud with the receptacles in the lower shroud and apply hand pressure to snap them together.
9. Install and tighten the two outboard screws that secure the upper shroud to the lower shroud. Tighten the screws to 2 N·m (20 in. lbs.).



10. Align the tilt steering column knob (3) with the tilt adjuster lever on the left side of the steering column and use hand pressure to snap it back into place.
11. If a new clockspring has been installed, remove the plastic locking pin that is securing the clockspring rotor to the clockspring case to maintain clockspring centering.



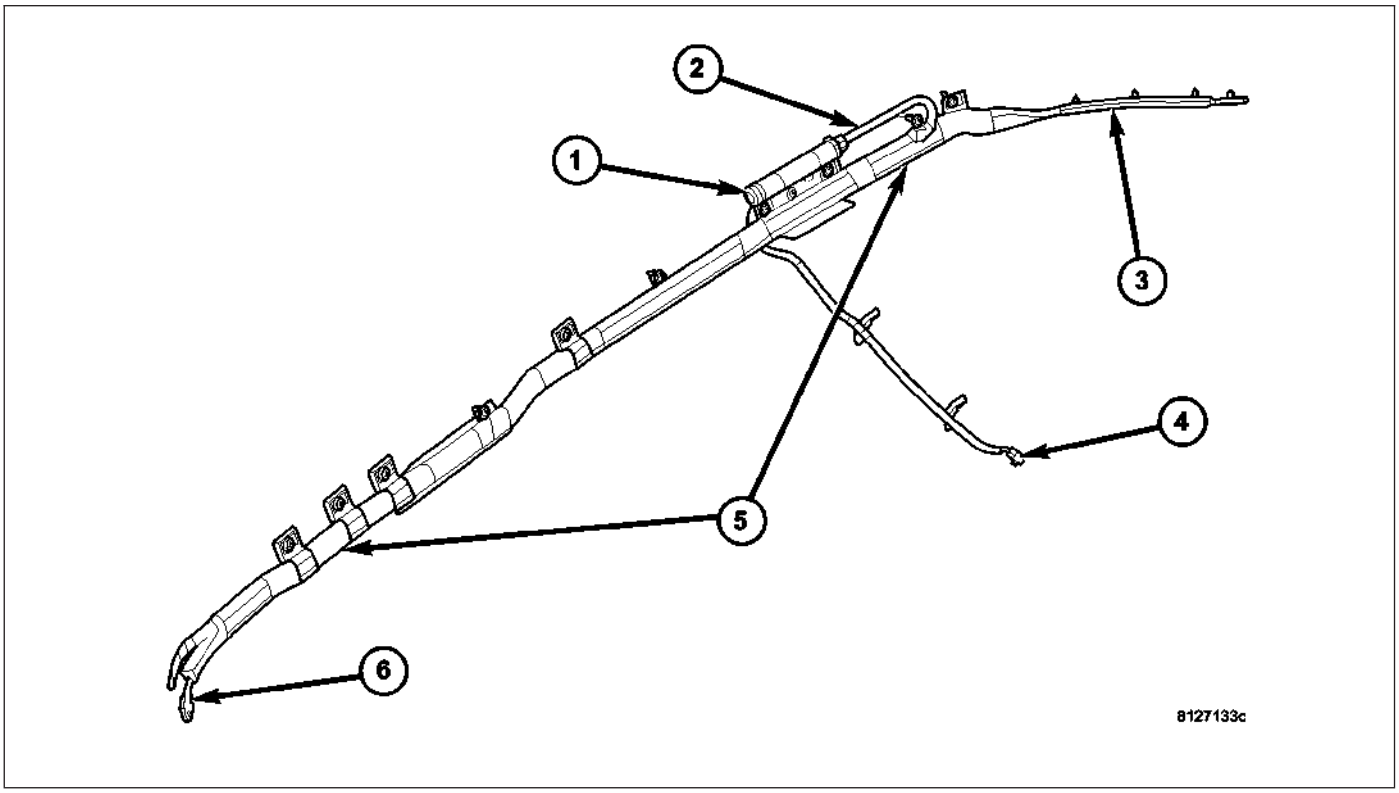
NOTE: When reinstalling the steering wheel, be certain to index the yellow rubber booted engagement dowel on the upper surface of the clockspring rotor between the two fins cast into the lower surface of the steering wheel armature hub.

12. Reinstall the steering wheel (1) onto the steering column. (Refer to 19 - STEERING/COLUMN/STEERING WHEEL - INSTALLATION).
13. Reconnect the steering wheel wire harness connectors to the upper clockspring connector receptacles. Be certain that the steering wheel wire harness is routed between the steering wheel back trim cover and the steering wheel armature.
14. Reinstall the driver airbag onto the steering wheel. (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - INSTALLATION).
15. Reconnect the battery negative cable.

AIR BAG-SIDE CURTAIN

DESCRIPTION

Optional side curtain airbags are available for this model when it is also equipped with dual front airbags. These airbags are passive, inflatable, Supplemental Restraint System (SRS) components, and vehicles with this equipment can be readily identified by a molded identification trim button with the “SRS - AIRBAG” logo located near the top of each upper B-pillar trim panel. This system is designed to reduce injuries to the vehicle occupants in the event of a side impact collision.



Vehicles equipped with side curtain airbags have two individually controlled curtain airbag units. These airbag units are concealed and mounted above the headliner where they are each secured to one of the roof side rails. Each folded airbag cushion is contained within a long extruded plastic channel (5) that extends along the roof rail from the A-pillar at the front of the vehicle to the D-pillar at the rear of the vehicle. The channel is initially secured during installation with plastic push-in fasteners to the roof rail.

A long tether (3) extends down the A-pillar from the front of the airbag cushion, where it is retained to the pillar with plastic push-in routing clips and it is secured to the base of the A-pillar near the belt line with a screw and a rivet nut. A short tether (6) is secured by a screw to a U-nut located near the top of the D-pillar.

The hybrid-type inflator (1) for each airbag is secured to the roof rail at the front of the airbag unit between the A-pillar and the B-pillar, and is connected to the airbag cushion by a long tubular manifold (2). The entire assembly is secured to U-nuts spaced along the inside of the roof rail with screws.

A two-wire pigtail harness (4) is routed from the rear of the airbag inflator and down the B-pillar, where it is retained by routing clips. The pigtail harness is connected to a take out and connector of the body wire harness on the B-pillar, which connects the airbag unit to the Occupant Restraint Controller (ORC).

The side curtain airbag unit cannot be adjusted or repaired and must be replaced if deployed, faulty, or in any way damaged. Once a side curtain airbag has been deployed, the complete airbag unit, the headliner, the upper A, B, C and D-pillar trim, and all other visibly damaged components must be replaced.

OPERATION

Each side curtain airbag is deployed individually by an electrical signal generated by the Occupant Restraint Controller (ORC) to which it is connected through left or right curtain airbag line 1 and line 2 (or squib) circuits. The hybrid-type inflator assembly for each airbag contains a small canister of highly compressed inert gas. When the ORC sends the proper electrical signal to the airbag inflator, the electrical energy creates enough heat to ignite chemical pellets within the inflator.

Once ignited, these chemicals burn rapidly and produce the pressure necessary to rupture a containment disk in the inert gas canister. The inflator and inert gas canister are sealed and connected to a tubular manifold so that all of the released gas is directed into the folded curtain airbag cushion, causing the cushion to inflate. As the airbag cushion inflates it will drop down from the roof rail between the edge of the headliner and the side glass/body pillars to form a curtain-like cushion to protect the vehicle occupants during a side impact collision.

The front and rear tethers keep the side airbag cushion taut to the side of the vehicle, thus ensuring that the bag will deploy in the proper position. Following the airbag deployment, the airbag cushion quickly deflates by venting

the inert gas through the loose weave of the cushion fabric, and the deflated cushion hangs down loosely from the roof rail.

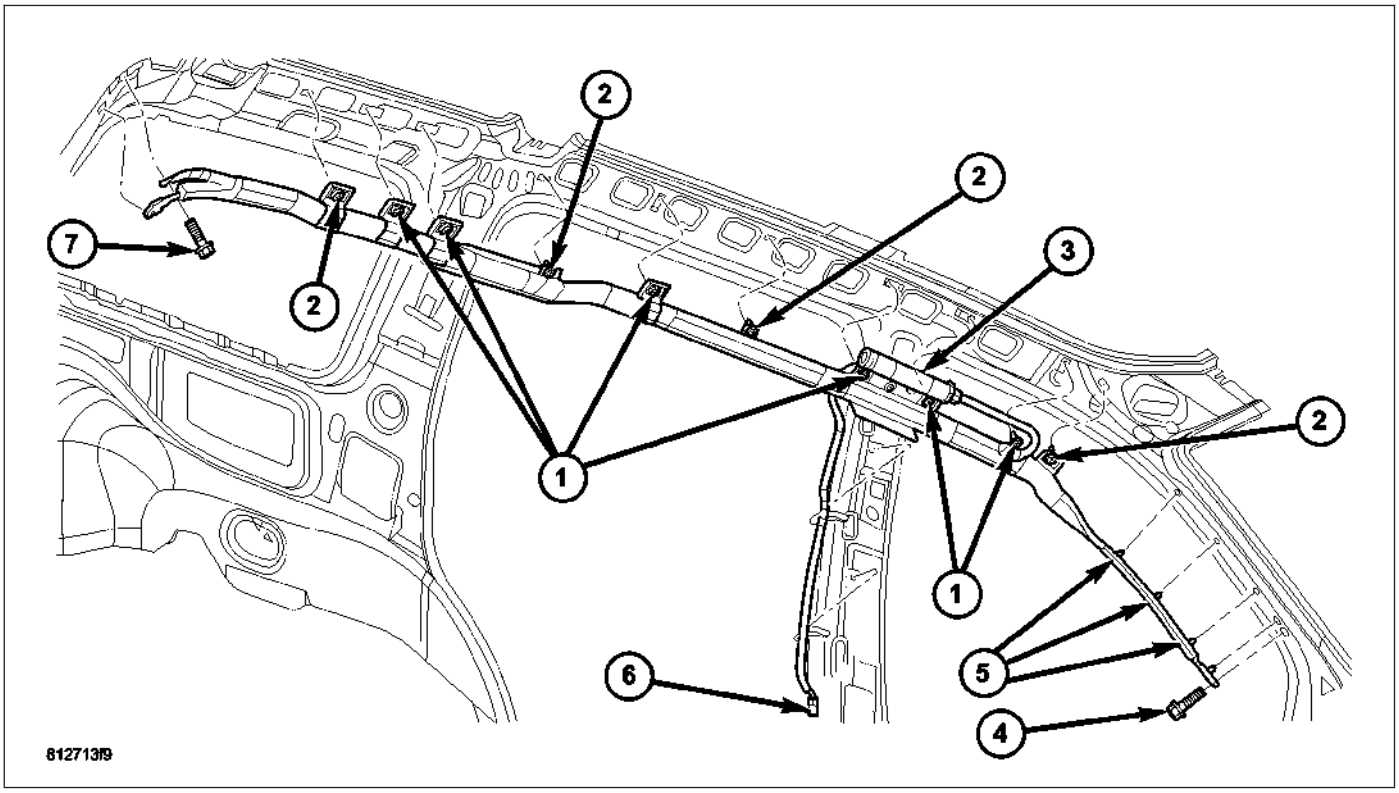
REMOVAL

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

WARNING: To avoid personal injury or death, when removing a deployed airbag, rubber gloves, eye protection, and a long-sleeved shirt should be worn. There may be deposits on the airbag unit and other interior surfaces. In large doses, these deposits may cause irritation to the skin and eyes.

WARNING: To avoid personal injury or death, use extreme care to prevent any foreign material from entering the side curtain airbag, or becoming entrapped between the side curtain airbag cushion and the headliner. Failure to observe this warning could result in occupant injuries upon airbag deployment.

NOTE: The following procedure is for replacement of a faulty or damaged side curtain airbag. If the airbag is faulty or damaged, but not deployed, review the recommended procedures for handling non-deployed supplemental restraints. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - HANDLING NON-DEPLOYED SUPPLEMENTAL RESTRAINTS). If the side curtain airbag has been deployed, review the recommended procedures for service after a supplemental restraint deployment before removing the airbag from the vehicle. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - SERVICE AFTER A SUPPLEMENTAL RESTRAINT DEPLOYMENT).



1. Disconnect and isolate the battery negative cable. Wait two minutes for the system capacitor to discharge before further service.
2. Remove the headliner from the vehicle. (Refer to 23 - BODY/INTERIOR/HEADLINER - REMOVAL).

3. Remove the lower trim from the inside of the B-pillar. (Refer to 23 - BODY/INTERIOR/B-PILLAR LOWER TRIM - REMOVAL).
4. Disconnect the side curtain airbag pigtail wire connector (6) from the body wire harness connector on the lower inner B-pillar.
5. Disengage the pigtail wire plastic retainers from the inner B-pillar.
6. Remove the screw (7) that secures the side curtain airbag (3) to the U-nut near the top of the inner D-pillar.
7. Remove the screw (4) that secures the side curtain airbag front tether to the inner A-pillar near the belt line.
8. Remove the remaining screws (1) that secure the side curtain airbag to the U-nuts in the inner roof rail and D-pillar.
9. Disengage the three front tether plastic retainers (5) from the inner A-pillar.
10. Disengage the four airbag plastic retainers (2) from the inner roof rail.
11. Remove the side curtain airbag from the vehicle through the liftgate opening as a unit.

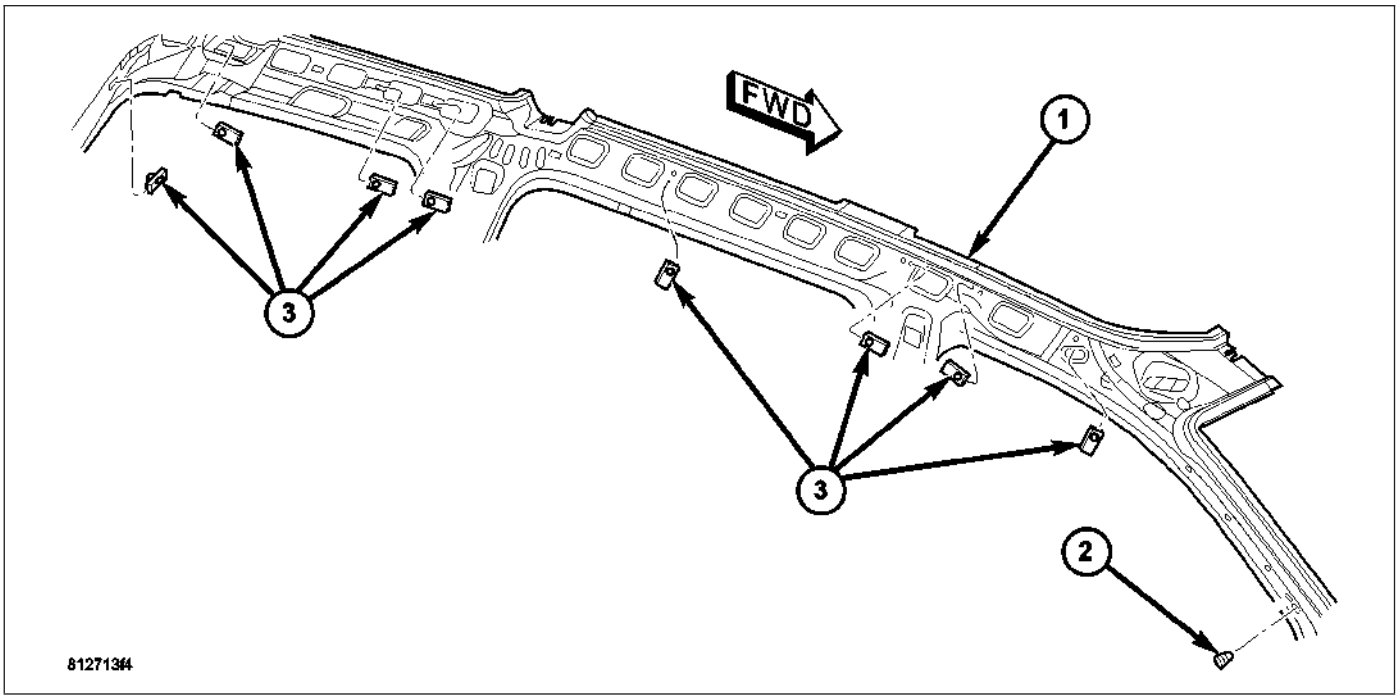
INSTALLATION

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

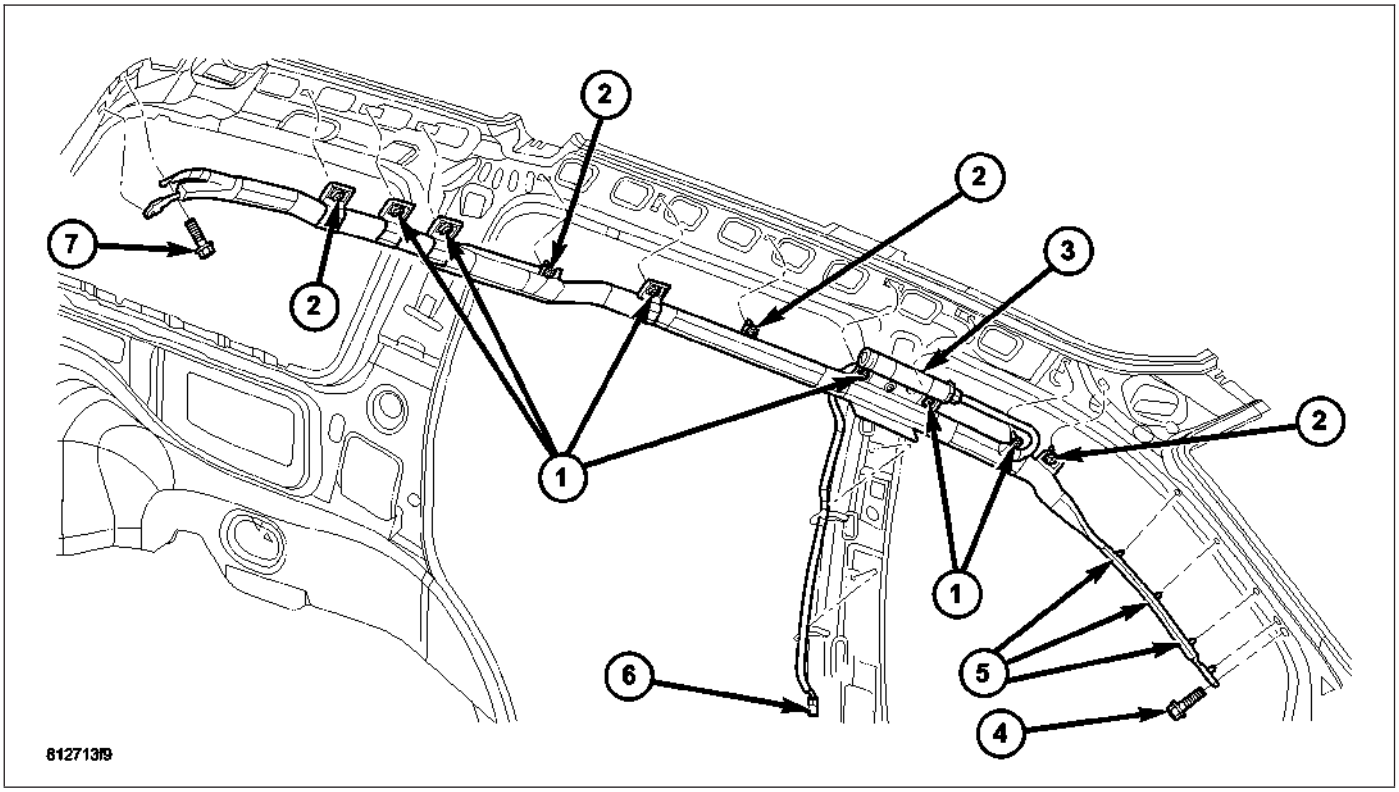
WARNING: To avoid personal injury or death, when removing a deployed airbag, rubber gloves, eye protection, and a long-sleeved shirt should be worn. There may be deposits on the airbag unit and other interior surfaces. In large doses, these deposits may cause irritation to the skin and eyes.

WARNING: To avoid personal injury or death, use extreme care to prevent any foreign material from entering the side curtain airbag, or becoming entrapped between the side curtain airbag cushion and the headliner. Failure to observe this warning could result in occupant injuries upon airbag deployment.

NOTE: The following procedure is for replacement of a faulty or damaged side curtain airbag. If the airbag is faulty or damaged, but not deployed, review the recommended procedures for handling non-deployed supplemental restraints. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - HANDLING NON-DEPLOYED SUPPLEMENTAL RESTRAINTS). If the side curtain airbag has been deployed, review the recommended procedures for service after a supplemental restraint deployment before removing the airbag from the vehicle. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - SERVICE AFTER A SUPPLEMENTAL RESTRAINT DEPLOYMENT).



1. Check to be certain that the rivet nut (2) is properly installed in the inner A-pillar, and that it is in good condition.
2. Check to be certain that the eight U-nuts (1) are properly installed in the inner roof rail (1) and inner D-pillar, and that they are in good condition.



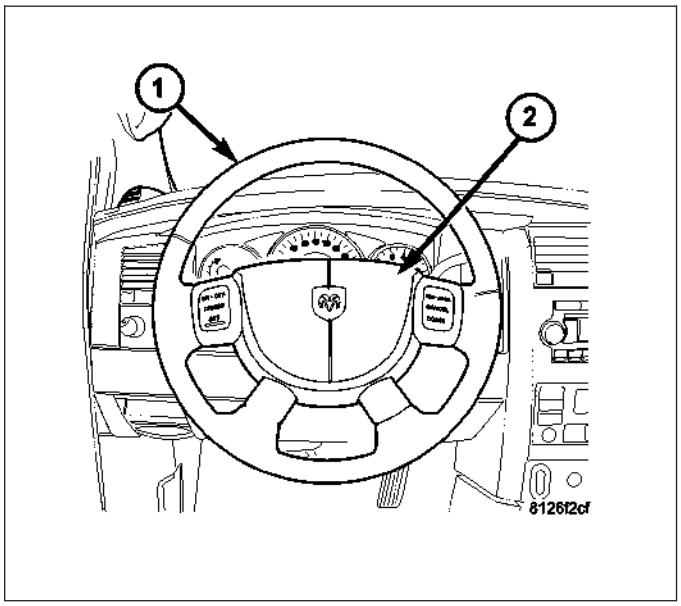
3. Position the side curtain airbag (3) into the vehicle as a unit through the liftgate opening.
4. Working from front to back, align each of the four plastic push-in fasteners (2) on the airbag channel with their holes in the inner roof side rail and push them straight in until they are fully seated.
5. Working from back to front, align each of the three front tether plastic retainers (5) with their holes in the inner A-pillar and push them in until they are fully seated.

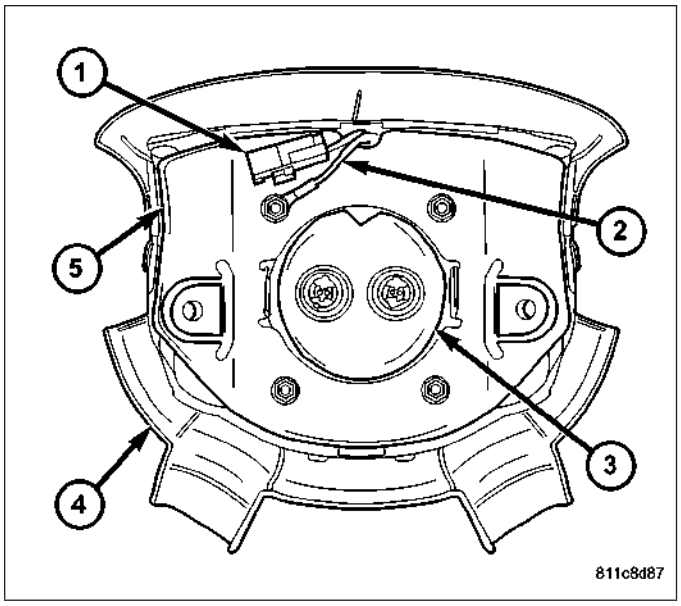
6. Loosely install the eight screws (1) that secure the side curtain airbag to the U-nuts in the inner roof rail and D-pillar.
7. Working from front to back, tighten each of the eight screws. Tighten the screws to 10 N·m (90 in. lbs.).
8. Install and tighten the screw (4) that secures the side curtain airbag front tether to the rivet nut in the inner A-pillar near the belt line. Tighten the screw to 6 N·m (50 in. lbs.).
9. Install and tighten the screw (7) that secures the side curtain airbag to the U-nut near the top of the inner D-pillar. Tighten the screw to 6 N·m (50 in. lbs.).
10. Reconnect the side curtain airbag pigtail wire connector (6) to the body wire harness connector on the lower inner B-pillar. Be certain the connector latches are fully engaged.
11. Engage the pigtail wire plastic retainers with their holes in the inner B-pillar.
12. Reinstall the lower trim onto the inside of the B-pillar. (Refer to 23 - BODY/INTERIOR/B-PILLAR LOWER TRIM - INSTALLATION).
13. Reinstall the headliner into the vehicle. (Refer to 23 - BODY/INTERIOR/HEADLINER - INSTALLATION).
14. Do not reconnect the battery negative cable at this time. The supplemental restraint system verification test procedure should be performed following service of any supplemental restraint system component. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - VERIFICATION TEST).

AIR BAG-DRIVER

DESCRIPTION

The color-keyed, injection molded, thermoplastic driver airbag protective trim cover (2) is the most visible part of the driver airbag. The driver airbag is located in the center of the steering wheel (1), where it is secured with two screws to the armature of the four-spoke steering wheel. All models have a chrome Dodge Ram emblem in the center of the trim cover. Concealed beneath the driver airbag trim cover are the horn switch, the folded airbag cushion, the airbag cushion retainer, the airbag housing, the airbag inflator, and the retainers that secure the inflator to the airbag housing.





The airbag cushion, housing (5), and inflator (3) are secured within an integral receptacle molded into the back of the trim cover (4). The four vertical walls of this receptacle have a total of twelve small windows with blocking tabs that are engaged by twelve hook formations around the perimeter of the airbag housing. Each hook is inserted through one of the windows and the blocking tab in each window keeps the hook properly engaged with the trim cover, locking the trim cover securely into place on the airbag housing.

The resistive membrane-type horn switch is secured with heat stakes to the inside surface of the driver airbag trim cover, between the trim cover and the folded airbag cushion. The horn switch ground pigtail wire (2) has an eyelet terminal connector that is captured beneath a flanged nut on the upper right inflator mounting stud on the back of the housing. The horn switch feed pigtail wire has a black, molded plastic insulator (1) that is secured by an integral retainer in a locator hole near the upper right corner of the airbag housing and is connected to the vehicle electrical system through a dedicated take out and connector of the steering wheel wire harness. Both horn switch wires are routed through an integral notch in the center of the upper edge of the airbag housing stamping.

The airbag used in this model is a multistage, Next Generation-type that complies with revised federal airbag standards to deploy with less force than those used in some prior models. A 71 centimeter (28 inch) diameter, radial deploying fabric cushion with internal tethers is used. The airbag inflator is a dual-initiator, non-azide, pyrotechnic-type unit with four mounting studs and is secured to the stamped metal airbag housing by four flanged hex nuts. Two keyed and color-coded connector receptacles on the driver airbag inflator connect the two inflator initiators to the vehicle electrical system through two yellow-jacketed, two-wire pigtail harnesses of the clockspring.

The driver airbag unit cannot be repaired, and must be replaced if deployed or in any way damaged. The driver airbag trim cover and horn switch unit may be disassembled from the driver airbag unit, and is available for separate service replacement.

OPERATION

The multistage driver airbag is deployed by electrical signals generated by the Occupant Restraint Controller (ORC) through the driver airbag squib 1 and squib 2 circuits to the two initiators in the airbag inflator. By using two initiators, the airbag can be deployed at multiple levels of force. The force level is controlled by the ORC to suit the monitored impact conditions by providing one of three delay intervals between the electrical signals provided to the two initiators. The longer the delay between these signals, the less forcefully the airbag will deploy.

When the ORC sends the proper electrical signals to each initiator, the electrical energy generates enough heat to initiate a small pyrotechnic charge which, in turn ignites chemical pellets within the inflator. Once ignited, these chemical pellets burn rapidly and produce a large quantity of inert gas. The inflator is sealed to the back of the airbag housing and a diffuser in the inflator directs all of the inert gas into the airbag cushion, causing the cushion to inflate. As the cushion inflates, the driver airbag trim cover will split at predetermined breakout lines, then fold back out of the way along with the horn switch unit. Following an airbag deployment, the airbag cushion quickly deflates by venting the inert gas towards the instrument panel through vent holes within the fabric used to construct the back (steering wheel side) panel of the airbag cushion.

Some of the chemicals used to create the inert gas may be considered hazardous while in their solid state before they are burned, but they are securely sealed within the airbag inflator. Typically, both initiators are used and all potentially hazardous chemicals are burned during an airbag deployment event. However, it is possible for only one initiator to be used during a deployment due to an airbag system fault; therefore, it is necessary to always confirm that both initiators have been used in order to avoid the improper disposal of potentially live pyrotechnic or hazardous materials. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - SERVICE AFTER A SUPPLEMENTAL RESTRAINT DEPLOYMENT).

The inert gas that is produced when the chemicals are burned is harmless. However, a small amount of residue from the burned chemicals may cause some temporary discomfort if it contacts the skin, eyes, or breathing passages. If skin or eye irritation is noted, rinse the affected area with plenty of cool, clean water. If breathing passages

are irritated, move to another area where there is plenty of clean, fresh air to breath. If the irritation is not alleviated by these actions, contact a physician.

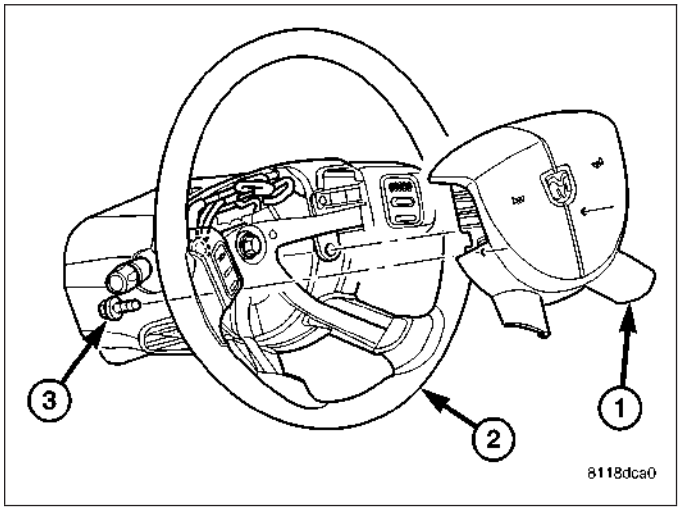
REMOVAL

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

WARNING: To avoid personal injury or death, when removing a deployed airbag, rubber gloves, eye protection, and a long-sleeved shirt should be worn. There may be deposits on the airbag cushion and other interior surfaces. In large doses, these deposits may cause irritation to the skin and eyes.

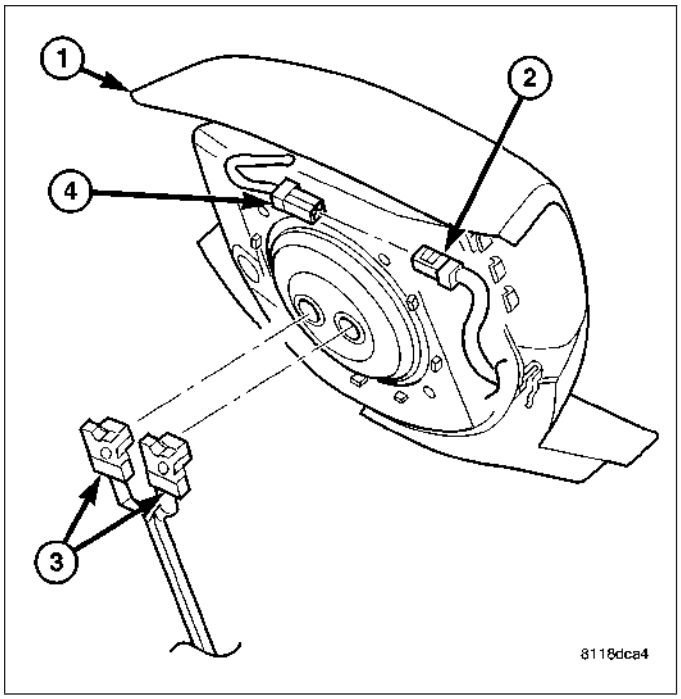
NOTE: The following procedure is for replacement of a faulty or damaged driver airbag. If the airbag is faulty or damaged, but not deployed, review the recommended procedures for handling non-deployed supplemental restraints. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - HANDLING NON-DEPLOYED SUPPLEMENTAL RESTRAINTS). If the driver airbag has been deployed, review the recommended procedures for service after a supplemental restraint deployment before removing the airbag from the vehicle. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - SERVICE AFTER A SUPPLEMENTAL RESTRAINT DEPLOYMENT).

1. Disconnect and isolate the battery negative cable. Wait two minutes for the system capacitor to discharge before further service.
2. From the underside of the steering wheel, remove the two screws (3) that secure the driver airbag (1) to the steering wheel armature (2).



CAUTION: Do not pull on the horn switch feed pigtail wire to disengage the connector from the driver airbag housing or to disconnect the horn switch to steering wheel wire harness connection. Improper pulling on this pigtail wire or connection can result in damage to the horn switch membrane or feed circuit.

3. Pull the driver airbag (1) away from the steering wheel far enough to access the three electrical connections on the back of the airbag housing.
4. Disconnect the steering wheel wire harness connector for the horn switch (2) from the horn switch feed pigtail wire connector (4), which is located on the back of the driver airbag housing.



CAUTION: Do not pull on the clockspring pigtail wires or pry on the connector insulator to disengage the connector from the driver airbag inflator connector receptacle. Improper removal of these pigtail wires and their connector insulators can result in damage to the airbag circuits or connector insulators.

5. The clockspring driver airbag pigtail wire connectors (3) are secured by integral latches to the airbag inflator connector receptacles, which are located on the back of the driver airbag housing. Depress the latches on each side of the connector insulator and pull the insulators straight out from the airbag inflator to disconnect them from the connector receptacles.
6. Remove the driver airbag from the steering wheel.
7. If the driver airbag has been deployed, the clockspring must be replaced. (Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCKSPRING - REMOVAL).

DISASSEMBLY

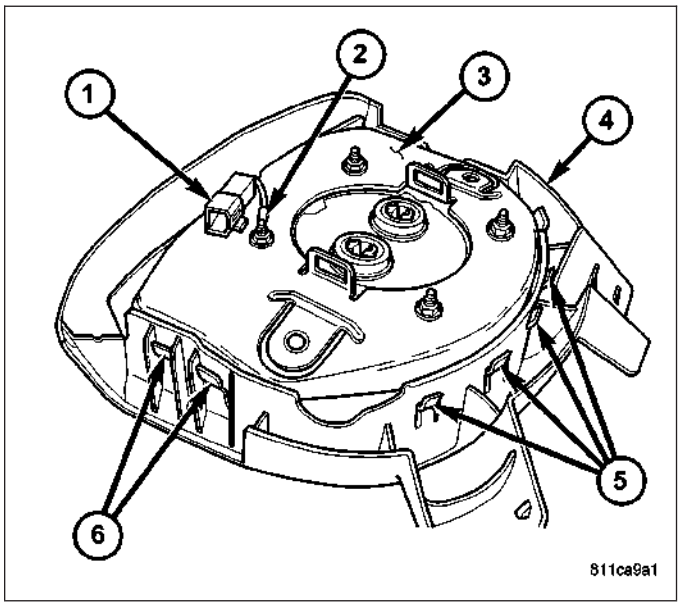
WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

WARNING: To avoid personal injury or death, service of this unit should be performed only by Daimler-Chrysler-trained and authorized dealer service technicians. Failure to take the proper precautions or to follow the proper procedures could result in accidental, incomplete, or improper airbag deployment and possible occupant injuries.

WARNING: To avoid personal injury or death, use extreme care to prevent any foreign material from entering the driver airbag, or becoming entrapped between the driver airbag cushion and the driver airbag trim cover. Failure to observe this warning could result in occupant injuries upon airbag deployment.

WARNING: To avoid personal injury or death, the driver airbag trim cover must never be painted. Replacement trim covers are serviced in the original colors. Paint may change the way in which the material of the trim cover responds to an airbag deployment. Failure to observe this warning could result in occupant injuries upon airbag deployment.

NOTE: The following procedures can be used to replace the driver airbag trim cover and horn switch unit for service. If the driver airbag is faulty or deployed, the entire driver airbag, trim cover and horn switch must be replaced as a unit.



1. Disconnect and isolate the battery negative cable. Wait two minutes for the system capacitor to discharge before further service.
2. Remove the driver airbag from the steering wheel (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - REMOVAL).
3. Place the driver airbag on a suitable clean and dry work surface with the trim cover facing down. If the trim cover will be reused, be certain to take the proper precautions to prevent the trim cover from receiving cosmetic damage during the following procedures.
4. Carefully pry the horn switch feed pigtail wire connector (1) away from the back of the driver airbag housing (3) far enough to disengage the integral connector retainer from the locator hole just above the upper right inflator mounting stud.
5. Remove the nut that secures the horn switch ground pigtail wire eyelet terminal (2) to the upper right inflator stud on the back of the driver airbag housing.
6. Remove the horn switch ground pigtail wire eyelet terminal from the upper right inflator stud on the back of the driver airbag housing.
7. Disengage each of the twelve hooks (5 and 6) of the airbag housing from the twelve windows in the vertical walls of the trim cover (4), one wall at a time. Start by disengaging the upper wall, then do each of the two side walls, and finish with the lower wall. To disengage the hooks, use hand pressure to push the adjacent edge of the airbag housing firmly and evenly downward into the trim cover receptacle, while at the same time pushing outward on the upper edge of the receptacle wall.
8. With all of the hooks disengaged, lift the housing, inflator, and cushion as a unit from the receptacle on the back of the driver airbag trim cover.

ASSEMBLY

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

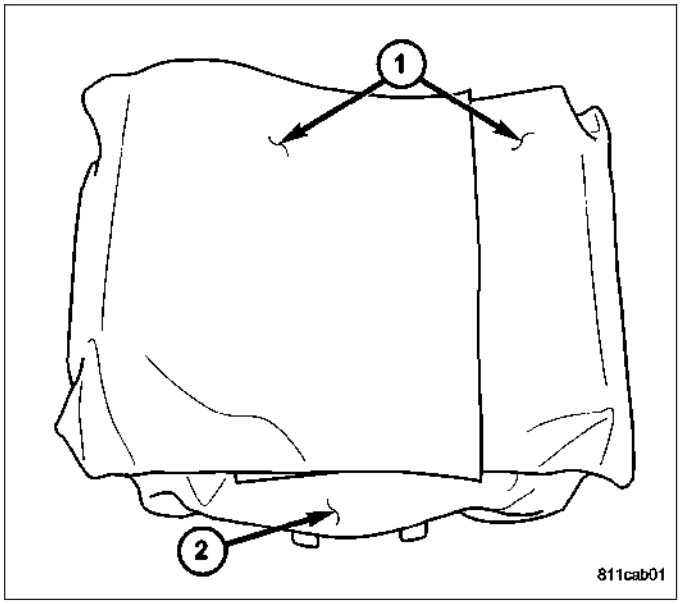
WARNING: To avoid personal injury or death, service of this unit should be performed only by Daimler-Chrysler-trained and authorized dealer service technicians. Failure to take the proper precautions or to follow the proper procedures could result in accidental, incomplete, or improper airbag deployment and possible occupant injuries.

WARNING: To avoid personal injury or death, use extreme care to prevent any foreign material from entering the driver airbag, or becoming entrapped between the driver airbag cushion and the driver airbag trim cover. Failure to observe this warning could result in occupant injuries upon airbag deployment.

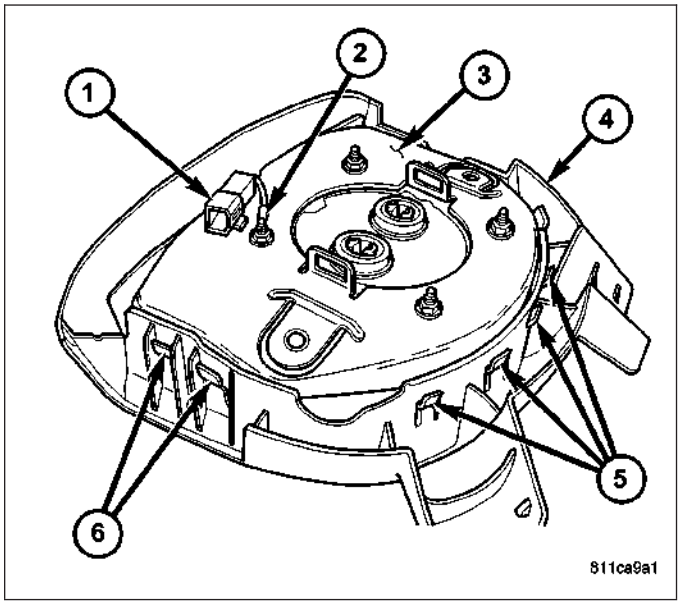
WARNING: To avoid personal injury or death, the driver airbag trim cover must never be painted. Replacement trim covers are serviced in the original colors. Paint may change the way in which the material of the trim cover responds to an airbag deployment. Failure to observe this warning could result in occupant injuries upon airbag deployment.

NOTE: The following procedures can be used to replace the driver airbag trim cover and horn switch unit for service. If the driver airbag is faulty or deployed, the entire driver airbag, trim cover and horn switch must be replaced as a unit.

1. Place the driver airbag on a suitable work surface with the airbag cushion facing up.
2. Fold the two flaps (1) of cushion material up around the sides and over the top of the airbag cushion retainer strap (2).
3. Position the new driver airbag trim cover over the airbag cushion, then push the receptacle of the trim cover down evenly over the cushion. Be certain that the cushion material flaps remain oriented over the cushion retainer strap as they were in Step 2.
4. Turn the driver airbag and the new driver airbag trim cover over as a unit, and place the unit on a suitable clean and dry work surface with the airbag cushion facing down. Be certain to take the proper precautions to prevent the trim cover from receiving cosmetic damage during the following procedures.

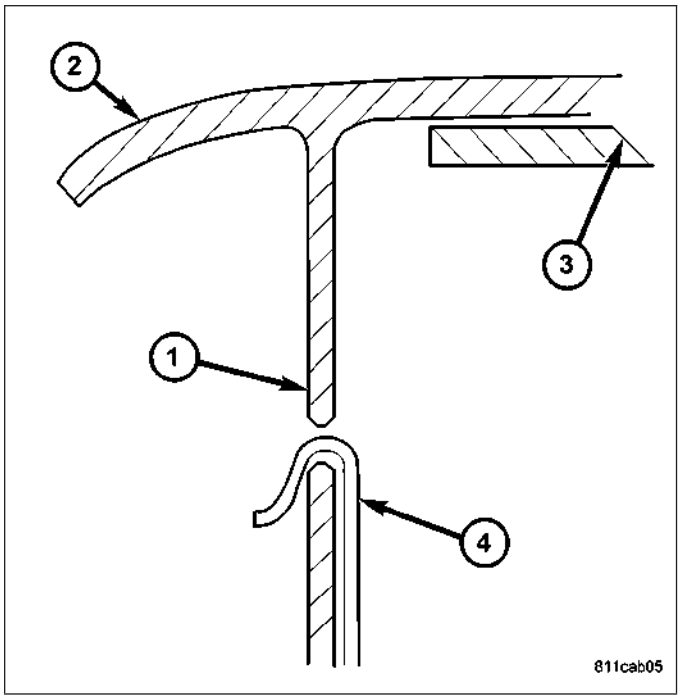


5. Be certain that the horn switch feed and ground pigtail wires are routed through the clearance notch at the top of the airbag housing (3), between the housing and the upper vertical wall of the trim cover receptacle.
6. Work around the perimeter of the unit engaging each of the twelve hooks (5 and 6) on the driver airbag housing through the windows in the walls of the trim cover receptacle.
7. Install the horn switch ground pigtail wire eyelet terminal (2) over the upper right inflator stud on the back of the driver airbag housing.
8. Install and tighten the nut that secures the horn switch ground pigtail wire eyelet terminal to the upper right inflator stud on the back of the driver airbag housing. Tighten the nut to 7 N·m (65 in. lbs.).
9. Using hand pressure, push the integral retainer of the horn switch feed pigtail wire connector (1) into the locator hole just above the upper right inflator mounting stud on the back of the airbag housing.



10. After the driver airbag has been assembled, try pulling the trim cover and the airbag housing away from each other. This action will fully seat the edges of the windows into the cradles of the hooks.

11. Before reinstalling the airbag onto the steering wheel, check that the blocking tab (1) in each of the trim cover windows is oriented over the airbag housing hook (4) as shown.
12. Reinstall the driver airbag onto the steering wheel (Refer to 8 - ELECTRICAL/RESTRAINTS/ DRIVER AIRBAG - INSTALLATION).



INSTALLATION

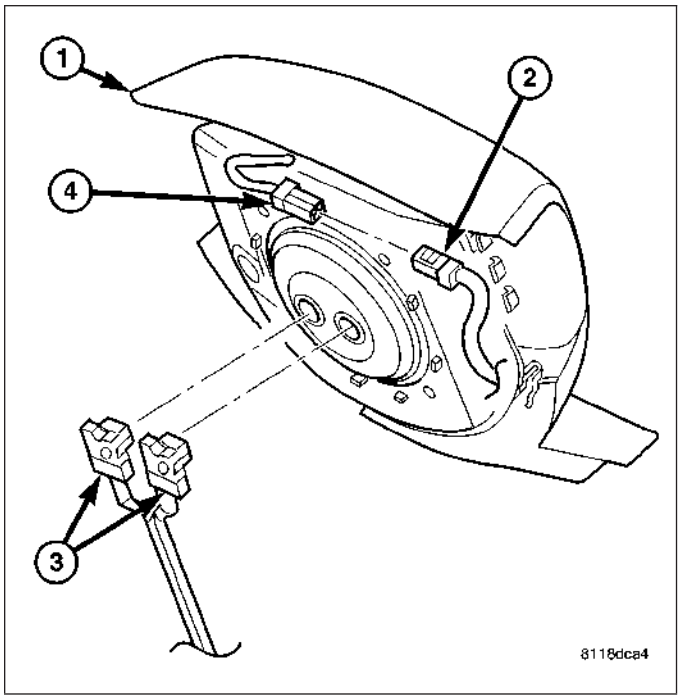
WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

WARNING: To avoid personal injury or death, use extreme care to prevent any foreign material from entering the driver airbag, or becoming entrapped between the driver airbag cushion and the driver airbag trim cover. Failure to observe this warning could result in occupant injuries upon airbag deployment.

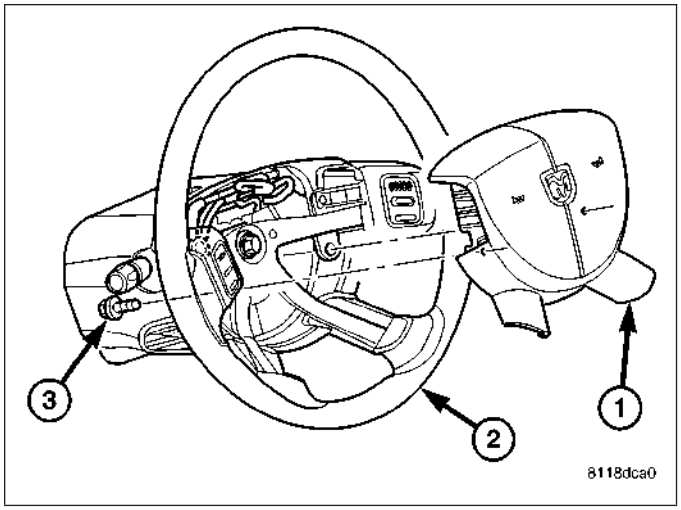
WARNING: To avoid personal injury or death, the driver airbag trim cover must never be painted. Replacement airbags are serviced with trim covers in the original colors. Paint may change the way in which the material of the trim cover responds to an airbag deployment. Failure to observe this warning could result in occupant injuries upon airbag deployment.

NOTE: The following procedure is for replacement of a faulty or damaged driver airbag. If the airbag is faulty or damaged, but not deployed, review the recommended procedures for handling non-deployed supplemental restraints. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - HANDLING NON-DEPLOYED SUPPLEMENTAL RESTRAINTS). If the driver airbag has been deployed, review the recommended procedures for service after a supplemental restraint deployment before removing the airbag from the vehicle. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - SERVICE AFTER A SUPPLEMENTAL RESTRAINT DEPLOYMENT).

1. Position the driver airbag (1) close enough to the steering wheel to reconnect the three electrical connections on the back of the airbag housing.
2. When installing the driver airbag, reconnect the two clockspring driver airbag pigtail wire connectors (3) to the airbag inflator connector receptacles by pressing straight in on the connector. Be certain to engage each keyed and color-coded connector to the matching connector receptacle. You can be certain that each connector is fully engaged in its receptacle by listening carefully for a distinct, audible click as the connector latches snap into place.
3. Reconnect the steering wheel wire harness connector (2) for the horn switch to the horn switch feed pigtail wire connector (4), which is located on the back of the driver airbag housing.



4. Carefully position the driver airbag (1) in the steering wheel (2). Be certain that the clockspring pigtail wires and the steering wheel wire harness in the steering wheel hub area are not pinched between the driver airbag and the steering wheel armature.
5. From the underside of the steering wheel, install and tighten the two screws (3) that secure the driver airbag to the steering wheel armature. Tighten the screws to 10 N·m (90 in. lbs.).
6. Do not reconnect the battery negative cable at this time. The supplemental restraint system verification test procedure should be performed following service of any supplemental restraint system component. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - VERIFICATION TEST).

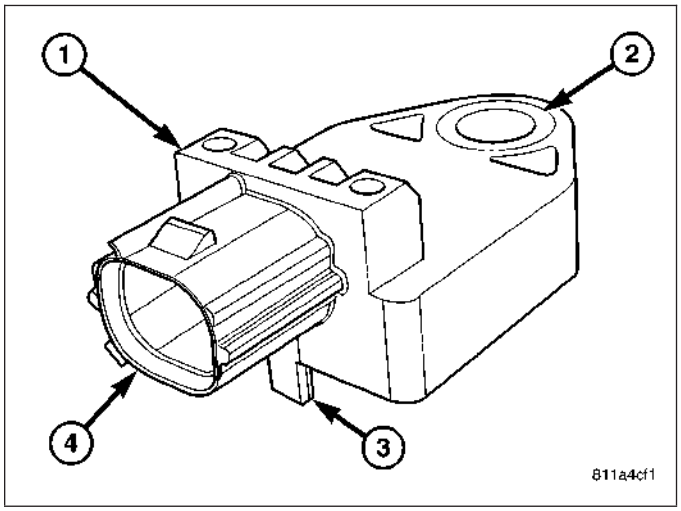


IMPACT SENSOR

DESCRIPTION

FRONT

Two front impact sensors (1) are used on this model, one each for the left and right sides of the vehicle. These sensors are mounted remotely from the impact sensor that is internal to the Occupant Restraint Controller (ORC). Each front sensor is secured with a screw to the backs of the right and left vertical members of the radiator support within the engine compartment. The sensor housing has an integral connector receptacle (4), an integral anti-rotation pin (3), and an integral mounting hole (2) with a metal sleeve to provide crush protection.

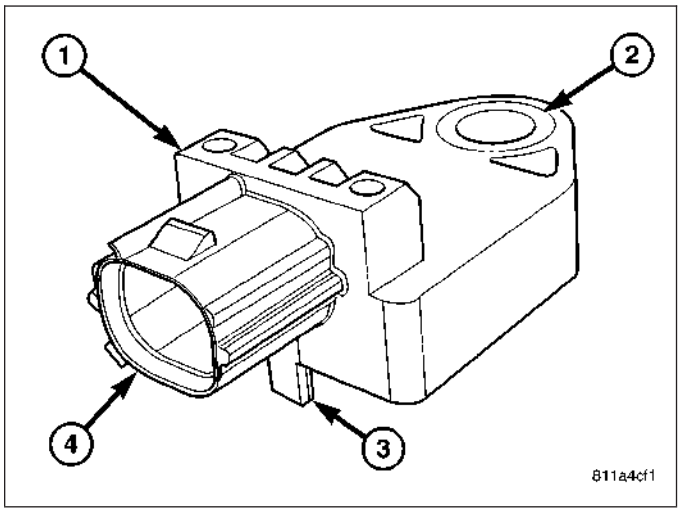


The right and left front impact sensors are identical in construction and calibration. A cavity in the center of the molded black plastic impact sensor housing contains the electronic circuitry of the sensor which includes an electronic communication chip and an electronic impact sensor. Potting material fills the cavity to seal and protect the internal electronic circuitry and components. The front impact sensors are each connected to the vehicle electrical system through a dedicated take out and connector of the headlamp and dash wire harness.

The impact sensors cannot be repaired or adjusted and, if damaged or faulty, they must be replaced.

SIDE

Six side impact sensors (1) are used on this model when it is equipped with the optional side curtain airbags, three each for the left and right sides of the vehicle. These sensors are mounted remotely from the impact sensor that is internal to the Occupant Restraint Controller (ORC). Each side sensor is secured with a screw to the inner right or left B-pillar, C-pillar or D-pillar within the passenger compartment. The sensor housing has an integral connector receptacle (4), an integral anti-rotation pin (3), and an integral mounting hole (2) with a metal sleeve to provide crush protection.



The right and left side impact sensors are identical in construction and calibration. A cavity in the center of the molded black plastic impact sensor housing contains the electronic circuitry of the sensor which includes an electronic communication chip and an electronic impact sensor. Potting material fills the cavity to seal and protect the internal electronic circuitry and components. The side impact sensors are each connected to the vehicle electrical system through a dedicated take out and connector of the body wire harness.

The impact sensors cannot be repaired or adjusted and, if damaged or faulty, they must be replaced.

OPERATION

FRONT

The front impact sensors are electronic accelerometers that sense the rate of vehicle deceleration, which provides verification of the direction and severity of an impact. Each sensor also contains an electronic communication chip that allows the unit to communicate the sensor status as well as sensor fault information to the microprocessor in the Occupant Restraint Controller (ORC).

The ORC microprocessor continuously monitors all of the passive restraint system electrical circuits to determine the system readiness. If the ORC detects a monitored system fault, it sets a Diagnostic Trouble Code (DTC) and controls the airbag indicator operation accordingly. The impact sensors each receive battery current and ground through dedicated left and right sensor plus and minus circuits from the ORC. The impact sensors and the ORC communicate by modulating the voltage in the sensor plus circuit.

The hard wired circuits between the front impact sensors and the ORC may be diagnosed and tested using conventional diagnostic tools and procedures. However, conventional diagnostic methods will not prove conclusive in the diagnosis of the ORC, the impact sensors, or the electronic message inputs to or outputs from the impact sensors. The most reliable, efficient, and accurate means to diagnose the impact sensors, the ORC, and the electronic message communication between the sensors and the ORC requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

SIDE

The side impact sensors are electronic accelerometers that sense the rate of vehicle deceleration, which provides verification of the direction and severity of an impact. Each sensor also contains an electronic communication chip that allows the unit to communicate the sensor status as well as sensor fault information to the microprocessor in the Occupant Restraint Controller (ORC).

The ORC microprocessor continuously monitors all of the side passive restraint system electrical circuits to determine the system readiness. If the ORC detects a monitored system fault, it sets a Diagnostic Trouble Code (DTC) and controls the airbag indicator operation accordingly. The impact sensors each receive battery current and ground through the same left or right sensor plus and minus circuits in a series arrangement from the ORC. The impact sensors and the ORC communicate by modulating the voltage in the sensor plus circuit.

The hard wired circuits between the side impact sensors, and those between the sensors and the ORC may be diagnosed and tested using conventional diagnostic tools and procedures. However, conventional diagnostic methods will not prove conclusive in the diagnosis of the ORC, the impact sensors, or the electronic message inputs to or outputs from the impact sensors. The most reliable, efficient, and accurate means to diagnose the impact sensors, the ORC, and the electronic message communication between the sensors and the ORC requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

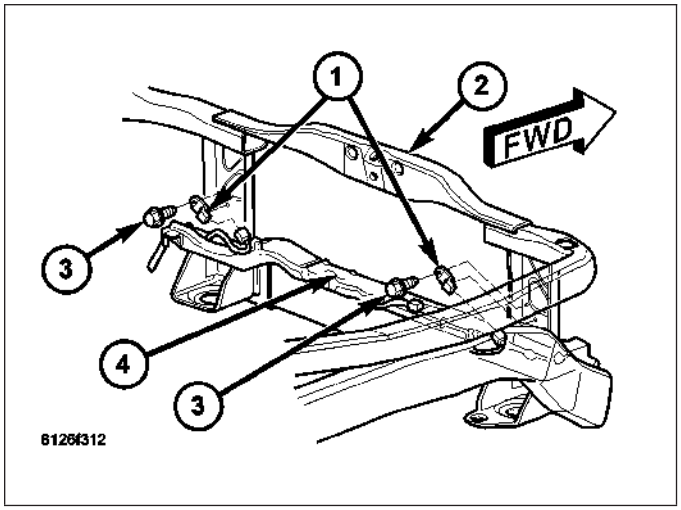
REMOVAL

FRONT

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

WARNING: To avoid personal injury or death, never strike or drop the front impact sensor, as it can damage the impact sensor or affect its calibration. The front impact sensor enables the system to deploy the front supplemental restraints. If an impact sensor is accidentally dropped during service, the sensor must be scrapped and replaced with a new unit. Failure to observe this warning could result in accidental, incomplete, or improper front supplemental restraint deployment.

1. Disconnect and isolate the battery negative cable. Wait two minutes for the system capacitor to discharge before further service.
2. Remove the screw (3) that secures the right or left front impact sensor (1) to the back of the right or left radiator support vertical member (2).
3. Disconnect the headlamp and dash wire harness connector (4) from the sensor connector receptacle.
4. Remove the right or left front impact sensor from the engine compartment.

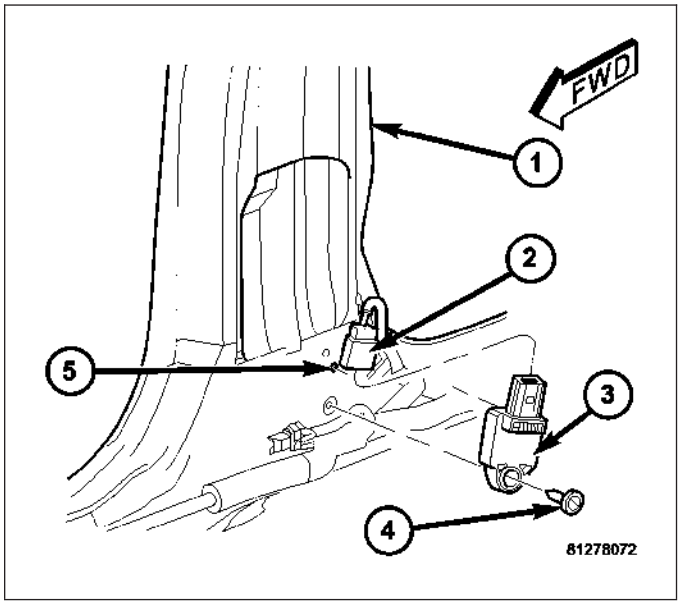


SIDE - B-PILLAR

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

WARNING: To avoid personal injury or death, never strike or drop the side impact sensor, as it can damage the impact sensor or affect its calibration. The side impact sensor enables the system to deploy the side curtain supplemental restraints. If an impact sensor is accidentally dropped during service, the sensor must be scrapped and replaced with a new unit. Failure to observe this warning could result in accidental, incomplete, or improper front supplemental restraint deployment.

1. Adjust the driver or passenger side front seat to its most forward position for easiest access to the B-pillar trim.
2. Disconnect and isolate the battery negative cable. Wait two minutes for the system capacitor to discharge before further service.
3. Remove the lower trim from the inside of the right or left B-pillar (1). (Refer to 23 - BODY/INTERIOR/ B-PILLAR LOWER TRIM - REMOVAL).
4. Remove the screw (4) that secures the side impact sensor (3) to the lower B-pillar.
5. Disconnect the body wire harness connector (2) from the sensor connector receptacle.
6. Remove the sensor from the B-pillar.

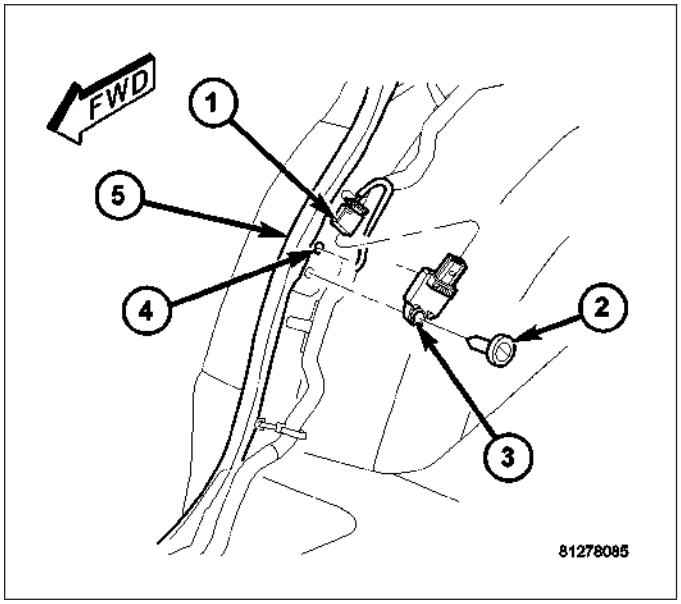


SIDE - C-PILLAR

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

WARNING: To avoid personal injury or death, never strike or drop the side impact sensor, as it can damage the impact sensor or affect its calibration. The side impact sensor enables the system to deploy the side curtain supplemental restraints. If an impact sensor is accidentally dropped during service, the sensor must be scrapped and replaced with a new unit. Failure to observe this warning could result in accidental, incomplete, or improper front supplemental restraint deployment.

1. Disconnect and isolate the battery negative cable. Wait two minutes for the system capacitor to discharge before further service.
2. Remove the quarter trim panel from the lower C-pillar. (Refer to 23 - BODY/INTERIOR/QUARTER TRIM PANEL - REMOVAL).
3. Remove the screw (2) that secures the side impact sensor (3) to the C-pillar (5).
4. Disconnect the body wire harness connector (1) from the sensor connector receptacle.
5. Remove the sensor from the C-pillar.

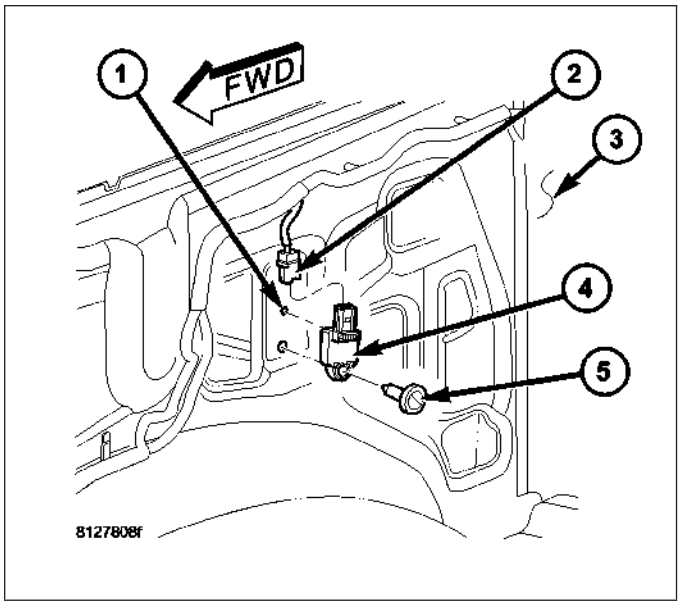


SIDE - D-PILLAR

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

WARNING: To avoid personal injury or death, never strike or drop the side impact sensor, as it can damage the impact sensor or affect its calibration. The side impact sensor enables the system to deploy the side curtain supplemental restraints. If an impact sensor is accidentally dropped during service, the sensor must be scrapped and replaced with a new unit. Failure to observe this warning could result in accidental, incomplete, or improper front supplemental restraint deployment.

1. Disconnect and isolate the battery negative cable. Wait two minutes for the system capacitor to discharge before further service.
2. Remove the quarter trim panel from the lower D-pillar. (Refer to 23 - BODY/INTERIOR/QUARTER TRIM PANEL - REMOVAL).
3. Remove the screw (5) that secures the side impact sensor (4) to the inner quarter panel forward of the D-pillar (3).
4. Disconnect the body wire harness connector (2) from the sensor connector receptacle.
5. Remove the sensor from the inner quarter panel.



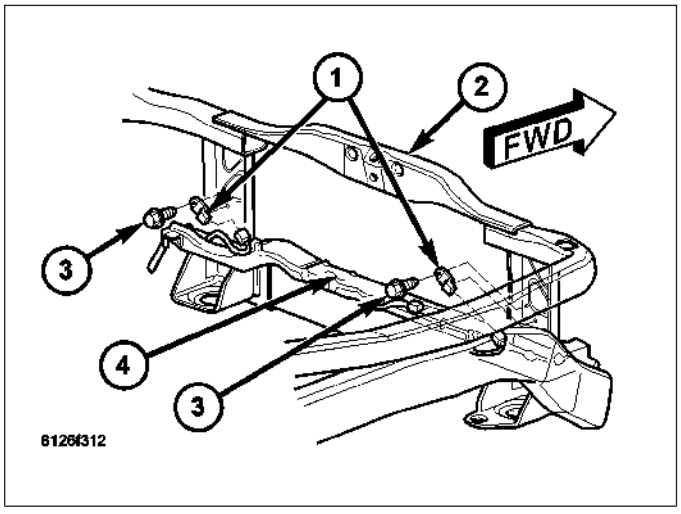
INSTALLATION

FRONT

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

WARNING: To avoid personal injury or death, never strike or drop the front impact sensor, as it can damage the impact sensor or affect its calibration. The front impact sensor enables the system to deploy the front supplemental restraints. If an impact sensor is accidentally dropped during service, the sensor must be scrapped and replaced with a new unit. Failure to observe this warning could result in accidental, incomplete, or improper front supplemental restraint deployment.

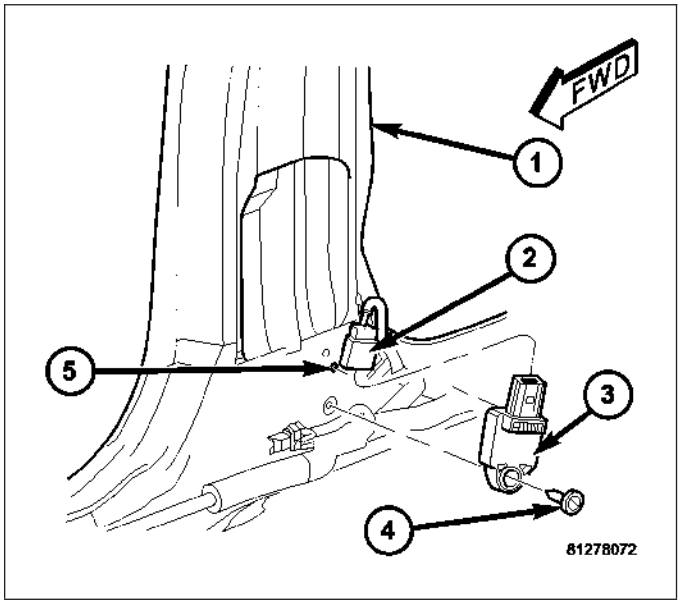
1. Position the right or left front impact sensor (1) into the engine compartment.
2. Reconnect the headlamp and dash wire harness connector (4) to the sensor connector receptacle.
3. Position the sensor onto the back of the right or left radiator support vertical member (2). Be certain that the anti-rotation pin on the back of the sensor is engaged in the lower clearance hole of the radiator support.
4. Install and tighten the screw (3) that secures the sensor to the back of the support vertical member. Tighten the screw to 6 N·m (55 in. lbs.).
5. Do not reconnect the battery negative cable at this time. The supplemental restraint system verification test procedure should be performed following service of any supplemental restraint system component. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - VERIFICATION TEST).



SIDE - B-PILLAR

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

WARNING: To avoid personal injury or death, never strike or drop the side impact sensor, as it can damage the impact sensor or affect its calibration. The side impact sensor enables the system to deploy the side curtain supplemental restraints. If an impact sensor is accidentally dropped during service, the sensor must be scrapped and replaced with a new unit. Failure to observe this warning could result in accidental, incomplete, or improper front supplemental restraint deployment.

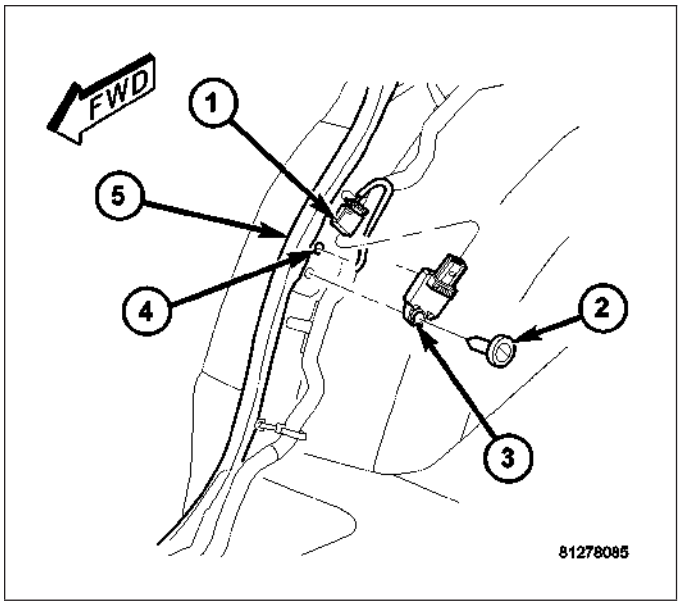


1. Check to be certain that the rivet nut used to secure the side impact sensor (3) is properly installed in the inner B-pillar (1), and that it is in good condition.
2. Position the side impact sensor near the inner B-pillar.
3. Reconnect the body wire harness connector (2) to the sensor connector receptacle.
4. Position the sensor onto the inner B-pillar. Be certain that the anti-rotation pin on the back of the sensor is engaged in the clearance hole (5) of the B-pillar.
5. Install and tighten the screw (4) that secures the sensor to the inner B-pillar. Tighten the screw to 6 N·m (50 in. lbs.).
6. Reinstall the lower trim onto the inside of the B-pillar. (Refer to 23 - BODY/INTERIOR/B-PILLAR LOWER TRIM - INSTALLATION).
7. Do not reconnect the battery negative cable at this time. The supplemental restraint system verification test procedure should be performed following service of any supplemental restraint system component. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - VERIFICATION TEST).

SIDE - C-PILLAR

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

WARNING: To avoid personal injury or death, never strike or drop the side impact sensor, as it can damage the impact sensor or affect its calibration. The side impact sensor enables the system to deploy the side curtain supplemental restraints. If an impact sensor is accidentally dropped during service, the sensor must be scrapped and replaced with a new unit. Failure to observe this warning could result in accidental, incomplete, or improper front supplemental restraint deployment.

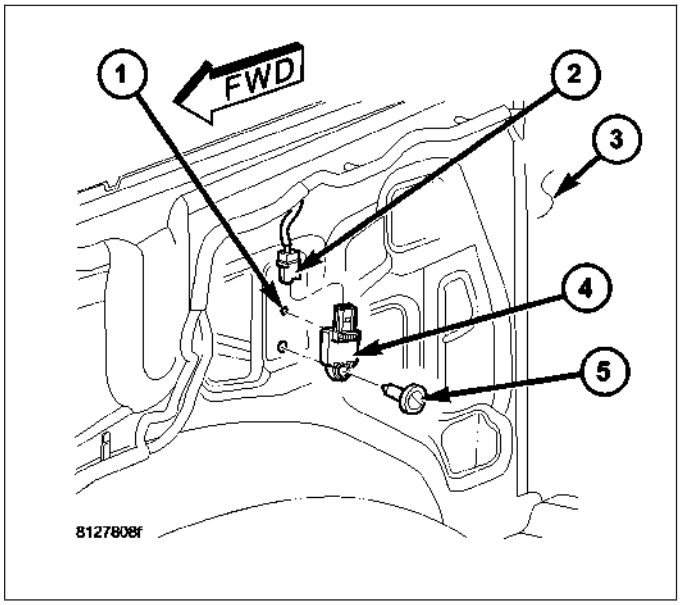


1. Check to be certain that the rivet nut used to secure the side impact sensor (3) is properly installed in the inner C-pillar (5), and that it is in good condition.
2. Position the side impact sensor near the inner C-pillar.
3. Reconnect the body wire harness connector (1) to the sensor connector receptacle.
4. Position the sensor onto the inner C-pillar. Be certain that the anti-rotation pin on the back of the sensor is engaged in the clearance hole (4) of the C-pillar.
5. Install and tighten the screw (2) that secures the sensor to the inner C-pillar. Tighten the screw to 6 N·m (50 in. lbs.).
6. Reinstall the quarter trim panel onto the lower C-pillar. (Refer to 23 - BODY/INTERIOR/QUARTER TRIM PANEL - INSTALLATION).
7. Do not reconnect the battery negative cable at this time. The supplemental restraint system verification test procedure should be performed following service of any supplemental restraint system component. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - VERIFICATION TEST).

SIDE - D-PILLAR

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

WARNING: To avoid personal injury or death, never strike or drop the side impact sensor, as it can damage the impact sensor or affect its calibration. The side impact sensor enables the system to deploy the side curtain supplemental restraints. If an impact sensor is accidentally dropped during service, the sensor must be scrapped and replaced with a new unit. Failure to observe this warning could result in accidental, incomplete, or improper front supplemental restraint deployment.

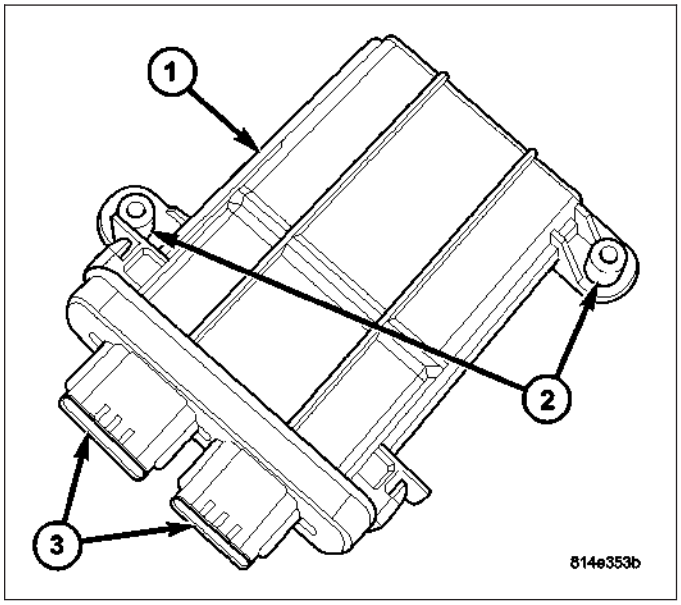


1. Check to be certain that the rivet nut used to secure the side impact sensor (4) is properly installed in the inner quarter panel forward of the C-pillar (3), and that it is in good condition.
2. Position the side impact sensor near the inner quarter panel.
3. Reconnect the body wire harness connector (2) to the sensor connector receptacle.
4. Position the sensor onto the inner quarter panel. Be certain that the anti-rotation pin on the back of the sensor is engaged in the clearance hole (1) of the quarter panel.
5. Install and tighten the screw (5) that secures the sensor to the inner quarter panel. Tighten the screw to 6 N·m (50 in. lbs.).

6. Reinstall the quarter trim panel onto the lower D-pillar. (Refer to 23 - BODY/INTERIOR/QUARTER TRIM PANEL - INSTALLATION).
7. Do not reconnect the battery negative cable at this time. The supplemental restraint system verification test procedure should be performed following service of any supplemental restraint system component. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - VERIFICATION TEST).

OCCUPANT CLASSIFICATION MODULE

DESCRIPTION



The Occupant Classification Module (OCM) (1) is secured with two screws to a stamped metal mount on the underside of the passenger side front seat cushion frame near the center. Concealed within a hollow in the center of the molded plastic OCM housing is a microprocessor and the other electronic circuitry of the module. The module housing is sealed to enclose and protect the internal electronic circuitry. The OCM software is flash programmable.

Two mounting tabs (2) and two connector receptacles (3) are integral to the OCM housing. The connector receptacles contain terminal pins that connect the OCM to the vehicle electrical system through a dedicated take out and connector of the passenger side front seat wire harness, and a second take out and connector of the body wire harness.

A non-calibrated OCM is available for separate service replacement. The OCM and all of the other components of the Occupant Classification System (OCS) including the passenger side front seat, the seat weight sensors, the passenger or driver seat track position sensor and the seat adjusters, cushion, back, frame, foam, springs, and wiring harness are a factory-calibrated and assembled unit. Any time any one of these components is removed or replaced for any reason, the OCM must be re-calibrated using a diagnostic scan tool, the Occupant Classification Seat Weight special tool, and the Occupant Classification System Verification Test. Refer to the appropriate diagnostic procedures.

The OCM cannot be adjusted or repaired and, if damaged or faulty, it must be replaced.

OPERATION

The microprocessor in the Occupant Classification Module (OCM) contains the Occupant Classification System (OCS) logic circuits. The OCM uses On-Board Diagnostics (OBD) and can communicate with other electronic modules in the vehicle as well as with the diagnostic scan tool using the Controller Area Network (CAN) data bus. This method of communication is also used for OCS diagnosis and testing through the 16-way data link connector located on the driver side lower edge of the instrument panel.

The OCM provides voltage to the four seat weight sensors located on the corners of the passenger side front seat, and to the seat track position sensors on the outboard passenger and driver side front seat upper seat tracks. The OCM then monitors return inputs from each of the sensors on dedicated hard wired data communication circuits. The seat weight sensor input allows the OCM to determine whether the passenger side front seat is occupied and the relative size of the occupant by providing a weight-sensing reference to the load on the seat. The seat track position sensor provides an additional logic input to the OCM microprocessor that allows it to determine the position of the front seat passenger and driver relative to the front airbags.

Pre-programmed decision algorithms and OCS calibration allow the OCM microprocessor to determine when passenger airbag protection is appropriate based upon the seat load as signaled by the seat weight sensors. When the programmed conditions are met, the OCM sends the proper electronic occupant classification messages over the CAN data bus to the Occupant Restraint Controller (ORC), and the ORC enables or disables the deployment circuits for the passenger front supplemental restraints. The ORC also provides a control output for the passenger

airbag on/off indicator in the instrument panel based upon the electronic occupant classification messages it receives from the OCM.

The OCM also sends electronic driver and passenger seat track position messages to the ORC over the CAN data bus. The ORC uses the seat track position data as an additional logic input for determining the force level with which to deploy the multistage front airbags.

The OCM microprocessor continuously monitors all of the OCS electrical circuits and components to determine the system readiness. If the OCM detects a monitored system fault, it sets an active and stored Diagnostic Trouble Code (DTC) and sends the appropriate electronic messages to the ORC over the CAN data bus. Then the ORC sets a DTC and sends messages to control the airbag indicator operation accordingly. An active fault only remains for the duration of the fault, or in some cases for the duration of the current ignition switch cycle, while a stored fault causes a DTC to be stored in memory by the OCM and the ORC. For some DTCs, if a fault does not recur for a number of ignition cycles, the OCM will automatically erase the stored DTC. For other internal faults, the stored DTC is latched forever.

The OCM receives battery current on a fused ignition switch output (run-start) circuit through a fuse in the Junction Block (JB). The OCM receives ground through a ground circuit and take out of the body wire harness. These connections allow the OCM to be operational whenever the ignition switch is in the Start or On positions.

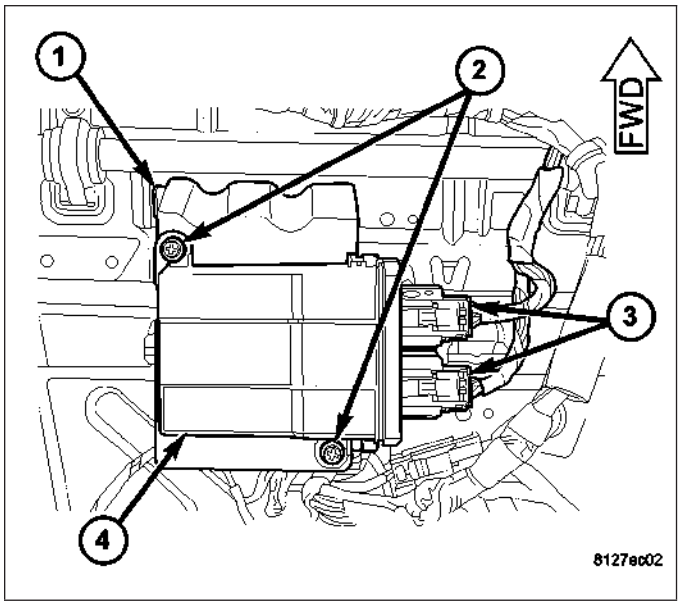
The hard wired inputs and outputs for the OCM may be diagnosed and tested using conventional diagnostic tools and procedures. However, conventional diagnostic methods will not prove conclusive in the diagnosis of the OCM, the CAN data bus, or the electronic message inputs to and outputs from the OCM. The most reliable, efficient, and accurate means to diagnose the OCM, the CAN data bus network, and the electronic message inputs to and outputs from the OCM requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

REMOVAL

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

NOTE: A non-calibrated Occupant Classification Module (OCM) is available for separate service replacement. The OCM and all of the other components of the Occupant Classification System (OCS) including the passenger side front seat, the seat weight sensors, the passenger or driver seat track position sensor and the seat adjusters, cushion, back, frame, foam, springs, and wiring harness are a factory-calibrated and assembled unit. Any time any one of these components is removed or replaced for any reason, the OCM must be re-calibrated using a diagnostic scan tool, the Occupant Classification Seat Weight special tool, and the Occupant Classification System Verification Test. Refer to the appropriate diagnostic procedures.

1. Disconnect and isolate the battery negative cable. Wait two minutes for the system capacitor to discharge before further service.
2. Reach under the front edge of the passenger side front seat cushion to access and disconnect the two seat wire harness connectors (3) from the Occupant Classification Module (OCM) (4) connector receptacles located on the inboard facing side of the module.
3. Remove the two screws (2) that secure the OCM to the OCM bracket (1) on the underside of the passenger side front seat cushion frame.
4. Remove the OCM from under the passenger side front seat.

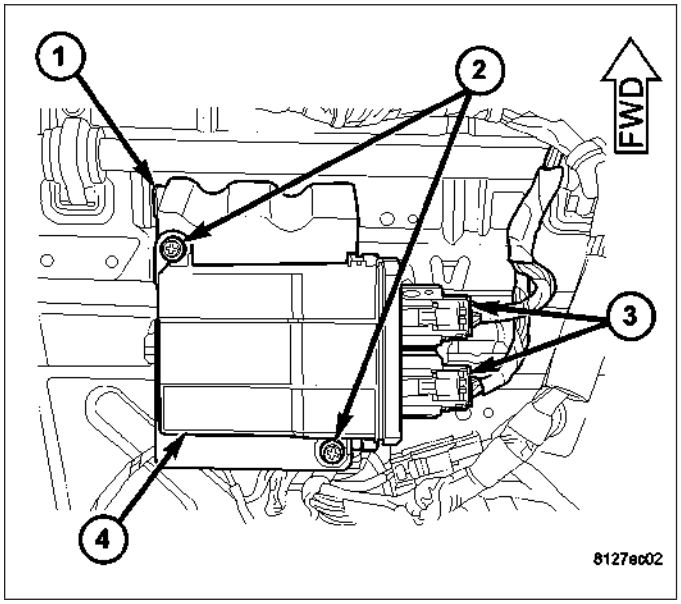


INSTALLATION

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

NOTE: A non-calibrated Occupant Classification Module (OCM) is available for separate service replacement. The OCM and all of the other components of the Occupant Classification System (OCS) including the passenger side front seat, the seat weight sensors, the passenger or driver seat track position sensor and the seat adjusters, cushion, back, frame, foam, springs, and wiring harness are a factory-calibrated and assembled unit. Any time any one of these components is removed or replaced for any reason, the OCM must be re-calibrated using a diagnostic scan tool, the Occupant Classification Seat Weight special tool, and the Occupant Classification System Verification Test. Refer to the appropriate diagnostic procedures.

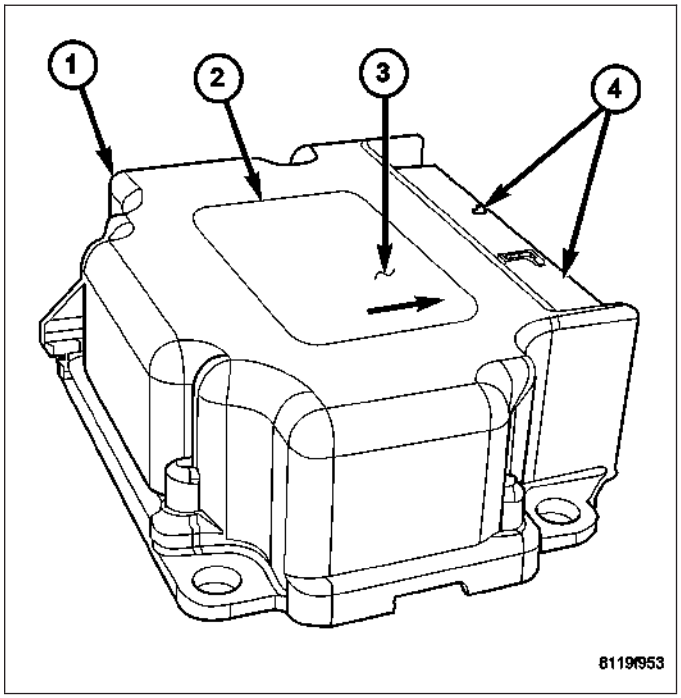
1. Carefully position the Occupant Classification Module (OCM) (4) to the OCM bracket (1) on the underside of the passenger side front seat cushion frame. When the OCM is correctly positioned, the connector receptacles on the module will be pointed inboard in the vehicle.
2. Install and tighten the two screws (2) that secure the OCM to the OCM bracket. Tighten the screws to 2 N·m (15 in. lbs.).
3. Reconnect the two seat wire harness connectors (3) to the OCM connector receptacles located on the inboard facing side of the module. Be certain that the latches on both connectors are each fully engaged.
4. Do not reconnect the battery negative cable at this time. The supplemental restraint system verification test procedure should be performed following service of any supplemental restraint system component. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - VERIFICATION TEST).



5. Following successful completion of the supplemental restraint system verification test procedure, perform the Occupant Classification System Verification Test using a diagnostic scan tool. Refer to the appropriate diagnostic procedures.

MODULE-OCCUPANT RESTRAINT CONTROLLER

DESCRIPTION



The Occupant Restraint Controller (ORC) (1) is secured with three screws to a stamped steel mounting bracket welded onto the top of the floor panel transmission tunnel just behind the front seat crossmember and beneath the center floor console in the passenger compartment of the vehicle. Concealed within a hollow in the center of the die cast aluminum ORC housing is the electronic circuitry of the ORC which includes a microprocessor, an electronic impact sensor, an electronic safing sensor, and an energy storage capacitor. A stamped metal cover plate is secured to the bottom of the ORC housing with four screws to enclose and protect the internal electronic circuitry and components.

An arrow (3) printed on the label (2) on the top of the ORC housing provides a visual verification of the proper orientation of the unit, and should always be pointed toward the front of the vehicle. The ORC housing has integral mounting flanges on three corners. The mounting flange to the right of the connector receptacle has an integral locating pin on its lower surface. Both right side flanges have round mounting holes, while the flange on the left side has a slotted mounting hole. A molded plastic electrical connector (4) with two receptacles, one containing twenty-four terminal pins and the other containing thirty-two terminal pins, exits the forward facing side of the ORC housing. These terminal pins connect the ORC to the vehicle electrical system through two dedicated take outs and connectors of the body wire harness.

The impact sensor and safing sensor internal to the ORC are calibrated for the specific vehicle, and are only serviced as a unit with the ORC. In addition, there are unique versions of the ORC for vehicles with or without the optional side curtain airbags. The ORC cannot be repaired or adjusted and, if damaged or faulty, it must be replaced.

OPERATION

The microprocessor in the Occupant Restraint Controller (ORC) contains the supplemental restraint system logic circuits and controls all of the supplemental restraint system components. The ORC uses On-Board Diagnostics (OBD) and can communicate with other electronic modules in the vehicle as well as with the diagnostic scan tool using the Controller Area Network (CAN) data bus. This method of communication is used for control of the airbag indicator in the ElectroMechanical Instrument Cluster (EMIC) and for supplemental restraint system diagnosis and testing through the 16-way data link connector located on the driver side lower edge of the instrument panel. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER/AIRBAG INDICATOR - OPERATION).

The ORC microprocessor continuously monitors all of the supplemental restraint system electrical circuits to determine the system readiness. If the ORC detects a monitored system fault, it sets an active and stored Diagnostic Trouble Code (DTC) and sends electronic messages to the EMIC over the CAN data bus to turn on the airbag indicator. An active fault only remains for the duration of the fault, or in some cases for the duration of the current ignition switch cycle, while a stored fault causes a DTC to be stored in memory by the ORC. For some DTCs, if a fault does not recur for a number of ignition cycles, the ORC will automatically erase the stored DTC. For other internal faults, the stored DTC is latched forever.

On models equipped with the Occupant Classification System (OCS), the ORC communicates with the Occupant Classification Module (OCM) over the CAN data bus. The ORC will internally disable the passenger airbag and seat belt tensioner deployment circuits if the OCM detects that the passenger side front seat is unoccupied or that it is occupied by a load that is inappropriate for an airbag deployment. The ORC also provides a control output to the passenger airbag on/off indicator through the passenger airbag indicator driver circuit. The OCM notifies the ORC when it has detected a monitored system fault and stored a DTC in its memory for any faulty OCS component or circuit, then the ORC sets a DTC and controls the airbag indicator operation accordingly.

The ORC receives battery current through two circuits; a fused ignition switch output (run) circuit through a fuse in the Junction Block (JB), and a fused ignition switch output (run-start) circuit through a second fuse in the JB. The ORC receives ground through a ground circuit and take out of the instrument panel wire harness. This take out has a single eyelet terminal connector that is secured by a ground screw near the center of the instrument panel structural support. These connections allow the ORC to be operational whenever the ignition switch is in the Start or On positions.

The ORC also contains an energy-storage capacitor. When the ignition switch is in the Start or On positions, this capacitor is continually being charged with enough electrical energy to deploy the supplemental restraint components for up to one second following a battery disconnect or failure. The purpose of the capacitor is to provide backup supplemental restraint system protection in case there is a loss of battery current supply to the ORC during an impact.

Two sensors are contained within the ORC, an electronic impact sensor and a safing sensor. The ORC also monitors inputs from two remote front impact sensors located on the back of the right and left vertical members of the radiator support near the front of the vehicle. The electronic impact sensors are accelerometers that sense the rate of vehicle deceleration, which provides verification of the direction and severity of an impact. On vehicles equipped with optional side curtain airbags the ORC also monitors inputs from six additional remote impact sensors located on the left and right inner B-pillars, C-pillars and D-pillars to control deployment of the side curtain airbag units.

The safing sensor is an electronic accelerometer sensor within the ORC that provides an additional logic input to the ORC microprocessor. The safing sensor is used to verify the need for a supplemental restraint deployment by detecting impact energy of a lesser magnitude than that of the primary electronic impact sensors, and must exceed a safing threshold in order for the airbags to deploy. Vehicles equipped with optional side curtain airbags, feature a second safing sensor within the ORC to provide confirmation to the ORC microprocessor of side impact forces. This second safing sensor is a bi-directional unit that detects impact forces from either side of the vehicle.

Pre-programmed decision algorithms in the ORC microprocessor determine when the deceleration rate as signaled by the impact sensors and the safing sensors indicate an impact that is severe enough to require supplemental restraint system protection and, based upon the severity of the monitored impact, determines the level of front airbag deployment force required for each front seating position. When the programmed conditions are met, the ORC sends the proper electrical signals to deploy the dual multistage front airbags at the programmed force levels, the front seat belt tensioners and, if the vehicle is so equipped, either side curtain airbag unit. For vehicles equipped with the OCS, the passenger front airbag and seat belt tensioner will be deployed by the ORC only if enabled by the OCM messages (passenger airbag on/off indicator Off) at the time of the impact.

The hard wired inputs and outputs for the ORC may be diagnosed and tested using conventional diagnostic tools and procedures. However, conventional diagnostic methods will not prove conclusive in the diagnosis of the ORC, the CAN data bus network, or the electronic message inputs to and outputs from the ORC. The most reliable, efficient, and accurate means to diagnose the ORC, the CAN data bus, and the electronic message inputs to and outputs from the ORC requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

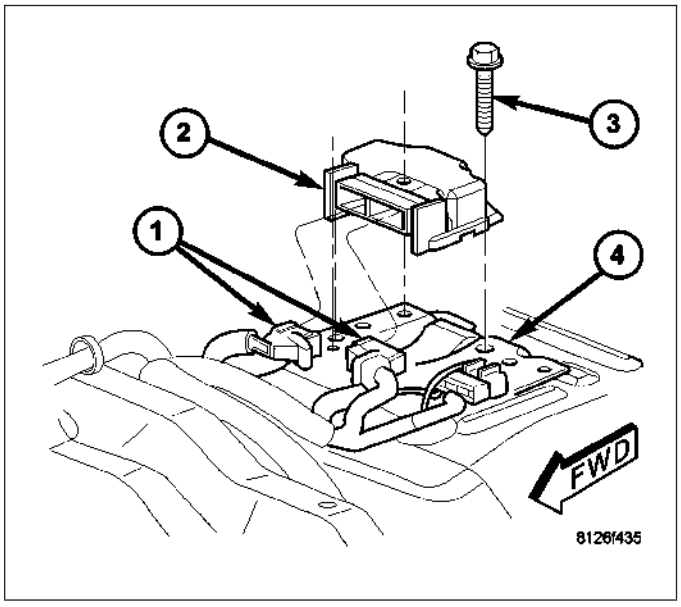
REMOVAL

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

WARNING: To avoid personal injury or death, never strike or drop the occupant restraint controller, as it can damage the impact sensor or affect its calibration. The occupant restraint controller contains the impact sensor, which enables the system to deploy the supplemental restraints. If an occupant restraint controller is accidentally dropped during service, the module must be scrapped and replaced with a new unit. Failure to observe this warning could result in accidental, incomplete, or improper supplemental restraint deployment.

CAUTION: On vehicles equipped with the Occupant Classification System (OCS), never replace both the Occupant Restraint Controller (ORC) and the Occupant Classification Module (OCM) at the same time. If both require replacement, replace one. Then perform the supplemental restraint verification test before replacing the other. Both the ORC and the OCM store OCS calibration data, which they transfer to one another when one of them is replaced. If both are replaced at the same time, an irreversible fault will be set in both modules.

1. Disconnect and isolate the battery negative cable. Wait two minutes for the system capacitor to discharge before further service.
2. Remove the center console from the top of the floor panel transmission tunnel. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL).
3. Disconnect the two body wire harness connectors (1) from the Occupant Restraint Controller (ORC) (2) connector receptacles located on the forward facing side of the module. To disconnect the wire harness connectors from the ORC, depress the release tab and lift the lever arm on each connector.
4. Remove the three screws (3) that secure the ORC to the ORC bracket (4) that is welded onto the top of the floor panel transmission tunnel.
5. Remove the ORC from the floor panel transmission tunnel.



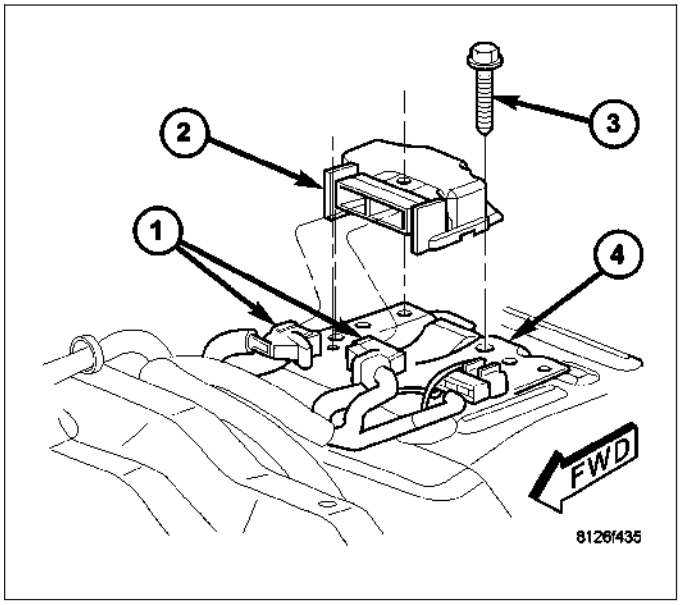
INSTALLATION

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

WARNING: To avoid personal injury or death, never strike or drop the occupant restraint controller, as it can damage the impact sensor or affect its calibration. The occupant restraint controller contains the impact sensor, which enables the system to deploy the supplemental restraints. If an occupant restraint controller is accidentally dropped during service, the module must be scrapped and replaced with a new unit. Failure to observe this warning could result in accidental, incomplete, or improper supplemental restraint deployment.

CAUTION: On vehicles equipped with the Occupant Classification System (OCS), never replace both the Occupant Restraint Controller (ORC) and the Occupant Classification Module (OCM) at the same time. If both require replacement, replace one. Then perform the supplemental restraint verification test before replacing the other. Both the ORC and the OCM store OCS calibration data, which they transfer to one another when one of them is replaced. If both are replaced at the same time, an irreversible fault will be set in both modules.

1. Carefully position the Occupant Restraint Controller (ORC) (2) to the ORC bracket (4) on the floor panel transmission tunnel. When the ORC is correctly positioned, the arrow on the ORC label will be pointed forward in the vehicle and the locating pin on the bottom of the right ORC mounting flange will be engaged into the locating hole in the ORC bracket.
2. Install and tighten the three screws (3) that secure the ORC to the ORC bracket that is welded onto the floor panel transmission tunnel. Tighten the screws to 11 N·m (8 ft. lbs.).



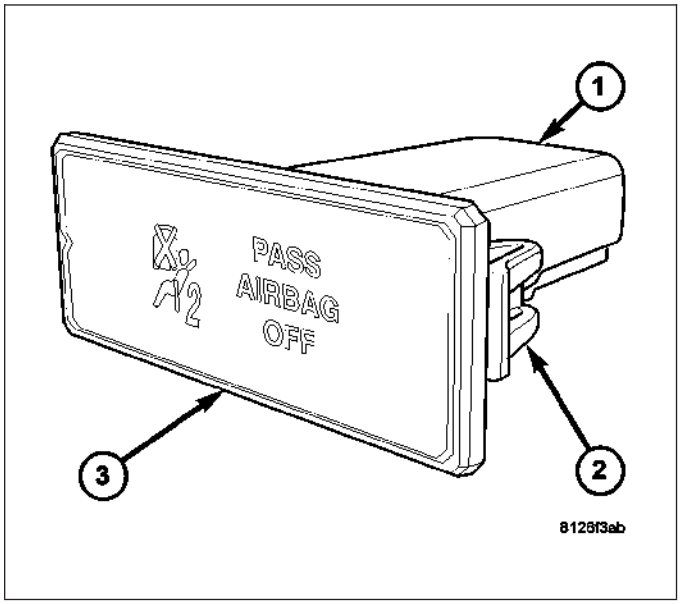
CAUTION: The lever arms of the wire harness connectors for the ORC MUST be in the unlatched position before they are inserted into their connector receptacles on the ORC or they may become damaged.

3. Reconnect the two body wire harness connectors (1) to the ORC connector receptacles located on the forward facing side of the module. Be certain that the latches on both connectors are each fully engaged.
4. Reinstall the center console onto the top of the floor panel transmission tunnel. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION).
5. Do not reconnect the battery negative cable at this time. The supplemental restraint system verification test procedure should be performed following service of any supplemental restraint system component. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - VERIFICATION TEST).

PASS AIRBAG ON/OFF INDICATOR

DESCRIPTION

Vehicles equipped with the Occupant Classification System (OCS) include a passenger airbag on/off indicator (3), which is located below the passenger side inboard air outlet on the instrument panel above the glove box. The passenger airbag on/off indicator consists of a molded plastic housing with an integral connector receptacle (1) at the back, an integral latch tab (2) on each side, and a rectangular dark translucent outer lens.



The opaque text “PASS AIRBAG OFF” and an opaque International Control and Display Symbol icon for “Passenger Airbag Off or Not Available” are imprinted on the back of the lens within the indicator. The dark outer lens prevents the indicator text and icon from being clearly visible when it is not illuminated. An amber Light Emitting Diode (LED) behind the lens causes the “PASS AIRBAG OFF” text and icon to appear silhouetted against an amber field through the translucent lens when the indicator is illuminated from behind by the LED.

The passenger airbag on/off indicator cannot be repaired or adjusted and, if faulty or damaged, the indicator unit must be replaced.

OPERATION

In the Occupant Classification System (OCS), the passenger airbag on/off indicator gives an indication when the passenger airbag and seat belt tensioner deployment circuits are disabled by the Occupant Restraint Controller (ORC). This indicator is controlled by a transistor within the ORC through a hard wired output based upon ORC programming and electronic occupant classification messages received by the ORC over the Controller Area Network (CAN) data bus from the Occupant Classification Module (OCM).

The passenger airbag on/off indicator Light Emitting Diode (LED) is completely controlled by the ORC. The LED receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the ORC transistor. The ORC will turn on the passenger airbag on/off indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the passenger airbag on/off indicator is illuminated for about six seconds.
- **Child Seat Detected (or Load Less Than Minimum Weight Threshold) Occupant Classification Message** - Each time the ORC receives a message from the OCM indicating a child seat has been detected in the passenger side front seat (or that the seat load is less than a minimum weight threshold) the passenger airbag and seat belt tensioner deployment circuits are deactivated and the passenger airbag on/off indicator will be illuminated. The indicator remains illuminated until the ORC receives an occupant classification message indicating that the passenger side front seat is empty, that the seat is occupied by a load equal to or greater than a minimum weight threshold, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Load Undetermined Occupant Classification Message** - Each time the ORC receives a message from the OCM indicating that a load cannot be determined in the passenger side front seat, the passenger airbag and seat belt tensioner deployment circuits are deactivated and the passenger airbag on/off indicator will be illuminated. The indicator remains illuminated until the ORC receives an occupant classification message indicating that the passenger side front seat is empty, that the seat is occupied by a load equal to or greater than a fifth percentile female, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Communication Error** - If the ORC receives invalid occupant classification messages or no messages from the OCM, the passenger airbag on/off indicator is illuminated. The indicator remains illuminated until the ORC

receives a valid message from the OCM indicating that the passenger side front seat is empty, that the seat is occupied by a load equal to or greater than a minimum weight threshold, or until the ignition switch is turned to the Off position, whichever occurs first.

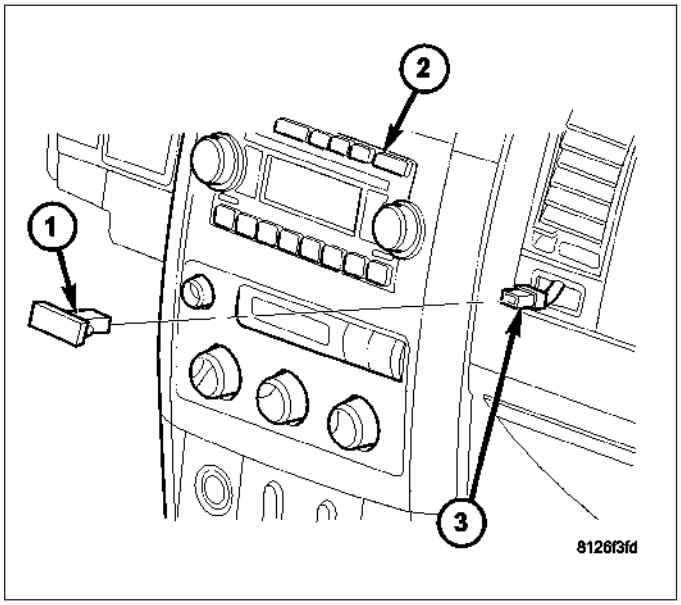
The ORC continually monitors the occupant classification messages from the OCM to decide whether the passenger airbag and seat belt tensioner deployment circuits should be activated or deactivated. Note that there may be several seconds of delay between changes in the detected occupant status and passenger airbag on/off indications. This is a programmed feature of the OCM used to prevent a flashing indicator condition resulting from the normal shifting of occupant weight on the passenger seat cushion. The ORC then provides the proper control output to turn the passenger airbag on/off indicator on or off.

The ORC will store a Diagnostic Trouble Code (DTC) for any malfunction it detects. For proper diagnosis of the OCM, the ORC, the CAN data bus, or the electronic message inputs to the ORC that control the passenger airbag on/off indicator, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

REMOVAL

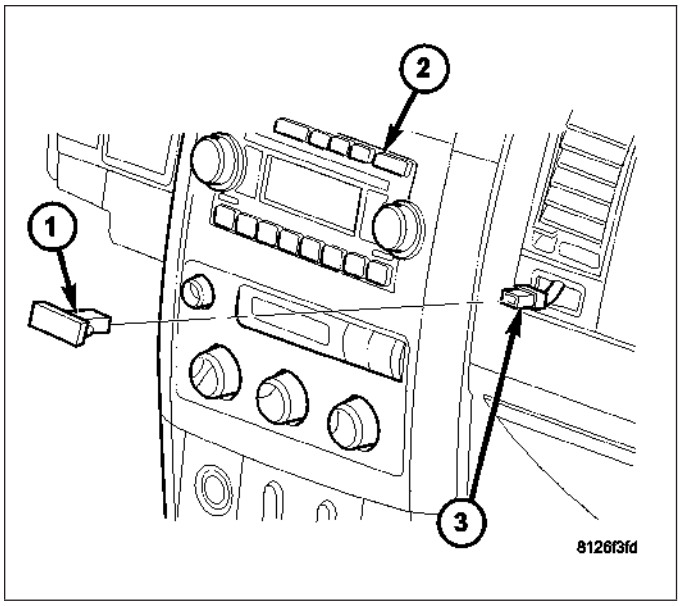
WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

1. Disconnect and isolate the battery negative cable. Wait two minutes for the system capacitor to discharge before further service.
2. Remove the radio (2) from the instrument panel. (Refer to 8 - ELECTRICAL/AUDIO/RADIO - REMOVAL).
3. Reach through the instrument panel radio opening to access the back of the passenger airbag on/off indicator (1).
4. From the back of the indicator, depress the two latches on the sides of the indicator housing and push the indicator out through the face of the instrument panel.
5. From the face of the instrument panel, pull the indicator out far enough to access and disconnect the wire harness connector (3) from the back of the indicator housing.



INSTALLATION

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

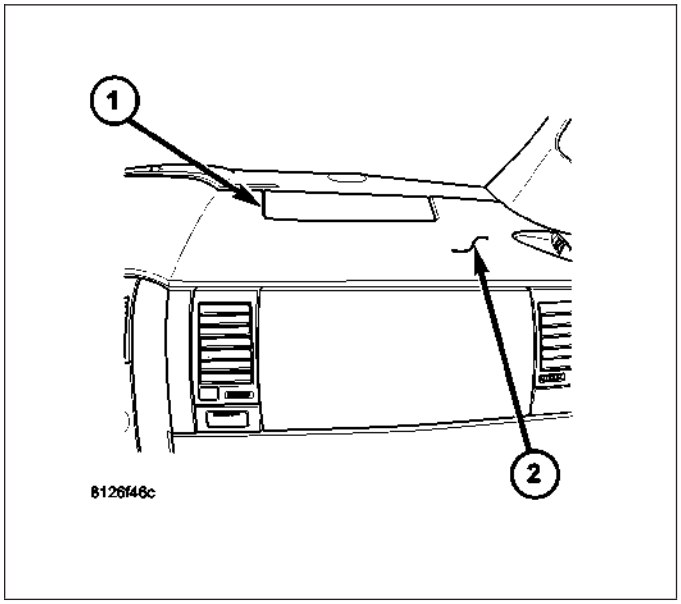


1. From the face of the instrument panel, reconnect the wire harness connector (3) to the receptacle on the back of the passenger airbag on/off indicator housing (1). Be certain that the connector is fully engaged in the receptacle.
2. Using hand pressure, push the indicator firmly and evenly into the mounting hole in the instrument panel until the two latches on the sides of the indicator housing are fully engaged on the back of the panel.
3. Reinstall the radio (2) into the instrument panel. (Refer to 8 - ELECTRICAL/AUDIO/RADIO - INSTALLATION).
4. Do not reconnect the battery negative cable at this time. The supplemental restraint system verification test procedure should be performed following service of any supplemental restraint system component. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - VERIFICATION TEST).
5. Following successful completion of the supplemental restraint system verification test procedure, perform the Occupant Classification System Verification Test using a diagnostic scan tool. Refer to the appropriate diagnostic procedures.

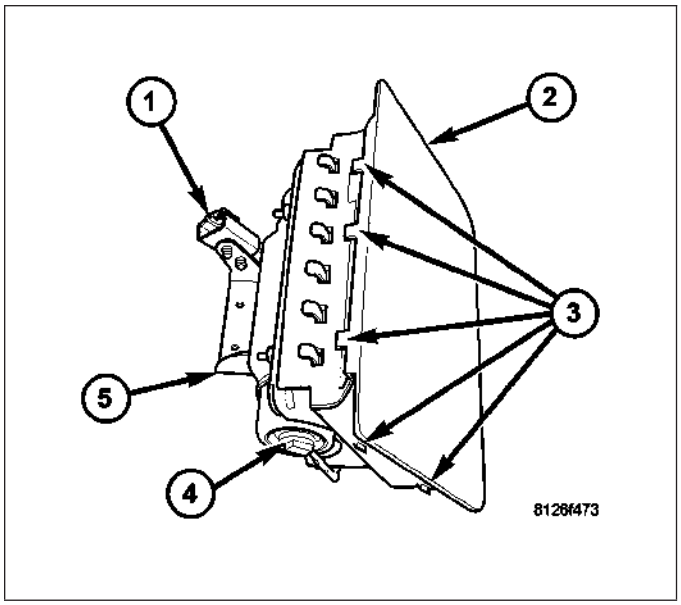
AIR BAG-PASSENGER

DESCRIPTION

The horizontal surface of the injection molded, thermoplastic passenger airbag door (1) is the most visible part of the passenger airbag. The passenger airbag door is located above the glove box opening on the top of the instrument panel (2) in front of the front seat passenger seating position.



The outboard edges of the airbag door are secured with integral snap features (3) to the instrument panel base trim. Located below the passenger airbag door (2) within the instrument panel is the passenger airbag unit. The passenger airbag housing fits into a molded receptacle on the back of the airbag door, where twelve stamped hook formations on the forward and rearward edges of the airbag housing are engaged in mating small window openings on the forward and rearward flanges of the receptacle to secure the airbag door to the airbag housing. These airbag door fasteners and mounting provisions are all concealed beneath the instrument panel base trim. The passenger airbag unit is secured by two screws through a stamped mounting bracket (5) to the instrument panel structural support.



The passenger airbag unit used in this model is a multistage, Next Generation-type that complies with revised federal airbag standards to deploy with less force than those used in some prior models. The passenger airbag unit consists of a stamped and welded metal housing, the airbag cushion, the airbag inflator, and a stamped metal airbag cushion retainer plate that is secured to the airbag housing with four studs and nuts. The airbag housing contains the airbag inflator and the folded airbag cushion. An approximately 80 centimeter (31.5 inch) wide by 90 centimeter (35.5 inch) high rectangular fabric cushion is used.

The airbag inflator (4) is a non-azide, pyrotechnic-type unit that is secured to and sealed within the airbag housing. A short four-wire pigtail harness with a keyed, yellow connector insulator (1) connects the two inflator initiators to the vehicle electrical system through a dedicated take out and connector of the instrument panel wire harness.

The passenger airbag includes the airbag door. This unit cannot be repaired, and must be replaced if deployed, faulty, or in any way damaged.

OPERATION

The multistage passenger airbag is deployed by electrical signals generated by the Occupant Restraint Controller (ORC) through the passenger airbag squib 1 and squib 2 circuits to the two initiators in the airbag inflator. By using two initiators, the airbag can be deployed at multiple levels of force. The force level is controlled by the ORC to suit the monitored impact conditions by providing one of three delay intervals between the electrical signals provided to the two initiators. The longer the delay between these signals, the less forcefully the airbag will deploy.

When the ORC sends the proper electrical signals to each initiator, the electrical energy generates enough heat to initiate a small pyrotechnic charge which, in turn ignites chemical pellets within the inflator. Once ignited, these chemical pellets burn rapidly and produce a large quantity of inert gas. The inflator is sealed to the airbag cushion and a diffuser in the inflator directs all of the inert gas into the airbag cushion, causing the cushion to inflate. As the cushion inflates, the passenger airbag door will split at predetermined tear seam lines concealed on the inside surface of the door, then the door will pivot up over the top of the instrument panel and out of the way. Following an airbag deployment, the airbag cushion quickly deflates by venting the inert gas through vent holes within the fabric used to construct the back (windshield side) of the airbag cushion.

Typically, both initiators are used during an airbag deployment event. However, it is possible for only one initiator to be used during a deployment due to an airbag system fault; therefore, it is necessary to always confirm that both initiators have been used in order to avoid the improper disposal of potentially live pyrotechnic materials. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - SERVICE AFTER A SUPPLEMENTAL RESTRAINT DEPLOYMENT).

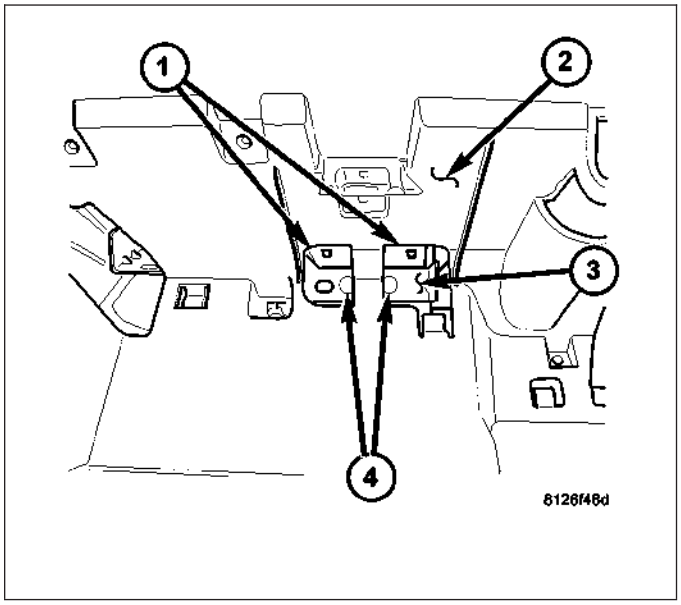
REMOVAL

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

WARNING: To avoid personal injury or death, when removing a deployed airbag, rubber gloves, eye protection, and a long-sleeved shirt should be worn. There may be deposits on the airbag unit and other interior surfaces. In large doses, these deposits may cause irritation to the skin and eyes.

NOTE: The following procedure is for replacement of a faulty or damaged passenger airbag. If the airbag is faulty or damaged, but not deployed, review the recommended procedures for handling non-deployed supplemental restraints. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - HANDLING NON-DEPLOYED SUPPLEMENTAL RESTRAINTS). If the passenger airbag has been deployed, review the recommended procedures for service after a supplemental restraint deployment before removing the airbag from the vehicle. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - SERVICE AFTER A SUPPLEMENTAL RESTRAINT DEPLOYMENT).

CAUTION: Be certain to take the proper precautions to prevent the instrument panel top pad from receiving cosmetic damage from the passenger airbag housing during the following procedures.



1. Disconnect and isolate the battery negative cable. Wait two minutes for the system capacitor to discharge before further service.
2. Remove the defroster grille from the top of the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/DEFROSTER GRILLE - REMOVAL).
3. Remove the glove box from the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/GLOVE BOX - REMOVAL).
4. Reach up into the instrument panel glove box opening (2) and through the access holes (1) to remove the two screws (4) that secure the passenger airbag bracket (3) to the instrument panel support structure.
5. Using a trim stick or another suitable wide flat-bladed tool, gently pry the forward and side edges of the passenger airbag door away from the top of the instrument panel far enough to disengage the snap features on the door from the receptacles in the instrument panel top pad.
6. Pull the passenger airbag out of the instrument panel far enough to access and disconnect the instrument panel wire harness connector from the airbag inflator pigtail wire connector on the right side of the airbag mounting bracket. To disconnect the connector:
   a. Slide the red Connector Position Assurance (CPA) lock on the top of the connector toward the side of the connector.
   b. Depress the connector latch tab and pull the two halves of the connector straight away from each other.
7. Remove the passenger airbag from the instrument panel as a unit.

INSTALLATION

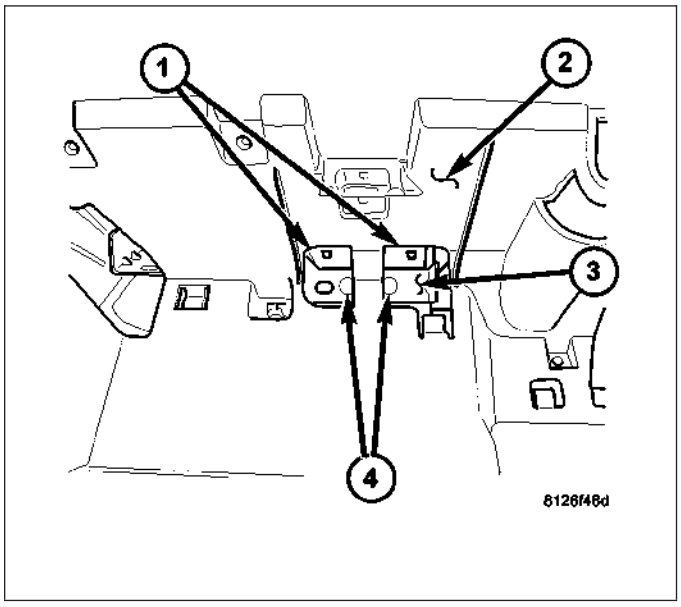
WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

WARNING: To avoid personal injury or death, use extreme care to prevent any foreign material from entering the passenger airbag, or becoming entrapped between the passenger airbag cushion and the passenger airbag door. Failure to observe this warning could result in occupant injuries upon airbag deployment.

WARNING: To avoid personal injury or death, the passenger airbag door must never be painted. Replacement passenger airbags are serviced with doors in the original colors. Paint may change the way in which the material of the airbag door responds to an airbag deployment. Failure to observe this warning could result in occupant injuries upon airbag deployment.

NOTE: The following procedure is for replacement of a faulty or damaged passenger airbag. If the airbag is faulty or damaged, but not deployed, review the recommended procedures for handling non-deployed supplemental restraints. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - HANDLING NON-DEPLOYED SUPPLEMENTAL RESTRAINTS). If the passenger airbag has been deployed, review the recommended procedures for service after a supplemental restraint deployment before removing the airbag from the vehicle. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - SERVICE AFTER A SUPPLEMENTAL RESTRAINT DEPLOYMENT).

CAUTION: Be certain to take the proper precautions to prevent the instrument panel top pad from receiving cosmetic damage from the passenger airbag housing during the following procedures.



1. Position the passenger airbag unit onto the instrument panel.
2. Reconnect the instrument panel wire harness connector for the airbag to the passenger airbag inflator pigtail wire connector on the right side of the airbag mounting bracket. Be certain that the latch on the connector and the red Connector Position Assurance (CPA) lock are each fully engaged.
3. Carefully lower the passenger airbag unit into the instrument panel, being certain that the airbag mounting bracket (3) is properly positioned to the instrument panel support structure.
4. Reach into the glove box opening (2) to install and tighten the two screws (4) that secure the passenger airbag mounting bracket to the instrument panel support structure through the access holes (1). Tighten the screws to 6 N·m (55 in. lbs.).
5. Align and insert the rearward tabs of the passenger airbag door into the slots in the instrument panel top pad.
6. Using hand pressure, push down on the forward and side edges of the passenger airbag door over each snap feature until it snaps into its receptacle in the instrument panel top pad.
7. Reinstall the glove box into the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/GLOVE BOX - INSTALLATION).
8. Reinstall the defroster grille onto the top of the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/DEFROSTER GRILLE - INSTALLATION).

9. Do not reconnect the battery negative cable at this time. The supplemental restraint system verification test procedure should be performed following service of any supplemental restraint system component. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - VERIFICATION TEST).

SEAT BELT BUCKLE

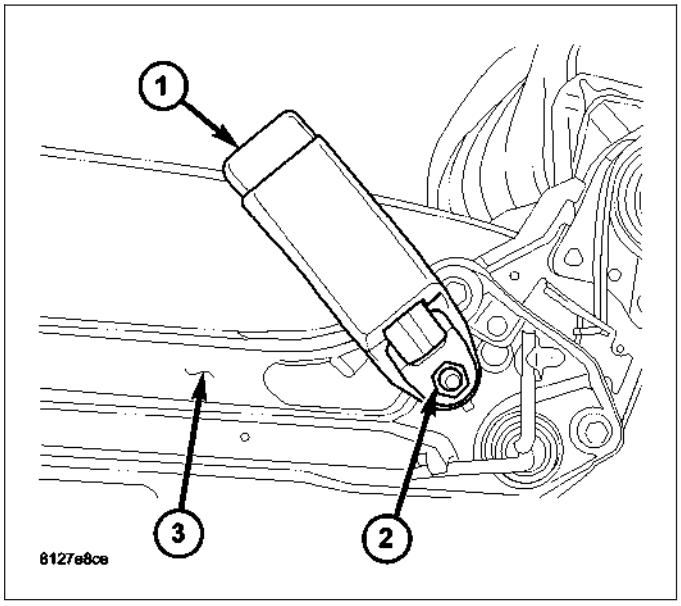
REMOVAL

FRONT

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

WARNING: To avoid personal injury or death, during and following any seat belt or child restraint anchor service, carefully inspect all seat belts, buckles, mounting hardware, retractors, tether straps, and anchors for proper installation, operation, or damage. Replace any belt that is cut, frayed, or torn. Straighten any belt that is twisted. Tighten any loose fasteners. Replace any belt that has a damaged or inoperative buckle or retractor. Replace any belt that has a bent or damaged latch plate or anchor plate. Replace any child restraint anchor or the unit to which the anchor is integral that has been bent or damaged. Never attempt to repair a seat belt or child restraint component. Always replace damaged or faulty seat belt and child restraint components with the correct, new and unused replacement parts listed in the DaimlerChrysler Mopar Parts Catalog.

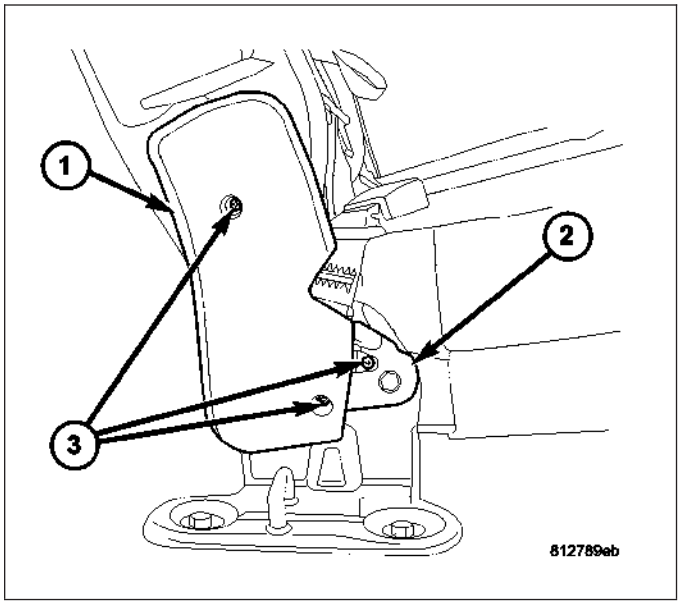
1. Disconnect and isolate the battery negative cable. Wait two minutes for the system capacitor to discharge before further service.
2. Remove the front seat and seat track from the floor panel as a unit. (Refer to 23 - BODY/SEATS/SEAT - FRONT - REMOVAL).
3. Remove the screws that secure the seat cushion side shield to the inboard side of the seat cushion frame (3) and remove the shield.
4. Remove the nut (2) that secures the front seat belt buckle anchor to the stud near the back of the inboard seat cushion frame.
5. Remove the buckle from the seat.



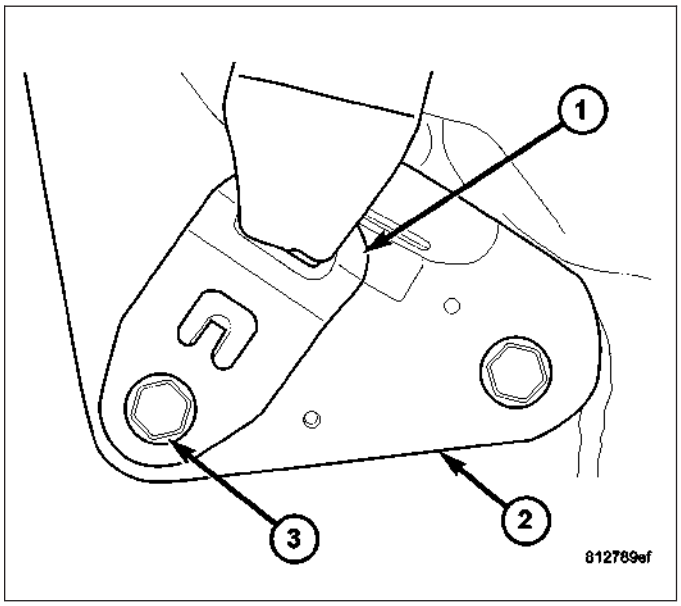
SECOND ROW - CENTER

WARNING: To avoid personal injury or death, during and following any seat belt or child restraint anchor service, carefully inspect all seat belts, buckles, mounting hardware, retractors, tether straps, and anchors for proper installation, operation, or damage. Replace any belt that is cut, frayed, or torn. Straighten any belt that is twisted. Tighten any loose fasteners. Replace any belt that has a damaged or inoperative buckle or retractor. Replace any belt that has a bent or damaged latch plate or anchor plate. Replace any child restraint anchor or the unit to which the anchor is integral that has been bent or damaged. Never attempt to repair a seat belt or child restraint component. Always replace damaged or faulty seat belt and child restraint components with the correct, new and unused replacement parts listed in the DaimlerChrysler Mopar Parts Catalog.

1. Fold and tumble the right outboard second row seat for easiest access to the center seat back right hinge bracket cover (1).
2. Remove the three screws (3) that secure the cover to the center seat back right hinge bracket (2) and remove the cover.



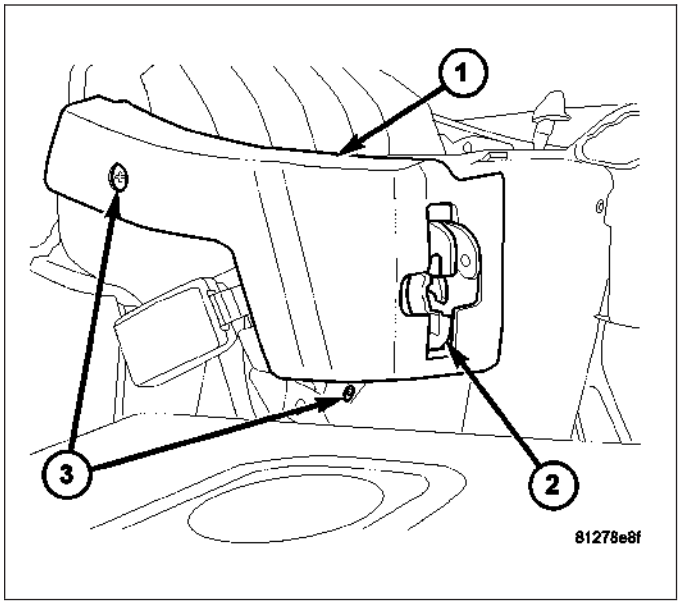
3. Remove the screw (3) that secures the second row center seat belt buckle anchor (1) to the hinge bracket (2) and remove the buckle.



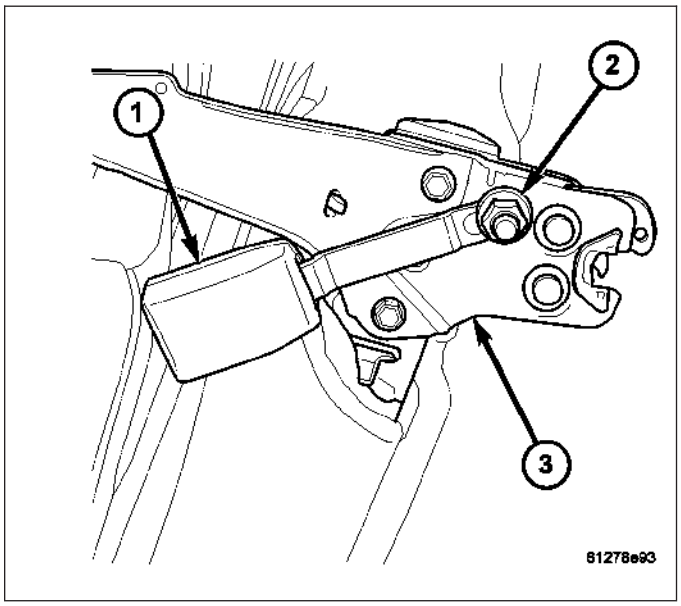
SECOND ROW - OUTBOARD

WARNING: To avoid personal injury or death, during and following any seat belt or child restraint anchor service, carefully inspect all seat belts, buckles, mounting hardware, retractors, tether straps, and anchors for proper installation, operation, or damage. Replace any belt that is cut, frayed, or torn. Straighten any belt that is twisted. Tighten any loose fasteners. Replace any belt that has a damaged or inoperative buckle or retractor. Replace any belt that has a bent or damaged latch plate or anchor plate. Replace any child restraint anchor or the unit to which the anchor is integral that has been bent or damaged. Never attempt to repair a seat belt or child restraint component. Always replace damaged or faulty seat belt and child restraint components with the correct, new and unused replacement parts listed in the DaimlerChrysler Mopar Parts Catalog.

1. Fold and tumble the outboard second row seat for easiest access to the latch bracket cover (1) on the inboard side of the seat.
2. Remove the two screws (3) that secure the cover to the seat latch bracket (2) and remove the cover.



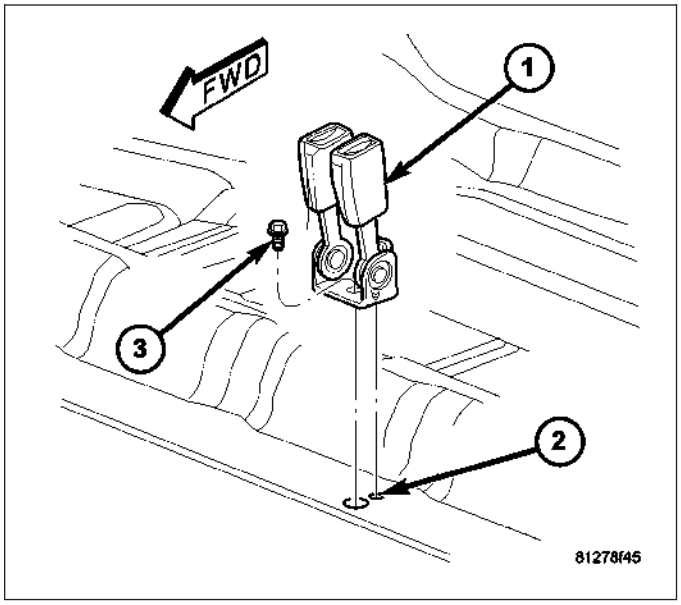
3. Remove the nut (2) that secures the second row outboard seat belt buckle anchor (1) to the latch bracket (3) and remove the buckle.



THIRD ROW

WARNING: To avoid personal injury or death, during and following any seat belt or child restraint anchor service, carefully inspect all seat belts, buckles, mounting hardware, retractors, tether straps, and anchors for proper installation, operation, or damage. Replace any belt that is cut, frayed, or torn. Straighten any belt that is twisted. Tighten any loose fasteners. Replace any belt that has a damaged or inoperative buckle or retractor. Replace any belt that has a bent or damaged latch plate or anchor plate. Replace any child restraint anchor or the unit to which the anchor is integral that has been bent or damaged. Never attempt to repair a seat belt or child restraint component. Always replace damaged or faulty seat belt and child restraint components with the correct, new and unused replacement parts listed in the DaimlerChrysler Mopar Parts Catalog.

1. Move the third row seat cushion to its storage position, but leave the third row seat back in its upright position for easiest access to the seat belt buckle and bracket unit (1) on the rear floor panel.
2. Remove the screw (3) that secures the bracket to the floor and remove the bracket and buckles from the floor panel as a unit.

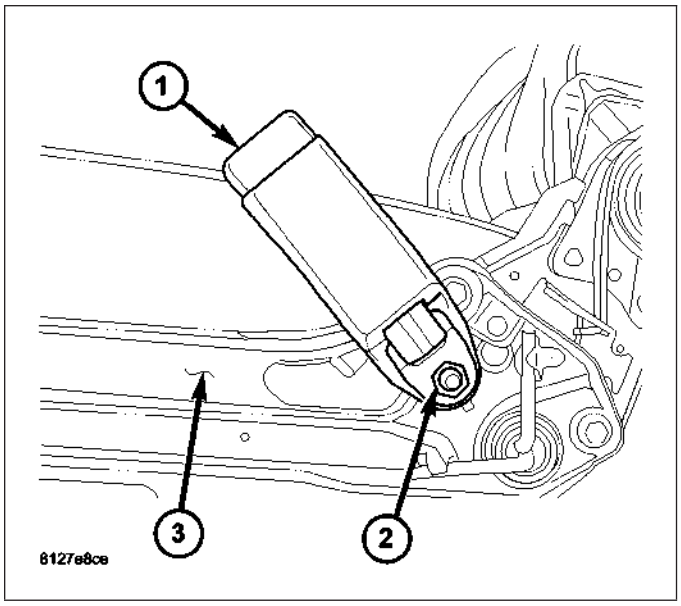


INSTALLATION

FRONT

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

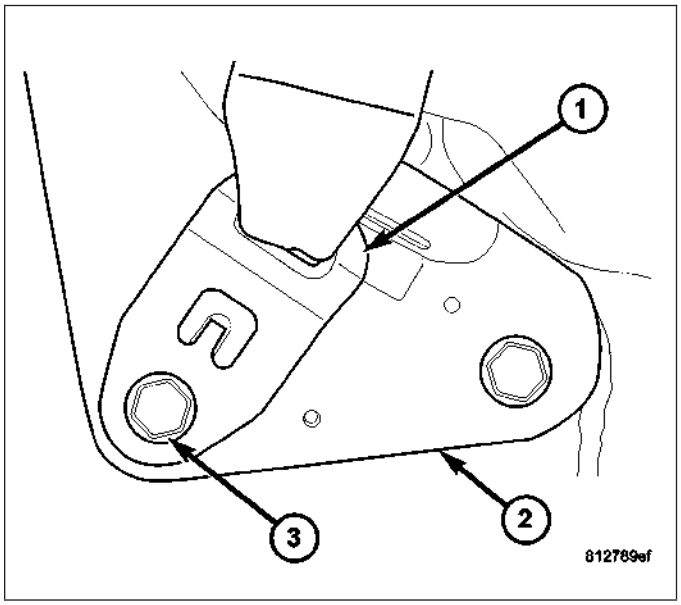
WARNING: To avoid personal injury or death, during and following any seat belt or child restraint anchor service, carefully inspect all seat belts, buckles, mounting hardware, retractors, tether straps, and anchors for proper installation, operation, or damage. Replace any belt that is cut, frayed, or torn. Straighten any belt that is twisted. Tighten any loose fasteners. Replace any belt that has a damaged or inoperative buckle or retractor. Replace any belt that has a bent or damaged latch plate or anchor plate. Replace any child restraint anchor or the unit to which the anchor is integral that has been bent or damaged. Never attempt to repair a seat belt or child restraint component. Always replace damaged or faulty seat belt and child restraint components with the correct, new and unused replacement parts listed in the DaimlerChrysler Mopar Parts Catalog.



1. Position the front seat belt buckle lower anchor (1) onto the stud near the rear of the inboard seat cushion frame (3). Be certain the anti-rotation tab on the anchor is engaged in the clearance hole of the frame.
2. Install and tighten the nut (2) that secures the anchor to the frame. Tighten the nut to 43 N·m (32 ft. lbs.).
3. Position the seat cushion side shield to the inboard seat cushion frame.
4. Install and tighten the screws that secure the shield to the frame. Tighten the screws to 1 N·m (9 in. lbs.).
5. Reinstall the front seat and seat track to the floor panel as a unit. (Refer to 23 - BODY/SEATS/SEAT - FRONT - INSTALLATION).
6. Do not reconnect the battery negative cable at this time. The supplemental restraint system verification test procedure should be performed following service of any supplemental restraint system component. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - VERIFICATION TEST).
7. On the passenger side only, following successful completion of the supplemental restraint system verification test procedure, perform the Occupant Classification System Verification Test using a diagnostic scan tool. Refer to the appropriate diagnostic procedures.

SECOND ROW - CENTER

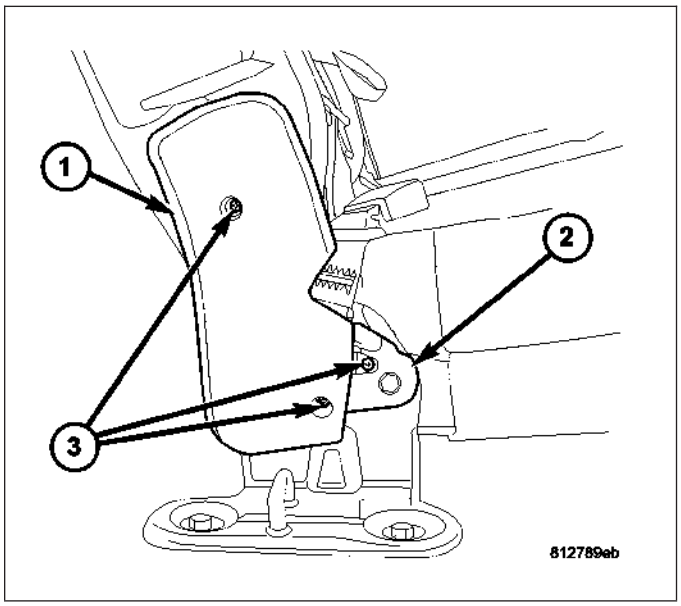
WARNING: To avoid personal injury or death, during and following any seat belt or child restraint anchor service, carefully inspect all seat belts, buckles, mounting hardware, retractors, tether straps, and anchors for proper installation, operation, or damage. Replace any belt that is cut, frayed, or torn. Straighten any belt that is twisted. Tighten any loose fasteners. Replace any belt that has a damaged or inoperative buckle or retractor. Replace any belt that has a bent or damaged latch plate or anchor plate. Replace any child restraint anchor or the unit to which the anchor is integral that has been bent or damaged. Never attempt to repair a seat belt or child restraint component. Always replace damaged or faulty seat belt and child restraint components with the correct, new and unused replacement parts listed in the DaimlerChrysler Mopar Parts Catalog.



1. Position the second row center seat belt buckle anchor (1) to the right seat back hinge bracket (2). Be certain the anti-rotation tab on the anchor is engaged in the clearance hole of the bracket.
2. Install and tighten the screw (3) that secures the anchor to the bracket. Tighten the screw to 43 N·m

(32 ft. lbs.).

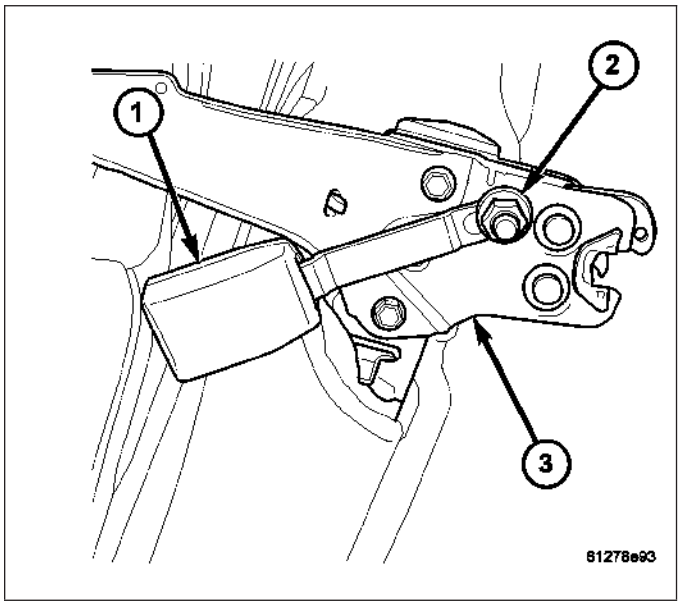
3. Position the center seat back right hinge bracket cover (1) onto the bracket (2).
4. Install and tighten the three screws (3) that secure the cover to the bracket. Tighten the screws to 2 N·m (20 in. lbs.).
5. Unfold and restore the right outboard second row seat to its upright position.



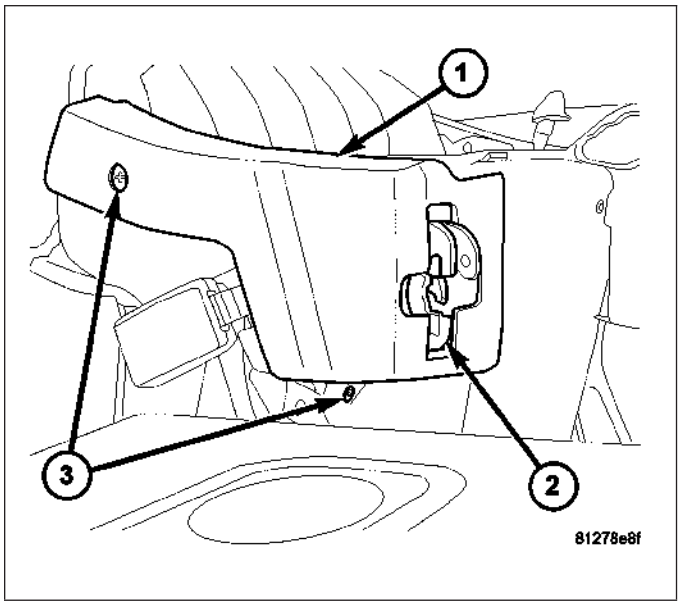
SECOND ROW - OUTBOARD

WARNING: To avoid personal injury or death, during and following any seat belt or child restraint anchor service, carefully inspect all seat belts, buckles, mounting hardware, retractors, tether straps, and anchors for proper installation, operation, or damage. Replace any belt that is cut, frayed, or torn. Straighten any belt that is twisted. Tighten any loose fasteners. Replace any belt that has a damaged or inoperative buckle or retractor. Replace any belt that has a bent or damaged latch plate or anchor plate. Replace any child restraint anchor or the unit to which the anchor is integral that has been bent or damaged. Never attempt to repair a seat belt or child restraint component. Always replace damaged or faulty seat belt and child restraint components with the correct, new and unused replacement parts listed in the DaimlerChrysler Mopar Parts Catalog.

1. Position the second row outboard seat belt buckle anchor (1) to the seat latch bracket (3). Be certain the anti-rotation tab on the anchor is engaged in the clearance notch of the bracket.
2. Install and tighten the nut (2) that secures the anchor to the bracket. Tighten the nut to 43 N·m (32 ft. lbs.).



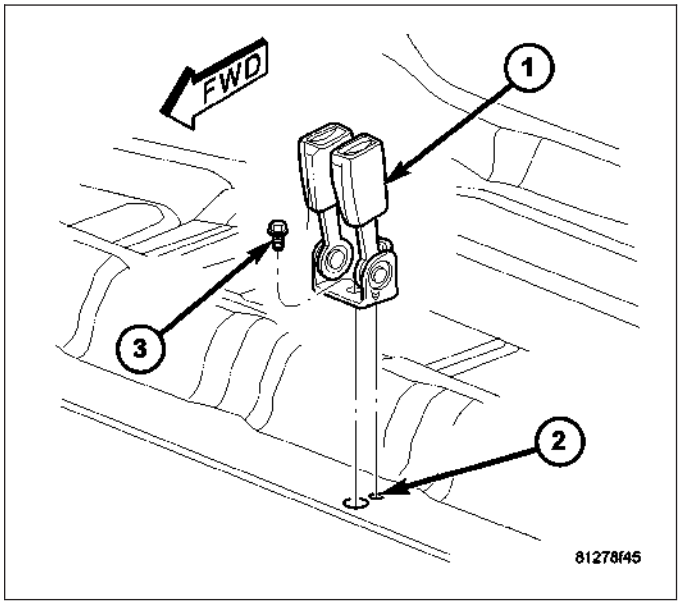
3. Position the outboard seat latch bracket cover (1) onto the bracket (2).
4. Install and tighten the two screws (3) that secure the cover to the bracket. Tighten the screws to 2 N·m (20 in. lbs.).
5. Unfold and restore the outboard second row seat to its upright position.



THIRD ROW

WARNING: To avoid personal injury or death, during and following any seat belt or child restraint anchor service, carefully inspect all seat belts, buckles, mounting hardware, retractors, tether straps, and anchors for proper installation, operation, or damage. Replace any belt that is cut, frayed, or torn. Straighten any belt that is twisted. Tighten any loose fasteners. Replace any belt that has a damaged or inoperative buckle or retractor. Replace any belt that has a bent or damaged latch plate or anchor plate. Replace any child restraint anchor or the unit to which the anchor is integral that has been bent or damaged. Never attempt to repair a seat belt or child restraint component. Always replace damaged or faulty seat belt and child restraint components with the correct, new and unused replacement parts listed in the DaimlerChrysler Mopar Parts Catalog.

1. Position the third row seat belt buckle and anchor bracket unit (1) to the rear floor panel. Be certain the anti-rotation tab on the anchor bracket is engaged in the clearance hole (2) in the floor.
2. Install and tighten the screw (3) that secures the anchor bracket to the floor. Tighten the screw to 43 N·m (32 ft. lbs.).
3. Restore the third row seat cushion to its seating position.



SEAT BELT & RETRACTOR

DESCRIPTION - AUTOMATIC LOCKING RETRACTOR

The seat belt retractors used in all seating positions include an inertia-type, emergency locking mechanism as standard equipment. However, the retractor locking mechanism for the second row center seating position is mechani-

cally switchable from an emergency locking retractor to an automatic locking retractor. The primary function of this feature is to securely accommodate a child seat in the second row center seating position of the vehicle without the need for a self-cinching seat belt tip half latch plate unit or another supplemental device that would be required to prevent the seat belt webbing from unwinding freely from the retractor spool of an inertia-type emergency locking retractor mechanism.

The automatic locking mechanism is integral to the second row center seat belt and retractor unit and is concealed beneath a molded plastic cover located on the side of the retractor spool. The retractor is secured to the center section seat back frame and is concealed beneath the seat back trim. The automatic locking mechanism cannot be adjusted or repaired and, if faulty or damaged, the entire second row center seat belt and retractor unit must be replaced.

OPERATION - AUTOMATIC LOCKING RETRACTOR

The automatic locking mode of the retractor is engaged and the retractor is switched from operating as a standard inertia-type emergency locking retractor by first buckling the combination lap and shoulder belt buckle. Then grasp the shoulder belt and pull all of the webbing out of the retractor. Once all of the belt webbing is extracted from the spool, the retractor will automatically become engaged in the pre-locked automatic locking mode and will make an audible clicking or ratcheting sound as the shoulder belt is allowed to retract to confirm that the automatic locking mode is now engaged. Once the automatic locking mode is engaged, the retractor will remain locked and the belt will remain tight around whatever it is restraining.

The retractor is returned to standard emergency locking mode by unbuckling the combination lap and shoulder belt buckle and allowing the belt webbing to be almost fully retracted onto the retractor spool. The emergency locking mode is confirmed by the absence of the audible clicking or ratcheting sound as the belt webbing retracts. This mode will allow the belt to unwind from and wind onto the retractor spool freely unless and until a predetermined inertia load is sensed, or until the retractor is again switched to the automatic locking mode.

REMOVAL

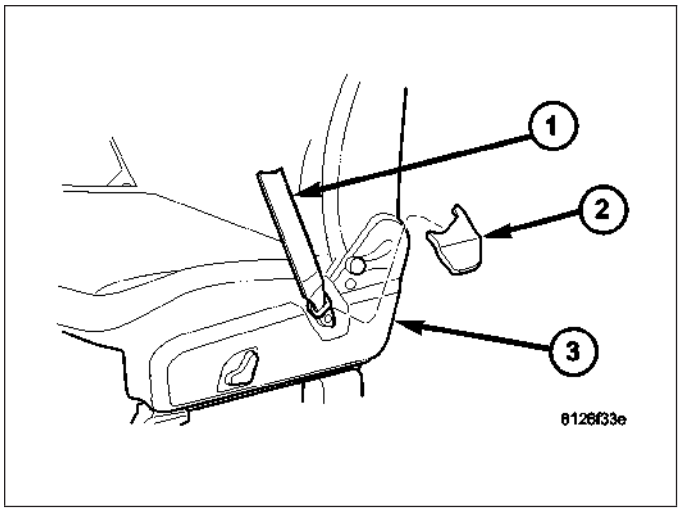
FRONT

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

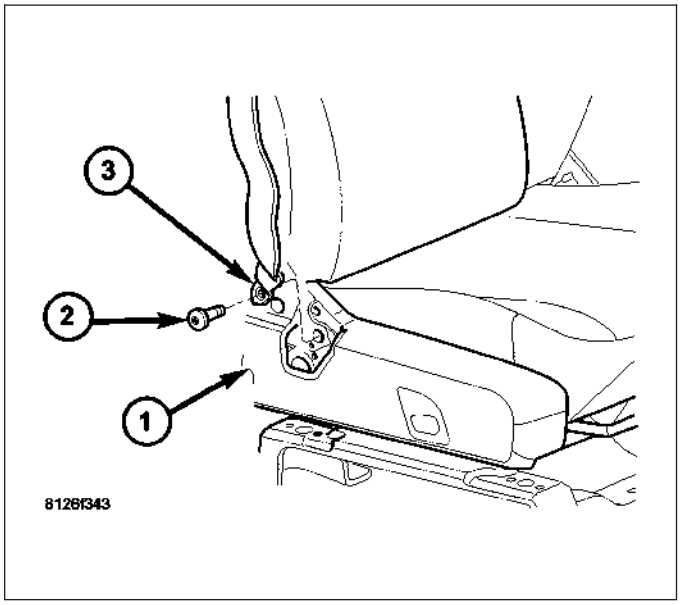
WARNING: To avoid personal injury or death, during and following any seat belt or child restraint anchor service, carefully inspect all seat belts, buckles, mounting hardware, retractors, tether straps, and anchors for proper installation, operation, or damage. Replace any belt that is cut, frayed, or torn. Straighten any belt that is twisted. Tighten any loose fasteners. Replace any belt that has a damaged or inoperative buckle or retractor. Replace any belt that has a bent or damaged latch plate or anchor plate. Replace any child restraint anchor or the unit to which the anchor is integral that has been bent or damaged. Never attempt to repair a seat belt or child restraint component. Always replace damaged or faulty seat belt and child restraint components with the correct, new and unused replacement parts listed in the DaimlerChrysler Mopar Parts Catalog.

NOTE: The following procedure is for replacement of a faulty or damaged seat belt and retractor unit. The front retractor also includes a seat belt tensioner. If the front seat belt or retractor is faulty or damaged, but the seat belt tensioner is not deployed, review the recommended procedures for handling non-deployed supplemental restraints. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - HANDLING NON-DEPLOYED SUPPLEMENTAL RESTRAINTS). If the seat belt tensioner has been deployed, review the recommended procedures for service after a supplemental restraint deployment before removing the unit from the vehicle. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - SERVICE AFTER A SUPPLEMENTAL RESTRAINT DEPLOYMENT).

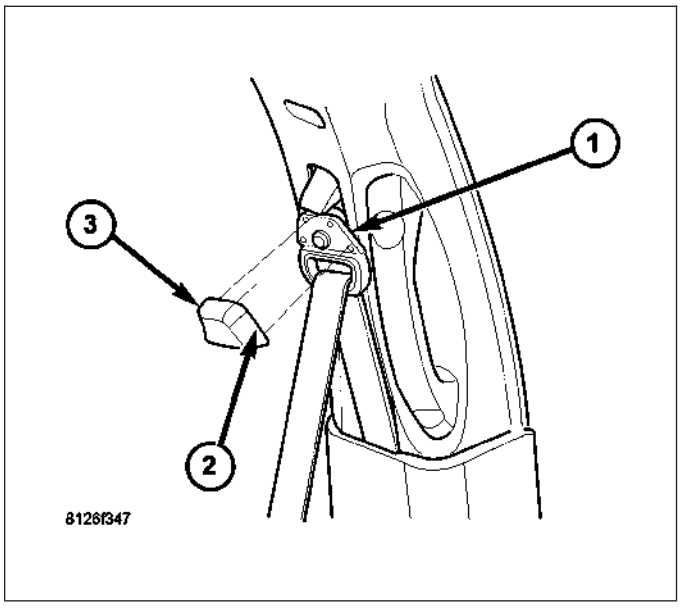
1. Adjust the front seat to its most forward position for easiest access to the front seat belt lower anchor and the B-pillar trim.
2. Disconnect and isolate the battery negative cable. Wait two minutes for the system capacitor to discharge before further service.
3. Using a trim stick or another suitable wide flat-bladed tool, gently pry the seat belt anchor cover (2) to remove it from the rear of the outboard seat side shield (1).



4. Remove the screw (2) that secures the lower anchor (3) to the bracket on the outboard side of the front seat cushion frame.

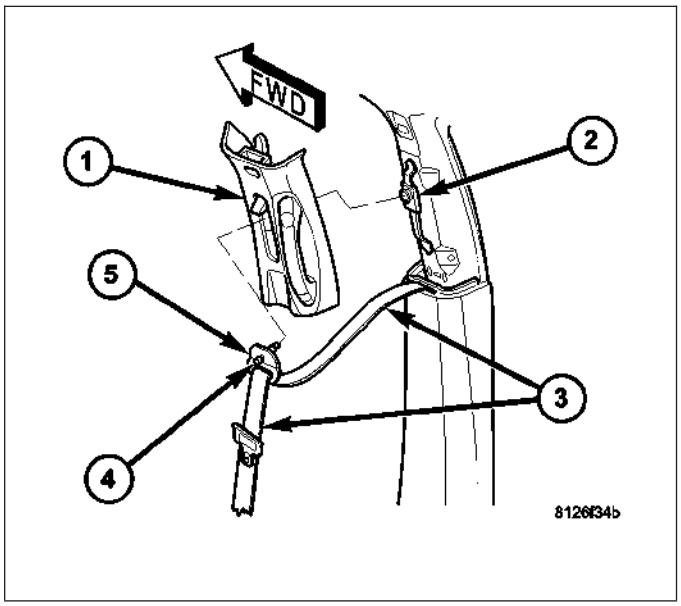


5. Unsnap the upper edge of the trim cover (3) from the front seat belt turning loop (1) and disengage the tab (2) on the lower edge of the cover to

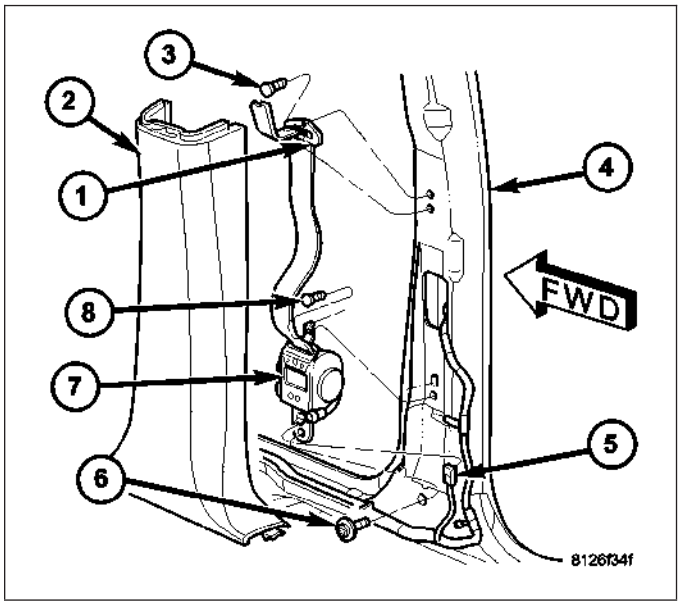


access the turning loop screw.

6. Remove the screw (4) that secures the seat belt turning loop (5) to the height adjuster (2) on the upper B-pillar.
7. Remove the seat belt turning loop from the height adjuster.
8. Remove the upper trim (1) from the inside of the B-pillar. (Refer to 23 - BODY/INTERIOR/B-PILLAR UPPER TRIM - REMOVAL).



9. Remove the lower trim (2) from the inside of the B-pillar (4). (Refer to 23 - BODY/INTERIOR/B-PILLAR LOWER TRIM - REMOVAL).
10. Remove the screw (3) that secures the belt web guide (1) to the B-pillar.
11. Disconnect the body wire harness connector (5) from the seat belt tensioner initiator on the retractor (7).
12. On the driver side only, disconnect the second body wire harness connector from the seat belt switch connector receptacle on the retractor.
13. Remove the screw (8) that secures the upper retractor bracket to the B-pillar.
14. Remove the screw (6) that secures the lower retractor bracket to the B-pillar.
15. Disengage the engagement tab on the upper retractor bracket from the engagement slot in the B-pillar.

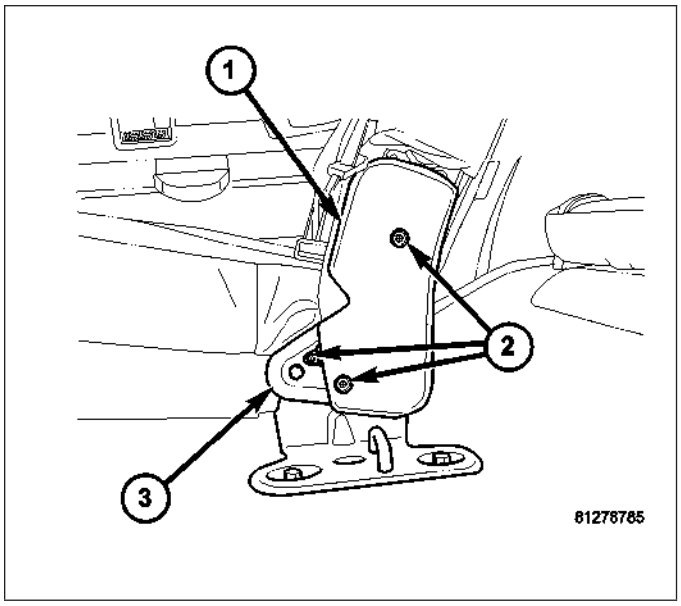


16. Remove the front seat belt and retractor from the B-pillar as a unit.

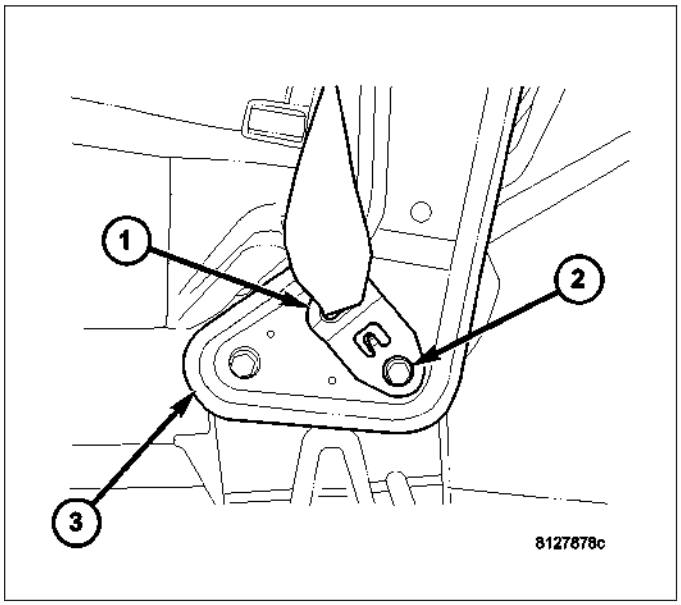
SECOND ROW - CENTER

WARNING: To avoid personal injury or death, during and following any seat belt or child restraint anchor service, carefully inspect all seat belts, buckles, mounting hardware, retractors, tether straps, and anchors for proper installation, operation, or damage. Replace any belt that is cut, frayed, or torn. Straighten any belt that is twisted. Tighten any loose fasteners. Replace any belt that has a damaged or inoperative buckle or retractor. Replace any belt that has a bent or damaged latch plate or anchor plate. Replace any child restraint anchor or the unit to which the anchor is integral that has been bent or damaged. Never attempt to repair a seat belt or child restraint component. Always replace damaged or faulty seat belt and child restraint components with the correct, new and unused replacement parts listed in the DaimlerChrysler Mopar Parts Catalog.

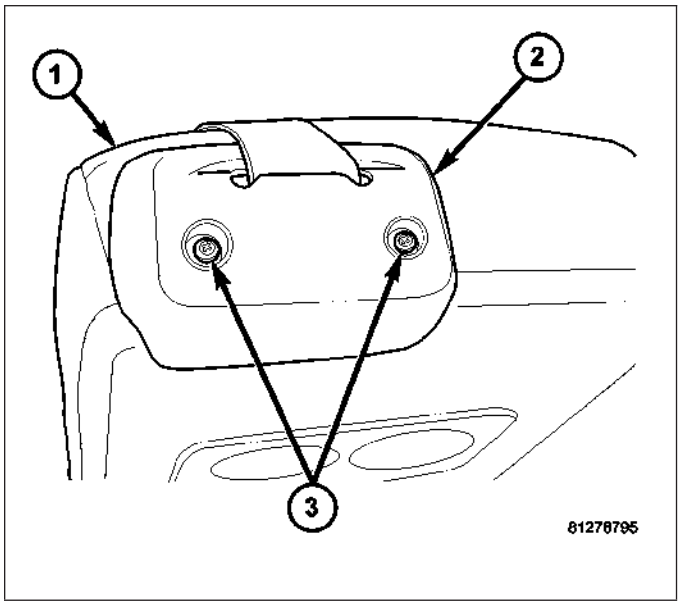
1. Fold and tumble the left outboard second row seat for easiest access to the center seat back left hinge bracket cover (1).
2. Remove the three screws (2) that secure the cover to the center seat back left hinge bracket (3) and remove the cover.



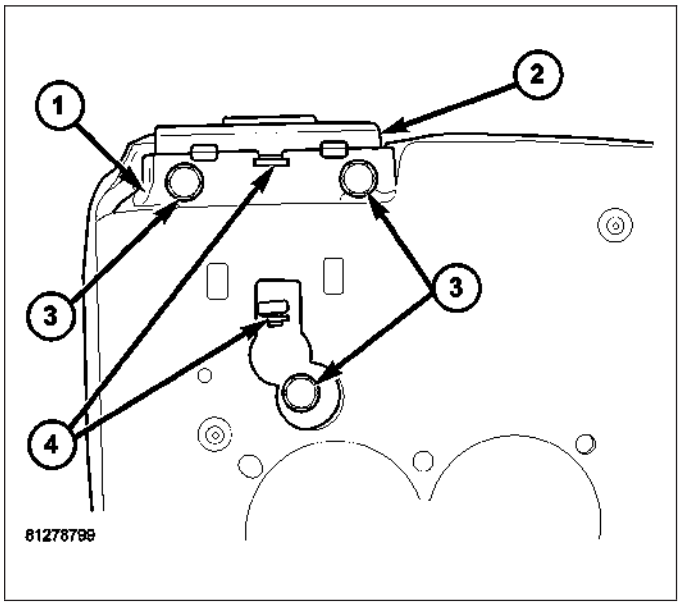
3. Remove the screw (2) that secures the second row center seat belt lower anchor (1) to the hinge bracket (3) and remove the anchor.



4. Remove the two screws (3) that secure the belt web guide bezel (2) to the top of the center seat back panel and remove the bezel from the seat back and the belt.
5. Remove the trim cover (1) from the center seat back. (Refer to 23 - BODY/SEATS/2ND ROW CENTER SEAT BACK COVER - REMOVAL).



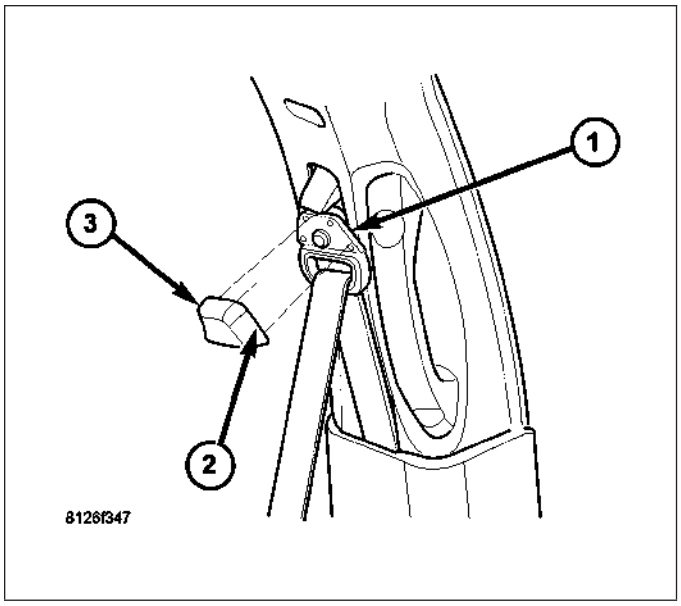
6. Remove the three screws (3) that secure the retractor (2) to the seat back frame (1).
7. Lift the retractor upward far enough to disengage the two tabs (4) on the retractor bracket from the keyed slots in the seat back frame.
8. Remove the second row seat belt and retractor from between the seat back foam and frame as a unit.



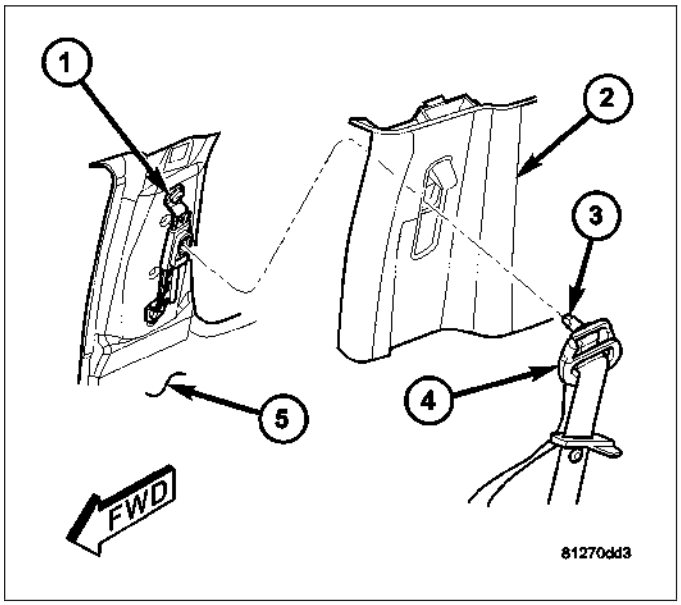
SECOND ROW - OUTBOARD

WARNING: To avoid personal injury or death, during and following any seat belt or child restraint anchor service, carefully inspect all seat belts, buckles, mounting hardware, retractors, tether straps, and anchors for proper installation, operation, or damage. Replace any belt that is cut, frayed, or torn. Straighten any belt that is twisted. Tighten any loose fasteners. Replace any belt that has a damaged or inoperative buckle or retractor. Replace any belt that has a bent or damaged latch plate or anchor plate. Replace any child restraint anchor or the unit to which the anchor is integral that has been bent or damaged. Never attempt to repair a seat belt or child restraint component. Always replace damaged or faulty seat belt and child restraint components with the correct, new and unused replacement parts listed in the DaimlerChrysler Mopar Parts Catalog.

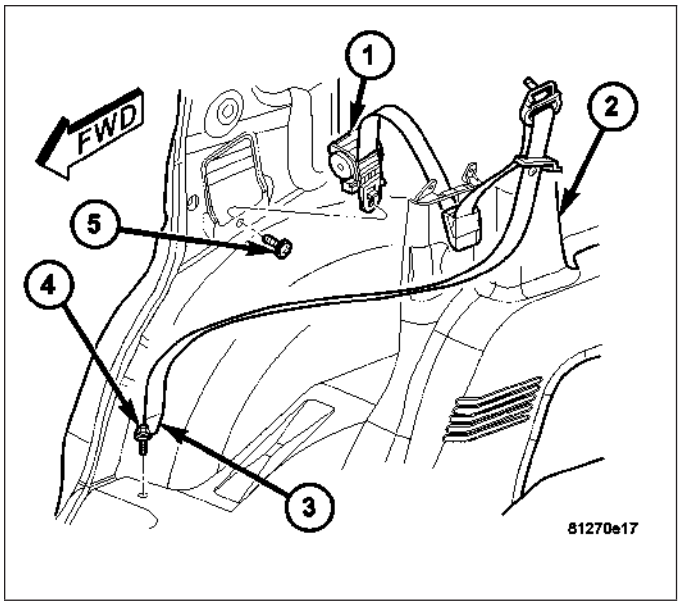
1. Unsnap the upper edge of the trim cover (3) from the second row outboard seat belt turning loop (1) and disengage the tab (2) on the lower edge of the cover to access the turning loop screw.



2. Remove the screw (3) that secures the seat belt turning loop (4) to the height adjuster (1) on the upper C-pillar (5).
3. Remove the seat belt turning loop from the height adjuster.
4. Remove the upper trim (2) from the inside of the C-pillar. (Refer to 23 - BODY/INTERIOR/C-PILLAR TRIM - REMOVAL).



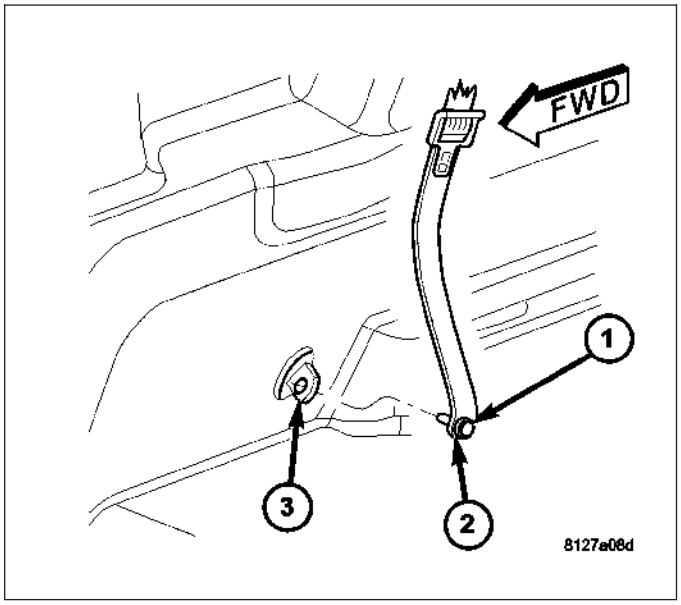
5. Remove the screw (4) that secures the lower seat belt anchor (3) to the rear floor panel.
6. Remove the quarter trim panel (2) from the lower C-pillar. (Refer to 23 - BODY/INTERIOR/QUARTER TRIM PANEL - REMOVAL).
7. Route the seat belt lower anchor and turning loop through the access hole in the quarter trim panel.
8. Remove the screw (5) that secures the retractor bracket (1) to the lower C-pillar.
9. Lift the retractor upward far enough to disengage the retractor tab from the engagement hole in the C-pillar.
10. Remove the second row outboard seat belt and retractor from the C-pillar as a unit.



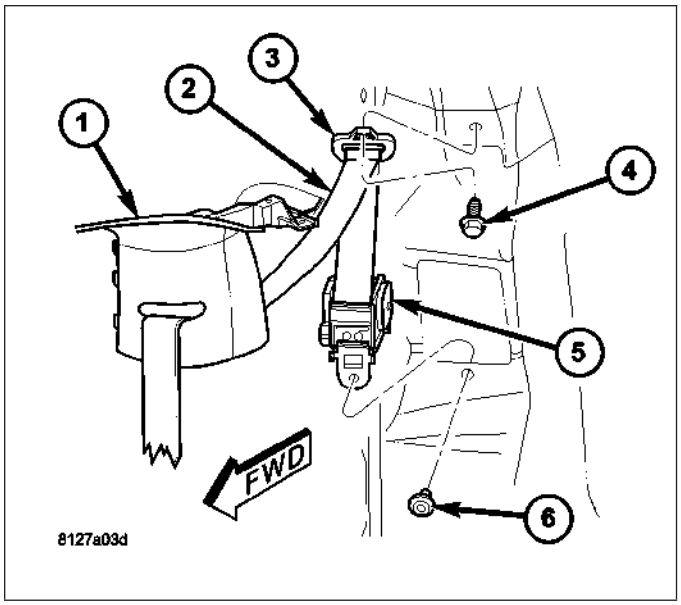
THIRD ROW

WARNING: To avoid personal injury or death, during and following any seat belt or child restraint anchor service, carefully inspect all seat belts, buckles, mounting hardware, retractors, tether straps, and anchors for proper installation, operation, or damage. Replace any belt that is cut, frayed, or torn. Straighten any belt that is twisted. Tighten any loose fasteners. Replace any belt that has a damaged or inoperative buckle or retractor. Replace any belt that has a bent or damaged latch plate or anchor plate. Replace any child restraint anchor or the unit to which the anchor is integral that has been bent or damaged. Never attempt to repair a seat belt or child restraint component. Always replace damaged or faulty seat belt and child restraint components with the correct, new and unused replacement parts listed in the DaimlerChrysler Mopar Parts Catalog.

1. Move the third row seat cushion to its storage position, but leave the third row seat back in its upright position for easiest access to the seat belt lower anchor (2) on the quarter inner panel (3).
2. Remove the screw (1) that secures the lower anchor to the tapping plate on the quarter inner panel.



3. Remove the D-pillar trim panel (1) from the inside of the upper D-pillar. (Refer to 23 - BODY/INTERIOR/D-PILLAR TRIM - REMOVAL).
4. Route the seat belt (2) and lower anchor through the access hole in the D-pillar trim panel.
5. Remove the screw (4) that secures the seat belt turning loop (3) to the inside of the upper D-pillar.
6. Remove the turning loop from the D-pillar.
7. Remove the quarter trim panel from the lower D-pillar. (Refer to 23 - BODY/INTERIOR/QUARTER TRIM PANEL - REMOVAL).
8. Remove the screw (6) that secures the retractor bracket (5) to the lower D-pillar.
9. Remove the third row seat belt and retractor from the D-pillar as a unit.



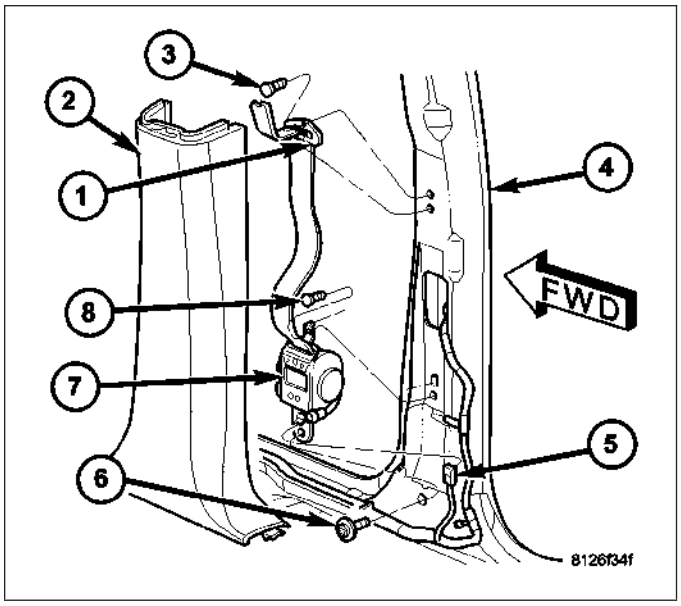
INSTALLATION

FRONT

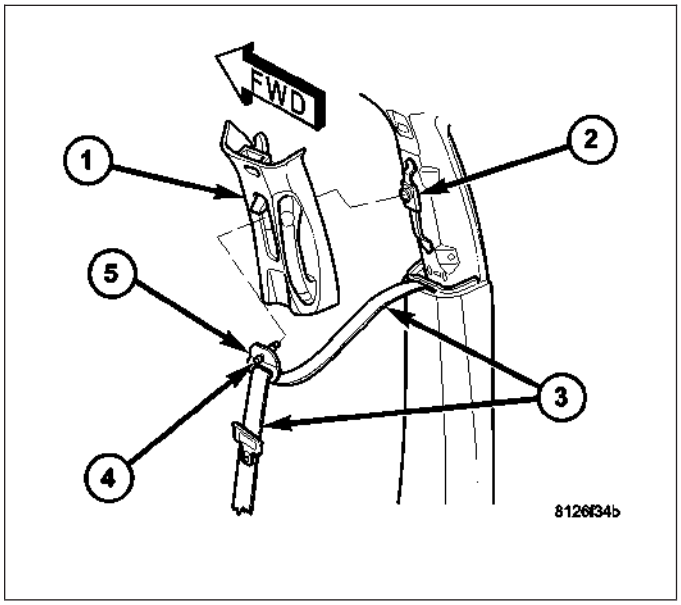
WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

WARNING: To avoid personal injury or death, during and following any seat belt or child restraint anchor service, carefully inspect all seat belts, buckles, mounting hardware, retractors, tether straps, and anchors for proper installation, operation, or damage. Replace any belt that is cut, frayed, or torn. Straighten any belt that is twisted. Tighten any loose fasteners. Replace any belt that has a damaged or inoperative buckle or retractor. Replace any belt that has a bent or damaged latch plate or anchor plate. Replace any child restraint anchor or the unit to which the anchor is integral that has been bent or damaged. Never attempt to repair a seat belt or child restraint component. Always replace damaged or faulty seat belt and child restraint components with the correct, new and unused replacement parts listed in the DaimlerChrysler Mopar Parts Catalog.

NOTE: The following procedure is for replacement of a faulty or damaged seat belt and retractor unit. The front retractor also includes a seat belt tensioner. If the front seat belt or retractor is faulty or damaged, but the seat belt tensioner is not deployed, review the recommended procedures for handling non-deployed supplemental restraints. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - HANDLING NON-DEPLOYED SUPPLEMENTAL RESTRAINTS). If the seat belt tensioner has been deployed, review the recommended procedures for service after a supplemental restraint deployment before removing the unit from the vehicle. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - SERVICE AFTER A SUPPLEMENTAL RESTRAINT DEPLOYMENT).

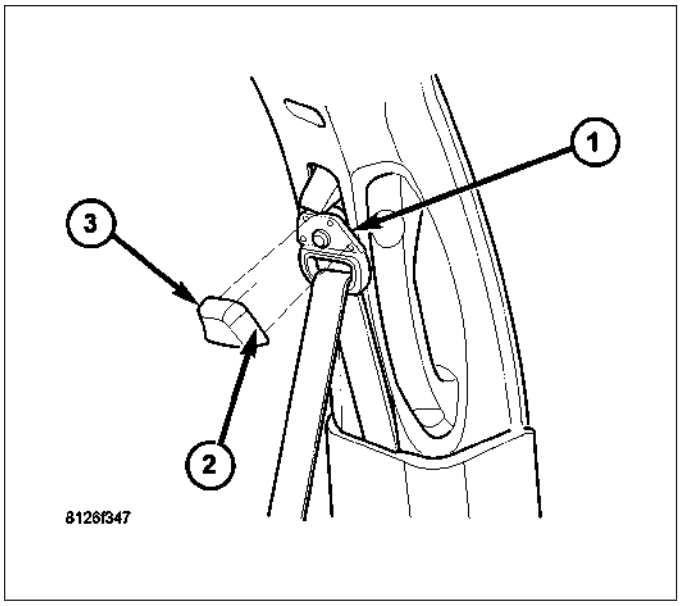


1. Position the front seat belt and retractor (7) to the B-pillar (4) as a unit. Be certain to engage the engagement tab on the upper retractor bracket into the engagement slot in the lower B-pillar.
2. Loosely install the screw (6) that secures the lower retractor bracket to the B-pillar.
3. Install and tighten the screw (8) that secures the upper retractor bracket to the B-pillar. Tighten the screw to 4 N·m (35 in. lbs.).
4. Tighten the screw (6) that secures the lower retractor bracket to the B-pillar. Tighten the screw to 39 N·m (29 ft. lbs.).
5. Reconnect the body wire harness connector (5) to the seat belt tensioner initiator on the retractor.
6. On the driver side only, reconnect the second body wire harness connector to the seat belt switch connector receptacle on the retractor.
7. Position the belt web guide (1) to the B-pillar.
8. Install and tighten the screw (3) that secures the belt web guide to the B-pillar. Tighten the screw to 4 N·m (35 in. lbs.).
9. Reinstall the lower trim onto the inside of the B-pillar. (Refer to 23 - BODY/INTERIOR/B-PILLAR LOWER TRIM - INSTALLATION).

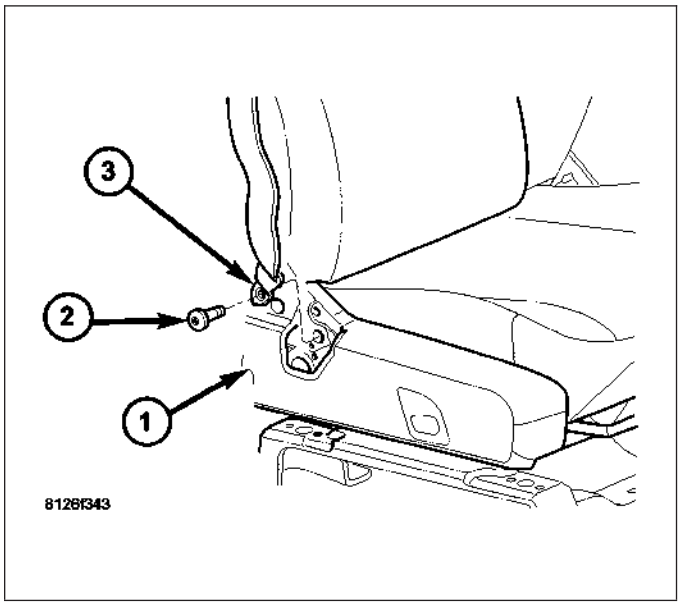


10. Reinstall the upper trim (1) onto the inside of the B-pillar. (Refer to 23 - BODY/INTERIOR/B-PILLAR UPPER TRIM - INSTALLATION).
11. Position the seat belt turning loop (5) onto the height adjuster (2) on the upper B-pillar.
12. Install and tighten the screw (4) that secures the turning loop to the height adjuster. Tighten the screw to 39 N·m (29 ft. lbs.).

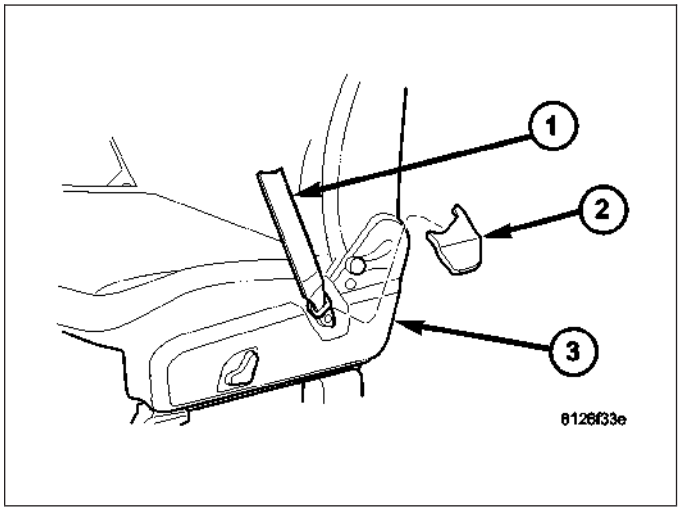
13. Engage the tab (2) on the lower edge of the trim cover (3) in the slot below the screw in the turning loop (1). Then press the upper edge of the trim cover over the top of the turning loop until it snaps into place.



14. Position the front seat belt lower anchor (3) to the bracket on the outboard side of the front seat cushion frame.
15. Install and tighten the screw (2) that secures the lower anchor to the bracket on the outboard side of the front seat cushion frame. Tighten the screw to 39 N·m (29 ft. lbs.).



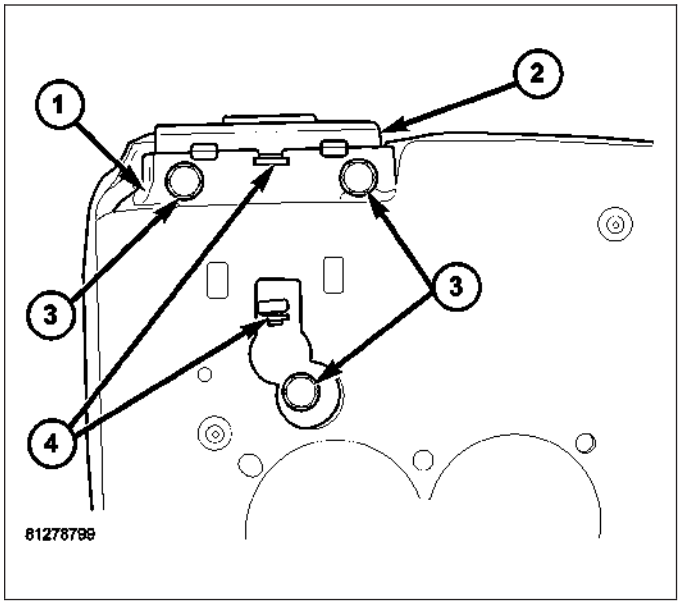
16. Align the seat belt anchor cover (2) to the opening near the rear of the outboard seat side shield (3). Using hand pressure, press firmly and evenly on the cover until it snaps into place.
17. Do not reconnect the battery negative cable at this time. The supplemental restraint system verification test procedure should be performed following service of any supplemental restraint system component. (Refer to 8 - ELECTRICAL/ RESTRAINTS - STANDARD PROCEDURE - VERIFICATION TEST).



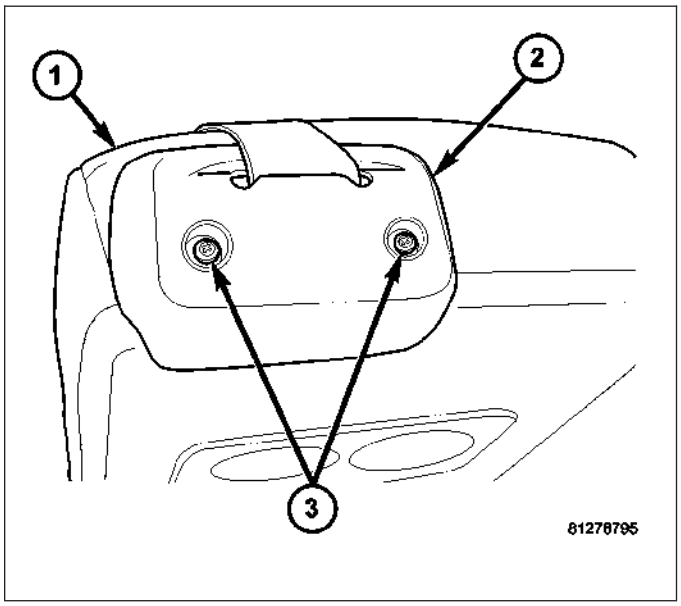
SECOND ROW - CENTER

WARNING: To avoid personal injury or death, during and following any seat belt or child restraint anchor service, carefully inspect all seat belts, buckles, mounting hardware, retractors, tether straps, and anchors for proper installation, operation, or damage. Replace any belt that is cut, frayed, or torn. Straighten any belt that is twisted. Tighten any loose fasteners. Replace any belt that has a damaged or inoperative buckle or retractor. Replace any belt that has a bent or damaged latch plate or anchor plate. Replace any child restraint anchor or the unit to which the anchor is integral that has been bent or damaged. Never attempt to repair a seat belt or child restraint component. Always replace damaged or faulty seat belt and child restraint components with the correct, new and unused replacement parts listed in the DaimlerChrysler Mopar Parts Catalog.

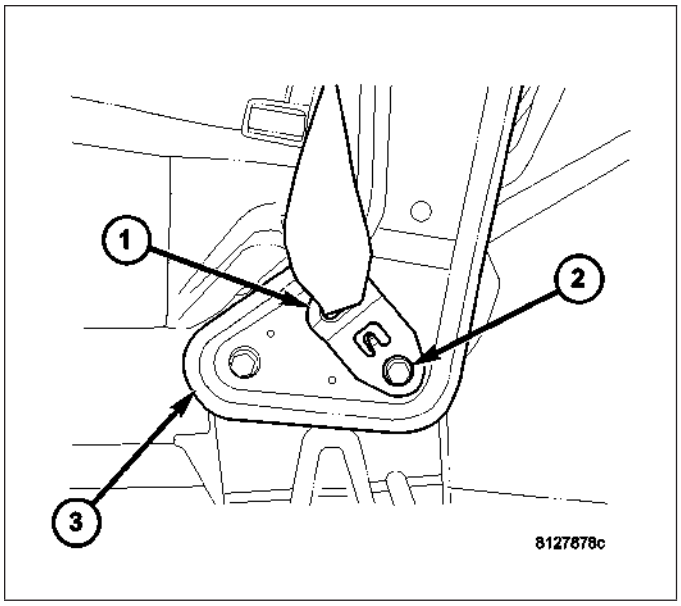
1. Position the second row seat belt and retractor (2) between the seat back foam pad and frame (1) as a unit.
2. Engage the two tabs (4) on the retractor bracket into the keyed slots in the seat back frame.
3. Install and tighten the three screws (3) that secure the retractor to the seat back frame. Tighten the screws to 27 N·m (20 ft. lbs.).



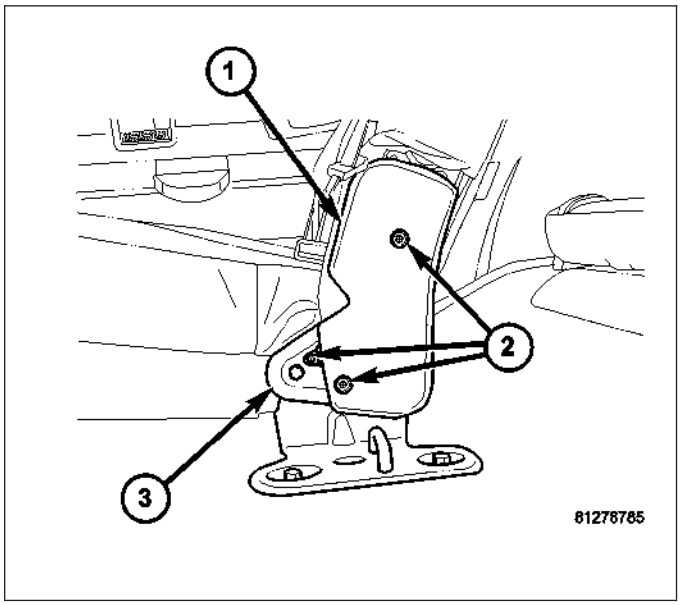
4. Reinstall the trim cover (1) onto the center seat back. (Refer to 23 - BODY/SEATS/2ND ROW CENTER SEAT BACK COVER - INSTALLATION).
5. Install the seat belt lower anchor through the belt web guide bezel (2) and position the bezel onto the top of the center seat back panel.
6. Install and tighten the two screws (3) that secure the bezel to the top of the seat back. Tighten the screws to 2 N·m (20 in. lbs.).



7. Position the second row center seat belt lower anchor (1) to the hinge bracket (3). Be certain the anti-rotation tab on the anchor is engaged in the clearance hole of the bracket.
8. Install and tighten the screw (2) that secures the lower anchor to the bracket. Tighten the screw to 43 N·m (32 ft. lbs.).



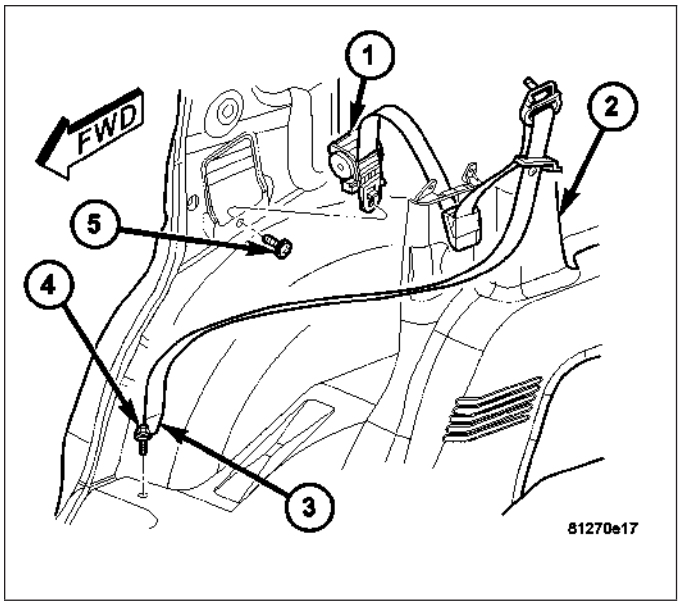
9. Position the center seat back left hinge bracket cover (1) onto the bracket (3).
10. Install and tighten the three screws (2) that secure the cover to the bracket. Tighten the screws to 2 N·m (20 in. lbs.).
11. Unfold and restore the left outboard second row seat to its upright position.



SECOND ROW - OUTBOARD

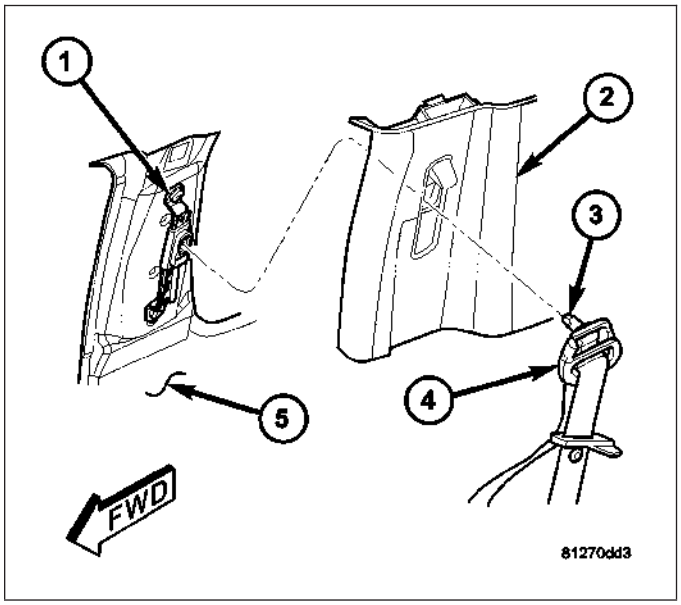
WARNING: To avoid personal injury or death, during and following any seat belt or child restraint anchor service, carefully inspect all seat belts, buckles, mounting hardware, retractors, tether straps, and anchors for proper installation, operation, or damage. Replace any belt that is cut, frayed, or torn. Straighten any belt that is twisted. Tighten any loose fasteners. Replace any belt that has a damaged or inoperative buckle or retractor. Replace any belt that has a bent or damaged latch plate or anchor plate. Replace any child restraint anchor or the unit to which the anchor is integral that has been bent or damaged. Never attempt to repair a seat belt or child restraint component. Always replace damaged or faulty seat belt and child restraint components with the correct, new and unused replacement parts listed in the DaimlerChrysler Mopar Parts Catalog.

1. Check to be certain that the molded plastic retractor cup is properly installed in the retractor mounting hole of the inner C-pillar, and that it is in good condition.
2. Position the second row outboard seat belt and retractor (1) to the C-pillar as a unit.
3. Engage the tab on the retractor bracket into the engagement hole in the C-pillar.
4. Install and tighten the screw (5) that secures the retractor to the lower C-pillar. Tighten the screw to 39 N·m (29 ft. lbs.).
5. Route the seat belt lower anchor and turning loop through the access hole in the quarter trim panel.
6. Reinstall the quarter trim panel onto the lower C-pillar. (Refer to 23 - BODY/INTERIOR/QUARTER TRIM PANEL - INSTALLATION).
7. Position the lower seat belt anchor (3) to the rear floor panel.

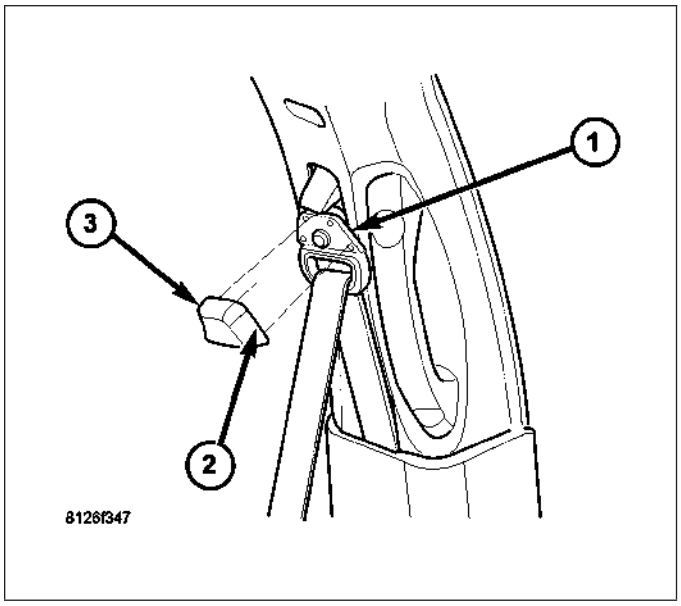


8. Install and tighten the screw (4) that secures the lower seat belt anchor to the floor. Tighten the screw to 39 N·m (29 ft. lbs.).

9. Reinstall the upper trim (2) onto the inside of the C-pillar (5). (Refer to 23 - BODY/INTERIOR/C-PILLAR TRIM - INSTALLATION).
10. Position the seat belt turning loop (4) to the height adjuster (1) on the upper C-pillar.
11. Install and tighten the screw (3) that secures the turning loop to the height adjuster. Tighten the screw to 39 N·m (29 ft. lbs.).



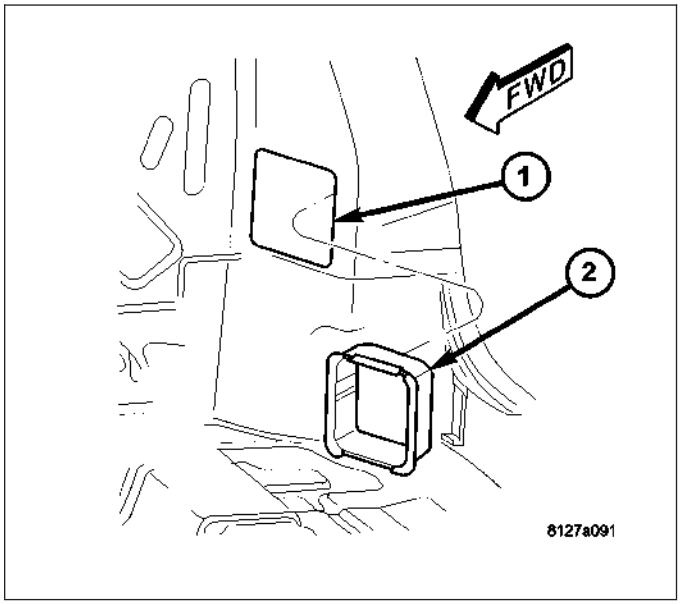
12. Engage the tab (2) on the lower edge of the trim cover (3) in the slot below the screw in the turning loop (1). Then press the upper edge of the trim cover over the top of the turning loop until it snaps into place.



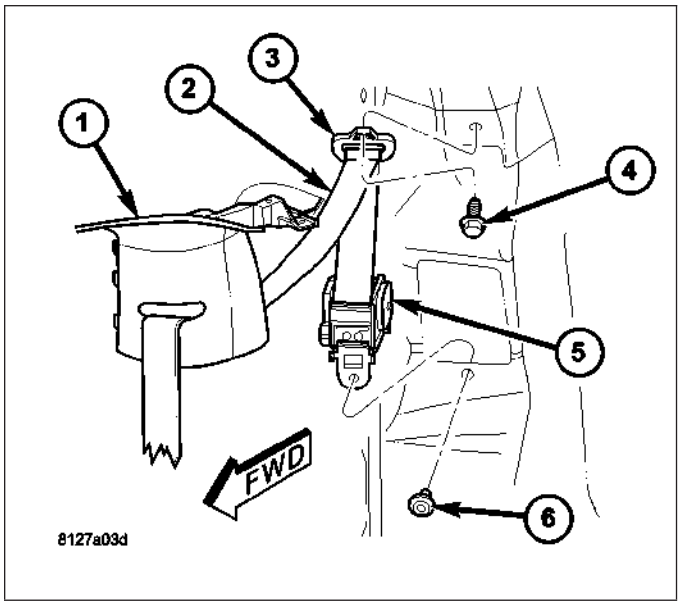
THIRD ROW

WARNING: To avoid personal injury or death, during and following any seat belt or child restraint anchor service, carefully inspect all seat belts, buckles, mounting hardware, retractors, tether straps, and anchors for proper installation, operation, or damage. Replace any belt that is cut, frayed, or torn. Straighten any belt that is twisted. Tighten any loose fasteners. Replace any belt that has a damaged or inoperative buckle or retractor. Replace any belt that has a bent or damaged latch plate or anchor plate. Replace any child restraint anchor or the unit to which the anchor is integral that has been bent or damaged. Never attempt to repair a seat belt or child restraint component. Always replace damaged or faulty seat belt and child restraint components with the correct, new and unused replacement parts listed in the DaimlerChrysler Mopar Parts Catalog.

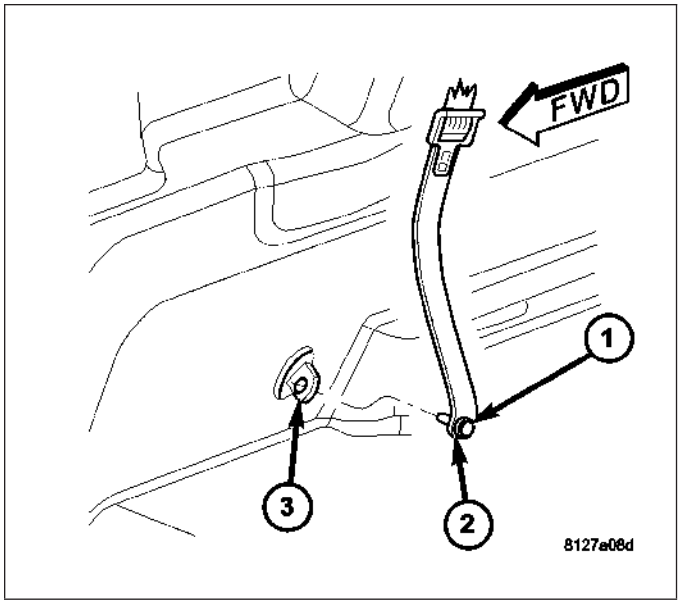
1. Check to be certain that the molded plastic retractor cup (2) is properly installed in the retractor mounting hole (1) of the inner D-pillar, and that it is in good condition.



2. Position the third row outboard seat belt and retractor (5) to the D-pillar as a unit.
3. Install and tighten the screw (6) that secures the retractor bracket to the lower D-pillar. Tighten the screw to 39 N·m (29 ft. lbs.).
4. Position the seat belt turning loop (3) to the inside of the upper D-pillar.
5. Install and tighten the screw (3) that secures the turning loop to the D-pillar. Tighten the screw to 39 N·m (29 ft. lbs.).
6. Reinstall the quarter trim panel to the lower D-pillar. (Refer to 23 - BODY/INTERIOR/QUARTER PANEL TRIM - INSTALLATION).
7. Route the seat belt (2) and lower anchor through the access hole in the D-pillar trim panel (1).
8. Reinstall the D-pillar trim panel to the inside of the upper D-pillar. (Refer to 23 - BODY/INTERIOR/D-PILLAR TRIM - INSTALLATION).



9. Position the seat belt lower anchor (2) to the tapping plate (3) on the quarter inner panel.
10. Install and tighten the screw (1) that secures the lower anchor to the tapping plate. Tighten the screw to 39 N·m (29 ft. lbs.).
11. Restore the third row seat cushion to its seating position.

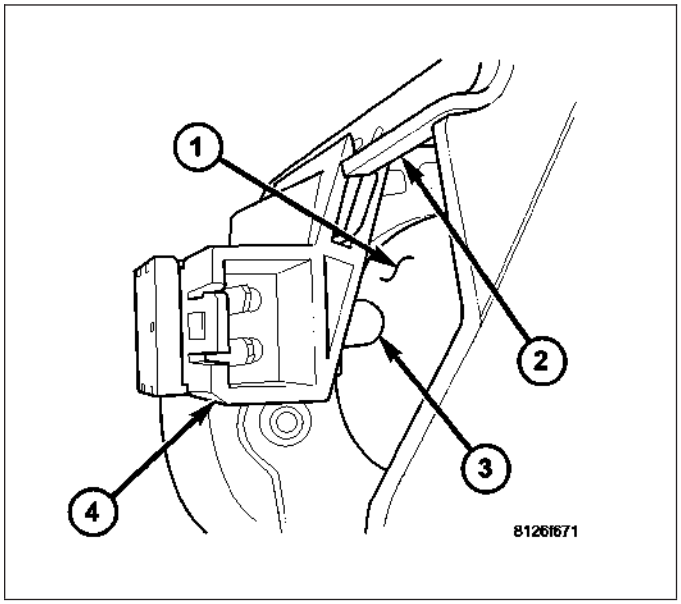


SWITCH-SEAT BELT-DRIVER

DESCRIPTION

The seat belt switch (4) is a small, normally open, single pole, single throw, plunger (3) actuated, momentary switch. Only one seat belt switch is installed in the vehicle, and it is located on the seat belt retractor frame (2) over the retractor spool (1) for the driver side front seat. The seat belt switch includes an integral connector that is connected to the vehicle electrical system through a take out and connector of the body wire harness.

The seat belt switch cannot be adjusted or repaired and, if faulty or damaged, the entire driver side front seat belt and retractor unit must be replaced.



OPERATION

The seat belt switch is designed to control a path to ground for the seat belt switch sense input of the ElectroMechanical Instrument Cluster (EMIC). The seat belt switch plunger is actuated by the seat belt webbing wound onto the seat belt retractor spool. When the seat belt tip-half webbing is pulled out of the retractor far enough to engage the seat belt buckle-half, the switch plunger is extended and closes the seat belt switch sense circuit to ground. Conversely, when the seat belt tip-half webbing is wound onto the retractor spool the switch plunger is depressed, opening the ground path.

The EMIC monitors the seat belt switch status, then controls the illumination of the seatbelt indicator and the generation of audible electronic chime tones based upon that input. The seat belt switch receives ground through its connection to the body wire harness from another take out of the body wire harness. An eyelet terminal connector on that ground take out is secured under a ground screw. The seat belt switch is connected in series between ground and the seat belt switch sense input of the EMIC.

The seat belt switch may be diagnosed using conventional diagnostic tools and methods. Refer to the appropriate wiring information.

PRETENSIONER-SEAT BELT

DESCRIPTION

Seat belt tensioners supplement the dual front airbags for this model. The seat belt tensioners are integral to the front seat belt retractor units, which are secured to the inner B-pillar on the right and left sides of the vehicle. The retractor is concealed beneath the molded plastic inner B-pillar trim. The seat belt tensioner consists primarily of a sprocket/pinion, a steel tube, a cast metal housing, numerous steel balls, a stamped metal ball trap, a torsion bar and a small pyrotechnically activated gas generator with a connector receptacle. All of these components are located on one side of the retractor spool on the outside of the retractor housing except for the torsion bar, which serves as the spindle upon which the retractor spool rides. The seat belt tensioners are controlled by the Occupant Restraint Controller (ORC) and are connected to the vehicle electrical system through a dedicated take out of the body wire harness by a keyed and latching yellow molded plastic connector insulator to ensure a secure connection.

The seat belt tensioners cannot be repaired and, if faulty or damaged, the entire front seat belt and retractor unit must be replaced. If the front airbags have been deployed, the seat belt tensioners have also been deployed. The seat belt tensioners are not intended for reuse and must be replaced following any front airbag deployment. A growling or grinding sound while attempting to operate the seat belt retractor is a sure indication that the seat belt ten-

sioner has been deployed and requires replacement. (Refer to 8 - ELECTRICAL/RESTRAINTS/FRONT SEAT BELT & RETRACTOR - REMOVAL).

OPERATION

The seat belt tensioners are deployed in conjunction with the dual front airbags by a signal generated by the Occupant Restraint Controller (ORC) through the driver or passenger seat belt tensioner line 1 and line 2 (or squib) circuits. When the ORC sends the proper electrical signal to the tensioners, the electrical energy generates enough heat to initiate a small pyrotechnic gas generator.

The gas generator is installed in one end of a steel tube that contains numerous steel balls. As the gas expands, it pushes the steel balls through the tube into a cast metal housing, where a ball guide directs the balls into engagement with the teeth of a sprocket that is geared to one end of the retractor spool. As the balls drive past the sprocket, the sprocket turns and drives the seat belt retractor spool causing the slack to be removed from the front seat belts. The ball trap captures the balls as they leave the sprocket and are expelled from the housing.

Removing excess slack from the front seat belts not only keeps the occupants properly positioned for an airbag deployment following a frontal impact of the vehicle, but also helps to reduce injuries that the occupant might experience in these situations as a result of harmful contact with the steering wheel, steering column, instrument panel and/or windshield. Also, the seat belt tensioner torsion bar that the retractor spool rides upon is designed to deform in order to control the loading being applied to the occupants by the seat belts during a frontal impact, further reducing the potential for occupant injuries.

The ORC monitors the condition of the seat belt tensioners through circuit resistance, and will illuminate the airbag indicator in the ElectroMechanical Instrument Cluster (EMIC) and store a Diagnostic Trouble Code (DTC) for any fault that is detected. For proper diagnosis of the seat belt tensioners, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

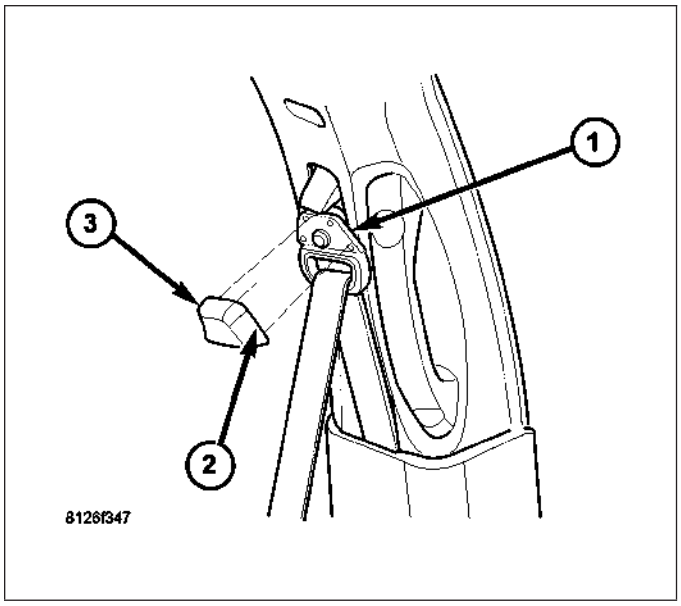
ADJUSTER-SEAT BELT TURNING LOOP

REMOVAL

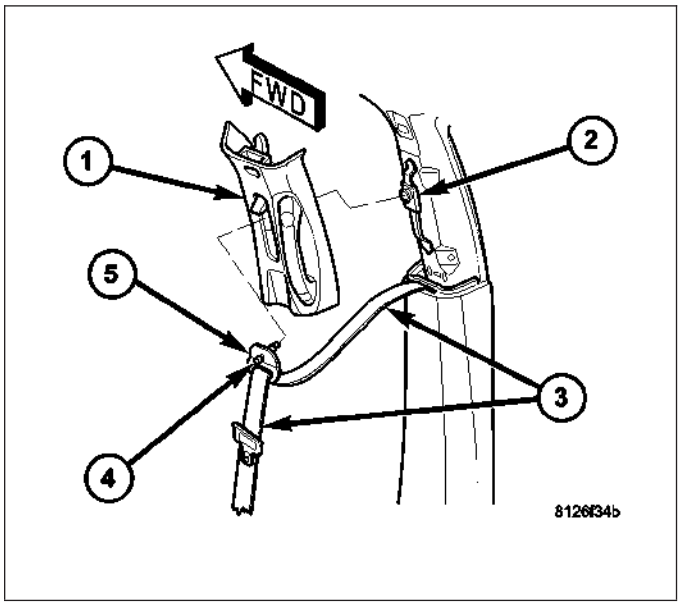
FRONT

WARNING: To avoid personal injury or death, during and following any seat belt or child restraint anchor service, carefully inspect all seat belts, buckles, mounting hardware, retractors, tether straps, and anchors for proper installation, operation, or damage. Replace any belt that is cut, frayed, or torn. Straighten any belt that is twisted. Tighten any loose fasteners. Replace any belt that has a damaged or inoperative buckle or retractor. Replace any belt that has a bent or damaged latch plate or anchor plate. Replace any child restraint anchor or the unit to which the anchor is integral that has been bent or damaged. Never attempt to repair a seat belt or child restraint component. Always replace damaged or faulty seat belt and child restraint components with the correct, new and unused replacement parts listed in the DaimlerChrysler Mopar Parts Catalog.

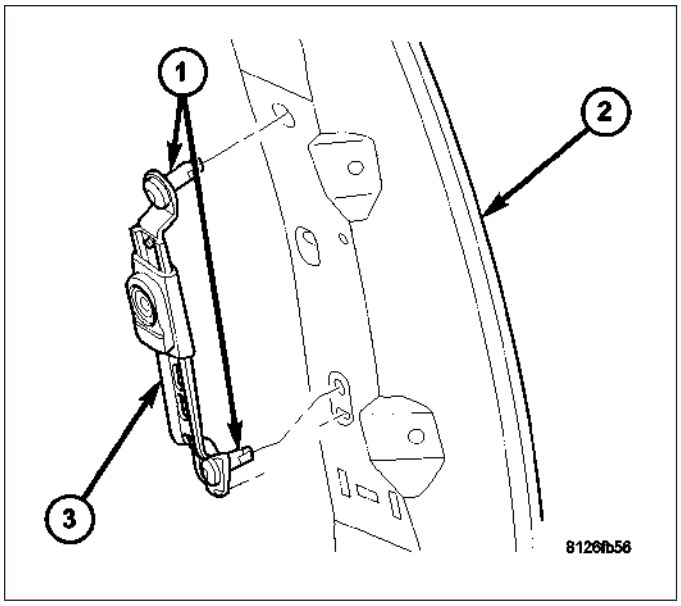
1. Unsnap the upper edge of the trim cover (3) from the front seat belt turning loop (1) and disengage the tab (2) on the lower edge of the cover to access the turning loop screw.



2. Remove the screw (4) that secures the seat belt turning loop (5) to the height adjuster (2) on the upper B-pillar.
3. Remove the seat belt turning loop from the height adjuster.
4. Remove the upper trim (1) from the inside of the B-pillar. (Refer to 23 - BODY/INTERIOR/B-PILLAR UPPER TRIM - REMOVAL).



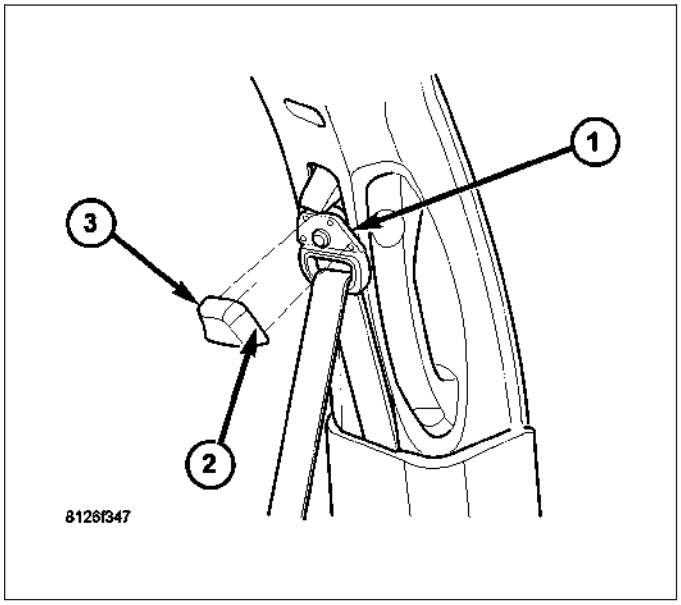
5. Remove the two screws (1) that secure the height adjuster (3) to the B-pillar (2).
6. Remove the adjuster from the B-pillar.



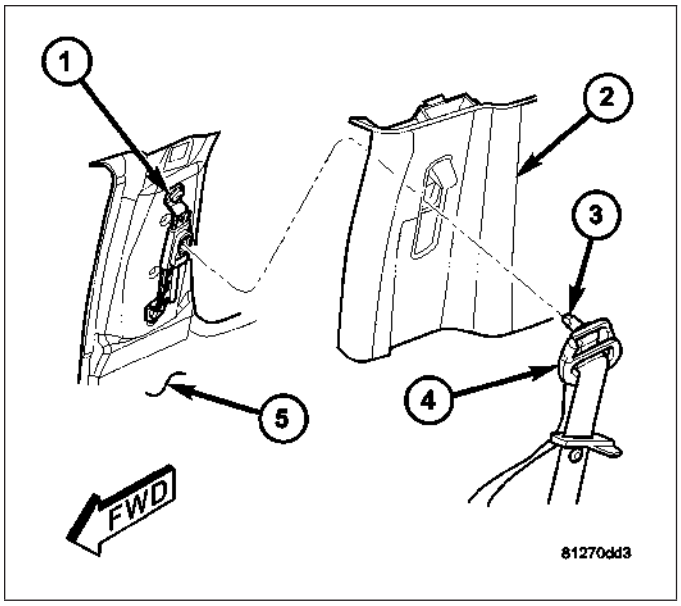
SECOND ROW - OUTBOARD

WARNING: To avoid personal injury or death, during and following any seat belt or child restraint anchor service, carefully inspect all seat belts, buckles, mounting hardware, retractors, tether straps, and anchors for proper installation, operation, or damage. Replace any belt that is cut, frayed, or torn. Straighten any belt that is twisted. Tighten any loose fasteners. Replace any belt that has a damaged or inoperative buckle or retractor. Replace any belt that has a bent or damaged latch plate or anchor plate. Replace any child restraint anchor or the unit to which the anchor is integral that has been bent or damaged. Never attempt to repair a seat belt or child restraint component. Always replace damaged or faulty seat belt and child restraint components with the correct, new and unused replacement parts listed in the DaimlerChrysler Mopar Parts Catalog.

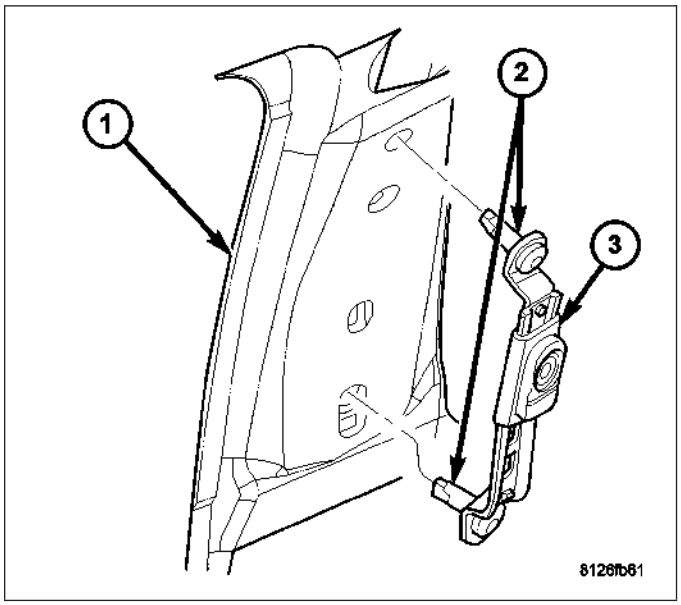
1. Unsnap the upper edge of the trim cover (3) from the second row outboard seat belt turning loop (1) and disengage the tab (2) on the lower edge of the cover to access the turning loop screw.



2. Remove the screw (3) that secures the seat belt turning loop (4) to the height adjuster (1) on the upper C-pillar (5).
3. Remove the seat belt turning loop from the height adjuster.
4. Remove the upper trim (2) from the inside of the C-pillar. (Refer to 23 - BODY/INTERIOR/C-PILLAR TRIM - REMOVAL).



5. Remove the two screws (2) that secure the height adjuster (3) to the C-pillar (1).
6. Remove the adjuster from the C-pillar.

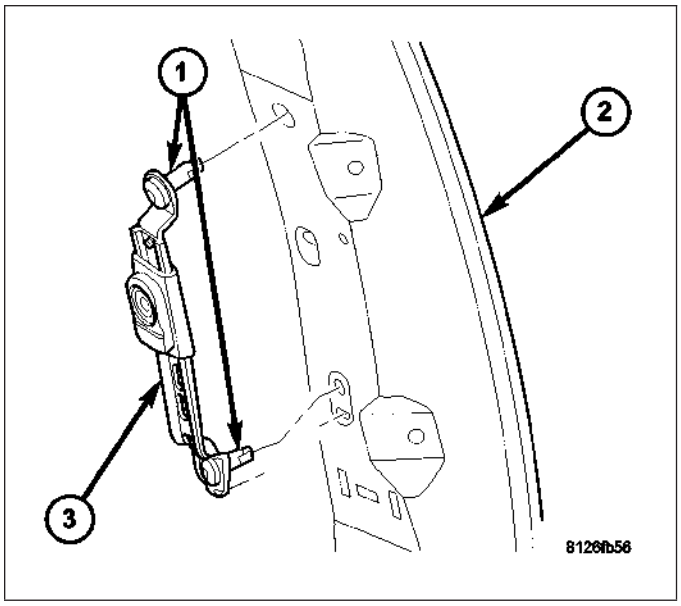


INSTALLATION

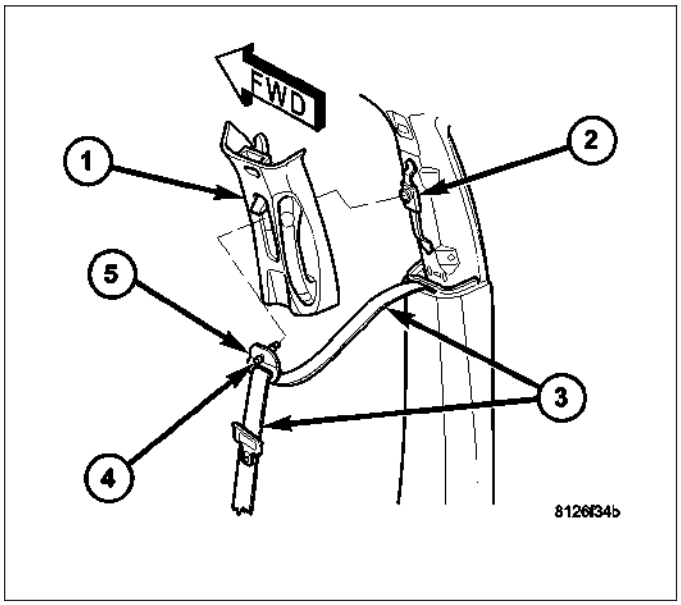
FRONT

WARNING: To avoid personal injury or death, during and following any seat belt or child restraint anchor service, carefully inspect all seat belts, buckles, mounting hardware, retractors, tether straps, and anchors for proper installation, operation, or damage. Replace any belt that is cut, frayed, or torn. Straighten any belt that is twisted. Tighten any loose fasteners. Replace any belt that has a damaged or inoperative buckle or retractor. Replace any belt that has a bent or damaged latch plate or anchor plate. Replace any child restraint anchor or the unit to which the anchor is integral that has been bent or damaged. Never attempt to repair a seat belt or child restraint component. Always replace damaged or faulty seat belt and child restraint components with the correct, new and unused replacement parts listed in the DaimlerChrysler Mopar Parts Catalog.

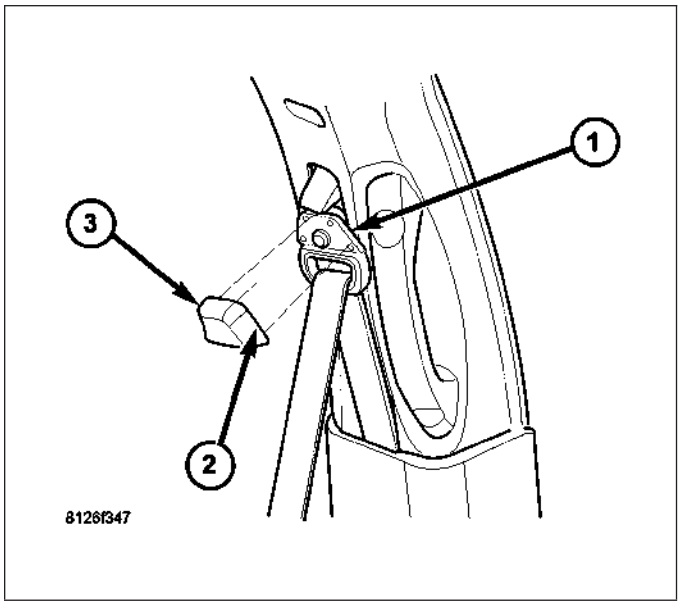
1. Position the seat belt turning loop adjuster (3) to the B-pillar (2).
2. Install and tighten the two screws (1) that secure the adjuster to the B-pillar. Tighten the screws to 39 N·m (29 ft. lbs.).



3. Reinstall the upper trim (1) onto the inside of the B-pillar. (Refer to 23 - BODY/INTERIOR/B-PILLAR UPPER TRIM - INSTALLATION).
4. Position the seat belt turning loop (5) onto the height adjuster (2) on the upper B-pillar.
5. Install and tighten the screw (4) that secures the turning loop to the height adjuster. Tighten the screw to 39 N·m (29 ft. lbs.).



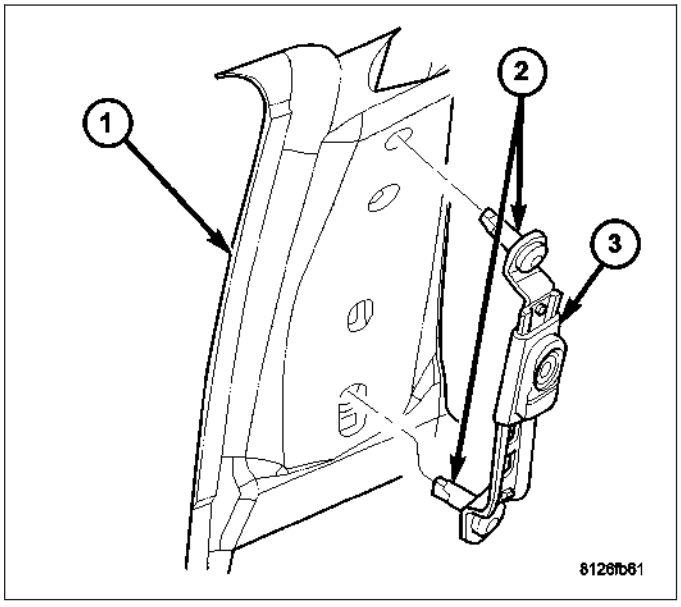
6. Engage the tab (2) on the lower edge of the trim cover (3) in the slot below the screw in the turning loop (1). Then press the upper edge of the trim cover over the top of the turning loop until it snaps into place.



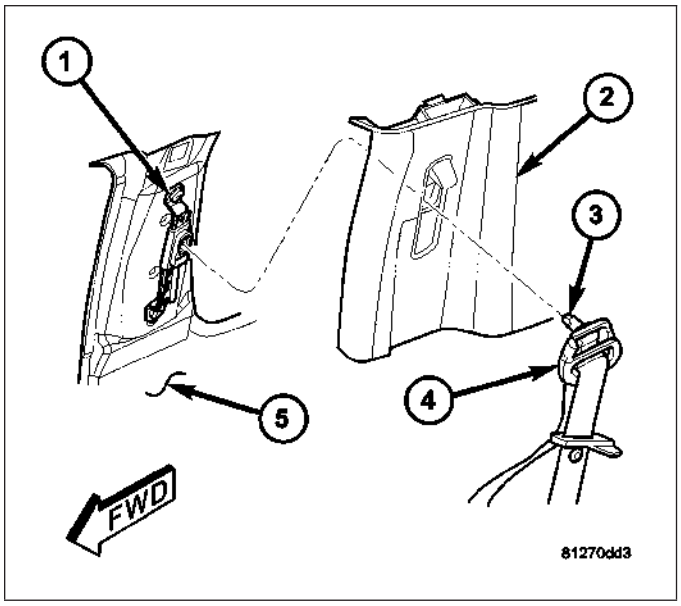
SECOND ROW - OUTBOARD

WARNING: To avoid personal injury or death, during and following any seat belt or child restraint anchor service, carefully inspect all seat belts, buckles, mounting hardware, retractors, tether straps, and anchors for proper installation, operation, or damage. Replace any belt that is cut, frayed, or torn. Straighten any belt that is twisted. Tighten any loose fasteners. Replace any belt that has a damaged or inoperative buckle or retractor. Replace any belt that has a bent or damaged latch plate or anchor plate. Replace any child restraint anchor or the unit to which the anchor is integral that has been bent or damaged. Never attempt to repair a seat belt or child restraint component. Always replace damaged or faulty seat belt and child restraint components with the correct, new and unused replacement parts listed in the DaimlerChrysler Mopar Parts Catalog.

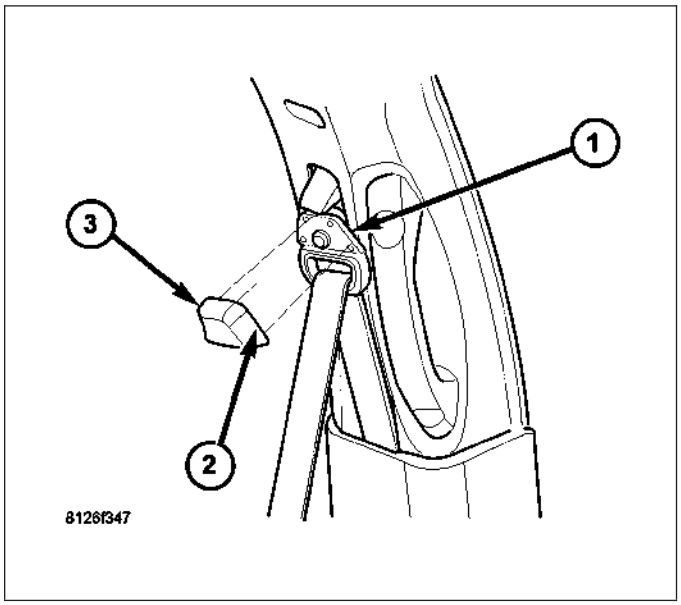
1. Position the seat belt turning loop adjuster (3) to the C-pillar (1).
2. Install and tighten the two screws (2) that secure the adjuster to the C-pillar. Tighten the screws to 39 N·m (29 ft. lbs.).



3. Reinstall the upper trim (2) onto the inside of the C-pillar (5). (Refer to 23 - BODY/INTERIOR/C-PILLAR TRIM - INSTALLATION).
4. Position the seat belt turning loop (4) to the height adjuster (1) on the upper C-pillar.
5. Install and tighten the screw (3) that secures the turning loop to the height adjuster. Tighten the screw to 39 N·m (29 ft. lbs.).



6. Engage the tab (2) on the lower edge of the trim cover (3) in the slot below the screw in the turning loop (1). Then press the upper edge of the trim cover over the top of the turning loop until it snaps into place.

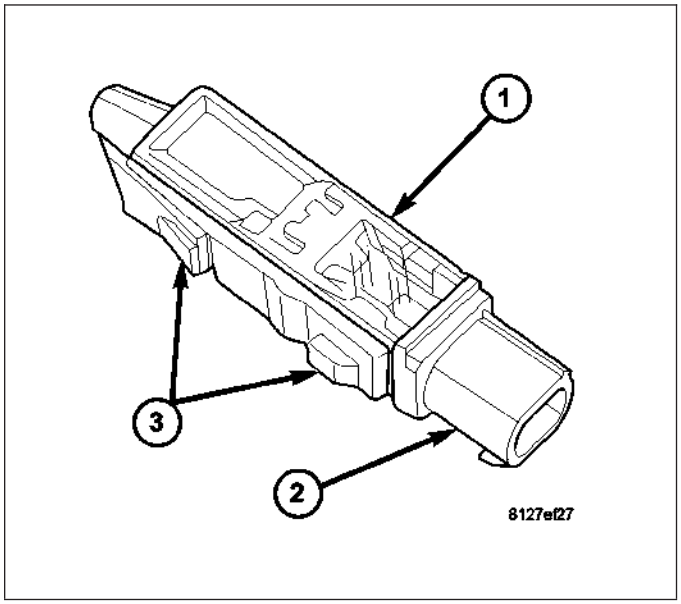


SENSOR-SEAT TRACK POSITION

DESCRIPTION

The seat track position sensor (1) is a Hall Effect-type sensor. This sensor consists of a Hall Effect Integrated Circuit (IC) chip encased in potting material within a cavity of the molded plastic sensor housing. The sensor housing has two integral snap features (3) and snaps into a stamped metal bracket located on the inboard side of one of the seat adjuster tracks on each front seat. A molded connector receptacle (2) integral to the sensor housing is connected to the vehicle electrical system through a connector and take out of the driver or passenger seat wire harness beneath the front seat cushion frame.

The seat track position sensor cannot be adjusted or repaired and, if faulty or damaged, the entire sensor must be replaced.



OPERATION

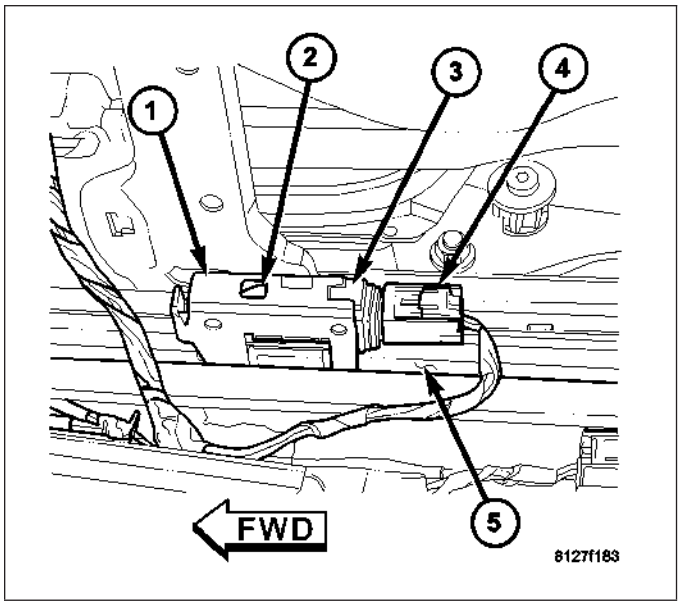
The seat track position sensor is designed to provide a seat position data input to the Occupant Classification Module (OCM) indicating whether the driver side or passenger side front seat is in a full forward or a not full forward position. The OCM sends electronic seat position messages to the Occupant Restraint Controller (ORC) over the Controller Area Network (CAN) data bus. The ORC uses this data as an additional logic input for use in determining the appropriate deployment force to be used when deploying the multistage front airbags.

The seat track position sensor receives a nominal five volt supply from the OCM. The sensor communicates the seat position by modulating the voltage returned to the OCM on a sensor data circuit. The OCM also monitors the condition of the sensor circuits and will store a Diagnostic Trouble Code (DTC) for any fault that is detected, then send messages to the ORC to illuminate the airbag indicator in the instrument cluster. For proper diagnosis of the seat track position sensor, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

REMOVAL

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

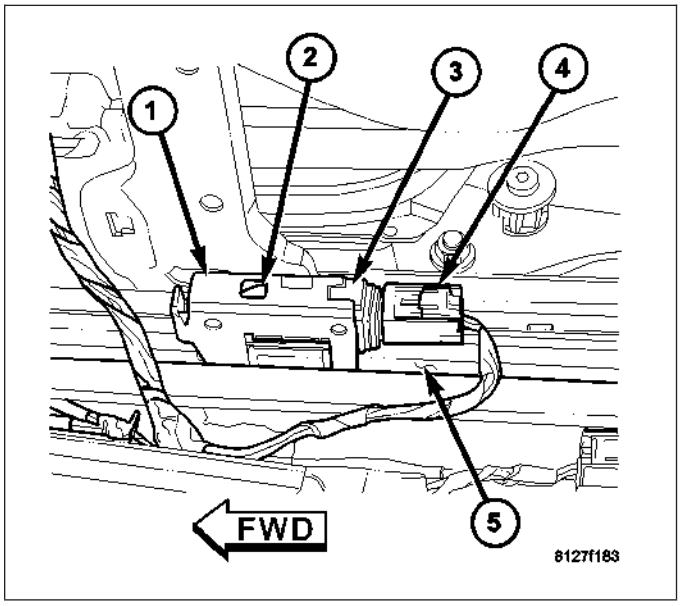
1. Disconnect and isolate the battery negative cable. Wait two minutes for the system capacitor to discharge before further service.
2. Reach under the front seat cushion to access the seat track position sensor (3) in a bracket (1) located on the inboard side of either the inner or outer, driver or passenger seat track (5).
3. Disconnect the seat wire harness connector (4) from the sensor connector receptacle located on the rearward facing end of the sensor.
4. Using a small screwdriver, depress the snap feature (2) and pull the sensor out of the rearward facing end of the bracket.
5. Remove the sensor from under the front seat.



INSTALLATION

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

1. Reach under the front edge of the front seat cushion to position the seat track position sensor (3) to the open end of the bracket (1) located on the inboard side of either the inner or outer, driver or passenger seat track (5).
2. Push the sensor firmly into the bracket until the snap feature (2) locks into place.
3. Reconnect the seat wire harness connector (4) to the sensor connector receptacle located on the rearward facing end of the sensor. Be certain that the latch on the connector is fully engaged.
4. Do not reconnect the battery negative cable at this time. The supplemental restraint system verification test procedure should be performed following service of any supplemental restraint system component. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - VERIFICATION TEST).



5. Following successful completion of the supplemental restraint system verification test procedure, perform the Occupant Classification System Verification Test using a diagnostic scan tool. Refer to the appropriate diagnostic procedures.

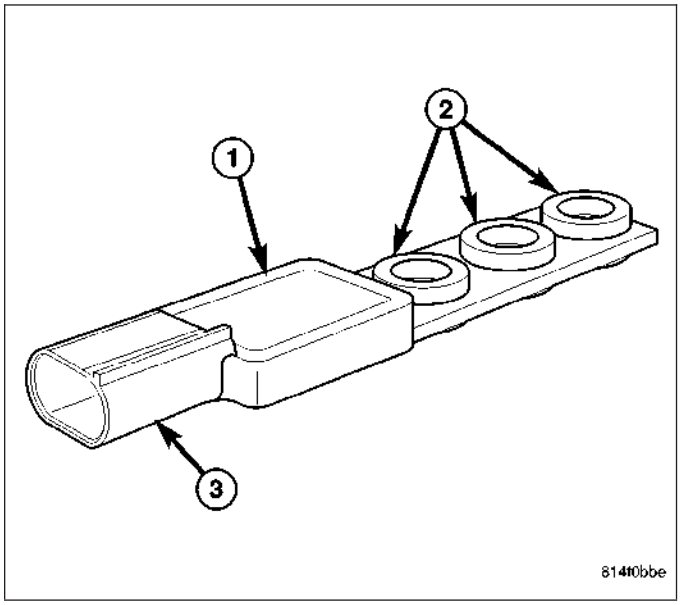
SENSOR-SEAT WEIGHT

DESCRIPTION

The seat weight sensors are strain gauge-type units. The electronic elements of the sensor are encased in a potting material within the molded plastic sensor housing (1). Four sensors are used in the Occupant Classification System (OCS). A sensor is located at each corner of the passenger side front seat.

The strain gauge for each sensor is secured through three mounting bosses (2) by three screws and nuts between the seat cushion frame and the seat adjuster tracks. A molded connector receptacle (3) integral to each sensor housing is connected to the vehicle electrical system through a dedicated connector and take out of the passenger seat wire harness beneath the seat cushion frame.

The seat weight sensors cannot be adjusted or repaired and, if faulty or damaged, the entire sensor must be replaced.



OPERATION

The seat weight sensor units are designed to sense the relative weight of a load applied to the passenger side front seat, which provides a logic input to the microprocessor of the Occupant Classification Module (OCM). When a load is applied to the seat, the strain gauge of each sensor is flexed causing a change of electrical resistance through the strain gauge. These changes in resistance are measured by the sensor and the internal sensor circuitry changes the sensor output voltage.

Each weight sensor receives a nominal five volts and a ground through parallel hard wired circuits from the OCM. The OCM then monitors the output voltage of each sensor on dedicated hard wired data communication circuits. The hard wired circuits between the sensors and the OCM may be diagnosed and tested using conventional diagnostic tools and procedures. However, the most reliable, efficient, and accurate means to diagnose the seat weight sensor inputs to the OCM, and the electronic message communication between the OCM and the Occupant Restraint Controller (ORC) requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

REMOVAL

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

WARNING: To avoid personal injury or death on vehicles equipped with the Occupant Classification System (OCS), do not modify the front passenger seat assembly or center floor console in any way. Do not use any prior year, subsequent year, secondary or aftermarket seat trim covers. At no time should any Supplemental Restraint System (SRS) or OCS component be modified or replaced with any part except those which are specified for the particular vehicle application in the DaimlerChrysler Mopar Parts Catalog. Failure to observe these precautions could cause an OCS miscalibration condition, which may result in the passenger airbag failing to deploy when required or deploying when not required.

WARNING: To avoid personal injury or death, never strike or drop a seat weight sensor or the passenger side front seat assembly to which the sensors are secured as it can damage the sensors or affect their calibration. The seat weight sensors and the passenger side front seat assembly must be handled with care to avoid damage to the sensors. Do not sit upon or place any loads upon a passenger side front seat while it is removed from its mounts in or outside of the vehicle. If an individual sensor is dropped or damaged, replace the sensor with a new and unused unit. If a seat has been dropped during removal or loaded while removed from its mounts, replace each of the seat weight sensors with new and unused units. Failure to observe this warning could result in an accidental, incomplete, or improper passenger side front supplemental restraint deployment.

1. Disconnect and isolate the battery negative cable. Wait two minutes for the system capacitor to discharge before further service.
2. Remove the passenger side front seat from the vehicle. (Refer to 23 - BODY/SEATS/SEAT - FRONT - REMOVAL).
3. Remove the riser from the seat weight sensors, then remove the seat weight sensors from the seat adjuster. (Refer to 23 - BODY/SEATS/SEAT RISER - REMOVAL).

INSTALLATION

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

WARNING: To avoid personal injury or death on vehicles equipped with the Occupant Classification System (OCS), do not modify the front passenger seat assembly or center floor console in any way. Do not use any prior year, subsequent year, secondary or aftermarket seat trim covers. At no time should any Supplemental Restraint System (SRS) or OCS component be modified or replaced with any part except those which are specified for the particular vehicle application in the DaimlerChrysler Mopar Parts Catalog. Failure to observe these precautions could cause an OCS miscalibration condition, which may result in the passenger airbag failing to deploy when required or deploying when not required.

WARNING: To avoid personal injury or death, never strike or drop a seat weight sensor or the passenger side front seat assembly to which the sensors are secured as it can damage the sensors or affect their calibration. The seat weight sensors and the passenger side front seat assembly must be handled with care to avoid damage to the sensors. Do not sit upon or place any loads upon a passenger side front seat while it is removed from its mounts in or outside of the vehicle. If an individual sensor is dropped or damaged, replace the sensor with a new and unused unit. If a seat has been dropped during removal or loaded while removed from its mounts, replace each of the seat weight sensors with new and unused units. Failure to observe this warning could result in an accidental, incomplete, or improper passenger side front supplemental restraint deployment.

WARNING: To avoid personal injury or death on vehicles equipped with the Occupant Classification System (OCS), any time the passenger side front seat assembly has been removed or loosened from the vehicle for service of any vehicle component or system the Occupant Classification System Verification Test must be performed using a diagnostic scan tool and the Occupant Classification Seat Weight special tool following reinstallation. Refer to the appropriate diagnostic procedures. Failure to observe this warning could result in an accidental, incomplete, or improper passenger side front supplemental restraint deployment.

1. Reinstall the seat weight sensors to the seat adjuster then the riser to the seat weight sensors. (Refer to 23 - BODY/SEATS/SEAT RISER - INSTALLATION).
2. Reinstall the passenger side front seat into the vehicle. (Refer to 23 - BODY/SEATS/SEAT - INSTALLATION).
3. Do not reconnect the battery negative cable at this time. The supplemental restraint system verification test procedure should be performed following service of any supplemental restraint system component. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - VERIFICATION TEST).
4. Following successful completion of the supplemental restraint system verification test procedure, perform the Occupant Classification System Verification Test using a diagnostic scan tool and the Occupant Classification Seat Weight special tool. Refer to the appropriate diagnostic procedures.

SPEED CONTROL

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SPEED CONTROL

DESCRIPTION

3.7L/4.7L Engine

The speed control system is operated by the use of a cable and a vacuum controlled servo. Electronic control of the speed control system is integrated into the Powertrain Control Module (PCM). The controls consist of two steering wheel mounted switches. The switches are labeled: ON/OFF, RES/ACCEL, SET, COAST, and CANCEL.

The system is designed to operate at speeds above 30 mph (50 km/h).

5.7L V-8 Engine

The speed control system is fully and electronically controlled by the Powertrain Control Module (PCM). **A cable and a vacuum controlled servo are not used. This is a servo-less system.** The controls consist of two steering wheel mounted switches. The switches are labeled: ON/OFF, RES/ACCEL, SET, COAST, and CANCEL.

The system is designed to operate at speeds above 30 mph (50 km/h).

OPERATION

When speed control is selected by depressing the ON switch, the PCM (the ECM if equipped with a diesel engine) allows a set speed to be stored in its RAM for speed control. To store a set speed, depress the SET switch while the vehicle is moving at a speed between 35 and 85 mph. In order for the speed control to engage, the brakes cannot be applied, nor can the gear selector be indicating the transmission is in Park or Neutral.

The speed control can be disengaged manually by:

- Stepping on the brake pedal
- Depressing the OFF switch
- Depressing the CANCEL switch.
- Depressing the clutch pedal (if equipped).

Note: Depressing the OFF switch or turning off the ignition switch will erase the set speed stored in the PCM (the ECM with a diesel engine).

For added safety, the speed control system is programmed to disengage for any of the following conditions:

- An indication of Park or Neutral
- A rapid increase rpm (indicates that the clutch has been disengaged)
- Excessive engine rpm (indicates that the transmission may be in a low gear)
- The speed signal increases at a rate of 10 mph per second (indicates that the coefficient of friction between the road surface and tires is extremely low)
- The speed signal decreases at a rate of 10 mph per second (indicates that the vehicle may have decelerated at an extremely high rate)

Once the speed control has been disengaged, depressing the RES/ACCEL switch (when speed is greater than 30 mph) restores the vehicle to the target speed that was stored in the PCM (the ECM with a diesel engine).

While the speed control is engaged, the driver can increase the vehicle speed by depressing the RES/ACCEL switch. The new target speed is stored in the PCM (the ECM with a diesel engine) when the RES/ACCEL is released. The PCM (the ECM with a diesel engine) also has a ″tap-up″ feature in which vehicle speed increases at a rate of approximately 2 mph for each momentary switch activation of the RES/ACCEL switch.

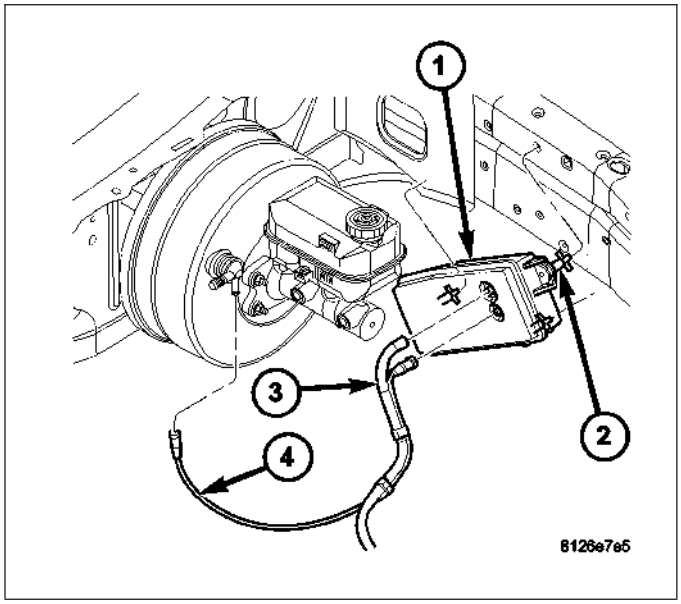
A “tap down” feature is used to decelerate without disengaging the speed control system. To decelerate from an existing recorded target speed, momentarily depress the COAST switch. For each switch activation, speed will be lowered approximately 1 mph.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - VACUUM SUPPLY TEST

3.7L / 4.7L Engines

Actual engine vacuum, a vacuum reservoir (1) equipped with a one-way check valve, and vacuum lines (3) and (4) are used to supply vacuum to the speed control servo.



1. Remove rubber air tube between throttle body and air filter housing to gain access to speed control servo.
2. Disconnect vacuum hose at speed control servo and install a vacuum gauge into the disconnected hose.
3. Start engine and observe gauge at idle. Vacuum gauge should read at least ten inches of mercury.
4. If vacuum is less than ten inches of mercury, determine source of leak. Check vacuum line to engine (4) for leaks. Also check actual engine intake manifold vacuum. If manifold vacuum does not meet this requirement, check for poor engine performance and repair as necessary.
5. If vacuum line to engine is not leaking, check for leak at vacuum reservoir. Disconnect vacuum line at reservoir and connect a hand-operated vacuum pump to reservoir fitting. Apply vacuum. Reservoir vacuum should not bleed off. If vacuum is being lost, replace reservoir.
6. The reservoir (1) is equipped with an integral one-way check valve to retain a certain amount of vacuum within the reservoir. Verify operation of one-way check valve and check it for leaks.

5.7 Engine

Vacuum is not used for any part of the speed control system if equipped with a 5.7L V-8 engine.

DIAGNOSIS AND TESTING - ROAD TEST

Perform a vehicle road test to verify reports of speed control system malfunction. The road test should include attention to the speedometer. Speedometer operation should be smooth and without flutter at all speeds.

Flutter in the speedometer indicates a problem which might cause surging in the speed control system. The cause of any speedometer problems should be corrected before proceeding. Refer to Instrument Cluster for speedometer diagnosis.

If a road test verifies a system problem and the speedometer operates properly, check for:

- A Diagnostic Trouble Code (DTC). If a DTC exists, conduct tests per the Powertrain Diagnostic Procedures service manual.
- A misadjusted brake (stop) lamp switch. This could also cause an intermittent problem.
- Loose, damaged or corroded electrical connections at the servo (if used). Corrosion should be removed from electrical terminals and a light coating of Mopar MultiPurpose Grease, or equivalent, applied.
- Leaking vacuum reservoir (if used).
- Loose or leaking vacuum hoses or connections (if used).
- Defective one-way vacuum check valve (if used).
- Secure attachment of both ends of the speed control servo cable (if used).
- Smooth operation of throttle linkage (if used) and throttle body air valve.
- Failed speed control servo (if used). Do the servo vacuum test.

CAUTION: When test probing for voltage or continuity at electrical connectors, care must be taken not to damage connector, terminals or seals. If these components are damaged, intermittent or complete system failure may occur.

SPECIFICATIONS

TORQUE - SPEED CONTROL

DESCRIPTION	N-m	Ft. Lbs.	In. Lbs.
Servo Mounting Bracket-to-Servo Nuts	7	-	60
Servo Mounting Bracket-to-Battery Tray Screws	4	-	30
Speed Control Switch Mounting Screws	1.7	-	15

CABLE-SPEED CONTROL

DESCRIPTION

The speed control servo cable is connected between the speed control vacuum servo diaphragm and the throttle body control linkage. This cable is used only with 3.7L/4.7L engines.

A speed control servo cable **is not used** if equipped with a 5.7L engine.

OPERATION

This cable causes the throttle control linkage to open or close the throttle valve in response to movement of the vacuum servo diaphragm.

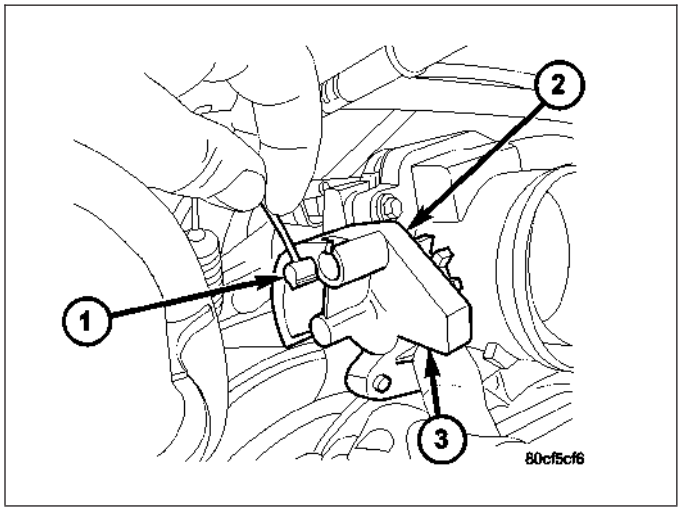
REMOVAL

3.7L / 4.7L ENGINES

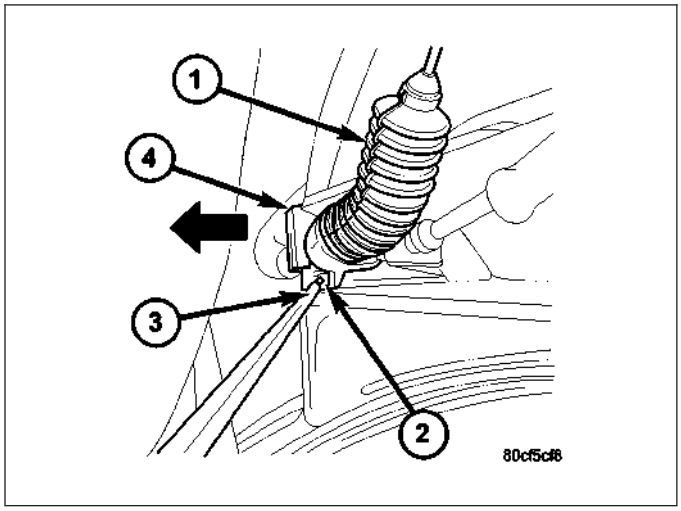
1. Disconnect negative battery cable at battery.
2. Remove air intake tube at top of throttle body.

The accelerator cable must be partially removed to gain access to speed control cable.

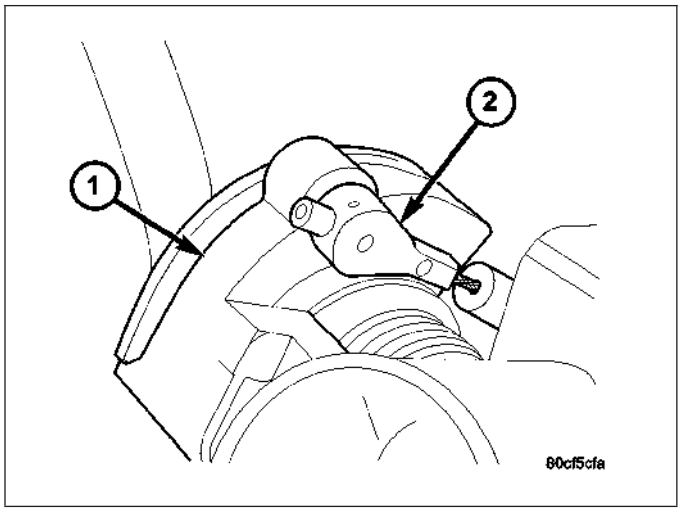
3. Hold throttle in wide open position. While held in this position, slide throttle cable pin (1) from throttle body bellcrank.



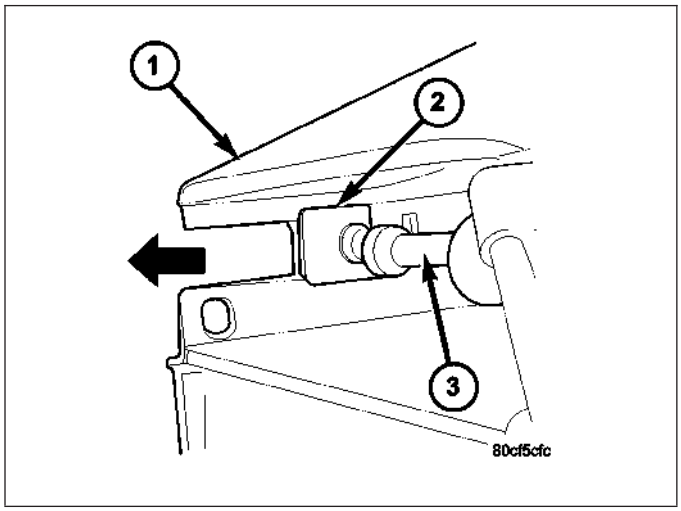
4. Using a pick or small screwdriver, press release tab (2) to release plastic cable mount from bracket. **Press on tab only enough to release cable from bracket. If tab is pressed too much, it will be broken.** Slide plastic mount (4) towards right side of vehicle to remove throttle cable from throttle body bracket.



5. Using finger pressure only, disconnect servo cable connector (2) at throttle body bellcrank pin by pushing connector off bellcrank pin towards front of vehicle. **DO NOT try to pull connector off perpendicular to the bellcrank pin. Connector will be broken.**



6. Slide speed control cable plastic mount (2) towards right of vehicle to remove cable from throttle body bracket.
7. Remove servo cable from servo. Refer to Servo Removal/Installation.



INSTALLATION

3.7L / 4.7L ENGINES

1. Install end of cable to speed control servo. Refer to Servo Removal/Installation.
2. Slide speed control cable plastic mount into throttle body bracket.
3. Install speed control cable connector onto throttle body bellcrank pin (push rearward to snap into location).
4. Slide throttle (accelerator) cable plastic mount into throttle body bracket. Continue sliding until cable release tab is aligned to hole in throttle body mounting bracket.
5. While holding throttle to wide open position, place throttle cable pin into throttle body bellcrank.
6. Install air intake tube to top of throttle body.
7. Connect negative battery cable at battery.
8. Before starting engine, operate accelerator pedal to check for any binding.

SERVO-SPEED CONTROL

DESCRIPTION

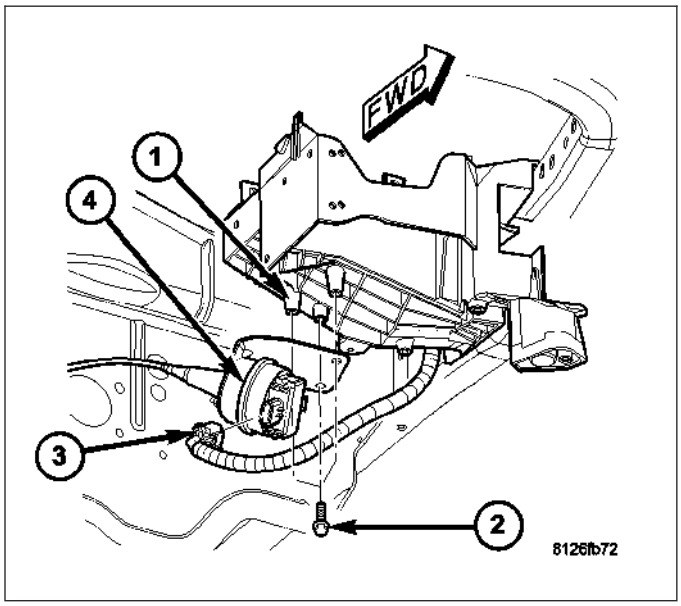
A speed control servo is used only with 3.7L V-6 or 4.7L V-8 engines.

The speed control servo (4) is located in the engine compartment and is attached to the bottom of the PDC (Power Distribution Center) (1).

The servo unit consists of a solenoid valve body, and a vacuum chamber. The solenoid valve body contains three solenoids:

- Vacuum
- Vent
- Dump

The vacuum chamber contains a diaphragm with a cable attached to control the throttle linkage.



OPERATION

A speed control servo is used only with 3.7L V-6 or 4.7L V-8 engines.

The Powertrain Control Module (PCM) controls the solenoid valve body. The solenoid valve body controls the application and release of vacuum to the diaphragm of the vacuum servo. The servo unit cannot be repaired and is serviced only as a complete assembly.

Power is supplied to the servo's by the PCM through the brake switch. The PCM controls the ground path for the vacuum and vent solenoids.

The dump solenoid is energized anytime it receives power. If power to the dump solenoid is interrupted, the solenoid dumps vacuum in the servo. This provides a safety backup to the vent and vacuum solenoids.

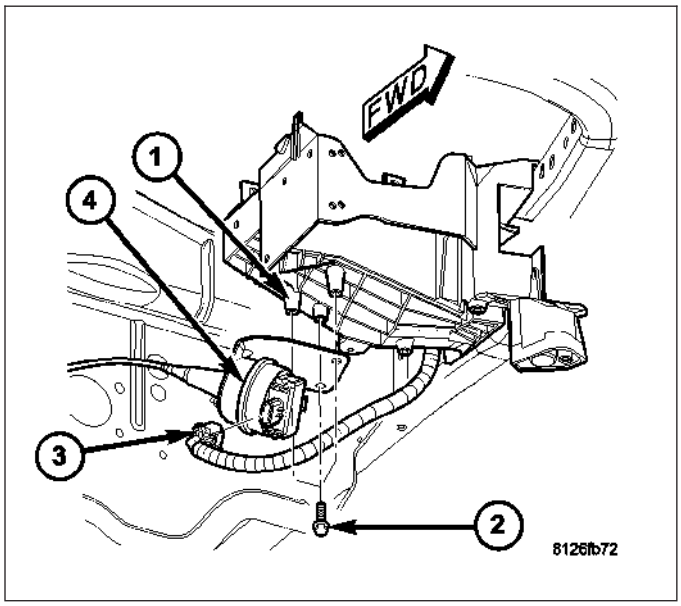
The vacuum and vent solenoids must be grounded at the PCM to operate. When the PCM grounds the vacuum servo solenoid, the solenoid allows vacuum to enter the servo and pull open the throttle plate using the cable. When the PCM breaks the ground, the solenoid closes and no more vacuum is allowed to enter the servo. The PCM also operates the vent solenoid via ground. The vent solenoid opens and closes a passage to bleed or hold vacuum in the servo as required.

The PCM duty cycles the vacuum and vent solenoids to maintain the set speed, or to accelerate and decelerate the vehicle. To increase throttle opening, the PCM grounds the vacuum and vent solenoids. To decrease throttle opening, the PCM removes the grounds from the vacuum and vent solenoids. When the brake is released, if vehicle speed exceeds 30 mph to resume, 35 mph to set, and the RES/ACCEL switch has been depressed, ground for the vent and vacuum circuits is restored.

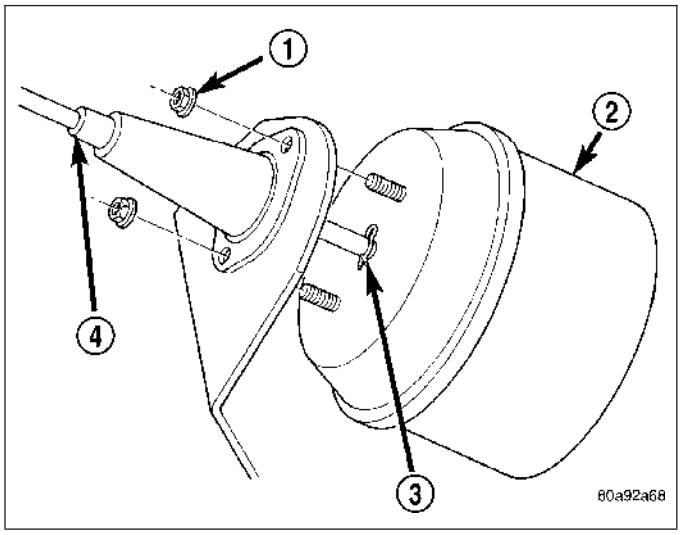
REMOVAL

The speed control servo assembly (4) is attached to the bottom of the PDC (Power Distribution Center) (1).

1. Disconnect negative battery cable at battery.
2. Disconnect vacuum line at servo.
3. Disconnect electrical connector (3) at servo.
4. Remove three servo mounting screws (2).
5. Disconnect servo cable at throttle body. Refer to Servo Cable Removal/Installation.

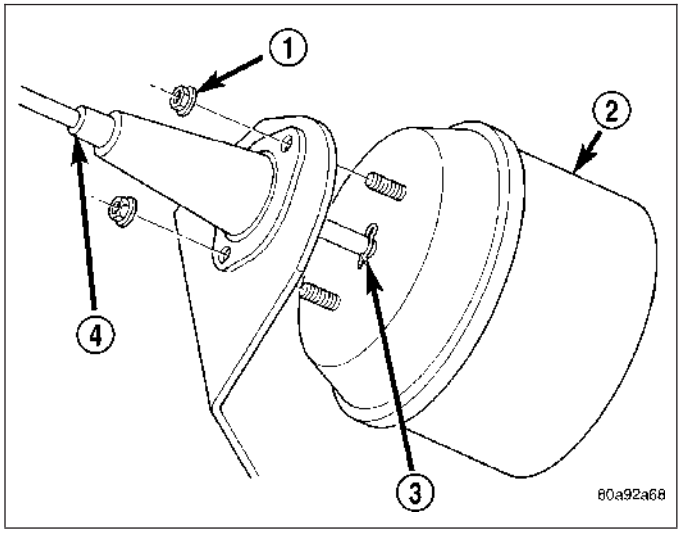


6. Remove 2 mounting nuts (1) holding servo cable sleeve (4) to bracket.
7. Pull speed control cable sleeve and servo away from servo mounting bracket to expose cable retaining clip (3) and remove clip. Note: The servo mounting bracket displayed is a typical bracket and may/may not be applicable to this model vehicle.
8. Remove servo (2) from mounting bracket. While removing, note orientation of servo to bracket.

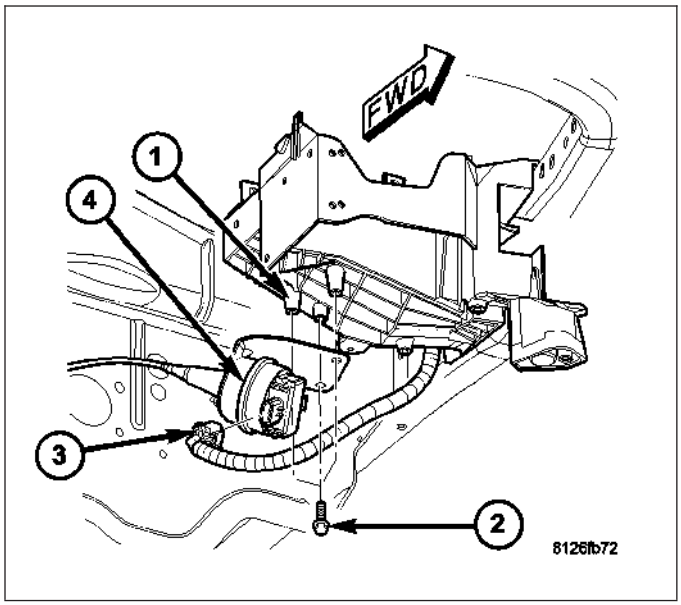


INSTALLATION

1. Position servo (2) to mounting bracket.
2. Align hole in cable connector with hole in servo pin. Install cable-to-servo retaining clip (3)..
3. Insert servo mounting studs through holes in servo mounting bracket.
4. Install two servo-to-mounting bracket nuts (1) and tighten. Refer to torque specifications.



5. Position servo assembly (4) to correct mounting lugs on bottom of PDC (1) and install 3 screws. Tighten 3 screws. Refer to torque specifications.
6. Connect vacuum line at servo.
7. Connect electrical connector at servo.
8. Connect servo cable to throttle body. Refer to Servo Cable Removal/Installation.
9. Connect negative battery cable to battery.
10. Before starting engine, operate accelerator pedal to check for any binding.



SWITCH-SPEED CONTROL

DESCRIPTION

Two separate switch pods operate the speed control system. The steering-wheel-mounted switches use multiplexed circuits to provide inputs to the PCM for ON, OFF, RESUME, ACCELERATE, SET, DECEL and CANCEL modes. Refer to the owner's manual for more information on speed control switch functions and setting procedures.

The individual switches cannot be repaired. If one switch fails, the entire switch module must be replaced.

OPERATION

When speed control is selected by depressing the ON, OFF switch, the PCM allows a set speed to be stored in its RAM for speed control. To store a set speed, depress the SET switch while the vehicle is moving at a speed between approximately 35 and 85 mph. In order for the speed control to engage, the brakes cannot be applied, nor can the gear selector be indicating the transmission is in Park or Neutral.

The speed control can be disengaged manually by:

- Stepping on the brake pedal
- Depressing the OFF switch
- Depressing the CANCEL switch.

The speed control can be disengaged also by any of the following conditions:

- An indication of Park or Neutral (auto. trans.)
- The VSS signal increases at a rate of 10 mph per second (indicates that the co-efficient of friction between the road surface and tires is extremely low)
- Depressing the clutch pedal (manual trans.).
- Excessive engine rpm (indicates that the transmission may be in a low gear)
- The VSS signal decreases at a rate of 10 mph per second (indicates that the vehicle may have decelerated at an extremely high rate)
- If the actual speed is not within 20 mph of the set speed

The previous disengagement conditions are programmed for added safety.

Once the speed control has been disengaged, depressing the ACCEL switch restores the vehicle to the target speed that was stored in the PCM's RAM

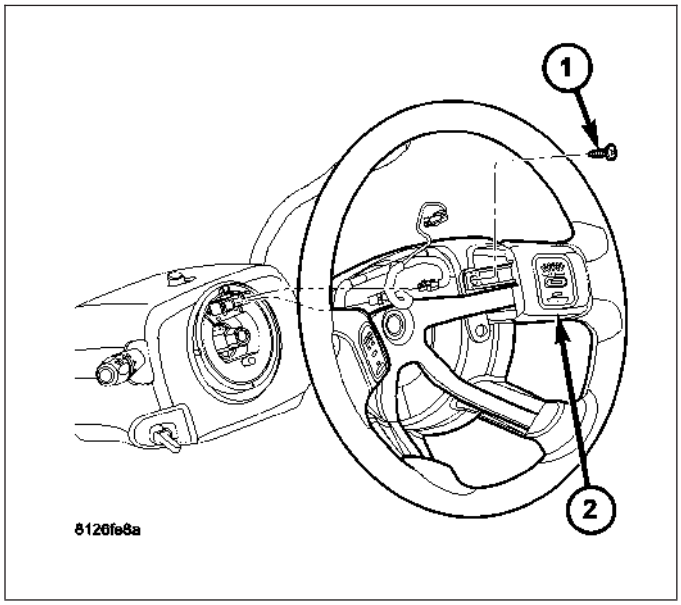
Note: Depressing the OFF switch will erase the set speed stored in the PCM's RAM.

If, while the speed control is engaged, the driver wishes to increase vehicle speed, the PCM is programmed for an acceleration feature. With the ACCEL switch held closed, the vehicle accelerates slowly to the desired speed. The new target speed is stored in the PCM's RAM when the ACCEL switch is released. The PCM also has a ″tap-up″ feature in which vehicle speed increases at a rate of approximately 2 mph for each momentary switch activation of the ACCEL switch.

The PCM also provides a means to decelerate without disengaging speed control. To decelerate from an existing recorded target speed, depress and hold the COAST switch until the desired speed is reached. Then release the switch. The ON, OFF switch operates two components: the PCM's ON, OFF input, and the battery voltage to the brake switch.

REMOVAL

WARNING: BEFORE ATTEMPTING TO DIAGNOSE, REMOVE OR INSTALL ANY AIRBAG SYSTEM OR RELATED STEERING WHEEL AND STEERING COLUMN COMPONENTS YOU MUST FIRST DISCONNECT AND ISOLATE THE NEGATIVE (GROUND) BATTERY CABLE. WAIT 2 MINUTES FOR SYSTEM CAPACITOR TO DISCHARGE BEFORE FURTHER SYSTEM SERVICE. FAILURE TO DO SO COULD RESULT IN ACCIDENTAL DEPLOYMENT AND POSSIBLE PERSONAL INJURY.



1. Disconnect and isolate negative battery cable from battery.
2. Remove airbag module. Refer to Restraint Systems.
3. Unplug electrical connector.
4. Remove speed control switch mounting screw (1) and remove switch from steering wheel.

INSTALLATION

1. Position switch to steering wheel.
2. Install switch mounting screw and tighten. Refer to torque specifications.
3. Plug electrical connector into switch.
4. Install airbag module. Refer to Restraint Systems.
5. Connect negative battery cable to battery.

RESERVOIR-VACUUM

DESCRIPTION

The vacuum reservoir is a plastic storage tank connected to an engine vacuum source by vacuum lines. A vacuum reservoir is not used with diesel engines or the 5.7L gas powered engine.

OPERATION

The vacuum reservoir is used to supply the vacuum needed to maintain proper speed control operation when engine vacuum drops, such as in climbing a grade while driving. A one-way check valve is used in the vacuum line between the reservoir and the vacuum source. This check valve is used to trap engine vacuum in the reservoir. On certain vehicle applications, this reservoir is shared with the heating/air-conditioning system. The vacuum reservoir cannot be repaired and must be replaced if faulty.

DIAGNOSIS AND TESTING - VACUUM RESERVOIR

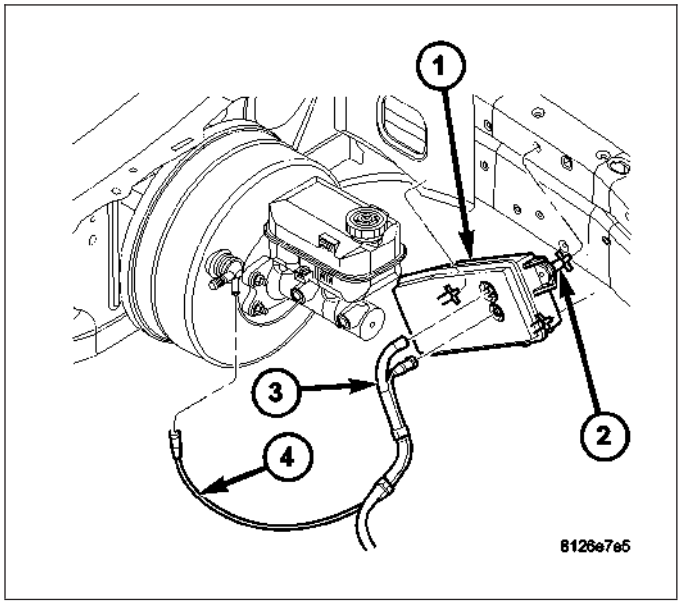
1. Disconnect vacuum hose at speed control servo and install a vacuum gauge into the disconnected hose.
2. Start engine and observe gauge at idle. Vacuum gauge should read at least ten inches of mercury.
3. If vacuum is less than ten inches of mercury, determine source of leak. Check vacuum line to engine for leaks. Also check actual engine intake manifold vacuum. If manifold vacuum does not meet this requirement, check for poor engine performance and repair as necessary.

4. If vacuum line to engine is not leaking, check for leak at vacuum reservoir. To locate and gain access to reservoir, refer to Vacuum Reservoir Removal/Installation in this group. Disconnect vacuum line at reservoir and connect a hand-operated vacuum pump to reservoir fitting. Apply vacuum. Reservoir vacuum should not bleed off. If vacuum is being lost, replace reservoir.
5. Verify operation of one-way check valve and check it for leaks. **Certain models may be equipped with 2 check-valves.**
   a. Locate one-way check valve. The valve is located in vacuum line between vacuum reservoir and engine vacuum source. Disconnect vacuum hoses (lines) at each end of valve.
   b. Connect a hand-operated vacuum pump to reservoir end of check valve. Apply vacuum. Vacuum should not bleed off. If vacuum is being lost, replace one-way check valve.
   c. Connect a hand-operated vacuum pump to vacuum source end of check valve. Apply vacuum. Vacuum should flow through valve. If vacuum is not flowing, replace one-way check valve. Seal the fitting at opposite end of valve with a finger and apply vacuum. If vacuum will not hold, diaphragm within check valve has ruptured. Replace valve.

REMOVAL

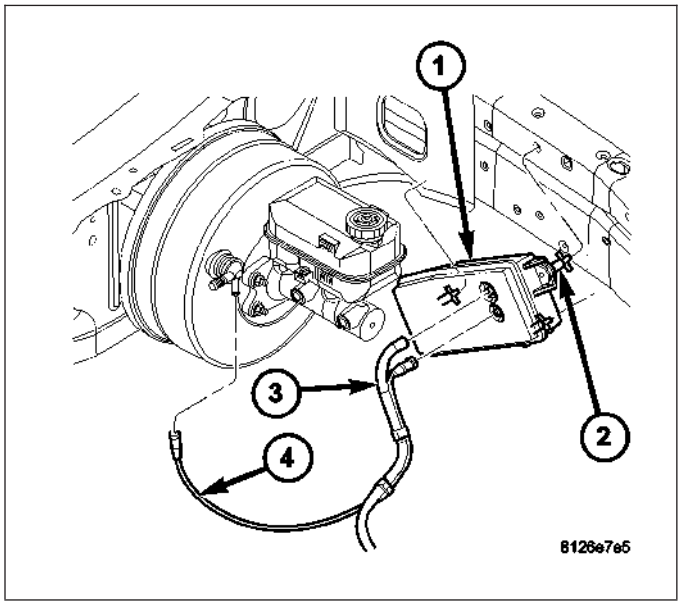
The vacuum reservoir (1) is attached to the left-inner fender in the engine compartment.

1. Disconnect two vacuum lines (3) and (4) at reservoir.
2. The reservoir is attached using three clips (2). Pry out on clips for removal.
3. Remove reservoir.



INSTALLATION

1. Position reservoir (1) onto inner fender.
2. Install three clips (2) to reservoir. Attach reservoir to inner fender by pushing clips into fender.
3. Connect vacuum lines (3) and (4) to reservoir fittings.



VEHICLE THEFT SECURITY

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VEHICLE THEFT SECURITY - ELECTRICAL DIAGNOSTICS

DIAGNOSIS AND TESTING

B1A24-KEY NOT PROGRAMMED

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition switch on.

Possible Causes
KEY NOT PROGRAMMED
SKREEM

Diagnostic Test

1. KEY NOT PROGRAMMED

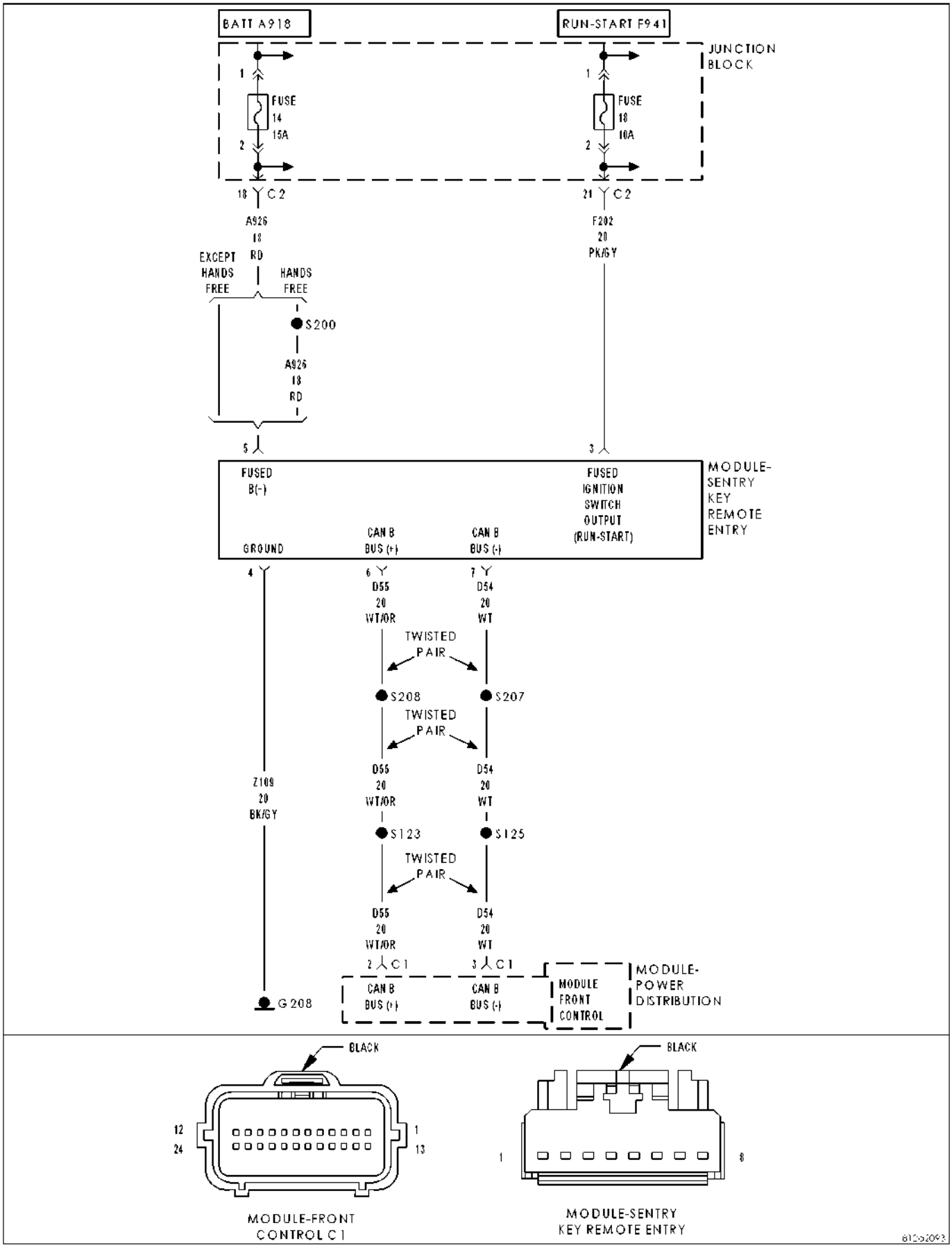
Turn the ignition on.
Using a scan tool, attempt to program the key(s) into the SKREEM.

Was the programming of the key(s) successful?

Yes >> Programming of the key(s) were successful. Test complete.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> Replace the ignition key and attempt to program it into the SKREEM. If the DTC resets, replace and program the SKREEM in accordance with the Service Information.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

B1A25-INVALID KEY



B1A25-INVALID KEY (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  At ignition on and during Key Programming Mode.
- **Set Condition:**
  When the SKREEM does not receive a transponder response after 8 consecutive transponder read attempts within 2.0 seconds.

Possible Causes
MULTIPLE KEY OPERATION
IGNITION KEY
SKREEM

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

With the scan tool, read and record the SKREEM DTCs.
With the scan tool, erase the SKREEM DTCs

NOTE: Perform the following test several times to ensure the DTC is current.
Turn the ignition off.
Wait 10 seconds.
Turn the ignition on.
With the scan tool, read the SKREEM DTCs.

Does the scan tool display the DTC that was previously erased?

Yes >> Go To 2
No >> Go To 6

---

2. CHECKING FOR MULTIPLE KEYS

Are there multiple vehicle ignition keys available?

Yes >> Go To 3
No >> Go To 4

B1A25-INVALID KEY (CONTINUED)

3. MULTIPLE KEY OPERATION

NOTE: Perform the following steps using one of the vehicle ignition keys. When finished, repeat the procedure using each of the other vehicle keys, one at a time.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on

With the scan tool, read the SKREEM DTCs.

Is the DTC present for all ignition keys?

Yes >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information. Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> Replace the ignition key(s) that cause the SKIM DTC. Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

---

4. REPROGRAM KEY

With the scan tool, attempt to reprogram the ignition key to the SKREEM.

With the scan tool, erase the SKREEM DTCs.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

Does the DTC set again?

Yes >> Go To 5

No >> Test complete.

---

5. PROGRAM NEW IGNITION KEY

Replace the ignition key with a new key.

With the scan tool, program the new ignition key to the SKREEM.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

Does the DTC set again?

Yes >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information. Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> Test complete.

B1A25-INVALID KEY (CONTINUED)

6. INTERMITTENT WIRING HARNESS PROBLEM

Turn the ignition off.

NOTE: Check the following items:

- **Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.**
- **Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.**
- **Refer to any Technical Service Bulletins (TSB) that may apply.**

Were any problems found?

Yes >> Repair wiring harness/connectors as necessary.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> Test Complete.

B1A26-MAXIMUM NUMBER OF KEYS PROGRAMMED

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition switch on.
- **Set Condition:**
  When the maximum number of key (8) have been programmed into the SKREEM

Possible Causes
MAXIMUM AMOUNT OF KEY PROGRAMMED INTO SKREEM
SKREEM

Diagnostic Test

1. MAXIMUM AMOUNT OF KEYS PROGRAMMED INTO SKREEM

NOTE: The below procedure has you clearing all the key information within the SKREEM. It is important to obtain all the customer's ignition key(s) so they may be reprogrammed into the module.

Turn the ignition on.

Using a scan tool, clear all the key information in the SKREEM.

Program the all the customer key(s) into the SKREEM (up to eight only)

Was the "Maximum Number of Keys Programmed" display again?

Yes >> Replace and program the SKREEM in accordance with the Service Information.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> Programming of the key(s) were successful. Test complete.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

B1A27-SKREEM PROGRAMMING PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition switch on.

Possible Causes
SKREEM

Diagnostic Test

1. SKREEM

NOTE: Before continuing review and check the following conditions.
- **Review the repair history of the vehicle. Ensure the vehicle has the correct PCM and SKREEM installed. Check the part numbers.**
- **Using a scan tool, ensure the PCM and SKREEM have been programmed correctly. Compare the PCM VIN to the SKREEM VIN and ensure the two VINS match.**

Turn the ignition on.

With the scan tool, clear DTC(s).

Perform 5 ignition cycles, leaving the ignition switch on for a minimum of 90 seconds per cycle.

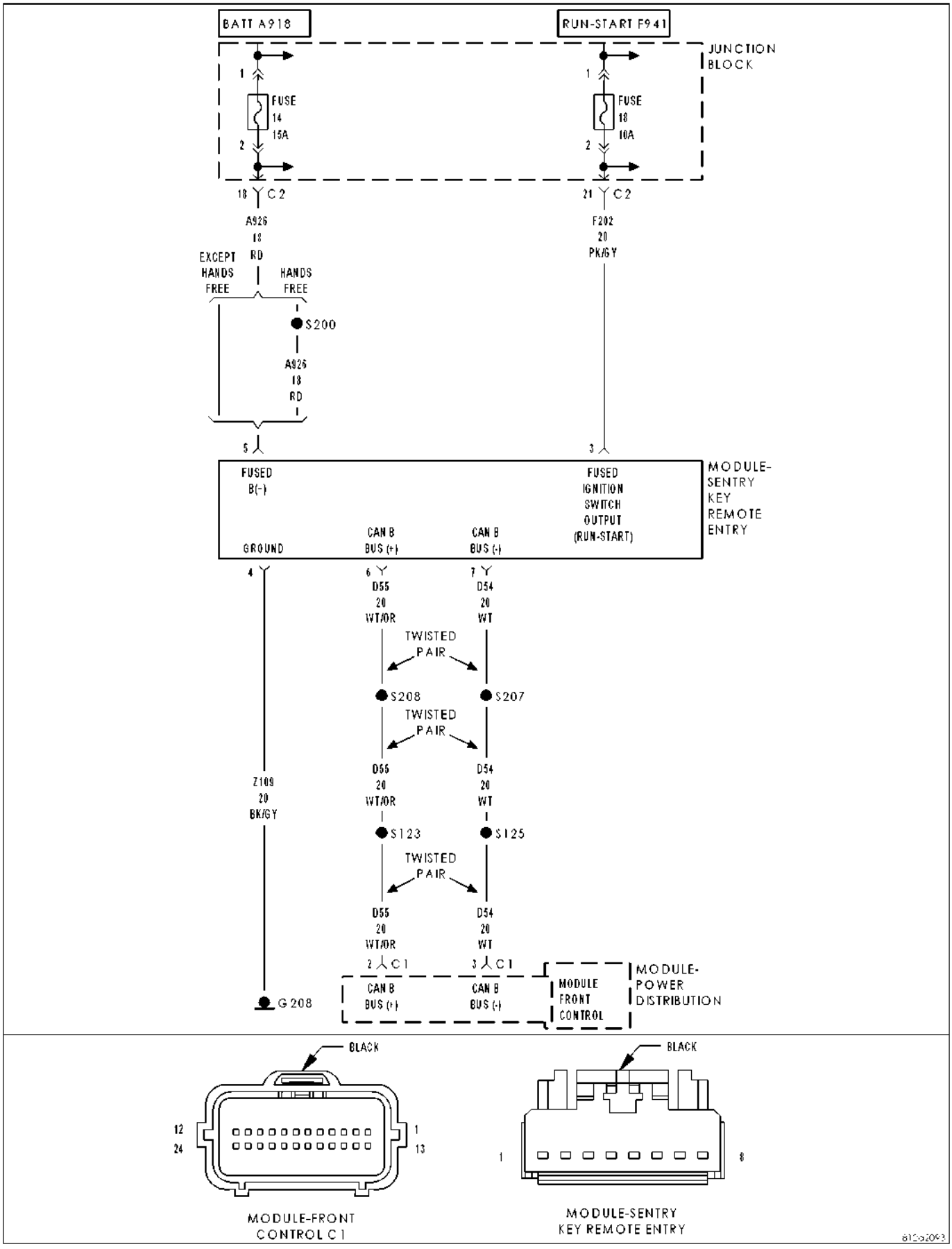
Using the scan tool, read DTC(s).

Does the DTC reset?

Yes >> Replace and program the SKREEM in accordance with the Service Information.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> The DTC is not active at this time. Test complete.

B1A28-ECM MISMATCH WITH SKIM



B1A28-ECM MISMATCH WITH SKIM (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  At ignition on, after ignition on during any rolling code handshake that occurs with the PCM due to a SKIM or PCM reset.
- **Set Condition:**
  When a PCM STATUS message with a Valid Key status is not received by the SKIM within 3.5 seconds of transmitting the last Valid Key Code message to the PCM.

Possible Causes
VERIFYING PCM VIN
REPLACE SKREEM AND CHECK DTC'S
PCM

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

With the scan tool, erase the SKREEM DTCs.
Turn the ignition off.
Wait 10 seconds.
Turn the ignition on and wait 2 minutes.
With the scan tool, read the SKREEM DTCs.

Does the scan tool display the DTC that was previously erased?

Yes >> Go To 2

No >> Go To 4

---

2. VERIFYING THE PCM VIN

Turn the ignition on.
With the scan tool, select Engine system from the main menu.
Display and record the Vehicle Identification Number.

NOTE: Make sure that a VIN has been programmed into the PCM. If a VIN is not displayed, attempt to program the PCM with the correct VIN before continuing.

Does the VIN recorded from the PCM match the VIN of the vehicle?

Yes >> Go To 3

No >> Perform the PCM replaced to update the VIN in the PCM.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

B1A28-ECM MISMATCH WITH SKIM (CONTINUED)

3. REPLACE SKREEM AND CHECK DTC'S

Turn the ignition off.

Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information.

Turn the ignition on.

With the scan tool, display and clear all PCM and SKREEM DTC's.

Perform 5 ignition key cycles leaving the ignition key on for 90 seconds per cycle.

With the scan tool, check for SKREEM DTCs.

Does the scan tool display the same DTC?

Yes >> Replace and program the Powertrain Control Module in accordance with the Service Information.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> The repair is complete.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

---

4. INTERMITTENT

Turn the ignition off.

NOTE: Check for the following conditions:

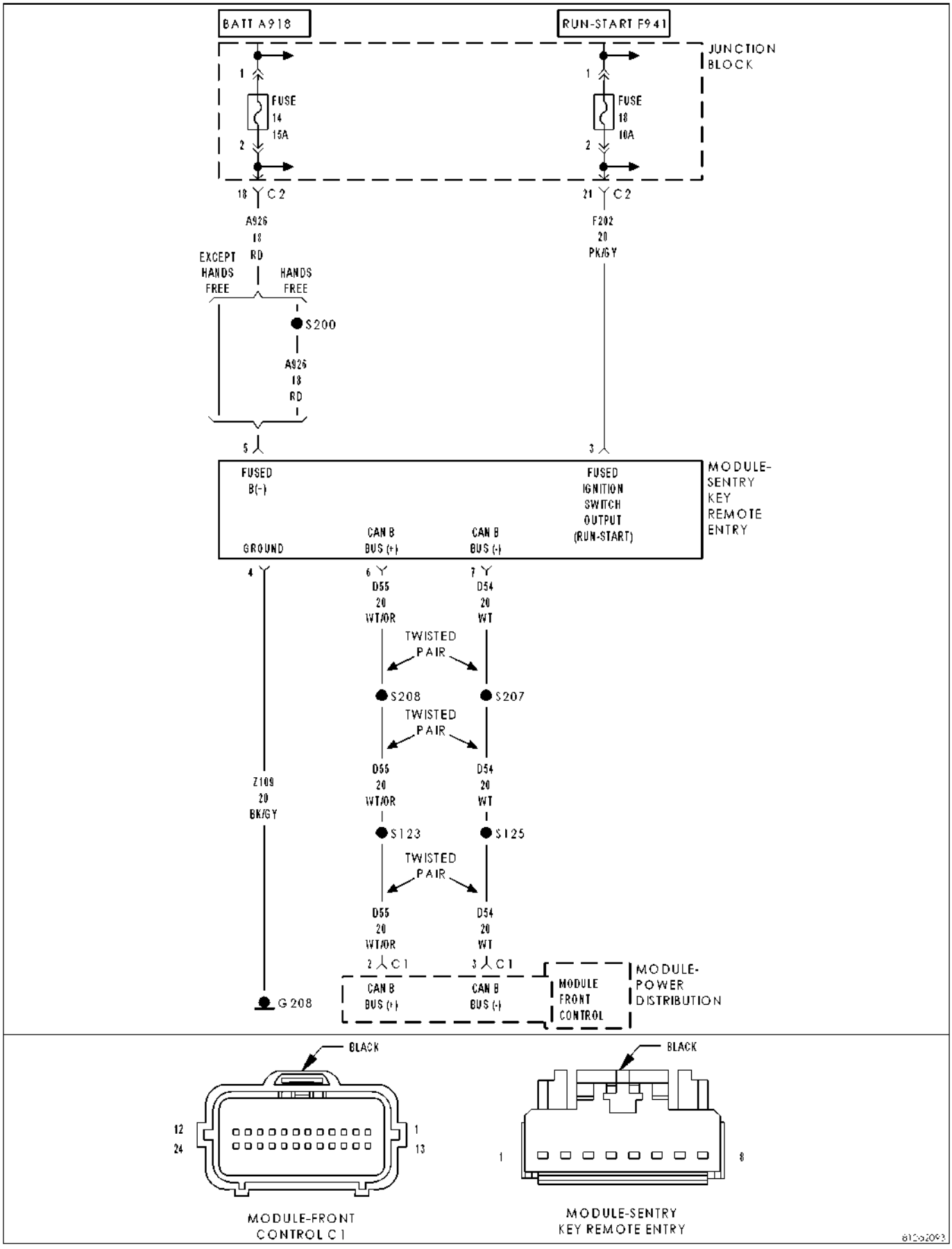
- **Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.**
- **Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.**
- **Refer to any Technical Service Bulletins (TSB) that may apply.**

Were any problems found?

Yes >> Repair wiring harness/connectors as necessary.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> Test Complete.

B1A29–ECM MISMATCH WITH SKIM



B1A29–ECM MISMATCH WITH SKIM (CONTINUED)
For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  At ignition on, after ignition on during any rolling code handshake that occurs with the PCM due to a SKIM or PCM reset.
- **Set Condition:**
  When a PCM STATUS message with a Valid Key status is not received by the SKIM within 3.5 seconds of transmitting the last Valid Key Code message to the PCM.

Possible Causes
VERIFYING PCM VIN
REPLACE SKREEM AND CHECK DTC'S
PCM

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

With the scan tool, erase the SKREEM DTCs.
Turn the ignition off.
Wait 10 seconds.
Turn the ignition on and wait 2 minutes.
With the scan tool, read the SKREEM DTCs.

Does the scan tool display the DTC that was previously erased?

Yes >> Go To 2

No >> Go To 4

---

2. VERIFYING THE PCM VIN

Turn the ignition on.
With the scan tool, select Engine system from the main menu.
Display and record the Vehicle Identification Number.

NOTE: Make sure that a VIN has been programmed into the PCM. If a VIN is not displayed, attempt to program the PCM with the correct vehicle VIN before continuing.

Does the VIN recorded from the PCM match the VIN of the vehicle?

Yes >> Go To 3

No >> Perform the PCM replaced to update the VIN in the PCM.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

B1A29–ECM MISMATCH WITH SKIM (CONTINUED)

3. REPLACE SKREEM AND CHECK DTC'S

Turn the ignition off.

Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information.

Turn the ignition on.

With the scan tool, display and clear all PCM and SKREEM DTC's.

Perform 5 ignition key cycles leaving the ignition key on for 90 seconds per cycle.

With the scan tool, check for SKREEM DTCs.

Does the scan tool display the same DTC?

Yes >> Replace and program the Powertrain Control Module in accordance with the Service Information.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> The repair is complete.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

---

4. INTERMITTENT

Turn the ignition off.

NOTE: Check for the following conditions:

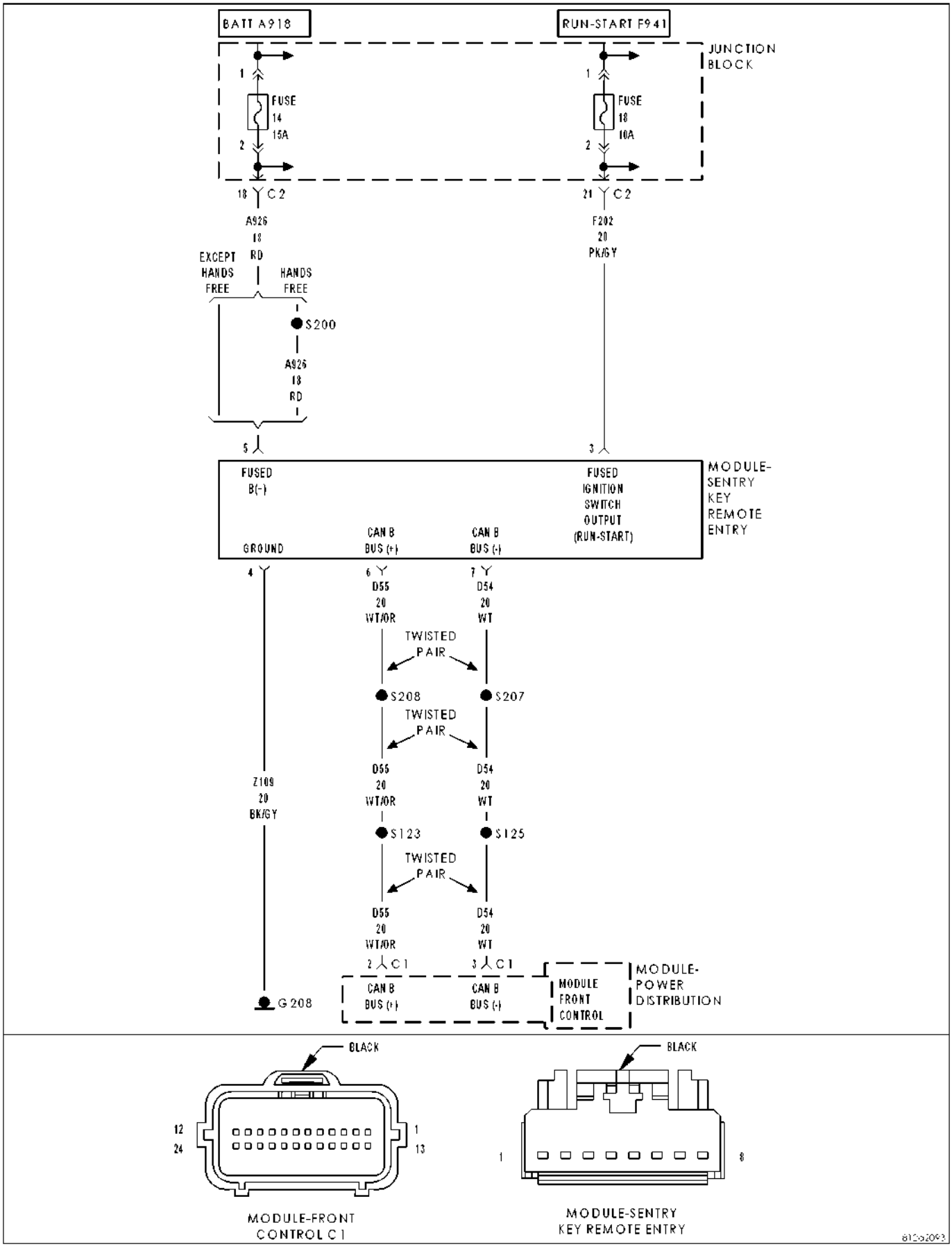
- **Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.**
- **Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.**
- **Refer to any Technical Service Bulletins (TSB) that may apply.**

Were any problems found?

Yes >> Repair wiring harness/connectors as necessary.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> Test Complete.

B1A2A-KEY 1 COMMUNICATION ERROR



B1A2A-KEY 1 COMMUNICATION ERROR (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  At ignition on and during Key Programming Mode.
- **Set Condition:**
  When the SKREEM does not receive a transponder response after 8 consecutive transponder read attempts within 2.0 seconds.

Possible Causes
MULTIPLE KEY OPERATION
IGNITION KEY
SKREEM

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

With the scan tool, read and record the SKREEM DTCs.
With the scan tool, erase the SKREEM DTCs.

NOTE: Perform the following test several times to make sure the DTC is current.
Turn the ignition off.
Wait 10 seconds.
Turn the ignition on.
With the scan tool, read the SKREEM DTCs.

Does the scan tool display the DTC that was previously erased?

Yes >> Go To 2
No >> Go To 6

---

2. CHECKING FOR MULTIPLE KEYS

Are there multiple vehicle ignition keys available?

Yes >> Go To 3
No >> Go To 4

B1A2A-KEY 1 COMMUNICATION ERROR (CONTINUED)

3. MULTIPLE KEY OPERATION

NOTE: Perform the following steps using one of the vehicle ignition keys. When finished, repeat the procedure using each of the other vehicle keys, one at a time.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

Is the DTC present for all ignition keys?

Yes >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information. Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> Replace the ignition key(s) that cause the SKIM DTC. Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

---

4. REPROGRAM KEY

With the scan tool, attempt to reprogram the ignition key to the SKREEM.

With the scan tool, erase the SKREEM DTCs.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

Does the DTC set again?

Yes >> Go To 5

No >> Test complete.

---

5. PROGRAM NEW IGNITION KEY

Replace the ignition key with a new key.

With the scan tool, program the new ignition key to the SKREEM.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

Does the DTC set again?

Yes >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information. Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> Test complete.

B1A2A-KEY 1 COMMUNICATION ERROR (CONTINUED)

6. INTERMITTENT WIRING HARNESS PROBLEM

Turn the ignition off.

NOTE: Check the following items:

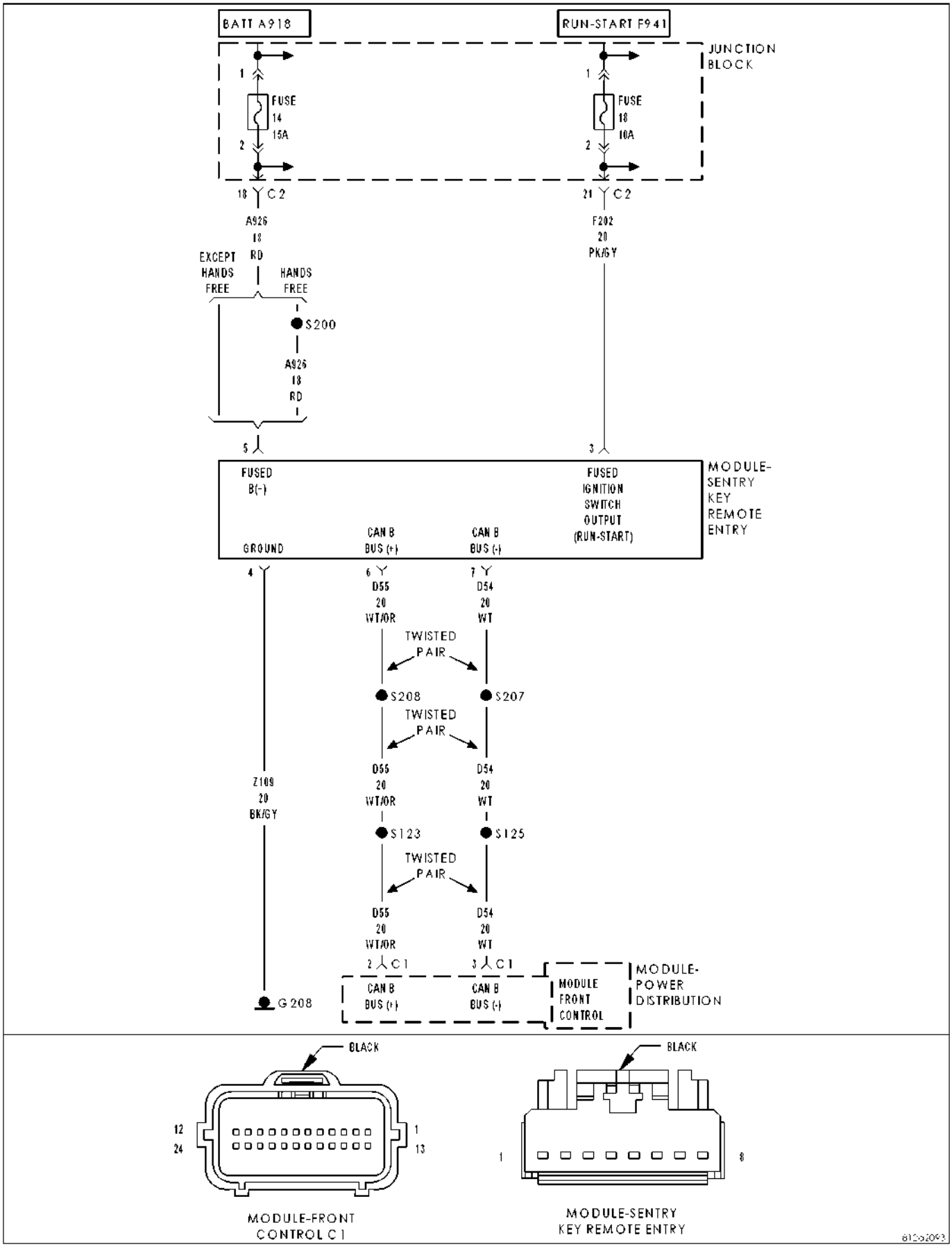
- **Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.**
- **Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.**
- **Refer to any Technical Service Bulletins (TSB) that may apply.**

Were any problems found?

Yes >> Repair wiring harness/connectors as necessary.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> Test Complete.

B1A2BA-KEY 2 COMMUNICATION ERROR



B1A2BA-KEY 2 COMMUNICATION ERROR (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  At ignition on and during Key Programming Mode.
- **Set Condition:**
  When the SKREEM does not receive a transponder response after 8 consecutive transponder read attempts within 2.0 seconds.

Possible Causes
MULTIPLE KEY OPERATION
IGNITION KEY
SKREEM

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

With the scan tool, read and record the SKREEM DTCs.
With the scan tool, erase the SKREEM DTCs

NOTE: Perform the following test several times to make sure the DTC is current.
Turn the ignition off.
Wait 10 seconds.
Turn the ignition on.
With the scan tool, read the SKREEM DTCs.

Does the scan tool display the DTC that was previously erased?

Yes >> Go To 2
No >> Go To 6

---

2. CHECKING FOR MULTIPLE KEYS

Are there multiple vehicle ignition keys available?

Yes >> Go To 3
No >> Go To 4

B1A2BA-KEY 2 COMMUNICATION ERROR (CONTINUED)

3. MULTIPLE KEY OPERATION

NOTE: Perform the following steps using one of the vehicle ignition keys. When finished, repeat the procedure using each of the other vehicle keys one at a time.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

Is the DTC present for all ignition keys?

Yes >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information. Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> Replace the ignition key(s) that cause the SKIM DTC. Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

---

4. REPROGRAM KEY

With the scan tool, attempt to reprogram the ignition key to the SKREEM.

With the scan tool, erase the SKREEM DTCs.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

Does the DTC set again?

Yes >> Go To 5

No >> Test complete.

---

5. PROGRAM NEW IGNITION KEY

Replace the ignition key with a new key.

With the scan tool, program the new ignition key to the SKREEM.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

Does the DTC set again?

Yes >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information. Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> Test complete.

B1A2BA-KEY 2 COMMUNICATION ERROR (CONTINUED)

6. INTERMITTENT WIRING HARNESS PROBLEM

Turn the ignition off.

NOTE: Check the following items:

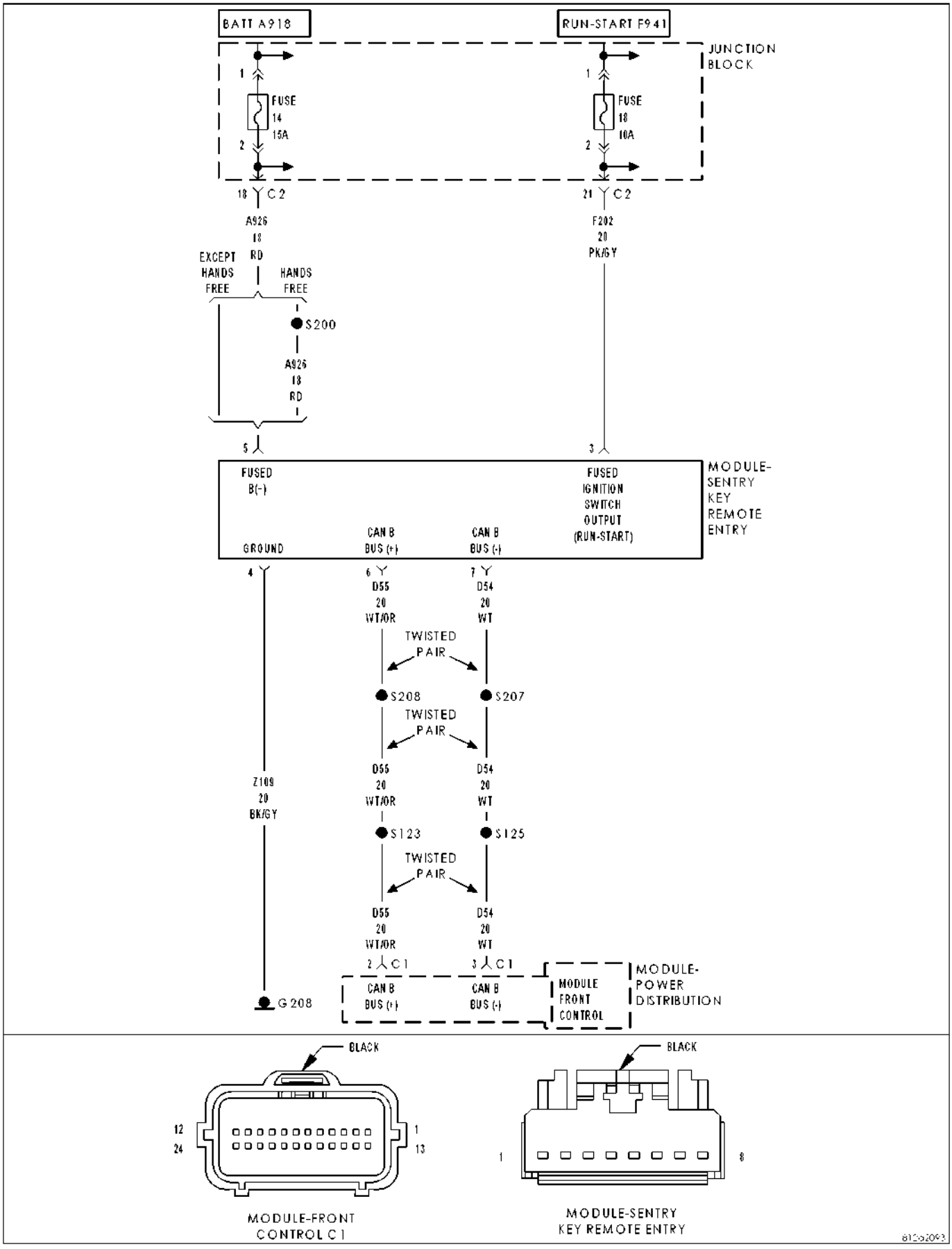
- **Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.**
- **Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.**
- **Refer to any Technical Service Bulletins (TSB) that may apply.**

Were any problems found?

Yes >> Repair wiring harness/connectors as necessary.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> Test Complete.

B1A2C-KEY 3 COMMUNICATION ERROR



B1A2C-KEY 3 COMMUNICATION ERROR (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  At ignition on and during Key Programming Mode.
- **Set Condition:**
  When the SKREEM does not receive a transponder response after 8 consecutive transponder read attempts within 2.0 seconds.

Possible Causes
MULTIPLE KEY OPERATION
IGNITION KEY
SKREEM

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

With the scan tool, read and record the SKREEM DTCs.
With the scan tool, erase the SKREEM DTCs

NOTE: Perform the following test several times to make sure the DTC is current.
Turn the ignition off.
Wait 10 seconds.
Turn the ignition on.
With the scan tool, read the SKREEM DTCs.

Does the scan tool display the DTC that was previously erased?

Yes >> Go To 2
No >> Go To 6

---

2. CHECKING FOR MULTIPLE KEYS

Are there multiple vehicle ignition keys available?

Yes >> Go To 3
No >> Go To 4

B1A2C-KEY 3 COMMUNICATION ERROR (CONTINUED)

3. MULTIPLE KEY OPERATION

NOTE: Perform the following steps using one of the vehicle ignition keys. When finished, repeat the procedure using each of the other vehicle keys one at a time.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

Is the DTC present for all ignition keys?

Yes >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information. Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> Replace the ignition key(s) that cause the SKIM DTC. Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

---

4. REPROGRAM KEY

With the scan tool, attempt to reprogram the ignition key to the SKREEM.

With the scan tool, erase the SKREEM DTCs.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

Does the DTC set again?

Yes >> Go To 5

No >> Test complete.

---

5. PROGRAM NEW IGNITION KEY

Replace the ignition key with a new key.

With the scan tool, program the new ignition key to the SKREEM.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

Does the DTC set again?

Yes >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information. Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> Test complete.

B1A2C-KEY 3 COMMUNICATION ERROR (CONTINUED)

6. INTERMITTENT WIRING HARNESS PROBLEM

Turn the ignition off.

NOTE: Check the following items:

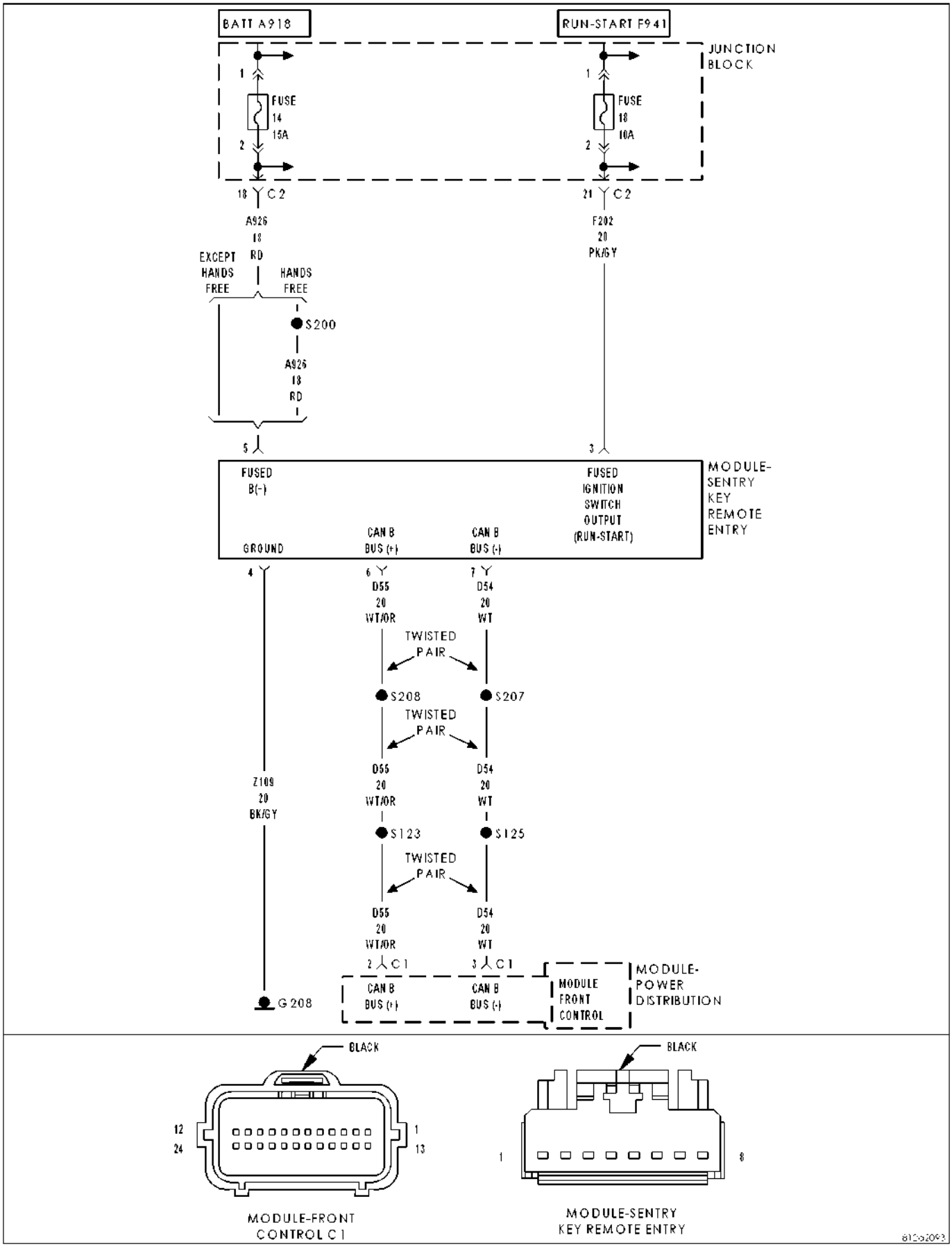
- **Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.**
- **Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.**
- **Refer to any Technical Service Bulletins (TSB) that may apply.**

Were any problems found?

Yes >> Repair wiring harness/connectors as necessary.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> Test Complete.

B1A2D-KEY 4 COMMUNICATION ERROR



B1A2D-KEY 4 COMMUNICATION ERROR (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  At ignition on and during Key Programming Mode.
- **Set Condition:**
  When the SKREEM does not receive a transponder response after 8 consecutive transponder read attempts within 2.0 seconds.

Possible Causes
MULTIPLE KEY OPERATION
IGNITION KEY
SKREEM

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

With the scan tool, read and record the SKREEM DTCs.
With the scan tool, erase the SKREEM DTCs

NOTE: Perform the following test several times to make sure the DTC is current.
Turn the ignition off.
Wait 10 seconds.
Turn the ignition on.
With the scan tool, read the SKREEM DTCs.

Does the scan tool display the DTC that was previously erased?

Yes >> Go To 2
No >> Go To 6

---

2. CHECKING FOR MULTIPLE KEYS

Are there multiple vehicle ignition keys available?

Yes >> Go To 3
No >> Go To 4

B1A2D-KEY 4 COMMUNICATION ERROR (CONTINUED)

3. MULTIPLE KEY OPERATION

NOTE: Perform the following steps using one of the vehicle ignition keys. When finished, repeat the procedure using each of the other vehicle keys, one at a time.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

Is the DTC present for all ignition keys?

Yes >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information. Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> Replace the ignition key(s) that cause the SKIM DTC. Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

---

4. REPROGRAM KEY

With the scan tool, attempt to reprogram the ignition key to the SKREEM.

With the scan tool, erase the SKREEM DTCs.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

Does the DTC set again?

Yes >> Go To 5

No >> Test complete.

---

5. PROGRAM NEW IGNITION KEY

Replace the ignition key with a new key.

With the scan tool, program the new ignition key to the SKREEM.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

Does the DTC set again?

Yes >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information. Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> Test complete.

B1A2D-KEY 4 COMMUNICATION ERROR (CONTINUED)

6. INTERMITTENT WIRING HARNESS PROBLEM

Turn the ignition off.

NOTE: Check the following items:

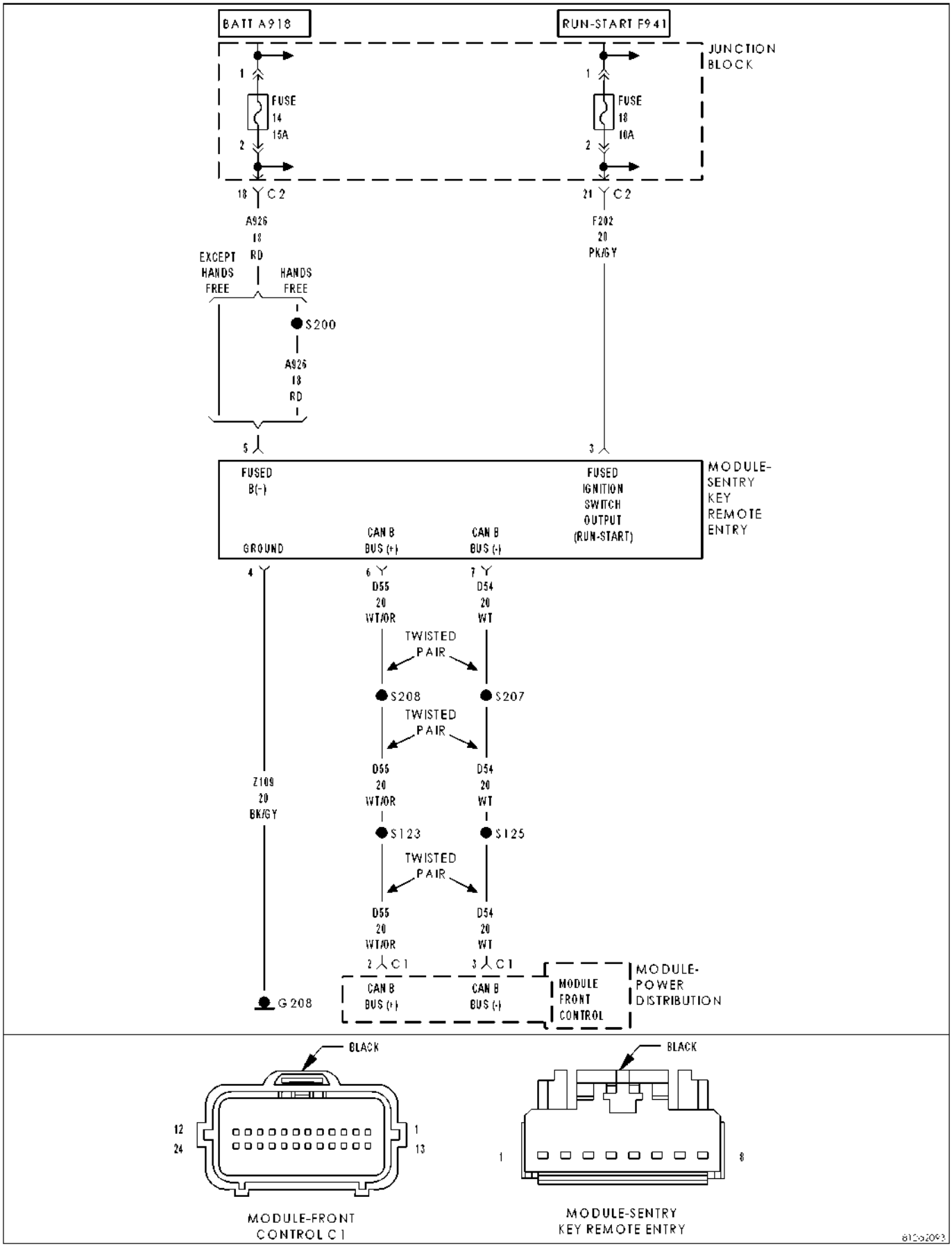
- **Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.**
- **Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.**
- **Refer to any Technical Service Bulletins (TSB) that may apply.**

Were any problems found?

Yes >> Repair wiring harness/connectors as necessary.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> Test Complete.

B1A2E-KEY 5 COMMUNICATION ERROR



B1A2E-KEY 5 COMMUNICATION ERROR (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  At ignition on and during Key Programming Mode.
- **Set Condition:**
  When the SKREEM does not receive a transponder response after 8 consecutive transponder read attempts within 2.0 seconds.

Possible Causes
MULTIPLE KEY OPERATION
IGNITION KEY
SKREEM

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

With the scan tool, read and record the SKREEM DTCs.
With the scan tool, erase the SKREEM DTCs

NOTE: Perform the following test several times to make sure the DTC is current.
Turn the ignition off.
Wait 10 seconds.
Turn the ignition on.
With the scan tool, read the SKREEM DTCs.

Does the scan tool display the DTC that was previously erased?

Yes >> Go To 2
No >> Go To 6

---

2. CHECKING FOR MULTIPLE KEYS

Are there multiple vehicle ignition keys available?

Yes >> Go To 3
No >> Go To 4

B1A2E-KEY 5 COMMUNICATION ERROR (CONTINUED)

3. MULTIPLE KEY OPERATION

NOTE: Perform the following steps using one of the vehicle ignition keys. When finished, repeat the procedure using each of the other vehicle keys, one at a time.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

Is the DTC present for all ignition keys?

Yes >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information. Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> Replace the ignition key(s) that cause the SKIM DTC. Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

---

4. REPROGRAM KEY

With the scan tool, attempt to reprogram the ignition key to the SKREEM.

With the scan tool, erase the SKREEM DTCs.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

Does the DTC set again?

Yes >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information. Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> Test complete.

---

5. PROGRAM NEW IGNITION KEY

Replace the ignition key with a new key.

With the scan tool, program the new ignition key to the SKREEM.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

Does the DTC set again?

Yes >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information. Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> Test complete.

B1A2E-KEY 5 COMMUNICATION ERROR (CONTINUED)

6. INTERMITTENT WIRING HARNESS PROBLEM

Turn the ignition off.

NOTE: Check the following items:

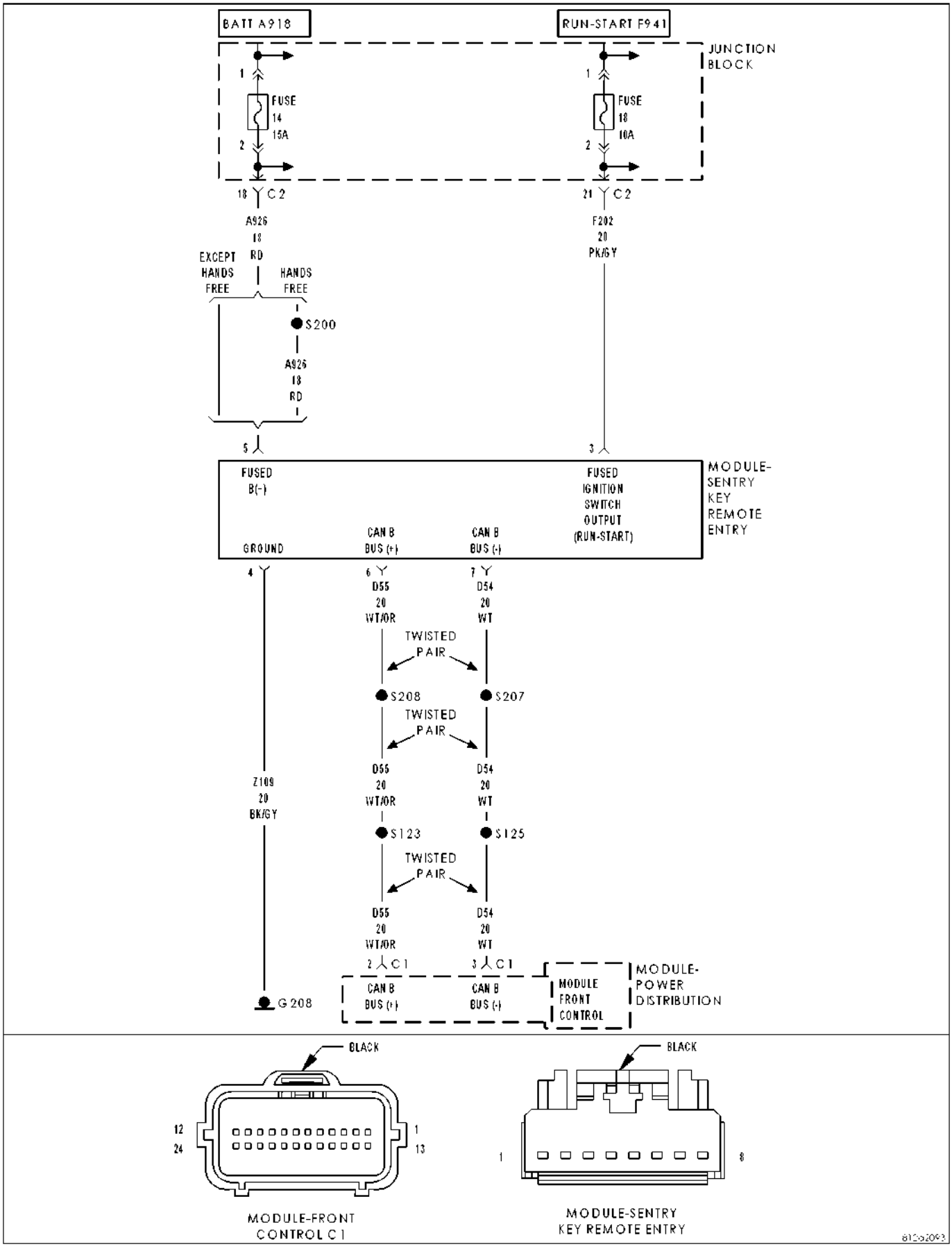
- **Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.**
- **Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.**
- **Refer to any Technical Service Bulletins (TSB) that may apply.**

Were any problems found?

Yes >> Repair wiring harness/connectors as necessary.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> Test Complete.

B1A2F-KEY 6 COMMUNICATION ERROR



B1A2F-KEY 6 COMMUNICATION ERROR (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  At ignition on and during Key Programming Mode.
- **Set Condition:**
  When the SKREEM does not receive a transponder response after 8 consecutive transponder read attempts within 2.0 seconds.

Possible Causes
MULTIPLE KEY OPERATION
IGNITION KEY
SKREEM

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

With the scan tool, read and record the SKREEM DTCs.

With the scan tool, erase the SKREEM DTCs

NOTE: Perform the following test several times to make sure the DTC is current.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

Does the scan tool display the DTC that was previously erased?

Yes >> Go To 2

No >> Go To 6

---

2. CHECKING FOR MULTIPLE KEYS

Are there multiple vehicle ignition keys available?

Yes >> Go To 3

No >> Go To 4

B1A2F-KEY 6 COMMUNICATION ERROR (CONTINUED)

3. MULTIPLE KEY OPERATION

NOTE: Perform the following steps using one of the vehicle ignition keys. When finished, repeat the procedure using each of the other vehicle keys, one at a time.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

Is the DTC present for all ignition keys?

Yes >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information. Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> Replace the ignition key(s) that cause the SKIM DTC. Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

---

4. REPROGRAM KEY

With the scan tool, attempt to reprogram the ignition key to the SKREEM.

With the scan tool, erase the SKREEM DTCs.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

Does the DTC set again?

Yes >> Go To 5

No >> Test complete.

---

5. PROGRAM NEW IGNITION KEY

Replace the ignition key with a new key.

With the scan tool, program the new ignition key to the SKREEM.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

Does the DTC set again?

Yes >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information. Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> Test complete.

B1A2F-KEY 6 COMMUNICATION ERROR (CONTINUED)

6. INTERMITTENT WIRING HARNESS PROBLEM

Turn the ignition off.

NOTE: Check the following items:

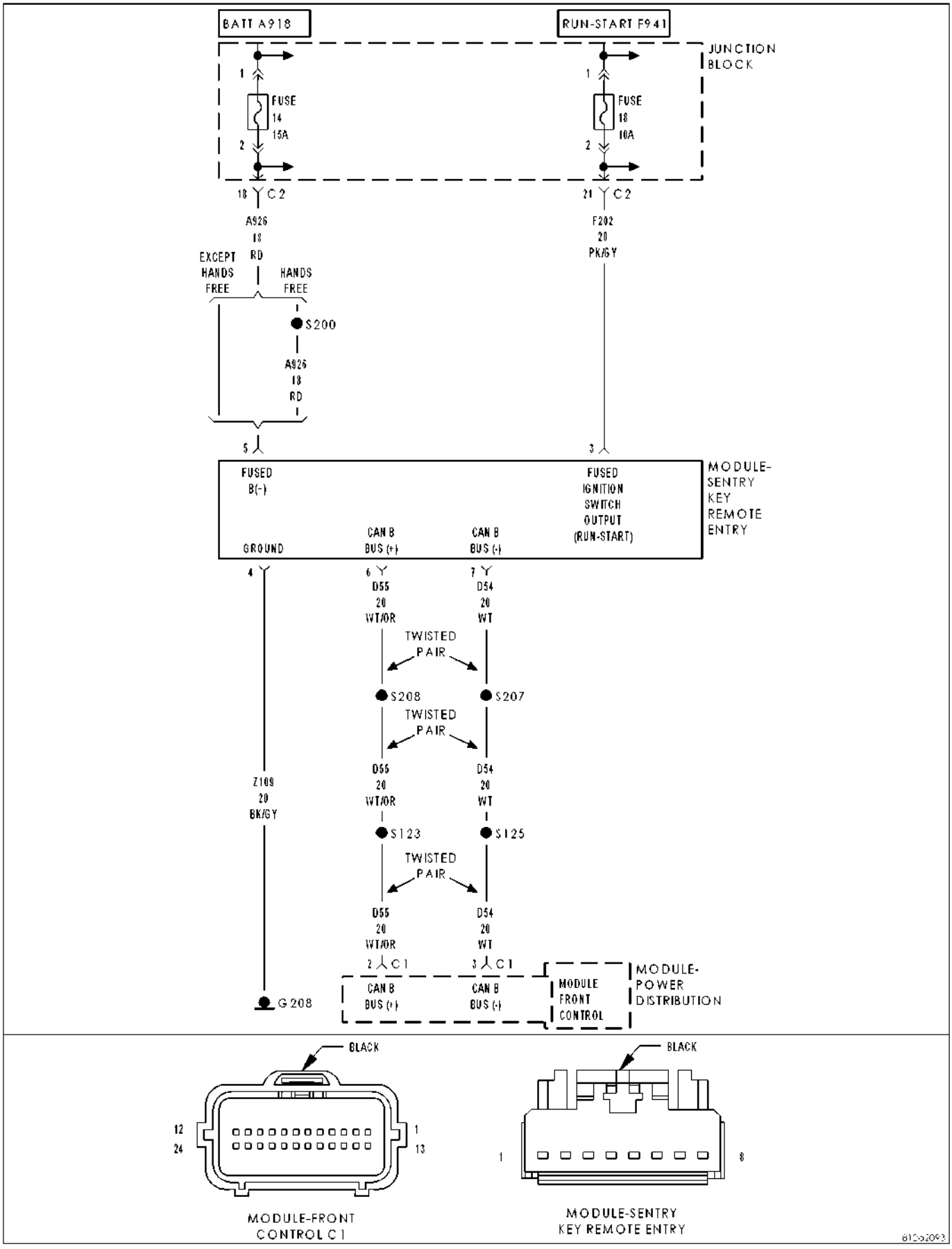
- **Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.**
- **Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.**
- **Refer to any Technical Service Bulletins (TSB) that may apply.**

Were any problems found?

Yes >> Repair wiring harness/connectors as necessary.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> Test Complete.

B1A30-KEY 7 COMMUNICATION ERROR



B1A30-KEY 7 COMMUNICATION ERROR (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  At ignition on and during Key Programming Mode.
- **Set Condition:**
  When the SKREEM does not receive a transponder response after 8 consecutive transponder read attempts within 2.0 seconds.

Possible Causes
MULTIPLE KEY OPERATION
IGNITION KEY
SKREEM

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

With the scan tool, read and record the SKREEM DTCs.
With the scan tool, erase the SKREEM DTCs

NOTE: Perform the following test several times to make sure the DTC is current.
Turn the ignition off.
Wait 10 seconds.
Turn the ignition on.
With the scan tool, read the SKREEM DTCs.

Does the scan tool display the DTC that was previously erased?

Yes >> Go To 2
No >> Go To 6

---

2. CHECKING FOR MULTIPLE KEYS

Are there multiple vehicle ignition keys available?

Yes >> Go To 3
No >> Go To 4

B1A30-KEY 7 COMMUNICATION ERROR (CONTINUED)

3. MULTIPLE KEY OPERATION

NOTE: Perform the following steps using one of the vehicle ignition keys. When finished, repeat the procedure using each of the other vehicle keys one at a time.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

Is the DTC present for all ignition keys?

Yes >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information. Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> Replace the ignition key(s) that cause the SKIM DTC. Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

---

4. REPROGRAM KEY

With the scan tool, attempt to reprogram the ignition key to the SKREEM.

With the scan tool, erase the SKREEM DTCs.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

Does the DTC set again?

Yes >> Go To 5

No >> Test complete.

---

5. PROGRAM NEW IGNITION KEY

Replace the ignition key with a new key.

With the scan tool, program the new ignition key to the SKREEM.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

Does the DTC set again?

Yes >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information. Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> Test complete.

B1A30-KEY 7 COMMUNICATION ERROR (CONTINUED)

6. INTERMITTENT WIRING HARNESS PROBLEM

Turn the ignition off.

NOTE: Check the following items:

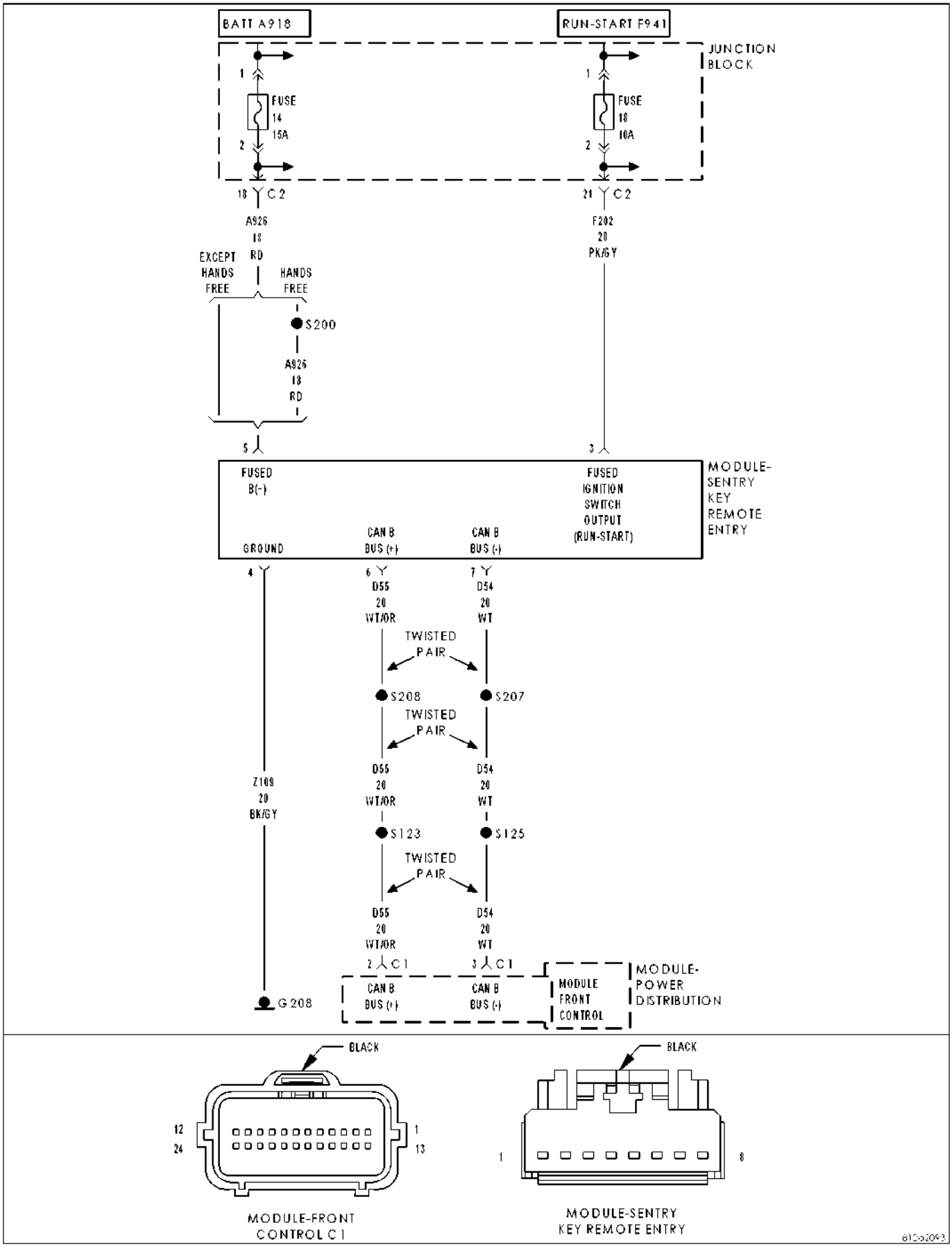
- **Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.**
- **Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.**
- **Refer to any Technical Service Bulletins (TSB) that may apply.**

Were any problems found?

Yes >> Repair wiring harness/connectors as necessary.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> Test Complete.

B1A31-KEY 8 COMMUNICATION ERROR



B1A31-KEY 8 COMMUNICATION ERROR (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  At ignition on and during Key Programming Mode.
- **Set Condition:**
  When the SKREEM does not receive a transponder response after 8 consecutive transponder read attempts within 2.0 seconds.

Possible Causes
MULTIPLE KEY OPERATION
IGNITION KEY
SKREEM

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

With the scan tool, read and record the SKREEM DTCs.
With the scan tool, erase the SKREEM DTCs

NOTE: Perform the following test several times to make sure the DTC is current.
Turn the ignition off.
Wait 10 seconds.
Turn the ignition on.
With the scan tool, read the SKREEM DTCs.

Does the scan tool display the DTC that was previously erased?

Yes >> Go To 2
No >> Go To 6

---

2. CHECKING FOR MULTIPLE KEYS

Are there multiple vehicle ignition keys available?

Yes >> Go To 3
No >> Go To 4

B1A31-KEY 8 COMMUNICATION ERROR (CONTINUED)

3. MULTIPLE KEY OPERATION

NOTE: Perform the following steps using one of the vehicle ignition keys. When finished, repeat the procedure using each of the other vehicle keys, one at a time.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

Is the DTC present for all ignition keys?

Yes >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information. Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> Replace the ignition key(s) that cause the SKIM DTC. Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

---

4. REPROGRAM KEY

With the scan tool, attempt to reprogram the ignition key to the SKREEM.

With the scan tool, erase the SKREEM DTCs.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

Does the DTC set again?

Yes >> Go To 5

No >> Test complete.

---

5. PROGRAM NEW IGNITION KEY

Replace the ignition key with a new key.

With the scan tool, program the new ignition key to the SKREEM.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

Does the DTC set again?

Yes >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information. Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> Test complete.

B1A31-KEY 8 COMMUNICATION ERROR (CONTINUED)

6. INTERMITTENT WIRING HARNESS PROBLEM

Turn the ignition off.

NOTE: Check the following items:

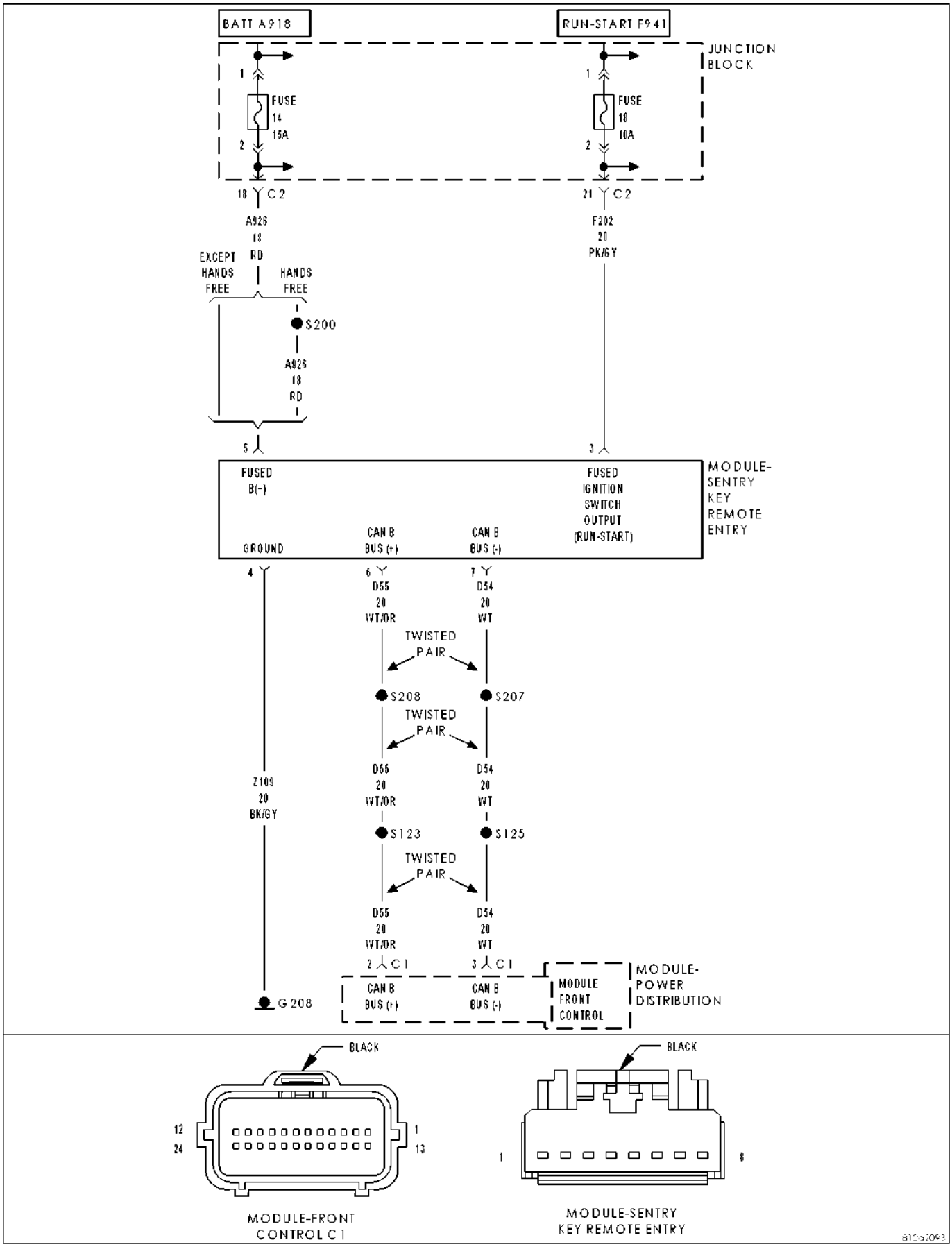
- **Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.**
- **Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.**
- **Refer to any Technical Service Bulletins (TSB) that may apply.**

Were any problems found?

Yes >> Repair wiring harness/connectors as necessary.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> Test Complete.

B1A35-UNIDENTIFIED KEY COMMUNICATION ERROR



B1A35-UNIDENTIFIED KEY COMMUNICATION ERROR (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  At ignition on and during Key Programming Mode.
- **Set Condition:**
  When the SKREEM does not receive a transponder response after 8 consecutive transponder read attempts within 2.0 seconds.

Possible Causes
MULTIPLE KEY OPERATION
IGNITION KEY
SKREEM

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

With the scan tool, read and record the SKREEM DTCs.
With the scan tool, erase the SKREEM DTCs

NOTE: Perform the following test several times to make sure the DTC is current.
Turn the ignition off.
Wait 10 seconds.
Turn the ignition on.
With the scan tool, read the SKREEM DTCs.

Does the scan tool display the DTC that was previously erased?

Yes >> Go To 2
No >> Go To 6

---

2. CHECKING FOR MULTIPLE KEYS

Are there multiple vehicle ignition keys available?

Yes >> Go To 3
No >> Go To 4

B1A35-UNIDENTIFIED KEY COMMUNICATION ERROR (CONTINUED)

3. MULTIPLE KEY OPERATION

NOTE: Perform the following steps using one of the vehicle ignition keys. When finished, repeat the procedure using each of the other vehicle keys, one at a time.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

Is the DTC present for all ignition keys?

Yes >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information. Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> Replace the ignition key(s) that cause the SKIM DTC. Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

---

4. REPROGRAM KEY

With the scan tool, attempt to reprogram the ignition key to the SKREEM.

With the scan tool, erase the SKREEM DTCs.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

Does the DTC set again?

Yes >> Go To 5

No >> Test complete.

---

5. PROGRAM NEW IGNITION KEY

Replace the ignition key with a new key.

With the scan tool, program the new ignition key to the SKREEM.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

Does the DTC set again?

Yes >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information. Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> Test complete.

B1A35-UNIDENTIFIED KEY COMMUNICATION ERROR (CONTINUED)

6. INTERMITTENT WIRING HARNESS PROBLEM

Turn the ignition off.

NOTE: Check the following items:

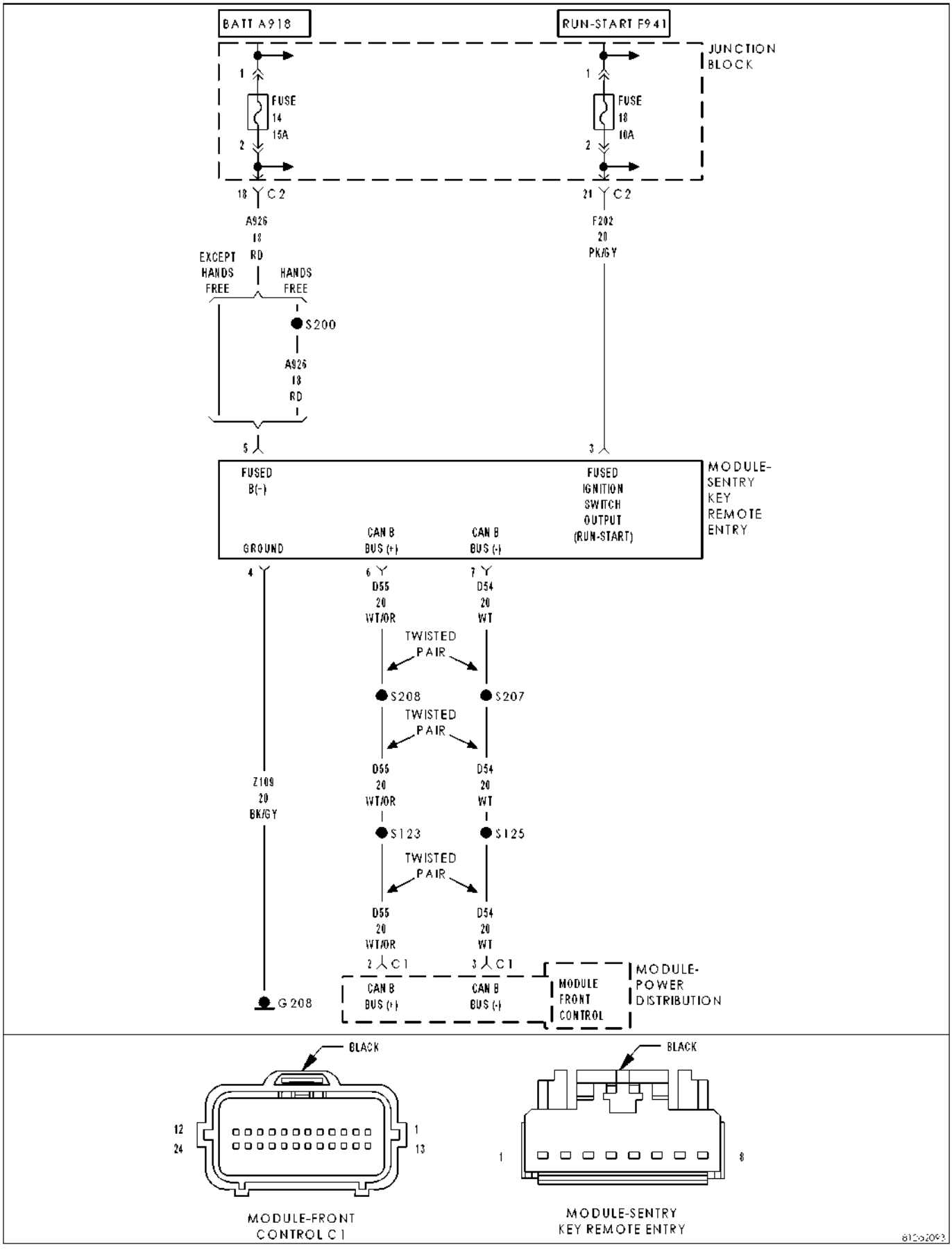
- **Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.**
- **Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.**
- **Refer to any Technical Service Bulletins (TSB) that may apply.**

Were any problems found?

Yes >> Repair wiring harness/connectors as necessary.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> Test Complete.

B2101-IGNITION RUN/START INPUT LOW



B2101-IGNITION RUN/START INPUT LOW (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition switch on.
- **Set Condition:**
  The SKREEM has detected the ignition switch input voltage below a calibrated value.

Possible Causes
FUSED IGNTION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN
SKREEM

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

NOTE: Diagnose any related Powertrain DTC(s) before continuing.

With a scan tool, read and record DTC(s).

With the scan tool, clear DTC(s).

Perform 5 ignition cycles, leaving the ignition switch on for a minimum of 90 seconds per cycle.

Using the scan tool, read DTC(s).

Does the DTC reset?

Yes >> Go To 3

No >> Go to 2

---

2. INTERMITTENT CONDITION

NOTE: Check for any of the follow conditions:

- **Poor wire to terminal connection**
- **Corroded terminals**
- **Backed out or loose terminals**
- **Broken wire internal to the insulation**
- **Dirty (partial) module ground**

With the ignition on, wiggle the related wires.

Using a scan tool, read DTC(s).

Does the DTC reset?

Yes >> Repair the wiring as necessary.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> DTC is not active at this time. Test complete.

B2101-IGNITION RUN/START INPUT LOW (CONTINUED)

3. FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPENED

NOTE: Check the related fuses to the Fused Ignition Switch Output (Run-Start) circuit. If the fuse is found to be open, repair the circuit for a shorted condition.

Turn the ignition off.

Disconnect the SKREEM harness connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, probe the Fused Ignition Switch Output (Run-Start) circuit in the SKREEM harness connector.

Does the test light illuminate brightly?

Yes >> Go to 4

No >> Repair the Fused Ignition Switch Output (Run-Start) circuit for an open.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

---

4. SKREEM

NOTE: A dirty (partial) ground can cause abnormal conditions within a system. Ensure the module has a good ground before continuing.

Turn the ignition off.

Reconnect the SKREEM connector

Back probe the Fused Ignition Switch Output (Run-Start) circuit.

Start the engine.

Using the scan tool, view battery voltage under Data Display in the Engine category.

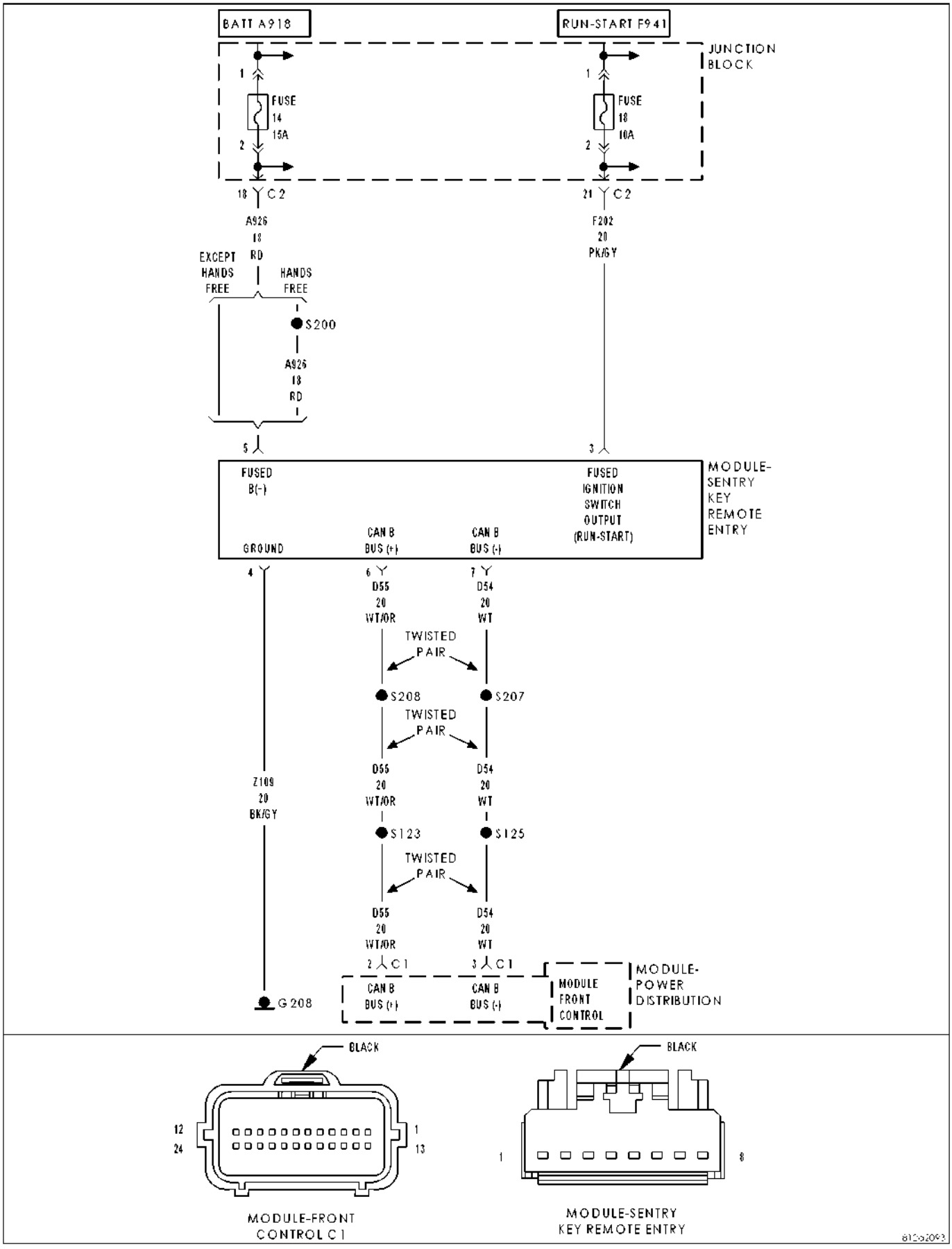
Compare the voltage on the scan tool to the voltage reading on the voltmeter.

Is the voltage on the scan tool equal to the voltmeter reading +/- .5 volt?

Yes >> Replace and program the SKREEM in accordance with the Service Information.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> Repair the Fused Ignition Switch Output (Run-Start) circuit for high resistance.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

B2102-IGNITION RUN/START INPUT HIGH



B2102-IGNITION RUN/START INPUT HIGH (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition switch on.
- **Set Condition:**
  The SKREEM has detected the ignition switch input voltage above a calibrated value.

Possible Causes
FUSED IGNTION SWITCH OUTPUT (RUN-START) CIRCUIT
SKREEM

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

NOTE: Diagnose any related Powertrain DTC(s) before continuing.

With a scan tool, read and record DTC(s).

With the scan tool, clear DTC(s).

Perform 5 ignition cycles, leaving the ignition switch on for a minimum of 90 seconds per cycle.

Using the scan tool, read DTC(s).

Does the DTC reset?

Yes >> Go To 3

No >> Go to 2

---

2. INTERMITTENT CONDITION

NOTE: Check for any of the follow conditions:

- **Poor wire to terminal connection**
- **Corroded terminals**
- **Backed out or loose terminals**
- **Broken wire internal to the insulation**
- **Dirty (partial) module ground**

With the ignition on, wiggle the related wires.

Using a scan tool, read DTC(s).

Does the DTC reset?

Yes >> Repair the wiring as necessary.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> DTC is not active at this time. Test complete.

B2102-IGNITION RUN/START INPUT HIGH (CONTINUED)

3. FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT SHORTED TO BATTERY VOLTAGE

NOTE: A dirty (partial) ground can cause abnormal conditions within a system. Ensure the module has a good ground before continuing.

Turn the ignition off.

Disconnect the SKREEM harness connector.

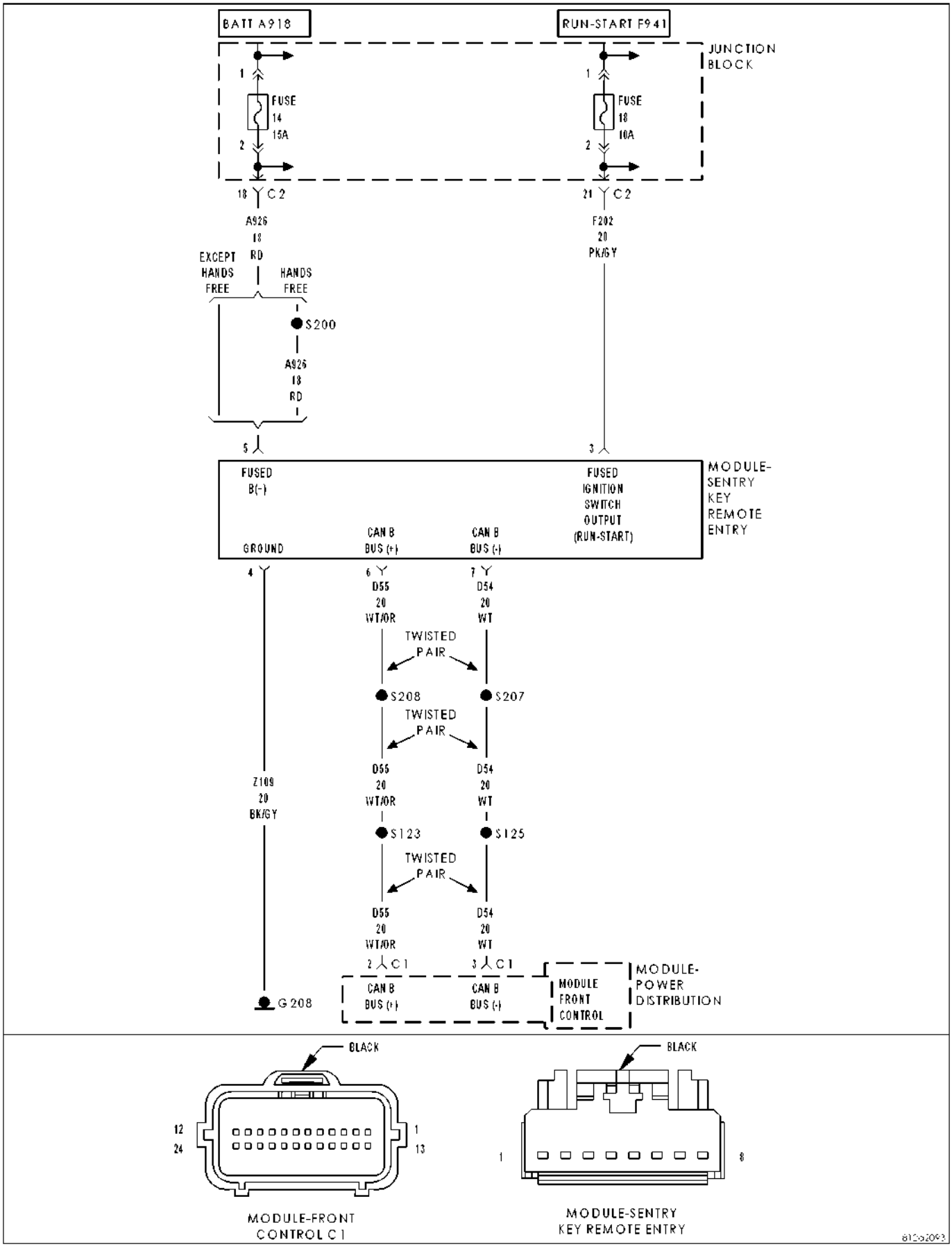
Using a 12 volt test light connected to ground, probe the Fused Ignition Switch Output (Run-Start) circuit in the SKREEM harness connector.

Does the test light illuminate brightly?

Yes >> Repair the Fused Ignition Switch Output (Run-Start) circuit for a short to voltage.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> Replace and program the SKREEM in accordance with the Service Information.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

B210A-SYSTEM VOLTAGE LOW



B210A-SYSTEM VOLTAGE LOW (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition switch on.
- **Set Condition:**
  The SKREEM has detected the system voltage is below a calibrated value.

Possible Causes
FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN
FUSED (B+) CIRCUIT OPEN
SKREEM

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

NOTE: Diagnose any related Powertrain DTC(s) before continuing.

With a scan tool, read and record DTC(s).

With the scan tool, clear DTC(s).

Perform 5 ignition cycles, leaving the ignition switch on for a minimum of 90 seconds per cycle.

Using the scan tool, read DTC(s).

Does the DTC reset?

Yes >> Go To 3

No >> Go to 2

---

2. INTERMITTENT CONDITION

NOTE: Check for any of the follow conditions:

- **Poor wire to terminal connection**
- **Corroded terminals**
- **Backed out or loose terminals**
- **Broken wire internal to the insulation**
- **Dirty (partial) module ground**

With the ignition on, wiggle the related wires.

Using a scan tool, read DTC(s).

Does the DTC reset?

Yes >> Repair the wiring as necessary.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> DTC is not active at this time. Test complete.

B210A-SYSTEM VOLTAGE LOW (CONTINUED)

3. FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN

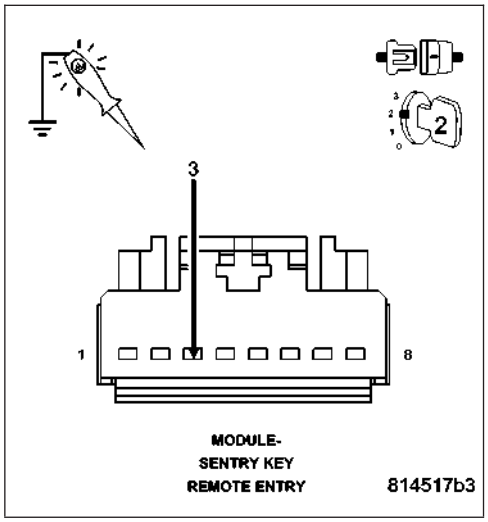
NOTE: Check the related fuses to the Fused Ignition Switch Output (Run-Start) circuit. If the fuse is found to be open repair the circuit for a shorted condition.

Turn the ignition off.

Disconnect the SKREEM harness connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, probe the Fused Ignition Switch Output (Run-Start) circuit in the SKREEM harness connector.



Does the test light illuminate brightly?

Yes >> Go to 4

No >> Repair the Fused Ignition Switch Output (Run-Start) circuit for an open.

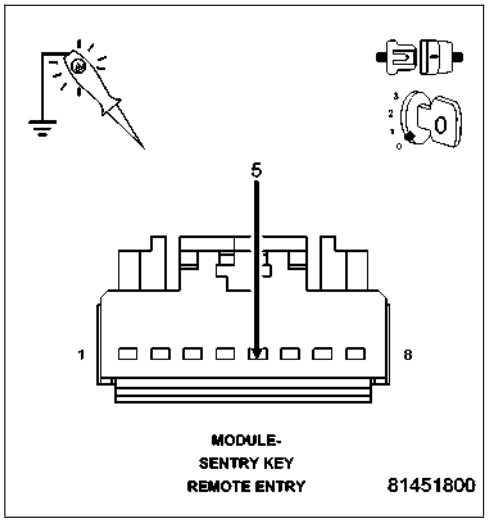
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

---

4. FUSED (B+) CIRCUIT OPEN

Turn the ignition off.

Using a 12 volt test light connected to ground, probe the Fused (B+) circuit in the SKREEM harness connector.



Does the test light illuminate brightly?

Yes >> Go to 5

No >> Repair the Fused (B+) circuit for an open.

Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

B210A-SYSTEM VOLTAGE LOW (CONTINUED)

5. SKREEM

NOTE: Repeat the below procedure for both the Fused Ignition Switch Output (Run-Start) circuit and the Fused (B+) circuit.

NOTE: A dirty (partial) ground can cause abnormal conditions within a system. Make sure the module has a good ground before continuing.

Turn the ignition off.

Reconnect the SKREEM connector.

Back probe the Fused Ignition Switch Output (Run-Start) circuit and then the Fused (B+) circuit.

Start the engine.

Using the scan tool, view battery voltage under Data Display in the Engine category.

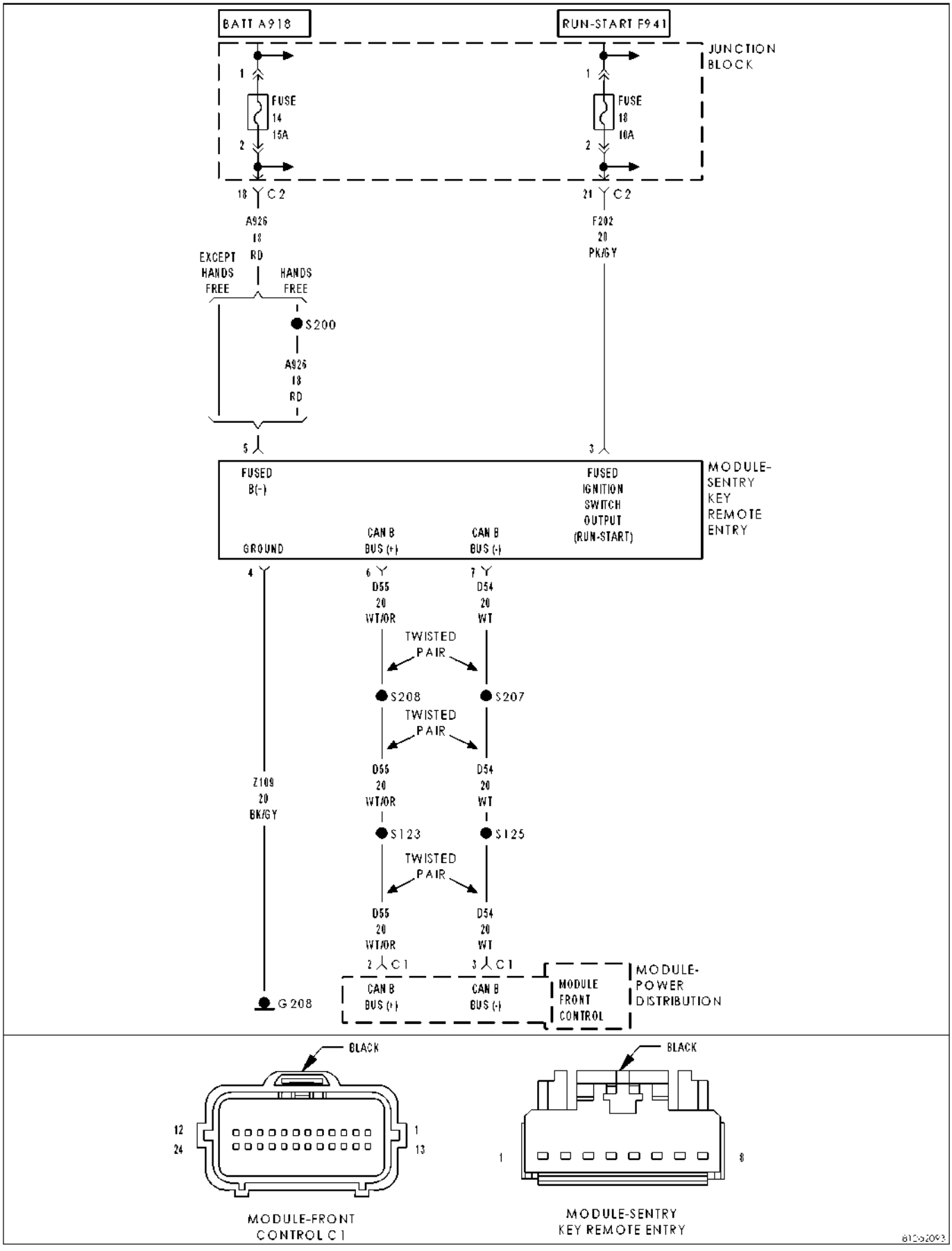
Compare the voltage on the scan tool to the voltage reading on the voltmeter.

Is the voltage on the scan tool equal to the voltmeter reading +/- .5 volt?

Yes >> Replace and program the SKREEM in accordance with the Service Information.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> Repair the circuit(s) that indicated the incorrect voltage.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

B210D-SYSTEM VOLTAGE HIGH



B210D-SYSTEM VOLTAGE HIGH (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition switch on.
- **Set Condition:**
  The SKREEM has detected the system voltage above a calibrated value.

Possible Causes
FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT
SKREEM

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

NOTE: Diagnose any related Powertrain DTC(s) before continuing.

With a scan tool, read and record DTC(s).

With the scan tool, clear DTC(s).

Perform 5 ignition cycles, leaving the ignition switch on for a minimum of 90 seconds per cycle.

Using the scan tool, read DTC(s).

Does the DTC reset?

Yes >> Go To 3

No >> Go to 2

---

2. INTERMITTENT CONDITION

NOTE: Check for any of the follow conditions:

- **Poor wire to terminal connection**
- **Corroded terminals**
- **Backed out or loose terminals**
- **Broken wire internal to the insulation**
- **Dirty (partial) module ground**

With the ignition on, wiggle the related wires.

Using a scan tool, read DTC(s).

Does the DTC reset?

Yes >> Repair the wiring as necessary.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> DTC is not active at this time. Test complete.

B210D-SYSTEM VOLTAGE HIGH (CONTINUED)

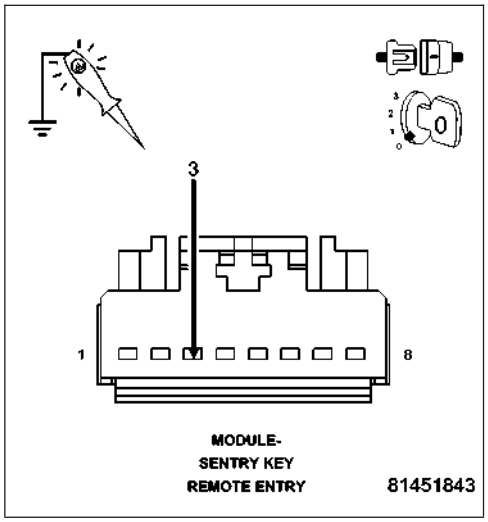
3. FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT SHORTED TO BATTERY VOLTAGE

NOTE: A dirty (partial) ground can cause abnormal conditions within a system. Make sure the module has a good ground before continuing.

Turn the ignition off.

Disconnect the SKREEM harness connector.

Using a 12 volt test light connected to ground, probe the Fused Ignition Switch Output (Run-Start) circuit in the SKREEM harness connector.



Does the test light illuminate brightly?

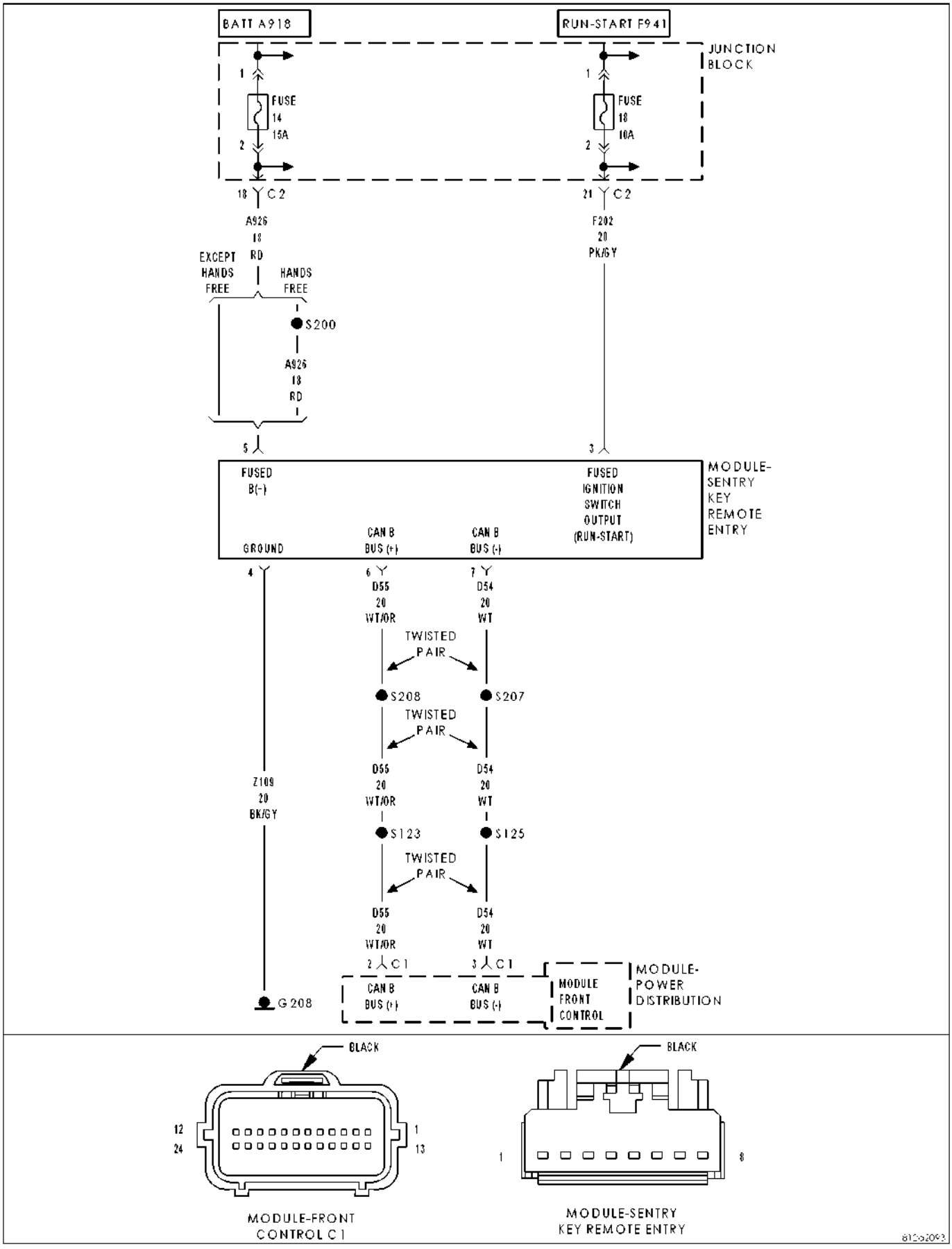
Yes >> Repair the Fused Ignition Switch Output (Run-Start) circuit for a short to voltage.

Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> Replace and reprogram the SKREEM in accordance with the Service Information.

Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

B210D-BATTERY VOLTAGE LOW



B210D-BATTERY VOLTAGE LOW (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition switch on.
- **Set Condition:**
  The SKREEM has detected the Fused (B+) input voltage below a calibrated value.

Possible Causes
FUSED (B+) CIRCUIT OPEN
SKREEM

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

NOTE: Diagnose any related Powertrain DTC(s) before continuing.

With a scan tool, read and record DTC(s).

With the scan tool, clear DTC(s).

Perform 5 ignition cycles, leaving the ignition switch on for a minimum of 90 seconds per cycle.

Using the scan tool, read DTC(s).

Does the DTC reset?

Yes >> Go To 3

No >> Go to 2

---

2. INTERMITTENT CONDITION

NOTE: Check for any of the follow conditions:

- **Poor wire to terminal connection**
- **Corroded terminals**
- **Backed out or loose terminals**
- **Broken wire internal to the insulation**
- **Dirty (partial) module ground**
- **Dirty (partial) module ground**

With the ignition on, wiggle the related wires.

Using a scan tool, read DTC(s).

Does the DTC reset?

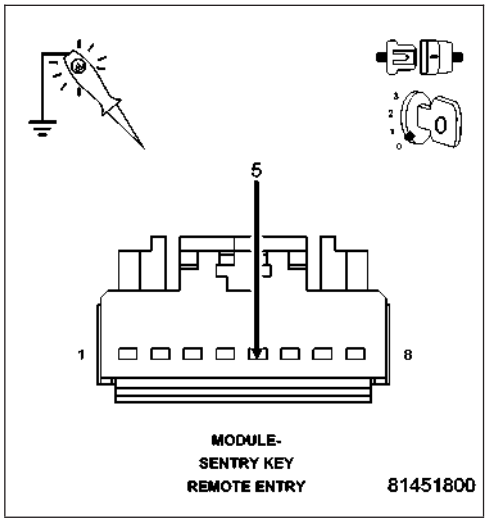
Yes >> Repair the wiring as necessary.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> DTC is not active at this time. Test complete.

B210D-BATTERY VOLTAGE LOW (CONTINUED)

3. FUSED (B+) CIRCUIT OPEN

NOTE: Check the related fuses to the Fused (B+) circuit. If the fuse is found to be open repair the circuit for a shorted condition.
Turn the ignition off.
Disconnect the SKREEM harness connector.
Turn the ignition on.
Using a 12 volt test light connected to ground, probe the Fused (B+) circuit in the SKREEM harness connector.



Does the test light illuminate brightly?

Yes >> Go to 4

No >> Repair the Fused (B+) circuit for an open.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

---

4. SKREEM

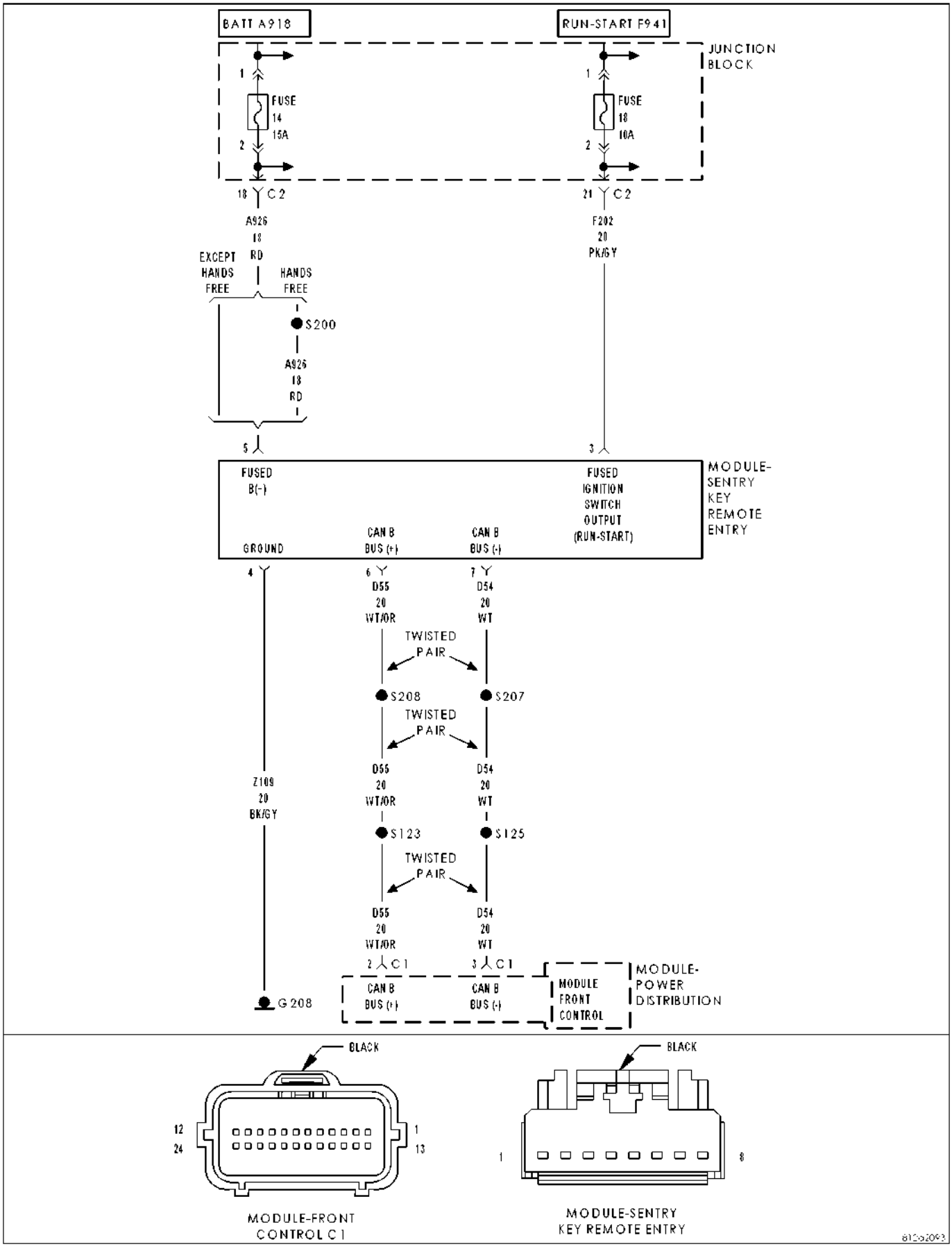
NOTE: A dirty (partial) ground can cause abnormal conditions within a system. Make sure the module has a good ground before continuing.
Turn the ignition off.
Reconnect the SKREEM connector
Back probe the Fused (B+) circuit.
Start the engine.
Using the scan tool, view battery voltage under Data Display in the Engine category.
Compare the voltage on the scan tool to the voltage reading on the voltmeter.

Is the voltage on the scan tool equal to the voltmeter reading +/- .5 volt?

Yes >> Replace and program the SKREEM in accordance with the Service Information.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> Repair the Fused (B+) circuit for high resistances.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

B210E-BATTERY VOLTAGE HIGH



B210E-BATTERY VOLTAGE HIGH (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition switch on.
- **Set Condition:**
  The SKREEM has detected the Fused (B+) input voltage above a calibrated value.

Possible Causes
FUSED (B+) CIRCUIT
SKREEM

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

NOTE: Diagnose any related Powertrain DTC(s) before continuing.

With a scan tool, read and record DTC(s).

With the scan tool, clear DTC(s).

Perform 5 ignition cycles, leaving the ignition switch on for a minimum of 90 seconds per cycle.

Using the scan tool, read DTC(s).

Does the DTC reset?

Yes >> Go To 3

No >> Go to 2

---

2. INTERMITTENT CONDITION

NOTE: Check for any of the follow conditions:

- **Poor wire to terminal connection**
- **Corroded terminals**
- **Backed out or loose terminals**
- **Broken wire internal to the insulation**
- **Dirty (partial) module ground**

With the ignition on, wiggle the related wires.

Using a scan tool, read DTC(s).

Does the DTC reset?

Yes >> Repair the wiring as necessary.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> DTC is not active at this time. Test complete.

B210E-BATTERY VOLTAGE HIGH (CONTINUED)

3. SKREEM

NOTE: A dirty (partial) ground can cause abnormal conditions with a system. Make sure the module has a good ground before continuing.

Turn the ignition off.

Back probe the Fused (B+) circuit in the SKREEM harness connector.

Start the engine.

Using a scan tool, view the battery voltage under Data Display in the Engine category.

Compare the voltage on the scan tool to the voltage reading on the voltmeter.

Is the voltage on the scan tool equal to the voltmeter reading +/- .5 volt?

Yes >> Replace and program the SKREEM in accordance with the Service Information.Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> Repair the Fused (B+) circuit.Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

B2204-ECU CONFIGURATION MISMATCH

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition switch on.

Possible Causes
SKREEM

Diagnostic Test

1. SKREEM

NOTE: Before continuing review and check the following conditions.
- **Review the repair history of the vehicle. Ensure the vehicle has the correct PCM and SKREEM installed. Check the part numbers.**
- **Using a scan tool, ensure the PCM and SKREEM have been programmed correctly. Compare the PCM VIN to the SKREEM VIN and ensure the two VINS match.**

Turn the ignition on.

With the scan tool, clear DTC(s).

Perform 5 ignition cycles, leaving the ignition switch on for a minimum of 90 seconds per cycle.

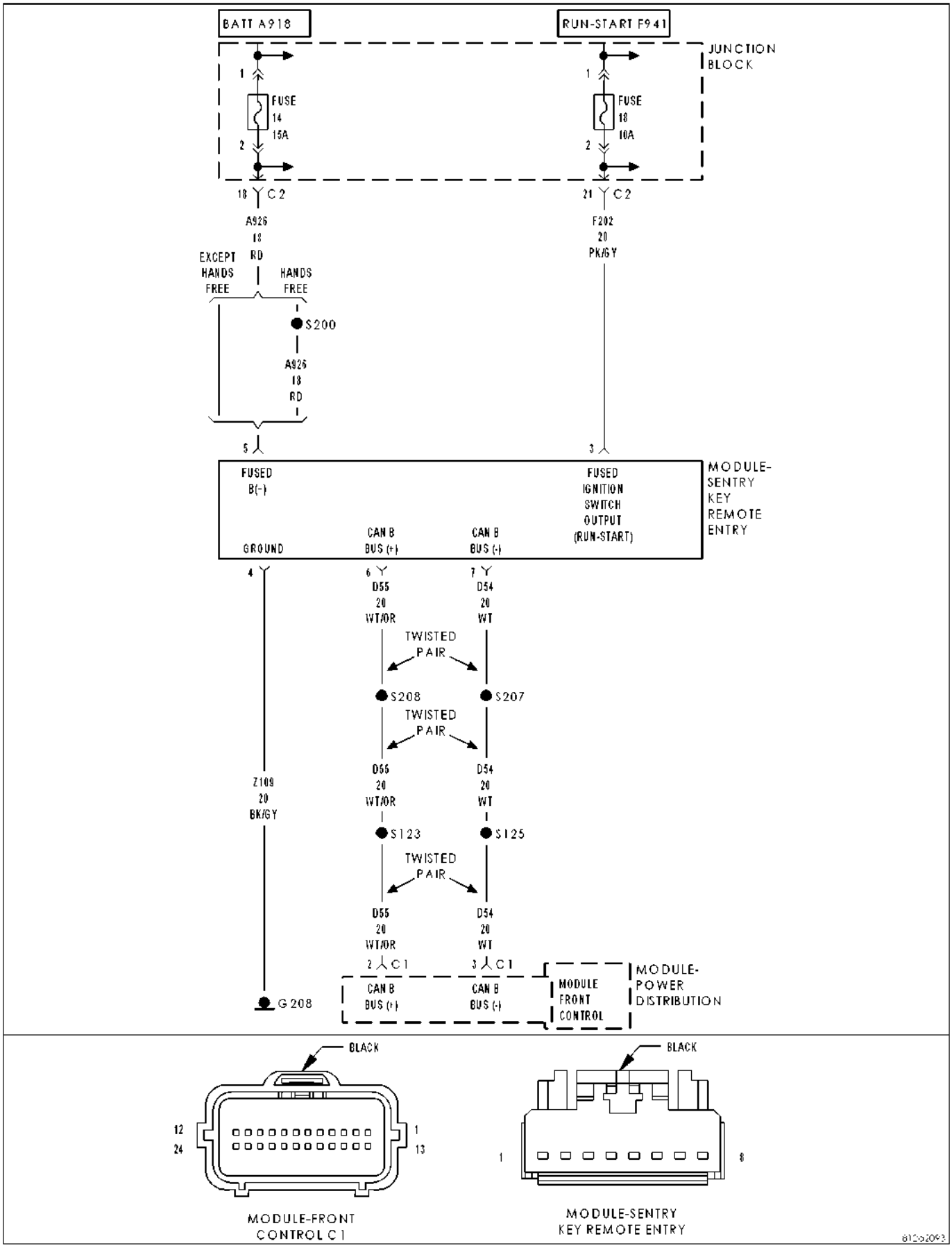
Using the scan tool, read DTC(s).

Does the DTC reset?

Yes >> Replace and program the SKREEM in accordance with the Service Information.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> The DTC is not active at this time. Test complete.

B2205-ORIGINAL VIN MISSING/MISMATCH



B2205-ORIGINAL VIN MISSING/MISMATCH (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  At ignition on, after ignition on during any rolling code handshake that occurs with the PCM due to a SKIM or PCM reset.
- **Set Condition:**
  When a PCM STATUS message with a Valid Key status is not received by the SKIM within 3.5 seconds of transmitting the last Valid Key Code message to the PCM.

Possible Causes
VERIFYING PCM VIN
REPLACE SKREEM AND CHECK DTC'S
PCM

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

With the scan tool, erase the SKREEM DTCs.
Turn the ignition off.
Wait 10 seconds.
Turn the ignition on and wait 2 minutes.
With the scan tool, read the SKREEM DTCs.

Does the scan tool display the DTC that was previously erased?

Yes >> Go To 2

No >> Go To 4

---

2. VERIFYING THE PCM VIN

Turn the ignition on.
With the scan tool, select Engine system from the main menu.
Display and record the Vehicle Identification Number.

NOTE: Make sure that a VIN has been programmed into the PCM. If a VIN is not displayed, attempt to program the PCM with the correct VIN before continuing.

Does the VIN recorded from the PCM match the VIN of the vehicle?

Yes >> Go To 3

No >> Perform the PCM replaced to update the VIN in the PCM.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

B2205-ORIGINAL VIN MISSING/MISMATCH (CONTINUED)

3. REPLACE SKREEM AND CHECK DTC'S

Turn the ignition off.

Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information.

Turn the ignition on.

With the scan tool, display and clear all PCM and SKREEM DTC's.

Perform 5 ignition key cycles leaving the ignition key on for 90 seconds per cycle.

With the scan tool, check for SKREEM DTCs.

Does the scan tool display the same DTC?

Yes >> Replace and program the Powertrain Control Module in accordance with the Service Information.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> The repair is complete.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

---

4. INTERMITTENT

Turn the ignition off.

NOTE: Check for the following conditions:

- **Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.**
- **Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.**
- **Refer to any Technical Service Bulletins (TSB) that may apply.**

Were any problems found?

Yes >> Repair wiring harness/connectors as necessary.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> Test Complete.

B2224-SKREEM INTERNAL

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition switch on.

Possible Causes
SKREEM

Diagnostic Test

1. SKREEM

NOTE: Before continuing review and check the following conditions.
- **Review the repair history of the vehicle. Ensure the vehicle has the correct PCM and SKREEM installed. Check the part numbers.**
- **Using a scan tool, ensure the PCM and SKREEM have been programmed correctly. Compare the PCM VIN to the SKREEM VIN and ensure the two VINS match.**

Turn the ignition on.

With the scan tool, clear DTC(s).

Perform 5 ignition cycles, leaving the ignition switch on for a minimum of 90 seconds per cycle.

Using the scan tool, read DTC(s).

Does the DTC reset?

Yes >> Replace and program the SKREEM in accordance with the Service Information.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> The DTC is not active at this time. Test complete.

B2228-SKREEM INTERNAL - RKE RECEIVER

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition switch on.

Possible Causes
SKREEM

Diagnostic Test

1. SKREEM

NOTE: Before continuing review and check the following conditions.
- **Review the repair history of the vehicle. Ensure the vehicle has the correct PCM and SKREEM installed. Check the part numbers.**
- **Using a scan tool, ensure the PCM and SKREEM have been programmed correctly. Compare the PCM VIN to the SKREEM VIN and ensure the two VINS match.**

Turn the ignition on.

With the scan tool, clear DTC(s).

Perform 5 ignition cycles, leaving the ignition switch on for a minimum of 90 seconds per cycle.

Using the scan tool, read DTC(s).

Does the DTC reset?

Yes >> Replace and program the SKREEM in accordance with the Service Information.
Perform SKREEM VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> The DTC is not active at this time. Test complete.

B2229-SKREEM INTERNAL - SKIM IMMOBILIZER

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition switch on.

Possible Causes
SKREEM

Diagnostic Test

1. SKREEM

NOTE: Before continuing review and check the following conditions.
- **Review the repair history of the vehicle. Ensure the vehicle has the correct PCM and SKREEM installed. Check the part numbers.**
- **Using a scan tool, ensure the PCM and SKREEM have been programmed correctly. Compare the PCM VIN to the SKREEM VIN and ensure the two VINS match.**

Turn the ignition on.

With the scan tool, clear DTC(s).

Perform 5 ignition cycles, leaving the ignition switch on for a minimum of 90 seconds per cycle.

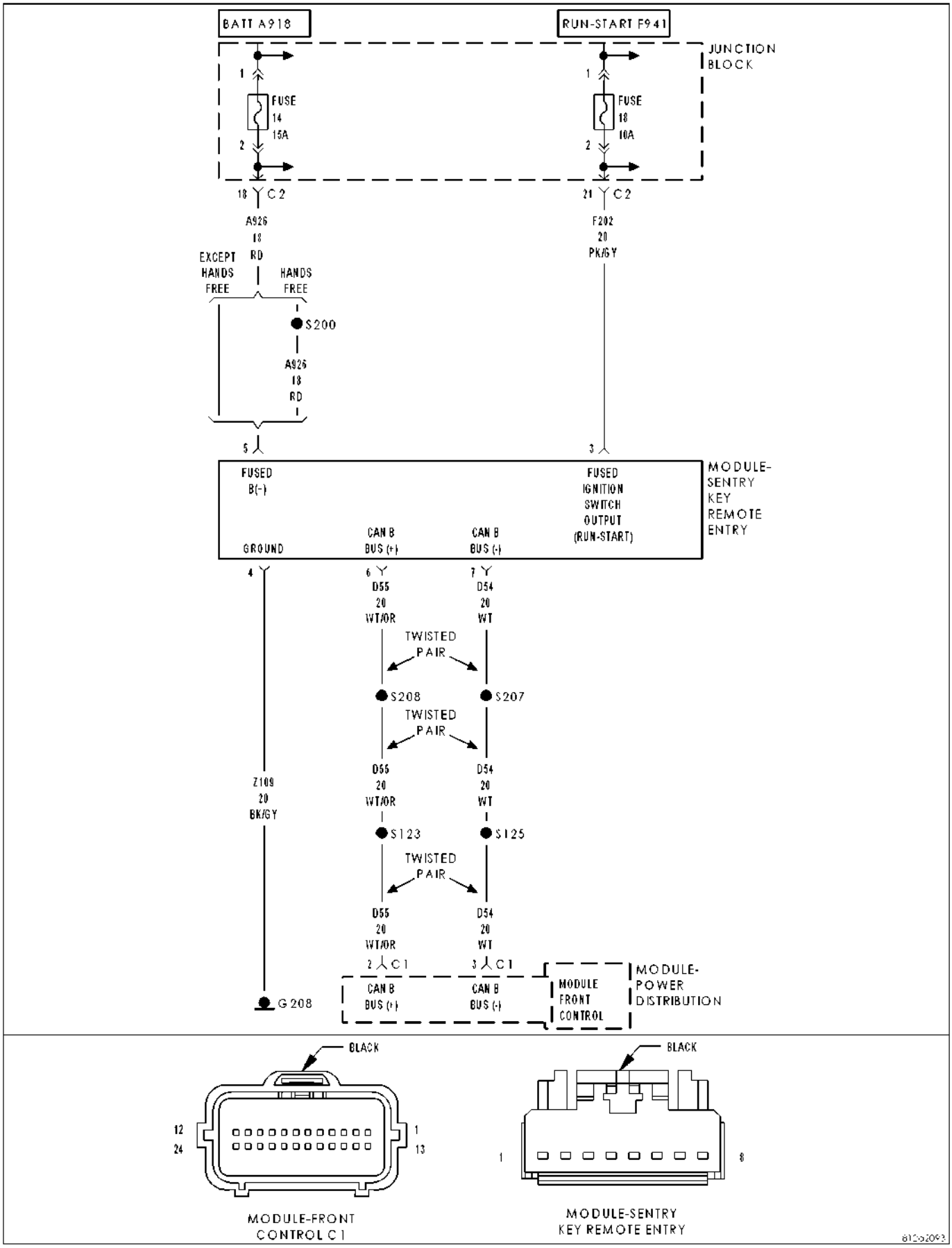
Using the scan tool, read DTC(s).

Does the DTC reset?

Yes >> Replace and program the SKREEM in accordance with the Service Information.
Perform VERIFICATION TEST. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> The DTC is not active at this time. Test complete.

U0019–CAN B BUS



U0019–CAN B BUS (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  Whenever the CAN B Bus (+) or CAN B Bus (-) circuit is open, shorted to voltage or shorted to ground.

Possible Causes
CAN B BUS DTC's IN FRONT CONTROL MODULE
(D55) CAN B BUS (+) CIRCUIT OPEN
(D54) CAN B BUS (-) CIRCUIT OPEN
HANDS FREE MODULE

Diagnostic Test

1. CHECK FOR ACTIVE DTCS

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

---

2. CHECK FRONT CONTROL MODULE DTC's

With the scan tool, read Front Control Module active DTC's

Does the scan tool display any CAN B BUS DTC's – ACTIVE?

Yes >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)

No >> Go To 3

U0019–CAN B BUS (CONTINUED)

3. (D55) CAN B BUS (+) CIRCUIT OPEN

Turn the ignition off.

Disconnect the negative battery cable.

Disconnect the Hands Free Module connector.

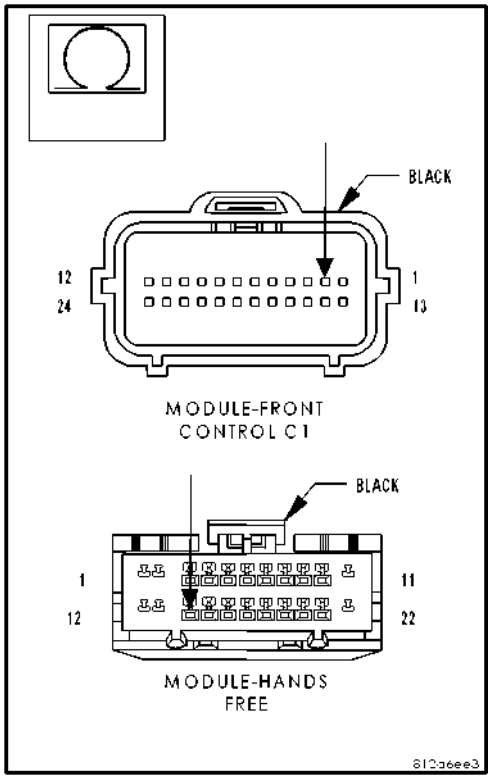
Disconnect the Front Control Module C1 connector.

Measure the resistance of the (D55) CAN B Bus (+) circuit between the Front Control Module C1 connector and the Hands Free Module connector.

Is the resistance below 2.0 ohms?

Yes >> Go To 4

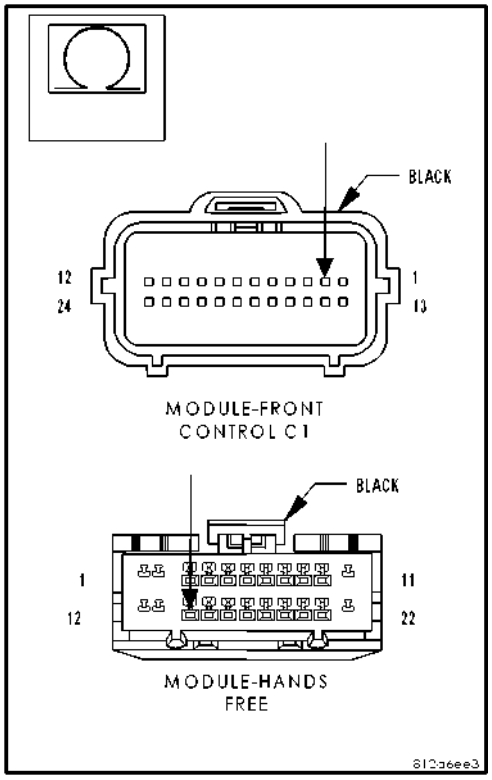
No >> Repair the (D55) CAN B Bus (+) circuit for an open. Perform BODY VERIFICATION TEST - VER 1.



U0019–CAN B BUS (CONTINUED)

4. (D54) CAN B BUS (–) CIRCUIT OPEN

Measure the resistance of the (D54) CAN B Bus (–) circuit between the Front Control Module C1 connector and the Hands Free Module connector.



Is the resistance below 2.0 ohms?

Yes >> Replace the Hands Free Module in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the (D54) CAN B Bus (–) circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0146-LOST COMMUNICATION WITH CENTRAL GATEWAY

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) and perform the U0141-Lost Communication With Front Control Module test for the diagnostic test procedure.

U0155-LOST COMMUNICATION WITH CLUSTER/CCN

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

SKREEM VERIFICATION

For a complete wiring diagram **Refer to Section 8W**.

Diagnostic Test

1. SKREEM VERIFICATION

NOTE: When entering the PIN, care should be taken because the SKREEM will only allow 3 consecutive attempts to enter the correct PIN. If 3 consecutive incorrect PIN's are entered the SKREEM will Lock Out the scan tool. To exit Lock Mode, the ignition key must remain the Run position for I hour. All accessories must be off. A battery charger connected to the battery during this time period is recommended.

1. Reconnect the previously disconnected components and connectors.
2. Obtain the vehicle's unique Personal Identification Number (PIN) assigned to it's original SKREEM. This number can be obtained from the vehicle invoice or from the DaimlerChrysler Customer Center (Phone 1-800-992-1997).
3. With the scan tool, select Miscellaneous Functions, WCM/Wireless Control Module. Then select the desired procedure and follow the display on the scan tool.
4. If the SKREEM was replaced, ensure all the customer's key have been programmed to the new module.
5. With the scan tool, ease all DTCs. Perform 5 ignition key cycles, leaving the key on for at least 90 seconds per cycle.
6. With the scan tool, read SKREEM DTC(s).

Are there any SKREEM DTC(s) present?

Yes >> Repair not complete, refer to the appropriate symptom.

No >> Repair is complete.

STANDARD PROCEDURE

SKREEM VERIFICATION

For a complete wiring diagram **Refer to Section 8W**.

Diagnostic Test

1. SKREEM VERIFICATION

NOTE: When entering the PIN, care should be taken because the SKREEM will only allow 3 consecutive attempts to enter the correct PIN. If 3 consecutive incorrect PIN's are entered the SKREEM will Lock Out the scan tool. To exit Lock Mode, the ignition key must remain the Run position for I hour. All accessories must be off. A battery charger connected to the battery during this time period is recommended.

1. Reconnect the previously disconnected components and connectors.
2. Obtain the vehicle's unique Personal Identification Number (PIN) assigned to it's original SKREEM. This number can be obtained from the vehicle invoice or from the DaimlerChrysler Customer Center (Phone 1-800-992-1997).
3. With the scan tool, select Miscellaneous Functions, WCM/Wireless Control Module. Then select the desired procedure and follow the display on the scan tool.
4. If the SKREEM was replaced, ensure all the customer's key have been programmed to the new module.
5. With the scan tool, ease all DTCs. Perform 5 ignition key cycles, leaving the key on for at least 90 seconds per cycle.
6. With the scan tool, read SKREEM DTC(s).

Are there any SKREEM DTC(s) present?

Yes >> Repair not complete, refer to the appropriate symptom.

No >> Repair is complete.

VEHICLE THEFT SECURITY - SERVICE INFORMATION

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TRANSPONDER KEY
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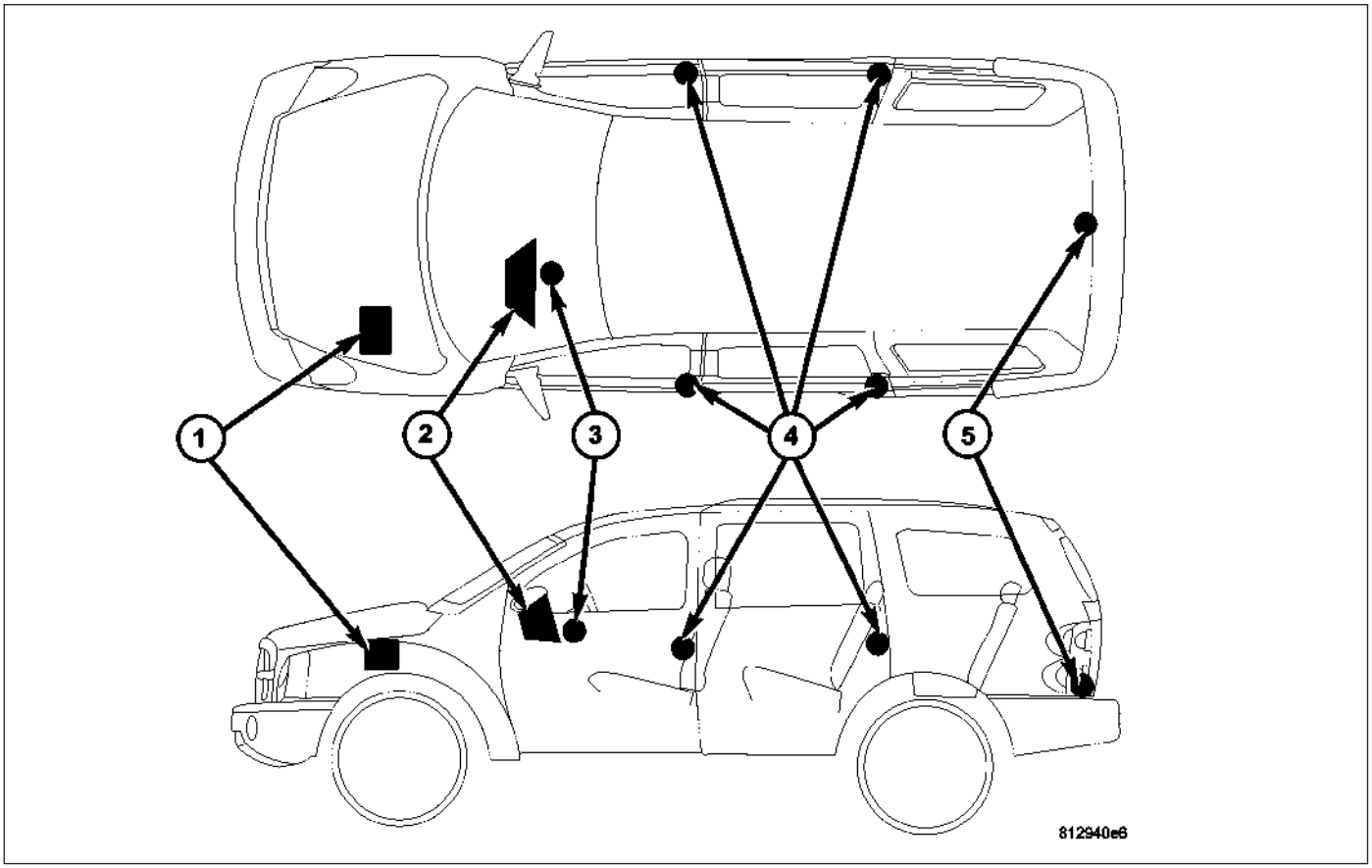
VEHICLE THEFT SECURITY - SERVICE INFORMATION

DESCRIPTION

VEHICLE THEFT SECURITY SYSTEM



The Vehicle Theft Security System (VTSS) is designed to provide perimeter protection against unauthorized use or tampering by monitoring the vehicle door and liftgate ajar circuits, the power lock and unlock circuits, and the igni-

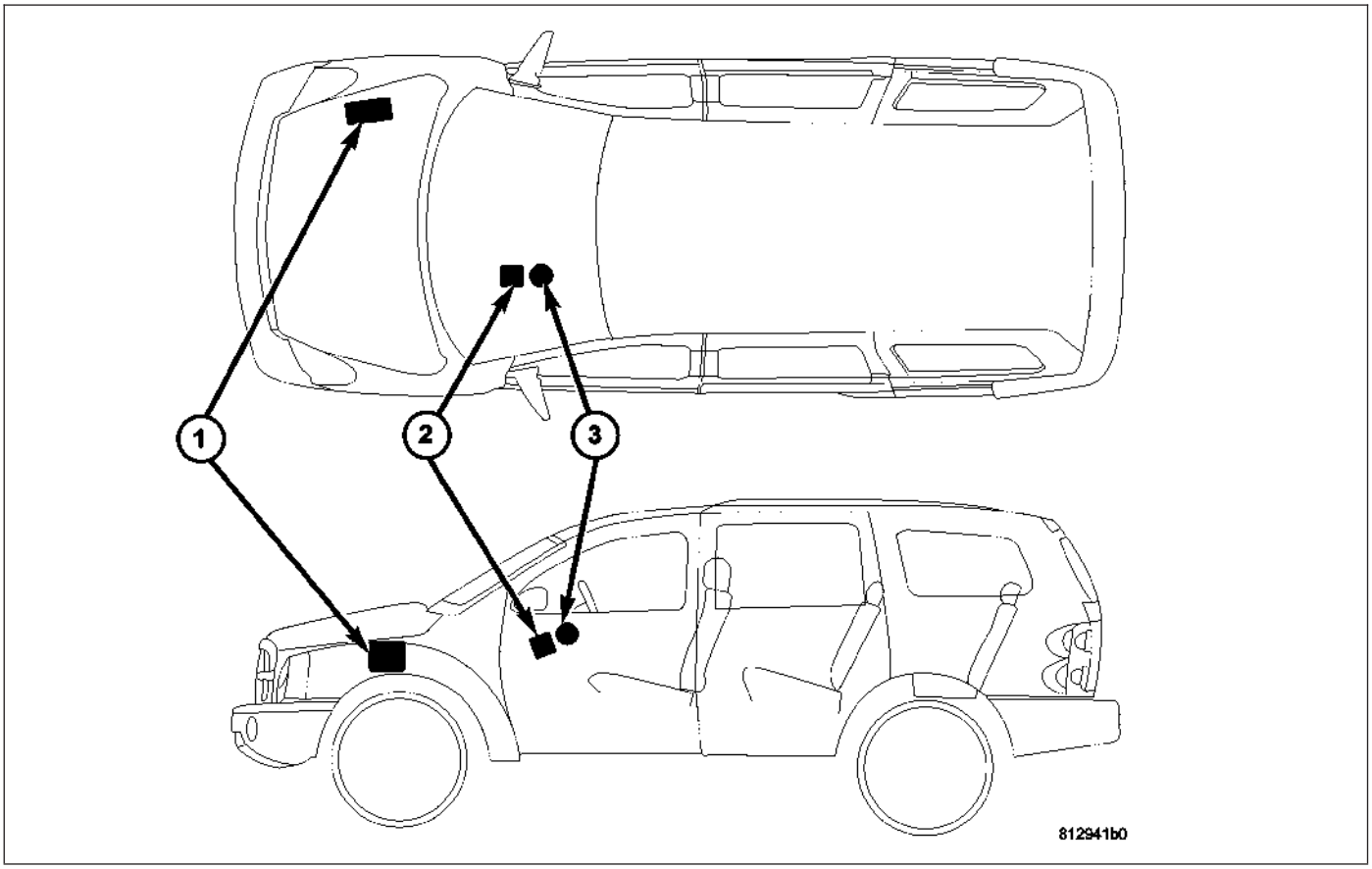
tion switch circuit. If unauthorized use or tampering is detected, the system responds by pulsing the horn for up to about three minutes and flashing the hazard warning lamps for up to about eighteen minutes.

The VTSS includes the following major components, which are described in further detail elsewhere in this service information:

- **Door Ajar Switches (4)** - A door ajar switch is integral to the door latch mechanism of each front and rear door. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - INTERIOR/DOOR AJAR SWITCH - DESCRIPTION).
- **Front Control Module (1)** - The Front Control Module (FCM) is integral to the Integrated Power Module (IPM). The FCM/IPM is located in the engine compartment, near the battery and the Power Distribution Center (PDC). (Refer to 8 - ELECTRICAL/POWER DISTRIBUTION - DESCRIPTION).
- **Horn Relay** - The horn relay is located in the Power Distribution Center (PDC) in the engine compartment near the battery. (Refer to 8 - ELECTRICAL/HORN/HORN RELAY - DESCRIPTION).
- **Ignition Switch (3)** - The ignition switch is located on the steering column in the passenger compartment. (Refer to 8 - ELECTRICAL/IGNITION CONTROL/IGNITION SWITCH - DESCRIPTION).
- **Instrument Cluster (2)** - The ElectroMechanical Instrument Cluster (EMIC) is also known as the Cab Control Node (CCN) in this vehicle. The EMIC/CCN is located in the instrument panel above the steering column opening, directly in front of the driver. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DESCRIPTION).
- **Liftgate Ajar Switch (5)** - A liftgate ajar switch is integral to the latch mechanism of the liftgate. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - INTERIOR/LIFTGATE AJAR SWITCH - DESCRIPTION).
- **Security Indicator** - The security indicator is integral to the instrument cluster. (Refer to 8 - ELECTRICAL/ INSTRUMENT CLUSTER/SECURITY INDICATOR - DESCRIPTION).

Hard wired circuitry connects the VTSS components to the electrical system of the vehicle. These hard wired circuits are integral to several wire harnesses, which are routed throughout the vehicle and retained by many different methods. These circuits may be connected to each other, to the vehicle electrical system and to the VTSS components through the use of a combination of soldered splices, splice block connectors, and many different types of wire harness terminal connectors and insulators. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, further details on wire harness routing and retention, as well as pin-out and location views for the various wire harness connectors, splices and grounds.

SENTRY KEY IMMOBILIZER SYSTEM



The Sentry Key Immobilizer System (SKIS) is available as a factory-installed option on this model. Vehicles equipped with this option can be readily identified by the illumination of the security indicator in the instrument cluster for about three seconds after the ignition switch is turned to the On position as a SKIS bulb test.

The SKIS includes the following major components, which are described in further detail elsewhere in this service information:

- **Powertrain Control Module (1)** - The Powertrain Control Module (PCM) is located in the engine compartment. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DESCRIPTION).
- **Sentry Key Remote Entry Module (2)** - The Sentry Key REmote Entry Module (SKREEM) is sometimes referred to as the Wireless Control Module (WCM). The SKREEM is located on the right side of the steering column near the ignition lock cylinder housing and an integral molded plastic antenna ring circles the ignition lock cylinder like a halo. Two SKREEM modules are available: one for vehicles equipped with RKE only, and one for vehicles equipped with RKE and SKIS. The SKREEM and its antenna are concealed beneath the steering column shrouds.
- **Sentry Key Transponder (3)** - The Sentry Key transponder is contained within the Remote Keyless Entry (RKE) transmitter on the ignition key.
- **Security Indicator** - The security indicator is integral to the ElectroMechanical Instrument Cluster. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER/SECURITY INDICATOR - DESCRIPTION).

Except for the Sentry Key transponders, which rely upon Radio Frequency (RF) communication, hard wired circuitry connects the SKIS components to the electrical system of the vehicle. These hard wired circuits are integral to several wire harnesses, which are routed throughout the vehicle and retained by many different methods. These circuits may be connected to each other, to the vehicle electrical system and to the SKIS components through the use of a combination of soldered splices, splice block connectors, and many different types of wire harness terminal connectors and insulators. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, further details on wire harness routing and retention, as well as pin-out and location views for the various wire harness connectors, splices and grounds.

OPERATION

VEHICLE THEFT SECURITY SYSTEM

The ElectroMechanical Instrument Cluster (EMIC) is used on this model to control and integrate many of the functions and features included in the Vehicle Theft Security System (VTSS). In the VTSS, the EMIC receives inputs indicating the status of the door ajar switches, the liftgate ajar switch and the ignition switch. The EMIC will process the information from all of these inputs, internally control the security indicator as appropriate, and send electronic messages to the Front Control Module (FCM) over the Controller Area Network (CAN) data bus. The FCM internally controls the output to the hazard warning lamps and sends a control output to energize or de-energize the horn relay as appropriate.

Following are paragraphs describing the operation of each of the VTSS features.

ENABLING

The EMIC must have the VTSS function electronically enabled in order for the VTSS to perform as designed. The logic in the EMIC keeps its VTSS function dormant until it is enabled using a diagnostic scan tool. The VTSS function of the EMIC is enabled on vehicles equipped with the VTSS option at the factory, but a service replacement EMIC must be VTSS-enabled by the dealer using a diagnostic scan tool. Refer to the appropriate diagnostic information.

ARMING

Passive arming of the VTSS occurs when the vehicle is exited with the key removed from the ignition switch, the headlamps are turned off, and the doors are locked while they are open using the power lock switch. Active arming occurs when the “Lock” button on the Remote Keyless Entry (RKE) transmitter is depressed to lock the vehicle. For active arming to occur, the doors must be closed and the ignition switch must be in the Off position when the RKE transmitter “Lock” button is depressed. The power lock switch will not function if the key is in the ignition switch or the headlamps are turned on with the driver side front door open.

Pre-arming of the VTSS is initiated when a door or the liftgate is open when the vehicle is locked using a power door lock switch or when the RKE transmitter “Lock” button is depressed. Pre-arming will not occur if the key is in the ignition switch or the headlamps are turned on with the driver side front door open. When the VTSS is pre-armed, the arming sequence is delayed until all of the doors and the liftgate have been closed. The VTSS will remain in “Pre-Armed” mode until after all doors and the liftgate have been closed, or until the interior lighting load shed threshold is surpassed (about eight minutes).

Once the VTSS begins the passive or active arming sequence, the security indicator in the instrument cluster will flash rapidly for about seventeen seconds. This indicates that VTSS arming is in progress. If the ignition switch is turned to the On position, a door or the liftgate is opened, a door or the liftgate is unlocked by any means, or the RKE “Panic” button is depressed during the seventeen second arming process, the security indicator will stop flashing and the arming process will abort. Once the seventeen second arming sequence is successfully completed, the security indicator will flash at a slower rate, indicating that the VTSS is armed.

DISARMING

Since this model is not equipped with lock cylinder switches, passive disarming of the VTSS is only possible if the vehicle is equipped with the optional Sentry Key Immobilizer System (SKIS). On vehicles with SKIS, turning the ignition switch to the On position using a valid SKIS key will passively disarm VTSS. Active disarming of the VTSS occurs when the vehicle is unlocked by depressing the “Unlock” button of the RKE transmitter. Once the alarm has been activated, either disarming method will also deactivate the alarm. Depressing the “Panic” button on the RKE transmitter will **not** disarm the VTSS.

POWER-UP MODE

When the armed VTSS senses that the battery has been disconnected and reconnected, it enters its power-up mode. In the power-up mode the alarm system remains armed following a battery failure or disconnect. If the VTSS was armed prior to a battery disconnect or failure, the technician or vehicle operator will have to actively or passively disarm the alarm system after the battery is reconnected. The power-up mode will also apply if the battery goes dead while the system is armed, and battery jump-starting is attempted. The VTSS will be armed until the technician or vehicle operator has actively or passively disarmed the alarm system. If the VTSS is in the disarmed

mode prior to a battery disconnect or failure, it will remain disarmed after the battery is reconnected or replaced, or if jump-starting is attempted.

TAMPER ALERT

The VTSS tamper alert feature will sound the horn three times upon disarming, if the alarm was triggered and has since timed-out (about eighteen minutes) or if the battery has been disconnected and reconnected. This feature alerts the vehicle operator that the VTSS alarm was activated while the vehicle was unattended.

SENTRY KEY IMMOBILIZER SYSTEM

The Sentry Key Immobilizer System (SKIS) is designed to provide passive protection against unauthorized vehicle use by disabling the engine after about two seconds of running, whenever any method other than a valid Sentry Key is used to start the vehicle. The SKIS is considered a passive protection system because it is always active when the ignition system is energized and does not require any customer intervention. The SKIS uses Radio Frequency (RF) communication to obtain confirmation that the key in the ignition switch is a valid key for operating the vehicle. The microprocessor-based SKIS hardware and software also uses electronic messages to communicate with other electronic modules in the vehicle over the Controller Area Network (CAN) data bus. (Refer to 8 - ELECTRICAL/ ELECTRONIC CONTROL MODULES/COMMUNICATION - OPERATION).

Pre-programmed Sentry Key transponders are provided with the vehicle from the factory. Each Sentry Key REmote Entry Module (SKREEM) will recognize a maximum of eight Sentry Keys. If the customer would like additional keys other than those provided with the vehicle, they may be purchased from any authorized dealer. These additional keys must be programmed to the SKREEM in the vehicle in order for the system to recognize them as valid keys. This can be done by the dealer using a diagnostic scan tool or, if Customer Learn programming is an available SKIS feature in the market where the vehicle was purchased, the customer can program the additional keys, as long as at least two valid Sentry Keys are already available. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE - TRANSPONDER PROGRAMMING).

The SKREEM performs a self-test of the SKIS each time the ignition switch is turned to the On position, and will store fault information in the form of a Diagnostic Trouble Code (DTC) if a system malfunction is detected. The SKIS can be diagnosed, and any stored DTC can be retrieved using a diagnostic scan tool. Refer to the appropriate diagnostic information.

DIAGNOSIS AND TESTING

VEHICLE THEFT SECURITY SYSTEM

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

The hard wired Vehicle Theft Security System (VTSS) components and circuits may be diagnosed and tested using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

However, conventional diagnostic methods may not prove conclusive in the diagnosis of the ElectroMechanical Instrument Cluster (EMIC), the Front Control Module (FCM), the Controller Area Network (CAN) data bus, or the electronic message inputs used to provide the electronic features of the VTSS. The most reliable, efficient, and accurate means to diagnose the EMIC, the FCM, the CAN data bus, and the electronic message inputs for the VTSS requires the use of a diagnostic scan tool. See the “Vehicle Theft Security System” menu item on the scan tool. Refer to the appropriate diagnostic information.

SENTRY KEY IMMOBILIZER SYSTEM

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

The hard wired Sentry Key Immobilizer System (SKIS) components and circuits may be diagnosed and tested using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

However, conventional diagnostic methods may not prove conclusive in the diagnosis of the Sentry Key REmote Entry Module (SKREEM), the ElectroMechanical Instrument Cluster (EMIC), the Powertrain Control Module (PCM), the Controller Area Network (CAN) data bus, or the electronic message inputs used to provide the electronic features of the SKIS. The most reliable, efficient, and accurate means to diagnose the SKREEM, the EMIC, the PCM, the CAN data bus, and the electronic message inputs for the SKIS requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

SENTRY KEY IMMOBILIZER SYSTEM DIAGNOSIS		
CONDITION	**POSSIBLE CAUSES**	**CORRECTION**
SECURITY INDICATOR FAILS TO LIGHT DURING BULB TEST	1. Light-Emitting Diode (LED) faulty.	1. Perform the instrument cluster actuator test. (Refer to 8 - ELECTRICAL/ INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING - ACTUATOR TEST)..
	2. Fuse faulty.	2. Check the SKREEM fused B(+) fuse and the fused ignition switch output (run-start) fuse in the Junction Block (JB). Replace fuses, if required.
	3. Ground path faulty.	3. Check for continuity to ground at the connector for the SKREEM. Repair wiring, if required.
	4. Battery feed faulty.	4. Check for battery voltage at the connector for the SKREEM. Repair wiring, if required.
	5. Ignition feed faulty.	5. Check for battery voltage at the connector for the SKREEM with the ignition switch in the On position. Repair wiring, if required.
SECURITY INDICATOR FLASHES FOLLOWING BULB TEST	1. Invalid key in ignition switch lock cylinder.	1. Replace the key with a known valid key.
	2. Key-related fault.	2. Use a diagnostic scan tool and the appropriate diagnostic information for further diagnosis.
SECURITY INDICATOR LIGHTS SOLID FOLLOWING BULB TEST	1. SKIS system malfunction/ fault detected.	1. Use a diagnostic scan tool and the appropriate diagnostic information for further diagnosis.
	2. SKIS system inoperative.	2. Use a diagnostic scan tool and the appropriate diagnostic information for further diagnosis.

STANDARD PROCEDURE

SKIS INITIALIZATION

The Sentry Key Immobilizer System (SKIS) must be initialized following a Sentry Key REmote Entry Module (SKREEM) replacement. SKIS initialization requires the use of a diagnostic scan tool. Initialization will also require that you have access to the unique four-digit PIN code that was assigned to the original SKREEM. The PIN code **must** be used to enter the Secured Access Mode in the SKREEM. This PIN number may be obtained from the vehicle owner, from the original vehicle invoice, or from the DaimlerChrysler Customer Center. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE - PCM/SKREEM PROGRAMMING).

NOTE: If a Powertrain Control Module (PCM) is replaced on a vehicle equipped with the Sentry Key Immobilizer System (SKIS), the unique Secret Key data must be transferred from the Sentry Key REmote Entry Module (SKREEM) to the new PCM using the PCM replacement procedure. This procedure also requires the use of a diagnostic scan tool and the unique four-digit PIN code to enter the Secured Access Mode in the SKREEM. Refer to the appropriate diagnostic information for the proper PCM replacement procedures.

SENTRY KEY TRANSPONDER PROGRAMMING

All Sentry Keys included with the vehicle are pre-programmed to work with the Sentry Key Immobilizer System (SKIS) when it is shipped from the factory. The Sentry Key REmote Entry Module (SKREEM) can be programmed to recognize up to a total of eight Sentry Keys. When programming a blank Sentry Key transponder, the key must first be cut to match the ignition switch lock cylinder in the vehicle for which it will be used. Once the additional or new key has been cut, the SKREEM must be programmed to recognize it as a valid key. There are two possible methods to program the SKREEM to recognize a new or additional valid key, the Secured Access Method and the Customer Learn Method. Following are the details of these two programming methods.

SECURED ACCESS METHOD

The Secured Access method applies to all vehicles. This method requires the use of a diagnostic scan tool. This method will also require that you have access to the unique four-digit PIN code that was assigned to the original SKREEM. The PIN code **must** be used to enter the Secured Access Mode in the SKREEM. This PIN number may be obtained from the vehicle owner, from the original vehicle invoice, or from the DaimlerChrysler Customer Center. Refer to the appropriate diagnostic information for the proper Secured Access method programming procedures.

CUSTOMER LEARN METHOD

The Customer Learn feature is only available on domestic vehicles, or those vehicles which have a U.S. country code designator. This programming method also requires access to at least two valid Sentry Keys. If two valid Sentry Keys are not available, or if the vehicle does not have a U.S. country code designator, the Secured Access Method **must** be used to program new or additional valid keys to the SKREEM. The Customer Learn programming method procedures are as follows:

1. Obtain the blank Sentry Key(s) that are to be programmed as valid keys for the vehicle. Cut the blank key(s) to match the ignition switch lock cylinder mechanical key codes.
2. Insert one of the two valid Sentry Keys into the ignition switch and turn the ignition switch to the On position.
3. After the ignition switch has been in the On position for longer than three seconds, but no more than fifteen seconds, cycle the ignition switch back to the Off position. Replace the first valid Sentry Key in the ignition switch lock cylinder with the second valid Sentry Key and turn the ignition switch back to the On position. The second valid Sentry Key must be inserted in the lock cylinder within fifteen seconds of removing the first valid key.
4. About ten seconds after the completion of Step 3, the security indicator in the instrument cluster will start to flash to indicate that the system has entered the Customer Learn programming mode.
5. Within sixty seconds of entering the Customer Learn programming mode, turn the ignition switch to the Off position, replace the valid Sentry Key with a blank Sentry Key transponder, and turn the ignition switch back to the On position.
6. About ten seconds after the completion of Step 5, the security indicator will stop flashing, stay on solid for three seconds, then turn off to indicate that the blank Sentry Key has been successfully programmed. The SKIS will immediately exit the Customer Learn programming mode. After the ignition is cycled the vehicle may be started using the newly programmed valid Sentry Key.

Each of these steps must be repeated and completed in their entirety for each additional Sentry Key that is to be programmed. If the above steps are not completed in the given sequence, or within the allotted time, the SKREEM will exit the Customer Learn programming mode and the programming will be unsuccessful. The SKREEM will also automatically exit the Customer Learn programming mode if it sees a non-blank Sentry Key transponder when it should see a blank, if it has already programmed eight (8) valid Sentry Keys, or if the ignition switch is turned to the Off position for more than about fifty seconds.

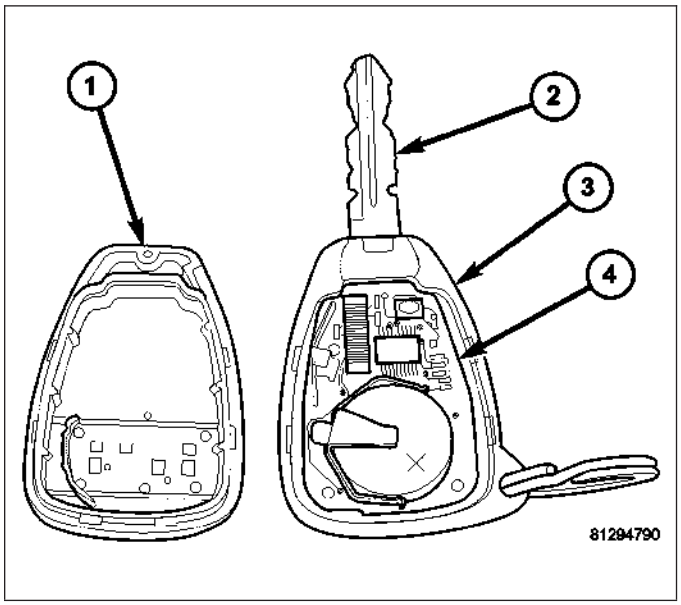
NOTE: If an attempt is made to start the vehicle while in the Customer Learn mode (security indicator flashing), the SKIS will respond as though the vehicle were being started with an invalid key. In other words, the engine will stall after about two seconds of operation. No faults will be set.

NOTE: Once a Sentry Key has been programmed as a valid key to a vehicle, it cannot be programmed as a valid key for use on any other vehicle.

TRANSPONDER KEY

DESCRIPTION

Each ignition key (2) used in the Sentry Key Immobilizer System (SKIS) has a transponder chip included on the circuit board (4) beneath the cover (1) of the integral Remote Keyless Entry (RKE) transmitter (3). In addition to having to be cut to match the mechanical coding of the ignition lock cylinder and programmed for operation of the RKE system, each new Sentry Key has a unique transponder identification code that is permanently programmed into it by the manufacturer, and which must be programmed into the Sentry Key REmote Entry Module (SKREEM) to be recognized by the SKIS as a valid key. The Sentry Key transponder cannot be adjusted or repaired. If faulty or damaged, the entire key and RKE transmitter unit must be replaced.



OPERATION

When the ignition switch is turned to the On position, the Sentry Key REmote Entry Module (SKREEM) communicates through its antenna with the Sentry Key transponder using a Radio Frequency (RF) signal. The SKREEM then listens for a RF response from the transponder through the same antenna. The Sentry Key transponder chip is within the range of the SKREEM transceiver antenna ring when it is inserted into the ignition lock cylinder. The SKREEM determines whether a valid key is present in the ignition lock cylinder based upon the response from the transponder. If a valid key is detected, that fact is communicated by the SKREEM to the Powertrain Control Module (PCM) over the Controller Area Network (CAN) data bus, and the PCM allows the engine to continue running. If the PCM receives an invalid key message, or receives no message from the SKREEM over the CAN data bus, the engine will be disabled after about two seconds of operation. The ElectroMechanical Instrument Cluster (EMIC) will also respond to the invalid key message on the CAN data bus by flashing the security indicator on and off.

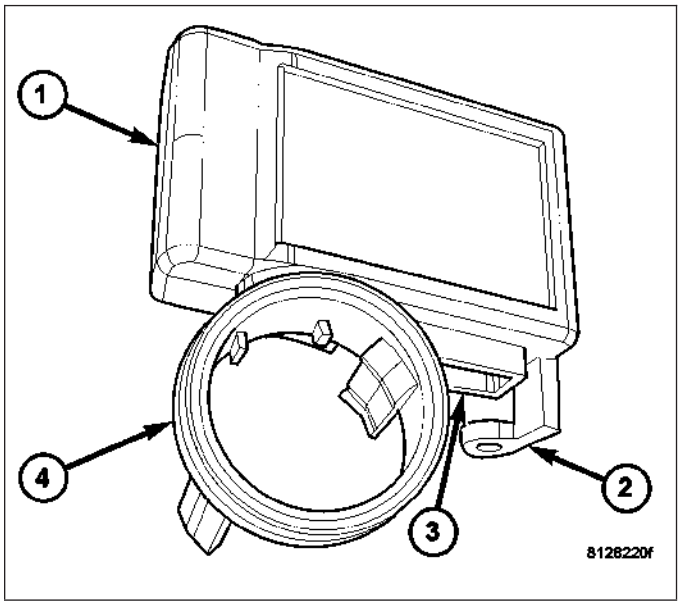
Each Sentry Key has a unique transponder identification code permanently programmed into it by the manufacturer. Likewise, the SKREEM has a unique Secret Key code programmed into it by the manufacturer. When a Sentry Key is programmed into the memory of the SKREEM, the SKREEM stores the transponder identification code from the Sentry Key, and the Sentry Key learns the Secret Key code from the SKREEM. Once the Sentry Key learns the Secret Key code of the SKREEM, it is permanently stored in the memory of the transponder. Therefore, once a Sentry Key has been programmed to a particular vehicle, it cannot be used on any other vehicle. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE - TRANSPONDER PROGRAMMING).

The SKIS performs a self-test each time the ignition switch is turned to the On position, and will store key-related fault information in the form of a Diagnostic Trouble Code (DTC) in SKREEM memory if a Sentry Key transponder problem is detected. The Sentry Key transponder chip can be diagnosed, and any stored DTC can be retrieved using a diagnostic scan tool. Refer to the appropriate diagnostic information.

MODULE-SENTRY KEY REMOTE ENTRY

DESCRIPTION

The Sentry Key REmote Entry Module (SKREEM) (1) is sometimes referred to as the Wireless Control Module (WCM). The SKREEM is the primary component of the Sentry Key Immobilizer System (SKIS) and is also the receiver for the Remote Keyless Entry (RKE) system. The SKREEM is located on the right side of the steering column, near the ignition lock cylinder housing and is concealed beneath the steering column shrouds. The molded black plastic housing for the SKREEM has an integral molded plastic halo-like antenna ring (4) that extends from the bottom. When the SKREEM is properly installed on the steering column, the antenna ring is oriented around the circumference of the ignition lock cylinder housing.



A single integral connector receptacle (3) is located just behind the antenna ring on the bottom of the SKREEM housing. An integral molded plastic mounting tab (2) on the rear corner of the SKREEM housing has a hole in the center through which a screw passes to secure the unit to the steering column. The SKREEM is connected to the vehicle electrical system through a single take out and connector of the instrument panel wire harness.

Two SKREEM modules are used: one for vehicles equipped with RKE only, and one for vehicles equipped with RKE and SKIS. The SKREEM cannot be adjusted or repaired. If faulty or damaged, the entire SKREEM unit must be replaced.

OPERATION

The Sentry Key REmote Entry Module (SKREEM) contains a Radio Frequency (RF) transceiver and a microprocessor. The SKREEM transmits RF signals to, and receives RF signals from the Sentry Key transponder through a tuned antenna enclosed within the molded plastic antenna ring integral to the SKREEM housing. If this antenna ring is not mounted properly around the ignition lock cylinder housing, communication problems between the SKREEM and the transponder may arise. These communication problems will result in Sentry Key transponder-related faults. The SKREEM also serves as the Remote Keyless Entry (RKE) RF receiver. (Refer to 8 - ELECTRICAL/POWER LOCKS - DESCRIPTION). The SKREEM communicates over the Controller Area Network (CAN) data bus with the ElectroMechanical Instrument Cluster (EMIC), the Powertrain Control Module (PCM), and/or the diagnostic scan tool.

The SKREEM retains in memory the ID numbers of any Sentry Key transponder that is programmed into it. A maximum of eight Sentry Key transponders can be programmed into the SKREEM. For added system security, each SKREEM is programmed with a unique Secret Key code. This code is stored in memory, sent over the CAN data bus to the PCM, and is encoded to the transponder of every Sentry Key that is programmed into the SKREEM. Therefore, the Secret Key code is a common element that is found in every component of the Sentry Key Immobilizer System (SKIS). Another security code, called a PIN, is used to gain access to the SKREEM Secured Access Mode. The Secured Access Mode is required during service to perform the SKIS initialization and Sentry Key transponder programming procedures. The SKREEM also stores the Vehicle Identification Number (VIN) in its memory, which it learns through a CAN data bus message from the PCM during SKIS initialization.

In the event that a SKREEM replacement is required, the Secret Key code can be transferred to the new SKREEM from the PCM using the diagnostic scan tool and the SKIS initialization procedure. Proper completion of the SKIS initialization will allow the existing Sentry Keys to be programmed into the new SKREEM so that new keys will not be required. In the event that the original Secret Key code cannot be recovered, SKREEM replacement will also require new Sentry Keys. The diagnostic scan tool will alert the technician during the SKIS initialization procedure if new Sentry Keys are required.

When the ignition switch is turned to the On position, the SKREEM transmits an RF signal to the transponder in the ignition key. The SKREEM then waits for an RF signal response from the transponder. If the response received identifies the key as valid, the SKREEM sends a valid key message to the PCM over the CAN data bus. If the response received identifies the key as invalid or if no response is received from the key transponder, the SKREEM sends an invalid key message to the PCM. The PCM will enable or disable engine operation based upon the status of the SKREEM messages. It is important to note that the default condition in the PCM is an invalid key; therefore, if no message is received from the SKREEM by the PCM, the engine will be disabled and the vehicle immobilized after two seconds of running.

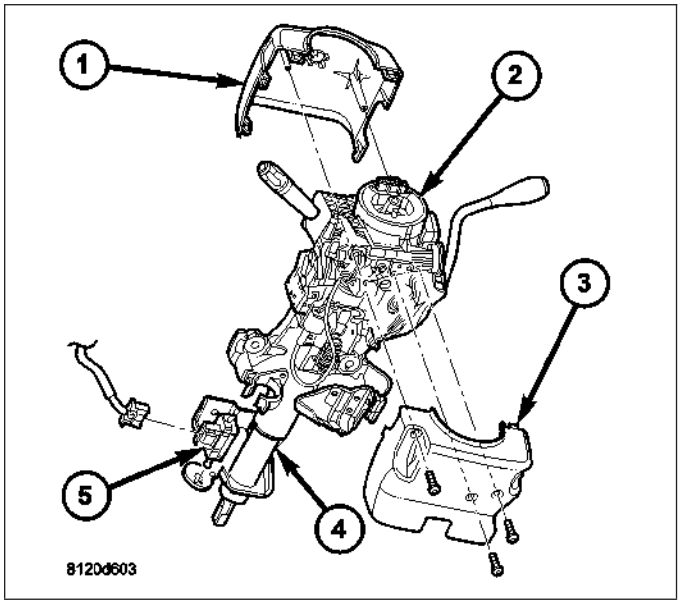
The SKREEM also sends security indicator status messages to the EMIC over the CAN data bus to tell the EMIC how to operate the security indicator. The security indicator status message from the SKREEM tells the EMIC to turn the indicator on for about three seconds each time the ignition switch is turned to the On position as a bulb test. After completion of the bulb test, the SKREEM sends security indicator status messages to the EMIC to turn the indicator off, turn the indicator on, or to flash the indicator on and off. If the security indicator flashes or stays on solid after the bulb test, it signifies a SKIS fault. If the SKREEM detects a system malfunction and/or the SKIS has become inoperative, the security indicator will stay on solid. If the SKREEM detects an invalid key or if a key transponder-related fault exists, the security indicator will flash. If the vehicle is equipped with the Customer Learn transponder programming feature, the SKREEM will also send messages to the EMIC to flash the security indicator whenever the Customer Learn programming mode is being utilized. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE - SENTRY KEY TRANSPONDER PROGRAMMING).

The SKIS performs a self-test each time the ignition switch is turned to the On position, and will store fault information in the form of a Diagnostic Trouble Code (DTC) in SKREEM memory if a system malfunction is detected. The SKREEM can be diagnosed, and any stored DTC can be retrieved using a diagnostic scan tool. Refer to the appropriate diagnostic information.

REMOVAL

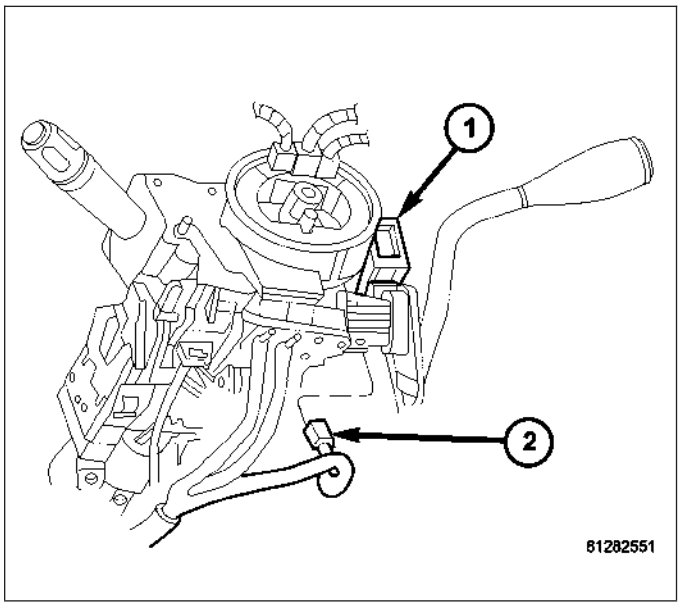
WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

1. Disconnect and isolate the battery negative cable.
2. Grasp the tilt steering column knob firmly and pull it straight rearward to remove it from the tilt adjuster lever on the left side of the column.
3. From below the steering column, remove the two outboard screws that secure the upper column shroud (1) to the lower shroud (3).
4. Using hand pressure, push gently inward on both sides of the upper shroud above the parting line of the lower shroud to release the snap features that secure the two shroud halves to each other.
5. Remove the upper shroud from the lower shroud and the steering column.
6. Remove the one center screw that secures the lower shroud to the steering column (4).

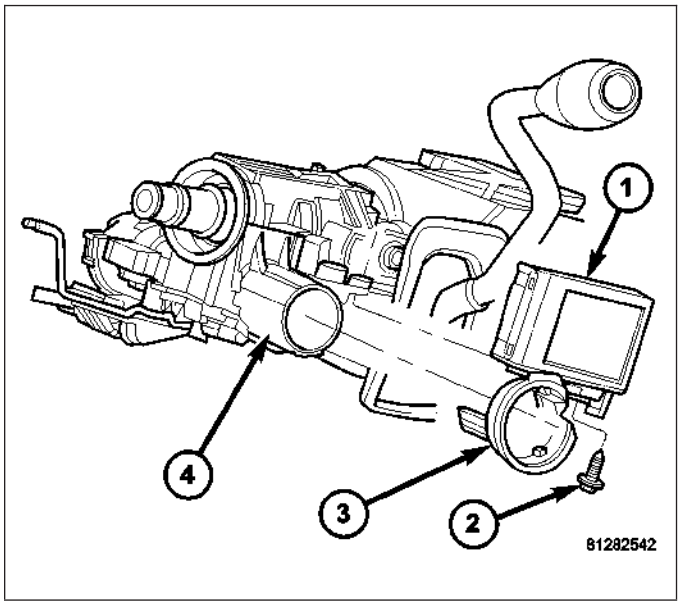


7. Remove the lower shroud from the steering column.

8. Disconnect the wire harness connector (2) from the Sentry Key REmote Entry Module (SKREEM) (1).



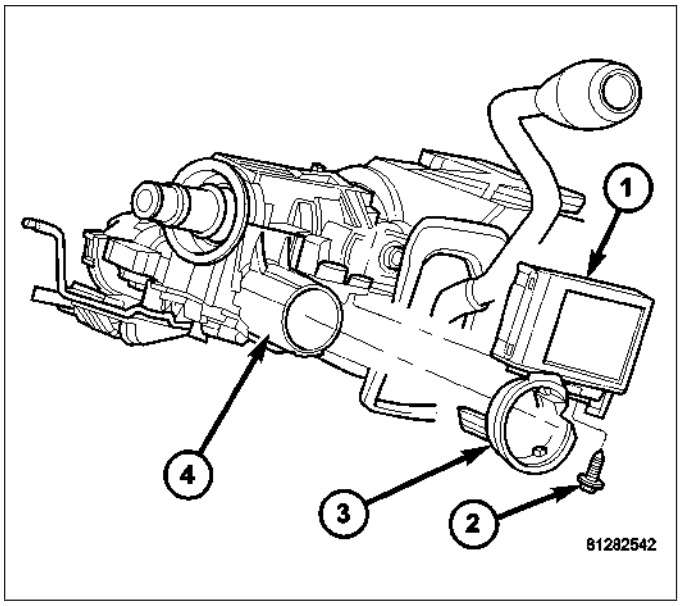
9. Remove the screw (2) that secures the SKREEM (1) to the steering column housing.
10. Disengage the antenna ring (4) from around the ignition lock cylinder housing (3) and remove the SKREEM.



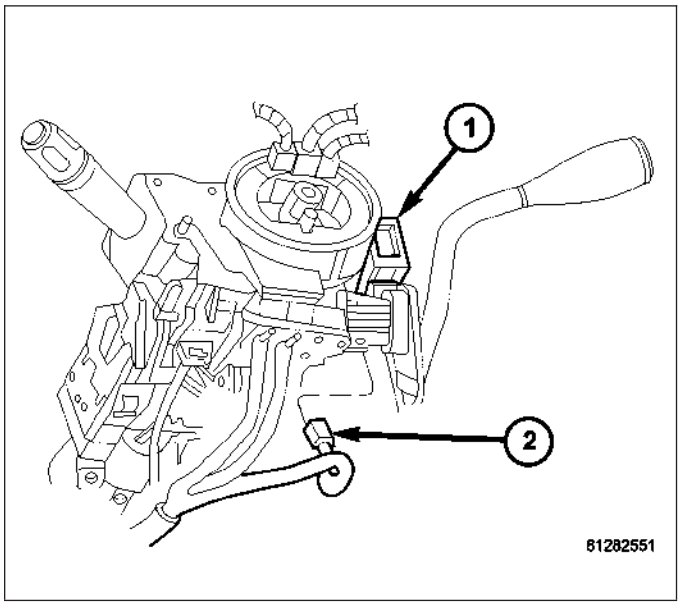
INSTALLATION

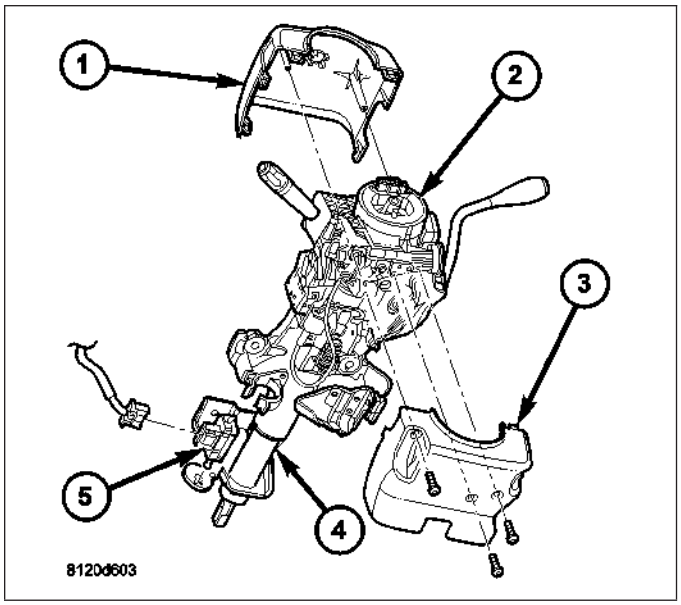
WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

1. Position the Sentry Key REmote Entry Module (SKREEM) (1) onto the steering column with the antenna ring (3) oriented around the ignition lock cylinder housing (4).
2. Install and tighten the screw (2) that secures the SKREEM to the steering column housing. Tighten the screw to 2 N·m (20 in. lbs.).



3. Reconnect the wire harness connector (2) to the SKREEM (1).





4. Position the lower shroud (3) onto the steering column (4).
5. From below the steering column, install and tighten the one center screw that secures the lower shroud to the steering column. Tighten the screw to 2 N·m (20 in. lbs.).
6. Position the upper shroud (1) onto the steering column over the lower shroud. Be certain to engage the gearshift lever gap hider into the opening in the right side of both shroud halves.
7. Align the snap features on the upper shroud with the receptacles in the lower shroud and apply hand pressure to snap them together.
8. Install and tighten the two outboard screws that secure the upper shroud to the lower shroud. Tighten the screws to 2 N·m (20 in. lbs.).
9. Align the tilt steering column knob with the tilt adjuster lever on the left side of the steering column and use hand pressure to snap it back into place.
10. Reconnect the battery negative cable.

NOTE: On vehicles equipped with the optional Sentry Key Immobilizer System (SKIS) if the SKREEM is replaced with a new unit, a diagnostic scan tool MUST be used to initialize the new SKREEM and to program at least two Sentry Key transponders before the vehicle can be operated. (Refer to 8 - ELECTRICAL/ VEHICLE THEFT SECURITY - STANDARD PROCEDURE - SKIS INITIALIZATION).

WIPERS/WASHERS

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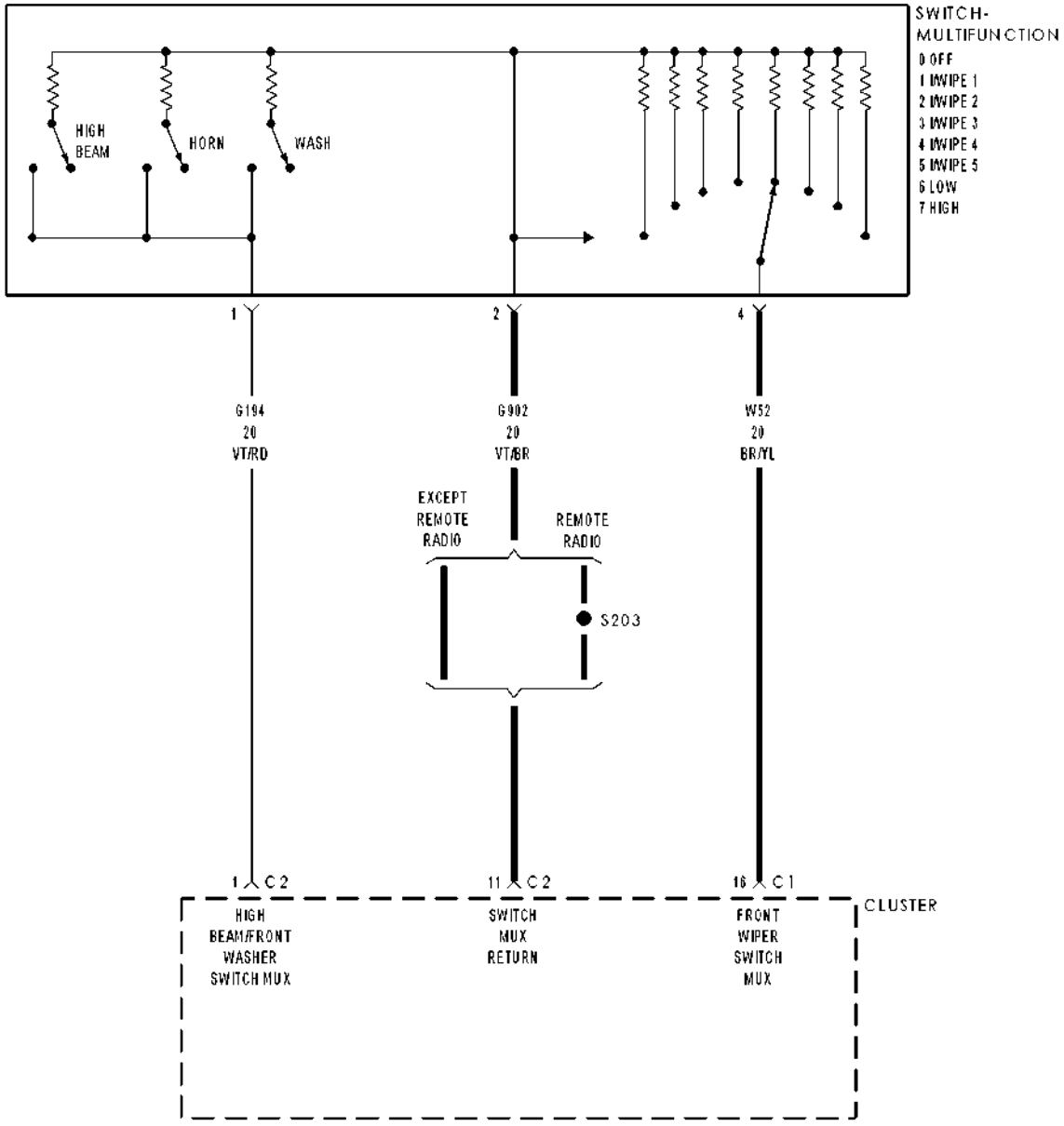
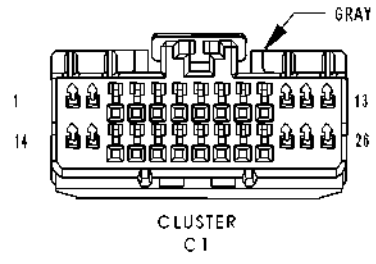
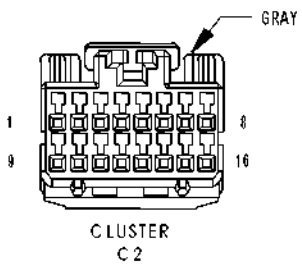
FRONT WIPERS/WASHERS - ELECTRICAL DIAGNOSTICS

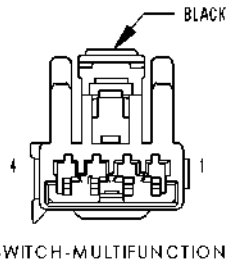
DIAGNOSIS AND TESTING

B2301-WIPER MODE SWITCH INPUT CIRCUIT LOW









B2301-WIPER MODE SWITCH INPUT CIRCUIT LOW (CONTINUED)

For the Wiper/Washer system circuit diagram (Refer to 8 - ELECTRICAL/WIPERS/WASHERS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the ignition on.
- **Set Condition:**
- When the Instrument Cluster detects a short/HIGH condition.

Possible Causes
MULTIFUNCTION SWITCH
SENSE CIRCUIT OPEN
INSTRUMENT CLUSTER

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.
With the Scan Tool, clear all CCN DTC's.
Turn the Wipers ON then OFF.
With the Scan Tool, read the Wiper DTC's.

Does the Scan Tool read: B2301-WIPER MODE SWITCH INPUT CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST — VER 1.

---

2. MULTIFUNCTION SWITCH

Turn the ignition off.
Disconnect the Multifunction Switch harness connector.
Ensure the switch is in the OFF position.
Measure the internal resistance of the Multifunction Switch between the G902 and W52 circuits.

Does the Switch measure more than 5.0 ohms?

Yes >> Replace the Multifunction Switch in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.

No >> Go To 3

B2301-WIPER MODE SWITCH INPUT CIRCUIT LOW (CONTINUED)

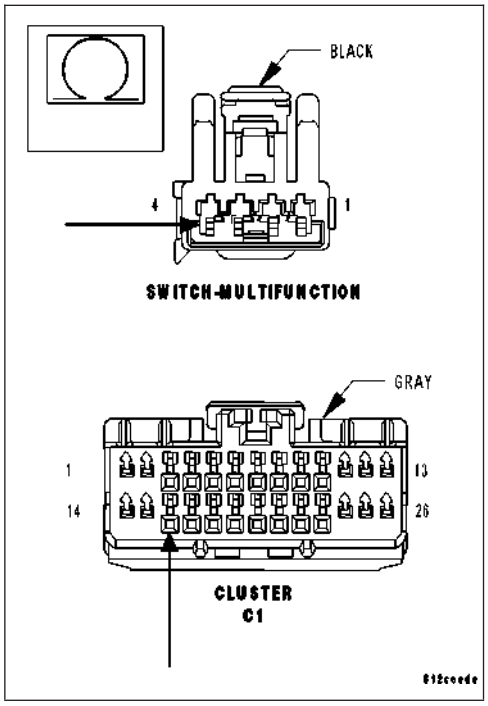
3. INSTRUMENT CLUSTER

Turn the ignition off.
Disconnect the Multifunction Switch connector.
Disconnect the Instrument Cluster C1 harness connector.
Measure the resistance of the (W2) MUX circuit to ground.

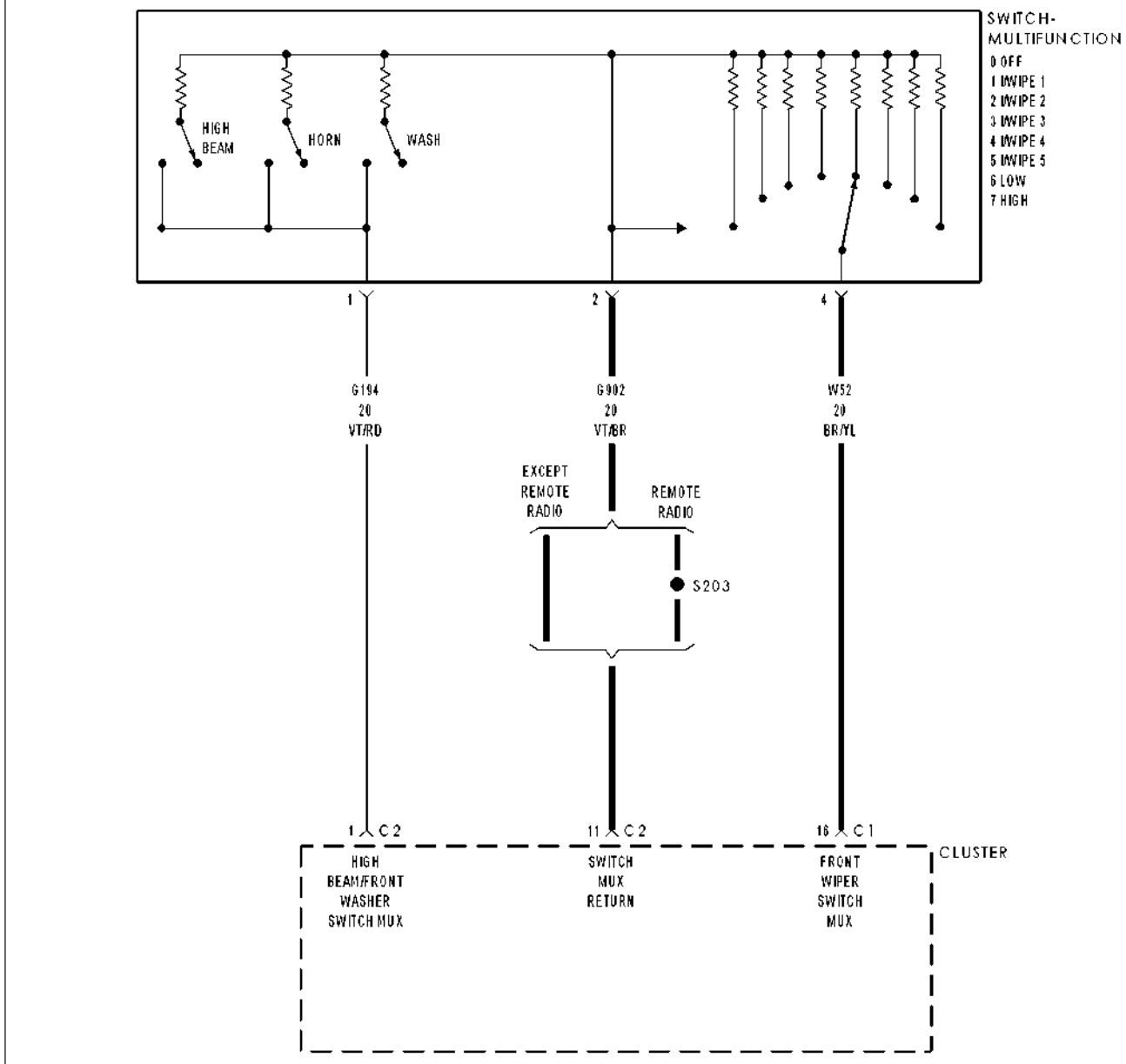
Is the resistance below 5.0 ohms?

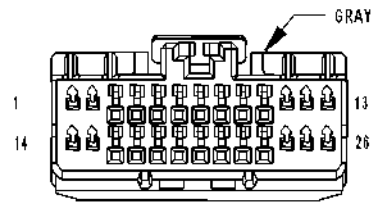
Yes >> Repair the (W2) MUX circuit for a short to ground condition.
Perform the BODY VERIFICATION TEST — VER 1.

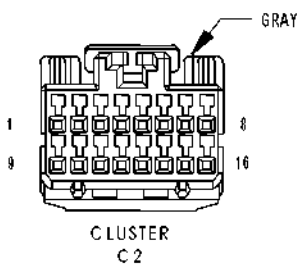
No >> Replace the Instrument Cluster in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.

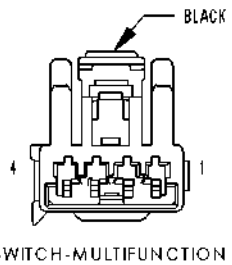


B2302-WIPER MODE SWITCH INPUT CIRCUIT HIGH









B2302-WIPER MODE SWITCH INPUT CIRCUIT HIGH (CONTINUED)

For the Wiper/Washer system circuit diagram (Refer to 8 - ELECTRICAL/WIPERS/WASHERS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the ignition on.
- **Set Condition:**
- When the Instrument Cluster detects a short/HIGH condition.

Possible Causes
MULTIFUNCTION SWITCH
SENSE CIRCUIT OPEN
INSTRUMENT CLUSTER

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.
With the Scan Tool, clear all CCN DTC's.
Turn the Wipers ON then OFF.
With the Scan Tool, read the Wiper DTC's.

Does the Scan Tool read: B2302-WIPER MODE SWITCH INPUT CIRCUIT HIGH?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST — VER 1.

---

2. MULTIFUNCTION SWITCH

Turn the ignition off.
Disconnect the Multifunction Switch harness connector.
Ensure the switch is in the OFF position.
Measure the internal resistance of the Multifunction Switch between the G902 and W52 circuits.

Does the Switch measure more than 5.0 ohms?

Yes >> Replace the Multifunction Switch in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.

No >> Go To 3

B2302-WIPER MODE SWITCH INPUT CIRCUIT HIGH (CONTINUED)

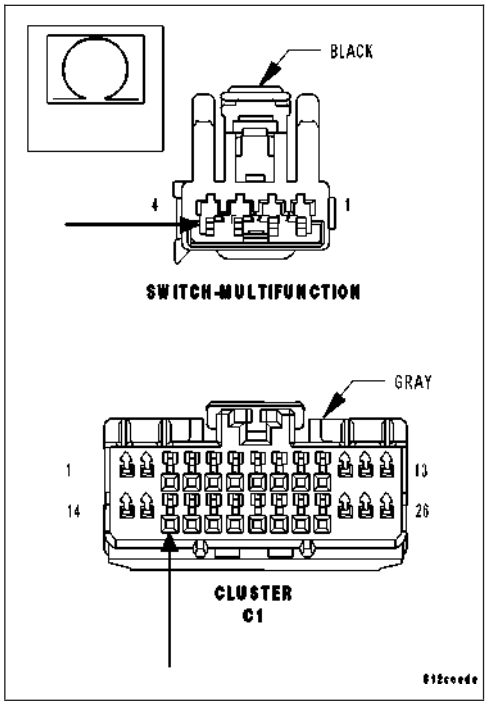
3. INSTRUMENT CLUSTER

Turn the ignition off.
Disconnect the Multifunction Switch connector.
Disconnect the Instrument Cluster C1 harness connector.
Measure the resistance of the (W2) MUX circuit.

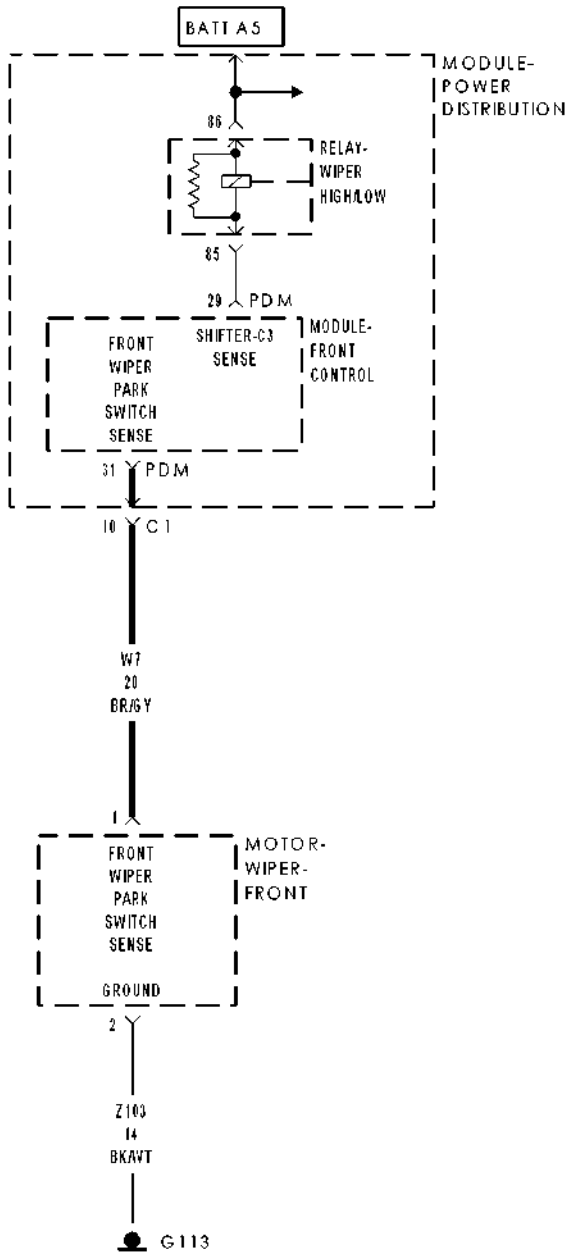
Is the resistance above 5.0 ohms?

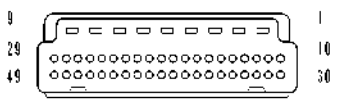
Yes >> Repair the (W2) MUX circuit for an open condition.
Perform the BODY VERIFICATION TEST — VER 1.

No >> Replace the Instrument Cluster in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.

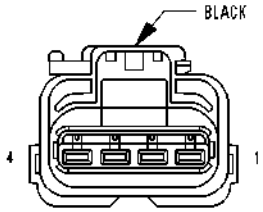


B2304-WIPER PARK SWITCH INPUT CIRCUIT LOW





MODULE-
FRONT
CONTROL
PDM



MOTOR-WIPER-FRONT

8r2c34a0

B2304-WIPER PARK SWITCH INPUT CIRCUIT LOW (CONTINUED)

For the Front/Rear Wipers/Washers circuit diagram (Refer to 8 - ELECTRICAL/WIPERS/WASHERS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- **Set Condition:**

Possible Causes
MULTIFUNCTION SWITCH
(W7) FRONT WIPER PARK SWITCH SENSE CIRCUIT LOW
FRONT CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all FCM DTC's.

Turn the Wipers on.

With the Scan Tool, read the Wiper DTC's.

Does the Scan Tool read: B2304-WIPER PARK SWITCH INPUT CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST — VER 1.

---

2. MULTIFUNCTION SWITCH

Turn the ignition off.

Disconnect the Multifunction Switch connector.

Measure the internal resistance of the Multifunction Switch between cavity 1 and 4 of the switch.

Is the resistance above 5.0 ohms?

Yes >> Replace the Multifunction Switch in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.

No >> Go To 3

B2304-WIPER PARK SWITCH INPUT CIRCUIT LOW (CONTINUED)

3. FRONT CONTROL MODULE

Turn the ignition off.

Disconnect the Multifunction Switch connector.

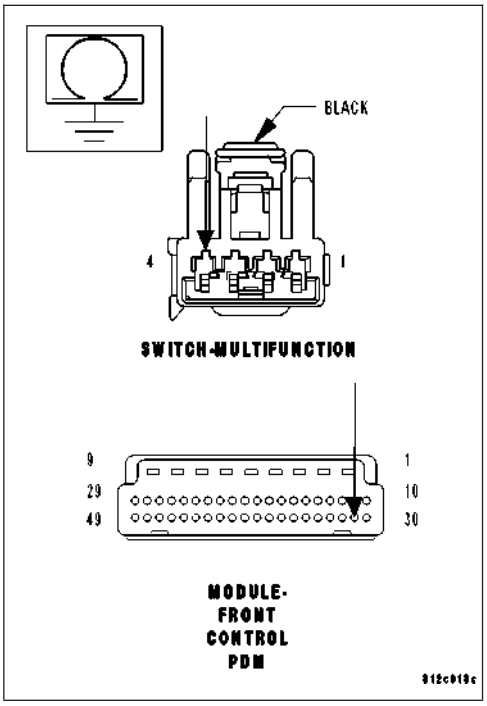
Disconnect the FCM C1 harness connector.

Measure the resistance between ground and the (W7) Front Wiper Park Switch Sense circuit.

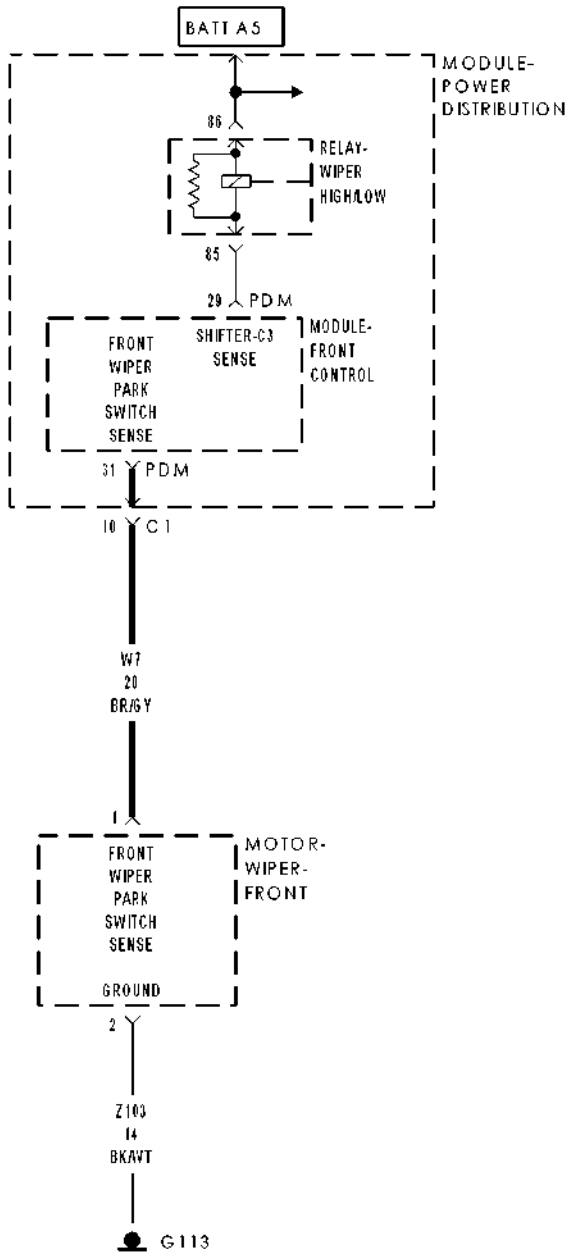
Is the resistance below 5.0 ohms?

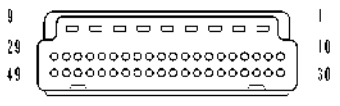
Yes >> Repair the (W7) Front Wiper Park Switch Sense circuit for a short condition.
Perform the BODY VERIFICATION TEST — VER 1.

No >> Replace the Front Control Module in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.

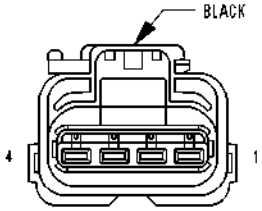


B2305-WIPER PARK SWITCH INPUT CIRCUIT HIGH





MODULE-
FRONT
CONTROL
PDM



MOTOR-WIPER-FRONT

8r2c34a0

B2305-WIPER PARK SWITCH INPUT CIRCUIT HIGH (CONTINUED)

For the Rear Wipers/Washers circuit diagram (Refer to 8 - ELECTRICAL/WIPERS/WASHERS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- **Set Condition:**

Possible Causes
MULTIFUNCTION SWITCH
(W7) FRONT WIPER PARK SWITCH SENSE CIRCUIT HIGH
FRONT CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all FCM DTC's.

Turn the Front Wipers on.

With the Scan Tool, read the Front Wiper DTC's.

Does the Scan Tool read: B2305-WIPER PARK SWITCH INPUT CIRCUIT HIGH?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST — VER 1.

---

2. MULTIFUNCTION SWITCH

Turn the ignition off.

Disconnect the Multifunction Switch connector.

Measure the internal resistance of the Multifunction Switch between cavity 2 and 4 of the switch.

Is the resistance above 5.0 ohms?

Yes >> Replace the Multifunction Switch in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.

No >> Go To 3

B2305-WIPER PARK SWITCH INPUT CIRCUIT HIGH (CONTINUED)

3. FRONT CONTROL MODULE

Turn the ignition off.

Disconnect the Multifunction Switch connector.

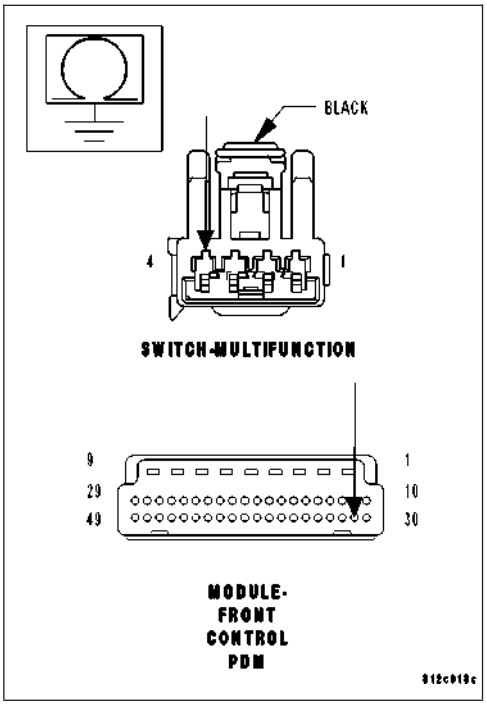
Disconnect the FCM C1 harness connector.

Measure the resistance of the (W7) Front Wiper Park Switch Sense circuit.

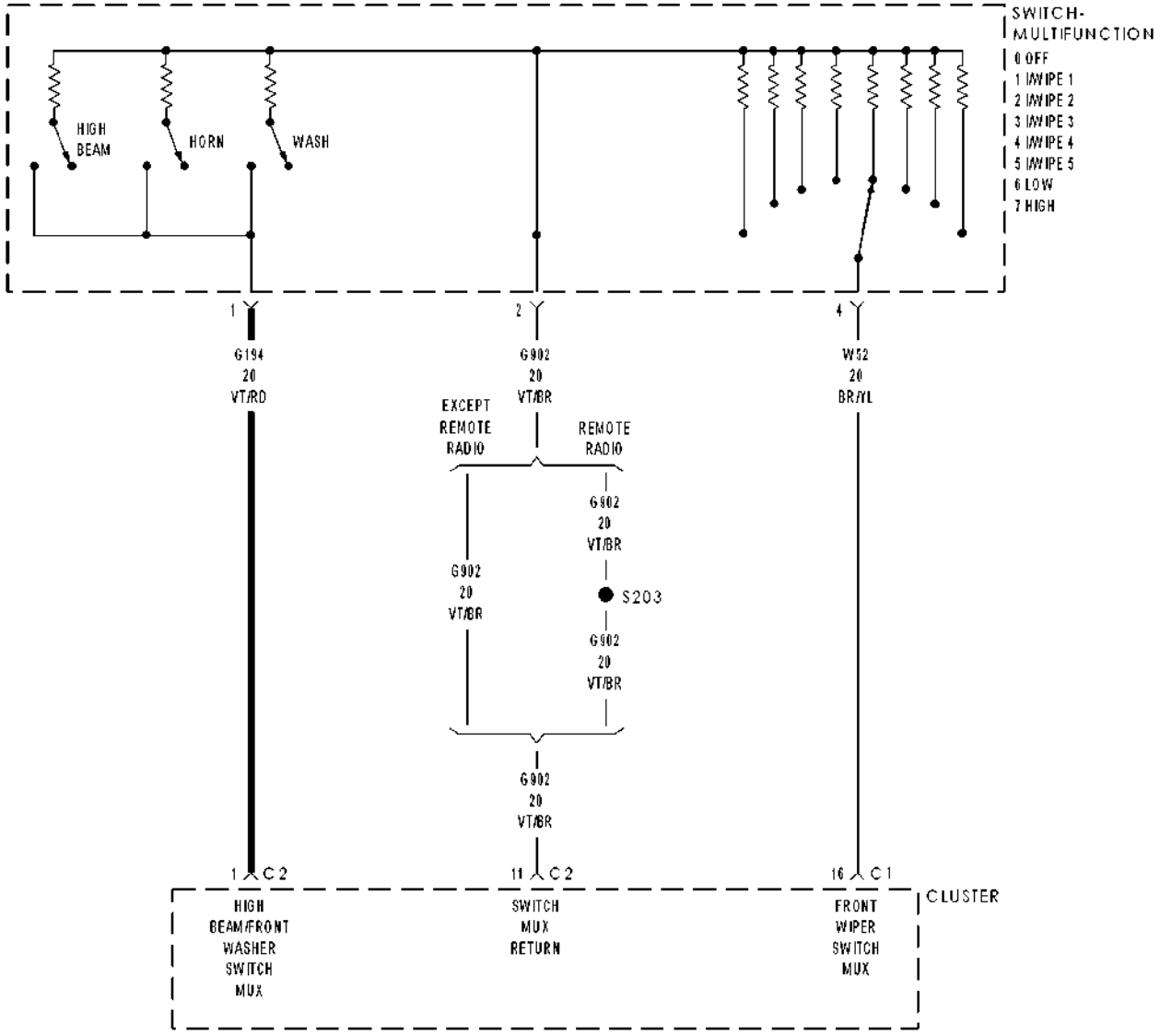
Is the resistance above 5.0 ohms?

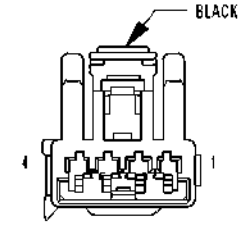
Yes >> Repair the (W7) Front Wiper Park Switch Sense circuit for an open condition.
Perform the BODY VERIFICATION TEST — VER 1.

No >> Replace the Front Control Module in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.

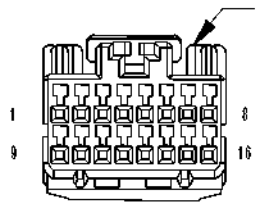


B2307-WASHER SWITCH INPUT CIRCUIT LOW





SWITCH-MULTIFUNCTION



CLUSTER
C2

B2307-WASHER SWITCH INPUT CIRCUIT LOW (CONTINUED)

For the Wiper/Washer system circuit diagram (Refer to 8 - ELECTRICAL/WIPERS/WASHERS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the ignition on.
- **Set Condition:**
- When the Instrument Cluster detects a short condition.

Possible Causes
MULTIFUNCTION SWITCH
(G194) SWITCH MUX CIRCUIT OPEN
INSTRUMENT CLUSTER

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.
With the Scan Tool, clear all CCN DTC's.
Turn the Washers ON then OFF.
With the Scan Tool, read the Washer DTC's.

Does the Scan Tool read: B2301-WIPER MODE SWITCH INPUT CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST — VER 1.

---

2. MULTIFUNCTION SWITCH

Turn the ignition off.
Disconnect the Multifunction Switch harness connector.
Ensure the switch is in the OFF position.
Measure the internal resistance of the Multifunction Switch between the G902 and G194 circuits.

Does the Switch measure more than 5.0 ohms?

Yes >> Replace the Multifunction Switch in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.

No >> Go To 3

B2307-WASHER SWITCH INPUT CIRCUIT LOW (CONTINUED)

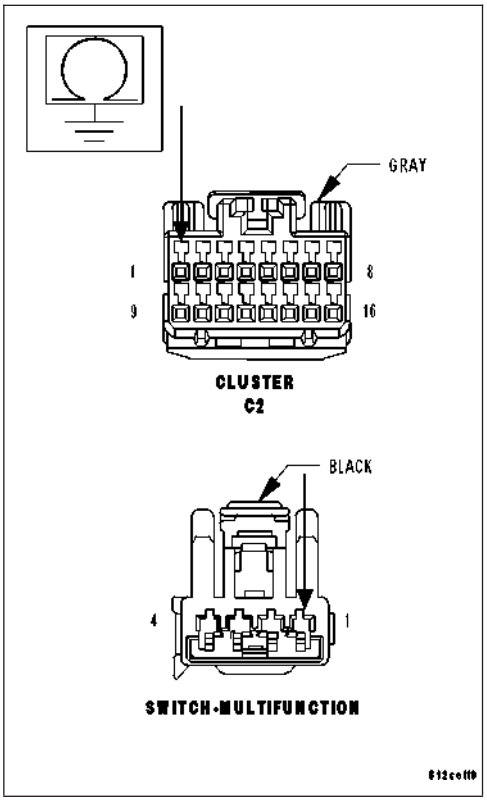
3. INSTRUMENT CLUSTER

Turn the ignition off.
Disconnect the Multifunction Switch connector.
Disconnect the Instrument Cluster C2 harness connector.
Measure the resistance of the (G194) MUX circuit to ground.

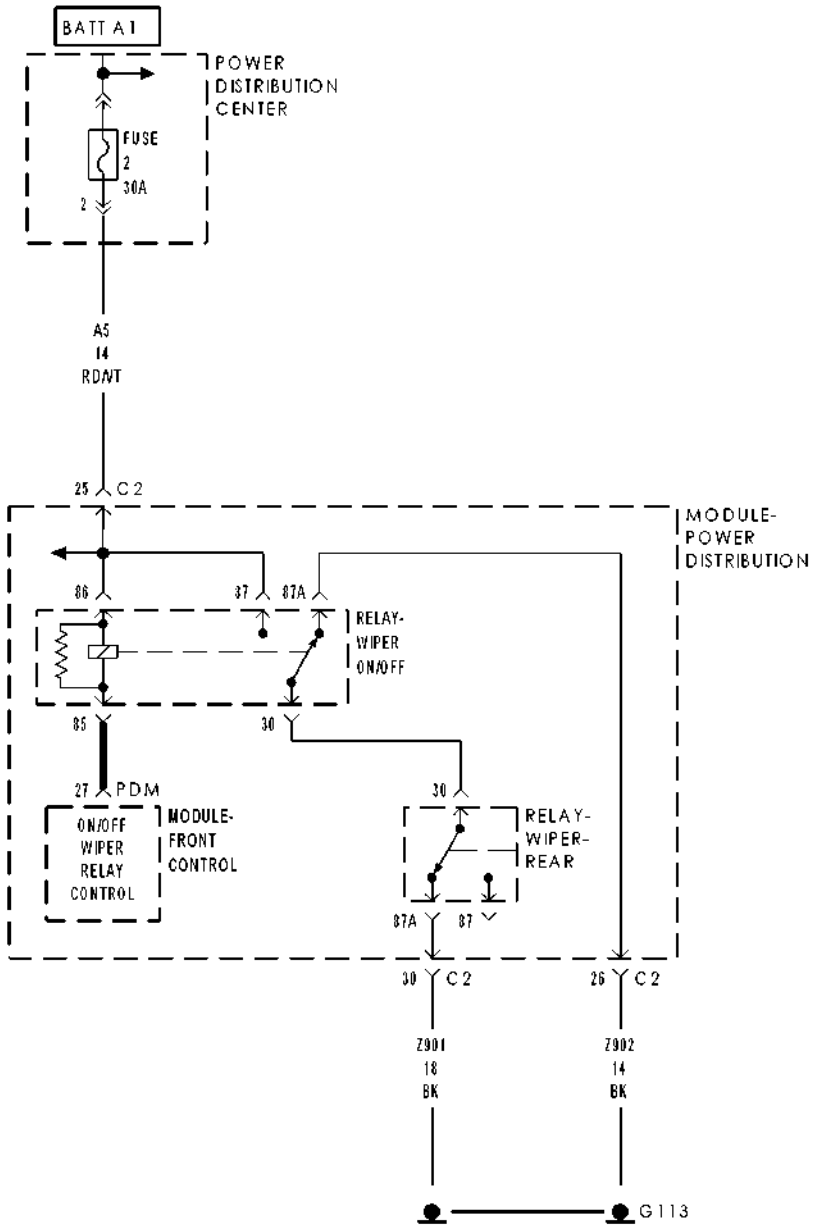
Is the resistance below 5.0 ohms?

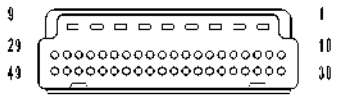
Yes >> Repair the (G194) MUX circuit for a short to ground condition.
Perform the BODY VERIFICATION TEST — VER 1.

No >> Replace the Instrument Cluster in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.



B2313-WIPER ON/OFF CONTROL CIRCUIT LOW





MODULE-FRONT CONTROL PDM

8r2cd50b

B2313-WIPER ON/OFF CONTROL CIRCUIT LOW (CONTINUED)

For the Wiper/Washer system circuit diagram (Refer to 8 - ELECTRICAL/WIPERS/WASHERS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the ignition on.
- **Set Condition:**
- When the FCM detects a short/low condition.

Possible Causes
WIPER ON/OFF RELAY
POWER DISTRIBUTION CENTER
FRONT CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.
With the Scan Tool, clear all FCM DTC's.
Turn the Wipers ON then OFF.
With the Scan Tool, read the Wiper DTC's.

Does the Scan Tool read: B2313-WIPER ON/OFF CONTROL CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST — VER 1.

---

2. WIPER ON/OFF RELAY

Turn the ignition off.
Install a substitute relay in place of the Wiper On/Off Relay.
Turn the ignition on.
With the Scan Tool, read the DTC's.

Does the Scan Tool read: B2313-WIPER ON/OFF CONTROL CIRCUIT LOW?

Yes >> Go To 3

No >> Replace the Wiper On/Off Relay in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.

B2313-WIPER ON/OFF CONTROL CIRCUIT LOW (CONTINUED)

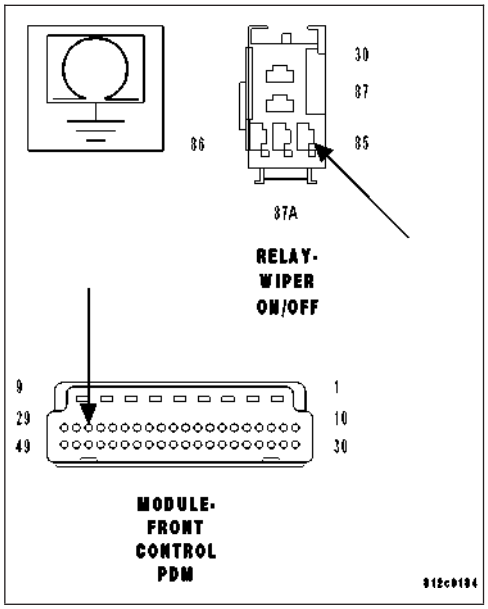
3. Front Control Module

Turn the ignition off.

Remove the Wiper On/Off Relay.

Disconnect the FCM C3 harness connector.

Measure the resistance between ground and the Wiper On/Off Relay Control circuit in the PDC.

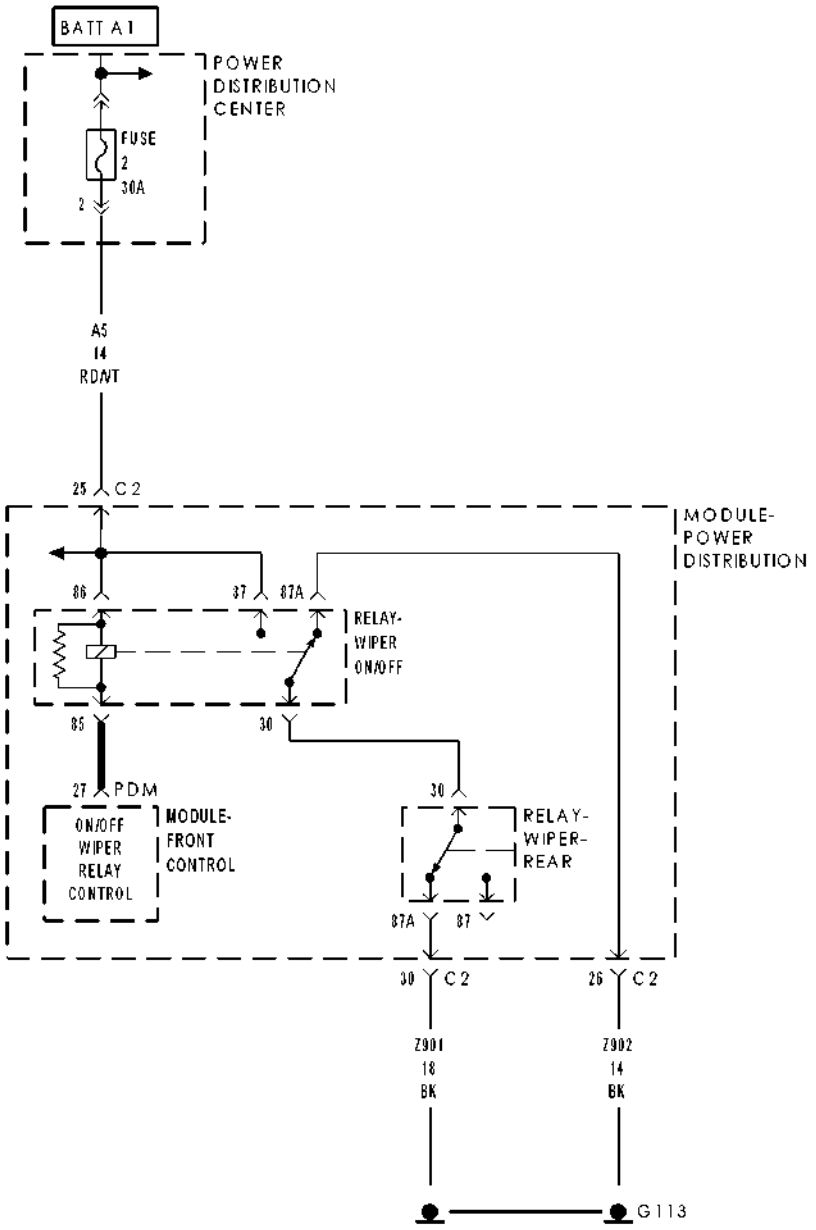


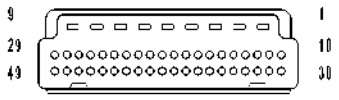
Is the resistance below 5.0 ohms?

Yes >> Replace the Power Distribution Center in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.

No >> Replace the Front Control Module in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.

B2314-WIPER ON/OFF CONTROL CIRCUIT HIGH





MODULE-FRONT CONTROL PDM

8r2cd50b

B2314-WIPER ON/OFF CONTROL CIRCUIT HIGH (CONTINUED)

For the Wiper/Washer system circuit diagram (Refer to 8 - ELECTRICAL/WIPERS/WASHERS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the ignition on.
- **Set Condition:**
- When the FCM detects a short/HIGH condition.

Possible Causes
WIPER ON/OFF RELAY
POWER DISTRIBUTION CENTER
FRONT CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.
With the Scan Tool, clear all FCM DTC's.
Turn the Wipers ON then OFF.
With the Scan Tool, read the Wiper DTC's.

Does the Scan Tool read: B2314-WIPER ON/OFF CONTROL CIRCUIT HIGH?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST — VER 1.

---

2. WIPER ON/OFF RELAY

Turn the ignition off.
Remove the Wiper On/Off Relay.
Turn the ignition on.
Activate the Wiper Switch to all speed positions.
With the Scan Tool, read the DTC's.

Does the Scan Tool read: B2314-WIPER ON/OFF CONTROL CIRCUIT HIGH?

Yes >> Replace the Wiper On/Off Relay in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.

No >> Go To 3

B2314-WIPER ON/OFF CONTROL CIRCUIT HIGH (CONTINUED)

3. FRONT CONTROL MODULE

Turn the ignition off.

Remove the Wiper On/Off Relay.

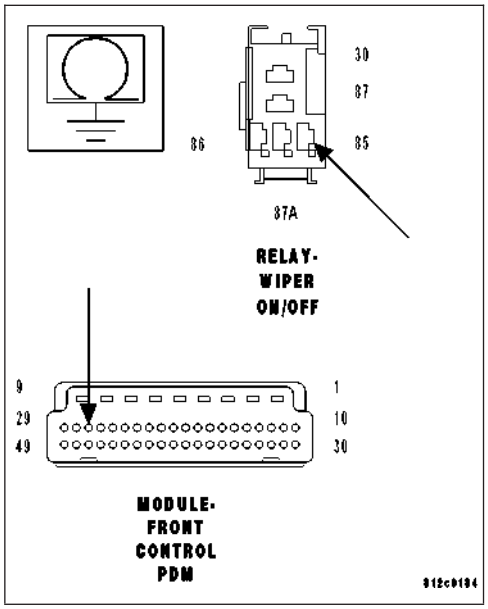
Disconnect the FCM C3 harness connector.

Measure the voltage between ground and the Wiper On/Off Relay Control circuit in the PDC.

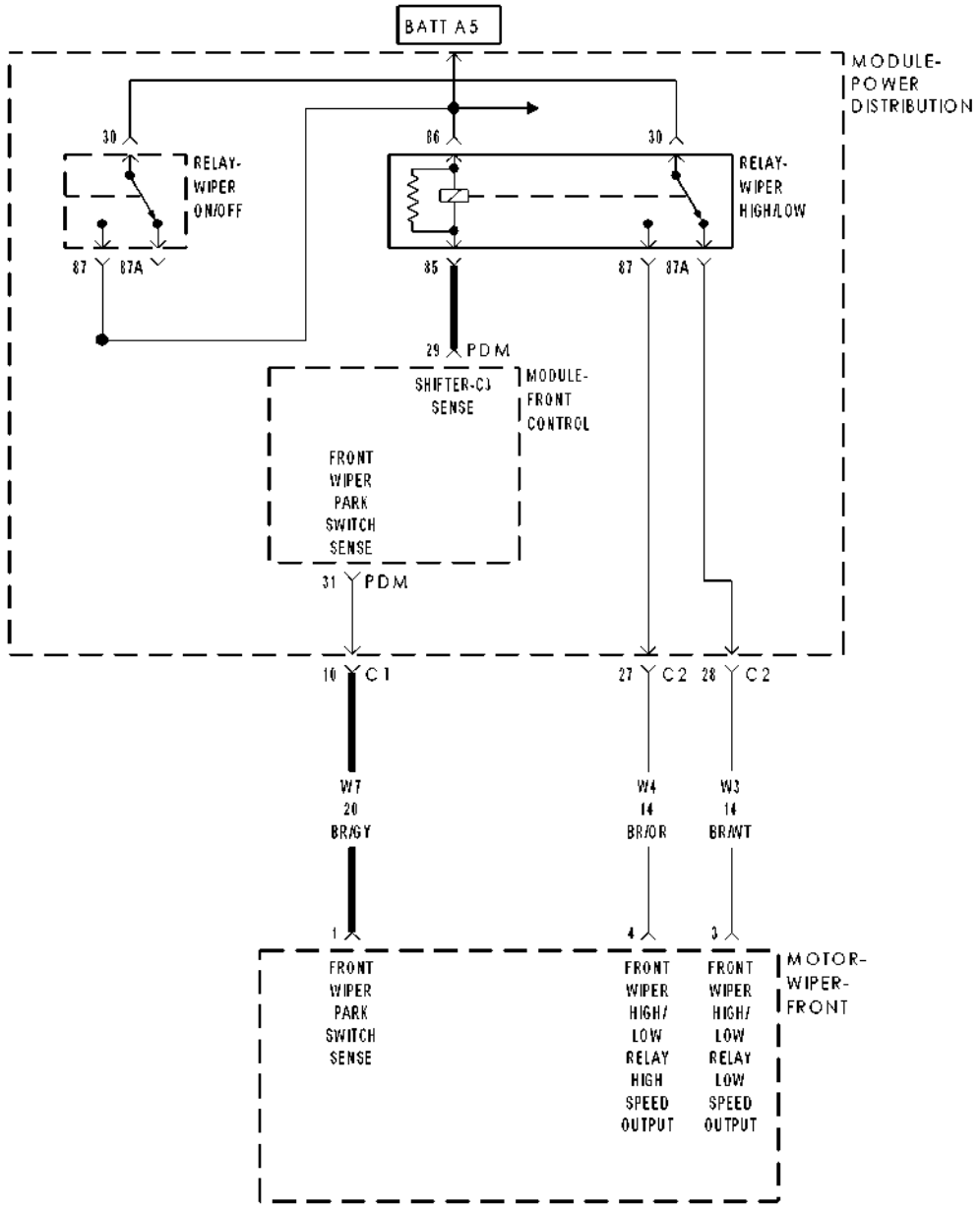
Is there any voltage present?

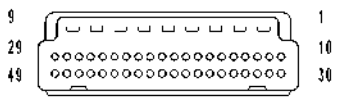
Yes >> Replace the Power Distribution Center in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.

No >> Replace the Front Control Module in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.

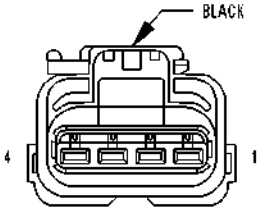


B2317-WIPER HI/LOW CONTROL CIRCUIT LOW





MODULE-
FRONT
CONTROL
PDM



MOTOR-WIPER-FRONT

81cc6519

B2317-WIPER HI/LOW CONTROL CIRCUIT LOW (CONTINUED)

For the Wiper/Washer system circuit diagram (Refer to 8 - ELECTRICAL/WIPERS/WASHERS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the ignition on.
- **Set Condition:**
- When the FCM detects a short/low condition.

Possible Causes
WIPER HIGH/LOW RELAY
POWER DISTRIBUTION CENTER
FRONT CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.
With the Scan Tool, clear all FCM DTC's.
Turn the Wipers from High to Low.
With the Scan Tool, read the Wiper DTC's.

Does the Scan Tool read: B2317-WIPER HI/LOW CONTROL CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST — VER 1.

---

2. WIPER HI/LOW RELAY

Turn the ignition off.
Install a substitute relay in place of the Wiper Hi/Low Relay.
Turn the ignition on.
With the Scan Tool, read the DTC's.

Does the Scan Tool read: B2317-WIPER HI/LOW CONTROL CIRCUIT LOW?

Yes >> Go To 3

No >> Replace the Wiper Hi/Low Relay in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.

B2317-WIPER HI/LOW CONTROL CIRCUIT LOW (CONTINUED)

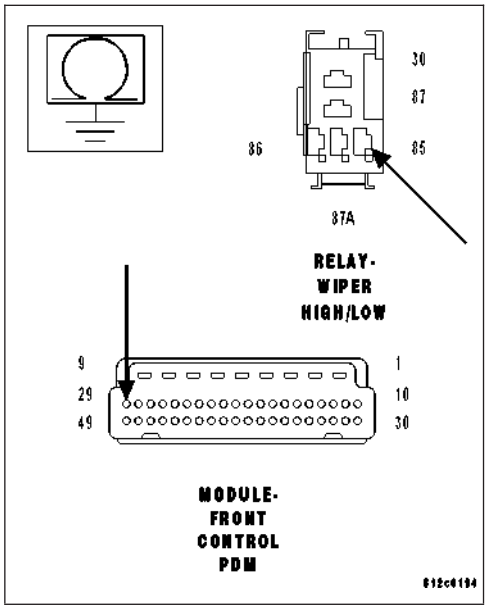
3. FRONT CONTROL MODULE

Turn the ignition off.

Remove the Wiper Hi/Low Relay.

Disconnect the FCM C3 harness connector.

Measure the resistance between ground and the Wiper Hi/Low Relay Control circuit in the PDC.

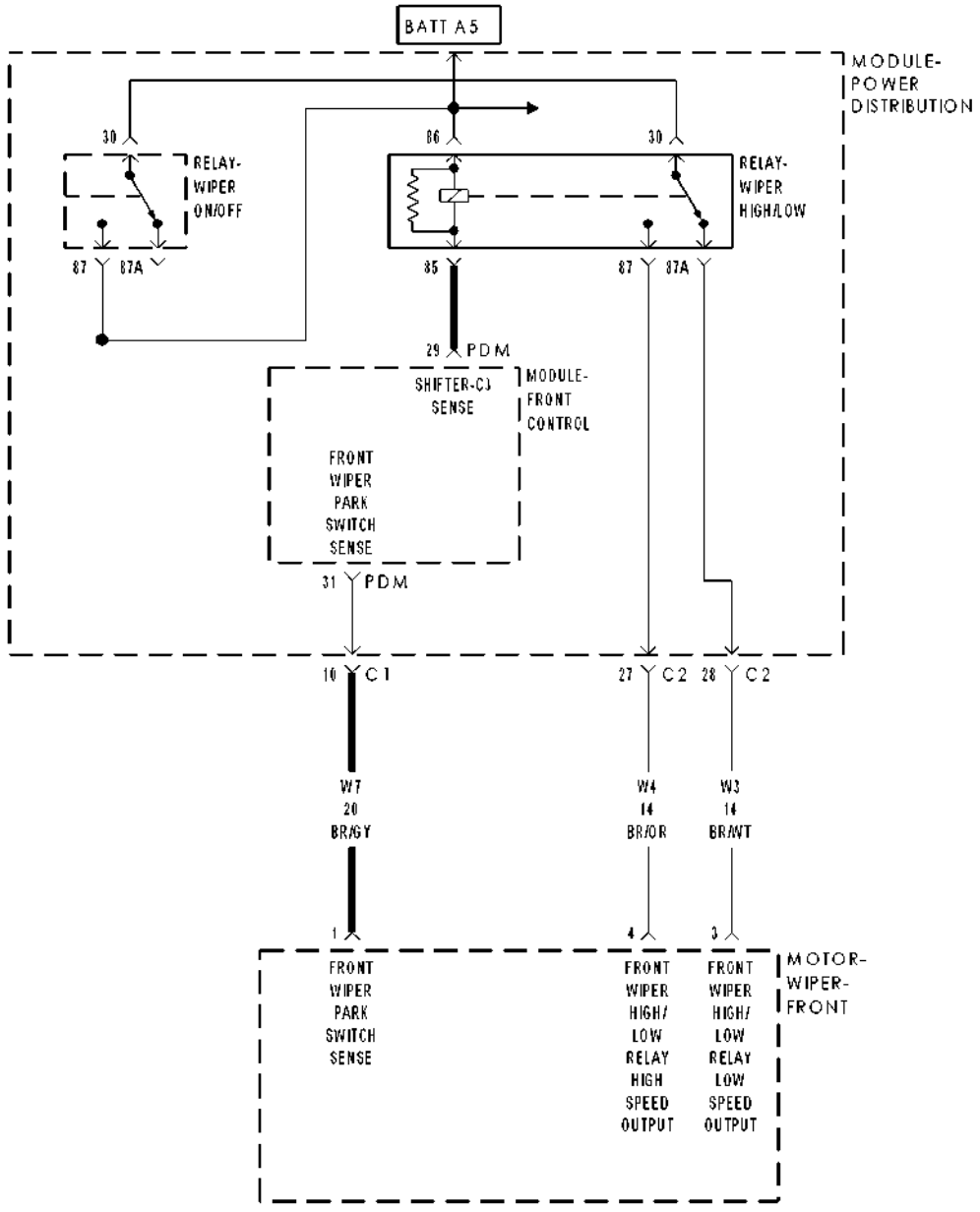


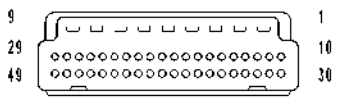
Is the resistance below 5.0 ohms?

Yes >> Replace the Power Distribution Center in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.

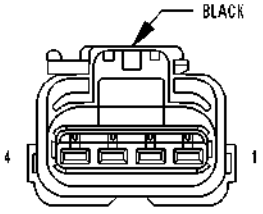
No >> Replace the Front Control Module in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.

B2318-WIPER HI/LOW CONTROL CIRCUIT HIGH





MODULE-
FRONT
CONTROL
PDM



MOTOR-WIPER-FRONT

81ccb519

B2318-WIPER HI/LOW CONTROL CIRCUIT HIGH (CONTINUED)

For the Wiper/Washer system circuit diagram (Refer to 8 - ELECTRICAL/WIPERS/WASHERS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the ignition on.
- **Set Condition:**
- When the FCM detects a short/HIGH condition.

Possible Causes
WIPER HIGH/LOW RELAY
POWER DISTRIBUTION CENTER
FRONT CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.
With the Scan Tool, clear all FCM DTC's.
Turn the Wipers to Low then High.
With the Scan Tool, read the Wiper DTC's.

Does the Scan Tool read: B2318-WIPER HI/LOW CONTROL CIRCUIT HIGH?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST — VER 1.

---

2. WIPER HIGH/LOW RELAY

Turn the ignition off.
Remove the Wiper Hi/Low Relay.
Turn the ignition on.
Activate the Wiper Switch to all speed positions.
With the Scan Tool, read the DTC's.

Does the Scan Tool read: B2318-WIPER HI/LOW CONTROL CIRCUIT HIGH?

Yes >> Replace the Wiper Hi/Low Relay in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.

No >> Go To 3

B2318-WIPER HI/LOW CONTROL CIRCUIT HIGH (CONTINUED)

3. FRONT CONTROL MODULE

Turn the ignition off.

Remove the Wiper Hi/Low Relay.

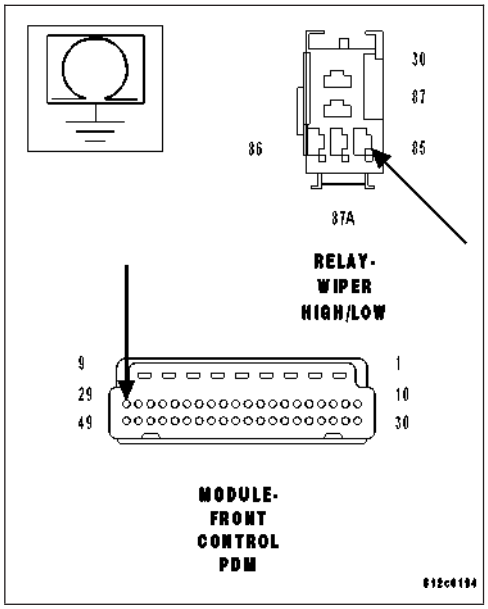
Disconnect the FCM C3 harness connector.

Measure the voltage between ground and the (W2) Wiper Hi/Low Relay Control circuit in the PDC.

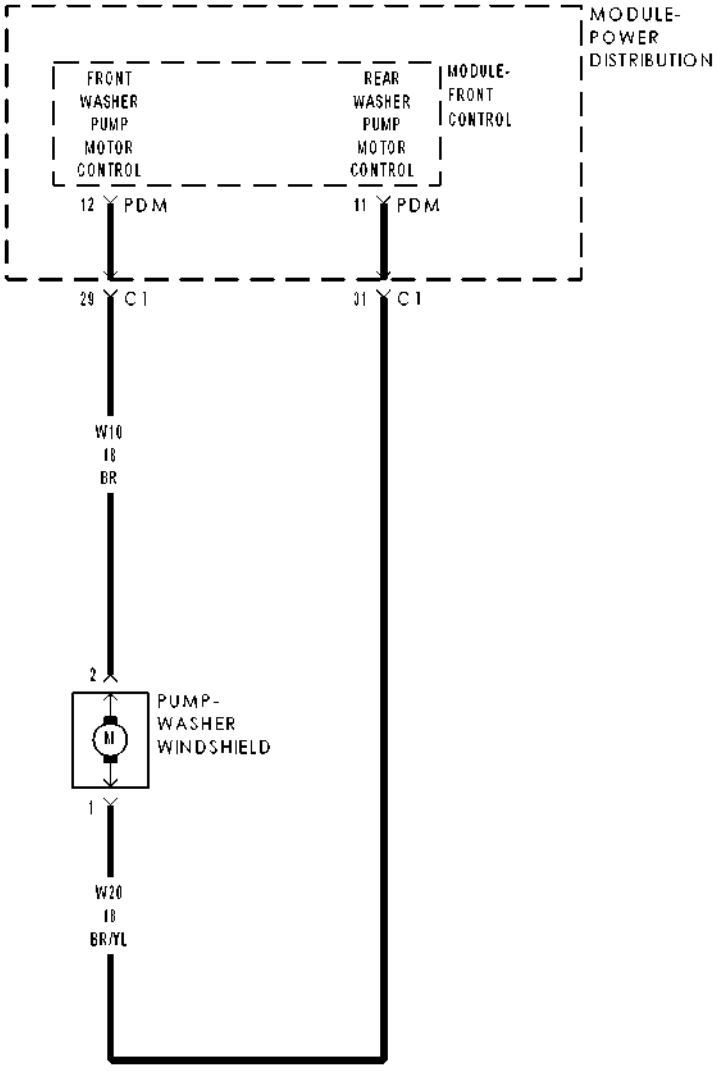
Is there any voltage present?

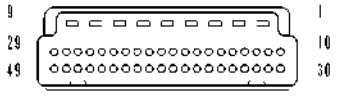
Yes >> Replace the Power Distribution Center in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.

No >> Replace the Front Control Module in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.

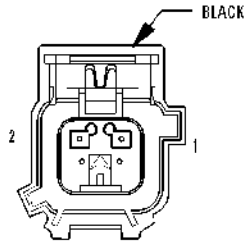


B231F-FRONT/REAR WASHER MOTOR CONTROL CIRCUIT LOW





MODULE-
FRONT
CONTROL
PDM



PUMP-WASHER-WINDSHEILD

B231F-FRONT/REAR WASHER MOTOR CONTROL CIRCUIT LOW (CONTINUED)

For the Wiper/Washer system circuit diagram (Refer to 8 - ELECTRICAL/WIPERS/WASHERS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- With the ignition on.
- **Set Condition:**
- When the FCM detects a short/low condition on the washer Pump Motor Control circuit.

Possible Causes
(W10)/(W20) WASHER PUMP MOTOR CONTROL CIRCUIT
WIPER WASHER PUMP
POWER DISTRIBUTION CENTER
FRONT CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.
With the Scan Tool, clear all FCM DTC's.
Turn the Washers on.
With the Scan Tool, read the Wiper/Washers DTC's.

Does the Scan Tool read: B231F-FRONT/REAR WASHER MOTOR CONTROL CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST — VER 1.

---

2. WASHER PUMP MOTOR

Turn the ignition off.
Disconnect the Washer Pump Motor connector.
Turn the ignition on.
With the Scan Tool, read the DTC's.

Does the Scan Tool read:B231F-FRONT/REAR WASHER MOTOR CONTROL CIRCUIT LOW?

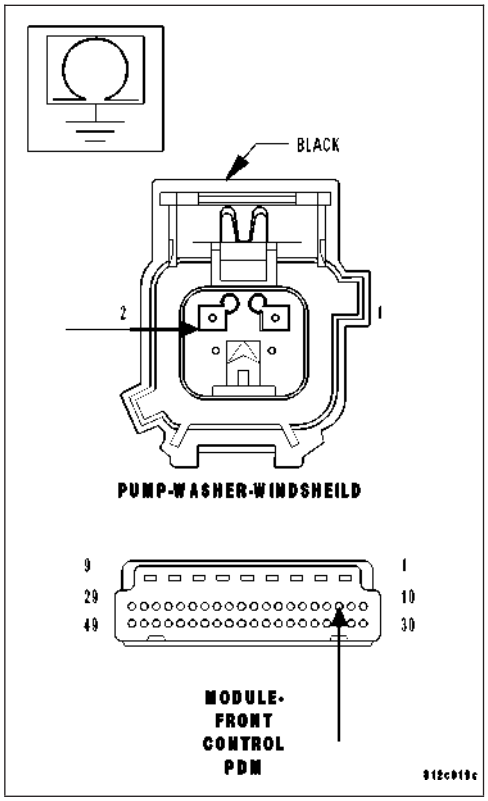
Yes >> Replace the Washer Pump Motor in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.

No >> Go To 3

B231F-FRONT/REAR WASHER MOTOR CONTROL CIRCUIT LOW (CONTINUED)

3. WASHER PUMP MOTOR CONTROL CIRCUIT

Turn the ignition off.
Disconnect the Washer Pump Motor harness connector.
Disconnect the FCM C3 harness connector.
Measure the resistance between ground and the (W10) Washer Pump Motor Control circuit in the.



Is the resistance below 5.0 ohms?

Yes >> Repair the Washer Pump Motor Control circuit.
Perform the BODY VERIFICATION TEST — VER 1.

No >> Go To 4

4. FRONT CONTROL MODULE

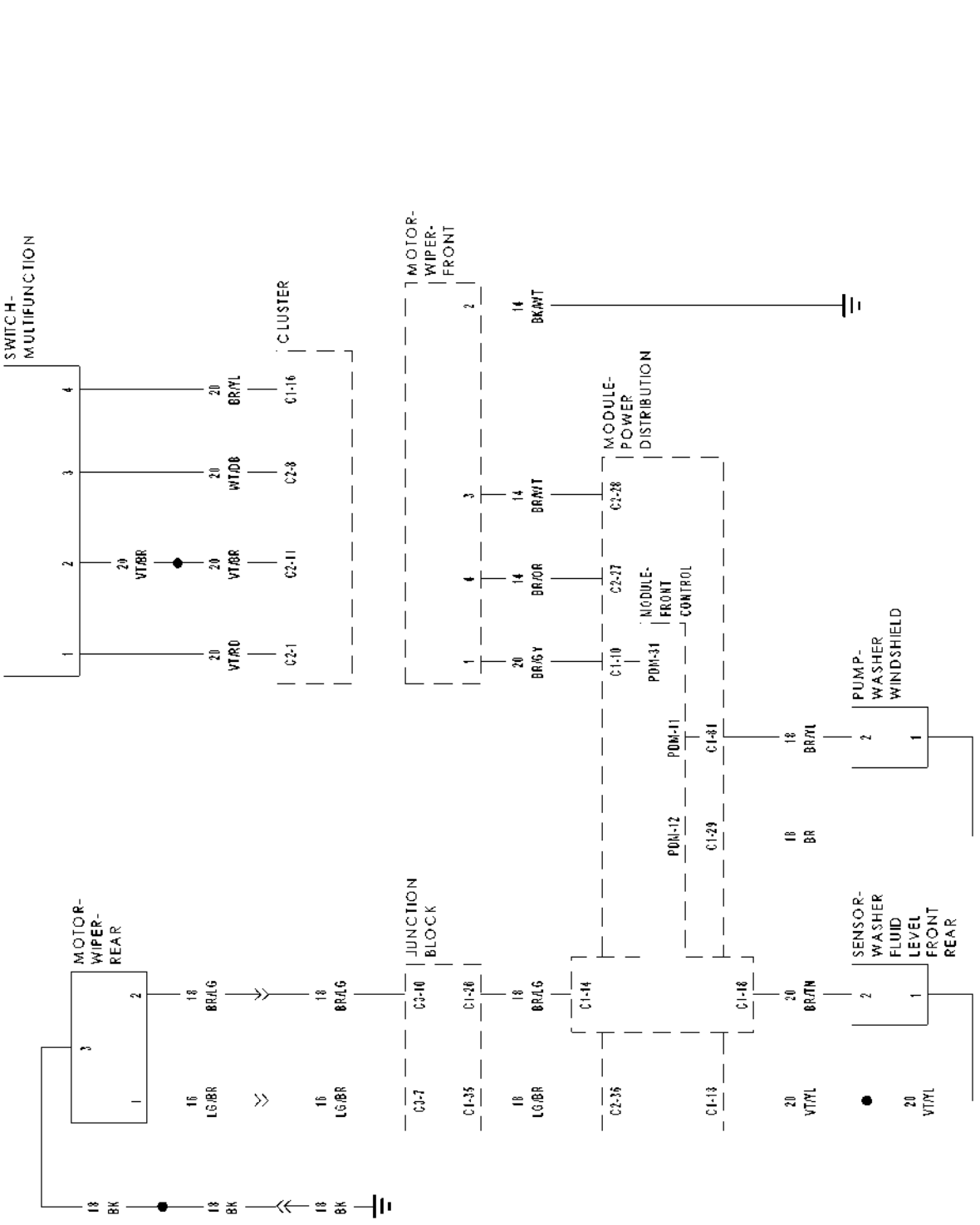
Turn the ignition off.
Disconnect the FCM from the PDC.
Measure the resistance between ground and the (W10) Washer Pump Motor Control circuit.

Is the resistance below 5.0 ohms?

Yes >> Replace the Power Distribution Center in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.

No >> Replace the Front Control Module in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.

SCHEMATICS AND DIAGRAMS



FRONT/REAR WIPERS WASHERS

FRONT WIPERS/WASHERS - SERVICE INFORMATION

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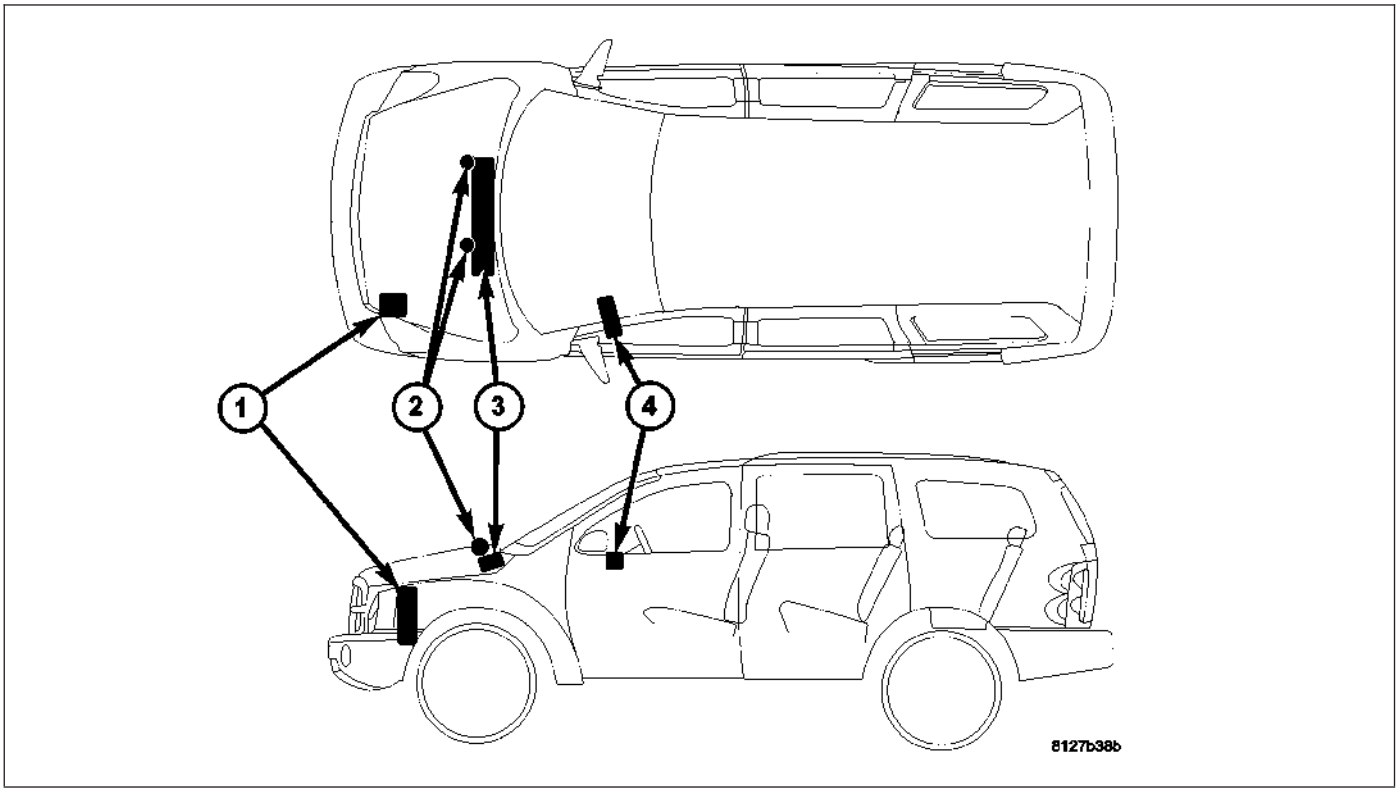
FRONT WIPERS/WASHERS - SERVICE INFORMATION

DESCRIPTION



An electrically operated intermittent front wiper and washer system is standard factory-installed safety equipment on this model. The wiper and washer system includes the following major components, which are described in further detail elsewhere in this service information:

- **Front Control Module** - The Front Control Module (FCM) is integral to the Integrated Power Module (IPM). The FCM/IPM is located in the engine compartment, near the battery and the Power Distribution Center (PDC). (Refer to 8 - ELECTRICAL/POWER DISTRIBUTION - DESCRIPTION).
- **Front Washer Nozzle (2)** - Two fluidic washer nozzles with integral check valves are secured by latch features to dedicated openings in the hood panel near the base of the windshield.
- **Front Washer Plumbing** - The plumbing for the washer system consists of rubber hoses and molded plastic fittings. The plumbing is routed along the underside of the Power Distribution Center (PDC) bracket to the engine compartment from the washer reservoir. The front washer hose is routed across the underside of the hood panel to the washer nozzles.
- **Front Wiper Arm** - The two wiper arms are secured with nuts to the threaded ends of the two wiper pivot shafts, which extend through the cowl plenum cover/grille panel located near the base of the windshield. The right arm is articulated by a unique linkage arrangement to increase the wiped area of the windshield glass.
- **Front Wiper Blade** - The two unequal length wiper blades are secured to the two wiper arms with an integral latch, and are parked on the glass near the bottom of the windshield when the wiper system is not in operation.
- **Front Wiper Module (3)** - The wiper pivot shafts are the only visible components of the front wiper module. The remainder of the module is concealed within the engine compartment beneath the cowl plenum cover/grille panel. The wiper module includes a cast aluminum wiper module bracket, four rubber-isolated wiper module mounts, the wiper motor, the wiper motor crank arm, the two wiper drive links, the two powered wiper pivots, and a static pivot point that is located outboard of the right pivot for the articulating link of the right wiper arm.
- **Instrument Cluster** - The ElectroMechanical Instrument Cluster (EMIC) is also known as the Cab Control Node (CCN) in this vehicle. The EMIC/CCN is located in the instrument panel above the steering column opening, directly in front of the driver. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DESCRIPTION).
- **Multi-Function Switch (4)** - The multi-function switch is located on the top of the steering column, just below the steering wheel. A control stalk that extends from the left side of the switch has a control knob on the end

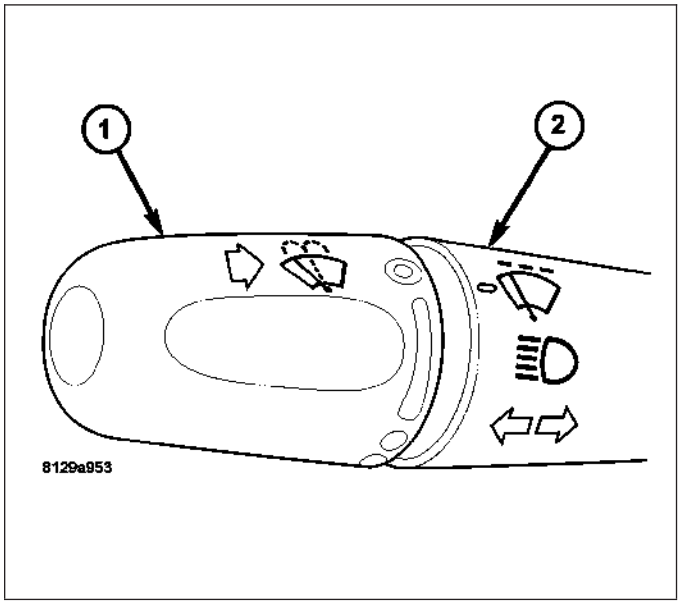
that is dedicated to providing all of the driver controls for the front wiper and washer systems. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/MULTI-FUNCTION SWITCH - DESCRIPTION).

- **Washer Fluid Level Switch** - The washer fluid level switch is located in a dedicated hole on the lower, rearward facing surface of the washer reservoir, ahead of the left front wheel house splash shield.
- **Washer Pump/Motor** - The reversible electric washer pump/motor unit is located in a dedicated hole on the lower, rearward facing surface of the washer reservoir, ahead of the left front wheel house splash shield. This single reversible washer pump/motor provides washer fluid to either the front or rear washer system plumbing, depending upon the direction of the pump motor rotation.
- **Washer Reservoir (1)** - The washer reservoir is combined with the engine coolant reserve bottle located on the radiator support to the left of the air conditioning condenser in the engine compartment. This combined reservoir has separate, clearly identified washer fluid and engine coolant filler caps that are accessed from the left front corner of the engine compartment.
- **Wiper High/Low Relay** - The wiper high/low relay is an International Standards Organization (ISO) micro relay located in the Power Distribution Center (PDC) in the engine compartment near the battery.
- **Wiper On/Off Relay** - The wiper on/off relay is an International Standards Organization (ISO) micro relay located in the Power Distribution Center (PDC) in the engine compartment near the battery.

Hard wired circuitry connects the front wiper and washer system components to the electrical system of the vehicle. These hard wired circuits are integral to several wire harnesses, which are routed throughout the vehicle and retained by many different methods. These circuits may be connected to each other, to the vehicle electrical system and to the front wiper and washer system components through the use of a combination of soldered splices, splice block connectors, and many different types of wire harness terminal connectors and insulators. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, further details on wire harness routing and retention, as well as pin-out and location views for the various wire harness connectors, splices and grounds.

OPERATION

The front wiper and washer system is designed to provide the vehicle operator with a convenient, safe, and reliable means of maintaining visibility through the windshield glass. The various components of this system are designed to convert electrical energy produced by the vehicle electrical system into the mechanical action of the wiper blades to wipe the outside surface of the glass, as well as into the hydraulic action of the washer system to apply washer fluid stored in an on-board reservoir to the area of the glass to be wiped. When combined, these components provide the means to effectively maintain clear visibility for the vehicle operator by removing excess accumulations of rain, snow, bugs, mud, or other minor debris from the outside windshield glass surface that might be encountered while driving the vehicle under numerous types of inclement operating conditions.



The vehicle operator initiates all front wiper and washer system functions with the control knob (1) on the end of the control stalk (2) of the multi-function switch that extends from the left side of the steering column, just below the steering wheel. Rotating the control knob on the end of the control stalk, selects the Off, Delay, Low, or High wiper system operating modes. In the Delay mode, the control knob also allows the vehicle operator to select from one of five intermittent wipe Delay intervals. Depressing the control knob towards the steering column actuates the momentary washer system switch, which selects the Wash, and Wipe-After-Wash Modes depending upon when and how long the switch is held closed. The multi-function switch provides hard wired resistor multiplexed inputs to the instrument cluster for all of the wiper and washer system functions. The instrument cluster then sends electronic mes-

sages to the Front Control Module (FCM) over the Controller Area Network (CAN) data bus requesting the appropriate front wiper and washer system operating modes.

Front wiper and washer system operation are completely controlled by the instrument cluster and FCM logic circuits, and that logic will only allow these systems to operate when the ignition switch is in the Accessory or On positions. Battery current is directed from a B(+) fuse in the Integrated Power Module (IPM) to the wiper on/off relay and the wiper high/low relay in the PDC through a fused B(+) circuit. The FCM uses low side drivers to control wiper system operation by energizing or de-energizing the wiper high/low and wiper on/off relays. The FCM uses both high side and low side drivers to control the operation of the washer pump/motor unit. The multi-function switch circuitry receives a clean ground output from the instrument cluster on a multi-function switch return circuit, then provides resistor multiplexed inputs to the instrument cluster on an intermittent wipe mux circuit to indicate the selected wiper system mode and on a wash/beam select mux circuit to indicate the selected washer system mode.

The hard wired circuits and components of the front wiper and washer system may be diagnosed and tested using conventional diagnostic tools and procedures. However, conventional diagnostic methods may not prove conclusive in the diagnosis of the instrument cluster, the FCM, or the electronic message inputs to or outputs from the instrument cluster or FCM that control the front wiper and washer system operating modes. The most reliable, efficient, and accurate means to diagnose the instrument cluster or the FCM inputs and outputs related to the various wiper and washer system operating modes requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

OPERATING MODES

Following are paragraphs that briefly describe the operation of each of the wiper and washer system operating modes.

CONTINUOUS WIPE MODE

When the Low position of the control knob on the control stalk of the multi-function switch is selected the instrument cluster sends an electronic wiper switch low message to the FCM, then the FCM energizes the wiper on/off relay. This directs battery current through the normally open contacts of the energized wiper on/off relay and the normally closed contacts of the de-energized wiper high/low relay to the low speed brush of the wiper motor, causing the wipers to cycle at low speed.

When the High position of the control knob is selected the instrument cluster sends an electronic wiper switch high message to the FCM, then the FCM energizes both the wiper on/off relay and the wiper high/low relay. This directs battery current through the normally open contacts of the energized wiper on/off relay and the normally open contacts of the energized wiper high/low relay to the high speed brush of the wiper motor, causing the wipers to cycle at high speed.

When the Off position of the multi-function switch control knob is selected, the instrument cluster sends an electronic wiper switch off message to the FCM. If the wiper motor was operating at high speed, the FCM immediately de-energizes the wiper high/low relay causing the wiper motor to return to low speed operation. Then one of two events will occur. The event that occurs depends upon the position of the wiper blades on the windshield at the moment that the control knob Off position is selected.

If the wiper blades are in the down position on the windshield when the Off position is selected, the park switch that is integral to the wiper motor is closed to ground and provides a hard wired park switch sense input to the FCM. The FCM then de-energizes the wiper on/off relay and the wiper motor ceases to operate. If the wiper blades are not in the down position on the windshield at the moment the Off position is selected, the park switch is an open circuit and the FCM keeps the wiper on/off relay energized, which causes the wiper motor to continue running at low speed until the wiper blades are in the down position on the windshield and the park switch input to the FCM is again closed to ground.

INTERMITTENT WIPE MODE

When the control knob on the control stalk of the multi-function switch is moved to one of the Delay interval positions the instrument cluster sends an electronic wiper switch delay message to the FCM, then the FCM electronic intermittent wipe logic circuit responds by calculating the correct length of time between wiper sweeps based upon the selected delay interval input. The FCM monitors the changing state of the wiper motor park switch through a hard wired park switch sense input. This input allows the FCM to determine the proper intervals at which to energize and de-energize the wiper on/off relay to operate the wiper motor intermittently for one low speed cycle at a time.

The FCM logic is also programmed to provide vehicle speed sensitivity to the selected intermittent wipe delay intervals. In order to provide this feature the FCM monitors electronic vehicle speed messages from the Powertrain Control Module (PCM) and doubles the selected delay interval whenever the vehicle speed is about sixteen kilometers-per-hour (ten miles-per-hour) or less.

WASH MODE

When the control knob on the control stalk of the multi-function switch is depressed to the momentary Wash position for more than about one-half second, the instrument cluster sends an electronic washer switch message to the FCM, then the FCM directs battery current and ground to the washer pump/motor unit. This will cause the washer pump/motor unit to be energized for as long as the Wash switch is held closed up to about ten seconds, and to de-energize when the front Wash switch is released.

When the control knob is depressed to the momentary Wash position while the wiper system is operating in one of the Delay interval positions, the washer pump/motor operation is the same. However, the FCM also energizes the wiper on/off relay to override the selected delay interval and operate the wiper motor in a continuous low speed mode for as long as the control knob is held depressed, then de-energizes the relay and reverts to the selected delay mode interval several wipe cycles after the control knob is released. If the control knob is held depressed for more than about ten seconds, the FCM will suspend washer pump/motor operation until the knob is released for about two seconds, then cycled back to the Wash position.

WIPE-AFTER-WASH MODE

When the control knob on the control stalk of the multi-function switch is depressed to the momentary Wash position for more than about one-half second while the wiper system is not operating, the instrument cluster sends an electronic washer switch message to the FCM, then the FCM directs battery current and ground to the washer pump/motor unit and energizes the wiper on/off relay. This will cause the washer pump/motor unit to be energized and operate the wiper motor in a continuous low speed mode for as long as the Wash switch is held closed up to about ten seconds. When the control knob is released, the FCM de-energizes the washer pump/motor unit, but allows the wiper motor to operate for several additional wipe cycles before it de-energizes the wiper on/off relay and parks the wiper blades near the base of the windshield.

If the control knob is held depressed for more than about ten seconds, the FCM will suspend washer pump/motor operation until the knob is released for about two seconds, then cycled back to the Wash position; however, the wipers will continue to operate for as long as the Wash switch is held closed. The FCM monitors the changing state of the wiper motor park switch through a hard wired wiper park switch sense circuit input. This input allows the FCM to count the number of wipe cycles that occur after the Wash switch is released, and to determine the proper interval at which to de-energize the wiper on/off relay to complete the wipe-after-wash mode cycle.

DIAGNOSIS AND TESTING

FRONT WIPER & WASHER SYSTEM

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

If the front wiper motor operates, but the wipers do not move on the windshield, replace the faulty front wiper module. If the washer pump/motor operates, but no washer fluid is dispensed on the glass; or, if the wipers operate, but chatter, lift, or do not clear the glass, clean and inspect the front wiper and washer system components as required. (Refer to 8 - ELECTRICAL/FRONT WIPERS/WASHERS - CLEANING) and (Refer to 8 - ELECTRICAL/FRONT WIPERS/WASHERS - INSPECTION).

The hard wired front wiper and washer system circuits and components may be diagnosed and tested using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

However, conventional diagnostic methods may not prove conclusive in the diagnosis of the ElectroMechanical Instrument Cluster (EMIC), the Front Control Module (FCM), the Integrated Power Module (IPM), the Power Distribution Center (PDC), the Controller Area Network (CAN) data bus, or the electronic message inputs or outputs used to provide front wiper and washer system service or many of the electronic features of the front wiper and washer systems. The most reliable, efficient, and accurate means to diagnose the EMIC, the FCM, the IPM, the PDC, the CAN data bus, and the electronic message inputs and outputs for the front wiper and washer system requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

CLEANING - FRONT WIPER & WASHER SYSTEM

WIPER SYSTEM

The squeegees of wiper blades exposed to the elements for a long time tend to lose their wiping effectiveness. Periodic cleaning of the squeegees is suggested to remove any deposits of salt or road film. The wiper blades, arms, and windshield glass should only be cleaned using a sponge or soft cloth and windshield washer fluid, a mild detergent, or a non-abrasive cleaner. If the wiper blades continue to leave streaks, smears, hazing, or beading on the glass after thorough cleaning of the squeegees and the glass, the entire wiper blade assembly must be replaced.

CAUTION: Protect the rubber squeegees of the wiper blades from any petroleum-based cleaners, solvents, or contaminants. These products can rapidly deteriorate the rubber squeegees.

WASHER SYSTEM

If the washer system is contaminated with foreign material, drain the washer reservoir by removing the washer pump/motor from the reservoir. Clean foreign material from the inside of the washer pump/motor inlet filter screen and the washer reservoir using clean washer fluid, a mild detergent, or a non-abrasive cleaner. Flush foreign material from the washer system plumbing by first disconnecting the washer hoses from the washer nozzles, then running the washer pump/motor to run clean washer fluid or water through the system. Plugged or restricted washer nozzles should be carefully back-flushed using compressed air. If the washer nozzle obstruction cannot be cleared, replace the washer nozzle.

CAUTION: Never introduce petroleum-based cleaners, solvents, or contaminants into the washer system. These products can rapidly deteriorate the rubber seals and hoses of the washer system, as well as the rubber squeegees of the wiper blades.

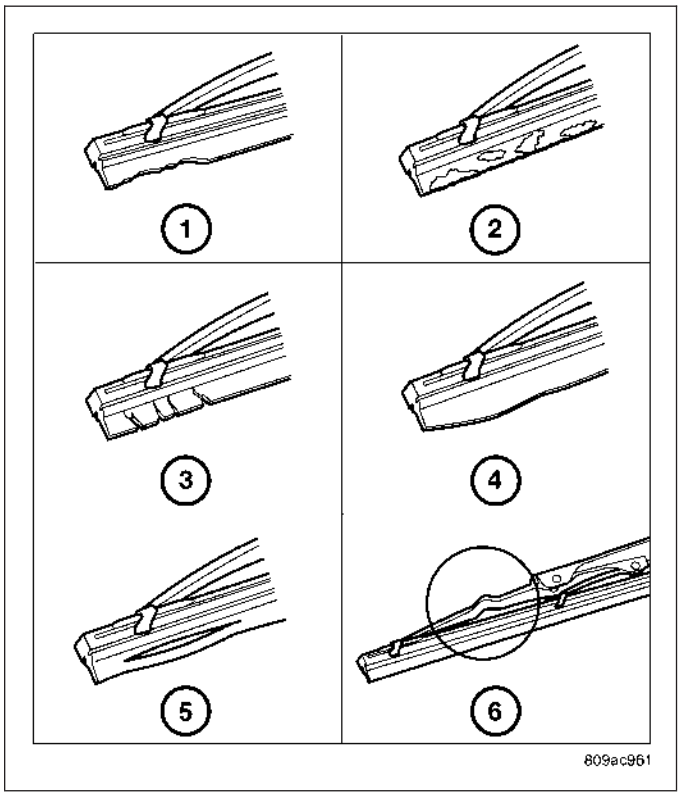
CAUTION: Never use compressed air to flush the washer system plumbing. Compressed air pressures are too great for the washer system plumbing components and will result in further system damage. Never use sharp instruments to clear a plugged washer nozzle or damage to the nozzle orifice and improper nozzle spray patterns will result.

INSPECTION - FRONT WIPER & WASHER SYSTEM

WIPER SYSTEM

The wiper blades and wiper arms should be inspected periodically, not just when wiper performance problems are experienced. This inspection should include the following points:

1. Carefully inspect the wiper blades for any indications of worn or uneven edges (1), foreign material deposits (2), hardening or cracking (3), deformation or fatigue (4), or splitting (5). Inspect the wiper blade support components and the wiper arms for damage (6) or corrosion. If the wiper arms and blades are contaminated with any foreign material, clean them and the glass as required. (Refer to 8 - ELECTRICAL/FRONT WIPERS/WASHERS - CLEANING). If a wiper blade or arm is damaged, or if corrosion is evident, replace the affected wiper arm or blade with a new unit. Do not attempt to repair a wiper arm or blade that is damaged or corroded.
2. Carefully lift the wiper blade off of the glass. Note the action of the wiper arm hinge. The wiper arm should pivot freely at the hinge, but with no lateral looseness evident. If there is any binding evident in the wiper arm hinge, or there is evident lateral play in the wiper arm hinge, replace the wiper arm.



CAUTION: Do not allow the wiper arm to spring back against the glass without the wiper blade in place or the glass may be damaged.

3. Once proper hinge action of the wiper arm is confirmed, check the hinge for proper spring tension. Remove the wiper blade from the wiper arm. Either place a small postal scale between the blade end of the wiper arm and the glass, or carefully lift the blade end of the arm away from the glass using a small fish scale. Compare the scale readings between the right and left wiper arms. Replace a wiper arm if it has comparatively lower spring tension, as evidenced by a lower scale reading.
4. After cleaning and inspecting the wiper components and the glass, if the wiper blade still fails to clear the glass without smearing, streaking, chattering, hazing, or beading, replace the wiper blade.

WASHER SYSTEM

The washer system components should be inspected periodically, not just when washer performance problems are experienced. This inspection should include the following points:

1. Check for ice or other foreign material in the washer reservoir. If contaminated, clean and flush the washer system. (Refer to 8 - ELECTRICAL/FRONT WIPERS/WASHERS - CLEANING).
2. Inspect the washer plumbing for pinched, leaking, deteriorated, or incorrectly routed hoses and damaged or disconnected hose fittings. Replace damaged or deteriorated hoses and hose fittings. Leaking washer hoses can sometimes be repaired by cutting the hose at the leak and splicing it back together using an in-line connector fitting. Similarly, sections of deteriorated hose can be cut out and replaced by splicing in new sections of hose using in-line connector fittings. Whenever routing a washer hose or a wire harness containing a washer hose, it

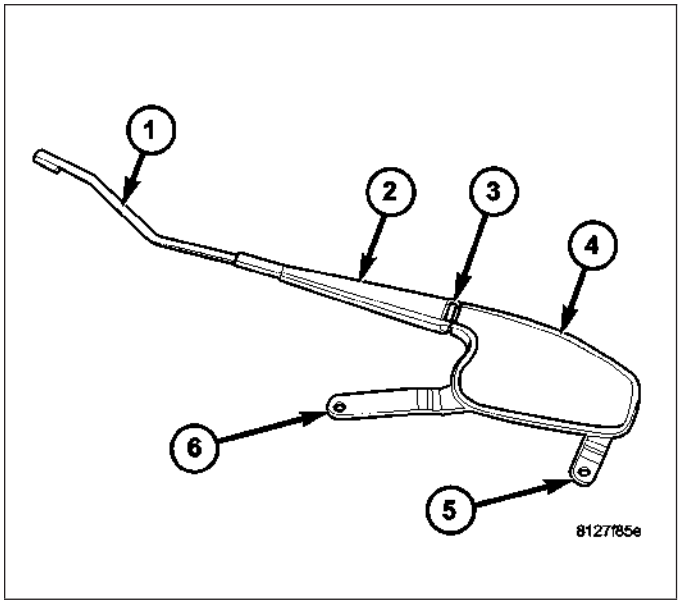
must be routed away from hot, sharp, or moving parts. Also, sharp bends that might pinch the washer hose must be avoided.

ARM-WINDSHIELD WIPER

DESCRIPTION

The front wiper arms are the rigid members located between the wiper pivots protruding from the cowl plenum cover/grille panel near the base of the windshield and the wiper blades on the windshield glass. Both wiper arms feature an over-center hinge (3) that allows easy access to the windshield glass for cleaning. The wiper arms each have a die cast metal pivot end. The left arm has a large tapered mounting hole on the pivot end that is secured by a nut to the left wiper pivot.

The unique, articulated right wiper arm has two pivoting links attached to the arm pivot end. A drive link (5) is secured by a nut to the right wiper pivot and is the unit that drives the right wiper arm. The articulating link (6) is secured by a nut to a drone pivot located outboard of the right wiper pivot on the wiper module bracket. The right wiper arm pivot end and the connections of both links to the arm are concealed beneath a molded black plastic appearance cover (4).



The wide end of a tapered, stamped steel channel (2) hinges on and is secured with a hinge pin to the blade end of both the right and left wiper arm pivot ends. One end of a long, rigid, stamped steel strap (1), with a small hole near its pivot end, is riveted and crimped within the narrow end of the stamped steel channel. The tip of the wiper blade end of this strap is bent back under itself to form a small hook. Concealed within the stamped steel channel, one end of a long spring is engaged with a wire hook on the underside of the die cast pivot end, while the other end of the spring is hooked through the small hole in the steel strap. The entire wiper arm has a satin black finish applied to all of its visible surfaces.

A wiper arm cannot be adjusted or repaired. If damaged or faulty, the entire wiper arm unit must be replaced.

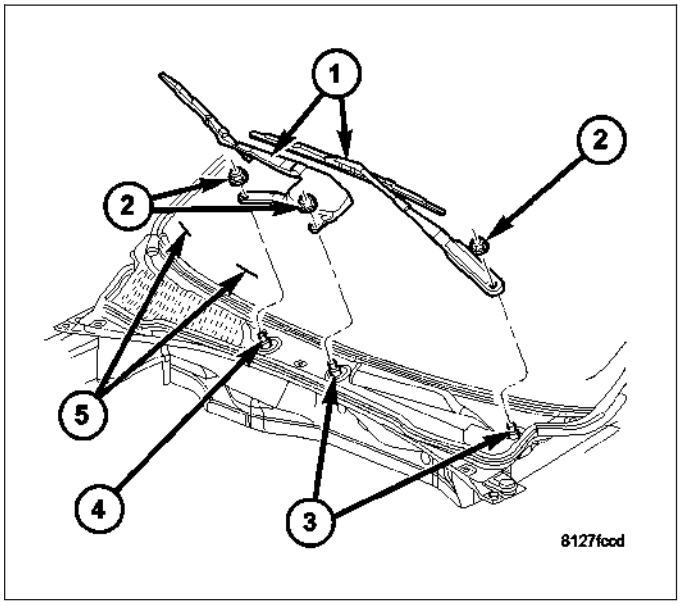
OPERATION

The front wiper arms are designed to mechanically transmit the motion from the wiper pivots to the wiper blades. The wiper arm must be properly indexed to the wiper pivot in order to maintain the proper wiper blade travel on the glass. The combination of the drive link, articulating link, wiper arm pivot end, the drone pivot and the wiper module bracket creates a four link system that articulates the wiping action of the right wiper arm to effectively clear a larger area of the windshield glass.

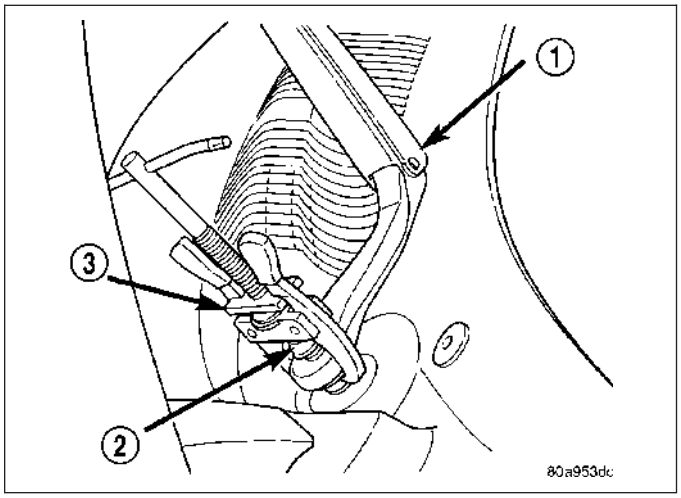
The tapered mounting hole in the left wiper arm pivot end or in the right wiper arm links interlock with the serrations on the tapered outer circumference of the wiper pivot shafts and the drone pivot, allowing positive engagement and finite adjustment of these connections. The mounting nuts lock the wiper arms to the threaded studs of the pivot shafts. The spring-loaded wiper arm hinge controls the down-force applied through the tip of the wiper arm to the wiper blade on the glass. The hook formation on the tip of the wiper arm provides a cradle for securing and latching the wiper blade pivot block to the wiper arm.

REMOVAL

1. Lift the front wiper arm to its over-center position to hold the wiper blade off of the glass and relieve the spring tension on the wiper arm to wiper pivot shaft connection.
2. Remove the nut or nuts (2) that secure the front wiper arm (1) or links to the pivot shaft or shafts (3 & 4).



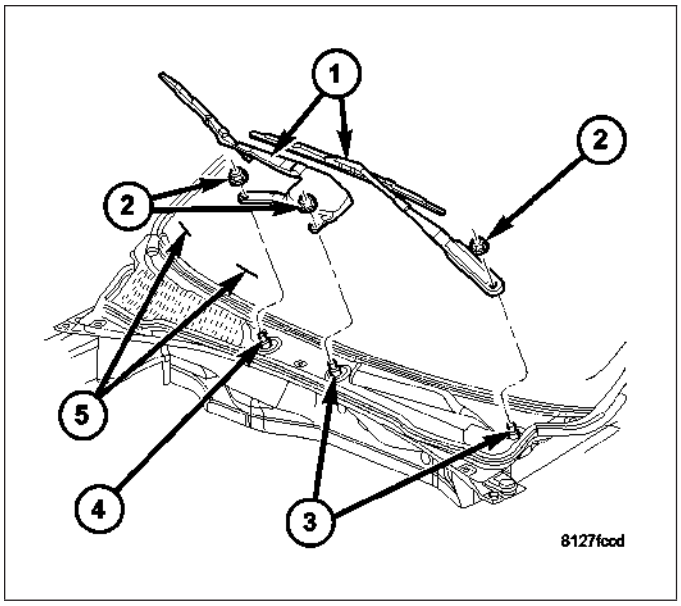
3. If necessary, use a suitable battery terminal puller (3) to disengage the front wiper arm (1) or links from the pivot shaft (2) or shafts.
4. Remove the wiper arm pivot end or links from the pivot shaft or shafts.



INSTALLATION

NOTE: Be certain that the wiper motor is in the park position before attempting to install the front wiper arms. Turn the ignition switch to the On position and move the multi-function switch control knob to its Off position. If the wiper pivots move, wait until they stop moving, then turn the ignition switch back to the Off position. The front wiper motor is now in its park position.

1. The front wiper arms (1) must be indexed to the pivot shafts (3 & 4) with the front wiper motor in the park position to be properly installed. Position the wiper arm pivot end or links onto the pivot shafts so that the lower edge of the wiper blade is aligned with the wiper alignment lines (5) concealed in the upper margin of the lower windshield blackout area.
2. Once the wiper blade is aligned, lift the front wiper arm away from the windshield slightly to relieve the spring tension on the pivot end or links and push the arm or links down over the pivot shaft or shafts.
3. Install and tighten the nut or nuts (2) that secure the wiper arm or links to the pivot shaft or shafts. Tighten the nuts to 35 N·m (26 ft. lbs.).
4. Wet the windshield glass, then operate the front wipers. Turn the wiper switch to the Off position, then check for the correct wiper arm position and readjust as required.

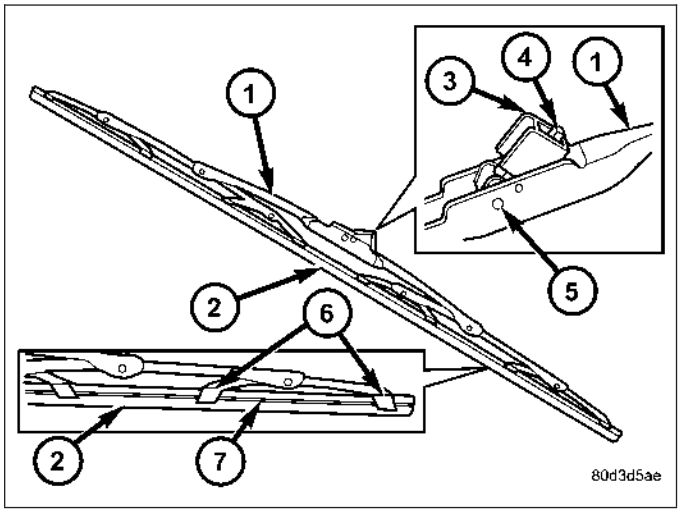


BLADE-WINDSHIELD WIPER

DESCRIPTION

Each front wiper blade is secured by an integral latching pivot block (3) to the hook formation on the tip of each wiper arm, and rests on the glass near the base of the windshield when the wipers are not in operation. The wiper blade consists of the following components:

- **Superstructure (1)** - The superstructure includes several stamped steel bridges and links with claw formations that grip the wiper blade element. Also included in this unit is the latching, molded plastic pivot block that secures the superstructure to the wiper arm. All of the metal components of the wiper blade have a satin black finish applied.
- **Element (2)** - The wiper element or squeegee is the resilient rubber member of the wiper blade that contacts the glass.



- **Flexor (7)** - The flexor is a rigid metal component running along the length of each side of the wiper element where it is gripped by the claws (6) of the superstructure.

The right wiper blade is 53.00 centimeters (20.87 inches) long, and the left blade is 65.09 centimeters (25.63 inches) long. Both have non-replaceable rubber elements (squeegees). The wiper blades cannot be adjusted or repaired. If faulty, worn, or damaged the entire wiper blade unit must be replaced.

OPERATION

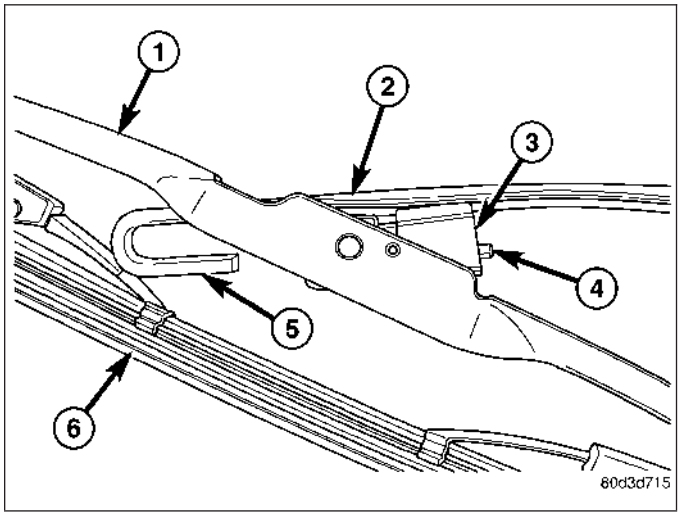
The wiper blades are moved back and forth across the glass by the wiper arms when the wipers are being operated. The wiper blade superstructure is the flexible frame that grips the wiper blade element and evenly distributes the force of the spring-loaded wiper arm along the length of the element. The combination of the wiper arm force and the flexibility of the superstructure makes the element conform to and maintain proper contact with the glass, even as the blade is moved over the varied curvature that may be encountered across the glass surface.

The wiper element flexor provides the claws of the blade superstructure with a rigid, yet flexible component on the element which can be gripped. The rubber element is designed to be stiff enough to maintain an even cleaning edge as it is drawn across the glass, yet resilient enough to conform to the glass surface and flip from one cleaning edge to the other each time the wiper blade changes directions.

REMOVAL

CAUTION: Do not allow the wiper arm to spring back against the glass without the wiper blade in place or the glass may be damaged.

NOTE: The notched end of the wiper element flexor should always be oriented towards the end of the wiper blade that is nearest to the wiper pivot.

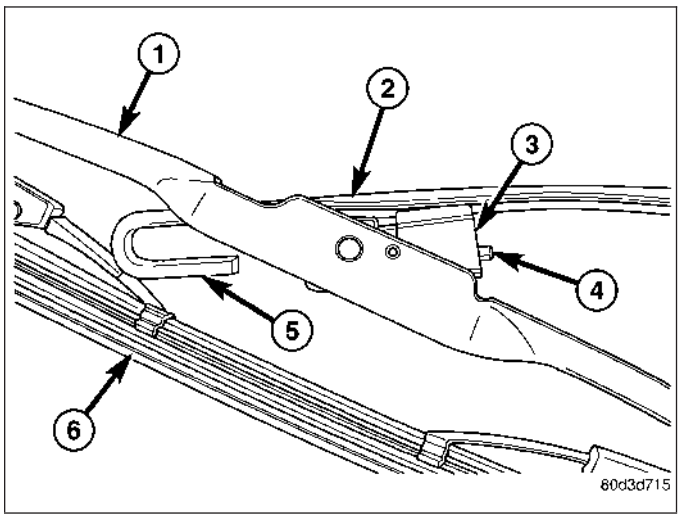


1. Lift the wiper arm (2) to raise the wiper blade and element (6) off of the glass, until the wiper arm hinge is in its over-center position.
2. To remove the blade from the arm, depress the latch release tab (4) on the pivot block (3) under the tip of the arm and slide the blade away from the tip towards the pivot end of the arm far enough to disengage the pivot block from the hook formation (5) on the end of the arm.
3. Extract the hook formation on the tip of the wiper arm through the opening in the wiper blade superstructure (1) just ahead of the pivot block.
4. Gently lower the tip of the wiper arm onto the glass.

INSTALLATION

CAUTION: Do not allow the wiper arm to spring back against the glass without the wiper blade in place or the glass may be damaged.

NOTE: The notched end of the wiper element flexor should always be oriented towards the end of the wiper blade that is nearest to the wiper pivot.

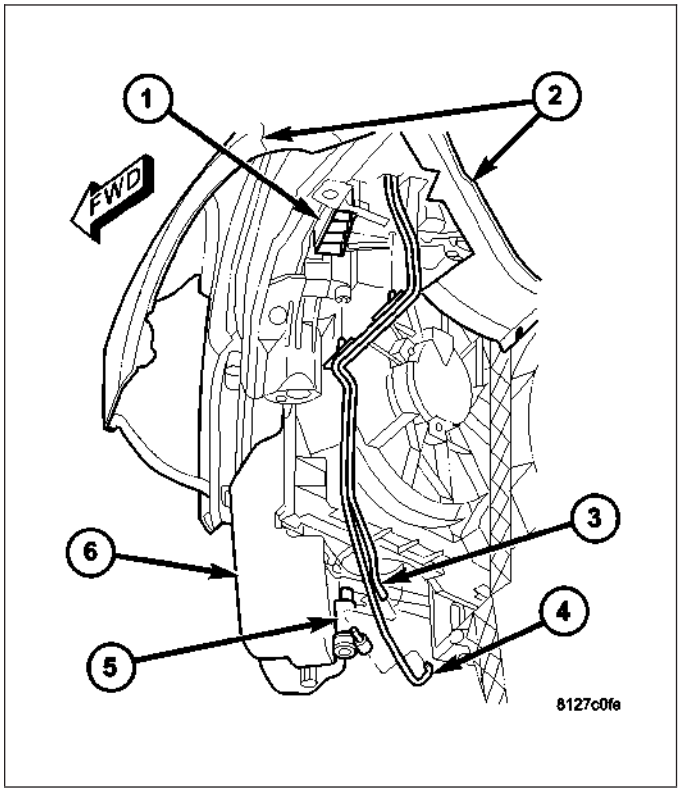


1. Lift the wiper arm (2) off of the windshield glass, until the wiper arm hinge is in its over-center position.
2. Position the wiper blade near the hook formation (5) on the tip of the arm with the notched end of the wiper element flexor oriented towards the end of the wiper arm that is nearest to the wiper pivot.
3. Insert the hook formation on the tip of the arm through the opening in the blade superstructure (1) ahead of the pivot block (3) far enough to engage the pivot block into the hook.
4. Slide the pivot block up into the hook formation on the tip of the wiper arm until the latch release tab (4) snaps into its locked position. Latch engagement will be accompanied by an audible click.
5. Gently lower the wiper blade and element (6) onto the glass.

HOSE-WINDSHIELD WASHER

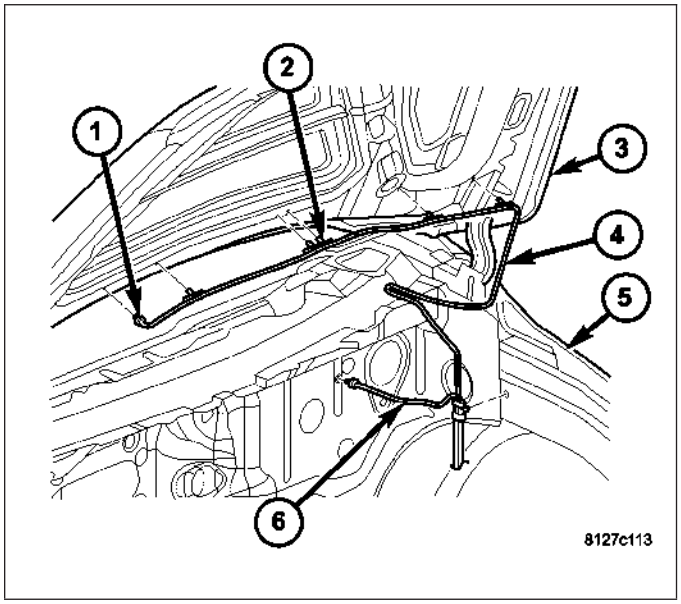
DESCRIPTION

The front washer plumbing consists of a small diameter rubber hose (4) that is routed along with the rear washer hose (3) from the washer reservoir (6) under the left front fender (2) ahead of the left front wheel to the engine compartment. Both hoses are attached to their respective front or rear outlet nipple of the washer pump/motor unit (5) near the bottom of the reservoir. The hoses are then secured by retainers to the back of the condenser shroud and the underside of the Power Distribution Center (PDC) bracket (1) above the wheel house splash shield before entering the left side of the engine compartment behind the PDC.



In the engine compartment, both hoses are secured by a retainer near the dash panel to the side support member for the left front fender (5). The two hoses are routed separately from this point. The front hose (4) is routed up toward the hood (3), while the rear hose (6) is routed through a grommet and a hole in the dash panel into the passenger compartment.

The front hose is engaged in a molded retainer integral to the right end of the cowl plenum cover/grille panel and is secured by a retainer near the hood hinge bracket on the fender ledge. Two retainers secure the hose to the underside of the hood panel reinforcement. A molded plastic tee fitting with a short connector hose provides the take out for the left washer nozzle (2), and a plastic in-line fitting with a rubber elbow terminate and connect the front hose at the left washer nozzle (1).



Washer hose is available for service only as roll stock, which must then be cut to length. The molded plastic washer hose fittings cannot be repaired. If these fittings are faulty or damaged, they must be replaced.

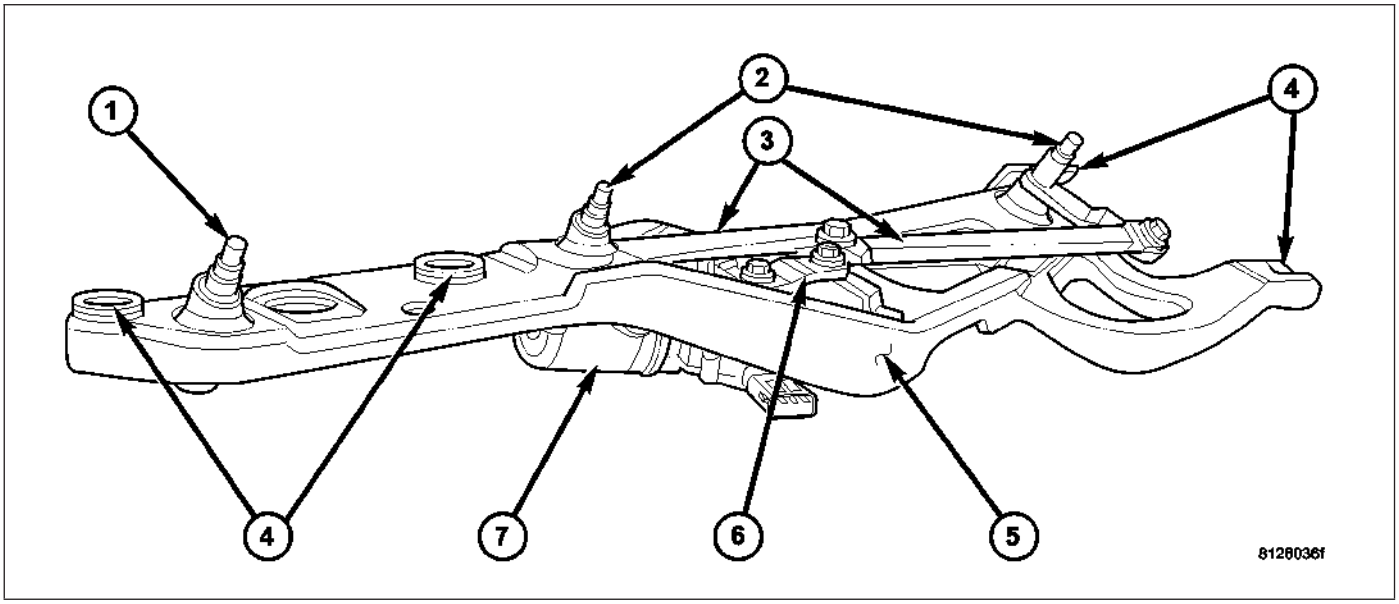
OPERATION

Washer fluid in the washer reservoir is pressurized and fed by the windshield washer pump through the front washer system plumbing and fittings to the two front washer nozzles. Whenever routing the washer hose or a wire harness

containing a washer hose, it must be routed away from hot, sharp, or moving parts; and, sharp bends that might pinch the hose must be avoided.

MODULE-WINDSHIELD WIPER

DESCRIPTION



The front wiper module is secured with screws through four rubber grommet-type insulators (4) to the cowl plenum panel and the left front fender ledge. The module is located in the rear of the engine compartment where it is concealed beneath the molded plastic cowl plenum cover/grille panel between the base of the windshield and the rear edge of the hood panel. The ends of the pivot shafts protruding through openings in the cowl plenum cover/grille panel are the only visible components of the wiper module. The wiper module consists of the following major components:

- **Bracket (5)** - The wiper module bracket is a single die cast aluminum unit that includes provisions for mounting the wiper motor and wiper pivots as well as for the for rubber insulators used in mounting the bracket to the vehicle.
- **Crank Arm (6)** - The wiper motor crank arm is a stamped steel unit with an internally splined hole on the driven end that is secured to the wiper motor output shaft with a nut, and a long ball stud secured to the drive end to accept the wiper linkage.
- **Linkage (3)** - The two wiper linkage members are each constructed of stamped steel. A driver side drive link with a plastic socket-type bushing in the left end, and a plastic sleeve-type bushing in the right end. The socket bushing is snap-fit over the pivot ball stud on the left pivot lever arm, while the sleeve bushing is fit over the longer pivot stud on the wiper motor crank arm. The passenger side drive link has a plastic socket-type bushing on each end. One end of this drive link is snap-fit over the ball stud on the right pivot lever arm, while the other end is snap-fit over the top of the driver side drive link on the ball stud of the wiper motor crank arm.
- **Motor (7)** - The wiper motor is secured on the underside of the module bracket near the center with three screws. The wiper motor output shaft passes through a hole in the module bracket, where a nut secures the wiper motor crank arm to the motor output shaft. The two-speed permanent magnet wiper motor features an integral transmission, an internal park switch, and an internal Positive Temperature Coefficient (PTC) circuit breaker.
- **Pivots (1 & 2)** - This module features two driven pivots (2) and one drone pivot (1) for the articulating link of the right wiper arm. The two driven wiper pivot shafts have lever arms with ball studs at their base to accept the wiper linkage. The upper end of all three pivot shafts has a threaded stud with a tapered and serrated area just below the threads to accept the left wiper arm or the right wiper arm links.

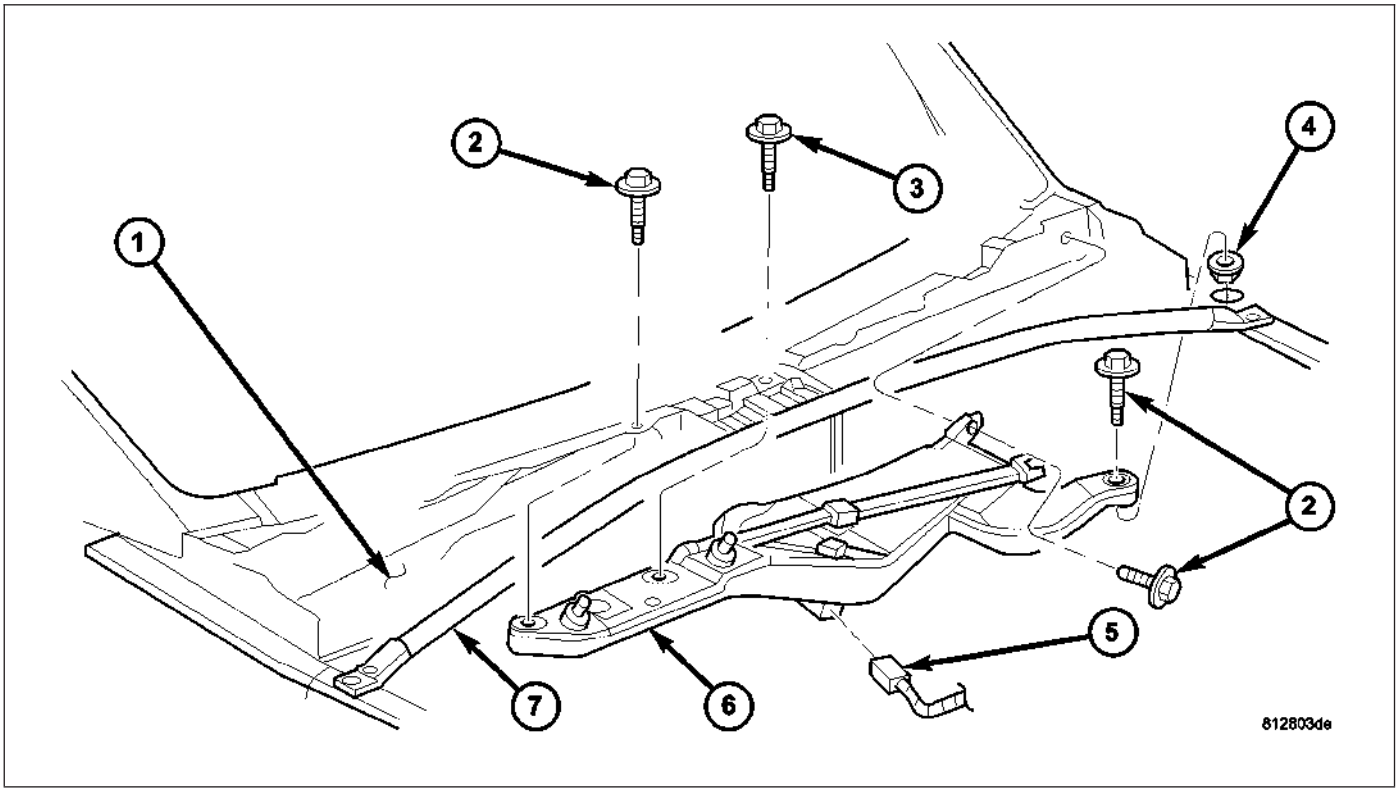
The front wiper module cannot be adjusted or repaired. The front wiper motor is available for separate service replacement. If any other component of the module is faulty or damaged, the entire front wiper module unit must be replaced.

OPERATION

The front wiper module operation is controlled by the battery current inputs received by the wiper motor through the wiper on/off and wiper high/low relays. The wiper motor speed is controlled by current flow to either the low speed or the high speed set of brushes. The park switch is a single pole, single throw, momentary switch within the wiper motor that is mechanically actuated by the wiper motor transmission components. The park switch alternately opens and closes the wiper park switch sense circuit to ground, depending upon the position of the wipers on the glass. This feature allows the motor to complete its current wipe cycle after the wiper system has been turned Off, and to park the wiper blades in the lowest portion of the wipe pattern. The automatic resetting circuit breaker protects the motor from overloads.

The wiper motor crank arm, the two wiper linkage members, and the two driven wiper pivots mechanically convert the rotary output of the wiper motor to the back and forth wiping motion of the wiper arms and blades on the glass. The drone pivot provides an anchor point for the articulating link of the right wiper arm.

REMOVAL

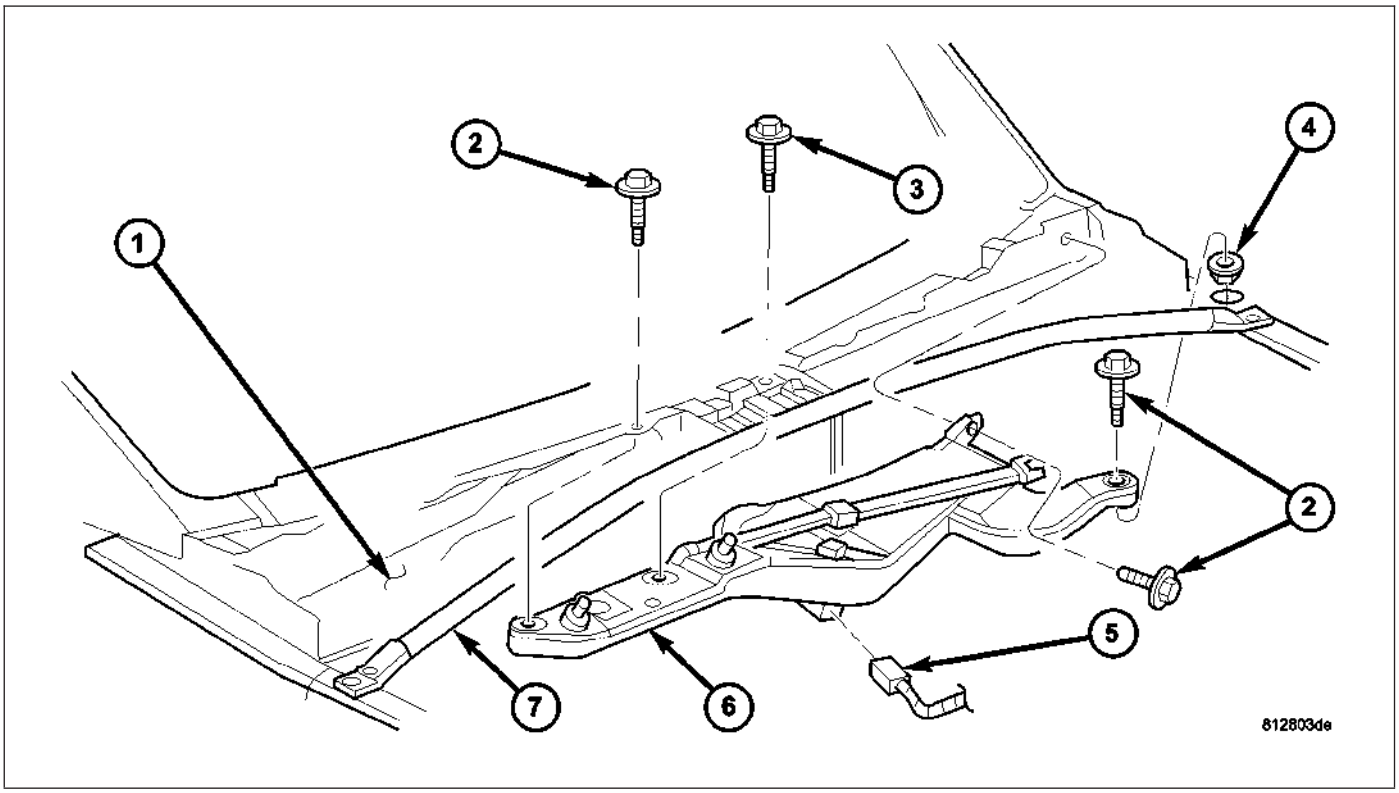


NOTE: The front wiper motor can be removed from the wiper module without removing the module from the vehicle, and is available as a separate service component for this model. (Refer to 8 - ELECTRICAL/FRONT WIPERS/WASHERS/FRONT WIPER MOTOR - REMOVAL).

1. Disconnect and isolate the battery negative cable.
2. Remove both front wiper arms from the wiper pivots. (Refer to 8 - ELECTRICAL/FRONT WIPERS/WASHERS/FRONT WIPER ARMS - REMOVAL).
3. Remove the cowl plenum cover/grille panel from over the front wiper module. (Refer to 23 - BODY/EXTERIOR/COWL GRILLE AND SCREEN - REMOVAL).
4. Disconnect the wire harness connector (5) from the front wiper motor connector.
5. Remove the screw (3) that secures the front wiper module bracket (6) and the center bracket of the cowl grille support (7) to the cowl plenum panel (1).

6. Remove the three screws (2) that secure the module bracket to the cowl plenum panel and the left front fender ledge.
7. Remove the wiper module from the engine compartment as a unit.

INSTALLATION



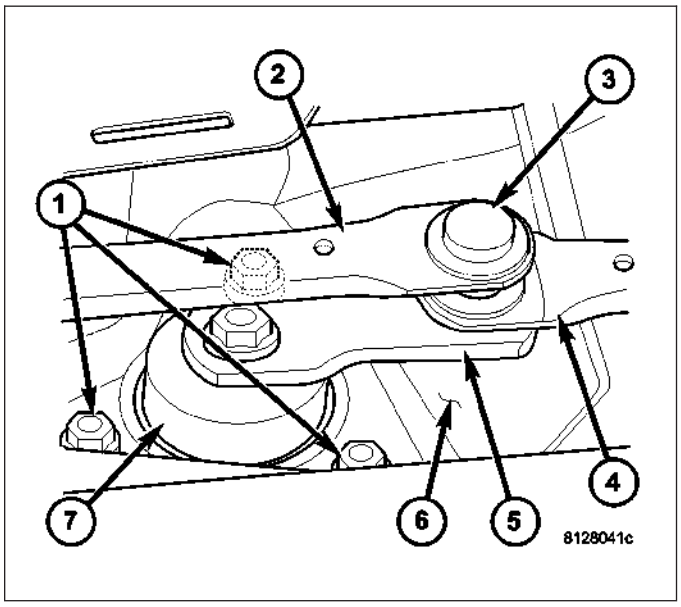
1. Check to be certain that the rivet nut (4) used to secure the front wiper module (6) is properly installed in the support at the left front fender ledge, and that it is in good condition.
2. Position the front wiper module to the cowl plenum panel (1) as a unit.
3. Install and tighten the three screws (2) that secure the module bracket to the cowl plenum panel and the left front fender ledge. Tighten the screws to 8 N·m (72 in. lbs.).
4. Install and tighten the screw (3) that secures the module bracket and the center bracket of the cowl grille support (7) to the cowl plenum panel. Tighten the screw to 11 N·m (100 in. lbs.).
5. Reconnect the wire harness connector (5) to the front wiper motor connector.
6. Reinstall the cowl plenum cover/grille panel over the front wiper module. (Refer to 23 - BODY/EXTERIOR/COWL GRILLE AND SCREEN - INSTALLATION).
7. Reinstall both front wiper arms onto the wiper pivots. (Refer to 8 - ELECTRICAL/FRONT WIPERS/WASHERS/ FRONT WIPER ARMS - INSTALLATION).
8. Reconnect the battery negative cable.

MOTOR-WINDSHIELD WIPER

REMOVAL

CAUTION: Do not apply pressure to, or pry on, the plastic drive link bushing. When removing the drive link from, or installing the drive link to the ball stud on the wiper motor crank arm, apply pressure to, or pry on, only the metal portions of the drive link around the bushing. If the bushing is damaged, the entire front wiper module MUST be replaced.

CAUTION: Do not remove the crank arm nut from the wiper motor output shaft. The crank arm is indexed to the output shaft with the motor in the park position during the manufacturing process, but there are no provisions made for correctly indexing this connection in the field. If the crank arm to output shaft indexing is incorrect, the entire front wiper module MUST be replaced.

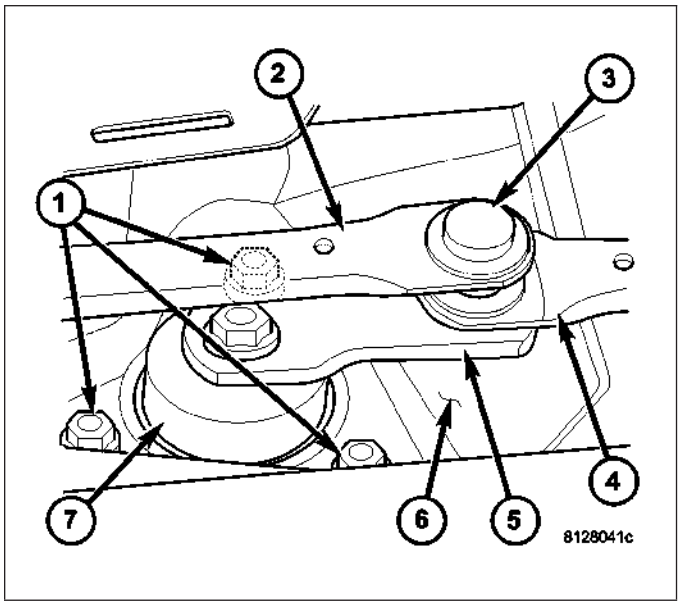


1. Disconnect and isolate the battery negative cable.
2. Remove both front wiper arms from the wiper pivots. (Refer to 8 - ELECTRICAL/FRONT WIPERS/WASHERS/FRONT WIPER ARMS - REMOVAL).
3. Remove the cowl plenum cover/grille panel from over the front wiper module. (Refer to 23 - BODY/EXTERIOR/COWL GRILLE AND SCREEN - REMOVAL).
4. Disconnect the wire harness connector from the front wiper motor connector.
5. Disengage the socket bushing (3) of the right wiper drive link (2) from the ball stud on the wiper motor crank arm (5) using two large screwdrivers, one on each side of the ball stud. Pry between the crank arm and the metal portion of the drive link until the socket unsnaps from the ball.
6. Remove the sleeve bushing of the left wiper drive link (4) from the ball stud on the wiper motor crank arm.
7. While supporting the wiper motor (7) from the underside of the wiper module bracket (6), remove the three screws (1) that secure the motor to the bracket.
8. Remove the wiper motor and crank arm unit from the underside of the module bracket.

INSTALLATION

CAUTION: Do not apply pressure to, or pry on, the plastic drive link bushing. When removing the drive link from, or installing the drive link to the ball stud on the wiper motor crank arm, apply pressure to, or pry on, only the metal portions of the drive link around the bushing. If the bushing is damaged, the entire front wiper module MUST be replaced.

CAUTION: Do not remove the crank arm nut from the wiper motor output shaft. The crank arm is indexed to the output shaft with the motor in the park position during the manufacturing process, but there are no provisions made for correctly indexing this connection in the field. If the crank arm to output shaft indexing is incorrect, the entire front wiper module MUST be replaced.

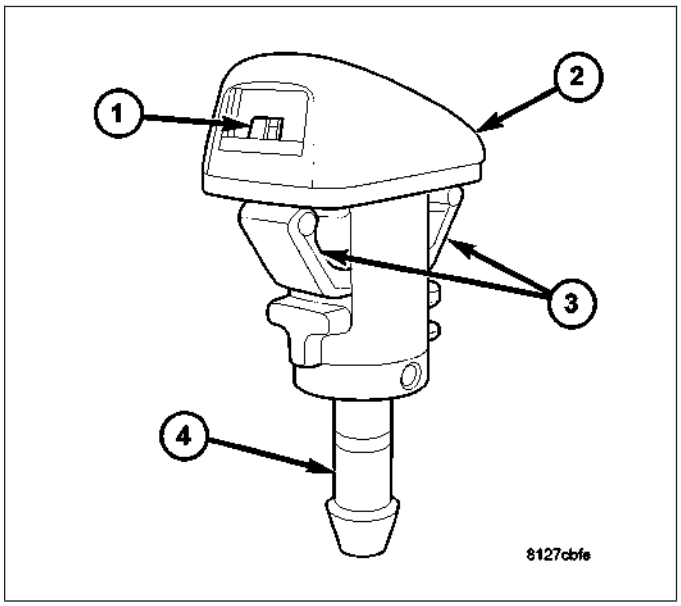


1. Position the front wiper motor (7) and crank arm (5) unit from the underside of the front wiper module bracket (6).
2. Install and tighten the three screws (1) that secure the motor to the bracket. Tighten the screws to 7 N·m (62 in. lbs.).
3. Position the left wiper drive link (4) sleeve bushing onto the ball stud on the end of the motor crank arm.
4. Position the socket bushing (3) of the right wiper drive link (2) over the ball stud on the crank arm.
5. Place a short 19 millimeter or 3/4 inch socket over the capped side of the bushing as an installation tool. Then use large channel-lock pliers to apply enough pressure to the underside of the crank arm and the top of the socket to snap the bushing onto the ball stud. **Do not apply pressure directly to the plastic bushing.**
6. Reconnect the wire harness connector to the wiper motor connector.
7. Reinstall the cowl plenum cover/grille panel over the front wiper module. (Refer to 23 - BODY/EXTERIOR/COWL GRILLE AND SCREEN - INSTALLATION).
8. Reconnect the battery negative cable.
9. Turn the ignition switch to the On position, then turn the front wiper switch On and Off again to cycle the wiper motor and linkage to their natural park positions before reinstalling the front wiper arms onto the wiper pivots.
10. Reinstall both front wiper arms onto the wiper pivots. (Refer to 8 - ELECTRICAL/FRONT WIPERS/WASHERS/ FRONT WIPER ARMS - INSTALLATION).

NOZZLE-WINDSHIELD WASHER

DESCRIPTION

The fluidic front washer nozzles (2) are constructed of molded plastic. Each nozzle has two integral latches that secure them in dedicated holes in the hood panel near the base of the windshield. A check valve is integral to each front washer nozzle. The domed upper surface of the washer nozzle is visible on the outside of the hood panel, and the nozzle orifice (1) is oriented towards the windshield glass. The washer plumbing fittings (4) for the washer nozzles extend below the hood panel and are accessible from the engine compartment. The front washer nozzles cannot be adjusted or repaired and, if faulty or damaged, they must be replaced.



OPERATION

The two front washer nozzles are designed to dispense washer fluid into the wiper pattern area on the outside of the windshield glass. Pressurized washer fluid is fed to each nozzle from the washer reservoir by the washer pump/

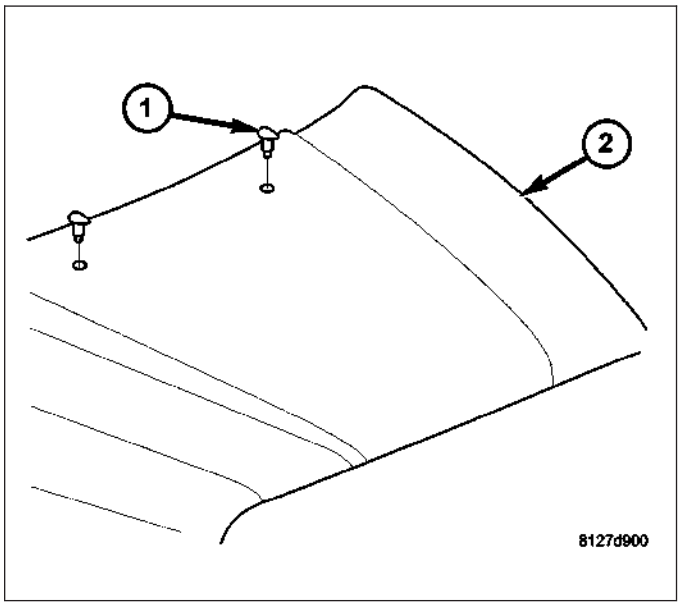
motor unit through a single hose, which is attached to a barbed nipple on each washer nozzle below the hood panel. A fluidic matrix within the washer nozzle causes the pressurized washer fluid to be emitted from the nozzle orifice as an oscillating stream to more effectively cover a larger area of the glass to be cleaned.

The integral check valve prevents washer fluid from draining out of the washer supply hoses back to the washer reservoir. This drain-back would result in a delay from when the washer pump is energized until washer fluid was dispensed through the nozzles. Such a drain-back condition could also result in water, dirt, or other outside contaminants being siphoned into the washer system through the washer nozzle orifice. This water could subsequently freeze and plug the nozzle, while other contaminants could interfere with proper nozzle operation and cause improper nozzle spray patterns.

When the washer pump pressurizes and pumps washer fluid from the reservoir through the washer plumbing, the fluid pressure unseats a diaphragm from over a sump well within the nozzle. With the diaphragm unseated, washer fluid is allowed to flow through the washer nozzle. When the washer pump stops operating, the diaphragm seats over the sump well in the valve and fluid flow in either direction within the washer plumbing is prevented.

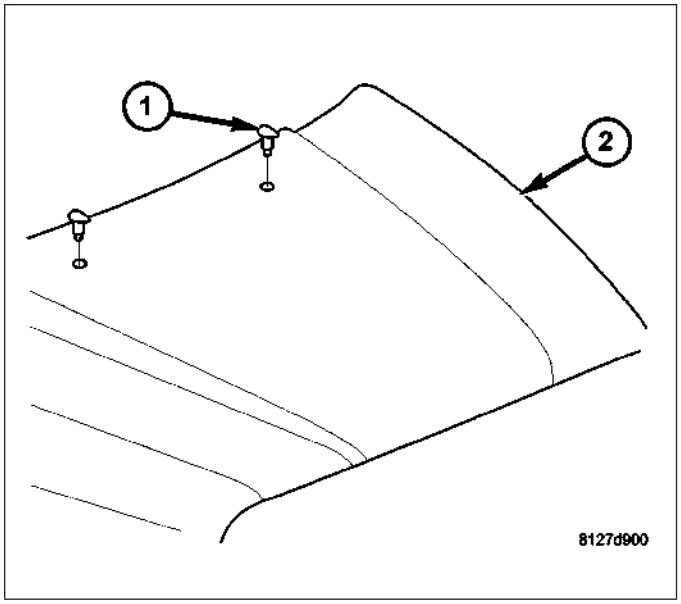
REMOVAL

1. Insert a trim stick or another suitable wide flat-bladed tool between the front or rear edge of the washer nozzle (1) and the hood panel (2) to depress one of the nozzle latches.
2. Holding the latch depressed, lift upward on the same edge of the nozzle to disengage it from the hood.
3. Pull the nozzle away from the hood far enough to access and disconnect the hose from the barbed nipple of the nozzle.
4. Remove the nozzle from the top of the hood panel.



INSTALLATION

1. Position the front washer nozzle (1) near the mounting hole on the outside of the hood panel (2).
2. Reconnect the washer hose to the barbed nipple of the nozzle.
3. Insert the nozzle into the mounting hole.
4. Using hand pressure, push firmly and evenly on the top of the nozzle until the integral latches lock into place on the underside of the outer hood panel.

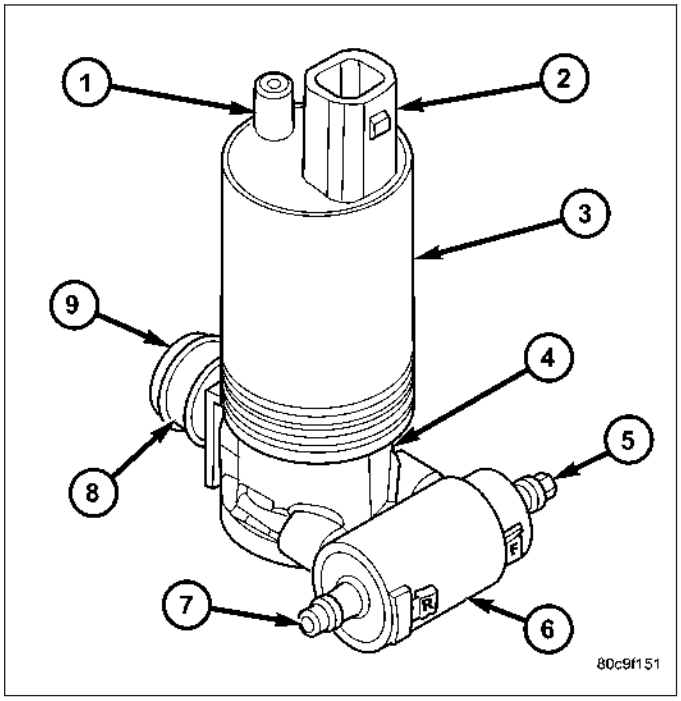


PUMP-WASHER

DESCRIPTION

The washer pump/motor unit is located on the rearward facing side of the washer reservoir, in the left front fender wheel house ahead of the front wheel and the left front wheel house splash shield. A small permanently lubricated and sealed reversible electric motor (2) is coupled to the rotor-type washer pump (4). The use of an integral valve body (6) allows the washer pump/motor unit to provide washer fluid to either the front or the rear washer systems, depending upon the direction of the motor/pump impeller rotation.

A seal flange with a barbed inlet nipple (8) on the pump housing passes through a rubber grommet seal installed in a dedicated mounting hole of the washer reservoir. A removable molded plastic filter screen (9) inserted into the inlet nipple prevents most debris from entering the pump housing. When the pump is installed in the reservoir the front barbed outlet nipple (5) on the pump valve body housing connects the unit to the front washer hose, and the rear barbed outlet nipple (7) connects the unit to the rear washer hose. The letters “F” and “R” molded into the valve body housing adjacent to each nipple provide further clarification of the nipple assignments.

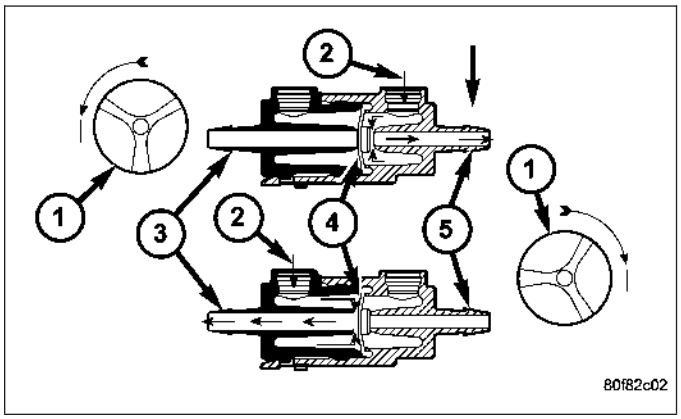


The washer pump/motor unit is retained on the reservoir by the interference fit between the barbed pump inlet nipple and the grommet seal, which is a light press fit. The top of the washer pump is also secured to the washer reservoir by the use of a snap post (1) on the motor and a snap post receptacle molded into the reservoir that allows for mounting of the washer pump without the use of fasteners. An integral connector receptacle (2) on the top of the motor housing connects the unit to the vehicle electrical system through a dedicated take out and connector of the headlamp and dash wire harness.

The washer pump/motor unit cannot be repaired. If faulty or damaged, the entire washer pump/motor unit must be replaced.

OPERATION

The washer pump/motor unit features a reversible electric motor. The direction of the motor is controlled by hard wired outputs from the Front Control Module (FCM). When battery current and ground are applied to the two pump motor terminals, the motor rotates in one direction. When the polarity of these connections is reversed, the motor rotates in the opposite direction. When the pump motor is energized, the rotor-type pump pressurizes the washer fluid and forces it through one of the two pump outlet nipples, and into the front or rear washer plumbing.



The FCM controls the hard wired outputs to the pump motor based upon electronic washer request messages received over the Controller Area Network (CAN) data bus from the ElectroMechanical Instrument Cluster (EMIC). The EMIC monitors a resistor multiplexed input from the front washer switch circuitry contained within the multi-

function switch, and electronic rear washer switch status messages received over the CAN data bus from the A/C-heater control on the instrument panel to determine the proper washer request message to send. Whenever the low washer fluid indicator is illuminated, the EMIC is programmed to suppress all rear washer requests in order to give priority to the vehicle operator's need for forward visibility.

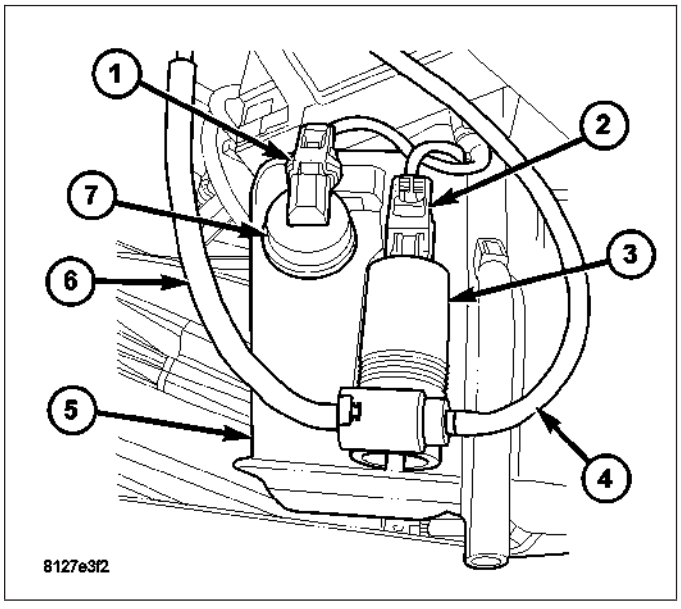
Washer fluid is gravity-fed from the washer reservoir to the inlet port of the washer pump housing. An integral valve body is located in a housing on the outlet port side (2) of the pump housing. A diaphragm (4) in this valve body controls which washer system plumbing receives the washer fluid being pressurized by the pump. When the pump is not operating the diaphragm is biased to close all washer fluid flow in the rear washer system and, in this way it also performs the function of the rear washer system check valve.

When the pump impeller (1) rotates in the counterclockwise direction (viewed from the bottom), the biased diaphragm is sealing off the rear washer system outlet and nipple so the pressurized washer fluid is pushed out through the pump front outlet port and the front washer outlet nipple (5). When the pump impeller rotates in the clockwise direction (viewed from the bottom), pressurized washer fluid is pushed out through the pump rear outlet port and moves the diaphragm to open the rear washer outlet nipple and seal off the front washer outlet nipple, then the pressurized washer fluid is pushed out through the rear washer outlet nipple (3).

The washer pump/motor unit and the hard wired motor control circuits from the FCM may be diagnosed and tested using conventional diagnostic tools and procedures. However, conventional diagnostic methods may not prove conclusive in the diagnosis of the FCM, the EMIC, the A/C-heater control, the CAN data bus, or the electronic messages used to provide washer pump/motor unit control. The most reliable, efficient, and accurate means to diagnose the FCM, the EMIC, the A/C-heater control, the CAN data bus, and the electronic messages for the washer pump/motor unit control requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

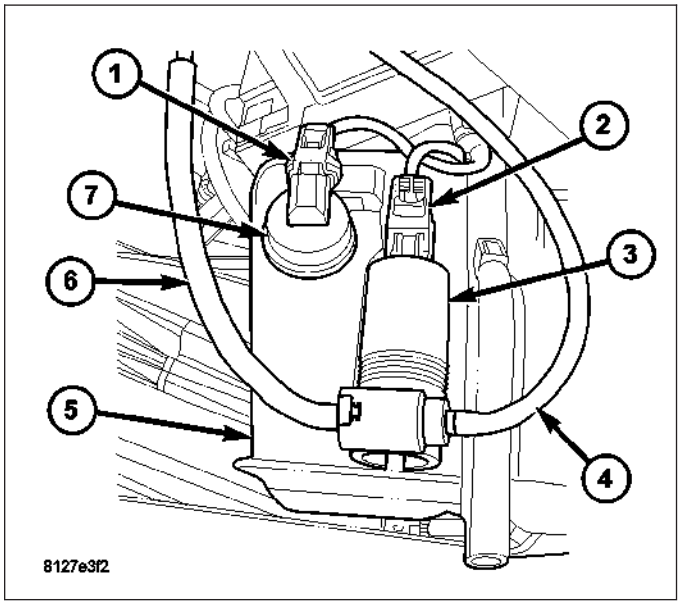
REMOVAL

NOTE: The washer pump/motor unit can be removed from the washer reservoir without removing the reservoir from the vehicle.



1. Disconnect and isolate the battery negative cable.
2. Reach between the front of the left front wheel house splash shield and the front bumper support to access the rearward facing lower surface of the washer reservoir (5).
3. Disconnect the wire harness connector (2) from the top of the washer pump/motor unit (3).
4. Disconnect the front washer hose (4) from the inboard pump outlet nipple and allow the washer fluid to drain into a clean container for reuse.
5. Disconnect the rear washer hose (6) from the outboard pump outlet nipple.
6. Grasp the top of the washer pump/motor housing and pull it firmly rearward far enough to disengage the snap post on the top of the motor from the receptacle in the reservoir.
7. Grasp the lower part of the washer pump/motor housing and, using a back and forth twisting action, pull the unit rearward from the reservoir far enough to disengage the pump inlet nipple from the rubber grommet seal in the reservoir.
8. Remove the rubber grommet seal from the washer pump mounting hole in the reservoir and discard.

INSTALLATION

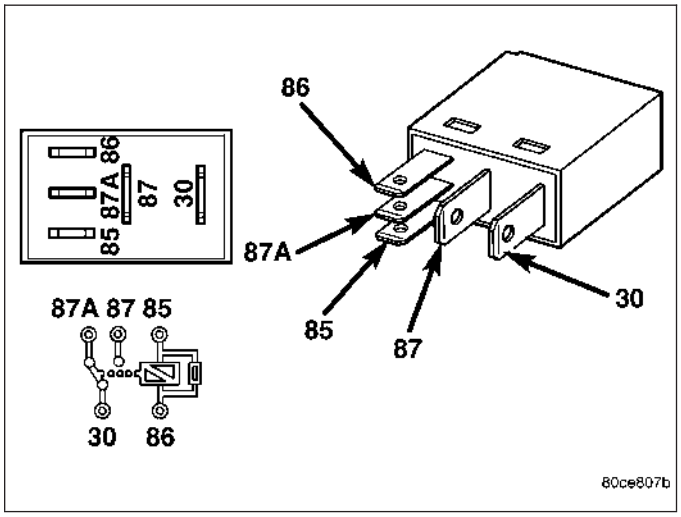


1. Install a new rubber grommet seal into the washer pump mounting hole of the washer reservoir (5). Always use a new rubber grommet seal on the reservoir.
2. Position the barbed inlet nipple of the washer pump/motor unit (3) to the rubber grommet seal in the reservoir.
3. Using hand pressure, press on the lower part of the washer pump firmly and evenly until the barbed inlet nipple is fully seated in the rubber grommet seal in the reservoir.
4. Align the snap post on the top of the motor housing with the snap post receptacle in the washer reservoir.
5. Using hand pressure, press firmly and evenly on the top of motor housing until the post snaps into the receptacle.
6. Reconnect the rear washer hose (6) to the outboard pump outlet nipple.
7. Reconnect the front washer hose (4) to the inboard pump outlet nipple.
8. Reconnect the wire harness connector (2) to the top of the pump motor.
9. Refill the washer reservoir with the washer fluid drained from the reservoir during the removal procedure.
10. Reconnect the battery negative cable.

RELAY-WIPER HIGH/LOW

DESCRIPTION

The wiper high/low relay is a conventional International Standards Organization (ISO) micro relay. Relays conforming to the ISO specifications have common physical dimensions, current capacities, terminal patterns, and terminal functions. This relay is contained within a small, rectangular, molded plastic housing and is connected to all of the required inputs and outputs through five integral male spade-type terminals that extend from the relay base plate.



The wiper high/low relay is located in the Power Distribution Center (PDC) in the engine compartment near the battery. Refer to the layout label on the underside of the PDC cover for specific relay cavity assignment information. The wiper high/low relay cannot be adjusted or repaired and, if faulty or damaged, the unit must be replaced.

OPERATION

The wiper high/low relay is an electromechanical switch that uses a low current input from the Front Control Module (FCM) to control a high current output to the front wiper motor. The movable common feed contact point is held against the fixed normally closed contact point by spring pressure. When the relay coil is energized, an electromagnetic field is produced by the coil windings. This electromagnetic field draws the movable relay contact point away

from the fixed normally closed contact point, and holds it against the fixed normally open contact point. When the relay coil is de-energized, spring pressure returns the movable contact point back against the fixed normally closed contact point. A resistor is connected in parallel with the relay coil in the relay, and helps to dissipate voltage spikes and electromagnetic interference that can be generated as the electromagnetic field of the relay coil collapses.

The wiper high/low relay terminals are connected to the vehicle electrical system through a connector receptacle in the Power Distribution Center (PDC). The inputs and outputs of the wiper high/low relay include:

- **Common Feed Terminal** - The common feed terminal (30) is connected to the output of the wiper on/off relay at all times through the wiper on/off relay output circuit.
- **Coil Ground Terminal** - The coil ground terminal (85) is connected to a control output of the Front Control Module (FCM) through a wiper high/low relay control circuit. The FCM controls wiper motor operation by controlling a ground path through this circuit.
- **Coil Battery Terminal** - The coil battery terminal (86) receives battery current when the ignition switch is in the On or Accessory positions from a fuse in the PDC through a fused ignition switch output (run-acc) circuit.
- **Normally Open Terminal** - The normally open terminal (87) is connected to the high speed brush of the wiper motor through a wiper high/low relay high speed output circuit, and is connected to the high speed brush whenever the relay is energized.
- **Normally Closed Terminal** - The normally closed terminal (87A) is connected to the low speed brush of the wiper motor through a wiper high/low relay low speed output circuit, and is connected to the low speed brush whenever the relay is de-energized.

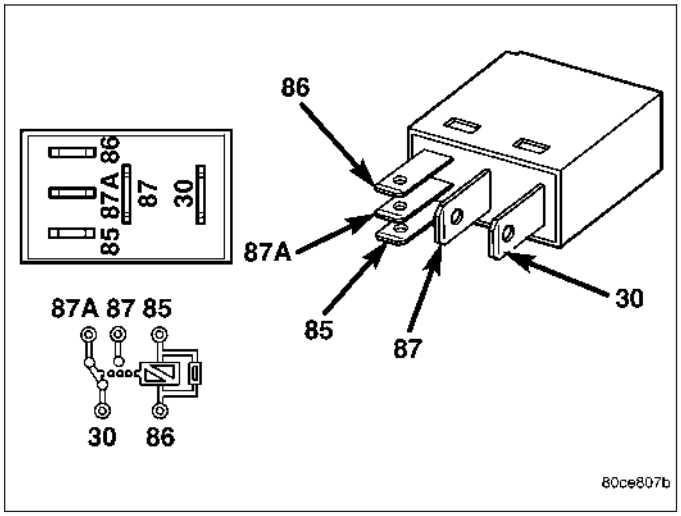
The wiper high/low relay can be diagnosed using conventional diagnostic tools and methods. However, conventional diagnostic methods may not prove conclusive in the diagnosis of the ElectroMechanical Instrument Cluster (EMIC), the FCM, or the electronic message inputs to or outputs from the EMIC and the FCM that control the operation of the wiper high/low relay. The most reliable, efficient, and accurate means to diagnose the wiper high/low relay, the EMIC, the FCM, or the electronic message inputs and outputs related to the wiper high/low relay operation requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

RELAY-WIPER ON/OFF

DESCRIPTION

The wiper on/off relay is a conventional International Standards Organization (ISO) micro relay. Relays conforming to the ISO specifications have common physical dimensions, current capacities, terminal patterns, and terminal functions. This relay is contained within a small, rectangular, molded plastic housing and is connected to all of the required inputs and outputs through five integral male spade-type terminals that extend from the relay base plate.

The wiper on/off relay is located in the Power Distribution Center (PDC) in the engine compartment near the battery. Refer to the layout label on the underside of the PDC cover for specific relay cavity assignment information. The wiper on/off relay cannot be adjusted or repaired and, if faulty or damaged, the unit must be replaced.



OPERATION

The wiper on/off relay is an electromechanical switch that uses a low current input from the Front Control Module (FCM) to control a high current output to the wiper motor. The movable common feed contact point is held against the fixed normally closed contact point by spring pressure. When the relay coil is energized, an electromagnetic field is produced by the coil windings. This electromagnetic field draws the movable relay contact point away from the fixed normally closed contact point, and holds it against the fixed normally open contact point. When the relay coil is de-energized, spring pressure returns the movable contact point back against the fixed normally closed contact

point. A resistor is connected in parallel with the relay coil in the relay, and helps to dissipate voltage spikes and electromagnetic interference that can be generated as the electromagnetic field of the relay coil collapses.

The wiper on/off relay terminals are connected to the vehicle electrical system through a connector receptacle in the Power Distribution Center (PDC). The inputs and outputs of the wiper on/off relay include:

- **Common Feed Terminal** - The common feed terminal (30) is connected to the common feed terminal of the wiper high/low relay at all times through the wiper on/off relay output circuit.
- **Coil Ground Terminal** - The coil ground terminal (85) is connected to a control output of the Front Control Module (FCM) through a wiper on/off relay control circuit. The FCM controls wiper motor operation by controlling a ground path through this circuit.
- **Coil Battery Terminal** - The coil battery terminal (86) receives battery current at all times from a fuse in the PDC through a fused ignition switch output (run-acc) circuit.
- **Normally Open Terminal** - The normally open terminal (87) receives battery current at all times from a fuse in the PDC through a fused ignition switch output (run-acc) circuit, and provides battery current to the wiper on/off relay output circuit whenever the relay is energized.
- **Normally Closed Terminal** - The normally closed terminal (87A) is connected to ground at all times through a take out of the headlamp and dash wire harness with an eyelet terminal connector that is secured by a screw to the front end sheet metal, and is connected to the wiper on/off relay output circuit whenever the relay is de-energized.

The wiper on/off relay may be diagnosed using conventional diagnostic tools and methods. However, conventional diagnostic methods may not prove conclusive in the diagnosis of the ElectroMechanical Instrument Cluster (EMIC), the FCM, or the electronic message inputs to or outputs from the EMIC and the FCM that control the operation of the wiper on/off relay. The most reliable, efficient, and accurate means to diagnose the wiper on/off relay, the EMIC, the FCM, or the electronic message inputs and outputs related to the wiper on/off relay operation requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

RESERVOIR-WASHER

DESCRIPTION

The molded plastic washer fluid reservoir is integral to the engine coolant overflow bottle located on the left end of the air conditioning condenser module in the left front corner of the engine compartment. A single washer fluid reservoir is used for both the front and rear washer systems.

A bright yellow plastic filler cap with a rubber seal and an International Control and Display Symbol icon for “Windshield Washer” and the text “Washer Fluid Only” molded into it snaps over the open end of the filler neck. The cap hinges on and is secured to a molded-in hook formation on the top of the reservoir just behind the filler neck when it is removed for inspecting or adjusting the fluid level in the reservoir.

There are separate, dedicated holes on the lower rearward facing side of the reservoir provided for the mounting of the washer/pump motor unit and the washer fluid level switch. A snap post receptacle for the washer pump is molded into the reservoir to allow for mounting of the washer pump/motor unit without the use of fasteners.

The washer reservoir is serviced only as a unit with the engine coolant reserve bottle. The washer reservoir cannot be repaired and, if faulty or damaged, the coolant reserve bottle/washer reservoir unit must be replaced. The grommet seals for the washer pump/motor unit and the washer fluid level switch, and the filler cap are each available for individual service replacement.

OPERATION

The washer fluid reservoir provides a secure, on-vehicle storage location for a large reserve of washer fluid for operation of the front and rear washer systems. The washer reservoir filler neck provides a clearly marked and readily accessible point from which to add washer fluid to the reservoir.

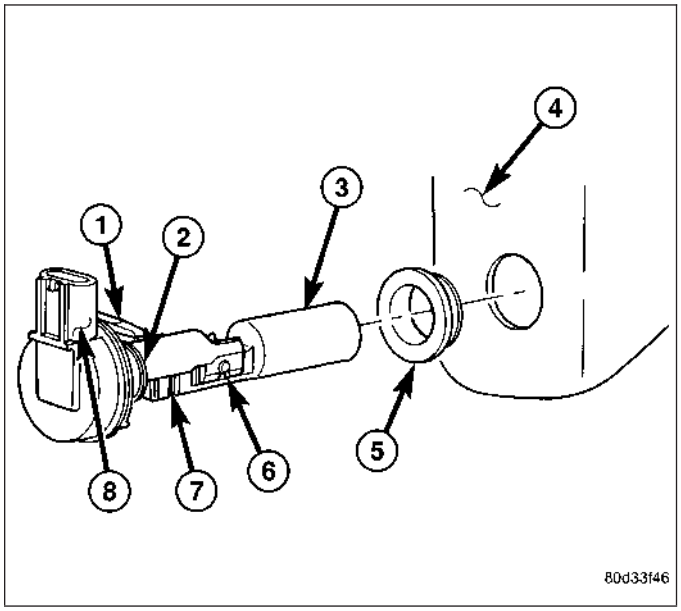
The washer/pump motor unit is located in a sump area near the bottom of the reservoir to be certain that washer fluid will be available to the pump as the fluid level in the reservoir becomes depleted. The washer fluid level switch is mounted just above the sump area of the reservoir so that there will be adequate warning to the vehicle operator that the washer fluid level is low, before the front washer system will no longer operate. The ElectroMechanical Instrument Cluster (EMIC) is programmed to suppress rear washer system operation upon illumination of the low washer fluid indicator so that the front washers can remain operational until the fluid level can be replenished.

SENSOR-WASHER FLUID LEVEL

DESCRIPTION

The washer fluid level switch is a single pole, single throw reed-type switch mounted on the rearward facing side of the washer reservoir (4). Only the molded plastic switch mounting flange (1) and the integral connector receptacle (8) are visible when the switch is installed in the reservoir. A short nipple formation (2) extends from the inner surface of the switch mounting flange, and a barb on the nipple is pressed through a rubber grommet seal (5) installed in the mounting hole of the reservoir.

A small, molded plastic float (3) has two pivot pins (6) near its center that are snapped into two receptacles near the ends of two stanchions that extend toward the float from the nipple formation. A small magnet (7) is secured within the end of the float nearest the nipple, and a reed switch is concealed within the nipple. A diagnostic resistor is connected between the two switch terminals within the switch mounting flange. The washer fluid level switch cannot be adjusted or repaired. If faulty or damaged, the switch must be replaced.



OPERATION

The washer fluid level switch uses a pivoting, oblong float to monitor the level of the washer fluid in the washer reservoir. The float contains a small magnet. When the float pivots, the proximity of this magnet to a stationary reed switch within the nipple formation of the switch changes. When the fluid level in the washer reservoir is at or above the float level, the float moves to a vertical position, the influence of the float magnetic field is removed from the reed switch, and the normally open reed switch contacts open. When the fluid level in the washer reservoir falls below the level of the pivoting float, the float moves to a horizontal position, the influence of the float magnetic field is applied to the reed switch, and the contacts of the normally open reed switch close.

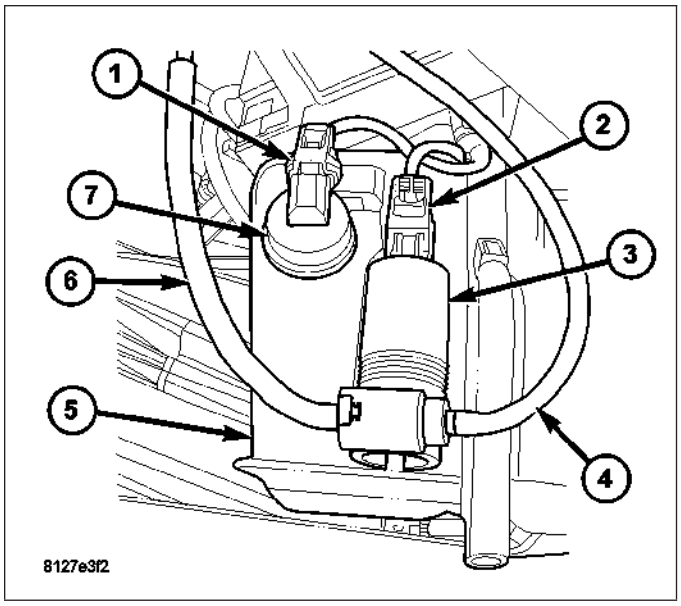
The washer fluid level switch is connected to the vehicle electrical system through a dedicated take out and connector of the headlamp and dash wire harness. The switch is connected in series between a clean ground output of the Front Control Module (FCM) on a sensor return circuit and the washer fluid switch sense input to the FCM. When the switch closes, the FCM senses the ground on the washer fluid switch sense circuit. The FCM is programmed to respond to this input by sending an electronic washer fluid indicator lamp-on message to the instrument cluster over the Controller Area Network (CAN) data bus. The instrument cluster responds to this message by illuminating the washer fluid indicator, by sounding an audible chime tone warning, and by suppressing requests for rear washer system operation.

The washer fluid level switch may be diagnosed and tested using conventional diagnostic tools and procedures. However, conventional diagnostic methods may not prove conclusive in the diagnosis of the instrument cluster, the FCM, or the electronic message inputs to or outputs from the instrument cluster and the FCM that control the operation of the washer fluid visual and/or audible indicators. The most reliable, efficient, and accurate means to diagnose the washer fluid level indicator, the instrument cluster, the FCM, or the electronic message inputs and outputs related to the washer fluid indicator requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

REMOVAL

NOTE: The washer fluid level switch can be removed from the washer reservoir without removing the reservoir from the vehicle.

1. Disconnect and isolate the battery negative cable.
2. Reach between the front of the left front wheel house splash shield and the front bumper support to access the rearward facing lower surface of the washer reservoir (5).
3. Disconnect the wire harness connector from the top of the washer fluid level switch unit (1).
4. Disconnect the front washer hose (4) from the inboard outlet nipple of the washer pump/motor unit (3) and allow the washer fluid to drain into a clean container for reuse.

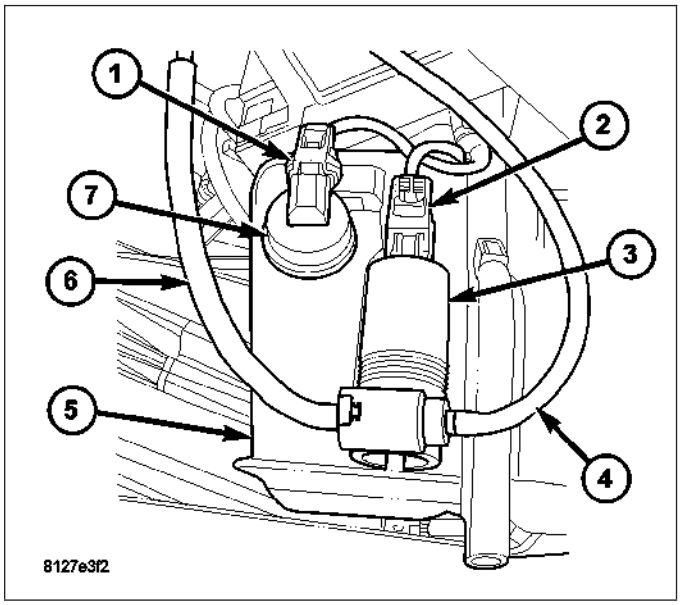


NOTE: The pivoting float of the washer fluid level switch must be in a horizontal position within the reservoir in order to be removed. With the reservoir empty and in an upright position, the pivoting float will orient itself to the horizontal position when the switch connector receptacle is pointed straight upwards.

5. Using a trim stick or another suitable wide flat-bladed tool, gently pry the barbed nipple of the washer fluid level switch out of the rubber grommet seal in the reservoir. Care must be taken not to damage the reservoir.
6. Remove the switch and float from the reservoir.
7. Remove the rubber grommet seal from the mounting hole in the washer reservoir and discard.

INSTALLATION

1. Install a new rubber grommet seal into the washer fluid level switch mounting hole in the rearward facing side of the washer reservoir (5). Always use a new rubber grommet seal on the reservoir.
2. Slide the float through and align the barbed nipple of the switch with the rubber grommet seal in the reservoir. The connector receptacle of the switch should be pointed upward.
3. Press firmly and evenly on the switch (1) using hand pressure until the barbed nipple is fully seated in the rubber grommet seal in the reservoir.
4. Reconnect the wire harness connector to the switch connector.
5. Reconnect the front washer hose (4) to the washer pump/motor unit (3) inboard outlet nipple.
6. Refill the washer reservoir with the washer fluid drained from the reservoir during the removal procedure.
7. Reconnect the battery negative cable.



REAR WIPERS/WASHERS - ELECTRICAL DIAGNOSTICS

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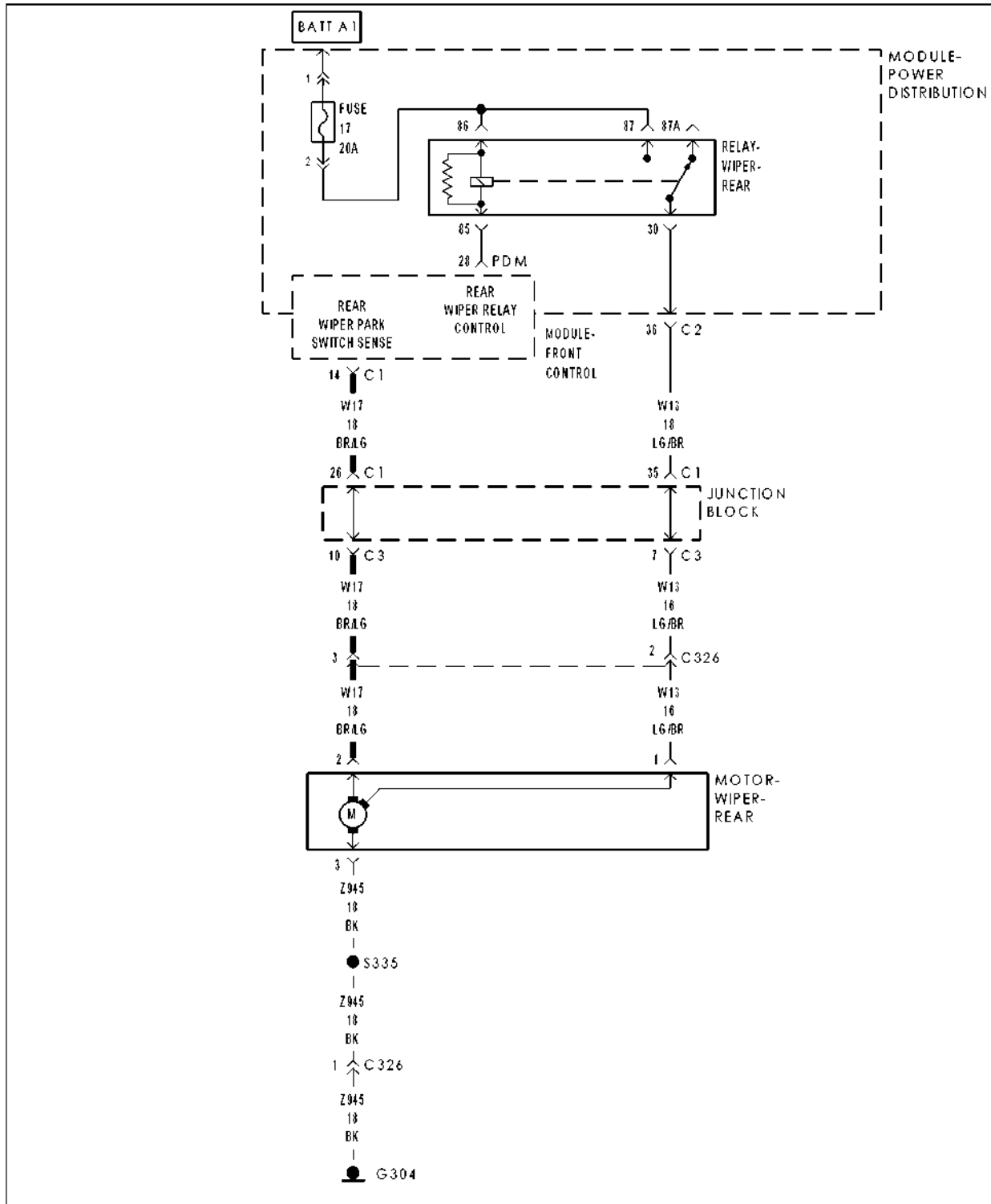
REAR WIPERS/WASHERS - ELECTRICAL DIAGNOSTICS

DIAGNOSIS AND TESTING

B230D-REAR WIPER PARK SWITCH INPUT CIRCUIT LOW



B230D-REAR WIPER PARK SWITCH INPUT CIRCUIT LOW (CONTINUED)

For the Rear Wipers/Washers circuit diagram (Refer to 8 - ELECTRICAL/WIPERS/WASHERS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- **Set Condition:**

Possible Causes
WIPER/WASHER SWITCH
(W17) REAR WIPER PARK SWITCH SENSE CIRCUIT LOW
FRONT CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all FCM DTC's.

Turn the Rear Wipers on.

With the Scan Tool, read the Rear Wiper DTC's.

Does the Scan Tool read: B230D-REAR WIPER PARK SWITCH INPUT CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST — VER 1.

---

2. WIPER/WASHER SWITCH

Turn the ignition off.

Disconnect the Rear Wiper/Washer Switch connector.

Measure the internal resistance of the Wiper/Washer Switch between cavity 1 and 2 of the switch.

Is the resistance above 5.0 ohms?

Yes >> Replace the Rear Wiper/Washer Switch in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.

No >> Go To 3

B230D-REAR WIPER PARK SWITCH INPUT CIRCUIT LOW (CONTINUED)

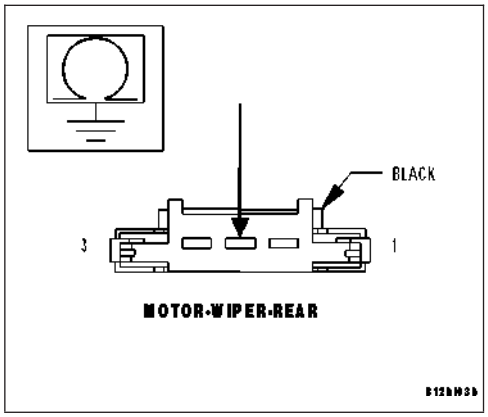
3. FRONT CONTROL MODULE

Turn the ignition off.

Disconnect the Rear Wiper/Washer Switch connector.

Disconnect the FCM C1 harness connector.

Measure the resistance between ground and the (W17) Rear Wiper Park Switch Sense circuit.

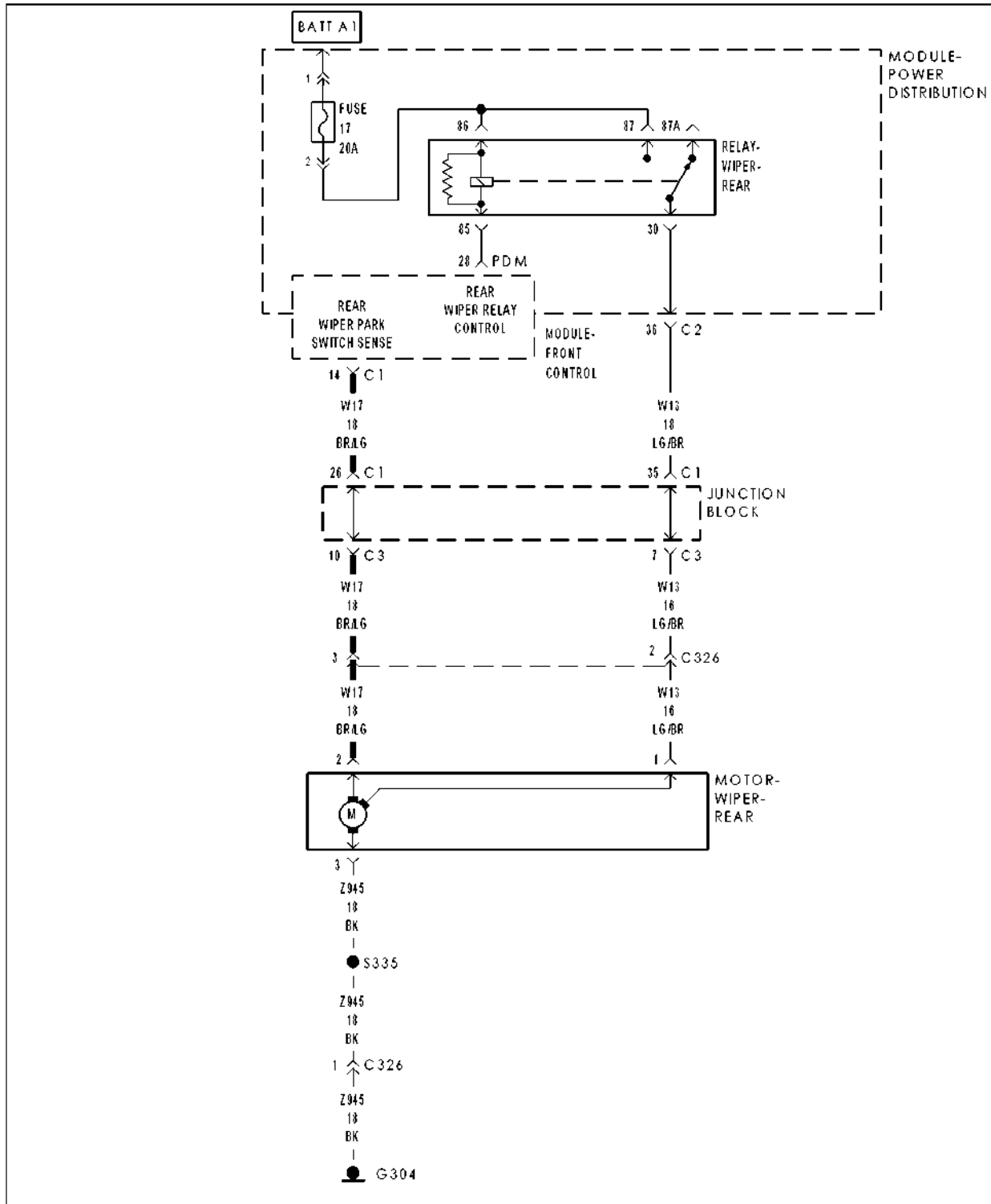


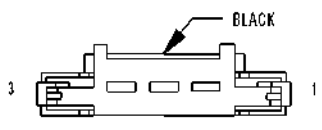
Is the resistance below 5.0 ohms?

Yes >> Repair the (W17) Rear Wiper Park Switch Sense circuit for a short condition.
Perform the BODY VERIFICATION TEST — VER 1.

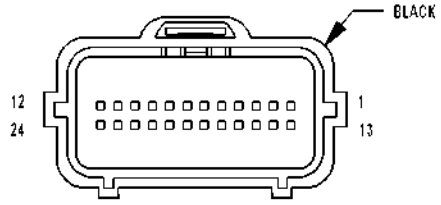
No >> Replace the Front Control Module in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.

B230E-REAR WIPER PARK SWITCH INPUT CIRCUIT OPEN

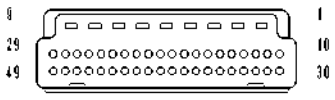




MOTOR-WIPER-REAR



MODULE-FRONT CONTROL C1



MODULE-FRONT CONTROL PDM

B230E-REAR WIPER PARK SWITCH INPUT CIRCUIT OPEN (CONTINUED)

For the Rear Wipers/Washers circuit diagram (Refer to 8 - ELECTRICAL/WIPERS/WASHERS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- **Set Condition:**

Possible Causes
WIPER/WASHER SWITCH
(W17) REAR WIPER PARK SWITCH SENSE CIRCUIT HIGH
FRONT CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all FCM DTC's.

Turn the Rear Wipers on.

With the Scan Tool, read the Rear Wiper DTC's.

Does the Scan Tool read: B230E-REAR WIPER PARK SWITCH INPUT CIRCUIT OPEN?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST — VER 1.

---

2. WIPER/WASHER SWITCH

Turn the ignition off.

Disconnect the Rear Wiper/Washer Switch connector.

Measure the internal resistance of the Wiper/Washer Switch between cavity 1 and 2 of the switch.

Is the resistance above 5.0 ohms?

Yes >> Replace the Rear Wiper/Washer Switch in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.

No >> Go To 3

B230E-REAR WIPER PARK SWITCH INPUT CIRCUIT OPEN (CONTINUED)

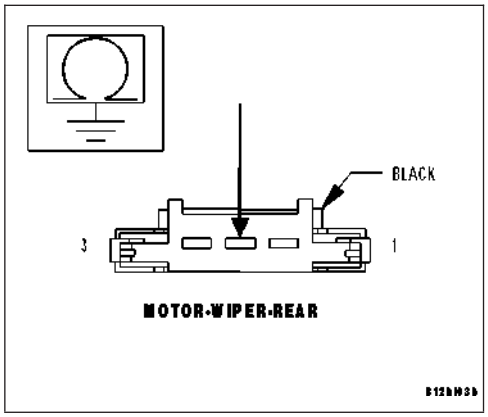
3. FRONT CONTROL MODULE

Turn the ignition off.

Disconnect the Wiper/Washer Switch connector.

Disconnect the FCM C1 harness connector.

Measure the resistance of the (W17) Rear Wiper Park Switch Sense circuit.

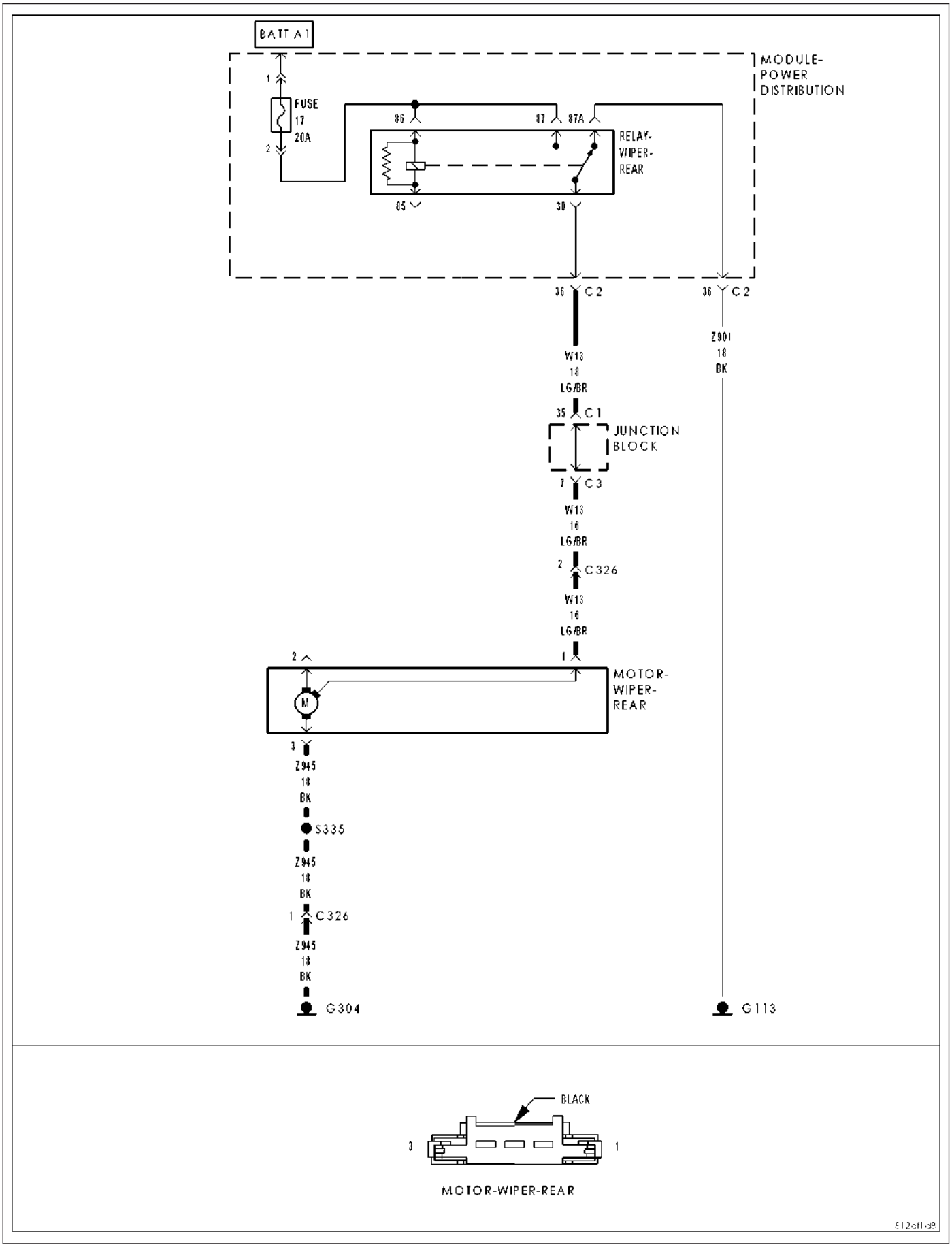


Is the resistance above 5.0 ohms?

Yes >> Repair the (W17) Rear Wiper Park Switch Sense circuit for an open condition.
Perform the BODY VERIFICATION TEST — VER 1.

No >> Replace the Front Control Module in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.

B231B-REAR WIPER MOTOR CONTROL CIRCUIT LOW



B231B-REAR WIPER MOTOR CONTROL CIRCUIT LOW (CONTINUED)

For the Rear Wipers/Washers circuit diagram (Refer to 8 - ELECTRICAL/WIPERS/WASHERS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- **Set Condition:**

Possible Causes
WIPER MOTOR
MODULE POWER DISTRIBUTION
(W13) REAR WIPER CONTROL CIRCUIT LOW
FRONT CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.

With the Scan Tool, clear all FCM DTC's.

Turn the Rear Wipers on.

With the Scan Tool, read the Rear Wiper DTC's.

Does the Scan Tool read: B231B-REAR WIPER MOTOR CONTROL CIRCUIT LOW?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST — VER 1.

---

2. WIPER MOTOR REAR

Turn the ignition off.

Disconnect the Rear Wiper Motor connector.

Measure the internal resistance of the Wiper Motor between cavity 1 and 2 of the Motor.

Is the resistance above 5.0 ohms?

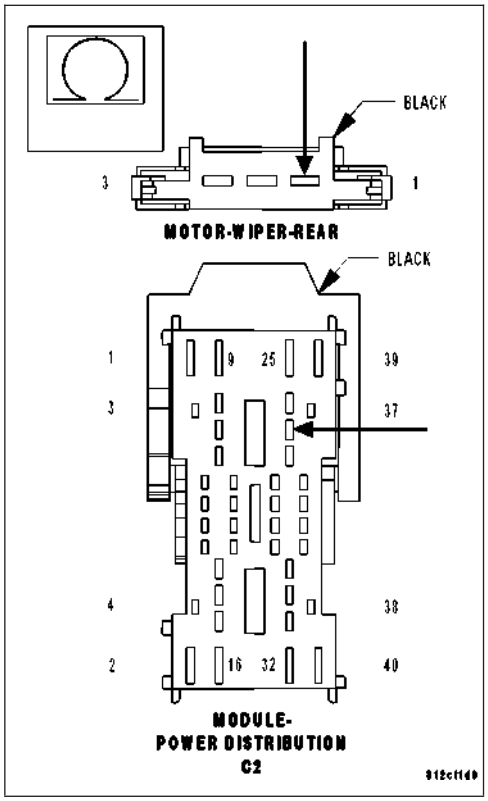
Yes >> Replace the Rear Wiper Motor in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.

No >> Go To 3

B231B-REAR WIPER MOTOR CONTROL CIRCUIT LOW (CONTINUED)

3. W13 MOTOR CONTROL CIRCUIT

Turn the ignition off.
Disconnect the Rear Wiper Motor connector.
Disconnect the Module Power Distribution C2 connector.
Measure the resistance between ground and the (W13) Wiper Motor Control circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (W13) Wiper Motor Control circuit.
Perform the BODY VERIFICATION TEST — VER 1.

No >> Go To 4

4. FRONT CONTROL MODULE

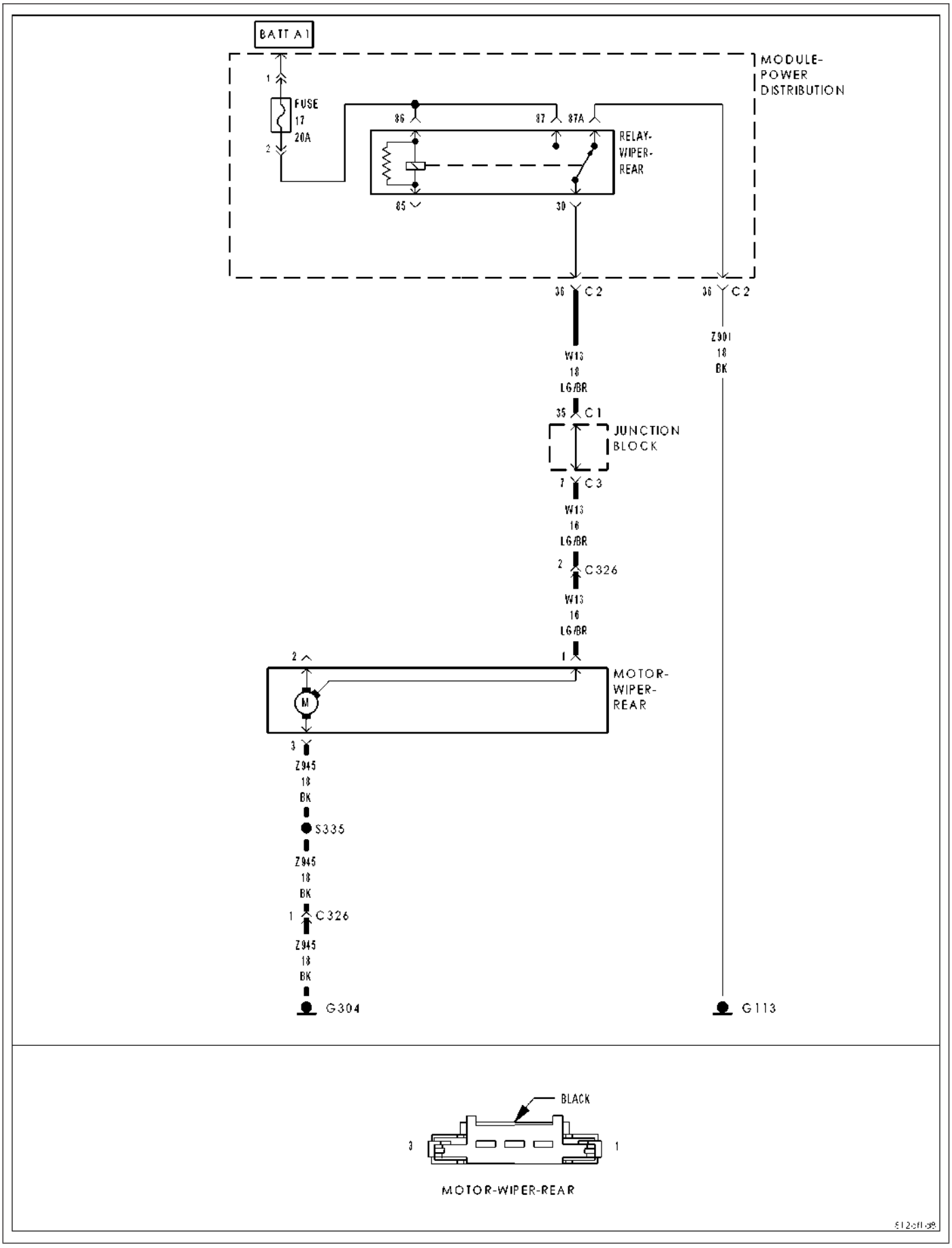
Turn the ignition off.
Disconnect the FCM from the PDC.
Disconnect the Module Power Distribution.
Measure the internal resistance of the PDC (W13) Wiper Motor Control circuit.

Is the resistance above 5.0 ohms?

Yes >> Replace the Module Power Distribution in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.

No >> Replace the Front Control Module in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.

B231C-REAR WIPER MOTOR CONTROL CIRCUIT HIGH



B231C-REAR WIPER MOTOR CONTROL CIRCUIT HIGH (CONTINUED)

For the Rear Wipers/Washers circuit diagram (Refer to 8 - ELECTRICAL/WIPERS/WASHERS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
- **Set Condition:**

Possible Causes
WIPER MOTOR
(Z945) GROUND CIRCUIT
MODULE POWER DISTRIBUTION
(W13) REAR WIPER CONTROL CIRCUIT LOW
FRONT CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.
With the Scan Tool, clear all FCM DTC's.
Turn the Rear Wipers on.
With the Scan Tool, read the Rear Wiper DTC's.

Does the Scan Tool read: B231C-REAR WIPER MOTOR CONTROL CIRCUIT HIGH?

Yes >> Go To 2

No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
Perform the BODY VERIFICATION TEST — VER 1.

---

2. WIPER MOTOR REAR

Turn the ignition off.
Disconnect the Rear Wiper Motor connector.
Measure the internal resistance of the Wiper Motor between cavity 1 and 2 of the Motor.

Is the resistance above 5.0 ohms?

Yes >> Replace the Rear Wiper Motor in accordance with the service information.
Perform the BODY VERIFICATION TEST — VER 1.

No >> Go To 3

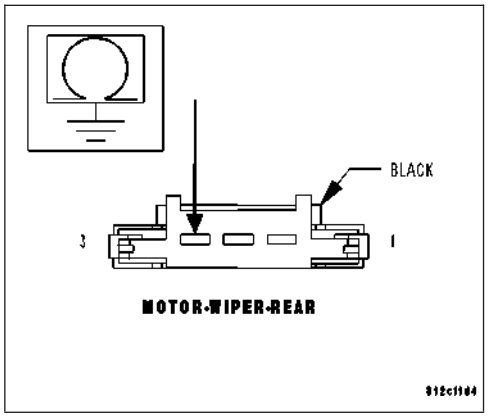
B231C-REAR WIPER MOTOR CONTROL CIRCUIT HIGH (CONTINUED)

3. Z945 WIPER MOTOR GROUND CIRCUIT

Turn the ignition off.

Disconnect the Rear Wiper Motor connector.

Measure the resistance between ground and the (Z945) Rear Wiper Motor ground circuit.



Is the resistance above 5.0 ohms?

Yes >> Repair the (Z945) Rear Wiper Motor Ground circuit for a short condition.
Perform the BODY VERIFICATION TEST — VER 1.

No >> Go To 4

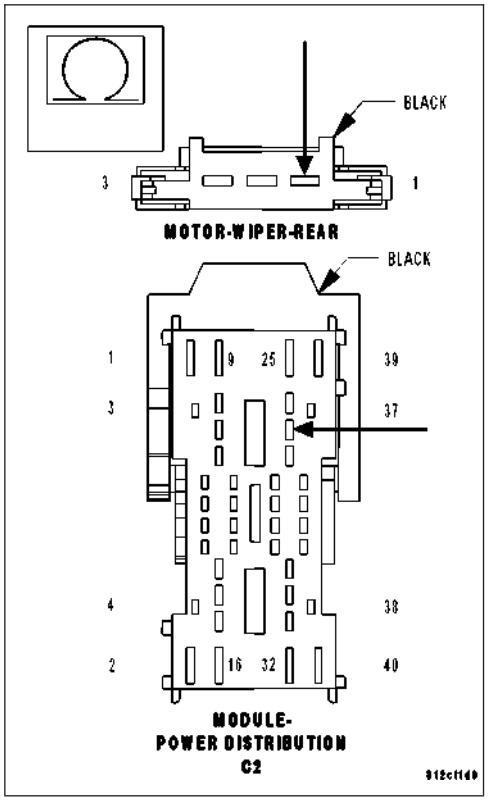
4. W13 MOTOR CONTROL CIRCUIT

Turn the ignition off.

Disconnect the Rear Wiper Motor connector.

Disconnect the Module Power Distribution C2 connector.

Measure the resistance of the wiper Motor Control circuit.



Is the resistance above 5.0 ohms?

Yes >> Repair the (W13) Wiper Motor Control circuit.
Perform the BODY VERIFICATION TEST — VER 1.

No >> Go To 5

B231C-REAR WIPER MOTOR CONTROL CIRCUIT HIGH (CONTINUED)

5. **FRONT CONTROL MODULE**

Turn the ignition off.
Disconnect the FCM from the PDC.
Disconnect the Module Power Distribution.
Measure the internal resistance of the PDC (W13) Wiper Motor Control circuit.

Is the resistance above 5.0 ohms?

Yes >> Replace the Module Power Distribution in accordance with the service information. Perform the BODY VERIFICATION TEST — VER 1.

No >> Replace the Front Control Module in accordance with the service information. Perform the BODY VERIFICATION TEST — VER 1.

REAR WIPERS/WASHERS - SERVICE INFORMATION

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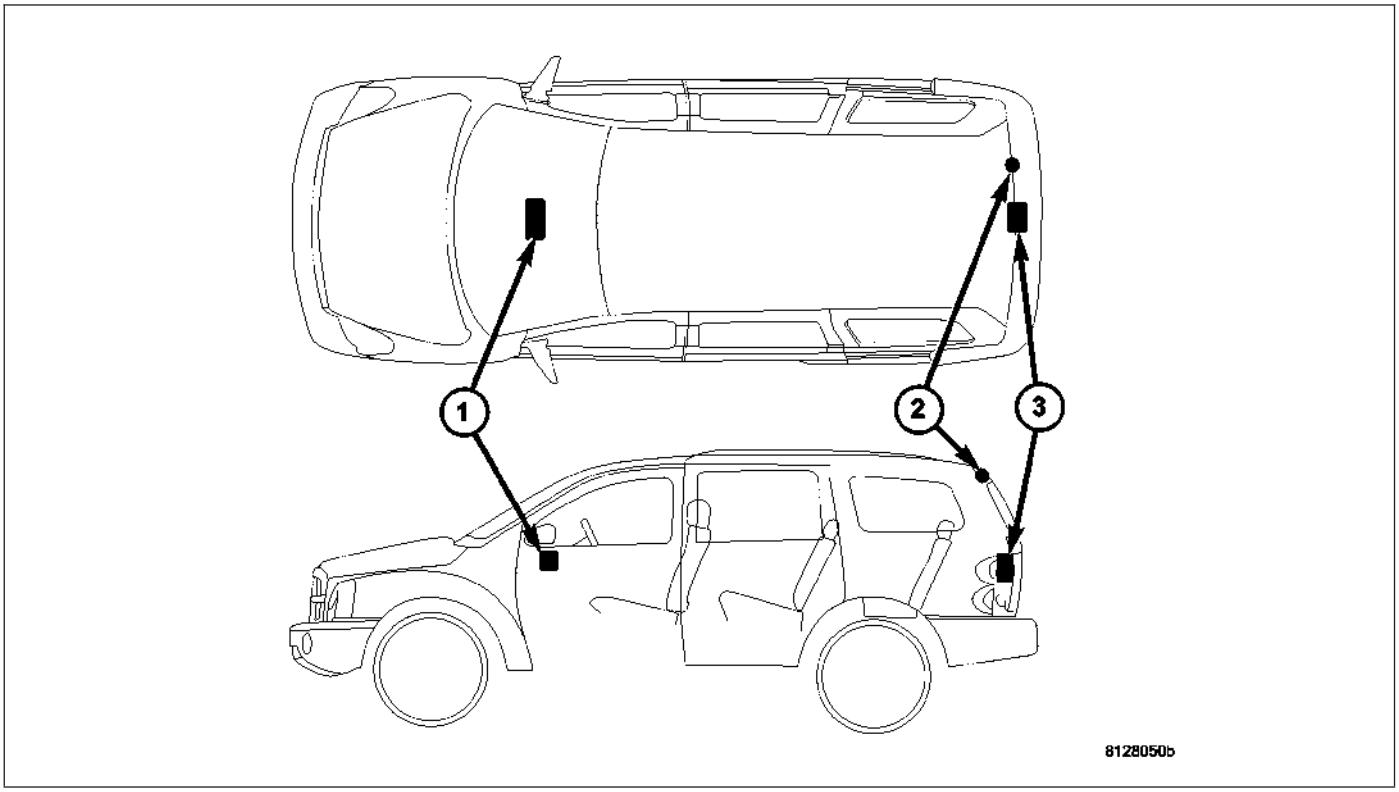
REAR WIPERS/WASHERS - SERVICE INFORMATION

DESCRIPTION



An electrically operated intermittent rear wiper and washer system is standard factory-installed equipment on this model. The rear wiper and washer system includes the following major components, which are described in further detail elsewhere in this service information:

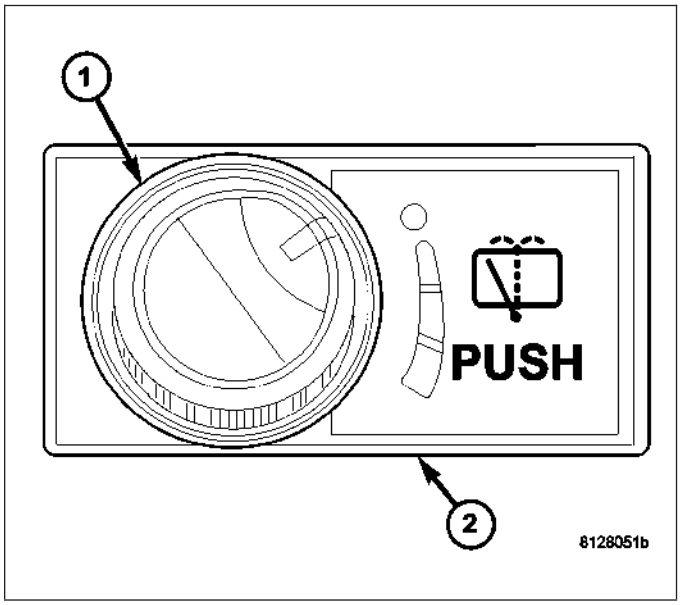
- **Front Control Module** - The Front Control Module (FCM) is integral to the Integrated Power Module (IPM). The FCM/IPM is located in the engine compartment, near the battery and the Power Distribution Center (PDC). (Refer to 8 - ELECTRICAL/POWER DISTRIBUTION - DESCRIPTION).
- **Heater-Air Conditioner Control (1)** - The vehicle operator controls all rear wiper and washer system functions through two switches that are operated by a single rotary control knob in the heater-air conditioner control located in the center stack area of the instrument panel. The heater-air conditioner control sends electronic rear wiper and rear washer switch status messages to the ElectroMechanical Instrument Cluster (EMIC over the Controller Area Network (CAN) data bus. (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/A/C HEATER CONTROL - DESCRIPTION).
- **Instrument Cluster** - The ElectroMechanical Instrument Cluster (EMIC) is also known as the Cab Control Node (CCN) in this vehicle. The EMIC/CCN is located in the instrument panel above the steering column opening, directly in front of the driver. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DESCRIPTION).
- **Rear Washer Nozzle (2)** - A fluidic rear washer nozzle is secured by latch features to a mounting hole in the liftgate header panel and to the right of the Center High-Mounted Stop Lamp (CHMSL) above the liftgate glass.
- **Rear Washer Plumbing** - The plumbing for the washer system consists of rubber hoses and molded plastic fittings. The plumbing is routed along the underside of the Power Distribution Center (PDC) bracket to the engine compartment from the washer reservoir. The rear washer hose is routed through the dash panel from the engine compartment into the passenger compartment, up the left A-pillar where it is connected to a hose integral to the headliner that runs from the A-pillar to the rear washer nozzle on the upper liftgate header.
- **Rear Wiper Arm** - The single rear wiper arm is secured by a nut directly to the rear wiper motor output shaft, which extends through the center of the liftgate outer panel near the base of the liftgate glass.
- **Rear Wiper Blade** - The single rear wiper blade is secured to the rear wiper arm with an integral latch, and is parked near the bottom of the liftgate glass when the rear wiper system is not in operation.

- **Rear Wiper Motor (3)** - The rear wiper motor output shaft is the only visible component of the rear wiper motor. The remainder of the motor is concealed within the liftgate beneath the liftgate glass opening. The rear wiper motor includes the motor bracket, the rear wiper motor, and the rear wiper motor park switch.
- **Rear Wiper Relay** - The rear wiper relay is located in the Power Distribution Center (PDC) in the engine compartment near the battery.
- **Washer Reservoir** - The rear washer system shares a single reservoir and reversible pump with the front washer system, but has its own dedicated plumbing. The washer reservoir is integral to the engine coolant reserve bottle located in the left front corner of the engine compartment.

Hard wired circuitry connects the rear wiper and washer system components to the electrical system of the vehicle. These hard wired circuits are integral to several wire harnesses, which are routed throughout the vehicle and retained by many different methods. These circuits may be connected to each other, to the vehicle electrical system and to the rear wiper and washer system components through the use of a combination of soldered splices, splice block connectors, and many different types of wire harness terminal connectors and insulators. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, further details on wire harness routing and retention, as well as pin-out and location views for the various wire harness connectors, splices and grounds.

OPERATION

The rear wiper and washer system is designed to provide the vehicle operator with a convenient, safe, and reliable means of maintaining visibility through the liftgate glass. The various components of this system are designed to convert electrical energy produced by the vehicle electrical system into the mechanical action of the wiper blade to wipe the outside surface of the glass, as well as into the hydraulic action of the washer system to apply washer fluid stored in an onboard reservoir to the area of the glass to be wiped. When combined, these components provide the means to effectively maintain clear visibility for the vehicle operator by removing excess accumulations of rain, snow, bugs, mud, or other minor debris from the outside liftgate glass surface that might be encountered while driving under numerous inclement operating conditions.



The vehicle operator initiates all rear wiper and washer system functions with the rear wiper and washer switch located in a corner of the heater-air conditioner control (2), just below the radio on the instrument panel. Rotating the rear wiper and washer switch control knob (1) to a detent position selects the rear wiper system operating mode, either continuous or intermittent. Intermittent operation provides one of four fixed delay intervals, from five to 21 seconds. Depressing the control knob activates the rear washer system. When a rear wiper or washer switch mode is selected, the circuitry within the heater-air conditioner control sends an electronic rear wiper/washer switch status message over the Controller Area Network (CAN) data bus to the Front Control Module (FCM) over the CAN data bus requesting the appropriate rear wiper and washer system operating modes.

The hard wired circuits and components of the rear wiper and washer system may be diagnosed and tested using conventional diagnostic tools and procedures. However, conventional diagnostic methods may not prove conclusive in the diagnosis of the heater-air conditioner control, the FCM, or the electronic message inputs to or outputs from the heater-air conditioner control or FCM that control the rear wiper and washer system operating modes. The most reliable, efficient, and accurate means to diagnose the heater-air conditioner control or the FCM inputs and outputs related to the various rear wiper and washer system operating modes requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

OPERATING MODES

Following are paragraphs that briefly describe the operation of each of the rear wiper and washer system operating modes.

CONTINUOUS WIPE MODE

When the On position of the rear wiper/washer control knob is selected the instrument cluster sends an electronic wiper switch message to the FCM, then the FCM energizes the rear wiper relay. This directs battery current to the rear wiper motor, causing the wiper to cycle continuously at a fixed speed until the FCM de-energizes the rear wiper relay.

INTERMITTENT WIPE MODE

When the rear wiper/washer control knob is moved to one of the Delay interval positions the instrument cluster sends an electronic wiper switch delay message to the FCM, then the FCM electronic intermittent wipe logic circuit responds by calculating the correct length of time between wiper sweeps based upon the selected delay interval input. The FCM monitors the changing state of the rear wiper motor park switch through a hard wired park switch sense input. This input allows the FCM to determine the proper intervals at which to energize and de-energize the rear wiper relay to operate the wiper motor intermittently for one cycle at a time.

WASH MODE

When the rear wiper/washer control knob is depressed to the momentary Wash position, the instrument cluster sends an electronic washer switch message to the FCM, then the FCM directs battery current and ground to the washer pump/motor unit. This will cause the washer pump/motor unit to be energized for as long as the Wash switch is held closed up to about thirty seconds, and to de-energize when the rear wiper/washer control knob is released.

WIPE-AFTER-WASH MODE

When the rear wiper/washer control knob is released from the momentary Wash position, the instrument cluster sends an electronic washer switch message to the FCM. The FCM de-energizes the washer pump/motor, but allows the rear wiper motor to operate for several wipe cycles before it de-energizes the rear wiper relay.

OFF MODE

When the Off position of the rear wiper/washer control knob is selected, one of three events is possible. The event that will occur depends upon the position of the wiper blade on the liftgate glass and the mode the wiper motor is operating under at the moment that the Off position is selected. If the wiper blade is in the down position on the glass and the rear wiper system is operating in the fixed or fixed intermittent cycle modes when the Off position is selected, the park switch is open and the FCM de-energizes the rear wiper relay control coil causing the rear wiper motor to cease to operation.

If the wiper blade is not in the down position on the glass and is operating in the fixed or fixed intermittent cycle modes when the Off position is selected, the park switch is closed to ground and the FCM keeps the rear wiper relay control coil energized to operate the rear wiper motor until the rear wiper blade is in the down position on the glass and the park switch input is an open circuit.

The third event occurs with the rear wiper operating in the wipe-after-wash mode when the Off position is selected, in which case the FCM will continue to run the wiper motor until the completion of about three wiper blade sweeps before the rear wiper blade is parked. The FCM will also run the rear wiper motor to park the rear wiper blade if the ignition switch is turned to the Off position while the rear wiper system is still operating.

DIAGNOSIS AND TESTING

REAR WIPER & WASHER SYSTEM

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

If the rear wiper motor operates, but the wiper motor output shaft does not move, replace the faulty rear wiper motor. If the washer pump/motor operates, but no washer fluid is dispensed on the glass; or, if the wiper operates, but chatters, lifts, or does not clear the glass, clean and inspect the wiper and washer system components as required. (Refer to 8 - ELECTRICAL/REAR WIPERS/WASHERS - CLEANING) and (Refer to 8 - ELECTRICAL/ REAR WIPERS/WASHERS - INSPECTION).

The hard wired rear wiper and washer system circuits and components may be diagnosed and tested using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

However, conventional diagnostic methods may not prove conclusive in the diagnosis of the ElectroMechanical Instrument Cluster (EMIC), the Front Control Module (FCM), the Integrated Power Module (IPM), the Power Distribution Center (PDC), the heater-A/C control panel, the Controller Area Network (CAN) data bus, or the electronic message inputs used to provide rear wiper and washer service or many of the electronic features of the wiper and washer systems. The most reliable, efficient, and accurate means to diagnose the EMIC, the FCM, the IPM, the PDC, the heater-A/C control, the CAN data bus, and the electronic message inputs for the rear wiper and washer system requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

CLEANING - REAR WIPER & WASHER SYSTEM

WIPER SYSTEM

The squeegee of a wiper blade exposed to the elements for a long time tends to lose its wiping effectiveness. Periodic cleaning of the squeegee is suggested to remove any deposits of salt or road film. The wiper blade, arm, and liftgate glass should only be cleaned using a sponge or soft cloth and windshield washer fluid, a mild detergent, or a non-abrasive cleaner. If the wiper blade continues to leave streaks, smears, hazing, or beading on the glass after thorough cleaning of the squeegees and the glass, the entire wiper blade assembly must be replaced.

CAUTION: Protect the rubber squeegee of the wiper blade from any petroleum-based cleaners, solvents, or contaminants. These products can rapidly deteriorate the rubber squeegee.

WASHER SYSTEM

If the washer system is contaminated with foreign material, drain the washer reservoir by removing the washer pump/motor from the reservoir. Clean foreign material from the inside of the washer pump/motor inlet filter screen and the washer reservoir using clean washer fluid, a mild detergent, or a non-abrasive cleaner. Flush foreign material from the washer system plumbing by first disconnecting the washer hose from the washer nozzle, then running the washer pump/motor to run clean washer fluid or water through the system. A plugged or restricted washer nozzle should be carefully back-flushed using compressed air. If the washer nozzle obstruction cannot be cleared, replace the washer nozzle.

CAUTION: Never introduce petroleum-based cleaners, solvents, or contaminants into the washer system. These products can rapidly deteriorate the rubber seals and hoses of the washer system, as well as the rubber squeegee of the wiper blade.

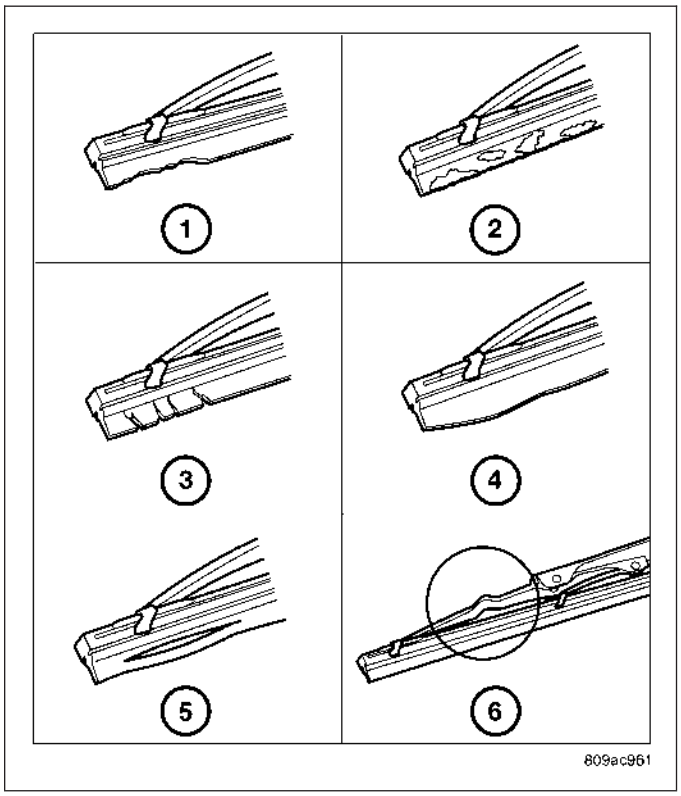
CAUTION: Never use compressed air to flush the washer system plumbing. Compressed air pressures are too great for the washer system plumbing components and will result in further system damage. Never use sharp instruments to clear a plugged washer nozzle or damage to the nozzle orifice and improper nozzle spray patterns will result.

INSPECTION - REAR WIPER & WASHER SYSTEM

WIPER SYSTEM

The rear wiper blade and wiper arm should be inspected periodically, not just when wiper performance problems are experienced. This inspection should include the following points:

1. Carefully inspect the wiper blade for any indications of worn or uneven edges (1), foreign material deposits (2), hardening or cracking (3), deformation or fatigue (4), or splitting (5). Inspect the wiper blade support components and the wiper arm for damage (6). If the wiper arms and blades are contaminated with any foreign material, clean them and the glass as required. (Refer to 8 - ELECTRICAL/REAR WIPERS/WASHERS - CLEANING). If a wiper blade or arm is damaged, replace the affected wiper arm or blade with a new unit. Do not attempt to repair a wiper arm or blade that is damaged or corroded.
2. Carefully lift the wiper blade off of the glass. Note the action of the wiper arm hinge. The wiper arm should pivot freely at the hinge, but with no lateral looseness evident. If there is any binding evident in the wiper arm hinge, or there is evident lateral play in the wiper arm hinge, replace the wiper arm.



CAUTION: Do not allow the wiper arm to spring back against the glass without the wiper blade in place or the glass may be damaged.

3. Once proper hinge action of the wiper arm is confirmed, check the hinge for proper spring tension. The spring tension of the wiper arm should be sufficient to cause the rubber squeegee to conform to the curvature of the glass. Replace a wiper arm if it has low or no spring tension.
4. After cleaning and inspecting the wiper components and the glass, if the wiper blade still fails to clear the glass without smearing, streaking, chattering, hazing, or beading, replace the wiper blade.

WASHER SYSTEM

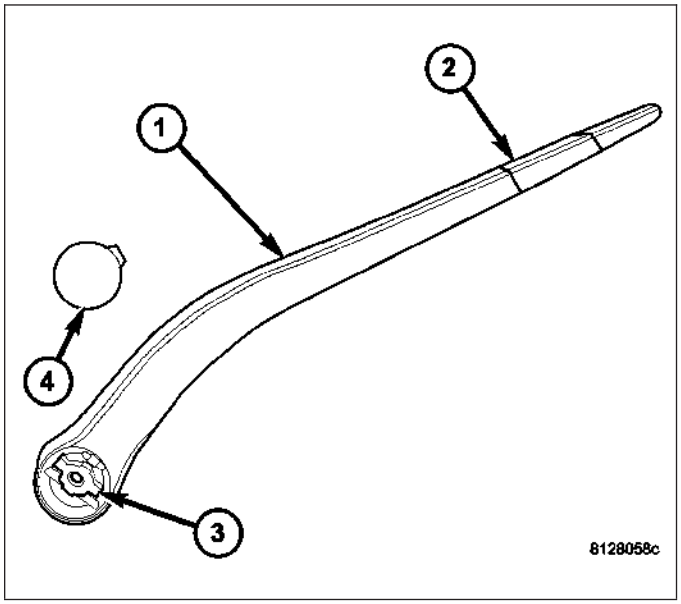
The washer system components should be inspected periodically, not just when washer performance problems are experienced. This inspection should include the following points:

1. Check for ice or other foreign material in the washer reservoir. If contaminated, clean and flush the washer system. (Refer to 8 - ELECTRICAL/REAR WIPERS/WASHERS - CLEANING).
2. Inspect the washer plumbing for pinched, leaking, deteriorated, or incorrectly routed hoses and damaged or disconnected hose fittings. Replace damaged or deteriorated hoses and hose fittings. Leaking washer hoses can sometimes be repaired by cutting the hose at the leak and splicing it back together using an in-line connector fitting. Similarly, sections of deteriorated hose can be cut out and replaced by splicing in new sections of hose using in-line connector fittings. Whenever routing a washer hose or a wire harness containing a washer hose, it must be routed away from hot, sharp, or moving parts. Also, sharp bends that might pinch the washer hose must be avoided.

ARM-LIFTGATE WIPER

DESCRIPTION

The rear wiper arm (1) is the rigid member located between the rear wiper motor output shaft that protrudes from the outer liftgate panel near the base of the liftgate glass opening and the rear wiper blade (2). The wiper arm is constructed of molded black plastic. A hinged pivot end is also molded plastic, except for a tapered metal sleeve that receives the wiper motor output shaft and a plate where the arm retaining nut is supported. A molded black plastic cap (4) with an engagement tab on one side and a snap feature on the other fits in the hole over the wiper arm retaining nut to conceal the nut and mounting hole following wiper arm installation.



The wiper arm hinge, pivot block and tension spring are all concealed on the underside of the wide end of the arm. The matching wiper blade unit has two pivot pins that latch into a receptacle concealed within the narrow end of the arm. The rear wiper arm cannot be adjusted or repaired. If damaged or faulty, the entire wiper arm unit must be replaced.

OPERATION

The rear wiper arm is designed to mechanically transmit the motion from the rear wiper motor output shaft to the rear wiper blade. The wiper arm must be properly indexed to the motor output shaft in order to maintain the proper wiper blade travel on the glass.

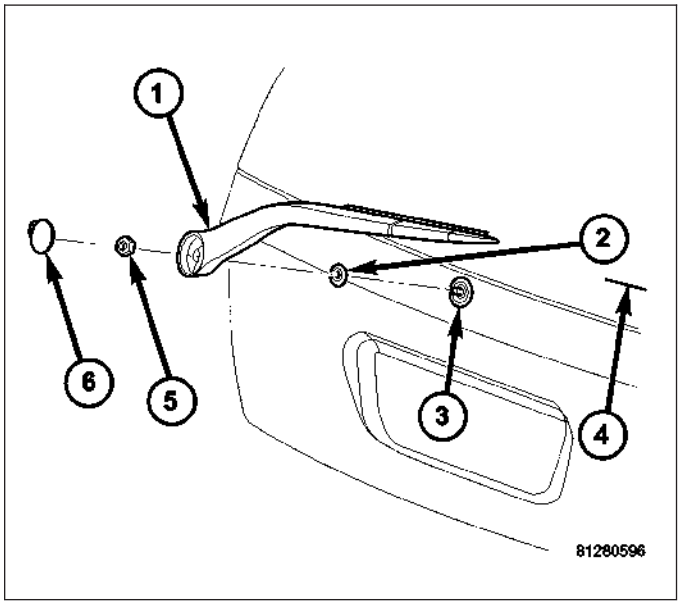
The hole tapered hole in the wiper arm pivot end interlocks with the serrations on the outer circumference of the tapered motor output shaft, allowing positive engagement and finite adjustment of this connection. A hex nut secures the wiper arm pivot end to the threads on the rear wiper motor output shaft and the plastic nut cap snaps over this connection for a neat appearance. The spring-loaded wiper arm hinge controls the down-force applied through the tip of the wiper arm to the wiper blade on the glass. The hook formation on the tip of the wiper arm provides a cradle for securing and latching the wiper blade pivot block to the wiper arm.

REMOVAL

1. Insert the tip of a small screwdriver into the notch on the large end of the rear wiper arm (1) and carefully pry the plastic cap (6) until it unsnaps from the mounting hole on the pivot end of the arm.
2. Remove the nut (5) that secures the arm to the rear wiper motor output shaft (3).

CAUTION: The use of a battery terminal puller when removing the rear wiper arm is NOT recommended as this may damage the rear wiper arm.

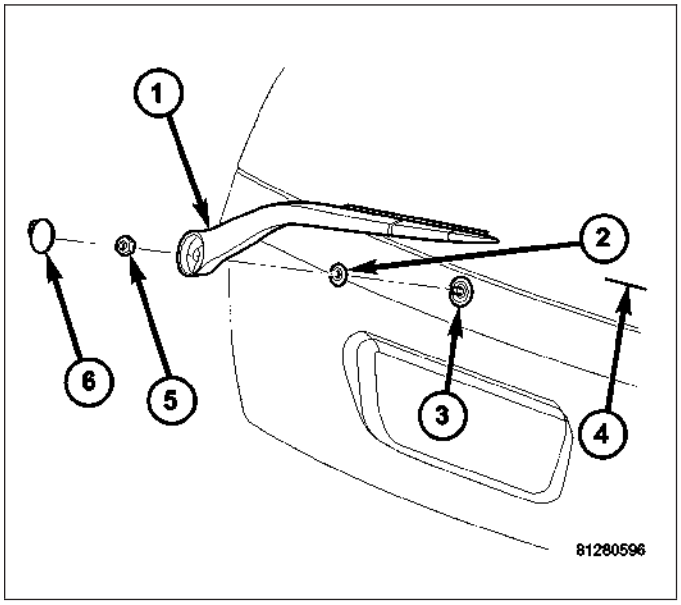
3. Use a slight rocking action to remove the rear wiper arm from the output shaft.



INSTALLATION

NOTE: Be certain that the rear wiper motor is in the park position before attempting to install the wiper arm. Turn the ignition switch to the On position and move the rear wiper switch to its Off position. If the wiper motor output shaft moves, wait until it stops moving, then turn the ignition switch back to the Off position. The wiper motor is now in its park position.

1. The rear wiper arm (1) must be indexed to the motor output shaft (3) with the rear wiper motor in the park position to be properly installed. Position the rear wiper arm pivot end onto the motor output shaft so that the wiper blade is aligned with the alignment mark (4) located in the upper margin of the lower liftgate glass blackout area on the lower right corner of the liftgate glass.
2. With the wiper arm properly indexed, push the tapered mounting hole on the pivot end of the wiper arm down over the output shaft.
3. Install and tighten the nut (5) that secures the arm to the shaft. Tighten the nut to 12 N·m (9 ft. lbs.).
4. Wet the liftgate glass, then operate the rear wiper. Turn the rear wiper switch to the Off position, then check for the correct wiper arm position and adjust as required.
5. Insert the tab of the plastic cap (6) into the mounting hole on the side opposite the notch and press firmly on the notched side of the cap until it snaps into place.

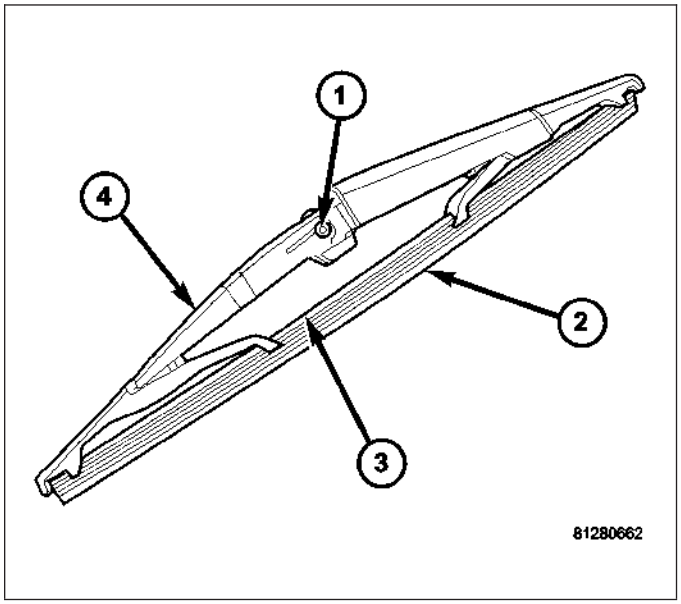


BLADE-LIFTGATE WIPER

DESCRIPTION

The rear wiper blade is secured by two integral latching pivot pins (1) to a receptacle in the small end at the tip of the rear wiper arm, and rests near the base of the liftgate glass when the wiper is not in operation. The rear wiper blade consists of the following components:

- **Superstructure (4)** - The superstructure includes a molded black plastic bridge and plastic links with claw formations that grip the wiper blade element. Also included in this unit are the two latching pivot pins that secure the superstructure to the wiper arm.
- **Element (2)** - The wiper element or squeegee is the resilient rubber member of the wiper blade that contacts the glass.
- **Flexor (3)** - The flexor is a rigid metal component running along the length of each side of the wiper element where it is gripped by the claws of the superstructure.



The rear wiper blade is 30.10 centimeters (11.85 inches) long with a replaceable element (squeegee). The wiper blade superstructure cannot be adjusted or repaired. If faulty, worn, or damaged the entire wiper blade unit must be replaced.

OPERATION

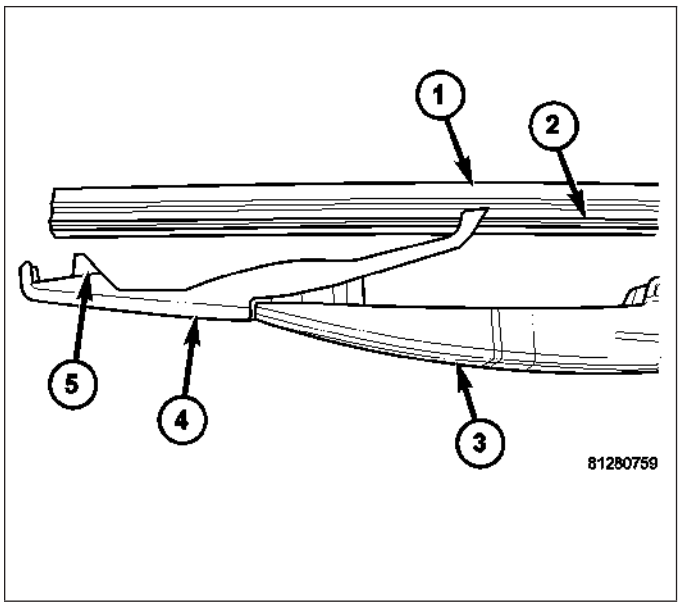
The rear wiper blade is moved back and forth across the liftgate glass by the wiper arm when the rear wiper system is in operation. The wiper blade superstructure is the flexible frame that grips the wiper blade element and evenly distributes the force of the spring-loaded wiper arm along the length of the element. The combination of the wiper arm force and the flexibility of the superstructure makes the element conform to and maintain proper contact with the glass, even as the blade is moved over the varied curvature found across the glass surface.

The wiper element flexor provides the claws of the blade superstructure with a rigid, yet flexible component on the element which can be gripped. The rubber element is designed to be stiff enough to maintain an even cleaning edge as it is drawn across the glass, but resilient enough to conform to the glass surface and flip from one cleaning edge to the other each time the wiper blade changes directions.

STANDARD PROCEDURE

REAR WIPER ELEMENT REPLACEMENT

1. Remove the rear wiper blade (3) from the wiper arm. (Refer to 8 - ELECTRICAL/REAR WIPERS/WASHERS/REAR WIPER BLADE - REMOVAL).
2. Grasp one of the wiper blade links (4) firmly with one hand, and grasp the wiper element (1) and flexor (2) midway between the two sets of claws (5) for that link with the other hand.
3. Pull the element and flexor away from the link until they flex enough to disengage them from the end pair of claws.
4. Slide the element and flexor toward the loose end to disengage them from the remaining sets of claws.
5. Reverse this process to install a new element and flexors into the wiper blade.
6. Reinstall the wiper blade into the wiper arm. (Refer to 8 - ELECTRICAL/REAR WIPERS/WASHERS/REAR WIPER BLADE - INSTALLATION).

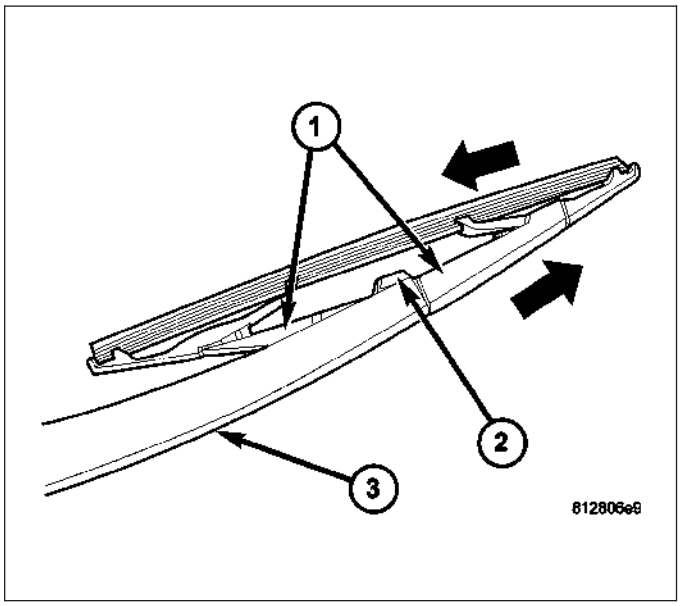


REMOVAL

1. Lift the rear wiper arm (3) to raise the wiper blade (1) and element off of the liftgate glass.
2. To remove the wiper blade from the wiper arm, squeeze the two latch release tabs (2) together while pulling the blade straight out from the receptacle in the end of the arm.

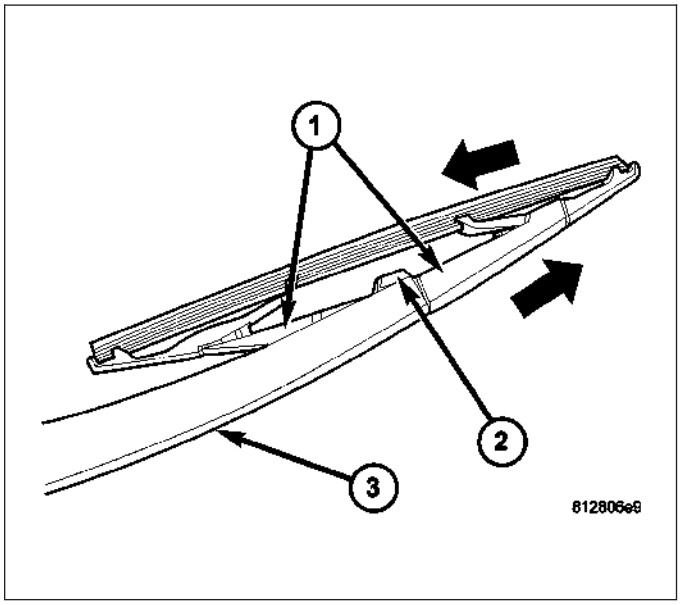
CAUTION: Do not allow the wiper arm to spring back against the glass without the wiper blade in place or the glass and/or the wiper arm may be damaged.

3. Gently lower the tip of the wiper arm onto the glass.



INSTALLATION

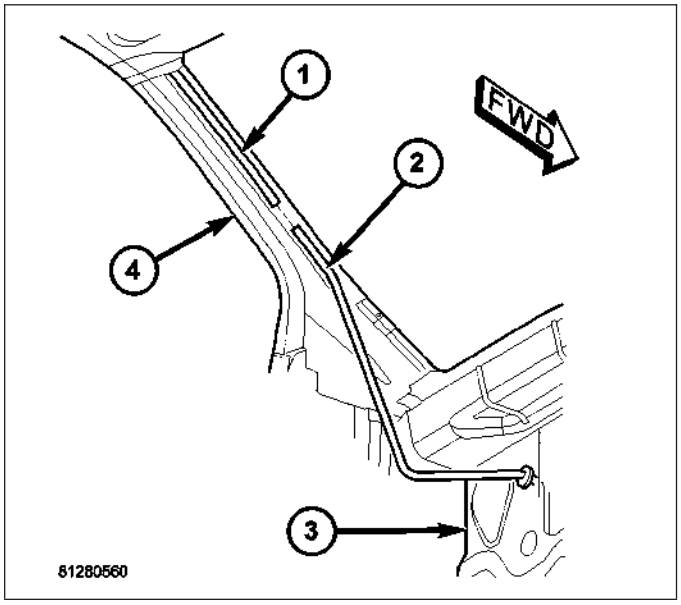
1. Lift the rear wiper arm (3) off of the liftgate glass.
2. Position the rear wiper blade (1) with the latching pivot pins aligned with the receptacle on the tip of the arm.
3. Slide the wiper blade pivot pins into the receptacle until they snap into place.
4. Lower the wiper blade onto the glass.



HOSE-LIFTGATE WASHER

DESCRIPTION

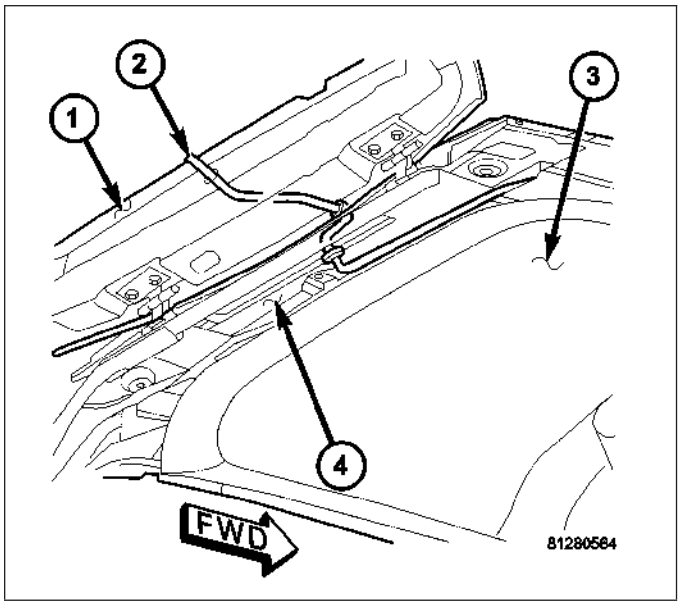
The rear washer plumbing consists of a small diameter rubber hose that is routed along with the front washer hose from the washer reservoir under the left front fender ahead of the left front wheel to the engine compartment. Both hoses are attached to their respective front or rear outlet nipple of the washer pump/motor unit near the bottom of the reservoir. The hoses are then secured by retainers to the back of the condenser shroud and the underside of the Power Distribution Center (PDC) bracket above the wheel house splash shield before entering the left side of the engine compartment behind the PDC.



In the engine compartment, both hoses are secured by a retainer near the dash panel to the side support member for the left front fender. The two hoses are routed separately from this point. The front hose is routed up toward the hood, while the rear hose (2) is routed through a grommet and a hole in the dash panel (3) into the passenger compartment. The hose is then routed below the instrument panel to the left cowl side inner panel and up the left inner A-pillar (4). Midway up the A-pillar the hose is connected with a molded plastic in-line fitting to the headliner hose (1).

The headliner hose (2) is secured above the headliner (3) from the A-pillar to the upper liftgate opening inner panel (4). Near the center of the liftgate opening the hose passes through a clearance hole in the liftgate opening outer panel and through a rubber grommet in a hole in the upper liftgate panel to the rear washer nozzle.

Washer hose is available for service only as roll stock, which must then be cut to length. The molded plastic washer hose fittings and routing clips cannot be repaired. If these fittings or clips are faulty or damaged, they must be replaced.



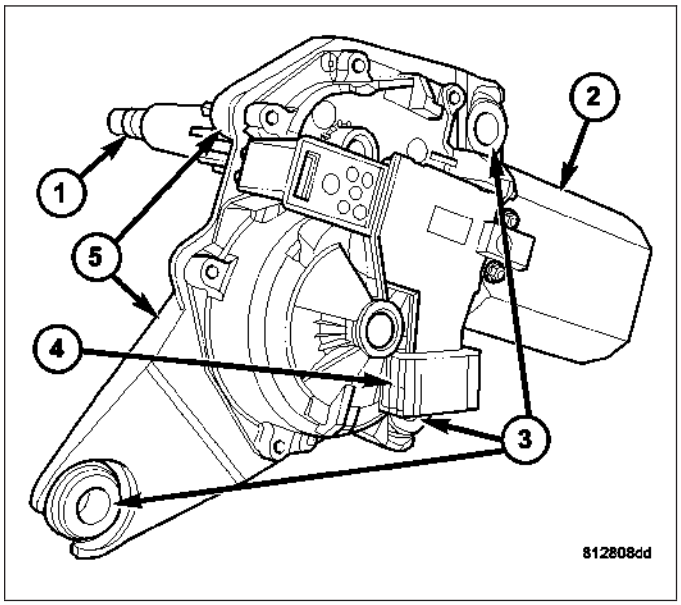
OPERATION

Washer fluid in the washer reservoir is pressurized and fed by the washer pump/motor unit through the rear washer system plumbing and fittings to the rear washer nozzle located on the liftgate outer panel above the liftgate glass. Whenever routing the washer hose or a wire harness containing a washer hose, it must be routed away from hot, sharp, or moving parts; and, sharp bends that might pinch the hose must be avoided.

MOTOR-REAR WINDOW WIPER

DESCRIPTION

The rear wiper motor (2) is concealed within the liftgate, below the liftgate glass and behind the liftgate inner trim panel. The end of the motor output shaft (1) that extends through the liftgate outer panel to drive the rear wiper arm and blade is the only visible component of the rear wiper motor. A rubber bezel and grommet is engaged within the output shaft hole of the liftgate outer panel and seals the output shaft where it passes through the panel. An integral connector receptacle (4) connects the rear wiper motor to the vehicle electrical system through a dedicated take out and connector of the liftgate wire harness. The rear wiper motor consists of the following major components:



- **Bracket (5)** - The rear wiper motor bracket consists of a molded plastic mounting plate for the wiper motor that is secured with screws to the wiper motor housing, and through three rubber isolators (3) to the liftgate inner panel.
- **Motor** - The single-speed permanent magnet rear wiper motor is secured with screws to the rear wiper motor bracket. The wiper motor includes an integral transmission, a motor output shaft, an automatic resetting circuit breaker, and the rear wiper motor park switch.

The rear wiper motor cannot be adjusted or repaired. If any component of the motor is faulty or damaged, the entire rear wiper motor unit must be replaced. The motor output shaft bezel and grommet, nut, and nut cover are available for individual service replacement.

OPERATION

The rear wiper motor operation is controlled by the rear wiper relay, which controls battery current flow to the rear wiper motor brushes based upon control outputs from the Front Control Module (FCM). The FCM uses internal programming, hard wired outputs from the rear wiper motor park switch, and electronic messages received over the Controller Area Network (CAN) data bus from the ElectroMechanical Instrument Cluster (EMIC) and from rear wiper and washer switches in the heater-A/C control to determine when to energize or de-energize the rear wiper relay.

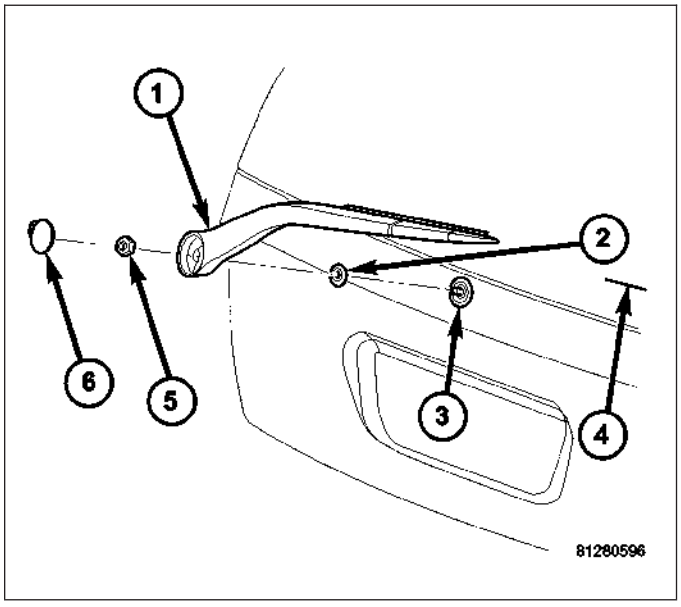
The rear wiper motor park switch is a single pole, single throw, momentary switch within the wiper motor that is mechanically actuated by the wiper motor transmission components. The park switch alternately closes and opens a path to ground for the rear wiper motor control circuit input to the FCM, depending upon the position of the rear wiper blade on the liftgate glass. This feature allows the FCM to monitor the number of rear wiper motor cycles, as well as to keep the rear wiper relay energized long enough for the motor to complete its current wipe cycle after the wiper system or the ignition has been turned Off, and to park the wiper blade in the lowest portion of the wipe pattern.

The rear wiper motor is grounded at all times through a take out with an eyelet terminal connector in the body wire harness that is secured to a ground location in the passenger compartment. The automatic resetting circuit breaker protects the motor from overloads. The rear wiper motor transmission converts the rotary output of the wiper motor to the back and forth wiping motion of the rear wiper arm and blade on the liftgate glass.

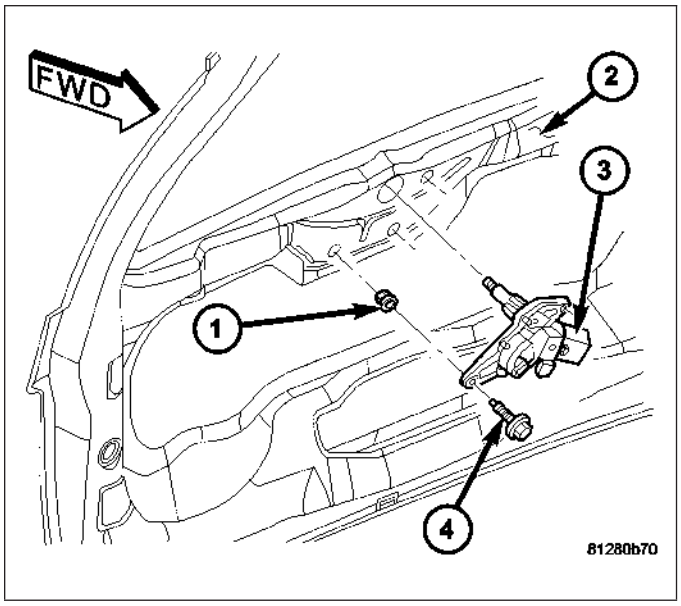
The hard wired inputs and outputs of the rear wiper motor may be diagnosed using conventional diagnostic tools and methods. Refer to the appropriate wiring information. However, conventional diagnostic methods may not prove conclusive in the diagnosis of the EMIC, the FCM, the heater-A/C control, CAN data bus, or the electronic message inputs used to control rear wiper motor operation. The most reliable, efficient, and accurate means to diagnose the EMIC, the FCM, the heater-A/C control, the CAN data bus, and the electronic message inputs and outputs that control rear wiper motor operation requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Remove the rear wiper arm (1) from the rear wiper motor output shaft (3). (Refer to 8 - ELECTRICAL/ REAR WIPERS/WASHERS/REAR WIPER ARM - REMOVAL).
3. Remove the bezel and rubber grommet (2) on the outer liftgate panel from the output shaft bezel.**Be certain to take proper precautions to protect the outer liftgate panel and its paint finish from damage during this procedure.**

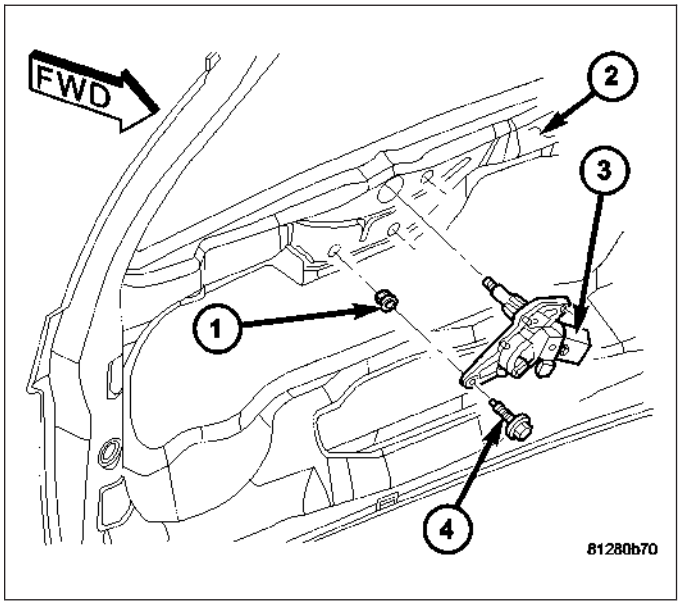


4. Remove the trim panel from the liftgate inner panel (2). (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/TRIM PANEL - REMOVAL).
5. Disconnect the wire harness connector from the rear wiper motor (3).
6. Remove the three screws (4) that secure the motor mounting bracket to the liftgate inner panel.
7. Remove the motor from the liftgate.

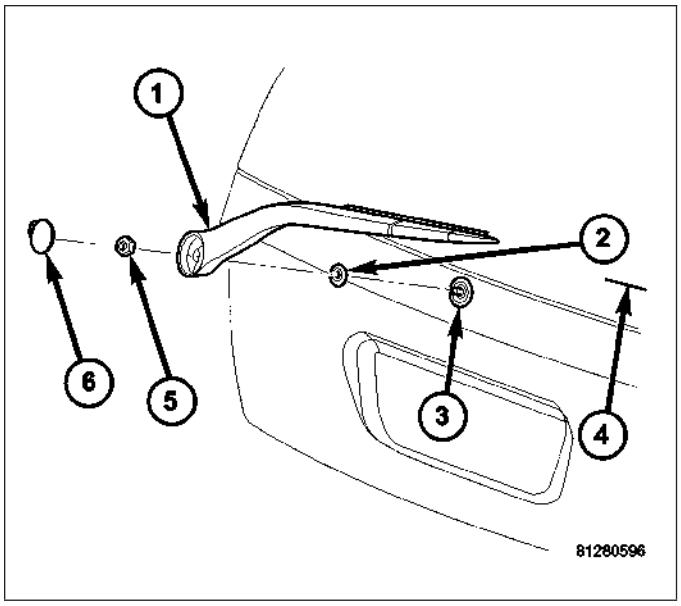


INSTALLATION

1. Check to be certain that the three rivet nuts (1) used to secure the rear wiper motor and bracket unit (3) are properly installed in the liftgate inner panel (2), and that they are in good condition.
2. Position the motor into the liftgate as a unit.
3. Install and tighten three screws (4) that secure the mounting bracket to the liftgate. Tighten the screws to 8 N·m (72 in. lbs.).
4. Reconnect the wire harness connector to the motor connector receptacle.
5. Reinstall the trim panel onto the liftgate inner panel. (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/TRIM PANEL - INSTALLATION).



6. From the outside of the liftgate, install the rubber bezel and grommet (2) over the motor output shaft (3) and engage it in the mounting hole of the liftgate outer panel.
7. Reinstall the rear wiper arm onto the output shaft. (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/ WIPER ARMS - INSTALLATION).
8. Reconnect the battery negative cable.

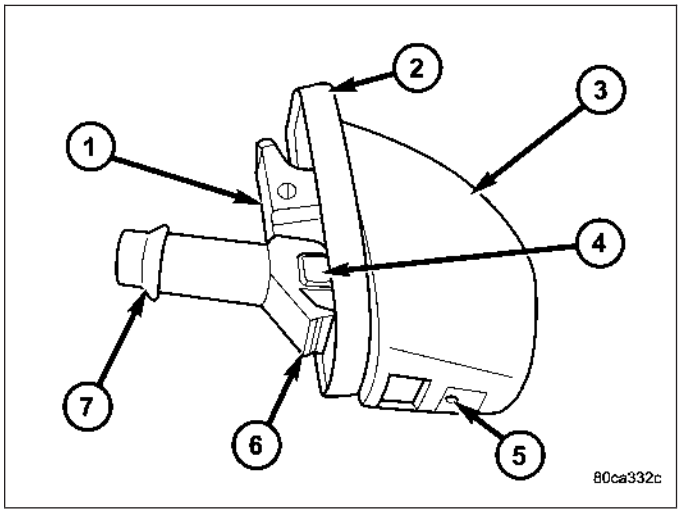


NOZZLE-LIFTGATE WASHER

DESCRIPTION

The rear washer nozzle (3) is a fluidic-type unit constructed of molded plastic. The nozzle is secured by a snap fit in a dedicated mounting hole in the liftgate outer panel above the liftgate glass with the orifice (5) aimed downward. A rubber gasket (2) seals the nozzle to the outside of the liftgate panel. The back of the nozzle includes an integral alignment feature (4), an engagement tab (1), a latch feature (6) and the washer plumbing nipple (7) which are all concealed between the liftgate inner and outer panels when the nozzle is installed.

The rear washer nozzle latch feature is a one time component, and will be damaged if the nozzle is removed from its mounting hole for service. The rear washer nozzle unit cannot be adjusted or repaired. If faulty or damaged, the entire nozzle unit must be replaced.



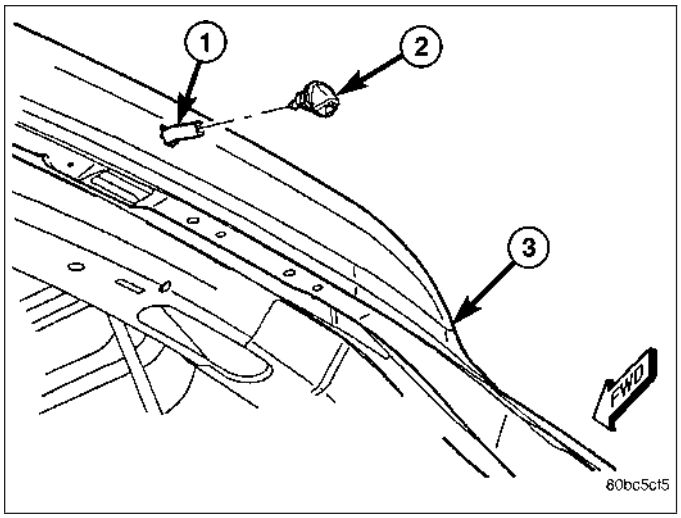
OPERATION

The rear washer nozzle is designed to dispense washer fluid into the wiper pattern area on the outside of the liftgate glass. Pressurized washer fluid is fed to the nozzle from the washer reservoir by the washer pump/motor unit through a single hose, which is attached to a barbed nipple on the back of the rear washer nozzle. A fluidic matrix within the washer nozzle causes the pressurized washer fluid to be emitted from the nozzle orifice as an oscillating stream to more effectively cover a larger area of the glass to be cleaned.

REMOVAL

NOTE: The rear washer nozzle latch feature is a one time component, and will be damaged if the nozzle is removed from its mounting hole for service. If removed from its mounting hole for any reason, the rear washer nozzle must be replaced with a new unit.

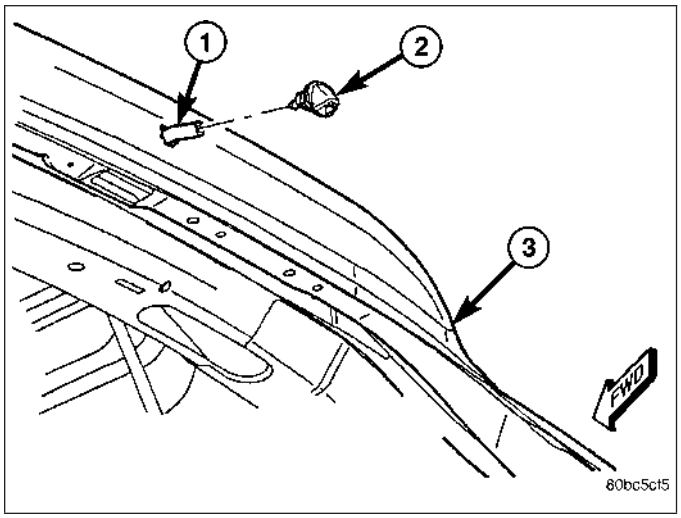
1. Using a trim stick or another suitable wide flat-bladed tool, gently pry at the bottom of the rear washer nozzle (2) to release the latch feature that secures it in the mounting hole of the liftgate outer panel (3).
2. Pull the rear washer nozzle out from the liftgate outer panel far enough to access the washer hose (1).
3. Disconnect the hose from the barbed nipple on the back of the nozzle.
4. Discard the nozzle.



INSTALLATION

NOTE: The rear washer nozzle latch feature is a one time component, and will be damaged if the nozzle is removed from its mounting hole for service. If removed from its mounting hole for any reason, the rear washer nozzle must be replaced with a new unit.

1. Position the new rear washer nozzle (2) to the mounting hole in the liftgate outer panel (3). Be certain that the rubber gasket is in position on the back of the nozzle.
2. Reconnect the washer hose (1) to the barbed nipple on the back of the nozzle.
3. Push the hose and nozzle nipple into the mounting hole in the liftgate outer panel and engage the tab located above the nipple with the upper edge of the hole.
4. Using hand pressure, push firmly and evenly on the lower edge of the nozzle until it snaps into place.

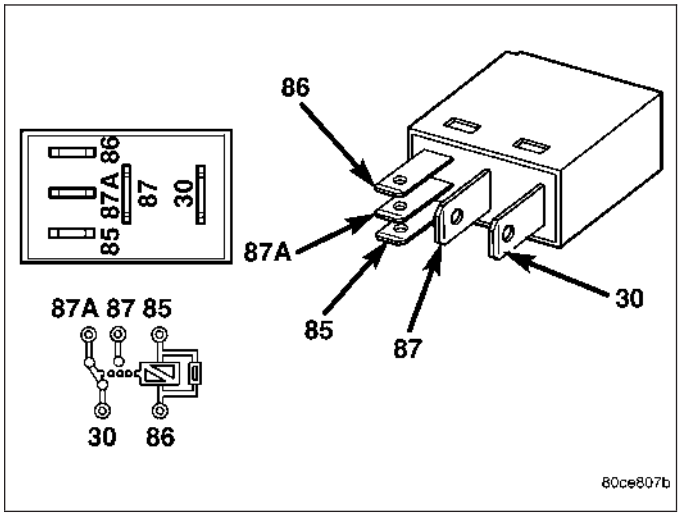


RELAY-WIPER-REAR

DESCRIPTION

The rear wiper relay is a conventional International Standards Organization (ISO) micro relay. Relays conforming to the ISO specifications have common physical dimensions, current capacities, terminal patterns, and terminal functions. This relay is contained within a small, rectangular, molded plastic housing and is connected to all of the required inputs and outputs through five integral male spade-type terminals that extend from the relay base plate.

The rear wiper relay is located in the Power Distribution Center (PDC) in the engine compartment near the battery. Refer to the layout label on the underside of the PDC cover for specific relay cavity assignment information. The rear wiper relay cannot be adjusted or repaired and, if faulty or damaged, the unit must be replaced.



OPERATION

The rear wiper relay is an electromechanical switch that uses a low current input from the Front Control Module (FCM) to control a high current output to the rear wiper motor. The movable common feed contact point is held against the fixed normally closed contact point by spring pressure. When the relay coil is energized, an electromagnetic field is produced by the coil windings. This electromagnetic field draws the movable relay contact point away from the fixed normally closed contact point, and holds it against the fixed normally open contact point. When the relay coil is de-energized, spring pressure returns the movable contact point back against the fixed normally closed contact point. A resistor is connected in parallel with the relay coil in the relay, and helps to dissipate voltage spikes and electromagnetic interference that can be generated as the electromagnetic field of the relay coil collapses.

The rear wiper relay terminals are connected to the vehicle electrical system through a connector receptacle in the Power Distribution Center (PDC). The inputs and outputs of the rear wiper relay include:

- **Common Feed Terminal** - The common feed terminal (30) is connected to the rear wiper motor through the rear wiper motor control circuit. When the rear wiper relay is de-energized, the common feed terminal is connected to ground. When the rear wiper relay is energized, the common feed terminal of the relay is connected to battery current from a fuse in the Power Distribution Center (PDC) through a fused B(+) circuit.
- **Coil Ground Terminal** - The coil ground terminal (85) is connected to the relay control output of the FCM through the rear wiper relay control circuit. The FCM controls the ground path for this circuit internally to energize or de-energize the rear wiper relay based upon its programming, rear wiper and washer request messages received from the ElectroMechanical Instrument Cluster (EMIC) over the Controller Area Network (CAN) data bus, and a hard wired input from the rear wiper motor park switch.
- **Coil Battery Terminal** - The coil battery terminal (86) is connected to battery current from a fuse in the PDC through a fused B(+) circuit at all times.
- **Normally Open Terminal** - The normally open terminal (87) is connected to battery current from a fuse in the PDC through a fused B(+) circuit at all times.
- **Normally Closed Terminal** - The normally closed terminal (87A) is connected to ground at all times.

The rear wiper relay may be diagnosed using conventional diagnostic tools and methods. Refer to the appropriate wiring information. However, conventional diagnostic methods may not prove conclusive in the diagnosis of the FCM, the EMIC, the CAN data bus or the electronic message inputs or outputs that control the operation of the rear wiper relay. The most reliable, efficient, and accurate means to diagnose the rear wiper relay, the FCM, the EMIC, the CAN data bus and the electronic message inputs and outputs related to the rear wiper relay operation requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

NAVIGATION/TELECOMMUNICATION

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NAVIGATION/TELECOMMUNICATION - SERVICE INFORMATION

DESCRIPTION

TELECOMMUNICATIONS

The hands-free cellular system uses Bluetooth™ technology to provide wireless communication between the operator's compatible cellular telephone and the vehicle's on-board receiver.

The system uses voice recognition technology to control operation. The incoming voice is broadcast through the vehicle's radio speakers, automatically overriding any other audio signals on the front speakers when the hands-free system is in use. A microphone in the rear view mirror picks up vehicle occupant's voices. If a call is in progress when the ignition is switched off, the hands-free system will continue to operate for up to 45 seconds as part of the Accessory Relay Delay function. Thereafter, the call can continue on the hand-held telephone.

The center console front storage compartment includes a cellular telephone holder, but the system will communicate with a telephone that is anywhere within the vehicle. However, covering the hand held phone or the hands-free phone module with a metal object may block the signal. The system will recognize up to seven telephones, each of which is given a spoken identification by the user during the setup process. The system includes Spanish and French voice recognition in addition to English.

Two buttons on the rearview mirror, identified with ISO icons, control the system: A ″phone″ button turns the system on and off; a ″voice recognition″ (or voice command) button prompts the hands-free system to listen for a voice command.

OPERATION

TELECOMMUNICATION

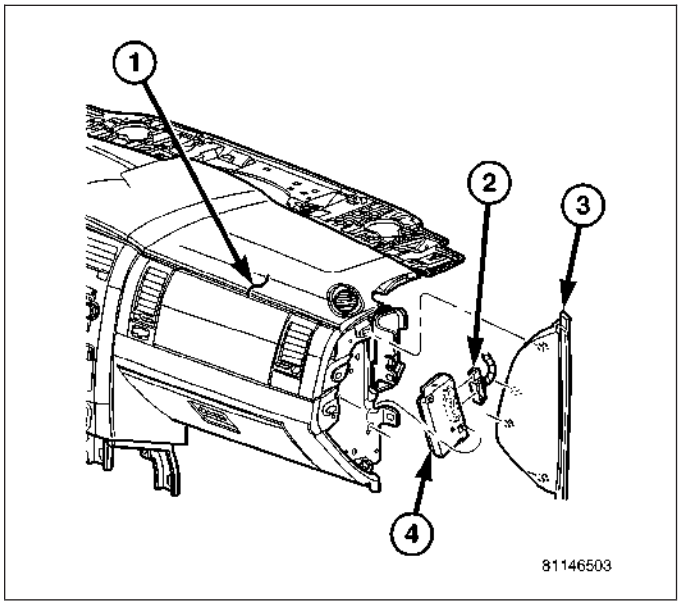
Two buttons on the rearview mirror, identified with ISO icons, control the system: A ″phone″ button turns the system on and off; a ″voice recognition″ (or voice command) button prompts the hands-free system to listen for a voice command. The system includes the following features:

- Phonebook - Stores telephone numbers for later recall by name or other verbal identification, called a voice tag, and memory location.
- Four memory locations - Home, Work, Cellular and Pager. A maximum of 32 unique names or voice tags may be stored at the same time, with a different number in each of the four memory locations.
- Voice tag dialing - Dials the number associated with a voice tag and memory location.
- Digit dialing - Dials the telephone number by recognizing the names of the digits as they are spoken.
- Receiving calls - A voice prompt notifies the user of an incoming call. A voice response accepts or rejects the call without manual intervention.
- Privacy Mode - Switches the call to the handheld telephone and the hands-free system and back again using the “voice recognition” (or “voice command”) button and a voice command, if desired.

MODULE-HANDS FREE

REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Remove the instrument panel end cap (3).
3. Remove the mounting fasteners.
4. Disconnect the electrical harness connector and remove the module (4).



INSTALLATION

1. Connect electrical harness connector and position module.
2. Install mounting fasteners.
3. Install instrument panel end cap.
4. Connect battery negative cable.

NAVIGATION/TELECOMMUNICATION - ELECTRICAL DIAGNOSTICS

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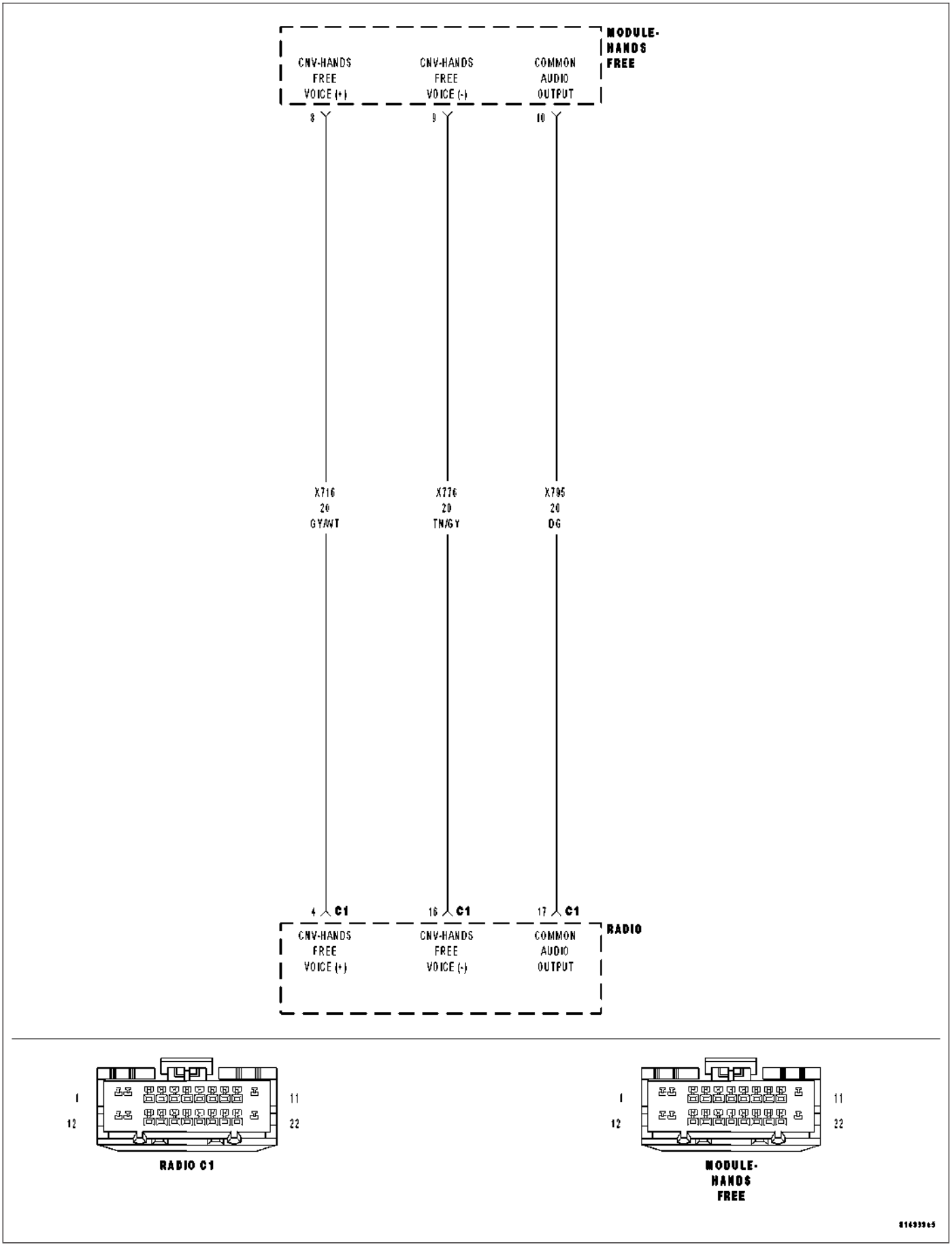
NAVIGATION/TELECOMMUNICATION - ELECTRICAL DIAGNOSTICS

DIAGNOSIS AND TESTING

B1411-HFM LEFT AUDIO OUTPUT CIRCUIT LOW



B1411-HFM LEFT AUDIO OUTPUT CIRCUIT LOW (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Hands Free Module detects low voltage on the (X716) CNV Hands Free Voice (+) circuit.

Possible Causes
(X716) CNV HANDS FREE VOICE (+) CIRCUIT OPEN
(X716) CNV HANDS FREE VOICE (+) CIRCUIT SHORT TO GROUND
(X795) COMMON AUDIO OUTPUT CIRCUIT OPEN
(X716) CNV HANDS FREE VOICE (+) CIRCUIT SHORT TO (X795) COMMON AUDIO OUTPUT CIRCUIT
HANDS FREE MODULE

Diagnostic Test

1. CHECK FOR ACTIVE DTC

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

B1411-HFM LEFT AUDIO OUTPUT CIRCUIT LOW (CONTINUED)

2. (X716) CNV HANDS FREE VOICE (+) CIRCUIT OPEN

Turn the ignition off.

Disconnect the Hands Free Module harness connector.

Disconnect the Radio C1 harness connector.

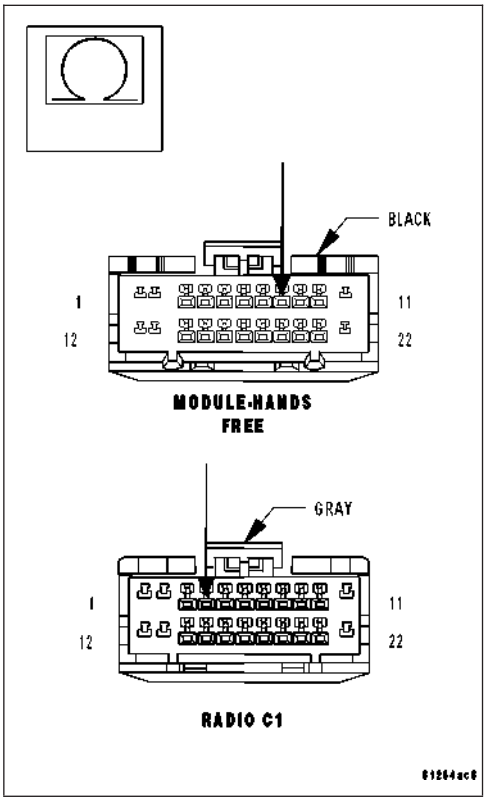
Measure the resistance of the (X716) CNV Hands Free Voice (+) circuit between the HFM connector and the radio connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 3

No >> Repair the (X716) CNV Hands Free Voice (+) circuit for an open

Perform BODY VERIFICATION TEST – VER 1.



3. (X716) CNV HANDS FREE VOICE (+) CIRCUIT SHORT TO GROUND

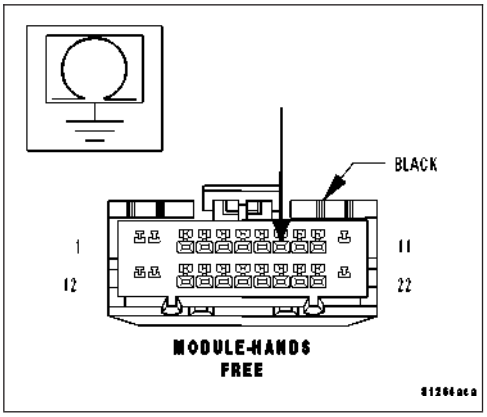
Measure the resistance between ground and the (X716) CNV Hands Free Voice (+) circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (X716) CNV Hands Free Voice (+) circuit for short to ground.

Perform BODY VERIFICATION TEST – VER 1.

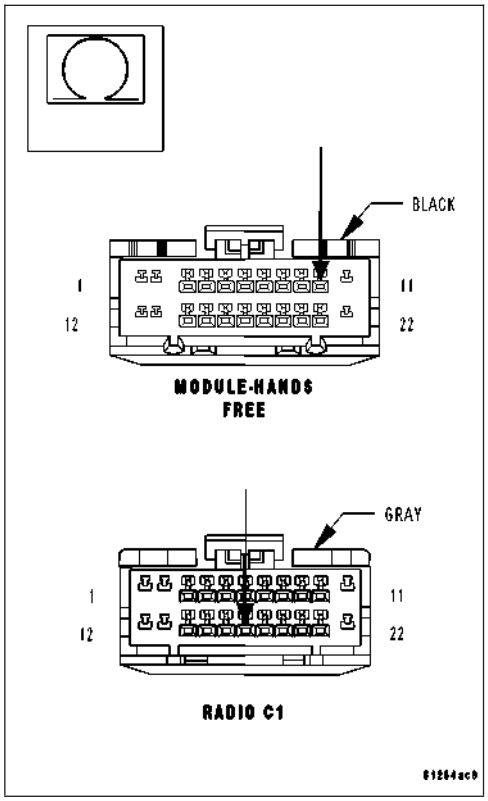
No >> Go To 4



B1411-HFM LEFT AUDIO OUTPUT CIRCUIT LOW (CONTINUED)

4. (X795) COMMON AUDIO OUTPUT CIRCUIT OPEN

Measure the resistance of the (X795) Common Audio Output circuit between the HFM connector and the radio connector.



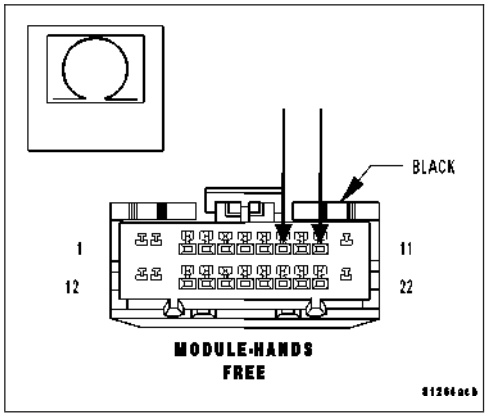
Is the resistance below 5.0 ohms?

Yes >> Go To 5

No >> Repair the (X795) Common Audio Output circuit for an open.
Perform BODY VERIFICATION TEST – VER 1.

5. (X716) CNV HANDS FREE VOICE (+) CIRCUIT SHORT TO (X795) COMMON AUDIO OUTPUT CIRCUIT

Measure the resistance between the (X716) CNV Hands Free Voice (+) circuit and the (X795) Common Audio Output circuit.

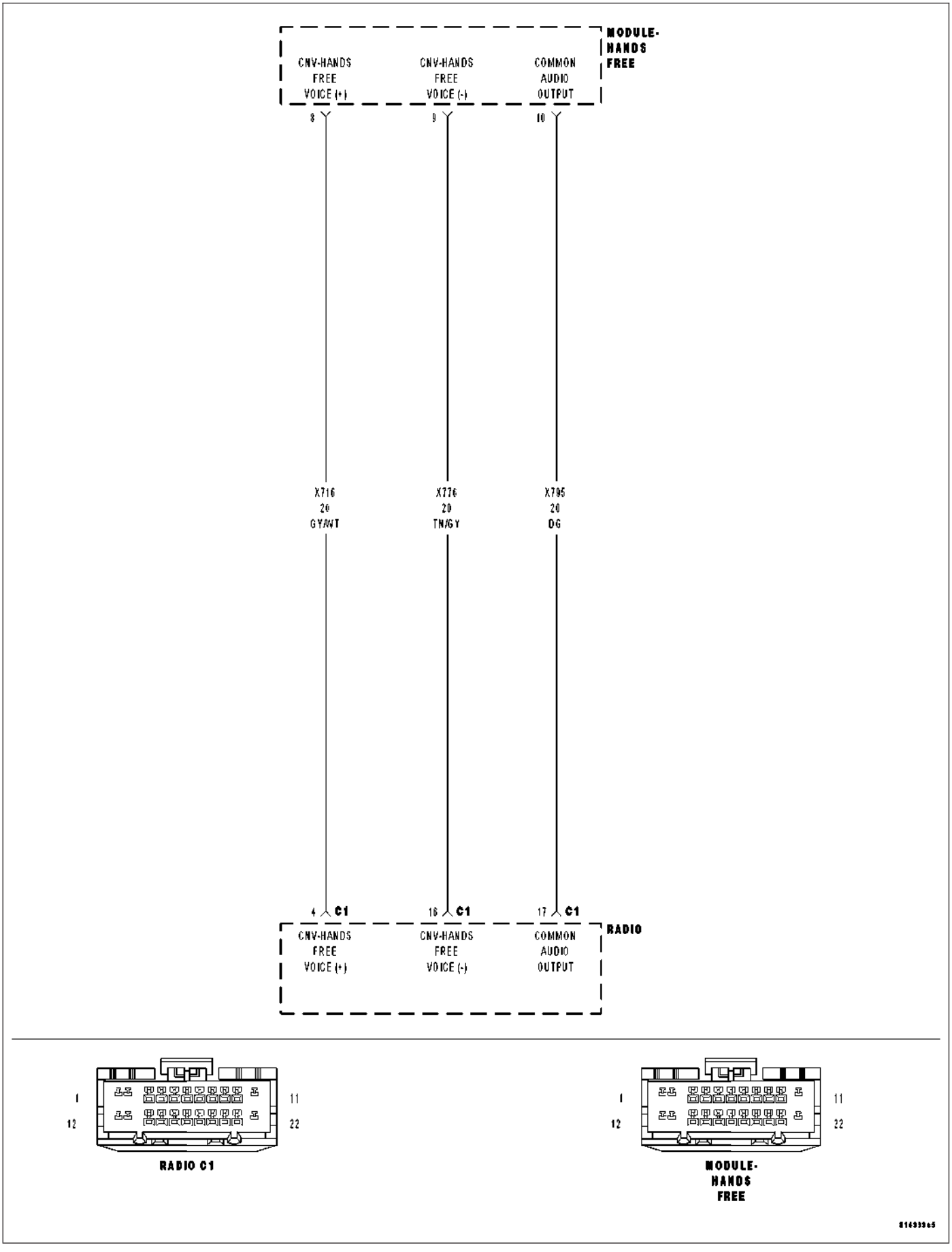


Is the resistance below 5.0 ohms?

Yes >> Repair the (X716) CNV Hands Free Voice (+) circuit for a short to the (X795) Common Audio Output circuit.
Perform BODY VERIFICATION TEST – VER 1.

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Hands Free Module in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

B1412-HFM LEFT AUDIO OUTPUT CIRCUIT HIGH



B1412-HFM LEFT AUDIO OUTPUT CIRCUIT HIGH (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Hands Free Module detects high voltage on the (X716) CNV Hands Free Voice (+) circuit.

Possible Causes
(X716) CNV HANDS FREE VOICE (+) CIRCUIT OPEN
(X795) COMMON AUDIO OUTPUT CIRCUIT OPEN
(X716) CNV HANDS FREE VOICE (+) CIRCUIT SHORT TO VOLTAGE
HANDS FREE MODULE

Diagnostic Test

1. CHECK FOR ACTIVE DTC

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

B1412-HFM LEFT AUDIO OUTPUT CIRCUIT HIGH (CONTINUED)

2. (X716) CNV HANDS FREE VOICE (+) CIRCUIT OPEN

Turn the ignition off.

Disconnect the Hands Free Module harness connector.

Disconnect the Radio C1 harness connector.

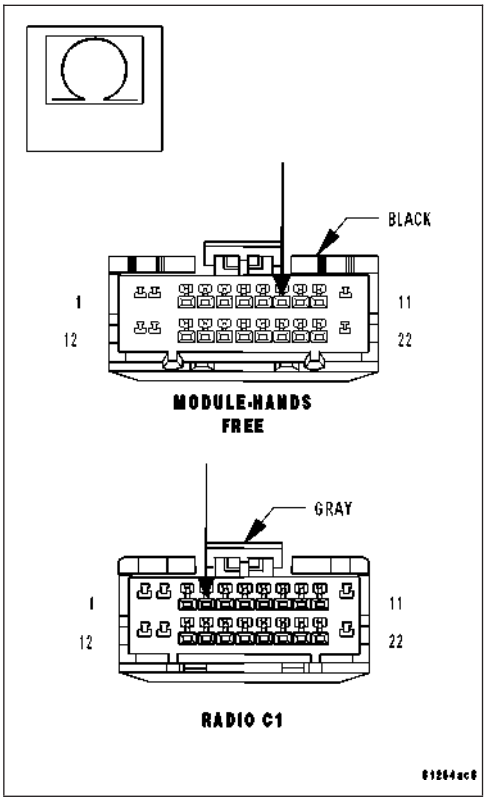
Measure the resistance of the (X716) CNV Hands Free Voice (+) circuit between the HFM connector and the radio connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 3

No >> Repair the (X716) CNV Hands Free Voice (+) circuit for an open

Perform BODY VERIFICATION TEST – VER 1.



3. (X795) COMMON AUDIO OUTPUT CIRCUIT OPEN

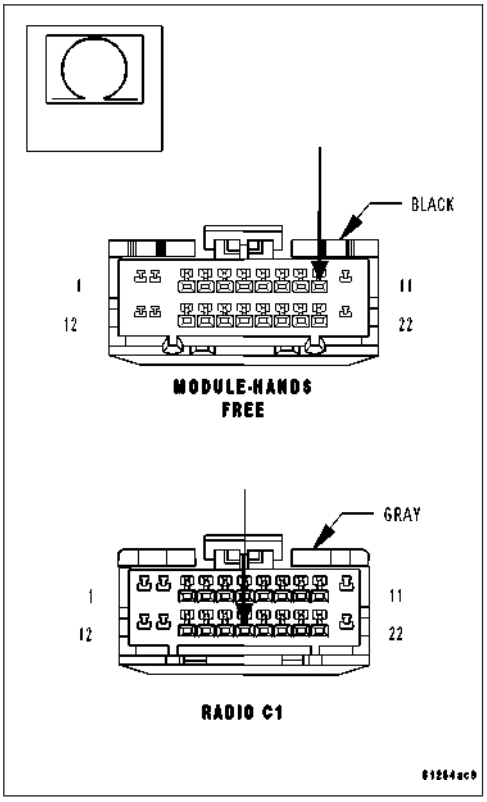
Measure the resistance of the (X795) Common Audio Output circuit between the HFM connector and the radio connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 4

No >> Repair the (X795) Common Audio Output circuit for an open.

Perform BODY VERIFICATION TEST – VER 1.

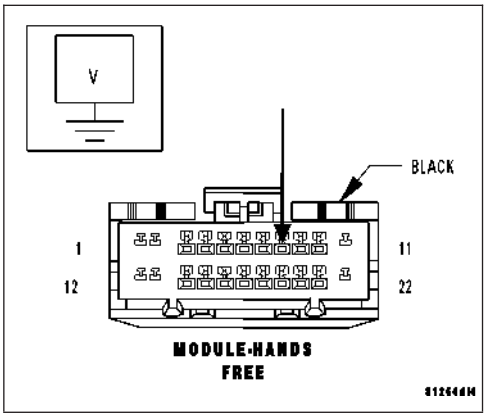


B1412-HFM LEFT AUDIO OUTPUT CIRCUIT HIGH (CONTINUED)

4. (X716) CNV HANDS FREE VOICE (+) CIRCUIT SHORT TO VOLTAGE

Turn the ignition on.

Measure the voltage of the (X716) CNV Hands Free Voice (+) circuit.



Is the voltage above 1.0 volts?

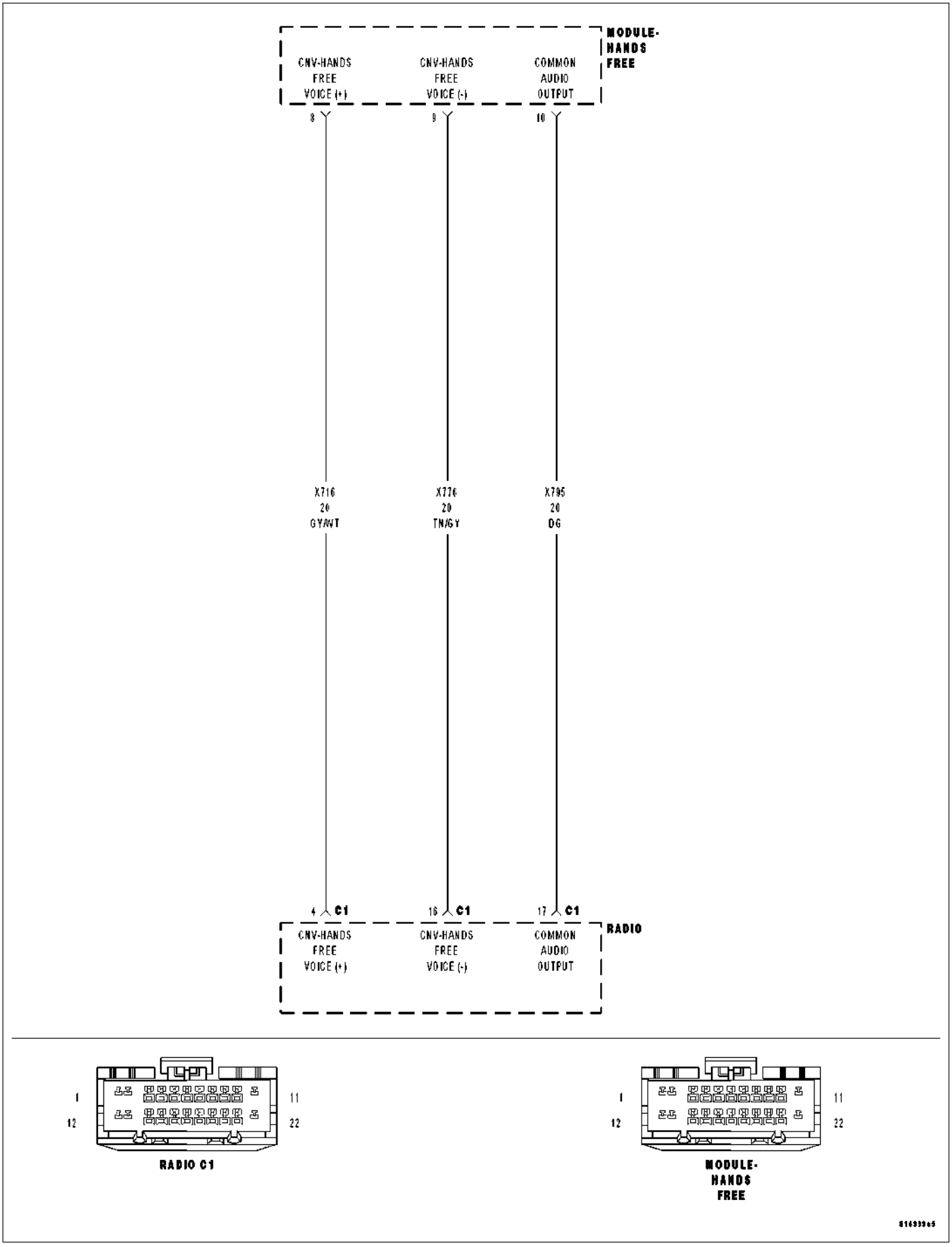
Yes >> Repair the (X716) CNV Hands Free Voice (+) circuit for a short to voltage.

Perform BODY VERIFICATION TEST – VER 1.

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Hands Free Module in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1.

B1415-HFM RIGHT AUDIO OUTPUT CIRCUIT LOW



B1415-HFM RIGHT AUDIO OUTPUT CIRCUIT LOW (CONTINUED)
For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Hands Free Module detects low voltage on the (X776) CNV Hands Free Voice (-) circuit.

Possible Causes
(X776) CNV HANDS FREE VOICE (-) CIRCUIT OPEN
(X776) CNV HANDS FREE VOICE (-) CIRCUIT SHORT TO GROUND
(X795) COMMON AUDIO OUTPUT CIRCUIT OPEN
(X776) CNV HANDS FREE VOICE (-) CIRCUIT SHORT TO (X795) COMMON AUDIO OUTPUT CIRCUIT
HANDS FREE MODULE

Diagnostic Test

1. CHECK FOR ACTIVE DTC

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

B1415-HFM RIGHT AUDIO OUTPUT CIRCUIT LOW (CONTINUED)

2. (X776) CNV HANDS FREE VOICE (-) CIRCUIT OPEN

Turn the ignition off.

Disconnect the Hands Free Module harness connector.

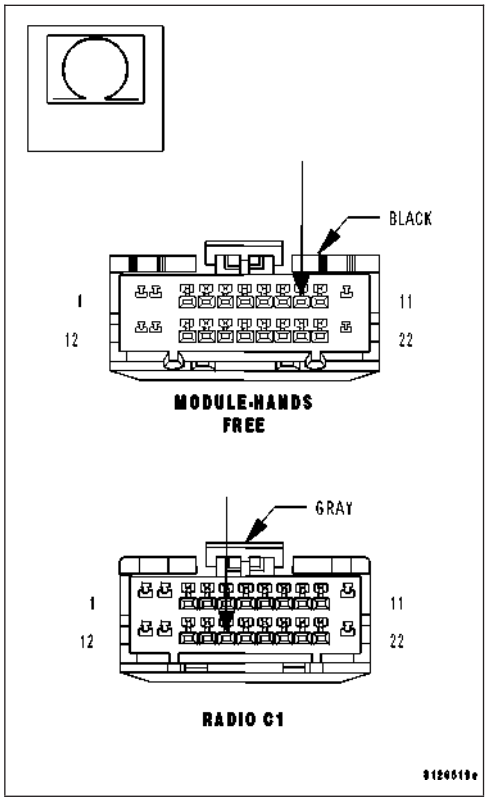
Disconnect the Radio C1 harness connector.

Measure the resistance of the (X776) CNV Hands Free Voice (-) circuit between the HFM connector and the radio connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 3

No >> Repair the (X776) CNV Hands Free Voice (-) circuit for an open.
Perform BODY VERIFICATION TEST – VER 1.



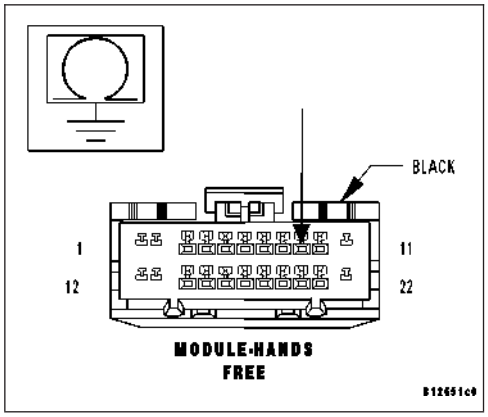
3. (X776) CNV HANDS FREE VOICE (-) CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (X776) CNV Hands Free Voice (-) circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (X776) CNV Hands Free Voice (-) circuit for short to ground.
Perform BODY VERIFICATION TEST – VER 1.

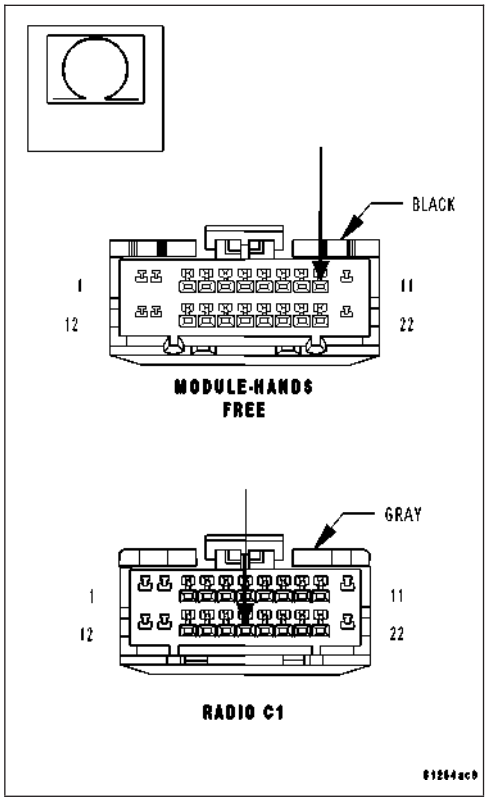
No >> Go To 4



B1415-HFM RIGHT AUDIO OUTPUT CIRCUIT LOW (CONTINUED)

4. (X795) COMMON AUDIO OUTPUT CIRCUIT OPEN

Measure the resistance of the (X795) Common Audio Output circuit between the HFM connector and the radio connector.



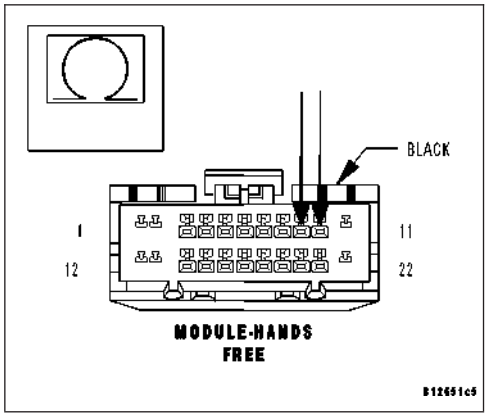
Is the resistance below 5.0 ohms?

Yes >> Go To 5

No >> Repair the (X795) Common Audio Output circuit for an open.
Perform BODY VERIFICATION TEST – VER 1.

5. (X776) CNV HANDS FREE VOICE (-) CIRCUIT SHORT TO (X795) COMMON AUDIO OUTPUT CIRCUIT

Measure the resistance between the (X776) CNV Hands Free Voice (-) circuit and the (X795) Common Audio Output circuit.

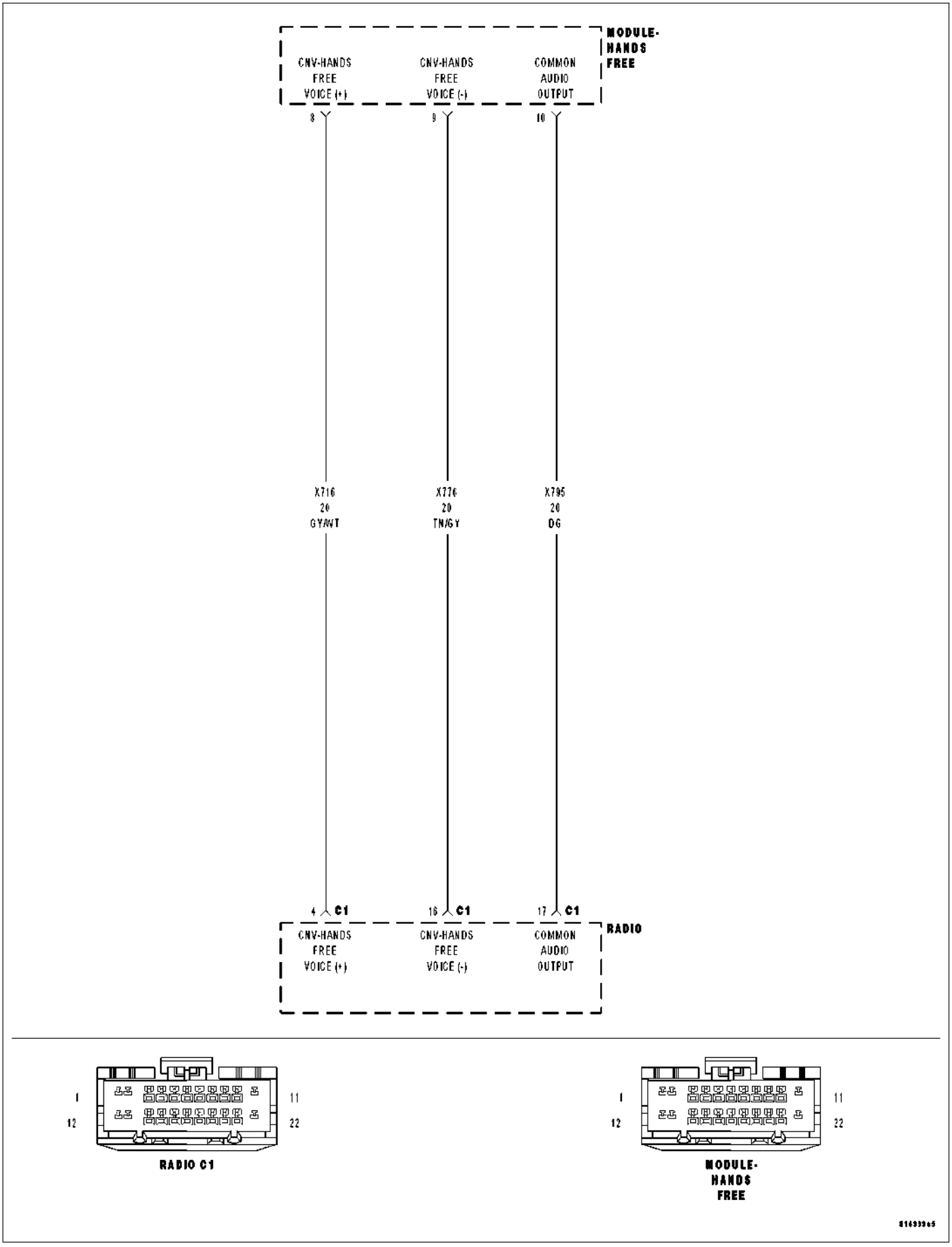


Is the resistance below 5.0 ohms?

Yes >> Repair the (X776) CNV Hands Free Voice (-) circuit for a short to the (X795) Common Audio Output circuit.
Perform BODY VERIFICATION TEST – VER 1.

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Hands Free Module in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

B1416-HFM RIGHT AUDIO OUTPUT CIRCUIT HIGH



B1416-HFM RIGHT AUDIO OUTPUT CIRCUIT HIGH (CONTINUED)
For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Hands Free Module detects high voltage on the (X776) CNV Hands Free Voice (-) circuit.

Possible Causes
(X776) CNV HANDS FREE VOICE (-) CIRCUIT OPEN
(X795) COMMON AUDIO OUTPUT CIRCUIT OPEN
(X776) CNV HANDS FREE VOICE (-) CIRCUIT SHORT TO VOLTAGE
HANDS FREE MODULE

Diagnostic Test

1. CHECK FOR ACTIVE DTC

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

B1416-HFM RIGHT AUDIO OUTPUT CIRCUIT HIGH (CONTINUED)

2. (X776) CNV HANDS FREE VOICE (-) CIRCUIT OPEN

Turn the ignition off.

Disconnect the Hands Free Module harness connector.

Disconnect the Radio C1 harness connector.

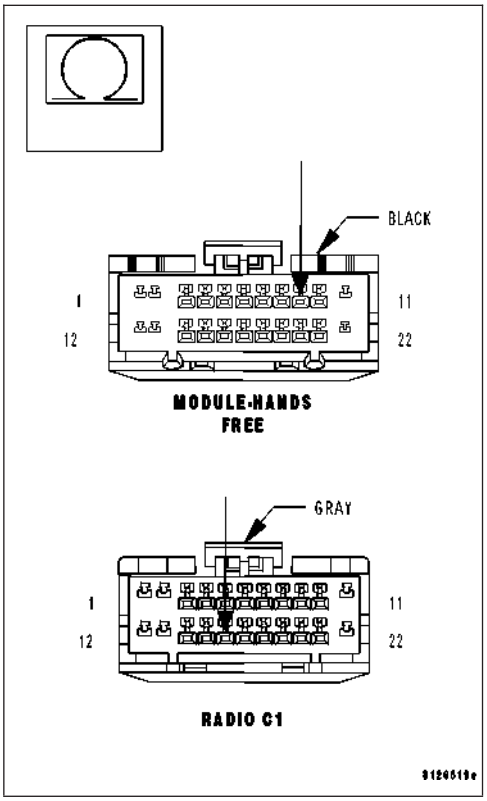
Measure the resistance of the (X776) CNV Hands Free Voice (-) circuit between the HFM connector and the radio connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 3

No >> Repair the (X776) CNV Hands Free Voice (-) circuit for an open

Perform BODY VERIFICATION TEST – VER 1.



3. (X795) COMMON AUDIO OUTPUT CIRCUIT OPEN

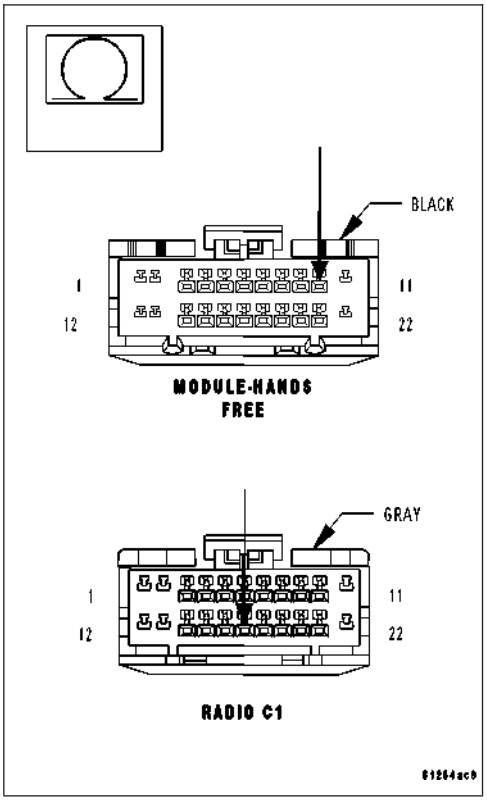
Measure the resistance of the (X795) Common Audio Output circuit between the HFM connector and the radio connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 4

No >> Repair the (X795) Common Audio Output circuit for an open.

Perform BODY VERIFICATION TEST – VER 1.

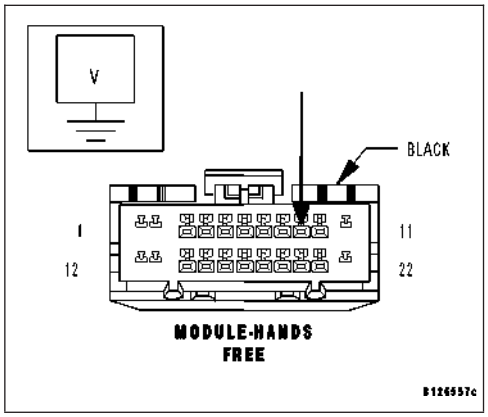


B1416-HFM RIGHT AUDIO OUTPUT CIRCUIT HIGH (CONTINUED)

4. (X776) CNV HANDS FREE VOICE (-) CIRCUIT SHORT TO VOLTAGE

Turn the ignition on.

Measure the voltage of the (X776) CNV Hands Free Voice (-) circuit.



Is the voltage above 1.0 volts?

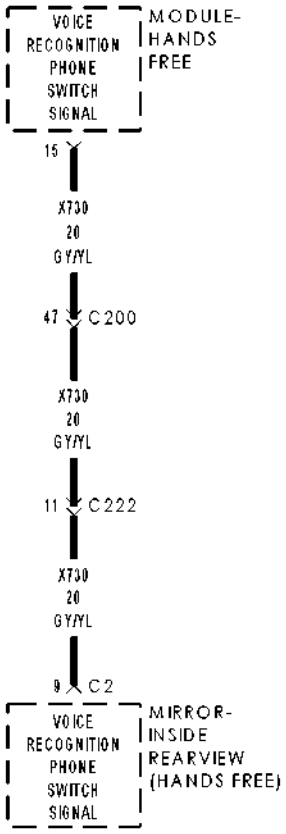
Yes >> Repair the (X776) CNV Hands Free Voice (-) circuit for a short to voltage.

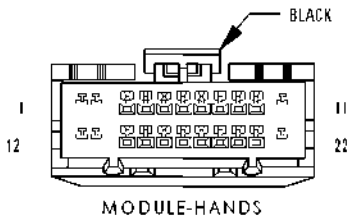
Perform BODY VERIFICATION TEST – VER 1.

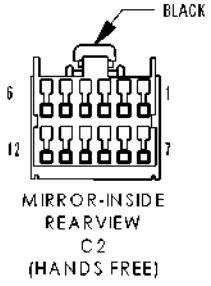
No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Hands Free Module in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1.

B1435-VOICE RECOGNITION /PHONE SWITCH INPUT CIRCUIT PERFORMANCE







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B1435-VOICE RECOGNITION /PHONE SWITCH INPUT CIRCUIT PERFORMANCE (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Hands Free Module detects an invalid voltage signal on the (X730) Voice Recognition/Phone Switch Signal circuit.

Possible Causes
INSIDE REARVIEW MIRROR
HANDS FREE MODULE

Diagnostic Test

1. Check for active DTC

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

---

2. Check the voltage of the (X730) Voice Recognition/Phone Switch Signal

Turn the ignition off.

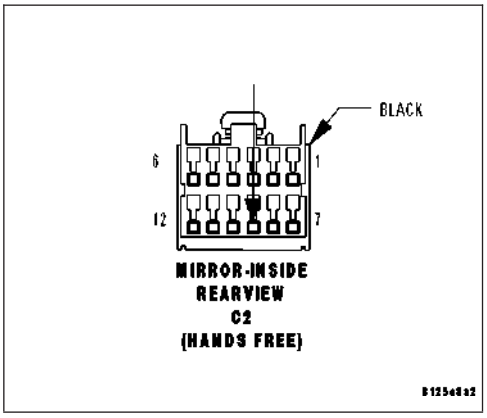
Disconnect the Inside Rearview Mirror C2 harness connector.

Turn the ignition on.

With the scan tool, monitor the VR Phone Switch voltage.

While monitoring the VR Phone Switch voltage, momentarily connect a jumper wire between (X730) Voice Recognition/Phone Switch Signal circuit and ground.

NOTE: The scan tool sensor voltage should switch from above 4.7 volts when the jumper is not connected to below 0.6 volts when the jumper is connected.

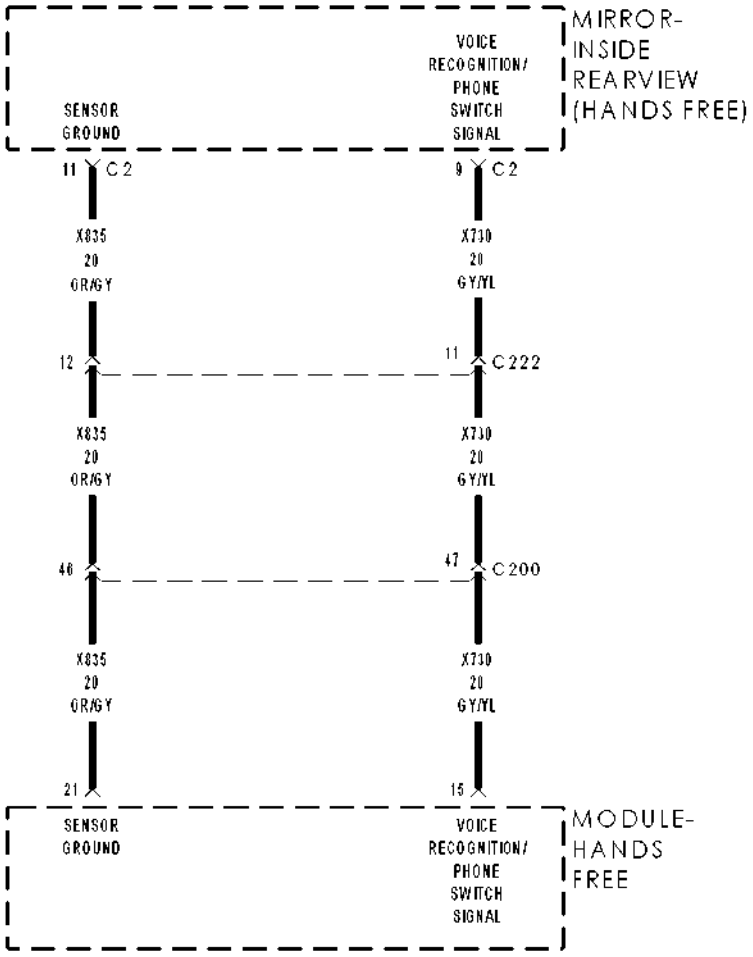


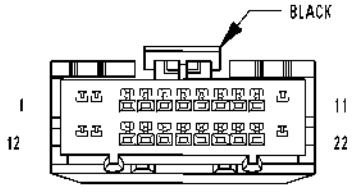
Does the sensor voltage switch from above 4.7 volts to below 0.6 volt as described?

Yes >> Replace the Inside Rearview Mirror in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

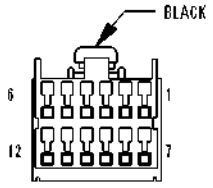
No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Hands Free Module in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

B1436-VOICE RECOGNITION/PHONE SWITCH INPUT CIRCUIT LOW





MODULE-HANDS
FREE



MIRROR-INSIDE
REARVIEW
C2
(HANDS FREE)

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B1436-VOICE RECOGNITION/PHONE SWITCH INPUT CIRCUIT LOW (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Hands Free Module detects voltage below 0.6 volts on the (X730) Voice Recognition/Phone Switch Signal circuit.

Possible Causes
INSIDE REARVIEW MIRROR
(X730) VOICE RECOGNITION/PHONE SWITCH SIGNAL CIRCUIT SHORT TO (X835) SENSOR GROUND CIRCUIT
(X730) VOICE RECOGNITION/PHONE SWITCH SIGNAL CIRCUIT SHORT TO GROUND
HANDS FREE MODULE

Diagnostic Test

1. Check for active DTC

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

---

2. Check the voltage of the (X730) Voice Recognition/Phone Switch Signal

Turn the ignition off.

Disconnect the Inside Rearview Mirror C2 harness connector.

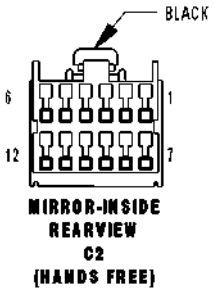
Turn the ignition on.

With the scan tool, monitor the VR Phone Switch voltage.

Is the voltage above 4.7 volts?

Yes >> Replace the Inside Rearview Mirror in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 3



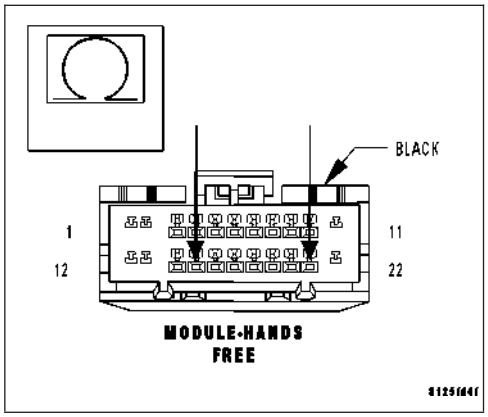
B1436-VOICE RECOGNITION/PHONE SWITCH INPUT CIRCUIT LOW (CONTINUED)

3. (X730) Voice Recognition/Phone Switch Signal circuit shorted to the (X835) Sensor Ground circuit

Turn the ignition off.

Disconnect the Hands Free Module harness connector.

Measure the resistance between the (X730) Voice Recognition/Phone Switch Signal circuit and the (X835) Sensor Ground circuit



Is the resistance below 100.0 ohms?

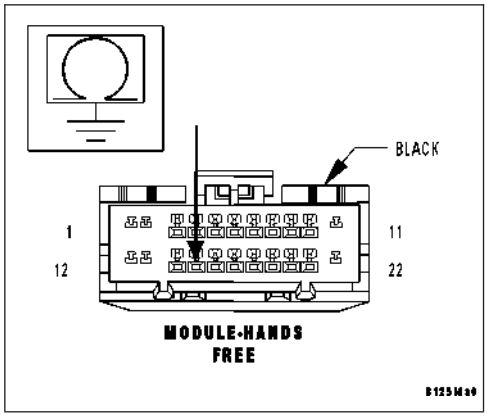
Yes >> Repair the (X730) Voice Recognition/Phone Switch Signal circuit for a short to the (X835) Sensor Ground circuit.
Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 4

---

4. (X730) Voice Recognition/Phone Switch Signal circuit shorted to ground

Measure the resistance between ground and the (X730) Voice Recognition/Phone Switch Signal circuit.

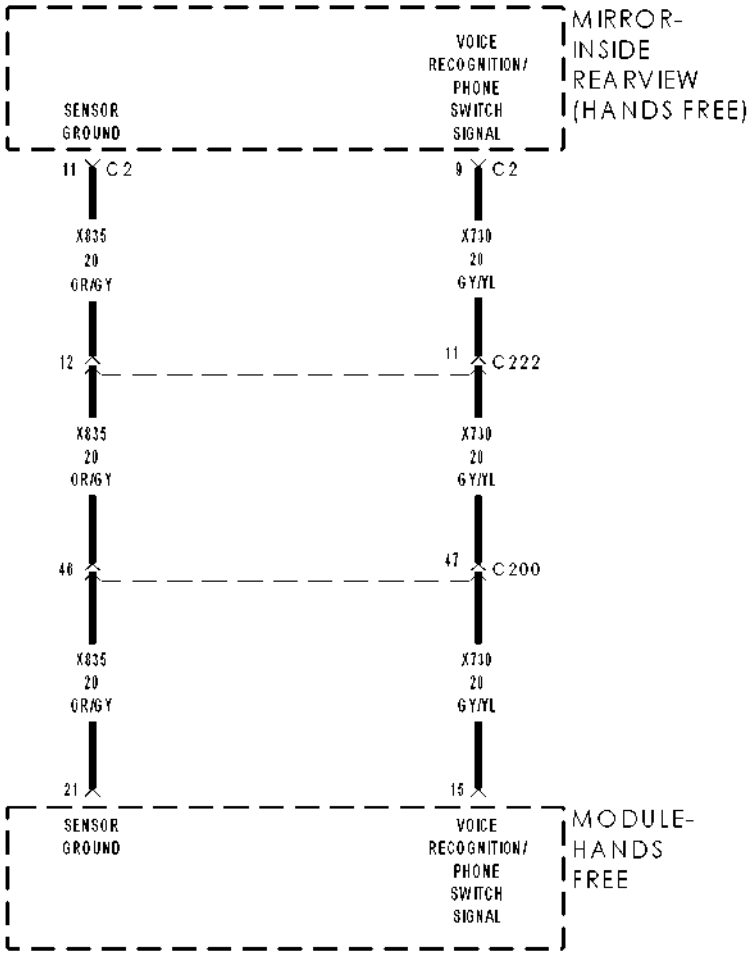


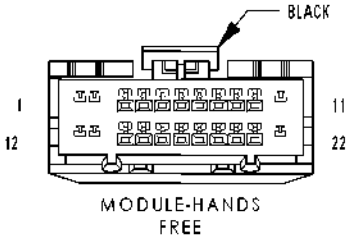
Is the resistance below 100.0 ohms?

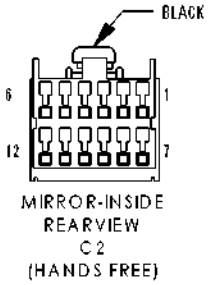
Yes >> Repair the (X730) Voice Recognition/Phone Switch Signal circuit for a short to ground
Perform BODY VERIFICATION TEST – VER 1.

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Hands Free Module in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

B1437-VOICE RECOGNITION/PHONE SWITCH INPUT CIRCUIT HIGH







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B1437-VOICE RECOGNITION/PHONE SWITCH INPUT CIRCUIT HIGH (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Hands Free Module detects voltage above 4.7 volts on the (X730) Voice Recognition/Phone Switch Signal circuit.

Possible Causes
(X730) VOICE RECOGNITION/PHONE SWITCH SIGNAL CIRCUIT SHORT TO VOLTAGE
(X730) VOICE RECOGNITION/PHONE SWITCH SIGNAL CIRCUIT OPEN
(X835) SENSOR GROUND CIRCUIT OPEN
INSIDE REARVIEW MIRROR
HANDS FREE MODULE

Diagnostic Test

1. Check for active DTC

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

---

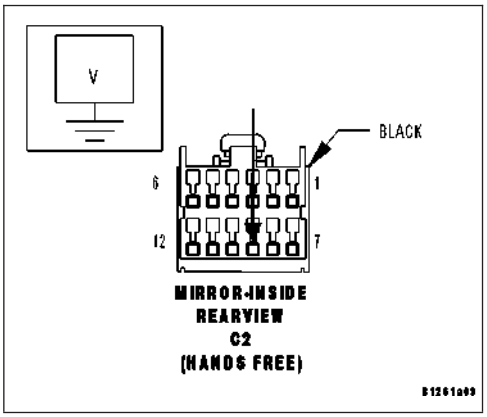
2. Check the voltage of the (X730) Voice Recognition/Phone Switch Signal

Turn the ignition off.

Disconnect the Inside Rearview Mirror C2 harness connector.

Turn the ignition on.

Measure the voltage of the (X730) Voice Recognition/Phone Switch Signal circuit.



Is the voltage above 5.3 volts?

Yes >> Repair the (X730) Voice Recognition/Phone Switch Signal circuit for a short to voltage.
Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 3

B1437-VOICE RECOGNITION/PHONE SWITCH INPUT CIRCUIT HIGH (CONTINUED)

3. Inside Rearview Mirror

Turn the ignition off.

Connect a jumper wire between (X730) Voice Recognition/Phone Switch Signal circuit and the (X835) Sensor Ground circuit.

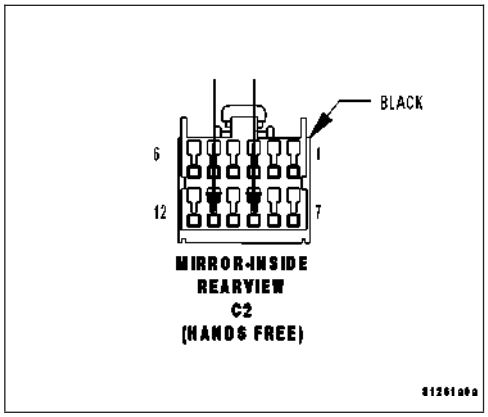
Turn the ignition on.

With the scan tool, monitor the VR Phone Switch Voltage.

Is the voltage approximately 0 volts?

Yes >> Replace the Inside Rearview Mirror in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 4



4. (X730) Voice Recognition/Phone Switch Signal circuit open

Turn the ignition off.

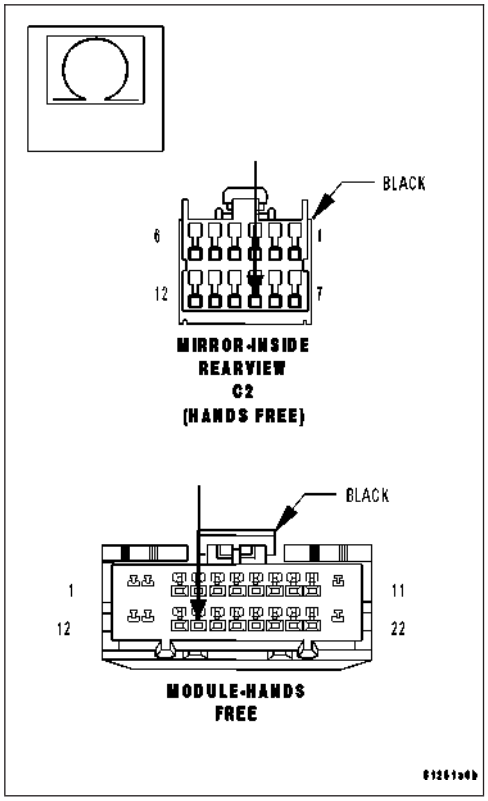
Disconnect the Hands Free Module harness connector.

Measure the resistance of the (X730) Voice Recognition/Phone Switch Signal circuit between the HFM connector and the inside rearview mirror connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 5

No >> Repair the (X730) Voice Recognition/Phone Switch Signal circuit for an open.
Perform BODY VERIFICATION TEST – VER 1.



B1437-VOICE RECOGNITION/PHONE SWITCH INPUT CIRCUIT HIGH (CONTINUED)

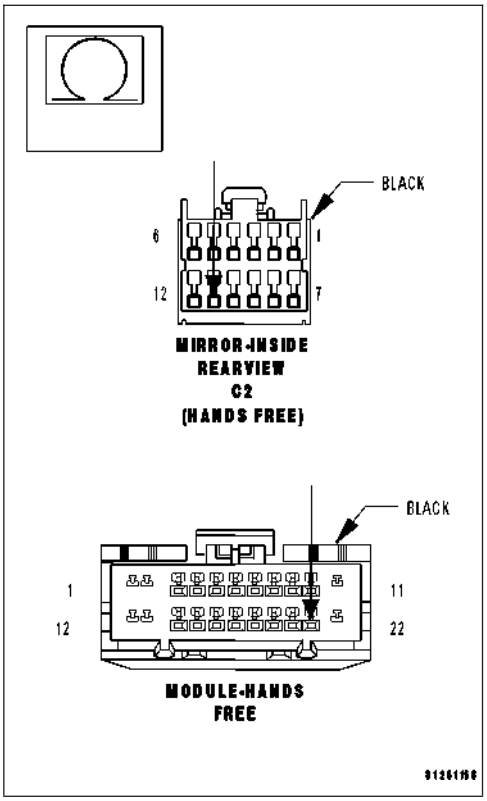
5. (X835) Sensor Ground circuit open

Measure the resistance of the (X835) Sensor Ground circuit between the HFM connector and the inside rearview mirror connector.

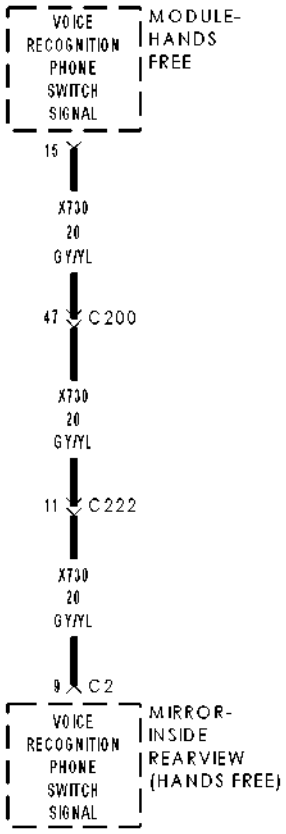
Is the resistance below 5.0 ohms?

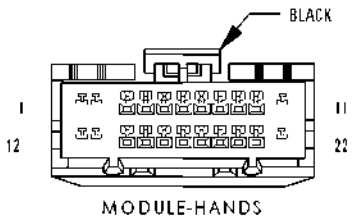
Yes >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Hands Free Module in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

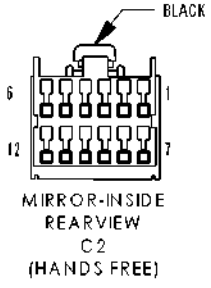
No >> Repair the (X835) Sensor Ground circuit for an open.
Perform BODY VERIFICATION TEST – VER 1.



B1438–VOICE RECOGNITION SWITCH STUCK







8125e835

B1438–VOICE RECOGNITION SWITCH STUCK (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Hands Free Module detects voltage between 3.5 volts and 4.0 volts on the (X730) Voice Recognition/ Phone Switch Signal circuit for more than 30 seconds.

Possible Causes
INSIDE REARVIEW MIRROR
HANDS FREE MODULE

Diagnostic Test

1. Check for active DTC

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

---

2. Check the voltage of the (X730) Voice Recognition/Phone Switch Signal

Turn the ignition off.

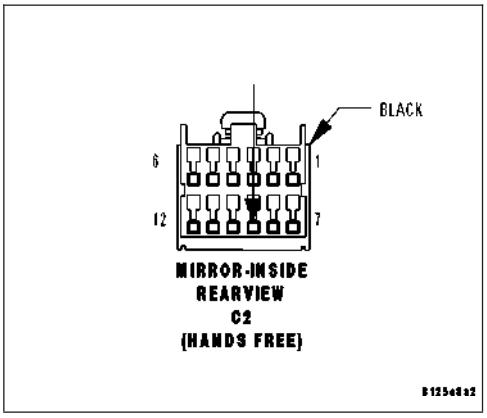
Disconnect the Inside Rearview Mirror C2 harness connector.

Turn the ignition on.

With the scan tool, monitor the VR Phone Switch voltage.

While monitoring the VR Phone Switch voltage, momentarily connect a jumper wire between (X730) Voice Recognition/Phone Switch Signal circuit and ground.

NOTE: The scan tool sensor voltage should switch from above 4.7 volts when the jumper is not connected to below 0.6 volts when the jumper is connected.

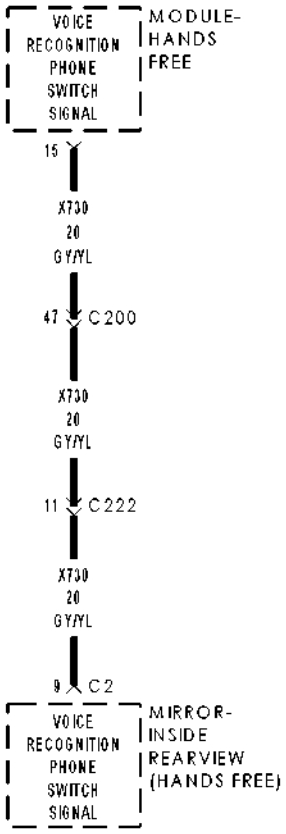


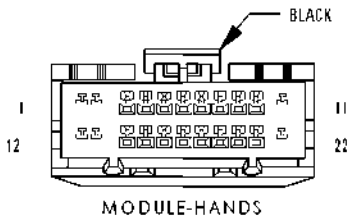
Does the sensor voltage switch from above 4.7 volts to below 0.6 volt as described?

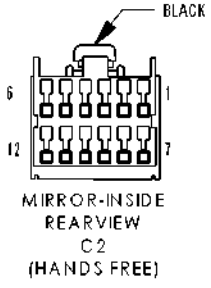
Yes >> Replace the Inside Rearview Mirror in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Hands Free Module in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

B1439-PHONE SWITCH STUCK







8125e835

B1439-PHONE SWITCH STUCK (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Hands Free Module detects voltage between 2.8 volts and 3.3 volts on the (X730) Voice Recognition/ Phone Switch Signal circuit for more than 30 seconds.

Possible Causes
INSIDE REARVIEW MIRROR
HANDS FREE MODULE

Diagnostic Test

1. Check for active DTC

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

---

2. Check the voltage of the (X730) Voice Recognition/Phone Switch Signal

Turn the ignition off.

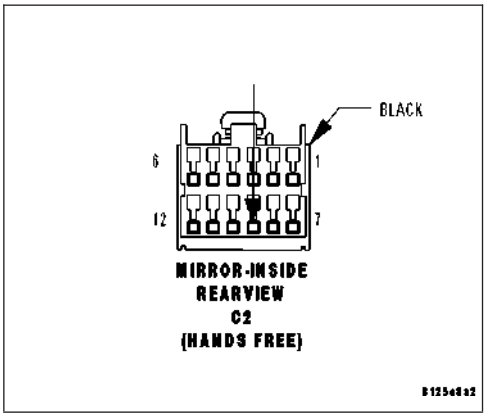
Disconnect the Inside Rearview Mirror C2 harness connector.

Turn the ignition on.

With the scan tool, monitor the VR Phone Switch voltage.

While monitoring the VR Phone Switch voltage, momentarily connect a jumper wire between (X730) Voice Recognition/Phone Switch Signal circuit and ground.

NOTE: The scan tool sensor voltage should switch from above 4.7 volts when the jumper is not connected to below 0.6 volts when the jumper is connected.

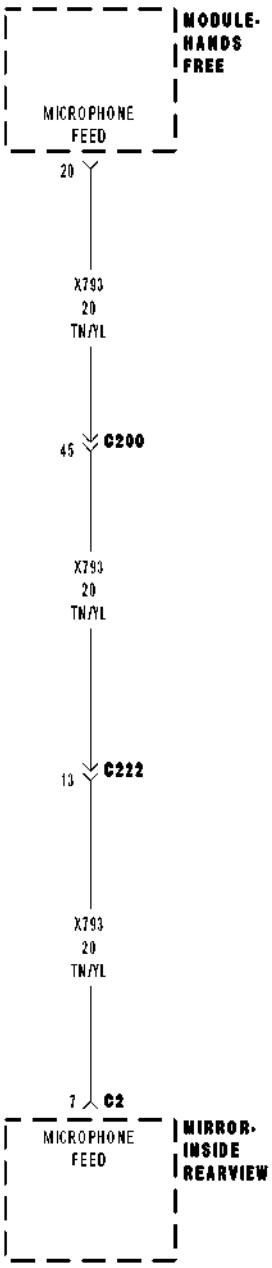


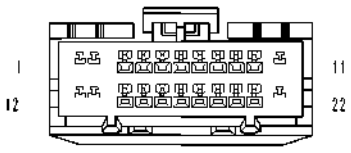
Does the sensor voltage switch from above 4.7 volts to below 0.6 volt as described?

Yes >> Replace the Inside Rearview Mirror in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

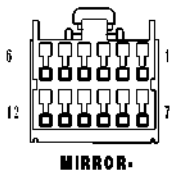
No >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Hands Free Module in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

B145A-TELEMATICS MIRROR CONTROL CIRCUIT HIGH





MODULE-
HANDS
FREE



MIRROR-
INSIDE
REARVIEW C2

B145ha3

B145A-TELEMATICS MIRROR CONTROL CIRCUIT HIGH (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Hands Free Module detects high voltage on the (X793) Microphone Feed circuit.

Possible Causes
(X793) MICROPHONE FEED CIRCUIT OPEN
(X793) MICROPHONE FEED CIRCUIT SHORT TO VOLTAGE
INSIDE REARVIEW MIRROR
HANDS FREE MODULE

Diagnostic Test

1. CHECK FOR ACTIVE DTC

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

Attempt to make a phone call with the system.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

B145A-TELEMATICS MIRROR CONTROL CIRCUIT HIGH (CONTINUED)

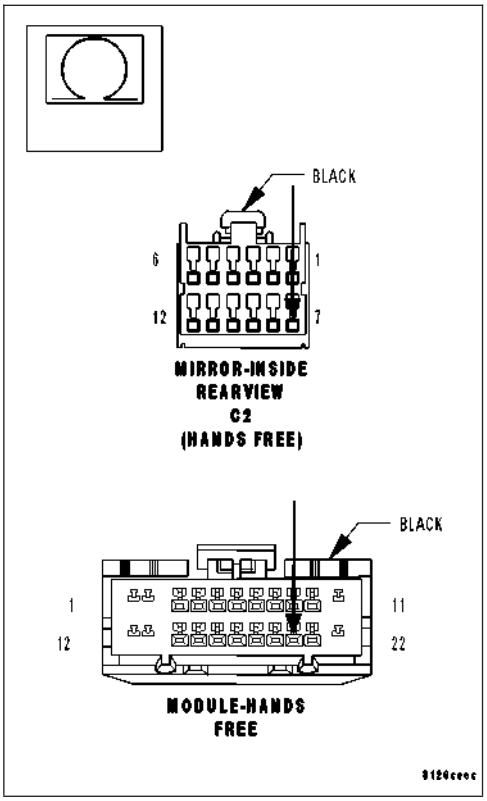
2. (X793) MICROPHONE FEED CIRCUIT OPEN

Turn the ignition off.

Disconnect the Hands Free Module harness connector.

Disconnect the Inside Rearview Mirror C2 harness connector.

Measure the resistance of the (X793) Microphone Feed circuit between the HFM connector and the inside rearview mirror connector.



Is the resistance below 5.0 ohms?

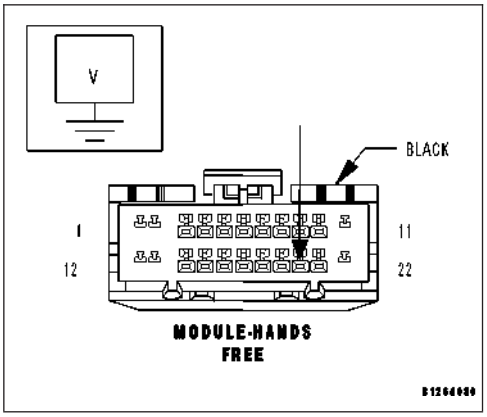
Yes >> Go To 3

No >> Repair the (X793) Microphone Feed circuit for an open.
Perform BODY VERIFICATION TEST – VER 1.

3. (X793) MICROPHONE FEED CIRCUIT SHORT TO VOLTAGE

Turn the ignition on.

Measure the voltage of the (X793) Microphone Feed circuit.



Is the voltage above 1.0 volt?

Yes >> Repair the (X793) Microphone Feed circuit for short to voltage.
Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 4

B145A-TELEMATICS MIRROR CONTROL CIRCUIT HIGH (CONTINUED)

4. INSIDE REARVIEW MIRROR

Replace the Inside Rearview Mirror in accordance with the service information.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

Attempt to make a phone call with the system.

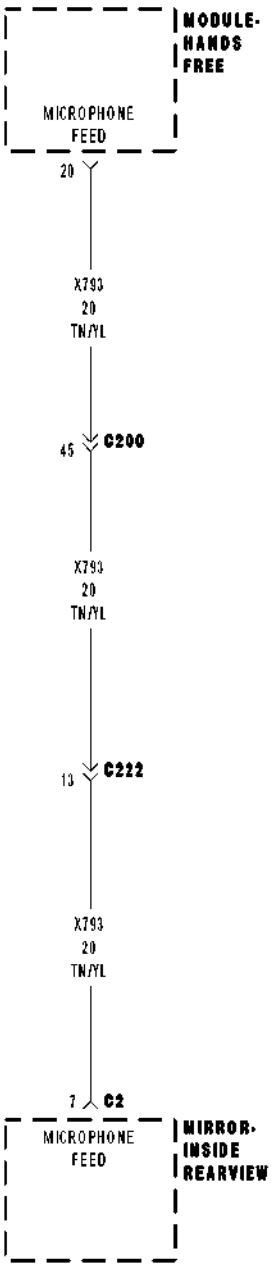
With the scan tool, read the active DTC's.

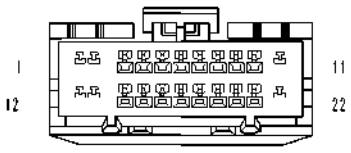
Does the scan tool display this DTC as active?

Yes >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Hands Free Module in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

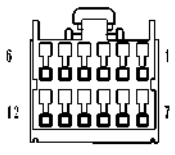
No >> Repair is complete.
Perform BODY VERIFICATION TEST – VER 1.

B1459-TELEMATICS MIRROR CONTROL CIRCUIT LOW





MODULE-
HANDS
FREE



MIRROR-
INSIDE
REARVIEW C2

B1459ha3

B1459-TELEMATICS MIRROR CONTROL CIRCUIT LOW (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Hands Free Module detects low voltage on the (X793) Microphone Feed circuit.

Possible Causes
(X793) MICROPHONE FEED CIRCUIT OPEN
(X793) MICROPHONE FEED CIRCUIT SHORT TO GROUND
INSIDE REARVIEW MIRROR
HANDS FREE MODULE

Diagnostic Test

1. CHECK FOR ACTIVE DTC

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

Attempt to make a phone call with the system.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

B1459-TELEMATICS MIRROR CONTROL CIRCUIT LOW (CONTINUED)

2. (X793) MICROPHONE FEED CIRCUIT OPEN

Turn the ignition off.

Disconnect the Hands Free Module harness connector.

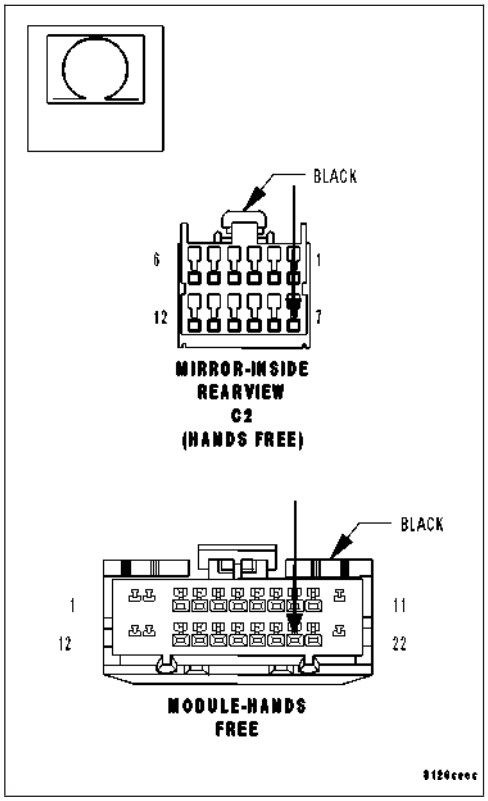
Disconnect the Inside Rearview Mirror C2 harness connector.

Measure the resistance of the (X793) Microphone Feed circuit between the HFM connector and the inside rearview mirror connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 3

No >> Repair the (X793) Microphone Feed circuit for an open.
Perform BODY VERIFICATION TEST – VER 1.



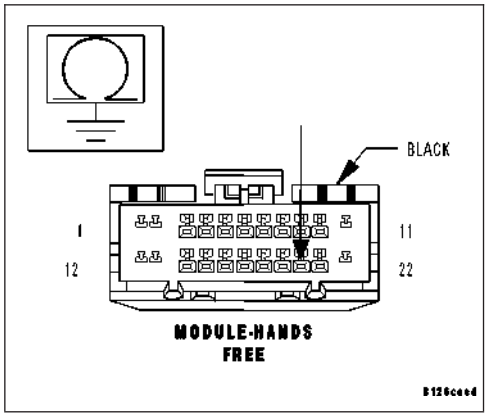
3. (X793) MICROPHONE FEED CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (X793) Microphone Feed circuit

Is the resistance below 100.0 ohms?

Yes >> Repair the (X793) Microphone Feed circuit for short to ground.
Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 4



B1459-TELEMATICS MIRROR CONTROL CIRCUIT LOW (CONTINUED)

4. INSIDE REARVIEW MIRROR

Replace the Inside Rearview Mirror in accordance with the service information.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

Attempt to make a phone call with the system.

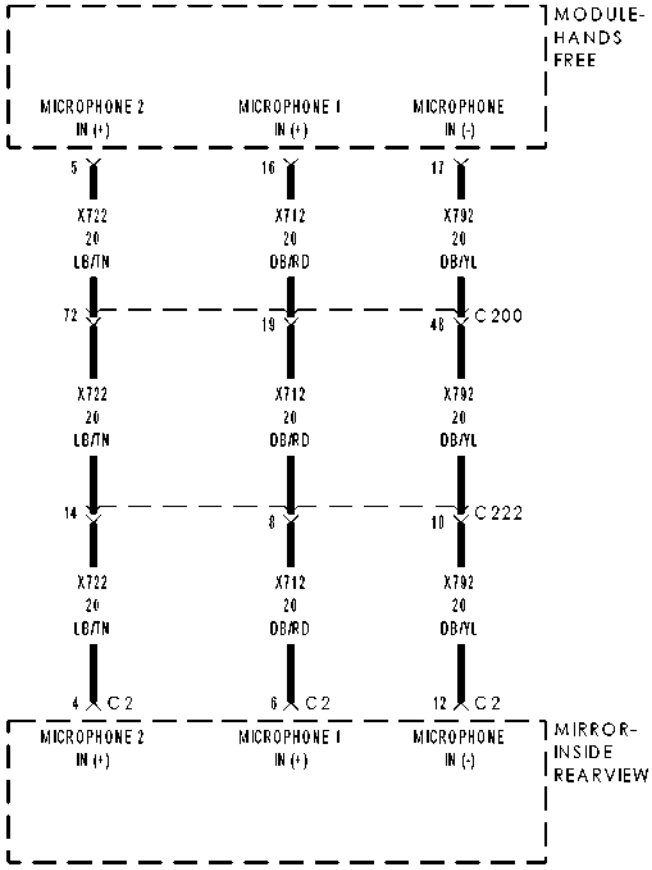
With the scan tool, read the active DTC's.

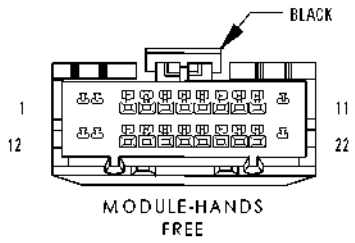
Does the scan tool display this DTC as active?

Yes >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Hands Free Module in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

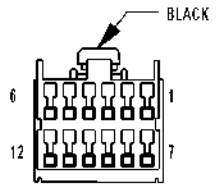
No >> Repair is complete.
Perform BODY VERIFICATION TEST – VER 1.

B1492–GENERAL MICROPHONE PERFORMANCE





MODULE-HANDS
FREE



MIRROR-INSIDE
REARVIEW
C2
(HANDS FREE)

81270157

B1492–GENERAL MICROPHONE PERFORMANCE (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Hands Free Module detects a fault in any of the microphone circuits.

Possible Causes
(X712) MICROPHONE 1 IN (+) CIRCUIT OPEN
(X722) MICROPHONE 2 IN (+) CIRCUIT OPEN
(X792) MICROPHONE IN (-) CIRCUIT OPEN
(X712) (X722) (X792) MICROPHONE CIRCUITS SHORTED TO GROUND
(X712) (X722) (X792) MICROPHONE CIRCUITS SHORTED TO VOLTAGE
(X712) (X722) (X792) MICROPHONE CIRCUITS SHORTED TOGETHER
INSIDE REARVIEW MIRROR
HANDS FREE MODULE

Diagnostic Test

1. CHECK FOR ACTIVE DTC

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

Attempt to make a phone call with the system.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

B1492–GENERAL MICROPHONE PERFORMANCE (CONTINUED)

2. (X712) MICROPHONE 1 IN (+) CIRCUIT OPEN

Turn the ignition off.

Disconnect the Hands Free Module harness connector.

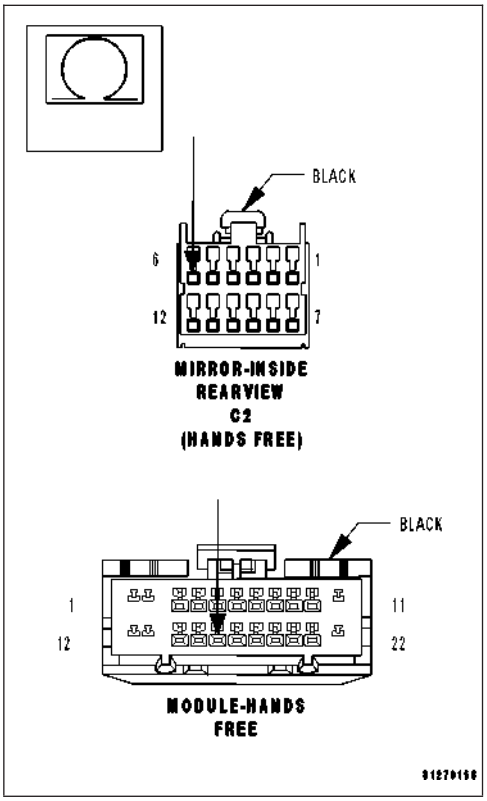
Disconnect the Inside Rearview Mirror C2 harness connector.

Measure the resistance of the (X712) Microphone 1 IN (+) circuit between the HFM connector and the inside rearview mirror connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 3

No >> Repair the (X712) Microphone 1 IN (+) circuit for an open. Perform BODY VERIFICATION TEST – VER 1.



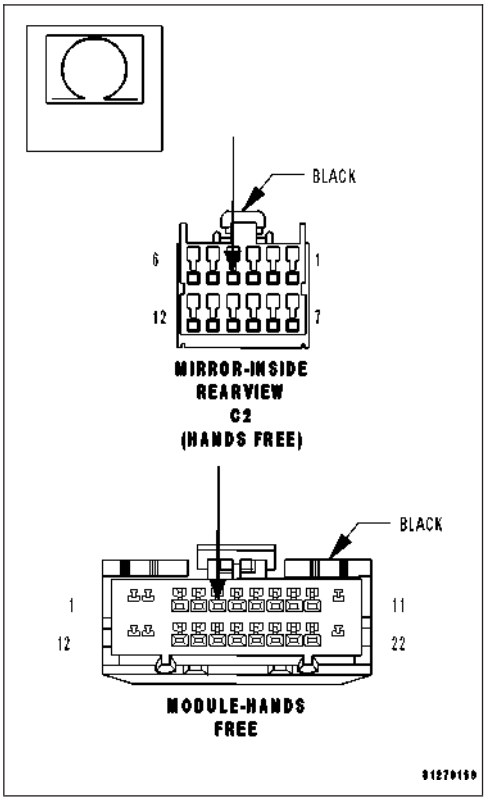
3. (X722) MICROPHONE 2 IN (+) CIRCUIT OPEN

Measure the resistance of the (X722) Microphone 2 IN (+) circuit between the HFM connector and the inside rearview mirror connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 4

No >> Repair the (X722) Microphone 2 IN (+) circuit for an open. Perform BODY VERIFICATION TEST – VER 1.



B1492–GENERAL MICROPHONE PERFORMANCE (CONTINUED)

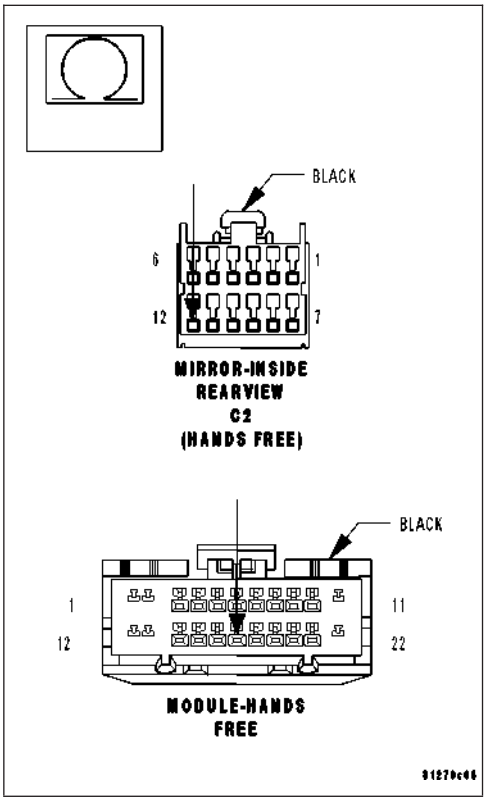
4. (X792) MICROPHONE IN (-) CIRCUIT OPEN

Measure the resistance of the (X792) Microphone IN (-) circuit between the HFM connector and the inside rearview mirror connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 5

No >> Repair the (X792) Microphone IN (-) circuit for an open.
Perform BODY VERIFICATION TEST – VER 1.



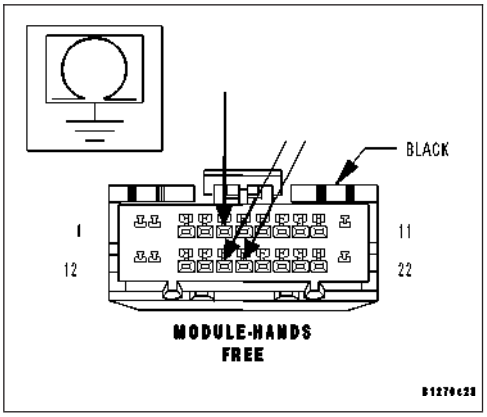
5. (X712) (X722) (X792) MICROPHONE CIRCUITS SHORTED TO GROUND

Measure the resistance between ground and each (X712) (X722) (X792) Microphone circuit.

Is the resistance below 100.0 ohms?

Yes >> Repair the Microphone circuit that measured below 100.0 ohms for short to ground.
Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 6

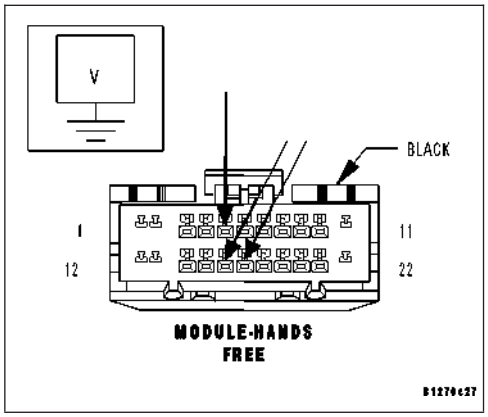


B1492–GENERAL MICROPHONE PERFORMANCE (CONTINUED)

6. (X712) (X722) (X792) MICROPHONE CIRCUITS SHORTED TO VOLTAGE

Turn the ignition on.

Measure the voltage of each (X712) (X722) (X792) Microphone circuit.



Is the voltage above 1.0 volt?

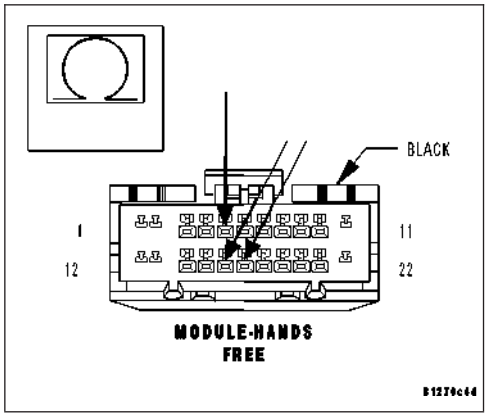
Yes >> Repair the Microphone circuit that measured above 1.0 volt for short to voltage.
Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 7

7. (X712) (X722) (X792) MICROPHONE CIRCUITS SHORTED TOGETHER

Turn the ignition off.

Measure the resistance between each (X712) (X722) (X792) Microphone circuit.



Is the resistance below 100.0 ohms?

Yes >> Repair the Microphone circuit that measured below 100.0 ohms for a short together.
Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 8

8. INSIDE REARVIEW MIRROR

Replace the Inside Rearview Mirror in accordance with the service information.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

Attempt to make a phone call with the system.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Hands Free Module in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Repair is complete.
Perform BODY VERIFICATION TEST – VER 1.

B2203–ROM CHECKSUM PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Hands Free Module detects a fault during an internal diagnostic check.

Possible Causes
Hands Free Module

Diagnostic Test

1. Replace the Hands Free Module if DTC is active

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Replace and program the Hands Free Module in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

B2205–ORIGINAL VIN MISSING/MISMATCH

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Hands Free Module will receive and monitor the VIN message from the PCM and record the VIN if different from the last VIN.

Possible Causes
INCORRECT VIN PROGRAMMED IN PCM
HANDS FREE MODULE

Diagnostic Test

1. Check for active DTC

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

---

2. CHECK VIN IN PCM

With the scan tool compare the VIN that is programmed into the PCM to the VIN on the vehicle.

Does the VIN programmed into the PCM match the vehicles VIN?

Yes >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Hands Free Module in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Program the correct VIN in the PCM and retest the HFM system.

B222A-VEHICLE LINE MISMATCH

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Hands Free Module will receive and monitor the vehicle line message from the PCM and record the vehicle line if different from the last vehicle line.

Possible Causes
INCORRECT PCM
HANDS FREE MODULE

Diagnostic Test

1. Check for active DTC

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

---

2. CHECK VEHICLE LINE IN PCM

With the scan tool compare the vehicle line that is programmed into the PCM to the vehicle line of the vehicle.

Does the vehicle line programmed into the PCM match the vehicle?

Yes >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Hands Free Module in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Replace and program the Powertrain Control Module in accordance with the service information. Ensure the PCM is replaced with the correct vehicle line PCM.
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

B222E–FLASH CHECKSUM PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Hands Free Module detects a fault during an internal diagnostic check.

Possible Causes
Hands Free Module

Diagnostic Test

1. Replace the Hands Free Module if DTC is active

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Replace and program the Hands Free Module in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

B222F–FLASH WRITE PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Hands Free Module detects a fault during an internal diagnostic check.

Possible Causes
Hands Free Module

Diagnostic Test

1. Replace the Hands Free Module if DTC is active

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Replace and program the Hands Free Module in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

B2223-(HFM) HANDS FREE PHONE INTERNAL

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Hands Free Module detects a fault during an internal diagnostic check.

Possible Causes
Hands Free Module

Diagnostic Test

1. Replace the Hands Free Module if DTC is active

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Replace and program the Hands Free Module in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

B2230–RAM WRITE PERFORMANCE

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Hands Free Module detects a fault during an internal diagnostic check.

Possible Causes
Hands Free Module

Diagnostic Test

1. Replace the Hands Free Module if DTC is active

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

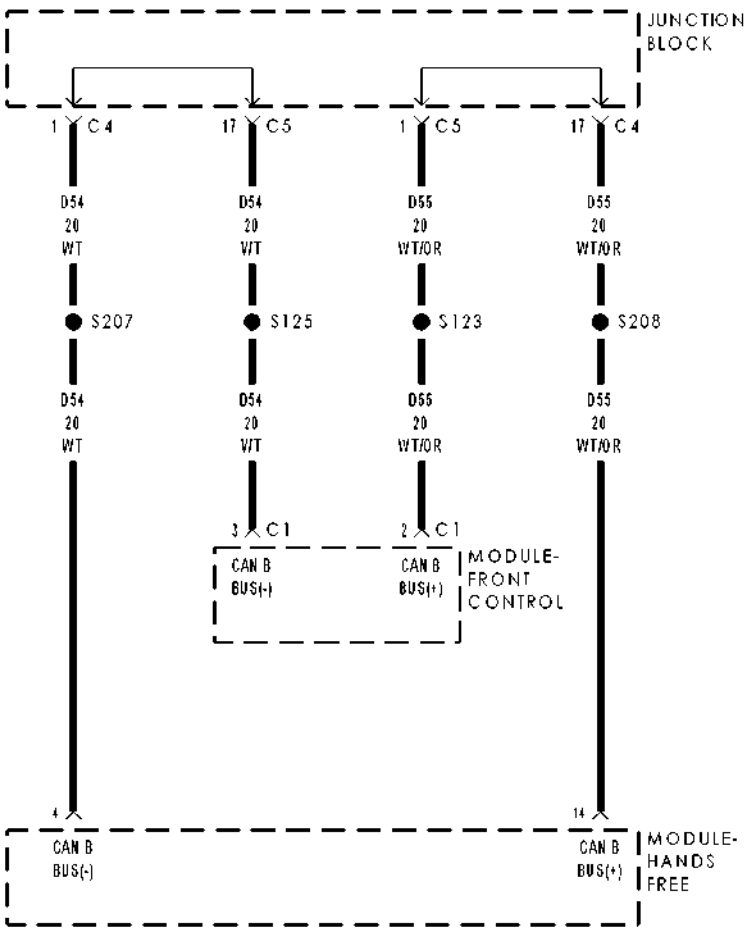
With the scan tool, read the active DTC's.

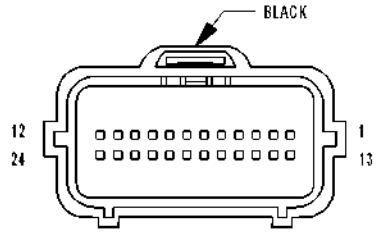
Does the scan tool display this DTC as active?

Yes >> Replace and program the Hands Free Module in accordance with the service information.
Perform BODY VERIFICATION TEST – VER 1.

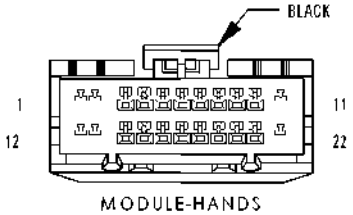
No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

U0019–CAN B BUS





MODULE-FRONT CONTROL C1



MODULE-HANDS FREE

8T298dcb

U0019–CAN B BUS (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  Whenever the CAN B Bus (+) or CAN B Bus (-) circuit is open, shorted to voltage or shorted to ground.

Possible Causes
CAN B BUS DTC's IN FRONT CONTROL MODULE
(D55) CAN B BUS (+) CIRCUIT OPEN
(D54) CAN B BUS (-) CIRCUIT OPEN
HANDS FREE MODULE

Diagnostic Test

1. CHECK FOR ACTIVE DTCS

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

Does the scan tool display this DTC as active?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

---

2. CHECK FRONT CONTROL MODULE DTC's

With the scan tool, read Front Control Module active DTC's

Does the scan tool display any CAN B BUS DTC's – ACTIVE?

Yes >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)

No >> Go To 3

U0019–CAN B BUS (CONTINUED)

3. (D55) CAN B BUS (+) CIRCUIT OPEN

Turn the ignition off.

Disconnect the negative battery cable.

Disconnect the Hands Free Module connector.

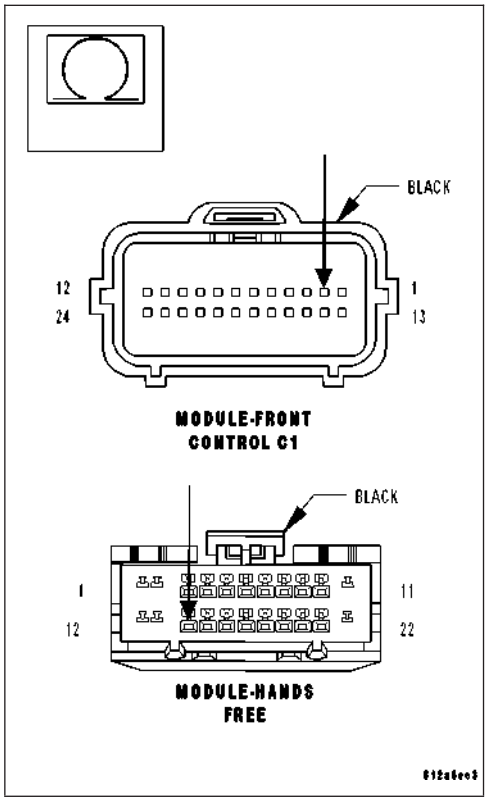
Disconnect the Front Control Module C1 connector.

Measure the resistance of the (D55) CAN B Bus (+) circuit between the Front Control Module C1 connector and the Hands Free Module connector.

Is the resistance below 2.0 ohms?

Yes >> Go To 4

No >> Repair the (D55) CAN B Bus (+) circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.



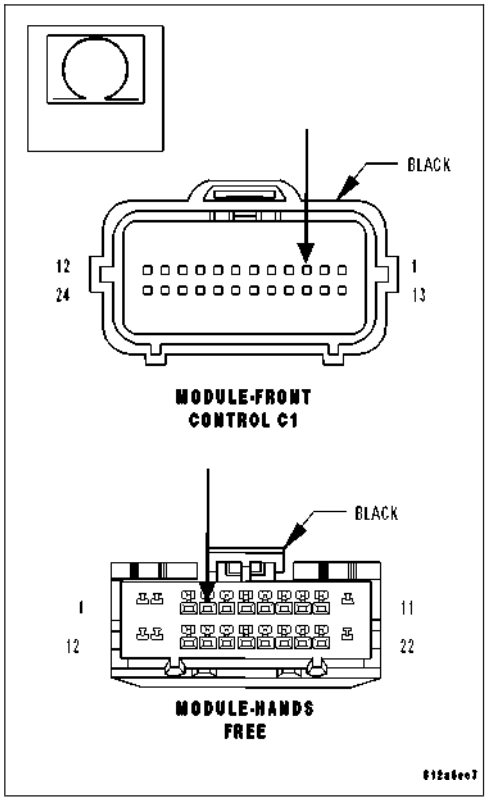
4. (D54) CAN B BUS (–) CIRCUIT OPEN

Measure the resistance of the (D54) CAN B Bus (–) circuit between the Front Control Module C1 connector and the Hands Free Module connector.

Is the resistance below 2.0 ohms?

Yes >> Replace the Hands Free Module in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the (D54) CAN B Bus (–) circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.



U0141–LOST COMMUNICATION WITH FRONT CONTROL MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0151-LOST COMMUNICATION WITH OCCUPANT RESTRAINT CONTROLLER

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0154-LOST COMMUNICATION WITH OCCUPANT CLASSIFICATION MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0155-LOST COMMUNICATION WITH CLUSTER/CCN

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0156-LOST COMMUNICATION WITH EOM

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0164-LOST COMMUNICATION WITH HVAC CONTROL MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0168-LOST COMMUNICATION WITH VEHICLE SECURITY CONTROL MODULE (SKREEM/WCM)

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0184-LOST COMMUNICATION WITH RADIO

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0186-LOST COMMUNICATION WITH AUDIO AMPLIFIER

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0195-LOST COMMUNICATION WITH SDARS

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0196-LOST COMMUNICATION WITH VEHICLE ENTERTAINMENT CONTROL MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0199-LOST COMMUNICATION WITH DRIVER DOOR MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0200-LOST COMMUNICATION WITH PASSENGER DOOR MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0208-LOST COMMUNICATION WITH HEATED SEAT CONTROL MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0209-LOST COMMUNICATION WITH MEMORY SEAT CONTROL MODULE

For a complete wiring diagram **Refer to Section 8W**.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

WIRING

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8W-01 WIRING DIAGRAM INFORMATION

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WIRING DIAGRAM INFORMATION

DESCRIPTION

DESCRIPTION - HOW TO USE WIRING DIAGRAMS

DaimlerChrysler Corporation wiring diagrams are designed to provide information regarding the vehicles wiring content. In order to effectively use the wiring diagrams to diagnose and repair DaimlerChrysler Corporation vehicles, it is important to understand all of their features and characteristics.

Diagrams are arranged such that the power (B+) side of the circuit is placed near the top of the page, and the ground (B-) side of the circuit is placed near the bottom of the page.

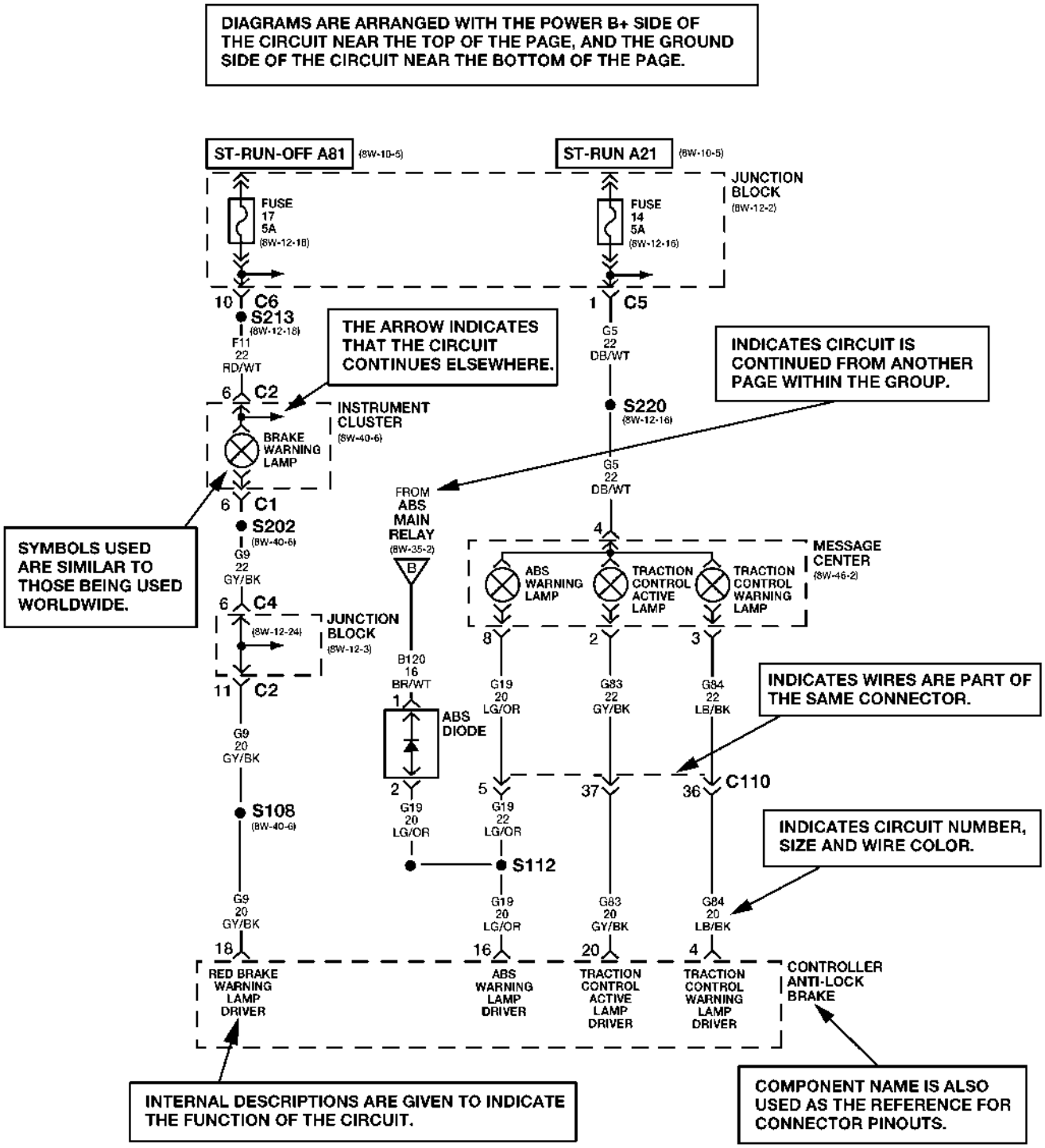
All switches, components, and modules are shown in the at rest position with the doors closed and the key removed from the ignition.

Components are shown two ways. A solid line around a component indicates that the component is complete. A dashed line around the component indicates that the component is being shown is not complete. Incomplete components have a reference number to indicate the page where the component is shown complete.

It is important to realize that no attempt is made on the diagrams to represent components and wiring as they appear on the vehicle. For example, a short piece of wire is treated the same as a long one. In addition, switches and other components are shown as simply as possible, with regard to function only.

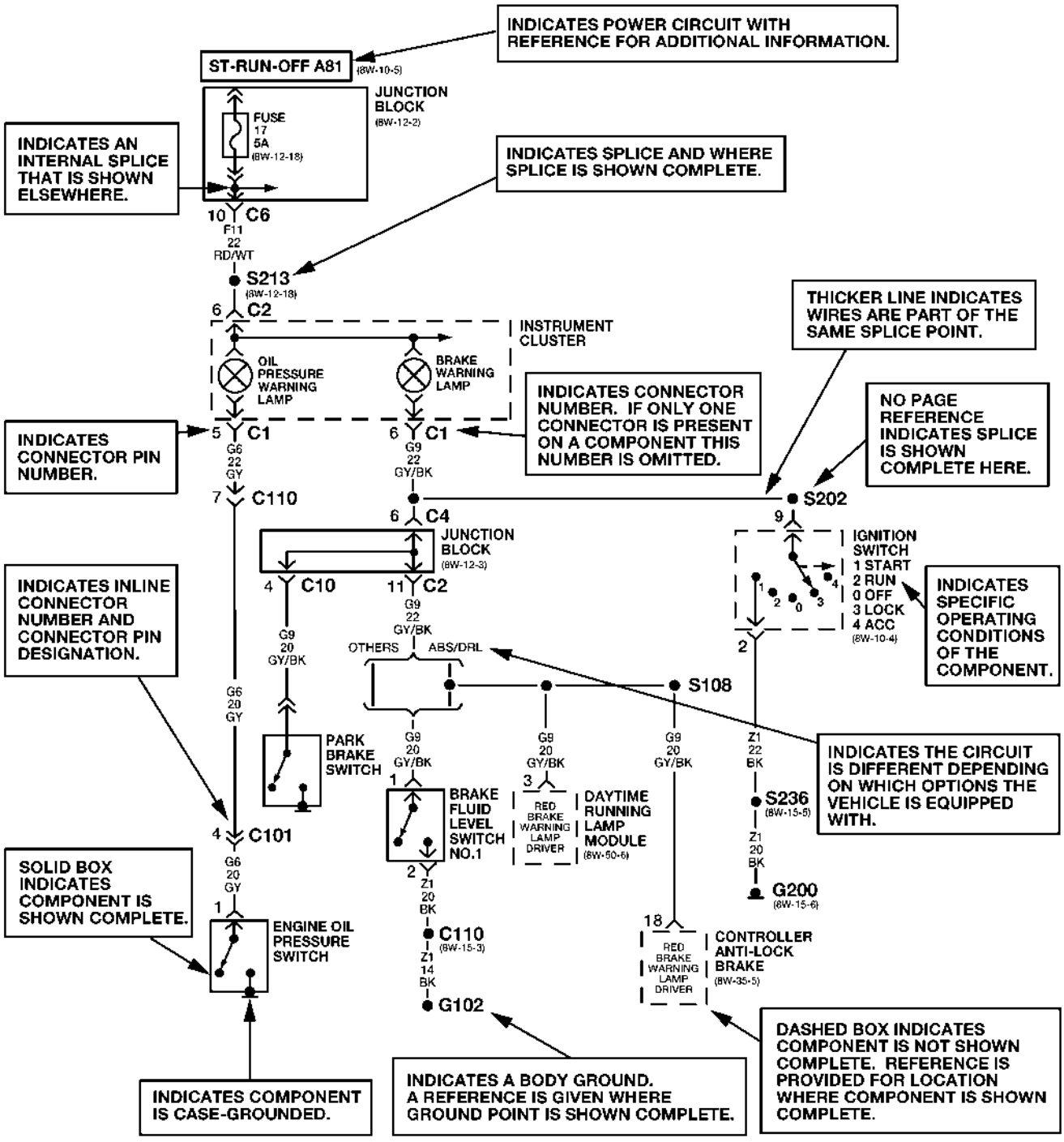
SYMBOLS

International symbols are used throughout the wiring diagrams. These symbols are consistent with those being used around the world.



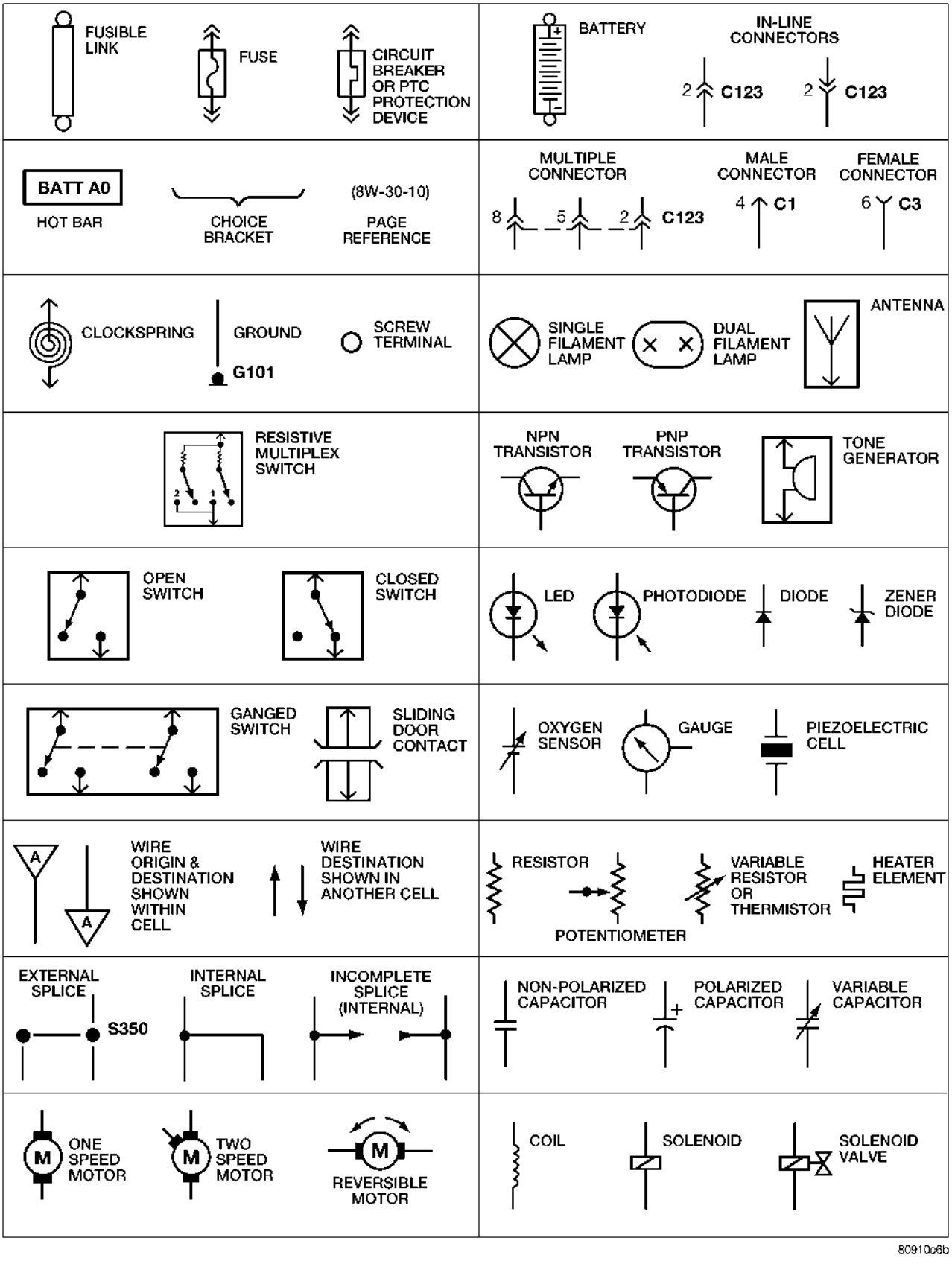
The System shown here is an EXAMPLE ONLY. It does not represent the actual circuit shown in the WIRING DIAGRAM SECTION.

80c06d01



The System shown here is an EXAMPLE ONLY. It does not represent the actual circuit shown in the WIRING DIAGRAM SECTION.

80c06d02


FUSIBLE LINK
FUSE
CIRCUIT BREAKER OR PTC PROTECTION DEVICE
BATTERY
IN-LINE CONNECTORS
2 C123
2 C123
BATT A0
HOT BAR
CHOICE BRACKET
(8W-30-10)
PAGE REFERENCE
MULTIPLE CONNECTOR
8 5 2 C123
MALE CONNECTOR
4 C1
FEMALE CONNECTOR
6 C3
CLOCKSPRING
GROUND
G101
SCREW TERMINAL
SINGLE FILAMENT LAMP
DUAL FILAMENT LAMP
ANTENNA
RESISTIVE MULTIPLEX SWITCH
NPN TRANSISTOR
PNP TRANSISTOR
TONE GENERATOR
OPEN SWITCH
CLOSED SWITCH
LED
PHOTODIODE
DIODE
ZENER DIODE
GANGED SWITCH
SLIDING DOOR CONTACT
OXYGEN SENSOR
GAUGE
PIEZOELECTRIC CELL
A
A
WIRE ORIGIN & DESTINATION SHOWN WITHIN CELL
WIRE DESTINATION SHOWN IN ANOTHER CELL
RESISTOR
POTENTIOMETER
VARIABLE RESISTOR OR THERMISTOR
HEATER ELEMENT
EXTERNAL SPLICE
S350
INTERNAL SPLICE
INCOMPLETE SPLICE (INTERNAL)
NON-POLARIZED CAPACITOR
POLARIZED CAPACITOR
VARIABLE CAPACITOR
M
ONE SPEED MOTOR
M
TWO SPEED MOTOR
M
REVERSIBLE MOTOR
COIL
SOLENOID
SOLENOID VALVE
80910c6b

TERMINOLOGY

This is a list of terms and definitions used in the wiring diagrams.

LHD . . . . . Left Hand Drive Vehicles
RHD . . . . . Right Hand Drive Vehicles
ATX . . . . . Automatic Transmissions-Front Wheel Drive
MTX . . . . . Manual Transmissions-Front Wheel Drive
AT . . . . . Automatic Transmissions-Rear Wheel Drive
MT . . . . . Manual Transmissions-Rear Wheel Drive
SOHC . . . . . Single Over Head Cam Engine
DOHC . . . . . Double Over Head Cam Engine
Export . . . . . Vehicles Built For Sale In Markets Other Than North America
Except Export . . . . . Vehicles Built For Sale In North America

DESCRIPTION - CIRCUIT INFORMATION

Each wire shown in the diagrams contains a code which identifies the main circuit, a specific part of the main circuit, gage of wire, and color. An example would be **A 2 18 LB/YL**. This is a Battery Feed circuit, level two, eighteen gauge, light blue with a yellow tracer.

WIRE COLOR CODE CHART

COLOR CODE	COLOR
BL	BLUE
BK	BLACK
BR	BROWN
DB	DARK BLUE
DG	DARK GREEN
GY	GRAY
LB	LIGHT BLUE
LG	LIGHT GREEN
OR	ORANGE
PK	PINK
RD	RED
TN	TAN
VT	VIOLET
WT	WHITE
YL	YELLOW
*	WITH TRACER

DESCRIPTION - CIRCUIT FUNCTIONS

All circuits in the diagrams use an alpha/numeric code to identify the wire and it's function. To identify which circuit code applies to a system, refer to the Circuit Identification Code Chart. This chart shows the main circuits only and does not show the secondary codes that may apply to some models.

CIRCUIT IDENTIFICATION CODE CHART

CIRCUIT	FUNCTION
A	BATTERY FEED
B	BRAKE CONTROLS
C	CLIMATE CONTROLS
D	DIAGNOSTIC CIRCUITS
E	DIMMING ILLUMINATION CIRCUITS
F	FUSED CIRCUITS
G	MONITORING CIRCUITS (GAUGES)
H	MULTIPLE
I	NOT USED
J	OPEN
K	POWERTRAIN CONTROL MODULE
L	EXTERIOR LIGHTING
M	INTERIOR LIGHTING
N	MULTIPLE
O	NOT USED
P	POWER OPTION (BATTERY FEED)
Q	POWER OPTIONS (IGNITION FEED)
R	PASSIVE RESTRAINT
S	SUSPENSION/STEERING
T	TRANSMISSION/TRANSAXLE/ TRANSFER CASE
U	OPEN
V	SPEED CONTROL, WIPER/ WASHER
W	WIPERS
X	AUDIO SYSTEMS
Y	TEMPORARY
Z	GROUNDS

DESCRIPTION - SECTION IDENTIFICATION AND INFORMATION

The wiring diagrams are grouped into individual sections. If a component is most likely found in a particular group, it will be shown complete (all wires, connectors, and pins) within that group. For example, the Auto Shutdown Relay is most likely to be found in Group 30, so it is shown there complete. It can, however, be shown partially in another group if it contains some associated wiring.

Splice diagrams in Section 8W-70 show the entire splice and provide references to other sections the splices serves. Section 8W-70 only contains splice diagrams that are not shown in their entirety somewhere else in the wiring diagrams.

Section 8W-80 shows each connector and the circuits involved with that connector. The connectors are identified using the name/number on the diagram pages.

DESCRIPTION - CONNECTOR, GROUND AND SPLICE INFORMATION

CAUTION: Not all connectors are serviced. Some connectors are serviced only with a harness. A typical example might be the Supplemental Restraint System connectors. Always check parts availability before attempting a repair.

IDENTIFICATION

In-line connectors are identified by a number, as follows:

- In-line connectors located in the engine compartment are C100 series numbers.
- In-line connectors located in the instrument panel area are C200 series numbers.
- In-line connectors located in the body are C300 series numbers.
- Jumper harness connectors are C400 series numbers.
- Grounds and ground connectors are identified with a “G” and follow the same series numbering as the in-line connectors.
- Splices are identified with an “S” and follow the same series numbering as the in-line connectors.
- Component connectors are identified by the component name instead of a number. Multiple connectors on a component use a C1, C2, etc. identifier.

LOCATIONS

Section 8W-91 contains connector/ground/splice location illustrations. The illustrations contain the connector name (or number)/ground number/splice number and component identification. Connector/ground/splice location charts in section 8W-91 reference the figure numbers of the illustrations.

The abbreviation T/O is used in the component location section to indicate a point in which the wiring harness branches out to a component. The abbreviation N/S means Not Shown in the illustrations

WARNING

WARNINGS - GENERAL

WARNINGS provide information to prevent personal injury and vehicle damage. Below is a list of general warnings that should be followed any time a vehicle is being serviced.

WARNING: ALWAYS WEAR SAFETY GLASSES FOR EYE PROTECTION.

WARNING: USE SAFETY STANDS ANYTIME A PROCEDURE REQUIRES BEING UNDER A VEHICLE.

WARNING: BE SURE THAT THE IGNITION SWITCH ALWAYS IS IN THE OFF POSITION, UNLESS THE PROCEDURE REQUIRES IT TO BE ON.

WARNING: SET THE PARKING BRAKE WHEN WORKING ON ANY VEHICLE. AN AUTOMATIC TRANSMISSION SHOULD BE IN PARK. A MANUAL TRANSMISSION SHOULD BE IN NEUTRAL.

WARNING: OPERATE THE ENGINE ONLY IN A WELL-VENTILATED AREA.

WARNING: KEEP AWAY FROM MOVING PARTS WHEN THE ENGINE IS RUNNING, ESPECIALLY THE FAN AND BELTS.

WARNING: TO PREVENT SERIOUS BURNS, AVOID CONTACT WITH HOT PARTS SUCH AS THE RADIATOR, EXHAUST MANIFOLD(S), TAIL PIPE, CATALYTIC CONVERTER AND MUFFLER.

WARNING: DO NOT ALLOW FLAME OR SPARKS NEAR THE BATTERY. GASES ARE ALWAYS PRESENT IN AND AROUND THE BATTERY.

WARNING: ALWAYS REMOVE RINGS, WATCHES, LOOSE HANGING JEWELRY AND AVOID LOOSE CLOTHING.

DIAGNOSIS AND TESTING - WIRING HARNESS

TROUBLESHOOTING TOOLS

When diagnosing a problem in an electrical circuit there are several common tools necessary. These tools are listed and explained below.

- Jumper Wire - This is a test wire used to connect two points of a circuit. It can be used to bypass an open in a circuit.

WARNING: Never use a jumper wire across a load, such as a motor, connected between a battery feed and ground.

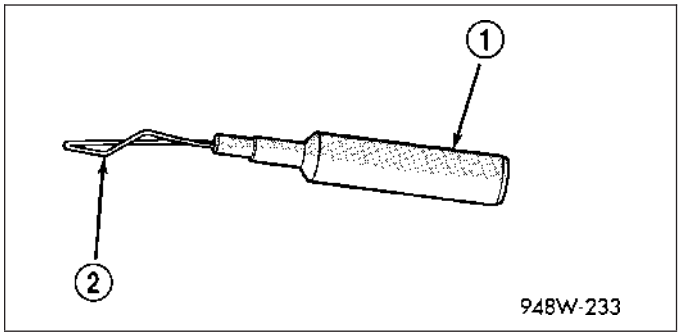
- Voltmeter - Used to check for voltage on a circuit. Always connect the black lead to a known good ground and the red lead to the positive side of the circuit.

CAUTION: Most of the electrical components used in today's vehicles are Solid State. When checking voltages in these circuits, use a meter with a 10 - megohm or greater impedance rating.

- Ohmmeter - Used to check the resistance between two points of a circuit. Low or no resistance in a circuit means good continuity.

CAUTION: Most of the electrical components used in today's vehicles are Solid State. When checking resistance in these circuits use a meter with a 10 - megohm or greater impedance rating. In addition, make sure the power is disconnected from the circuit. Circuits that are powered up by the vehicle's electrical system can cause damage to the equipment and provide false readings.

- Probing Tools - These tools are used for probing terminals in connectors. Select the proper size tool from Special Tool Package 6807, and insert the probing end (2) into the terminal being tested. Use the other end of the tool (1) to insert the meter probe.



INTERMITTENT AND POOR CONNECTIONS

Most intermittent electrical problems are caused by faulty electrical connections or wiring. It is also possible for a sticking component or relay to cause a problem. Before condemning a component or wiring assembly, check the following items.

- Connectors are fully seated
- Spread terminals, or terminal push out
- Terminals in the wiring assembly are fully seated into the connector/component and locked into position
- Dirt or corrosion on the terminals. Any amount of corrosion or dirt could cause an intermittent problem
- Damaged connector/component casing exposing the item to dirt or moisture
- Wire insulation that has rubbed through causing a short to ground
- Some or all of the wiring strands broken inside of the insulation
- Wiring broken inside of the insulation

TROUBLESHOOTING WIRING PROBLEMS

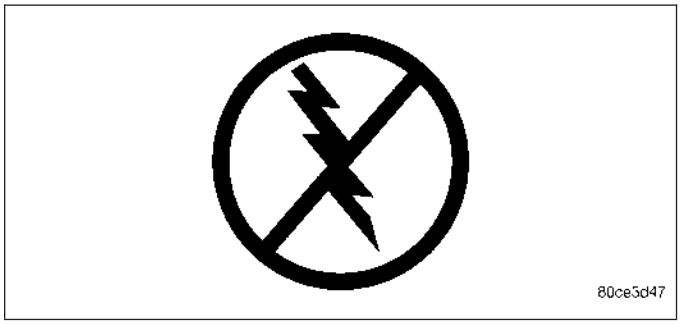
When troubleshooting wiring problems there are six steps which can aid in the procedure. The steps are listed and explained below. Always check for non-factory items added to the vehicle before doing any diagnosis. If the vehicle is equipped with these items, disconnect them to verify these add-on items are not the cause of the problem.

1. Verify the problem.
2. Verify any related symptoms. Do this by performing operational checks on components that are in the same circuit. Refer to the wiring diagrams.
3. Analyze the symptoms. Use the wiring diagrams to determine what the circuit is doing, where the problem most likely is occurring and where the diagnosis will continue.
4. Isolate the problem area.
5. Repair the problem area.
6. Verify the proper operation. For this step, check for proper operation of all items on the repaired circuit. Refer to the wiring diagrams.

STANDARD PROCEDURE

STANDARD PROCEDURE - ELECTROSTATIC DISCHARGE (ESD) SENSITIVE DEVICES

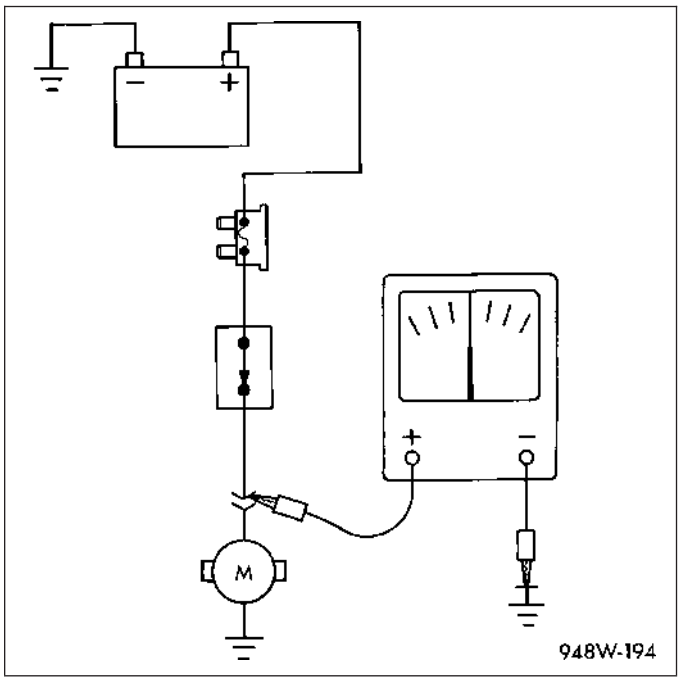
All ESD sensitive components are solid state and a symbol is used to indicate this. When handling any component with this symbol, comply with the following procedures to reduce the possibility of electrostatic charge build up on the body and inadvertent discharge into the component. If it is not known whether the part is ESD sensitive, assume that it is.



1. Always touch a known good ground before handling the part. This should be repeated while handling the part and more frequently after sliding across a seat, sitting down from a standing position, or walking a distance.
2. Avoid touching electrical terminals of the part, unless instructed to do so by a written procedure.
3. When using a voltmeter, be sure to connect the ground lead first.
4. Do not remove the part form it’s protective packing until it is time to install the part.
5. Before removing the part from it’s pakage, ground the pakage to a known good ground on the vehicle.

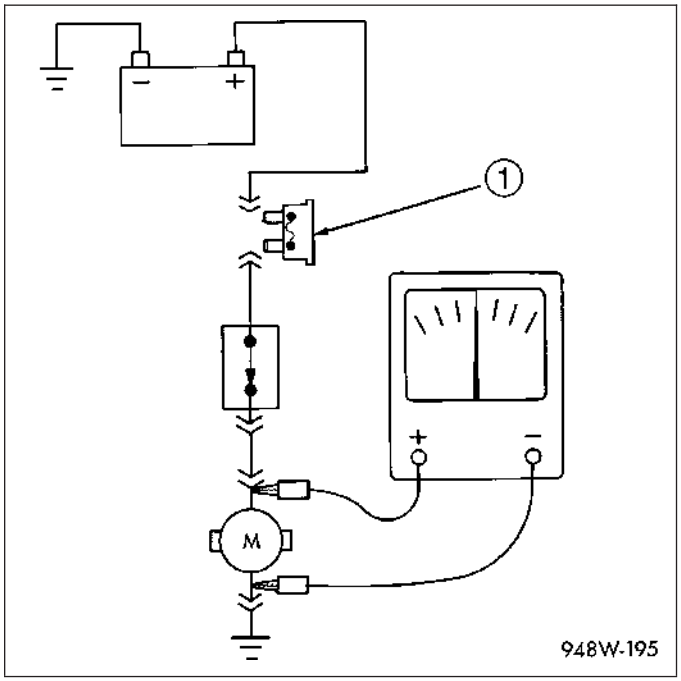
STANDARD PROCEDURE - TESTING OF VOLTAGE POTENTIAL

1. Connect the ground lead of a voltmeter to a known good ground.
2. Connect the other lead of the voltmeter to the selected test point. The vehicle ignition may need to be turned ON to check voltage. Refer to the appropriate test procedure.



STANDARD PROCEDURE - TESTING FOR CONTINUITY

1. Remove the fuse (1) for the circuit being checked or, disconnect the battery.
2. Connect one lead of the ohmmeter to one side of the circuit being tested
3. Connect the other lead to the other end of the circuit being tested. Low or no resistance means good continuity.



STANDARD PROCEDURE - TESTING FOR A SHORT TO GROUND

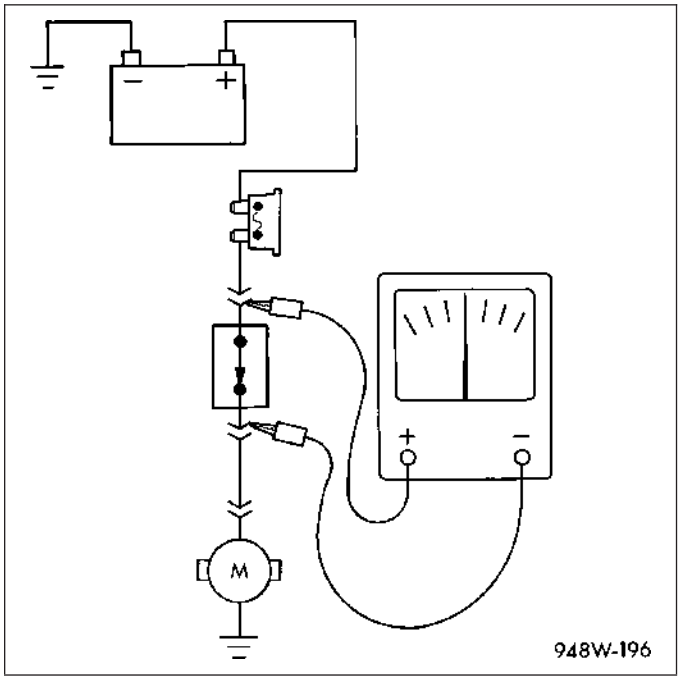
1. Remove the fuse and disconnect all items involved with the fuse.
2. Connect a test light or a voltmeter across the terminals of the fuse.
3. Starting at the fuse block, wiggle the wiring harness about six to eight inches apart and watch the voltmeter/test lamp.
4. If the voltmeter registers voltage or the test lamp glows, there is a short to ground in that general area of the wiring harness.

STANDARD PROCEDURE - TESTING FOR A SHORT TO GROUND ON FUSES POWERING SEVERAL LOADS

1. Refer to the wiring diagrams and disconnect or isolate all items on the suspected fused circuits.
2. Replace the blown fuse.
3. Supply power to the fuse by turning ON the ignition switch or re-connecting the battery.
4. Start connecting or energizing the items in the fuse circuit one at a time. When the fuse blows the circuit with the short to ground has been isolated.

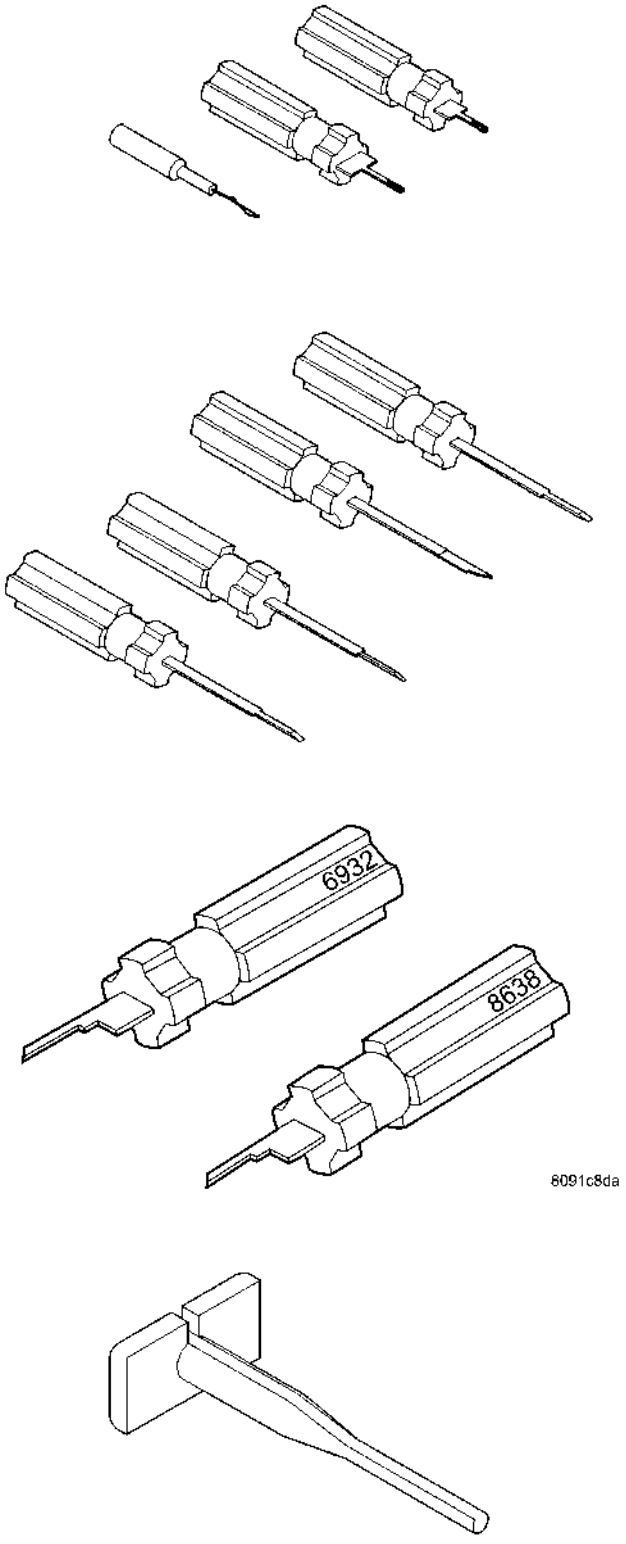
STANDARD PROCEDURE - TESTING FOR A VOLTAGE DROP

1. Connect the positive lead of the voltmeter to the side of the circuit closest to the battery.
2. Connect the other lead of the voltmeter to the other side of the switch, component or circuit.
3. Operate the item.
4. The voltmeter will show the difference in voltage between the two points.



SPECIAL TOOLS

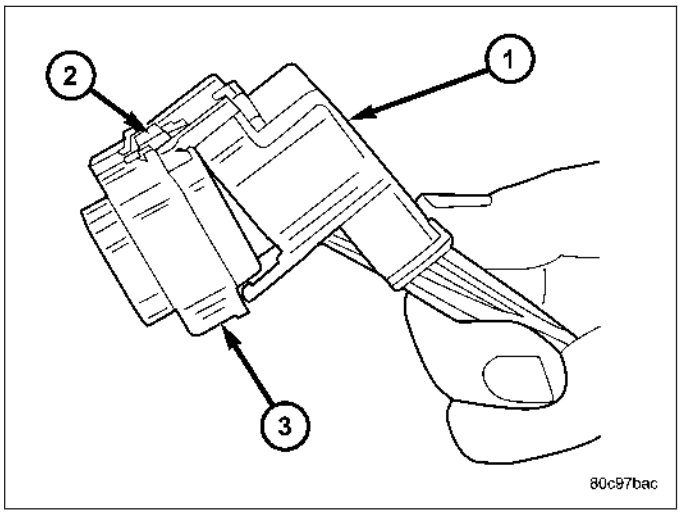
WIRING/TERMINAL

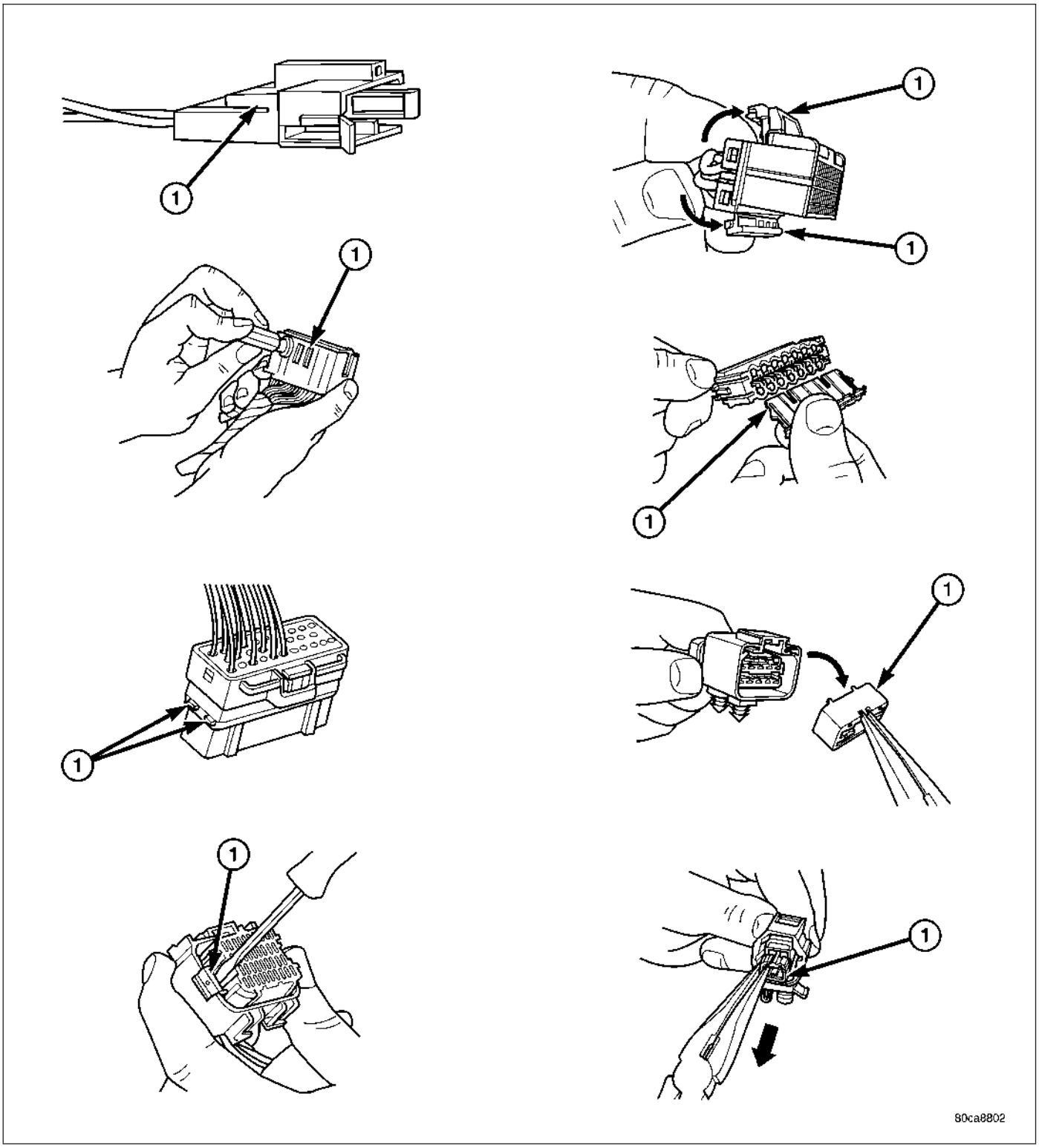


CONNECTOR

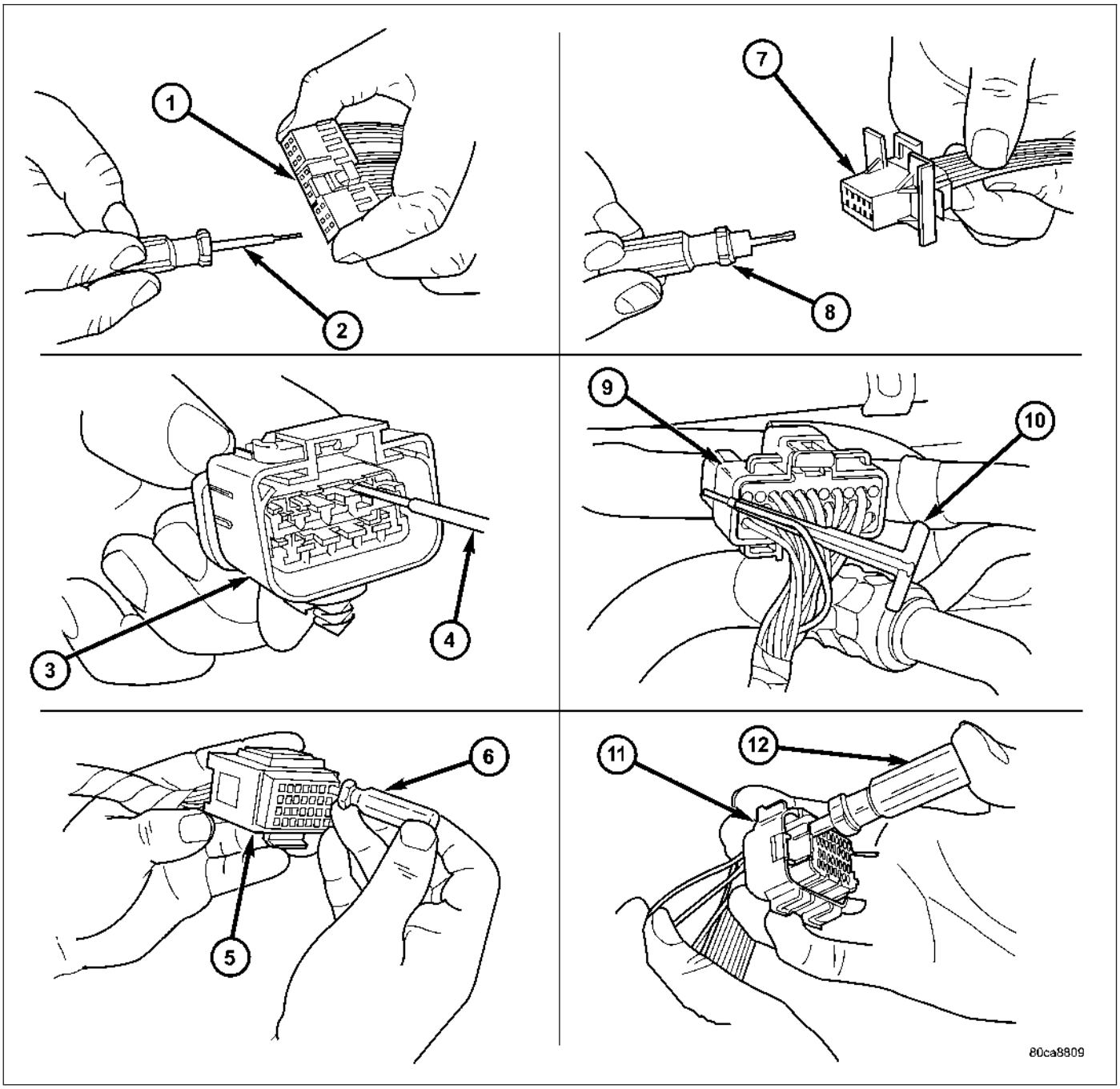
REMOVAL

1. Disconnect battery.
2. Release Connector Lock (2).
3. Disconnect the connector (3) being repaired from its mating half/component.
4. Remove the dress cover (if applicable) (1).





5. Release the Secondary Terminal Lock, if required (1).



1 - TYPICAL CONNECTOR
2 - PICK FROM SPECIAL TOOL KIT 6680
3 - APEX CONNECTOR
4 - PICK FROM SPECIAL TOOL KIT 6680
5 - AUGAT CONNECTOR
6 - SPECIAL TOOL 6932
7 - MOLEX CONNECTOR
8 - SPECIAL TOOL 6742
9 - THOMAS AND BETTS CONNECTOR
10 - SPECIAL TOOL 6934
11 - TYCO CONNECTOR
12 - SPECIAL TOOL 8638

6. Position the connector locking finger away from the terminal using the proper special tool. Pull on the wire to remove the terminal from the connector.

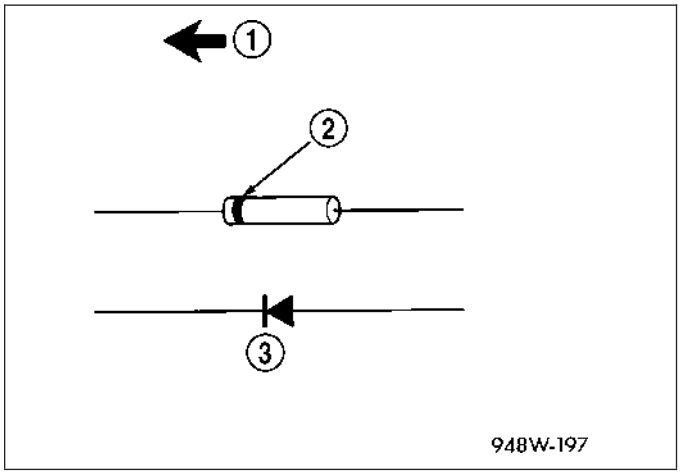
INSTALLATION

1. Insert the removed terminal in the same cavity on the repair connector.
2. Repeat steps for each terminal in the connector, being sure that all wires are inserted into the proper cavities. For additional connector pin-out identification, refer to the wiring diagrams.
3. When the connector is re-assembled, the secondary terminal lock must be placed in the locked position to prevent terminal push out.
4. Replace dress cover (if applicable).
5. Connect connector to its mating half/component.
6. Connect battery and test all affected systems.

DIODE

REMOVAL

1. Disconnect the battery.
2. Locate the diode in the harness, and remove the protective covering.
3. Remove the diode from the harness, pay attention to the current flow direction (1) (2) (3).



INSTALLATION

1. Remove the insulation from the wires in the harness. Only remove enough insulation to solder in the new diode.
2. Install the new diode in the harness, making sure current flow is correct. If necessary, refer to the appropriate wiring diagram for current flow.
3. Solder the connection together using rosin core type solder only. **Do not use acid core solder.**
4. Tape the diode to the harness using electrical tape. Make sure the diode is completely sealed from the elements.
5. Re-connect the battery and test affected systems.

TERMINAL

REMOVAL

1. Follow steps for removing terminals described in the connector removal section.
2. Cut the wire 6 inches from the back of the connector.

INSTALLATION

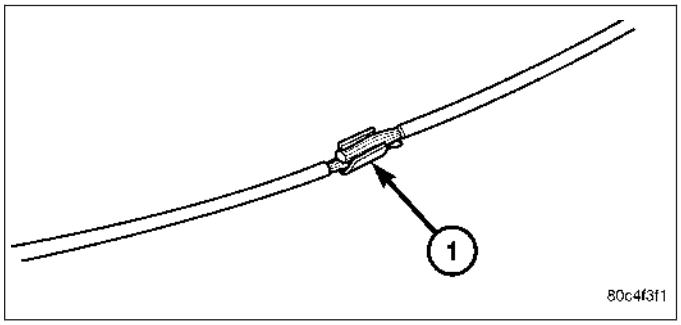
1. Select a wire from the terminal repair kit that best matches the color and gage of the wire being repaired.
2. Cut the repair wire to the proper length and remove one–half (1/2) inch of insulation.
3. Splice the repair wire to the wire harness (see wire splicing procedure) .
4. Insert the repaired wire into the connector.
5. Install the connector locking wedge, if required, and reconnect the connector to its mating half/component.
6. Re-tape the wire harness starting at 1–1/2 inches behind the connector and 2 inches past the repair.
7. Connect battery and test all affected systems.

WIRE

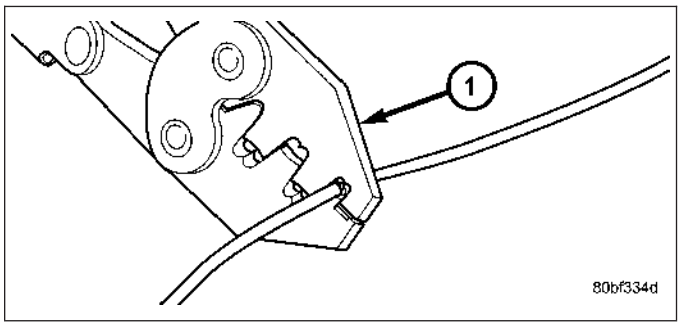
STANDARD PROCEDURE - WIRE SPLICING

When splicing a wire, it is important that the correct gage be used as shown in the wiring diagrams.

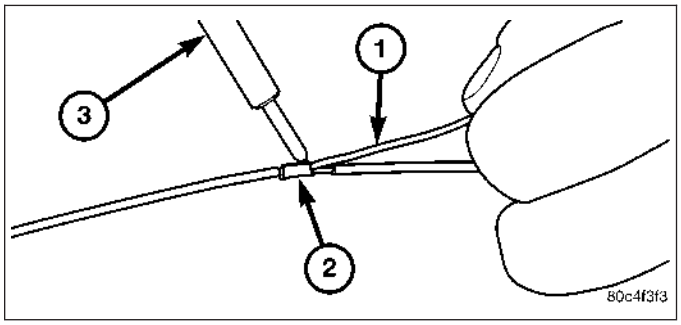
1. Remove one-half (1/2) inch of insulation from each wire that needs to be spliced.
2. Place a piece of adhesive lined heat shrink tubing on one side of the wire. Make sure the tubing will be long enough to cover and seal the entire repair area.
3. Place the strands of wire overlapping each other inside of the splice clip (1).



4. Using crimping tool (1), Mopar p/n 05019912AA, crimp the splice clip and wires together.

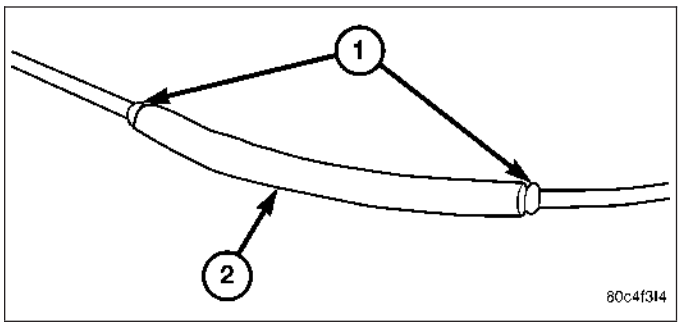


5. Solder (3) the connection (2) together using rosin core type solder (1) only.



CAUTION: DO NOT USE ACID CORE SOLDER.

6. Center the heat shrink tubing (2) over the joint and heat using a heat gun. Heat the joint until the tubing is tightly sealed and sealant (1) comes out of both ends of the tubing.



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Relay-Auto Shut Down	8W-10-7, 11, 12
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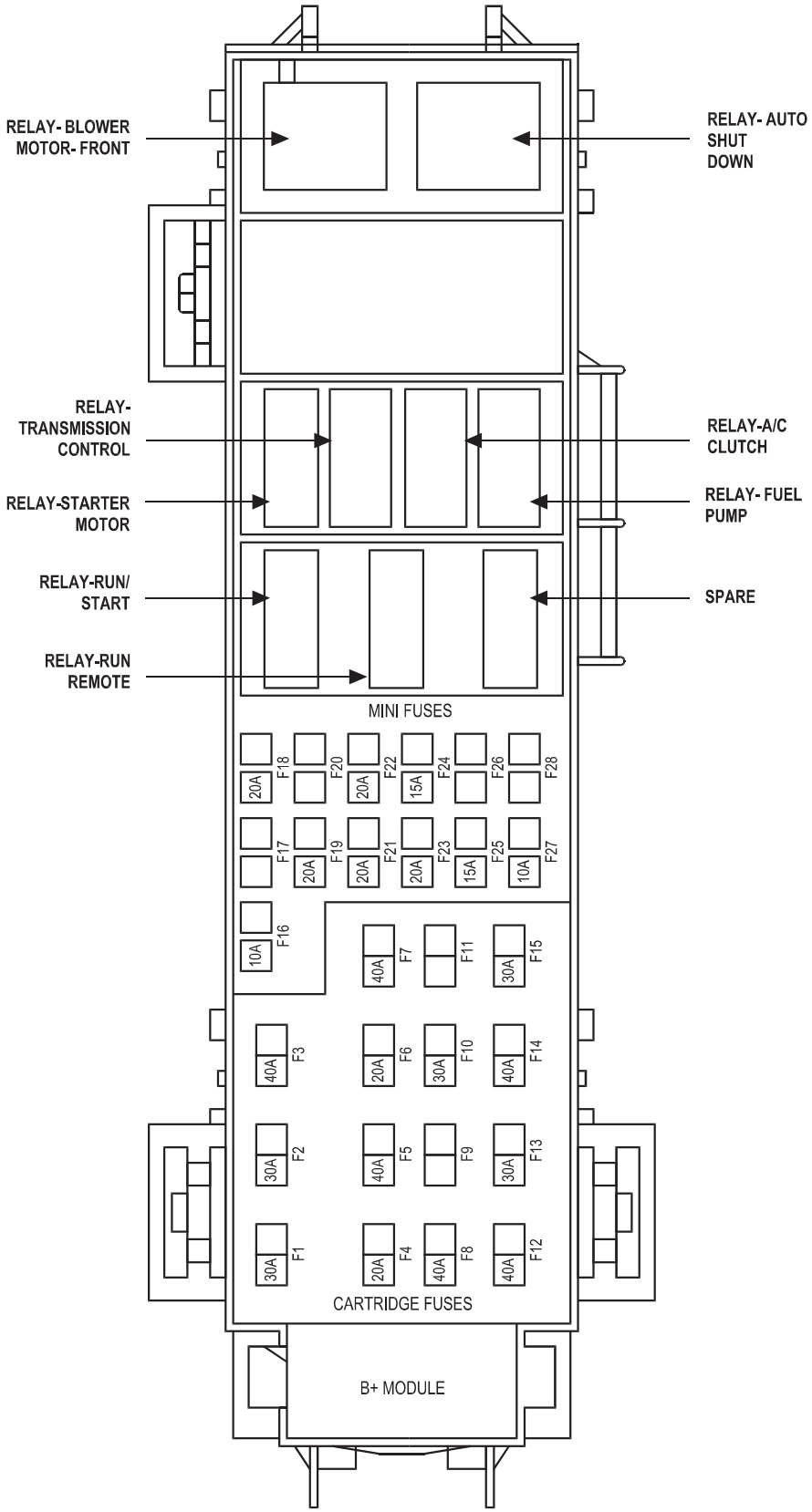
Relay-Blower Motor-Rear	8W-10-16
Relay-Fuel Pump	8W-10-8, 16
Relay-Rear Window Defogger	8W-10-16
Relay-Run Remote	8W-10-10
Relay-Run/Start	8W-10-9, 18
Relay-Starter Motor	8W-10-7, 9, 20
Relay-Transmission Control	8W-10-8, 16
Relay-Wiper High/Low	8W-10-9
Relay-Wiper On/Off	8W-10-9
Starter	8W-10-6, 9
Switch-Ignition	8W-10-9, 10, 17, 18, 19
Switch-Seat-Driver	8W-10-11
Switch-Seat-Passenger	8W-10-11
Switch-Stop Lamp	8W-10-17
Wiring-Trailer Tow 7-Way	8W-10-8, 17

POWER DISTRIBUTION CENTER



FUSES

FUSE NO.	AMPS	FUSED CIRCUIT	FUNCTION
1	30A	A923 14RD/OR	FUSED B(+)
2	30A	A5 14 RD/VT	FUSED B(+)
3	40A	A400 12TN/RD	FUSED B(+)
4	30A	A904 14RD/GY	FUSED B(+)
5	40A	A940 12RD/GY	FUSED B(+)
6	20A	A917 16RD/DB	FUSED B(+)
7	40A	A927 12RD/BR	FUSED B(+)
8	40A	A901 12RD/PK	FUSED B(+)
9	-	-	-
10	30A	A922 14RD/LB	FUSED B(+)
11	-	-	-
12	40A	A915 14OR/BR	FUSED B(+)
13	30A	A222 14RD/LB	FUSED B(+)
14	40A	A107 12TN/RD	FUSED B(+)
15	50A	A952 10OR/DB	FUSED B(+)
16	10A	F924 20PK/YL	FUSED IGNITION SWITCH OUTPUT (START)
17	-	-	-
18	20A	A921 18OR/PK	FUSED B(+)
19	20A	A104 18YL/RD	FUSED B(+)
20	-	-	-
21	20A	A111 18DG/RD	FUSED B(+)
22	20A	A919 18OR/GY	FUSED B(+)
23	20A	A100 18RD/VT	FUSED B(+)
24	15A	A916 20OR/WT	FUSED B(+)
25	15A	A103 20GY/RD	FUSED B(+)
26	-	-	-
27	10A	A953 20RD/YL	FUSED B(+)
28	-	-	-

RELAYS

RELAY-A/C CLUTCH

CAVITY	CIRCUIT	FUNCTION
30	A916 20OR/WT	FUSED B(+)
85	C13 20LB/OR	A/C CLUTCH RELAY CONTROL
86	F202 20PK/GY	FUSED IGNITION SWITCH OUTPUT (RUN-START)
87	C3 20DB/GY	A/C CLUTCH RELAY OUTPUT
87A	-	-

RELAY-AUTO SHUT DOWN

CAVITY	CIRCUIT	FUNCTION
30	A922 14RD/LB	FUSED B(+)
85	K51 20BR/GY	ASD RELAY OUTPUT
86	A922 14RD/LB	FUSED B(+)
87	A955 14RD	ASD RELAY OUTPUT
87A	-	-

RELAY-BLOWER MOTOR-FRONT

CAVITY	CIRCUIT	FUNCTION
30	A927 12RD/BR	FUSED B(+)
85	C229 20DB	FRONT BLOWER CONTROL
86	A927 12RD/BR	FUSED B(+)
87	C7 12DB	FRONT BLOWER MOTOR RELAY OUTPUT
87A	-	-

RELAY-FUEL PUMP

CAVITY	CIRCUIT	FUNCTION
30	A921 18OR/PK	FUSED B(+)
85	K31 20BR	FUEL PUMP RELAY CONTROL
86	F202 20PK/GY	FUSED IGNITION SWITCH OUTPUT (RUN-START)
87	N1 18DB/OR	FUEL PUMP RELAY OUTPUT
87A	-	-

RELAYS

RELAY-RUN REMOTE

CAVITY	CIRCUIT	FUNCTION
30	A927 12RD/BR	FUSED B(+)
85	C229 20DB	FRONT BLOWER CONTROL
86	A927 12RD/BR	FUSED B(+)
87	F921 12PK/YL	IGNITION SWITCH OUTPUT (RUN)
87A	-	-

RELAY-RUN/ START

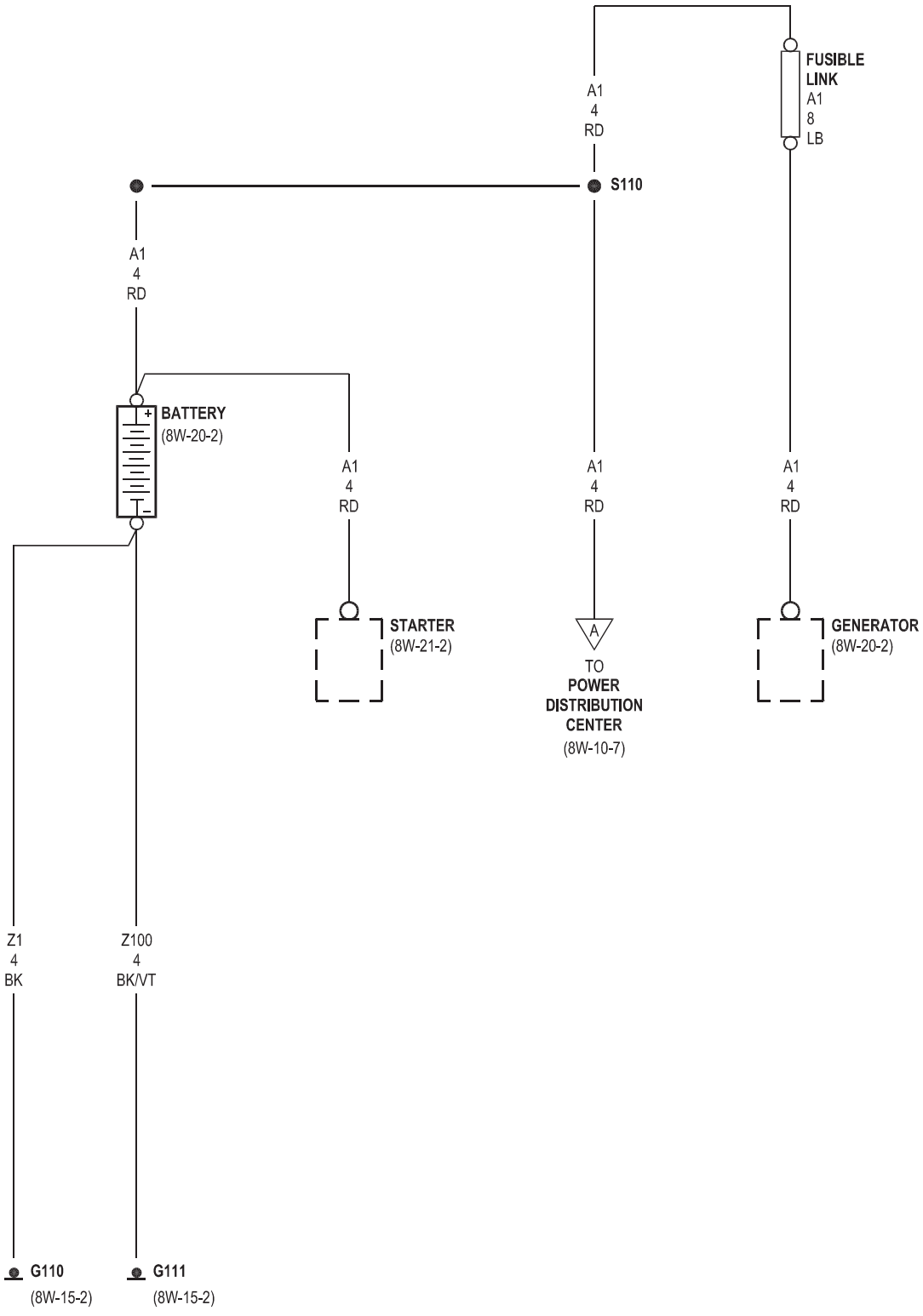
CAVITY	CIRCUIT	FUNCTION
30	A923 14RD/OR	FUSED B(+)
85	K617 20BR	RUN START RELAY CONTROL
86	A923 14RD/OR	FUSED B(+)
87	F941 14PK/LG	IGNITION SWITCH OUTPUT (RUN-START)
87A	-	-

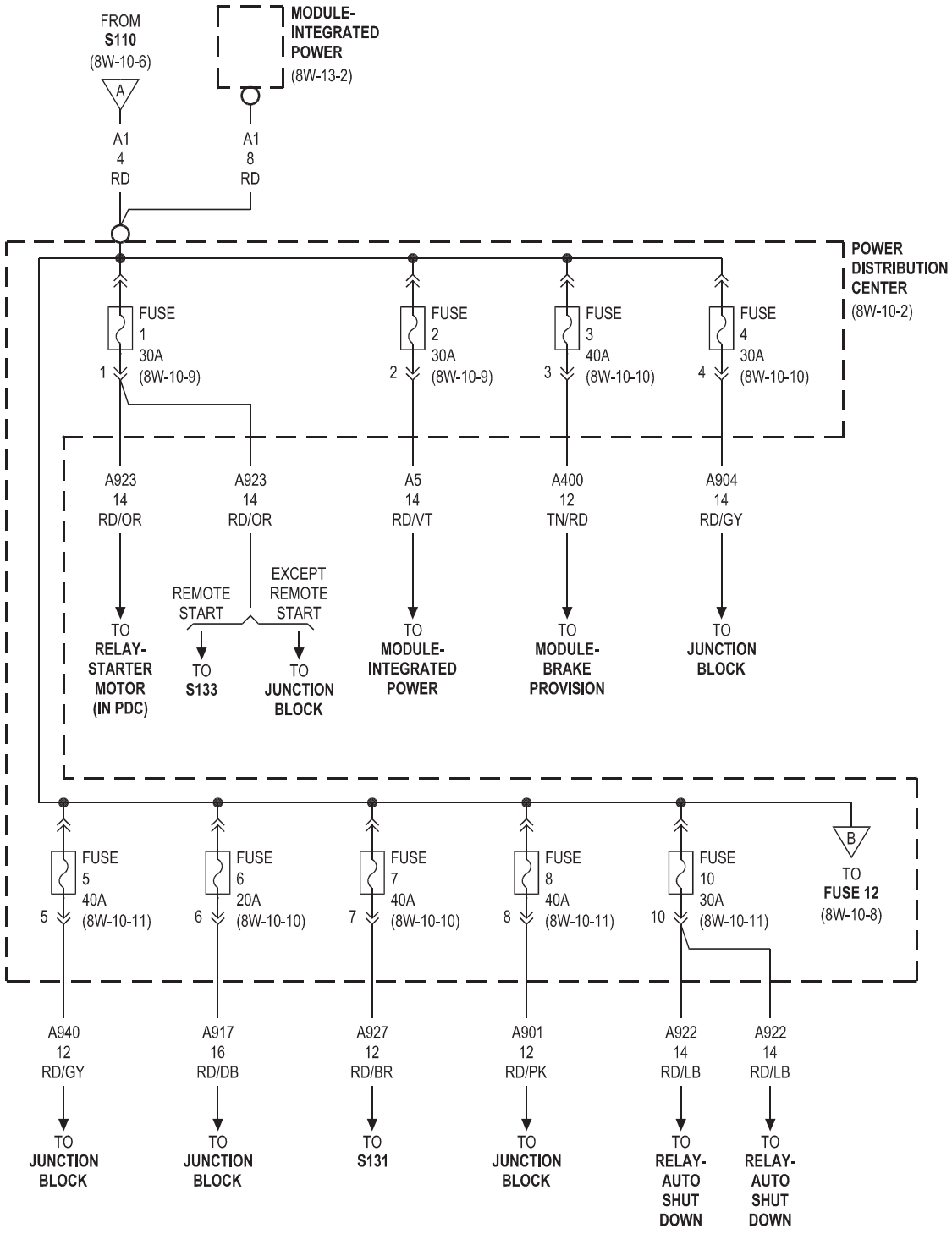
RELAY- STARTER MOTOR

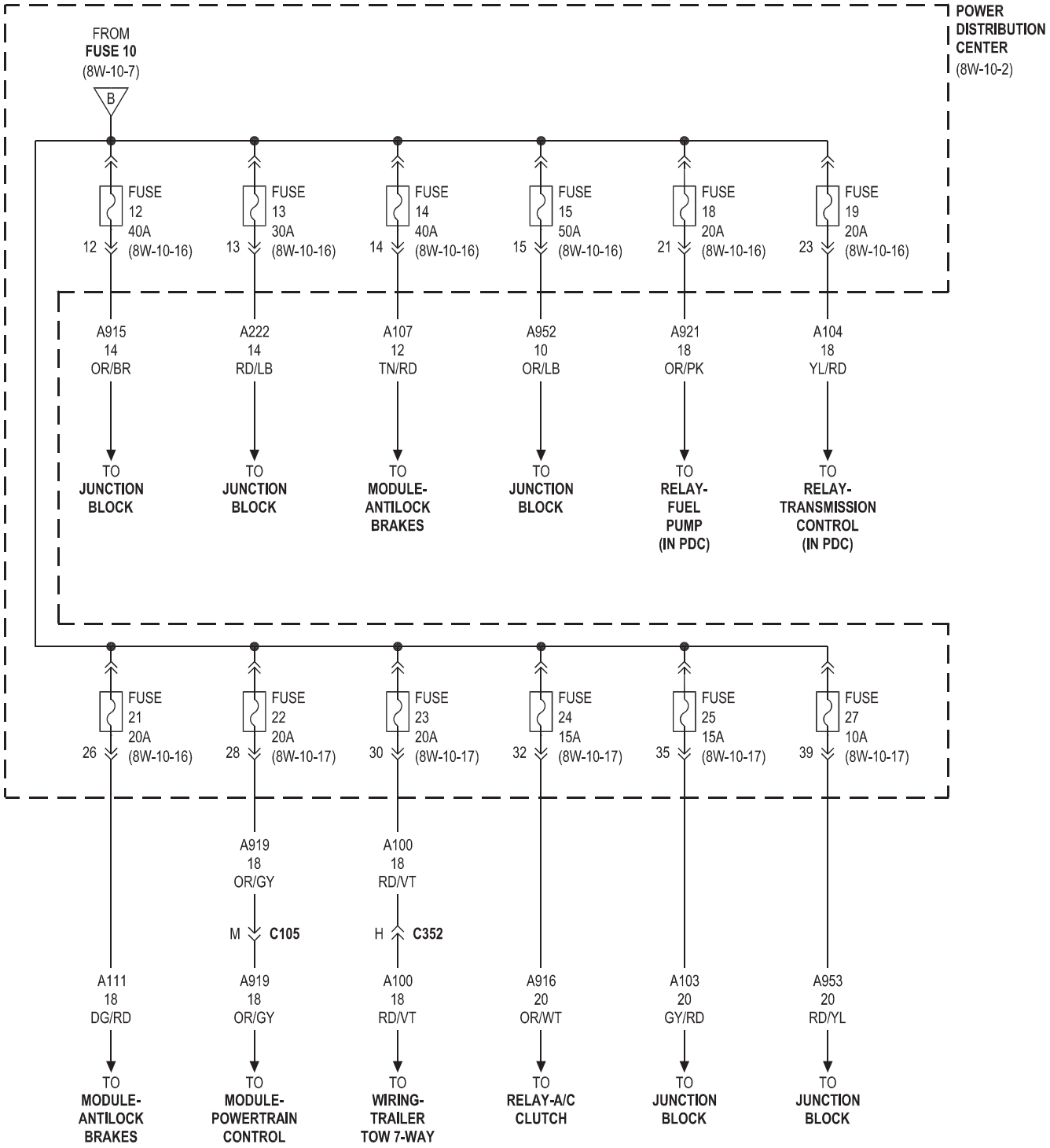
CAVITY	CIRCUIT	FUNCTION
30	A923 14RD/OR	FUSED B(+)
85	T752 20DG/OR	ENGINE STARTER MOTOR RELAY CONTROL
86	F924 20PK/YL	FUSED IGNITION SWITCH OUTPUT (START)
87	T750 14GY/YL	ENGINE STARTER MOTOR RELAY OUTPUT
87A	-	-

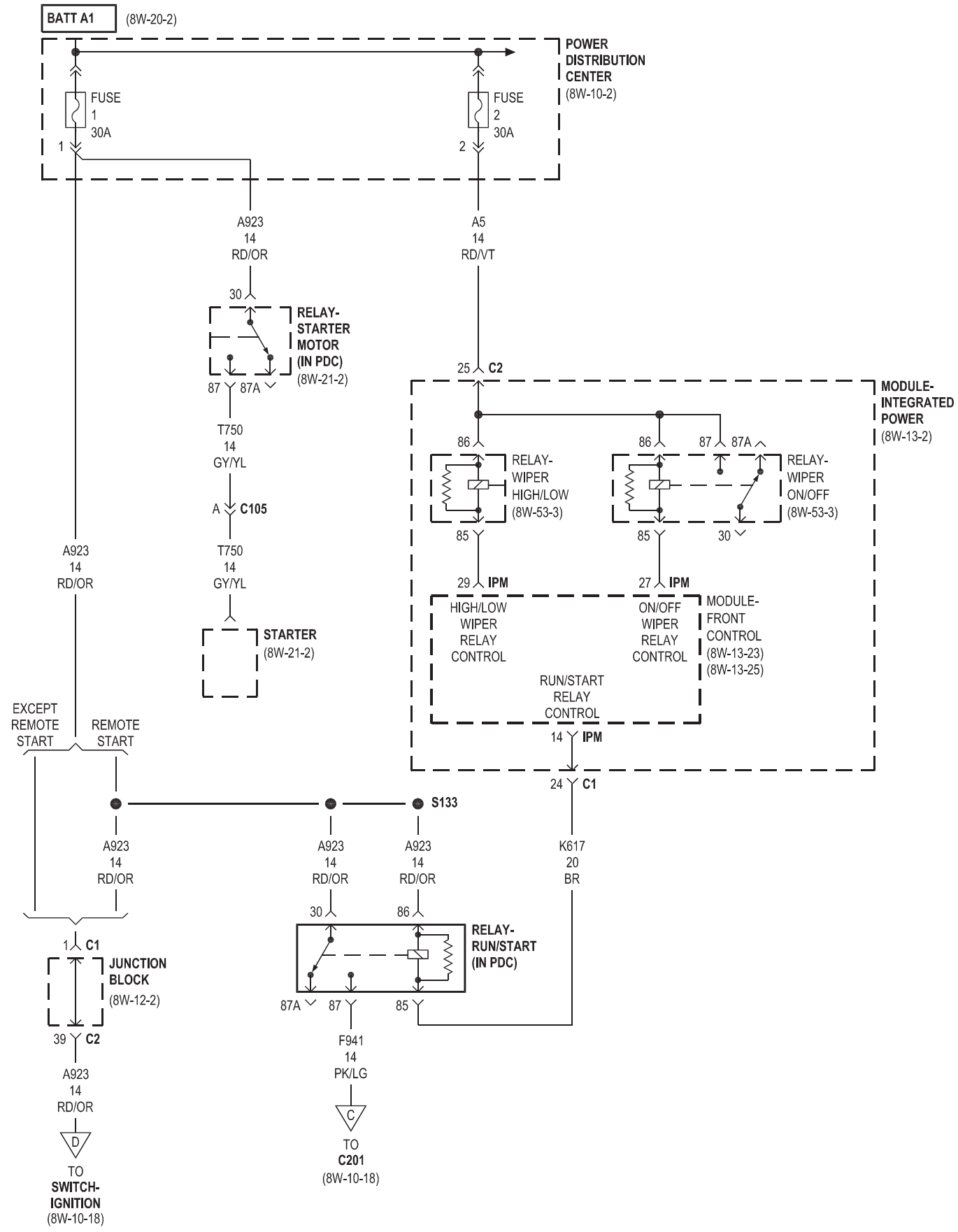
RELAY- TRANSMISSION CONTROL

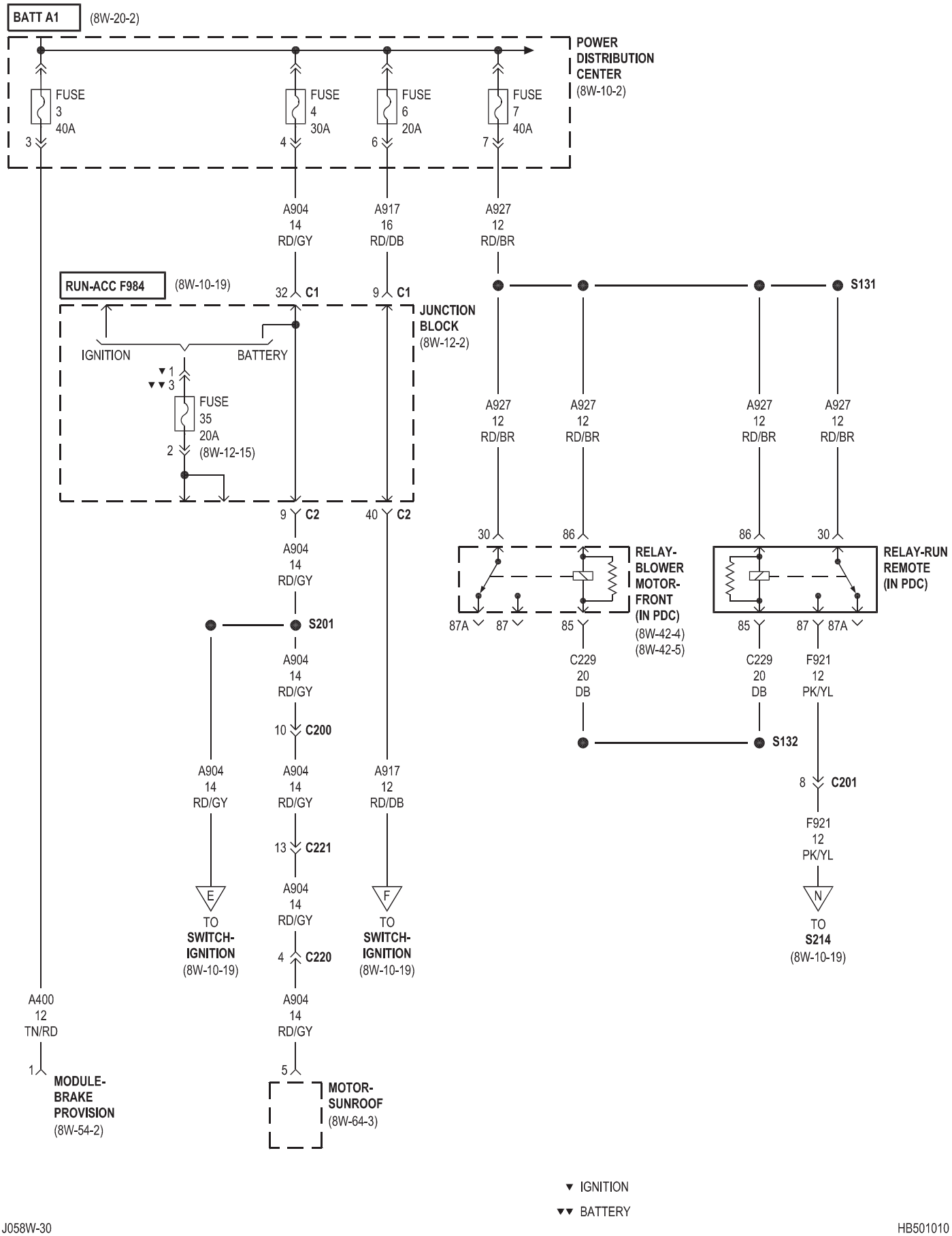
CAVITY	CIRCUIT	FUNCTION
30	A104 18YL/RD	FUSED B(+)
85	Z915 20BK	GROUND
86	T15 20YL/VT	TRANSMISSION CONTROL RELAY CONTROL
87	T16 18YL/OR	TRANSMISSION CONTROL RELAY OUTPUT
87A	-	-

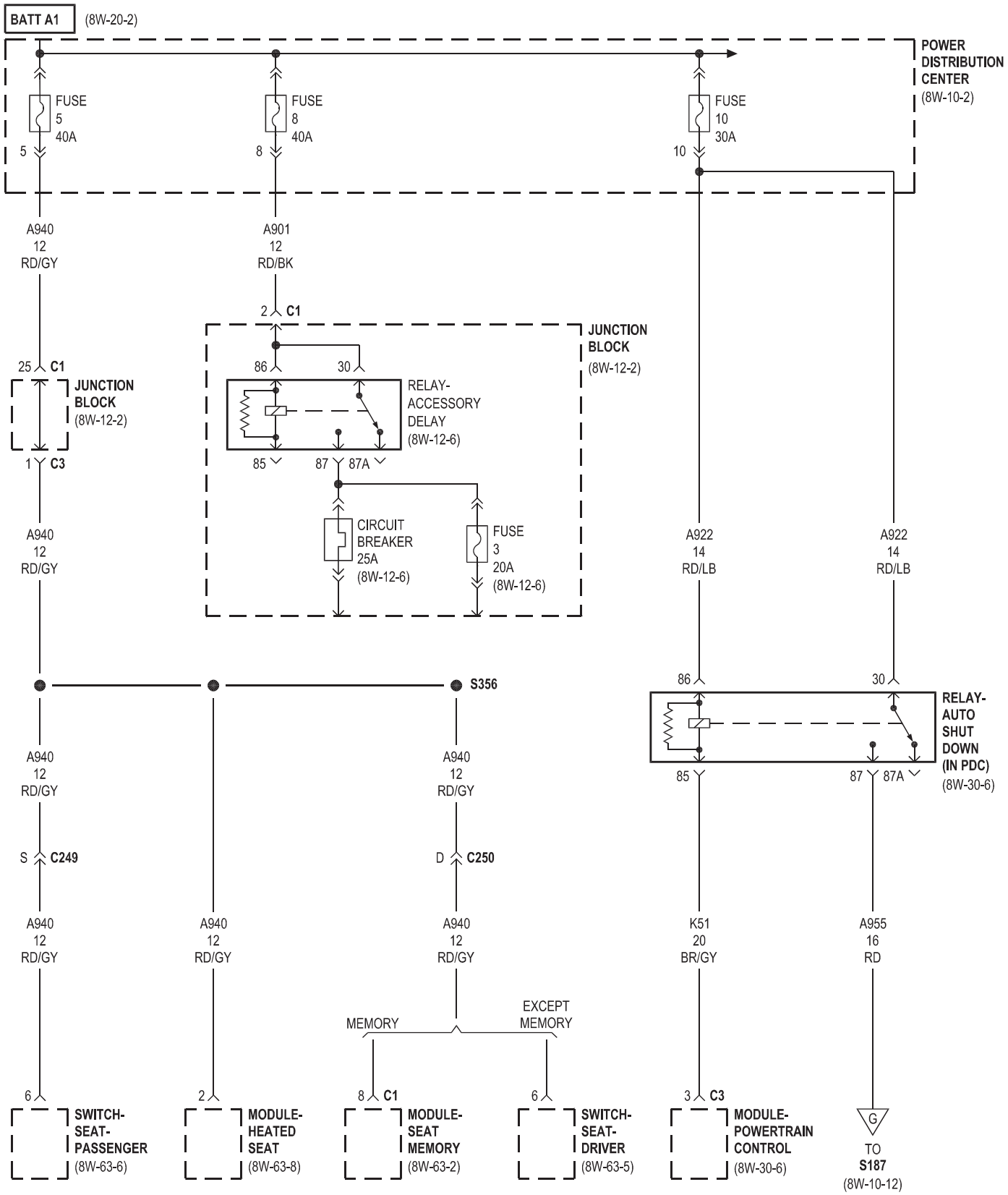

A1
4
RD
FUSIBLE
LINK
A1
8
LB
S110
A1
4
RD
BATTERY
(8W-20-2)
A1
4
RD
A1
4
RD
A1
4
RD
STARTER
(8W-21-2)
A
TO
POWER
DISTRIBUTION
CENTER
(8W-10-7)
GENERATOR
(8W-20-2)
Z1
4
BK
Z100
4
BK/VT
G110
(8W-15-2)
G111
(8W-15-2)

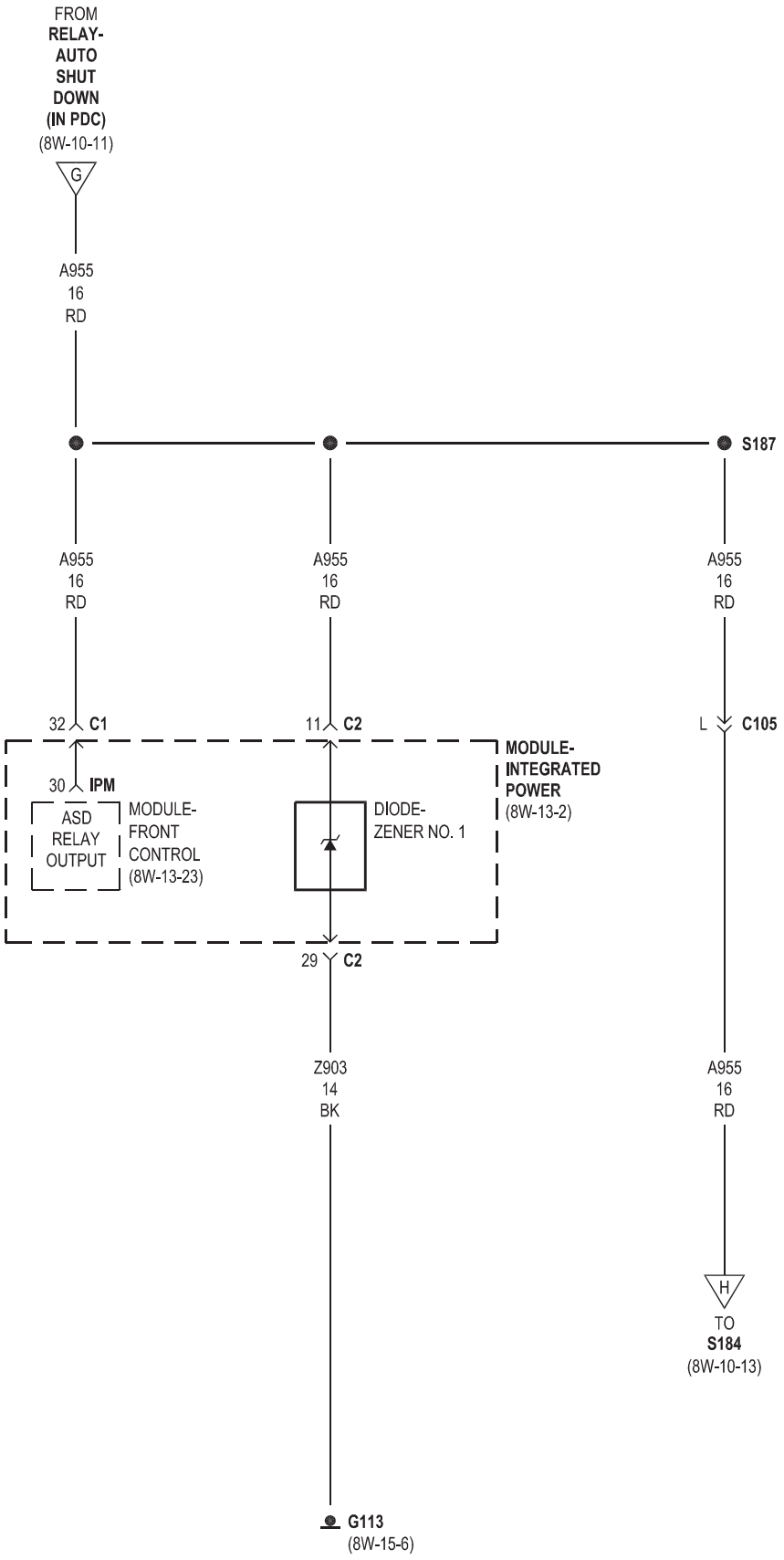

FROM
S110
(8W-10-6)
A
A1
4
RD
MODULE-
INTEGRATED
POWER
(8W-13-2)
A1
8
RD
POWER
DISTRIBUTION
CENTER
(8W-10-2)
FUSE
1
30A
(8W-10-9)
1
FUSE
2
30A
(8W-10-9)
2
FUSE
3
40A
(8W-10-10)
3
FUSE
4
30A
(8W-10-10)
4
A923
14
RD/OR
A923
14
RD/OR
A5
14
RD/VT
A400
12
TN/RD
A904
14
RD/GY
REMOTE
START
EXCEPT
REMOTE
START
TO
RELAY-
STARTER
MOTOR
(IN PDC)
TO
S133
TO
JUNCTION
BLOCK
TO
MODULE-
INTEGRATED
POWER
TO
MODULE-
BRAKE
PROVISION
TO
JUNCTION
BLOCK
FUSE
5
40A
(8W-10-11)
5
FUSE
6
20A
(8W-10-10)
6
FUSE
7
40A
(8W-10-10)
7
FUSE
8
40A
(8W-10-11)
8
FUSE
10
30A
(8W-10-11)
10
B
TO
FUSE 12
(8W-10-8)
A940
12
RD/GY
A917
16
RD/DB
A927
12
RD/BR
A901
12
RD/PK
A922
14
RD/LB
A922
14
RD/LB
TO
JUNCTION
BLOCK
TO
JUNCTION
BLOCK
TO
S131
TO
JUNCTION
BLOCK
TO
RELAY-
AUTO
SHUT
DOWN
TO
RELAY-
AUTO
SHUT
DOWN

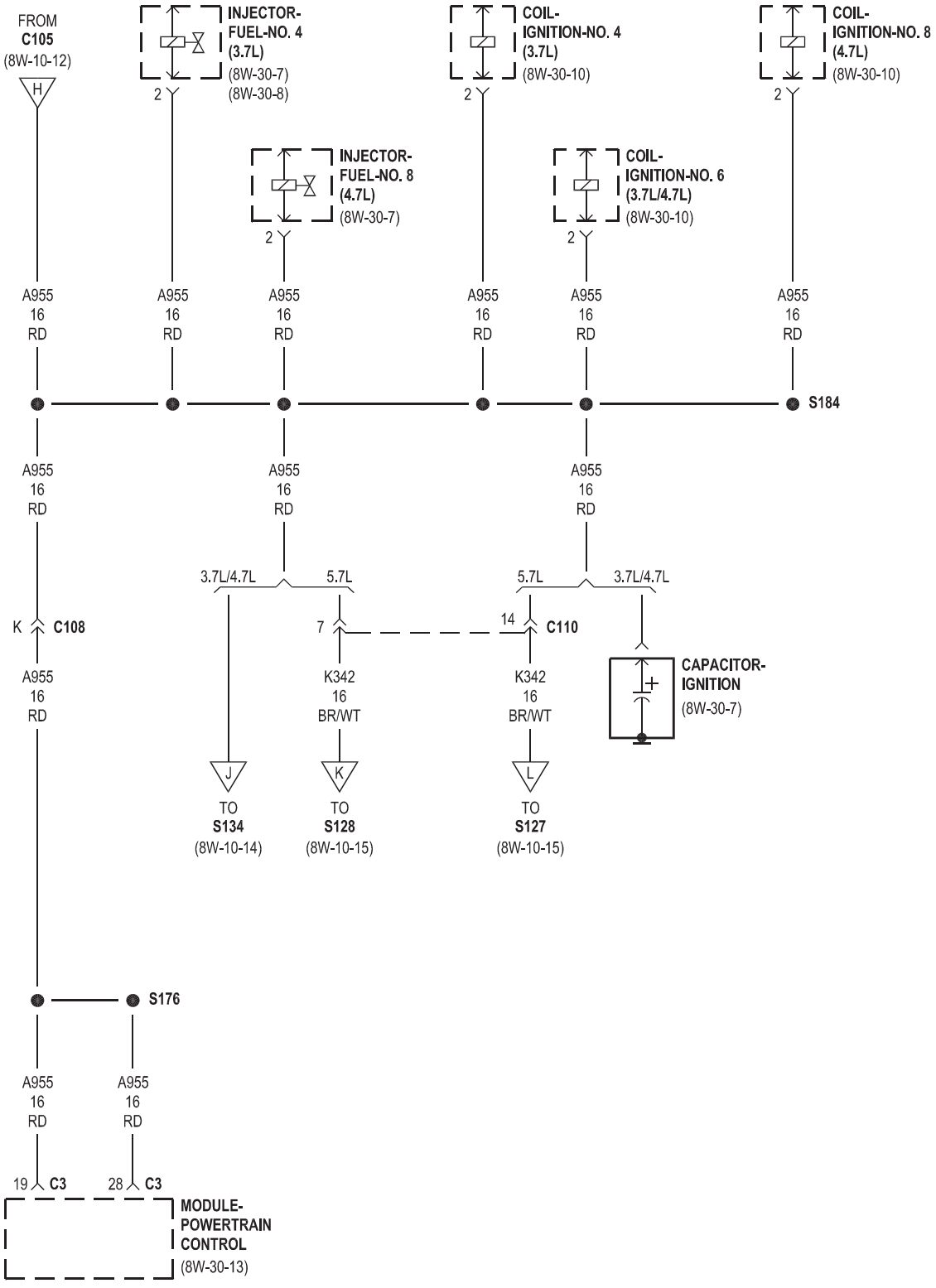

POWER DISTRIBUTION CENTER
(8W-10-2)
FROM FUSE 10
(8W-10-7)
B
FUSE 12 40A
12
(8W-10-16)
FUSE 13 30A
13
(8W-10-16)
FUSE 14 40A
14
(8W-10-16)
FUSE 15 50A
15
(8W-10-16)
FUSE 18 20A
21
(8W-10-16)
FUSE 19 20A
23
(8W-10-16)
A915 14 OR/BR
A222 14 RD/LB
A107 12 TN/RD
A952 10 OR/LB
A921 18 OR/PK
A104 18 YL/RD
TO JUNCTION BLOCK
TO JUNCTION BLOCK
TO MODULE-ANTILOCK BRAKES
TO JUNCTION BLOCK
TO RELAY-FUEL PUMP (IN PDC)
TO RELAY-TRANSMISSION CONTROL (IN PDC)
FUSE 21 20A
26
(8W-10-16)
FUSE 22 20A
28
(8W-10-17)
FUSE 23 20A
30
(8W-10-17)
FUSE 24 15A
32
(8W-10-17)
FUSE 25 15A
35
(8W-10-17)
FUSE 27 10A
39
(8W-10-17)
A919 18 OR/GY
M C105
A100 18 RD/VT
H C352
A111 18 DG/RD
A919 18 OR/GY
A100 18 RD/VT
A916 20 OR/WT
A103 20 GY/RD
A953 20 RD/YL
TO MODULE-ANTILOCK BRAKES
TO MODULE-POWERTRAIN CONTROL
TO WIRING-TRAILER TOW 7-WAY
TO RELAY-A/C CLUTCH
TO JUNCTION BLOCK
TO JUNCTION BLOCK

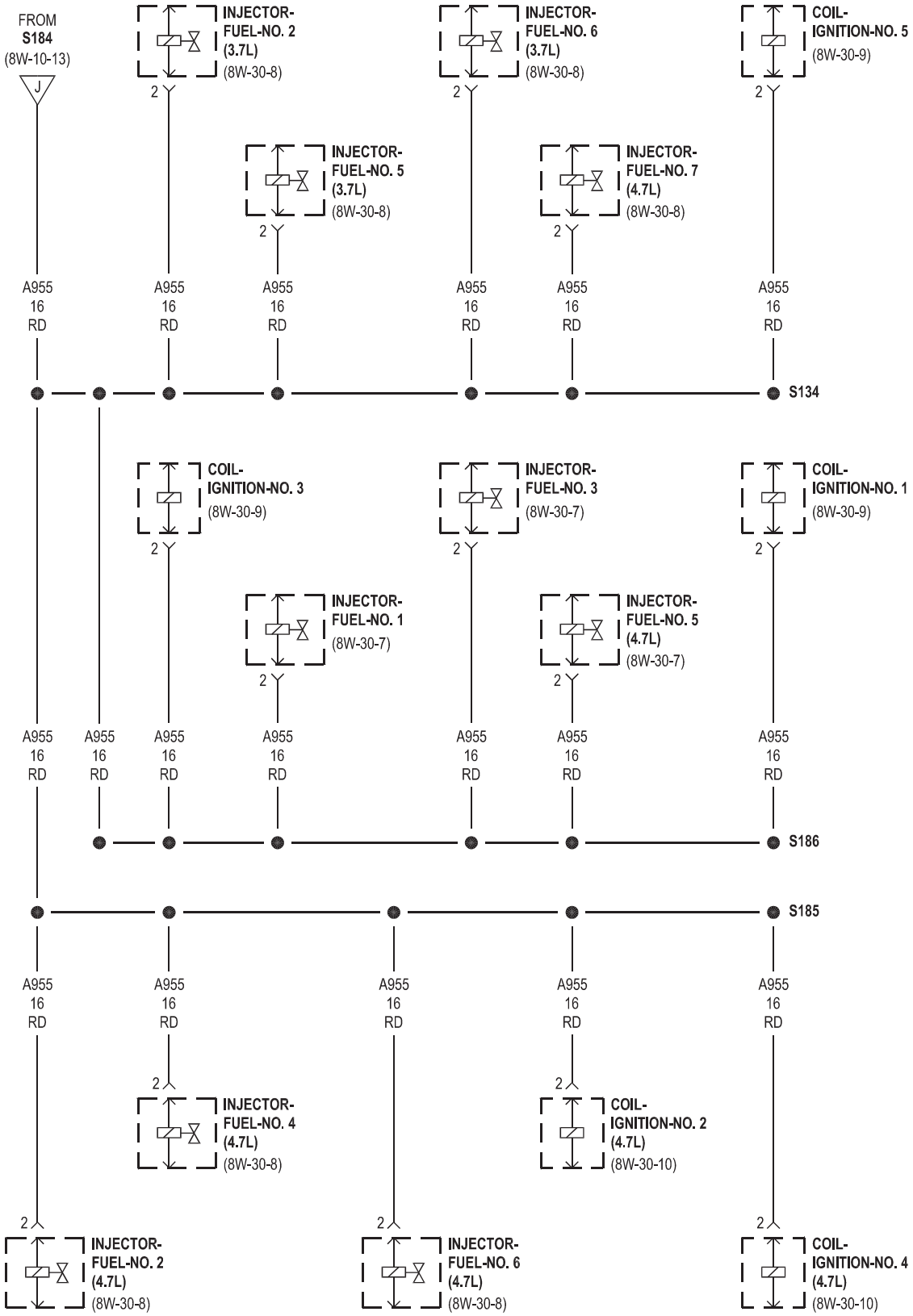

BATT A1
(8W-20-2)
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE 1 30A
FUSE 2 30A
A923 14 RD/OR
A5 14 RD/VT
RELAY-STARTER MOTOR (IN PDC)
(8W-21-2)
T750 14 GY/YL
C105
STARTER
(8W-21-2)
MODULE-INTEGRATED POWER
(8W-13-2)
C2
RELAY-WIPER HIGH/LOW
(8W-53-3)
RELAY-WIPER ON/OFF
(8W-53-3)
IPM
HIGH/LOW WIPER RELAY CONTROL
ON/OFF WIPER RELAY CONTROL
RUN/START RELAY CONTROL
MODULE-FRONT CONTROL
(8W-13-23)
(8W-13-25)
C1
EXCEPT REMOTE START
REMOTE START
S133
K617 20 BR
RELAY-RUN/START (IN PDC)
JUNCTION BLOCK
(8W-12-2)
F941 14 PK/LG
TO C201
(8W-10-18)
TO SWITCH-IGNITION
(8W-10-18)

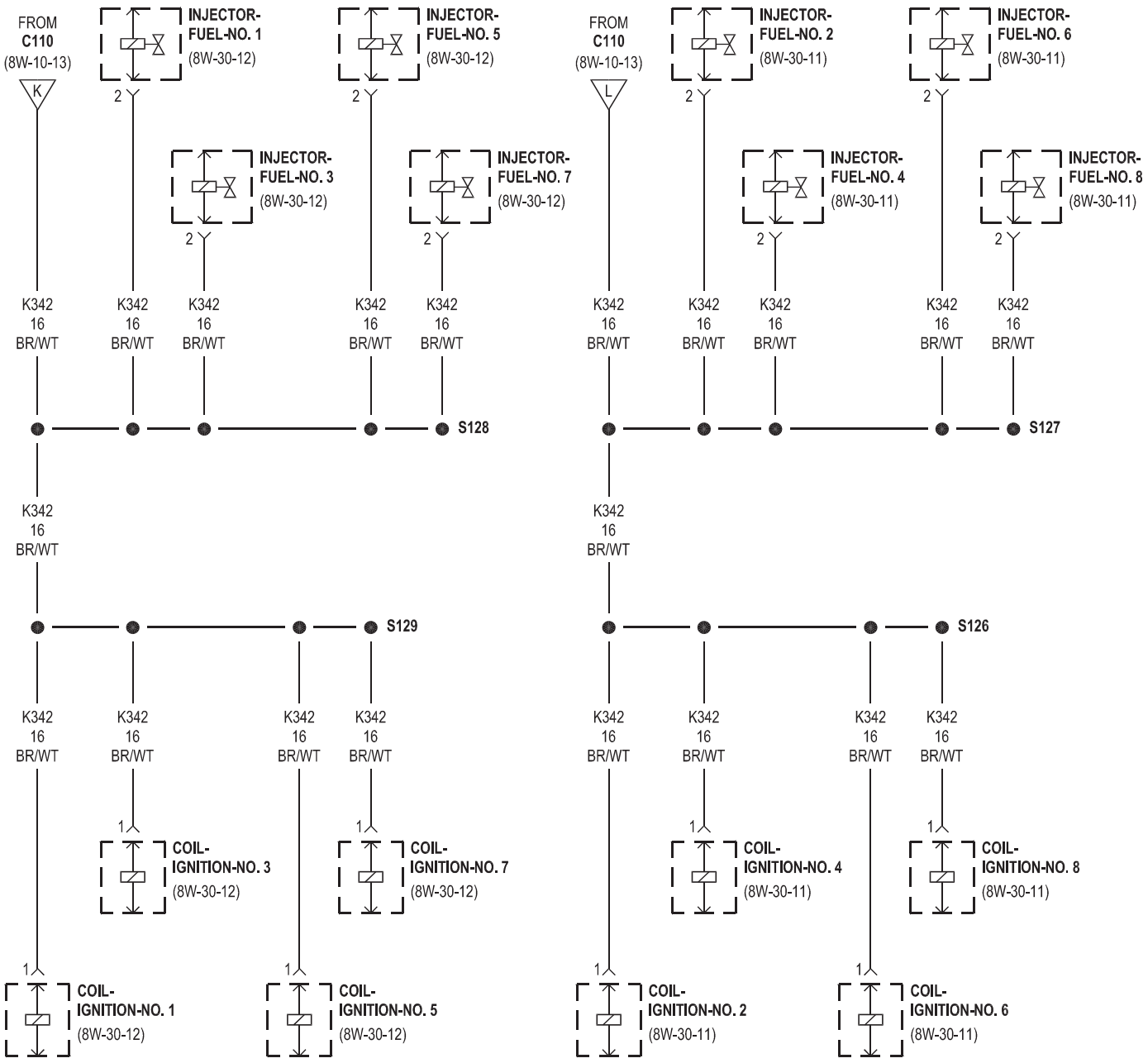

BATT A1
(8W-20-2)
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE 3 40A
FUSE 4 30A
FUSE 6 20A
FUSE 7 40A
A904 14 RD/GY
A917 16 RD/DB
A927 12 RD/BR
RUN-ACC F984
(8W-10-19)
JUNCTION BLOCK
(8W-12-2)
IGNITION
BATTERY
FUSE 35 20A
(8W-12-15)
S131
S201
S132
RELAY-BLOWER MOTOR-FRONT (IN PDC)
(8W-42-4)
(8W-42-5)
RELAY-RUN REMOTE (IN PDC)
C229 20 DB
F921 12 PK/YL
C200
C201
C220
C221
TO SWITCH-IGNITION
(8W-10-19)
TO S214
(8W-10-19)
A400 12 TN/RD
MODULE-BRAKE PROVISION
(8W-54-2)
MOTOR-SUNROOF
(8W-64-3)
▼ IGNITION
▼▼ BATTERY

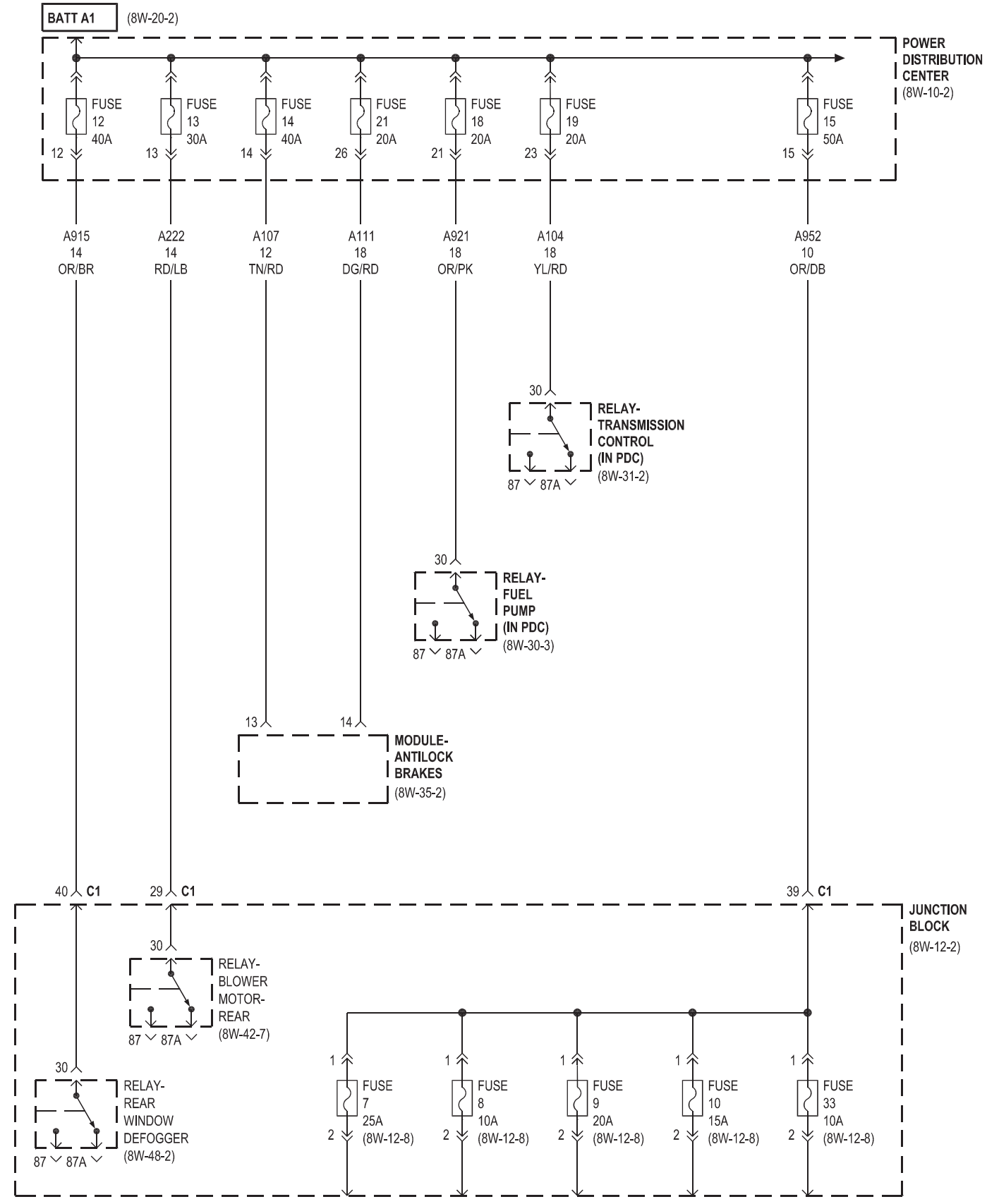

BATT A1
(8W-20-2)
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE 5 40A
FUSE 8 40A
FUSE 10 30A
5
8
10
A940 12 RD/GY
A901 12 RD/BK
2 C1
JUNCTION BLOCK
(8W-12-2)
25 C1
JUNCTION BLOCK
(8W-12-2)
1 C3
86
30
RELAY-ACCESSORY DELAY
(8W-12-6)
85
87
87A
CIRCUIT BREAKER 25A
(8W-12-6)
FUSE 3 20A
(8W-12-6)
A922 14 RD/LB
A922 14 RD/LB
S356
RELAY-AUTO SHUT DOWN (IN PDC)
(8W-30-6)
S C249
D C250
K51 20 BR/GY
A955 16 RD
MEMORY
EXCEPT MEMORY
6
2
8 C1
6
3 C3
G
TO S187
(8W-10-12)
SWITCH-SEAT-PASSENGER
(8W-63-6)
MODULE-HEATED SEAT
(8W-63-8)
MODULE-SEAT MEMORY
(8W-63-2)
SWITCH-SEAT-DRIVER
(8W-63-5)
MODULE-POWERTRAIN CONTROL
(8W-30-6)

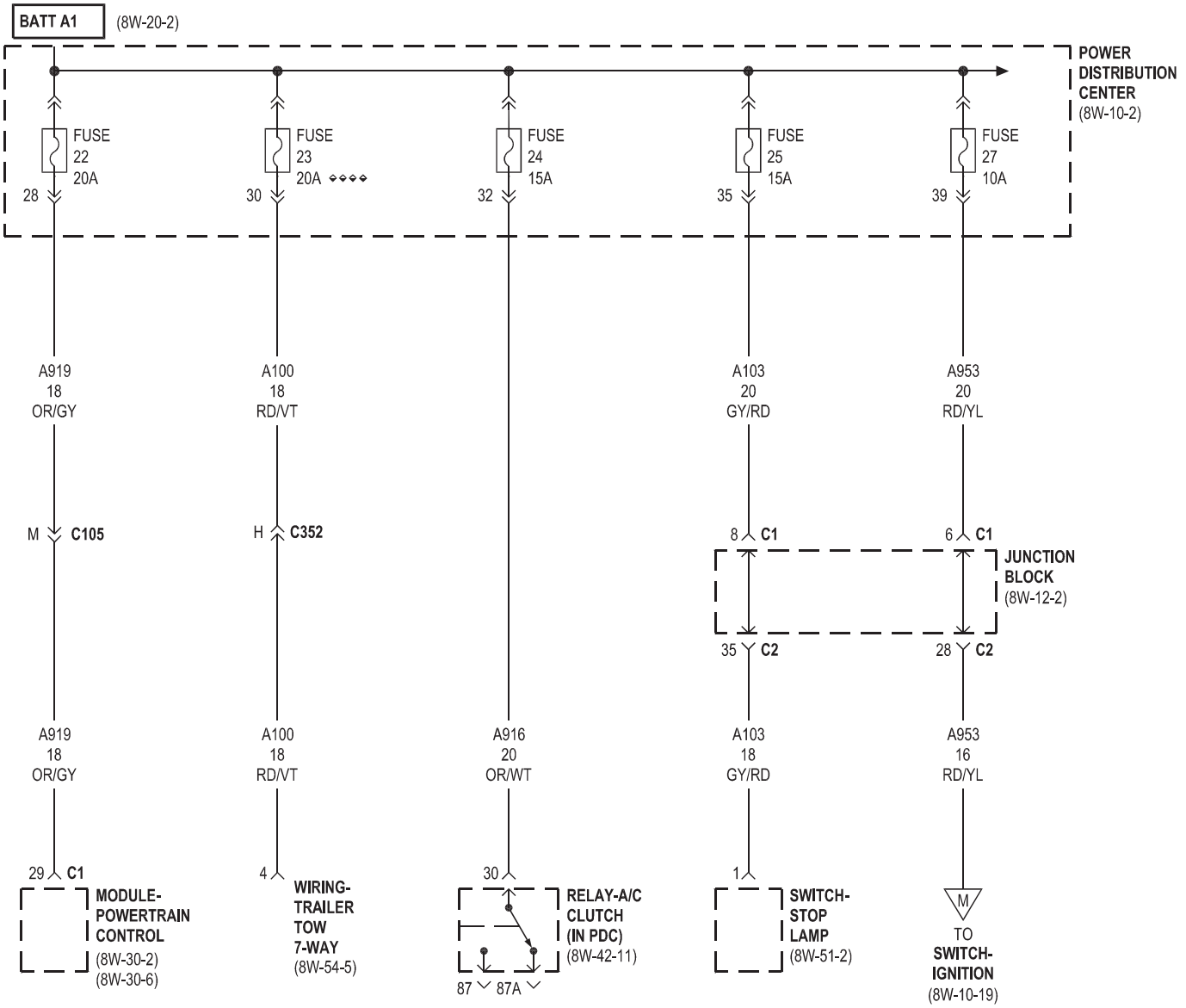

FROM
RELAY-
AUTO
SHUT
DOWN
(IN PDC)
(8W-10-11)
G
A955
16
RD
S187
A955
16
RD
A955
16
RD
A955
16
RD
32 C1
11 C2
L C105
30 IPM
ASD
RELAY
OUTPUT
MODULE-
FRONT
CONTROL
(8W-13-23)
DIODE-
ZENER NO. 1
MODULE-
INTEGRATED
POWER
(8W-13-2)
29 C2
Z903
14
BK
A955
16
RD
H
TO
S184
(8W-10-13)
G113
(8W-15-6)


FROM
C105
(8W-10-12)
H
INJECTOR-
FUEL-NO. 4
(3.7L)
(8W-30-7)
(8W-30-8)
2
INJECTOR-
FUEL-NO. 8
(4.7L)
(8W-30-7)
2
COIL-
IGNITION-NO. 4
(3.7L)
(8W-30-10)
2
COIL-
IGNITION-NO. 6
(3.7L/4.7L)
(8W-30-10)
2
COIL-
IGNITION-NO. 8
(4.7L)
(8W-30-10)
2
A955
16
RD
S184
3.7L/4.7L
5.7L
5.7L
3.7L/4.7L
K
C108
7
14
C110
K342
16
BR/WT
CAPACITOR-
IGNITION
(8W-30-7)
J
K
L
TO
S134
(8W-10-14)
TO
S128
(8W-10-15)
TO
S127
(8W-10-15)
S176
19
C3
28
C3
MODULE-
POWERTRAIN
CONTROL
(8W-30-13)

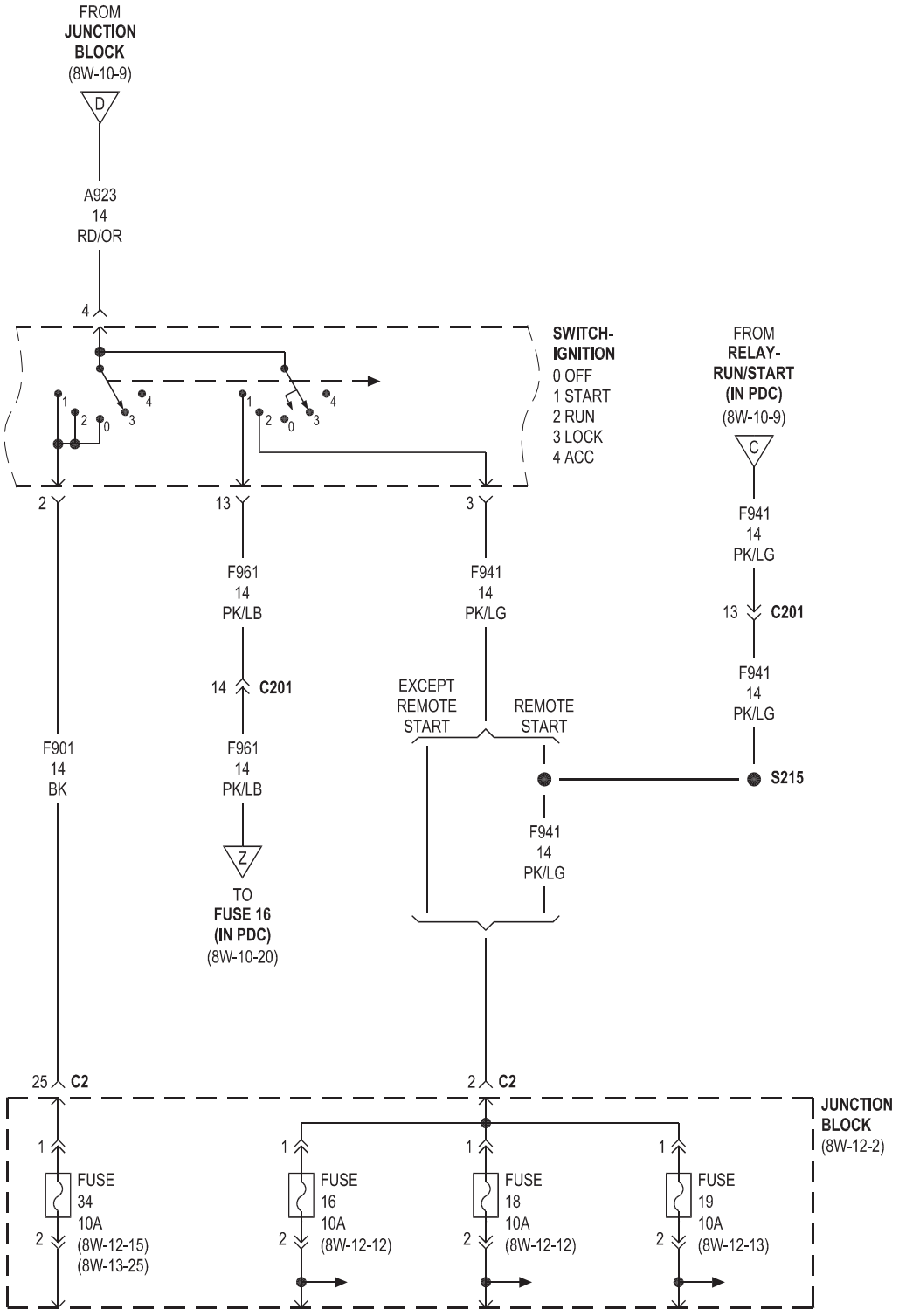

FROM
S184
(8W-10-13)
J
INJECTOR-
FUEL-NO. 2
(3.7L)
(8W-30-8)
INJECTOR-
FUEL-NO. 6
(3.7L)
(8W-30-8)
COIL-
IGNITION-NO. 5
(8W-30-9)
INJECTOR-
FUEL-NO. 5
(3.7L)
(8W-30-8)
INJECTOR-
FUEL-NO. 7
(4.7L)
(8W-30-8)
A955
16
RD
S134
COIL-
IGNITION-NO. 3
(8W-30-9)
INJECTOR-
FUEL-NO. 3
(8W-30-7)
COIL-
IGNITION-NO. 1
(8W-30-9)
INJECTOR-
FUEL-NO. 1
(8W-30-7)
INJECTOR-
FUEL-NO. 5
(4.7L)
(8W-30-7)
S186
S185
INJECTOR-
FUEL-NO. 4
(4.7L)
(8W-30-8)
COIL-
IGNITION-NO. 2
(4.7L)
(8W-30-10)
INJECTOR-
FUEL-NO. 2
(4.7L)
(8W-30-8)
INJECTOR-
FUEL-NO. 6
(4.7L)
(8W-30-8)
COIL-
IGNITION-NO. 4
(4.7L)
(8W-30-10)

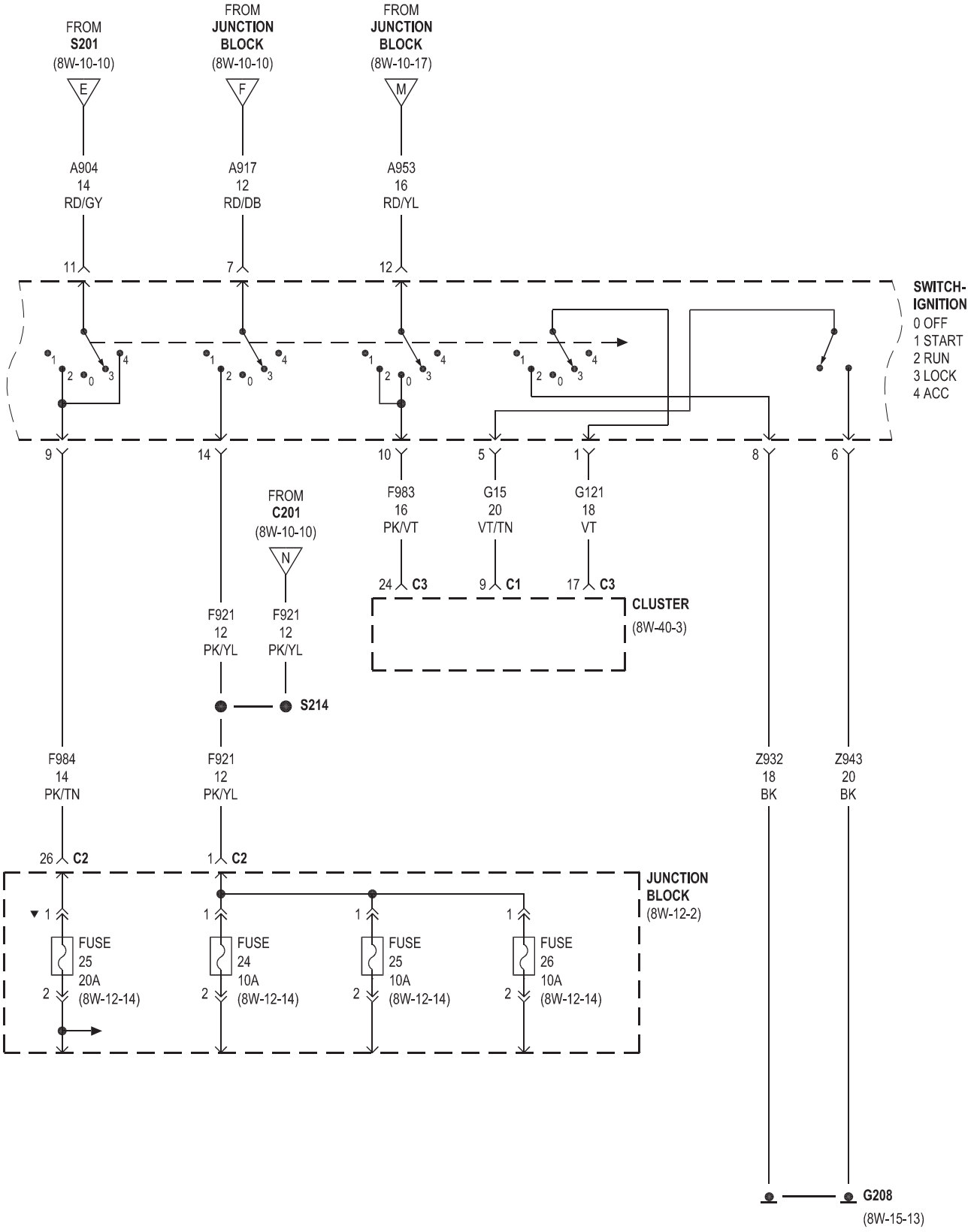

FROM C110 (8W-10-13)
K
L
INJECTOR-FUEL-NO. 1 (8W-30-12)
INJECTOR-FUEL-NO. 5 (8W-30-12)
INJECTOR-FUEL-NO. 3 (8W-30-12)
INJECTOR-FUEL-NO. 7 (8W-30-12)
INJECTOR-FUEL-NO. 2 (8W-30-11)
INJECTOR-FUEL-NO. 6 (8W-30-11)
INJECTOR-FUEL-NO. 4 (8W-30-11)
INJECTOR-FUEL-NO. 8 (8W-30-11)
K342 16 BR/WT
S128
S127
S129
S126
COIL-IGNITION-NO. 3 (8W-30-12)
COIL-IGNITION-NO. 7 (8W-30-12)
COIL-IGNITION-NO. 1 (8W-30-12)
COIL-IGNITION-NO. 5 (8W-30-12)
COIL-IGNITION-NO. 4 (8W-30-11)
COIL-IGNITION-NO. 8 (8W-30-11)
COIL-IGNITION-NO. 2 (8W-30-11)
COIL-IGNITION-NO. 6 (8W-30-11)

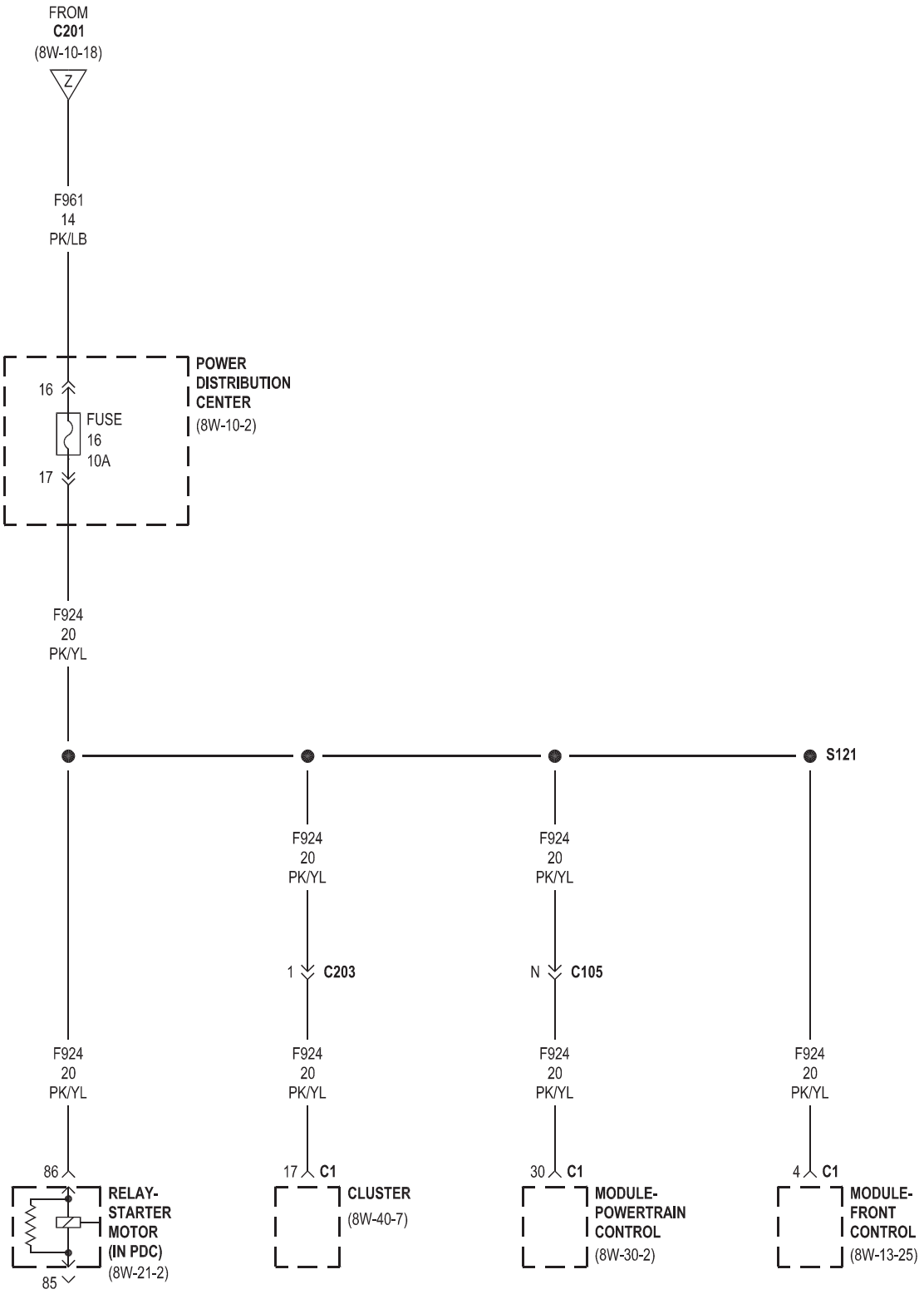

BATT A1
(8W-20-2)
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE 12 40A
FUSE 13 30A
FUSE 14 40A
FUSE 21 20A
FUSE 18 20A
FUSE 19 20A
FUSE 15 50A
12
13
14
26
21
23
15
A915 14 OR/BR
A222 14 RD/LB
A107 12 TN/RD
A111 18 DG/RD
A921 18 OR/PK
A104 18 YL/RD
A952 10 OR/DB
30
RELAY-TRANSMISSION CONTROL (IN PDC)
(8W-31-2)
87
87A
RELAY-FUEL PUMP (IN PDC)
(8W-30-3)
13
14
MODULE-ANTILOCK BRAKES
(8W-35-2)
40 C1
29 C1
39 C1
JUNCTION BLOCK
(8W-12-2)
RELAY-BLOWER MOTOR-REAR
(8W-42-7)
RELAY-REAR WINDOW DEFOGGER
(8W-48-2)
1
2
FUSE 7 25A (8W-12-8)
FUSE 8 10A (8W-12-8)
FUSE 9 20A (8W-12-8)
FUSE 10 15A (8W-12-8)
FUSE 33 10A (8W-12-8)


BATT A1
(8W-20-2)
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE 22 20A
28
FUSE 23 20A ◇◇◇◇
30
FUSE 24 15A
32
FUSE 25 15A
35
FUSE 27 10A
39
A919 18 OR/GY
A100 18 RD/VT
A103 20 GY/RD
A953 20 RD/YL
M C105
H C352
8 C1
6 C1
JUNCTION BLOCK
(8W-12-2)
35 C2
28 C2
A919 18 OR/GY
A100 18 RD/VT
A916 20 OR/WT
A103 18 GY/RD
A953 16 RD/YL
29 C1
MODULE-POWERTRAIN CONTROL
(8W-30-2)
(8W-30-6)
4
WIRING-TRAILER TOW 7-WAY
(8W-54-5)
30
RELAY-A/C CLUTCH (IN PDC)
(8W-42-11)
87 87A
1
SWITCH-STOP LAMP
(8W-51-2)
M
TO SWITCH-IGNITION
(8W-10-19)

◇◇◇◇ TRAILER TOW

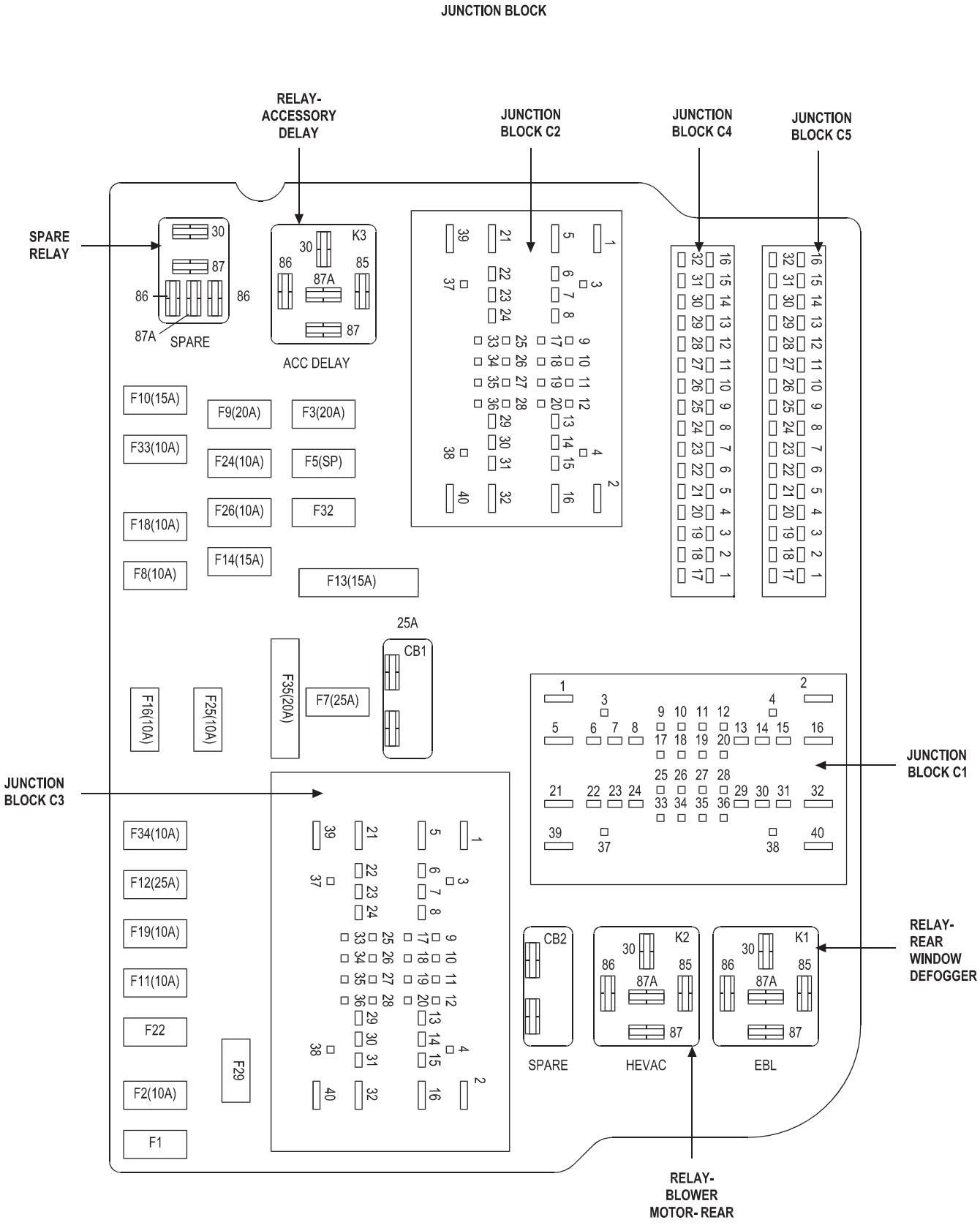

FROM
JUNCTION
BLOCK
(8W-10-9)
D
A923
14
RD/OR
4
SWITCH-
IGNITION
0 OFF
1 START
2 RUN
3 LOCK
4 ACC
FROM
RELAY-
RUN/START
(IN PDC)
(8W-10-9)
C
F941
14
PK/LG
13 C201
F941
14
PK/LG
2
13
3
F961
14
PK/LB
14 C201
F961
14
PK/LB
Z
TO
FUSE 16
(IN PDC)
(8W-10-20)
F901
14
BK
EXCEPT
REMOTE
START
REMOTE
START
S215
F941
14
PK/LG
25 C2
2 C2
JUNCTION
BLOCK
(8W-12-2)
FUSE
34
10A
(8W-12-15)
(8W-13-25)
FUSE
16
10A
(8W-12-12)
FUSE
18
10A
(8W-12-12)
FUSE
19
10A
(8W-12-13)


FROM S201 (8W-10-10)
E
A904 14 RD/GY
11
FROM JUNCTION BLOCK (8W-10-10)
F
A917 12 RD/DB
7
FROM JUNCTION BLOCK (8W-10-17)
M
A953 16 RD/YL
12
SWITCH-IGNITION
0 OFF
1 START
2 RUN
3 LOCK
4 ACC
9
14
10
5
1
8
6
FROM C201 (8W-10-10)
N
F983 16 PK/VT
G15 20 VT/TN
G121 18 VT
24 C3
9 C1
17 C3
CLUSTER
(8W-40-3)
F921 12 PK/YL
F921 12 PK/YL
S214
F984 14 PK/TN
F921 12 PK/YL
Z932 18 BK
Z943 20 BK
26 C2
1 C2
JUNCTION BLOCK
(8W-12-2)
FUSE 25 20A (8W-12-14)
FUSE 24 10A (8W-12-14)
FUSE 25 10A (8W-12-14)
FUSE 26 10A (8W-12-14)
G208
(8W-15-13)
▼ IGNITION


FROM
C201
(8W-10-18)
Z
F961
14
PK/LB
16
FUSE
16
10A
17
POWER
DISTRIBUTION
CENTER
(8W-10-2)
F924
20
PK/YL
S121
F924
20
PK/YL
1
C203
F924
20
PK/YL
N
C105
F924
20
PK/YL
F924
20
PK/YL
F924
20
PK/YL
F924
20
PK/YL
86
85
RELAY-
STARTER
MOTOR
(IN PDC)
(8W-21-2)
17
C1
CLUSTER
(8W-40-7)
30
C1
MODULE-
POWERTRAIN
CONTROL
(8W-30-2)
4
C1
MODULE-
FRONT
CONTROL
(8W-13-25)

8W-12 JUNCTION BLOCK

Component	Page
Amplifier-Radio	8W-12-8
Circuit Breaker	8W-12-6, 7
Clockspring	8W-12-21
Cluster	8W-12-8, 11, 13, 15
Control-A/C-Heater	8W-12-10, 14, 22
Control-A/C-Heater-Rear	8W-12-14
Data Link Connector	8W-12-10, 17
Fuse 1	8W-12-11
Fuse 2	8W-12-5
Fuse 3	8W-12-6
Fuse 4	8W-12-15
Fuse 5	8W-12-19
Fuse 6	8W-12-11
Fuse 7	8W-12-8
Fuse 8	8W-12-6, 8, 16
Fuse 9	8W-12-8
Fuse 10	8W-12-8, 16
Fuse 11	8W-12-9
Fuse 12	8W-12-5, 9
Fuse 13	8W-12-10, 20
Fuse 14	8W-12-10, 16
Fuse 15	8W-12-8
Fuse 16	8W-12-12
Fuse 17	8W-12-16
Fuse 18	8W-12-12
Fuse 19	8W-12-13
Fuse 24	8W-12-14
Fuse 25	8W-12-14, 20
Fuse 26	8W-12-14
Fuse 27	8W-12-9, 11
Fuse 28	8W-12-10
Fuse 33	8W-12-8
Fuse 34	8W-12-15
Fuse 35	8W-12-15
G114	8W-12-14
Glass-Liftgate-Heated	8W-12-5
Junction Block	8W-12-2, 5, 6, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23
Lamp-High Mounted Stop	8W-12-18
Lamp-License Plate	8W-12-16
Lamp-Passenger Airbag On/Off Indicator	8W-12-12
Lamp-Tail/Stop/Turn-Left	8W-12-16, 18, 22
Lamp-Tail/Stop/Turn-Right	8W-12-16, 18, 22
Media System-Monitor/Dvd	8W-12-9
Mirror-Inside Rearview	8W-12-13, 22
Mirror-Outside Rearview-Driver	8W-12-5
Mirror-Outside Rearview-Passenger	8W-12-5
Module-Antilock Brakes	8W-12-14
Module-Brake Provision	8W-12-18
Module-Electronic Overhead	8W-12-10
Module-Front Control	8W-12-6, 12, 14, 15, 16, 17, 18, 22
Module-Hands Free	8W-12-10
Module-Heated Seat	8W-12-19
Module-Integrated Power	8W-12-6, 9, 10, 12, 14, 15, 16, 22
Module-Memory Mirror-Driver	8W-12-8
Module-Memory Mirror-Passenger	8W-12-8
Module-Occupant Classification	8W-12-8, 12, 17, 18
Module-Occupant Restraint Controller	8W-12-12, 14, 17, 18
Module-Power-Blower Motor-Front	8W-12-12
Module-Powertrain Control	8W-12-12, 15, 17, 20, 21, 23
Module-Seat Memory	8W-12-19
Module-Sentry Key Remote Entry	8W-12-10, 12
Motor-Blower-Rear	8W-12-20
Motor-Rear Window Wiper	8W-12-16
Motor-Sunroof	8W-12-7, 15
Power Distribution Center	8W-12-5, 6, 8, 11, 15, 19, 20
Power Outlet-Console	8W-12-15
Power Outlet-Instrument Panel	8W-12-6
Power Outlet-Rear	8W-12-15
Pump-Auxiliary Coolant	8W-12-22
Radio	8W-12-9
Receiver-Satellite	8W-12-9
Relay-A/C Clutch	8W-12-12
Relay-Accessory Delay	8W-12-6
Relay-Adjustable Pedals	8W-12-16
Relay-Blower Motor-Front	8W-12-12
Relay-Blower Motor-Rear	8W-12-14, 20
Relay-Fuel Pump	8W-12-12
Relay-Park Lamp	8W-12-16
Relay-Rear Window Defogger	8W-12-5, 14
Relay-Wiper-Rear	8W-12-16
Sensor-Accelerator Pedal Position	8W-12-23
Sensor-Infrared	8W-12-13
Servo-Speed Control	8W-12-20
Switch-Adjustable Pedals	8W-12-16
Switch-Heated Seat-Driver	8W-12-13
Switch-Heated Seat-Passenger	8W-12-13
Switch-Ignition	8W-12-11, 15
Switch-Mirror	8W-12-7, 8
Switch-Seat-Driver	8W-12-19
Switch-Seat-Passenger	8W-12-19
Switch-Speed Control-Left	8W-12-21
Switch-Speed Control-Right	8W-12-21
Switch-Stop Lamp	8W-12-18, 20
Switch-Tow/Haul Overdrive	8W-12-23
Switch-Transfer Case Selector	8W-12-13
Switch-Window/Door Lock-Driver	8W-12-7
Switch-Window/Door Lock-Passenger	8W-12-7


JUNCTION BLOCK
RELAY-
ACCESSORY
DELAY
JUNCTION
BLOCK C2
JUNCTION
BLOCK C4
JUNCTION
BLOCK C5
SPARE
RELAY
30
87
86
86
87A
SPARE
30
K3
86
85
87A
87
ACC DELAY
F10(15A)
F9(20A)
F3(20A)
F33(10A)
F24(10A)
F5(SP)
F26(10A)
F32
F18(10A)
F14(15A)
F8(10A)
F13(15A)
25A
CB1
F35(20A)
F7(25A)
F16(10A)
F25(10A)
JUNCTION
BLOCK C3
JUNCTION
BLOCK C1
F34(10A)
F12(25A)
F19(10A)
F11(10A)
F22
F29
F2(10A)
F1
CB2
SPARE
K2
HEVAC
K1
EBL
RELAY-
REAR
WINDOW
DEFOGGER
RELAY-
BLOWER
MOTOR- REAR

FUSES

FUSE NO.	AMPS	FUSED CIRCUIT	FUNCTION
1	-	-	-
2	10A	C16 20DB/GY	FUSED REAR WINDOW DEFOGGER RELAY OUTPUT
3	20A	F306 18DB/PK	FUSED ACCESSORY RELAY OUTPUT
4	-	-	-
5	-	-	-
6	-	-	-
7	25A	A116 16YL/RD	FUSED B(+)
8	10A	A215 20RD/LG	FUSED B(+)
9	20A	A924 16RD/LG	FUSED B(+)
10	15A	A117 18RD/DG	FUSED B(+)
11	10A	A300 20GY/LG	FUSED B(+)
12	25A	A114 16GY/RD	FUSED B(+)
13	15A	A925 18RD/BK	FUSED B(+)
14	15A	A926 18RD	FUSED B(+)
15	-	-	-
16	10A	F201 20PK/OR	FUSED IGNITION SWITCH OUTPUT (RUN-START)
17	-	-	-
18	10A	F202 20PK/GY	FUSED IGNITION SWITCH OUTPUT (RUN-START)
19	10A	F21 20PK/DG	FUSED IGNITION SWITCH OUTPUT (RUN-START)
20	-	-	-
21	-	-	-
22	-	-	-
23	-	-	-
24	10A	F504 20GY/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
25	10A	F100 20PK/VT	FUSED IGNITION SWITCH OUTPUT (RUN)
26	10A	F500 20DG/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
27	-	-	-
28	-	-	-
29	-	-	-
30	-	-	-
31	-	-	-
32	-	-	-
33	10A	A956 20RD/BL	FUSED B(+)
34	10A	F1 20PK/DG	FUSED IGNITION SWITCH OUTPUT (OFF-RUN-START)
35	20A	F307 18LB/PK	FUSED ACCESSORY RELAY OUTPUT

CIRCUIT BREAKER

C.B.	AMPS	FUSED CIRCUIT	FUNCTION
1	25A	F30 14PK/YL	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)

RELAYS

RELAY-ACCESSORY DELAY

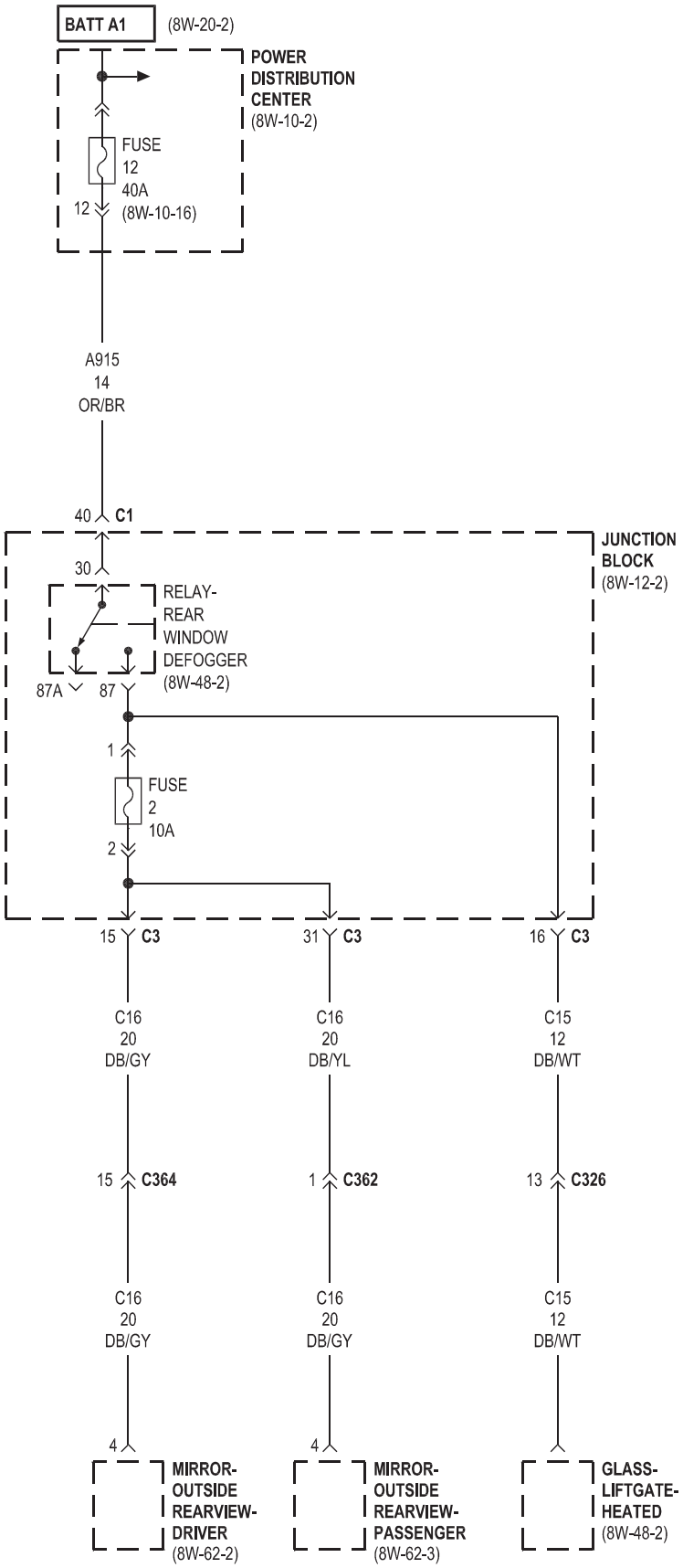
CAVITY	CIRCUIT	FUNCTION
30	A901 12RD/PK	FUSED B(+)
85	P305 20LG/LB	ACCESSORY DELAY RELAY CONTROL
86	A901 12RD/PK	FUSED B(+)
87	INTERNAL	ACCESSORY DELAY RELAY OUTPUT
87A	-	-

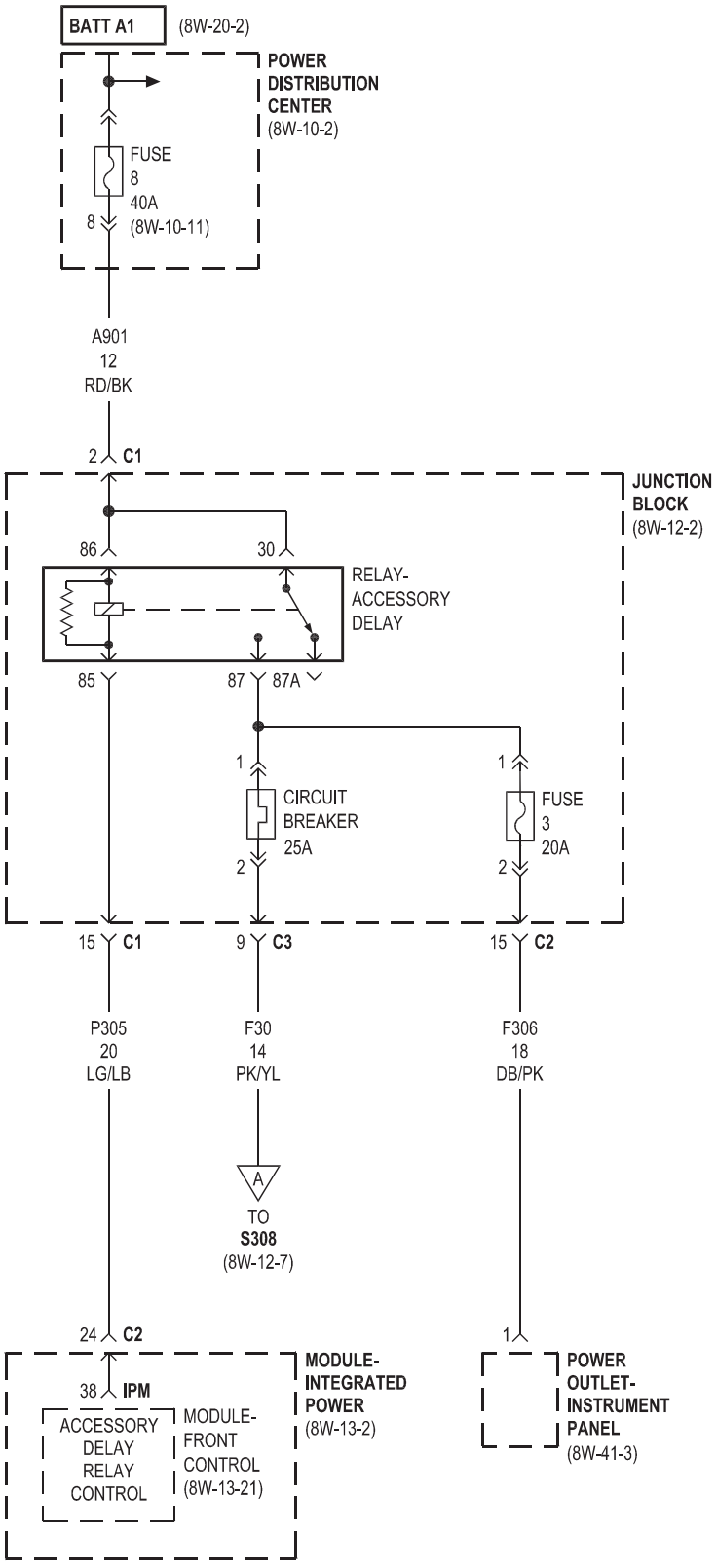
RELAY-BLOWER MOTOR-REAR

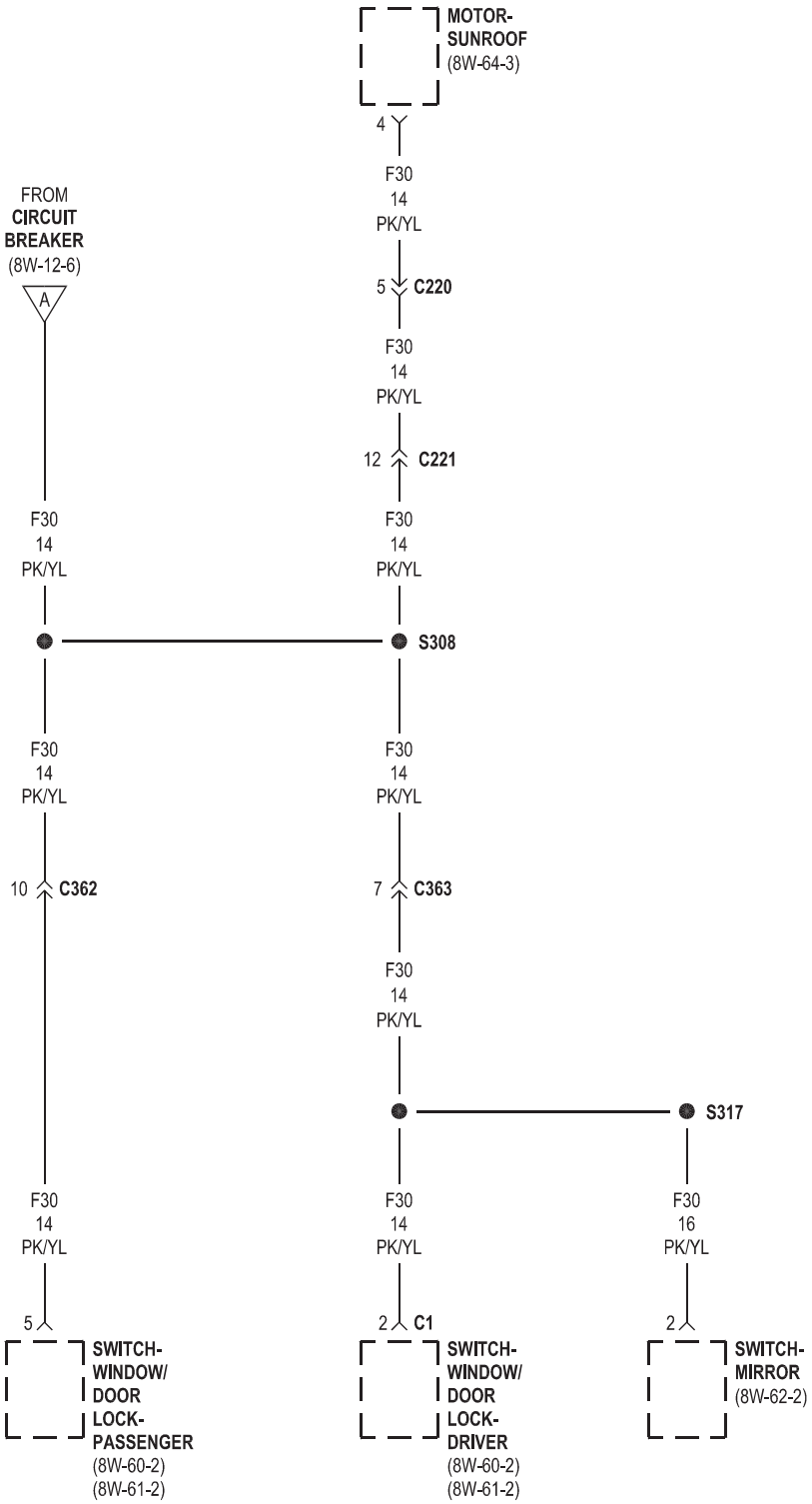
CAVITY	CIRCUIT	FUNCTION
30	A222 14RD/LB	FUSED B(+)
85	Z911 20BK	GROUND
86	F504 20GY/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
87	C51 14BR/RD	FUSED REAR BLOWER MOTOR RELAY OUTPUT
87A	-	-

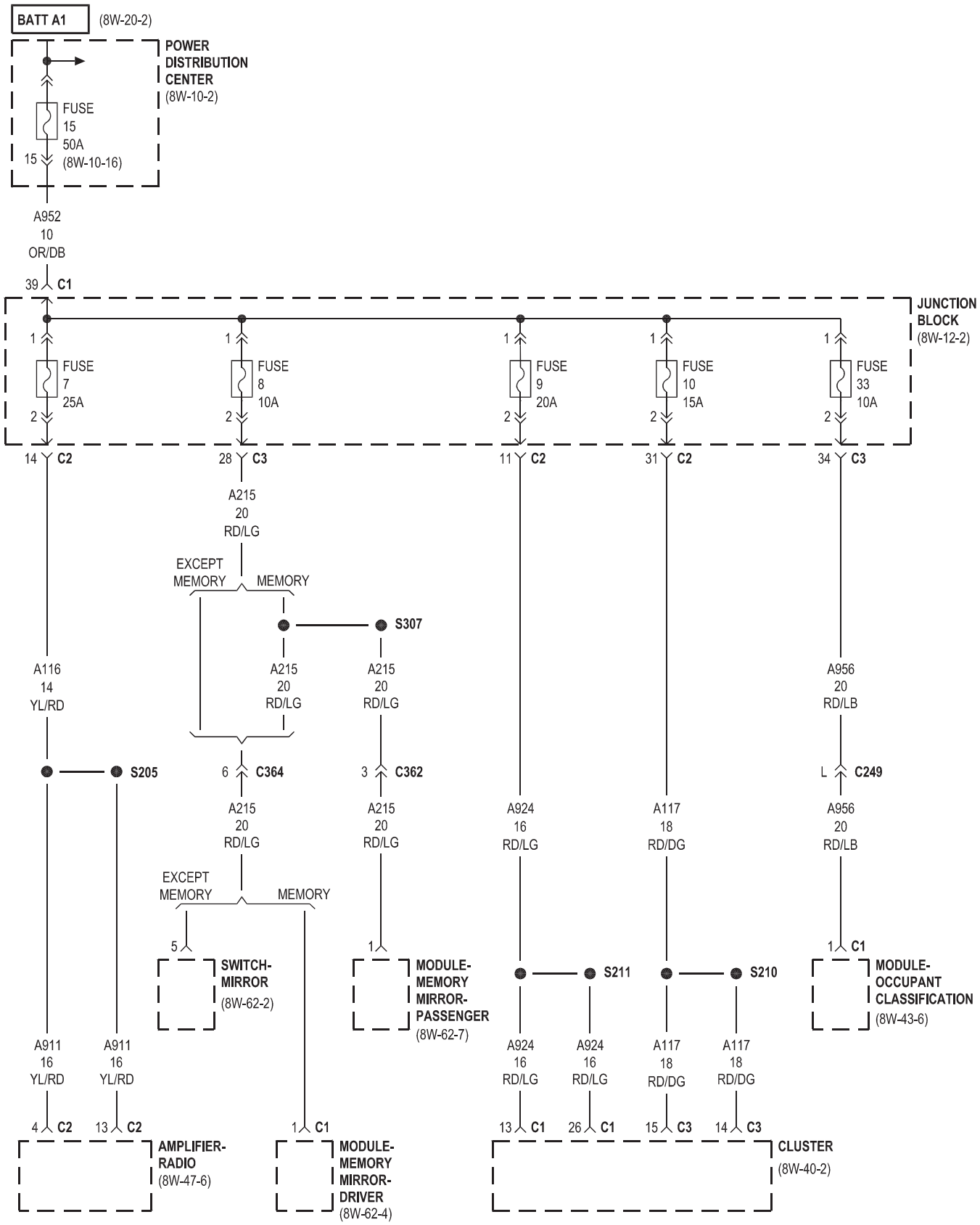
RELAY-REAR WINDOW DEFOGGER

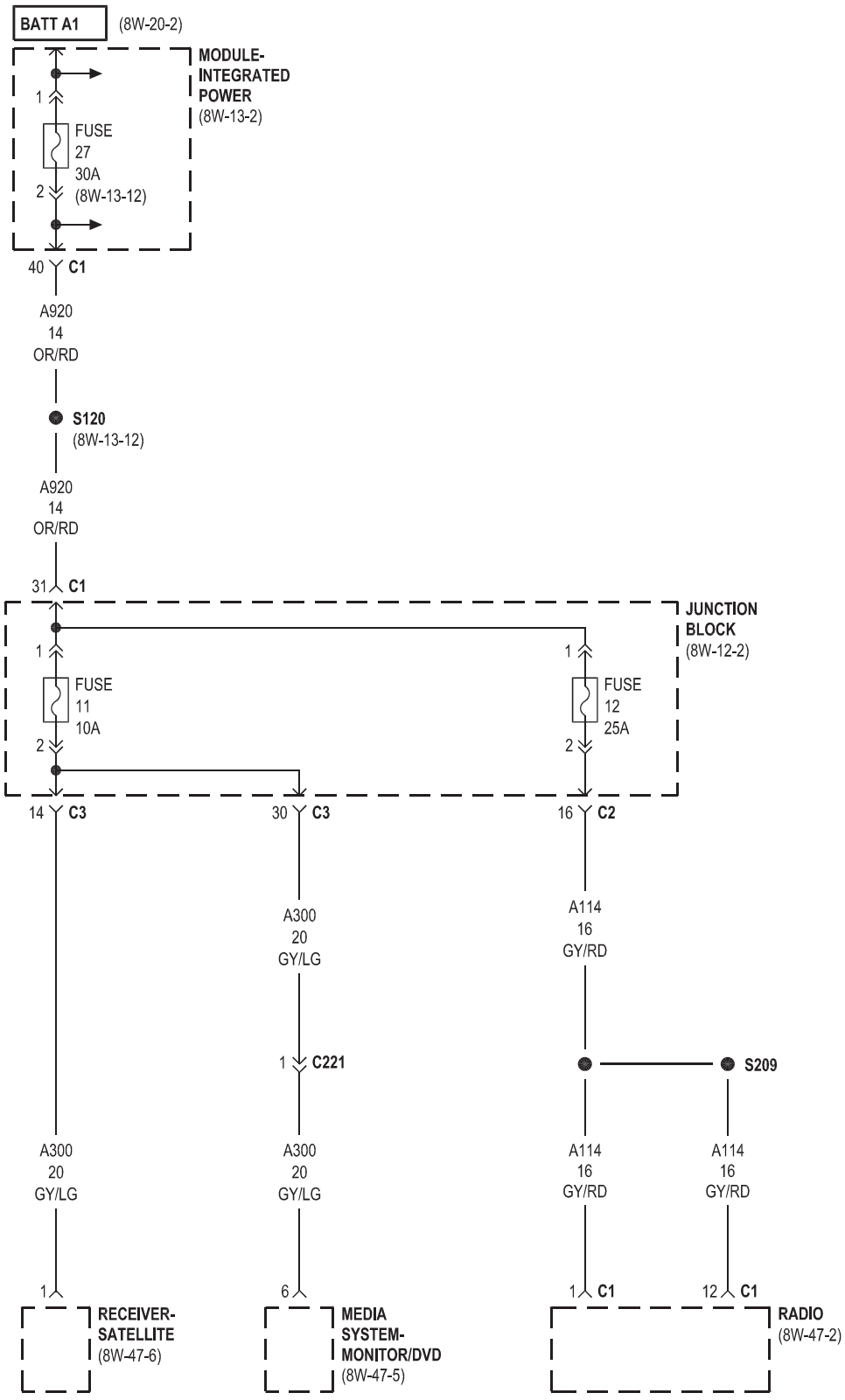
CAVITY	CIRCUIT	FUNCTION
30	A915 12OR/BR	FUSED B(+)
85	C115 20DB	DEFOGGER RELAY CONTROL
86	F504 20GY/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
87	C15 12DB/WT	REAR WINDOW DEFOGGER RELAY OUTPUT
87A	-	-

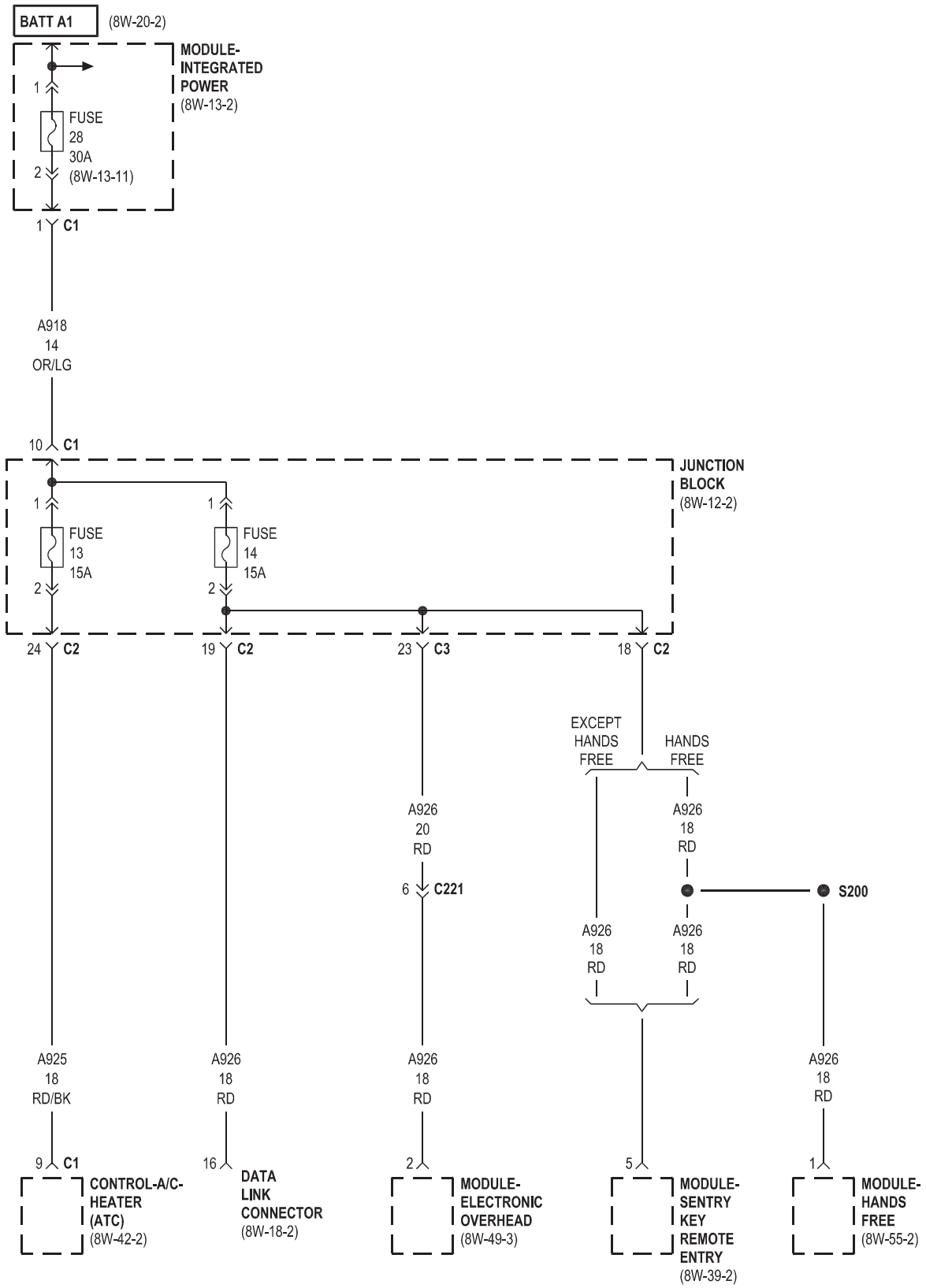

BATT A1
(8W-20-2)
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE
12
40A
12
(8W-10-16)
A915
14
OR/BR
40 C1
JUNCTION BLOCK
(8W-12-2)
30
RELAY-
REAR
WINDOW
DEFOGGER
(8W-48-2)
87A
87
1
FUSE
2
10A
2
15 C3
31 C3
16 C3
C16
20
DB/GY
C16
20
DB/YL
C15
12
DB/WT
15 C364
1 C362
13 C326
C16
20
DB/GY
C16
20
DB/GY
C15
12
DB/WT
4
4
MIRROR-
OUTSIDE
REARVIEW-
DRIVER
(8W-62-2)
MIRROR-
OUTSIDE
REARVIEW-
PASSENGER
(8W-62-3)
GLASS-
LIFTGATE-
HEATED
(8W-48-2)

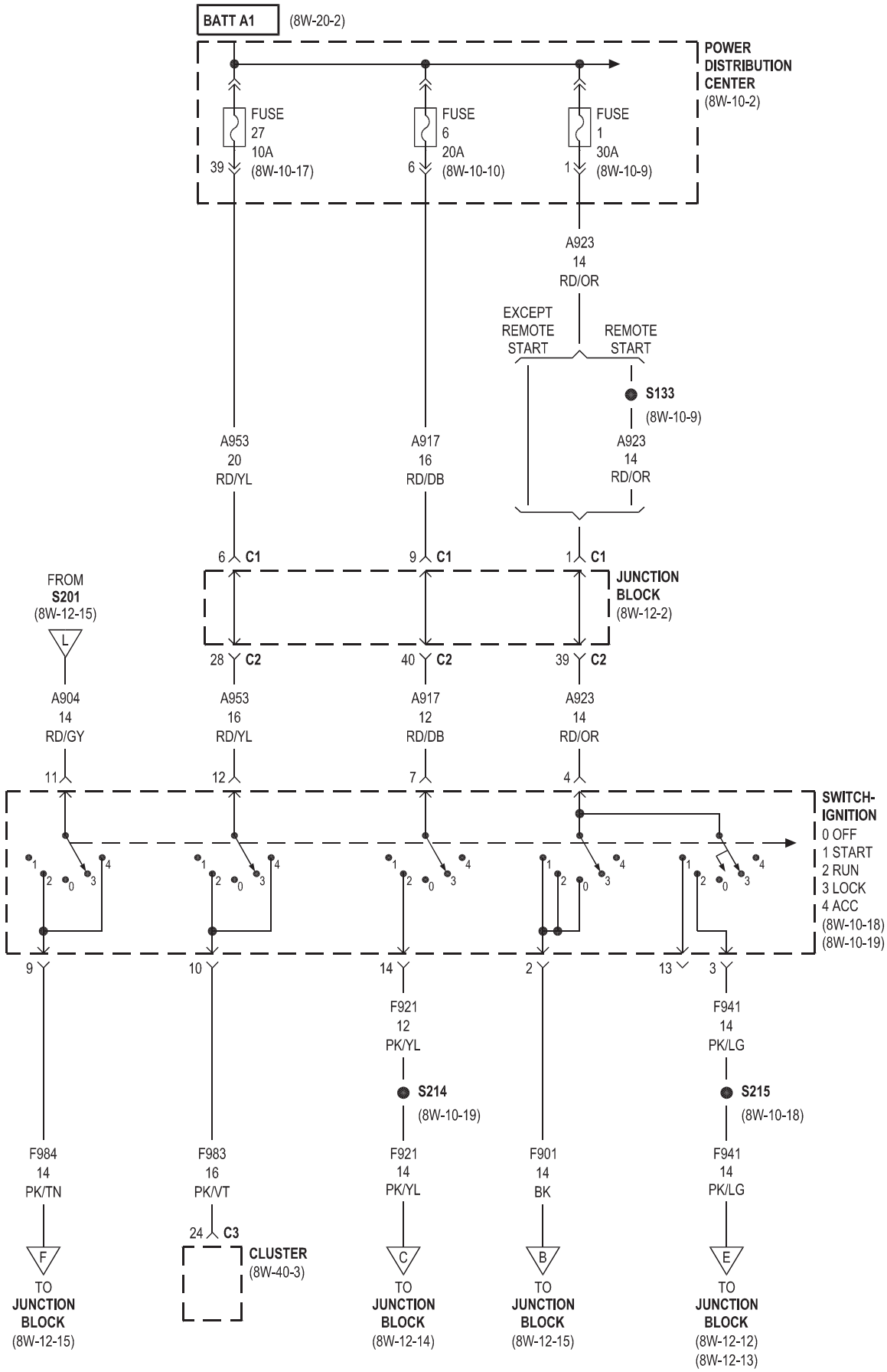

BATT A1
(8W-20-2)
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE
8
40A
8
(8W-10-11)
A901
12
RD/BK
2 C1
JUNCTION BLOCK
(8W-12-2)
86
30
RELAY-
ACCESSORY
DELAY
85
87
87A
1
CIRCUIT
BREAKER
25A
2
1
FUSE
3
20A
2
15 C1
9 C3
15 C2
P305
20
LG/LB
F30
14
PK/YL
F306
18
DB/PK
A
TO
S308
(8W-12-7)
24 C2
38 IPM
ACCESSORY
DELAY
RELAY
CONTROL
MODULE-
FRONT
CONTROL
(8W-13-21)
MODULE-
INTEGRATED
POWER
(8W-13-2)
1
POWER
OUTLET-
INSTRUMENT
PANEL
(8W-41-3)

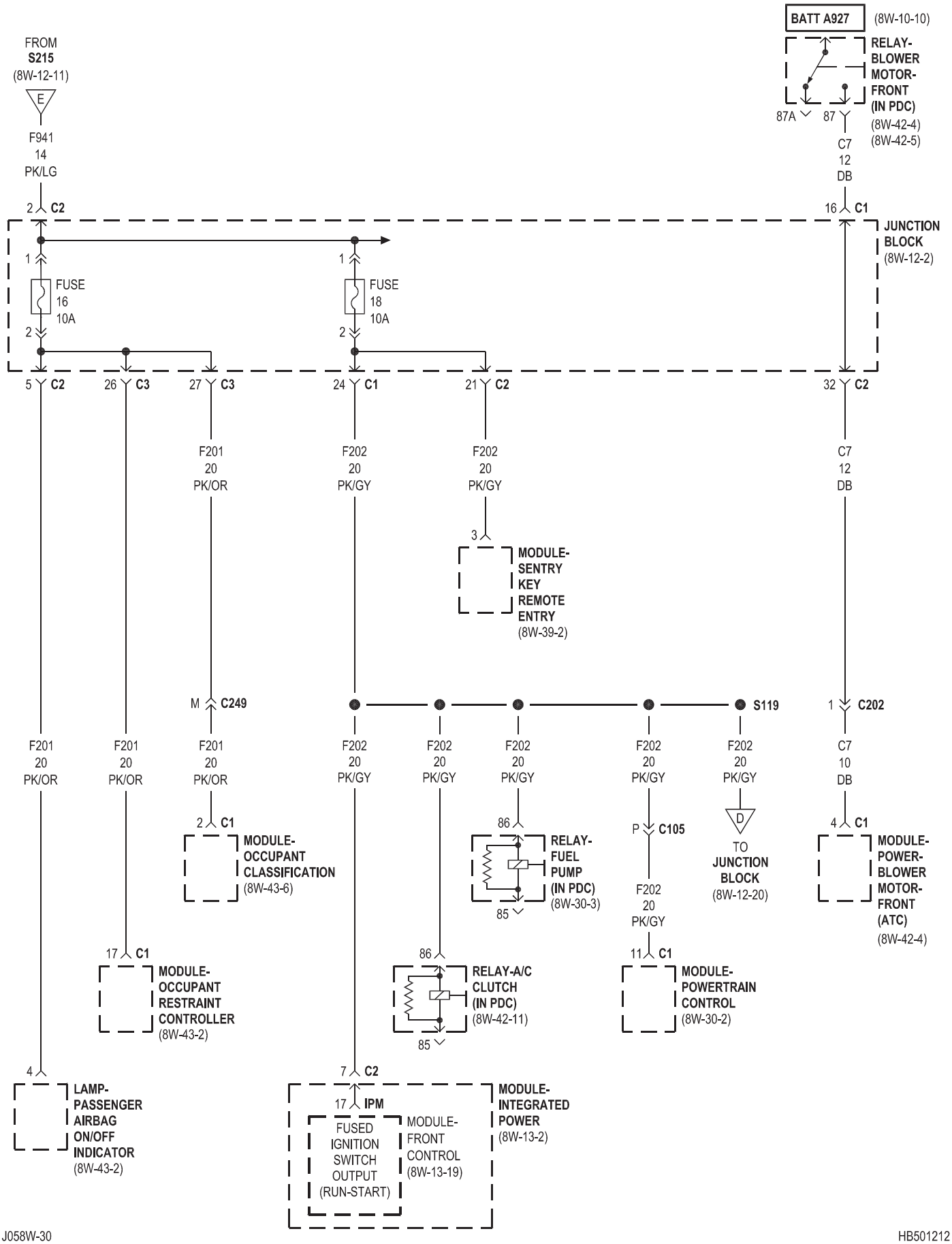

MOTOR-
SUNROOF
(8W-64-3)
4
F30
14
PK/YL
5 C220
F30
14
PK/YL
12 C221
F30
14
PK/YL
S308
F30
14
PK/YL
7 C363
F30
14
PK/YL
S317
F30
16
PK/YL
2
SWITCH-
MIRROR
(8W-62-2)
FROM
CIRCUIT
BREAKER
(8W-12-6)
A
F30
14
PK/YL
10 C362
F30
14
PK/YL
5
SWITCH-
WINDOW/
DOOR
LOCK-
PASSENGER
(8W-60-2)
(8W-61-2)
F30
14
PK/YL
2 C1
SWITCH-
WINDOW/
DOOR
LOCK-
DRIVER
(8W-60-2)
(8W-61-2)

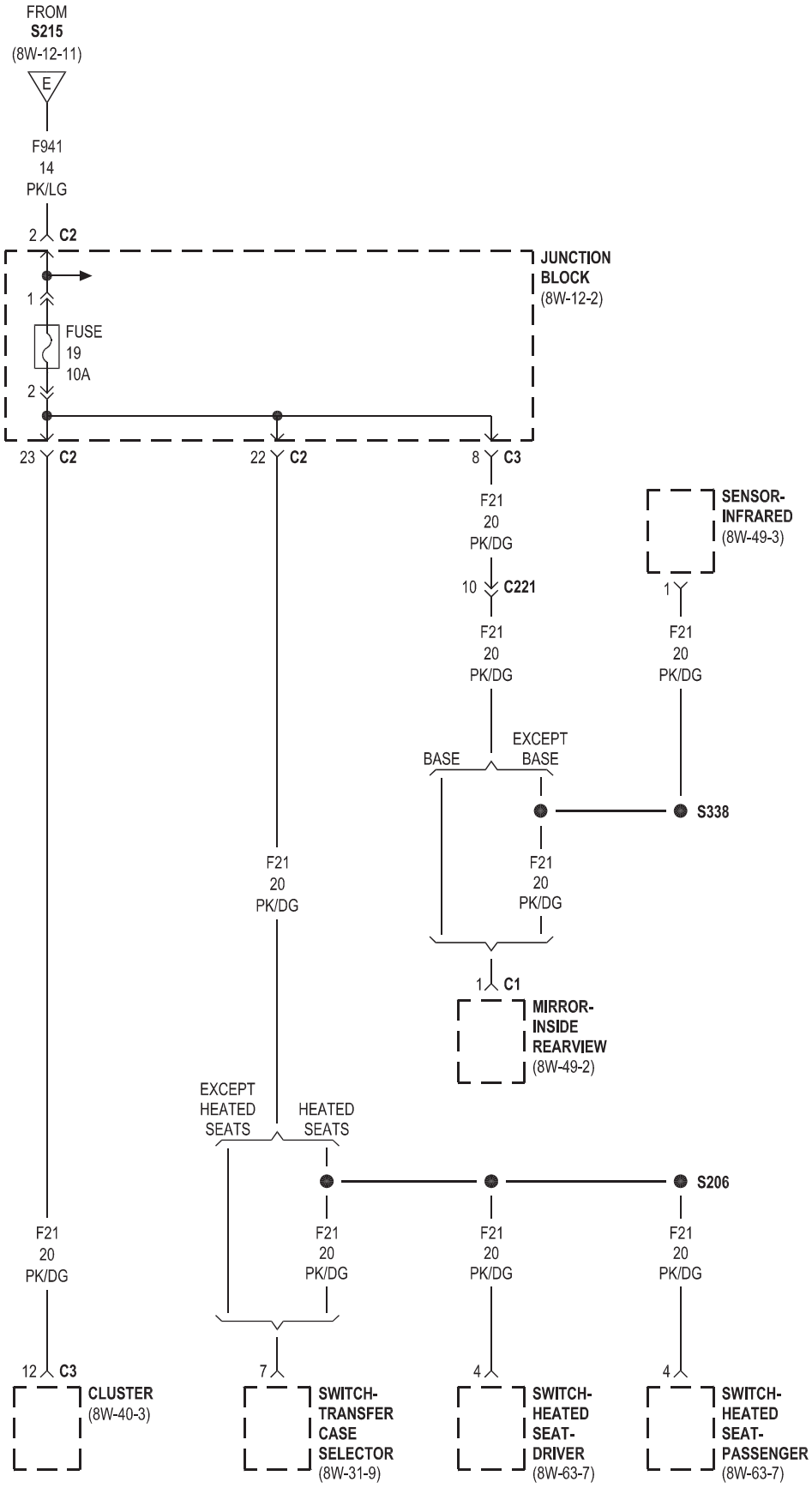

BATT A1
(8W-20-2)
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE 15 50A
15
(8W-10-16)
A952 10 OR/DB
39 C1
JUNCTION BLOCK
(8W-12-2)
FUSE 7 25A
FUSE 8 10A
FUSE 9 20A
FUSE 10 15A
FUSE 33 10A
14 C2
28 C3
11 C2
31 C2
34 C3
A215 20 RD/LG
EXCEPT MEMORY
MEMORY
S307
A116 14 YL/RD
A215 20 RD/LG
A215 20 RD/LG
A956 20 RD/LB
S205
6 C364
3 C362
L C249
A215 20 RD/LG
A215 20 RD/LG
A924 16 RD/LG
A117 18 RD/DG
A956 20 RD/LB
EXCEPT MEMORY
MEMORY
5
1
1
1 C1
SWITCH-MIRROR
(8W-62-2)
MODULE-MEMORY MIRROR-PASSENGER
(8W-62-7)
S211
S210
MODULE-OCCUPANT CLASSIFICATION
(8W-43-6)
A911 16 YL/RD
A911 16 YL/RD
A924 16 RD/LG
A924 16 RD/LG
A117 18 RD/DG
A117 18 RD/DG
4 C2
13 C2
1 C1
13 C1
26 C1
15 C3
14 C3
AMPLIFIER-RADIO
(8W-47-6)
MODULE-MEMORY MIRROR-DRIVER
(8W-62-4)
CLUSTER
(8W-40-2)

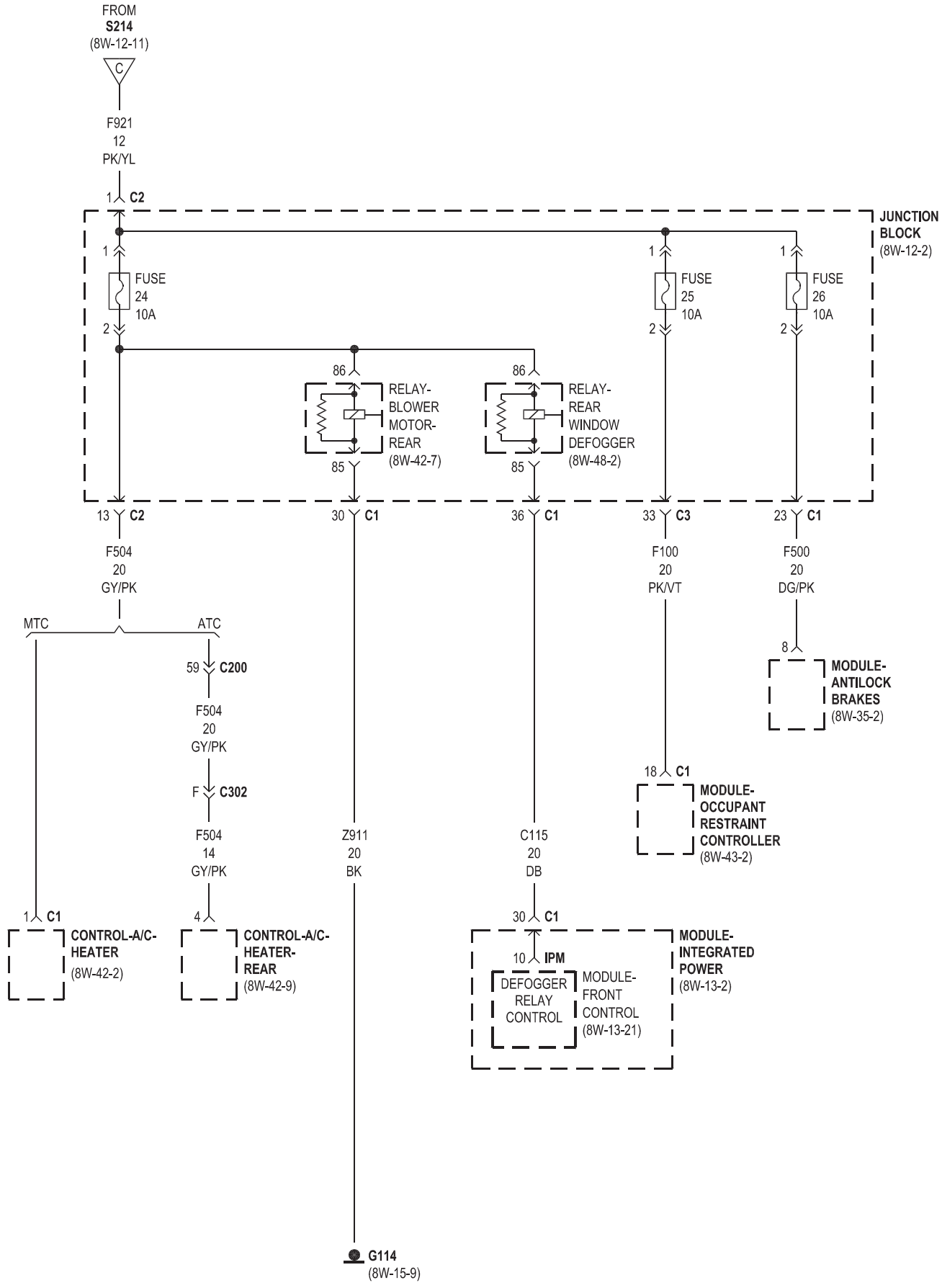

BATT A1
(8W-20-2)
MODULE-
INTEGRATED
POWER
(8W-13-2)
1
FUSE
27
30A
2
(8W-13-12)
40 C1
A920
14
OR/RD
S120
(8W-13-12)
A920
14
OR/RD
31 C1
JUNCTION
BLOCK
(8W-12-2)
1
FUSE
11
10A
2
1
FUSE
12
25A
2
14 C3
30 C3
16 C2
A300
20
GY/LG
A114
16
GY/RD
1 C221
S209
A300
20
GY/LG
A300
20
GY/LG
A114
16
GY/RD
A114
16
GY/RD
1
6
1 C1
12 C1
RECEIVER-
SATELLITE
(8W-47-6)
MEDIA
SYSTEM-
MONITOR/DVD
(8W-47-5)
RADIO
(8W-47-2)

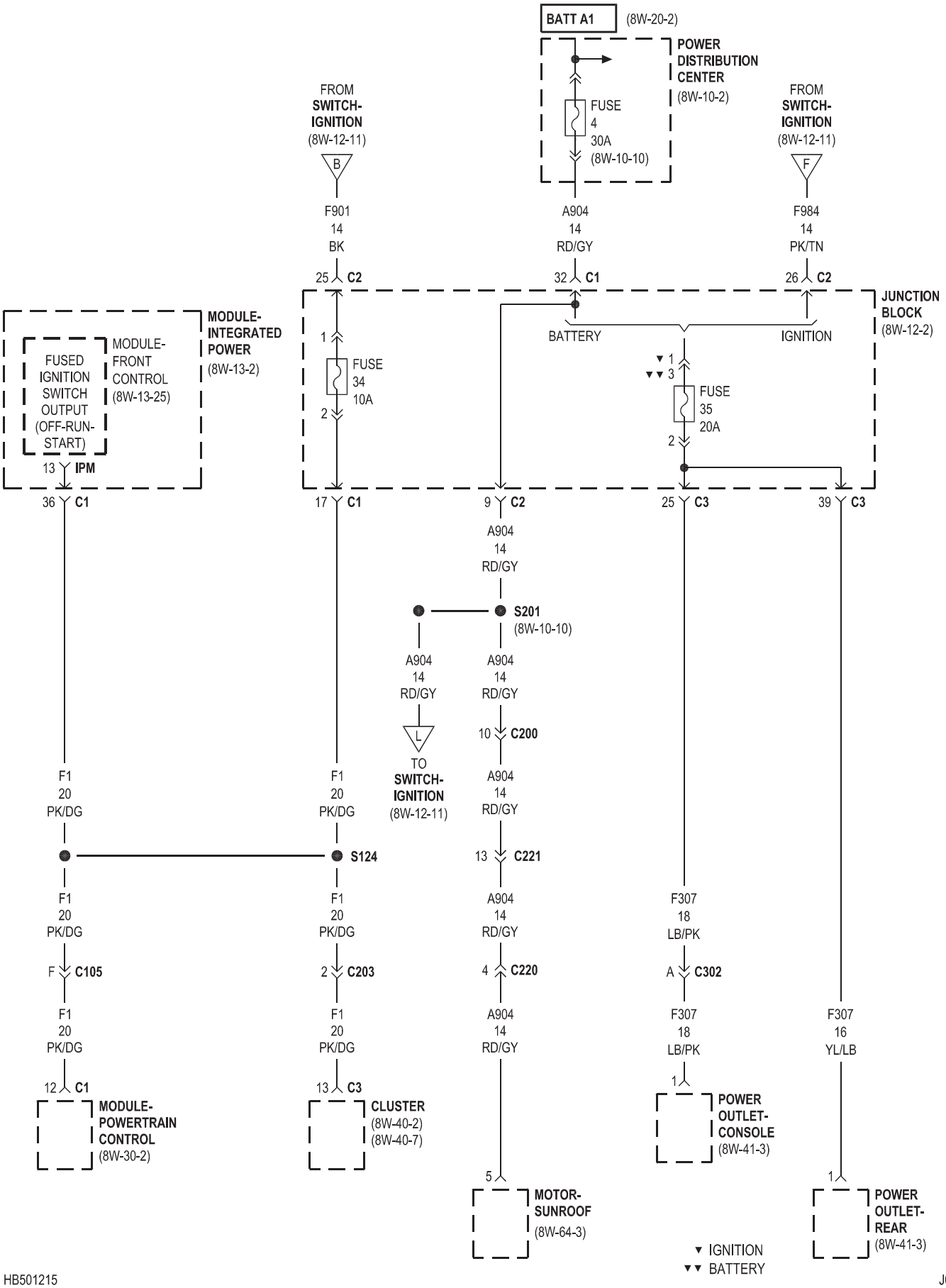

BATT A1
(8W-20-2)
MODULE-
INTEGRATED
POWER
(8W-13-2)
1
FUSE
28
30A
2
(8W-13-11)
1 C1
A918
14
OR/LG
10 C1
JUNCTION
BLOCK
(8W-12-2)
1
FUSE
13
15A
2
1
FUSE
14
15A
2
24 C2
19 C2
23 C3
18 C2
EXCEPT
HANDS
FREE
HANDS
FREE
A926
20
RD
6 C221
A926
18
RD
S200
A926
18
RD
A926
18
RD
A925
18
RD/BK
A926
18
RD
A926
18
RD
A926
18
RD
9 C1
16
2
5
1
CONTROL-A/C-
HEATER
(ATC)
(8W-42-2)
DATA
LINK
CONNECTOR
(8W-18-2)
MODULE-
ELECTRONIC
OVERHEAD
(8W-49-3)
MODULE-
SENTRY
KEY
REMOTE
ENTRY
(8W-39-2)
MODULE-
HANDS
FREE
(8W-55-2)

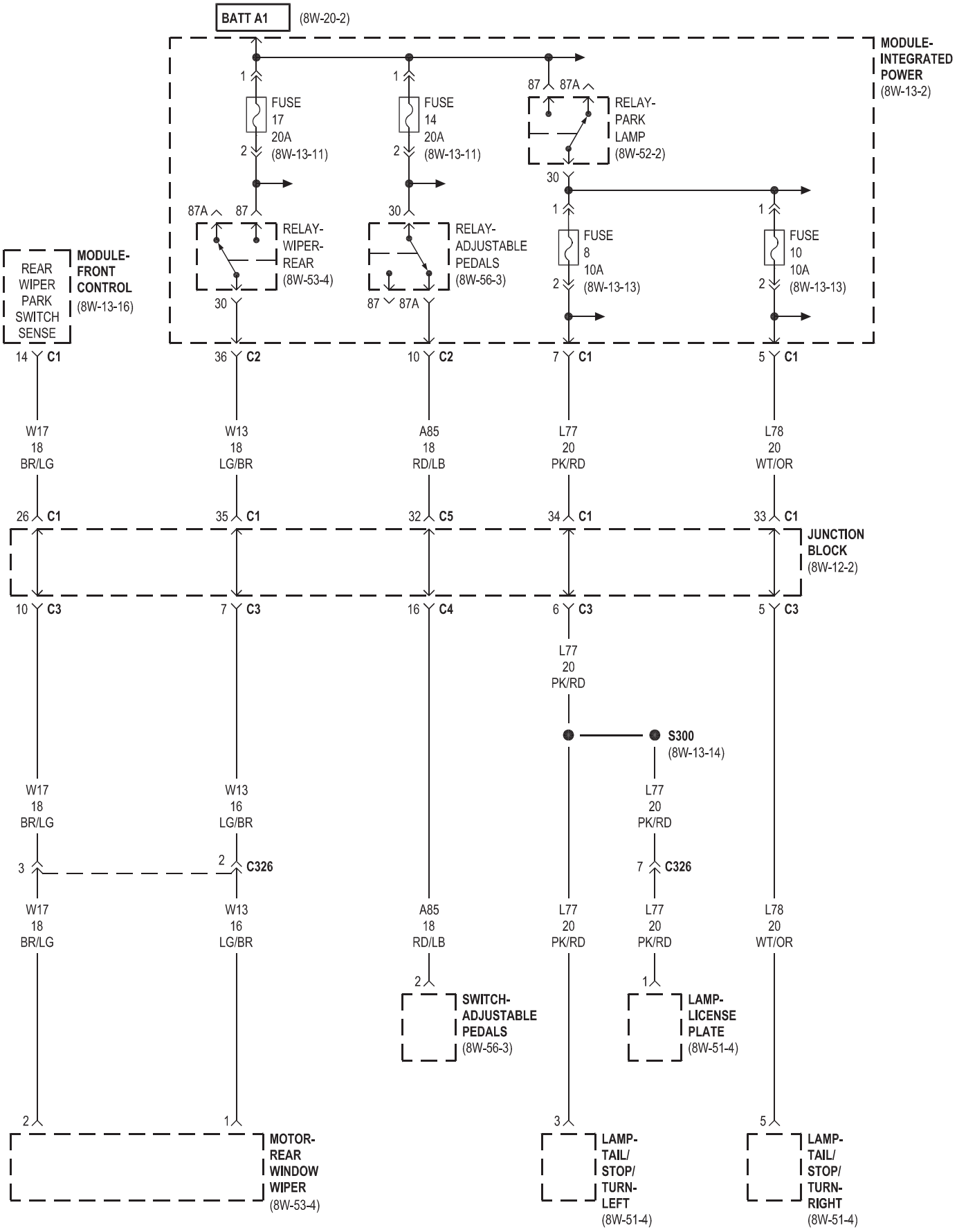

BATT A1
(8W-20-2)
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE 27 10A
39
(8W-10-17)
FUSE 6 20A
6
(8W-10-10)
FUSE 1 30A
1
(8W-10-9)
A923 14 RD/OR
EXCEPT REMOTE START
REMOTE START
S133
(8W-10-9)
A953 20 RD/YL
A917 16 RD/DB
A923 14 RD/OR
6 C1
9 C1
1 C1
JUNCTION BLOCK
(8W-12-2)
FROM S201
(8W-12-15)
L
28 C2
40 C2
39 C2
A904 14 RD/GY
A953 16 RD/YL
A917 12 RD/DB
A923 14 RD/OR
11
12
7
4
SWITCH-IGNITION
0 OFF
1 START
2 RUN
3 LOCK
4 ACC
(8W-10-18)
(8W-10-19)
9
10
14
2
13
3
F921 12 PK/YL
F941 14 PK/LG
S214
(8W-10-19)
S215
(8W-10-18)
F984 14 PK/TN
F983 16 PK/VT
F921 14 PK/YL
F901 14 BK
F941 14 PK/LG
24 C3
CLUSTER
(8W-40-3)
F
C
B
E
TO JUNCTION BLOCK
(8W-12-15)
TO JUNCTION BLOCK
(8W-12-14)
TO JUNCTION BLOCK
(8W-12-15)
TO JUNCTION BLOCK
(8W-12-12)
(8W-12-13)

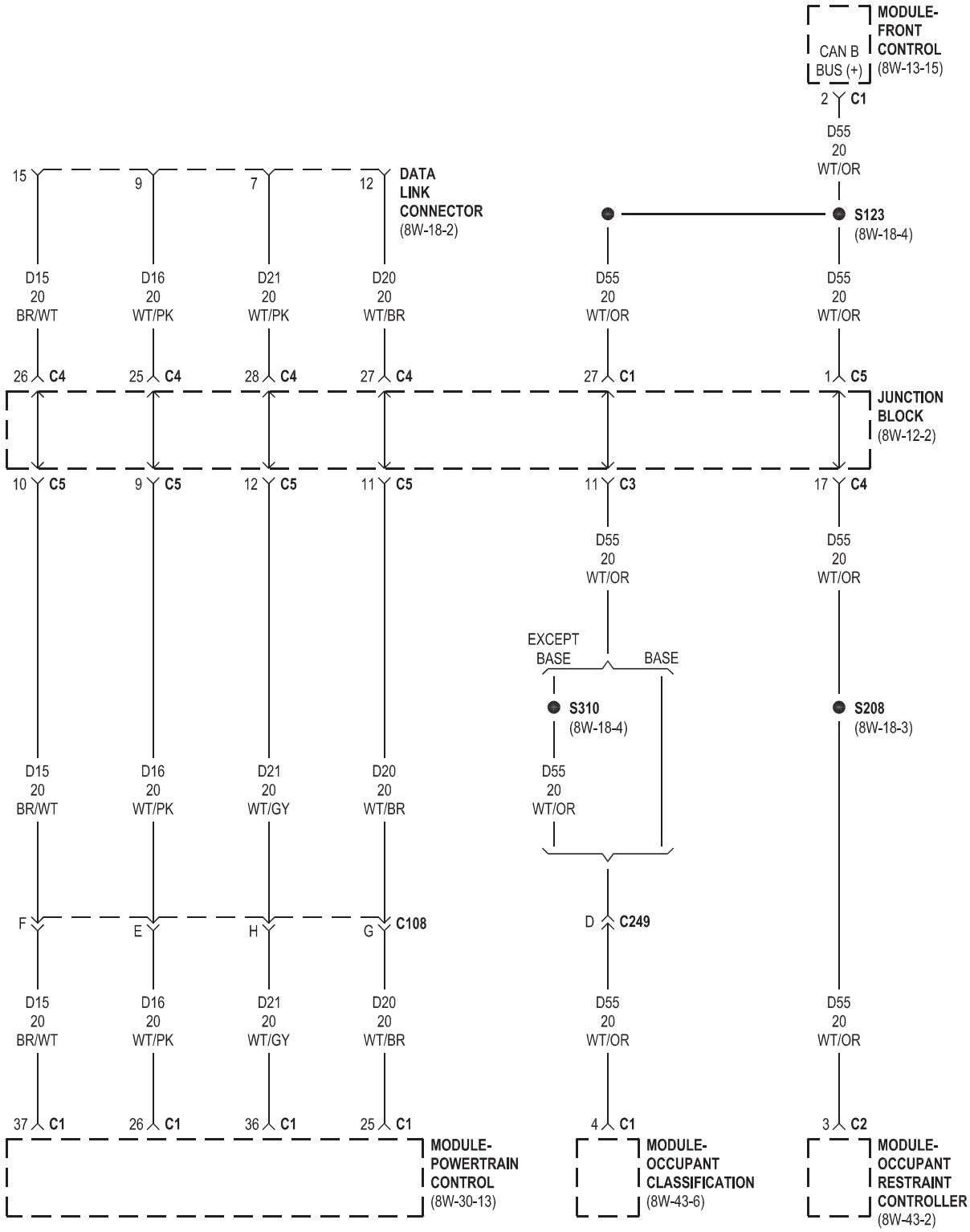

BATT A927
(8W-10-10)
RELAY-BLOWER MOTOR-FRONT (IN PDC)
(8W-42-4)
(8W-42-5)
87A
87
C7
12
DB
16 C1
FROM
S215
(8W-12-11)
E
F941
14
PK/LG
2 C2
JUNCTION BLOCK
(8W-12-2)
1
FUSE
16
10A
2
1
FUSE
18
10A
2
5 C2
26 C3
27 C3
24 C1
21 C2
32 C2
F201
20
PK/OR
F202
20
PK/GY
F202
20
PK/GY
C7
12
DB
3
MODULE-SENTRY KEY REMOTE ENTRY
(8W-39-2)
M C249
S119
1 C202
F201
20
PK/OR
F201
20
PK/OR
F201
20
PK/OR
F202
20
PK/GY
F202
20
PK/GY
F202
20
PK/GY
F202
20
PK/GY
F202
20
PK/GY
C7
10
DB
2 C1
MODULE-OCCUPANT CLASSIFICATION
(8W-43-6)
86
RELAY-FUEL PUMP (IN PDC)
(8W-30-3)
85
P C105
D
TO JUNCTION BLOCK
(8W-12-20)
4 C1
MODULE-POWER-BLOWER MOTOR-FRONT (ATC)
(8W-42-4)
17 C1
MODULE-OCCUPANT RESTRAINT CONTROLLER
(8W-43-2)
86
RELAY-A/C CLUTCH (IN PDC)
(8W-42-11)
85
F202
20
PK/GY
11 C1
MODULE-POWERTRAIN CONTROL
(8W-30-2)
4
LAMP-PASSENGER AIRBAG ON/OFF INDICATOR
(8W-43-2)
7 C2
17 IPM
FUSED IGNITION SWITCH OUTPUT (RUN-START)
MODULE-FRONT CONTROL
(8W-13-19)
MODULE-INTEGRATED POWER
(8W-13-2)

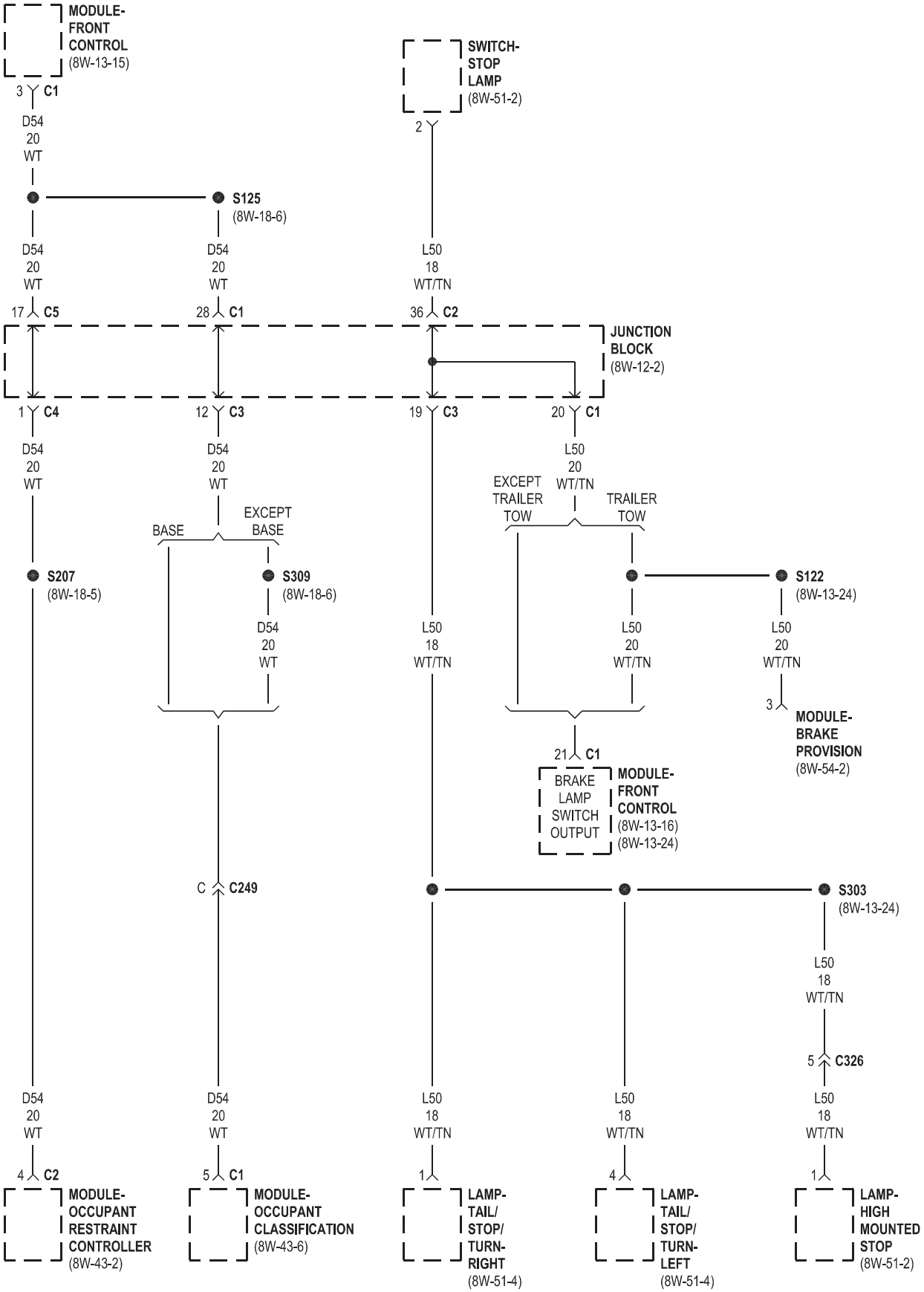

FROM
S215
(8W-12-11)
E
F941
14
PK/LG
2 C2
JUNCTION
BLOCK
(8W-12-2)
1
FUSE
19
10A
2
23 C2
22 C2
8 C3
F21
20
PK/DG
10 C221
SENSOR-
INFRARED
(8W-49-3)
1
F21
20
PK/DG
F21
20
PK/DG
BASE
EXCEPT
BASE
S338
F21
20
PK/DG
F21
20
PK/DG
1 C1
MIRROR-
INSIDE
REARVIEW
(8W-49-2)
EXCEPT
HEATED
SEATS
HEATED
SEATS
S206
F21
20
PK/DG
F21
20
PK/DG
F21
20
PK/DG
F21
20
PK/DG
12 C3
CLUSTER
(8W-40-3)
7
SWITCH-
TRANSFER
CASE
SELECTOR
(8W-31-9)
4
SWITCH-
HEATED
SEAT-
DRIVER
(8W-63-7)
4
SWITCH-
HEATED
SEAT-
PASSENGER
(8W-63-7)

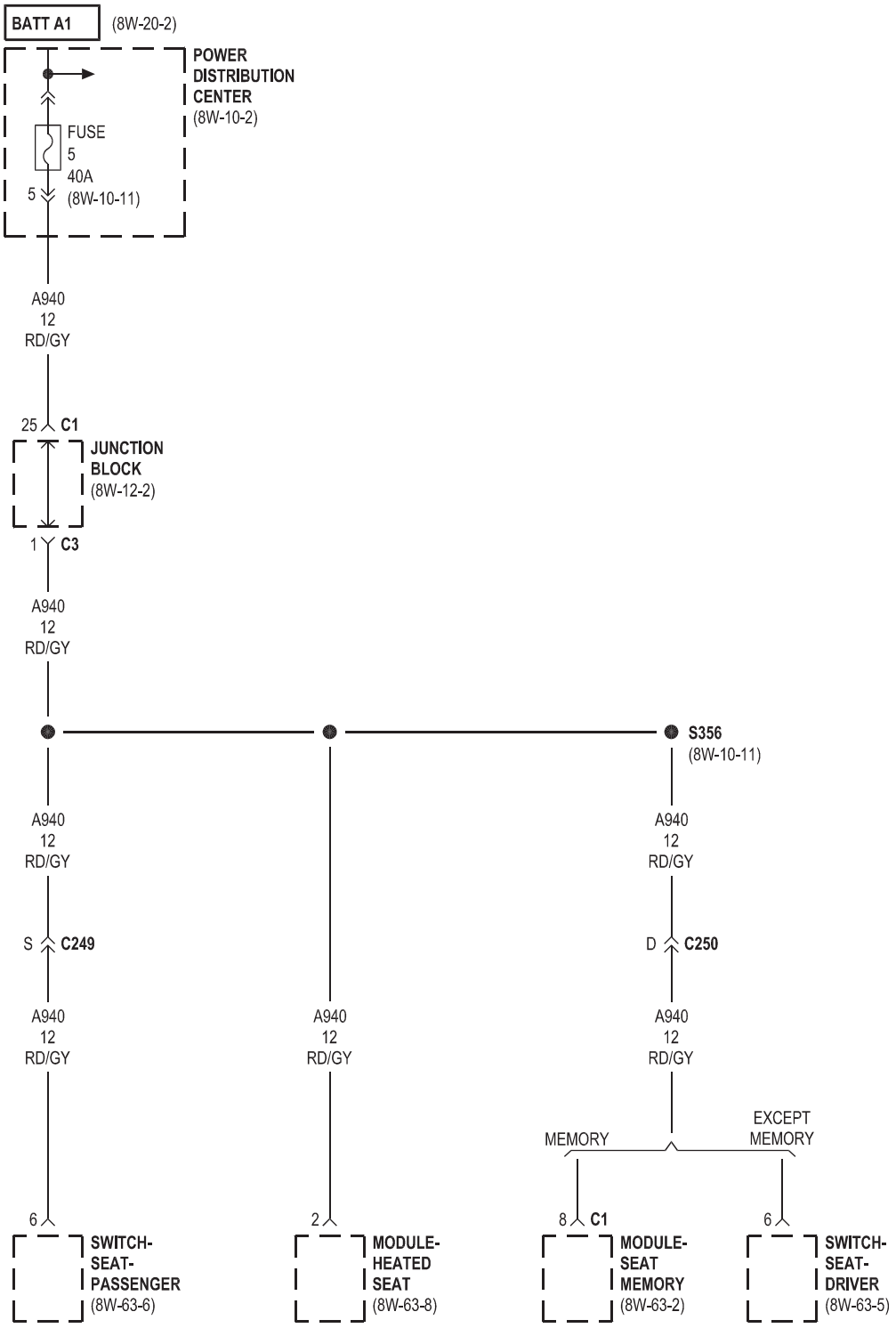

FROM
S214
(8W-12-11)
C
F921
12
PK/YL
1 C2
JUNCTION
BLOCK
(8W-12-2)
1
FUSE
24
10A
2
1
FUSE
25
10A
2
1
FUSE
26
10A
2
86
RELAY-
BLOWER
MOTOR-
REAR
(8W-42-7)
85
86
RELAY-
REAR
WINDOW
DEFOGGER
(8W-48-2)
85
13 C2
30 C1
36 C1
33 C3
23 C1
F504
20
GY/PK
F100
20
PK/VT
F500
20
DG/PK
8
MODULE-
ANTILOCK
BRAKES
(8W-35-2)
MTC
ATC
59 C200
F504
20
GY/PK
F C302
F504
14
GY/PK
18 C1
MODULE-
OCCUPANT
RESTRAINT
CONTROLLER
(8W-43-2)
Z911
20
BK
C115
20
DB
1 C1
CONTROL-A/C-
HEATER
(8W-42-2)
4
CONTROL-A/C-
HEATER-
REAR
(8W-42-9)
30 C1
10 IPM
DEFOGGER
RELAY
CONTROL
MODULE-
FRONT
CONTROL
(8W-13-21)
MODULE-
INTEGRATED
POWER
(8W-13-2)
G114
(8W-15-9)

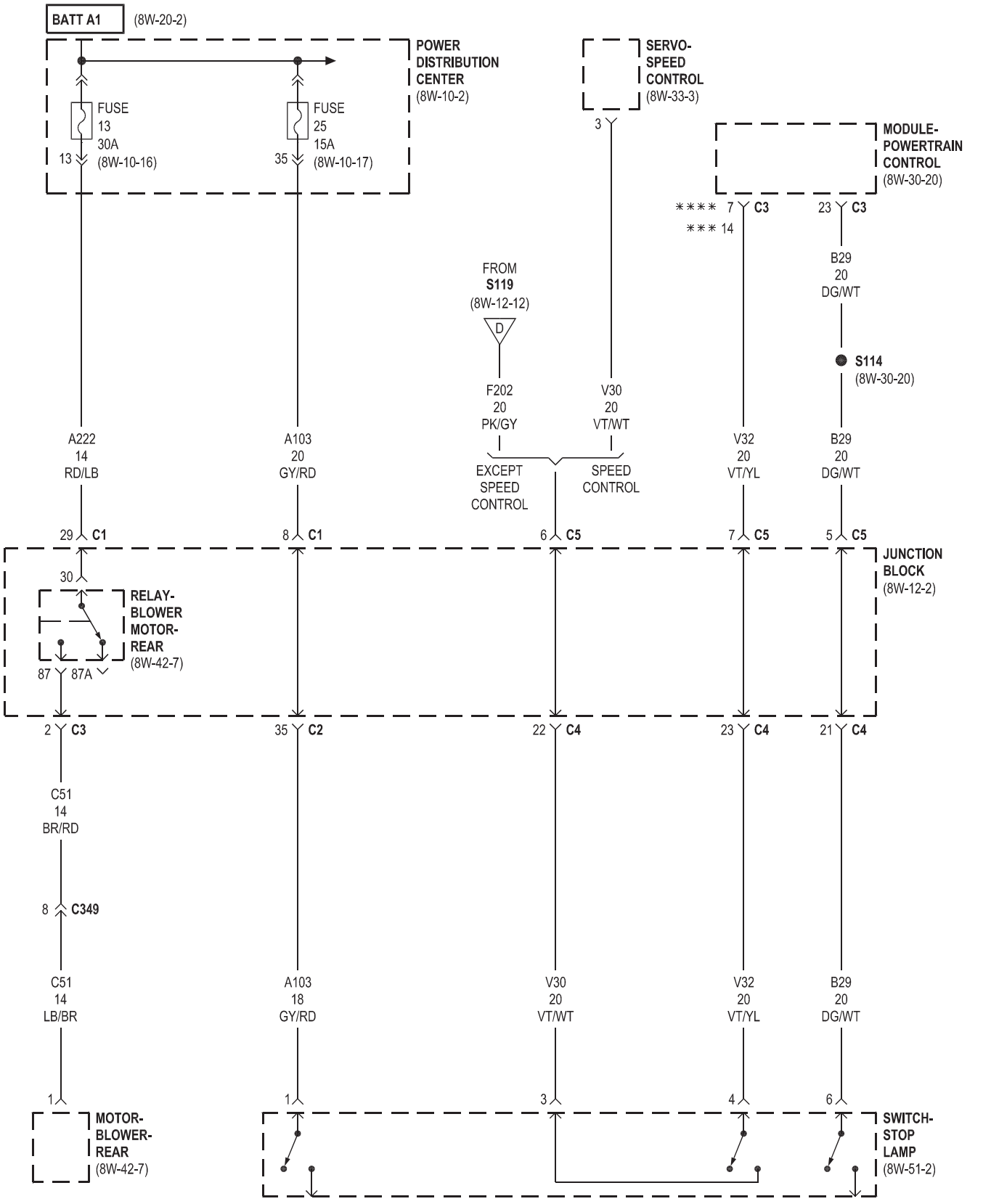

BATT A1
(8W-20-2)
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE 4 30A
(8W-10-10)
FROM SWITCH-IGNITION
(8W-12-11)
B
F
F901 14 BK
A904 14 RD/GY
F984 14 PK/TN
25 C2
32 C1
26 C2
JUNCTION BLOCK
(8W-12-2)
BATTERY
IGNITION
FUSE 34 10A
FUSE 35 20A
MODULE-INTEGRATED POWER
(8W-13-2)
FUSED IGNITION SWITCH OUTPUT (OFF-RUN-START)
MODULE-FRONT CONTROL
(8W-13-25)
13 IPM
36 C1
17 C1
9 C2
25 C3
39 C3
S201
(8W-10-10)
TO SWITCH-IGNITION
(8W-12-11)
10 C200
13 C221
S124
F1 20 PK/DG
F307 18 LB/PK
F307 16 YL/LB
F C105
2 C203
4 C220
A C302
12 C1
13 C3
1
5
MODULE-POWERTRAIN CONTROL
(8W-30-2)
CLUSTER
(8W-40-2)
(8W-40-7)
POWER OUTLET-CONSOLE
(8W-41-3)
MOTOR-SUNROOF
(8W-64-3)
POWER OUTLET-REAR
(8W-41-3)
▼ IGNITION
▼▼ BATTERY


BATT A1
(8W-20-2)
MODULE-
INTEGRATED
POWER
(8W-13-2)
FUSE
17
20A
(8W-13-11)
FUSE
14
20A
(8W-13-11)
RELAY-
PARK
LAMP
(8W-52-2)
FUSE
8
10A
(8W-13-13)
FUSE
10
10A
(8W-13-13)
RELAY-
WIPER-
REAR
(8W-53-4)
RELAY-
ADJUSTABLE
PEDALS
(8W-56-3)
REAR
WIPER
PARK
SWITCH
SENSE
MODULE-
FRONT
CONTROL
(8W-13-16)
W17
18
BR/LG
W13
18
LG/BR
A85
18
RD/LB
L77
20
PK/RD
L78
20
WT/OR
JUNCTION
BLOCK
(8W-12-2)
S300
(8W-13-14)
W17
18
BR/LG
W13
16
LG/BR
C326
L77
20
PK/RD
L78
20
WT/OR
SWITCH-
ADJUSTABLE
PEDALS
(8W-56-3)
LAMP-
LICENSE
PLATE
(8W-51-4)
MOTOR-
REAR
WINDOW
WIPER
(8W-53-4)
LAMP-
TAIL/
STOP/
TURN-
LEFT
(8W-51-4)
LAMP-
TAIL/
STOP/
TURN-
RIGHT
(8W-51-4)


MODULE-
FRONT
CONTROL
(8W-13-15)
CAN B
BUS (+)
2 C1
D55
20
WT/OR
15
9
7
12
DATA
LINK
CONNECTOR
(8W-18-2)
S123
(8W-18-4)
D15
20
BR/WT
D16
20
WT/PK
D21
20
WT/PK
D20
20
WT/BR
D55
20
WT/OR
D55
20
WT/OR
26 C4
25 C4
28 C4
27 C4
27 C1
1 C5
JUNCTION
BLOCK
(8W-12-2)
10 C5
9 C5
12 C5
11 C5
11 C3
17 C4
D55
20
WT/OR
D55
20
WT/OR
EXCEPT
BASE
BASE
S310
(8W-18-4)
S208
(8W-18-3)
D15
20
BR/WT
D16
20
WT/PK
D21
20
WT/GY
D20
20
WT/BR
D55
20
WT/OR
F
E
H
G
C108
D
C249
D15
20
BR/WT
D16
20
WT/PK
D21
20
WT/GY
D20
20
WT/BR
D55
20
WT/OR
D55
20
WT/OR
37 C1
26 C1
36 C1
25 C1
4 C1
3 C2
MODULE-
POWERTRAIN
CONTROL
(8W-30-13)
MODULE-
OCCUPANT
CLASSIFICATION
(8W-43-6)
MODULE-
OCCUPANT
RESTRAINT
CONTROLLER
(8W-43-2)

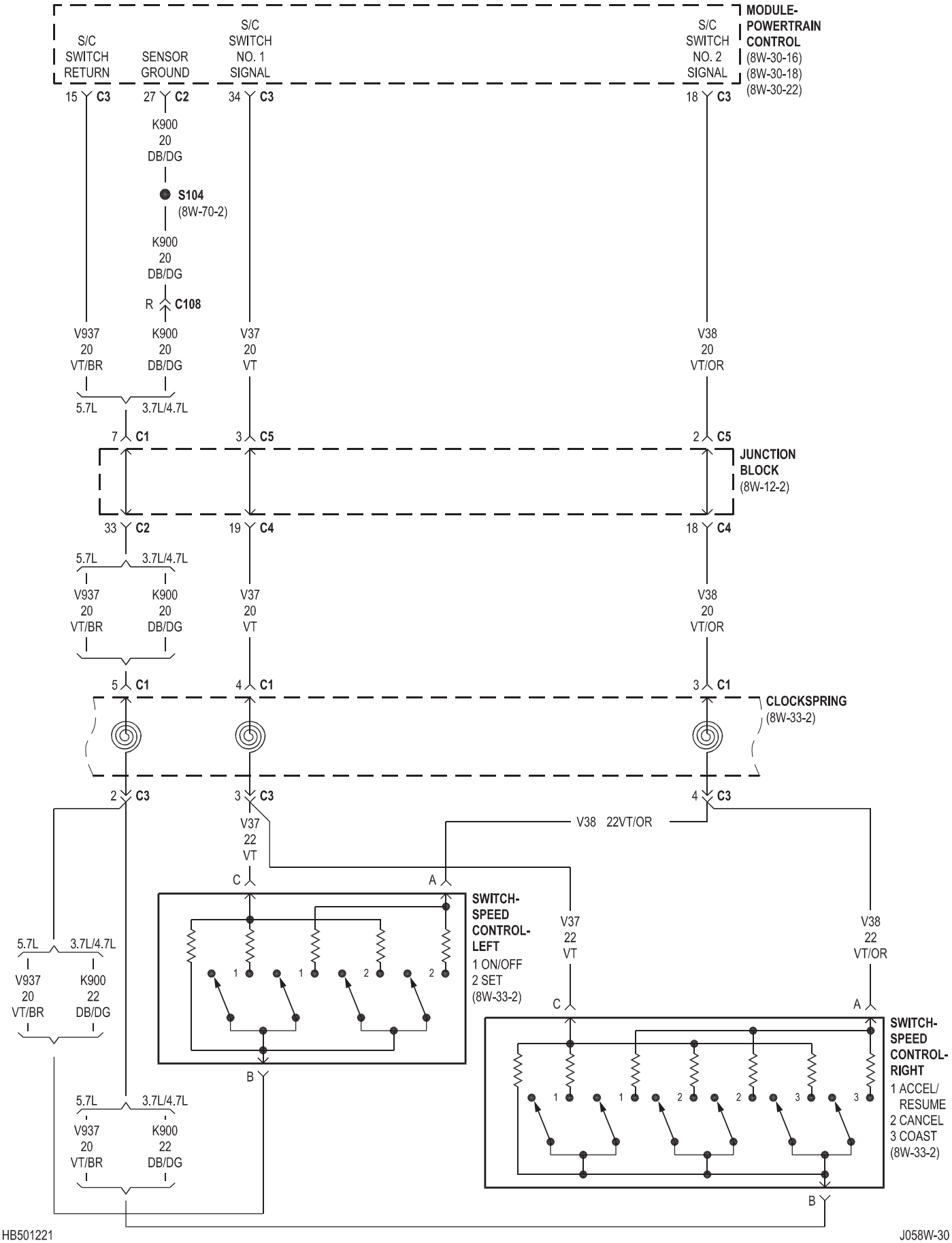

MODULE-
FRONT
CONTROL
(8W-13-15)
3 C1
D54
20
WT
S125
(8W-18-6)
D54
20
WT
17 C5
D54
20
WT
28 C1
D54
20
WT
SWITCH-
STOP
LAMP
(8W-51-2)
2
L50
18
WT/TN
36 C2
JUNCTION
BLOCK
(8W-12-2)
1 C4
D54
20
WT
12 C3
D54
20
WT
19 C3
20 C1
L50
20
WT/TN
EXCEPT
TRAILER
TOW
TRAILER
TOW
BASE
EXCEPT
BASE
S207
(8W-18-5)
S309
(8W-18-6)
D54
20
WT
L50
18
WT/TN
L50
20
WT/TN
S122
(8W-13-24)
L50
20
WT/TN
3
MODULE-
BRAKE
PROVISION
(8W-54-2)
21 C1
BRAKE
LAMP
SWITCH
OUTPUT
MODULE-
FRONT
CONTROL
(8W-13-16)
(8W-13-24)
C C249
S303
(8W-13-24)
L50
18
WT/TN
5 C326
D54
20
WT
D54
20
WT
L50
18
WT/TN
L50
18
WT/TN
L50
18
WT/TN
4 C2
5 C1
1
4
1
MODULE-
OCCUPANT
RESTRAINT
CONTROLLER
(8W-43-2)
MODULE-
OCCUPANT
CLASSIFICATION
(8W-43-6)
LAMP-
TAIL/
STOP/
TURN-
RIGHT
(8W-51-4)
LAMP-
TAIL/
STOP/
TURN-
LEFT
(8W-51-4)
LAMP-
HIGH
MOUNTED
STOP
(8W-51-2)

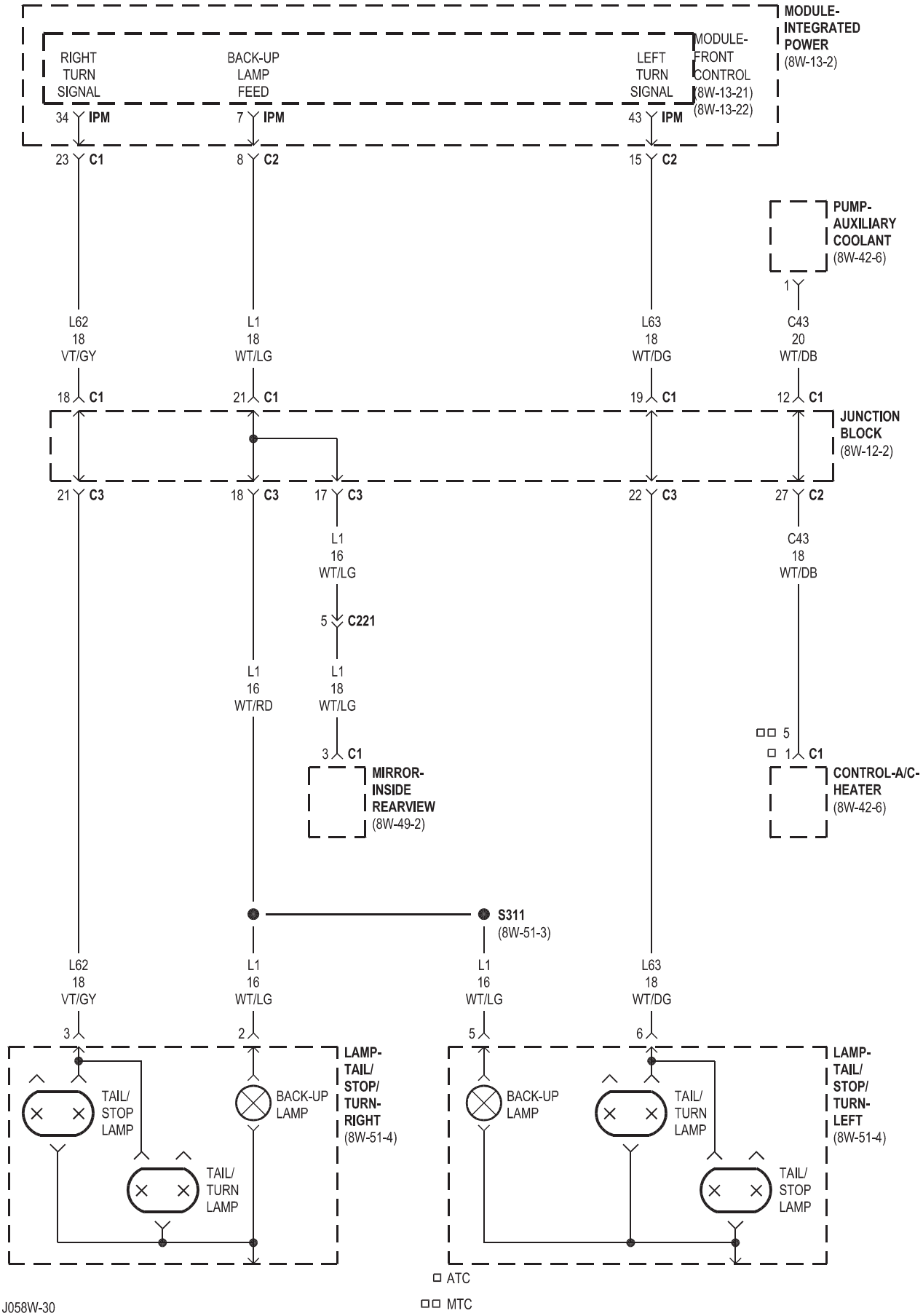

BATT A1
(8W-20-2)
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE
5
40A
5
(8W-10-11)
A940
12
RD/GY
25 C1
JUNCTION BLOCK
(8W-12-2)
1 C3
A940
12
RD/GY
S356
(8W-10-11)
A940
12
RD/GY
S C249
A940
12
RD/GY
6
SWITCH-SEAT-PASSENGER
(8W-63-6)
A940
12
RD/GY
2
MODULE-HEATED SEAT
(8W-63-8)
A940
12
RD/GY
D C250
A940
12
RD/GY
MEMORY
EXCEPT MEMORY
8 C1
MODULE-SEAT MEMORY
(8W-63-2)
6
SWITCH-SEAT-DRIVER
(8W-63-5)

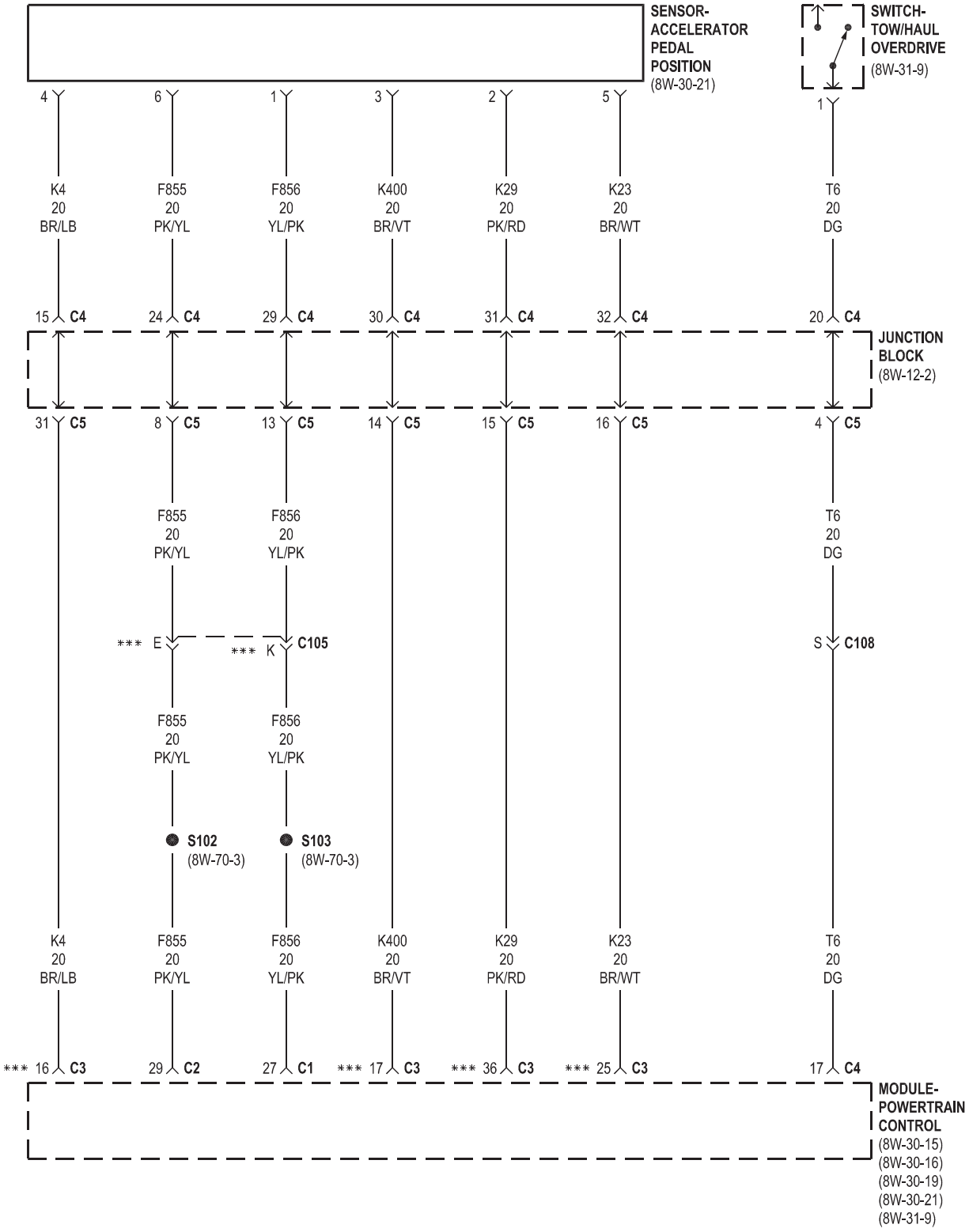

BATT A1
(8W-20-2)
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE 13 30A
13
(8W-10-16)
FUSE 25 15A
35
(8W-10-17)
SERVO-SPEED CONTROL
(8W-33-3)
3
MODULE-POWERTRAIN CONTROL
(8W-30-20)
**** 7 C3
*** 14
23 C3
B29 20 DG/WT
S114
(8W-30-20)
FROM S119
(8W-12-12)
D
F202 20 PK/GY
V30 20 VT/WT
EXCEPT SPEED CONTROL
SPEED CONTROL
A222 14 RD/LB
A103 20 GY/RD
V32 20 VT/YL
B29 20 DG/WT
29 C1
8 C1
6 C5
7 C5
5 C5
JUNCTION BLOCK
(8W-12-2)
30
RELAY-BLOWER MOTOR-REAR
(8W-42-7)
87
87A
2 C3
35 C2
22 C4
23 C4
21 C4
C51 14 BR/RD
8 C349
C51 14 LB/BR
A103 18 GY/RD
V30 20 VT/WT
V32 20 VT/YL
B29 20 DG/WT
1
1
3
4
6
MOTOR-BLOWER-REAR
(8W-42-7)
SWITCH-STOP LAMP
(8W-51-2)

*** 5.7L

**** 3.7L/4.7L


MODULE-
POWERTRAIN
CONTROL
(8W-30-16)
(8W-30-18)
(8W-30-22)
S/C
SWITCH
RETURN
SENSOR
GROUND
S/C
SWITCH
NO. 1
SIGNAL
S/C
SWITCH
NO. 2
SIGNAL
15 C3
27 C2
34 C3
18 C3
K900
20
DB/DG
S104
(8W-70-2)
K900
20
DB/DG
R C108
V937
20
VT/BR
K900
20
DB/DG
V37
20
VT
V38
20
VT/OR
5.7L
3.7L/4.7L
7 C1
3 C5
2 C5
JUNCTION
BLOCK
(8W-12-2)
33 C2
19 C4
18 C4
5.7L
3.7L/4.7L
V937
20
VT/BR
K900
20
DB/DG
V37
20
VT
V38
20
VT/OR
5 C1
4 C1
3 C1
CLOCKSPRING
(8W-33-2)
2 C3
3 C3
4 C3
V37
22
VT
V38 22VT/OR
C
A
SWITCH-
SPEED
CONTROL-
LEFT
1 ON/OFF
2 SET
(8W-33-2)
V37
22
VT
V38
22
VT/OR
5.7L
3.7L/4.7L
V937
20
VT/BR
K900
22
DB/DG
B
C
A
SWITCH-
SPEED
CONTROL-
RIGHT
1 ACCEL/
RESUME
2 CANCEL
3 COAST
(8W-33-2)
B


MODULE-INTEGRATED POWER (8W-13-2)
MODULE-FRONT CONTROL (8W-13-21) (8W-13-22)
RIGHT TURN SIGNAL
BACK-UP LAMP FEED
LEFT TURN SIGNAL
34 IPM
7 IPM
43 IPM
23 C1
8 C2
15 C2
PUMP-AUXILIARY COOLANT (8W-42-6)
1
L62 18 VT/GY
L1 18 WT/LG
L63 18 WT/DG
C43 20 WT/DB
18 C1
21 C1
19 C1
12 C1
JUNCTION BLOCK (8W-12-2)
21 C3
18 C3
17 C3
22 C3
27 C2
L1 16 WT/LG
5 C221
C43 18 WT/DB
L1 16 WT/RD
L1 18 WT/LG
5
1 C1
3 C1
MIRROR-INSIDE REARVIEW (8W-49-2)
CONTROL-A/C-HEATER (8W-42-6)
S311 (8W-51-3)
L62 18 VT/GY
L1 16 WT/LG
L1 16 WT/LG
L63 18 WT/DG
3
2
5
6
LAMP-TAIL/STOP/TURN-RIGHT (8W-51-4)
LAMP-TAIL/STOP/TURN-LEFT (8W-51-4)
TAIL/STOP LAMP
BACK-UP LAMP
TAIL/TURN LAMP
BACK-UP LAMP
TAIL/TURN LAMP
TAIL/STOP LAMP
ATC
MTC

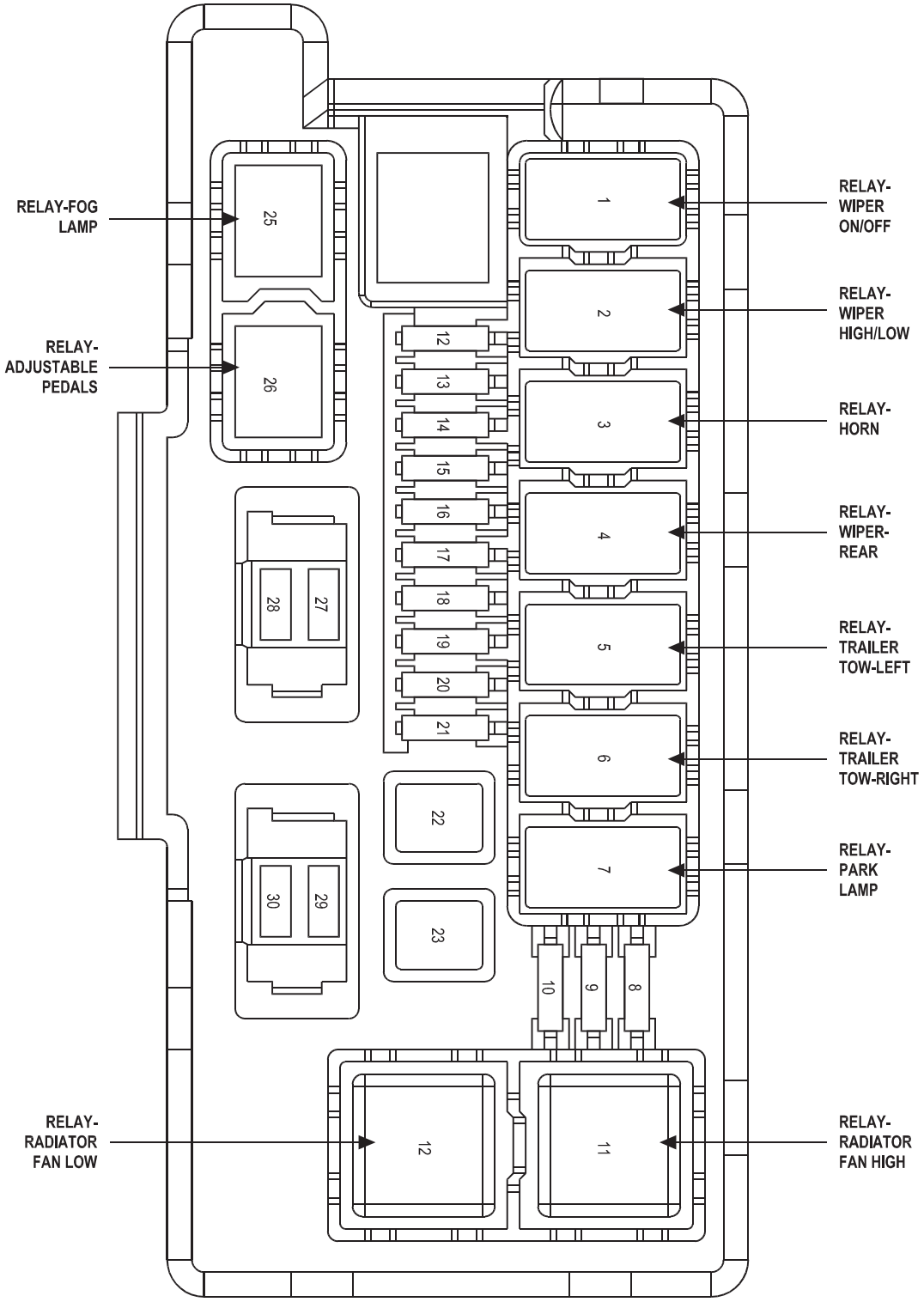

SENSOR-
ACCELERATOR
PEDAL
POSITION
(8W-30-21)
SWITCH-
TOW/HAUL
OVERDRIVE
(8W-31-9)
4
6
1
3
2
5
1
K4
20
BR/LB
F855
20
PK/YL
F856
20
YL/PK
K400
20
BR/VT
K29
20
PK/RD
K23
20
BR/WT
T6
20
DG
15 C4
24 C4
29 C4
30 C4
31 C4
32 C4
20 C4
JUNCTION
BLOCK
(8W-12-2)
31 C5
8 C5
13 C5
14 C5
15 C5
16 C5
4 C5
F855
20
PK/YL
F856
20
YL/PK
T6
20
DG
*** E
*** K
C105
S C108
F855
20
PK/YL
F856
20
YL/PK
S102
(8W-70-3)
S103
(8W-70-3)
K4
20
BR/LB
F855
20
PK/YL
F856
20
YL/PK
K400
20
BR/VT
K29
20
PK/RD
K23
20
BR/WT
T6
20
DG
*** 16 C3
29 C2
27 C1
*** 17 C3
*** 36 C3
*** 25 C3
17 C4
MODULE-
POWERTRAIN
CONTROL
(8W-30-15)
(8W-30-16)
(8W-30-19)
(8W-30-21)
(8W-31-9)

*** 5.7L

8W-13 INTEGRATED POWER MODULE

Component	Page
Assembly-Shift Motor/Mode Sensor	8W-13-16, 20, 25
Battery	8W-13-7
Cluster	8W-13-12
Data Link Connector	8W-13-15
Fan Module-Condenser Cooling	8W-13-10
Fuse 1	8W-13-7, 25
Fuse 2	8W-13-23
Fuse 7	8W-13-23
Fuse 8	8W-13-13, 14
Fuse 9	8W-13-13
Fuse 10	8W-13-13, 14, 23
Fuse 11	8W-13-12
Fuse 12	8W-13-8, 12
Fuse 13	8W-13-8, 11, 12
Fuse 14	8W-13-8, 11
Fuse 15	8W-13-8, 10
Fuse 16	8W-13-7, 8, 9, 25
Fuse 17	8W-13-8, 11
Fuse 18	8W-13-8, 12, 19
Fuse 19	8W-13-8, 9
Fuse 20	8W-13-8, 12
Fuse 21	8W-13-8, 9
Fuse 22	8W-13-8, 12
Fuse 23	8W-13-8, 10
Fuse 27	8W-13-8, 12
Fuse 28	8W-13-8, 11
Fuse 34	8W-13-25
G114	8W-13-12, 22, 25
Horn-No. 1	8W-13-9
Horn-No. 2	8W-13-9
Junction Block	8W-13-8, 11, 12, 13, 14, 15, 16, 19, 21, 22, 24, 25
Lamp-Fog-Left Front	8W-13-10
Lamp-Fog-Right Front	8W-13-10
Lamp-Headlamp-Left	8W-13-18
Lamp-Headlamp-Right	8W-13-18
Lamp-High Mounted Stop	8W-13-24
Lamp-License Plate	8W-13-14
Lamp-Park/Turn-Left Front	8W-13-13, 18
Lamp-Park/Turn-Right Front	8W-13-13, 18
Lamp-Side Marker-Left Front	8W-13-13
Lamp-Side Marker-Right Front	8W-13-13
Lamp-Tail/Stop/Turn-Left	8W-13-14, 21, 22, 24
Lamp-Tail/Stop/Turn-Right	8W-13-14, 21, 22, 24
Mirror-Inside Rearview	8W-13-21
Module-Antilock Brakes	8W-13-17
Module-Brake Provision	8W-13-24
Module-Front Control	8W-13-8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25
Module-Integrated Power	8W-13-2, 8, 9, 10, 11, 12, 13, 19, 20, 21, 22, 23, 25
Module-Occupant Classification	8W-13-15
Module-Powertrain Control	8W-13-17, 19
Motor-Rear Window Wiper	8W-13-11, 16
Motor-Windshield Wiper	8W-13-19
Power Distribution Center	8W-13-7, 8, 23, 25
Pump-Washer Windshield	8W-13-22
Relay-A/C Clutch	8W-13-19
Relay-Accessory Delay	8W-13-21
Relay-Adjustable Pedals	8W-13-8, 11
Relay-Auto Shut Down	8W-13-23
Relay-Blower Motor-Front	8W-13-23
Relay-Fog Lamp	8W-13-8, 10
Relay-Fuel Pump	8W-13-19
Relay-Horn	8W-13-8, 9
Relay-Park Lamp	8W-13-8, 13
Relay-Radiator Fan High	8W-13-8, 10
Relay-Radiator Fan Low	8W-13-8, 10
Relay-Rear Window Defogger	8W-13-21
Relay-Run/Start	8W-13-25
Relay-Starter Motor	8W-13-7
Relay-Trailer Tow-Left	8W-13-8, 9
Relay-Trailer Tow-Right	8W-13-8, 9
Relay-Wiper High/Low	8W-13-23
Relay-Wiper On/Off	8W-13-23
Relay-Wiper-Rear	8W-13-8, 11
Resistor-Radiator Fan	8W-13-10
Sensor-Ambient Air Temperature	8W-13-18
Sensor-Battery Temperature	8W-13-16
Sensor-Washer Fluid Level-Front Rear	8W-13-16, 20
Switch-Adjustable Pedals	8W-13-11
Switch-Hood Ajar	8W-13-25
Switch-Stop Lamp	8W-13-16, 24
Transducer-A/C Pressure	8W-13-16, 20
Wiring-Trailer Tow 4-Way	8W-13-9, 13
Wiring-Trailer Tow 7-Way	8W-13-9, 13, 21

MODULE- INTEGRATED POWER



FUSES

FUSE NO.	AMPS	FUSED CIRCUIT	FUNCTION
8	10A	L77 20PK/RD	FUSED LEFT INBOARD TAIL LAMP
9	10A	L76 20PK/RD	FUSED PARK LAMP RELAY OUTPUT
10	10A	L78 20WT/OR	FUSED PARK LAMP RELAY OUTPUT
12	20A	INTERNAL	FUSED B(+)
13	20A	INTERNAL	FUSED B(+)
14	20A	INTERNAL	FUSED B(+)
15	20A	INTERNAL	FUSED B(+)
16	20A	INTERNAL	FUSED B(+)
17	20A	INTERNAL	FUSED B(+)
18	20A	INTERNAL	FUSED B(+)
19	20A	INTERNAL	FUSED B(+)
20	20A	INTERNAL	FUSED B(+)
21	20A	INTERNAL	FUSED B(+)
22	30A	INTERNAL	FUSED B(+)
23	40A	INTERNAL	FUSED B(+)
27	30A	A920 14OR/RD	FUSED B(+)
28	30A	A918 14OR/LG	FUSED B(+)
29	-	-	-
30	-	-	-

RELAYS

RELAY-ADJUSTABLE PEDALS

CAVITY	CIRCUIT	FUNCTION
30	A902 18RD	FUSED B(+)
85	P201 20LG/DB	ADJUSTABLE PEDALS RELAY CONTROL
86	A902 18RD	FUSED B(+)
87	-	-
87A	A85 18RD/LB	ADJUSTABLE PEDALS RELAY OUTPUT

RELAY-FOG LAMP

CAVITY	CIRCUIT	FUNCTION
30	A39 18RD/LG	FUSED B(+)
85	L139 20WT/YL	FOG LAMP RELAY CONTROL
86	A39 18RD/LG	FUSED B(+)
87	L89 18WT/YL	FRONT FOG LAMP RELAY OUTPUT
87A	-	-

RELAY-HORN

CAVITY	CIRCUIT	FUNCTION
30	A950 18RD	FUSED B(+)
85	X4 20DG/WT	HORN RELAY CONTROL
86	A950 18RD	FUSED B(+)
87	X2 18DG/OR	HORN RELAY OUTPUT
87A	-	-

RELAYS

RELAY-PARK LAMP

CAVITY	CIRCUIT	FUNCTION
30	A913 6RD	FUSED B(+)
85	L779 20WT/LB	PARK LAMP RELAY CONTROL
86	A914 6RD	PARK LAMP RELAY OUTPUT
87	A914 6RD	PARK LAMP RELAY OUTPUT
87A	Z385 20BK	GROUND

RELAY-RADIATOR FAN HIGH

CAVITY	CIRCUIT	FUNCTION
30	A16 12RD/BR	FUSED B(+)
85	N112 20DB/OR	HIGH SPEED RADIATOR FAN RELAY CONTROL
86	A16 12RD/BR	FUSED B(+)
87	N23 12DB/DG	HIGH SPEED RADIATOR FAN RELAY OUTPUT
87A	-	-

RELAY-RADIATOR FAN LOW

CAVITY	CIRCUIT	FUNCTION
30	A16 12RD/BR	FUSED B(+)
85	N201 20DB/LG	LOW SPEED RADIATOR FAN RELAY CONTROL
86	A16 12RD/BR	FUSED B(+)
87	N202 12DB/OR	RADIATOR FAN NO. 1 CONTROL
87A	-	-

RELAY-TRAILER TOW-LEFT

CAVITY	CIRCUIT	FUNCTION
30	A911 20RD	FUSED B(+)
85	L655 20WT/OR	LEFT TRAILER TOW BRAKE LAMP RELAY CONTROL
86	A911 20RD	FUSED B(+)
87	L673 18YL	LEFT TRAILER TOW BRAKE LAMP RELAY OUTPUT
87A	-	-

RELAYS

RELAY-TRAILER TOW-RIGHT

CAVITY	CIRCUIT	FUNCTION
30	A910 20RD	FUSED B(+)
85	L656 20WT/DG	RIGHT TRAILER TOW BRAKE LAMP RELAY CONTROL
86	A910 20RD	FUSED B(+)
87	L674 18LG	RIGHT TRAILER TOW BRAKE LAMP RELAY OUTPUT
87A	-	-

RELAY-WIPER HIGH/LOW

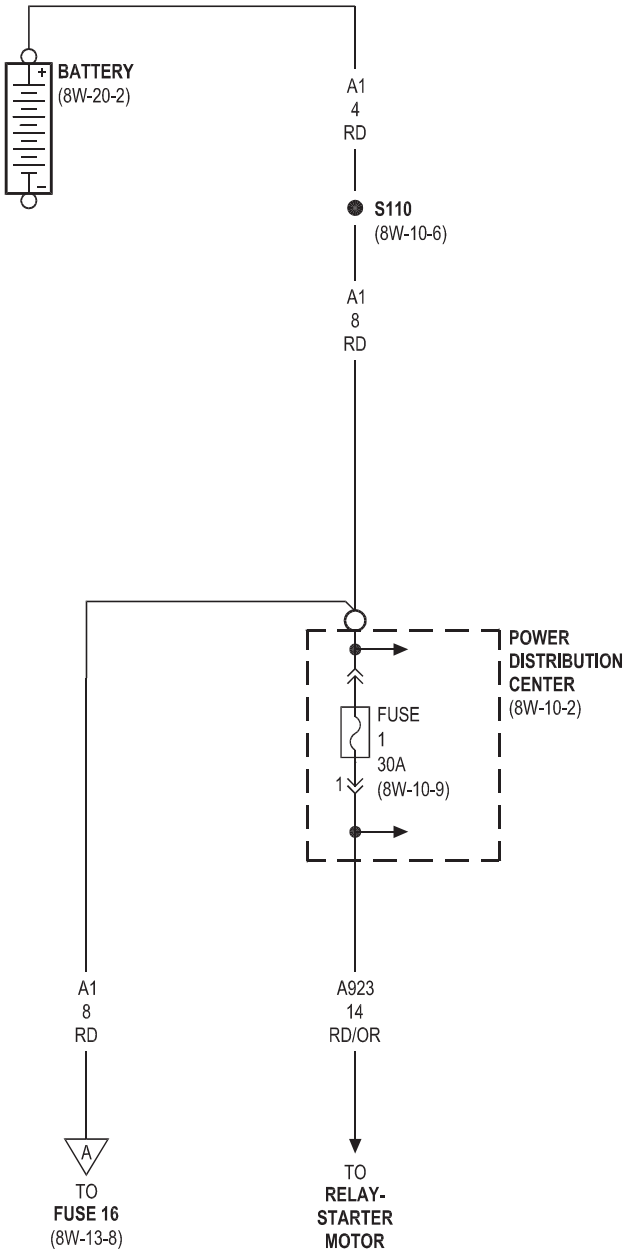
CAVITY	CIRCUIT	FUNCTION
30	A951 14RD	FUSED B(+)
85	W2 20BR/LG	HIGH/LOW WIPER RELAY CONTROL
86	A5 14RD/VT	FUSED B(+)
87	W4 14BR/OR	FRONT WIPER HIGH/LOW RELAY HIGH SPEED OUTPUT
87A	W3 14BR/WT	FRONT WIPER HIGH/LOW RELAY LOW SPEED OUTPUT

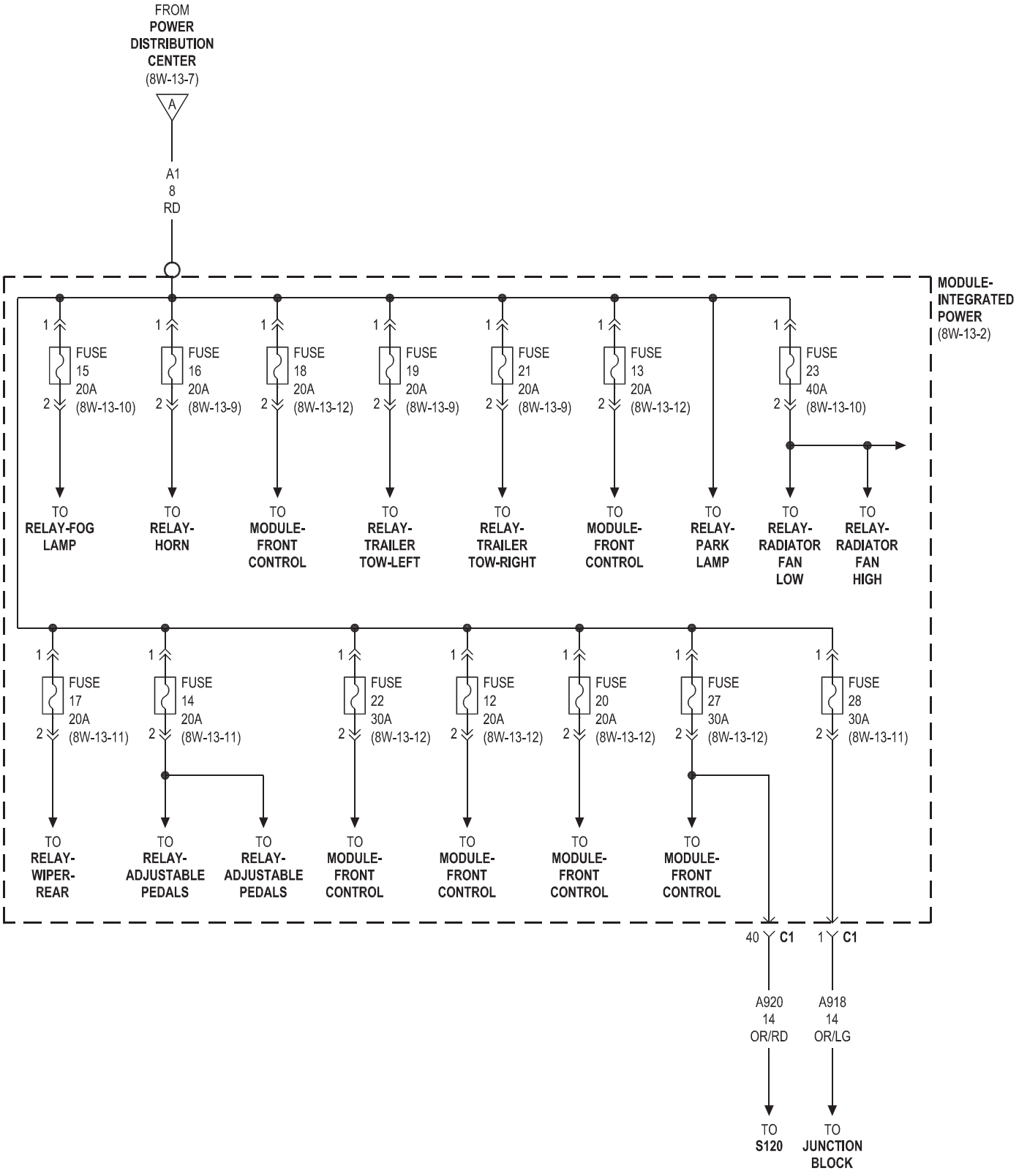
RELAY-WIPER ON/OFF

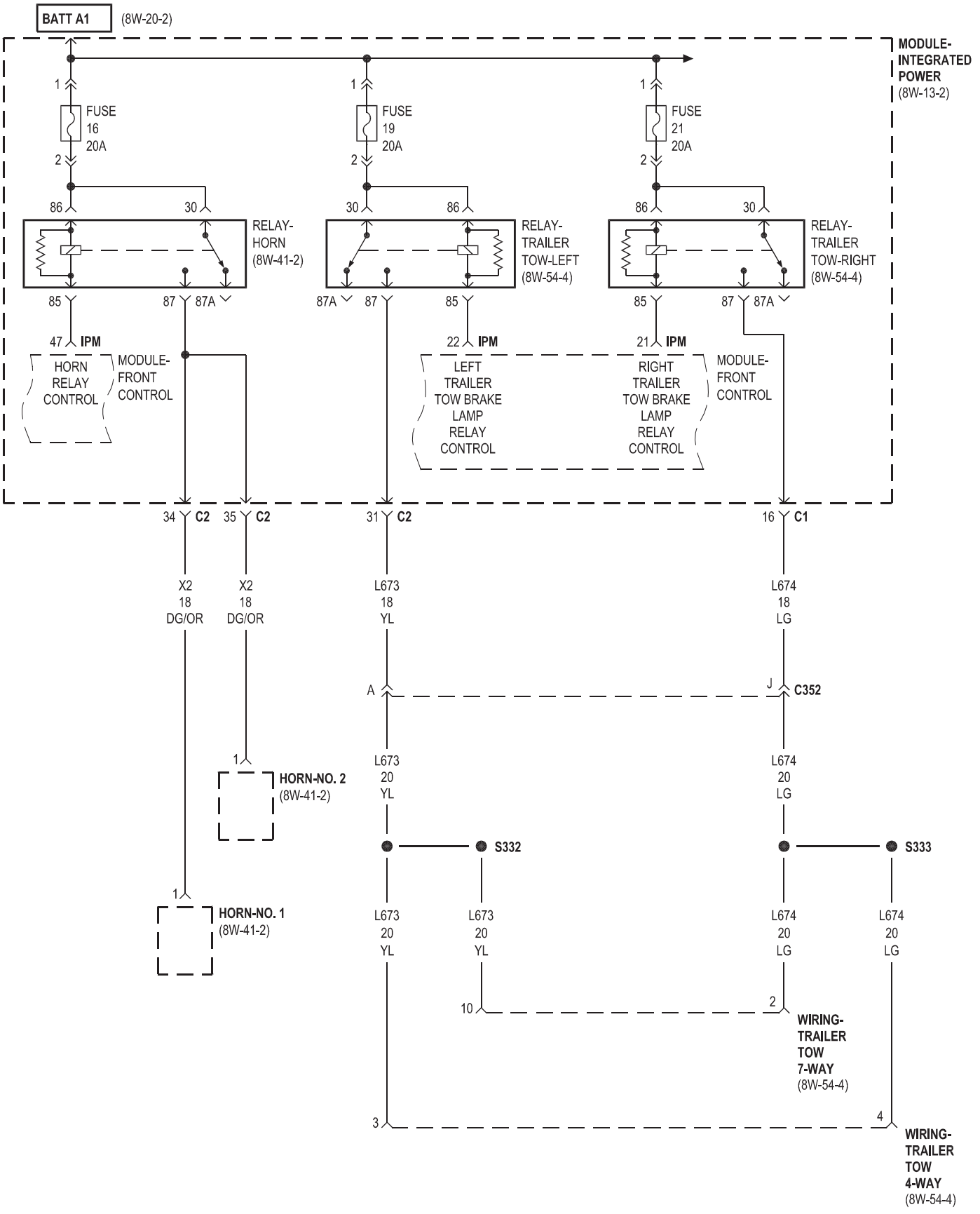
CAVITY	CIRCUIT	FUNCTION
30	A951 14RD	FUSED B(+)
85	W5 20BR/LG	ON/OFF WIPER RELAY CONTROL
86	A5 14RD/VT	FUSED B(+)
87	A5 14RD/VT	FUSED B(+)
87A	Z902 14BK	GROUND

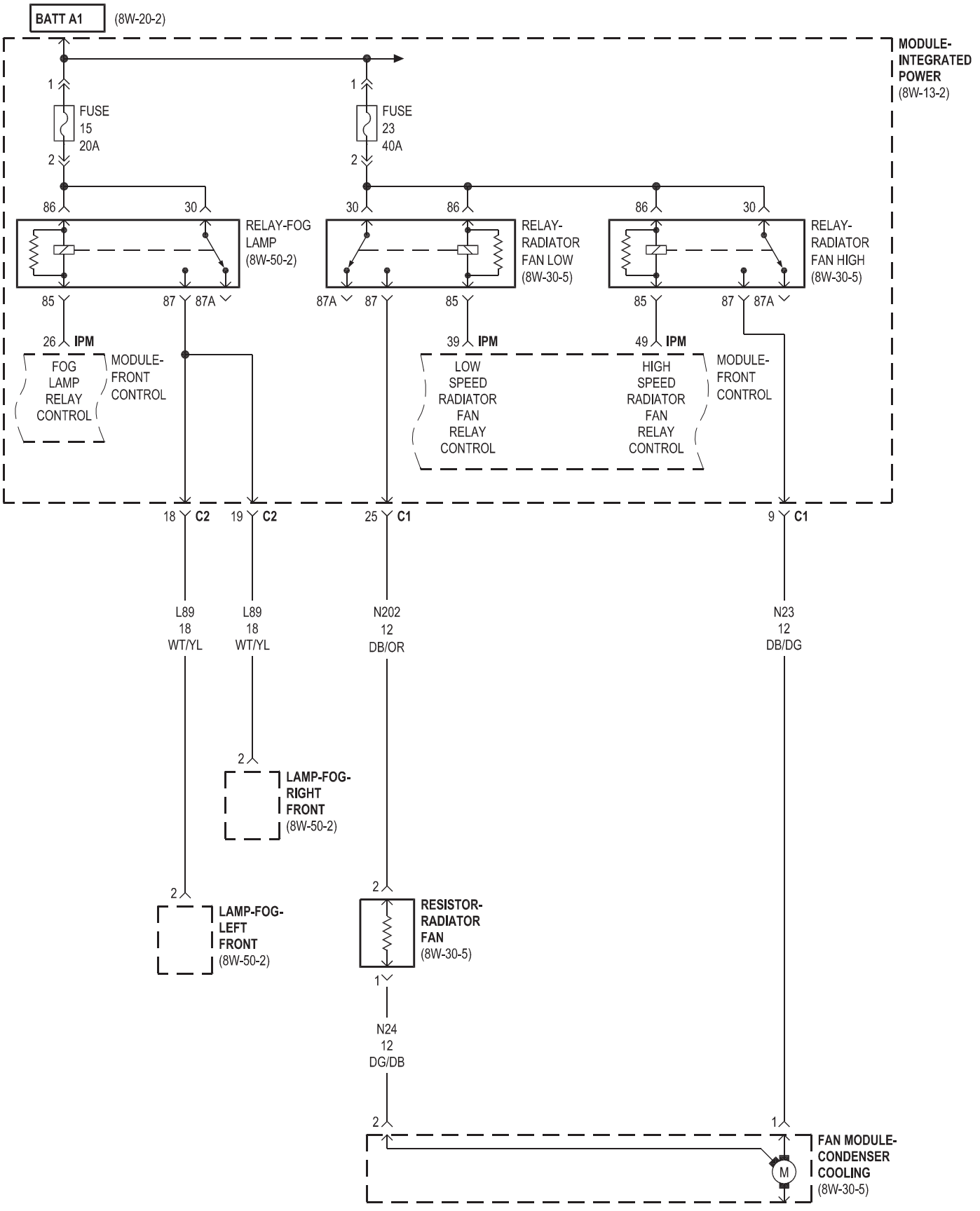
RELAY-WIPER-REAR

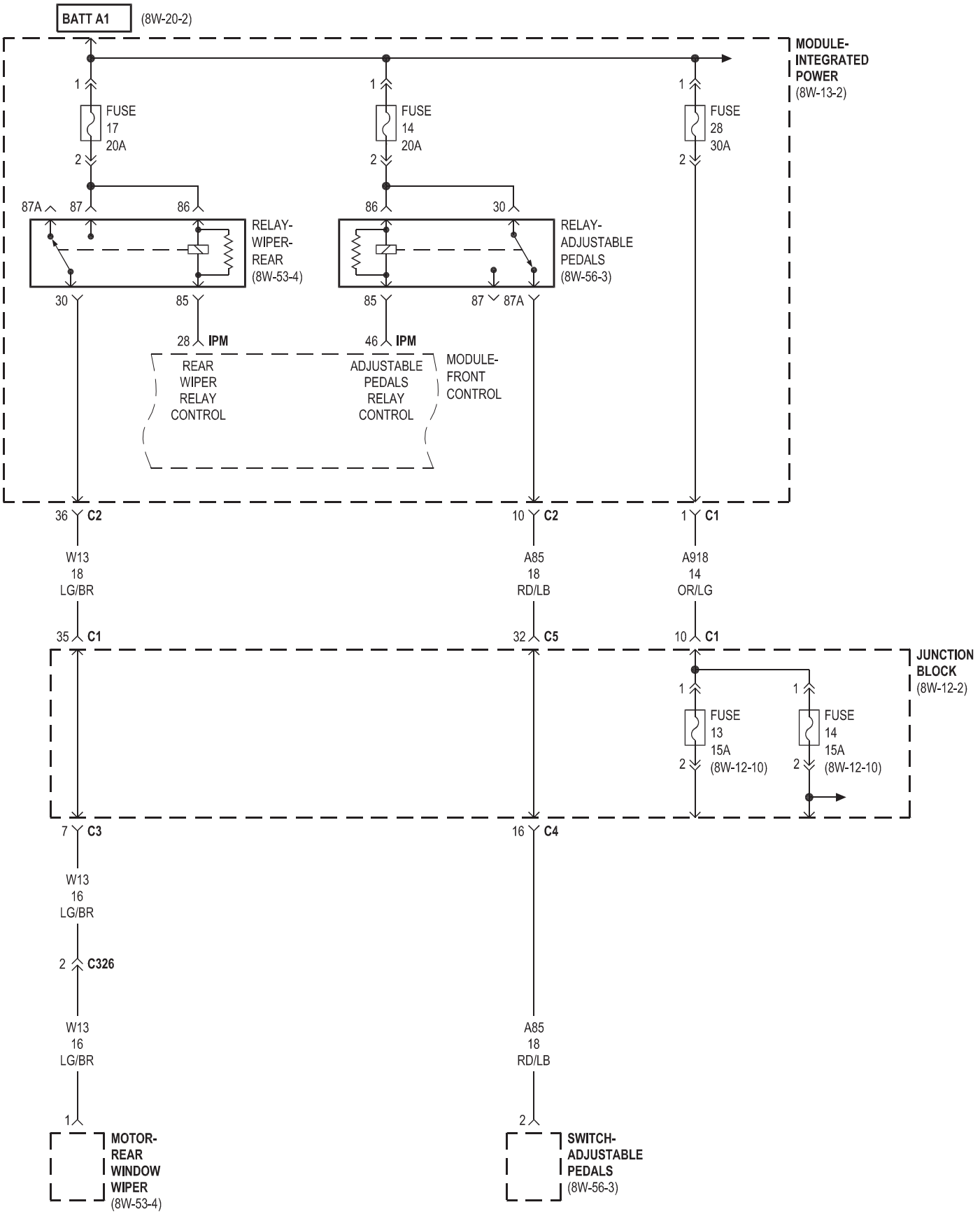
CAVITY	CIRCUIT	FUNCTION
30	W13 18LG/BR	REAR WIPER MOTOR CONTROL
85	W12 20BR/OR	REAR WIPER RELAY CONTROL
86	A44 18RD/OR	FUSED B(+)
87	A44 18RD/OR	FUSED B(+)
87A	Z901 18BK	GROUND

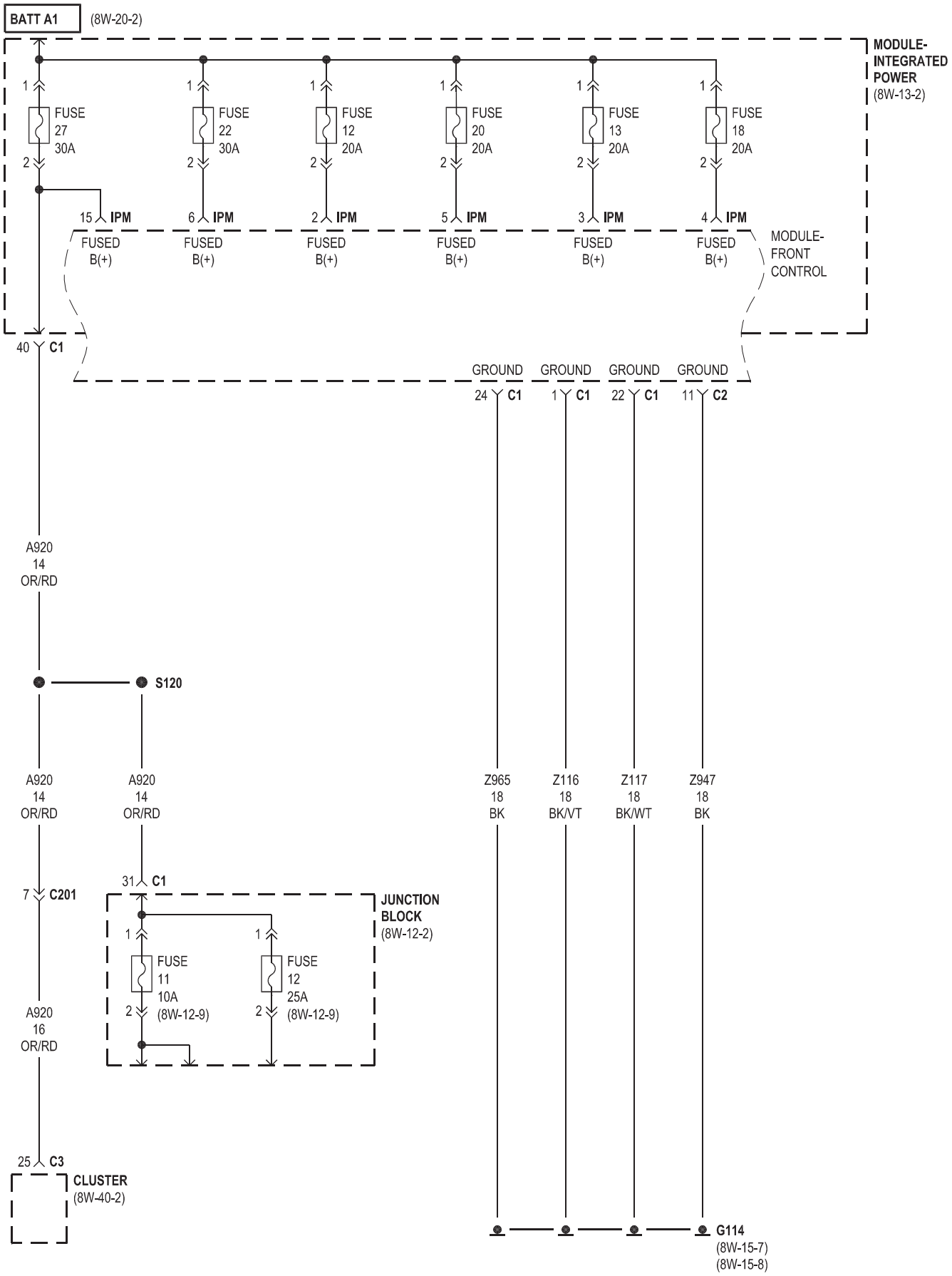

BATTERY
(8W-20-2)
A1
4
RD
S110
(8W-10-6)
A1
8
RD
POWER
DISTRIBUTION
CENTER
(8W-10-2)
FUSE
1
30A
(8W-10-9)
1
A1
8
RD
A923
14
RD/OR
A
TO
FUSE 16
(8W-13-8)
TO
RELAY-
STARTER
MOTOR

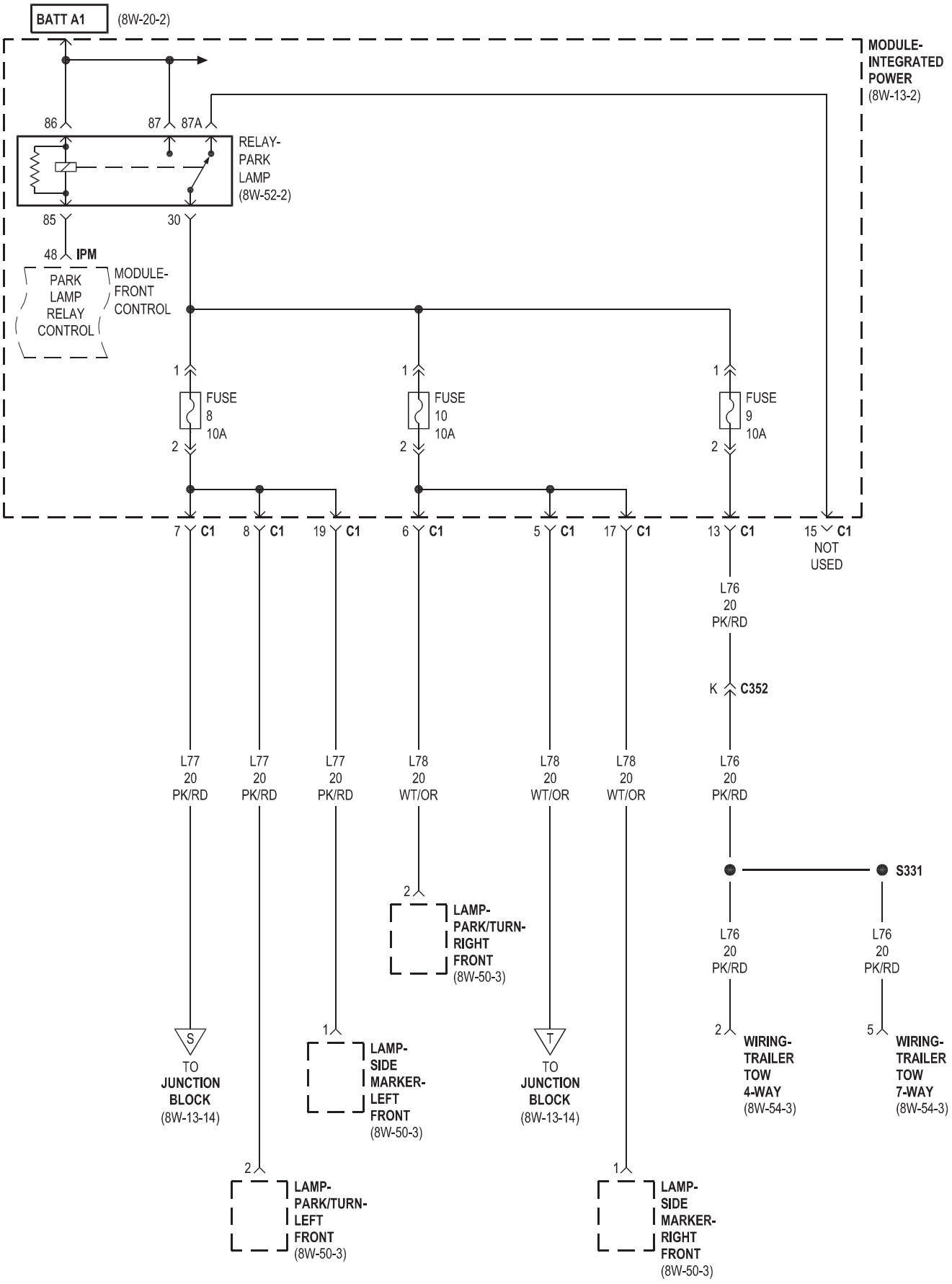

FROM
POWER
DISTRIBUTION
CENTER
(8W-13-7)
A
A1
8
RD
MODULE-
INTEGRATED
POWER
(8W-13-2)
1
2
FUSE
15
20A
(8W-13-10)
TO
RELAY-FOG
LAMP
FUSE
16
20A
(8W-13-9)
TO
RELAY-
HORN
FUSE
18
20A
(8W-13-12)
TO
MODULE-
FRONT
CONTROL
FUSE
19
20A
(8W-13-9)
TO
RELAY-
TRAILER
TOW-LEFT
FUSE
21
20A
(8W-13-9)
TO
RELAY-
TRAILER
TOW-RIGHT
FUSE
13
20A
(8W-13-12)
TO
MODULE-
FRONT
CONTROL
TO
RELAY-
PARK
LAMP
FUSE
23
40A
(8W-13-10)
TO
RELAY-
RADIATOR
FAN
LOW
TO
RELAY-
RADIATOR
FAN
HIGH
FUSE
17
20A
(8W-13-11)
TO
RELAY-
WIPER-
REAR
FUSE
14
20A
(8W-13-11)
TO
RELAY-
ADJUSTABLE
PEDALS
TO
RELAY-
ADJUSTABLE
PEDALS
FUSE
22
30A
(8W-13-12)
TO
MODULE-
FRONT
CONTROL
FUSE
12
20A
(8W-13-12)
TO
MODULE-
FRONT
CONTROL
FUSE
20
20A
(8W-13-12)
TO
MODULE-
FRONT
CONTROL
FUSE
27
30A
(8W-13-12)
TO
MODULE-
FRONT
CONTROL
FUSE
28
30A
(8W-13-11)
40
C1
1
C1
A920
14
OR/RD
A918
14
OR/LG
TO
S120
TO
JUNCTION
BLOCK

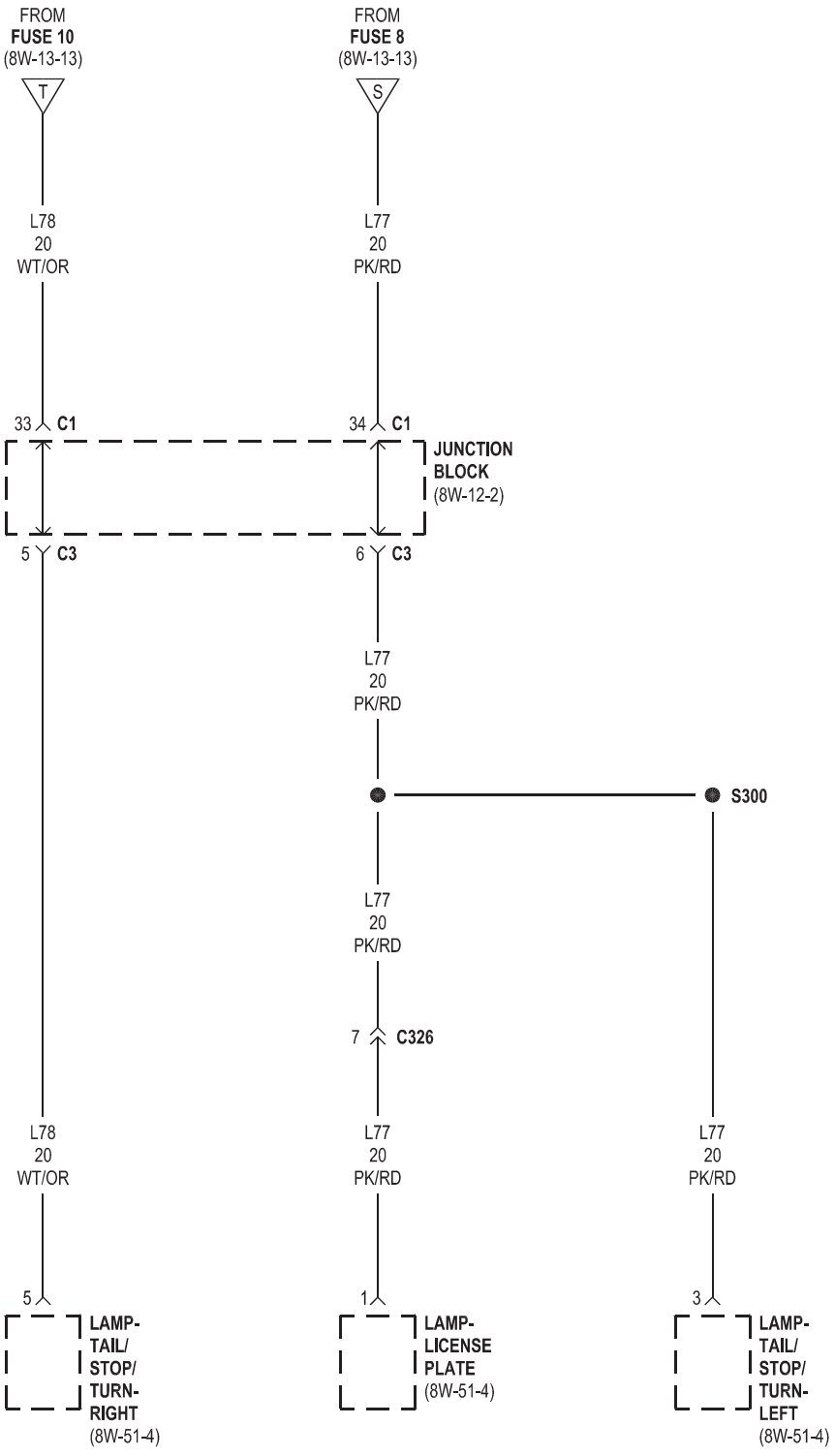

BATT A1
(8W-20-2)
MODULE-
INTEGRATED
POWER
(8W-13-2)
FUSE
16
20A
FUSE
19
20A
FUSE
21
20A
RELAY-
HORN
(8W-41-2)
RELAY-
TRAILER
TOW-LEFT
(8W-54-4)
RELAY-
TRAILER
TOW-RIGHT
(8W-54-4)
47 IPM
HORN
RELAY
CONTROL
MODULE-
FRONT
CONTROL
22 IPM
LEFT
TRAILER
TOW BRAKE
LAMP
RELAY
CONTROL
21 IPM
RIGHT
TRAILER
TOW BRAKE
LAMP
RELAY
CONTROL
MODULE-
FRONT
CONTROL
34 C2
35 C2
31 C2
16 C1
X2
18
DG/OR
X2
18
DG/OR
L673
18
YL
L674
18
LG
A
J C352
HORN-NO. 2
(8W-41-2)
HORN-NO. 1
(8W-41-2)
L673
20
YL
L674
20
LG
S332
S333
L673
20
YL
L673
20
YL
L674
20
LG
L674
20
LG
10
2
WIRING-
TRAILER
TOW
7-WAY
(8W-54-4)
3
4
WIRING-
TRAILER
TOW
4-WAY
(8W-54-4)

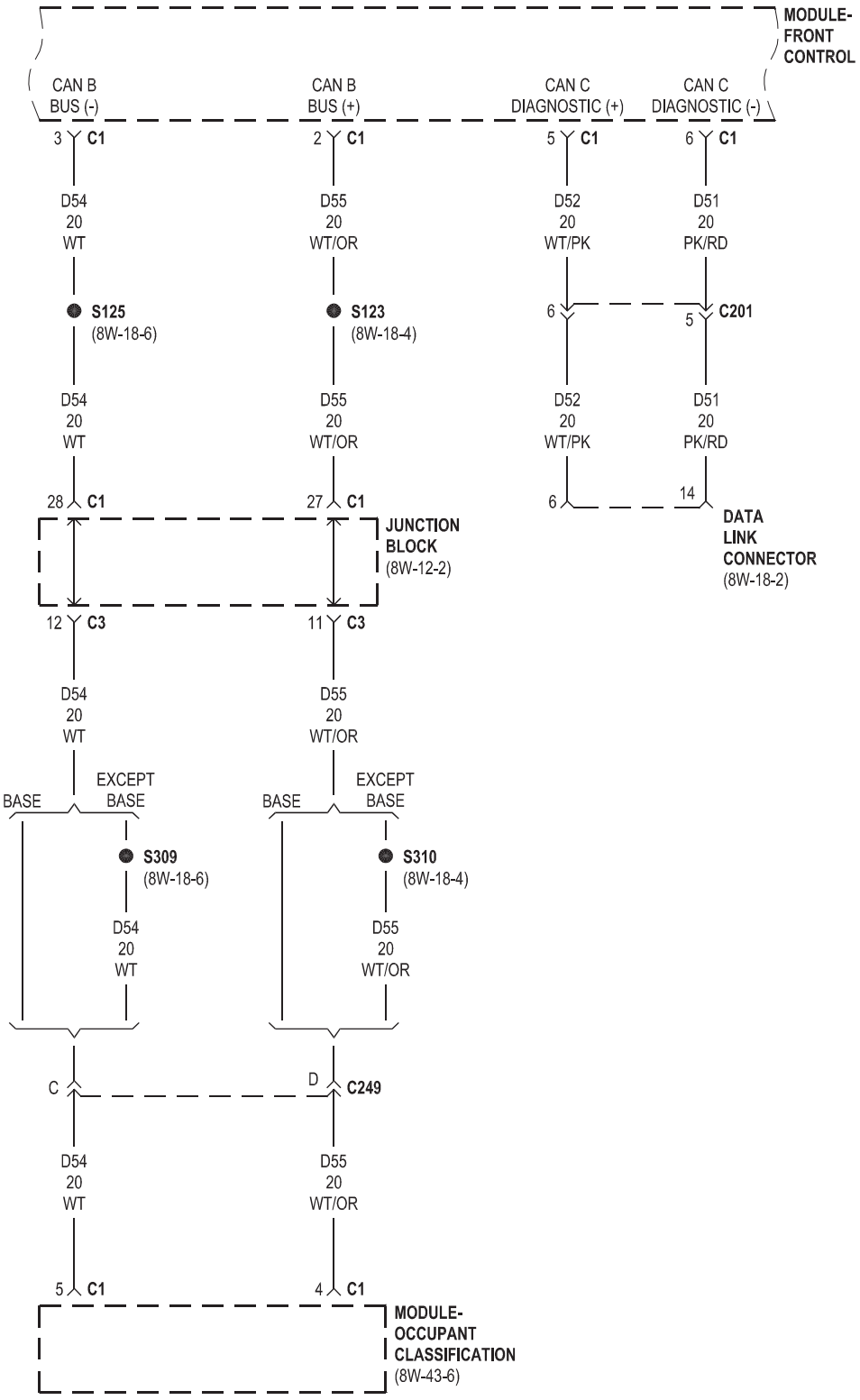

BATT A1
(8W-20-2)
MODULE-
INTEGRATED
POWER
(8W-13-2)
1
FUSE
15
20A
2
1
FUSE
23
40A
2
86
30
RELAY-FOG
LAMP
(8W-50-2)
30
86
RELAY-
RADIATOR
FAN LOW
(8W-30-5)
86
30
RELAY-
RADIATOR
FAN HIGH
(8W-30-5)
85
87
87A
87A
87
85
85
87
87A
26
IPM
FOG
LAMP
RELAY
CONTROL
MODULE-
FRONT
CONTROL
39
IPM
LOW
SPEED
RADIATOR
FAN
RELAY
CONTROL
49
IPM
HIGH
SPEED
RADIATOR
FAN
RELAY
CONTROL
MODULE-
FRONT
CONTROL
18
C2
19
C2
25
C1
9
C1
L89
18
WT/YL
L89
18
WT/YL
N202
12
DB/OR
N23
12
DB/DG
2
LAMP-FOG-
RIGHT
FRONT
(8W-50-2)
2
LAMP-FOG-
LEFT
FRONT
(8W-50-2)
2
RESISTOR-
RADIATOR
FAN
(8W-30-5)
1
N24
12
DG/DB
2
1
M
FAN MODULE-
CONDENSER
COOLING
(8W-30-5)

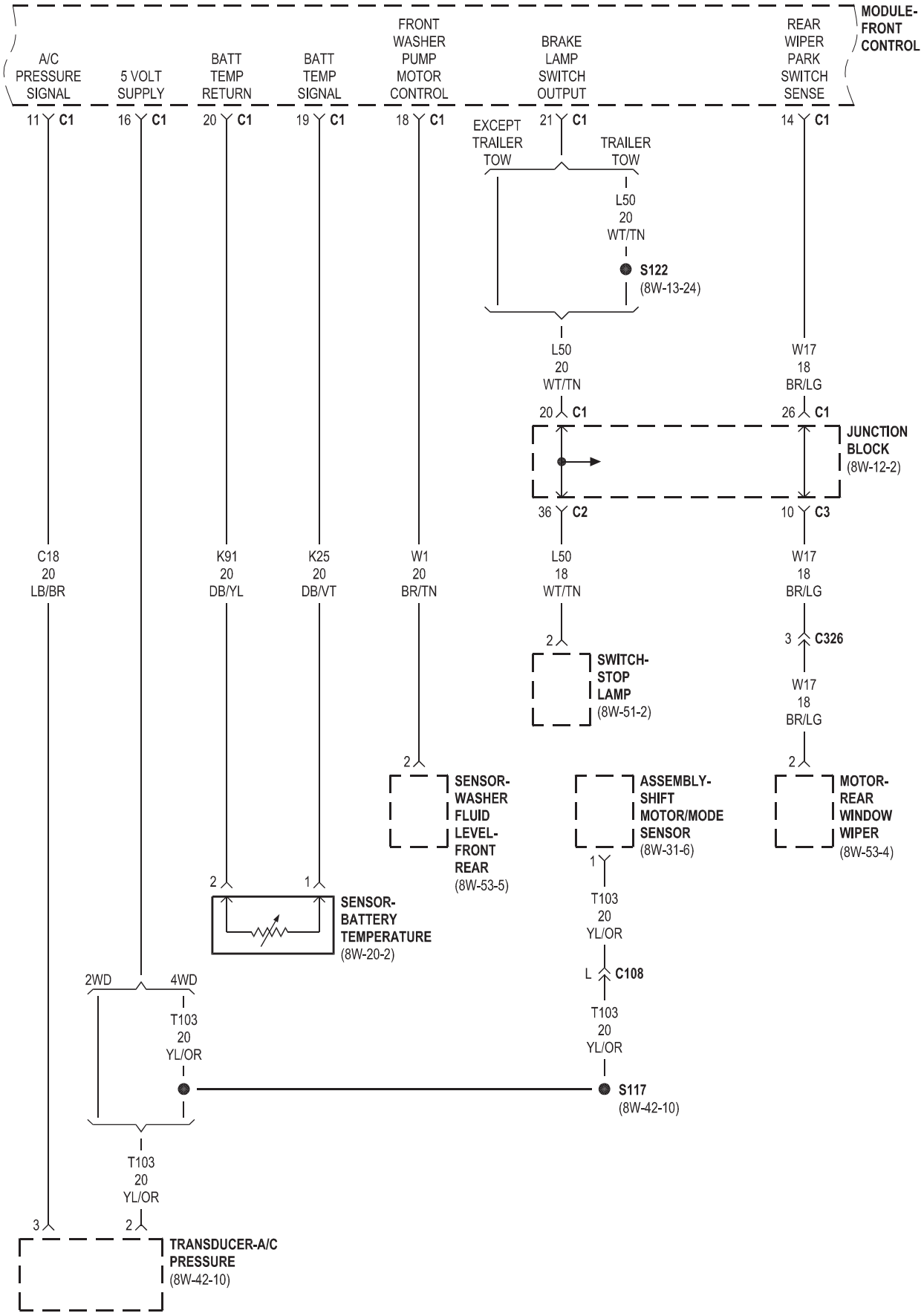

BATT A1
(8W-20-2)
MODULE-INTEGRATED POWER
(8W-13-2)
FUSE 17 20A
FUSE 14 20A
FUSE 28 30A
RELAY-WIPER-REAR
(8W-53-4)
RELAY-ADJUSTABLE PEDALS
(8W-56-3)
IPM
REAR WIPER RELAY CONTROL
ADJUSTABLE PEDALS RELAY CONTROL
MODULE-FRONT CONTROL
W13 18 LG/BR
A85 18 RD/LB
A918 14 OR/LG
JUNCTION BLOCK
(8W-12-2)
FUSE 13 15A
(8W-12-10)
FUSE 14 15A
(8W-12-10)
W13 16 LG/BR
C326
MOTOR-REAR WINDOW WIPER
(8W-53-4)
SWITCH-ADJUSTABLE PEDALS
(8W-56-3)

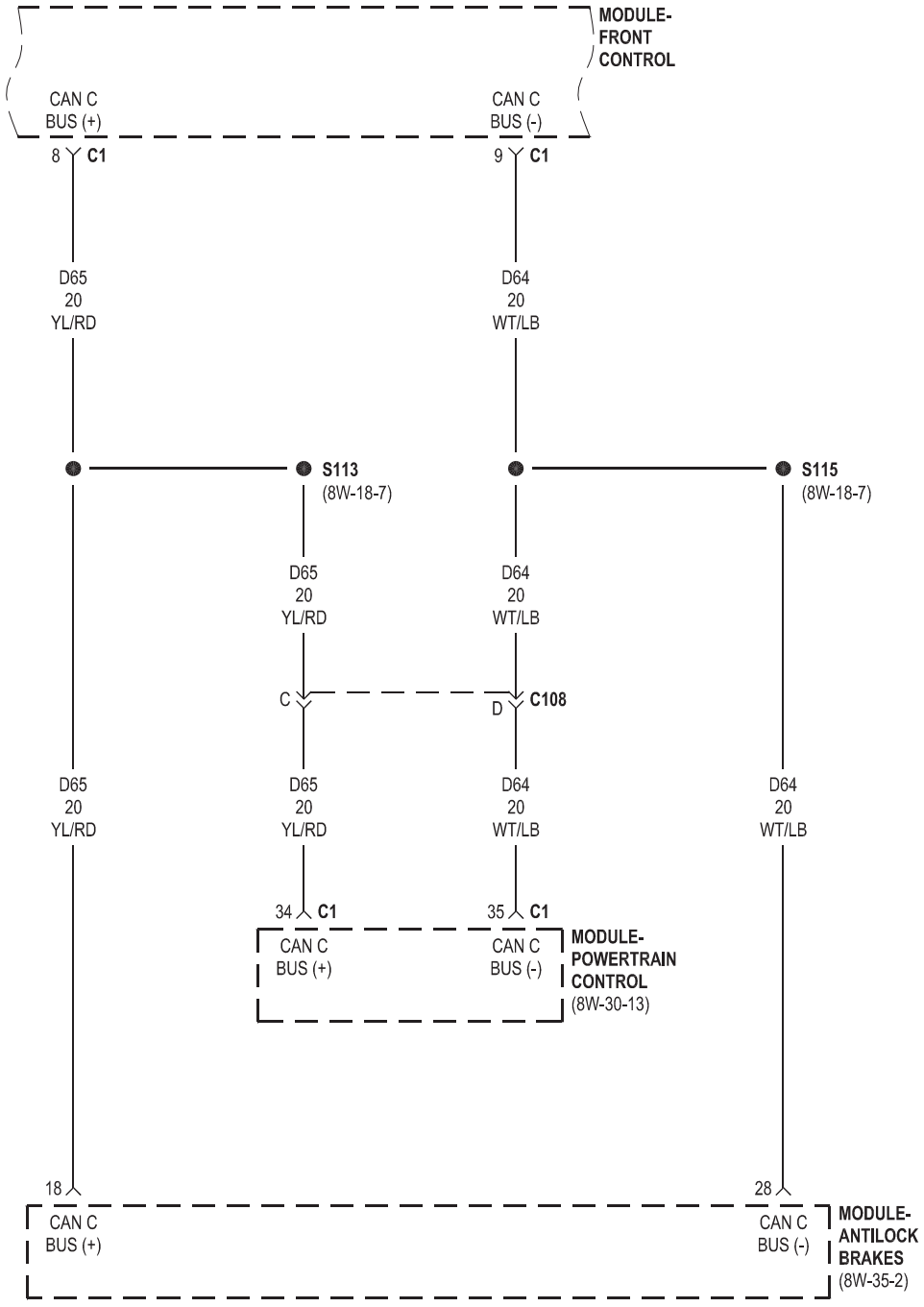

BATT A1
(8W-20-2)
MODULE-
INTEGRATED
POWER
(8W-13-2)
FUSE
27
30A
FUSE
22
30A
FUSE
12
20A
FUSE
20
20A
FUSE
13
20A
FUSE
18
20A
15 IPM
6 IPM
2 IPM
5 IPM
3 IPM
4 IPM
FUSED
B(+)
MODULE-
FRONT
CONTROL
40 C1
GROUND
GROUND
GROUND
GROUND
24 C1
1 C1
22 C1
11 C2
A920
14
OR/RD
S120
A920
14
OR/RD
A920
14
OR/RD
Z965
18
BK
Z116
18
BK/VT
Z117
18
BK/WT
Z947
18
BK
31 C1
7 C201
JUNCTION
BLOCK
(8W-12-2)
FUSE
11
10A
(8W-12-9)
FUSE
12
25A
(8W-12-9)
A920
16
OR/RD
25 C3
CLUSTER
(8W-40-2)
G114
(8W-15-7)
(8W-15-8)

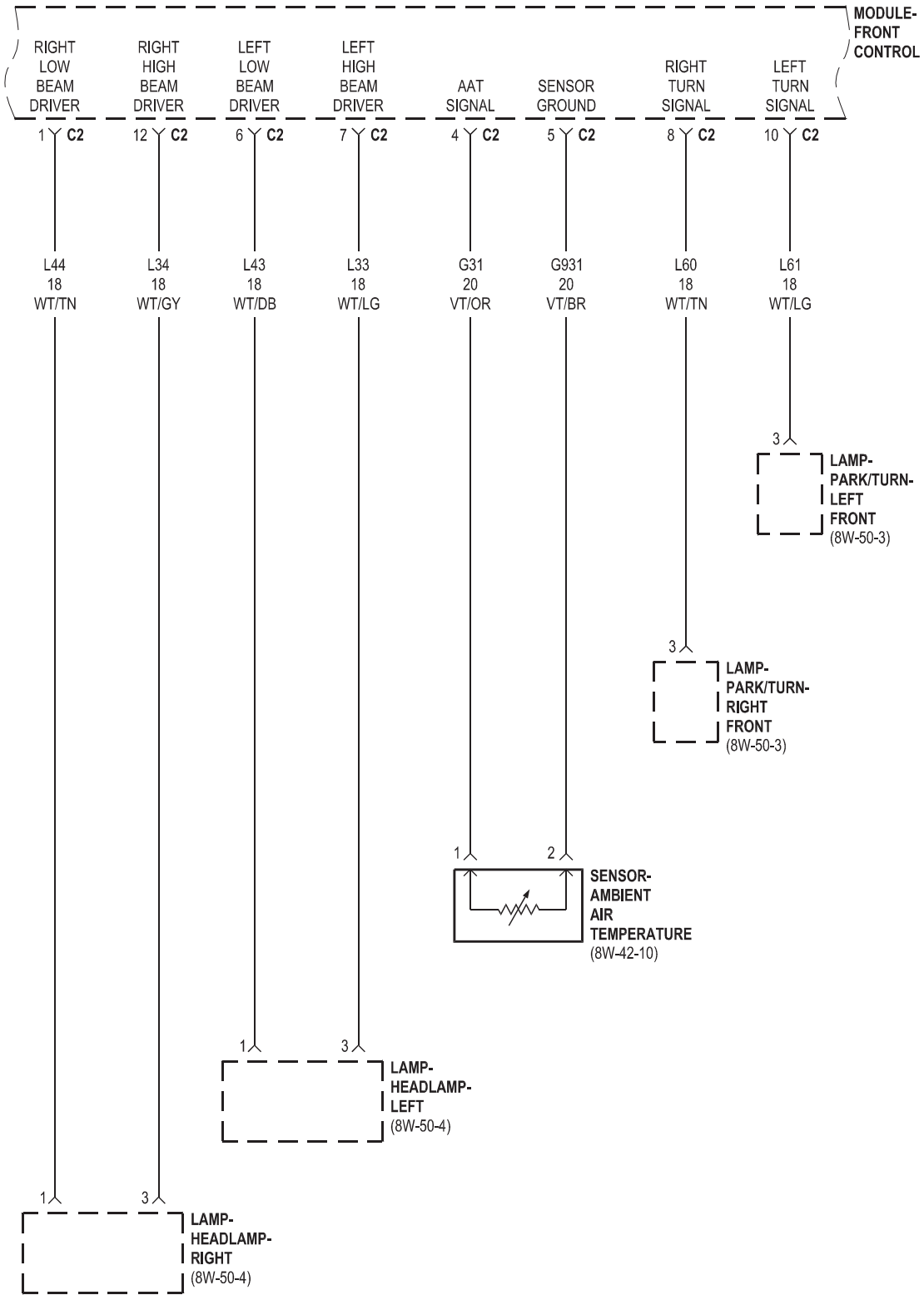

BATT A1
(8W-20-2)
MODULE-
INTEGRATED
POWER
(8W-13-2)
86
87
87A
RELAY-
PARK
LAMP
(8W-52-2)
85
30
48
IPM
PARK
LAMP
RELAY
CONTROL
MODULE-
FRONT
CONTROL
1
FUSE
8
10A
2
1
FUSE
10
10A
2
1
FUSE
9
10A
2
7 C1
8 C1
19 C1
6 C1
5 C1
17 C1
13 C1
15 C1
NOT
USED
L76
20
PK/RD
K
C352
L77
20
PK/RD
L77
20
PK/RD
L77
20
PK/RD
L78
20
WT/OR
L78
20
WT/OR
L78
20
WT/OR
L76
20
PK/RD
S331
2
LAMP-
PARK/TURN-
RIGHT
FRONT
(8W-50-3)
L76
20
PK/RD
L76
20
PK/RD
S
TO
JUNCTION
BLOCK
(8W-13-14)
1
LAMP-
SIDE
MARKER-
LEFT
FRONT
(8W-50-3)
T
TO
JUNCTION
BLOCK
(8W-13-14)
2
WIRING-
TRAILER
TOW
4-WAY
(8W-54-3)
5
WIRING-
TRAILER
TOW
7-WAY
(8W-54-3)
2
LAMP-
PARK/TURN-
LEFT
FRONT
(8W-50-3)
1
LAMP-
SIDE
MARKER-
RIGHT
FRONT
(8W-50-3)

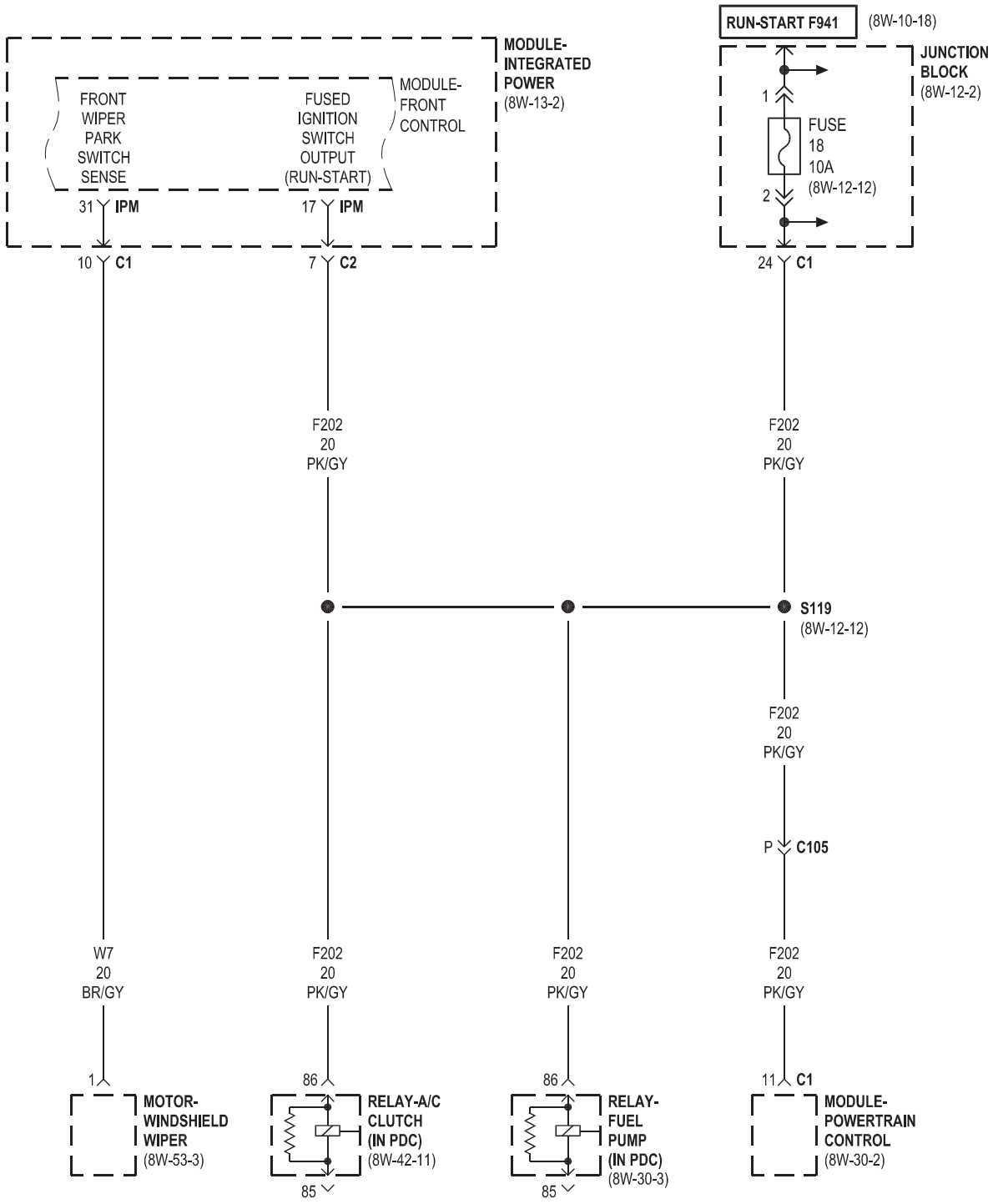

FROM
FUSE 10
(8W-13-13)
T
L78
20
WT/OR
33 C1
5 C3
FROM
FUSE 8
(8W-13-13)
S
L77
20
PK/RD
34 C1
6 C3
JUNCTION
BLOCK
(8W-12-2)
L77
20
PK/RD
S300
L77
20
PK/RD
7 C326
L78
20
WT/OR
5
LAMP-
TAIL/
STOP/
TURN-
RIGHT
(8W-51-4)
L77
20
PK/RD
1
LAMP-
LICENSE
PLATE
(8W-51-4)
L77
20
PK/RD
3
LAMP-
TAIL/
STOP/
TURN-
LEFT
(8W-51-4)

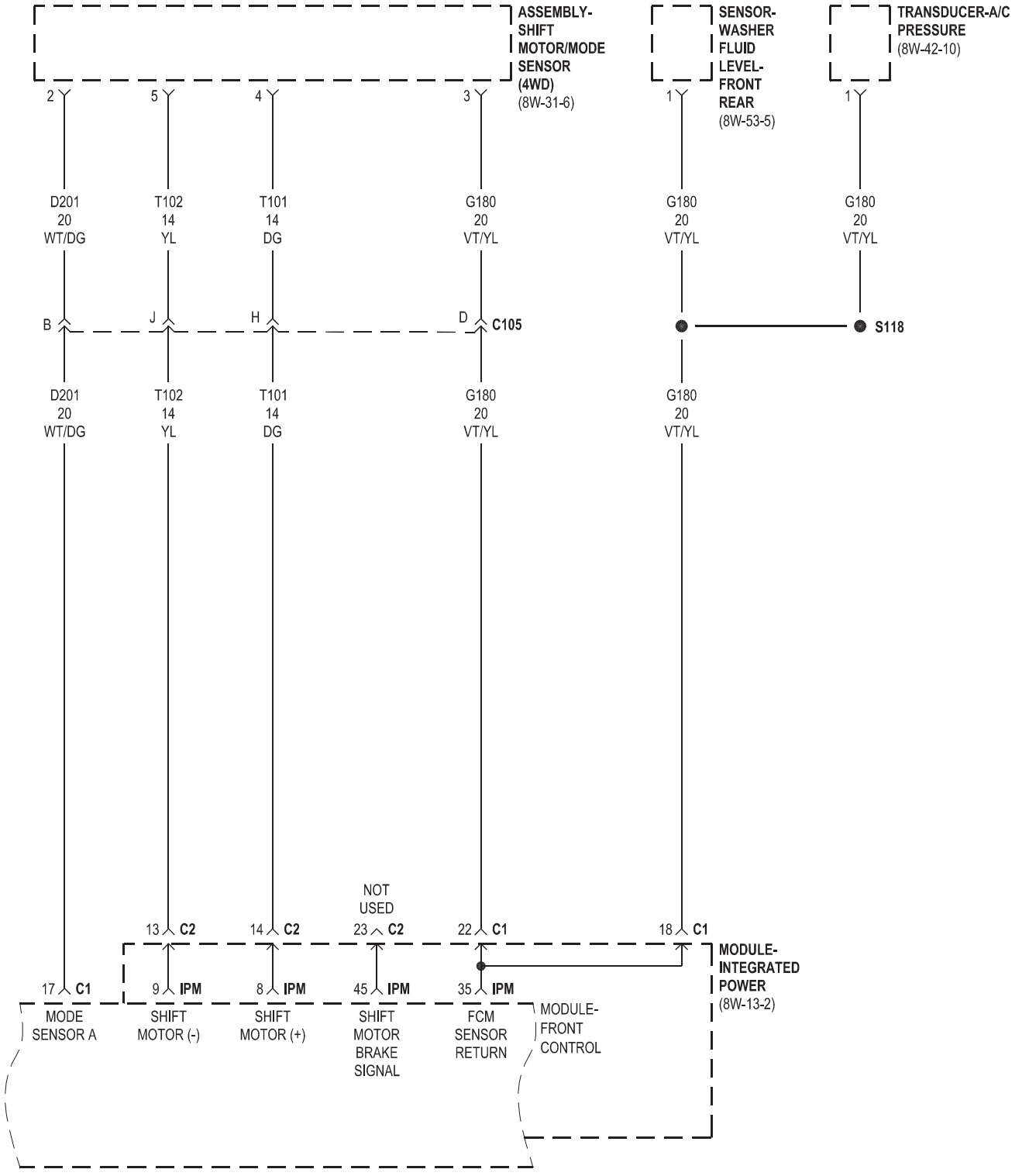

MODULE-
FRONT
CONTROL
CAN B
BUS (-)
CAN B
BUS (+)
CAN C
DIAGNOSTIC (+)
CAN C
DIAGNOSTIC (-)
3 C1
2 C1
5 C1
6 C1
D54
20
WT
D55
20
WT/OR
D52
20
WT/PK
D51
20
PK/RD
S125
(8W-18-6)
S123
(8W-18-4)
6
C201
5
D54
20
WT
D55
20
WT/OR
D52
20
WT/PK
D51
20
PK/RD
28 C1
27 C1
14
6
JUNCTION
BLOCK
(8W-12-2)
DATA
LINK
CONNECTOR
(8W-18-2)
12 C3
11 C3
D54
20
WT
D55
20
WT/OR
BASE
EXCEPT
BASE
BASE
EXCEPT
BASE
S309
(8W-18-6)
S310
(8W-18-4)
D54
20
WT
D55
20
WT/OR
C
D
C249
D54
20
WT
D55
20
WT/OR
5 C1
4 C1
MODULE-
OCCUPANT
CLASSIFICATION
(8W-43-6)

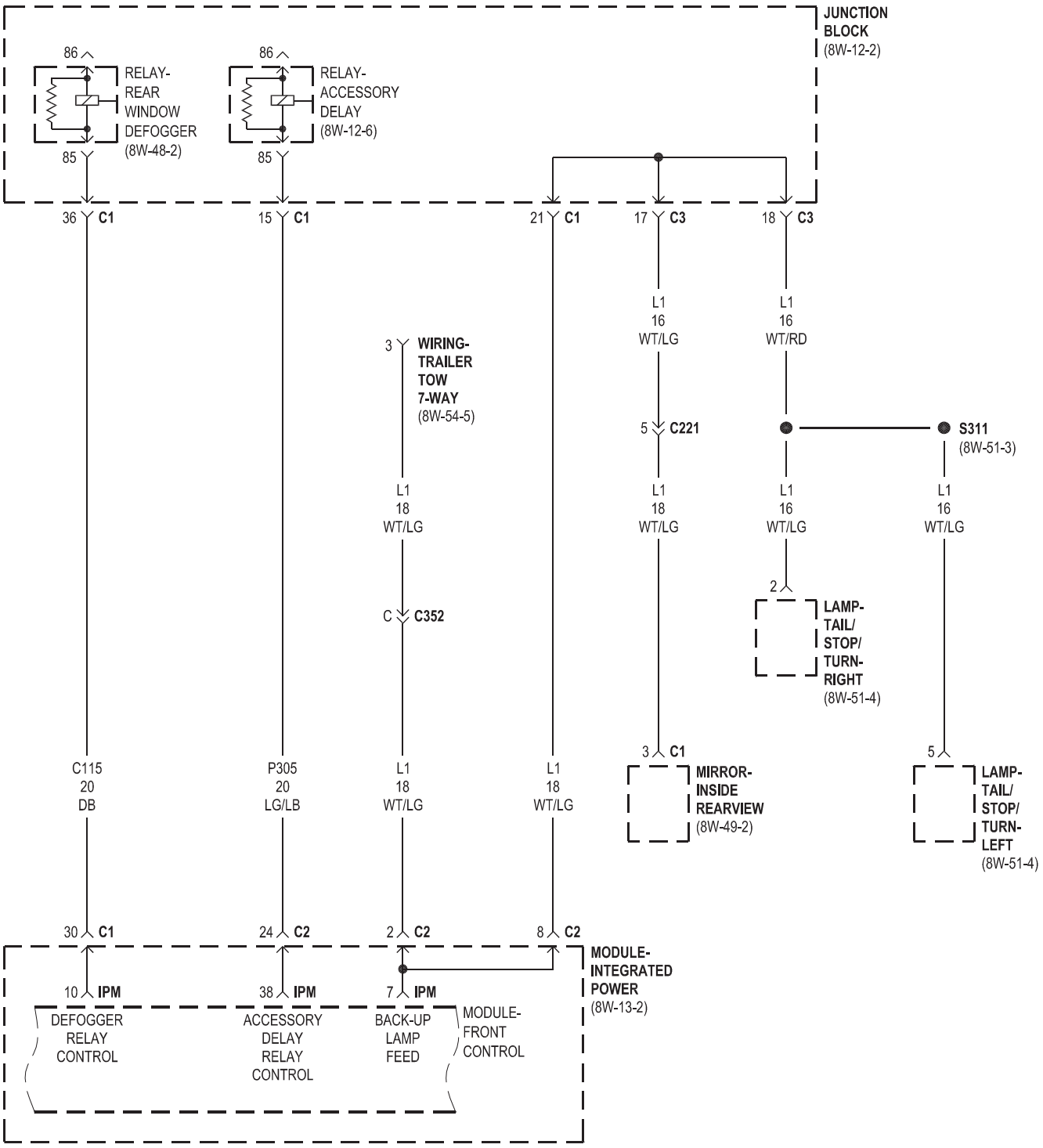

MODULE-FRONT CONTROL
A/C PRESSURE SIGNAL
5 VOLT SUPPLY
BATT TEMP RETURN
BATT TEMP SIGNAL
FRONT WASHER PUMP MOTOR CONTROL
BRAKE LAMP SWITCH OUTPUT
REAR WIPER PARK SWITCH SENSE
11 C1
16 C1
20 C1
19 C1
18 C1
21 C1
14 C1
EXCEPT TRAILER TOW
TRAILER TOW
L50 20 WT/TN
S122 (8W-13-24)
L50 20 WT/TN
W17 18 BR/LG
20 C1
26 C1
JUNCTION BLOCK (8W-12-2)
36 C2
10 C3
C18 20 LB/BR
K91 20 DB/YL
K25 20 DB/VT
W1 20 BR/TN
L50 18 WT/TN
W17 18 BR/LG
2
SWITCH-STOP LAMP (8W-51-2)
3 C326
W17 18 BR/LG
2
SENSOR-WASHER FLUID LEVEL-FRONT REAR (8W-53-5)
ASSEMBLY-SHIFT MOTOR/MODE SENSOR (8W-31-6)
MOTOR-REAR WINDOW WIPER (8W-53-4)
2
1
SENSOR-BATTERY TEMPERATURE (8W-20-2)
T103 20 YL/OR
L C108
T103 20 YL/OR
2WD
4WD
T103 20 YL/OR
S117 (8W-42-10)
T103 20 YL/OR
3
2
TRANSDUCER-A/C PRESSURE (8W-42-10)

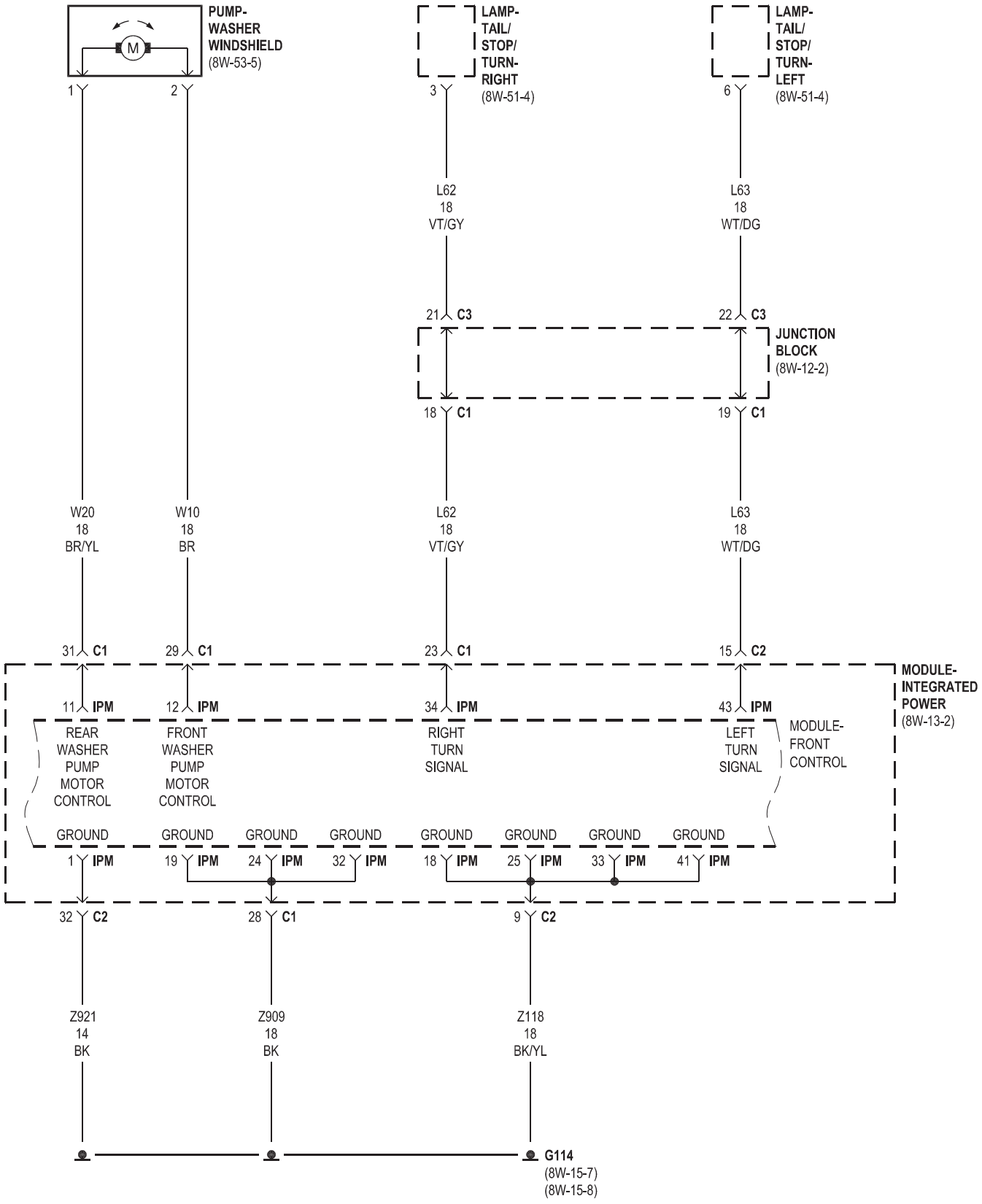

MODULE-
FRONT
CONTROL
CAN C
BUS (+)
8 C1
CAN C
BUS (-)
9 C1
D65
20
YL/RD
D64
20
WT/LB
S113
(8W-18-7)
S115
(8W-18-7)
D65
20
YL/RD
D64
20
WT/LB
C
D
C108
D65
20
YL/RD
D65
20
YL/RD
D64
20
WT/LB
D64
20
WT/LB
34 C1
35 C1
CAN C
BUS (+)
CAN C
BUS (-)
MODULE-
POWERTRAIN
CONTROL
(8W-30-13)
18
28
CAN C
BUS (+)
CAN C
BUS (-)
MODULE-
ANTILOCK
BRAKES
(8W-35-2)

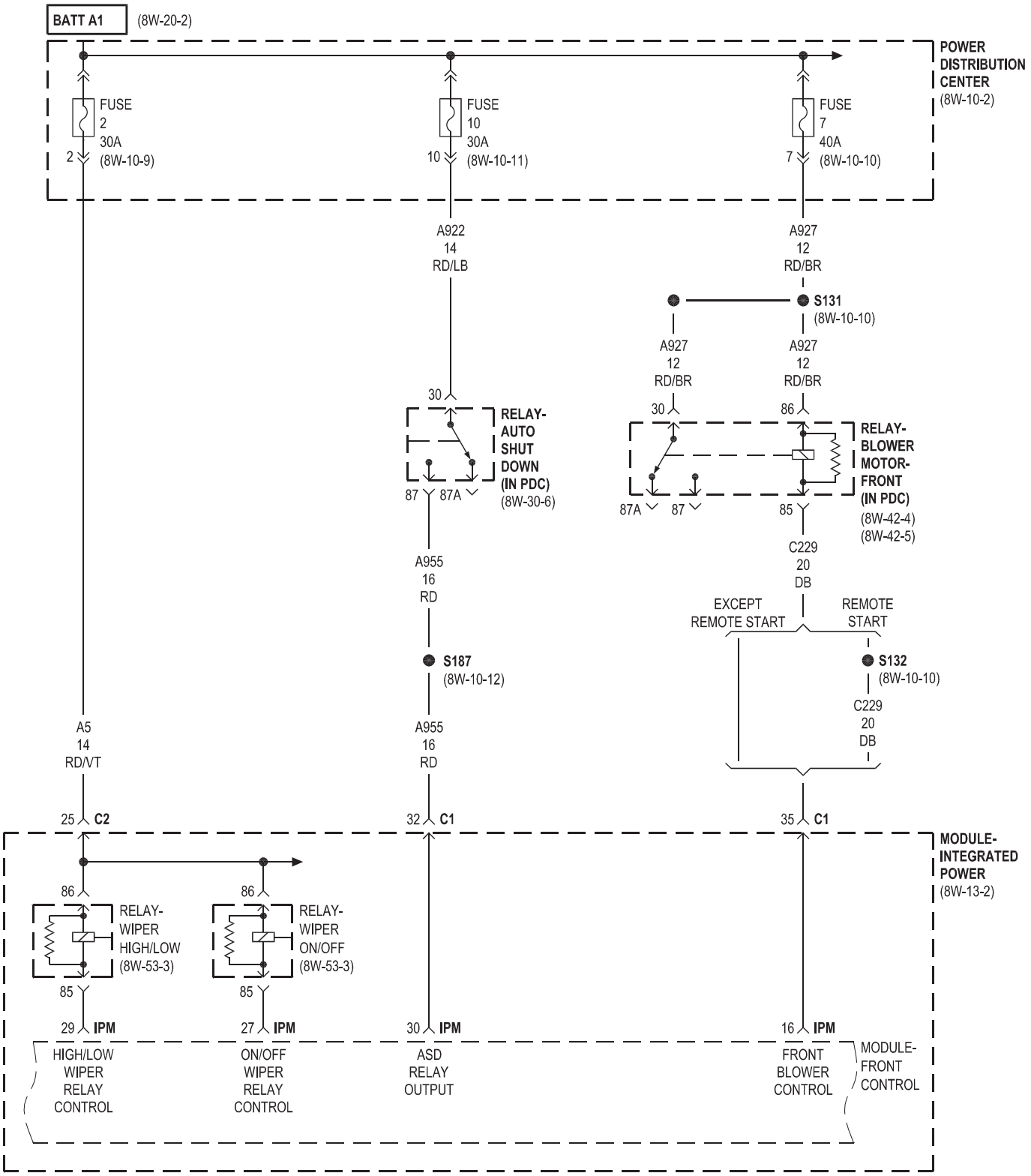

MODULE-
FRONT
CONTROL
RIGHT
LOW
BEAM
DRIVER
RIGHT
HIGH
BEAM
DRIVER
LEFT
LOW
BEAM
DRIVER
LEFT
HIGH
BEAM
DRIVER
AAT
SIGNAL
SENSOR
GROUND
RIGHT
TURN
SIGNAL
LEFT
TURN
SIGNAL
1 C2
12 C2
6 C2
7 C2
4 C2
5 C2
8 C2
10 C2
L44
18
WT/TN
L34
18
WT/GY
L43
18
WT/DB
L33
18
WT/LG
G31
20
VT/OR
G931
20
VT/BR
L60
18
WT/TN
L61
18
WT/LG
3
LAMP-
PARK/TURN-
LEFT
FRONT
(8W-50-3)
3
LAMP-
PARK/TURN-
RIGHT
FRONT
(8W-50-3)
1
2
SENSOR-
AMBIENT
AIR
TEMPERATURE
(8W-42-10)
1
3
LAMP-
HEADLAMP-
LEFT
(8W-50-4)
1
3
LAMP-
HEADLAMP-
RIGHT
(8W-50-4)

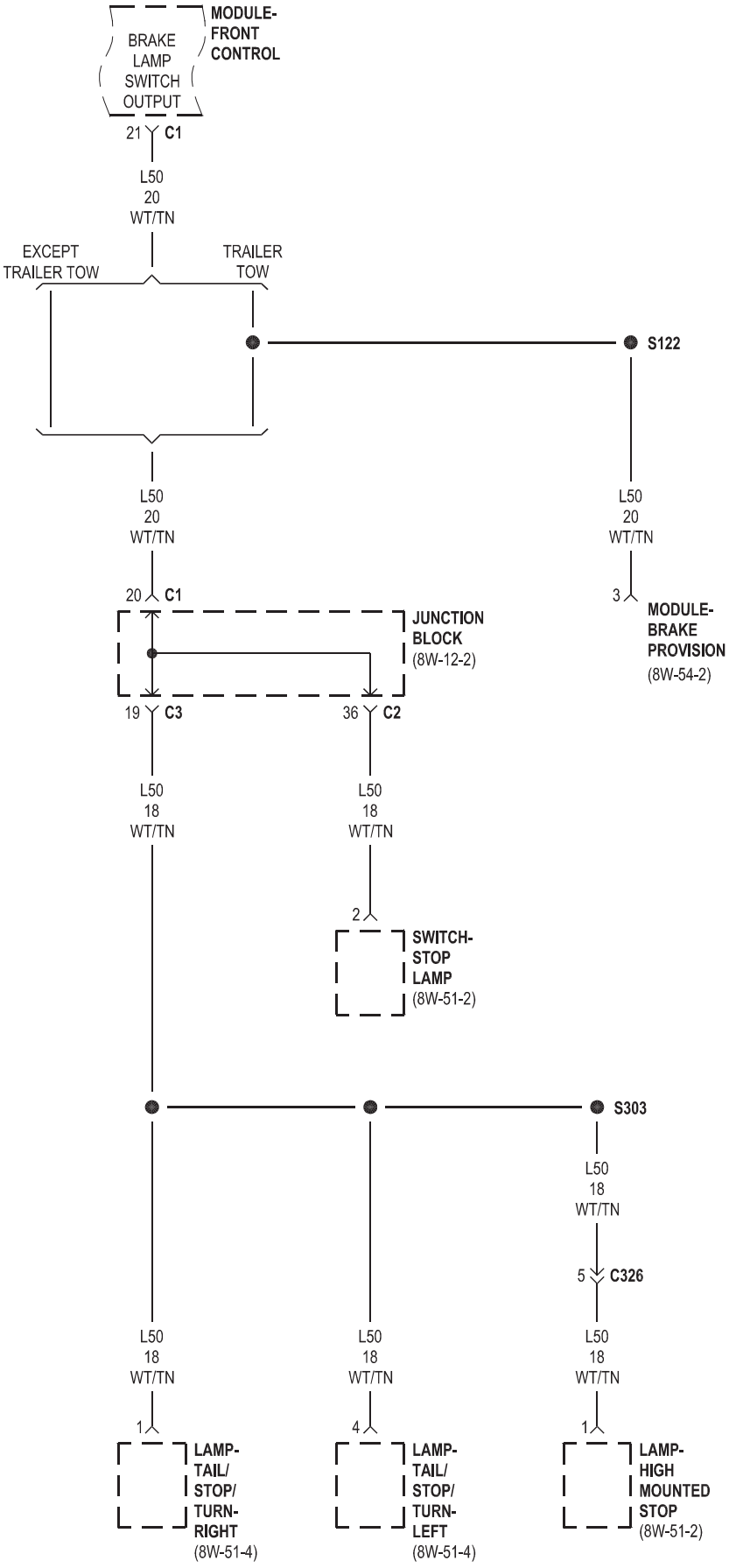

RUN-START F941
(8W-10-18)
MODULE-
INTEGRATED
POWER
(8W-13-2)
FRONT
WIPER
PARK
SWITCH
SENSE
FUSED
IGNITION
SWITCH
OUTPUT
(RUN-START)
MODULE-
FRONT
CONTROL
31 IPM
17 IPM
10 C1
7 C2
JUNCTION
BLOCK
(8W-12-2)
1
FUSE
18
10A
(8W-12-12)
2
24 C1
F202
20
PK/GY
F202
20
PK/GY
S119
(8W-12-12)
F202
20
PK/GY
P C105
W7
20
BR/GY
F202
20
PK/GY
F202
20
PK/GY
F202
20
PK/GY
1
86
86
11 C1
MOTOR-
WINDSHIELD
WIPER
(8W-53-3)
RELAY-A/C
CLUTCH
(IN PDC)
(8W-42-11)
RELAY-
FUEL
PUMP
(IN PDC)
(8W-30-3)
MODULE-
POWERTRAIN
CONTROL
(8W-30-2)
85
85

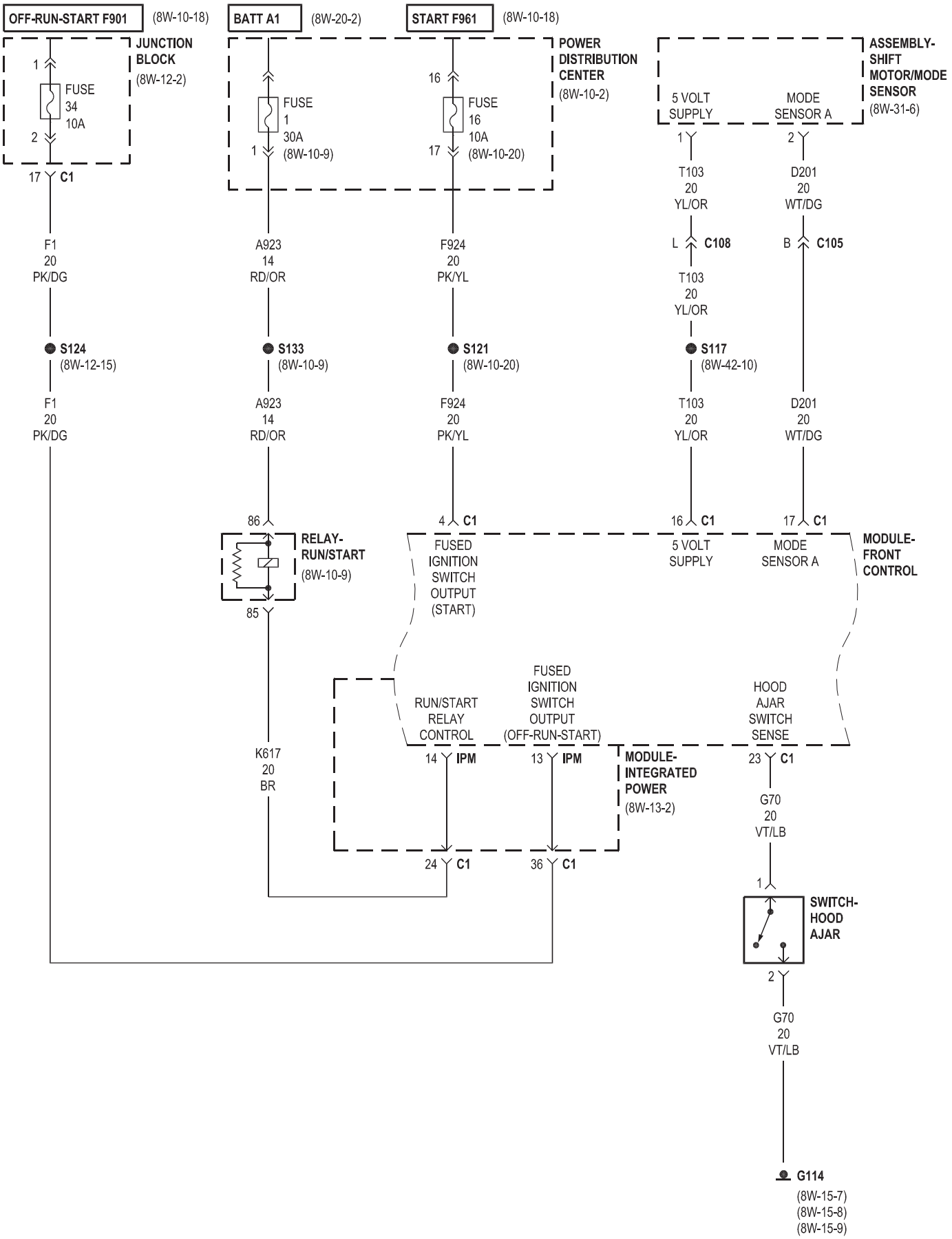

ASSEMBLY-
SHIFT
MOTOR/MODE
SENSOR
(4WD)
(8W-31-6)
SENSOR-
WASHER
FLUID
LEVEL-
FRONT
REAR
(8W-53-5)
TRANSDUCER-A/C
PRESSURE
(8W-42-10)
2
5
4
3
1
1
D201
20
WT/DG
T102
14
YL
T101
14
DG
G180
20
VT/YL
G180
20
VT/YL
G180
20
VT/YL
B
J
H
D
C105
S118
D201
20
WT/DG
T102
14
YL
T101
14
DG
G180
20
VT/YL
G180
20
VT/YL
NOT
USED
13 C2
14 C2
23 C2
22 C1
18 C1
MODULE-
INTEGRATED
POWER
(8W-13-2)
17 C1
9 IPM
8 IPM
45 IPM
35 IPM
MODE
SENSOR A
SHIFT
MOTOR (-)
SHIFT
MOTOR (+)
SHIFT
MOTOR
BRAKE
SIGNAL
FCM
SENSOR
RETURN
MODULE-
FRONT
CONTROL


JUNCTION BLOCK (8W-12-2)
86
RELAY- REAR WINDOW DEFOGGER (8W-48-2)
85
86
RELAY- ACCESSORY DELAY (8W-12-6)
85
36 C1
15 C1
21 C1
17 C3
18 C3
L1 16 WT/LG
L1 16 WT/RD
3 WIRING- TRAILER TOW 7-WAY (8W-54-5)
5 C221
S311 (8W-51-3)
L1 18 WT/LG
L1 18 WT/LG
L1 16 WT/LG
L1 16 WT/LG
2
LAMP- TAIL/ STOP/ TURN- RIGHT (8W-51-4)
C C352
C115 20 DB
P305 20 LG/LB
L1 18 WT/LG
L1 18 WT/LG
3 C1
MIRROR- INSIDE REARVIEW (8W-49-2)
5
LAMP- TAIL/ STOP/ TURN- LEFT (8W-51-4)
30 C1
24 C2
2 C2
8 C2
MODULE- INTEGRATED POWER (8W-13-2)
10 IPM
38 IPM
7 IPM
DEFOGGER RELAY CONTROL
ACCESSORY DELAY RELAY CONTROL
BACK-UP LAMP FEED
MODULE- FRONT CONTROL


PUMP-
WASHER
WINDSHIELD
(8W-53-5)
M
1
2
LAMP-
TAIL/
STOP/
TURN-
RIGHT
(8W-51-4)
3
LAMP-
TAIL/
STOP/
TURN-
LEFT
(8W-51-4)
6
L62
18
VT/GY
L63
18
WT/DG
21 C3
22 C3
JUNCTION
BLOCK
(8W-12-2)
18 C1
19 C1
W20
18
BR/YL
W10
18
BR
L62
18
VT/GY
L63
18
WT/DG
31 C1
29 C1
23 C1
15 C2
MODULE-
INTEGRATED
POWER
(8W-13-2)
11 IPM
12 IPM
34 IPM
43 IPM
REAR
WASHER
PUMP
MOTOR
CONTROL
FRONT
WASHER
PUMP
MOTOR
CONTROL
RIGHT
TURN
SIGNAL
LEFT
TURN
SIGNAL
MODULE-
FRONT
CONTROL
GROUND
1 IPM
19 IPM
24 IPM
32 IPM
18 IPM
25 IPM
33 IPM
41 IPM
32 C2
28 C1
9 C2
Z921
14
BK
Z909
18
BK
Z118
18
BK/YL
G114
(8W-15-7)
(8W-15-8)


BATT A1
(8W-20-2)
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE 2 30A
2
(8W-10-9)
FUSE 10 30A
10
(8W-10-11)
FUSE 7 40A
7
(8W-10-10)
A922 14 RD/LB
A927 12 RD/BR
S131
(8W-10-10)
A927 12 RD/BR
A927 12 RD/BR
30
RELAY-AUTO SHUT DOWN (IN PDC)
(8W-30-6)
87
87A
30
87A
87
86
85
RELAY-BLOWER MOTOR-FRONT (IN PDC)
(8W-42-4)
(8W-42-5)
C229 20 DB
EXCEPT REMOTE START
REMOTE START
A955 16 RD
S187
(8W-10-12)
S132
(8W-10-10)
C229 20 DB
A5 14 RD/VT
A955 16 RD
25 C2
32 C1
35 C1
MODULE-INTEGRATED POWER
(8W-13-2)
86
RELAY-WIPER HIGH/LOW
(8W-53-3)
86
RELAY-WIPER ON/OFF
(8W-53-3)
85
85
29 IPM
27 IPM
30 IPM
16 IPM
HIGH/LOW WIPER RELAY CONTROL
ON/OFF WIPER RELAY CONTROL
ASD RELAY OUTPUT
FRONT BLOWER CONTROL
MODULE-FRONT CONTROL


MODULE-
FRONT
CONTROL
BRAKE
LAMP
SWITCH
OUTPUT
21 C1
L50
20
WT/TN
EXCEPT
TRAILER TOW
TRAILER
TOW
S122
L50
20
WT/TN
20 C1
L50
20
WT/TN
3
MODULE-
BRAKE
PROVISION
(8W-54-2)
JUNCTION
BLOCK
(8W-12-2)
19 C3
36 C2
L50
18
WT/TN
L50
18
WT/TN
2
SWITCH-
STOP
LAMP
(8W-51-2)
S303
L50
18
WT/TN
5 C326
L50
18
WT/TN
L50
18
WT/TN
L50
18
WT/TN
1
4
1
LAMP-
TAIL/
STOP/
TURN-
RIGHT
(8W-51-4)
LAMP-
TAIL/
STOP/
TURN-
LEFT
(8W-51-4)
LAMP-
HIGH
MOUNTED
STOP
(8W-51-2)


OFF-RUN-START F901
(8W-10-18)
JUNCTION BLOCK
(8W-12-2)
1
FUSE 34 10A
2
17 C1
F1 20 PK/DG
S124
(8W-12-15)
F1 20 PK/DG
BATT A1
(8W-20-2)
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE 1 30A
1
(8W-10-9)
A923 14 RD/OR
S133
(8W-10-9)
A923 14 RD/OR
86
RELAY-RUN/START
(8W-10-9)
85
K617 20 BR
START F961
(8W-10-18)
16
FUSE 16 10A
17
(8W-10-20)
F924 20 PK/YL
S121
(8W-10-20)
F924 20 PK/YL
4 C1
FUSED IGNITION SWITCH OUTPUT (START)
RUN/START RELAY CONTROL
14 IPM
FUSED IGNITION SWITCH OUTPUT (OFF-RUN-START)
13 IPM
MODULE-INTEGRATED POWER
(8W-13-2)
24 C1
36 C1
ASSEMBLY-SHIFT MOTOR/MODE SENSOR
(8W-31-6)
5 VOLT SUPPLY
MODE SENSOR A
1
2
T103 20 YL/OR
D201 20 WT/DG
L C108
B C105
T103 20 YL/OR
S117
(8W-42-10)
T103 20 YL/OR
D201 20 WT/DG
16 C1
17 C1
5 VOLT SUPPLY
MODE SENSOR A
MODULE-FRONT CONTROL
HOOD AJAR SWITCH SENSE
23 C1
G70 20 VT/LB
1
SWITCH-HOOD AJAR
2
G70 20 VT/LB
G114
(8W-15-7)
(8W-15-8)
(8W-15-9)

8W-15 GROUND DISTRIBUTION

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G102	8W-15-9
G110	8W-15-2
G111	8W-15-2
G112	8W-15-4
G113	8W-15-5, 6
G114	8W-15-7, 8, 9
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G207	8W-15-10, 11
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G210	8W-15-14
G304	8W-15-15
G305	8W-15-14
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Generator	8W-15-3
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Heater-Cushion Pad-Driver	8W-15-18
Heater-Cushion Pad-Passenger	8W-15-18
Horn-No. 1	8W-15-5
Horn-No. 2	8W-15-4
Junction Block	8W-15-9
Lamp-Center Bezel	8W-15-10
Lamp-Dome-Front	8W-15-17
Lamp-Dome-Rear	8W-15-17
Lamp-Fog-Left Front	8W-15-5
Lamp-Fog-Right Front	8W-15-4
Lamp-Headlamp-Left	8W-15-5
Lamp-Headlamp-Right	8W-15-4
Lamp-High Mounted Stop	8W-15-15
Lamp-License Plate	8W-15-15
Lamp-Liftgate	8W-15-15
Lamp-Park/Turn-Left Front	8W-15-5
Lamp-Park/Turn-Right Front	8W-15-4
Lamp-Reading-Front	8W-15-17
Lamp-Side Marker-Left Front	8W-15-5
Lamp-Side Marker-Right Front	8W-15-4
Lamp-Tail/Stop/Turn-Left	8W-15-15
Lamp-Tail/Stop/Turn-Right	8W-15-19
Lamp-Vanity-Left	8W-15-17
Lamp-Vanity-Right	8W-15-17
Latch-Door-Left Front	8W-15-16
Latch-Door-Left Rear	8W-15-15
Latch-Door-Right Front	8W-15-19
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Media System-Monitor/Dvd	8W-15-17
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Module-Powertrain Control	8W-15-2
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Motor-Windshield Wiper	8W-15-5
Power Distribution Center	8W-15-6
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Power Outlet-Instrument Panel	8W-15-11
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Sensor-Oxygen-Left Rear	8W-15-3
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Sensor-Oxygen-Right Rear	8W-15-3
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Switch-Headlamp	8W-15-12
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Switch-Hood Ajar	8W-15-9
Switch-Ignition	8W-15-13
Switch-Liftgate Ajar	8W-15-15
Switch-Mirror	8W-15-16
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Switch-Seat-Driver	8W-15-18
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Switch-Stop Lamp	8W-15-12
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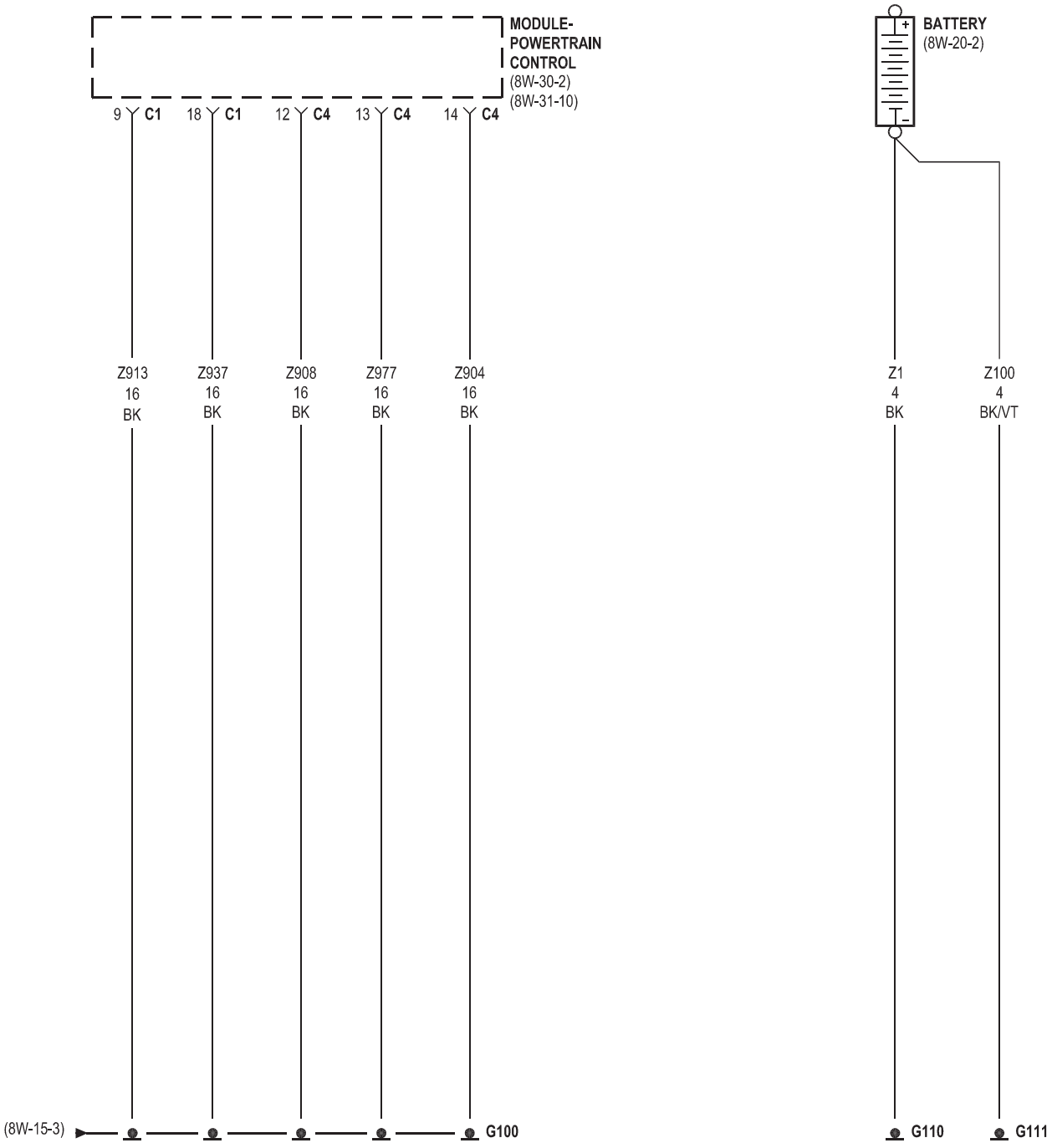
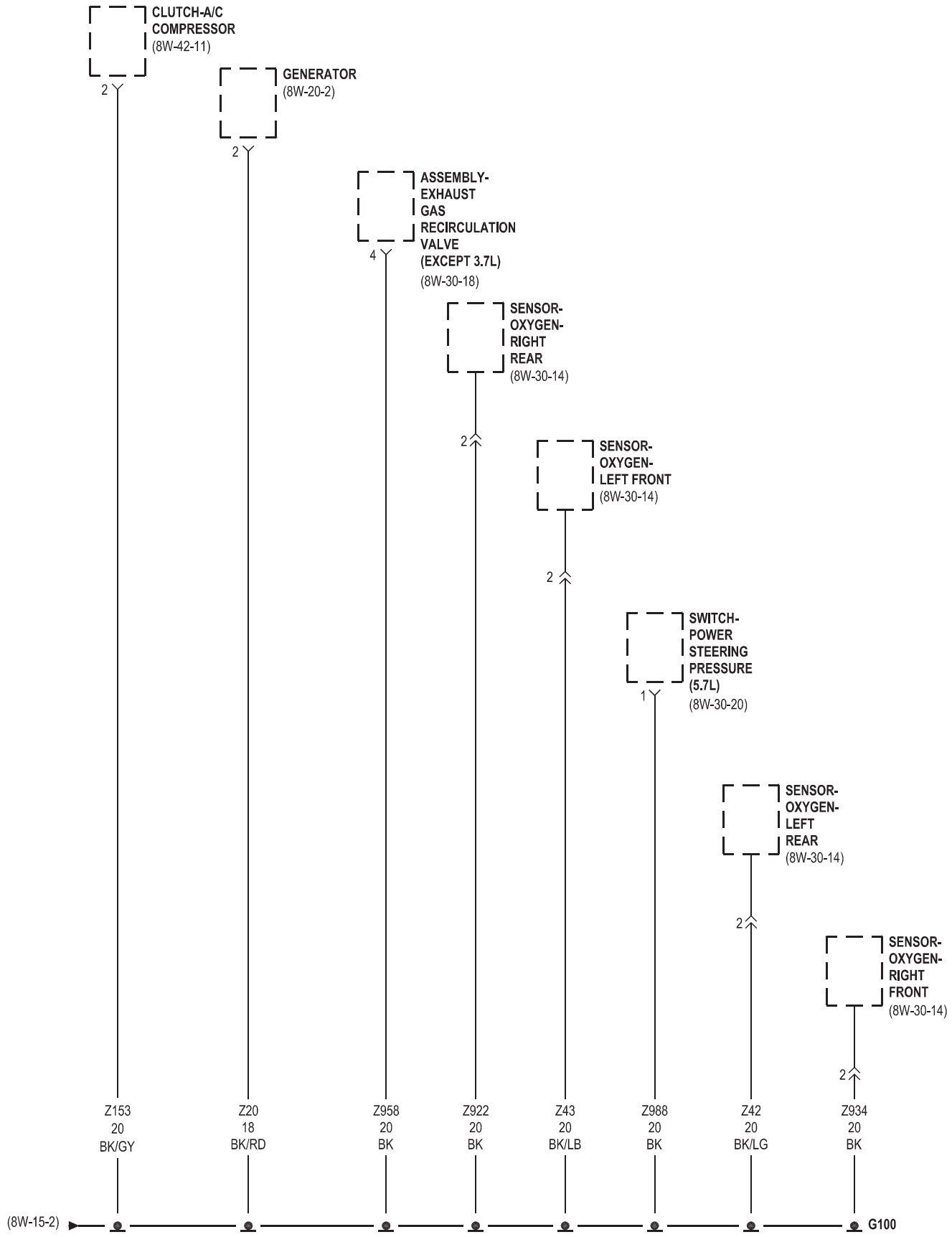
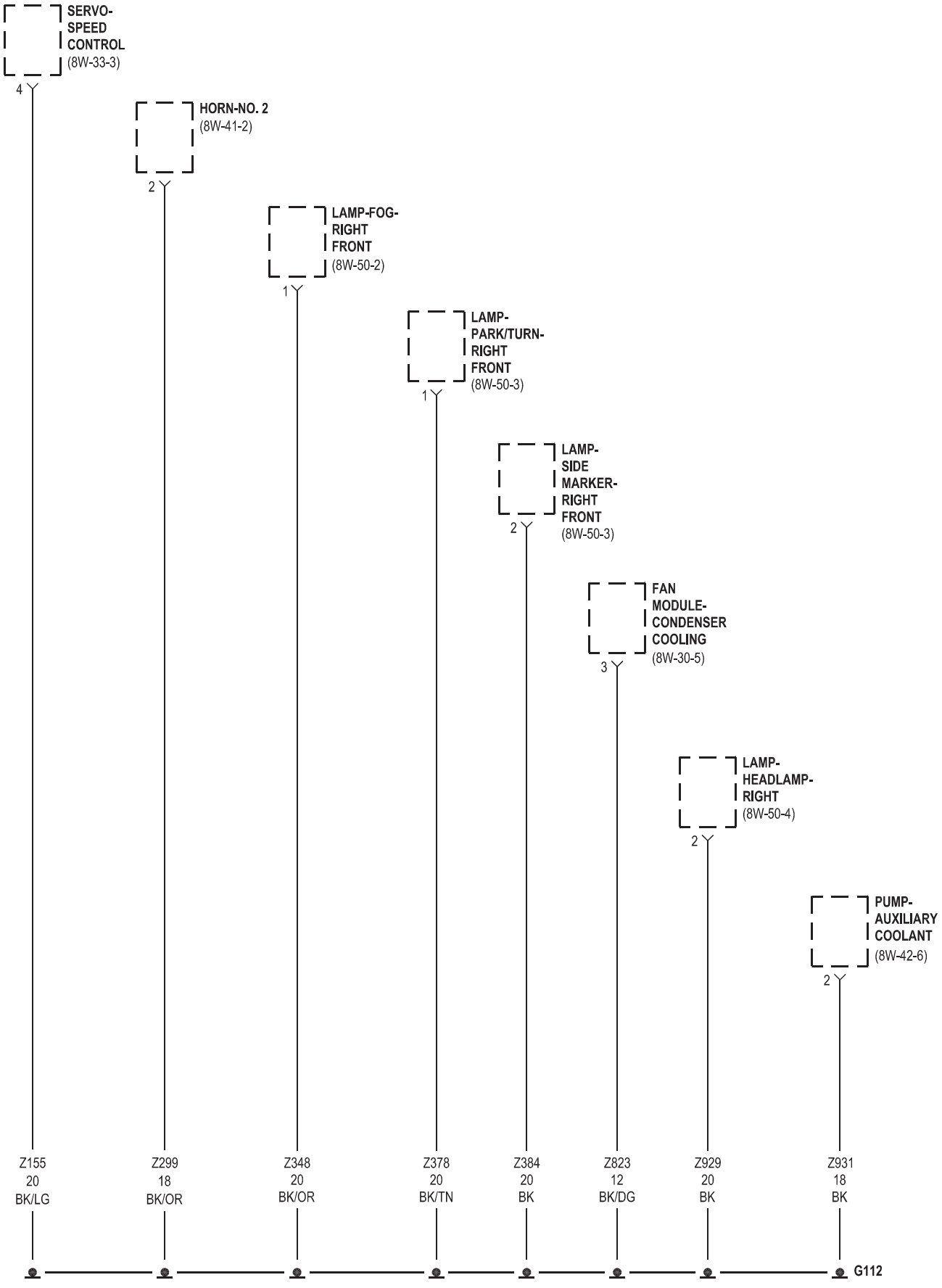
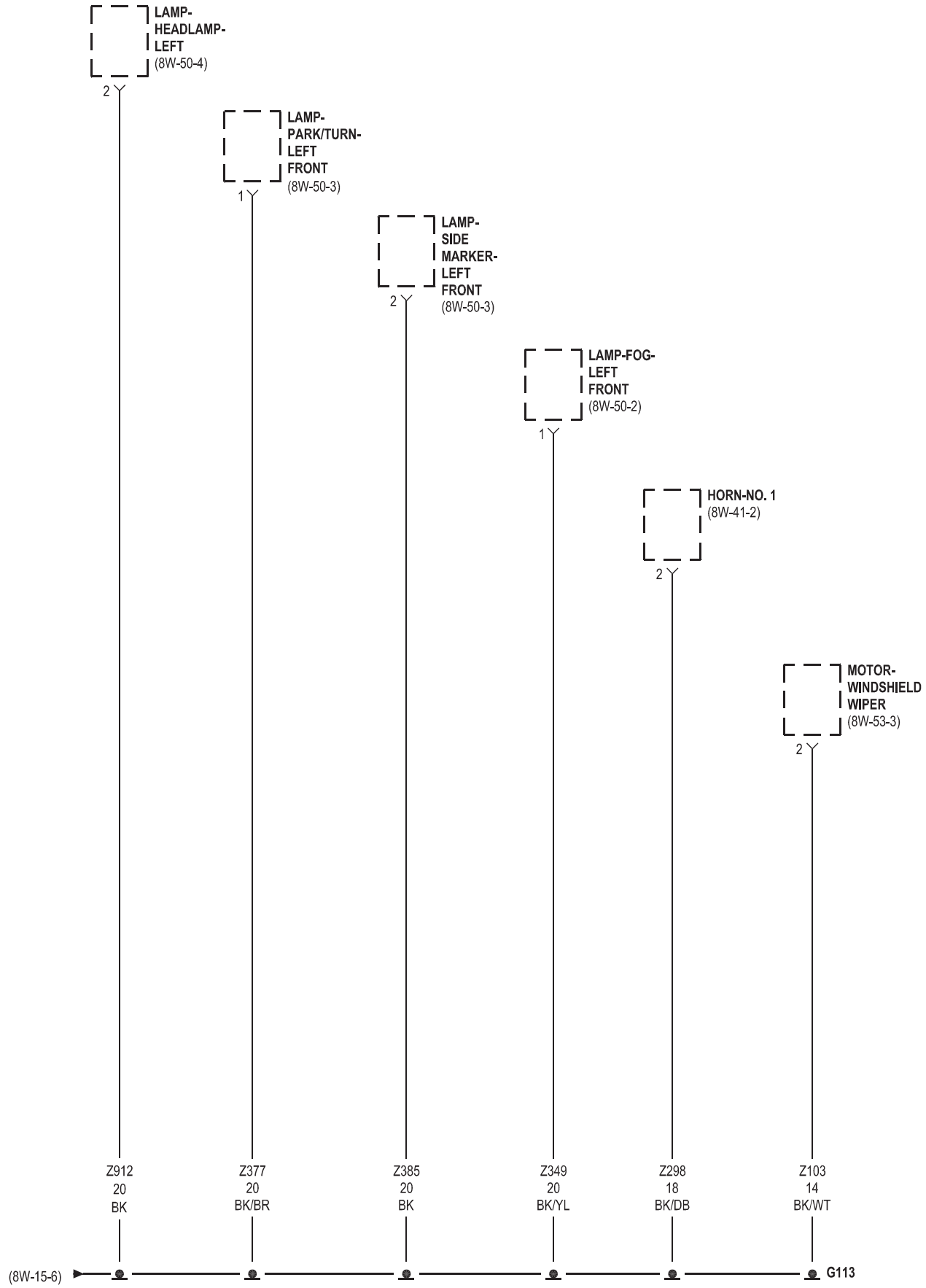
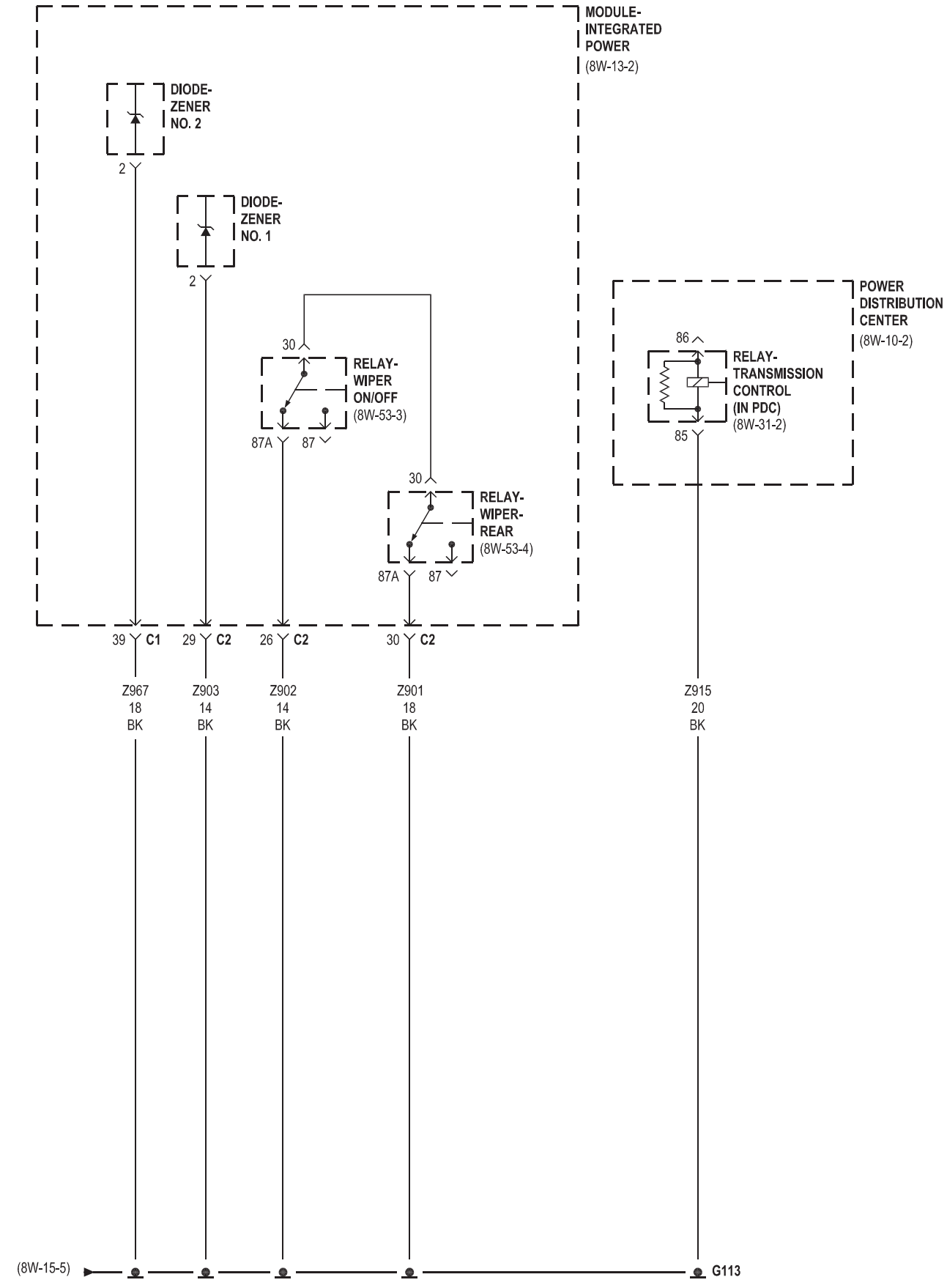
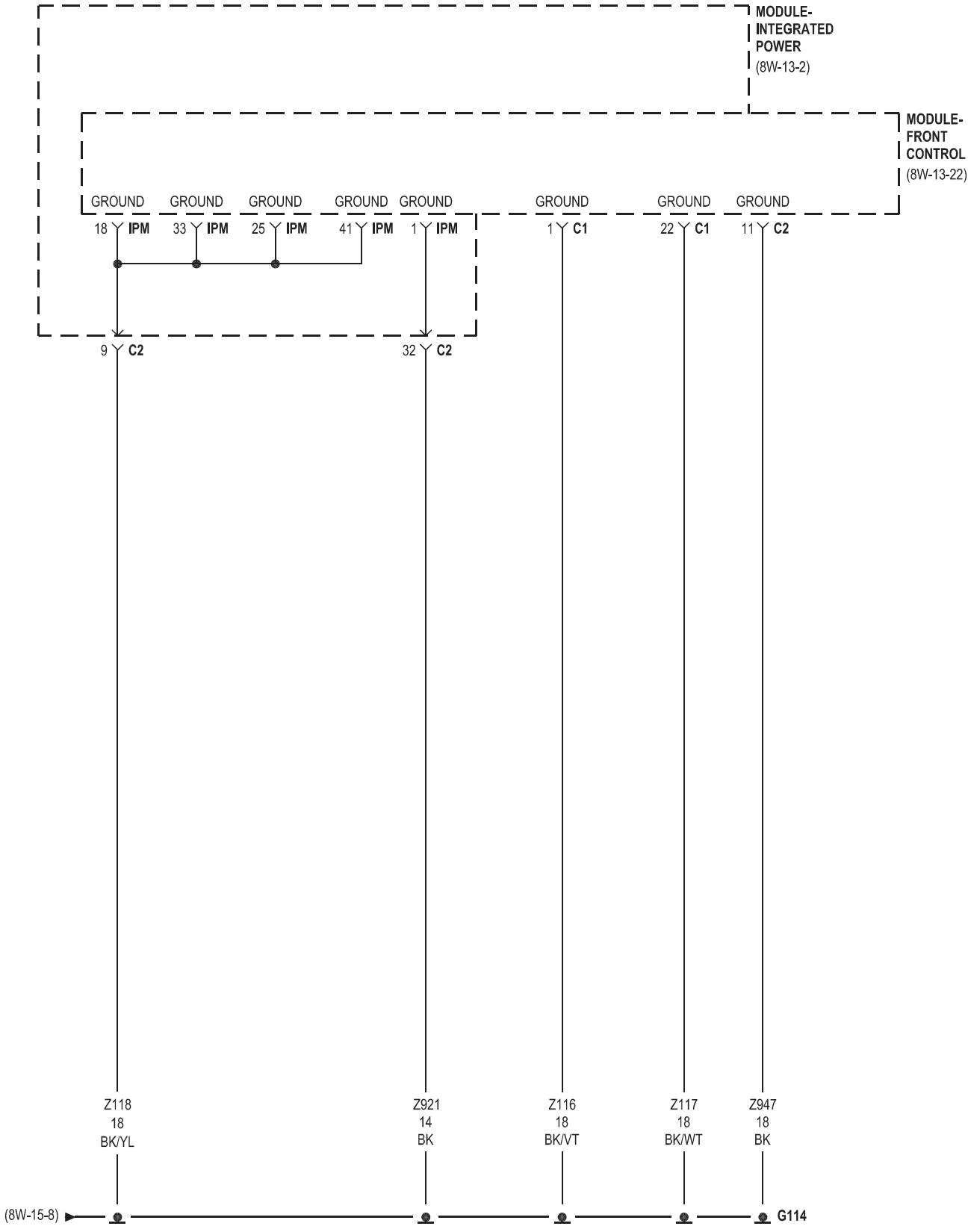

MODULE-
POWERTRAIN
CONTROL
(8W-30-2)
(8W-31-10)
9 C1
18 C1
12 C4
13 C4
14 C4
Z913
16
BK
Z937
16
BK
Z908
16
BK
Z977
16
BK
Z904
16
BK
(8W-15-3)
G100
BATTERY
(8W-20-2)
Z1
4
BK
Z100
4
BK/VT
G110
G111

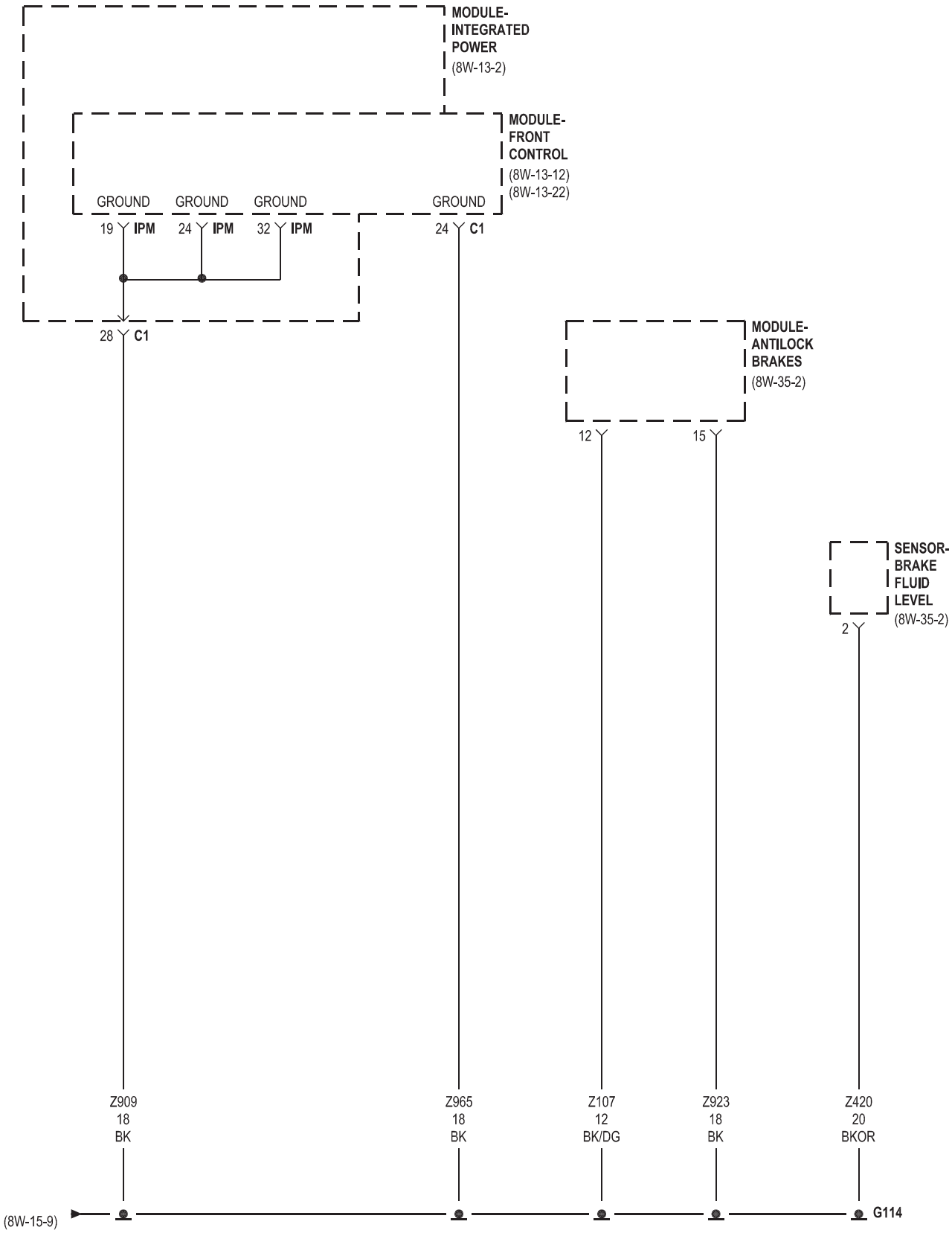

CLUTCH-A/C COMPRESSOR
(8W-42-11)
2
GENERATOR
(8W-20-2)
2
ASSEMBLY-EXHAUST GAS RECIRCULATION VALVE (EXCEPT 3.7L)
(8W-30-18)
4
SENSOR-OXYGEN-RIGHT REAR
(8W-30-14)
2
SENSOR-OXYGEN-LEFT FRONT
(8W-30-14)
2
SWITCH-POWER STEERING PRESSURE (5.7L)
(8W-30-20)
1
SENSOR-OXYGEN-LEFT REAR
(8W-30-14)
2
SENSOR-OXYGEN-RIGHT FRONT
(8W-30-14)
2
Z153 20 BK/GY
Z20 18 BK/RD
Z958 20 BK
Z922 20 BK
Z43 20 BK/LB
Z988 20 BK
Z42 20 BK/LG
Z934 20 BK
(8W-15-2)
G100

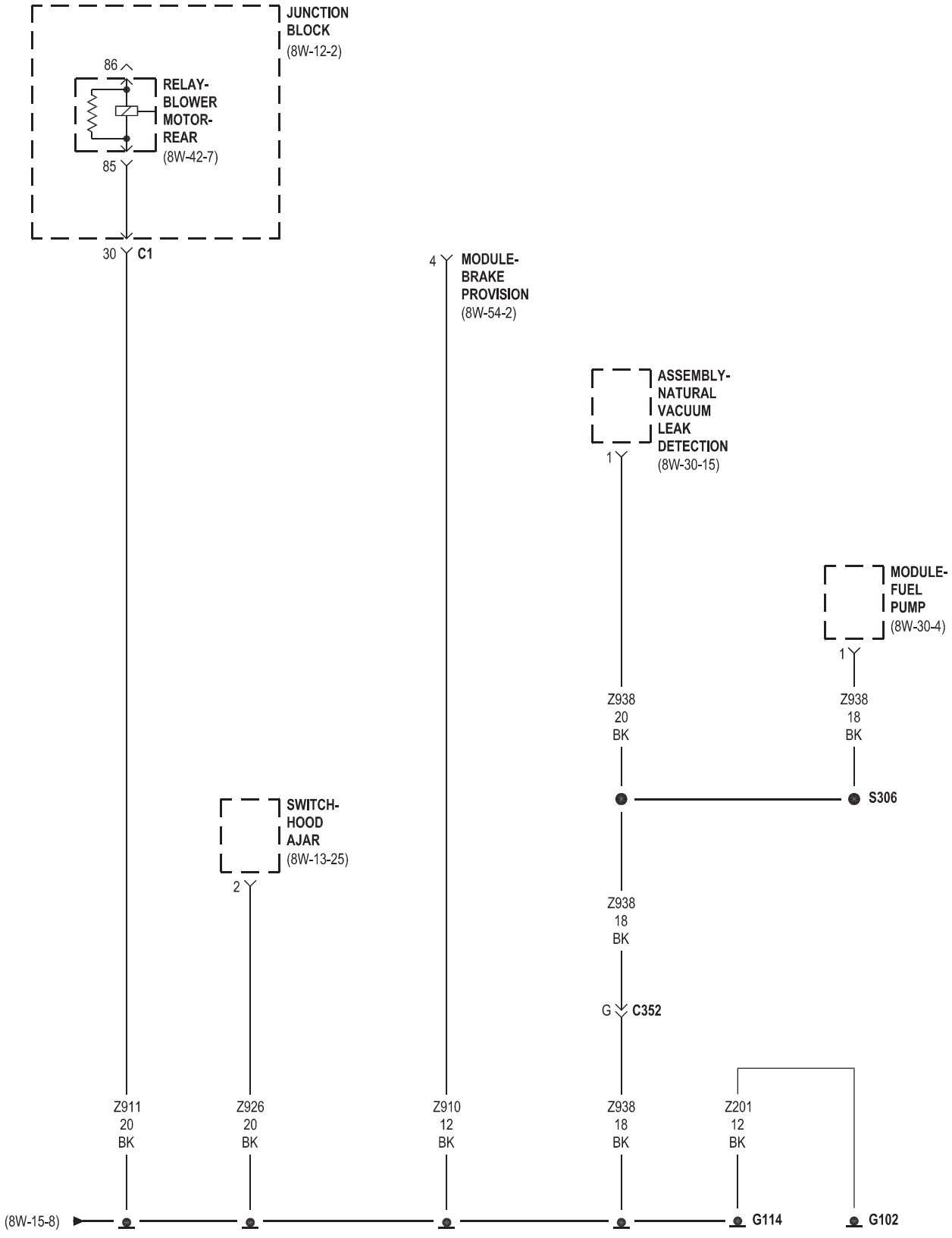

SERVO-
SPEED
CONTROL
(8W-33-3)
4
HORN-NO. 2
(8W-41-2)
2
LAMP-FOG-
RIGHT
FRONT
(8W-50-2)
1
LAMP-
PARK/TURN-
RIGHT
FRONT
(8W-50-3)
1
LAMP-
SIDE
MARKER-
RIGHT
FRONT
(8W-50-3)
2
FAN
MODULE-
CONDENSER
COOLING
(8W-30-5)
3
LAMP-
HEADLAMP-
RIGHT
(8W-50-4)
2
PUMP-
AUXILIARY
COOLANT
(8W-42-6)
2
Z155
20
BK/LG
Z299
18
BK/OR
Z348
20
BK/OR
Z378
20
BK/TN
Z384
20
BK
Z823
12
BK/DG
Z929
20
BK
Z931
18
BK
G112

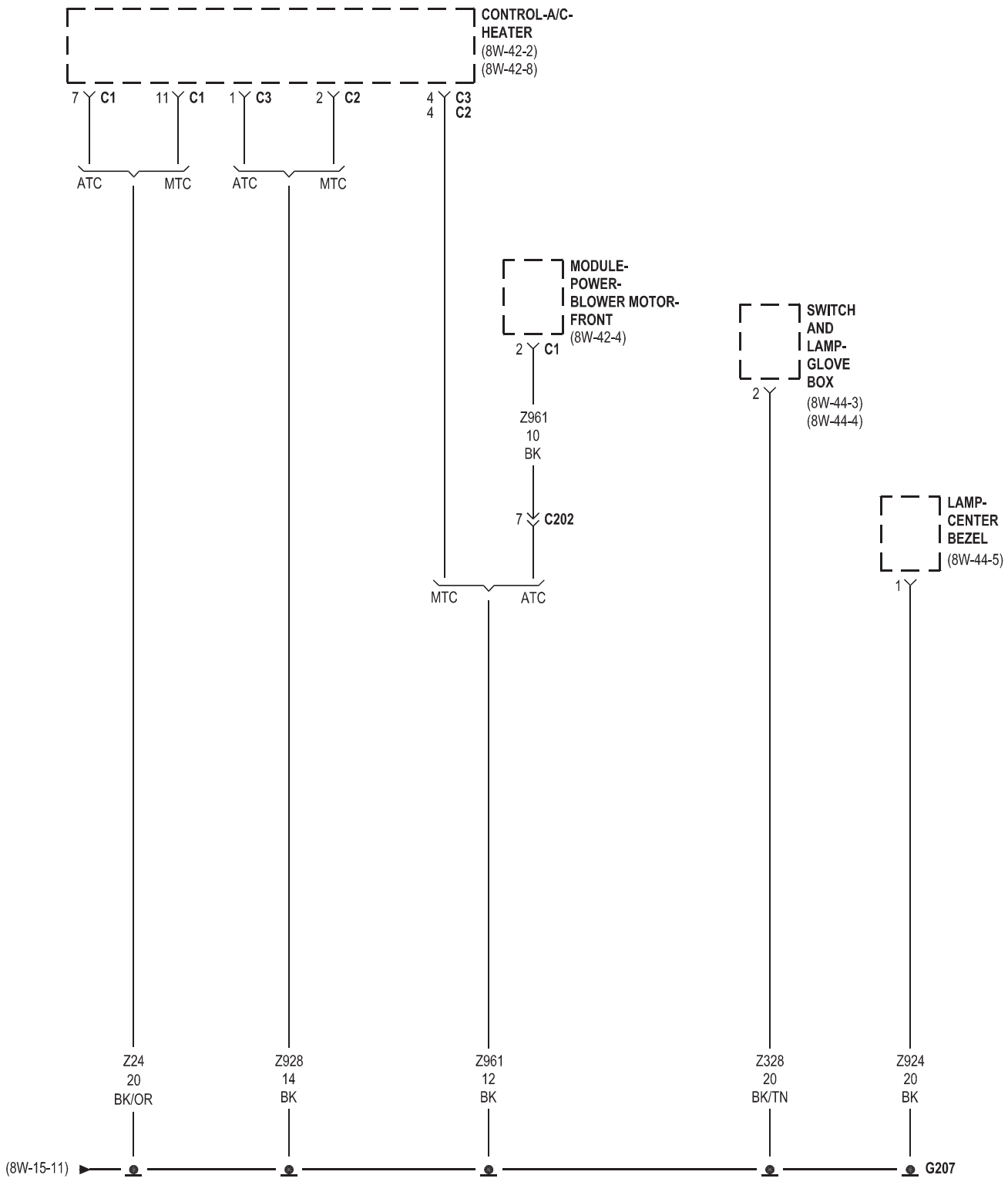

LAMP-
HEADLAMP-
LEFT
(8W-50-4)
2
LAMP-
PARK/TURN-
LEFT
FRONT
(8W-50-3)
1
LAMP-
SIDE
MARKER-
LEFT
FRONT
(8W-50-3)
2
LAMP-FOG-
LEFT
FRONT
(8W-50-2)
1
HORN-NO. 1
(8W-41-2)
2
MOTOR-
WINDSHIELD
WIPER
(8W-53-3)
2
Z912
20
BK
Z377
20
BK/BR
Z385
20
BK
Z349
20
BK/YL
Z298
18
BK/DB
Z103
14
BK/WT
(8W-15-6)
G113

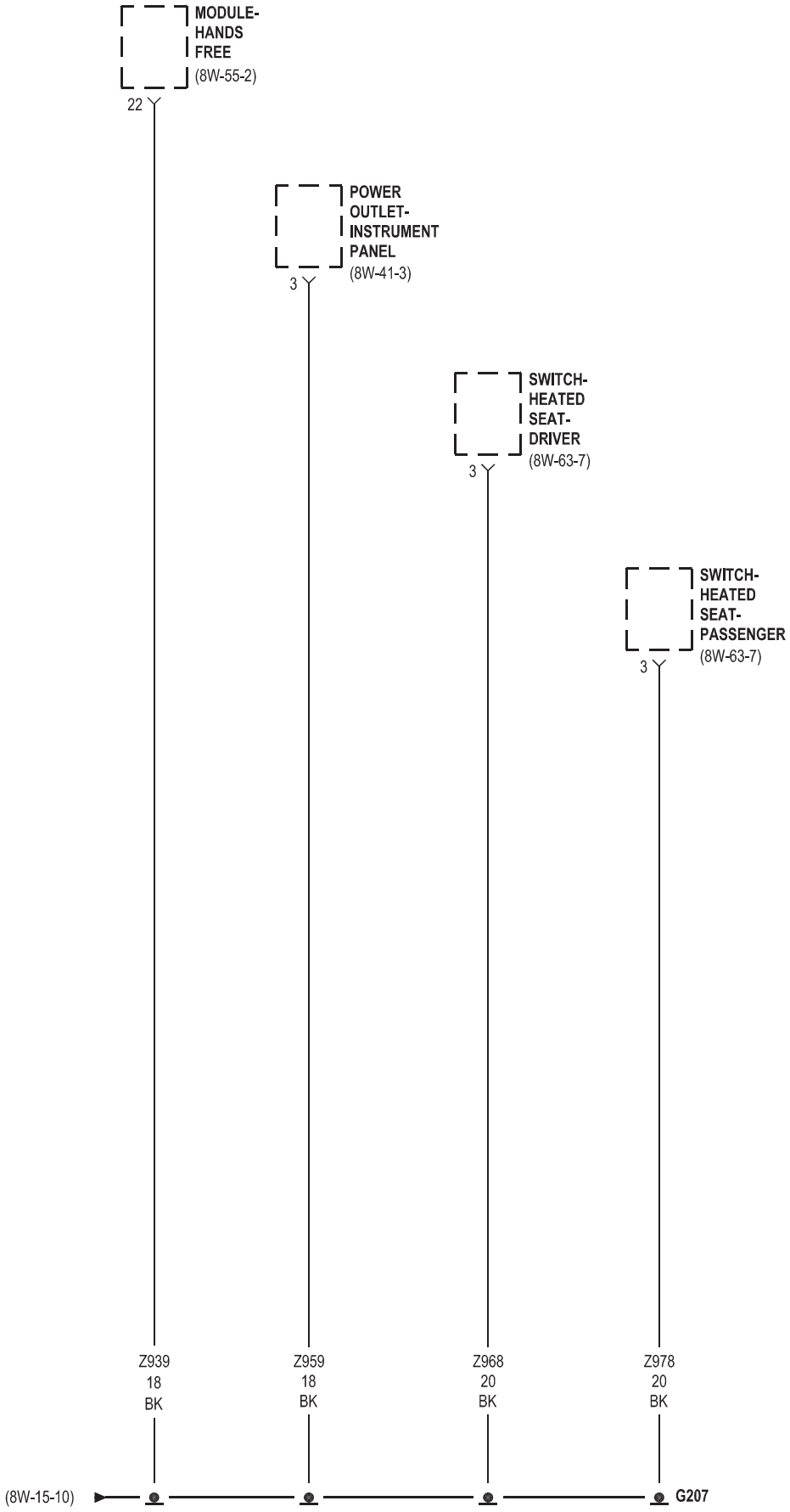

MODULE-
INTEGRATED
POWER
(8W-13-2)
DIODE-
ZENER
NO. 2
2
DIODE-
ZENER
NO. 1
2
30
RELAY-
WIPER
ON/OFF
(8W-53-3)
87A
87
30
RELAY-
WIPER-
REAR
(8W-53-4)
87A
87
POWER
DISTRIBUTION
CENTER
(8W-10-2)
86
RELAY-
TRANSMISSION
CONTROL
(IN PDC)
(8W-31-2)
85
39 C1
29 C2
26 C2
30 C2
Z967
18
BK
Z903
14
BK
Z902
14
BK
Z901
18
BK
Z915
20
BK
(8W-15-5)
G113

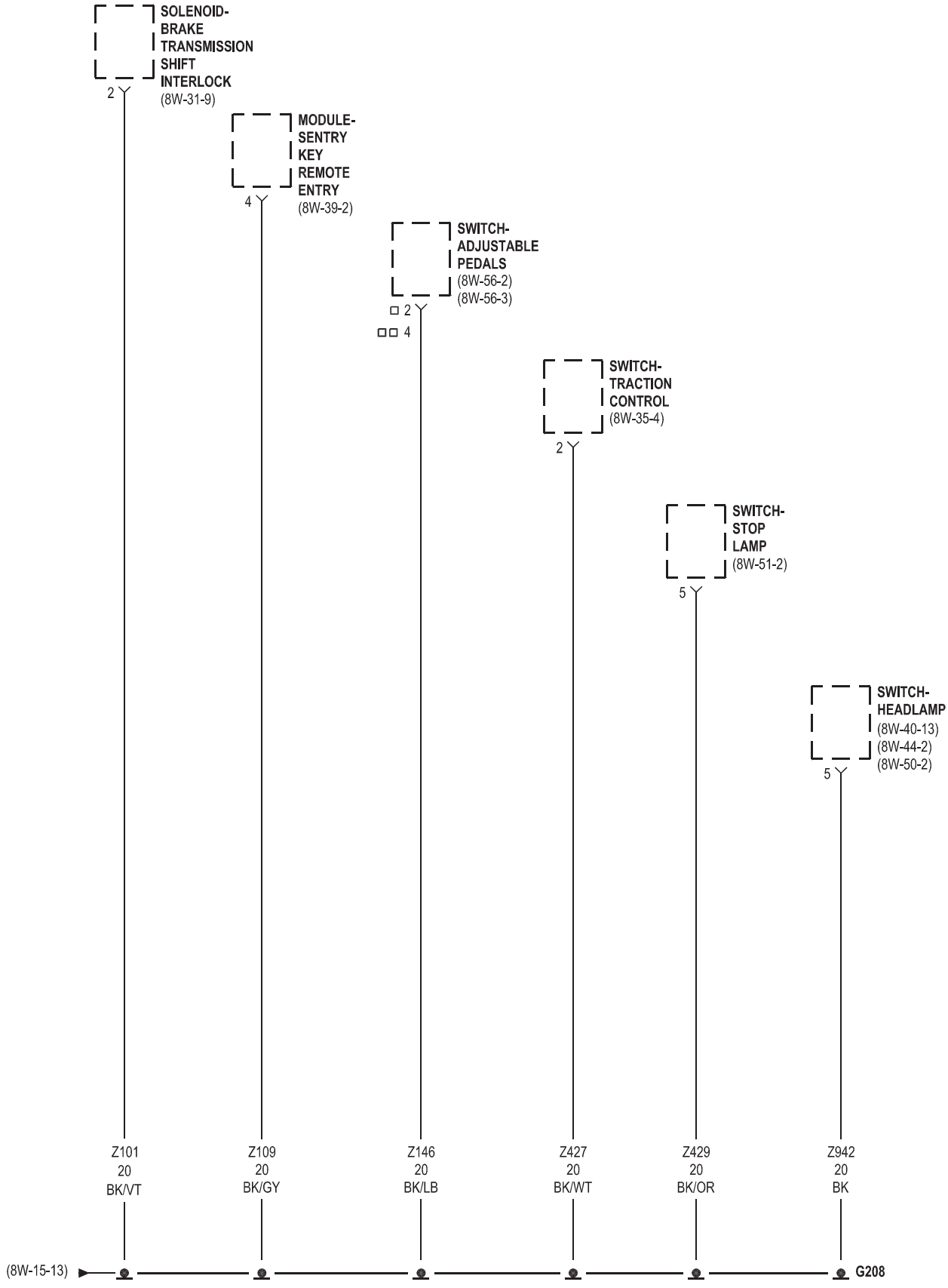

MODULE-
INTEGRATED
POWER
(8W-13-2)
MODULE-
FRONT
CONTROL
(8W-13-22)
GROUND
GROUND
GROUND
GROUND
GROUND
GROUND
GROUND
GROUND
18 IPM
33 IPM
25 IPM
41 IPM
1 IPM
1 C1
22 C1
11 C2
9 C2
32 C2
Z118
18
BK/YL
Z921
14
BK
Z116
18
BK/VT
Z117
18
BK/WT
Z947
18
BK
(8W-15-8)
G114

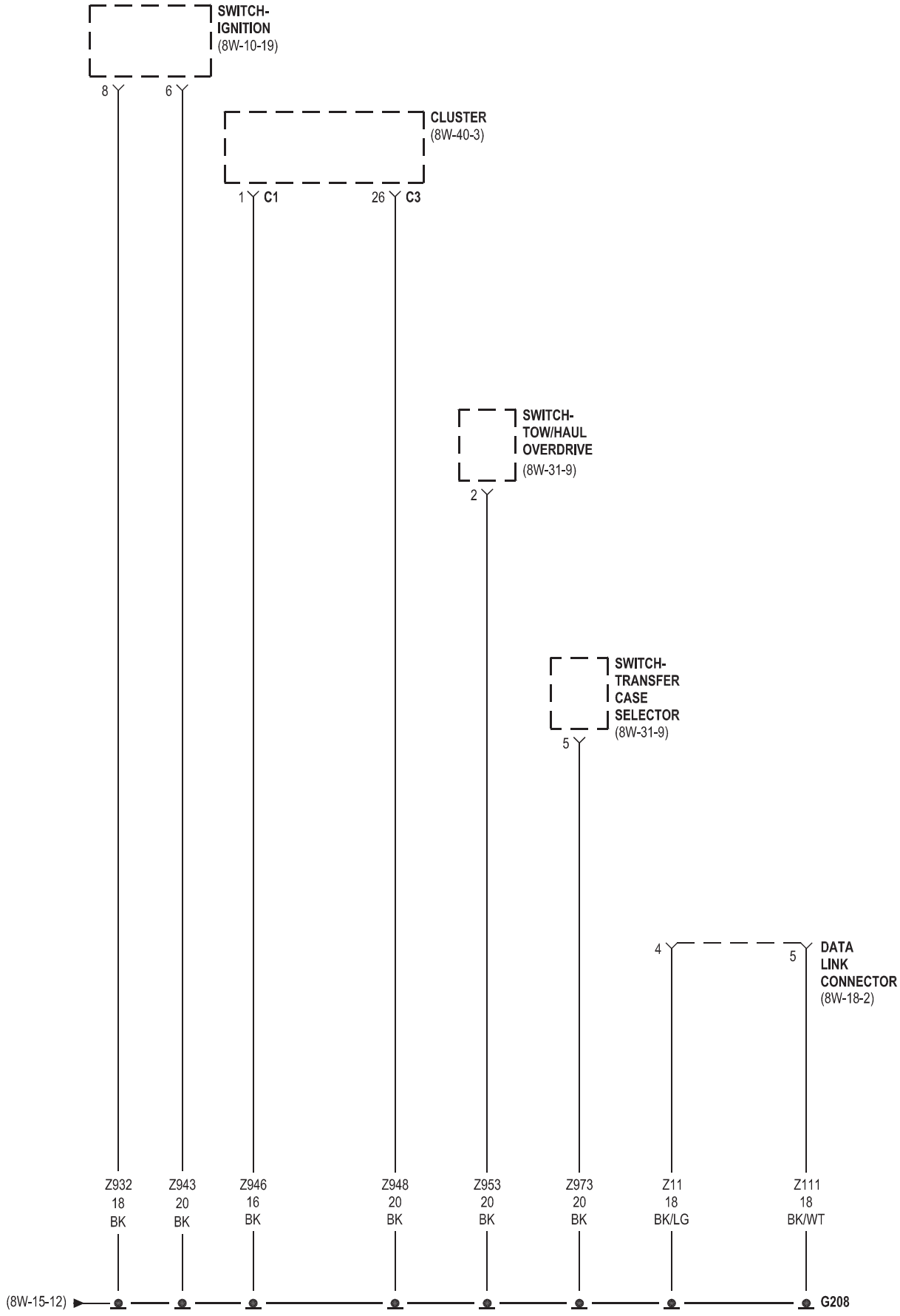

MODULE-
INTEGRATED
POWER
(8W-13-2)
MODULE-
FRONT
CONTROL
(8W-13-12)
(8W-13-22)
GROUND
GROUND
GROUND
GROUND
19 IPM
24 IPM
32 IPM
24 C1
28 C1
MODULE-
ANTILOCK
BRAKES
(8W-35-2)
12
15
SENSOR-
BRAKE
FLUID
LEVEL
(8W-35-2)
2
Z909
18
BK
Z965
18
BK
Z107
12
BK/DG
Z923
18
BK
Z420
20
BKOR
(8W-15-9)
G114

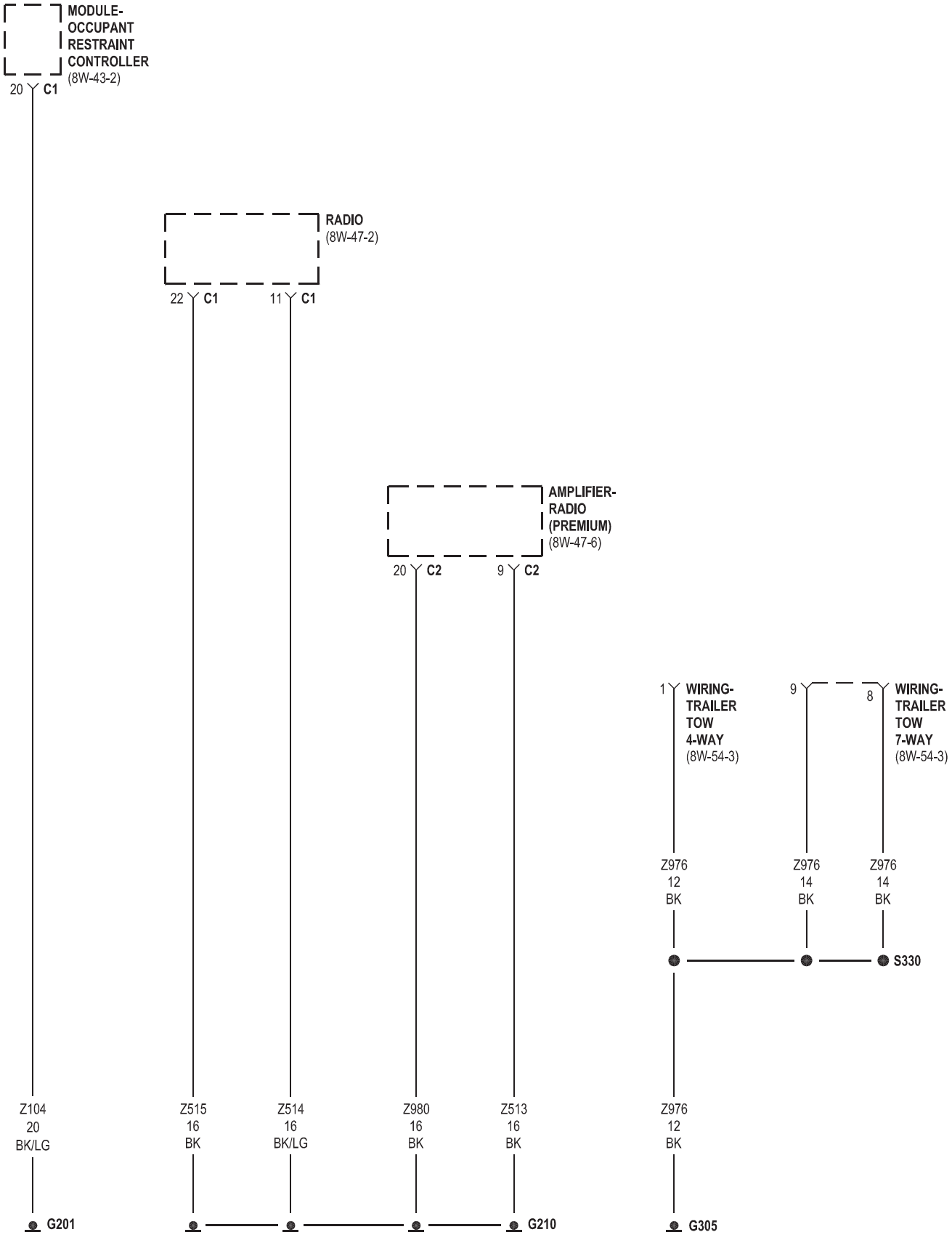

JUNCTION BLOCK
(8W-12-2)
86
RELAY-BLOWER MOTOR-REAR
(8W-42-7)
85
30
C1
4
MODULE-BRAKE PROVISION
(8W-54-2)
ASSEMBLY-NATURAL VACUUM LEAK DETECTION
(8W-30-15)
1
MODULE-FUEL PUMP
(8W-30-4)
1
Z938
20
BK
Z938
18
BK
S306
SWITCH-HOOD AJAR
(8W-13-25)
2
Z938
18
BK
G
C352
Z911
20
BK
Z926
20
BK
Z910
12
BK
Z938
18
BK
Z201
12
BK
(8W-15-8)
G114
G102

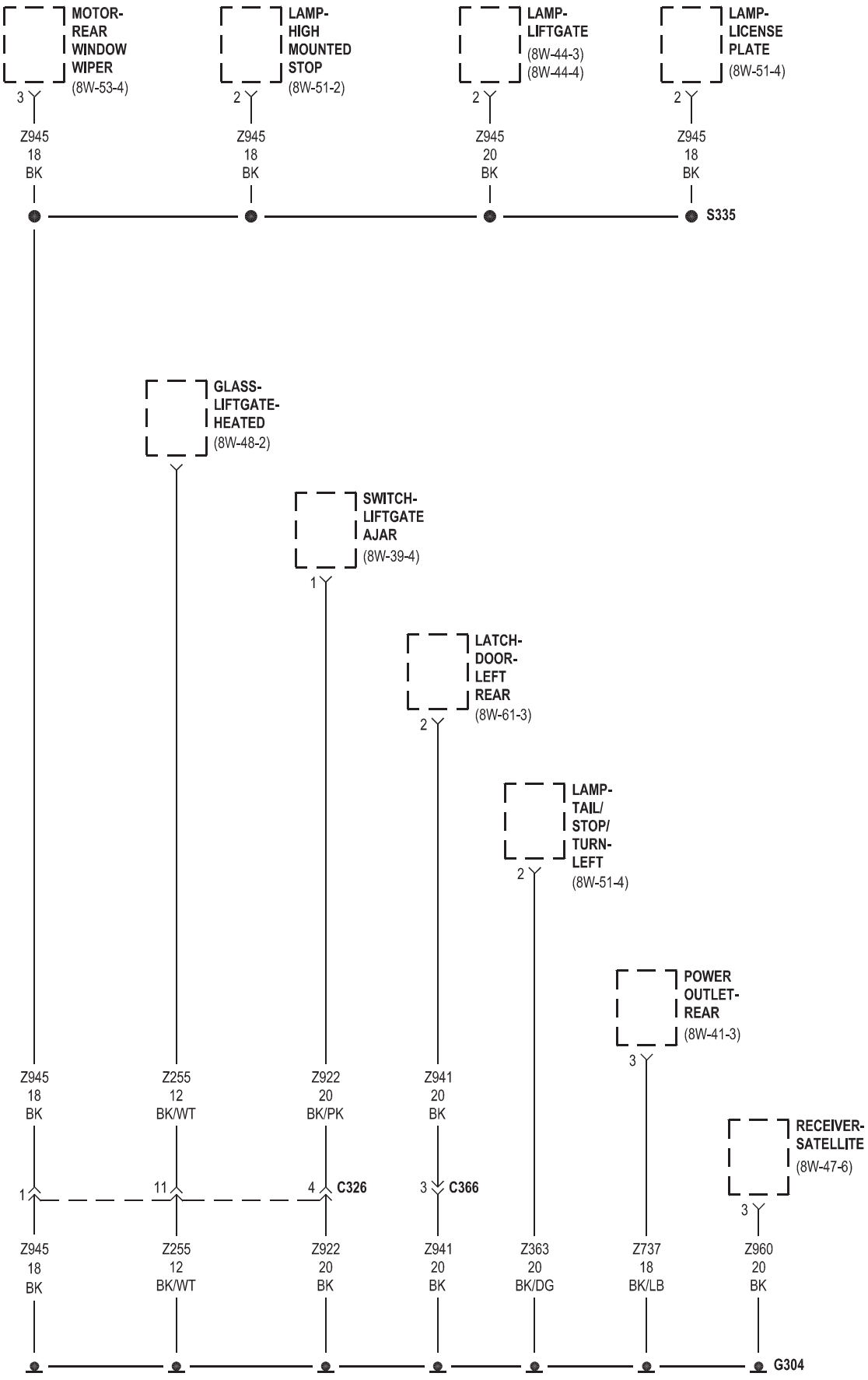

CONTROL-A/C-HEATER
(8W-42-2)
(8W-42-8)
7 C1
11 C1
1 C3
2 C2
4 C3
4 C2
ATC
MTC
ATC
MTC
MODULE-POWER-BLOWER MOTOR-FRONT
(8W-42-4)
2 C1
Z961
10
BK
7 C202
MTC
ATC
SWITCH AND LAMP-GLOVE BOX
(8W-44-3)
(8W-44-4)
2
LAMP-CENTER BEZEL
(8W-44-5)
1
Z24
20
BK/OR
Z928
14
BK
Z961
12
BK
Z328
20
BK/TN
Z924
20
BK
(8W-15-11)
G207

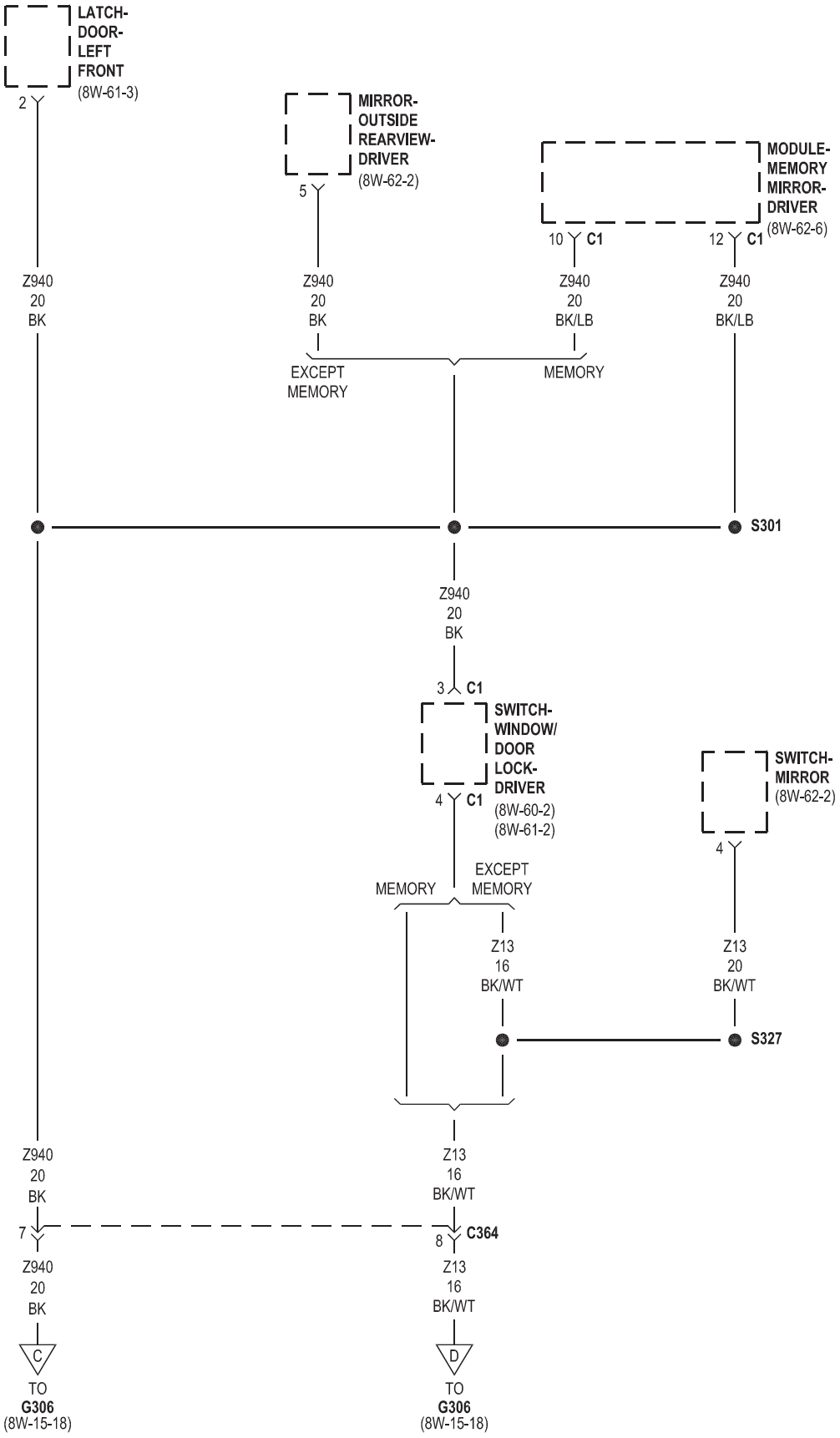

MODULE-
HANDS
FREE
(8W-55-2)
22
POWER
OUTLET-
INSTRUMENT
PANEL
(8W-41-3)
3
SWITCH-
HEATED
SEAT-
DRIVER
(8W-63-7)
3
SWITCH-
HEATED
SEAT-
PASSENGER
(8W-63-7)
3
Z939
18
BK
Z959
18
BK
Z968
20
BK
Z978
20
BK
(8W-15-10)
G207

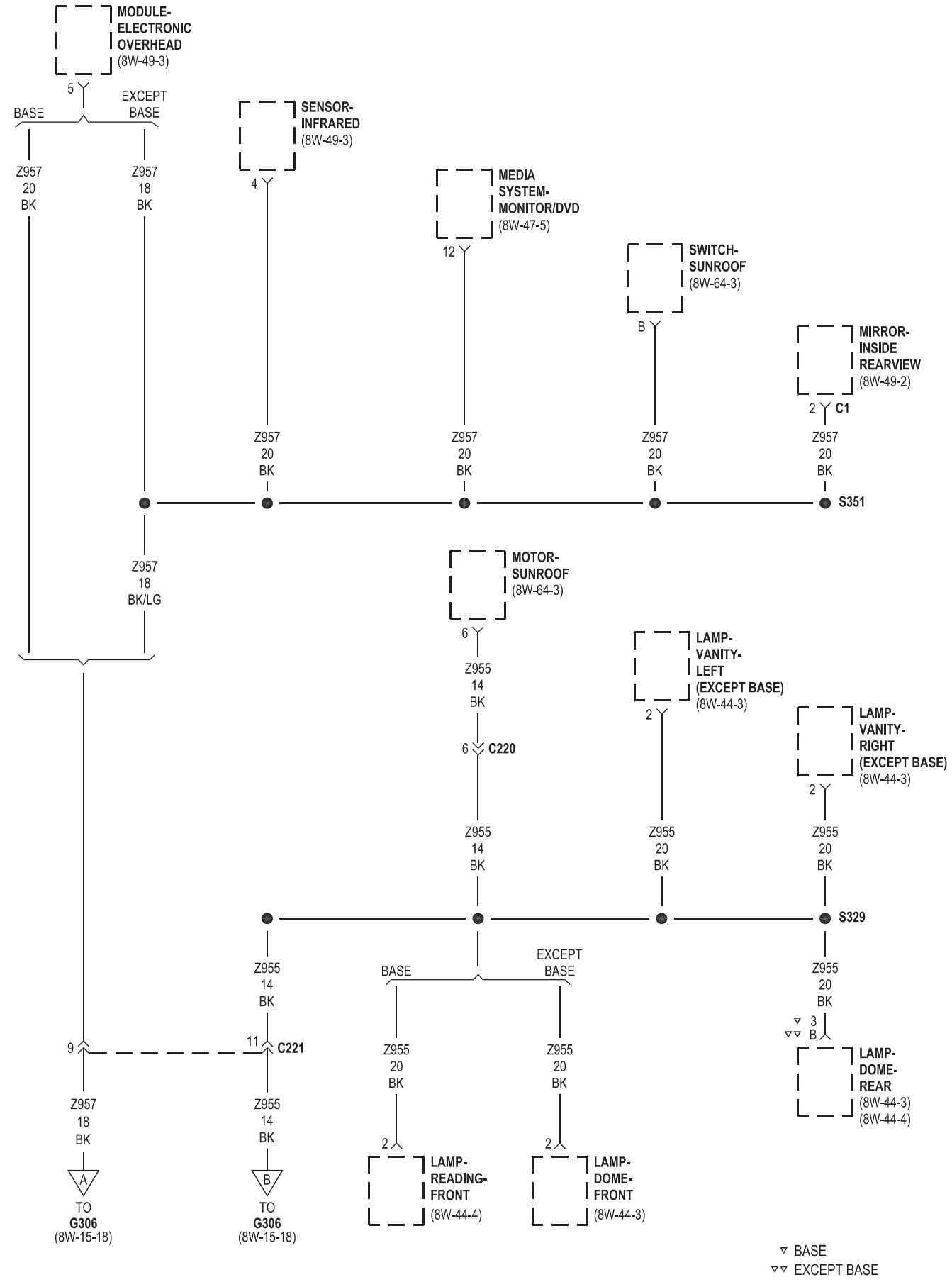

SOLENOID-
BRAKE
TRANSMISSION
SHIFT
INTERLOCK
(8W-31-9)
2
MODULE-
SENTRY
KEY
REMOTE
ENTRY
(8W-39-2)
4
SWITCH-
ADJUSTABLE
PEDALS
(8W-56-2)
(8W-56-3)
□ 2
□□ 4
SWITCH-
TRACTION
CONTROL
(8W-35-4)
2
SWITCH-
STOP
LAMP
(8W-51-2)
5
SWITCH-
HEADLAMP
(8W-40-13)
(8W-44-2)
(8W-50-2)
5
Z101
20
BK/VT
Z109
20
BK/GY
Z146
20
BK/LB
Z427
20
BK/WT
Z429
20
BK/OR
Z942
20
BK
(8W-15-13)
G208
□ ATC
□□ MTC

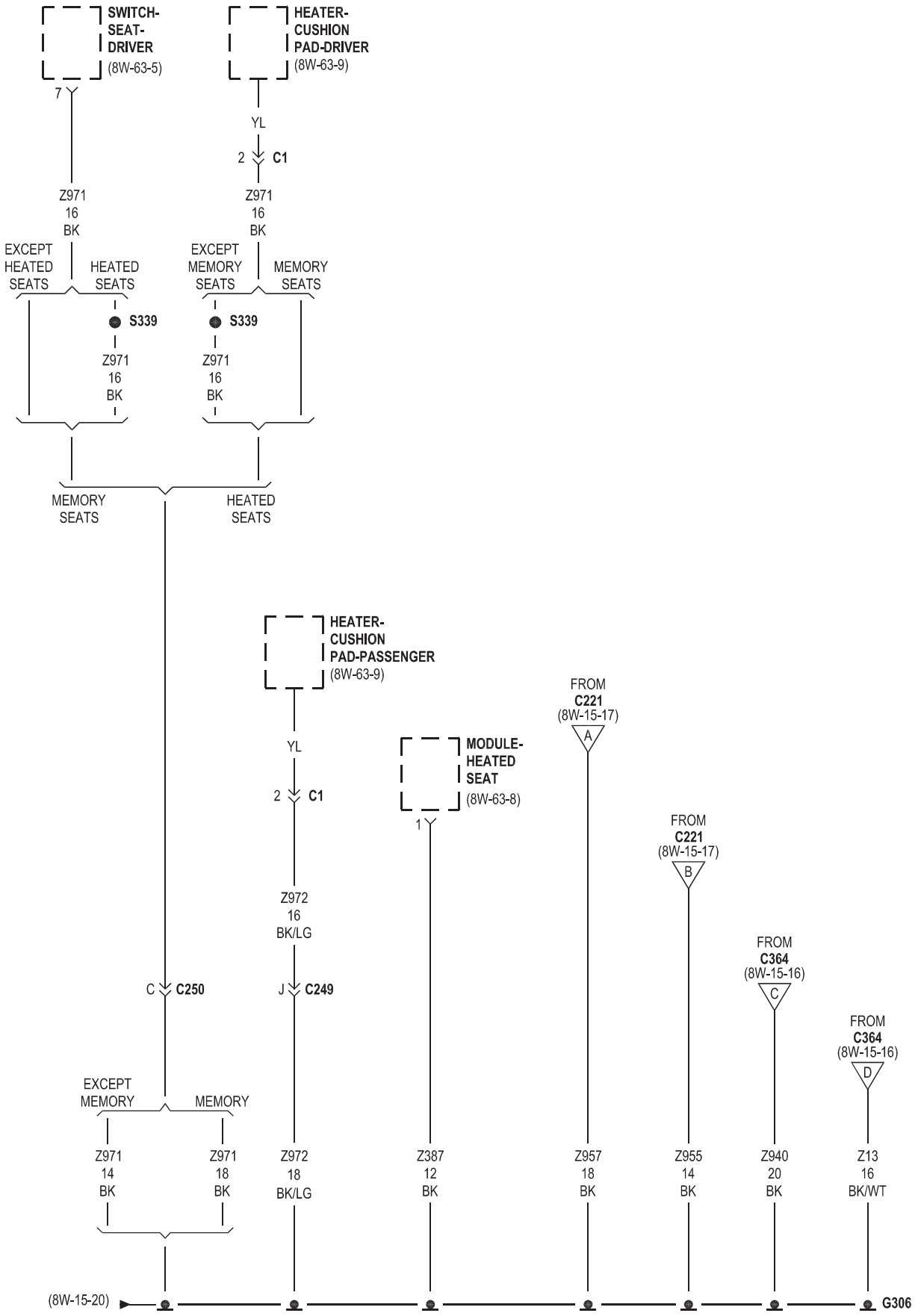

SWITCH-
IGNITION
(8W-10-19)
8
6
CLUSTER
(8W-40-3)
1
C1
26
C3
SWITCH-
TOW/HAUL
OVERDRIVE
(8W-31-9)
2
SWITCH-
TRANSFER
CASE
SELECTOR
(8W-31-9)
5
4
5
DATA
LINK
CONNECTOR
(8W-18-2)
Z932
18
BK
Z943
20
BK
Z946
16
BK
Z948
20
BK
Z953
20
BK
Z973
20
BK
Z11
18
BK/LG
Z111
18
BK/WT
(8W-15-12)
G208

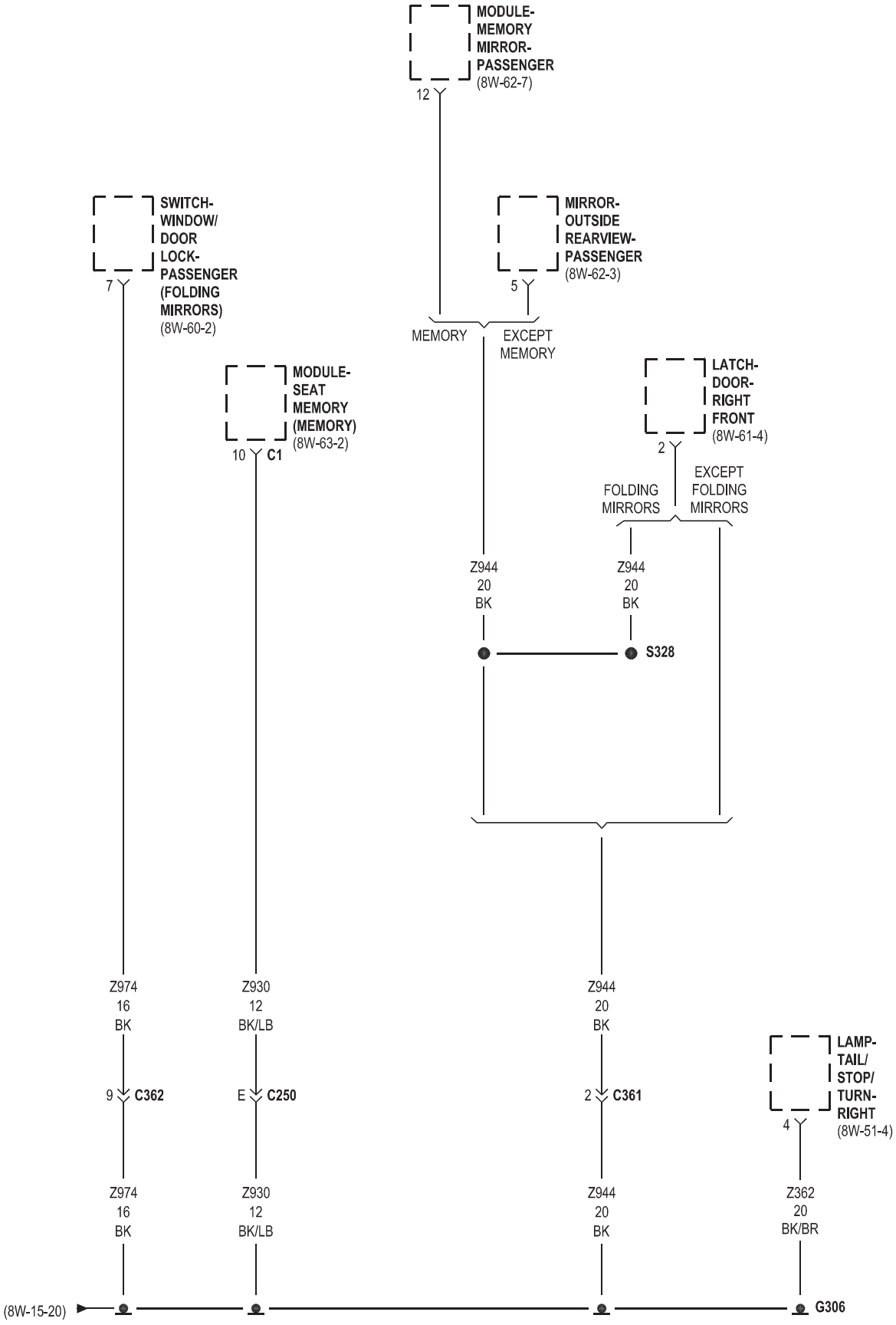

MODULE-
OCCUPANT
RESTRAINT
CONTROLLER
(8W-43-2)
20 C1
RADIO
(8W-47-2)
22 C1
11 C1
AMPLIFIER-
RADIO
(PREMIUM)
(8W-47-6)
20 C2
9 C2
1 WIRING-
TRAILER
TOW
4-WAY
(8W-54-3)
9
8
WIRING-
TRAILER
TOW
7-WAY
(8W-54-3)
Z976
12
BK
Z976
14
BK
Z976
14
BK
S330
Z104
20
BK/LG
Z515
16
BK
Z514
16
BK/LG
Z980
16
BK
Z513
16
BK
Z976
12
BK
G201
G210
G305

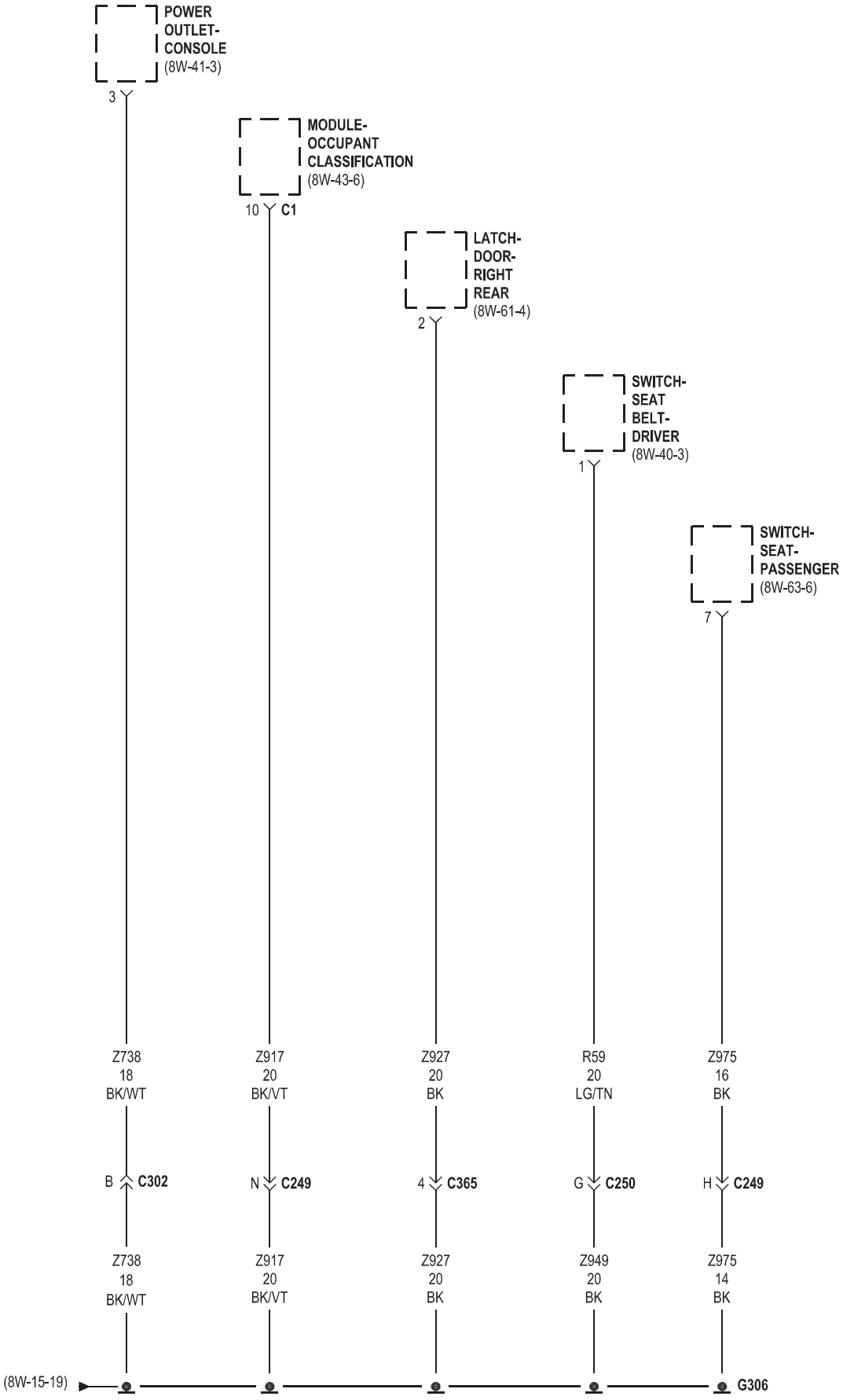

MOTOR-
REAR
WINDOW
WIPER
(8W-53-4)
3
Z945
18
BK
LAMP-
HIGH
MOUNTED
STOP
(8W-51-2)
2
Z945
18
BK
LAMP-
LIFTGATE
(8W-44-3)
(8W-44-4)
2
Z945
20
BK
LAMP-
LICENSE
PLATE
(8W-51-4)
2
Z945
18
BK
S335
GLASS-
LIFTGATE-
HEATED
(8W-48-2)
SWITCH-
LIFTGATE
AJAR
(8W-39-4)
1
LATCH-
DOOR-
LEFT
REAR
(8W-61-3)
2
LAMP-
TAIL/
STOP/
TURN-
LEFT
(8W-51-4)
2
POWER
OUTLET-
REAR
(8W-41-3)
3
RECEIVER-
SATELLITE
(8W-47-6)
3
Z945
18
BK
Z255
12
BK/WT
Z922
20
BK/PK
Z941
20
BK
1
11
4
C326
3
C366
Z945
18
BK
Z255
12
BK/WT
Z922
20
BK
Z941
20
BK
Z363
20
BK/DG
Z737
18
BK/LB
Z960
20
BK
G304


LATCH-
DOOR-
LEFT
FRONT
(8W-61-3)
2
MIRROR-
OUTSIDE
REARVIEW-
DRIVER
(8W-62-2)
5
MODULE-
MEMORY
MIRROR-
DRIVER
(8W-62-6)
10 C1
12 C1
Z940
20
BK
Z940
20
BK
Z940
20
BK/LB
Z940
20
BK/LB
EXCEPT
MEMORY
MEMORY
S301
Z940
20
BK
3 C1
SWITCH-
WINDOW/
DOOR
LOCK-
DRIVER
4 C1
(8W-60-2)
(8W-61-2)
SWITCH-
MIRROR
(8W-62-2)
4
MEMORY
EXCEPT
MEMORY
Z13
16
BK/WT
Z13
20
BK/WT
S327
Z940
20
BK
Z13
16
BK/WT
7
C364
8
Z940
20
BK
Z13
16
BK/WT
C
D
TO
G306
(8W-15-18)
TO
G306
(8W-15-18)


MODULE-
ELECTRONIC
OVERHEAD
(8W-49-3)
5
BASE
EXCEPT
BASE
Z957
20
BK
Z957
18
BK
SENSOR-
INFRARED
(8W-49-3)
4
Z957
20
BK
MEDIA
SYSTEM-
MONITOR/DVD
(8W-47-5)
12
Z957
20
BK
SWITCH-
SUNROOF
(8W-64-3)
B
Z957
20
BK
MIRROR-
INSIDE
REARVIEW
(8W-49-2)
2
C1
Z957
20
BK
S351
Z957
18
BK/LG
MOTOR-
SUNROOF
(8W-64-3)
6
Z955
14
BK
6
C220
Z955
14
BK
LAMP-
VANITY-
LEFT
(EXCEPT BASE)
(8W-44-3)
2
Z955
20
BK
LAMP-
VANITY-
RIGHT
(EXCEPT BASE)
(8W-44-3)
2
Z955
20
BK
S329
Z955
14
BK
11
C221
BASE
EXCEPT
BASE
Z955
20
BK
Z955
20
BK
Z955
20
BK
3
B
LAMP-
DOME-
REAR
(8W-44-3)
(8W-44-4)
9
Z957
18
BK
Z955
14
BK
2
LAMP-
READING-
FRONT
(8W-44-4)
2
LAMP-
DOME-
FRONT
(8W-44-3)
A
TO
G306
(8W-15-18)
B
TO
G306
(8W-15-18)
▽ BASE
▽▽ EXCEPT BASE


SWITCH-SEAT-DRIVER
(8W-63-5)
7
Z971
16
BK
EXCEPT HEATED SEATS
HEATED SEATS
S339
Z971
16
BK
HEATER-CUSHION PAD-DRIVER
(8W-63-9)
YL
2 C1
Z971
16
BK
EXCEPT MEMORY SEATS
MEMORY SEATS
S339
Z971
16
BK
MEMORY SEATS
HEATED SEATS
HEATER-CUSHION PAD-PASSENGER
(8W-63-9)
YL
2 C1
Z972
16
BK/LG
J C249
MODULE-HEATED SEAT
(8W-63-8)
1
Z387
12
BK
FROM C221 (8W-15-17)
A
Z957
18
BK
FROM C221 (8W-15-17)
B
Z955
14
BK
FROM C364 (8W-15-16)
C
Z940
20
BK
FROM C364 (8W-15-16)
D
Z13
16
BK/WT
C C250
EXCEPT MEMORY
MEMORY
Z971
14
BK
Z971
18
BK
Z972
18
BK/LG
(8W-15-20)
G306


MODULE-MEMORY MIRROR-PASSENGER
(8W-62-7)
12
SWITCH-WINDOW/ DOOR LOCK-PASSENGER (FOLDING MIRRORS)
(8W-60-2)
7
MIRROR-OUTSIDE REARVIEW-PASSENGER
(8W-62-3)
5
MEMORY
EXCEPT MEMORY
MODULE-SEAT MEMORY (MEMORY)
(8W-63-2)
10 C1
LATCH-DOOR-RIGHT FRONT
(8W-61-4)
2
FOLDING MIRRORS
EXCEPT FOLDING MIRRORS
Z944 20 BK
Z944 20 BK
S328
Z974 16 BK
Z930 12 BK/LB
Z944 20 BK
LAMP-TAIL/ STOP/ TURN-RIGHT
(8W-51-4)
9 C362
E C250
2 C361
4
Z974 16 BK
Z930 12 BK/LB
Z944 20 BK
Z362 20 BK/BR
(8W-15-20)
G306


POWER OUTLET-CONSOLE (8W-41-3)
3
MODULE-OCCUPANT CLASSIFICATION (8W-43-6)
10 C1
LATCH-DOOR-RIGHT REAR (8W-61-4)
2
SWITCH-SEAT BELT-DRIVER (8W-40-3)
1
SWITCH-SEAT-PASSENGER (8W-63-6)
7
Z738 18 BK/WT
Z917 20 BK/VT
Z927 20 BK
R59 20 LG/TN
Z975 16 BK
B C302
N C249
4 C365
G C250
H C249
Z738 18 BK/WT
Z917 20 BK/VT
Z927 20 BK
Z949 20 BK
Z975 14 BK
(8W-15-19)
G306

8W-18 BUS COMMUNICATIONS

Component	Page
Amplifier-Radio	8W-18-3, 5
Cluster	8W-18-3, 5
Control-A/C-Heater	8W-18-3, 5
Data Link Connector	8W-18-2
Fuse 14	8W-18-2
G208	8W-18-2
Junction Block	8W-18-2, 3, 4, 5, 6
Media System-Monitor/Dvd	8W-18-4, 6
Module-Antilock Brakes	8W-18-7
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Module-Front Control	8W-18-2, 4, 6, 7
Module-Hands Free	8W-18-3, 5
Module-Heated Seat	8W-18-4, 6
Module-Memory Mirror-Driver	8W-18-4, 6
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Module-Occupant Classification	8W-18-4, 6
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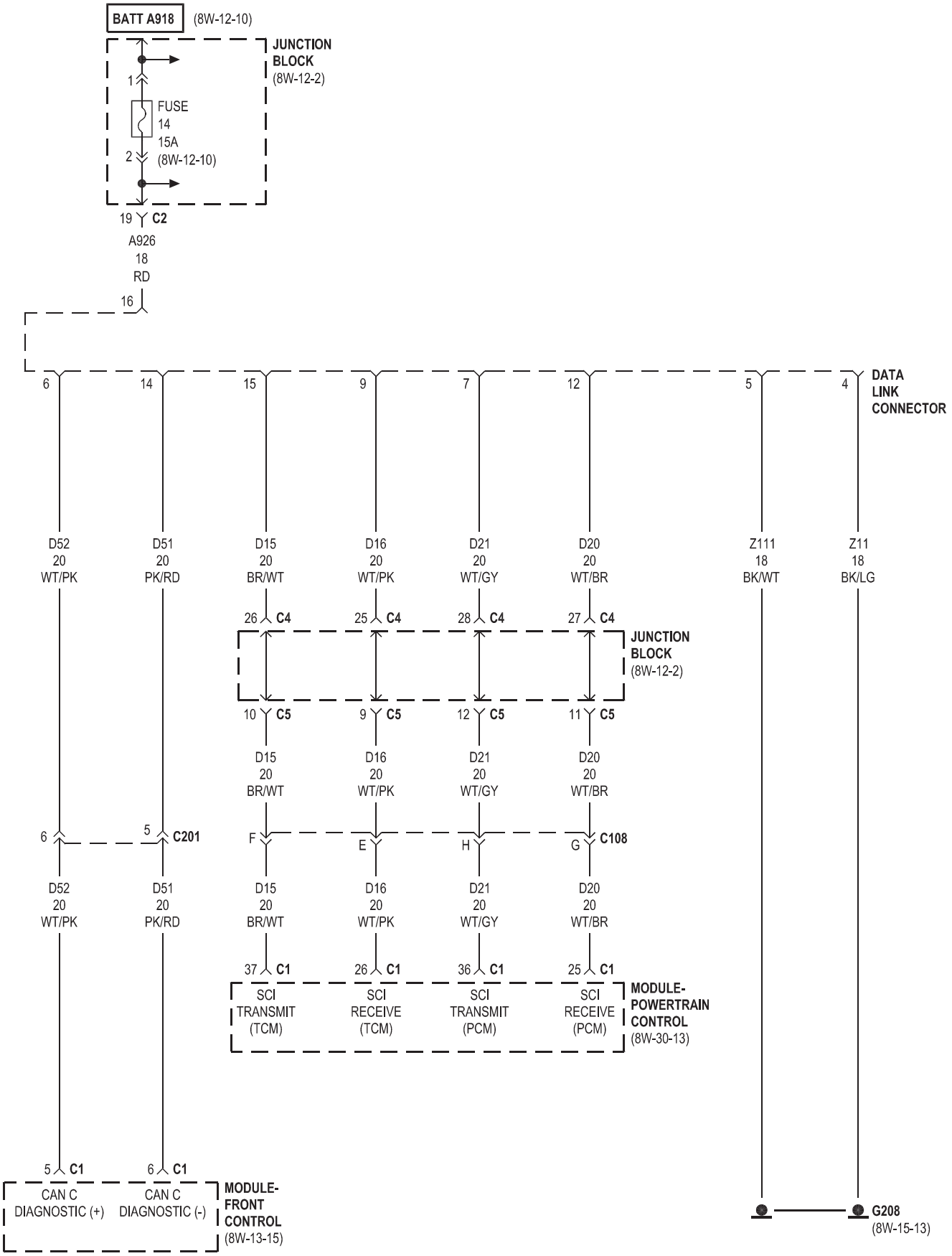
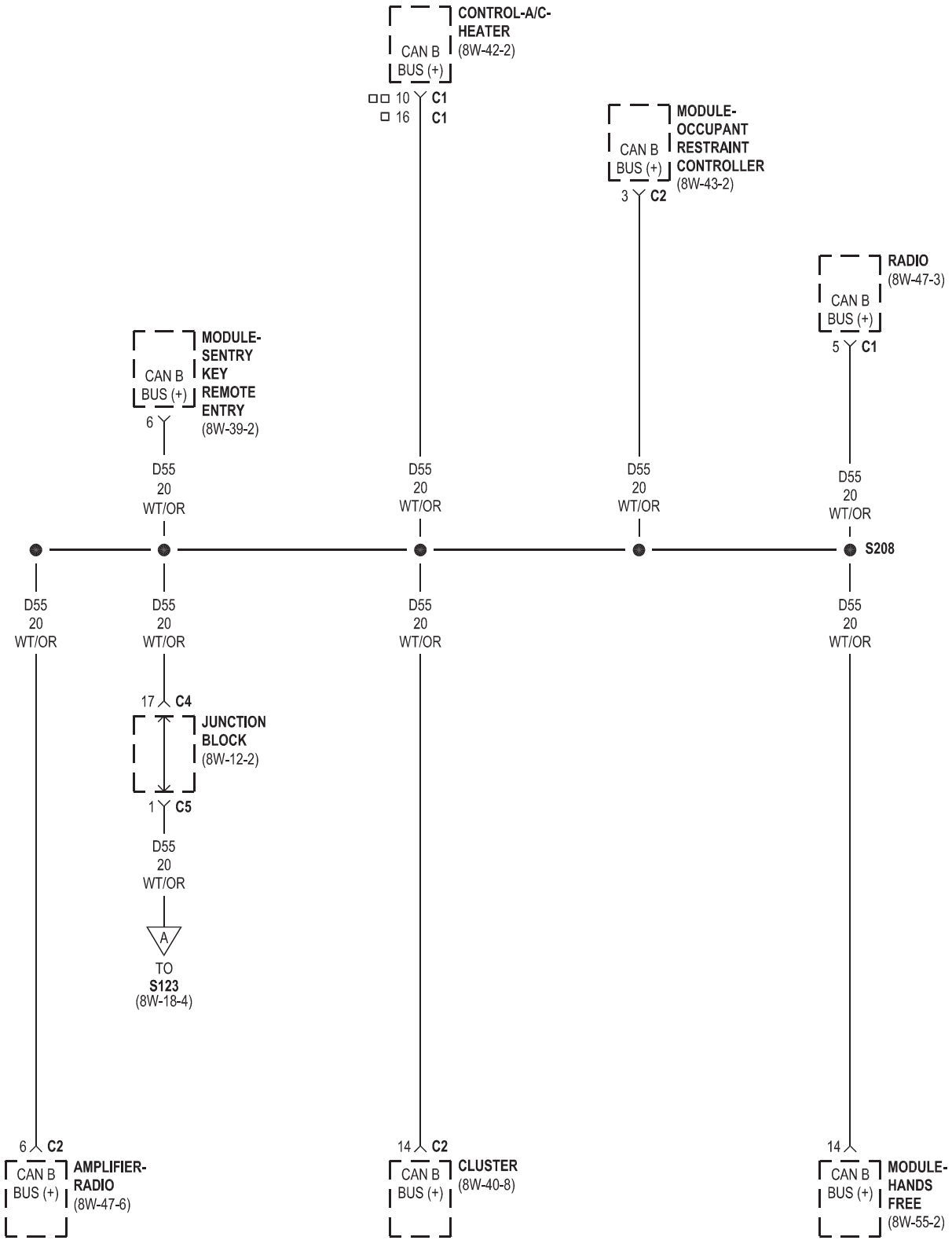
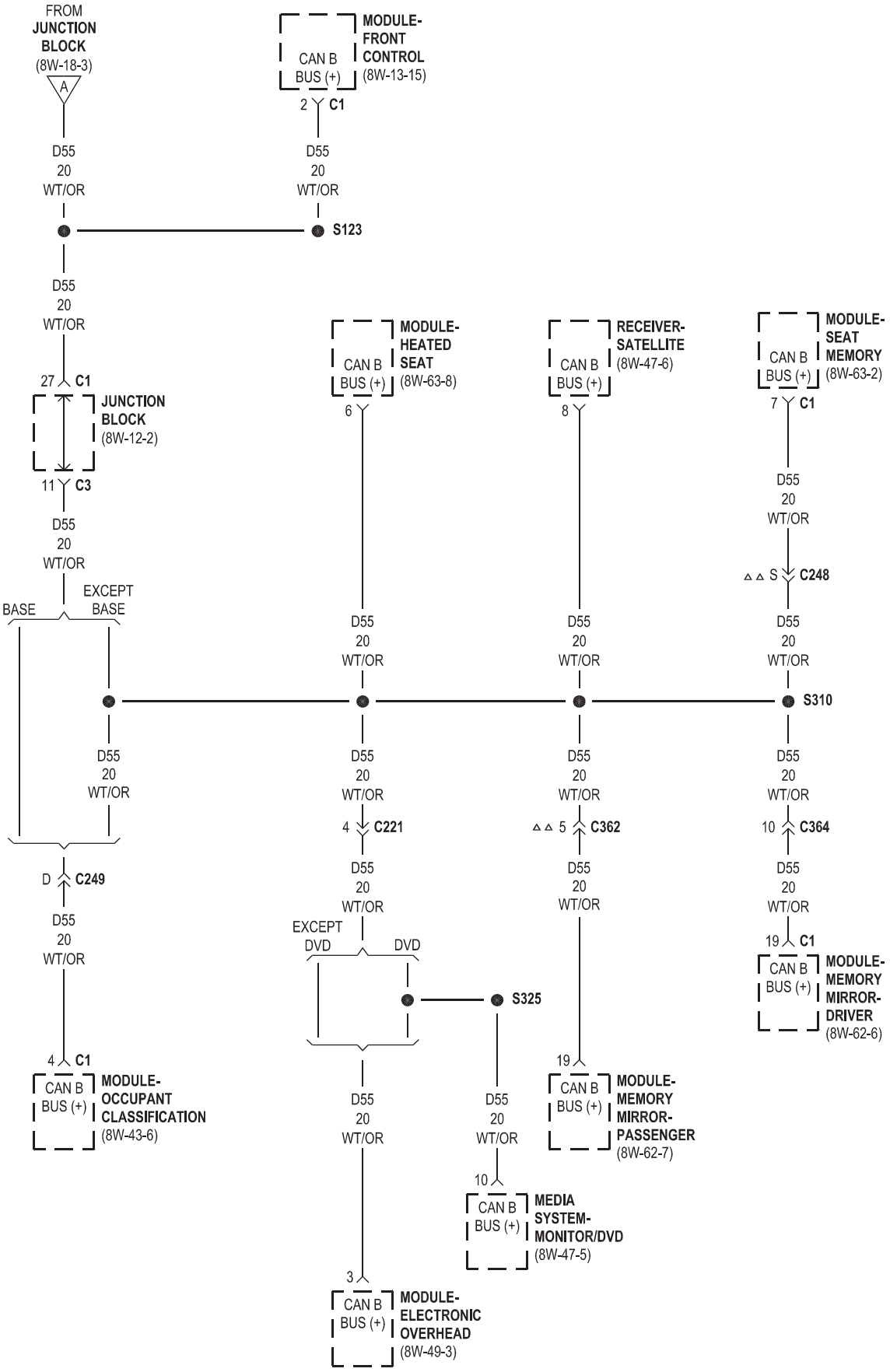
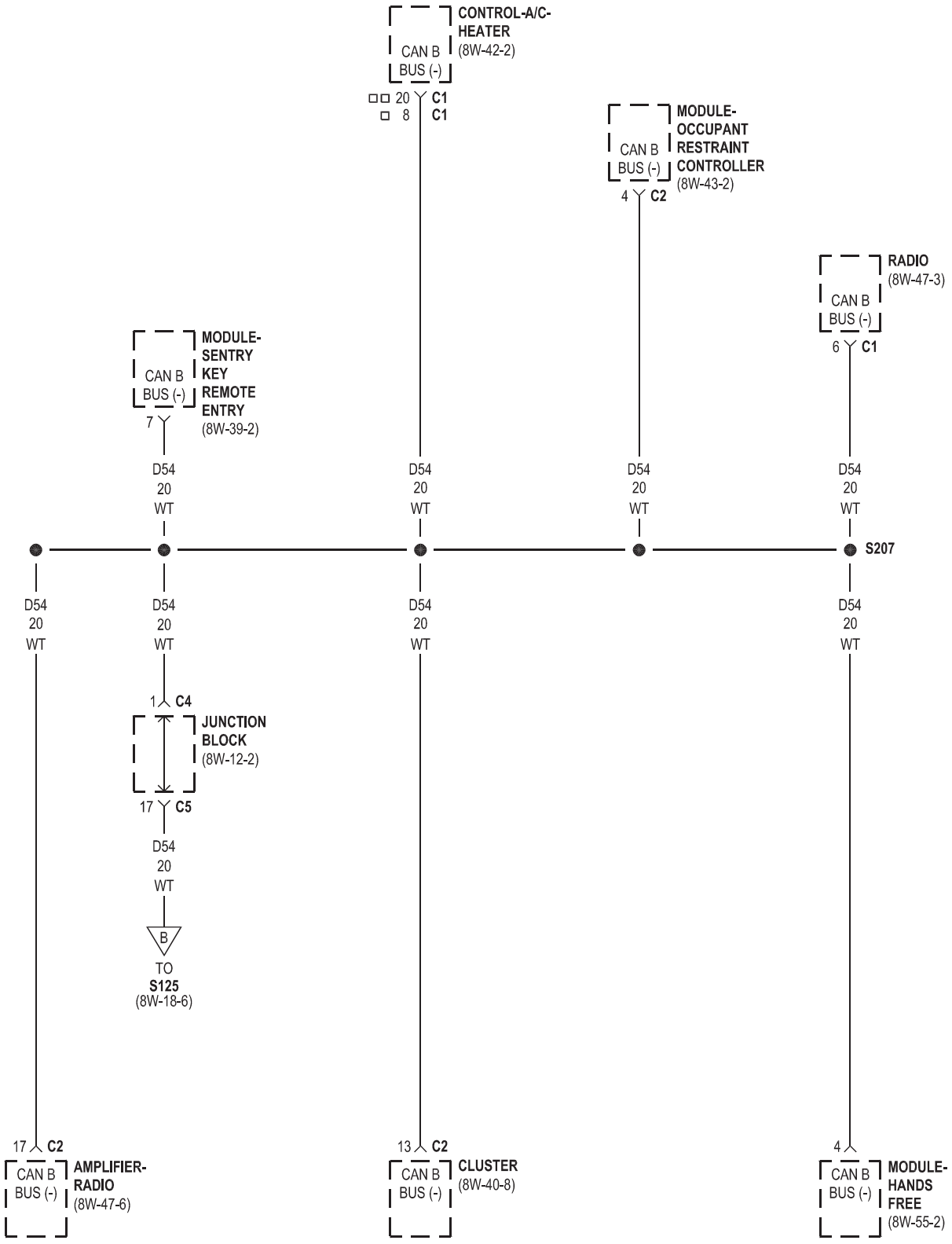
Module-Seat Memory	8W-18-4, 6
Module-Sentry Key Remote Entry	8W-18-3, 5
Radio	8W-18-3, 5
Receiver-Satellite	8W-18-4, 6

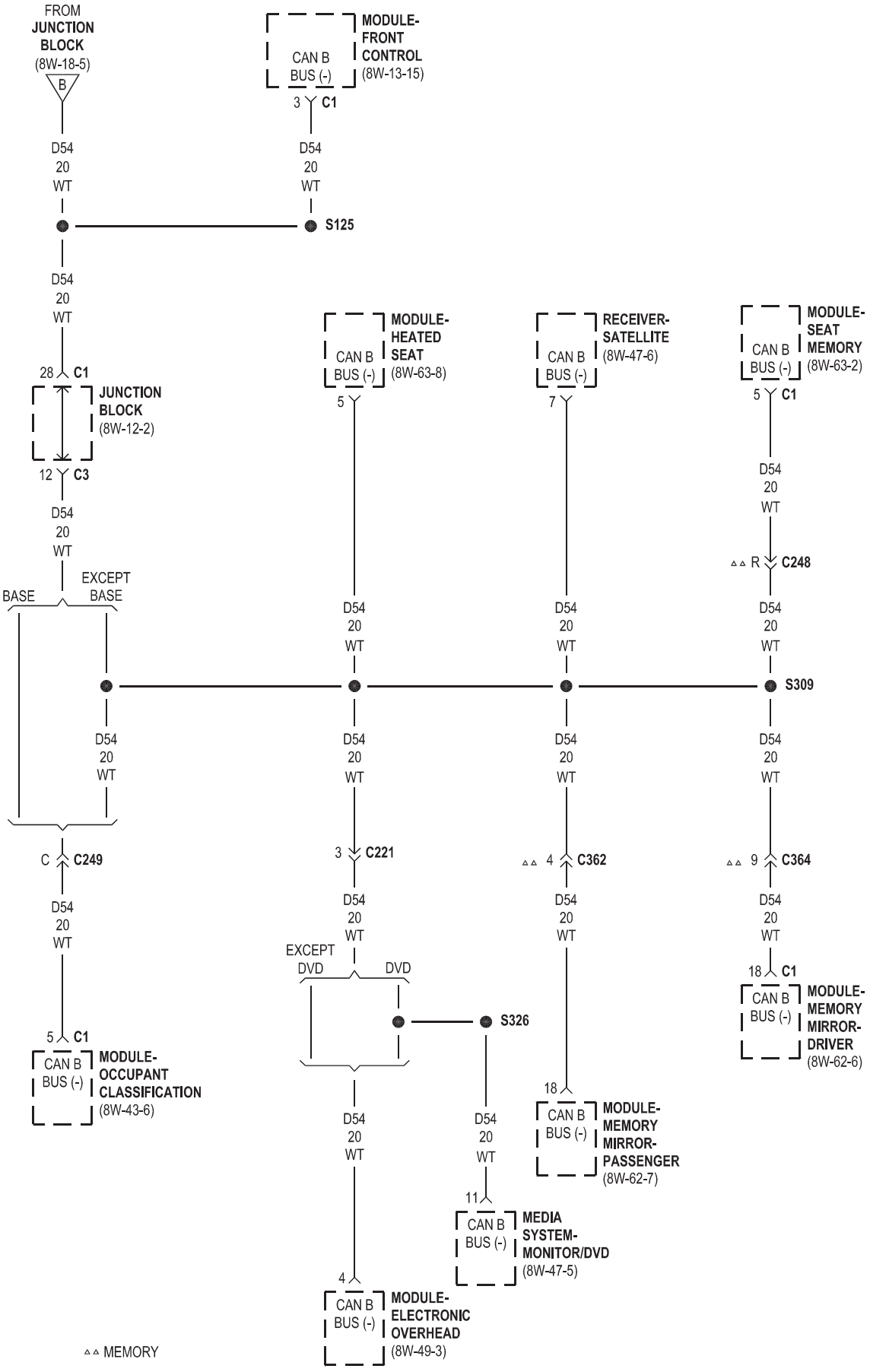

BATT A918
(8W-12-10)
JUNCTION BLOCK
(8W-12-2)
1
FUSE
14
15A
2
(8W-12-10)
19 C2
A926
18
RD
16
6
14
15
9
7
12
5
4
DATA LINK CONNECTOR
D52
20
WT/PK
D51
20
PK/RD
D15
20
BR/WT
D16
20
WT/PK
D21
20
WT/GY
D20
20
WT/BR
Z111
18
BK/WT
Z11
18
BK/LG
26 C4
25 C4
28 C4
27 C4
JUNCTION BLOCK
(8W-12-2)
10 C5
9 C5
12 C5
11 C5
D15
20
BR/WT
D16
20
WT/PK
D21
20
WT/GY
D20
20
WT/BR
6
5 C201
F
E
H
G C108
D52
20
WT/PK
D51
20
PK/RD
D15
20
BR/WT
D16
20
WT/PK
D21
20
WT/GY
D20
20
WT/BR
37 C1
26 C1
36 C1
25 C1
SCI TRANSMIT (TCM)
SCI RECEIVE (TCM)
SCI TRANSMIT (PCM)
SCI RECEIVE (PCM)
MODULE-POWERTRAIN CONTROL
(8W-30-13)
5 C1
6 C1
CAN C DIAGNOSTIC (+)
CAN C DIAGNOSTIC (-)
MODULE-FRONT CONTROL
(8W-13-15)
G208
(8W-15-13)

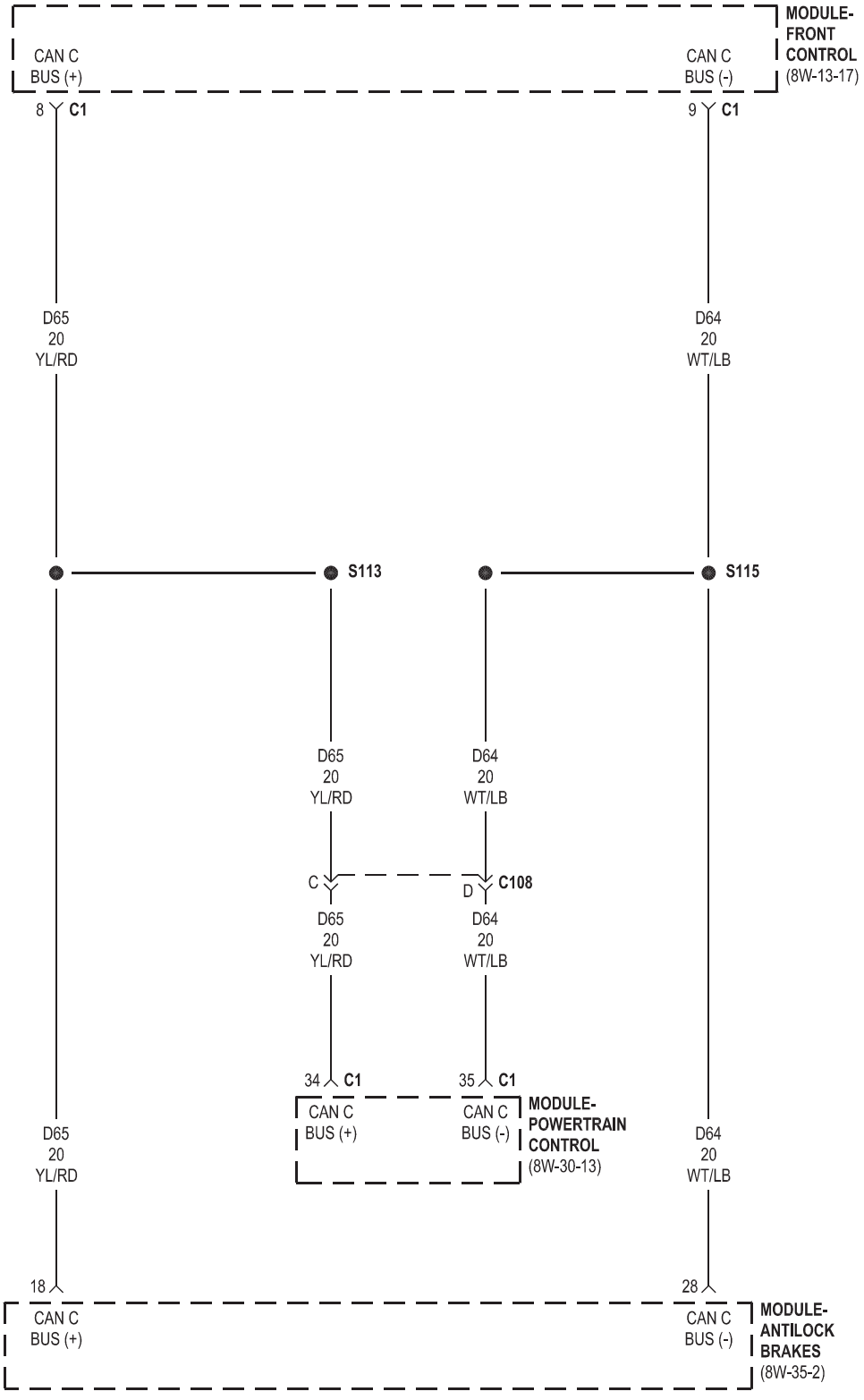

CONTROL-A/C-HEATER
(8W-42-2)
CAN B BUS (+)
10 C1
16 C1
MODULE-OCCUPANT RESTRAINT CONTROLLER
(8W-43-2)
CAN B BUS (+)
3 C2
RADIO
(8W-47-3)
CAN B BUS (+)
5 C1
MODULE-SENTRY KEY REMOTE ENTRY
(8W-39-2)
CAN B BUS (+)
6
D55 20 WT/OR
D55 20 WT/OR
D55 20 WT/OR
D55 20 WT/OR
S208
D55 20 WT/OR
D55 20 WT/OR
D55 20 WT/OR
D55 20 WT/OR
17 C4
JUNCTION BLOCK
(8W-12-2)
1 C5
D55 20 WT/OR
A
TO S123
(8W-18-4)
6 C2
CAN B BUS (+)
AMPLIFIER-RADIO
(8W-47-6)
14 C2
CAN B BUS (+)
CLUSTER
(8W-40-8)
14
CAN B BUS (+)
MODULE-HANDS FREE
(8W-55-2)
ATC
MTC


FROM JUNCTION BLOCK (8W-18-3)
A
D55 20 WT/OR
CAN B BUS (+)
MODULE- FRONT CONTROL (8W-13-15)
2 C1
S123
27 C1
JUNCTION BLOCK (8W-12-2)
11 C3
BASE
EXCEPT BASE
MODULE- HEATED SEAT (8W-63-8)
6
RECEIVER- SATELLITE (8W-47-6)
8
MODULE- SEAT MEMORY (8W-63-2)
7 C1
△△ S C248
S310
4 C221
△△ 5 C362
10 C364
D C249
EXCEPT DVD
DVD
S325
19 C1
MODULE- MEMORY MIRROR- DRIVER (8W-62-6)
4 C1
MODULE- OCCUPANT CLASSIFICATION (8W-43-6)
19
MODULE- MEMORY MIRROR- PASSENGER (8W-62-7)
10
MEDIA SYSTEM- MONITOR/DVD (8W-47-5)
3
MODULE- ELECTRONIC OVERHEAD (8W-49-3)
△△ MEMORY


CONTROL-A/C-HEATER
(8W-42-2)
CAN B
BUS (-)
20 C1
8 C1
MODULE-OCCUPANT RESTRAINT CONTROLLER
(8W-43-2)
4 C2
RADIO
(8W-47-3)
6 C1
MODULE-SENTRY KEY REMOTE ENTRY
(8W-39-2)
7
D54
20
WT
S207
1 C4
JUNCTION BLOCK
(8W-12-2)
17 C5
B
TO
S125
(8W-18-6)
17 C2
AMPLIFIER-RADIO
(8W-47-6)
13 C2
CLUSTER
(8W-40-8)
4
MODULE-HANDS FREE
(8W-55-2)

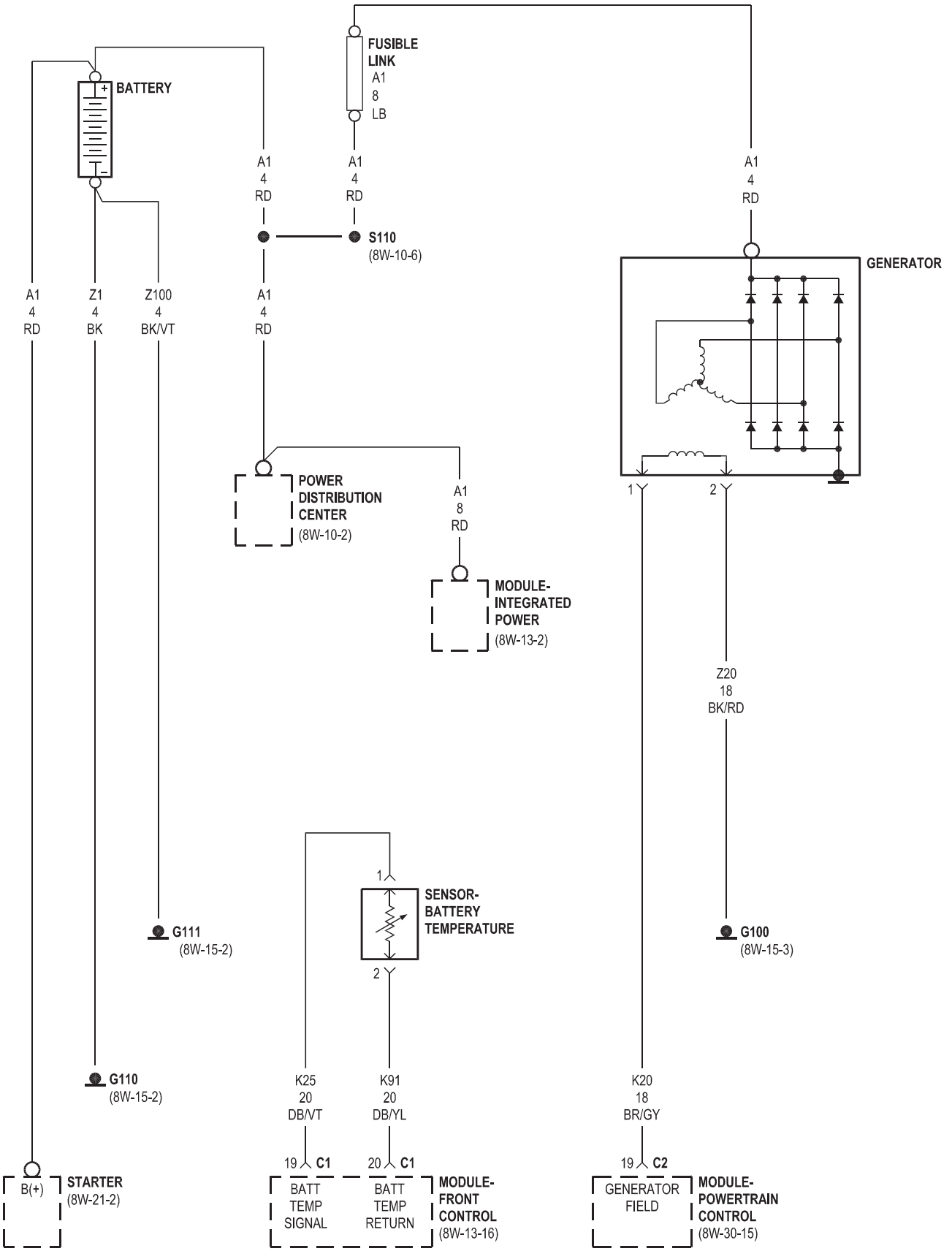
□ ATC
□□ MTC


FROM JUNCTION BLOCK (8W-18-5)
B
D54 20 WT
MODULE- FRONT CONTROL (8W-13-15)
CAN B BUS (-)
3 C1
D54 20 WT
S125
D54 20 WT
28 C1
JUNCTION BLOCK (8W-12-2)
12 C3
D54 20 WT
MODULE- HEATED SEAT (8W-63-8)
CAN B BUS (-)
5
RECEIVER- SATELLITE (8W-47-6)
CAN B BUS (-)
7
MODULE- SEAT MEMORY (8W-63-2)
CAN B BUS (-)
5 C1
D54 20 WT
R C248
D54 20 WT
BASE
EXCEPT BASE
S309
D54 20 WT
C C249
D54 20 WT
5 C1
MODULE- OCCUPANT CLASSIFICATION (8W-43-6)
CAN B BUS (-)
3 C221
D54 20 WT
EXCEPT DVD
DVD
S326
D54 20 WT
4
MODULE- ELECTRONIC OVERHEAD (8W-49-3)
CAN B BUS (-)
D54 20 WT
11
MEDIA SYSTEM- MONITOR/DVD (8W-47-5)
CAN B BUS (-)
4 C362
D54 20 WT
18
MODULE- MEMORY MIRROR- PASSENGER (8W-62-7)
CAN B BUS (-)
9 C364
D54 20 WT
18 C1
MODULE- MEMORY MIRROR- DRIVER (8W-62-6)
CAN B BUS (-)
MEMORY


MODULE-
FRONT
CONTROL
(8W-13-17)
CAN C
BUS (+)
CAN C
BUS (-)
8
C1
9
C1
D65
20
YL/RD
D64
20
WT/LB
S113
S115
D65
20
YL/RD
D64
20
WT/LB
C
D
C108
D65
20
YL/RD
D64
20
WT/LB
34
C1
35
C1
CAN C
BUS (+)
CAN C
BUS (-)
MODULE-
POWERTRAIN
CONTROL
(8W-30-13)
D65
20
YL/RD
D64
20
WT/LB
18
28
CAN C
BUS (+)
CAN C
BUS (-)
MODULE-
ANTILOCK
BRAKES
(8W-35-2)

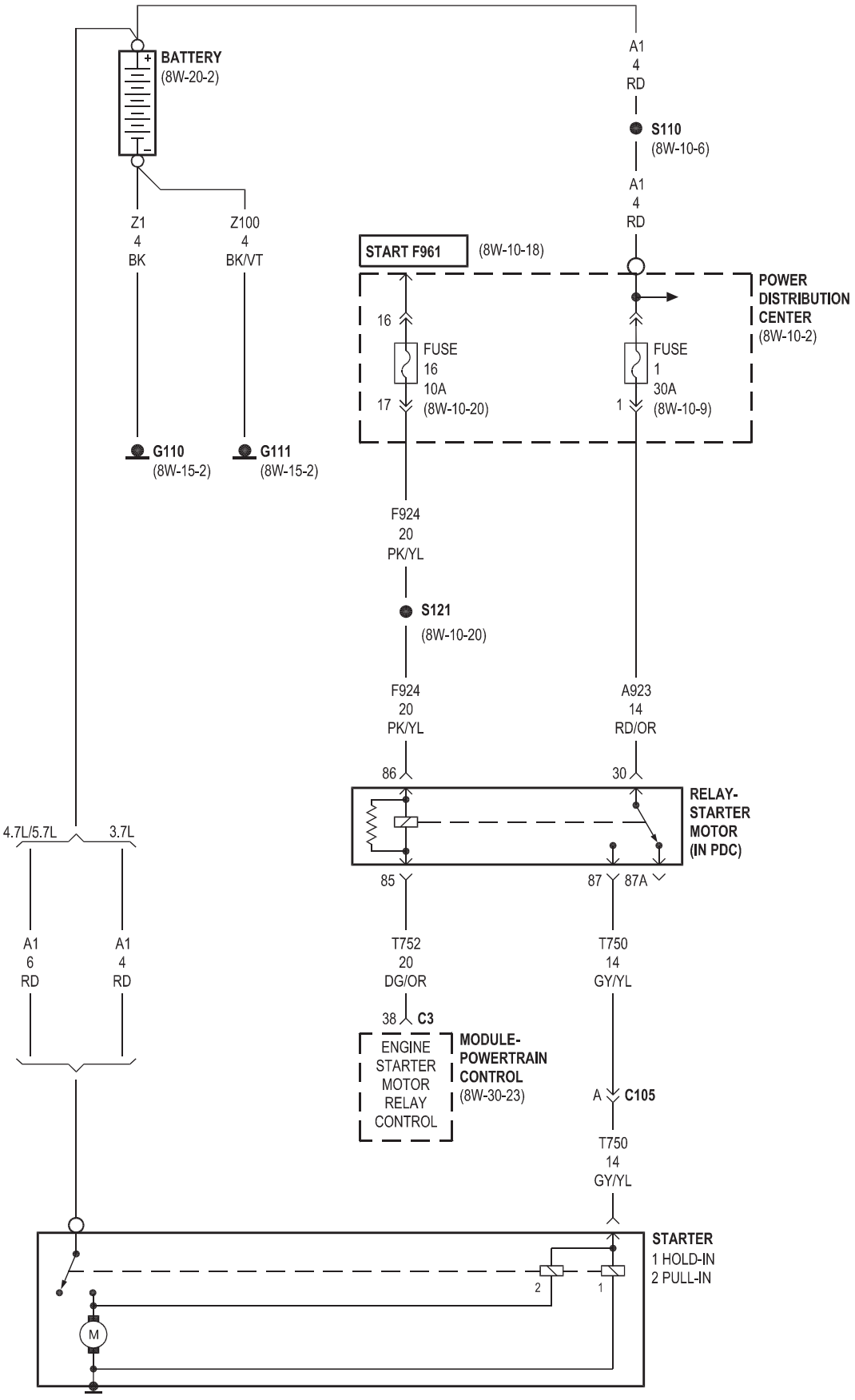
8W-20 CHARGING SYSTEM

Component	Page	Component	Page
Battery	8W-20-2	Module-Front Control	8W-20-2
Fusible Link	8W-20-2	Module-Integrated Power	8W-20-2
G100	8W-20-2	Module-Powertrain Control	8W-20-2
G110	8W-20-2	Power Distribution Center	8W-20-2
G111	8W-20-2	Sensor-Battery Temperature	8W-20-2
Generator	8W-20-2	Starter	8W-20-2


FUSIBLE LINK
A1
8
LB
BATTERY
A1
4
RD
A1
4
RD
A1
4
RD
S110
(8W-10-6)
GENERATOR
A1
4
RD
Z1
4
BK
Z100
4
BK/VT
A1
4
RD
POWER DISTRIBUTION CENTER
(8W-10-2)
A1
8
RD
MODULE-INTEGRATED POWER
(8W-13-2)
1
2
Z20
18
BK/RD
G111
(8W-15-2)
G100
(8W-15-3)
1
SENSOR-BATTERY TEMPERATURE
2
G110
(8W-15-2)
K25
20
DB/VT
K91
20
DB/YL
K20
18
BR/GY
B(+)
STARTER
(8W-21-2)
19 C1
20 C1
BATT TEMP SIGNAL
BATT TEMP RETURN
MODULE-FRONT CONTROL
(8W-13-16)
19 C2
GENERATOR FIELD
MODULE-POWERTRAIN CONTROL
(8W-30-15)

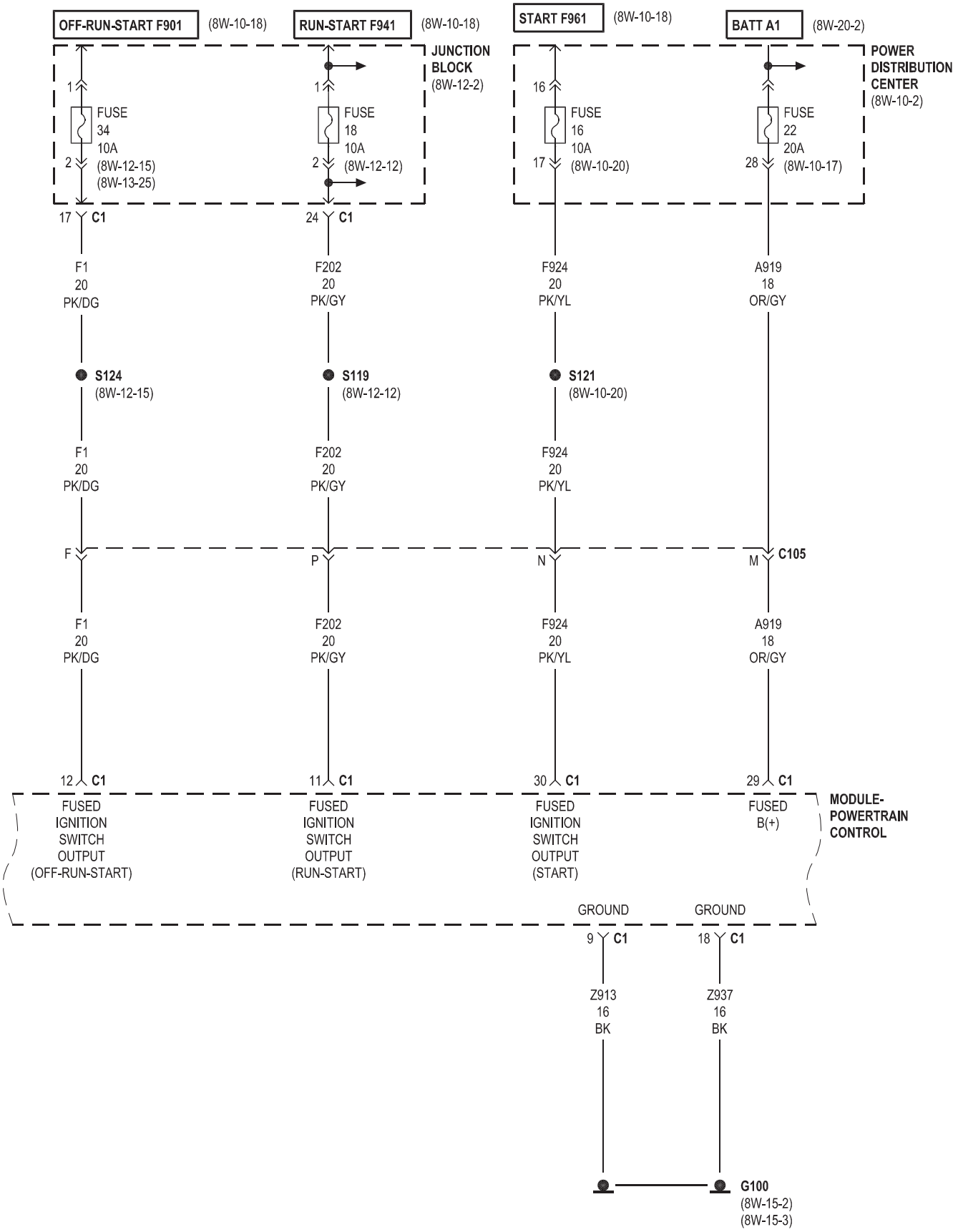
8W-21 STARTING SYSTEM

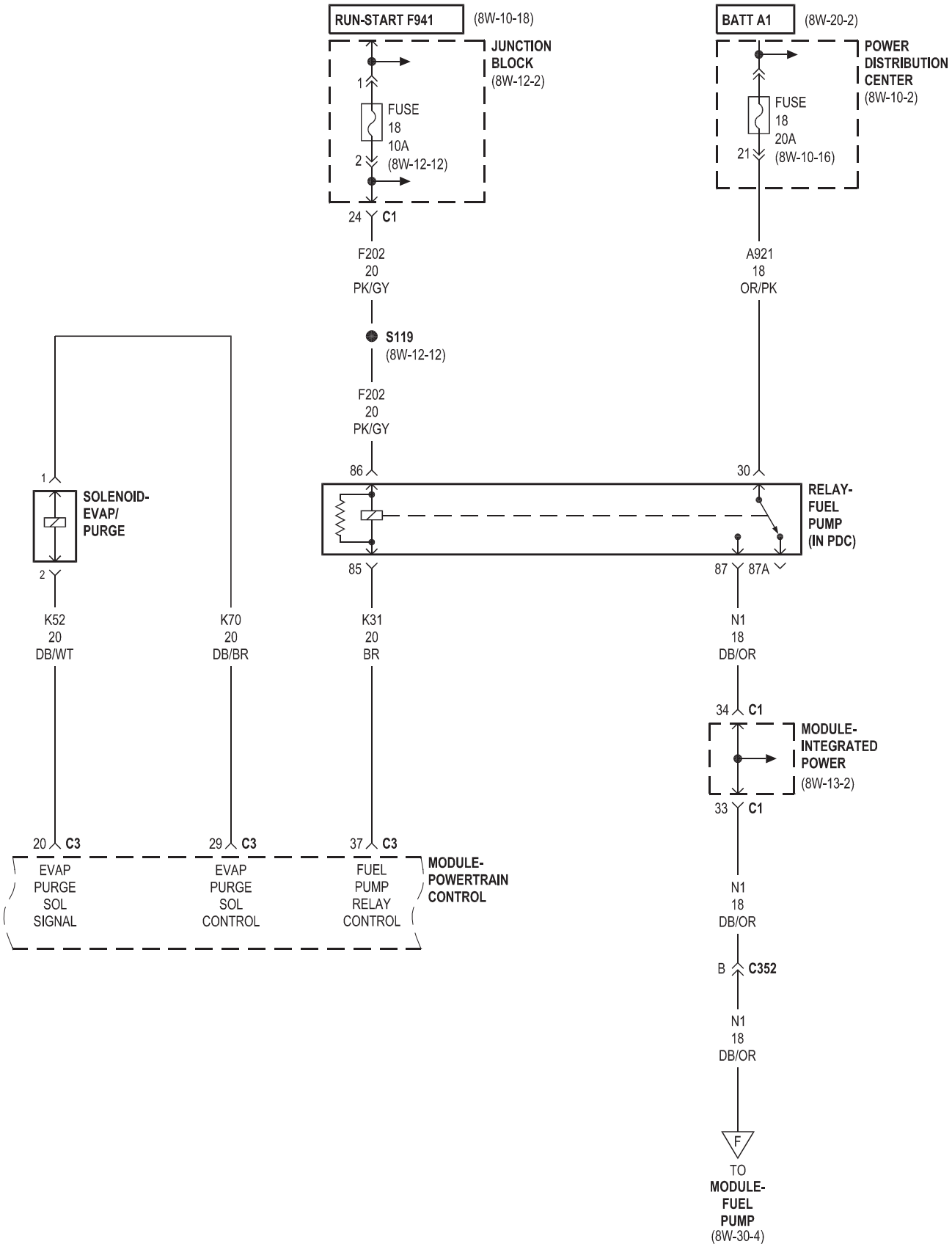
Component	Page
Battery	8W-21-2
Fuse 1	8W-21-2
Fuse 16	8W-21-2
G110	8W-21-2
G111	8W-21-2
Module-Powertrain Control	8W-21-2
Power Distribution Center	8W-21-2
Relay-Starter Motor	8W-21-2
Starter	8W-21-2

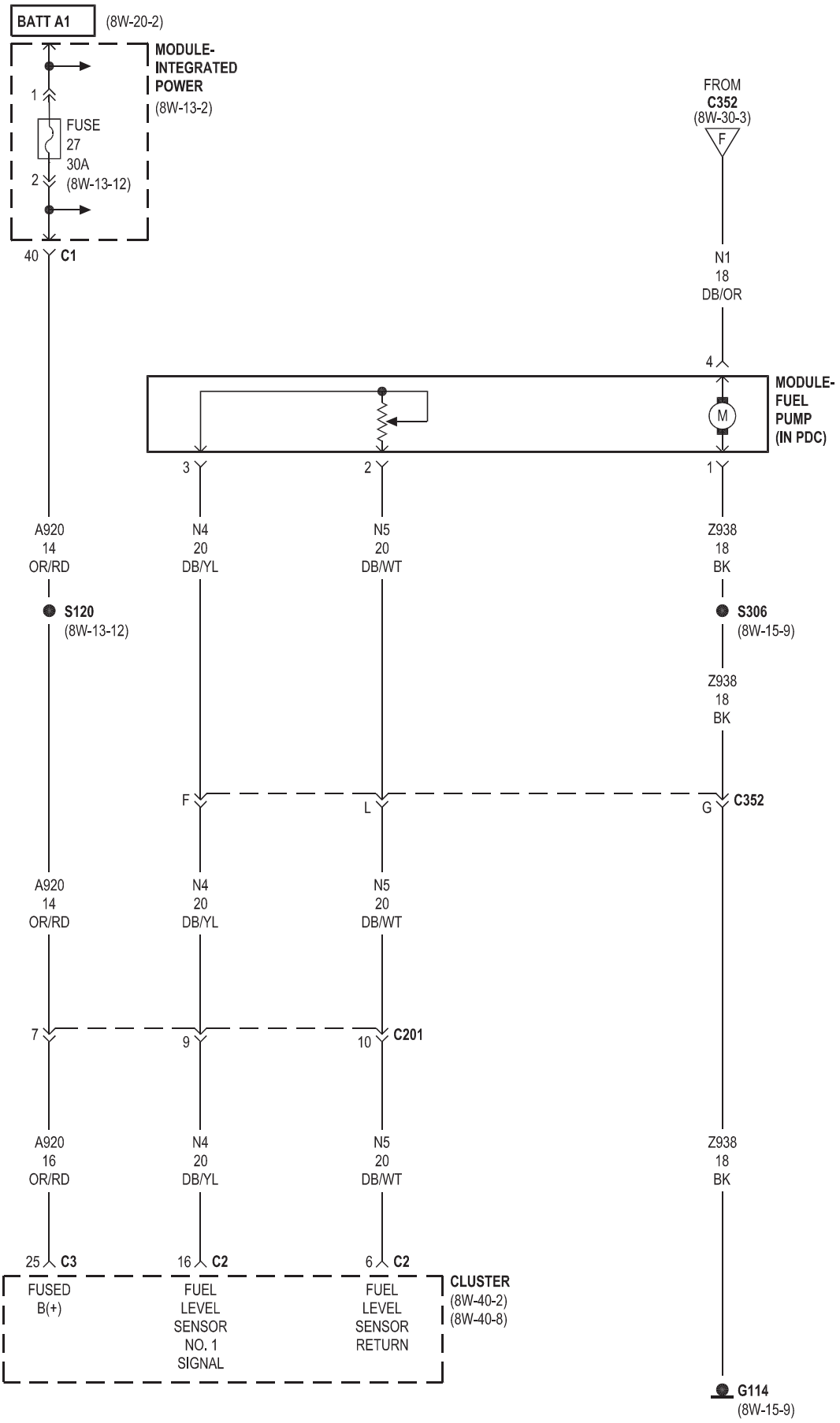

BATTERY
(8W-20-2)
A1
4
RD
S110
(8W-10-6)
A1
4
RD
Z1
4
BK
Z100
4
BK/VT
START F961
(8W-10-18)
POWER
DISTRIBUTION
CENTER
(8W-10-2)
16
FUSE
16
10A
17
(8W-10-20)
FUSE
1
30A
1
(8W-10-9)
G110
(8W-15-2)
G111
(8W-15-2)
F924
20
PK/YL
S121
(8W-10-20)
F924
20
PK/YL
A923
14
RD/OR
86
30
RELAY-
STARTER
MOTOR
(IN PDC)
85
87
87A
4.7L/5.7L
3.7L
A1
6
RD
A1
4
RD
T752
20
DG/OR
T750
14
GY/YL
38
C3
ENGINE
STARTER
MOTOR
RELAY
CONTROL
MODULE-
POWERTRAIN
CONTROL
(8W-30-23)
A
C105
T750
14
GY/YL
STARTER
1 HOLD-IN
2 PULL-IN
2
1
M

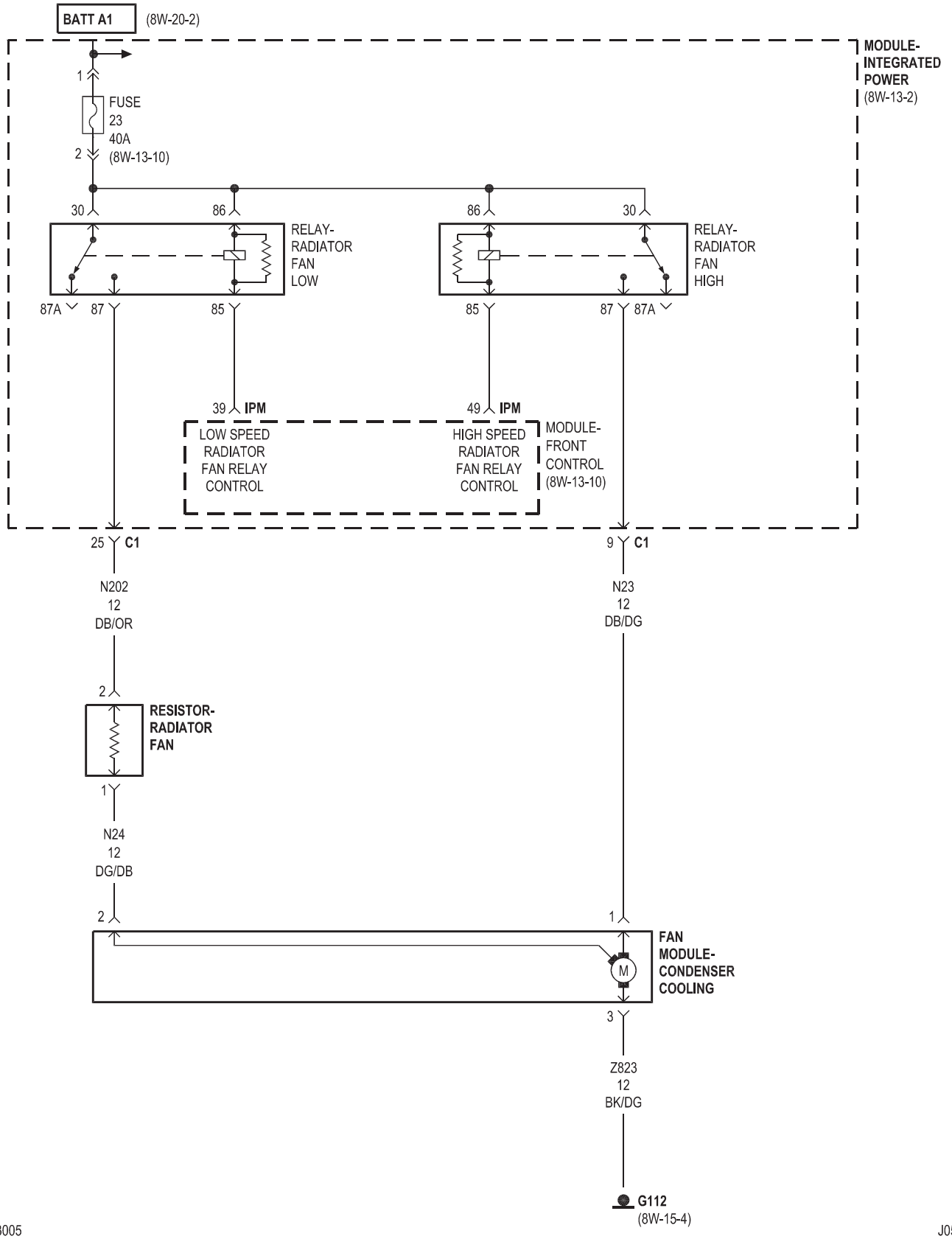
8W-30 FUEL/IGNITION SYSTEM

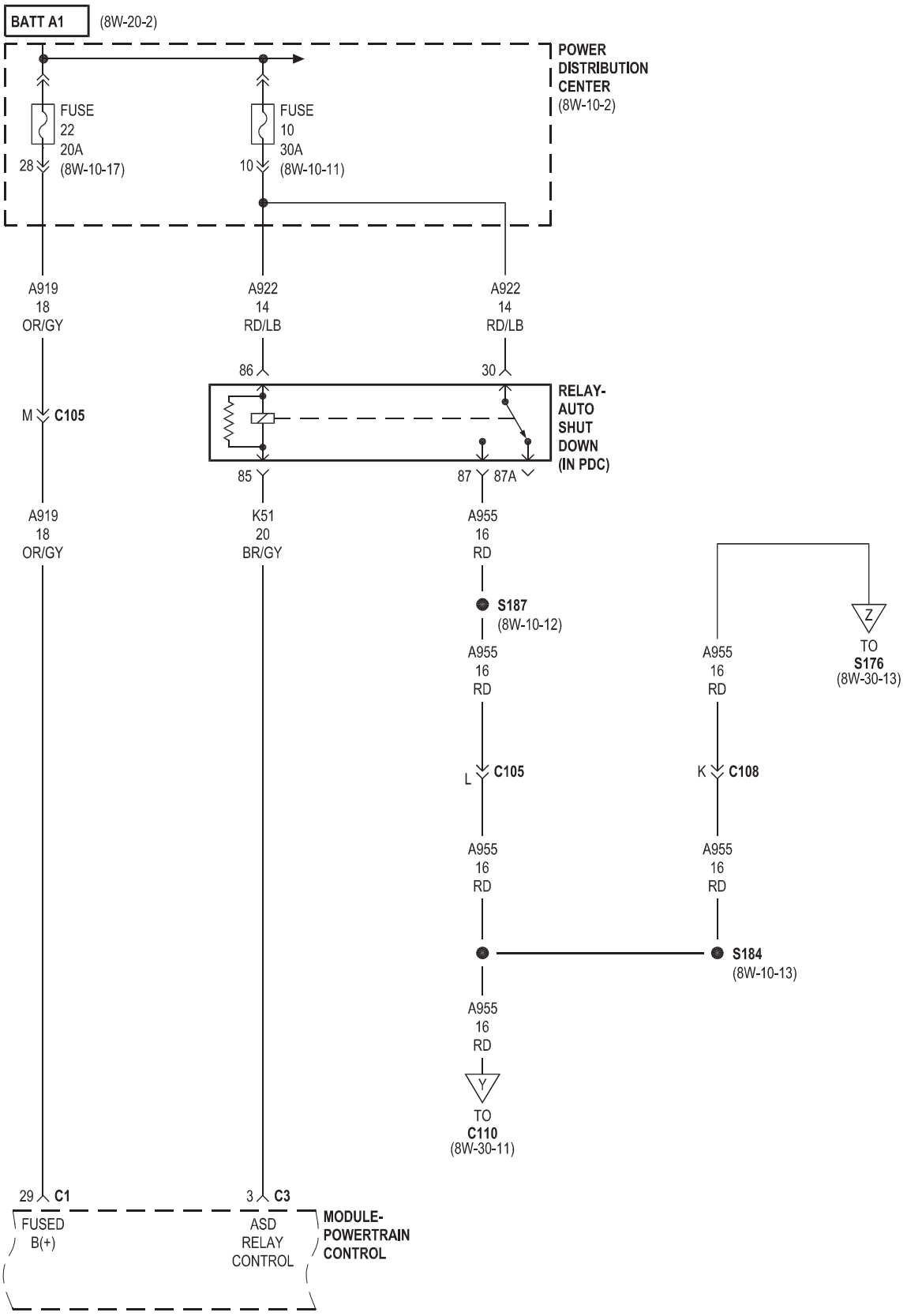
Component	Page
Assembly-Exhaust Gas Recirculation Valve	8W-30-18
Assembly-Natural Vacuum Leak Detection	8W-30-15
Assembly-Transmission Solenoid/TRS	8W-30-23
Capacitor-Ignition	8W-30-7
Clockspring	8W-30-22
Cluster	8W-30-4
Coil-Ignition-No. 1	8W-30-9, 12
Coil-Ignition-No. 2	8W-30-9, 10, 11
Coil-Ignition-No. 3	8W-30-9, 12
Coil-Ignition-No. 4	8W-30-10, 11
Coil-Ignition-No. 5	8W-30-9, 12
Coil-Ignition-No. 6	8W-30-10, 11
Coil-Ignition-No. 7	8W-30-9, 12
Coil-Ignition-No. 8	8W-30-10, 11
Data Link Connector	8W-30-13
Fan Module-Condenser Cooling	8W-30-5
Fuse 10	8W-30-6
Fuse 16	8W-30-2
Fuse 18	8W-30-2, 3, 21
Fuse 22	8W-30-2, 6
Fuse 23	8W-30-5
Fuse 27	8W-30-4
Fuse 34	8W-30-2
G100	8W-30-2, 14, 18, 20
G112	8W-30-5
G114	8W-30-4, 15
Generator	8W-30-15
Injector-Fuel-No. 1	8W-30-7, 12
Injector-Fuel-No. 2	8W-30-8, 11
Injector-Fuel-No. 3	8W-30-7, 12
Injector-Fuel-No. 4	8W-30-7, 8, 11
Injector-Fuel-No. 5	8W-30-7, 8, 12
Injector-Fuel-No. 6	8W-30-8, 11
Injector-Fuel-No. 7	8W-30-8, 12
Injector-Fuel-No. 8	8W-30-7, 11
Junction Block	8W-30-2, 3, 13, 20, 21, 22
Module-Antilock Brakes	8W-30-20
Module-Front Control	8W-30-5, 13
Module-Fuel Pump	8W-30-3, 4
Module-Integrated Power	8W-30-3, 4, 5
Module-Powertrain Control	8W-30-2, 3, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23
Motor-Iac	8W-30-17
Power Distribution Center	8W-30-2, 3, 6
Relay-A/C Clutch	8W-30-21
Relay-Auto Shut Down	8W-30-6, 7
Relay-Fuel Pump	8W-30-3
Relay-Radiator Fan High	8W-30-5
Relay-Radiator Fan Low	8W-30-5
Relay-Starter Motor	8W-30-23
Resistor-Radiator Fan	8W-30-5
Sensor-Accelerator Pedal Position	8W-30-21
Sensor-Camshaft Position	8W-30-15
Sensor-Crankshaft Position	8W-30-15
Sensor-Engine Coolant Temperature	8W-30-17, 18
Sensor-Intake Air Temperature	8W-30-17, 18
Sensor-Knock	8W-30-17
Sensor-Knock No. 1	8W-30-19
Sensor-Knock No. 2	8W-30-19
Sensor-Map	8W-30-16, 18
Sensor-Oxygen-Left Front	8W-30-14
Sensor-Oxygen-Left Rear	8W-30-14
Sensor-Oxygen-Right Front	8W-30-14
Sensor-Oxygen-Right Rear	8W-30-14
Sensor-Throttle Position	8W-30-16
Sensor-Transmission Range	8W-30-23
Servo-Speed Control	8W-30-23
Solenoid-EVAP/Purge	8W-30-3
Switch-Oil Pressure	8W-30-15
Switch-Power Steering Pressure	8W-30-20
Switch-Speed Control-Left	8W-30-22
Switch-Speed Control-Right	8W-30-22
Switch-Stop Lamp	8W-30-20
Throttle Body	8W-30-19

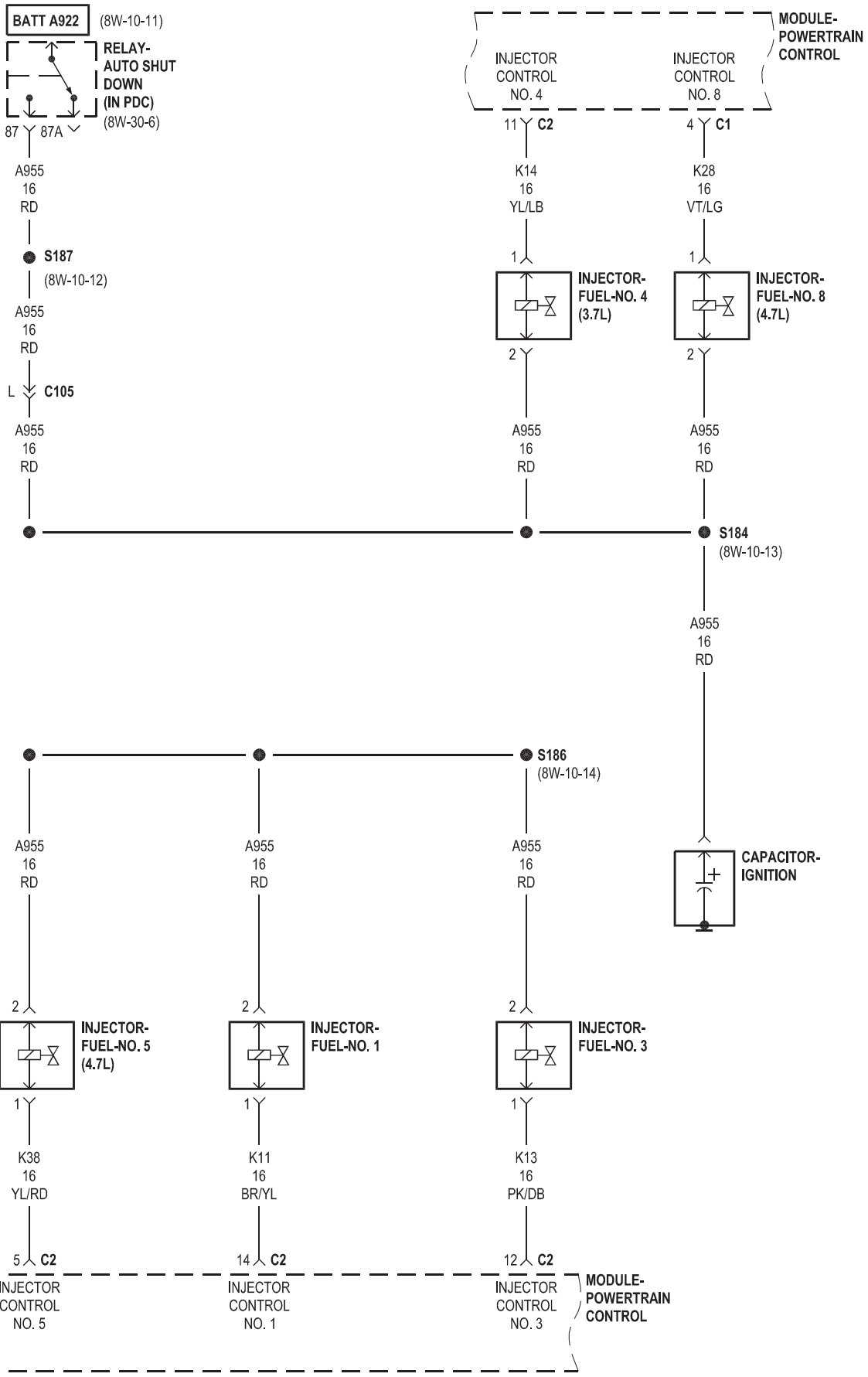

OFF-RUN-START F901
(8W-10-18)
RUN-START F941
(8W-10-18)
START F961
(8W-10-18)
BATT A1
(8W-20-2)
JUNCTION BLOCK
(8W-12-2)
POWER DISTRIBUTION CENTER
(8W-10-2)
1
FUSE
34
10A
2
(8W-12-15)
(8W-13-25)
1
FUSE
18
10A
2
(8W-12-12)
16
FUSE
16
10A
17
(8W-10-20)
FUSE
22
20A
28
(8W-10-17)
17 C1
24 C1
F1
20
PK/DG
F202
20
PK/GY
F924
20
PK/YL
A919
18
OR/GY
S124
(8W-12-15)
S119
(8W-12-12)
S121
(8W-10-20)
F
P
N
M C105
12 C1
11 C1
30 C1
29 C1
FUSED IGNITION SWITCH OUTPUT (OFF-RUN-START)
FUSED IGNITION SWITCH OUTPUT (RUN-START)
FUSED IGNITION SWITCH OUTPUT (START)
FUSED B(+)
MODULE-POWERTRAIN CONTROL
GROUND
GROUND
9 C1
18 C1
Z913
16
BK
Z937
16
BK
G100
(8W-15-2)
(8W-15-3)

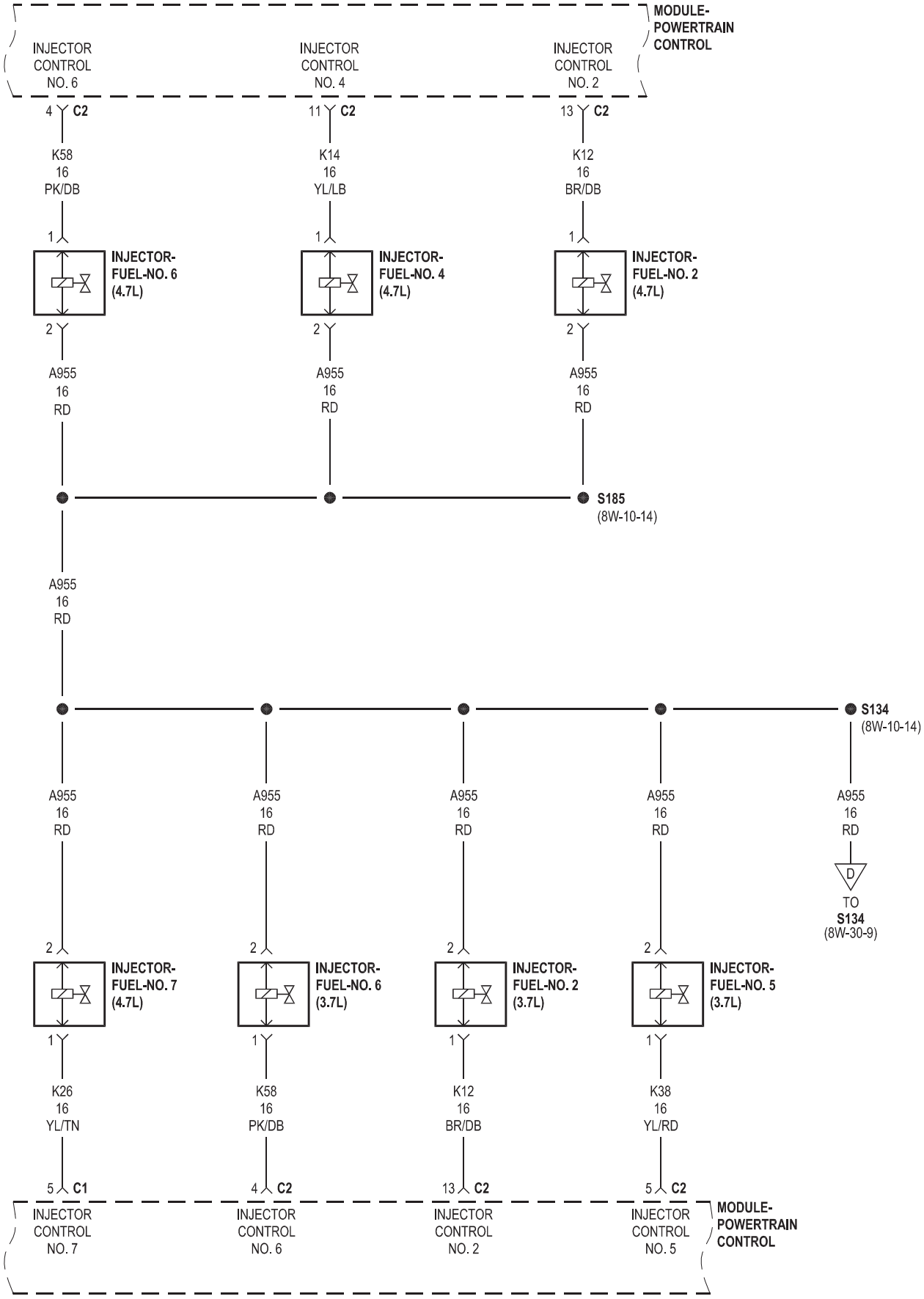

RUN-START F941
(8W-10-18)
JUNCTION BLOCK
(8W-12-2)
1
FUSE
18
10A
2
(8W-12-12)
24 C1
F202
20
PK/GY
S119
(8W-12-12)
F202
20
PK/GY
86
85
BATT A1
(8W-20-2)
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE
18
20A
21
(8W-10-16)
A921
18
OR/PK
30
RELAY-FUEL PUMP (IN PDC)
87
87A
1
SOLENOID-EVAP/ PURGE
2
K52
20
DB/WT
K70
20
DB/BR
K31
20
BR
N1
18
DB/OR
34 C1
MODULE-INTEGRATED POWER
(8W-13-2)
33 C1
20 C3
29 C3
37 C3
EVAP PURGE SOL SIGNAL
EVAP PURGE SOL CONTROL
FUEL PUMP RELAY CONTROL
MODULE-POWERTRAIN CONTROL
N1
18
DB/OR
B C352
N1
18
DB/OR
F
TO MODULE-FUEL PUMP
(8W-30-4)

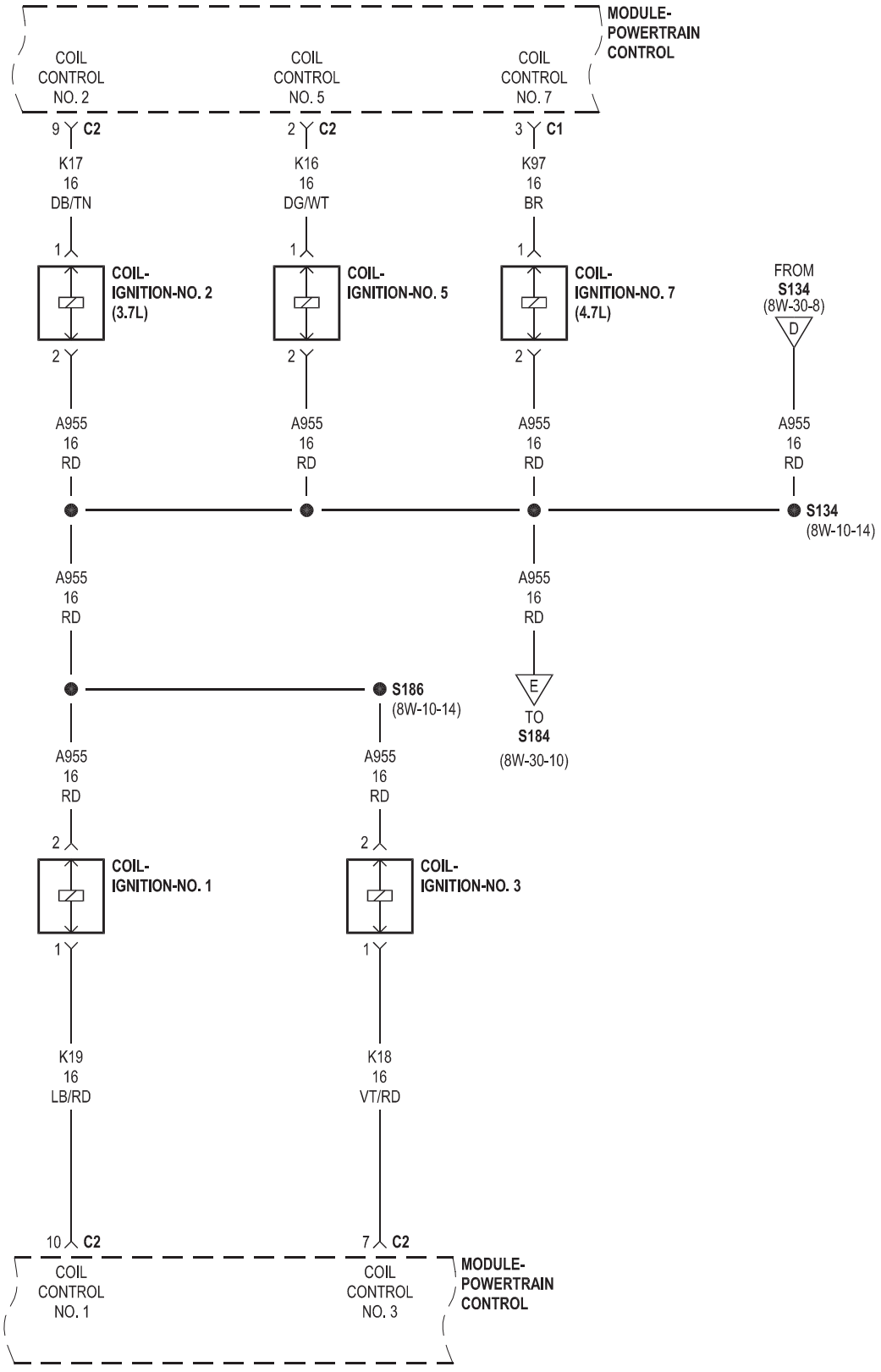

BATT A1
(8W-20-2)
MODULE-
INTEGRATED
POWER
(8W-13-2)
1
FUSE
27
30A
2
(8W-13-12)
40
C1
FROM
C352
(8W-30-3)
F
N1
18
DB/OR
4
MODULE-
FUEL
PUMP
(IN PDC)
M
3
2
1
A920
14
OR/RD
N4
20
DB/YL
N5
20
DB/WT
Z938
18
BK
S120
(8W-13-12)
S306
(8W-15-9)
Z938
18
BK
F
L
G
C352
A920
14
OR/RD
N4
20
DB/YL
N5
20
DB/WT
7
9
10
C201
A920
16
OR/RD
N4
20
DB/YL
N5
20
DB/WT
Z938
18
BK
25
C3
16
C2
6
C2
FUSED
B(+)
FUEL
LEVEL
SENSOR
NO. 1
SIGNAL
FUEL
LEVEL
SENSOR
RETURN
CLUSTER
(8W-40-2)
(8W-40-8)
G114
(8W-15-9)

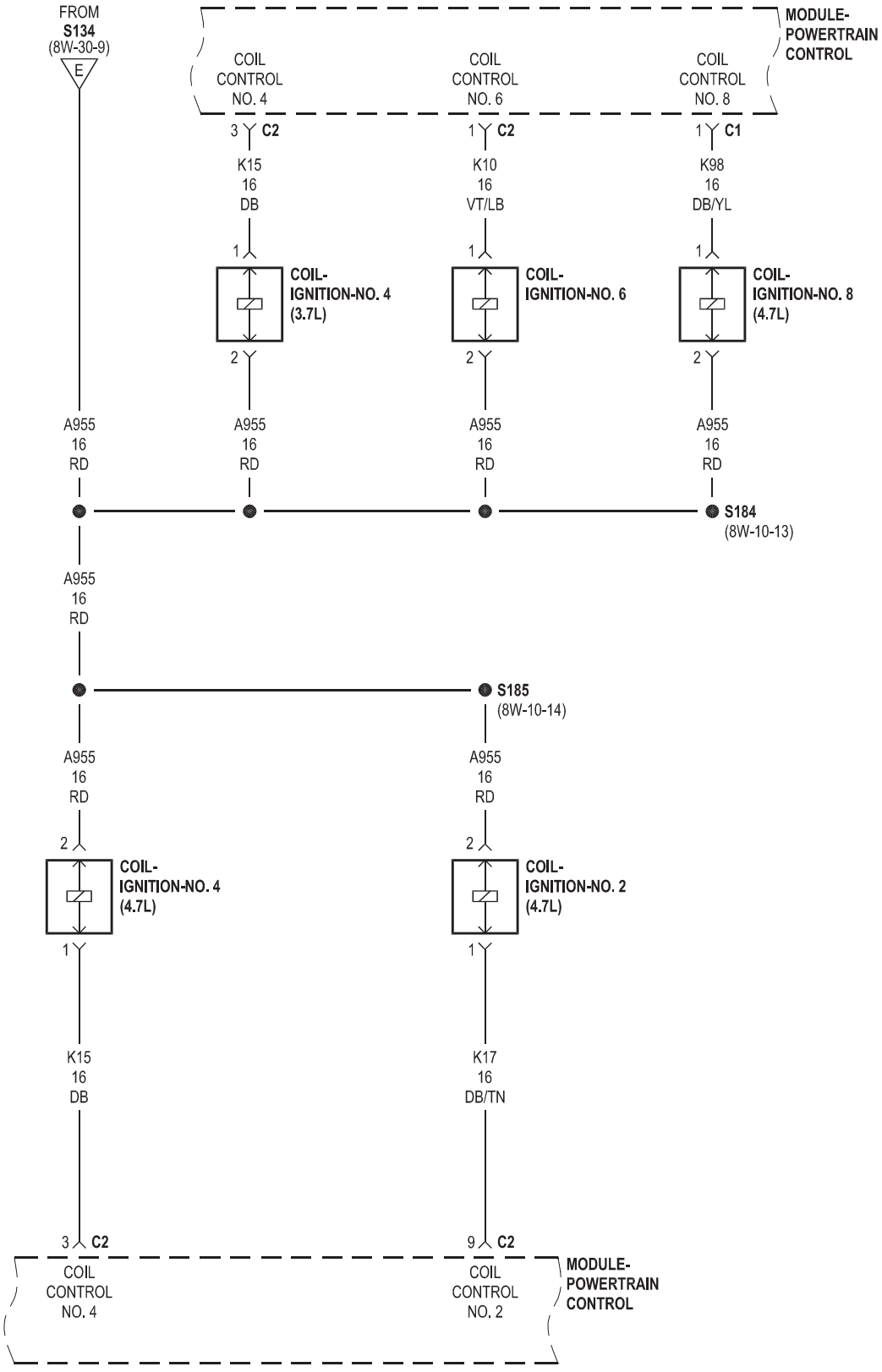

BATT A1
(8W-20-2)
MODULE-
INTEGRATED
POWER
(8W-13-2)
1
FUSE
23
40A
2
(8W-13-10)
30
86
RELAY-
RADIATOR
FAN
LOW
87A
87
85
86
30
RELAY-
RADIATOR
FAN
HIGH
85
87
87A
39 IPM
LOW SPEED
RADIATOR
FAN RELAY
CONTROL
49 IPM
HIGH SPEED
RADIATOR
FAN RELAY
CONTROL
MODULE-
FRONT
CONTROL
(8W-13-10)
25 C1
9 C1
N202
12
DB/OR
N23
12
DB/DG
2
RESISTOR-
RADIATOR
FAN
1
N24
12
DG/DB
2
1
M
FAN
MODULE-
CONDENSER
COOLING
3
Z823
12
BK/DG
G112
(8W-15-4)

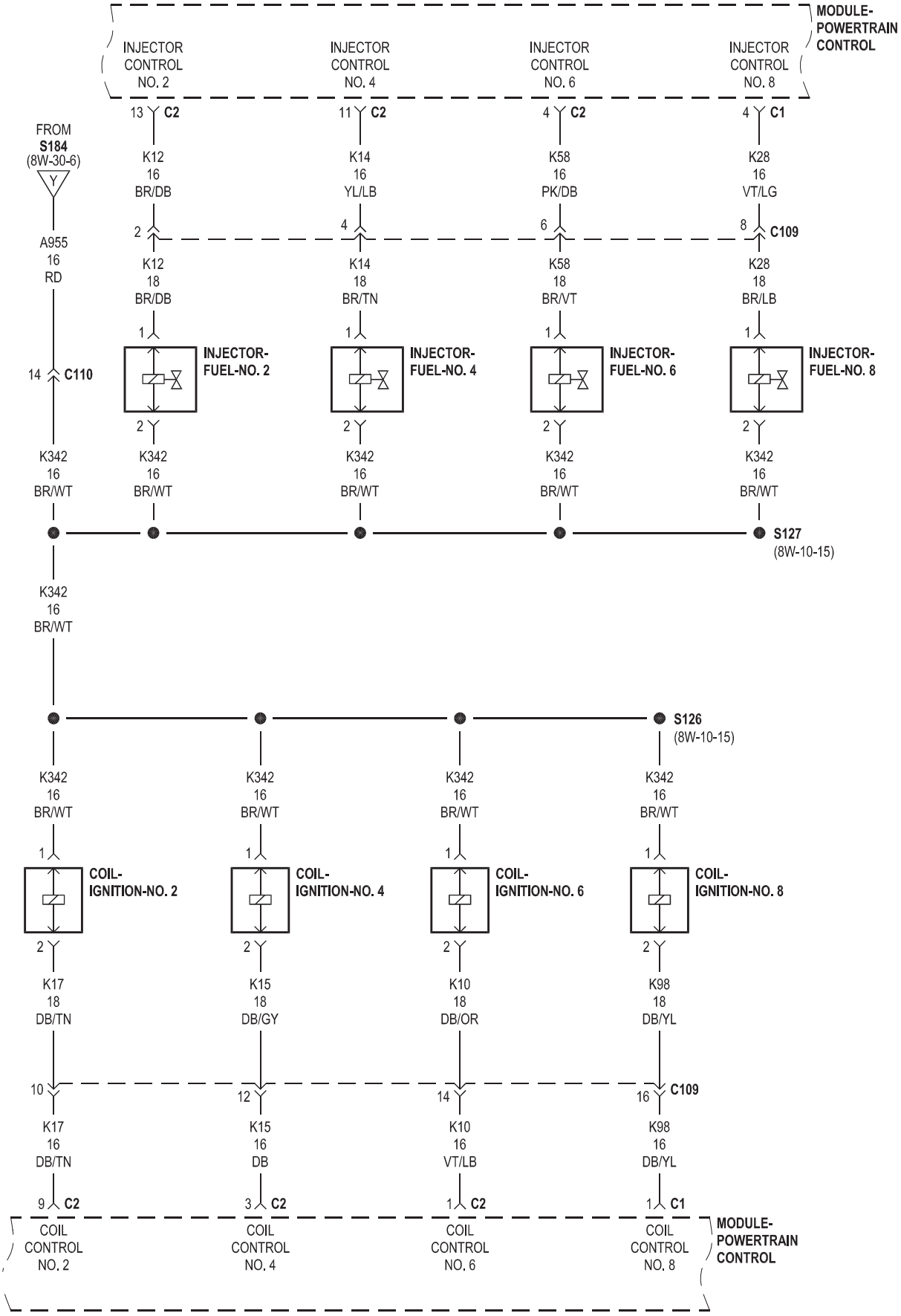

BATT A1
(8W-20-2)
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE 22 20A
28
(8W-10-17)
FUSE 10 30A
10
(8W-10-11)
A919 18 OR/GY
A922 14 RD/LB
A922 14 RD/LB
86
30
M C105
RELAY-AUTO SHUT DOWN (IN PDC)
85
87
87A
A919 18 OR/GY
K51 20 BR/GY
A955 16 RD
S187
(8W-10-12)
A955 16 RD
L C105
A955 16 RD
A955 16 RD
S184
(8W-10-13)
A955 16 RD
Y
TO C110
(8W-30-11)
A955 16 RD
K C108
A955 16 RD
Z
TO S176
(8W-30-13)
29 C1
3 C3
FUSED B(+)
ASD RELAY CONTROL
MODULE-POWERTRAIN CONTROL

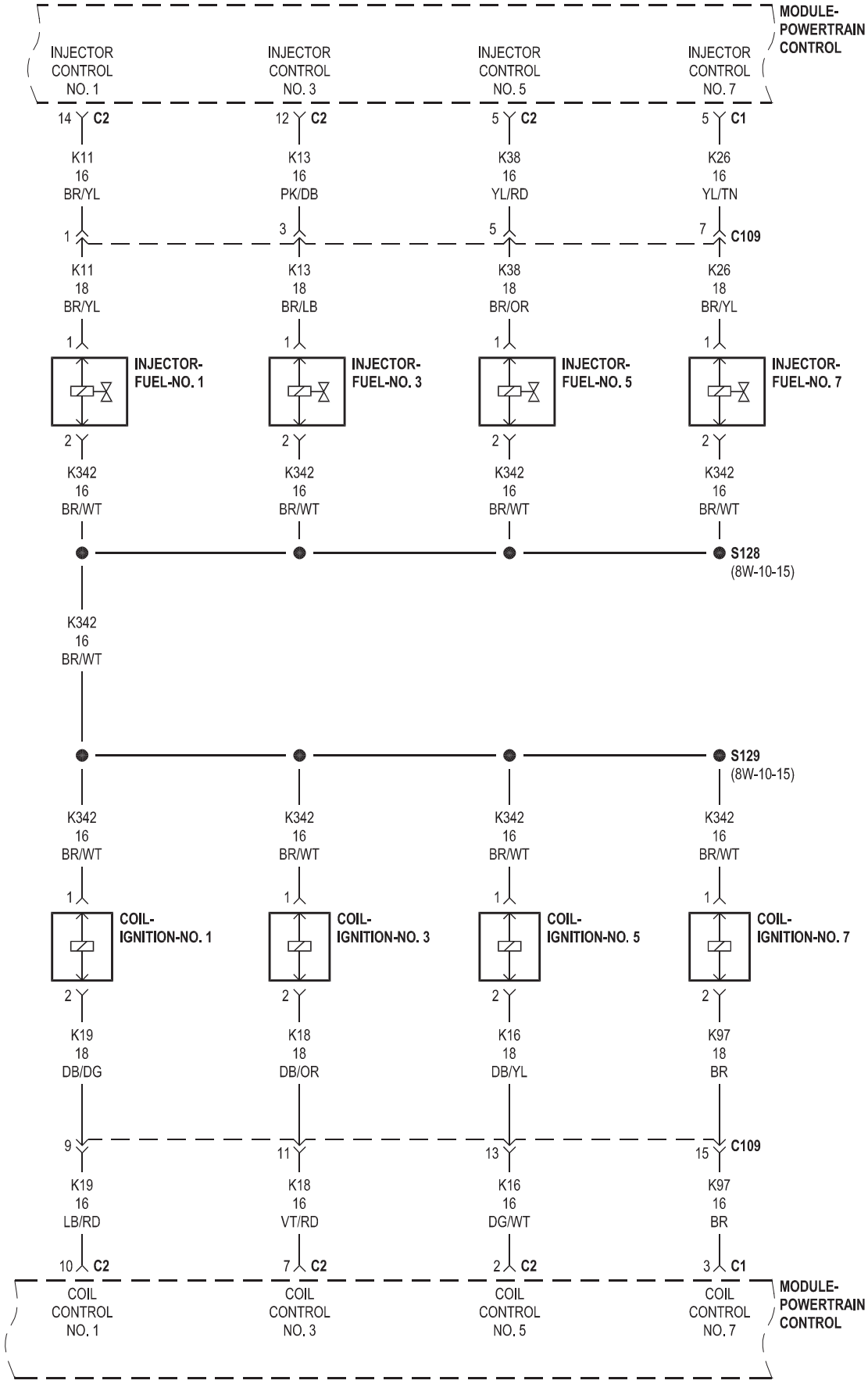

BATT A922
(8W-10-11)
RELAY-
AUTO SHUT
DOWN
(IN PDC)
(8W-30-6)
87
87A
A955
16
RD
S187
(8W-10-12)
A955
16
RD
L
C105
A955
16
RD
MODULE-
POWERTRAIN
CONTROL
INJECTOR
CONTROL
NO. 4
INJECTOR
CONTROL
NO. 8
11
C2
4
C1
K14
16
YL/LB
K28
16
VT/LG
1
1
INJECTOR-
FUEL-NO. 4
(3.7L)
INJECTOR-
FUEL-NO. 8
(4.7L)
2
2
A955
16
RD
A955
16
RD
S184
(8W-10-13)
A955
16
RD
S186
(8W-10-14)
A955
16
RD
A955
16
RD
A955
16
RD
CAPACITOR-
IGNITION
2
2
2
INJECTOR-
FUEL-NO. 5
(4.7L)
INJECTOR-
FUEL-NO. 1
INJECTOR-
FUEL-NO. 3
1
1
1
K38
16
YL/RD
K11
16
BR/YL
K13
16
PK/DB
5
C2
14
C2
12
C2
INJECTOR
CONTROL
NO. 5
INJECTOR
CONTROL
NO. 1
INJECTOR
CONTROL
NO. 3
MODULE-
POWERTRAIN
CONTROL

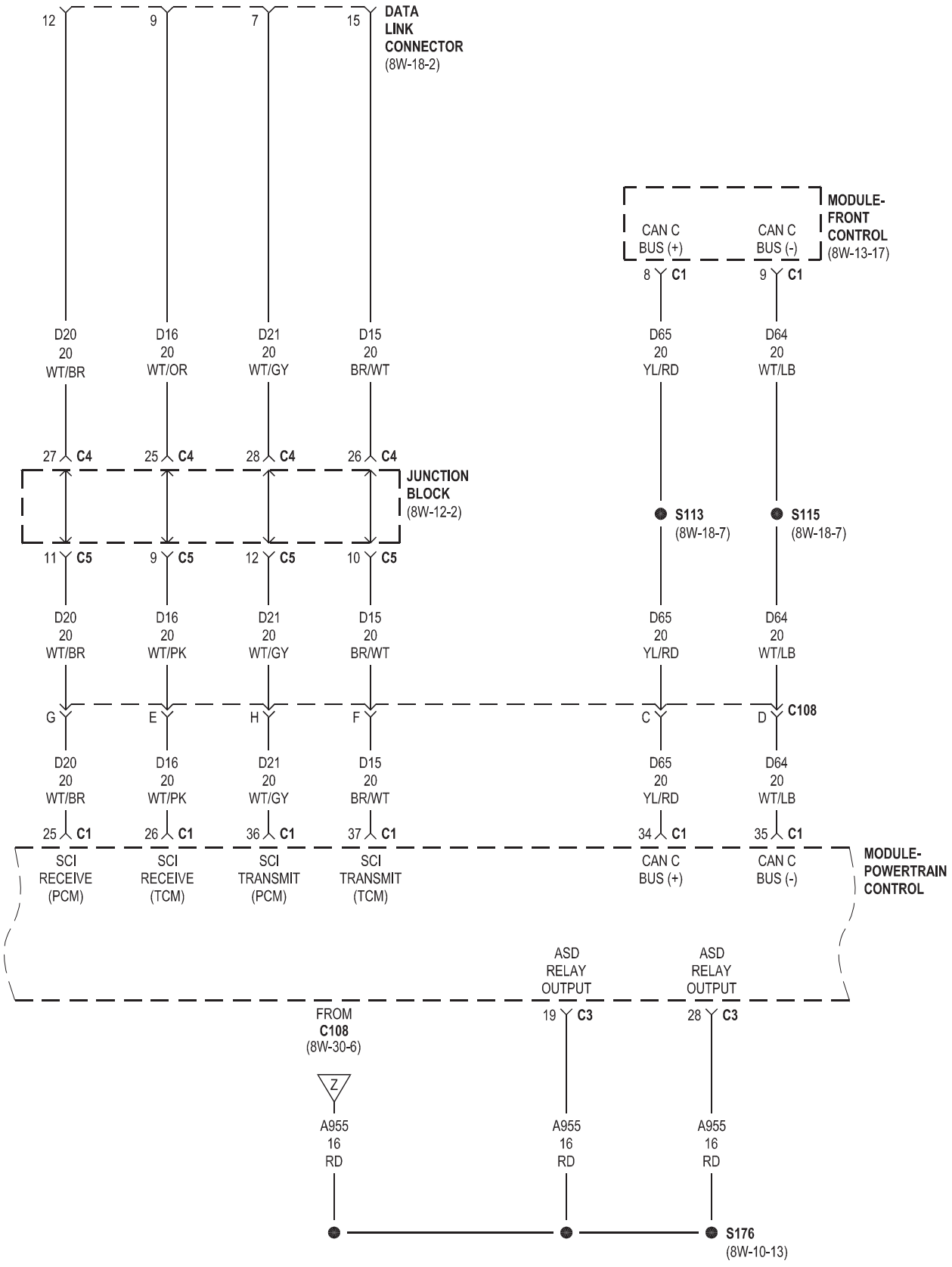

MODULE-
POWERTRAIN
CONTROL
INJECTOR
CONTROL
NO. 6
INJECTOR
CONTROL
NO. 4
INJECTOR
CONTROL
NO. 2
4 C2
11 C2
13 C2
K58
16
PK/DB
K14
16
YL/LB
K12
16
BR/DB
1
1
1
INJECTOR-
FUEL-NO. 6
(4.7L)
INJECTOR-
FUEL-NO. 4
(4.7L)
INJECTOR-
FUEL-NO. 2
(4.7L)
2
2
2
A955
16
RD
A955
16
RD
A955
16
RD
S185
(8W-10-14)
A955
16
RD
S134
(8W-10-14)
A955
16
RD
A955
16
RD
A955
16
RD
A955
16
RD
A955
16
RD
D
TO
S134
(8W-30-9)
2
2
2
2
INJECTOR-
FUEL-NO. 7
(4.7L)
INJECTOR-
FUEL-NO. 6
(3.7L)
INJECTOR-
FUEL-NO. 2
(3.7L)
INJECTOR-
FUEL-NO. 5
(3.7L)
1
1
1
1
K26
16
YL/TN
K58
16
PK/DB
K12
16
BR/DB
K38
16
YL/RD
5 C1
4 C2
13 C2
5 C2
INJECTOR
CONTROL
NO. 7
INJECTOR
CONTROL
NO. 6
INJECTOR
CONTROL
NO. 2
INJECTOR
CONTROL
NO. 5
MODULE-
POWERTRAIN
CONTROL

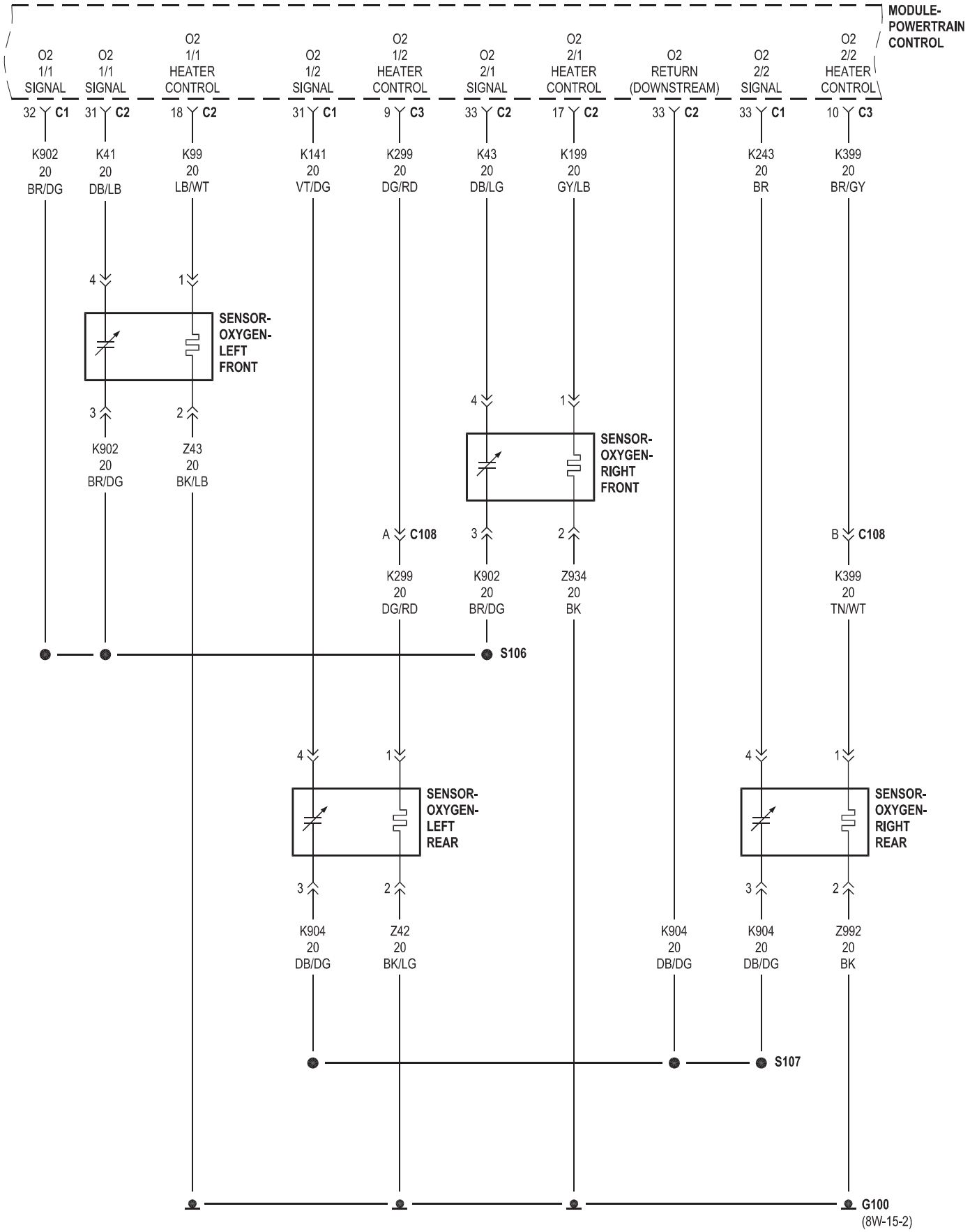

MODULE-
POWERTRAIN
CONTROL
COIL
CONTROL
NO. 2
COIL
CONTROL
NO. 5
COIL
CONTROL
NO. 7
9 C2
2 C2
3 C1
K17
16
DB/TN
K16
16
DG/WT
K97
16
BR
1
1
1
COIL-
IGNITION-NO. 2
(3.7L)
COIL-
IGNITION-NO. 5
COIL-
IGNITION-NO. 7
(4.7L)
FROM
S134
(8W-30-8)
D
2
2
2
A955
16
RD
A955
16
RD
A955
16
RD
A955
16
RD
S134
(8W-10-14)
A955
16
RD
A955
16
RD
S186
(8W-10-14)
E
TO
S184
(8W-30-10)
A955
16
RD
A955
16
RD
2
2
COIL-
IGNITION-NO. 1
COIL-
IGNITION-NO. 3
1
1
K19
16
LB/RD
K18
16
VT/RD
10 C2
7 C2
COIL
CONTROL
NO. 1
COIL
CONTROL
NO. 3
MODULE-
POWERTRAIN
CONTROL

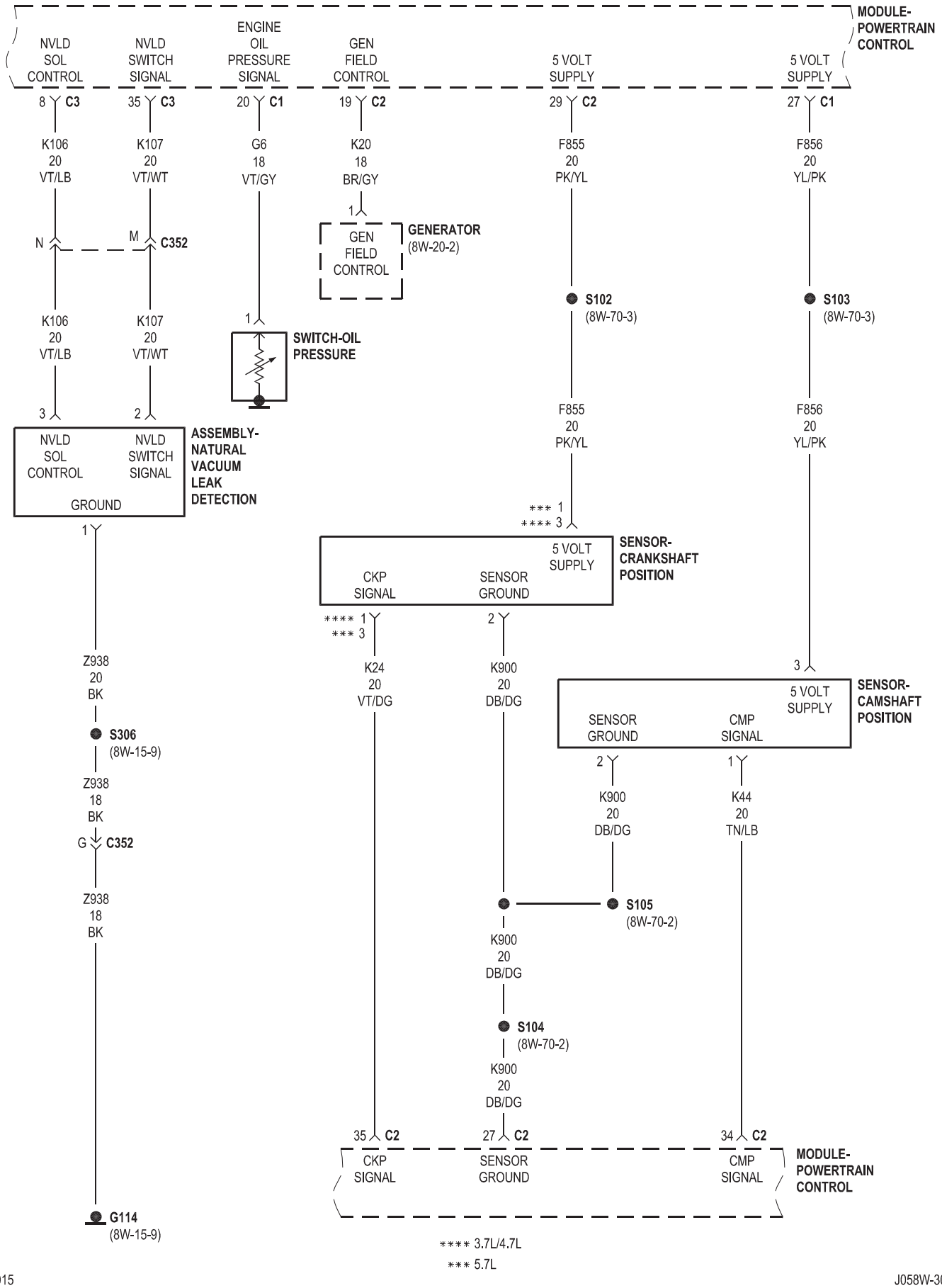

FROM
S134
(8W-30-9)
E
MODULE-
POWERTRAIN
CONTROL
COIL
CONTROL
NO. 4
COIL
CONTROL
NO. 6
COIL
CONTROL
NO. 8
3 C2
1 C2
1 C1
K15
16
DB
K10
16
VT/LB
K98
16
DB/YL
1
COIL-
IGNITION-NO. 4
(3.7L)
COIL-
IGNITION-NO. 6
COIL-
IGNITION-NO. 8
(4.7L)
2
A955
16
RD
S184
(8W-10-13)
S185
(8W-10-14)
COIL-
IGNITION-NO. 4
(4.7L)
COIL-
IGNITION-NO. 2
(4.7L)
K15
16
DB
K17
16
DB/TN
3 C2
9 C2
COIL
CONTROL
NO. 4
COIL
CONTROL
NO. 2
MODULE-
POWERTRAIN
CONTROL

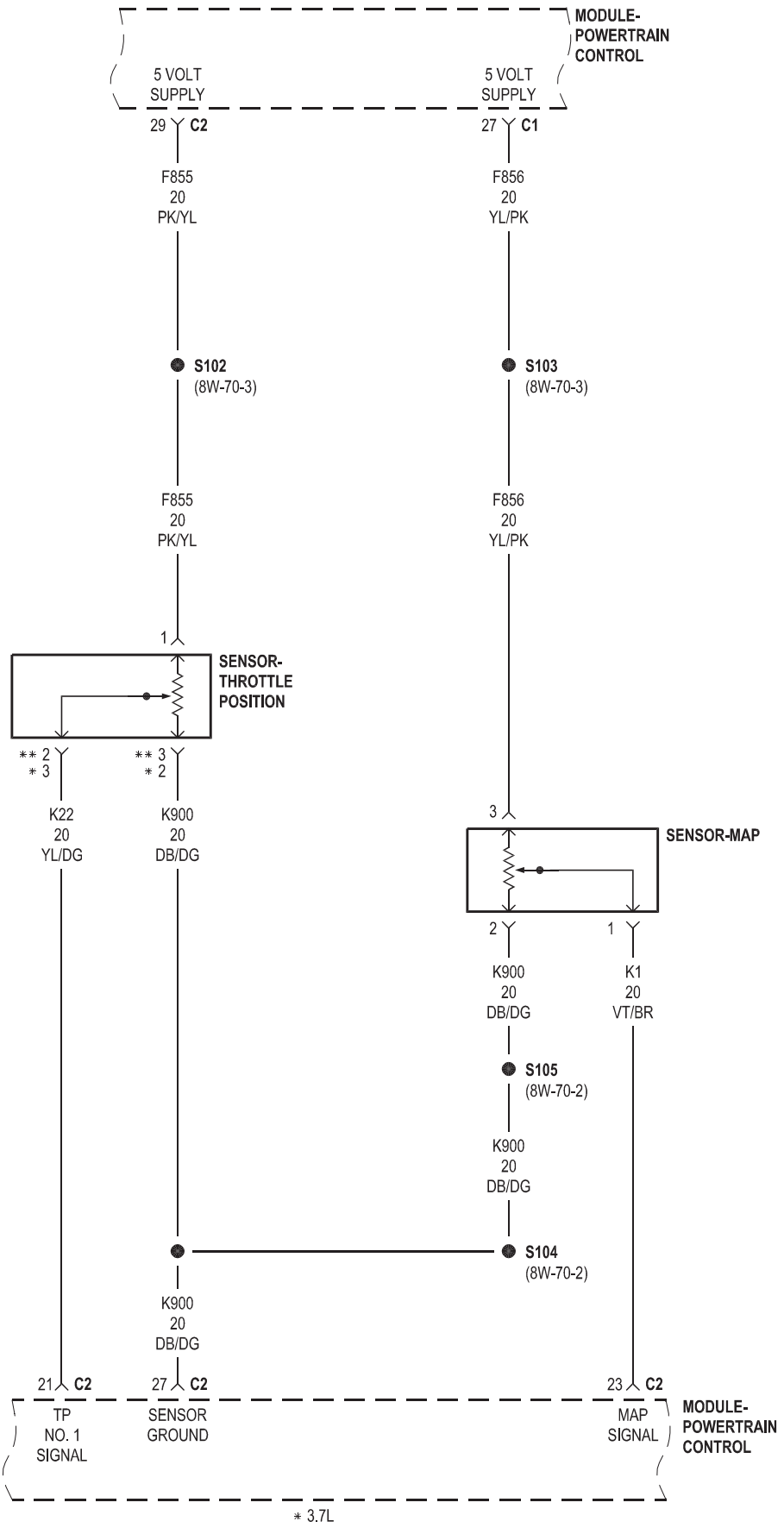

MODULE-POWERTRAIN CONTROL
INJECTOR CONTROL NO. 2
INJECTOR CONTROL NO. 4
INJECTOR CONTROL NO. 6
INJECTOR CONTROL NO. 8
13 C2
11 C2
4 C2
4 C1
K12 16 BR/DB
K14 16 YL/LB
K58 16 PK/DB
K28 16 VT/LG
2
4
6
8 C109
FROM S184 (8W-30-6)
A955 16 RD
K12 18 BR/DB
K14 18 BR/TN
K58 18 BR/VT
K28 18 BR/LB
1
INJECTOR-FUEL-NO. 2
INJECTOR-FUEL-NO. 4
INJECTOR-FUEL-NO. 6
INJECTOR-FUEL-NO. 8
14 C110
2
K342 16 BR/WT
S127 (8W-10-15)
S126 (8W-10-15)
COIL-IGNITION-NO. 2
COIL-IGNITION-NO. 4
COIL-IGNITION-NO. 6
COIL-IGNITION-NO. 8
K17 18 DB/TN
K15 18 DB/GY
K10 18 DB/OR
K98 18 DB/YL
10
12
14
16 C109
K17 16 DB/TN
K15 16 DB
K10 16 VT/LB
K98 16 DB/YL
9 C2
3 C2
1 C2
1 C1
COIL CONTROL NO. 2
COIL CONTROL NO. 4
COIL CONTROL NO. 6
COIL CONTROL NO. 8
MODULE-POWERTRAIN CONTROL


MODULE-POWERTRAIN CONTROL
INJECTOR CONTROL NO. 1
INJECTOR CONTROL NO. 3
INJECTOR CONTROL NO. 5
INJECTOR CONTROL NO. 7
14 C2
12 C2
5 C2
5 C1
K11 16 BR/YL
K13 16 PK/DB
K38 16 YL/RD
K26 16 YL/TN
1
3
5
7 C109
K11 18 BR/YL
K13 18 BR/LB
K38 18 BR/OR
K26 18 BR/YL
INJECTOR-FUEL-NO. 1
INJECTOR-FUEL-NO. 3
INJECTOR-FUEL-NO. 5
INJECTOR-FUEL-NO. 7
K342 16 BR/WT
S128 (8W-10-15)
S129 (8W-10-15)
COIL-IGNITION-NO. 1
COIL-IGNITION-NO. 3
COIL-IGNITION-NO. 5
COIL-IGNITION-NO. 7
K19 18 DB/DG
K18 18 DB/OR
K16 18 DB/YL
K97 18 BR
9
11
13
15 C109
K19 16 LB/RD
K18 16 VT/RD
K16 16 DG/WT
K97 16 BR
10 C2
7 C2
2 C2
3 C1
COIL CONTROL NO. 1
COIL CONTROL NO. 3
COIL CONTROL NO. 5
COIL CONTROL NO. 7
MODULE-POWERTRAIN CONTROL

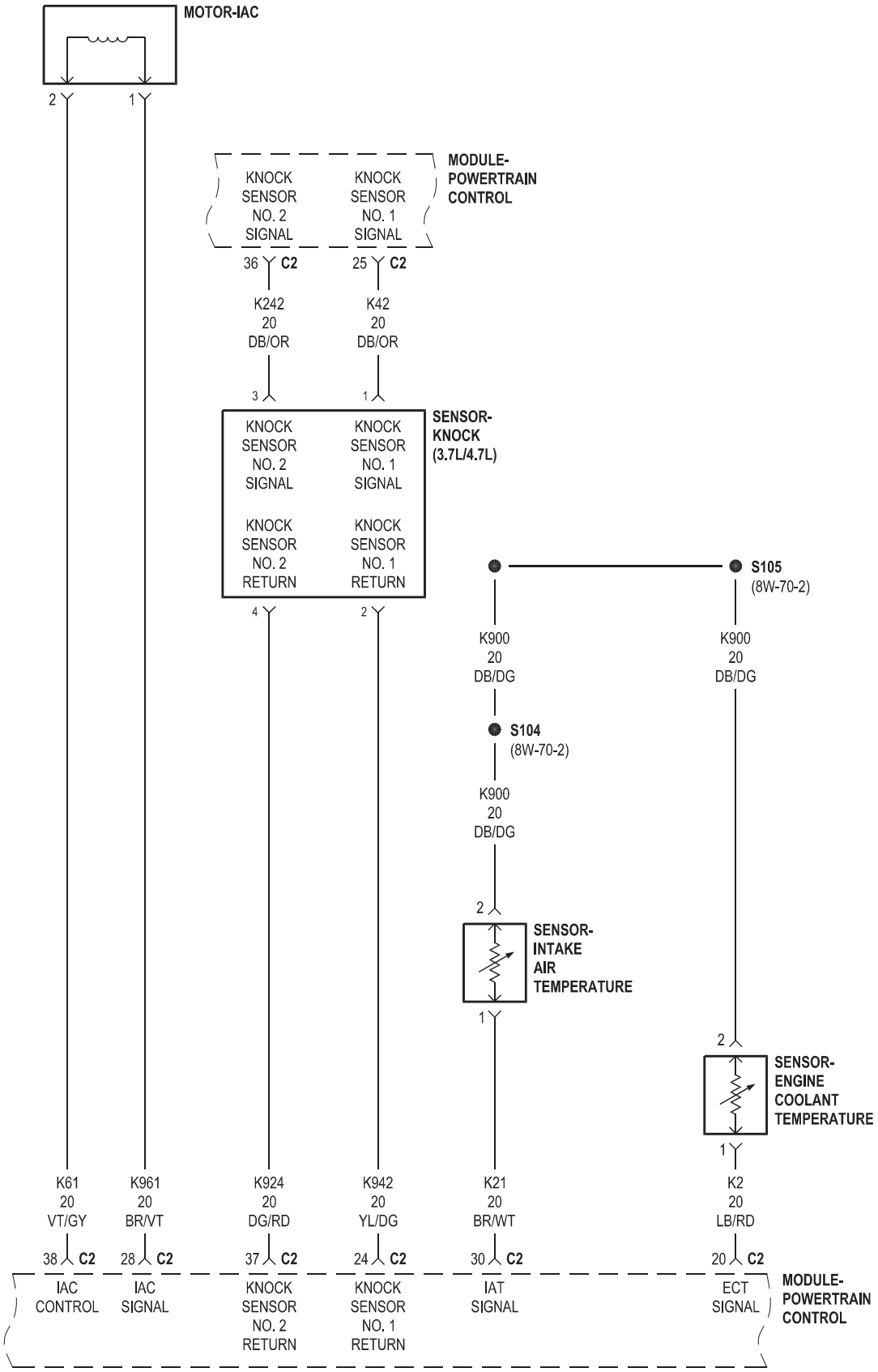

12
9
7
15
DATA LINK CONNECTOR
(8W-18-2)
MODULE-FRONT CONTROL
(8W-13-17)
CAN C BUS (+)
CAN C BUS (-)
8 C1
9 C1
D20 20 WT/BR
D16 20 WT/OR
D21 20 WT/GY
D15 20 BR/WT
D65 20 YL/RD
D64 20 WT/LB
27 C4
25 C4
28 C4
26 C4
JUNCTION BLOCK
(8W-12-2)
S113
(8W-18-7)
S115
(8W-18-7)
11 C5
9 C5
12 C5
10 C5
D20 20 WT/BR
D16 20 WT/PK
D21 20 WT/GY
D15 20 BR/WT
D65 20 YL/RD
D64 20 WT/LB
G
E
H
F
C
D
C108
D20 20 WT/BR
D16 20 WT/PK
D21 20 WT/GY
D15 20 BR/WT
D65 20 YL/RD
D64 20 WT/LB
25 C1
26 C1
36 C1
37 C1
34 C1
35 C1
SCI RECEIVE (PCM)
SCI RECEIVE (TCM)
SCI TRANSMIT (PCM)
SCI TRANSMIT (TCM)
CAN C BUS (+)
CAN C BUS (-)
MODULE-POWERTRAIN CONTROL
ASD RELAY OUTPUT
ASD RELAY OUTPUT
19 C3
28 C3
FROM C108
(8W-30-6)
Z
A955 16 RD
A955 16 RD
A955 16 RD
S176
(8W-10-13)


MODULE-
POWERTRAIN
CONTROL
O2
1/1
SIGNAL
O2
1/1
SIGNAL
O2
1/1
HEATER
CONTROL
O2
1/2
SIGNAL
O2
1/2
HEATER
CONTROL
O2
2/1
SIGNAL
O2
2/1
HEATER
CONTROL
O2
RETURN
(DOWNSTREAM)
O2
2/2
SIGNAL
O2
2/2
HEATER
CONTROL
32 C1
31 C2
18 C2
31 C1
9 C3
33 C2
17 C2
33 C2
33 C1
10 C3
K902
20
BR/DG
K41
20
DB/LB
K99
20
LB/WT
K141
20
VT/DG
K299
20
DG/RD
K43
20
DB/LG
K199
20
GY/LB
K243
20
BR
K399
20
BR/GY
SENSOR-
OXYGEN-
LEFT
FRONT
SENSOR-
OXYGEN-
RIGHT
FRONT
A C108
B C108
K902
20
BR/DG
Z43
20
BK/LB
K299
20
DG/RD
K902
20
BR/DG
Z934
20
BK
K399
20
TN/WT
S106
SENSOR-
OXYGEN-
LEFT
REAR
SENSOR-
OXYGEN-
RIGHT
REAR
K904
20
DB/DG
Z42
20
BK/LG
K904
20
DB/DG
K904
20
DB/DG
Z992
20
BK
S107
G100
(8W-15-2)

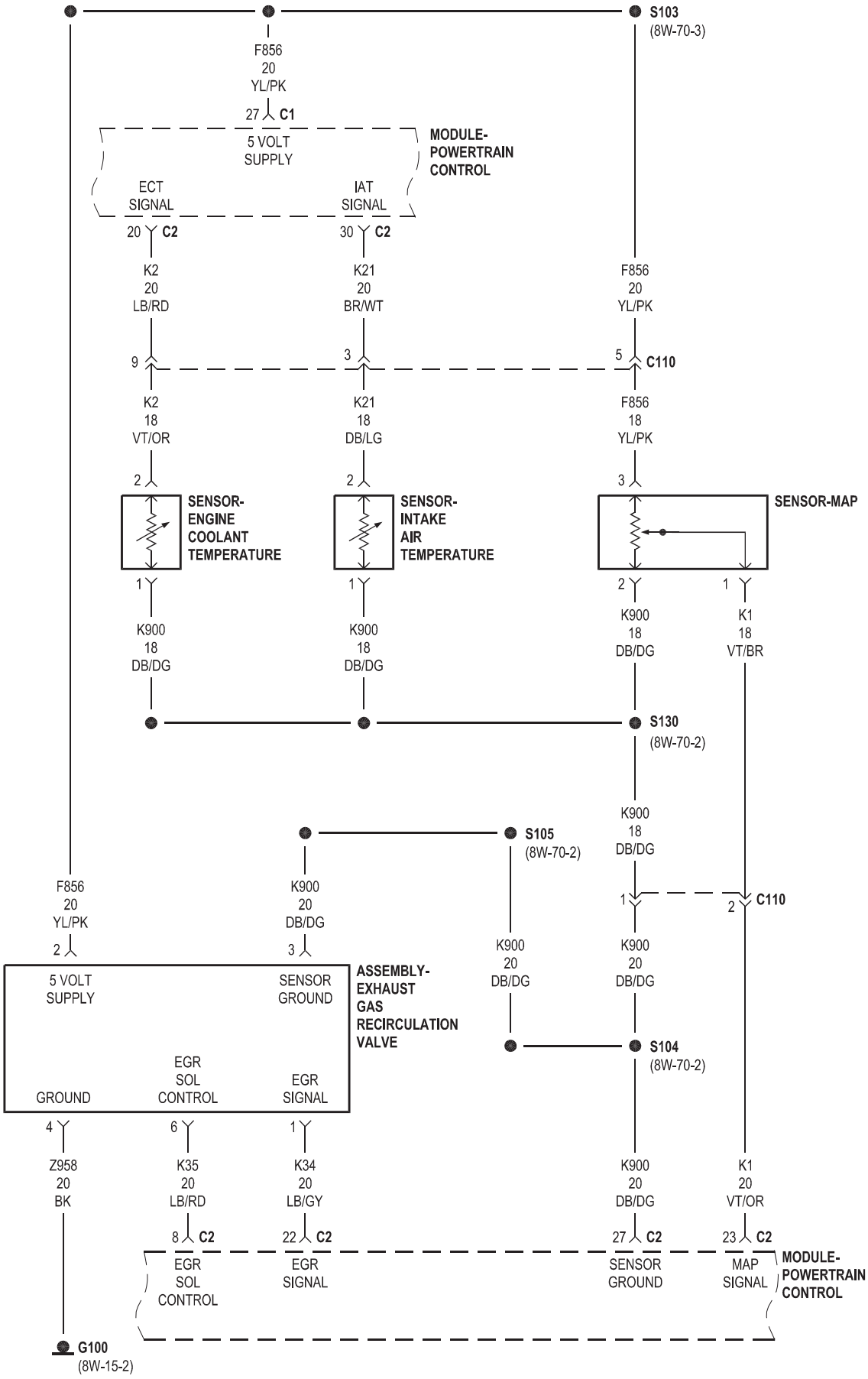

MODULE-POWERTRAIN CONTROL
NVLD SOL CONTROL
NVLD SWITCH SIGNAL
ENGINE OIL PRESSURE SIGNAL
GEN FIELD CONTROL
5 VOLT SUPPLY
5 VOLT SUPPLY
8 C3
35 C3
20 C1
19 C2
29 C2
27 C1
K106 20 VT/LB
K107 20 VT/WT
G6 18 VT/GY
K20 18 BR/GY
F855 20 PK/YL
F856 20 YL/PK
1
GEN FIELD CONTROL
GENERATOR (8W-20-2)
N
M C352
S102 (8W-70-3)
S103 (8W-70-3)
K106 20 VT/LB
K107 20 VT/WT
1
SWITCH-OIL PRESSURE
F855 20 PK/YL
F856 20 YL/PK
3
2
NVLD SOL CONTROL
NVLD SWITCH SIGNAL
GROUND
ASSEMBLY-NATURAL VACUUM LEAK DETECTION
*** 1
**** 3
5 VOLT SUPPLY
SENSOR-CRANKSHAFT POSITION
CKP SIGNAL
SENSOR GROUND
**** 1
*** 3
2
3
1
Z938 20 BK
K24 20 VT/DG
K900 20 DB/DG
5 VOLT SUPPLY
SENSOR-CAMSHAFT POSITION
SENSOR GROUND
CMP SIGNAL
S306 (8W-15-9)
2
1
Z938 18 BK
K900 20 DB/DG
K44 20 TN/LB
G C352
S105 (8W-70-2)
Z938 18 BK
K900 20 DB/DG
S104 (8W-70-2)
K900 20 DB/DG
35 C2
27 C2
34 C2
CKP SIGNAL
SENSOR GROUND
CMP SIGNAL
MODULE-POWERTRAIN CONTROL
G114 (8W-15-9)
**** 3.7L/4.7L
*** 5.7L

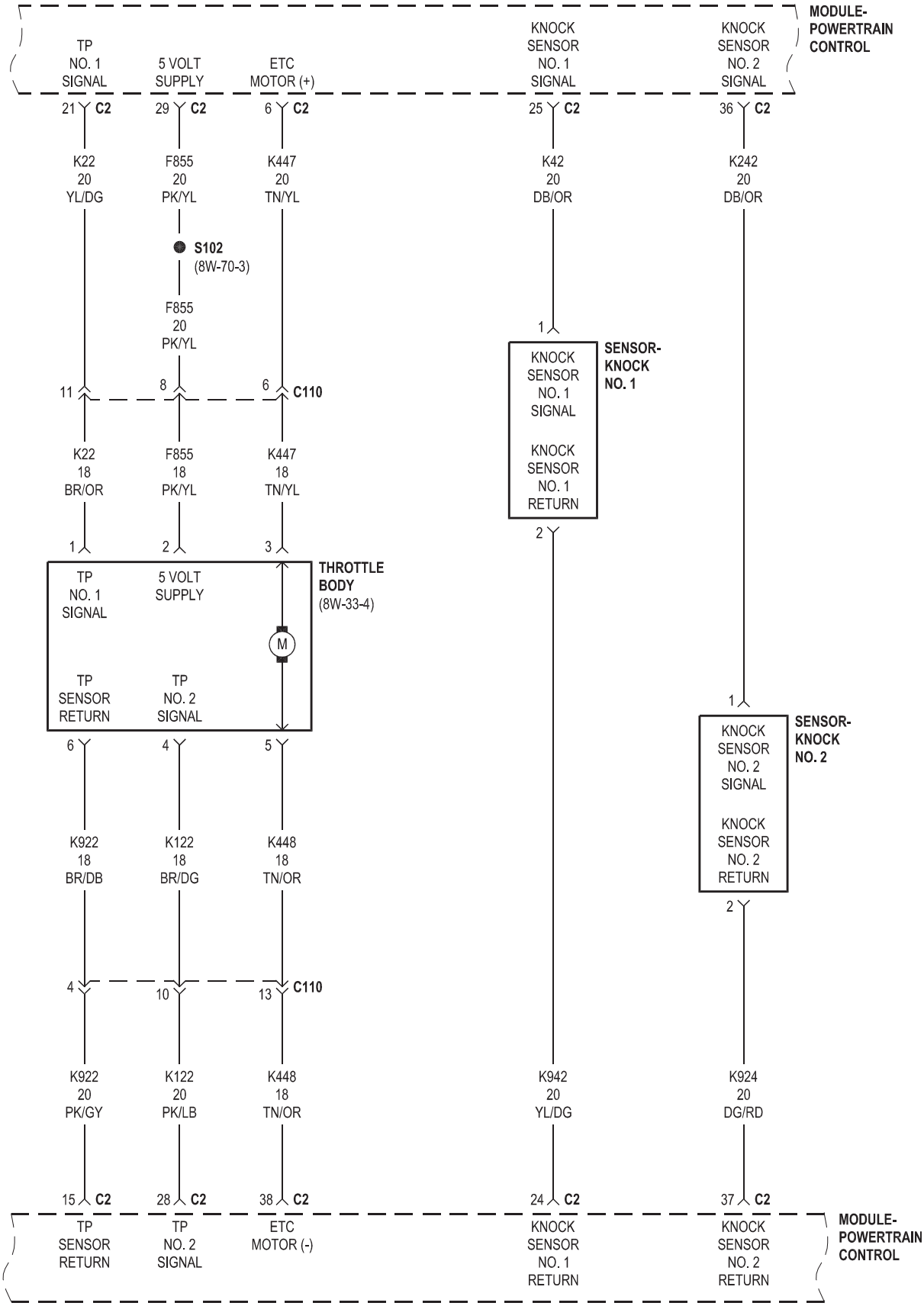

MODULE-
POWERTRAIN
CONTROL
5 VOLT
SUPPLY
29 C2
5 VOLT
SUPPLY
27 C1
F855
20
PK/YL
F856
20
YL/PK
S102
(8W-70-3)
S103
(8W-70-3)
F855
20
PK/YL
F856
20
YL/PK
1
SENSOR-
THROTTLE
POSITION
** 2
* 3
** 3
* 2
K22
20
YL/DG
K900
20
DB/DG
3
SENSOR-MAP
2
1
K900
20
DB/DG
K1
20
VT/BR
S105
(8W-70-2)
K900
20
DB/DG
S104
(8W-70-2)
K900
20
DB/DG
21 C2
27 C2
23 C2
TP
NO. 1
SIGNAL
SENSOR
GROUND
MAP
SIGNAL
MODULE-
POWERTRAIN
CONTROL

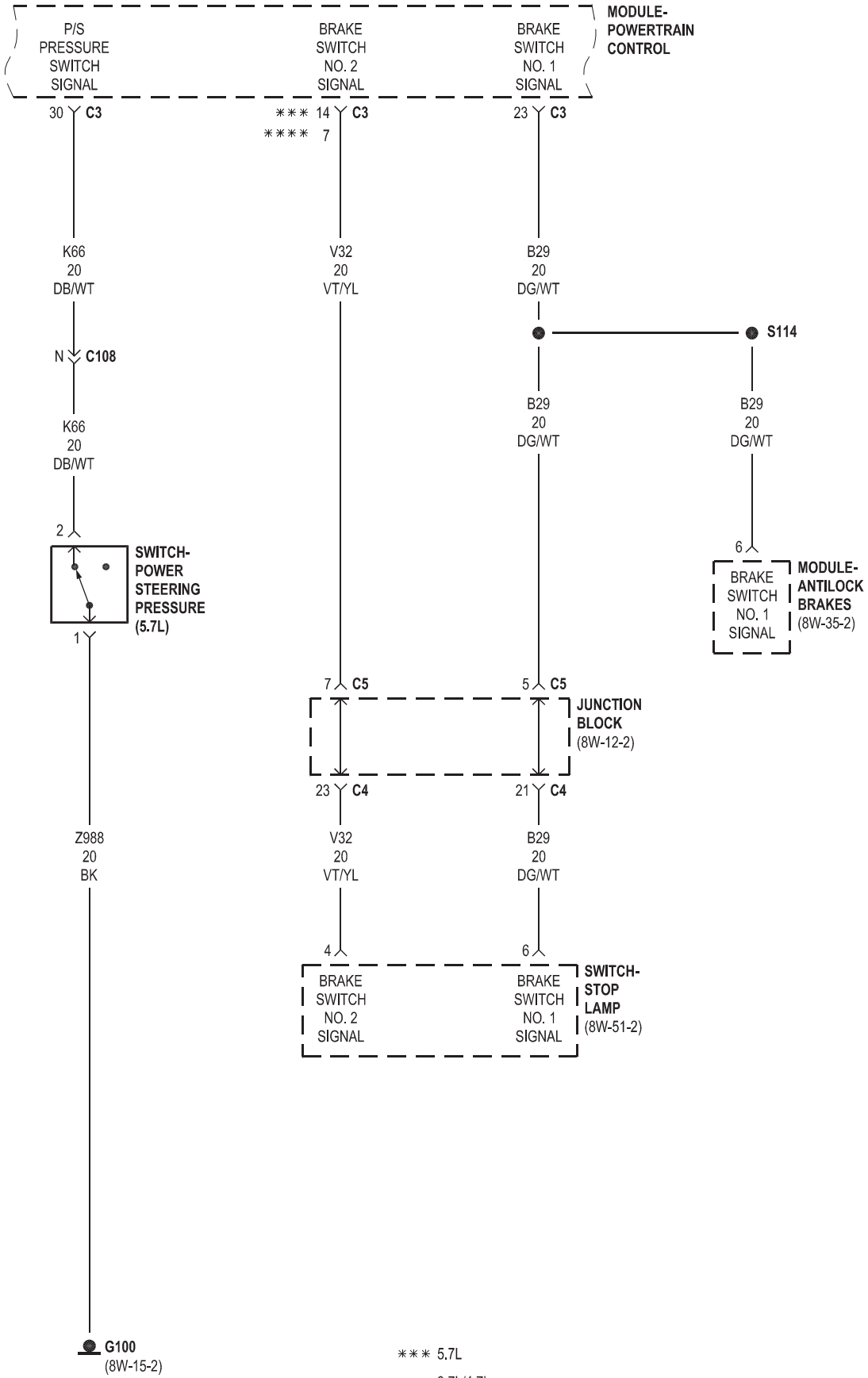
* 3.7L
** 4.7L

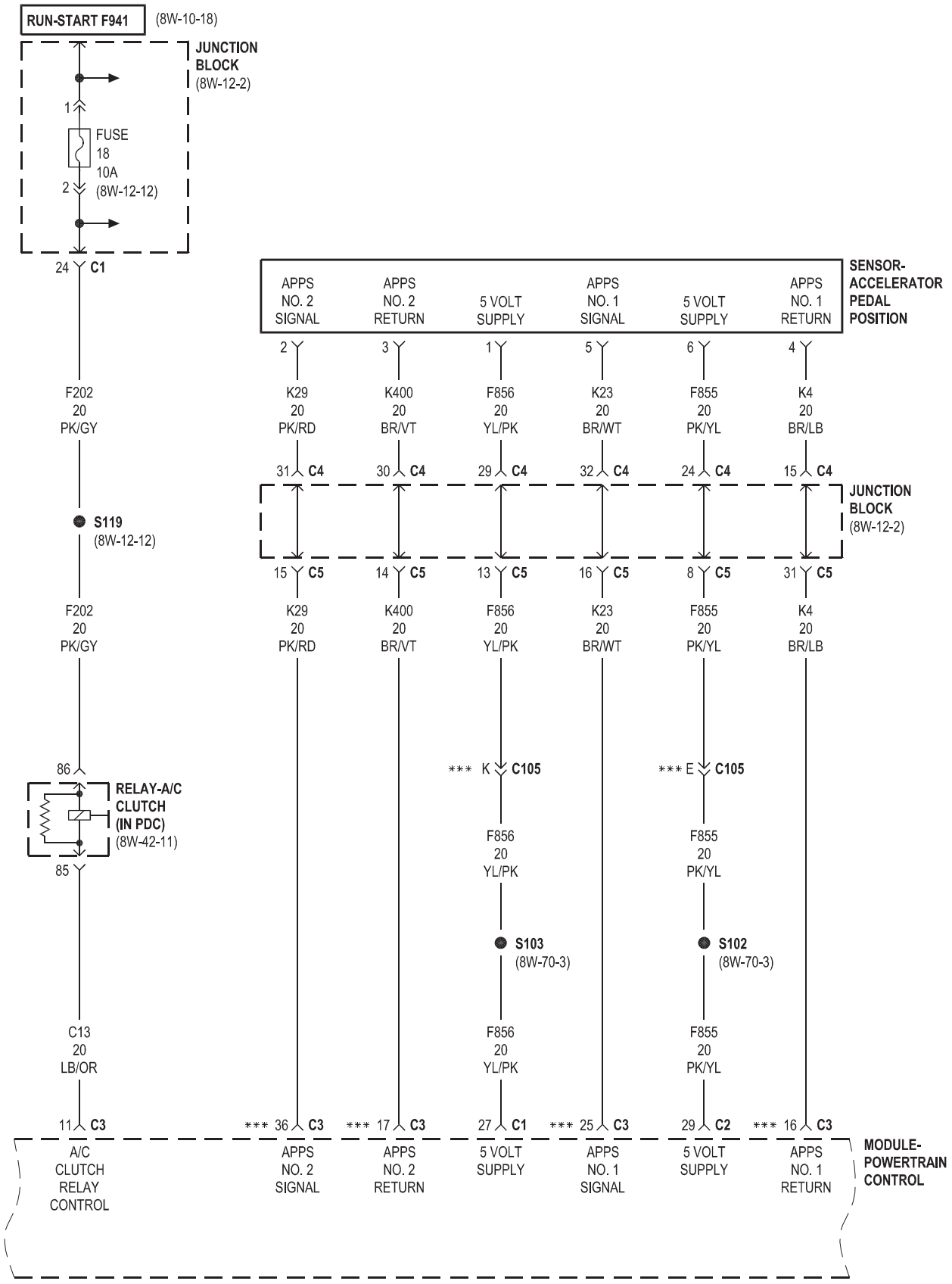

MOTOR-IAC
2
1
MODULE-
POWERTRAIN
CONTROL
KNOCK
SENSOR
NO. 2
SIGNAL
KNOCK
SENSOR
NO. 1
SIGNAL
36 C2
25 C2
K242
20
DB/OR
K42
20
DB/OR
3
1
SENSOR-
KNOCK
(3.7L/4.7L)
KNOCK
SENSOR
NO. 2
SIGNAL
KNOCK
SENSOR
NO. 1
SIGNAL
KNOCK
SENSOR
NO. 2
RETURN
KNOCK
SENSOR
NO. 1
RETURN
4
2
S105
(8W-70-2)
K900
20
DB/DG
K900
20
DB/DG
S104
(8W-70-2)
K900
20
DB/DG
2
SENSOR-
INTAKE
AIR
TEMPERATURE
1
2
SENSOR-
ENGINE
COOLANT
TEMPERATURE
1
K61
20
VT/GY
K961
20
BR/VT
K924
20
DG/RD
K942
20
YL/DG
K21
20
BR/WT
K2
20
LB/RD
38 C2
28 C2
37 C2
24 C2
30 C2
20 C2
IAC
CONTROL
IAC
SIGNAL
KNOCK
SENSOR
NO. 2
RETURN
KNOCK
SENSOR
NO. 1
RETURN
IAT
SIGNAL
ECT
SIGNAL
MODULE-
POWERTRAIN
CONTROL

5.7L

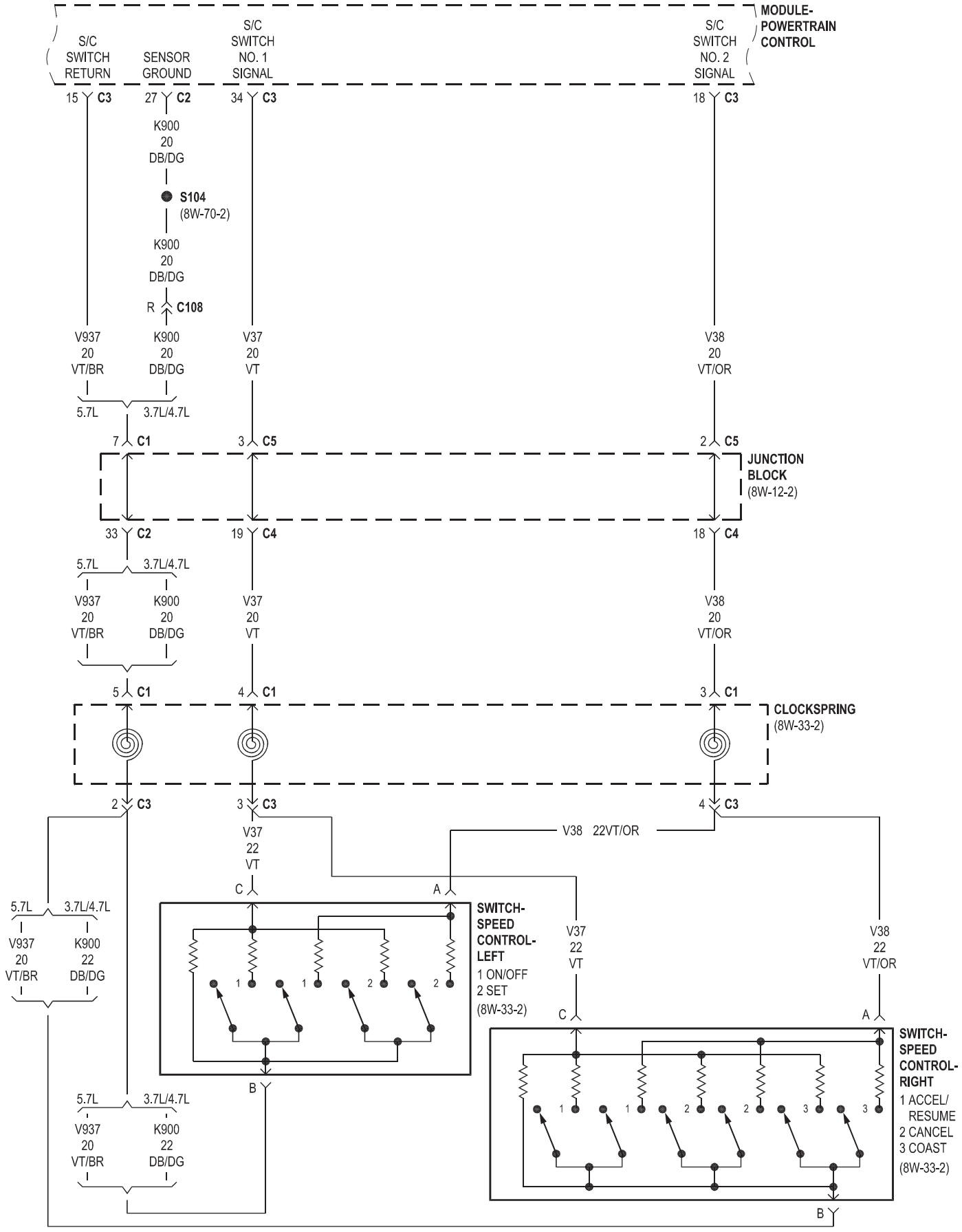

S103
(8W-70-3)
F856
20
YL/PK
27 C1
5 VOLT
SUPPLY
MODULE-
POWERTRAIN
CONTROL
ECT
SIGNAL
IAT
SIGNAL
20 C2
30 C2
K2
20
LB/RD
K21
20
BR/WT
F856
20
YL/PK
9
3
5 C110
K2
18
VT/OR
K21
18
DB/LG
F856
18
YL/PK
2
2
3
SENSOR-
ENGINE
COOLANT
TEMPERATURE
SENSOR-
INTAKE
AIR
TEMPERATURE
SENSOR-MAP
1
1
2
1
K900
18
DB/DG
K900
18
DB/DG
K900
18
DB/DG
K1
18
VT/BR
S130
(8W-70-2)
S105
(8W-70-2)
K900
18
DB/DG
F856
20
YL/PK
K900
20
DB/DG
1
2 C110
2
3
K900
20
DB/DG
K900
20
DB/DG
5 VOLT
SUPPLY
SENSOR
GROUND
ASSEMBLY-
EXHAUST
GAS
RECIRCULATION
VALVE
S104
(8W-70-2)
EGR
SOL
CONTROL
GROUND
EGR
SIGNAL
4
6
1
Z958
20
BK
K35
20
LB/RD
K34
20
LB/GY
K900
20
DB/DG
K1
20
VT/OR
8 C2
22 C2
27 C2
23 C2
EGR
SOL
CONTROL
EGR
SIGNAL
SENSOR
GROUND
MAP
SIGNAL
MODULE-
POWERTRAIN
CONTROL
G100
(8W-15-2)

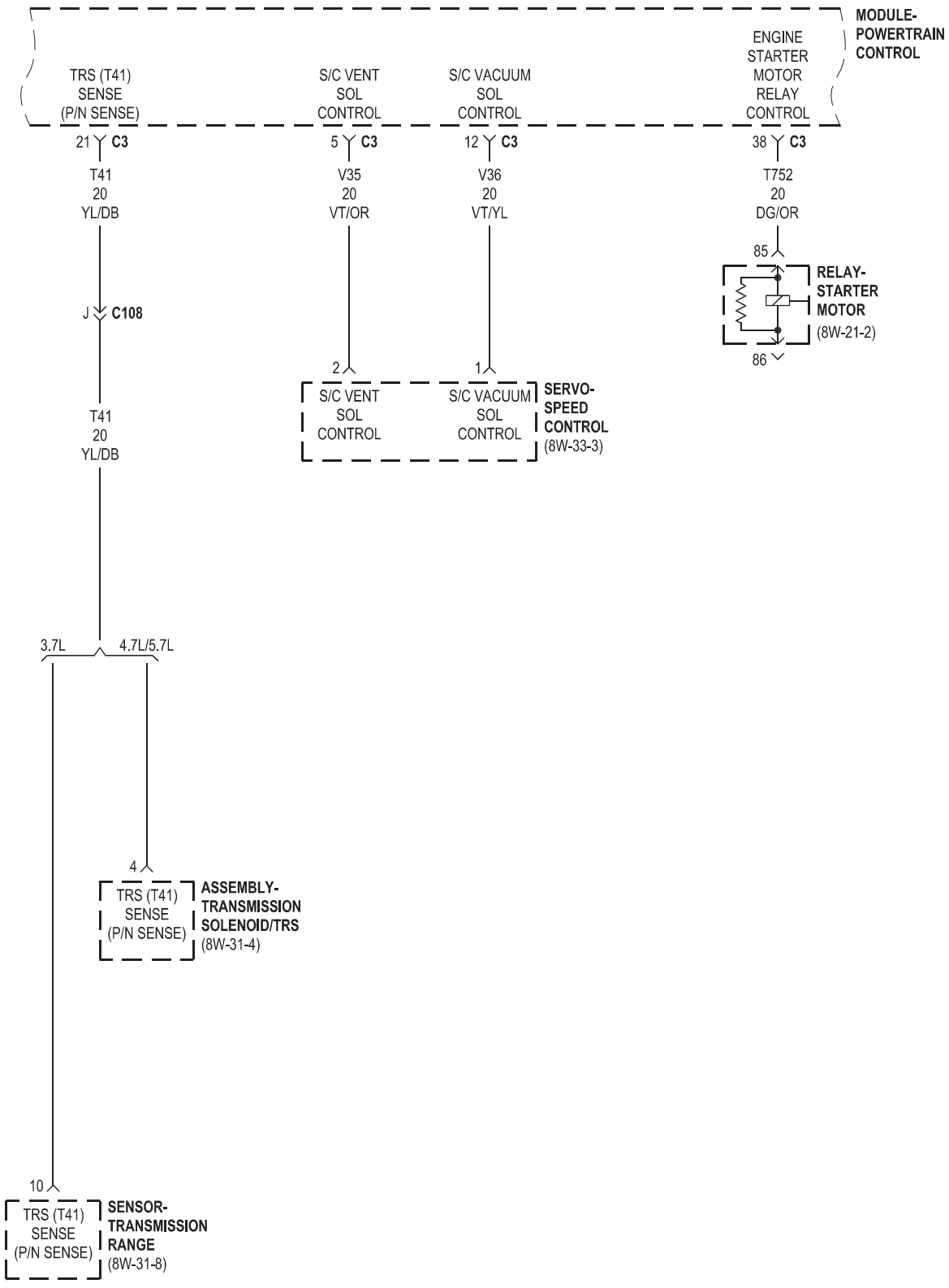

MODULE-
POWERTRAIN
CONTROL
TP
NO. 1
SIGNAL
5 VOLT
SUPPLY
ETC
MOTOR (+)
KNOCK
SENSOR
NO. 1
SIGNAL
KNOCK
SENSOR
NO. 2
SIGNAL
21 C2
29 C2
6 C2
25 C2
36 C2
K22
20
YL/DG
F855
20
PK/YL
K447
20
TN/YL
K42
20
DB/OR
K242
20
DB/OR
S102
(8W-70-3)
F855
20
PK/YL
1
KNOCK
SENSOR
NO. 1
SIGNAL
KNOCK
SENSOR
NO. 1
RETURN
SENSOR-
KNOCK
NO. 1
2
11
8
6 C110
K22
18
BR/OR
F855
18
PK/YL
K447
18
TN/YL
1
2
3
TP
NO. 1
SIGNAL
5 VOLT
SUPPLY
THROTTLE
BODY
(8W-33-4)
M
TP
SENSOR
RETURN
TP
NO. 2
SIGNAL
1
KNOCK
SENSOR
NO. 2
SIGNAL
KNOCK
SENSOR
NO. 2
RETURN
SENSOR-
KNOCK
NO. 2
2
6
4
5
K922
18
BR/DB
K122
18
BR/DG
K448
18
TN/OR
4
10
13 C110
K922
20
PK/GY
K122
20
PK/LB
K448
18
TN/OR
K942
20
YL/DG
K924
20
DG/RD
15 C2
28 C2
38 C2
24 C2
37 C2
TP
SENSOR
RETURN
TP
NO. 2
SIGNAL
ETC
MOTOR (-)
KNOCK
SENSOR
NO. 1
RETURN
KNOCK
SENSOR
NO. 2
RETURN
MODULE-
POWERTRAIN
CONTROL


MODULE-
POWERTRAIN
CONTROL
P/S
PRESSURE
SWITCH
SIGNAL
BRAKE
SWITCH
NO. 2
SIGNAL
BRAKE
SWITCH
NO. 1
SIGNAL
30 C3
*** 14 C3
**** 7
23 C3
K66
20
DB/WT
V32
20
VT/YL
B29
20
DG/WT
S114
N C108
K66
20
DB/WT
B29
20
DG/WT
B29
20
DG/WT
2
6
SWITCH-
POWER
STEERING
PRESSURE
(5.7L)
1
BRAKE
SWITCH
NO. 1
SIGNAL
MODULE-
ANTILOCK
BRAKES
(8W-35-2)
7 C5
5 C5
JUNCTION
BLOCK
(8W-12-2)
23 C4
21 C4
Z988
20
BK
V32
20
VT/YL
B29
20
DG/WT
4
6
BRAKE
SWITCH
NO. 2
SIGNAL
BRAKE
SWITCH
NO. 1
SIGNAL
SWITCH-
STOP
LAMP
(8W-51-2)
G100
(8W-15-2)
*** 5.7L
**** 3.7L/4.7L


RUN-START F941
(8W-10-18)
JUNCTION BLOCK
(8W-12-2)
1
FUSE
18
10A
2
(8W-12-12)
24 C1
F202
20
PK/GY
S119
(8W-12-12)
F202
20
PK/GY
86
RELAY-A/C CLUTCH (IN PDC)
(8W-42-11)
85
C13
20
LB/OR
11 C3
A/C CLUTCH RELAY CONTROL
SENSOR-ACCELERATOR PEDAL POSITION
APPS NO. 2 SIGNAL
APPS NO. 2 RETURN
5 VOLT SUPPLY
APPS NO. 1 SIGNAL
5 VOLT SUPPLY
APPS NO. 1 RETURN
2
3
1
5
6
4
K29
20
PK/RD
K400
20
BR/VT
F856
20
YL/PK
K23
20
BR/WT
F855
20
PK/YL
K4
20
BR/LB
31 C4
30 C4
29 C4
32 C4
24 C4
15 C4
JUNCTION BLOCK
(8W-12-2)
15 C5
14 C5
13 C5
16 C5
8 C5
31 C5
K29
20
PK/RD
K400
20
BR/VT
F856
20
YL/PK
K23
20
BR/WT
F855
20
PK/YL
K4
20
BR/LB
*** K C105
*** E C105
F856
20
YL/PK
F855
20
PK/YL
S103
(8W-70-3)
S102
(8W-70-3)
F856
20
YL/PK
F855
20
PK/YL
*** 36 C3
*** 17 C3
27 C1
*** 25 C3
29 C2
*** 16 C3
APPS NO. 2 SIGNAL
APPS NO. 2 RETURN
5 VOLT SUPPLY
APPS NO. 1 SIGNAL
5 VOLT SUPPLY
APPS NO. 1 RETURN
MODULE-POWERTRAIN CONTROL

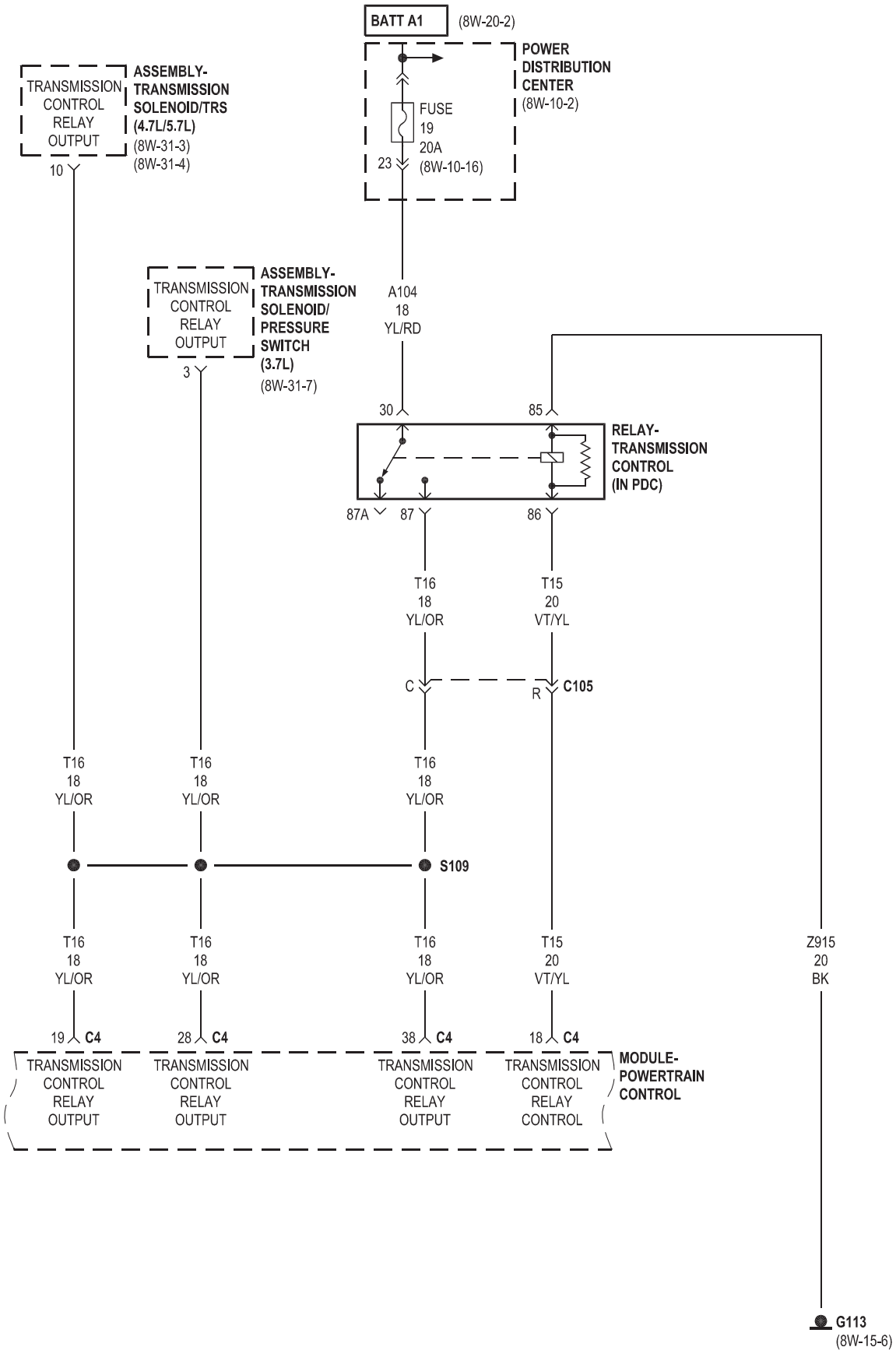
*** 5.7L

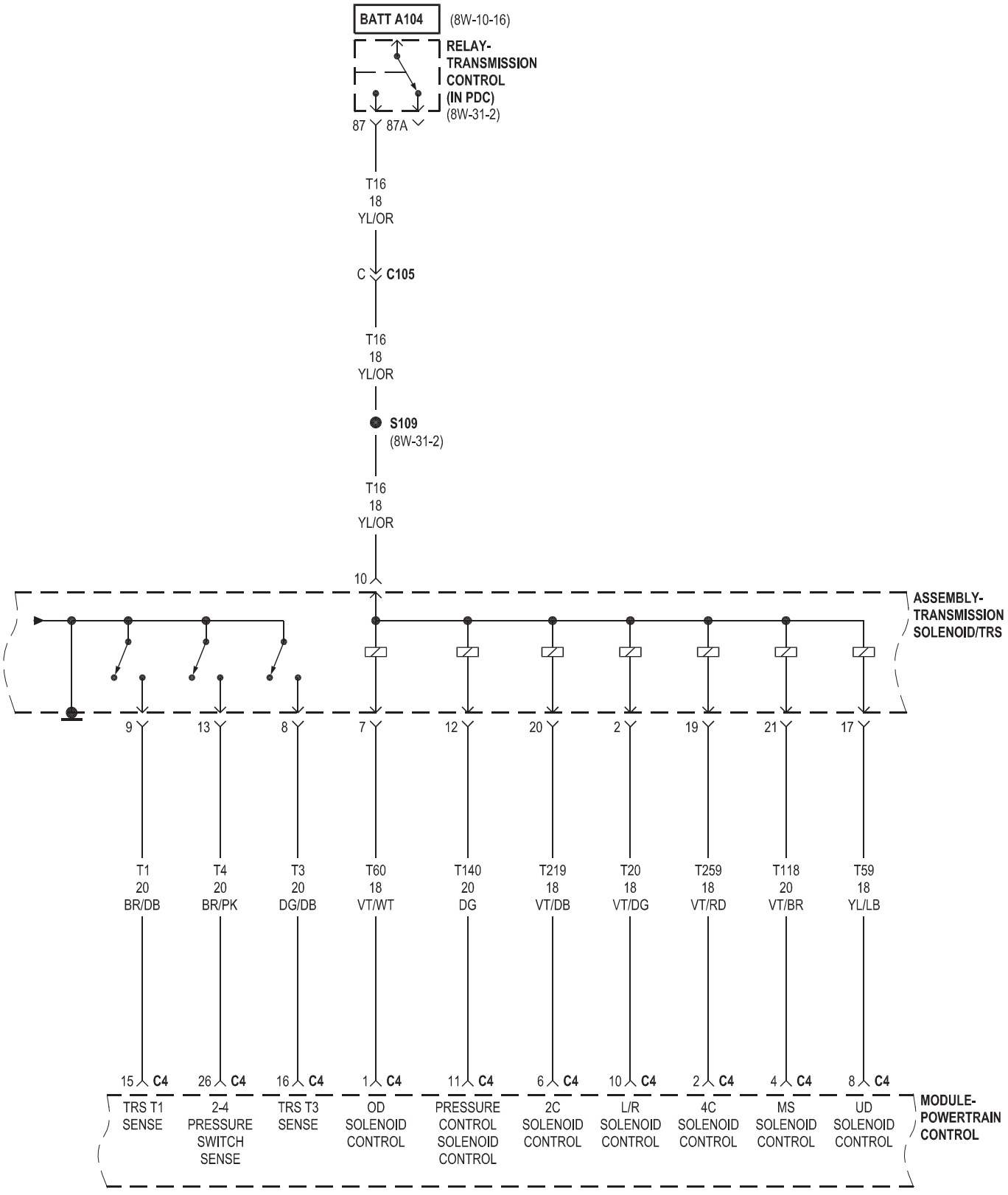

MODULE-
POWERTRAIN
CONTROL
S/C
SWITCH
RETURN
SENSOR
GROUND
S/C
SWITCH
NO. 1
SIGNAL
S/C
SWITCH
NO. 2
SIGNAL
15 C3
27 C2
34 C3
18 C3
K900
20
DB/DG
S104
(8W-70-2)
K900
20
DB/DG
R C108
V937
20
VT/BR
K900
20
DB/DG
V37
20
VT
V38
20
VT/OR
5.7L
3.7L/4.7L
7 C1
3 C5
2 C5
JUNCTION
BLOCK
(8W-12-2)
33 C2
19 C4
18 C4
5.7L
3.7L/4.7L
V937
20
VT/BR
K900
20
DB/DG
V37
20
VT
V38
20
VT/OR
5 C1
4 C1
3 C1
CLOCKSPRING
(8W-33-2)
2 C3
3 C3
4 C3
V37
22
VT
V38 22VT/OR
C
A
5.7L
3.7L/4.7L
V937
20
VT/BR
K900
22
DB/DG
SWITCH-
SPEED
CONTROL-
LEFT
1 ON/OFF
2 SET
(8W-33-2)
V37
22
VT
V38
22
VT/OR
C
A
SWITCH-
SPEED
CONTROL-
RIGHT
1 ACCEL/
RESUME
2 CANCEL
3 COAST
(8W-33-2)
B
B
5.7L
3.7L/4.7L
V937
20
VT/BR
K900
22
DB/DG

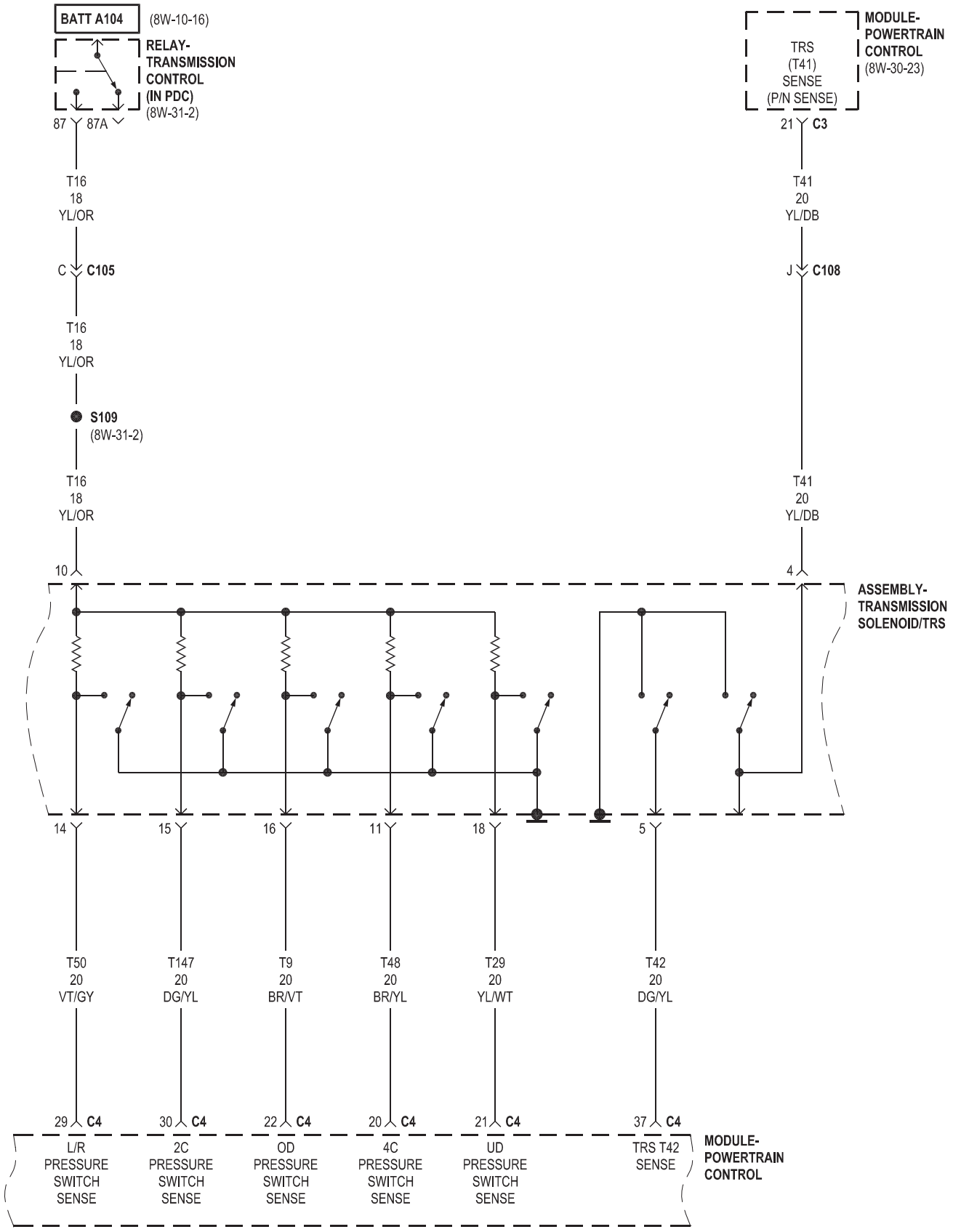

MODULE-
POWERTRAIN
CONTROL
TRS (T41)
SENSE
(P/N SENSE)
S/C VENT
SOL
CONTROL
S/C VACUUM
SOL
CONTROL
ENGINE
STARTER
MOTOR
RELAY
CONTROL
21 C3
5 C3
12 C3
38 C3
T41
20
YL/DB
V35
20
VT/OR
V36
20
VT/YL
T752
20
DG/OR
85
RELAY-
STARTER
MOTOR
(8W-21-2)
86
J C108
2
1
S/C VENT
SOL
CONTROL
S/C VACUUM
SOL
CONTROL
SERVO-
SPEED
CONTROL
(8W-33-3)
T41
20
YL/DB
3.7L
4.7L/5.7L
4
TRS (T41)
SENSE
(P/N SENSE)
ASSEMBLY-
TRANSMISSION
SOLENOID/TRS
(8W-31-4)
10
TRS (T41)
SENSE
(P/N SENSE)
SENSOR-
TRANSMISSION
RANGE
(8W-31-8)

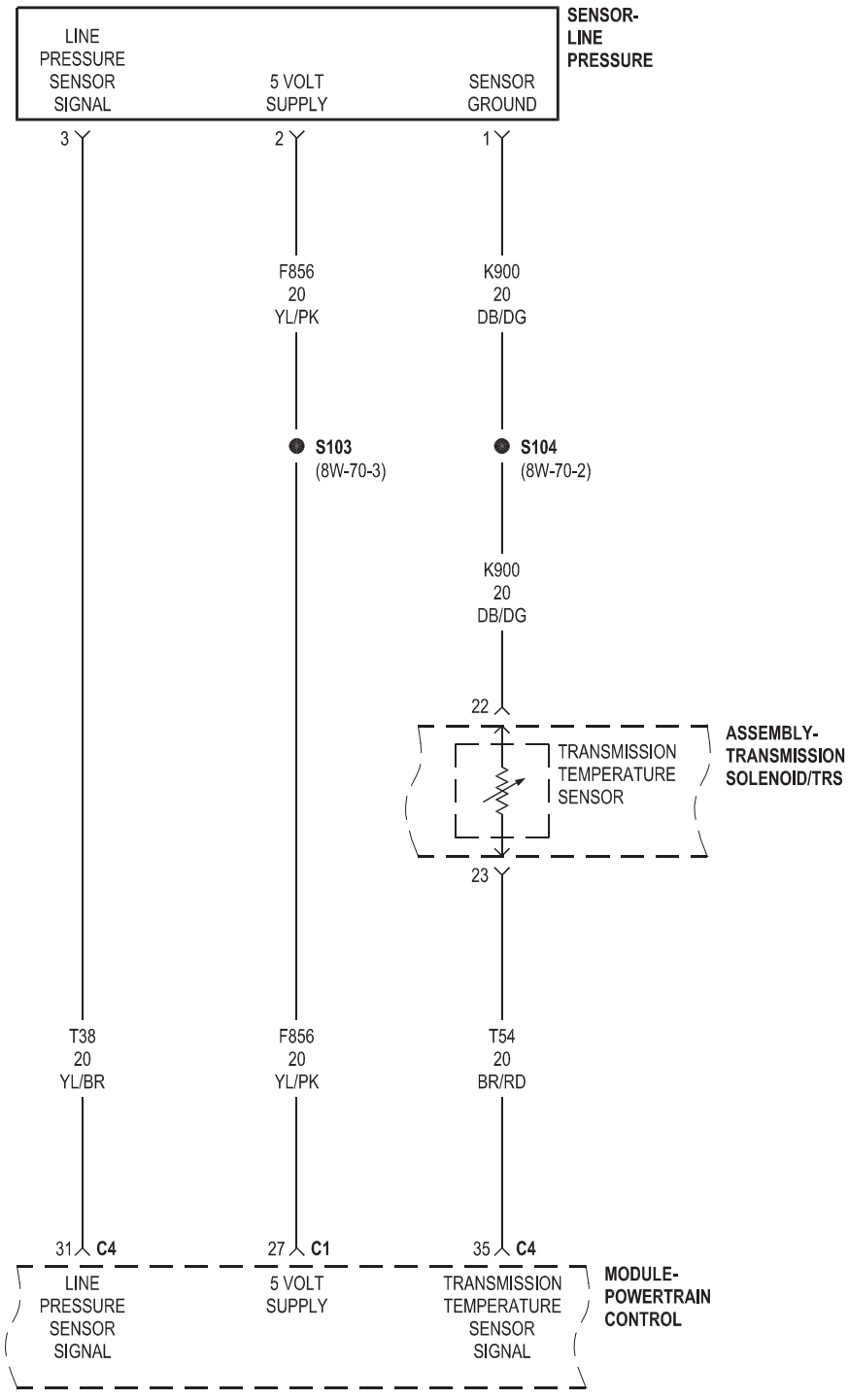
8W-31 TRANSMISSION CONTROL SYSTEM

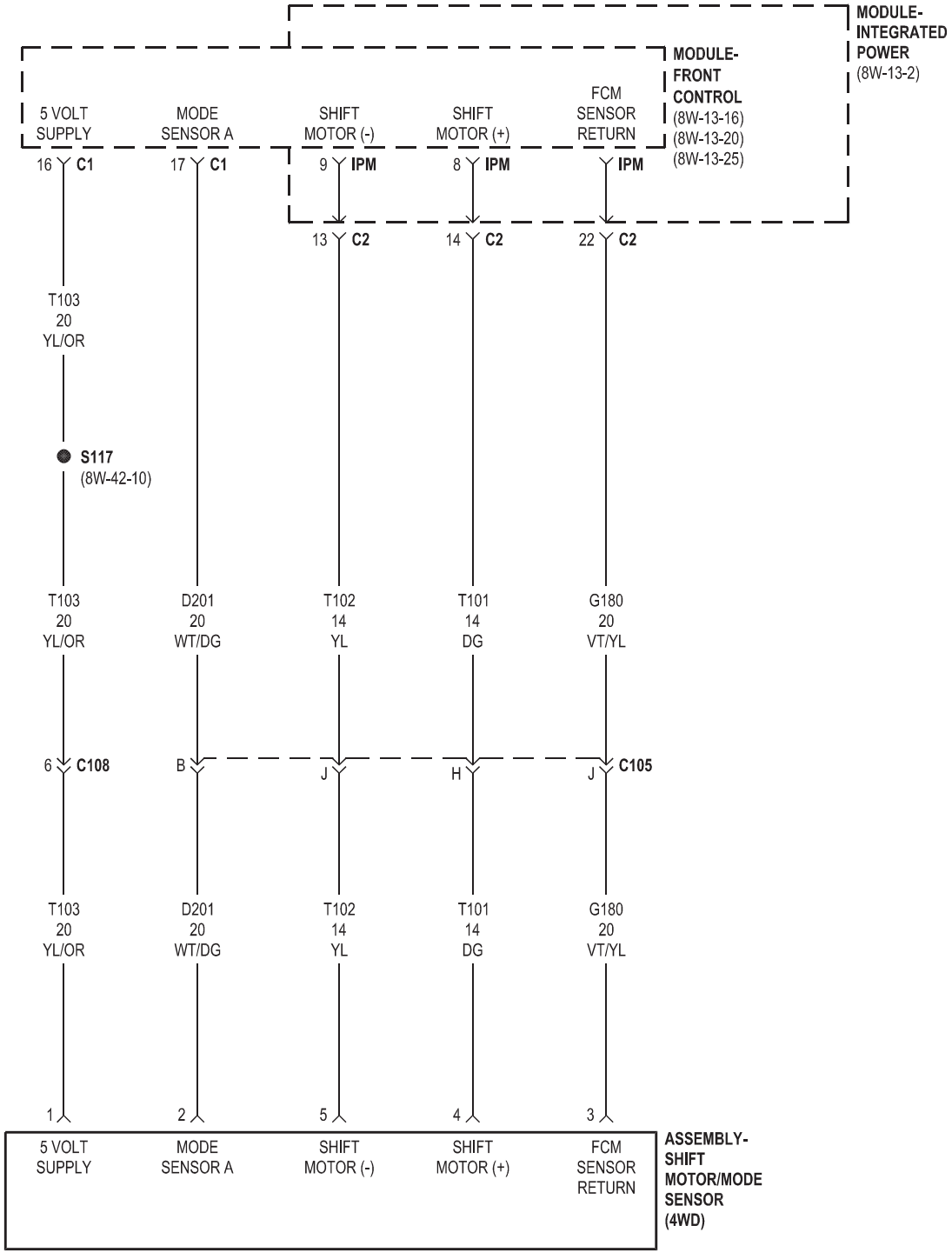
Component	Page
Assembly-Shift Motor/Mode Sensor	8W-31-6
Assembly-Transmission Solenoid/Pressure Switch	8W-31-2, 7
Assembly-Transmission Solenoid/TRS	8W-31-2, 3, 4, 5
Cluster	8W-31-9
Fuse 19	8W-31-2, 9
G100	8W-31-10
G113	8W-31-2
G208	8W-31-9
Junction Block	8W-31-9
Module-Front Control	8W-31-6
Module-Integrated Power	8W-31-6
Module-Powertrain Control	8W-31-2, 3, 4, 5, 7, 8, 9, 10
Power Distribution Center	8W-31-2
Relay-Transmission Control	8W-31-2, 3, 4, 7
Sensor-Input Speed	8W-31-10
Sensor-Line Pressure	8W-31-5
Sensor-Output Speed	8W-31-10
Sensor-Transmission Range	8W-31-8
Solenoid-Brake Transmission Shift Interlock	8W-31-9
Switch-Tow/Haul Overdrive	8W-31-9
Switch-Transfer Case Selector	8W-31-9

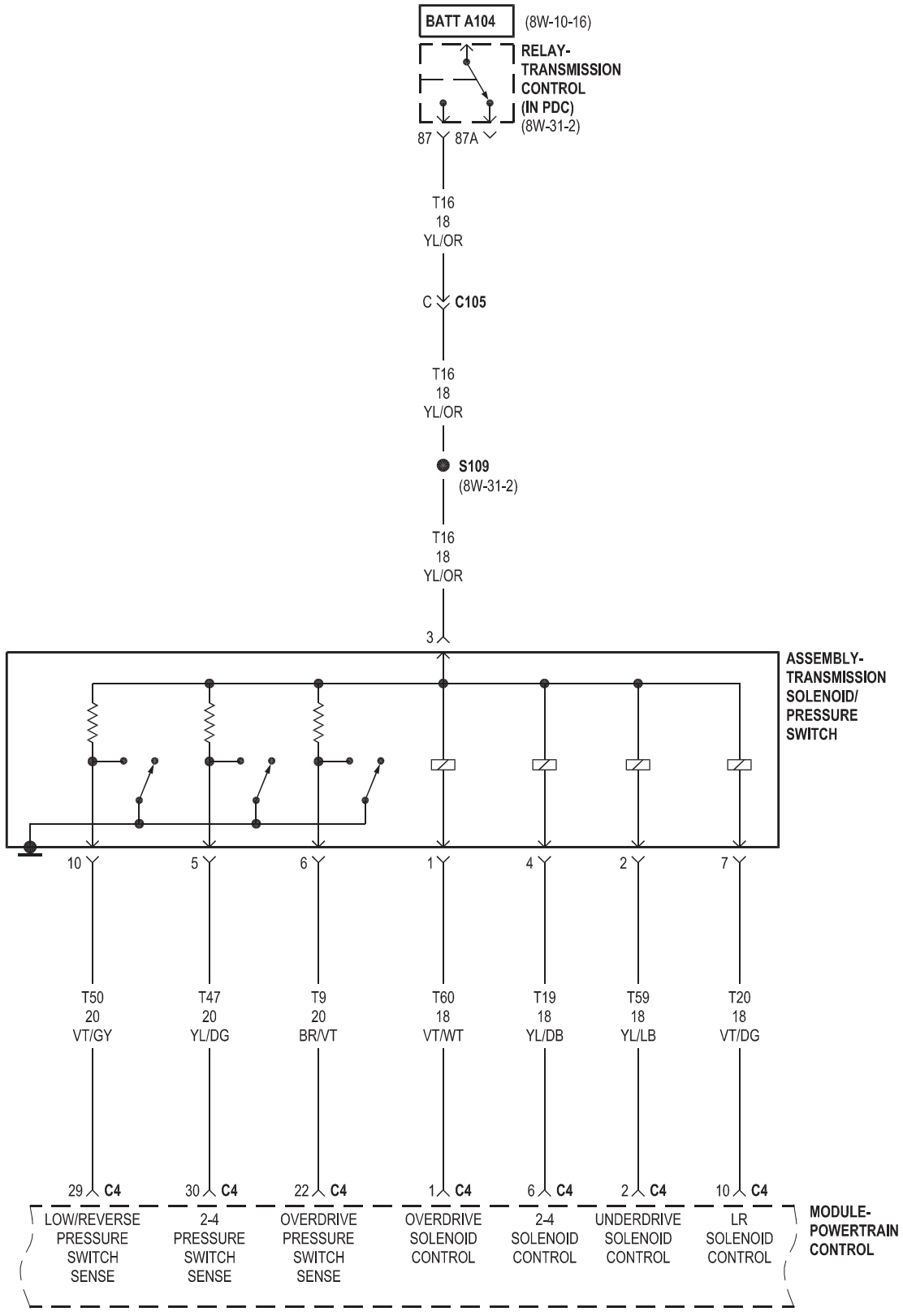

BATT A1
(8W-20-2)
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE 19 20A
23
(8W-10-16)
TRANSMISSION CONTROL RELAY OUTPUT
ASSEMBLY-TRANSMISSION SOLENOID/TRS (4.7L/5.7L)
(8W-31-3)
(8W-31-4)
10
TRANSMISSION CONTROL RELAY OUTPUT
ASSEMBLY-TRANSMISSION SOLENOID/ PRESSURE SWITCH (3.7L)
(8W-31-7)
3
A104 18 YL/RD
30
85
RELAY-TRANSMISSION CONTROL (IN PDC)
87A
87
86
T16 18 YL/OR
T15 20 VT/YL
C
R
C105
T16 18 YL/OR
T16 18 YL/OR
T16 18 YL/OR
S109
T16 18 YL/OR
T16 18 YL/OR
T16 18 YL/OR
T15 20 VT/YL
Z915 20 BK
19 C4
28 C4
38 C4
18 C4
TRANSMISSION CONTROL RELAY OUTPUT
TRANSMISSION CONTROL RELAY OUTPUT
TRANSMISSION CONTROL RELAY OUTPUT
TRANSMISSION CONTROL RELAY CONTROL
MODULE-POWERTRAIN CONTROL
G113
(8W-15-6)

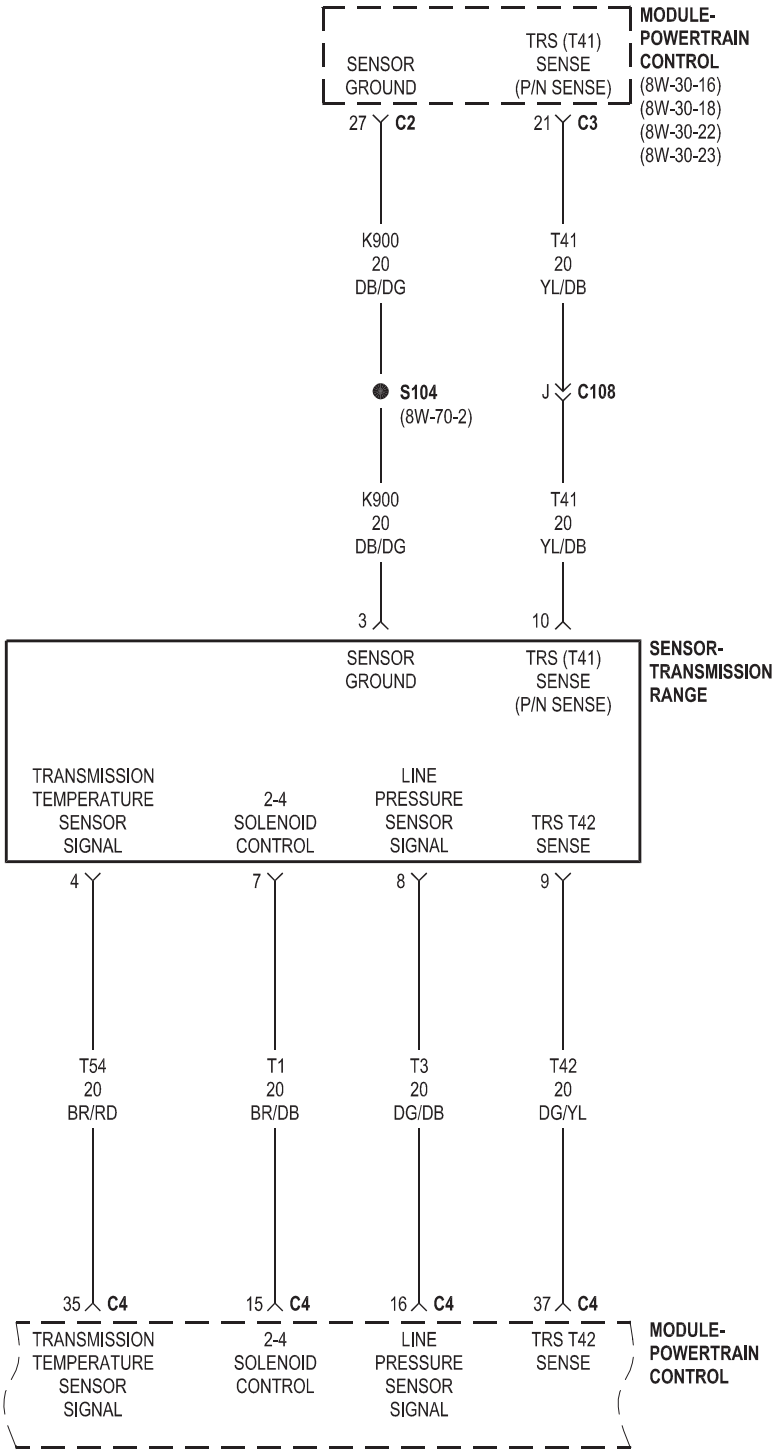

BATT A104
(8W-10-16)
RELAY-TRANSMISSION CONTROL (IN PDC)
(8W-31-2)
87
87A
T16
18
YL/OR
C
C105
T16
18
YL/OR
S109
(8W-31-2)
T16
18
YL/OR
10
ASSEMBLY-TRANSMISSION SOLENOID/TRS
9
13
8
7
12
20
2
19
21
17
T1
20
BR/DB
T4
20
BR/PK
T3
20
DG/DB
T60
18
VT/WT
T140
20
DG
T219
18
VT/DB
T20
18
VT/DG
T259
18
VT/RD
T118
20
VT/BR
T59
18
YL/LB
15 C4
TRS T1 SENSE
26 C4
2-4 PRESSURE SWITCH SENSE
16 C4
TRS T3 SENSE
1 C4
OD SOLENOID CONTROL
11 C4
PRESSURE CONTROL SOLENOID CONTROL
6 C4
2C SOLENOID CONTROL
10 C4
L/R SOLENOID CONTROL
2 C4
4C SOLENOID CONTROL
4 C4
MS SOLENOID CONTROL
8 C4
UD SOLENOID CONTROL
MODULE-POWERTRAIN CONTROL

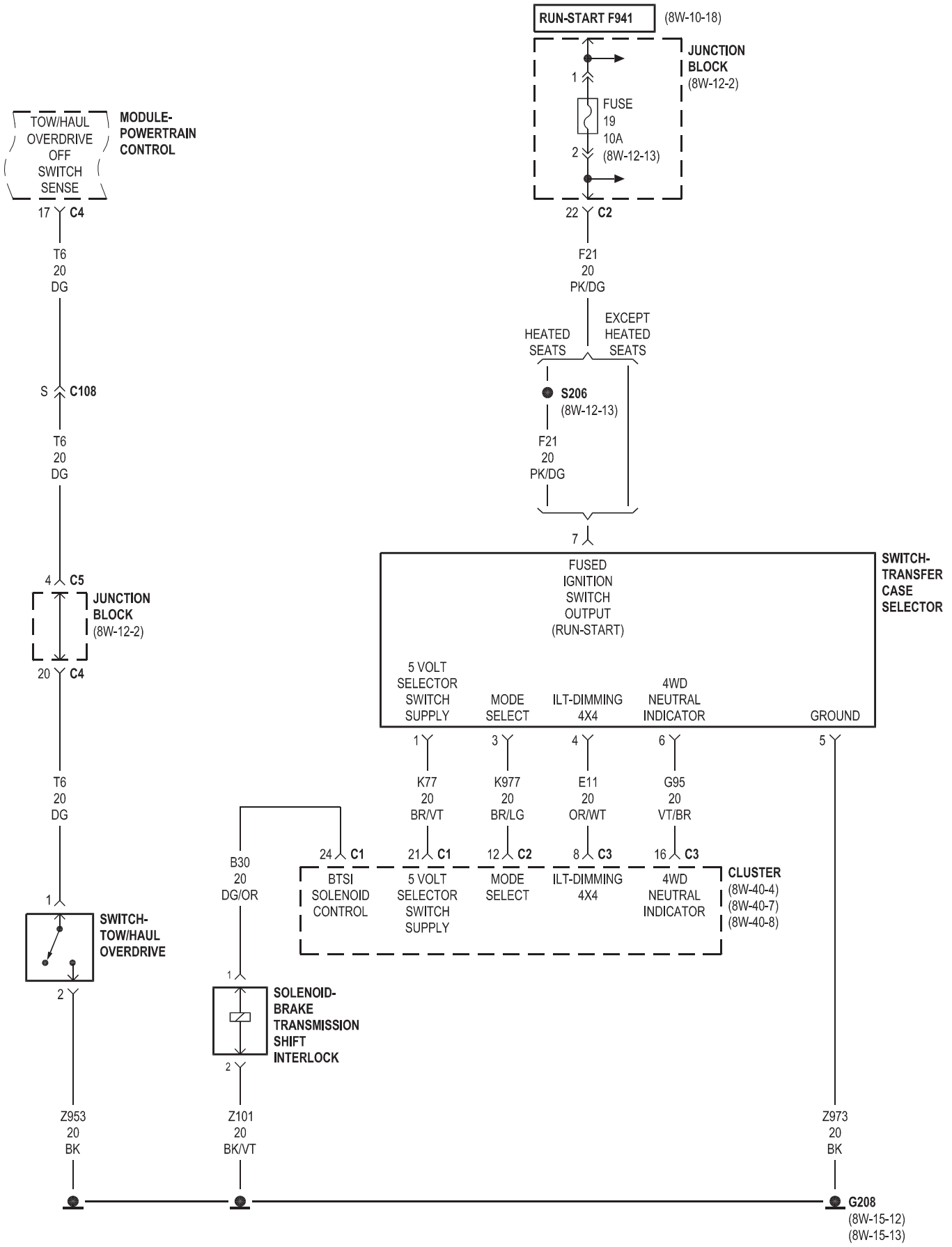

BATT A104
(8W-10-16)
RELAY-
TRANSMISSION
CONTROL
(IN PDC)
(8W-31-2)
87
87A
MODULE-
POWERTRAIN
CONTROL
(8W-30-23)
TRS
(T41)
SENSE
(P/N SENSE)
21
C3
T16
18
YL/OR
T41
20
YL/DB
C
C105
J
C108
T16
18
YL/OR
S109
(8W-31-2)
T16
18
YL/OR
T41
20
YL/DB
10
4
ASSEMBLY-
TRANSMISSION
SOLENOID/TRS
14
15
16
11
18
5
T50
20
VT/GY
T147
20
DG/YL
T9
20
BR/VT
T48
20
BR/YL
T29
20
YL/WT
T42
20
DG/YL
29
C4
30
C4
22
C4
20
C4
21
C4
37
C4
L/R
PRESSURE
SWITCH
SENSE
2C
PRESSURE
SWITCH
SENSE
OD
PRESSURE
SWITCH
SENSE
4C
PRESSURE
SWITCH
SENSE
UD
PRESSURE
SWITCH
SENSE
TRS T42
SENSE
MODULE-
POWERTRAIN
CONTROL

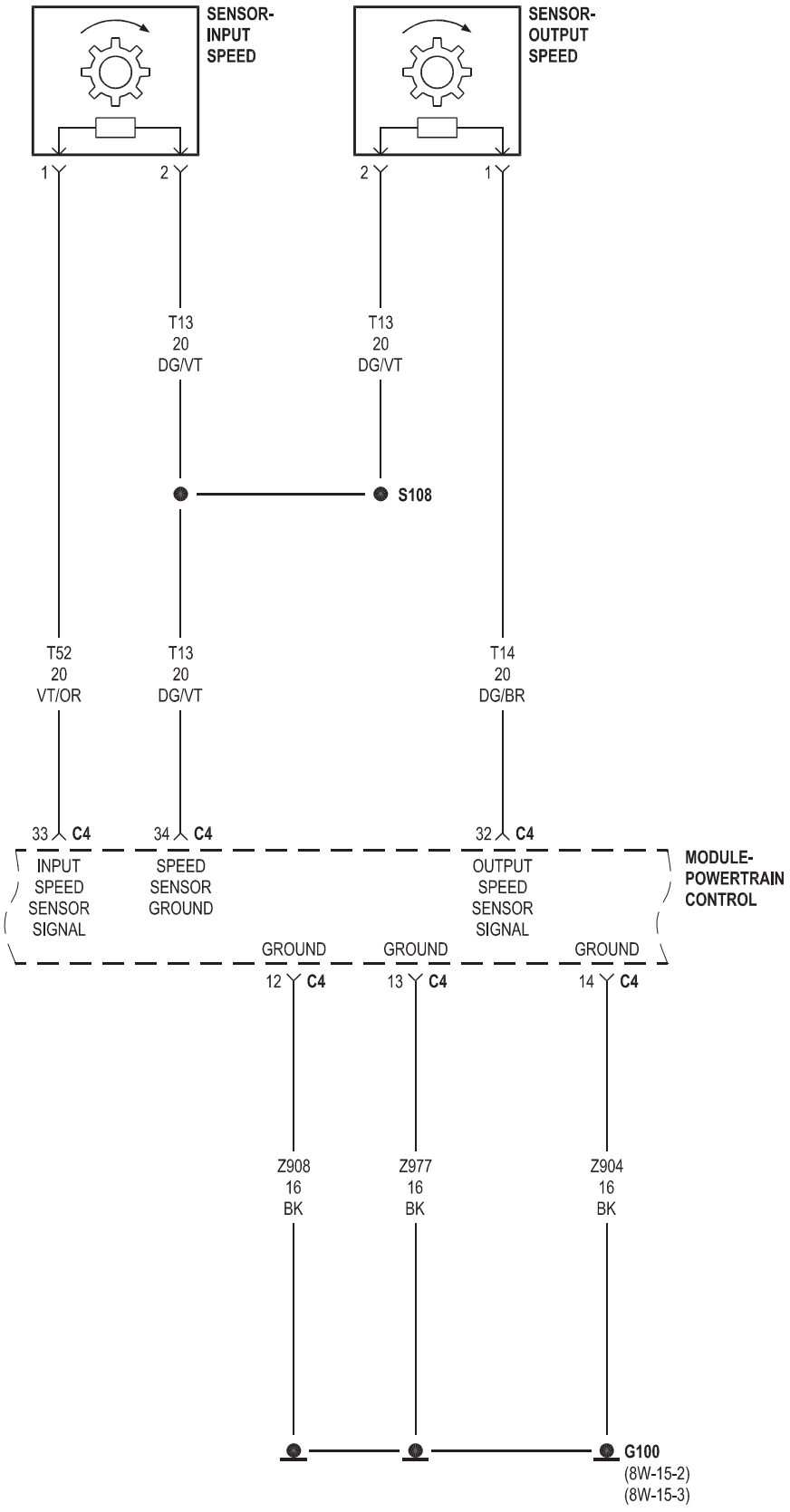

SENSOR-
LINE
PRESSURE
LINE
PRESSURE
SENSOR
SIGNAL
5 VOLT
SUPPLY
SENSOR
GROUND
3
2
1
F856
20
YL/PK
K900
20
DB/DG
S103
(8W-70-3)
S104
(8W-70-2)
K900
20
DB/DG
22
TRANSMISSION
TEMPERATURE
SENSOR
ASSEMBLY-
TRANSMISSION
SOLENOID/TRS
23
T38
20
YL/BR
F856
20
YL/PK
T54
20
BR/RD
31 C4
27 C1
35 C4
LINE
PRESSURE
SENSOR
SIGNAL
5 VOLT
SUPPLY
TRANSMISSION
TEMPERATURE
SENSOR
SIGNAL
MODULE-
POWERTRAIN
CONTROL


MODULE-
INTEGRATED
POWER
(8W-13-2)
MODULE-
FRONT
CONTROL
(8W-13-16)
(8W-13-20)
(8W-13-25)
5 VOLT
SUPPLY
MODE
SENSOR A
SHIFT
MOTOR (-)
SHIFT
MOTOR (+)
FCM
SENSOR
RETURN
16 C1
17 C1
9 IPM
8 IPM
IPM
13 C2
14 C2
22 C2
T103
20
YL/OR
S117
(8W-42-10)
T103
20
YL/OR
D201
20
WT/DG
T102
14
YL
T101
14
DG
G180
20
VT/YL
6 C108
B
J
H
J C105
T103
20
YL/OR
D201
20
WT/DG
T102
14
YL
T101
14
DG
G180
20
VT/YL
1
2
5
4
3
5 VOLT
SUPPLY
MODE
SENSOR A
SHIFT
MOTOR (-)
SHIFT
MOTOR (+)
FCM
SENSOR
RETURN
ASSEMBLY-
SHIFT
MOTOR/MODE
SENSOR
(4WD)


BATT A104
(8W-10-16)
RELAY-
TRANSMISSION
CONTROL
(IN PDC)
(8W-31-2)
87
87A
T16
18
YL/OR
C
C105
T16
18
YL/OR
S109
(8W-31-2)
T16
18
YL/OR
3
ASSEMBLY-
TRANSMISSION
SOLENOID/
PRESSURE
SWITCH
10
5
6
1
4
2
7
T50
20
VT/GY
T47
20
YL/DG
T9
20
BR/VT
T60
18
VT/WT
T19
18
YL/DB
T59
18
YL/LB
T20
18
VT/DG
29
C4
30
C4
22
C4
1
C4
6
C4
2
C4
10
C4
LOW/REVERSE
PRESSURE
SWITCH
SENSE
2-4
PRESSURE
SWITCH
SENSE
OVERDRIVE
PRESSURE
SWITCH
SENSE
OVERDRIVE
SOLENOID
CONTROL
2-4
SOLENOID
CONTROL
UNDERDRIVE
SOLENOID
CONTROL
LR
SOLENOID
CONTROL
MODULE-
POWERTRAIN
CONTROL

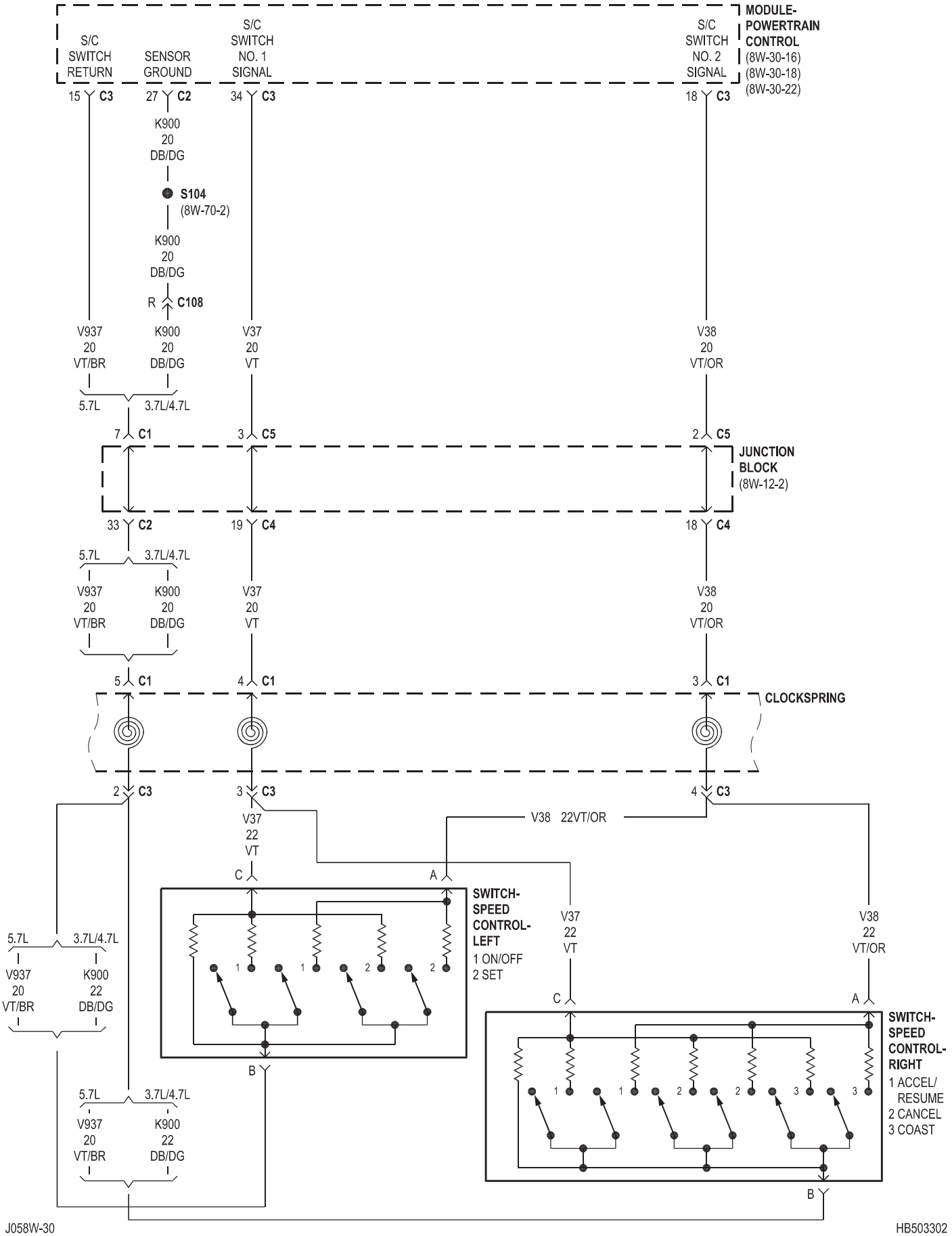

MODULE-
POWERTRAIN
CONTROL
(8W-30-16)
(8W-30-18)
(8W-30-22)
(8W-30-23)
SENSOR
GROUND
TRS (T41)
SENSE
(P/N SENSE)
27 C2
21 C3
K900
20
DB/DG
T41
20
YL/DB
S104
(8W-70-2)
J C108
K900
20
DB/DG
T41
20
YL/DB
3
10
SENSOR
GROUND
TRS (T41)
SENSE
(P/N SENSE)
SENSOR-
TRANSMISSION
RANGE
TRANSMISSION
TEMPERATURE
SENSOR
SIGNAL
2-4
SOLENOID
CONTROL
LINE
PRESSURE
SENSOR
SIGNAL
TRS T42
SENSE
4
7
8
9
T54
20
BR/RD
T1
20
BR/DB
T3
20
DG/DB
T42
20
DG/YL
35 C4
15 C4
16 C4
37 C4
TRANSMISSION
TEMPERATURE
SENSOR
SIGNAL
2-4
SOLENOID
CONTROL
LINE
PRESSURE
SENSOR
SIGNAL
TRS T42
SENSE
MODULE-
POWERTRAIN
CONTROL


RUN-START F941
(8W-10-18)
JUNCTION BLOCK
(8W-12-2)
1
FUSE
19
10A
2
(8W-12-13)
22 C2
F21
20
PK/DG
HEATED SEATS
EXCEPT HEATED SEATS
S206
(8W-12-13)
F21
20
PK/DG
7
TOW/HAUL OVERDRIVE OFF SWITCH SENSE
MODULE-POWERTRAIN CONTROL
17 C4
T6
20
DG
S C108
T6
20
DG
4 C5
JUNCTION BLOCK
(8W-12-2)
20 C4
T6
20
DG
1
SWITCH-TOW/HAUL OVERDRIVE
2
Z953
20
BK
FUSED IGNITION SWITCH OUTPUT (RUN-START)
SWITCH-TRANSFER CASE SELECTOR
5 VOLT SELECTOR SWITCH SUPPLY
MODE SELECT
ILT-DIMMING 4X4
4WD NEUTRAL INDICATOR
GROUND
1
3
4
6
5
K77
20
BR/VT
K977
20
BR/LG
E11
20
OR/WT
G95
20
VT/BR
B30
20
DG/OR
24 C1
21 C1
12 C2
8 C3
16 C3
BTSI SOLENOID CONTROL
5 VOLT SELECTOR SWITCH SUPPLY
MODE SELECT
ILT-DIMMING 4X4
4WD NEUTRAL INDICATOR
CLUSTER
(8W-40-4)
(8W-40-7)
(8W-40-8)
1
SOLENOID-BRAKE TRANSMISSION SHIFT INTERLOCK
2
Z101
20
BK/VT
Z973
20
BK
G208
(8W-15-12)
(8W-15-13)


SENSOR-
INPUT
SPEED
SENSOR-
OUTPUT
SPEED
1
2
2
1
T13
20
DG/VT
T13
20
DG/VT
S108
T52
20
VT/OR
T13
20
DG/VT
T14
20
DG/BR
33 C4
34 C4
32 C4
MODULE-
POWERTRAIN
CONTROL
INPUT
SPEED
SENSOR
SIGNAL
SPEED
SENSOR
GROUND
OUTPUT
SPEED
SENSOR
SIGNAL
GROUND
GROUND
GROUND
12 C4
13 C4
14 C4
Z908
16
BK
Z977
16
BK
Z904
16
BK
G100
(8W-15-2)
(8W-15-3)

8W-33 VEHICLE SPEED CONTROL

Component	Page
Clockspring	8W-33-2
G112	8W-33-3
Junction Block	8W-33-2, 3
Module-Powertrain Control	8W-33-2, 3, 4
Servo-Speed Control	8W-33-3
Switch-Speed Control-Left	8W-33-2
Switch-Speed Control-Right	8W-33-2
Switch-Stop Lamp	8W-33-3
Throttle Body	8W-33-4



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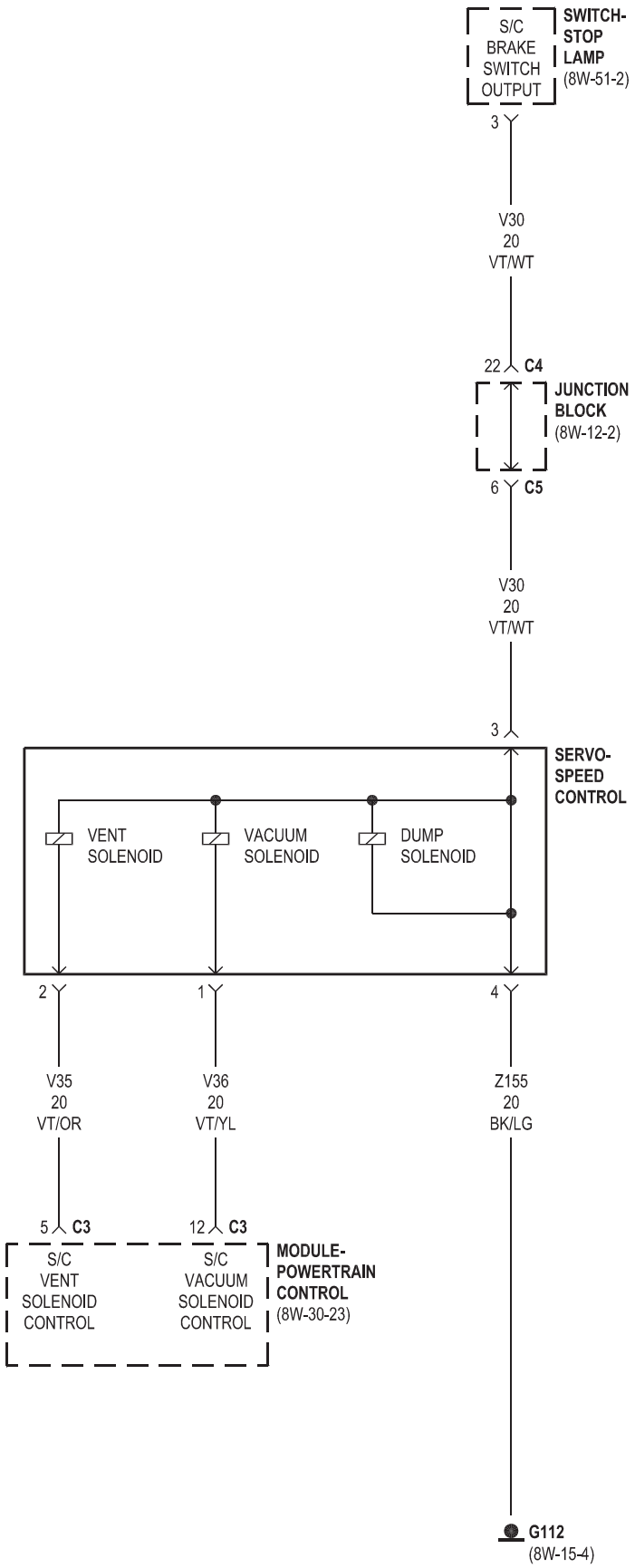
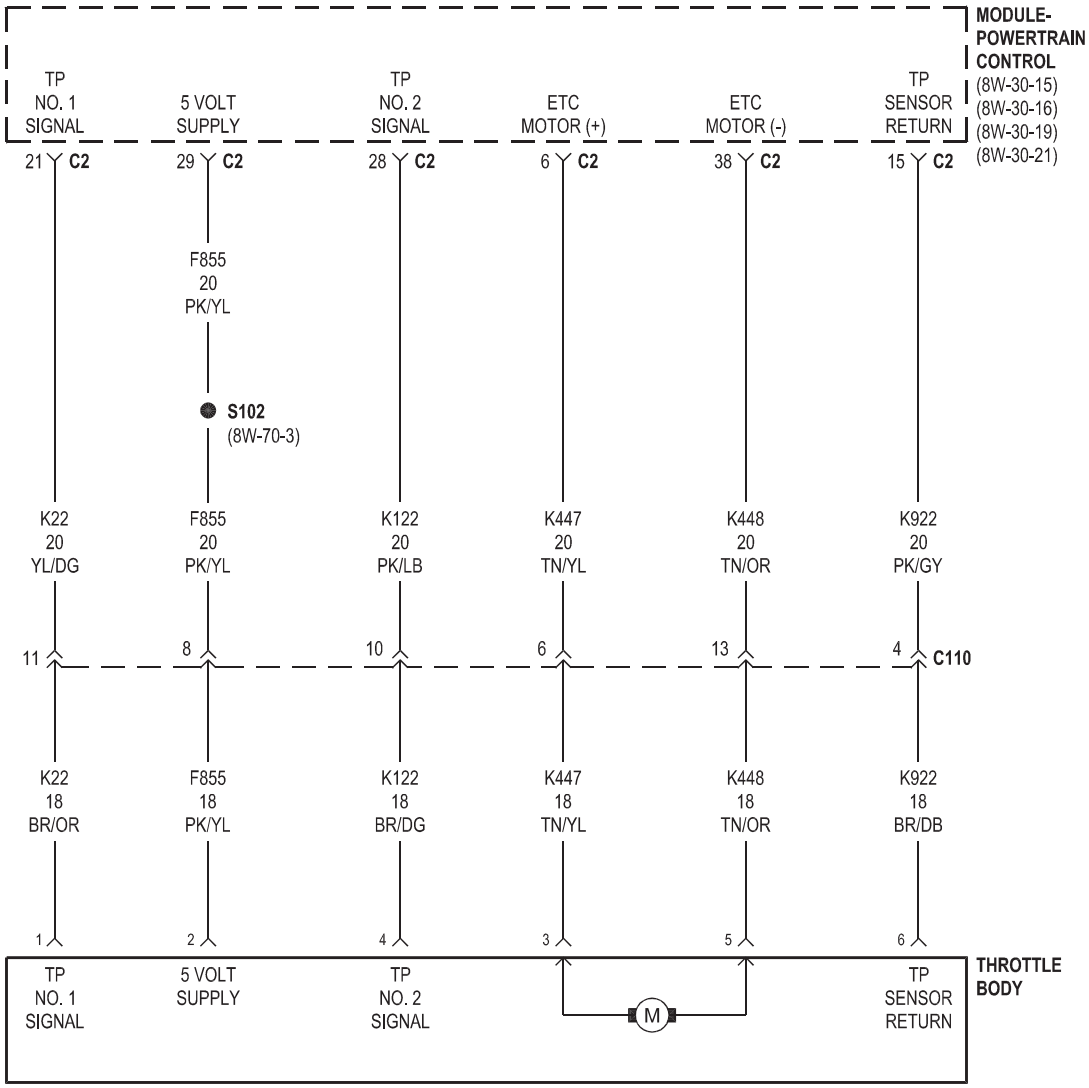
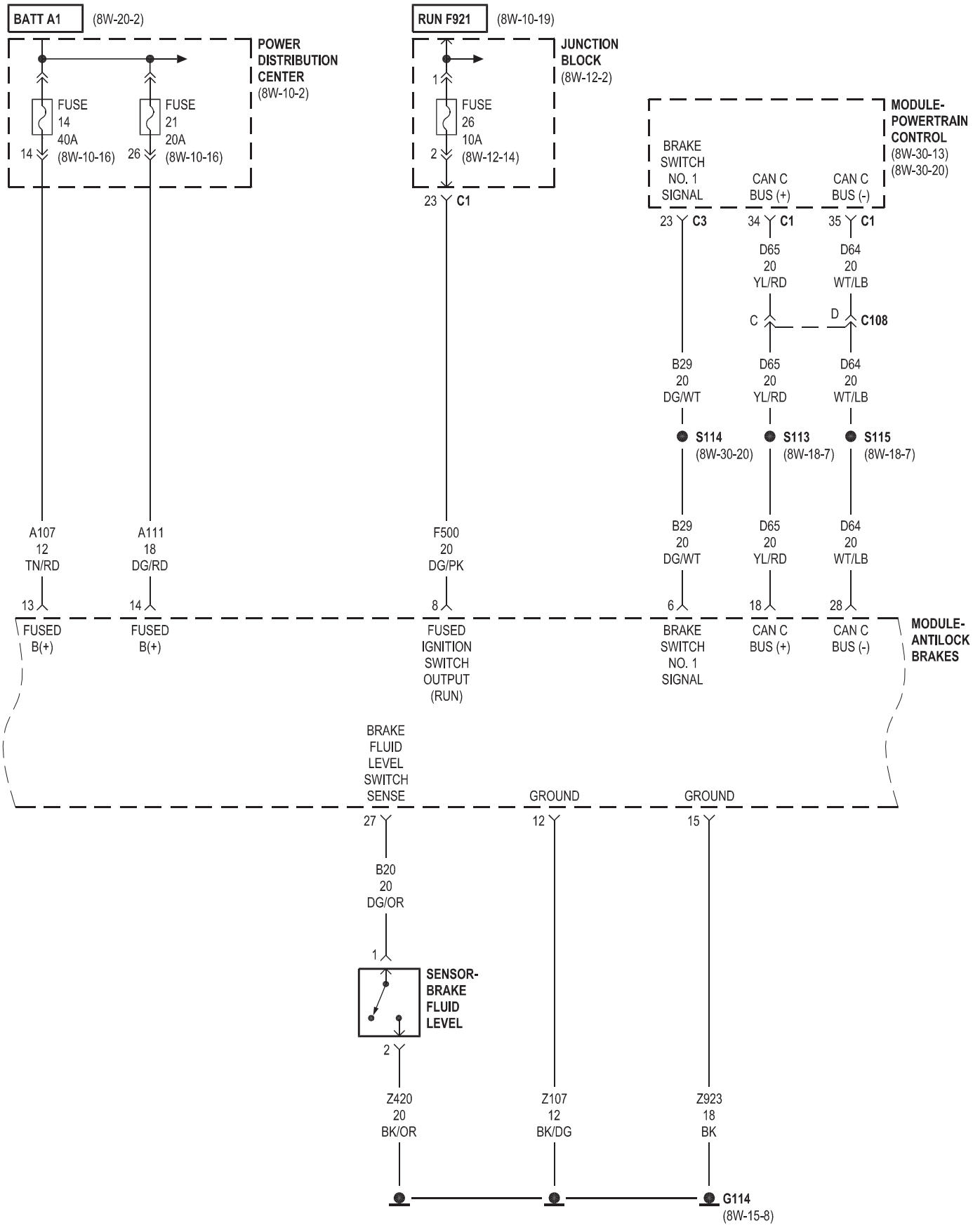
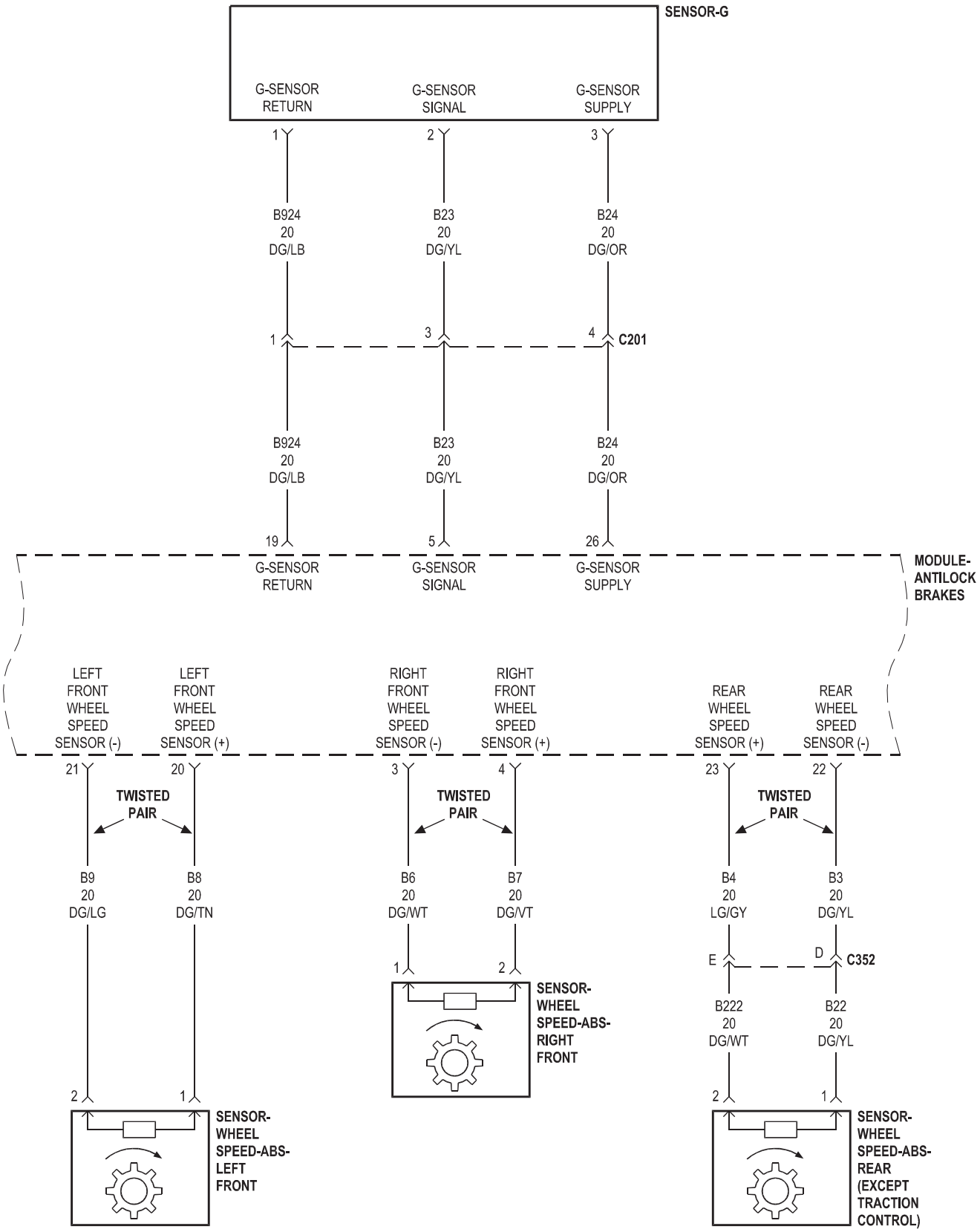

S/C BRAKE SWITCH OUTPUT
SWITCH-STOP LAMP (8W-51-2)
3
V30 20 VT/WT
22 C4
JUNCTION BLOCK (8W-12-2)
6 C5
V30 20 VT/WT
3
SERVO-SPEED CONTROL
VENT SOLENOID
VACUUM SOLENOID
DUMP SOLENOID
2
1
4
V35 20 VT/OR
V36 20 VT/YL
Z155 20 BK/LG
5 C3
12 C3
S/C VENT SOLENOID CONTROL
S/C VACUUM SOLENOID CONTROL
MODULE-POWERTRAIN CONTROL (8W-30-23)
G112 (8W-15-4)

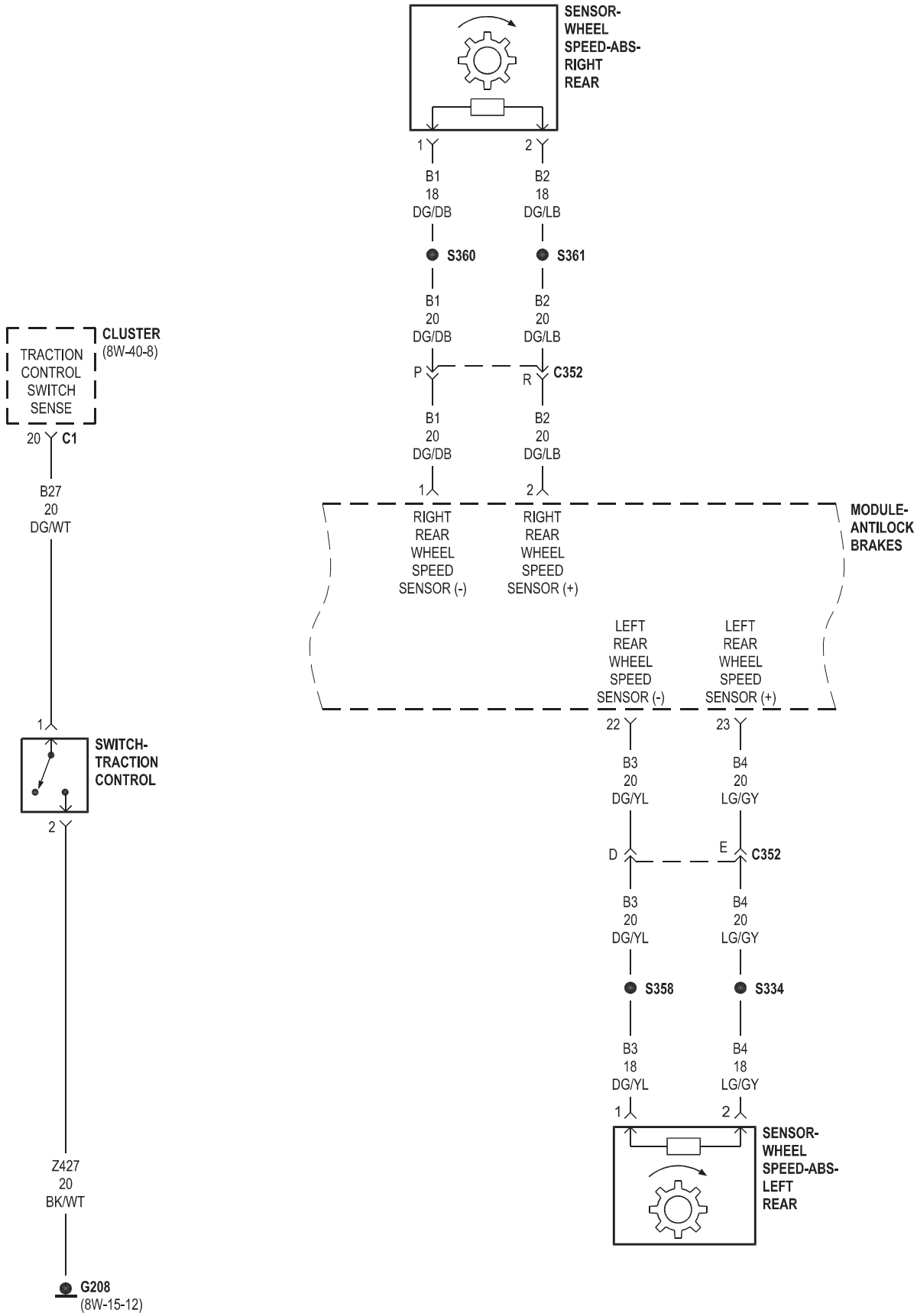

MODULE-
POWERTRAIN
CONTROL
(8W-30-15)
(8W-30-16)
(8W-30-19)
(8W-30-21)
TP
NO. 1
SIGNAL
5 VOLT
SUPPLY
TP
NO. 2
SIGNAL
ETC
MOTOR (+)
ETC
MOTOR (-)
TP
SENSOR
RETURN
21 C2
29 C2
28 C2
6 C2
38 C2
15 C2
F855
20
PK/YL
S102
(8W-70-3)
K22
20
YL/DG
F855
20
PK/YL
K122
20
PK/LB
K447
20
TN/YL
K448
20
TN/OR
K922
20
PK/GY
11
8
10
6
13
4
C110
K22
18
BR/OR
F855
18
PK/YL
K122
18
BR/DG
K447
18
TN/YL
K448
18
TN/OR
K922
18
BR/DB
1
2
4
3
5
6
TP
NO. 1
SIGNAL
5 VOLT
SUPPLY
TP
NO. 2
SIGNAL
M
TP
SENSOR
RETURN
THROTTLE
BODY

8W-35 ALL WHEEL ANTILOCK BRAKES

Component	Page
Cluster	8W-35-4
Fuse 14	8W-35-2
Fuse 21	8W-35-2
Fuse 26	8W-35-2
G114	8W-35-2
G208	8W-35-4
Junction Block	8W-35-2
Module-Antilock Brakes	8W-35-2, 3, 4
Module-Powertrain Control	8W-35-2
Power Distribution Center	8W-35-2
Sensor-Brake Fluid Level	8W-35-2
Sensor-G	8W-35-3
Sensor-Wheel Speed-Abs-Left Front	8W-35-3
Sensor-Wheel Speed-Abs-Left Rear	8W-35-4
Sensor-Wheel Speed-Abs-Rear	8W-35-3
Sensor-Wheel Speed-Abs-Right Front	8W-35-3
Sensor-Wheel Speed-Abs-Right Rear	8W-35-4
Switch-Traction Control	8W-35-4

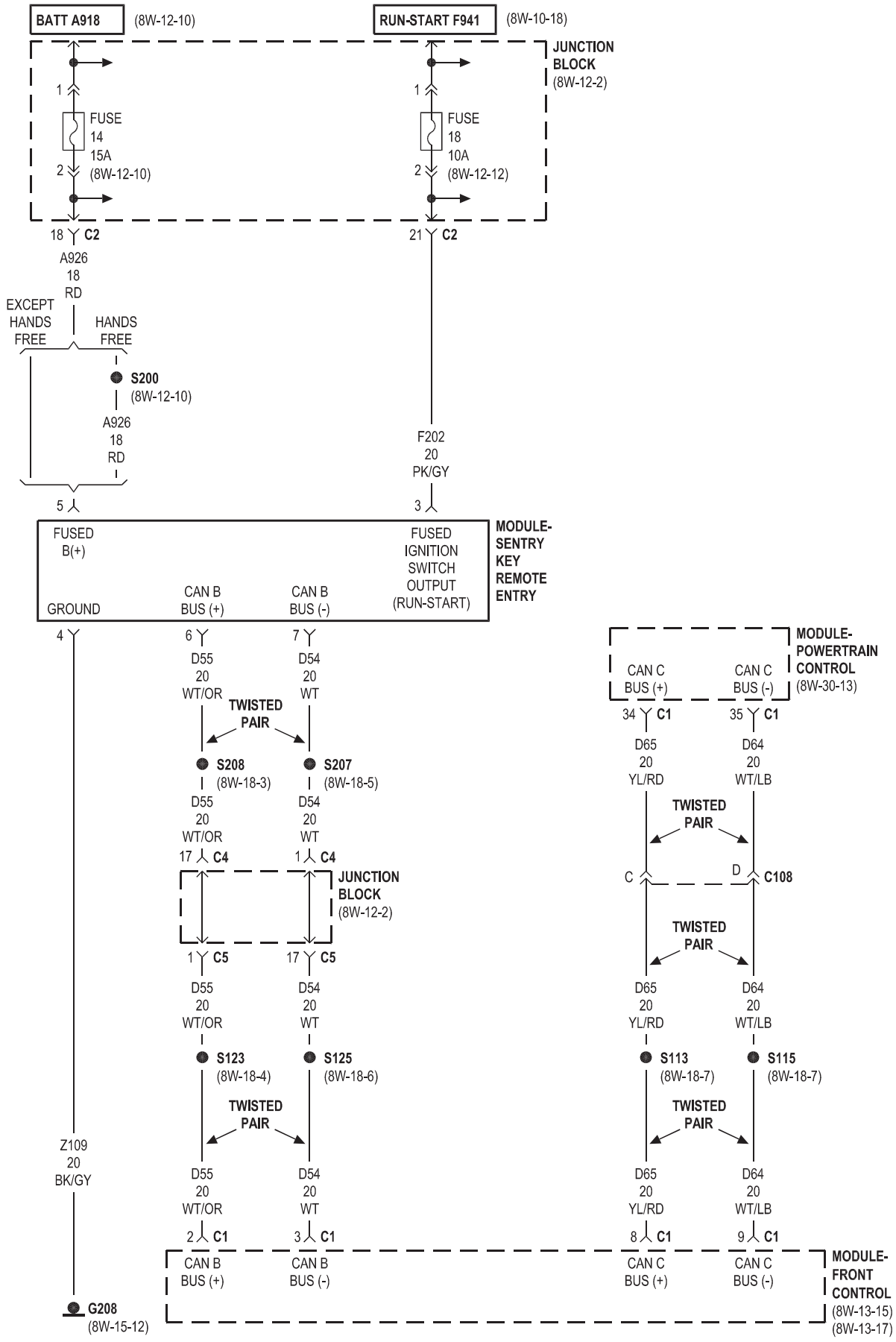

BATT A1
(8W-20-2)
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE 14 40A (8W-10-16)
FUSE 21 20A (8W-10-16)
14
26
RUN F921
(8W-10-19)
JUNCTION BLOCK
(8W-12-2)
1
FUSE 26 10A
2
(8W-12-14)
23 C1
MODULE-POWERTRAIN CONTROL
(8W-30-13)
(8W-30-20)
BRAKE SWITCH NO. 1 SIGNAL
CAN C BUS (+)
CAN C BUS (-)
23 C3
34 C1
35 C1
D65 20 YL/RD
D64 20 WT/LB
C
D
C108
B29 20 DG/WT
D65 20 YL/RD
D64 20 WT/LB
S114 (8W-30-20)
S113 (8W-18-7)
S115 (8W-18-7)
A107 12 TN/RD
A111 18 DG/RD
F500 20 DG/PK
B29 20 DG/WT
D65 20 YL/RD
D64 20 WT/LB
13
14
8
6
18
28
FUSED B(+)
FUSED B(+)
FUSED IGNITION SWITCH OUTPUT (RUN)
BRAKE SWITCH NO. 1 SIGNAL
CAN C BUS (+)
CAN C BUS (-)
MODULE-ANTILOCK BRAKES
BRAKE FLUID LEVEL SWITCH SENSE
GROUND
GROUND
27
12
15
B20 20 DG/OR
1
SENSOR-BRAKE FLUID LEVEL
2
Z420 20 BK/OR
Z107 12 BK/DG
Z923 18 BK
G114
(8W-15-8)

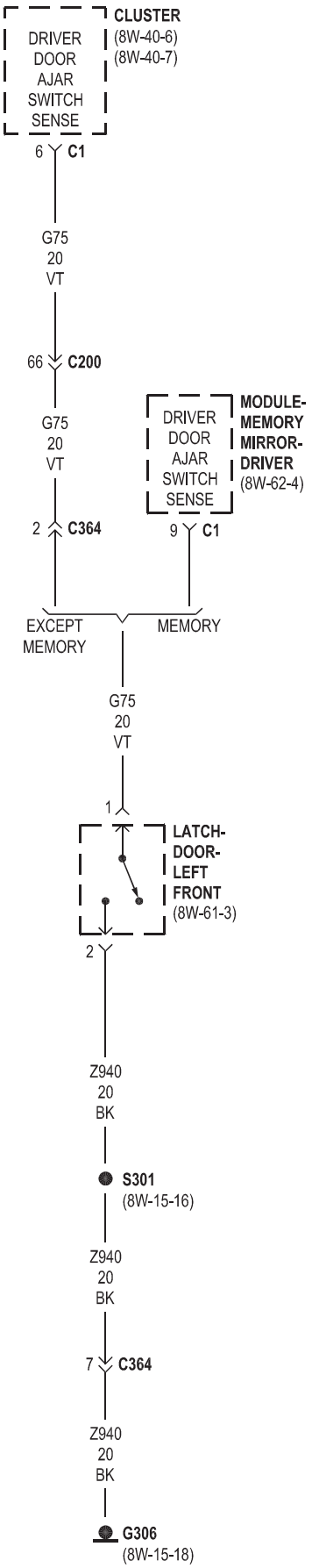

SENSOR-G
G-SENSOR RETURN
G-SENSOR SIGNAL
G-SENSOR SUPPLY
1
2
3
B924 20 DG/LB
B23 20 DG/YL
B24 20 DG/OR
1
3
4
C201
B924 20 DG/LB
B23 20 DG/YL
B24 20 DG/OR
19
5
26
G-SENSOR RETURN
G-SENSOR SIGNAL
G-SENSOR SUPPLY
MODULE-ANTILOCK BRAKES
LEFT FRONT WHEEL SPEED SENSOR (-)
LEFT FRONT WHEEL SPEED SENSOR (+)
RIGHT FRONT WHEEL SPEED SENSOR (-)
RIGHT FRONT WHEEL SPEED SENSOR (+)
REAR WHEEL SPEED SENSOR (+)
REAR WHEEL SPEED SENSOR (-)
21
20
3
4
23
22
TWISTED PAIR
TWISTED PAIR
TWISTED PAIR
B9 20 DG/LG
B8 20 DG/TN
B6 20 DG/WT
B7 20 DG/VT
B4 20 LG/GY
B3 20 DG/YL
E
D
C352
1
2
B222 20 DG/WT
B22 20 DG/YL
2
1
2
1
SENSOR-WHEEL SPEED-ABS-LEFT FRONT
SENSOR-WHEEL SPEED-ABS-RIGHT FRONT
SENSOR-WHEEL SPEED-ABS-REAR (EXCEPT TRACTION CONTROL)

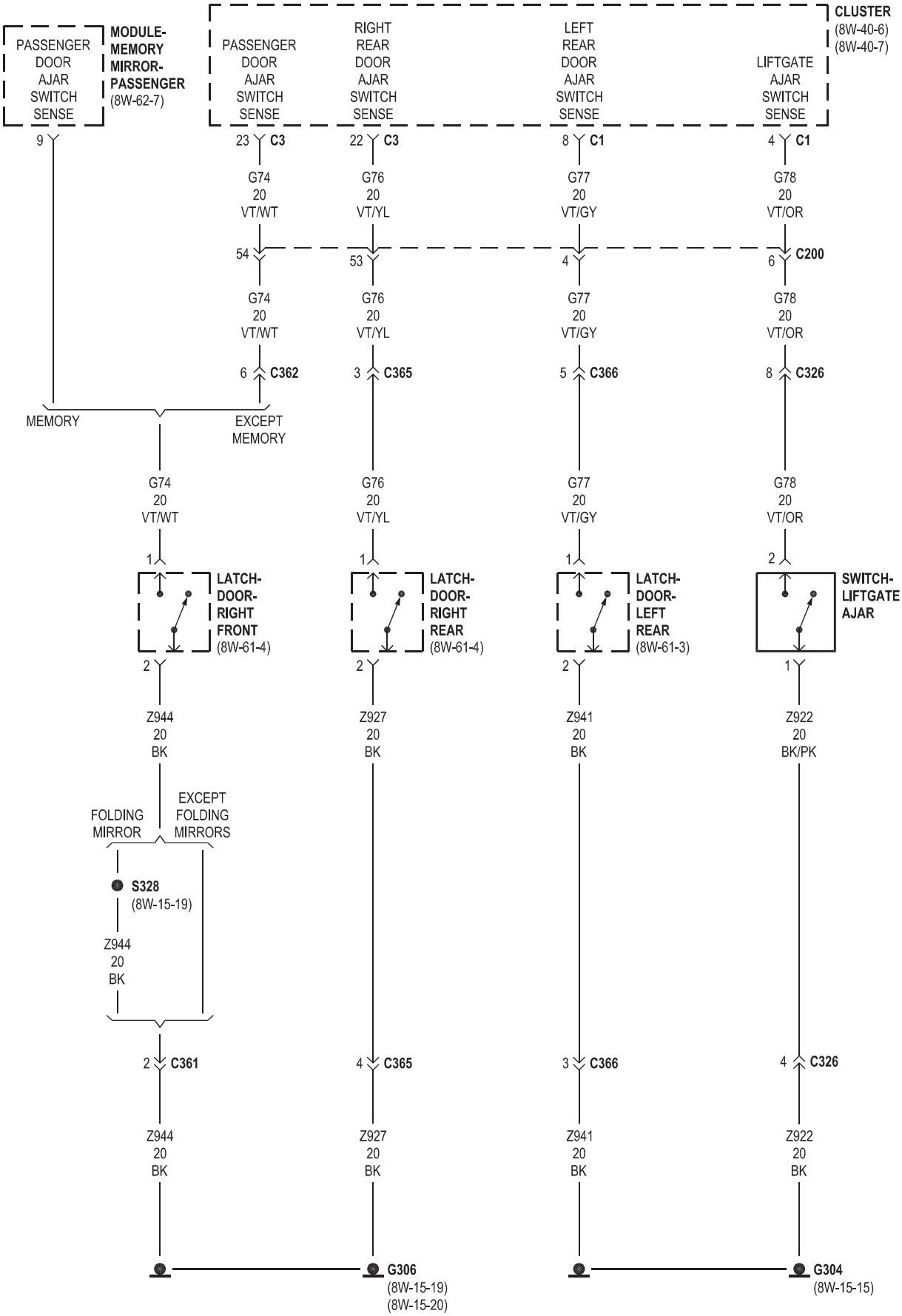

SENSOR-WHEEL SPEED-ABS-RIGHT REAR
1
2
B1 18 DG/DB
B2 18 DG/LB
S360
S361
B1 20 DG/DB
B2 20 DG/LB
P
R
C352
B1 20 DG/DB
B2 20 DG/LB
1
2
RIGHT REAR WHEEL SPEED SENSOR (-)
RIGHT REAR WHEEL SPEED SENSOR (+)
MODULE-ANTILOCK BRAKES
LEFT REAR WHEEL SPEED SENSOR (-)
LEFT REAR WHEEL SPEED SENSOR (+)
22
23
B3 20 DG/YL
B4 20 LG/GY
D
E
C352
B3 20 DG/YL
B4 20 LG/GY
S358
S334
B3 18 DG/YL
B4 18 LG/GY
1
2
SENSOR-WHEEL SPEED-ABS-LEFT REAR
CLUSTER (8W-40-8)
TRACTION CONTROL SWITCH SENSE
20
C1
B27 20 DG/WT
1
SWITCH-TRACTION CONTROL
2
Z427 20 BK/WT
G208 (8W-15-12)

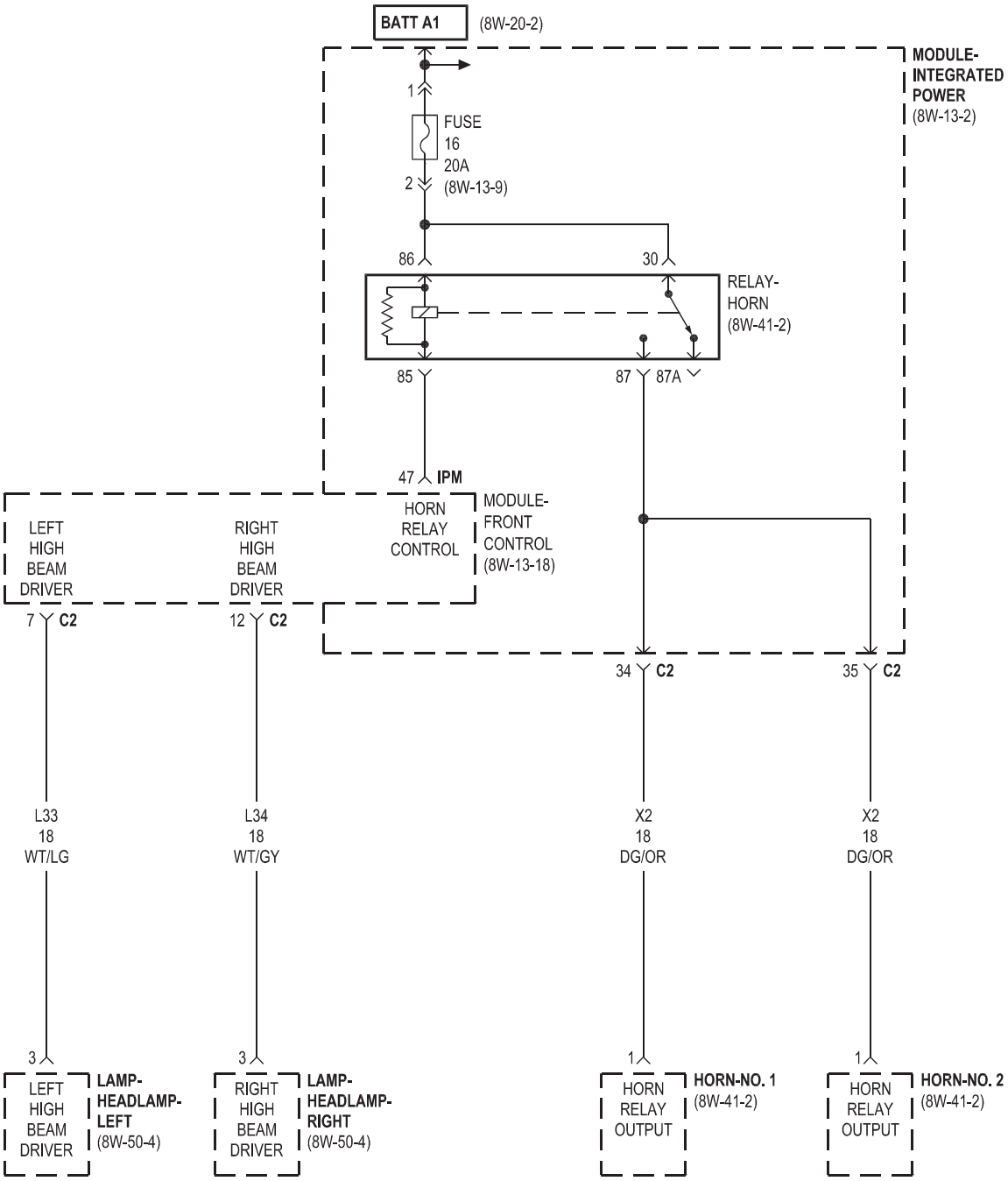
8W-39 VEHICLE THEFT SECURITY SYSTEM

Component	Page
Cluster	8W-39-3, 4
Fuse 14	8W-39-2
Fuse 16	8W-39-5
Fuse 18	8W-39-2
G208	8W-39-2
G304	8W-39-4
G306	8W-39-3, 4
Horn-No. 1	8W-39-5
Horn-No. 2	8W-39-5
Junction Block	8W-39-2
Lamp-Headlamp-Left	8W-39-5
Lamp-Headlamp-Right	8W-39-5
Latch-Door-Left Front	8W-39-3
Latch-Door-Left Rear	8W-39-4
Latch-Door-Right Front	8W-39-4
Latch-Door-Right Rear	8W-39-4
Module-Front Control	8W-39-2, 5
Module-Integrated Power	8W-39-5
Module-Memory Mirror-Driver	8W-39-3
Module-Memory Mirror-Passenger	8W-39-4
Module-Powertrain Control	8W-39-2
Module-Sentry Key Remote Entry	8W-39-2
Relay-Horn	8W-39-5
Switch-Liftgate Ajar	8W-39-4


BATT A918
(8W-12-10)
RUN-START F941
(8W-10-18)
JUNCTION BLOCK
(8W-12-2)
FUSE 14 15A
(8W-12-10)
FUSE 18 10A
(8W-12-12)
18 C2
21 C2
A926 18 RD
EXCEPT HANDS FREE
HANDS FREE
S200
(8W-10-10)
A926 18 RD
F202 20 PK/GY
5
3
FUSED B(+)
GROUND
CAN B BUS (+)
CAN B BUS (-)
FUSED IGNITION SWITCH OUTPUT (RUN-START)
MODULE-SENTRY KEY REMOTE ENTRY
4
6
7
D55 20 WT/OR
D54 20 WT
TWISTED PAIR
S208
(8W-18-3)
S207
(8W-18-5)
17 C4
1 C4
JUNCTION BLOCK
(8W-12-2)
1 C5
17 C5
S123
(8W-18-4)
S125
(8W-18-6)
Z109 20 BK/GY
2 C1
3 C1
G208
(8W-15-12)
CAN C BUS (+)
CAN C BUS (-)
MODULE-POWERTRAIN CONTROL
(8W-30-13)
34 C1
35 C1
D65 20 YL/RD
D64 20 WT/LB
C
D
C108
S113
(8W-18-7)
S115
(8W-18-7)
8 C1
9 C1
MODULE-FRONT CONTROL
(8W-13-15)
(8W-13-17)

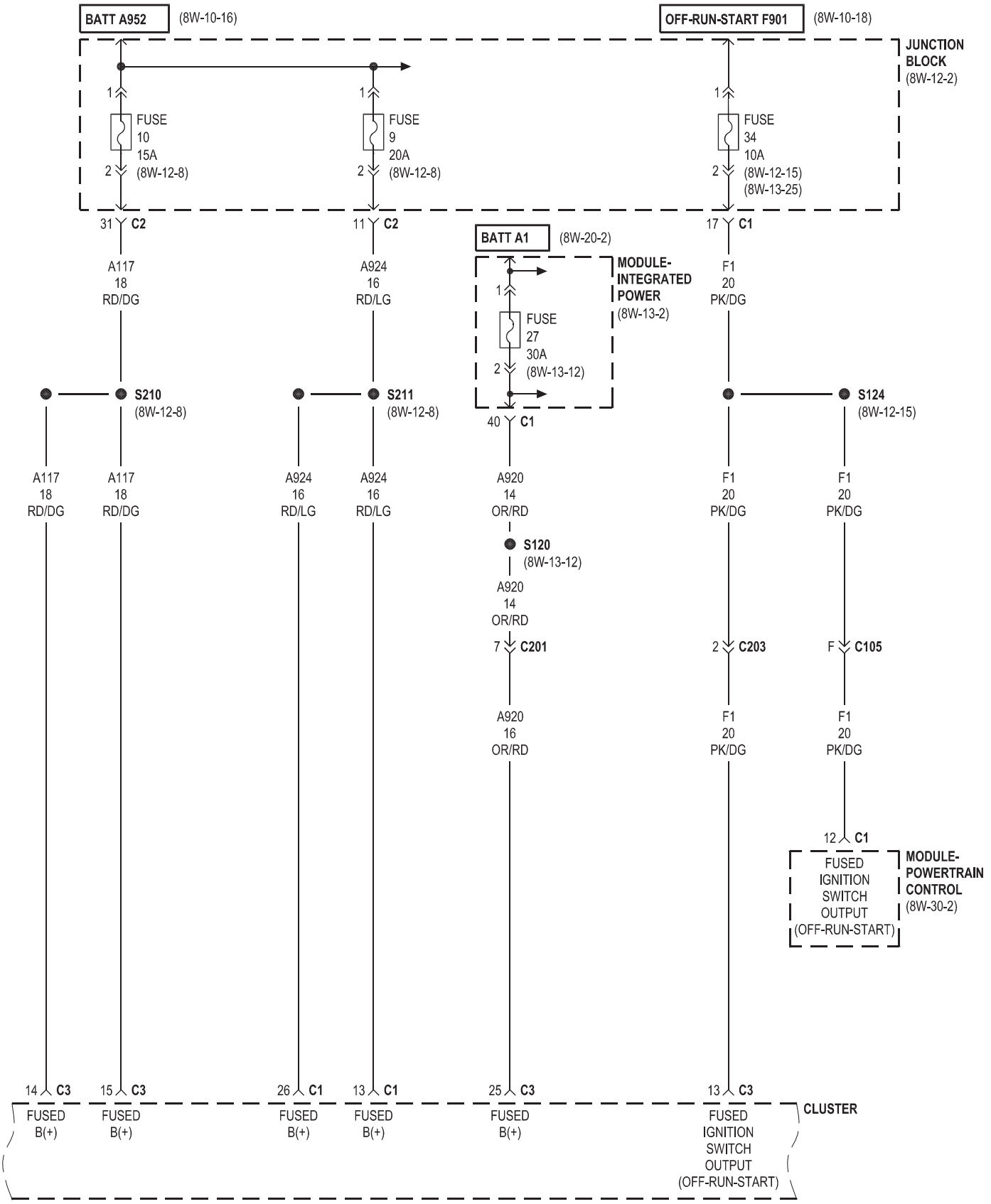

CLUSTER
(8W-40-6)
(8W-40-7)
DRIVER DOOR AJAR SWITCH SENSE
6 C1
G75 20 VT
66 C200
G75 20 VT
2 C364
EXCEPT MEMORY
DRIVER DOOR AJAR SWITCH SENSE
MODULE-MEMORY MIRROR-DRIVER
(8W-62-4)
9 C1
MEMORY
G75 20 VT
1
LATCH-DOOR-LEFT FRONT
(8W-61-3)
2
Z940 20 BK
S301
(8W-15-16)
Z940 20 BK
7 C364
Z940 20 BK
G306
(8W-15-18)

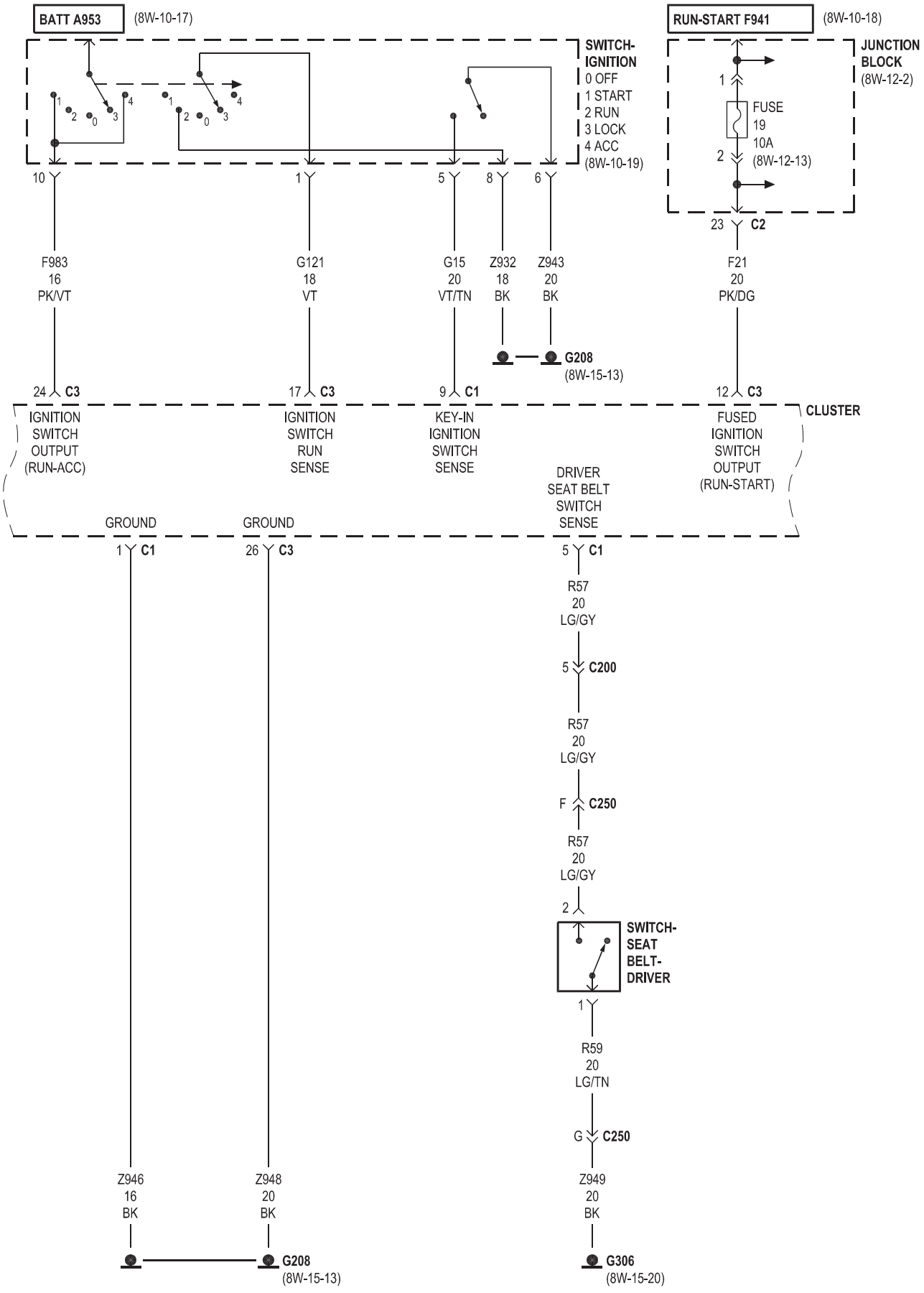

MODULE-
MEMORY
MIRROR-
PASSENGER
(8W-62-7)
PASSENGER
DOOR
AJAR
SWITCH
SENSE
CLUSTER
(8W-40-6)
(8W-40-7)
RIGHT
REAR
DOOR
AJAR
SWITCH
SENSE
LEFT
REAR
DOOR
AJAR
SWITCH
SENSE
LIFTGATE
AJAR
SWITCH
SENSE
9
23 C3
22 C3
8 C1
4 C1
G74
20
VT/WT
G76
20
VT/YL
G77
20
VT/GY
G78
20
VT/OR
54
53
4
6 C200
6 C362
3 C365
5 C366
8 C326
MEMORY
EXCEPT
MEMORY
1
2
LATCH-
DOOR-
RIGHT
FRONT
(8W-61-4)
LATCH-
DOOR-
RIGHT
REAR
(8W-61-4)
LATCH-
DOOR-
LEFT
REAR
(8W-61-3)
SWITCH-
LIFTGATE
AJAR
Z944
20
BK
Z927
20
BK
Z941
20
BK
Z922
20
BK/PK
FOLDING
MIRROR
EXCEPT
FOLDING
MIRRORS
S328
(8W-15-19)
2 C361
4 C365
3 C366
4 C326
G306
(8W-15-19)
(8W-15-20)
G304
(8W-15-15)

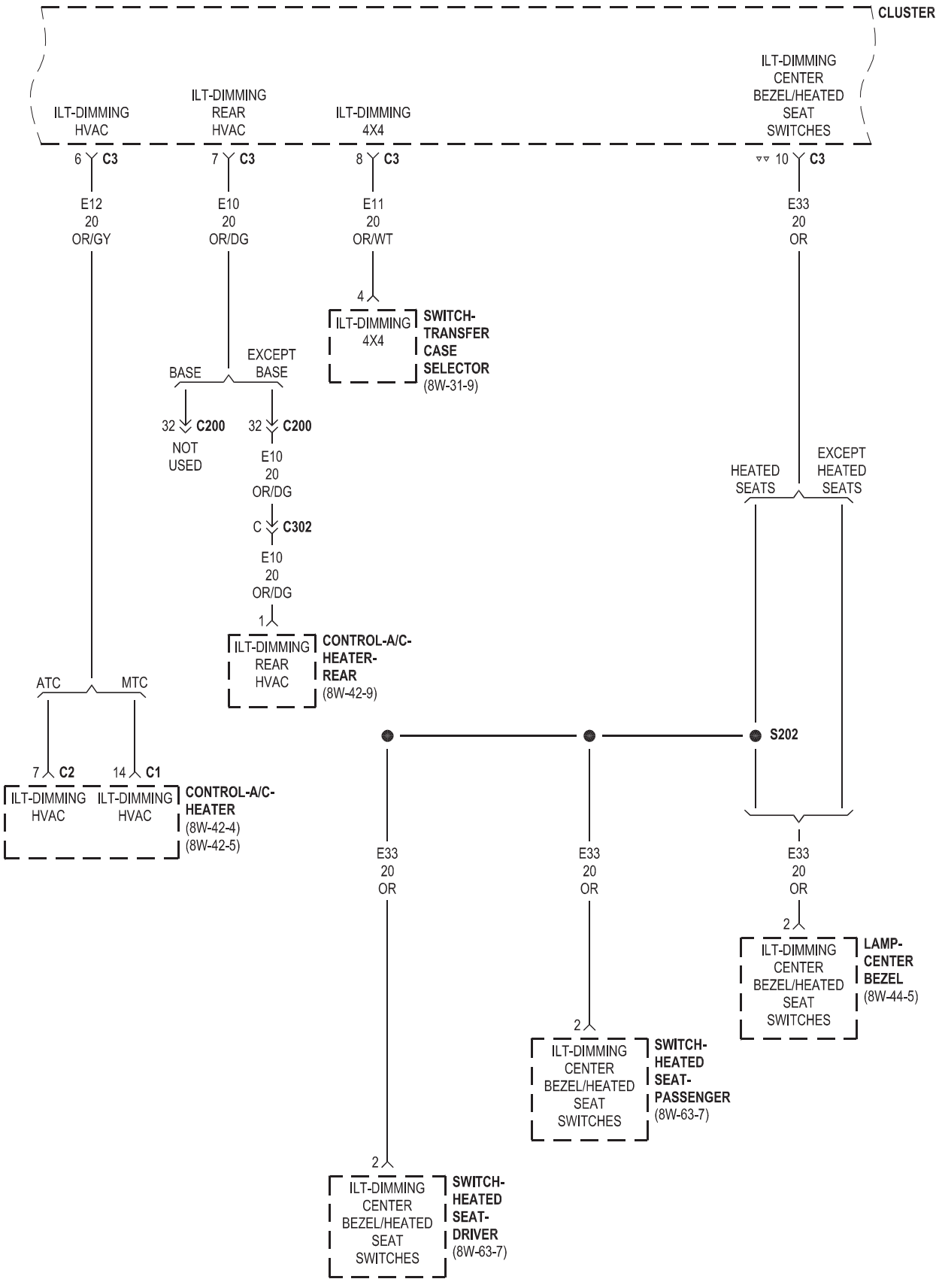

BATT A1
(8W-20-2)
MODULE-
INTEGRATED
POWER
(8W-13-2)
1
FUSE
16
20A
2
(8W-13-9)
86
30
RELAY-
HORN
(8W-41-2)
85
87
87A
47
IPM
MODULE-
FRONT
CONTROL
(8W-13-18)
LEFT
HIGH
BEAM
DRIVER
RIGHT
HIGH
BEAM
DRIVER
HORN
RELAY
CONTROL
7
C2
12
C2
34
C2
35
C2
L33
18
WT/LG
L34
18
WT/GY
X2
18
DG/OR
X2
18
DG/OR
3
3
1
1
LEFT
HIGH
BEAM
DRIVER
LAMP-
HEADLAMP-
LEFT
(8W-50-4)
RIGHT
HIGH
BEAM
DRIVER
LAMP-
HEADLAMP-
RIGHT
(8W-50-4)
HORN
RELAY
OUTPUT
HORN-NO. 1
(8W-41-2)
HORN
RELAY
OUTPUT
HORN-NO. 2
(8W-41-2)

8W-40 INSTRUMENT CLUSTER

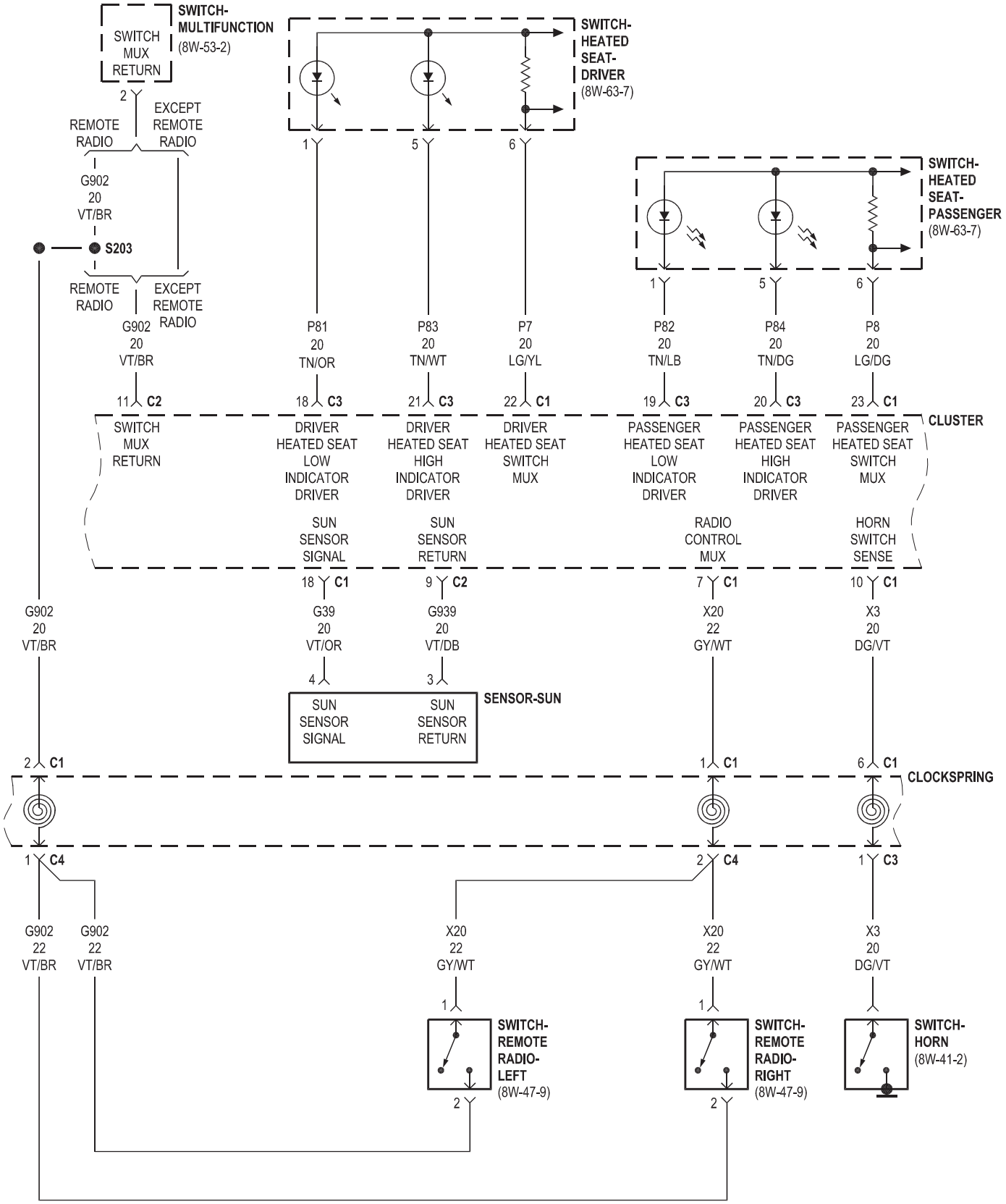
Component	Page
Amplifier-Radio	8W-40-9, 11
Clockspring	8W-40-5
Cluster	8W-40-2, 3, 4, 5, 6, 7, 8, 9, 11, 13
Control-A/C-Heater	8W-40-4, 9, 11
Control-A/C-Heater-Rear	8W-40-4
Fuse 9	8W-40-2
Fuse 10	8W-40-2
Fuse 16	8W-40-7
Fuse 19	8W-40-3
Fuse 27	8W-40-2
Fuse 34	8W-40-2
G208	8W-40-3, 13
G306	8W-40-3
Junction Block	8W-40-2, 3, 9, 10, 11, 12
Lamp-Center Bezel	8W-40-4
Lamp-Dome-Front	8W-40-8, 13
Lamp-Dome-Rear	8W-40-8, 13
Lamp-Liftgate	8W-40-8
Lamp-Reading-Front	8W-40-8, 13
Lamp-Vanity-Left	8W-40-13
Lamp-Vanity-Right	8W-40-13
Latch-Door-Left Front	8W-40-6
Latch-Door-Left Rear	8W-40-6
Latch-Door-Right Front	8W-40-6
Latch-Door-Right Rear	8W-40-6
Latch-Liftgate	8W-40-6
Media System-Monitor/Dvd	8W-40-10, 12
Module-Electronic Overhead	8W-40-10, 12
Module-Front Control	8W-40-10, 12
Module-Fuel Pump	8W-40-8
Module-Hands Free	8W-40-9, 11
Module-Heated Seat	8W-40-10, 12
Module-Integrated Power	8W-40-2
Module-Memory Mirror-Driver	8W-40-10, 12
Module-Memory Mirror-Passenger	8W-40-10, 12
Module-Occupant Classification	8W-40-10, 12
Module-Occupant Restraint Controller	8W-40-9, 11
Module-Powertrain Control	8W-40-2
Module-Seat Memory	8W-40-10, 12
Module-Sentry Key Remote Entry	8W-40-9, 11
Power Distribution Center	8W-40-7
Radio	8W-40-9, 11
Receiver-Satellite	8W-40-10, 12
Sensor-Sun	8W-40-5
Solenoid-Brake Transmission Shift Interlock	8W-40-8
Switch And Lamp-Glove Box	8W-40-13
Switch-Headlamp	8W-40-13
Switch-Heated Seat-Driver	8W-40-4, 5
Switch-Heated Seat-Passenger	8W-40-4, 5
Switch-Horn	8W-40-5
Switch-Ignition	8W-40-3
Switch-Liftgate Ajar	8W-40-7
Switch-Multifunction	8W-40-5, 7
Switch-Parking Brake	8W-40-8
Switch-Remote Radio-Left	8W-40-5
Switch-Remote Radio-Right	8W-40-5
Switch-Seat Belt-Driver	8W-40-3
Switch-Traction Control	8W-40-8
Switch-Transfer Case Selector	8W-40-4, 7
Switch-Window/Door Lock-Driver	8W-40-7
Switch-Window/Door Lock-Passenger	8W-40-7

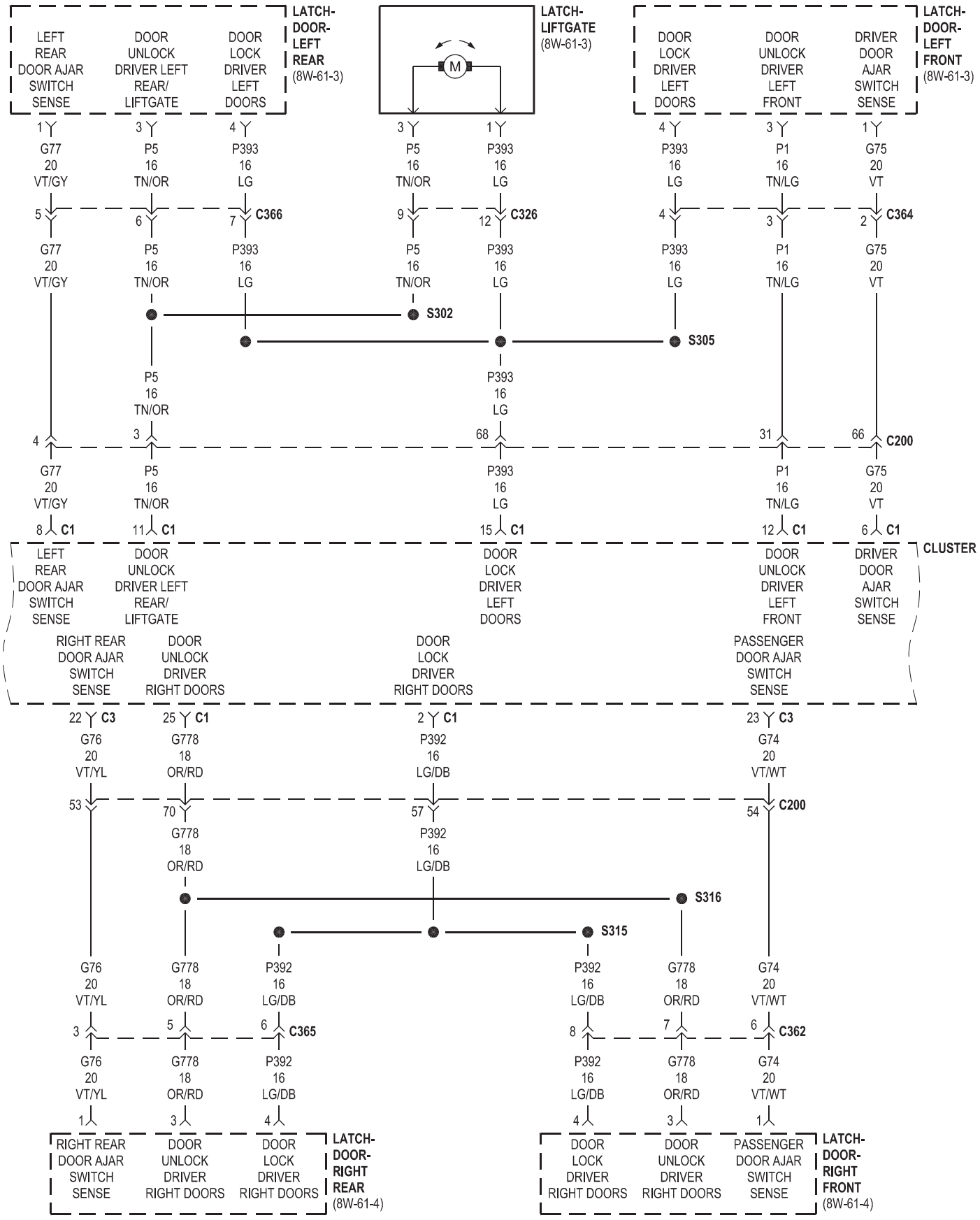

BATT A952
(8W-10-16)
OFF-RUN-START F901
(8W-10-18)
JUNCTION BLOCK
(8W-12-2)
FUSE 10 15A
(8W-12-8)
FUSE 9 20A
(8W-12-8)
FUSE 34 10A
(8W-12-15)
(8W-13-25)
31 C2
11 C2
17 C1
A117 18 RD/DG
A924 16 RD/LG
F1 20 PK/DG
BATT A1
(8W-20-2)
MODULE-INTEGRATED POWER
(8W-13-2)
FUSE 27 30A
(8W-13-12)
40 C1
S210
(8W-12-8)
S211
(8W-12-8)
S124
(8W-12-15)
A117 18 RD/DG
A924 16 RD/LG
A920 14 OR/RD
S120
(8W-13-12)
A920 14 OR/RD
7 C201
2 C203
F C105
A920 16 OR/RD
F1 20 PK/DG
12 C1
FUSED IGNITION SWITCH OUTPUT (OFF-RUN-START)
MODULE-POWERTRAIN CONTROL
(8W-30-2)
14 C3
15 C3
26 C1
13 C1
25 C3
13 C3
FUSED B(+)
FUSED IGNITION SWITCH OUTPUT (OFF-RUN-START)
CLUSTER

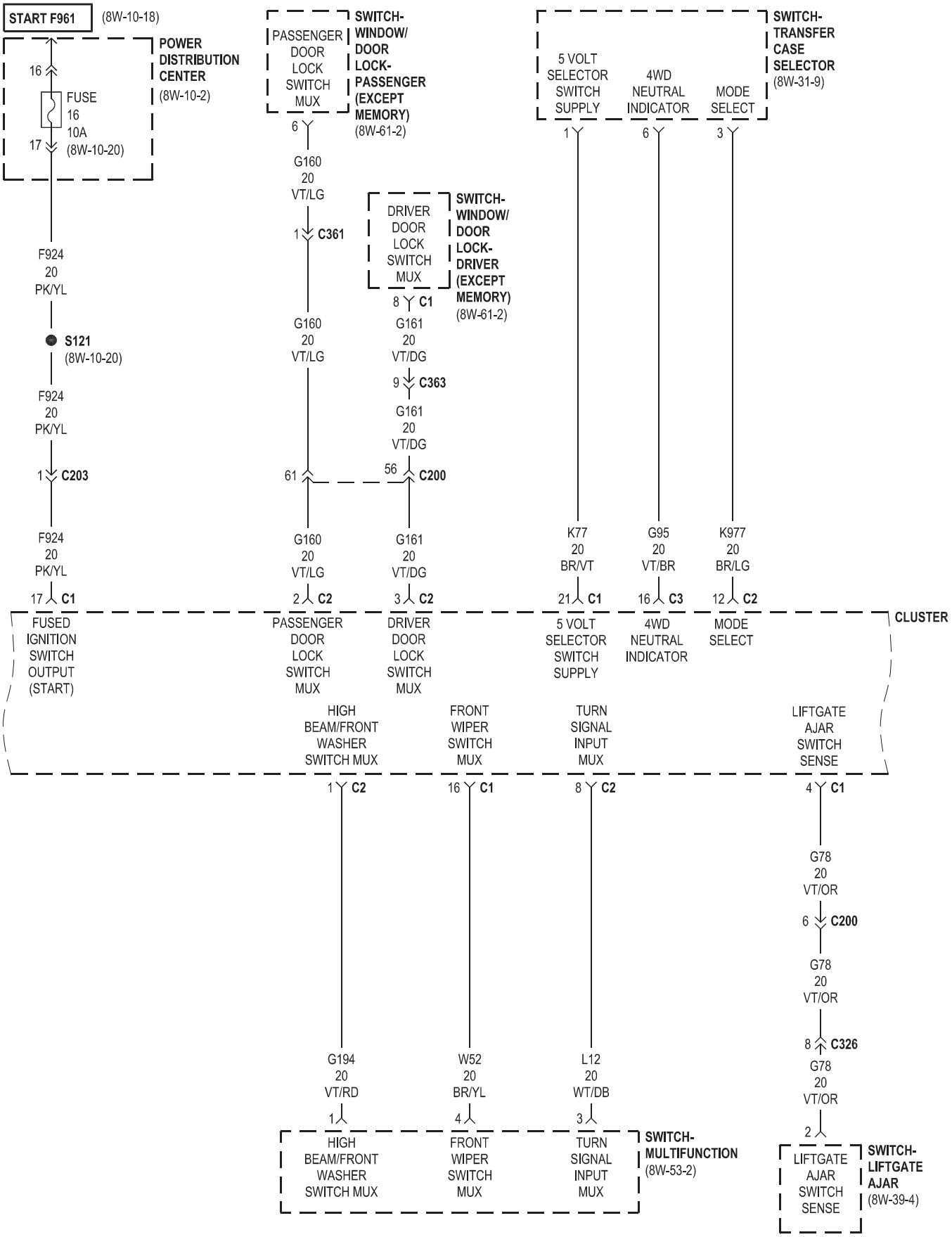

BATT A953
(8W-10-17)
RUN-START F941
(8W-10-18)
SWITCH-IGNITION
0 OFF
1 START
2 RUN
3 LOCK
4 ACC
(8W-10-19)
JUNCTION BLOCK
(8W-12-2)
FUSE
19
10A
(8W-12-13)
F983
16
PK/VT
G121
18
VT
G15
20
VT/TN
Z932
18
BK
Z943
20
BK
F21
20
PK/DG
G208
(8W-15-13)
CLUSTER
IGNITION SWITCH OUTPUT (RUN-ACC)
IGNITION SWITCH RUN SENSE
KEY-IN IGNITION SWITCH SENSE
FUSED IGNITION SWITCH OUTPUT (RUN-START)
DRIVER SEAT BELT SWITCH SENSE
GROUND
GROUND
R57
20
LG/GY
C200
C250
SWITCH-SEAT BELT-DRIVER
R59
20
LG/TN
Z946
16
BK
Z948
20
BK
Z949
20
BK
G306
(8W-15-20)

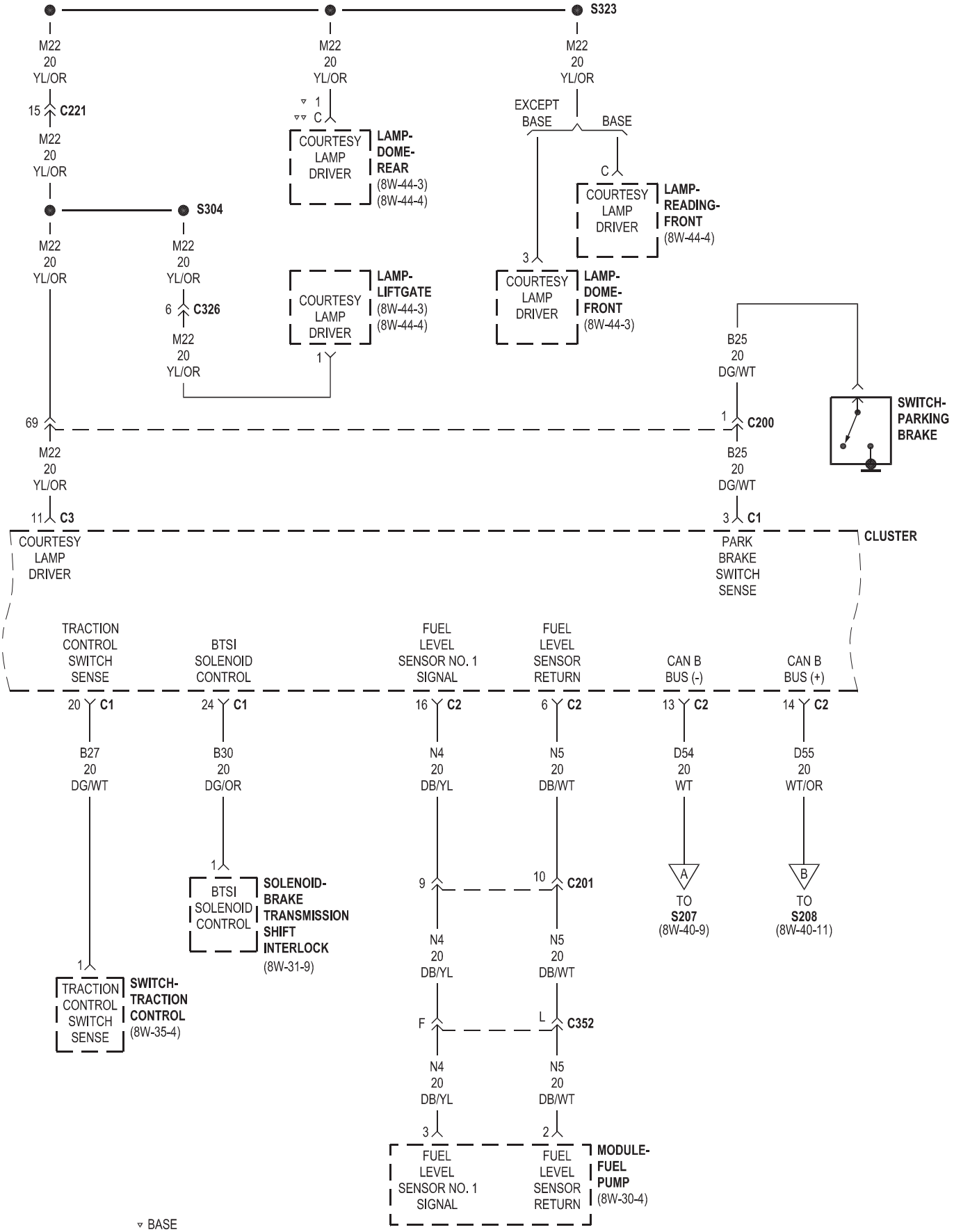

CLUSTER
ILT-DIMMING HVAC
ILT-DIMMING REAR HVAC
ILT-DIMMING 4X4
ILT-DIMMING CENTER BEZEL/HEATED SEAT SWITCHES
6 C3
7 C3
8 C3
▿▿ 10 C3
E12 20 OR/GY
E10 20 OR/DG
E11 20 OR/WT
E33 20 OR
4
ILT-DIMMING 4X4
SWITCH-TRANSFER CASE SELECTOR (8W-31-9)
BASE
EXCEPT BASE
32 C200
NOT USED
32 C200
E10 20 OR/DG
C C302
E10 20 OR/DG
1
ILT-DIMMING REAR HVAC
CONTROL-A/C-HEATER-REAR (8W-42-9)
HEATED SEATS
EXCEPT HEATED SEATS
ATC
MTC
7 C2
14 C1
ILT-DIMMING HVAC
ILT-DIMMING HVAC
CONTROL-A/C-HEATER (8W-42-4) (8W-42-5)
S202
E33 20 OR
E33 20 OR
E33 20 OR
2
ILT-DIMMING CENTER BEZEL/HEATED SEAT SWITCHES
LAMP-CENTER BEZEL (8W-44-5)
2
ILT-DIMMING CENTER BEZEL/HEATED SEAT SWITCHES
SWITCH-HEATED SEAT-PASSENGER (8W-63-7)
2
ILT-DIMMING CENTER BEZEL/HEATED SEAT SWITCHES
SWITCH-HEATED SEAT-DRIVER (8W-63-7)

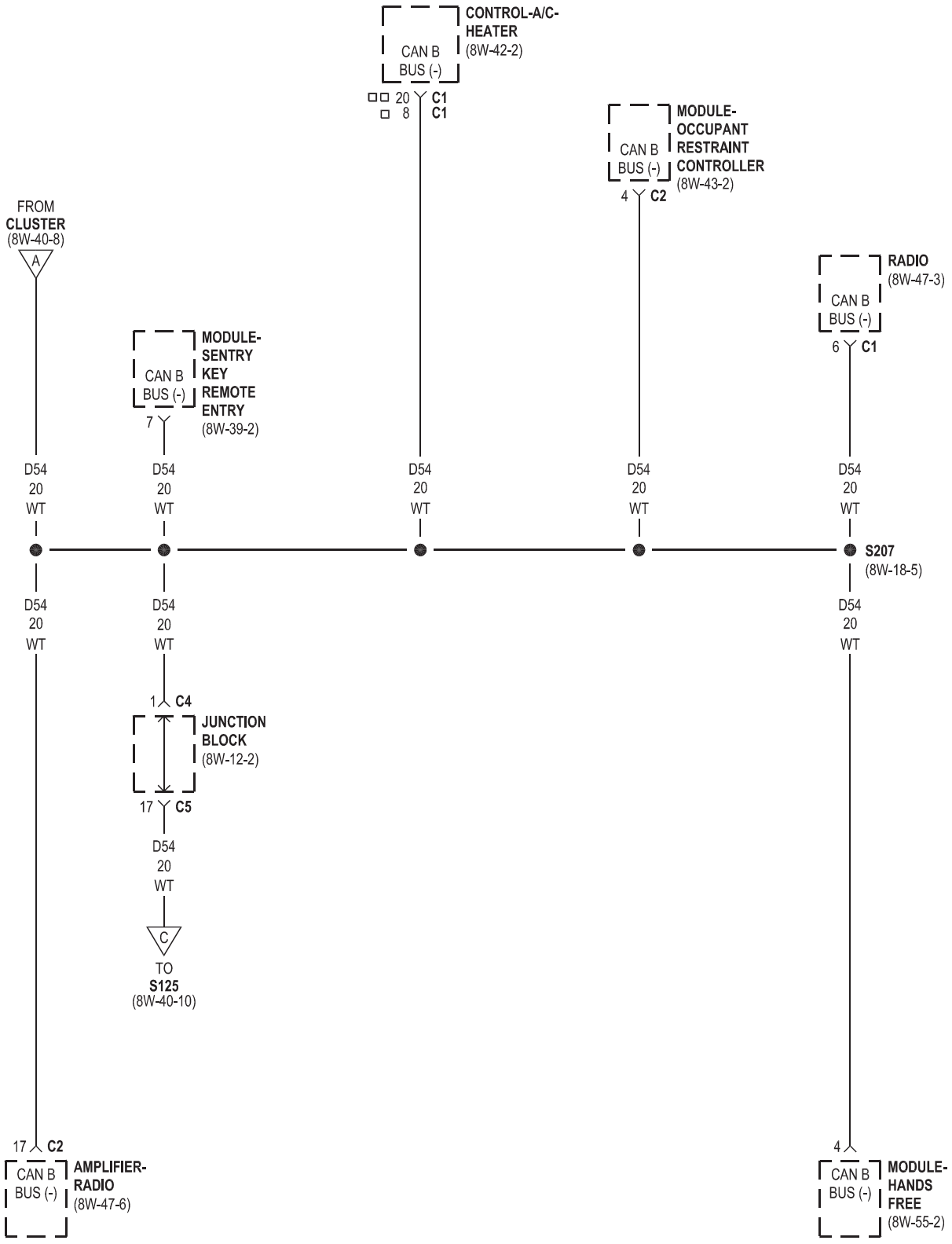
▿▿ EXCEPT BASE

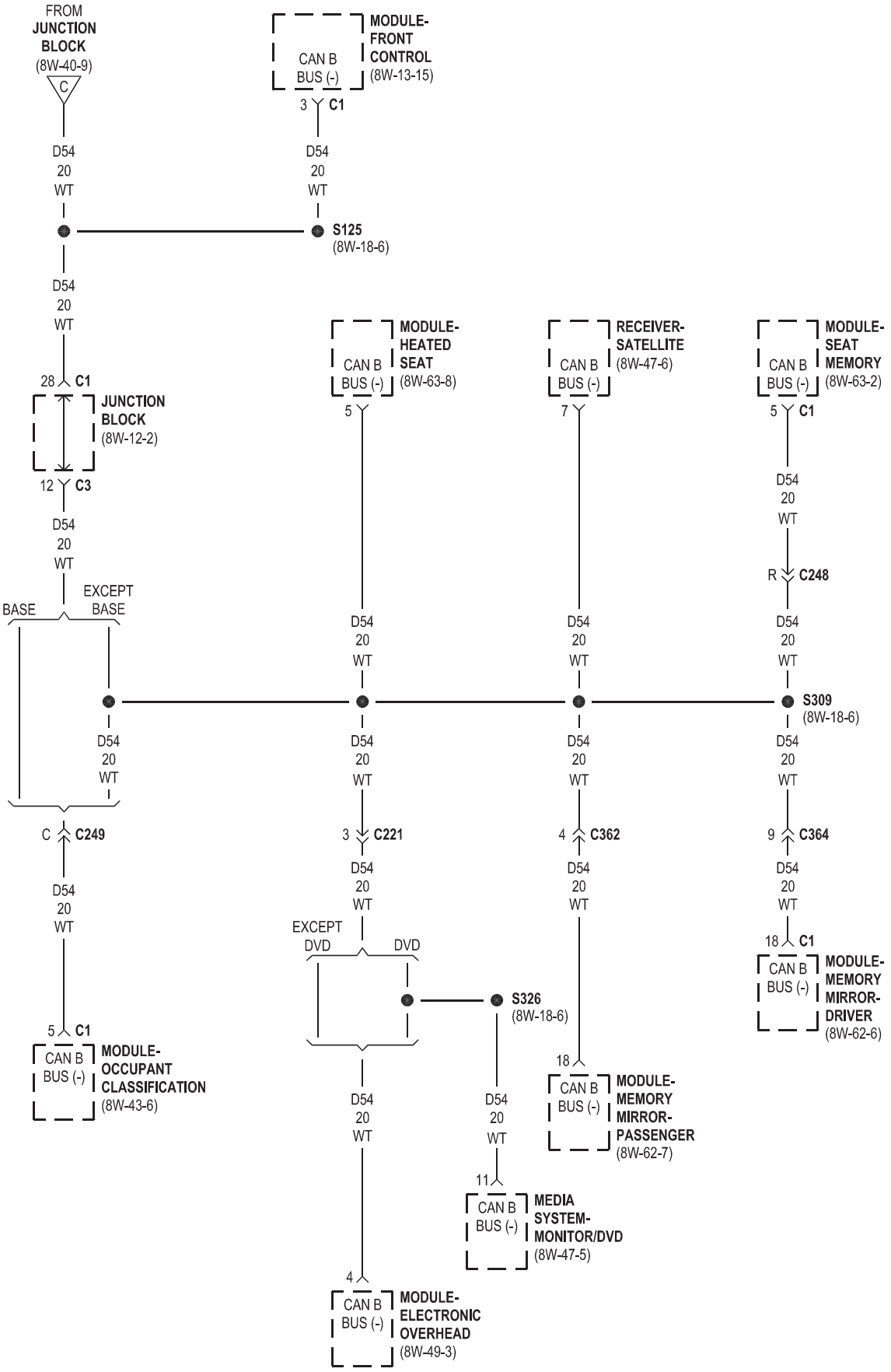

SWITCH-
MULTIFUNCTION
(8W-53-2)
SWITCH
MUX
RETURN
2
REMOTE
RADIO
EXCEPT
REMOTE
RADIO
G902
20
VT/BR
S203
REMOTE
RADIO
EXCEPT
REMOTE
RADIO
G902
20
VT/BR
11 C2
SWITCH
MUX
RETURN
SWITCH-
HEATED
SEAT-
DRIVER
(8W-63-7)
1
5
6
P81
20
TN/OR
18 C3
DRIVER
HEATED SEAT
LOW
INDICATOR
DRIVER
P83
20
TN/WT
21 C3
DRIVER
HEATED SEAT
HIGH
INDICATOR
DRIVER
P7
20
LG/YL
22 C1
DRIVER
HEATED SEAT
SWITCH
MUX
SWITCH-
HEATED
SEAT-
PASSENGER
(8W-63-7)
1
5
6
P82
20
TN/LB
19 C3
PASSENGER
HEATED SEAT
LOW
INDICATOR
DRIVER
P84
20
TN/DG
20 C3
PASSENGER
HEATED SEAT
HIGH
INDICATOR
DRIVER
P8
20
LG/DG
23 C1
PASSENGER
HEATED SEAT
SWITCH
MUX
CLUSTER
SUN
SENSOR
SIGNAL
18 C1
SUN
SENSOR
RETURN
9 C2
RADIO
CONTROL
MUX
7 C1
HORN
SWITCH
SENSE
10 C1
G902
20
VT/BR
G39
20
VT/OR
4
G939
20
VT/DB
3
X20
22
GY/WT
X3
20
DG/VT
SUN
SENSOR
SIGNAL
SUN
SENSOR
RETURN
SENSOR-SUN
2 C1
1 C1
6 C1
CLOCKSPRING
1 C4
2 C4
1 C3
G902
22
VT/BR
G902
22
VT/BR
X20
22
GY/WT
X20
22
GY/WT
X3
20
DG/VT
1
1
SWITCH-
REMOTE
RADIO-
LEFT
(8W-47-9)
2
SWITCH-
REMOTE
RADIO-
RIGHT
(8W-47-9)
2
SWITCH-
HORN
(8W-41-2)

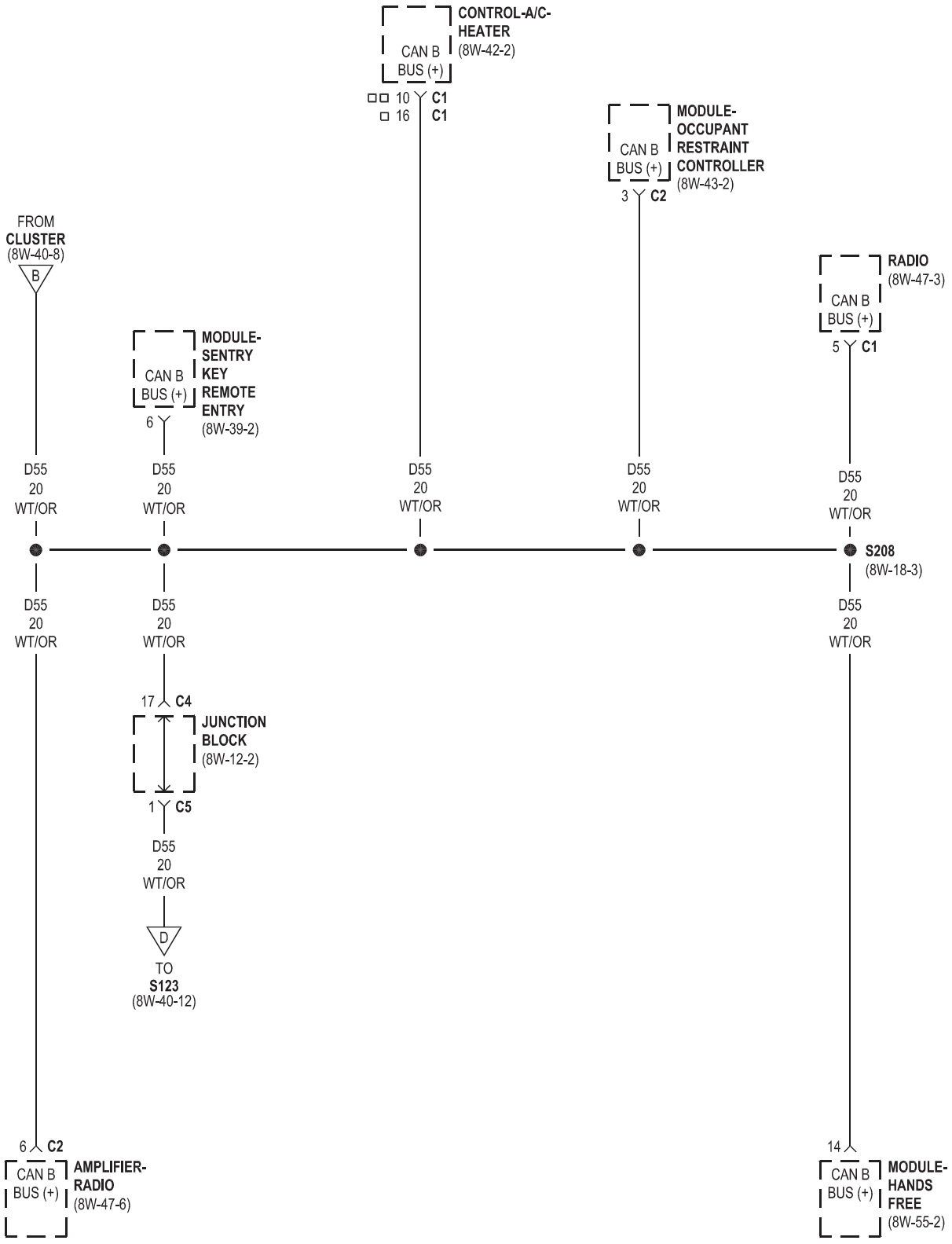

LATCH-DOOR-LEFT REAR (8W-61-3)
LEFT REAR DOOR AJAR SWITCH SENSE
DOOR UNLOCK DRIVER LEFT REAR/ LIFTGATE
DOOR LOCK DRIVER LEFT DOORS
LATCH-LIFTGATE (8W-61-3)
M
LATCH-DOOR-LEFT FRONT (8W-61-3)
DOOR LOCK DRIVER LEFT DOORS
DOOR UNLOCK DRIVER LEFT FRONT
DRIVER DOOR AJAR SWITCH SENSE
1 G77 20 VT/GY
3 P5 16 TN/OR
4 P393 16 LG
3 P5 16 TN/OR
1 P393 16 LG
4 P393 16 LG
3 P1 16 TN/LG
1 G75 20 VT
5 C366
6 C366
7 C366
9 C326
12 C326
4 C364
3 C364
2 C364
G77 20 VT/GY
P5 16 TN/OR
P393 16 LG
P5 16 TN/OR
P393 16 LG
P393 16 LG
P1 16 TN/LG
G75 20 VT
S302
S305
P5 16 TN/OR
P393 16 LG
4 C200
3 C200
68 C200
31 C200
66 C200
G77 20 VT/GY
P5 16 TN/OR
P393 16 LG
P1 16 TN/LG
G75 20 VT
8 C1
11 C1
15 C1
12 C1
6 C1
CLUSTER
LEFT REAR DOOR AJAR SWITCH SENSE
DOOR UNLOCK DRIVER LEFT REAR/ LIFTGATE
DOOR LOCK DRIVER LEFT DOORS
DOOR UNLOCK DRIVER LEFT FRONT
DRIVER DOOR AJAR SWITCH SENSE
RIGHT REAR DOOR AJAR SWITCH SENSE
DOOR UNLOCK DRIVER RIGHT DOORS
DOOR LOCK DRIVER RIGHT DOORS
PASSENGER DOOR AJAR SWITCH SENSE
22 C3
25 C1
2 C1
23 C3
G76 20 VT/YL
G778 18 OR/RD
P392 16 LG/DB
G74 20 VT/WT
53 C3
70 C1
57 C1
54 C3
54 C200
G778 18 OR/RD
P392 16 LG/DB
S316
S315
G76 20 VT/YL
G778 18 OR/RD
P392 16 LG/DB
P392 16 LG/DB
G778 18 OR/RD
G74 20 VT/WT
3 C365
5 C365
6 C365
8 C362
7 C362
6 C362
G76 20 VT/YL
G778 18 OR/RD
P392 16 LG/DB
P392 16 LG/DB
G778 18 OR/RD
G74 20 VT/WT
1
3
4
4
3
1
RIGHT REAR DOOR AJAR SWITCH SENSE
DOOR UNLOCK DRIVER RIGHT DOORS
DOOR LOCK DRIVER RIGHT DOORS
LATCH-DOOR-RIGHT REAR (8W-61-4)
DOOR LOCK DRIVER RIGHT DOORS
DOOR UNLOCK DRIVER RIGHT DOORS
PASSENGER DOOR AJAR SWITCH SENSE
LATCH-DOOR-RIGHT FRONT (8W-61-4)


START F961
(8W-10-18)
POWER DISTRIBUTION CENTER
(8W-10-2)
16
FUSE 16 10A
17
(8W-10-20)
F924 20 PK/YL
S121
(8W-10-20)
F924 20 PK/YL
1 C203
F924 20 PK/YL
17 C1
FUSED IGNITION SWITCH OUTPUT (START)
PASSENGER DOOR LOCK SWITCH MUX
SWITCH-WINDOW/ DOOR LOCK-PASSENGER (EXCEPT MEMORY)
(8W-61-2)
6
G160 20 VT/LG
1 C361
G160 20 VT/LG
61
G160 20 VT/LG
2 C2
PASSENGER DOOR LOCK SWITCH MUX
DRIVER DOOR LOCK SWITCH MUX
SWITCH-WINDOW/ DOOR LOCK-DRIVER (EXCEPT MEMORY)
(8W-61-2)
8 C1
G161 20 VT/DG
9 C363
G161 20 VT/DG
56 C200
G161 20 VT/DG
3 C2
DRIVER DOOR LOCK SWITCH MUX
5 VOLT SELECTOR SWITCH SUPPLY
4WD NEUTRAL INDICATOR
MODE SELECT
SWITCH-TRANSFER CASE SELECTOR
(8W-31-9)
1
6
3
K77 20 BR/VT
21 C1
G95 20 VT/BR
16 C3
K977 20 BR/LG
12 C2
5 VOLT SELECTOR SWITCH SUPPLY
4WD NEUTRAL INDICATOR
MODE SELECT
CLUSTER
HIGH BEAM/FRONT WASHER SWITCH MUX
FRONT WIPER SWITCH MUX
TURN SIGNAL INPUT MUX
LIFTGATE AJAR SWITCH SENSE
1 C2
16 C1
8 C2
4 C1
G194 20 VT/RD
1
W52 20 BR/YL
4
L12 20 WT/DB
3
HIGH BEAM/FRONT WASHER SWITCH MUX
FRONT WIPER SWITCH MUX
TURN SIGNAL INPUT MUX
SWITCH-MULTIFUNCTION
(8W-53-2)
G78 20 VT/OR
6 C200
G78 20 VT/OR
8 C326
G78 20 VT/OR
2
LIFTGATE AJAR SWITCH SENSE
SWITCH-LIFTGATE AJAR
(8W-39-4)

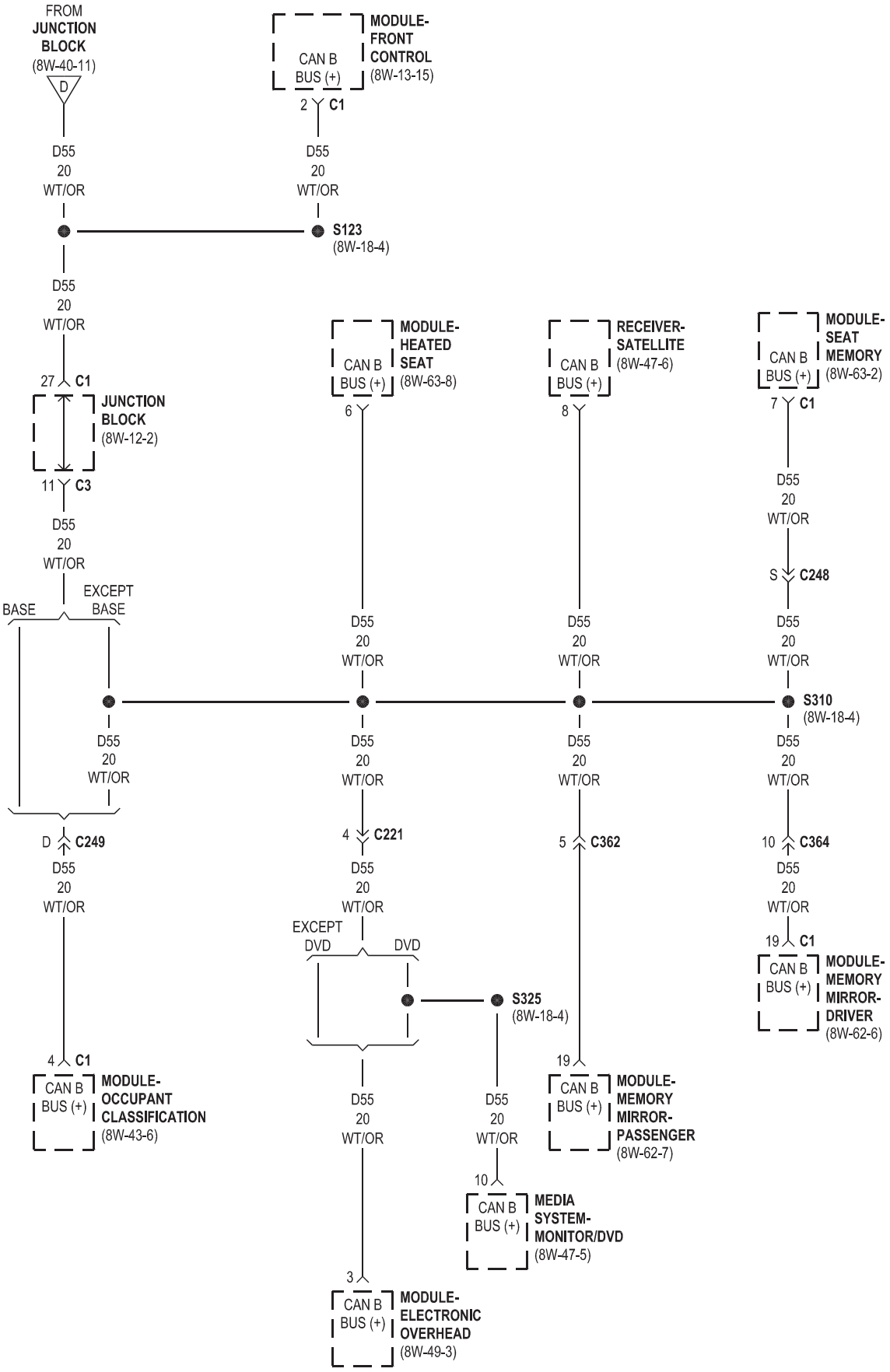

S323
M22 20 YL/OR
15 C221
M22 20 YL/OR
S304
M22 20 YL/OR
6 C326
M22 20 YL/OR
1
C
COURTESY LAMP DRIVER
LAMP-DOME-REAR
(8W-44-3)
(8W-44-4)
EXCEPT BASE
BASE
C
COURTESY LAMP DRIVER
LAMP-READING-FRONT
(8W-44-4)
3
COURTESY LAMP DRIVER
LAMP-DOME-FRONT
(8W-44-3)
COURTESY LAMP DRIVER
LAMP-LIFTGATE
(8W-44-3)
(8W-44-4)
1
B25 20 DG/WT
1 C200
B25 20 DG/WT
3 C1
SWITCH-PARKING BRAKE
69
M22 20 YL/OR
11 C3
COURTESY LAMP DRIVER
PARK BRAKE SWITCH SENSE
CLUSTER
TRACTION CONTROL SWITCH SENSE
BTSI SOLENOID CONTROL
FUEL LEVEL SENSOR NO. 1 SIGNAL
FUEL LEVEL SENSOR RETURN
CAN B BUS (-)
CAN B BUS (+)
20 C1
24 C1
16 C2
6 C2
13 C2
14 C2
B27 20 DG/WT
B30 20 DG/OR
N4 20 DB/YL
N5 20 DB/WT
D54 20 WT
D55 20 WT/OR
1
BTSI SOLENOID CONTROL
SOLENOID-BRAKE TRANSMISSION SHIFT INTERLOCK
(8W-31-9)
9
10 C201
N4 20 DB/YL
N5 20 DB/WT
F
L C352
N4 20 DB/YL
N5 20 DB/WT
3
2
FUEL LEVEL SENSOR NO. 1 SIGNAL
FUEL LEVEL SENSOR RETURN
MODULE-FUEL PUMP
(8W-30-4)
1
TRACTION CONTROL SWITCH SENSE
SWITCH-TRACTION CONTROL
(8W-35-4)
A
TO S207
(8W-40-9)
B
TO S208
(8W-40-11)
▿ BASE
▿▿ EXCEPT BASE

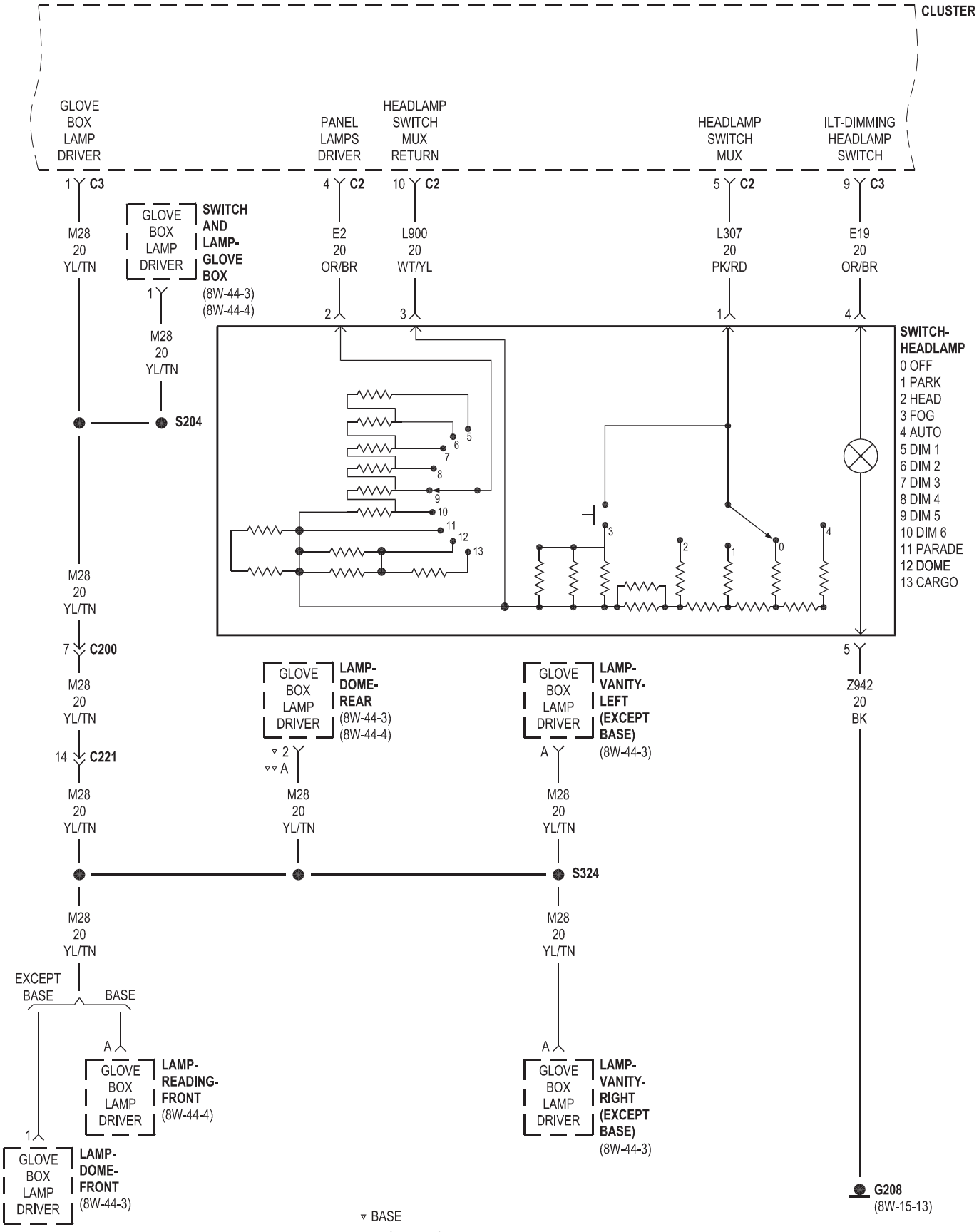

CONTROL-A/C-HEATER
(8W-42-2)
CAN B
BUS (-)
20 C1
8 C1
MODULE-OCCUPANT RESTRAINT CONTROLLER
(8W-43-2)
CAN B
BUS (-)
4 C2
RADIO
(8W-47-3)
CAN B
BUS (-)
6 C1
FROM
CLUSTER
(8W-40-8)
A
MODULE-SENTRY KEY REMOTE ENTRY
(8W-39-2)
CAN B
BUS (-)
7
D54
20
WT
S207
(8W-18-5)
1 C4
JUNCTION BLOCK
(8W-12-2)
17 C5
C
TO
S125
(8W-40-10)
17 C2
CAN B
BUS (-)
AMPLIFIER-RADIO
(8W-47-6)
4
MODULE-HANDS FREE
(8W-55-2)
ATC
MTC


FROM JUNCTION BLOCK (8W-40-9)
C
D54 20 WT
MODULE- FRONT CONTROL (8W-13-15)
CAN B BUS (-)
3 C1
D54 20 WT
S125 (8W-18-6)
D54 20 WT
28 C1
JUNCTION BLOCK (8W-12-2)
12 C3
D54 20 WT
BASE
EXCEPT BASE
MODULE- HEATED SEAT (8W-63-8)
CAN B BUS (-)
5
RECEIVER- SATELLITE (8W-47-6)
CAN B BUS (-)
7
MODULE- SEAT MEMORY (8W-63-2)
CAN B BUS (-)
5 C1
D54 20 WT
R C248
D54 20 WT
S309 (8W-18-6)
D54 20 WT
C C249
D54 20 WT
3 C221
D54 20 WT
4 C362
D54 20 WT
9 C364
D54 20 WT
EXCEPT DVD
DVD
S326 (8W-18-6)
18 C1
CAN B BUS (-)
MODULE- MEMORY MIRROR- DRIVER (8W-62-6)
5 C1
CAN B BUS (-)
MODULE- OCCUPANT CLASSIFICATION (8W-43-6)
18
CAN B BUS (-)
MODULE- MEMORY MIRROR- PASSENGER (8W-62-7)
11
CAN B BUS (-)
MEDIA SYSTEM- MONITOR/DVD (8W-47-5)
4
CAN B BUS (-)
MODULE- ELECTRONIC OVERHEAD (8W-49-3)


CONTROL-A/C-HEATER
(8W-42-2)
CAN B
BUS (+)
10 C1
16 C1
MODULE-OCCUPANT RESTRAINT CONTROLLER
(8W-43-2)
3 C2
RADIO
(8W-47-3)
5 C1
FROM CLUSTER
(8W-40-8)
B
MODULE-SENTRY KEY REMOTE ENTRY
(8W-39-2)
6
D55
20
WT/OR
S208
(8W-18-3)
17 C4
JUNCTION BLOCK
(8W-12-2)
1 C5
D
TO
S123
(8W-40-12)
6 C2
AMPLIFIER-RADIO
(8W-47-6)
14
MODULE-HANDS FREE
(8W-55-2)

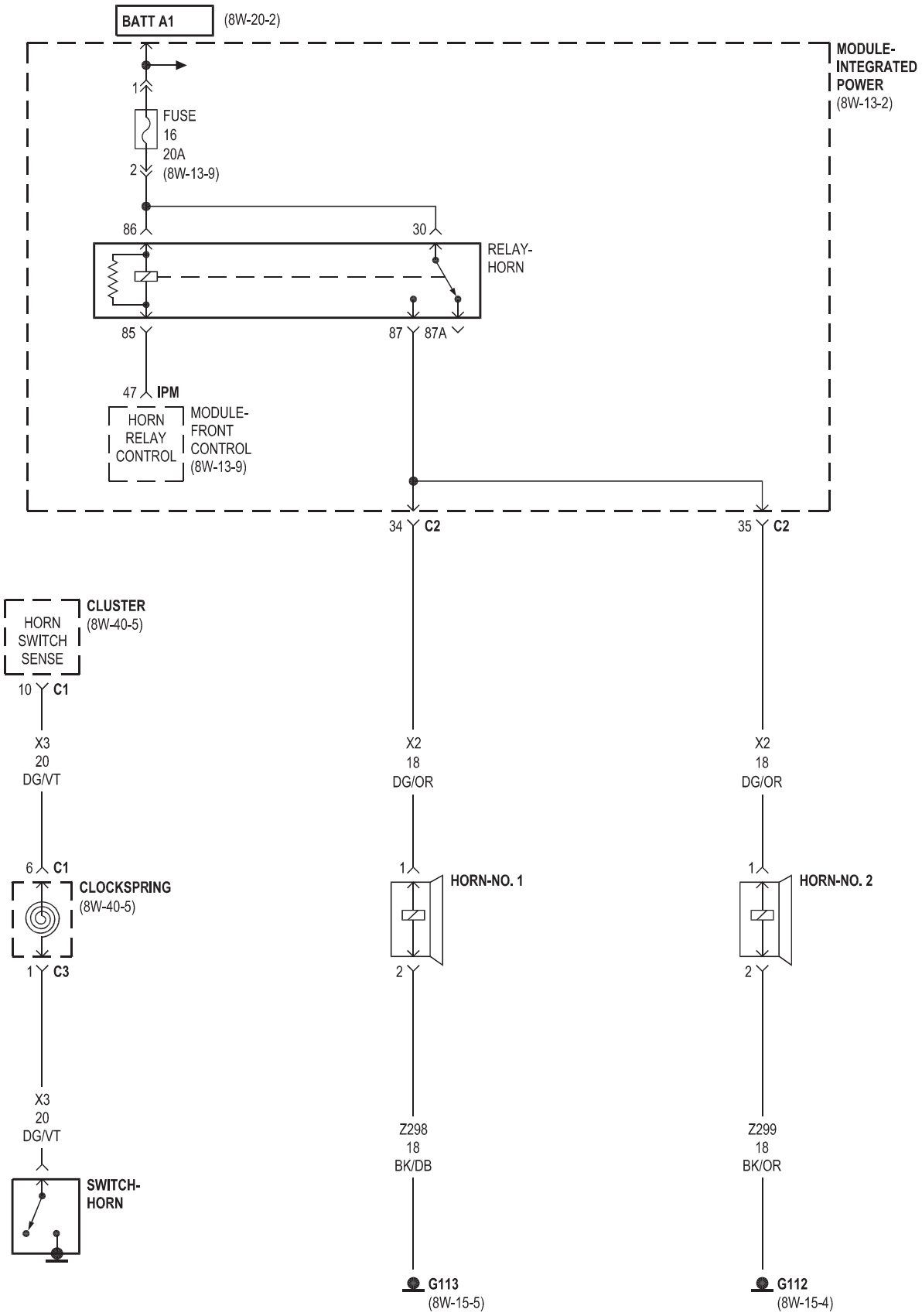
□ ATC
□□ MTC

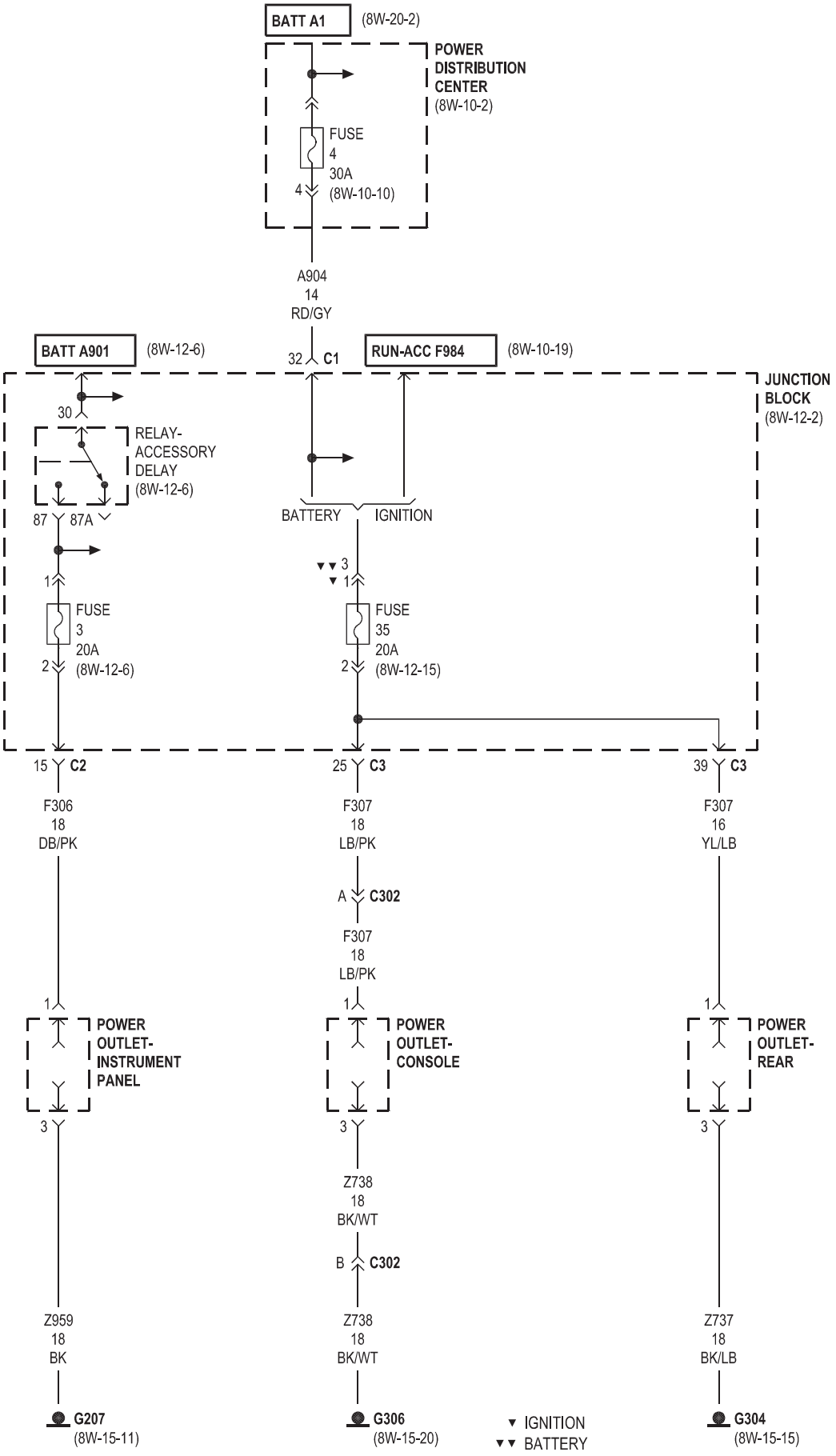

FROM JUNCTION BLOCK (8W-40-11)
D
D55 20 WT/OR
CAN B BUS (+)
MODULE- FRONT CONTROL (8W-13-15)
2 C1
D55 20 WT/OR
S123 (8W-18-4)
D55 20 WT/OR
27 C1
JUNCTION BLOCK (8W-12-2)
11 C3
D55 20 WT/OR
BASE
EXCEPT BASE
CAN B BUS (+)
MODULE- HEATED SEAT (8W-63-8)
6
CAN B BUS (+)
RECEIVER- SATELLITE (8W-47-6)
8
CAN B BUS (+)
MODULE- SEAT MEMORY (8W-63-2)
7 C1
D55 20 WT/OR
S C248
D55 20 WT/OR
D55 20 WT/OR
D55 20 WT/OR
D55 20 WT/OR
S310 (8W-18-4)
D55 20 WT/OR
D55 20 WT/OR
D55 20 WT/OR
D55 20 WT/OR
D55 20 WT/OR
D C249
4 C221
5 C362
10 C364
D55 20 WT/OR
D55 20 WT/OR
D55 20 WT/OR
EXCEPT DVD
DVD
19 C1
CAN B BUS (+)
MODULE- MEMORY MIRROR- DRIVER (8W-62-6)
S325 (8W-18-4)
4 C1
CAN B BUS (+)
MODULE- OCCUPANT CLASSIFICATION (8W-43-6)
D55 20 WT/OR
D55 20 WT/OR
19
CAN B BUS (+)
MODULE- MEMORY MIRROR- PASSENGER (8W-62-7)
10
CAN B BUS (+)
MEDIA SYSTEM- MONITOR/DVD (8W-47-5)
3
CAN B BUS (+)
MODULE- ELECTRONIC OVERHEAD (8W-49-3)


CLUSTER
GLOVE BOX LAMP DRIVER
PANEL LAMPS DRIVER
HEADLAMP SWITCH MUX RETURN
HEADLAMP SWITCH MUX
ILT-DIMMING HEADLAMP SWITCH
1 C3
4 C2
10 C2
5 C2
9 C3
M28 20 YL/TN
E2 20 OR/BR
L900 20 WT/YL
L307 20 PK/RD
E19 20 OR/BR
GLOVE BOX LAMP DRIVER
SWITCH AND LAMP-GLOVE BOX
(8W-44-3)
(8W-44-4)
2
3
1
4
S204
SWITCH-HEADLAMP
0 OFF
1 PARK
2 HEAD
3 FOG
4 AUTO
5 DIM 1
6 DIM 2
7 DIM 3
8 DIM 4
9 DIM 5
10 DIM 6
11 PARADE
12 DOME
13 CARGO
7 C200
14 C221
5
Z942 20 BK
LAMP-DOME-REAR
(8W-44-3)
(8W-44-4)
LAMP-VANITY-LEFT (EXCEPT BASE)
(8W-44-3)
S324
EXCEPT BASE
BASE
LAMP-READING-FRONT
(8W-44-4)
LAMP-DOME-FRONT
(8W-44-3)
LAMP-VANITY-RIGHT (EXCEPT BASE)
(8W-44-3)
G208
(8W-15-13)
BASE
EXCEPT BASE

8W-41 HORN/CIGAR LIGHTER/POWER OUTLET

Component	Page
Clockspring	8W-41-2
Cluster	8W-41-2
Fuse 3	8W-41-3
Fuse 4	8W-41-3
Fuse 16	8W-41-2
Fuse 35	8W-41-3
G112	8W-41-2
G113	8W-41-2
G207	8W-41-3
G304	8W-41-3
G306	8W-41-3
Horn-No. 1	8W-41-2
Horn-No. 2	8W-41-2
Junction Block	8W-41-3
Module-Front Control	8W-41-2
Module-Integrated Power	8W-41-2
Power Distribution Center	8W-41-3
Power Outlet-Console	8W-41-3
Power Outlet-Instrument Panel	8W-41-3
Power Outlet-Rear	8W-41-3
Relay-Accessory Delay	8W-41-3
Relay-Horn	8W-41-2
Switch-Horn	8W-41-2


BATT A1
(8W-20-2)
MODULE-
INTEGRATED
POWER
(8W-13-2)
1
FUSE
16
20A
2
(8W-13-9)
86
30
RELAY-
HORN
85
87
87A
47
IPM
HORN
RELAY
CONTROL
MODULE-
FRONT
CONTROL
(8W-13-9)
34
C2
35
C2
HORN
SWITCH
SENSE
CLUSTER
(8W-40-5)
10
C1
X3
20
DG/VT
X2
18
DG/OR
X2
18
DG/OR
6
C1
CLOCKSPRING
(8W-40-5)
1
C3
1
HORN-NO. 1
2
1
HORN-NO. 2
2
X3
20
DG/VT
Z298
18
BK/DB
Z299
18
BK/OR
SWITCH-
HORN
G113
(8W-15-5)
G112
(8W-15-4)

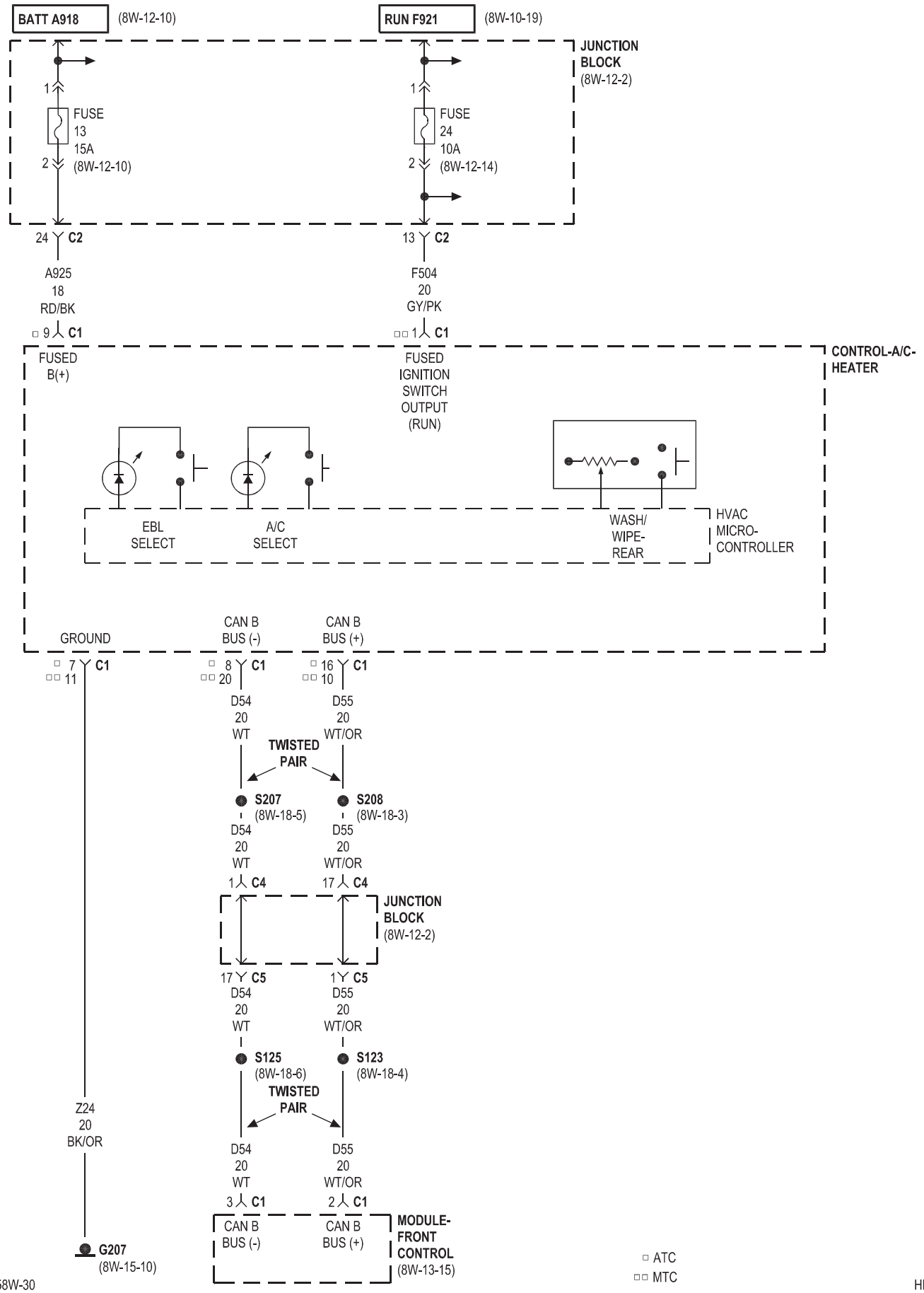


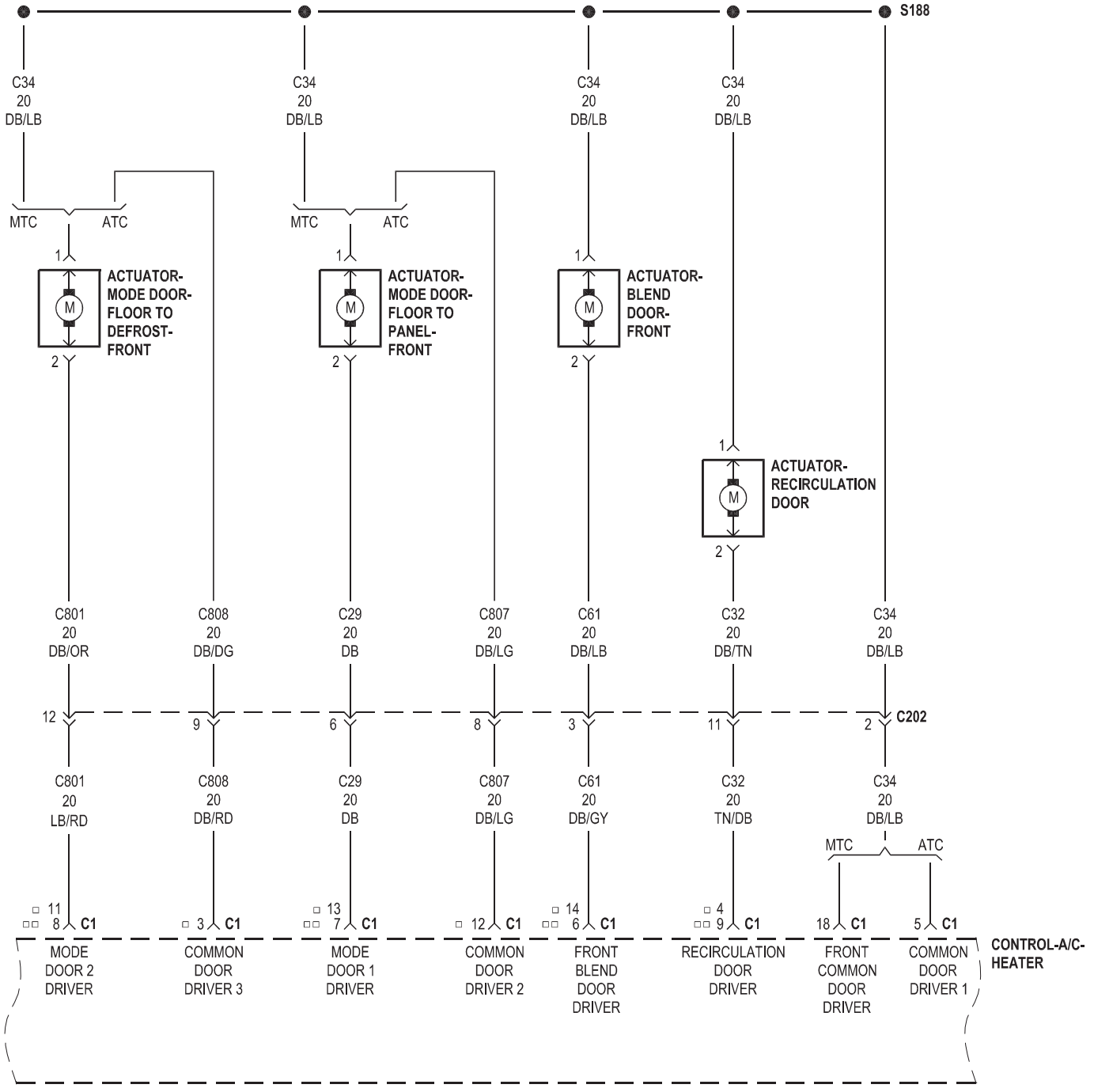
HB504103

J058W-30

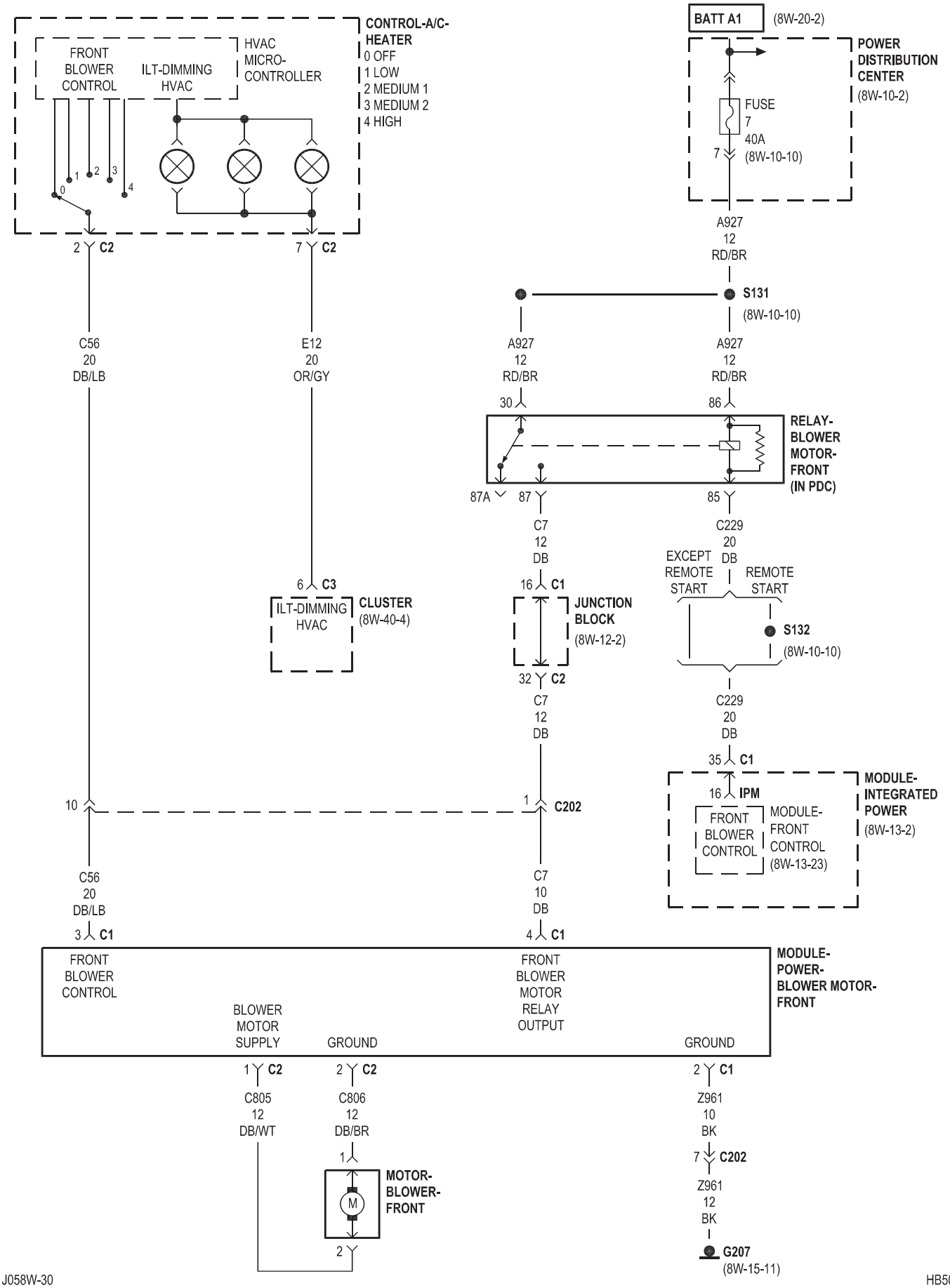
8W-42 AIR CONDITIONING-HEATER

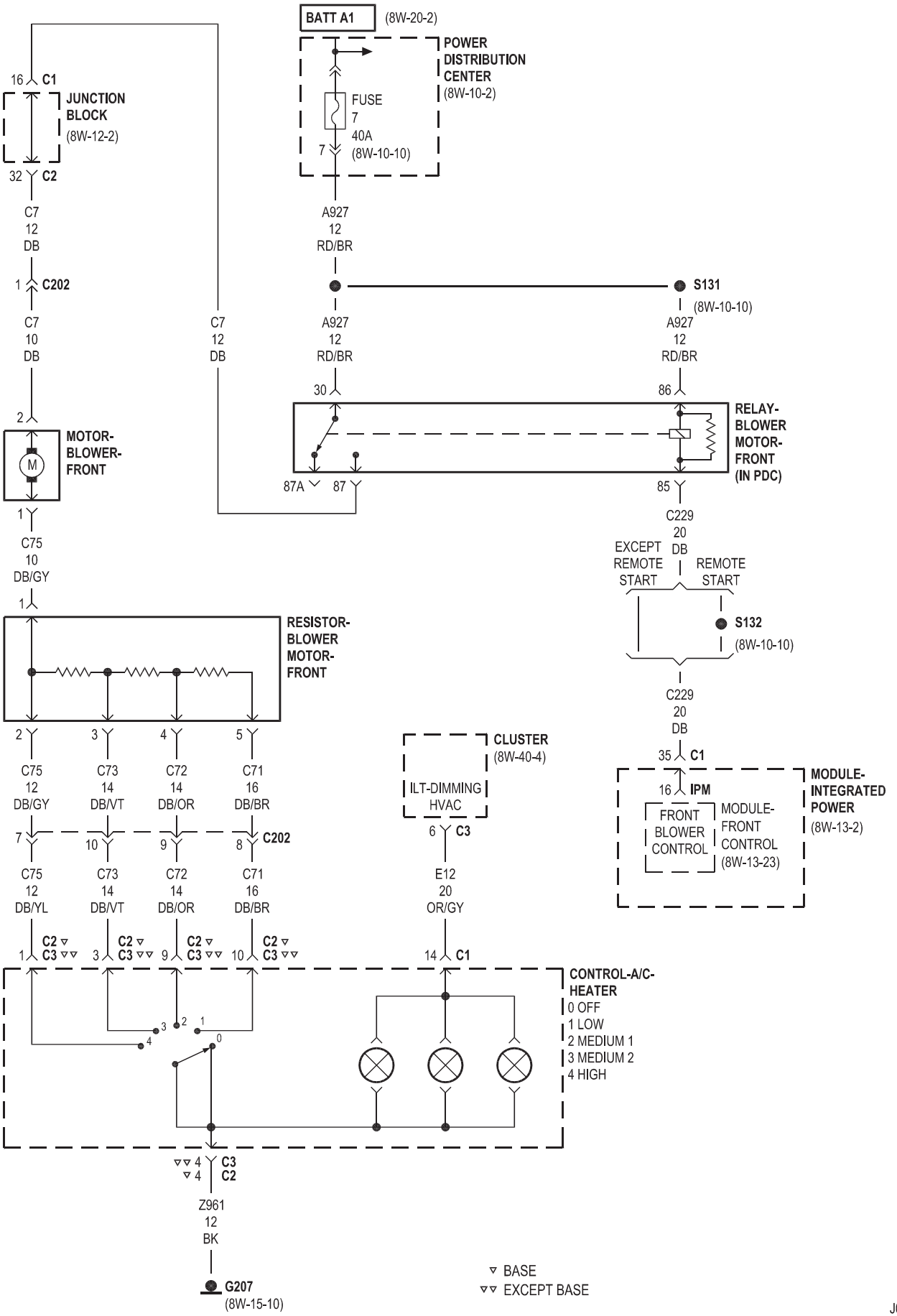
Component	Page
Actuator-Blend Door-Front	8W-42-3
Actuator-Blend Door-Rear	8W-42-6
Actuator-Mode Door-Floor To Defrost-Front	8W-42-3
Actuator-Mode Door-Floor To Panel-Front	8W-42-3
Actuator-Mode Door-Rear	8W-42-6
Actuator-Recirculation Door	8W-42-3
Assembly-Shift Motor/Mode Sensor	8W-42-10
Cluster	8W-42-4, 5, 9
Clutch-A/C Compressor	8W-42-11
Control-A/C-Heater	8W-42-2, 3, 4, 5, 6, 8, 9
Control-A/C-Heater-Rear	8W-42-9
Fuse 7	8W-42-4, 5
Fuse 13	8W-42-2
Fuse 18	8W-42-11
Fuse 19	8W-42-12
Fuse 24	8W-42-2, 7, 9, 11
G100	8W-42-11
G112	8W-42-6
G114	8W-42-7
G207	8W-42-2, 4, 5, 8
G306	8W-42-12
Junction Block	8W-42-2, 4, 5, 6, 7, 9, 11, 12
Module-Electronic Overhead	8W-42-12
Module-Front Control	8W-42-2, 4, 5, 10
Module-Integrated Power	8W-42-4, 5, 10
Module-Power-Blower Motor-Front	8W-42-4
Module-Powertrain Control	8W-42-11
Motor-Blower-Front	8W-42-4, 5
Motor-Blower-Rear	8W-42-7
Power Distribution Center	8W-42-4, 5, 11
Pump-Auxiliary Coolant	8W-42-6
Relay-A/C Clutch	8W-42-11
Relay-Blower Motor-Front	8W-42-4, 5
Relay-Blower Motor-Rear	8W-42-7
Resistor-Blower Motor-Front	8W-42-5
Resistor-Blower Motor-Rear	8W-42-7, 8
Sensor-Ambient Air Temperature	8W-42-10
Sensor-EVAPOrator Temperature	8W-42-6
Sensor-Infrared	8W-42-12
Transducer-A/C Pressure	8W-42-10

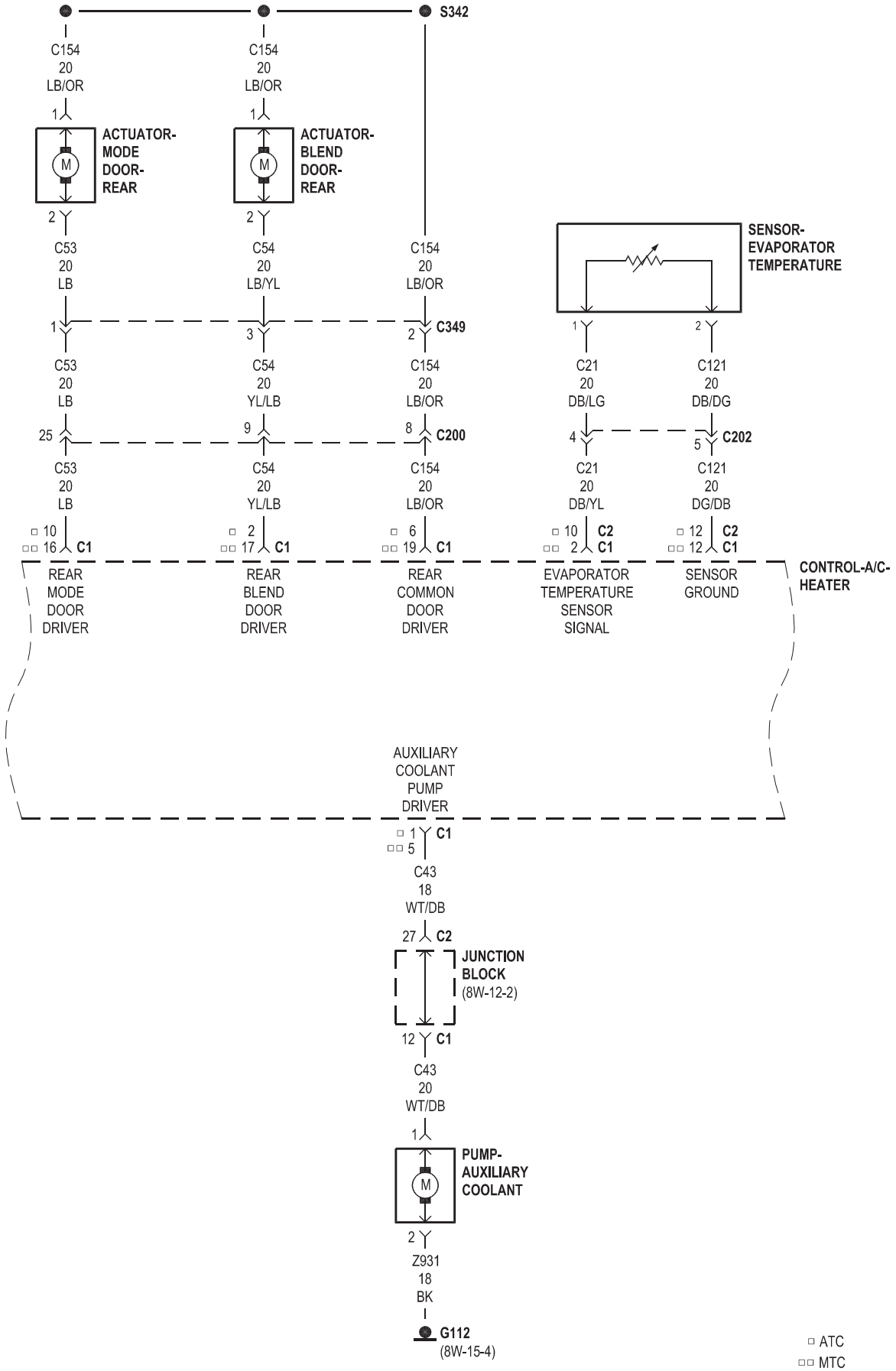

BATT A918
(8W-12-10)
RUN F921
(8W-10-19)
JUNCTION BLOCK
(8W-12-2)
1
FUSE 13 15A
2
(8W-12-10)
1
FUSE 24 10A
2
(8W-12-14)
24 C2
A925 18 RD/BK
9 C1
FUSED B(+)
13 C2
F504 20 GY/PK
1 C1
FUSED IGNITION SWITCH OUTPUT (RUN)
CONTROL-A/C-HEATER
EBL SELECT
A/C SELECT
WASH/ WIPE- REAR
HVAC MICRO-CONTROLLER
GROUND
CAN B BUS (-)
CAN B BUS (+)
7 C1
11
8 C1
20
16 C1
10
D54 20 WT
D55 20 WT/OR
TWISTED PAIR
S207
(8W-18-5)
S208
(8W-18-3)
D54 20 WT
D55 20 WT/OR
1 C4
17 C4
JUNCTION BLOCK
(8W-12-2)
17 C5
1 C5
D54 20 WT
D55 20 WT/OR
S125
(8W-18-6)
S123
(8W-18-4)
TWISTED PAIR
D54 20 WT
D55 20 WT/OR
3 C1
2 C1
CAN B BUS (-)
CAN B BUS (+)
MODULE-FRONT CONTROL
(8W-13-15)
Z24 20 BK/OR
G207
(8W-15-10)
ATC
MTC

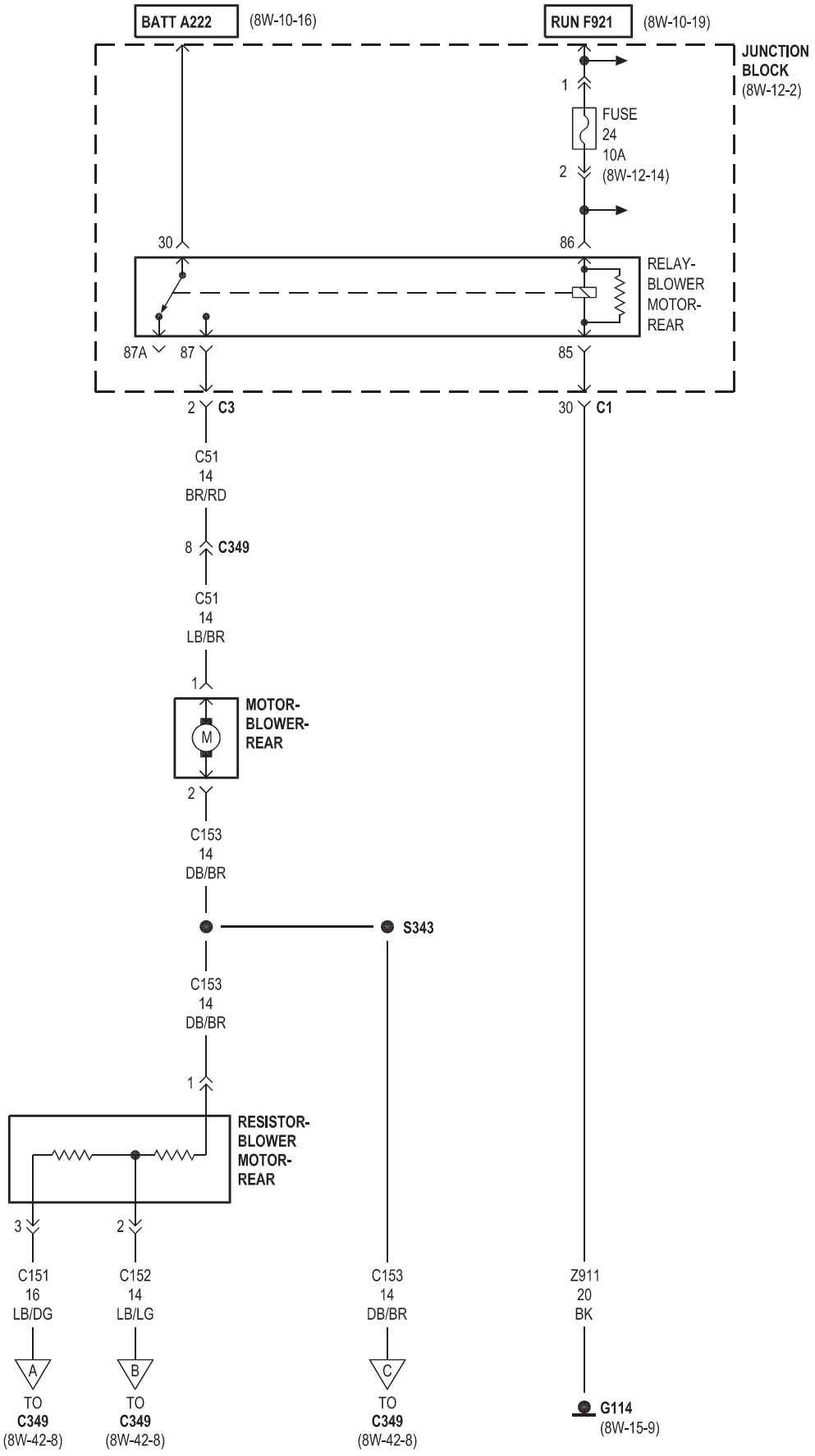

S188
C34
20
DB/LB
MTC
ATC
1
2
M
ACTUATOR-
MODE DOOR-
FLOOR TO
DEFROST-
FRONT
ACTUATOR-
MODE DOOR-
FLOOR TO
PANEL-
FRONT
ACTUATOR-
BLEND
DOOR-
FRONT
ACTUATOR-
RECIRCULATION
DOOR
C801
20
DB/OR
C808
20
DB/DG
C29
20
DB
C807
20
DB/LG
C61
20
DB/LB
C32
20
DB/TN
12
9
6
8
3
11
2
C202
C801
20
LB/RD
C808
20
DB/RD
C29
20
DB
C807
20
DB/LG
C61
20
DB/GY
C32
20
TN/DB
C34
20
DB/LB
11
8
C1
3
13
7
12
14
6
4
9
18
5
MODE
DOOR 2
DRIVER
COMMON
DOOR
DRIVER 3
MODE
DOOR 1
DRIVER
COMMON
DOOR
DRIVER 2
FRONT
BLEND
DOOR
DRIVER
RECIRCULATION
DOOR
DRIVER
FRONT
COMMON
DOOR
DRIVER
COMMON
DOOR
DRIVER 1
CONTROL-A/C-
HEATER

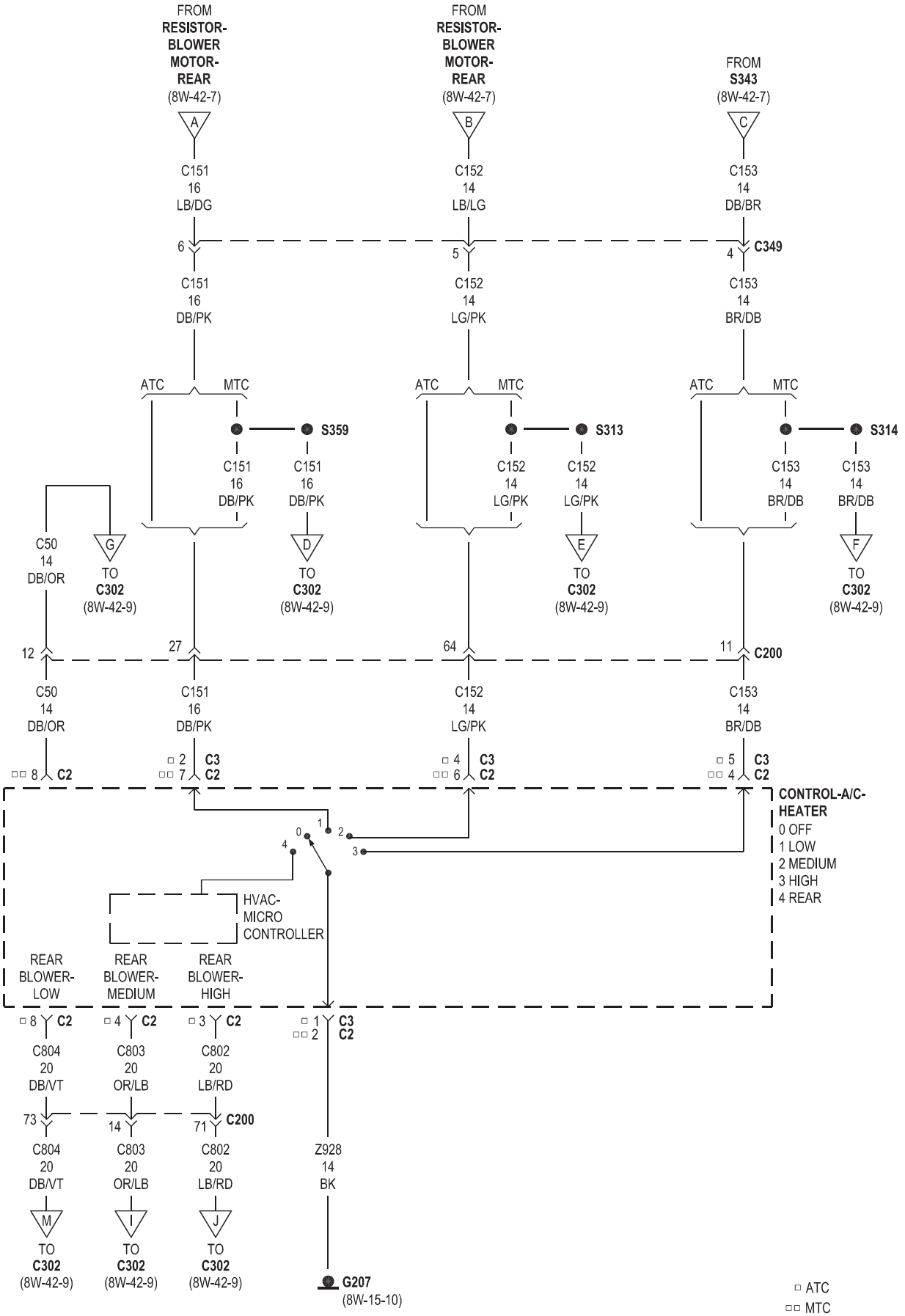
□ ATC
□□ MTC

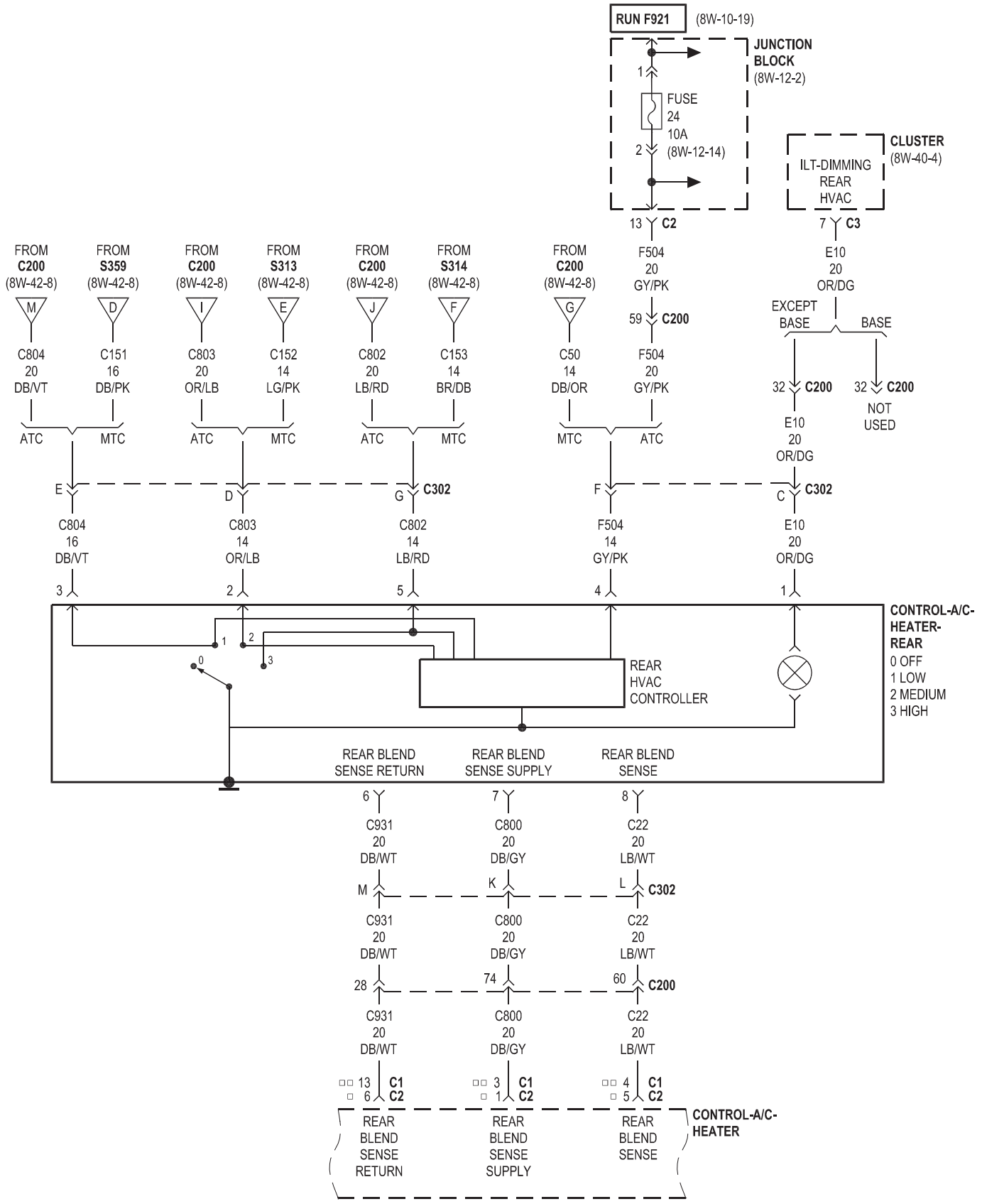

CONTROL-A/C-HEATER
0 OFF
1 LOW
2 MEDIUM 1
3 MEDIUM 2
4 HIGH
FRONT BLOWER CONTROL
ILT-DIMMING HVAC
HVAC MICRO-CONTROLLER
BATT A1
(8W-20-2)
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE 7 40A
(8W-10-10)
A927 12 RD/BR
S131
(8W-10-10)
2 C2
7 C2
C56 20 DB/LB
E12 20 OR/GY
A927 12 RD/BR
A927 12 RD/BR
30
86
RELAY-BLOWER MOTOR-FRONT (IN PDC)
87A
87
85
C7 12 DB
C229 20 DB
EXCEPT REMOTE START
REMOTE START
6 C3
CLUSTER
(8W-40-4)
16 C1
JUNCTION BLOCK
(8W-12-2)
S132
(8W-10-10)
32 C2
C7 12 DB
C229 20 DB
35 C1
16 IPM
FRONT BLOWER CONTROL
MODULE-FRONT CONTROL
(8W-13-23)
MODULE-INTEGRATED POWER
(8W-13-2)
10
1 C202
C56 20 DB/LB
C7 10 DB
3 C1
4 C1
FRONT BLOWER CONTROL
FRONT BLOWER MOTOR RELAY OUTPUT
MODULE-POWER-BLOWER MOTOR-FRONT
BLOWER MOTOR SUPPLY
GROUND
GROUND
1 C2
2 C2
2 C1
C805 12 DB/WT
C806 12 DB/BR
Z961 10 BK
7 C202
Z961 12 BK
1
M
MOTOR-BLOWER-FRONT
2
G207
(8W-15-11)

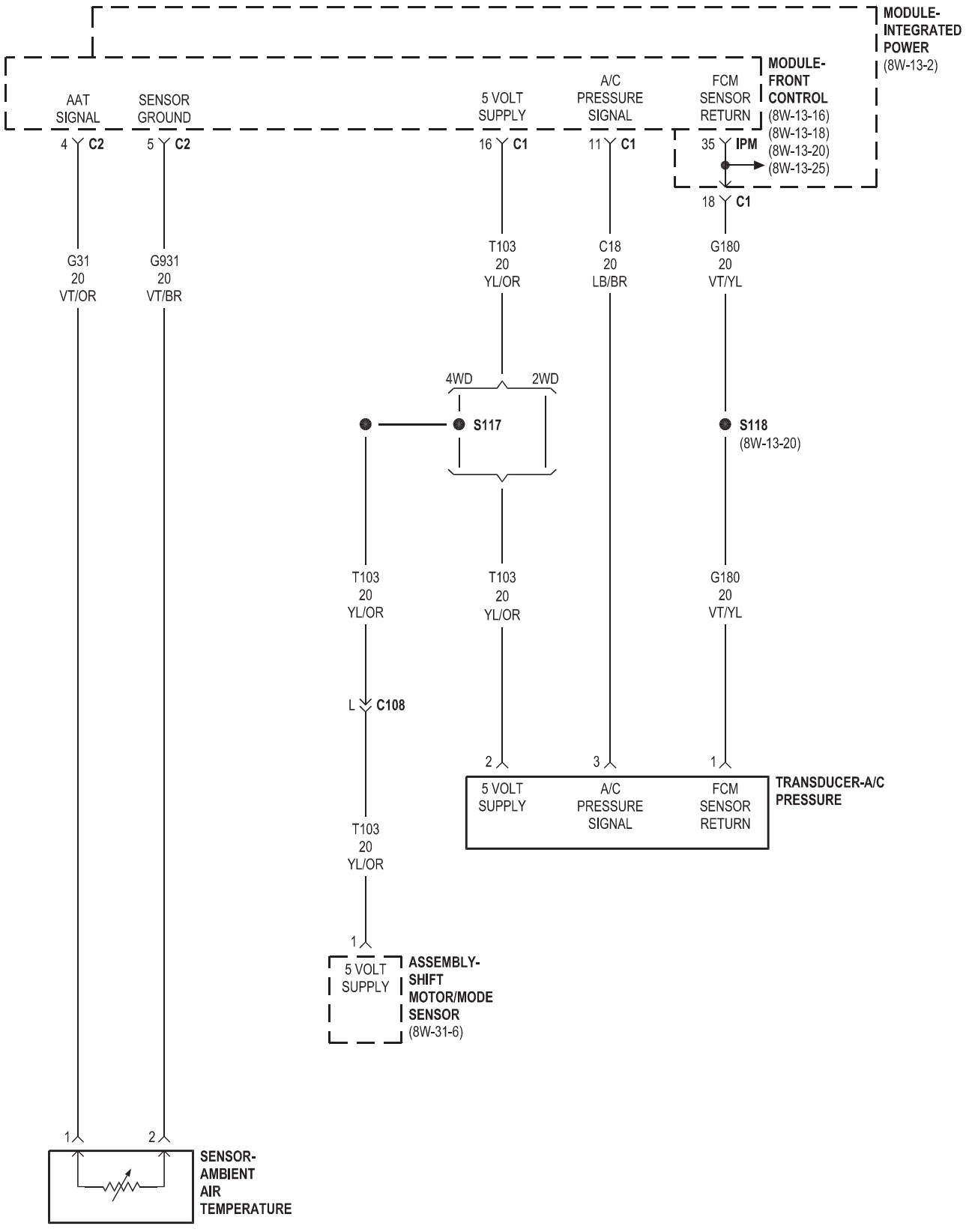

BATT A1
(8W-20-2)
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE 7 40A
(8W-10-10)
16 C1
JUNCTION BLOCK
(8W-12-2)
32 C2
C7 12 DB
1 C202
C7 10 DB
2
MOTOR-BLOWER-FRONT
M
1
C75 10 DB/GY
1
RESISTOR-BLOWER MOTOR-FRONT
2 3 4 5
C75 12 DB/GY
C73 14 DB/VT
C72 14 DB/OR
C71 16 DB/BR
7 10 9 8 C202
C75 12 DB/YL
C73 14 DB/VT
C72 14 DB/OR
C71 16 DB/BR
1 3 9 10
C2 C3
C7 12 DB
A927 12 RD/BR
S131
(8W-10-10)
A927 12 RD/BR
30
87A 87
RELAY-BLOWER MOTOR-FRONT (IN PDC)
86
85
C229 20 DB
EXCEPT REMOTE START
REMOTE START
S132
(8W-10-10)
C229 20 DB
35 C1
16 IPM
FRONT BLOWER CONTROL
MODULE-FRONT CONTROL
(8W-13-23)
MODULE-INTEGRATED POWER
(8W-13-2)
CLUSTER
(8W-40-4)
ILT-DIMMING HVAC
6 C3
E12 20 OR/GY
14 C1
CONTROL-A/C-HEATER
0 OFF
1 LOW
2 MEDIUM 1
3 MEDIUM 2
4 HIGH
4 4 C3 C2
Z961 12 BK
G207
(8W-15-10)
BASE
EXCEPT BASE

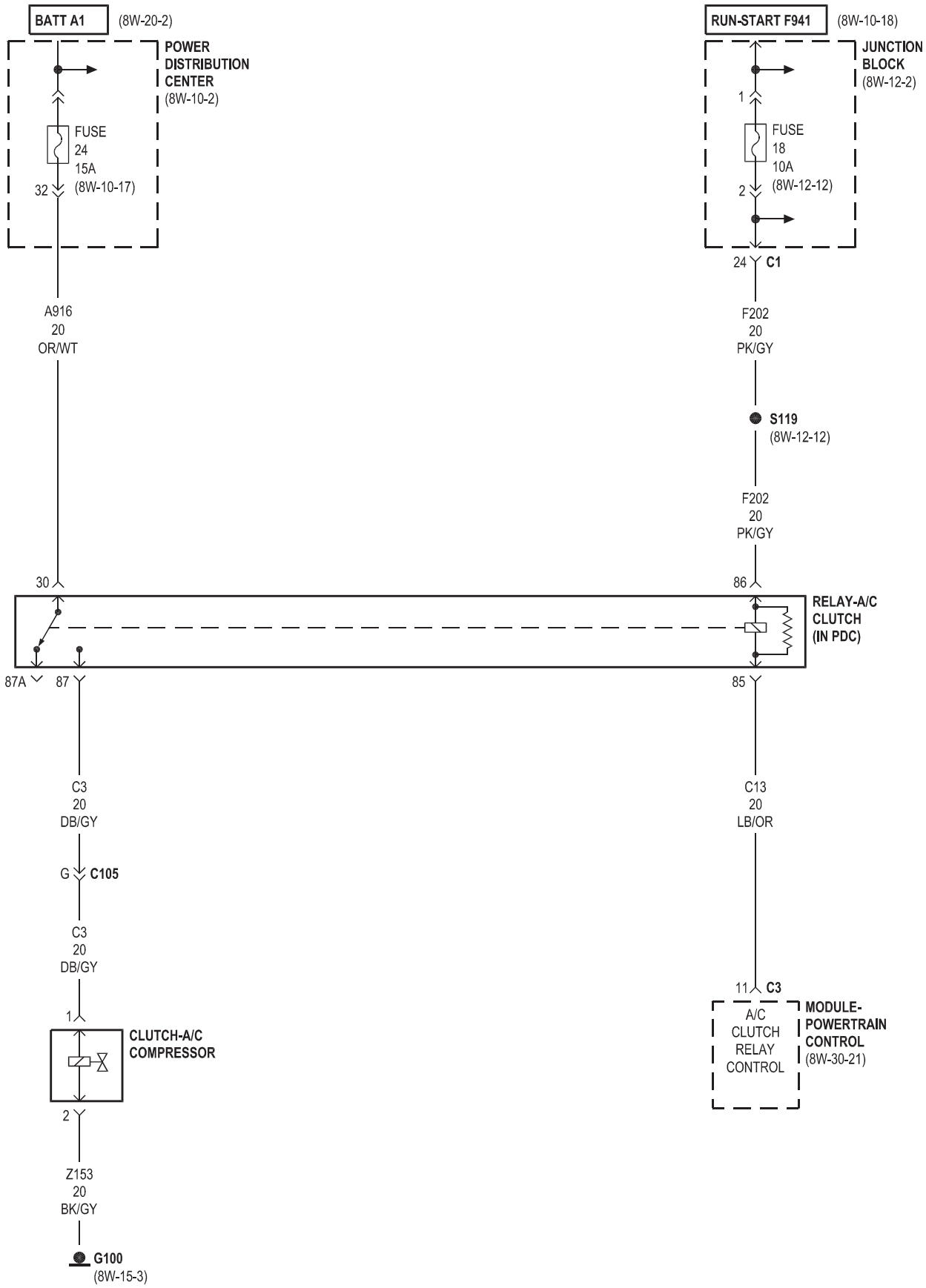

S342
C154
20
LB/OR
1
ACTUATOR-
MODE
DOOR-
REAR
2
C53
20
LB
1
25
C53
20
LB
10
16
C1
REAR
MODE
DOOR
DRIVER
C154
20
LB/OR
1
ACTUATOR-
BLEND
DOOR-
REAR
2
C54
20
LB/YL
3
9
C54
20
YL/LB
2
17
C1
REAR
BLEND
DOOR
DRIVER
C154
20
LB/OR
2
C349
8
C200
C154
20
LB/OR
6
19
C1
REAR
COMMON
DOOR
DRIVER
SENSOR-
EVAPORATOR
TEMPERATURE
1
2
C21
20
DB/LG
4
C121
20
DB/DG
5
C202
C21
20
DB/YL
10
2
C2
C1
EVAPORATOR
TEMPERATURE
SENSOR
SIGNAL
C121
20
DG/DB
12
12
C2
C1
SENSOR
GROUND
CONTROL-A/C-
HEATER
AUXILIARY
COOLANT
PUMP
DRIVER
1
5
C1
C43
18
WT/DB
27
C2
JUNCTION
BLOCK
(8W-12-2)
12
C1
C43
20
WT/DB
1
PUMP-
AUXILIARY
COOLANT
2
Z931
18
BK
G112
(8W-15-4)
ATC
MTC

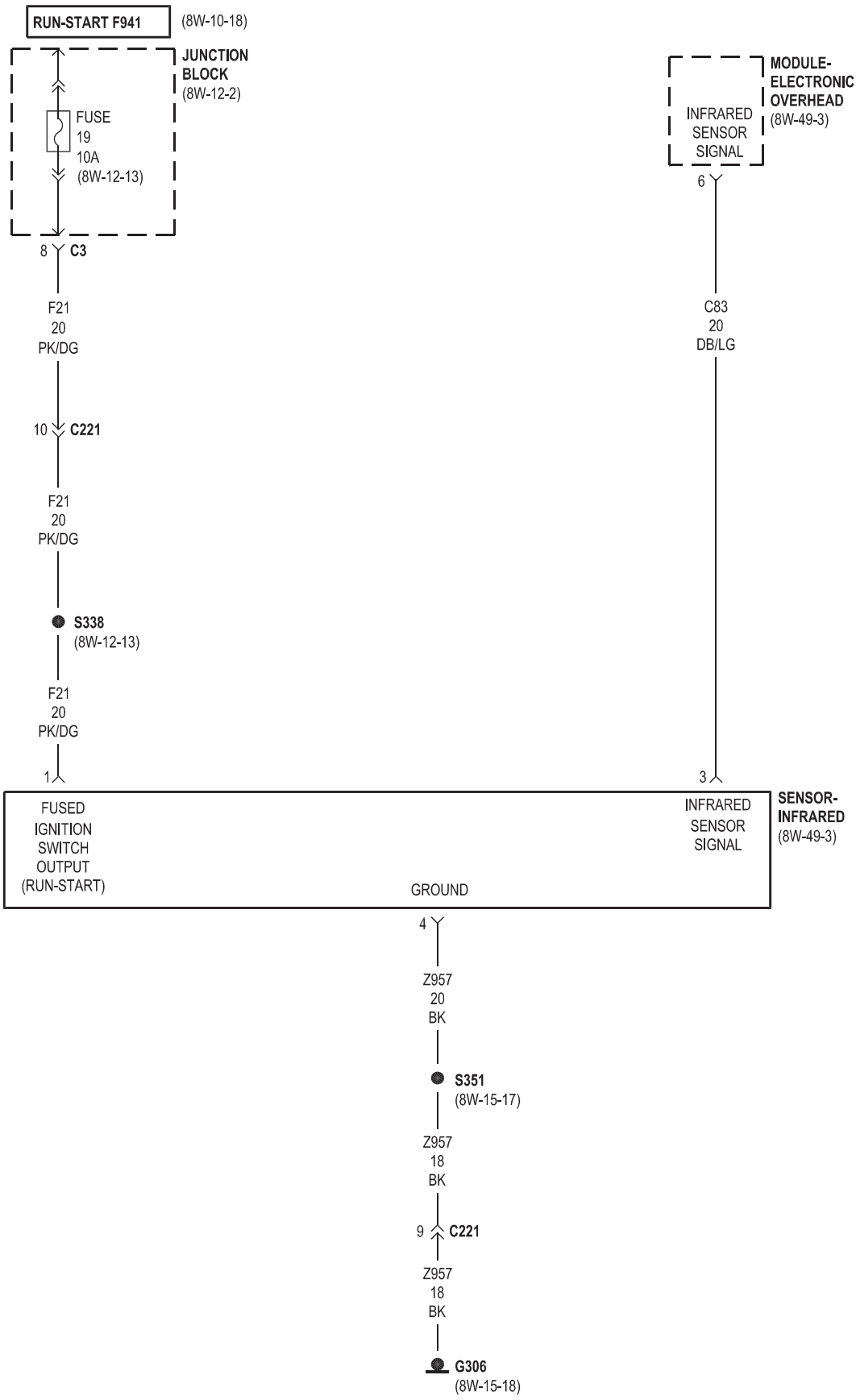

BATT A222
(8W-10-16)
RUN F921
(8W-10-19)
JUNCTION BLOCK
(8W-12-2)
1
FUSE
24
10A
2
(8W-12-14)
30
86
RELAY-
BLOWER
MOTOR-
REAR
87A
87
85
2
C3
30
C1
C51
14
BR/RD
8
C349
C51
14
LB/BR
1
M
MOTOR-
BLOWER-
REAR
2
C153
14
DB/BR
S343
C153
14
DB/BR
1
RESISTOR-
BLOWER
MOTOR-
REAR
3
2
C151
16
LB/DG
C152
14
LB/LG
C153
14
DB/BR
Z911
20
BK
A
B
C
TO
C349
(8W-42-8)
TO
C349
(8W-42-8)
TO
C349
(8W-42-8)
G114
(8W-15-9)


FROM RESISTOR-BLOWER MOTOR-REAR (8W-42-7)
A
C151 16 LB/DG
6
C151 16 DB/PK
FROM RESISTOR-BLOWER MOTOR-REAR (8W-42-7)
B
C152 14 LB/LG
5
C152 14 LG/PK
FROM S343 (8W-42-7)
C
C153 14 DB/BR
4 C349
C153 14 BR/DB
ATC MTC
S359
C151 16 DB/PK
C151 16 DB/PK
D
TO C302 (8W-42-9)
S313
C152 14 LG/PK
C152 14 LG/PK
E
TO C302 (8W-42-9)
S314
C153 14 BR/DB
C153 14 BR/DB
F
TO C302 (8W-42-9)
C50 14 DB/OR
G
TO C302 (8W-42-9)
12
C50 14 DB/OR
27
C151 16 DB/PK
64
C152 14 LG/PK
11 C200
C153 14 BR/DB
□□ 8 C2
□ 2 C3
□□ 7 C2
□ 4 C3
□□ 6 C2
□ 5 C3
□□ 4 C2
CONTROL-A/C-HEATER
0 OFF
1 LOW
2 MEDIUM
3 HIGH
4 REAR
HVAC-MICRO CONTROLLER
REAR BLOWER-LOW
REAR BLOWER-MEDIUM
REAR BLOWER-HIGH
□ 8 C2
□ 4 C2
□ 3 C2
□ 1 C3
□□ 2 C2
C804 20 DB/VT
C803 20 OR/LB
C802 20 LB/RD
73
14
71 C200
C804 20 DB/VT
C803 20 OR/LB
C802 20 LB/RD
Z928 14 BK
M
I
J
TO C302 (8W-42-9)
TO C302 (8W-42-9)
TO C302 (8W-42-9)
G207 (8W-15-10)
□ ATC
□□ MTC


RUN F921
(8W-10-19)
JUNCTION BLOCK
(8W-12-2)
1
FUSE
24
10A
2
(8W-12-14)
CLUSTER
(8W-40-4)
ILT-DIMMING
REAR
HVAC
13 C2
7 C3
F504
20
GY/PK
59 C200
E10
20
OR/DG
EXCEPT BASE
BASE
32 C200
32 C200
NOT USED
FROM C200 (8W-42-8)
FROM S359 (8W-42-8)
FROM C200 (8W-42-8)
FROM S313 (8W-42-8)
FROM C200 (8W-42-8)
FROM S314 (8W-42-8)
FROM C200 (8W-42-8)
M
D
I
E
J
F
G
C804
20
DB/VT
C151
16
DB/PK
C803
20
OR/LB
C152
14
LG/PK
C802
20
LB/RD
C153
14
BR/DB
C50
14
DB/OR
ATC
MTC
E
D
G C302
F
C C302
C804
16
DB/VT
C803
14
OR/LB
C802
14
LB/RD
F504
14
GY/PK
E10
20
OR/DG
3
2
5
4
1
CONTROL-A/C-HEATER-REAR
0 OFF
1 LOW
2 MEDIUM
3 HIGH
REAR HVAC CONTROLLER
REAR BLEND SENSE RETURN
REAR BLEND SENSE SUPPLY
REAR BLEND SENSE
6
7
8
C931
20
DB/WT
C800
20
DB/GY
C22
20
LB/WT
M
K
L C302
28
74
60 C200
□□ 13 C1
□ 6 C2
□□ 3 C1
□ 1 C2
□□ 4 C1
□ 5 C2
REAR BLEND SENSE RETURN
REAR BLEND SENSE SUPPLY
REAR BLEND SENSE
CONTROL-A/C-HEATER
□ ATC
□□ MTC

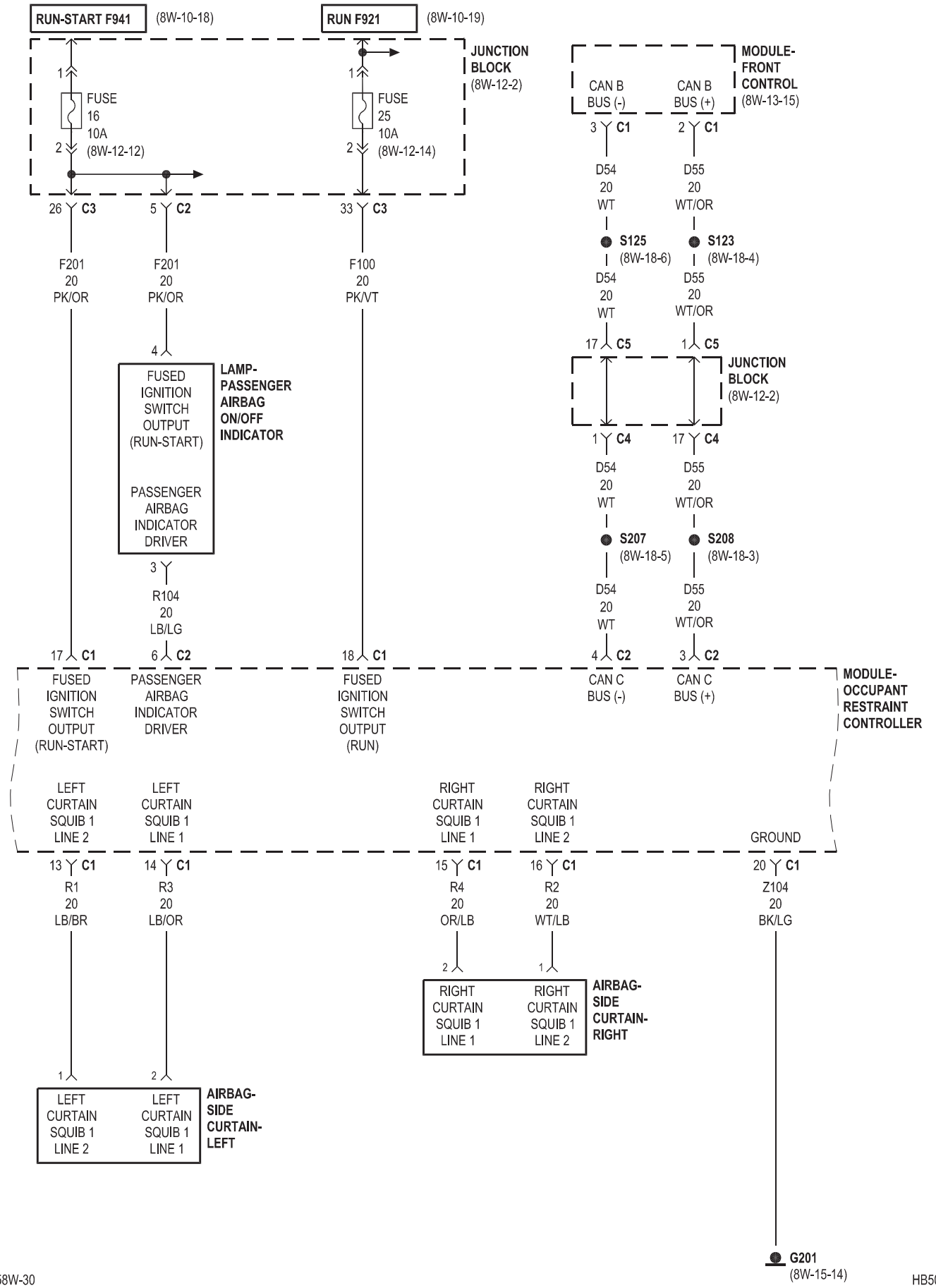

MODULE-INTEGRATED POWER (8W-13-2)
MODULE-FRONT CONTROL (8W-13-16) (8W-13-18) (8W-13-20) (8W-13-25)
AAT SIGNAL
SENSOR GROUND
5 VOLT SUPPLY
A/C PRESSURE SIGNAL
FCM SENSOR RETURN
4 C2
5 C2
16 C1
11 C1
35 IPM
18 C1
G31 20 VT/OR
G931 20 VT/BR
T103 20 YL/OR
C18 20 LB/BR
G180 20 VT/YL
4WD
2WD
S117
S118 (8W-13-20)
T103 20 YL/OR
T103 20 YL/OR
G180 20 VT/YL
L C108
2
3
1
5 VOLT SUPPLY
A/C PRESSURE SIGNAL
FCM SENSOR RETURN
TRANSDUCER-A/C PRESSURE
T103 20 YL/OR
1
5 VOLT SUPPLY
ASSEMBLY-SHIFT MOTOR/MODE SENSOR (8W-31-6)
1
2
SENSOR-AMBIENT AIR TEMPERATURE

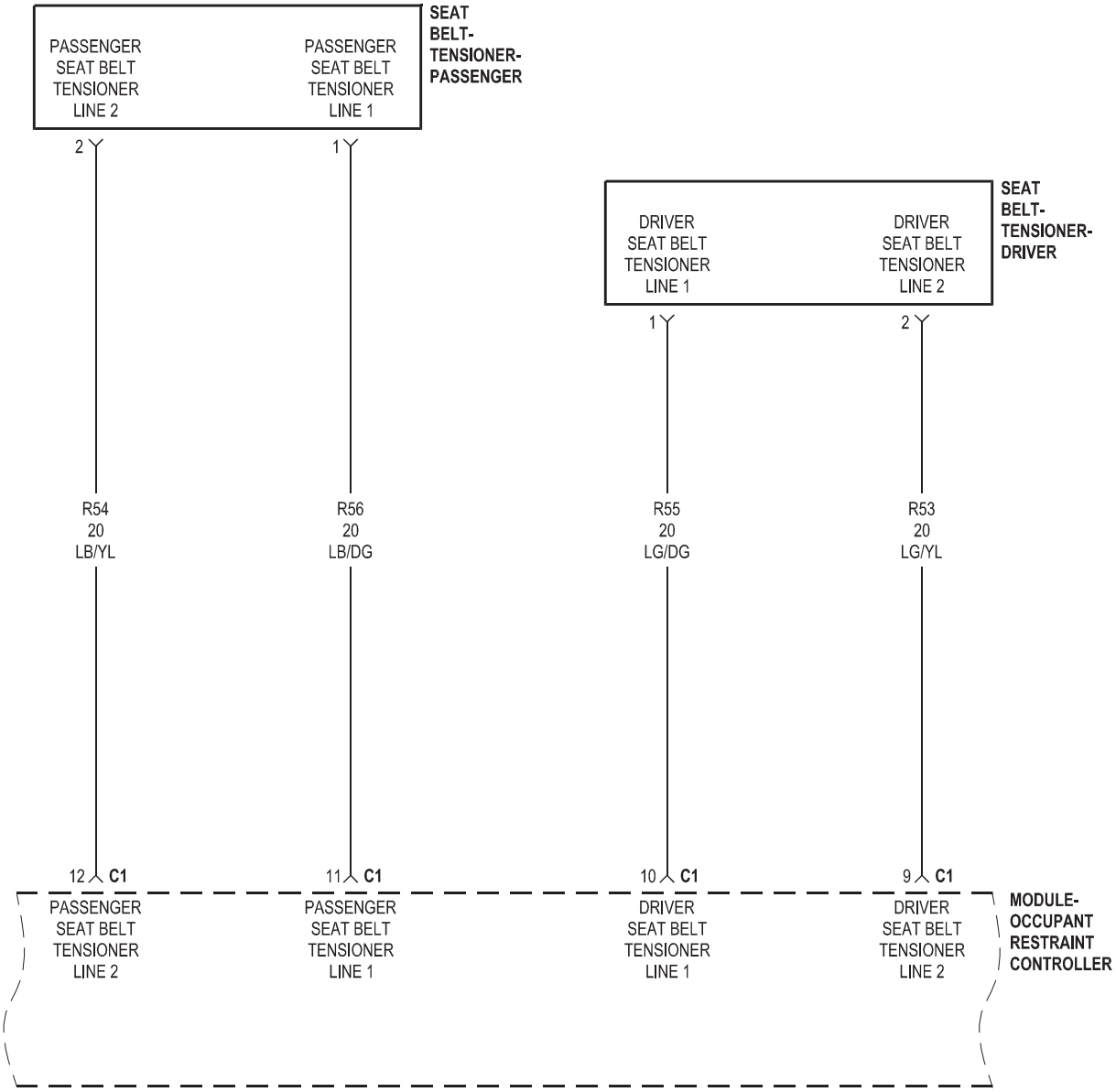

BATT A1
(8W-20-2)
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE 24 15A
32
(8W-10-17)
A916 20 OR/WT
30
RUN-START F941
(8W-10-18)
JUNCTION BLOCK
(8W-12-2)
1
FUSE 18 10A
2
(8W-12-12)
24 C1
F202 20 PK/GY
S119
(8W-12-12)
F202 20 PK/GY
86
RELAY-A/C CLUTCH (IN PDC)
87A
87
85
C3 20 DB/GY
G C105
C3 20 DB/GY
1
CLUTCH-A/C COMPRESSOR
2
Z153 20 BK/GY
G100
(8W-15-3)
C13 20 LB/OR
11 C3
A/C CLUTCH RELAY CONTROL
MODULE-POWERTRAIN CONTROL
(8W-30-21)

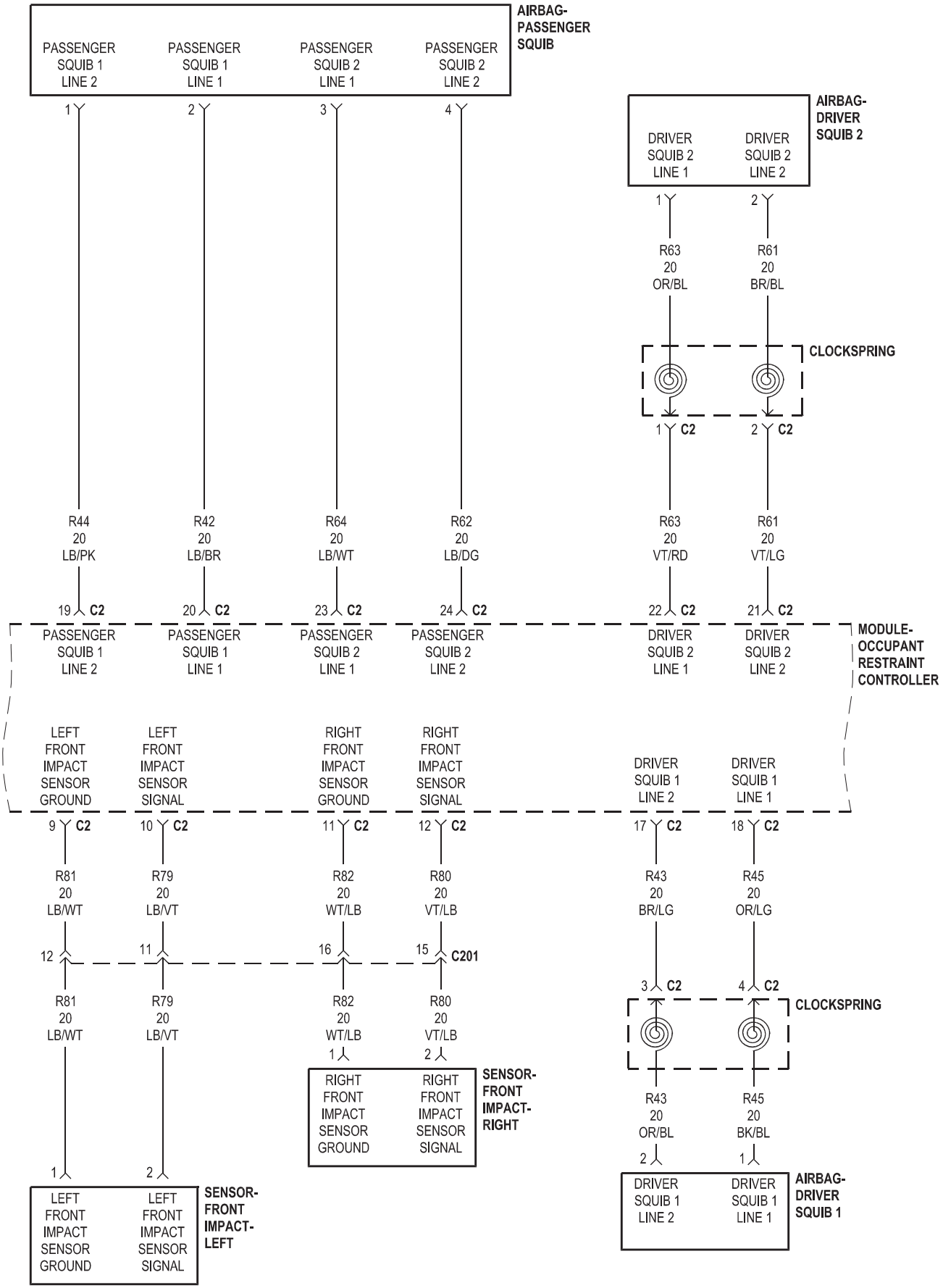

RUN-START F941
(8W-10-18)
JUNCTION BLOCK
(8W-12-2)
FUSE
19
10A
(8W-12-13)
8
C3
F21
20
PK/DG
10
C221
F21
20
PK/DG
S338
(8W-12-13)
F21
20
PK/DG
1
FUSED IGNITION SWITCH OUTPUT (RUN-START)
MODULE-ELECTRONIC OVERHEAD
(8W-49-3)
INFRARED SENSOR SIGNAL
6
C83
20
DB/LG
3
INFRARED SENSOR SIGNAL
SENSOR-INFRARED
(8W-49-3)
GROUND
4
Z957
20
BK
S351
(8W-15-17)
Z957
18
BK
9
C221
Z957
18
BK
G306
(8W-15-18)

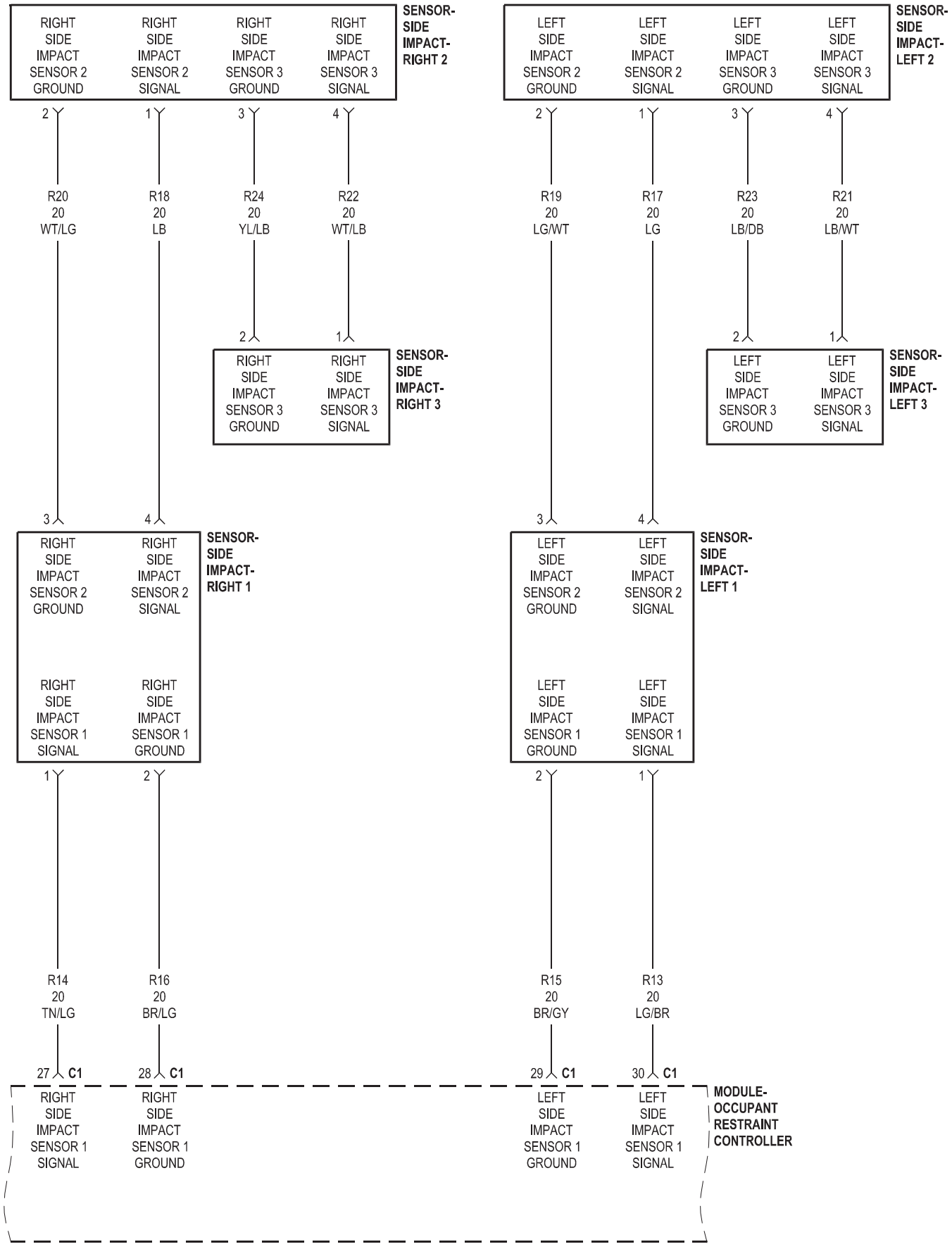
8W-43 AIRBAG SYSTEM

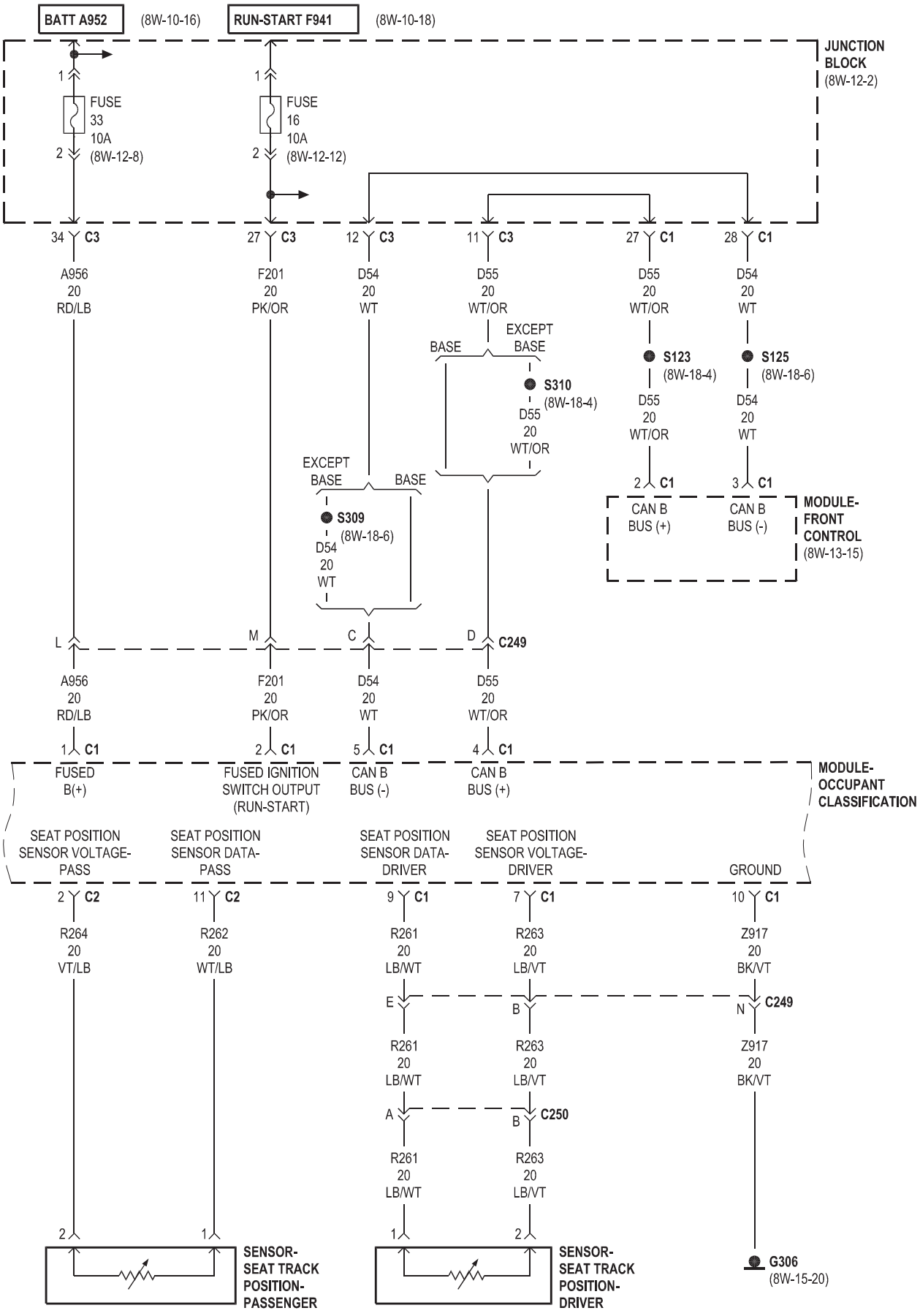
Component	Page
Airbag-Driver Squib 1	8W-43-4
Airbag-Driver Squib 2	8W-43-4
Airbag-Passenger Squib	8W-43-4
Airbag-Side Curtain-Left	8W-43-2
Airbag-Side Curtain-Right	8W-43-2
Clockspring	8W-43-4
Fuse 16	8W-43-2, 6
Fuse 25	8W-43-2
Fuse 33	8W-43-6
G201	8W-43-2
G306	8W-43-6
Junction Block	8W-43-2, 6
Lamp-Passenger Airbag On/Off Indicator	8W-43-2
Module-Front Control	8W-43-2, 6
Module-Occupant Classification	8W-43-6, 7
Module-Occupant Restraint Controller	8W-43-2, 3, 4, 5
Seat Belt-Tensioner-Driver	8W-43-3
Seat Belt-Tensioner-Passenger	8W-43-3
Sensor-Front Impact-Left	8W-43-4
Sensor-Front Impact-Right	8W-43-4
Sensor-Seat Track Position-Driver	8W-43-6
Sensor-Seat Track Position-Passenger	8W-43-6
Sensor-Seat Weight-Left Front	8W-43-7
Sensor-Seat Weight-Left Rear	8W-43-7
Sensor-Seat Weight-Right Front	8W-43-7
Sensor-Seat Weight-Right Rear	8W-43-7
Sensor-Side Impact-Left 1	8W-43-5
Sensor-Side Impact-Left 2	8W-43-5
Sensor-Side Impact-Left 3	8W-43-5
Sensor-Side Impact-Right 1	8W-43-5
Sensor-Side Impact-Right 2	8W-43-5
Sensor-Side Impact-Right 3	8W-43-5

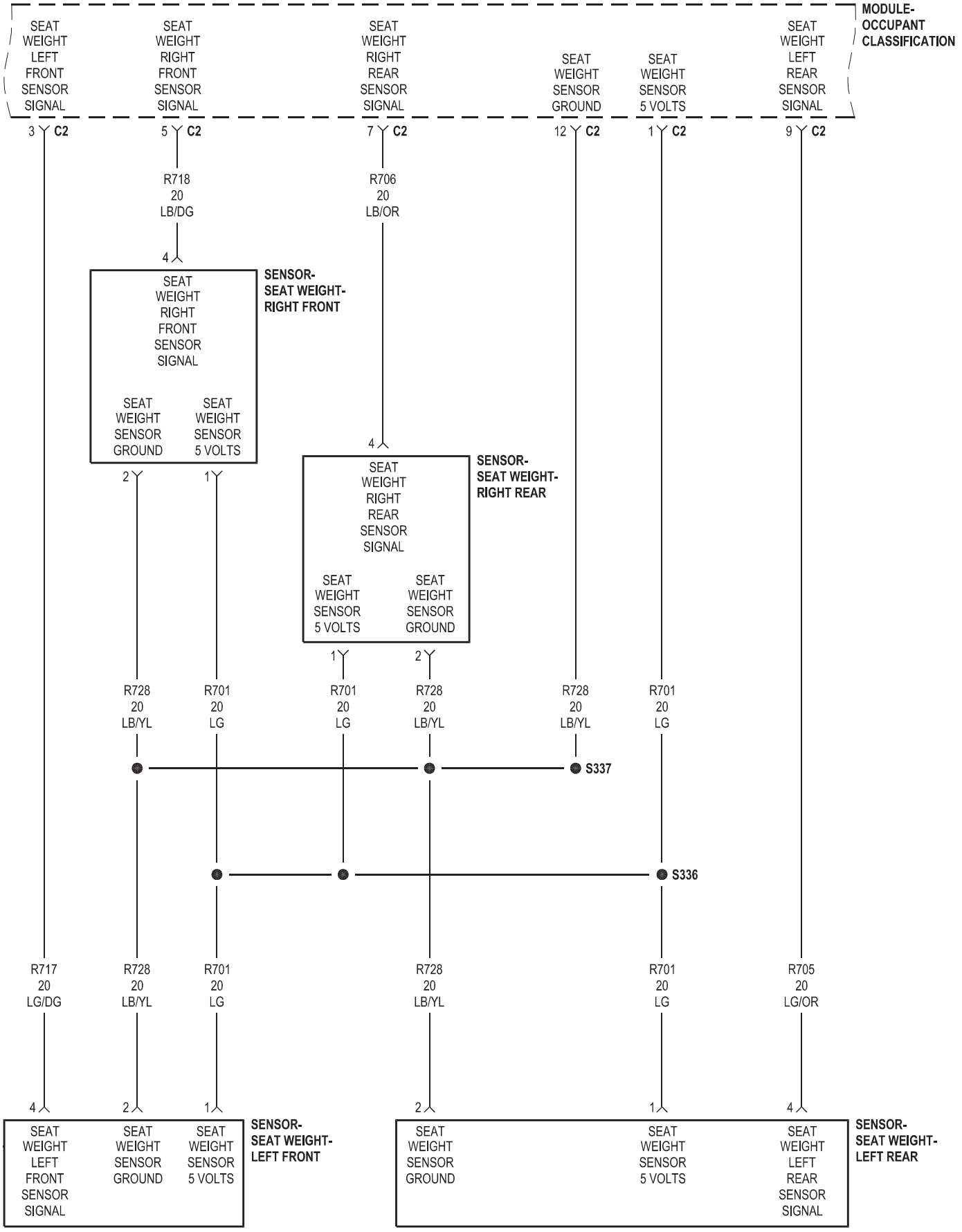

RUN-START F941
(8W-10-18)
RUN F921
(8W-10-19)
JUNCTION BLOCK (8W-12-2)
FUSE 16 10A (8W-12-12)
FUSE 25 10A (8W-12-14)
MODULE-FRONT CONTROL (8W-13-15)
CAN B BUS (-)
CAN B BUS (+)
D54 20 WT
D55 20 WT/OR
S125 (8W-18-6)
S123 (8W-18-4)
JUNCTION BLOCK (8W-12-2)
S207 (8W-18-5)
S208 (8W-18-3)
F201 20 PK/OR
F201 20 PK/OR
F100 20 PK/VT
LAMP-PASSENGER AIRBAG ON/OFF INDICATOR
FUSED IGNITION SWITCH OUTPUT (RUN-START)
PASSENGER AIRBAG INDICATOR DRIVER
R104 20 LB/LG
CAN C BUS (-)
CAN C BUS (+)
MODULE-OCCUPANT RESTRAINT CONTROLLER
FUSED IGNITION SWITCH OUTPUT (RUN-START)
PASSENGER AIRBAG INDICATOR DRIVER
FUSED IGNITION SWITCH OUTPUT (RUN)
LEFT CURTAIN SQUIB 1 LINE 2
LEFT CURTAIN SQUIB 1 LINE 1
RIGHT CURTAIN SQUIB 1 LINE 1
RIGHT CURTAIN SQUIB 1 LINE 2
GROUND
R1 20 LB/BR
R3 20 LB/OR
R4 20 OR/LB
R2 20 WT/LB
Z104 20 BK/LG
AIRBAG-SIDE CURTAIN-LEFT
AIRBAG-SIDE CURTAIN-RIGHT
G201 (8W-15-14)


SEAT BELT-TENSIONER-PASSENGER
PASSENGER SEAT BELT TENSIONER LINE 2
PASSENGER SEAT BELT TENSIONER LINE 1
2
1
SEAT BELT-TENSIONER-DRIVER
DRIVER SEAT BELT TENSIONER LINE 1
DRIVER SEAT BELT TENSIONER LINE 2
1
2
R54 20 LB/YL
R56 20 LB/DG
R55 20 LG/DG
R53 20 LG/YL
12 C1
11 C1
10 C1
9 C1
PASSENGER SEAT BELT TENSIONER LINE 2
PASSENGER SEAT BELT TENSIONER LINE 1
DRIVER SEAT BELT TENSIONER LINE 1
DRIVER SEAT BELT TENSIONER LINE 2
MODULE-OCCUPANT RESTRAINT CONTROLLER


AIRBAG-
PASSENGER
SQUIB
PASSENGER
SQUIB 1
LINE 2
PASSENGER
SQUIB 1
LINE 1
PASSENGER
SQUIB 2
LINE 1
PASSENGER
SQUIB 2
LINE 2
1
2
3
4
AIRBAG-
DRIVER
SQUIB 2
DRIVER
SQUIB 2
LINE 1
DRIVER
SQUIB 2
LINE 2
1
2
R63
20
OR/BL
R61
20
BR/BL
CLOCKSPRING
1 C2
2 C2
R44
20
LB/PK
R42
20
LB/BR
R64
20
LB/WT
R62
20
LB/DG
R63
20
VT/RD
R61
20
VT/LG
19 C2
20 C2
23 C2
24 C2
22 C2
21 C2
PASSENGER
SQUIB 1
LINE 2
PASSENGER
SQUIB 1
LINE 1
PASSENGER
SQUIB 2
LINE 1
PASSENGER
SQUIB 2
LINE 2
DRIVER
SQUIB 2
LINE 1
DRIVER
SQUIB 2
LINE 2
MODULE-
OCCUPANT
RESTRAINT
CONTROLLER
LEFT
FRONT
IMPACT
SENSOR
GROUND
LEFT
FRONT
IMPACT
SENSOR
SIGNAL
RIGHT
FRONT
IMPACT
SENSOR
GROUND
RIGHT
FRONT
IMPACT
SENSOR
SIGNAL
DRIVER
SQUIB 1
LINE 2
DRIVER
SQUIB 1
LINE 1
9 C2
10 C2
11 C2
12 C2
17 C2
18 C2
R81
20
LB/WT
R79
20
LB/VT
R82
20
WT/LB
R80
20
VT/LB
R43
20
BR/LG
R45
20
OR/LG
12
11
16
15 C201
3 C2
4 C2
CLOCKSPRING
R81
20
LB/WT
R79
20
LB/VT
R82
20
WT/LB
R80
20
VT/LB
R43
20
OR/BL
R45
20
BK/BL
1
2
1
2
2
1
RIGHT
FRONT
IMPACT
SENSOR
GROUND
RIGHT
FRONT
IMPACT
SENSOR
SIGNAL
SENSOR-
FRONT
IMPACT-
RIGHT
DRIVER
SQUIB 1
LINE 2
DRIVER
SQUIB 1
LINE 1
AIRBAG-
DRIVER
SQUIB 1
LEFT
FRONT
IMPACT
SENSOR
GROUND
LEFT
FRONT
IMPACT
SENSOR
SIGNAL
SENSOR-
FRONT
IMPACT-
LEFT

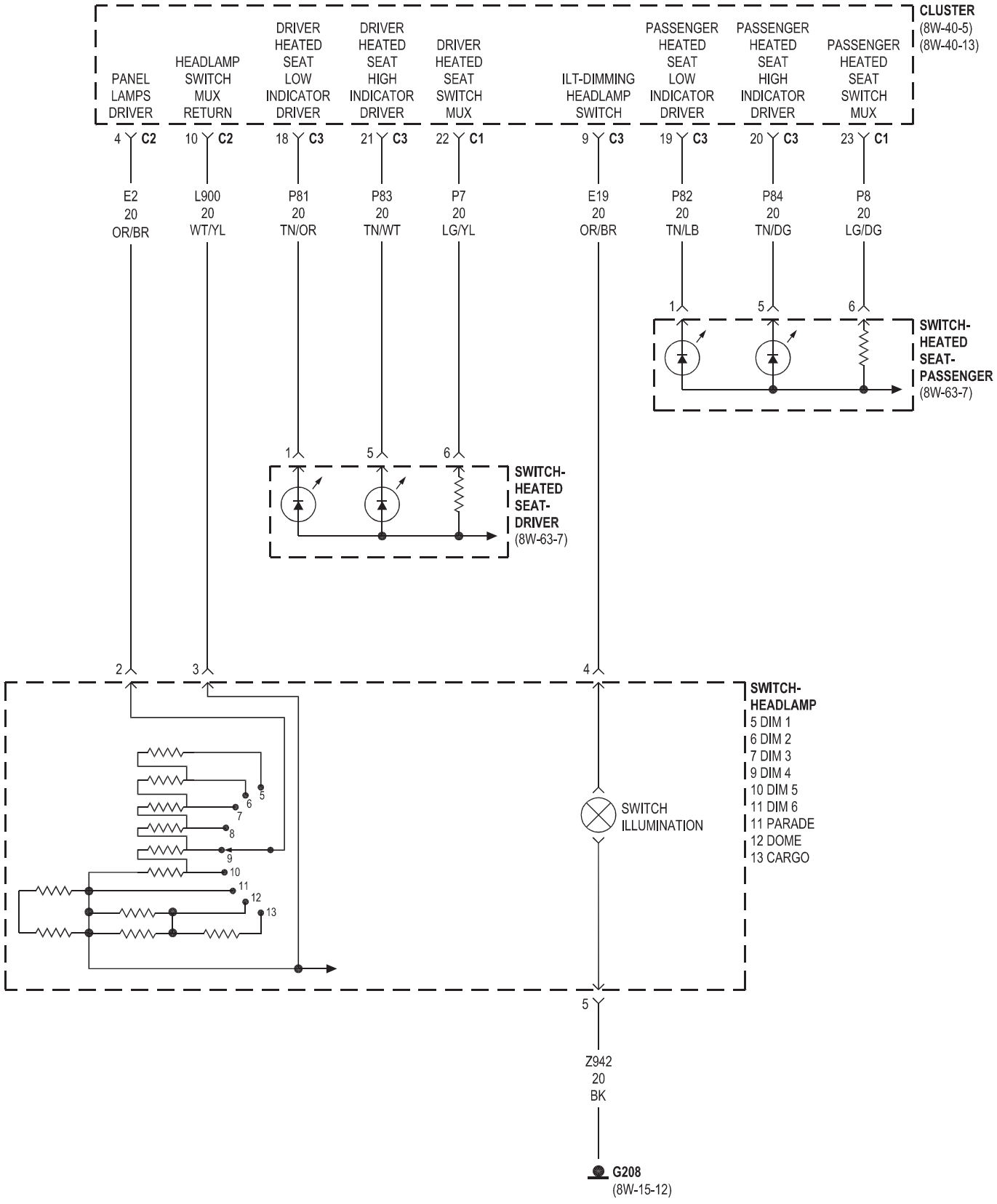

RIGHT SIDE IMPACT SENSOR 2 GROUND
RIGHT SIDE IMPACT SENSOR 2 SIGNAL
RIGHT SIDE IMPACT SENSOR 3 GROUND
RIGHT SIDE IMPACT SENSOR 3 SIGNAL
SENSOR-SIDE IMPACT-RIGHT 2
2
1
3
4
R20 20 WT/LG
R18 20 LB
R24 20 YL/LB
R22 20 WT/LB
2
1
RIGHT SIDE IMPACT SENSOR 3 GROUND
RIGHT SIDE IMPACT SENSOR 3 SIGNAL
SENSOR-SIDE IMPACT-RIGHT 3
3
4
RIGHT SIDE IMPACT SENSOR 2 GROUND
RIGHT SIDE IMPACT SENSOR 2 SIGNAL
SENSOR-SIDE IMPACT-RIGHT 1
RIGHT SIDE IMPACT SENSOR 1 SIGNAL
RIGHT SIDE IMPACT SENSOR 1 GROUND
1
2
R14 20 TN/LG
R16 20 BR/LG
27 C1
28 C1
LEFT SIDE IMPACT SENSOR 2 GROUND
LEFT SIDE IMPACT SENSOR 2 SIGNAL
LEFT SIDE IMPACT SENSOR 3 GROUND
LEFT SIDE IMPACT SENSOR 3 SIGNAL
SENSOR-SIDE IMPACT-LEFT 2
2
1
3
4
R19 20 LG/WT
R17 20 LG
R23 20 LB/DB
R21 20 LB/WT
2
1
LEFT SIDE IMPACT SENSOR 3 GROUND
LEFT SIDE IMPACT SENSOR 3 SIGNAL
SENSOR-SIDE IMPACT-LEFT 3
3
4
LEFT SIDE IMPACT SENSOR 2 GROUND
LEFT SIDE IMPACT SENSOR 2 SIGNAL
SENSOR-SIDE IMPACT-LEFT 1
LEFT SIDE IMPACT SENSOR 1 GROUND
LEFT SIDE IMPACT SENSOR 1 SIGNAL
2
1
R15 20 BR/GY
R13 20 LG/BR
29 C1
30 C1
MODULE-OCCUPANT RESTRAINT CONTROLLER

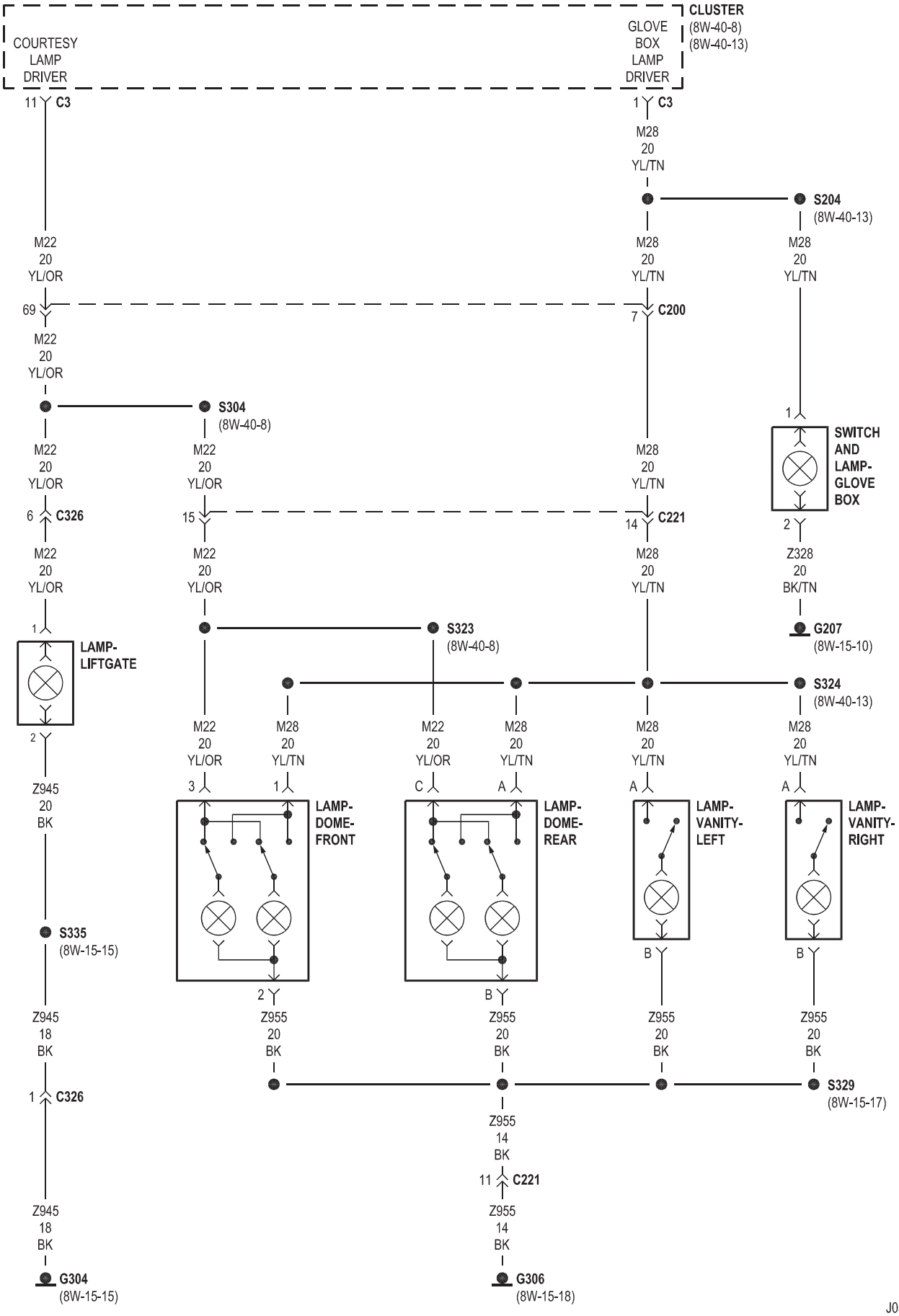

BATT A952
(8W-10-16)
RUN-START F941
(8W-10-18)
JUNCTION BLOCK (8W-12-2)
FUSE 33 10A (8W-12-8)
FUSE 16 10A (8W-12-12)
34 C3
27 C3
12 C3
11 C3
27 C1
28 C1
A956 20 RD/LB
F201 20 PK/OR
D54 20 WT
D55 20 WT/OR
EXCEPT BASE
BASE
S310 (8W-18-4)
S123 (8W-18-4)
S125 (8W-18-6)
S309 (8W-18-6)
CAN B BUS (+)
CAN B BUS (-)
MODULE-FRONT CONTROL (8W-13-15)
C249
FUSED B(+)
FUSED IGNITION SWITCH OUTPUT (RUN-START)
CAN B BUS (-)
CAN B BUS (+)
MODULE-OCCUPANT CLASSIFICATION
SEAT POSITION SENSOR VOLTAGE-PASS
SEAT POSITION SENSOR DATA-PASS
SEAT POSITION SENSOR DATA-DRIVER
SEAT POSITION SENSOR VOLTAGE-DRIVER
GROUND
C2
C1
R264 20 VT/LB
R262 20 WT/LB
R261 20 LB/WT
R263 20 LB/VT
Z917 20 BK/VT
C250
SENSOR-SEAT TRACK POSITION-PASSENGER
SENSOR-SEAT TRACK POSITION-DRIVER
G306 (8W-15-20)

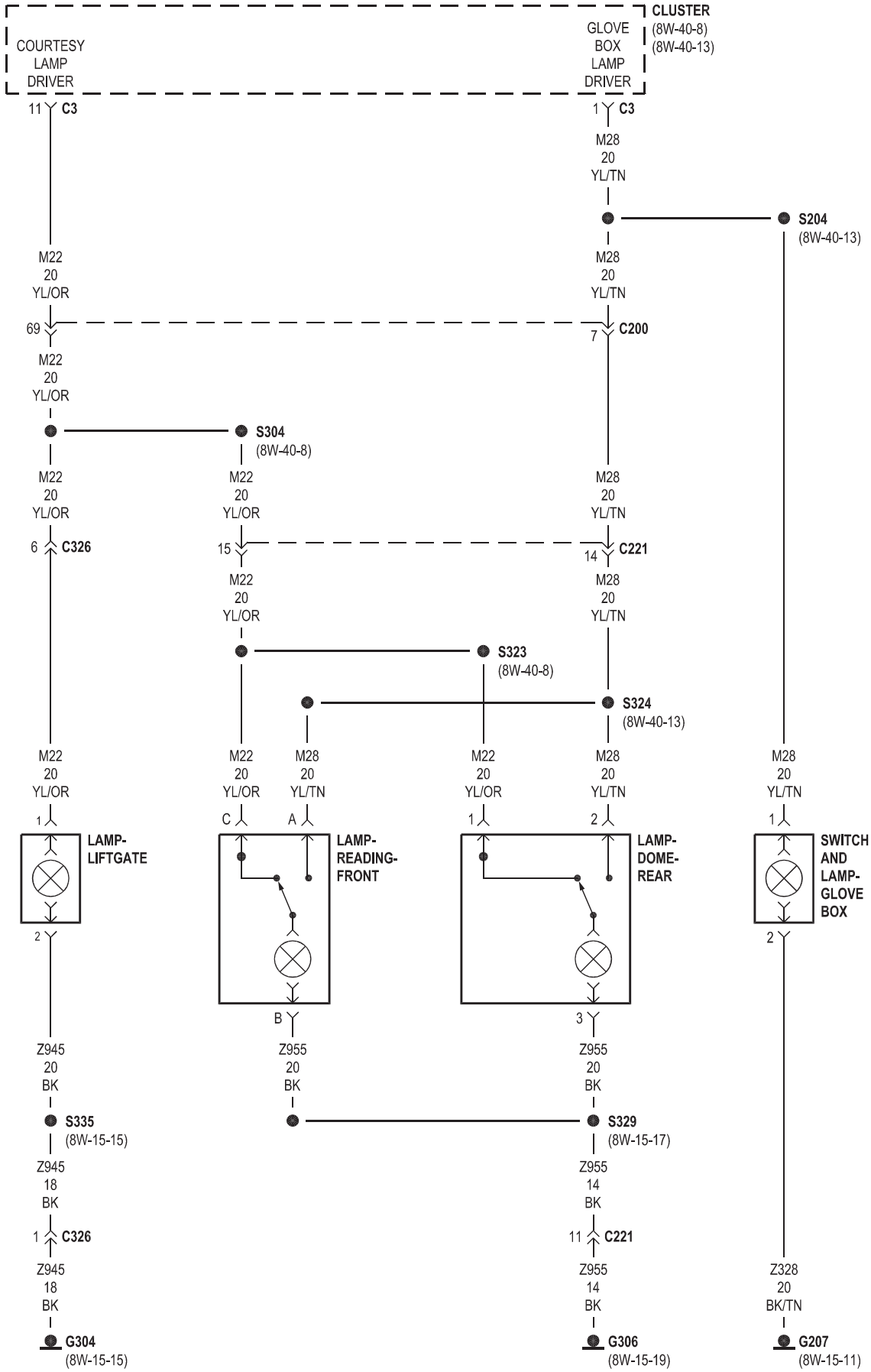

MODULE-
OCCUPANT
CLASSIFICATION
SEAT WEIGHT LEFT FRONT SENSOR SIGNAL
SEAT WEIGHT RIGHT FRONT SENSOR SIGNAL
SEAT WEIGHT RIGHT REAR SENSOR SIGNAL
SEAT WEIGHT SENSOR GROUND
SEAT WEIGHT SENSOR 5 VOLTS
SEAT WEIGHT LEFT REAR SENSOR SIGNAL
3 C2
5 C2
7 C2
12 C2
1 C2
9 C2
R718
20
LB/DG
R706
20
LB/OR
4
SEAT WEIGHT RIGHT FRONT SENSOR SIGNAL
SEAT WEIGHT SENSOR GROUND
SEAT WEIGHT SENSOR 5 VOLTS
SENSOR-
SEAT WEIGHT-
RIGHT FRONT
2
1
SEAT WEIGHT RIGHT REAR SENSOR SIGNAL
SEAT WEIGHT SENSOR 5 VOLTS
SEAT WEIGHT SENSOR GROUND
SENSOR-
SEAT WEIGHT-
RIGHT REAR
1
2
R728
20
LB/YL
R701
20
LG
R728
20
LB/YL
R701
20
LG
S337
S336
R717
20
LG/DG
R728
20
LB/YL
R701
20
LG
R728
20
LB/YL
R701
20
LG
R705
20
LG/OR
SEAT WEIGHT LEFT FRONT SENSOR SIGNAL
SEAT WEIGHT SENSOR GROUND
SEAT WEIGHT SENSOR 5 VOLTS
SENSOR-
SEAT WEIGHT-
LEFT FRONT
SEAT WEIGHT SENSOR GROUND
SEAT WEIGHT SENSOR 5 VOLTS
SEAT WEIGHT LEFT REAR SENSOR SIGNAL
SENSOR-
SEAT WEIGHT-
LEFT REAR

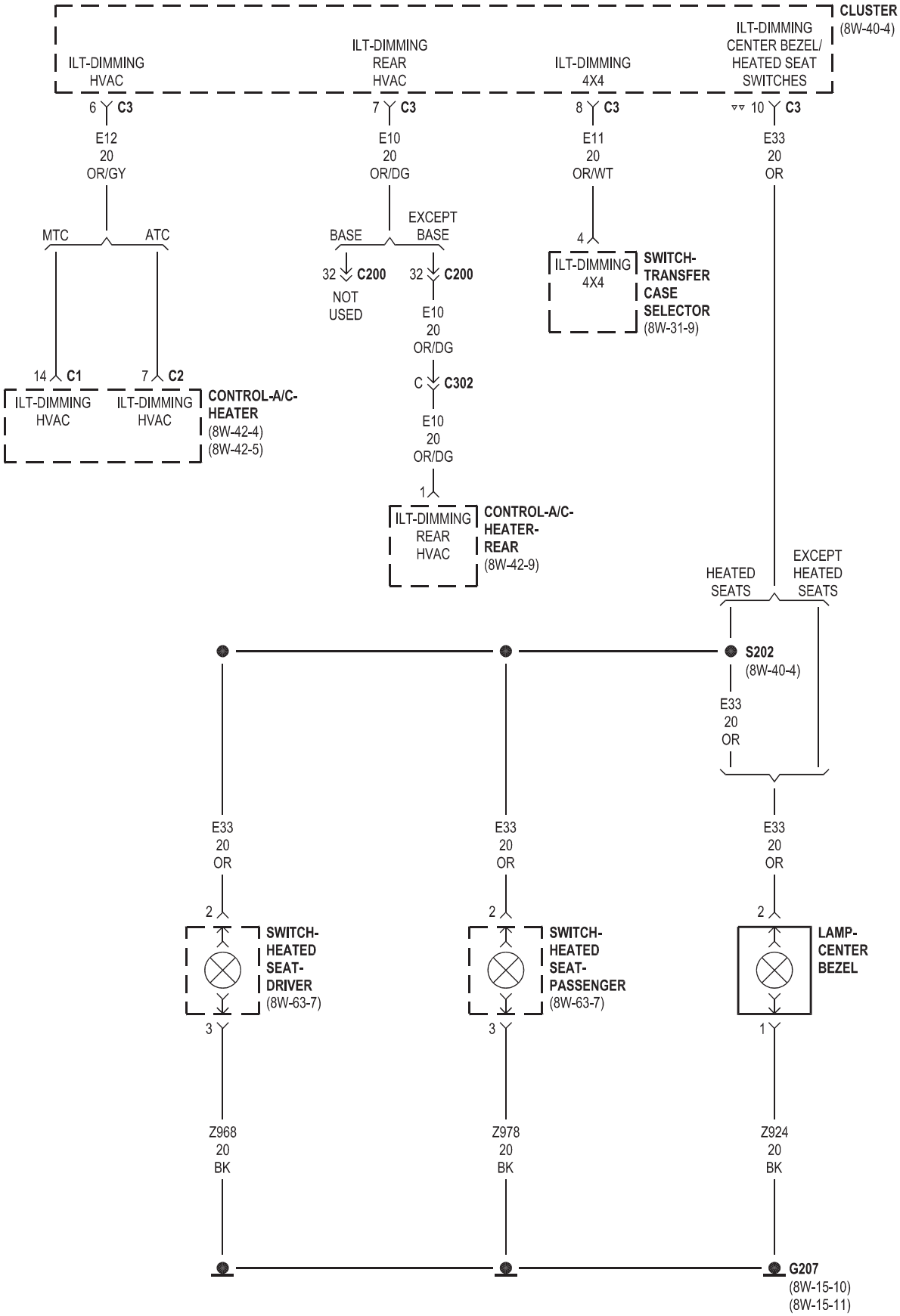
8W-44 INTERIOR LIGHTING

Component	Page
Cluster	8W-44-2, 3, 4, 5
Control-A/C-Heater	8W-44-5
Control-A/C-Heater-Rear	8W-44-5
Fuse 19	8W-44-6, 7
G207	8W-44-3, 4, 5
G208	8W-44-2
G304	8W-44-3, 4
G306	8W-44-3, 4, 6, 7
Junction Block	8W-44-6, 7
Lamp-Center Bezel	8W-44-5
Lamp-Dome-Front	8W-44-3
Lamp-Dome-Rear	8W-44-3, 4
Lamp-Liftgate	8W-44-3, 4
Lamp-Reading-Front	8W-44-4
Lamp-Vanity-Left	8W-44-3
Lamp-Vanity-Right	8W-44-3
Mirror-Inside Rearview	8W-44-6, 7
Mirror-Outside Rearview-Driver	8W-44-6, 7
Module-Front Control	8W-44-6, 7
Module-Integrated Power	8W-44-6, 7
Switch And Lamp-Glove Box	8W-44-3, 4
Switch-Headlamp	8W-44-2
Switch-Heated Seat-Driver	8W-44-2, 5
Switch-Heated Seat-Passenger	8W-44-2, 5
Switch-Transfer Case Selector	8W-44-5

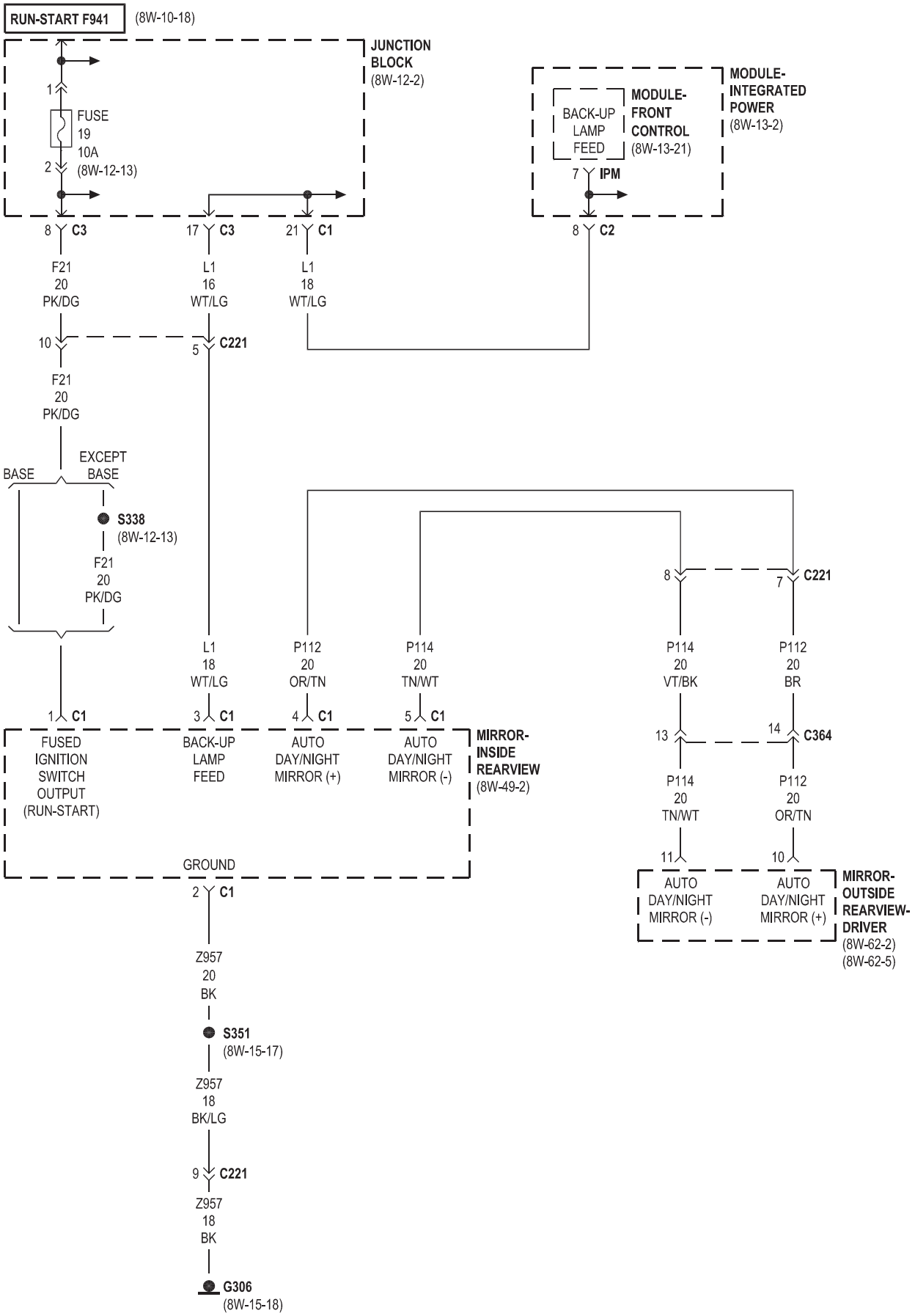

CLUSTER
(8W-40-5)
(8W-40-13)
PANEL LAMPS DRIVER
HEADLAMP SWITCH MUX RETURN
DRIVER HEATED SEAT LOW INDICATOR DRIVER
DRIVER HEATED SEAT HIGH INDICATOR DRIVER
DRIVER HEATED SEAT SWITCH MUX
ILT-DIMMING HEADLAMP SWITCH
PASSENGER HEATED SEAT LOW INDICATOR DRIVER
PASSENGER HEATED SEAT HIGH INDICATOR DRIVER
PASSENGER HEATED SEAT SWITCH MUX
4 C2
10 C2
18 C3
21 C3
22 C1
9 C3
19 C3
20 C3
23 C1
E2 20 OR/BR
L900 20 WT/YL
P81 20 TN/OR
P83 20 TN/WT
P7 20 LG/YL
E19 20 OR/BR
P82 20 TN/LB
P84 20 TN/DG
P8 20 LG/DG
1
5
6
SWITCH-HEATED SEAT-PASSENGER
(8W-63-7)
SWITCH-HEATED SEAT-DRIVER
(8W-63-7)
2
3
4
SWITCH-HEADLAMP
5 DIM 1
6 DIM 2
7 DIM 3
9 DIM 4
10 DIM 5
11 DIM 6
11 PARADE
12 DOME
13 CARGO
SWITCH ILLUMINATION
5
Z942 20 BK
G208
(8W-15-12)


CLUSTER
(8W-40-8)
(8W-40-13)
COURTESY LAMP DRIVER
GLOVE BOX LAMP DRIVER
11 C3
1 C3
M28 20 YL/TN
S204
(8W-40-13)
M22 20 YL/OR
M28 20 YL/TN
M28 20 YL/TN
69
7 C200
M22 20 YL/OR
S304
(8W-40-8)
1
SWITCH AND LAMP- GLOVE BOX
M22 20 YL/OR
M22 20 YL/OR
M28 20 YL/TN
6 C326
15
14 C221
2
M22 20 YL/OR
M22 20 YL/OR
M28 20 YL/TN
Z328 20 BK/TN
1
S323
(8W-40-8)
G207
(8W-15-10)
LAMP- LIFTGATE
S324
(8W-40-13)
2
M22 20 YL/OR
M28 20 YL/TN
M22 20 YL/OR
M28 20 YL/TN
M28 20 YL/TN
M28 20 YL/TN
3
1
C
A
A
A
Z945 20 BK
LAMP- DOME- FRONT
LAMP- DOME- REAR
LAMP- VANITY- LEFT
LAMP- VANITY- RIGHT
S335
(8W-15-15)
2
B
B
B
Z945 18 BK
Z955 20 BK
Z955 20 BK
Z955 20 BK
Z955 20 BK
1 C326
S329
(8W-15-17)
Z955 14 BK
11 C221
Z945 18 BK
Z955 14 BK
G304
(8W-15-15)
G306
(8W-15-18)

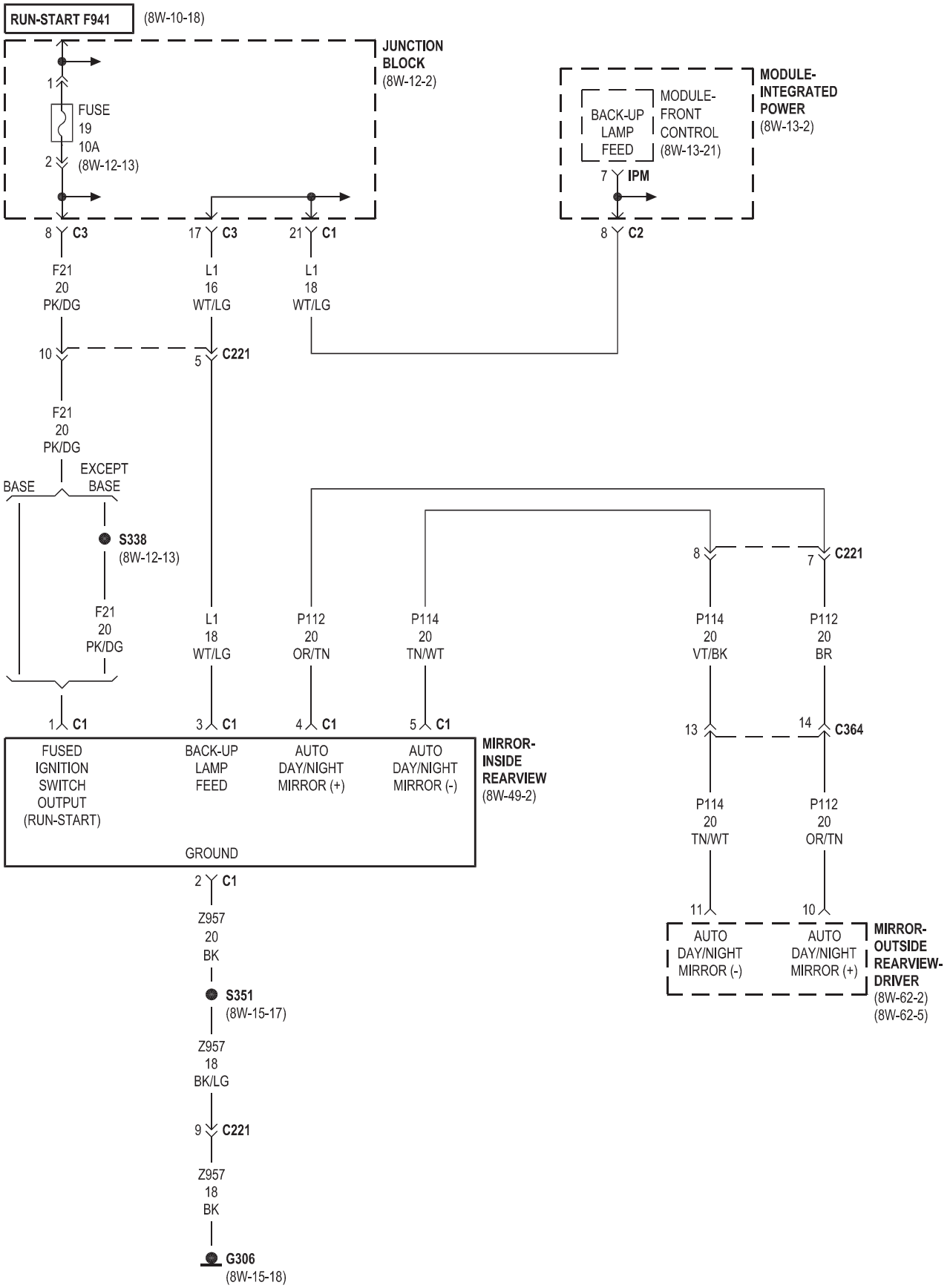

CLUSTER
(8W-40-8)
(8W-40-13)
COURTESY LAMP DRIVER
GLOVE BOX LAMP DRIVER
11 C3
1 C3
M28 20 YL/TN
S204
(8W-40-13)
M22 20 YL/OR
M28 20 YL/TN
69
7 C200
M22 20 YL/OR
S304
(8W-40-8)
M22 20 YL/OR
M22 20 YL/OR
M28 20 YL/TN
6 C326
15
14 C221
M22 20 YL/OR
M28 20 YL/TN
S323
(8W-40-8)
S324
(8W-40-13)
M22 20 YL/OR
M22 20 YL/OR
M28 20 YL/TN
M22 20 YL/OR
M28 20 YL/TN
M28 20 YL/TN
1
C
A
1
2
1
LAMP- LIFTGATE
LAMP- READING- FRONT
LAMP- DOME- REAR
SWITCH AND LAMP- GLOVE BOX
2
B
3
2
Z945 20 BK
Z955 20 BK
Z955 20 BK
S335
(8W-15-15)
S329
(8W-15-17)
Z945 18 BK
Z955 14 BK
Z328 20 BK/TN
1 C326
11 C221
Z945 18 BK
Z955 14 BK
G304
(8W-15-15)
G306
(8W-15-19)
G207
(8W-15-11)


CLUSTER
(8W-40-4)
ILT-DIMMING HVAC
ILT-DIMMING REAR HVAC
ILT-DIMMING 4X4
ILT-DIMMING CENTER BEZEL/ HEATED SEAT SWITCHES
6 C3
7 C3
8 C3
▿▿ 10 C3
E12 20 OR/GY
E10 20 OR/DG
E11 20 OR/WT
E33 20 OR
MTC
ATC
BASE
EXCEPT BASE
32 C200
NOT USED
32 C200
E10 20 OR/DG
C C302
E10 20 OR/DG
1
4
ILT-DIMMING 4X4
SWITCH-TRANSFER CASE SELECTOR
(8W-31-9)
14 C1
7 C2
ILT-DIMMING HVAC
ILT-DIMMING HVAC
CONTROL-A/C-HEATER
(8W-42-4)
(8W-42-5)
ILT-DIMMING REAR HVAC
CONTROL-A/C-HEATER-REAR
(8W-42-9)
HEATED SEATS
EXCEPT HEATED SEATS
S202
(8W-40-4)
E33 20 OR
E33 20 OR
E33 20 OR
E33 20 OR
2
2
2
SWITCH-HEATED SEAT-DRIVER
(8W-63-7)
SWITCH-HEATED SEAT-PASSENGER
(8W-63-7)
LAMP-CENTER BEZEL
3
3
1
Z968 20 BK
Z978 20 BK
Z924 20 BK
G207
(8W-15-10)
(8W-15-11)
▿▿ EXCEPT BASE

HANDS FREE

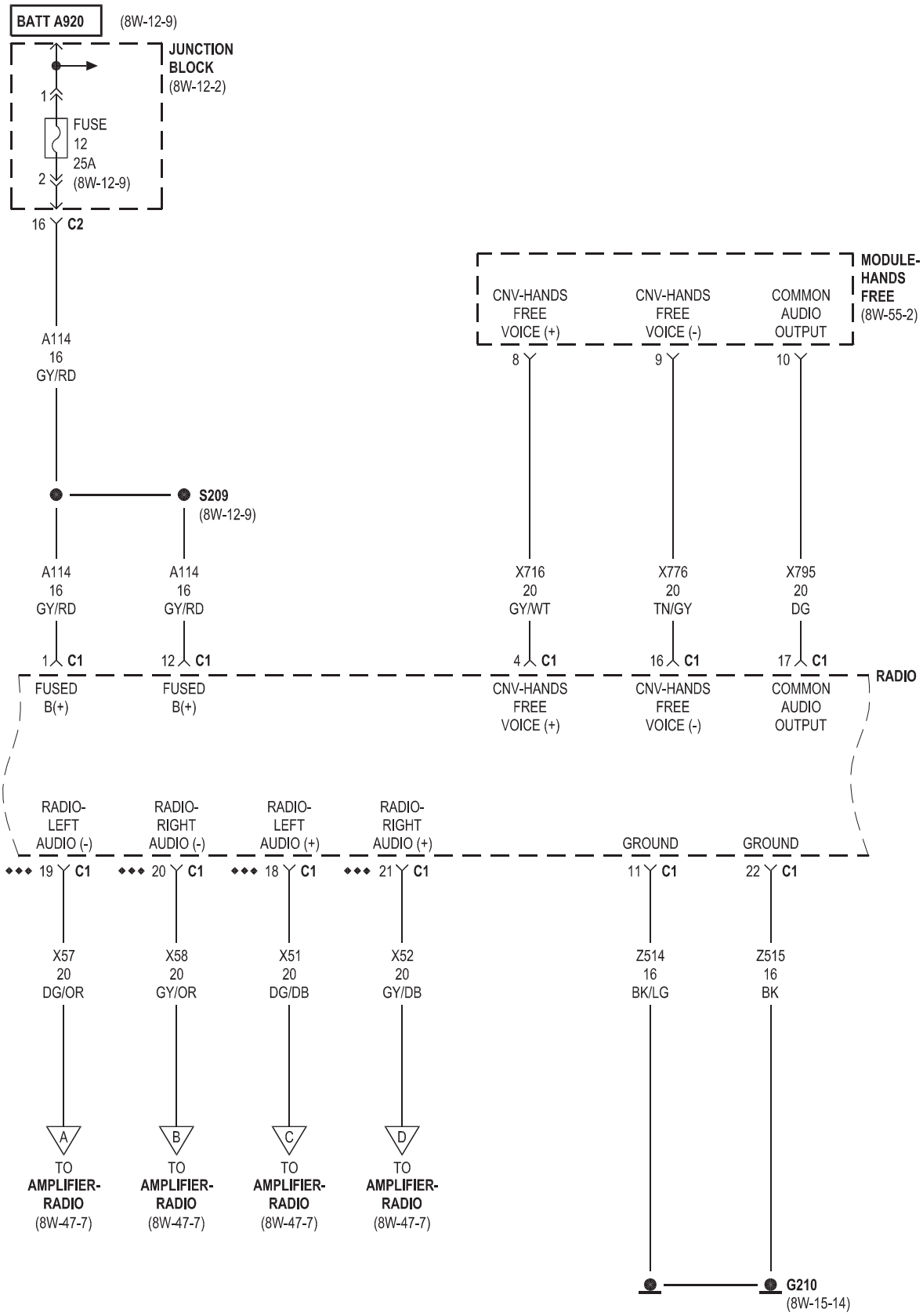

RUN-START F941
(8W-10-18)
JUNCTION BLOCK
(8W-12-2)
1
FUSE
19
10A
2
(8W-12-13)
8 C3
17 C3
21 C1
F21
20
PK/DG
L1
16
WT/LG
L1
18
WT/LG
10
5 C221
F21
20
PK/DG
BASE
EXCEPT BASE
S338
(8W-12-13)
F21
20
PK/DG
MODULE-INTEGRATED POWER
(8W-13-2)
BACK-UP LAMP FEED
MODULE-FRONT CONTROL
(8W-13-21)
7 IPM
8 C2
8 C221
7 C221
L1
18
WT/LG
P112
20
OR/TN
P114
20
TN/WT
P114
20
VT/BK
P112
20
BR
1 C1
3 C1
4 C1
5 C1
13
14 C364
FUSED IGNITION SWITCH OUTPUT (RUN-START)
BACK-UP LAMP FEED
AUTO DAY/NIGHT MIRROR (+)
AUTO DAY/NIGHT MIRROR (-)
MIRROR-INSIDE REARVIEW
(8W-49-2)
P114
20
TN/WT
P112
20
OR/TN
11
10
AUTO DAY/NIGHT MIRROR (-)
AUTO DAY/NIGHT MIRROR (+)
MIRROR-OUTSIDE REARVIEW-DRIVER
(8W-62-2)
(8W-62-5)
GROUND
2 C1
Z957
20
BK
S351
(8W-15-17)
Z957
18
BK/LG
9 C221
Z957
18
BK
G306
(8W-15-18)

EXCEPT HANDS FREE

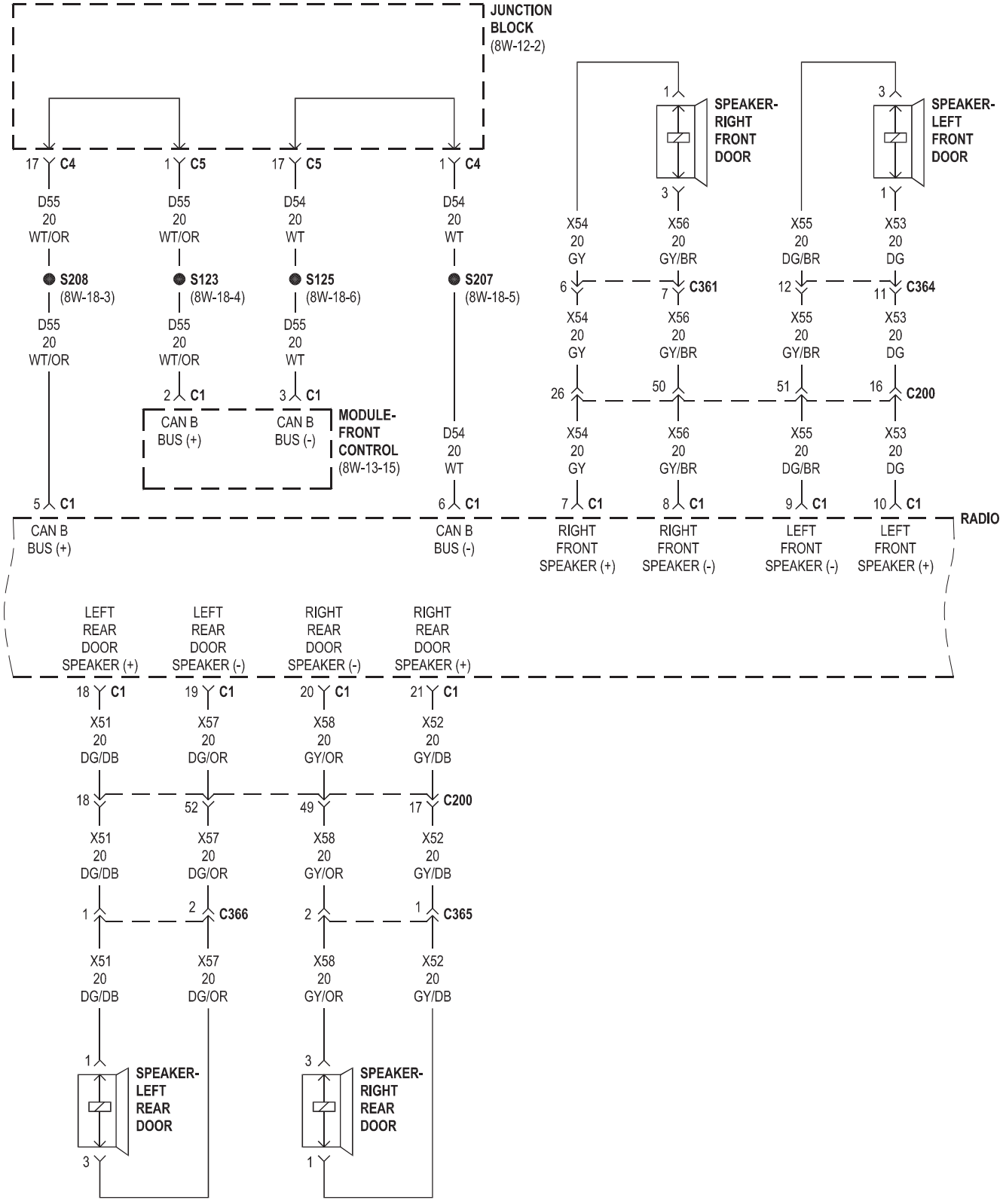


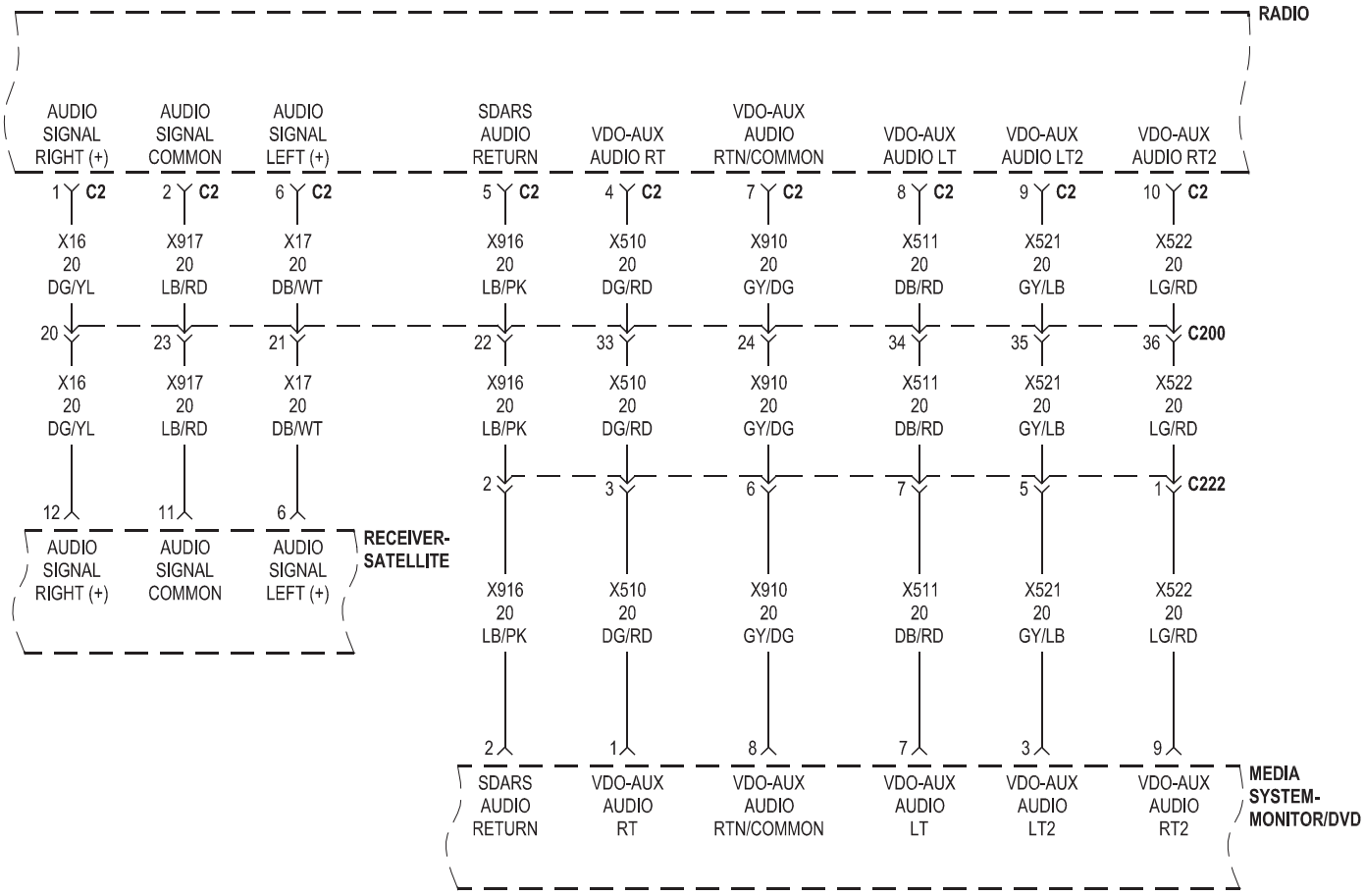
8W-47 AUDIO SYSTEM

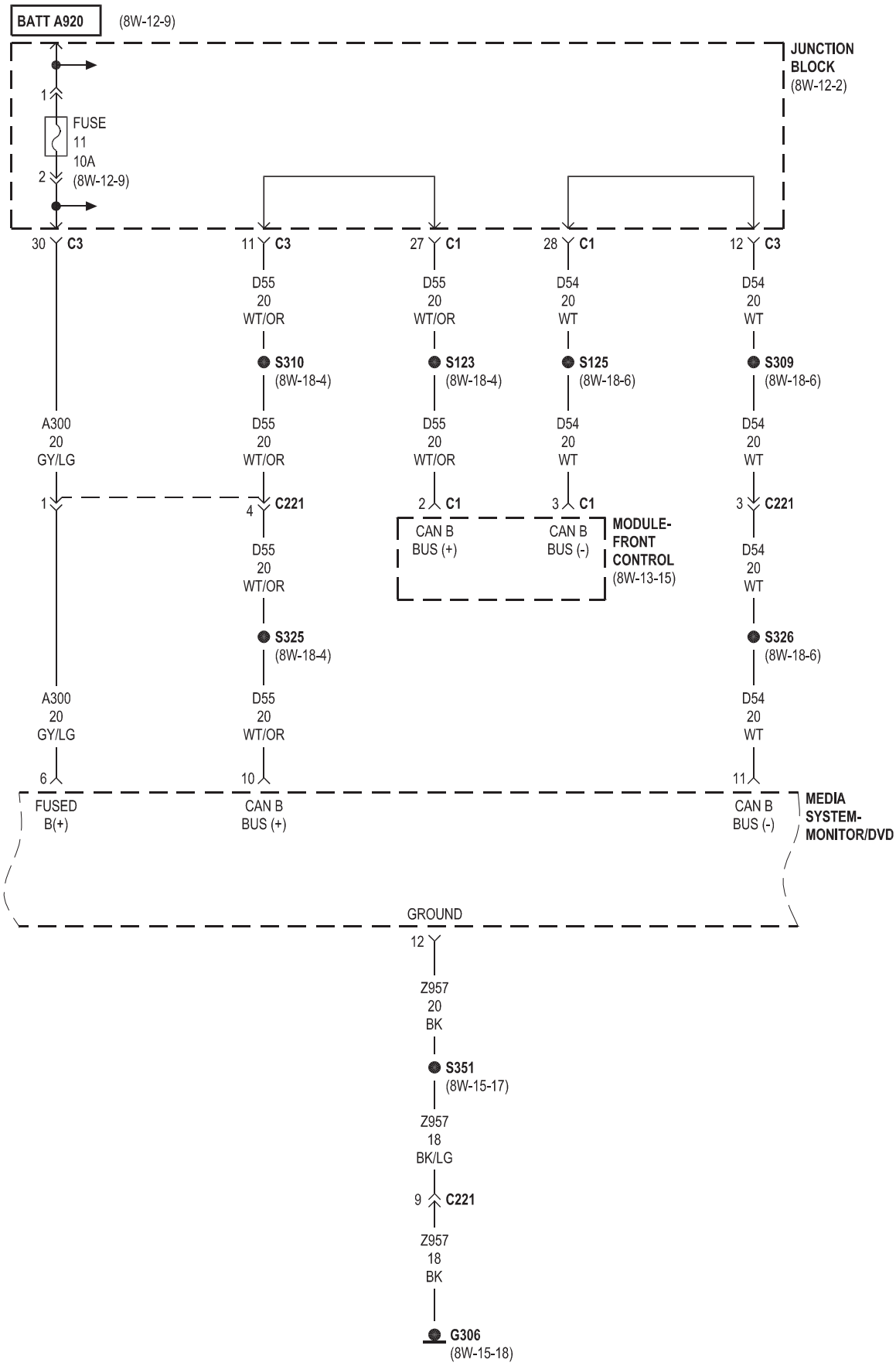
Component	Page
Amplifier-Radio	8W-47-2, 6, 7, 8
Clockspring	8W-47-9
Cluster	8W-47-9
Fuse 7	8W-47-6
Fuse 11	8W-47-5, 6
Fuse 12	8W-47-2
G210	8W-47-2, 6
G304	8W-47-6
G306	8W-47-5
Junction Block	8W-47-2, 3, 5, 6
Media System-Monitor/Dvd	8W-47-4, 5
Module-Front Control	8W-47-3, 5, 6
Module-Hands Free	8W-47-2
Radio	8W-47-2, 3, 4, 7
Receiver-Satellite	8W-47-4, 6
Speaker-Left Front Door	8W-47-3, 7
Speaker-Left Rear Door	8W-47-3, 8
Speaker-Right Front Door	8W-47-3, 7
Speaker-Right Rear Door	8W-47-3, 8
Speaker-Subwoofer	8W-47-7
Speaker-Tweeter-Left Front	8W-47-7
Speaker-Tweeter-Left Rear	8W-47-8
Speaker-Tweeter-Right Front	8W-47-7
Speaker-Tweeter-Right Rear	8W-47-8
Switch-Remote Radio-Left	8W-47-9
Switch-Remote Radio-Right	8W-47-9

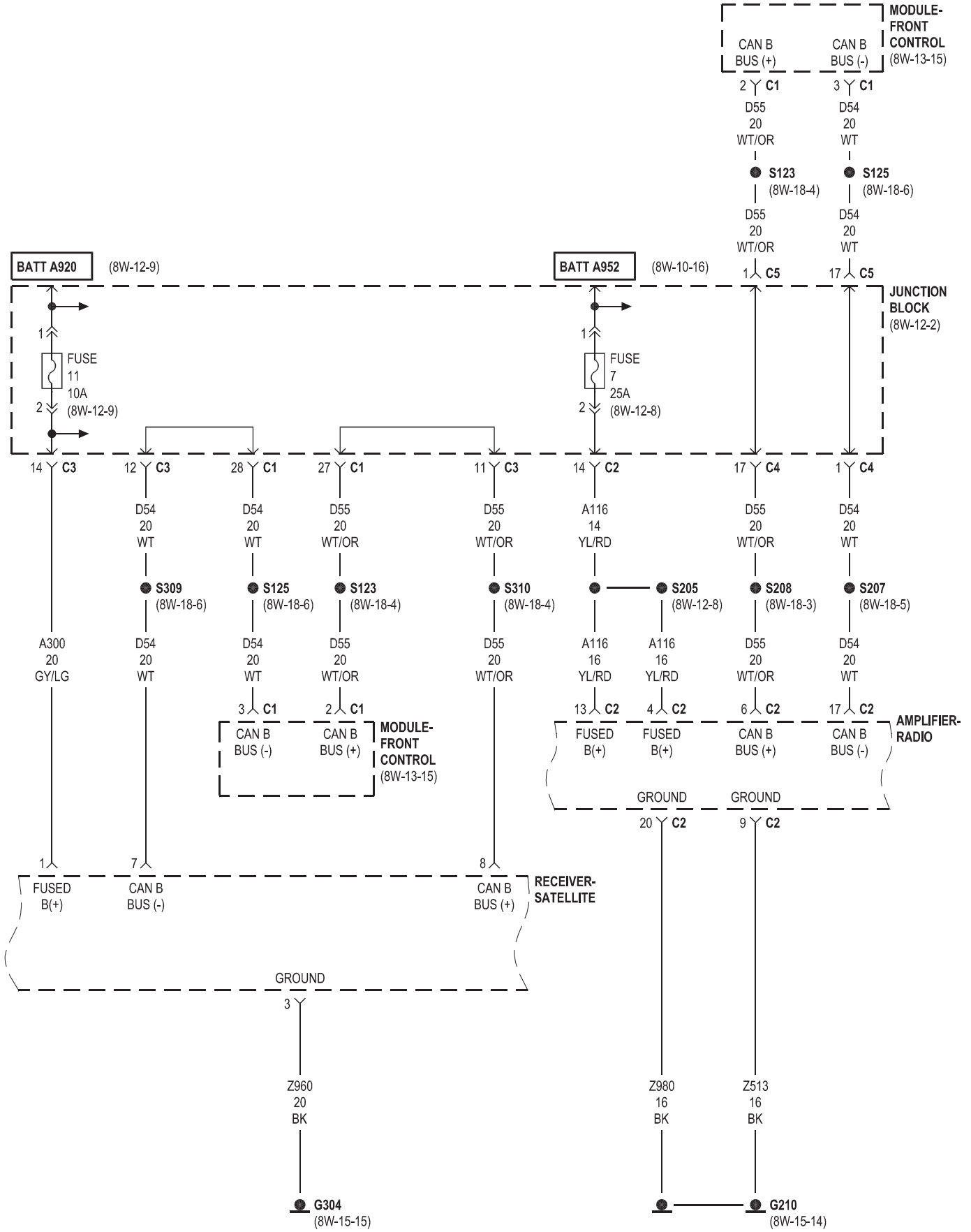

BATT A920
(8W-12-9)
JUNCTION BLOCK
(8W-12-2)
1
FUSE 12 25A
2
(8W-12-9)
16 C2
A114 16 GY/RD
S209
(8W-12-9)
A114 16 GY/RD
A114 16 GY/RD
1 C1
12 C1
FUSED B(+)
FUSED B(+)
MODULE-HANDS FREE
(8W-55-2)
CNV-HANDS FREE VOICE (+)
CNV-HANDS FREE VOICE (-)
COMMON AUDIO OUTPUT
8
9
10
X716 20 GY/WT
X776 20 TN/GY
X795 20 DG
4 C1
16 C1
17 C1
CNV-HANDS FREE VOICE (+)
CNV-HANDS FREE VOICE (-)
COMMON AUDIO OUTPUT
RADIO
RADIO-LEFT AUDIO (-)
RADIO-RIGHT AUDIO (-)
RADIO-LEFT AUDIO (+)
RADIO-RIGHT AUDIO (+)
GROUND
GROUND
19 C1
20 C1
18 C1
21 C1
11 C1
22 C1
X57 20 DG/OR
X58 20 GY/OR
X51 20 DG/DB
X52 20 GY/DB
Z514 16 BK/LG
Z515 16 BK
A
B
C
D
TO AMPLIFIER-RADIO
(8W-47-7)
TO AMPLIFIER-RADIO
(8W-47-7)
TO AMPLIFIER-RADIO
(8W-47-7)
TO AMPLIFIER-RADIO
(8W-47-7)
G210
(8W-15-14)

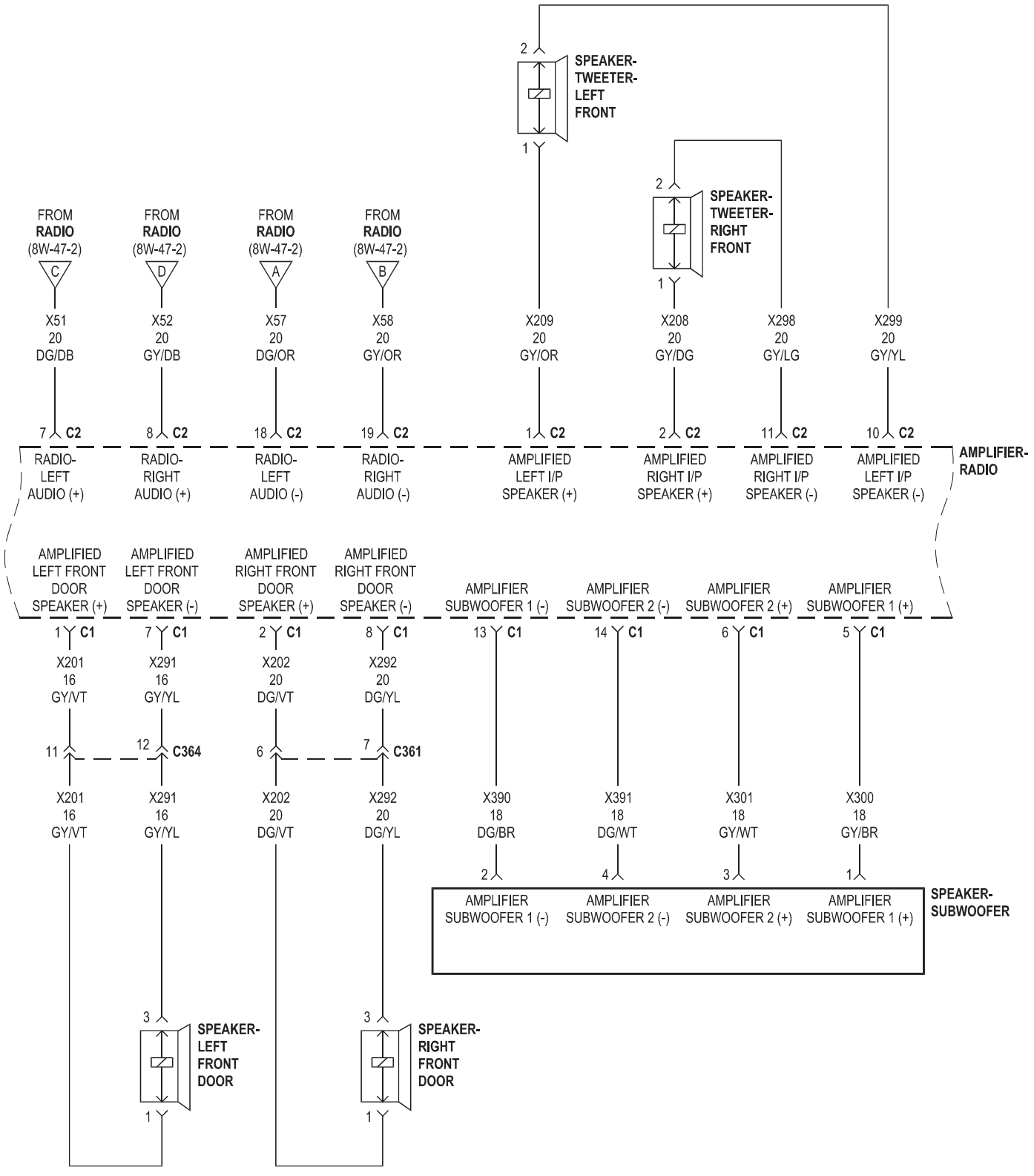
◆◆◆ HIGHLINE

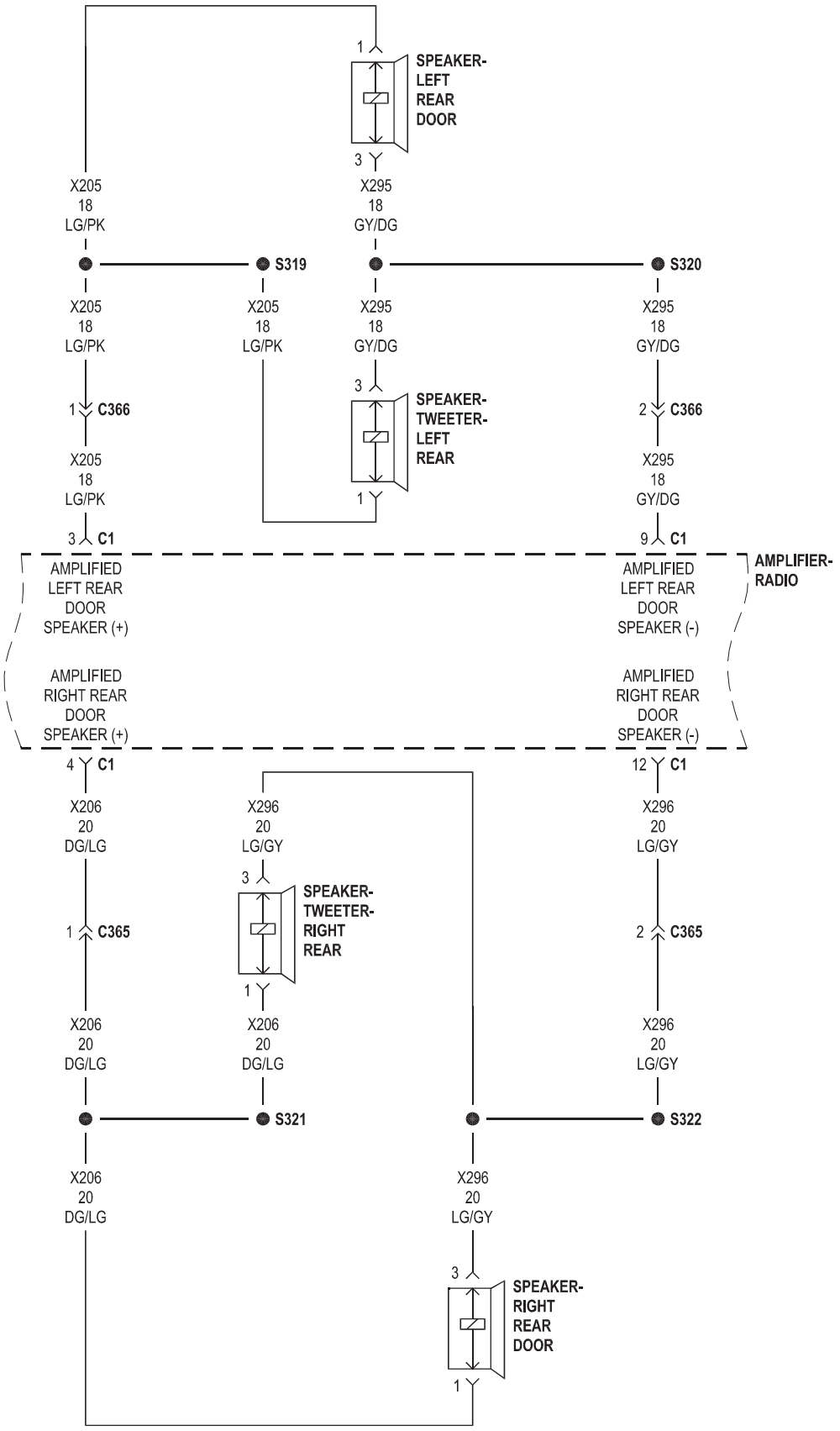

JUNCTION BLOCK (8W-12-2)
17 C4
1 C5
17 C5
1 C4
D55 20 WT/OR
D55 20 WT/OR
D54 20 WT
D54 20 WT
S208 (8W-18-3)
S123 (8W-18-4)
S125 (8W-18-6)
S207 (8W-18-5)
D55 20 WT/OR
D55 20 WT/OR
D55 20 WT
2 C1
3 C1
CAN B BUS (+)
CAN B BUS (-)
MODULE-FRONT CONTROL (8W-13-15)
5 C1
6 C1
CAN B BUS (+)
CAN B BUS (-)
1
SPEAKER-RIGHT FRONT DOOR
3
3
SPEAKER-LEFT FRONT DOOR
1
X54 20 GY
X56 20 GY/BR
X55 20 DG/BR
X53 20 DG
6
7 C361
12
11 C364
X54 20 GY
X56 20 GY/BR
X55 20 GY/BR
X53 20 DG
26
50
51
16 C200
X54 20 GY
X56 20 GY/BR
X55 20 DG/BR
X53 20 DG
7 C1
8 C1
9 C1
10 C1
RIGHT FRONT SPEAKER (+)
RIGHT FRONT SPEAKER (-)
LEFT FRONT SPEAKER (-)
LEFT FRONT SPEAKER (+)
RADIO
LEFT REAR DOOR SPEAKER (+)
LEFT REAR DOOR SPEAKER (-)
RIGHT REAR DOOR SPEAKER (-)
RIGHT REAR DOOR SPEAKER (+)
18 C1
19 C1
20 C1
21 C1
X51 20 DG/DB
X57 20 DG/OR
X58 20 GY/OR
X52 20 GY/DB
18
52
49
17 C200
X51 20 DG/DB
X57 20 DG/OR
X58 20 GY/OR
X52 20 GY/DB
1
2 C366
2
1 C365
X51 20 DG/DB
X57 20 DG/OR
X58 20 GY/OR
X52 20 GY/DB
1
SPEAKER-LEFT REAR DOOR
3
3
SPEAKER-RIGHT REAR DOOR
1


RADIO
AUDIO SIGNAL RIGHT (+)
AUDIO SIGNAL COMMON
AUDIO SIGNAL LEFT (+)
SDARS AUDIO RETURN
VDO-AUX AUDIO RT
VDO-AUX AUDIO RTN/COMMON
VDO-AUX AUDIO LT
VDO-AUX AUDIO LT2
VDO-AUX AUDIO RT2
1 C2
2 C2
6 C2
5 C2
4 C2
7 C2
8 C2
9 C2
10 C2
X16 20 DG/YL
X917 20 LB/RD
X17 20 DB/WT
X916 20 LB/PK
X510 20 DG/RD
X910 20 GY/DG
X511 20 DB/RD
X521 20 GY/LB
X522 20 LG/RD
20
23
21
22
33
24
34
35
36 C200
X16 20 DG/YL
X917 20 LB/RD
X17 20 DB/WT
X916 20 LB/PK
X510 20 DG/RD
X910 20 GY/DG
X511 20 DB/RD
X521 20 GY/LB
X522 20 LG/RD
12
11
6
2
3
6
7
5
1 C222
AUDIO SIGNAL RIGHT (+)
AUDIO SIGNAL COMMON
AUDIO SIGNAL LEFT (+)
RECEIVER-SATELLITE
X916 20 LB/PK
X510 20 DG/RD
X910 20 GY/DG
X511 20 DB/RD
X521 20 GY/LB
X522 20 LG/RD
2
1
8
7
3
9
SDARS AUDIO RETURN
VDO-AUX AUDIO RT
VDO-AUX AUDIO RTN/COMMON
VDO-AUX AUDIO LT
VDO-AUX AUDIO LT2
VDO-AUX AUDIO RT2
MEDIA SYSTEM-MONITOR/DVD

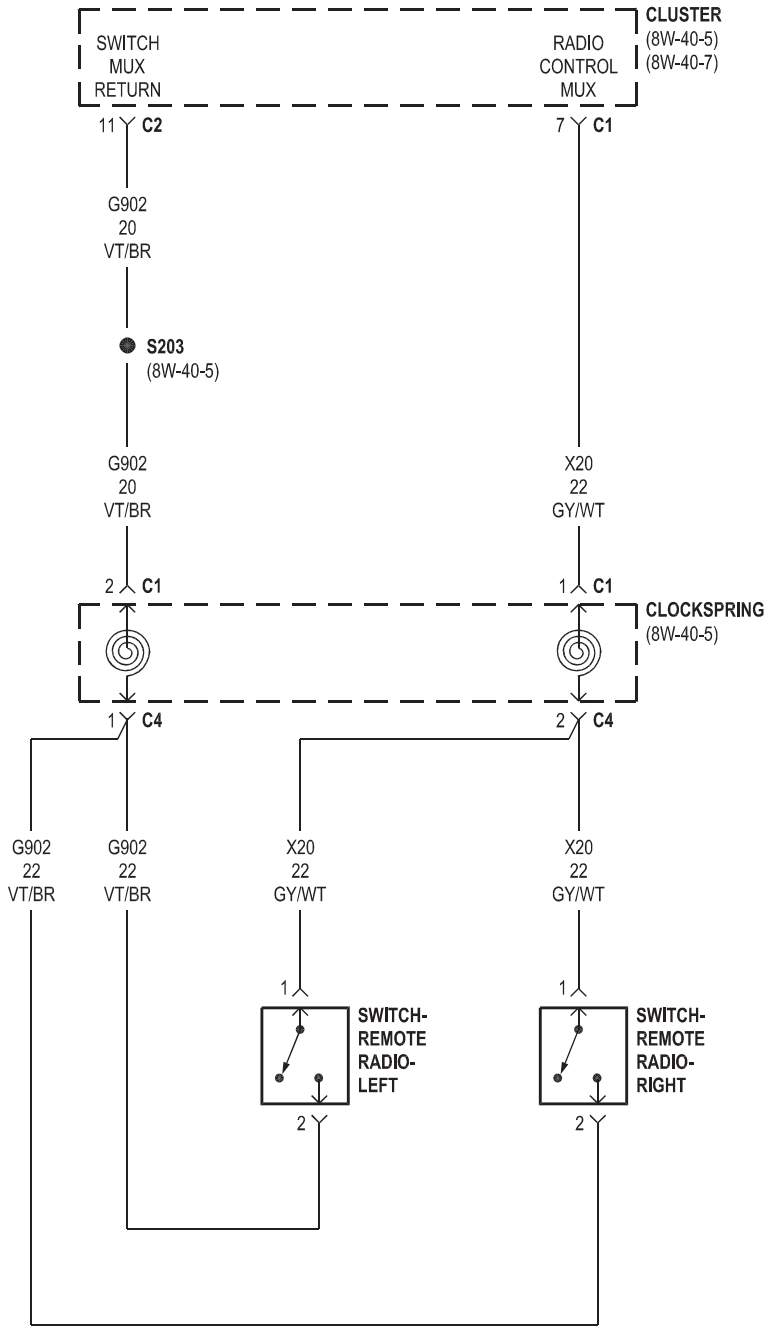

BATT A920
(8W-12-9)
JUNCTION BLOCK
(8W-12-2)
1
FUSE
11
10A
2
(8W-12-9)
30 C3
11 C3
27 C1
28 C1
12 C3
D55
20
WT/OR
D54
20
WT
S310
(8W-18-4)
S123
(8W-18-4)
S125
(8W-18-6)
S309
(8W-18-6)
A300
20
GY/LG
1
4 C221
2 C1
3 C1
3 C221
CAN B
BUS (+)
CAN B
BUS (-)
MODULE-
FRONT
CONTROL
(8W-13-15)
S325
(8W-18-4)
S326
(8W-18-6)
6
10
11
FUSED
B(+)
CAN B
BUS (+)
CAN B
BUS (-)
MEDIA
SYSTEM-
MONITOR/DVD
GROUND
12
Z957
20
BK
S351
(8W-15-17)
Z957
18
BK/LG
9 C221
Z957
18
BK
G306
(8W-15-18)


MODULE-FRONT CONTROL (8W-13-15)
CAN B BUS (+)
CAN B BUS (-)
2 C1
3 C1
D55 20 WT/OR
D54 20 WT
S123 (8W-18-4)
S125 (8W-18-6)
BATT A920 (8W-12-9)
BATT A952 (8W-10-16)
1 C5
17 C5
JUNCTION BLOCK (8W-12-2)
FUSE 11 10A (8W-12-9)
FUSE 7 25A (8W-12-8)
14 C3
12 C3
28 C1
27 C1
11 C3
14 C2
17 C4
1 C4
A116 14 YL/RD
S309 (8W-18-6)
S310 (8W-18-4)
S205 (8W-12-8)
S208 (8W-18-3)
S207 (8W-18-5)
A300 20 GY/LG
A116 16 YL/RD
13 C2
4 C2
6 C2
17 C2
AMPLIFIER-RADIO
FUSED B(+)
CAN B BUS (+)
CAN B BUS (-)
GROUND
20 C2
9 C2
1
7
8
RECEIVER-SATELLITE
3
Z960 20 BK
Z980 16 BK
Z513 16 BK
G304 (8W-15-15)
G210 (8W-15-14)


2
SPEAKER-
TWEETER-
LEFT
FRONT
1
2
SPEAKER-
TWEETER-
RIGHT
FRONT
1
FROM
RADIO
(8W-47-2)
C
FROM
RADIO
(8W-47-2)
D
FROM
RADIO
(8W-47-2)
A
FROM
RADIO
(8W-47-2)
B
X51
20
DG/DB
X52
20
GY/DB
X57
20
DG/OR
X58
20
GY/OR
X209
20
GY/OR
X208
20
GY/DG
X298
20
GY/LG
X299
20
GY/YL
7 C2
8 C2
18 C2
19 C2
1 C2
2 C2
11 C2
10 C2
AMPLIFIER-
RADIO
RADIO-
LEFT
AUDIO (+)
RADIO-
RIGHT
AUDIO (+)
RADIO-
LEFT
AUDIO (-)
RADIO-
RIGHT
AUDIO (-)
AMPLIFIED
LEFT I/P
SPEAKER (+)
AMPLIFIED
RIGHT I/P
SPEAKER (+)
AMPLIFIED
RIGHT I/P
SPEAKER (-)
AMPLIFIED
LEFT I/P
SPEAKER (-)
AMPLIFIED
LEFT FRONT
DOOR
SPEAKER (+)
AMPLIFIED
LEFT FRONT
DOOR
SPEAKER (-)
AMPLIFIED
RIGHT FRONT
DOOR
SPEAKER (+)
AMPLIFIED
RIGHT FRONT
DOOR
SPEAKER (-)
AMPLIFIER
SUBWOOFER 1 (-)
AMPLIFIER
SUBWOOFER 2 (-)
AMPLIFIER
SUBWOOFER 2 (+)
AMPLIFIER
SUBWOOFER 1 (+)
1 C1
7 C1
2 C1
8 C1
13 C1
14 C1
6 C1
5 C1
X201
16
GY/VT
X291
16
GY/YL
X202
20
DG/VT
X292
20
DG/YL
11
12 C364
6
7 C361
X201
16
GY/VT
X291
16
GY/YL
X202
20
DG/VT
X292
20
DG/YL
X390
18
DG/BR
X391
18
DG/WT
X301
18
GY/WT
X300
18
GY/BR
2
4
3
1
AMPLIFIER
SUBWOOFER 1 (-)
AMPLIFIER
SUBWOOFER 2 (-)
AMPLIFIER
SUBWOOFER 2 (+)
AMPLIFIER
SUBWOOFER 1 (+)
SPEAKER-
SUBWOOFER
3
SPEAKER-
LEFT
FRONT
DOOR
1
3
SPEAKER-
RIGHT
FRONT
DOOR
1

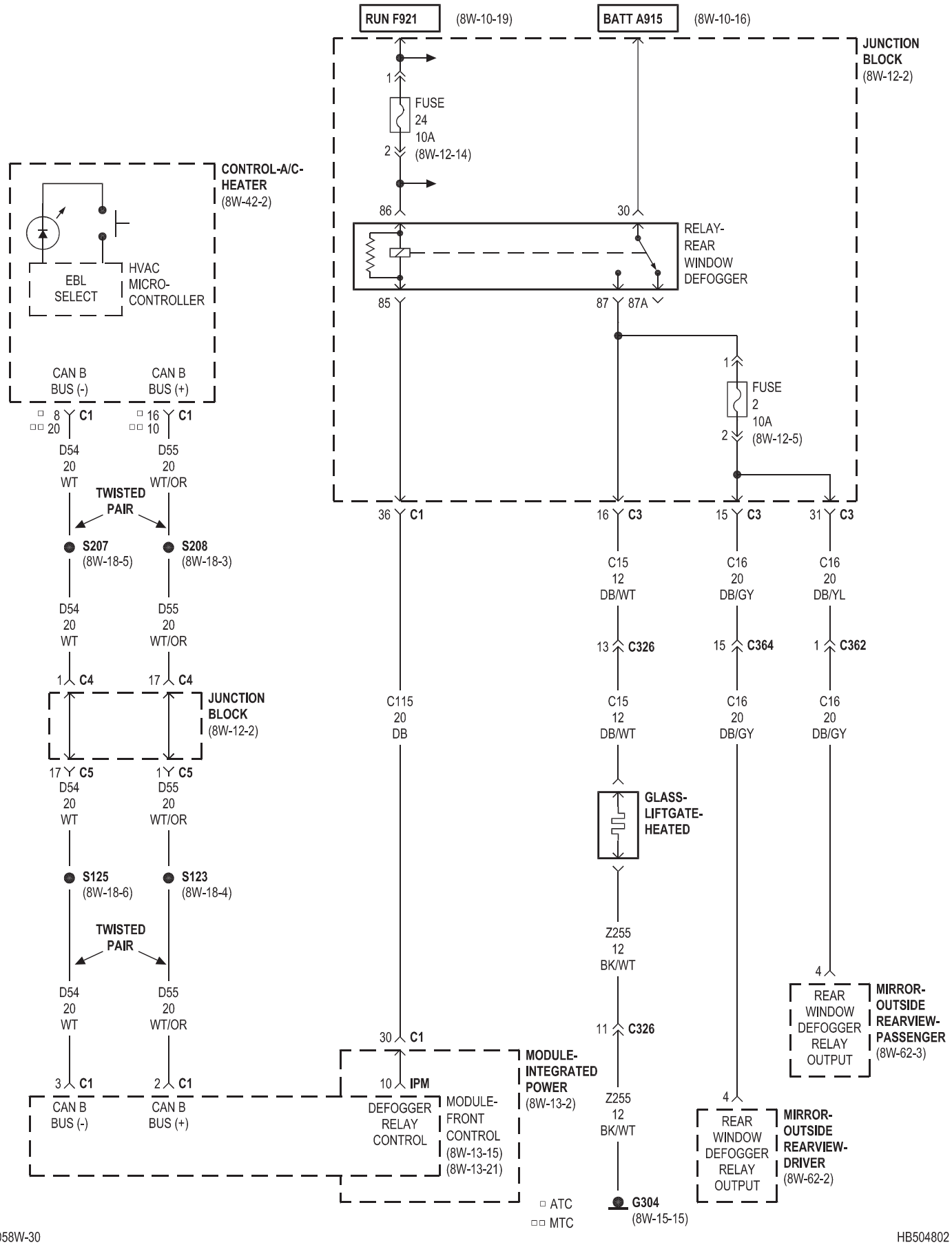

1
SPEAKER-
LEFT
REAR
DOOR
3
X205
18
LG/PK
X295
18
GY/DG
S319
S320
X205
18
LG/PK
X205
18
LG/PK
X295
18
GY/DG
X295
18
GY/DG
3
1
C366
SPEAKER-
TWEETER-
LEFT
REAR
2
C366
X205
18
LG/PK
1
X295
18
GY/DG
3
C1
9
C1
AMPLIFIER-
RADIO
AMPLIFIED
LEFT REAR
DOOR
SPEAKER (+)
AMPLIFIED
LEFT REAR
DOOR
SPEAKER (-)
AMPLIFIED
RIGHT REAR
DOOR
SPEAKER (+)
AMPLIFIED
RIGHT REAR
DOOR
SPEAKER (-)
4
C1
12
C1
X206
20
DG/LG
X296
20
LG/GY
X296
20
LG/GY
3
SPEAKER-
TWEETER-
RIGHT
REAR
1
C365
2
C365
1
X206
20
DG/LG
X206
20
DG/LG
X296
20
LG/GY
S321
S322
X206
20
DG/LG
X296
20
LG/GY
3
SPEAKER-
RIGHT
REAR
DOOR
1

REMOTE RADIO



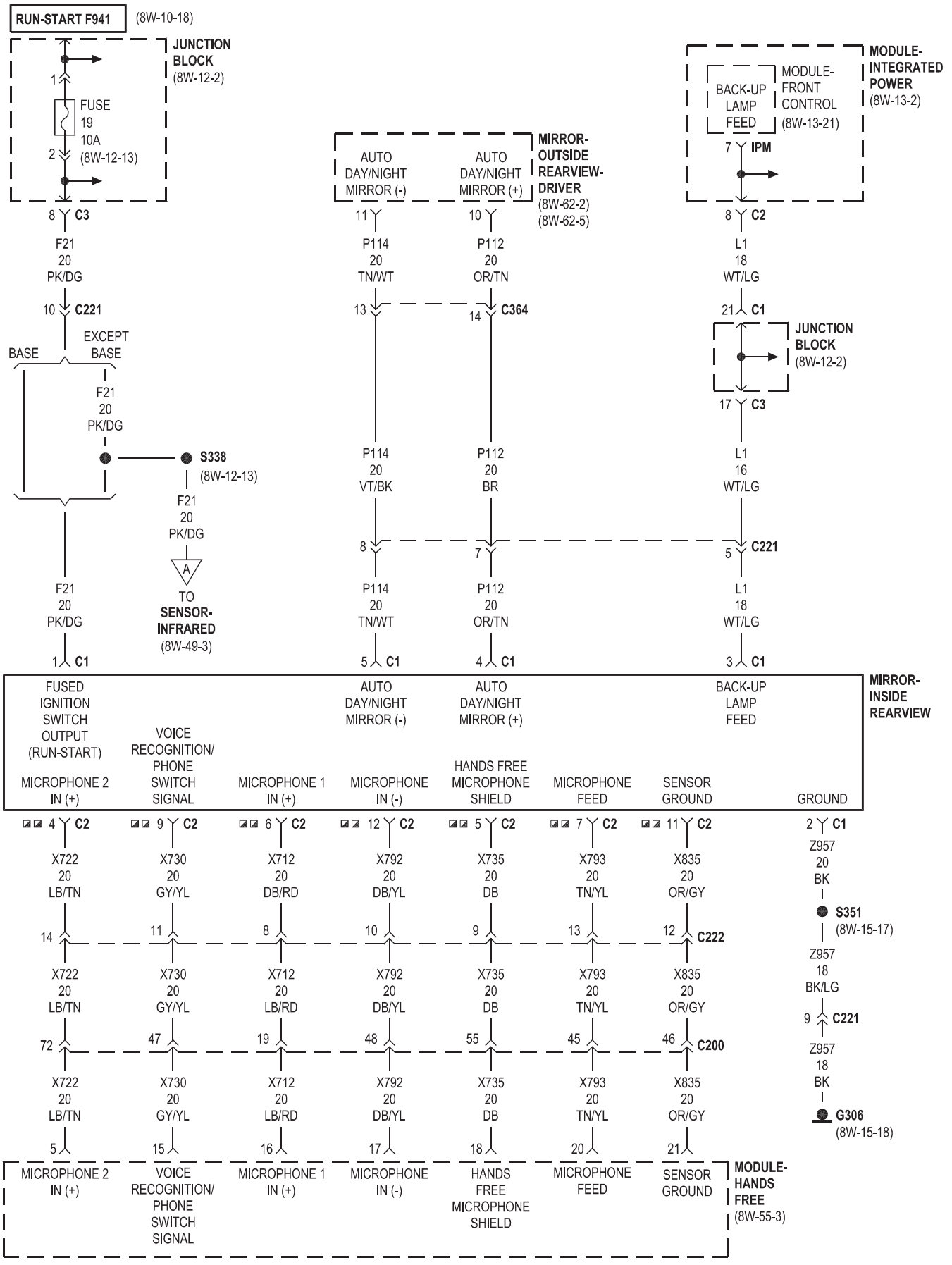
8W-48 REAR WINDOW DEFOGGER

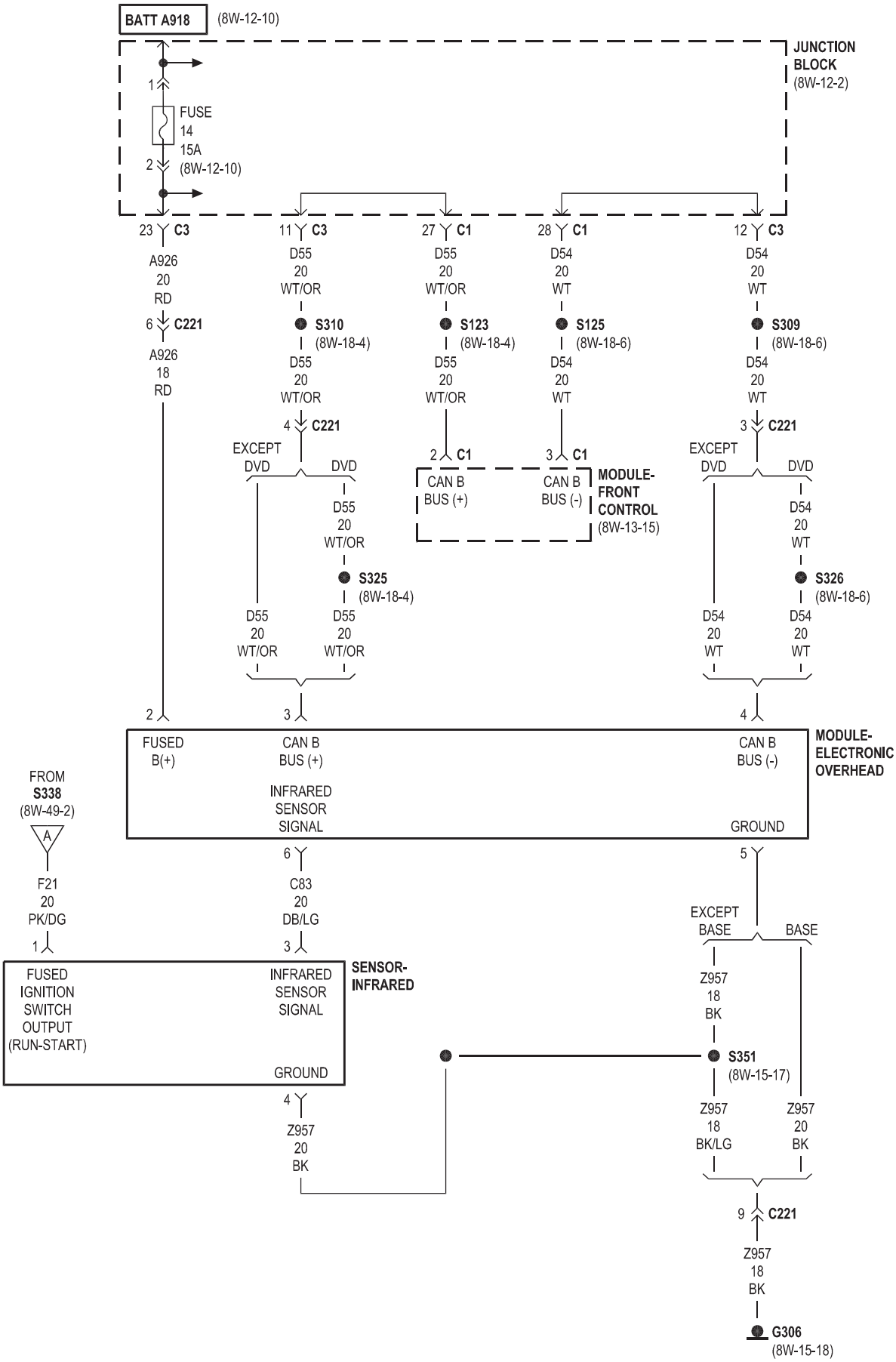
Component	Page
Control-A/C-Heater	8W-48-2
Fuse 2	8W-48-2
Fuse 24	8W-48-2
G304	8W-48-2
Glass-Liftgate-Heated	8W-48-2
Junction Block	8W-48-2
Mirror-Outside Rearview-Driver	8W-48-2
Mirror-Outside Rearview-Passenger	8W-48-2
Module-Front Control	8W-48-2
Module-Integrated Power	8W-48-2
Relay-Rear Window Defogger	8W-48-2

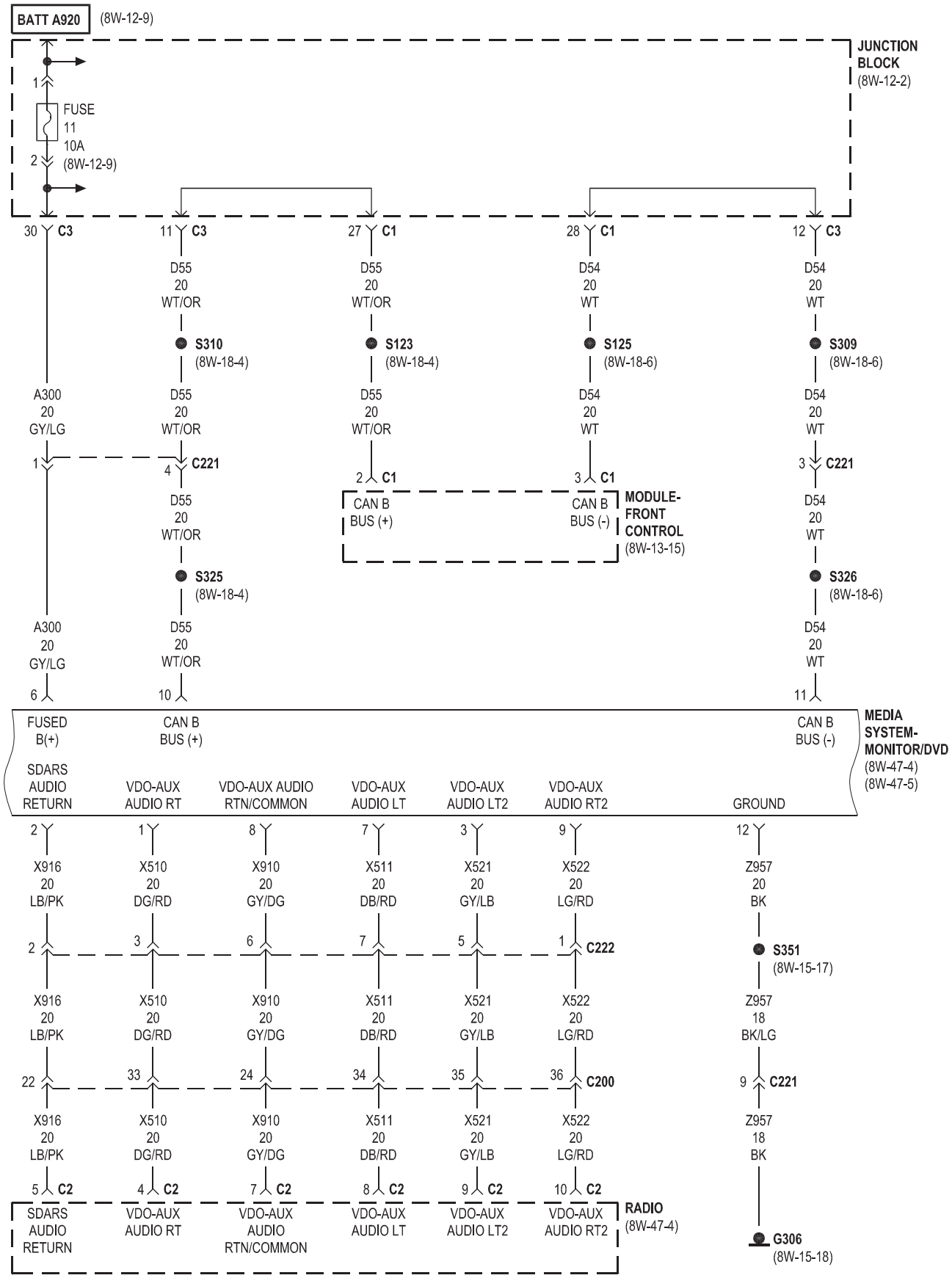

RUN F921
(8W-10-19)
BATT A915
(8W-10-16)
JUNCTION BLOCK
(8W-12-2)
FUSE 24 10A
(8W-12-14)
RELAY-REAR WINDOW DEFOGGER
FUSE 2 10A
(8W-12-5)
CONTROL-A/C-HEATER
(8W-42-2)
EBL SELECT
HVAC MICRO-CONTROLLER
CAN B BUS (-)
CAN B BUS (+)
D54 20 WT
D55 20 WT/OR
TWISTED PAIR
S207
(8W-18-5)
S208
(8W-18-3)
C115 20 DB
C15 12 DB/WT
C16 20 DB/GY
C16 20 DB/YL
C326
C364
C362
JUNCTION BLOCK
(8W-12-2)
GLASS-LIFTGATE-HEATED
Z255 12 BK/WT
S125
(8W-18-6)
S123
(8W-18-4)
REAR WINDOW DEFOGGER RELAY OUTPUT
MIRROR-OUTSIDE REARVIEW-PASSENGER
(8W-62-3)
MODULE-INTEGRATED POWER
(8W-13-2)
IPM
DEFOGGER RELAY CONTROL
MODULE-FRONT CONTROL
(8W-13-15)
(8W-13-21)
MIRROR-OUTSIDE REARVIEW-DRIVER
(8W-62-2)
ATC
MTC
G304
(8W-15-15)

8W-49 OVERHEAD CONSOLE

Component	Page
Fuse 11	8W-49-4
Fuse 14	8W-49-3
Fuse 19	8W-49-2
G306	8W-49-2, 3, 4
Junction Block	8W-49-2, 3, 4
Media System-Monitor/Dvd	8W-49-4
Mirror-Inside Rearview	8W-49-2
Mirror-Outside Rearview-Driver	8W-49-2
Module-Electronic Overhead	8W-49-3
Module-Front Control	8W-49-2, 3, 4
Module-Hands Free	8W-49-2
Module-Integrated Power	8W-49-2
Radio	8W-49-4
Sensor-Infrared	8W-49-2, 3

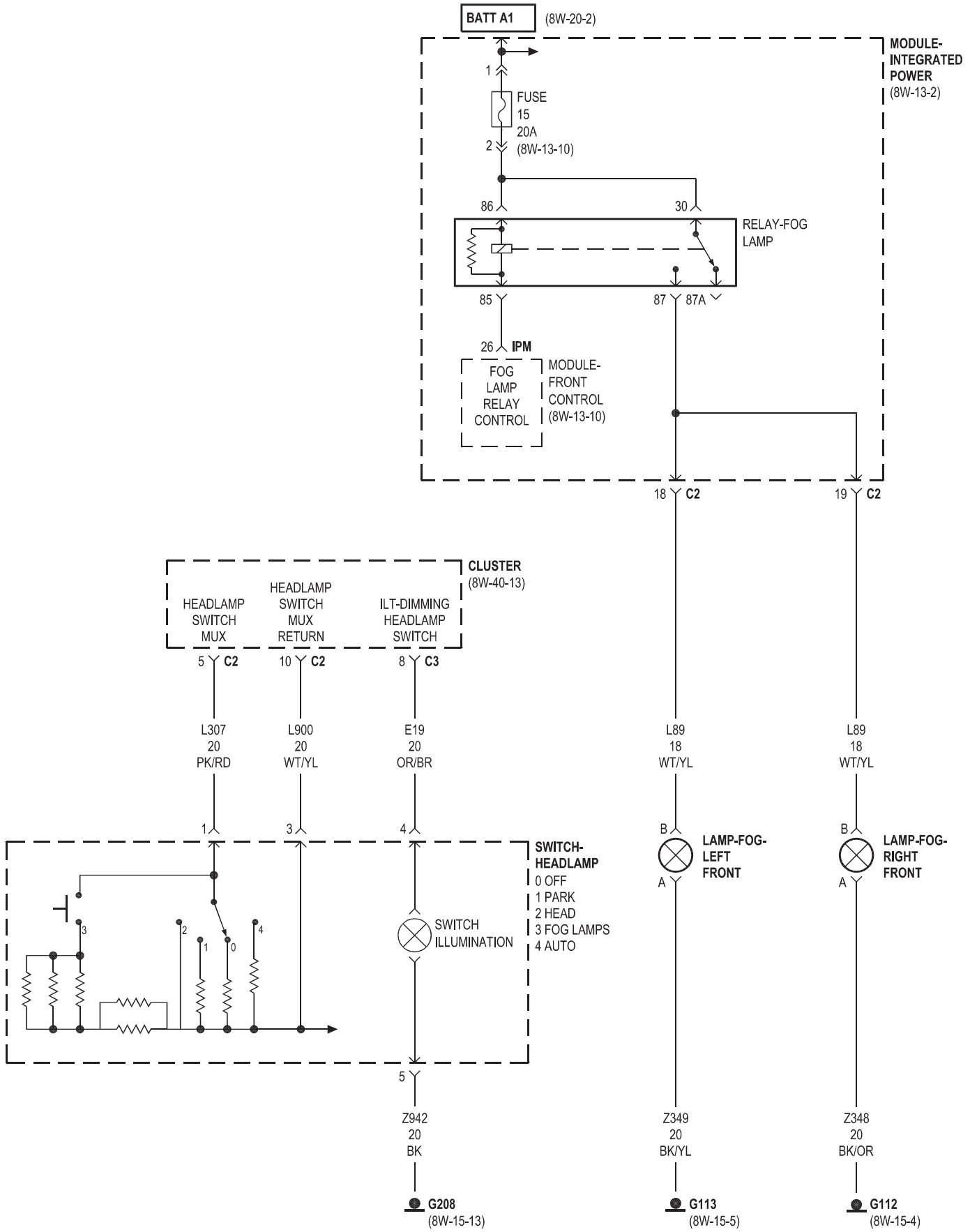

RUN-START F941
(8W-10-18)
JUNCTION BLOCK
(8W-12-2)
1
FUSE 19 10A
2
(8W-12-13)
8 C3
F21 20 PK/DG
10 C221
BASE
EXCEPT BASE
F21 20 PK/DG
S338
(8W-12-13)
F21 20 PK/DG
A
TO SENSOR-INFRARED
(8W-49-3)
F21 20 PK/DG
1 C1
AUTO DAY/NIGHT MIRROR (-)
AUTO DAY/NIGHT MIRROR (+)
MIRROR-OUTSIDE REARVIEW-DRIVER
(8W-62-2)
(8W-62-5)
11
10
P114 20 TN/WT
P112 20 OR/TN
13
14 C364
P114 20 VT/BK
P112 20 BR
8
7
5 C221
P114 20 TN/WT
P112 20 OR/TN
5 C1
4 C1
BACK-UP LAMP FEED
MODULE-FRONT CONTROL
(8W-13-21)
7 IPM
MODULE-INTEGRATED POWER
(8W-13-2)
8 C2
L1 18 WT/LG
21 C1
JUNCTION BLOCK
(8W-12-2)
17 C3
L1 16 WT/LG
L1 18 WT/LG
3 C1
MIRROR-INSIDE REARVIEW
FUSED IGNITION SWITCH OUTPUT (RUN-START)
VOICE RECOGNITION/ PHONE SWITCH SIGNAL
AUTO DAY/NIGHT MIRROR (-)
AUTO DAY/NIGHT MIRROR (+)
BACK-UP LAMP FEED
MICROPHONE 2 IN (+)
MICROPHONE 1 IN (+)
MICROPHONE IN (-)
HANDS FREE MICROPHONE SHIELD
MICROPHONE FEED
SENSOR GROUND
GROUND
4 C2
9 C2
6 C2
12 C2
5 C2
7 C2
11 C2
2 C1
X722 20 LB/TN
X730 20 GY/YL
X712 20 DB/RD
X792 20 DB/YL
X735 20 DB
X793 20 TN/YL
X835 20 OR/GY
Z957 20 BK
S351
(8W-15-17)
14
11
8
10
9
13
12 C222
Z957 18 BK/LG
9 C221
72
47
19
48
55
45
46 C200
Z957 18 BK
G306
(8W-15-18)
5
15
16
17
18
20
21
MODULE-HANDS FREE
(8W-55-3)
HANDS FREE

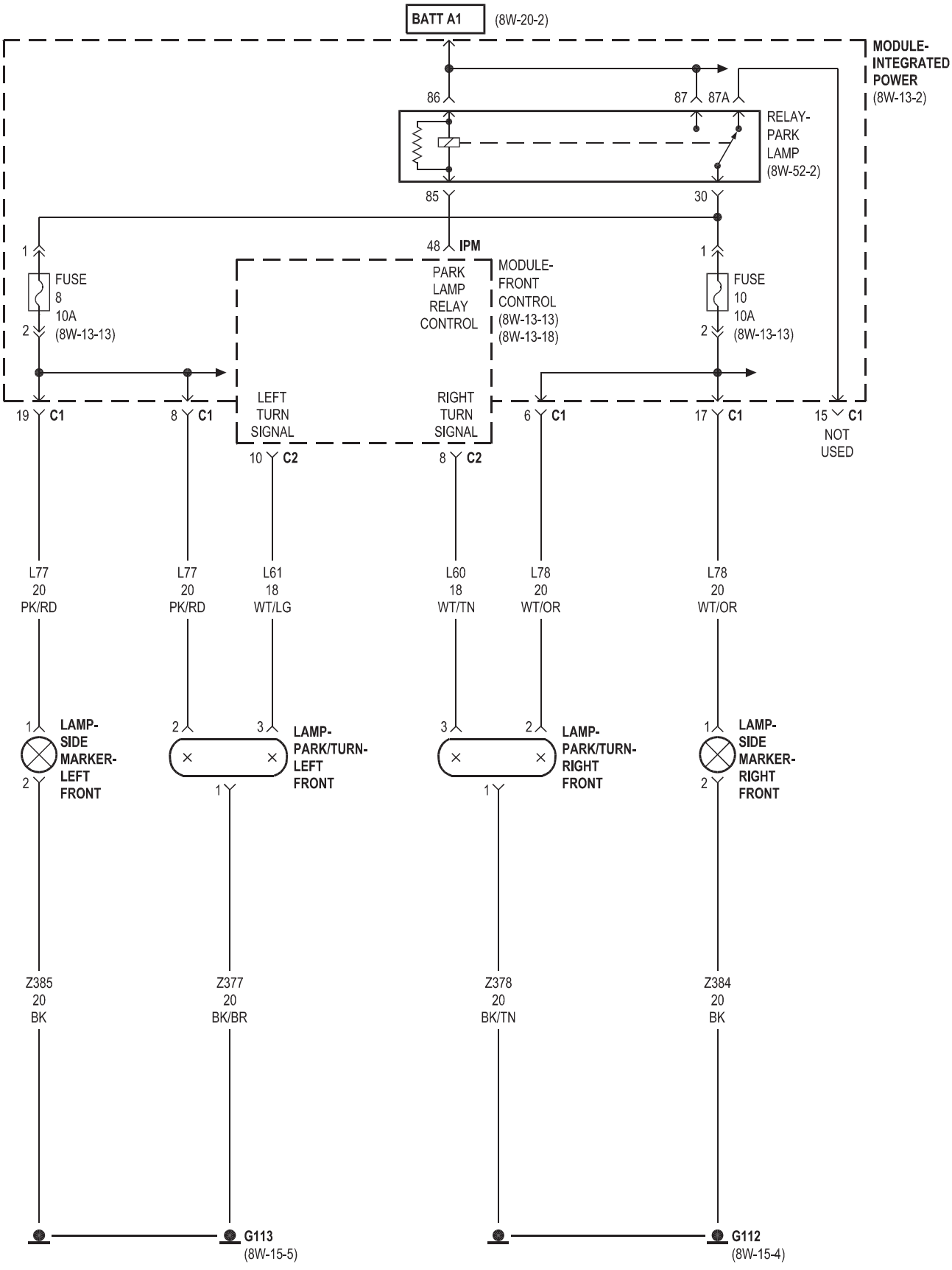

BATT A918
(8W-12-10)
JUNCTION BLOCK
(8W-12-2)
1
FUSE 14 15A
2
(8W-12-10)
23 C3
A926 20 RD
6 C221
A926 18 RD
11 C3
D55 20 WT/OR
S310
(8W-18-4)
D55 20 WT/OR
4 C221
EXCEPT DVD
DVD
D55 20 WT/OR
S325
(8W-18-4)
D55 20 WT/OR
D55 20 WT/OR
27 C1
D55 20 WT/OR
S123
(8W-18-4)
D55 20 WT/OR
2 C1
CAN B BUS (+)
28 C1
D54 20 WT
S125
(8W-18-6)
D54 20 WT
3 C1
CAN B BUS (-)
MODULE-FRONT CONTROL
(8W-13-15)
12 C3
D54 20 WT
S309
(8W-18-6)
D54 20 WT
3 C221
EXCEPT DVD
DVD
D54 20 WT
S326
(8W-18-6)
D54 20 WT
D54 20 WT
2
3
4
FUSED B(+)
CAN B BUS (+)
INFRARED SENSOR SIGNAL
CAN B BUS (-)
GROUND
MODULE-ELECTRONIC OVERHEAD
FROM S338
(8W-49-2)
A
F21 20 PK/DG
1
FUSED IGNITION SWITCH OUTPUT (RUN-START)
6
C83 20 DB/LG
3
INFRARED SENSOR SIGNAL
GROUND
SENSOR-INFRARED
4
Z957 20 BK
5
EXCEPT BASE
BASE
Z957 18 BK
S351
(8W-15-17)
Z957 18 BK/LG
Z957 20 BK
9 C221
Z957 18 BK
G306
(8W-15-18)

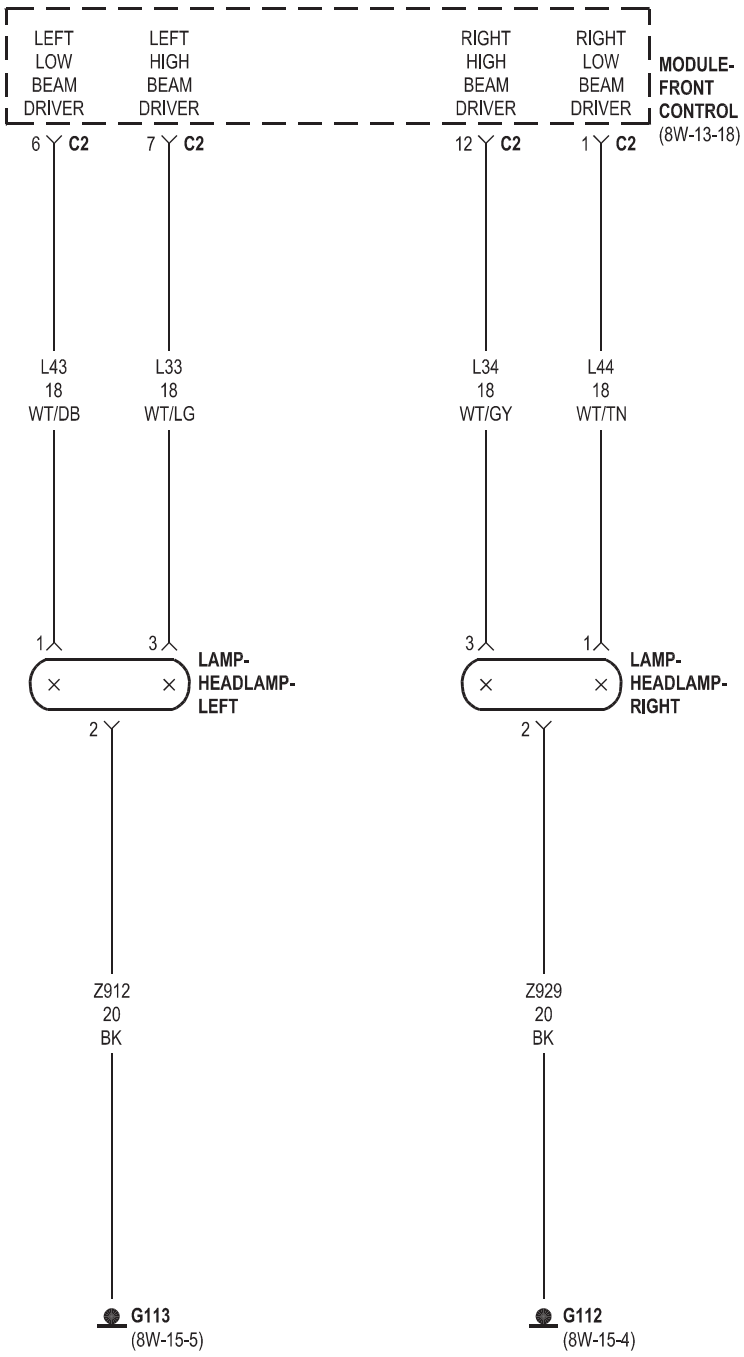

BATT A920
(8W-12-9)
JUNCTION BLOCK
(8W-12-2)
FUSE
11
10A
(8W-12-9)
30 C3
11 C3
27 C1
28 C1
12 C3
D55 20 WT/OR
D54 20 WT
S310
(8W-18-4)
S123
(8W-18-4)
S125
(8W-18-6)
S309
(8W-18-6)
A300 20 GY/LG
C221
S325
(8W-18-4)
S326
(8W-18-6)
CAN B BUS (+)
CAN B BUS (-)
MODULE-FRONT CONTROL
(8W-13-15)
FUSED B(+)
CAN B BUS (+)
MEDIA SYSTEM-MONITOR/DVD
(8W-47-4)
(8W-47-5)
SDARS AUDIO RETURN
VDO-AUX AUDIO RT
VDO-AUX AUDIO RTN/COMMON
VDO-AUX AUDIO LT
VDO-AUX AUDIO LT2
VDO-AUX AUDIO RT2
GROUND
X916 20 LB/PK
X510 20 DG/RD
X910 20 GY/DG
X511 20 DB/RD
X521 20 GY/LB
X522 20 LG/RD
Z957 20 BK
C222
S351
(8W-15-17)
Z957 18 BK/LG
C200
C221
Z957 18 BK
C2
RADIO
(8W-47-4)
G306
(8W-15-18)

8W-50 FRONT LIGHTING

Component	Page
Cluster	8W-50-2
Fuse 8	8W-50-3
Fuse 10	8W-50-3
Fuse 15	8W-50-2
G112	8W-50-2, 3, 4
G113	8W-50-2, 3, 4
G208	8W-50-2
Lamp-Fog-Left Front	8W-50-2
Lamp-Fog-Right Front	8W-50-2
Lamp-Headlamp-Left	8W-50-4
Lamp-Headlamp-Right	8W-50-4
Lamp-Park/Turn-Left Front	8W-50-3
Lamp-Park/Turn-Right Front	8W-50-3
Lamp-Side Marker-Left Front	8W-50-3
Lamp-Side Marker-Right Front	8W-50-3
Module-Front Control	8W-50-2, 3, 4
Module-Integrated Power	8W-50-2, 3
Relay-Fog Lamp	8W-50-2
Relay-Park Lamp	8W-50-3
Switch-Headlamp	8W-50-2

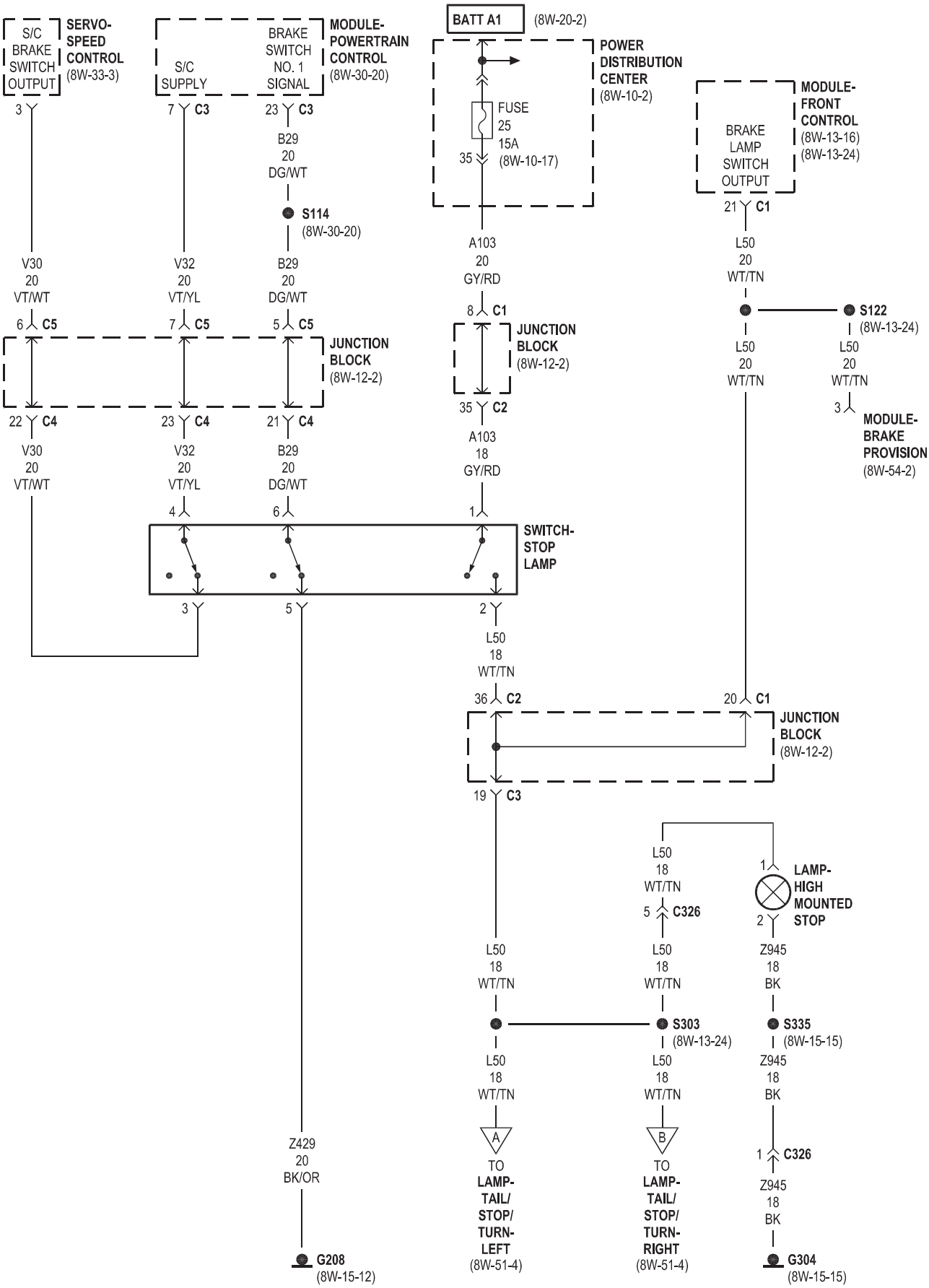

BATT A1
(8W-20-2)
MODULE-
INTEGRATED
POWER
(8W-13-2)
1
FUSE
15
20A
2
(8W-13-10)
86
30
RELAY-FOG
LAMP
85
87
87A
26
IPM
FOG
LAMP
RELAY
CONTROL
MODULE-
FRONT
CONTROL
(8W-13-10)
18
C2
19
C2
CLUSTER
(8W-40-13)
HEADLAMP
SWITCH
MUX
HEADLAMP
SWITCH
MUX
RETURN
ILT-DIMMING
HEADLAMP
SWITCH
5
C2
10
C2
8
C3
L307
20
PK/RD
L900
20
WT/YL
E19
20
OR/BR
L89
18
WT/YL
L89
18
WT/YL
1
3
4
B
A
LAMP-FOG-
LEFT
FRONT
LAMP-FOG-
RIGHT
FRONT
SWITCH-
HEADLAMP
0 OFF
1 PARK
2 HEAD
3 FOG LAMPS
4 AUTO
SWITCH
ILLUMINATION
5
Z942
20
BK
Z349
20
BK/YL
Z348
20
BK/OR
G208
(8W-15-13)
G113
(8W-15-5)
G112
(8W-15-4)

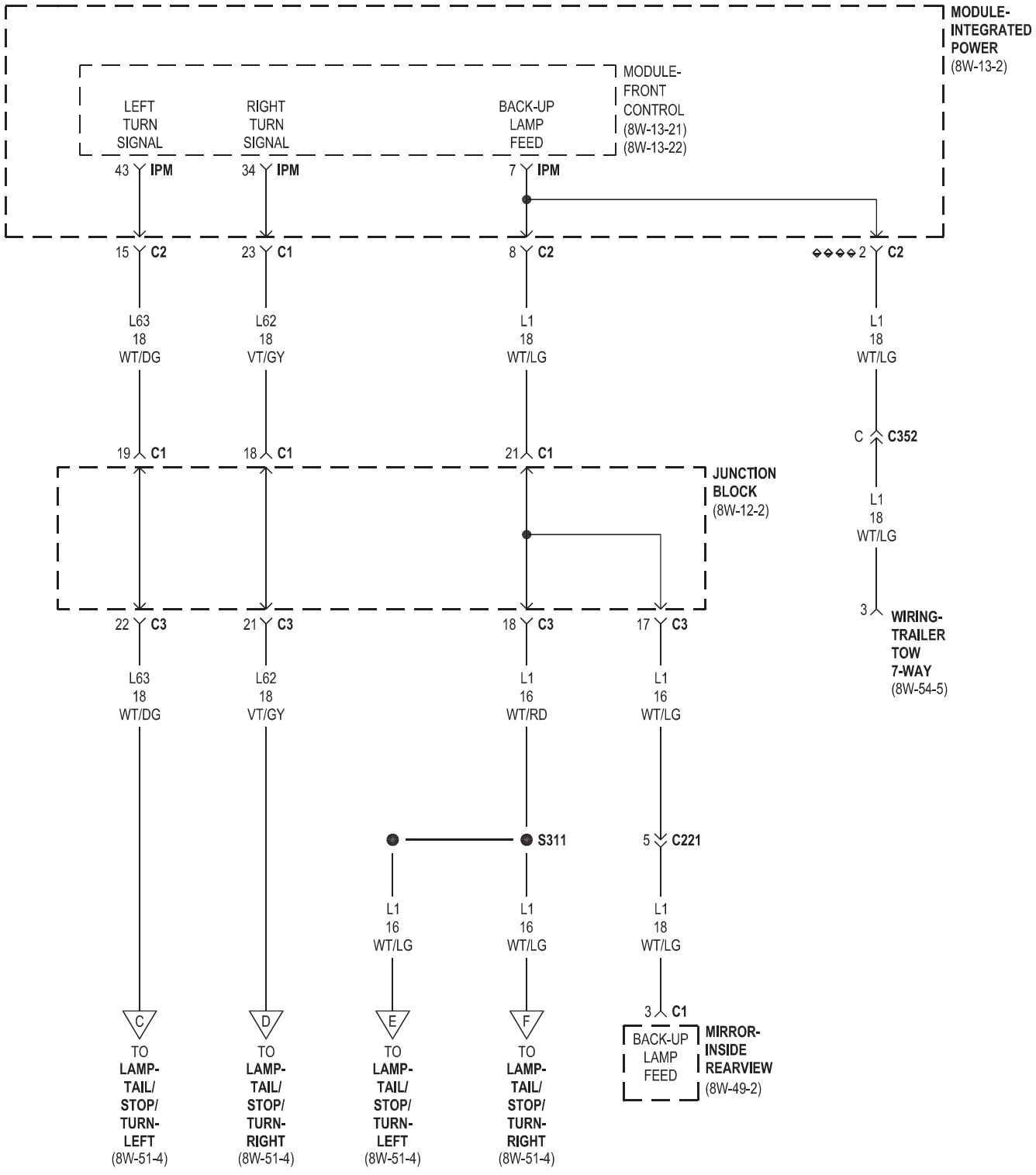

BATT A1
(8W-20-2)
MODULE-
INTEGRATED
POWER
(8W-13-2)
86
87
87A
RELAY-
PARK
LAMP
(8W-52-2)
85
30
48
IPM
1
FUSE
8
10A
2
(8W-13-13)
PARK
LAMP
RELAY
CONTROL
MODULE-
FRONT
CONTROL
(8W-13-13)
(8W-13-18)
1
FUSE
10
10A
2
(8W-13-13)
19
C1
8
C1
LEFT
TURN
SIGNAL
10
C2
RIGHT
TURN
SIGNAL
8
C2
6
C1
17
C1
15
C1
NOT
USED
L77
20
PK/RD
L77
20
PK/RD
L61
18
WT/LG
L60
18
WT/TN
L78
20
WT/OR
L78
20
WT/OR
1
2
LAMP-
SIDE
MARKER-
LEFT
FRONT
2
3
1
LAMP-
PARK/TURN-
LEFT
FRONT
3
2
1
LAMP-
PARK/TURN-
RIGHT
FRONT
1
2
LAMP-
SIDE
MARKER-
RIGHT
FRONT
Z385
20
BK
Z377
20
BK/BR
Z378
20
BK/TN
Z384
20
BK
G113
(8W-15-5)
G112
(8W-15-4)


LEFT LOW BEAM DRIVER
LEFT HIGH BEAM DRIVER
RIGHT HIGH BEAM DRIVER
RIGHT LOW BEAM DRIVER
MODULE-FRONT CONTROL
(8W-13-18)
6 C2
7 C2
12 C2
1 C2
L43 18 WT/DB
L33 18 WT/LG
L34 18 WT/GY
L44 18 WT/TN
1
3
3
1
LAMP-HEADLAMP-LEFT
LAMP-HEADLAMP-RIGHT
2
2
Z912 20 BK
Z929 20 BK
G113
(8W-15-5)
G112
(8W-15-4)

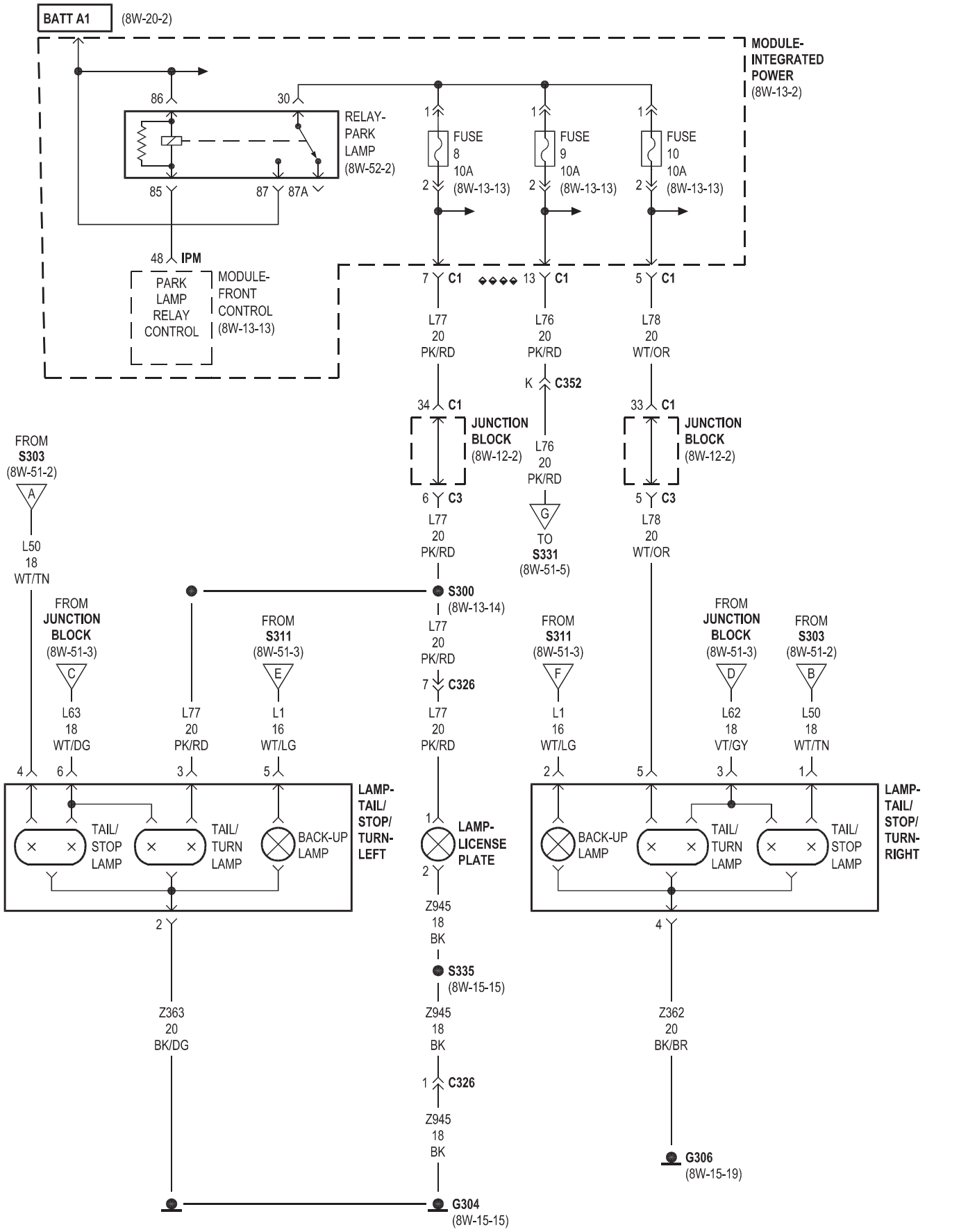
8W-51 REAR LIGHTING

Component	Page
Fuse 8	8W-51-4
Fuse 9	8W-51-4
Fuse 10	8W-51-4
Fuse 25	8W-51-2
G208	8W-51-2
G304	8W-51-2, 4
G305	8W-51-5
G306	8W-51-4
Junction Block	8W-51-2, 3, 4
Lamp-High Mounted Stop	8W-51-2
Lamp-License Plate	8W-51-4
Lamp-Tail/Stop/Turn-Left	8W-51-2, 3, 4
Lamp-Tail/Stop/Turn-Right	8W-51-2, 3, 4
Mirror-Inside Rearview	8W-51-3
Module-Brake Provision	8W-51-2
Module-Front Control	8W-51-2, 3, 4
Module-Integrated Power	8W-51-3, 4
Module-Powertrain Control	8W-51-2
Power Distribution Center	8W-51-2
Relay-Park Lamp	8W-51-4
Servo-Speed Control	8W-51-2
Switch-Stop Lamp	8W-51-2
Wiring-Trailer Tow 4-Way	8W-51-5
Wiring-Trailer Tow 7-Way	8W-51-3, 5

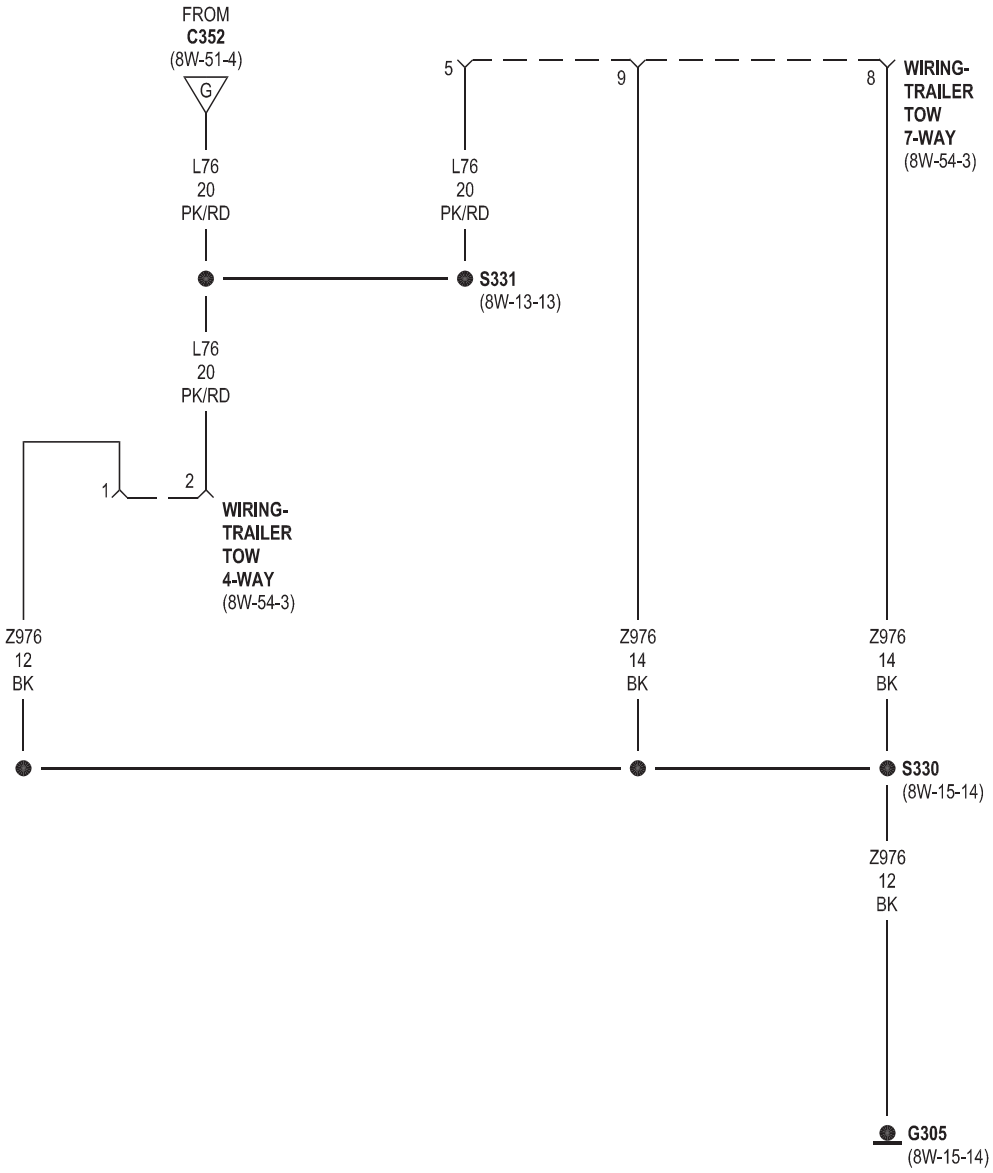

S/C BRAKE SWITCH OUTPUT
SERVO-SPEED CONTROL (8W-33-3)
S/C SUPPLY
BRAKE SWITCH NO. 1 SIGNAL
MODULE-POWERTRAIN CONTROL (8W-30-20)
BATT A1 (8W-20-2)
POWER DISTRIBUTION CENTER (8W-10-2)
FUSE 25 15A (8W-10-17)
BRAKE LAMP SWITCH OUTPUT
MODULE-FRONT CONTROL (8W-13-16) (8W-13-24)
S114 (8W-30-20)
S122 (8W-13-24)
JUNCTION BLOCK (8W-12-2)
MODULE-BRAKE PROVISION (8W-54-2)
SWITCH-STOP LAMP
LAMP-HIGH MOUNTED STOP
S303 (8W-13-24)
S335 (8W-15-15)
TO LAMP-TAIL/STOP/TURN-LEFT (8W-51-4)
TO LAMP-TAIL/STOP/TURN-RIGHT (8W-51-4)
G208 (8W-15-12)
G304 (8W-15-15)


MODULE-INTEGRATED POWER (8W-13-2)
MODULE-FRONT CONTROL (8W-13-21) (8W-13-22)
LEFT TURN SIGNAL
RIGHT TURN SIGNAL
BACK-UP LAMP FEED
43 IPM
34 IPM
7 IPM
15 C2
23 C1
8 C2
2 C2
L63 18 WT/DG
L62 18 VT/GY
L1 18 WT/LG
L1 18 WT/LG
C C352
L1 18 WT/LG
3 WIRING-TRAILER TOW 7-WAY (8W-54-5)
19 C1
18 C1
21 C1
JUNCTION BLOCK (8W-12-2)
22 C3
21 C3
18 C3
17 C3
L63 18 WT/DG
L62 18 VT/GY
L1 16 WT/RD
L1 16 WT/LG
S311
5 C221
L1 16 WT/LG
L1 16 WT/LG
L1 18 WT/LG
3 C1
BACK-UP LAMP FEED
MIRROR-INSIDE REARVIEW (8W-49-2)
C
D
E
F
TO LAMP-TAIL/STOP/TURN-LEFT (8W-51-4)
TO LAMP-TAIL/STOP/TURN-RIGHT (8W-51-4)
TO LAMP-TAIL/STOP/TURN-LEFT (8W-51-4)
TO LAMP-TAIL/STOP/TURN-RIGHT (8W-51-4)

◆◆◆◆ TRAILER TOW

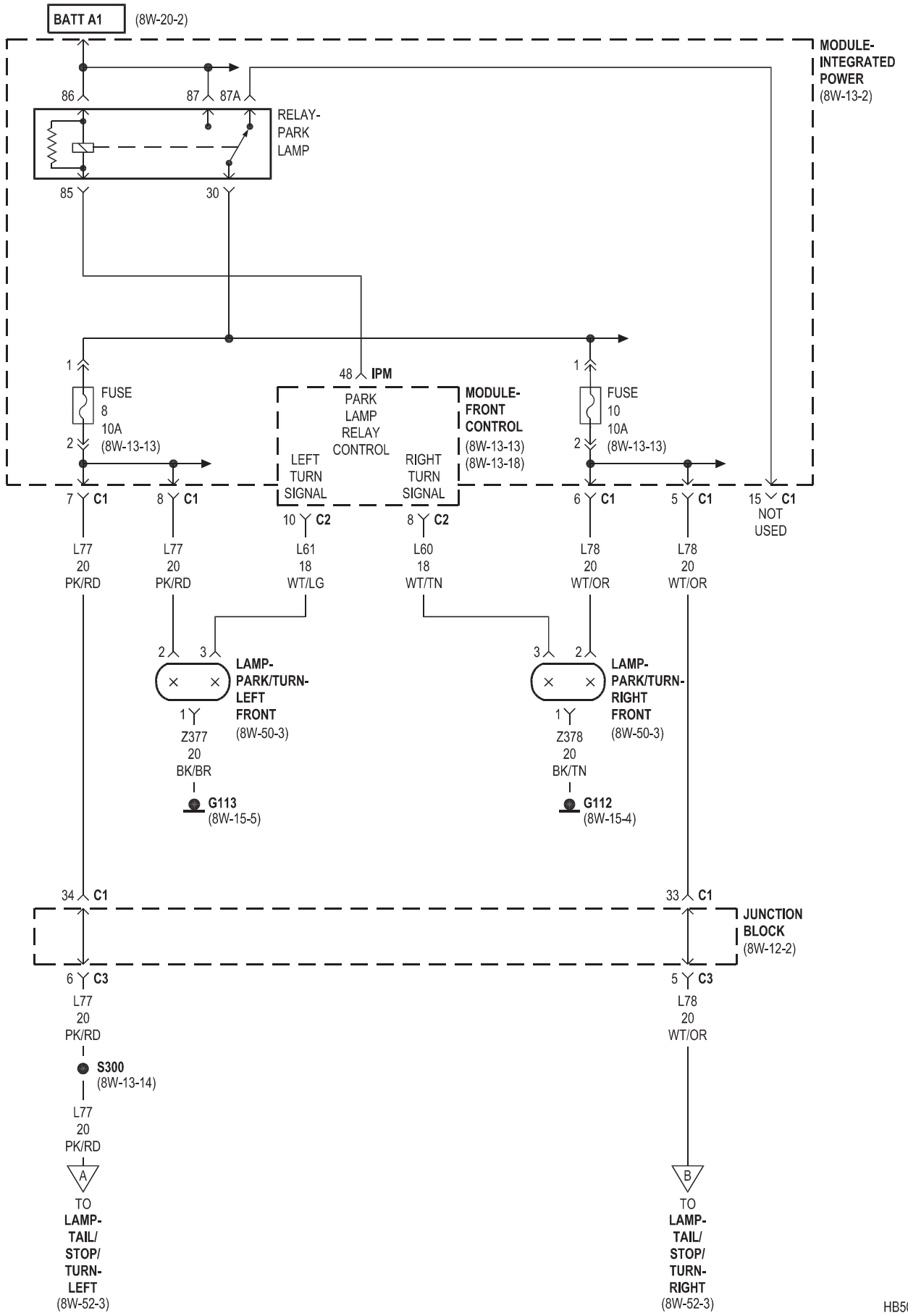

BATT A1
(8W-20-2)
MODULE-
INTEGRATED
POWER
(8W-13-2)
86
30
RELAY-
PARK
LAMP
(8W-52-2)
85
87
87A
1
FUSE
8
10A
2
(8W-13-13)
FUSE
9
10A
FUSE
10
10A
48
IPM
PARK
LAMP
RELAY
CONTROL
MODULE-
FRONT
CONTROL
(8W-13-13)
7
C1
13
C1
5
C1
L77
20
PK/RD
L76
20
PK/RD
L78
20
WT/OR
K
C352
34
C1
33
C1
JUNCTION
BLOCK
(8W-12-2)
6
C3
5
C3
L76
20
PK/RD
G
TO
S331
(8W-51-5)
FROM
S303
(8W-51-2)
A
L50
18
WT/TN
S300
(8W-13-14)
FROM
JUNCTION
BLOCK
(8W-51-3)
C
L63
18
WT/DG
FROM
S311
(8W-51-3)
E
L1
16
WT/LG
L77
20
PK/RD
7
C326
FROM
S311
(8W-51-3)
F
L1
16
WT/LG
FROM
JUNCTION
BLOCK
(8W-51-3)
D
L62
18
VT/GY
FROM
S303
(8W-51-2)
B
L50
18
WT/TN
4
6
3
5
2
5
3
1
LAMP-
TAIL/
STOP/
TURN-
LEFT
TAIL/
STOP
LAMP
TAIL/
TURN
LAMP
BACK-UP
LAMP
LAMP-
LICENSE
PLATE
BACK-UP
LAMP
TAIL/
TURN
LAMP
TAIL/
STOP
LAMP
LAMP-
TAIL/
STOP/
TURN-
RIGHT
2
4
Z945
18
BK
S335
(8W-15-15)
Z363
20
BK/DG
Z945
18
BK
Z362
20
BK/BR
1
C326
Z945
18
BK
G306
(8W-15-19)
G304
(8W-15-15)

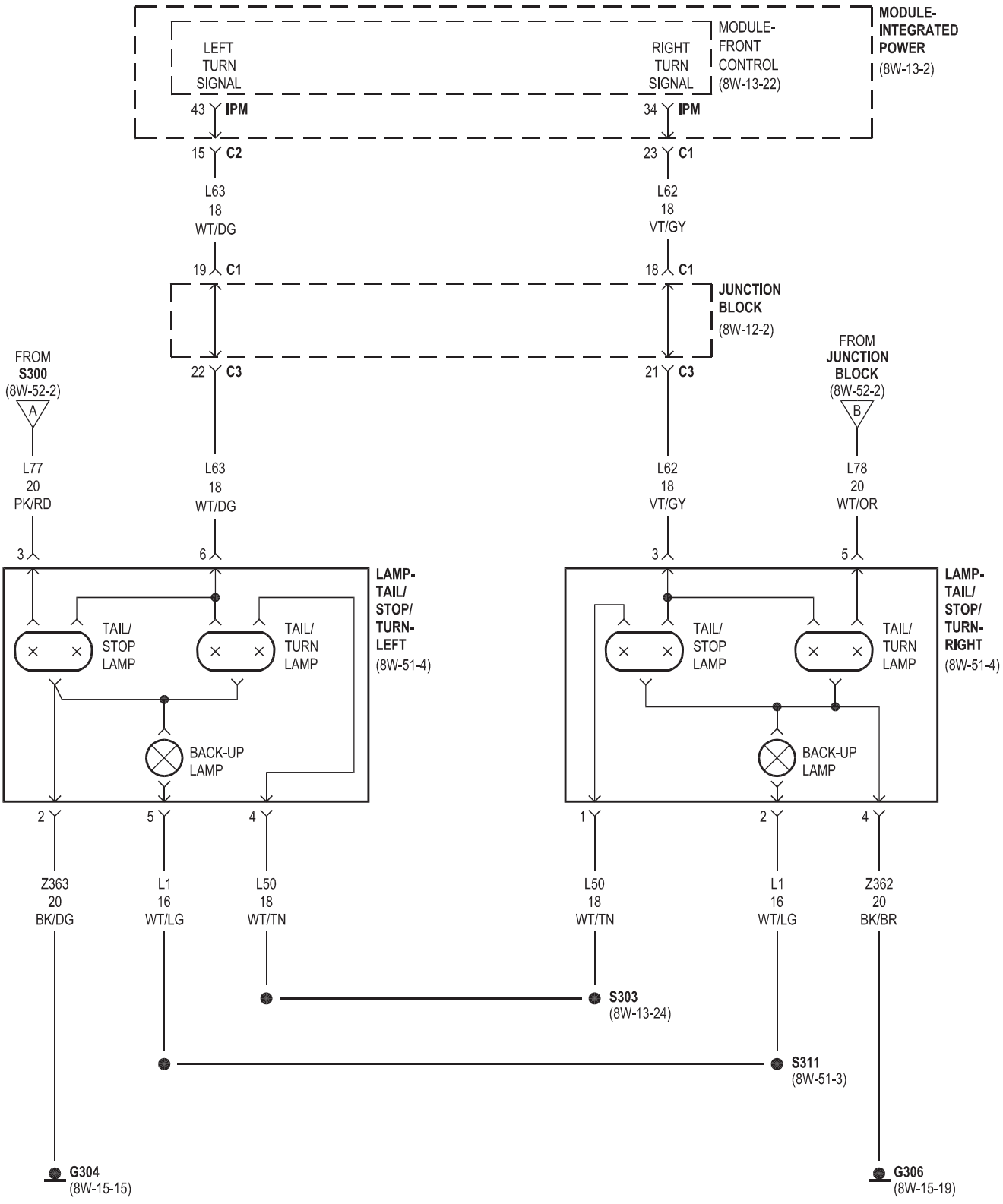
◆◆◆◆ TRAILER TOW


FROM
C352
(8W-51-4)
G
L76
20
PK/RD
5
L76
20
PK/RD
S331
(8W-13-13)
9
8
WIRING-
TRAILER
TOW
7-WAY
(8W-54-3)
L76
20
PK/RD
1
2
WIRING-
TRAILER
TOW
4-WAY
(8W-54-3)
Z976
12
BK
Z976
14
BK
Z976
14
BK
S330
(8W-15-14)
Z976
12
BK
G305
(8W-15-14)

8W-52 TURN SIGNALS

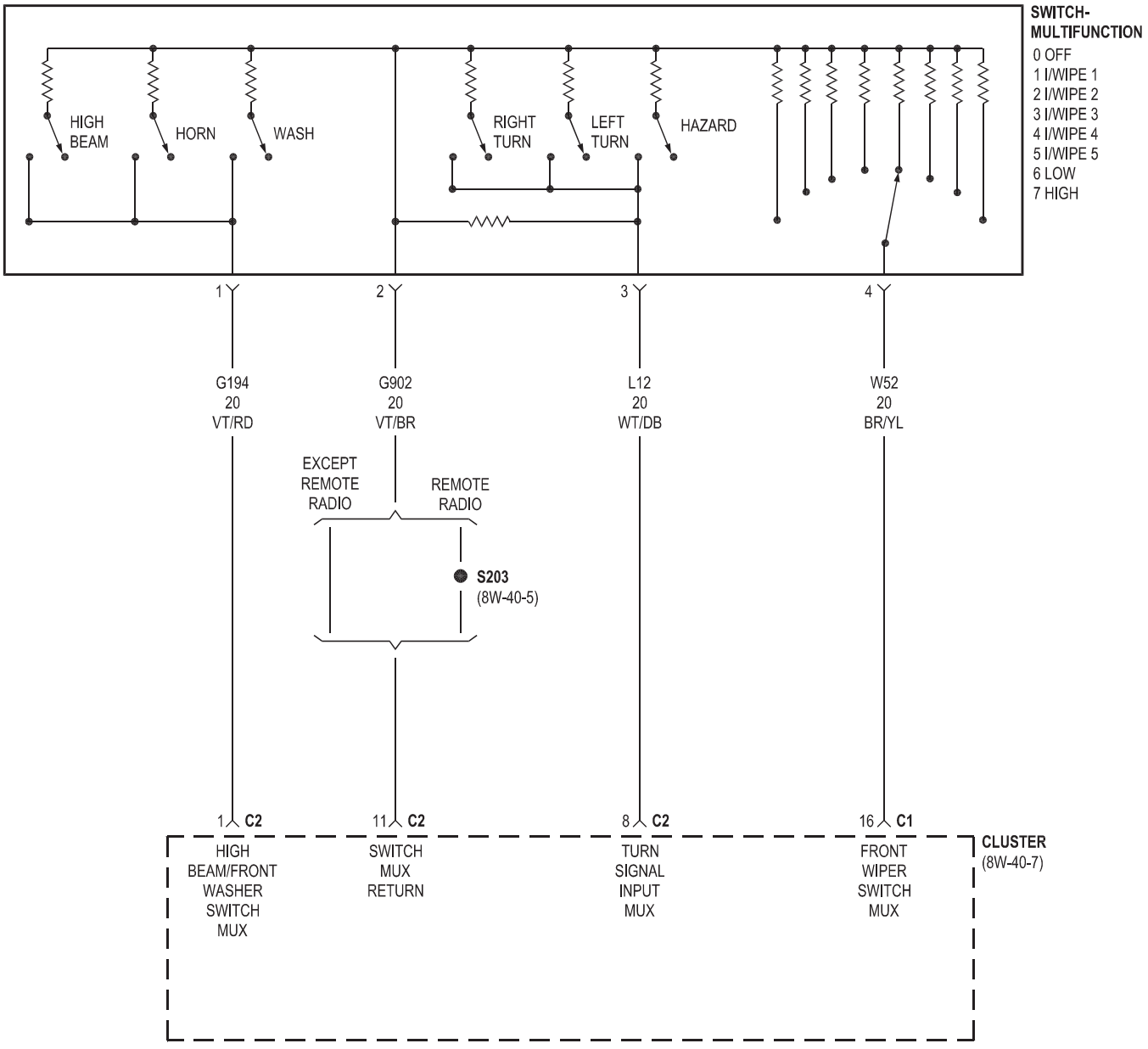
Component	Page
Fuse 8	8W-52-2
Fuse 10	8W-52-2
G112	8W-52-2
G113	8W-52-2
G304	8W-52-3
G306	8W-52-3
Junction Block	8W-52-2, 3
Lamp-Park/Turn-Left Front	8W-52-2
Lamp-Park/Turn-Right Front	8W-52-2
Lamp-Tail/Stop/Turn-Left	8W-52-2, 3
Lamp-Tail/Stop/Turn-Right	8W-52-2, 3
Module-Front Control	8W-52-2, 3
Module-Integrated Power	8W-52-2, 3
Relay-Park Lamp	8W-52-2

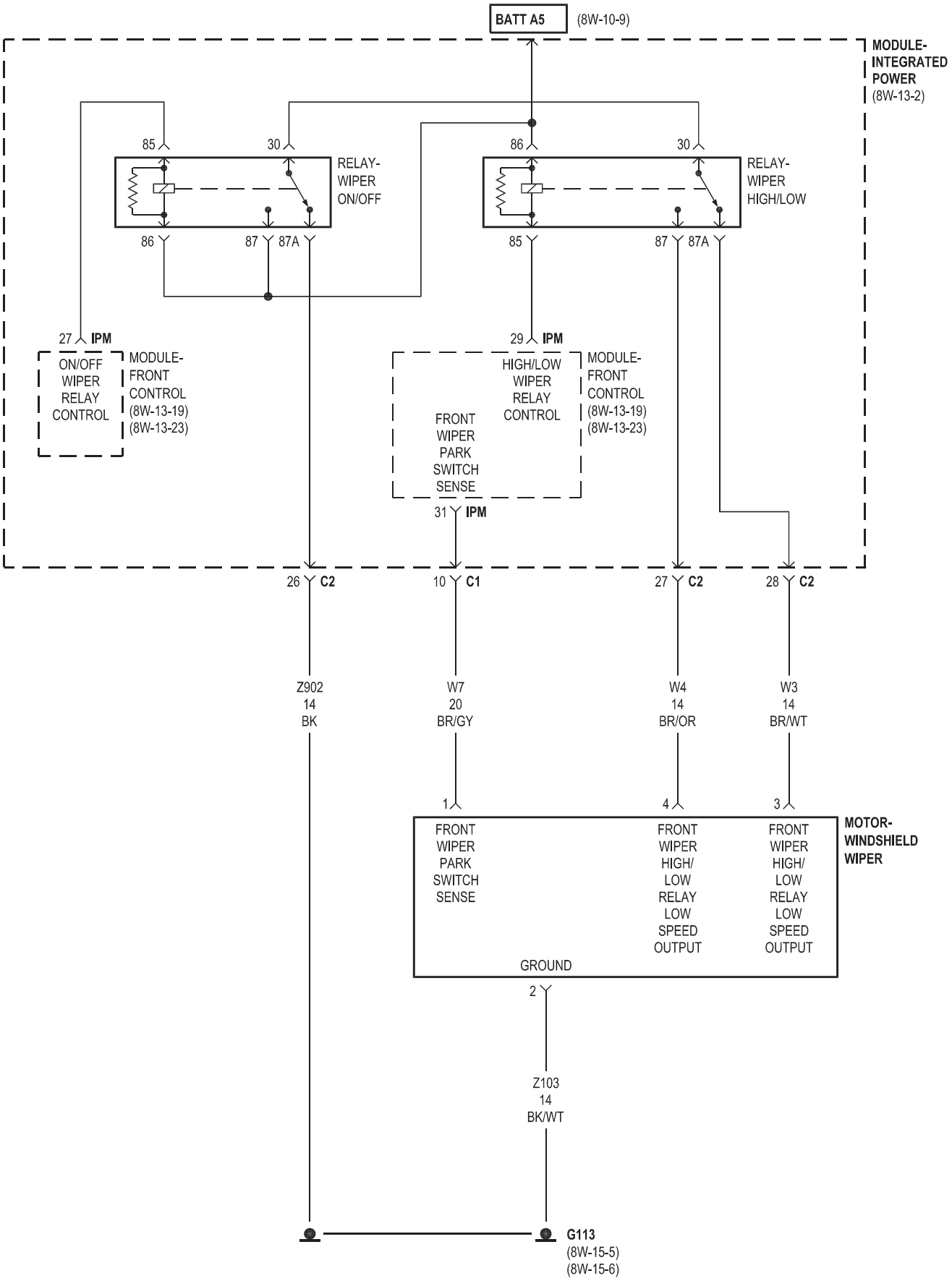

BATT A1
(8W-20-2)
MODULE-
INTEGRATED
POWER
(8W-13-2)
86
87
87A
RELAY-
PARK
LAMP
85
30
1
FUSE
8
10A
(8W-13-13)
2
48 IPM
PARK
LAMP
RELAY
CONTROL
LEFT
TURN
SIGNAL
RIGHT
TURN
SIGNAL
MODULE-
FRONT
CONTROL
(8W-13-13)
(8W-13-18)
1
FUSE
10
10A
(8W-13-13)
2
7 C1
8 C1
10 C2
8 C2
6 C1
5 C1
15 C1
NOT
USED
L77
20
PK/RD
L77
20
PK/RD
L61
18
WT/LG
L60
18
WT/TN
L78
20
WT/OR
L78
20
WT/OR
2
3
LAMP-
PARK/TURN-
LEFT
FRONT
(8W-50-3)
1
Z377
20
BK/BR
G113
(8W-15-5)
3
2
LAMP-
PARK/TURN-
RIGHT
FRONT
(8W-50-3)
1
Z378
20
BK/TN
G112
(8W-15-4)
34 C1
33 C1
JUNCTION
BLOCK
(8W-12-2)
6 C3
L77
20
PK/RD
S300
(8W-13-14)
L77
20
PK/RD
A
TO
LAMP-
TAIL/
STOP/
TURN-
LEFT
(8W-52-3)
5 C3
L78
20
WT/OR
B
TO
LAMP-
TAIL/
STOP/
TURN-
RIGHT
(8W-52-3)

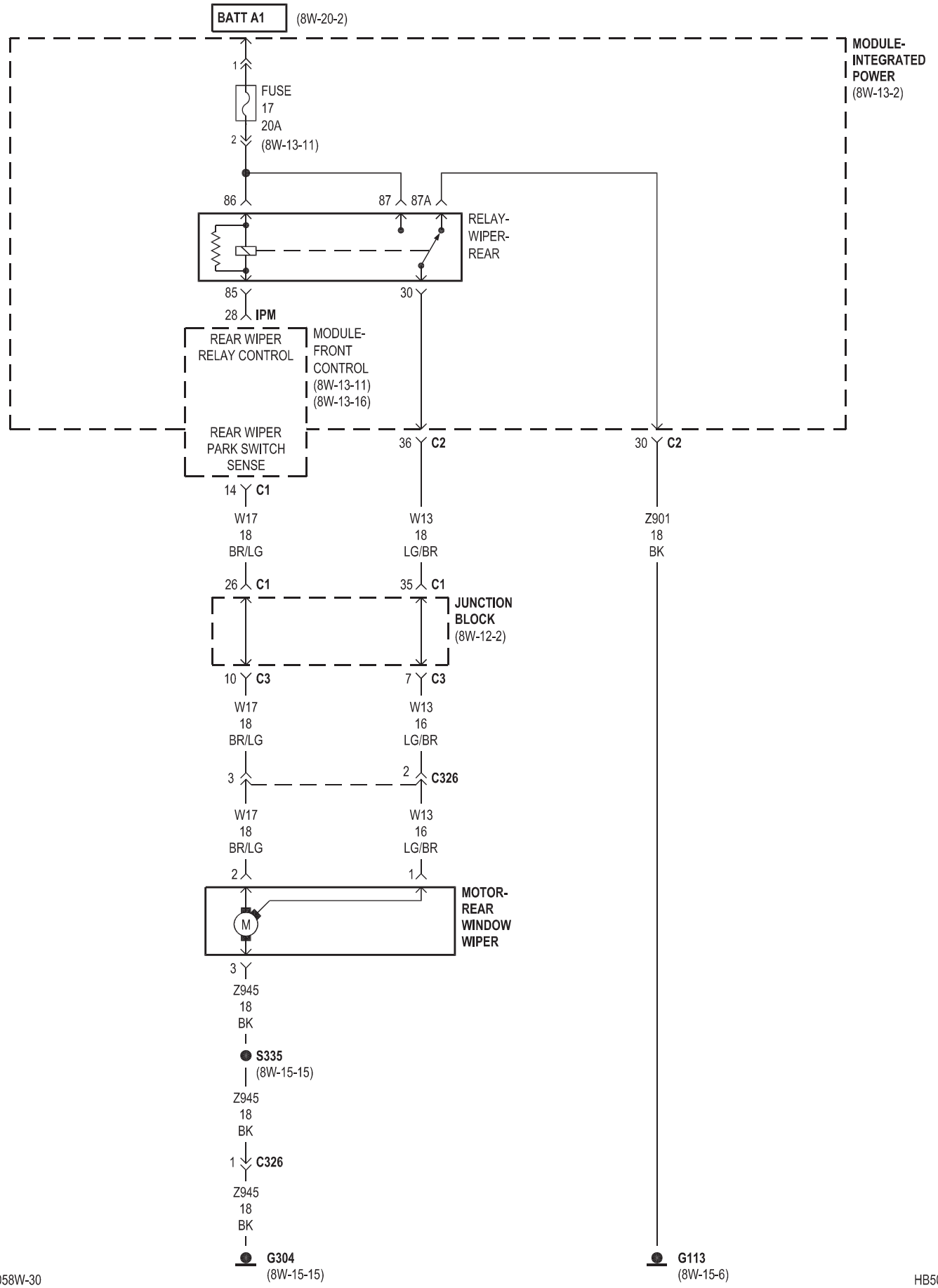

MODULE-
INTEGRATED
POWER
(8W-13-2)
MODULE-
FRONT
CONTROL
(8W-13-22)
LEFT
TURN
SIGNAL
RIGHT
TURN
SIGNAL
43 IPM
34 IPM
15 C2
23 C1
L63
18
WT/DG
L62
18
VT/GY
19 C1
18 C1
JUNCTION
BLOCK
(8W-12-2)
22 C3
21 C3
FROM
S300
(8W-52-2)
A
FROM
JUNCTION
BLOCK
(8W-52-2)
B
L77
20
PK/RD
L63
18
WT/DG
L62
18
VT/GY
L78
20
WT/OR
3
6
3
5
LAMP-
TAIL/
STOP/
TURN-
LEFT
(8W-51-4)
LAMP-
TAIL/
STOP/
TURN-
RIGHT
(8W-51-4)
TAIL/
STOP
LAMP
TAIL/
TURN
LAMP
BACK-UP
LAMP
2
5
4
1
2
4
Z363
20
BK/DG
L1
16
WT/LG
L50
18
WT/TN
L50
18
WT/TN
L1
16
WT/LG
Z362
20
BK/BR
S303
(8W-13-24)
S311
(8W-51-3)
G304
(8W-15-15)
G306
(8W-15-19)

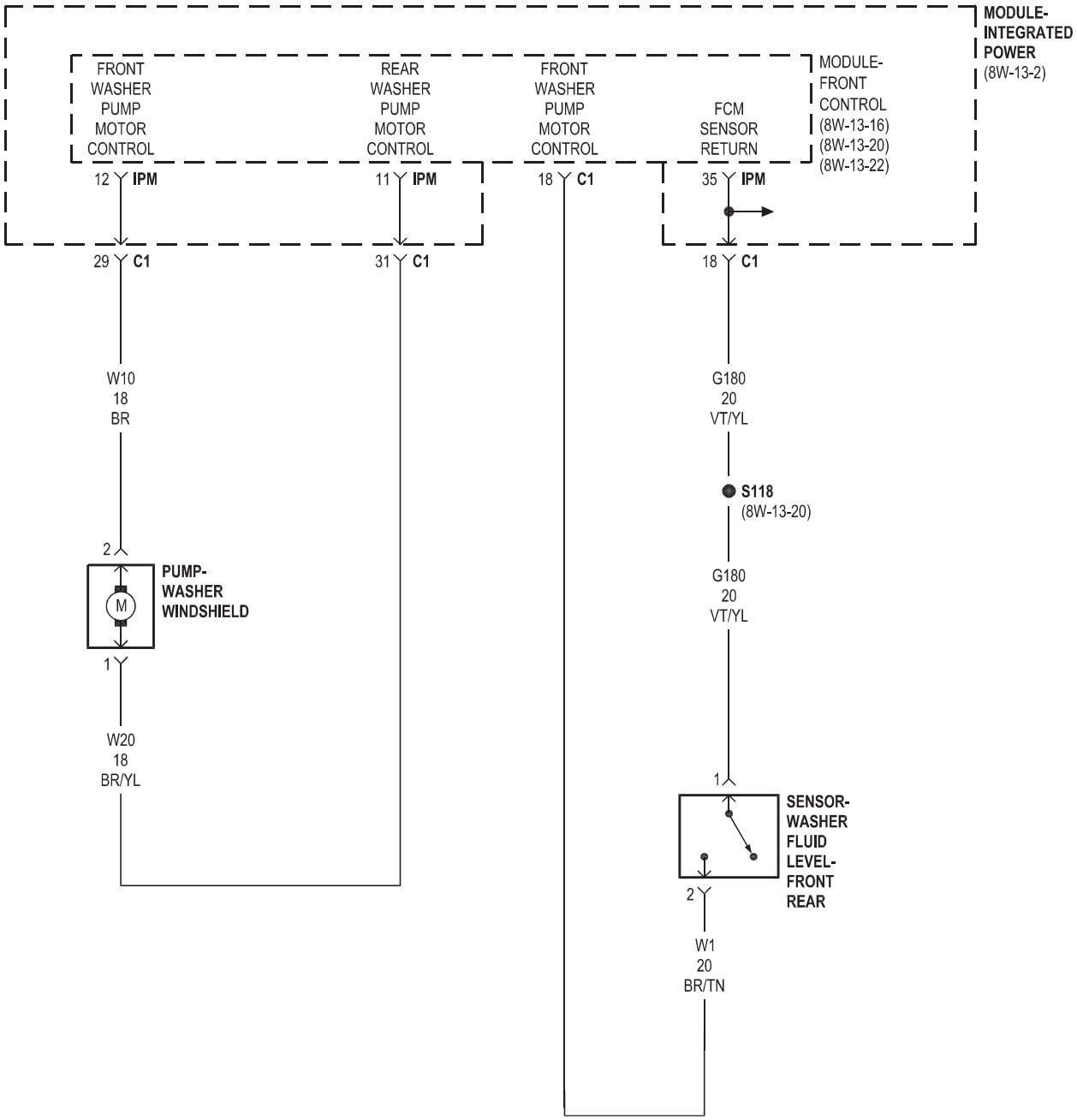
8W-53 WIPERS

Component	Page
Cluster	8W-53-2
Fuse 17	8W-53-4
G113	8W-53-3, 4
G304	8W-53-4
Junction Block	8W-53-4
Module-Front Control	8W-53-3, 4, 5
Module-Integrated Power	8W-53-3, 4, 5
Motor-Rear Window Wiper	8W-53-4
Motor-Windshield Wiper	8W-53-3
Pump-Washer Windshield	8W-53-5
Relay-Wiper High/Low	8W-53-3
Relay-Wiper On/Off	8W-53-3
Relay-Wiper-Rear	8W-53-4
Sensor-Washer Fluid Level-Front Rear	8W-53-5
Switch-Multifunction	8W-53-2


SWITCH-
MULTIFUNCTION
0 OFF
1 I/WIPE 1
2 I/WIPE 2
3 I/WIPE 3
4 I/WIPE 4
5 I/WIPE 5
6 LOW
7 HIGH
HIGH BEAM
HORN
WASH
RIGHT TURN
LEFT TURN
HAZARD
1
2
3
4
G194
20
VT/RD
G902
20
VT/BR
L12
20
WT/DB
W52
20
BR/YL
EXCEPT REMOTE RADIO
REMOTE RADIO
S203
(8W-40-5)
1 C2
11 C2
8 C2
16 C1
HIGH BEAM/FRONT WASHER SWITCH MUX
SWITCH MUX RETURN
TURN SIGNAL INPUT MUX
FRONT WIPER SWITCH MUX
CLUSTER
(8W-40-7)

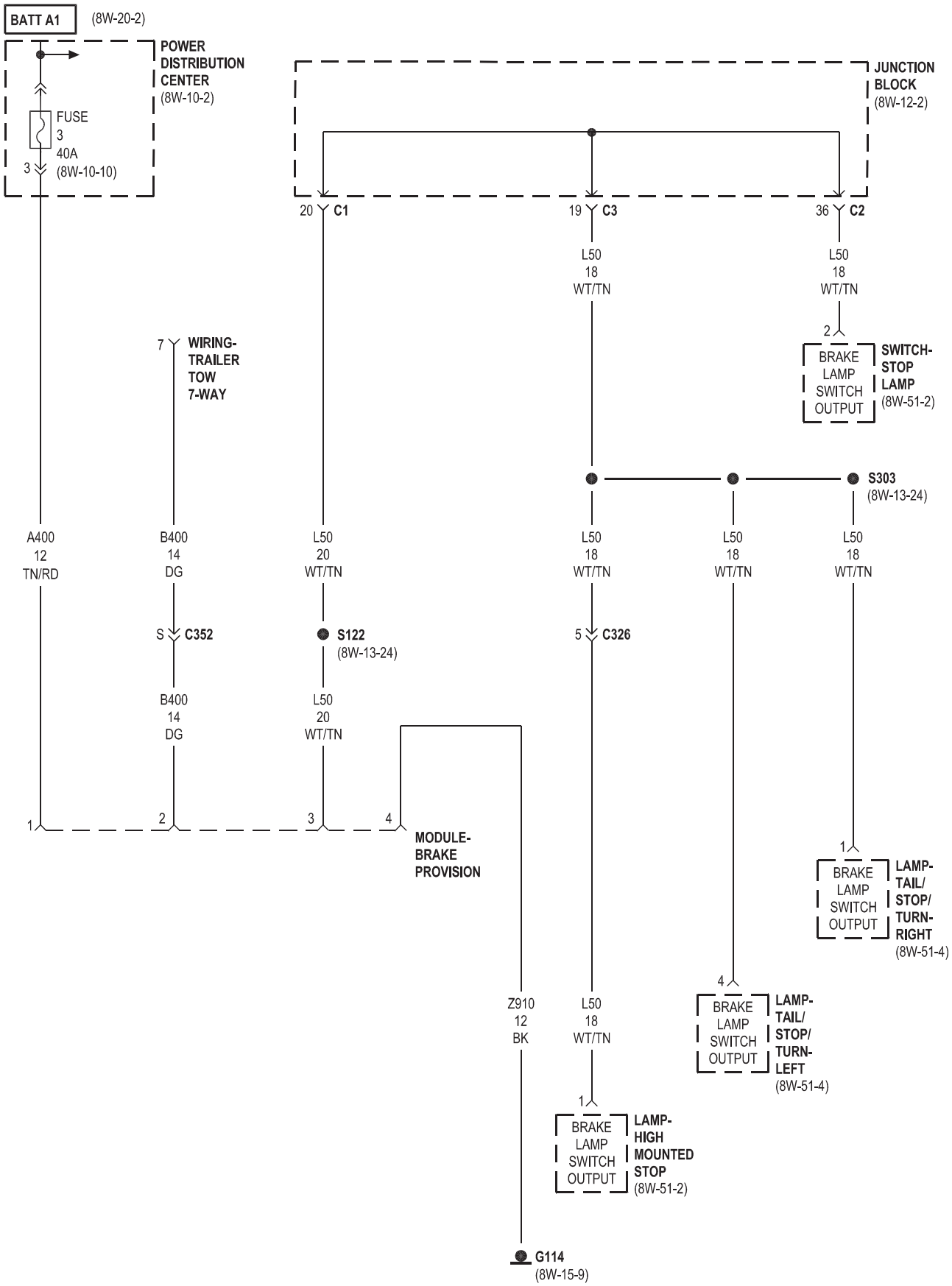

BATT A5
(8W-10-9)
MODULE-
INTEGRATED
POWER
(8W-13-2)
85
30
RELAY-
WIPER
ON/OFF
86
87
87A
86
30
RELAY-
WIPER
HIGH/LOW
85
87
87A
27 IPM
ON/OFF
WIPER
RELAY
CONTROL
MODULE-
FRONT
CONTROL
(8W-13-19)
(8W-13-23)
29 IPM
HIGH/LOW
WIPER
RELAY
CONTROL
FRONT
WIPER
PARK
SWITCH
SENSE
MODULE-
FRONT
CONTROL
(8W-13-19)
(8W-13-23)
31 IPM
26 C2
10 C1
27 C2
28 C2
Z902
14
BK
W7
20
BR/GY
W4
14
BR/OR
W3
14
BR/WT
1
4
3
FRONT
WIPER
PARK
SWITCH
SENSE
FRONT
WIPER
HIGH/
LOW
RELAY
LOW
SPEED
OUTPUT
FRONT
WIPER
HIGH/
LOW
RELAY
LOW
SPEED
OUTPUT
GROUND
MOTOR-
WINDSHIELD
WIPER
2
Z103
14
BK/WT
G113
(8W-15-5)
(8W-15-6)

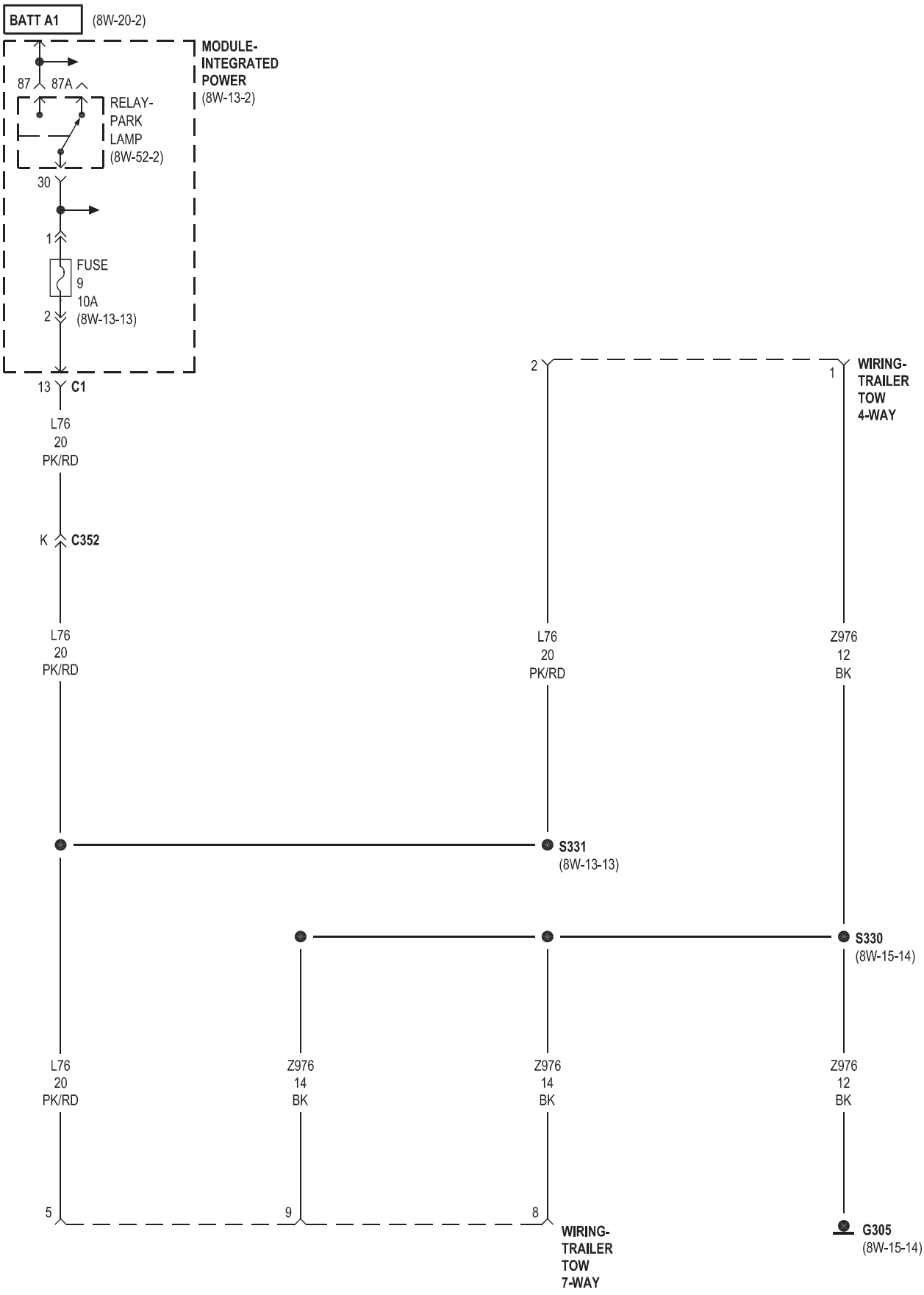

BATT A1
(8W-20-2)
MODULE-
INTEGRATED
POWER
(8W-13-2)
1
FUSE
17
20A
2
(8W-13-11)
86
87
87A
RELAY-
WIPER-
REAR
85
30
28
IPM
REAR WIPER
RELAY CONTROL
MODULE-
FRONT
CONTROL
(8W-13-11)
(8W-13-16)
REAR WIPER
PARK SWITCH
SENSE
36
C2
30
C2
14
C1
W17
18
BR/LG
W13
18
LG/BR
Z901
18
BK
26
C1
35
C1
JUNCTION
BLOCK
(8W-12-2)
10
C3
7
C3
W17
18
BR/LG
W13
16
LG/BR
3
2
C326
W17
18
BR/LG
W13
16
LG/BR
2
1
M
MOTOR-
REAR
WINDOW
WIPER
3
Z945
18
BK
S335
(8W-15-15)
Z945
18
BK
1
C326
Z945
18
BK
G304
(8W-15-15)
G113
(8W-15-6)

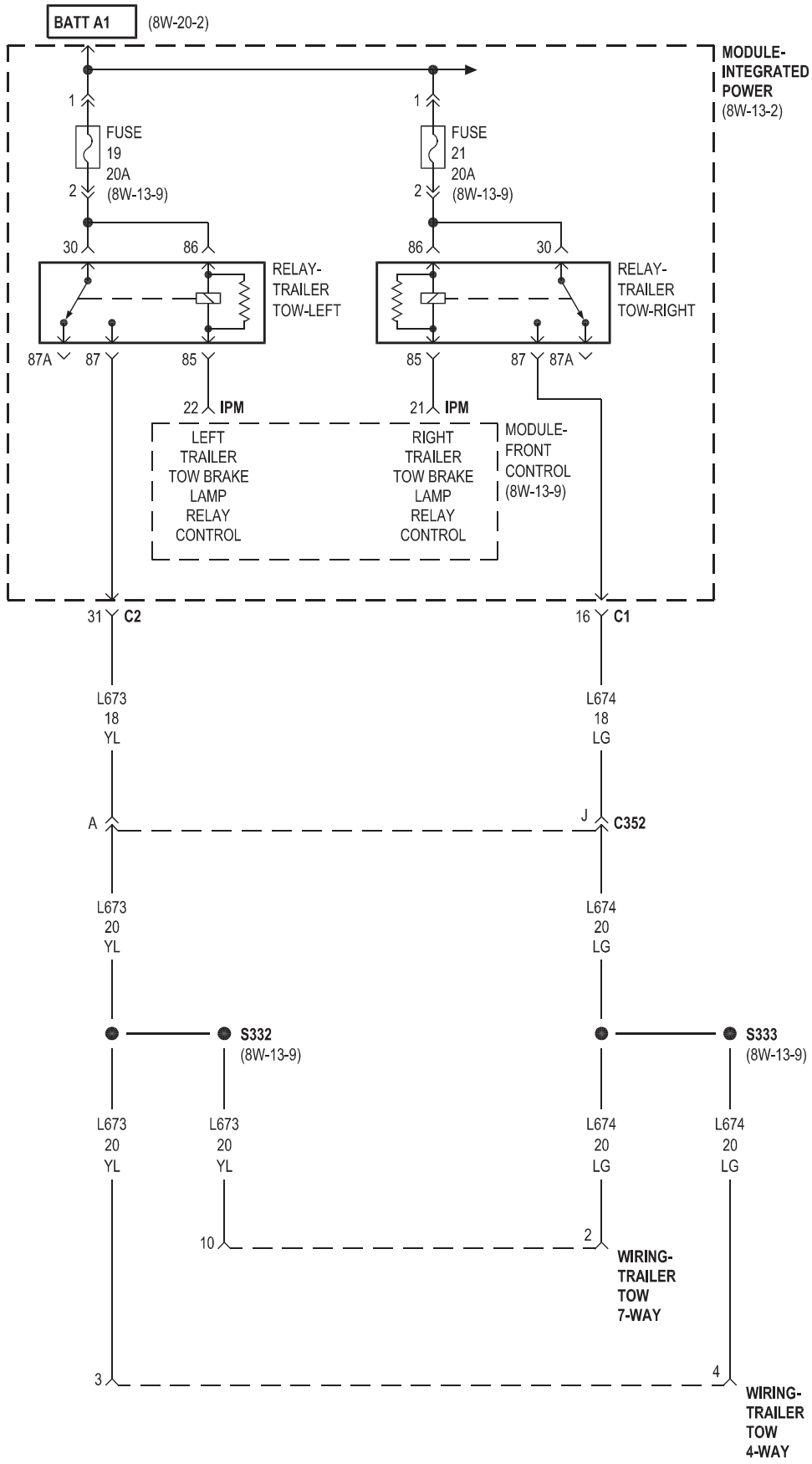

MODULE-
INTEGRATED
POWER
(8W-13-2)
MODULE-
FRONT
CONTROL
(8W-13-16)
(8W-13-20)
(8W-13-22)
FRONT
WASHER
PUMP
MOTOR
CONTROL
REAR
WASHER
PUMP
MOTOR
CONTROL
FRONT
WASHER
PUMP
MOTOR
CONTROL
FCM
SENSOR
RETURN
12 IPM
11 IPM
18 C1
35 IPM
29 C1
31 C1
18 C1
W10
18
BR
G180
20
VT/YL
S118
(8W-13-20)
G180
20
VT/YL
2
M
PUMP-
WASHER
WINDSHIELD
1
W20
18
BR/YL
1
SENSOR-
WASHER
FLUID
LEVEL-
FRONT
REAR
2
W1
20
BR/TN

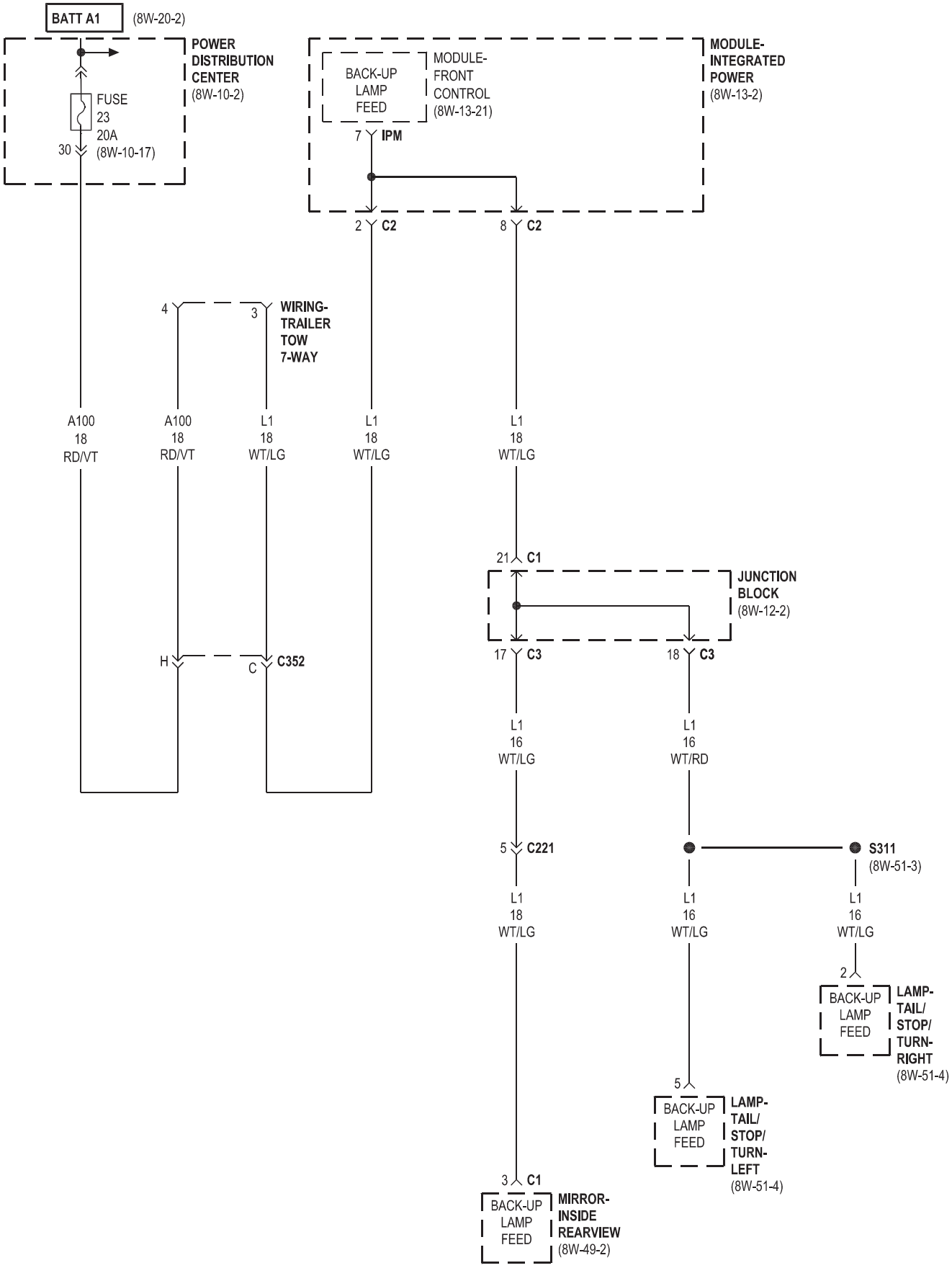
8W-54 TRAILER TOW

Component	Page
Fuse 3	8W-54-2
Fuse 9	8W-54-3
Fuse 19	8W-54-4
Fuse 21	8W-54-4
Fuse 23	8W-54-5
G114	8W-54-2
G305	8W-54-3
Junction Block	8W-54-2, 5
Lamp-High Mounted Stop	8W-54-2
Lamp-Tail/Stop/Turn-Left	8W-54-2, 5
Lamp-Tail/Stop/Turn-Right	8W-54-2, 5
Mirror-Inside Rearview	8W-54-5
Module-Brake Provision	8W-54-2
Module-Front Control	8W-54-4, 5
Module-Integrated Power	8W-54-3, 4, 5
Power Distribution Center	8W-54-2, 5
Relay-Park Lamp	8W-54-3
Relay-Trailer Tow-Left	8W-54-4
Relay-Trailer Tow-Right	8W-54-4
Switch-Stop Lamp	8W-54-2
Wiring-Trailer Tow 4-Way	8W-54-3, 4
Wiring-Trailer Tow 7-Way	8W-54-2, 3, 4, 5


BATT A1
(8W-20-2)
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE 3 40A
3
(8W-10-10)
JUNCTION BLOCK
(8W-12-2)
20 C1
19 C3
36 C2
L50 18 WT/TN
L50 18 WT/TN
2
BRAKE LAMP SWITCH OUTPUT
SWITCH-STOP LAMP
(8W-51-2)
7
WIRING-TRAILER TOW 7-WAY
S303
(8W-13-24)
A400 12 TN/RD
B400 14 DG
L50 20 WT/TN
L50 18 WT/TN
L50 18 WT/TN
L50 18 WT/TN
S C352
S122
(8W-13-24)
5 C326
B400 14 DG
L50 20 WT/TN
1
2
3
4
MODULE-BRAKE PROVISION
1
BRAKE LAMP SWITCH OUTPUT
LAMP-TAIL/STOP/TURN-RIGHT
(8W-51-4)
4
BRAKE LAMP SWITCH OUTPUT
LAMP-TAIL/STOP/TURN-LEFT
(8W-51-4)
Z910 12 BK
L50 18 WT/TN
1
BRAKE LAMP SWITCH OUTPUT
LAMP-HIGH MOUNTED STOP
(8W-51-2)
G114
(8W-15-9)

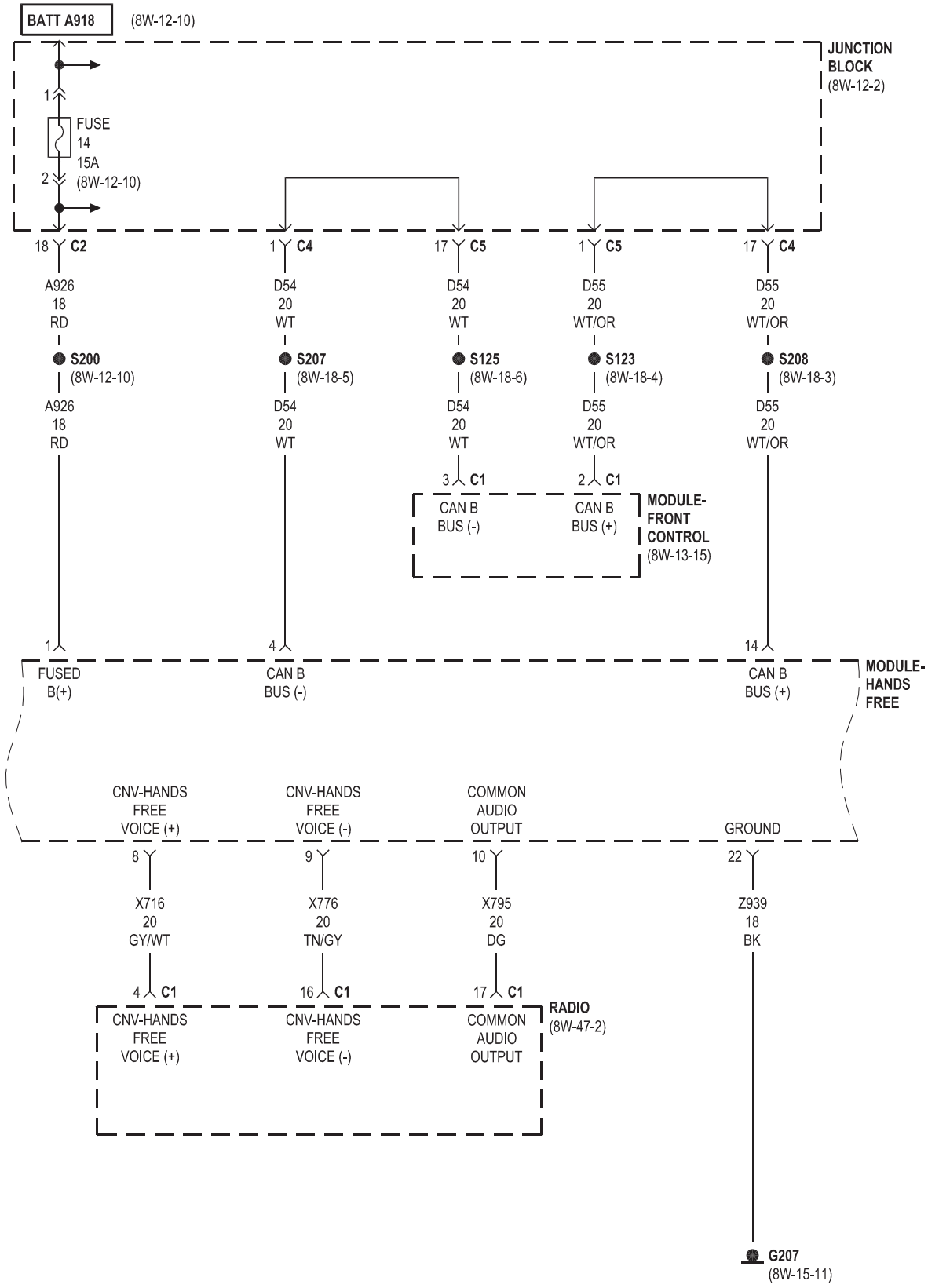

BATT A1
(8W-20-2)
MODULE-
INTEGRATED
POWER
(8W-13-2)
87
87A
RELAY-
PARK
LAMP
(8W-52-2)
30
1
FUSE
9
10A
2
(8W-13-13)
13
C1
L76
20
PK/RD
K
C352
L76
20
PK/RD
2
1
WIRING-
TRAILER
TOW
4-WAY
L76
20
PK/RD
Z976
12
BK
S331
(8W-13-13)
S330
(8W-15-14)
L76
20
PK/RD
Z976
14
BK
Z976
14
BK
Z976
12
BK
5
9
8
WIRING-
TRAILER
TOW
7-WAY
G305
(8W-15-14)

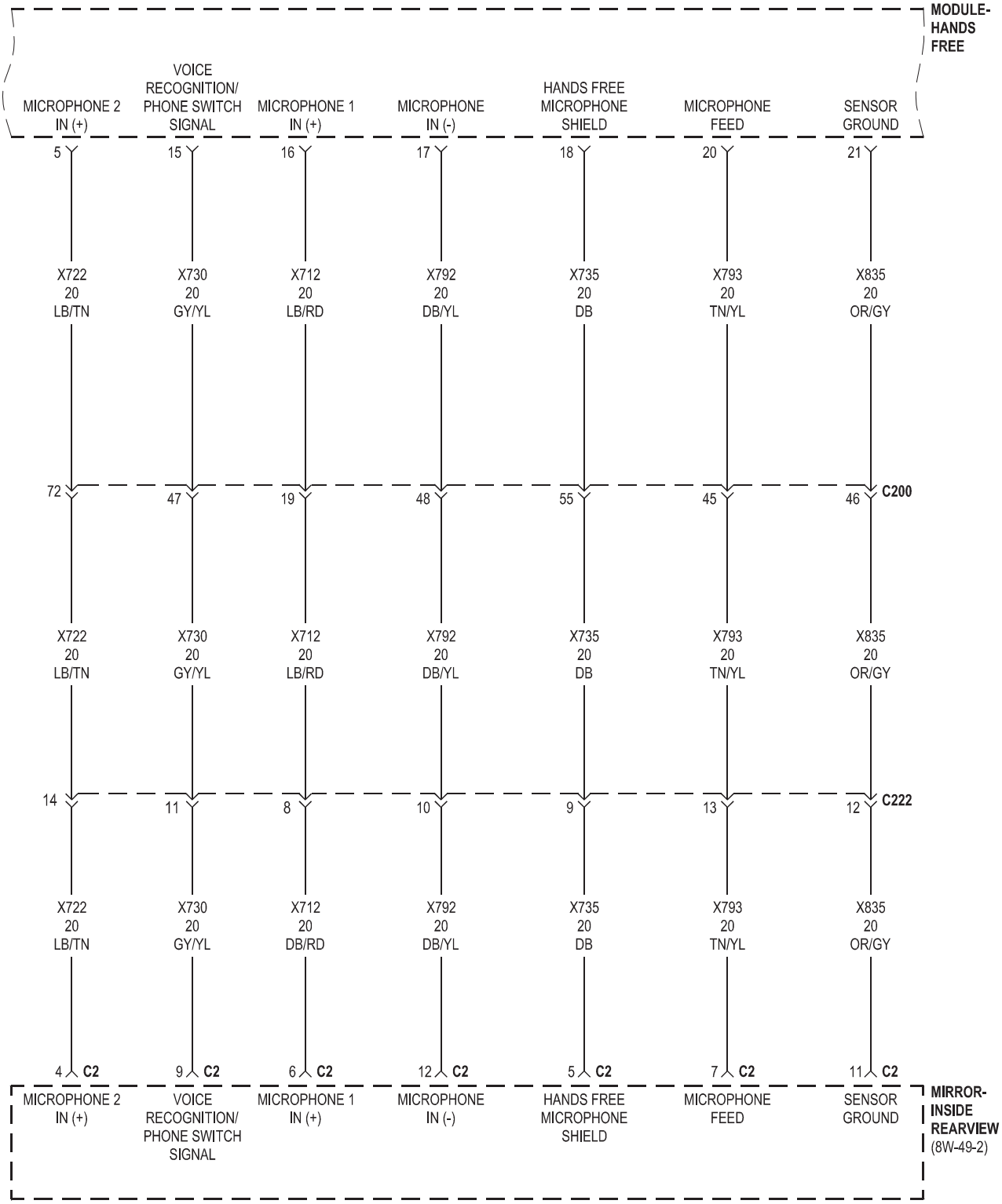

BATT A1
(8W-20-2)
MODULE-
INTEGRATED
POWER
(8W-13-2)
1
FUSE
19
20A
2
(8W-13-9)
1
FUSE
21
20A
2
(8W-13-9)
30
86
RELAY-
TRAILER
TOW-LEFT
86
30
RELAY-
TRAILER
TOW-RIGHT
87A
87
85
85
87
87A
22
IPM
21
IPM
LEFT
TRAILER
TOW BRAKE
LAMP
RELAY
CONTROL
RIGHT
TRAILER
TOW BRAKE
LAMP
RELAY
CONTROL
MODULE-
FRONT
CONTROL
(8W-13-9)
31
C2
16
C1
L673
18
YL
L674
18
LG
A
J
C352
L673
20
YL
L674
20
LG
S332
(8W-13-9)
S333
(8W-13-9)
L673
20
YL
L673
20
YL
L674
20
LG
L674
20
LG
10
2
WIRING-
TRAILER
TOW
7-WAY
3
4
WIRING-
TRAILER
TOW
4-WAY


BATT A1
(8W-20-2)
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE 23 20A
30
(8W-10-17)
BACK-UP LAMP FEED
MODULE-FRONT CONTROL
(8W-13-21)
7 IPM
MODULE-INTEGRATED POWER
(8W-13-2)
2 C2
8 C2
4
3
WIRING-TRAILER TOW 7-WAY
A100 18 RD/VT
A100 18 RD/VT
L1 18 WT/LG
L1 18 WT/LG
L1 18 WT/LG
H
C
C352
21 C1
JUNCTION BLOCK
(8W-12-2)
17 C3
18 C3
L1 16 WT/LG
L1 16 WT/RD
5 C221
S311
(8W-51-3)
L1 18 WT/LG
L1 16 WT/LG
L1 16 WT/LG
2
BACK-UP LAMP FEED
LAMP-TAIL/STOP/TURN-RIGHT
(8W-51-4)
5
BACK-UP LAMP FEED
LAMP-TAIL/STOP/TURN-LEFT
(8W-51-4)
3 C1
BACK-UP LAMP FEED
MIRROR-INSIDE REARVIEW
(8W-49-2)

8W-55 NAVIGATION/TELECOMMUNICATIONS

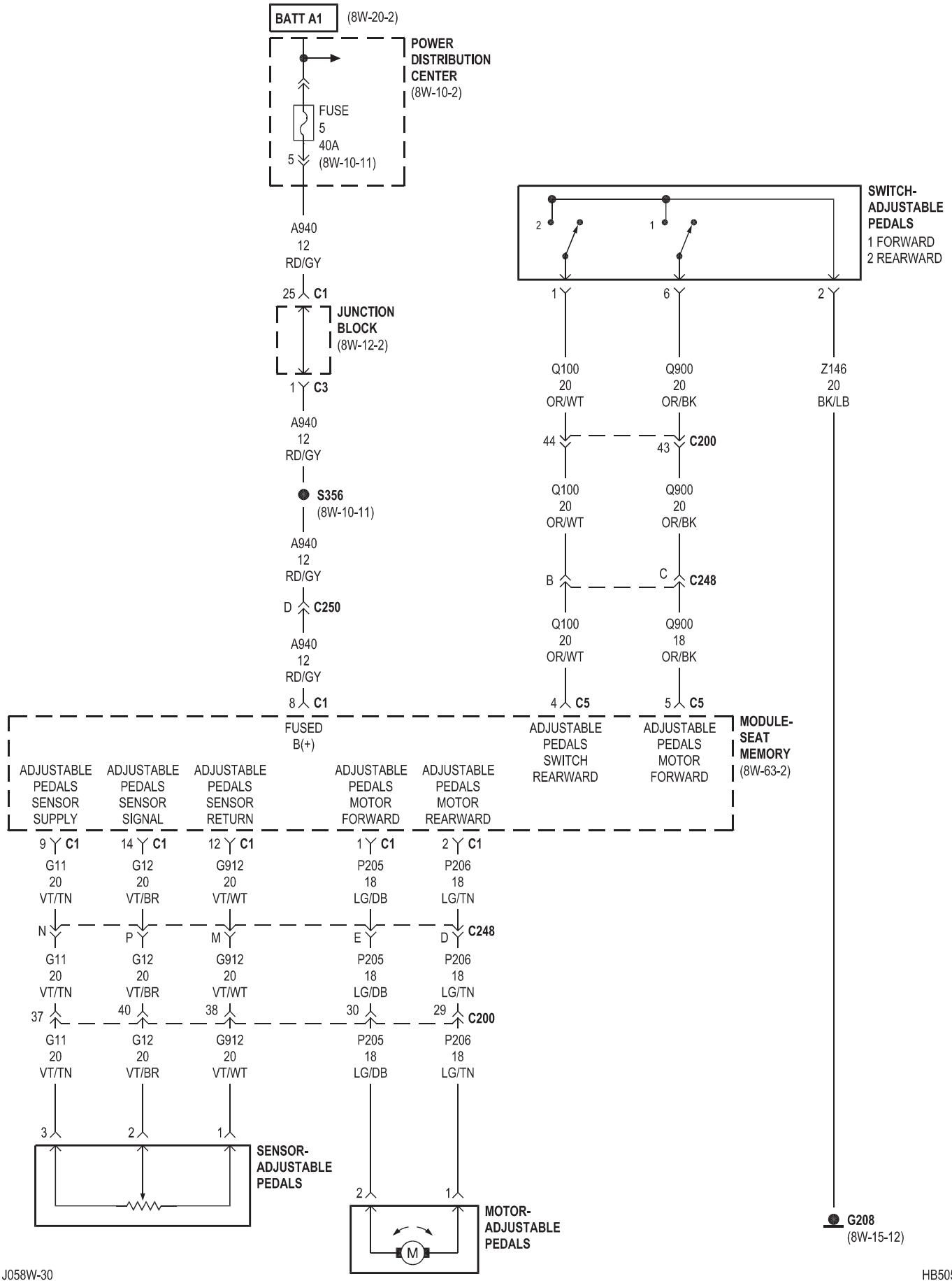
Component	Page
Fuse 14	8W-55-2
G207	8W-55-2
Junction Block	8W-55-2
Mirror-Inside Rearview	8W-55-3
Module-Front Control	8W-55-2
Module-Hands Free	8W-55-2, 3
Radio	8W-55-2


BATT A918
(8W-12-10)
JUNCTION BLOCK
(8W-12-2)
1
FUSE
14
15A
2
(8W-12-10)
18 C2
A926
18
RD
S200
(8W-12-10)
A926
18
RD
1
FUSED
B(+)
1 C4
D54
20
WT
S207
(8W-18-5)
D54
20
WT
4
CAN B
BUS (-)
17 C5
D54
20
WT
S125
(8W-18-6)
D54
20
WT
3 C1
CAN B
BUS (-)
1 C5
D55
20
WT/OR
S123
(8W-18-4)
D55
20
WT/OR
2 C1
CAN B
BUS (+)
MODULE-
FRONT
CONTROL
(8W-13-15)
17 C4
D55
20
WT/OR
S208
(8W-18-3)
D55
20
WT/OR
14
CAN B
BUS (+)
MODULE-
HANDS
FREE
CNV-HANDS
FREE
VOICE (+)
8
X716
20
GY/WT
4 C1
CNV-HANDS
FREE
VOICE (+)
CNV-HANDS
FREE
VOICE (-)
9
X776
20
TN/GY
16 C1
CNV-HANDS
FREE
VOICE (-)
COMMON
AUDIO
OUTPUT
10
X795
20
DG
17 C1
COMMON
AUDIO
OUTPUT
RADIO
(8W-47-2)
GROUND
22
Z939
18
BK
G207
(8W-15-11)


MODULE-HANDS FREE
MICROPHONE 2 IN (+)
VOICE RECOGNITION/ PHONE SWITCH SIGNAL
MICROPHONE 1 IN (+)
MICROPHONE IN (-)
HANDS FREE MICROPHONE SHIELD
MICROPHONE FEED
SENSOR GROUND
5
15
16
17
18
20
21
X722 20 LB/TN
X730 20 GY/YL
X712 20 LB/RD
X792 20 DB/YL
X735 20 DB
X793 20 TN/YL
X835 20 OR/GY
72
47
19
48
55
45
46
C200
X722 20 LB/TN
X730 20 GY/YL
X712 20 LB/RD
X792 20 DB/YL
X735 20 DB
X793 20 TN/YL
X835 20 OR/GY
14
11
8
10
9
13
12
C222
X722 20 LB/TN
X730 20 GY/YL
X712 20 DB/RD
X792 20 DB/YL
X735 20 DB
X793 20 TN/YL
X835 20 OR/GY
4 C2
9 C2
6 C2
12 C2
5 C2
7 C2
11 C2
MICROPHONE 2 IN (+)
VOICE RECOGNITION/ PHONE SWITCH SIGNAL
MICROPHONE 1 IN (+)
MICROPHONE IN (-)
HANDS FREE MICROPHONE SHIELD
MICROPHONE FEED
SENSOR GROUND
MIRROR-INSIDE REARVIEW (8W-49-2)

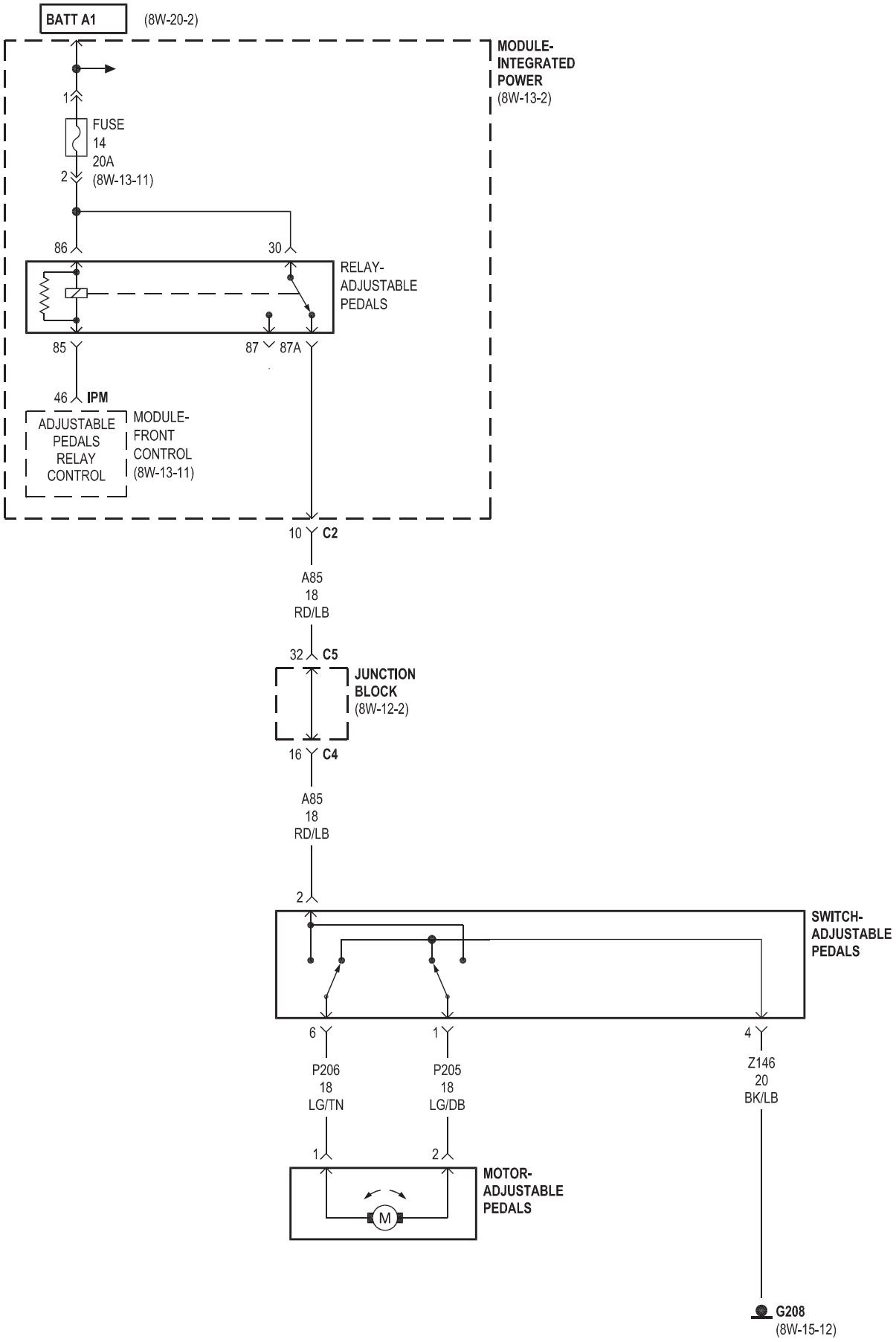
8W-56 CONVENIENCE SYSTEMS

Component	Page
Fuse 5	8W-56-2
Fuse 14	8W-56-3
G208	8W-56-2, 3
Junction Block	8W-56-2, 3
Module-Front Control	8W-56-3
Module-Integrated Power	8W-56-3
Module-Seat Memory	8W-56-2
Motor-Adjustable Pedals	8W-56-2, 3
Power Distribution Center	8W-56-2
Relay-Adjustable Pedals	8W-56-3
Sensor-Adjustable Pedals	8W-56-2
Switch-Adjustable Pedals	8W-56-2, 3



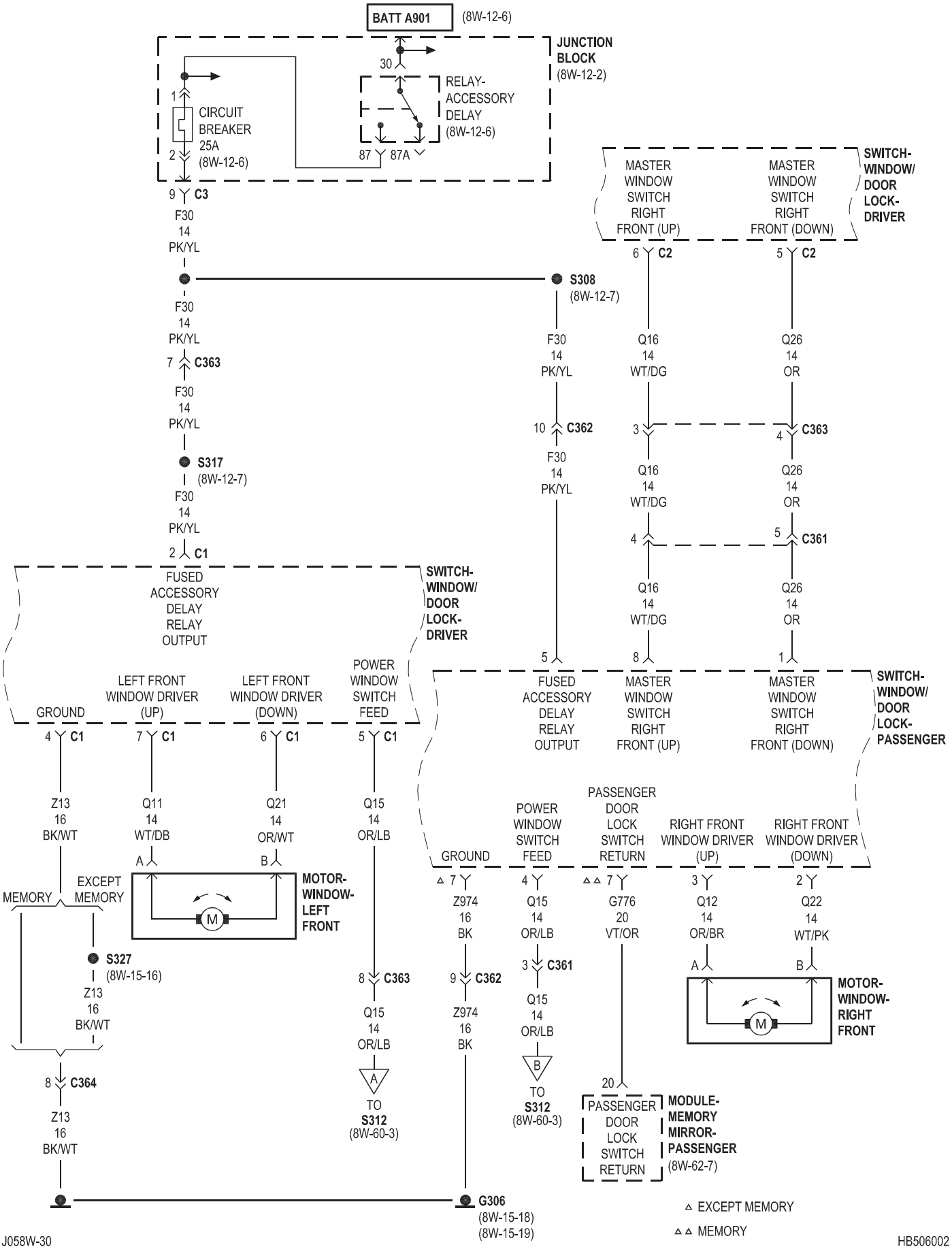
J058W-30

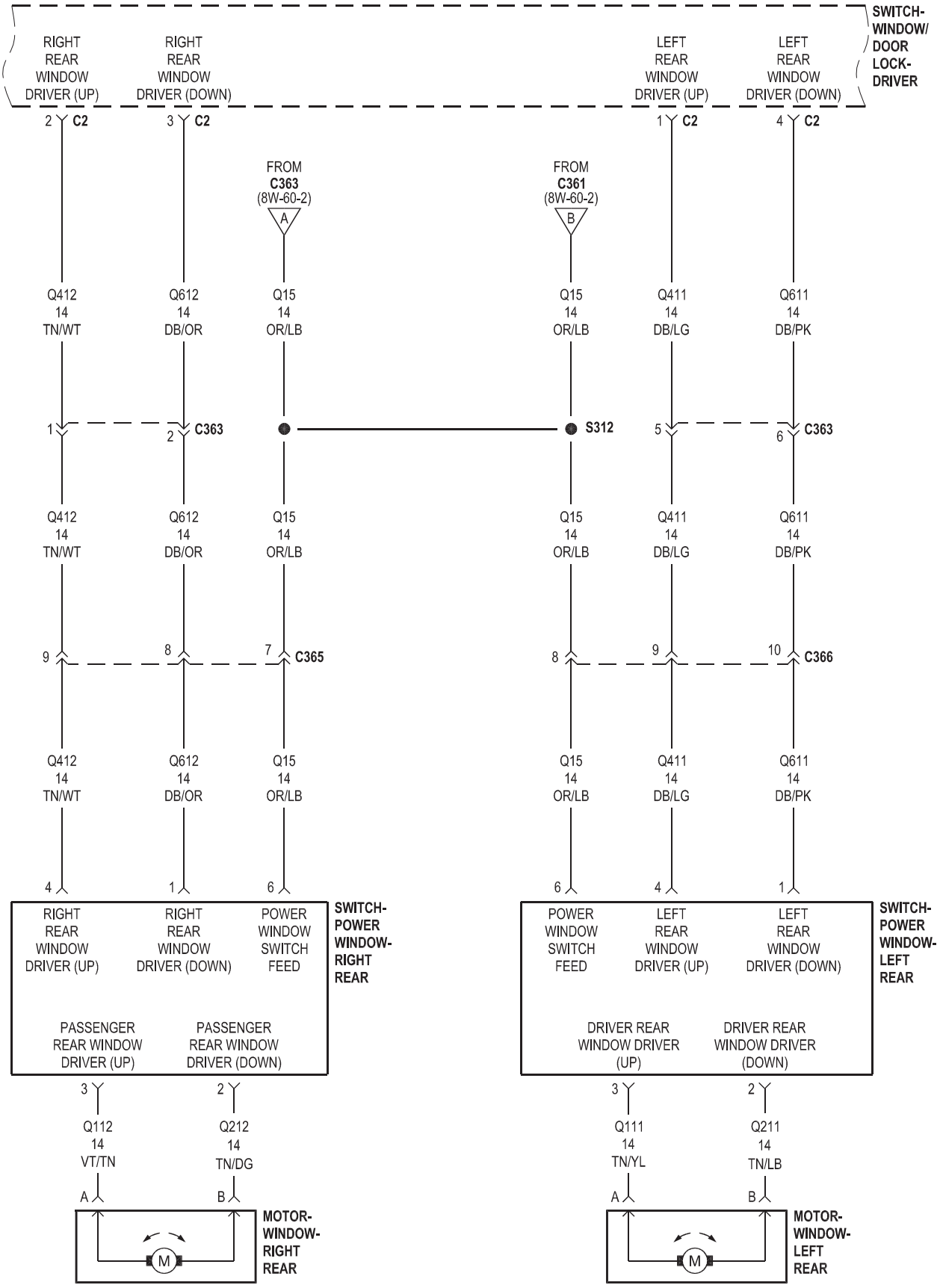
HB505602


BATT A1
(8W-20-2)
MODULE-
INTEGRATED
POWER
(8W-13-2)
1
FUSE
14
20A
2
(8W-13-11)
86
30
RELAY-
ADJUSTABLE
PEDALS
85
87
87A
46
IPM
ADJUSTABLE
PEDALS
RELAY
CONTROL
MODULE-
FRONT
CONTROL
(8W-13-11)
10
C2
A85
18
RD/LB
32
C5
JUNCTION
BLOCK
(8W-12-2)
16
C4
A85
18
RD/LB
2
SWITCH-
ADJUSTABLE
PEDALS
6
1
4
P206
18
LG/TN
P205
18
LG/DB
Z146
20
BK/LB
1
2
M
MOTOR-
ADJUSTABLE
PEDALS
G208
(8W-15-12)

8W-60 POWER WINDOWS

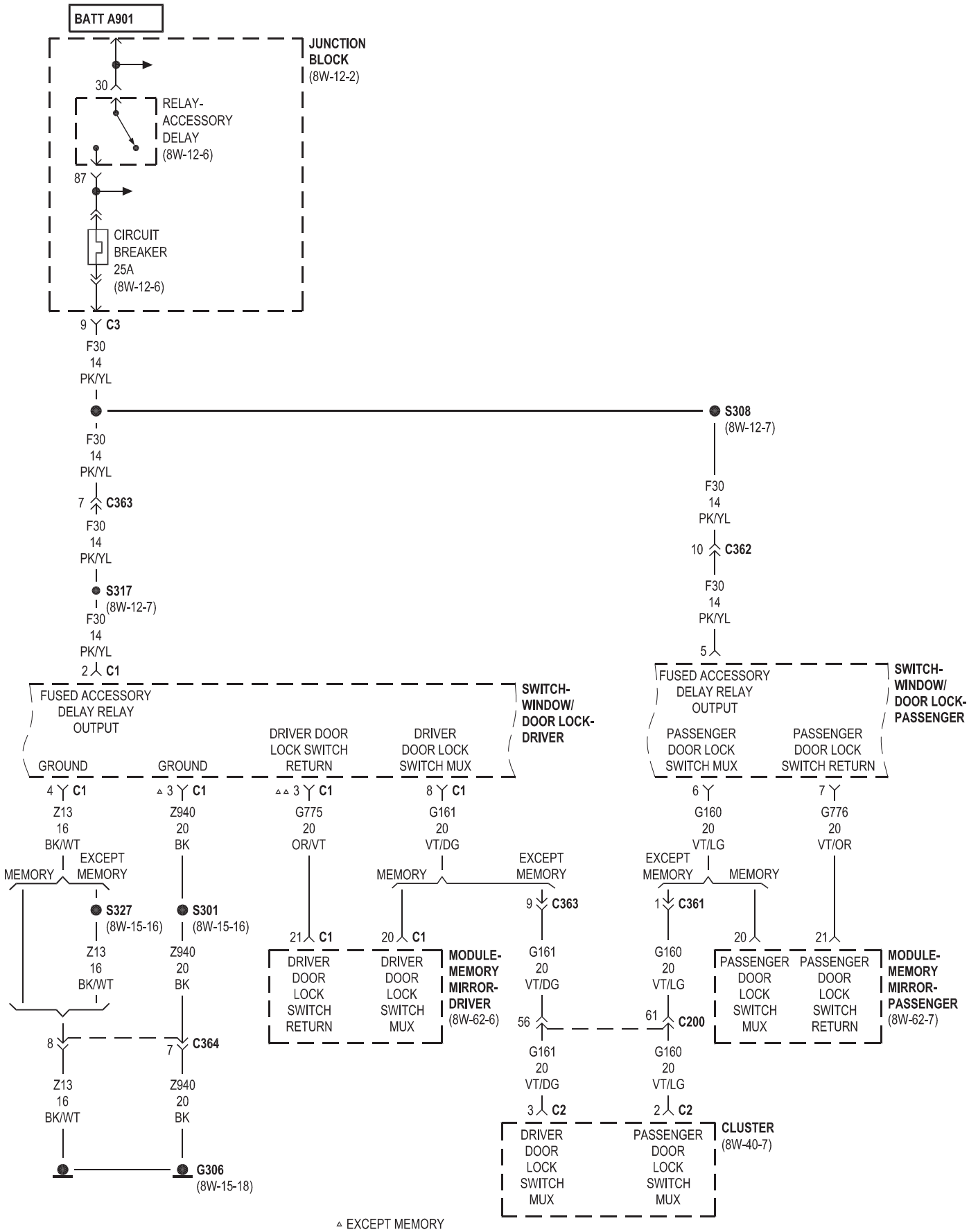
Component	Page
Circuit Breaker	8W-60-2
G306	8W-60-2
Junction Block	8W-60-2
Module-Memory Mirror-Passenger	8W-60-2
Motor-Window-Left Front	8W-60-2
Motor-Window-Left Rear	8W-60-3
Motor-Window-Right Front	8W-60-2
Motor-Window-Right Rear	8W-60-3
Relay-Accessory Delay	8W-60-2
Switch-Power Window-Left Rear	8W-60-3
Switch-Power Window-Right Rear	8W-60-3
Switch-Window/Door Lock-Driver	8W-60-2, 3
Switch-Window/Door Lock-Passenger	8W-60-2

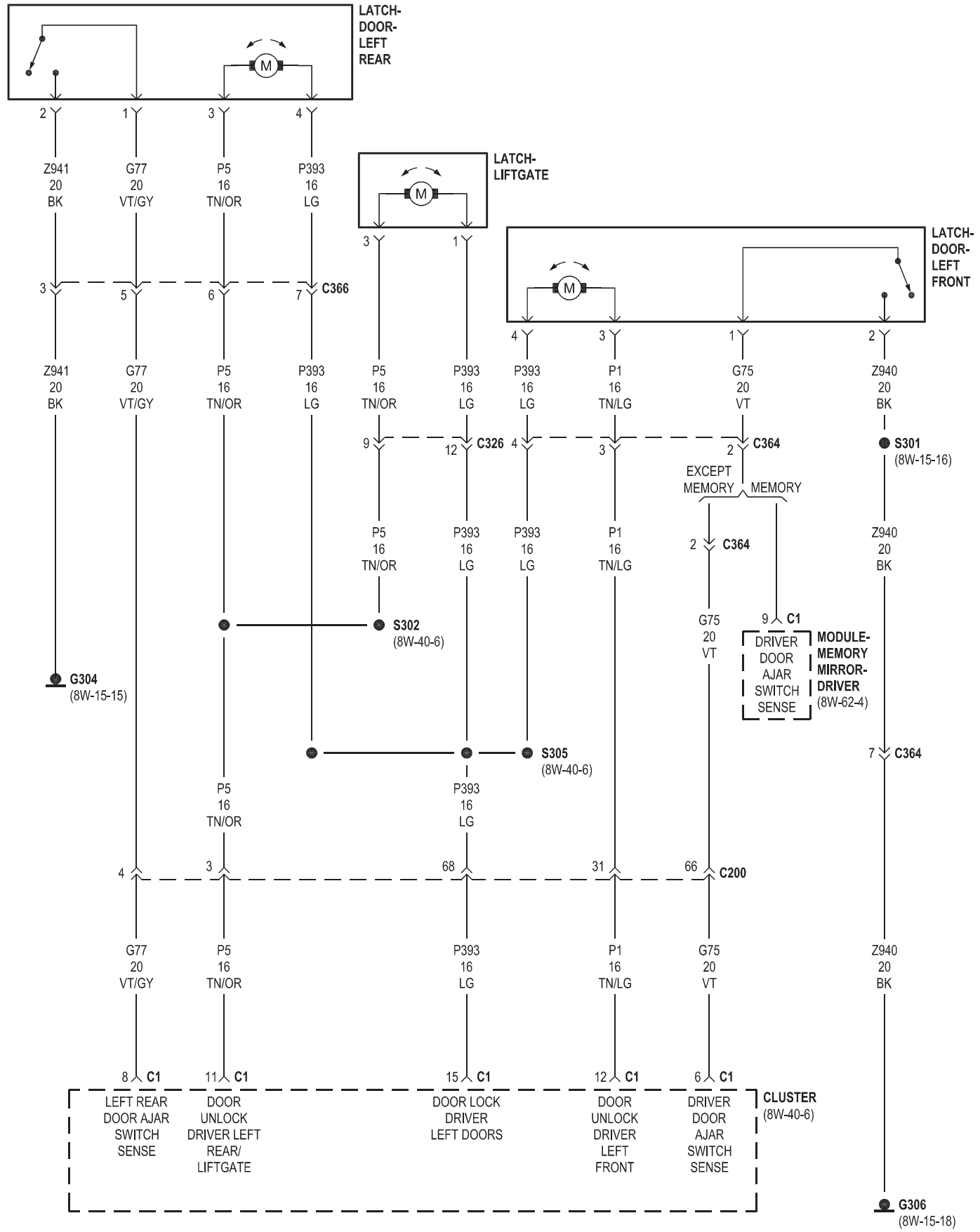

BATT A901
(8W-12-6)
JUNCTION BLOCK
(8W-12-2)
30
1
CIRCUIT BREAKER 25A
(8W-12-6)
2
RELAY-ACCESSORY DELAY
(8W-12-6)
87
87A
9 C3
F30
14
PK/YL
S308
(8W-12-7)
SWITCH-WINDOW/ DOOR LOCK-DRIVER
MASTER WINDOW SWITCH RIGHT FRONT (UP)
MASTER WINDOW SWITCH RIGHT FRONT (DOWN)
6 C2
5 C2
Q16
14
WT/DG
Q26
14
OR
7 C363
10 C362
3
4 C363
4
5 C361
FUSED ACCESSORY DELAY RELAY OUTPUT
2 C1
SWITCH-WINDOW/ DOOR LOCK-PASSENGER
GROUND
LEFT FRONT WINDOW DRIVER (UP)
LEFT FRONT WINDOW DRIVER (DOWN)
POWER WINDOW SWITCH FEED
4 C1
7 C1
6 C1
5 C1
Z13
16
BK/WT
Q11
14
WT/DB
Q21
14
OR/WT
Q15
14
OR/LB
A
B
MEMORY
EXCEPT MEMORY
MOTOR-WINDOW-LEFT FRONT
M
S327
(8W-15-16)
8 C364
8 C363
9 C362
TO S312
(8W-60-3)
POWER WINDOW SWITCH FEED
PASSENGER DOOR LOCK SWITCH RETURN
RIGHT FRONT WINDOW DRIVER (UP)
RIGHT FRONT WINDOW DRIVER (DOWN)
7
4
7
3
2
Z974
16
BK
G776
20
VT/OR
Q12
14
OR/BR
Q22
14
WT/PK
20
PASSENGER DOOR LOCK SWITCH RETURN
MODULE-MEMORY MIRROR-PASSENGER
(8W-62-7)
MOTOR-WINDOW-RIGHT FRONT
G306
(8W-15-18)
(8W-15-19)
EXCEPT MEMORY
MEMORY
J058W-30
HB506002

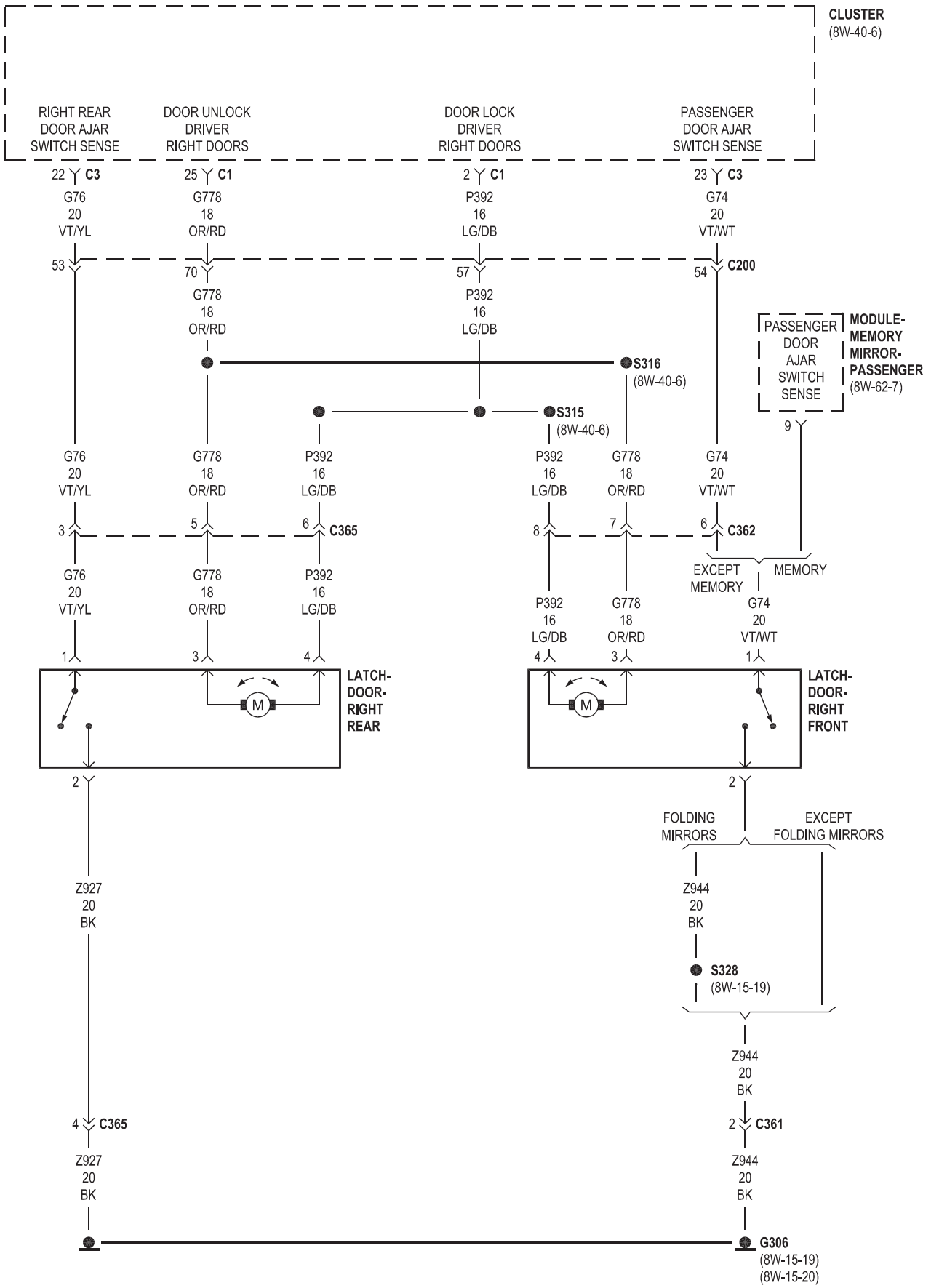

SWITCH-WINDOW/DOOR LOCK-DRIVER
RIGHT REAR WINDOW DRIVER (UP)
RIGHT REAR WINDOW DRIVER (DOWN)
LEFT REAR WINDOW DRIVER (UP)
LEFT REAR WINDOW DRIVER (DOWN)
2 C2
3 C2
1 C2
4 C2
FROM C363 (8W-60-2)
A
FROM C361 (8W-60-2)
B
Q412 14 TN/WT
Q612 14 DB/OR
Q15 14 OR/LB
Q15 14 OR/LB
Q411 14 DB/LG
Q611 14 DB/PK
1
2 C363
S312
5
6 C363
9
8
7 C365
8
9
10 C366
4
1
6
6
4
1
SWITCH-POWER WINDOW-RIGHT REAR
RIGHT REAR WINDOW DRIVER (UP)
RIGHT REAR WINDOW DRIVER (DOWN)
POWER WINDOW SWITCH FEED
SWITCH-POWER WINDOW-LEFT REAR
POWER WINDOW SWITCH FEED
LEFT REAR WINDOW DRIVER (UP)
LEFT REAR WINDOW DRIVER (DOWN)
PASSENGER REAR WINDOW DRIVER (UP)
PASSENGER REAR WINDOW DRIVER (DOWN)
DRIVER REAR WINDOW DRIVER (UP)
DRIVER REAR WINDOW DRIVER (DOWN)
3
2
3
2
Q112 14 VT/TN
Q212 14 TN/DG
Q111 14 TN/YL
Q211 14 TN/LB
A
B
A
B
M
MOTOR-WINDOW-RIGHT REAR
M
MOTOR-WINDOW-LEFT REAR

8W-61 POWER DOOR LOCKS

Component	Page
Circuit Breaker	8W-61-2
Cluster	8W-61-2, 3, 4
G304	8W-61-3
G306	8W-61-2, 3, 4
Junction Block	8W-61-2
Latch-Door-Left Front	8W-61-3
Latch-Door-Left Rear	8W-61-3
Latch-Door-Right Front	8W-61-4
Latch-Door-Right Rear	8W-61-4
Latch-Liftgate	8W-61-3
Module-Memory Mirror-Driver	8W-61-2, 3
Module-Memory Mirror-Passenger	8W-61-2, 4
Relay-Accessory Delay	8W-61-2
Switch-Window/Door Lock-Driver	8W-61-2
Switch-Window/Door Lock-Passenger	8W-61-2


BATT A901
JUNCTION BLOCK (8W-12-2)
30
RELAY-ACCESSORY DELAY (8W-12-6)
87
CIRCUIT BREAKER 25A (8W-12-6)
9 C3
F30 14 PK/YL
S308 (8W-12-7)
F30 14 PK/YL
7 C363
F30 14 PK/YL
S317 (8W-12-7)
F30 14 PK/YL
2 C1
F30 14 PK/YL
10 C362
F30 14 PK/YL
5
FUSED ACCESSORY DELAY RELAY OUTPUT
SWITCH-WINDOW/ DOOR LOCK-DRIVER
SWITCH-WINDOW/ DOOR LOCK-PASSENGER
GROUND
GROUND
DRIVER DOOR LOCK SWITCH RETURN
DRIVER DOOR LOCK SWITCH MUX
PASSENGER DOOR LOCK SWITCH MUX
PASSENGER DOOR LOCK SWITCH RETURN
4 C1
Z13 16 BK/WT
3 C1
Z940 20 BK
3 C1
G775 20 OR/VT
8 C1
G161 20 VT/DG
6
G160 20 VT/LG
7
G776 20 VT/OR
MEMORY
EXCEPT MEMORY
MEMORY
EXCEPT MEMORY
EXCEPT MEMORY
MEMORY
S327 (8W-15-16)
S301 (8W-15-16)
9 C363
1 C361
20
21
Z13 16 BK/WT
Z940 20 BK
21 C1
20 C1
DRIVER DOOR LOCK SWITCH RETURN
DRIVER DOOR LOCK SWITCH MUX
MODULE-MEMORY MIRROR-DRIVER (8W-62-6)
G161 20 VT/DG
G160 20 VT/LG
PASSENGER DOOR LOCK SWITCH MUX
PASSENGER DOOR LOCK SWITCH RETURN
MODULE-MEMORY MIRROR-PASSENGER (8W-62-7)
8
7 C364
56
61 C200
Z13 16 BK/WT
Z940 20 BK
G161 20 VT/DG
G160 20 VT/LG
3 C2
2 C2
CLUSTER (8W-40-7)
DRIVER DOOR LOCK SWITCH MUX
PASSENGER DOOR LOCK SWITCH MUX
G306 (8W-15-18)
▵ EXCEPT MEMORY
▵▵ MEMORY

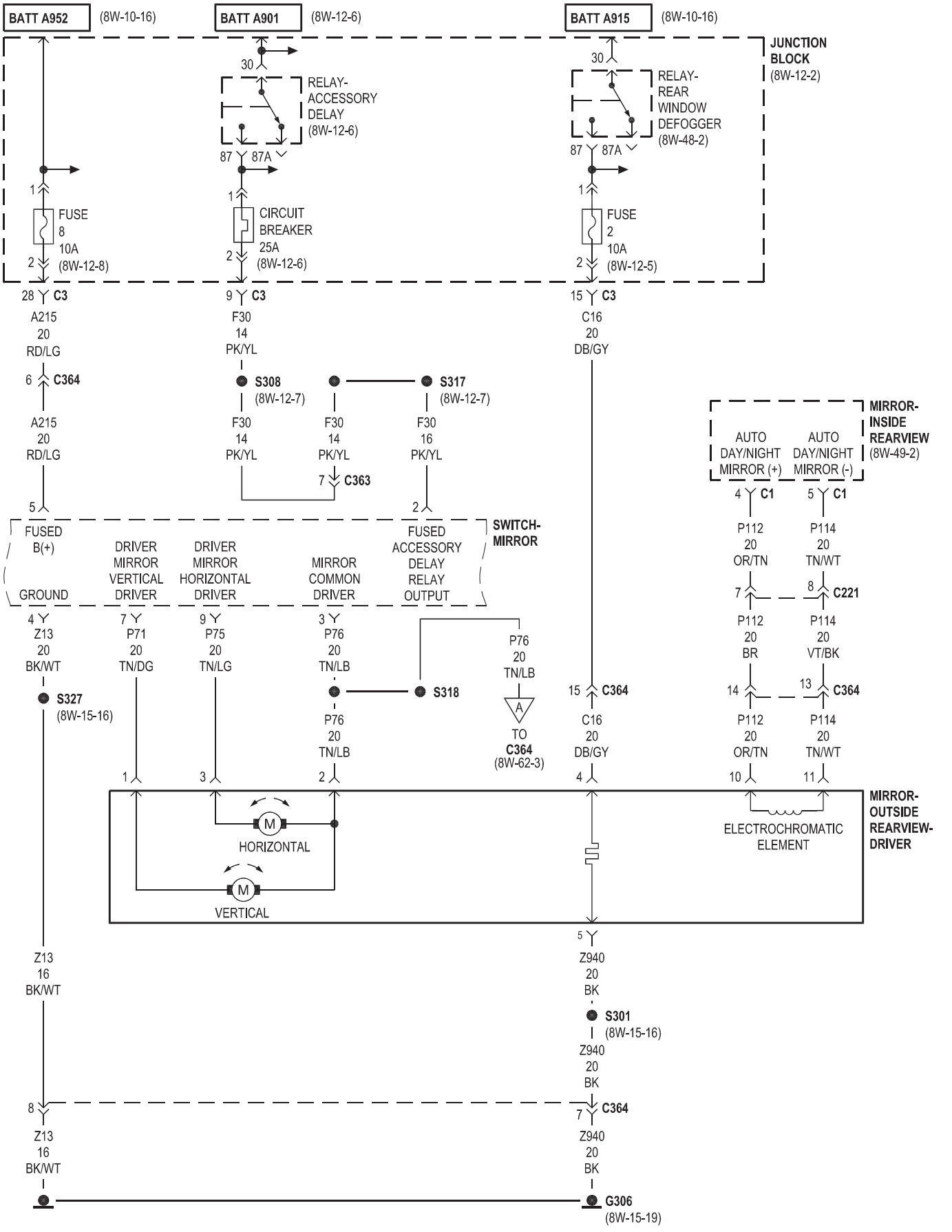

LATCH-
DOOR-
LEFT
REAR
M
2
1
3
4
Z941
20
BK
G77
20
VT/GY
P5
16
TN/OR
P393
16
LG
LATCH-
LIFTGATE
3
1
LATCH-
DOOR-
LEFT
FRONT
4
3
1
2
P1
16
TN/LT
G75
20
VT
Z940
20
BK
C366
C326
C364
S301
(8W-15-16)
EXCEPT
MEMORY
MEMORY
S302
(8W-40-6)
G304
(8W-15-15)
S305
(8W-40-6)
C1
DRIVER
DOOR
AJAR
SWITCH
SENSE
MODULE-
MEMORY
MIRROR-
DRIVER
(8W-62-4)
C200
CLUSTER
(8W-40-6)
LEFT REAR
DOOR AJAR
SWITCH
SENSE
DOOR
UNLOCK
DRIVER LEFT
REAR/
LIFTGATE
DOOR LOCK
DRIVER
LEFT DOORS
DOOR
UNLOCK
DRIVER
LEFT
FRONT
DRIVER
DOOR
AJAR
SWITCH
SENSE
G306
(8W-15-18)


CLUSTER
(8W-40-6)
RIGHT REAR DOOR AJAR SWITCH SENSE
DOOR UNLOCK DRIVER RIGHT DOORS
DOOR LOCK DRIVER RIGHT DOORS
PASSENGER DOOR AJAR SWITCH SENSE
22 C3
25 C1
2 C1
23 C3
G76 20 VT/YL
G778 18 OR/RD
P392 16 LG/DB
G74 20 VT/WT
53
70
57
54 C200
S316
(8W-40-6)
S315
(8W-40-6)
PASSENGER DOOR AJAR SWITCH SENSE
MODULE-MEMORY MIRROR-PASSENGER
(8W-62-7)
9
3
5
6 C365
8
7
6 C362
EXCEPT MEMORY
MEMORY
1
3
4
4
3
1
LATCH-DOOR-RIGHT REAR
LATCH-DOOR-RIGHT FRONT
M
2
2
FOLDING MIRRORS
EXCEPT FOLDING MIRRORS
Z927 20 BK
Z944 20 BK
S328
(8W-15-19)
4 C365
2 C361
G306
(8W-15-19)
(8W-15-20)

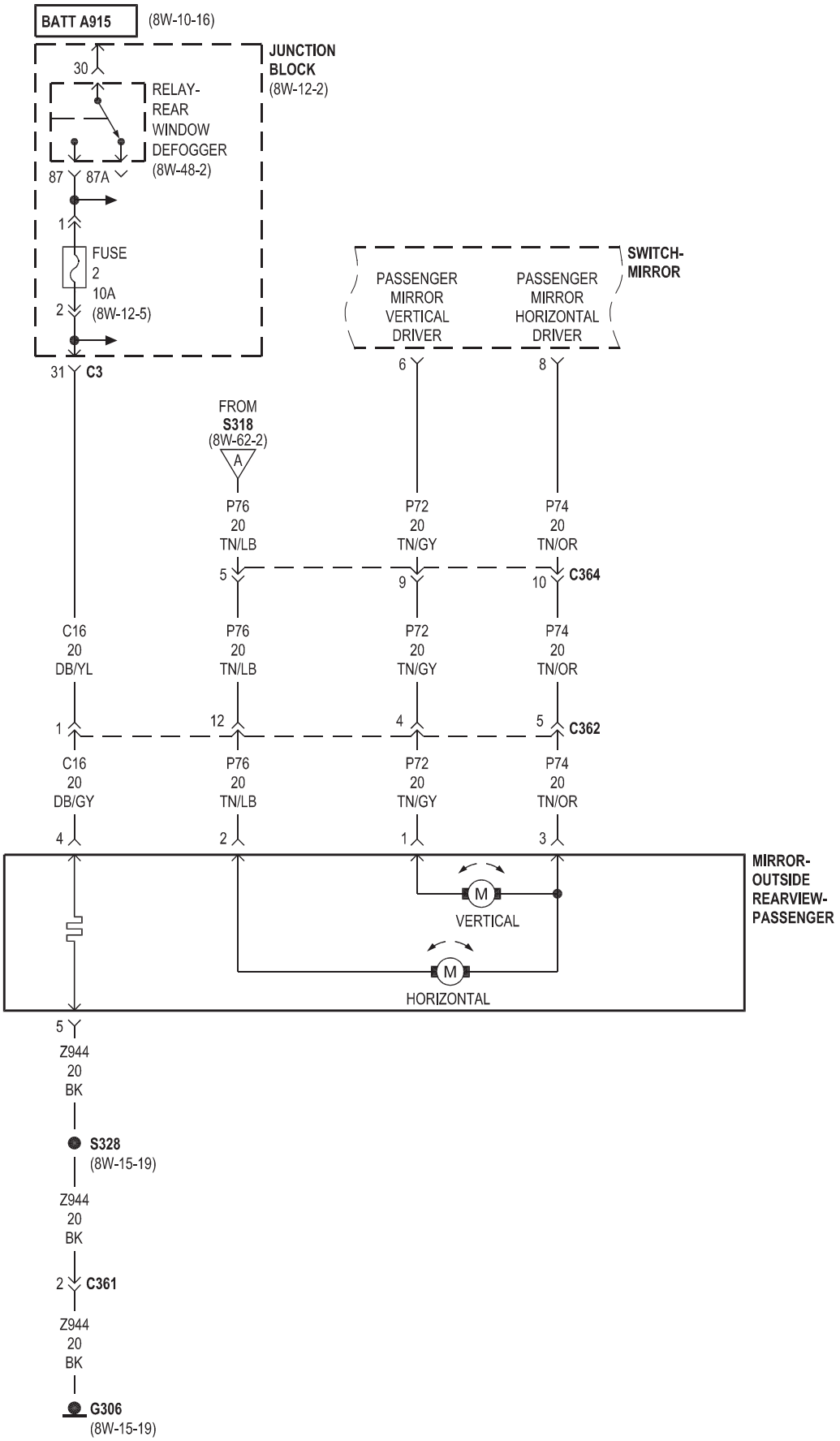
8W-62 POWER MIRRORS

Component	Page
Circuit Breaker	8W-62-2, 4
Fuse 2	8W-62-2, 3
Fuse 8	8W-62-2, 4, 7
G306	8W-62-2, 3, 6, 7
Junction Block	8W-62-2, 3, 4, 7
Latch-Door-Left Front	8W-62-4
Latch-Door-Right Front	8W-62-7
Mirror-Inside Rearview	8W-62-2, 5
Mirror-Outside Rearview-Driver	8W-62-2, 5
Mirror-Outside Rearview-Passenger	8W-62-3, 7
Module-Memory Mirror-Driver	8W-62-4, 5, 6, 7
Module-Memory Mirror-Passenger	8W-62-6, 7
Relay-Accessory Delay	8W-62-2, 4
Relay-Rear Window Defogger	8W-62-2, 3
Switch-Memory Selector	8W-62-4
Switch-Mirror	8W-62-2, 3, 4
Switch-Window/Door Lock-Driver	8W-62-6
Switch-Window/Door Lock-Passenger	8W-62-7

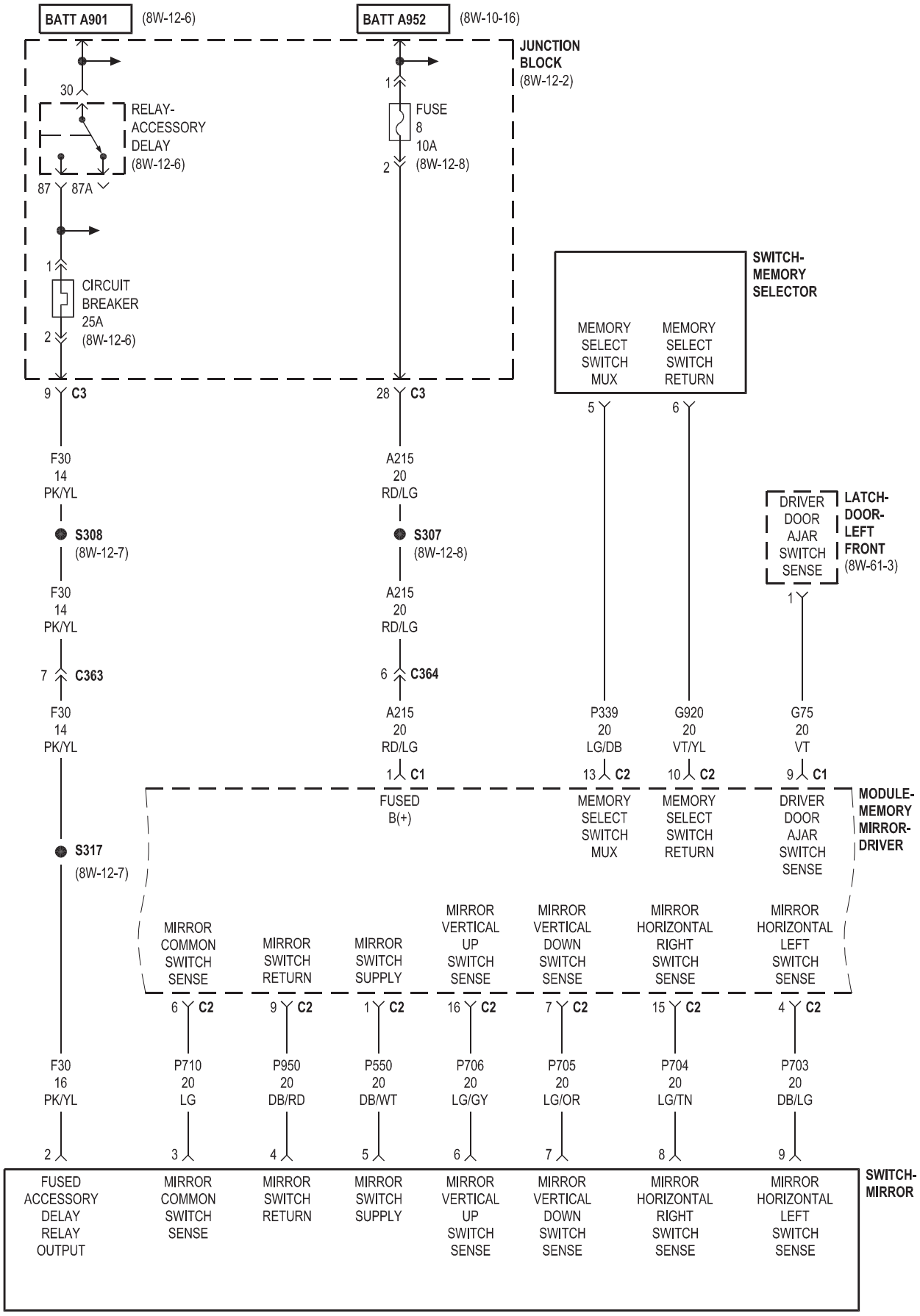
EXCEPT MEMORY

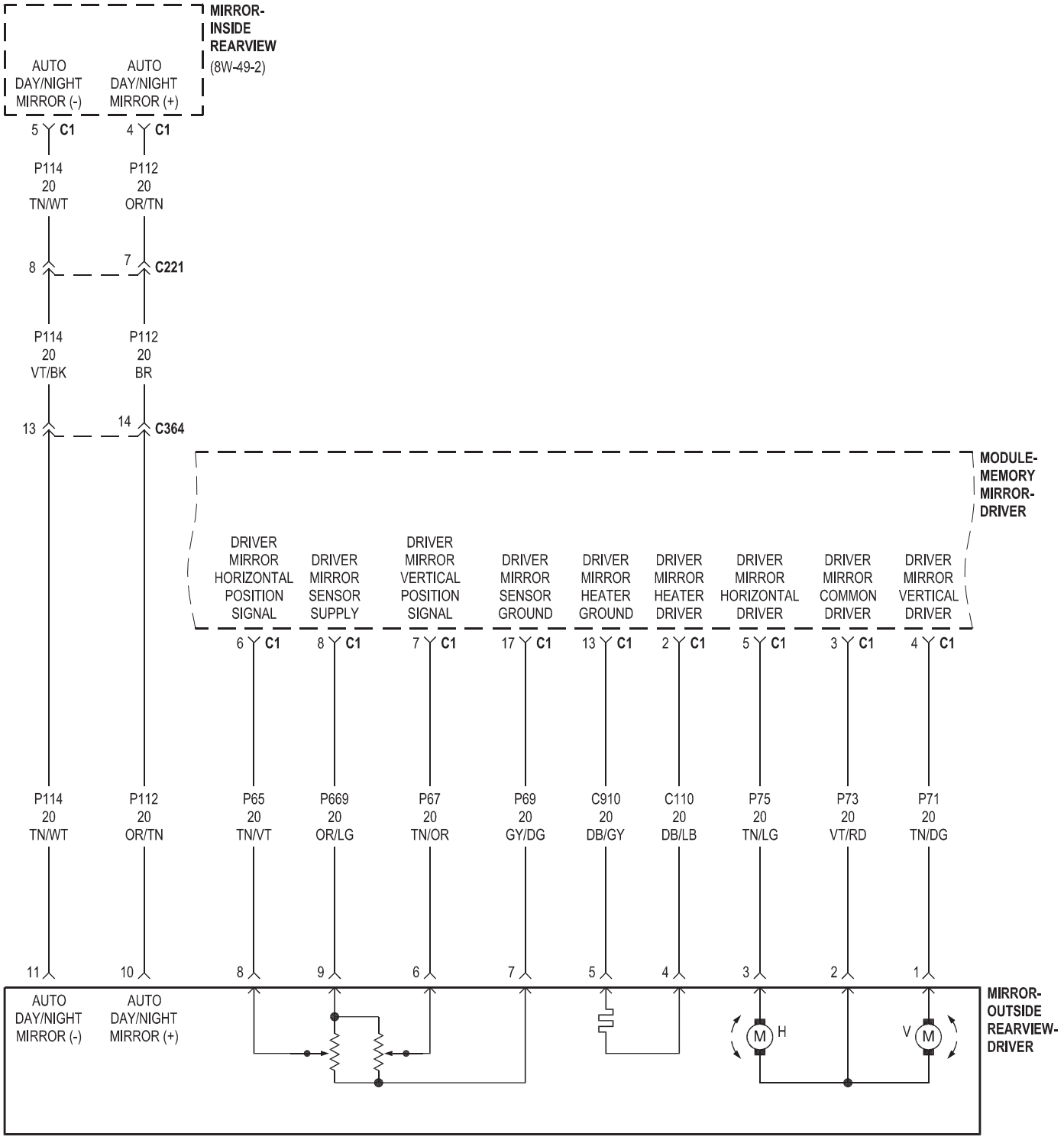


EXCEPT MEMORY

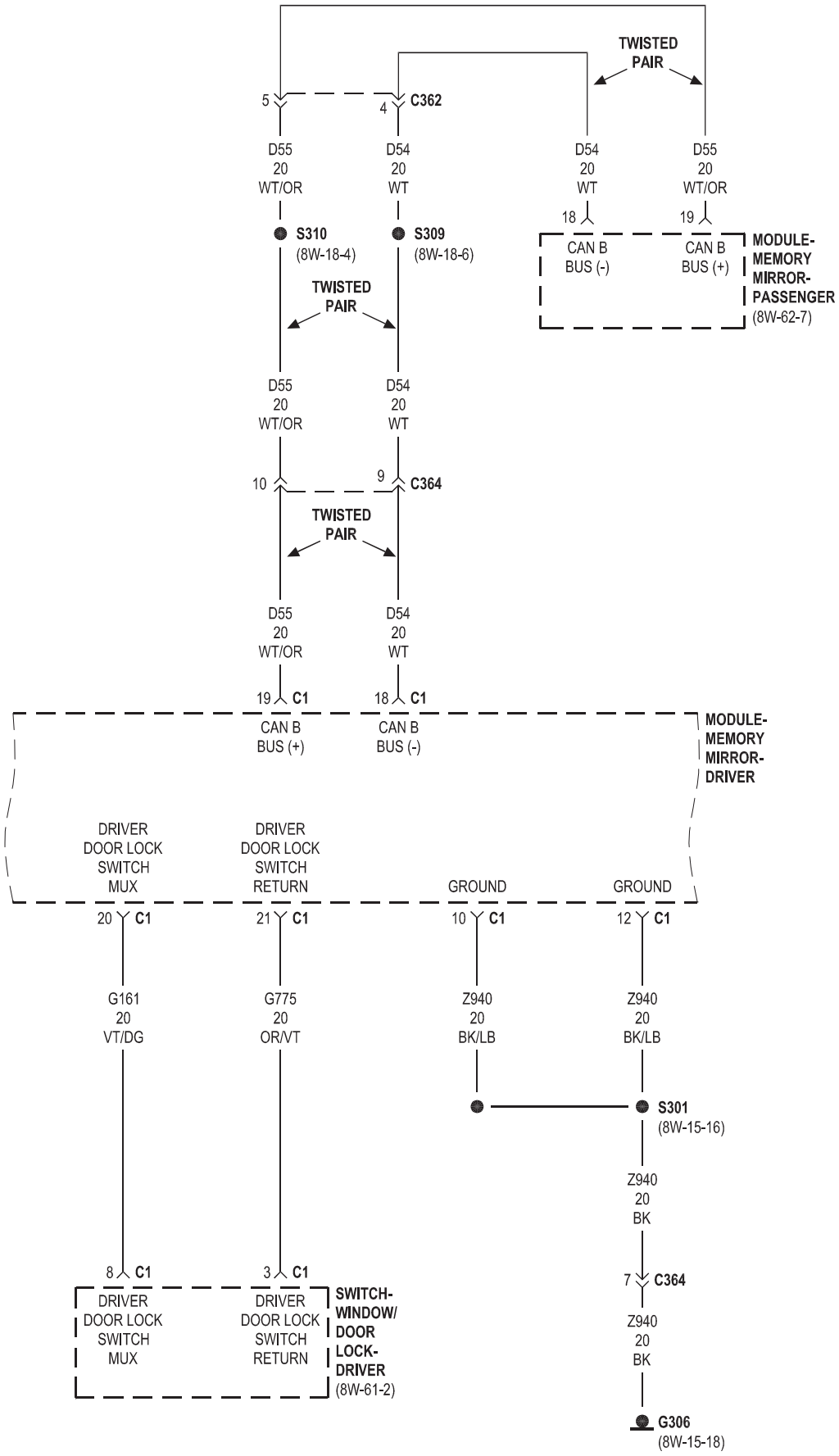


MEMORY

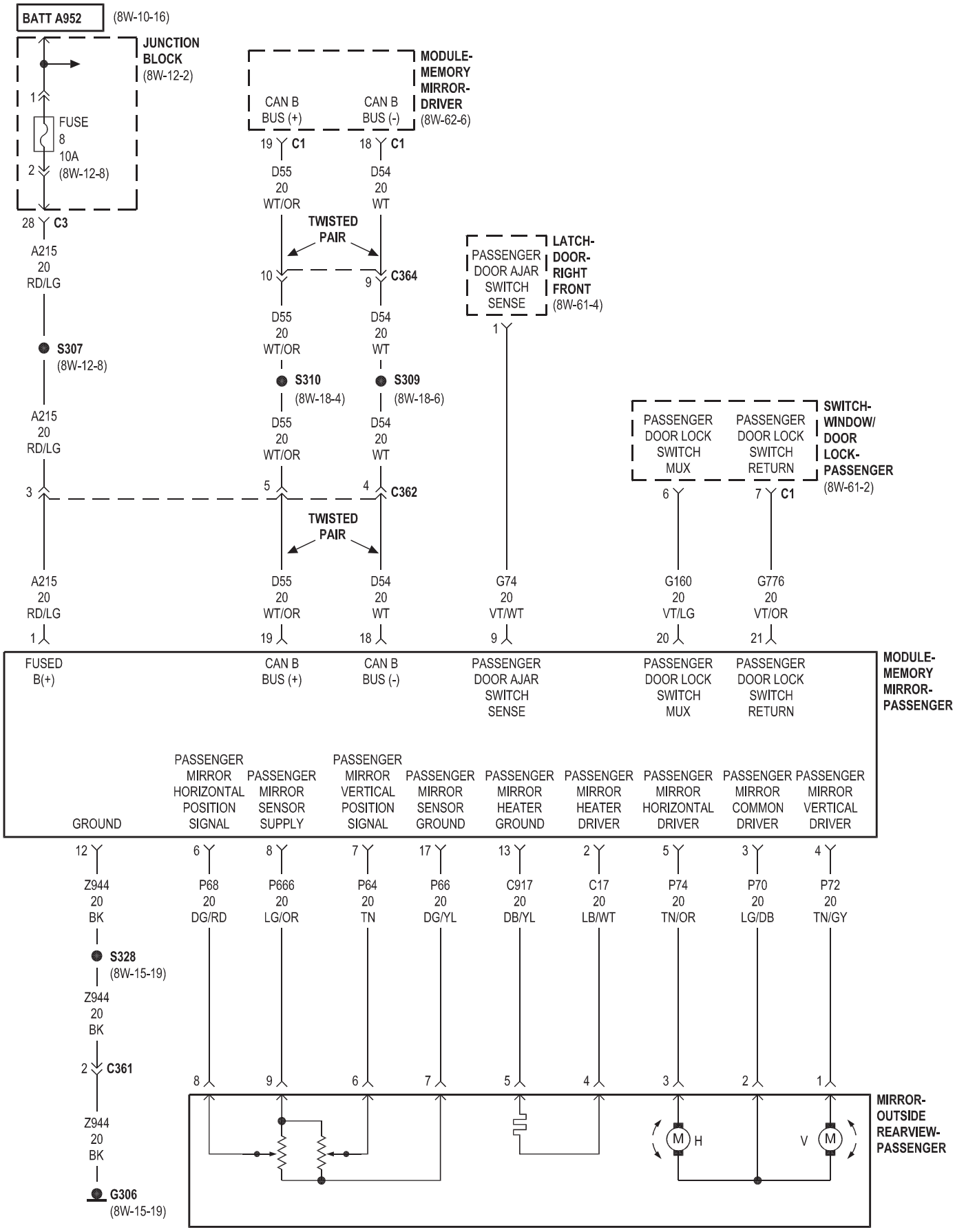

BATT A901
(8W-12-6)
BATT A952
(8W-10-16)
JUNCTION BLOCK
(8W-12-2)
30
RELAY-ACCESSORY DELAY
(8W-12-6)
87
87A
1
CIRCUIT BREAKER
25A
2
(8W-12-6)
1
FUSE
8
10A
2
(8W-12-8)
SWITCH-MEMORY SELECTOR
MEMORY SELECT SWITCH MUX
MEMORY SELECT SWITCH RETURN
5
6
9 C3
28 C3
F30
14
PK/YL
A215
20
RD/LG
S308
(8W-12-7)
S307
(8W-12-8)
DRIVER DOOR AJAR SWITCH SENSE
LATCH-DOOR-LEFT FRONT
(8W-61-3)
1
7 C363
6 C364
P339
20
LG/DB
G920
20
VT/YL
G75
20
VT
13 C2
10 C2
9 C1
1 C1
FUSED B(+)
MEMORY SELECT SWITCH MUX
MEMORY SELECT SWITCH RETURN
DRIVER DOOR AJAR SWITCH SENSE
MODULE-MEMORY MIRROR-DRIVER
S317
(8W-12-7)
MIRROR COMMON SWITCH SENSE
MIRROR SWITCH RETURN
MIRROR SWITCH SUPPLY
MIRROR VERTICAL UP SWITCH SENSE
MIRROR VERTICAL DOWN SWITCH SENSE
MIRROR HORIZONTAL RIGHT SWITCH SENSE
MIRROR HORIZONTAL LEFT SWITCH SENSE
6 C2
9 C2
1 C2
16 C2
7 C2
15 C2
4 C2
P710
20
LG
P950
20
DB/RD
P550
20
DB/WT
P706
20
LG/GY
P705
20
LG/OR
P704
20
LG/TN
P703
20
DB/LG
16
2
3
4
5
6
7
8
9
SWITCH-MIRROR
FUSED ACCESSORY DELAY RELAY OUTPUT
MIRROR COMMON SWITCH SENSE
MIRROR SWITCH RETURN
MIRROR SWITCH SUPPLY
MIRROR VERTICAL UP SWITCH SENSE
MIRROR VERTICAL DOWN SWITCH SENSE
MIRROR HORIZONTAL RIGHT SWITCH SENSE
MIRROR HORIZONTAL LEFT SWITCH SENSE


MIRROR-
INSIDE
REARVIEW
(8W-49-2)
AUTO
DAY/NIGHT
MIRROR (-)
AUTO
DAY/NIGHT
MIRROR (+)
5 C1
4 C1
P114
20
TN/WT
P112
20
OR/TN
8
7 C221
P114
20
VT/BK
P112
20
BR
13
14 C364
MODULE-
MEMORY
MIRROR-
DRIVER
DRIVER
MIRROR
HORIZONTAL
POSITION
SIGNAL
DRIVER
MIRROR
SENSOR
SUPPLY
DRIVER
MIRROR
VERTICAL
POSITION
SIGNAL
DRIVER
MIRROR
SENSOR
GROUND
DRIVER
MIRROR
HEATER
GROUND
DRIVER
MIRROR
HEATER
DRIVER
DRIVER
MIRROR
HORIZONTAL
DRIVER
DRIVER
MIRROR
COMMON
DRIVER
DRIVER
MIRROR
VERTICAL
DRIVER
6 C1
8 C1
7 C1
17 C1
13 C1
2 C1
5 C1
3 C1
4 C1
P114
20
TN/WT
P112
20
OR/TN
P65
20
TN/VT
P669
20
OR/LG
P67
20
TN/OR
P69
20
GY/DG
C910
20
DB/GY
C110
20
DB/LB
P75
20
TN/LG
P73
20
VT/RD
P71
20
TN/DG
11
10
8
9
6
7
5
4
3
2
1
AUTO
DAY/NIGHT
MIRROR (-)
AUTO
DAY/NIGHT
MIRROR (+)
M
H
V
M
MIRROR-
OUTSIDE
REARVIEW-
DRIVER

MEMORY


TWISTED PAIR
5
C362
4
D55 20 WT/OR
D54 20 WT
D54 20 WT
D55 20 WT/OR
18
19
S310 (8W-18-4)
S309 (8W-18-6)
CAN B BUS (-)
CAN B BUS (+)
MODULE-MEMORY MIRROR-PASSENGER (8W-62-7)
TWISTED PAIR
D55 20 WT/OR
D54 20 WT
10
9
C364
TWISTED PAIR
D55 20 WT/OR
D54 20 WT
19 C1
18 C1
CAN B BUS (+)
CAN B BUS (-)
MODULE-MEMORY MIRROR-DRIVER
DRIVER DOOR LOCK SWITCH MUX
DRIVER DOOR LOCK SWITCH RETURN
GROUND
GROUND
20 C1
21 C1
10 C1
12 C1
G161 20 VT/DG
G775 20 OR/VT
Z940 20 BK/LB
Z940 20 BK/LB
S301 (8W-15-16)
Z940 20 BK
8 C1
3 C1
7 C364
DRIVER DOOR LOCK SWITCH MUX
DRIVER DOOR LOCK SWITCH RETURN
SWITCH-WINDOW/ DOOR LOCK-DRIVER (8W-61-2)
Z940 20 BK
G306 (8W-15-18)

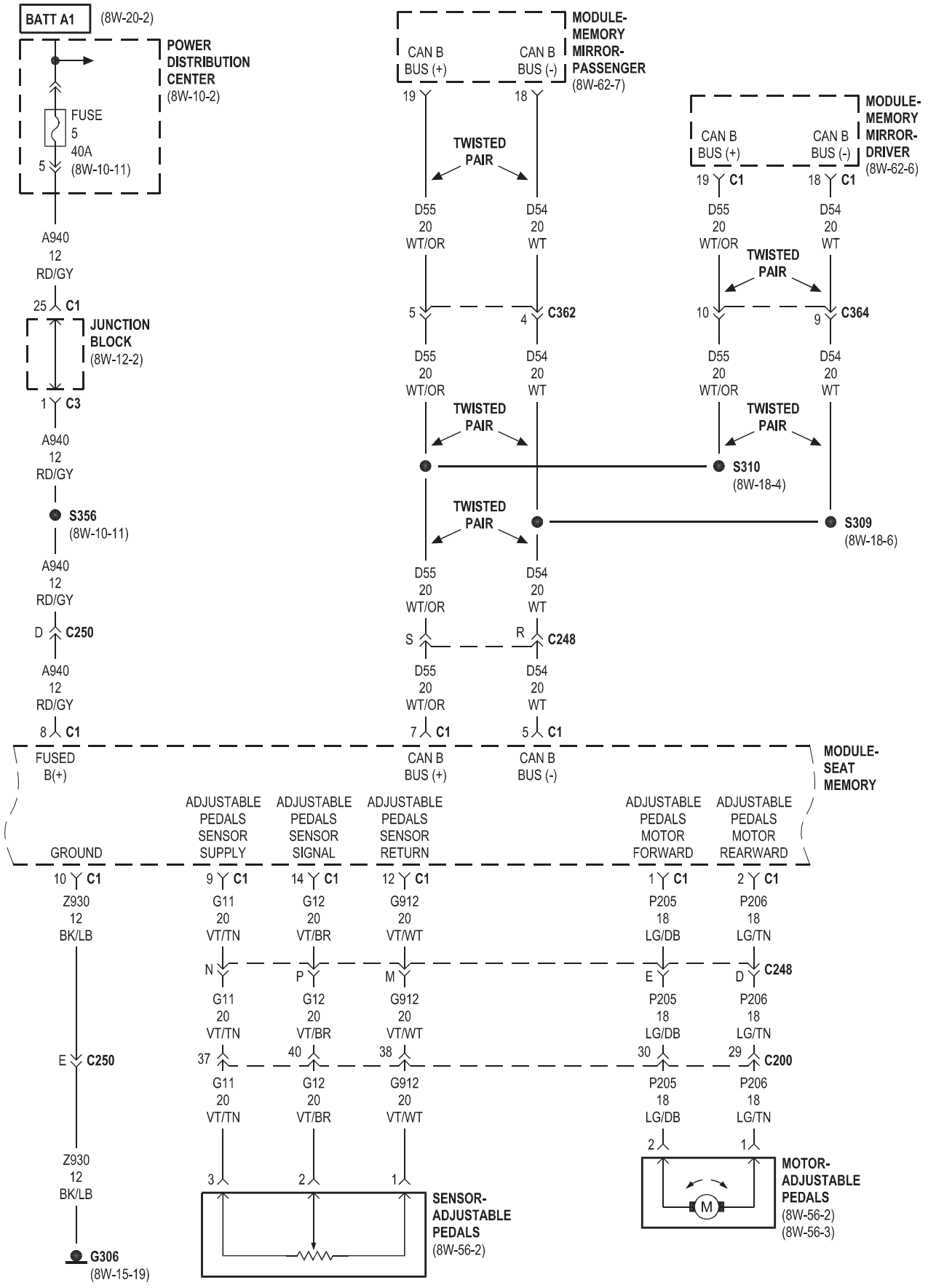
MEMORY

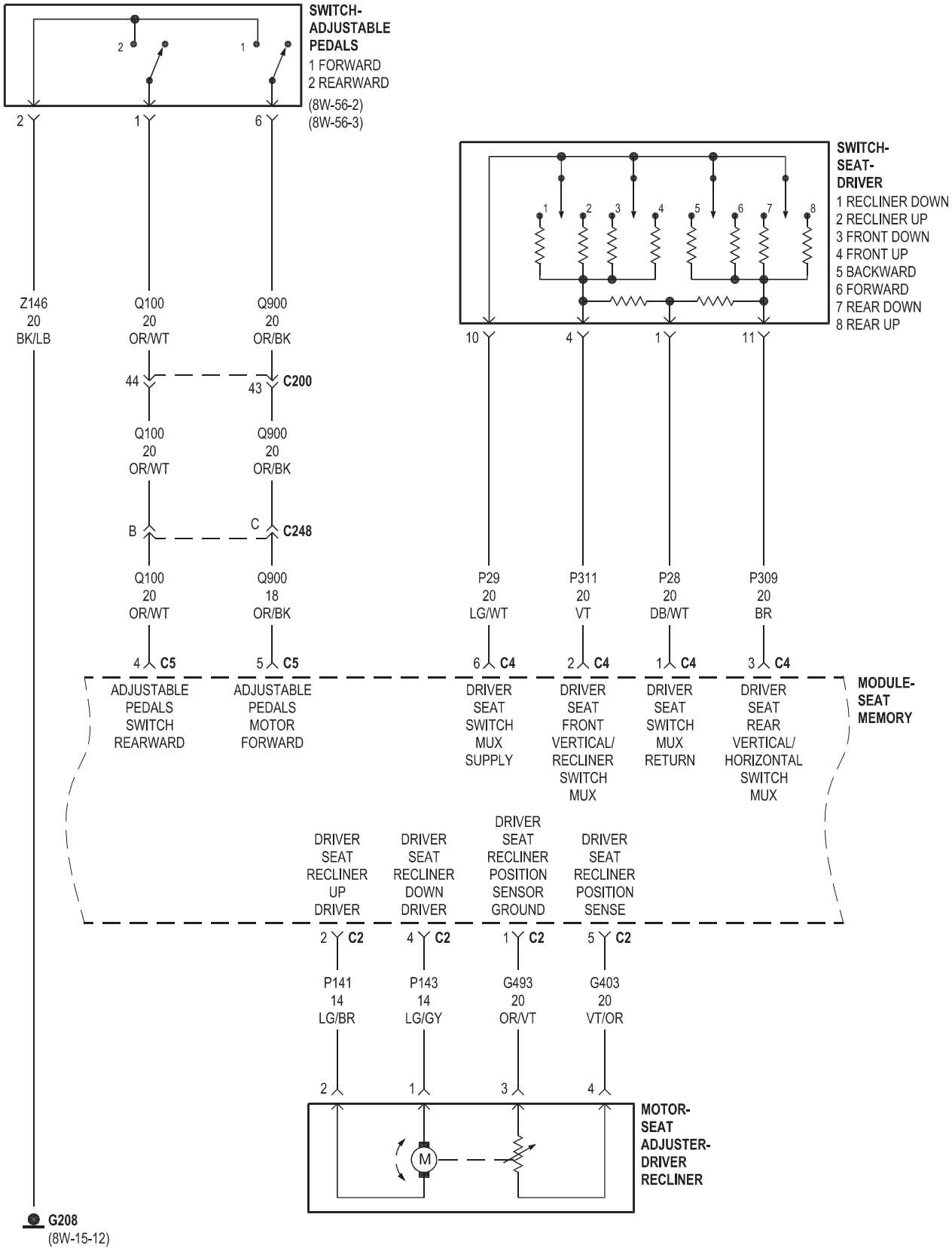

BATT A952
(8W-10-16)
JUNCTION BLOCK
(8W-12-2)
1
FUSE 8 10A
2
(8W-12-8)
28 C3
A215 20 RD/LG
S307
(8W-12-8)
A215 20 RD/LG
3
A215 20 RD/LG
1
FUSED B(+)
MODULE-MEMORY MIRROR-DRIVER
(8W-62-6)
CAN B BUS (+)
CAN B BUS (-)
19 C1
18 C1
D55 20 WT/OR
D54 20 WT
TWISTED PAIR
10
9 C364
D55 20 WT/OR
D54 20 WT
S310
(8W-18-4)
S309
(8W-18-6)
D55 20 WT/OR
D54 20 WT
5
4 C362
TWISTED PAIR
D55 20 WT/OR
19
CAN B BUS (+)
D54 20 WT
18
CAN B BUS (-)
LATCH-DOOR-RIGHT FRONT
(8W-61-4)
PASSENGER DOOR AJAR SWITCH SENSE
1
G74 20 VT/WT
9
PASSENGER DOOR AJAR SWITCH SENSE
SWITCH-WINDOW/DOOR LOCK-PASSENGER
(8W-61-2)
PASSENGER DOOR LOCK SWITCH MUX
PASSENGER DOOR LOCK SWITCH RETURN
6
7 C1
G160 20 VT/LG
20
PASSENGER DOOR LOCK SWITCH MUX
G776 20 VT/OR
21
PASSENGER DOOR LOCK SWITCH RETURN
MODULE-MEMORY MIRROR-PASSENGER
GROUND
PASSENGER MIRROR HORIZONTAL POSITION SIGNAL
PASSENGER MIRROR SENSOR SUPPLY
PASSENGER MIRROR VERTICAL POSITION SIGNAL
PASSENGER MIRROR SENSOR GROUND
PASSENGER MIRROR HEATER GROUND
PASSENGER MIRROR HEATER DRIVER
PASSENGER MIRROR HORIZONTAL DRIVER
PASSENGER MIRROR COMMON DRIVER
PASSENGER MIRROR VERTICAL DRIVER
12
6
8
7
17
13
2
5
3
4
Z944 20 BK
P68 20 DG/RD
P666 20 LG/OR
P64 20 TN
P66 20 DG/YL
C917 20 DB/YL
C17 20 LB/WT
P74 20 TN/OR
P70 20 LG/DB
P72 20 TN/GY
S328
(8W-15-19)
Z944 20 BK
2 C361
8
9
6
7
5
4
3
2
1
Z944 20 BK
G306
(8W-15-19)
M H
V M
MIRROR-OUTSIDE REARVIEW-PASSENGER

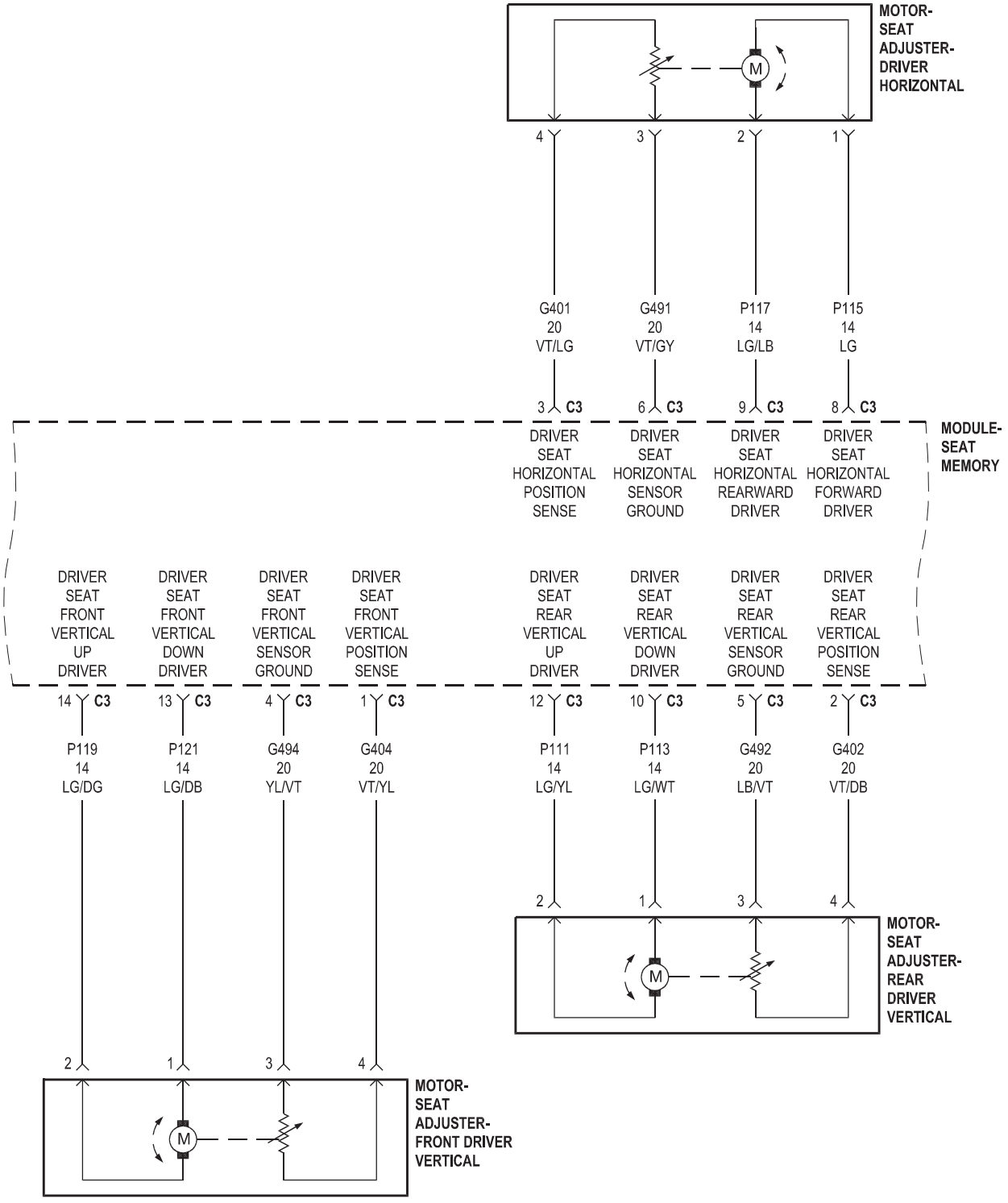
8W-63 POWER SEAT

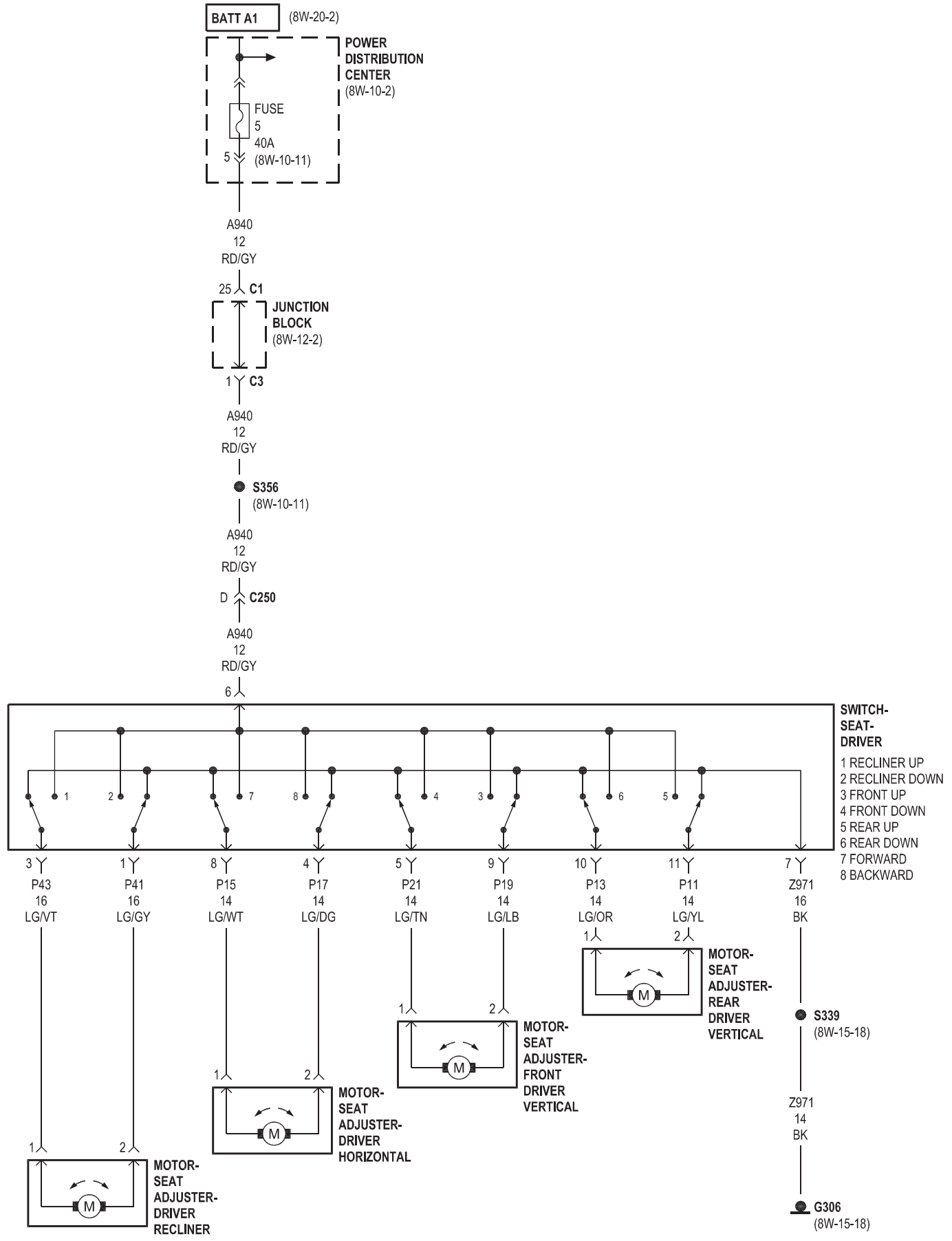
Component	Page
Cluster	8W-63-7, 8
Fuse 5	8W-63-2, 5, 6, 8
Fuse 19	8W-63-7
G207	8W-63-7
G208	8W-63-3
G306	8W-63-2, 5, 6, 8, 9
Heater-Cushion Pad-Driver	8W-63-8, 9
Heater-Cushion Pad-Passenger	8W-63-8, 9
Heater-Seat Back-Driver	8W-63-9
Heater-Seat Back-Passenger	8W-63-9
Junction Block	8W-63-2, 5, 6, 7, 8
Module-Heated Seat	8W-63-8
Module-Memory Mirror-Driver	8W-63-2
Module-Memory Mirror-Passenger	8W-63-2
Module-Seat Memory	8W-63-2, 3, 4
Motor-Adjustable Pedals	8W-63-2
Motor-Seat Adjuster-Driver Horizontal	8W-63-4, 5
Motor-Seat Adjuster-Driver Recliner	8W-63-3, 5
Motor-Seat Adjuster-Front Driver Vertical	8W-63-4, 5
Motor-Seat Adjuster-Passenger Horizontal	8W-63-6
Motor-Seat Adjuster-Passenger Recliner	8W-63-6
Motor-Seat Adjuster-Rear Driver Vertical	8W-63-4, 5
Power Distribution Center	8W-63-2, 5, 6, 8
Sensor-Adjustable Pedals	8W-63-2
Switch-Adjustable Pedals	8W-63-3
Switch-Heated Seat-Driver	8W-63-7
Switch-Heated Seat-Passenger	8W-63-7
Switch-Seat-Driver	8W-63-3, 5, 9
Switch-Seat-Passenger	8W-63-6

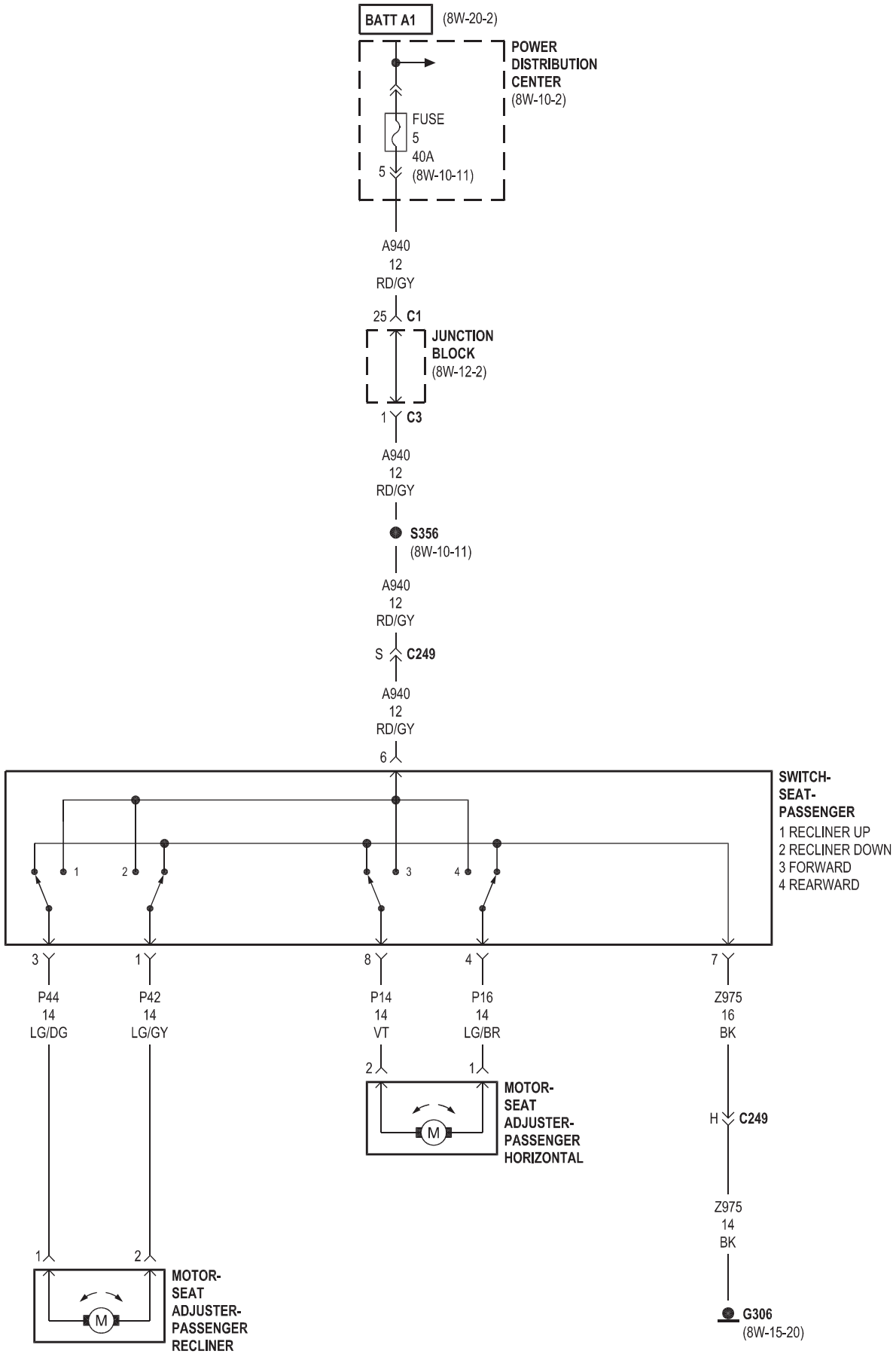
MEMORY

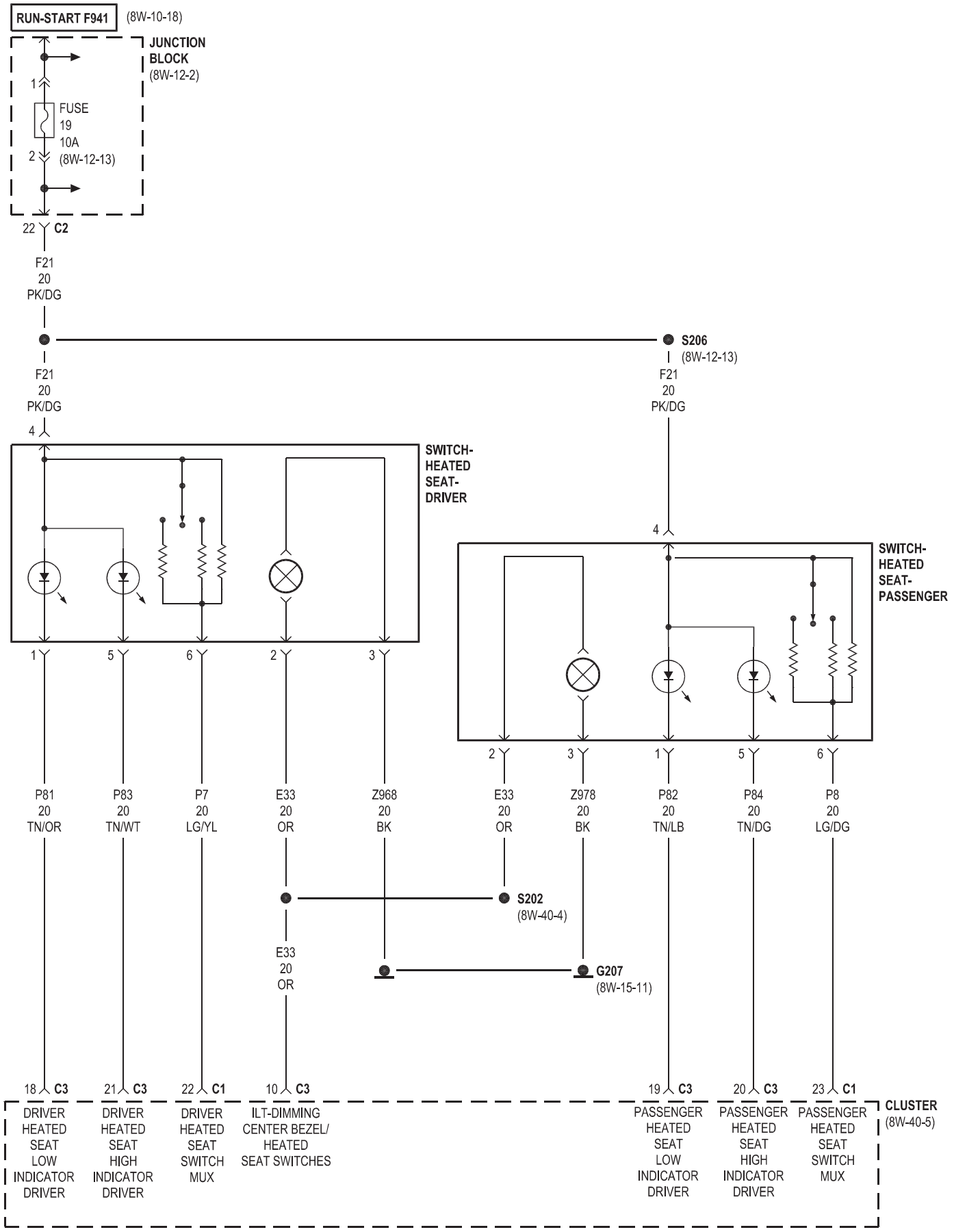

BATT A1
(8W-20-2)
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE 5 40A
(8W-10-11)
5
A940 12 RD/GY
25 C1
JUNCTION BLOCK
(8W-12-2)
1 C3
A940 12 RD/GY
S356
(8W-10-11)
A940 12 RD/GY
D C250
A940 12 RD/GY
8 C1
FUSED B(+)
MODULE-MEMORY MIRROR-PASSENGER
(8W-62-7)
CAN B BUS (+)
CAN B BUS (-)
19
18
TWISTED PAIR
D55 20 WT/OR
D54 20 WT
5
4 C362
S
R C248
7 C1
5 C1
CAN B BUS (+)
CAN B BUS (-)
MODULE-MEMORY MIRROR-DRIVER
(8W-62-6)
19 C1
18 C1
10
9 C364
S310
(8W-18-4)
S309
(8W-18-6)
MODULE-SEAT MEMORY
GROUND
ADJUSTABLE PEDALS SENSOR SUPPLY
ADJUSTABLE PEDALS SENSOR SIGNAL
ADJUSTABLE PEDALS SENSOR RETURN
ADJUSTABLE PEDALS MOTOR FORWARD
ADJUSTABLE PEDALS MOTOR REARWARD
10 C1
9 C1
14 C1
12 C1
1 C1
2 C1
Z930 12 BK/LB
G11 20 VT/TN
G12 20 VT/BR
G912 20 VT/WT
P205 18 LG/DB
P206 18 LG/TN
N
P
M
E
D C248
37
40
38
30
29 C200
E C250
Z930 12 BK/LB
G306
(8W-15-19)
3
2
1
SENSOR-ADJUSTABLE PEDALS
(8W-56-2)
M
MOTOR-ADJUSTABLE PEDALS
(8W-56-2)
(8W-56-3)


SWITCH-
ADJUSTABLE
PEDALS
1 FORWARD
2 REARWARD
(8W-56-2)
(8W-56-3)
SWITCH-
SEAT-
DRIVER
1 RECLINER DOWN
2 RECLINER UP
3 FRONT DOWN
4 FRONT UP
5 BACKWARD
6 FORWARD
7 REAR DOWN
8 REAR UP
Z146
20
BK/LB
Q100
20
OR/WT
Q900
20
OR/BK
C200
Q100
20
OR/WT
Q900
20
OR/BK
C248
Q100
20
OR/WT
Q900
18
OR/BK
P29
20
LG/WT
P311
20
VT
P28
20
DB/WT
P309
20
BR
C5
C5
C4
C4
C4
C4
ADJUSTABLE PEDALS SWITCH REARWARD
ADJUSTABLE PEDALS MOTOR FORWARD
DRIVER SEAT SWITCH MUX SUPPLY
DRIVER SEAT FRONT VERTICAL/ RECLINER SWITCH MUX
DRIVER SEAT SWITCH MUX RETURN
DRIVER SEAT REAR VERTICAL/ HORIZONTAL SWITCH MUX
MODULE-
SEAT
MEMORY
DRIVER SEAT RECLINER UP DRIVER
DRIVER SEAT RECLINER DOWN DRIVER
DRIVER SEAT RECLINER POSITION SENSOR GROUND
DRIVER SEAT RECLINER POSITION SENSE
C2
C2
C2
C2
P141
14
LG/BR
P143
14
LG/GY
G493
20
OR/VT
G403
20
VT/OR
MOTOR-
SEAT
ADJUSTER-
DRIVER
RECLINER
G208
(8W-15-12)

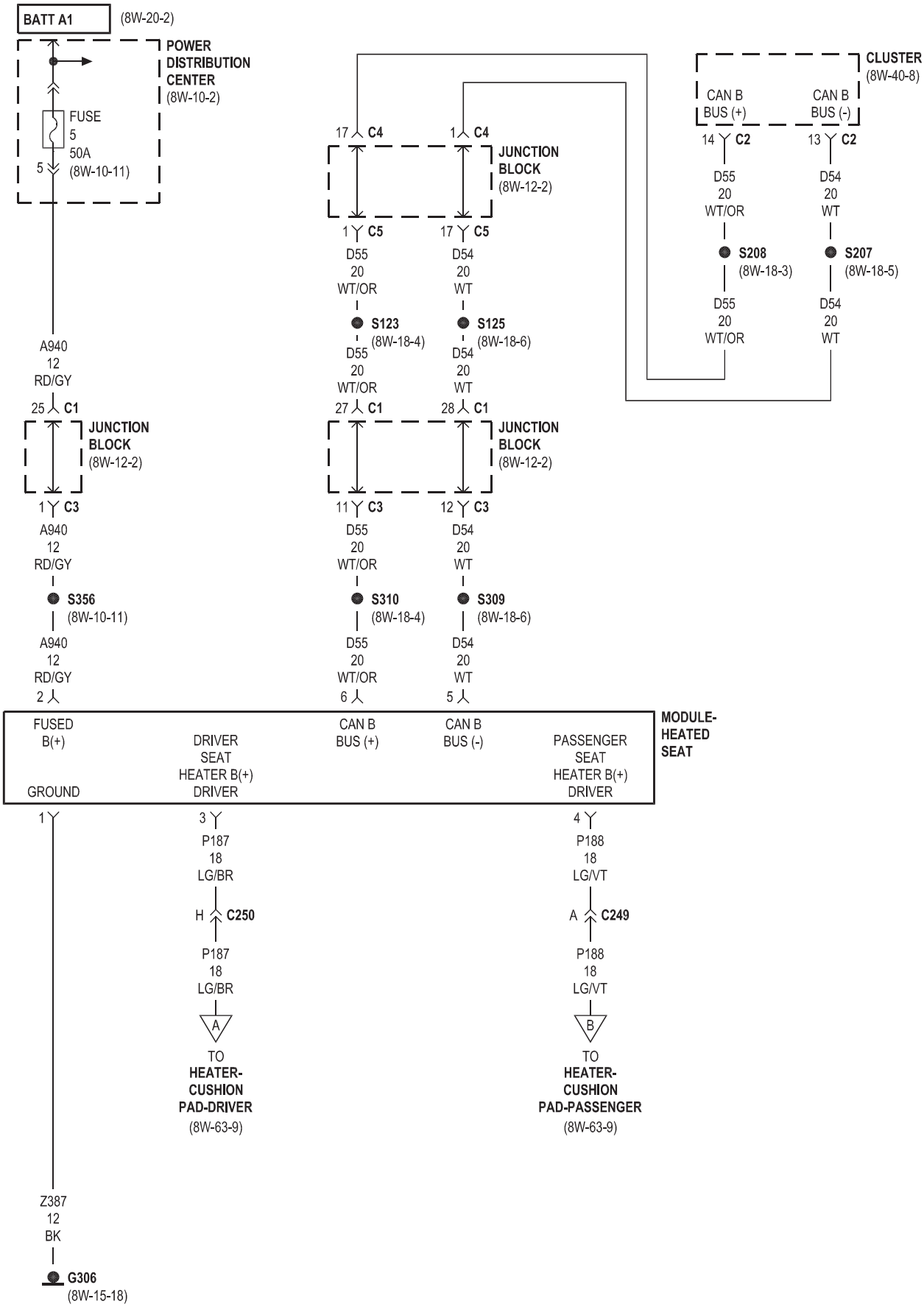

MOTOR-
SEAT
ADJUSTER-
DRIVER
HORIZONTAL
M
4
3
2
1
G401
20
VT/LG
G491
20
VT/GY
P117
14
LG/LB
P115
14
LG
3 C3
6 C3
9 C3
8 C3
DRIVER
SEAT
HORIZONTAL
POSITION
SENSE
DRIVER
SEAT
HORIZONTAL
SENSOR
GROUND
DRIVER
SEAT
HORIZONTAL
REARWARD
DRIVER
DRIVER
SEAT
HORIZONTAL
FORWARD
DRIVER
MODULE-
SEAT
MEMORY
DRIVER
SEAT
FRONT
VERTICAL
UP
DRIVER
DRIVER
SEAT
FRONT
VERTICAL
DOWN
DRIVER
DRIVER
SEAT
FRONT
VERTICAL
SENSOR
GROUND
DRIVER
SEAT
FRONT
VERTICAL
POSITION
SENSE
DRIVER
SEAT
REAR
VERTICAL
UP
DRIVER
DRIVER
SEAT
REAR
VERTICAL
DOWN
DRIVER
DRIVER
SEAT
REAR
VERTICAL
SENSOR
GROUND
DRIVER
SEAT
REAR
VERTICAL
POSITION
SENSE
14 C3
13 C3
4 C3
1 C3
12 C3
10 C3
5 C3
2 C3
P119
14
LG/DG
P121
14
LG/DB
G494
20
YL/VT
G404
20
VT/YL
P111
14
LG/YL
P113
14
LG/WT
G492
20
LB/VT
G402
20
VT/DB
2
1
3
4
2
1
3
4
M
MOTOR-
SEAT
ADJUSTER-
REAR
DRIVER
VERTICAL
M
MOTOR-
SEAT
ADJUSTER-
FRONT DRIVER
VERTICAL

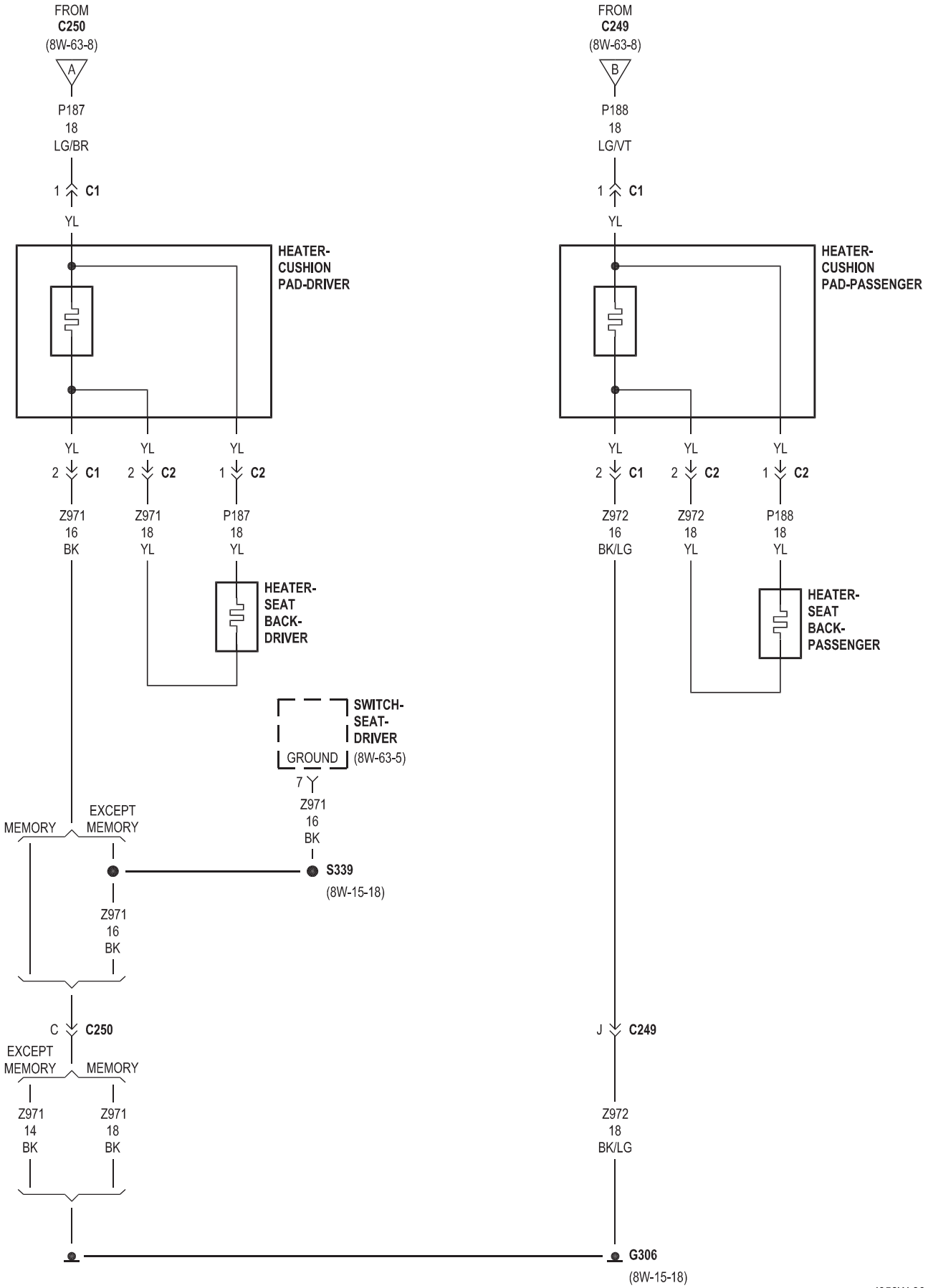

BATT A1
(8W-20-2)
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE 5 40A
(8W-10-11)
A940 12 RD/GY
25 C1
JUNCTION BLOCK
(8W-12-2)
1 C3
A940 12 RD/GY
S356
(8W-10-11)
A940 12 RD/GY
D C250
A940 12 RD/GY
6
SWITCH-SEAT-DRIVER
1 RECLINER UP
2 RECLINER DOWN
3 FRONT UP
4 FRONT DOWN
5 REAR UP
6 REAR DOWN
7 FORWARD
8 BACKWARD
3 P43 16 LG/VT
1 P41 16 LG/GY
8 P15 14 LG/WT
4 P17 14 LG/DG
5 P21 14 LG/TN
9 P19 14 LG/LB
10 P13 14 LG/OR
11 P11 14 LG/YL
7 Z971 16 BK
MOTOR-SEAT ADJUSTER-DRIVER RECLINER
MOTOR-SEAT ADJUSTER-DRIVER HORIZONTAL
MOTOR-SEAT ADJUSTER-FRONT DRIVER VERTICAL
MOTOR-SEAT ADJUSTER-REAR DRIVER VERTICAL
S339
(8W-15-18)
Z971 14 BK
G306
(8W-15-18)


BATT A1
(8W-20-2)
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE 5 40A
5
(8W-10-11)
A940 12 RD/GY
25
C1
JUNCTION BLOCK
(8W-12-2)
1
C3
A940 12 RD/GY
S356
(8W-10-11)
A940 12 RD/GY
S
C249
A940 12 RD/GY
6
SWITCH-SEAT-PASSENGER
1 RECLINER UP
2 RECLINER DOWN
3 FORWARD
4 REARWARD
1
2
3
4
3
1
8
4
7
P44 14 LG/DG
P42 14 LG/GY
P14 14 VT
P16 14 LG/BR
Z975 16 BK
2
1
MOTOR-SEAT ADJUSTER-PASSENGER HORIZONTAL
M
H
C249
Z975 14 BK
1
2
MOTOR-SEAT ADJUSTER-PASSENGER RECLINER
M
G306
(8W-15-20)


RUN-START F941
(8W-10-18)
JUNCTION BLOCK
(8W-12-2)
1
FUSE
19
10A
2
(8W-12-13)
22 C2
F21
20
PK/DG
S206
(8W-12-13)
4
SWITCH-HEATED SEAT-DRIVER
SWITCH-HEATED SEAT-PASSENGER
1
5
6
2
3
P81
20
TN/OR
P83
20
TN/WT
P7
20
LG/YL
E33
20
OR
Z968
20
BK
Z978
20
BK
P82
20
TN/LB
P84
20
TN/DG
P8
20
LG/DG
S202
(8W-40-4)
G207
(8W-15-11)
18 C3
21 C3
22 C1
10 C3
19 C3
20 C3
23 C1
DRIVER HEATED SEAT LOW INDICATOR DRIVER
DRIVER HEATED SEAT HIGH INDICATOR DRIVER
DRIVER HEATED SEAT SWITCH MUX
ILT-DIMMING CENTER BEZEL/ HEATED SEAT SWITCHES
PASSENGER HEATED SEAT LOW INDICATOR DRIVER
PASSENGER HEATED SEAT HIGH INDICATOR DRIVER
PASSENGER HEATED SEAT SWITCH MUX
CLUSTER
(8W-40-5)

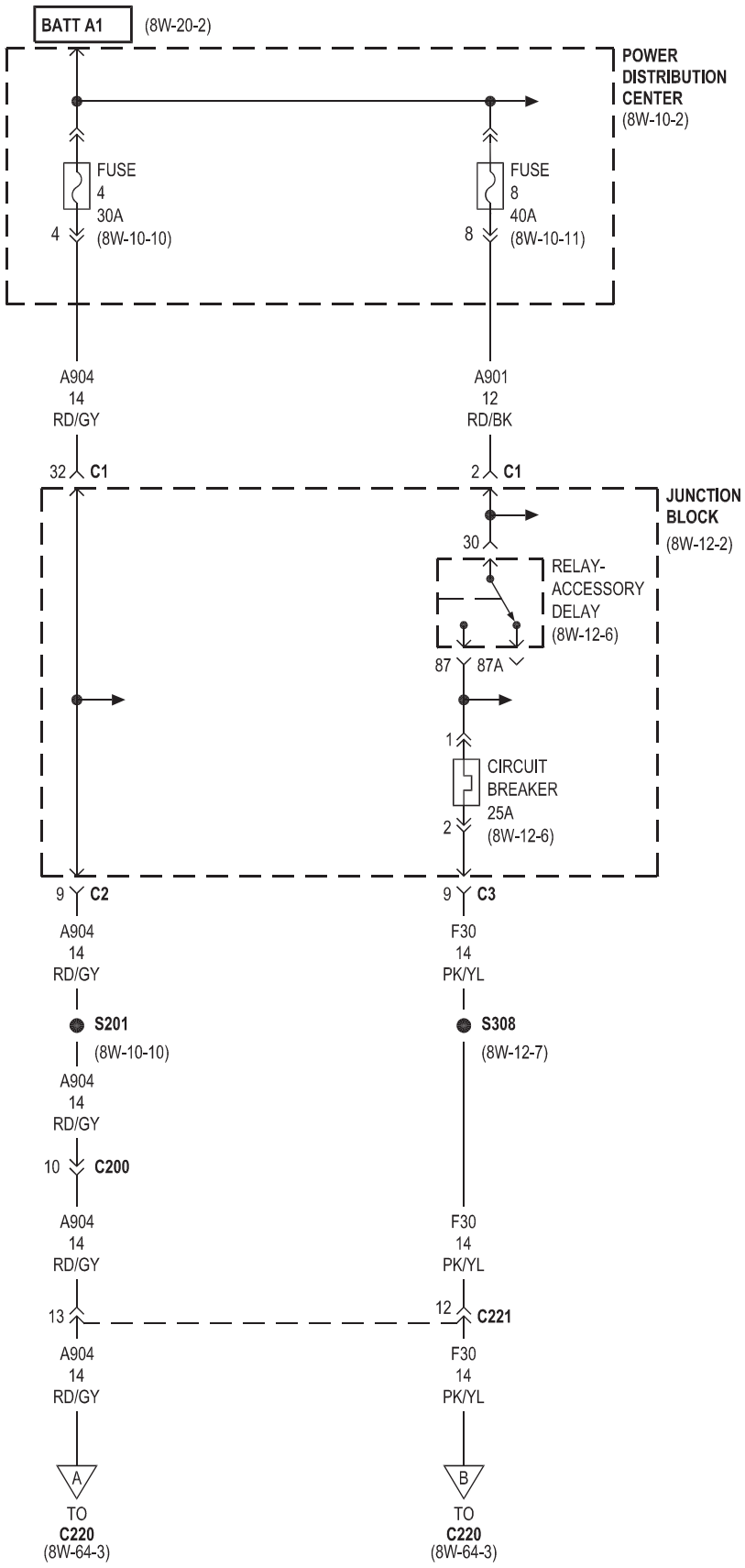
HEATED SEATS

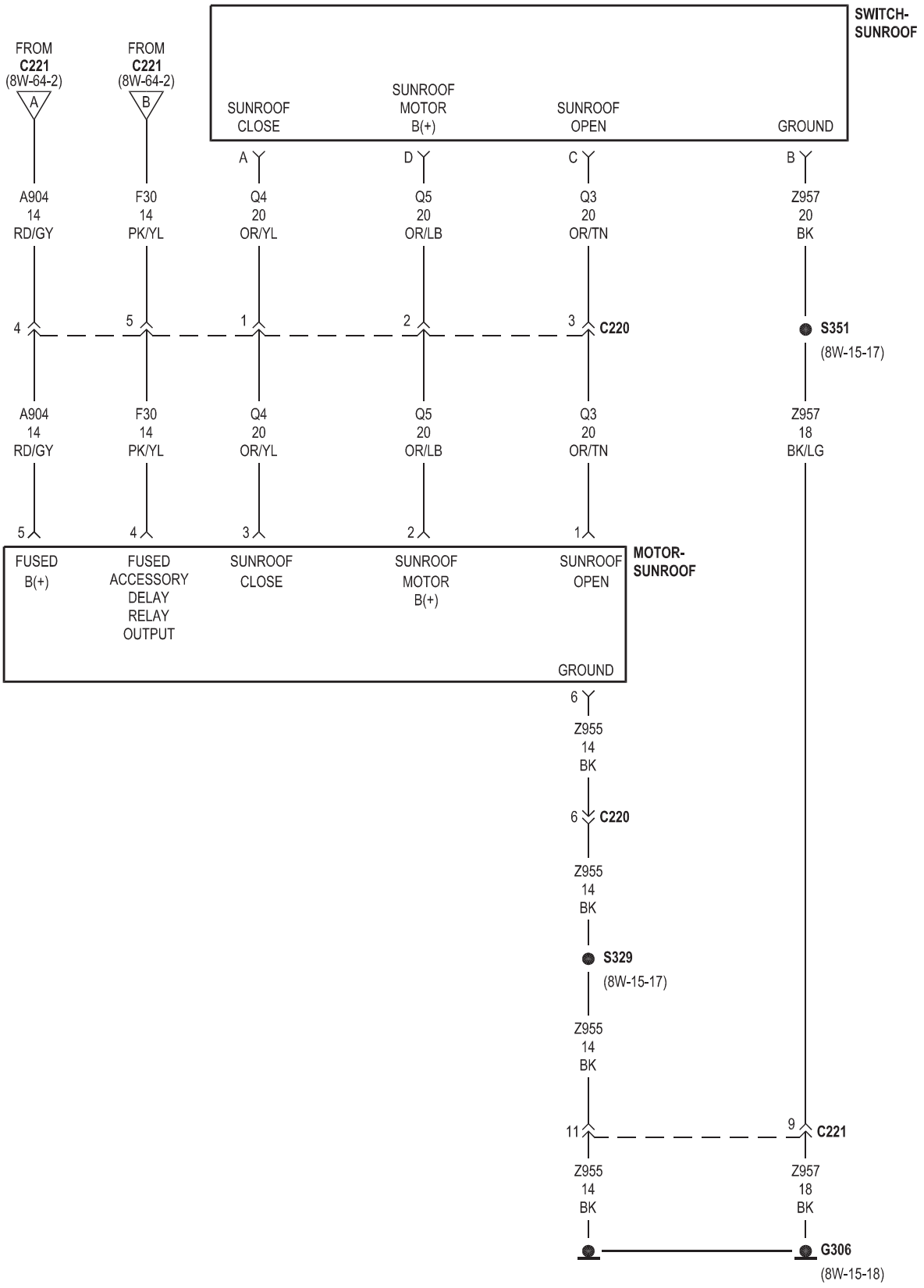



FROM
C250
(8W-63-8)
A
P187
18
LG/BR
1 C1
YL
HEATER-
CUSHION
PAD-DRIVER
YL
2 C1
Z971
16
BK
YL
2 C2
Z971
18
YL
YL
1 C2
P187
18
YL
HEATER-
SEAT
BACK-
DRIVER
SWITCH-
SEAT-
DRIVER
GROUND
(8W-63-5)
7
Z971
16
BK
S339
(8W-15-18)
MEMORY
EXCEPT
MEMORY
Z971
16
BK
C C250
EXCEPT
MEMORY
MEMORY
Z971
14
BK
Z971
18
BK
FROM
C249
(8W-63-8)
B
P188
18
LG/VT
1 C1
YL
HEATER-
CUSHION
PAD-PASSENGER
YL
2 C1
Z972
16
BK/LG
YL
2 C2
Z972
18
YL
YL
1 C2
P188
18
YL
HEATER-
SEAT
BACK-
PASSENGER
J C249
Z972
18
BK/LG
G306
(8W-15-18)

8W-64 POWER SUNROOF

Component	Page
Circuit Breaker	8W-64-2
Fuse 4	8W-64-2
Fuse 8	8W-64-2
G306	8W-64-3
Junction Block	8W-64-2
Motor-Sunroof	8W-64-3
Power Distribution Center	8W-64-2
Relay-Accessory Delay	8W-64-2
Switch-Sunroof	8W-64-3


BATT A1
(8W-20-2)
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE
4
30A
4
(8W-10-10)
FUSE
8
40A
8
(8W-10-11)
A904
14
RD/GY
A901
12
RD/BK
32 C1
2 C1
JUNCTION BLOCK
(8W-12-2)
30
RELAY-
ACCESSORY
DELAY
(8W-12-6)
87
87A
1
CIRCUIT
BREAKER
25A
2
(8W-12-6)
9 C2
9 C3
A904
14
RD/GY
F30
14
PK/YL
S201
(8W-10-10)
S308
(8W-12-7)
A904
14
RD/GY
10 C200
A904
14
RD/GY
F30
14
PK/YL
13
12 C221
A904
14
RD/GY
F30
14
PK/YL
A
B
TO
C220
(8W-64-3)
TO
C220
(8W-64-3)


SWITCH-
SUNROOF
SUNROOF
CLOSE
SUNROOF
MOTOR
B(+)
SUNROOF
OPEN
GROUND
FROM
C221
(8W-64-2)
A
FROM
C221
(8W-64-2)
B
A
D
C
B
A904
14
RD/GY
F30
14
PK/YL
Q4
20
OR/YL
Q5
20
OR/LB
Q3
20
OR/TN
Z957
20
BK
4
5
1
2
3
C220
S351
(8W-15-17)
A904
14
RD/GY
F30
14
PK/YL
Q4
20
OR/YL
Q5
20
OR/LB
Q3
20
OR/TN
Z957
18
BK/LG
5
4
3
2
1
FUSED
B(+)
FUSED
ACCESSORY
DELAY
RELAY
OUTPUT
SUNROOF
CLOSE
SUNROOF
MOTOR
B(+)
SUNROOF
OPEN
MOTOR-
SUNROOF
GROUND
6
Z955
14
BK
6
C220
Z955
14
BK
S329
(8W-15-17)
Z955
14
BK
11
9
C221
Z955
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BK
Z957
18
BK
G306
(8W-15-18)

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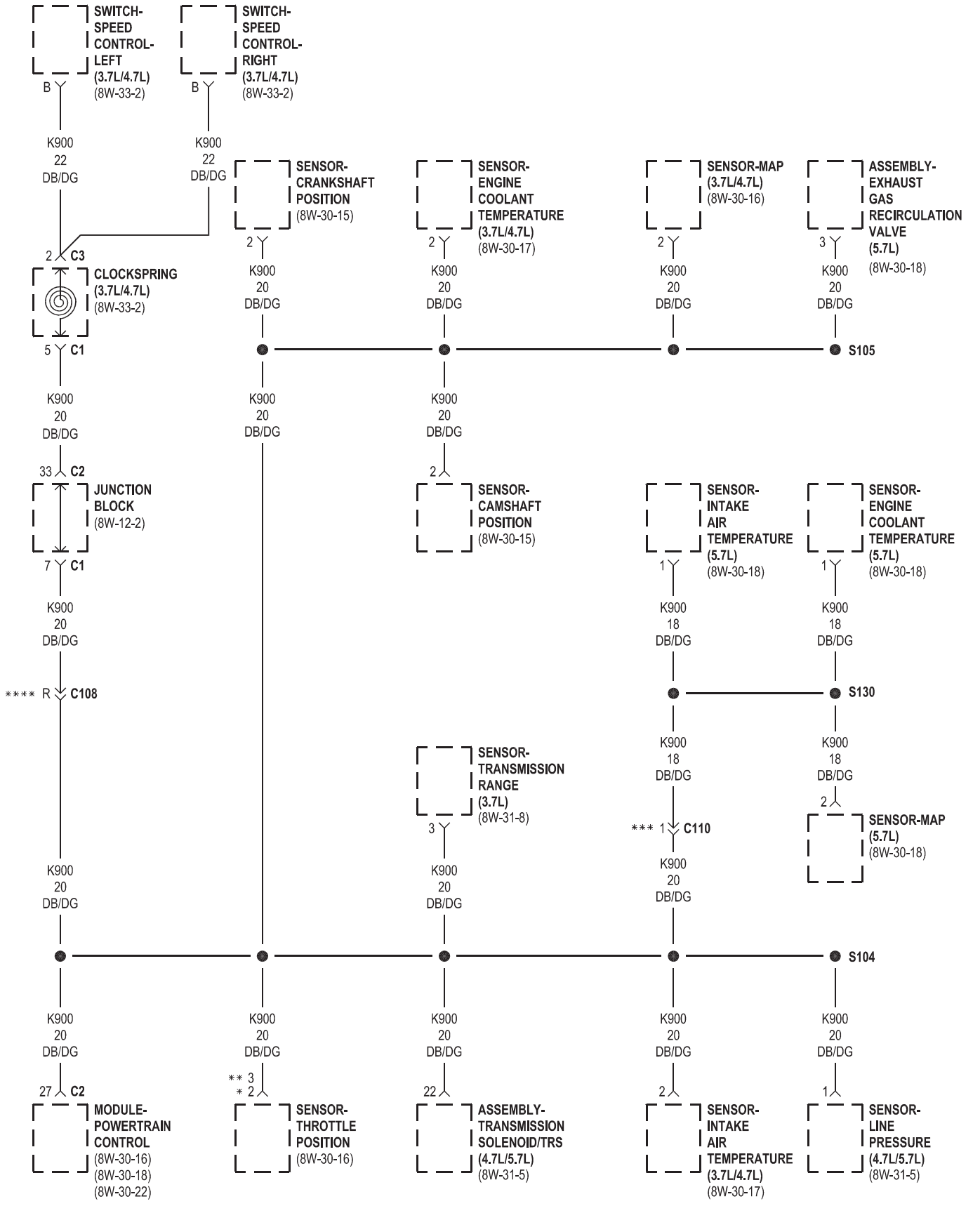
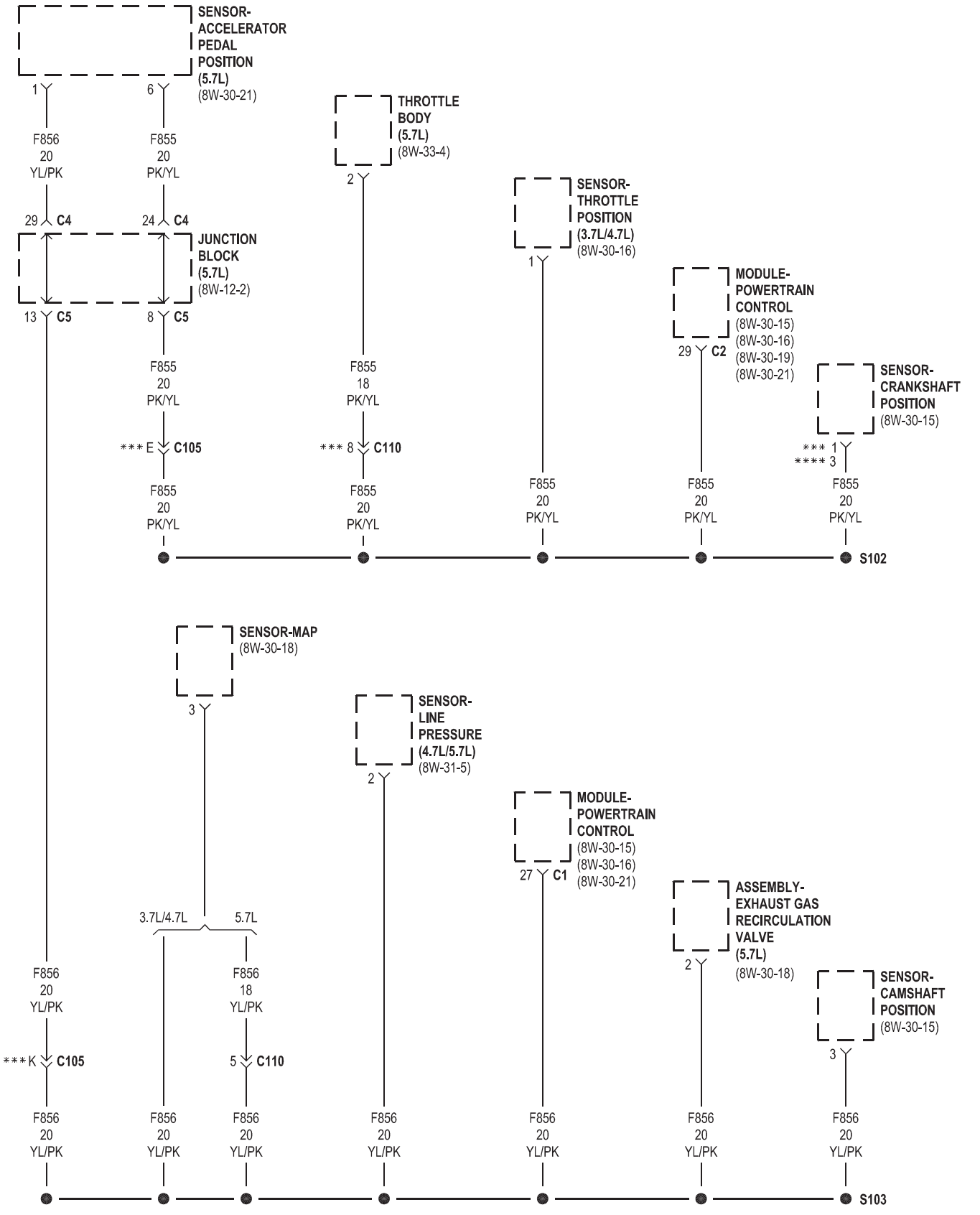


* 3.7L
** 4.7L
*** 5.7L
**** 3.7L/4.7L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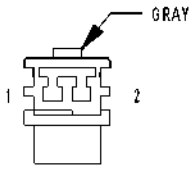
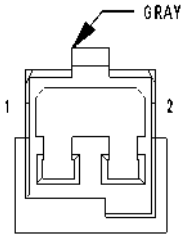
Switch-Window/Door Lock-Driver C1	8W-80-104
Switch-Window/Door Lock-Driver C2 (Memory)	8W-80-104
Switch-Window/Door Lock-Passenger	8W-80-104
Throttle Body	8W-80-104
Transducer-A/C Pressure	8W-80-105
Wiring-Trailer Tow 4-Way	8W-80-105
Wiring-Trailer Tow 7-Way	8W-80-105



ACTUATOR-
BLEND
DOOR-
FRONT

ACTUATOR-BLEND DOOR-FRONT - GRAY 2 WAY

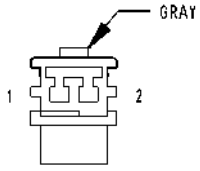
CAV	CIRCUIT	FUNCTION
1	C34 20DB/LB (ATC)	COMMON DOOR DRIVER 1
1	C34 20DB/LB (MTC)	FRONT COMMON DOOR DRIVER
2	C61 20DB/LB	FRONT BLEND DOOR DRIVER



ACTUATOR-
BLEND
DOOR-
REAR

ACTUATOR-BLEND DOOR-REAR - GRAY 2 WAY

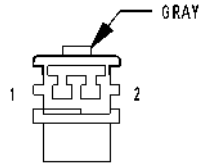
CAV	CIRCUIT	FUNCTION
1	C154 20LB/OR	REAR COMMON DOOR DRIVER
2	C54 20LB/YL	REAR BLEND DOOR DRIVER



ACTUATOR-
MODE DOOR-
FLOOR TO DEFROST-
FRONT

ACTUATOR-MODE DOOR-FLOOR TO DEFROST-FRONT - GRAY 2 WAY

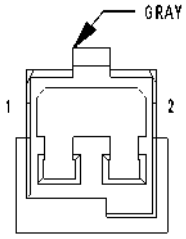
CAV	CIRCUIT	FUNCTION
1	C808 20DB/DG (ATC)	COMMON DOOR DRIVER 3
1	C34 20DB/LB (MTC)	FRONT COMMON DOOR DRIVER
2	C801 20DB/OR	MODE DOOR 2 DRIVER



ACTUATOR-
MODE DOOR-
FLOOR TO PANEL-
FRONT

ACTUATOR-MODE DOOR-FLOOR TO PANEL-FRONT - GRAY 2 WAY

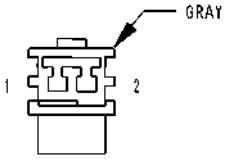
CAV	CIRCUIT	FUNCTION
1	C807 20DB/LG (ATC)	COMMON DOOR DRIVER 2
1	C34 20DB/LB (MTC)	FRONT COMMON DOOR DRIVER
2	C29 20DB	MODE DOOR 1 DRIVER



ACTUATOR-MODE DOOR-REAR

ACTUATOR-MODE DOOR-REAR - GRAY 2 WAY

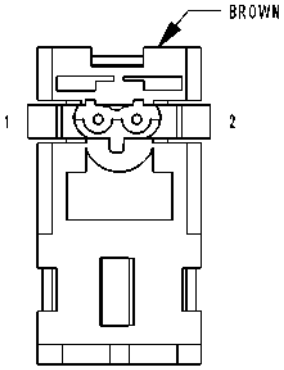
CAV	CIRCUIT	FUNCTION
1	C154 20LB/OR	REAR COMMON DOOR DRIVER
2	C53 20LB	REAR MODE DOOR DRIVER



ACTUATOR-RECIRCULATION DOOR

ACTUATOR-RECIRCULATION DOOR - GRAY 2 WAY

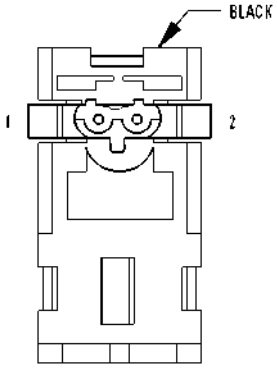
CAV	CIRCUIT	FUNCTION
1	C34 20DB/LB (ATC)	COMMON DOOR DRIVER 1
1	C34 20DB/LB (MTC)	FRONT COMMON DOOR DRIVER
2	C32 20DB/TN	RECIRCULATION DOOR DRIVER



AIRBAG-DRIVER SQUIB 1

AIRBAG-DRIVER SQUIB 1 - BROWN

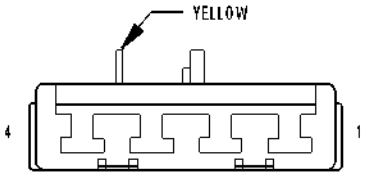
CAV	CIRCUIT	FUNCTION
1	R45 20BK/BL	DRIVER SQUIB 1 LINE 1
2	R43 20OR/BL	DRIVER SQUIB 1 LINE 2



AIRBAG-DRIVER SQUIB 2

AIRBAG-DRIVER SQUIB 2 - BLACK

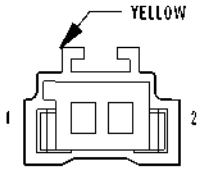
CAV	CIRCUIT	FUNCTION
1	R63 20OR/BL	DRIVER SQUIB 2 LINE 1
2	R61 20BR/BL	DRIVER SQUIB 2 LINE 2



AIRBAG-PASSENGER SQUIB

AIRBAG-PASSENGER SQUIB - YELLOW 4 WAY

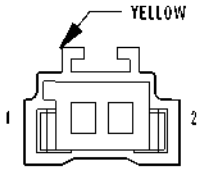
CAV	CIRCUIT	FUNCTION
1	R44 20LB/PK	PASSENGER SQUIB 1 LINE 2
2	R42 20LB/BR	PASSENGER SQUIB 1 LINE 1
3	R64 20LB/WT	PASSENGER SQUIB 2 LINE 1
4	R62 20LB/DG	PASSENGER SQUIB 2 LINE 2



AIRBAG-SIDE CURTAIN-LEFT

AIRBAG-SIDE CURTAIN-LEFT - YELLOW 2 WAY

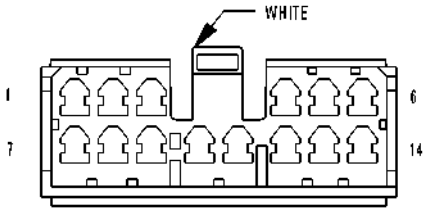
CAV	CIRCUIT	FUNCTION
1	R1 20LB/BR	LEFT CURTAIN SQUIB 1 LINE 2
2	R3 20LB/OR	LEFT CURTAIN SQUIB 1 LINE 1



AIRBAG-SIDE CURTAIN-RIGHT

AIRBAG-SIDE CURTAIN-RIGHT - YELLOW 2 WAY

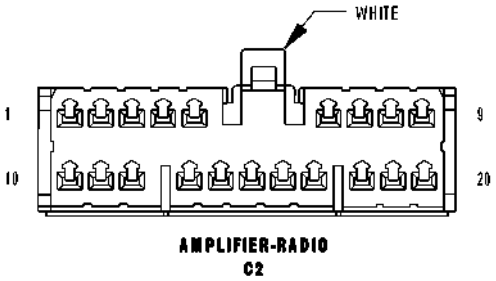
CAV	CIRCUIT	FUNCTION
1	R2 20WT/LB	RIGHT CURTAIN SQUIB 1 LINE 2
2	R4 20OR/LB	RIGHT CURTAIN SQUIB 1 LINE 1



AMPLIFIER-RADIO C1

AMPLIFIER-RADIO C1 - WHITE 14 WAY

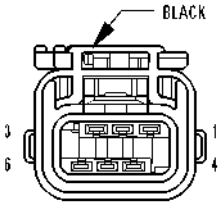
CAV	CIRCUIT	FUNCTION
1	X201 16GY/VT	AMPLIFIED LEFT FRONT DOOR SPEAKER (+)
2	X202 20DG/VT	AMPLIFIED RIGHT FRONT DOOR SPEAKER (+)
3	X205 18LG/PK	AMPLIFIED LEFT REAR DOOR SPEAKER (+)
4	X206 20DG/LG	AMPLIFIED RIGHT REAR DOOR SPEAKER (+)
5	X300 18GY/BR (SUBWOOFER)	AMPLIFIED SUBWOOFER 1 (+)
6	X301 18GY/WT (SUBWOOFER)	AMPLIFIED SUBWOOFER 2 (+)
7	X291 16GY/YL	AMPLIFIED LEFT FRONT DOOR SPEAKER (-)
8	X292 20DG/YL	AMPLIFIED RIGHT FRONT DOOR SPEAKER (-)
9	X295 18GY/DG	AMPLIFIED LEFT REAR DOOR SPEAKER (-)
10	-	-
11	-	-
12	X296 20LG/GY	AMPLIFIED RIGHT REAR DOOR SPEAKER (-)
13	X390 18DG/BR (SUBWOOFER)	AMPLIFIED SUBWOOFER 1 (-)
14	X391 18DG/WT (SUBWOOFER)	AMPLIFIED SUBWOOFER 2 (-)



AMPLIFIER-RADIO
C2

AMPLIFIER-RADIO C2 - WHITE 20 WAY

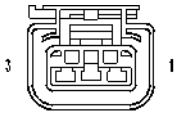
CAV	CIRCUIT	FUNCTION
1	X209 20GY/OR	AMPLIFIED LEFT I/P SPEAKER (+)
2	X208 20GY/DG	AMPLIFIED RIGHT I/P SPEAKER (+)
3	-	-
4	A116 16YL/RD	FUSED B(+)
5	-	-
6	D55 20WT/OR	CAN B BUS (+)
7	X51 20DG/DB	RADIO-LEFT AUDIO (+)
8	X52 20GY/DB	RADIO-RIGHT AUDIO (+)
9	Z513 16BK	GROUND
10	X299 20GY/YL	AMPLIFIED LEFT I/P SPEAKER (-)
11	X298 20GY/LG	AMPLIFIED RIGHT I/P SPEAKER (-)
12	-	-
13	A116 16YL/RD	FUSED B(+)
14	-	-
15	-	-
16	-	-
17	D54 20WT	CAN B BUS (-)
18	X57 20DG/OR	RADIO-LEFT AUDIO (-)
19	X58 20GY/OR	RADIO-RIGHT AUDIO (-)
20	Z980 16BK	GROUND



ASSEMBLY-
EXHAUST GAS
RECIRCULATION
VALVE

ASSEMBLY-EXHAUST GAS RECIRCULATION VALVE - BLACK 6 WAY

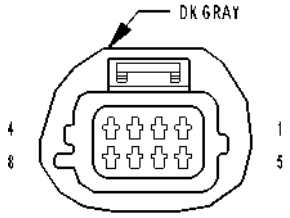
CAV	CIRCUIT	FUNCTION
1	K34 20LB/GY	EGR SIGNAL
2	F856 20YL/PK	5 VOLT SUPPLY
3	K900 20DB/DG	SENSOR GROUND
4	Z958 20BK	GROUND
5	-	-
6	K35 20LB/RD	EGR SOL CONTROL



ASSEMBLY-
NATURAL
VACUUM
LEAK
DETECTION

ASSEMBLY-NATURAL VACUUM LEAK DETECTION - 3 WAY

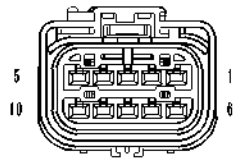
CAV	CIRCUIT	FUNCTION
1	Z938 20BK	GROUND
2	K107 20VT/WT	NVLD SWITCH SIGNAL
3	K106 20VT/LB	NVLD SOL CONTROL



ASSEMBLY-SHIFT MOTOR/MODE SENSOR

ASSEMBLY-SHIFT MOTOR/MODE SENSOR - DK GRAY 8 WAY

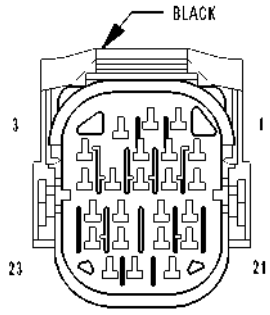
CAV	CIRCUIT	FUNCTION
1	T103 20YL/OR	5 VOLT SUPPLY
2	D201 20WT/DG	MODE SENSOR A
3	G180 20VT/YL	FCM SENSOR RETURN
4	T101 14DG	SHIFT MOTOR (+)
5	T102 14YL	SHIFT MOTOR (-)
6	-	-
7	-	-
8	-	-



ASSEMBLY-TRANSMISSION SOLENOID/PRESSURE SWITCH (3.7L)

ASSEMBLY-TRANSMISSION SOLENOID/PRESSURE SWITCH (3.7L) - 10 WAY

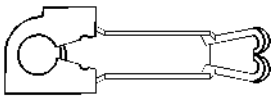
CAV	CIRCUIT	FUNCTION
1	T60 18VT/WT	OD SOLENOID CONTROL
2	T59 18YL/LB	UD SOLENOID CONTROL
3	T16 18YL/OR	TRANSMISSION CONTROL RELAY OUTPUT
4	T19 18YL/DB	2-4 SOLENOID CONTROL
5	T47 20YL/DG	2-4 PRESSURE SWITCH SENSE
6	T9 20BR/VT	OD PRESSURE SWITCH SENSE
7	T20 18VT/DG	L/R SOLENOID CONTROL
8	-	-
9	-	-
10	T50 20VT/GY	L/R PRESSURE SWITCH SENSE



ASSEMBLY-TRANSMISSION SOLENOID/TRS (4.7L/5.7L)

ASSEMBLY-TRANSMISSION SOLENOID/TRS (4.7L/5.7L) - BLACK 23 WAY

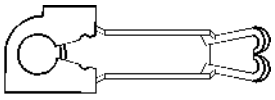
CAV	CIRCUIT	FUNCTION
1	-	-
2	T20 18VT/DG	L/R SOLENOID CONTROL
3	-	-
4	T41 20YL/DB	TRS (T41) SENSE (P/N SENSE)
5	T42 20DG/YL	TRS T42 SENSE
6	-	-
7	T60 18VT/WT	OD SOLENOID CONTROL
8	T3 20DG/DB	TRS T3 SENSE
9	T1 20BR/DB	TRS T1 SENSE
10	T16 18YL/OR	TRANSMISSION CONTROL RELAY OUTPUT
11	T48 20BR/YL	4C PRESSURE SWITCH SENSE
12	T140 20DG	PRESSURE CONTROL SOLENOID CONTROL
13	T4 20BR/PK	2-4 PRESSURE SWITCH SENSE
14	T50 20VT/GY	L/R PRESSURE SWITCH SENSE
15	T147 20DG/YL	2C PRESSURE SWITCH SENSE
16	T9 20BR/VT	OD PRESSURE SWITCH SENSE
17	T59 18YL/LB	UD SOLENOID CONTROL
18	T29 20YL/WT	UD PRESSURE SWITCH SENSE
19	T259 18VT/RD	4C SOLENOID CONTROL
20	T219 18VT/DB	2C SOLENOID CONTROL
21	T118 20VT/BR	MS SOLENOID CONTROL
22	K900 20DB/DG	SENSOR GROUND
23	T54 20BR/RD	TRANSMISSION TEMPERATURE SENSOR SIGNAL



BATTERY (+)

BATTERY (+) - 1 WAY

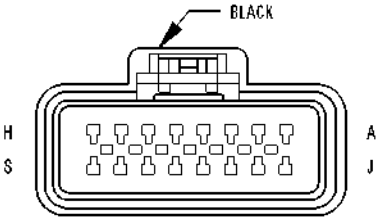
CAV	CIRCUIT	FUNCTION
1	A1 04RD	B(+)
1	A1 06RD	B(+)



BATTERY (-)

BATTERY (-) - 2 WAY

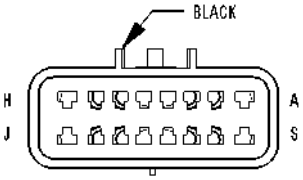
CAV	CIRCUIT	FUNCTION
1	Z100 04BK/VT	GROUND
2	Z1 04BK	GROUND



C105

C105 - BLACK (ENGINE SIDE)

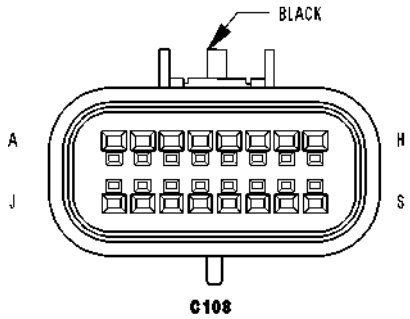
CAV	CIRCUIT
A	T750 14GY/YL
B	D201 20WT/DG
C	T16 18YL/OR
D	G180 20VT/YL
E	F855 20PK/YL
F	F1 20PK/DG
G	C3 20DB/GY
H	-
J	-
K	F856 20YL/PK
L	A955 16RD
M	A919 18OR/GY
N	F924 20PK/YL
P	F202 20PK/GY
R	T15 20VT/YL
S	-



C105

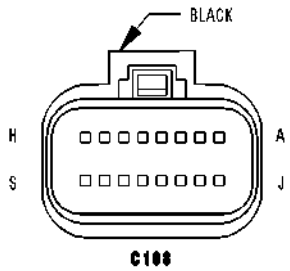
C105 - BLACK (HEADLAMP AND DASH SIDE)

CAV	CIRCUIT
A	T750 14GY/YL
B	D201 20WT/DG (4WD)
C	T16 18YL/OR
D	G180 20VT/YL (4WD)
E	F855 20PK/YL (4WD)
F	F1 20PK/DG
G	C3 20DB/GY
H	T101 14DG (4WD)
J	T102 14YL (4WD)
K	F856 20YL/PK (4WD)
L	A955 16RD
M	A919 18OR/GY
N	F924 20PK/YL
P	F202 20PK/GY
R	T15 20VT/YL
S	-



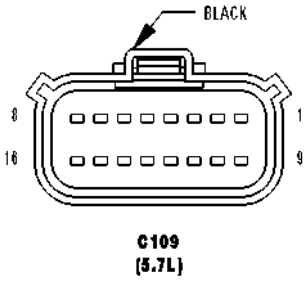
C108 - BLACK (HEADLAMP AND DASH SIDE)

CAV	CIRCUIT
A	K299 20DG/RD
B	K399 20BR/GY
C	D65 20YL/RD
D	D64 20WT/LB
E	D16 20WT/PK
F	D15 20BR/WT
G	D20 20WT/BR
H	D21 20WT/GY
J	T41 20YL/DB
K	A955 16RD
L	T103 20YL/OR (4WD)
M	-
N	K66 20DB/WT
N	-
P	-
R	K900 20DB/DG (3.7L/4.7L)
S	T6 20DG



C108 - BLACK (ENGINE SIDE)

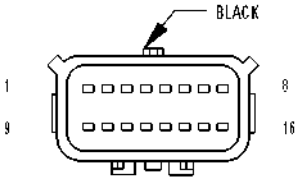
CAV	CIRCUIT
A	K299 20DG/RD
B	K399 20TN/WT
C	D65 20YL/RD
D	D64 20WT/LB
E	D16 20WT/PK
F	D15 20BR/WT
G	D20 20WT/BR
H	D21 20WT/GY
J	T41 20YL/DB
K	A955 16RD
L	T103 20YL/OR
N	K66 20DB/WT
P	-
R	K900 20DB/DG
S	T6 20DG



C109
(5.7L)

C109 (5.7L) - BLACK (ENGINE SIDE)

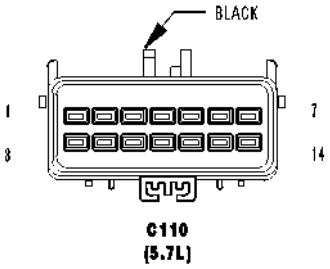
CAV	CIRCUIT
1	K11 16BR/YL
2	K12 16BR/DB
3	K13 16PK/DB
4	K14 16YL/LB
5	K38 16YL/RD
6	K58 16PK/DB
7	K26 16YL/TN
8	K28 16VT/LG
9	K19 16LB/RD
10	K17 16DB/TN
11	K18 16VT/RD
12	K15 16DB
13	K16 16DG/WT
14	K10 16VT/LB
15	K97 16BR
16	K98 16DB/YL



C109
(5.7L)

C109 (5.7L) - BLACK (INTAKE AIR FUEL MANIFOLD SIDE)

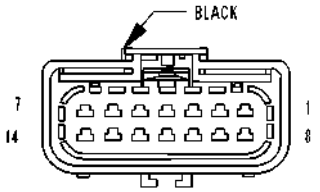
CAV	CIRCUIT
1	K11 18BR/YL
2	K12 18BR/DB
3	K13 18BR/LB
4	K14 18BR/TN
5	K38 18BR/OR
6	K58 18BR/VT
7	K26 18BR/YL
8	K28 18BR/LB
9	K19 18DB/DG
10	K17 18DB/TN
11	K18 18DB/OR
12	K15 18DB/GY
13	K16 18DB/YL
14	K10 18DB/OR
15	K97 18BR
16	K98 18DB/YL



C110
(5.7L)

C110 (5.7L) - BLACK (INTAKE AIR FUEL MANIFOLD SIDE)

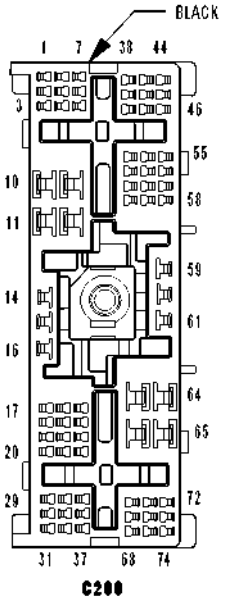
CAV	CIRCUIT
1	K900 18DB/DG
2	K1 18VT/BR
3	K21 18DB/LG
4	K922 18BR/DB
5	F856 18YL/PK
6	K447 18TN/YL
7	K342 16BR/WT
8	F855 18PK/YL
9	K2 18VT/OR
10	K122 18BR/DG
11	K22 18BR/OR
12	-
13	K448 18TN/OR
14	K342 16BR/WT



C110
(5.7L)

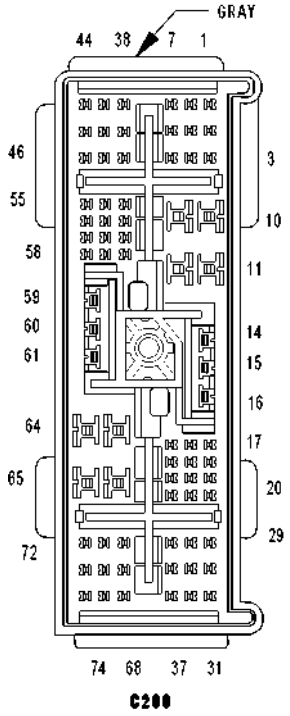
C110 (5.7L) - BLACK (ENGINE SIDE)

CAV	CIRCUIT
1	K900 20DB/DG
2	K1 20VT/BR
3	K21 20BR/WT
4	K922 20PK/GY
5	F856 20YL/PK
6	K447 20TN/YL
7	A955 16RD
8	F855 20PK/YL
9	K2 20LB/RD
10	K122 20PK/LB
11	K22 20YL/DG
12	-
13	K448 20TN/OR
14	A955 16RD



C200 - BLACK (BODY SIDE)

CAV	CIRCUIT
1	B25 20DG/WT
2	-
3	P5 16TN/OR
4	G77 20VT/GY
5	R57 20LG/GY
6	G78 20VT/OR
7	M28 20YL/TN
8	C154 20LB/OR
9	C54 20YL/LB
10	A904 14RD/GY
11	C153 14BR/DB
12	C50 14DB/OR
13	-
14	C803 20OR/LB
15	-
16	X53 20DG
17	X52 20GY/DB
18	X51 20DG/DB
19	X712 20LB/RD
20	X16 20DG/YL
21	X17 20DB/WT
22	X916 20LB/PK
23	X917 20LB/RD
24	X910 20GY/DG
25	C53 20LB
26	X54 20GY
27	C151 16DB/PK
28	C931 20DB/WT
29	P206 18LG/TN
30	P205 18LG/DB
31	P1 16TN/LG
32	E10 20OR/DG
33	X510 20DG/RD
34	X511 20DB/RD
35	X521 20GY/LB
36	X522 20LG/RD
37	G11 20VT/TN
38	G912 20VT/WT
39	-
40	G12 20VT/BR
41	-
42	-
43	Q900 20OR/BK
44	Q100 20OR/WT
45	X793 20TN/YL
46	X835 20OR/GY
47	X730 20GY/YL
48	X792 20DB/YL
49	X58 20GY/OR
50	X56 20GY/BR
51	X55 20DG/BR
52	X57 20DG/OR
53	G76 20VT/YL
54	G74 20VT/WT



C200 - BLACK (BODY SIDE)

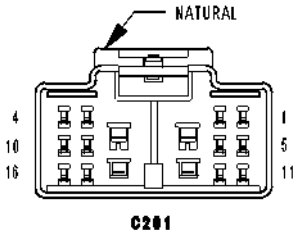
CAV	CIRCUIT
55	X735 20DB
56	G161 20VT/DG
57	P392 16LG/DB
58	-
59	F504 20GY/PK
60	C22 20LB/WT
61	G160 20VT/LG
62	-
63	-
64	C152 14LG/PK
65	-
66	G75 20VT
67	-
68	P393 16LG
69	M22 20YL/OR
70	G778 18OR/RD
71	C802 20LB/RD
72	X722 20LB/TN
73	C804 20DB/VT
74	C800 20DB/GY

C200 - GRAY (INSTRUMENT PANEL SIDE)

CAV	CIRCUIT
1	B25 20DG/WT
2	-
3	P5 16TN/OR
4	G77 20VT/GY
5	R57 20LG/GY
6	G78 20VT/OR
7	M28 20YL/TN
8	C154 20LB/OR
9	C54 20YL/LB
10	A904 14RD/GY
11	C153 14BR/DB
12	C50 14DB/OR
13	-
14	C803 20OR/LB
15	-
16	X53 20DG
17	X52 20GY/DB
18	X51 20DG/DB
19	X712 20LB/RD
20	X16 20DG/YL
21	X17 20DB/WT
22	-
22	X916 20LB/PK
23	X917 20LB/RD
24	X910 20GY/DG
25	C53 20LB
26	X54 20GY
27	C151 16DB/PK
28	C931 20DB/WT
29	P206 18LG/TN

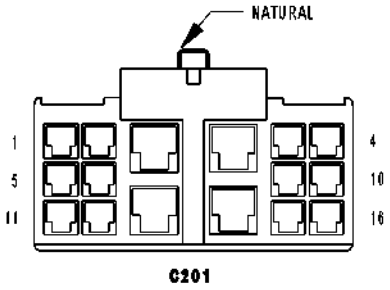
C200 - GRAY (INSTRUMENT PANEL SIDE)

CAV	CIRCUIT
30	P205 18LG/DB
31	P1 16TN/LG
32	E10 20OR/DG
33	X510 20DG/RD
34	X511 20DB/RD
35	X521 20GY/LB
36	X522 20LG/RD
37	G11 20VT/TN
38	G912 20VT/WT
39	-
40	G12 20VT/BR
41	-
42	-
43	Q900 20OR/BK
44	Q100 20OR/WT
45	X793 20TN/YL
46	X835 20OR/GY
47	X730 20GY/YL
48	X792 20DB/YL
49	X58 20GY/OR
50	X56 20GY/BR
51	X55 20DG/BR
52	X57 20DG/OR
53	G76 20VT/YL
54	G74 20VT/WT
55	X735 20DB
56	G161 20VT/DG
57	P392 16LG/DB
58	-
59	F504 20GY/PK
60	C22 20LB/WT
61	G160 20VT/LG
62	-
63	-
64	C152 14LG/PK
65	-
66	G75 20VT
67	-
68	P393 16LG
69	M22 20YL/OR
70	G778 18OR/RD
71	C802 20LB/RD
72	X722 20LB/TN
73	C804 20DB/VT
74	C800 20DB/GY



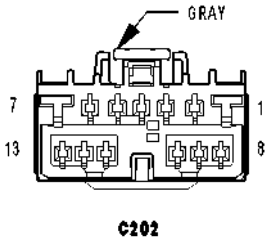
C201 - NATURAL (HEADLAMP AND DASH SIDE)

CAV	CIRCUIT
1	B924 20DG/LB
2	-
3	B23 20DG/YL
4	B24 20DG/OR
5	D51 20PK/RD
6	D52 20WT/PK
7	A920 14OR/RD
8	F921 12PK/YL
9	N4 20DB/YL
10	N5 20DB/WT
11	R79 20LB/VT
12	R81 20LB/WT
13	F941 14PK/LG
14	F961 14PK/LB
15	R80 20VT/LB
16	R82 20WT/LB



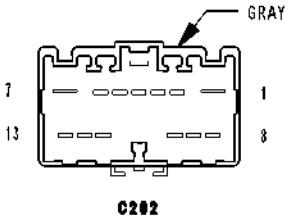
C201 - NATURAL (INSTRUMENT PANEL SIDE)

CAV	CIRCUIT
1	B924 20DG/LB
2	-
3	B23 20DG/YL
4	B24 20DG/OR
5	D51 20PK/RD
6	D52 20WT/PK
7	A920 16OR/RD
8	F921 12PK/YL
9	N4 20DB/YL
10	N5 20DB/WT
11	R79 20LB/VT
12	R81 20LB/WT
13	F941 14PK/LG
14	F961 14PK/LB
15	R80 20VT/LB
16	R82 20WT/LB



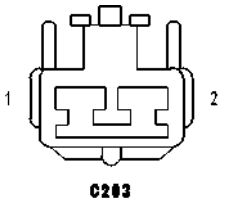
C202 - GRAY (INSTRUMENT PANEL SIDE)

CAV	CIRCUIT
1	C7 12DB
2	C34 20DB/LB
3	C61 20DB/GY
4	C21 20DB/YL
5	C121 20DG/DB
6	C29 20DB
7	Z961 12BK (ATC)
7	C75 12DB/YL (MTC)
8	C807 20DB/LG (ATC)
8	C71 16DB/BR (MTC)
9	C808 20DB/RD (ATC)
9	C72 14DB/OR (MTC)
10	C56 20DB/LB (ATC)
10	C73 14DB/VT (MTC)
11	C32 20TN/DB
12	C801 20LB/RD
13	-



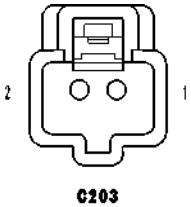
C202 - GRAY (HVAC SIDE)

CAV	CIRCUIT
1	C7 10DB
2	C34 20DB/LB
3	C61 20DB/LG
4	C21 20DB/LG
5	C121 20DB/DG
6	C29 20DB
7	Z961 10BK (ATC)
7	C75 12DB/GY (MTC)
8	C807 20DB/LG (ATC)
8	C71 16DB/BR (MTC)
9	C808 20DB/DG (ATC)
9	C72 14DB/OR (MTC)
10	C56 20DB/LB (ATC)
10	C73 14DB/VT (MTC)
11	C32 20DB/TN
12	C801 20DB/OR
13	- -



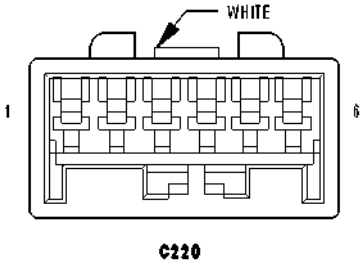
C203 - (HEADLAMP AND DASH SIDE)

CAV	CIRCUIT
1	F924 20PK/YL
2	F1 20PK/DG



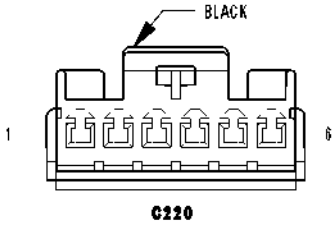
C203 - (INSTRUMENT PANEL SIDE)

CAV	CIRCUIT
1	F924 20PK/YL
2	F1 20PK/DG



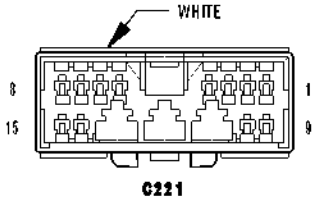
C220 - WHITE (SUNROOF SIDE)

CAV	CIRCUIT
1	Q4 20OR/YL
2	Q5 20OR/LB
3	Q3 20OR/TN
4	A904 14RD/GY
5	F30 14PK/YL
6	Z955 14BK



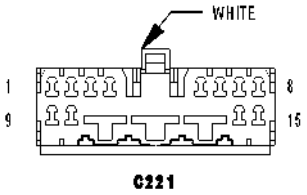
C220 - BLACK (HEADLINER SIDE)

CAV	CIRCUIT
1	Q4 20OR/YL
2	Q5 20OR/LB
3	Q3 20OR/TN
4	A904 14RD/GY
5	F30 14PK/YL
6	Z955 14BK



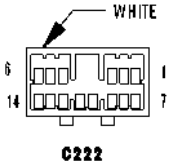
C221 - WHITE (BODY SIDE)

CAV	CIRCUIT
1	A300 20GY/LG
2	-
3	D54 20WT
4	D55 20WT/OR
5	L1 16WT/LG
6	A926 20RD
7	P112 20BR
8	P114 20VT/BK
9	Z957 18BK
10	F21 20PK/DG
11	Z955 14BK
12	F30 14PK/YL
13	A904 14RD/GY
14	M28 20YL/TN
15	M22 20YL/OR



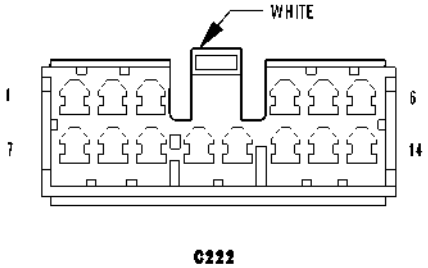
C221 - WHITE (HEADLINER SIDE)

CAV	CIRCUIT
1	A300 20GY/LG
2	-
3	D54 20WT
4	D55 20WT/OR
5	L1 18WT/LG
6	A926 18RD
7	P112 20OR/TN
8	P114 20TN/WT
9	Z957 18BK/LG
9	Z957 20BK
10	F21 20PK/DG
11	Z955 14BK
12	F30 14PK/YL
13	A904 14RD/GY
14	M28 20YL/TN
15	M22 20YL/OR



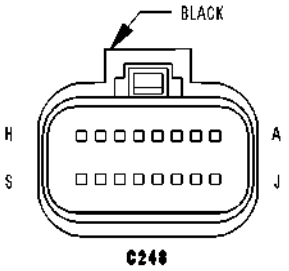
C222 - WHITE (BODY SIDE)

CAV	CIRCUIT
1	X522 20LG/RD
2	X916 20LB/PK
3	X510 20DG/RD
4	-
5	X521 20GY/LB
6	X910 20GY/DG
7	X511 20DB/RD
8	X712 20LB/RD
9	X735 20DB
10	X792 20DB/YL
11	X730 20GY/YL
12	X835 20OR/GY
13	X793 20TN/YL
14	X722 20LB/TN



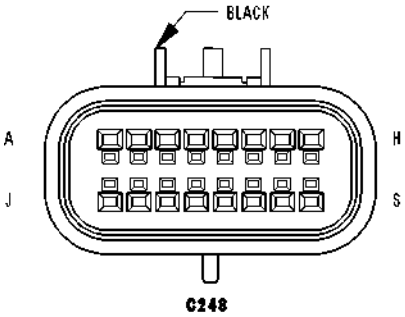
C222 - WHITE (HEADLINER SIDE)

CAV	CIRCUIT
1	X522 20LG/RD
2	X916 20LB/PK
3	X510 20DG/RD
4	-
5	X521 20GY/LB
6	X910 20GY/DG
7	X511 20DB/RD
8	X712 20DB/RD
9	X735 20DB
10	X792 20DB/YL
11	X730 20GY/YL
12	X835 20OR/GY
13	X793 20TN/YL
14	X722 20LB/TN



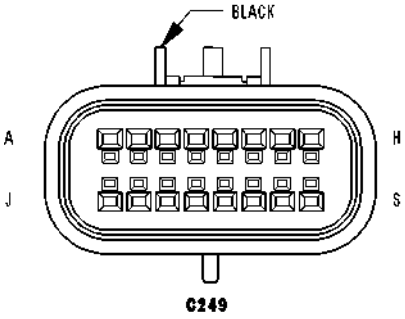
C248 - BLACK (BODY SIDE)

CAV	CIRCUIT
A	-
B	Q100 20OR/WT
C	Q900 20OR/BK
D	P206 18LG/TN
E	P205 18LG/DB
F	-
G	-
H	-
J	-
K	-
L	-
M	G912 20VT/WT
N	G11 20VT/TN
P	G12 20VT/BR
R	D54 20WT
S	D55 20WT/OR



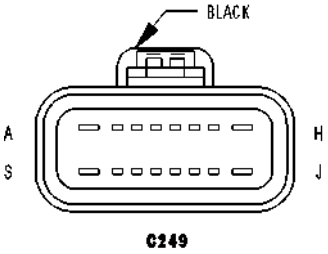
C248 - BLACK (LEFT SEAT SIDE)

CAV	CIRCUIT
A	-
B	Q100 20OR/WT
C	Q900 18OR/BK
D	P206 18LG/TN
E	P205 18LG/DB
F	-
G	-
H	-
J	-
K	-
L	-
M	G912 20VT/WT
N	G11 20VT/TN
P	G12 20VT/BR
R	D54 20WT
S	D55 20WT/OR



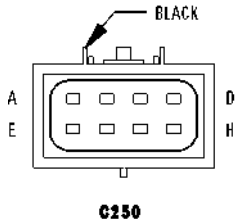
C249 - BLACK (RIGHT SEAT SIDE)

CAV	CIRCUIT
A	P188 18LG/VT
B	R263 20LB/VT
C	D54 20WT
D	D55 20WT/OR
E	R261 20LB/WT
F	-
G	-
H	Z975 16BK
J	Z972 16BK/LG
K	-
L	A956 20RD/LB
M	F201 20PK/OR
N	Z917 20BK/VT
P	-
R	-
S	A940 12RD/GY



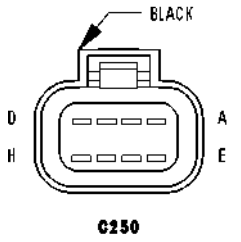
C249 - BLACK (BODY SIDE)

CAV	CIRCUIT
A	P188 18LG/VT
B	R263 20LB/VT
C	D54 20WT
D	D55 20WT/OR
E	R261 20LB/WT
F	-
G	-
H	Z975 14BK
J	Z972 18BK/LG
K	-
L	A956 20RD/LB
M	F201 20PK/OR
N	Z917 20BK/VT
P	-
R	-
S	A940 12RD/GY
S	-



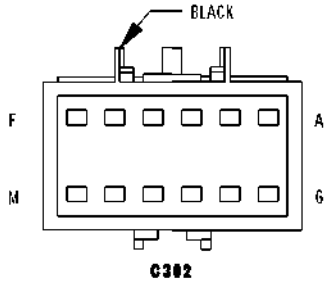
C250 - BLACK (LEFT SEAT SIDE)

CAV	CIRCUIT
A	R261 20LB/WT
B	R263 20LB/VT
C	Z971 16BK
D	A940 12RD/GY
E	Z930 12BK/LB
F	R57 20LG/GY
G	R59 20LG/TN
H	P187 18LG/BR



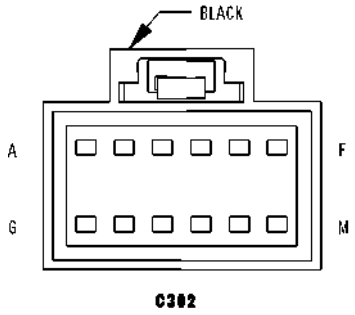
C250 - BLACK (BODY SIDE)

CAV	CIRCUIT
A	R261 20LB/WT
B	R263 20LB/VT
C	Z971 14BK (EXCEPT MEMORY)
C	Z971 18BK (MEMORY)
D	A940 12RD/GY
E	Z930 12BK/LB
F	R57 20LG/GY
G	Z949 20BK
H	P187 18LG/BR



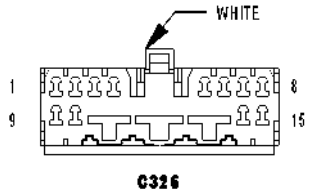
C302 - BLACK (BODY SIDE)

CAV	CIRCUIT
A	F307 18LB/PK
B	Z738 18BK/WT
C	E10 20OR/DG
D	C152 14LG/PK (SLT)
D	C803 20OR/LB (SLT+)
E	C151 16DB/PK (SLT)
E	C804 20DB/VT (SLT+)
F	C50 14DB/OR (SLT)
F	F504 20GY/PK (SLT+)
G	C153 14BR/DB (SLT)
G	C802 20LB/RD (SLT+)
H	-
J	-
K	C800 20DB/GY
L	C22 20LB/WT
M	C931 20DB/WT



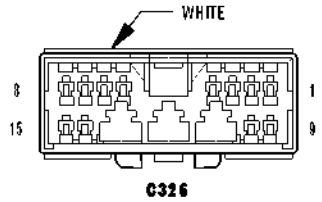
C302 - BLACK (CONSOLE SIDE)

CAV	CIRCUIT
A	F307 18LB/PK
B	Z738 18BK/WT
C	E10 20OR/DG
D	C803 14OR/LB
E	C804 16DB/VT
F	F504 14GY/PK
G	C802 14LB/RD
H	-
J	-
K	C800 20DB/GY
L	C22 20LB/WT
M	C931 20DB/WT



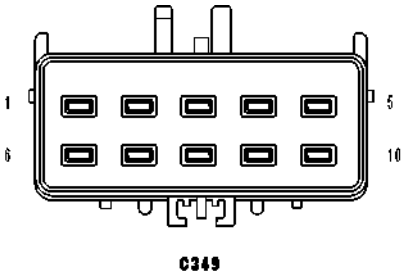
C326 - WHITE (BODY SIDE)

CAV	CIRCUIT
1	Z945 18BK
2	W13 16LG/BR
3	W17 18BR/LG
4	Z922 20BK
5	L50 18WT/TN
6	M22 20YL/OR
7	L77 20PK/RD
8	G78 20VT/OR
9	P5 16TN/OR
10	-
11	Z255 12BK/WT
12	P393 16LG
13	C15 12DB/WT
14	-
15	-



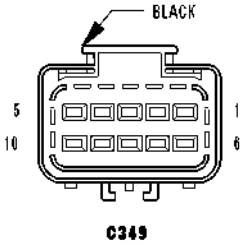
C326 - WHITE (LIFTGATE SIDE)

CAV	CIRCUIT
1	Z945 18BK
2	W13 16LG/BR
3	W17 18BR/LG
4	Z922 20BK/PK
5	L50 18WT/TN
6	M22 20YL/OR
7	L77 20PK/RD
8	G78 20VT/OR
9	P5 16TN/OR
10	-
11	Z255 12BK/WT
12	P393 16LG
13	C15 12DB/WT
14	-
15	-



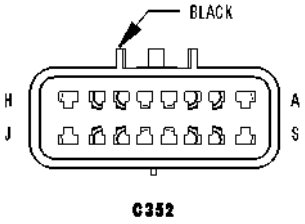
C349 - (HVAC SIDE)

CAV	CIRCUIT
1	C53 20LB
2	C154 20LB/OR
3	C54 20LB/YL
4	C153 14DB/BR
5	C152 14LB/LG
6	C151 16LB/DG
7	-
8	C51 14LB/BR
9	-
10	-



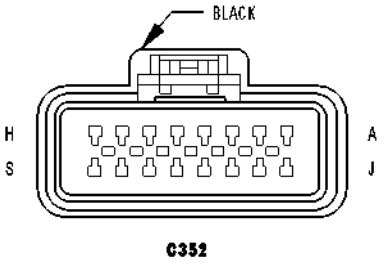
C349 - BLACK (BODY SIDE)

CAV	CIRCUIT
1	C53 20LB
2	C154 20LB/OR
3	C54 20YL/LB
4	C153 14BR/DB
5	C152 14LG/PK
6	C151 16DB/PK
7	-
8	C51 14BR/RD
9	-
10	-



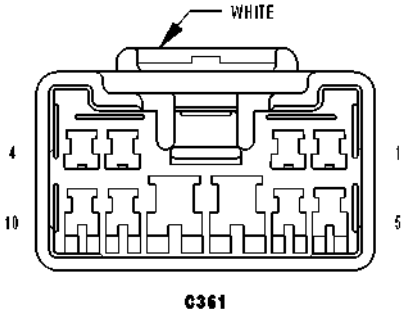
C352 - BLACK (CHASSIS SIDE)

CAV	CIRCUIT
A	L673 20YL (TRAILER TOW)
B	N1 18DB/OR
C	L1 18WT/LG (TRAILER TOW)
D	B22 20DG/YL (EXCEPT TRAILER TOW)
D	B3 20DG/YL (TRAILER TOW)
E	B222 20DG/WT (EXCEPT TRACTION CONTROL)
E	B4 20LG/GY (TRACTION CONTROL)
F	N4 20DB/YL
G	Z938 18BK
H	A100 18RD/VT (TRAILER TOW)
J	L674 20LG (TRAILER TOW)
K	L76 20PK/RD (TRAILER TOW)
L	N5 20DB/WT
M	K107 20VT/WT
N	K106 20VT/LB
P	B1 20DG/DB (TRACTION CONTROL)
R	B2 20DG/LB (TRACTION CONTROL)
S	B400 14DG (TRAILER TOW)



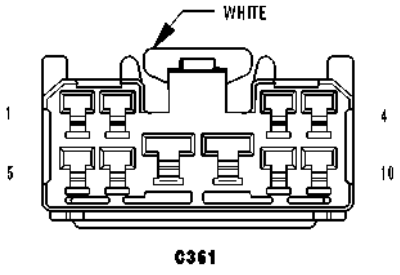
C352 - BLACK (HEADLAMP AND DASH SIDE)

CAV	CIRCUIT
A	L673 18YL
B	N1 18DB/OR
C	L1 18WT/LG
D	B3 20DG/YL
E	B4 20LG/GY
F	N4 20DB/YL
G	Z938 18BK
H	A100 18RD/VT
J	L674 18LG
K	L76 20PK/RD
L	N5 20DB/WT
M	K107 20VT/WT
N	K106 20VT/LB
P	B1 20DG/DB
R	B2 20DG/LB
S	B400 14DG



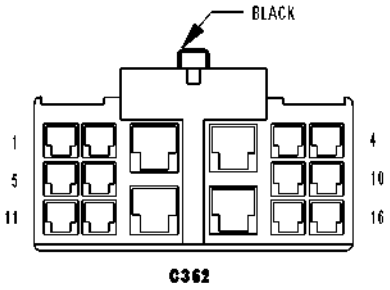
C361 - WHITE (RIGHT FRONT DOOR SIDE)

CAV	CIRCUIT
1	G160 20VT/LG
2	Z944 20BK
3	Q15 14OR/LB
4	Q16 14WT/DG
5	Q26 14OR
6	X54 20GY (BASE AUDIO)
6	X202 20DG/VT (PREMIUM AUDIO)
7	X56 20GY/BR (BASE AUDIO)
7	X292 20DG/YL (PREMIUM AUDIO)
8	-
9	-
10	-



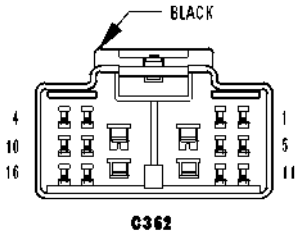
C361 - WHITE (BODY SIDE)

CAV	CIRCUIT
1	G160 20VT/LG
2	Z944 20BK
3	Q15 14OR/LB
4	Q16 14WT/DG
5	Q26 14OR
6	X54 20GY (BASE AUDIO)
6	X202 20DG/VT (PREMIUM AUDIO)
7	X56 20GY/BR (BASE AUDIO)
7	X292 20DG/YL (PREMIUM AUDIO)
8	-
9	-
10	-



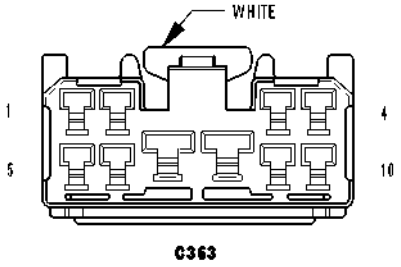
C362 - BLACK (BODY SIDE)

CAV	CIRCUIT
1	C16 20DB/YL
2	-
3	A215 20RD/LG (MEMORY)
4	P72 20TN/GY (SLT)
4	D54 20WT (SLT+)
5	P74 20TN/OR (SLT)
5	D55 20WT/OR (SLT+)
6	G74 20VT/WT
7	G778 18OR/RD
8	P392 16LG/DB
9	Z974 16BK
10	F30 14PK/YL
12	P76 20TN/LB
13	-
14	-
15	-
16	-



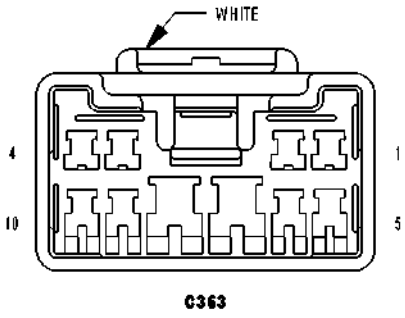
C362 - BLACK (RIGHT FRONT DOOR SIDE)

CAV	CIRCUIT
1	C16 20DB/GY (FOLDING MIRRORS)
2	-
3	A215 20RD/LG (MEMORY)
4	P72 20TN/GY (EXCEPT MEMORY)
4	D54 20WT (MEMORY)
5	P74 20TN/OR (EXCEPT MEMORY)
5	D55 20WT/OR (MEMORY)
6	G74 20VT/WT (EXCEPT MEMORY)
7	G778 18OR/RD
8	P392 16LG/DB
9	Z974 16BK (EXCEPT MEMORY)
10	F30 14PK/YL
11	-
12	P76 20TN/LB (EXCEPT MEMORY)
13	-
14	-
15	-
16	-



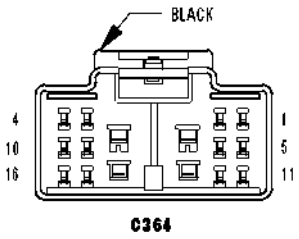
C363 - WHITE (BODY SIDE)

CAV	CIRCUIT
1	Q412 14TN/WT
2	Q612 14DB/OR
3	Q16 14WT/DG
4	Q26 14OR
5	Q411 14DB/LG
6	Q611 14DB/PK
7	F30 14PK/YL
8	Q15 14OR/LB
9	G161 20VT/DG
9	-
10	-



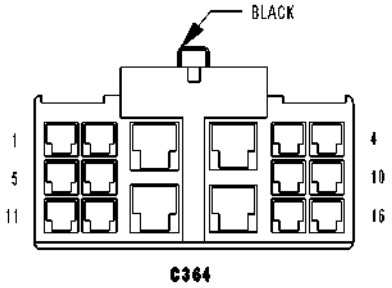
C363 - WHITE (LEFT FRONT DOOR SIDE)

CAV	CIRCUIT
1	Q412 14TN/WT
2	Q612 14DB/OR
3	Q16 14WT/DG
4	Q26 14OR
5	Q411 14DB/LG
6	Q611 14DB/PK
7	F30 14PK/YL
8	Q15 14OR/LB
9	G161 20VT/DG
9	-
10	-



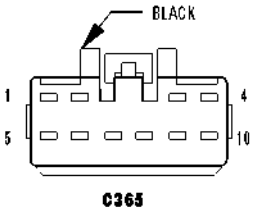
C364 - BLACK (LEFT FRONT DOOR SIDE)

CAV	CIRCUIT
1	-
2	G75 20VT
2	-
3	P1 16TN/LG
4	P393 16LG
5	-
5	P76 20TN/LB
6	A215 20RD/LG
7	Z940 20BK
8	Z13 16BK/WT
9	P72 20TN/GY (EXCEPT MEMORY)
9	D54 20WT (MEMORY)
10	P74 20TN/OR (EXCEPT MEMORY)
10	D55 20WT/OR (MEMORY)
11	X201 16GY/VT
11	X53 20DG
12	X291 16GY/YL
12	X55 20DG/BR
13	-
13	P114 20TN/WT
14	-
14	P112 20OR/TN
15	C16 20DB/GY
15	-
16	-



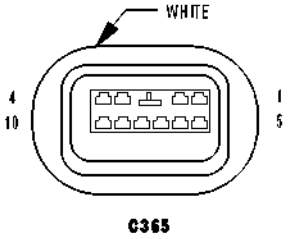
C364 - BLACK (BODY SIDE)

CAV	CIRCUIT
1	-
2	G75 20VT
2	-
3	P1 16TN/LG
4	P393 16LG
5	-
5	P76 20TN/LB
6	A215 20RD/LG
7	Z940 20BK
8	Z13 16BK/WT
9	P72 20TN/GY (EXCEPT MEMORY)
9	D54 20WT (MEMORY)
10	P74 20TN/OR (EXCEPT MEMORY)
10	D55 20WT/OR (MEMORY)
11	X201 16GY/VT
11	X53 20DG
12	X291 16GY/YL
12	X55 20DG/BR
13	-
13	P114 20VT/BK
14	-
14	P112 20BR
15	C16 20DB/GY
15	-
16	-



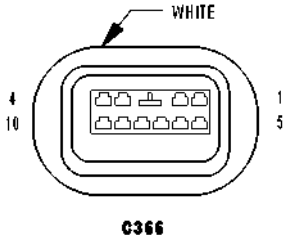
C365 - BLACK (BODY SIDE)

CAV	CIRCUIT
1	X206 20DG/LG
1	X52 20GY/DB
2	X296 20LG/GY
2	X58 20GY/OR
3	G76 20VT/YL
4	Z927 20BK
5	G778 18OR/RD
6	P392 16LG/DB
7	Q15 14OR/LB
8	Q612 14DB/OR
9	Q412 14TN/WT
10	-



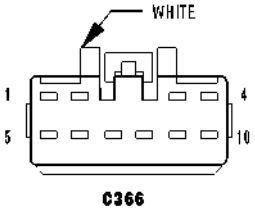
C365 - WHITE (RIGHT REAR DOOR SIDE)

CAV	CIRCUIT
1	X52 20GY/DB (BASE AUDIO)
1	X206 20DG/LG (PREMIUM AUDIO)
2	X58 20GY/OR (BASE AUDIO)
2	X296 20LG/GY (PREMIUM AUDIO)
3	G76 20VT/YL
4	Z927 20BK
5	G778 18OR/RD
6	P392 16LG/DB
7	Q15 14OR/LB
8	Q612 14DB/OR
9	Q412 14TN/WT
10	-



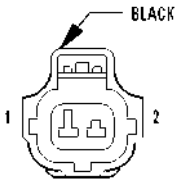
C366 - WHITE (LEFT REAR DOOR SIDE)

CAV	CIRCUIT
1	X51 20DG/DB (BASE AUDIO)
1	X205 18LG/PK (PREMIUM AUDIO)
2	X57 20DG/OR (BASE AUDIO)
2	X295 18GY/DG (PREMIUM AUDIO)
3	Z941 20BK
4	-
5	G77 20VT/GY
6	P5 16TN/OR
7	P393 16LG
8	Q15 14OR/LB
9	Q411 14DB/LG
10	Q611 14DB/PK



C366 - WHITE (BODY SIDE)

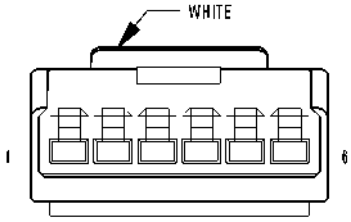
CAV	CIRCUIT
1	X205 18LG/PK
1	X51 20DG/DB
2	X295 18GY/DG
2	X57 20DG/OR
3	Z941 20BK
4	-
5	G77 20VT/GY
6	P5 16TN/OR
7	P393 16LG
8	Q15 14OR/LB
9	Q411 14DB/LG
10	Q611 14DB/PK



CAPACITOR-IGNITION

CAPACITOR-IGNITION - BLACK 2 WAY

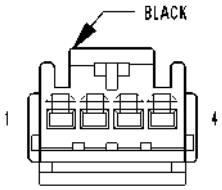
CAV	CIRCUIT	FUNCTION
1	A955 16RD	ASD RELAY OUTPUT
2	-	-



CLOCKSPRING C1

CLOCKSPRING C1 - WHITE 6 WAY

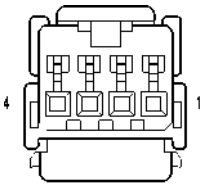
CAV	CIRCUIT	FUNCTION
1	X20 22GY/WT (REMOTE)	RADIO CONTROL MUX
2	G902 20VT/BR (REMOTE)	SWITCH MUX RETURN
3	V38 20VT/OR (5.7L)	S/C SWITCH NO. 2 SIGNAL
4	V37 20VT	S/C SWITCH NO. 1 SIGNAL
5	K900 20DB/DG (3.7L/4.7L)	SENSOR GROUND
5	V937 20VT/BR (5.7L)	S/C SWITCH RETURN
6	X3 20DG/VT	HORN SWITCH SENSE



CLOCKSPRING C2

CLOCKSPRING C2 - BLACK 4 WAY

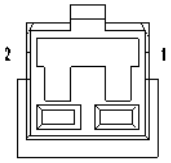
CAV	CIRCUIT	FUNCTION
1	R61 20VT/LG	DRIVER SQUIB 2 LINE 2
2	R63 20VT/RD	DRIVER SQUIB 2 LINE 1
3	R43 20BR/LG	DRIVER SQUIB 1 LINE 2
4	R45 20OR/LG	DRIVER SQUIB 1 LINE 1



CLOCKSPRING C3

CLOCKSPRING C3 - 4 WAY

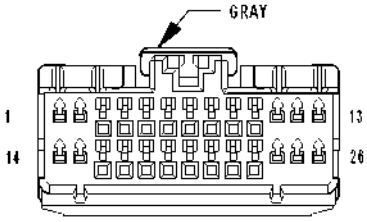
CAV	CIRCUIT	FUNCTION
1	X3 20DG/VT	HORN SWITCH SENSE
2	K900 22DB/DG (3.7L/4.7L)	SENSOR GROUND
2	K900 22DB/DG (3.7L/4.7L)	SENSOR GROUND
2	V937 20VT/BR (5.7L)	S/C SWITCH RETURN
2	V937 20VT/BR (5.7L)	S/C SWITCH RETURN
3	V37 22VT	S/C SWITCH NO. 1 SIGNAL
3	V37 22VT	S/C SWITCH NO. 1 SIGNAL
4	V38 22VT/OR	S/C SWITCH NO. 2 SIGNAL
4	V38 22VT/OR	S/C SWITCH NO. 2 SIGNAL



CLOCKSPRING C4

CLOCKSPRING C4 - 2 WAY

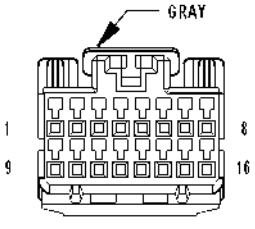
CAV	CIRCUIT	FUNCTION
1	G902 22VT/BR	SWITCH MUX RETURN
1	G902 22VT/BR	SWITCH MUX RETURN
2	X20 22GY/WT	RADIO CONTROL MUX
2	X20 22GY/WT	RADIO CONTROL MUX



CLUSTER C1

CLUSTER C1 - GRAY 26 WAY

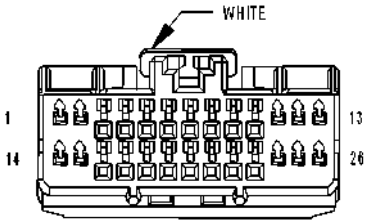
CAV	CIRCUIT	FUNCTION
1	Z946 16BK	GROUND
2	P392 16LG/DB	DOOR LOCK DRIVER RIGHT DOORS
3	B25 20DG/WT	PARK BRAKE SWITCH SENSE
4	G78 20VT/OR	LIFTGATE AJAR SWITCH SENSE
5	R57 20LG/GY	DRIVER SEAT BELT SWITCH SENSE
6	G75 20VT (EXCEPT MEMORY)	DRIVER DOOR AJAR SWITCH SENSE
7	X20 22GY/WT (REMOTE AUDIO)	RADIO CONTROL MUX
8	G77 20VT/GY	LEFT REAR DOOR AJAR SWITCH SENSE
9	G15 20VT/TN	KEY-IN IGNITION SWITCH SENSE
10	X3 20DG/VT	HORN SWITCH SENSE
11	P5 16TN/OR	DOOR UNLOCK DRIVER LEFT REAR/LIFTGATE
12	P1 16TN/LG	DOOR UNLOCK DRIVER LEFT FRONT
13	A924 16RD/LG	FUSED B(+)
14	-	-
15	P393 16LG	DOOR LOCK DRIVER LEFT DOORS
16	W52 20BR/YL	FRONT WIPER SWITCH MUX
17	F924 20PK/YL	FUSED IGNITION SWITCH OUTPUT (START)
18	G39 20VT/OR (HIGHLINE)	SUN SENSOR SIGNAL
19	-	-
20	B27 20DG/WT	TRACTION CONTROL SWITCH SENSE
21	K77 20BR/VT	5 VOLT SELECTOR SWITCH SUPPLY
22	P7 20LG/YL (HEATED SEATS)	DRIVER HEATED SEAT SWITCH MUX
23	P8 20LG/DG (HEATED SEATS)	PASSENGER HEATED SEAT SWITCH MUX
24	B30 20DG/OR	BTSI SOLENOID CONTROL
25	G778 18OR/RD	DOOR UNLOCK DRIVER RIGHT DOORS
26	A924 16RD/LG	FUSED B(+)



CLUSTER C2

CLUSTER C2 - GRAY 16 WAY

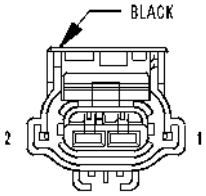
CAV	CIRCUIT	FUNCTION
1	G194 20VT/RD	HIGH BEAM/FRONT WASHER SWITCH MUX
2	G160 20VT/LG (EXCEPT MEMORY)	PASSENGER DOOR LOCK SWITCH MUX
3	G161 20VT/DG (EXCEPT MEMORY)	DRIVER DOOR LOCK SWITCH MUX
4	E2 20OR/BR	PANEL LAMPS DRIVER
5	L307 20PK/RD	HEADLAMP SWITCH MUX
6	N5 20DB/WT	FUEL LEVEL SENSOR RETURN
7	-	-
8	L12 20WT/DB	TURN SIGNAL INPUT MUX
9	G939 20VT/DB (HIGHLINE)	SUN SENSOR RETURN
10	L900 20WT/YL	HEADLAMP SWITCH MUX RETURN
11	G902 20VT/BR	SWITCH MUX RETURN
12	K977 20BR/LG	MODE SELECT
13	D54 20WT	CAN B BUS (-)
14	D55 20WT/OR	CAN B BUS (+)
15	-	-
16	N4 20DB/YL	FUEL LEVEL SENSOR NO. 1 SIGNAL



CLUSTER C3

CLUSTER C3 - WHITE 26 WAY

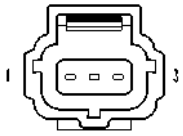
CAV	CIRCUIT	FUNCTION
1	M28 20YL/TN	GLOVE BOX LAMP DRIVER
2	-	-
3	-	-
4	-	-
5	-	-
6	E12 20OR/GY	ILT-DIMMING HVAC
7	E10 20OR/DG	ILT-DIMMING REAR HVAC
8	E11 20OR/WT	ILT-DIMMING 4X4
9	E19 20OR/BR	ILT-DIMMING HEADLAMP SWITCH
10	E33 20OR (EXCEPT BASE)	ILT-DIMMING CENTER BEZEL/HEATED SEAT SWITCHES
11	M22 20YL/OR	COURTESY LAMPS DRIVER
12	F21 20PK/DG	FUSED IGNITION SWITCH OUTPUT (RUN-START)
13	F1 20PK/DG	FUSED IGNITION SWITCH OUTPUT (OFF-RUN-START)
14	A117 18RD/DG	FUSED B(+)
15	A117 18RD/DG	FUSED B(+)
16	G95 20VT/BR	4WD NEUTRAL INDICATOR
17	G121 18VT	IGNITION SWITCH OUTPUT RUN SENSE
18	P81 20TN/OR (HEATED SEATS)	DRIVER HEATED SEAT LOW INDICATOR DRIVER
19	P82 20TN/LB (HEATED SEATS)	PASSENGER HEATED SEAT LOW INDICATOR DRIVER
20	P84 20TN/DG (HEATED SEATS)	PASSENGER HEATED SEAT HIGH INDICATOR DRIVER
21	P83 20TN/WT (HEATED SEATS)	DRIVER HEATED SEAT HIGH INDICATOR DRIVER
22	G76 20VT/YL	RIGHT REAR DOOR AJAR SWITCH SENSE
23	G74 20VT/WT (EXCEPT MEMORY)	PASSENGER DOOR AJAR SWITCH SENSE
24	F983 16PK/VT	IGNITION SWITCH OUTPUT (RUN-ACC)
25	A920 16OR/RD	FUSED B(+)
26	Z948 20BK	GROUND



CLUTCH-A/C COMPRESSOR

CLUTCH-A/C COMPRESSOR - BLACK 2 WAY

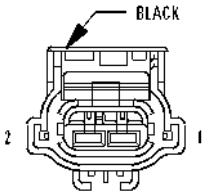
CAV	CIRCUIT	FUNCTION
1	C3 20DB/GY	A/C CLUTCH RELAY OUTPUT
2	Z153 20BK/GY	GROUND



COIL-IGNITION-NO. 1 (3.7L/4.7L)

COIL-IGNITION-NO. 1 (3.7L/4.7L) - 3 WAY

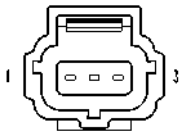
CAV	CIRCUIT	FUNCTION
1	K19 16LB/RD	COIL CONTROL NO. 1
2	A955 16RD	ASD RELAY OUTPUT
3	-	-



**COIL-
IGNITION-NO. 1
(5.7L)**

COIL-IGNITION-NO. 1 (5.7L) - BLACK 2 WAY

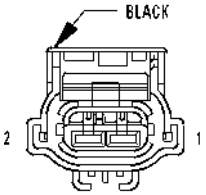
CAV	CIRCUIT	FUNCTION
1	K342 16BR/WT	ASD RELAY OUTPUT
2	K19 18DB/DG	COIL CONTROL NO. 1



**COIL-
IGNITION-NO. 2
(3.7L/4.7L)**

COIL-IGNITION-NO. 2 (3.7L/4.7L) - 3 WAY

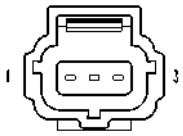
CAV	CIRCUIT	FUNCTION
1	K17 16DB/TN	COIL CONTROL NO. 2
2	A955 16RD	ASD RELAY OUTPUT
3	-	-



**COIL-
IGNITION-NO. 2
(5.7L)**

COIL-IGNITION-NO. 2 (5.7L) - BLACK 2 WAY

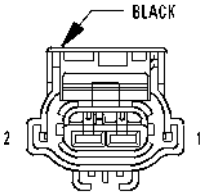
CAV	CIRCUIT	FUNCTION
1	K342 16BR/WT	ASD RELAY OUTPUT
2	K17 18DB/TN	COIL CONTROL NO. 2



**COIL-
IGNITION-NO. 3
(3.7L/4.7L)**

COIL-IGNITION-NO. 3 (3.7L/4.7L) - 3 WAY

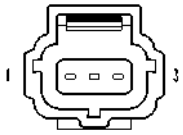
CAV	CIRCUIT	FUNCTION
1	K18 16VT/RD	COIL CONTROL NO. 3
2	A955 16RD	ASD RELAY OUTPUT
3	-	-



**COIL-
IGNITION-NO. 3
(5.7L)**

COIL-IGNITION-NO. 3 (5.7L) - BLACK 2 WAY

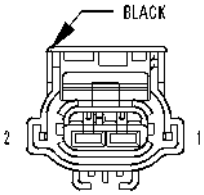
CAV	CIRCUIT	FUNCTION
1	K342 16BR/WT	ASD RELAY OUTPUT
2	K18 18DB/OR	COIL CONTROL NO. 3



COIL-IGNITION-NO. 4 (3.7L/4.7L)

COIL-IGNITION-NO. 4 (3.7L/4.7L) - 3 WAY

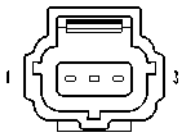
CAV	CIRCUIT	FUNCTION
1	K15 16DB	COIL CONTROL NO. 4
2	A955 16RD	ASD RELAY OUTPUT
3	-	-



COIL-IGNITION-NO. 4 (5.7L)

COIL-IGNITION-NO. 4 (5.7L) - BLACK 2 WAY

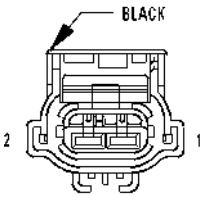
CAV	CIRCUIT	FUNCTION
1	K342 16BR/WT	ASD RELAY OUTPUT
2	K15 18DB/GY	COIL CONTROL NO. 4



COIL-IGNITION-NO. 5 (3.7L/4.7L)

COIL-IGNITION-NO. 5 (3.7L/4.7L) - 3 WAY

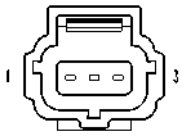
CAV	CIRCUIT	FUNCTION
1	K16 16DG/WT	COIL CONTROL NO. 5
2	A955 16RD	ASD RELAY OUTPUT
3	-	-



COIL-IGNITION-NO. 5 (5.7L)

COIL-IGNITION-NO. 5 (5.7L) - BLACK 2 WAY

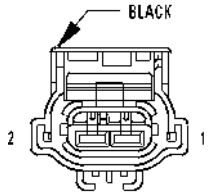
CAV	CIRCUIT	FUNCTION
1	K342 16BR/WT	ASD RELAY OUTPUT
2	K16 18DB/YL	COIL CONTROL NO. 5



COIL-IGNITION-NO. 6 (3.7L/4.7L)

COIL-IGNITION-NO. 6 (3.7L/4.7L) - 3 WAY

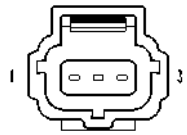
CAV	CIRCUIT	FUNCTION
1	K10 16VT/LB	COIL CONTROL NO. 6
2	A955 16RD	ASD RELAY OUTPUT
3	-	-



COIL-IGNITION-NO. 6 (5.7L)

COIL-IGNITION-NO. 6 (5.7L) - BLACK 2 WAY

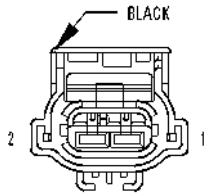
CAV	CIRCUIT	FUNCTION
1	K342 16BR/WT	ASD RELAY OUTPUT
2	K10 18DB/OR	COIL CONTROL NO. 6



COIL-IGNITION-NO. 7 (4.7L)

COIL-IGNITION-NO. 7 (4.7L) - 3 WAY

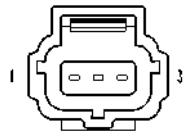
CAV	CIRCUIT	FUNCTION
1	K97 16BR	COIL CONTROL NO. 7
2	A955 16RD	ASD RELAY OUTPUT
3	-	-



COIL-IGNITION-NO. 7 (5.7L)

COIL-IGNITION-NO. 7 (5.7L) - BLACK 2 WAY

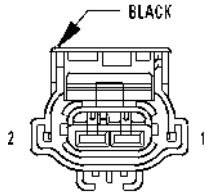
CAV	CIRCUIT	FUNCTION
1	K342 16BR/WT	ASD RELAY OUTPUT
2	K97 18BR	COIL CONTROL NO. 7



COIL-IGNITION-NO. 8 (4.7L)

COIL-IGNITION-NO. 8 (4.7L) - 3 WAY

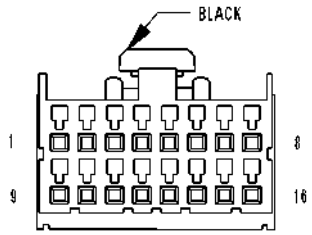
CAV	CIRCUIT	FUNCTION
1	K98 16DB/YL	COIL CONTROL NO. 8
2	A955 16RD	ASD RELAY OUTPUT
3	-	-



COIL-IGNITION-NO. 8 (5.7L)

COIL-IGNITION-NO. 8 (5.7L) - BLACK 2 WAY

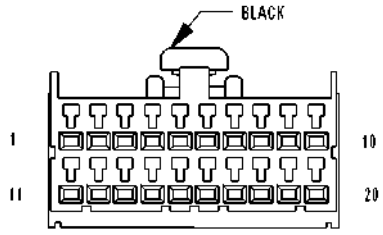
CAV	CIRCUIT	FUNCTION
1	K342 16BR/WT	ASD RELAY OUTPUT
2	K98 18DB/YL	COIL CONTROL NO. 8



CONTROL-A/C-HEATER C1 (ATC)

CONTROL-A/C-HEATER C1 (ATC) - BLACK 16 WAY

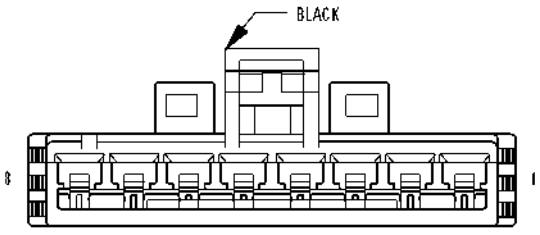
CAV	CIRCUIT	FUNCTION
1	C43 18WT/DB	AUXILIARY COOLANT PUMP DRIVER
2	C54 20YL/LB	REAR BLEND DOOR DRIVER
3	C808 20DB/RD	COMMON DOOR DRIVER 3
4	C32 20TN/DB	RECIRCULATION DOOR DRIVER
5	C34 20DB/LB	COMMON DOOR DRIVER 1
6	C154 20LB/OR	REAR COMMON DOOR DRIVER
7	Z24 20BK/OR	GROUND
8	D54 20WT	CAN B BUS (-)
9	A925 18RD/BK	FUSED B(+)
10	C53 20LB	REAR MODE DOOR DRIVER
11	C801 20LB/RD	MODE DOOR 2 DRIVER
12	C807 20DB/LG	COMMON DOOR DRIVER 2
13	C29 20DB	MODE DOOR 1 DRIVER
14	C61 20DB/GY	FRONT BLEND DOOR DRIVER
15	-	-
16	D55 20WT/OR	CAN B BUS (+)



CONTROL-A/C-HEATER C1 (MTC)

CONTROL-A/C-HEATER C1 (MTC) - BLACK 20 WAY

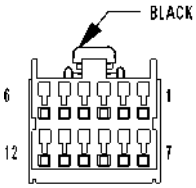
CAV	CIRCUIT	FUNCTION
1	F504 20GY/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
2	C21 20DB/YL	EVAPORATOR TEMPERATURE SENSOR SIGNAL
3	C800 20DB/GY (REAR HVAC)	REAR BLEND SENSE SUPPLY
4	C22 20LB/WT (REAR HVAC)	REAR BLEND SENSE
5	C43 18WT/DB	AUXILIARY COOLANT PUMP DRIVER
6	C61 20DB/GY	FRONT BLEND DOOR DRIVER
7	C29 20DB	MODE DOOR 1 DRIVER
8	C801 20LB/RD	MODE DOOR 2 DRIVER
9	C32 20TN/DB	RECIRCULATION DOOR DRIVER
10	D55 20WT/OR	CAN B BUS (+)
11	Z24 20BK/OR	GROUND
12	C121 20DG/DB	SENSOR GROUND
13	C931 20DB/WT (REAR HVAC)	REAR BLEND SENSE RETURN
14	E12 20OR/GY	ILT-DIMMING HVAC
15	-	-
16	C53 20LB (REAR HVAC)	REAR MODE DOOR DRIVER
17	C54 20YL/LB (REAR HVAC)	REAR BLEND DOOR DRIVER
18	C34 20DB/LB	FRONT COMMON DOOR DRIVER
19	C154 20LB/OR (REAR HVAC)	REAR COMMON DOOR DRIVER
20	D54 20WT	CAN B BUS (-)



CONTROL-A/C-HEATER C2 (MTC)

CONTROL-A/C-HEATER C2 (MTC) - BLACK 8 WAY

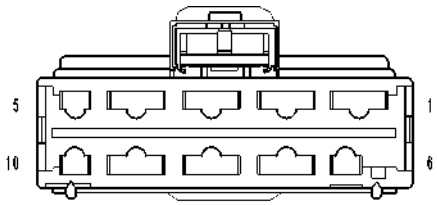
CAV	CIRCUIT	FUNCTION
1	-	-
2	Z928 14BK	GROUND
3	-	-
4	C153 14BR/DB	REAR BLOWER HIGH SPEED
5	-	-
6	C152 14LG/PK	REAR BLOWER MEDIUM SPEED
7	C151 16DB/PK	REAR BLOWER LOW SPEED
8	C50 14DB/OR	REAR BLOWER CONTROL FEED



CONTROL-A/C-HEATER C2 (ATC)

CONTROL-A/C-HEATER C2 (ATC) - BLACK 12 WAY

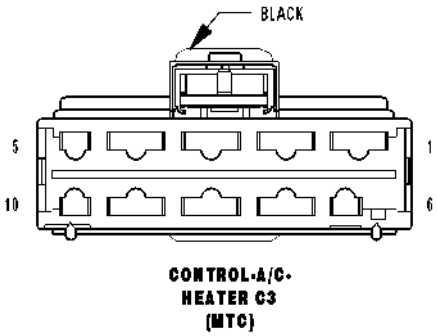
CAV	CIRCUIT	FUNCTION
1	C800 20DB/GY	REAR BLEND SENSE SUPPLY
2	C56 20DB/LB	FRONT BLOWER CONTROL
3	C802 20LB/RD	REAR BLOWER HIGH
4	C803 20OR/LB	REAR BLOWER MEDIUM
5	C22 20LB/WT	REAR BLEND SENSE
6	C931 20DB/WT	REAR BLEND SENSE RETURN
7	E12 20OR/GY	ILT-DIMMING HVAC
8	C804 20DB/VT	REAR BLOWER LOW
9	-	-
10	C21 20DB/YL	EVAPORATOR TEMPERATURE SENSOR SIGNAL
11	-	-
12	C121 20DG/DB	SENSOR GROUND



CONTROL-A/C-HEATER C2 (MTC EXCEPT REAR HEAT)

CONTROL-A/C-HEATER C2 (MTC EXCEPT REAR HEAT) - 10 WAY

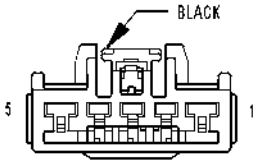
CAV	CIRCUIT	FUNCTION
1	C75 12DB/YL	FRONT BLOWER HIGH SPEED
2	-	
3	C73 14DB/VT	FRONT BLOWER M2 SPEED
4	Z961 12 BK	GROUND
5	-	
6	-	
7	-	
8	-	
9	C72 14DB/OR	FRONT BLOWER M1 SPEED
10	C71 16DB/BR	FRONT BLOWER LOW SPEED



CONTROL-A/C-HEATER C3 (MTC)

CONTROL-A/C-HEATER C3 (MTC) - BLACK 10 WAY

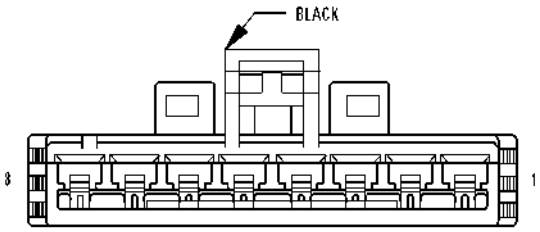
CAV	CIRCUIT	FUNCTION
1	C75 12DB/YL	FRONT BLOWER HIGH SPEED
2	-	-
3	C73 14DB/VT	FRONT BLOWER M2 SPEED
4	Z961 12BK	GROUND
5	-	-
6	-	-
7	-	-
8	-	-
9	C72 14DB/OR	FRONT BLOWER M1 SPEED
10	C71 16DB/BR	FRONT BLOWER LOW SPEED



CONTROL-A/C-HEATER C3 (ATC)

CONTROL-A/C-HEATER C3 (ATC) - BLACK 5 WAY

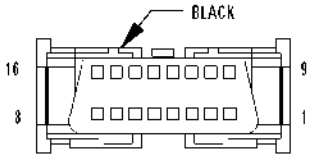
CAV	CIRCUIT	FUNCTION
1	Z928 14BK	GROUND
2	C151 16DB/PK	REAR BLOWER LOW SPEED
3	-	-
4	C152 14LG/PK	REAR BLOWER MEDIUM SPEED
5	C153 14BR/DB	REAR BLOWER HIGH SPEED



CONTROL-A/C-HEATER-REAR

CONTROL-A/C-HEATER-REAR - BLACK 8 WAY

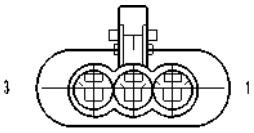
CAV	CIRCUIT	FUNCTION
1	E10 20OR/DG	ILT-DIMMING REAR HVAC
2	C803 14OR/LB	REAR BLOWER MEDIUM
3	C804 16DB/VT	REAR BLOWER LOW
4	F504 14GY/PK (ATC)	FUSED IGNITION SWITCH OUTPUT (RUN)
4	C50 14DB/OR (MTC)	REAR BLOWER CONTROL FEED
5	C802 14LB/RD	REAR BLOWER HIGH
6	C931 20DB/WT	REAR BLEND SENSE RETURN
7	C800 20DB/GY	REAR BLEND SENSE SUPPLY
8	C22 20LB/WT	REAR BLEND SENSE



DATA LINK CONNECTOR

DATA LINK CONNECTOR - BLACK 16 WAY

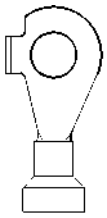
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	-	-
4	Z11 18BK/LG	GROUND
5	Z111 18BK/WT	GROUND
6	D52 20WT/PK	CAN C DIAGNOSTIC (+)
7	D21 20WT/GY	SCI TRANSMIT (PCM)
8	-	-
9	D16 20WT/PK	SCI RECEIVE (TCM)
10	-	-
11	-	-
12	D20 20WT/BR	SCI RECEIVE (PCM)
13	-	-
14	D51 20PK/RD	CAN C DIAGNOSTIC (-)
15	D15 20BR/WT	SCI TRANSMIT (TCM)
16	A926 18RD	FUSED B(+)



FAN MODULE-
CONDENSER COOLING

FAN MODULE-CONDENSER COOLING - 3 WAY

CAV	CIRCUIT	FUNCTION
1	N23 12DB/DG	HIGH SPEED RADIATOR FAN RELAY OUTPUT
2	N24 12DG/DB	LOW SPEED RADIATOR FAN RELAY OUTPUT
3	Z823 12BK/DG	GROUND



GENERATOR

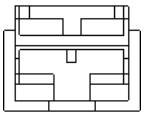
GENERATOR - 1 WAY

CAV	CIRCUIT	FUNCTION
1	A1 04RD	B(+)

GENERATOR

GENERATOR - 2 WAY

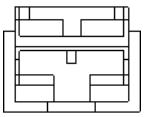
CAV	CIRCUIT	FUNCTION
1	K20 18BR/GY	GEN FIELD CONTROL
2	Z20 18BK/RD	GROUND



GLASS-
LIFTGATE-
HEATED

GLASS-LIFTGATE-HEATED - 1 WAY

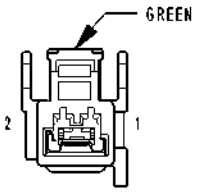
CAV	CIRCUIT	FUNCTION
1	C15 12DB/WT	REAR WINDOW DEFOGGER RELAY OUTPUT



GLASS-
LIFTGATE-
HEATED-
GROUND

GLASS-LIFTGATE-HEATED-GROUND - 1 WAY

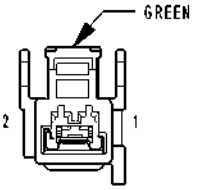
CAV	CIRCUIT	FUNCTION
1	Z255 12BK/WT	GROUND



HEATER-
CUSHION PAD-
DRIVER C1

HEATER-CUSHION PAD-DRIVER C1 - GREEN 2 WAY

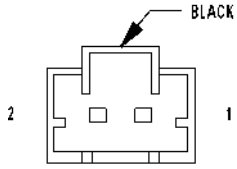
CAV	CIRCUIT	FUNCTION
1	P187 18LG/BR	DRIVER SEAT HEATER B(+) DRIVER
2	Z971 16BK	GROUND



HEATER-
CUSHION PAD-
PASSENGER C1

HEATER-CUSHION PAD-PASSENGER C1 - GREEN 2 WAY

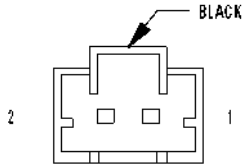
CAV	CIRCUIT	FUNCTION
1	P188 18LG/VT	PASSENGER SEAT HEATER B(+) DRIVER
2	Z972 16BK/LG	GROUND



HEATER-
SEAT BACK-
DRIVER

HEATER-SEAT BACK-DRIVER - BLACK 2 WAY

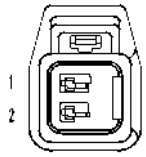
CAV	CIRCUIT	FUNCTION
1	Z971 18YL	GROUND
2	P187 18YL	DRIVER SEAT HEATER B(+) DRIVER



HEATER-
SEAT BACK-
PASSENGER

HEATER-SEAT BACK-PASSENGER - BLACK 2 WAY

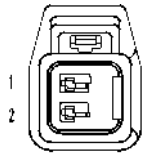
CAV	CIRCUIT	FUNCTION
1	Z972 18YL	GROUND
2	P188 18YL	PASSENGER SEAT HEATER B(+) DRIVER



HORN-NO. 1

HORN-NO. 1 - 2 WAY

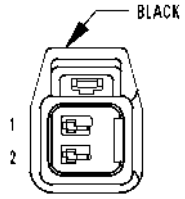
CAV	CIRCUIT	FUNCTION
1	X2 18DG/OR	HORN RELAY OUTPUT
2	Z298 18BK/DB	GROUND



HORN-NO. 2

HORN-NO. 2 - 2 WAY

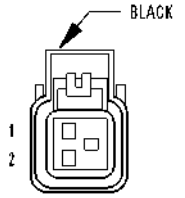
CAV	CIRCUIT	FUNCTION
1	X2 18DG/OR	HORN RELAY OUTPUT
2	Z299 18BK/OR	GROUND



INJECTOR-FUEL-NO. 1 (5.7L)

INJECTOR-FUEL-NO. 1 (5.7L) - BLACK 2 WAY

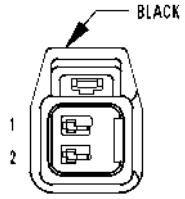
CAV	CIRCUIT	FUNCTION
1	K11 18BR/YL	INJECTOR CONTROL NO. 1
2	K342 16BR/WT	ASD RELAY OUTPUT



INJECTOR-FUEL-NO. 1 (3.7L/4.7L)

INJECTOR-FUEL-NO. 1 (3.7L/4.7L) - BLACK 2 WAY

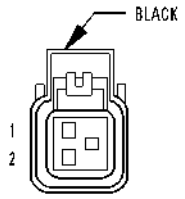
CAV	CIRCUIT	FUNCTION
1	K11 16BR/YL	INJECTOR CONTROL NO. 1
2	A955 16RD	ASD RELAY OUTPUT



INJECTOR-FUEL-NO. 2 (5.7L)

INJECTOR-FUEL-NO. 2 (5.7L) - BLACK 2 WAY

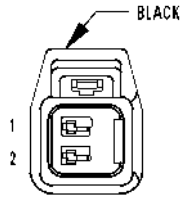
CAV	CIRCUIT	FUNCTION
1	K12 18BR/DB	INJECTOR CONTROL NO. 2
2	K342 16BR/WT	ASD RELAY OUTPUT



INJECTOR-FUEL-NO. 2 (3.7L/4.7L)

INJECTOR-FUEL-NO. 2 (3.7L/4.7L) - BLACK 2 WAY

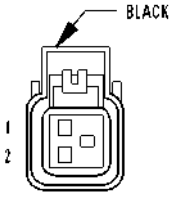
CAV	CIRCUIT	FUNCTION
1	K12 16BR/DB	INJECTOR CONTROL NO. 2
2	A955 16RD	ASD RELAY OUTPUT



INJECTOR-FUEL-NO. 3 (5.7L)

INJECTOR-FUEL-NO. 3 (5.7L) - BLACK 2 WAY

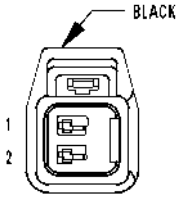
CAV	CIRCUIT	FUNCTION
1	K13 18BR/LB	INJECTOR CONTROL NO. 3
2	K342 16BR/WT	ASD RELAY OUTPUT



INJECTOR-FUEL-NO. 3 (3.7L/4.7L)

INJECTOR-FUEL-NO. 3 (3.7L/4.7L) - BLACK 2 WAY

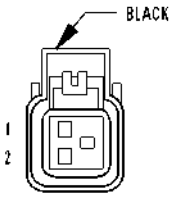
CAV	CIRCUIT	FUNCTION
1	K13 16PK/DB	INJECTOR CONTROL NO. 3
2	A955 16RD	ASD RELAY OUTPUT



INJECTOR-FUEL-NO. 4 (5.7L)

INJECTOR-FUEL-NO. 4 (5.7L) - BLACK 2 WAY

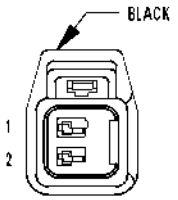
CAV	CIRCUIT	FUNCTION
1	K14 18BR/TN	INJECTOR CONTROL NO. 4
2	K342 16BR/WT	ASD RELAY OUTPUT



INJECTOR-FUEL-NO. 4 (3.7L/4.7L)

INJECTOR-FUEL-NO. 4 (3.7L/4.7L) - BLACK 2 WAY

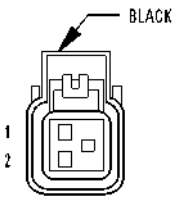
CAV	CIRCUIT	FUNCTION
1	K14 16YL/LB	INJECTOR CONTROL NO. 4
2	A955 16RD	ASD RELAY OUTPUT



INJECTOR-FUEL-NO. 5 (5.7L)

INJECTOR-FUEL-NO. 5 (5.7L) - BLACK 2 WAY

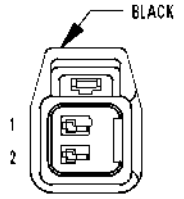
CAV	CIRCUIT	FUNCTION
1	K38 18BR/OR	INJECTOR CONTROL NO. 5
2	K342 16BR/WT	ASD RELAY OUTPUT



INJECTOR-FUEL-NO. 5 (3.7L/4.7L)

INJECTOR-FUEL-NO. 5 (3.7L/4.7L) - BLACK 2 WAY

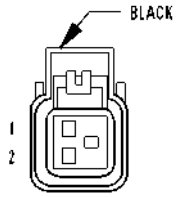
CAV	CIRCUIT	FUNCTION
1	K38 16YL/RD	INJECTOR CONTROL NO. 5
2	A955 16RD	ASD RELAY OUTPUT



INJECTOR-FUEL-NO. 6 (5.7L)

INJECTOR-FUEL-NO. 6 (5.7L) - BLACK 2 WAY

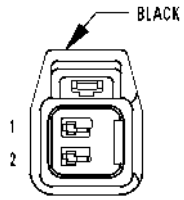
CAV	CIRCUIT	FUNCTION
1	K58 18BR/VT	INJECTOR CONTROL NO. 6
2	K342 16BR/WT	ASD RELAY OUTPUT



INJECTOR-FUEL-NO. 6 (3.7L/4.7L)

INJECTOR-FUEL-NO. 6 (3.7L/4.7L) - BLACK 2 WAY

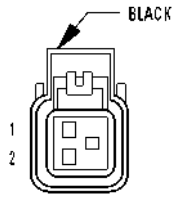
CAV	CIRCUIT	FUNCTION
1	K58 16PK/DB	INJECTOR CONTROL NO. 6
2	A955 16RD	ASD RELAY OUTPUT



INJECTOR-FUEL-NO. 7 (5.7L)

INJECTOR-FUEL-NO. 7 (5.7L) - BLACK 2 WAY

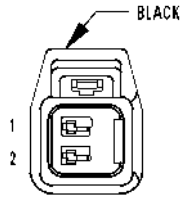
CAV	CIRCUIT	FUNCTION
1	K26 18BR/YL	INJECTOR CONTROL NO. 7
2	K342 16BR/WT	ASD RELAY OUTPUT



INJECTOR-FUEL-NO. 7 (4.7L)

INJECTOR-FUEL-NO. 7 (4.7L) - BLACK 2 WAY

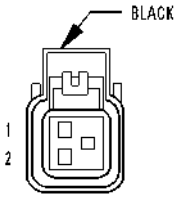
CAV	CIRCUIT	FUNCTION
1	K26 16YL/TN	INJECTOR CONTROL NO. 7
2	A955 16RD	ASD RELAY OUTPUT



INJECTOR-FUEL-NO. 8 (5.7L)

INJECTOR-FUEL-NO. 8 (5.7L) - BLACK 2 WAY

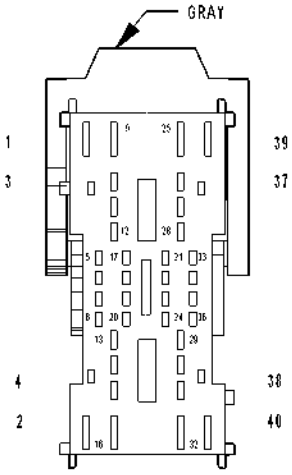
CAV	CIRCUIT	FUNCTION
1	K28 18BR/LB	INJECTOR CONTROL NO. 8
2	K342 16BR/WT	ASD RELAY OUTPUT



INJECTOR-FUEL-NO. 8 (4.7L)

INJECTOR-FUEL-NO. 8 (4.7L) - BLACK 2 WAY

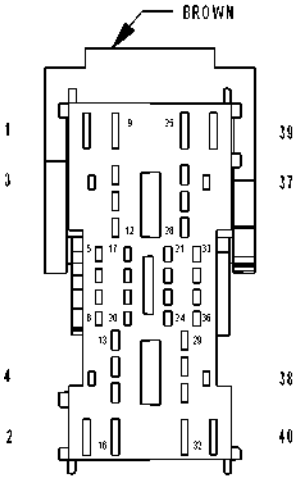
CAV	CIRCUIT	FUNCTION
1	K28 16VT/LG	INJECTOR CONTROL NO. 8
2	A955 16RD	ASD RELAY OUTPUT



JUNCTION BLOCK C1

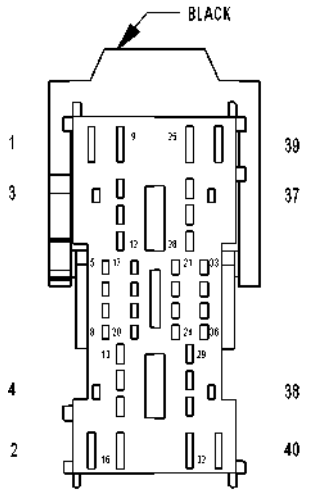
JUNCTION BLOCK C1 - GRAY (HEADLAMP AND DASH SIDE)

CAV	CIRCUIT	FUNCTION
1	A923 14RD/OR	FUSED B(+)
2	A901 12RD/PK	FUSED B(+)
3	-	-
4	-	-
5	-	-
6	A953 20RD/YL	FUSED B(+)
7	K900 20DB/DG	SENSOR GROUND
7	V937 20VT/BR	S/C SWITCH RETURN
8	A103 20GY/RD	FUSED B(+)
9	A917 16RD/DB	FUSED B(+)
10	A918 14OR/LG	FUSED B(+)
11	-	-
12	C43 20WT/DB	AUXILIARY COOLANT PUMP DRIVER
13	-	-
14	-	-
15	P305 20LG/LB	ACCESSORY DELAY RELAY CONTROL
16	C7 12DB	FRONT BLOWER MOTOR RELAY OUTPUT
17	F1 20PK/DG	FUSED IGNITION SWITCH OUTPUT (OFF-RUN-START)
18	L62 18VT/GY	RIGHT TURN SIGNAL
19	L63 18WT/DG	LEFT TURN SIGNAL
20	L50 20WT/TN	BRAKE LAMP SWITCH OUTPUT
21	L1 18WT/LG	BACK-UP LAMP FEED
22	-	-
23	F500 20DG/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
24	F202 20PK/GY	FUSED IGNITION SWITCH OUTPUT (RUN-START)
25	A940 12RD/GY	FUSED B(+)
26	W17 18BR/LG	REAR WIPER PARK SWITCH SENSE
27	D55 20WT/OR	CAN B BUS (+)
28	D54 20WT	CAN B BUS (-)
29	A222 14RD/LB	FUSED B(+)
30	Z911 20BK	GROUND
31	A920 14OR/RD	FUSED B(+)
32	A904 14RD/GY	FUSED B(+)
33	L78 20WT/OR	FUSED PARK LAMP RELAY OUTPUT
34	L77 20PK/RD	FUSED LEFT INBOARD TAIL LAMP
35	W13 18LG/BR	REAR WIPER MOTOR CONTROL
36	C115 20DB	DEFOGGER RELAY CONTROL
37	-	-
38	-	-
39	A952 10OR/DB	FUSED B(+)
40	A915 14OR/BR	FUSED B(+)



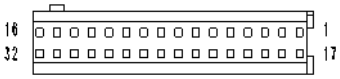
JUNCTION BLOCK C2 - BROWN (INSTRUMENT PANEL SIDE)

CAV	CIRCUIT	FUNCTION
1	F921 12PK/YL	IGNITION SWITCH OUTPUT (RUN)
2	F941 14PK/LG	IGNITION SWITCH OUTPUT (RUN-START)
3	-	-
4	-	-
5	F201 20PK/OR	FUSED IGNITION SWITCH OUTPUT (RUN-START)
6	-	-
7	-	-
8	-	-
9	A904 14RD/GY	FUSED B(+)
10	-	-
11	A924 16RD/LG	FUSED B(+)
12	-	-
13	F504 20GY/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
14	A116 14YL/RD	FUSED B(+)
14	-	-
15	F306 18DB/PK	FUSED ACCESSORY RELAY OUTPUT
16	A114 16GY/RD	FUSED B(+)
17	-	-
18	A926 18RD	FUSED B(+)
19	A926 18RD	FUSED B(+)
20	-	-
21	F202 20PK/GY	FUSED IGNITION SWITCH OUTPUT (RUN-START)
22	F21 20PK/DG	FUSED IGNITION SWITCH OUTPUT (RUN-START)
23	F21 20PK/DG	FUSED IGNITION SWITCH OUTPUT (RUN-START)
24	A925 18RD/BK	FUSED B(+)
24	-	-
25	F901 14PK	IGNITION SWITCH OUTPUT (OFF-RUN-START)
26	F984 14PK/TN	IGNITION SWITCH OUTPUT (RUN-ACC)
27	C43 18WT/DB	AUXILIARY COOLANT PUMP DRIVER
28	A953 16RD/YL	FUSED B(+)
29	-	-
30	-	-
31	A117 18RD/DG	FUSED B(+)
32	C7 12DB	FRONT BLOWER MOTOR RELAY OUTPUT
33	K900 20DB/DG (3.7L/4.7L)	SENSOR GROUND
33	V937 20VT/BR (5.7L)	S/C SWITCH RETURN
34	-	-
35	A103 18GY/RD	FUSED B(+)
36	L50 18WT/TN	BRAKE LAMP SWITCH OUTPUT
37	-	-
38	-	-
39	A923 14RD/OR	FUSED B(+)
40	A917 12RD/DB	FUSED B(+)



JUNCTION BLOCK C3 - BLACK (BODY SIDE)

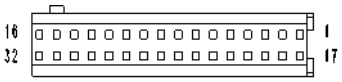
CAV	CIRCUIT	FUNCTION
1	A940 12RD/GY	FUSED B(+)
1	-	-
2	C51 14BR/RD	FUSED REAR BLOWER MOTOR RELAY OUTPUT
2	-	-
3	-	-
4	-	-
5	L78 20WT/OR	FUSED PARK LAMP RELAY OUTPUT
6	L77 20PK/RD	FUSED LEFT INBOARD TAIL LAMP
7	W13 16LG/BR	REAR WIPER MOTOR CONTROL
8	F21 20PK/DG	FUSED IGNITION SWITCH OUTPUT (RUN-START)
8	-	-
9	F30 14PK/YL	FUSED ACCESSORY DELAY RELAY OUTPUT
10	W17 18BR/LG	REAR WIPER PARK SWITCH SENSE
11	D55 20WT/OR	CAN B BUS (+)
12	D54 20WT	CAN B BUS (-)
13	-	-
14	A300 20GY/LG	FUSED B(+)
14	-	-
15	C16 20DB/GY	FUSED REAR WINDOW DEFOGGER RELAY OUTPUT
15	-	-
16	C15 12DB/WT	REAR WINDOW DEFOGGER RELAY OUTPUT
17	L1 16WT/LG	BACK-UP LAMP FEED
17	-	-
18	L1 16WT/RD	BACK-UP LAMP FEED
19	L50 18WT/TN	BRAKE LAMP SWITCH OUTPUT
20	-	-
21	L62 18VT/GY	RIGHT TURN SIGNAL
22	L63 18WT/DG	LEFT TURN SIGNAL
23	A926 20RD	FUSED B(+)
23	-	-
24	-	-
25	F307 18LB/PK	FUSED ACCESSORY RELAY OUTPUT
26	F201 20PK/OR	FUSED IGNITION SWITCH OUTPUT (RUN-START)
27	F201 20PK/OR	FUSED IGNITION SWITCH OUTPUT (RUN-START)
28	A215 20RD/LG	FUSED B(+)
29	-	-
30	A300 20GY/LG	FUSED B(+)
30	-	-
31	C16 20DB/YL	FUSED REAR WINDOW DEFOGGER RELAY OUTPUT
31	-	-
32	-	-
33	F100 20PK/VT	FUSED IGNITION SWITCH OUTPUT (RUN)
34	A956 20RD/LB	FUSED B(+)
35	-	-
36	-	-
37	-	-
38	-	-
39	F307 16YL/LB	FUSED ACCESSORY RELAY OUTPUT
40	-	-



JUNCTION BLOCK C4

JUNCTION BLOCK C4 - (INSTRUMENT PANEL SIDE)

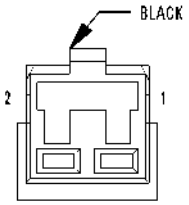
CAV	CIRCUIT	FUNCTION
1	D54 20WT	CAN B BUS (-)
2	-	-
3	-	-
4	-	-
5	-	-
6	-	-
7	-	-
8	-	-
9	-	-
10	-	-
11	-	-
12	-	-
13	-	-
14	-	-
15	K4 20BR/LB	APPS NO. 1 RETURN
15	-	-
16	A85 18RD/LB	ADJUSTABLE PEDALS RELAY OUTPUT
16	-	-
17	D55 20WT/OR	CAN B BUS (+)
18	V38 20VT/OR	S/C SWITCH NO. 2 SIGNAL
19	V37 20VT	S/C SWITCH NO. 1 SIGNAL
20	T6 20DG	TOW/HAUL OVERDRIVE OFF SWITCH SENSE
21	B29 20DG/WT	BRAKE SWITCH NO. 1 SIGNAL
22	V30 20VT/WT	S/C BRAKE SWITCH OUTPUT
23	V32 20VT/YL	S/C SUPPLY
24	F855 20PK/YL	5 VOLT SUPPLY
24	-	-
25	D16 20WT/PK	SCI RECEIVE (TCM)
26	D15 20BR/WT	SCI TRANSMIT (TCM)
27	D20 20WT/BR	SCI RECEIVE (PCM)
28	D21 20WT/GY	SCI TRANSMIT (PCM)
29	F856 20YL/PK	5 VOLT SUPPLY
29	-	-
30	K400 20BR/VT	APPS NO. 2 RETURN
30	-	-
31	K29 20PK/RD	APPS NO. 2 SIGNAL
31	-	-
32	K23 20BR/WT	APPS NO. 1 SIGNAL
32	-	-



JUNCTION BLOCK C5

JUNCTION BLOCK C5 - (HEADLAMP AND DASH SIDE)

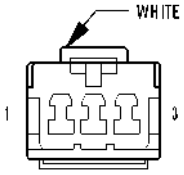
CAV	CIRCUIT	FUNCTION
1	D55 20WT/OR	CAN B BUS (+)
2	-	-
2	V38 20VT/OR	S/C SWITCH NO. 2 SIGNAL
3	V37 20VT	S/C SWITCH NO. 1 SIGNAL
4	T6 20DG	TOW/HAUL OVERDRIVE OFF SWITCH SENSE
5	B29 20DG/WT	BRAKE SWITCH NO. 1 SIGNAL
6	F202 20PK/GY	FUSED IGNITION SWITCH OUTPUT (RUN-START)
6	V30 20VT/WT	S/C BRAKE SWITCH OUTPUT
7	V32 20VT/YL	S/C SUPPLY
8	F855 20PK/YL	5 VOLT SUPPLY
8	-	-
9	D16 20WT/PK	SCI RECEIVE (TCM)
10	D15 20BR/WT	SCI TRANSMIT (TCM)
11	D20 20WT/BR	SCI RECEIVE (PCM)
12	D21 20WT/GY	SCI TRANSMIT (PCM)
13	F856 20YL/PK	5 VOLT SUPPLY
13	-	-
14	K400 20BR/VT	APPS NO. 2 RETURN
14	-	-
15	K29 20PK/RD	APPS NO. 2 SIGNAL
15	-	-
16	K23 20BR/WT	APPS NO. 1 SIGNAL
16	-	-
17	D54 20WT	CAN B BUS (-)
18	-	-
19	-	-
20	-	-
21	-	-
22	-	-
23	-	-
24	-	-
25	-	-
26	-	-
27	-	-
28	-	-
29	-	-
30	-	-
31	K4 20BR/LB	APPS NO. 1 RETURN
31	-	-
32	A85 18RD/LB	ADJUSTABLE PEDALS RELAY OUTPUT



LAMP-
CENTER
BEZEL

LAMP-CENTER BEZEL - BLACK 2 WAY

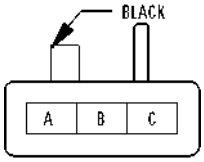
CAV	CIRCUIT	FUNCTION
1	Z924 20BK	GROUND
2	E33 20OR	ILT-DIMMING CENTER BEZEL/HEATED SEAT SWITCHES



LAMP-
DOME-
FRONT

LAMP-DOME-FRONT - WHITE 3 WAY

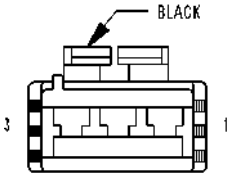
CAV	CIRCUIT	FUNCTION
1	M28 20YL/TN	GLOVE BOX LAMP DRIVER
2	Z955 20BK	GROUND
3	M22 20YL/OR	COURTESY LAMPS DRIVER



LAMP-
DOME-
REAR
(DUAL SWITCH)

LAMP-DOME-REAR (DUAL SWITCH) - BLACK 3 WAY

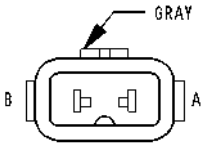
CAV	CIRCUIT	FUNCTION
A	M28 20YL/TN	GLOVE BOX LAMP DRIVER
B	Z955 20BK	GROUND
C	M22 20YL/OR	COURTESY LAMPS DRIVER



LAMP-
DOME-
REAR
(SINGLE SWITCH)

LAMP-DOME-REAR (SINGLE SWITCH) - BLACK 3 WAY

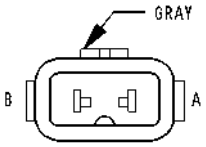
CAV	CIRCUIT	FUNCTION
1	M22 20YL/OR	COURTESY LAMPS DRIVER
2	M28 20YL/TN	GLOVE BOX LAMP DRIVER
3	Z955 20BK	GROUND



LAMP-FOG-
LEFT
FRONT

LAMP-FOG-LEFT FRONT - GRAY 2 WAY

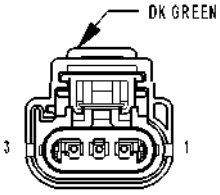
CAV	CIRCUIT	FUNCTION
A	Z349 20BK/YL	GROUND
B	L89 18WT/YL	FRONT FOG LAMP RELAY OUTPUT



LAMP-FOG-RIGHT FRONT

LAMP-FOG-RIGHT FRONT - GRAY 2 WAY

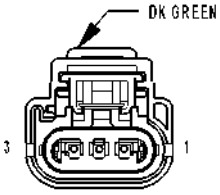
CAV	CIRCUIT	FUNCTION
A	Z348 20BK/OR	GROUND
B	L89 18WT/YL	FRONT FOG LAMP RELAY OUTPUT



LAMP-HEADLAMP-LEFT

LAMP-HEADLAMP-LEFT - DK GREEN 3 WAY

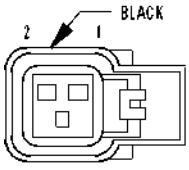
CAV	CIRCUIT	FUNCTION
1	L43 18WT/DB	LEFT LOW BEAM DRIVER
2	Z912 20BK	GROUND
3	L33 18WT/LG	LEFT HIGH BEAM DRIVER



LAMP-HEADLAMP-RIGHT

LAMP-HEADLAMP-RIGHT - DK GREEN 3 WAY

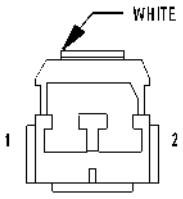
CAV	CIRCUIT	FUNCTION
1	L44 18WT/TN	RIGHT LOW BEAM DRIVER
2	Z929 20BK	GROUND
3	L34 18WT/GY	RIGHT HIGH BEAM DRIVER



LAMP-HIGH MOUNTED STOP

LAMP-HIGH MOUNTED STOP - BLACK 2 WAY

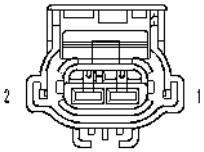
CAV	CIRCUIT	FUNCTION
1	L50 18WT/TN	BRAKE LAMP SWITCH OUTPUT
2	Z945 18BK	GROUND



LAMP-LICENSE PLATE

LAMP-LICENSE PLATE - WHITE 2 WAY

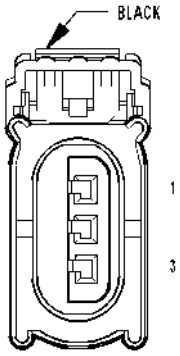
CAV	CIRCUIT	FUNCTION
1	L77 20PK/RD	FUSED LEFT INBOARD TAIL LAMP
2	Z945 18BK	GROUND



LAMP-
LIFTGATE

LAMP-LIFTGATE - 2 WAY

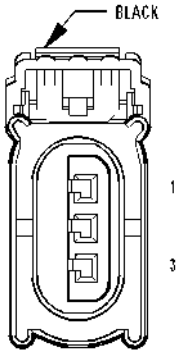
CAV	CIRCUIT	FUNCTION
1	M22 20YL/OR	COURTESY LAMPS DRIVER
2	Z945 20BK	GROUND



LAMP-
PARK/
TURN-
LEFT
FRONT

LAMP-PARK/TURN-LEFT FRONT - BLACK 3 WAY

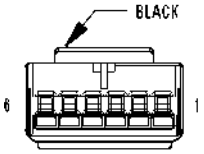
CAV	CIRCUIT	FUNCTION
1	Z377 20BK/BR	GROUND
2	L77 20PK/RD	FUSED LEFT INBOARD TAIL LAMP
3	L61 18WT/LG	LEFT TURN SIGNAL



LAMP-
PARK/
TURN-
RIGHT
FRONT

LAMP-PARK/TURN-RIGHT FRONT - BLACK 3 WAY

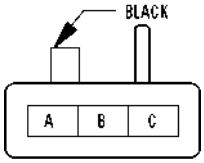
CAV	CIRCUIT	FUNCTION
1	Z378 20BK/TN	GROUND
2	L78 20WT/OR	FUSED PARK LAMP RELAY OUTPUT
3	L60 18WT/TN	RIGHT TURN SIGNAL



LAMP-PASSENGER
AIRBAG ON/OFF
INDICATOR

LAMP-PASSENGER AIRBAG ON/OFF INDICATOR - BLACK 6 WAY

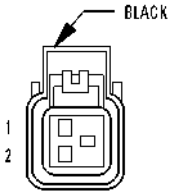
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	R104 20LB/LG	PASSENGER AIRBAG INDICATOR DRIVER
4	F201 20PK/OR	FUSED IGNITION SWITCH OUTPUT (RUN-START)
5	-	-
6	-	-



LAMP-
READING-
FRONT

LAMP-READING-FRONT - BLACK 3 WAY

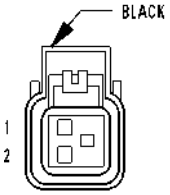
CAV	CIRCUIT	FUNCTION
A	M28 20YL/TN	GLOVE BOX LAMP DRIVER
B	Z955 20BK	GROUND
C	M22 20YL/OR	COURTESY LAMPS DRIVER



LAMP-
SIDE
MARKER-
LEFT
FRONT

LAMP-SIDE MARKER-LEFT FRONT - BLACK 2 WAY

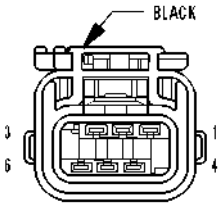
CAV	CIRCUIT	FUNCTION
1	L77 20PK/RD	FUSED LEFT INBOARD TAIL LAMP
2	Z385 20BK	GROUND



LAMP-
SIDE
MARKER-
RIGHT
FRONT

LAMP-SIDE MARKER-RIGHT FRONT - BLACK 2 WAY

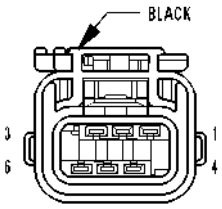
CAV	CIRCUIT	FUNCTION
1	L78 20WT/OR	FUSED PARK LAMP RELAY OUTPUT
2	Z384 20BK	GROUND



LAMP-
TAIL/
STOP/
TURN-
LEFT

LAMP-TAIL/STOP/TURN-LEFT - BLACK 6 WAY

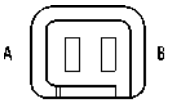
CAV	CIRCUIT	FUNCTION
1	-	-
2	Z363 20BK/DG	GROUND
3	L77 20PK/RD	FUSED LEFT INBOARD TAIL LAMP
4	L50 18WT/TN	BRAKE LAMP SWITCH OUTPUT
5	L1 16WT/LG	BACK-UP LAMP FEED
6	L63 18WT/DG	LEFT TURN SIGNAL



LAMP-TAIL/STOP/TURN-RIGHT

LAMP-TAIL/STOP/TURN-RIGHT - BLACK 6 WAY

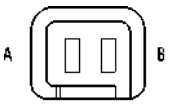
CAV	CIRCUIT	FUNCTION
1	L50 18WT/TN	BRAKE LAMP SWITCH OUTPUT
2	L1 16WT/LG	BACK-UP LAMP FEED
3	L62 18VT/GY	RIGHT TURN SIGNAL
4	Z362 20BK/BR	GROUND
5	L78 20WT/OR	FUSED PARK LAMP RELAY OUTPUT
6	-	-



LAMP-VANITY-LEFT

LAMP-VANITY-LEFT - 2 WAY

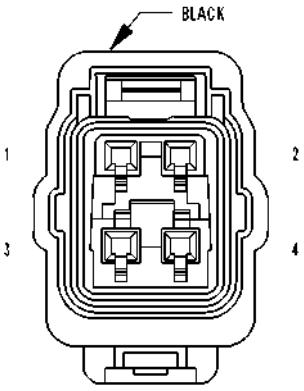
CAV	CIRCUIT	FUNCTION
A	M28 20YL/TN	GLOVE BOX LAMP DRIVER
B	Z955 20BK	GROUND



LAMP-VANITY-RIGHT

LAMP-VANITY-RIGHT - 2 WAY

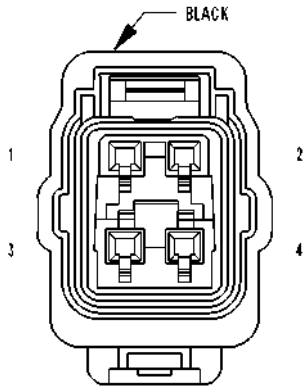
CAV	CIRCUIT	FUNCTION
A	M28 20YL/TN	GLOVE BOX LAMP DRIVER
B	Z955 20BK	GROUND



LATCH-DOOR-LEFT FRONT

LATCH-DOOR-LEFT FRONT - BLACK 4 WAY

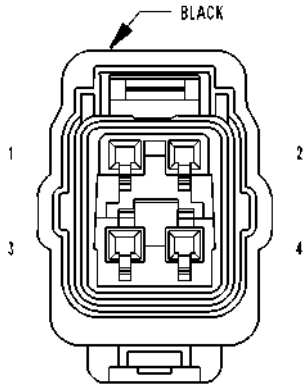
CAV	CIRCUIT	FUNCTION
1	G75 20VT	DRIVER DOOR AJAR SWITCH SENSE
2	Z940 20BK	GROUND
3	P1 16TN/LG	DOOR UNLOCK DRIVER LEFT FRONT
4	P393 16LG	DOOR LOCK DRIVER LEFT DOORS



LATCH-DOOR-LEFT REAR

LATCH-DOOR-LEFT REAR - BLACK 4 WAY

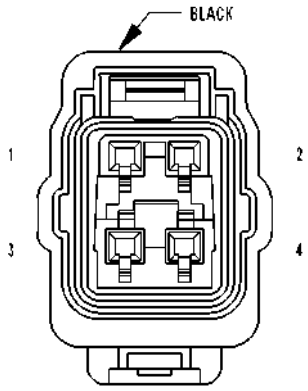
CAV	CIRCUIT	FUNCTION
1	G77 20VT/GY	LEFT REAR DOOR AJAR SWITCH SENSE
2	Z941 20BK	GROUND
3	P5 16TN/OR	DOOR UNLOCK DRIVER LEFT REAR/LIFTGATE
4	P393 16LG	DOOR LOCK DRIVER LEFT DOORS



LATCH-DOOR-RIGHT FRONT

LATCH-DOOR-RIGHT FRONT - BLACK 4 WAY

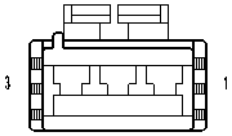
CAV	CIRCUIT	FUNCTION
1	G74 20VT/WT	PASSENGER DOOR AJAR SWITCH SENSE
2	Z944 20BK	GROUND
3	G778 18OR/RD	DOOR UNLOCK DRIVER RIGHT DOORS
4	P392 16LG/DB	DOOR LOCK DRIVER RIGHT DOORS



LATCH-DOOR-RIGHT REAR

LATCH-DOOR-RIGHT REAR - BLACK 4 WAY

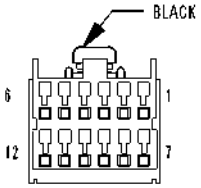
CAV	CIRCUIT	FUNCTION
1	G76 20VT/YL	RIGHT REAR DOOR AJAR SWITCH SENSE
2	Z927 20BK	GROUND
3	G778 18OR/RD	DOOR UNLOCK DRIVER RIGHT DOORS
4	P392 16LG/DB	DOOR LOCK DRIVER RIGHT DOORS



LATCH-
LIFTGATE

LATCH-LIFTGATE - 3 WAY

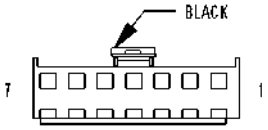
CAV	CIRCUIT	FUNCTION
1	P393 16LG	DOOR LOCK DRIVER LEFT DOORS
2	-	-
3	P5 16TN/OR	DOOR UNLOCK DRIVER LEFT REAR/LIFTGATE



MEDIA
SYSTEM-
MONITOR/DVD

MEDIA SYSTEM-MONITOR/DVD - BLACK 12 WAY

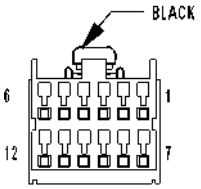
CAV	CIRCUIT	FUNCTION
1	X510 20DG/RD	VDO-AUX AUDIO RT
2	X916 20LB/PK	SDARS AUDIO RETURN
3	X521 20GY/LB	VDO-AUX AUDIO LT 2
4	-	-
5	-	-
6	A300 20GY/LG	FUSED B(+)
7	X511 20DB/RD	VDO-AUX AUDIO LT
8	X910 20GY/DG	VDO-AUX AUDIO RTN/COMMON
9	X522 20LG/RD	VDO-AUX AUDIO RT 2
10	D55 20WT/OR	CAN B BUS (+)
11	D54 20WT	CAN B BUS (-)
12	Z957 20BK	GROUND



MIRROR-
INSIDE
REARVIEW C1

MIRROR-INSIDE REARVIEW C1 - BLACK 7 WAY

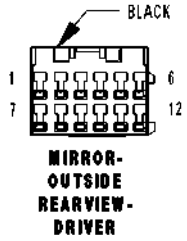
CAV	CIRCUIT	FUNCTION
1	F21 20PK/DG	FUSED IGNITION SWITCH OUTPUT (RUN-START)
2	Z957 20BK	GROUND
3	L1 18WT/LG	BACK-UP LAMP FEED
4	P112 20OR/TN	AUTO DAY/NIGHT MIRROR (+)
5	P114 20TN/WT	AUTO DAY/NIGHT MIRROR (-)
6	-	-
7	-	-



MIRROR-
INSIDE
REARVIEW C2

MIRROR-INSIDE REARVIEW C2 - BLACK 12 WAY

CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	-	-
4	X722 20LB/TN	MICROPHONE 2 IN (+)
5	X735 20DB	HANDS FREE MICROPHONE SHIELD
6	X712 20DB/RD	MICROPHONE 1 IN (+)
7	X793 20TN/YL	MICROPHONE FEED
8	-	-
9	X730 20GY/YL	VOICE RECOGNITION/PHONE SWITCH SIGNAL
10	-	-
11	X835 20OR/GY	SENSOR GROUND
12	X792 20DB/YL	MICROPHONE IN (-)

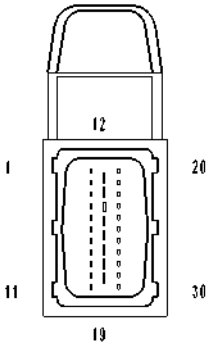


MIRROR-OUTSIDE REARVIEW-DRIVER - BLACK 12 WAY

CAV	CIRCUIT	FUNCTION
1	P71 20TN/DG	DRIVER MIRROR VERTICAL DRIVER
2	P76 20TN/DG (BASE HEATED SEATS)	MIRROR COMMON DRIVER
2	P73 20VT/RD (PREMIUM)	DRIVER MIRROR COMMON DRIVER
3	P75 20TN/LG	DRIVER MIRROR HORIZONTAL DRIVER
4	C16 20DB/GY (BASE HEATED SEATS)	FUSED REAR WINDOW DEFOGGER RELAY OUTPUT
4	C110 20DB/LB (PREMIUM HEATED SEATS)	DRIVER MIRROR HEATER DRIVER
5	Z940 20BK (BASE HEATED SEATS)	GROUND
5	C910 20DB/GY (PREMIUM HEATED SEATS)	DRIVER MIRROR HEATER GROUND
6	P67 20TN/OR (PREMIUM)	DRIVER MIRROR VERTICAL POSITION SIGNAL
7	P69 20GY/DG (PREMIUM)	DRIVER MIRROR SENSOR GROUND
8	P65 20TN/VT (PREMIUM)	DRIVER MIRROR HORIZONTAL POSITION SIGNAL
9	P669 20OR/LG (PREMIUM)	DRIVER MIRROR SENSOR SUPPLY
10	P112 20OR/TN (PREMIUM)	AUTO DAY/NIGHT MIRROR (+)
11	P114 20TN/WT (PREMIUM)	AUTO DAY/NIGHT MIRROR (-)
12	-	-

MIRROR-OUTSIDE REARVIEW-PASSENGER - BLACK 12 WAY

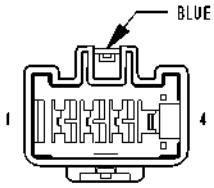
CAV	CIRCUIT	FUNCTION
1	P72 20TN/GY	PASSENGER MIRROR VERTICAL DRIVER
2	P76 20TN/LB (BASE)	MIRROR COMMON DRIVER
2	P70 20LG/DB (PREMIUM HEATED)	PASSENGER MIRROR COMMON DRIVER
3	P74 20TN/OR	PASSENGER MIRROR HORIZONTAL DRIVER
4	C16 20DB/GY (BASE HEATED)	FUSED REAR WINDOW DEFOGGER RELAY OUTPUT
4	C17 20LB/WT (PREMIUM HEATED)	PASSENGER MIRROR HEATER DRIVER
5	Z944 20BK (BASE HEATED)	GROUND
5	C917 20DB/YL (PREMIUM HEATED)	PASSENGER MIRROR HEATER GROUND
6	P64 20TN (PREMIUM HEATED)	PASSENGER MIRROR VERTICAL POSITION SIGNAL
7	P66 20DG/YL (PREMIUM HEATED)	PASSENGER MIRROR SENSOR GROUND
8	P68 20DG/RD (PREMIUM HEATED)	PASSENGER MIRROR HORIZONTAL POSITION SIGNAL
9	P666 20LG/OR (PREMIUM HEATED)	PASSENGER MIRROR SENSOR SUPPLY
10	-	-
11	-	-
12	-	-



MODULE-ANTILOCK BRAKES

MODULE-ANTILOCK BRAKES - 30 WAY

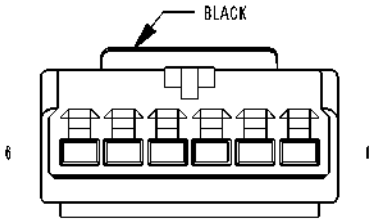
CAV	CIRCUIT	FUNCTION
1	B1 20DG/DB (TRACTION CONTROL)	RIGHT REAR WHEEL SPEED SENSOR SIGNAL
2	B2 20DG/LB (TRACTION CONTROL)	BRAKE FLUID LEVEL SWITCH SENSE
3	B6 20DG/WT	RIGHT FRONT WHEEL SPEED SENSOR (-)
4	B7 20DG/VT	RIGHT FRONT WHEEL SPEED SENSOR (+)
5	B23 20DG/YL (4WD)	G-SENSOR SIGNAL
6	B29 20DG/WT	BRAKE SWITCH NO. 1 SIGNAL
7	-	-
8	F500 20DG/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
9	-	-
10	-	-
11	-	-
12	Z107 12BK/DG	GROUND
13	A107 12TN/RD	FUSED B(+)
14	A111 18DG/RD	FUSED B(+)
15	Z923 18BK	GROUND
16	-	-
17	-	-
18	D65 20YL/RD (2WD)	CAN C BUS (+)
18	D65 20VT/RD (4WD)	CAN C BUS (+)
19	B924 20DG/LB (4WD)	G-SENSOR RETURN
20	B8 20DG/TN	LEFT FRONT WHEEL SPEED SENSOR (+)
21	B9 20DG/LG	LEFT FRONT WHEEL SPEED SENSOR (-)
22	B3 20DG/YL (EXCEPT TRACTION CONTROL)	REAR WHEEL SPEED SENSOR (-)
22	B3 20DG/YL (TRACTION CONTROL)	LEFT REAR WHEEL SPEED SENSOR (-)
23	B4 20LG/GY (EXCEPT TRACTION CONTROL)	REAR WHEEL SPEED SENSOR (+)
23	B4 20LG/GY (TRACTION CONTROL)	LEFT REAR WHEEL SPEED SENSOR (+)
24	-	-
25	-	-
26	B24 20DG/OR (4WD)	G-SENSOR SUPPLY
27	B20 20DG/OR	BRAKE FLUID LEVEL SWITCH SENSE
28	D64 20WT/LB	CAN C BUS (-)
29	-	-
30	-	-



MODULE-BRAKE PROVISION

MODULE-BRAKE PROVISION - BLUE 4 WAY

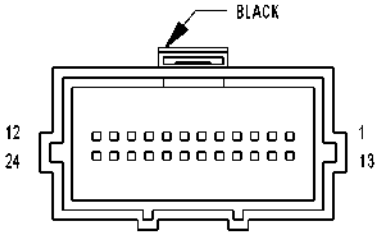
CAV	CIRCUIT	FUNCTION
1	A400 12TN/RD	FUSED B(+)
2	B400 14DG	TRAILER TOW ELECTRIC BRAKE OUTPUT
3	L50 20WT/TN	BRAKE LAMP SWITCH OUTPUT
4	Z910 12BK	GROUND



MODULE-
ELECTRONIC
OVERHEAD

MODULE-ELECTRONIC OVERHEAD - BLACK 6 WAY

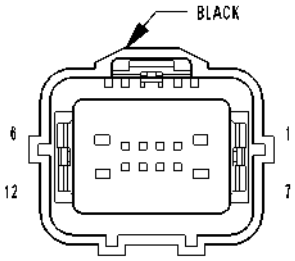
CAV	CIRCUIT	FUNCTION
1	-	-
2	A926 18RD	FUSED B(+)
3	D55 20WT/OR	CAN B BUS (+)
4	D54 20WT	CAN B BUS (-)
5	Z957 20BK (BASE)	GROUND
5	Z957 18BK (EXCEPT BASE)	GROUND
6	C83 20DB/LG	INFRARED SENSOR SIGNAL



MODULE-
FRONT
CONTROL C1

MODULE-FRONT CONTROL C1 - BLACK 24 WAY

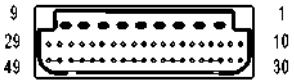
CAV	CIRCUIT	FUNCTION
1	Z116 18BK/VT	GROUND
2	D55 20WT/OR	CAN B BUS (+)
3	D54 20WT	CAN B BUS (-)
4	F924 20PK/YL	FUSED IGNITION SWITCH OUTPUT (START)
5	D52 20WT/PK	CAN C DIAGNOSTIC (+)
6	D51 20PK/RD	CAN C DIAGNOSTIC (-)
7	-	-
8	D65 20YL/RD	CAN C BUS (+)
9	D64 20WT/LB	CAN C BUS (-)
10	-	-
11	C18 20LB/BR	A/C PRESSURE SIGNAL
12	-	-
13	-	-
14	W17 18BR/LG	REAR WIPER PARK SWITCH SENSE
15	-	-
16	T103 20YL/OR	5 VOLT SUPPLY
17	D201 20WT/DG (4WD)	MODE SENSOR A
18	W1 20BR/TN	FRONT WASHER PUMP MOTOR CONTROL
19	K25 20DB/VT	BATT TEMP SIGNAL
20	K91 20DB/YL	BATT TEMP RETURN
21	L50 20WT/TN	BRAKE LAMP SWITCH OUTPUT
22	Z117 18BK/WT	GROUND
23	G70 20VT/LB (REMOTE START)	HOOD AJAR SWITCH SENSE
24	Z965 18BK	GROUND



MODULE-
FRONT
CONTROL C2

MODULE-FRONT CONTROL C2 - BLACK 12 WAY

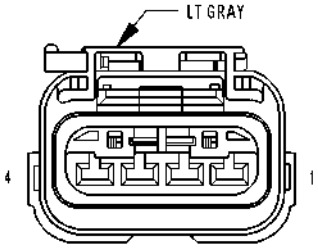
CAV	CIRCUIT	FUNCTION
1	L44 18WT/TN	RIGHT LOW BEAM DRIVER
2	-	-
3	-	-
4	G31 20VT/OR	AAT SIGNAL
5	G931 20VT/BR	SENSOR GROUND
6	L43 18WT/DB	LEFT LOW BEAM DRIVER
7	L33 18WT/LG	LEFT HIGH BEAM DRIVER
8	L60 18WT/TN	RIGHT TURN SIGNAL
9	-	-
10	L61 18WT/LG	LEFT TURN SIGNAL
11	Z947 18BK	GROUND
12	L34 18WT/GY	RIGHT HIGH BEAM DRIVER



MODULE-
FRONT
CONTROL IPM

MODULE-FRONT CONTROL IPM - 49 WAY

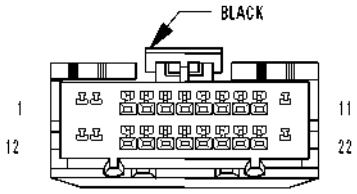
CAV	CIRCUIT	FUNCTION
1	Z921 14BK	GROUND
2	A908 18RD	FUSED B(+)
3	A906 18RD	FUSED B(+)
4	A905 18RD	FUSED B(+)
5	A907 18RD	FUSED B(+)
6	A909 14RD	FUSED B(+)
7	L1 18WT/LG	BACK-UP LAMP FEED
8	T101 14DG	SHIFT MOTOR (+)
9	T102 14YL	SHIFT MOTOR (-)
10	C115 20DB	DEFOGGER RELAY CONTROL
11	W20 18BR/YL	REAR WASHER PUMP MOTOR CONTROL
12	W10 18BR	FRONT WASHER PUMP MOTOR CONTROL
13	F1 20PK/DG	FUSED IGNITION SWITCH OUTPUT (OFF-RUN-START)
14	K617 20BR	RUN/START RELAY CONTROL
15	A920 14OR/RD	FUSED B(+)
16	C229 20DB (EXCEPT REMOTE START)	FRONT BLOWER CONTROL
16	C229 20DB (REMOTE START)	FRONT BLOWER CONTROL
17	F202 20PK/GY	FUSED IGNITION SWITCH OUTPUT (RUN-START)
18	Z118 18BK/YL	GROUND
19	Z909 18BK	GROUND
20	-	-
21	L656 20WT/DG	RIGHT TRAILER TOW BRAKE LAMP RELAY CONTROL
22	L655 20WT/OR	LEFT TRAILER TOW BRAKE LAMP RELAY CONTROL
23	-	-
24	Z909 18BK	GROUND
25	Z118 18BK/YL	GROUND
26	L139 20WT/YL	FOG LAMP RELAY CONTROL
27	W5 20BR/LG	ON/OFF WIPER RELAY CONTROL
28	W12 20BR/OR	REAR WIPER RELAY CONTROL
29	W2 20BR/LG	HIGH/LOW WIPER RELAY CONTROL
30	A955 14RD	ASD RELAY OUTPUT
31	W7 20BR/GY	FRONT WIPER PARK SWITCH SENSE
32	Z909 18BK	GROUND
33	Z118 18BK/YL	GROUND
34	L62 18VT/GY	RIGHT TURN SIGNAL
35	G180 20VT/YL	FCM SENSOR RETURN
36	-	-
37	-	-
38	P305 20LG/LB	ACCESSORY DELAY RELAY CONTROL
39	N201 20DB/LG	LOW SPEED RADIATOR FAN RELAY CONTROL
40	-	-
41	Z118 18BK/YL	GROUND
42	-	-
43	L63 18WT/DG	LEFT TURN SIGNAL
44	-	-
45	-	-
46	P201 20LG/DB	ADJUSTABLE PEDALS RELAY CONTROL
47	X4 20DG/WT	HORN RELAY CONTROL
48	L779 20WT/LB	PARK LAMP RELAY CONTROL
49	N112 20DB/OR	HIGH SPEED RADIATOR FAN RELAY CONTROL



MODULE-
FUEL
PUMP

MODULE-FUEL PUMP - LT GRAY 4 WAY

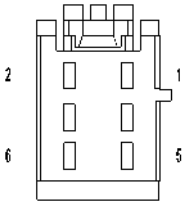
CAV	CIRCUIT	FUNCTION
1	Z938 18BK	GROUND
2	N5 20DB/WT	FUEL LEVEL SENSOR RETURN
3	N4 20DB/YL	FUEL LEVEL SENSOR NO. 1 SIGNAL
4	N1 18DB/OR	FUEL PUMP RELAY OUTPUT



MODULE-
HANDS
FREE

MODULE-HANDS FREE - BLACK 22 WAY

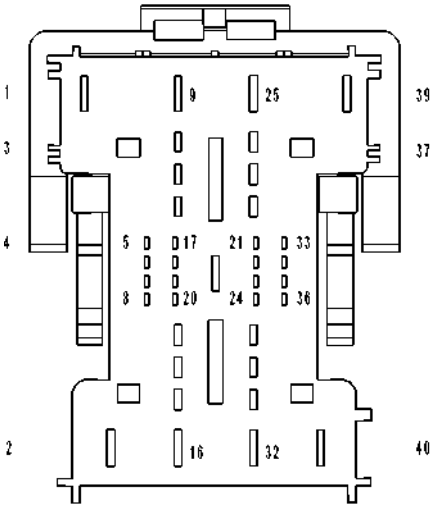
CAV	CIRCUIT	FUNCTION
1	A926 18RD	FUSED B(+)
2	-	-
3	-	-
4	D54 20WT	CAN B BUS (-)
5	X722 20LB/TN	MICROPHONE 2 IN (+)
6	-	-
7	-	-
8	X716 20GY/WT	CNV-HANDS FREE VOICE (+)
9	X776 20TN/GY	CNV-HANDS FREE VOICE (-)
10	X795 20DG	COMMON AUDIO OUTPUT
11	-	-
12	-	-
13	-	-
14	D55 20WT/OR	CAN B BUS (+)
15	X730 20GY/YL	VOICE RECOGNITION/PHONE SWITCH SIGNAL
16	X712 20LB/RD	MICROPHONE 1 IN (+)
17	X792 20DB/YL	MICROPHONE IN (-)
18	X735 20DB	HANDS FREE MICROPHONE SHIELD
19	-	-
20	X793 20TN/YL	MICROPHONE FEED
21	X835 20OR/GY	SENSOR GROUND
22	Z939 18BK	GROUND



MODULE-
HEATED
SEAT

MODULE-HEATED SEAT - 6 WAY

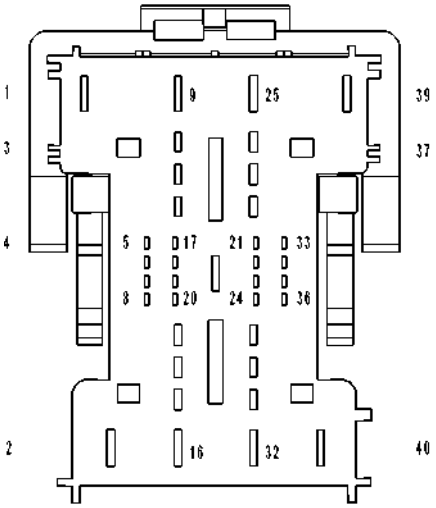
CAV	CIRCUIT	FUNCTION
1	Z387 12BK	GROUND
2	A940 12RD/GY	FUSED B(+)
3	P187 18LG/BR	DRIVER SEAT HEATER B(+) DRIVER
4	P188 18LG/VT	PASSENGER SEAT HEATER B(+) DRIVER
5	D54 20WT	CAN B BUS (-)
6	D55 20WT/OR	CAN B BUS (+)



MODULE-INTEGRATED POWER C1

MODULE-INTEGRATED POWER C1 - 40 WAY

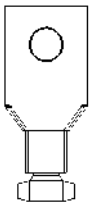
CAV	CIRCUIT	FUNCTION
1	A918 14OR/LG	FUSED B(+)
2	-	-
3	-	-
4	-	-
5	L78 20WT/OR	FUSED PARK LAMP RELAY OUTPUT
6	L78 20WT/OR	FUSED PARK LAMP RELAY OUTPUT
7	L77 20PK/RD	FUSED LEFT INBOARD TAIL LAMP
8	L77 20PK/RD	FUSED LEFT INBOARD TAIL LAMP
9	N23 12DB/DG	HIGH SPEED RADIATOR FAN RELAY OUTPUT
10	W7 20BR/GY	FRONT WIPER PARK SWITCH SENSE
11	-	-
12	-	-
13	L76 20PK/RD	FUSED PARK LAMP RELAY OUTPUT
14	-	-
15	-	-
16	L674 18LG	RIGHT TRAILER TOW BRAKE LAMP RELAY OUTPUT
17	L78 20WT/OR	FUSED PARK LAMP RELAY OUTPUT
18	G180 20VT/YL	FCM SENSOR RETURN
19	L77 20PK/RD	FUSED LEFT INBOARD TAIL LAMP
20	-	-
21	-	-
22	G180 20VT/YL	FCM SENSOR RETURN
23	L62 18VT/GY	RIGHT TURN SIGNAL
24	K617 20BR	RUN/START RELAY CONTROL
25	N202 12DB/OR	LOW SPEED RADIATOR FAN RELAY OUTPUT
26	-	-
27	-	-
28	Z909 18BK	GROUND
29	W10 18BR	FRONT WASHER PUMP MOTOR CONTROL
30	C115 20DB	DEFOGGER RELAY CONTROL
31	W20 18BR/YL	REAR WASHER PUMP MOTOR CONTROL
32	A955 16RD	ASD RELAY OUTPUT
33	N1 18DB/OR	FUEL PUMP RELAY OUTPUT
34	N1 18DB/OR	FUEL PUMP RELAY OUTPUT
35	C229 20DB	FRONT BLOWER CONTROL
36	F1 20PK/DG	FUSED IGNITION SWITCH OUTPUT (OFF-RUN-START)
37	-	-
38	-	-
39	Z967 18BK	GROUND
40	A920 14OR/RD	FUSED B(+)



MODULE-INTEGRATED POWER C2

MODULE-INTEGRATED POWER C2 - 40 WAY

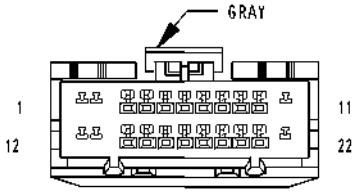
CAV	CIRCUIT	FUNCTION
1	-	-
2	L1 18WT/LG	BACK-UP LAMP FEED
3	-	-
4	-	-
5	-	-
6	-	-
7	F202 20PK/GY	FUSED IGNITION SWITCH OUTPUT (RUN-START)
8	L1 18WT/LG	BACK-UP LAMP FEED
9	Z118 18BK/YL	GROUND
10	A85 18RD/LB	ADJUSTABLE PEDALS RELAY OUTPUT
11	A955 16RD	ASD RELAY OUTPUT
12	-	-
13	T102 14YL	SHIFT MOTOR (-)
14	T101 14DG	SHIFT MOTOR (+)
15	L63 18WT/DG	LEFT TURN SIGNAL
16	-	-
17	-	-
18	L89 18WT/YL	FRONT FOG LAMP RELAY OUTPUT
19	L89 18WT/YL	FRONT FOG LAMP RELAY OUTPUT
20	-	-
21	-	-
22	-	-
23	-	-
24	P305 20LG/LB	ACCESSORY DELAY RELAY CONTROL
25	A5 14RD/VT	FUSED B(+)
26	Z902 14BK	GROUND
27	W4 14BR/OR	FRONT WIPER HIGH/LOW RELAY HIGH SPEED OUTPUT
28	W3 14BR/WT	FRONT WIPER HIGH/LOW RELAY LOW SPEED OUTPUT
29	Z903 14BK	GROUND
30	Z901 18BK	GROUND
31	L673 18YL	LEFT TRAILER TOW BRAKE LAMP RELAY OUTPUT
32	Z921 14BK	GROUND
33	-	-
34	X2 18DG/OR	HORN RELAY OUTPUT
35	X2 18DG/OR	HORN RELAY OUTPUT
36	W13 18LG/BR	REAR WIPER MOTOR CONTROL
37	-	-
38	-	-
39	-	-
40	-	-



POWER DISTRIBUTION CENTER EYELET

MODULE-INTEGRATED POWER EYELET - 1 WAY

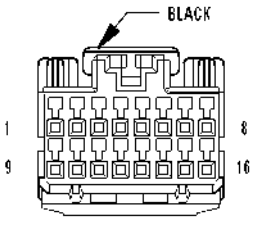
CAV	CIRCUIT	FUNCTION
1	A1 08RD	B(+)



MODULE-MEMORY MIRROR-DRIVER C1

MODULE-MEMORY MIRROR-DRIVER C1 - GRAY 22 WAY

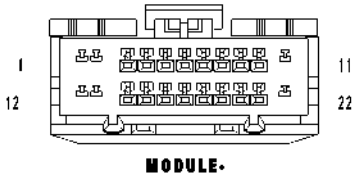
CAV	CIRCUIT	FUNCTION
1	A215 20RD/LG	FUSED B(+)
2	C110 20DB/LB	DRIVER MIRROR HEATER DRIVER
3	P73 20VT/RD	DRIVER MIRROR COMMON DRIVER
4	P71 20TN/DG	DRIVER MIRROR VERTICAL DRIVER
5	P75 20TN/LG	DRIVER MIRROR HORIZONTAL DRIVER
6	P65 20TN/VT	DRIVER MIRROR HORIZONTAL POSITION SIGNAL
7	P67 20TN/OR	DRIVER MIRROR VERTICAL POSITION SIGNAL
8	P669 20OR/LG	DRIVER MIRROR SENSOR SUPPLY
9	G75 20VT	DRIVER DOOR AJAR SWITCH SENSE
10	Z940 20BK/LB	GROUND
11	-	-
12	Z940 20BK/LB	GROUND
13	C910 20DB/GY	DRIVER MIRROR HEATER GROUND
14	-	-
15	-	-
16	-	-
17	P69 20GY/DG	DRIVER MIRROR SENSOR GROUND
18	D54 20WT	CAN B BUS (-)
19	D55 20WT/OR	CAN B BUS (+)
20	G161 20VT/DG	DRIVER DOOR LOCK SWITCH MUX
21	G775 20OR/VT	DRIVER DOOR LOCK SWITCH RETURN
22	-	-



MODULE-MEMORY MIRROR-DRIVER C2

MODULE-MEMORY MIRROR-DRIVER C2 - GRAY 16 WAY

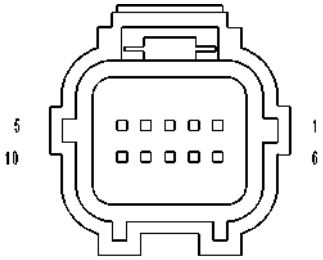
CAV	CIRCUIT	FUNCTION
1	P550 20DB/WT	MIRROR SWITCH SUPPLY
2	-	-
3	-	-
4	P703 20DB/LG	MIRROR HORIZONTAL LEFT SWITCH SENSE
5	-	-
6	P710 20LG	MIRROR COMMON SWITCH SENSE
7	P705 20LG/OR	MIRROR VERTICAL DOWN SWITCH SENSE
8	-	-
9	P950 20DB/RD	MIRROR SWITCH RETURN
10	G920 20VT/YL	MEMORY SELECT SWITCH RETURN
11	-	-
12	-	-
13	P339 20LG/DB	MEMORY SELECT SWITCH MUX
14	-	-
15	P704 20LG/TN	MIRROR HORIZONTAL RIGHT SWITCH SENSE
16	P706 20LG/GY	MIRROR VERTICAL UP SWITCH SENSE



MODULE-
MEMORY
MIRROR-
PASSENGER

MODULE-MEMORY MIRROR-PASSENGER - 22 WAY

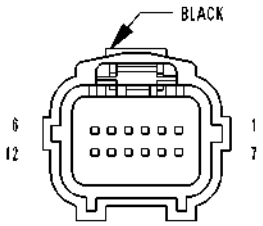
CAV	CIRCUIT	FUNCTION
1	A215 20RD/LG	FUSED B(+)
2	C17 20LB/WT	PASSENGER MIRROR HEATER DRIVER
3	P70 20LG/DB	PASSENGER MIRROR COMMON DRIVER
4	P72 20TN/GY	PASSENGER MIRROR VERTICAL DRIVER
5	P74 20TN/OR	PASSENGER MIRROR HORIZONTAL DRIVER
6	P68 20DG/RD	PASSENGER MIRROR HORIZONTAL POSITION SIGNAL
7	P64 20TN	PASSENGER MIRROR VERTICAL POSITION SIGNAL
8	P666 20LG/OR	PASSENGER MIRROR SENSOR SUPPLY
9	G74 20VT/WT	PASSENGER DOOR AJAR SWITCH SENSE
10	-	-
11	-	-
12	Z944 20BK	GROUND
13	C917 20DB/YL	PASSENGER MIRROR HEATER GROUND
14	-	-
15	-	-
16	-	-
17	P66 20DG/YL	PASSENGER MIRROR SENSOR GROUND
18	D54 20WT	CAN B BUS (-)
19	D55 20WT/OR	CAN B BUS (+)
20	G160 20VT/LG	PASSENGER DOOR LOCK SWITCH MUX
21	G776 20VT/OR	PASSENGER DOOR LOCK SWITCH RETURN
22	-	-



MODULE-
OCCUPANT
CLASSIFICATION C1

MODULE-OCCUPANT CLASSIFICATION C1 - 10 WAY

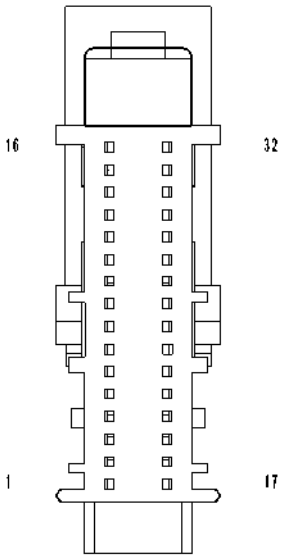
CAV	CIRCUIT	FUNCTION
1	A956 20RD/LB	FUSED B(+)
2	F201 20PK/OR	FUSED IGNITION SWITCH OUTPUT (RUN-START)
3	-	-
4	D55 20WT/OR	CAN B BUS (+)
5	D54 20WT	CAN B BUS (-)
6	-	-
7	R263 20LB/VT	DRIVER SEAT POSITION SENSOR VOLTAGE
8	-	-
9	R261 20LB/WT	DRIVER SEAT POSITION SENSOR DATA
10	Z917 20BK/VT	GROUND



MODULE-OCCUPANT CLASSIFICATION C2

MODULE-OCCUPANT CLASSIFICATION C2 - BLACK 12 WAY

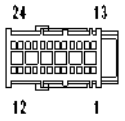
CAV	CIRCUIT	FUNCTION
1	R701 20LG	SEAT WEIGHT SENSOR 5 VOLTS
2	R264 20VT/LB	PASSENGER SEAT POSITION SENSOR VOLTAGE
3	R717 20LG/DG	SEAT WEIGHT LEFT FRONT SENSOR SIGNAL
4	-	-
5	R718 20LB/DG	SEAT WEIGHT RIGHT FRONT SENSOR SIGNAL
6	-	-
7	R706 20LB/OR	SEAT WEIGHT RIGHT REAR SENSOR SIGNAL
8	-	-
9	R705 20LG/OR	SEAT WEIGHT LEFT REAR SENSOR SIGNAL
10	-	-
11	R262 20WT/LB	PASSENGER SEAT POSITION SENSOR DATA
12	R728 20LB/YL	SEAT WEIGHT SENSOR GROUND



MODULE-OCCUPANT RESTRAINT CONTROLLER C1

MODULE-OCCUPANT RESTRAINT CONTROLLER C1 - 32 WAY

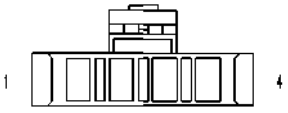
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	-	-
4	-	-
5	-	-
6	-	-
7	-	-
8	-	-
9	R53 20LG/YL	DRIVER SEAT BELT TENSIONER LINE 2
10	R55 20LG/DG	DRIVER SEAT BELT TENSIONER LINE 1
11	R56 20LB/DG	PASSENGER SEAT BELT TENSIONER LINE 1
12	R54 20LB/YL	PASSENGER SEAT BELT TENSIONER LINE 2
13	R1 20LB/BR (SIDE AIRBAG)	LEFT CURTAIN SQUIB 1 LINE 2
14	R3 20LB/OR (SIDE AIRBAG)	LEFT CURTAIN SQUIB 1 LINE 1
15	R4 20OR/LB (SIDE AIRBAG)	RIGHT CURTAIN SQUIB 1 LINE 1
16	R2 20WT/LB (SIDE AIRBAG)	RIGHT CURTAIN SQUIB 1 LINE 2
17	F201 20PK/OR	FUSED IGNITION SWITCH OUTPUT (RUN-START)
18	F100 20PK/VT	FUSED IGNITION SWITCH OUTPUT (RUN)
19	-	-
20	Z104 20BK/LG	GROUND
21	-	-
22	-	-
23	-	-
24	-	-
25	-	-
26	-	-
27	R14 20TN/LG (SIDE AIRBAG)	RIGHT SIDE IMPACT SENSOR 1 SIGNAL
28	R16 20BR/LG (SIDE AIRBAG)	RIGHT SIDE IMPACT SENSOR 1 GROUND
29	R15 20BR/GY (SIDE AIRBAG)	LEFT SIDE IMPACT SENSOR 1 GROUND
30	R13 20LG/BR (SIDE AIRBAG)	LEFT SIDE IMPACT SENSOR 1 SIGNAL
31	-	-
32	-	-



MODULE-
OCCUPANT
RESTRAINT
CONTROLLER C2

MODULE-OCCUPANT RESTRAINT CONTROLLER C2 (SIDE AIRBAG) - 24 WAY

CAV	CIRCUIT	FUNCTION
B1	-	-
B2	-	-
B3	D55 20WT/OR	CAN B BUS (+)
B4	D54 20WT	CAN B BUS (-)
B5	-	-
B6	R104 20LB/LG	PASSENGER AIRBAG INDICATOR DRIVER
B7	-	-
B8	-	-
B9	R81 20LB/WT	LEFT FRONT IMPACT SENSOR GROUND
B10	R79 20LB/VT	LEFT FRONT IMPACT SENSOR SIGNAL
B11	R82 20WT/LB	RIGHT FRONT IMPACT SENSOR GROUND
B12	R80 20VT/LB	RIGHT FRONT IMPACT SENSOR SIGNAL
B13	-	-
B14	-	-
B15	-	-
B16	-	-
B17	R43 20BR/LG	DRIVER SQUIB 1 LINE 2
B18	R45 20OR/LG	DRIVER SQUIB 1 LINE 1
B19	R44 20LB/PK	PASSENGER SQUIB 1 LINE 2
B20	R42 20LB/BR	PASSENGER SQUIB 1 LINE 1
B21	R61 20VT/LG	DRIVER SQUIB 2 LINE 2
B22	R63 20VT/RD	DRIVER SQUIB 2 LINE 1
B23	R64 20LB/WT	PASSENGER SQUIB 2 LINE 1
B24	R62 20LB/DG	PASSENGER SQUIB 2 LINE 2



MODULE-
POWER-
BLOWER MOTOR-
FRONT C1
(ATC)

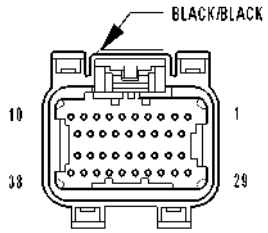
MODULE-POWER-BLOWER MOTOR-FRONT C1 (ATC)

CAV	CIRCUIT	FUNCTION
1	-	-
2	Z961 10BK	GROUND
3	C56 20DB/LB	FRONT BLOWER CONTROL
4	C7 10DB	FRONT BLOWER MOTOR RELAY OUTPUT

MODULE-
POWER-
BLOWER MOTOR-
FRONT C2
(ATC)

MODULE-POWER-BLOWER MOTOR-FRONT C2 (ATC)

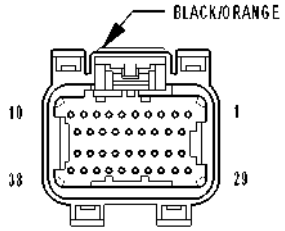
CAV	CIRCUIT	FUNCTION
1	C805 12DB/WT	BLOWER MOTOR SUPPLY
2	C806 12DB/BR	GROUND



MODULE-
POWERTRAIN
CONTROL C1

MODULE-POWERTRAIN CONTROL C1 - BLACK/BLACK 38 WAY

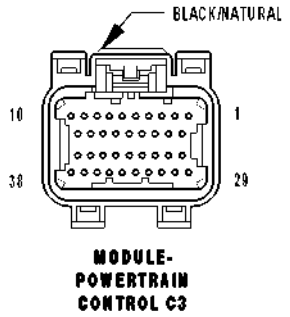
CAV	CIRCUIT	FUNCTION
1	K98 16DB/YL (4.7L/5.7L)	COIL CONTROL NO. 8
2	-	-
3	K97 16BR (4.7L/5.7L)	COIL CONTROL NO. 7
4	K28 16VT/LG (4.7L/5.7L)	INJECTOR CONTROL NO. 8
5	K26 16YL/TN (4.7L/5.7L)	INJECTOR CONTROL NO. 7
6	-	-
7	-	-
8	-	-
9	Z913 16BK	GROUND
10	-	-
11	F202 20PK/GY	FUSED IGNITION SWITCH OUTPUT (RUN-START)
12	F1 20PK/DG	FUSED IGNITION SWITCH OUTPUT (OFF-RUN-START)
13	-	-
14	-	-
15	-	-
16	-	-
17	-	-
18	Z937 16BK	GROUND
19	-	-
20	G6 18VT/GY	ENGINE OIL PRESSURE SIGNAL
21	-	-
22	-	-
23	-	-
24	-	-
25	D20 20WT/BR	SCI RECEIVE (PCM)
26	D16 20WT/PK	SCI RECEIVE (TCM)
27	F856 20YL/PK	5 VOLT SUPPLY
28	-	-
29	A919 18OR/GY	FUSED B(+)
30	F924 20PK/YL	FUSED IGNITION SWITCH OUTPUT (START)
31	K141 20VT/DG	02 1/2 SIGNAL
32	K902 20BR/DG	O2 RETURN (UPSTREAM)
33	K243 20BR	O2 2/2 SIGNAL
34	D65 20YL/RD	CAN C BUS (+)
35	D64 20WT/LB	CAN C BUS (-)
36	D21 20WT/GY	SCI TRANSMIT (PCM)
37	D15 20BR/WT	SCI TRANSMIT (TCM)
38	-	-



MODULE-
POWERTRAIN
CONTROL C2

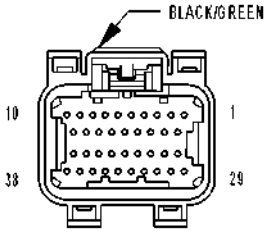
MODULE-POWERTRAIN CONTROL C2 - BLACK/ORANGE 38 WAY

CAV	CIRCUIT	FUNCTION
1	K10 16VT/LB	COIL CONTROL NO. 6
2	K16 16DG/WT	COIL CONTROL NO. 5
3	K15 16DB	COIL CONTROL NO. 4
4	K58 16PK/DB	INJECTOR CONTROL NO. 6
5	K38 16YL/RD	INJECTOR CONTROL NO. 5
6	K447 20TN/YL (5.7L)	ETC MOTOR (+)
7	K18 16VT/RD	COIL CONTROL NO. 3
8	K35 20LB/RD (4.7L/5.7L)	EGR SOL CONTROL
9	K17 16DB/TN	COIL CONTROL NO. 2
10	K19 16LB/RD	COIL CONTROL NO. 1
11	K14 16YL/LB	INJECTOR CONTROL NO. 4
12	K13 16PK/DB	INJECTOR CONTROL NO. 3
13	K12 16BR/DB	INJECTOR CONTROL NO. 2
14	K11 16BR/YL	INJECTOR CONTROL NO. 1
15	K922 20PK/GY (5.7L)	TP SENSOR RETURN
16	-	-
17	K199 20GY/LB	O2 2/1 HEATER CONTROL
18	K99 20LB/WT	O2 1/1 HEATER CONTROL
19	K20 18BR/GY	GEN FIELD CONTROL
20	K2 20LB/RD	ECT SIGNAL
21	K22 20YL/DG	TP NO. 1 SIGNAL
22	K34 20LB/GY	EGR SIGNAL
23	K1 20VT/BR	MAP SIGNAL
24	K942 20YL/DG	KNOCK SENSOR NO. 1 RETURN
25	K42 20DB/OR	KNOCK SENSOR NO. 1 SIGNAL
26	-	-
27	K900 20DB/DG	SENSOR GROUND
28	K961 20BR/VT (3.7L/4.7L)	IAC SIGNAL
28	K122 20PK/LB (5.7L)	TP NO. 2 SIGNAL
29	F855 20PK/YL	5 VOLT SUPPLY
30	K21 20BR/WT	IAT SIGNAL
31	K41 20DB/LB	O2 1/1 SIGNAL
32	K904 20DB/DG	O2 RETURN (DOWNSTREAM)
33	K43 20DB/LG	O2 2/1 SIGNAL
34	K44 20TN/LB	CMP SIGNAL
35	K24 20VT/DG	CKP SIGNAL
36	K242 20DB/OR	KNOCK SENSOR NO. 2 SIGNAL
37	K924 20DG/RD	KNOCK SENSOR NO. 2 RETURN
38	K61 20VT/GY (3.7L/4.7L)	IAC CONTROL
38	K448 20TN/OR (5.7L)	ETC MOTOR (-)



MODULE-POWERTRAIN CONTROL C3 - BLACK/NATURAL 38 WAY

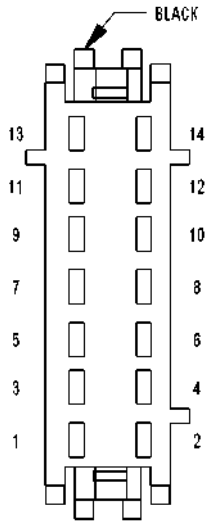
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	K51 20BR/GY	ASD RELAY CONTROL
4	-	-
5	V35 20VT/OR (3.7L/4.7L)	S/C VENT SOL CONTROL
6	-	-
7	V32 20VT/YL (3.7L/4.7L)	S/C SUPPLY
8	K106 20VT/LB	NVLD SOL CONTROL
9	K299 20DG/RD	O2 1/2 HEATER CONTROL
10	K399 20BR/GY	O2 2/2 HEATER CONTROL
11	C13 20LB/OR	A/C CLUTCH RELAY CONTROL
12	V36 20VT/YL (3.7L/4.7L)	S/C VACUUM SOL CONTROL
13	-	-
14	V32 20VT/YL (5.7L)	S/C SUPPLY
15	V937 20VT/BR (5.7L)	S/C SWITCH RETURN
16	K4 20BR/LB (5.7L)	APPS NO. 1 RETURN
17	K400 20BR/VT (5.7L)	APPS NO. 2 RETURN
18	V38 20VT/OR (5.7L)	S/C SWITCH NO. 2 SIGNAL
19	A955 16RD	ASD RELAY OUTPUT
20	K52 20DB/WT	EVAP PURGE SOL SIGNAL
21	T41 20YL/DB	TRS (T41) SENSE (P/N SENSE)
22	-	-
23	B29 20DG/WT	BRAKE SWITCH NO. 1 SIGNAL
24	-	-
25	K23 20BR/WT (5.7L)	APPS NO. 1 SIGNAL
26	-	-
27	-	-
28	A955 16RD	ASD RELAY OUTPUT
29	K70 20DB/BR	EVAP PURGE SOL CONTROL
30	K66 20DB/WT (5.7L)	P/S PRESSURE SWITCH SIGNAL
31	-	-
32	-	-
33	-	-
34	V37 20VT	S/C SWITCH NO. 1 SIGNAL
35	K107 20VT/WT	NVLD SWITCH SIGNAL
36	K29 20PK/RD (5.7L)	APPS NO. 2 SIGNAL
37	K31 20BR	FUEL PUMP RELAY CONTROL
38	T752 20DG/OR	ENGINE STARTER MOTOR RELAY CONTROL



**MODULE-
POWERTRAIN
CONTROL C4**

MODULE-POWERTRAIN CONTROL C4 - BLACK/GREEN 38 WAY

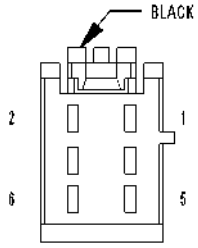
CAV	CIRCUIT	FUNCTION
1	T60 18VT/WT	OD SOLENOID CONTROL
2	T59 18YL/LB (3.7L)	UD SOLENOID CONTROL
2	T259 18VT/RD (4.7L/5.7L)	4C SOLENOID CONTROL
3	-	-
4	T118 20VT/BR (4.7L/5.7L)	MS SOLENOID CONTROL
5	-	-
6	T19 18YL/DB (3.7L)	2-4 SOLENOID CONTROL
6	T219 18VT/DB (4.7L/5.7L)	2C SOLENOID CONTROL
7	-	-
8	T59 18YL/LB (4.7L/5.7L)	UD SOLENOID CONTROL
9	-	-
10	T20 18VT/DG	L/R SOLENOID CONTROL
11	T140 20DG	PRESSURE CONTROL SOLENOID CONTROL
12	Z908 16BK	GROUND
13	Z977 16BK	GROUND
14	Z904 16BK	GROUND
15	T1 20BR/DB	TRS T1 SENSE
16	T3 20DG/DB	TRS T3 SENSE
17	T6 20DG	TOW/HAUL OVERDRIVE OFF SWITCH SENSE
18	T15 20VT/YL	TRANSMISSION CONTROL RELAY CONTROL
19	T16 18YL/OR	TRANSMISSION CONTROL RELAY OUTPUT
20	T48 20BR/YL (4.7L/5.7L)	4C PRESSURE SWITCH SENSE
21	T29 20YL/WT (4.7L/5.7L)	UD PRESSURE SWITCH SENSE
22	T9 20BR/VT	OD PRESSURE SWITCH SENSE
23	-	-
24	-	-
25	-	-
26	T4 20BR/PK (4.7L/5.7L)	2-4 PRESSURE SWITCH SENSE
27	-	-
28	T16 18YL/OR	TRANSMISSION CONTROL RELAY OUTPUT
29	T50 20VT/GY	L/R PRESSURE SWITCH SENSE
30	T47 20YL/DG (3.7L)	2-4 PRESSURE SWITCH SENSE
30	T147 20DG/YL (4.7L/5.7L)	2C PRESSURE SWITCH SENSE
31	T38 20YL/BR	LINE PRESSURE SENSOR SIGNAL
32	T14 20DG/BR	OUTPUT SPEED SENSOR SIGNAL
33	T52 20VT/OR	INPUT SPEED SENSOR SIGNAL
34	T13 20DG/VT	SPEED SENSOR GROUND
35	T54 20BR/RD	TRANSMISSION TEMPERATURE SENSOR SIGNAL
36	-	-
37	T42 20DG/YL	TRS T42 SENSE
38	T16 18YL/OR	TRANSMISSION CONTROL RELAY OUTPUT



MODULE-SEAT MEMORY C1

MODULE-SEAT MEMORY C1 - BLACK 14 WAY

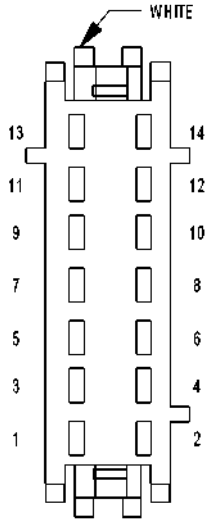
CAV	CIRCUIT	FUNCTION
1	P205 18LG/DB	ADJUSTABLE PEDALS MOTOR FORWARD
2	P206 18LG/TN	ADJUSTABLE PEDALS MOTOR REARWARD
3	-	-
4	-	-
5	D54 20WT	CAN B BUS (-)
6	-	-
7	D55 20WT/OR	CAN B BUS (+)
8	A940 12RD/GY	FUSED B(+)
9	G11 20VT/TN	ADJUSTABLE PEDALS SENSOR SUPPLY
10	Z930 12BK/LB	GROUND
11	-	-
12	G912 20VT/WT	ADJUSTABLE PEDALS SENSOR RETURN
13	-	-
14	G12 20VT/BR	ADJUSTABLE PEDALS SENSOR SIGNAL



MODULE-SEAT MEMORY C2

MODULE-SEAT MEMORY C2 - BLACK 6 WAY

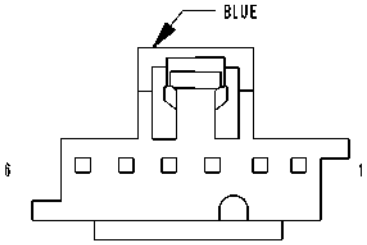
CAV	CIRCUIT	FUNCTION
1	G493 20OR/VT	DRIVER SEAT RECLINER POSITION SENSOR GROUND
2	P141 14LG/BR	DRIVER SEAT RECLINER UP DRIVER
3	-	-
4	P143 14LG/GY	DRIVER SEAT RECLINER DOWN DRIVER
5	G403 20VT/OR	DRIVER SEAT RECLINER POSITION SENSE
6	-	-



MODULE-SEAT MEMORY C3

MODULE-SEAT MEMORY C3 - WHITE 14 WAY

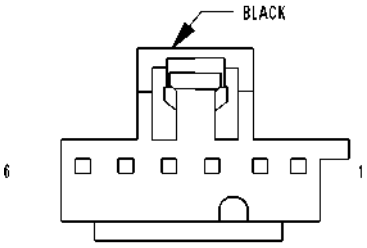
CAV	CIRCUIT	FUNCTION
1	G404 20VT/YL	DRIVER SEAT FRONT VERTICAL POSITION SENSE
2	G402 20VT/DB	DRIVER SEAT REAR VERTICAL POSITION SENSE
3	G401 20VT/LG	DRIVER SEAT HORIZONTAL POSITION SENSE
4	G494 20YL/VT	DRIVER SEAT FRONT VERTICAL SENSOR GROUND
5	G492 20LB/VT	DRIVER SEAT REAR VERTICAL SENSOR GROUND
6	G491 20VT/GY	DRIVER SEAT HORIZONTAL SENSOR GROUND
7	-	-
8	P115 14LG	DRIVER SEAT HORIZONTAL FORWARD DRIVER
9	P117 14LG/LB	DRIVER SEAT HORIZONTAL REARWARD DRIVER
10	P113 14LG/WT	DRIVER SEAT REAR VERTICAL DOWN DRIVER
11	-	-
12	P111 14LG/YL	DRIVER SEAT REAR VERTICAL UP DRIVER
13	P121 14LG/DB	DRIVER SEAT FRONT VERTICAL DOWN DRIVER
14	P119 14LG/DG	DRIVER SEAT FRONT VERTICAL UP DRIVER



MODULE-
SEAT
MEMORY C4

MODULE-SEAT MEMORY C4 - BLUE 6 WAY

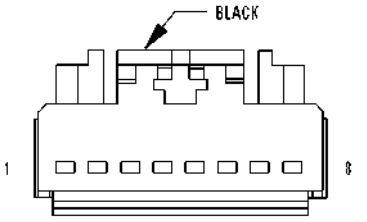
CAV	CIRCUIT	FUNCTION
1	P28 20DB/WT	DRIVER SEAT SWITCH MUX RETURN
2	P311 20VT	DRIVER SEAT FRONT VERTICAL/RECLINER SWITCH MUX
3	P309 20BR	DRIVER SEAT REAR VERTICAL/HORIZONTAL SWITCH MUX
4	-	-
5	-	-
6	P29 20LG/WT	DRIVER SEAT SWITCH MUX SUPPLY



MODULE-
SEAT
MEMORY C5
(ADJUSTABLE PEDALS)

MODULE-SEAT MEMORY C5 (ADJUSTABLE PEDALS) - BLACK 6 WAY

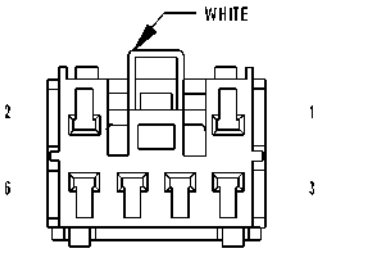
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	-	-
4	Q100 20OR/WT	ADJUSTABLE PEDALS SWITCH REARWARD
5	Q900 18OR/BK	ADJUSTABLE PEDALS MOTOR FORWARD
6	-	-



MODULE-
SENTRY KEY
REMOTE
ENTRY

MODULE-SENTRY KEY REMOTE ENTRY - BLACK 8 WAY

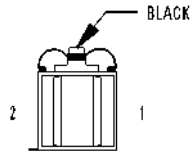
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	F202 20PK/GY	FUSED IGNITION SWITCH OUTPUT (RUN-START)
4	Z109 20BK/GY	GROUND
5	A926 18RD	FUSED B(+)
6	D55 20WT/OR	CAN B BUS (+)
7	D54 20WT	CAN B BUS (-)
8	-	-



MOTOR-
ADJUSTABLE
PEDALS

MOTOR-ADJUSTABLE PEDALS - WHITE 6 WAY

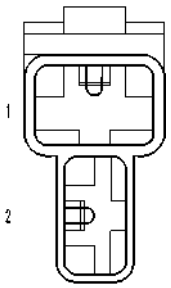
CAV	CIRCUIT	FUNCTION
1	P206 18LG/TN	ADJUSTABLE PEDALS MOTOR REARWARD
2	P205 18LG/DB	ADJUSTABLE PEDALS MOTOR FORWARD
3	-	-
4	-	-
5	-	-
6	-	-



MOTOR-BLOWER-FRONT

MOTOR-BLOWER-FRONT - BLACK 2 WAY

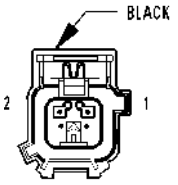
CAV	CIRCUIT	FUNCTION
1	C806 12DB/BR (ATC)	GROUND
1	C75 10DB/GY (MTC)	FRONT BLOWER HIGH SPEED
2	C805 12DB/WT (ATC)	BLOWER MOTOR SUPPLY
2	C7 10DB (MTC)	FRONT BLOWER MOTOR RELAY OUTPUT



MOTOR-BLOWER-REAR

MOTOR-BLOWER-REAR - 2 WAY

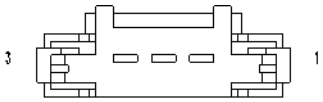
CAV	CIRCUIT	FUNCTION
1	C51 14LB/BR	FUSED REAR BLOWER MOTOR RELAY OUTPUT
2	C153 14DB/BR	REAR BLOWER HIGH SPEED



MOTOR-IAC (3.7L/4.7L)

MOTOR-IAC (3.7L/4.7L) - BLACK 2 WAY

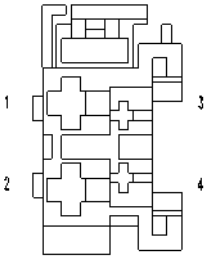
CAV	CIRCUIT	FUNCTION
1	K961 20BR/VT	IAC SIGNAL
2	K61 20VT/GY	IAC CONTROL



MOTOR-REAR WINDOW WIPER

MOTOR-REAR WINDOW WIPER - 3 WAY

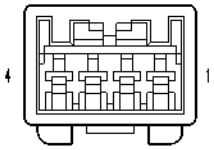
CAV	CIRCUIT	FUNCTION
1	W13 16LG/BR	REAR WIPER MOTOR CONTROL
2	W17 18BR/LG	REAR WIPER PARK SWITCH SENSE
3	Z945 18BK	GROUND



MOTOR-SEAT ADJUSTER-DRIVER HORIZONTAL

MOTOR-SEAT ADJUSTER-DRIVER HORIZONTAL - 4 WAY

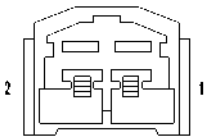
CAV	CIRCUIT	FUNCTION
1	P15 14LG/WT (EXCEPT MEMORY)	DRIVER SEAT HORIZONTAL FORWARD DRIVER
1	P115 14LG (MEMORY)	DRIVER SEAT HORIZONTAL FORWARD DRIVER
2	P17 14LG/DG (EXCEPT MEMORY)	DRIVER SEAT HORIZONTAL REARWARD DRIVER
2	P117 14LG/LB (MEMORY)	DRIVER SEAT HORIZONTAL REARWARD DRIVER
3	G491 20VT/GY (MEMORY)	DRIVER SEAT HORIZONTAL SENSOR GROUND
4	G401 20VT/LG (MEMORY)	DRIVER SEAT HORIZONTAL POSITION SENSE



MOTOR-
SEAT ADJUSTER-
DRIVER
RECLINER
(MEMORY)

MOTOR-SEAT ADJUSTER-DRIVER RECLINER (MEMORY) - 4 WAY

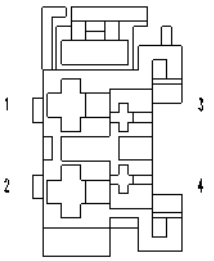
CAV	CIRCUIT	FUNCTION
1	P143 14LG/GY	DRIVER SEAT RECLINER DOWN DRIVER
2	P141 14LG/BR	DRIVER SEAT RECLINER UP DRIVER
3	G493 20OR/VT	DRIVER SEAT RECLINER POSITION SENSOR GROUND
4	G403 20VT/OR	DRIVER SEAT RECLINER POSITION SENSE



MOTOR-
SEAT ADJUSTER-
DRIVER RECLINER
(EXCEPT MEMORY)

MOTOR-SEAT ADJUSTER-DRIVER RECLINER (EXCEPT MEMORY) - 2 WAY

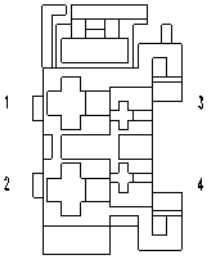
CAV	CIRCUIT	FUNCTION
1	P43 16LG/VT	DRIVER SEAT RECLINER UP DRIVER
2	P41 16LG/GY	DRIVER SEAT RECLINER DOWN DRIVER



MOTOR-
SEAT
ADJUSTER-
FRONT
DRIVER
VERTICAL

MOTOR-SEAT ADJUSTER-FRONT DRIVER VERTICAL - 4 WAY

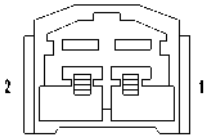
CAV	CIRCUIT	FUNCTION
1	P21 14LG/TN (EXCEPT MEMORY)	DRIVER SEAT FRONT DOWN DRIVER
1	P121 14LG/DB (MEMORY)	DRIVER SEAT FRONT VERTICAL DOWN DRIVER
2	P19 14LG/LB (EXCEPT MEMORY)	DRIVER SEAT FRONT UP DRIVER
2	P119 14LG/DG (MEMORY)	DRIVER SEAT FRONT VERTICAL UP DRIVER
3	G494 20YL/VT (MEMORY)	DRIVER SEAT FRONT VERTICAL SENSOR GROUND
4	G404 20VT/YL (MEMORY)	DRIVER SEAT FRONT VERTICAL POSITION SENSE



MOTOR-
SEAT
ADJUSTER-
PASSENGER
HORIZONTAL

MOTOR-SEAT ADJUSTER-PASSENGER HORIZONTAL - 4 WAY

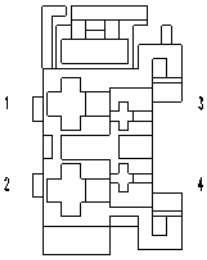
CAV	CIRCUIT	FUNCTION
1	P16 14LG/BR	PASSENGER SEAT HORIZONTAL REARWARD DRIVER
2	P14 14VT	DRIVER SEAT RECLINER DOWN DRIVER
3	-	-
4	-	-



MOTOR-
SEAT ADJUSTER-
PASSENGER
RECLINER

MOTOR-SEAT ADJUSTER-PASSENGER RECLINER - 2 WAY

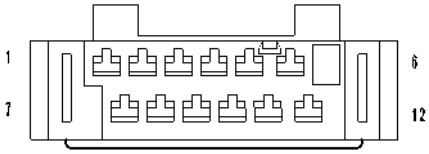
CAV	CIRCUIT	FUNCTION
1	P44 14LG/DG	PASSENGER SEAT RECLINER SWITCH UP
2	P42 14LG/GY	PASSENGER SEAT RECLINER SWITCH DOWN



MOTOR-
SEAT
ADJUSTER-
REAR
DRIVER
VERTICAL

MOTOR-SEAT ADJUSTER-REAR DRIVER VERTICAL - 4 WAY

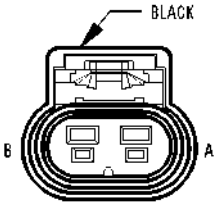
CAV	CIRCUIT	FUNCTION
1	P13 14LG/OR (EXCEPT MEMORY)	DRIVER SEAT REAR DOWN DRIVER
1	P113 14LG/WT (MEMORY)	DRIVER SEAT REAR VERTICAL DOWN DRIVER
2	P11 14LG/YL (EXCEPT MEMORY)	DRIVER SEAT REAR UP
2	P111 14LG/YL (MEMORY)	DRIVER SEAT REAR VERTICAL UP DRIVER
3	G492 20LB/VT (MEMORY)	DRIVER SEAT REAR VERTICAL SENSOR GROUND
4	G402 20VT/DB (MEMORY)	DRIVER SEAT REAR VERTICAL POSITION SENSE



MOTOR-
SUNROOF

MOTOR-SUNROOF - 12 WAY

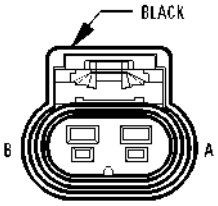
CAV	CIRCUIT	FUNCTION
1	Q3 20OR/TN	SUNROOF OPEN
2	Q5 20OR/LB	SUNROOF MOTOR B(+)
3	Q4 20OR/YL	SUNROOF CLOSE
4	F30 14PK/YL	FUSED ACCESSORY DELAY RELAY OUTPUT
5	A904 14RD/GY	FUSED B(+)
6	Z955 14BK	GROUND
7	-	-
8	-	-
9	-	-
10	-	-
11	-	-
12	-	-



MOTOR-WINDOW-LEFT FRONT

MOTOR-WINDOW-LEFT FRONT - BLACK 2 WAY

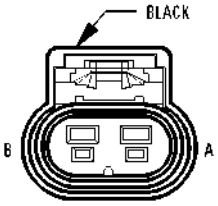
CAV	CIRCUIT	FUNCTION
A	Q11 14WT/DB	LEFT FRONT WINDOW DRIVER (UP)
B	Q21 14OR/WT	LEFT FRONT WINDOW DRIVER (DOWN)



MOTOR-WINDOW-LEFT REAR

MOTOR-WINDOW-LEFT REAR - BLACK 2 WAY

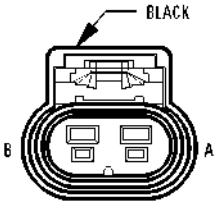
CAV	CIRCUIT	FUNCTION
A	Q111 14TN/YL	DRIVER REAR WINDOW DRIVER (UP)
B	Q211 14TN/LB	DRIVER REAR WINDOW DRIVER (DOWN)



MOTOR-WINDOW-RIGHT FRONT

MOTOR-WINDOW-RIGHT FRONT - BLACK 2 WAY

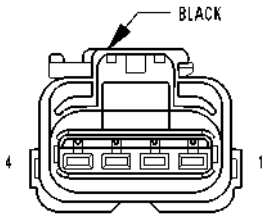
CAV	CIRCUIT	FUNCTION
A	Q12 14OR/BR	RIGHT FRONT WINDOW DRIVER (UP)
B	Q22 14WT/PK	RIGHT FRONT WINDOW DRIVER (DOWN)



MOTOR-WINDOW-RIGHT REAR

MOTOR-WINDOW-RIGHT REAR - BLACK 2 WAY

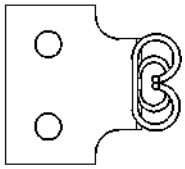
CAV	CIRCUIT	FUNCTION
A	Q112 14VT/TN	PASSENGER REAR WINDOW DRIVER (UP)
B	Q212 14TN/DG	PASSENGER REAR WINDOW DRIVER (DOWN)



MOTOR-WINDSHIELD WIPER

MOTOR-WINDSHIELD WIPER - BLACK 4 WAY

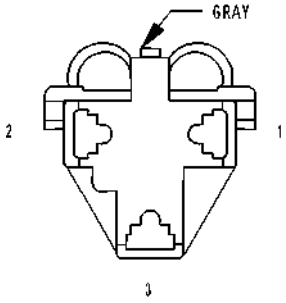
CAV	CIRCUIT	FUNCTION
1	W7 20BR/GY	FRONT WIPER PARK SWITCH SENSE
2	Z103 14BK/WT	GROUND
3	W3 14BR/WT	FRONT WIPER HIGH/LOW RELAY LOW SPEED OUTPUT
4	W4 14BR/OR	FRONT WIPER HIGH/LOW RELAY HIGH SPEED OUTPUT



POWER DISTRIBUTION CENTER EYELET

POWER DISTRIBUTION CENTER EYELET (BATTERY) - 1 WAY

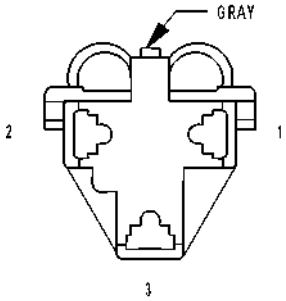
CAV	CIRCUIT	FUNCTION
1	A1 04RD	B(+)
1	A1 08RD	B(+)



POWER OUTLET-CONSOLE

POWER OUTLET-CONSOLE - GRAY 3 WAY

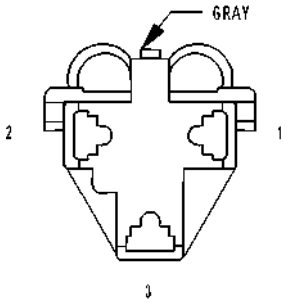
CAV	CIRCUIT	FUNCTION
1	F307 18LB/PK	FUSED ACCESSORY RELAY OUTPUT
2	-	-
3	Z738 18BK/WT	GROUND



POWER OUTLET-INSTRUMENT PANEL

POWER OUTLET-INSTRUMENT PANEL - GRAY 3 WAY

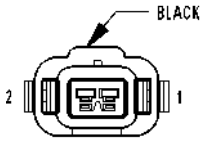
CAV	CIRCUIT	FUNCTION
1	F306 18DB/PK	FUSED ACCESSORY RELAY OUTPUT
2	-	-
3	Z959 18BK	GROUND



POWER OUTLET- REAR

POWER OUTLET-REAR - GRAY 3 WAY

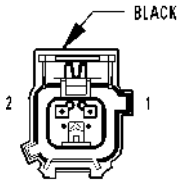
CAV	CIRCUIT	FUNCTION
1	F307 16YL/LB	FUSED ACCESSORY RELAY OUTPUT
2	-	-
3	Z737 18BK/LB	GROUND



PUMP- AUXILIARY COOLANT

PUMP-AUXILIARY COOLANT - BLACK 2 WAY

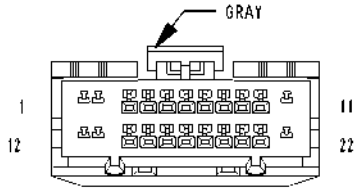
CAV	CIRCUIT	FUNCTION
1	C43 20WT/DB	AUXILIARY COOLANT PUMP DRIVER
2	Z931 18BK	GROUND



PUMP- WASHER- WINDSHIELD

PUMP-WASHER-WINDSHIELD - BLACK 2 WAY

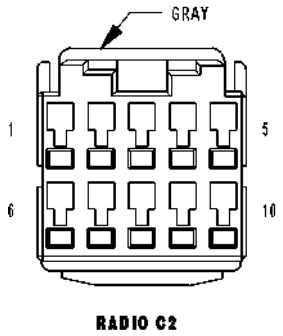
CAV	CIRCUIT	FUNCTION
1	W20 18BR/YL	REAR WASHER PUMP MOTOR CONTROL
2	W10 18BR	FRONT WASHER PUMP MOTOR CONTROL



RADIO C1

RADIO C1 - GRAY 22 WAY

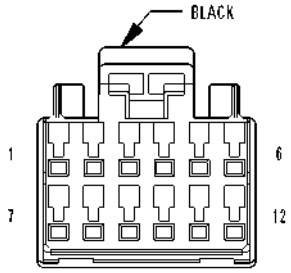
CAV	CIRCUIT	FUNCTION
1	A114 16GY/RD	FUSED B(+)
2	-	-
3	-	-
4	X716 20GY/WT (HANDS FREE)	CNV-HANDS FREE VOICE (+)
5	D55 20WT/OR	CAN B BUS (+)
6	D54 20WT	CAN B BUS (-)
7	X54 20GY (BASE)	RIGHT FRONT SPEAKER (+)
8	X56 20GY/BR (BASE)	RIGHT FRONT SPEAKER (-)
9	X55 20DG/BR (BASE)	LEFT FRONT SPEAKER (-)
10	X53 20DG (BASE)	LEFT FRONT SPEAKER (+)
11	Z514 16BK/LG	GROUND
12	A114 16GY/RD	FUSED B(+)
13	-	-
14	-	-
15	-	-
16	X776 20TN/GY (HANDS FREE)	CNV-HANDS FREE VOICE (-)
17	X795 20DG (HANDS FREE)	COMMON AUDIO OUTPUT
18	X51 20DG/DB	RADIO-LEFT AUDIO (+)
19	X57 20DG/OR	RADIO-LEFT AUDIO (-)
20	X58 20GY/OR	RADIO-RIGHT AUDIO (-)
21	X52 20GY/DB	RADIO-RIGHT AUDIO (+)
22	Z515 16BK	GROUND



RADIO C2

RADIO C2 - GRAY 10 WAY

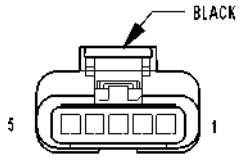
CAV	CIRCUIT	FUNCTION
1	X16 20DG/YL (PREMIUM/HANDS FREE)	AUDIO SIGNAL RIGHT (+)
2	X917 20LB/RD (PREMIUM/HANDS FREE)	AUDIO SIGNAL COMMON
3	-	-
4	X510 20DG/RD	VDO-AUX AUDIO RT
5	X916 20LB/PK	SDARS AUDIO RETURN
6	X17 20DB/WT (PREMIUM/HANDS FREE)	AUDIO SIGNAL LEFT (+)
7	X910 20GY/DG	VDO-AUX AUDIO RTN/COMMON
8	X511 20DB/RD	VDO-AUX AUDIO LT
9	X521 20GY/LB	VDO-AUX AUDIO LT 2
10	X522 20LG/RD	VDO-AUX AUDIO RT 2



RECEIVER-SATELLITE

RECEIVER-SATELLITE - BLACK 12 WAY

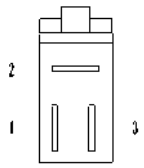
CAV	CIRCUIT	FUNCTION
1	A300 20GY/LG	FUSED B(+)
2	-	-
3	Z960 20BK	GROUND
4	-	-
5	-	-
6	X17 20DB/WT	AUDIO SIGNAL LEFT (+)
7	D54 20WT	CAN B BUS (-)
8	D55 20WT/OR	CAN B BUS (+)
9	-	-
10	-	-
11	X917 20LB/RD	AUDIO SIGNAL COMMON
12	X16 20DG/YL	AUDIO SIGNAL RIGHT (+)



RESISTOR-BLOWER MOTOR-FRONT (MTC)

RESISTOR-BLOWER MOTOR-FRONT (MTC) - BLACK 5 WAY

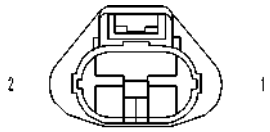
CAV	CIRCUIT	FUNCTION
1	C75 10DB/GY	FRONT BLOWER HIGH SPEED
2	C75 12DB/GY	FRONT BLOWER HIGH SPEED
3	C73 14DB/VT	FRONT BLOWER M2 SPEED
4	C72 14DB/OR	FRONT BLOWER M1 SPEED
5	C71 16DB/BR	FRONT BLOWER LOW SPEED



RESISTOR-
BLOWER MOTOR-
REAR

RESISTOR-BLOWER MOTOR-REAR - 3 WAY

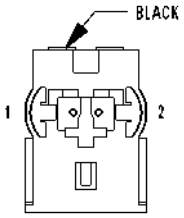
CAV	CIRCUIT	FUNCTION
1	C153 14DB/BR	REAR BLOWER HIGH SPEED
2	C152 14LB/LG	REAR BLOWER MEDIUM SPEED
3	C151 16LB/DG	REAR BLOWER LOW SPEED



RESISTOR-
RADIATOR FAN

RESISTOR-RADIATOR FAN - 2 WAY

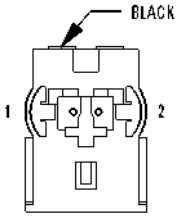
CAV	CIRCUIT	FUNCTION
1	N24 12DG/DB	LOW SPEED RADIATOR FAN RELAY OUTPUT
2	N202 12DB/OR	LOW SPEED RADIATOR FAN RELAY OUTPUT



SEAT BELT-
TENSIONER-
DRIVER

SEAT BELT-TENSIONER-DRIVER - BLACK 2 WAY

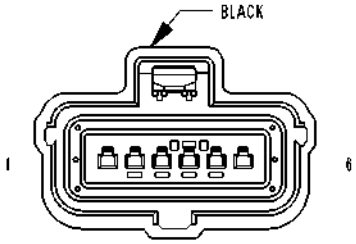
CAV	CIRCUIT	FUNCTION
1	R55 20LG/DG	DRIVER SEAT BELT TENSIONER LINE 1
2	R53 20LG/YL	DRIVER SEAT BELT TENSIONER LINE 2



SEAT BELT-
TENSIONER-
PASSENGER

SEAT BELT-TENSIONER-PASSENGER - BLACK 2 WAY

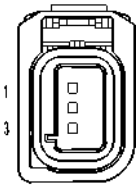
CAV	CIRCUIT	FUNCTION
1	R56 20LB/DG	PASSENGER SEAT BELT TENSIONER LINE 1
2	R54 20LB/YL	PASSENGER SEAT BELT TENSIONER LINE 2



SENSOR-
ACCELERATOR
PEDAL
POSITION

SENSOR-ACCELERATOR PEDAL POSITION - BLACK 6 WAY

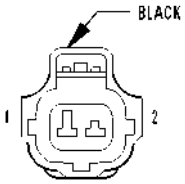
CAV	CIRCUIT	FUNCTION
1	F856 20YL/PK	5 VOLT SUPPLY
2	K29 20PK/RD	APPS NO. 2 SIGNAL
3	K400 20BR/VT	APPS NO. 2 RETURN
4	K4 20BR/LB	APPS NO. 1 RETURN
5	K23 20BR/WT	APPS NO. 1 SIGNAL
6	F855 20PK/YL	5 VOLT SUPPLY



SENSOR-
ADJUSTABLE
PEDALS

SENSOR-ADJUSTABLE PEDALS - 3 WAY

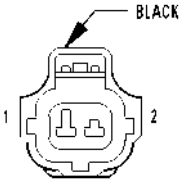
CAV	CIRCUIT	FUNCTION
1	G912 20VT/WT	ADJUSTABLE PEDALS SENSOR RETURN
2	G12 20VT/BR	ADJUSTABLE PEDALS SENSOR SIGNAL
3	G11 20VT/TN	ADJUSTABLE PEDALS SENSOR SUPPLY



SENSOR-
AMBIENT AIR
TEMPERATURE

SENSOR-AMBIENT AIR TEMPERATURE - BLACK 2 WAY

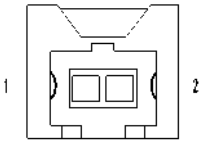
CAV	CIRCUIT	FUNCTION
1	G31 20VT/OR	AAT SIGNAL
2	G931 20VT/BR	SENSOR GROUND



SENSOR-
BATTERY
TEMPERATURE

SENSOR-BATTERY TEMPERATURE - BLACK 2 WAY

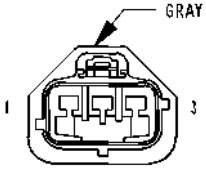
CAV	CIRCUIT	FUNCTION
1	K25 20DB/VT	BATT TEMP SIGNAL
2	K91 20DB/YL	BATT TEMP RETURN



SENSOR-
BRAKE
FLUID
LEVEL

SENSOR-BRAKE FLUID LEVEL - 2 WAY

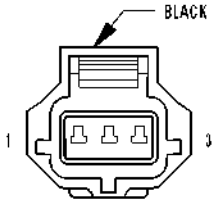
CAV	CIRCUIT	FUNCTION
1	B20 20DG/OR	BRAKE FLUID LEVEL SWITCH SENSE
2	Z420 20BK/OR	GROUND



SENSOR-
CAMSHAFT
POSITION

SENSOR-CAMSHAFT POSITION - GRAY 3 WAY

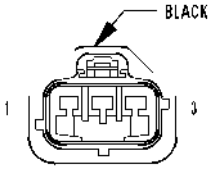
CAV	CIRCUIT	FUNCTION
1	K44 20TN/LB	CMP SIGNAL
2	K900 20DB/DG	SENSOR GROUND
3	F856 20YL/PK	5 VOLT SUPPLY



SENSOR-CRANKSHAFT POSITION (3.7L)

SENSOR-CRANKSHAFT POSITION (3.7L) - BLACK 3 WAY

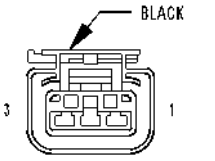
CAV	CIRCUIT	FUNCTION
1	K24 20VT/DG	CKP SIGNAL
2	K900 20DB/DG	SENSOR GROUND
3	F855 20PK/YL	5 VOLT SUPPLY



SENSOR-CRANKSHAFT POSITION (4.7L)

SENSOR-CRANKSHAFT POSITION (4.7L) - BLACK 3 WAY

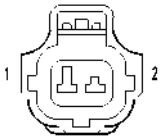
CAV	CIRCUIT	FUNCTION
1	K24 20VT/DG	CKP SIGNAL
2	K900 20DB/DG	SENSOR GROUND
3	F855 20PK/YL	5 VOLT SUPPLY



SENSOR-CRANKSHAFT POSITION (5.7L)

SENSOR-CRANKSHAFT POSITION (5.7L) - BLACK 3 WAY

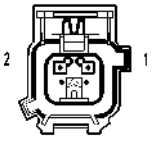
CAV	CIRCUIT	FUNCTION
1	F855 20PK/YL	5 VOLT SUPPLY
2	K900 20DB/DG	SENSOR GROUND
3	K24 20VT/DG	CKP SIGNAL



SENSOR-ENGINE COOLANT TEMPERATURE (3.7L/4.7L)

SENSOR-ENGINE COOLANT TEMPERATURE (3.7L/4.7L) - 2 WAY

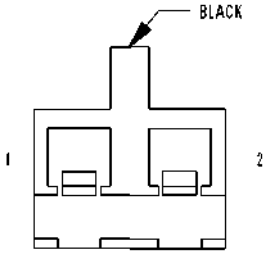
CAV	CIRCUIT	FUNCTION
1	K2 20LB/RD	ECT SIGNAL
2	K900 20DB/DG	SENSOR GROUND



SENSOR-ENGINE COOLANT TEMPERATURE (5.7L)

SENSOR-ENGINE COOLANT TEMPERATURE (5.7L) - 2 WAY

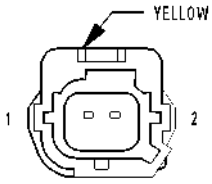
CAV	CIRCUIT	FUNCTION
1	K900 18DB/DG	SENSOR GROUND
2	K2 18VT/OR	ECT SIGNAL



SENSOR-EVAPORATOR TEMPERATURE

SENSOR-EVAPORATOR TEMPERATURE - BLACK 2 WAY

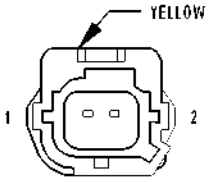
CAV	CIRCUIT	FUNCTION
1	C21 20DB/LG	EVAPORATOR TEMPERATURE SENSOR SIGNAL
2	C121 20DB/DG	SENSOR GROUND



SENSOR-FRONT IMPACT-LEFT

SENSOR-FRONT IMPACT-LEFT - YELLOW 2 WAY

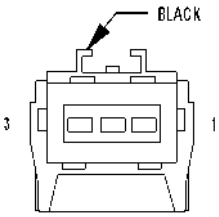
CAV	CIRCUIT	FUNCTION
1	R81 20LB/WT	LEFT FRONT IMPACT SENSOR GROUND
2	R79 20LB/VT	LEFT FRONT IMPACT SENSOR SIGNAL



SENSOR-FRONT IMPACT-RIGHT

SENSOR-FRONT IMPACT-RIGHT - YELLOW 2 WAY

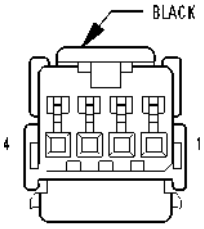
CAV	CIRCUIT	FUNCTION
1	R82 20WT/LB	RIGHT FRONT IMPACT SENSOR GROUND
2	R80 20VT/LB	RIGHT FRONT IMPACT SENSOR SIGNAL



SENSOR-G

SENSOR-G - BLACK 3 WAY

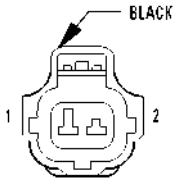
CAV	CIRCUIT	FUNCTION
1	B924 20DG/LB	G-SENSOR RETURN
2	B23 20DG/YL	G-SENSOR SIGNAL
3	B24 20DG/OR	G-SENSOR SUPPLY



SENSOR-
INFRARED

SENSOR-INFRARED - BLACK 4 WAY

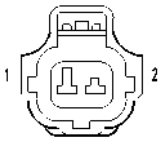
CAV	CIRCUIT	FUNCTION
1	F21 20PK/DG	FUSED IGNITION SWITCH OUTPUT (RUN-START)
2	-	-
3	C83 20DB/LG	INFRARED SENSOR SIGNAL
4	Z957 20BK	GROUND



SENSOR-
INPUT
SPEED

SENSOR-INPUT SPEED - BLACK 2 WAY

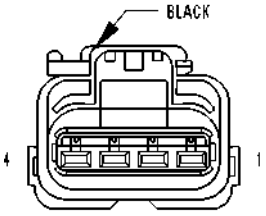
CAV	CIRCUIT	FUNCTION
1	T52 20VT/OR	INPUT SPEED SENSOR SIGNAL
2	T13 20DG/VT	SPEED SENSOR GROUND



SENSOR-
INTAKE AIR
TEMPERATURE

SENSOR-INTAKE AIR TEMPERATURE - 2 WAY

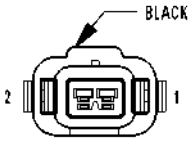
CAV	CIRCUIT	FUNCTION
1	K21 20BR/WT (3.7L/4.7L)	IAT SIGNAL
1	K900 18DB/DG (5.7L)	SENSOR GROUND
2	K900 20DB/DG (3.7L/4.7L)	SENSOR GROUND
2	K21 18DB/LG (5.7L)	IAT SIGNAL



SENSOR-
KNOCK
(3.7L/4.7L)

SENSOR-KNOCK (3.7L/4.7L) - BLACK 4 WAY

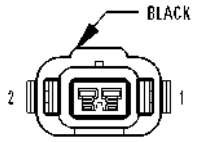
CAV	CIRCUIT	FUNCTION
1	K42 20DB/OR	KNOCK SENSOR NO. 1 SIGNAL
2	K942 20YL/DG	KNOCK SENSOR NO. 1 RETURN
3	K242 20DB/OR	KNOCK SENSOR NO. 2 SIGNAL
4	K924 20DG/RD	KNOCK SENSOR NO. 2 RETURN



SENSOR-
KNOCK NO. 1
(5.7L)

SENSOR-KNOCK NO. 1 (5.7L) - BLACK 2 WAY

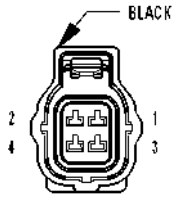
CAV	CIRCUIT	FUNCTION
1	K42 20DB/OR	KNOCK SENSOR NO. 1 SIGNAL
2	K942 20YL/DG	KNOCK SENSOR NO. 1 RETURN



SENSOR-KNOCK NO. 2 (5.7L)

SENSOR-KNOCK NO. 2 (5.7L) - BLACK 2 WAY

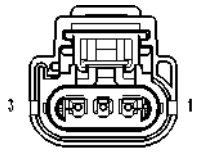
CAV	CIRCUIT	FUNCTION
1	K242 20DB/OR	KNOCK SENSOR NO. 2 SIGNAL
2	K924 20DG/RD	KNOCK SENSOR NO. 2 RETURN



SENSOR-LINE PRESSURE (4.7L/5.7L)

SENSOR-LINE PRESSURE (4.7L/5.7L) - BLACK 4 WAY

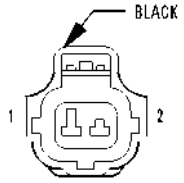
CAV	CIRCUIT	FUNCTION
1	K900 20DB/DG	SENSOR GROUND
2	F856 20YL/PK	5 VOLT SUPPLY
3	T38 20YL/BR	LINE PRESSURE SENSOR SIGNAL
4	-	-



SENSOR-MAP

SENSOR-MAP - 3 WAY

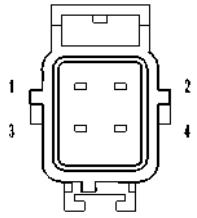
CAV	CIRCUIT	FUNCTION
1	K1 20VT/BR (3.7L/4.7L)	MAP SIGNAL
1	K1 18VT/BR (5.7L)	MAP SIGNAL
2	K900 20DB/DG (3.7L/4.7L)	SENSOR GROUND
2	K900 18DB/DG (5.7L)	SENSOR GROUND
3	F856 20YL/PK (3.7L/4.7L)	5 VOLT SUPPLY
3	F856 18YL/PK (5.7L)	5 VOLT SUPPLY



SENSOR-OUTPUT SPEED

SENSOR-OUTPUT SPEED - BLACK 2 WAY

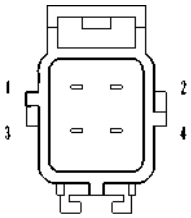
CAV	CIRCUIT	FUNCTION
1	T14 20DG/BR	OUTPUT SPEED SENSOR SIGNAL
2	T13 20DG/VT	SPEED SENSOR GROUND



SENSOR-OXYGEN-LEFT FRONT (3.7L/5.7L)

SENSOR-OXYGEN-LEFT FRONT (3.7L/5.7L) - 4 WAY

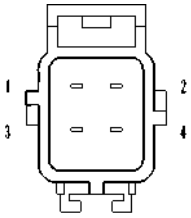
CAV	CIRCUIT	FUNCTION
1	K99 20LB/WT	O2 1/1 HEATER CONTROL
2	Z43 20BK/LB	GROUND
3	K902 20BR/DG	O2 RETURN (UPSTREAM)
4	K41 20DB/LB	O2 1/1 SIGNAL



SENSOR-OXYGEN-LEFT FRONT (4.7L)

SENSOR-OXYGEN-LEFT FRONT (4.7L) - 4 WAY

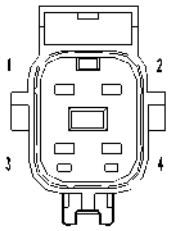
CAV	CIRCUIT	FUNCTION
1	K99 20LB/WT	O2 1/1 HEATER CONTROL
2	Z43 20BK/LB	GROUND
3	K902 20BR/DG	O2 RETURN (UPSTREAM)
4	K41 20DB/LB	O2 1/1 SIGNAL



SENSOR-OXYGEN-LEFT REAR (3.7L)

SENSOR-OXYGEN-LEFT REAR (3.7L) - 4 WAY

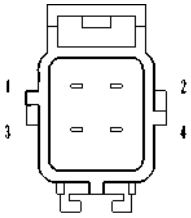
CAV	CIRCUIT	FUNCTION
1	K299 20DG/RD	O2 1/2 HEATER CONTROL
2	Z42 20BK/LG	GROUND
3	K904 20DB/DG	O2 RETURN (DOWNSTREAM)
4	K141 20VT/DG	02 1/2 SIGNAL



SENSOR-OXYGEN-LEFT REAR (4.7L/5.7L)

SENSOR-OXYGEN-LEFT REAR (4.7L/5.7L) - 4 WAY

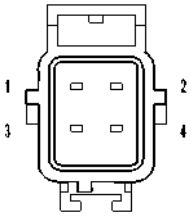
CAV	CIRCUIT	FUNCTION
1	K299 20DG/RD	O2 1/2 HEATER CONTROL
2	Z42 20BK/LG	GROUND
3	K904 20DB/DG	O2 RETURN (DOWNSTREAM)
4	K141 20VT/DG	02 1/2 SIGNAL



SENSOR-OXYGEN-RIGHT FRONT (4.7L)

SENSOR-OXYGEN-RIGHT FRONT (4.7L) - 4 WAY

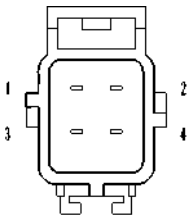
CAV	CIRCUIT	FUNCTION
1	K199 20GY/LB	O2 2/1 HEATER CONTROL
2	Z934 20BK	GROUND
3	K902 20BR/DG	O2 RETURN (UPSTREAM)
4	K43 20DB/LG	O2 2/1 SIGNAL



SENSOR-
OXYGEN-
RIGHT
FRONT
(3.7L/5.7L)

SENSOR-OXYGEN-RIGHT FRONT (3.7L/5.7L) - 4 WAY

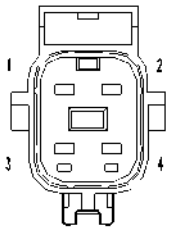
CAV	CIRCUIT	FUNCTION
1	K199 20GY/LB	O2 2/1 HEATER CONTROL
2	Z934 20BK	GROUND
3	K902 20BR/DG	O2 RETURN (UPSTREAM)
4	K43 20DB/LG	O2 2/1 SIGNAL



SENSOR-
OXYGEN-
RIGHT
REAR
(4.7L)

SENSOR-OXYGEN-RIGHT REAR (4.7L) - 4 WAY

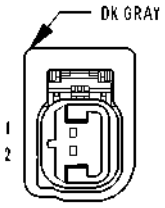
CAV	CIRCUIT	FUNCTION
1	K399 20TN/WT	O2 2/2 HEATER CONTROL
2	Z992 20BK	GROUND
3	K904 20DB/DG	O2 RETURN (DOWNSTREAM)
4	K243 20BR	O2 2/2 SIGNAL



SENSOR-
OXYGEN-
RIGHT
REAR
(3.7L/5.7L)

SENSOR-OXYGEN-RIGHT REAR (3.7L/5.7L) - 4 WAY

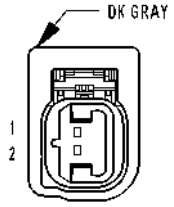
CAV	CIRCUIT	FUNCTION
1	K399 20TN/WT	O2 2/2 HEATER CONTROL
2	Z992 20BK	GROUND
3	K904 20DB/DG	O2 RETURN (DOWNSTREAM)
4	K243 20BR	O2 2/2 SIGNAL



SENSOR-
SEAT
TRACK
POSITION-
DRIVER

SENSOR-SEAT TRACK POSITION-DRIVER - DK GRAY 2 WAY

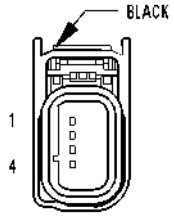
CAV	CIRCUIT	FUNCTION
1	R261 20LB/WT	DRIVER SEAT POSITION SENSOR DATA
2	R263 20LB/VT	DRIVER SEAT POSITION SENSOR VOLTAGE



**SENSOR-
SEAT
TRACK
POSITION-
PASSENGER**

SENSOR-SEAT TRACK POSITION-PASSENGER - DK GRAY 2 WAY

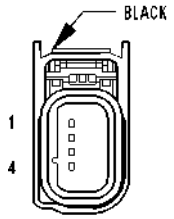
CAV	CIRCUIT	FUNCTION
1	R262 20WT/LB	PASSENGER SEAT POSITION SENSOR DATA
2	R264 20VT/LB	PASSENGER SEAT POSITION SENSOR VOLTAGE



**SENSOR-
SEAT
WEIGHT-
LEFT
FRONT**

SENSOR-SEAT WEIGHT-LEFT FRONT - BLACK 4 WAY

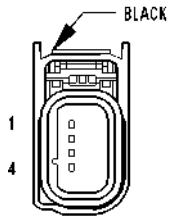
CAV	CIRCUIT	FUNCTION
1	R701 20LG	SEAT WEIGHT SENSOR 5 VOLTS
2	R728 20LB/YL	SEAT WEIGHT SENSOR GROUND
3	-	-
4	R717 20LG/DG	SEAT WEIGHT LEFT FRONT SENSOR SIGNAL



**SENSOR-
SEAT
WEIGHT-
LEFT
REAR**

SENSOR-SEAT WEIGHT-LEFT REAR - BLACK 4 WAY

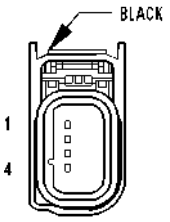
CAV	CIRCUIT	FUNCTION
1	R701 20LG	SEAT WEIGHT SENSOR 5 VOLTS
2	R728 20LB/YL	SEAT WEIGHT SENSOR GROUND
3	-	-
4	R705 20LG/OR	SEAT WEIGHT LEFT REAR SENSOR SIGNAL



**SENSOR-
SEAT
WEIGHT-
RIGHT
FRONT**

SENSOR-SEAT WEIGHT-RIGHT FRONT - BLACK 4 WAY

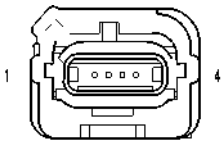
CAV	CIRCUIT	FUNCTION
1	R701 20LG	SEAT WEIGHT SENSOR 5 VOLTS
2	R728 20LB/YL	SEAT WEIGHT SENSOR GROUND
3	-	-
4	R718 20LB/DG	SEAT WEIGHT RIGHT FRONT SENSOR SIGNAL



SENSOR-SEAT WEIGHT-RIGHT REAR

SENSOR-SEAT WEIGHT-RIGHT REAR - BLACK 4 WAY

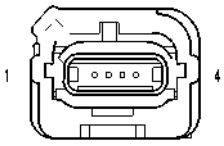
CAV	CIRCUIT	FUNCTION
1	R701 20LG	SEAT WEIGHT SENSOR 5 VOLTS
2	R728 20LB/YL	SEAT WEIGHT SENSOR GROUND
3	-	-
4	R706 20LB/OR	SEAT WEIGHT RIGHT REAR SENSOR SIGNAL



SENSOR-SIDE IMPACT-LEFT 1

SENSOR-SIDE IMPACT-LEFT 1 - 4 WAY

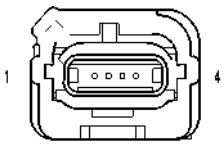
CAV	CIRCUIT	FUNCTION
1	R13 20LG/BR	LEFT SIDE IMPACT SENSOR 1 SIGNAL
2	R15 20BR/GY	LEFT SIDE IMPACT SENSOR 1 GROUND
3	R19 20LG/WT	LEFT SIDE IMPACT SENSOR 2 GROUND
4	R17 20LG	LEFT SIDE IMPACT SENSOR 2 SIGNAL



SENSOR-SIDE IMPACT-LEFT 2

SENSOR-SIDE IMPACT-LEFT 2 - 4 WAY

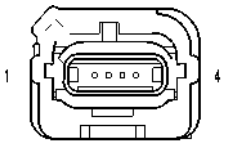
CAV	CIRCUIT	FUNCTION
1	R17 20LG	LEFT SIDE IMPACT SENSOR 2 SIGNAL
2	R19 20LG/WT	LEFT SIDE IMPACT SENSOR 2 GROUND
3	R23 20LB/DB	LEFT SIDE IMPACT SENSOR 3 GROUND
4	R21 20LB/WT	LEFT SIDE IMPACT SENSOR 3 SIGNAL



SENSOR-SIDE IMPACT-LEFT 3

SENSOR-SIDE IMPACT-LEFT 3 - 4 WAY

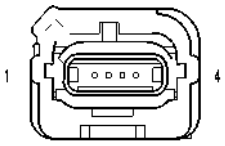
CAV	CIRCUIT	FUNCTION
1	R21 20LB/WT	LEFT SIDE IMPACT SENSOR 3 SIGNAL
2	R23 20LB/DB	LEFT SIDE IMPACT SENSOR 3 GROUND
3	-	-
4	-	-



SENSOR-SIDE IMPACT-RIGHT 1

SENSOR-SIDE IMPACT-RIGHT 1 - 4 WAY

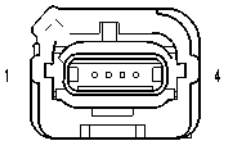
CAV	CIRCUIT	FUNCTION
1	R14 20TN/LG	RIGHT SIDE IMPACT SENSOR 1 SIGNAL
2	R16 20BR/LG	RIGHT SIDE IMPACT SENSOR 1 GROUND
3	R20 20WT/LG	RIGHT SIDE IMPACT SENSOR 2 GROUND
4	R18 20LB	RIGHT SIDE IMPACT SENSOR 2 SIGNAL



SENSOR-SIDE IMPACT-RIGHT 2

SENSOR-SIDE IMPACT-RIGHT 2 - 4 WAY

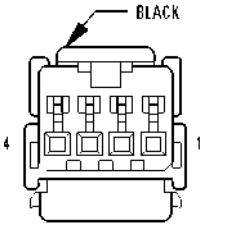
CAV	CIRCUIT	FUNCTION
1	R18 20LB	RIGHT SIDE IMPACT SENSOR 2 SIGNAL
2	R20 20WT/LG	RIGHT SIDE IMPACT SENSOR 2 GROUND
3	R24 20YL/LB	RIGHT SIDE IMPACT SENSOR 3 GROUND
4	R22 20WT/LB	RIGHT SIDE IMPACT SENSOR 3 SIGNAL



SENSOR-SIDE IMPACT-RIGHT 3

SENSOR-SIDE IMPACT-RIGHT 3 - 4 WAY

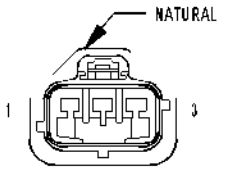
CAV	CIRCUIT	FUNCTION
1	R22 20WT/LB	RIGHT SIDE IMPACT SENSOR 3 SIGNAL
2	R24 20YL/LB	RIGHT SIDE IMPACT SENSOR 3 GROUND
3	-	-
4	-	-



SENSOR-SUN

SENSOR-SUN - BLACK 4 WAY

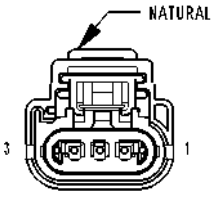
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	G939 20VT/DB	SUN SENSOR RETURN
4	G39 20VT/OR	SUN SENSOR SIGNAL



SENSOR-THROTTLE POSITION (4.7L)

SENSOR-THROTTLE POSITION (4.7L) - NATURAL 3 WAY

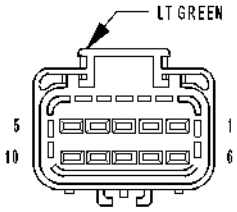
CAV	CIRCUIT	FUNCTION
1	F855 20PK/YL	5 VOLT SUPPLY
2	K22 20YL/DG	TP NO. 1 SIGNAL
3	K900 20DB/DG	SENSOR GROUND



SENSOR-THROTTLE POSITION (3.7L)

SENSOR-THROTTLE POSITION (3.7L) - NATURAL 3 WAY

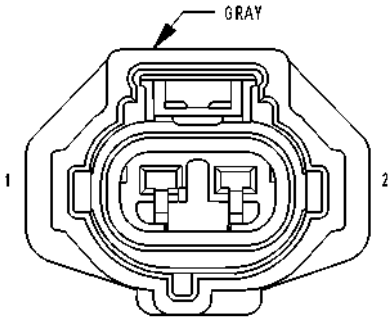
CAV	CIRCUIT	FUNCTION
1	F855 20PK/YL	5 VOLT SUPPLY
2	K900 20DB/DG	SENSOR GROUND
3	K22 20YL/DG	TP NO. 1 SIGNAL



SENSOR-TRANSMISSION RANGE (3.7L)

SENSOR-TRANSMISSION RANGE (3.7L) - LT GREEN 10 WAY

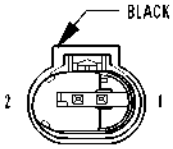
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	K900 20DB/DG	SENSOR GROUND
4	T54 20BR/RD	TRANSMISSION TEMPERATURE SENSOR SIGNAL
5	-	-
6	-	-
7	T1 20BR/DB	TRS T1 SENSE
8	T3 20DG/DB	TRS T3 SENSE
9	T42 20DG/YL	TRS T42 SENSE
10	T41 20YL/DB	TRS (T41) SENSE (P/N SENSE)



SENSOR-WASHER FLUID LEVEL-FRONT REAR

SENSOR-WASHER FLUID LEVEL-FRONT REAR - GRAY 2 WAY

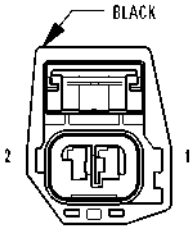
CAV	CIRCUIT	FUNCTION
1	G180 20VT/YL	FCM SENSOR RETURN
2	W1 20BR/TN	FRONT WASHER PUMP MOTOR CONTROL



SENSOR-WHEEL SPEED-ABS-LEFT FRONT

SENSOR-WHEEL SPEED-ABS-LEFT FRONT - BLACK 2 WAY

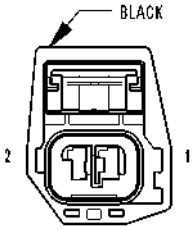
CAV	CIRCUIT	FUNCTION
1	B8 20DG/TN	LEFT FRONT WHEEL SPEED SENSOR (+)
2	B9 20DG/LG	LEFT FRONT WHEEL SPEED SENSOR (-)



SENSOR-WHEEL SPEED-ABS-LEFT REAR

SENSOR-WHEEL SPEED-ABS-LEFT REAR - BLACK 2 WAY

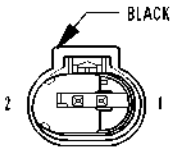
CAV	CIRCUIT	FUNCTION
1	B3 18DG/YL	REAR WHEEL SPEED SENSOR (-)
2	B4 18LG/GY	REAR WHEEL SPEED SENSOR (+)



SENSOR-WHEEL SPEED-ABS-REAR

SENSOR-WHEEL SPEED-ABS-REAR - BLACK 2 WAY

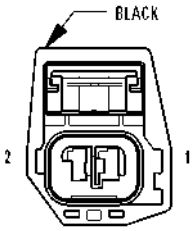
CAV	CIRCUIT	FUNCTION
1	B22 20DG/YL	REAR WHEEL SPEED SENSOR (-)
2	B222 20DG/WT	REAR WHEEL SPEED SENSOR (+)



SENSOR-WHEEL SPEED-ABS-RIGHT FRONT

SENSOR-WHEEL SPEED-ABS-RIGHT FRONT - BLACK 2 WAY

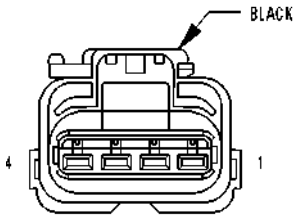
CAV	CIRCUIT	FUNCTION
1	B6 20DG/WT	RIGHT FRONT WHEEL SPEED SENSOR (-)
2	B7 20DG/VT	RIGHT FRONT WHEEL SPEED SENSOR (+)



SENSOR-WHEEL SPEED-ABS-RIGHT REAR

SENSOR-WHEEL SPEED-ABS-RIGHT REAR - BLACK 2 WAY

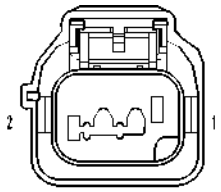
CAV	CIRCUIT	FUNCTION
1	B1 18DG/DB	RIGHT REAR WHEEL SPEED SENSOR SIGNAL
2	B2 18DG/LB	BRAKE FLUID LEVEL SWITCH SENSE



SERVO-
SPEED
CONTROL

SERVO-SPEED CONTROL - BLACK 4 WAY

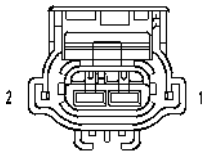
CAV	CIRCUIT	FUNCTION
1	V36 20VT/YL	S/C VACUUM SOL CONTROL
2	V35 20VT/OR	S/C VENT SOL CONTROL
3	V30 20VT/WT	S/C BRAKE SWITCH OUTPUT
4	Z155 20BK/LG	GROUND



SOLENOID-
BRAKE TRANSMISSION
SHIFT INTERLOCK

SOLENOID-BRAKE TRANSMISSION SHIFT INTERLOCK - 2 WAY

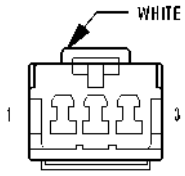
CAV	CIRCUIT	FUNCTION
1	B30 20DG/OR	BTSI SOLENOID CONTROL
2	Z101 20BK/VT	GROUND



SOLENOID-
EVAP/
PURGE

SOLENOID-EVAP/PURGE - 2 WAY

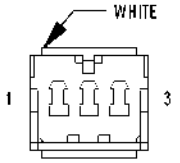
CAV	CIRCUIT	FUNCTION
1	K70 20DB/BR	EVAP PURGE SOL CONTROL
2	K52 20DB/WT	EVAP PURGE SOL SIGNAL



SPEAKER-
LEFT
FRONT
DOOR

SPEAKER-LEFT FRONT DOOR - WHITE 3 WAY

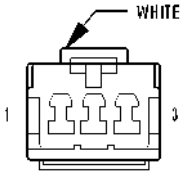
CAV	CIRCUIT	FUNCTION
1	X53 20DG (EXCEPT PREMIUM)	LEFT FRONT SPEAKER (+)
1	X201 16GY/VT (PREMIUM)	AMPLIFIED LEFT FRONT DOOR SPEAKER (+)
2	-	-
3	X55 20DG/BR (EXCEPT PREMIUM)	LEFT FRONT SPEAKER (-)
3	X291 16GY/YL (PREMIUM)	AMPLIFIED LEFT FRONT DOOR SPEAKER (-)



SPEAKER-LEFT REAR DOOR

SPEAKER-LEFT REAR DOOR - WHITE 3 WAY

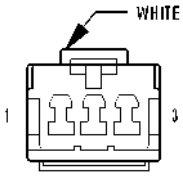
CAV	CIRCUIT	FUNCTION
1	X51 20DG/DB (EXCEPT PREMIUM)	RADIO-LEFT AUDIO (+)
1	X205 18LG/PK (PREMIUM)	AMPLIFIED LEFT REAR DOOR SPEAKER (+)
2	-	-
3	X57 20DG/OR (EXCEPT PREMIUM)	RADIO-LEFT AUDIO (-)
3	X295 18GY/DG (PREMIUM)	AMPLIFIED LEFT REAR DOOR SPEAKER (-)



SPEAKER-RIGHT FRONT DOOR

SPEAKER-RIGHT FRONT DOOR - WHITE 3 WAY

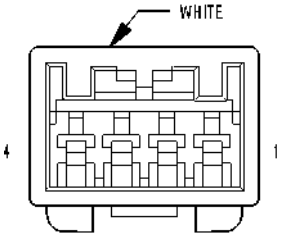
CAV	CIRCUIT	FUNCTION
1	X54 20GY (EXCEPT PREMIUM)	RIGHT FRONT SPEAKER (+)
1	X202 20DG/VT (PREMIUM)	AMPLIFIED RIGHT FRONT DOOR SPEAKER (+)
2	-	-
3	X56 20GY/BR (EXCEPT PREMIUM)	RIGHT FRONT SPEAKER (-)
3	X292 20DG/YL (PREMIUM)	AMPLIFIED RIGHT FRONT DOOR SPEAKER (-)



SPEAKER-RIGHT REAR DOOR

SPEAKER-RIGHT REAR DOOR - WHITE 3 WAY

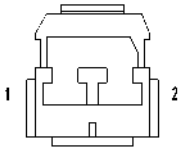
CAV	CIRCUIT	FUNCTION
1	X52 20GY/DB (EXCEPT PREMIUM)	RADIO-RIGHT AUDIO (+)
1	X206 20DG/LG (PREMIUM)	AMPLIFIED RIGHT REAR DOOR SPEAKER (+)
2	-	-
3	X58 20GY/OR (EXCEPT PREMIUM)	RADIO-RIGHT AUDIO (-)
3	X296 20LG/GY (PREMIUM)	AMPLIFIED RIGHT REAR DOOR SPEAKER (-)



SPEAKER-SUBWOOFER (PREMIUM)

SPEAKER-SUBWOOFER (PREMIUM) - WHITE 4 WAY

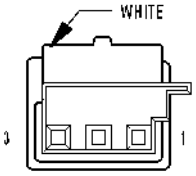
CAV	CIRCUIT	FUNCTION
1	X300 18GY/BR	AMPLIFIED SUBWOOFER 1 (+)
2	X390 18DG/BR	AMPLIFIED SUBWOOFER 1 (-)
3	X301 18GY/WT	AMPLIFIED SUBWOOFER 2 (+)
4	X391 18DG/WT	AMPLIFIED SUBWOOFER 2 (-)



SPEAKER-TWEETER-LEFT FRONT (PREMIUM)

SPEAKER-TWEETER-LEFT FRONT (PREMIUM) - 2 WAY

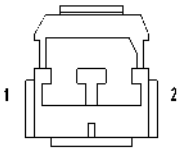
CAV	CIRCUIT	FUNCTION
1	X209 20GY/OR	AMPLIFIED LEFT I/P SPEAKER (+)
2	X299 20GY/YL	AMPLIFIED LEFT I/P SPEAKER (-)



SPEAKER-TWEETER-LEFT REAR (PREMIUM)

SPEAKER-TWEETER-LEFT REAR (PREMIUM) - WHITE 3 WAY

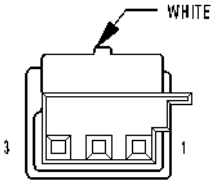
CAV	CIRCUIT	FUNCTION
1	X205 18LG/PK	AMPLIFIED LEFT REAR DOOR SPEAKER (+)
2	-	-
3	X295 18GY/DG	AMPLIFIED LEFT REAR DOOR SPEAKER (-)



SPEAKER-TWEETER-RIGHT FRONT (PREMIUM)

SPEAKER-TWEETER-RIGHT FRONT (PREMIUM) - 2 WAY

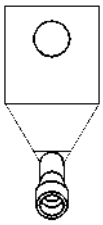
CAV	CIRCUIT	FUNCTION
1	X208 20GY/DG	AMPLIFIED RIGHT I/P SPEAKER (+)
2	X298 20GY/LG	AMPLIFIED RIGHT I/P SPEAKER (-)



SPEAKER-TWEETER-RIGHT REAR (PREMIUM)

SPEAKER-TWEETER-RIGHT REAR (PREMIUM) - WHITE 3 WAY

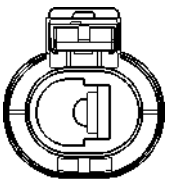
CAV	CIRCUIT	FUNCTION
1	X206 20DG/LG	AMPLIFIED RIGHT REAR DOOR SPEAKER (+)
2	-	-
3	X296 20LG/GY	AMPLIFIED RIGHT REAR DOOR SPEAKER (-)



STARTER (3.7L)

STARTER (3.7L) - 1 WAY

CAV	CIRCUIT	FUNCTION
A1	A1 04RD	B(+)



STARTER

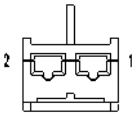
STARTER - 1 WAY

CAV	CIRCUIT	FUNCTION
B1	T750 14GY/YL	ENGINE STARTER MOTOR RELAY OUTPUT

STARTER (4.7L/5.7L)

STARTER - 1 WAY

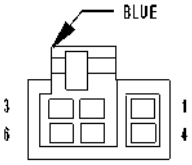
CAV	CIRCUIT	FUNCTION
A1	A1 06RD	B(+)



SWITCH AND LAMP- GLOVE BOX

SWITCH AND LAMP-GLOVE BOX - 2 WAY

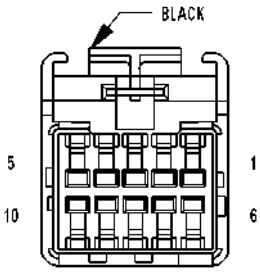
CAV	CIRCUIT	FUNCTION
1	M28 20YL/TN	GLOVE BOX LAMP DRIVER
2	Z328 20BK/TN	GROUND



SWITCH- ADJUSTABLE PEDALS

SWITCH-ADJUSTABLE PEDALS - BLUE 6 WAY

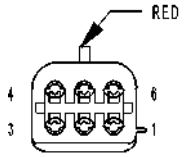
CAV	CIRCUIT	FUNCTION
1	P205 18LG/DB (EXCEPT MEMORY)	ADJUSTABLE PEDALS MOTOR FORWARD
1	Q100 20OR/WT (MEMORY)	ADJUSTABLE PEDALS SWITCH REARWARD
2	A85 18RD/LB (EXCEPT MEMORY)	ADJUSTABLE PEDALS RELAY OUTPUT
2	Z146 20BK/LB (MEMORY)	GROUND
3	-	-
4	Z146 20BK/LB (EXCEPT MEMORY)	GROUND
5	-	-
6	P206 18LG/TN (EXCEPT MEMORY)	ADJUSTABLE PEDALS MOTOR REARWARD
6	Q900 20OR/BK (MEMORY)	ADJUSTABLE PEDALS MOTOR FORWARD



SWITCH- HEADLAMP

SWITCH-HEADLAMP - BLACK 10 WAY

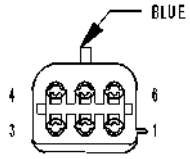
CAV	CIRCUIT	FUNCTION
1	L307 20PK/RD	HEADLAMP SWITCH MUX
2	E2 20OR/BR	PANEL LAMPS DRIVER
3	L900 20WT/YL	HEADLAMP SWITCH MUX RETURN
4	E19 20OR/BR	ILT-DIMMING HEADLAMP SWITCH
5	Z942 20BK	GROUND
6	-	-
7	-	-
8	-	-
9	-	-
10	-	-



SWITCH-
HEATED
SEAT-
DRIVER

SWITCH-HEATED SEAT-DRIVER - RED 6 WAY

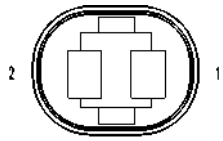
CAV	CIRCUIT	FUNCTION
1	P81 20TN/OR	DRIVER HEATED SEAT LOW INDICATOR DRIVER
2	E33 20OR	ILT-DIMMING CENTER BEZEL/HEATED SEAT SWITCHES
3	Z968 20BK	GROUND
4	F21 20PK/DG	FUSED IGNITION SWITCH OUTPUT (RUN-START)
5	P83 20TN/WT	DRIVER HEATED SEAT HIGH INDICATOR DRIVER
6	P7 20LG/YL	DRIVER HEATED SEAT SWITCH MUX



SWITCH-
HEATED
SEAT-
PASSENGER

SWITCH-HEATED SEAT-PASSENGER - BLUE 6 WAY

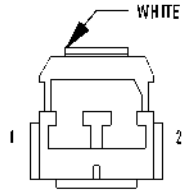
CAV	CIRCUIT	FUNCTION
1	P82 20TN/LB	PASSENGER HEATED SEAT LOW INDICATOR DRIVER
2	E33 20OR	ILT-DIMMING CENTER BEZEL/HEATED SEAT SWITCHES
3	Z978 20BK	GROUND
4	F21 20PK/DG	FUSED IGNITION SWITCH OUTPUT (RUN-START)
5	P84 20TN/DG	PASSENGER HEATED SEAT HIGH INDICATOR DRIVER
6	P8 20LG/DG	PASSENGER HEATED SEAT SWITCH MUX



SWITCH-
HOOD
AJAR

SWITCH-HOOD AJAR - 2 WAY

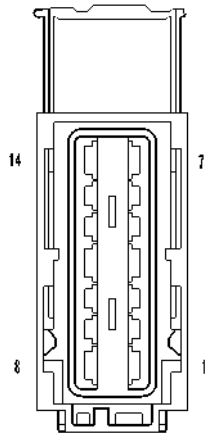
CAV	CIRCUIT	FUNCTION
1	G70 20VT/LB	HOOD AJAR SWITCH SENSE
2	Z926 20BK	GROUND



SWITCH-
HORN

SWITCH-HORN - WHITE 2 WAY

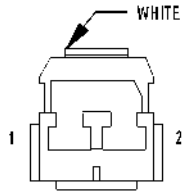
CAV	CIRCUIT	FUNCTION
1	X3 20DG/VT	HORN SWITCH SENSE
2	-	-



SWITCH-
IGNITION

SWITCH-IGNITION - BLACK 14 WAY

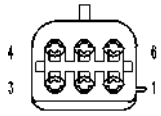
CAV	CIRCUIT	FUNCTION
1	G121 18VT	IGNITION SWITCH OUTPUT RUN SENSE
2	F901 14PK	IGNITION SWITCH OUTPUT (OFF-RUN-START)
3	F941 14PK/LG	IGNITION SWITCH OUTPUT (RUN-START)
4	A923 14RD/OR	FUSED B(+)
5	G15 20VT/TN	KEY-IN IGNITION SWITCH SENSE
6	Z943 20BK	GROUND
7	A917 12RD/DB	FUSED B(+)
8	Z932 18BK	GROUND
9	F984 14PK/TN	IGNITION SWITCH OUTPUT (RUN-ACC)
10	F983 16PK/VT	IGNITION SWITCH OUTPUT (RUN-ACC)
11	A904 14RD/GY	FUSED B(+)
12	A953 16RD/YL	FUSED B(+)
13	F961 14PK/LB	IGNITION SWITCH OUTPUT (START)
14	F921 12PK/YL	IGNITION SWITCH OUTPUT (RUN)



SWITCH-
LIFTGATE
AJAR

SWITCH-LIFTGATE AJAR - WHITE 2 WAY

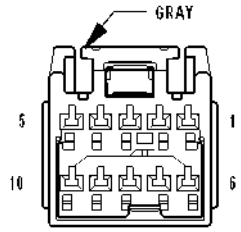
CAV	CIRCUIT	FUNCTION
1	Z922 20BK/PK	GROUND
2	G78 20VT/OR	LIFTGATE AJAR SWITCH SENSE



SWITCH-
MEMORY
SELECTOR

SWITCH-MEMORY SELECTOR - 6 WAY

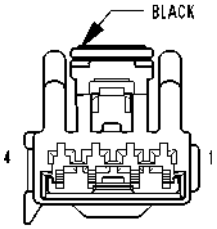
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	-	-
4	-	-
5	P339 20LG/DB	MEMORY SELECT SWITCH MUX
6	G920 20VT/YL	MEMORY SELECT SWITCH RETURN



SWITCH-
MIRROR

SWITCH-MIRROR - GRAY 10 WAY

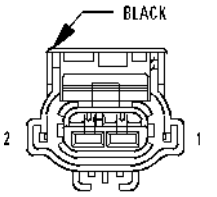
CAV	CIRCUIT	FUNCTION
1	-	-
2	F30 16PK/YL	FUSED ACCESSORY DELAY RELAY OUTPUT
3	P76 20TN/LB (EXCEPT MEMORY)	MIRROR COMMON DRIVER
3	P710 20LG (MEMORY)	MIRROR COMMON SWITCH SENSE
4	Z13 20BK/WT (EXCEPT MEMORY)	GROUND
4	P950 20DB/RD (MEMORY)	MIRROR SWITCH RETURN
5	A215 20RD/LG (EXCEPT MEMORY)	FUSED B(+)
5	P550 20DB/WT (MEMORY)	MIRROR SWITCH SUPPLY
6	P72 20TN/GY (EXCEPT MEMORY)	PASSENGER MIRROR VERTICAL DRIVER
6	P706 20LG/GY (MEMORY)	MIRROR VERTICAL UP SWITCH SENSE
7	P71 20TN/DG (EXCEPT MEMORY)	DRIVER MIRROR VERTICAL DRIVER
7	P705 20LG/OR (MEMORY)	MIRROR VERTICAL DOWN SWITCH SENSE
8	P74 20TN/OR (EXCEPT MEMORY)	PASSENGER MIRROR HORIZONTAL DRIVER
8	P704 20LG/TN (MEMORY)	MIRROR HORIZONTAL RIGHT SWITCH SENSE
9	P75 20TN/LG (EXCEPT MEMORY)	DRIVER MIRROR HORIZONTAL DRIVER
9	P703 20DB/LG (MEMORY)	MIRROR HORIZONTAL LEFT SWITCH SENSE
10	-	-



SWITCH-
MULTIFUNCTION

SWITCH-MULTIFUNCTION - BLACK 4 WAY

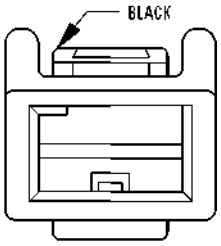
CAV	CIRCUIT	FUNCTION
1	G194 20VT/RD	HIGH BEAM/FRONT WASHER SWITCH MUX
2	G902 20VT/BR	SWITCH MUX RETURN
3	L12 20WT/DB	TURN SIGNAL INPUT MUX
4	W52 20BR/YL	FRONT WIPER SWITCH MUX



SWITCH-OIL
PRESSURE

SWITCH-OIL PRESSURE - BLACK 2 WAY

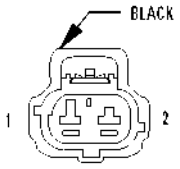
CAV	CIRCUIT	FUNCTION
1	G6 18VT/GY	ENGINE OIL PRESSURE SIGNAL
2	-	-



SWITCH-
PARKING
BRAKE

SWITCH-PARKING BRAKE - BLACK 1 WAY

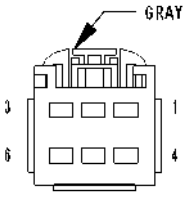
CAV	CIRCUIT	FUNCTION
1	B25 20DG/WT	PARK BRAKE SWITCH SENSE



SWITCH-
POWER
STEERING
PRESSURE
(5.7L)

SWITCH-POWER STEERING PRESSURE (5.7L) - BLACK 2 WAY

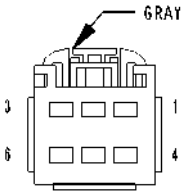
CAV	CIRCUIT	FUNCTION
1	Z988 20BK	GROUND
2	K66 20DB/WT	P/S PRESSURE SWITCH SIGNAL



SWITCH-
POWER
WINDOW-
LEFT
REAR

SWITCH-POWER WINDOW-LEFT REAR - GRAY 6 WAY

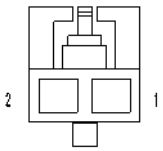
CAV	CIRCUIT	FUNCTION
1	Q611 14DB/PK	LEFT REAR WINDOW DRIVER (DOWN)
2	Q211 14TN/LB	DRIVER REAR WINDOW DRIVER (DOWN)
3	Q111 14TN/YL	DRIVER REAR WINDOW DRIVER (UP)
4	Q411 14DB/LG	LEFT REAR WINDOW DRIVER (UP)
5	-	-
6	Q15 14OR/LB	POWER WINDOW SWITCH FEED



SWITCH-
POWER
WINDOW-
RIGHT
REAR

SWITCH-POWER WINDOW-RIGHT REAR - GRAY 6 WAY

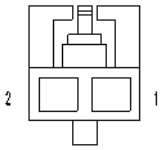
CAV	CIRCUIT	FUNCTION
1	Q612 14DB/OR	RIGHT REAR WINDOW DRIVER (DOWN)
2	Q212 14TN/DG	PASSENGER REAR WINDOW DRIVER (DOWN)
3	Q112 14VT/TN	PASSENGER REAR WINDOW DRIVER (UP)
4	Q412 14TN/WT	RIGHT REAR WINDOW DRIVER (UP)
5	-	-
6	Q15 14OR/LB	POWER WINDOW SWITCH FEED



SWITCH-
REMOTE
RADIO-
LEFT

SWITCH-REMOTE RADIO-LEFT - 2 WAY

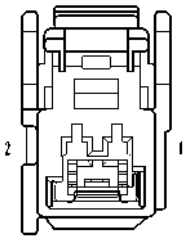
CAV	CIRCUIT	FUNCTION
1	X20 22GY/WT	RADIO CONTROL MUX
2	G902 22VT/BR	SWITCH MUX RETURN



SWITCH-
REMOTE
RADIO-
RIGHT

SWITCH-REMOTE RADIO-RIGHT - 2 WAY

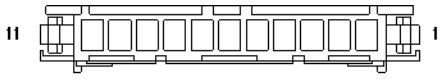
CAV	CIRCUIT	FUNCTION
1	X20 22GY/WT	RADIO CONTROL MUX
2	G902 22VT/BR	SWITCH MUX RETURN



SWITCH-
SEAT
BELT-
DRIVER

SWITCH-SEAT BELT-DRIVER - 2 WAY

CAV	CIRCUIT	FUNCTION
1	R59 20LG/TN	GROUND
2	R57 20LG/GY	DRIVER SEAT BELT SWITCH SENSE



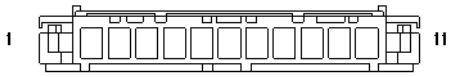
SWITCH-
SEAT-
DRIVER

SWITCH-SEAT-DRIVER - 11 WAY

CAV	CIRCUIT	FUNCTION
1	P41 16LG/GY (EXCEPT MEMORY)	DRIVER SEAT RECLINER DOWN DRIVER
1	P28 20DB/WT (MEMORY)	DRIVER SEAT SWITCH MUX RETURN
2	-	-
3	P43 16LG/VT (EXCEPT MEMORY)	DRIVER SEAT RECLINER UP DRIVER
4	P17 14LG/DG (EXCEPT MEMORY)	DRIVER SEAT HORIZONTAL REARWARD DRIVER
4	P311 20VT (MEMORY)	DRIVER SEAT FRONT VERTICAL/RECLINER SWITCH MUX
5	P21 14LG/TN (EXCEPT MEMORY)	DRIVER SEAT FRONT DOWN DRIVER
6	A940 12RD/GY (EXCEPT MEMORY)	FUSED B(+)
7	Z971 16BK (EXCEPT MEMORY)	GROUND

SWITCH-SEAT-DRIVER - 11 WAY

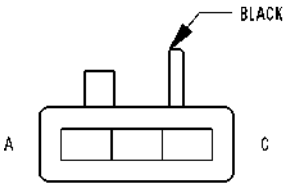
CAV	CIRCUIT	FUNCTION
8	P15 14LG/WT (EXCEPT MEMORY)	DRIVER SEAT HORIZONTAL FORWARD DRIVER
9	P19 14LG/LB (EXCEPT MEMORY)	DRIVER SEAT FRONT UP DRIVER
10	P13 14LG/OR (EXCEPT MEMORY)	DRIVER SEAT REAR DOWN DRIVER
10	P29 20LG/WT (MEMORY)	DRIVER SEAT SWITCH MUX SUPPLY
11	P11 14LG/YL (EXCEPT MEMORY)	DRIVER SEAT REAR UP
11	P309 20BR (MEMORY)	DRIVER SEAT REAR VERTICAL/HORIZONTAL SWITCH MUX



SWITCH-
SEAT-
PASSENGER

SWITCH-SEAT-PASSENGER - 11 WAY

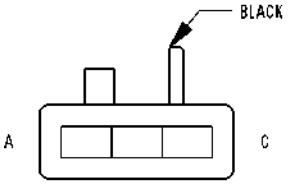
CAV	CIRCUIT	FUNCTION
1	P42 14LG/GY	PASSENGER SEAT RECLINER SWITCH DOWN
2	-	-
3	P44 14LG/DG	PASSENGER SEAT RECLINER SWITCH UP
4	P16 14LG/BR	PASSENGER SEAT HORIZONTAL REARWARD DRIVER
5	-	-
6	A940 12RD/GY	FUSED B(+)
7	Z975 16BK	GROUND
8	P14 14VT	DRIVER SEAT RECLINER DOWN DRIVER
9	-	-
10	-	-
11	-	-



SWITCH-
SPEED
CONTROL-
LEFT

SWITCH-SPEED CONTROL-LEFT - BLACK 3 WAY

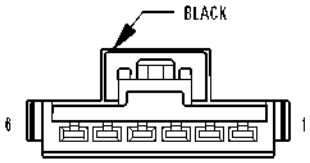
CAV	CIRCUIT	FUNCTION
A	V38 22VT/OR (5.7L)	S/C SWITCH NO. 2 SIGNAL
B	K900 22DB/DG (3.7L/4.7L)	SENSOR GROUND
B	V937 20VT/BR (5.7L)	S/C SWITCH RETURN
C	V37 22VT	S/C SWITCH NO. 1 SIGNAL



SWITCH-
SPEED
CONTROL-
RIGHT

SWITCH-SPEED CONTROL-RIGHT - BLACK 3 WAY

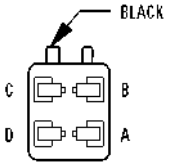
CAV	CIRCUIT	FUNCTION
A	V38 22VT/OR (5.7L)	S/C SWITCH NO. 2 SIGNAL
B	K900 22DB/DG (3.7L/4.7L)	SENSOR GROUND
B	V937 20VT/BR (5.7L)	S/C SWITCH RETURN
C	V37 22VT	S/C SWITCH NO. 1 SIGNAL



SWITCH-
STOP
LAMP

SWITCH-STOP LAMP - BLACK 6 WAY

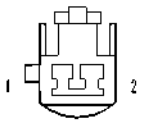
CAV	CIRCUIT	FUNCTION
1	A103 18GY/RD	FUSED B(+)
2	L50 18WT/TN	BRAKE LAMP SWITCH OUTPUT
3	V30 20VT/WT	S/C BRAKE SWITCH OUTPUT
4	V32 20VT/YL	S/C SUPPLY
5	Z429 20BK/OR	GROUND
6	B29 20DG/WT	BRAKE SWITCH NO. 1 SIGNAL



SWITCH-
SUNROOF

SWITCH-SUNROOF - BLACK 4 WAY

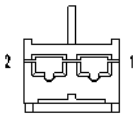
CAV	CIRCUIT	FUNCTION
A	Q4 20OR/YL	SUNROOF CLOSE
B	Z957 20BK	GROUND
C	Q3 20OR/TN	SUNROOF OPEN
D	Q5 20OR/LB	SUNROOF MOTOR B(+)



SWITCH-
TOW/HAUL
OVERDRIVE

SWITCH-TOW/HAUL OVERDRIVE - 2 WAY

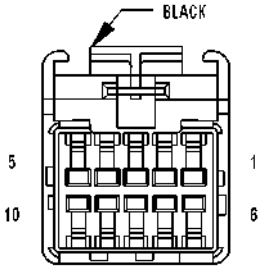
CAV	CIRCUIT	FUNCTION
1	T6 20DG	TOW/HAUL OVERDRIVE OFF SWITCH SENSE
2	Z953 20BK	GROUND



SWITCH-
TRACTION
CONTROL

SWITCH-TRACTION CONTROL - 2 WAY

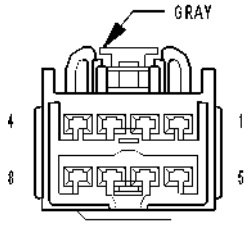
CAV	CIRCUIT	FUNCTION
1	B27 20DG/WT	TRACTION CONTROL SWITCH SENSE
2	Z427 20BK/WT	GROUND



SWITCH-
TRANSFER
CASE
SELECTOR

SWITCH-TRANSFER CASE SELECTOR - BLACK 10 WAY

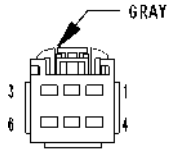
CAV	CIRCUIT	FUNCTION
1	K77 20BR/VT	5 VOLT SELECTOR SWITCH SUPPLY
2	-	-
3	K977 20BR/LG	MODE SELECT
4	E11 20OR/WT	ILT-DIMMING 4X4
5	Z973 20BK	GROUND
6	G95 20VT/BR	4WD NEUTRAL INDICATOR
7	F21 20PK/DG	FUSED IGNITION SWITCH OUTPUT (RUN-START)
8	-	-
9	-	-
10	-	-



SWITCH-WINDOW/DOOR LOCK-DRIVER C1

SWITCH-WINDOW/DOOR LOCK-DRIVER C1 - GRAY 8 WAY

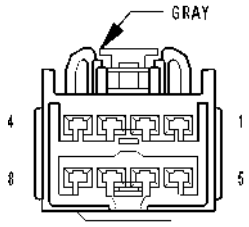
CAV	CIRCUIT	FUNCTION
1	-	-
2	F30 14PK/YL	FUSED ACCESSORY DELAY RELAY OUTPUT
3	Z940 20BK (EXCEPT MEMORY)	GROUND
3	G775 20OR/VT (MEMORY)	DRIVER DOOR LOCK SWITCH RETURN
4	Z13 16BK/WT	GROUND
5	Q15 14OR/LB	POWER WINDOW SWITCH FEED
6	Q21 14OR/WT	LEFT FRONT WINDOW DRIVER (DOWN)
7	Q11 14WT/DB	LEFT FRONT WINDOW DRIVER (UP)
8	G161 20VT/DG	DRIVER DOOR LOCK SWITCH MUX



SWITCH-WINDOW/DOOR LOCK-DRIVER C2 (MEMORY)

SWITCH-WINDOW/DOOR LOCK-DRIVER C2 (MEMORY) - GRAY 6 WAY

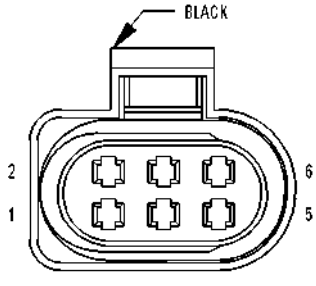
CAV	CIRCUIT	FUNCTION
1	Q411 14DB/LG	LEFT REAR WINDOW DRIVER (UP)
2	Q412 14TN/WT	RIGHT REAR WINDOW DRIVER (UP)
3	Q612 14DB/OR	RIGHT REAR WINDOW DRIVER (DOWN)
4	Q611 14DB/PK	LEFT REAR WINDOW DRIVER (DOWN)
5	Q26 14OR	MASTER WINDOW SWITCH RIGHT FRONT (DOWN)
6	Q16 14WT/DG	MASTER WINDOW SWITCH RIGHT FRONT (UP)



SWITCH-WINDOW-DOOR LOCK-PASSENGER

SWITCH-WINDOW/DOOR LOCK-PASSENGER - GRAY 8 WAY

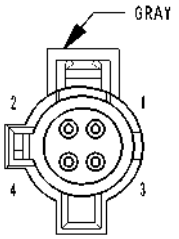
CAV	CIRCUIT	FUNCTION
1	Q26 14OR	MASTER WINDOW SWITCH RIGHT FRONT (DOWN)
2	Q22 14WT/PK	RIGHT FRONT WINDOW DRIVER (DOWN)
3	Q12 14OR/BR	RIGHT FRONT WINDOW DRIVER (UP)
4	Q15 14OR/LB	POWER WINDOW SWITCH FEED
5	F30 14PK/YL	FUSED ACCESSORY DELAY RELAY OUTPUT
6	G160 20VT/LG	PASSENGER DOOR LOCK SWITCH MUX
7	Z974 16BK (EXCEPT MEMORY)	GROUND
7	G776 20VT/OR (MEMORY)	PASSENGER DOOR LOCK SWITCH RETURN
8	Q16 14WT/DG	MASTER WINDOW SWITCH RIGHT FRONT (UP)



THROTTLE BODY

THROTTLE BODY - BLACK 6 WAY

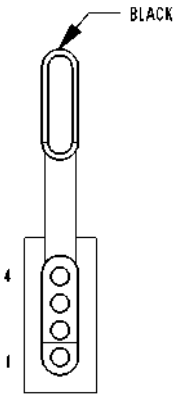
CAV	CIRCUIT	FUNCTION
1	K22 18BR/OR	TP NO. 1 SIGNAL
2	F855 18PK/YL	5 VOLT SUPPLY
3	K447 18TN/YL	ETC MOTOR (+)
4	K122 18BR/DG	TP NO. 2 SIGNAL
5	K448 18TN/OR	ETC MOTOR (-)
6	K922 18BR/DB	TP SENSOR RETURN



TRANSDUCER-A/C PRESSURE

TRANSDUCER-A/C PRESSURE - GRAY 4 WAY

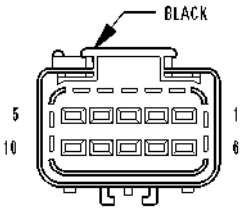
CAV	CIRCUIT	FUNCTION
1	G180 20VT/YL	FCM SENSOR RETURN
2	T103 20YL/OR	5 VOLT SUPPLY
3	C18 20LB/BR	A/C PRESSURE SIGNAL
4	-	-



WIRING-TRAILER TOW 4-WAY

WIRING-TRAILER TOW 4-WAY - BLACK 4 WAY

CAV	CIRCUIT	FUNCTION
1	Z976 12BK	GROUND
2	L76 20PK/RD	FUSED PARK LAMP RELAY OUTPUT
3	L673 20YL	LEFT TRAILER TOW BRAKE LAMP RELAY OUTPUT
4	L674 20LG	RIGHT TRAILER TOW BRAKE LAMP RELAY OUTPUT



WIRING-TRAILER TOW 7-WAY

WIRING-TRAILER TOW 7-WAY - BLACK 10 WAY

CAV	CIRCUIT	FUNCTION
1	-	-
2	L674 20LG	RIGHT TRAILER TOW BRAKE LAMP RELAY OUTPUT
3	L1 18WT/LG	BACK-UP LAMP FEED
4	A100 18RD/VT	FUSED B(+)
5	L76 20PK/RD	FUSED PARK LAMP RELAY OUTPUT
6	-	-
7	B400 14DG	TRAILER TOW ELECTRIC BRAKE OUTPUT
8	Z976 14BK	GROUND
9	Z976 14BK	GROUND
10	L673 20YL	LEFT TRAILER TOW BRAKE LAMP RELAY OUTPUT

8W-91 CONNECTOR/GROUND/SPLICE LOCATION

TABLE OF CONTENTS

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CONNECTOR/GROUND/SPLICE LOCATION
DESCRIPTION 1

CONNECTOR/GROUND/SPLICE LOCATION

DESCRIPTION

This section provides illustrations identifying connector, ground and splice locations in the vehicle. Connector, ground and splice indexes are provided. Use the wiring diagrams in each section for connector, ground and splice identification. Refer to the appropriate index for the proper figure number. For items that are not shown in this section N/S is placed in the Fig. column.

CONNECTORS

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Actuator-Blend Door-Front	GY	Front HVAC Unit	27
Actuator-Blend Door-Rear	GY	Rear HVAC Unit	48
Actuator-Mode Door-Floor to Defrost-Front	GY	Front HVAC Unit	27
Actuator-Mode Door-Floor to Panel-Front	GY	Front HVAC Unit	27
Actuator-Mode Door-Rear	GY	Rear HVAC Unit	48
Actuator-Recirculation Door-Front	GY	Front HVAC Unit	27
Airbag-Driver Squib 1	TAN	Steering Wheel	33
Airbag-Driver Squib 2	BK	Steering Wheel	33
Airbag-Passenger Squib	YL	Right Instrument Panel	29
Airbag-Side Curtain-Left	YL	Left Side B-Pillar	44
Airbag-Side Curtain-Right	YL	Right Side B-Pillar	47
Amplifier-Radio C1	NAT	Right Lower Kick Panel	36, 46
Amplifier-Radio C2	WT	Right Lower Kick Panel	36
Antenna-Radio	-	Right Lower Kick Panel	37
Antenna-Receiver Satellite	-	Rear of Roof	45
Assembly-EGR Valve	BK	Right Front of Engine	22, 23
Assembly-Natural Vacuum Leak Detection	BK	Left Side of Fuel Tank	53
Assembly-Shift Motor/Mode Sensor	GY	Front of Transfer Case	20
Assembly-Transmission Solenoid/TRS	BK	Right Side of Transmission	13, 18, 26

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Battery (+)	-	Right Front Engine Compartment	5
Battery (-)	-	Right Front Engine Compartment	5
C105	BK	Near T/O for Oil Pressure Switch	10
C108	BK	Right Front of Engine Compartment	4, 17
C109 (5.7L)	BK	Top Right Rear of Engine	21, 24
C110 (5.7L)	BK	Top Right Rear of Engine	21, 24
C200	BK	Lower Left Instrument Panel	28, 31, 35
C201	NAT	Lower Left Instrument Panel	28, 31
C202	GY	Front HVAC Unit	27, 29, 36
C203		Lower Left Instrument Panel	31
C220	BK	Right Side Headliner	42
C221	WT	Left Side Instrument Panel	35, 42
C222	WT	Left Side Instrument Panel	35, 42
C248	BK	Under Driver Seat	39, 43
C249	BK	Under Passenger Seat	40, 46
C250	BK	Under Driver Seat	39, 43
C302	BK	Center Body	43
C326	WT	Top of Liftgate	45, 52
C349	BK	Right Rear Quarter Panel	47, 48
C352	BK	Right Side of Frame in Front of Fuel Tank	9, 53
C361	WT	Right Kick Panel	46, 50
C362	BK	Right Kick Panel	46, 50
C363	WT	Left Side Instrument Panel	35, 50
C364	BK	Left Side Instrument Panel	35, 50
C365	WT	Right Side B-Pillar	47, 51
C366	WT	Left Side B-Pillar	44, 51
Capacitor-Ignition	BK	Right Side Engine Compartment	17
Clockspring C1	WT	At Steering Column	32
Clockspring C2	BK	Steering Wheel	34
Clockspring C3	BK	Steering Wheel	34
Clockspring C4	YL	At Steering Column	32
Cluster C1	GY	Left Side of Instrument Panel	31
Cluster C2	GY	Left Side of Instrument Panel	31
Cluster C3	WT	Left Side of Instrument Panel	31
Clutch-A/C Compressor	BK	At A/C Compressor	11, 15, 16
Coil-Ignition-No. 1 (3.7L)	BK	Left Top Engine	10
Coil-Ignition-No. 1 (4.7L)	BK	Left Top Engine	14
Coil-Ignition-No. 1 (5.7L)	BK	Left Top Engine	24
Coil-Ignition-No. 2 (3.7L)	BK	Right Top Engine	11
Coil-Ignition-No. 2 (4.7L)	BK	Right Top Engine	15
Coil-Ignition-No. 2 (5.7L)	BK	Right Top Engine	25

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Coil-Ignition-No. 3 (3.7L)	BK	Left Top Engine	10
Coil-Ignition-No. 3 (4.7L)	BK	Left Top Engine	14
Coil-Ignition-No. 3 (5.7L)	BK	Left Top Engine	24
Coil-Ignition-No. 4 (3.7L)	BK	Right Top Engine	11
Coil-Ignition-No. 4 (4.7L)	BK	Right Top Engine	15
Coil-Ignition-No. 4 (5.7L)	BK	Right Top Engine	25
Coil-Ignition-No. 5 (3.7L)	BK	Left Top Engine	10
Coil-Ignition-No. 5 (4.7L)	BK	Left Top Engine	14
Coil-Ignition-No. 5 (5.7L)	BK	Left Top Engine	24
Coil-Ignition-No. 6 (3.7L)	BK	Right Top Engine	11
Coil-Ignition-No. 6 (4.7L)	BK	Right Top Engine	15
Coil-Ignition-No. 6 (5.7L)	BK	Right Top Engine	25
Coil-Ignition-No. 7 (4.7L)	BK	Left Top Engine	14
Coil-Ignition-No. 7 (5.7L)	BK	Left Top Engine	24
Coil-Ignition-No. 8 (4.7L)	BK	Right Top Engine	15
Coil-Ignition-No. 8 (5.7L)	BK	Right Top Engine	25
Control-A/C-Heater C1	BK	Center of Instrument Panel	31
Control-A/C-Heater C2	BK	Center of Instrument Panel	31
Control-A/C-Heater C3	BK	Center of Instrument Panel	31
Control-A/C-Heater-Rear	BK	Center Console	38
Data Link Connector	BK	Lower Left Instrument Panel	28, 31
Fan Module-Condenser Cooling	BK	Front Center of Engine Compartment	9
Generator	GY	At Generator	11, 15, 16, 21, 22
Glass-Liftgate-Heated	-	At Liftgate	52
Glass-Liftgate-Heated Ground	-	At Liftgate	52
Heater-Cushion Pad-Driver	GY	Under Driver Seat	39
Heater-Cushion Pad-Passenger	GY	Under Passenger Seat	40
Heater-Seat Back-Driver	-	Driver Seat	39
Heater-Seat Back-Passenger	-	Passenger Seat	40
Horn No. 1	BK	In front of Left Radiator	3
Horn No. 2	BK	In Front of Left Radiator	3
Injector-Fuel-No. 1 (3.7L)	BK	Left Top Engine	10
Injector-Fuel-No. 1 (4.7L)	BK	Left Top Engine	14
Injector-Fuel-No. 1 (5.7L)	BK	Left Top Engine	24
Injector-Fuel-No. 2 (3.7L)	BK	Right Top Engine	11
Injector-Fuel-No. 2 (4.7L)	BK	Right Top Engine	15
Injector-Fuel-No. 2 (5.7L)	BK	Right Top Engine	25
Injector-Fuel-No. 3 (3.7L)	BK	Left Top Engine	10
Injector-Fuel-No. 3 (4.7L)	BK	Left Top Engine	14
Injector-Fuel-No. 3 (5.7L)	BK	Left Top Engine	24

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Injector-Fuel-No. 4 (3.7L)	BK	Right Top Engine	11
Injector-Fuel-No. 4 (4.7L)	BK	Right Top Engine	15
Injector-Fuel-No. 4 (5.7L)	BK	Right Top Engine	25
Injector-Fuel-No. 5 (3.7L)	BK	Left Top Engine	10
Injector-Fuel-No. 5 (4.7L)	BK	Left Top Engine	14
Injector-Fuel-No. 5 (5.7L)	BK	Left Top Engine	24
Injector-Fuel-No. 6 (3.7L)	BK	Right Top Engine	11
Injector-Fuel-No. 6 (4.7L)	BK	Right Top Engine	15
Injector-Fuel-No. 6 (5.7L)	BK	Right Top Engine	25
Injector-Fuel-No. 7 (4.7L)	BK	Left Top Engine	14
Injector-Fuel-No. 7 (5.7L)	BK	Left Top Engine	24
Injector-Fuel-No. 8 (4.7L)	BK	Right Top Engine	15
Injector-Fuel-No. 8 (5.7L)	BK	Right Top Engine	25
Junction Block C1	GY	Lower Left Kick Panel	31
Junction Block C2	BR	Lower Left Kick Panel	28, 31
Junction Block C3	BK	Lower Left Kick Panel	28, 31, 35
Junction Block C4	GY	Lower Left Kick Panel	28, 31
Junction Block C5	BL	Lower Left Kick Panel	31
Lamp-Center Bezel	BK	At Cigar Lighter	31
Lamp-Dome-Front	WT	Headliner Front	42
Lamp-Dome-Rear	BK	Headliner Rear	42
Lamp-Fog-Left Front	GY	Left Front Fender	1
Lamp-Fog-Right Front	GY	Right Front Fender	1
Lamp-Headlamp-Left	DK GN	Left Front Headlamp Assembly	1
Lamp-Headlamp-Right	DK GN	Right Front Headlamp Assembly	1
Lamp-High Mounted Stop	BK	Top of Liftgate	45, 52, 57
Lamp-License Plate	WT	At Rear License Plate	52
Lamp-Liftgate	BK	At Liftgate	52
Lamp-Park/Turn-Left Front	BK	At Left Headlamp Assembly	1
Lamp-Park/Turn-Right Front	BK	At Right Headlamp Assembly	1
Lamp-Passenger Airbag On/Off Indicator	BK	Instrument Panel	29
Lamp-Reading-Front	BK	At Lamp	42
Lamp-Side Marker-Left Front	BK	At Left Headlamp Assembly	1
Lamp-Side Marker-Right Front	BK	At Right Headlamp Assembly	1
Lamp-Tail/Stop/Turn-Left	BK	At Left Tail Lamp Assembly	56
Lamp-Tail/Stop/Turn-Right	BK	At Right Tail Lamp Assembly	44, 56
Lamp-Vanity-Left	BK	Left Sunvisor	42
Lamp-Vanity-Right	BK	Right Sunvisor	42
Latch-Door-Left Front	BK	At Latch	50
Latch-Door-Left Rear	BK	At Latch	51

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Latch-Door-Right Front	BK	At Latch	50
Latch-Door-Right Rear	BK	At Latch	51
Latch-Liftgate	BK	At Liftgate	52
Power Outlet-Instrument Panel	GY	Center of Instrument Panel	31
Media System-Monitor/DVD	BK	At Monitor	42
Mirror-Inside Rearview C1	BK	At Mirror	42
Mirror-Inside Rearview C2	BK	At Mirror	42
Mirror-Outside Rearview-Driver	BK	Left Door	50
Mirror-Outside Rearview-Passenger	BK	Right Door	50
Module-Antilock Brakes	BK	Lower Left Kick Panel	9
Module-Brake Provision		Left Rear Engine Compartment	31
Module-Electronic Overhead	BK	Front Headliner	42
Module-Front Control C1	BK	Left Side Engine Compartment	8
Module-Front Control C2	BK	Left Side Engine Compartment	8
Module-Front Control IPM	-	At Power Distribution Module	8
Module-Fuel Pump	LT GY	Top of Fuel Tank	53
Module-Hands Free	BK	Right Side Instrument Panel	29
Module-Heated Seat	BK	Right Rear Quarter Panel	47
Module-Integrated Power C1	GY	Left Front Engine Compartment	8
Module-Integrated Power C2	BK	Left Front Engine Compartment	8
Module-Integrated Power Eyelet	-	Right Side of Power Distribution Module	7
Module-Memory Mirror Driver C1	GY	Left Front Door	50
Module-Memory Mirror Driver C2	GY	Left Front Door	50
Module-Memory Mirror Passenger		Right Front Door	50
Module-Occupant Classification C1	BK	Under Passenger Seat	40
Module-Occupant Classification C2	BK	Under Passenger Seat	40
Module-Occupant Restraint Controller C1	YL	Below Center Console	43
Module-Occupant Restraint Controller C2	YL	Below Center Console	36
Module-Power-Blower Motor-Front C1 (ATC)		Front HVAC unit	27
Module-Power-Blower Motor-Front C2 (ATC)		Front HVAC unit	27
Module-Powertrain Control C1	BK	Right Front Engine Compartment	17

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Module-Powertrain Control C2	BK/OR	Right Front Engine Compartment	17
Module-Powertrain Control C3	BK/WT	Right Front Engine Compartment	4
Module-Powertrain Control C4	BK/GN	Right Front Engine Compartment	17
Module-Seat Memory C1	BK	Under Driver Seat	39
Module-Seat Memory C2	BK	Under Driver Seat	39
Module-Seat Memory C3	WT	Under Driver Seat	39
Module-Seat Memory C4	BL	Under Driver Seat	39
Module-Seat Memory C5	BK	Under Driver Seat	39
Module-Sentry Key Remote Entry	BK	At Steering Column	32
Motor-Adjustable Pedals	WT	At Pedals	30
Motor-Blower-Front	BK	Front HVAC Unit	27
Motor-Blower-Rear	NAT	Rear HVAC Unit	48
Motor-IAC (3.7L)	BK	At Throttle Body	10
Motor-IAC (4.7L)	BK	At Throttle Body	14
Motor-Rear Window Wiper	BK	At Liftgate	52
Motor-Seat Adjuster-Driver Horizontal	BK	Under Driver Seat	39
Motor-Seat Adjuster-Driver Recliner	BK	Under Driver Seat	39
Motor-Seat Adjuster-Front Driver Vertical	BK	Under Driver Seat	39
Motor-Seat Adjuster-Passenger Horizontal	BK	Left Side Under Passenger Seat	40
Motor-Seat Adjuster-Passenger Recliner	BK	Right Side Under Passenger Seat	40
Motor-Seat Adjuster-Rear Driver Vertical	BK	Under Driver Seat	39
Motor-Sunroof	BK	At Sunroof	49
Motor-Window-Left Front	BK	In Left Front Door	50
Motor-Window-Left Rear	BK	In Left Rear Door	51
Motor-Window-Right Front	BK	In Right Front Door	50
Motor-Window-Right Rear	BK	In Right Rear Door	51
Motor-Windshield Wiper	BK	Near Power Brake Booster	8
Power Distribution Center eyelet	-	Right Side of Power Distribution Center	7
Power Outlet-Console	GY	At Console	38
Power Outlet-Instrument Panel	GY	Center of Instrument Panel	31
Power Outlet-Rear	GY	Right Rear Quarter Panel	47
Pump-Auxiliary Coolant	BK	Right Side of Engine Compartment	4
Pump Washer-Windshield	BK	Left Front of Engine Compartment	2

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Radio C1	GY	Rear of Radio	31
Radio C2	GY	Rear of Radio	31
Receiver-Satellite	BK	Left Rear Quarter Panel	45
Relay-Adjustable Pedals	-	In Module-Power Distribution	8
Relay-Trailer Tow Left	-	In Module-Power Distribution	8
Relay-Trailer Tow Right	-	In Module-Power Distribution	8
Resistor-Blower Motor-Front (MTC)	BK	Front HVAC Unit	27
Resistor-Blower Motor-Rear	NAT	Rear HVAC Unit	48
Resistor-Condenser Fan		Front Center Engine Compartment	9
Seat Belt-Tensioner-Driver	BK	Base of Left B-Pillar	44
Seat Belt-Tensioner-Passenger	BK	Base of Right B-Pillar	47
Sensor-Accelerator Pedal Position	BK	Center of Instrument Panel	29
Sensor-Adjustable Pedals		Near Adjustable Pedals	28
Sensor-Ambient Air Temperature	BK	Front Center of Engine Compartment	2
Sensor-Battery Temperature	BK	Left Rear Engine Compartment	4
Sensor-Brake Fluid Level	BK	Left Rear Engine Compartment	8
Sensor-Camshaft Position (3.7L)	GY	Right Front Side of Engine	6
Sensor-Camshaft Position (4.7L)	GY	Right Front Side of Engine	18
Sensor-Camshaft Position (5.7L)	GY	Right Front Side of Engine	23
Sensor-Crankshaft Position (3.7L)	BK	Right Front Side of Engine	6
Sensor-Crankshaft Position (4.7L)	BK	Right Front Side of Engine	18
Sensor-Crankshaft Position (5.7L)	BK	Right Front Side of Engine	23
Sensor-Engine Coolant Temperature	BK	Right Front Side of Engine	11, 15, 16
Sensor-Evaporator Temperature	BK	Front HVAC Unit	27
Sensor-Front Impact-Left	YL	Left Front of Engine Compartment	2
Sensor-Front Impact-Right	YL	Right Front of Engine Compartment	2
Sensor-G	BK	Right Side of Instrument Panel	29
Sensor-Infrared	BK	Near T/O For Lamp-Dome-Front	42
Sensor-Input Speed	BK	Right Front of Transmission	13, 18, 26
Sensor-Intake Air Temperature (3.7L)	GY	At Throttle Body	10
Sensor-Intake Air Temperature (4.7L)	GY	At Throttle Body	14

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Sensor-Knock (3.7L/4.7L)	BK	Left Rear of Engine	10
Sensor Knock No. 1 (5.7L)	BK	Left Side of Engine	23
Sensor-Knock No. 2 (5.7L)	BK	Right Side of Engine	23
Sensor-Line Pressure	BK	Left Rear of Transmission	19, 26
Sensor-MAP	GY	Right Front Side of Engine	11, 15, 16
Sensor-Output Speed	BK	Right Rear of Transmission	13, 18, 20, 26
Sensor-Oxygen-Left Front (3.7L)	BK	Left Front of Transmission	10
Sensor-Oxygen-Left Front (4.7L)	BK	Left Front of Transmission	14, 20
Sensor-Oxygen-Left Front (5.7L)	BK	Left Front of Transmission	26
Sensor-Oxygen-Left Rear	BK	Left Rear of Transmission	13, 18, 20, 26
Sensor-Oxygen-Right Front	BK	Right Front of Transmission	13, 19, 26
Sensor-Oxygen-Right Rear	BK	Right Rear of Transmission	13, 19, 26
Sensor-Seat Track Position-Dirver	DK GY	Under Driver Seat	39
Sensor-Seat Track Position-Passenger	DK GY	Right Side Under Passenger Seat	40
Sensor-Seat Weight-Left Front	BK	Left Front Under Passenger Seat	40
Sensor-Seat Weight-Left Rear	BK	Left Rear Under Passenger Seat	40
Sensor-Seat Weight-Right Front	BK	Right Front Under Passenger Seat	40
Sensor-Seat Weight-Right Rear	BK	Right Rear Under Passenger Seat	40
Sensor-Side Impact-Left 1	YL	Left Side Near B-Pillar	44
Sensor-Side Impact-Left 2	YL	Left Side Body Behind Left Rear Door	44
Sensor-Side Impact-Left 3	YL	Left Rear Quarter Panel	44
Sensor-Side Impact-Right 1	YL	Right Side Near B-Pillar	47
Sensor-Side Impact-Right 2	YL	Right Side Body Behind Right Rear Door	47
Sensor-Side Impact-Right 3	YL	Right Rear Quarter Panel	47
Sensor-Sun	BK	Right Side of Instrument Panel	29
Sensor-Throttle Position (3.7L)	NAT	At Throttle Body	10
Sensor-Throttle Position (4.7L)	NAT	At Throttle Body	14
Sensor-Transmission Range	LT GN	Left Side of Transmission	13
Sensor-Washer Fluid Level-Front Rear	GY	Left Front of Engine Compartment	2
Sensor-Wheel Speed-ABS-Left Front	BK	Left Front Wheel	9
Sensor-Wheel Speed-ABS-Left Rear	BK	Left Rear Wheel	54

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Sensor-Wheel Speed-ABS-Rear	BK	Near Right Rear Wheel by Crossmember	55
Sensor-Wheel Speed-ABS-Right Front	BK	Right Front Wheel	4
Sensor-Wheel Speed-ABS-Right Rear	BK	Right Rear Wheel	54
Servo-Speed Control	BK	Left Front Engine Compartment	8
Solenoid-Brake Transmission Interlock	BK	At Steering Column	32
Solenoid-EVAP/Purge	BK	Near Power Brake Booster	8
Speaker-Left Front Door	WT	At Left Front Door	50
Speaker-Left Rear Door	WT	At Left Rear Door	51
Speaker-Right Front Door	WT	At Right Front Door	50
Speaker-Right Rear Door	WT	At Right Rear Door	51
Speaker-Subwoofer	WT	Left Rear Quarter Panel	44
Speaker-Tweeter-Left Front (Premium)	WT	Left Front Instrument Panel	29
Speaker-Tweeter-Left Rear (Premium)	BK	Left Rear Door	51
Speaker-Tweeter-Right Front (Premium)	WT	Right Front Instrument Panel	29
Speaker-Tweeter-Right Rear (Premium)	BK	Right Rear Door	51
Starter	-	At Engine Starter Motor	12, 18, 23
Switch-Adjustable Pedals	BL	Left Side of Instrument Panel	28, 31
Switch-Headlamp	BK	Left Side of Instrument Panel	31
Switch-Heated Seat-Driver	RD	Center of Instrument Panel	31
Switch-Heated Seat-Passenger	BL	Center of Instrument Panel	31
Switch-Hood Ajar		Front Center Engine Compartment	9
Switch-Horn	WT	In Steering Wheel	34
Switch-Ignition	BK	At Steering Column	32
Switch-Liftgate Ajar	WT	At Liftgate	52
Switch-Memory Selector		Left Front Door	50
Switch-Mirror	GY	Left Front Door	50
Switch-Multifunction	BK	At Steering Column	32
Switch-Oil Pressure (3.7L)	BK	Right Front of Engine	12
Switch-Oil Pressure (4.7L)	BK	Right Front of Engine	16
Switch-Oil Pressure (5.7L)	BK	Right Front of Engine	23
Switch-Parking Brake	BK	Left Side Instrument Panel	35
Switch-Power Steering Pressure	BK	Left Front of Engine	23
Switch-Power Window-Left Rear	GY	Left Rear Door	51

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Switch-Power Window-Right Rear	GY	Right Rear Door	51
Switch-Remote Radio-Left	BK	Steering Wheel	34
Switch-Remote Radio-Right	BK	Steering Wheel	34
Switch-Seat Belt-Driver		Under Driver Seat	39
Switch-Seat-Driver		At Driver Seat	39
Switch-Seat-Passenger		At Passenger Seat	41
Switch-Speed Control-Left	BK	Steering Wheel	34
Switch-Speed Control-Right	BK	Steering Wheel	34
Switch-Stop Lamp	BK	Left Lower Instrument Panel	28, 31
Switch-Sunroof	BK	At Switch	42
Switch-Tow/Haul Overdrive	NAT	At Lower Steering Column	32
Switch-Traction Control	BK	At Switch	31
Switch-Transfer Case Selector	BK	Center of Instrument Panel	31
Switch-Window/Door Lock Driver C1	GY	Left Front Door	50
Switch-Window/Door Lock Driver C2	GY	Left Front Door	50
Switch-Window/Door Lock Passenger	GY	Right Front Door	50
Switch and Lamp-Glove Box	BK	Right Instrument Panel	29, 36
Throttle Body (5.7L)	BK	Top of Engine	22
Transducer-A/C Pressure	GY	Top of Radiator Fan	9
Wiring-Trailer Tow 4-Way	BK	Near Rear Bumper	55
Wiring-Trailer Tow 7-Way	BK	Near Rear Bumper	55

GROUNDS

GROUND	LOCATION	FIG.
G100	Right Side Engine Compartment	17
G102	Left Front Frame	9
G110	Right Front Engine	6
G111	Right Engine Compartment Near Battery	5
G112	Right Front Engine Compartment	4
G113	Left Front Engine Compartment	8
G114	Left Front Engine Compartment	8
G201	Center Body	43
G207	Right Lower Kick Panel	36
G208	Left Lower Kick Panel	28, 31, 36
G210	Right Lower Kick Panel	36
G304	Left Rear Quarter Panel	45
G305	Left Front Frame	9
G306	Center Body	43

SPLICES

SPLICE	LOCATION	FIG.
S102	Near T/O for Sensor-Oxygen-Right Front	13, 19
S103	Near T/O for Injector-Fuel No. 8	11, 15, 22
S104	Near T/O for Input Sensor-Speed	13, 19
S105	Near T/O for Sensor-MAP	11, 15, 23
S106	Near T/O for Sensor-Input Speed	13, 18, 26
S107	Near T/O for Sensor-Oxygen-Right Front	13, 19, 26
S108	Near T/O for Module-Powertrain Control C4	17
S109	Near T/O for Module-Powertrain Control C4	17
S110	On Battery Harness Near Battery	5
S113	Near T/O for Sensor-Ambient Air Temperature	2
S114	Near T/O for Sensor-Ambient Air Temperature	2
S115	Near T/O for Sensor-Ambient Air Temperature	2
S117	Near T/O for Sensor-Front Impact-Left	2
S118	Near T/O for Sensor-Front Impact-Left	2
S119	Near T/O for Servo-Speed Control	8
S120	Near T/O for Module-Antilock Brakes	9
S121	Near T/O for Module-Antilock Brakes	9
S122	Near T/O for Solenoid-Proportional Purge	9
S123	Near T/O for C201	31
S124	Near T/O for Junction Block C5	31
S125	Near T/O for Junction Block C5	31
S126	Right Side Engine	25
S127	Right Side Engine	25
S128	Left Side Engine	24
S129	Left Side Engine	24
S130	Left Side Engine	24
S131	Left Side Engine Compartment	8
S132	Left Side Engine Compartment	8
S133	Left Side Engine Compartment	8
S134	Near T/O For Injector-Fuel No. 5	10, 14
S141 (4.7L)	Near Positive Battery Terminal	5
S141 (5.7L)	Near Positive Battery Terminal	22
S176	Near T/O For C108	4
S184	Engine Harness near T/O for C108	17
S185	Near T/O for Injector-Fuel No. 4	11, 15
S186	Near T/O to Motor-IAC	10, 14
S187	Near T/O for Module-Power Distribution C1	8
S188	On HVAC Unit Near T/O for C202	27
S200	Near T/O for Airbag-Passenger Squib	29
S201	Near T/O For Switch-Overdrive	32
S202	Left Front Instrument Panel	28

SPLICE	LOCATION	FIG.
S203	Left Front Instrument Panel	28
S204	Center of Instrument Panel	29
S205	Near T/O for Airbag-Passenger Squib	29
S206	Near T/O for Speaker-Tweeter-Left Front	29
S207	Center of Instrument Panel	29
S208	Center of Instrument Panel	29
S209	Near T/O for Speaker-Tweeter-Left Front	29
S210	In T/O to Cluster C3	31
S211	In T/O for Cluster C1	31
S214	Lower Steering Column	32
S215	Lower Steering Column	32
S300	Body Under Rear Door Sill	44, 47
S301	Left Front Door Near T/O for C364	50
S302	Body Under Rear Door Sill	44, 47
S303	Left Body Between A and B-Pillar	43
S304	Left Body Between A and B-Pillar	43
S305	Left Body Between A and B-Pillar	43
S306	Near T/O for Assembly-Natural Vacuum Leak Detection	53
S307	Left Body Between A and B-Pillar	43
S308	Left Body Between A and B-Pillar	43
S309	Left Body Between A and B-Pillar	43
S310	Left Body Between A and B-Pillar	43
S311	Near T/O for C250	43
S312	Near T/O for C250	43
S313	Near T/O for G306	43
S314	Near T/O for G306	43
S315	Right Body Between A and B-Pillar	46
S316	Right Body Between A and B-Pillar	46
S317	Left Front Door Near T/O for Switch-Memory Selector	50
S318	In T/O for Mirror-Outside Rearview-Driver	50
S319	Left Rear Door Near T/O for C366	51
S320	Left Rear Door Near T/O for C366	51
S321	Near T/O for Speaker-Right Rear Door	51
S322	Near T/O for Speaker-Right Rear Door	51
S323	Near T/O for Lamp-Reading-Front	42
S324	Headliner Near T/O for C222	42
S325	Headliner Near T/O for C222	42
S326	Headliner Near T/O for C222	42
S327	Left Front Door Near T/O for Switch-Mirror	50
S328	Near T/O for Switch-Window-Door Lock Passenger	50
S329	Headliner Near T/O for C222	42
S330	Near T/O for Wiring-Trailer Tow	54
S331	Near T/O for Wiring-Trailer Tow	54

SPLICE	LOCATION	FIG.
S332	Near T/O for Wiring-Trailer Tow	54
S333	Near T/O for Wiring-Trailer Tow	54
S334	In T/O To Sensor-Wheel Speed-ABS-Left Rear	54
S335	Near T/O for Lamp-License Plate	52
S336	In T/O to Sensor-Seat Weight-Right Rear	40
S337	In T/O to Sensor-Seat Weight -Left Rear	40
S338	Near T/O for Mirror-Inside Rearview C2	42
S339	Under Left Seat	N/S
S342	Rear HVAC	48
S343	Rear HVAC	48
S351	Headliner Near T/O for C222	42
S356	Left Body Between A and B-Pillar	43
S358	In T/O for Sensor-Wheel Speed-ABS-Left Rear	54
S359	Near T/O for G306	43
S360	Near Right Rear Wheel on Crossmember	54
S361	Near Right Rear Wheel on Crossmember	54

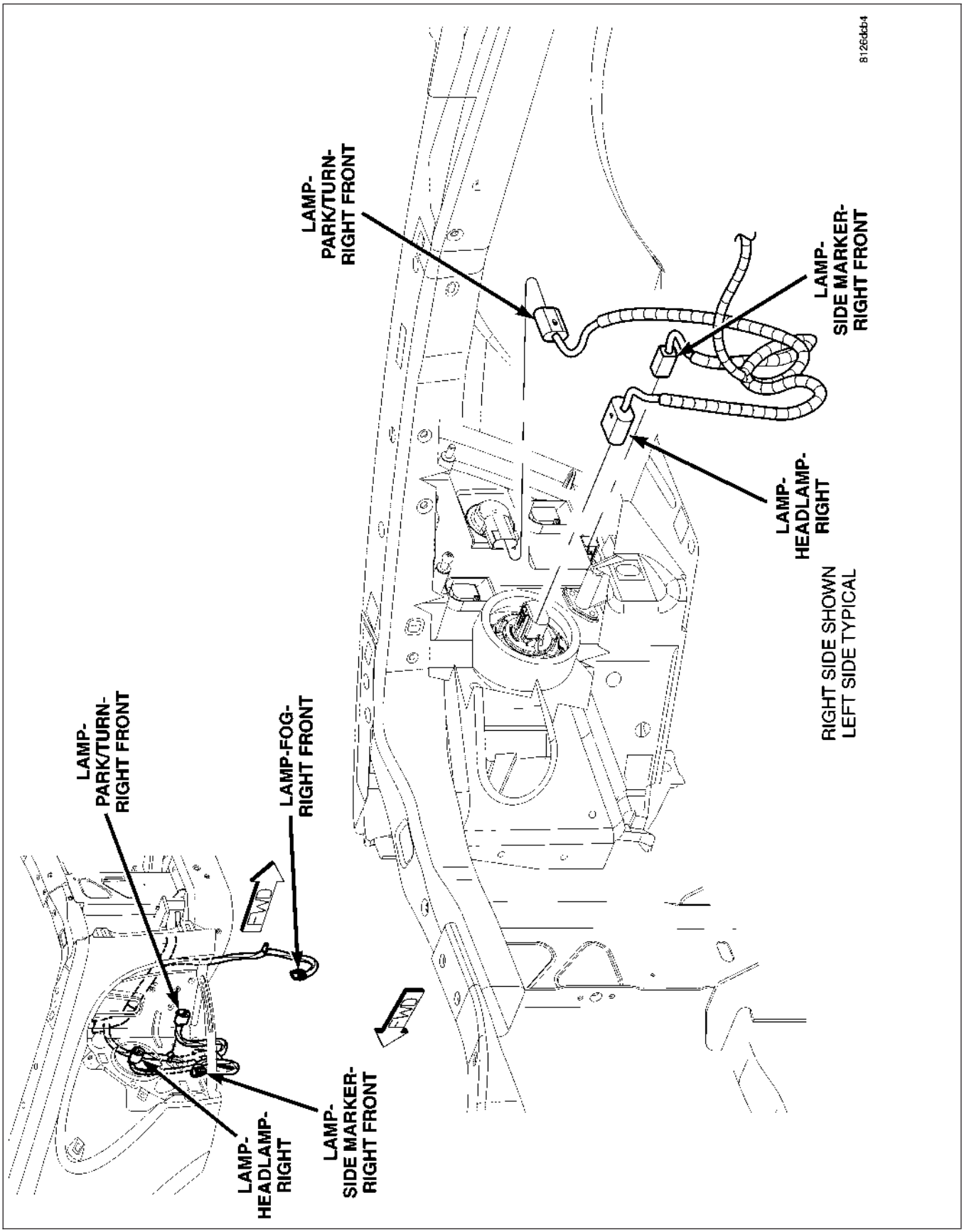

Fig. 1 ENGINE COMPARTMENT - RIGHT FRONT

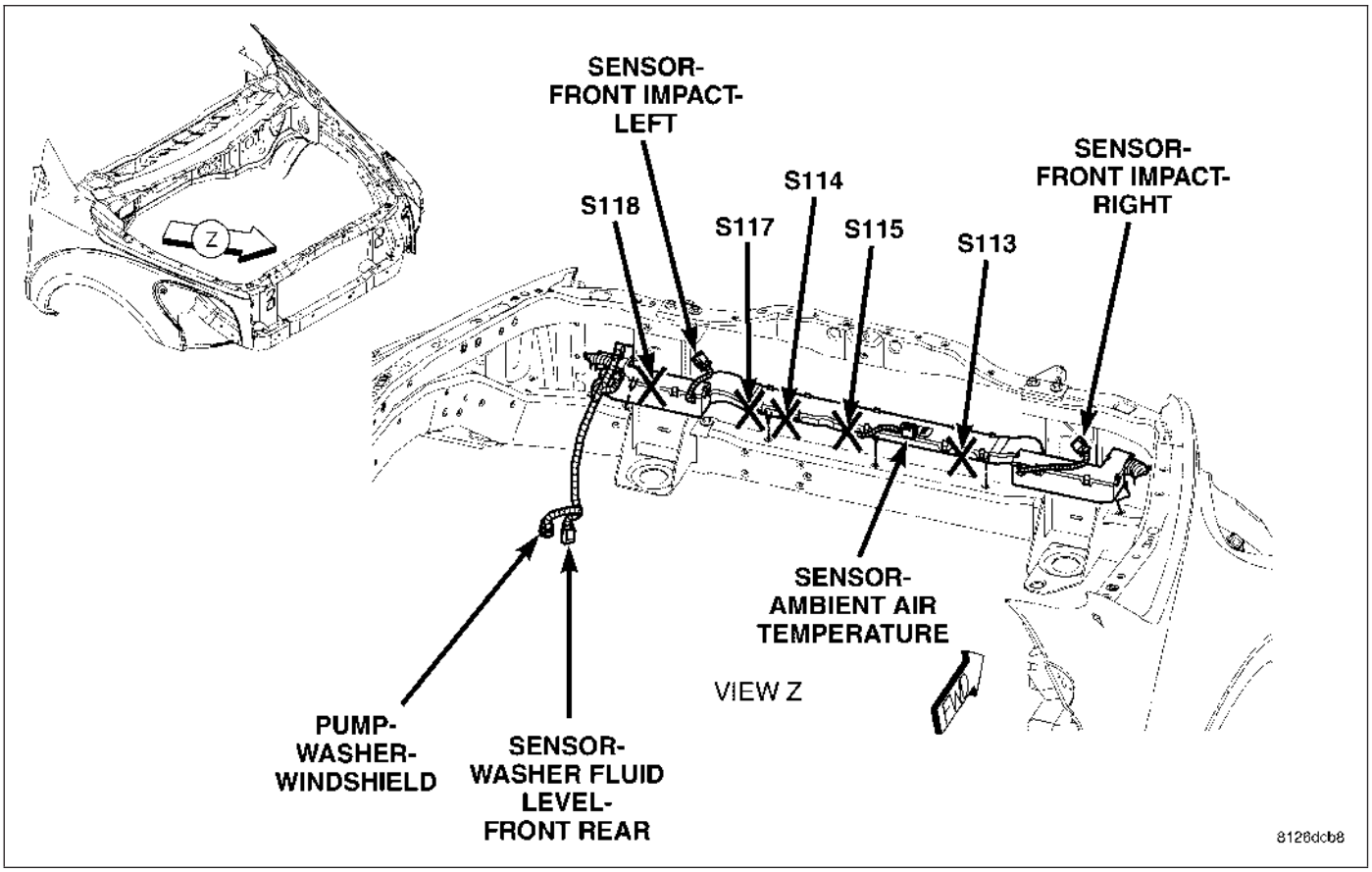

Fig. 2 ENGINE COMPARTMENT - FRONT

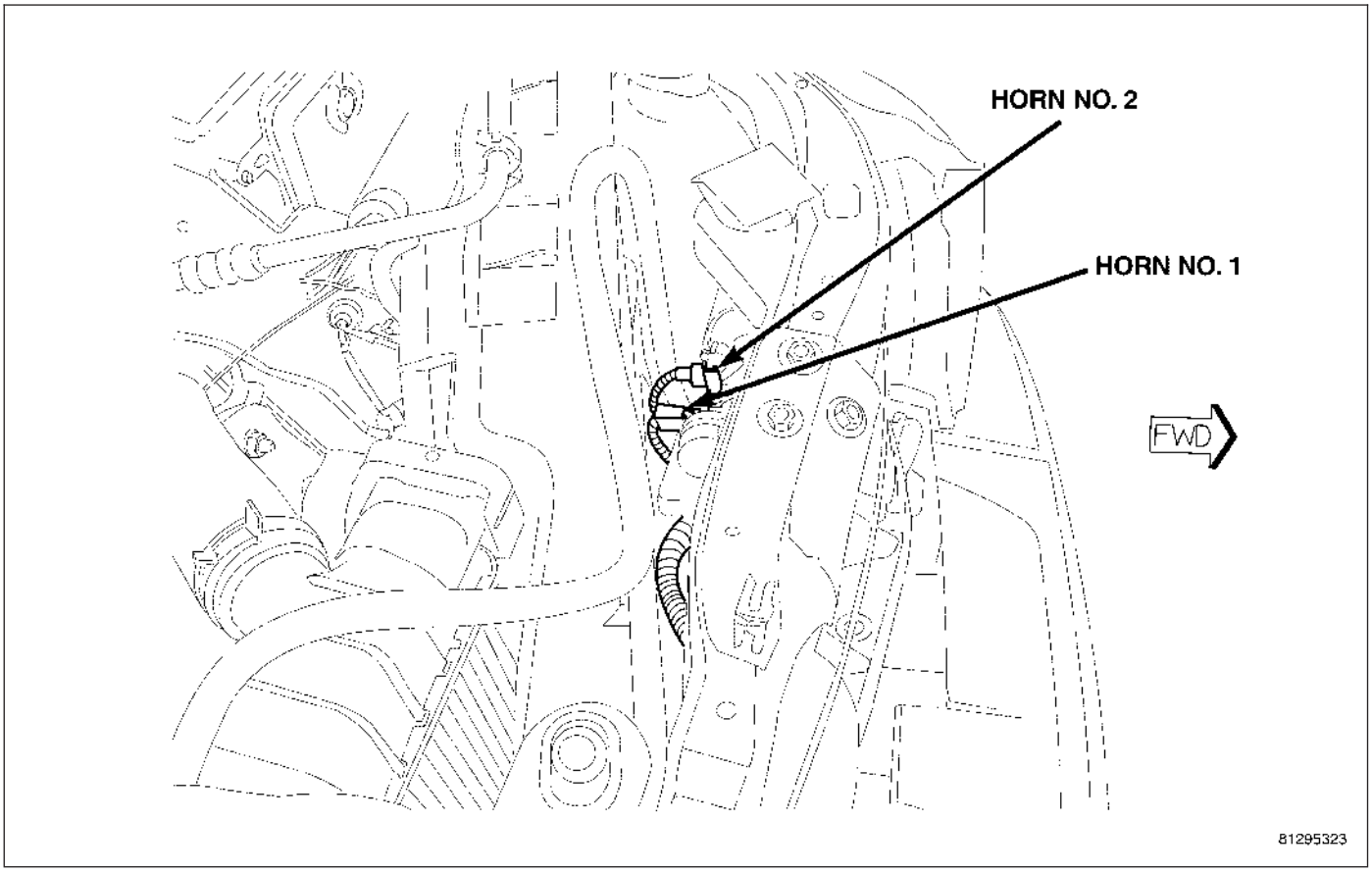

Fig. 3 ENGINE COMPARTMENT - TOP LEFT FRONT

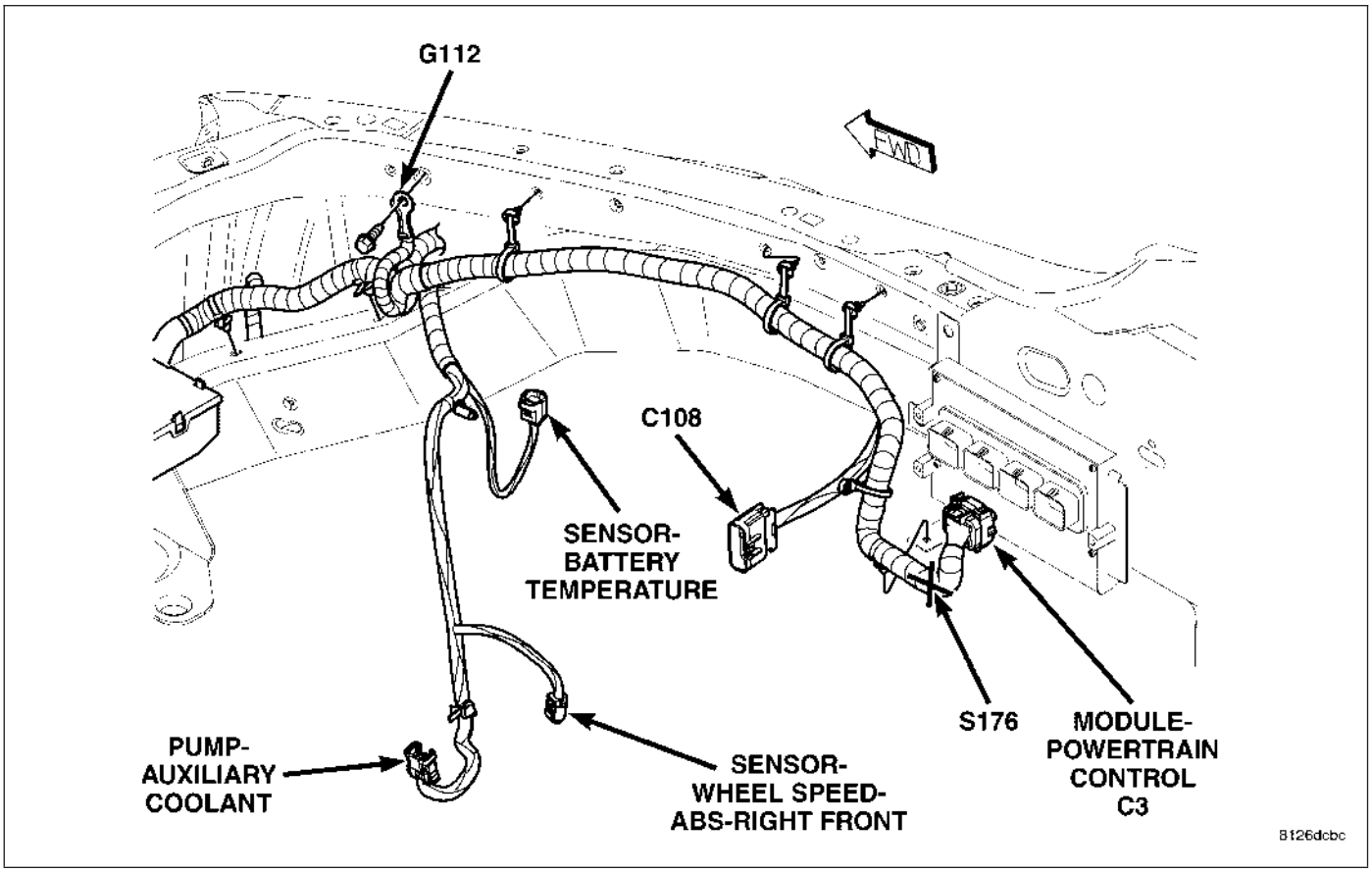

Fig. 4 ENGINE COMPARTMENT - RIGHT

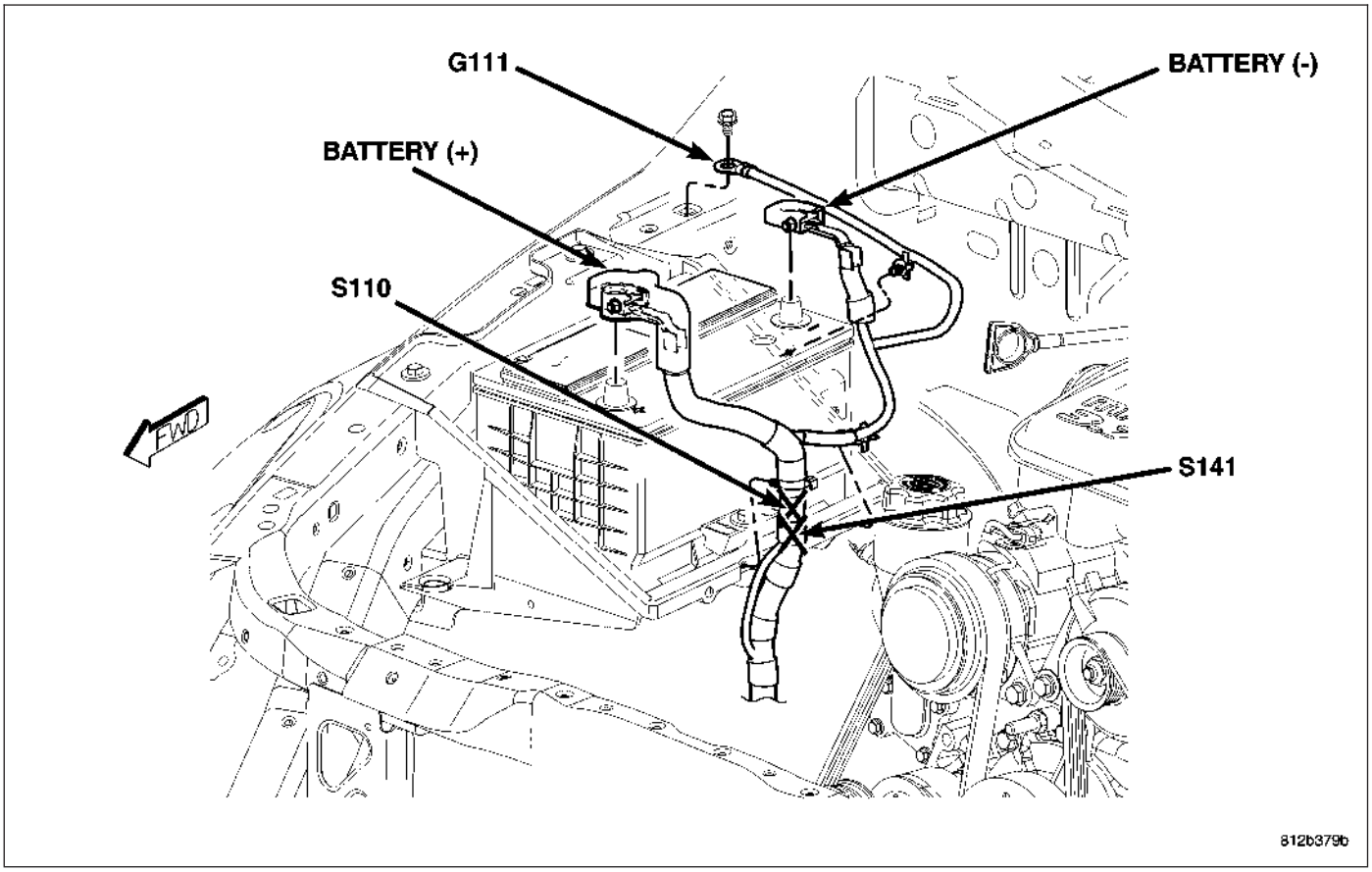

Fig. 5 BATTERY

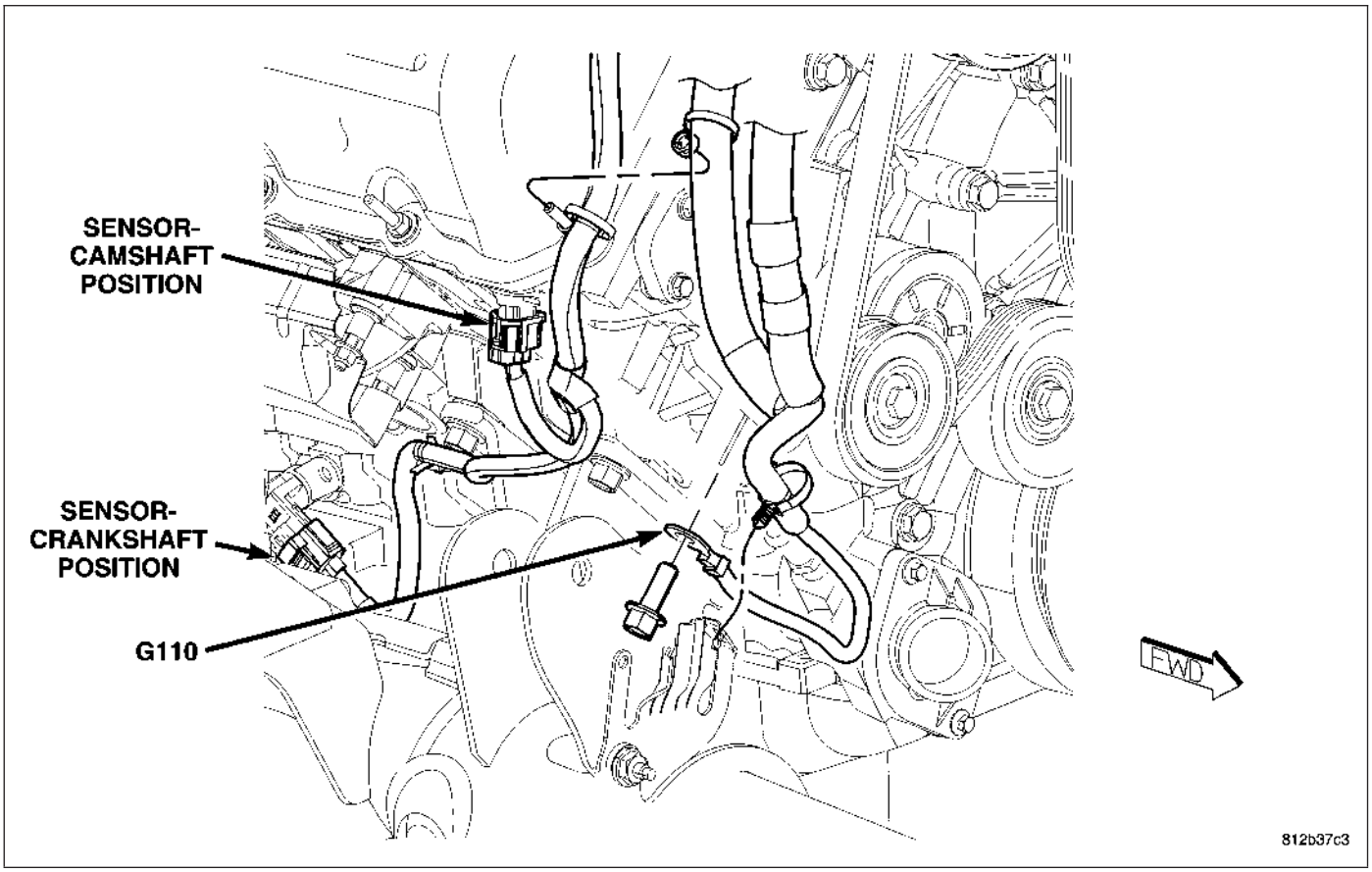

Fig. 6 LOWER RIGHT FRONT ENGINE (3.7L/4.7L)

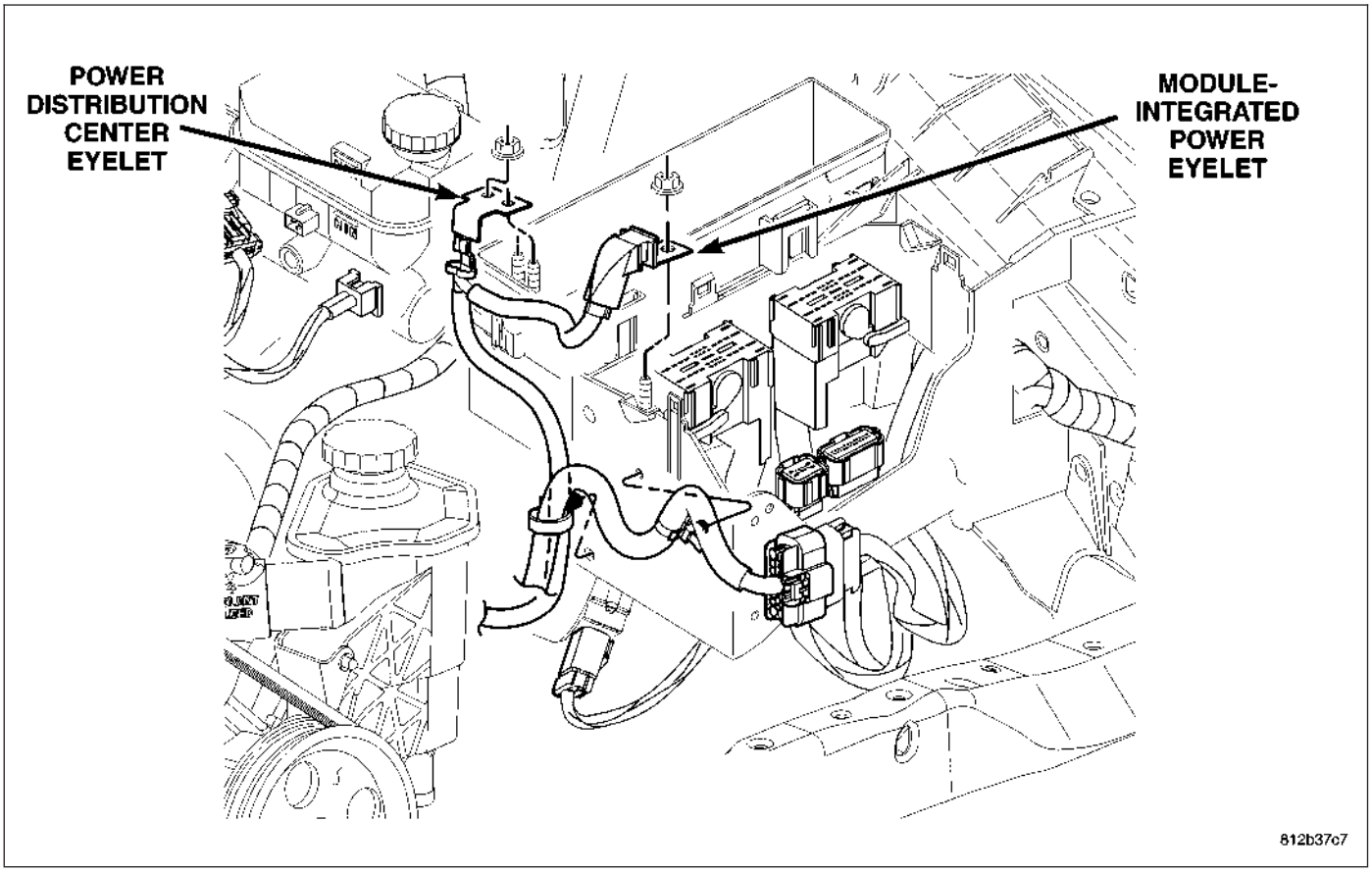

Fig. 7 PDC AND IPM POWER CONNECTIONS

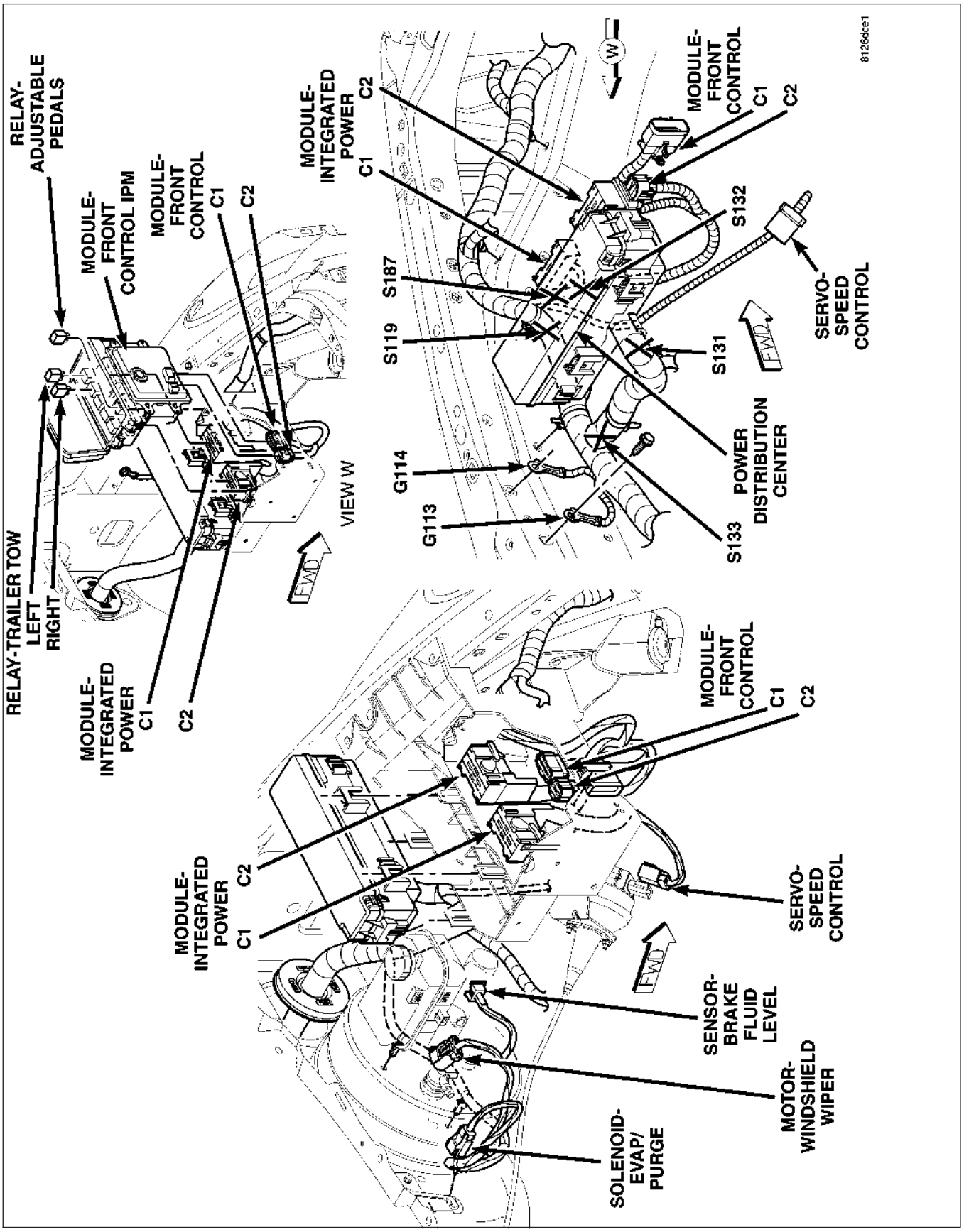

Fig. 8 ENGINE COMPARTMENT - LEFT

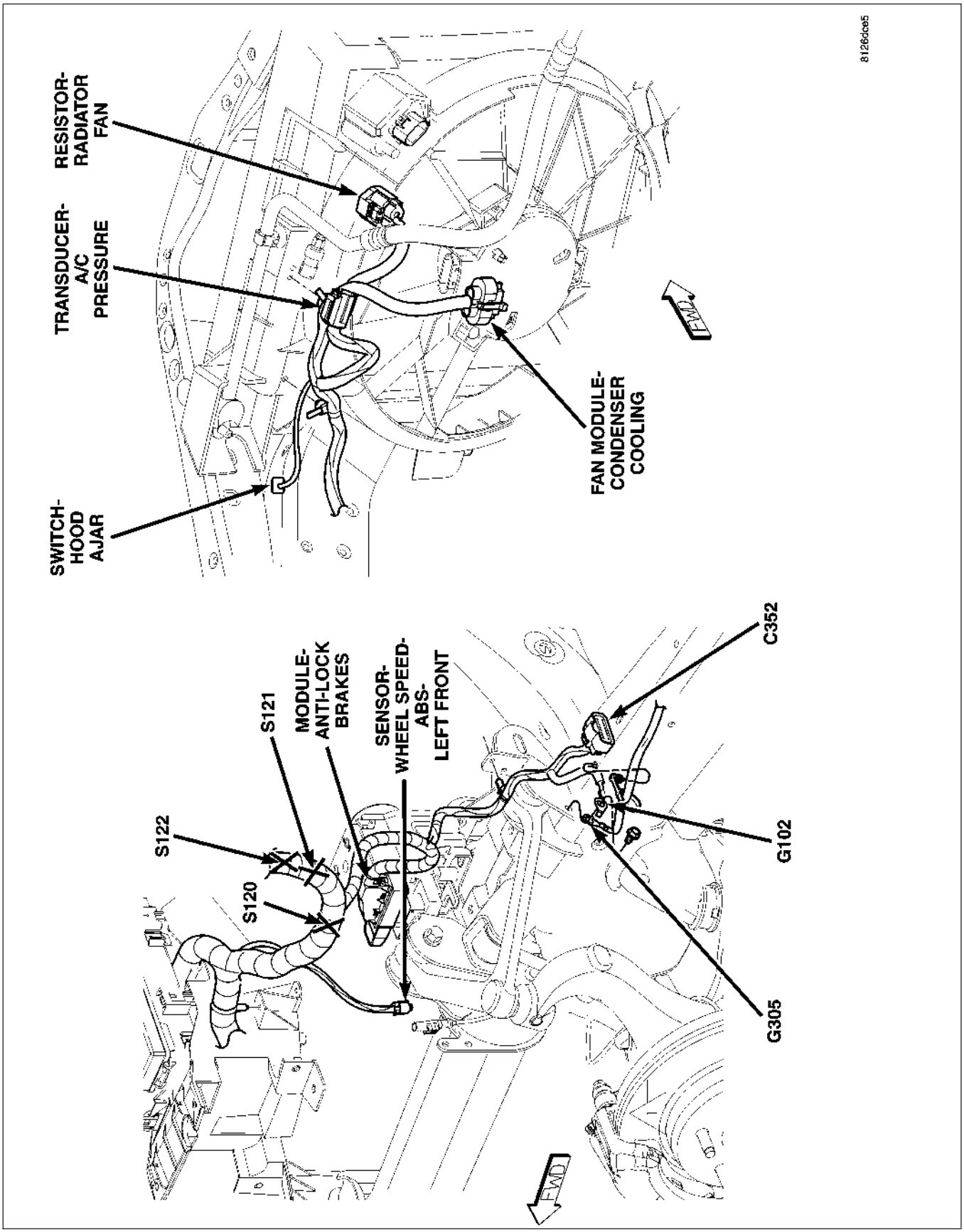

Fig. 9 ENGINE COMPARTMENT - LEFT FRONT

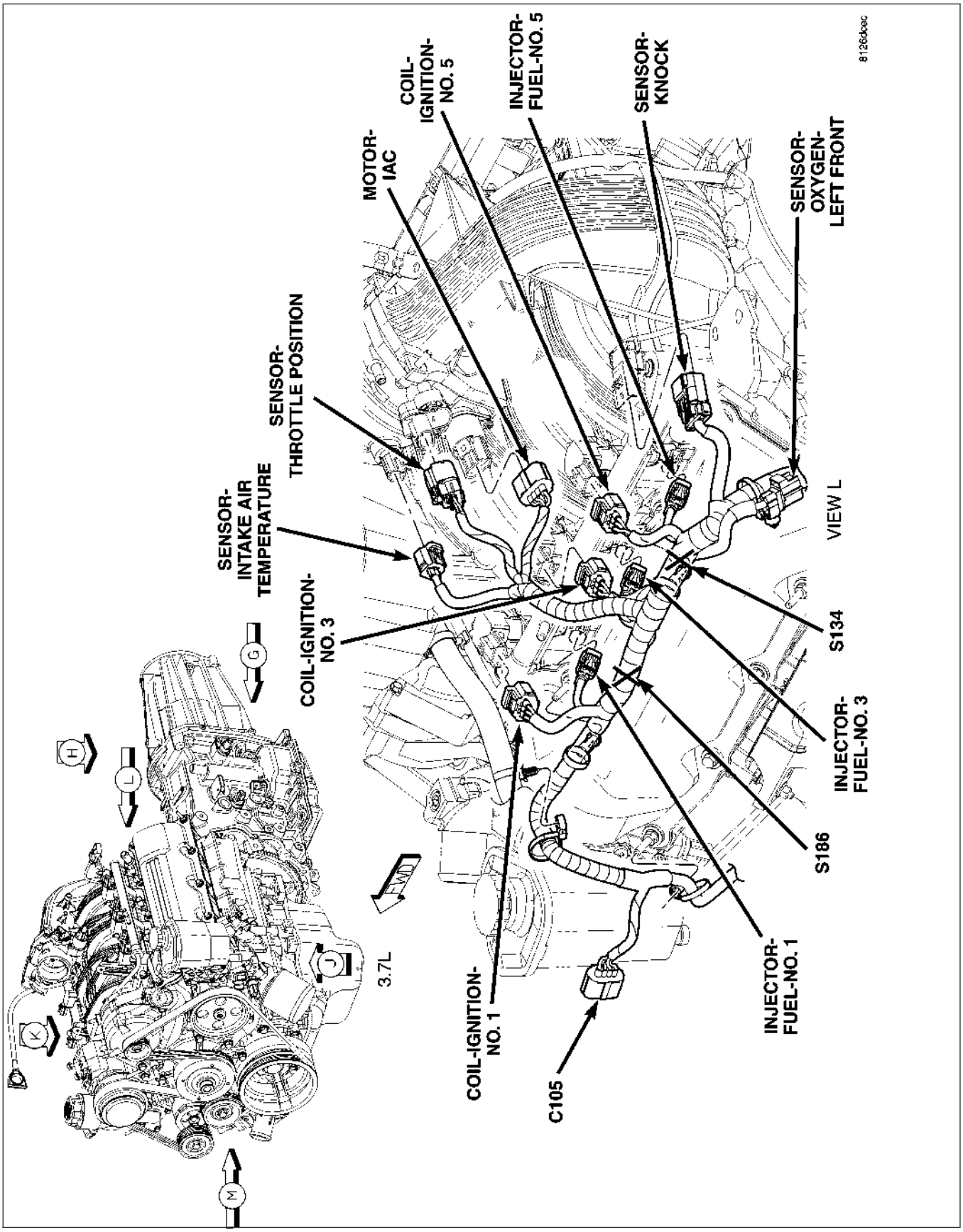

Fig. 10 ENGINE 3.7L

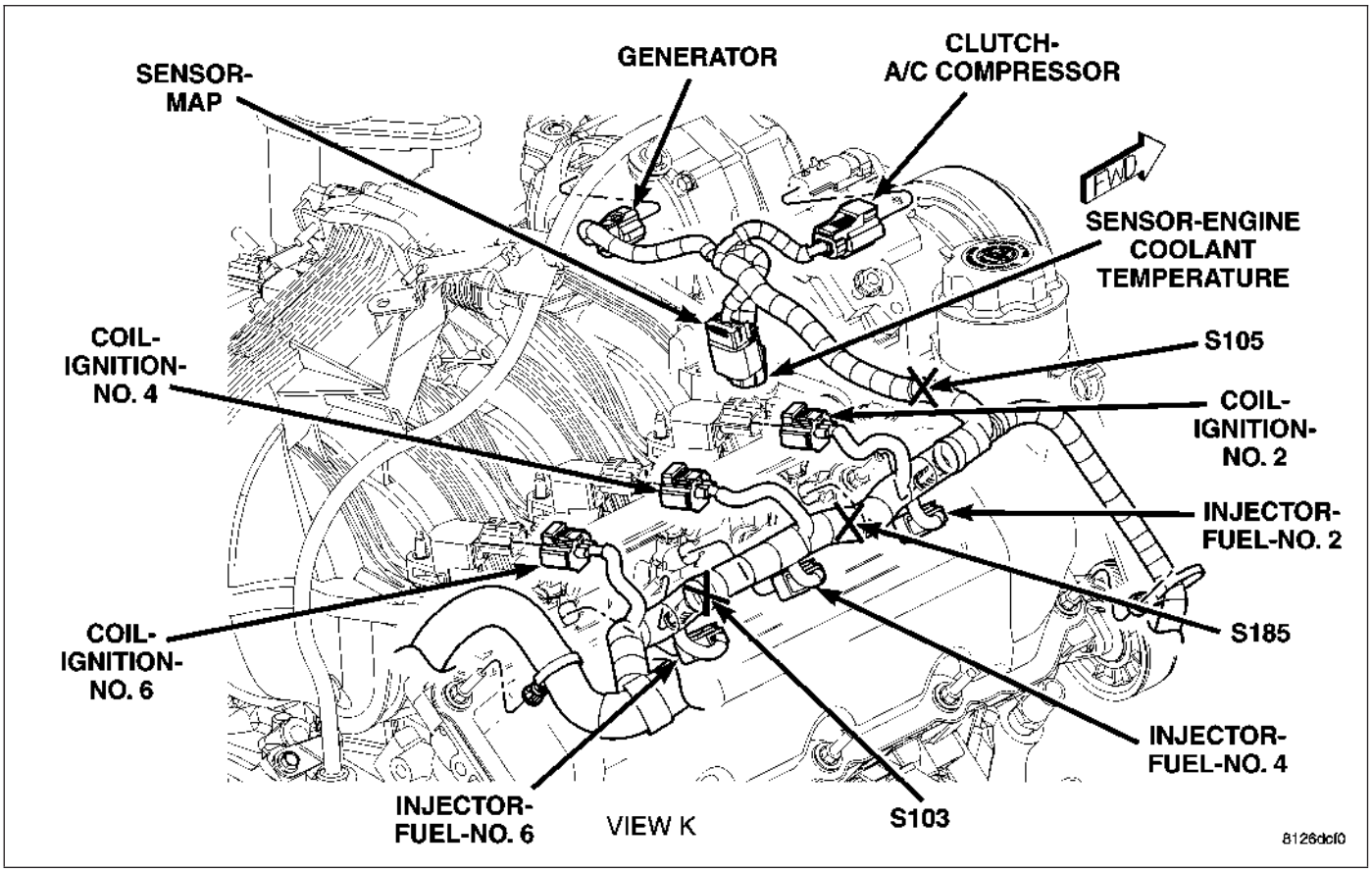

Fig. 11 ENGINE 3.7L - RIGHT

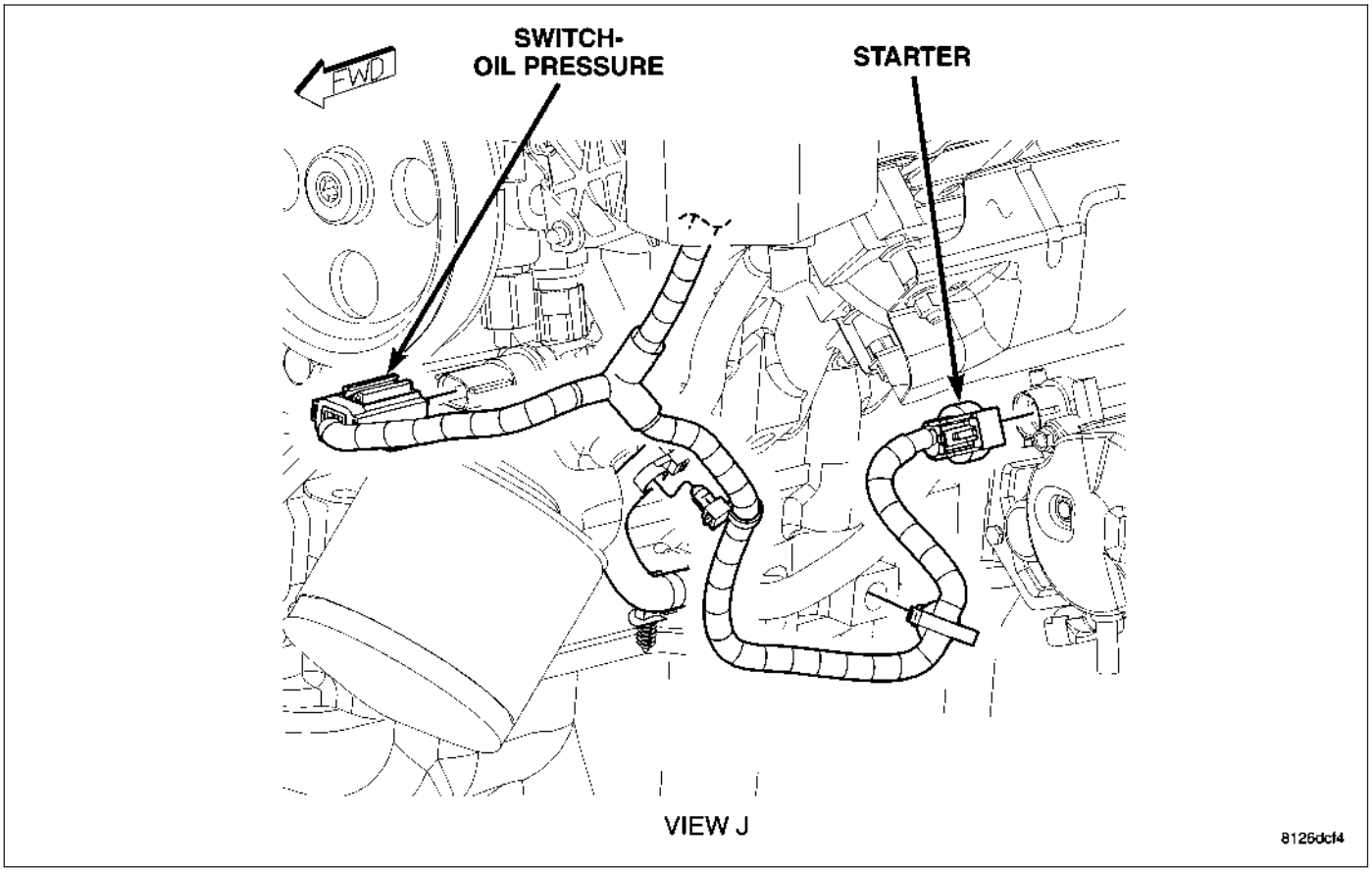

Fig. 12 ENGINE 3.7L - FRONT

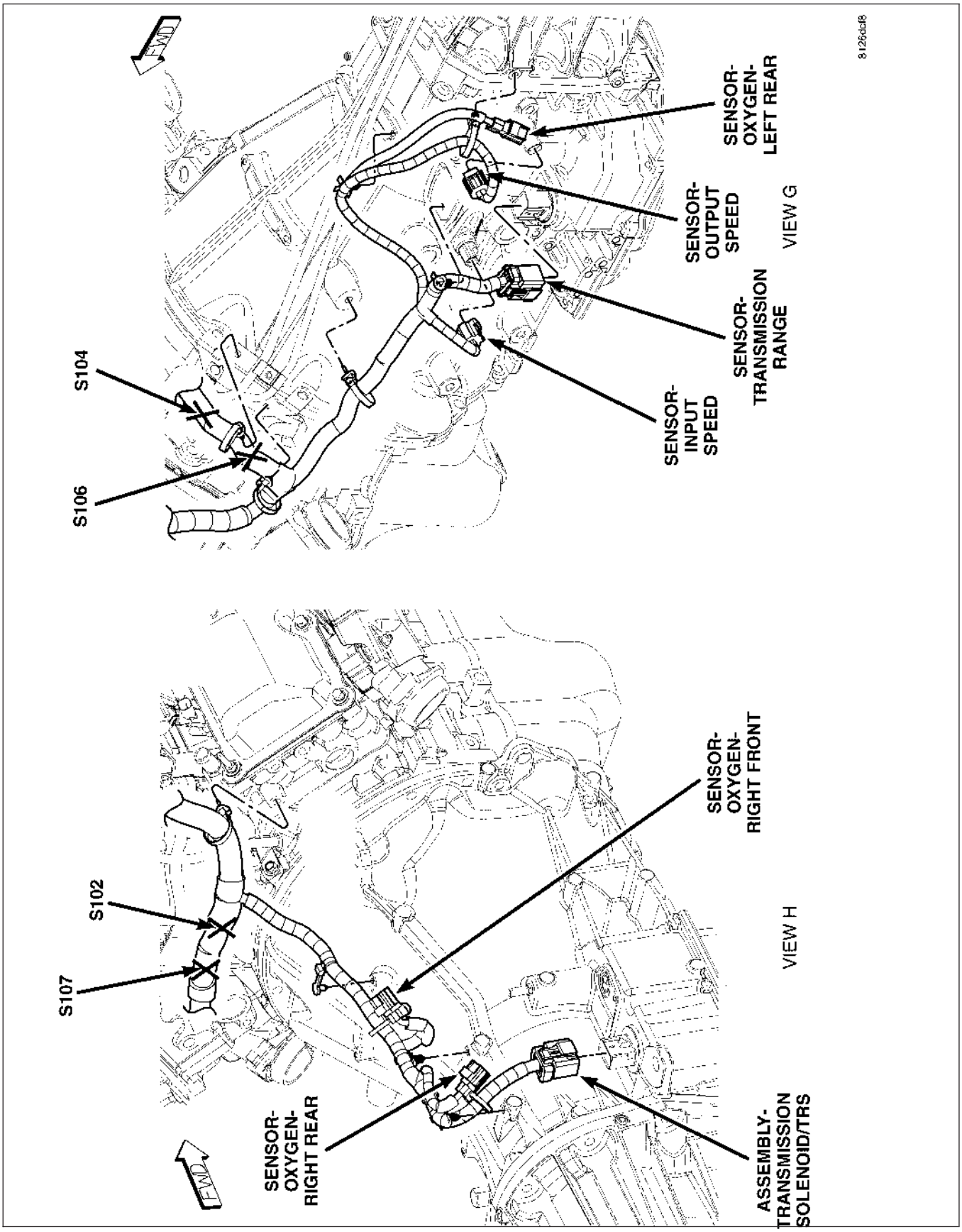

Fig. 13 TRANSMISSION 3.7L

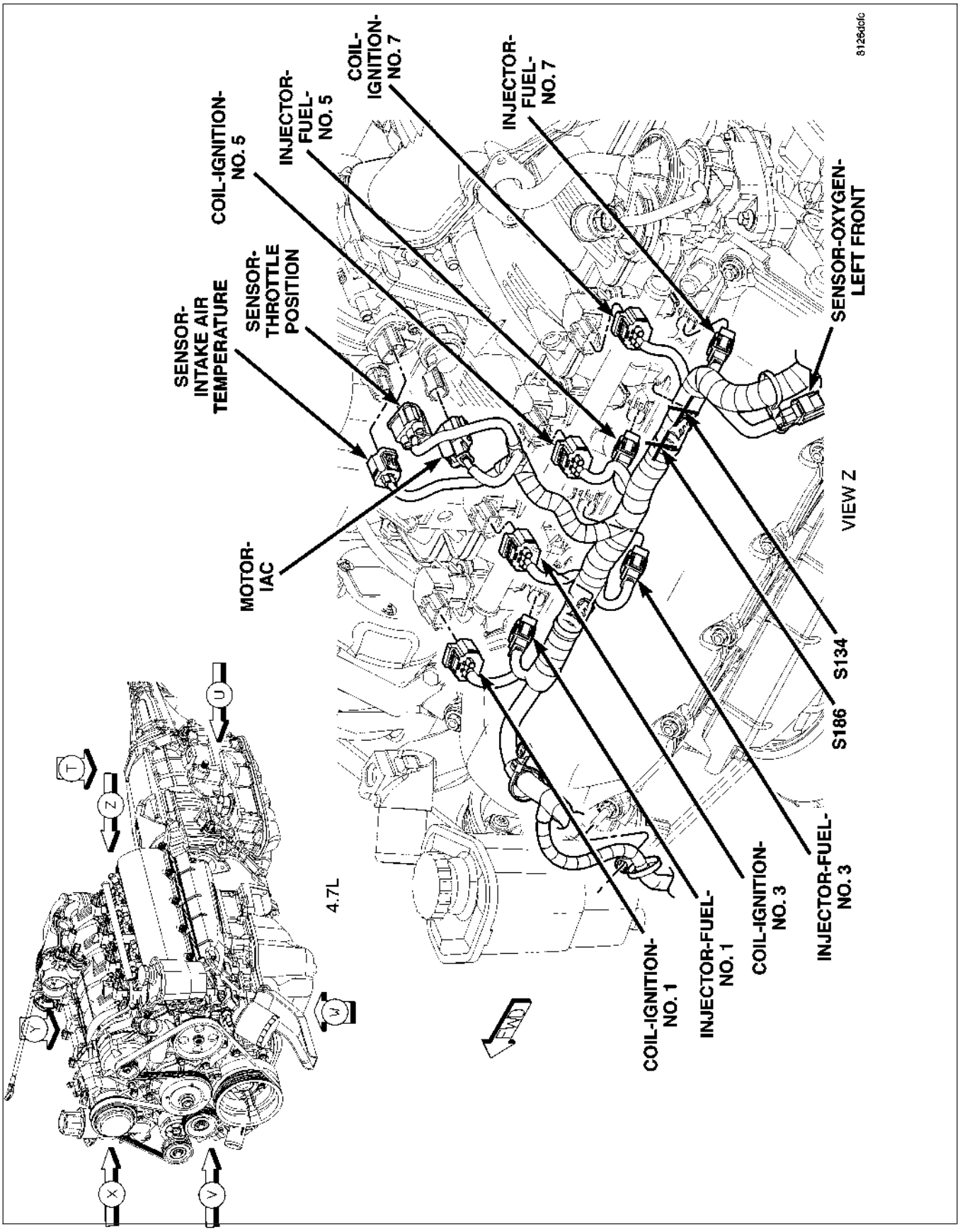

Fig. 14 ENGINE 4.7L

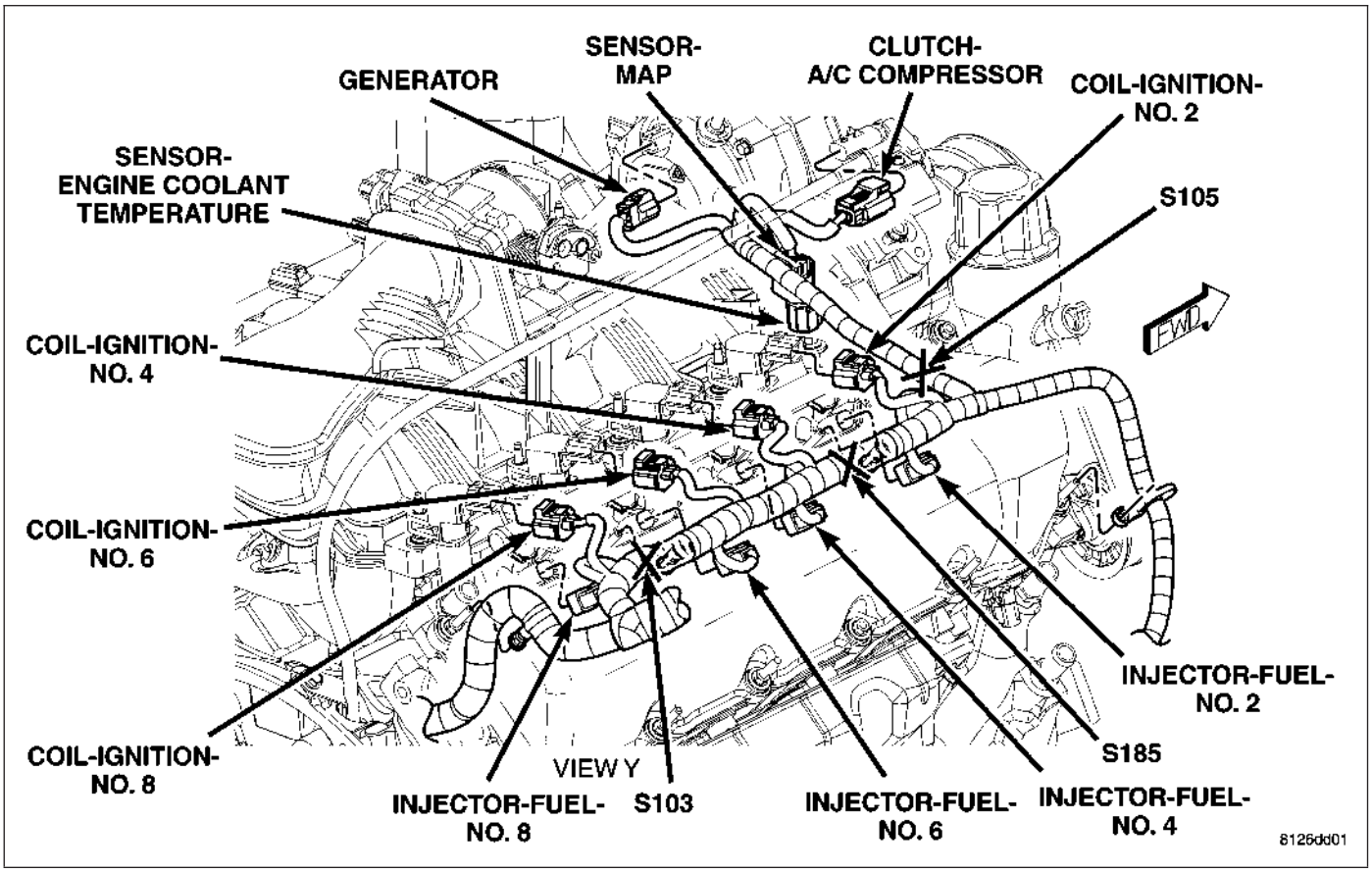

Fig. 15 ENGINE 4.7L - RIGHT

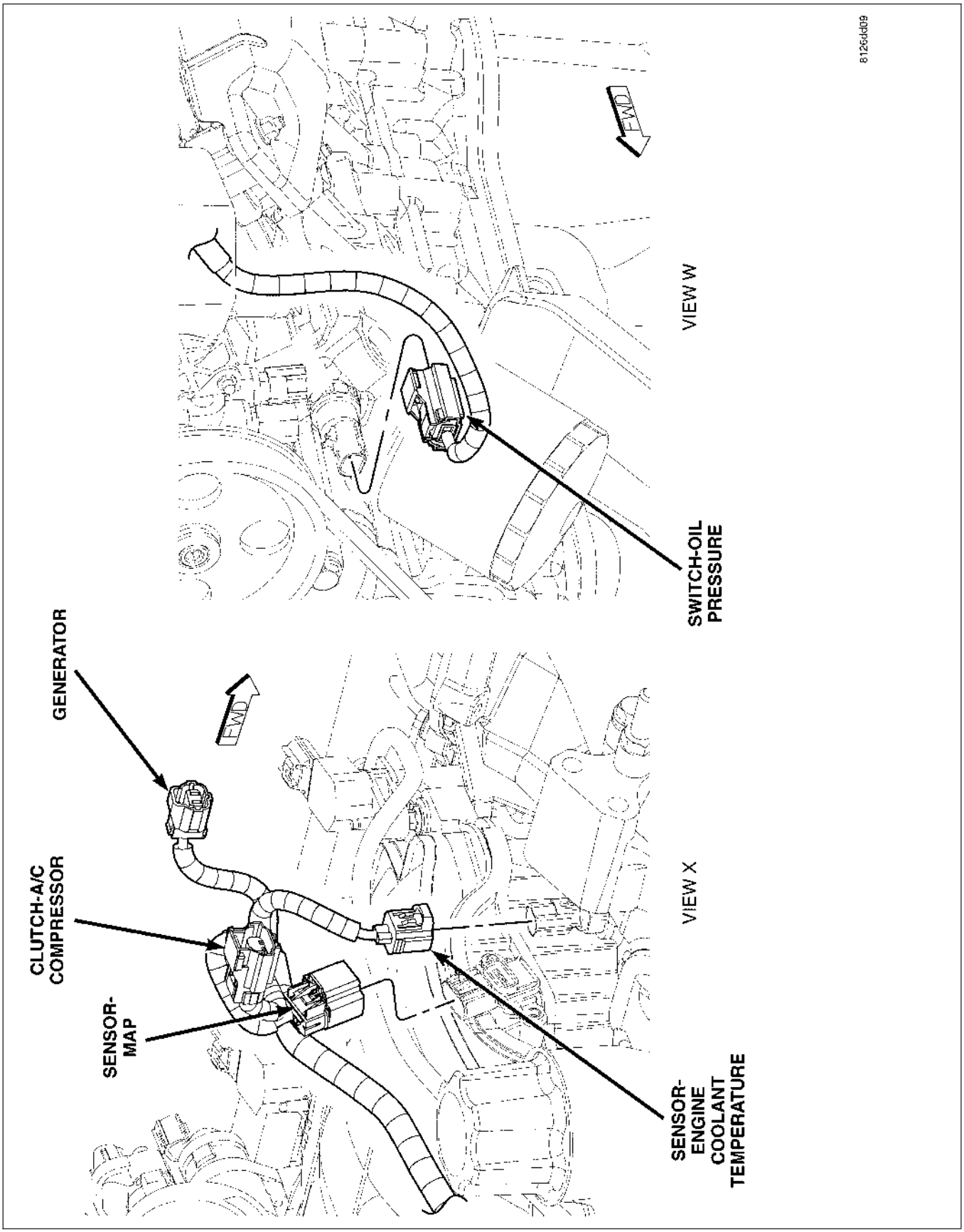

Fig. 16 ENGINE 4.7L - FRONT

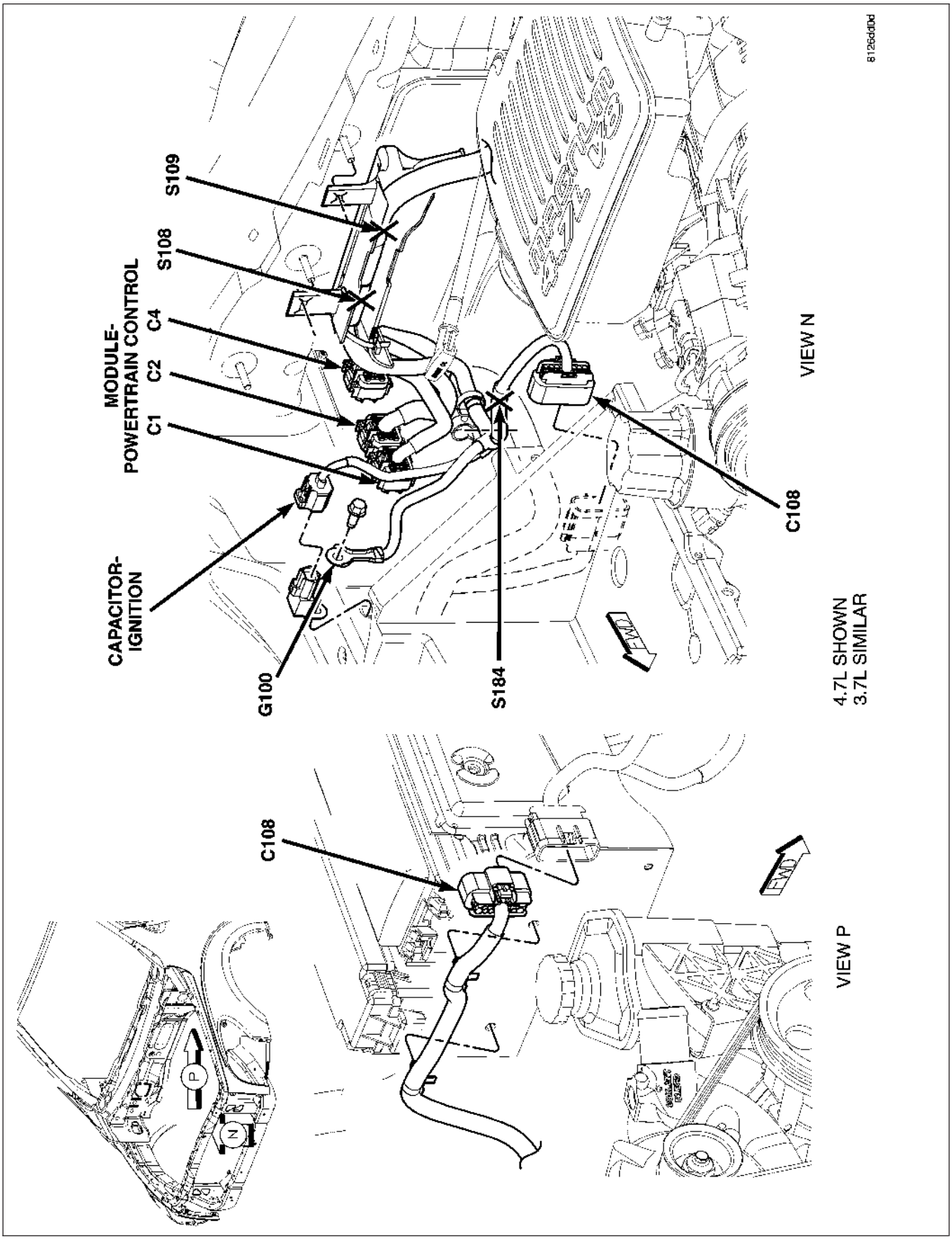

Fig. 17 ENGINE COMPARTMENT - LEFT AND RIGHT SIDES

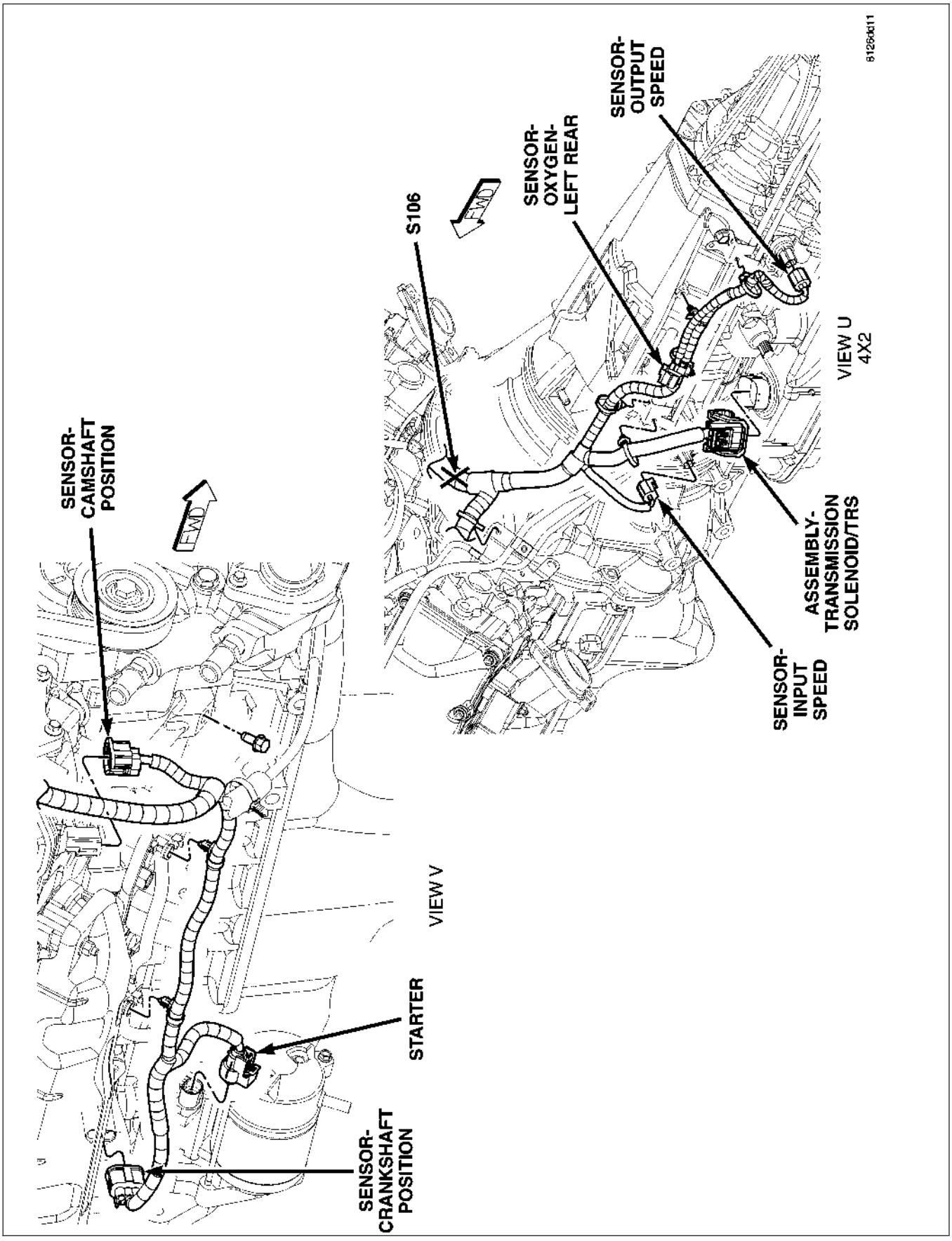

Fig. 18 ENGINE AND TRANSMISSION 4.7L

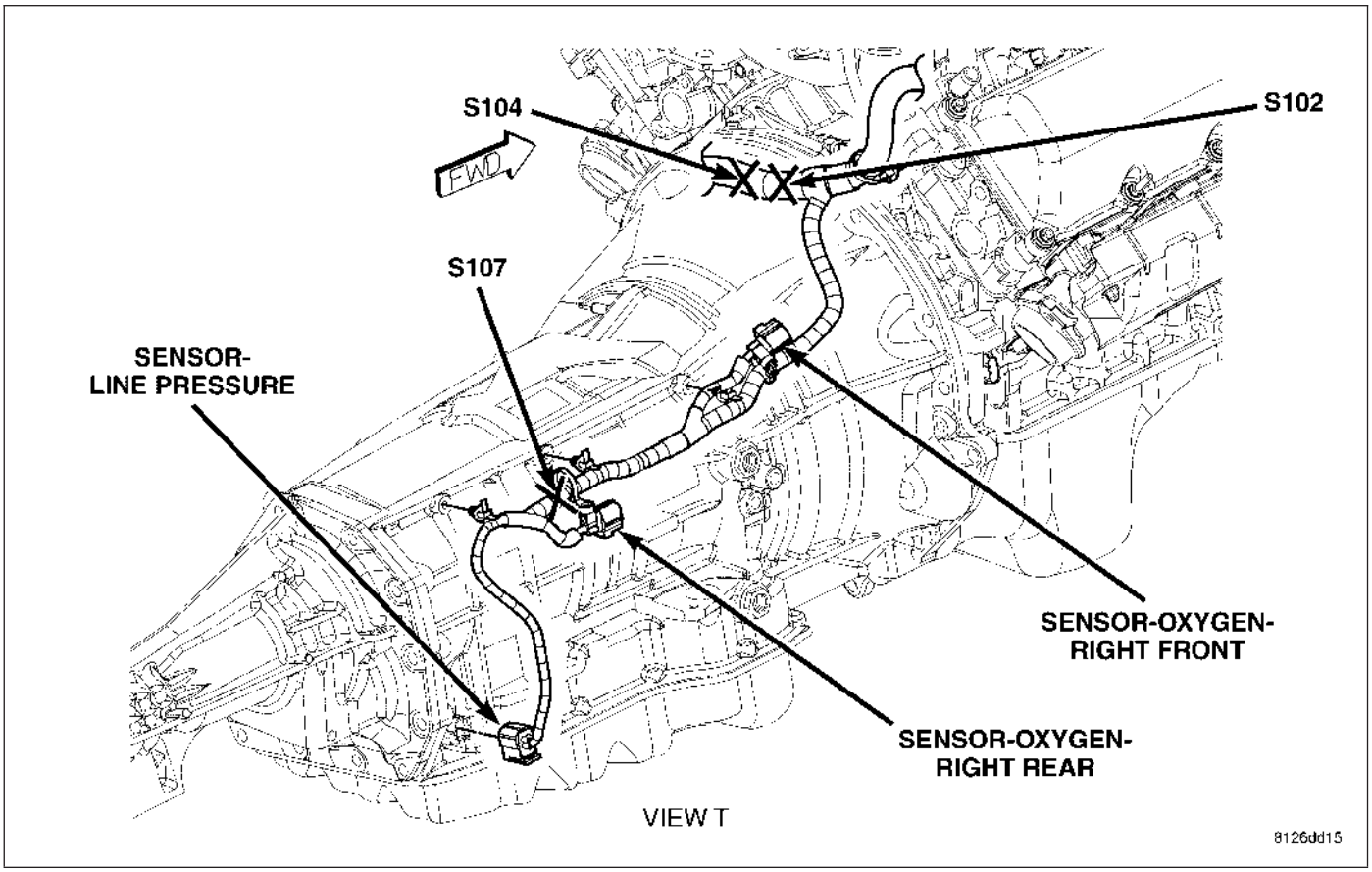

Fig. 19 TRANSMISSION 3.7L - RIGHT

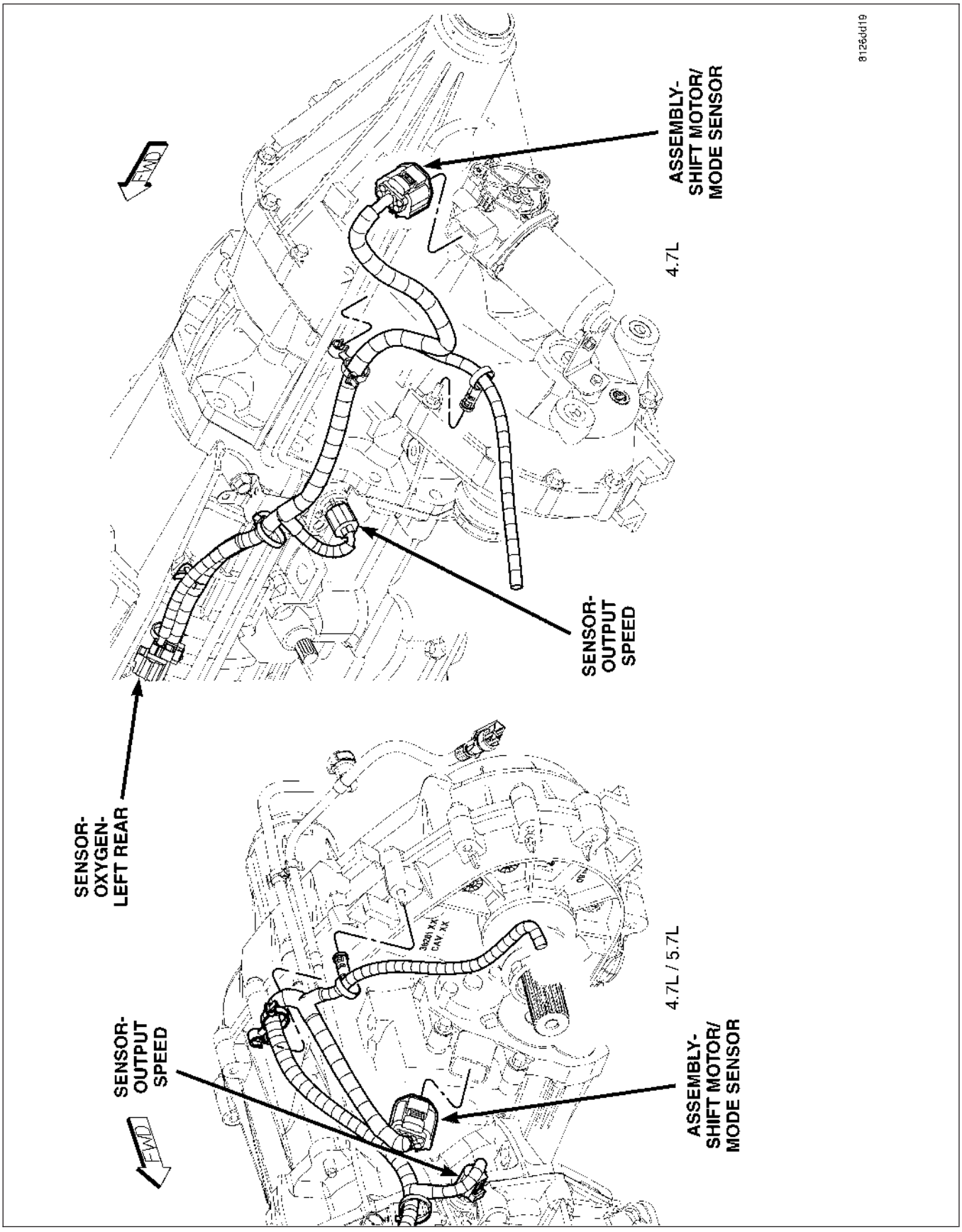

Fig. 20 TRANSMISSION 4.7L/5.7L - LEFT

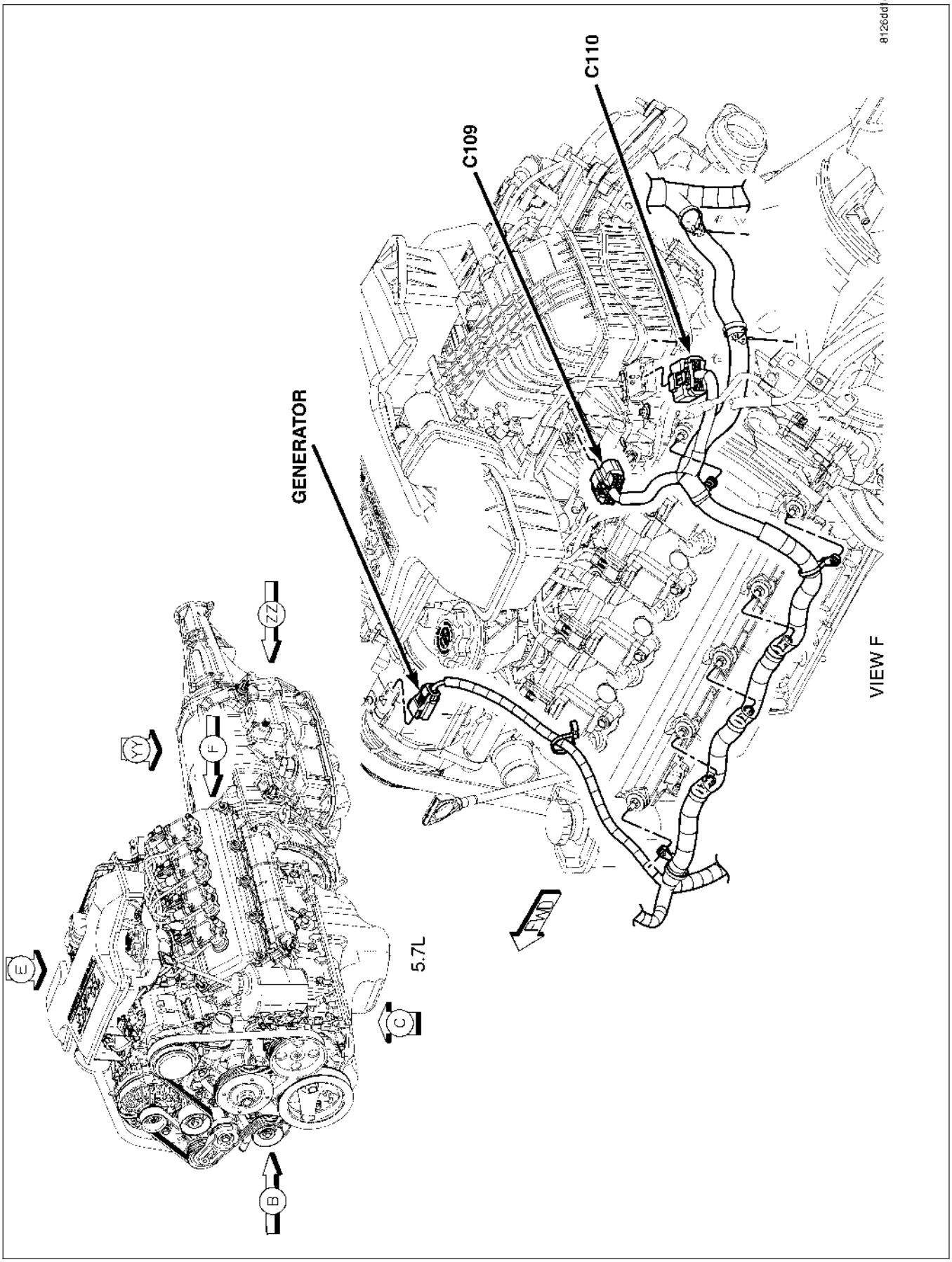

Fig. 21 ENGINE 5.7L

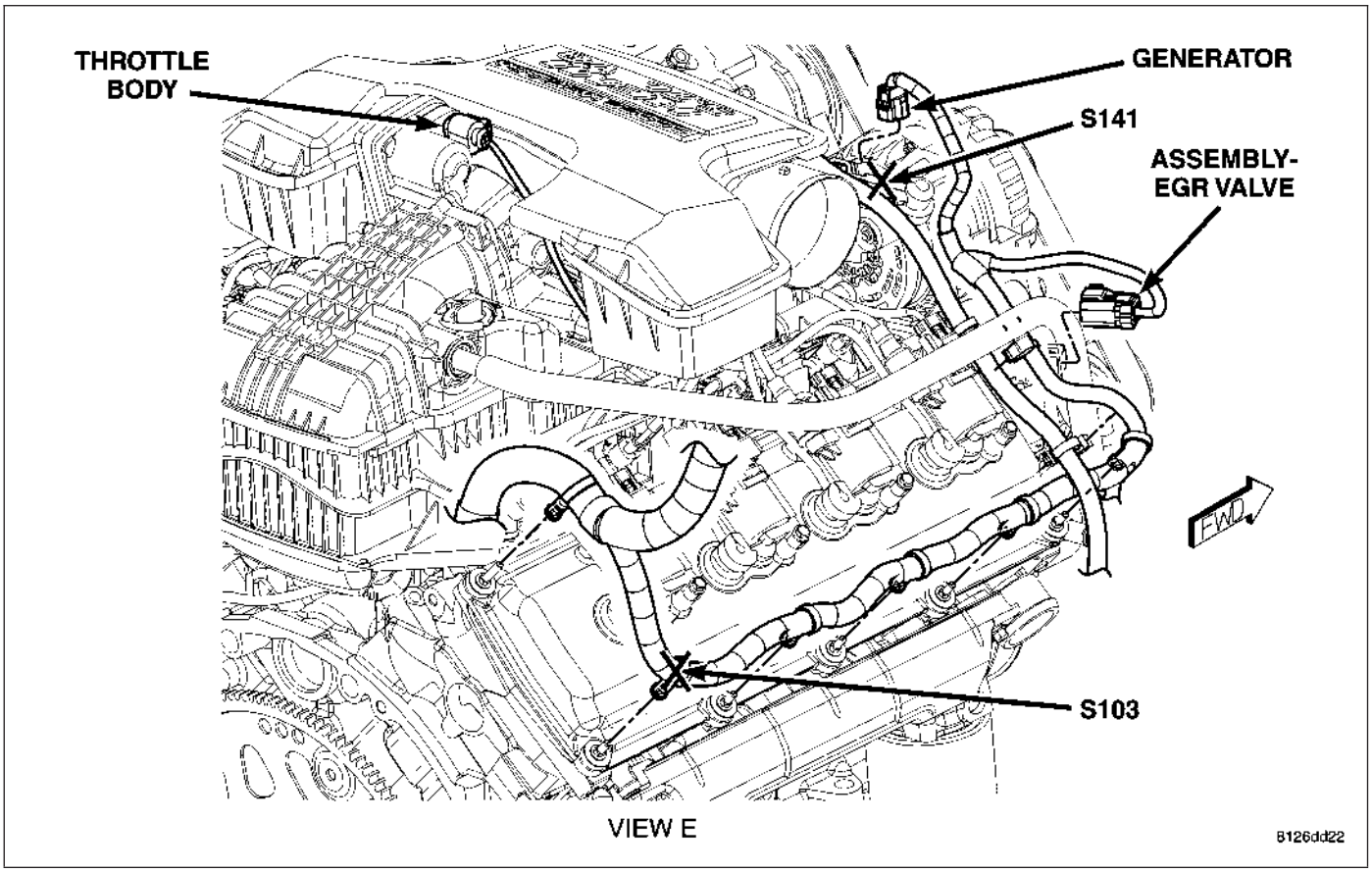

Fig. 22 ENGINE 5.7L - RIGHT REAR

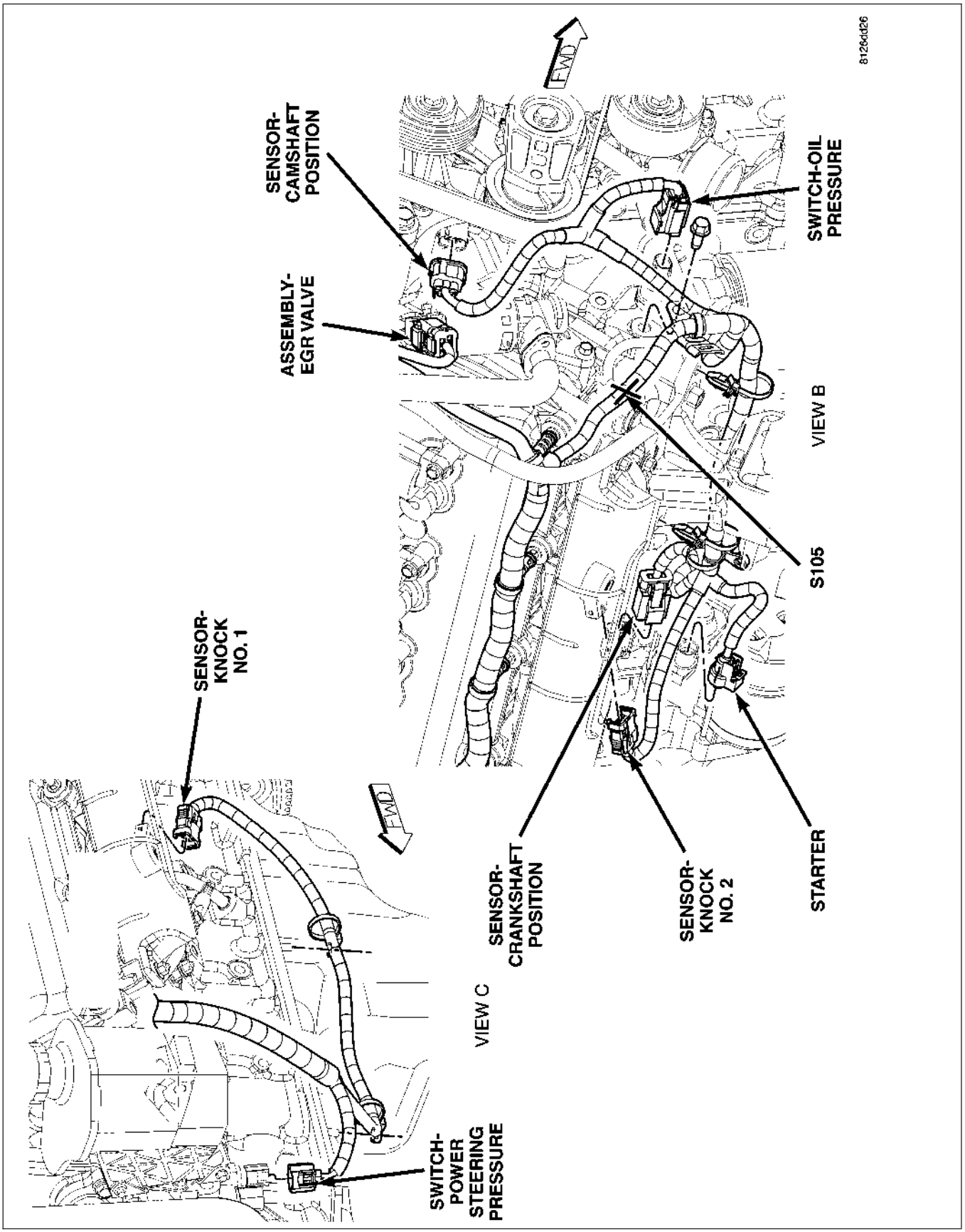

Fig. 23 ENGINE 5.7L - FRONT

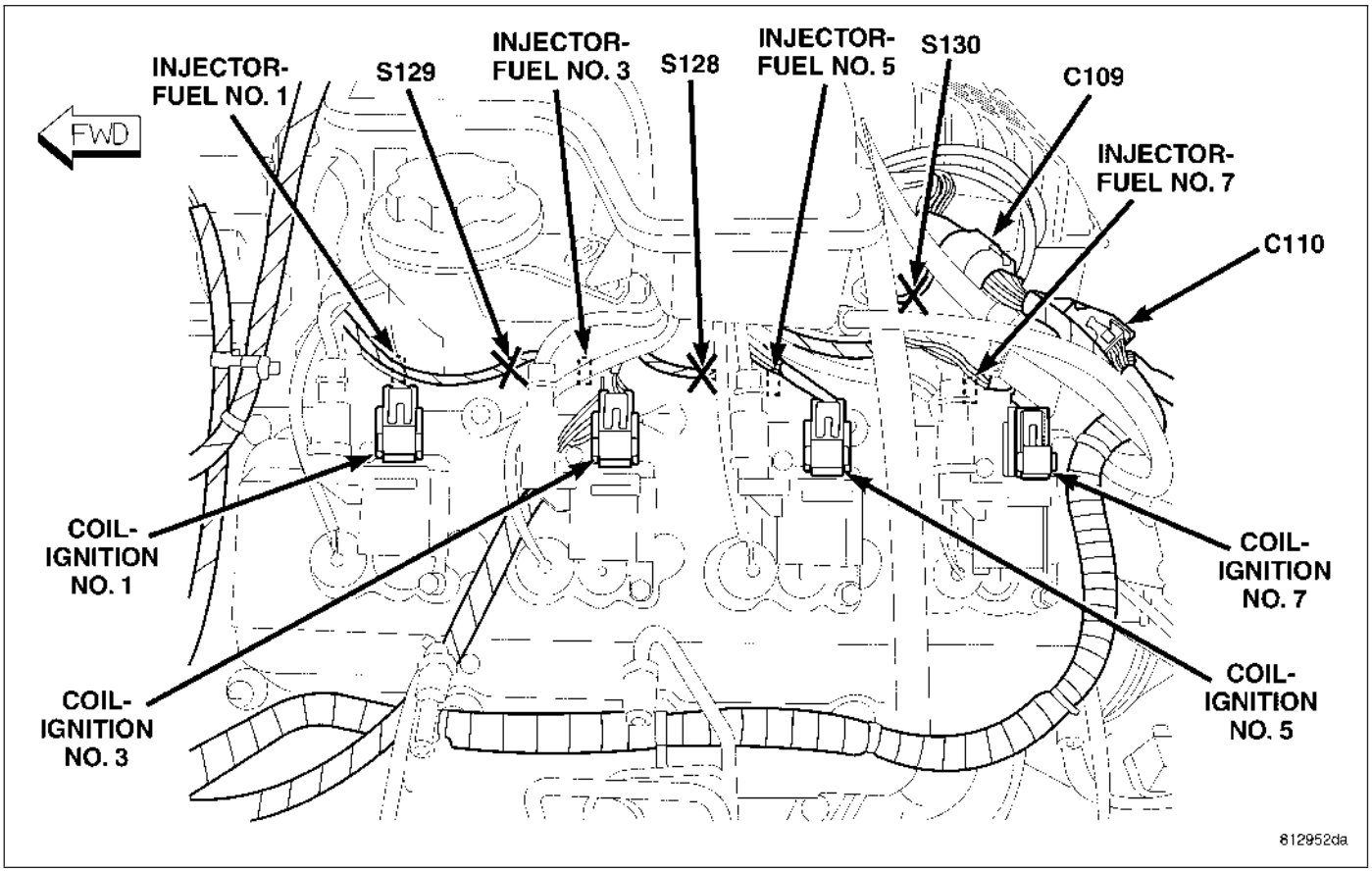

Fig. 24 ENGINE 5.7L - TOP LEFT

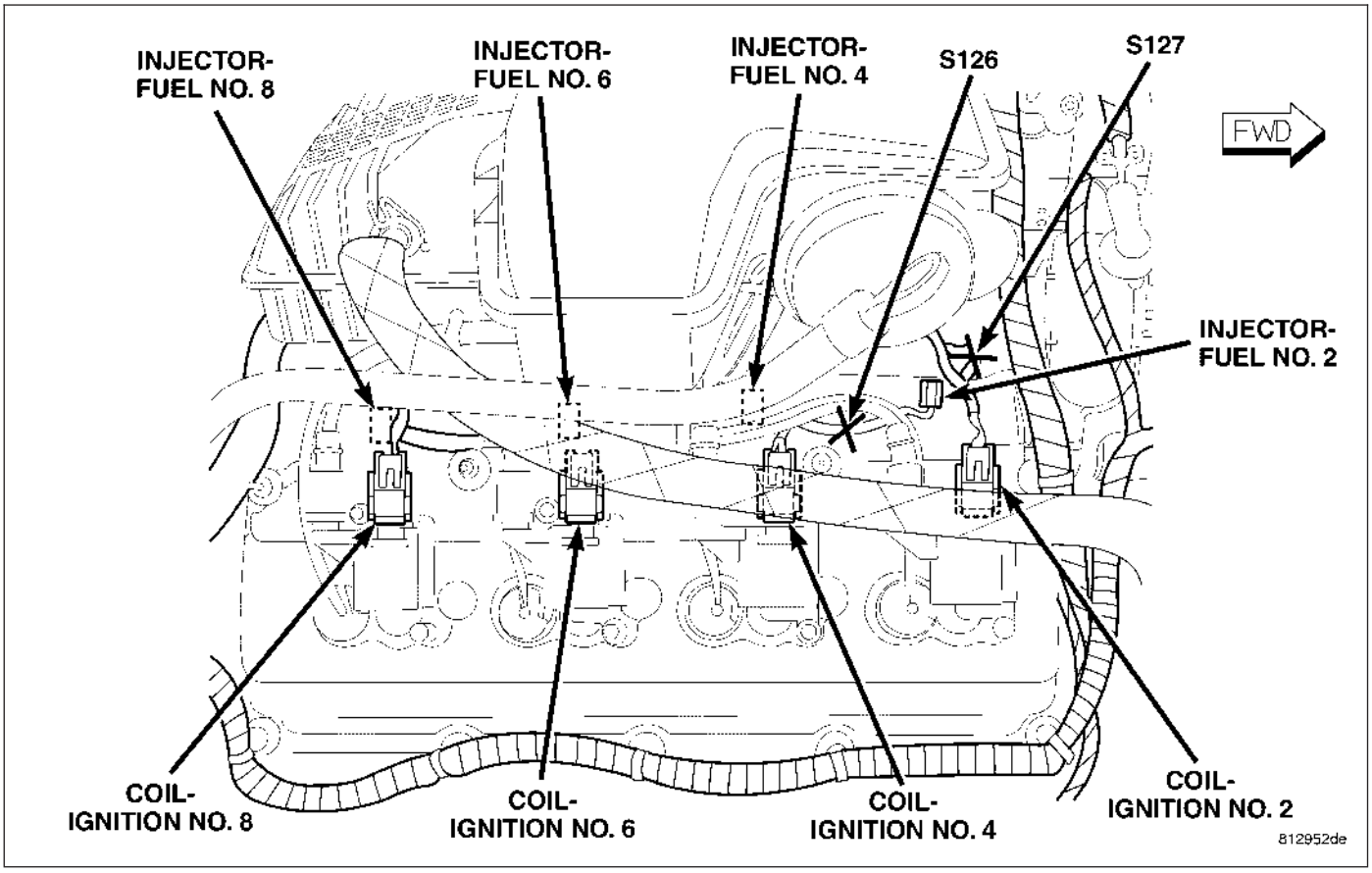

Fig. 25 ENGINE 5.7L - TOP RIGHT

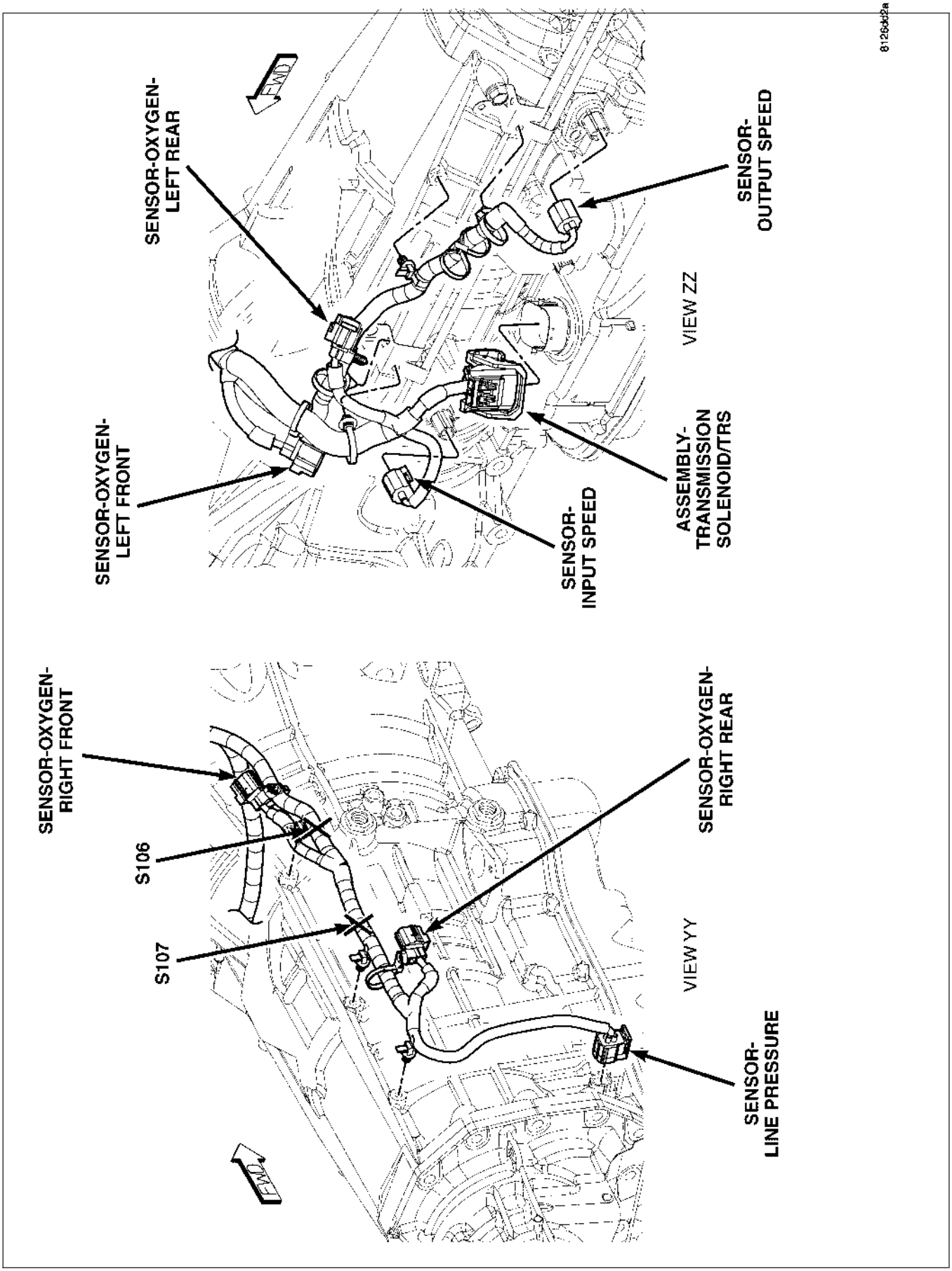

Fig. 26 TRANSMISSION 5.7L

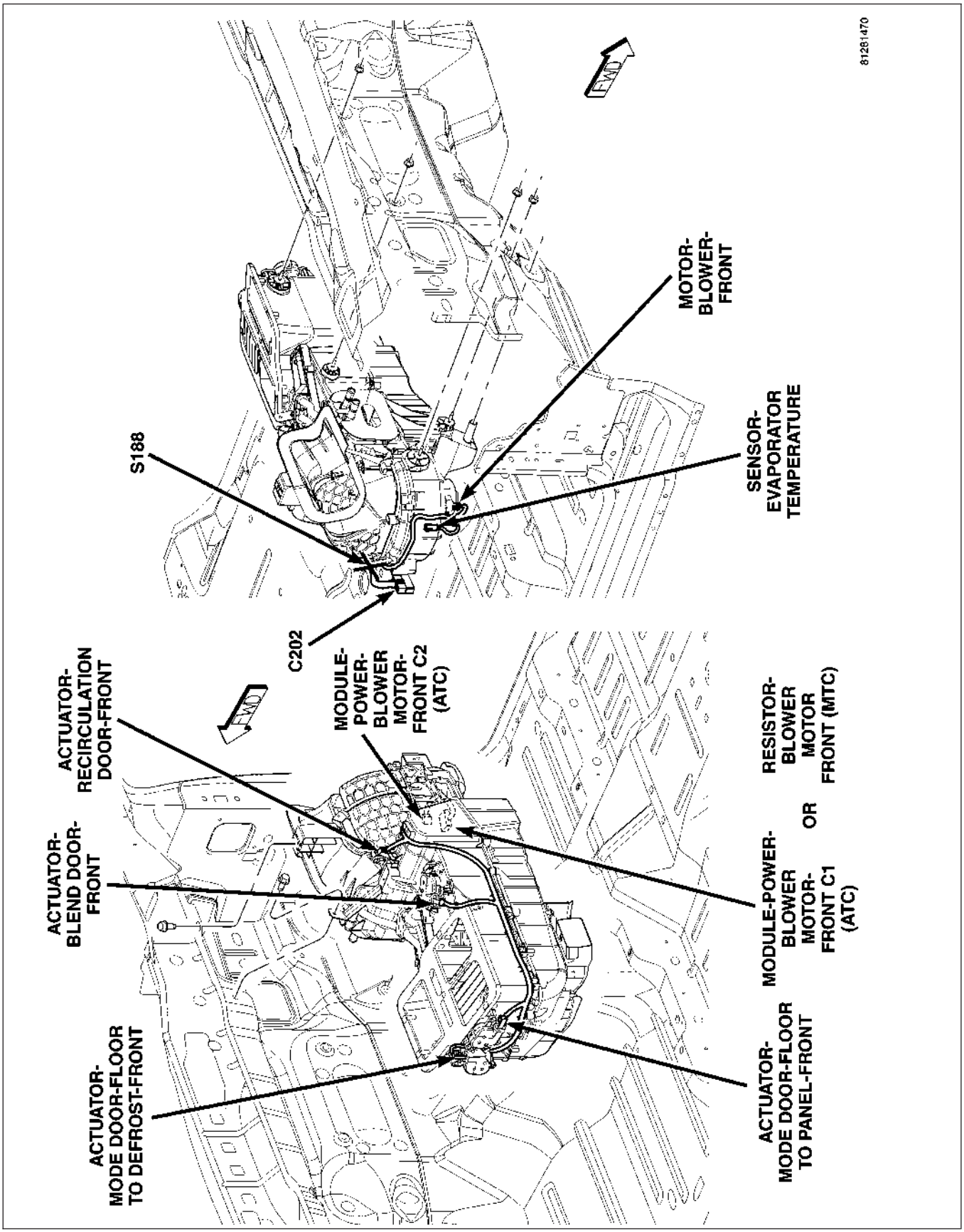

Fig. 27 FRONT HVAC

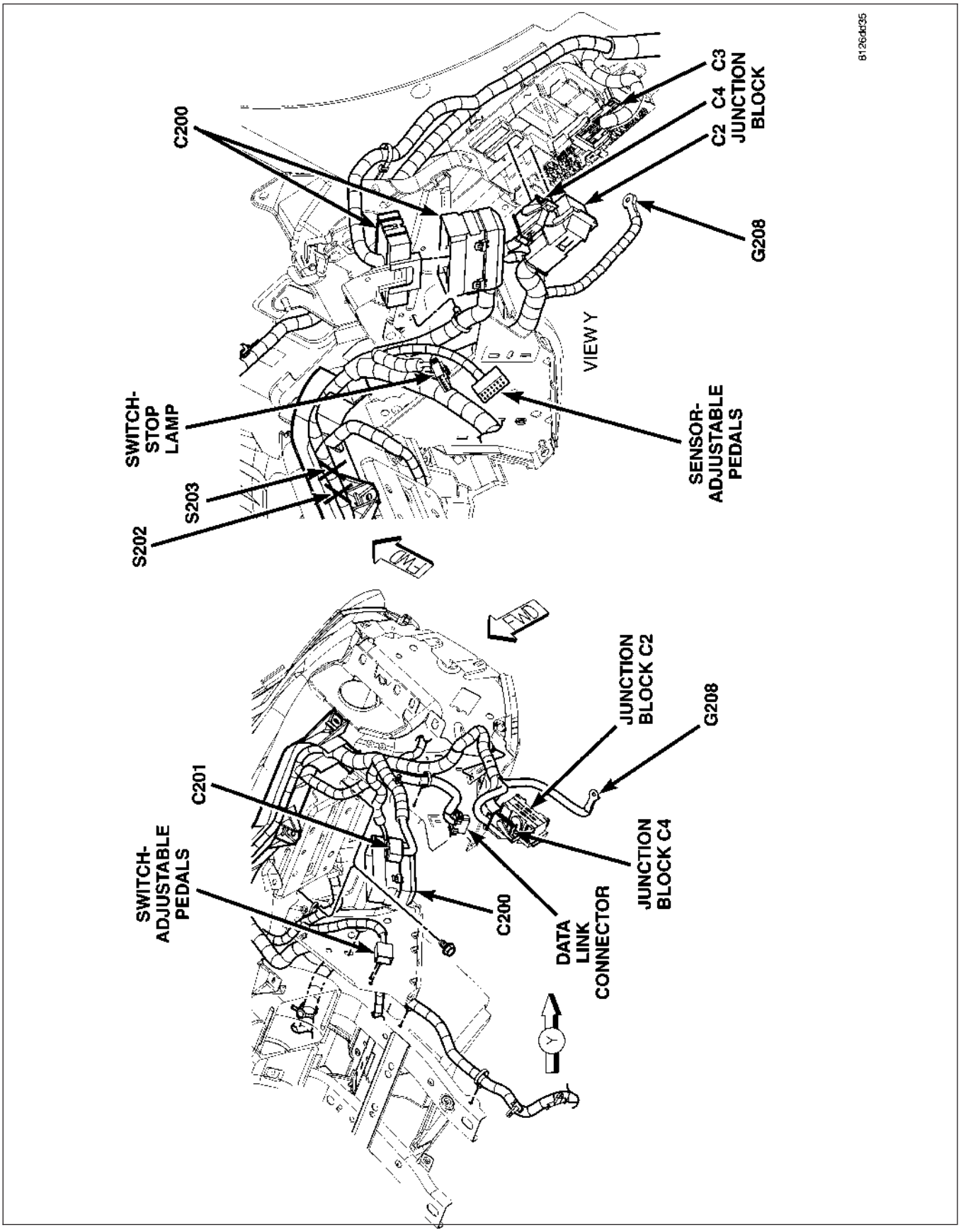

Fig. 28 INSTRUMENT PANEL - LEFT

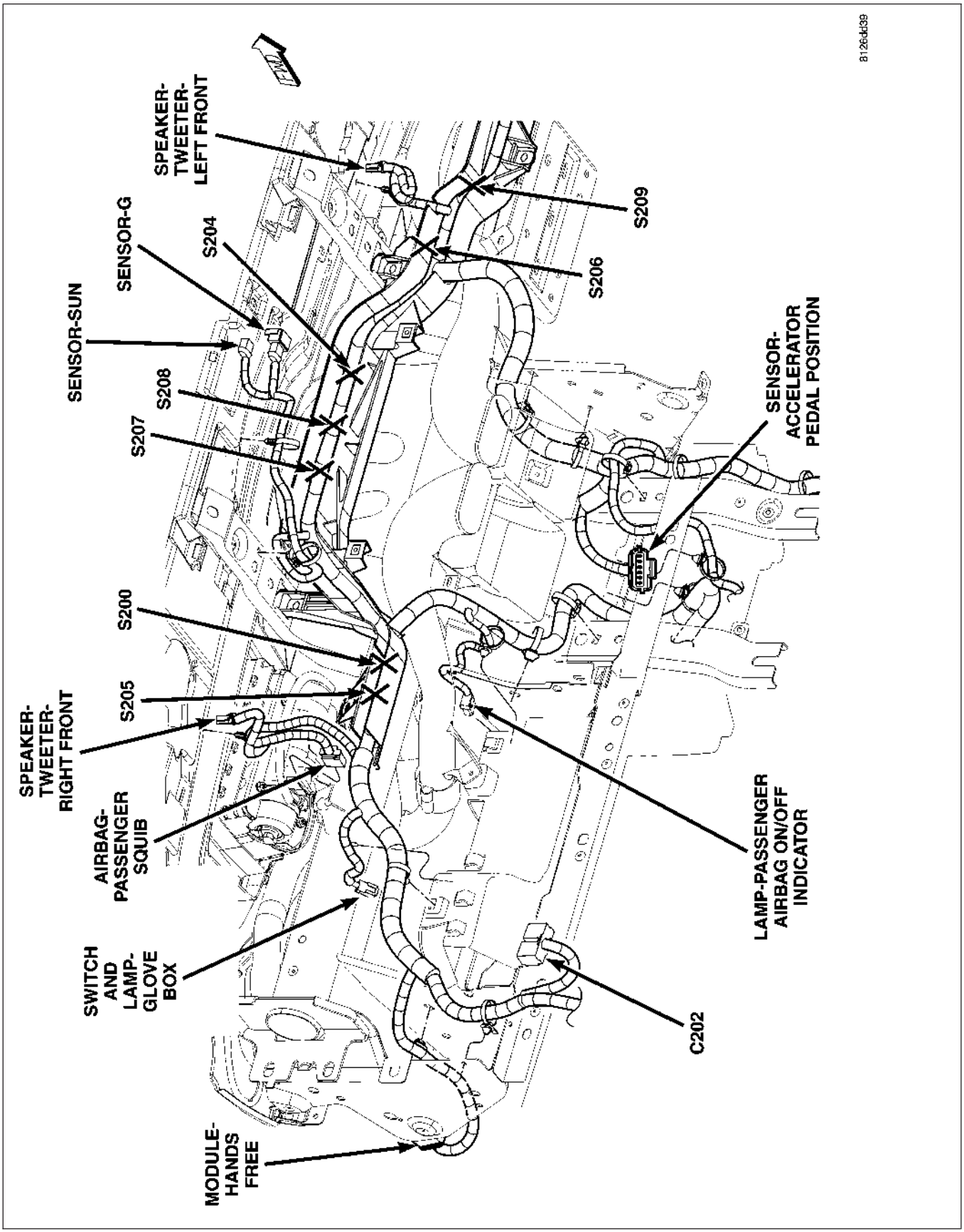

Fig. 29 INSTRUMENT PANEL - RIGHT

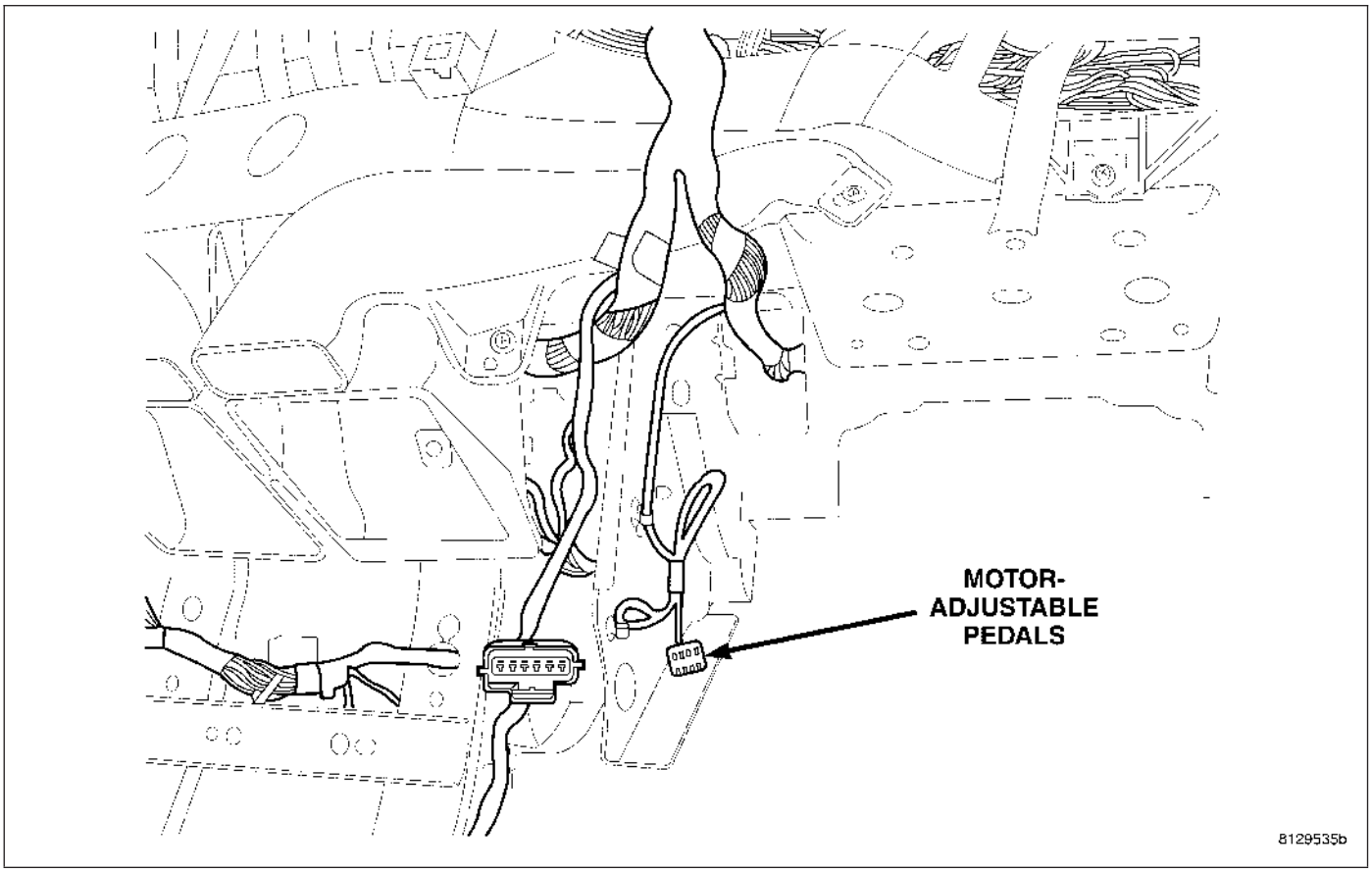

Fig. 30 INSTRUMENT PANEL - CENTER LEFT

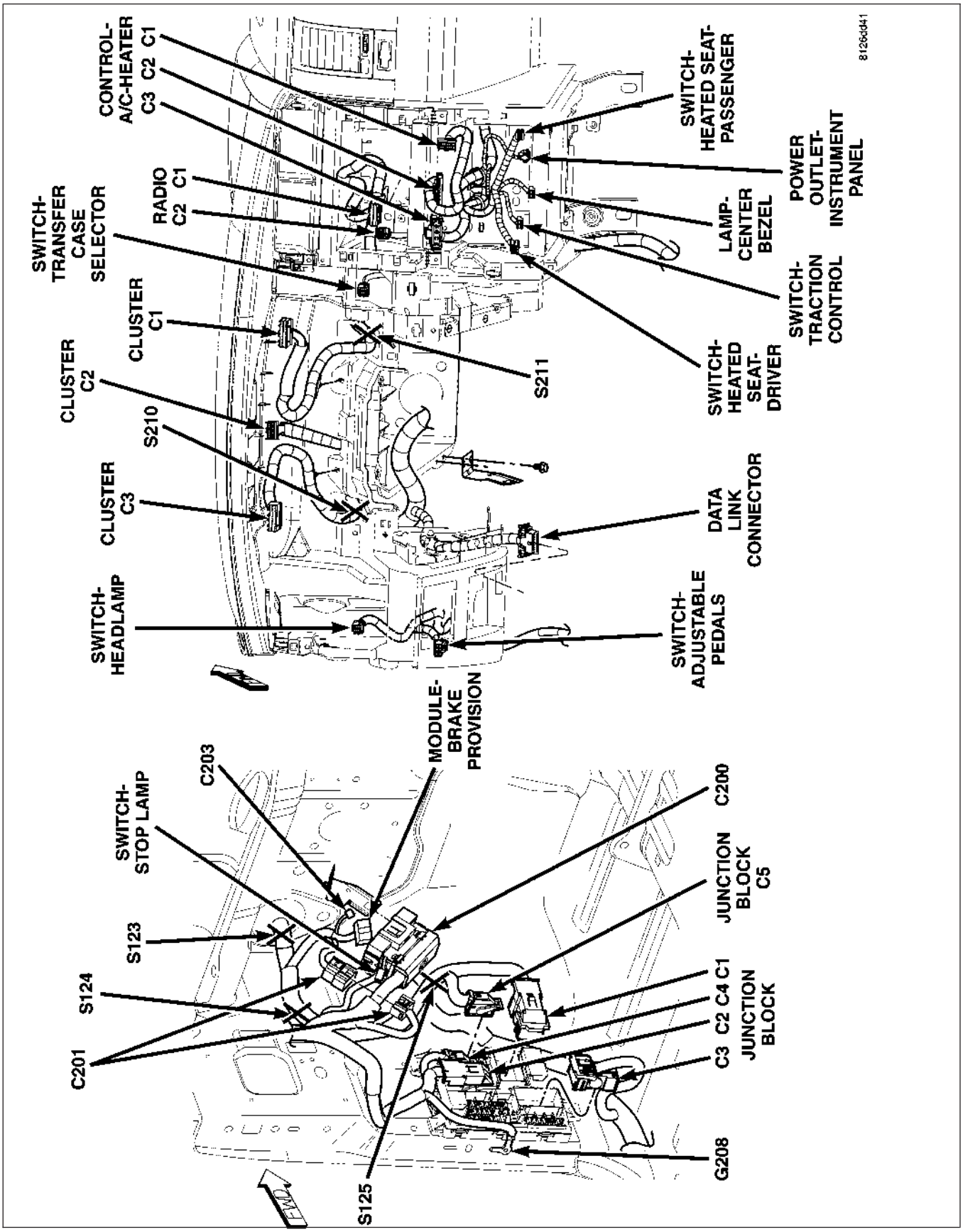

Fig. 31 INSTRUMENT PANEL - LEFT CENTER

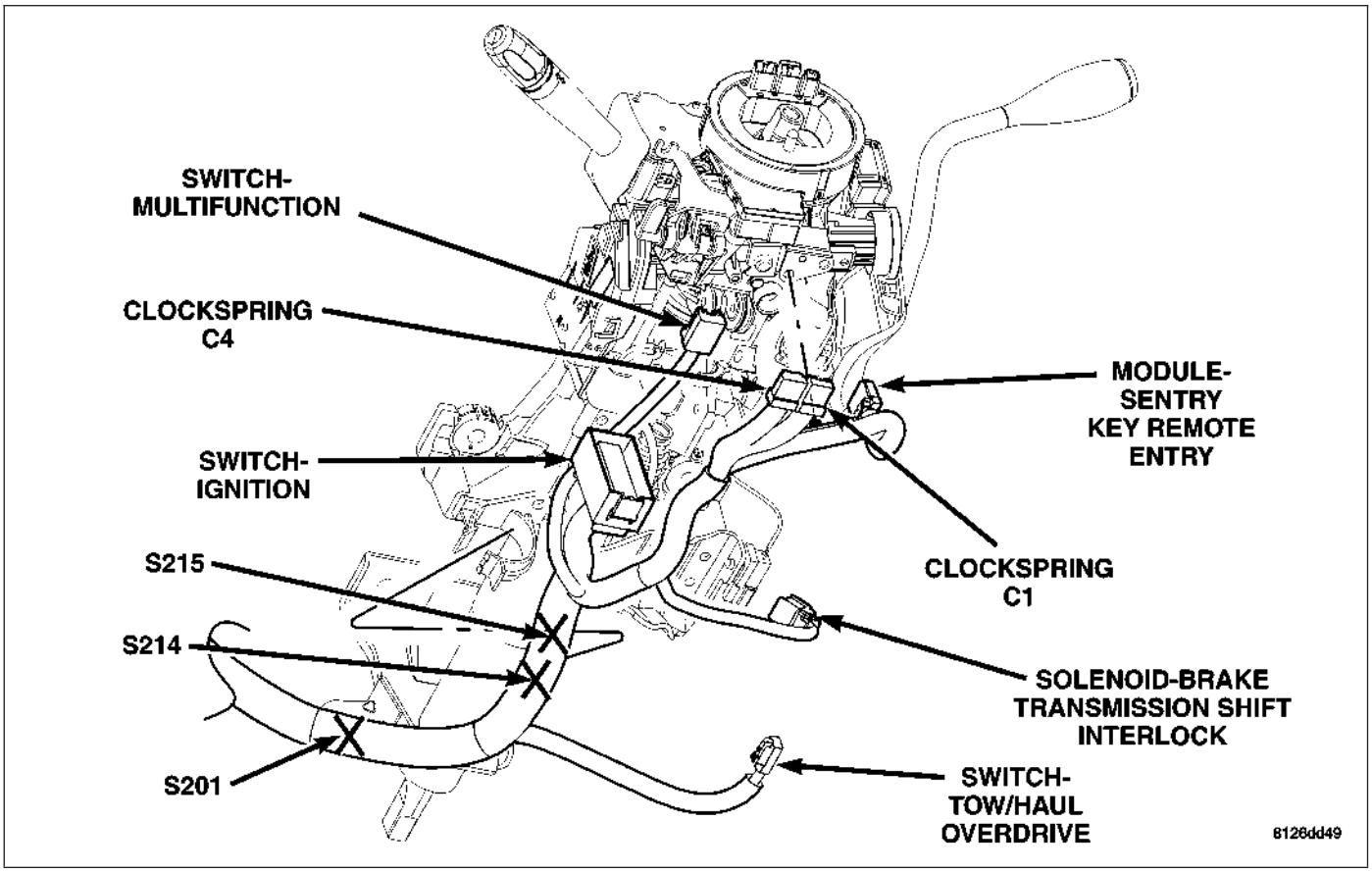

Fig. 32 STEERING COLUMN

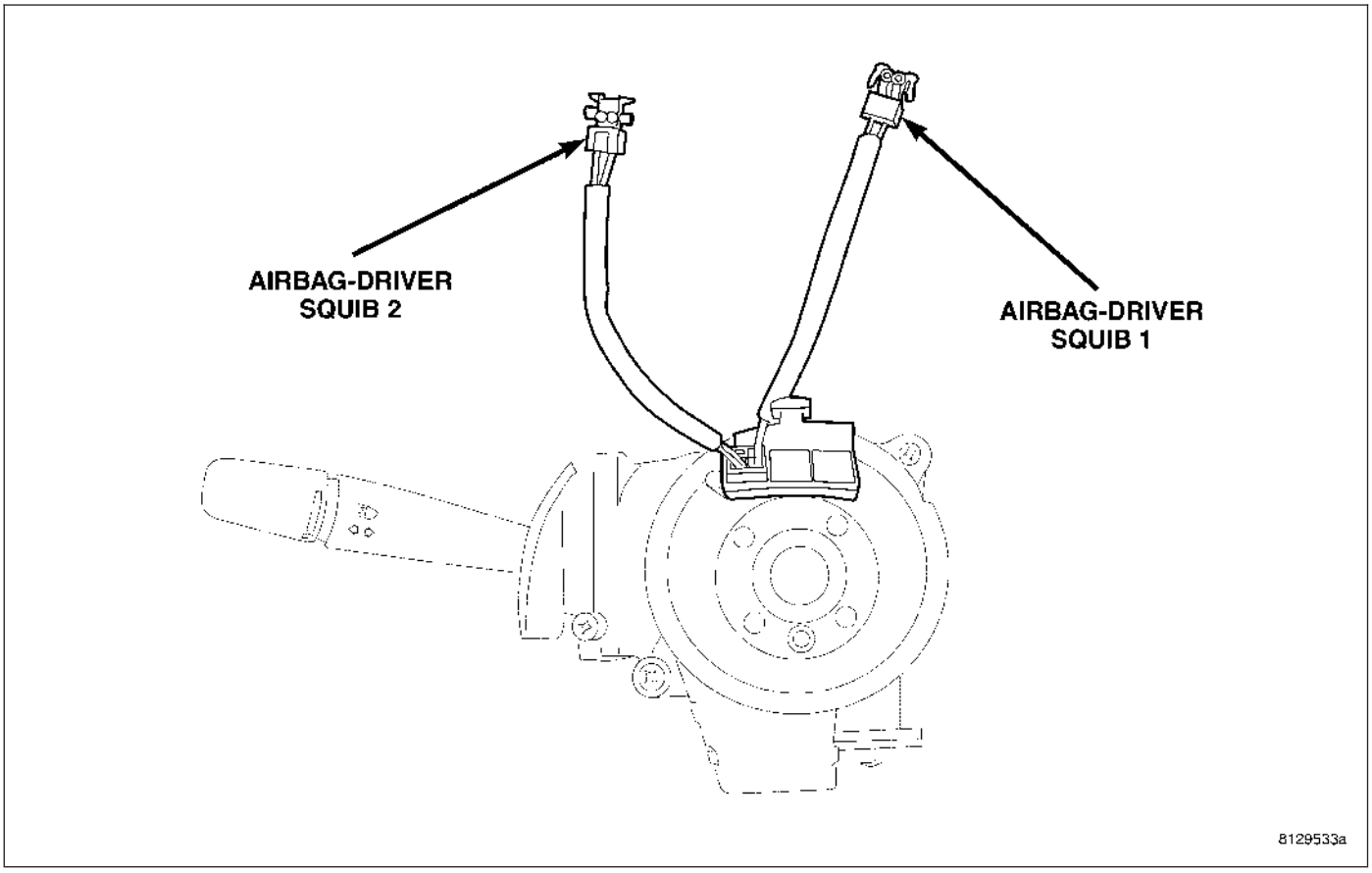

Fig. 33 STALK SWITCH HOUSING

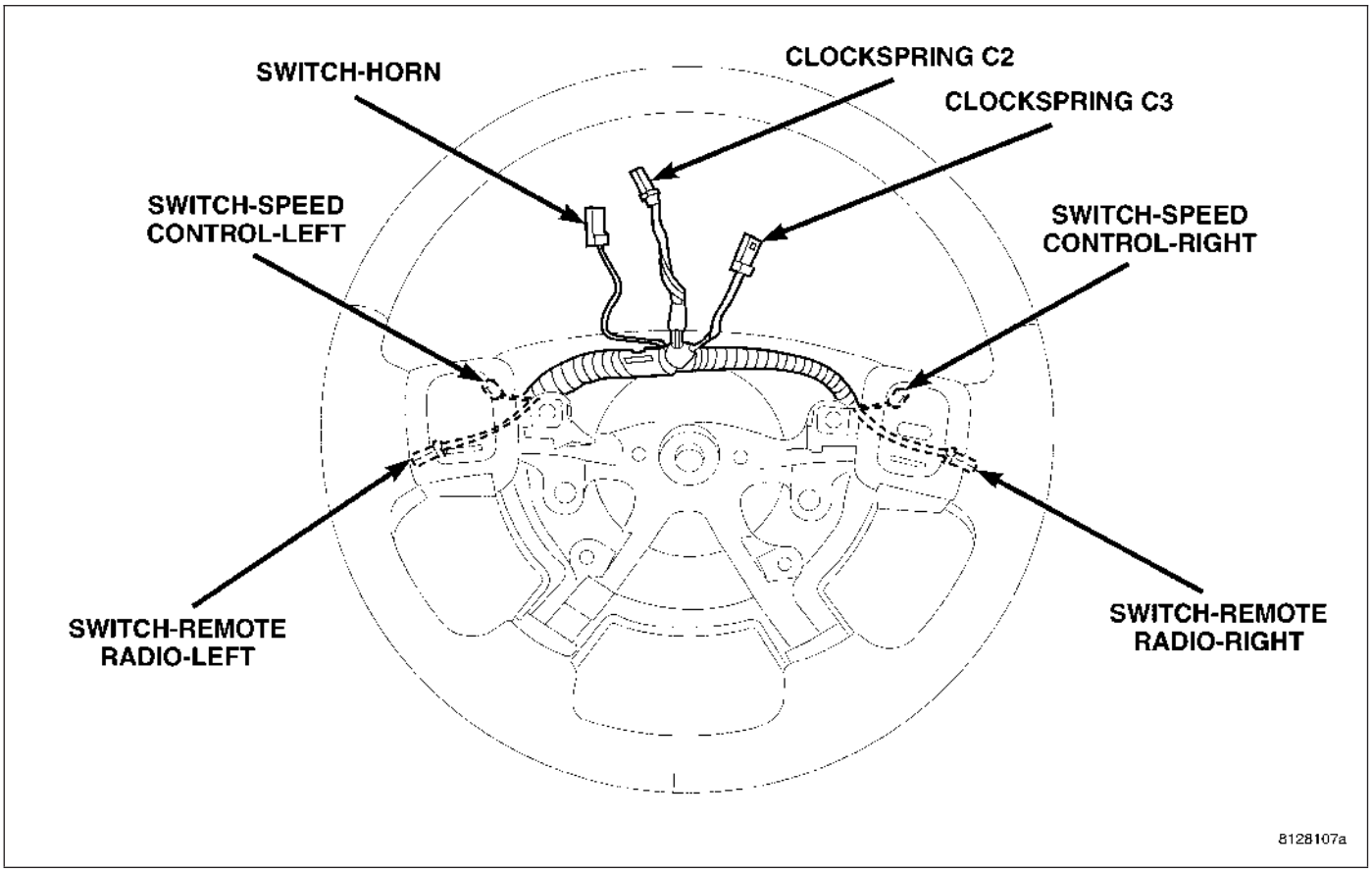

Fig. 34 STEERING WHEEL

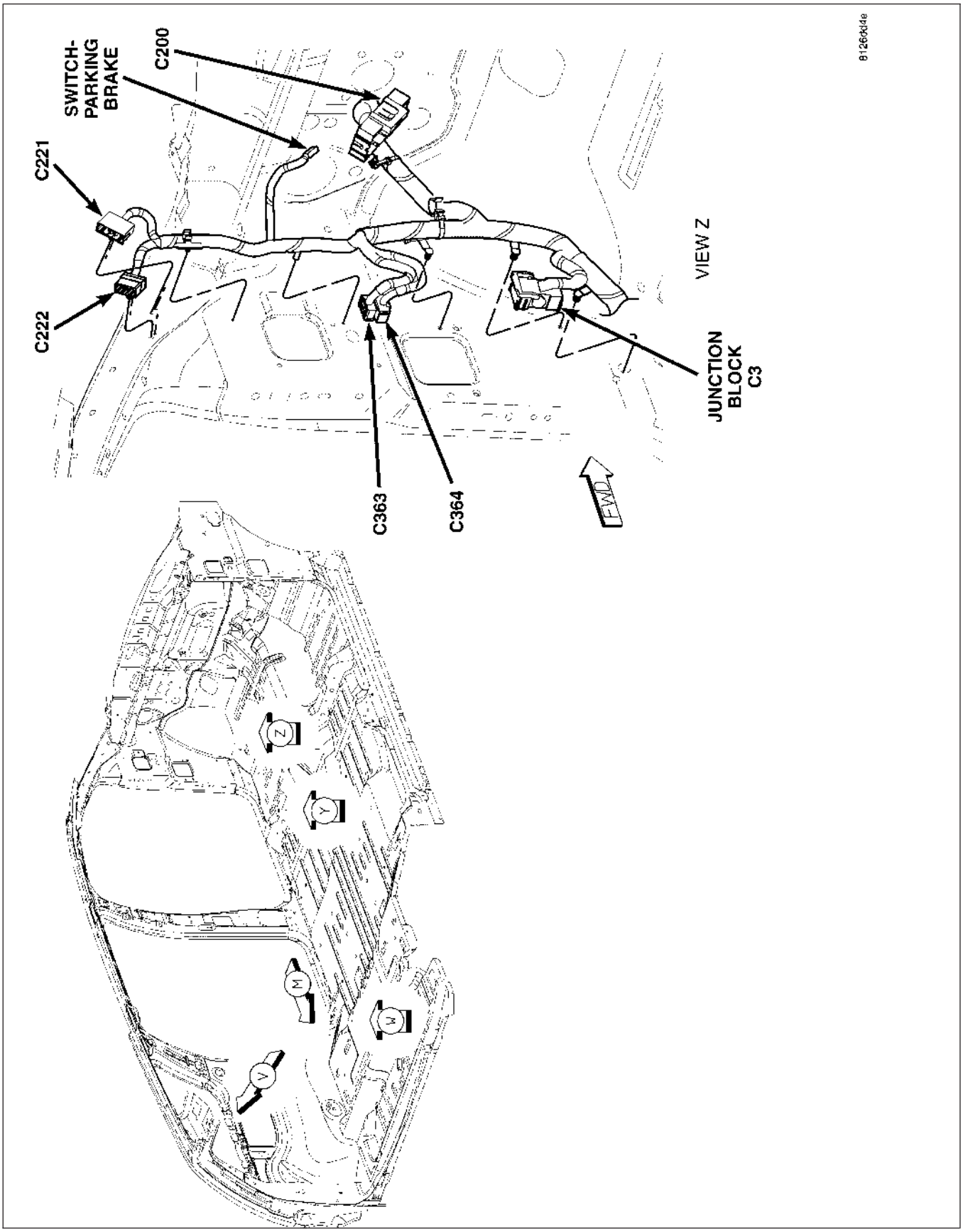

Fig. 35 LEFT KICK PANEL

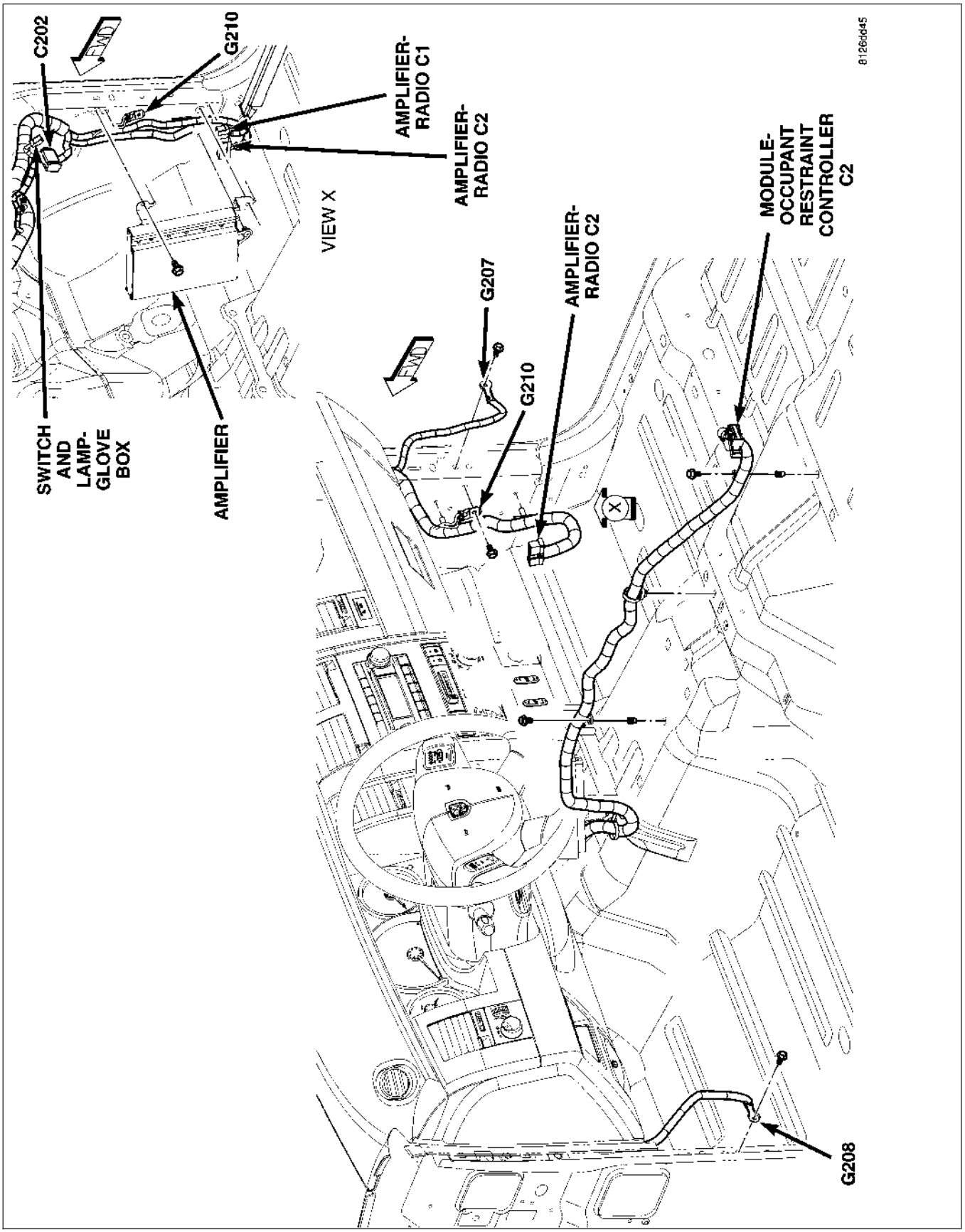

Fig. 36 BODY - RIGHT FRONT

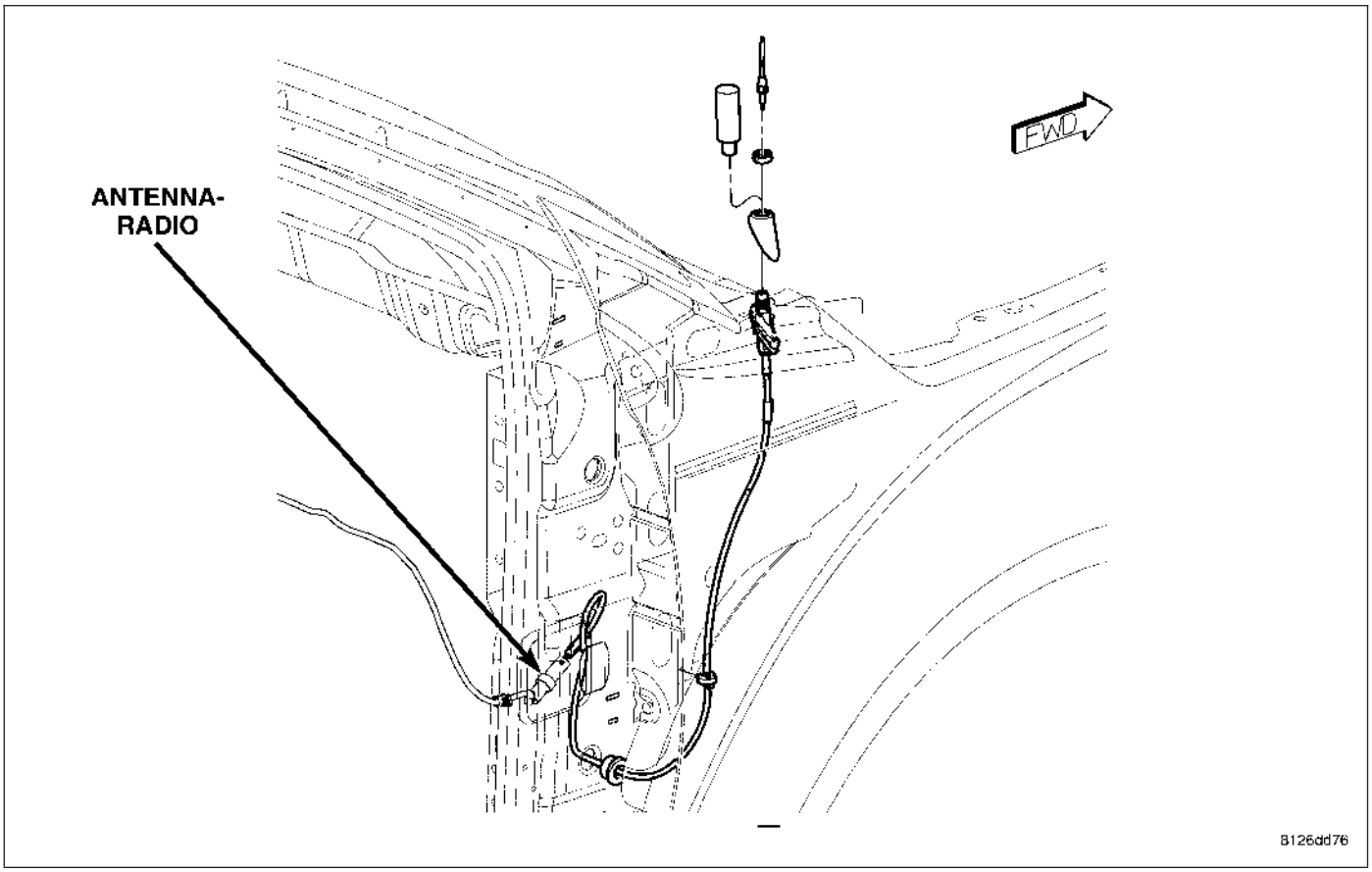

Fig. 37 RIGHT FRONT FENDER

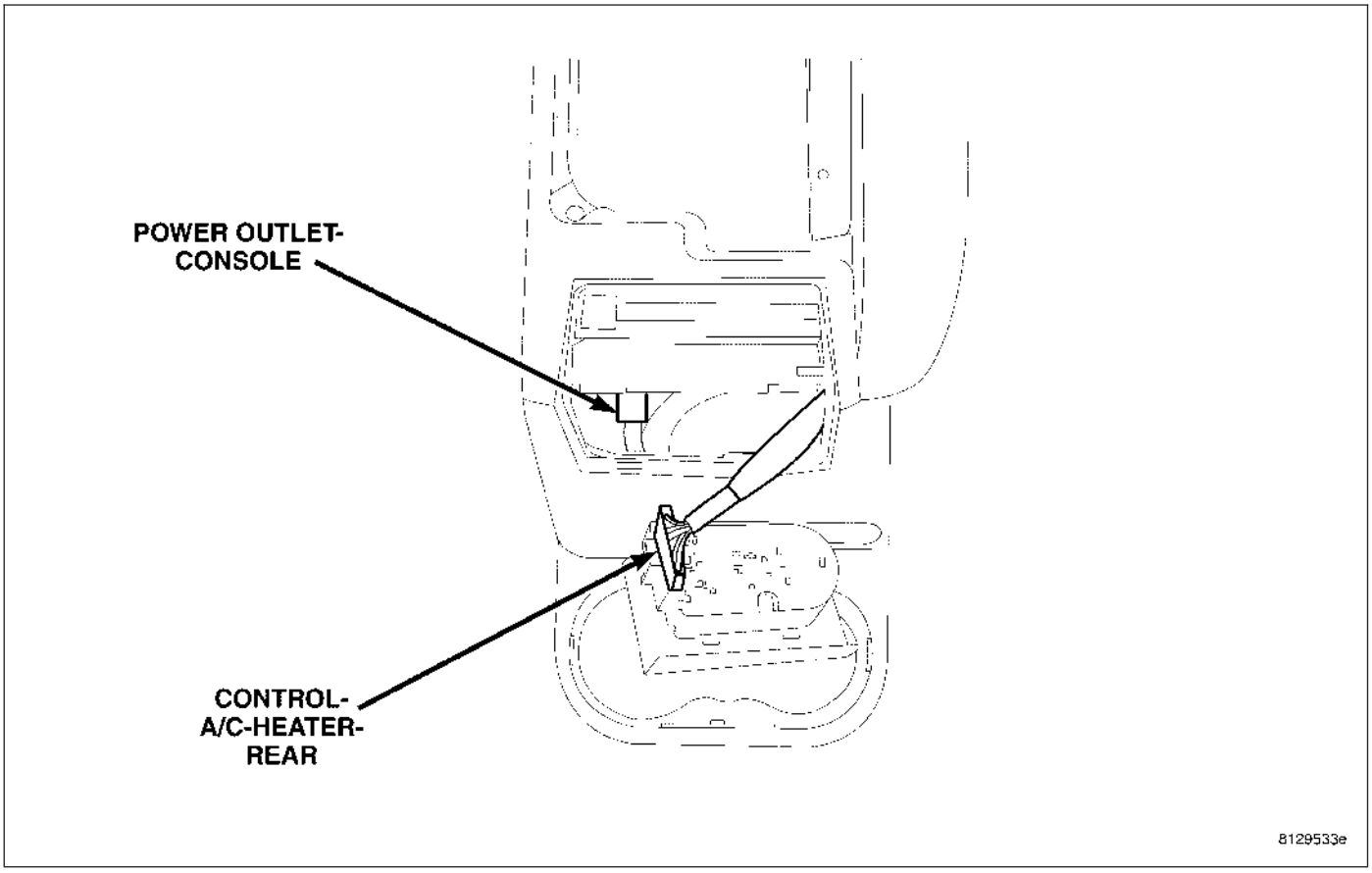

Fig. 38 CENTER CONSOLE

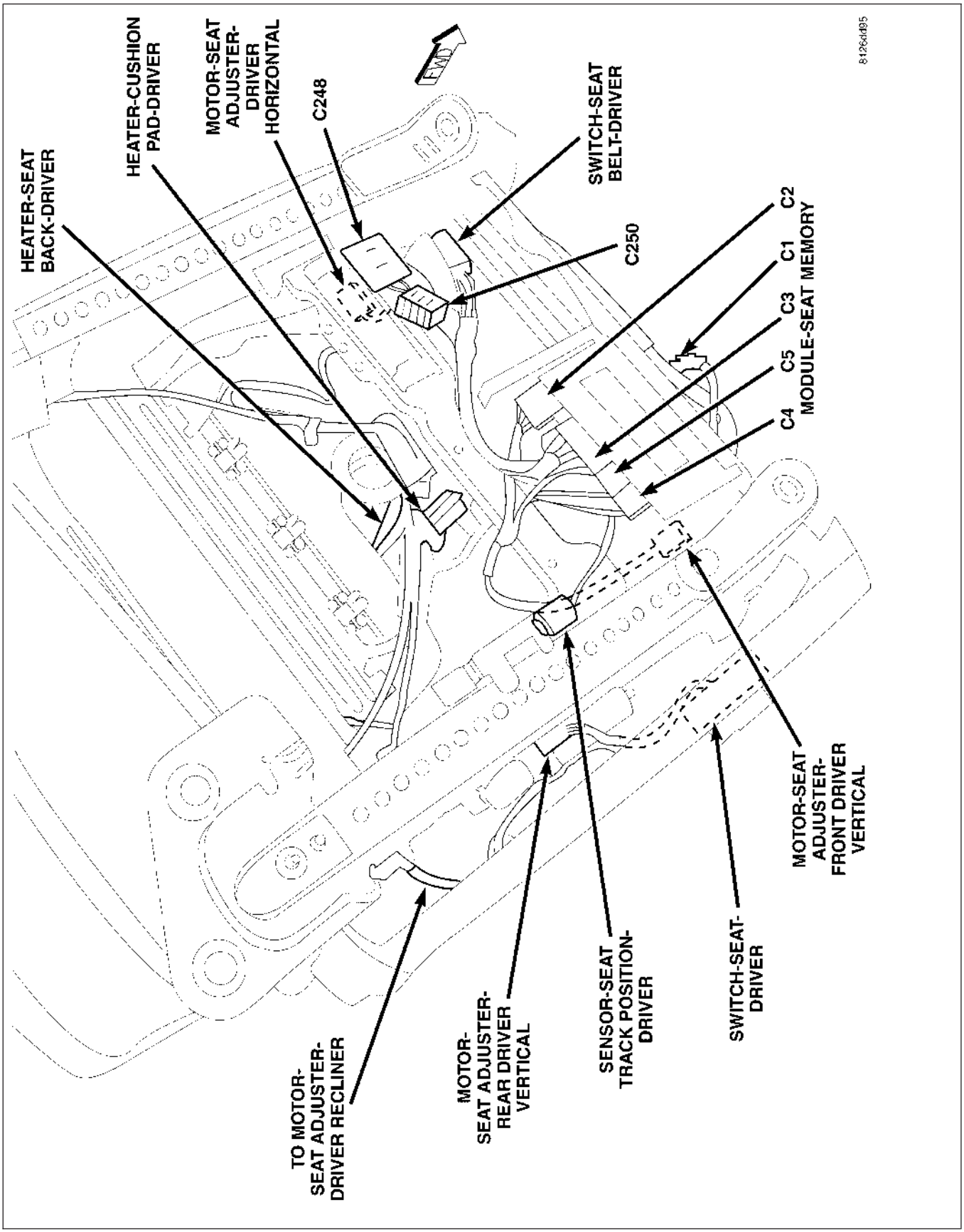

Fig. 39 DRIVER SEAT - BOTTOM

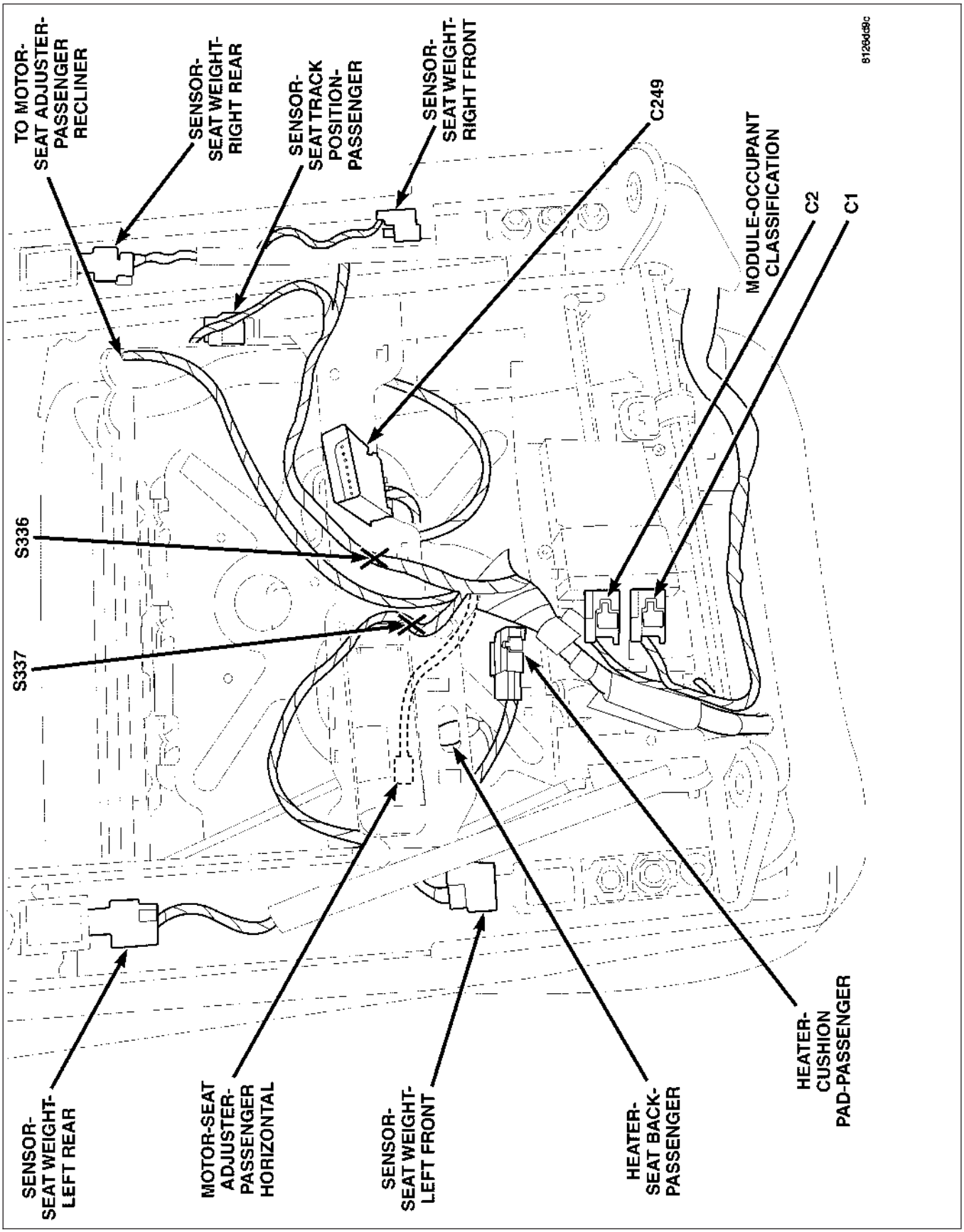

Fig. 40 PASSENGER SEAT - BOTTOM

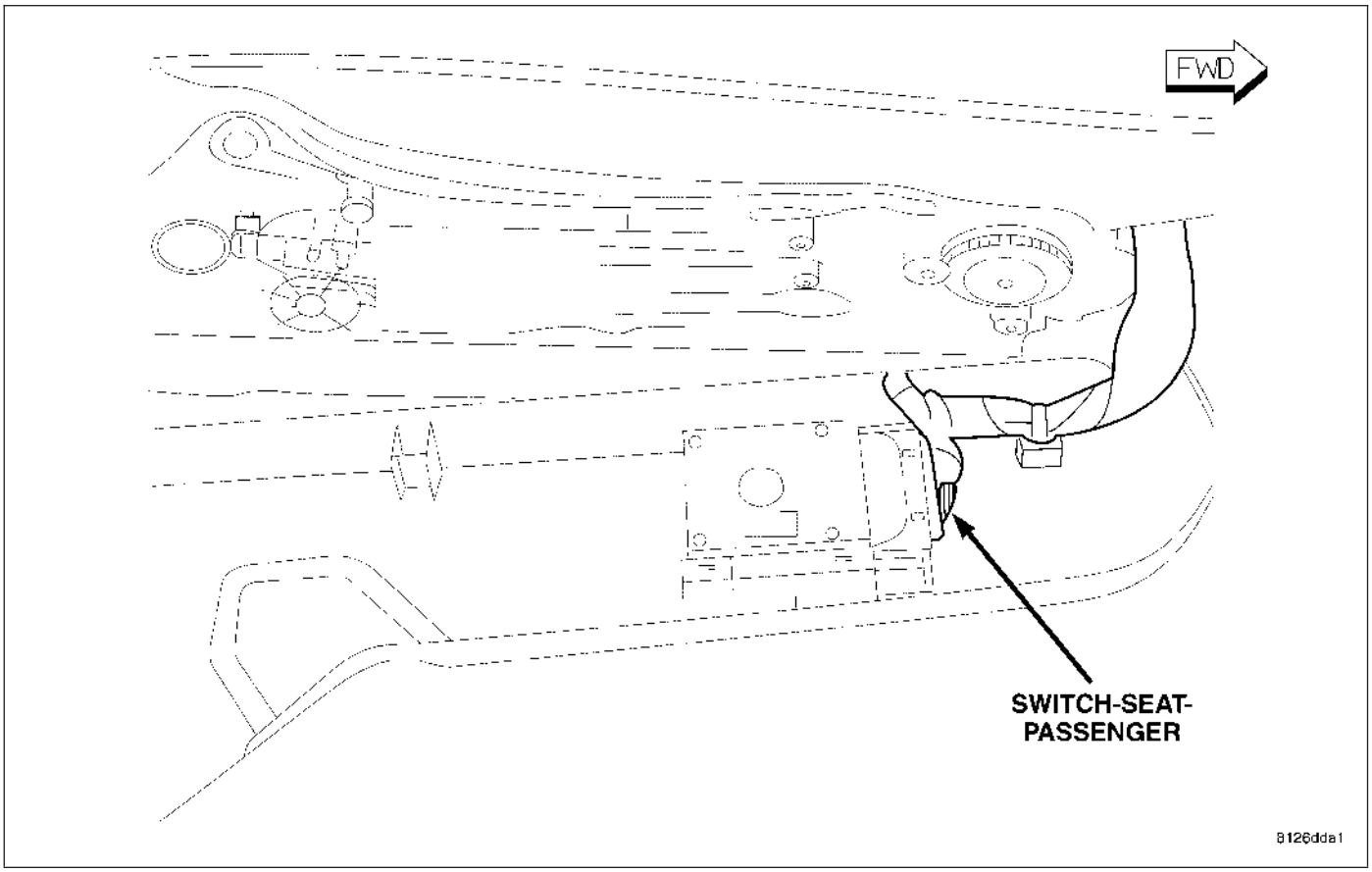

Fig. 41 PASSENGER SEAT - RIGHT SIDE

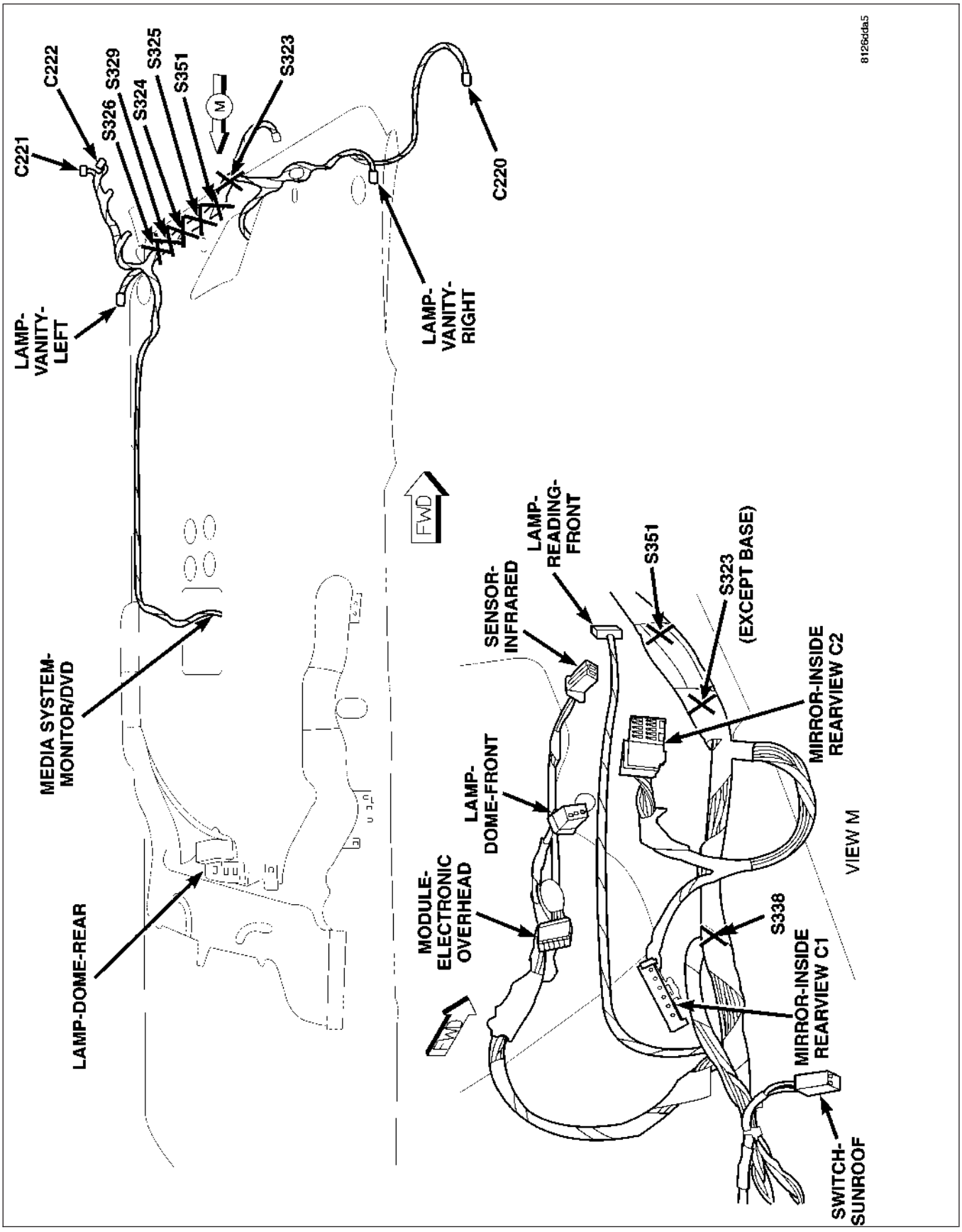

Fig. 42 HEADLINER

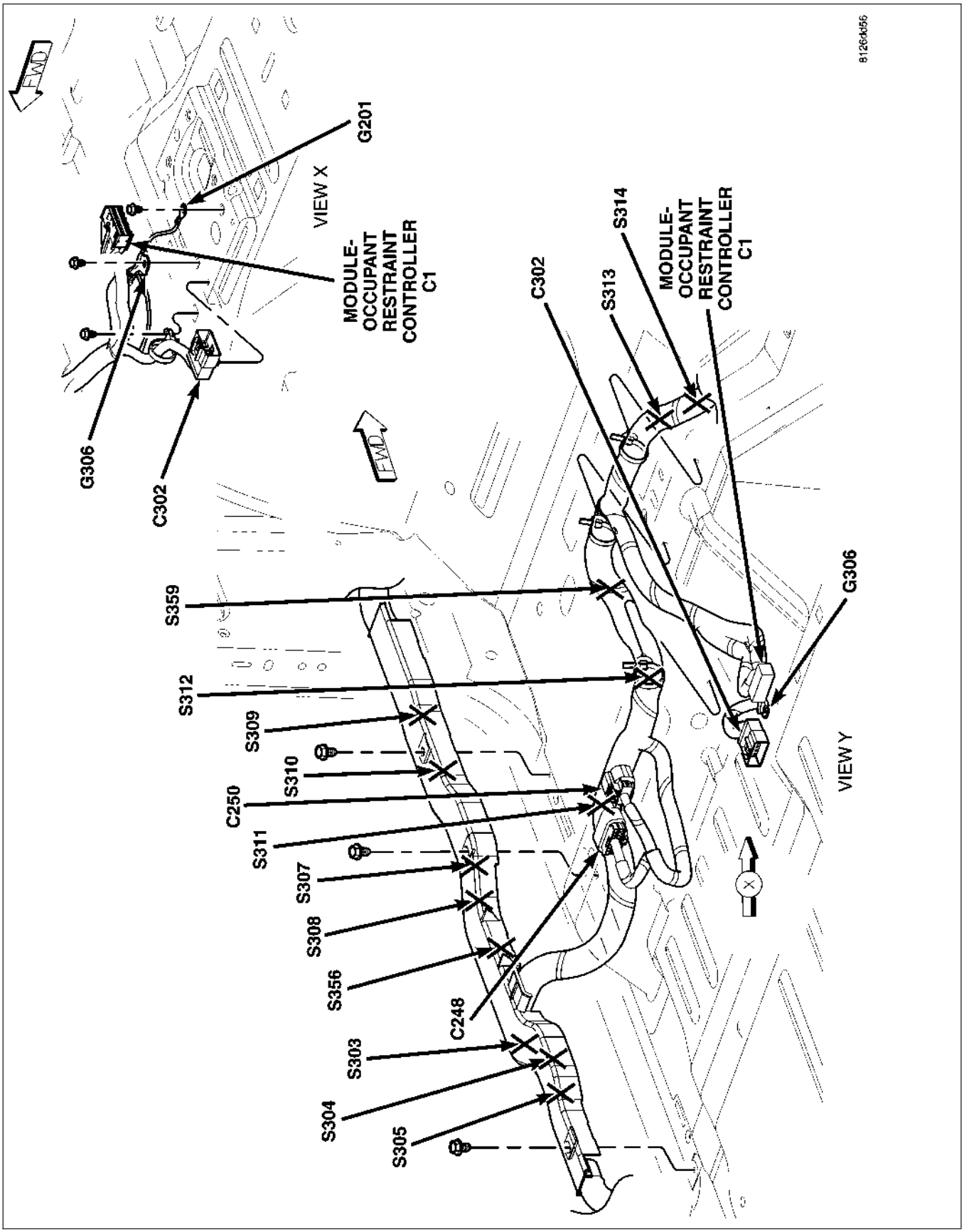

Fig. 43 BODY - LEFT SIDE

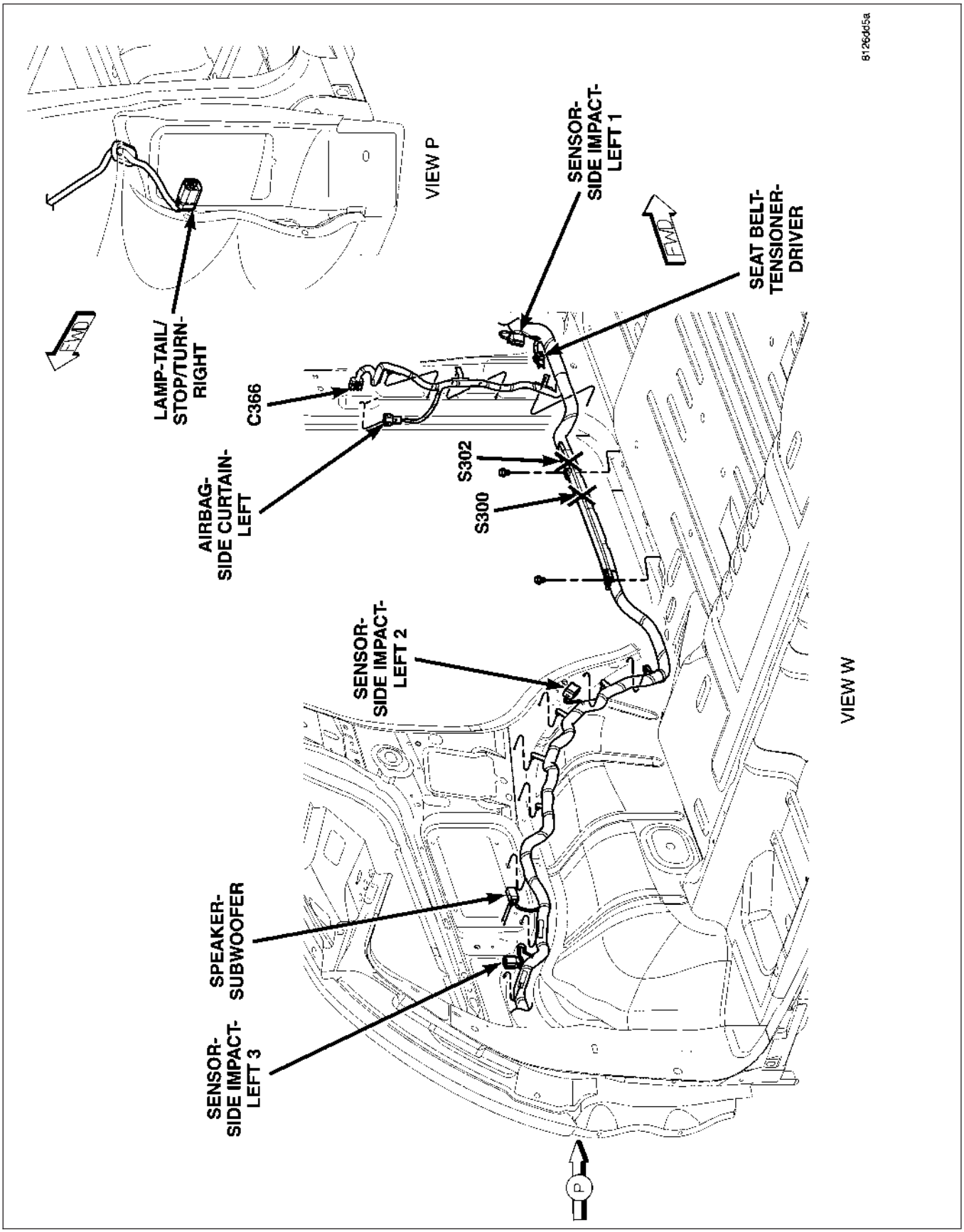

Fig. 44 BODY - LEFT REAR

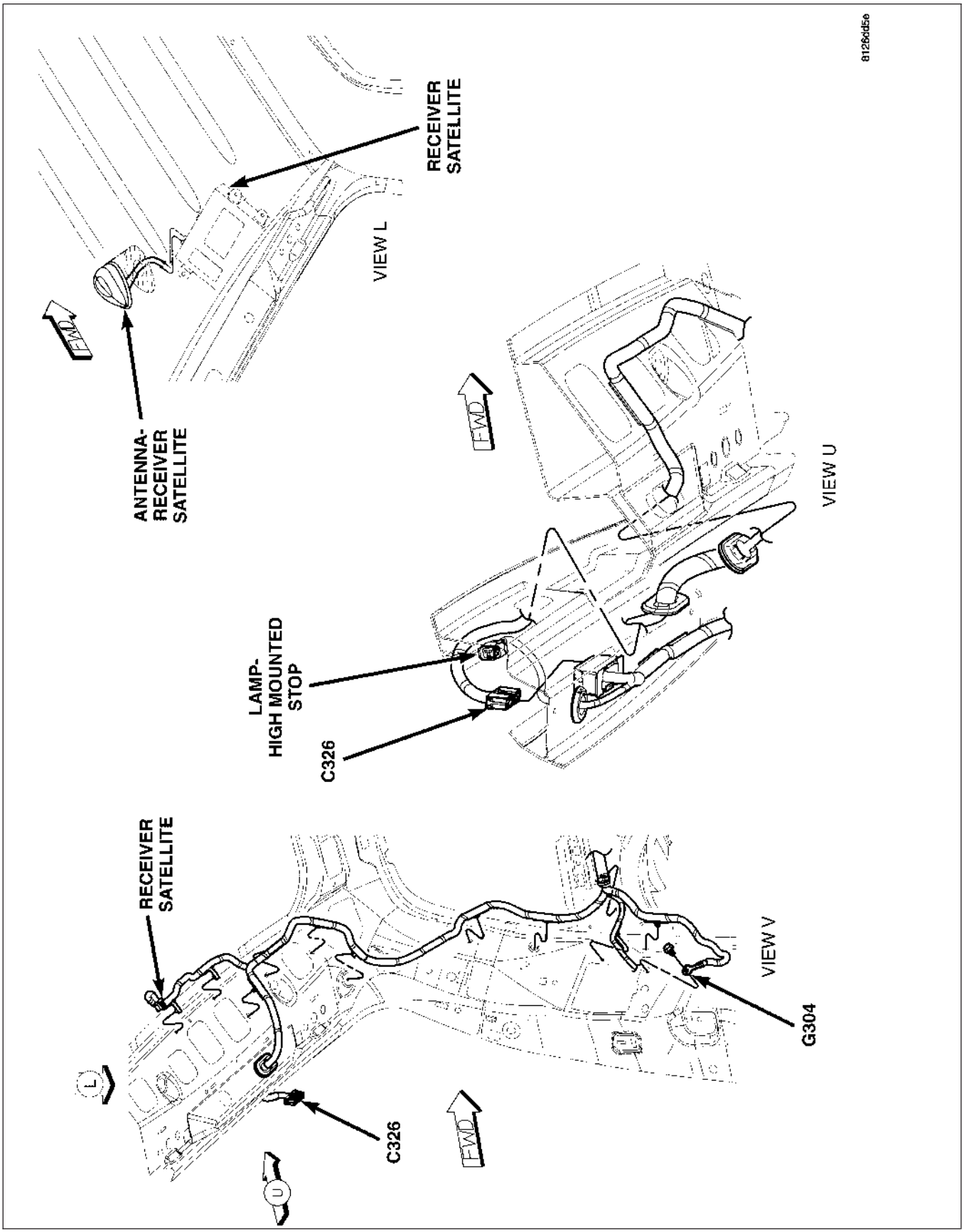

Fig. 45 BODY - REAR

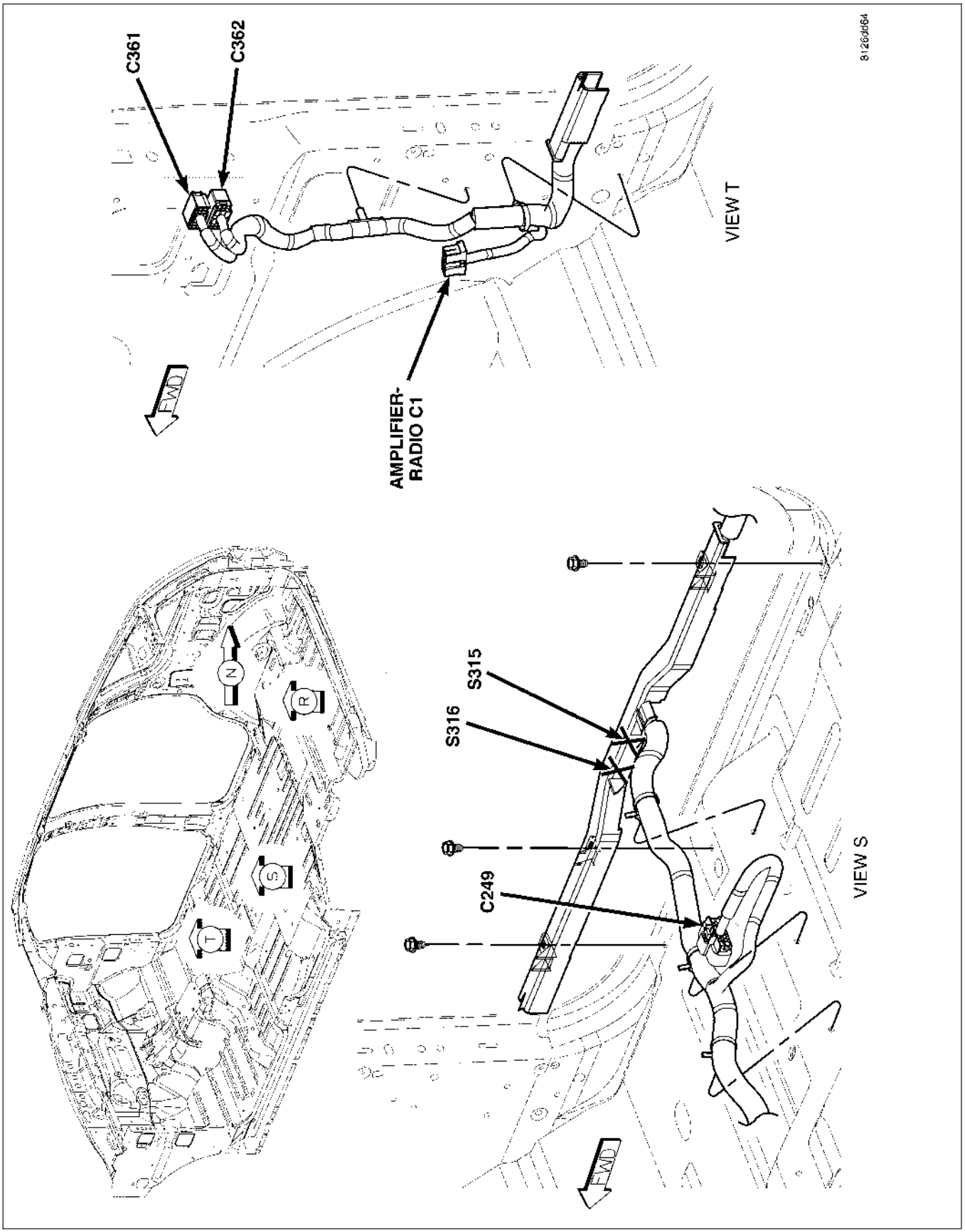

Fig. 46 BODY - RIGHT SIDE

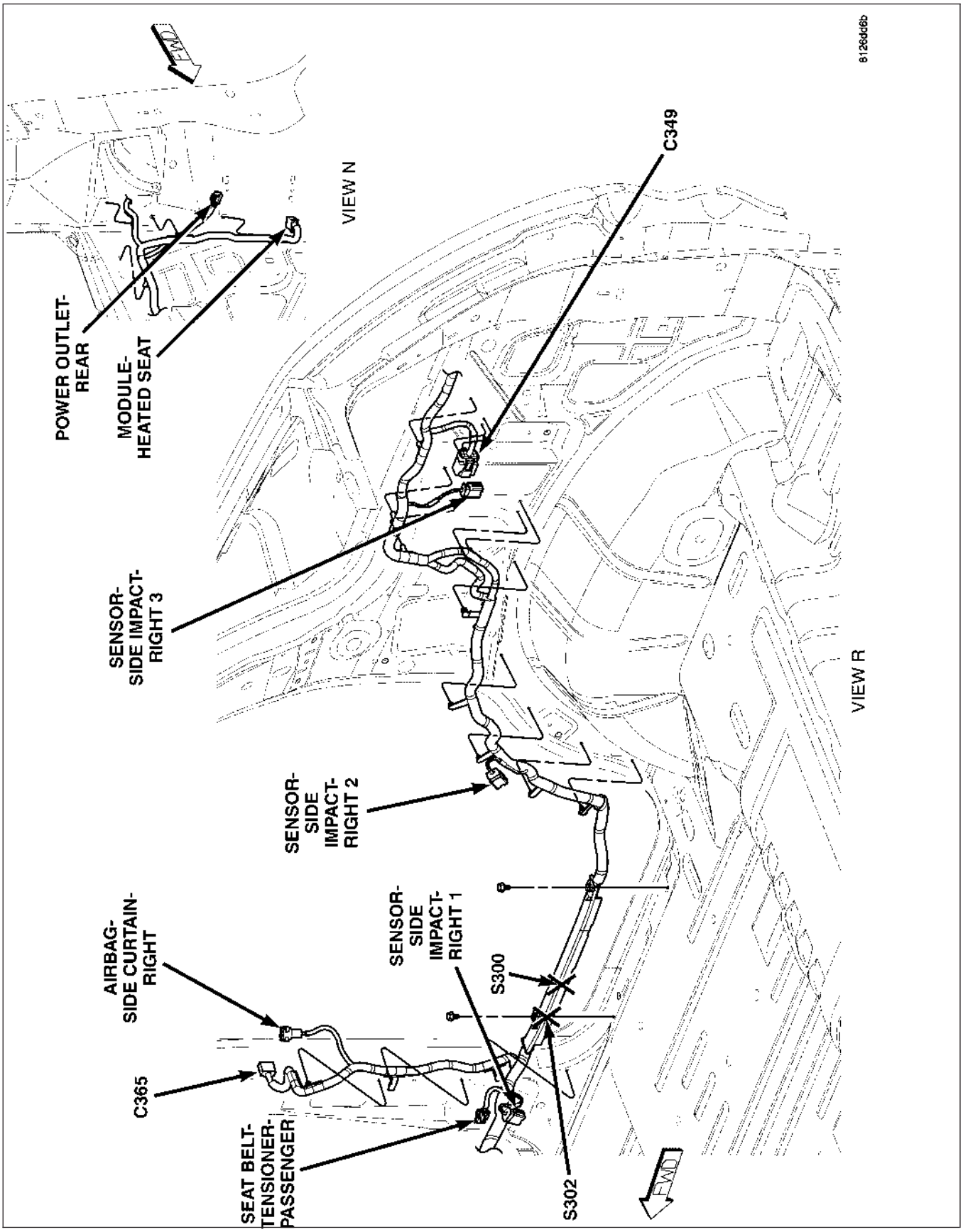

Fig. 47 BODY - RIGHT REAR

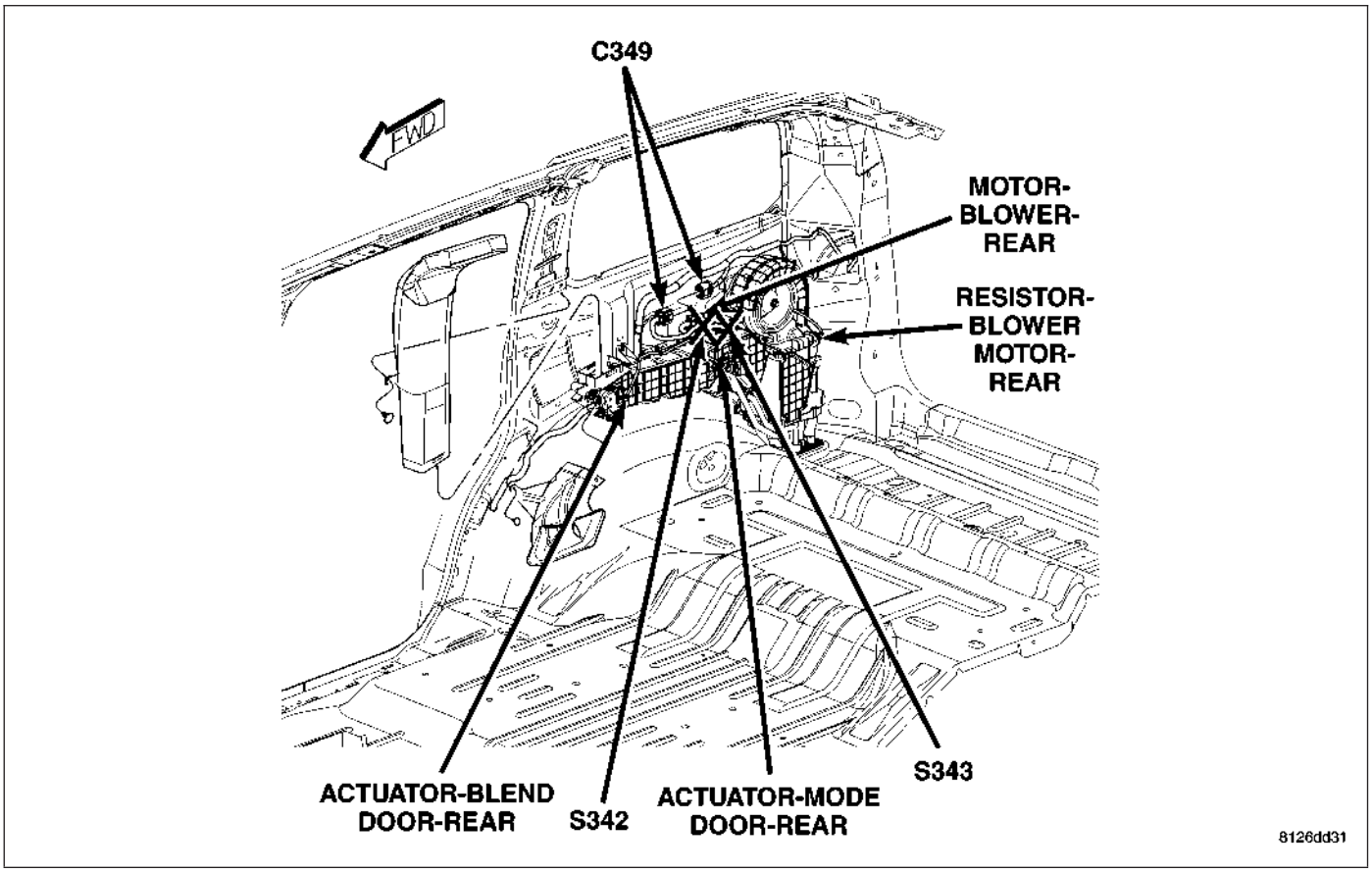

Fig. 48 REAR HVAC

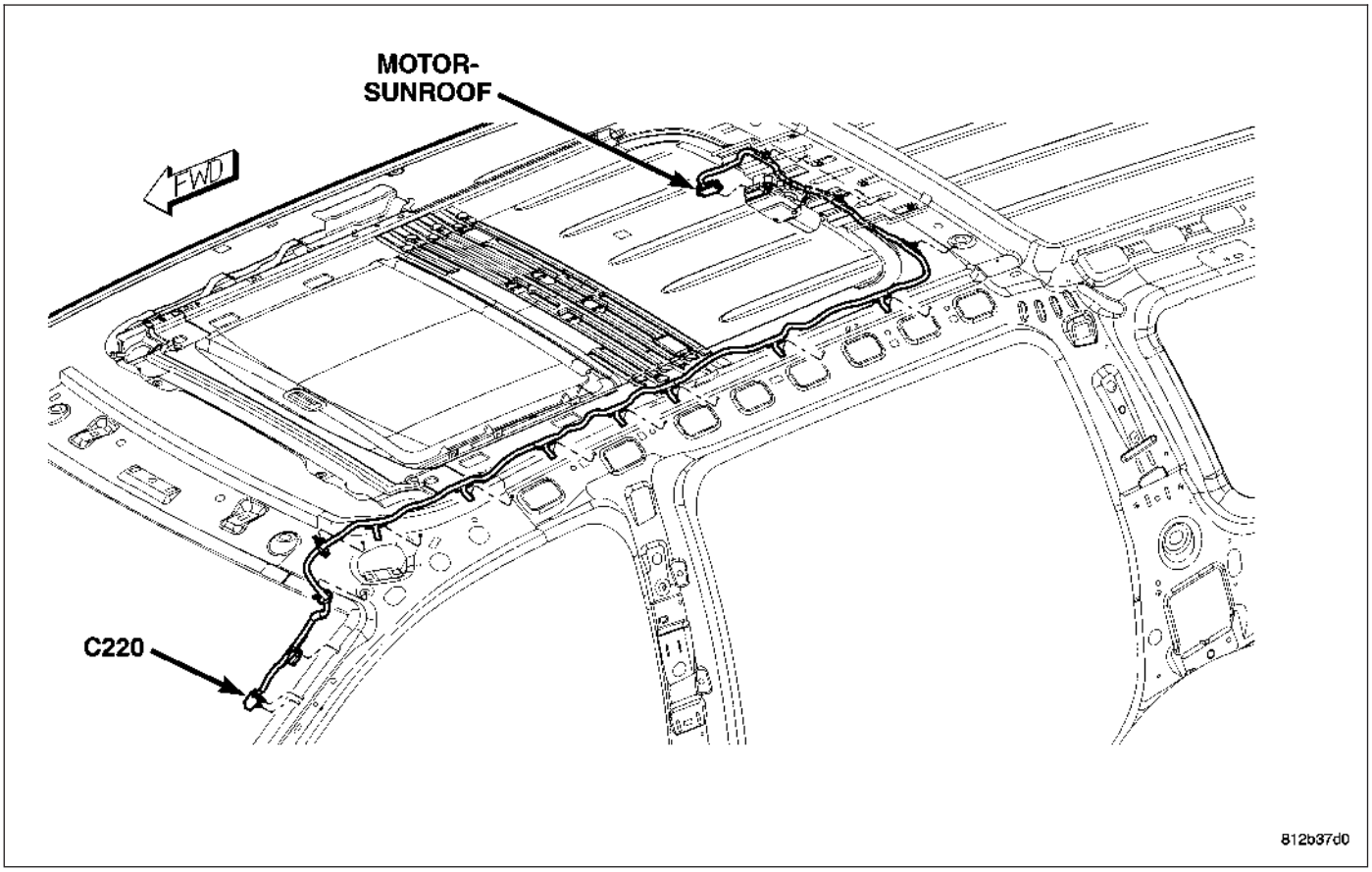

Fig. 49 INSIDE ROOF

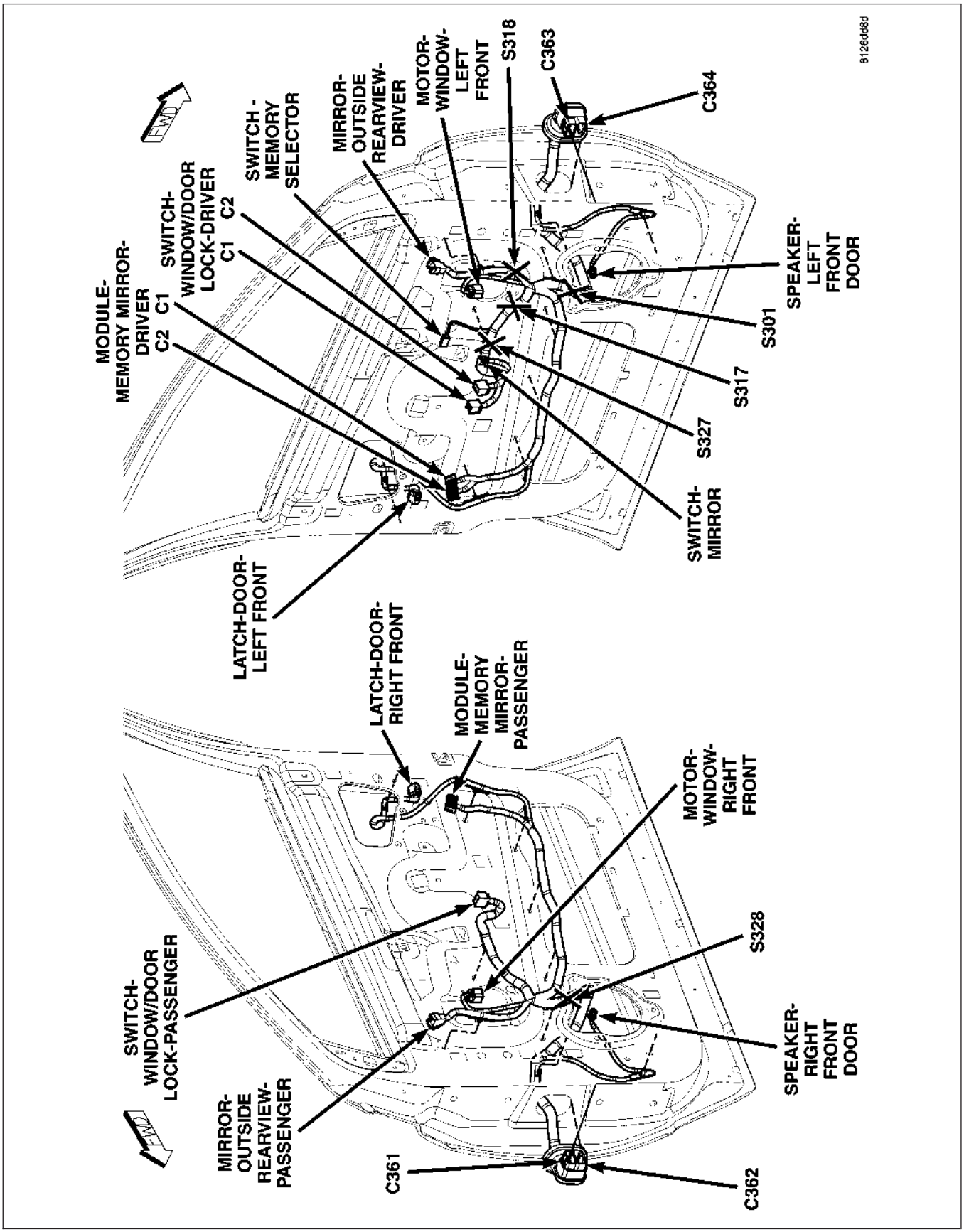

Fig. 50 FRONT DOORS

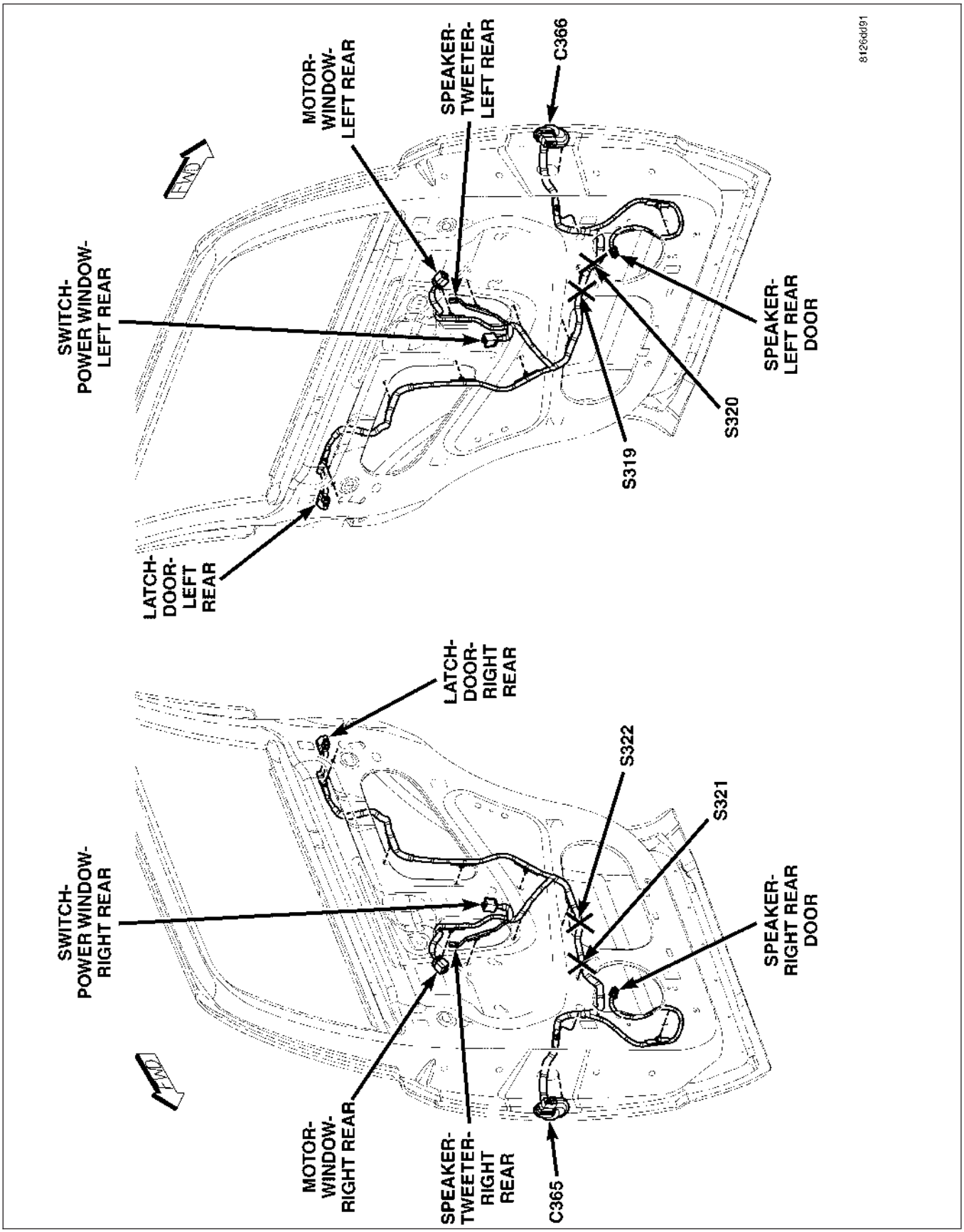

Fig. 51 REAR DOORS

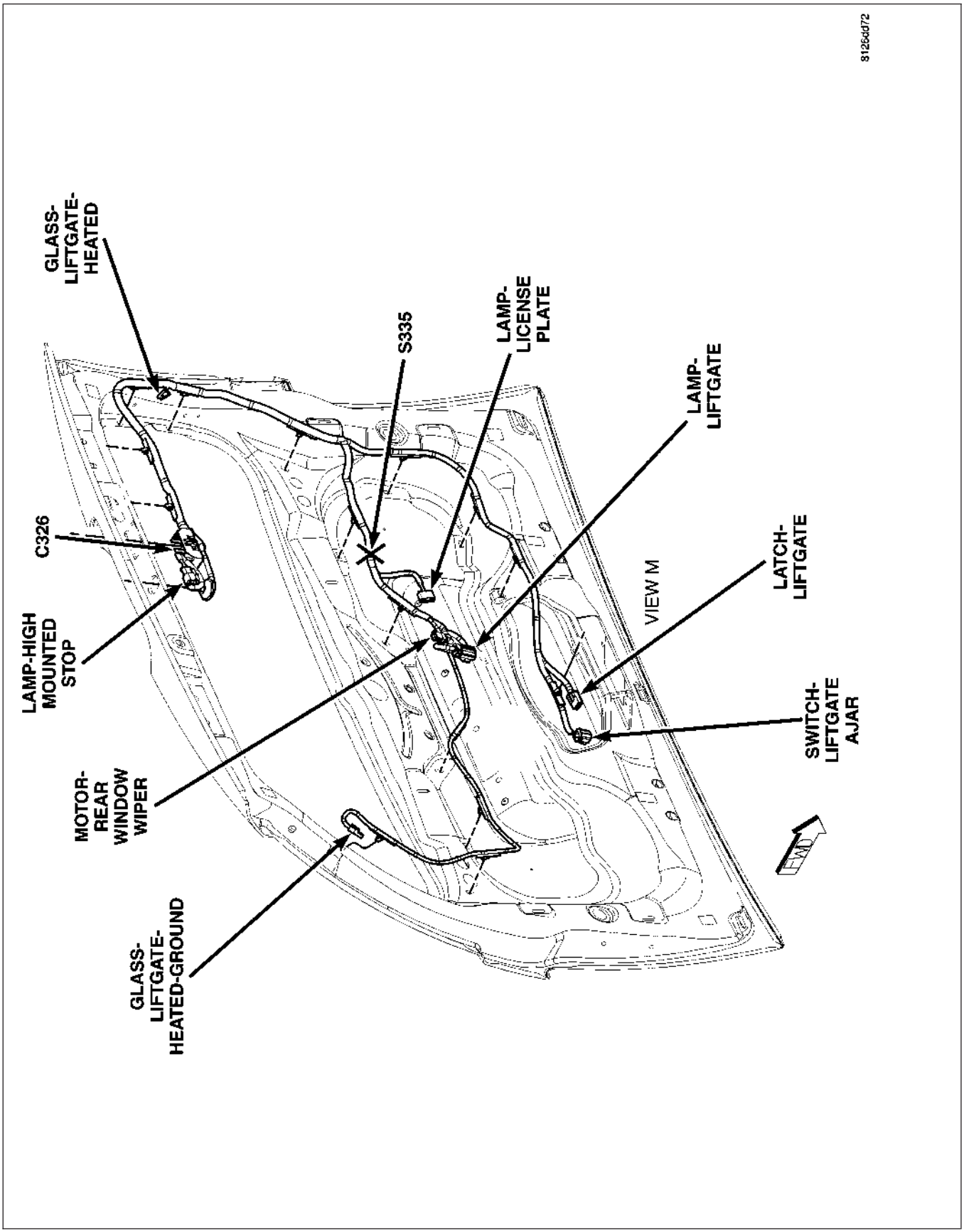

Fig. 52 DECKLID

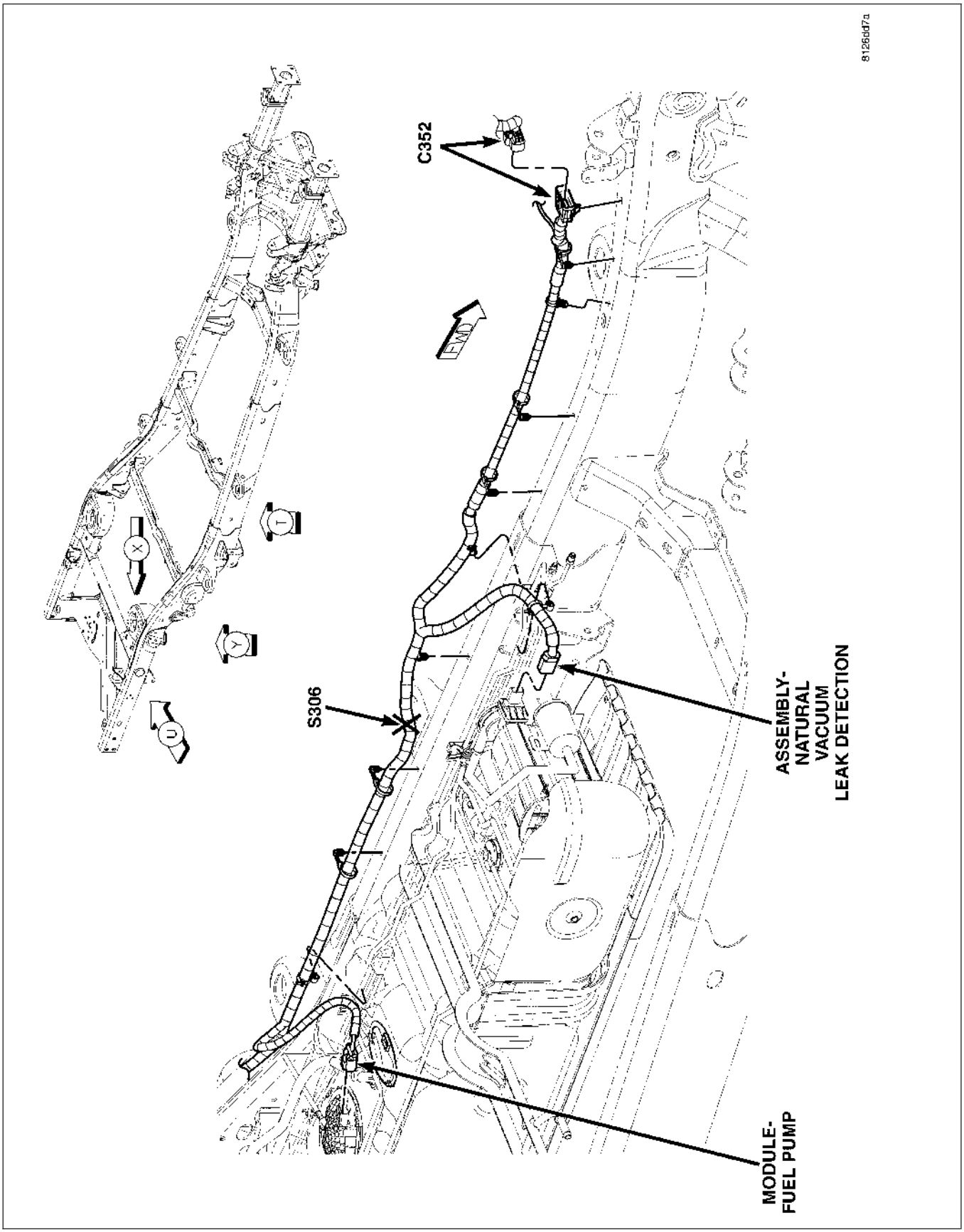

Fig. 53 CHASSIS - LEFT

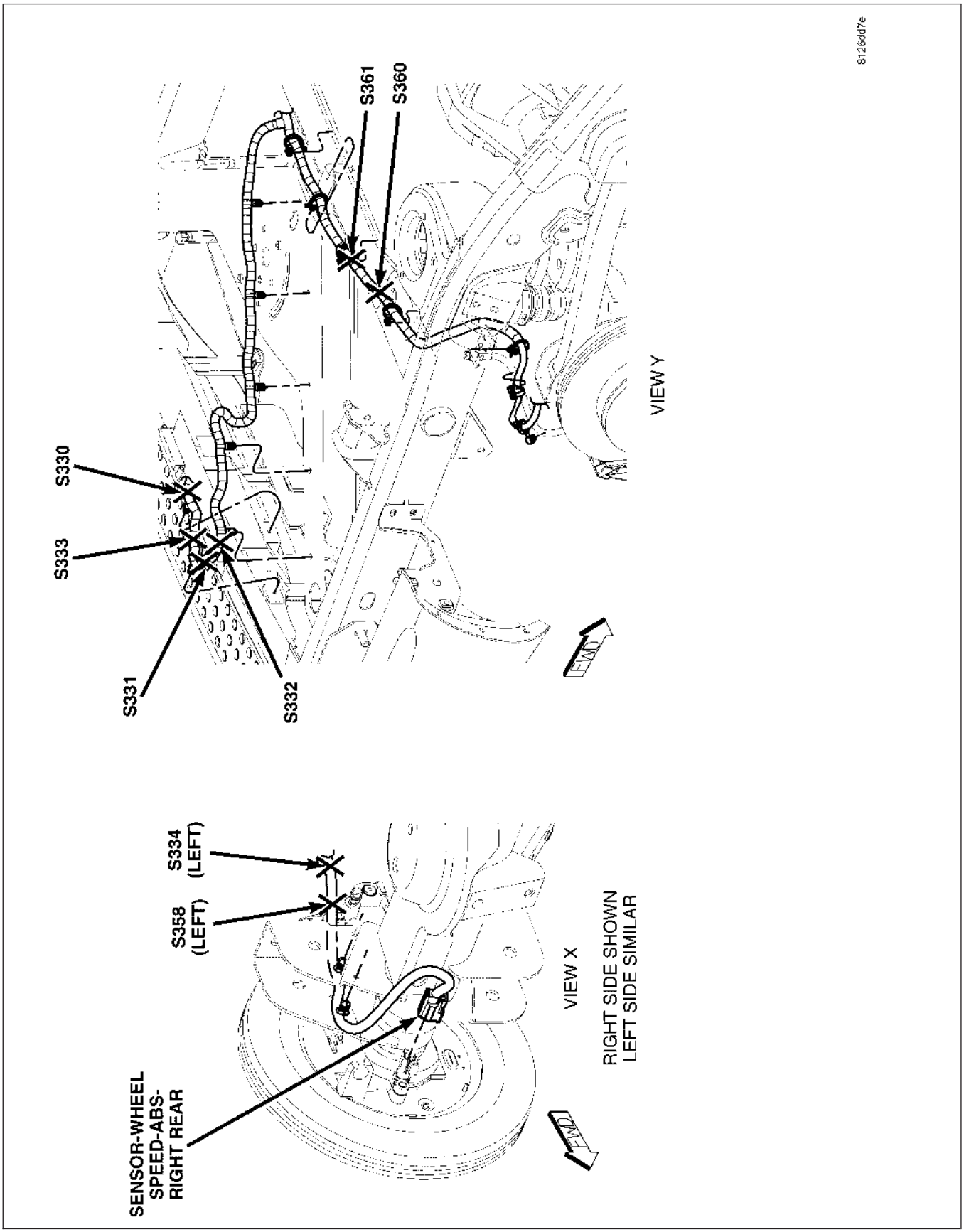

Fig. 54 CHASSIS

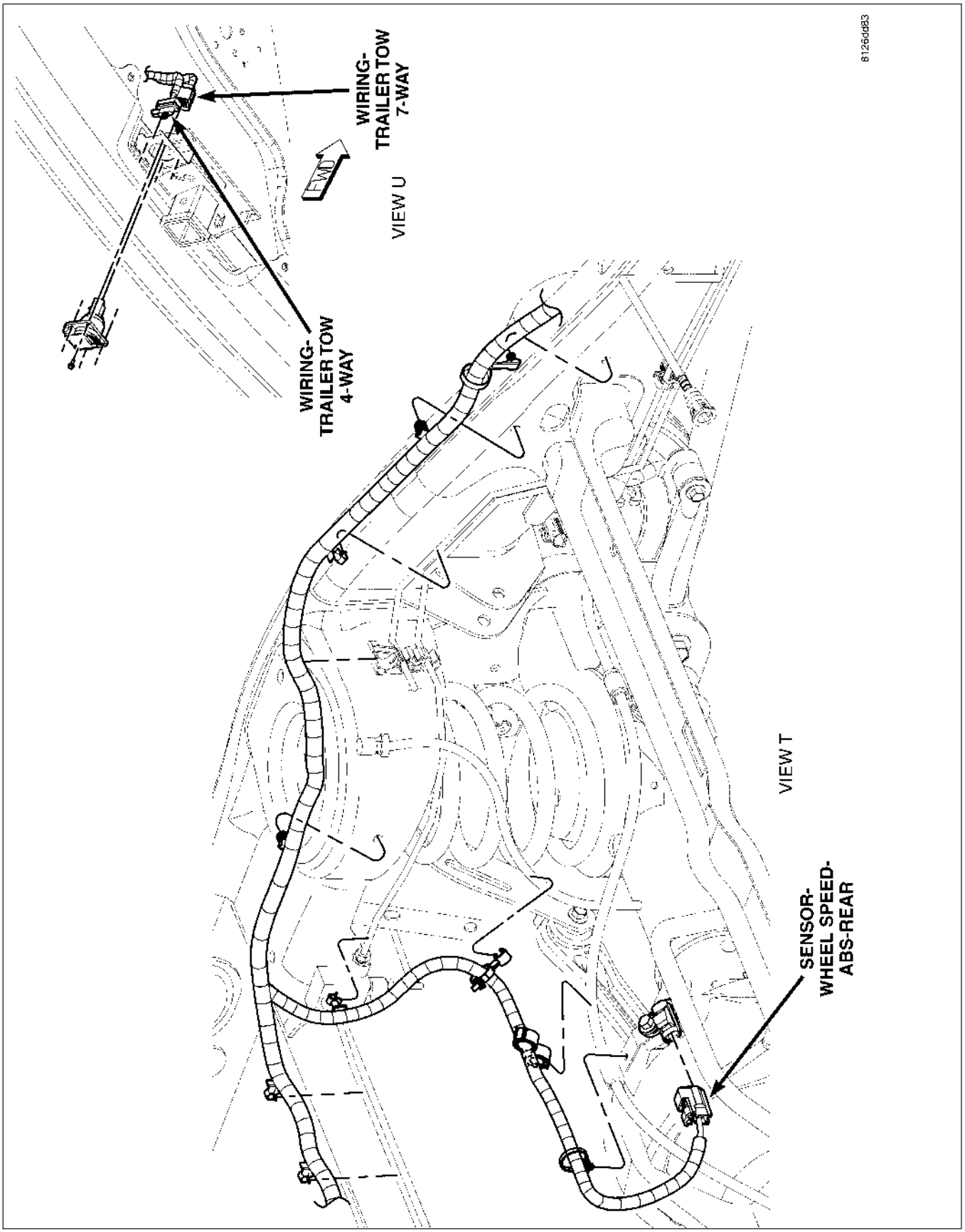

Fig. 55 CHASSIS - REAR

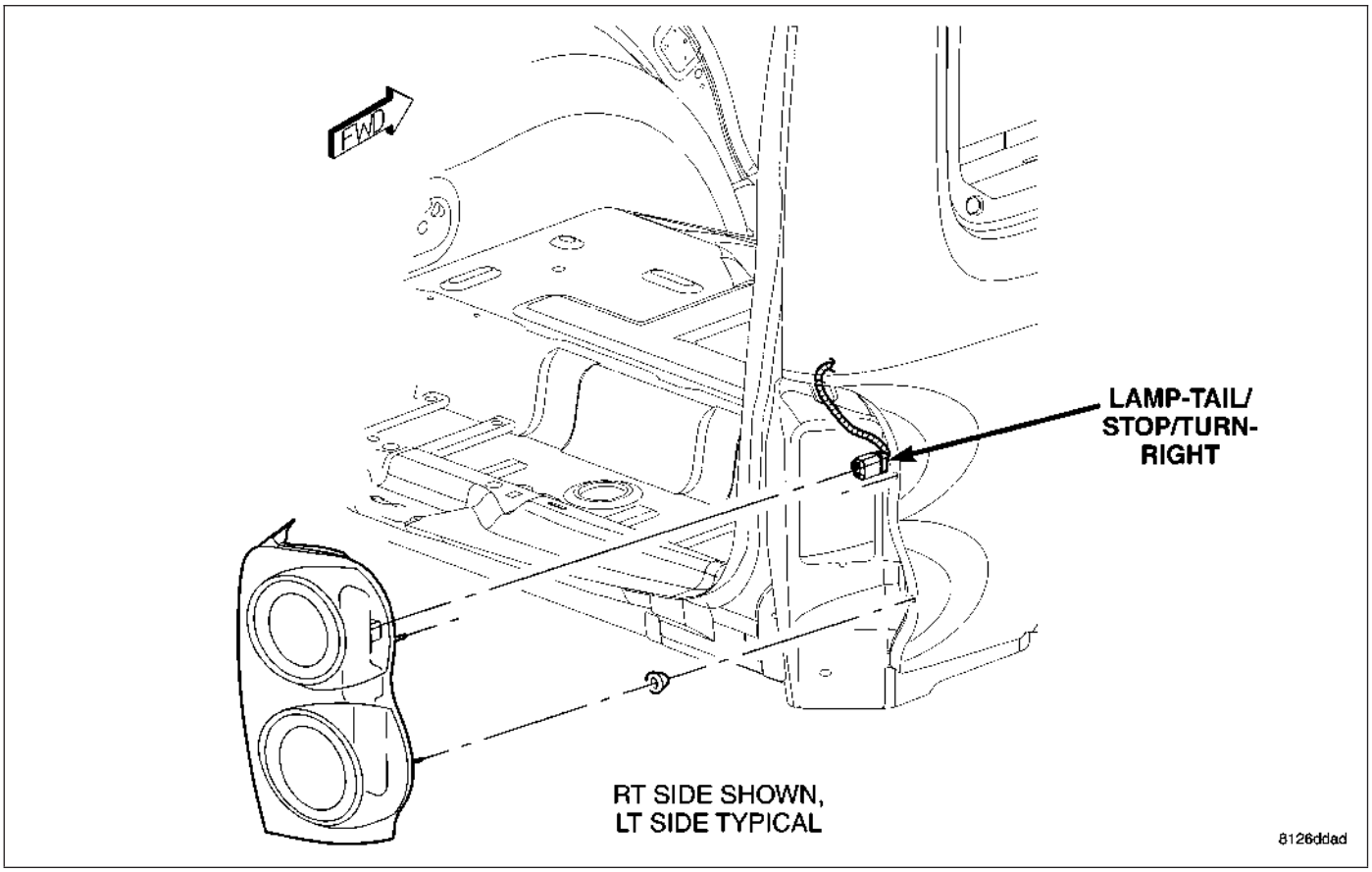

Fig. 56 TAIL LAMP

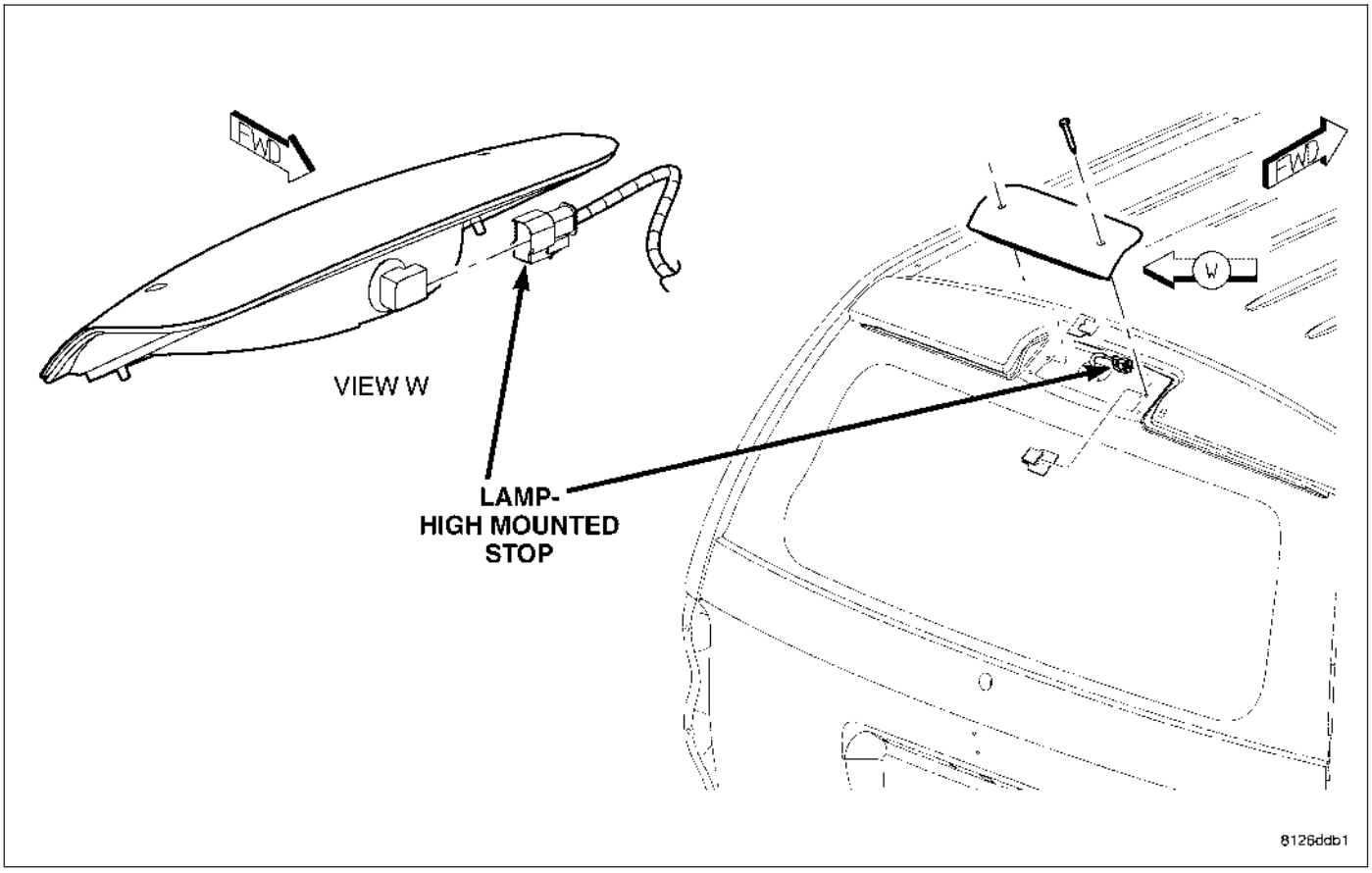

Fig. 57 CENTER HIGH MOUNTED STOP LAMP

8W-97 POWER DISTRIBUTION - SERVICE INFORMATION

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POWER DISTRIBUTION - SERVICE INFORMATION

DESCRIPTION

The power distribution system for this vehicle consists of the following components:

- Cigar Lighter Outlet
- Front Control Module (FCM)
- Integrated Power Module (IPM)
- Power Distribution Center (PDC)
- Power Outlets

Refer to Wiring Diagrams for complete circuit schematics.

The power distribution system also incorporates various types of circuit control and protection features, including:

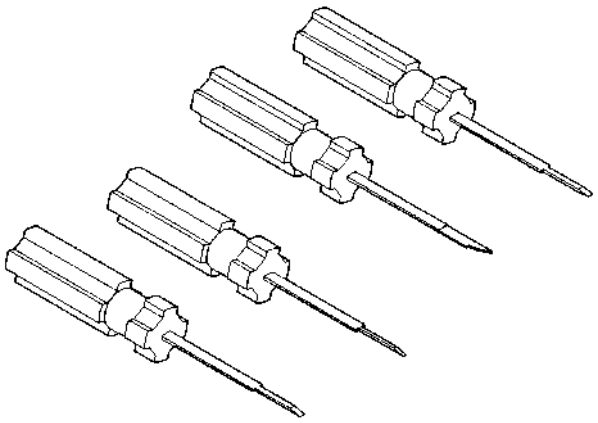
- Automatic resetting circuit breakers
- Blade-type fuses
- Cartridge fuses
- Relays

OPERATION

The power distribution system for this vehicle is designed to provide safe, reliable, and centralized distribution points for the electrical current required to operate all of the many standard and optional factory-installed electrical and electronic powertrain, chassis, safety, security, comfort and convenience systems. At the same time, the power distribution system was designed to provide ready access to these electrical distribution points for the technician to use when conducting diagnosis and repair of inoperative circuits. The power distribution system can also prove useful for the sourcing of additional electrical circuits that may be required to provide the electrical current needed to operate many accessories that the vehicle owner may choose to have installed.

SPECIAL TOOLS

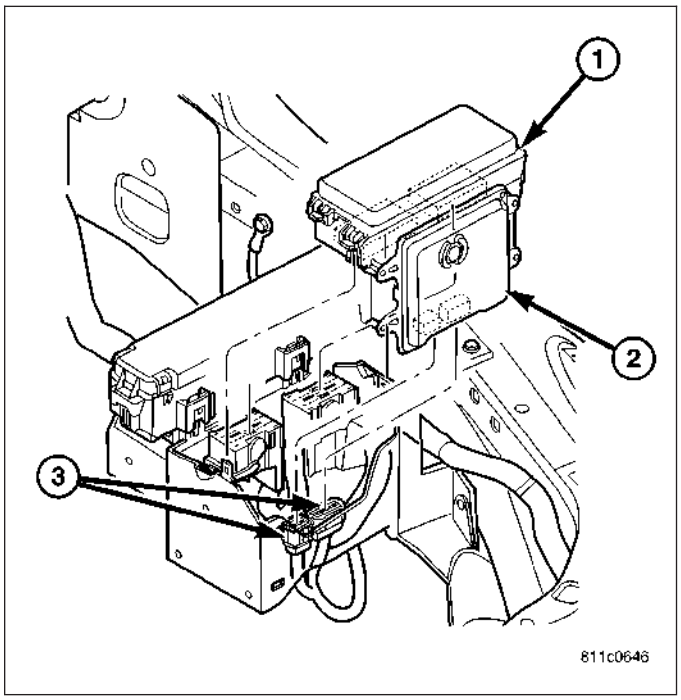
POWER DISTRIBUTION SYSTEMS



MODULE-INTEGRATED POWER

DESCRIPTION

The Integrated Power Module (IPM) is a combination of the Power Distribution Center (PDC) (1) and the Front Control Module (FCM) (2). The IPM is located in the engine compartment, next to the battery. The power distribution center mates directly with the (FCM) to form the IPM. The (PDC) is a printed circuit board based module that contains fuses and relays, while the FCM contains the electronics controlling the IPM and other functions. The IPM connects directly to the battery positive via a stud located on top of the unit. The ground connection is via electrical connectors. The IPM provides the primary means of voltage distribution and protection for the entire vehicle.

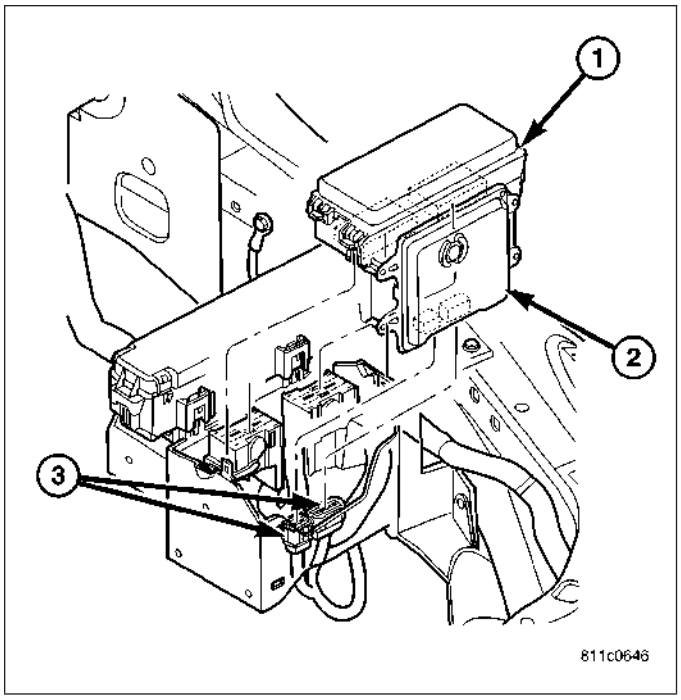


OPERATION

All of the current from the battery and the generator output enters the integrated power module via a stud on the top of the module. Internal connections of all of the power distribution center circuits is accomplished by a combination of bus bars and a printed circuit board.

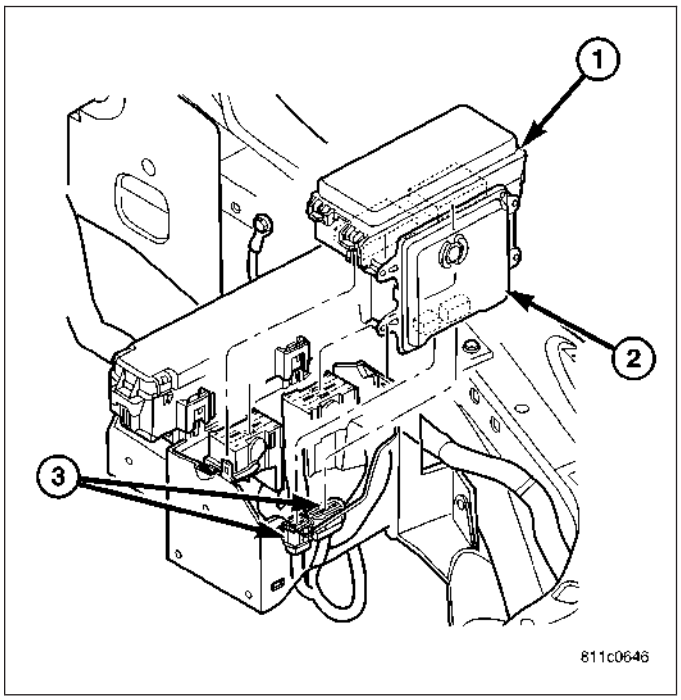
REMOVAL

1. Disconnect the negative and positive battery cables.
2. Unsnap cover and remove the B+ terminal nut from the integrated power module (IPM). Remove the B+ cable.
3. Remove the IPM from the retaining bracket (1).
4. Disconnect the connectors from the (IPM).
5. Remove the Front Control Module (FCM) (2) retaining screws.
6. Disconnect the front control module by pulling it straight off the integrated power module.



INSTALLATION

1. Install the Front Control Module (FCM) (2) to the Integrated Power Module (IPM).
2. Connect the electrical connectors to the IPM (1).
3. Install the IPM to the retaining bracket.
4. Install the B+ cable and nut on the IPM B+ terminal. Snap the cover in place.
5. Connect the negative and positive battery cables.



IOD FUSE

DESCRIPTION

All vehicles are equipped with an Ignition-Off Draw (IOD) fuse that is disconnected within the Integrated Power Module when the vehicle is shipped from the factory. Dealer personnel are to reconnect the IOD fuse in the Integrated Power Module as part of the preparation procedures performed just prior to new vehicle delivery. The following circuits are protected by the IOD fuse:

- Cluster (CCN)
- Diagnostic Connector
- Map Lamps
- Glove Box Lamp
- Courtesy Lamps
- Radio
- Underhood Lamp

OPERATION

The term ignition-off draw identifies a normal condition where power is being drained from the battery with the ignition switch in the Off position. The IOD fuse feeds the memory and sleep mode functions for some of the electronic modules in the vehicle as well as various other accessories that require battery current when the ignition switch is in the Off position. The only reason the IOD fuse is disconnected is to reduce the normal IOD of the vehicle electrical system during new vehicle transportation and pre-delivery storage to reduce battery depletion, while still allowing vehicle operation so that the vehicle can be loaded, unloaded and moved as needed.

The IOD fuse is disconnected from Integrated Power Module when the vehicle is shipped from the assembly plant. Dealer personnel must reconnect the IOD fuse when the vehicle is being prepared for delivery in order to restore full electrical system operation. Once the vehicle is prepared for delivery, the IOD function of this fuse becomes transparent and the fuse that has been assigned the IOD designation becomes another Fused B(+) circuit fuse.

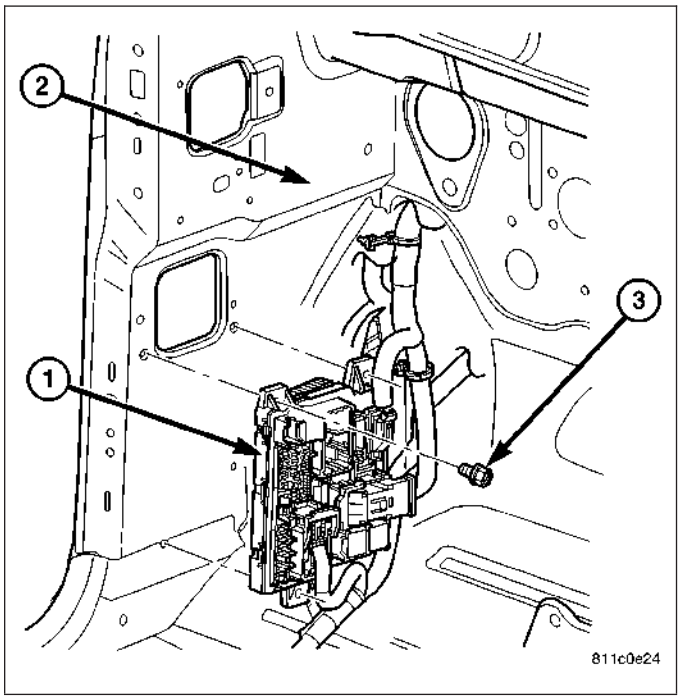
The IOD fuse can be used by the vehicle owner as a convenient means of reducing battery depletion when a vehicle is to be stored for periods not to exceed about thirty days. However, it must be remembered that disconnecting the IOD fuse will not eliminate IOD, but only reduce this normal condition. If a vehicle will be stored for more than about thirty days, the battery negative cable should be disconnected to eliminate normal IOD; and, the battery

should be tested and recharged at regular intervals during the vehicle storage period to prevent the battery from becoming discharged or damaged.

JUNCTION BLOCK

DESCRIPTION

An electrical Junction Block (JB) (1) is concealed behind the left outboard end of the instrument panel cover. The JB combines the functions previously provided by a separate fuseblock module and relay center, serves to simplify and centralize numerous electrical components, and to distribute electrical current to many of the accessory systems in the vehicle. It also eliminates the need for numerous splice connections and serves in place of a bulkhead connector between many of the engine compartment, instrument panel, and body wire harnesses.



The molded plastic JB housing has integral mounting brackets that are secured with two screws to the left instrument panel end bracket. The left end of the instrument panel cover has a snap-fit fuse access panel that can be removed for service of the JB. A fuse puller and spare fuse holders are located on the back of the fuse access cover, as well as a fuse layout to help ensure proper fuse identification.

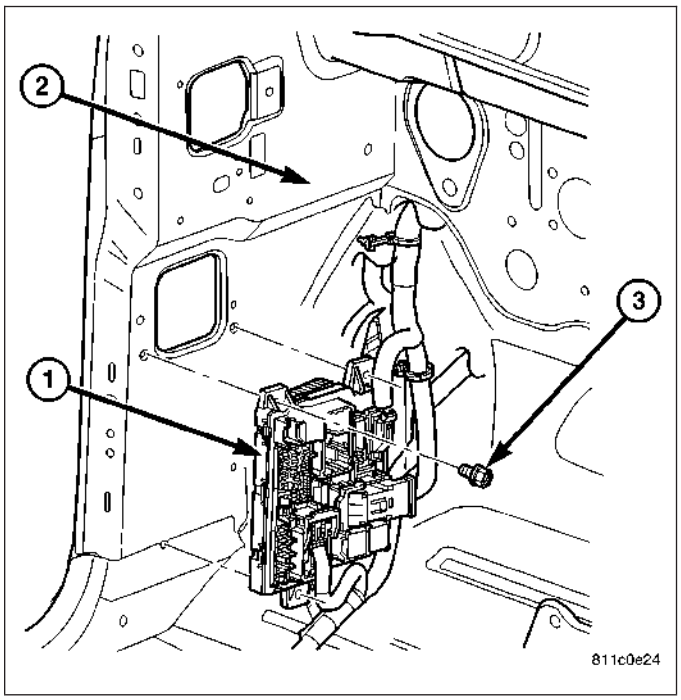
The JB unit cannot be repaired and is only serviced as an assembly. If any internal circuit or the JB housing is faulty or damaged, the entire JB unit must be replaced.

OPERATION

All of the circuits entering and leaving the JB do so through wire harness connectors, which are connected to the JB through integral connector receptacles molded into the JB housing. Internal connection of all of the JB circuits is accomplished by an intricate combination of hard wiring and bus bars.

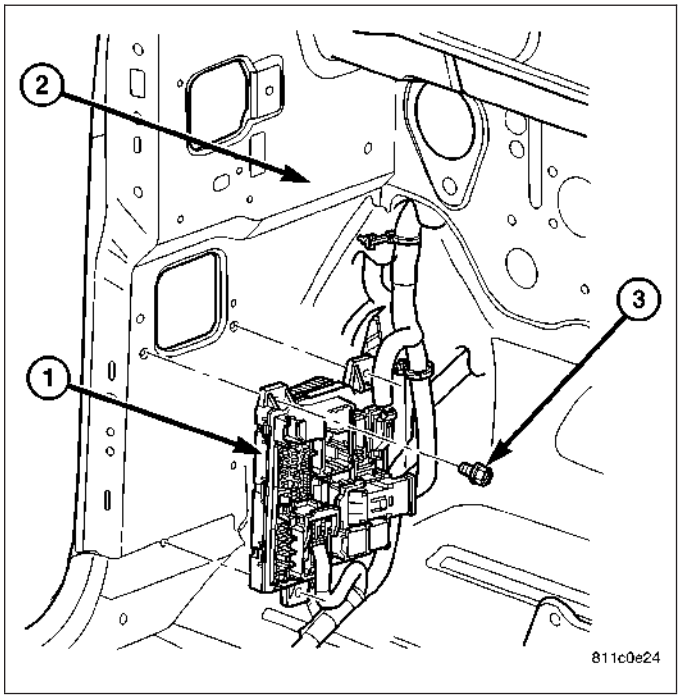
REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Remove the cowl trim cover (Refer to 23 - BODY/INTERIOR/COWL TRIM COVER - REMOVAL).
3. Remove the mounting fasteners (3).
4. Disconnect the electrical harness connectors and remove Junction Block (1).
5. Transfer components as necessary.



INSTALLATION

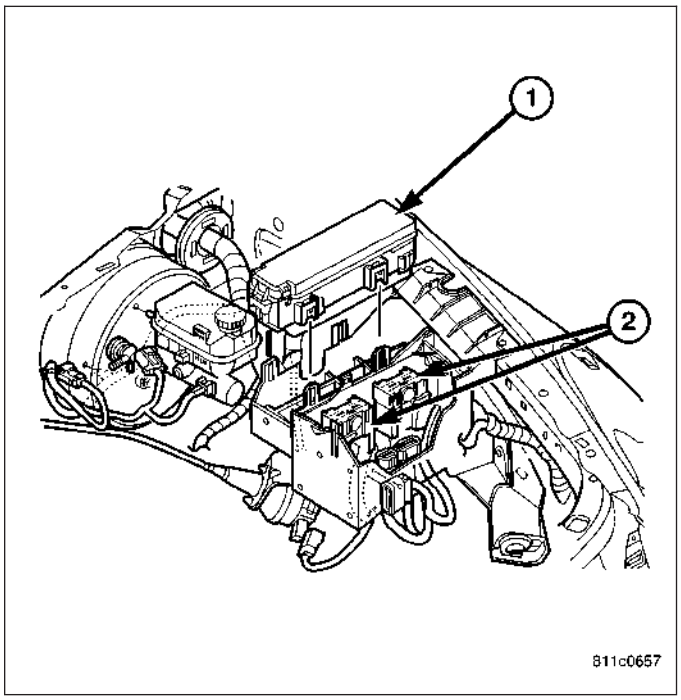
1. Connect wire harness connectors to the Junction Block (JB) (1).
2. Position JB and install mounting fasteners (3).
3. Install cowl trim cover (Refer to 23 - BODY/INTERIOR/COWL TRIM COVER - INSTALLATION).
4. Connect the battery negative cable.



POWER DISTRIBUTION CENTER

DESCRIPTION

All of the electrical current distributed throughout this vehicle is directed through the Power Distribution Center (PDC) (1). The molded plastic PDC housing is located in the left front corner of the engine compartment, just behind the battery. The PDC houses the generator cartridge fuse and maxi-type cartridge fuses, which replace all in-line fusible links. The PDC also houses blade-type fuses, relays, and a fuse puller.

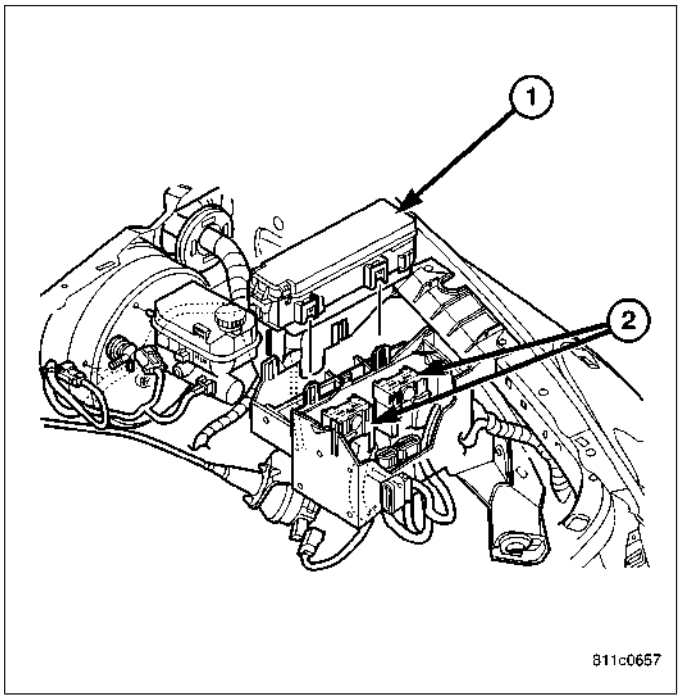


OPERATION

All of the current from the battery and the generator output enters the PDC through two cables with eyelets that are secured with nuts to the two B(+) terminal studs located just inside the inboard end of the PDC housing. The PDC cover is unlatched and removed to access the battery and generator output connection B(+) terminal studs, the fuses, the relays, the joint connectors and the engine wire harness in-line connector.

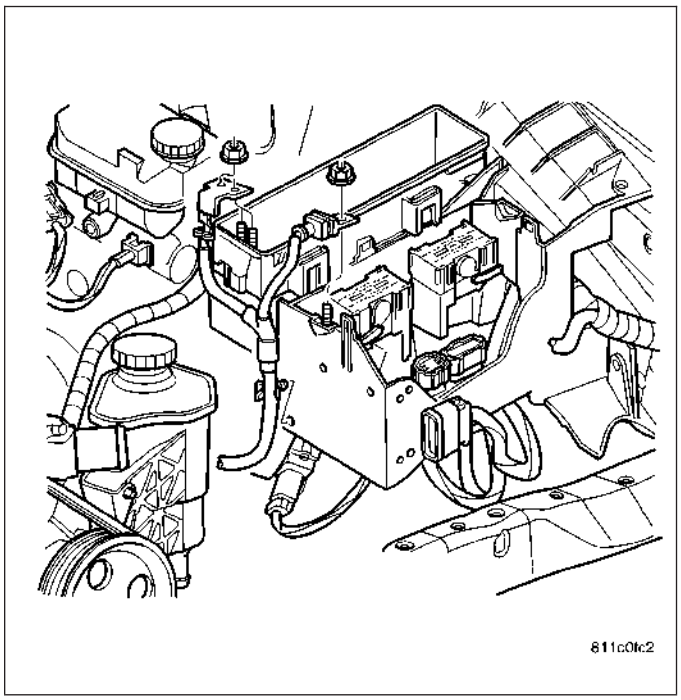
REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Depress retaining tabs on the side on the PDC (1).
3. Disconnect electrical harness connectors (2) and remove PDC.



INSTALLATION

1. Connect electrical harness connectors to Power Distribution Center (PDC).
2. Position PDC and engage into the retaining tabs.
3. Connect the battery negative cable.



POWER OUTLET

REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Pull the cigar lighter knob and element out of the cigar lighter receptacle base, or unsnap the protective cap from the power outlet receptacle base.
3. Look inside the cigar lighter or power outlet receptacle base and note the position of the rectangular retaining bosses of the mount that secures the receptacle base to the panel.
4. Insert a pair of external snap ring pliers into the cigar lighter or power outlet receptacle base and engage the tips of the pliers with the retaining bosses of the mount.
5. Squeeze the pliers to disengage the mount retaining bosses from the receptacle base and, using a gentle rocking motion, pull the pliers and the receptacle base out of the mount.
6. Pull the receptacle base away from the instrument panel far enough to access the instrument panel wire harness connector.
7. Disconnect the instrument panel wire harness connector from the cigar lighter or power outlet receptacle base connector receptacle.
8. Remove the cigar lighter or power outlet mount from the instrument panel.

INSTALLATION

1. Connect the instrument panel wire harness connector to the cigar lighter or power outlet receptacle base connector receptacle.
2. Install the cigar lighter or power outlet mount into the instrument panel.
3. Align the splines on the outside of the cigar lighter or power outlet receptacle base connector receptacle with the grooves on the inside of the mount.
4. Press firmly on the cigar lighter or power outlet receptacle base until the retaining bosses of the mount are fully engaged in their receptacles.
5. Install the cigar lighter knob and element into the cigar lighter receptacle base, or the protective cap into the power outlet receptacle base.
6. Connect the battery negative cable.

ENGINE

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ENGINE ELECTRICAL DIAGNOSTICS

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ENGINE ELECTRICAL DIAGNOSTICS

DIAGNOSIS AND TESTING

PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Diagnostic Test

1. NO RESPONSE

Make sure the scan tool will communicate with the appropriate modules.

Are you currently experiencing a NO RESPONSE condition?

Yes >> The NO RESPONSE condition must be properly diagnosed before continuing.
Refer to the appropriate BUS Communication test in Section 8 ELECTRONIC CONTROL MODULES - ELECTRICAL DIAGNOSTICS.

No >> Go To 2

---

2. NO START

Is the customer complaint a NO START condition?

Yes >> Check the vehicle for any NO START related PCM DTC(s) or Vehicle Theft Security related DTC(s).
If no Theft related DTC(s) are present, refer to the Non DTC Diagnostic Procedures that relate to Fuel and Starting.

No >> Go To 3

---

3. VEHICLE HISTORY AND TSB(s)

Continue by reading PCM DTC(s) and record the related Freeze Frame data if any DTC(s) are present.

Whether or not any DTC(s) are present you will want to check the following items which may assist in repairing the customers complaint successfully.

Check the vehicles repair history.

If the vehicle has a repair history that pertains to the customer's current complaint, review the repair.

Inpect the vehicle for any aftermarket accessories that may have been installed incorrectly.

Check for any TSB(s) related to the customer's complaint or DTC(s).

If a TSB applies, follow the instructions per the TSB.

Choose the following scenario that best applies.

The TSB repaired the customers complaint.
Testing complete.

A DTC is present, no TSB applies, or the TSB didn't repair the customers complaint.
Go To 4

No DTC(s) are present.
Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE (CONTINUED)

4. WIRE HARNESS INSPECTION

Clear the DTC(s).

Attempt to duplicate the customer complaint.

Whether the customer complaint can be duplicated or not, make a quick wire harness inspection related to the DTC(s) that were previously cleared.

Check the Powertrain Control Module connectors, the suspected component connection, in-line connectors, wire harness splices, PCM power and ground circuits, and any related fuses.

If the DTC(s) are fuel or air related, check the fuel level and quality.

Were any repairs made that fixed the customer's complaint?

Yes >> Testing complete.

No >> Refer to the diagnostic test procedure related to the DTC.

INTERMITTENT CONDITION

For the Engine circuit diagrams (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

POSSIBLE CAUSES
INTERMITTENT CONDITION

Diagnostic Test

1. INTERMITTENT CONDITION

NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Refer to any Technical Service Bulletins (TSBs) that may apply.

Review the scan tool Freeze Frame information. If possible, try to duplicate the conditions under which the DTC set.

With the engine running at normal operating temperature, monitor the scan tool parameters related to the DTC while wiggling the wire harness. Look for parameter values to change and/or a DTC to set.

Turn the ignition off.

Visually inspect the related wire harness. Disconnect all the related harness connectors. Look for any chafed, pierced, pinched, partially broken wires and broken, bent, pushed out, or corroded terminals.

Perform a voltage drop test on the related circuits between the suspected faulty component and the PCM.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Inspect and clean all PCM, engine, and chassis grounds that are related to the most current DTC.

If numerous trouble codes were set, use a wire schematic and look for any common ground or supply circuits.

For any Relay DTCs, actuate the Relay with the scan tool and wiggle the related wire harness to try to interrupt the actuation.

For intermittent Evaporative Emission trouble codes perform a visual and physical inspection of the related parts including hoses and the Fuel Filler cap.

For intermittent Misfire DTC's check for restrictions in the Intake and Exhaust system, proper installation of Sensors, vacuum leaks, and binding components that are run by the accessory drive belt.

Use the scan tool to perform a System Test if one applies to failing component.

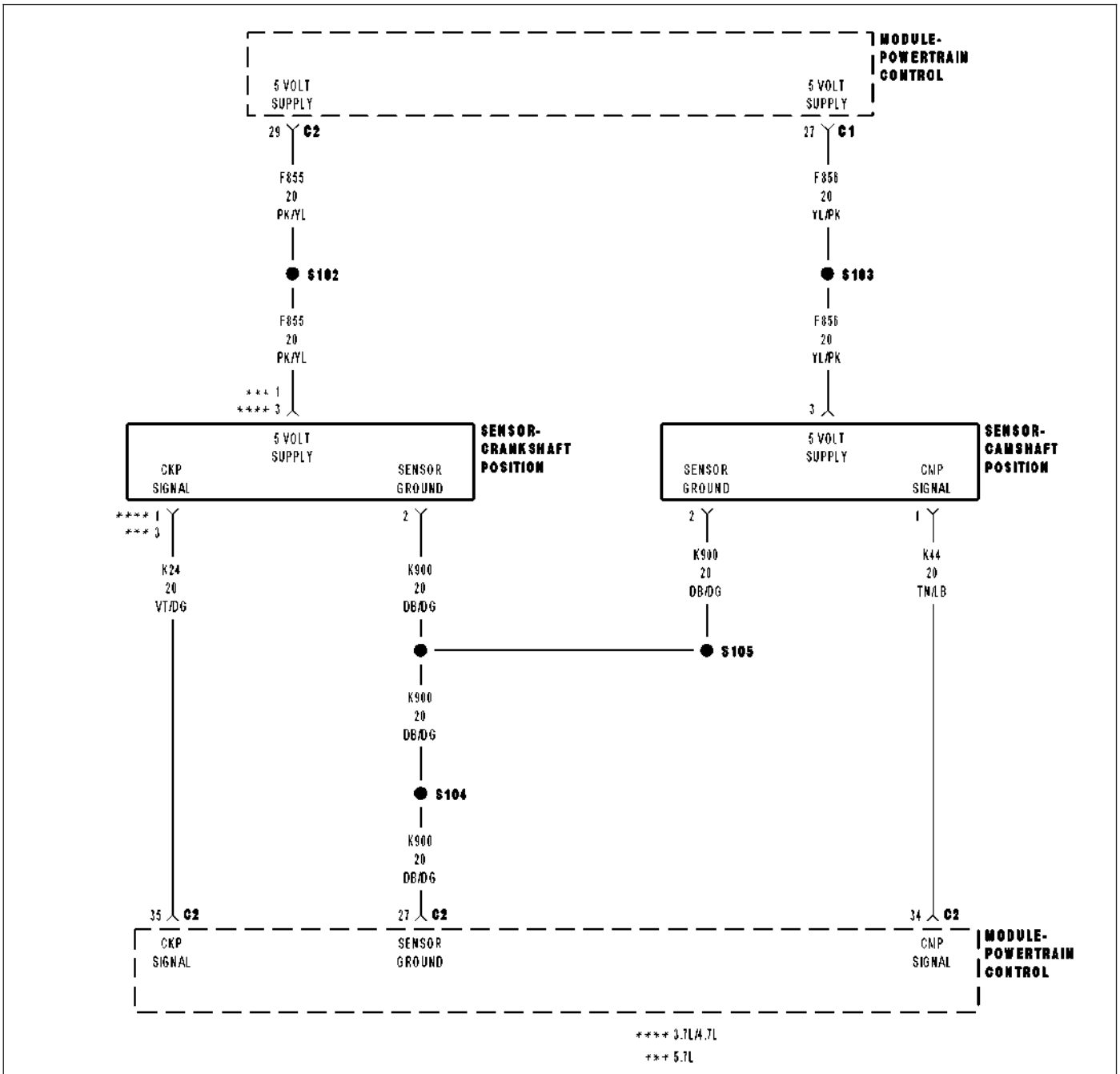
A co-pilot, data recorder, and/or lab scope should be used to help diagnose intermittent conditions.

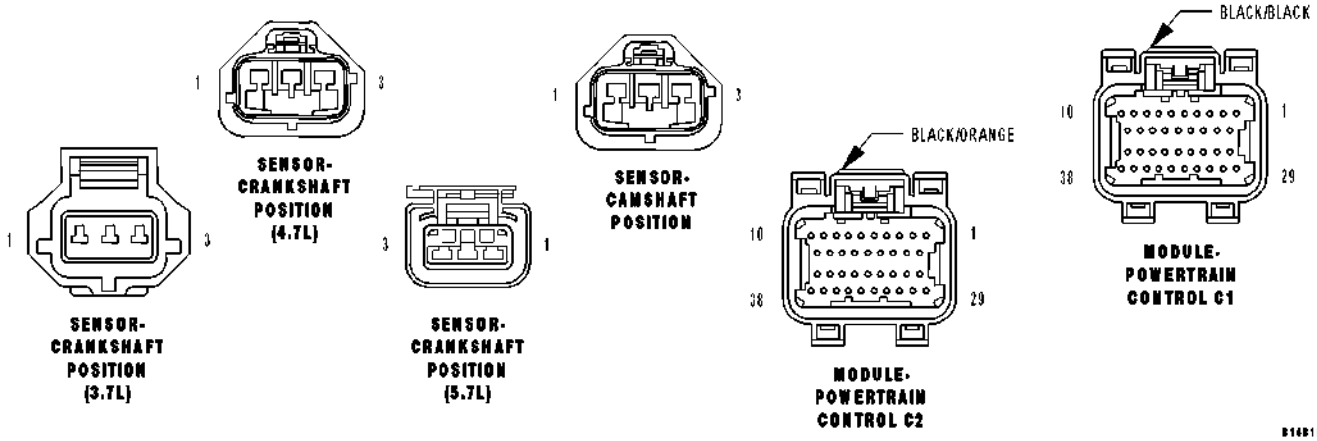
Were any problems found during the above inspections?

Yes >> Perform the necessary repairs.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Test Complete.

P0016–CRANKSHAFT / CAMSHAFT TIMING MISALIGNMENT





P0016–CRANKSHAFT / CAMSHAFT TIMING MISALIGNMENT (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Engine cranking and Engine running
- **Set Condition:**
  Powertrain Control Module detects an error when the camshaft position is out of phase with the crankshaft position. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
ERRATIC CAM POSITION SENSOR SIGNAL
CAMSHAFT POSITION SENSOR TONE WHEEL/PULSE RING
ERRATIC CRANKSHAFT POSITION SENSOR SIGNAL
CRANKSHAFT POSITION SENSOR TONE WHEEL/PULSE RING
CAMSHAFT POSITION SENSOR
CRANKSHAFT POSITION SENSOR

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool clear the DTC(s).

Start the engine and run until operating temp is reached. (Closed Loop)

If the DTC does not reset it may be necessary to test drive the vehicle.

Does the P0016 return?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. CHECKING THE CMP SIGNAL WITH A LAB SCOPE

With a lab scope, backprobe the (K44) CMP Signal circuit at the CMP Sensor harness connector.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Start the engine.

Observe the lab scope screen.

Are there any irregular or missing signals?

Yes >> Go To 3

No >> Go To 6

P0016–CRANKSHAFT / CAMSHAFT TIMING MISALIGNMENT (CONTINUED)

3. CMP WIRE HARNESS INSPECTION

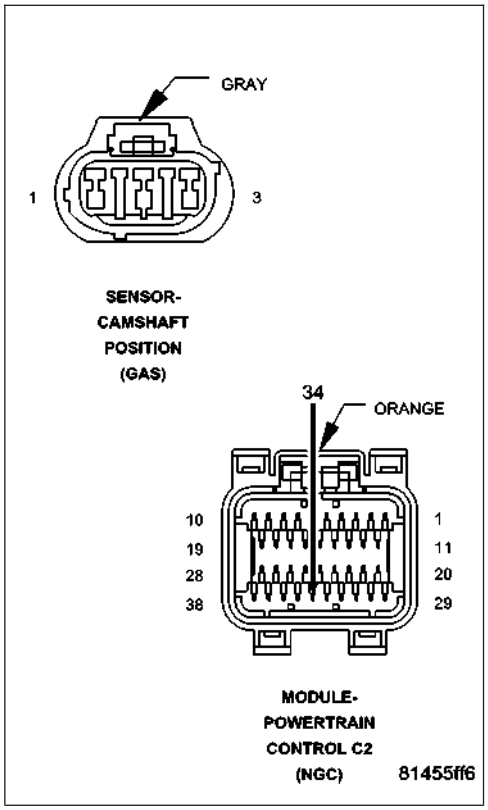
Turn the ignition off.

Visually inspect the related wire harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Make sure the Crankshaft Position Sensor and the Camshaft Position Sensor are properly installed and the mounting bolt(s) are torqued to their proper specification.

Refer to any TSBs that may apply.



Were any of the above conditions present?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

4. TONE WHEEL/PULSE RING INSPECTION

Remove the Camshaft Position Sensor.

Inspect the Tone Wheel/Pulse Ring for damage, foreign material, or excessive movement.

Were any problems found?

Yes >> Repair or replace the Tone Wheel/Pulse Ring as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

5. CAMSHAFT POSITION SENSOR

If there are no possible causes remaining, view repair.

Repair

Replace the Camshaft Position Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0016–CRANKSHAFT / CAMSHAFT TIMING MISALIGNMENT (CONTINUED)

6. ERRATIC CMP SIGNAL

Turn the ignition off.

Remove the lab scope probe.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Ignition on, engine not running.

With scan tool, erase DTCs.

Start the engine.

Gently tap on and wiggle the Cam Position Sensor.

Ignition on, engine not running.

Inspect the Sensor connector and harness connector, and inspect the PCM connector and harness connector for loose, bent, corroded, or pushed out pins/terminals.

Inspect the related wire harness and the splices in the CMP circuit.

Does the P0016 return?

Yes >> Repair the wiring/connector concerns as needed or replace the Camshaft Position Sensor. Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 7

---

7. CHECKING THE CKP SIGNAL WITH A LAB SCOPE

Turn the ignition off.

With a lab scope, backprobe the (K24) CKP Signal circuit at the CKP harness connector.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Start the engine.

Observe the lab scope screen.

Are there any irregular or missing signals?

Yes >> Go To 8

No >> Go To 10

P0016–CRANKSHAFT / CAMSHAFT TIMING MISALIGNMENT (CONTINUED)

8. CKP WIRE HARNESS INSPECTION

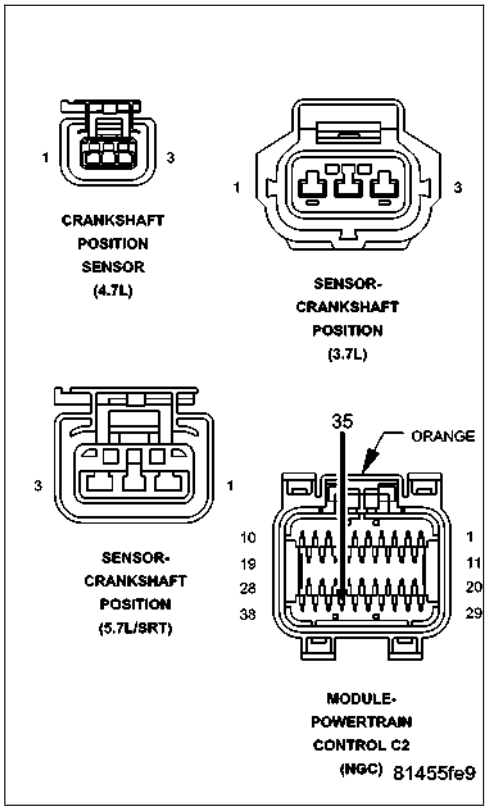
Turn the ignition off.

Visually inspect the related wire harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Make sure the Crankshaft Position Sensor and the Camshaft Position Sensor are properly installed and the mounting bolt(s) are torqued to their proper specification.

Refer to any TSBs that may apply.



Were any of the above conditions present?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 9

9. TONE WHEEL/FLEX PLATE INSPECTION

Remove the Crankshaft Position Sensor.

Inspect the Tone Wheel/Flex Plate slots for damage, foreign material, or excessive movement.

Were any problems found?

Yes >> Repair or replace the Tone Wheel/Flex Plate as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace the Crankshaft Position Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE).

P0016–CRANKSHAFT / CAMSHAFT TIMING MISALIGNMENT (CONTINUED)

10. ERRATIC CKP SIGNAL

NOTE: The conditions that set this DTC are not present at this time. The following test may help in identifying the intermittent condition.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Start the engine.

Gently tap on and wiggle the Crank Position Sensor.

Turn the ignition off.

Inspect the Sensor connector and harness connector, and inspect the PCM connector and harness connector for loose, bent, corroded, or pushed out pins/terminals.

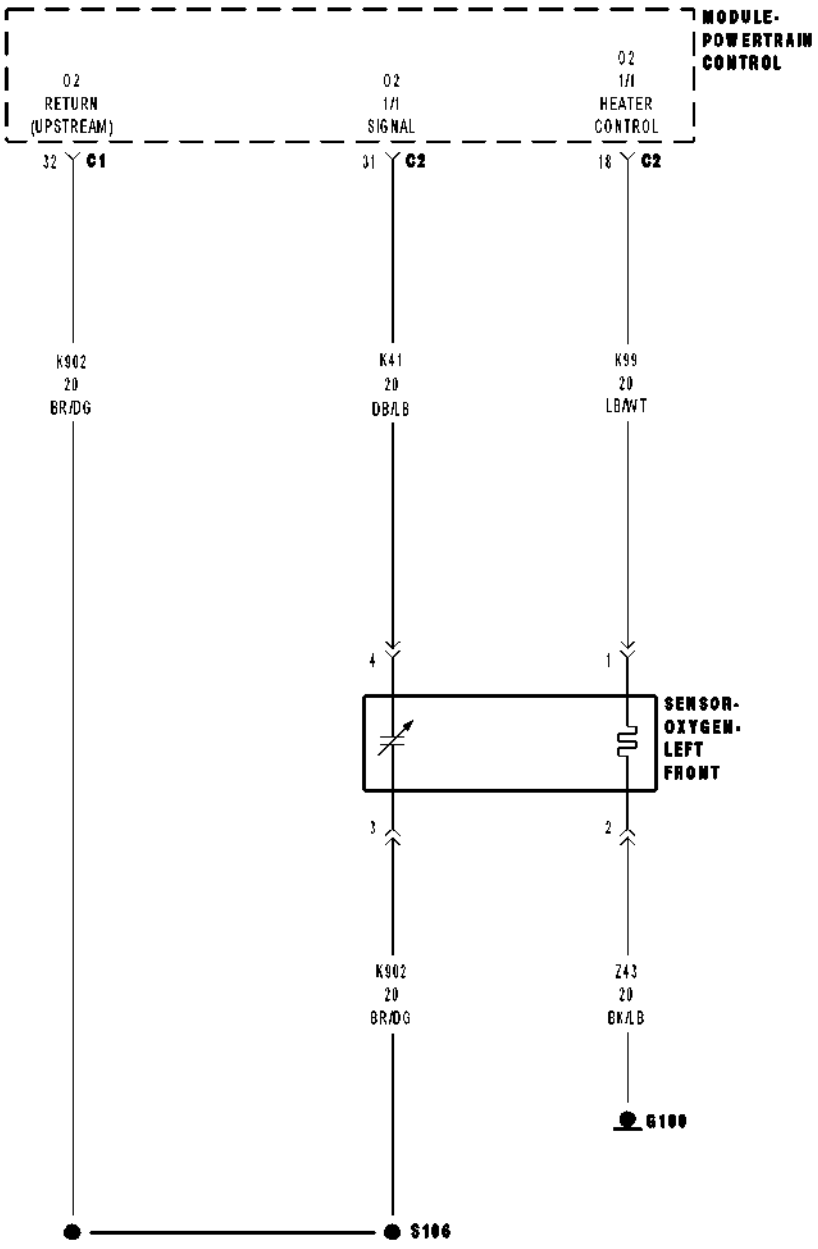
Inspect the related wire harness and the splices in the CKP circuits.

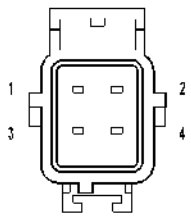
Were any problems found?

Yes >> Repair the wiring/connector concerns as needed or replace the Crankshaft Position Sensor. Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

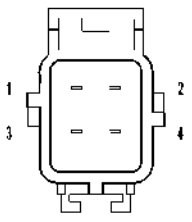
No >> Test Complete.

P0031-O2 SENSOR 1/1 HEATER CIRCUIT LOW

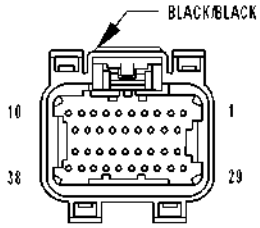




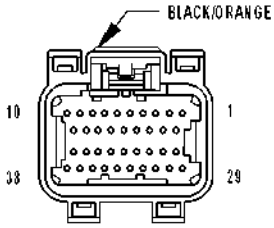
SENSOR-
OXYGEN-
LEFT
FRONT
(5.7L)



SENSOR-
OXYGEN-
LEFT
FRONT
(4.7L)



MODULE-
POWERTRAIN
CONTROL C1



MODULE-
POWERTRAIN
CONTROL C2

B14826ca

P0031-O2 SENSOR 1/1 HEATER CIRCUIT LOW (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Battery voltage above 10.6 volts, ASD is powered up, and O2 heater is powered.
- **Set Condition:**
  Desired state does not match Actual state. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K99) O2 SENSOR 1/1 HEATER CONTROL CIRCUIT SHORTED TO GROUND
O2 SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. O2 SENSOR HEATER OPERATION

Turn the ignition off.

NOTE: Wait a minimum of 8 minutes to allow the O2 Sensor to cool down before continuing the test. Allow the O2 Sensor voltage to stabilize at 5.0 volts.

Ignition on, engine not running.

With a scan tool, actuate the O2 Heater Test.

With the scan tool, monitor 1/1 O2 Sensor voltage for at least 2 minutes.

Does the O2 Sensor voltage stay above 4.5 volts?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. O2 HEATER ELEMENT

Turn the ignition off.

NOTE: Allow the O2 Sensor to cool down to room temperature.

Disconnect the 1/1 O2 Sensor harness connector.

Measure the resistance across the O2 Sensor Heater element, between the Heater Control terminal and the Heater ground terminal at the component.

NOTE: O2 Heater Element resistance values should be measured at 70°F (21.1°C). The resistance value will vary with different temperature values.

Is the O2 Sensor Heater Element resistance between 2.0 and 30.0 ohms?

Yes >> Go To 3

No >> Replace the O2 Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0031-O2 SENSOR 1/1 HEATER CIRCUIT LOW (CONTINUED)

3. O2 SENSOR

Ignition on, engine not running.

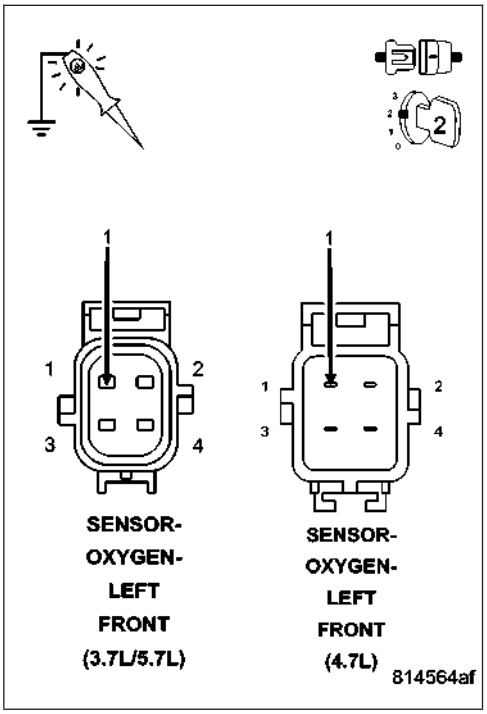
With a scan tool, actuate the O2 1/1 Heater Test with the O2 Sensor harness connector still disconnected.

Using a 12-volt test light connected to ground, probe the (K99) O2 1/1 Heater Control circuit in the O2 Sensor harness connector.

Does the test light illuminate brightly and flash on and off during the actuation?

Yes >> Replace the O2 Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4



4. (K99) O2 1/1 HEATER CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

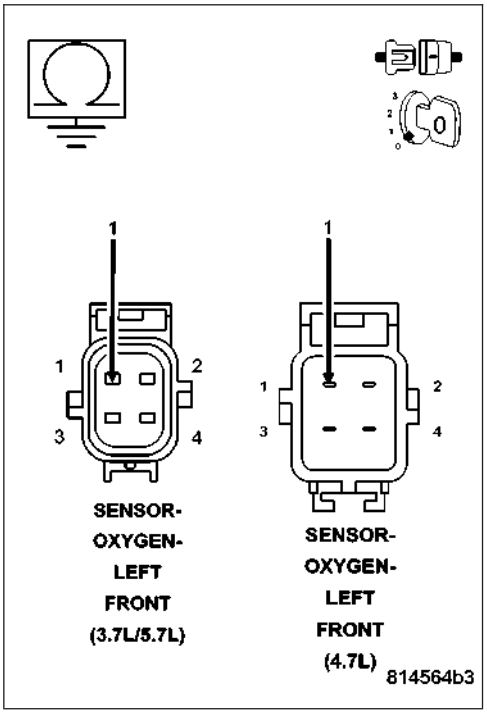
Disconnect the C2 PCM harness connector.

Measure the resistance between ground and the (K99) O2 1/1 Heater Control circuit in the O2 Sensor harness connector.

Is the resistance below 5.0 ohms?

Yes >> Repair the short to ground in the (K99) O2 1/1 Heater Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5



P0031-O2 SENSOR 1/1 HEATER CIRCUIT LOW (CONTINUED)

5. **PCM**

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

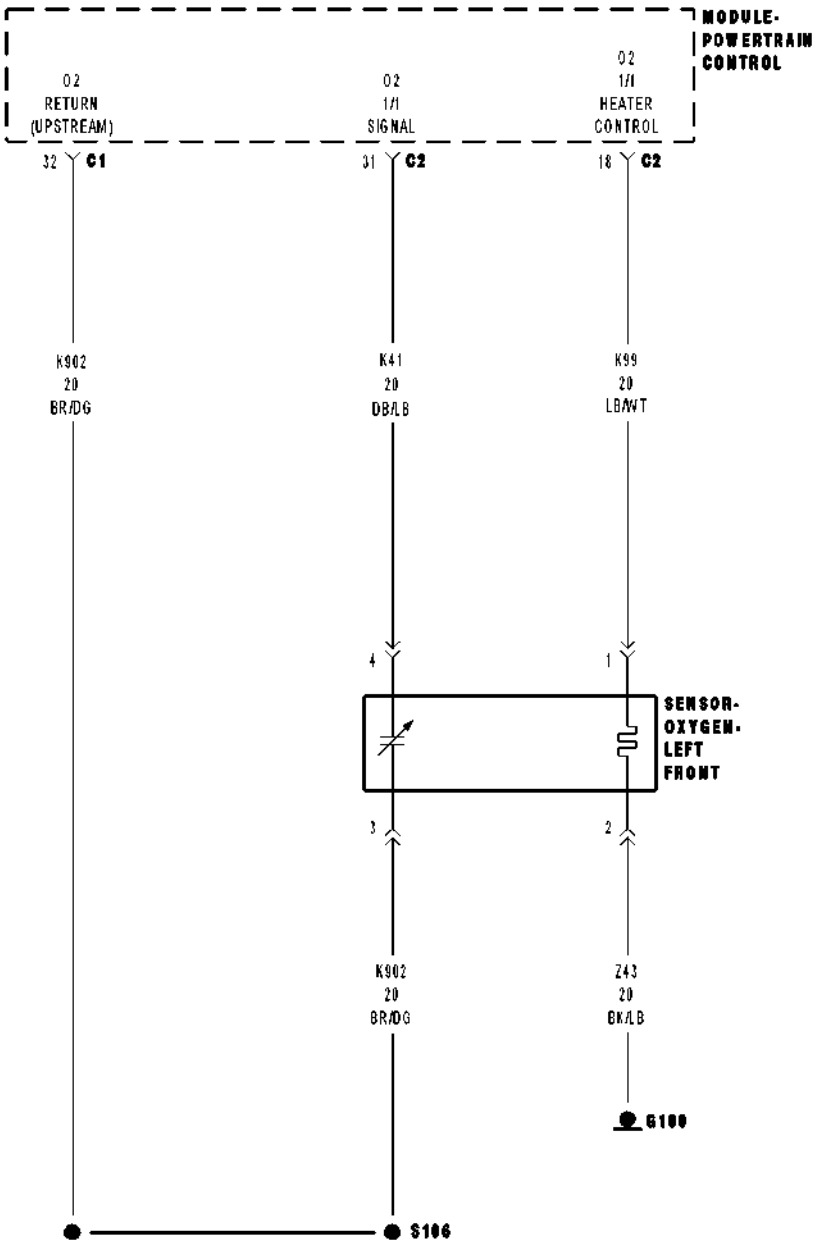
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

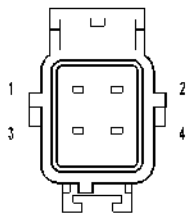
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

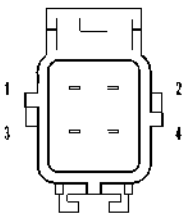
No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0032-O2 SENSOR 1/1 HEATER CIRCUIT HIGH

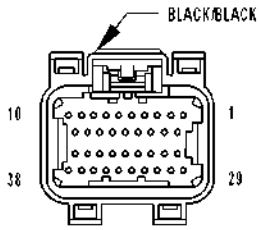




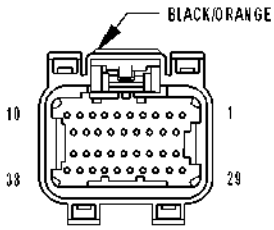
SENSOR-
OXYGEN-
LEFT
FRONT
(5.7L)



SENSOR-
OXYGEN-
LEFT
FRONT
(4.7L)



MODULE-
POWERTRAIN
CONTROL C1



MODULE-
POWERTRAIN
CONTROL C2

B14826ca

P0032-O2 SENSOR 1/1 HEATER CIRCUIT HIGH (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Battery voltage above 10.6 volts, ASD is powered up, and O2 heater is off.
- **Set Condition:**
  Desired state does not equal Actual state. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K99) O2 1/1 HEATER CONTROL CIRCUIT OPEN
(Z43) O2 1/1 HEATER GROUND CIRCUIT OPEN
(K99) O2 1/1 HEATER CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE
O2 SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, read DTC's

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. O2 HEATER ELEMENT

Turn the ignition off.

NOTE: Allow the O2 Sensor to cool down to room temperature.

Disconnect the 1/1 O2 Sensor harness connector.

Measure the resistance across the O2 Sensor Heater element between the O2 Heater Control terminal and the O2 Heater ground terminal at the component.

NOTE: O2 Heater Element resistance values should be measured at 70°F (21.1°C). The resistance value will vary with different temperature values.

Is the O2 Sensor Heater Element resistance between 2.0 and 30.0 ohms?

Yes >> Go To 3

No >> Replace the O2 Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0032-O2 SENSOR 1/1 HEATER CIRCUIT HIGH (CONTINUED)

3. (K99) O2 1/1 HEATER CONTROL CIRCUIT

Ignition on, engine not running.

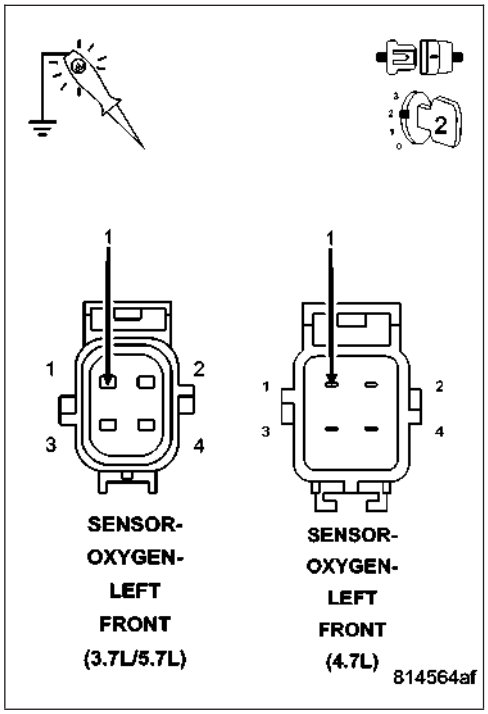
With a scan tool, actuate the O2 1/1 Heater Test with the Sensor harness connector still disconnected.

Using a 12-volt test light connected to ground, probe the (K99) O2 1/1 Heater Control circuit in the O2 Sensor harness connector.

Does the test light illuminate brightly and flash on and off during the actuation?

Yes >> Go To 4

No >> Go To 5



4. (Z43) O2 HEATER GROUND CIRCUIT OPEN

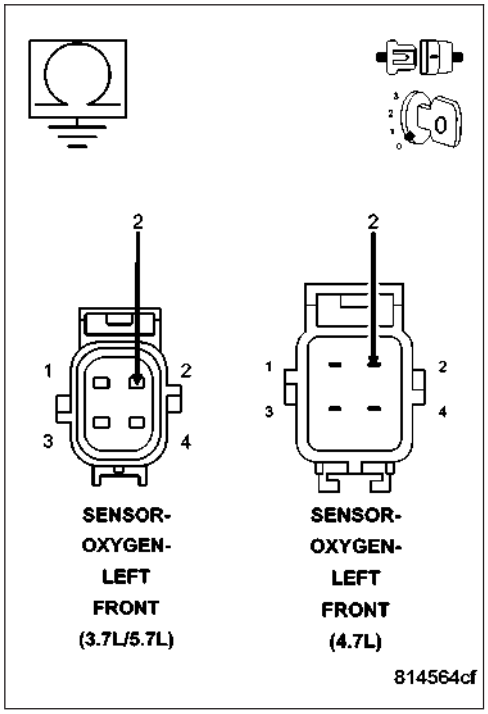
Turn the ignition off.

Measure the resistance between an engine ground and the (Z43) O2 1/1 Heater ground circuit in the O2 Sensor harness connector.

Is the resistance below 5.0 ohms?

Yes >> Replace the O2 Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Repair the open in the (Z43) O2 1/1 Heater ground circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P0032-O2 SENSOR 1/1 HEATER CIRCUIT HIGH (CONTINUED)

5. (K99) O2 1/1 HEATER CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

Disconnect the C2 PCM harness connector.

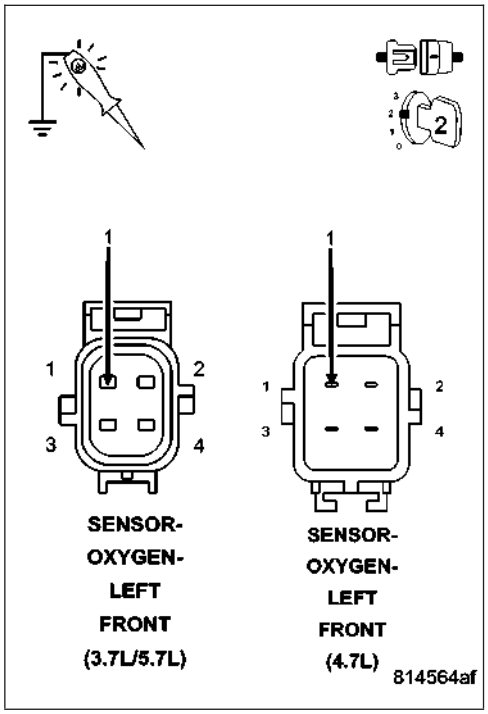
Ignition on, engine not running.

Using a 12-volt test light connected to ground, probe the (K99) O2 1/1 Heater Control circuit in the O2 Sensor harness connector.

Does the test light illuminate brightly?

Yes >> Repair the short to battery voltage in the (K99) O2 1/1 Heater Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6



6. (K99) O2 1/1 HEATER CONTROL CIRCUIT OPEN

Turn the ignition off.

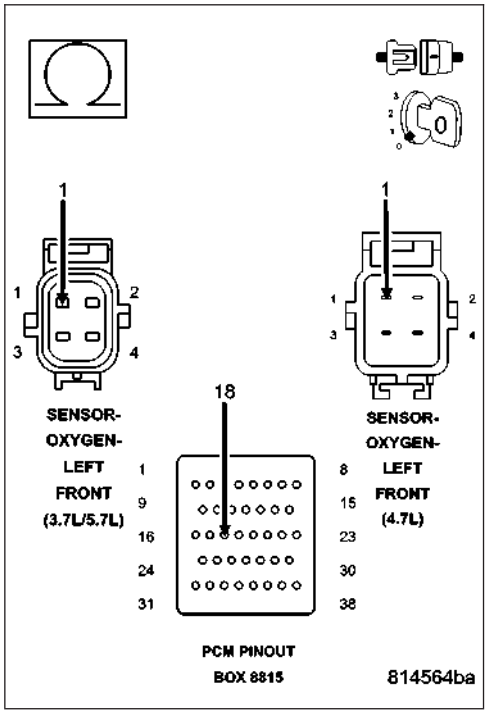
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K99) O2 1/1 Heater Control circuit from the O2 Sensor harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 7

No >> Repair the open in the (K99) O2 1/1 Heater Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P0032-O2 SENSOR 1/1 HEATER CIRCUIT HIGH (CONTINUED)

7. **PCM**

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

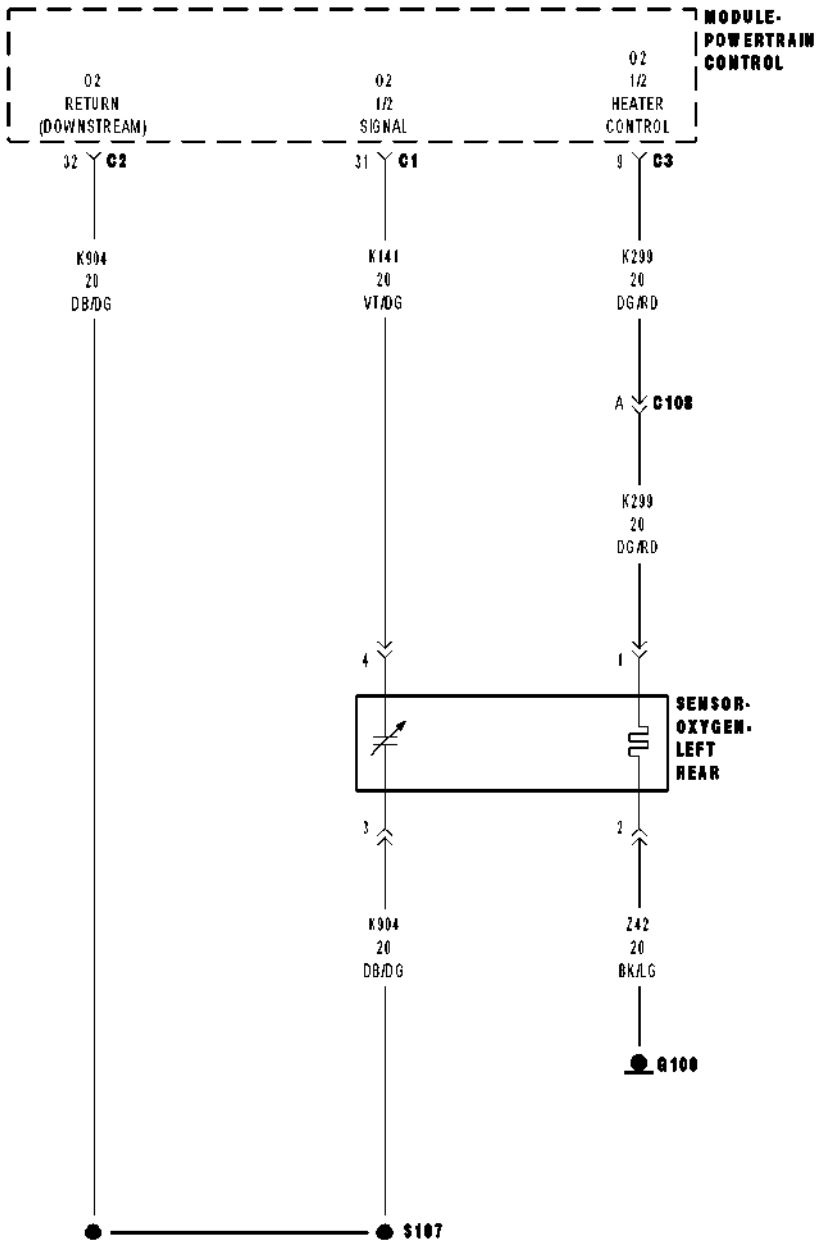
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

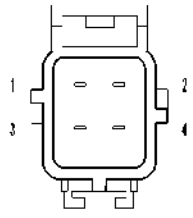
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

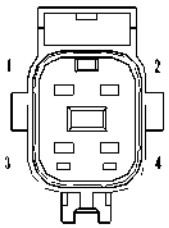
No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0037-O2 SENSOR 1/2 HEATER CIRCUIT LOW

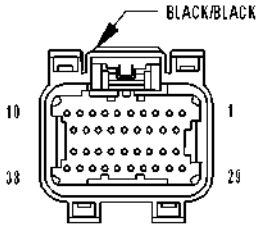




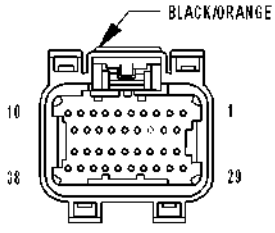
SENSOR-
OXYGEN-
LEFT
REAR
(3.7L)



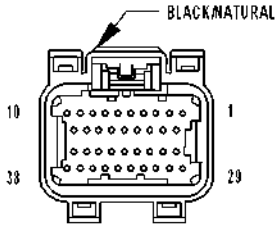
SENSOR-
OXYGEN-
LEFT
REAR
(4.7L/5.7L)



MODULE-
POWERTRAIN
CONTROL C1



MODULE-
POWERTRAIN
CONTROL C2



MODULE-
POWERTRAIN
CONTROL C3

8148295c

P0037-O2 SENSOR 1/2 HEATER CIRCUIT LOW (CONTINUED)

For the Engine circuit diagrams (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Battery voltage above 10.6 volts, ASD is powered up, and O2 heater is on.
- **Set Condition:**
  Desired state does not match Actual state. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K299) O2 1/2 HEATER CONTROL CIRCUIT SHORTED TO GROUND
O2 SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. O2 SENSOR HEATER OPERATION

Turn the ignition off.

NOTE: Wait a minimum of 8 minutes to allow the O2 Sensor to cool down before continuing the test. Allow the O2 Sensor voltage to stabilize at 5.0 volts.

Ignition on, engine not running.

With a scan tool, actuate the O2 1/2 Heater Test.

With the scan tool, monitor 1/2 O2 Sensor voltage for at least 2 minutes.

Does the O2 Sensor voltage stay above 4.5 volts?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. O2 HEATER ELEMENT

Turn the ignition off.

NOTE: Allow the O2 Sensor to cool down to room temperature.

Disconnect the 1/2 O2 Sensor harness connector.

Measure the resistance across the O2 Sensor Heater element, between the O2 Heater Control terminal and the O2 Heater ground terminal at the component.

NOTE: O2 Heater Element resistance values should be measured at 70°F (21.1°C). The resistance value will vary with different temperature values.

Is the O2 Sensor Heater Element resistance between 2.0 and 30.0 ohms?

Yes >> Go To 3

No >> Replace the O2 Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0037-O2 SENSOR 1/2 HEATER CIRCUIT LOW (CONTINUED)

3. O2 SENSOR

Ignition on, engine not running.

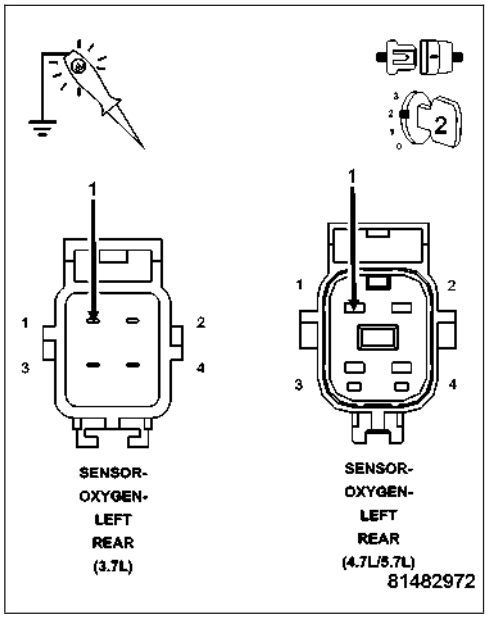
With a scan tool, actuate the O2 Heater Test with the 1/2 O2 Sensor harness connector still disconnected.

Using a 12-volt test light connected to ground, probe the (K299) O2 1/2 Heater Control circuit in the O2 Sensor harness connector.

Does the test light illuminate brightly and flash on and off during the actuation?

Yes >> Replace the O2 Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4



4. (K299) O2 1/2 HEATER CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

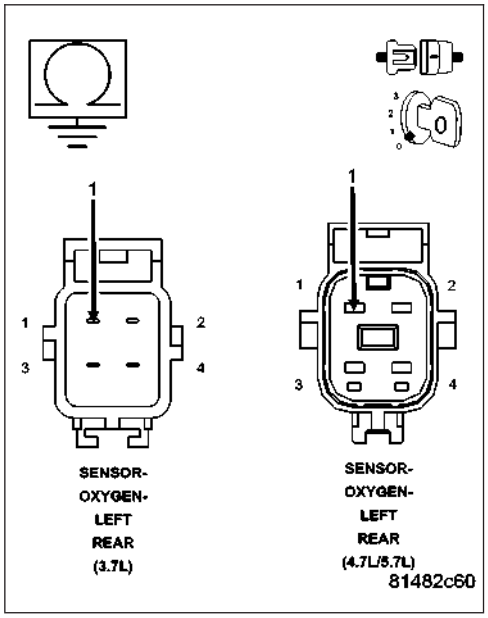
Disconnect the C3 PCM harness connector.

Measure the resistance between ground and the (K299) O2 1/2 Heater Control circuit in the O2 Sensor harness connector.

Is the resistance below 5.0 ohms?

Yes >> Repair the short to ground in the (K299) O2 1/2 Heater Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5



P0037-O2 SENSOR 1/2 HEATER CIRCUIT LOW (CONTINUED)

5. **PCM**

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

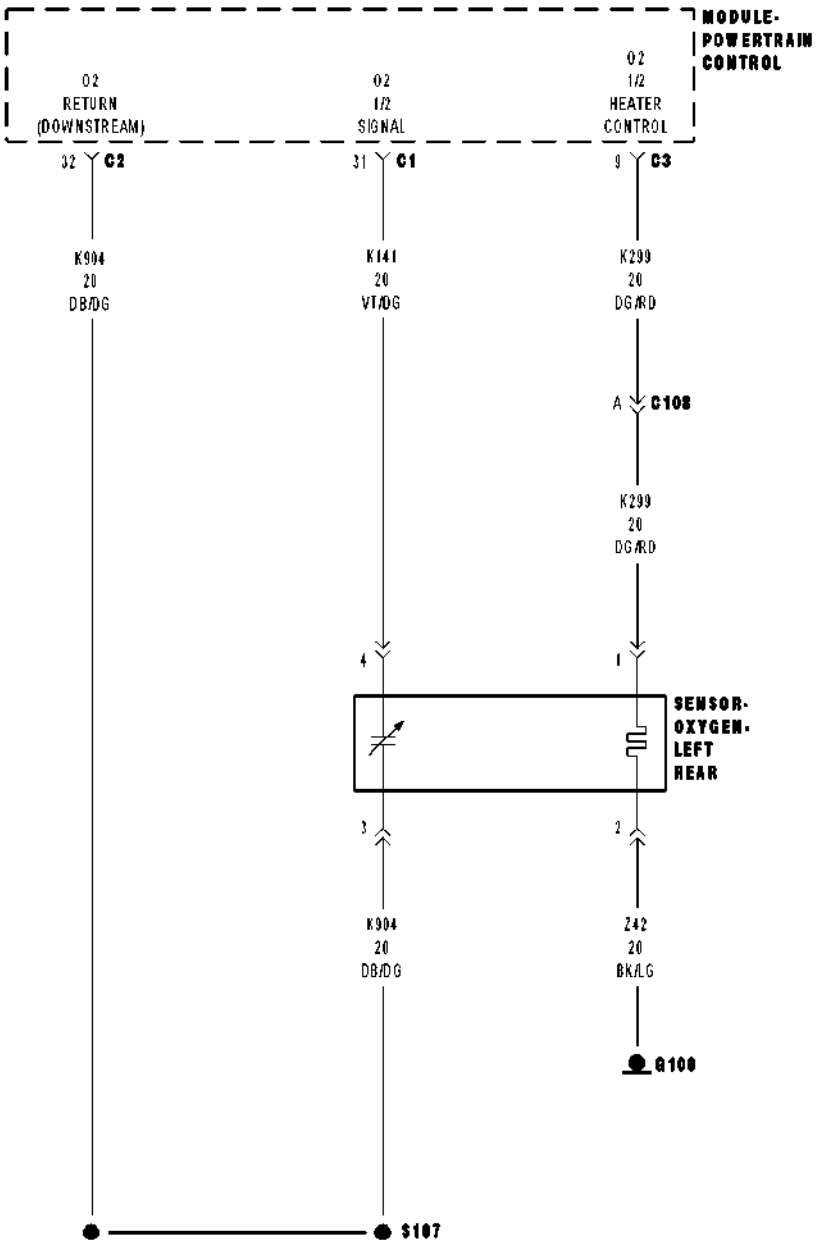
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

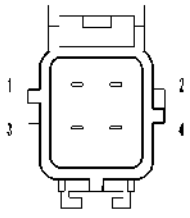
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

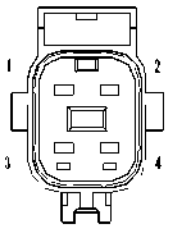
No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0038-O2 SENSOR 1/2 HEATER CIRCUIT HIGH

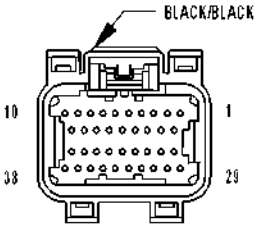




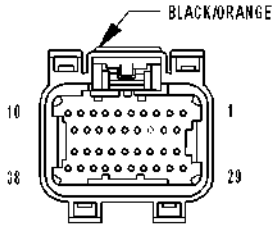
SENSOR-
OXYGEN-
LEFT
REAR
(3.7L)



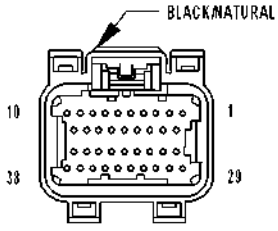
SENSOR-
OXYGEN-
LEFT
REAR
(4.7L/5.7L)



MODULE-
POWERTRAIN
CONTROL C1



MODULE-
POWERTRAIN
CONTROL C2



MODULE-
POWERTRAIN
CONTROL C3

8148295c

P0038-O2 SENSOR 1/2 HEATER CIRCUIT HIGH (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Battery voltage above 10.6 volts, ASD is powered up, and O2 heater is off.
- **Set Condition:**
  Desired state does not equal Actual state. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K299) O2 1/2 HEATER CONTROL CIRCUIT OPEN
(Z42) O2 1/2 HEATER GROUND CIRCUIT OPEN
(K299) O2 SENSOR 1/2 HEATER CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE
O2 SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, read DTC's.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. O2 HEATER ELEMENT

Turn the ignition off.

NOTE: Allow the O2 Sensor to cool down to room temperature.

Disconnect the 1/2 O2 Sensor harness connector.

Measure the resistance across the O2 Sensor Heater element, between the Heater Control terminal and the Heater ground terminal at the component.

NOTE: O2 Heater Element resistance values should be measured at 70°F (21.1°C). The resistance value will vary with different temperature values.

Is the O2 Sensor Heater Element resistance between 2.0 and 30.0 ohms?

Yes >> Go To 3

No >> Replace the O2 Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0038-O2 SENSOR 1/2 HEATER CIRCUIT HIGH (CONTINUED)

3. (K299) O2 1/2 HEATER CONTROL CIRCUIT

Ignition on, engine not running.

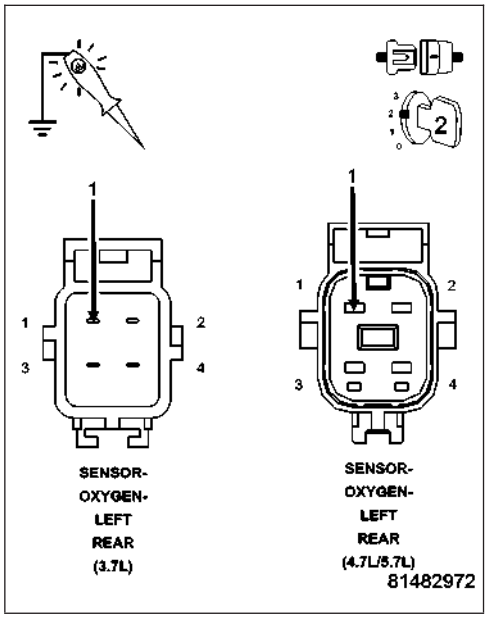
With a scan tool, actuate the O2 1/2 Heater Test with the O2 Sensor harness connector still disconnected.

Using a 12-volt test light connected to ground, probe the (K299) O2 1/2 Heater Control circuit in the O2 Sensor harness connector.

Does the test light illuminate brightly and flash on and off during the actuation?

Yes >> Go To 4

No >> Go To 5



4. (Z42) O2 HEATER GROUND CIRCUIT OPEN

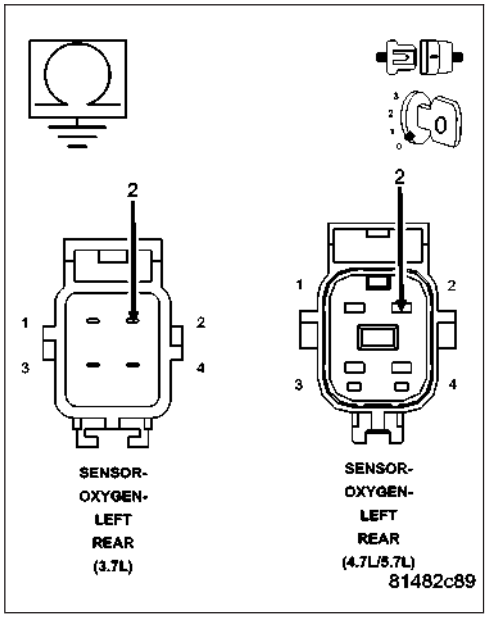
Turn the ignition off.

Measure the resistance between an engine ground and the (Z42) O2 1/2 Heater ground circuit in the O2 Sensor harness connector.

Is the resistance below 5.0 ohms?

Yes >> Replace the O2 Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Repair the open in the (Z42) O2 1/2 Heater ground circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P0038-O2 SENSOR 1/2 HEATER CIRCUIT HIGH (CONTINUED)

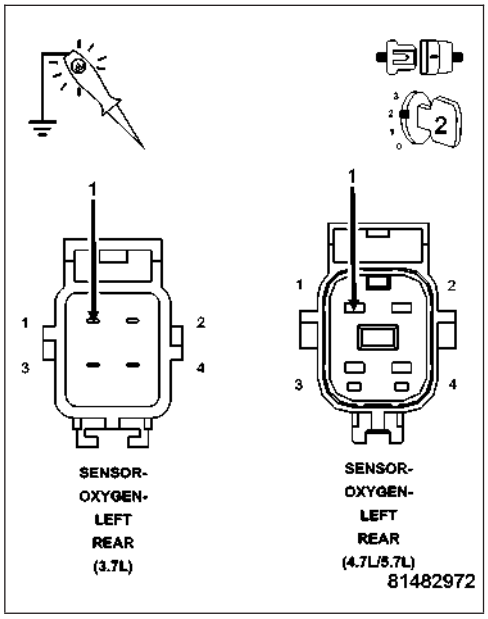
5. (K299) O2 1/2 HEATER CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

Disconnect the C3 PCM harness connector.

Ignition on, engine not running.

Using a 12-volt test light connect to ground, probe the (K299) O2 1/2 Heater Control circuit in the O2 Sensor harness connector.



Does the test light illuminate brightly?

Yes >> Repair the short to battery voltage in the (K299) O2 1/2 Heater Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

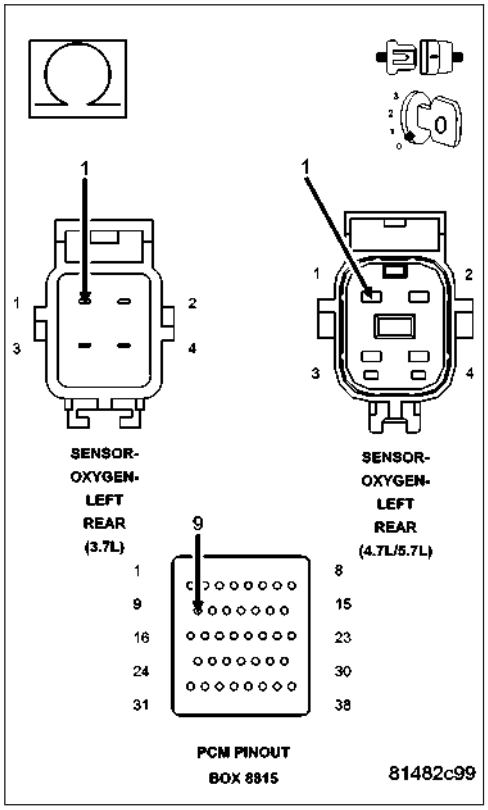
No >> Go To 6

6. (K299) O2 1/2 HEATER CONTROL CIRCUIT OPEN

Turn the ignition off.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K299) O2 1/2 Heater Control circuit from the O2 Sensor harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 7

No >> Repair the open in the (K299) O2 1/2 Heater Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0038-O2 SENSOR 1/2 HEATER CIRCUIT HIGH (CONTINUED)

7. **PCM**

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

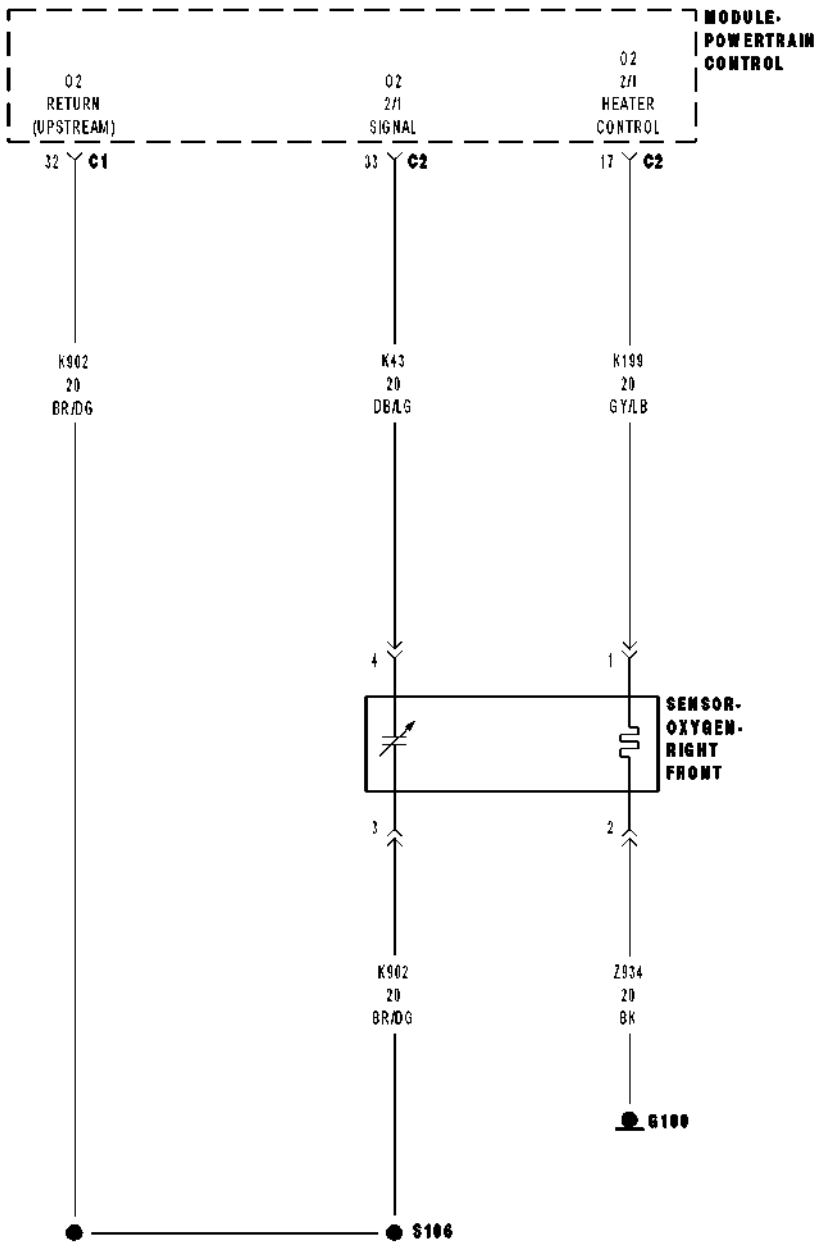
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

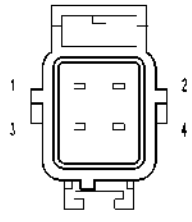
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

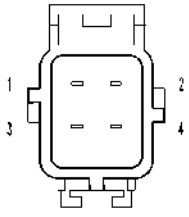
No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0051-O2 SENSOR 2/1 HEATER CIRCUIT LOW

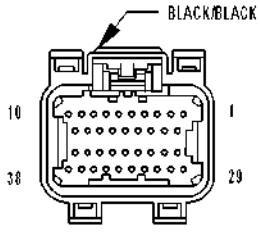




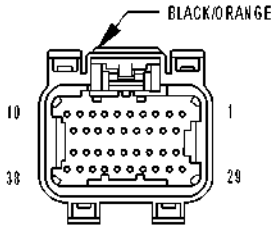
SENSOR-
OXYGEN-
RIGHT
FRONT
(3.7L/5.7L)



SENSOR-
OXYGEN-
RIGHT
FRONT
(4.7L)



MODULE-
POWERTRAIN
CONTROL C1



MODULE-
POWERTRAIN
CONTROL C2

P0051-O2 SENSOR 2/1 HEATER CIRCUIT LOW (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Battery voltage above 10.6 volts, ASD is powered up, and O2 heater is on.
- **Set Condition:**
  Desired state does not match Actual state. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K199) O2 2/1 HEATER CONTROL CIRCUIT SHORTED TO GROUND
O2 SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. O2 SENSOR HEATER OPERATION

Turn the ignition off.

NOTE: Wait a minimum of 8 minutes to allow the O2 Sensor to cool down before continuing the test. Allow the O2 Sensor voltage to stabilize at 5.0 volts.

Ignition on, engine not running.

With a scan tool, actuate the O2 Heater Test.

With a scan tool, monitor 2/1 O2 Sensor voltage for at least 2 minutes.

Does the O2 Sensor voltage stay above 4.5 volts?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. O2 HEATER ELEMENT

Turn the ignition off.

NOTE: Allow the O2 Sensor to cool down to room temperature.

Disconnect the 2/1 O2 Sensor harness connector.

Measure the resistance across the O2 Sensor Heater element, between the Heater Control terminal and the Heater ground terminal at the component.

NOTE: O2 Heater Element resistance values should be measured at 70°F (21.1°C). The resistance value will vary with different temperature values.

Is the O2 Sensor Heater Element resistance between 2.0 and 30.0 ohms?

Yes >> Go To 3

No >> Replace the O2 Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0051-O2 SENSOR 2/1 HEATER CIRCUIT LOW (CONTINUED)

3. O2 SENSOR

Ignition on, engine not running.

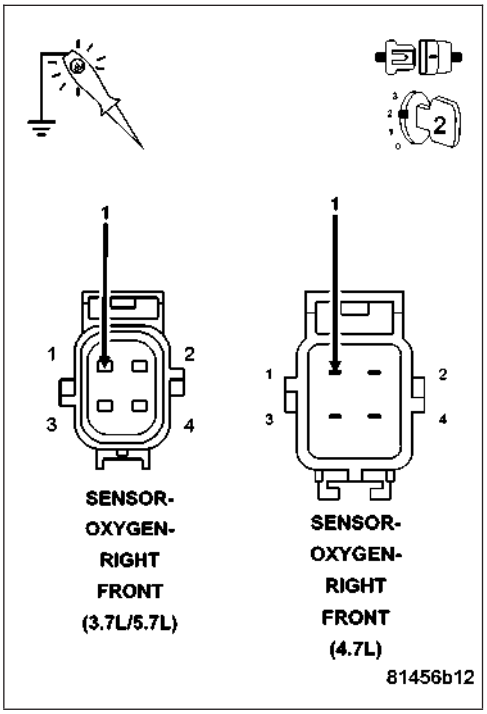
With a scan tool, actuate the O2 Heater Test with the O2 Sensor harness connector still disconnected.

Using a 12-volt test light connected to ground, probe the (K199) O2 2/1 Heater Control circuit in the O2 Sensor harness connector.

Does the test light illuminate brightly and flash on and off during the actuation?

Yes >> Replace the O2 Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4



4. (K199) O2 2/1 HEATER CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

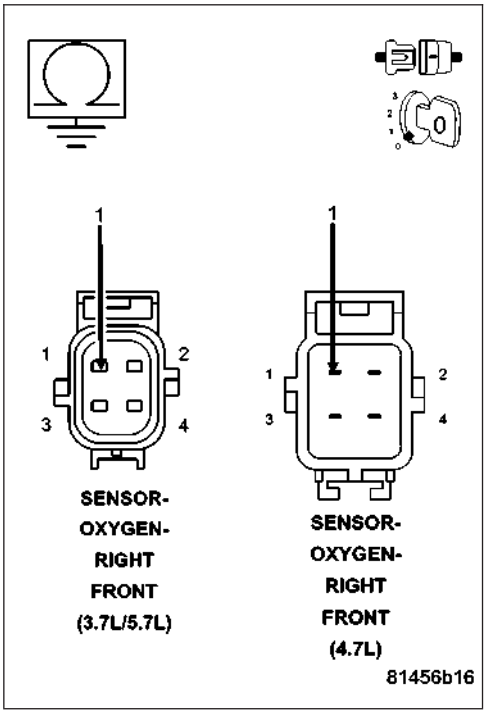
Disconnect the C2 PCM harness connector.

Measure the resistance between ground and the (K199) O2 2/1 Heater Control circuit in the O2 Sensor harness connector.

Is the resistance below 5.0 ohms?

Yes >> Repair the short to ground in the (K199) O2 2/1 Sensor Heater Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5



P0051-O2 SENSOR 2/1 HEATER CIRCUIT LOW (CONTINUED)

5. **PCM**

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

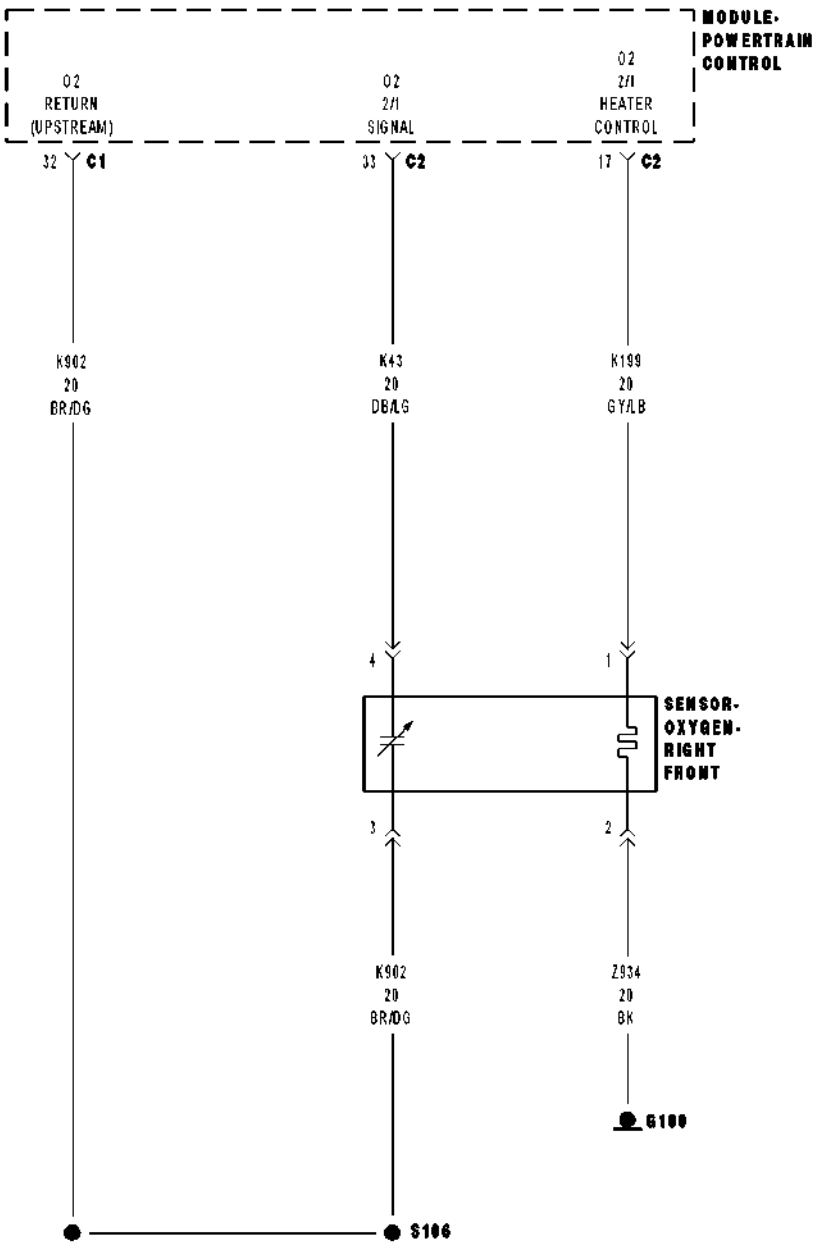
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

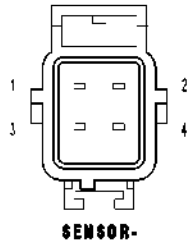
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

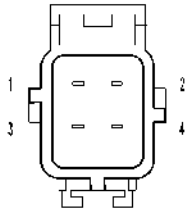
No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0052-O2 SENSOR 2/1 HEATER CIRCUIT HIGH

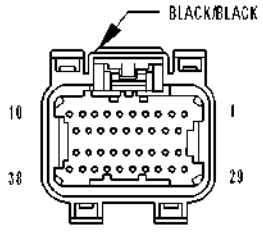




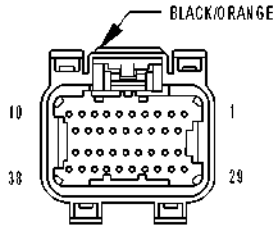
SENSOR-
OXYGEN-
RIGHT
FRONT
(3.7L/5.7L)



SENSOR-
OXYGEN-
RIGHT
FRONT
(4.7L)



MODULE-
POWERTRAIN
CONTROL C1



MODULE-
POWERTRAIN
CONTROL C2

P0052-O2 SENSOR 2/1 HEATER CIRCUIT HIGH (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Battery voltage above 10.6 volts, ASD is powered up, and O2 heater is off.
- **Set Condition:**
  Desired state does not equal Actual state. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K199) O2 2/1 HEATER CONTROL CIRCUIT OPEN
(Z934) O2 2/1 HEATER GROUND CIRCUIT OPEN
(K199) O2 2/1 HEATER CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE
O2 SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, read DTC's.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. O2 HEATER ELEMENT

Turn the ignition off.

NOTE: Allow the O2 Sensor to cool down to room temperature.

Disconnect the 2/1 O2 Sensor harness connector.

Measure the resistance across the O2 Sensor Heater element, between the O2 Heater Control terminal and the Heater ground terminal at the component connector.

NOTE: O2 Heater Element resistance values should be measured at 70°F (21.1°C). The resistance value will vary with different temperature values.

Is the O2 Sensor Heater Element resistance between 2.0 and 30.0 ohms?

Yes >> Go To 3

No >> Replace the O2 Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0052-O2 SENSOR 2/1 HEATER CIRCUIT HIGH (CONTINUED)

3. (K199) O2 2/1 HEATER CONTROL CIRCUIT

Ignition on, engine not running.

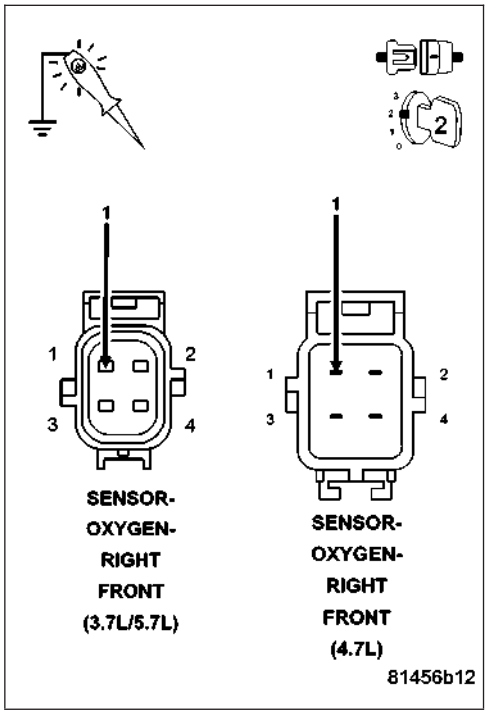
With the scan tool, actuate the O2 Heater Test with the Sensor harness connector still disconnected.

Using a 12-volt test light connected to ground, probe the (K199) O2 2/1 Heater Control circuit in the O2 Sensor harness connector.

Does the test light illuminate brightly and flash on and off during the actuation?

Yes >> Go To 4

No >> Go To 5



4. (Z934) O2 2/1 HEATER GROUND CIRCUIT OPEN

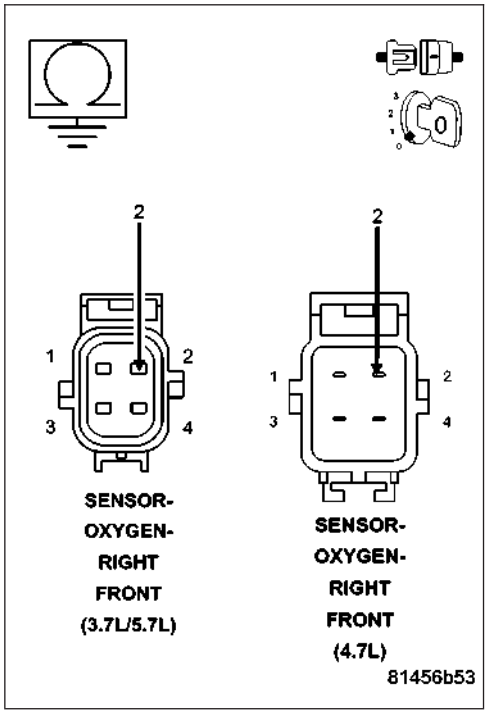
Turn the ignition off.

Measure the resistance between an engine ground and the (Z934) O2 2/1 Heater ground circuit in the O2 Sensor harness connector.

Is the resistance below 5.0 ohms?

Yes >> Replace the O2 Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Repair the open in the (Z934) O2 2/1 Heater ground circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P0052-O2 SENSOR 2/1 HEATER CIRCUIT HIGH (CONTINUED)

5. (K199) O2 2/1 HEATER CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

Disconnect the C3 PCM harness connector.

Ignition on, engine not running.

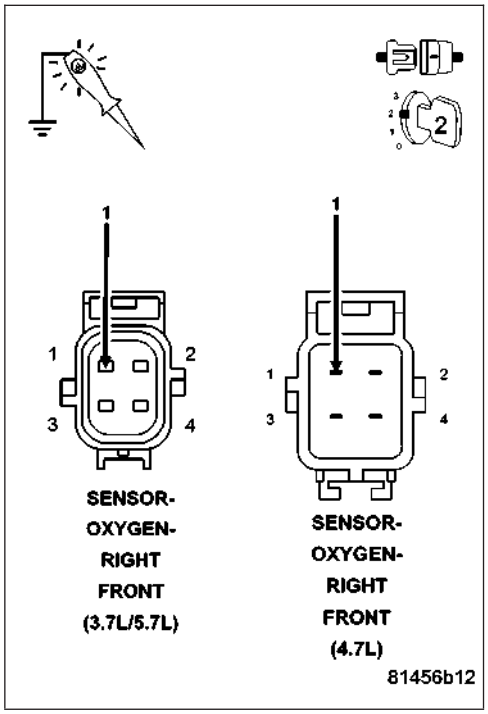
Using a 12-volt test light connected to ground, probe the (K199) O2 2/1 Heater Control circuit in the O2 Sensor harness connector.

Does the test light illuminate?

Yes >> Repair the short to battery voltage in the (K199) O2 2/1 Heater Control circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6



6. (K199) O2 2/1 HEATER CONTROL CIRCUIT OPEN

Turn the ignition off.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

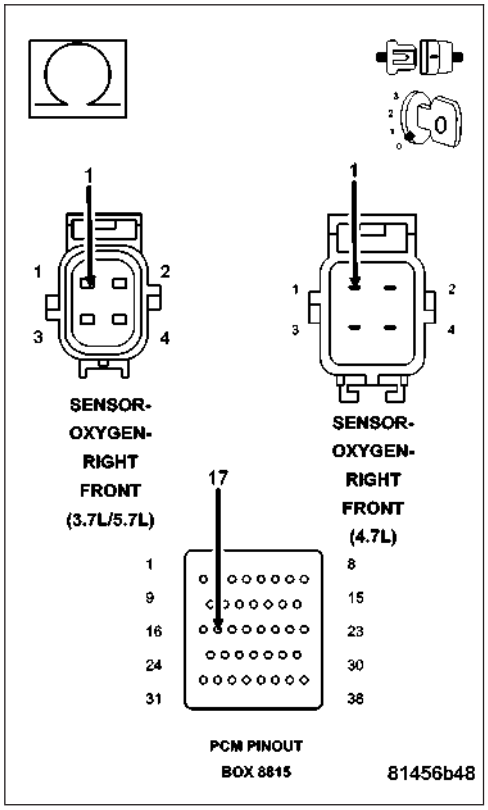
Measure the resistance of the (K199) O2 2/1 Heater Control circuit from the O2 Sensor harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 7

No >> Repair the open in the (K199) O2 2/1 Heater Control circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P0052-O2 SENSOR 2/1 HEATER CIRCUIT HIGH (CONTINUED)

7. **PCM**

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

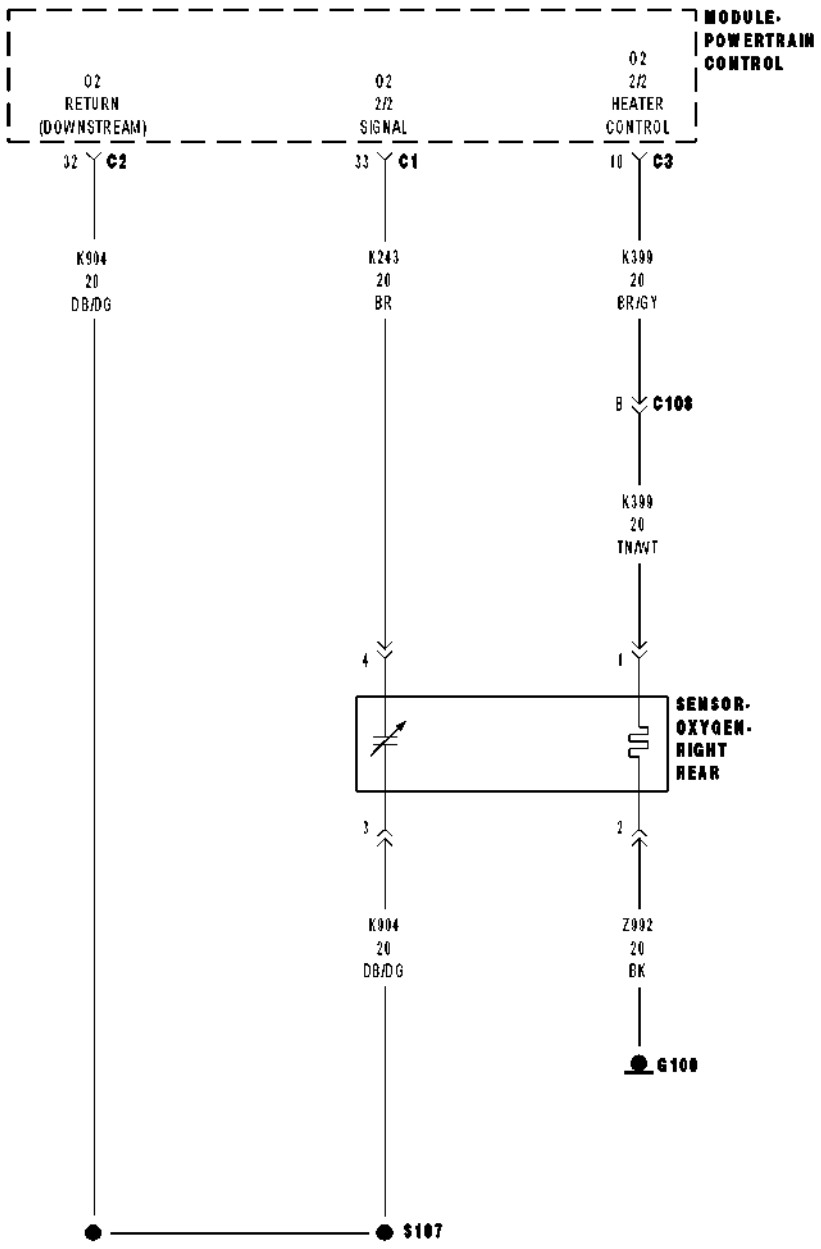
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

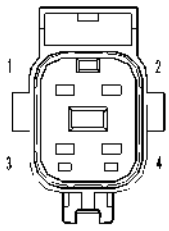
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

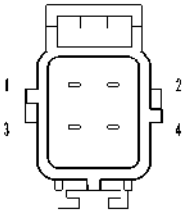
No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0057-O2 SENSOR 2/2 HEATER CIRCUIT LOW

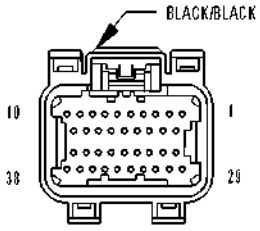




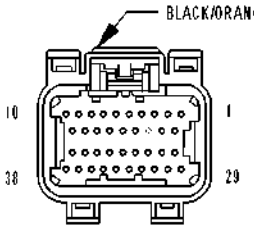
SENSOR-
OXYGEN-
RIGHT
REAR
(3.7L/5.7L)



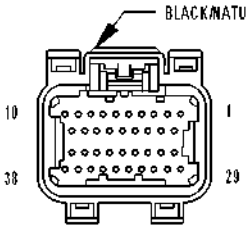
SENSOR-
OXYGEN-
RIGHT
REAR
(4.7L)



MODULE-
POWERTRAIN
CONTROL C1



MODULE-
POWERTRAIN
CONTROL C2



MODULE-
POWERTRAIN
CONTROL C3

81483cc8

P0057-O2 SENSOR 2/2 HEATER CIRCUIT LOW (CONTINUED)

For the Engine circuit diagrams (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Battery voltage above 10.6 volts, ASD is powered up, and O2 heater is on.
- **Set Condition:**
  Desired state does not match Actual state. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K399) O2 SENSOR 2/2 HEATER CONTROL CIRCUIT SHORTED TO GROUND
O2 SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. O2 SENSOR HEATER OPERATION

Turn the ignition off.

NOTE: Wait a minimum of 8 minutes to allow the O2 Sensor to cool down before continuing the test. Allow the O2 Sensor voltage to stabilize at 5.0 volts.

Ignition on, engine not running.

With a scan tool, actuate the O2 Heater Test.

With the scan tool, monitor 2/2 O2 Sensor voltage for at least 2 minutes.

Does the O2 Sensor voltage stay above 4.5 volts?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. O2 HEATER ELEMENT

Turn the ignition off.

NOTE: Allow the O2 Sensor to cool down to room temperature.

Disconnect the 2/2 O2 Sensor harness connector.

Measure the resistance across the O2 Sensor Heater element, between the O2 Heater Control terminal and the O2 Heater ground terminal in the component connector.

NOTE: O2 Heater Element resistance values should be measured at 70°F (21.1°C). The resistance value will vary with different temperature values.

Is the O2 Sensor Heater Element resistance between 2.0 and 30.0 ohms?

Yes >> Go To 3

No >> Replace the O2 Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0057-O2 SENSOR 2/2 HEATER CIRCUIT LOW (CONTINUED)

3. O2 SENSOR

Ignition on, engine not running.

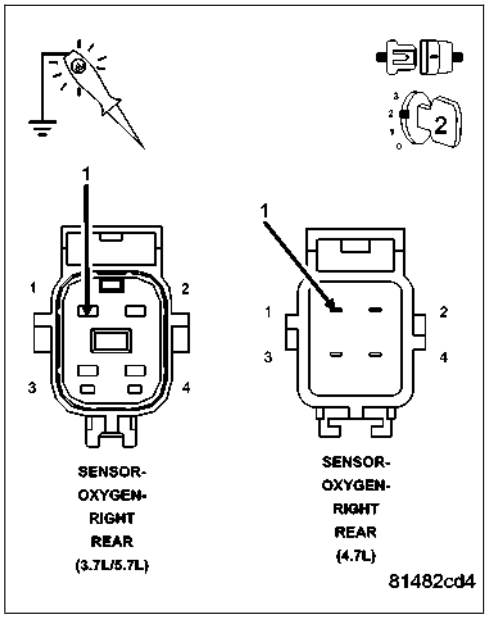
With a scan tool, actuate the O2 Heater Test with the O2 Sensor harness connector still disconnected.

Using a 12-volt test light connected to ground, probe the (K399) O2 2/2 Heater Control circuit in the O2 Sensor harness connector.

Does the test light illuminate brightly and flash on and off during the actuation?

Yes >> Replace the O2 Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4



4. (K399) O2 2/2 HEATER CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

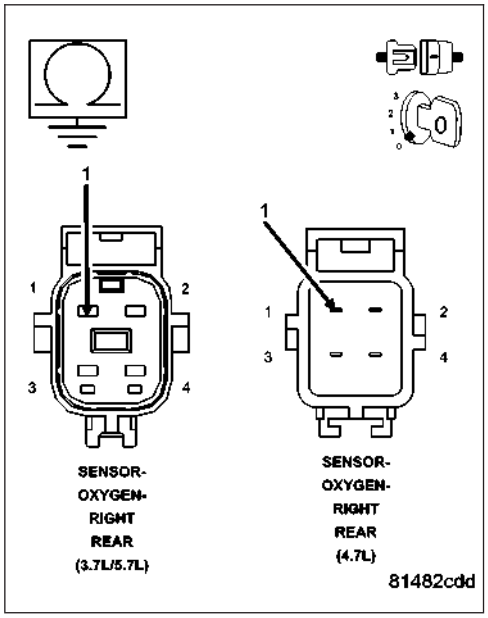
Disconnect the C3 PCM harness connector.

Measure the resistance between ground and the (K399) O2 2/2 Heater Control circuit in the O2 Sensor harness connector.

Is the resistance below 5.0 ohms?

Yes >> Repair the short to ground in the (K399) O2 2/2 Sensor Heater Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5



P0057-O2 SENSOR 2/2 HEATER CIRCUIT LOW (CONTINUED)

5. **PCM**

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

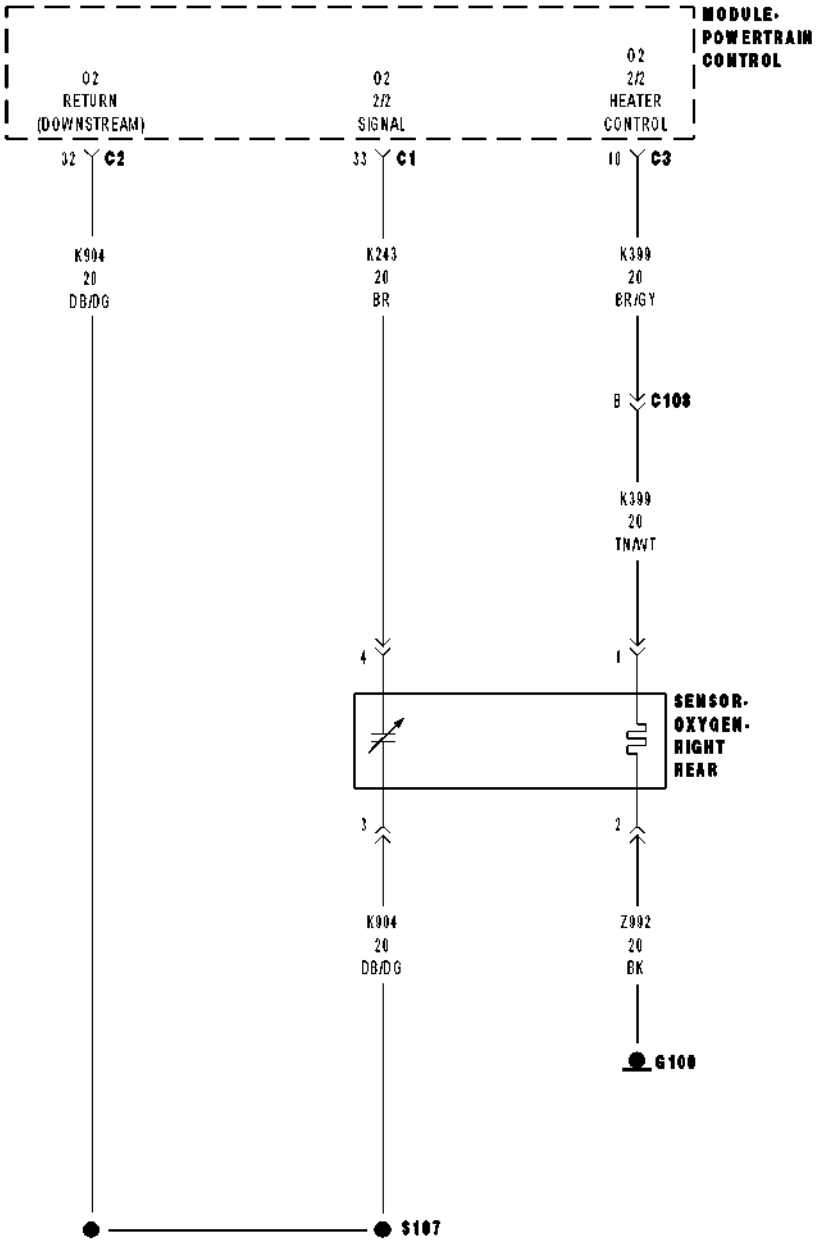
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

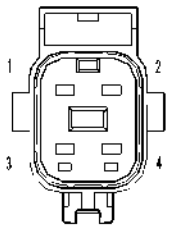
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

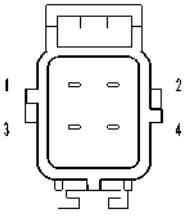
No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0058-O2 SENSOR 2/2 HEATER CIRCUIT HIGH

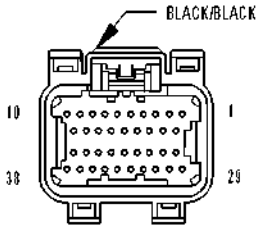




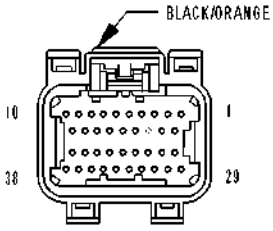
SENSOR-
OXYGEN-
RIGHT
REAR
(3.7L/5.7L)



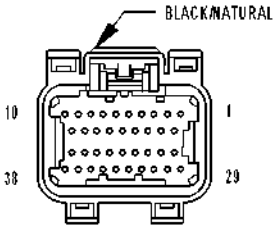
SENSOR-
OXYGEN-
RIGHT
REAR
(4.7L)



MODULE-
POWERTRAIN
CONTROL C1



MODULE-
POWERTRAIN
CONTROL C2



MODULE-
POWERTRAIN
CONTROL C3

81483cc8

P0058-O2 SENSOR 2/2 HEATER CIRCUIT HIGH (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Battery voltage above 10.6 volts, ASD is powered up, and O2 heater is off.
- **Set Condition:**
  Desired state does not equal Actual state. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K399) O2 2/2 HEATER CONTROL CIRCUIT OPEN
(Z992) O2 2/2 HEATER GROUND CIRCUIT OPEN
(K399) O2 2/2 HEATER CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE
O2 SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, read DTC's.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. O2 HEATER ELEMENT

Turn the ignition off.

NOTE: Allow the O2 Sensor to cool down to room temperature.

Disconnect the 2/2 O2 Sensor harness connector.

Measure the resistance across the O2 Sensor Heater element, between the O2 Heater Control terminal and the O2 Heater ground terminal in the component connector.

NOTE: O2 Heater Element resistance values should be measured at 70°F (21.1°C). The resistance value will vary with different temperature values.

Is the O2 Sensor Heater Element resistance between 2.0 and 30.0 ohms?

Yes >> Go To 3

No >> Replace the O2 Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0058-O2 SENSOR 2/2 HEATER CIRCUIT HIGH (CONTINUED)

3. (K399) O2 2/2 HEATER CONTROL CIRCUIT

Ignition on, engine not running.

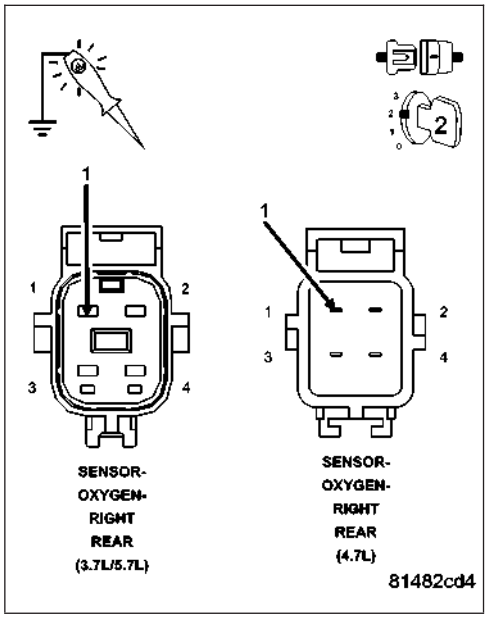
With a scan tool, actuate the O2 2/2 Heater Test with the Sensor harness connector still disconnected.

Using a 12-volt test light connected to ground, probe the (K399) O2 2/2 Heater Control circuit in the O2 Sensor harness connector.

Does the test light illuminate brightly and flash on and off during the actuation?

Yes >> Go To 4

No >> Go To 5



4. (Z992) O2 HEATER GROUND CIRCUIT OPEN

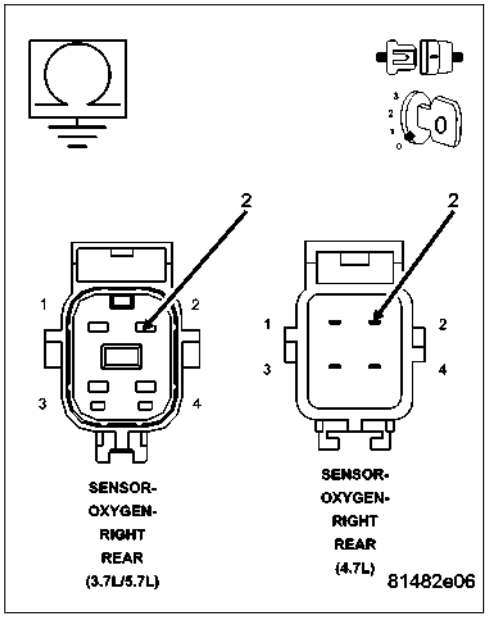
Turn the ignition off.

Measure the resistance between an engine ground and the (Z992) O2 2/2 Heater ground circuit in the O2 Sensor harness connector.

Is the resistance below 5.0 ohms?

Yes >> Replace the O2 Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Repair the open in the (Z992) O2 2/2 Heater ground circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P0058-O2 SENSOR 2/2 HEATER CIRCUIT HIGH (CONTINUED)

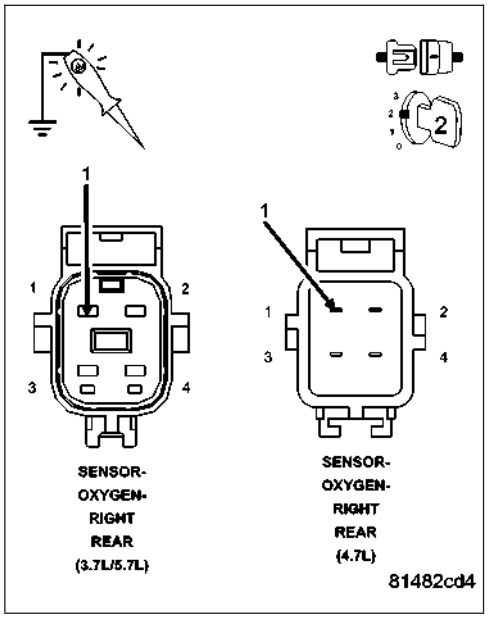
5. (K399) O2 2/2 HEATER CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

Disconnect the C3 PCM harness connector.

Ignition on, engine not running.

Using a 12-volt test light connected to ground, probe the (K399) O2 Heater 2/2 Control circuit in the O2 Sensor harness connector.



Does the test light illuminate?

Yes >> Repair the short to battery voltage in the (K399) O2 2/2 Heater Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

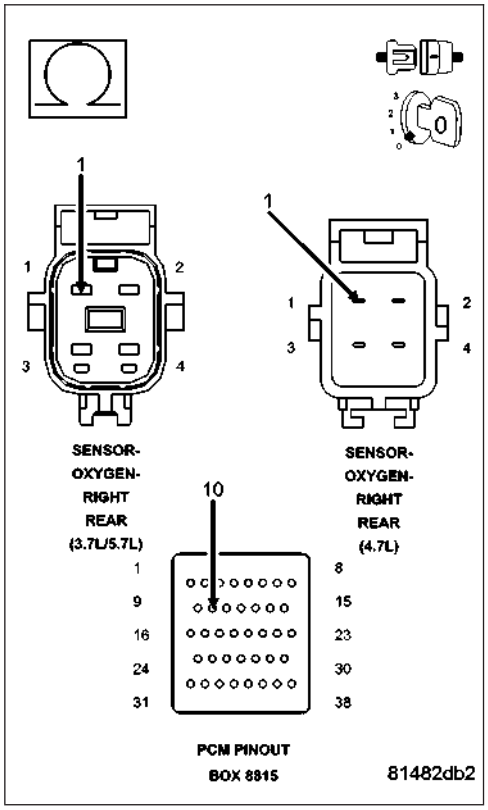
No >> Go To 6

6. (K399) O2 2/2 HEATER CONTROL CIRCUIT OPEN

Turn the ignition off.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM hanrness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K399) O2 2/2 Heater Control circuit from the O2 Sensor harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 7

No >> Repair the open in the (K399) O2 2/2 Heater Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0058-O2 SENSOR 2/2 HEATER CIRCUIT HIGH (CONTINUED)

7. **PCM**

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

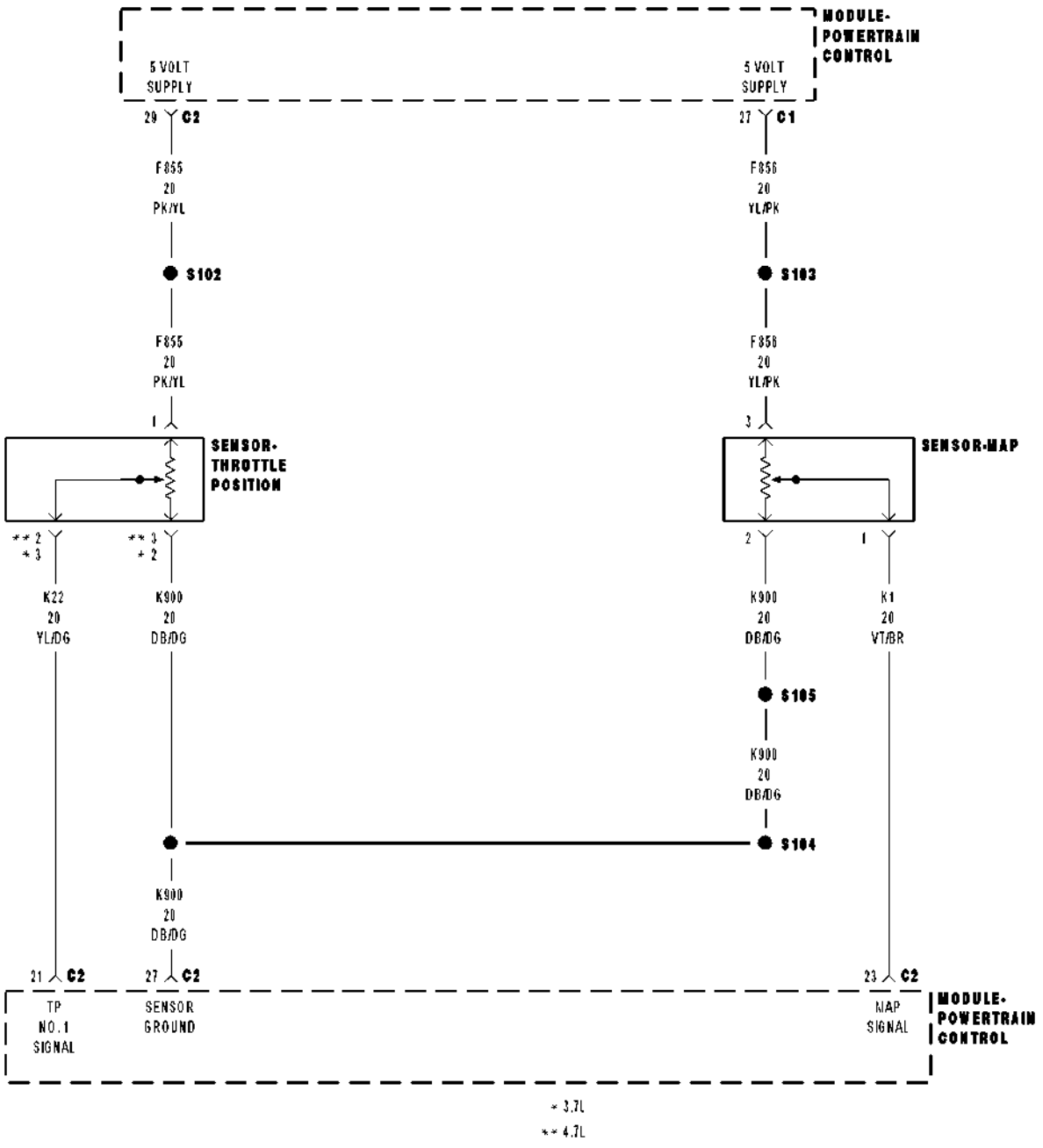
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

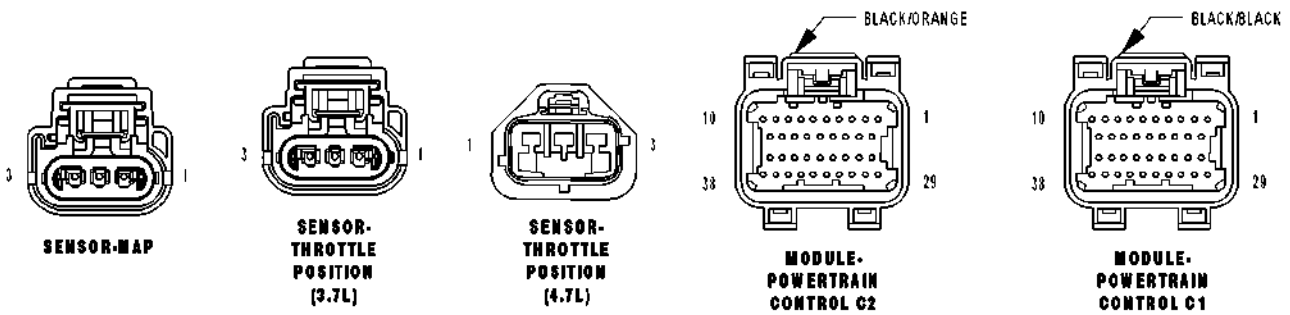
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0068-MANIFOLD PRESSURE/THROTTLE POSITION CORRELATION





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P0068-MANIFOLD PRESSURE/THROTTLE POSITION CORRELATION (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

This DTC sets when an unexpected high intake manifold air flow condition exists that can lead to increased engine speed and puts the NGC into a High Air flow Protection limiting mode. The High Air flow Protection feature includes RPM limits for when a Throttle and/or MAP sensor limp-in fault is present.

- **When Monitored:**
  During all drive modes
- **Set Condition:**
  If vacuum drops below 1.5″Hg with engine RPM greater than 2000 RPM and closed throttle. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
VACUUM LEAK
RESISTANCE IN THE (F856) 5-VOLT SUPPLY CIRCUIT
(F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
RESISTANCE IN THE (K1) MAP SIGNAL CIRCUIT
(K1) MAP SIGNAL CIRCUIT SHORTED TO GROUND
RESISTANCE IN THE (F855) 5-VOLT SUPPLY CIRCUIT
(F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
RESISTANCE IN THE (K22) TP SENSOR NO.1 SIGNAL CIRCUIT
(K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO GROUND
RESISTANCE IN THE (K900) SENSOR GROUND CIRCUIT
MAP SENSOR
THROTTLE POSITION SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: Diagnose any TP Sensor or MAP Sensor component DTCs before continuing.

NOTE: If the P0501 - No Vehicle Speed Signal is set long with this DTC, refer to the P0501 diagnostics before continuing.

NOTE: The throttle plate and linkage should be free from binding and carbon build up.

NOTE: Make sure the throttle plate is at the idle position.

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0068-MANIFOLD PRESSURE/THROTTLE POSITION CORRELATION (CONTINUED)

2. VACUUM LEAK

NOTE: This code is enabled on engines with a plastic intake manifold and is intended to shut down the engine if a large crack occurs.

NOTE: A large vacuum leak is most likely the cause of this DTC.

Inspect the Intake Manifold for leaks and cracks.

Inspect the Power Brake Booster for any vacuum leaks.

Inspect the PCV system for proper operation and vacuum leaks.

Inspect the throttle plate to see if it is bent and will close entirely, if it is bent it may need to be replaced.

Inspect the MAP Sensor for proper installation.

Verify the engine is free from any mechanical failures.

Were any vacuum leaks found?

Yes >> Repair the vacuum leak as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

---

3. MAP SENSOR OPERATION

Start the engine.

With a scan tool, monitor the MAP Sensor voltage.

Snap the throttle.

Does the MAP Sensor voltage vary from below 2.0 volts at idle to above 3.5 volts at wide open throttle?

Yes >> Go To 4

No >> Go To 11

---

4. TP SENSOR OPERATION

Ignition on, engine not running.

With a scan tool, monitor the TP Sensor voltage while slowly pressing the throttle pedal from closed to wide open throttle.

Does voltage start at approximately 0.8 of a volt and go above 3.5 volts with a smooth transition?

Yes >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

P0068-MANIFOLD PRESSURE/THROTTLE POSITION CORRELATION (CONTINUED)

5. EXCESSIVE RESISTANCE IN THE (F855) 5-VOLT SUPPLY CIRCUIT

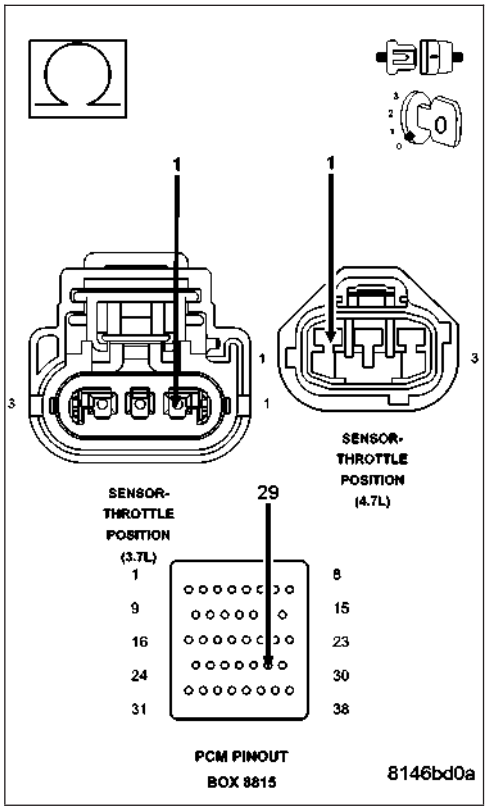
Turn the ignition off.

Disconnect the TP Sensor harness connector.

Disconnect the C2 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (F855) 5-volt Supply circuit from the TP Sensor harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

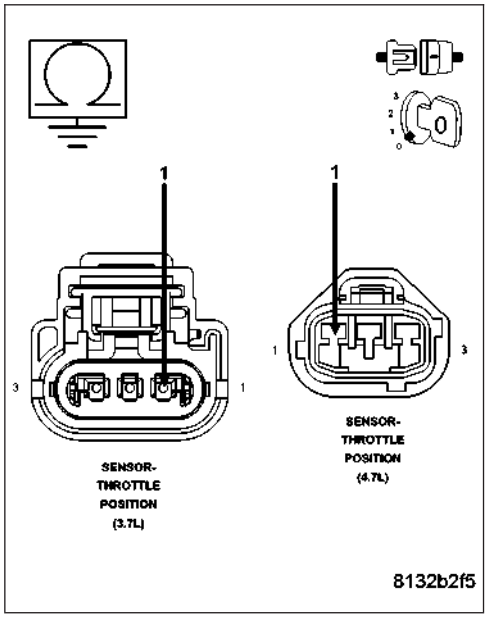
Yes >> Go To 6

No >> Repair the excessive resistance in the (F855) 5-volt Supply circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

6. (F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and (F855) 5-volt Supply circuit in the TP Sensor harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (F855) 5-volt Supply circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 7

P0068-MANIFOLD PRESSURE/THROTTLE POSITION CORRELATION (CONTINUED)

7. THROTTLE POSITION SENSOR

Connect the C2 PCM harness connector.

Ignition on, engine not running.

With a scan tool, monitor the TP Sensor voltage.

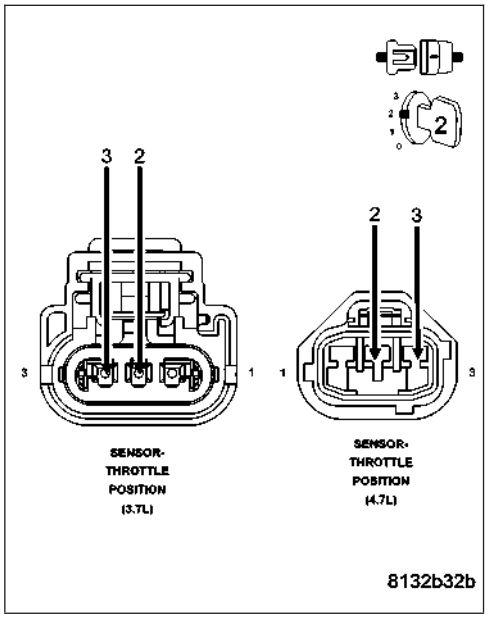
Connect a jumper wire between the (K22) TP Sensor No.1 Signal circuit and the (K900) Sensor ground circuit in the Sensor harness connector.

Does the TP Sensor voltage change from approximately 4.9 volts to below 0.5 of a volt with the jumper wire installed?

Yes >> Replace the Throttle Position Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8

NOTE: Remove the jumper wire before continuing.



8. EXCESSIVE RESISTANCE IN THE (K22) TP NO.1 SIGNAL CIRCUIT

Turn the ignition off.

Disconnect the C2 PCM harness connector.

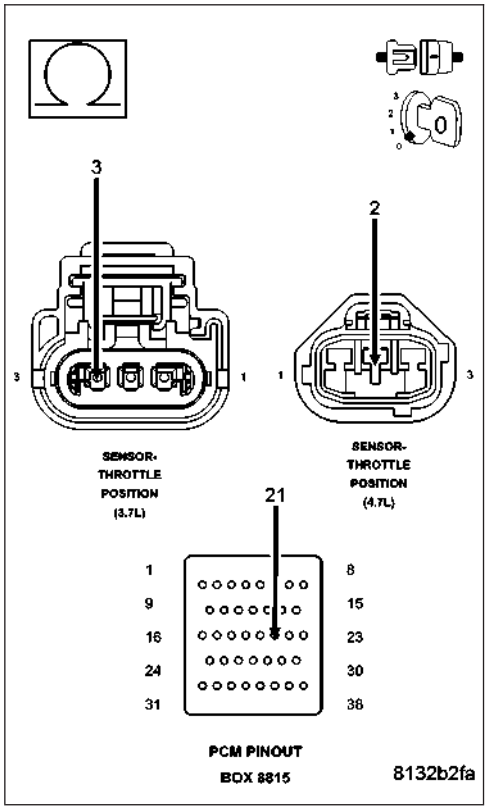
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K22) TP Sensor No.1 Signal circuit from the TP Sensor harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 9

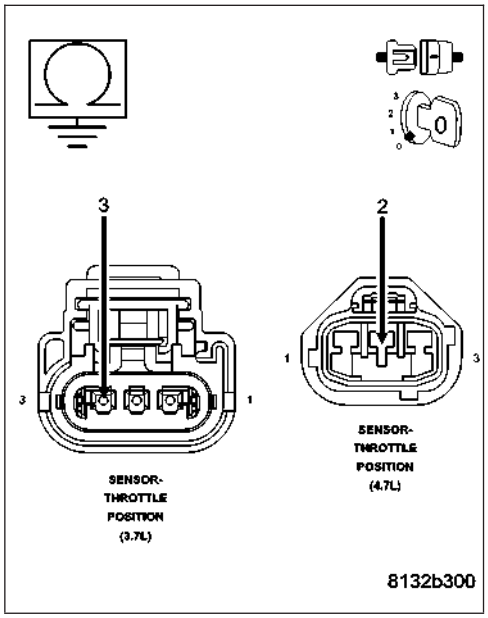
No >> Repair the excessive resistance in the (K22) TP Sensor No.1 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P0068-MANIFOLD PRESSURE/THROTTLE POSITION CORRELATION (CONTINUED)

9. (K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K22) TP Sensor No.1 Signal circuit in the TP Sensor harness connector.



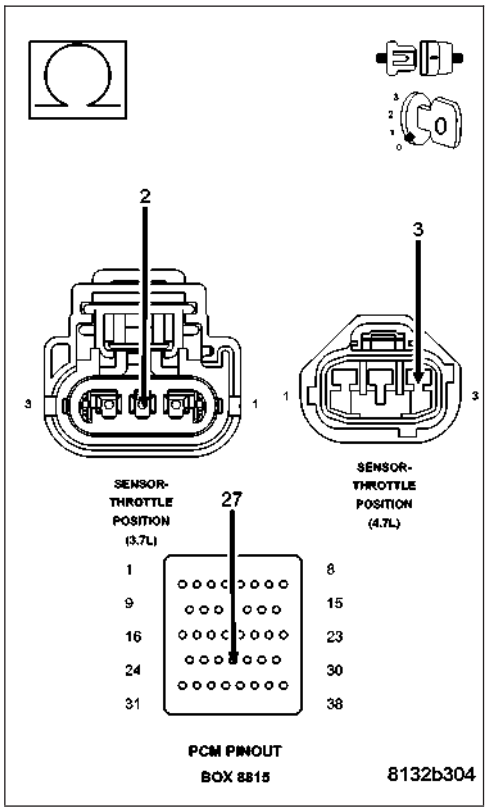
Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K22) TP Sensor No.1 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 10

10. EXCESSIVE RESISTANCE IN THE (K900) SENSOR GROUND CIRCUIT

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.
Measure the resistance of the (K900) Sensor ground circuit from the TP Sensor harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 17

No >> Repair the excessive resistance in the (K900) Sensor ground circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0068-MANIFOLD PRESSURE/THROTTLE POSITION CORRELATION (CONTINUED)

11. EXCESSIVE RESISTANCE IN THE (F856) 5-VOLT SUPPLY CIRCUIT

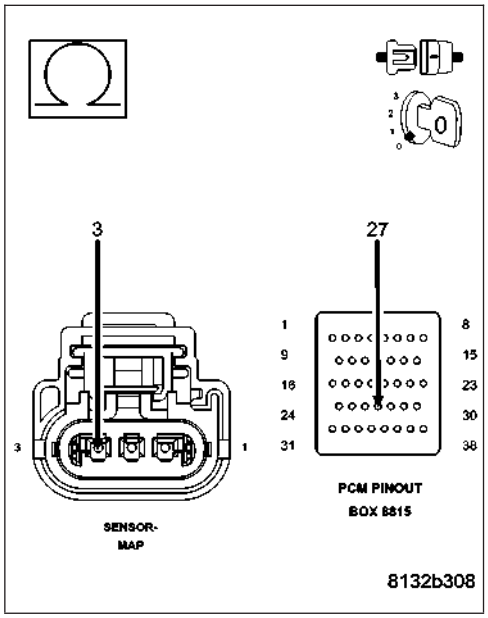
Turn the ignition off.

Disconnect the MAP Sensor harness connector.

Disconnect the C1 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (F856) 5-volt Supply circuit from the MAP Sensor harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

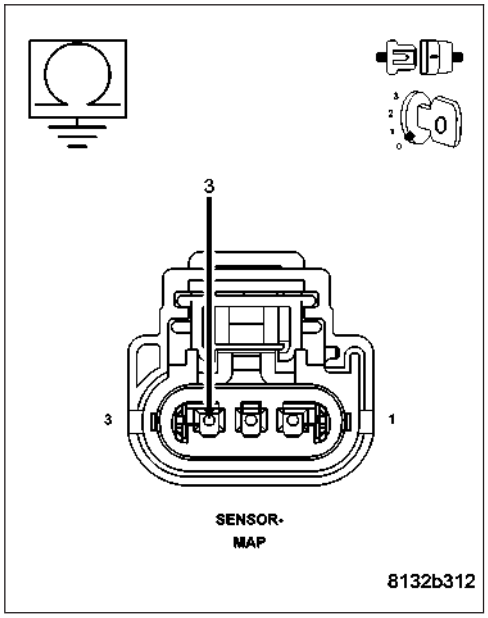
Yes >> Go To 12

No >> Repair the excessive resistance in the (F856) 5-volt Supply circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

12. (F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (F856) 5-volt Supply circuit in the MAP Sensor harness connector.



Is the resistance above 100k ohms?

Yes >> Go To 13

No >> Repair the short to ground in the (F856) 5-volt Supply circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0068-MANIFOLD PRESSURE/THROTTLE POSITION CORRELATION (CONTINUED)

13. MAP SENSOR

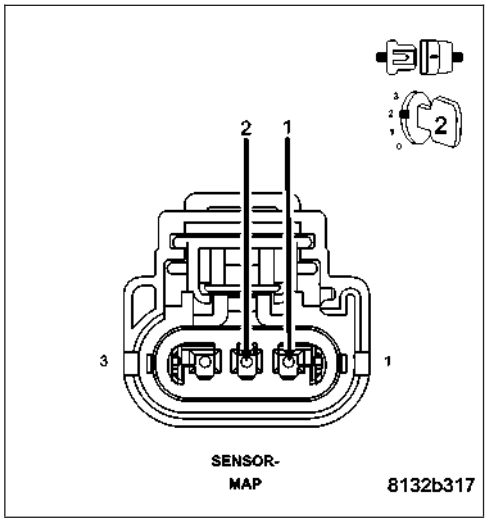
Turn the ignition off.

Connect the C1 PCM harness connector.

Ignition on, engine not running.

With a scan tool, monitor the MAP Sensor voltage.

Connect a jumper wire between the (K1) MAP Signal circuit and the (K900) Sensor ground circuit.



Does the scan tool display MAP voltage from approximately 4.9 volts to below 0.5 of a volt with the jumper wire installed?

Yes >> Replace the MAP Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 14

NOTE: Remove the jumper wire before continuing.

---

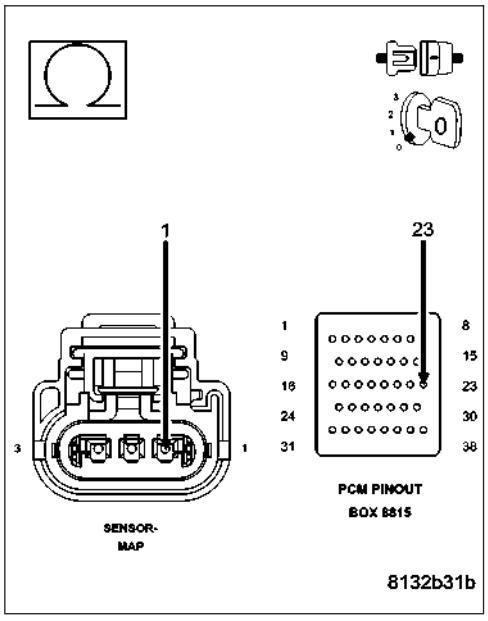
14. EXCESSIVE RESISTANCE IN THE (K1) MAP SIGNAL CIRCUIT

Turn the ignition off.

Disconnect the C2 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K1) MAP Signal circuit from the MAP Sensor harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 15

No >> Repair the excessive resistance in the (K1) MAP Signal circuit
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0068-MANIFOLD PRESSURE/THROTTLE POSITION CORRELATION (CONTINUED)

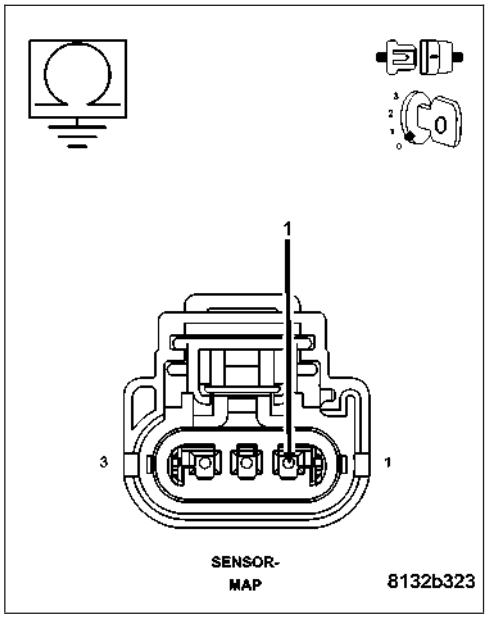
15. (K1) MAP SIGNAL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K1) MAP Signal circuit in the MAP Sensor harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K1) MAP Signal circuit. Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 16



16. EXCESSIVE RESISTANCE IN THE (K900) SENSOR GROUND CIRCUIT

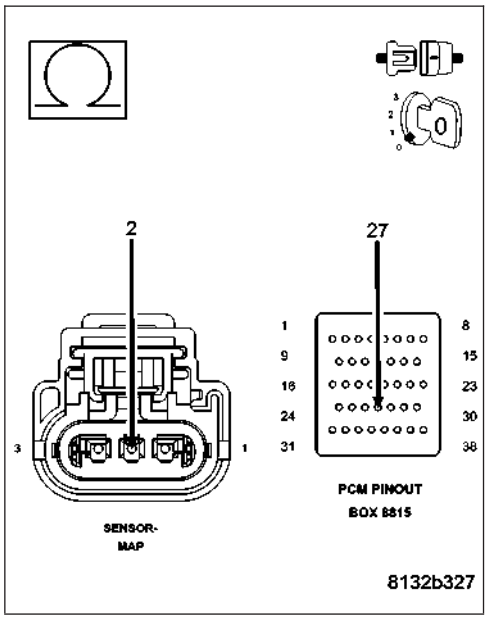
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K900) Sensor ground circuit from the MAP Sensor harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 17

No >> Repair the excessive resistance in the (K900) Sensor ground circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P0068-MANIFOLD PRESSURE/THROTTLE POSITION CORRELATION (CONTINUED)

17. **PCM**

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

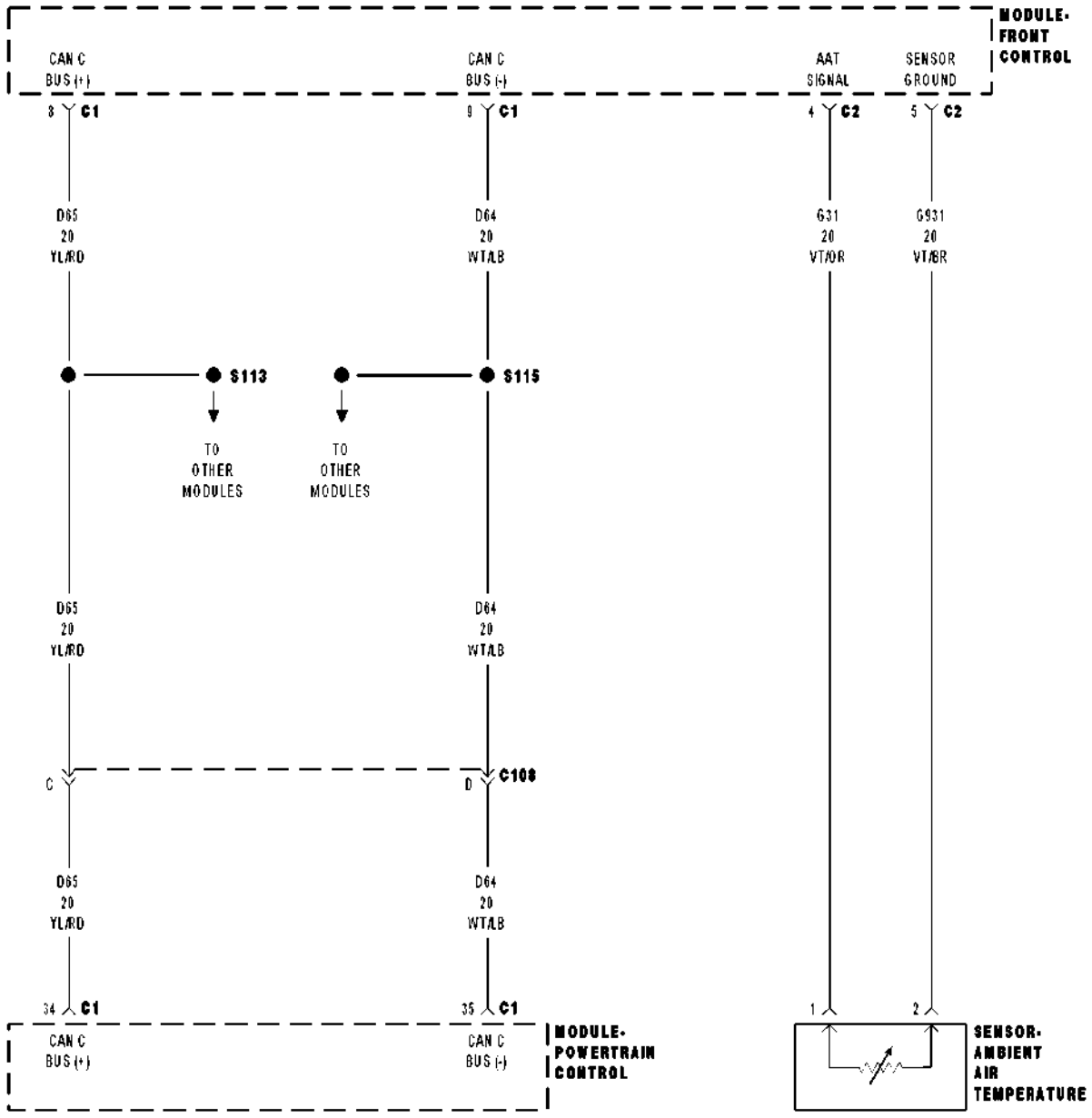
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

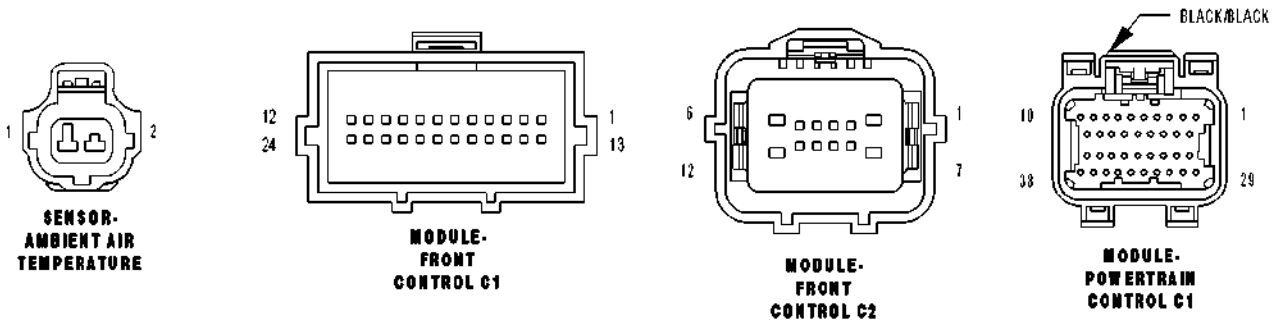
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0071-AMBIENT AIR TEMPERATURE SENSOR PERFORMANCE





P0071-AMBIENT AIR TEMPERATURE SENSOR PERFORMANCE (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

Ambient Air Temperature Sensor performance looks at the outputs of three temperature sensors and compare them under cold start conditions. Following a start to run delay time, the outputs of the ambient, engine coolant, and intake air temperature sensors will be compared. If the engine coolant and intake air temperature sensors agree and the ambient air temperature does not agree, the ambient air temperature sensor is declared as irrational.

- **When Monitored:**
  Engine off time is greater than 480 minutes. Ambient temperature is greater than 4 deg C (38 deg F).
- **Set Condition:**
  After a calibrated amount of cool down time the PCM compares the ECT Sensor, IAT Sensor, and the Ambient Air Temp Sensor values. If the IAT Sensor value is not within –10 deg C (18 deg F) of the other two temperature sensors. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(G31) AAT SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(G31) AAT SIGNAL CIRCUIT OPEN
(G931) SENSOR GROUND CIRCUIT OPEN
(G31) AAT SIGNAL CIRCUIT SHORTED TO GROUND
(G31) AAT SIGNAL CIRCUIT SHORTED TO THE (G931) SENSOR GROUND CIRCUIT
AMBIENT AIR TEMPERATURE SENSOR
FRONT CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: Diagnose any CAN - C Communication DTCs before continuing.

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0071-AMBIENT AIR TEMPERATURE SENSOR PERFORMANCE (CONTINUED)

2. (G31) AAT SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

Disconnect the C2 FCM harness connector.

Disconnect the AAT Sensor harness connector.

NOTE: Visually inspect both the component and the FCM connectors. Look for damaged, partially broken wires, and backed out or corroded terminals.

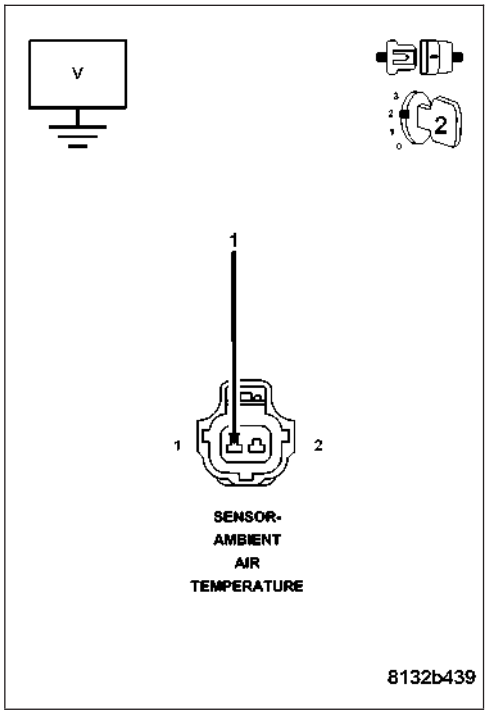
Ignition on, engine not running.

Measure the voltage on the (G31) AAT Signal circuit in the AAT Sensor harness connector.

Is the voltage above 5.2 volts?

Yes >> Repair the short to voltage in the (G31) AAT Signal circuit. Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3



3. AAT SENSOR VOLTAGE ABOVE 4.6 VOLTS

Turn the ignition off.

Connect the C2 FCM harness connector.

Ignition on, engine not running.

With a scan tool, read the AAT voltage.

Is the voltage above 4.6 volts?

Yes >> Go To 4

No >> Go To 7

P0071-AMBIENT AIR TEMPERATURE SENSOR PERFORMANCE (CONTINUED)

4. AAT SENSOR

Connect a jumper wire between the (G31) AAT Signal circuit and the (G931) Sensor ground circuit in the AAT Sensor harness connector.

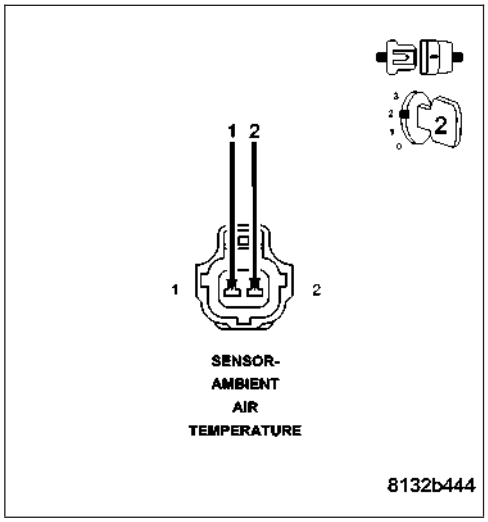
With a scan tool, read the AAT voltage.

Is the voltage below 1.0 volt with the jumper wire installed?

Yes >> Replace the AAT Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

NOTE: Remove the jumper wire before continuing.



5. (G31) AAT SIGNAL CIRCUIT OPEN

Turn the ignition off.

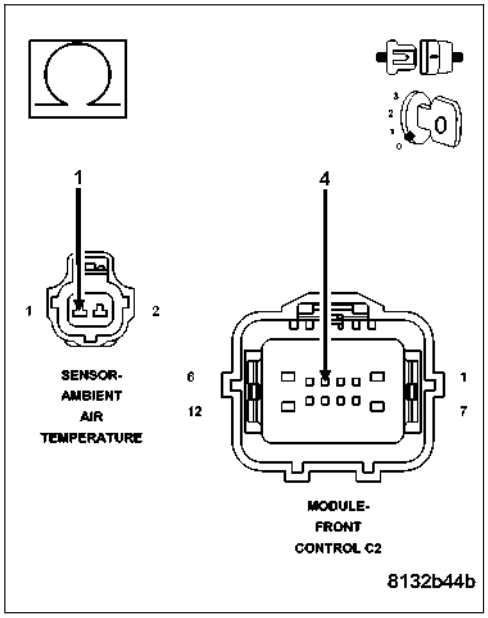
Disconnect the C2 FCM harness connector.

Measure the resistance of the (G31) AAT Signal circuit from the AAT Sensor harness connector to the C2 FCM harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 6

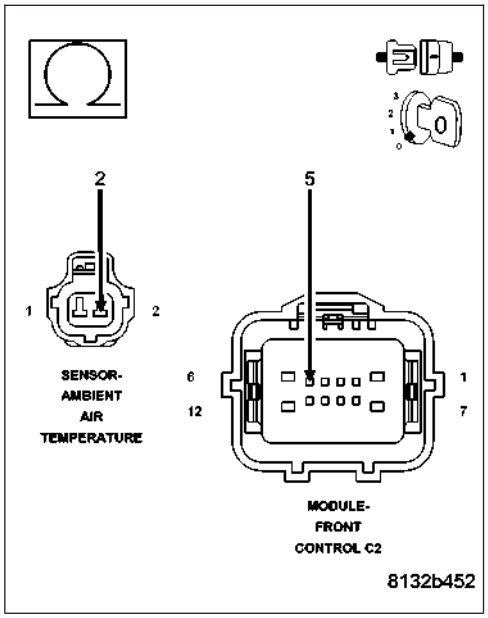
No >> Repair the open in the (G31) AAT Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P0071-AMBIENT AIR TEMPERATURE SENSOR PERFORMANCE (CONTINUED)

6. (G931) SENSOR GROUND CIRCUIT OPEN

Measure the resistance of the (G931) Sensor ground circuit from the AAT Sensor harness connector to the C2 FCM harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go To 9

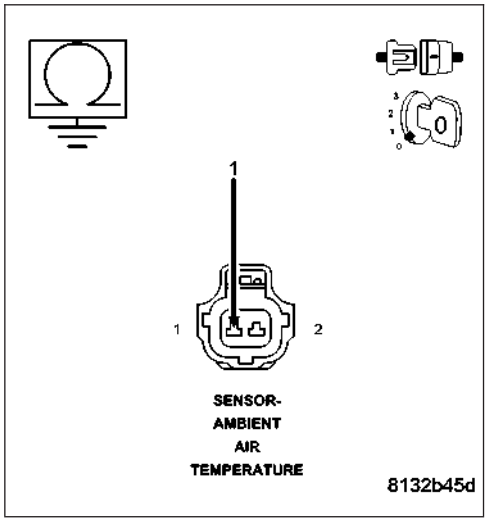
No >> Repair the open in the (G931) Sensor ground circuit. Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

7. (G31) AAT SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the C2 FCM harness connector.

Measure the resistance between ground and the (G31) AAT Signal circuit in the AAT Sensor harness connector.



Is the resistance below 100 ohms?

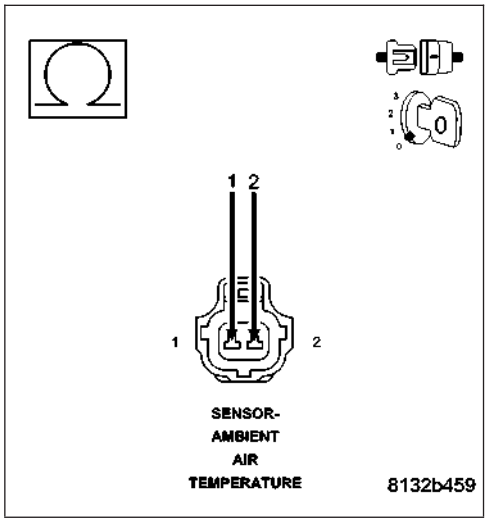
Yes >> Repair the short to ground in the (G31) AAT Signal circuit. Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8

P0071-AMBIENT AIR TEMPERATURE SENSOR PERFORMANCE (CONTINUED)

8. (G31) AAT SIGNAL CIRCUIT SHORTED TO THE (G931) SENSOR GROUND CIRCUIT

Measure the resistance between the (G31) AAT Signal circuit and the (G931) Sensor ground circuit in the AAT Sensor harness connector.



Is the resistance below 5.0 ohms?

Yes >> Repair the short between the (G931) Sensor ground circuit and the (G31) AAT Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 9

---

9. FRONT CONTROL MODULE

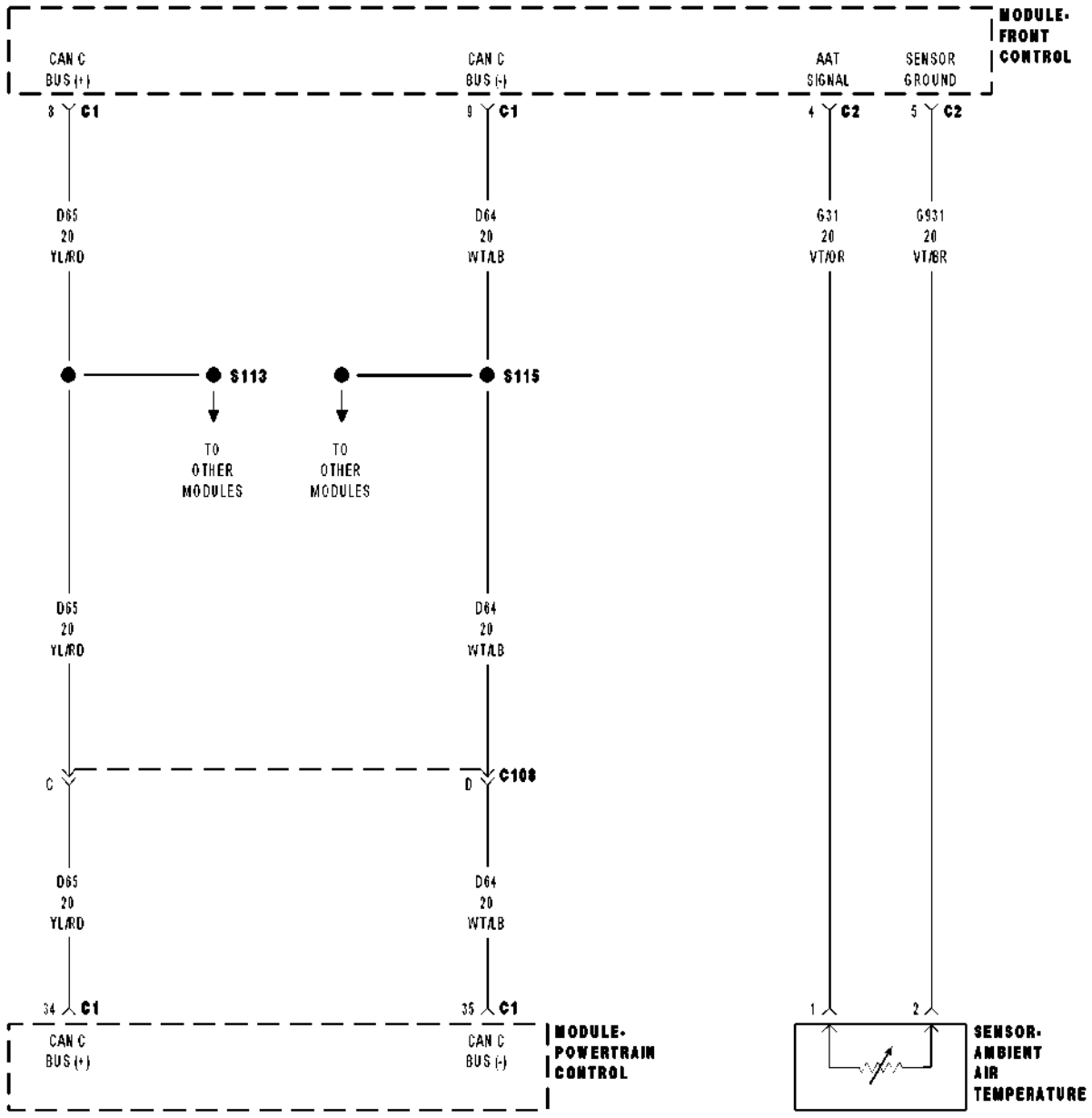
NOTE: Before continuing, check the FCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

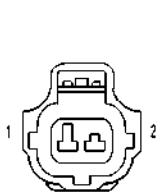
Were there any problems found?

Yes >> Repair as necessary.
Perform BODY VERIFICATION TEST VER - 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

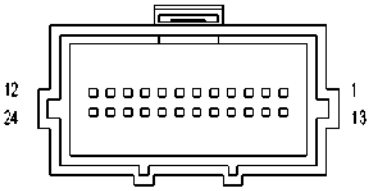
No >> Replace the Front Control Module per Service Information.
Perform BODY VERIFICATION TEST VER - 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

P0072-AMBIENT AIR TEMPERATURE SENSOR CIRCUIT LOW

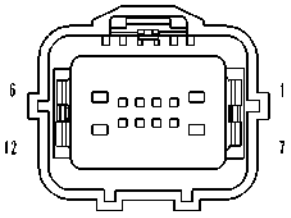




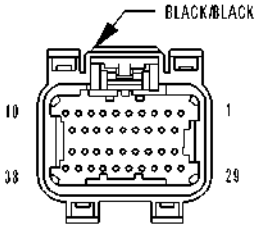
SENSOR-
AMBIENT AIR
TEMPERATURE



MODULE-
FRONT
CONTROL C1



MODULE-
FRONT
CONTROL C2



MODULE-
POWERTRAIN
CONTROL C1

81482ea3

P0072-AMBIENT AIR TEMPERATURE SENSOR CIRCUIT LOW (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  The ignition key on.
- **Set Condition:**
  Ambient Temperature Sensor is less than 0.078 of a volt at the PCM for 2.8 seconds. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(G31) AAT SIGNAL CIRCUIT SHORTED TO GROUND
(G31) AAT SIGNAL CIRCUIT SHORTED TO THE (G931) SENSOR GROUND CIRCUIT
AMBIENT AIR TEMPERATURE SENSOR
FRONT CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. AAT SENSOR VOLTAGE BELOW 0.078 OF A VOLT

NOTE: Diagnose any CAN - C Communication DTCs before continuing.
Ignition on, engine not running.
With a scan tool, read the Ambient Air Temperature Sensor voltage.

Is the voltage below 0.078 of a volt?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. CHECKING AAT SENSOR

Turn the ignition off.
Disconnect the Ambient Air Temperature Sensor harness connector.
Ignition on, engine not running.
With a scan tool, read the AAT Sensor voltage.

Is the voltage above 4.6 volts?

Yes >> Replace the Ambient Temperature Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

P0072-AMBIENT AIR TEMPERATURE SENSOR CIRCUIT LOW (CONTINUED)

3. (G31) AAT SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

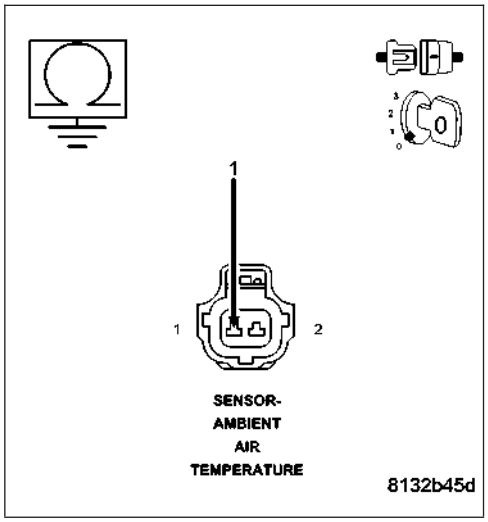
Disconnect the C2 FCM harness connector.

Measure the resistance between ground and the (G31) AAT Signal circuit in the AAT Sensor harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (G31) AAT Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4



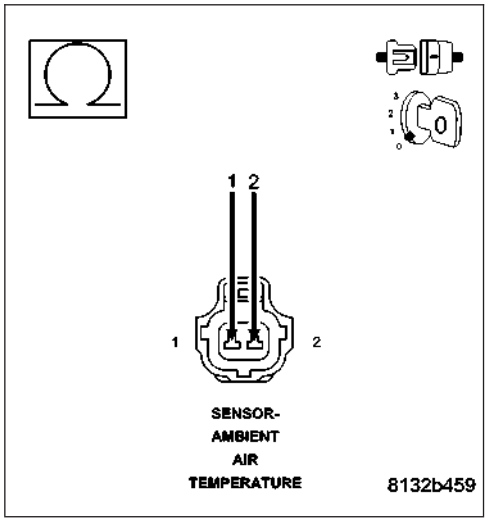
4. (G31) AAT SIGNAL CIRCUIT SHORTED TO THE (G931) SENSOR GROUND CIRCUIT

Measure the resistance between the (G931) Sensor ground circuit and the (G31) AAT Signal circuit in the AAT Sensor harness connector.

Is the resistance below 5.0 ohms?

Yes >> Repair the short between the (G931) Sensor ground circuit and the (G31) AAT Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5



5. FRONT CONTROL MODULE

NOTE: Before continuing, check the FCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

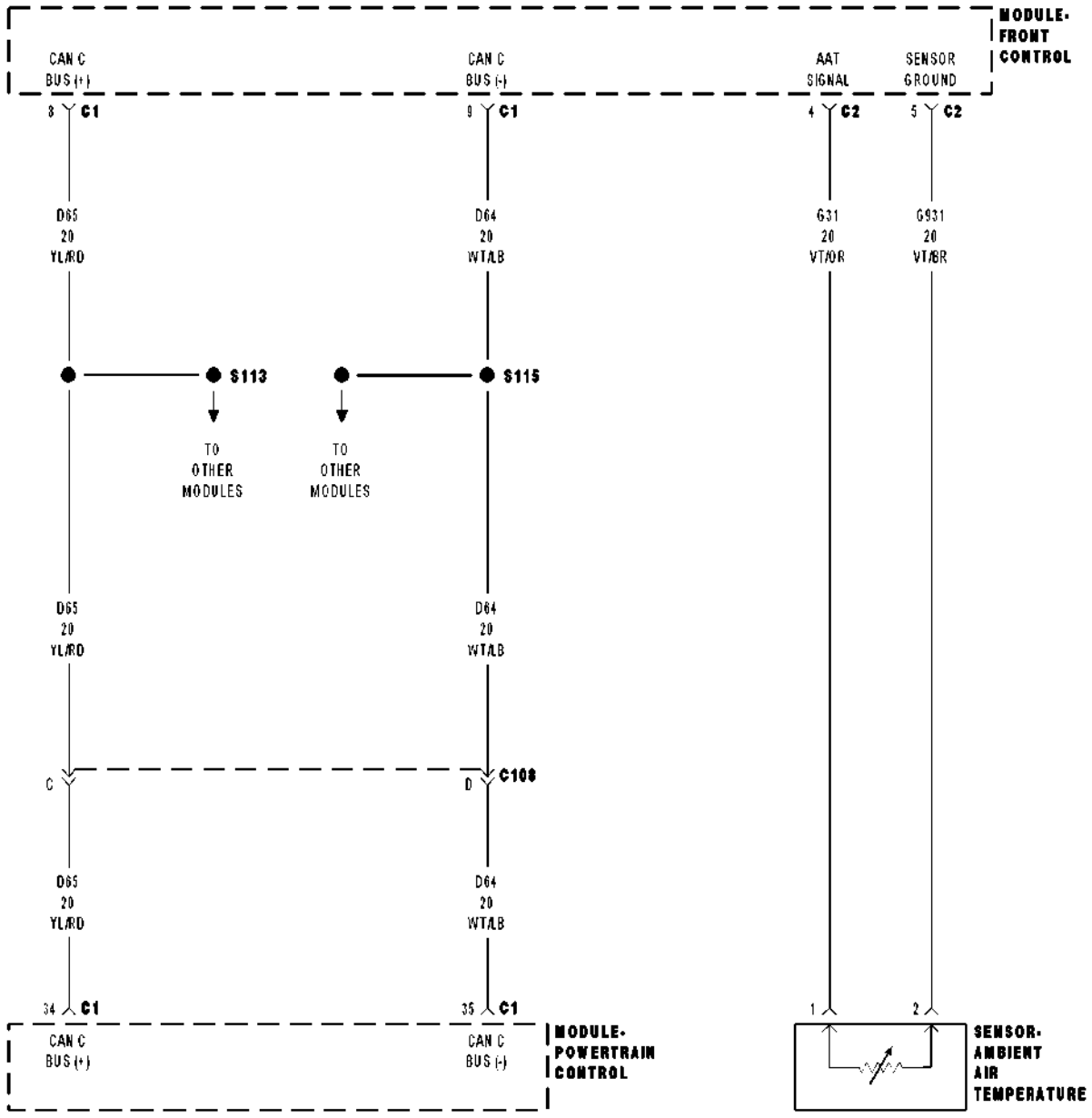
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

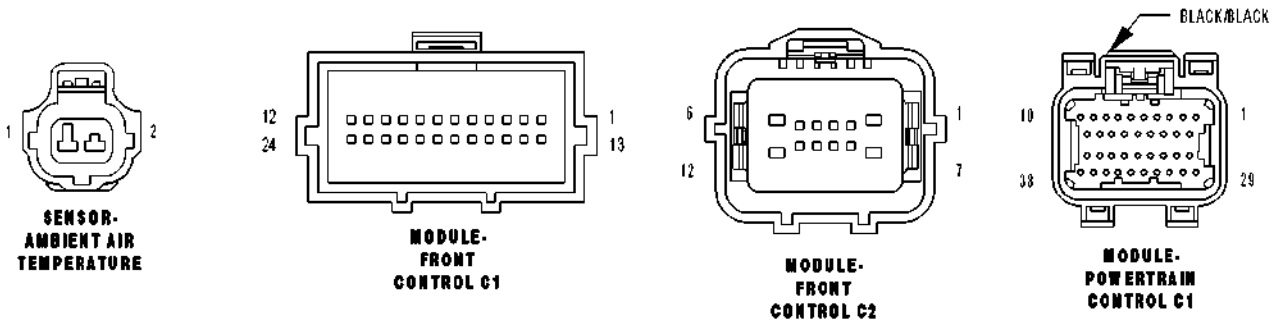
Were there any problems found?

Yes >> Repair as necessary.
Perform BODY VERIFICATION TEST VER - 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Replace and program the Front Control Module per Service Information.
Perform BODY VERIFICATION TEST VER - 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

P0073–AMBIENT AIR TEMPERATURE SENSOR CIRCUIT HIGH





P0073–AMBIENT AIR TEMPERATURE SENSOR CIRCUIT HIGH (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. Battery voltage greater than 10 volts.
- **Set Condition:**
  The Ambient Temperature Sensor voltage is greater than 4.98 volts at the PCM for 2.8 seconds. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(G31) AAT SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(G31) AAT SIGNAL CIRCUIT OPEN
(G931) SENSOR GROUND CIRCUIT OPEN
AMBIENT AIR TEMPERATURE SENSOR
FRONT CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. AAT SENSOR VOLTAGE ABOVE 4.98 VOLTS

Ignition on, engine not running.

With a scan tool, read the Ambient Air Temperature Sensor voltage.

Is the voltage above 4.98 volts?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

2. AAT SENSOR

Turn the ignition off.

Disconnect the Ambient Air Temperature Sensor harness connector.

Connect a jumper wire between the (G31) AAT Signal circuit and the (G931) Sensor ground circuit in the AAT Sensor harness connector.

Ignition on, engine not running.

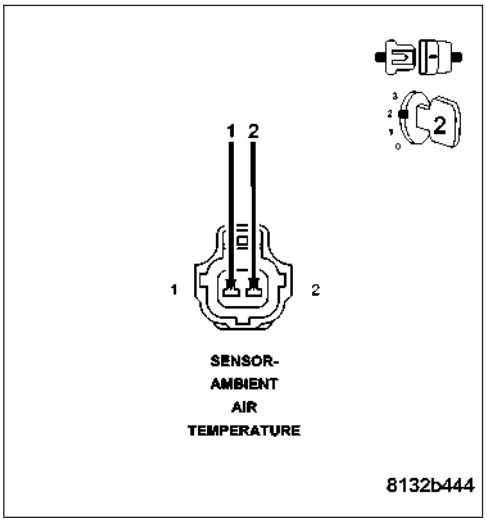
With a scan tool, read AAT Sensor voltage.

Is the voltage below 1.0 volt with the jumper wire installed?

Yes >> Replace the Ambient Air Temperature Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

NOTE: Remove the jumper wire before continuing.



P0073–AMBIENT AIR TEMPERATURE SENSOR CIRCUIT HIGH (CONTINUED)

3. (G31) AAT SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

Disconnect the C2 FCM harness connector.

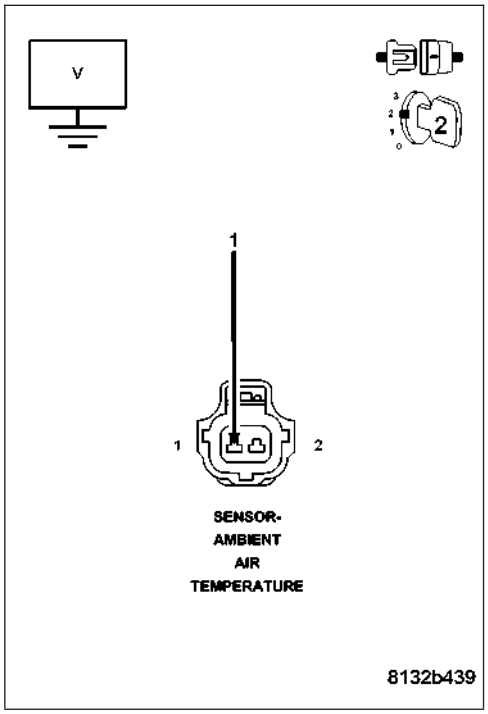
Ignition on, engine not running.

Measure the voltage on the (G31) AAT Signal circuit in the AAT Sensor harness connector.

Is the voltage above 5.2 volts?

Yes >> Repair the short to battery voltage in the (G31) AAT Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4



4. (G31) AAT SIGNAL CIRCUIT OPEN

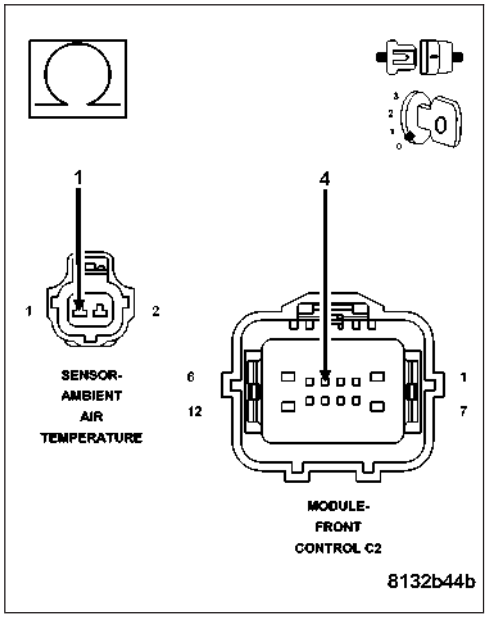
Turn the ignition off.

Measure the resistance of the (G31) AAT Signal circuit from the AAT Sensor harness connector to the C2 FCM harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 5

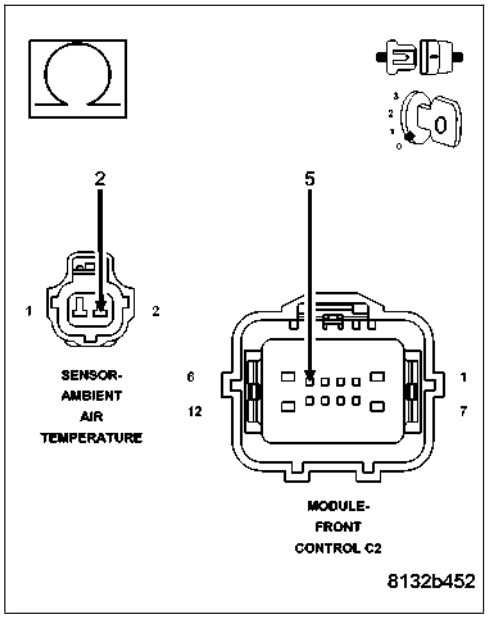
No >> Repair the open in the (G31) AAT Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P0073–AMBIENT AIR TEMPERATURE SENSOR CIRCUIT HIGH (CONTINUED)

5. (G931) SENSOR GROUND CIRCUIT OPEN

Measure the resistance of the (G931) Sensor ground circuit from the AAT Sensor harness connector to the C2 FCM harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go To 6

No >> Repair the open in the (G931) Sensor ground circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

6. FRONT CONTROL MODULE

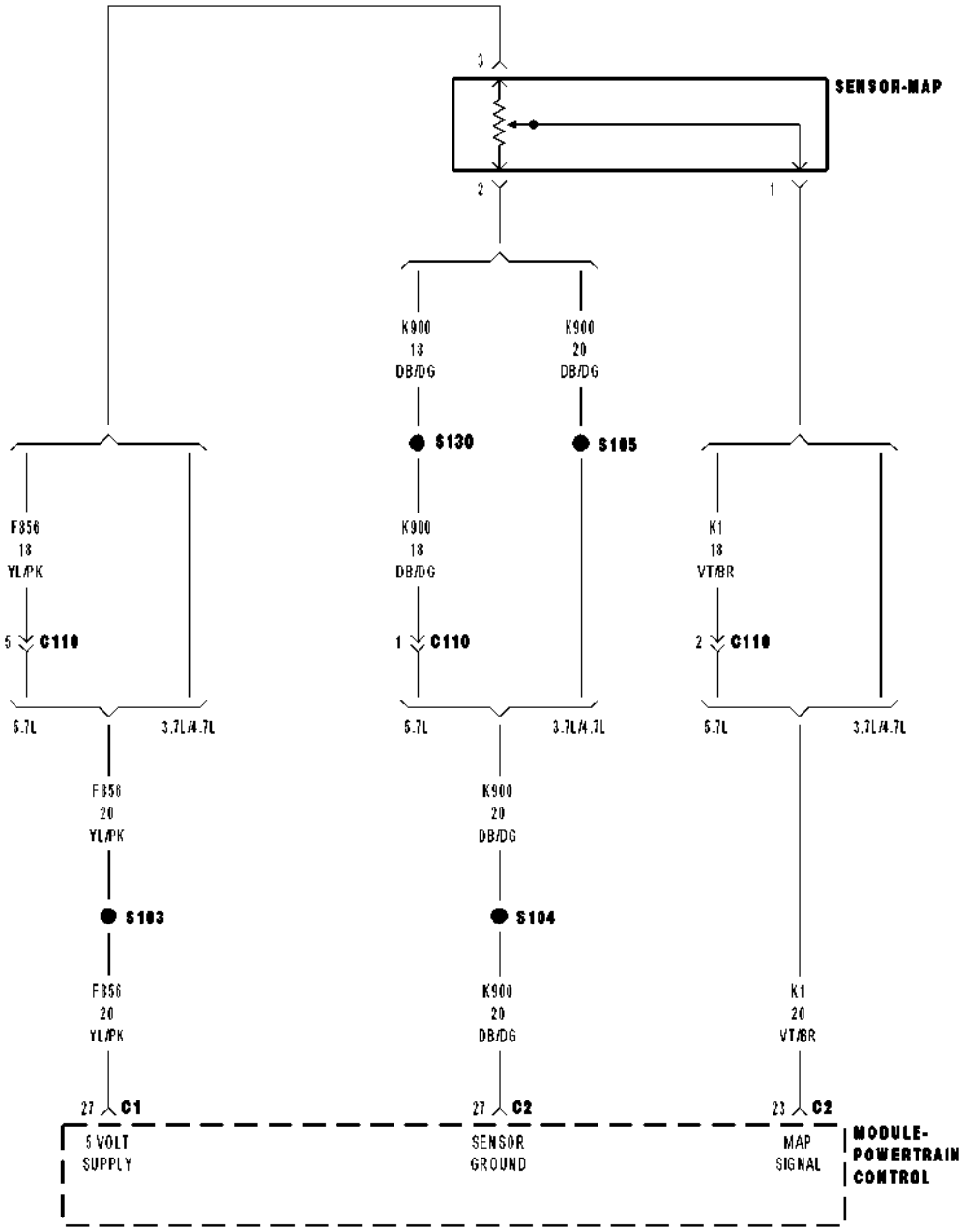
NOTE: Before continuing, check the FCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

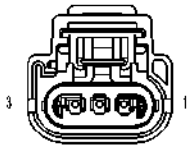
Were there any problems found?

Yes >> Repair as necessary.
Perform BODY VERIFICATION TEST VER - 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

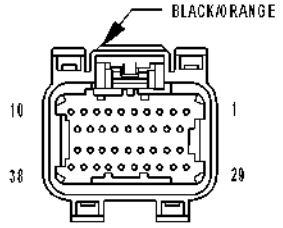
No >> Replace the Front Control Module per Service Information.
Perform BODY VERIFICATION TEST VER - 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

P0107-MANIFOLD ABSOLUTE PRESSURE SENSOR CIRCUIT LOW

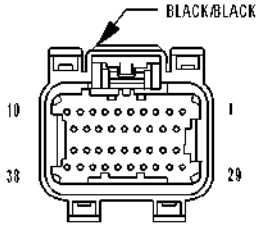




SENSOR-MAP



MODULE-
POWERTRAIN
CONTROL C2



MODULE-
POWERTRAIN
CONTROL C1

P0107-MANIFOLD ABSOLUTE PRESSURE SENSOR CIRCUIT LOW (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Engine speed between 600 to 3500 RPM. Battery voltage greater than 10 volts.
- **Set Condition:**
  The MAP sensor signal voltage is below 0.08 of a volt for 3.0 seconds. One Trip Fault. Three good trips to turn off the MIL, (5.7L ETC light will flash.)

Possible Causes
(F856) 5-VOLT SUPPLY CIRCUIT OPEN
(F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K1) MAP SIGNAL CIRCUIT SHORTED TO GROUND
(K1) MAP SIGNAL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT
MAP SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. MAP SENSOR VOLTAGE BELOW 0.08 OF A VOLT

Ignition on, engine not running.

With a scan tool, read the MAP Sensor voltage.

Is the voltage below 0.08 of a volt?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

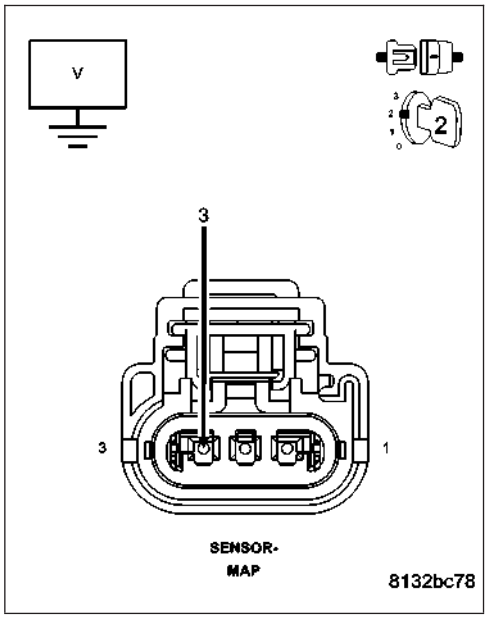
2. (F856) 5-VOLT SUPPLY CIRCUIT

Turn the ignition off.

Disconnect the MAP Sensor harness connector.

Ignition on, engine not running.

Measure the voltage on the (F856) 5-volt Supply circuit in the MAP Sensor harness connector.



Is the voltage between 4.5 to 5.2 volts?

Yes >> Go To 3

No >> Go To 6

P0107-MANIFOLD ABSOLUTE PRESSURE SENSOR CIRCUIT LOW (CONTINUED)

3. MAP SENSOR

With a scan tool, monitor the MAP Sensor voltage with the Sensor harness connector disconnected.

Is the voltage above 4.5 volts?

Yes >> Replace the MAP Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

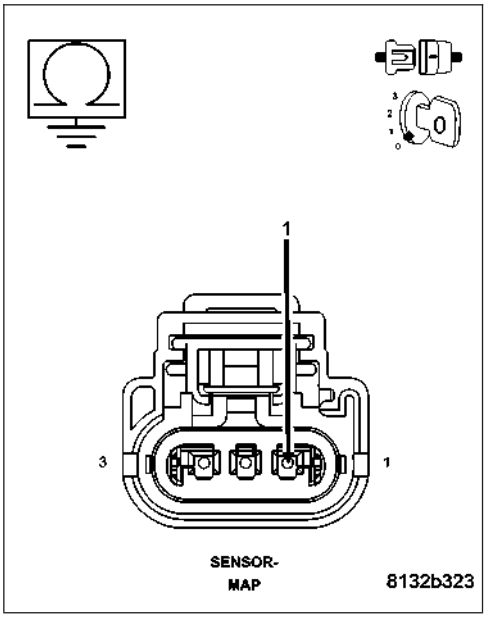
---

4. (K1) MAP SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the C2 PCM harness connector.

Measure the resistance between ground and the (K1) MAP Signal circuit in the MAP Sensor harness connector.



Is the resistance below 100 ohms?

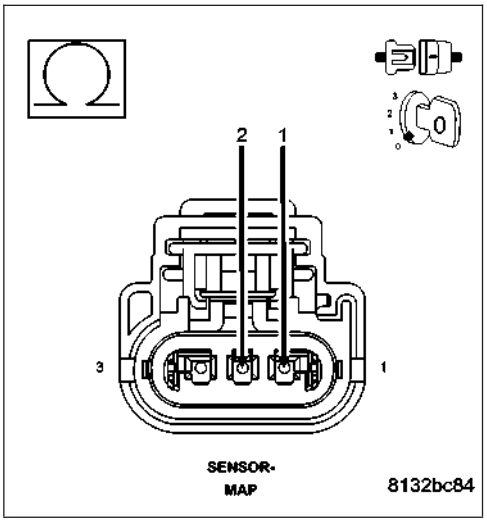
Yes >> Repair the short to ground in the (K1) MAP Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

---

5. (K1) MAP SIGNAL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT

Measure the resistance between the (K1) MAP Signal circuit and the (K900) Sensor ground circuit in the MAP Sensor harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short between the (K900) Sensor ground and the (K1) MAP Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8

P0107-MANIFOLD ABSOLUTE PRESSURE SENSOR CIRCUIT LOW (CONTINUED)

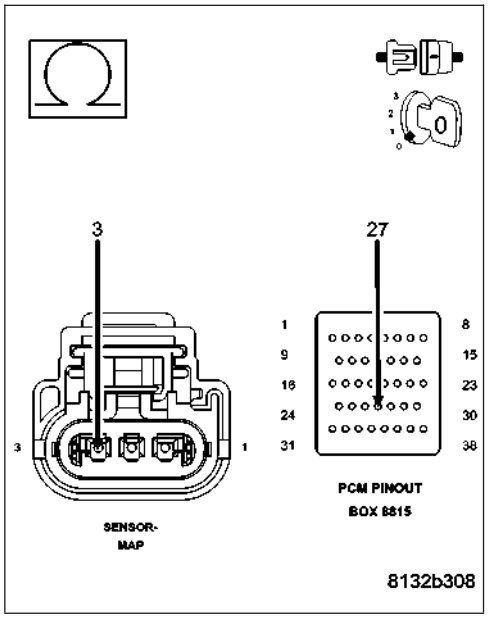
6. (F856) 5-VOLT SUPPLY CIRCUIT OPEN

Turn the ignition off.

Disconnect the C1 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (F856) 5-volt Supply circuit from the MAP Sensor harness connector to the appropriate terminal of special tool #8815.



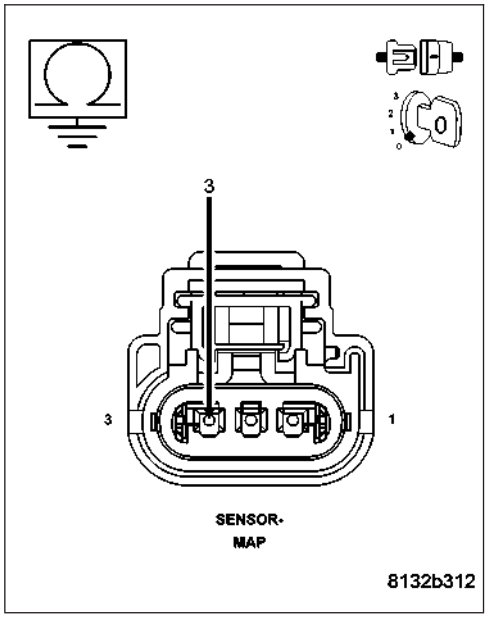
Is the resistance below 5.0 ohms?

Yes >> Go To 7

No >> Repair the open in the (F856) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

7. (F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (F856) 5-volt Supply circuit in the MAP Sensor harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (F856) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8

P0107-MANIFOLD ABSOLUTE PRESSURE SENSOR CIRCUIT LOW (CONTINUED)

8. **PCM**

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

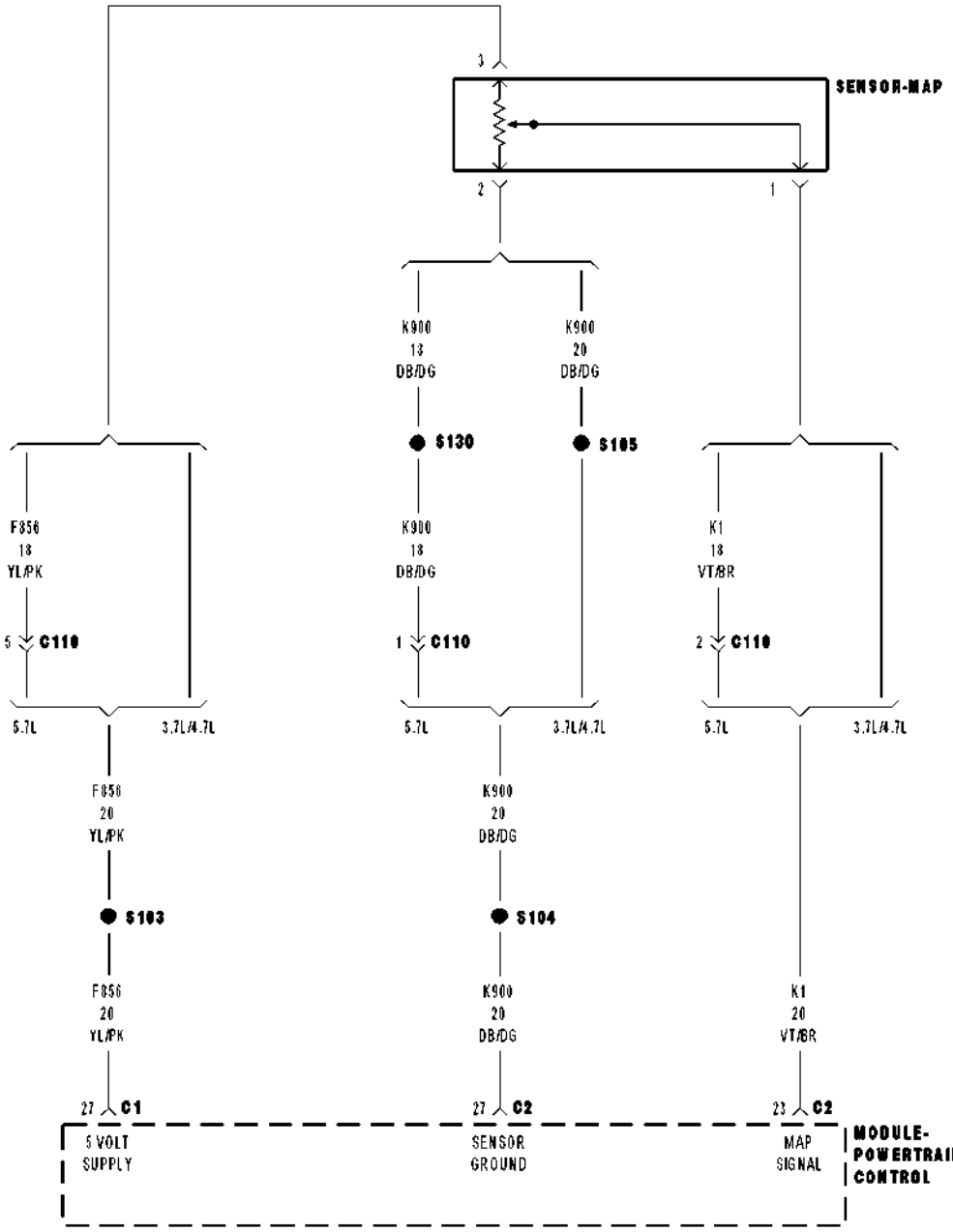
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

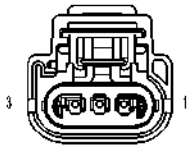
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

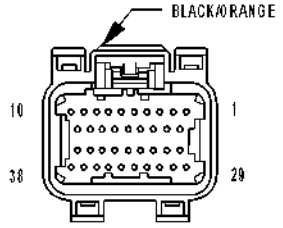
No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0108-MANIFOLD ABSOLUTE PRESSURE SENSOR CIRCUIT HIGH

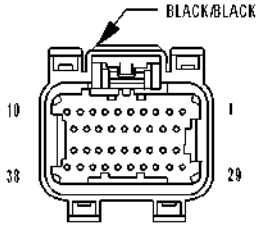




SENSOR-MAP



MODULE-
POWERTRAIN
CONTROL C2



MODULE-
POWERTRAIN
CONTROL C1

81682ee9

P0108-MANIFOLD ABSOLUTE PRESSURE SENSOR CIRCUIT HIGH (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Engine speed between 600 to 3500 RPM. Battery voltage greater than 10.37 volts.
- **Set Condition:**
  The MAP sensor signal voltage is greater than 4.92 volts for 3.0 seconds. One trip fault. Three good trips to turn off the MIL. (5.7L ETC light will flash).

Possible Causes
(K1) MAP SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K1) MAP SIGNAL CIRCUIT OPEN
(K1) MAP SIGNAL CIRCUIT SHORTED TO THE (F856) 5-VOLT SUPPLY CIRCUIT
(K900) SENSOR GROUND CIRCUIT OPEN
MAP SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. MAP SENSOR VOLTAGE ABOVE 4.92 VOLTS

Start the engine.

With a scan tool, read the MAP Sensor voltage.

Is the voltage above 4.92 volts?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. MAP SENSOR

Turn the ignition off.

Disconnect the MAP Sensor harness connector.

Connect a jumper wire between the (K1) MAP Signal circuit and the (K900) Sensor ground circuit in the Sensor harness connector.

Ignition on, engine not running.

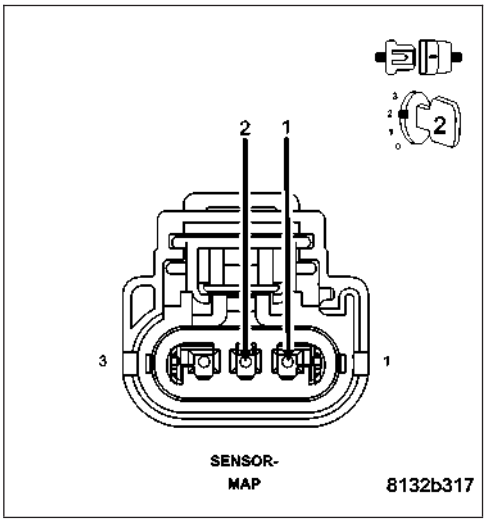
With a scan tool, monitor the MAP Sensor voltage.

Is the voltage below 1.0 volt with the jumper wire installed?

Yes >> Replace the MAP Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

NOTE: Remove the jumper wire before continuing.



P0108-MANIFOLD ABSOLUTE PRESSURE SENSOR CIRCUIT HIGH (CONTINUED)

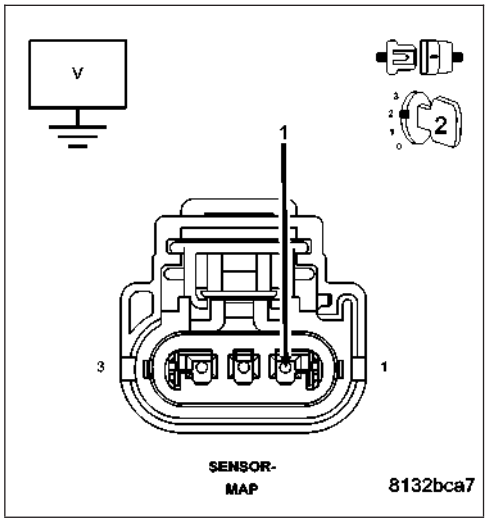
3. (K1) MAP SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

Disconnect the C1 and C2 PCM harness connectors.

Ignition on, engine not running.

Measure the voltage on the (K1) MAP Signal circuit in the MAP Sensor harness connector.



Is the voltage above 5.2 volts?

Yes >> Repair the short to battery voltage in the (K1) MAP Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

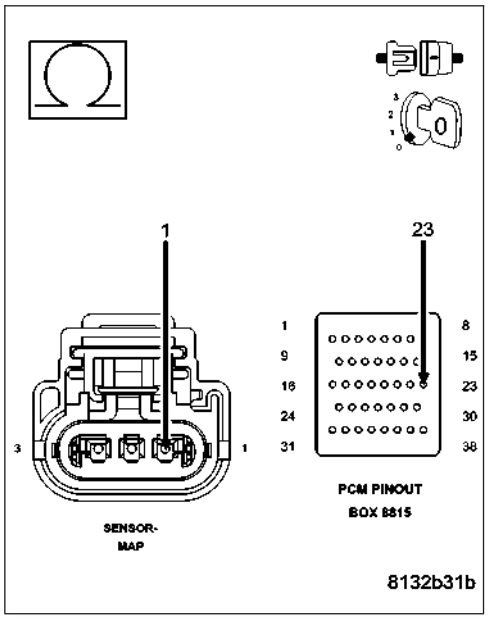
No >> Go To 4

4. (K1) MAP SIGNAL CIRCUIT OPEN

Turn the ignition off.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K1) MAP Signal circuit from the MAP Sensor harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

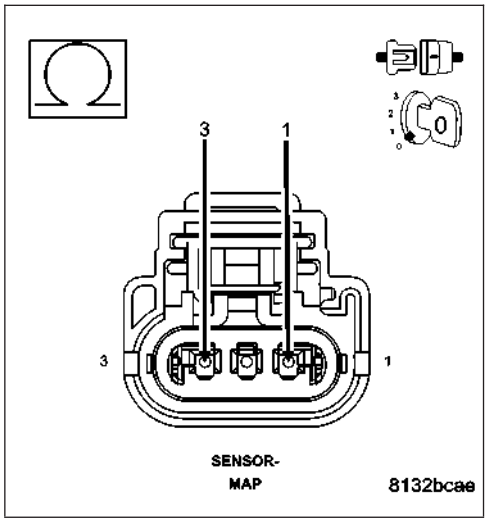
Yes >> Go To 5

No >> Repair the open in the (K1) MAP Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0108-MANIFOLD ABSOLUTE PRESSURE SENSOR CIRCUIT HIGH (CONTINUED)

5. (K1) MAP SIGNAL CIRCUIT SHORTED TO THE (F856) 5-VOLT SUPPLY CIRCUIT

Measure the resistance between the (K1) MAP Signal circuit and the (F856) 5-volt Supply circuit in the MAP Sensor harness connector.



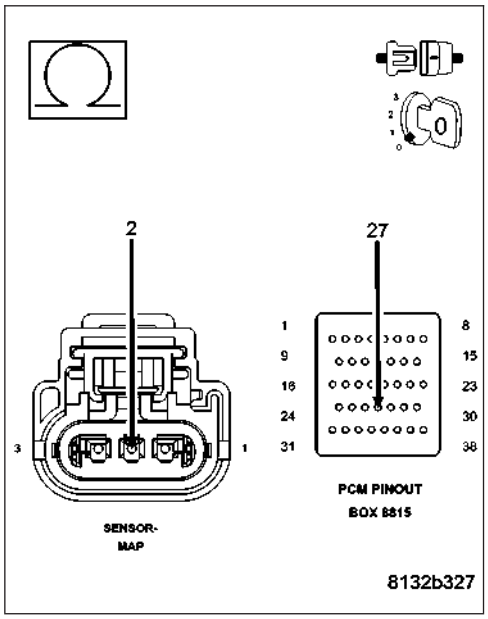
Is the resistance below 100 ohms?

Yes >> Repair the short between the (F856) 5-volt Supply circuit and the (K1) MAP Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6

6. (K900) SENSOR GROUND CIRCUIT OPEN

Measure the resistance of the (K900) Sensor ground circuit from the MAP Sensor harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 7

No >> Repair the open in the (K900) Sensor ground circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0108-MANIFOLD ABSOLUTE PRESSURE SENSOR CIRCUIT HIGH (CONTINUED)

7. **PCM**

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

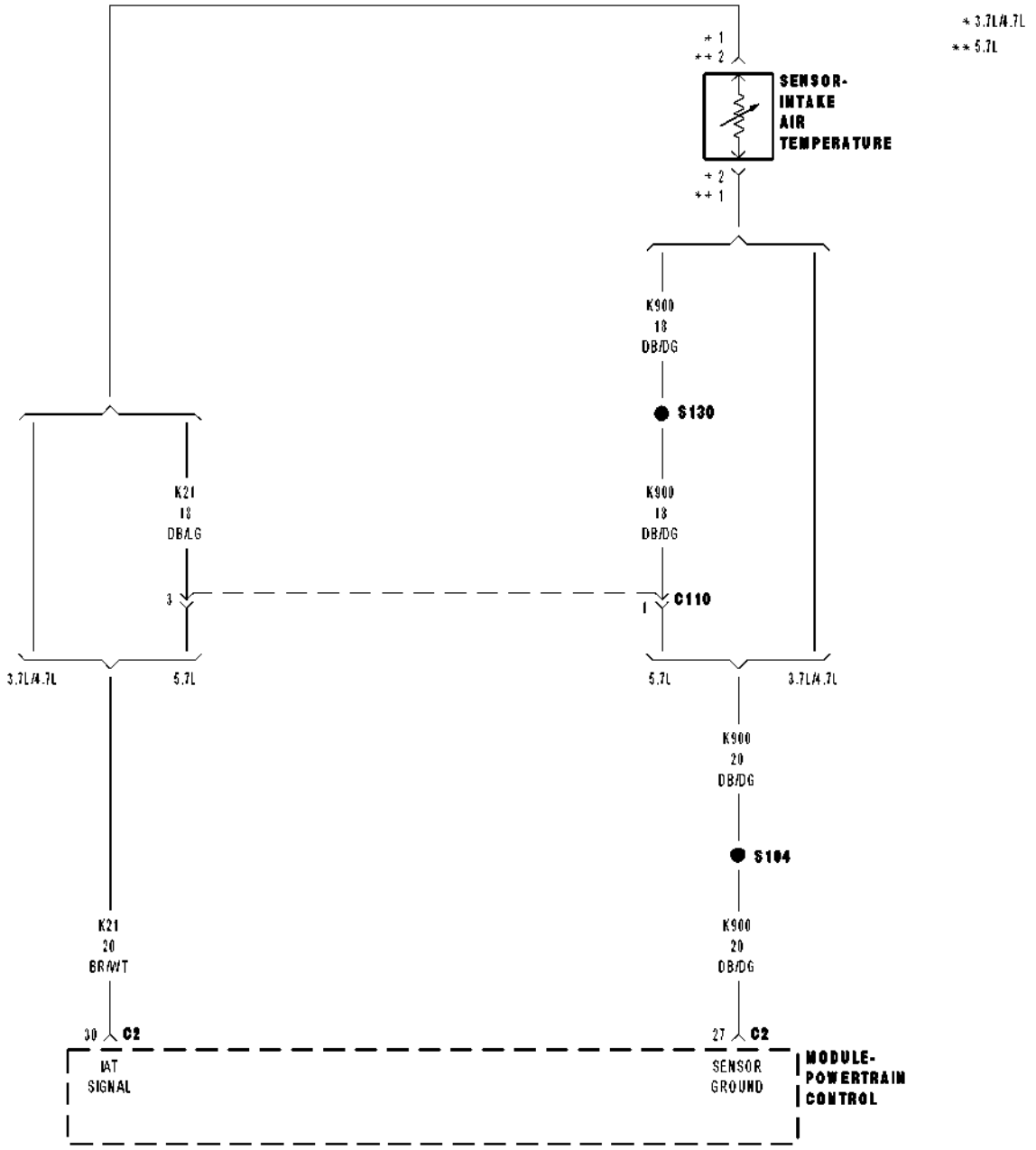
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

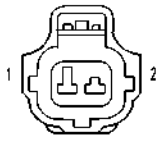
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

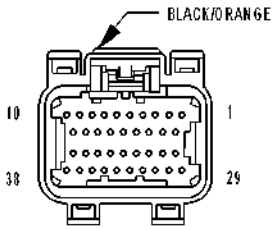
No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0111-INTAKE AIR TEMPERATURE SENSOR RATIONALITY





SENSOR-
INTAKE AIR
TEMPERATURE



MODULE-
POWERTRAIN
CONTROL C2

P0111-INTAKE AIR TEMPERATURE SENSOR RATIONALITY (CONTINUED)

For the Engine System Schematic circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

Intake Air Temperature Sensor performance looks at the outputs of three temperature sensors and compare them under cold start conditions. Following a start to run delay time, the outputs of the ambient, engine coolant, and intake air temperature sensors will be compared. If the engine coolant and ambient air temperature sensors agree and the intake air temperature does not agree, the intake air temperature sensor is declared as irrational.

- **When Monitored:**
  The engine off time is greater than 480 minutes. Ambient Temperature if greater than 4 deg C (38 deg F).
- **Set Condition:**
  After a calibrated amount of cool down time the PCM compares the ECT Sensor, IAT Sensor, and the Ambient Air Temp Sensor values. If the IAT Sensor value is not within 10 deg C of the other two temperature sensors. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K21) IAT SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K21) IAT SIGNAL CIRCUIT OPEN
(K900) SENSOR GROUND CIRCUIT OPEN
(K21) IAT SIGNAL CIRCUIT SHORTED TO GROUND
(K21) IAT SIGNAL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT
INTAKE AIR TEMPERATURE SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.
With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0111-INTAKE AIR TEMPERATURE SENSOR RATIONALITY (CONTINUED)

2. (K21) IAT SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

Disconnect the C2 PCM harness connector.

Disconnect the IAT Sensor harness connector.

NOTE: Visually inspect both the component and the PCM connectors. Look for damaged, partially broken wires, and backed out or corroded terminals.

Ignition on, engine not running.

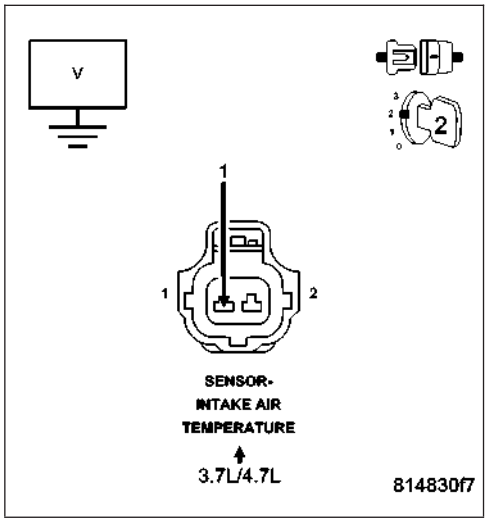
Measure the voltage on the (K21) IAT Signal circuit in the IAT Sensor harness connector.

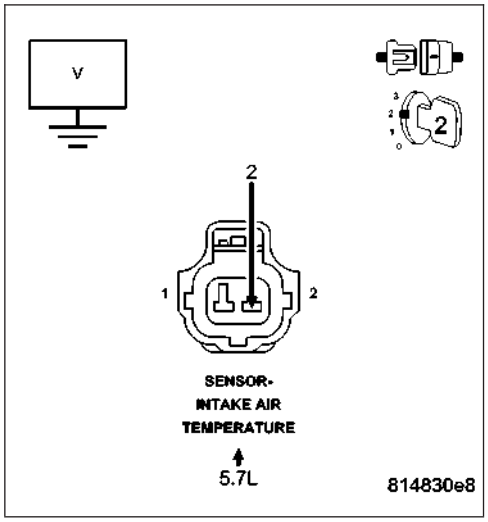
Is the voltage above 0 volts?

Yes >> Repair the short to battery voltage in the (K21) IAT Signal circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3





3. IAT SENSOR VOLTAGE ABOVE 4.6 VOLTS

Turn the ignition off.

Connect the C2 PCM harness connector.

Ignition on, engine not running.

With a scan tool, read the IAT voltage.

Is the voltage above 4.6 volts?

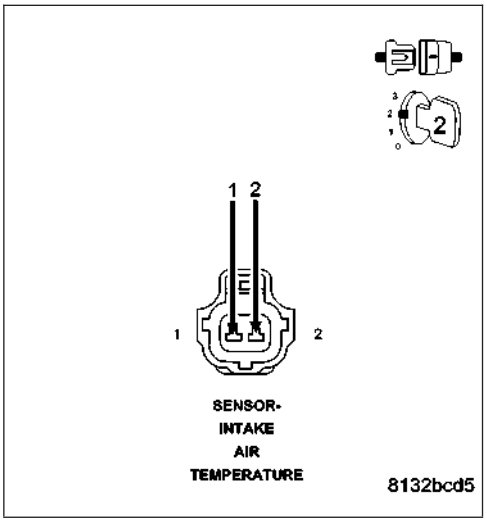
Yes >> Go To 4

No >> Go To 7

P0111-INTAKE AIR TEMPERATURE SENSOR RATIONALITY (CONTINUED)

4. IAT SENSOR

Connect a jumper wire between the (K21) IAT Signal circuit and the (K900) Sensor ground circuit in the IAT Sensor harness connector. With a scan tool, read the IAT voltage.



Is the voltage below 1.0 volt with the jumper wire installed?

Yes >> Replace the IAT Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

NOTE: Remove the jumper wire before continuing.

P0111-INTAKE AIR TEMPERATURE SENSOR RATIONALITY (CONTINUED)

5. (K21) IAT SIGNAL CIRCUIT OPEN

Turn the ignition off.

Disconnect the C2 PCM harness connector.

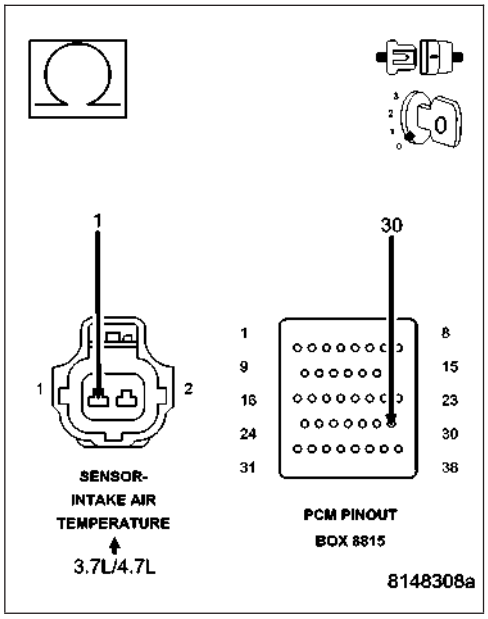
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

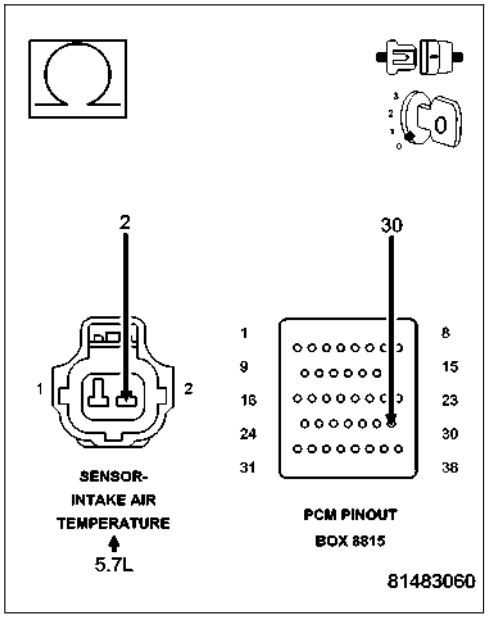
Measure the resistance of the (K21) IAT Signal circuit from the IAT Sensor harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 6

No >> Repair the open in the (K21) IAT Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)





P0111-INTAKE AIR TEMPERATURE SENSOR RATIONALITY (CONTINUED)

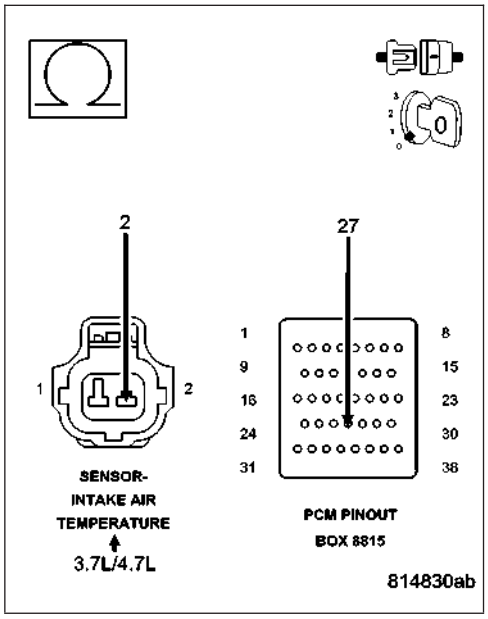
6. (K900) SENSOR GROUND CIRCUIT OPEN

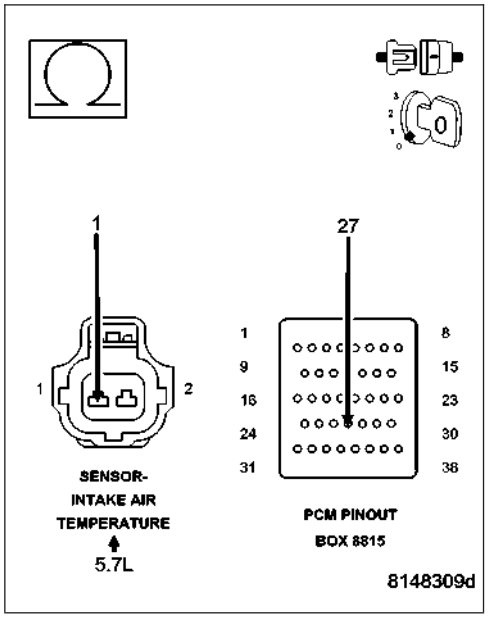
Measure the resistance of the (K900) Sensor ground circuit from the IAT Sensor harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 9

No >> Repair the open in the (K900) Sensor ground circuit. Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)





P0111-INTAKE AIR TEMPERATURE SENSOR RATIONALITY (CONTINUED)

7. (K21) IAT SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

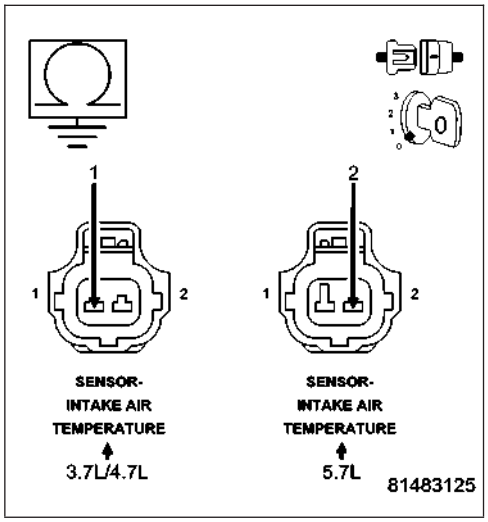
Disconnect the C2 PCM harness connector.

Measure the resistance between ground and the (K21) IAT Signal circuit in the IAT Sensor harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K21) IAT Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8



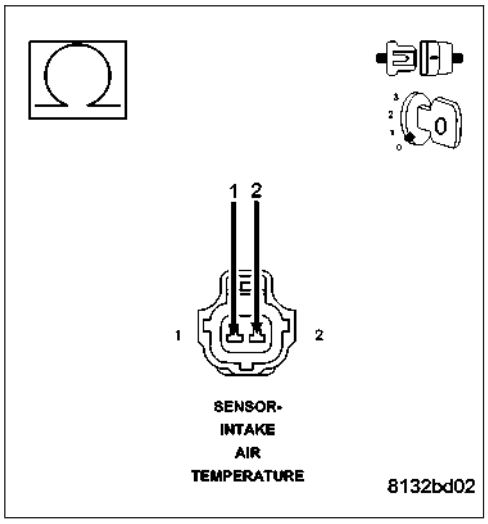
8. (K21) IAT SIGNAL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT

Measure the resistance between the (K21) IAT Signal circuit and the (K900) Sensor ground circuit in the IAT Sensor harness connector.

Is the resistance below 5.0 ohms?

Yes >> Repair the short between the (K900) Sensor ground and the (K21) IAT Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 9



9. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

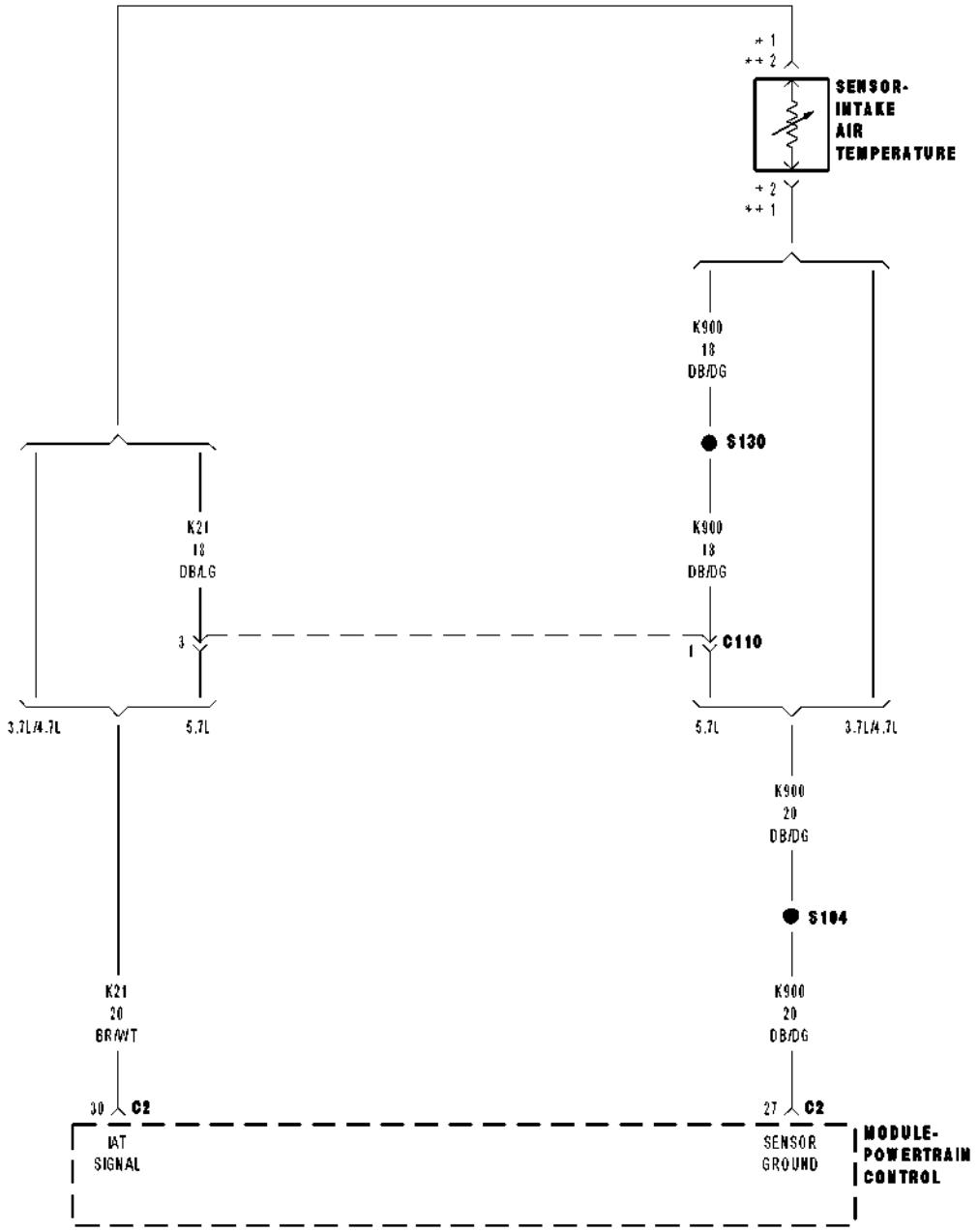
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

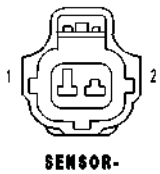
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

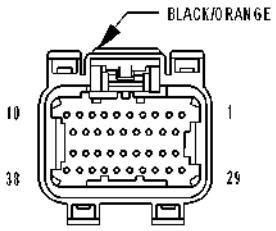
No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0112-INTAKE AIR TEMPERATURE SENSOR CIRCUIT LOW





SENSOR-
INTAKE AIR
TEMPERATURE



MODULE-
POWERTRAIN
CONTROL C2

P0112-INTAKE AIR TEMPERATURE SENSOR CIRCUIT LOW (CONTINUED)

For the Engine System Schematic circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on and battery voltage greater than 10.4 volts.
- **Set Condition:**
  When the Inlet Air Temp Sensor Signal circuit voltage is less than .078 volt for more than 2.8 seconds. One trip failure. Three good trips to clear the MIL.

Possible Causes
(K21) IAT SIGNAL CIRCUIT SHORTED TO GROUND
(K21) IAT SIGNAL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT
INTAKE AIR TEMPERATURE SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. IAT SENSOR VOLTAGE BELOW 0.078 OF A VOLT

Ignition on, engine not running.
With a scan tool, read the IAT voltage.

Is the voltage below 0.078 of a volt?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. IAT SENSOR

Turn the ignition off.
Disconnect the IAT Sensor harness connector.
Ignition on, engine not running.
With a scan tool, read IAT voltage.

Is the voltage above 0.05 of a volt?

Yes >> Replace the Intake Air Temperature Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

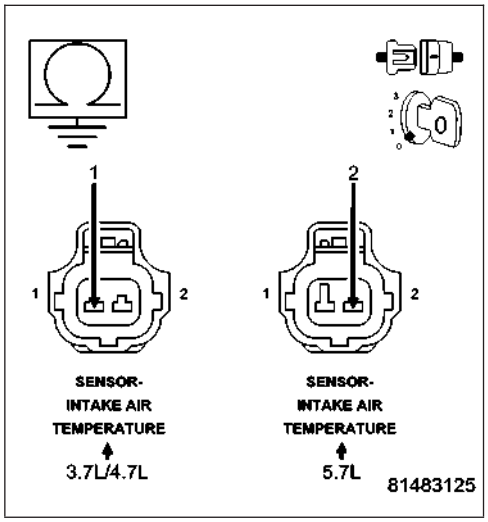
P0112-INTAKE AIR TEMPERATURE SENSOR CIRCUIT LOW (CONTINUED)

3. (K21) IAT SENSOR SIGNAL SHORTED TO GROUND

Turn the ignition off.

Disconnect the C2 PCM harness connector.

Measure the resistance between ground and the (K21) IAT Signal circuit in the IAT Sensor harness connector.



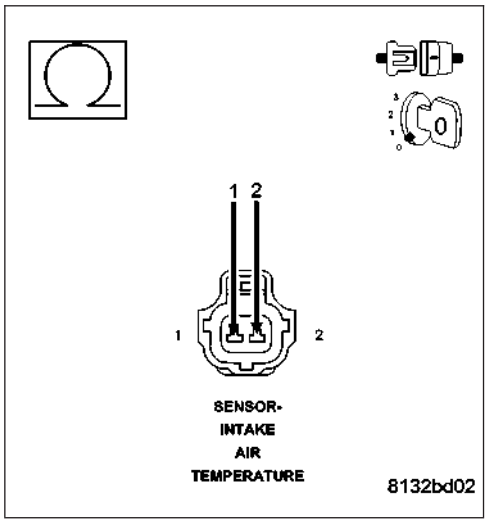
Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K21) IAT Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

4. (K21) IAT SIGNAL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT

Measure the resistance between the (K21) IAT Signal circuit and the (K900) Sensor ground circuit in the IAT Sensor harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short between the (K900) Sensor ground circuit and the (K21) IAT Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

5. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

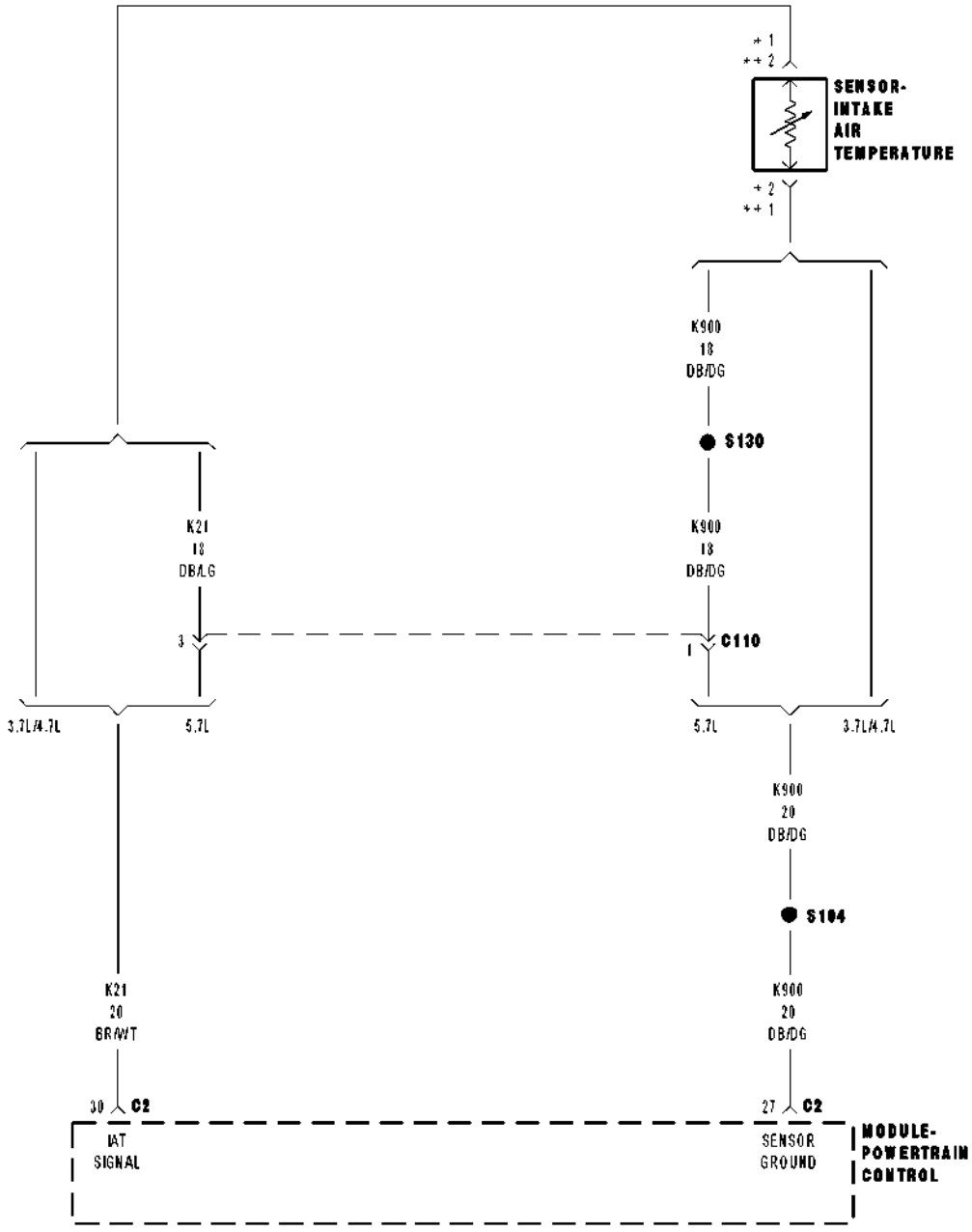
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

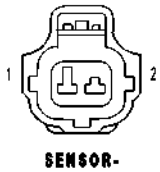
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

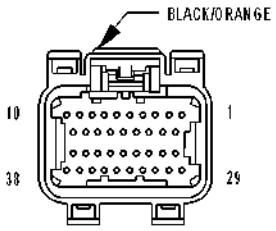
No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0113-INTAKE AIR TEMPERATURE SENSOR CIRCUIT HIGH





SENSOR-
INTAKE AIR
TEMPERATURE



MODULE-
POWERTRAIN
CONTROL C2

P0113-INTAKE AIR TEMPERATURE SENSOR CIRCUIT HIGH (CONTINUED)

For the Engine System Schematic circuit diagram. (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. Battery voltage greater than 10.4 volts.
- **Set Condition:**
  The Intake Air Temperature (IAT) sensor circuit voltage at the PCM goes above 4.98 volts for 2.8 seconds. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K21) IAT SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K21) IAT SIGNAL CIRCUIT OPEN
(K900) SENSOR GROUND CIRCUIT OPEN
IAT SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. IAT SENSOR VOLTAGE ABOVE 4.98 VOLTS

Ignition on, engine not running.

With a scan tool, read the Intake Air Temperature Sensor voltage.

Is the voltage above 4.98 volts?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

2. IAT SENSOR

Turn the ignition off.

Disconnect the Intake Air Temperature Sensor harness connector.

Connect a jumper wire between the (K21) IAT Signal circuit and the (K900) Sensor ground circuit in the IAT Sensor harness connector.

Ignition on, engine not running.

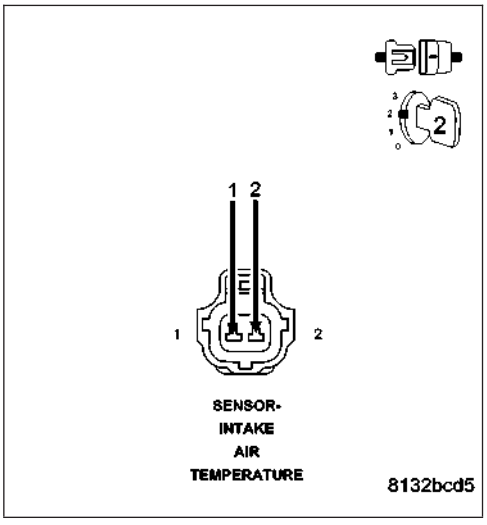
With a scan tool, read the IAT Sensor voltage.

Is the voltage below 1.0 volt with the jumper wire installed?

Yes >> Replace the IAT Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

NOTE: Remove the jumper wire before continuing.



P0113-INTAKE AIR TEMPERATURE SENSOR CIRCUIT HIGH (CONTINUED)

3. (K21) IAT SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE

Disconnect the C2 PCM harness connector.

Ignition on, engine not running.

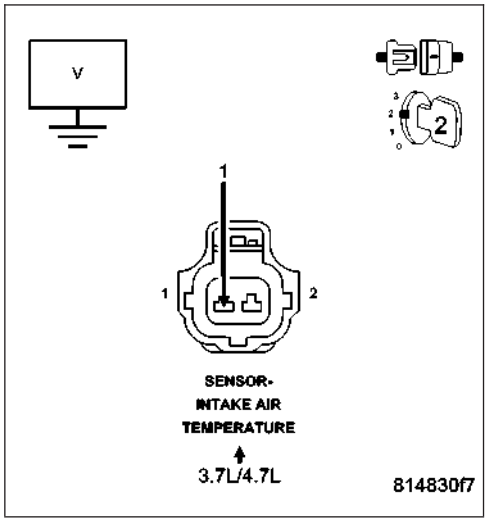
Measure the voltage on the (K21) IAT Signal circuit in the IAT Sensor harness connector.

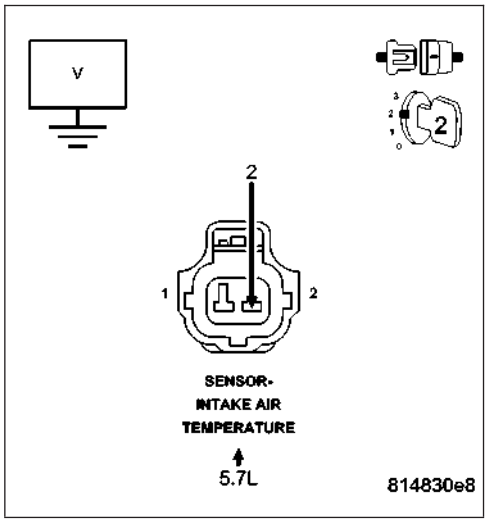
Is the voltage above 0 volts?

Yes >> Repair the short to battery voltage in the (K21) IAT Signal circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4





P0113-INTAKE AIR TEMPERATURE SENSOR CIRCUIT HIGH (CONTINUED)

4. (K21) IAT SIGNAL CIRCUIT OPEN

Turn the ignition off.

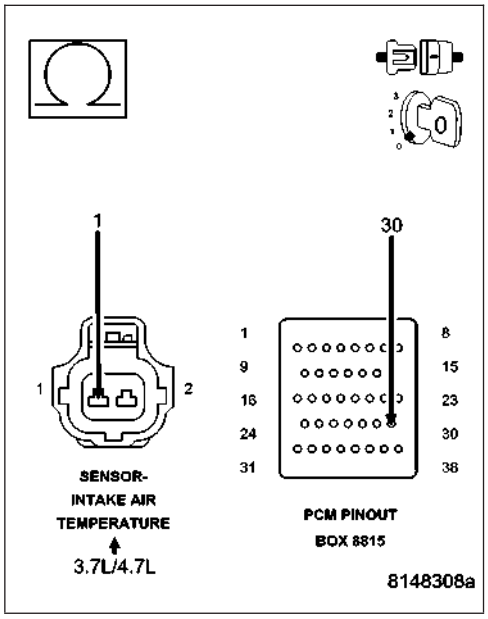
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

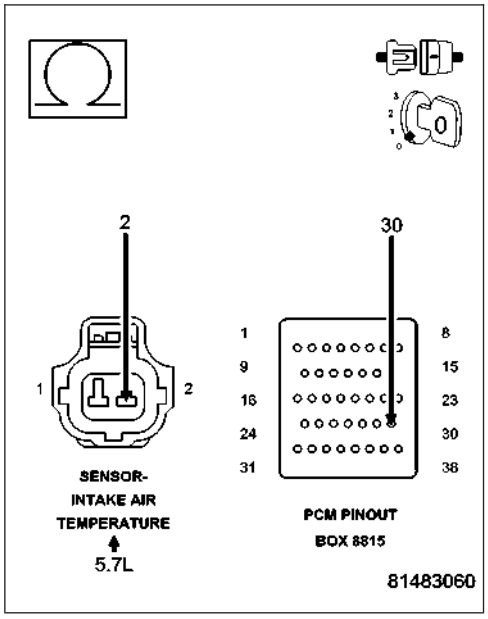
Measure the resistance of the (K21) IAT Signal circuit from the IAT Sensor harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 5

No >> Repair the open in the (K21) IAT Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

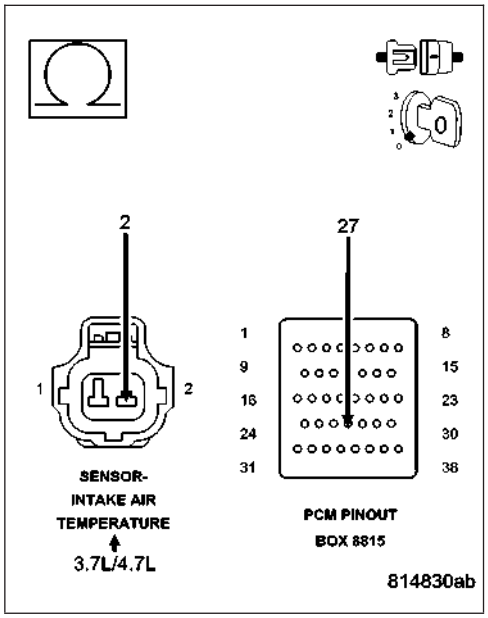




P0113-INTAKE AIR TEMPERATURE SENSOR CIRCUIT HIGH (CONTINUED)

5. (K900) SENSOR GROUND CIRCUIT OPEN

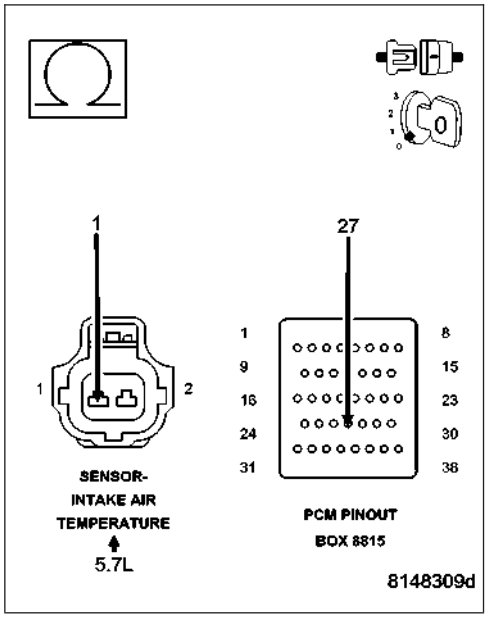
Measure the resistance of the (K900) Sensor ground circuit from the IAT Sensor harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 6

No >> Repair the open in the (K900) Sensor ground circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



6. PCM

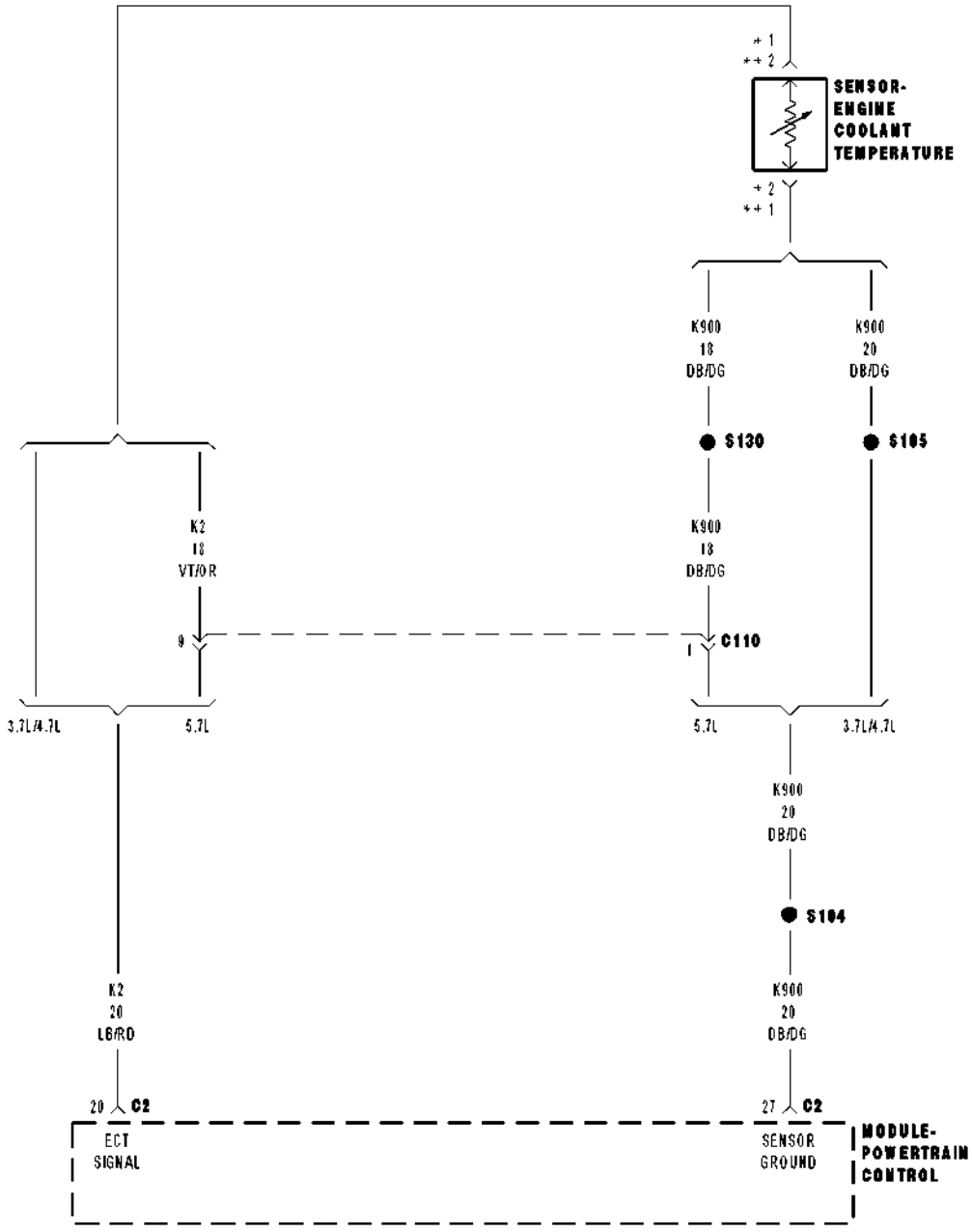
NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

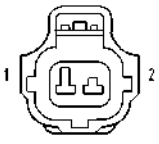
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

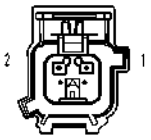
No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0116–ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT PERFORMANCE

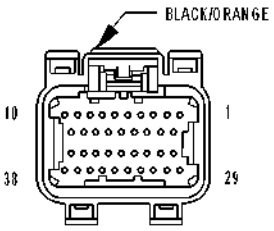




SENSOR-
ENGINE
COOLANT
TEMPERATURE
(3.7L/4.7L)



SENSOR-
ENGINE
COOLANT
TEMPERATURE
(5.7L)



MODULE-
POWERTRAIN
CONTROL C2

81492837

P0116–ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT PERFORMANCE (CONTINUED)

For the Engine System Schematic circuit diagram. (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

Engine Coolant Temperature Sensor performance looks at the outputs of three temperature sensors and compare them under cold start conditions. Following a start to run delay time, the outputs of the ambient, engine coolant, and intake air temperature sensors will be compared. If the intake air and ambient air temperature sensors agree and the engine coolant temperature does not agree, the engine coolant temperature sensor is declared as irrational.

- **When Monitored:**
  Engine off time is greater than 480 minutes. Ambient temperature is greater than 4 deg C (38 deg F).
- **Set Condition:**
  After a calibrated amount of cool down time the PCM compares the ECT Sensor, IAT Sensor, and the Ambient Air Temp Sensor values. If the ECT Sensor value is not within 10 deg C of the other two temperature sensors. Two Trip Fault. Three good trips to turn off the MIL. (5.7L ETC lamp will illuminate with the MIL.)

Possible Causes
(K2) ECT SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K2) ECT SIGNAL CIRCUIT OPEN
(K900) SENSOR GROUND CIRCUIT OPEN
(K2) ECT SIGNAL CIRCUIT SHORTED TO GROUND
(K2) ECT SIGNAL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT
ECT SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.
With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0116–ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT PERFORMANCE (CONTINUED)

2. (K2) ECT SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

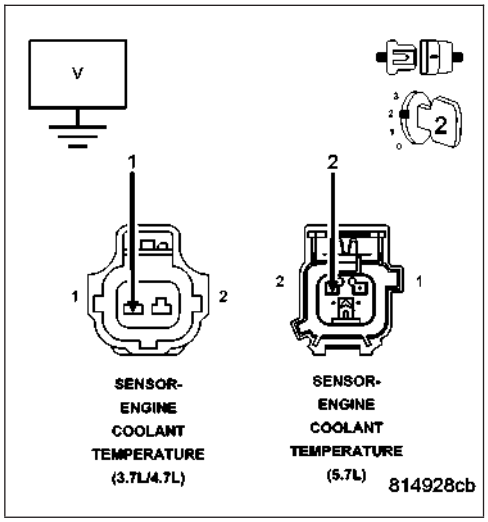
Disconnect the C2 PCM harness connector.

Disconnect the ECT Sensor harness connector.

NOTE: Visually inspect both the component and the PCM connectors. Look for damaged, partially broken wires, and backed out or corroded terminals.

Ignition on, engine not running.

Measure the voltage on the (K2) ECT Signal circuit in the ECT Sensor harness connector.



Is the voltage above 0 volts?

Yes >> Repair the short to battery voltage in the (K2) ECT Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

---

3. ECT SENSOR VOLTAGE ABOVE 4.6 VOLTS

Turn the ignition off.

Connect the C2 PCM harness connector.

Ignition on, engine not running.

With a scan tool, read the ECT voltage.

Is the voltage above 4.6 volts?

Yes >> Go To 4

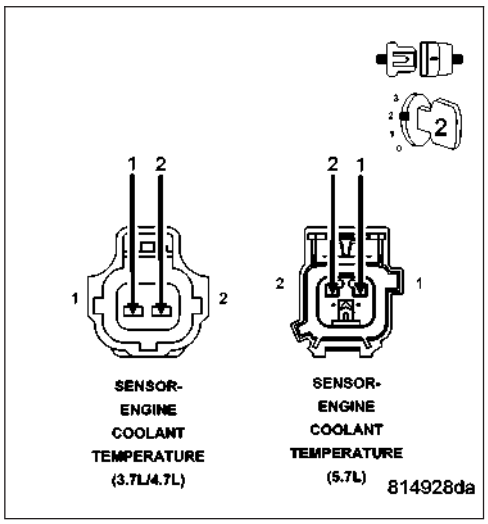
No >> Go To 7

---

4. ECT SENSOR

Connect a jumper wire between the (K2) ECT Signal circuit and the (K900) Sensor ground circuit in the ECT Sensor harness connector.

With a scan tool, read the ECT voltage.



Is the voltage below 1.0 volt with the jumper wire installed?

Yes >> Replace the ECT Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

NOTE: Remove the jumper wire before continuing.

P0116–ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT PERFORMANCE (CONTINUED)

5. (K2) ECT SIGNAL CIRCUIT OPEN

Turn the ignition off.

Disconnect the C2 PCM harness connector.

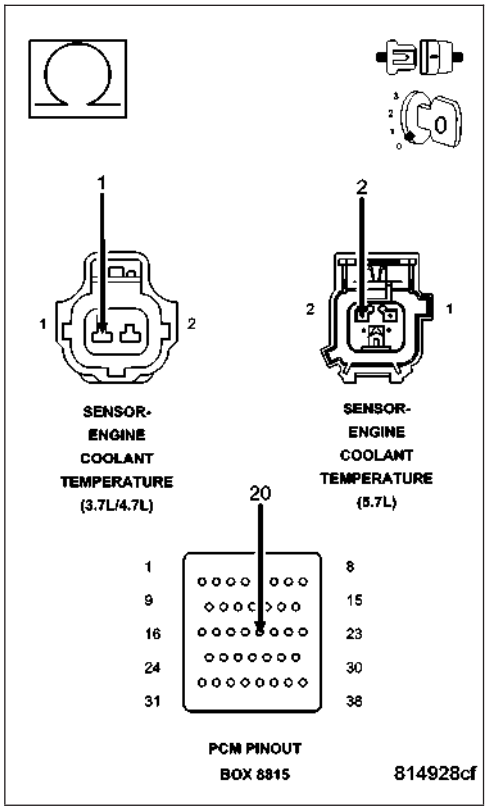
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K2) ECT Signal circuit from the ECT Sensor harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 6

No >> Repair the open in the (K2) ECT Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



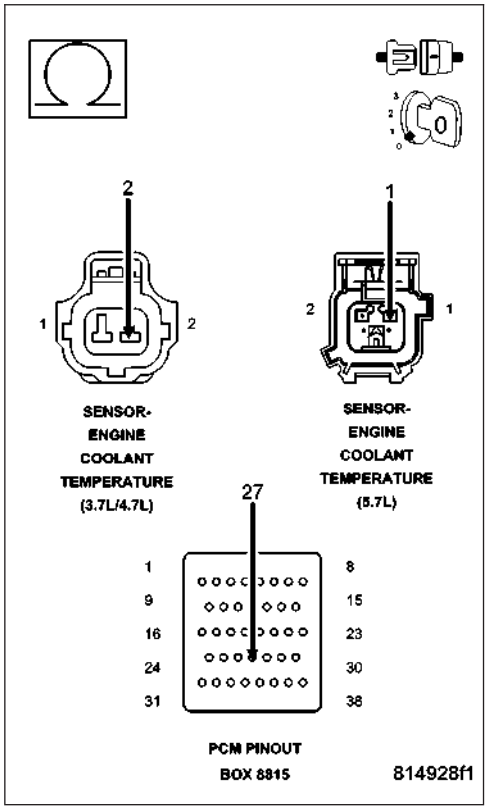
6. (K900) SENSOR GROUND CIRCUIT OPEN

Measure the resistance of the (K900) Sensor ground circuit from the ECT Sensor harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 9

No >> Repair the open in the (K900) Sensor ground circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P0116–ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT PERFORMANCE (CONTINUED)

7. (K2) ECT SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

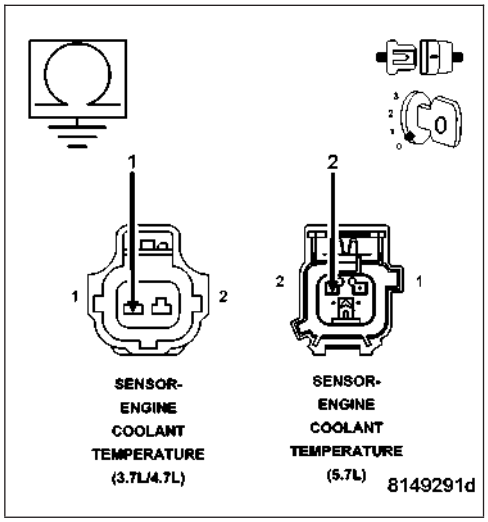
Disconnect the C2 PCM harness connector.

Measure the resistance between ground and the (K2) ECT Signal circuit in the ECT Sensor harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K2) ECT Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8



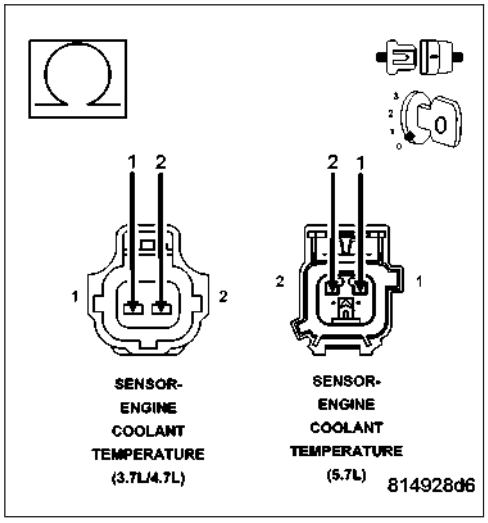
8. (K2) ECT SIGNAL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT

Measure the resistance between the (K2) ECT Signal circuit and the (K900) Sensor ground circuit in the ECT Sensor harness connector.

Is the resistance below 5.0 ohms?

Yes >> Repair the short between the (K900) Sensor ground circuit and the (K2) ECT Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 9



9. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

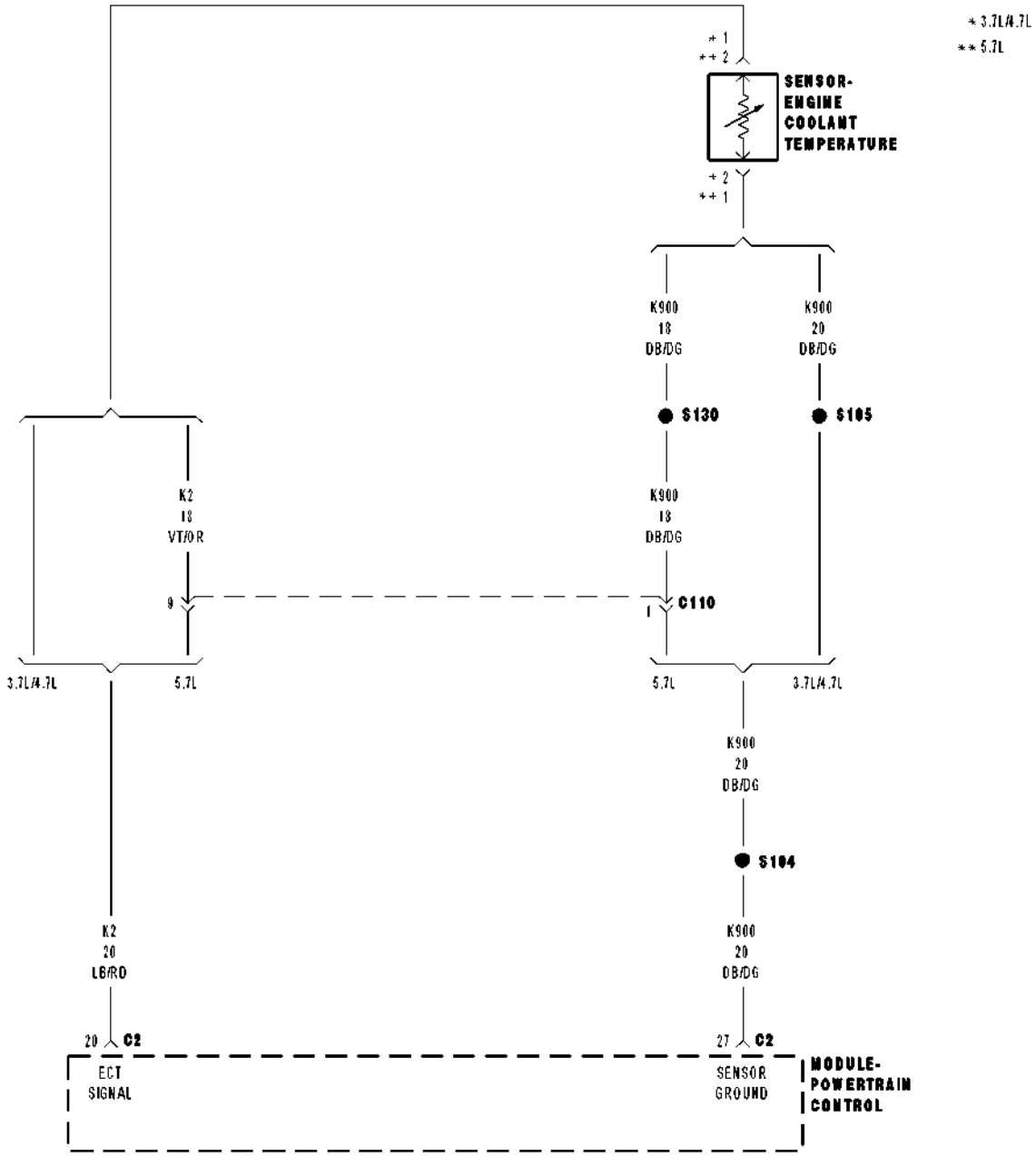
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

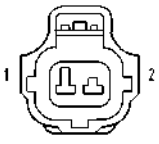
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

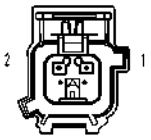
No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0117-ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT LOW

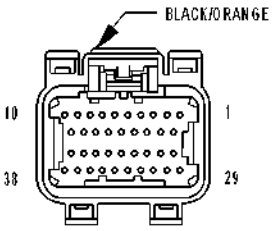




SENSOR-
ENGINE
COOLANT
TEMPERATURE
(3.7L/4.7L)



SENSOR-
ENGINE
COOLANT
TEMPERATURE
(5.7L)



MODULE-
POWERTRAIN
CONTROL C2

81492837

P0117-ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT LOW (CONTINUED)

For the Engine System Schematic circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The engine coolant temperature sensor is a negative temperature coefficient thermistor-type sensor whose resistance varies inversely with temperature. At cold temperatures the sensor resistance is high so the voltage is high. As the coolant temperature increases the resistance decreases and the voltage becomes low.

- **When Monitored:**
  With the ignition on. Battery voltage greater than 10.4 volts.
- **Set Condition:**
  The Engine Coolant Temperature (ECT) sensor circuit voltage at the PCM is less than 0.078 of a volt for more than 2.8 seconds. One Trip Fault. Three good trips to clear the MIL.

Possible Causes
(K2) ECT SIGNAL CIRCUIT SHORTED TO GROUND
(K2) ECT SIGNAL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT
ECT SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ECT SENSOR VOLTAGE BELOW 0.078 OF A VOLT

Ignition on, engine not running.
With a scan tool, read the ECT voltage.

Is the voltage below 0.078 of a volt?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. ECT SENSOR

Turn the ignition off.
Disconnect the ECT harness connector.
Ignition on, engine not running.
With a scan tool, read ECT voltage.

Is the voltage above 1.0 volt?

Yes >> Replace the ECT Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

P0117-ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT LOW (CONTINUED)

3. (K2) ECT SIGNAL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT

Turn the ignition off.

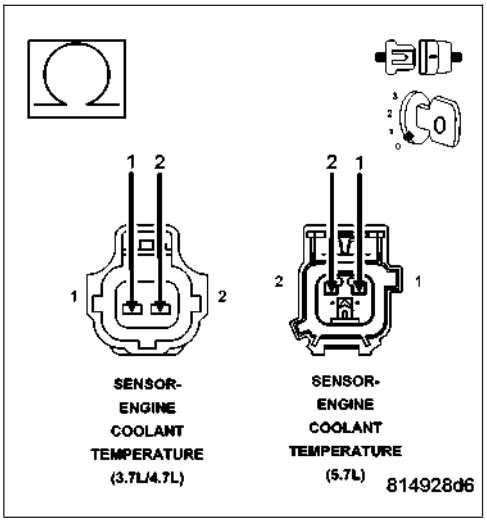
Disconnect the C2 PCM harness connector.

Measure the resistance between the (K900) Sensor ground circuit and the (K2) ECT Signal circuit in the ECT Sensor harness connector.

Is the resistance below 5.0 ohms?

Yes >> Repair the short to between the (K900) Sensor ground circuit and the (K2) ECT Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4



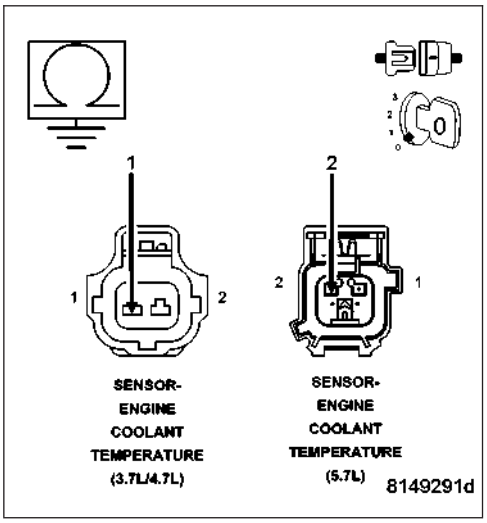
4. (K2) ECT SIGNAL CIRCUIT SHORTED GROUND

Measure the resistance between ground and the (K2) ECT Signal circuit in the ECT Sensor harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K2) ECT Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5



5. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

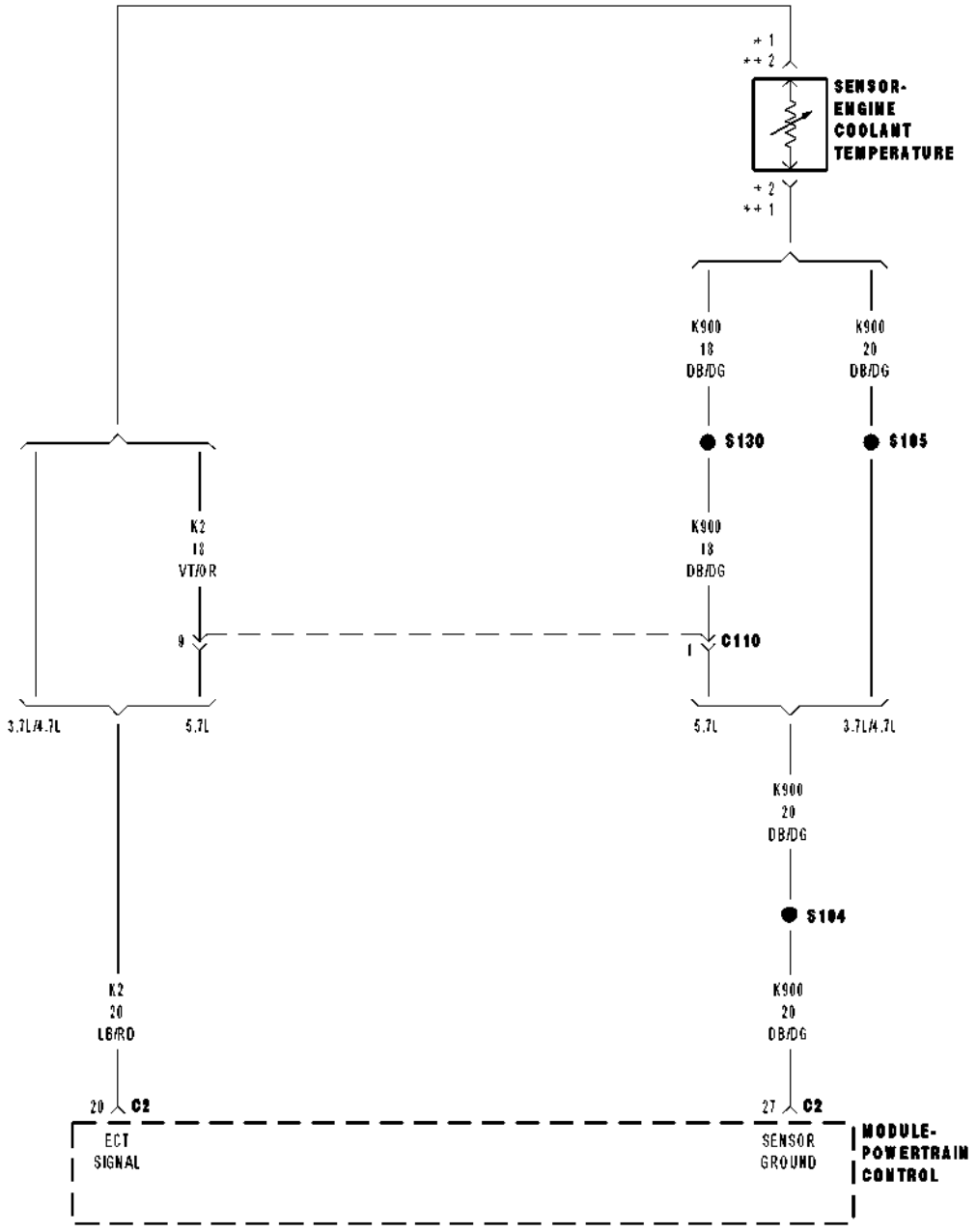
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

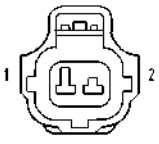
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

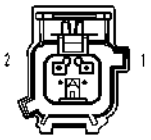
No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0118-ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT HIGH

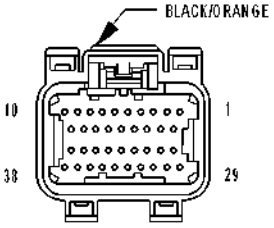




SENSOR-
ENGINE
COOLANT
TEMPERATURE
(3.7L/4.7L)



SENSOR-
ENGINE
COOLANT
TEMPERATURE
(5.7L)



MODULE-
POWERTRAIN
CONTROL C2

81492837

P0118-ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT HIGH (CONTINUED)

For the Engine System Schematic circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. Battery voltage greater than 10.4 volts.
- **Set Condition:**
  The Engine Coolant Temperature (ECT) sensor circuit voltage at the PCM is greater than 4.98 volts for more than 2.8 seconds. One Trip Fault. Three good trips to turn off the MIL. (5.7L ETC lamp will illuminate with the MIL.)

Possible Causes
(K2) ECT SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K2) ECT SIGNAL CIRCUIT OPEN
(K900) SENSOR GROUND CIRCUIT OPEN
ECT SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ECT SENSOR VOLTAGE ABOVE 4.98 VOLTS

Ignition on, engine not running.

With a scan tool, read the ECT voltage.

Is the voltage above 4.98 volts?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

2. ECT SENSOR

Turn the ignition off.

Disconnect the ECT harness connector.

Connect a jumper wire between the (K2) ECT Signal circuit and the (K900) Sensor ground circuit in the ECT harness connector.

Ignition on, engine not running.

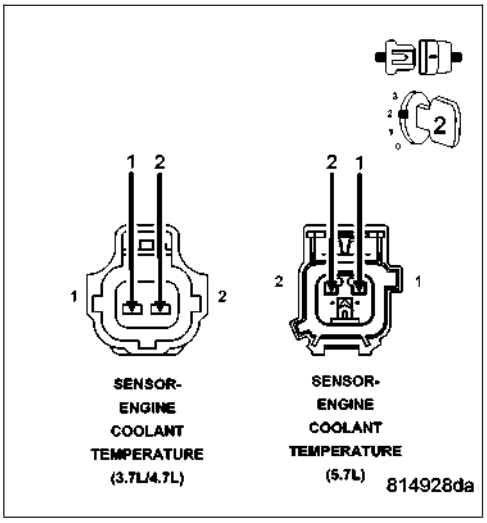
With a scan tool, read ECT voltage.

Is the voltage below 1.0 volt with the jumper wire installed?

Yes >> Replace the ECT Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

NOTE: Remove the jumper wire before continuing.



P0118-ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT HIGH (CONTINUED)

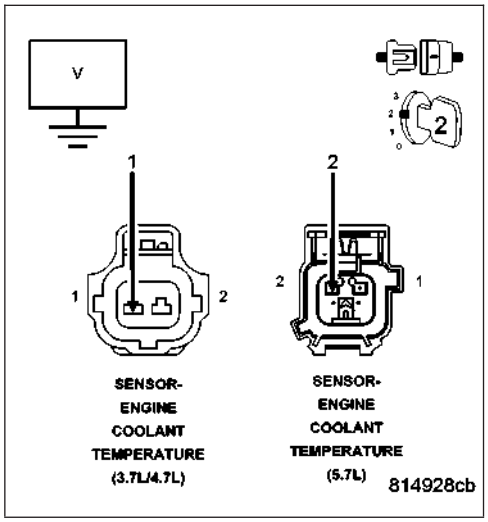
3. (K2) ECT SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

Disconnect the C2 PCM harness connector.

Ignition on, engine not running.

Measure the voltage on the (K2) ECT Signal circuit in the ECT Sensor harness connector.



Is the voltage above 0 volts?

Yes >> Repair the short to battery voltage in the (K2) ECT Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

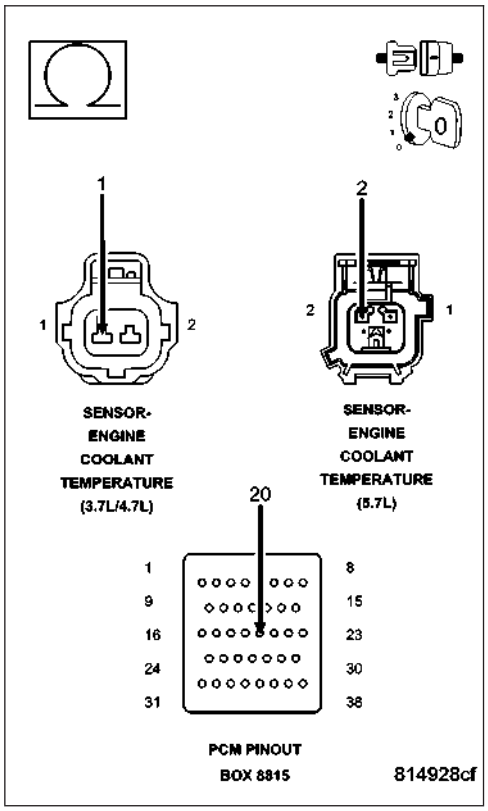
No >> Go To 4

4. (K2) ECT SIGNAL CIRCUIT OPEN

Turn the ignition off.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K2) ECT Signal circuit from the ECT Sensor harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

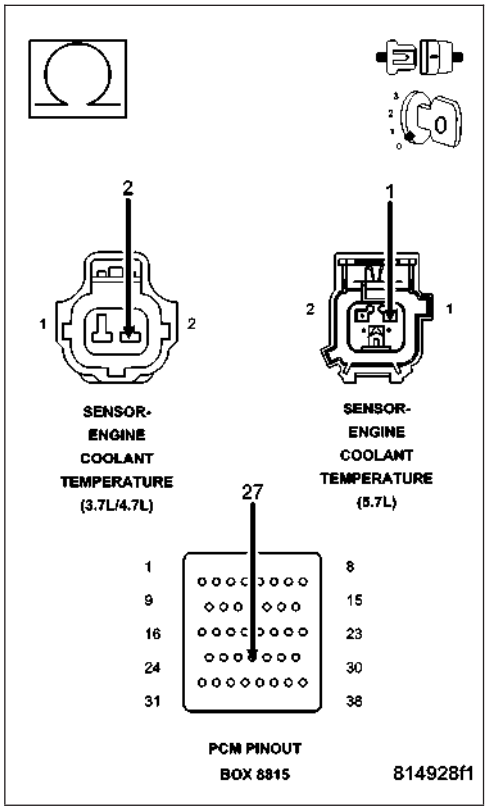
Yes >> Go To 5

No >> Repair the open in the (K2) ECT Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0118-ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT HIGH (CONTINUED)

5. (K900) SENSOR GROUND CIRCUIT OPEN

Measure the resistance of the (K900) Sensor ground circuit from the ECT Sensor harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 6

No >> Repair the open in the (K900) Sensor ground circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

6. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

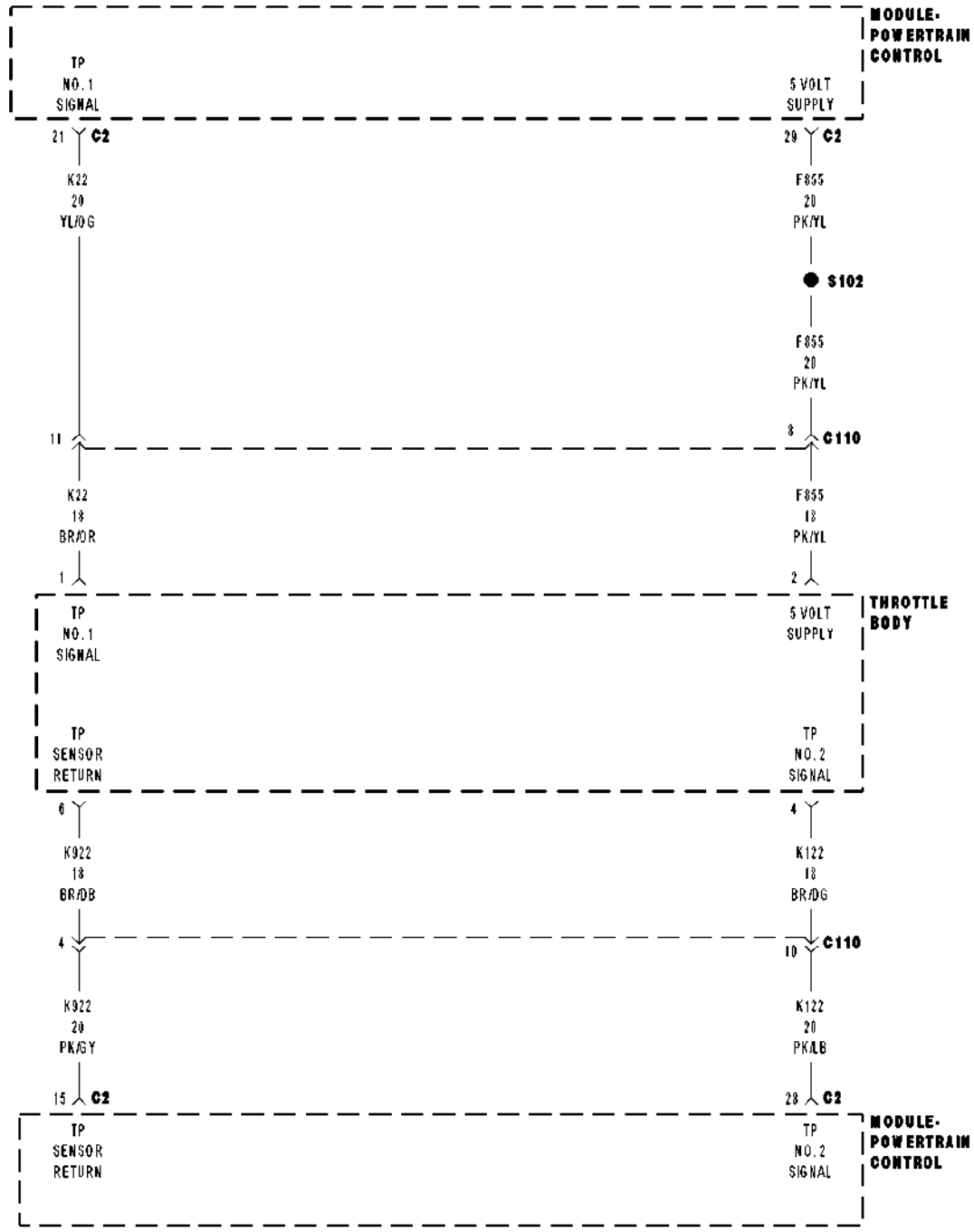
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

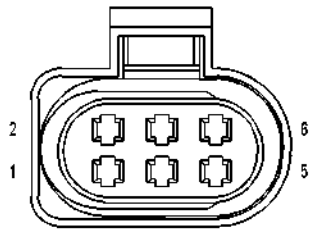
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

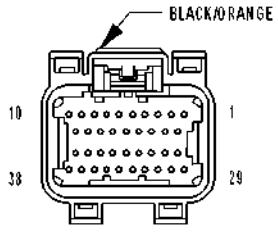
No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0121-THROTTLE POSITION SENSOR 1 PERFORMANCE





THROTTLE
BODY



MODULE-
POWERTRAIN
CONTROL C2

B1492b1b

P0121-THROTTLE POSITION SENSOR 1 PERFORMANCE (CONTINUED)

For the Engine System Schematic circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on and No MAP Sensor DTCs set.
- **Set Condition:**
  TP Sensor signals do not correlate to the MAP Sensor signal. One Trip Fault. ETC light will illuminate. P2135 should set with this code also.

Possible Causes
(K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
RESISTANCE IN THE (K22) TP SENSOR NO.1 OR (K122) TP SENSOR NO.2 SIGNAL CIRCUIT
(K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO GROUND
RESISTANCE IN THE (F855) 5-VOLT SUPPLY CIRCUIT
(F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
RESISTANCE IN THE (K922) SENSOR RETURN CIRCUIT
(K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO THE (K122) TP SENSOR NO.2 SIGNAL CIRCUIT
THROTTLE POSITION SENSOR/THROTTLE BODY
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: Diagnose any other TP Sensor DTC(s) before continuing.

NOTE: The throttle plate should be free from binding and carbon build up.

NOTE: Make sure the throttle plate is at the idle position.
Ignition on, engine not running.

NOTE: Inspect the engine for vacuum leaks.
With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Go To 11

P0121-THROTTLE POSITION SENSOR 1 PERFORMANCE (CONTINUED)

2. (K22) TP SENSOR NO.1 SIGNAL CIRCUIT OR (K122) TP SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

Disconnect the C2 PCM harness connector.

Disconnect the Throttle Body harness connector.

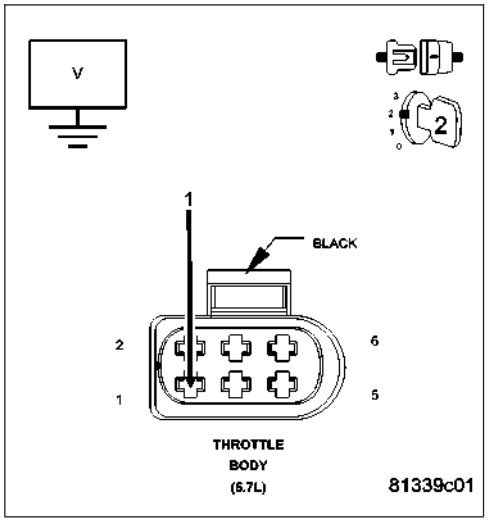
Ignition on, engine not running.

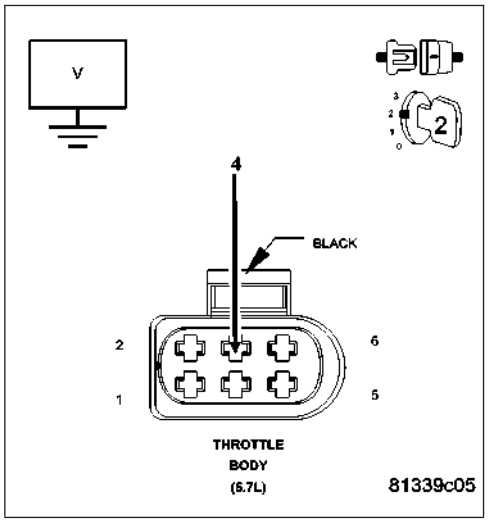
Measure the voltage on the (K22) TP No.1 Signal and the (K122) TP No.2 Signal circuits in the Throttle Body harness connector.

Is the voltage above 0 volts?

Yes >> Repair the short to battery voltage in the (K22) TP Sensor No.1 or (K122) TP Sensor No.2 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3





P0121-THROTTLE POSITION SENSOR 1 PERFORMANCE (CONTINUED)

3. THROTTLE POSITION SENSOR

Turn the ignition off.

Connect the C2 PCM harness connector.

Ignition on, engine not running.

With a scan tool, monitor the TP Sensor No.1 and No.2 voltage.

Connect a jumper wire between the (K922) Sensor Return circuit and the (K22) TP Sensor No.1 Signal circuit.

NOTE: TP Sensor No.1 voltage should change from approximately 4.5 volts to less than 0.5 of a volt.

For TP Sensor No.2, connect a jumper wire between (F855) 5-volt supply circuit and the (K122) TP Sensor No.2 signal circuit.

NOTE: TP Sensor No.2 voltage should change from approximately 0 volts to 5.0 volts?

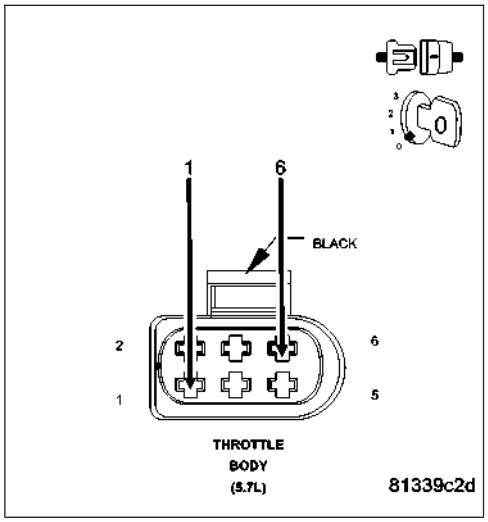
Is the voltage reading within the listed specification when the jumper wire is installed?

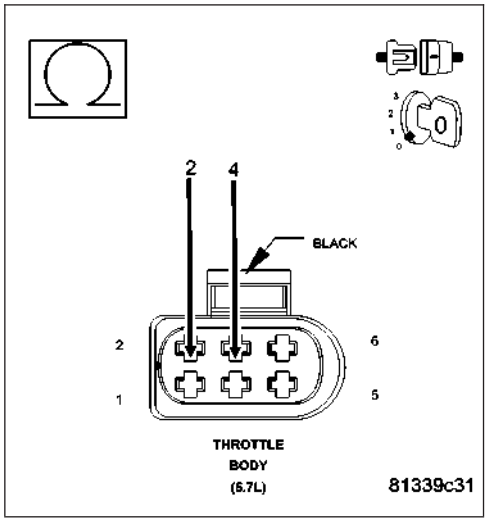
Yes >> Replace the Throttle Body Assembly. Disconnect the Battery when replacing the Throttle Body Assembly. After installation is complete, use a scan tool and select the ETC RELEARN function.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

NOTE: Remove the jumper wire before continuing.





P0121-THROTTLE POSITION SENSOR 1 PERFORMANCE (CONTINUED)

4. EXCESSIVE RESISTANCE IN THE (K22) TP SENSOR NO.1 SIGNAL CIRCUIT AND (K122) TP SENSOR NO.2 SIGNAL CIRCUIT

Turn the ignition off.

Disconnect the C2 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K22) TP Sensor No.1 Signal circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.

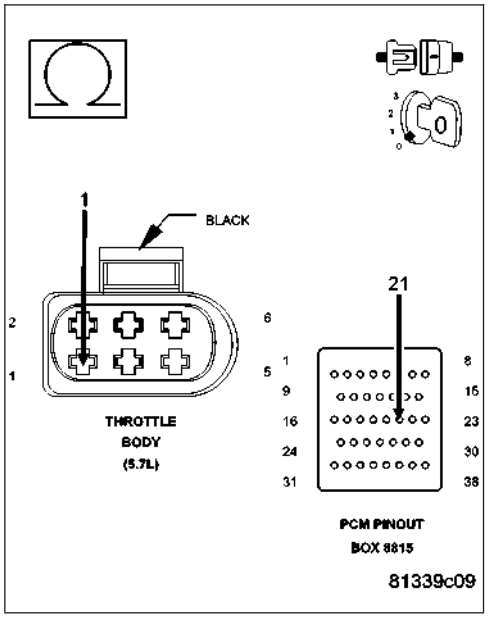
Measure the resistance of the (K122) TP Sensor No.2 Signal circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.

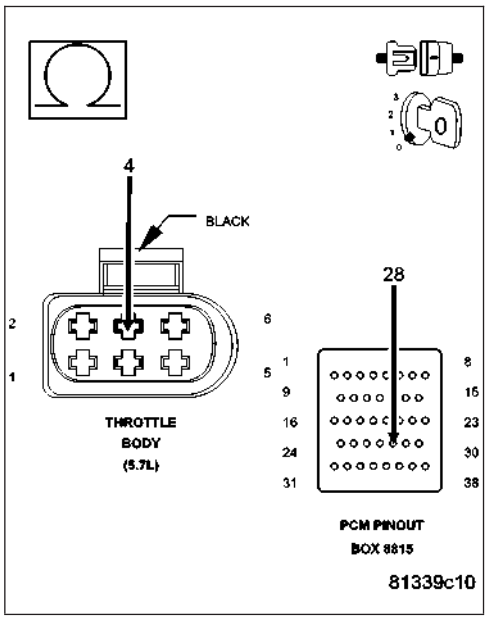
Is the resistance below 5.0 ohms for each circuit?

Yes >> Go To 5

No >> Repair the excessive resistance in the (K22) TP Sensor No.1 Signal circuit or the (K122) TP Sensor No.2 Signal circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

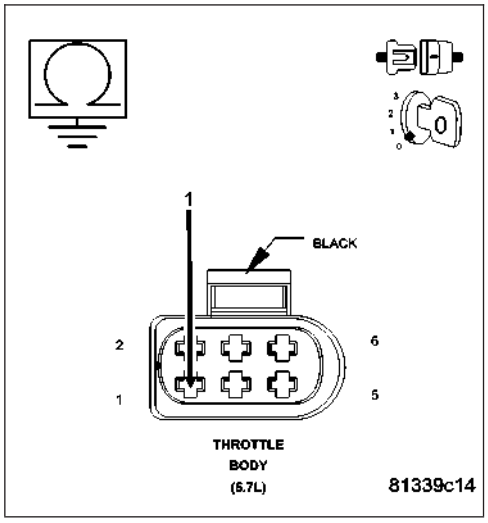




P0121-THROTTLE POSITION SENSOR 1 PERFORMANCE (CONTINUED)

5. (K22) TP SENSOR NO.1 SIGNAL CIRCUIT OR (K122) TP SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO GROUND

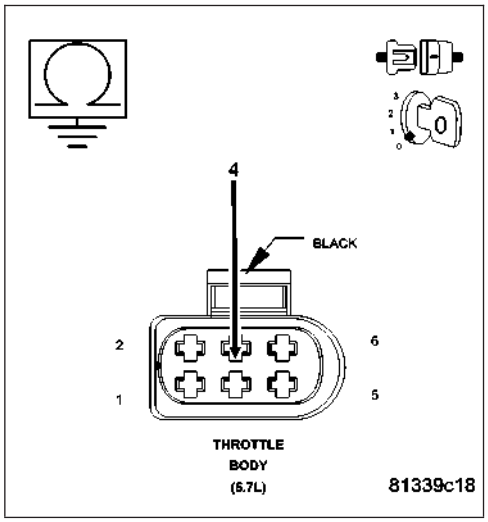
Measure the resistance between ground and the (K22) TP Sensor No.1 Signal circuit and the (K122) TP Sensor No.2 Signal circuit in Throttle Body harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K22) TP Sensor No.1 Signal circuit or the (K122) TP Sensor No.2 Signal circuit. Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

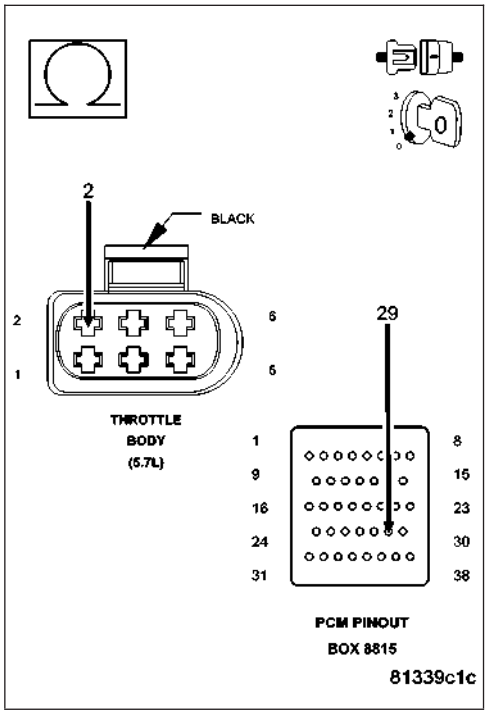
No >> Go To 6



P0121-THROTTLE POSITION SENSOR 1 PERFORMANCE (CONTINUED)

6. EXCESSIVE RESISTANCE IN THE (F855) 5–VOLT SUPPLY CIRCUIT

Measure the resistance of the (F855) 5-volt Supply circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

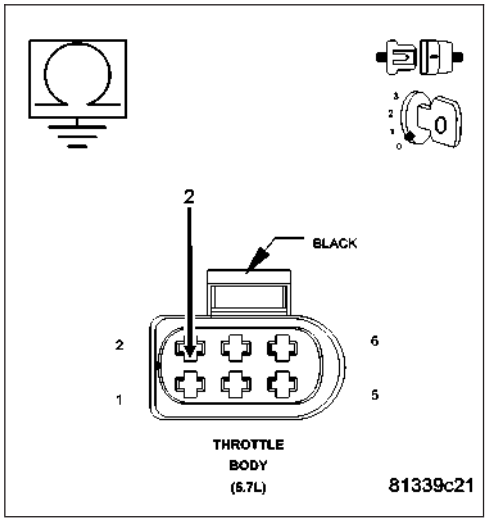
Yes >> Go To 7

No >> Repair the excessive resistance in the (F855) 5-volt Supply circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

7. (F855) 5-VOLT SUPPLY SHORTED TO GROUND

Measure the resistance between ground and the (F855) 5-volt Supply circuit in the Throttle Body harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (F855) 5-volt Supply circuit.

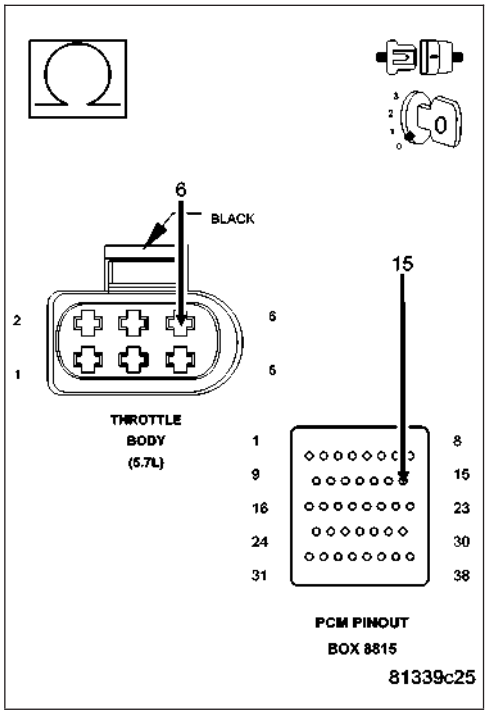
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8

P0121-THROTTLE POSITION SENSOR 1 PERFORMANCE (CONTINUED)

8. EXCESSIVE RESISTANCE IN THE (K922) SENSOR RETURN CIRCUIT

Measure the resistance of the (K922) Sensor Return circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.



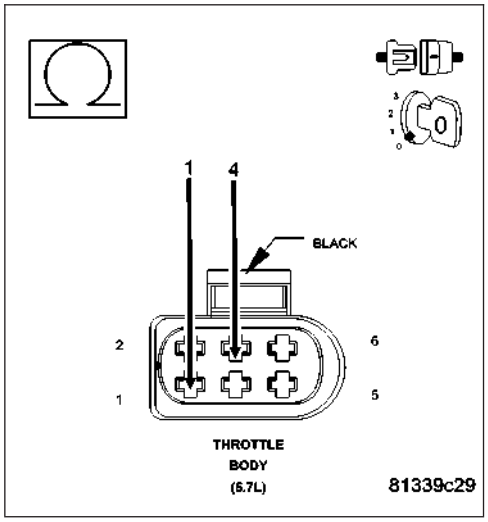
Is the resistance below 5.0 ohms?

Yes >> Go To 9

No >> Repair the excessive resistance in the (K922) Sensor Return circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

9. (K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO THE (K122) TP SENSOR NO.2 SIGNAL CIRCUIT

Measure the resistance between the (K22) TP Sensor No.1 Signal circuit and the (K122) TP Sensor No.2 Signal circuit in the Throttle Body harness connector.



Is the resistance below 5.0 ohms?

Yes >> Repair the short between the (K122) TP Sensor No.2 Signal circuit and the (K22) TP Sensor No.1 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 10

P0121-THROTTLE POSITION SENSOR 1 PERFORMANCE (CONTINUED)

10. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

11. THROTTLE FOLLOWER TEST

Ignition on, engine not running.

With a scan tool, perform the Throttle Follower Test and monitor the TP Sensor No.1 or No.2 voltage.

Slowly press the throttle pedal down.

The voltage for TP Sensor No.1 should start at approximately 0.3 of a volt and increase to above 4.7 volts.

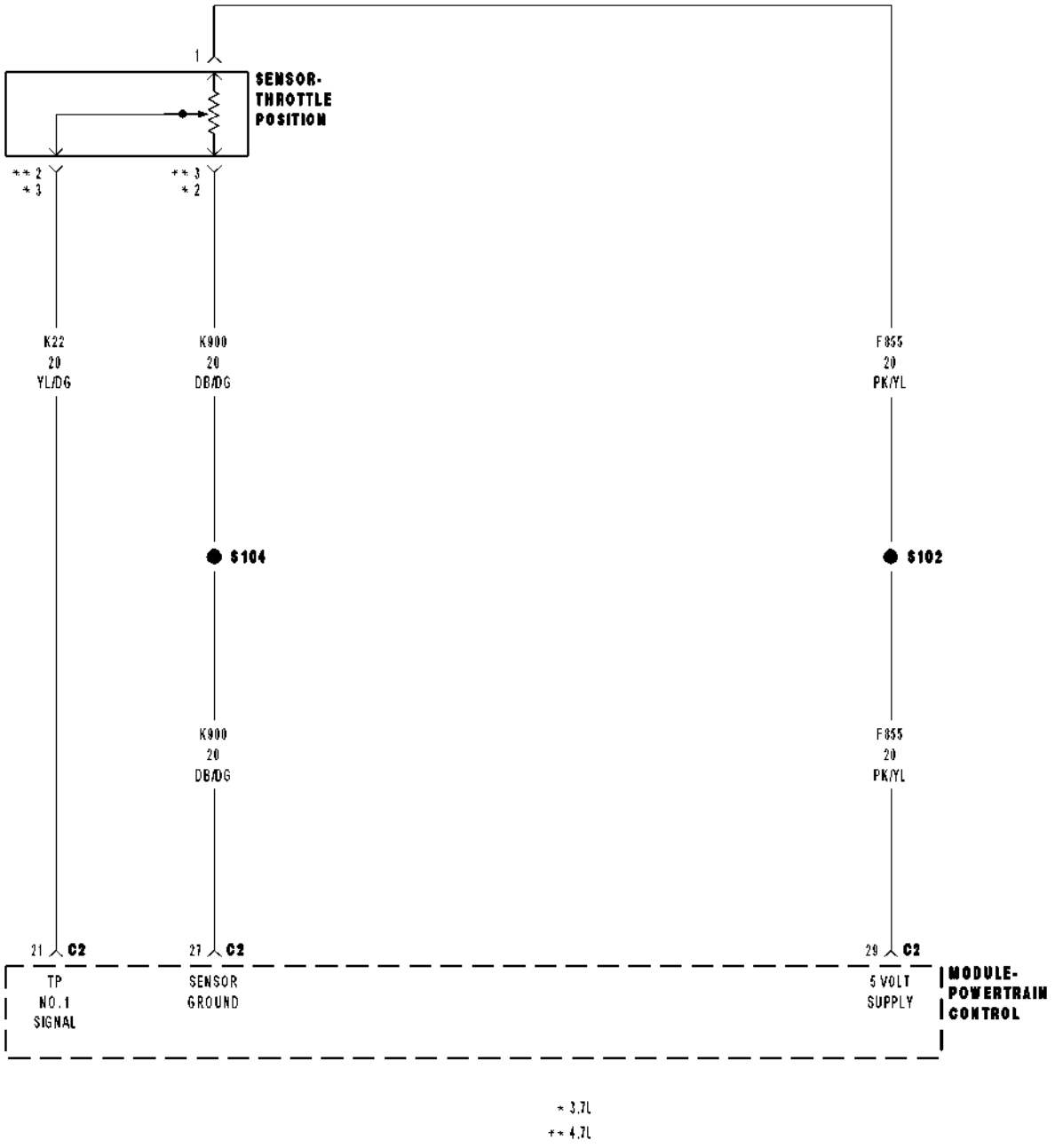
The voltage for TP Sensor No.2 should start at approximately 4.7 volts and decrease to approximately 0.3 of a volt.

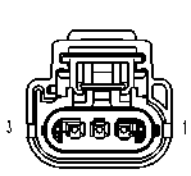
Is the voltage within the range of the listed specification for the appropriate Sensor?

Yes >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

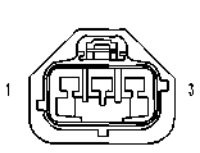
No >> Disconnect the Battery when replacing the Throttle Body Assembly. Replace the Throttle Body Assembly. After installation is complete, use a scan tool and select the ETC RELEARN function.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0122-THROTTLE POSITION SENSOR 1 CIRCUIT LOW (3.7L, 4.7L)

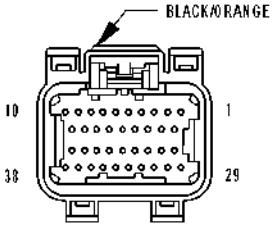




SENSOR-
THROTTLE
POSITION
(3.7L)



SENSOR-
THROTTLE
POSITION
(4.7L)



MODULE-
POWERTRAIN
CONTROL C2

P0122-THROTTLE POSITION SENSOR 1 CIRCUIT LOW (3.7L, 4.7L) (CONTINUED)

For the Engine System Schematic circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. Battery voltage greater than 10.4 volts.
- **Set Condition:**
  Throttle Position Sensor voltage at the PCM is less than 0.0978 of a volt for 1.3 seconds. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(F855) 5-VOLT SUPPLY CIRCUIT OPEN
(F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO GROUND
(K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT
THROTTLE POSITION SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. THROTTLE POSITION SENSOR VOLTAGE BELOW 0.098 OF A VOLT

Ignition on, engine not running.

With a scan tool, read the TP Sensor voltage.

Is the voltage below 0.098 of a volt?

Yes >> Go To 2

No >> Go To 9

---

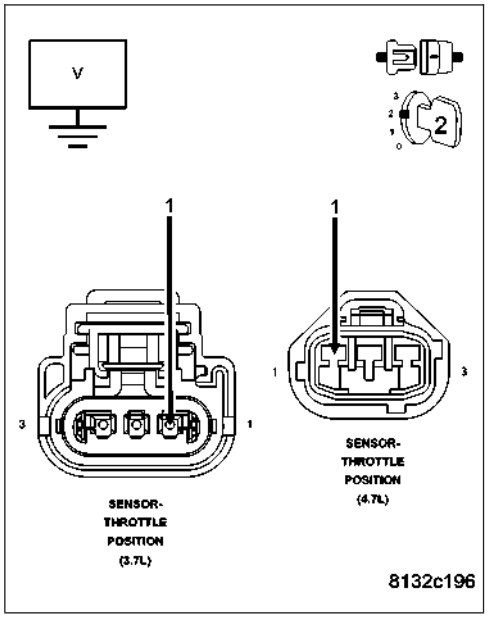
2. (F855) 5-VOLT SUPPLY CIRCUIT

Turn the ignition off.

Disconnect the TP Sensor harness connector.

Ignition on, engine not running.

Measure the voltage on the (F855) 5-volt Supply circuit in the TP Sensor harness connector.



Is the voltage between 4.5 to 5.2 volts?

Yes >> Go To 3

No >> Go To 6

P0122-THROTTLE POSITION SENSOR 1 CIRCUIT LOW (3.7L, 4.7L) (CONTINUED)

3. THROTTLE POSITION SENSOR

With the a scan tool, monitor the TP Sensor voltage with the Sensor harness connector disconnected.

Is the voltage above 4.5 volts?

Yes >> Replace the Throttle Position Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

---

4. (K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

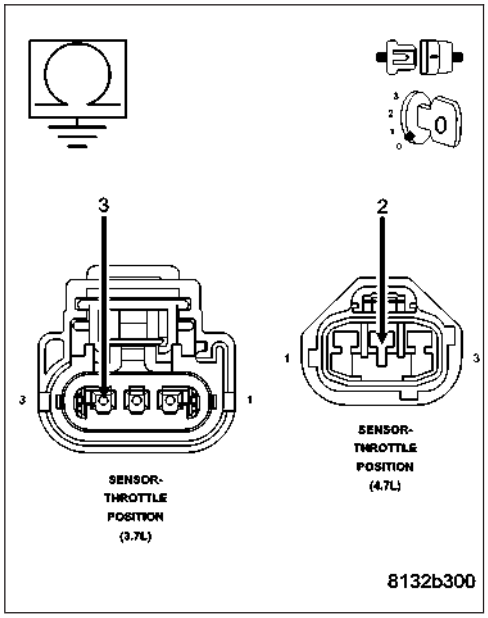
Disconnect the C2 PCM harness connector.

Measure the resistance between ground and the (K22) TP Sensor No.1 Signal circuit in the TP Sensor harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K22) TP Sensor No.1 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5



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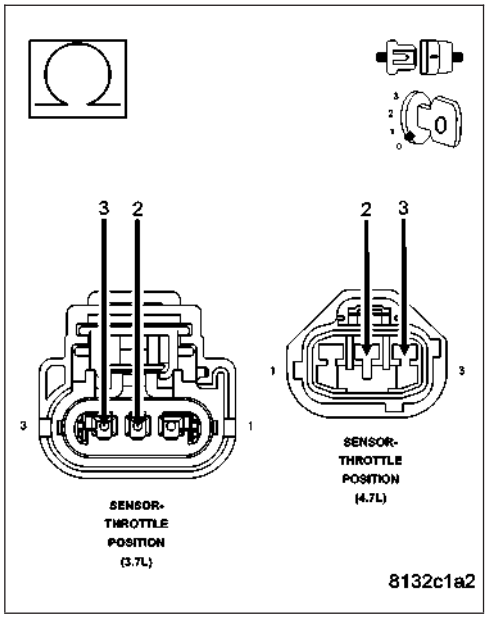
5. (K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT

Measure the resistance between the (K22) TP Sensor No.1 Signal circuit and the (K900) Sensor ground circuit in the TP Sensor harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the short between the (K900) Sensor ground and the (K22) TP Sensor No.1 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8



P0122-THROTTLE POSITION SENSOR 1 CIRCUIT LOW (3.7L, 4.7L) (CONTINUED)

6. (F855) 5-VOLT SUPPLY CIRCUIT OPEN

Turn the ignition off.

Disconnect the C2 PCM harness connector.

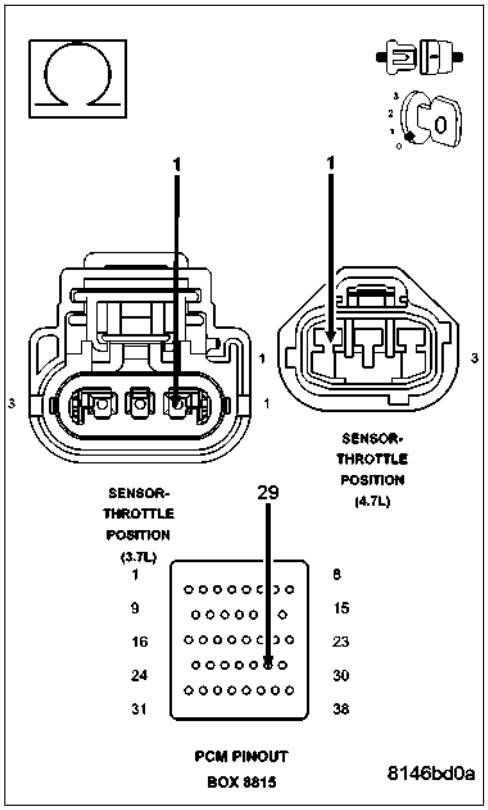
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (F855) 5-volt Supply circuit from the TP Sensor harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 7

No >> Repair the open in the (F855) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



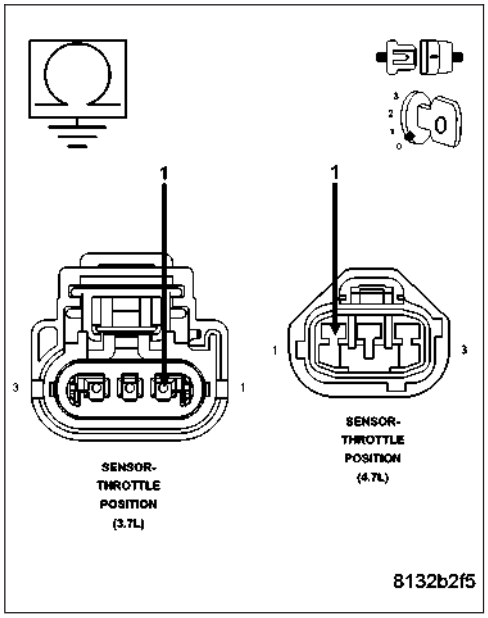
7. (F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (F855) 5-volt Supply circuit in the TP Sensor harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (F855) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8



P0122-THROTTLE POSITION SENSOR 1 CIRCUIT LOW (3.7L, 4.7L) (CONTINUED)

8. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

9. THROTTLE POSITION SENSOR SWEEP

With a scan tool, monitor the Throttle Position Sensor voltage.

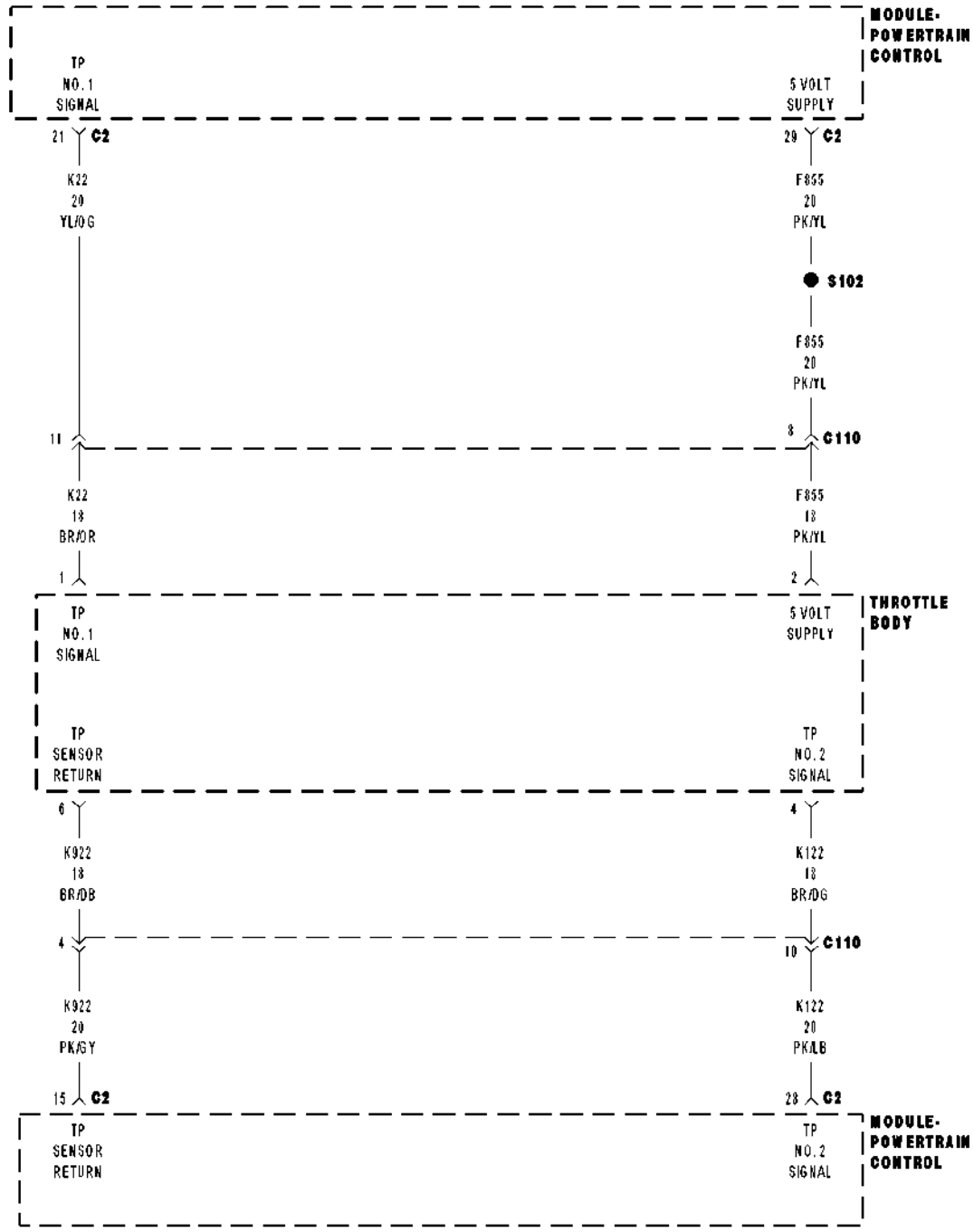
Slowly open the throttle from the idle position to the wide open throttle position.

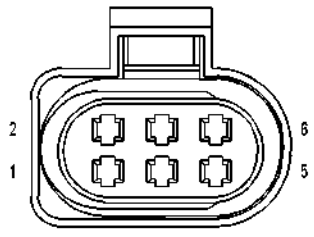
Does voltage start at approximately 0.8 of a volt and go above 3.5 volts with a smooth transition?

Yes >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

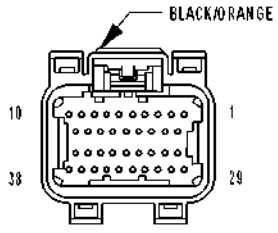
No >> Replace the Throttle Position Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0122-THROTTLE POSITION SENSOR 1 CIRCUIT LOW (5.7L)





THROTTLE
BODY



MODULE-
POWERTRAIN
CONTROL C2

B1492b1b

P0122-THROTTLE POSITION SENSOR 1 CIRCUIT LOW (5.7L) (CONTINUED)

For the Engine System Schematic circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. Battery voltage greater than 10 volts.
- **Set Condition:**
  Throttle Position Sensor voltage at the PCM is less than 0.16 of a volt for 0.7 of a second. One Trip Fault. Three good trips to turn off the MIL. ETC light will illuminate.

Possible Causes
(F855) 5-VOLT SUPPLY CIRCUIT OPEN
(F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO GROUND
(K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO THE (K922) SENSOR RETURN CIRCUIT
THROTTLE POSITION SENSOR/THROTTLE BODY
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: If a 5-Volt Supply DTC has also set, diagnose the 5-Volt DTC before continuing.
Ignition on, engine not running.
With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2
No >> Go To 10

---

2. P0222 ALSO SET

Was the P0222-TP SENSOR NO.2 VOLTAGE LOW DTC set along with the P0122?

Yes >> Go To 3
No >> Go To 4

P0122-THROTTLE POSITION SENSOR 1 CIRCUIT LOW (5.7L) (CONTINUED)

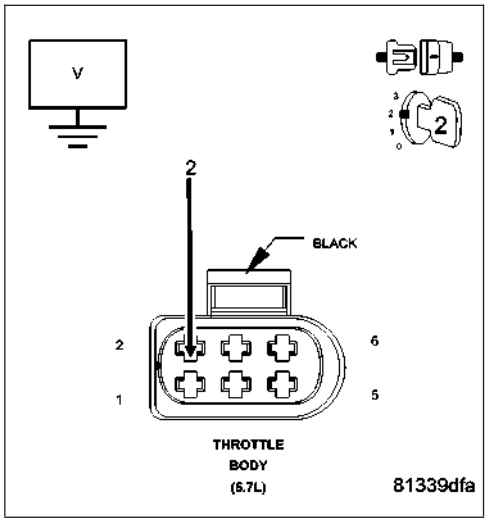
3. (F855) 5-VOLT SUPPLY CIRCUIT

Turn the ignition off.

Disconnect the Throttle Body harness connector.

Ignition on, engine not running.

Measure the voltage on the (F855) 5-volt Supply circuit in the Throttle Body harness connector.



Is the voltage between 4.8 to 5.2 volts?

Yes >> Go To 4

No >> Go To 7

4. THROTTLE POSITION SENSOR

With a scan tool, monitor the TP Sensor No.1 voltage with the Sensor harness connector disconnected.

Is the voltage above 4.5 volts?

Yes >> Disconnect the Battery when replacing the Throttle Body Assembly. Replace the Throttle Body Assembly. After installation is complete, using a scan tool select the ETC RELEARN function.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

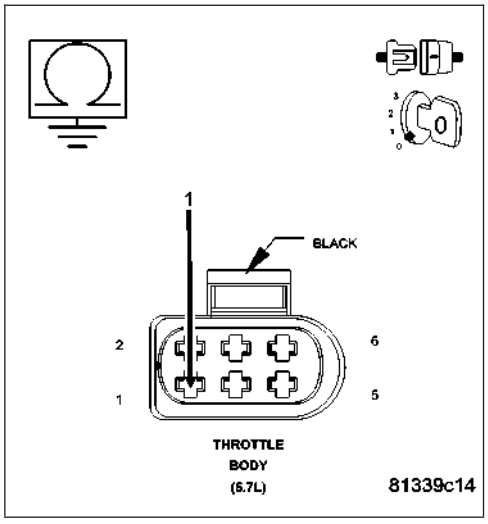
No >> Go To 5

5. (K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the C2 PCM harness connector.

Measure the resistance between ground and the (K22) TP Sensor No.1 Signal circuit in the Throttle Body harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K22) TP Sensor No.1 Signal circuit.

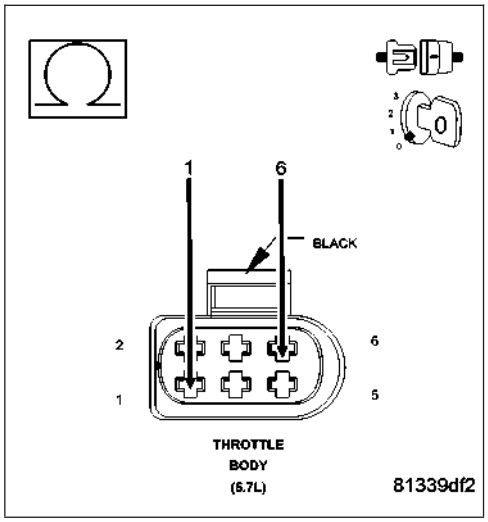
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6

P0122-THROTTLE POSITION SENSOR 1 CIRCUIT LOW (5.7L) (CONTINUED)

6. (K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO THE (K922) SENSOR RETURN CIRCUIT

Measure the resistance between the (K22) TP Sensor No.1 Signal circuit and the (K922) Sensor Return circuit in the Throttle Body harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short between the (K922) Sensor Return circuit and the (K22) TP Sensor No.1 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 9

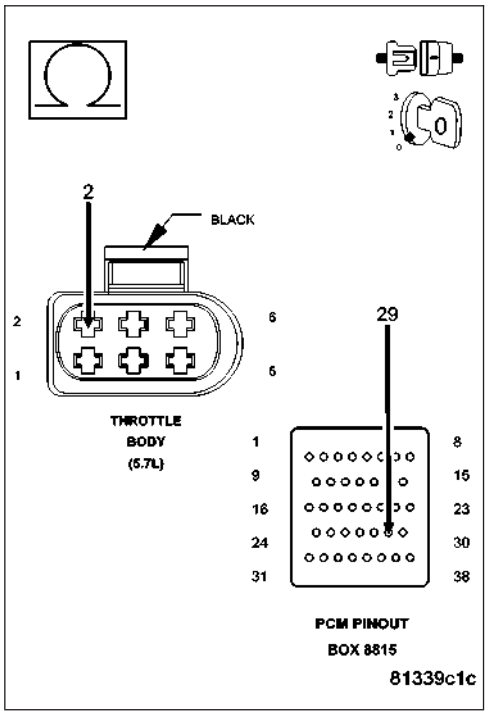
7. (F855) 5-VOLT SUPPLY CIRCUIT OPEN

Turn the ignition off.

Disconnect the C2 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnostics.

Measure the resistance of the (F855) 5-volt Supply circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

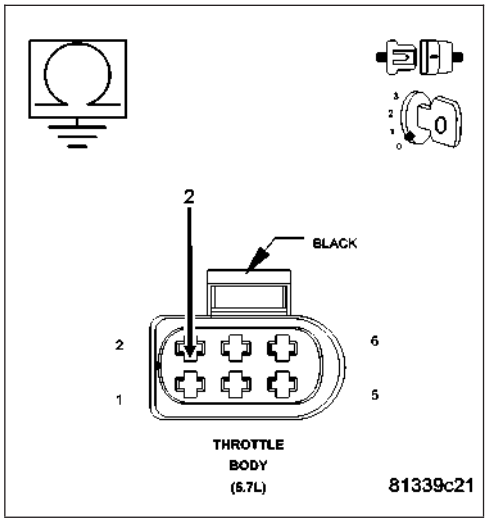
Yes >> Go To 8

No >> Repair the open in the (F855) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0122-THROTTLE POSITION SENSOR 1 CIRCUIT LOW (5.7L) (CONTINUED)

8. (F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (F855) 5-volt Supply circuit in the Throttle Body harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (F855) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 9

---

9. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

10. THROTTLE FOLLOWER TEST

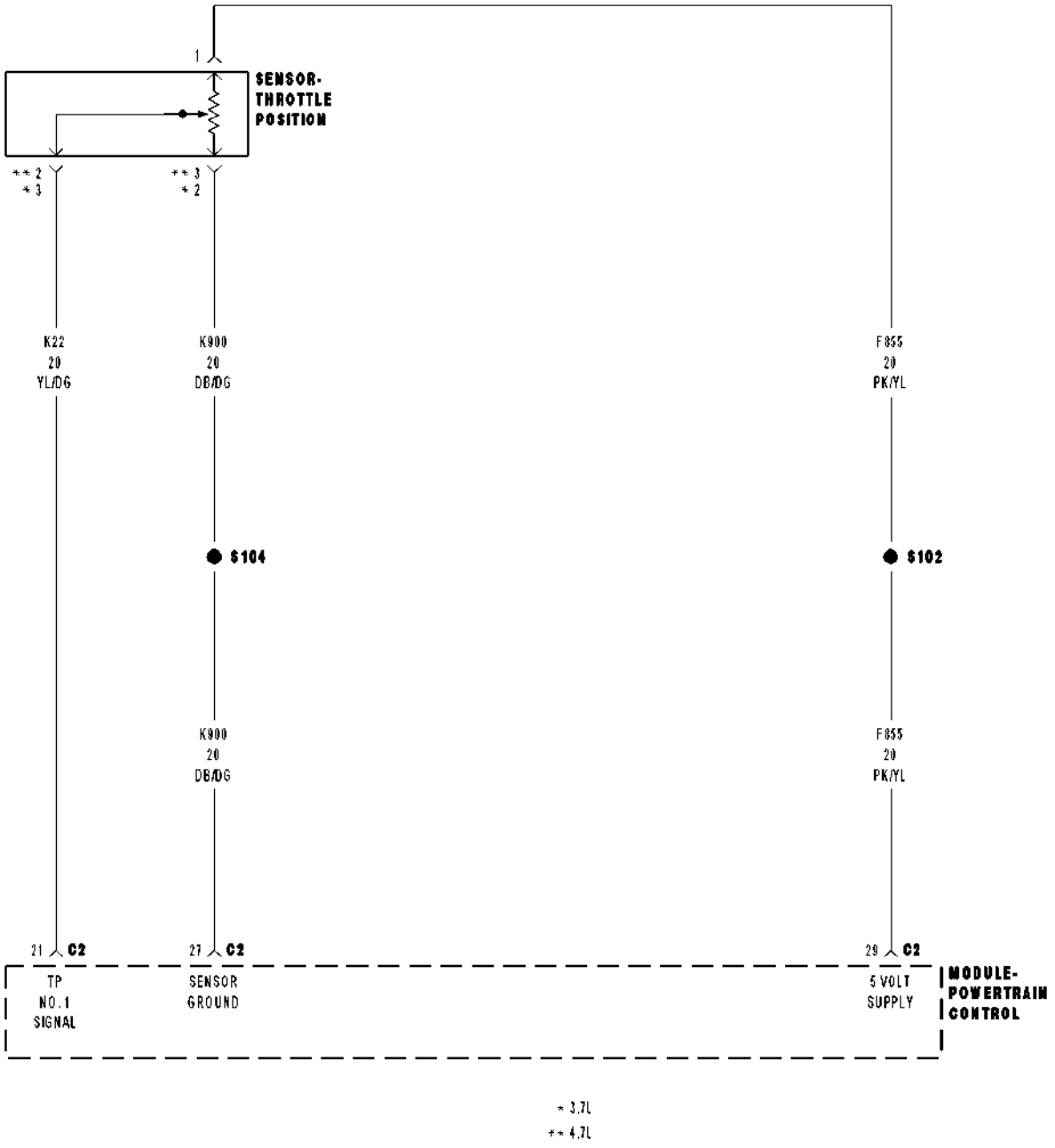
With a scan tool, perform the Throttle Follower Test.
Monitor the TP Sensor No.1 voltage.

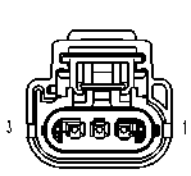
Does voltage start at approximately 0.8 of a volt and go above 3.5 volts with a smooth transition?

Yes >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

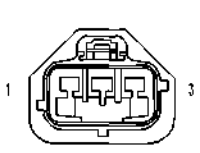
No >> Disconnect the Battery when replacing the Throttle Body Assembly. Replace the Throttle Body Assembly. After installation is complete, using a scan tool select ETC RELEARN function.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0123-THROTTLE POSITION SENSOR 1 CIRCUIT HIGH (3.7L, 4.7L)

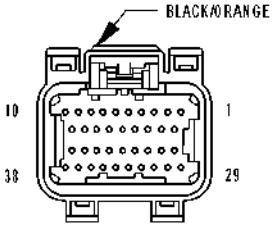




SENSOR-
THROTTLE
POSITION
(3.7L)



SENSOR-
THROTTLE
POSITION
(4.7L)



MODULE-
POWERTRAIN
CONTROL C2

P0123-THROTTLE POSITION SENSOR 1 CIRCUIT HIGH (3.7L, 4.7L) (CONTINUED)

For the Engine System Schematic circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. Battery voltage greater than 10.4 volts.
- **Set Condition:**
  Throttle Position Sensor voltage at the PCM is greater than 4.47 volts for 1.3 seconds. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K22) TP SENSOR NO.1 SIGNAL CIRCUIT OPEN
(K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO THE (F855) 5-VOLT SUPPLY CIRCUIT
(K900) SENSOR GROUND CIRCUIT OPEN
THROTTLE POSITION SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. TP SENSOR VOLTAGE ABOVE 4.5 VOLTS

NOTE: Make sure the throttle is fully closed and free from binding or carbon build up.

Start the engine.

With a scan tool, read the TP Sensor voltage.

Is the voltage above 4.5 volts?

Yes >> Go To 2

No >> Go To 8

P0123-THROTTLE POSITION SENSOR 1 CIRCUIT HIGH (3.7L, 4.7L) (CONTINUED)

2. THROTTLE POSITION SENSOR

Turn the ignition off.

Disconnect the TP Sensor harness connector.

Connect a jumper wire between the (K22) TP Sensor No.1 Signal circuit and the (K900) Sensor ground circuit in the Sensor harness connector.

With a scan tool, monitor the TP Sensor voltage.

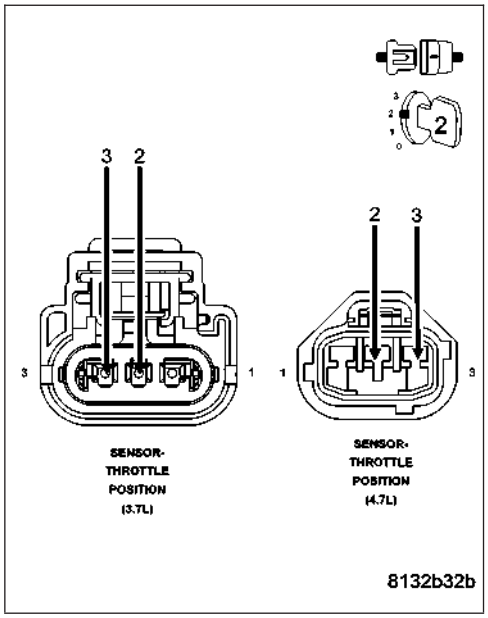
Ignition on, engine not running.

Is the voltage below 0.5 of a volt with the jumper wire installed?

Yes >> Replace the Throttle Position Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

NOTE: Remove the jumper wire before continuing.



3. (K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

Disconnect the C2 PCM harness connector.

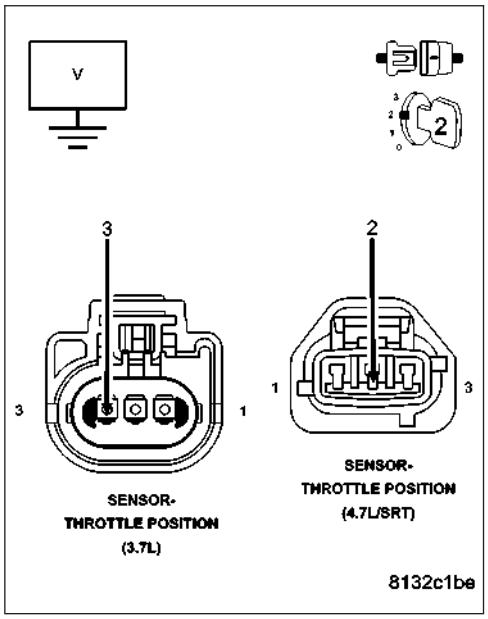
Ignition on, engine not running.

Measure the voltage on the (K22) TP Sensor No.1 Signal circuit in the TP Sensor harness connector.

Is the voltage above 0 volts?

Yes >> Repair the short to battery voltage in the (K22) TP Sensor No.1 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4



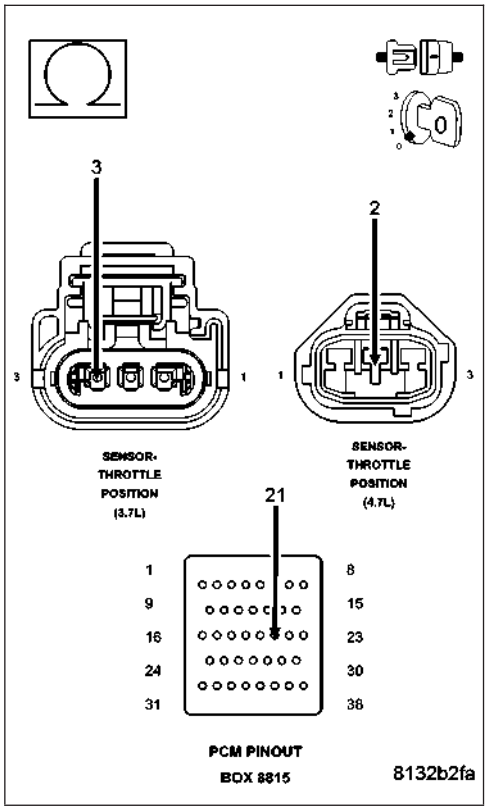
P0123-THROTTLE POSITION SENSOR 1 CIRCUIT HIGH (3.7L, 4.7L) (CONTINUED)

4. (K22) TP SENSOR NO.1 SIGNAL CIRCUIT OPEN

Turn the ignition off.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K22) TP Sensor No.1 Signal circuit from the TP Sensor harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

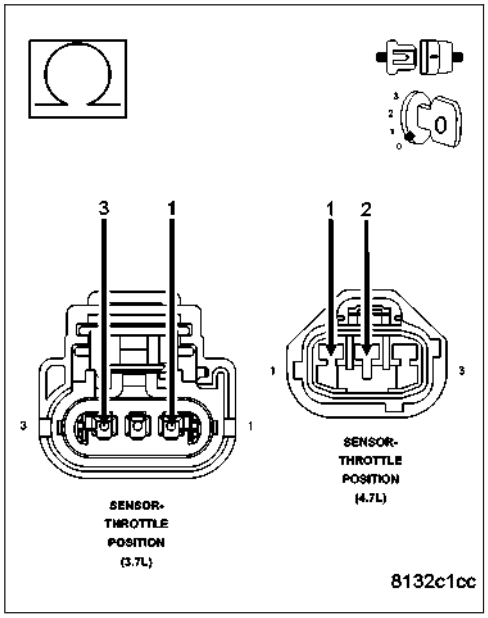
Yes >> Go To 5

No >> Repair the open in the (K22) TP Sensor No.1 Signal circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

5. (K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO THE (F855) 5-VOLT SUPPLY CIRCUIT

Measure the resistance between the (K22) TP Sensor No.1 Signal circuit and the (F855) 5-volt Supply circuit in the TP Sensor harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short between the (F855) 5-volt Supply circuit and the (K22) TP Sensor No.1 Signal circuit.

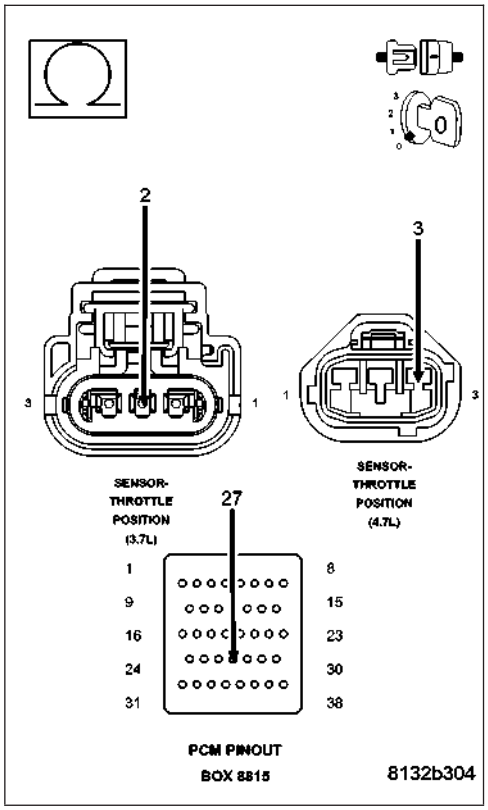
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6

P0123-THROTTLE POSITION SENSOR 1 CIRCUIT HIGH (3.7L, 4.7L) (CONTINUED)

6. (K900) SENSOR GROUND CIRCUIT OPEN

Measure the resistance of the (K900) Sensor ground circuit from the TP Sensor harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 7

No >> Repair the open in the (K900) Sensor ground circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

7. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

8. THROTTLE POSITION SENSOR SWEEP

With a scan tool, monitor the Throttle Position Sensor voltage.

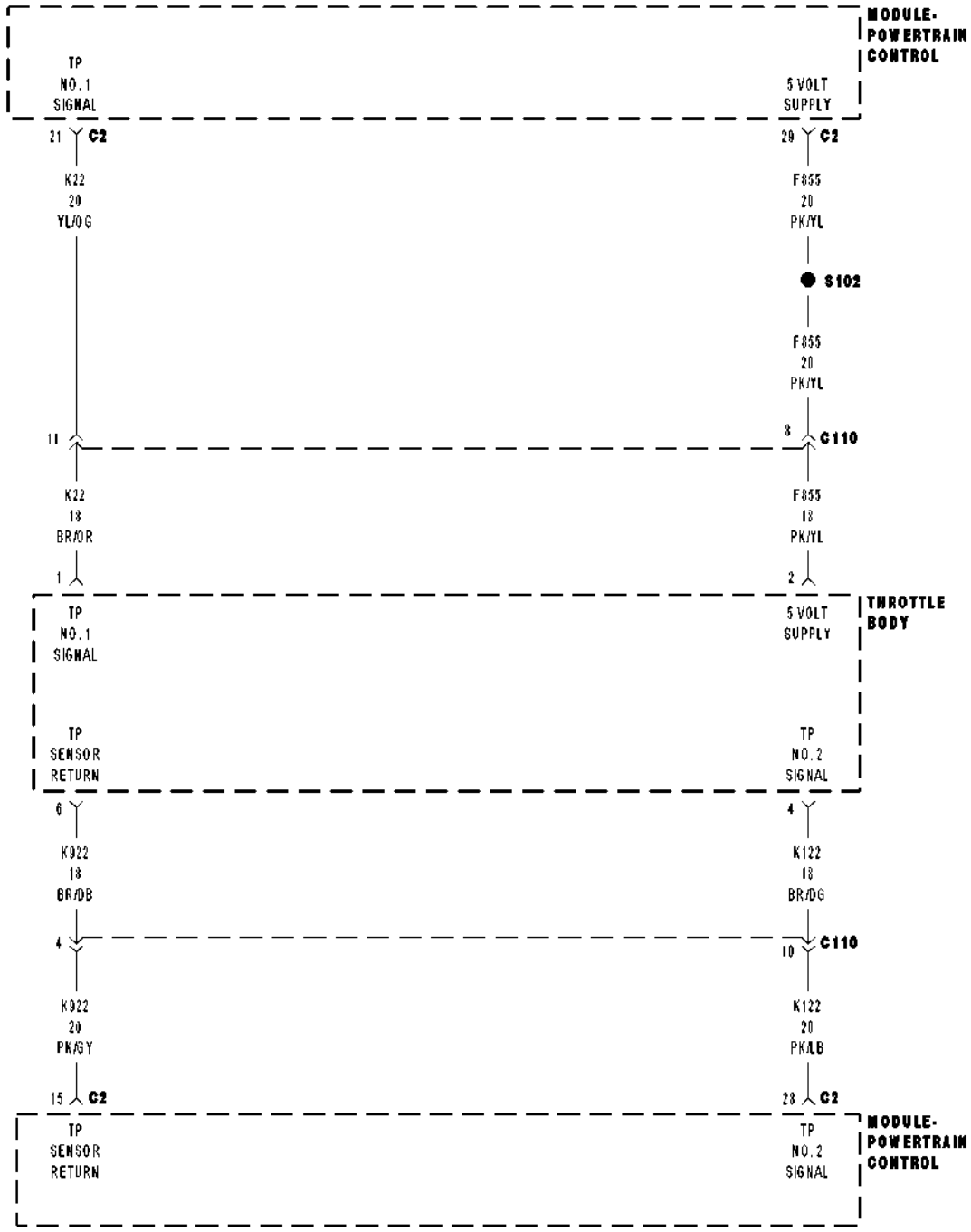
Slowly open the throttle from the idle position to the wide open throttle position.

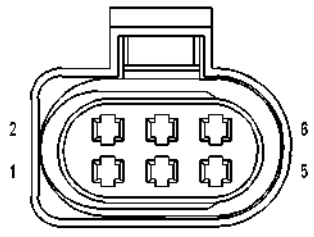
Does voltage start at approximately 0.8 of a volt and go above 3.5 volts with a smooth transition?

Yes >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

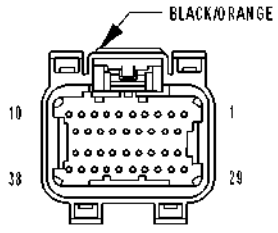
No >> Replace the Throttle Position Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0123-THROTTLE POSITION SENSOR 1 CIRCUIT HIGH (5.7L)





THROTTLE
BODY



MODULE-
POWERTRAIN
CONTROL C2

B1492b1b

P0123-THROTTLE POSITION SENSOR 1 CIRCUIT HIGH (5.7L) (CONTINUED)

For the Engine System Schematic circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. Battery voltage greater than 10 volts.
- **Set Condition:**
  Throttle Position Sensor No.1 voltage is greater than 4.8 volts for 25 ms. One Trip Fault. 5.7L ETC light will illuminate.

Possible Causes
(K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K22) TP SENSOR NO.1 SIGNAL CIRCUIT OPEN
(K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO THE (F855) 5-VOLT SUPPLY CIRCUIT
(K922) SENSOR RETURN CIRCUIT OPEN
THROTTLE POSITION SENSOR/THROTTLE BODY
THROTTLE PLATE JAMMED AGAINST THE MAXIMUM STOP
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. TP SENSOR NO.1 VOLTAGE ABOVE 4.8 VOLTS

NOTE: Make sure the throttle is fully closed and free from binding or carbon build up.

NOTE: If a 5-Volt Supply DTC has also set, diagnose the 5-Volt DTC before continuing.

NOTE: If P2101 is also set, then make sure that the blade moves freely and does not hang up near Wide Open Throttle before trying to repair P0123.

Start the engine.

With a scan tool, read the TP Sensor No.1 voltage.

Is the voltage above 4.8 volts?

Yes >> Go To 2

No >> Go To 8

P0123-THROTTLE POSITION SENSOR 1 CIRCUIT HIGH (5.7L) (CONTINUED)

2. THROTTLE POSITION SENSOR

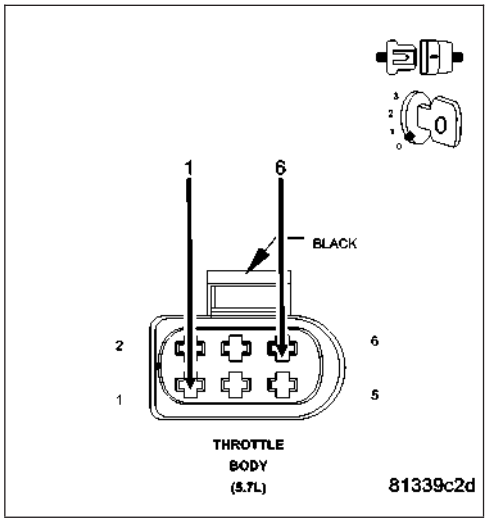
Turn the ignition off.

Disconnect the Throttle Body harness connector.

Connect a jumper wire between the (K22) TP Sensor No.1 Signal circuit and the (K922) Sensor Return circuit in the Throttle Body harness connector.

With a scan tool, monitor the TP Sensor No.1 voltage.

Ignition on, engine not running.



Is the voltage below 0.5 of a volt with the jumper wire installed?

Yes >> Disconnect the Battery when replacing the Throttle Body Assembly. Replace the Throttle Body Assembly. After installation is complete, using a scan tool, select the ETC RELEARN function.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

NOTE: Remove the jumper wire before continuing.

---

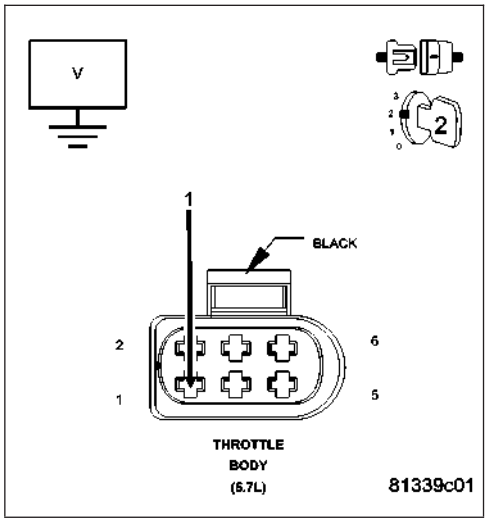
3. (K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

Disconnect the C2 PCM harness connector.

Ignition on, engine not running.

Measure the voltage on the (K22) TP Sensor No.1 Signal circuit in the Throttle Body harness connector.



Is the voltage above 0 volts?

Yes >> Repair the short to battery voltage in the (K22) TP Sensor No.1 Signal circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

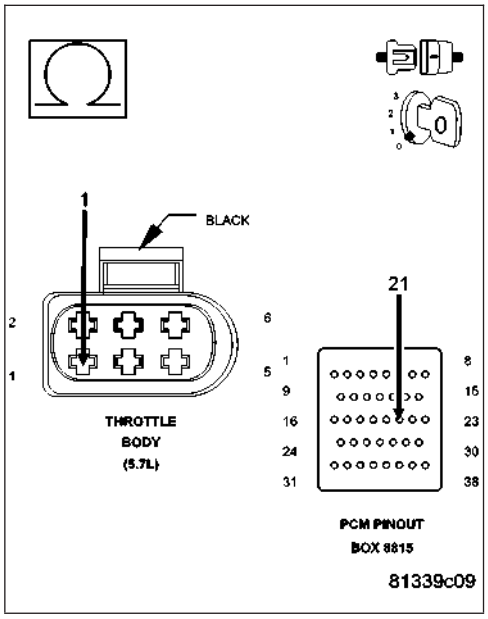
P0123-THROTTLE POSITION SENSOR 1 CIRCUIT HIGH (5.7L) (CONTINUED)

4. (K22) TP SENSOR NO.1 SIGNAL CIRCUIT OPEN

Turn the ignition off.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K22) TP Sensor No.1 Signal circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

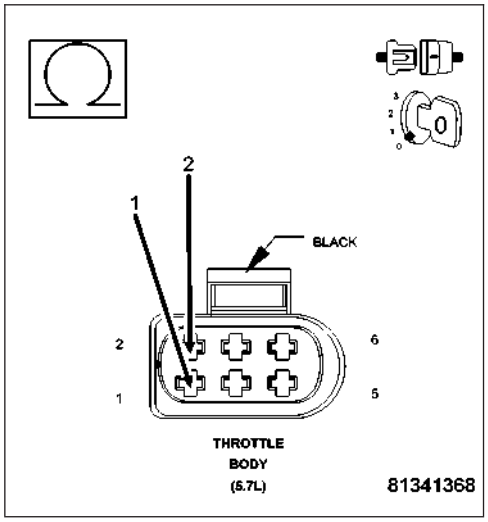
Yes >> Go To 5

No >> Repair the open in the (K22) TP Sensor No.1 Signal circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

5. (K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO THE (F855) 5-VOLT SUPPLY CIRCUIT

Measure the resistance between the (K22) TP Sensor No.1 Signal circuit and the (F855) 5-volt Supply circuit in the Throttle Body harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short between the (F855) 5-volt Supply circuit and the (K22) TP Sensor No.1 Signal circuit.

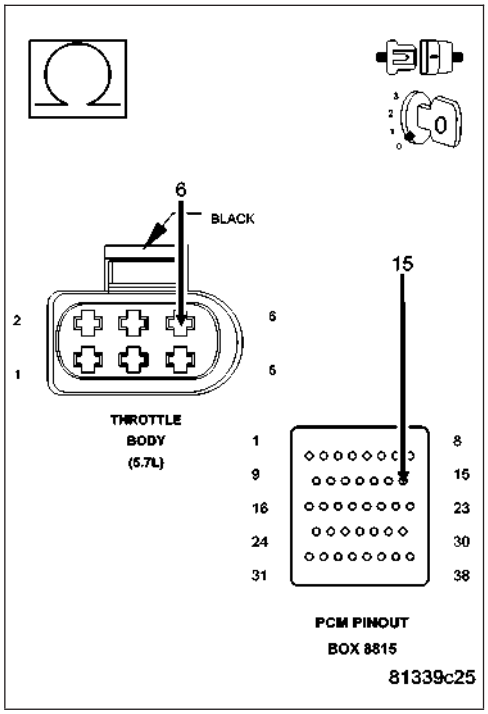
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6

P0123-THROTTLE POSITION SENSOR 1 CIRCUIT HIGH (5.7L) (CONTINUED)

6. (K922) SENSOR RETURN CIRCUIT OPEN

Measure the resistance of the (K922) Sensor Return circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 7

No >> Repair the open in the (K922) Sensor Return circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

7. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

8. THROTTLE FOLLOWER TEST

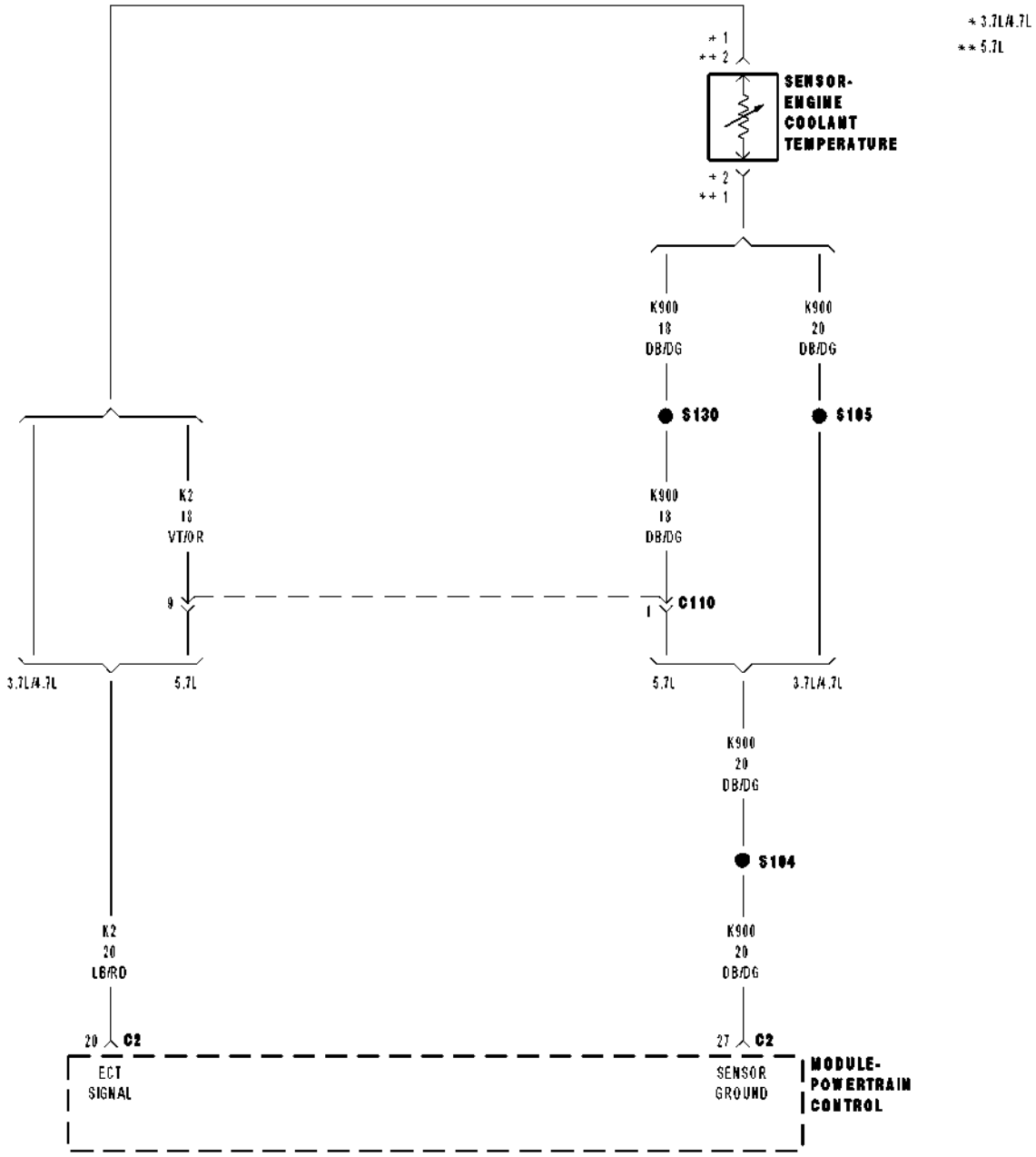
With a scan tool, perform the Throttle Follower Test.
Monitor the TP Sensor No.1 voltage.

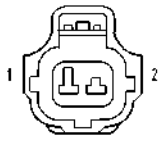
Does voltage start at approximately 0.3 of a volt and go above 4.7 volts with a smooth transition?

Yes >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

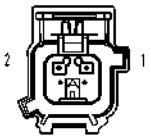
No >> Disconnect the Battery when replacing the Throttle Body Assembly. Replace the Throttle Body Assembly. After installation is complete, using a scan tool select the ETC RELEARN function.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0125-INSUFFICIENT COOLANT TEMP FOR CLOSED-LOOP FUEL CONTROL

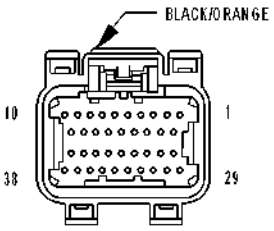




SENSOR-
ENGINE
COOLANT
TEMPERATURE
(3.7L/4.7L)



SENSOR-
ENGINE
COOLANT
TEMPERATURE
(5.7L)



MODULE-
POWERTRAIN
CONTROL C2

81492837

P0125-INSUFFICIENT COOLANT TEMP FOR CLOSED-LOOP FUEL CONTROL (CONTINUED)

For the Engine System circuit diagrams Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The engine coolant temperature sensor is a negative temperature coefficient thermistor-type sensor whose resistance varies inversely with temperature. At cold temperatures the sensor resistance is high so the voltage is high. As the coolant temperature increases the resistance decreases and the voltage becomes low. The INSUFFICIENT COOLANT TEMP FOR CLOSED-LOOP FUEL CONTROL determines if the engine coolant temperature will reach the closed loop fueling control temperature limit in a regulated time after start.

- **When Monitored:**
  With battery voltage greater than 10.4 volts and after engine is started.
- **Set Condition:**
  The engine temperature does not go above -10°C (15°F). Failure time depends on start-up coolant temperature and ambient temperature. (i.e. 2 minutes for a start temp of -10°C (15°F) or up to 10 minutes for a vehicle with a start-up temp of -28°C (5°F). Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
LOW COOLANT LEVEL
THERMOSTAT
ECT SENSOR

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. CHECKING COOLANT LEVEL AND CONDITION

Ignition on, engine not running.

With a scan tool, read DTCs.

NOTE: If an Engine Coolant Temperature (ECT) DTC is set along with this code, diagnose the ECT DTC first.

NOTE: Inspect the ECT terminals and related PCM terminals. Make sure the terminals are free from corrosion and damage.

NOTE: The best way to diagnose this DTC is to allow the vehicle to sit overnight outside in order to have a totally cold soaked engine.

NOTE: Extremely cold outside ambient temperatures may have caused this DTC to set.

WARNING: Never open the cooling system when the engine is hot. The system is under pressure. Extreme burns or scalding may result. Failure to follow these instructions can result in personal injury or death. Allow the engine to cool before opening the cooling system.

Inspect the coolant system for proper level and condition.

Is the coolant level and condition OK?

Yes >> Go To 2

No >> Inspect the vehicle for a coolant leak, make the appropriate repairs, and add the correct amount of coolant.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0125-INSUFFICIENT COOLANT TEMP FOR CLOSED-LOOP FUEL CONTROL (CONTINUED)

2. THERMOSTAT OPERATION

NOTE: This test works best if performed on a cold engine (cold soak)
Ignition on, engine not running.

With a scan tool, read the Eng Coolant Tmp Deg value. If the engine was allowed to sit overnight (cold soak), the temperature value should be a sensible value that is somewhere close to the ambient temperature.

NOTE: If engine coolant temperature is above 82°C (180°F), allow the engine to cool until 65°C (150°F) is reached.
Start the Engine.

During engine warm-up monitor the Eng Coolant Tmp Deg value. The temp deg value change should be a smooth transition from start up to normal operating temp 82°C (180°F). Also monitor the actual coolant temperature with a thermometer.

NOTE: As the engine warms up to operating temperature, the actual coolant temperature (thermometer reading) and the scan tool Eng Coolant Tmp Deg values should stay relatively close to each other.
Using the appropriate service information, determine the proper opening temperature of the thermostat.

Did the thermostat open at the proper temperature?

Yes >> Go To 3

No >> Replace the thermostat.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

3. ECT SENSOR OPERATION

Ignition on, engine not running.

With a scan tool, read the Eng Coolant Tmp Deg value. If the engine was allowed to sit overnight (cold soak), the temperature value should be a sensible value that is somewhere close to the ambient temperature.

NOTE: If engine coolant temperature is above 82°C (180°F), allow the engine to cool until 65°C (150°F) is reached.
Start the Engine.

During engine warm-up monitor the Eng Coolant Tmp Deg value. The temp deg value change should be a smooth transition from start up to normal operating temp 82°C (180°F). Also monitor the actual coolant temperature with a thermometer.

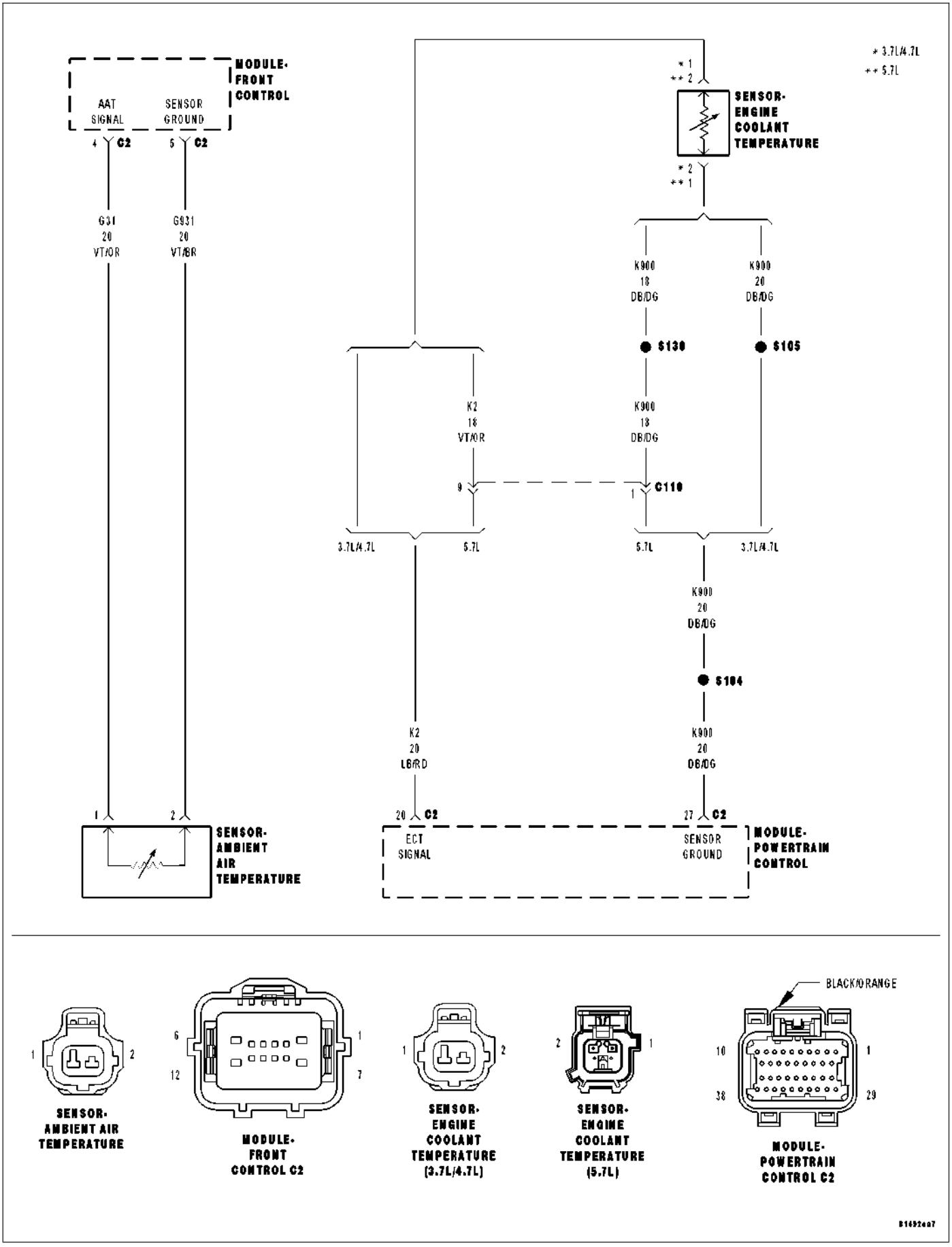
NOTE: As the engine warms up to operating temperature, the actual coolant temperature (thermometer reading) and the scan tools Eng Coolant Tmp Deg value should stay relatively close to each other.

Is the thermometer reading relatively close to the scan tool ECT reading?

Yes >> Test Complete.

No >> Replace the Engine Coolant Temperature Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0128-THERMOSTAT RATIONALITY



P0128-THERMOSTAT RATIONALITY (CONTINUED)

For the Engine circuit diagrams (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The PCM predicts what the engine coolant temperature should be, based on the engine coolant temperature at start-up, ambient temperature and how the vehicle is subsequently driven. The predicted engine coolant temperature is compared to the Engine Coolant Temperature Sensor reading. The error between the two is calculated and integrated with respect to time. When the Thermostat diagnostic runs, the integrated error is compared to a calibrated threshold and pass/fail is determined. Separate pass and fail thresholds are used in order to improve accuracy of the diagnostic.

- **When Monitored:**
  Engine running.
- **Set Condition:**
  The PCM predicts a coolant temperature value that it will compare to the actual coolant temperature. A significant difference results in an error. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
LOW COOLANT LEVEL
THERMOSTAT OPERATION
SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
TEMPERATURE SENSOR
SIGNAL CIRCUIT OPEN
(K900) SENSOR GROUND CIRCUIT OPEN
SIGNAL CIRCUIT SHORTED TO GROUND
SIGNAL CIRCUIT SHORTED TO (K900), (G931) SENSOR GROUND
OTHER POSSIBLE CAUSES
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: If any ECT, AAT, CMP or CKP sensor DTCs have set along with P0128, diagnose them before continuing.

NOTE: Make sure that the Pinion Factor has been programmed correctly into the PCM.

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0128-THERMOSTAT RATIONALITY (CONTINUED)

2. LOW COOLANT LEVEL

NOTE: If an Engine Coolant Temperature (ECT) DTC is set along with this code, diagnose the ECT DTC first.

NOTE: Inspect the ECT terminals and related PCM terminals. Make sure the terminals are free from corrosion and damage.

NOTE: The best way to diagnose this DTC is to allow the vehicle to sit overnight outside in order to have a totally cold soaked engine.

NOTE: Extremely cold outside ambient temperatures may have caused this DTC to set.

WARNING: Never open the cooling system when the engine is hot. The system is under pressure. Failure to follow these instructions can result in personal injury including extreme burns, scalding, or death. Allow the engine to cool before opening the cooling system.

Check the coolant system to make sure that the coolant is in good condition and at the proper level.

Is the coolant level and condition OK?

Yes >> Go To 3

No >> Inspect the vehicle for a coolant leak and add the necessary amount of coolant.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

3. THERMOSTAT OPERATION

NOTE: This test works best if performed on a cold engine (cold soak).

Ignition on, engine not running.

With a scan tool, read the ECT Deg value. If the engine was allowed to sit overnight (cold soak), the temperature value should be a sensible value that is somewhere close to the ambient temperature.

NOTE: If engine coolant temperature is above 82°C (180°F), allow the engine to cool until 65°C (150°F) is reached.

Start the Engine.

During engine warm-up, monitor the ECT Deg value. The temp deg value change should be a smooth transition from start up to normal operating temp 82°C (180°F). Also monitor the actual coolant temperature with a thermometer.

NOTE: As the engine warms up to operating temperature, the actual coolant temperature (thermometer reading) and the scan tool, ECT Temperature value should stay relatively close to each other.

Using the appropriate service information, determine the proper opening temperature of the thermostat.

Did the thermostat open at the proper temperature?

Yes >> Go To 4

No >> Replace the thermostat.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

4. AMBIENT AIR TEMP SENSOR OPERATION

Ignition on, engine not running.

With a scan tool, read and record the AAT Sensor Temperature value.

Using the DRB Temperature Probe #CH7050, or an equivalent temperature measuring tool, measure the ambient air temperature near the AAT Sensor.

Is the AAT Sensor value with -15°C (5°F) of the temperature probe reading?

Yes >> Go To 5

No >> Go To 7

P0128-THERMOSTAT RATIONALITY (CONTINUED)

5. ECT SENSOR OPERATION

WARNING: Make sure the engine cooling system is cool before removing the pressure cap or any hose. The cooling system is pressurized when hot. Failure to follow these instructions can result in personal injury including extreme burns, scalding, or death.

With a scan tool, read and record the ECT Sensor Temperature value.

Use the DRB Temperature Probe #CH7050, or an equivalent temperature measuring tool, measure the engine coolant temperature.

Is the ECT Sensor value with -15°C (5°F) of the temperature probe reading?

Yes >> Go To 6

No >> Go To 7

---

6. OTHER POSSIBLE CAUSES

Inspect the Temperature Sensors for any physical damage.

Inspect the engine coolant. Make sure the coolant is at the proper level. Refer to the Service Information COOLING.

Make sure the Temperature Sensors are properly installed.

Make sure the CMP and CKP sensors are installed properly. Check the connectors for any signs of damage.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Refer to any Technical Service Bulletins (TSBs) that may apply.

With the engine running at normal operating temperature, monitor the Temperature sensor parameters while wiggling the wire harness. Look for parameter values to change.

Visually inspect the related wire harness. Look for any chafed, pierced, pinched, partially broken wires and broken, bent, pushed out, or corroded terminals.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Inspect and clean all PCM, engine, and chassis grounds.

Were any problems found during the above inspections?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Test Complete.

P0128-THERMOSTAT RATIONALITY (CONTINUED)

7. SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE

NOTE: Visually inspect both the component and the PCM connectors. Look for damage, partially broken wires and backed out or corroded terminals

Turn the ignition off.

Disconnect the applicable Temperature Sensor harness connector.

Disconnect the C2 FCM harness connector and the C2 PCM harness connector.

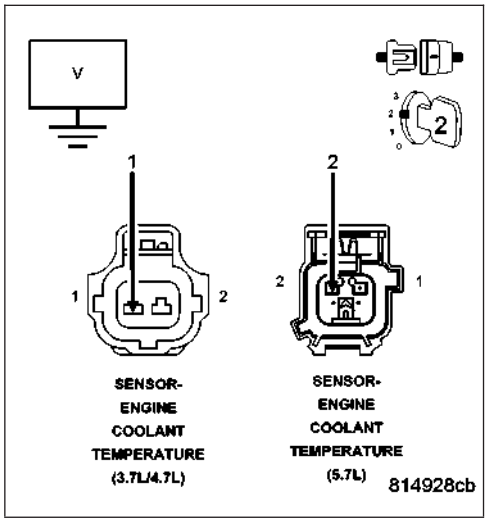
Ignition on, engine not running.

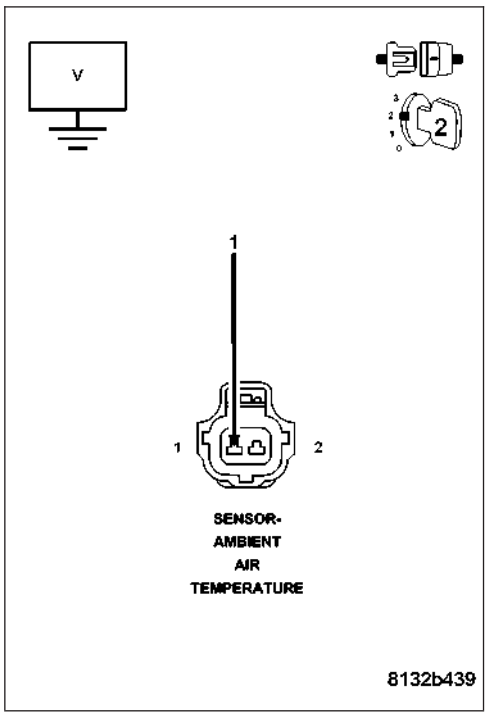
Measure the voltage on the (K2) ECT Signal circuit and the (G31) AAT Signal circuit at the appropriate Temperature Sensor harness connector.

Is the voltage above 5.2 volts?

Yes >> Repair the short to battery voltage in the Signal circuit. Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8





P0128-THERMOSTAT RATIONALITY (CONTINUED)

8. TEMPERATURE SENSOR

Turn the ignition off.

Connect the C2 FCM harness connector and the C2 PCM harness connector.

Connect a jumper wire across the ECT and AAT Sensor harness connectors.

Ignition on, engine not running.

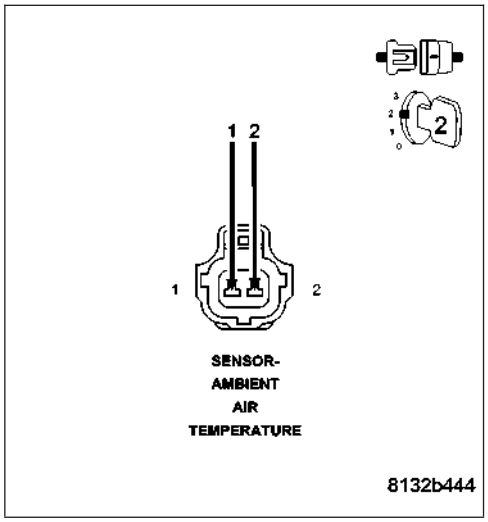
With a scan tool, read the Temperature Sensor voltage.

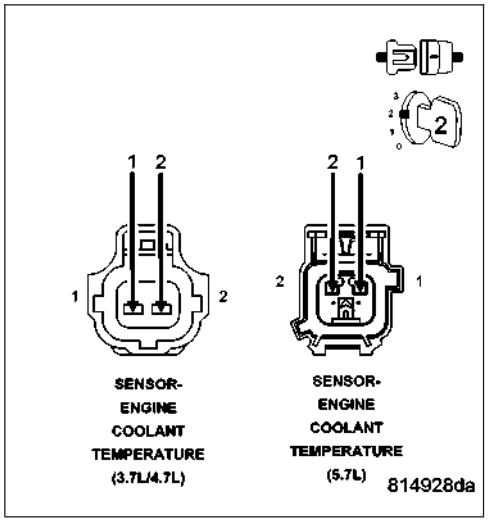
Does the voltage start at 5.0 volts and drop below 1.0 volt when the jumper wire is installed?

Yes >> Replace the appropriate Temperature Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 9

NOTE: Disconnect the jumper wire before continuing.





P0128-THERMOSTAT RATIONALITY (CONTINUED)

9. SIGNAL CIRCUIT OPEN

Turn the ignition off.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

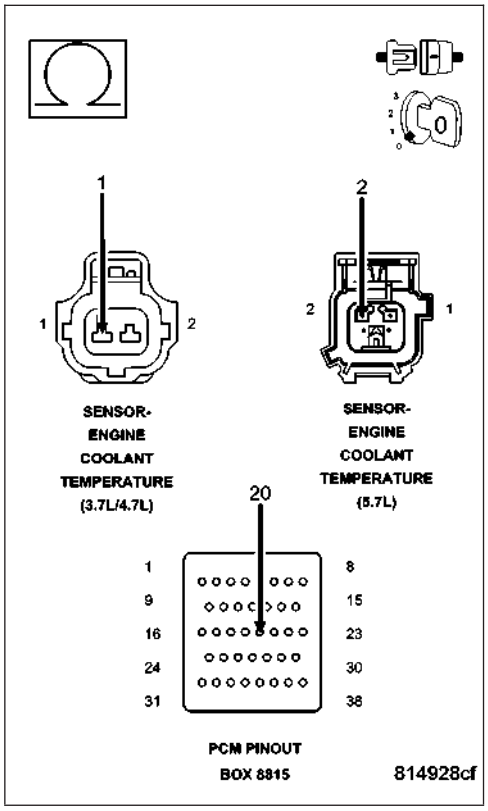
Measure the resistance of the (K2) ECT Sensor Signal circuit from the ECT Sensor harness connector to the appropriate terminal of special tool #8815.

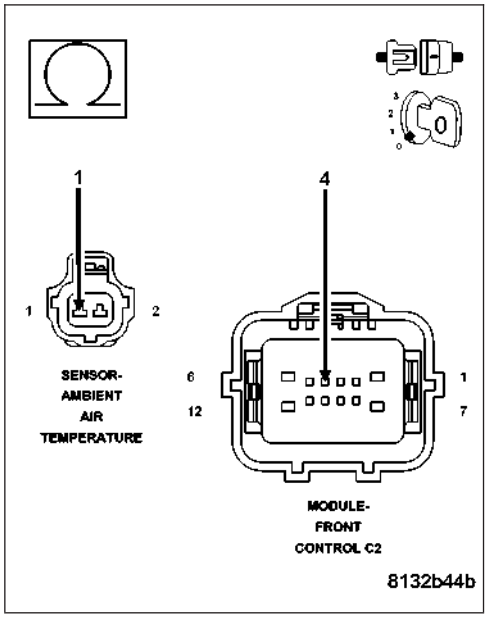
Measure the resistance of the (G31) AAT Sensor Signal circuit from the AAT Sensor harness connector to the C2 FCM harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 10

No >> Repair the open in the Sensor Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)





P0128-THERMOSTAT RATIONALITY (CONTINUED)

10. SENSOR GROUND CIRCUIT OPEN

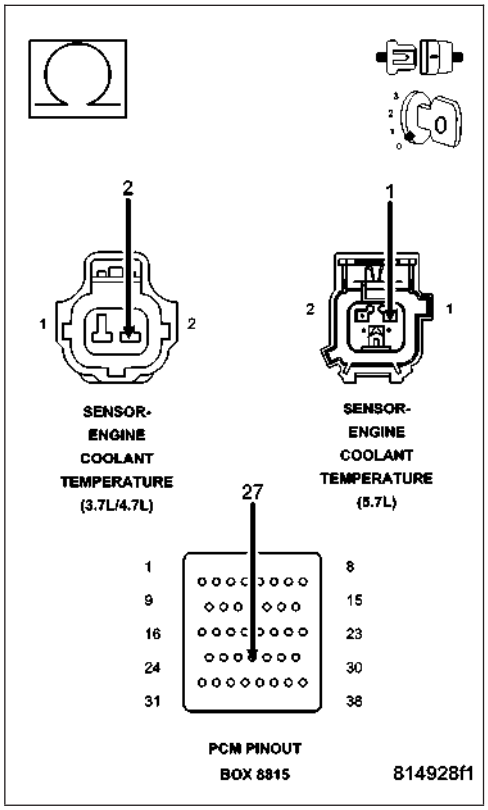
Measure the resistance of the (K900) Sensor ground circuit from the appropriate Temperature Sensor harness connector to the appropriate terminal of special tool #8815.

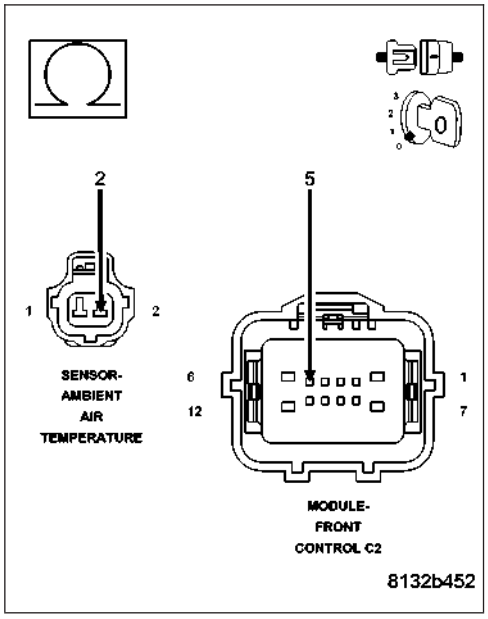
Measure the resistance of the (G931) Sensor ground circuit from the AAT Sensor harness connector to the C2 FCM harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 11

No >> Repair the open in the Sensor ground circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)





P0128-THERMOSTAT RATIONALITY (CONTINUED)

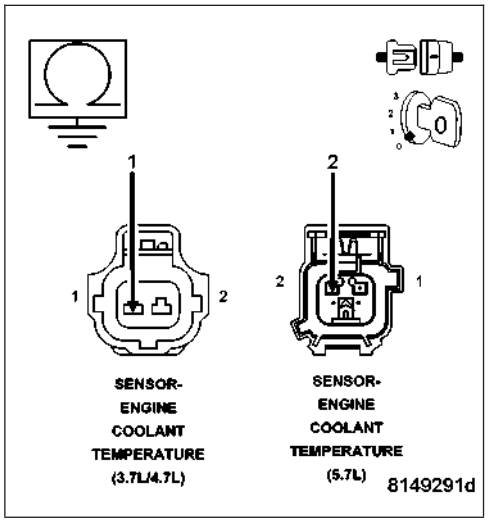
11. SIGNAL CIRCUIT SHORTED TO GROUND

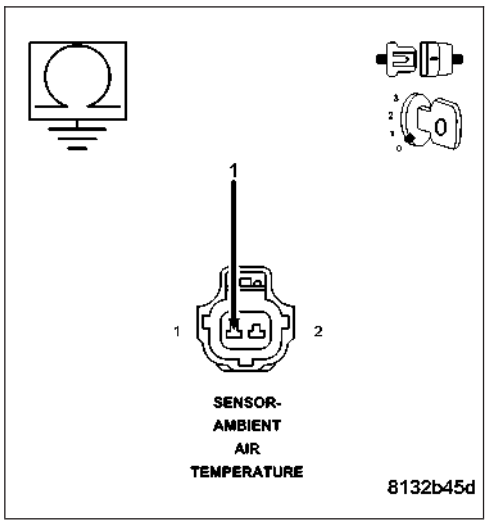
Measure the resistance between ground and the Sensor Signal circuit in the Temperature Sensor harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the Signal circuit. Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 12



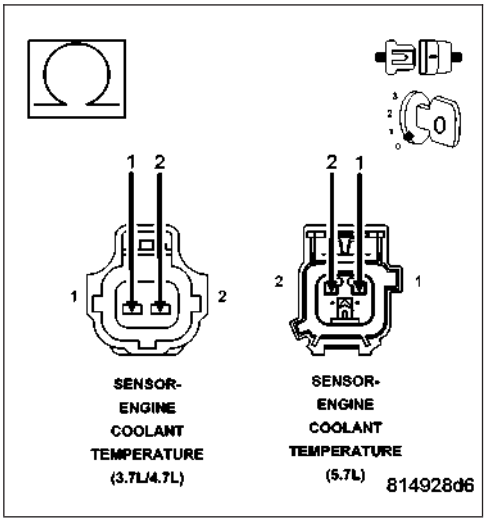


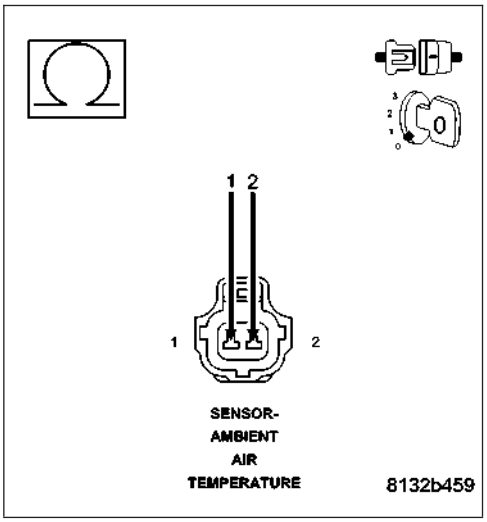
P0128-THERMOSTAT RATIONALITY (CONTINUED)

12. SIGNAL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT OR THE (G931) SENSOR GROUND CIRCUIT

Measure the resistance between the Signal circuit and the (K900) Sensor ground circuit in the (K2) ECT Sensor harness connector.

Measure the resistance between the Signal circuit and the (G931) Sensor ground circuit in the (G31) AAT Sensor harness connector.





Is the resistance below 100 ohms?

Yes >> Repair the short between the Sensor ground circuit and the Sensor Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 13

---

13. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

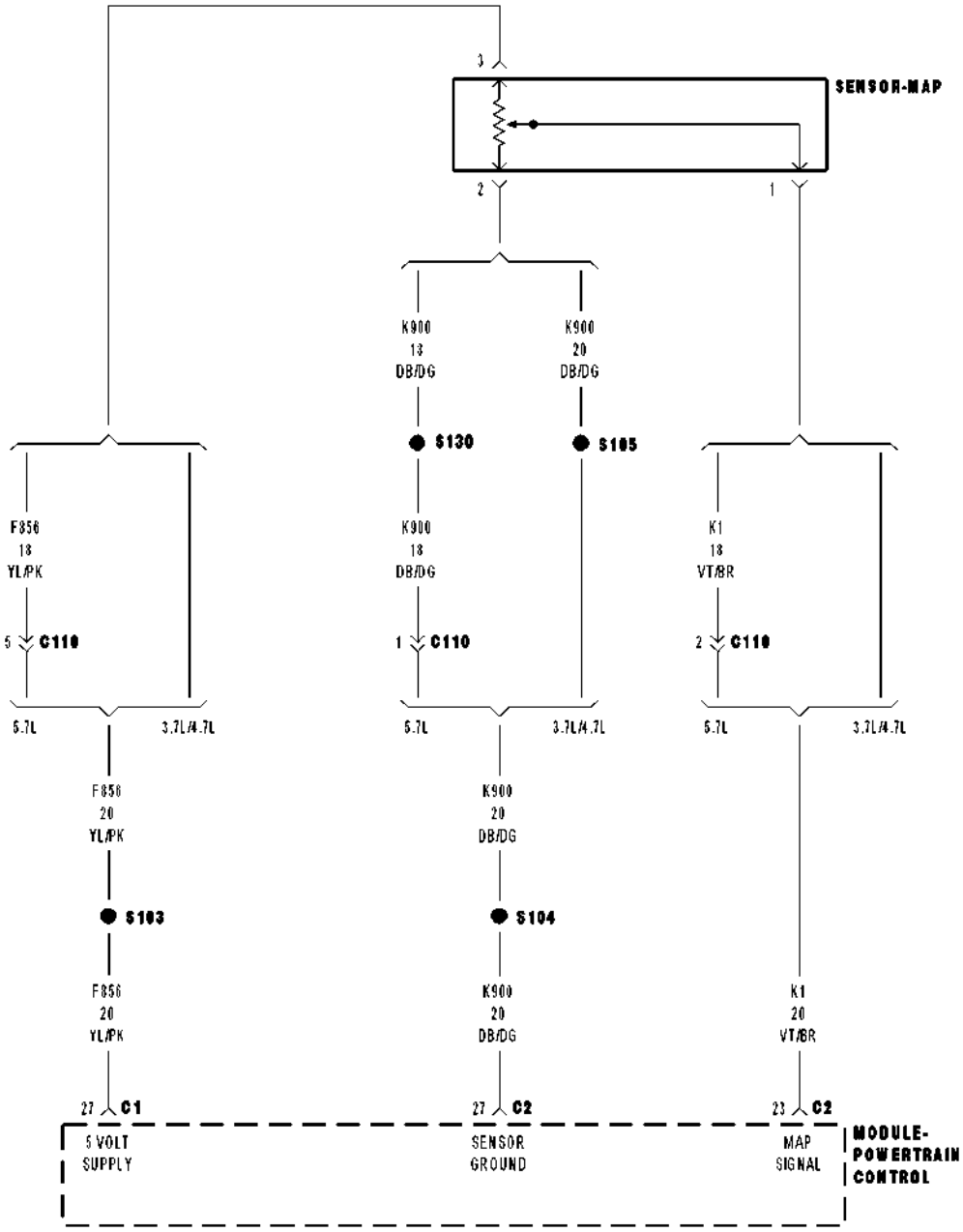
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

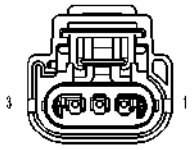
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

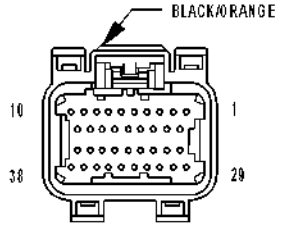
No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0129-BAROMETRIC PRESSURE OUT-OF-RANGE LOW

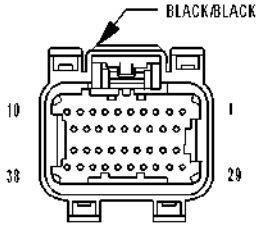




SENSOR-MAP



MODULE-
POWERTRAIN
CONTROL C2



MODULE-
POWERTRAIN
CONTROL C1

P0129-BAROMETRIC PRESSURE OUT-OF-RANGE LOW (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition key on. No Cam or Crank signal within 75 ms. Engine speed less than 250 RPM.
- **Set Condition:**
  The PCM senses the voltage from the MAP sensor to be less than 2.2 volts but above 0.04 of a volt for 300 milliseconds. One Trip Fault. Three good trips to turn off the MIL. (5.7L ETC lamp will flash)

Possible Causes
(F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO BATTERY VOLTAGE
(F856) 5-VOLT SUPPLY CIRCUIT OPEN
(F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K1) MAP SIGNAL CIRCUIT OPEN
(K1) MAP SIGNAL CIRCUIT SHORTED TO GROUND
(K1) MAP SIGNAL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT
MAP SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.
With a scan tool, read DTCs.

Is the DTC active at this time.

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0129-BAROMETRIC PRESSURE OUT-OF-RANGE LOW (CONTINUED)

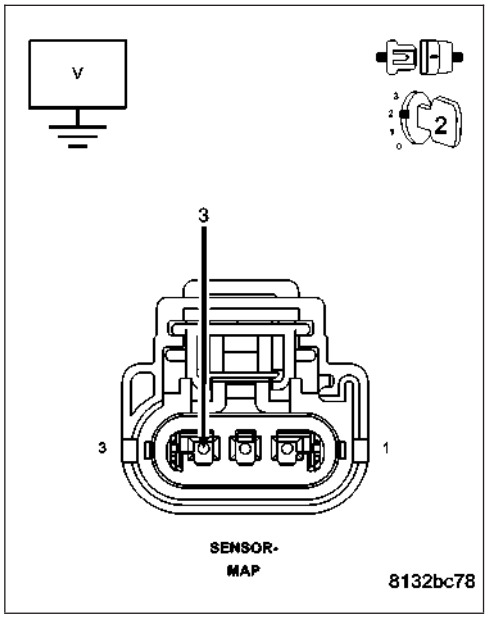
2. (F856) 5-VOLT SUPPLY CIRCUIT

Turn the ignition off.

Disconnect the MAP Sensor harness connector.

Ignition on, engine not running.

Measure the voltage on the (F856) 5-volt Supply circuit in the MAP Sensor harness connector.



Is the voltage between 4.5 to 5.2 volts?

Yes >> Go To 3

No >> Go To 7

3. MAP SENSOR

With a scan tool, monitor the MAP Sensor voltage with the Sensor harness connector disconnected.

Is the voltage above 2.2 volts?

Yes >> Replace the MAP Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

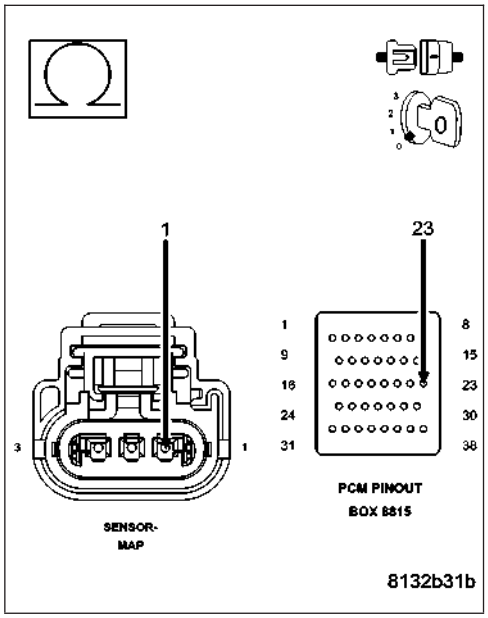
4. (K1) MAP SIGNAL CIRCUIT OPEN

Turn the ignition off.

Disconnect the C2 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K1) MAP Signal circuit from the MAP Sensor harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

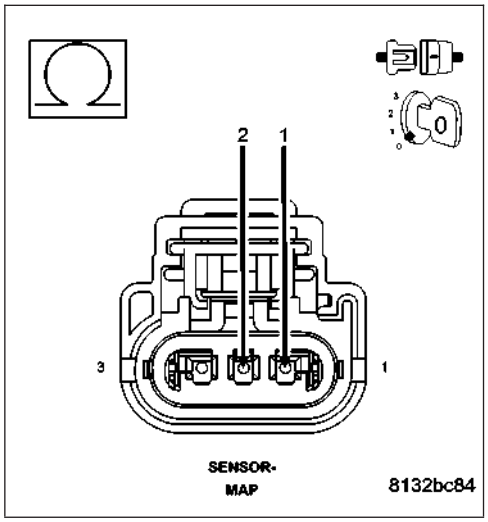
Yes >> Go To 5

No >> Repair the open in the (K1) MAP Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0129-BAROMETRIC PRESSURE OUT-OF-RANGE LOW (CONTINUED)

5. (K1) MAP SIGNAL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT

Measure the resistance between the (K900) Sensor ground circuit and the (K1) MAP Signal circuit in the MAP Sensor harness connector.



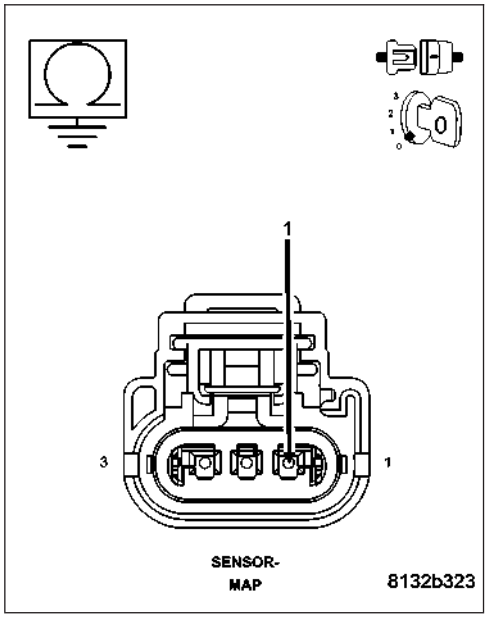
Is the resistance below 5.0 ohms?

Yes >> Repair the short between the (K900) Sensor ground circuit and the (K1) MAP Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6

6. (K1) MAP SIGNAL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K1) MAP Signal circuit in the MAP Sensor harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K1) MAP Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 10

P0129-BAROMETRIC PRESSURE OUT-OF-RANGE LOW (CONTINUED)

7. (F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

Disconnect the C1 PCM harness connector.

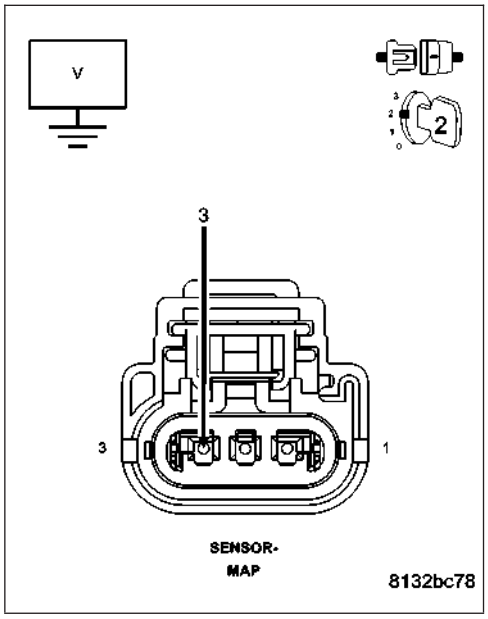
Ignition on, engine not running.

Measure the voltage on the (F856) 5-volt Supply circuit in the MAP Sensor harness connector.

Is the voltage above 0 volts?

Yes >> Repair the short to battery voltage in the (F856) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8



8. (F856) 5-VOLT SUPPLY CIRCUIT OPEN

Turn the ignition off.

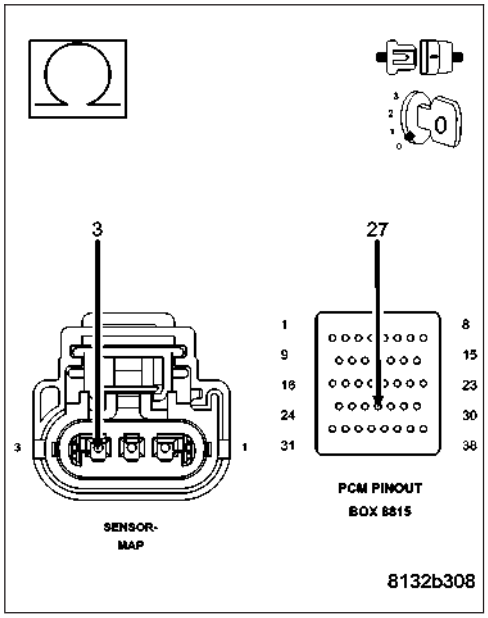
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (F856) 5-volt Supply circuit from the MAP Sensor harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 9

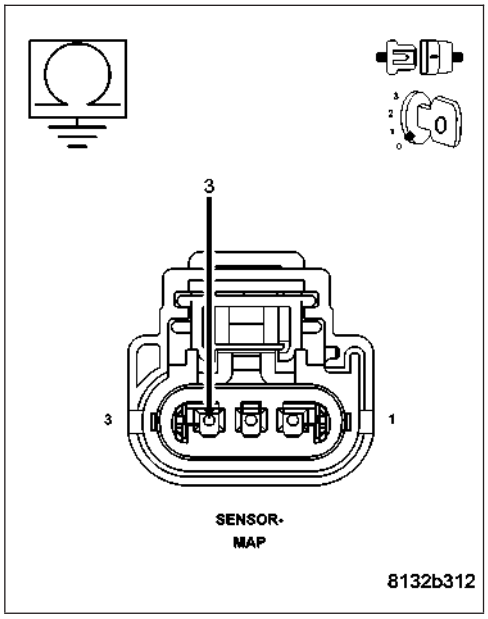
No >> Repair the open in the (F856) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P0129-BAROMETRIC PRESSURE OUT-OF-RANGE LOW (CONTINUED)

9. (F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (F856) 5-volt Supply circuit in the MAP Sensor harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (F856) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 10

10. PCM

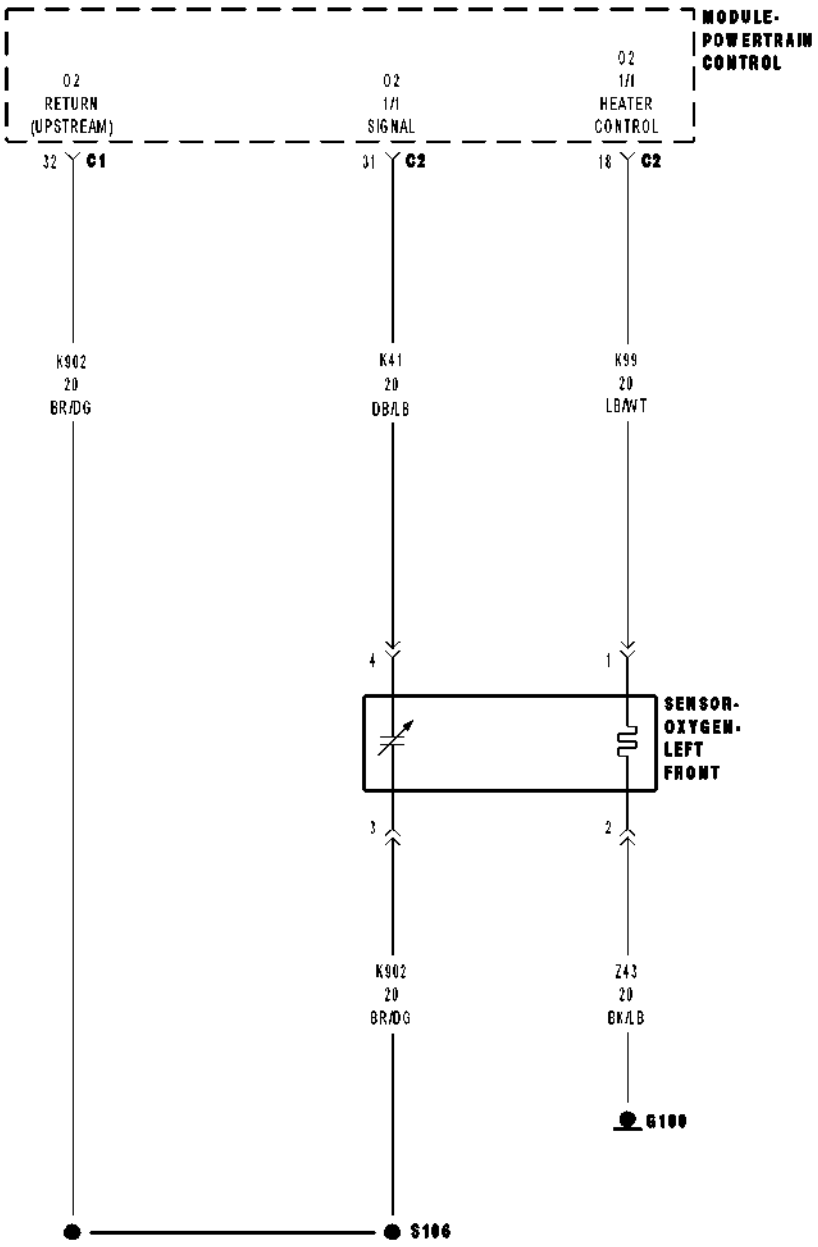
NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

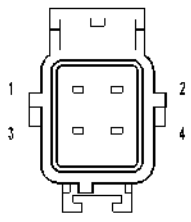
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

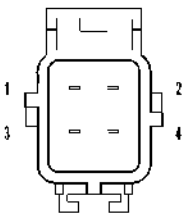
No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0131-O2 SENSOR 1/1 CIRCUIT LOW

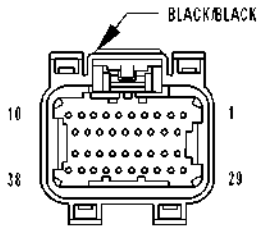




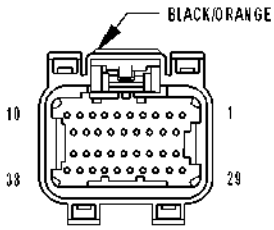
SENSOR-
OXYGEN-
LEFT
FRONT
(5.7L)



SENSOR-
OXYGEN-
LEFT
FRONT
(4.7L)



MODULE-
POWERTRAIN
CONTROL C1



MODULE-
POWERTRAIN
CONTROL C2

B14826ca

P0131-O2 SENSOR 1/1 CIRCUIT LOW (CONTINUED)

For the Engine circuit diagrams (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Engine running for less than 30 seconds and the O2 Sensor Heater Temperature is less than 251°C (484°F) with battery voltage greater 10.4 volts.
- **Set Condition:**
  The oxygen sensor signal voltage is below 2.5196 volts for 6 seconds after starting engine. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K902) O2 RETURN UPSTREAM CIRCUIT SHORTED TO GROUND
(K41) O2 1/1 SIGNAL CIRCUIT SHORTED TO GROUND
(K41) O2 1/1 SIGNAL CIRCUIT SHORTED TO THE (K902) O2 RETURN UPSTREAM CIRCUIT
(K41) O2 1/1 SIGNAL CIRCUIT SHORTED TO THE (Z43) O2 1/1 HEATER GROUND CIRCUIT
O2 SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. O2 SENSOR BELOW 2.52 VOLTS

Start the engine.
Allow the engine to reach normal operating temperature.
With a scan tool, read the 1/1 O2 Sensor voltage.

Is the voltage below 2.52 volts?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. (K41) O2 SENSOR 1/1 SIGNAL CIRCUIT

Turn the ignition off.
Disconnect the 1/1 O2 Sensor harness connector.
Ignition on, engine not running.
With a scan tool, monitor the O2 Sensor voltage.

Is the 1/1 O2 Sensor voltage above 4.8 volts?

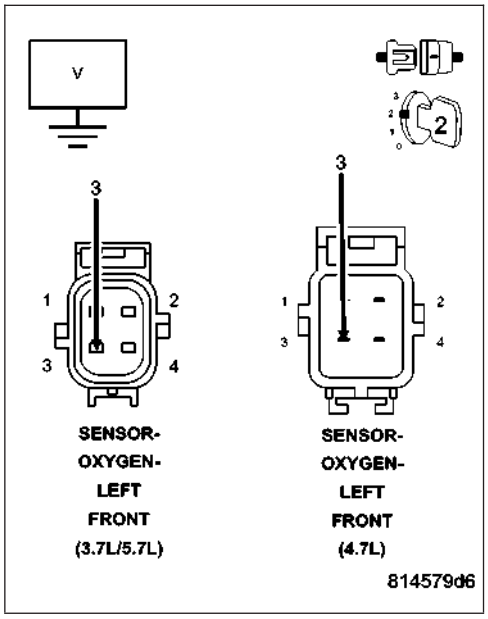
Yes >> Go To 3

No >> Go To 5

P0131-O2 SENSOR 1/1 CIRCUIT LOW (CONTINUED)

3. O2 SENSOR

Measure the voltage on the (K902) O2 Return Upstream circuit in the O2 Sensor harness connector.



Is the voltage at 2.5 volts?

Yes >> Replace the O2 Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

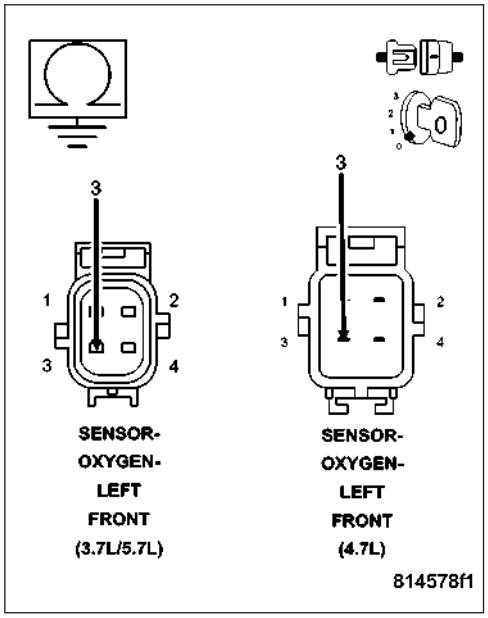
No >> Go To 4

4. (K902) O2 RETURN UPSTREAM CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the C1 PCM harness connector.

Measure the resistance between ground and the (K902) O2 Return Upstream circuit in the O2 Sensor harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K902) O2 Return Upstream circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8

P0131-O2 SENSOR 1/1 CIRCUIT LOW (CONTINUED)

5. (K41) O2 SENSOR 1/1 SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

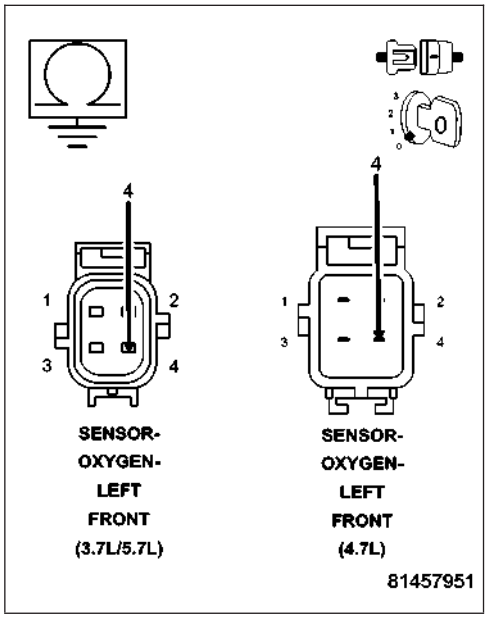
Disconnect the C1 and C2 PCM harness connectors.

Measure the resistance between ground and the (K41) O2 Sensor 1/1 Signal circuit in the O2 Sensor harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K41) O2 Sensor 1/1 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6



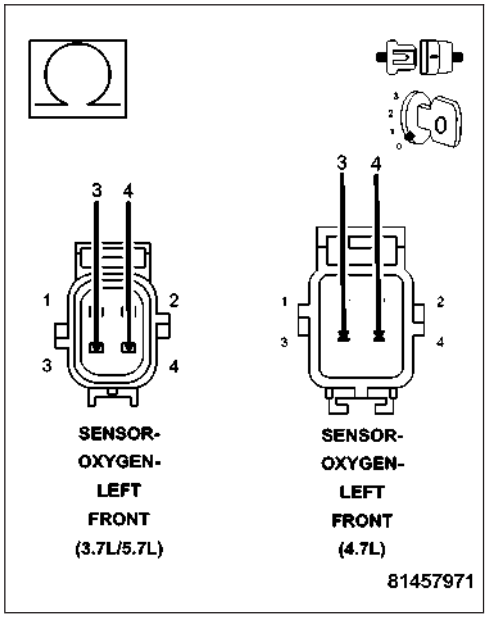
6. (K41) O2 SENSOR 1/1 SIGNAL CIRCUIT SHORTED TO THE (K902) O2 RETURN UPSTREAM CIRCUIT

Measure the resistance between the (K41) O2 Sensor 1/1 Signal circuit and the (K902) O2 Return Upstream circuit in the O2 Sensor harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the short between the (K902) O2 Return Upstream circuit and the (K41) O2 Sensor 1/1 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

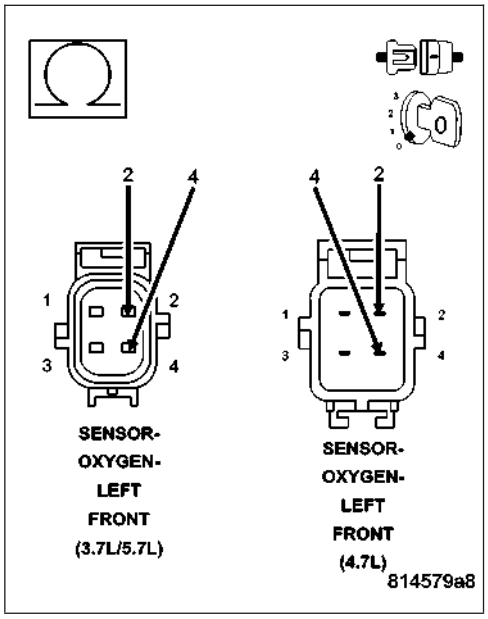
No >> Go To 7



P0131-O2 SENSOR 1/1 CIRCUIT LOW (CONTINUED)

7. (K41) O2 SENSOR 1/1 SIGNAL CIRCUIT SHORTED TO THE (Z43) O2 1/1 HEATER GROUND CIRCUIT

Measure the resistance between the (K41) O2 Sensor 1/1 Signal circuit and the (Z43) O2 1/1 Heater ground circuit in the O2 Sensor harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short between the (Z43) O2 1/1 Heater ground circuit and the (K41) O2 Sensor 1/1 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8

8. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

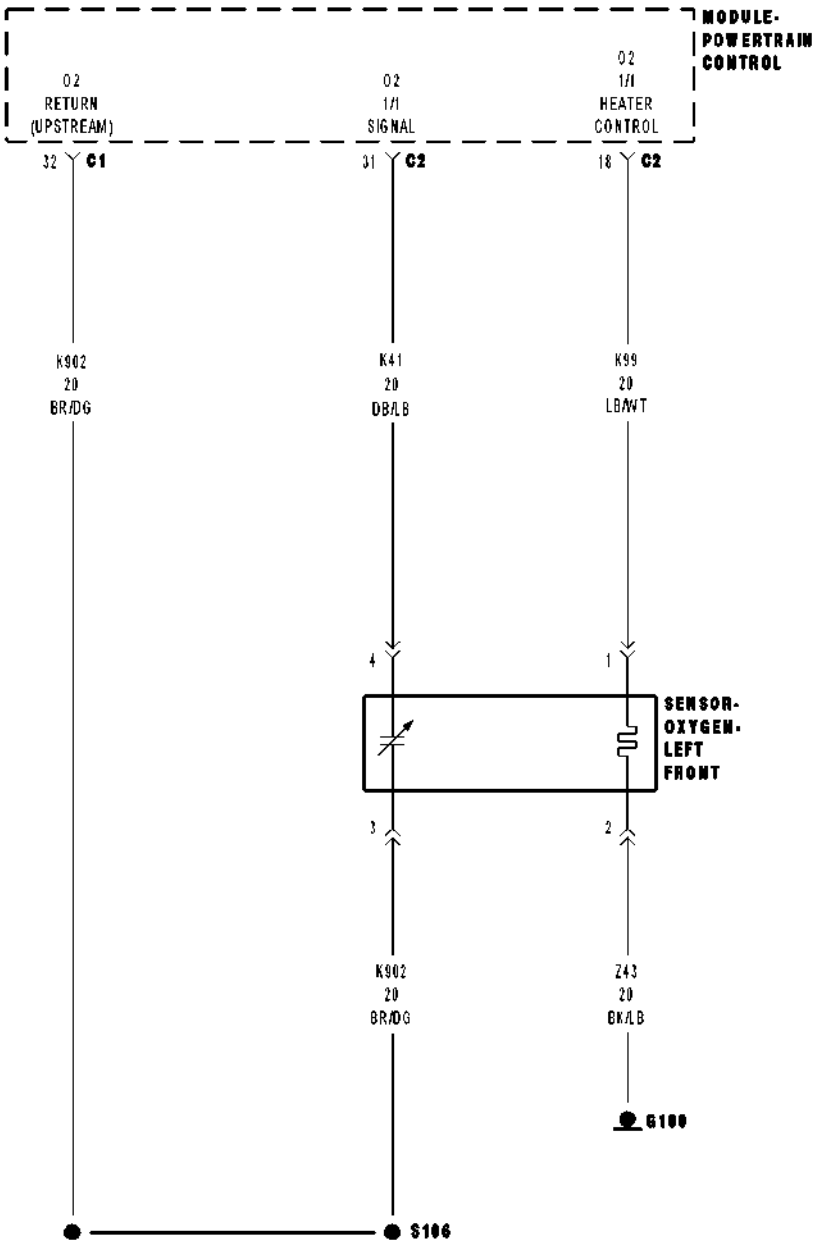
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

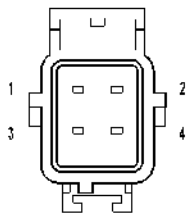
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

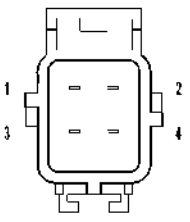
No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0132-O2 SENSOR 1/1 CIRCUIT HIGH

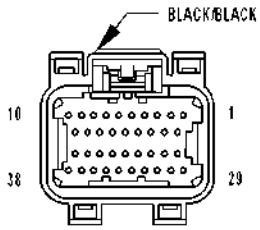




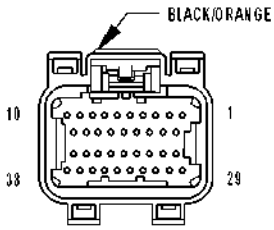
SENSOR-
OXYGEN-
LEFT
FRONT
(5.7L)



SENSOR-
OXYGEN-
LEFT
FRONT
(4.7L)



MODULE-
POWERTRAIN
CONTROL C1



MODULE-
POWERTRAIN
CONTROL C2

B14826ca

P0132-O2 SENSOR 1/1 CIRCUIT HIGH (CONTINUED)

For the Engine circuit diagrams (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  O2 Sensor Heater Temperature is greater than 496°C (925°F) and battery voltage greater than 10.4 volts.
- **Set Condition:**
  The Oxygen Sensor voltage is above 3.99 volts for 40 seconds. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K41) O2 1/1 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K902) O2 RETURN UPSTREAM CIRCUIT SHORTED TO BATTERY VOLTAGE
(K41) O2 1/1 SIGNAL CIRCUIT OPEN
(K902) O2 RETURN UPSTREAM CIRCUIT OPEN
O2 SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. O2 SENSOR ABOVE 3.99 VOLTS

NOTE: When only one O2 Sensor is shorted to voltage, the scan tool will display all O2 Sensor voltage readings at approximately 5.0 volts. When diagnosing this DTC, only diagnose the O2 Sensor that set the DTC.

Start the engine.

Allow the engine to reach normal operating temperature.

With a scan tool, read the 1/1 O2 Sensor voltage.

Is the voltage above 3.9 volts?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0132-O2 SENSOR 1/1 CIRCUIT HIGH (CONTINUED)

2. (K41) O2 1/1 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE

Start the engine and allow the engine to idle.

Disconnect the 1/1 O2 Sensor harness connector.

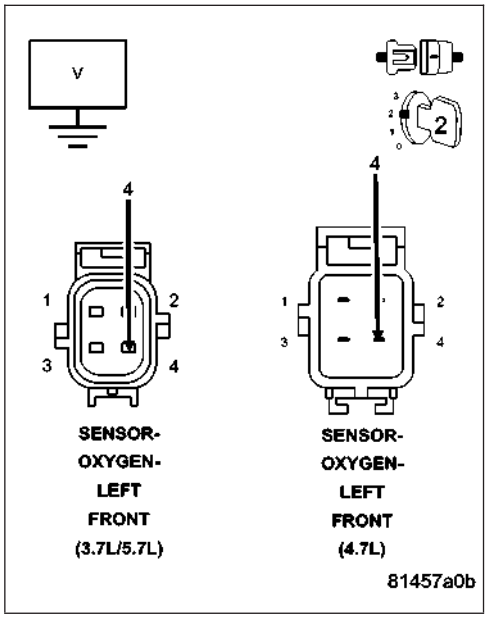
Measure the voltage on the (K41) O2 Sensor 1/1 Signal circuit in the 1/1 O2 Sensor harness connector.

NOTE: Measure the voltage in reference to ground, not the (K902) O2 Return Upstream circuit.

Is the voltage above 5.2 volts?

Yes >> Repair the short to battery voltage in the (K41) O2 Sensor 1/1 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3



3. (K902) O2 RETURN UPSTREAM CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

Disconnect the C1 PCM harness connector.

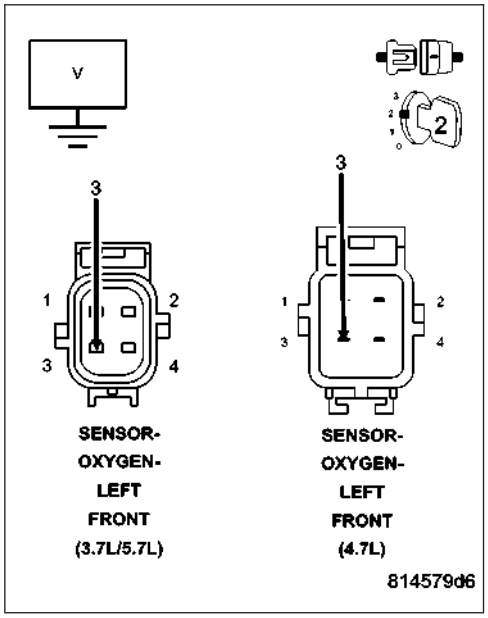
Ignition on, engine not running.

Measure the voltage on the (K902) O2 Return Upstream circuit in the 1/1 O2 Sensor harness connector.

Is there any voltage present?

Yes >> Repair the short to battery voltage in the (K902) O2 Return Upstream circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4



P0132-O2 SENSOR 1/1 CIRCUIT HIGH (CONTINUED)

4. 1/1 O2 SENSOR

Turn the ignition off.

Connect the C1 PCM harness connector.

Connect a jumper wire between the (K41) O2 1/1 Signal circuit and the (K902) O2 Return Upstream circuit in the O2 Sensor harness connector.

Ignition on, engine not running.

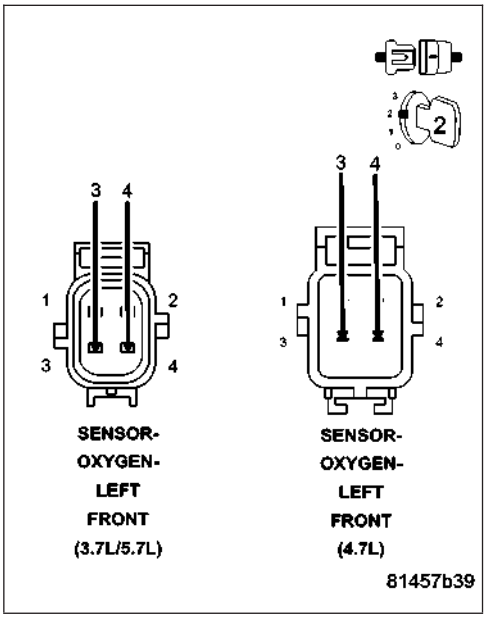
With a scan tool, monitor the 1/1 O2 Sensor voltage.

Is the voltage between 2.3 and 2.7 volts with the jumper wire installed?

Yes >> Replace the O2 Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

NOTE: Remove the jumper wire before continuing.



5. (K41) O2 1/1 SIGNAL CIRCUIT OPEN

Turn the ignition off.

Disconnect the C1 and C2 PCM harness connectors.

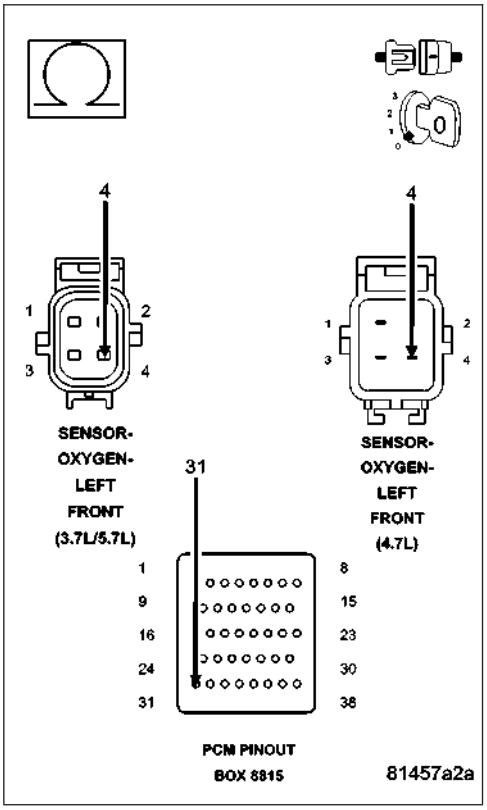
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K41) O2 1/1 Signal circuit from the 1/1 O2 Sensor harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 6

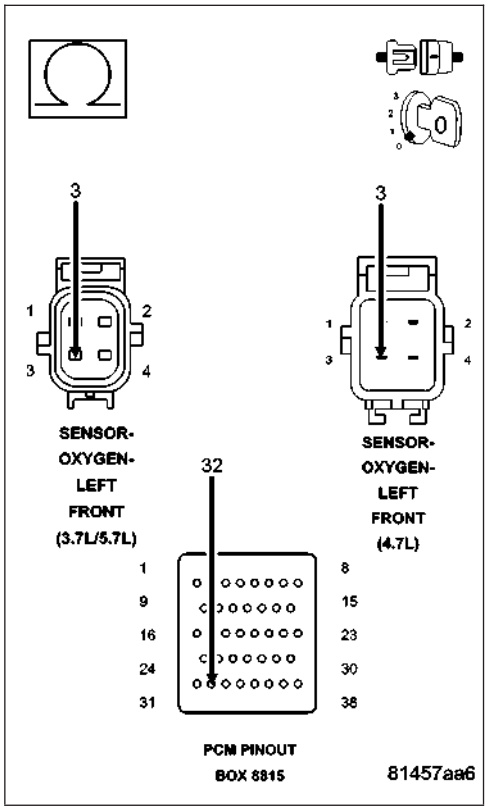
No >> Repair the open in the (K41) O2 1/1 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P0132-O2 SENSOR 1/1 CIRCUIT HIGH (CONTINUED)

6. (K902) O2 RETURN UPSTREAM CIRCUIT OPEN

Measure the resistance of the (K902) O2 Return Upstream circuit from the O2 Sensor harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 7

No >> Repair the open in the (K902) O2 Return Upstream circuit. Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

7. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

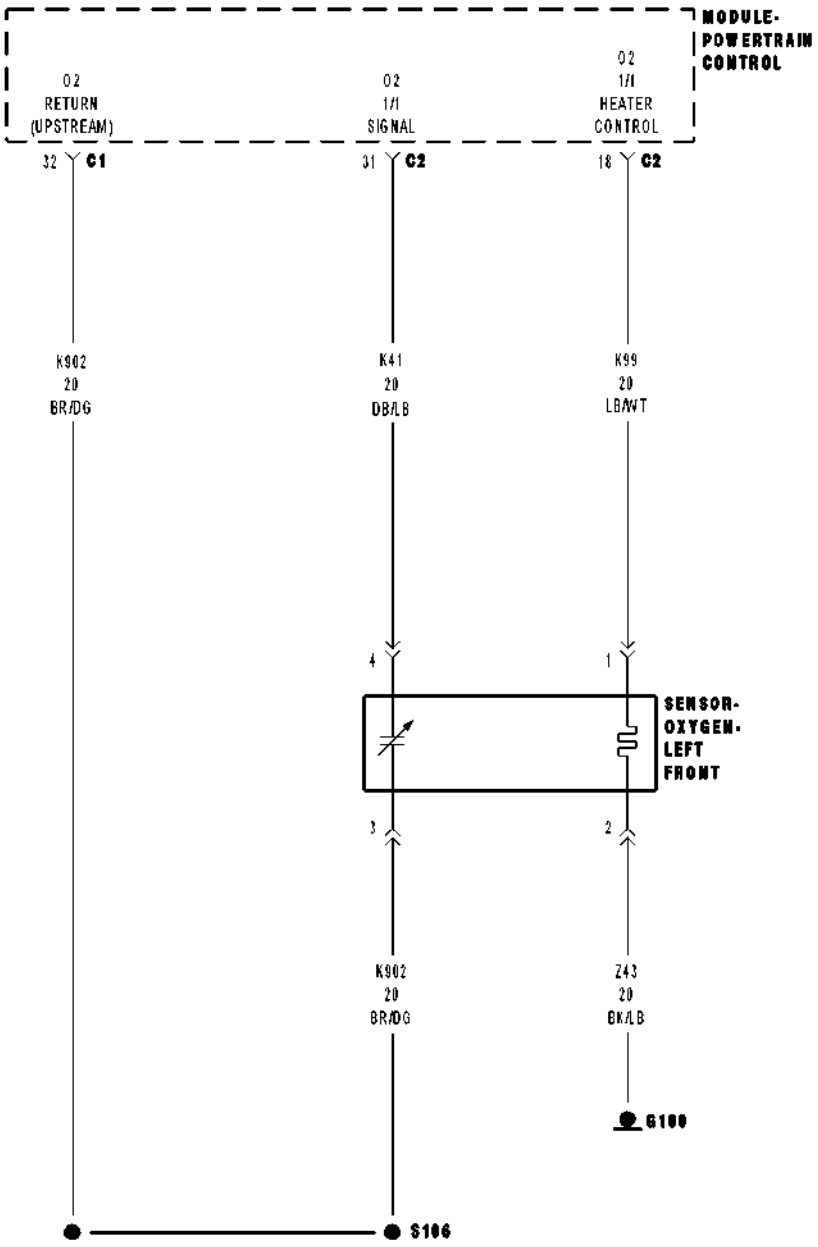
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

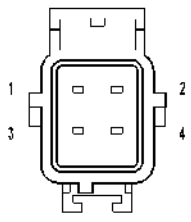
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

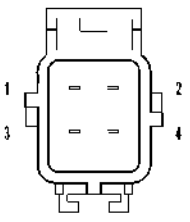
No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0133-O2 SENSOR 1/1 SLOW RESPONSE

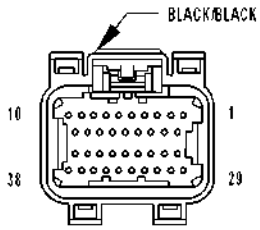




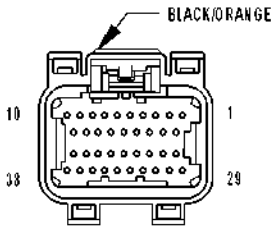
SENSOR-
OXYGEN-
LEFT
FRONT
(5.7L)



SENSOR-
OXYGEN-
LEFT
FRONT
(4.7L)



MODULE-
POWERTRAIN
CONTROL C1



MODULE-
POWERTRAIN
CONTROL C2

B14826ca

P0133-O2 SENSOR 1/1 SLOW RESPONSE (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Vehicle is started and driven between 20 and 55 MPH with the Throttle open for a minimum of 120 seconds. Coolant greater than 70°C (158°F). Catalytic Converter Temp greater than 600°C (1112°F) and EVAP Purge is active.
- **Set Condition:**
  The oxygen sensor signal voltage switches less than 16 times from lean to rich within 20 seconds during monitoring. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
EXHAUST LEAK
(K41) O2 1/1 SIGNAL CIRCUIT
(K902) O2 RETURN UPSTREAM CIRCUIT
O2 SENSOR

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: Check for contaminants that may have damaged the O2 Sensor: contaminated fuel, unapproved silicone, oil and coolant.
Ignition on, engine not running.

NOTE: After the repairs have been made, verify proper O2 Sensor operation. If all the O2 Sensor voltage readings have not returned to normal, follow the diagnostic procedure for the remaining O2 Sensors.
With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. EXHAUST LEAK

Start the engine.
Inspect the exhaust system for leaks between the engine and the O2 Sensors.

Are there any exhaust leaks?

Yes >> Repair or replace the leaking exhaust parts as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

P0133-O2 SENSOR 1/1 SLOW RESPONSE (CONTINUED)

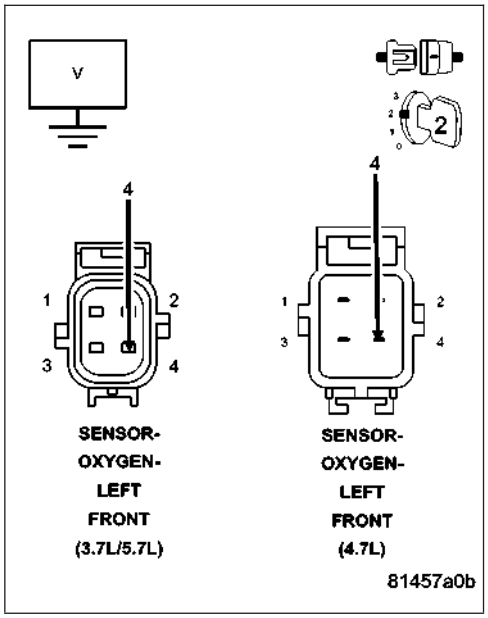
3. (K41) O2 1/1 SIGNAL CIRCUIT

Turn the ignition off

Disconnect the 1/1 O2 Sensor harness connector.

Ignition on, engine not running.

Measure the voltage on the (K41) O2 1/1 Signal circuit in the O2 Sensor harness connector.



Is the voltage between 4.5 and 5.0 volts?

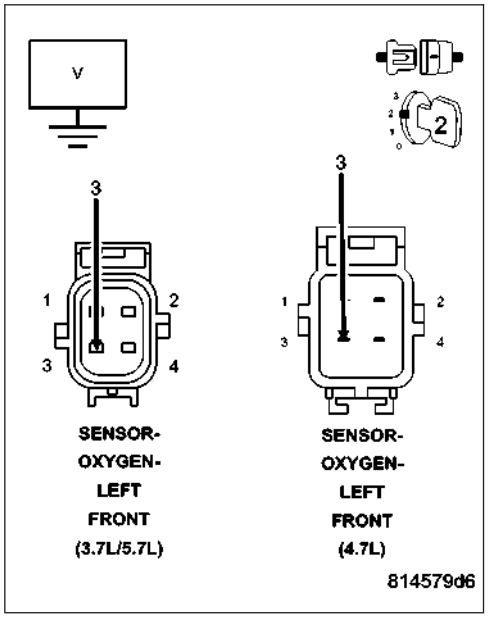
Yes >> Go To 4

No >> Check the (K41) O2 1/1 Signal circuit for a short to ground, open, or short to voltage. If OK, replace and program the Powertrain Control Module per Service Information.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

4. (K902) O2 RETURN UPSTREAM CIRCUIT

Measure the voltage on the (K902) O2 Return Upstream circuit in the O2 Sensor harness connector.



Is the voltage at 2.5 volts?

Yes >> Go To 5

No >> Check the (K902) O2 Return Upstream circuit for a short to ground, open, or short to voltage. If OK, replace and program the Powertrain Control Module per Service Information.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

5. O2 SENSOR

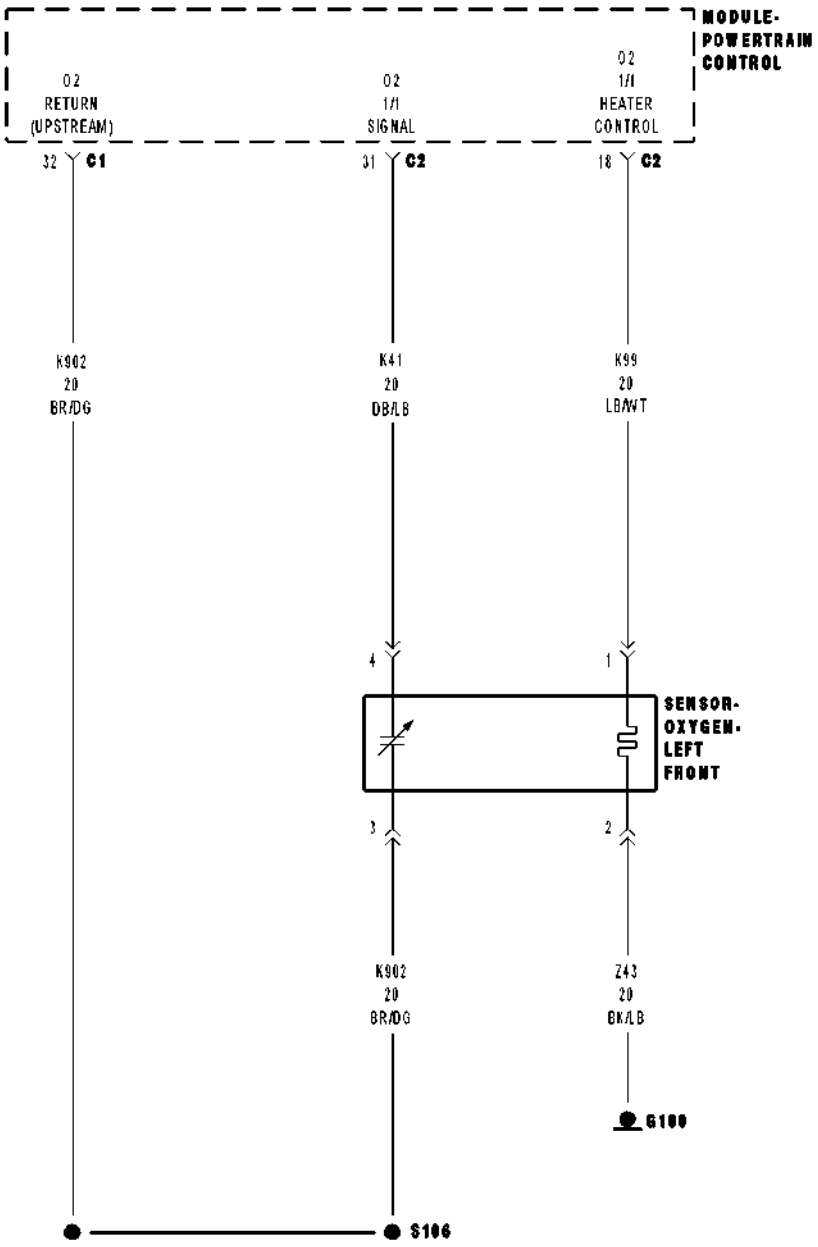
If there are no possible causes remaining, view repair.

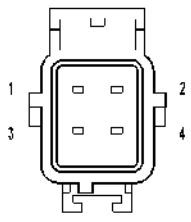
Repair

Replace the O2 Sensor

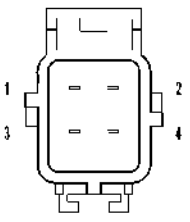
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0135-O2 SENSOR 1/1 HEATER PERFORMANCE

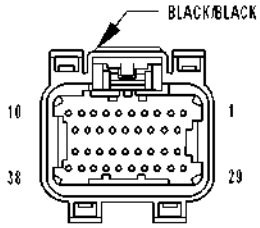




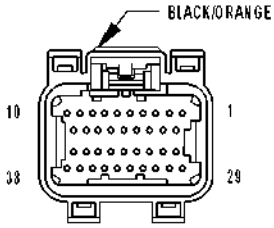
SENSOR-
OXYGEN-
LEFT
FRONT
(5.7L)



SENSOR-
OXYGEN-
LEFT
FRONT
(4.7L)



MODULE-
POWERTRAIN
CONTROL C1



MODULE-
POWERTRAIN
CONTROL C2

B14826ca

P0135-O2 SENSOR 1/1 HEATER PERFORMANCE (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

This diagnostic provides a continuous check of the O2 heater circuit during operation. The heater circuit is momentarily disabled to allow a resistance measurement to be taken to infer heater temperature. The current delivery to the heater is duty cycled to maintain a specific target temperature. The error from the target temperature is continuously monitored to assess heater performance.

- **When Monitored:**
  Engine running and heater duty cycle greater than 0%. Battery voltage greater than 11.0 volts.
- **Set Condition:**
  No sensor output is received when the PCM powers up the sensor heater. Two trip fault. Three good trips to turn off the MIL.

Possible Causes
(K99) O2 1/1 HEATER CONTROL CIRCUIT OPEN
(Z43) O2 1/1 HEATER GROUND CIRCUIT OPEN
O2 SENSOR HEATER ELEMENT
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. O2 SENSOR HEATER OPERATION

Turn the ignition off.

NOTE: Wait a minimum of 8 minutes to allow the O2 Sensor to cool down before continuing the test. Allow the O2 Sensor voltage to stabilize between 4.6 and 5.0 volts.

Ignition on, engine not running.

With a scan tool, actuate the O2 Heater Test.

With the scan tool, monitor 1/1 O2 Sensor voltage for at least 2 minutes.

Does the voltage stay above 4.5 volts?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0135-O2 SENSOR 1/1 HEATER PERFORMANCE (CONTINUED)

2. O2 SENSOR HEATER ELEMENT

Turn the ignition off.

NOTE: Allow the O2 sensor to cool down to room temperature.

Disconnect the O2 Sensor harness connector.

Measure the resistance of the O2 Heater Element across the 1/1 O2 Sensor connector between the O2 Heater Control terminal and the Heater ground terminal.

NOTE: O2 Heater Element resistance values should be measured at 70°F (21.1°C). The resistance value will vary with different temperature values.

Is the resistance of the O2 Sensor Heater Element between 2.0 and 30.0 ohms?

Yes >> Go To 3

No >> Replace the O2 Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

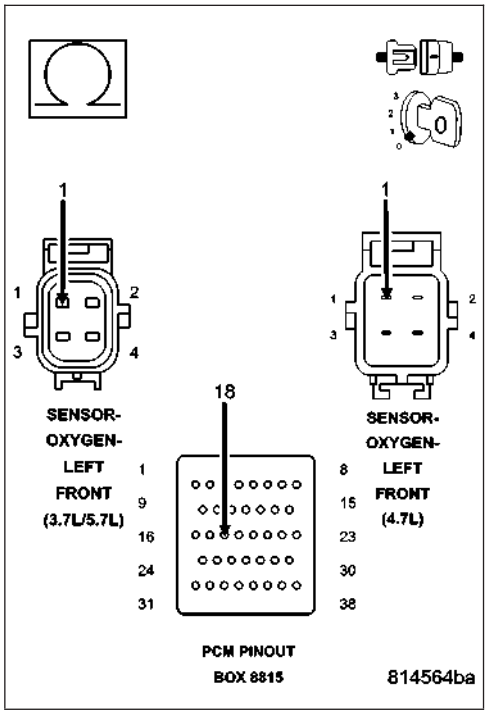
---

3. (K99) O2 1/1 HEATER CONTROL CIRCUIT OPEN

Disconnect the C2 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K99) O2 1/1 Heater Control circuit from the O2 harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 0.5 of an ohm?

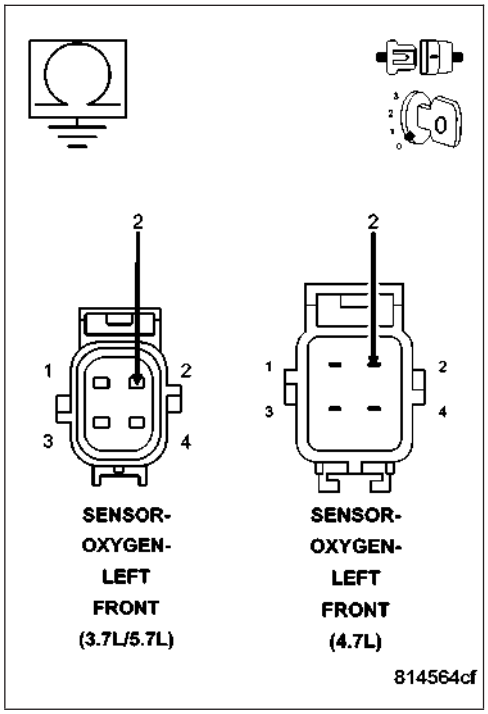
Yes >> Go To 4

No >> Repair the excessive resistance in the (K99) O2 1/1 Heater Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0135-O2 SENSOR 1/1 HEATER PERFORMANCE (CONTINUED)

4. (Z43) O2 1/1 HEATER GROUND CIRCUIT OPEN

Measure the resistance between ground and the (Z43) O2 1/1 Heater ground circuit in the O2 Sensor harness connector.



Is the resistance below 0.5 of an ohm?

Yes >> Go To 5

No >> Repair the excessive resistance in the (Z43) O2 1/1 Heater ground circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

5. PCM

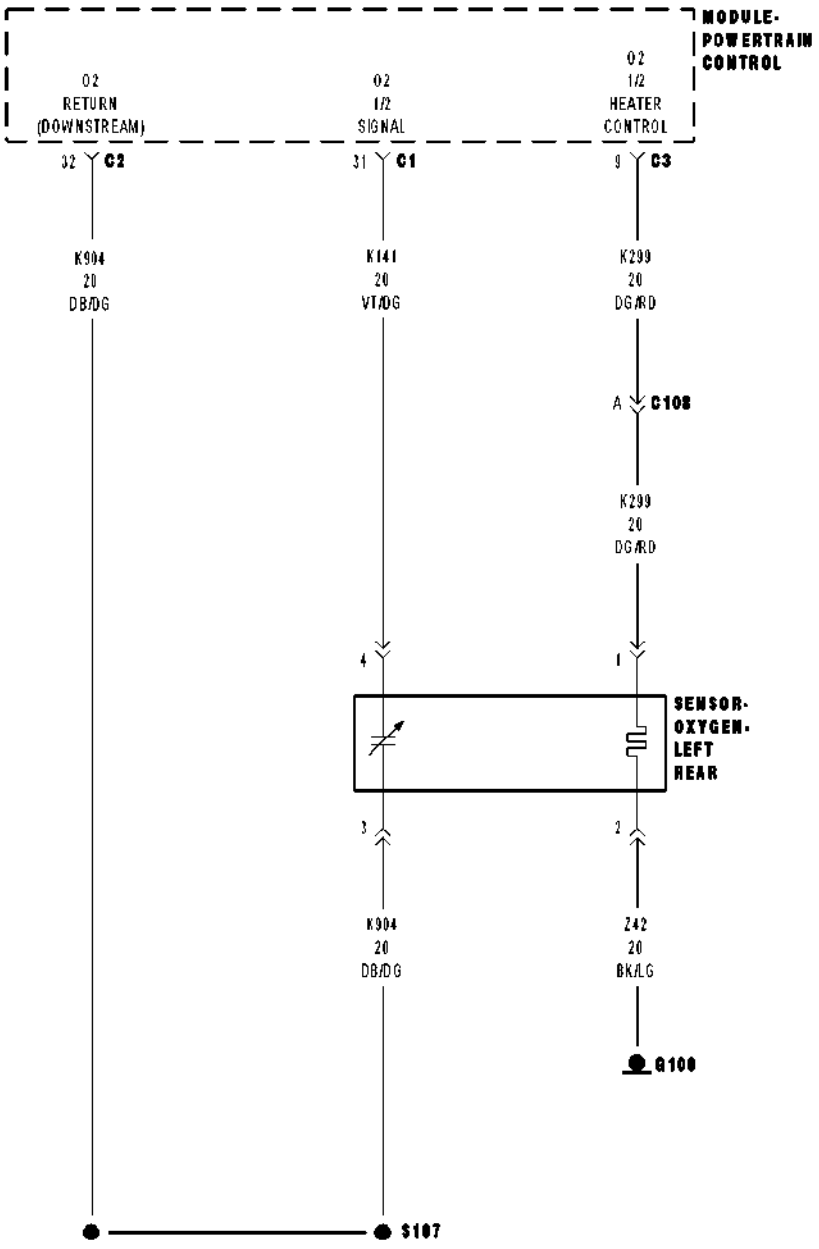
NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

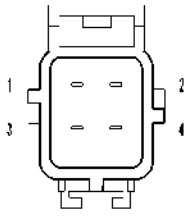
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

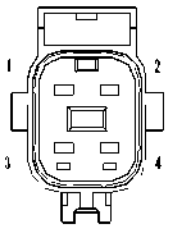
No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0137-O2 SENSOR 1/2 CIRCUIT LOW

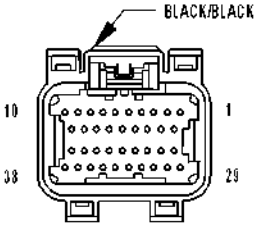




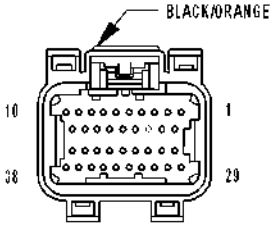
SENSOR-
OXYGEN-
LEFT
REAR
(3.7L)



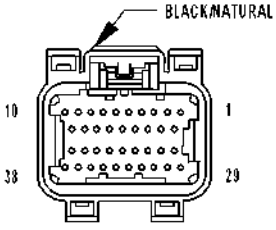
SENSOR-
OXYGEN-
LEFT
REAR
(4.7L/5.7L)



MODULE-
POWERTRAIN
CONTROL C1



MODULE-
POWERTRAIN
CONTROL C2



MODULE-
POWERTRAIN
CONTROL C3

8148295c

P0137-O2 SENSOR 1/2 CIRCUIT LOW (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Engine running for less than 30 seconds and the O2 Sensor Heater Temperature is less than 251°C (484°F) with battery voltage greater 10.99 volts.
- **Set Condition:**
  The oxygen sensor signal voltage is below 2.5196 volts for 3 seconds after starting engine. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K904) O2 RETURN DOWNSTREAM CIRCUIT SHORTED TO GROUND
(K141) O2 1/2 SIGNAL CIRCUIT SHORTED TO GROUND
(K141) O2 1/2 SIGNAL CIRCUIT SHORTED TO THE (K904) O2 RETURN DOWNSTREAM CIRCUIT
(K141) O2 1/2 SIGNAL CIRCUIT SHORTED TO THE (Z42) O2 1/2 HEATER GROUND CIRCUIT
O2 SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. O2 SENSOR BELOW 2.52 VOLTS

Start the engine.
Allow the engine to reach normal operating temperature.
With a scan tool, read the 1/2 O2 Sensor voltage.

Is the voltage below 2.52 volts?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. (K141) O2 1/2 SIGNAL CIRCUIT

Turn the ignition off.
Disconnect the 1/2 O2 Sensor harness connector.
Ignition on, engine not running.
With a scan tool, monitor the 1/2 O2 Sensor voltage.

Is the O2 Sensor voltage above 4.8 volts?

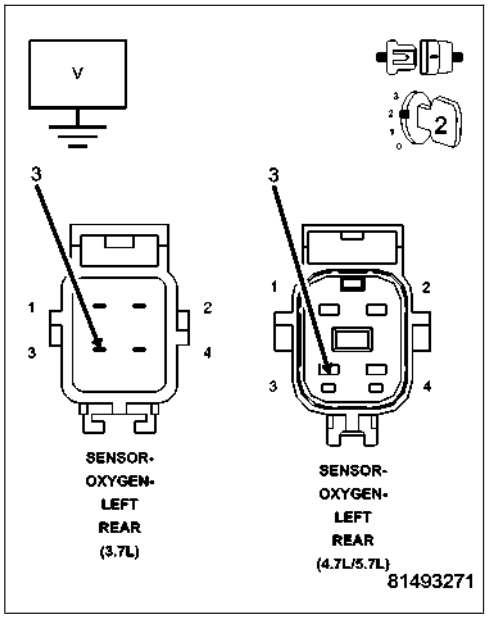
Yes >> Go To 3

No >> Go To 5

P0137-O2 SENSOR 1/2 CIRCUIT LOW (CONTINUED)

3. O2 SENSOR

Measure the voltage on the (K904) O2 Return Downstream circuit in the O2 Sensor harness connector.



Is the voltage at 2.5 volts?

Yes >> Replace the O2 Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

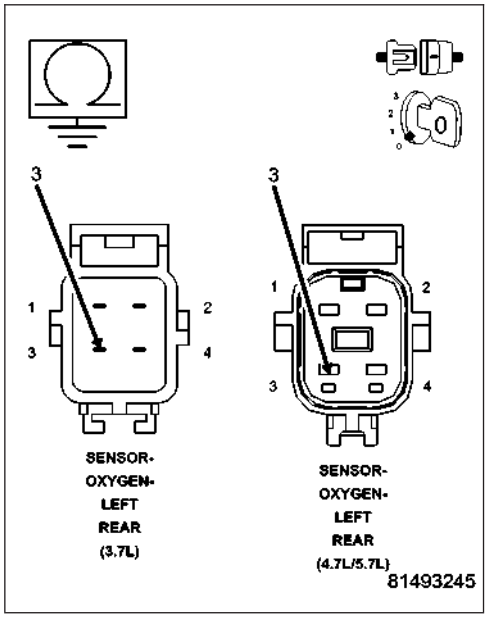
No >> Go To 4

4. (K904) O2 RETURN DOWNSTREAM CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the C2 PCM harness connector.

Measure the resistance between ground and the (K904) O2 Return Downstream circuit in the O2 Sensor harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K904) O2 Return Downstream circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8

P0137-O2 SENSOR 1/2 CIRCUIT LOW (CONTINUED)

5. (K141) O2 1/2 SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the C1 and C2 PCM harness connectors.

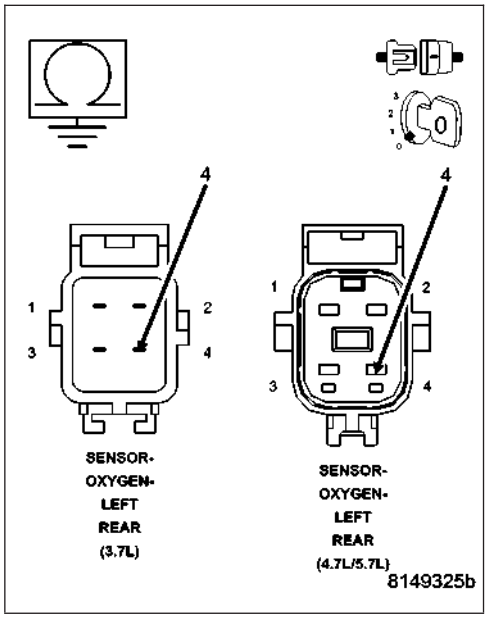
Measure the resistance between ground and the (K141) O2 1/2 Signal circuit in the O2 Sensor harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K141) O2 1/2 Signal circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6



6. (K141) O2 1/2 SIGNAL CIRCUIT SHORTED TO THE (K904) O2 RETURN DOWNSTREAM CIRCUIT

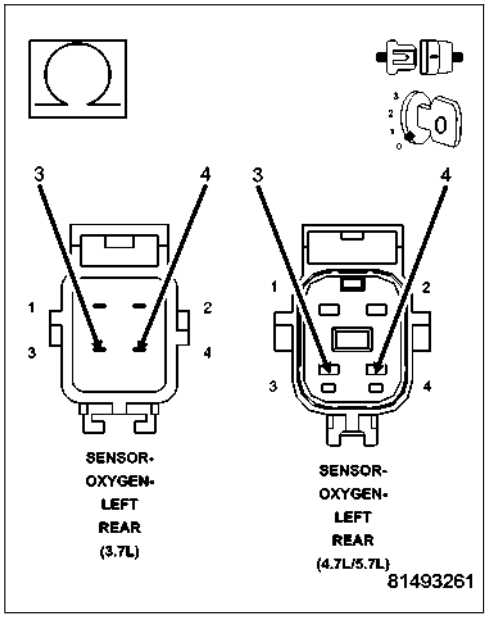
Measure the resistance between the (K141) O2 1/2 Signal circuit and the (K904) O2 Return Downstream circuit in the O2 Sensor harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the short between the (K904) O2 Return Downstream circuit and the (K141) O2 1/2 Signal circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

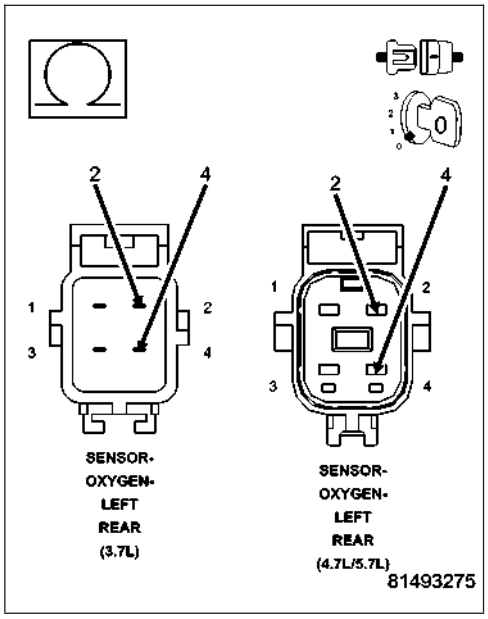
No >> Go To 7



P0137-O2 SENSOR 1/2 CIRCUIT LOW (CONTINUED)

7. (K141) O2 1/2 SIGNAL CIRCUIT SHORTED TO THE (Z42) O2 1/2 HEATER GROUND CIRCUIT

Measure the resistance between the (K141) O2 1/2 Signal circuit and the (Z42) O2 1/2 Heater ground circuit in the O2 Sensor harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short between the (Z42) O2 1/2 Heater ground circuit and the (K141) O2 1/2 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8

---

8. PCM

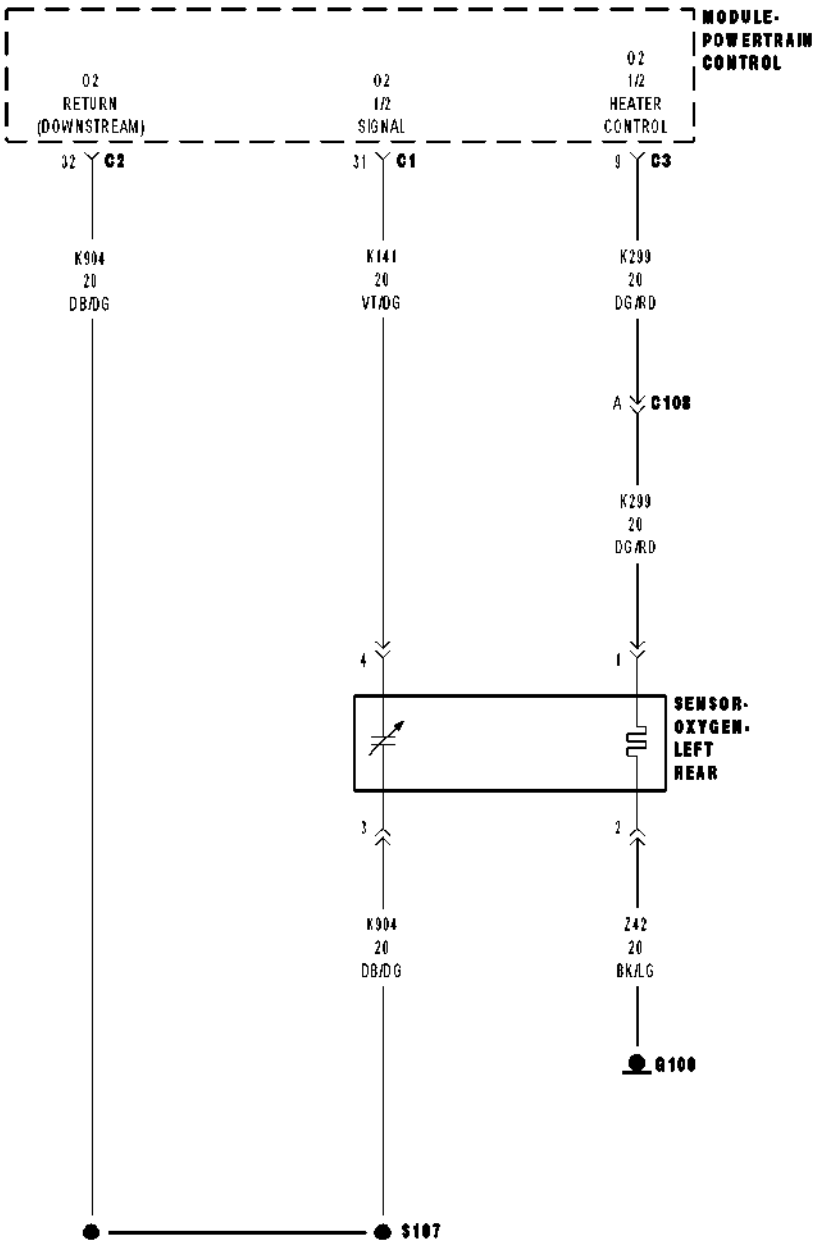
NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

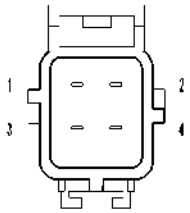
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

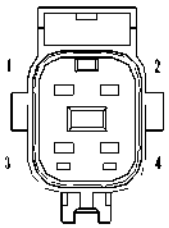
No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0138-O2 SENSOR 1/2 CIRCUIT HIGH

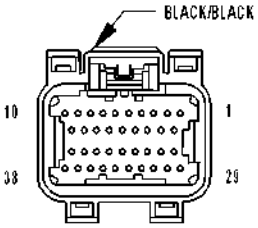




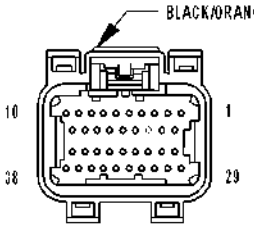
SENSOR-
OXYGEN-
LEFT
REAR
(3.7L)



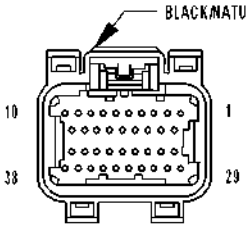
SENSOR-
OXYGEN-
LEFT
REAR
(4.7L/5.7L)



MODULE-
POWERTRAIN
CONTROL C1



MODULE-
POWERTRAIN
CONTROL C2



MODULE-
POWERTRAIN
CONTROL C3

8148295c

P0138-O2 SENSOR 1/2 CIRCUIT HIGH (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  O2 Sensor Heater Temperature is greater than 496°C (925°F) and battery voltage greater than 10.99 volts.
- **Set Condition:**
  The Oxygen Sensor voltage is above 3.99 volts for 30 seconds. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K141) O2 1/2 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K904) O2 RETURN DOWNSTREAM CIRCUIT SHORTED TO BATTERY VOLTAGE
(K141) O2 1/2 SENSOR SIGNAL CIRCUIT OPEN
(K904) O2 RETURN DOWNSTREAM CIRCUIT OPEN
O2 SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. O2 SENSOR ABOVE 3.7 VOLTS

NOTE: When only one O2 Sensor is shorted to voltage, the scan tool will display all O2 Sensor voltage readings at approximately 5.0 volts. When diagnosing this DTC, only diagnose the O2 Sensor that set the DTC.

Start the engine.

Allow the engine to reach normal operating temperature.

With a scan tool, read the 1/2 O2 Sensor voltage.

Is the voltage above 3.7 volts?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0138-O2 SENSOR 1/2 CIRCUIT HIGH (CONTINUED)

2. (K141) O2 1/2 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE

Start the engine and allow the engine to idle.

Disconnect the 1/2 O2 Sensor harness connector.

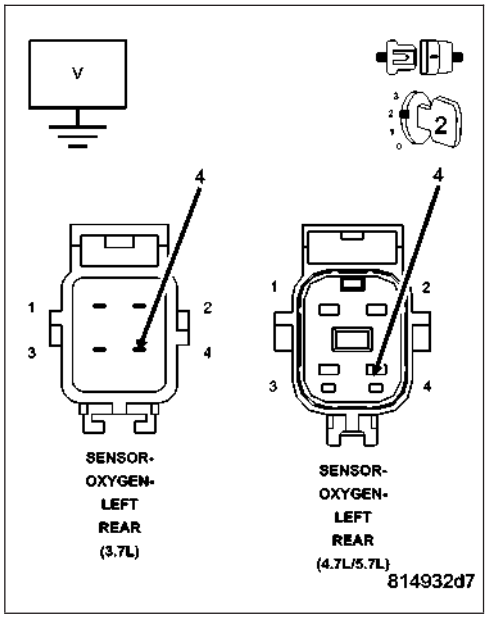
Measure the voltage on the (K141) O2 Sensor 1/2 Signal circuit in the O2 Sensor harness connector.

NOTE: Measure the voltage in reference to ground, not the (K904) O2 Return Downstream circuit.

Is the voltage above 0 volts?

Yes >> Repair the short to battery voltage in the (K141) O2 Sensor 1/2 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3



3. (K904) O2 RETURN DOWNSTREAM CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

Disconnect the C2 PCM harness connector.

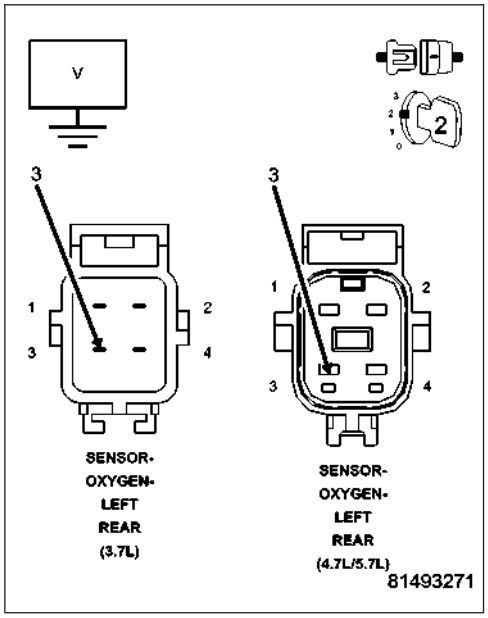
Ignition on, engine not running.

Measure the voltage on the (K904) O2 Return Downstream circuit in the O2 Sensor harness connector.

Is there any voltage present?

Yes >> Repair the short to battery voltage in the (K904) O2 Return Downstream circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4



P0138-O2 SENSOR 1/2 CIRCUIT HIGH (CONTINUED)

4. O2 SENSOR

Turn the ignition off.

Connect the C2 PCM harness connector.

Connect a jumper wire between the (K141) O2 1/2 Signal circuit and the (K904) O2 Return Downstream circuit in the 1/2 O2 Sensor harness connector.

Ignition on, engine not running.

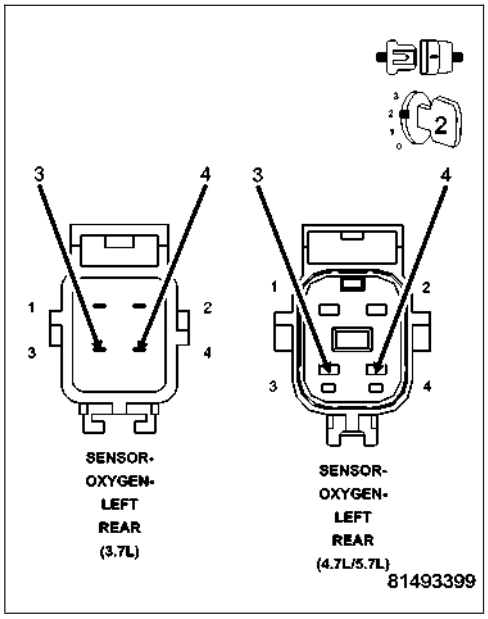
With a scan tool, monitor the 1/2 O2 Sensor voltage.

Is the voltage between 2.3 and 2.7 volts with the jumper wire installed?

Yes >> Replace the O2 Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

NOTE: Remove the jumper wire before continuing.



5. (K141) O2 1/2 SIGNAL CIRCUIT OPEN

Turn the ignition off.

Disconnect the C1 and C2 PCM harness connectors.

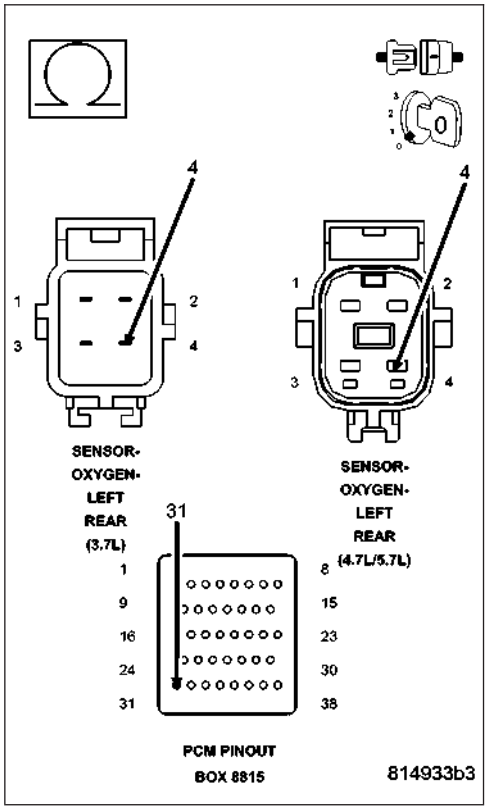
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K141) O2 1/2 Signal circuit from the O2 Sensor harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 6

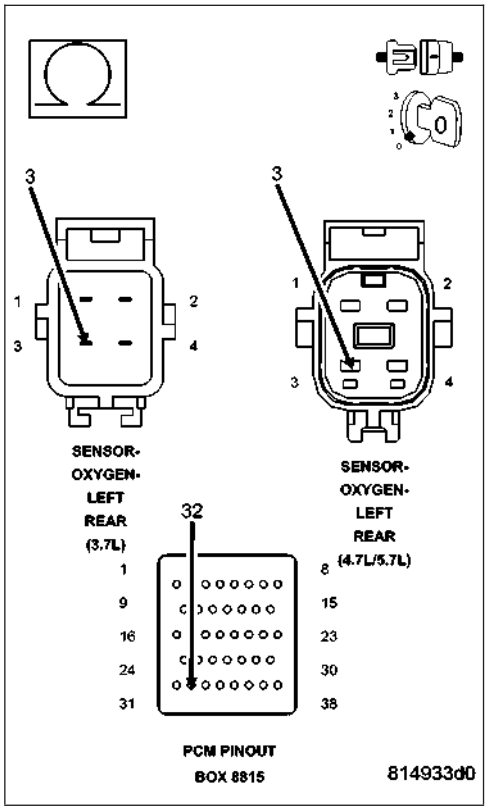
No >> Repair the open in the (K141) O2 1/2 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P0138-O2 SENSOR 1/2 CIRCUIT HIGH (CONTINUED)

6. (K904) O2 RETURN DOWNSTREAM CIRCUIT OPEN

Measure the resistance of the (K904) O2 Return Downstream circuit from the O2 Sensor harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 7

No >> Repair the open in the (K904) O2 Return Downstream circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

7. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

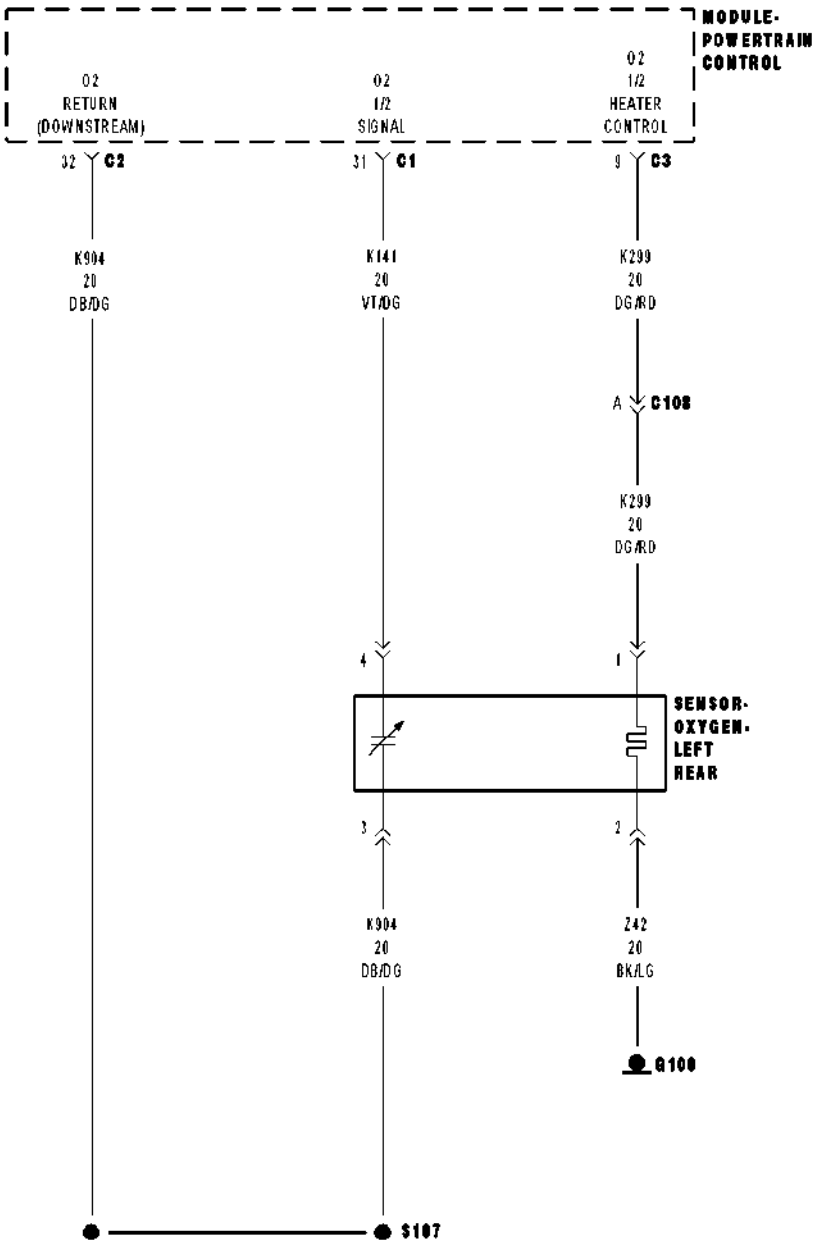
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

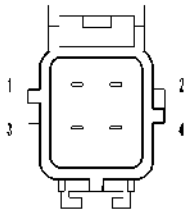
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

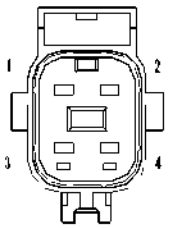
No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0139-O2 SENSOR 1/2 SLOW RESPONSE

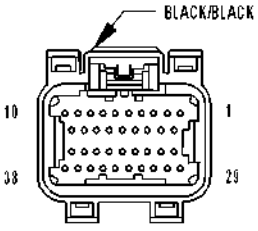




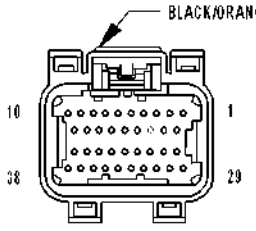
SENSOR-
OXYGEN-
LEFT
REAR
(3.7L)



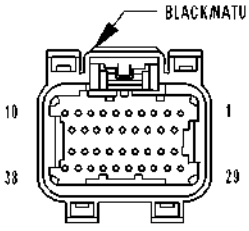
SENSOR-
OXYGEN-
LEFT
REAR
(4.7L/5.7L)



MODULE-
POWERTRAIN
CONTROL C1



MODULE-
POWERTRAIN
CONTROL C2



MODULE-
POWERTRAIN
CONTROL C3

8148295c

P0139-O2 SENSOR 1/2 SLOW RESPONSE (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The downstream O2 Sensor is located in the exhaust path behind the catalytic converter, is monitored for proper response to assure optimum catalytic converter efficiency. The downstream O2 response monitor is intended to diagnose a downstream O2 sensor that is not moving or stuck in a voltage window and to insure accurate information for catalyst monitor diagnosis.

- **When Monitored:**
  Vehicle is started and driven between 20 and 55 MPH with the Throttle open for a minimum of 120 seconds. Coolant greater than 70°C (158°F). Catalytic Converter Temp greater than 600°C (1112°F) and EVAP Purge is active.
- **Set Condition:**
  The oxygen sensor signal voltage switches less than 16 times from lean to rich within 20 seconds during monitoring. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
EXHAUST LEAK
(K141) O2 1/2 SIGNAL CIRCUIT
(K904) O2 RETURN DOWNSTREAM CIRCUIT
O2 SENSOR

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: Check for contaminants that may have damaged the O2 Sensor: contaminated fuel, unapproved silicone, oil and coolant.
Ignition on, engine not running.

NOTE: After the repairs have been made, verify proper O2 Sensor operation. If all the O2 Sensor voltage readings have not returned to normal, follow the diagnostic procedure for the remaining O2 Sensors.
With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. EXHAUST LEAK

Start the engine.

Inspect the exhaust system for leaks between the engine and the O2 Sensors.

Are there any exhaust leaks?

Yes >> Repair or replace the leaking exhaust parts as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

P0139-O2 SENSOR 1/2 SLOW RESPONSE (CONTINUED)

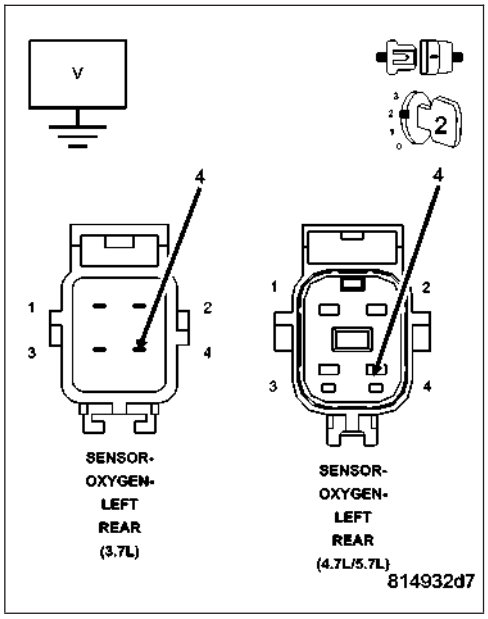
3. (K141) O2 1/2 SIGNAL CIRCUIT

Turn the ignition off

Disconnect the 1/2 O2 Sensor harness connector.

Ignition on, engine not running.

Measure the voltage on the (K141) O2 1/2 Signal circuit in the O2 Sensor harness connector.



Is the voltage between 4.5 and 5.0 volts?

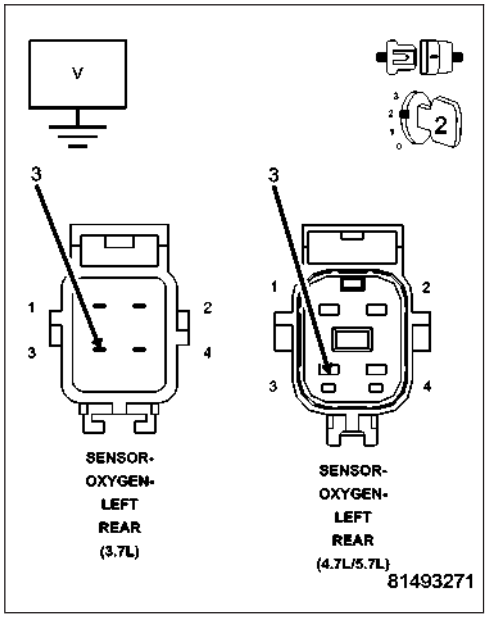
Yes >> Go To 4

No >> Check the (K141) O2 1/2 Signal circuit for a short to ground, open, or short to voltage. If OK, replace and program the Powertrain Control Module per Service Information.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

4. (K904) O2 RETURN DOWNSTREAM CIRCUIT

Measure the voltage on the (K904) O2 Return Downstream circuit in the 1/2 O2 Sensor harness connector.



Is the voltage at 2.5 volts?

Yes >> Go To 5

No >> Check the (K904) O2 Return Downstream circuit for a short to ground, open, or short to voltage. If OK, replace and program the Powertrain Control Module per Service Information.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

5. O2 SENSOR

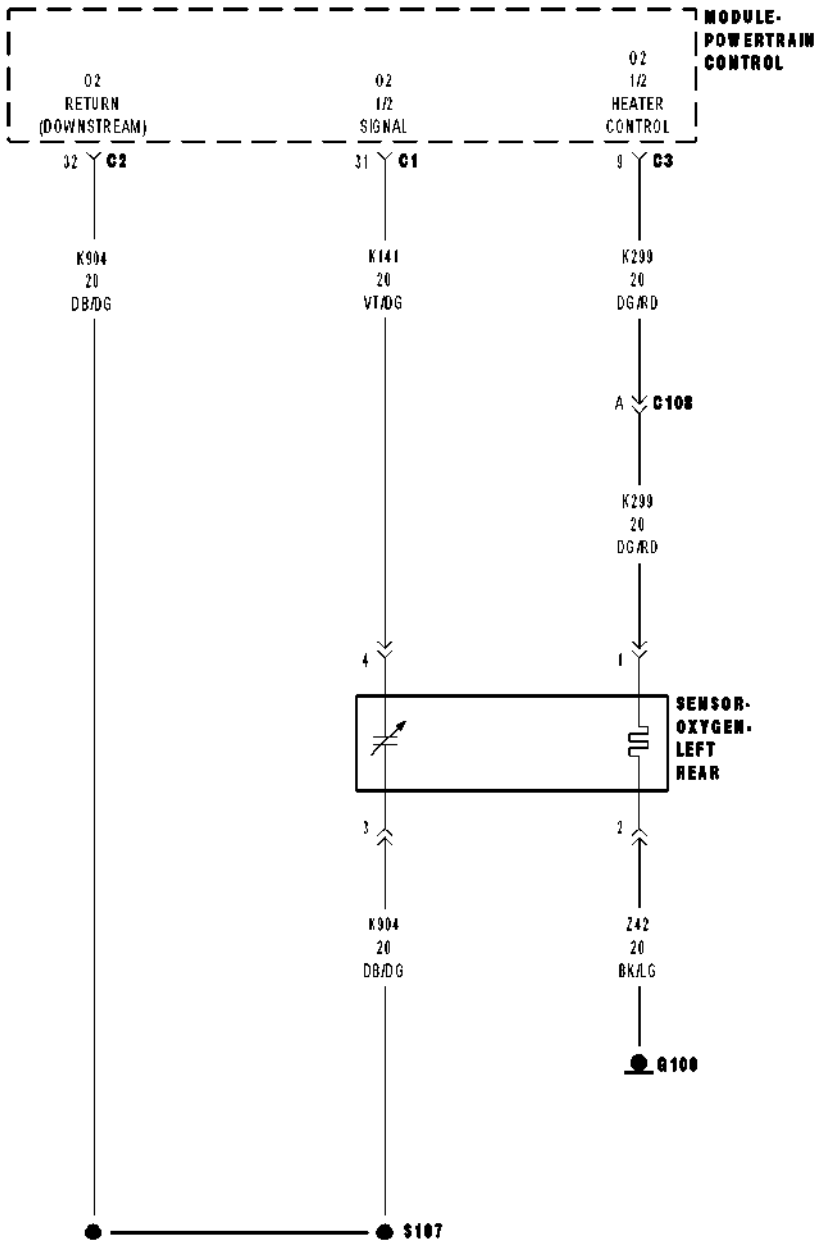
If there are no possible causes remaining, view repair.

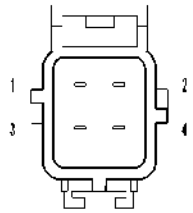
Repair

Replace the O2 Sensor

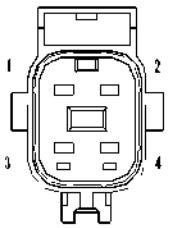
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0141-O2 SENSOR 1/2 HEATER PERFORMANCE

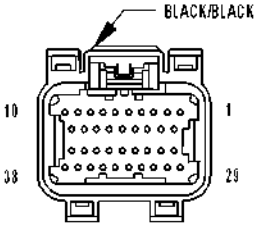




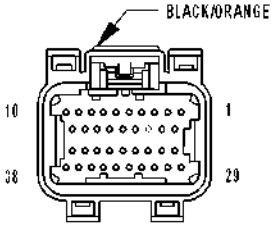
SENSOR-
OXYGEN-
LEFT
REAR
(3.7L)



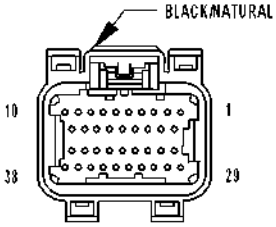
SENSOR-
OXYGEN-
LEFT
REAR
(4.7L/5.7L)



MODULE-
POWERTRAIN
CONTROL C1



MODULE-
POWERTRAIN
CONTROL C2



MODULE-
POWERTRAIN
CONTROL C3

8148295c

P0141-O2 SENSOR 1/2 HEATER PERFORMANCE (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

This diagnostic provides a continuous check of the O2 heater circuit during operation. The heater circuit is momentarily disabled to allow a resistance measurement to be taken to infer heater temperature. The current delivery to the heater is duty cycled to maintain a specific target temperature. The error from the target temperature is continuously monitored to assess heater performance.

- **When Monitored:**
  Engine running and heater duty cycle greater than 0%. Battery voltage greater than 11.0 volts.
- **Set Condition:**
  No sensor output is received when the PCM powers up the sensor heater. Two trip fault. Three good trips to turn off the MIL.

Possible Causes
(K299) O2 1/2 HEATER CONTROL CIRCUIT OPEN
(Z42) O2 HEATER GROUND CIRCUIT OPEN
O2 SENSOR HEATER ELEMENT
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. O2 SENSOR HEATER OPERATION

Turn the ignition off.

NOTE: Wait a minimum of 8 minutes to allow the O2 Sensor to cool down before continuing the test. Allow the O2 Sensor voltage to stabilize between 4.6 and 5.0 volts.

Ignition on, engine not running.

With a scan tool, actuate the O2 Heater Test.

With the scan tool, monitor 1/2 O2 Sensor voltage for at least 2 minutes.

Does the voltage stay above 4.5 volts?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0141-O2 SENSOR 1/2 HEATER PERFORMANCE (CONTINUED)

2. O2 SENSOR HEATER ELEMENT

Turn the ignition off.

NOTE: Allow the O2 sensor to cool down to room temperature.

Disconnect the O2 Sensor harness connector.

Measure the resistance of the O2 Heater Element across the O2 Sensor connector between the O2 Heater Control terminal and the Heater ground terminal.

NOTE: O2 Heater Element resistance values should be measured at 70°F (21.1°C). The resistance value will vary with different temperature values.

Is the resistance of the O2 Sensor Heater Element between 2.0 and 30.0 ohms?

Yes >> Go To 3

No >> Replace the O2 Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

3. (K299) O2 1/2 HEATER CONTROL CIRCUIT OPEN

Disconnect the C3 PCM harness connector.

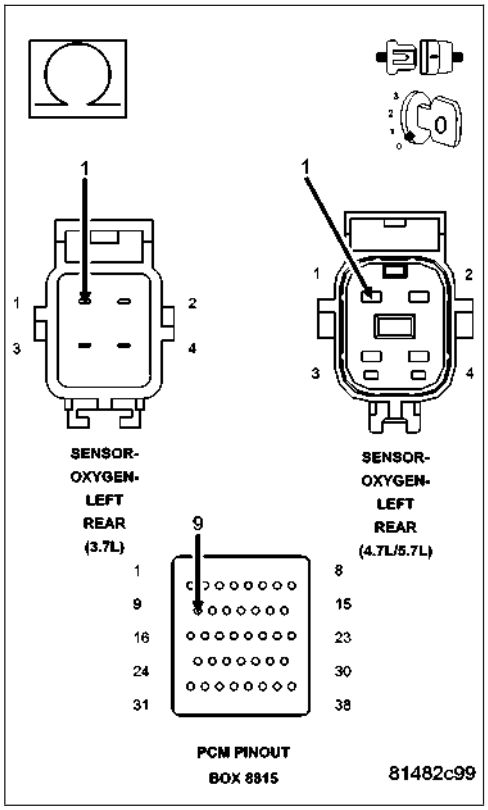
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K299) O2 1/2 Heater Control circuit from the O2 harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 0.5 of an ohm?

Yes >> Go To 4

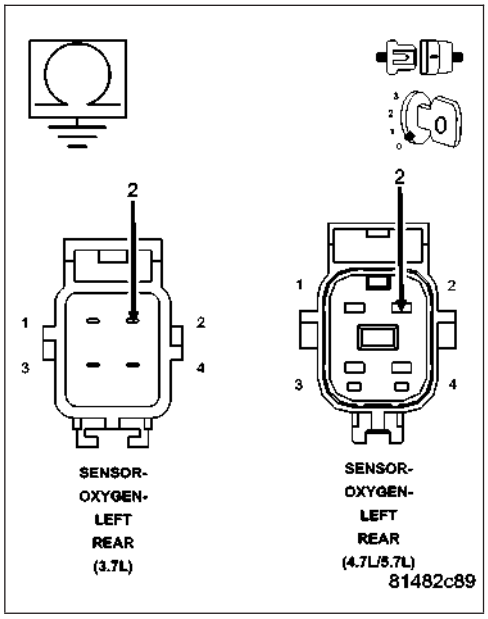
No >> Repair the excessive resistance in the (K299) O2 1/2 Heater Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P0141-O2 SENSOR 1/2 HEATER PERFORMANCE (CONTINUED)

4. (Z42) O2 1/2 HEATER GROUND CIRCUIT OPEN

Measure the resistance between ground and the (Z42) O2 1/2 Heater ground circuit in the O2 Sensor harness connector.



Is the resistance below 0.5 of an ohm?

Yes >> Go To 5

No >> Repair the excessive resistance in the (Z42) O2 1/2 Heater ground circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

5. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

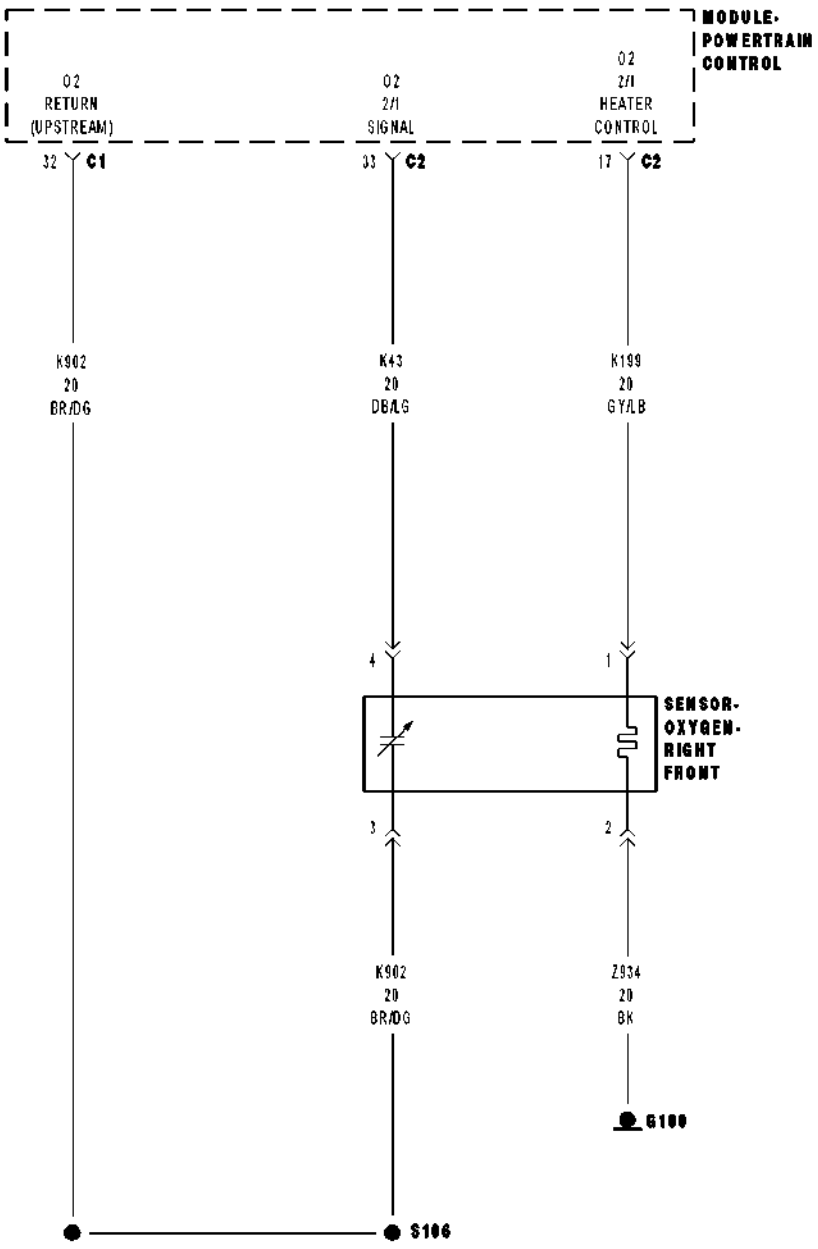
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

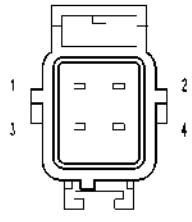
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

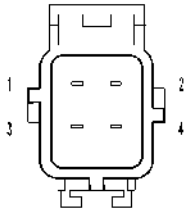
No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0151-O2 SENSOR 2/1 CIRCUIT LOW

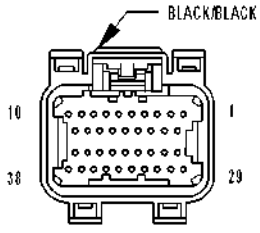




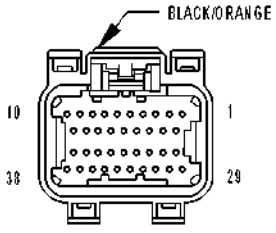
SENSOR-
OXYGEN-
RIGHT
FRONT
(3.7L/5.7L)



SENSOR-
OXYGEN-
RIGHT
FRONT
(4.7L)



MODULE-
POWERTRAIN
CONTROL C1



MODULE-
POWERTRAIN
CONTROL C2

P0151-O2 SENSOR 2/1 CIRCUIT LOW (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Engine running for less than 30 seconds and the O2 Sensor Heater Temperature is less than 251°C (484°F) with battery voltage greater 10.99 volts.
- **Set Condition:**
  The oxygen sensor signal voltage is below 2.5196 volts for 3 seconds after starting engine. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K902) O2 RETURN UPSTREAM CIRCUIT SHORTED TO GROUND
(K43) O2 2/1 SIGNAL CIRCUIT SHORTED TO GROUND
(K43) O2 2/1 SIGNAL CIRCUIT SHORTED TO THE (K902) O2 RETURN UPSTREAM CIRCUIT
(K43) O2 2/1 SIGNAL CIRCUIT SHORTED TO THE (Z934) HEATER GROUND CIRCUIT
O2 SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. O2 SENSOR BELOW 2.52 VOLTS

Start the engine.
Allow the engine to reach normal operating temperature.
With a scan tool, read the 2/1 O2 Sensor voltage.

Is the voltage below 2.52 volts?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. (K43) O2 2/1 SIGNAL CIRCUIT

Turn the ignition off.
Disconnect the 2/1 O2 Sensor harness connector.
Ignition on, engine not running.
With a scan tool, monitor the 2/1 O2 Sensor voltage.

Is the O2 Sensor voltage above 4.8 volts?

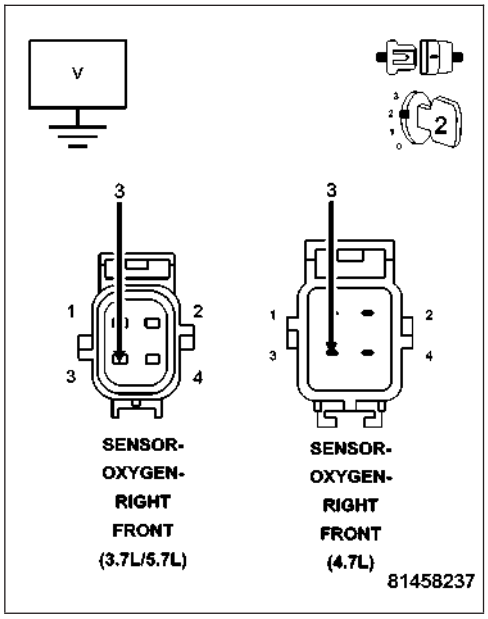
Yes >> Go To 3

No >> Go To 5

P0151-O2 SENSOR 2/1 CIRCUIT LOW (CONTINUED)

3. O2 SENSOR

Measure the voltage on the (K902) O2 Return Upstream circuit in the O2 Sensor harness connector.



Is the voltage at 2.5 volts?

Yes >> Replace the 2/1 O2 Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

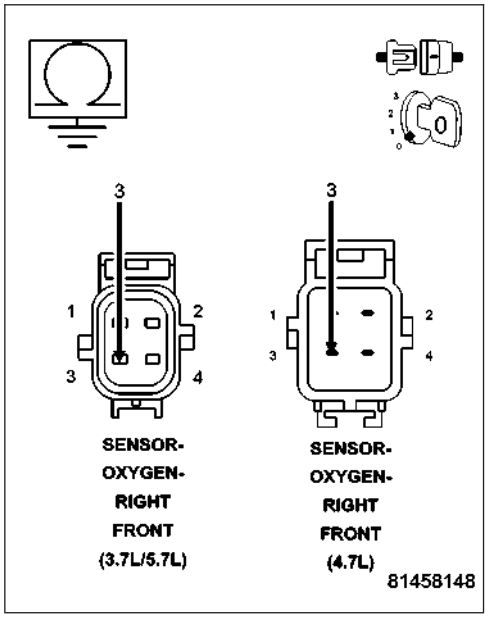
No >> Go To 4

4. (K902) O2 RETURN UPSTREAM CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the C1 PCM harness connector.

Measure the resistance between ground and the (K902) O2 Return Upstream circuit in the O2 Sensor harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K902) O2 Return Upstream circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8

P0151-O2 SENSOR 2/1 CIRCUIT LOW (CONTINUED)

5. (K43) O2 2/1 SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the C1 and C2 PCM harness connectors.

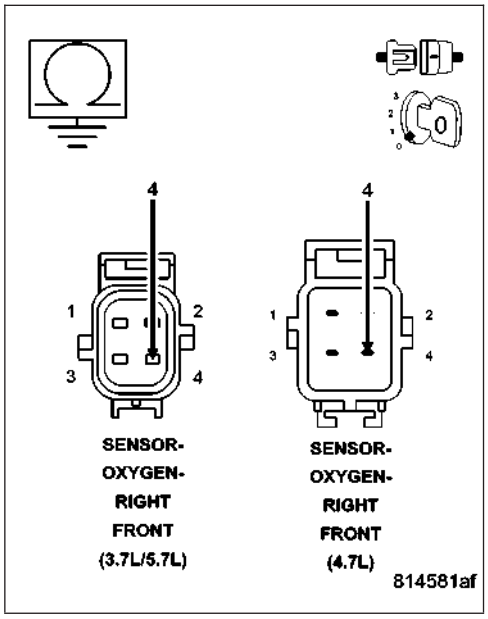
Measure the resistance between ground and the (K43) O2 2/1 Signal circuit in the O2 Sensor harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K43) O2 2/1 Signal circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6



6. (K43) O2 2/1 SIGNAL CIRCUIT SHORTED TO THE (K902) O2 RETURN UPSTREAM CIRCUIT

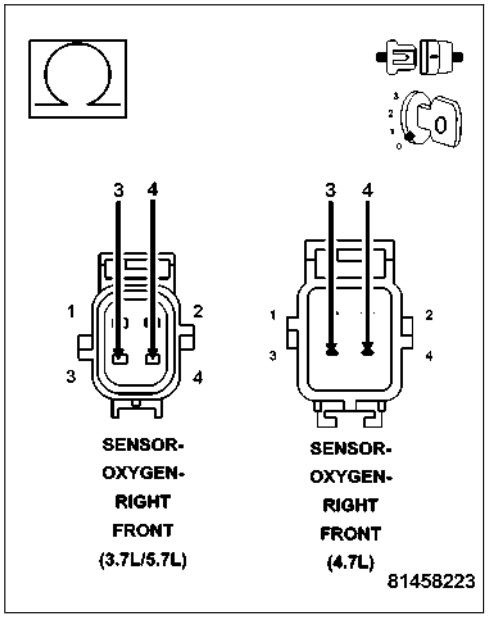
Measure the resistance between the (K43) O2 2/1 Signal circuit and the (K902) O2 Return Upstream circuit in the O2 Sensor harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the short between the (K902) O2 Return Upstream circuit and the (K43) O2 2/1 Signal circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

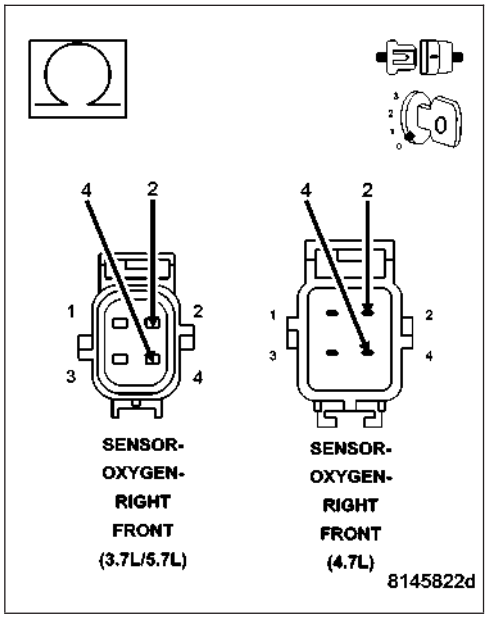
No >> Go To 7



P0151-O2 SENSOR 2/1 CIRCUIT LOW (CONTINUED)

7. (K43) O2 2/1 SIGNAL CIRCUIT SHORTED TO THE (Z934) HEATER GROUND CIRCUIT

Measure the resistance between the (K43) O2 2/1 Signal circuit and the (Z934) O2 Heater ground circuit in the O2 Sensor harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short between the (Z934) O2 Heater ground circuit and the (K43) O2 2/1 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8

---

8. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

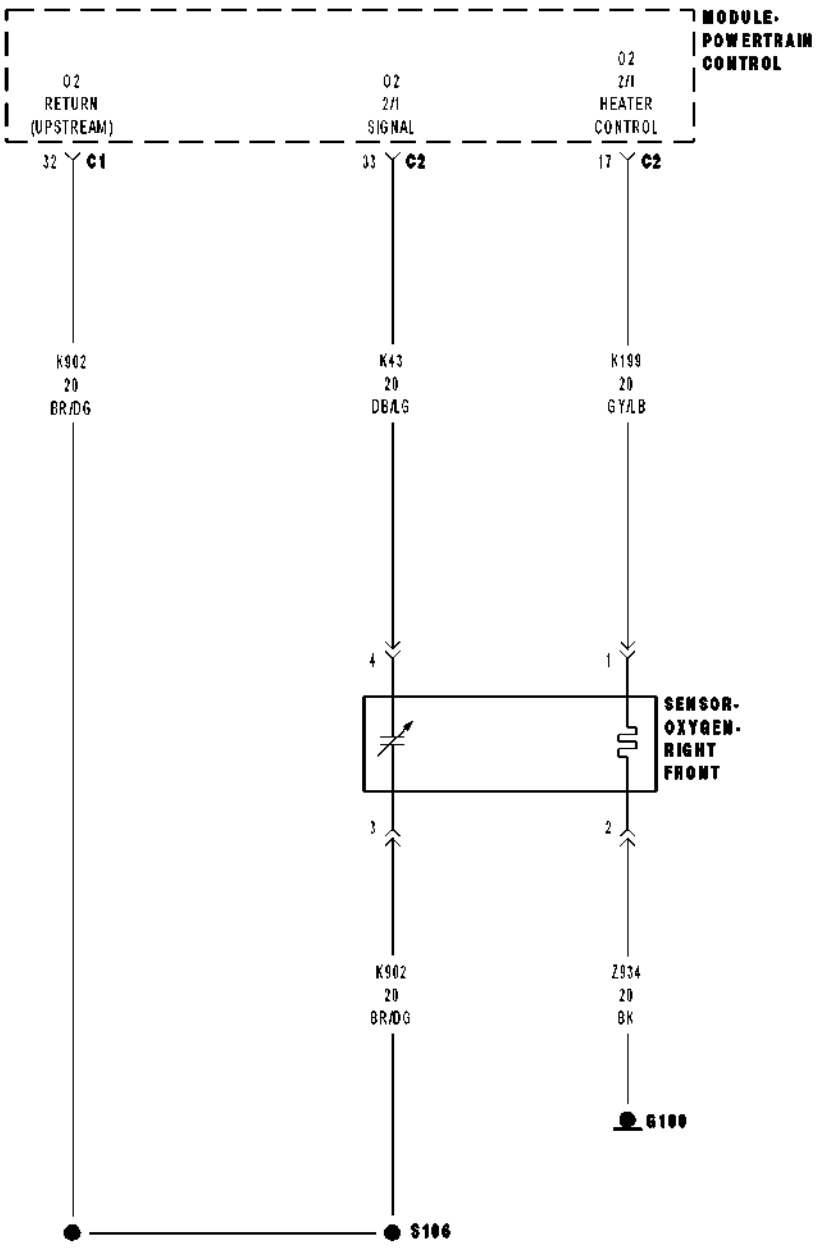
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

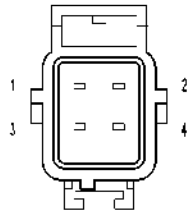
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

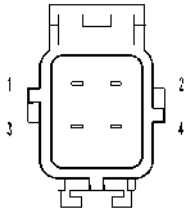
No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0152-O2 SENSOR 2/1 CIRCUIT HIGH

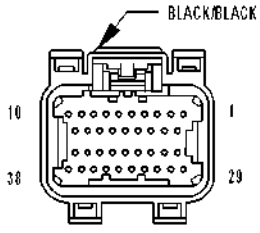




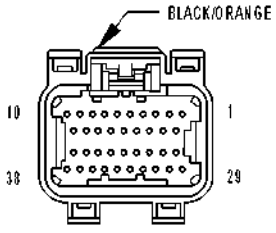
SENSOR-
OXYGEN-
RIGHT
FRONT
(3.7L/5.7L)



SENSOR-
OXYGEN-
RIGHT
FRONT
(4.7L)



MODULE-
POWERTRAIN
CONTROL C1



MODULE-
POWERTRAIN
CONTROL C2

P0152-O2 SENSOR 2/1 CIRCUIT HIGH (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  O2 Sensor Heater Temperature is greater than 496°C (925°F) and battery voltage greater than 10.99 volts.
- **Set Condition:**
  The Oxygen Sensor voltage is above 3.99 volts for 30 seconds. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K43) O2 2/1 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K902) O2 RETURN UPSTREAM CIRCUIT SHORTED TO BATTERY VOLTAGE
(K43) O2 2/1 SIGNAL CIRCUIT OPEN
(K902) O2 RETURN UPSTREAM CIRCUIT OPEN
O2 SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. O2 SENSOR ABOVE 3.99 VOLTS

NOTE: When only one O2 Sensor is shorted to voltage, the scan tool will display all O2 Sensor voltage readings at approximately 5.0 volts. When diagnosing this DTC, only diagnose the O2 Sensor that set the DTC.

Start the engine.

Allow the engine to reach normal operating temperature.

With a scan tool, read the 2/1 O2 Sensor voltage.

Is the voltage above 3.99 volts?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0152-O2 SENSOR 2/1 CIRCUIT HIGH (CONTINUED)

2. (K43) O2 2/1 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE

Start the engine and allow the engine to idle.

Disconnect the 2/1 O2 Sensor harness connector.

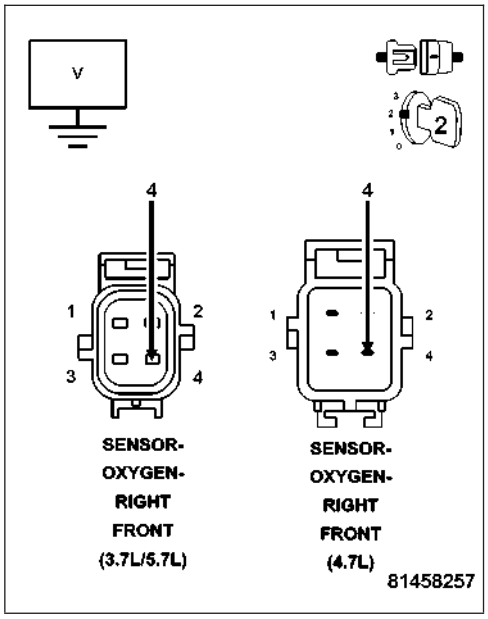
Measure the voltage on the (K43) O2 Sensor 2/1 Signal circuit in the 2/1 O2 Sensor harness connector.

NOTE: Measure the voltage in reference to ground, not the (K902) O2 Return Upstream circuit.

Is the voltage above 0 volts?

Yes >> Repair the short to battery voltage in the (K43) O2 Sensor 2/1 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3



3. (K902) O2 RETURN UPSTREAM CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

Disconnect the C1 PCM harness connector.

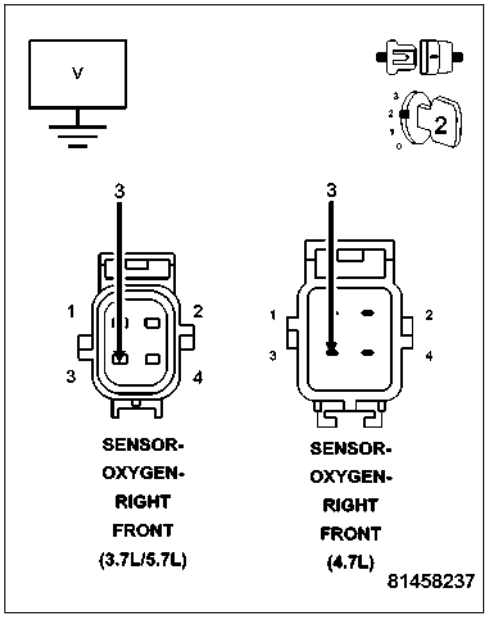
Ignition on, engine not running.

Measure the voltage on the (K902) O2 Return Upstream circuit in the 2/1 O2 Sensor harness connector.

Is there any voltage present?

Yes >> Repair the short to battery voltage in the (K902) O2 Return Upstream circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4



P0152-O2 SENSOR 2/1 CIRCUIT HIGH (CONTINUED)

4. O2 SENSOR

Turn the ignition off.

Connect the C1 PCM harness connector.

Connect a jumper wire between the (K43) O2 2/1 Signal circuit and the (K902) O2 Return Upstream circuit in the O2 Sensor harness connector.

Ignition on, engine not running.

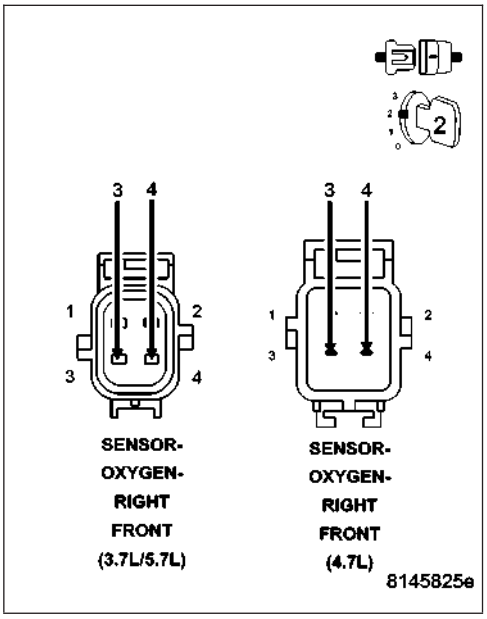
With a scan tool, monitor the 2/1 O2 Sensor voltage.

Is the voltage between 2.3 and 2.7 volts with the jumper wire in place?

Yes >> Replace the O2 Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

NOTE: Remove the jumper wire before continuing.



5. (K43) O2 2/1 SIGNAL CIRCUIT OPEN

Turn the ignition off.

Disconnect the C1 and C2 PCM harness connectors.

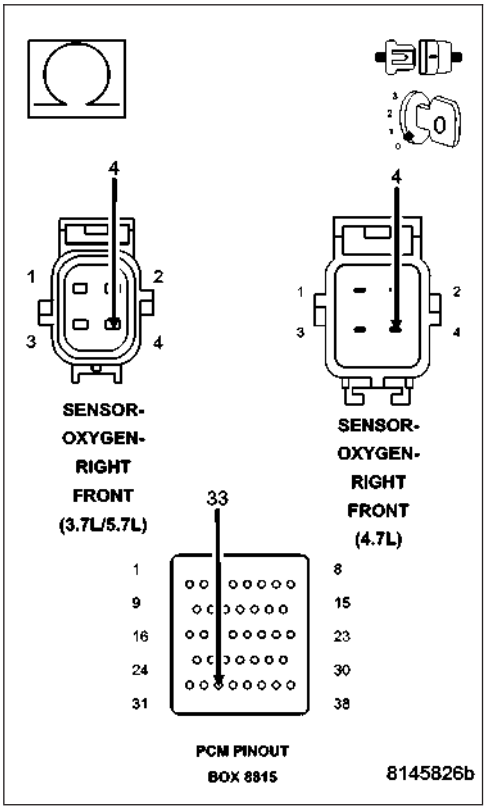
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K43) O2 2/1 Signal circuit from the 2/1 O2 Sensor harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 6

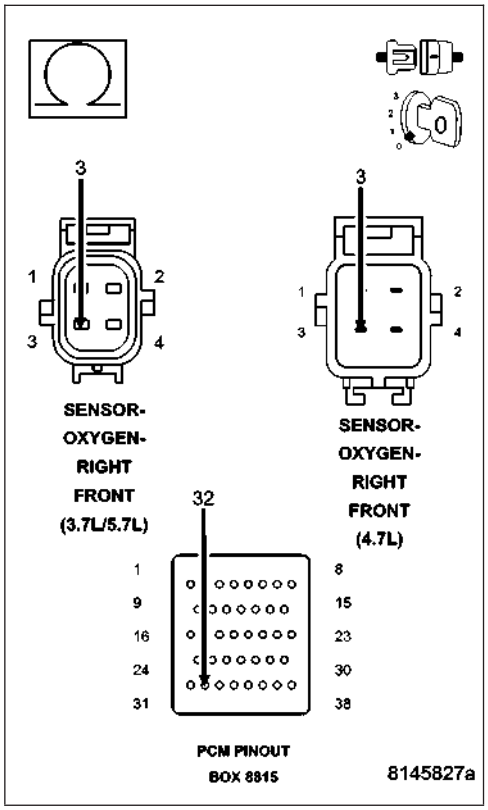
No >> Repair the open in the (K43) O2 2/1 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P0152-O2 SENSOR 2/1 CIRCUIT HIGH (CONTINUED)

6. (K902) O2 RETURN UPSTREAM CIRCUIT OPEN

Measure the resistance of the (K902) O2 Return Upstream circuit from the O2 Sensor harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 7

No >> Repair the open in the (K902) O2 Return Upstream circuit. Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

7. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

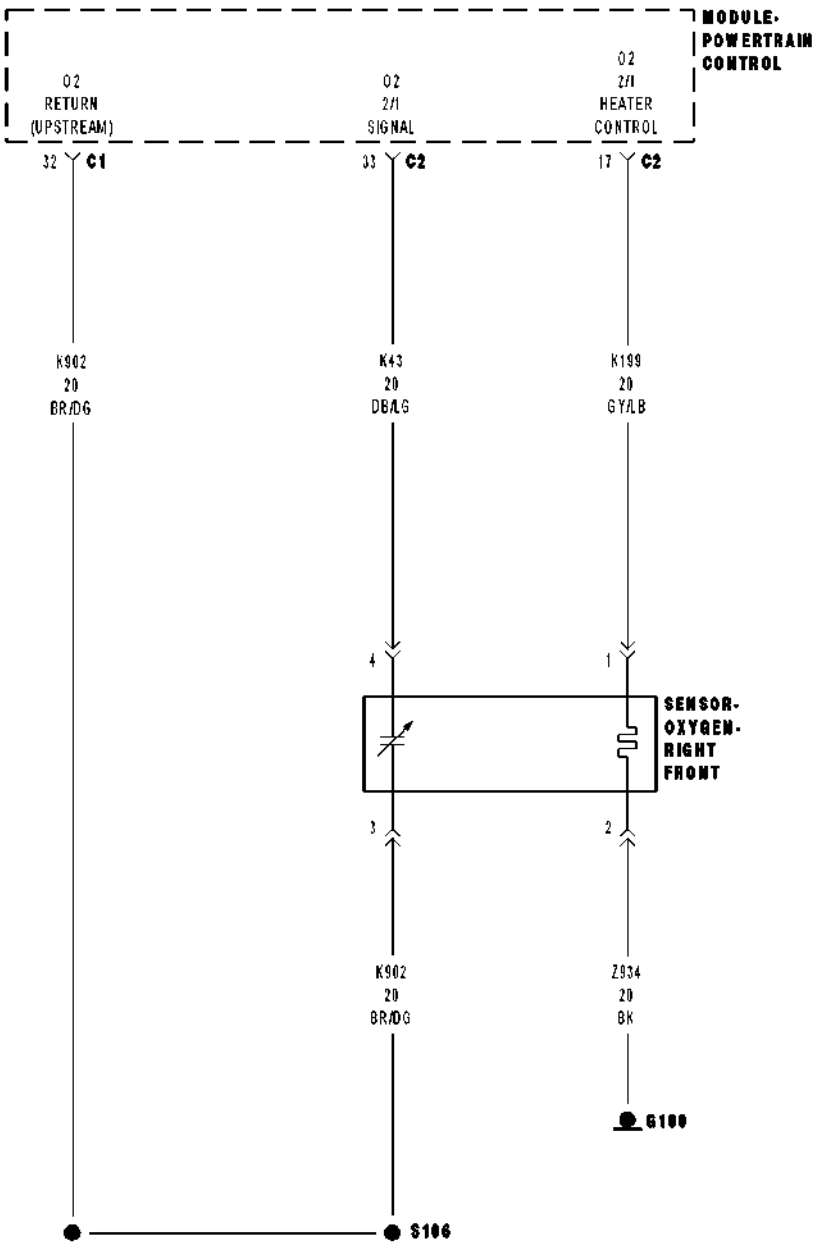
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

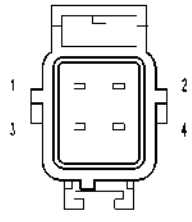
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

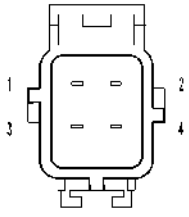
No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0153-O2 SENSOR 2/1 SLOW RESPONSE

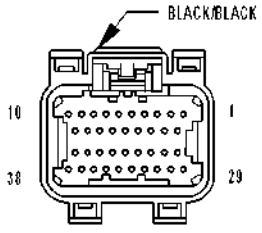




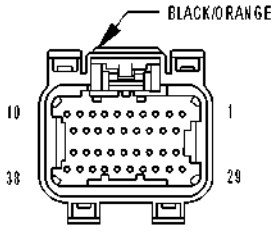
SENSOR-
OXYGEN-
RIGHT
FRONT
(3.7L/5.7L)



SENSOR-
OXYGEN-
RIGHT
FRONT
(4.7L)



MODULE-
POWERTRAIN
CONTROL C1



MODULE-
POWERTRAIN
CONTROL C2

P0153-O2 SENSOR 2/1 SLOW RESPONSE (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Vehicle is started and driven between 20 and 55 MPH with the Throttle open for a minimum of 120 seconds. Coolant greater than 70°C (158°F). Catalytic Converter Temp greater than 600°C (1112°F) and EVAP Purge is active.
- **Set Condition:**
  The oxygen sensor signal voltage switches less than 16 times from lean to rich within 20 seconds during monitoring. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
EXHAUST LEAK
(K43) O2 2/1 SIGNAL CIRCUIT
(K902) O2 RETURN UPSTREAM CIRCUIT
O2 SENSOR

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: Check for contaminants that may have damaged the O2 Sensor: contaminated fuel, unapproved silicone, oil and coolant.
Ignition on, engine not running.

NOTE: After the repairs have been made, verify proper O2 Sensor operation. If all the O2 Sensor voltage readings have not returned to normal, follow the diagnostic procedure for the remaining O2 Sensors.
With a scan tool, read DTCs and record the related Freeze Frame data.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. EXHAUST LEAK

Start the engine.
Inspect the exhaust system for leaks between the engine and the O2 Sensors.

Are there any exhaust leaks?

Yes >> Repair or replace the leaking exhaust parts as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

P0153-O2 SENSOR 2/1 SLOW RESPONSE (CONTINUED)

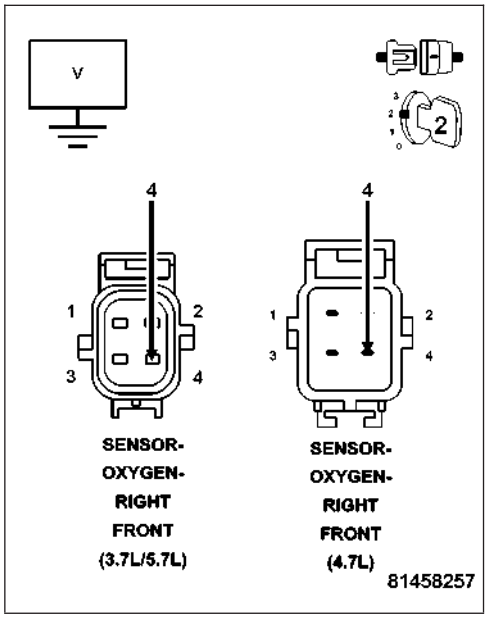
3. (K43) O2 2/1 SIGNAL CIRCUIT

Turn the ignition off

Disconnect the O2 Sensor harness connector.

Ignition on, engine not running.

Measure the voltage on the (K43) O2 2/1 Signal circuit in the O2 Sensor harness connector.



Is the voltage between 4.5 and 5.0 volts?

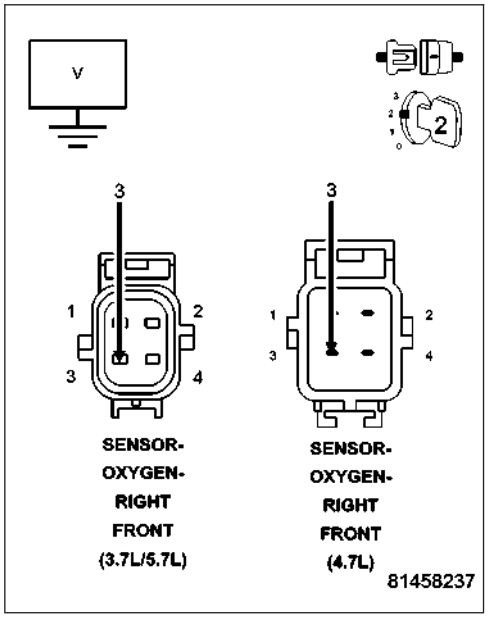
Yes >> Go To 4

No >> Check the (K43) O2 2/1 Signal circuit for a short to ground, open, or short to voltage. If OK, replace and program the Powertrain Control Module per Service Information.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

4. (K902) O2 RETURN UPSTREAM CIRCUIT

Measure the voltage on the (K902) O2 Return Upstream circuit in the O2 Sensor harness connector.



Is the voltage at 2.5 volts?

Yes >> Go To 5

No >> Check the (K902) O2 Return Upstream circuit for a short to ground, open, or short to voltage. If OK, replace and program the Powertrain Control Module per Service Information.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

5. O2 SENSOR

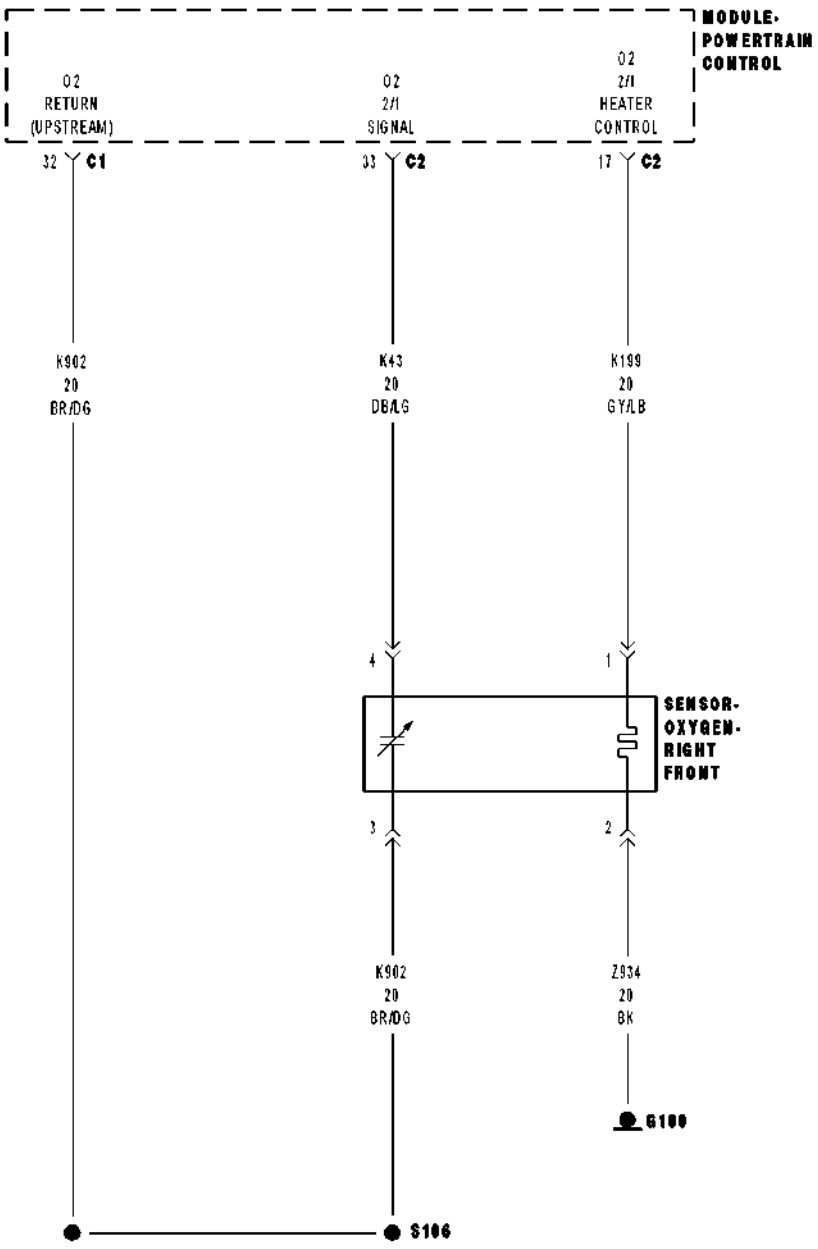
If there are no possible causes remaining, view repair.

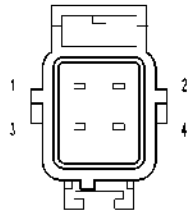
Repair

Replace the O2 Sensor

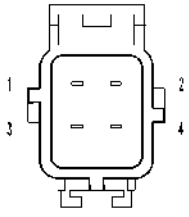
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0155-O2 SENSOR 2/1 HEATER PERFORMANCE

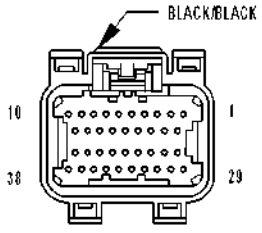




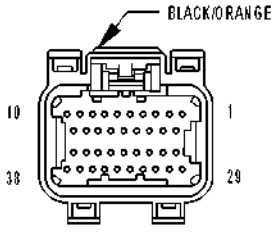
SENSOR-
OXYGEN-
RIGHT
FRONT
(3.7L/5.7L)



SENSOR-
OXYGEN-
RIGHT
FRONT
(4.7L)



MODULE-
POWERTRAIN
CONTROL C1



MODULE-
POWERTRAIN
CONTROL C2

P0155-O2 SENSOR 2/1 HEATER PERFORMANCE (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

This diagnostic provides a continuous check of the O2 heater circuit during operation. The heater circuit is momentarily disabled to allow a resistance measurement to be taken to infer heater temperature. The current delivery to the heater is duty cycled to maintain a specific target temperature. The error from the target temperature is continuously monitored to assess heater performance.

- **When Monitored:**
  Engine running and heater duty cycle greater than 0%. Battery voltage greater than 11.0 volts.
- **Set Condition:**
  No sensor output is received when the PCM powers up the sensor heater. Two trip fault. Three good trips to turn off the MIL.

Possible Causes
(K199) O2 2/1 HEATER CONTROL CIRCUIT OPEN
(Z934) O2 HEATER GROUND CIRCUIT OPEN
O2 SENSOR HEATER ELEMENT
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. O2 SENSOR HEATER OPERATION

Turn the ignition off.

NOTE: Wait a minimum of 8 minutes to allow the O2 Sensor to cool down before continuing the test. Allow the O2 Sensor voltage to stabilize between 4.6 and 5.0 volts.

Ignition on, engine not running.

With a scan tool, actuate the O2 Heater Test.

With the scan tool, monitor 2/1 O2 Sensor voltage for at least 2 minutes.

Does the voltage stay above 4.5 volts?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0155-O2 SENSOR 2/1 HEATER PERFORMANCE (CONTINUED)

2. O2 SENSOR HEATER ELEMENT

Turn the ignition off.

NOTE: Allow the O2 sensor to cool down to room temperature.

Disconnect the 2/1 O2 Sensor harness connector.

Measure the resistance of the O2 Heater Element across the O2 Sensor connector between the O2 Heater Control terminal and the O2 Heater ground terminal.

NOTE: O2 Heater Element resistance values should be measured at 70°F (21.1°C). The resistance value will vary with different temperature values.

Is the resistance of the O2 Sensor Heater Element between 2.0 and 30.0 ohms?

Yes >> Go To 3

No >> Replace the O2 Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

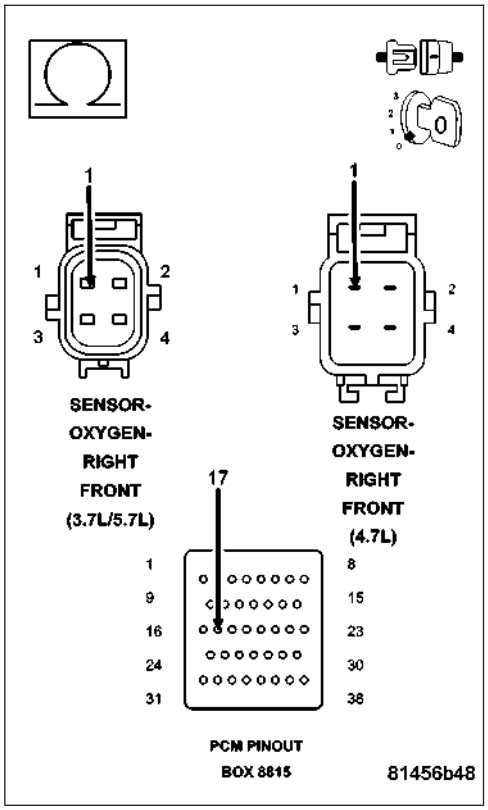
---

3. (K199) O2 2/1 HEATER CONTROL CIRCUIT OPEN

Disconnect the C2 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K199) O2 2/1 Heater Control circuit from the O2 harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 0.5 of an ohm?

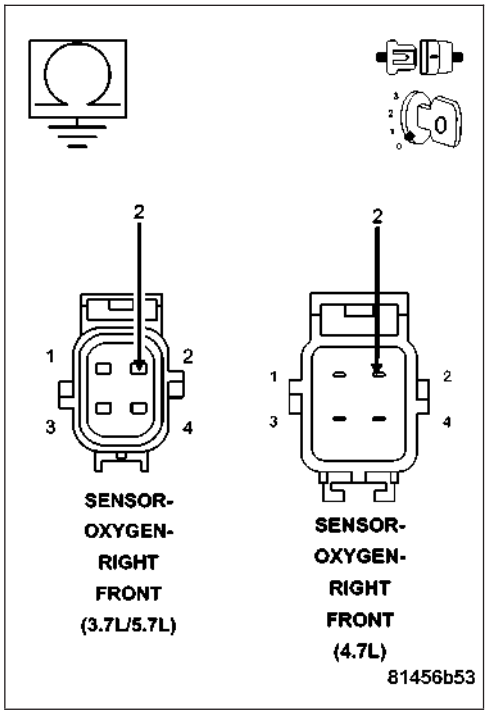
Yes >> Go To 4

No >> Repair the excessive resistance in the (K199) O2 2/1 Heater Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0155-O2 SENSOR 2/1 HEATER PERFORMANCE (CONTINUED)

4. (Z934) O2 SENSOR HEATER GROUND CIRCUIT OPEN

Measure the resistance between ground and the (Z934) O2 Heater ground circuit in the O2 Sensor harness connector.



Is the resistance below 0.5 of an ohm?

Yes >> Go To 5

No >> Repair the excessive resistance in the (Z934) O2 Heater ground circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

5. PCM

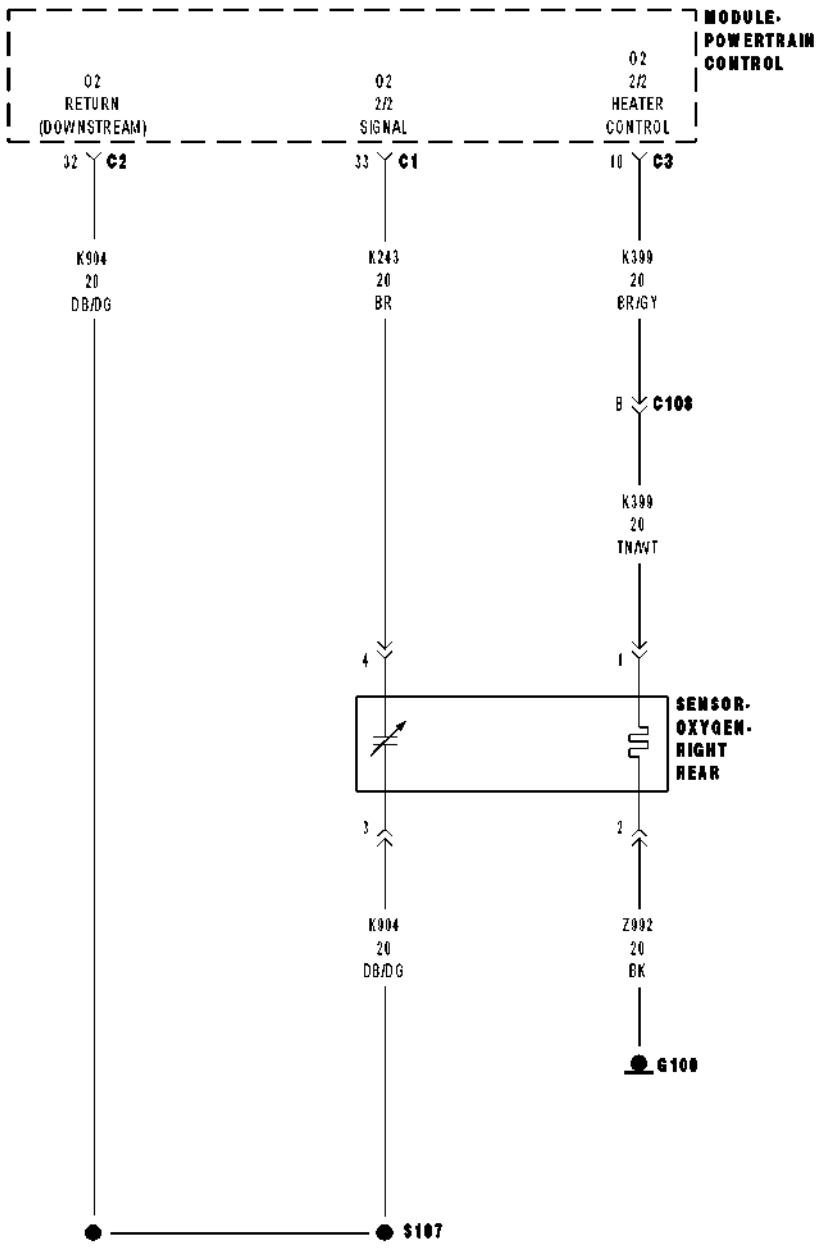
NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

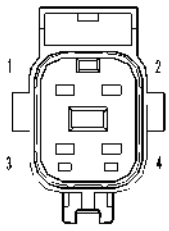
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

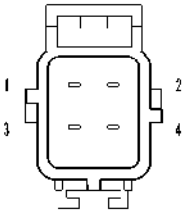
No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0157-O2 SENSOR 2/2 CIRCUIT LOW

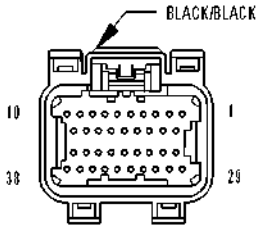




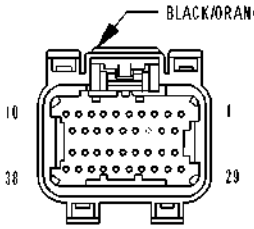
SENSOR-
OXYGEN-
RIGHT
REAR
(3.7L/5.7L)



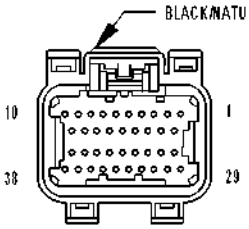
SENSOR-
OXYGEN-
RIGHT
REAR
(4.7L)



MODULE-
POWERTRAIN
CONTROL C1



MODULE-
POWERTRAIN
CONTROL C2



MODULE-
POWERTRAIN
CONTROL C3

81483cc8

P0157-O2 SENSOR 2/2 CIRCUIT LOW (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Engine running for less than 30 seconds and the O2 Sensor Heater Temperature is less than 251°C (484°F) with battery voltage greater 10.99 volts.
- **Set Condition:**
  The oxygen sensor signal voltage is below 2.5196 volts for 3 seconds after starting engine. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K904) O2 RETURN DOWNSTREAM CIRCUIT SHORTED TO GROUND
(K243) O2 2/2 SIGNAL CIRCUIT SHORTED TO GROUND
(K243) O2 SIGNAL CIRCUIT SHORTED TO THE (K904) O2 RETURN DOWNSTREAM CIRCUIT
(K243) O2 SIGNAL CIRCUIT SHORTED TO THE (Z992) O2 2/2 HEATER GROUND CIRCUIT
O2 SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. O2 SENSOR BELOW 2.52 VOLTS

Start the engine.
Allow the engine to reach normal operating temperature.
With a scan tool, read the 2/2 O2 Sensor voltage.

Is the voltage below 2.52 volts?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. (K243) O2 2/2 SIGNAL CIRCUIT

Turn the ignition off.
Disconnect the 2/2 O2 Sensor harness connector.
Ignition on, engine not running.
With a scan tool, monitor the 2/2 O2 Sensor voltage.

Is the O2 Sensor voltage above 4.8 volts?

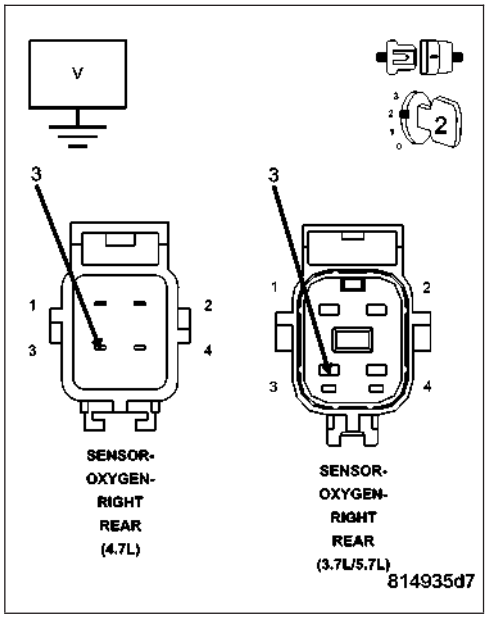
Yes >> Go To 3

No >> Go To 5

P0157-O2 SENSOR 2/2 CIRCUIT LOW (CONTINUED)

3. O2 SENSOR

Measure the voltage on the (K904) O2 Return Downstream circuit in the O2 Sensor harness connector.



Is the voltage at 2.5 volts?

Yes >> Replace the O2 Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

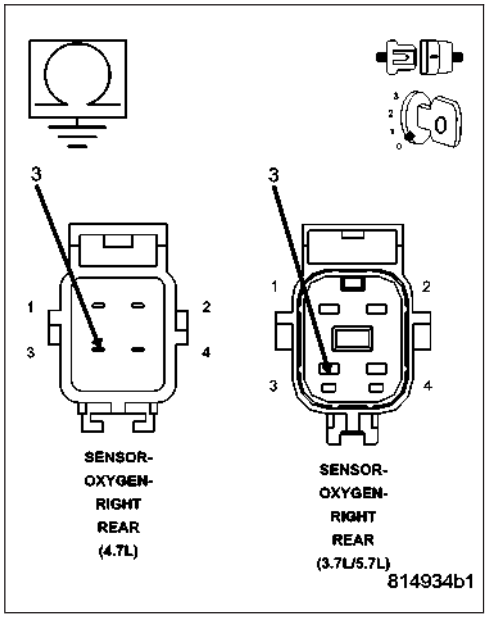
No >> Go To 4

4. (K904) O2 RETURN DOWNSTREAM CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the C2 PCM harness connector.

Measure the resistance between ground and the (K904) O2 Return Downstream circuit in the O2 Sensor harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K904) O2 Return Downstream circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8

P0157-O2 SENSOR 2/2 CIRCUIT LOW (CONTINUED)

5. (K243) O2 2/2 SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

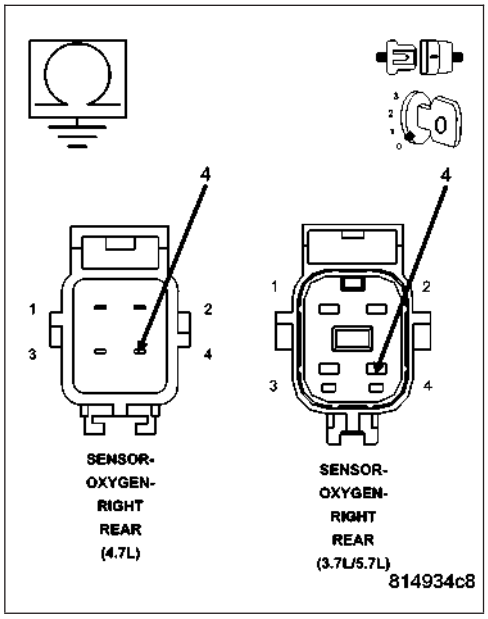
Disconnect the C1and C2 PCM harness connectors.

Measure the resistance between ground and the (K243) O2 2/2 Signal circuit in the O2 Sensor harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K243) O2 2/2 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6



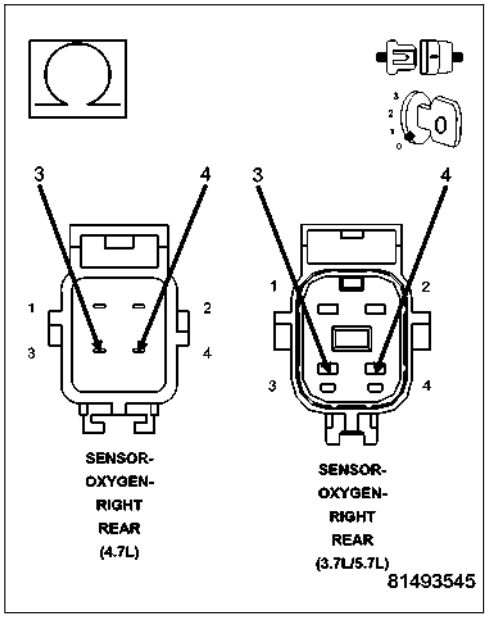
6. (K243) O2 2/2 SIGNAL CIRCUIT SHORTED TO THE (K904) O2 RETURN DOWNSTREAM CIRCUIT

Measure the resistance between the (K243) O2 2/2 Signal circuit and the (K904) O2 Return Downstream circuit in the O2 Sensor harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the short between the (K904) O2 Return Downstream circuit and the (K243) O2 2/2 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

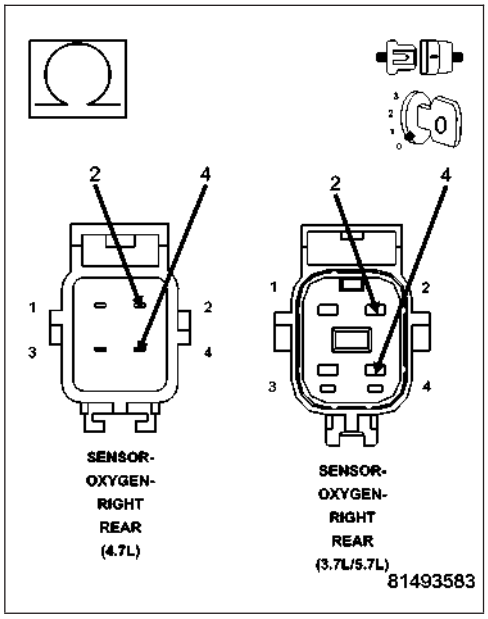
No >> Go To 7



P0157-O2 SENSOR 2/2 CIRCUIT LOW (CONTINUED)

7. (K243) O2 2/2 SIGNAL CIRCUIT SHORTED TO THE (Z992) O2 2/2 HEATER GROUND CIRCUIT

Measure the resistance between the (K243) O2 2/2 Signal circuit and the (Z992) O2 2/2 Heater ground circuit in the O2 Sensor harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short between the (Z992) O2 2/2 Heater ground circuit and the (K243) O2 2/2 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8

---

8. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

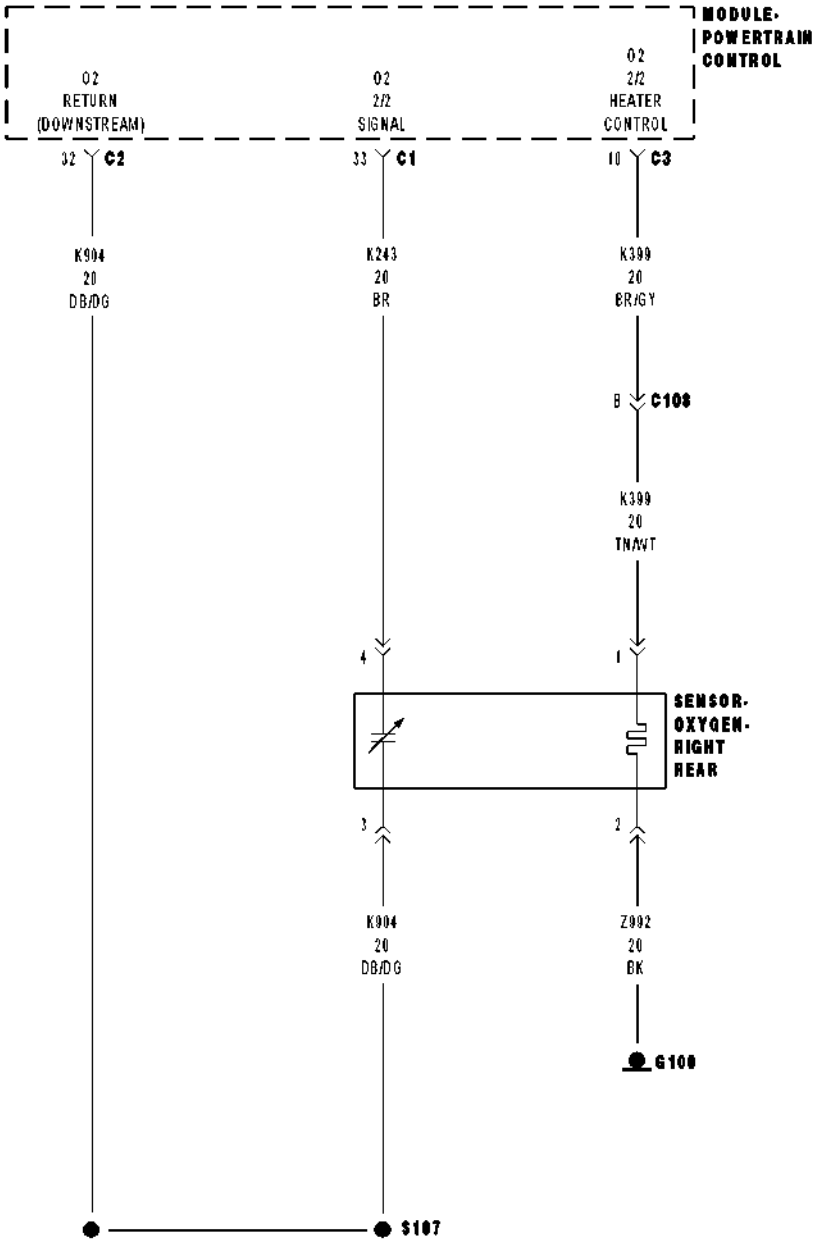
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

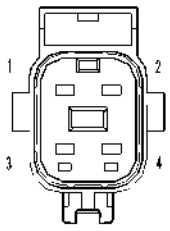
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

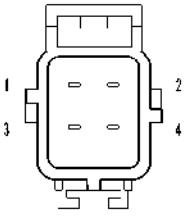
No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0158-O2 SENSOR 2/2 CIRCUIT HIGH

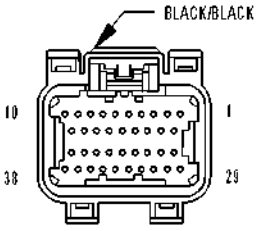




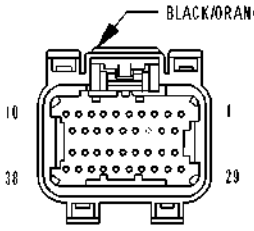
SENSOR-
OXYGEN-
RIGHT
REAR
(3.7L/5.7L)



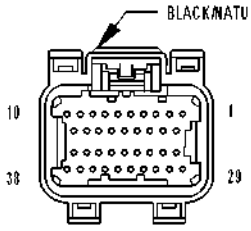
SENSOR-
OXYGEN-
RIGHT
REAR
(4.7L)



MODULE-
POWERTRAIN
CONTROL C1



MODULE-
POWERTRAIN
CONTROL C2



MODULE-
POWERTRAIN
CONTROL C3

81483cc8

P0158-O2 SENSOR 2/2 CIRCUIT HIGH (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  O2 Sensor Heater Temperature is greater than 496°C (925°F) and battery voltage greater than 10.99 volts.
- **Set Condition:**
  The Oxygen Sensor voltage is above 3.99 volts for 30 seconds. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K243) O2 2/2 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K904) O2 RETURN DOWNSTREAM CIRCUIT SHORTED TO BATTERY VOLTAGE
(K243) O2 2/2 SIGNAL CIRCUIT OPEN
(K904) O2 RETURN DOWNSTREAM CIRCUIT OPEN
O2 SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. O2 SENSOR ABOVE 3.99 VOLTS

NOTE: When only one O2 Sensor is shorted to voltage, the scan tool will display all O2 Sensor voltage readings at approximately 5.0 volts. When diagnosing this DTC, only diagnose the O2 Sensor that set the DTC.

Start the engine.

Allow the engine to reach normal operating temperature.

With a scan tool, read the 2/2 O2 Sensor voltage.

Is the voltage above 3.99 volts?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0158-O2 SENSOR 2/2 CIRCUIT HIGH (CONTINUED)

2. (K243) O2 2/2 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE

Start the engine and allow the engine to idle.

Disconnect the 2/2 O2 Sensor harness connector.

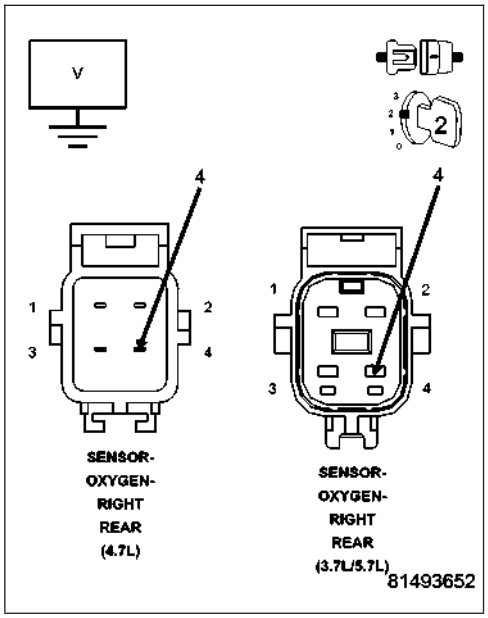
Measure the voltage on the (K243) O2 Sensor 2/2 Signal circuit in the O2 Sensor harness connector.

NOTE: Measure the voltage in reference to ground, not the (K904) O2 Return Downstream circuit.

Is the voltage above 0 volts?

Yes >> Repair the short to battery voltage in the (K243) O2 Sensor 2/2 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3



3. (K904) O2 RETURN DOWNSTREAM CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

Disconnect the C2 PCM harness connector.

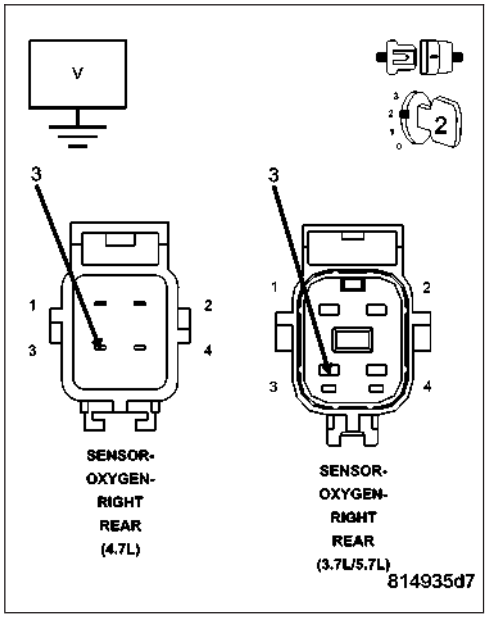
Ignition on, engine not running.

Measure the voltage on the (K904) O2 Return Downstream circuit in the 2/2 O2 Sensor harness connector.

Is there any voltage present?

Yes >> Repair the short to battery voltage in the (K904) O2 Return Downstream circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4



P0158-O2 SENSOR 2/2 CIRCUIT HIGH (CONTINUED)

4. O2 SENSOR

Turn the ignition off.

Connect the C2 PCM harness connector.

Connect a jumper wire between the (K243) O2 2/2 Signal circuit and the (K904) O2 Return Downstream circuit in the 2/2 O2 Sensor harness connector.

Ignition on, engine not running.

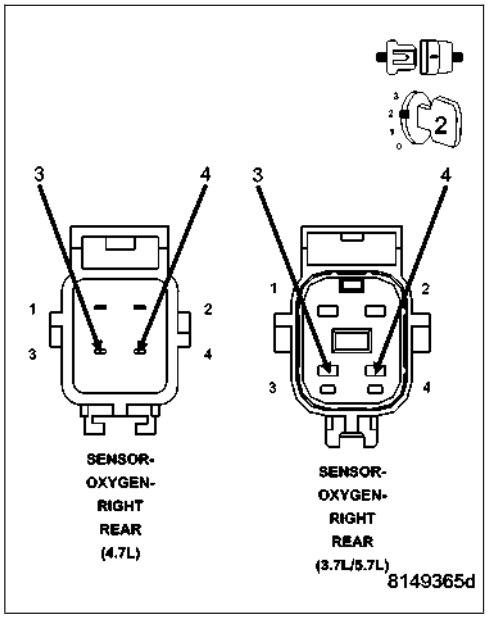
With a scan tool, monitor the 2/2 O2 Sensor voltage.

Is the voltage between 2.3 and 2.7 volts with the jumper wire installed?

Yes >> Replace the O2 Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

NOTE: Remove the jumper wire before continuing.



5. (K243) O2 2/2 SIGNAL CIRCUIT OPEN

Turn the ignition off.

Disconnect the C1 and C2 PCM harness connectors.

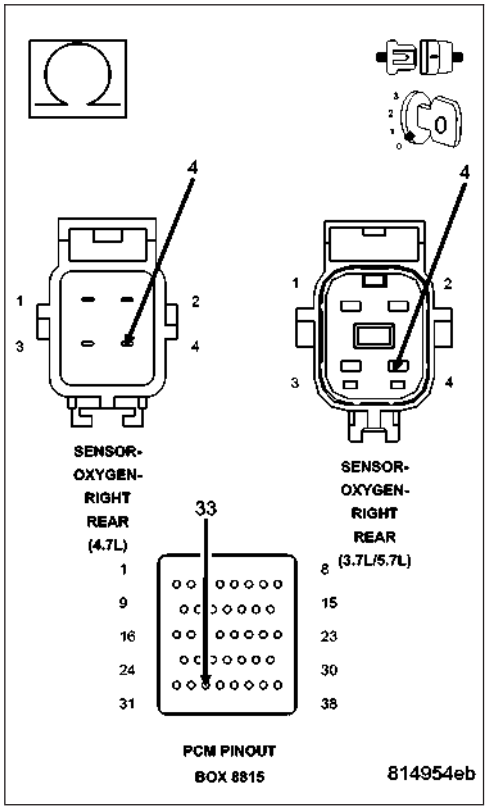
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K243) O2 2/2 Signal circuit from the O2 Sensor harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 6

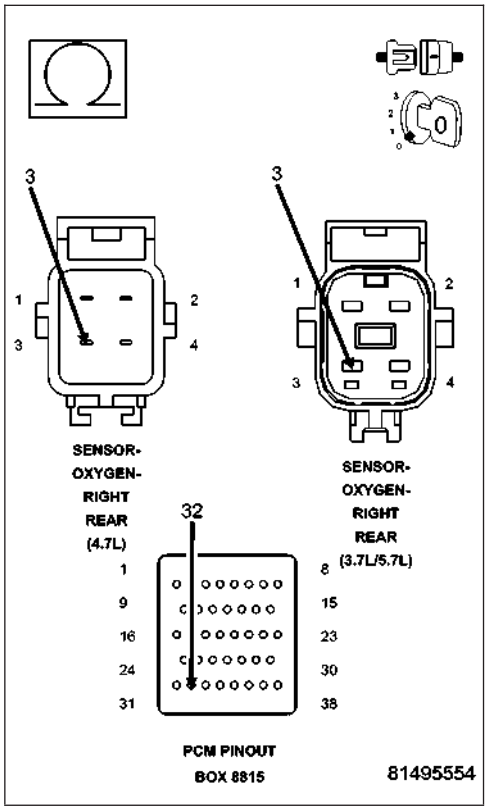
No >> Repair the open in the (K243) O2 2/2 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P0158-O2 SENSOR 2/2 CIRCUIT HIGH (CONTINUED)

6. (K904) O2 RETURN DOWNSTREAM CIRCUIT OPEN

Measure the resistance of the (K904) O2 Return Downstream circuit from the O2 Sensor harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 7

No >> Repair the open in the (K904) O2 Return Downstream circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

7. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

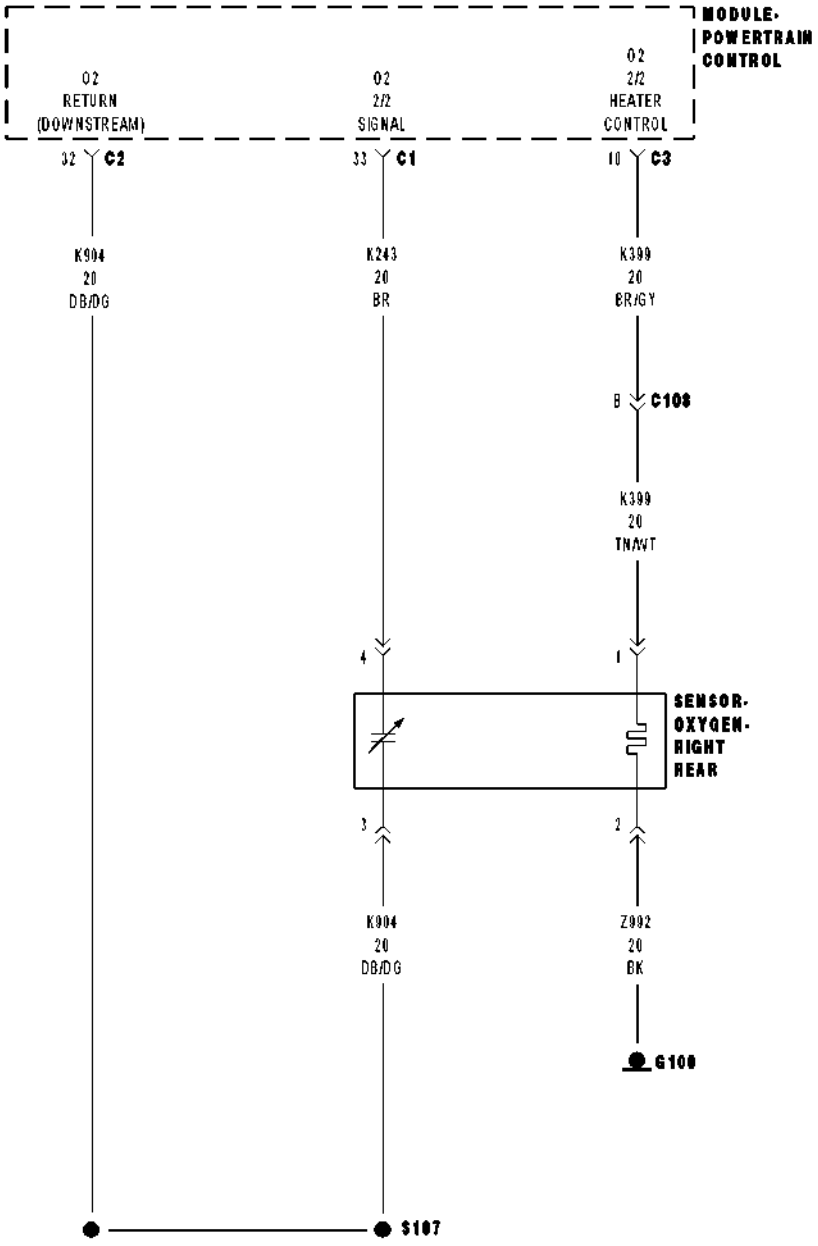
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

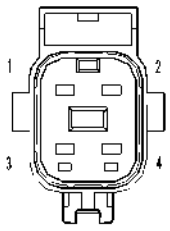
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

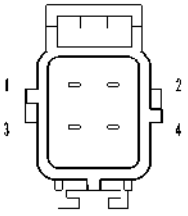
No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0159-O2 SENSOR 2/2 SLOW RESPONSE

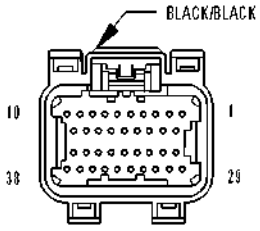




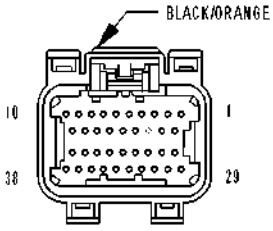
SENSOR-
OXYGEN-
RIGHT
REAR
(3.7L/5.7L)



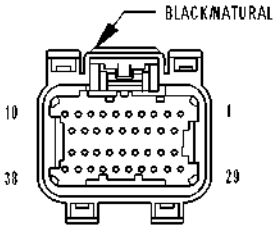
SENSOR-
OXYGEN-
RIGHT
REAR
(4.7L)



MODULE-
POWERTRAIN
CONTROL C1



MODULE-
POWERTRAIN
CONTROL C2



MODULE-
POWERTRAIN
CONTROL C3

81483cc8

P0159-O2 SENSOR 2/2 SLOW RESPONSE (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The downstream O2 Sensor is located in the exhaust path behind the catalytic converter, is monitored for proper response to assure optimum catalytic converter efficiency. The downstream O2 response monitor is intended to diagnose a downstream O2 sensor that is not moving or stuck in a voltage window and to insure accurate information for catalyst monitor diagnosis.

- **When Monitored:**
  Vehicle is started and driven between 20 and 55 MPH with the Throttle open for a minimum of 120 seconds. Coolant greater than 70°C (158°F). Catalytic Converter Temp greater than 600°C (1112°F) and EVAP Purge is active.
- **Set Condition:**
  The oxygen sensor signal voltage switches less than 16 times from lean to rich within 20 seconds during monitoring. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
EXHAUST LEAK
(K243) O2 2/2 SIGNAL CIRCUIT
(K904) O2 RETURN DOWNSTREAM CIRCUIT
O2 SENSOR

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: Check for contaminants that may have damaged the O2 Sensor: contaminated fuel, unapproved silicone, oil and coolant.
Ignition on, engine not running.

NOTE: After the repairs have been made, verify proper O2 Sensor operation. If all the O2 Sensor voltage readings have not returned to normal, follow the diagnostic procedure for the remaining O2 Sensors.
With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. EXHAUST LEAK

Start the engine.

Inspect the exhaust system for leaks between the engine and the O2 Sensors.

Are there any exhaust leaks?

Yes >> Repair or replace the leaking exhaust parts as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

P0159-O2 SENSOR 2/2 SLOW RESPONSE (CONTINUED)

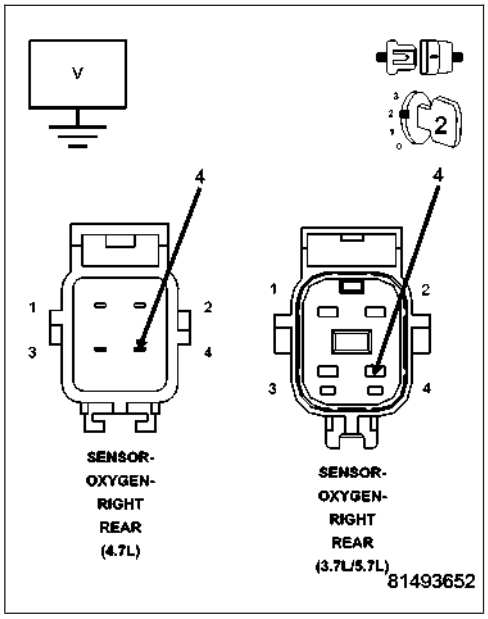
3. (K243) O2 2/2 SIGNAL CIRCUIT

Turn the ignition off

Disconnect the 2/2 O2 Sensor harness connector.

Ignition on, engine not running.

Measure the voltage on the (K243) O2 2/2 Signal circuit in the O2 Sensor harness connector.



Is the voltage between 4.5 and 5.0 volts?

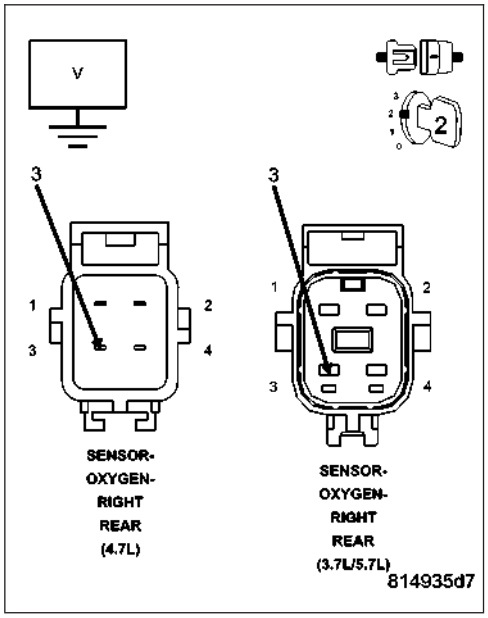
Yes >> Go To 4

No >> Check the (K243) O2 2/2 Signal circuit for a short to ground, open, or short to voltage. If OK, replace and program the Powertrain Control Module per Service Information.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

4. (K904) O2 RETURN DOWNSTREAM CIRCUIT

Measure the voltage on the (K904) O2 Return Downstream circuit in the O2 Sensor harness connector.



Is the voltage at 2.5 volts?

Yes >> Check the (K904) O2 Return Downstream circuit for a short to ground, open, or short to voltage. If OK, replace and program the Powertrain Control Module per Service Information.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

5. O2 SENSOR

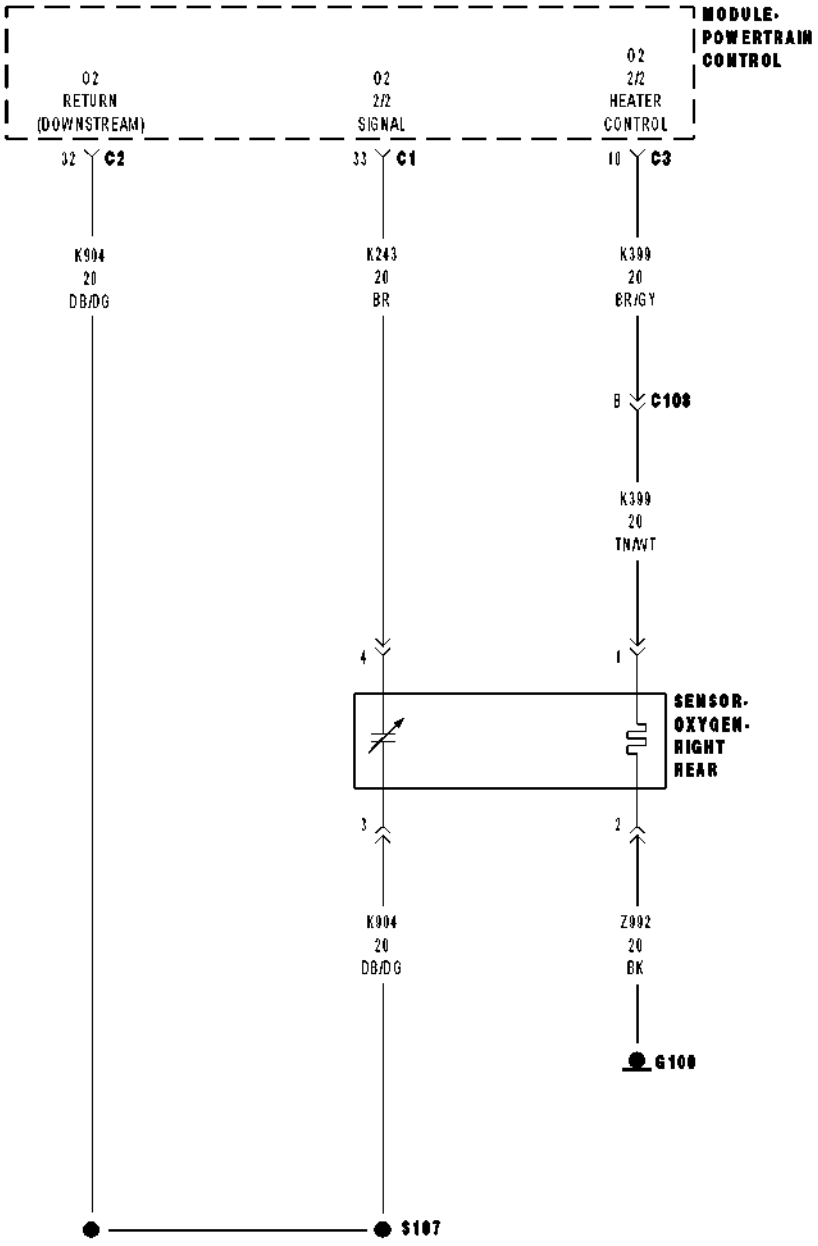
If there are no possible causes remaining, view repair.

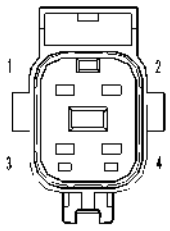
Repair

Replace the O2 Sensor

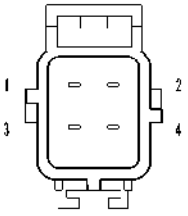
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0161-O2 SENSOR 2/2 HEATER PERFORMANCE

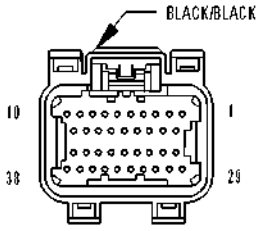




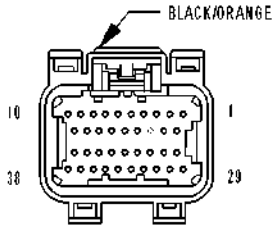
SENSOR-
OXYGEN-
RIGHT
REAR
(3.7L/5.7L)



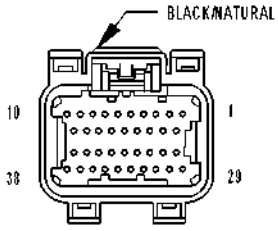
SENSOR-
OXYGEN-
RIGHT
REAR
(4.7L)



MODULE-
POWERTRAIN
CONTROL C1



MODULE-
POWERTRAIN
CONTROL C2



MODULE-
POWERTRAIN
CONTROL C3

81483cc8

P0161-O2 SENSOR 2/2 HEATER PERFORMANCE (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

This diagnostic provides a continuous check of the O2 heater circuit during operation. The heater circuit is momentarily disabled to allow a resistance measurement to be taken to infer heater temperature. The current delivery to the heater is duty cycled to maintain a specific target temperature. The error from the target temperature is continuously monitored to assess heater performance.

- **When Monitored:**
  Engine running and heater duty cycle greater than 0%. Battery voltage greater than 11.0 volts.
- **Set Condition:**
  No sensor output is received when the PCM powers up the sensor heater. Two trip fault. Three good trips to turn off the MIL.

Possible Causes
(K399) O2 2/2 HEATER CONTROL CIRCUIT OPEN
(Z922) O2 2/2 HEATER GROUND CIRCUIT OPEN
O2 SENSOR HEATER ELEMENT
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING.

Diagnostic Test

1. O2 SENSOR HEATER OPERATION

Turn the ignition off.

NOTE: Wait a minimum of 8 minutes to allow the O2 Sensor to cool down before continuing the test. Allow the O2 Sensor voltage to stabilize between 4.6 and 5.0 volts.

Ignition on, engine not running.

With a scan tool, actuate the O2 Heater Test.

With a scan tool, monitor 2/2 O2 Sensor voltage for at least 2 minutes.

Does the voltage stay above 4.5 volts?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0161-O2 SENSOR 2/2 HEATER PERFORMANCE (CONTINUED)

2. O2 SENSOR HEATER ELEMENT

Turn the ignition off.

NOTE: Allow the O2 sensor to cool down to room temperature.

Disconnect the O2 Sensor harness connector.

Measure the resistance of the 2/2 O2 Heater Element, between the O2 Heater Control terminal and the O2 Heater ground terminal in the O2 Sensor connector.

NOTE: O2 Heater Element resistance values should be measured at 70°F (21.1°C). The resistance value will vary with different temperature values.

Is the resistance of the O2 Sensor Heater Element between 2.0 and 30.0 ohms?

Yes >> Go To 3

No >> Replace the O2 Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

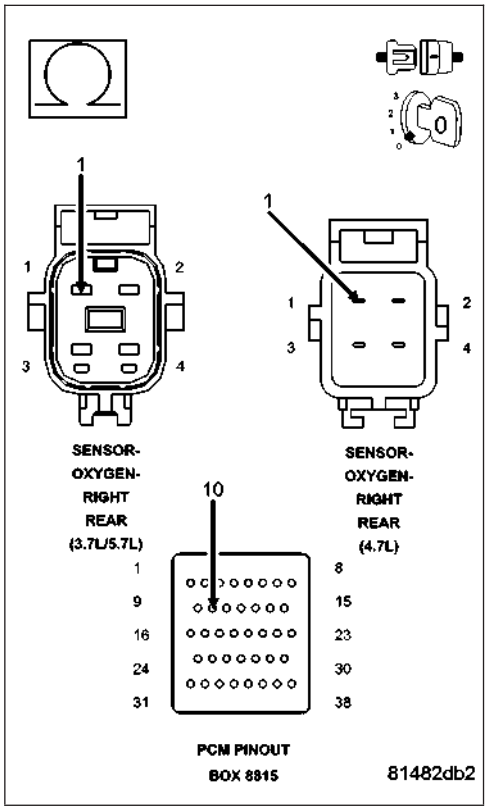
---

3. (K399) O2 2/2 HEATER CONTROL CIRCUIT OPEN

Disconnect the C3 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K399) O2 2/2 Heater Control circuit from the O2 harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 0.5 of an ohm?

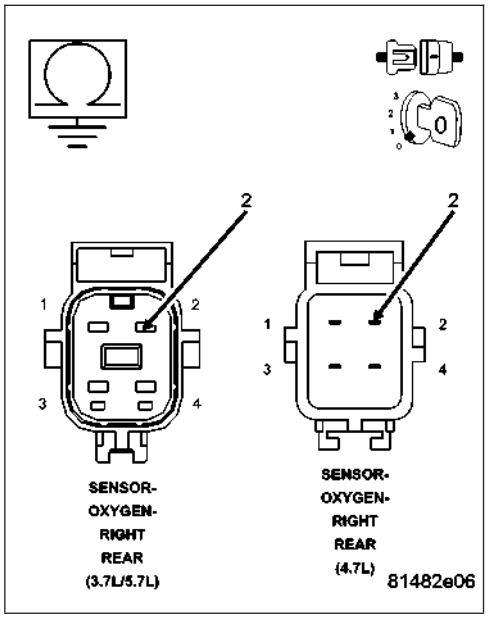
Yes >> Go To 4

No >> Repair the excessive resistance in the (K399) O2 2/2 Heater Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0161-O2 SENSOR 2/2 HEATER PERFORMANCE (CONTINUED)

4. (Z992) O2 2/2 HEATER GROUND CIRCUIT OPEN

Measure the resistance between ground and the (Z992) O2 2/2 Heater ground circuit in the O2 Sensor harness connector.



Is the resistance below 0.5 of an ohm?

Yes >> Go To 5

No >> Repair the excessive resistance in the (Z992) O2 2/2 Heater ground circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

5. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

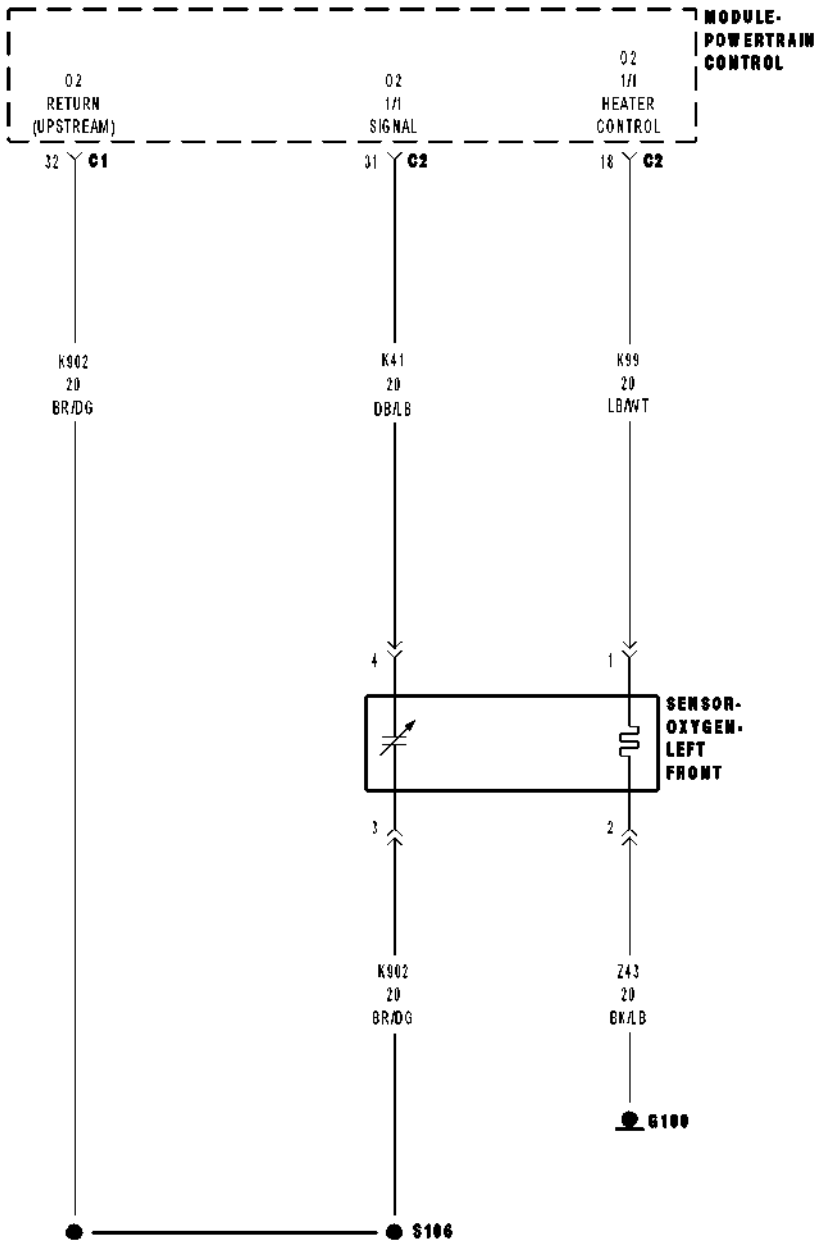
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

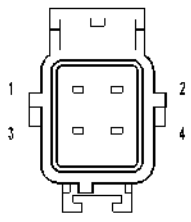
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

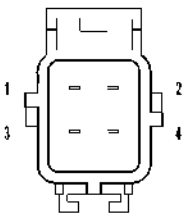
No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0171-FUEL SYSTEM 1/1 LEAN

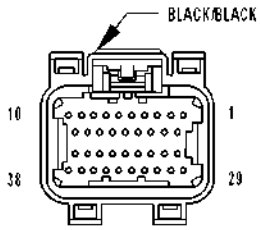




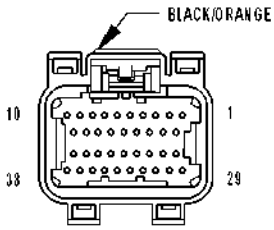
SENSOR-
OXYGEN-
LEFT
FRONT
(5.7L)



SENSOR-
OXYGEN-
LEFT
FRONT
(4.7L)



MODULE-
POWERTRAIN
CONTROL C1



MODULE-
POWERTRAIN
CONTROL C2

B14826ca

P0171-FUEL SYSTEM 1/1 LEAN (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The fuel feedback system will maintain a stoiciometric fuel/air mixture, 14.7:1, by modifying the injector pulsewidth according to the oxygen content of the exhaust gas. The PCM makes short term and long term fuel corrections to maintain stoiciometric fuel/air ratio for best catalytic converter efficiency. Short term fuel correction is based on upstream O2 sensor output and is designed for quick engine response. The long term fuel correction compensated for variations in the engine specifications, sensor tolerances and component aging and is designed to correct rich and lean conditions over a longer period of time.

- **When Monitored:**
  With the engine running in closed loop mode, the ambient/battery temperature above 20 deg. F and altitude below 8500 ft.
- **Set Condition:**
  If the PCM multiplies short term compensation by long term adaptive and a certain percentage is exceeded for two trips, a freeze frame is stored, the MIL illuminates and a trouble code is stored. Two Trip Fault. Three good trips to turn off the MIL

Possible Causes
RESTRICTED FUEL SUPPLY LINE
FUEL PUMP INLET STRAINER PLUGGED
FUEL PUMP MODULE
O2 SIGNAL CIRCUIT
O2 RETURN CIRCUIT
O2 SENSOR HEATER OPERATION
O2 SENSOR
MAP SENSOR OPERATION
ECT SENSOR OPERATION
ENGINE MECHANICAL
FUEL FILTER/PRESSURE REGULATOR (HIGH)
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Diagnose all other trouble codes before continuing.

NOTE: Check for contaminants that may have damaged an O2 Sensor: contaminated fuel, unapproved silicone, oil and coolant.

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0171-FUEL SYSTEM 1/1 LEAN (CONTINUED)

2. CHECKING FUEL PRESSURE

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Install a fuel pressure gauge to the fuel rail.

Ignition on, engine not running.

With a scan tool, actuate the ASD Fuel System test and observe the fuel pressure gauge.

NOTE: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Turn the ignition off.

CAUTION: Stop All Actuations.

Choose a conclusion that best matches your fuel pressure reading.

Within Specification

Go To 3

Above Specification

Replace the fuel filter/pressure regulator.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

Below Specification

Go To 12

---

3. O2 SENSOR OPERATION

Start the engine.

Allow the engine to reach normal operating temperature.

NOTE: If one of the O2 Sensor's Signal or Return circuit is shorted to ground the scan tool will display all O2 Sensor voltage readings low. The O2 Sensor that is shorted to ground will display a voltage reading near or at 0 volts.

NOTE: If one of the O2 Sensor Signal or Return circuits are shorted to voltage, the scan tool will display all O2 Sensor voltage readings high.

NOTE: After the repairs have been made, verify proper O2 Sensor operation. If all the O2 Sensor voltage readings have not returned to normal, follow the diagnostic procedure for the remaining O2 Sensors.

With a scan tool, monitor all of the O2 Sensor voltage readings.

Is the voltage switching between 2.5 and 3.4 volts for all the O2 Sensors?

Yes >> Go To 4

No >> Go To 8

P0171-FUEL SYSTEM 1/1 LEAN (CONTINUED)

4. 1/1 O2 SENSOR HEATER OPERATION

Turn the ignition off.

NOTE: Wait a minimum of 10 minutes to allow the O2 Sensor to cool down before continuing the test. Allow the O2 Sensor voltage to stabilize at 5.0 volts.

Ignition on, engine not running.

With a scan tool, actuate the 1/1 O2 Heater Test.

With the scan tool, monitor 1/1 O2 Sensor voltage for at least 2 minutes.

Does the voltage stay above 4.5 volts?

Yes >> Replace the 1/1 O2 Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

---

5. MAP SENSOR OPERATION

Turn the ignition off.

Connect a Vacuum Gauge to a Manifold Vacuum source.

Start the engine.

Allow the engine to idle.

NOTE: If engine will not idle, maintain a constant RPM above idle.

With the scan tool, read the MAP Sensor vacuum value.

Is the scan tool reading within 1″ of the Vacuum Gauge reading?

Yes >> Go To 6

No >> Replace the MAP Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

6. ECT SENSOR OPERATION

NOTE: For this test to be valid, the thermostat must be operating correctly.

NOTE: This test works best if performed on a cold engine (cold soak)

Ignition on, engine not running.

With a scan tool, read the Engine Coolant Temperature (ECT) Sensor value. If the engine was allowed to sit overnight (cold soak), the temperature value should be a sensible value that is somewhere close to the ambient temperature.

NOTE: If engine coolant temperature is above 82°C (180°F), allow the engine to cool until 65°C (150°F) is reached.

Start the Engine.

During engine warm-up, monitor the ECT Sensor value. The temperature value change should be a smooth transition from start up to normal operating temperature 82°C (180°F). The value should reach at least 82°C (180°F).

Did the ECT value increase smoothly and did it reach at least 180°F (82°C)?

Yes >> Go To 7

No >> Replace the Engine Coolant Temperature Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0171-FUEL SYSTEM 1/1 LEAN (CONTINUED)

7. ENGINE MECHANICAL

Turn the ignition off.

Check for any of the following conditions/mechanical problems.

AIR INDUCTION SYSTEM - must be free from leaks.

ENGINE VACUUM - must be at least 13 inches in neutral

ENGINE VALVE TIMING - must be within specifications

ENGINE COMPRESSION - must be within specifications

ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks.

ENGINE PCV SYSTEM - must flow freely

TORQUE CONVERTER STALL SPEED - must be within specifications

POWER BRAKE BOOSTER - no internal vacuum leaks

FUEL - must be free of contamination

FUEL INJECTOR - plugged or restricted injector; control wire not connected to correct injector

Are there any engine mechanical problems?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 11

---

8. 1/1 O2 SENSOR

Ignition on, engine not running.

Disconnect the 1/1 O2 Sensor harness connector.

With a scan tool, monitor the 1/1 O2 Sensor voltage.

O2 Sensor voltage should read 5.0 volts on the scan tool with the connector disconnected.

Connect a jumper wire between the (K41) Signal circuit and the (K902) O2 Upstream Return circuit in the O2 Sensor harness connector.

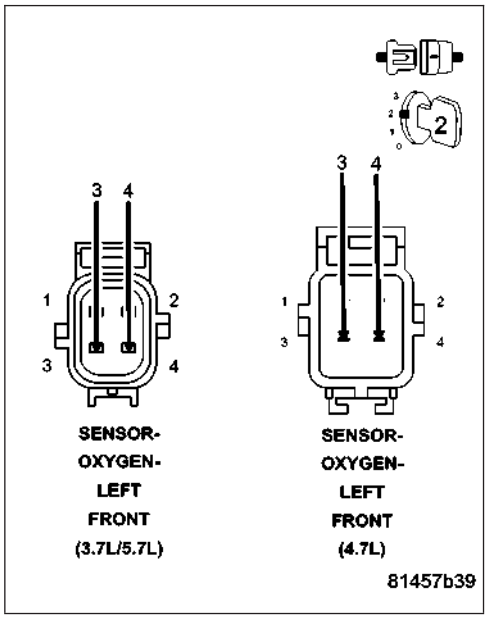
NOTE: The voltage should drop from 5.0 volts to 2.5 volts with the jumper wire in place.

Did the O2 Sensor voltage change from 5.0 volts to 2.5 volts with the jumper wire installed?

Yes >> Replace the O2 Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 9

NOTE: Remove the jumper wire before continuing.



P0171-FUEL SYSTEM 1/1 LEAN (CONTINUED)

9. (K41) O2 SENSOR 1/1 SIGNAL CIRCUIT

With a scan tool, monitor the 1/1 O2 Sensor voltage reading with the jumper wire removed.

NOTE: The scan tool will display all O2 Sensor voltage readings approximately 5.0 volts when only one O2 Sensor's Signal circuit is shorted to voltage.

NOTE: The scan tool will display one O2 Sensor voltage close to zero and the others will read lower than normal when one O2 Sensor Signal circuit contains excessive resistance.

Is the voltage above 4.8 volts?

Yes >> Go To 10

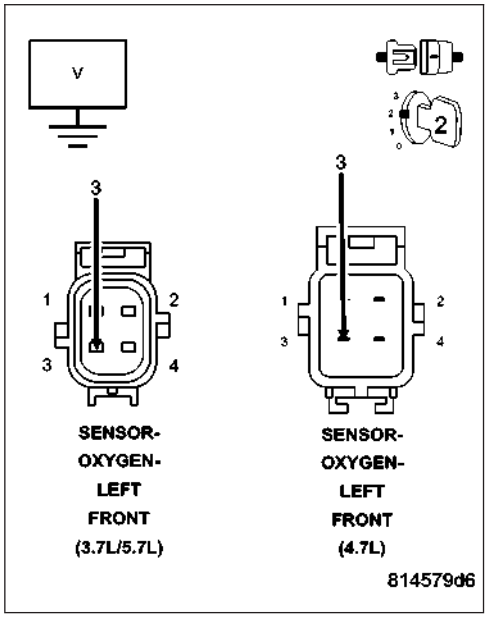
No >> Check the (K41) O2 Sensor 1/1 Signal circuit for a short to ground, open, or short to voltage. Inspect the O2 Sensor connector and the PCM harness connector. If OK, replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

10. (K902) O2 UPSTREAM RETURN CIRCUIT

Disconnect the 1/1 O2 Sensor harness connector.

Measure the voltage on the (K902) O2 Upstream Return circuit in the O2 Sensor harness connector.



Is the voltage at 2.5 volts?

Yes >> Go To 11

No >> Check the O2 Return circuit for a short to ground, open, or short to voltage. Inspect the O2 Sensor connector and the PCM harness connector. If OK, replace and program the Powertriain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

11. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0171-FUEL SYSTEM 1/1 LEAN (CONTINUED)

12. RESTRICTED FUEL SUPPLY LINE

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Raise vehicle on hoist, and disconnect the fuel pressure line at the fuel pump module.

Install special 5/16 fuel line adapter tool #6539 between disconnected fuel line and the fuel pump module.

Attach a fuel pressure test gauge to the T fitting on tool #6539.

Ignition on, engine not running.

With a scan tool, actuate the ASD Fuel System test and observe the fuel pressure gauge.

NOTE: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

CAUTION: Stop All Actuations.

Is the fuel pressure within specification?

Yes >> Repair or replace fuel supply line as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 13

---

13. FUEL PUMP INLET STRAINER

Turn the ignition off.

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released.

Remove the Fuel Pump Module and inspect the Fuel Inlet Strainer.

Is the Fuel Inlet Strainer plugged?

Yes >> Replace the Fuel Pump Inlet Strainer.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 14

---

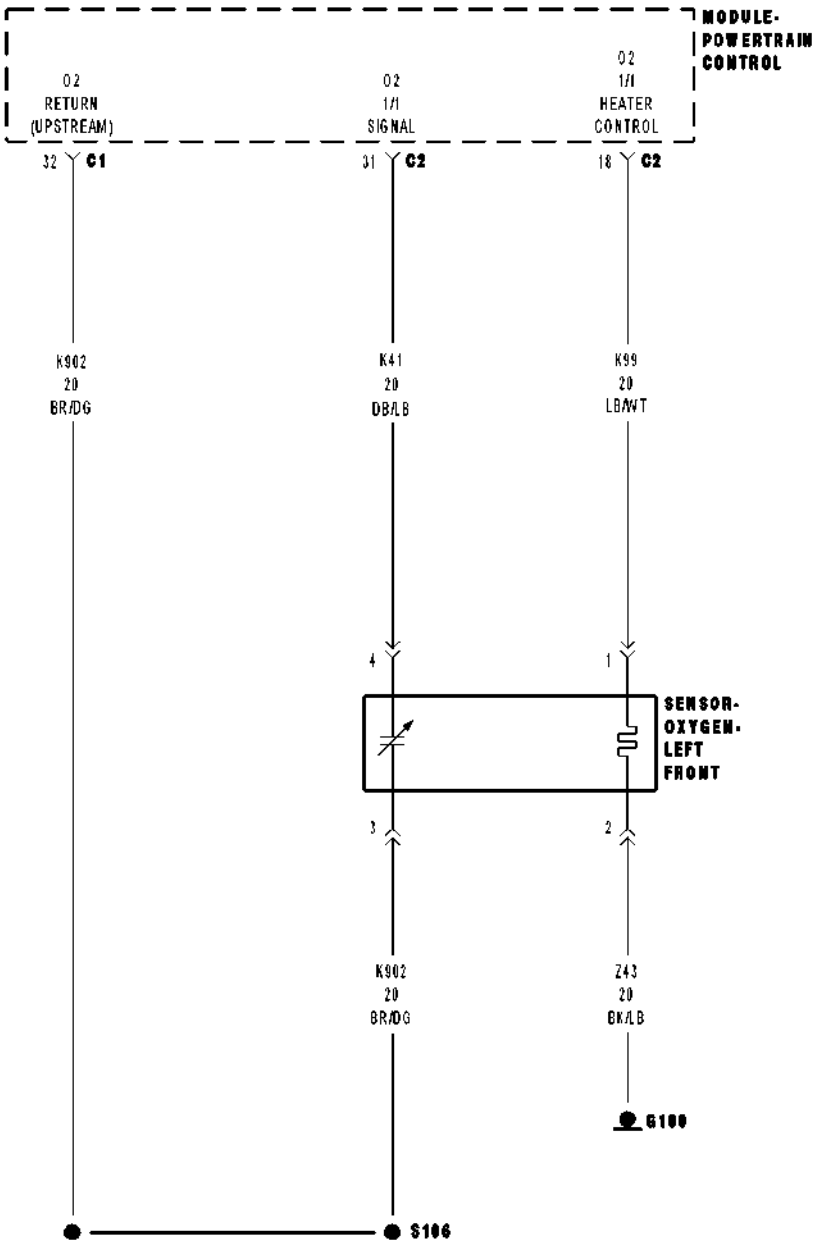
14. FUEL PUMP MODULE

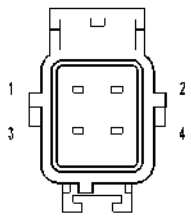
If there are no possible causes remaining, view repair.

Repair

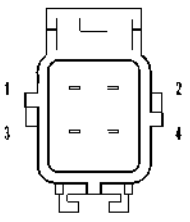
Replace the Fuel Pump Module.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0172-FUEL SYSTEM 1/1 RICH

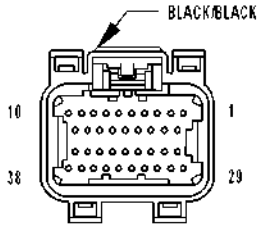




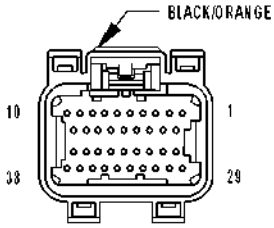
SENSOR-
OXYGEN-
LEFT
FRONT
(5.7L)



SENSOR-
OXYGEN-
LEFT
FRONT
(4.7L)



MODULE-
POWERTRAIN
CONTROL C1



MODULE-
POWERTRAIN
CONTROL C2

B14826ca

P0172-FUEL SYSTEM 1/1 RICH (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The fuel feedback system will maintain a stoiciometric fuel/air mixture, 14.7:1, by modifying the injector pulsewidth according to the oxygen content of the exhaust gas. The PCM makes short term and long term fuel corrections to maintain stoiciometric fuel/air ratio for best catalytic converter efficiency. Short term fuel correction is based on upstream O2 sensor output and is designed for quick engine response. The long term fuel correction compensated for variations in the engine specifications, sensor tolerances and component aging and is designed to correct rich and lean conditions over a longer period of time.

- **When Monitored:**
  With the engine running in closed loop mode, the ambient/battery temperature above 20 deg. F and altitude below 8500 ft.
- **Set Condition:**
  If the PCM multiplies short term compensation by long term adaptive and a purge fuel multiplier and the result is below a certain value for 30 seconds over two trips, a freeze frame is stored, the MIL illuminates and a trouble code is stored. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
O2 SENSOR HEATER OPERATION
EVAP PURGE SOLENOID OPERATION
O2 SIGNAL CIRCUIT
O2 RETURN CIRCUIT
O2 SENSOR
MAP SENSOR
ECT SENSOR
ENGINE MECHANICAL
FUEL FILTER/PRESSURE REGULATOR (HIGH)
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: Check for contaminates that may have damaged an O2 Sensor: contaminated fuel, unapproved silicone, oil and coolant.

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0172-FUEL SYSTEM 1/1 RICH (CONTINUED)

2. CHECKING FUEL PRESSURE

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Install a fuel pressure gauge to the fuel rail.

Ignition on, engine not running.

With the scan tool, actuate the ASD Fuel System test and observe the fuel pressure gauge.

NOTE: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Turn the ignition off.

CAUTION: Stop All Actuations.

Choose a conclusion that best matches your fuel pressure reading.

Within Specification

Go To 3

Above Specification

Replace the fuel filter/pressure regulator.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

3. O2 SENSOR OPERATION

Start the engine.

Allow the engine to reach normal operating temperature.

NOTE: If one of the O2 Sensors Signal or Return circuit is shorted to ground or voltage, all the other O2 Sensor voltage readings will be affected.

NOTE: After the repairs have been made, verify proper O2 Sensor operation. If all the O2 Sensor voltage readings have not returned to normal, follow the diagnostic procedure for the remaining O2 Sensors.

With the scan tool, monitor the 1/1 O2 Sensor voltage reading.

Is the voltage switching between 2.5 and 3.4 volts?

Yes >> Go To 4

No >> Go To 9

---

4. 1/1 O2 SENSOR HEATER OPERATION

Turn the ignition off.

NOTE: Wait a minimum of 10 minutes to allow the O2 Sensor to cool down before continuing the test. Allow the O2 Sensor voltage to stabilize at 5.0 volts.

Ignition on, engine not running.

With the scan tool, perform the 1/1 O2 Heater Test.

With the scan tool, monitor the O2 Sensor voltage while performing the Heater test for at least 2 minutes.

Does the voltage stay above 4.5 volts during the Heater test?

Yes >> Replace the O2 Sensor.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

P0172-FUEL SYSTEM 1/1 RICH (CONTINUED)

5. MAP SENSOR OPERATION

Turn the ignition off.

Connect a Vacuum Gauge to a Manifold Vacuum source.

Start the engine.

Allow the engine to idle.

NOTE: If engine will not idle, maintain a constant RPM above idle.

With a scan tool, read the MAP Sensor vacuum value.

Is the scan tool reading within 1″ of the Vacuum Gauge reading?

Yes >> Go To 6

No >> Replace the MAP Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

NOTE: Remove the vacuum gauge before continuing.

---

6. ECT SENSOR OPERATION

NOTE: For this test to be valid, the thermostat must be operating correctly.

NOTE: This test works best if performed on a cold engine (cold soak)

Ignition on, engine not running.

With a scan tool, read the Engine Coolant Temperature Sensor value. If the engine was allowed to sit overnight (cold soak), the temperature value should be a sensible value that is somewhere close to the ambient temperature.

NOTE: If engine coolant temperature is above 82°C (180°F), allow the engine to cool until 65°C (150°F) is reached.

Start the Engine.

During engine warm-up, monitor the Engine Coolant Temperature value. The temp value change should be a smooth transition from start up to normal operating temp 82°C (180°F). The value should reach at least 82°C (180°F).

Did the ECT value increase smoothly and reach at least 180°F (82°C)?

Yes >> Go To 7

No >> Replace the Engine Coolant Temperature Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

7. EVAP PURGE SOLENOID OPERATION

Turn the ignition off.

Disconnect the hoses at the Evap Purge Solenoid.

Using a hand vacuum pump, apply 10 inches of vacuum to the Evap Purge Solenoid vacuum source port on the component side.

Did the Evap Purge Solenoid hold vacuum?

Yes >> Go To 8

No >> Replace the EVAP Purge Solenoid.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

NOTE: Connect the vacuum hoses before continuing.

P0172-FUEL SYSTEM 1/1 RICH (CONTINUED)

8. ENGINE MECHANICAL

Check for any of the following conditions/mechanical problems.
AIR INDUCTION SYSTEM - must be free from restrictions.
ENGINE VACUUM - must be at least 13 inches in neutral
ENGINE VALVE TIMING - must be within specifications
ENGINE COMPRESSION - must be within specifications
ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks.
ENGINE PCV SYSTEM - must flow freely
TORQUE CONVERTER STALL SPEED - must be within specifications
POWER BRAKE BOOSTER - no internal vacuum leaks
FUEL - must be free of contamination
FUEL INJECTOR - plugged or restricted injector; control wire not connected to correct injector

Are there any engine mechanical problems?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 12

---

9. 1/1 O2 SENSOR

NOTE: Perform the following test on the O2 Sensors whose voltage was not switching properly in the previous step.
Ignition on, engine not running.
Disconnect the 1/1 O2 Sensor harness connector.
With a scan tool, monitor the 1/1 O2 Sensor voltage.
O2 Sensor voltage should read 5.0 volts on the scan tool with the connector disconnected.
Connect a jumper wire between the (K41) O2 Sensor 1/1 Signal circuit and the (K902) O2 Upstream Return circuit in the O2 Sensor harness connector.

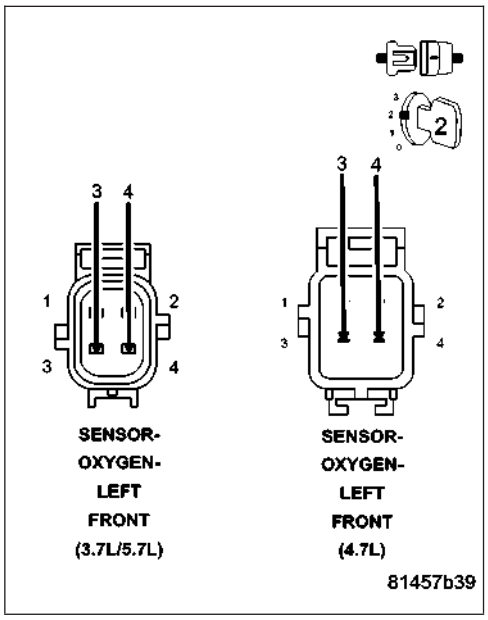
NOTE: The voltage should drop from 5.0 volts down to 2.5 volts with the jumper wire connected.

Did the O2 Sensor voltage drop from 5 volts to 2.5 volts when the jumper wire was installed?

Yes >> Replace the 1/1 O2 Sensor
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 10

NOTE: Remove the jumper wire before continuing.



P0172-FUEL SYSTEM 1/1 RICH (CONTINUED)

10. (K41) O2 SENSOR 1/1 SIGNAL CIRCUIT

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Start the engine.

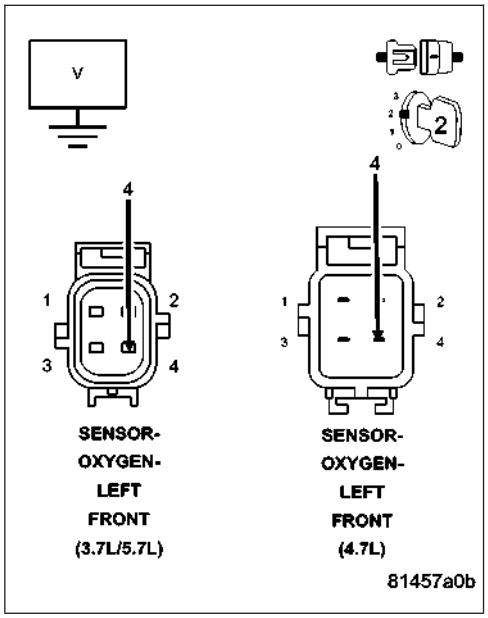
Measure the voltage on the (K41) O2 Sensor 1/1 Signal circuit in the O2 Sensor harness connector.

Is the voltage above 4.8 volts?

Yes >> Check the (K41) O2 Sensor 1/1 Signal circuit for damage, short to ground, open, or short to voltage. Inspect the O2 Sensor connector and the PCM harness connector. If OK, replace and program the Powertrain Control Module per Service Information.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 11



11. (K902) O2 SENSOR UPSTREAM RETURN CIRCUIT

Engine still running.

Measure the voltage on the (K902) O2 Upstream Return circuit in the 1/1 O2 Sensor harness connector.

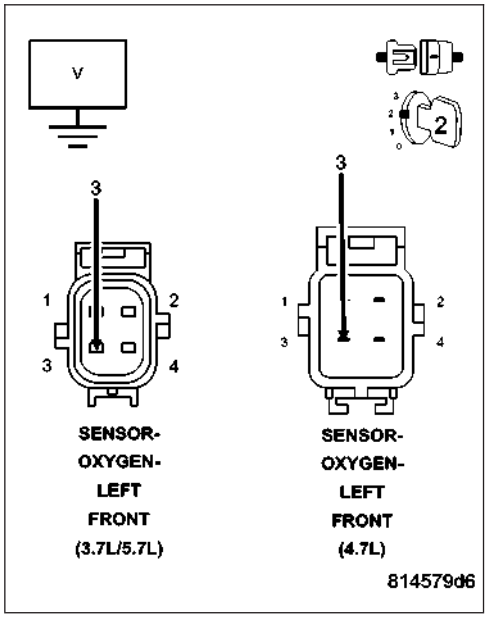
Is the voltage at 2.5 volts?

Yes >> Go To 12

No >> Check the (K902) O2 Upstream Return circuit for damage, short to ground, open, or short to voltage. Inspect the O2 Sensor connector and the PCM harness connector. If OK, replace and program the Powertrain Control Module per Service Information.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

NOTE: Turn the ignition off before continuing.



P0172-FUEL SYSTEM 1/1 RICH (CONTINUED)

12. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

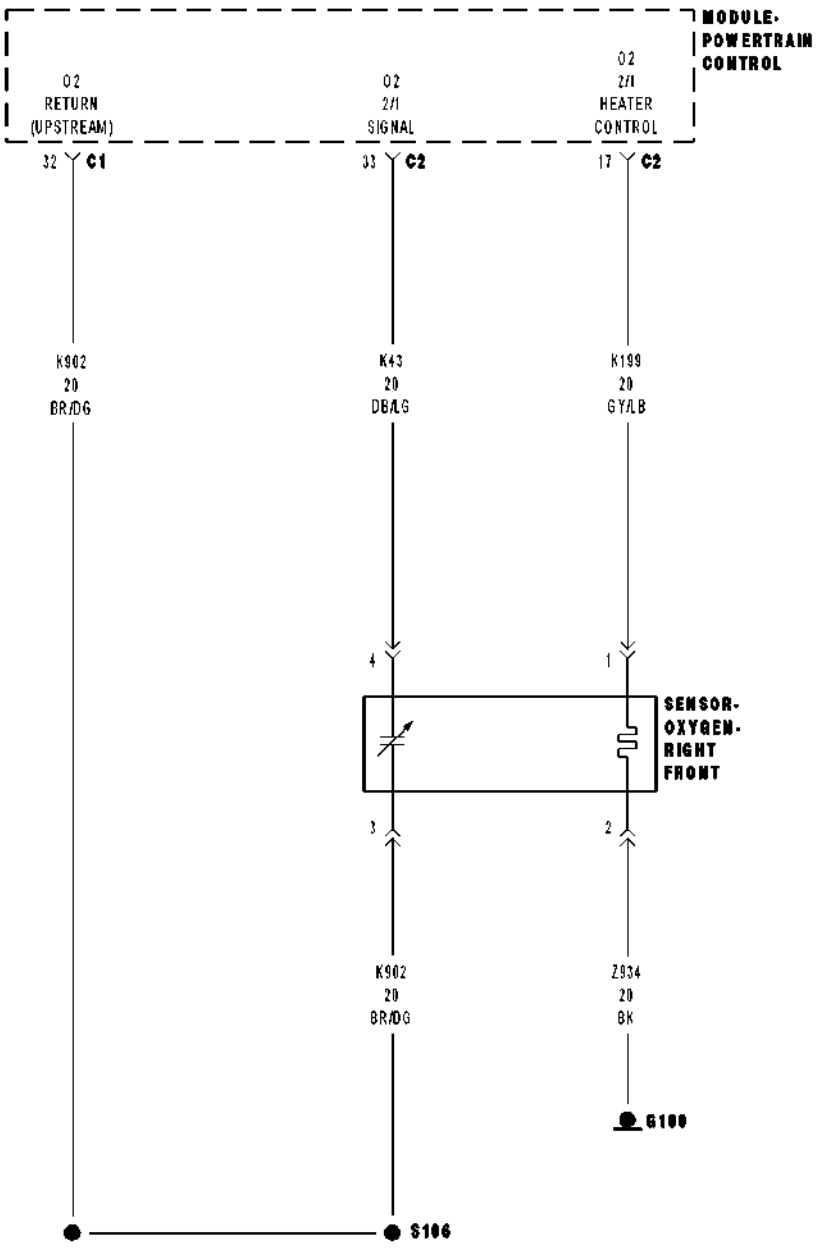
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

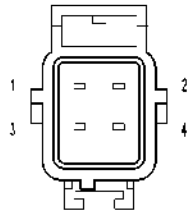
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

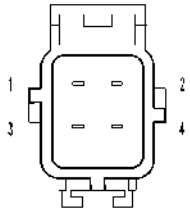
No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0174-FUEL SYSTEM 2/1 LEAN

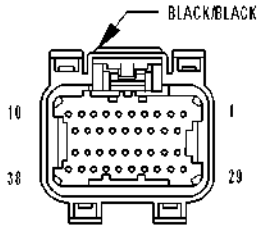




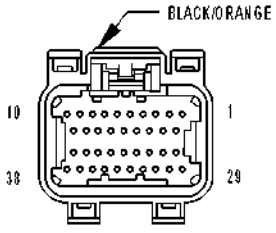
SENSOR-
OXYGEN-
RIGHT
FRONT
(3.7L/5.7L)



SENSOR-
OXYGEN-
RIGHT
FRONT
(4.7L)



MODULE-
POWERTRAIN
CONTROL C1



MODULE-
POWERTRAIN
CONTROL C2

P0174-FUEL SYSTEM 2/1 LEAN (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The fuel feedback system will maintain a stoiciometric fuel/air mixture, 14.7:1, by modifying the injector pulsewidth according to the oxygen content of the exhaust gas. The PCM makes short term and long term fuel corrections to maintain stoiciometric fuel/air ratio for best catalytic converter efficiency. Short term fuel correction is based on upstream O2 sensor output and is designed for quick engine response. The long term fuel correction compensated for variations in the engine specifications, sensor tolerances and component aging and is designed to correct rich and lean conditions over a longer period of time.

- **When Monitored:**
  With the engine running in closed loop mode, the ambient/battery temperature above 20 deg. F and altitude below 8500 ft.
- **Set Condition:**
  If the PCM multiplies short term compensation by long term adaptive and a certain percentage is exceeded for two trips, a freeze frame is stored, the MIL illuminates and a trouble code is stored. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
RESTRICTED FUEL SUPPLY LINE
FUEL PUMP INLET STRAINER PLUGGED
FUEL PUMP MODULE
O2 SIGNAL CIRCUIT
O2 RETURN CIRCUIT
O2 SENSOR HEATER OPERATION
O2 SENSOR
MAP SENSOR OPERATION
ECT SENSOR OPERATION
ENGINE MECHANICAL
FUEL FILTER/PRESSURE REGULATOR (HIGH)
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Diagnose all other trouble codes before continuing.

NOTE: Check for contaminants that may have damaged an O2 Sensor: contaminated fuel, unapproved silicone, oil and coolant.

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0174-FUEL SYSTEM 2/1 LEAN (CONTINUED)

2. CHECKING FUEL PRESSURE

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Install a fuel pressure gauge to the fuel rail.

Ignition on, engine not running.

With the scan tool, actuate the ASD Fuel System test and observe the fuel pressure gauge.

NOTE: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Turn the ignition off.

CAUTION: Stop All Actuations.

Choose a conclusion that best matches your fuel pressure reading.

Within Specification

Go To 3

Above Specification

Replace the fuel filter/pressure regulator.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

Below Specification

Go To 12

---

3. O2 SENSOR OPERATION

Start the engine.

Allow the engine to reach normal operating temperature.

NOTE: If one of the O2 Sensor's Signal or Return circuit is shorted to ground the scan tool will display all O2 Sensor voltage readings low. The O2 Sensor that is shorted to ground will display a voltage reading near or at 0 volts.

NOTE: If one of the O2 Sensor Signal or Return circuits are shorted to voltage, the scan tool will display all O2 Sensor voltage readings high.

NOTE: After the repairs have been made, verify proper O2 Sensor operation. If all the O2 Sensor voltage readings have not returned to normal, follow the diagnostic procedure for the remaining O2 Sensors.

With the scan tool, monitor the 2/1 O2 Sensor voltage reading.

Is the voltage switching between 2.5 and 3.4 volts?

Yes >> Go To 4

No >> Go To 8

P0174-FUEL SYSTEM 2/1 LEAN (CONTINUED)

4. 2/1 O2 SENSOR HEATER OPERATION

Turn the ignition off.

NOTE: Wait a minimum of 10 minutes to allow the O2 Sensor to cool down before continuing the test. Allow the O2 Sensor voltage to stabilize at 5.0 volts.

NOTE: Perform the following test on all O2 Sensors.

Ignition on, engine not running.

With a scan tool, actuate the 2/1 O2 Heater Test.

With the scan tool, monitor 2/1 O2 Sensor voltage for at least 2 minutes.

Does the voltage stay above 4.5 volts?

Yes >> Replace the 2/1 O2 Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

---

5. MAP SENSOR OPERATION

Turn the ignition off.

Connect a Vacuum Gauge to a Manifold Vacuum source.

Start the engine.

Allow the engine to idle.

NOTE: If engine will not idle, maintain a constant RPM above idle.

With the scan tool, read the MAP Sensor vacuum value.

Is the scan tool reading within 1″ of the Vacuum Gauge reading?

Yes >> Go To 6

No >> Replace the MAP Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

6. ECT SENSOR OPERATION

NOTE: For this test to be valid, the thermostat must be operating correctly.

NOTE: This test works best if performed on a cold engine (cold soak).

Ignition on, engine not running.

With the scan tool, read the Engine Coolant Temperature (ECT) Sensor value. If the engine was allowed to sit overnight (cold soak), the temperature value should be a sensible value that is somewhere close to the ambient temperature.

NOTE: If engine coolant temperature is above 82°C (180°F), allow the engine to cool until 65°C (150°F) is reached.

Start the Engine.

During engine warm-up, monitor the ECT Sensor value. The temperature value change should be a smooth transition from start up to normal operating temperature 82°C (180°F). The value should reach at least 82°C (180°F).

Did the ECT value increase smoothly and did it reach at least 180°F (82°C)?

Yes >> Go To 7

No >> Replace the Engine Coolant Temperature Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0174-FUEL SYSTEM 2/1 LEAN (CONTINUED)

7. ENGINE MECHANICAL

Turn the ignition off.

Check for any of the following conditions/mechanical problems.

AIR INDUCTION SYSTEM - must be free from leaks.

ENGINE VACUUM - must be at least 13 inches in neutral

ENGINE VALVE TIMING - must be within specifications

ENGINE COMPRESSION - must be within specifications

ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks.

ENGINE PCV SYSTEM - must flow freely

TORQUE CONVERTER STALL SPEED - must be within specifications

POWER BRAKE BOOSTER - no internal vacuum leaks

FUEL - must be free of contamination

FUEL INJECTOR - plugged or restricted injector; control wire not connected to correct injector

Are there any engine mechanical problems?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 11

---

8. O2 SENSOR

Ignition on, engine not running.

Disconnect the 2/1 O2 Sensor harness connector.

With the scan tool, monitor the 2/1 O2 Sensor voltage.

O2 Sensor voltage should read 5.0 volts on the scan tool with the connector disconnected.

Connect a jumper wire between the (K43) O2 Sensor 2/1 Signal circuit and the (K902) O2 Upstream Return circuit in the O2 Sensor harness connector.

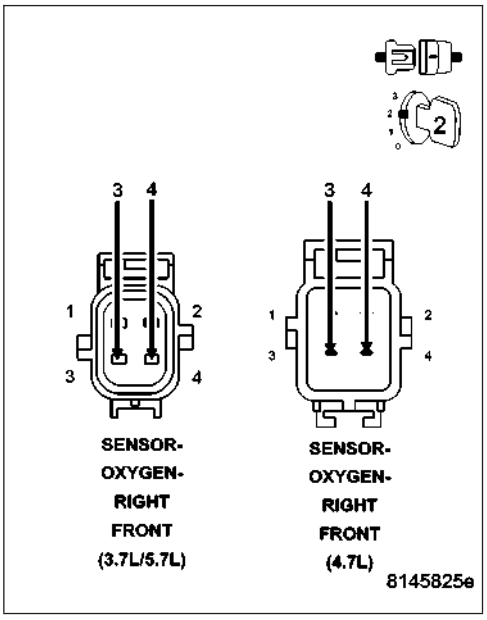
NOTE: The voltage should drop from 5.0 volts to 2.5 volts with the jumper wire in place.

Did the O2 Sensor voltage change from 5.0 volts to 2.5 volts when the jumper wire was installed?

Yes >> Replace the 2/1 O2 Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 9

NOTE: Remove the jumper wire before continuing.



P0174-FUEL SYSTEM 2/1 LEAN (CONTINUED)

9. O2 SENSOR SIGNAL CIRCUIT

With the scan tool, monitor all the O2 Sensor voltage reading with the jumper wire removed.

NOTE: The scan tool will display all O2 Sensor voltage readings approximately 5.0 volts when only one O2 Sensor's Signal circuit is shorted to voltage.

NOTE: The scan tool will display one O2 Sensor voltage close to zero and the others will read lower than normal when one O2 Sensor Signal circuit contains excessive resistance.

Is the voltage above 4.8 volts?

Yes >> Go To 10

No >> Check all the O2 Signal circuits for a short to ground, open, or short to voltage. Inspect the O2 Sensor connector and the PCM harness connector. If OK, replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

10. (K902) O2 UPSTREAM RETURN CIRCUIT

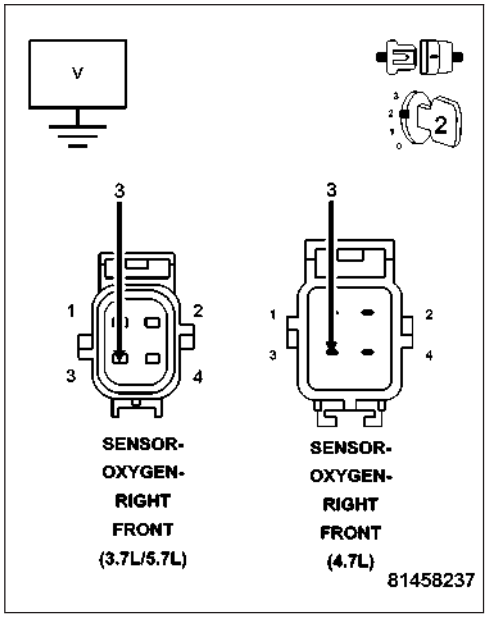
Disconnect the 2/1 O2 Sensor harness connector.

Measure the voltage on the (K902) O2 Upstream Return circuit in the O2 Sensor harness connector.

Is the voltage at 2.5 volts?

Yes >> Go To 11

No >> Check the (K902) O2 Upstream Return circuit for a short to ground, open, or short to voltage. Inspect the O2 Sensor connector and the PCM harness connector. If OK, replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



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11. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0174-FUEL SYSTEM 2/1 LEAN (CONTINUED)

12. RESTRICTED FUEL SUPPLY LINE

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Raise vehicle on hoist, and disconnect the fuel pressure line at the fuel pump module.

Install special 5/16 fuel line adapter tool #6539 between disconnected fuel line and the fuel pump module.

Attach a fuel pressure test gauge to the T fitting on tool #6539.

Ignition on, engine not running.

With the scan tool, actuate the ASD Fuel System test and observe the fuel pressure gauge.

NOTE: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

CAUTION: Stop All Actuations.

Is the fuel pressure within specification?

Yes >> Repair or replace fuel supply line as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 13

---

13. FUEL PUMP INLET STRAINER

Turn the ignition off.

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released.

Remove the Fuel Pump Module and inspect the Fuel Inlet Strainer.

Is the Fuel Inlet Strainer plugged?

Yes >> Replace the Fuel Pump Inlet Strainer.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 14

---

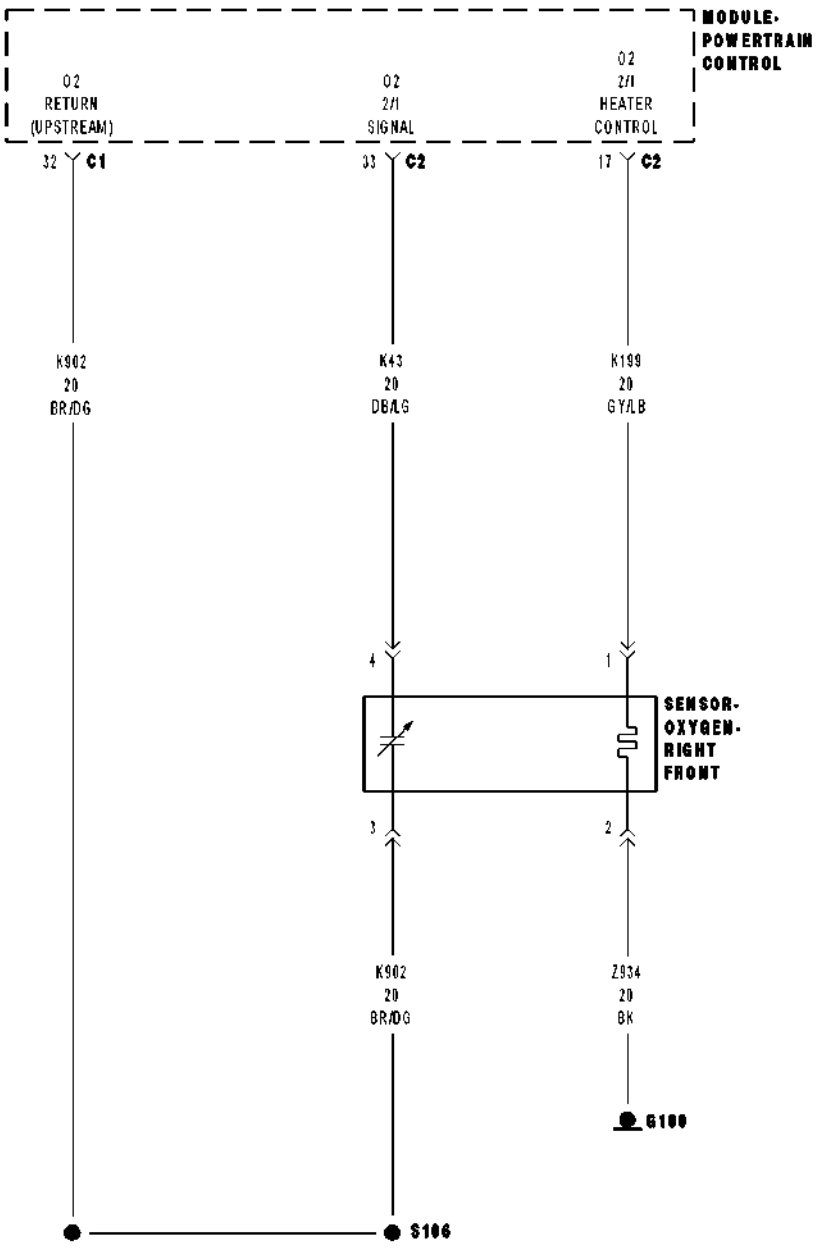
14. FUEL PUMP MODULE

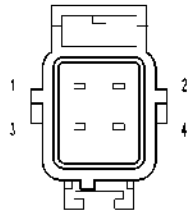
If there are no possible causes remaining, view repair.

Repair

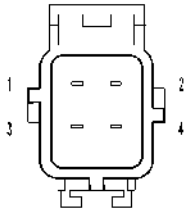
Replace the Fuel Pump Module.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0175-FUEL SYSTEM 2/1 RICH

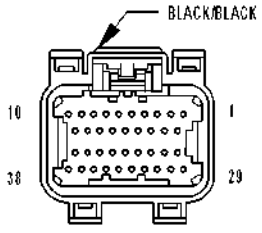




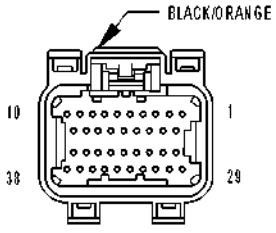
SENSOR-
OXYGEN-
RIGHT
FRONT
(3.7L/5.7L)



SENSOR-
OXYGEN-
RIGHT
FRONT
(4.7L)



MODULE-
POWERTRAIN
CONTROL C1



MODULE-
POWERTRAIN
CONTROL C2

P0175-FUEL SYSTEM 2/1 RICH (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The fuel feedback system will maintain a stoiciometric fuel/air mixture, 14.7:1, by modifying the injector pulsewidth according to the oxygen content of the exhaust gas. The PCM makes short term and long term fuel corrections to maintain stoiciometric fuel/air ratio for best catalytic converter efficiency. Short term fuel correction is based on upstream O2 sensor output and is designed for quick engine response. The long term fuel correction compensated for variations in the engine specifications, sensor tolerances and component aging and is designed to correct rich and lean conditions over a longer period of time.

- **When Monitored:**
  With the engine running in closed loop mode, the ambient/battery temperature above 20 deg. F and altitude below 8500 ft.
- **Set Condition:**
  If the PCM multiplies short term compensation by long term adaptive and a purge fuel multiplier and the result is below a certain value for 30 seconds over two trips, a freeze frame is stored, the MIL illuminates and a trouble code is stored. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
O2 SENSOR HEATER OPERATION
EVAP PURGE SOLENOID OPERATION
O2 SIGNAL CIRCUIT
O2 RETURN CIRCUIT
O2 SENSOR
MAP SENSOR
ECT SENSOR
ENGINE MECHANICAL
FUEL FILTER/PRESSURE REGULATOR (HIGH)
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: Check for contaminates that may have damaged an O2 Sensor: contaminated fuel, unapproved silicone, oil and coolant.

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0175-FUEL SYSTEM 2/1 RICH (CONTINUED)

2. CHECKING FUEL PRESSURE

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Install a fuel pressure gauge to the fuel rail.

Ignition on, engine not running.

With the scan tool, actuate the ASD Fuel System test and observe the fuel pressure gauge.

NOTE: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Turn the ignition off.

CAUTION: Stop All Actuations.

Choose a conclusion that best matches your fuel pressure reading.

Within Specification

Go To 3

Above Specification

Replace the fuel filter/pressure regulator.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

3. O2 SENSOR OPERATION

Start the engine.

Allow the engine to reach normal operating temperature.

NOTE: If one of the O2 Sensors Signal or Return circuit is shorted to ground or voltage, all the other O2 Sensor voltage readings will be affected.

NOTE: After the repairs have been made, verify proper O2 Sensor operation. If all the O2 Sensor voltage readings have not returned to normal, follow the diagnostic procedure for the remaining O2 Sensors.

With the scan tool, monitor the 2/1 O2 Sensor voltage reading.

Is the voltage switching between 2.5 and 3.4 volts?

Yes >> Go To 4

No >> Go To 9

---

4. 2/1 O2 SENSOR HEATER OPERATION

Turn the ignition off.

NOTE: Wait a minimum of 10 minutes to allow the O2 Sensor to cool down before continuing the test. Allow the O2 Sensor voltage to stabilize at 5.0 volts.

Ignition on, engine not running.

With the scan tool, perform the 2/1 O2 Heater Test for each O2 Sensor.

With the scan tool, monitor the 2/1 O2 Sensor voltage while performing the Heater test for at least 2 minutes.

Does the voltage stay above 4.5 volts for each Sensor?

Yes >> Replace the 2/1 O2 Sensor.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

P0175-FUEL SYSTEM 2/1 RICH (CONTINUED)

5. MAP SENSOR OPERATION

Turn the ignition off.

Connect a Vacuum Gauge to a Manifold Vacuum source.

Start the engine.

Allow the engine to idle.

NOTE: If engine will not idle, maintain a constant RPM above idle.

With the scan tool, read the MAP Sensor vacuum value.

Is the scan tool reading within 1″ of the Vacuum Gauge reading?

Yes >> Go To 6

No >> Replace the MAP Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

NOTE: Remove the vacuum gauge before continuing.

---

6. ECT SENSOR OPERATION

NOTE: For this test to be valid, the thermostat must be operating correctly.

NOTE: This test works best if performed on a cold engine (cold soak).

Ignition on, engine not running.

With the scan tool, read the Engine Coolant Temperature Sensor value. If the engine was allowed to sit overnight (cold soak), the temperature value should be a sensible value that is somewhere close to the ambient temperature.

NOTE: If engine coolant temperature is above 82°C (180°F), allow the engine to cool until 65°C (150°F) is reached.

Start the Engine.

During engine warm-up, monitor the Engine Coolant Temperature value. The temp value change should be a smooth transition from start up to normal operating temp 82°C (180°F). The value should reach at least 82°C (180°F).

Did the ECT value increase smoothly and reach at least 180°F (82°C)?

Yes >> Go To 7

No >> Replace the Engine Coolant Temperature Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

7. EVAP PURGE SOLENOID OPERATION

Turn the ignition off.

Disconnect the hoses at the Evap Purge Solenoid.

Using a hand vacuum pump, apply 10 inches of vacuum to the Evap Purge Solenoid vacuum source port on the component side.

Did the Evap Purge Solenoid hold vacuum?

Yes >> Go To 8

No >> Replace the EVAP Purge Solenoid.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

NOTE: Connect the vacuum hoses before continuing.

P0175-FUEL SYSTEM 2/1 RICH (CONTINUED)

8. ENGINE MECHANICAL

Check for any of the following conditions/mechanical problems.
AIR INDUCTION SYSTEM - must be free from restrictions.
ENGINE VACUUM - must be at least 13 inches in neutral
ENGINE VALVE TIMING - must be within specifications
ENGINE COMPRESSION - must be within specifications
ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks.
ENGINE PCV SYSTEM - must flow freely
TORQUE CONVERTER STALL SPEED - must be within specifications
POWER BRAKE BOOSTER - no internal vacuum leaks
FUEL - must be free of contamination
FUEL INJECTOR - plugged or restricted injector; control wire not connected to correct injector

Are there any engine mechanical problems?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 12

---

9. 2/1 O2 SENSOR

Ignition on, engine not running.
Disconnect the 2/1 O2 Sensor harness connector.
With the scan tool, monitor the 2/1 O2 Sensor voltage.
O2 Sensor voltage should read 5.0 volts on the scan tool with the connector disconnected.
Connect a jumper wire between the (K43) O2 Sensor 2/1 Signal circuit and the (K902) O2 Upstream Return circuit in the O2 Sensor harness connector.

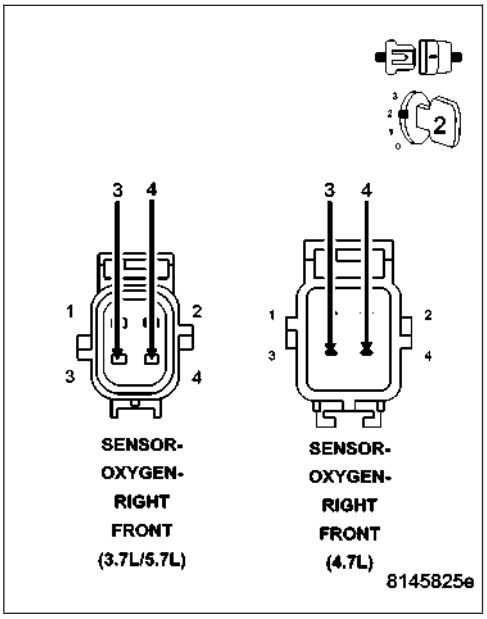
NOTE: The voltage should drop from 5.0 volts down to 2.5 volts with the jumper wire connected.

Did the O2 Sensor voltage drop from 5 volts to 2.5 volts when the jumper wire was installed?

Yes >> Replace the O2 Sensor
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 10

NOTE: Remove the jumper wire before continuing.



P0175-FUEL SYSTEM 2/1 RICH (CONTINUED)

10. O2 SENSOR SIGNAL CIRCUIT

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Start the engine.

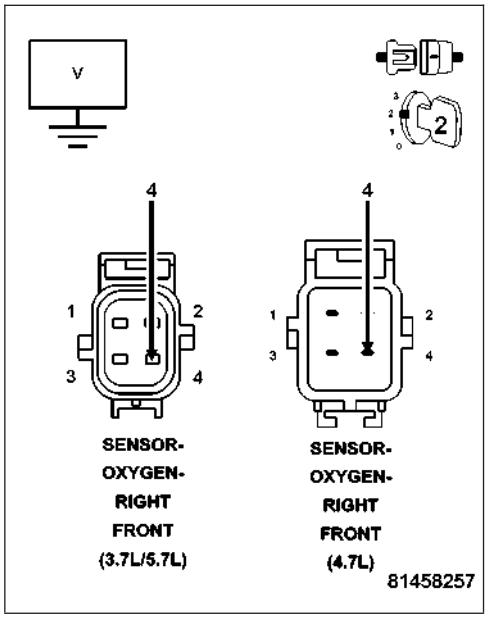
Measure the voltage on the (K43) O2 Sensor 2/1 Signal circuit in the O2 Sensor harness connector.

Is the voltage above 4.8 volts?

Yes >> Check the (K43) O2 Sensor 2/1 Signal circuit for damage, short to ground, open, or short to voltage. Inspect the O2 Sensor connector and the PCM harness connector. If OK, replace and program the Powertrain Control Module per Service Information.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 11



11. (K902) O2 SENSOR UPSTREAM RETURN CIRCUIT

Engine still running.

Measure the voltage on the (K902) O2 Upstream Return circuit in the O2 Sensor harness connector.

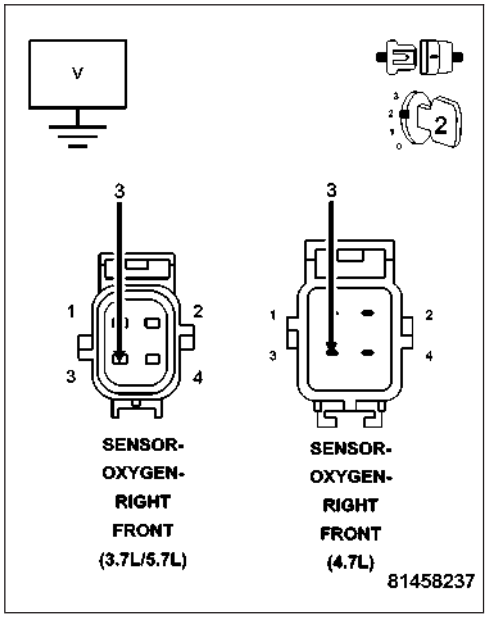
Is the voltage at 2.5 volts?

Yes >> Go To 12

No >> Check the (K902) O2 Upstream Return circuit for damage, short to ground, open, or short to voltage. Inspect the O2 Sensor connector and the PCM harness connector. If OK, replace and program the Powertrain Control Module per Service Information.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

NOTE: Turn the ignition off before continuing.



P0175-FUEL SYSTEM 2/1 RICH (CONTINUED)

12. **PCM**

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

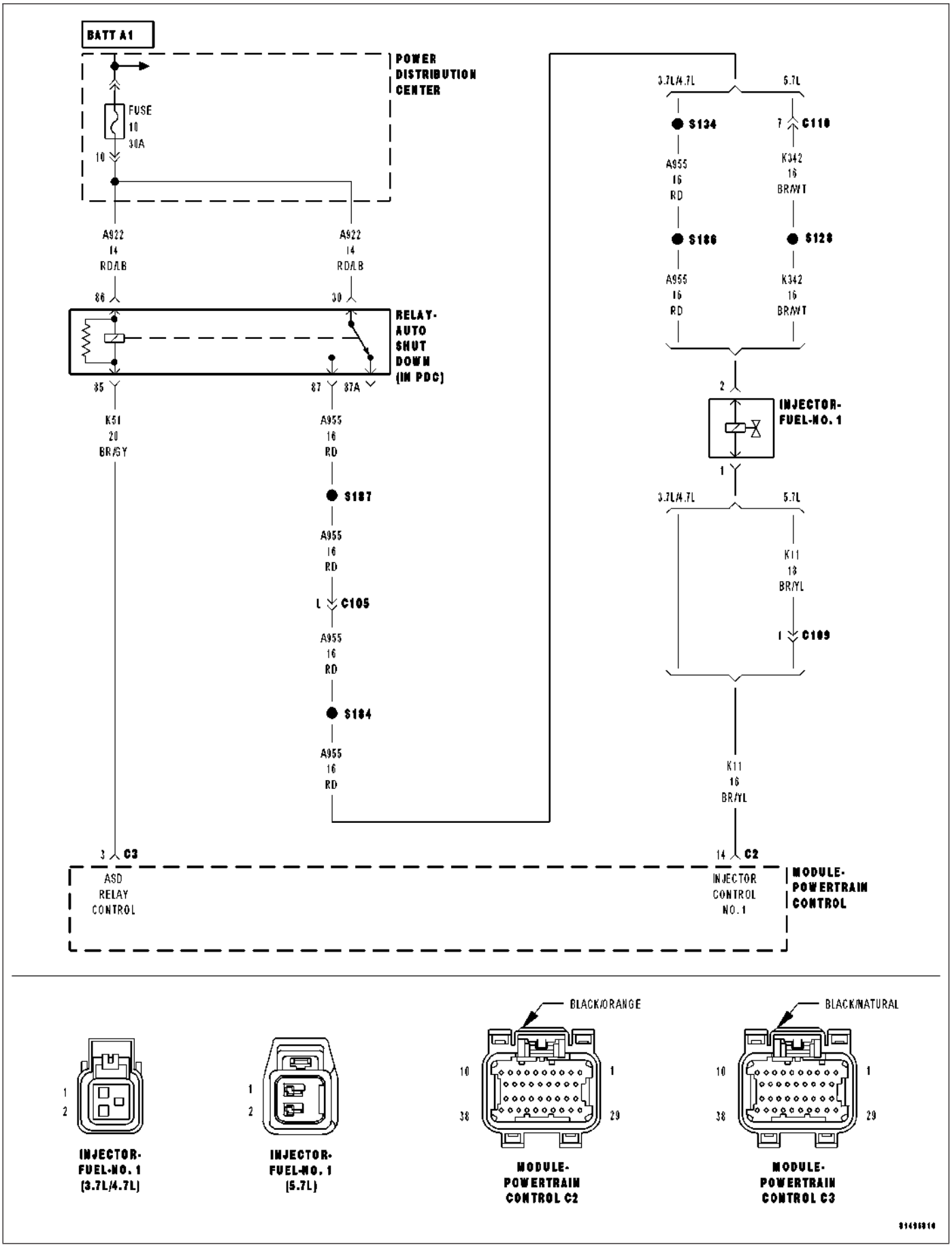
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0201-FUEL INJECTOR 1 CIRCUIT



P0201-FUEL INJECTOR 1 CIRCUIT (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With battery voltage greater than 10 volts. Auto Shutdown Relay energized. Engine speed less than 3000 rpm.
- **Set Condition:**
  No inductive spike is detected after injector turn off.

Possible Causes
(K342), (A955) ASD RELAY OUTPUT CIRCUIT
(K11) INJECTOR CONTROL NO.1 CIRCUIT OPEN
(K11) INJECTOR CONTROL NO.1 CIRCUIT SHORTED TO GROUND
FUEL INJECTOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. (A955), (K342) ASD RELAY OUTPUT CIRCUIT

NOTE: The circuit id (K342) is used on vehicles equipped with a 5.7L engine and the (A955) circuit id is used on vehicles equipped with a 3.7L and 4.7L engine.

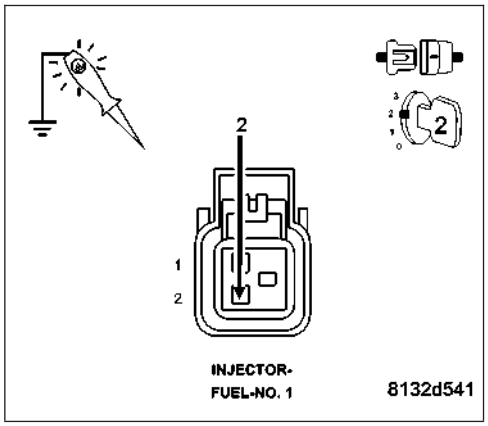
Turn the ignition off.

Disconnect the No.1 Fuel Injector harness connector.

Ignition on, engine not running.

With the scan tool, actuate the ASD Relay.

Using a 12-volt test light connected to ground, probe the (A955), (K342) ASD Relay Output circuit in the Fuel Injector harness connector.



Does the test light illuminate brightly?

Yes >> Go To 3

No >> Repair the excessive resistance or short to ground in the (A955), (K342) ASD Relay Output circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0201-FUEL INJECTOR 1 CIRCUIT (CONTINUED)

3. FUEL INJECTOR

Using a 12-volt test light connected to 12-volts, probe the (K11) Injector Control No.1 circuit.

With the scan tool, actuate the Fuel Injector.

What is the state of the test light during the actuation?

Brightly Blinking.

Replace the Fuel Injector.

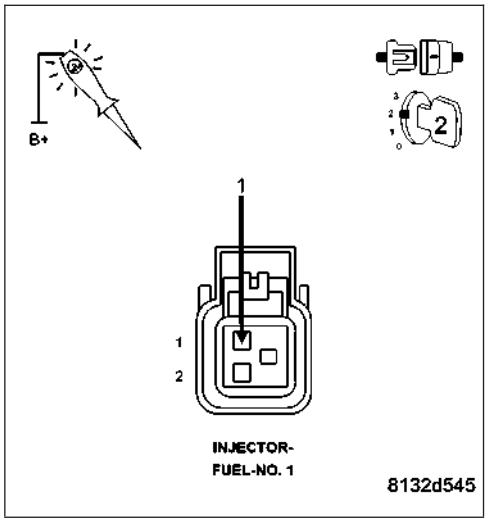
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

ON Constantly.

Go To 4

OFF Constantly.

Go To 5



4. (K11) INJECTOR CONTROL NO.1 CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the C2 PCM harness connector.

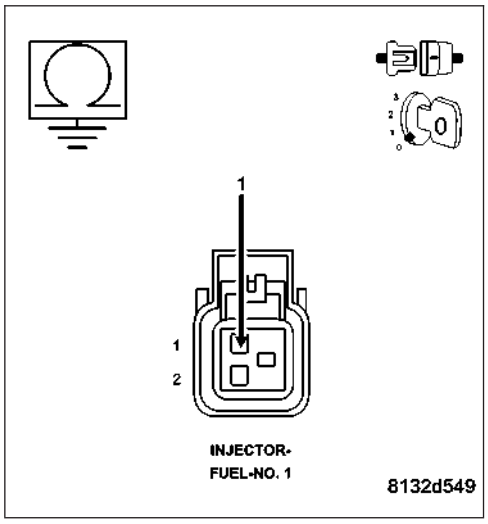
Measure the resistance between ground and the (K11) Injector Control No.1 circuit in the Injector harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K11) Injector Control No.1 circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6



P0201-FUEL INJECTOR 1 CIRCUIT (CONTINUED)

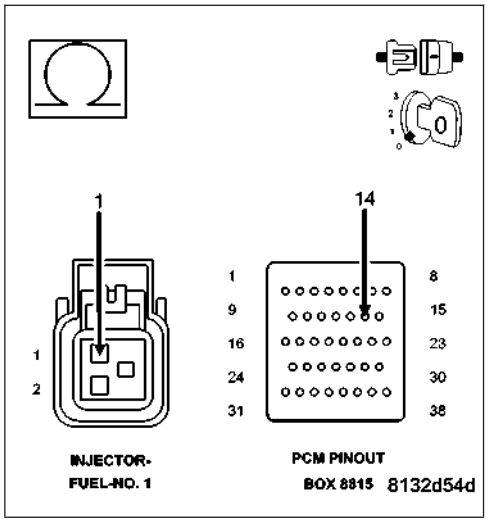
5. (K11) INJECTOR CONTROL NO.1 CIRCUIT OPEN

Turn the ignition off.

Disconnect the C2 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K11) Injector Control No.1 circuit from the Fuel Injector harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 6

No >> Repair the open in the (K11) Injector Control No.1 circuit. Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

6. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

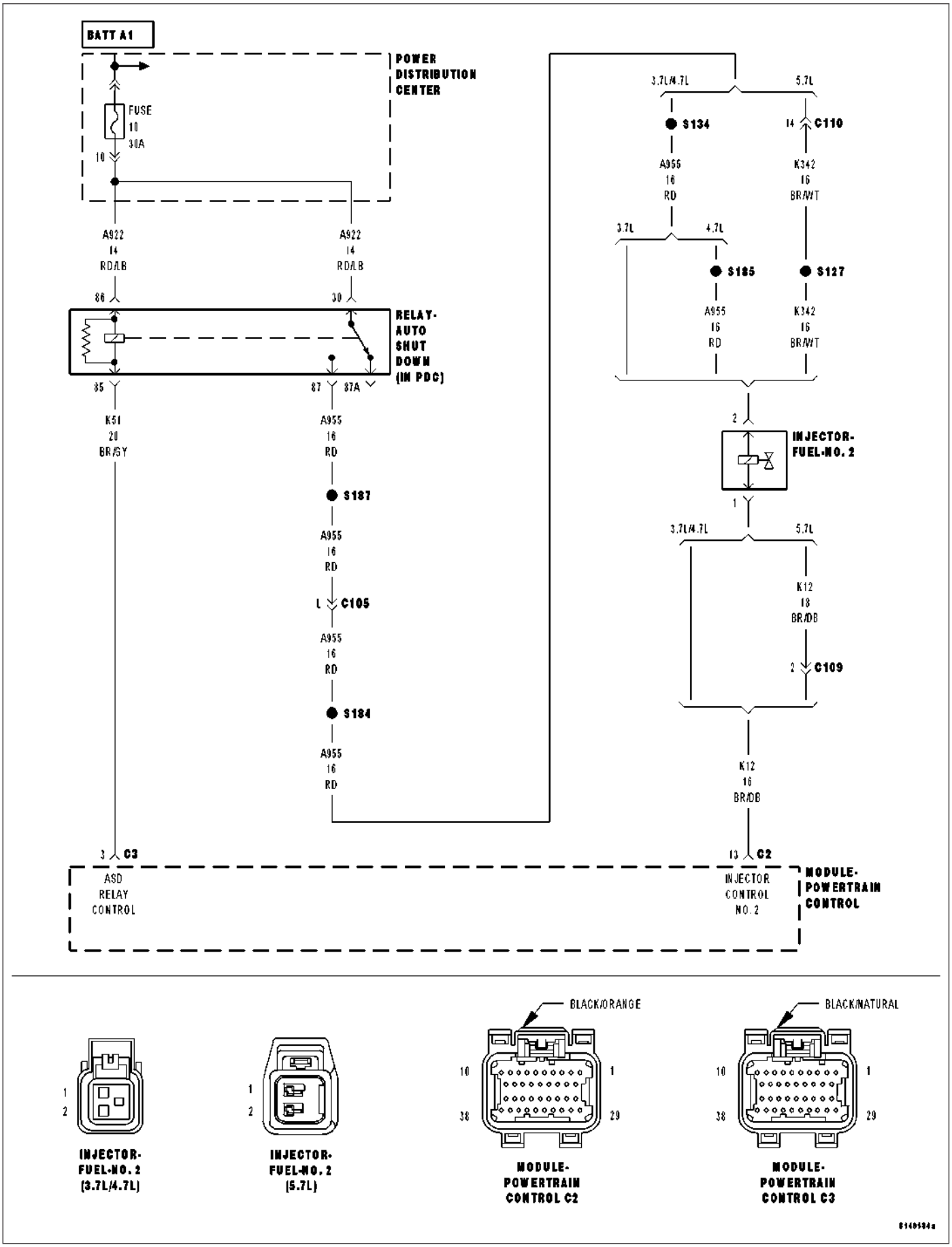
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0202-FUEL INJECTOR 2 CIRCUIT



P0202-FUEL INJECTOR 2 CIRCUIT (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With battery voltage greater than 10 volts. Auto Shutdown Relay energized. Engine speed less than 3000 rpm.
- **Set Condition:**
  No inductive spike is detected after injector turn off.

Possible Causes
(K342), (A955) ASD RELAY OUTPUT CIRCUIT
(K12) INJECTOR CONTROL NO.2 CIRCUIT OPEN
(K12) INJECTOR CONTROL NO.2 CIRCUIT SHORTED TO GROUND
FUEL INJECTOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. (K342), (A955) ASD RELAY OUTPUT CIRCUIT

NOTE: The circuit id (K342) is used on vehicles equipped with a 5.7L engine and the (A955) circuit id is used on vehicles equipped with a 3.7L and 4.7L engine.

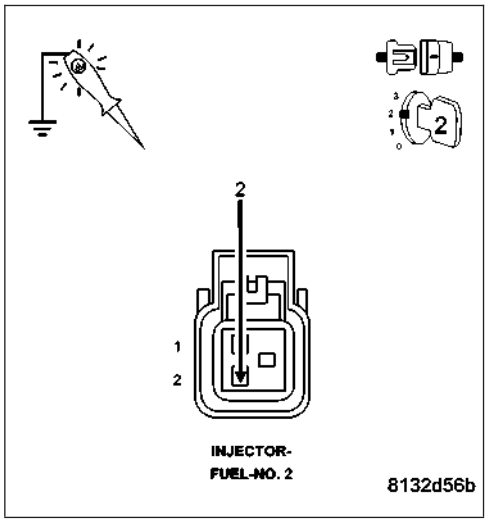
Turn the ignition off.

Disconnect the No.2 Fuel Injector harness connector.

Ignition on, engine not running.

With the scan tool, actuate the ASD Relay.

Using a 12-volt test light connected to ground, probe the (K342), or (A955) ASD Relay Output circuit in the No.2 Fuel Injector harness connector.



Does the test light illuminate brightly?

Yes >> Go To 3

No >> Repair the excessive resistance or short to ground in the (K342), (A955) ASD Relay Output circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0202-FUEL INJECTOR 2 CIRCUIT (CONTINUED)

3. FUEL INJECTOR

Using a 12-volt test light connected to 12-volts, probe the (K12) Injector Control No.2 circuit.

With the scan tool, actuate the No.2 Fuel Injector.

What is the state of the test light during the actuation?

Brightly Blinking.

Replace the Fuel Injector.

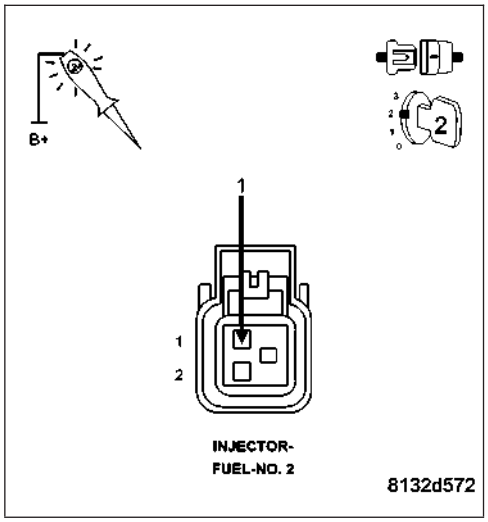
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

ON Constantly.

Go To 4

OFF Constantly.

Go To 5



4. (K12) INJECTOR CONTROL NO.2 CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the C2 PCM harness connector.

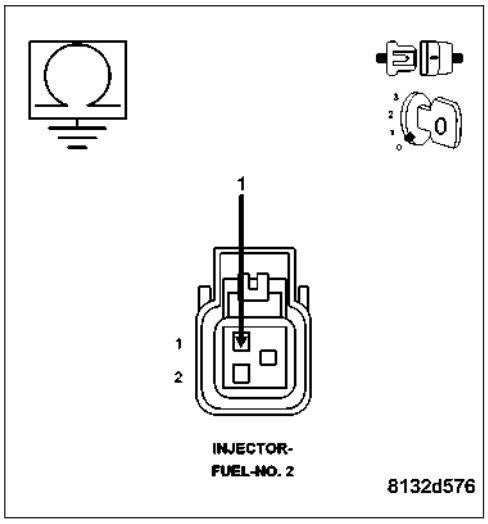
Measure the resistance between ground and the (K12) Injector Control No.2 circuit in the Injector harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K12) Injector Control No.2 circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6



P0202-FUEL INJECTOR 2 CIRCUIT (CONTINUED)

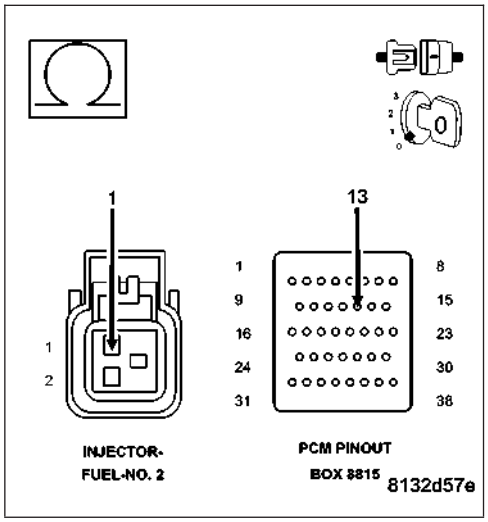
5. (K12) INJECTOR CONTROL NO.2 CIRCUIT OPEN

Turn the ignition off.

Disconnect the C2 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K12) Injector Control No.2 circuit from the Fuel Injector harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 6

No >> Repair the open in the (K12) Injector Control No.2 circuit. Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

6. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

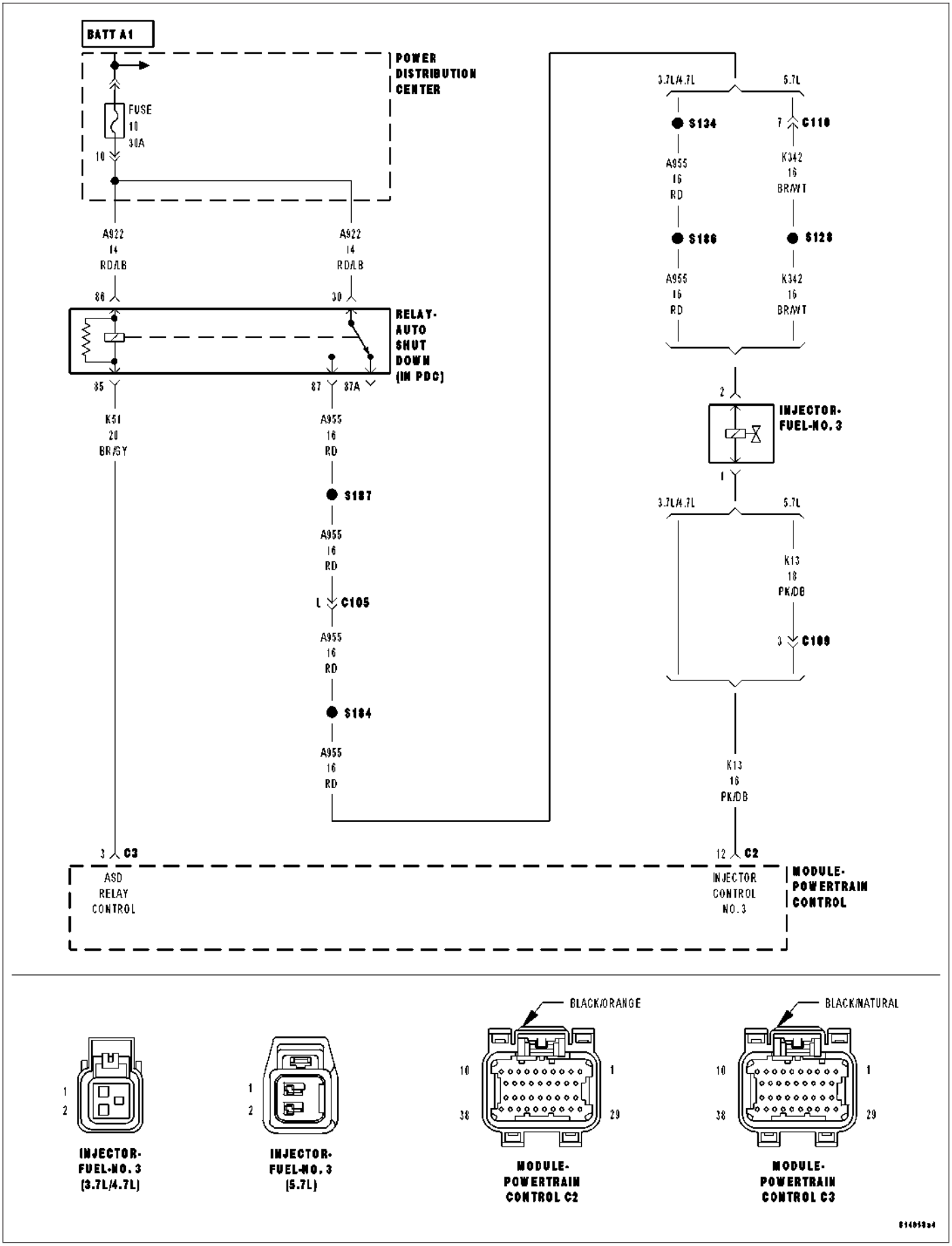
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0203-FUEL INJECTOR 3 CIRCUIT



P0203-FUEL INJECTOR 3 CIRCUIT (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With battery voltage greater than 10 volts. Auto Shutdown Relay energized. Engine speed less than 3000 rpm.
- **Set Condition:**
  No inductive spike is detected after injector turn off.

Possible Causes
(K342), (A955) ASD RELAY OUTPUT CIRCUIT
(K13) INJECTOR CONTROL NO.3 CIRCUIT OPEN
(K13) INJECTOR CONTROL NO.3 CIRCUIT SHORTED TO GROUND
FUEL INJECTOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. (K342), (A955) ASD RELAY OUTPUT CIRCUIT

NOTE: The circuit id (K342) is used on vehicles equipped with a 5.7L engine and the (A955) circuit id is used on vehicles equipped with a 3.7L and 4.7L engine.

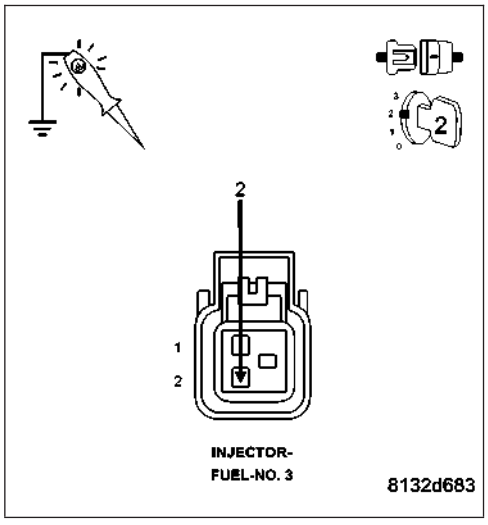
Turn the ignition off.

Disconnect the No.3 Fuel Injector harness connector.

Ignition on, engine not running.

With the scan tool, actuate the ASD Relay.

Using a 12-volt test light connected to ground, probe the (K342), (A955) ASD Relay Output circuit in the No.3 Fuel Injector harness connector.



Does the test light illuminate brightly?

Yes >> Go To 3

No >> Repair the excessive resistance or short to ground in the (K342), (A955) ASD Relay Output circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0203-FUEL INJECTOR 3 CIRCUIT (CONTINUED)

3. FUEL INJECTOR

Using a 12-volt test light connected to 12-volts, probe the (K13) Injector Control No.3 circuit.

With the scan tool, actuate the No.3 Fuel Injector.

What is the state of the test light during the actuation?

Brightly Blinking.

Replace the Fuel Injector.

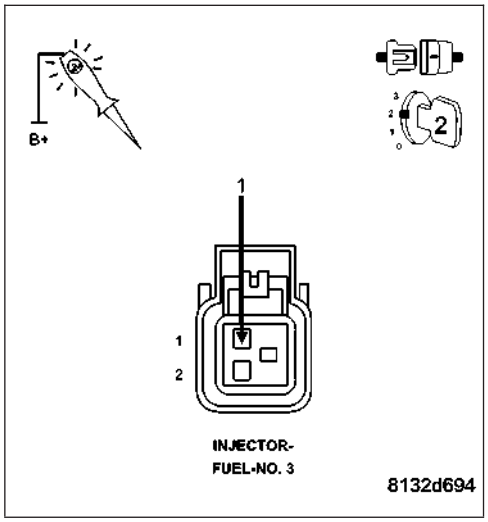
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

ON Constantly.

Go To 4

OFF Constantly.

Go To 5



4. (K13) INJECTOR CONTROL NO.3 CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the C2 PCM harness connector.

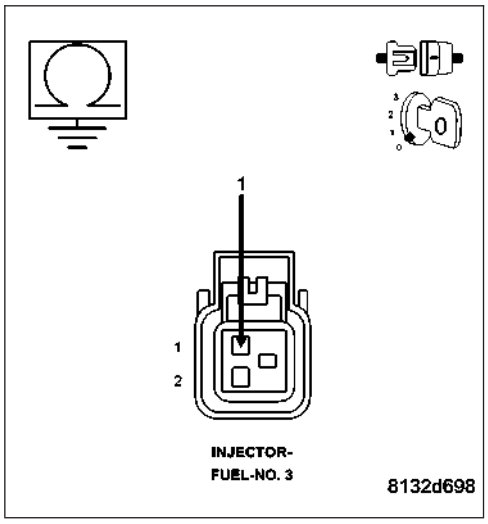
Measure the resistance between ground and the (K13) Injector Control No.3 circuit in the Injector harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K13) Injector Control No.3 circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6



P0203-FUEL INJECTOR 3 CIRCUIT (CONTINUED)

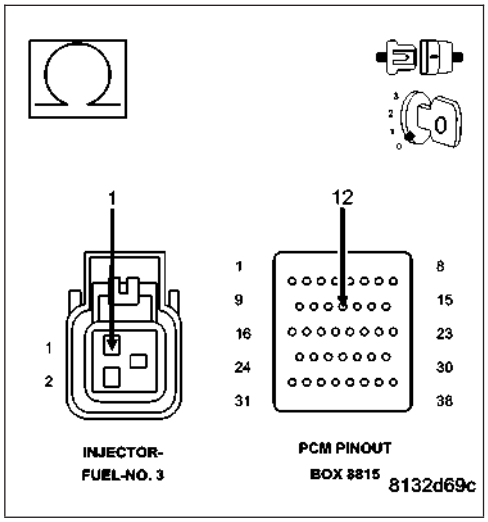
5. (K13) INJECTOR CONTROL NO.3 CIRCUIT OPEN

Turn the ignition off.

Disconnect the C2 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K13) Injector Control No.3 circuit from the Fuel Injector harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 6

No >> Repair the open in the (K13) Injector Control No.3 circuit. Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

6. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

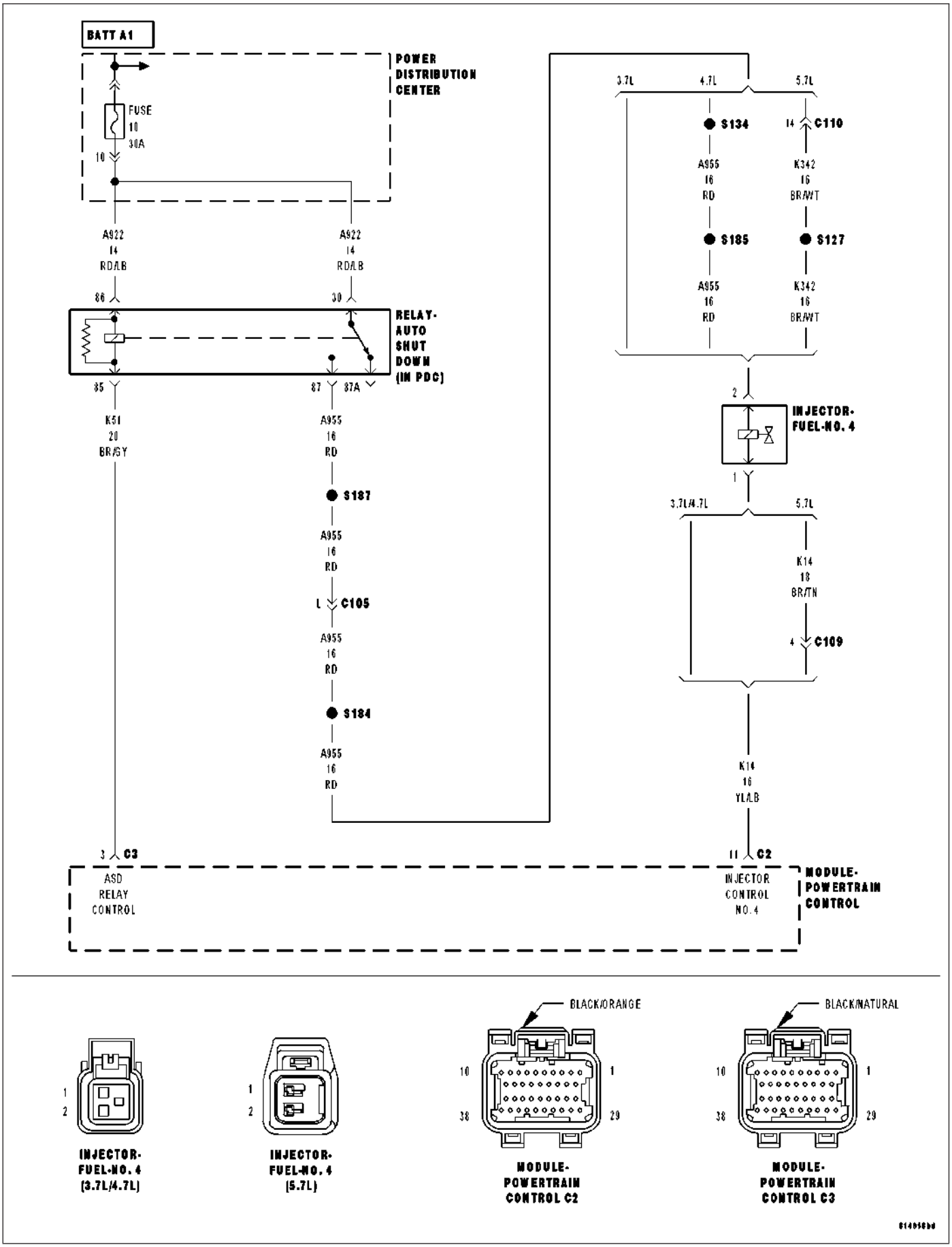
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0204-FUEL INJECTOR 4 CIRCUIT



P0204-FUEL INJECTOR 4 CIRCUIT (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With battery voltage greater than 10 volts. Auto Shutdown Relay energized. Engine speed less than 3000 rpm.
- **Set Condition:**
  No inductive spike is detected after injector turn off.

Possible Causes
(K342), (A955) ASD RELAY OUTPUT CIRCUIT
(K14) INJECTOR CONTROL NO.4 CIRCUIT OPEN
(K14) INJECTOR CONTROL NO.4 CIRCUIT SHORTED TO GROUND
FUEL INJECTOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. (K342), (A955) ASD RELAY OUTPUT CIRCUIT

NOTE: The circuit id (K342) is used on vehicles equipped with a 5.7L engine and the (A955) circuit id is used on vehicles equipped with a 3.7L and 4.7L engine.

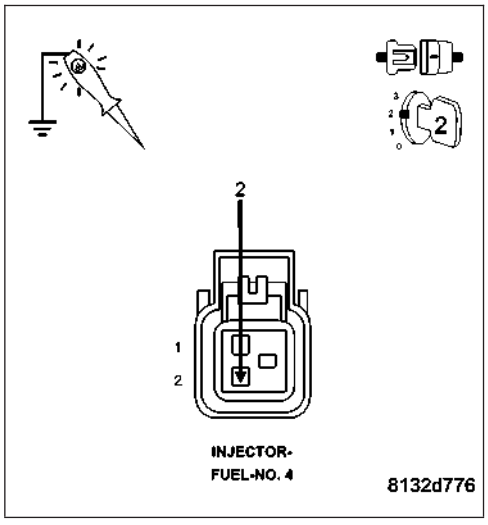
Turn the ignition off.

Disconnect the No.4 Fuel Injector harness connector.

Ignition on, engine not running.

With the scan tool, actuate the ASD Relay.

Using a 12-volt test light connected to ground, probe the (K342), (A955) ASD Relay Output circuit in the No.4 Fuel Injector harness connector.



Does the test light illuminate brightly?

Yes >> Go To 3

No >> Repair the excessive resistance or short to ground in the (K342), (A955) ASD Relay Output circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0204-FUEL INJECTOR 4 CIRCUIT (CONTINUED)

3. FUEL INJECTOR

Using a 12-volt test light connected to 12-volts, probe the (K14) Injector Control No.4 circuit.

With the scan tool, actuate the No.4 Fuel Injector.

What is the state of the test light during the actuation?

Brightly Blinking.

Replace the Fuel Injector.

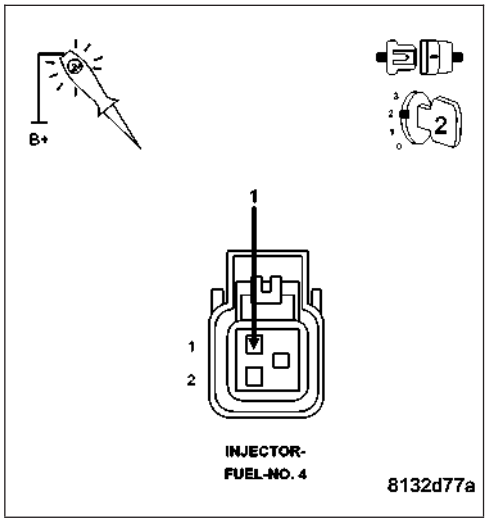
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

ON Constantly.

Go To 4

OFF Constantly.

Go To 5



4. (K14) INJECTOR CONTROL NO.4 CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the C2 PCM harness connector.

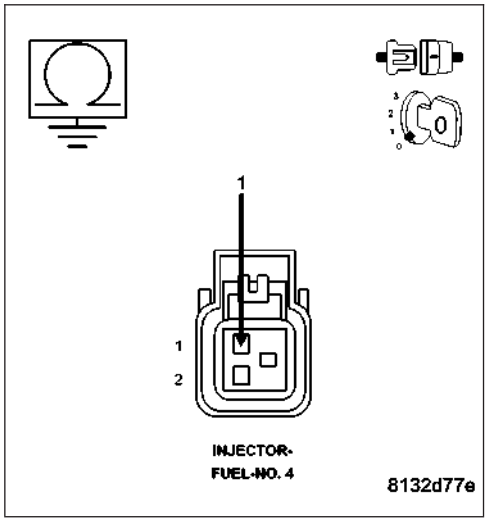
Measure the resistance between ground and the (K14) Injector Control No.4 circuit in the Injector harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K14) Injector Control No.4 circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6



P0204-FUEL INJECTOR 4 CIRCUIT (CONTINUED)

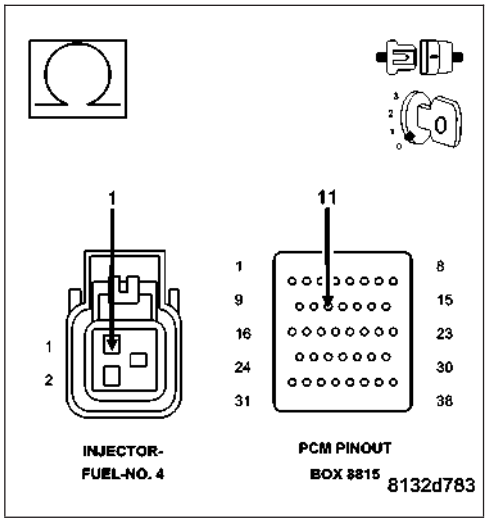
5. (K14) INJECTOR CONTROL NO.4 CIRCUIT OPEN

Turn the ignition off.

Disconnect the C2 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K14) Injector Control No.4 circuit from the Fuel Injector harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 6

No >> Repair the open in the (K14) Injector Control No.4 circuit. Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

6. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

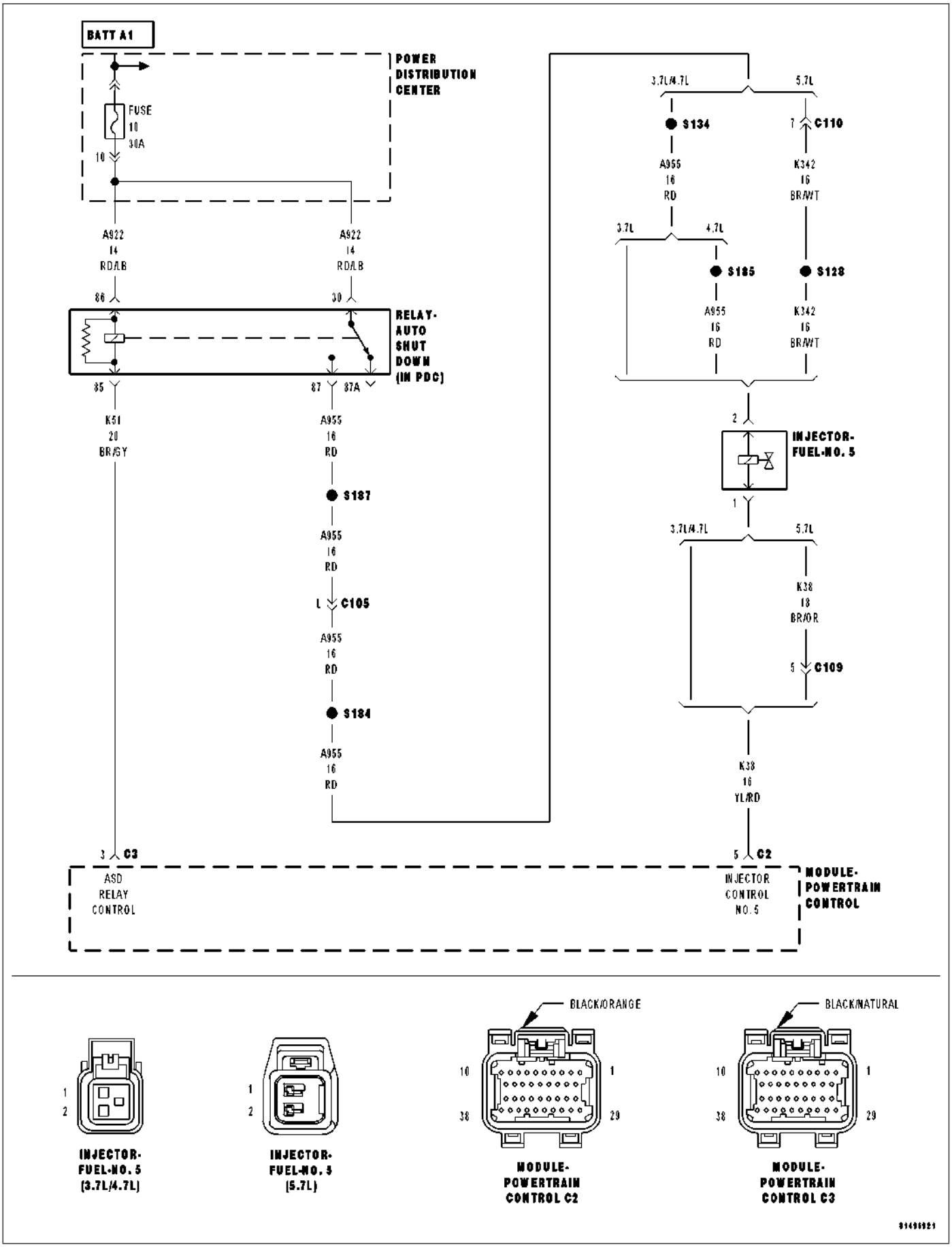
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0205-FUEL INJECTOR 5 CIRCUIT



P0205-FUEL INJECTOR 5 CIRCUIT (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With battery voltage greater than 10 volts. Auto Shutdown Relay energized. Engine speed less than 3000 rpm.
- **Set Condition:**
  No inductive spike is detected after injector turn off.

Possible Causes
(K342), (A955) ASD RELAY OUTPUT CIRCUIT
(K38) INJECTOR CONTROL NO.5 CIRCUIT OPEN
(K38) INJECTOR CONTROL NO.5 CIRCUIT SHORTED TO GROUND
FUEL INJECTOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. (K342), (A955) ASD RELAY OUTPUT CIRCUIT

NOTE: The circuit id (K342) is used on vehicles equipped with a 5.7L engine and the (A955) circuit id is used on vehicles equipped with a 3.7L and 4.7L engine.

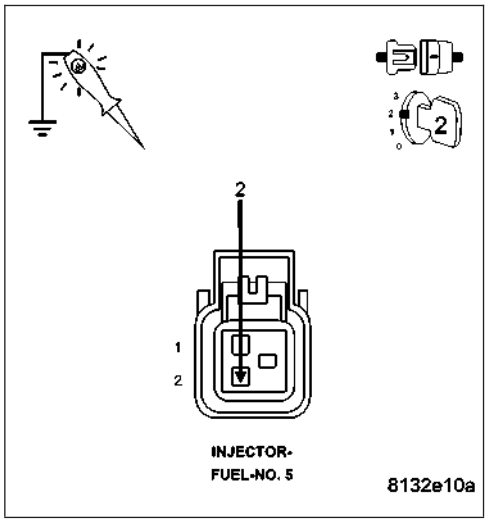
Turn the ignition off.

Disconnect the No.5 Fuel Injector harness connector.

Ignition on, engine not running.

With the scan tool, actuate the ASD Relay.

Using a 12-volt test light connected to ground, probe the (K342), (A955) ASD Relay Output circuit in the No.5 Fuel Injector harness connector.



Does the test light illuminate brightly?

Yes >> Go To 3

No >> Repair the excessive resistance or short to ground in the (K342), (A955) ASD Relay Output circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0205-FUEL INJECTOR 5 CIRCUIT (CONTINUED)

3. FUEL INJECTOR

Using a 12-volt test light connected to 12-volts, probe the (K38) Injector Control No.5 circuit.

With the scan tool, actuate the No.5 Fuel Injector.

What is the state of the test light during the actuation?

Brightly Blinking.

Replace the Fuel Injector.

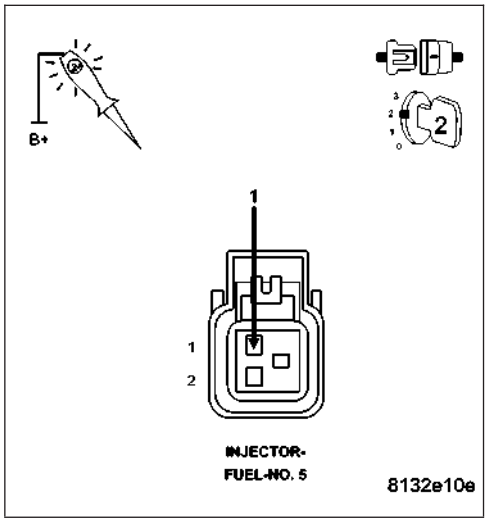
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

ON Constantly.

Go To 4

OFF Constantly.

Go To 5



4. (K38) INJECTOR CONTROL NO.5 CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the C2 PCM harness connector.

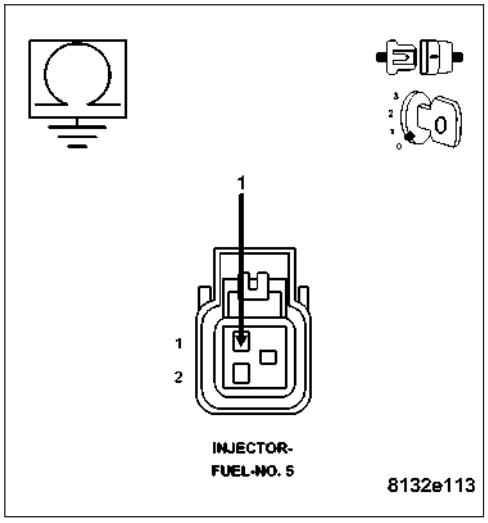
Measure the resistance between ground and the (K38) Injector Control No.5 circuit in the Injector harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K38) Injector Control No.5 circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6



P0205-FUEL INJECTOR 5 CIRCUIT (CONTINUED)

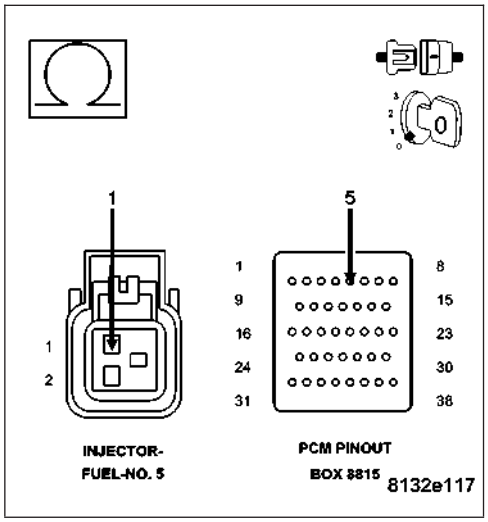
5. (K38) INJECTOR CONTROL NO.5 CIRCUIT OPEN

Turn the ignition off.

Disconnect the C2 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K38) Injector Control No.5 circuit from the Fuel Injector harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 6

No >> Repair the open in the (K38) Injector Control No.5 circuit. Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

6. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

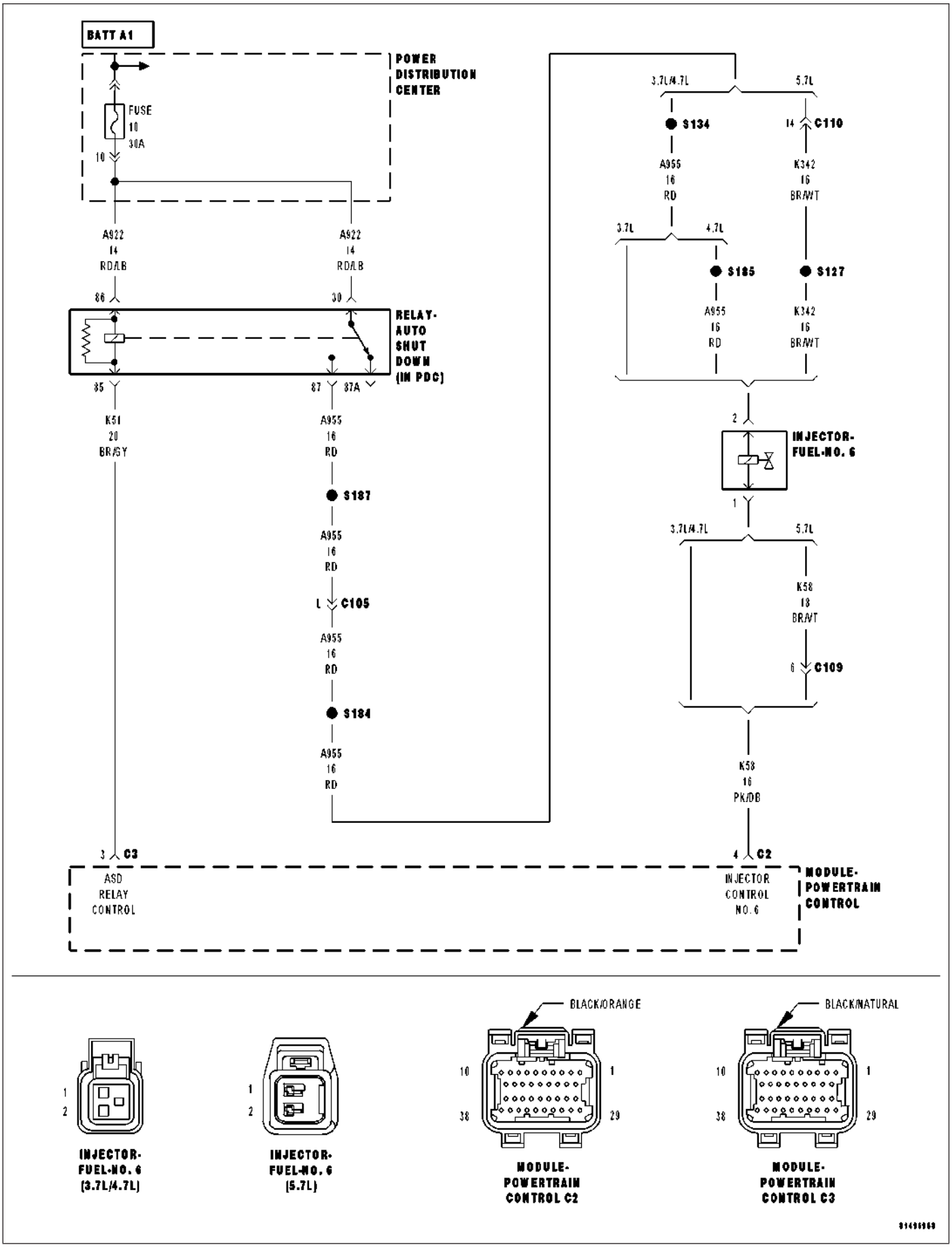
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0206-FUEL INJECTOR 6 CIRCUIT



P0206-FUEL INJECTOR 6 CIRCUIT (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With battery voltage greater than 10 volts. Auto Shutdown Relay energized. Engine speed less than 3000 rpm.
- **Set Condition:**
  No inductive spike is detected after injector turn off.

Possible Causes
(K342), (A955) ASD RELAY OUTPUT CIRCUIT
(K58) INJECTOR CONTROL NO.6 CIRCUIT OPEN
(K58) INJECTOR CONTROL NO.6 CIRCUIT SHORTED TO GROUND
FUEL INJECTOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. (K342), (A955) ASD RELAY OUTPUT CIRCUIT

NOTE: The circuit id (K342) is used on vehicles equipped with a 5.7L engine and the (A955) circuit id is used on vehicles equipped with a 3.7L and 4.7L engine.

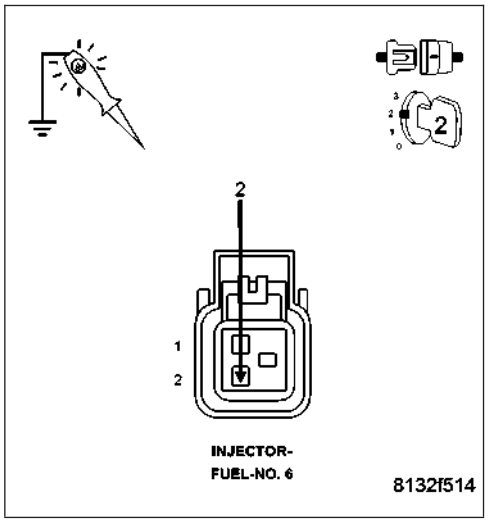
Turn the ignition off.

Disconnect the No.6 Fuel Injector harness connector.

Ignition on, engine not running.

With the scan tool, actuate the ASD Relay.

Using a 12-volt test light connected to ground, probe the (K342), (A955) ASD Relay Output circuit in the No.6 Fuel Injector harness connector.



Does the test light illuminate brightly?

Yes >> Go To 3

No >> Repair the excessive resistance or short to ground in the (K342), (A955) ASD Relay Output circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0206-FUEL INJECTOR 6 CIRCUIT (CONTINUED)

3. FUEL INJECTOR

Using a 12-volt test light connected to 12-volts, probe the (K58) Injector Control No.6 circuit.

With the scan tool, actuate the No.6 Fuel Injector.

What is the state of the test light during the actuation?

Brightly Blinking.

Replace the Fuel Injector.

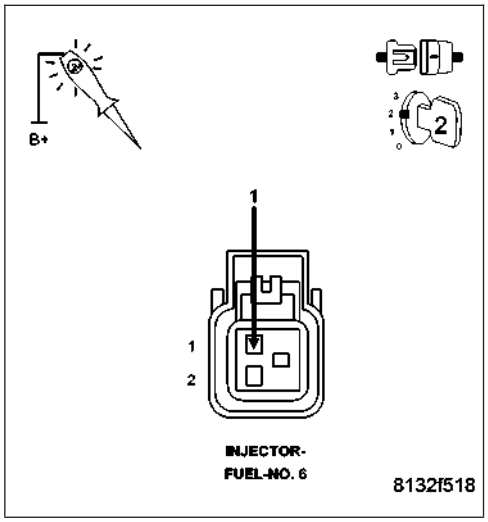
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

ON Constantly.

Go To 4

OFF Constantly.

Go To 5



4. (K58) INJECTOR CONTROL NO.6 CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the C2 PCM harness connector.

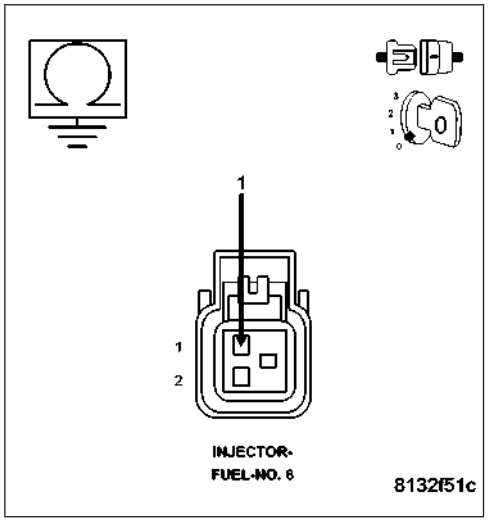
Measure the resistance between ground and the (K58) Injector Control No.6 circuit in the Injector harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K58) Injector Control No.6 circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6



P0206-FUEL INJECTOR 6 CIRCUIT (CONTINUED)

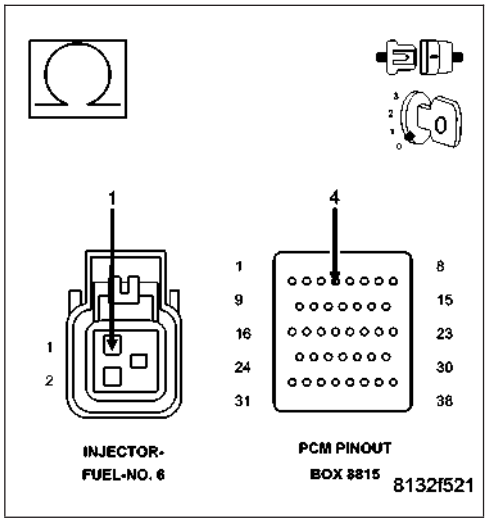
5. (K58) INJECTOR CONTROL NO.6 CIRCUIT OPEN

Turn the ignition off.

Disconnect the C2 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K58) Injector Control No.6 circuit from the Fuel Injector harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 6

No >> Repair the open in the (K58) Injector Control No.6 circuit. Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

6. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

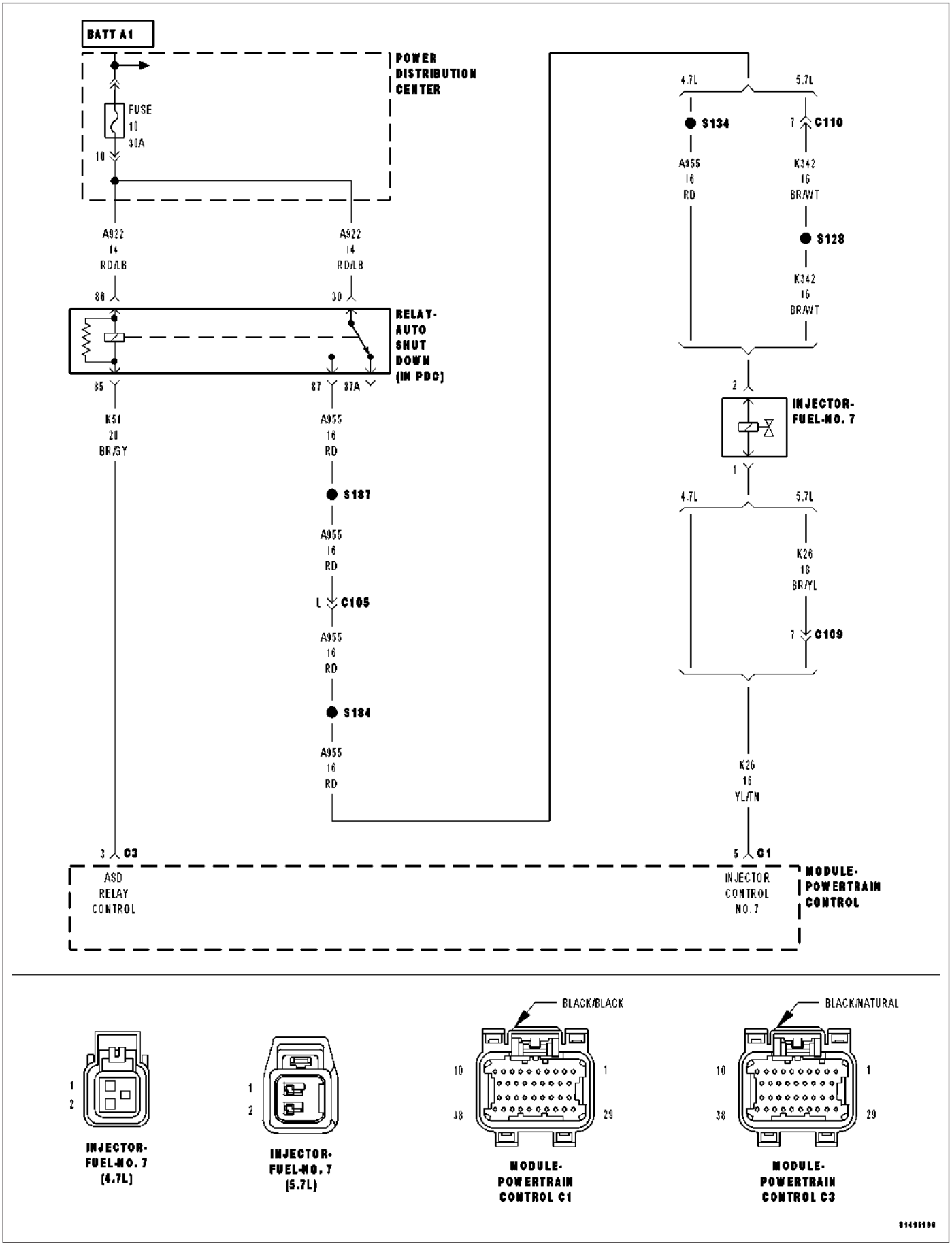
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0207-FUEL INJECTOR 7 CIRCUIT



P0207-FUEL INJECTOR 7 CIRCUIT (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With battery voltage greater than 10 volts. Auto Shutdown Relay energized. Engine speed less than 3000 rpm.
- **Set Condition:**
  No inductive spike is detected after injector turn off.

Possible Causes
(K342), (A955) ASD RELAY OUTPUT CIRCUIT
(K26) INJECTOR CONTROL NO.7 CIRCUIT OPEN
(K26) INJECTOR CONTROL NO.7 CIRCUIT SHORTED TO GROUND
FUEL INJECTOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. (K342), (A955) ASD RELAY OUTPUT CIRCUIT

NOTE: The circuit id (K342) is used on vehicles equipped with a 5.7L engine and the (A955) circuit id is used on vehicles equipped with a 4.7L engine.

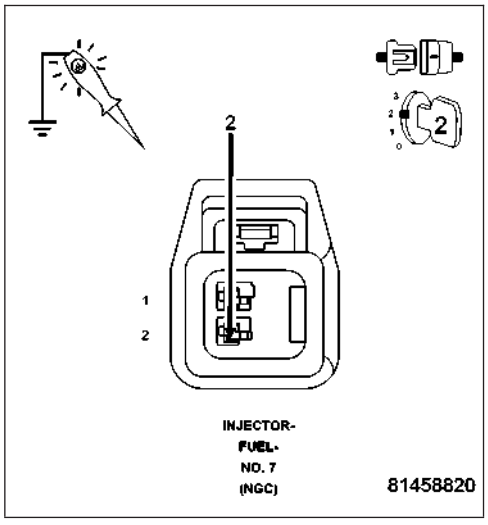
Turn the ignition off.

Disconnect the No.7 Fuel Injector harness connector.

Ignition on, engine not running.

With the scan tool, actuate the ASD Relay.

Using a 12-volt test light connected to ground, probe the (K342), (A955) ASD Relay Output circuit in the No.7 Fuel Injector harness connector.



Does the test light illuminate brightly?

Yes >> Go To 3

No >> Repair the excessive resistance or short to ground in the (K342), (A955) ASD Relay Output circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0207-FUEL INJECTOR 7 CIRCUIT (CONTINUED)

3. FUEL INJECTOR

Using a 12-volt test light connected to 12-volts, probe the (K26) Injector Control No.7 circuit.

With the scan tool, actuate the No.7 Fuel Injector.

What is the state of the test light during the actuation?

Brightly Blinking.

Replace the Fuel Injector.

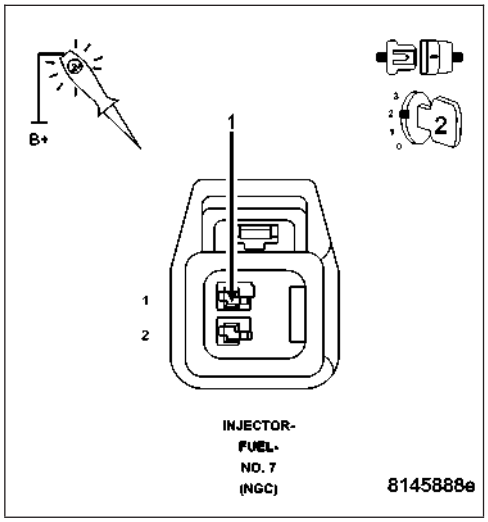
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

ON Constantly.

Go To 4

OFF Constantly.

Go To 5



4. (K26) INJECTOR CONTROL NO.7 CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the C1 PCM harness connector.

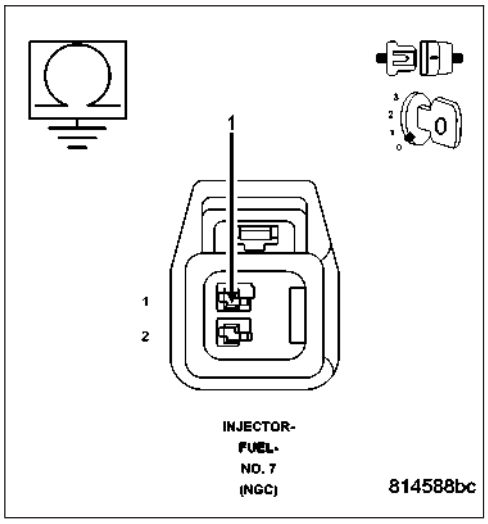
Measure the resistance between ground and the (K26) Injector Control No.7 circuit in the Injector harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K26) Injector Control No.7 circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6



P0207-FUEL INJECTOR 7 CIRCUIT (CONTINUED)

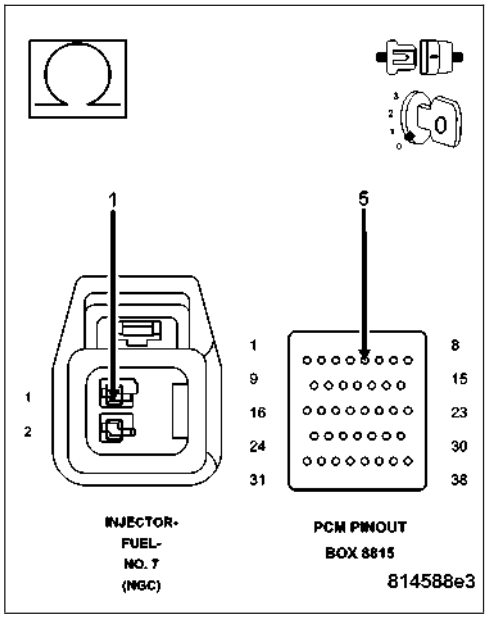
5. (K26) INJECTOR CONTROL NO.7 CIRCUIT OPEN

Turn the ignition off.

Disconnect the C1 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K26) Injector Control No.7 circuit from the Fuel Injector harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 6

No >> Repair the open in the (K26) Injector Control No.7 circuit. Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

6. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

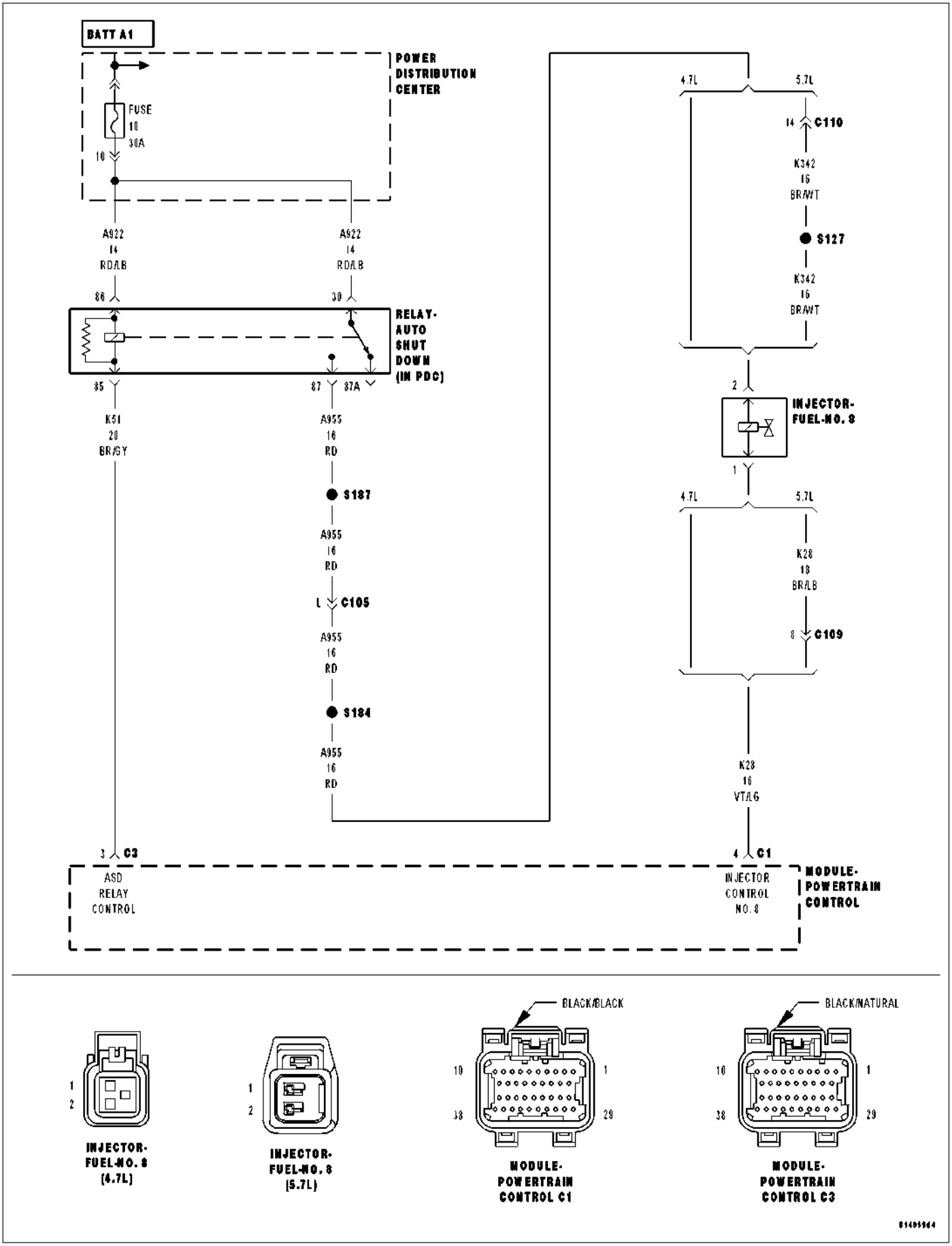
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0208-FUEL INJECTOR 8 CIRCUIT



P0208-FUEL INJECTOR 8 CIRCUIT (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With battery voltage greater than 10 volts. Auto Shutdown Relay energized. Engine speed less than 3000 rpm.
- **Set Condition:**
  No inductive spike is detected after injector turn off.

Possible Causes
(K342), (A955) ASD RELAY OUTPUT CIRCUIT
(K28) INJECTOR CONTROL NO.8 CIRCUIT OPEN
(K28) INJECTOR CONTROL NO.8 CIRCUIT SHORTED TO GROUND
FUEL INJECTOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, read DTC.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. (K342), (A955) ASD RELAY OUTPUT CIRCUIT

NOTE: The circuit id (K342) is used on vehicles equipped with a 5.7L engine and the (A955) circuit id is used on vehicles equipped with a 4.7L engine.

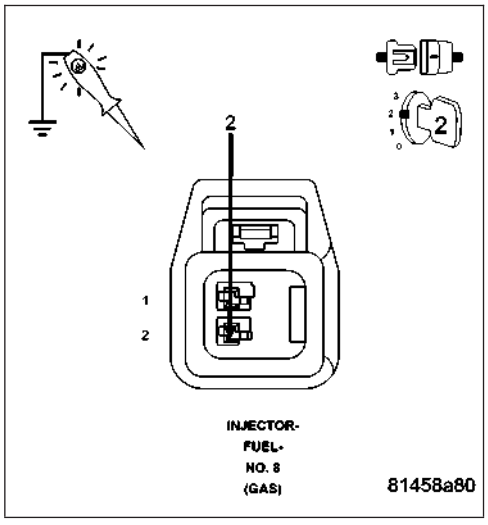
Turn the ignition off.

Disconnect the No.8 Fuel Injector harness connector.

Ignition on, engine not running.

With the scan tool, actuate the ASD Relay.

Using a 12-volt test light connected to ground, probe the (K342), (A955) ASD Relay Output circuit in the No.8 Fuel Injector harness connector.



Does the test light illuminate brightly?

Yes >> Go To 3

No >> Repair the excessive resistance or short to ground in the (K342), (A955) ASD Relay Output circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0208-FUEL INJECTOR 8 CIRCUIT (CONTINUED)

3. FUEL INJECTOR

Using a 12-volt test light connected to 12-volts, probe the (K28) Injector Control No.8 circuit.

With the scan tool, actuate the No.8 Fuel Injector.

What is the state of the test light during the actuation?

Brightly Blinking.

Replace the Fuel Injector.

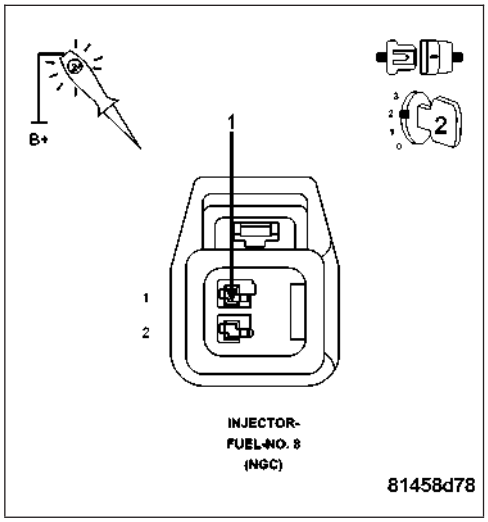
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

ON Constantly.

Go To 4

OFF Constantly.

Go To 5



4. (K28) INJECTOR CONTROL NO.8 CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the C1 PCM harness connector.

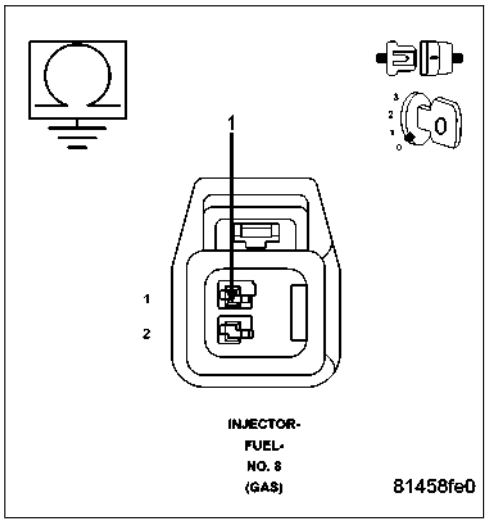
Measure the resistance between ground and the (K28) Injector Control No.8 circuit in the Injector harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K28) Injector Control No.8 circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6



P0208-FUEL INJECTOR 8 CIRCUIT (CONTINUED)

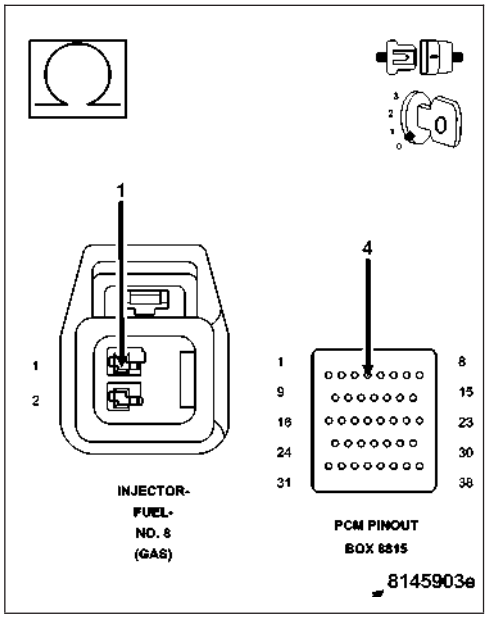
5. (K28) INJECTOR CONTROL NO.8 CIRCUIT OPEN

Turn the ignition off.

Disconnect the C1 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K28) Injector Control No.8 circuit from the Fuel Injector harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 6

No >> Repair the open in the (K28) Injector Control No.8 circuit. Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

6. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

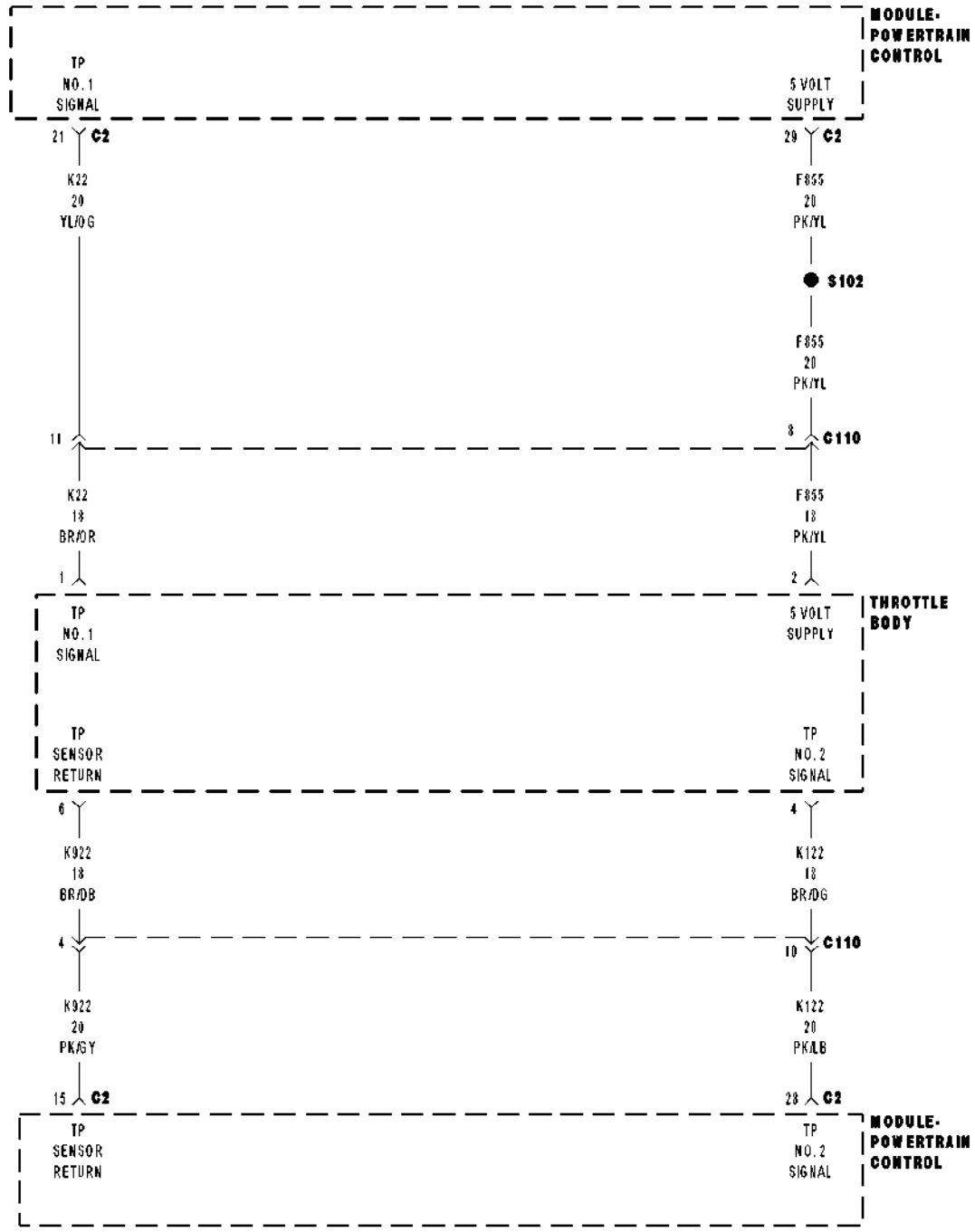
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

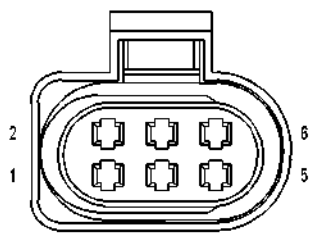
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

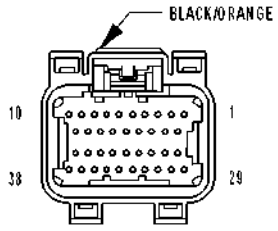
No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0221-THROTTLE POSITION SENSOR 2 PERFORMANCE





THROTTLE
BODY



MODULE-
POWERTRAIN
CONTROL C2

B1492b1b

P0221-THROTTLE POSITION SENSOR 2 PERFORMANCE (CONTINUED)

For the Engine System Schematic circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on and No MAP Sensor DTCs set.
- **Set Condition:**
  TP Sensor signals do not correlate to the MAP Sensor signal. One Trip Fault. ETC light will illuminate. P2135 should set with this code also.

Possible Causes
(K122) TP SENSOR NO.2 SIGNAL CIRCUIT OR (K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
RESISTANCE IN THE (K22) TP SENSOR NO.1 OR (K122) TP SENSOR NO.2 SIGNAL CIRCUIT
(K122) TP SENSOR NO.2 SIGNAL CIRCUIT OR (K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO GROUND
RESISTANCE IN THE (F855) 5-VOLT SUPPLY CIRCUIT
(F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
RESISTANCE IN THE (K922) SENSOR RETURN CIRCUIT
(K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO THE (K122) TP SENSOR NO.2 SIGNAL CIRCUIT
THROTTLE POSITION SENSOR/THROTTLE BODY
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: Diagnose any other TP Sensor DTC(s) before continuing.

NOTE: The throttle plate and linkage should be free from binding and carbon build up.

NOTE: Make sure the throttle plate is at the idle position.
Ignition on, engine not running.

NOTE: Inspect the engine for vacuum leaks.
With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Go To 11

P0221-THROTTLE POSITION SENSOR 2 PERFORMANCE (CONTINUED)

2. (K122) TP SENSOR NO.2 SIGNAL CIRCUIT OR (K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

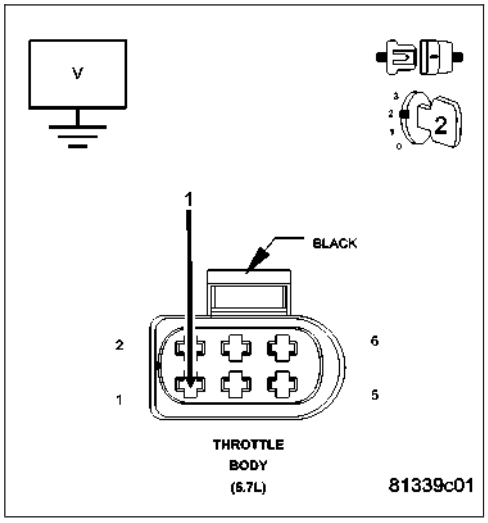
Disconnect the C2 PCM harness connector.

Disconnect the Throttle Body harness connector.

Ignition on, engine not running.

Measure the voltage on the (K122) TP No.2 Signal circuit in the Throttle Body harness connector.

Measure the voltage on the (K22) TP No.1 Signal circuit in the Throttle Body harness connector.

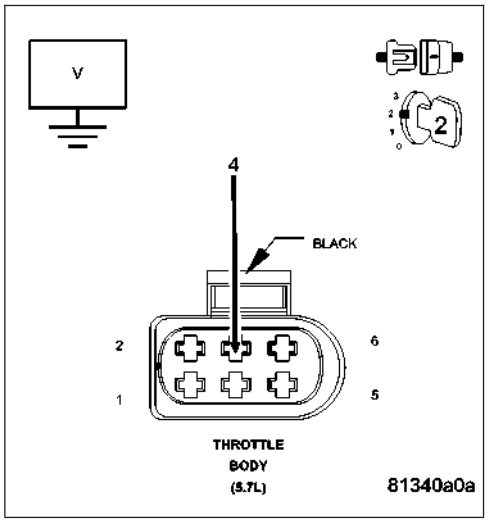


Is the voltage above 5.2 volts for either reading?

Yes >> Repair the short to battery voltage in the (K122) TP Sensor No.2 Signal circuit or the (K22) TP Sensor No.2 Signal circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3



P0221-THROTTLE POSITION SENSOR 2 PERFORMANCE (CONTINUED)

3. THROTTLE POSITION SENSOR

Turn the ignition off.

Connect the C2 PCM harness connector.

Ignition on, engine not running.

With the scan tool, monitor the TP Sensor No.1 and No.2 voltage.

Connect a jumper wire between the (K922) Sensor Return circuit and the (K22) TP Sensor No.1 Signal circuit.

NOTE: TP Sensor No.1 voltage should change from approximately 4.7 volts to 0.3 of a volt.

For TP Sensor No.2, connect a jumper wire between (F855) 5-volt supply circuit and the (K122) TP Sensor No.2 Signal circuit.

NOTE: TP Sensor No.2 voltage should change from approximately 0 volts to 5.0 volts.

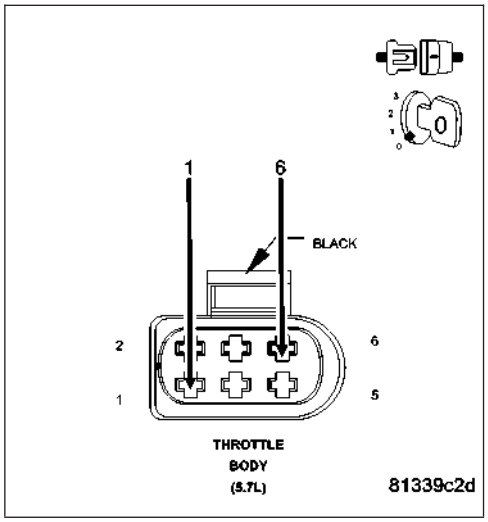
Is the voltage reading within the listed specification with the jumper wire installed?

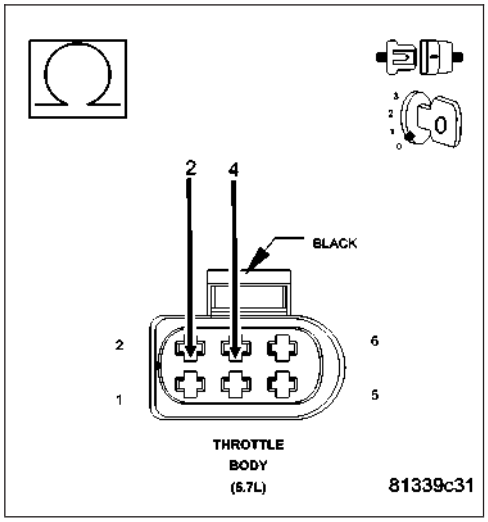
Yes >> Disconnect the Battery when replacing the Throttle Body Assembly. Replace the Throttle Body Assembly. After installation is complete, using a scan tool, select the ETC RELEARN function.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

NOTE: Remove the jumper wire before continuing.





P0221-THROTTLE POSITION SENSOR 2 PERFORMANCE (CONTINUED)

4. EXCESSIVE RESISTANCE IN THE (K22) TP SENSOR NO.1 OR (K122) TP SENSOR NO.2 SIGNAL CIRCUIT

Turn the ignition off.

Disconnect the C2 PCM harness connector.

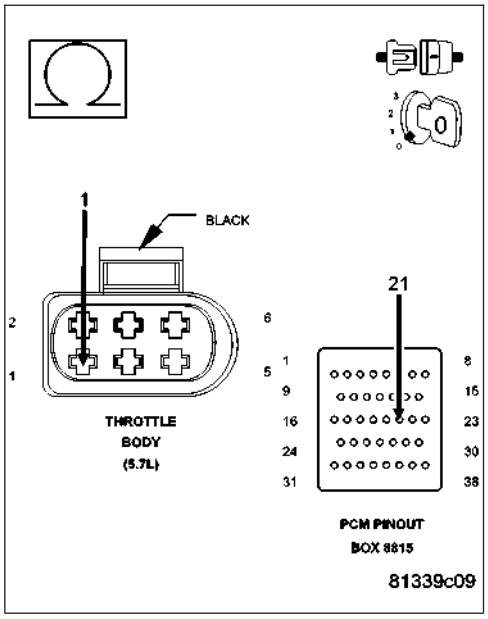
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

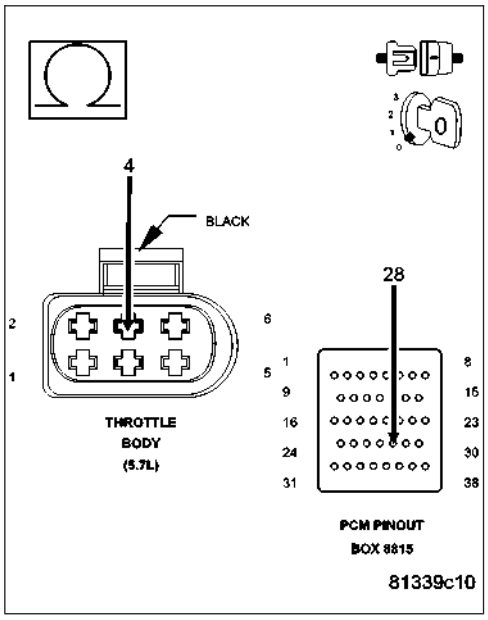
Measure the resistance of the (K22) TP Sensor No.1 Signal circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815. Measure the resistance of the (K122) TP Sensor No.2 Signal circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms for each circuit?

Yes >> Go To 5

No >> Repair the excessive resistance in the (K22) TP Sensor No.1 or (K122) TP Sensor No.2 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)





P0221-THROTTLE POSITION SENSOR 2 PERFORMANCE (CONTINUED)

5. (K22) TP SENSOR NO.1 OR (K122) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K122) TP Sensor No.2 Signal circuit at the Throttle Body harness connector.

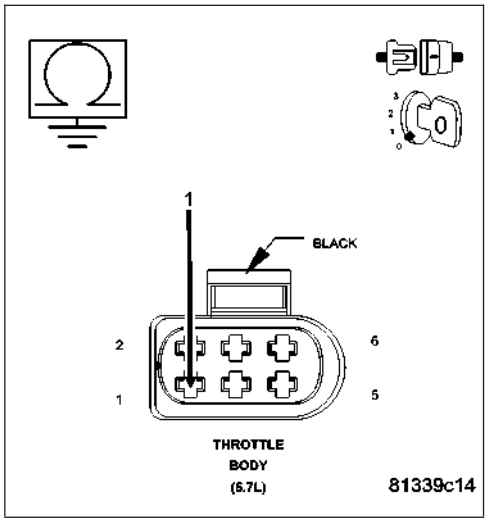
Measure the resistance between ground and the (K22) TP Sensor No.1 Signal circuit at the Throttle Body harness connector.

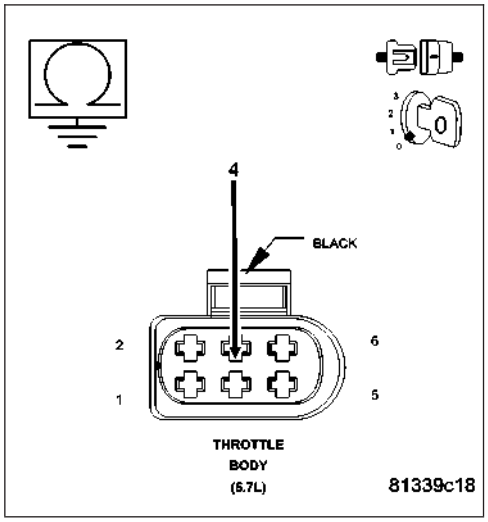
Is the resistance below 100 ohms for each circuit?

Yes >> Go To 6

No >> Repair the short to ground in the (K122), (K22) TP Sensor Signal circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

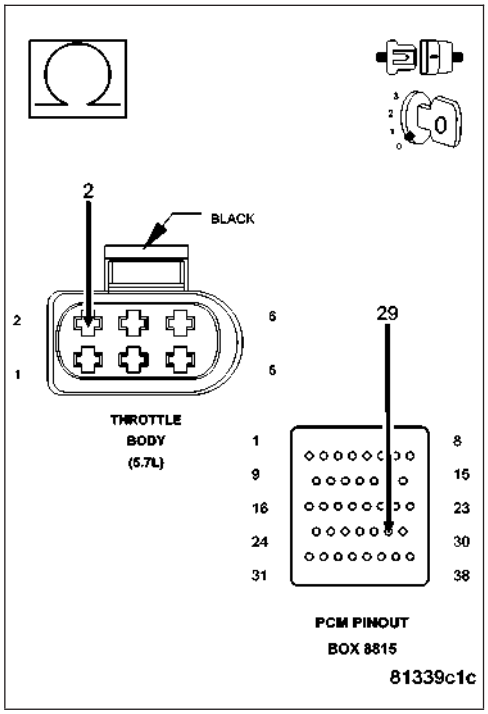




P0221-THROTTLE POSITION SENSOR 2 PERFORMANCE (CONTINUED)

6. EXCESSIVE RESISTANCE IN THE (F855) 5-VOLT SUPPLY CIRCUIT

Measure the resistance of the (F855) 5-volt Supply circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

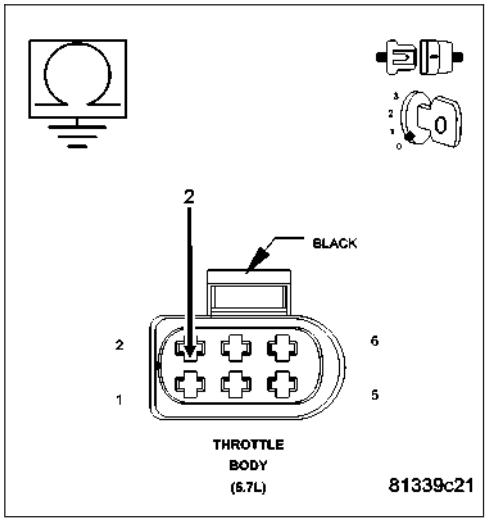
Yes >> Go To 7

No >> Repair the excessive resistance in the (F855) 5-volt Supply circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

7. (F855) 5-VOLT SUPPLY SHORTED TO GROUND

Measure the resistance between ground and the (F855) 5-volt Supply circuit at the Throttle Body harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (F855) 5-volt Supply circuit.

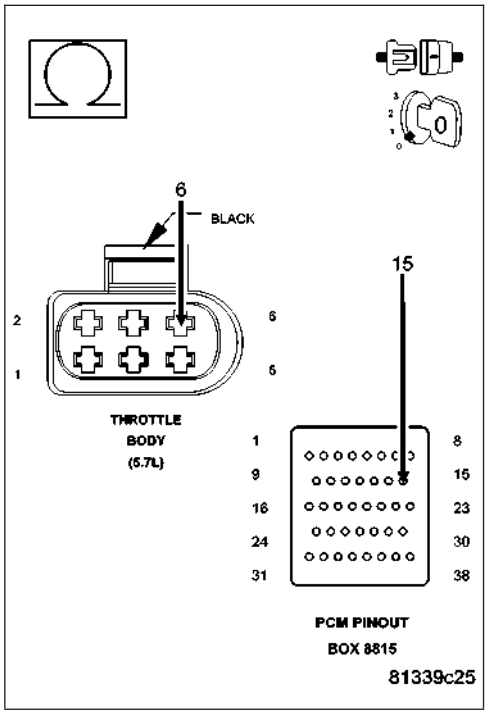
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8

P0221-THROTTLE POSITION SENSOR 2 PERFORMANCE (CONTINUED)

8. EXCESSIVE RESISTANCE IN THE (K922) SENSOR RETURN CIRCUIT

Measure the resistance of the (K922) Sensor Return circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.



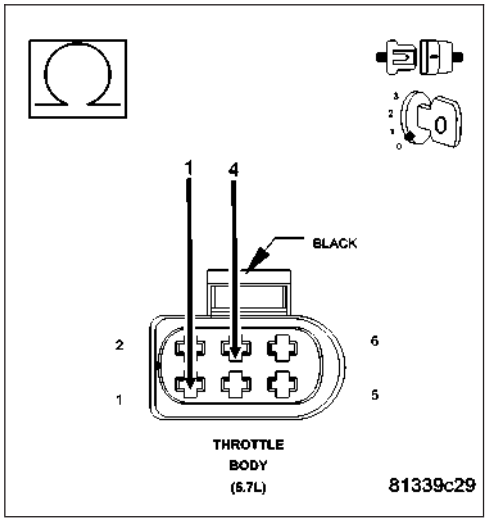
Is the resistance below 5.0 ohms?

Yes >> Go To 9

No >> Repair the excessive resistance in the (K922) Sensor Return circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

9. (K22) TP SENSOR NO.1 SIGNAL SHORTED TO THE (K122) TP SENSOR NO.2 SIGNAL

Measure the resistance between the (K22) TP Sensor No.1 Signal circuit and the (K122) TP Sensor No.2 Signal circuit at the Throttle Body harness connector.



Is the resistance below 5.0 ohms?

Yes >> Repair the short between the (K122) TP Sensor No.2 Signal circuit and the (K22) TP Sensor No.1 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 10

P0221-THROTTLE POSITION SENSOR 2 PERFORMANCE (CONTINUED)

10. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

11. THROTTLE FOLLOWER TEST

Ignition on, engine not running.

With the scan tool, perform the Throttle Follower Test and monitor the TP Sensor No.1 or No.2 voltage.

Slowly press the throttle pedal down.

The voltage for TP Sensor No.1 should start at approximately 0.3 of a volt and increase to above 4.3 volts.

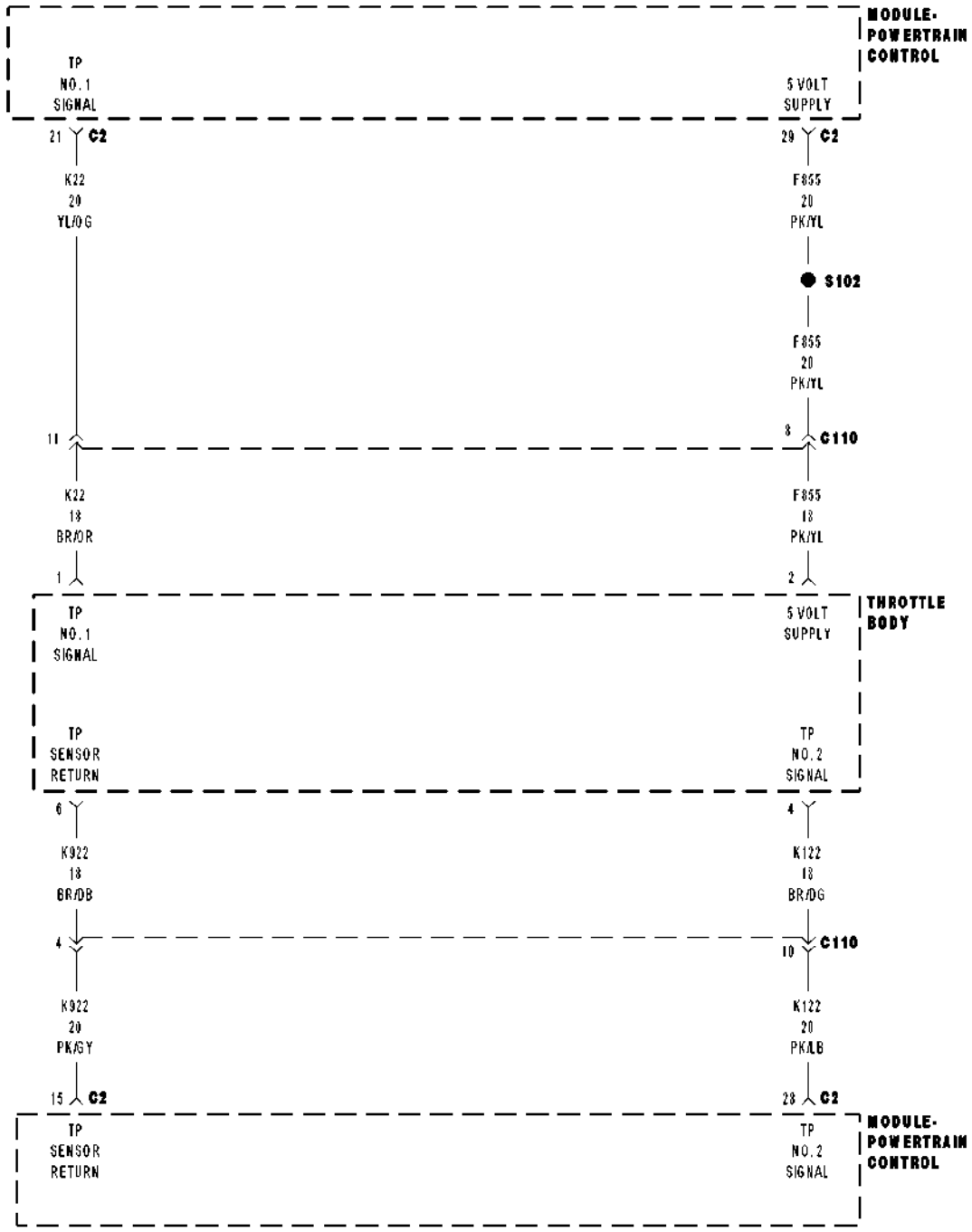
The voltage for TP Sensor No.2 should start at approximately 4.3 volts and decrease to approximately 0.3 of a volt.

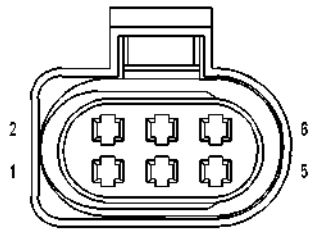
Is the voltage within the range of the listed specification for the appropriate Sensor?

Yes >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

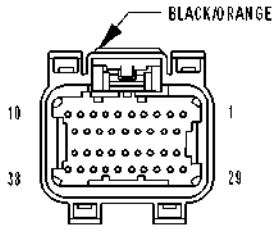
No >> Disconnect the Battery when replacing the Throttle Body Assembly. Replace the Throttle Body Assembly. After installation is complete, using a scan tool select the ETC RELEARN function.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0222-THROTTLE POSITION SENSOR 2 CIRCUIT LOW





THROTTLE
BODY



MODULE-
POWERTRAIN
CONTROL C2

B1492b1b

P0222-THROTTLE POSITION SENSOR 2 CIRCUIT LOW (CONTINUED)

For the Engine System Schematic circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete Engine wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. Battery voltage greater than 10 volts.
- **Set Condition:**
  Throttle Position Sensor voltage at the PCM is less than 0.16 of a volt for 0.7 of a second. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(F855) 5-VOLT SUPPLY CIRCUIT OPEN
(F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K122) TP SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO GROUND
(K122) TP SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO THE (K922) SENSOR RETURN CIRCUIT
THROTTLE POSITION SENSOR/THROTTLE BODY
THROTTLE PLATE JAMMED AGAINST THE MAXIMUM STOP
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. TP SENSOR NO.2 BELOW 0.35 OF A VOLT

NOTE: If a 5-Volt supply DTC has also set, diagnose the 5-Volt DTC before continuing.

NOTE: Make sure the throttle moves freely and does not hang up at Wide Open Throttle, by performing the Throttle Follower Test

NOTE: If P2101 is also set, then make sure that the blade moves freely and does not hang up near Wide Open Throttle before trying to repair P0222.

Ignition on, engine not running.

With the scan tool, read the TP Sensor voltage.

Is the voltage below 0.35 of a volt?

Yes >> Go To 2

No >> Go To 11

---

2. P0122 ALSO SET

Was the P0122-TP SENSOR NO.1 VOLTAGE LOW DTC set along with the P0222?

Yes >> Go To 3

No >> Go To 4

P0222-THROTTLE POSITION SENSOR 2 CIRCUIT LOW (CONTINUED)

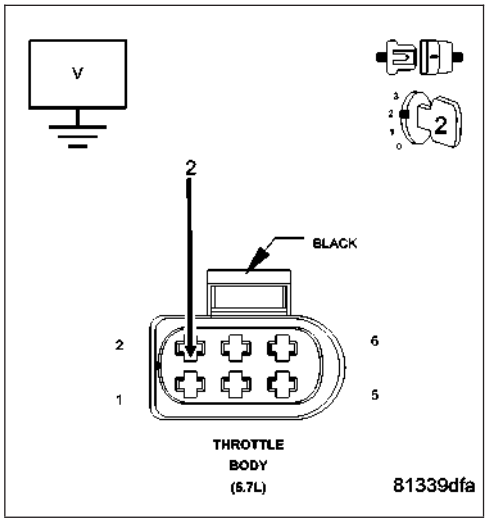
3. (F855) 5-VOLT SUPPLY CIRCUIT

Turn the ignition off.

Disconnect the Throttle Body harness connector.

Ignition on, engine not running.

Measure the voltage on the (F855) 5-volt Supply circuit in the Throttle Body harness connector.



Is the voltage between 4.5 to 5.2 volts?

Yes >> Go To 4

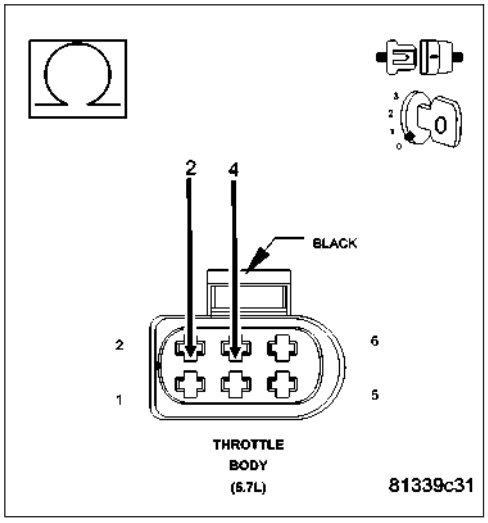
No >> Go To 8

---

4. THROTTLE POSITION SENSOR

Connect a jumper wire between the (F855) 5-volt Supply circuit and the (K122) TP Sensor No.2 Signal circuit in the Throttle Body harness connector.

With the scan tool, monitor the TP Sensor No.2 voltage.



Is the voltage between 4.8 and 5.2 volts with the jumper wire installed?

Yes >> Disconnect the Battery when replacing the Throttle Body Assembly. Replace the Throttle Body Assembly. After installation is complete, with a scan tool select the ETC RELEARN function.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

NOTE: Remove the jumper wire before continuing.

P0222-THROTTLE POSITION SENSOR 2 CIRCUIT LOW (CONTINUED)

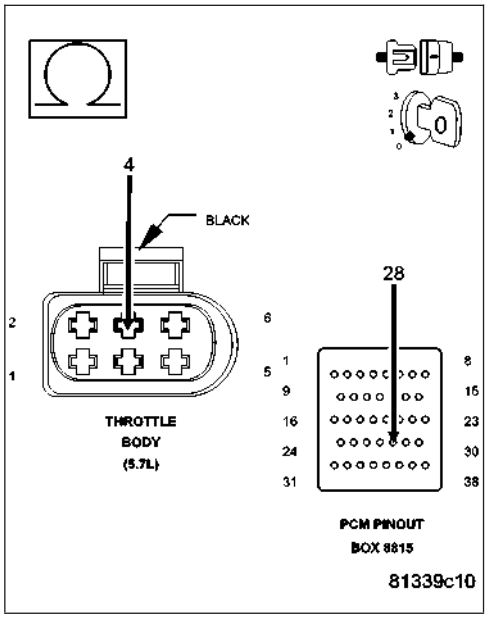
5. (K122) TP SENSOR NO.2 SIGNAL CIRCUIT OPEN

Turn the ignition off.

Disconnect the C2 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K122) TP Sensor No.2 Signal circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

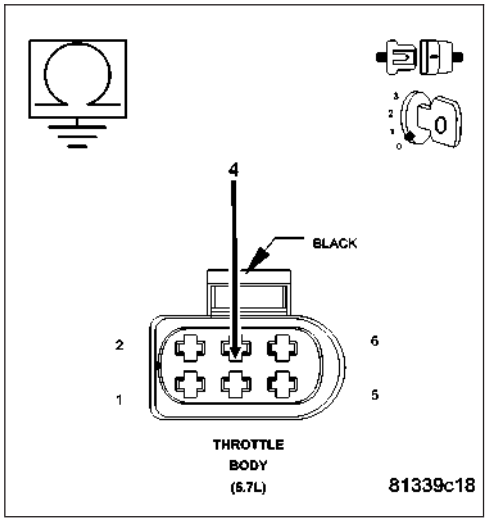
Yes >> Go To 6

No >> Repair the open in the (K122) TP Sensor No.2 Signal circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

6. (K122) TP SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K122) TP Sensor No.2 Signal circuit at the Throttle Body harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K122) TP Sensor No.2 Signal.

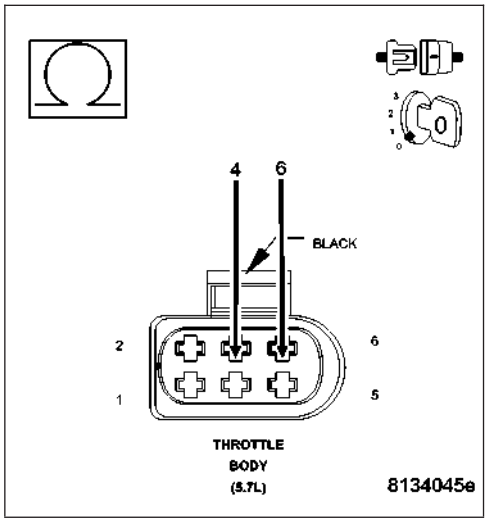
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 7

P0222-THROTTLE POSITION SENSOR 2 CIRCUIT LOW (CONTINUED)

7. (K122) TP SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO THE (K922) SENSOR RETURN CIRCUIT

Measure the resistance between the (K122) TP Sensor No.2 Signal circuit and the (K922) TP Sensor Return circuit at the Throttle Body harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short between the (K922) Sensor Return circuit and the (K122) TP Sensor No.2 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 10

---

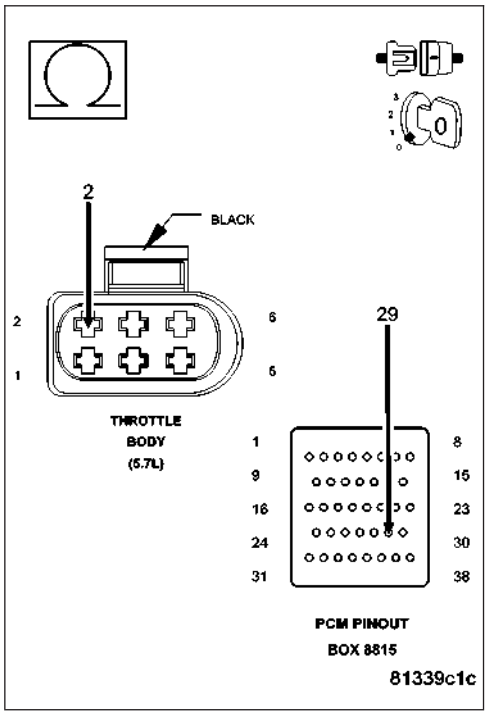
8. (F855) 5-VOLT SUPPLY CIRCUIT OPEN

Turn the ignition off.

Disconnect the C2 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (F855) 5-volt Supply circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

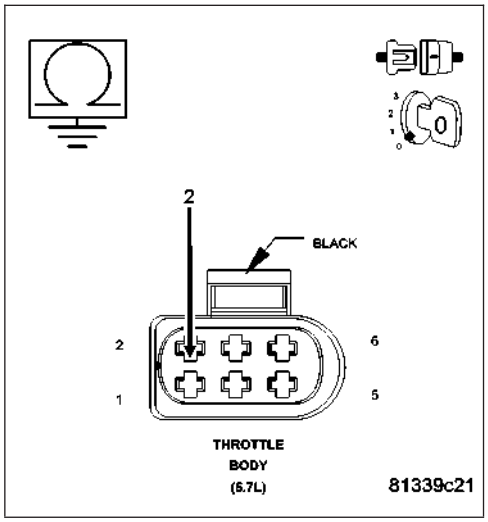
Yes >> Go To 9

No >> Repair the open in the (F855) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0222-THROTTLE POSITION SENSOR 2 CIRCUIT LOW (CONTINUED)

9. (F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (F855) 5-volt Supply circuit at the Throttle Body harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (F855) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 10

---

10. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

11. THROTTLE FOLLOWER TEST

Ignition on, engine not running.

With the scan tool, perform the Throttle Follower Test.

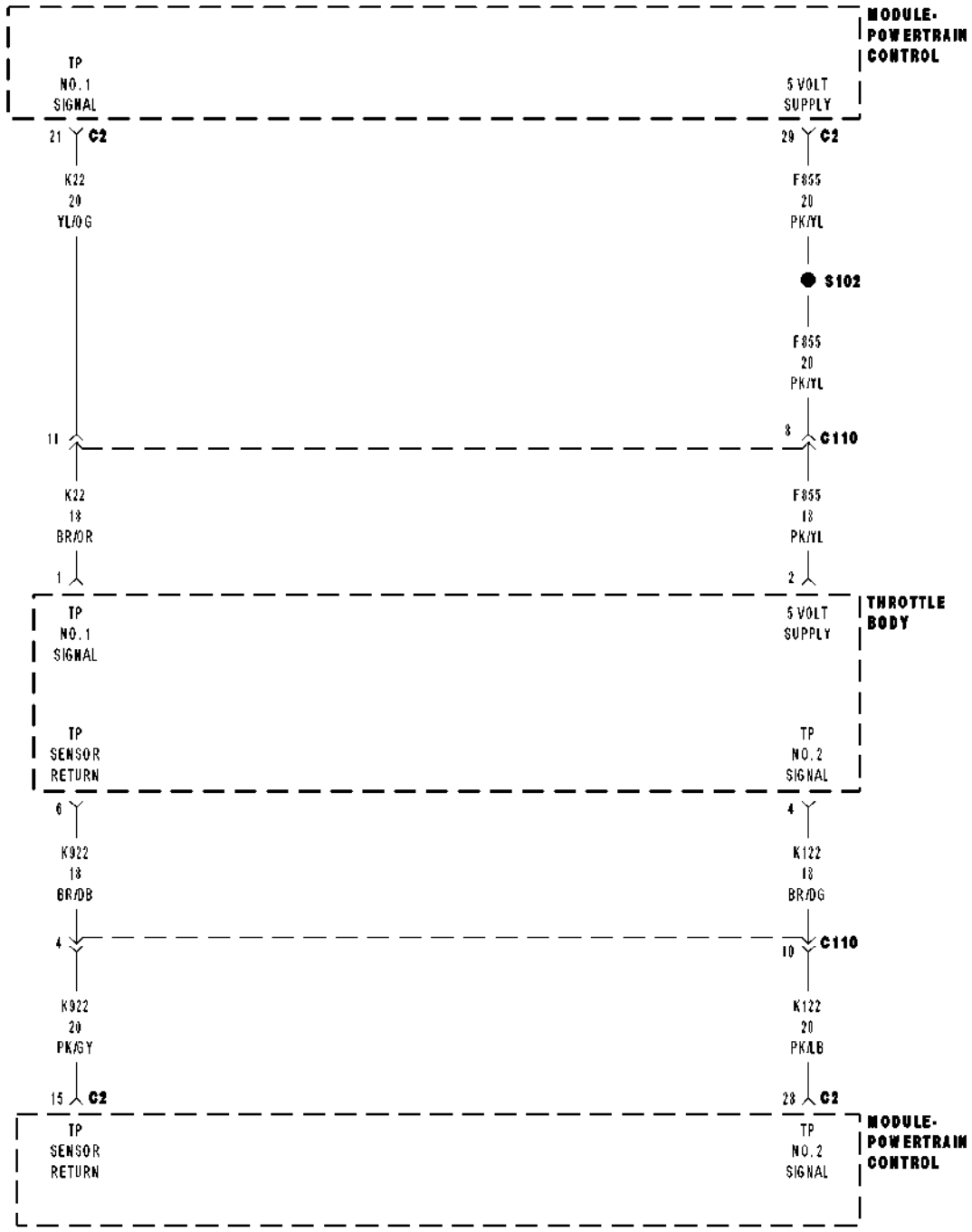
Monitor the TP Sensor No.2 voltage while slowly pressing the Throttle pedal down.

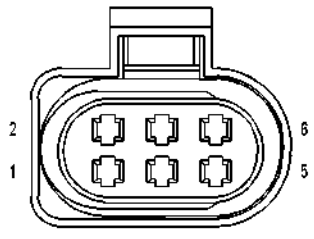
Is there a smooth voltage change from high to low?

Yes >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

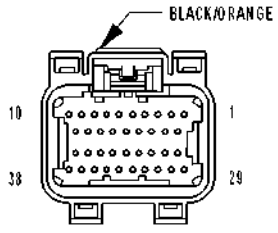
No >> Disconnect the Battery when replacing the Throttle Body Assembly. Replace the Throttle Body Assembly. After installation is complete, with a scan tool select the ETC RELEARN function.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0223-THROTTLE POSITION SENSOR 2 CIRCUIT HIGH





THROTTLE BODY



MODULE-POWERTRAIN CONTROL C2

B1492b1b

P0223-THROTTLE POSITION SENSOR 2 CIRCUIT HIGH (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  Throttle Position Sensor No.2 Signal circuit voltage is greater than 4.9 volts for 25 ms. One Trip Fault. ETC light will illuminate.

Possible Causes
(K122) TP SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K122) TP SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO THE (F855) 5-VOLT SUPPLY CIRCUIT
(K922) SENSOR RETURN CIRCUIT OPEN
THROTTLE POSITION SENSOR/THROTTLE BODY
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: If a 5-Volt supply DTC has also set, diagnose the 5-Volt DTC before continuing.
Ignition on, engine not running.
With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Go To 7

---

2. THROTTLE POSITION SENSOR

Turn the ignition off.
Disconnect the Throttle Body Assembly harness connector.
Ignition on, engine not running.
With the scan tool monitor the TP Sensor No.2 voltage.

Is the voltage below 0.5 volt?

Yes >> Disconnect the Battery when replacing the Throttle Body Assembly. Replace the Throttle Body Assembly. After installation is complete, with the scan tool select the ETC RELEARN function.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

P0223-THROTTLE POSITION SENSOR 2 CIRCUIT HIGH (CONTINUED)

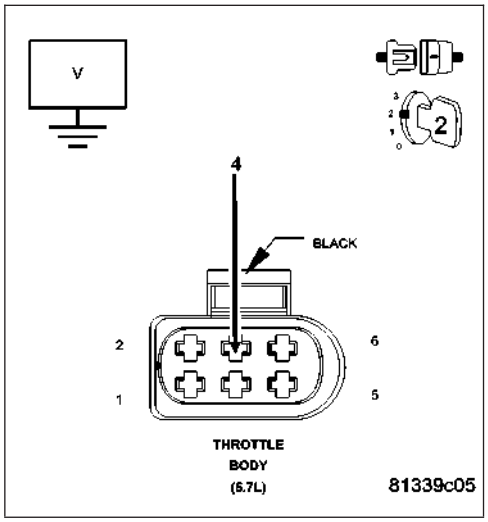
3. (K122) TP SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

Disconnect the C2 PCM harness connector.

Ignition on, engine not running.

Measure the voltage on the (K122) TP Sensor No.2 Signal circuit at the Throttle Body harness connector.



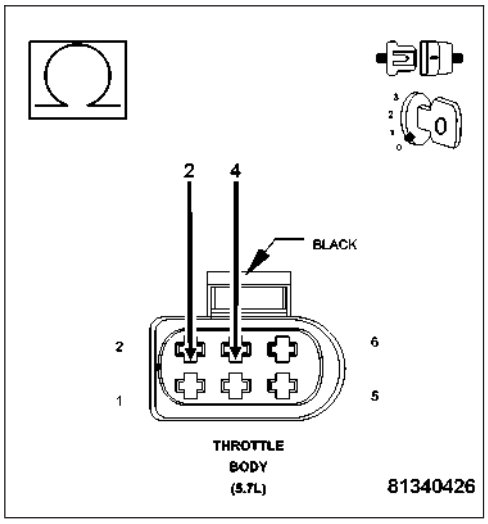
Is the voltage above 0 volts?

Yes >> Repair the short to battery voltage in the (K122) TP Sensor No.2 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

4. (K122) TP SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO THE (F855) 5-VOLT SUPPLY CIRCUIT

Measure the resistance between the (K122) TP Sensor No.2 Signal circuit and the (F855) 5-volt Supply circuit at the Throttle Body harness connector.



Is the resistance below 100 ohms?

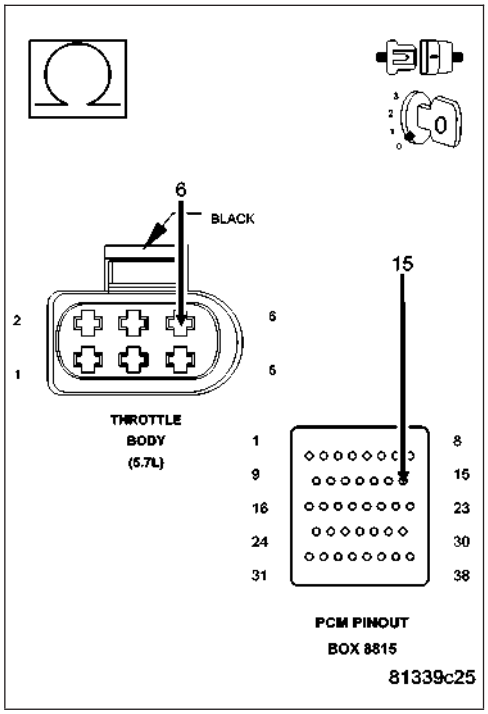
Yes >> Repair the short between the (K122) TP Sensor No.2 Signal circuit and the (F855) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

P0223-THROTTLE POSITION SENSOR 2 CIRCUIT HIGH (CONTINUED)

5. (K922) SENSOR RETURN CIRCUIT OPEN

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.
Measure the resistance of the (K922) Sensor Return circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 6

No >> Repair the open in the (K922) Sensor Return circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

6. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

7. THROTTLE FOLLOWER TEST

With the scan tool, perform the Throttle Follower Test.
Monitor the TP Sensor No.2 voltage while slowly pressing the Throttle pedal down.

Is there a smooth voltage change from high to low?

Yes >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Disconnect the Battery when replacing the Throttle Body Assembly. Replace the Throttle Body Assembly. After installation is complete, with the scan tool select the ETC RELEARN function.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0300-MULTIPLE CYLINDER MISFIRE

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Any time the engine is running, and the adaptive numerator has been successfully updated.
- **Set Condition:**
  When more than a 2% (2.5% LEV) misfire rate is measured during two trips. Above 3000 RPM 1 trip less than 3000 RPM 2 trip. Three good trips to turn off the MIL.

Possible Causes
(K342), (A955) ASD RELAY OUTPUT CIRCUIT
INJECTOR CONTROL CIRCUIT
COIL CONTROL CIRCUIT
IGNITION WIRE
SPARK PLUG
IGNITION COIL
FUEL PUMP INLET STRAINER PLUGGED
RESTRICTED FUEL SUPPLY LINE
FUEL PUMP MODULE
FUEL PRESSURE LEAK DOWN
FUEL INJECTOR
ENGINE MECHANICAL
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. CYLINDER MIS-FIRE CONDITION ACTIVE

NOTE: Check for any TSB's that apply to a Misfire condition. Review the vehicle repair history for any misfire condition repairs that have been performed.

Star the engine.

Observe the WHICH CYLINDER IS MISFIRING screen for at least one minute on the scan tool.

Is there a misfire present?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0300-MULTIPLE CYLINDER MISFIRE (CONTINUED)

2. VISUAL INSPECTION

NOTE: Anything that affects the speed of the crankshaft can cause a misfire DTC.

NOTE: When a Misfire is detected for a particular cylinder, the PCM will shut down that cylinders Injector Control circuit.

- Visually inspect the engine for any of the following conditions.
- Worn serpentine belt
- Binding Engine-Driven accessories: A/C Compressor, P/S Pump, Water pump.
- Misalignment of the Water pump, P/S Pump and A/C Compressor pulleys
- Corroded PCM power and ground circuits.
- Improper CKP, CMP, MAP, and TP Sensor mounting
- Poor connector/terminal to component connection. i.e., CKP sensor, Fuel Injector, Ign coil, etc.
- Vacuum leaks
- Restricted Air Induction system or Exhaust system.
- Internal engine component failures.

Were any of the above conditions present?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

---

3. (K342), (A955) ASD RELAY OUTPUT CIRCUIT

NOTE: The circuit id (K342) is used on vehicles equipped with a 5.7L engine and the (A955) circuit id is used with the 3.7L and 4.7L engines.

Turn the ignition off.

Disconnect the Ignition Coil harness connector of the misfiring cylinders.

Disconnect the Fuel Injector harness connector of the misfiring cylinders.

Ignition on, engine not running.

With a scan tool, actuate the ASD Relay.

Using a 12-volt test light connected to ground, probe the (K342), (A955) ASD Relay Output circuit in the Ignition Coil harness connector and Fuel Injector harness connector while the relay is actuating.

Does the test light illuminate brightly?

Yes >> Go To 4

No >> Repair the excessive resistance or short to ground in the (K342), (A955) ASD Relay Output circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0300-MULTIPLE CYLINDER MISFIRE (CONTINUED)

4. IGNITION SYSTEM OPERATION

Turn the ignition off.
Connect the Ignition Coil harness connectors.
Remove the Ignition Coils.
Leave the Fuel Injector harness connector of the cylinder being tested disconnected.
Install a spark tester on the Ignition Coil.
While cranking the engine observe the spark coming from the spark tester.

NOTE: A crisp blue spark that is able to jump the gap of the spark tester should be generated.

Is good spark present?

Yes >> Go To 5

No >> Go To 14

NOTE: Connect the Fuel Injector harness connector before continuing.

---

5. SPARK PLUG

Turn the ignition off.
Remove the Spark Plug.
Inspect the Spark Plug for the following conditions.
- Cracks
- Carbon Tracking
- Foreign Material
- Gap size out of specifications
- Loose or broke electrode

NOTE: Lightly tap the bottom of the spark plug on a solid surface. The electrode in the spark plug should not move.

Does the Spark Plug have any problems?

Yes >> Replace the Spark Plug.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6

---

6. FUEL PRESSURE CHECK

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.
Install a fuel pressure gauge to the fuel rail.
Start the engine and observe the fuel pressure reading.

NOTE: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Choose a conclusion that best matches your fuel pressure reading.

Within Specification
Go To 7

Below Specification
Go To 12

Above Specification
Replace the fuel filter/pressure regulator.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0300-MULTIPLE CYLINDER MISFIRE (CONTINUED)

7. FUEL PRESSURE LEAK DOWN

NOTE: Before continuing visually and physically inspect the fuel delivery system for external leaks or damage. Repair / replace as necessary.

Turn the ignition off.

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death

Install special tool #6539 (5/16″) or #6631 (3/8″) fuel line adapter.

Install the fuel pressure gauge.

Start the engine and allow the fuel system to reach maximum pressure.

Turn the ignition off.

NOTE: Fuel specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Using special tool #C4390, Hose Clamp Pliers, pinch the rubber fuel line between the fuel pressure gauge and the engine.

Monitor the fuel pressure gauge for a minimum of 5 minutes.

NOTE: The pressure should not fall below 241 KPa (35 psi)

Does the pressure fall below the listed specification?

Yes >> Replace the leaking Fuel Injector(s).
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8

---

8. FUEL INJECTOR OPERATION

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

CAUTION: After each Fuel Injector actuation, start the engine to clean the cylinder of fuel. Failure to do so could cause engine damage.

Remove special tool #C4390.

Start the engine and allow the fuel pressure to reach maximum pressure.

Ignition on, engine not running.

Using the scan tool, actuate the Fuel Injector for the cylinder that indicated the misfire.

Monitor the fuel pressure gauge.

Does the fuel pressure gauge indicate a drop in fuel pressure?

Yes >> Go To 9

No >> Go To 10

NOTE: Turn the ignition off, remove the Fuel Pressure gauge, and connect the fuel lines before continuing.

P0300-MULTIPLE CYLINDER MISFIRE (CONTINUED)

9. ENGINE MECHANICAL

Check for any of the following conditions/mechanical problems.
ENGINE VACUUM - must be at least 13 inches in neutral
ENGINE VALVE TIMING - must be within specifications
ENGINE COMPRESSION - must be within specifications
ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks.
ENGINE PCV SYSTEM - must flow freely
TORQUE CONVERTER STALL SPEED - must be within specifications
POWER BRAKE BOOSTER - no internal vacuum leaks
FUEL - must be free of contamination
CAM LOBES - must not be worn excessively
CYLINDER LEAKAGE TEST - must be within specifications
VALVE SPRINGS - cannot be weak or broken

Are there any engine mechanical problems?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 17

---

10. FUEL INJECTOR

Turn the ignition off.
Disconnect the Fuel Injector harness connector of the misfiring cylinder.
Ignition on, engine not running.

NOTE: When a Misfire is detected for a particular cylinder, the PCM will shut down that cylinders Injector Control circuit.
With the scan tool, erase DTCs.
Using a 12-volt test light connected to 12-volts, probe the Injector Control circuit.
With the scan tool, actuate the Fuel Injector.

Does the test light blink/flicker?

Yes >> Replace the Fuel Injector.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 11

---

11. INJECTOR CONTROL CIRCUIT

Turn the ignition off.
Disconnect the Fuel Injector harness connector.
Disconnect the PCM harness connectors.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.
Check the Injector Control circuit for an open, short to ground, and short to voltage.

Was a problem found with the Injector Control circuit?

Yes >> Repair the excessive resistance or short in the Injector Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 17

P0300-MULTIPLE CYLINDER MISFIRE (CONTINUED)

12. FUEL SUPPLY LINE RESTRICTED

Turn the ignition off.

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Raise vehicle on hoist, and disconnect the fuel pressure line at the fuel pump module.

Install special tool #6539 (5/16″) #6631(3/8″) fuel line adapter and the fuel pressure gauge between the fuel supply line and the fuel pump module.

Ignition on, engine not running.

With the scan tool, actuate the ASD Fuel System test and observe the fuel pressure gauge.

NOTE: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Is the fuel pressure within specification?

Yes >> Repair or replace fuel supply line as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 13

---

13. FUEL PUMP INLET STRAINER

Turn the ignition off.

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Remove the Fuel Pump Module and inspect the Fuel Inlet Strainer.

Is the Fuel Inlet Strainer plugged?

Yes >> Replace the Fuel Pump Inlet Strainer.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Before continuing, check the Fuel Pump Module harness connector terminals for corrosion, damage, or terminal push out. Make sure the ground circuit is functional. Repair as necessary. Replace the Fuel Pump Module.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

14. IGNITION WIRE

NOTE: If the vehicle being tested does not have an ignition wire answer YES to this test and continue.

Turn the ignition off.

Remove the ignition wire.

Measure the resistance of the ignition wire.

Is the resistance below 10K ohms?

Yes >> Go To 15

No >> Replace the Ignition Wire.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0300-MULTIPLE CYLINDER MISFIRE (CONTINUED)

15. IGNITION COIL

Disconnect the Ignition Coil harness connector.

Remove the Fuel Pump Relay or ASD Relay.

Using a 12-volt test light connected to 12-volts, probe the Ignition Coil Control circuit.

Crank the engine for 5 seconds while observing the test light.

NOTE: The primary resistance of the 3.7L and 4.7L Ignition coil is 0.6 to 0.9 of an ohm and the resistance of a 5.7L Ignition coil is 0.558 to 0.682 of an ohm at 77°F (25°C).

Does the test light brightly blink/flicker?

Yes >> Replace the Ignition Coil.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 16

---

16. COIL CONTROL CIRCUIT

Turn the ignition off.

Disconnect the Ignition Coil harness connector.

Disconnect the PCM harness connectors.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Check the Coil Control circuit for an open, short to ground, and short to voltage.

Was a problem found with the Coil Control circuit?

Yes >> Repair the Coil Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 17

---

17. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

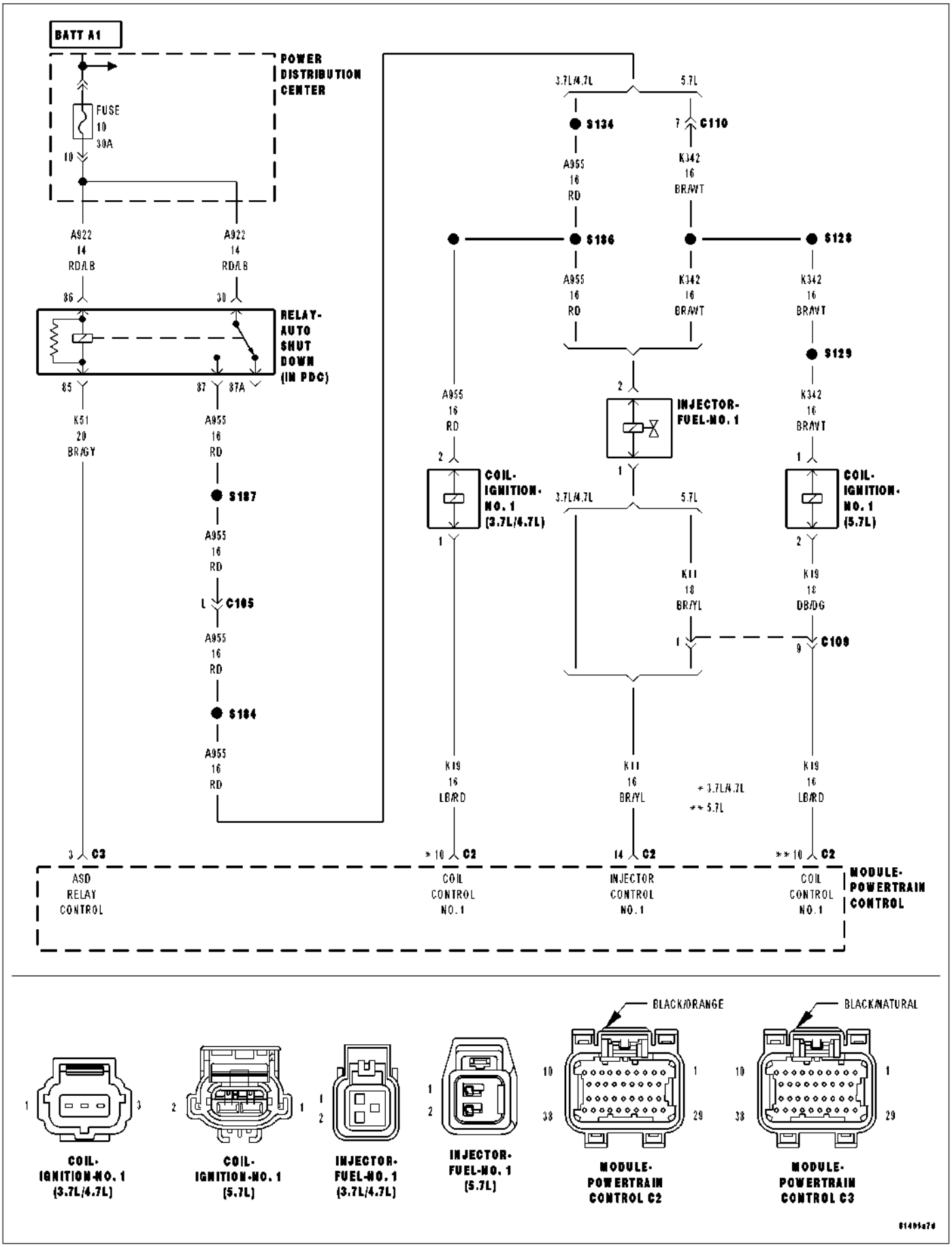
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0301-CYLINDER 1 MISFIRE



P0301-CYLINDER 1 MISFIRE (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Any time the engine is running, and the adaptive numerator has been successfully updated.
- **Set Condition:**
  When more than 2% (2.5% LEV) misfire rate is measured during two trips, or with 10% to 30% misfire rate during on trip. Three good trips to clear the MIL.

Possible Causes
(K342), (A955) ASD RELAY OUTPUT CIRCUIT
(K11) INJECTOR CONTROL NO.1 CIRCUIT
(K19) COIL CONTROL NO.1 CIRCUIT
IGNITION WIRE
SPARK PLUG
IGNITION COIL
FUEL PUMP INLET STRAINER PLUGGED
RESTRICTED FUEL SUPPLY LINE
FUEL PUMP MODULE
FUEL PRESSURE LEAK DOWN
FUEL INJECTOR
ENGINE MECHANICAL
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. CYLINDER MIS-FIRE CONDITION ACTIVE

Engine running.

Observe the WHICH CYLINDER IS MISFIRING screen for at least one minute on the scan tool.

Is there a misfire present at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0301-CYLINDER 1 MISFIRE (CONTINUED)

2. VISUAL INSPECTION

NOTE: Anything that affects the speed of the crankshaft can cause a misfire DTC.

NOTE: When a Misfire is detected for a particular cylinder, the PCM will shut down that cylinders Injector Control circuit.

- Visually inspect the engine for any of the following conditions.
- Worn serpentine belt
- Binding Engine-Driven accessories: A/C Compressor, P/S Pump, Water pump.
- Misalignment of the Water pump, P/S Pump and A/C Compressor pulleys
- Corroded PCM power and ground circuits.
- Improper CKP, CMP, MAP, and TP Sensor mounting
- Poor connector/terminal to component connection. i.e., CKP sensor, Fuel Injector, Ign coil, etc.
- Vacuum leaks
- Restricted Air Induction system or Exhaust system.
- Internal engine component failures.

Were any of the above conditions present?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

---

3. (K342), (A955) ASD RELAY OUTPUT CIRCUIT

NOTE: The circuit id (K342) is used on vehicles equipped with a 5.7L engine and the (A955) circuit id is used with the 3.7L and 4.7L engines.

Turn the ignition off.

Disconnect the Ignition Coil No.1 harness connector.

Disconnect the Fuel Injector No.1 harness connector.

Ignition on, engine not running.

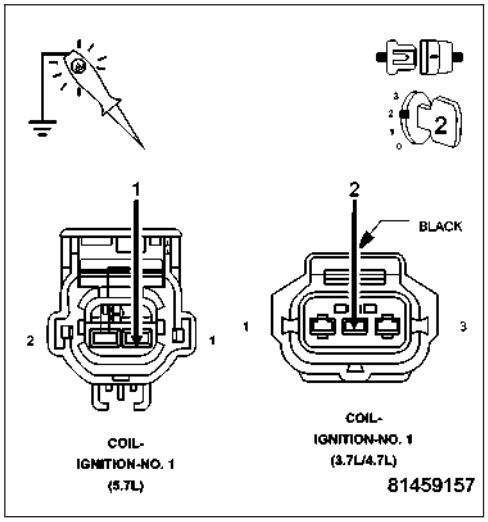
With the scan tool, actuate the ASD Relay.

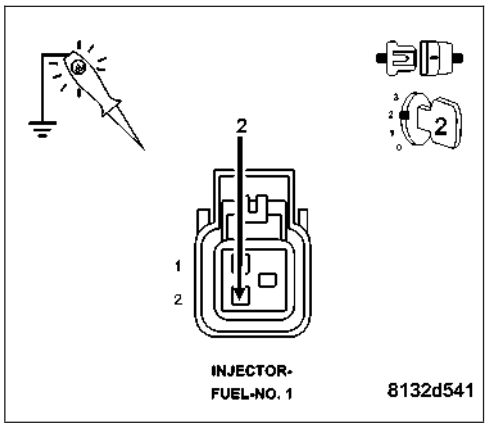
Using a 12-volt test light connected to ground, probe the (K342), (A955) ASD Relay Output circuit in the Ignition Coil harness connector and Fuel Injector harness connector while the relay is actuating.

Does the test light illuminate brightly?

Yes >> Go To 4

No >> Repair the excessive resistance or short to ground in the (K342), (A955) ASD Relay Output circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)





P0301-CYLINDER 1 MISFIRE (CONTINUED)

4. IGNITION SYSTEM OPERATION

Turn the ignition off.
Connect the Ignition Coil No.1 harness connector.
Remove the Ignition Coil.
Leave the Fuel Injector harness connector of the cylinder being tested disconnected.
Install a spark tester on the Ignition Coil.
While cranking the engine observe the spark coming from the spark tester.

NOTE: A crisp blue spark that is able to jump the gap of the spark tester should be generated.

Is good spark present?

Yes >> Go To 5

No >> Go To 14

NOTE: Connect the Fuel Injector harness connector before continuing.

---

5. SPARK PLUG

Turn the ignition off.
Remove the Spark Plug.
Inspect the Spark Plug for the following conditions.
- Cracks
- Carbon Tracking
- Foreign Material
- Gap size out of specifications
- Loose or broke electrode

NOTE: Lightly tap the bottom of the spark plug on a solid surface. The electrode in the spark plug should not move.

Were any of the above conditions present?

Yes >> Replace the Spark Plug.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6

---

6. FUEL PRESSURE CHECK

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.
Install a fuel pressure gauge to the fuel rail.
Start the engine and observe the fuel pressure reading.

NOTE: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Choose a conclusion that best matches your fuel pressure reading.

Within Specification
Go To 7

Below Specification
Go To 12

Above Specification
Replace the fuel filter/pressure regulator.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0301-CYLINDER 1 MISFIRE (CONTINUED)

7. FUEL PRESSURE LEAK DOWN

NOTE: Before continuing visually and physically inspect the fuel delivery system for external leaks or damage. Repair / replace as necessary.

Turn the ignition off.

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death

Install special tool #6539 (5/16″) or #6631 (3/8″) fuel line adapter.

Install the fuel pressure gauge.

Start the engine and allow the fuel system to reach maximum pressure.

Turn the ignition off.

NOTE: Fuel specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Using special tool #C4390, Hose Clamp Pliers, pinch the rubber fuel line between the fuel pressure gauge and the engine.

Monitor the fuel pressure gauge for a minimum of 5 minutes.

NOTE: The pressure should not fall below 241 KPa (35 psi).

Does the pressure fall below the listed specification?

Yes >> Replace the leaking Fuel Injector(s).
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8

---

8. FUEL INJECTOR OPERATION

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

CAUTION: After each Fuel Injector actuation, start the engine to clean the cylinder of fuel. Failure to do so could cause engine damage.

Remove special tool #C4390.

Start the engine and allow the fuel pressure to reach maximum pressure.

Ignition on, engine not running.

Using the scan tool, actuate the No.1 Fuel Injector.

Monitor the fuel pressure gauge.

Does the fuel pressure gauge indicate a drop in fuel pressure?

Yes >> Go To 9

No >> Go To 10

NOTE: Turn the ignition off, remove the Fuel Pressure gauge, and connect the fuel lines before continuing.

P0301-CYLINDER 1 MISFIRE (CONTINUED)

9. ENGINE MECHANICAL

Check for any of the following conditions/mechanical problems.
ENGINE VACUUM - must be at least 13 inches in neutral
ENGINE VALVE TIMING - must be within specifications
ENGINE COMPRESSION - must be within specifications
ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks.
ENGINE PCV SYSTEM - must flow freely
TORQUE CONVERTER STALL SPEED - must be within specifications
POWER BRAKE BOOSTER - no internal vacuum leaks
FUEL - must be free of contamination
CAM LOBES - must not be worn excessively
CYLINDER LEAKAGE TEST - must be within specifications
VALVE SPRINGS - cannot be weak or broken

Are there any engine mechanical problems?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

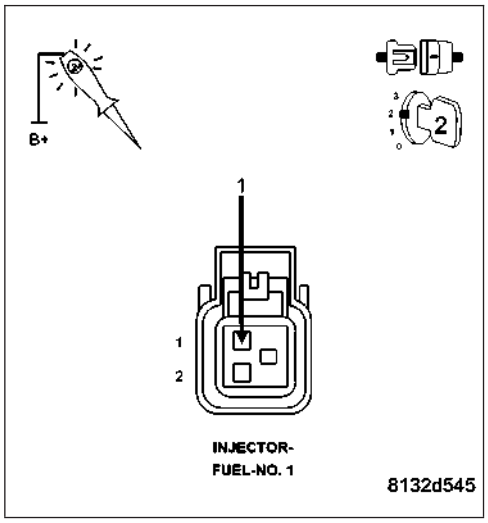
No >> Go To 17

---

10. FUEL INJECTOR

Turn the ignition off.
Disconnect the No.1 Fuel Injector harness connector.
Ignition on, engine not running.

NOTE: When a Misfire is detected for a particular cylinder, the PCM will shut down that cylinders Injector Control circuit.
With the scan tool, erase DTCs.
Using a 12-volt test light connected to 12-volts, probe the (K11) Injector Control No.1 circuit.
With the scan tool, actuate the Fuel Injector.



Does the test light blink/flicker?

Yes >> Replace the Fuel Injector.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 11

P0301-CYLINDER 1 MISFIRE (CONTINUED)

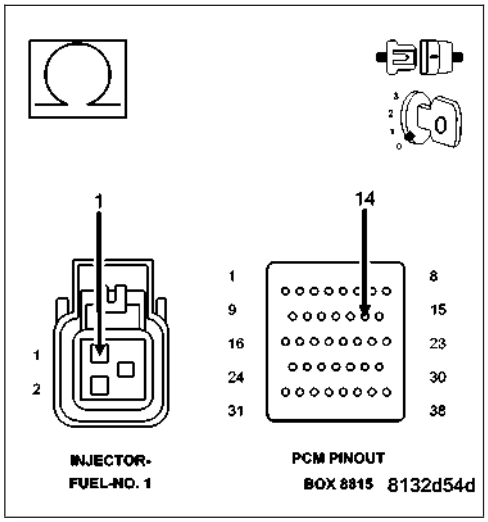
11. (K11) INJECTOR CONTROL NO.1 CIRCUIT

Turn the ignition off.

Disconnect the C2 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Check the (K11) Injector Control No.1 circuit for an open, short to ground, and short to voltage.



Was a problem found with the (K11) Injector Control No.1 circuit?

Yes >> Repair the excessive resistance or short in the (K11) Injector Control No.1 circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 17

---

12. FUEL SUPPLY LINE RESTRICTED

Turn the ignition off.

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Raise vehicle on hoist, and disconnect the fuel pressure line at the fuel pump module.

Install special tool #6539 (5/16″) #6631(3/8″) fuel line adapter and the fuel pressure gauge between the fuel supply line and the fuel pump module.

Ignition on, engine not running.

With the scan tool, actuate the ASD Fuel System test and observe the fuel pressure gauge.

NOTE: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Is the fuel pressure within specification?

Yes >> Repair or replace fuel supply line as necessary.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 13

P0301-CYLINDER 1 MISFIRE (CONTINUED)

13. FUEL PUMP INLET STRAINER

Turn the ignition off.

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Remove the Fuel Pump Module and inspect the Fuel Inlet Strainer.

Is the Fuel Inlet Strainer plugged?

Yes >> Replace the Fuel Pump Inlet Strainer.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Before continuing, check the Fuel Pump Module harness connector terminals for corrosion, damage, or terminal push out. Make sure the ground circuit is functional. Repair as necessary. Replace the Fuel Pump Module.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

14. IGNITION WIRE

NOTE: If the vehicle being tested does not have an ignition wire answer YES to this test and continue.

Turn the ignition off.

Remove the ignition wire.

Measure the resistance of the ignition wire.

Is the resistance below 10K ohms?

Yes >> Go To 15

No >> Replace the Ignition Wire.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

15. IGNITION COIL

Disconnect the Ignition Coil harness connector.

Remove the Fuel Pump Relay.

Using a 12-volt test light connected to 12-volts, probe the (K19) Coil Control No.1 circuit.

Crank the engine for 5 seconds while observing the test light.

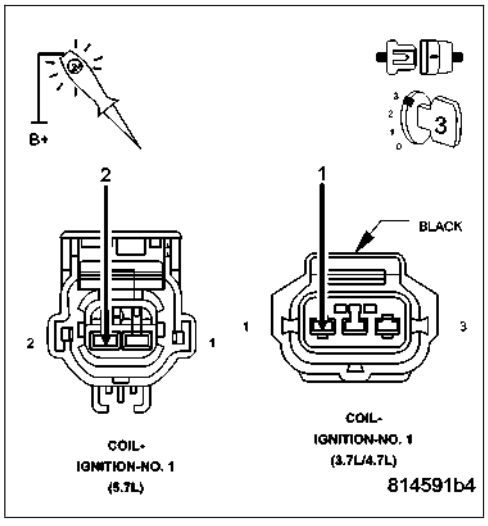
NOTE: The primary resistance of the 3.7L and 4.7L Ignition coil is 0.6 to 0.9 of an ohm at 77°F (25°C).

NOTE: 5.7L Primary Ignition Coil resistance is 0.558 to 0.682 of an ohm at 77°F (25°C).

Does the test light brightly blink/flicker?

Yes >> Replace the Ignition Coil.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 16



P0301-CYLINDER 1 MISFIRE (CONTINUED)

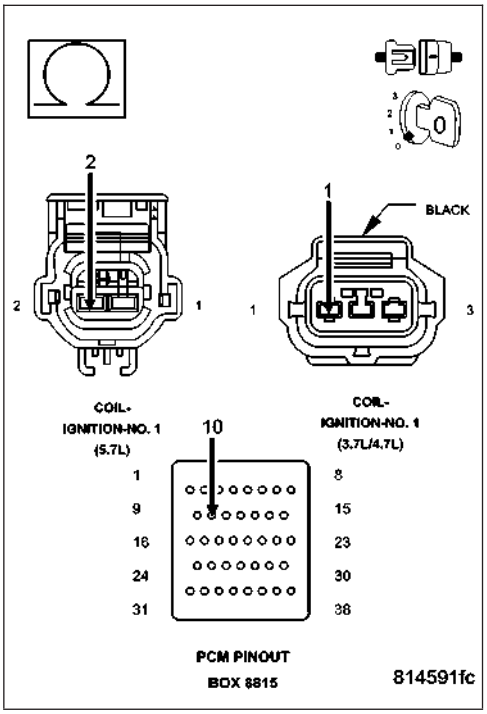
16. (K19) COIL CONTROL NO.1 CIRCUIT

Turn the ignition off.

Disconnect the C2 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Check the (K19) Coil Control No.1 circuit for an open, short to ground, and short to voltage.



Was a problem found with the (K19) Coil Control No.1 circuit?

Yes >> Repair the (K19) Coil Control No.1 circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 17

17. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

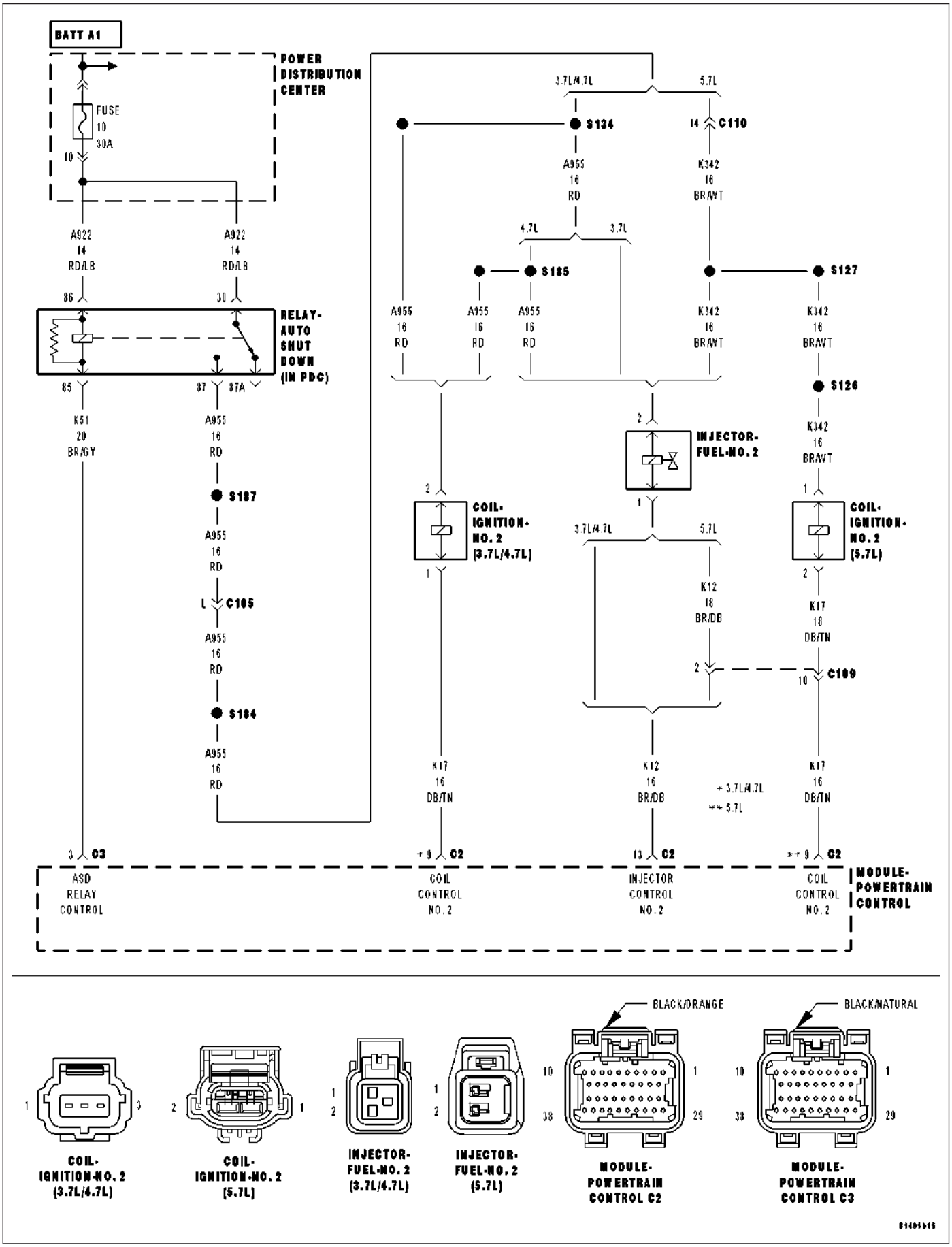
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0302-CYLINDER 2 MISFIRE



P0302-CYLINDER 2 MISFIRE (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Any time the engine is running, and the adaptive numerator has been successfully updated.
- **Set Condition:**
  When more than 2% (2.5% LEV) misfire rate is measured during two trips, or with 10 % to 30 % misfire rate during one trip. Three good trips to clear the MIL.

Possible Causes
(K342), (A955) ASD RELAY OUTPUT CIRCUIT
(K12) INJECTOR CONTROL NO.2 CIRCUIT
(K17) COIL CONTROL NO.2 CIRCUIT
IGNITION WIRE
SPARK PLUG
IGNITION COIL
FUEL PUMP INLET STRAINER PLUGGED
RESTRICTED FUEL SUPPLY LINE
FUEL PUMP MODULE
FUEL PRESSURE LEAK DOWN
FUEL INJECTOR
ENGINE MECHANICAL
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. CYLINDER MIS-FIRE CONDITION ACTIVE

Engine running.

Observe the WHICH CYLINDER IS MISFIRING screen for at least one minute with the scan tool.

Is there a misfire present?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0302-CYLINDER 2 MISFIRE (CONTINUED)

2. VISUAL INSPECTION

NOTE: Anything that affects the speed of the crankshaft can cause a misfire DTC.

NOTE: When a Misfire is detected for a particular cylinder, the PCM will shut down that cylinders Injector Control circuit.

- Visually inspect the engine for any of the following conditions.
- Worn serpentine belt
- Binding Engine-Driven accessories: A/C Compressor, P/S Pump, Water pump.
- Misalignment of the Water pump, P/S Pump and A/C Compressor pulleys
- Corroded PCM power and ground circuits.
- Improper CKP, CMP, MAP, and TP Sensor mounting
- Poor connector/terminal to component connection. i.e., CKP sensor, Fuel Injector, Ign coil, etc.
- Vacuum leaks
- Restricted Air Induction system or Exhaust system.
- Internal engine component failures.

Were any of the above conditions present?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

P0302-CYLINDER 2 MISFIRE (CONTINUED)

3. (K342), (A955) ASD RELAY OUTPUT CIRCUIT

NOTE: The circuit id (K342) is used on vehicles equipped with a 5.7L engine and the (A955) circuit id is used with the 3.7L and 4.7L engines.

Turn the ignition off.

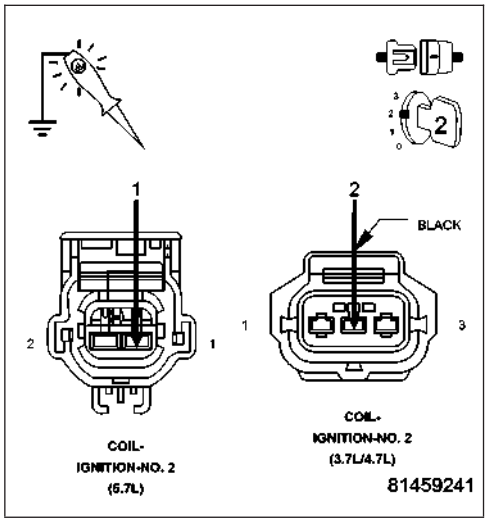
Disconnect the Ignition Coil No.2 harness connector.

Disconnect the Fuel Injector No.2 harness connector.

Ignition on, engine not running.

With the scan tool, actuate the ASD Relay.

Using a 12-volt test light connected to ground, probe the (K342), (A955) ASD Relay Output circuit in the Ignition Coil harness connector and Fuel Injector harness connector while the relay is actuating.

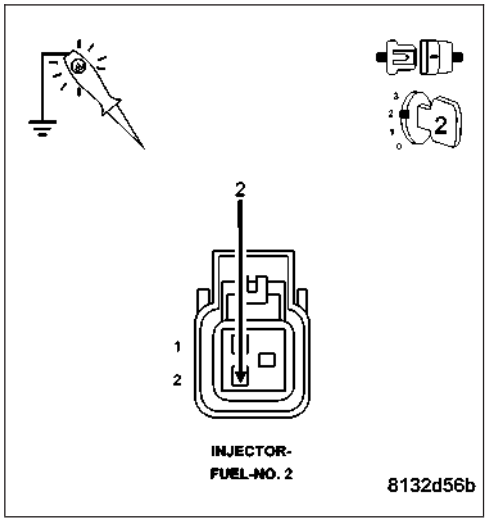


Does the test light illuminate brightly?

Yes >> Go To 4

No >> Repair the excessive resistance or short to ground in the (K342), (A955) ASD Relay Output circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



4. IGNITION SYSTEM OPERATION

Turn the ignition off.

Connect the Ignition Coil No.2 harness connector.

Remove the Ignition Coil.

Leave the Fuel Injector harness connector of the cylinder being tested disconnected.

Install a spark tester on the Ignition Coil.

While cranking the engine observe the spark coming from the spark tester.

NOTE: A crisp blue spark that is able to jump the gap of the spark tester should be generated.

Is good spark present?

Yes >> Go To 5

No >> Go To 14

NOTE: Connect the Fuel Injector harness connector before continuing.

P0302-CYLINDER 2 MISFIRE (CONTINUED)

5. SPARK PLUG

Turn the ignition off.

Remove the Spark Plug.

Inspect the Spark Plug for the following conditions.

- Cracks
- Carbon Tracking
- Foreign Material
- Gap size out of specifications
- Loose or broke electrode

NOTE: Lightly tap the bottom of the spark plug on a solid surface. The electrode in the spark plug should not move.

Were any of the above conditions present?

Yes >> Replace the Spark Plug.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6

---

6. FUEL PRESSURE CHECK

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Install a fuel pressure gauge to the fuel rail.

Start the engine and observe the fuel pressure reading.

NOTE: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Choose a conclusion that best matches your fuel pressure reading.

Within Specification
Go To 7

Below Specification
Go To 12

Above Specification
Replace the fuel filter/pressure regulator.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0302-CYLINDER 2 MISFIRE (CONTINUED)

7. FUEL PRESSURE LEAK DOWN

NOTE: Before continuing visually and physically inspect the fuel delivery system for external leaks or damage. Repair / replace as necessary.

Turn the ignition off.

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Install special tool #6539 (5/16″) or #6631 (3/8″) fuel line adapter.

Install the fuel pressure gauge.

Start the engine and allow the fuel system to reach maximum pressure.

Turn the ignition off.

NOTE: Fuel specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Using special tool #C4390, Hose Clamp Pliers, pinch the rubber fuel line between the fuel pressure gauge and the engine.

Monitor the fuel pressure gauge for a minimum of 5 minutes.

NOTE: The pressure should not fall below 241 KPa (35 psi)

Does the pressure fall below the listed specification?

Yes >> Replace the leaking Fuel Injector(s).
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8

---

8. FUEL INJECTOR OPERATION

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

CAUTION: After each Fuel Injector actuation, start the engine to clean the cylinder of fuel. Failure to do so could cause engine damage.

Remove special tool #C4390.

Start the engine and allow the fuel pressure to reach maximum pressure.

Ignition on, engine not running.

Using scan tool, actuate the No.2 Fuel Injector.

Monitor the fuel pressure gauge.

Does the fuel pressure gauge indicate a drop in fuel pressure?

Yes >> Go To 9

No >> Go To 10

NOTE: Turn the ignition off, remove the Fuel Pressure gauge, and connect the fuel lines before continuing.

P0302-CYLINDER 2 MISFIRE (CONTINUED)

9. ENGINE MECHANICAL

Check for any of the following conditions/mechanical problems.
ENGINE VACUUM - must be at least 13 inches in neutral
ENGINE VALVE TIMING - must be within specifications
ENGINE COMPRESSION - must be within specifications
ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks.
ENGINE PCV SYSTEM - must flow freely
TORQUE CONVERTER STALL SPEED - must be within specifications
POWER BRAKE BOOSTER - no internal vacuum leaks
FUEL - must be free of contamination
CAM LOBES - must not be worn excessively
CYLINDER LEAKAGE TEST - must be within specifications
VALVE SPRINGS - cannot be weak or broken

Are there any engine mechanical problems?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 17

---

10. FUEL INJECTOR

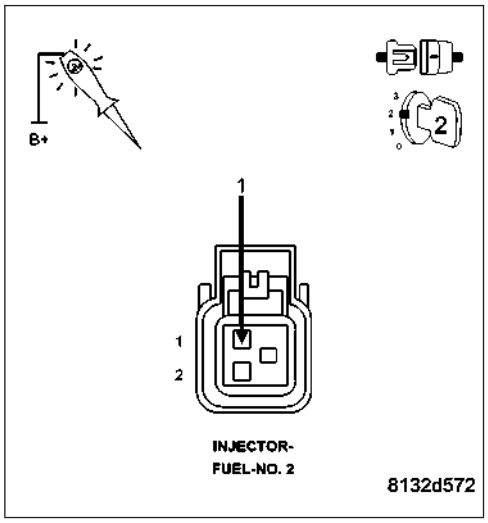
Turn the ignition off.
Disconnect the No.2 Fuel Injector harness connector.
Ignition on, engine not running.

NOTE: When a Misfire is detected for a particular cylinder, the PCM will shut down that cylinders Injector Control circuit.
With the scan tool, erase DTCs.
Using a 12-volt test light connected to 12-volts, probe the (K12) Injector Control No.2 circuit.
With the scan tool, actuate the Fuel Injector.

Does the test light blink/flicker?

Yes >> Replace the Fuel Injector.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 11



P0302-CYLINDER 2 MISFIRE (CONTINUED)

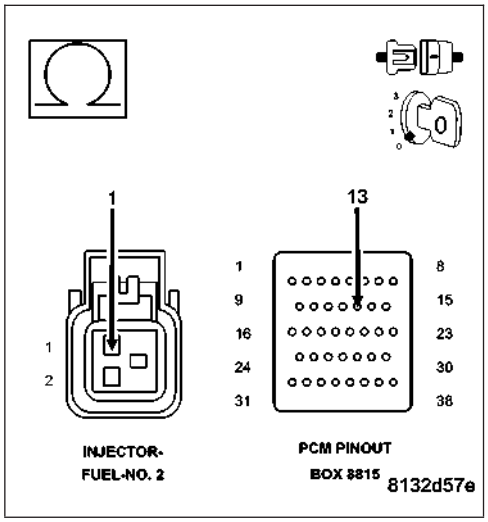
11. (K12) INJECTOR CONTROL NO.2 CIRCUIT

Turn the ignition off.

Disconnect the C2 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Check the (K12) Injector Control No.2 circuit for an open, short to ground, and short to voltage.



Was a problem found with the (K12) Injector Control No.2 circuit?

Yes >> Repair the excessive resistance or short in the (K12) Injector Control No.2 circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 17

---

12. FUEL SUPPLY LINE RESTRICTED

Turn the ignition off.

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Raise vehicle on hoist, and disconnect the fuel pressure line at the fuel pump module.

Install special tool #6539 (5/16″) #6631(3/8″) fuel line adapter and the fuel pressure gauge between the fuel supply line and the fuel pump module.

Ignition on, engine not running.

With the scan tool, actuate the ASD Fuel System test and observe the fuel pressure gauge.

NOTE: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Is the fuel pressure within specification?

Yes >> Repair or replace fuel supply line as necessary.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 13

P0302-CYLINDER 2 MISFIRE (CONTINUED)

13. FUEL PUMP INLET STRAINER

Turn the ignition off.

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Remove the Fuel Pump Module and inspect the Fuel Inlet Strainer.

Is the Fuel Inlet Strainer plugged?

Yes >> Replace the Fuel Pump Inlet Strainer.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Before continuing, check the Fuel Pump Module harness connector terminals for corrosion, damage, or terminal push out. Ensure the ground circuit is functional. Repair as necessary. Replace the Fuel Pump Module.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

14. IGNITION WIRE

NOTE: If the vehicle being tested does not have an ignition wire answer YES to this test and continue.

Turn the ignition off.

Remove the ignition wire.

Measure the resistance of the ignition wire.

Is the resistance below 10K ohms?

Yes >> Go To 15

No >> Replace the Ignition Wire.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

15. IGNITION COIL

Disconnect the Ignition Coil harness connector.

Remove the Fuel Pump Relay.

Using a 12-volt test light connected to 12-volts, probe the (K17) Coil Control No.2 circuit.

Crank the engine for 5 seconds while observing the test light.

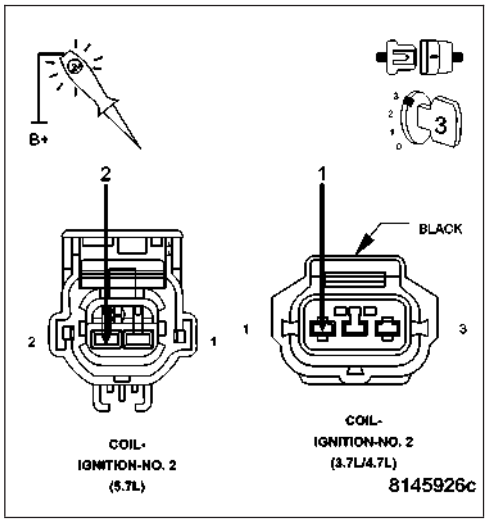
NOTE: The primary resistance of the 3.7L and 4.7L Ignition coil is 0.6 to 0.9 of an ohm at 77°F (25°C).

NOTE: 5.7L Primary Ignition Coil resistance is 0.558 to 0.682 of an ohm at 77°F (25°C).

Does the test light brightly blink/flicker?

Yes >> Replace the Ignition Coil.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 16



P0302-CYLINDER 2 MISFIRE (CONTINUED)

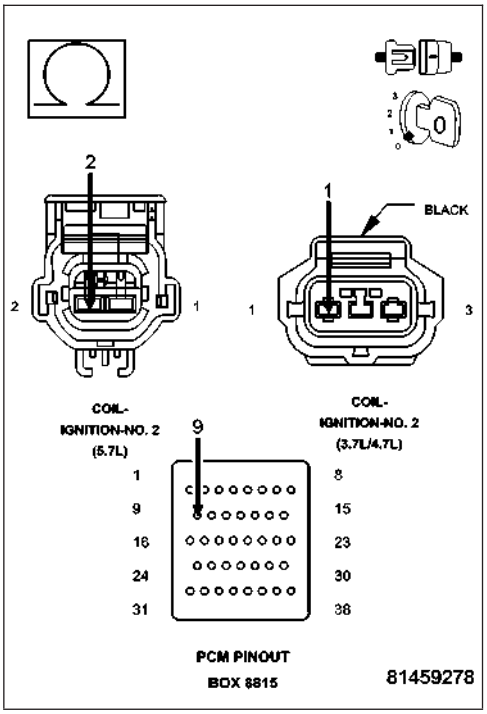
16. (K17) COIL CONTROL NO.2 CIRCUIT

Turn the ignition off.

Disconnect the C2 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Check the (K17) Coil Control No.2 circuit for an open, short to ground, and short to voltage.



Was a problem found with the (K17) Coil Control No.2 circuit?

Yes >> Repair the (K17) Coil Control No.2 circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 17

17. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

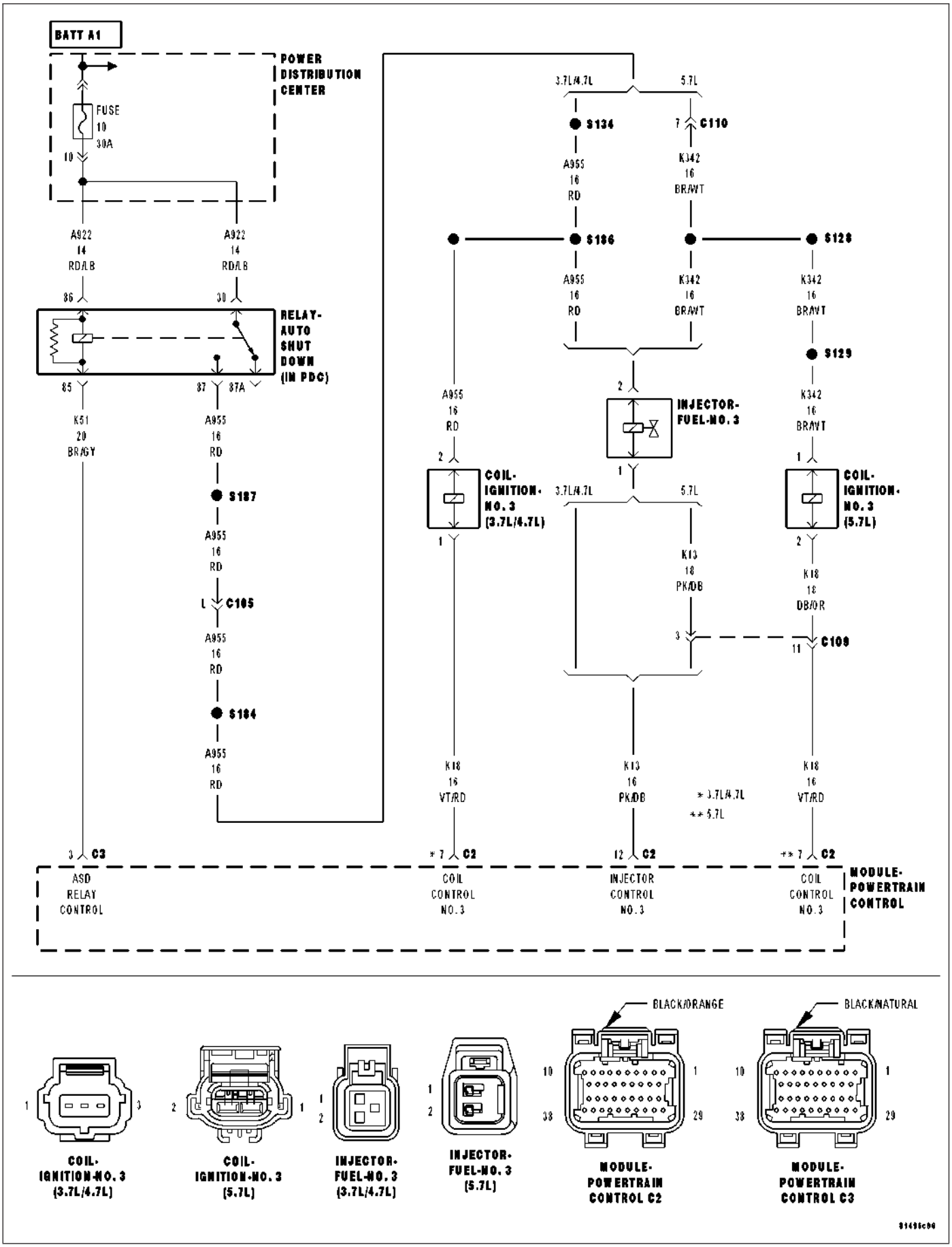
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0303-CYLINDER 3 MISFIRE



P0303-CYLINDER 3 MISFIRE (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Any time the engine is running, and the adaptive numerator has been successfully updated.
- **Set Condition:**
  When more than 2% (2.5% LEV) misfire rate is measured during two trips, or with 10% to 30% misfire rate during on trip. Three good trips to clear the MIL.

Possible Causes
(K342), (A955) ASD RELAY OUTPUT CIRCUIT
(K13) INJECTOR CONTROL NO.3 CIRCUIT
(K18) COIL CONTROL NO.3 CIRCUIT
IGNITION WIRE
SPARK PLUG
IGNITION COIL
FUEL PUMP INLET STRAINER PLUGGED
RESTRICTED FUEL SUPPLY LINE
FUEL PUMP MODULE
FUEL PRESSURE LEAK DOWN
FUEL INJECTOR
ENGINE MECHANICAL
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. CYLINDER MIS-FIRE CONDITION ACTIVE

Engine running.

Observe the WHICH CYLINDER IS MISFIRING screen for at least one minute with the scan tool.

Is there a misfire present at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0303-CYLINDER 3 MISFIRE (CONTINUED)

2. VISUAL INSPECTION

NOTE: Anything that affects the speed of the crankshaft can cause a misfire DTC.

NOTE: When a Misfire is detected for a particular cylinder, the PCM will shut down that cylinders Injector Control circuit.

- Visually inspect the engine for any of the following conditions.
- Worn serpentine belt
- Binding Engine-Driven accessories: A/C Compressor, P/S Pump, Water pump.
- Misalignment of the Water pump, P/S Pump and A/C Compressor pulleys.
- Corroded PCM power and ground circuits.
- Improper CKP, CMP, MAP, and TP Sensor mounting
- Poor connector/terminal to component connection. i.e., CKP sensor, Fuel Injector, Ign coil, etc.
- Vacuum leaks
- Restricted Air Induction system or Exhaust system.
- Internal engine component failures.

Were any of the above conditions present?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

P0303-CYLINDER 3 MISFIRE (CONTINUED)

3. (K342), (A955) ASD RELAY OUTPUT CIRCUIT

NOTE: The circuit id (K342) is used on vehicles equipped with a 5.7L engine and the (A955) circuit id is used with the 3.7L and 4.7L engines.

Turn the ignition off.

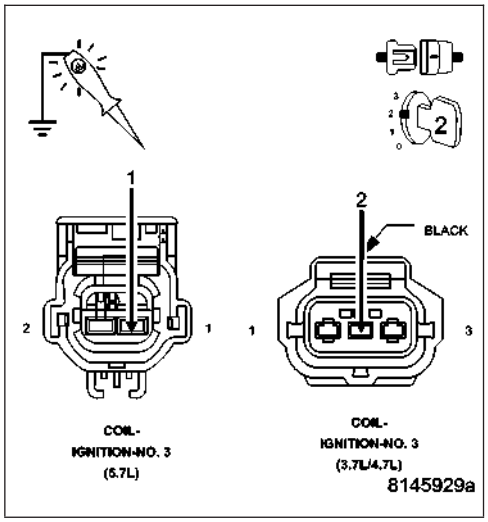
Disconnect the No.3 Ignition Coil harness connector.

Disconnect the No.3 Fuel Injector harness connector.

Ignition on, engine not running.

With a scan tool, actuate the ASD Relay.

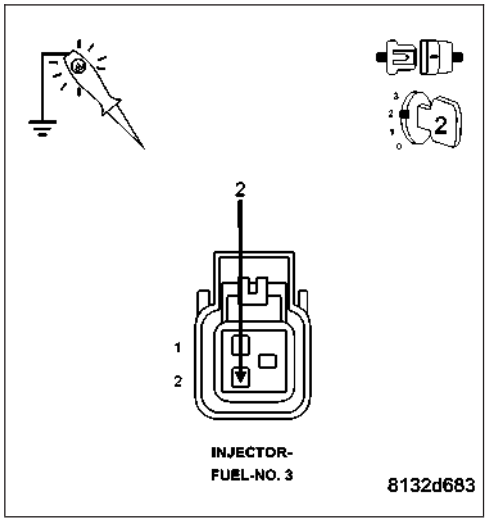
Using a 12-volt test light connected to ground, probe the (K342), (A955) ASD Relay Output circuit in the Ignition Coil harness connector and Fuel Injector harness connector while the relay is actuating.



Does the test light illuminate brightly?

Yes >> Go To 4

No >> Repair the excessive resistance or short to ground in the (K342), (A955) ASD Relay Output circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



4. IGNITION SYSTEM OPERATION

Turn the ignition off.

Connect the Ignition Coil No.3 harness connector.

Remove the Ignition Coil.

Leave the Fuel Injector harness connector of the cylinder being tested disconnected.

Install a spark tester on the Ignition Coil.

While cranking the engine observe the spark coming from the spark tester.

NOTE: A crisp blue spark that is able to jump the gap of the spark tester should be generated.

Is good spark present?

Yes >> Go To 5

No >> Go To 14

NOTE: Connect the Fuel Injector harness connector before continuing.

P0303-CYLINDER 3 MISFIRE (CONTINUED)

5. SPARK PLUG

Turn the ignition off.

Remove the Spark Plug.

Inspect the Spark Plug for the following conditions.

- Cracks
- Carbon Tracking
- Foreign Material
- Gap size out of specifications
- Loose or broke electrode

NOTE: Lightly tap the bottom of the spark plug on a solid surface. The electrode in the spark plug should not move.

Were any of the above conditions present?

Yes >> Replace the Spark Plug.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6

---

6. FUEL PRESSURE CHECK

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Install a fuel pressure gauge to the fuel rail.

Start the engine and observe the fuel pressure reading.

NOTE: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Choose a conclusion that best matches your fuel pressure reading.

Within Specification
Go To 7

Below Specification
Go To 12

Above Specification
Replace the fuel filter/pressure regulator.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0303-CYLINDER 3 MISFIRE (CONTINUED)

7. FUEL PRESSURE LEAK DOWN

NOTE: Before continuing visually and physically inspect the fuel delivery system for external leaks or damage. Repair / replace as necessary.

Turn the ignition off.

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death

Install special tool #6539 (5/16″) or #6631 (3/8″) fuel line adapter.

Install the fuel pressure gauge.

Start the engine and allow the fuel system to reach maximum pressure.

Turn the ignition off.

NOTE: Fuel specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Using special tool #C4390, Hose Clamp Pliers, pinch the rubber fuel line between the fuel pressure gauge and the engine.

Monitor the fuel pressure gauge for a minimum of 5 minutes.

NOTE: The pressure should not fall below 241 KPa (35 psi).

Does the pressure fall below the listed specification?

Yes >> Replace the leaking Fuel Injector(s).
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8

---

8. FUEL INJECTOR OPERATION

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

CAUTION: After each Fuel Injector actuation, start the engine to clean the cylinder of fuel. Failure to do so could cause engine damage.

Remove special tool #C4390.

Start the engine and allow the fuel pressure to reach maximum pressure.

Ignition on, engine not running.

Using a scan tool, actuate the No.3 Fuel Injector.

Monitor the fuel pressure gauge.

Does the fuel pressure gauge indicate a drop in fuel pressure?

Yes >> Go To 9

No >> Go To 10

NOTE: Turn the ignition off, remove the Fuel Pressure gauge, and connect the fuel lines before continuing.

P0303-CYLINDER 3 MISFIRE (CONTINUED)

9. ENGINE MECHANICAL

Check for any of the following conditions/mechanical problems.
ENGINE VACUUM - must be at least 13 inches in neutral
ENGINE VALVE TIMING - must be within specifications
ENGINE COMPRESSION - must be within specifications
ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks.
ENGINE PCV SYSTEM - must flow freely
TORQUE CONVERTER STALL SPEED - must be within specifications
POWER BRAKE BOOSTER - no internal vacuum leaks
FUEL - must be free of contamination
CAM LOBES - must not be worn excessively
CYLINDER LEAKAGE TEST - must be within specifications
VALVE SPRINGS - cannot be weak or broken

Are there any engine mechanical problems?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

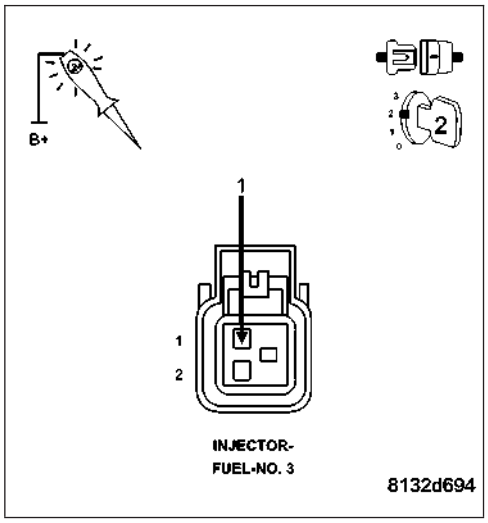
No >> Go To 17

---

10. FUEL INJECTOR

Turn the ignition off.
Disconnect the No.3 Fuel Injector harness connector.
Ignition on, engine not running.

NOTE: When a Misfire is detected for a particular cylinder, the PCM will shut down that cylinders Injector Control circuit.
With the scan tool, erase DTCs.
Using a 12-volt test light connected to 12-volts, probe the (K13) Injector Control No.3 circuit.
With the scan tool, actuate the Fuel Injector.



Does the test light blink/flicker?

Yes >> Replace the Fuel Injector.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 11

P0303-CYLINDER 3 MISFIRE (CONTINUED)

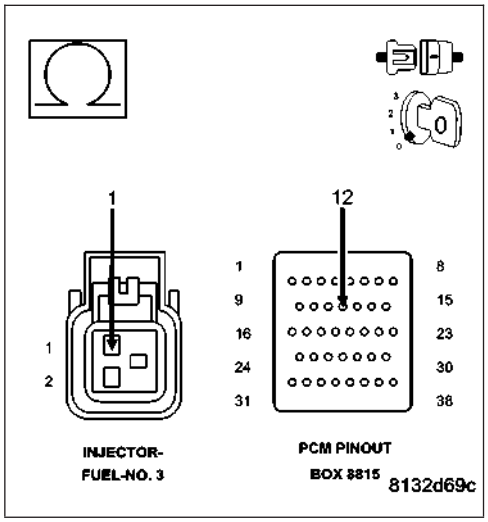
11. (K13) INJECTOR CONTROL NO.3 CIRCUIT

Turn the ignition off.

Disconnect the C2 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Check the (K13) Injector Control No.3 circuit for an open, short to ground, and short to voltage.



Was a problem found with the (K13) Injector Control No.3 circuit?

Yes >> Repair the excessive resistance or short in the (K13) Injector Control No.3 circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 17

---

12. FUEL SUPPLY LINE RESTRICTED

Turn the ignition off.

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Raise vehicle on hoist, and disconnect the fuel pressure line at the fuel pump module.

Install special tool #6539 (5/16″) #6631(3/8″) fuel line adapter and the fuel pressure gauge between the fuel supply line and the fuel pump module.

Ignition on, engine not running.

With a scan tool, actuate the ASD Fuel System test and observe the fuel pressure gauge.

NOTE: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Is the fuel pressure within specification?

Yes >> Repair or replace fuel supply line as necessary.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 13

P0303-CYLINDER 3 MISFIRE (CONTINUED)

13. FUEL PUMP INLET STRAINER

Turn the ignition off.

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Remove the Fuel Pump Module and inspect the Fuel Inlet Strainer.

Is the Fuel Inlet Strainer plugged?

Yes >> Replace the Fuel Pump Inlet Strainer.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Before continuing, check the Fuel Pump Module harness connector terminals for corrosion, damage, or terminal push out. Make sure the ground circuit is functional. Repair as necessary. Replace the Fuel Pump Module.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

14. IGNITION WIRE

NOTE: If the vehicle being tested does not have an ignition wire answer YES to this test and continue.

Turn the ignition off.

Remove the ignition wire.

Measure the resistance of the ignition wire.

Is the resistance below 10K ohms?

Yes >> Go To 15

No >> Replace the Ignition Wire.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

15. IGNITION COIL

Disconnect the No.3 Ignition Coil harness connector.

Remove the Fuel Pump Relay.

Using a 12-volt test light connected to 12-volts, probe the (K18) Coil Control No.3 circuit.

Crank the engine for 5 seconds while observing the test light.

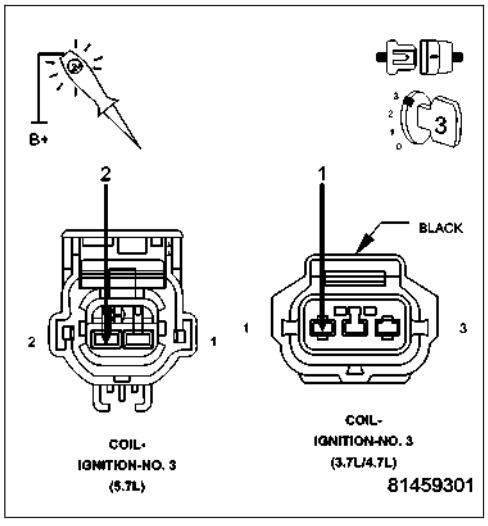
NOTE: The primary resistance of the 3.7L and 4.7L Ignition coil is 0.6 to 0.9 of an ohm at 77°F (25°C).

NOTE: 5.7L Primary Ignition Coil resistance is 0.558 to 0.682 of an ohm at 77°F (25°C).

Does the test light brightly blink/flicker?

Yes >> Replace the Ignition Coil.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 16



P0303-CYLINDER 3 MISFIRE (CONTINUED)

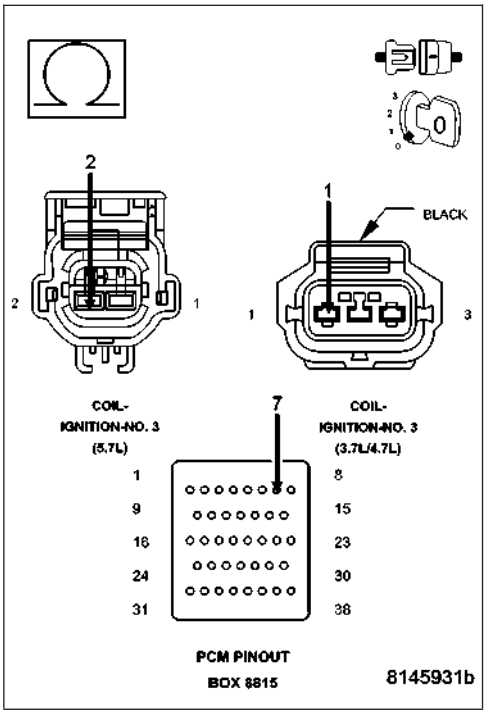
16. (K18) COIL CONTROL NO.3 CIRCUIT

Turn the ignition off.

Disconnect the C2 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Check the (K18) Coil Control No.3 circuit for an open, short to ground, and short to voltage.



Was a problem found with the (K18) Coil Control No.3 circuit?

Yes >> Repair the (K18) Coil Control No.3 circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 17

17. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

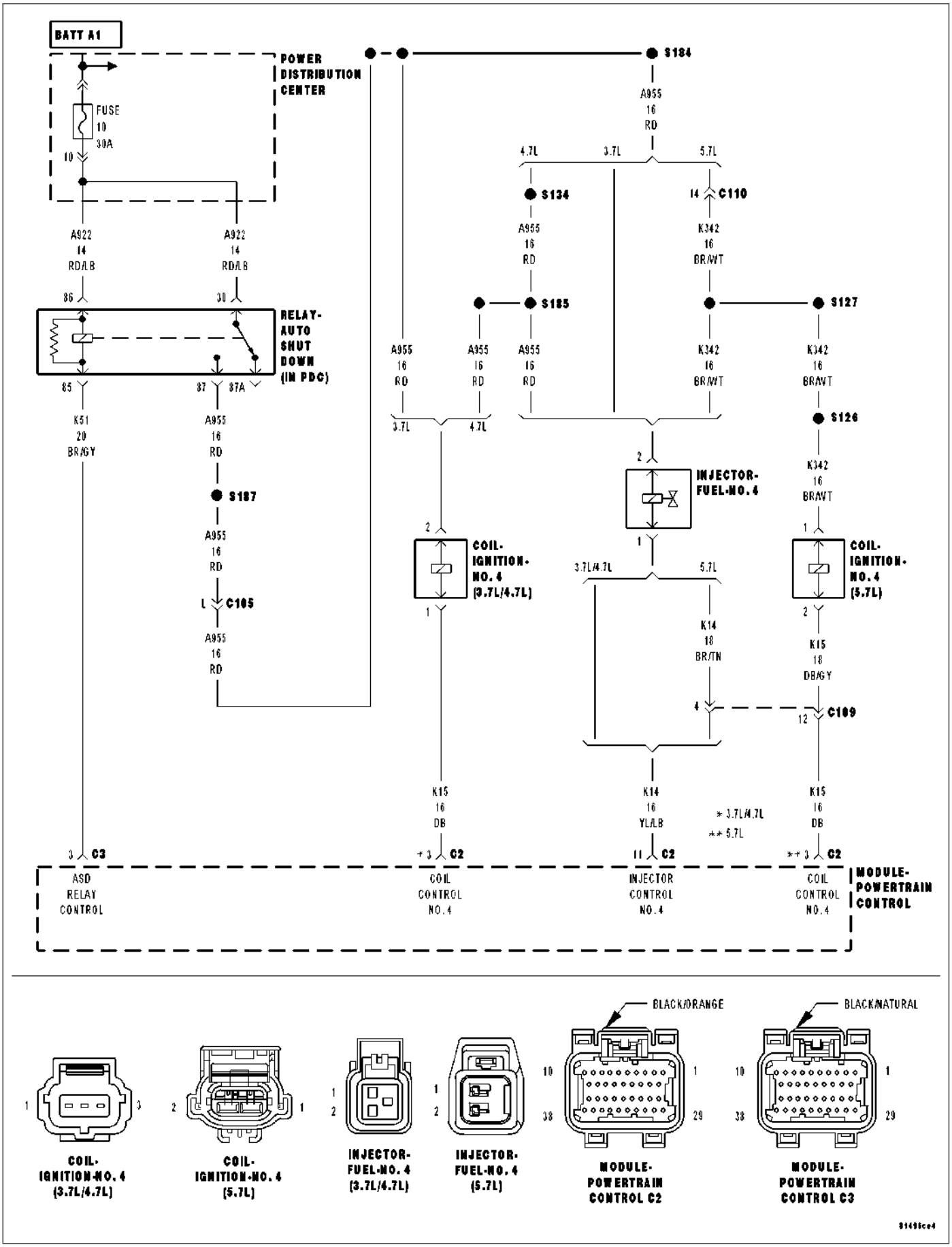
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0304-CYLINDER 4 MISFIRE



P0304-CYLINDER 4 MISFIRE (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Any time the engine is running, and the adaptive numerator has been successfully updated.
- **Set Condition:**
  When more than 2% (2.5% LEV) misfire rate is measured during two trips, or with 10% to 30% misfire rate during on trip. Three good trips to clear the MIL.

Possible Causes
(K342), (A955) ASD RELAY OUTPUT CIRCUIT
(K14) INJECTOR CONTROL NO.4 CIRCUIT
(K15) COIL CONTROL NO.4 CIRCUIT
IGNITION WIRE
SPARK PLUG
IGNITION COIL
FUEL PUMP INLET STRAINER PLUGGED
RESTRICTED FUEL SUPPLY LINE
FUEL PUMP MODULE
FUEL PRESSURE LEAK DOWN
FUEL INJECTOR
ENGINE MECHANICAL
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. CYLINDER MIS-FIRE CONDITION ACTIVE

Engine running.

Observe the WHICH CYLINDER IS MISFIRING screen for at least one minute with the scan tool.

Is there a misfire present at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0304-CYLINDER 4 MISFIRE (CONTINUED)

2. VISUAL INSPECTION

NOTE: Anything that affects the speed of the crankshaft can cause a misfire DTC.

NOTE: When a Misfire is detected for a particular cylinder, the PCM will shut down that cylinders Injector Control circuit.

- Visually inspect the engine for any of the following conditions.
- Worn serpentine belt
- Binding Engine-Driven accessories: A/C Compressor, P/S Pump, Water pump.
- Misalignment of the Water pump, P/S Pump and A/C Compressor pulleys.
- Corroded PCM power and ground circuits.
- Improper CKP, CMP, MAP, and TP Sensor mounting
- Poor connector/terminal to component connection. i.e., CKP sensor, Fuel Injector, Ign coil, etc.
- Vacuum leaks
- Restricted Air Induction system or Exhaust system.
- Internal engine component failures.

Were any of the above conditions present?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

P0304-CYLINDER 4 MISFIRE (CONTINUED)

3. (K342), (A955) ASD RELAY OUTPUT CIRCUIT

NOTE: The circuit id (K342) is used on vehicles equipped with a 5.7L engine and the (A955) circuit id is used with the 3.7L and 4.7L engines.

Turn the ignition off.

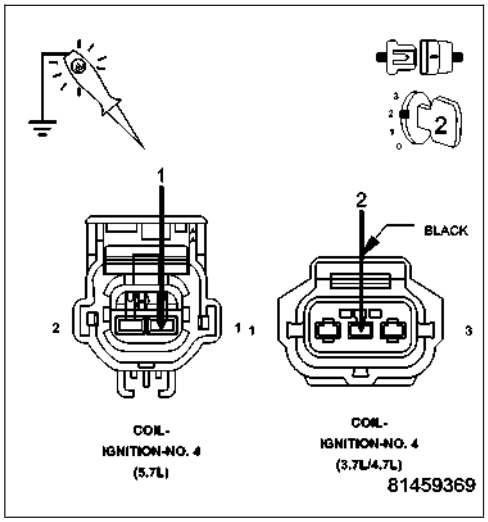
Disconnect the No.4 Ignition Coil harness connector.

Disconnect the No.4 Fuel Injector harness connector.

Ignition on, engine not running.

With the scan tool, actuate the ASD Relay.

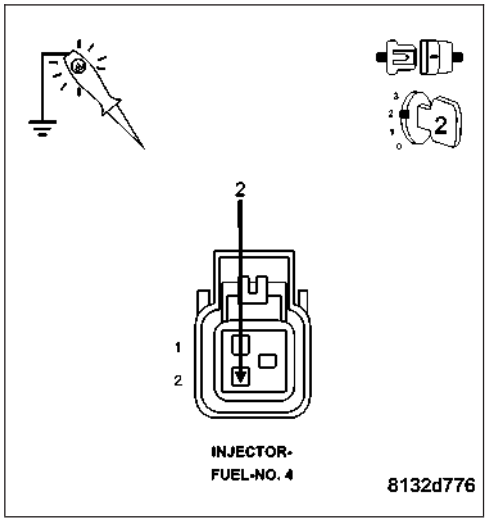
Using a 12-volt test light connected to ground, probe the (K342), (A955) ASD Relay Output circuit in the Ignition Coil harness connector and Fuel Injector harness connector while the relay is actuating.



Does the test light illuminate brightly?

Yes >> Go To 4

No >> Repair the excessive resistance or short to ground in the (K342), (A955) ASD Relay Output circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



4. IGNITION SYSTEM OPERATION

Turn the ignition off.

Connect the No.4 Ignition Coil harness connector.

Remove the No.4 Ignition Coil.

Leave the Fuel Injector harness connector of the cylinder being tested disconnected.

Install a spark tester on the Ignition Coil.

While cranking the engine observe the spark coming from the spark tester.

NOTE: A crisp blue spark that is able to jump the gap of the spark tester should be generated.

Is good spark present?

Yes >> Go To 5

No >> Go To 14

NOTE: Connect the Fuel Injector harness connector before continuing.

P0304-CYLINDER 4 MISFIRE (CONTINUED)

5. SPARK PLUG

Turn the ignition off.

Remove the Spark Plug.

Inspect the Spark Plug for the following conditions.

- Cracks
- Carbon Tracking
- Foreign Material
- Gap size out of specifications
- Loose or broke electrode

NOTE: Lightly tap the bottom of the spark plug on a solid surface. The electrode in the spark plug should not move.

Were any of the above conditions present?

Yes >> Replace the Spark Plug.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6

---

6. FUEL PRESSURE CHECK

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Install a fuel pressure gauge to the fuel rail.

Start the engine and observe the fuel pressure reading.

NOTE: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Choose a conclusion that best matches your fuel pressure reading.

Within Specification
Go To 7

Below Specification
Go To 12

Above Specification
Replace the fuel filter/pressure regulator.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0304-CYLINDER 4 MISFIRE (CONTINUED)

7. FUEL PRESSURE LEAK DOWN

NOTE: Before continuing visually and physically inspect the fuel delivery system for external leaks or damage. Repair / replace as necessary.

Turn the ignition off.

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death

Install special tool #6539 (5/16″) or #6631 (3/8″) fuel line adapter.

Install the fuel pressure gauge.

Start the engine and allow the fuel system to reach maximum pressure.

Turn the ignition off.

NOTE: Fuel specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Using special tool #C4390, Hose Clamp Pliers, pinch the rubber fuel line between the fuel pressure gauge and the engine.

Monitor the fuel pressure gauge for a minimum of 5 minutes.

NOTE: The pressure should not fall below 241 KPa (35 psi)

Does the pressure fall below the listed specification?

Yes >> Replace the leaking Fuel Injector(s).
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8

---

8. FUEL INJECTOR OPERATION

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

CAUTION: After each Fuel Injector actuation, start the engine to clean the cylinder of fuel. Failure to do so could cause engine damage.

Remove special tool #C4390.

Start the engine and allow the fuel pressure to reach maximum pressure.

Ignition on, engine not running.

Using the scan tool, actuate the No.4 Fuel Injector.

Monitor the fuel pressure gauge.

Does the fuel pressure gauge indicate a drop in fuel pressure?

Yes >> Go To 9

No >> Go To 10

NOTE: Turn the ignition off, remove the Fuel Pressure gauge, and connect the fuel lines before continuing.

P0304-CYLINDER 4 MISFIRE (CONTINUED)

9. ENGINE MECHANICAL

Check for any of the following conditions/mechanical problems.
ENGINE VACUUM - must be at least 13 inches in neutral
ENGINE VALVE TIMING - must be within specifications
ENGINE COMPRESSION - must be within specifications
ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks.
ENGINE PCV SYSTEM - must flow freely
TORQUE CONVERTER STALL SPEED - must be within specifications
POWER BRAKE BOOSTER - no internal vacuum leaks
FUEL - must be free of contamination
CAM LOBES - must not be worn excessively
CYLINDER LEAKAGE TEST - must be within specifications
VALVE SPRINGS - cannot be weak or broken

Are there any engine mechanical problems?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

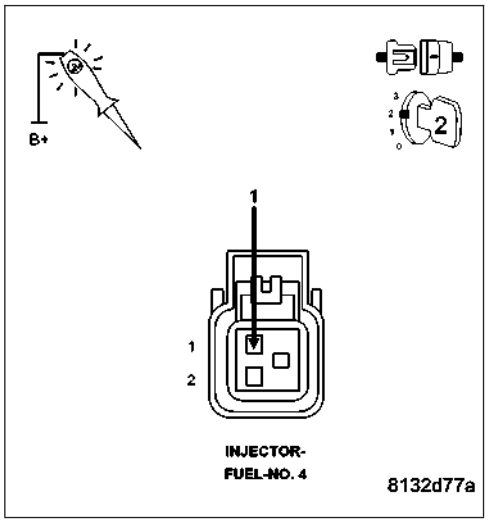
No >> Go To 17

---

10. FUEL INJECTOR

Turn the ignition off.
Disconnect the No.4 Fuel Injector harness connector.
Ignition on, engine not running.

NOTE: When a Misfire is detected for a particular cylinder, the PCM will shut down that cylinders Injector Control circuit.
With the scan tool, erase DTCs.
Using a 12-volt test light connected to 12-volts, probe the (K14) Injector Control No.4 circuit.
With the scan tool, actuate the Fuel Injector.



Does the test light blink/flicker?

Yes >> Replace the Fuel Injector.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 11

P0304-CYLINDER 4 MISFIRE (CONTINUED)

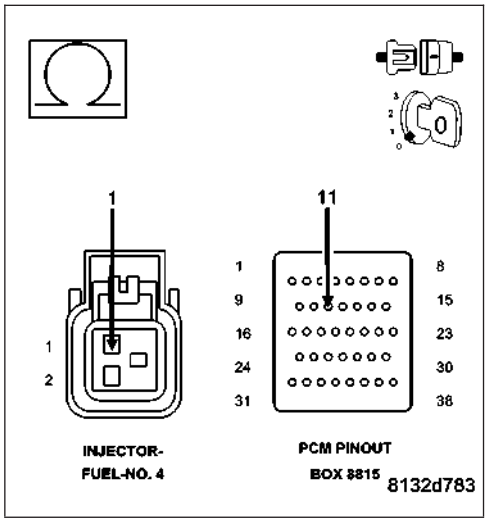
11. (K14) INJECTOR CONTROL NO.4 CIRCUIT

Turn the ignition off.

Disconnect the C2 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Check the (K14) Injector Control No.4 circuit for an open, short to ground, and short to voltage.



Was a problem found with the (K14) Injector Control No.4 circuit?

Yes >> Repair the excessive resistance or short in the (K14) Injector Control No.4 circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 17

12. FUEL SUPPLY LINE RESTRICTED

Turn the ignition off.

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Raise vehicle on hoist, and disconnect the fuel pressure line at the fuel pump module.

Install special tool #6539 (5/16″) #6631(3/8″) fuel line adapter and the fuel pressure gauge between the fuel supply line and the fuel pump module.

Ignition on, engine not running.

With the scan tool, actuate the ASD Fuel System test and observe the fuel pressure gauge.

NOTE: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Is the fuel pressure within specification?

Yes >> Repair or replace fuel supply line as necessary.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 13

P0304-CYLINDER 4 MISFIRE (CONTINUED)

13. FUEL PUMP INLET STRAINER

Turn the ignition off.

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Remove the Fuel Pump Module and inspect the Fuel Inlet Strainer.

Is the Fuel Inlet Strainer plugged?

Yes >> Replace the Fuel Pump Inlet Strainer.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Before continuing, check the Fuel Pump Module harness connector terminals for corrosion, damage, or terminal push out. Make sure the ground circuit is functional. Repair as necessary. Replace the Fuel Pump Module.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

14. IGNITION WIRE

NOTE: If the vehicle being tested does not have an ignition wire answer YES to this test and continue.

Turn the ignition off.

Remove the ignition wire.

Measure the resistance of the ignition wire.

Is the resistance below 10K ohms?

Yes >> Go To 15

No >> Replace the Ignition Wire.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

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15. IGNITION COIL

Disconnect the No.4 Ignition Coil harness connector.

Remove the Fuel Pump Relay.

Using a 12-volt test light connected to 12-volts, probe the (K15) Coil Control No.4 circuit.

Crank the engine for 5 seconds while observing the test light.

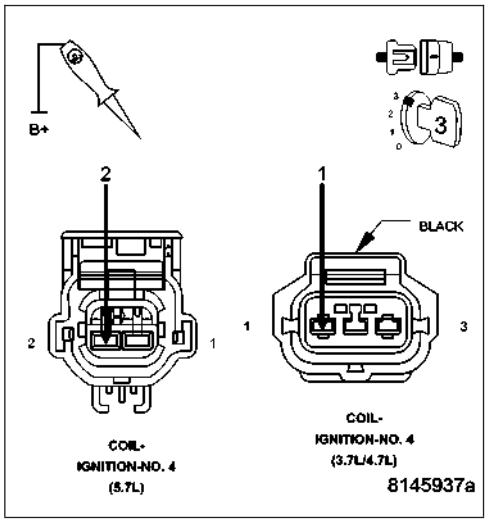
NOTE: The primary resistance of the 3.7L and 4.7L Ignition coil is 0.6 to 0.9 of an ohm at 77°F (25°C).

NOTE: 5.7L Primary Ignition Coil resistance is 0.558 to 0.682 of an ohm at 77°F (25°C).

Does the test light brightly blink/flicker?

Yes >> Replace the Ignition Coil.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 16



P0304-CYLINDER 4 MISFIRE (CONTINUED)

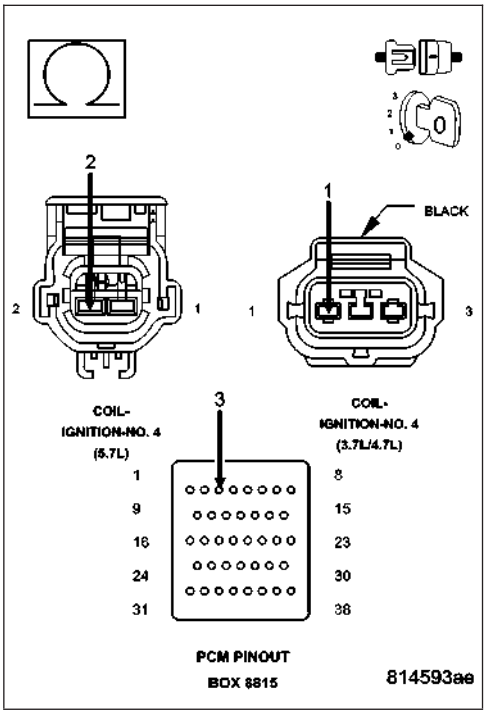
16. (K15) COIL CONTROL NO.4 CIRCUIT

Turn the ignition off.

Disconnect the C2 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Check the (K15) Coil Control No.4 circuit for an open, short to ground, and short to voltage.



Was a problem found with the (K15) Coil Control No.4 circuit?

Yes >> Repair the (K15) Coil Control No.4 circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 17

17. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

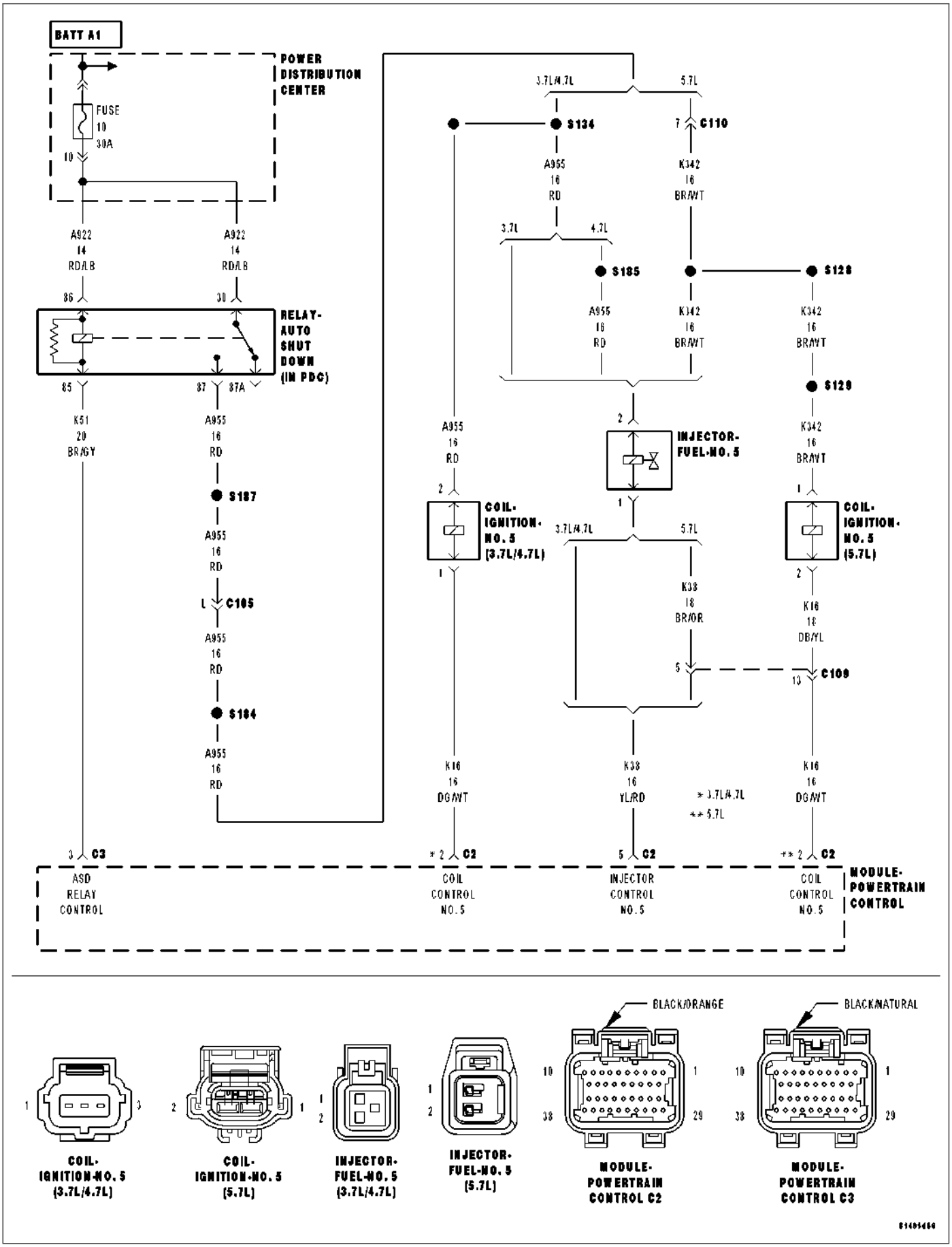
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0305-CYLINDER 5 MISFIRE



P0305-CYLINDER 5 MISFIRE (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Any time the engine is running, and the adaptive numerator has been successfully updated.
- **Set Condition:**
  When more than 2% (2.5% LEV) misfire rate is measured during two trips, or with 10% to 30% misfire rate during on trip. Three good trips to clear the MIL.

Possible Causes
(K342), (A955) ASD RELAY OUTPUT CIRCUIT
(K38) INJECTOR CONTROL NO.5 CIRCUIT
(K16) COIL CONTROL NO.5 CIRCUIT
IGNITION WIRE
SPARK PLUG
IGNITION COIL
FUEL PUMP INLET STRAINER PLUGGED
RESTRICTED FUEL SUPPLY LINE
FUEL PUMP MODULE
FUEL PRESSURE LEAK DOWN
FUEL INJECTOR
ENGINE MECHANICAL
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. CYLINDER MIS-FIRE CONDITION ACTIVE

Engine running.

Observe the WHICH CYLINDER IS MISFIRING screen for at least one minute with a scan tool.

Is there a misfire present at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0305-CYLINDER 5 MISFIRE (CONTINUED)

2. VISUAL INSPECTION

NOTE: Anything that affects the speed of the crankshaft can cause a misfire DTC.

NOTE: When a Misfire is detected for a particular cylinder, the PCM will shut down that cylinders Injector Control circuit.

- Visually inspect the engine for any of the following conditions.
- Worn serpentine belt
- Binding Engine-Driven accessories: A/C Compressor, P/S Pump, Water pump.
- Misalignment of the Water pump, P/S Pump and A/C Compressor pulleys.
- Corroded PCM power and ground circuits.
- Improper CKP, CMP, MAP, and TP Sensor mounting
- Poor connector/terminal to component connection. i.e., CKP sensor, Fuel Injector, Ign coil, etc.
- Vacuum leaks
- Restricted Air Induction system or Exhaust system.
- Internal engine component failures.

Were any of the above conditions present?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

P0305-CYLINDER 5 MISFIRE (CONTINUED)

3. (K342), (A955) ASD RELAY OUTPUT CIRCUIT

NOTE: The circuit id (K342) is used on vehicles equipped with a 5.7L engine and the (A955) circuit id is used with the 3.7L and 4.7L engines.

Turn the ignition off.

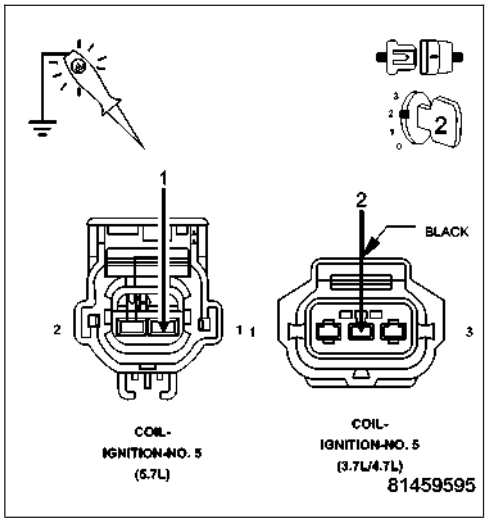
Disconnect the No.5 Ignition Coil harness connector.

Disconnect the No.5 Fuel Injector harness connector.

Ignition on, engine not running.

With the scan tool, actuate the ASD Relay.

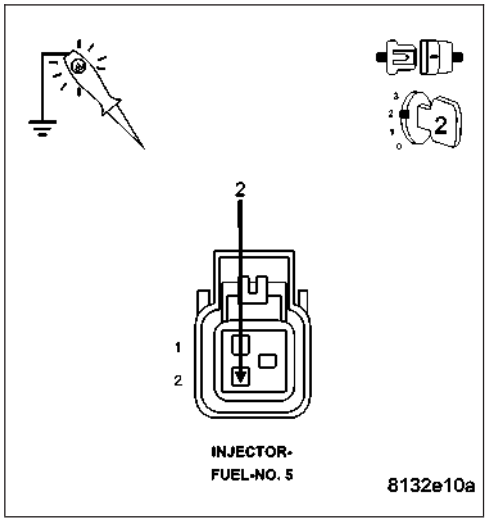
Using a 12-volt test light connected to ground, probe the (K342), (A955) ASD Relay Output circuit in the Ignition Coil harness connector and Fuel Injector harness connector while the relay is actuating.



Does the test light illuminate brightly?

Yes >> Go To 4

No >> Repair the excessive resistance or short to ground in the (K342), (A955) ASD Relay Output circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



4. IGNITION SYSTEM OPERATION

Turn the ignition off.

Connect the Ignition Coil No.5 harness connector.

Remove the Ignition Coil.

Leave the Fuel Injector harness connector of the cylinder being tested disconnected.

Install a spark tester on the Ignition Coil.

While cranking the engine observe the spark coming from the spark tester.

NOTE: A crisp blue spark that is able to jump the gap of the spark tester should be generated.

Is good spark present?

Yes >> Go To 5

No >> Go To 14

NOTE: Connect the Fuel Injector harness connector before continuing.

P0305-CYLINDER 5 MISFIRE (CONTINUED)

5. SPARK PLUG

Turn the ignition off.

Remove the Spark Plug.

Inspect the Spark Plug for the following conditions.

- Cracks
- Carbon Tracking
- Foreign Material
- Gap size out of specifications
- Loose or broke electrode

NOTE: Lightly tap the bottom of the spark plug on a solid surface. The electrode in the spark plug should not move.

Were any of the above conditions present?

Yes >> Replace the Spark Plug.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6

---

6. FUEL PRESSURE CHECK

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Install a fuel pressure gauge to the fuel rail.

Start the engine and observe the fuel pressure reading.

NOTE: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Choose a conclusion that best matches your fuel pressure reading.

Within Specification
Go To 7

Below Specification
Go To 12

Above Specification
Replace the fuel filter/pressure regulator.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0305-CYLINDER 5 MISFIRE (CONTINUED)

7. FUEL PRESSURE LEAK DOWN

NOTE: Before continuing visually and physically inspect the fuel delivery system for external leaks or damage. Repair / replace as necessary.

Turn the ignition off.

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Install special tool #6539 (5/16″) or #6631 (3/8″) fuel line adapter.

Install the fuel pressure gauge.

Start the engine and allow the fuel system to reach maximum pressure.

Turn the ignition off.

NOTE: Fuel specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Using special tool #C4390, Hose Clamp Pliers, pinch the rubber fuel line between the fuel pressure gauge and the engine.

Monitor the fuel pressure gauge for a minimum of 5 minutes.

NOTE: The pressure should not fall below 241 KPa (35 psi).

Does the pressure fall below the listed specification?

Yes >> Replace the leaking Fuel Injector(s).
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8

---

8. FUEL INJECTOR OPERATION

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

CAUTION: After each Fuel Injector actuation, start the engine to clean the cylinder of fuel. Failure to do so could cause engine damage.

Remove special tool #C4390.

Start the engine and allow the fuel pressure to reach maximum pressure.

Ignition on, engine not running.

Using the scan tool, actuate the No.5 Fuel Injector.

Monitor the fuel pressure gauge.

Does the fuel pressure gauge indicate a drop in fuel pressure?

Yes >> Go To 9

No >> Go To 10

NOTE: Turn the ignition off, remove the Fuel Pressure gauge, and connect the fuel lines before continuing.

P0305-CYLINDER 5 MISFIRE (CONTINUED)

9. ENGINE MECHANICAL

Check for any of the following conditions/mechanical problems.
ENGINE VACUUM - must be at least 13 inches in neutral
ENGINE VALVE TIMING - must be within specifications
ENGINE COMPRESSION - must be within specifications
ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks.
ENGINE PCV SYSTEM - must flow freely
TORQUE CONVERTER STALL SPEED - must be within specifications
POWER BRAKE BOOSTER - no internal vacuum leaks
FUEL - must be free of contamination
CAM LOBES - must not be worn excessively
CYLINDER LEAKAGE TEST - must be within specifications
VALVE SPRINGS - cannot be weak or broken

Are there any engine mechanical problems?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

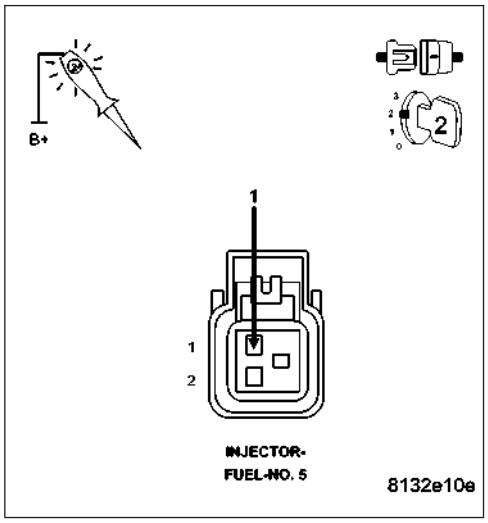
No >> Go To 17

---

10. FUEL INJECTOR

Turn the ignition off.
Disconnect the No.5 Fuel Injector harness connector.
Ignition on, engine not running.

NOTE: When a Misfire is detected for a particular cylinder, the PCM will shut down that cylinders Injector Control circuit.
With the scan tool, erase DTCs.
Using a 12-volt test light connected to 12-volts, probe the (K38) Injector Control No.5 circuit.
With the scan tool, actuate the Fuel Injector.



Does the test light blink/flicker?

Yes >> Replace the Fuel Injector.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 11

P0305-CYLINDER 5 MISFIRE (CONTINUED)

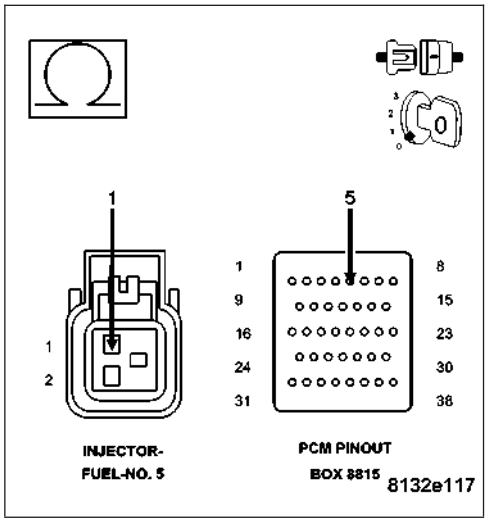
11. (K38) INJECTOR CONTROL NO.5 CIRCUIT

Turn the ignition off.

Disconnect the C2 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Check the (K38) Injector Control No.5 circuit for an open, short to ground, and short to voltage.



Was a problem found with the (K38) Injector Control No.5 circuit?

Yes >> Repair the excessive resistance or short in the (K38) Injector Control No.5 circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 17

12. FUEL SUPPLY LINE RESTRICTED

Turn the ignition off.

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Raise vehicle on hoist, and disconnect the fuel pressure line at the fuel pump module.

Install special tool #6539 (5/16″) #6631(3/8″) fuel line adapter and the fuel pressure gauge between the fuel supply line and the fuel pump module.

Ignition on, engine not running.

With the scan tool, actuate the ASD Fuel System test and observe the fuel pressure gauge.

NOTE: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Is the fuel pressure within specification?

Yes >> Repair or replace fuel supply line as necessary.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 13

P0305-CYLINDER 5 MISFIRE (CONTINUED)

13. FUEL PUMP INLET STRAINER

Turn the ignition off.

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Remove the Fuel Pump Module and inspect the Fuel Inlet Strainer.

Is the Fuel Inlet Strainer plugged?

Yes >> Replace the Fuel Pump Inlet Strainer.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Before continuing, check the Fuel Pump Module harness connector terminals for corrosion, damage, or terminal push out. Make sure the ground circuit is functional. Repair as necessary. Replace the Fuel Pump Module.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

14. IGNITION WIRE

NOTE: If the vehicle being tested does not have an ignition wire answer YES to this test and continue.

Turn the ignition off.

Remove the ignition wire.

Measure the resistance of the ignition wire.

Is the resistance below 10K ohms?

Yes >> Go To 15

No >> Replace the Ignition Wire.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

15. IGNITION COIL

Disconnect the No.5 Ignition Coil harness connector.

Remove the Fuel Pump Relay.

Using a 12-volt test light connected to 12-volts, probe the (K16) Coil Control No.5 circuit.

Crank the engine for 5 seconds while observing the test light.

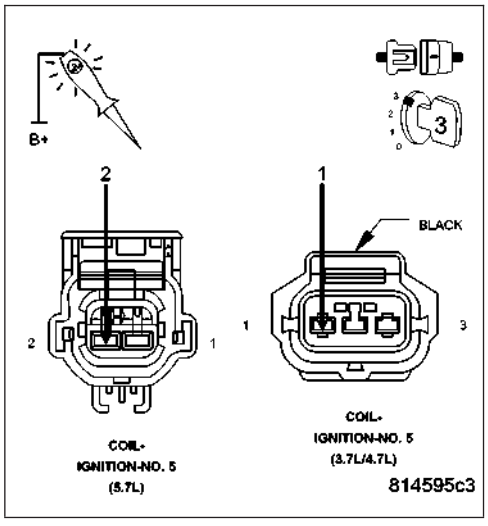
NOTE: The primary resistance of the 3.7L and 4.7L Ignition coil is 0.6 to 0.9 of an ohm at 77°F (25°C).

NOTE: 5.7L Primary Ignition Coil resistance is 0.558 to 0.682 of an ohm at 77°F (25°C).

Does the test light brightly blink/flicker?

Yes >> Replace the Ignition Coil.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 16



P0305-CYLINDER 5 MISFIRE (CONTINUED)

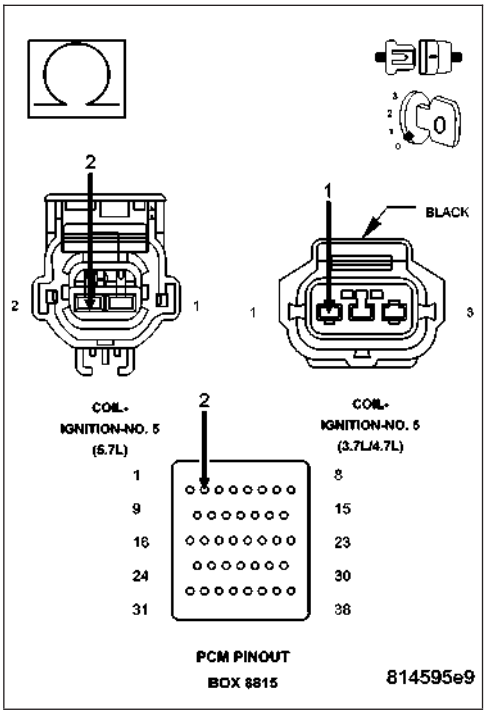
16. (K16) COIL CONTROL NO.5 CIRCUIT

Turn the ignition off.

Disconnect the C2 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Check the (K16) Coil Control No.5 circuit for an open, short to ground, and short to voltage.



Was a problem found with the (K16) Coil Control No.5 circuit?

Yes >> Repair the (K16) Coil Control No.5 circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 17

17. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

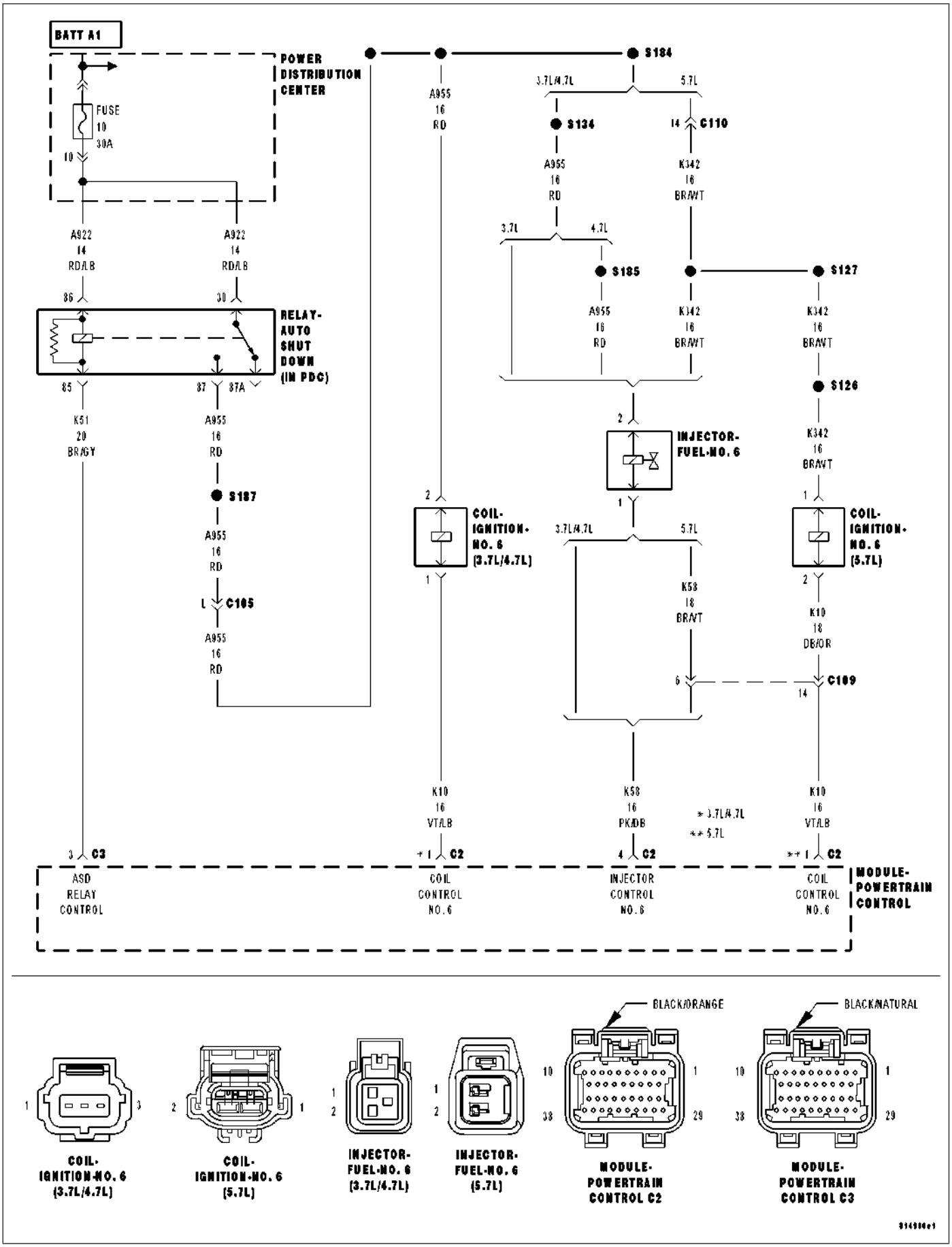
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0306-CYLINDER 6 MISFIRE



P0306-CYLINDER 6 MISFIRE (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Any time the engine is running, and the adaptive numerator has been successfully updated.
- **Set Condition:**
  When more than 2% (2.5% LEV) misfire rate is measured during two trips, or with 10% to 30% misfire rate during on trip. Three good trips to clear the MIL.

Possible Causes
(K342), (A955) ASD RELAY OUTPUT CIRCUIT
(K58) INJECTOR CONTROL NO.6 CIRCUIT
(K10) COIL CONTROL NO.6 CIRCUIT
IGNITION WIRE
SPARK PLUG
IGNITION COIL
FUEL PUMP INLET STRAINER PLUGGED
RESTRICTED FUEL SUPPLY LINE
FUEL PUMP MODULE
FUEL PRESSURE LEAK DOWN
FUEL INJECTOR
ENGINE MECHANICAL
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. CYLINDER MIS-FIRE CONDITION ACTIVE

Engine running.

Observe the WHICH CYLINDER IS MISFIRING screen for at least one minute with a scan tool.

Is there a misfire present at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0306-CYLINDER 6 MISFIRE (CONTINUED)

2. VISUAL INSPECTION

NOTE: Anything that affects the speed of the crankshaft can cause a misfire DTC.

NOTE: When a Misfire is detected for a particular cylinder, the PCM will shut down that cylinders Injector Control circuit.

- Visually inspect the engine for any of the following conditions.
- Worn serpentine belt
- Binding Engine-Driven accessories: A/C Compressor, P/S Pump, Water pump.
- Misalignment of the Water pump, P/S Pump and A/C Compressor pulleys
- Corroded PCM power and ground circuits.
- Improper CKP, CMP, MAP, and TP Sensor mounting
- Poor connector/terminal to component connection. i.e., CKP sensor, Fuel Injector, Ign coil, etc.
- Vacuum leaks
- Restricted Air Induction system or Exhaust system.
- Internal engine component failures.

Were any of the above conditions present?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

P0306-CYLINDER 6 MISFIRE (CONTINUED)

3. (K342), (A955) ASD RELAY OUTPUT CIRCUIT

NOTE: The circuit id (K342) is used on vehicles equipped with a 5.7L engine and the (A955) circuit id is used with the 3.7L and 4.7L engines.

Turn the ignition off.

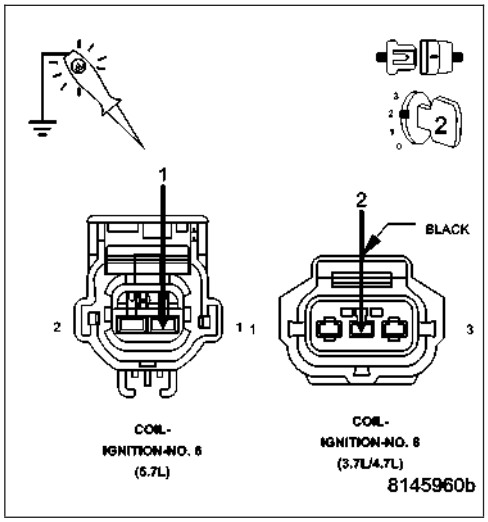
Disconnect the No.6 Ignition Coil harness connector.

Disconnect the No.6 Fuel Injector harness connector.

Ignition on, engine not running.

With the scan tool, actuate the ASD Relay.

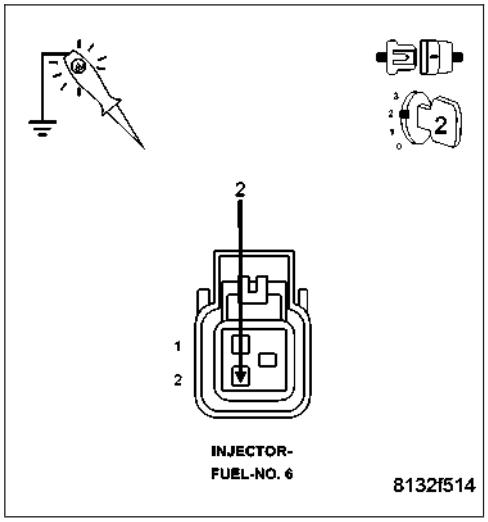
Using a 12-volt test light connected to ground, probe the (K342), (A955) ASD Relay Output circuit in the Ignition Coil harness connector and Fuel Injector harness connector while the relay is actuating.



Does the test light illuminate brightly?

Yes >> Go To 4

No >> Repair the excessive resistance or short to ground in the (K342), (A955) ASD Relay Output circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



4. IGNITION SYSTEM OPERATION

Turn the ignition off.

Connect the Ignition Coil No.6 harness connector.

Remove the Ignition Coil.

Leave the Fuel Injector harness connector of the cylinder being tested disconnected.

Install a spark tester on the Ignition Coil.

While cranking the engine observe the spark coming from the spark tester.

NOTE: A crisp blue spark that is able to jump the gap of the spark tester should be generated.

Is good spark present?

Yes >> Go To 5

No >> Go To 14

NOTE: Connect the Fuel Injector harness connector before continuing.

P0306-CYLINDER 6 MISFIRE (CONTINUED)

5. SPARK PLUG

Turn the ignition off.

Remove the Spark Plug.

Inspect the Spark Plug for the following conditions.

- Cracks
- Carbon Tracking
- Foreign Material
- Gap size out of specifications
- Loose or broke electrode

NOTE: Lightly tap the bottom of the spark plug on a solid surface. The electrode in the spark plug should not move.

Were any of the above conditions present?

Yes >> Replace the Spark Plug.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6

---

6. FUEL PRESSURE CHECK

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Install a fuel pressure gauge to the fuel rail.

Start the engine and observe the fuel pressure reading.

Choose a conclusion that best matches your fuel pressure reading.

Within Specification
Go To 7

Below Specification
Go To 12

Above Specification
Replace the fuel filter/pressure regulator.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

NOTE: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

P0306-CYLINDER 6 MISFIRE (CONTINUED)

7. FUEL PRESSURE LEAK DOWN

NOTE: Before continuing visually and physically inspect the fuel delivery system for external leaks or damage. Repair / replace as necessary.

Turn the ignition off.

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death

Install special tool #6539 (5/16″) or #6631 (3/8″) fuel line adapter.

Install the fuel pressure gauge.

Start the engine and allow the fuel system to reach maximum pressure.

Turn the ignition off.

NOTE: Fuel specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Using special tool #C4390, Hose Clamp Pliers, pinch the rubber fuel line between the fuel pressure gauge and the engine.

Monitor the fuel pressure gauge for a minimum of 5 minutes.

NOTE: The pressure should not fall below 241 KPa (35 psi).

Does the pressure fall below the listed specification?

Yes >> Replace the leaking Fuel Injector(s).
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8

---

8. FUEL INJECTOR OPERATION

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

CAUTION: After each Fuel Injector actuation, start the engine to clean the cylinder of fuel. Failure to do so could cause engine damage.

Remove special tool #C4390.

Start the engine and allow the fuel pressure to reach maximum pressure.

Ignition on, engine not running.

Using the scan tool, actuate the No.6 Fuel Injector.

Monitor the fuel pressure gauge.

Does the fuel pressure gauge indicate a drop in fuel pressure?

Yes >> Go To 9

No >> Go To 10

NOTE: Turn the ignition off, remove the Fuel Pressure gauge, and connect the fuel lines before continuing.

P0306-CYLINDER 6 MISFIRE (CONTINUED)

9. ENGINE MECHANICAL

Check for any of the following conditions/mechanical problems.
ENGINE VACUUM - must be at least 13 inches in neutral
ENGINE VALVE TIMING - must be within specifications
ENGINE COMPRESSION - must be within specifications
ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks.
ENGINE PCV SYSTEM - must flow freely
TORQUE CONVERTER STALL SPEED - must be within specifications
POWER BRAKE BOOSTER - no internal vacuum leaks
FUEL - must be free of contamination
CAM LOBES - must not be worn excessively
CYLINDER LEAKAGE TEST - must be within specifications
VALVE SPRINGS - cannot be weak or broken

Are there any engine mechanical problems?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

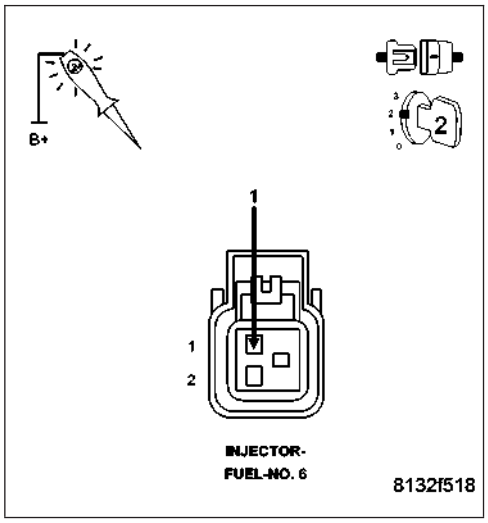
No >> Go To 17

---

10. FUEL INJECTOR

Turn the ignition off.
Disconnect the No.6 Fuel Injector harness connector.
Ignition on, engine not running.

NOTE: When a Misfire is detected for a particular cylinder, the PCM will shut down that cylinders Injector Control circuit.
With the scan tool, erase DTCs.
Using a 12-volt test light connected to 12-volts, probe the (K58) Injector Control No.6 circuit.
With the scan tool, actuate the Fuel Injector.



Does the test light blink/flicker?

Yes >> Replace the Fuel Injector.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 11

P0306-CYLINDER 6 MISFIRE (CONTINUED)

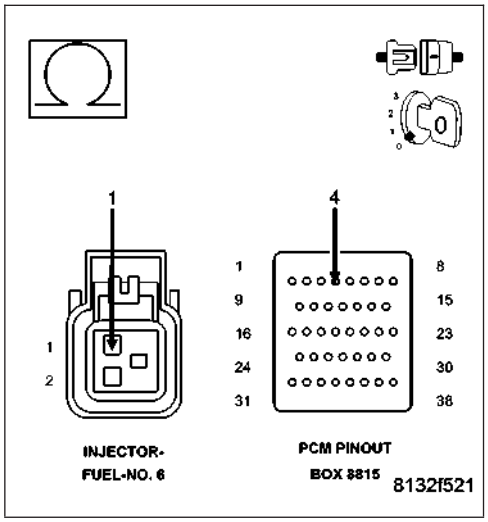
11. (K58) INJECTOR CONTROL NO.6 CIRCUIT

Turn the ignition off.

Disconnect the C2 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Check the (K58) Injector Control No.6 circuit for an open, short to ground, and short to voltage.



Was a problem found with the (K58) Injector Control No.6 circuit?

Yes >> Repair the excessive resistance or short in the (K58) Injector Control No.6 circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 17

12. FUEL SUPPLY LINE RESTRICTED

Turn the ignition off.

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Raise vehicle on hoist, and disconnect the fuel pressure line at the fuel pump module.

Install special tool #6539 (5/16″) #6631(3/8″) fuel line adapter and the fuel pressure gauge between the fuel supply line and the fuel pump module.

Ignition on, engine not running.

With the scan tool, actuate the ASD Fuel System test and observe the fuel pressure gauge.

NOTE: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Is the fuel pressure within specification?

Yes >> Repair or replace fuel supply line as necessary.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 13

P0306-CYLINDER 6 MISFIRE (CONTINUED)

13. FUEL PUMP INLET STRAINER

Turn the ignition off.

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Remove the Fuel Pump Module and inspect the Fuel Inlet Strainer.

Is the Fuel Inlet Strainer plugged?

Yes >> Replace the Fuel Pump Inlet Strainer.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Before continuing, check the Fuel Pump Module harness connector terminals for corrosion, damage, or terminal push out. Make sure the ground circuit is functional. Repair as necessary. Replace the Fuel Pump Module.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

14. IGNITION WIRE

NOTE: If the vehicle being tested does not have an ignition wire answer YES to this test and continue.

Turn the ignition off.

Remove the ignition wire.

Measure the resistance of the ignition wire.

Is the resistance below 10K ohms?

Yes >> Go To 15

No >> Replace the Ignition Wire.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

15. IGNITION COIL

Disconnect the No.6 Ignition Coil harness connector.

Remove the Fuel Pump Relay.

Using a 12-volt test light connected to 12-volts, probe the (K10) Coil Control No.6 circuit.

Crank the engine for 5 seconds while observing the test light.

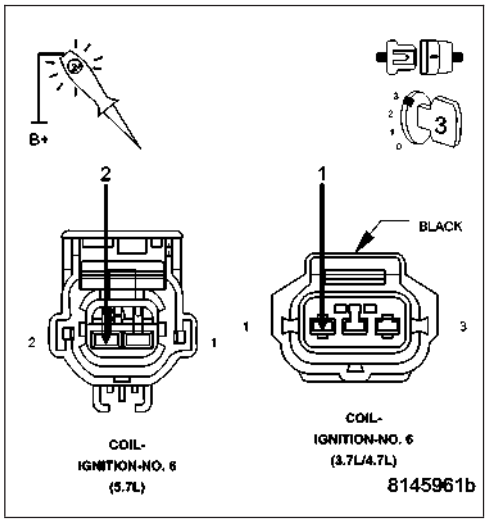
NOTE: The primary resistance of the 3.7L and 4.7L Ignition coil is 0.6 to 0.9 of an ohm at 77°F (25°C).

NOTE: 5.7L Primary Ignition Coil resistance is 0.558 to 0.682 of an ohm at 77°F (25°C).

Does the test light brightly blink/flicker?

Yes >> Replace the Ignition Coil.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 16



P0306-CYLINDER 6 MISFIRE (CONTINUED)

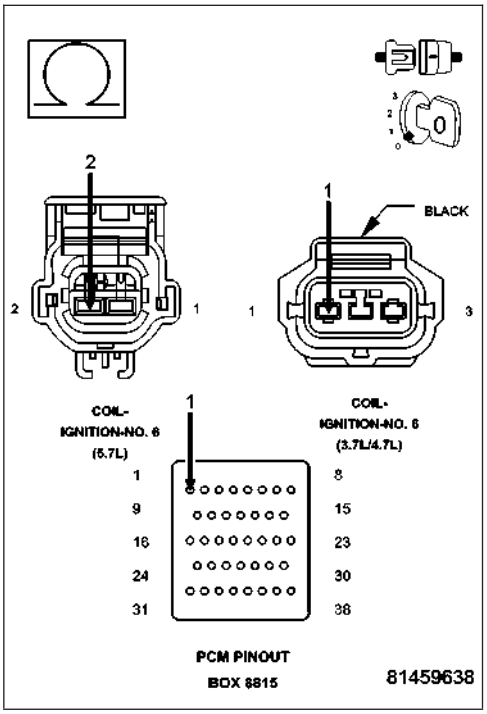
16. (K10) COIL CONTROL NO.6 CIRCUIT

Turn the ignition off.

Disconnect the C2 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Check the (K10) Coil Control No.6 circuit for an open, short to ground, and short to voltage.



Was a problem found with the (K10) Coil Control No.6 circuit?

Yes >> Repair the (K10) Coil Control No.6 circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 17

17. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

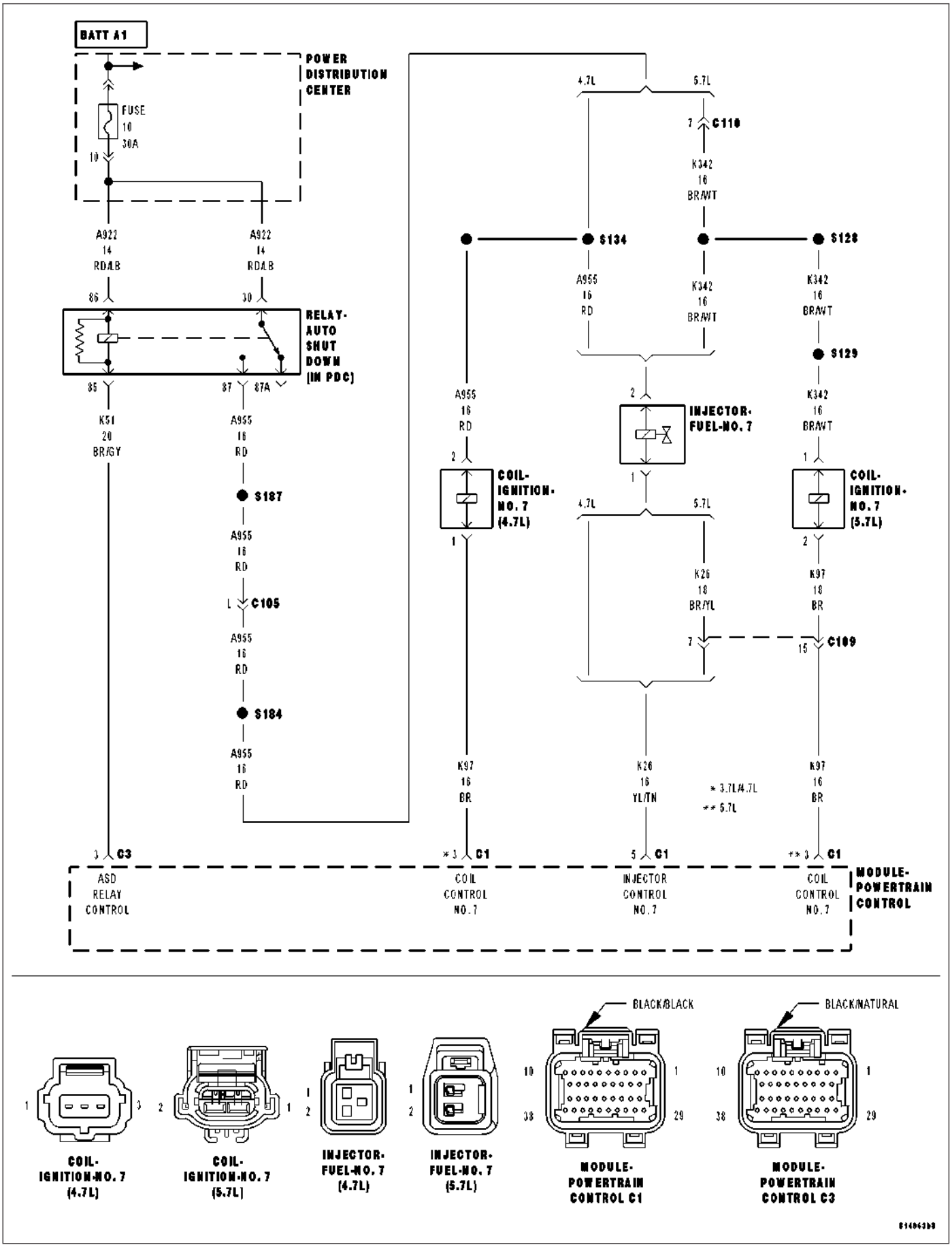
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0307-CYLINDER 7 MISFIRE



P0307-CYLINDER 7 MISFIRE (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Any time the engine is running, and the adaptive numerator has been successfully updated.
- **Set Condition:**
  When more than 2% (2.5% LEV) misfire rate is measured during two trips, or with 10% to 30% misfire rate during on trip. Three good trips to clear the MIL.

Possible Causes
(K342), (A955) ASD RELAY OUTPUT CIRCUIT
(K26) INJECTOR CONTROL NO.7 CIRCUIT
(K97) COIL CONTROL NO.7 CIRCUIT
IGNITION WIRE
SPARK PLUG
IGNITION COIL
FUEL PUMP INLET STRAINER PLUGGED
RESTRICTED FUEL SUPPLY LINE
FUEL PUMP MODULE
FUEL PRESSURE LEAK DOWN
FUEL INJECTOR
ENGINE MECHANICAL
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. CYLINDER MIS-FIRE CONDITION ACTIVE

Engine running.

Observe the WHICH CYLINDER IS MISFIRING screen for at least one minute with a scan tool.

Is there a misfire present at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0307-CYLINDER 7 MISFIRE (CONTINUED)

2. VISUAL INSPECTION

NOTE: Anything that affects the speed of the crankshaft can cause a misfire DTC.

NOTE: When a Misfire is detected for a particular cylinder, the PCM will shut down that cylinders Injector Control circuit.

- Visually inspect the engine for any of the following conditions.
- Worn serpentine belt
- Binding Engine-Driven accessories: A/C Compressor, P/S Pump, Water pump.
- Misalignment of the Water pump, P/S Pump and A/C Compressor pulleys
- Corroded PCM power and ground circuits.
- Improper CKP, CMP, MAP, and TP Sensor mounting
- Poor connector/terminal to component connection. i.e., CKP sensor, Fuel Injector, Ign coil, etc.
- Vacuum leaks
- Restricted Air Induction system or Exhaust system.
- Internal engine component failures.

Were any of the above conditions present?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

P0307-CYLINDER 7 MISFIRE (CONTINUED)

3. (K342), (A955) ASD RELAY OUTPUT CIRCUIT

NOTE: The circuit id (K342) is used on vehicles equipped with a 5.7L engine and the (A955) circuit id is used with the 4.7L engines.

Turn the ignition off.

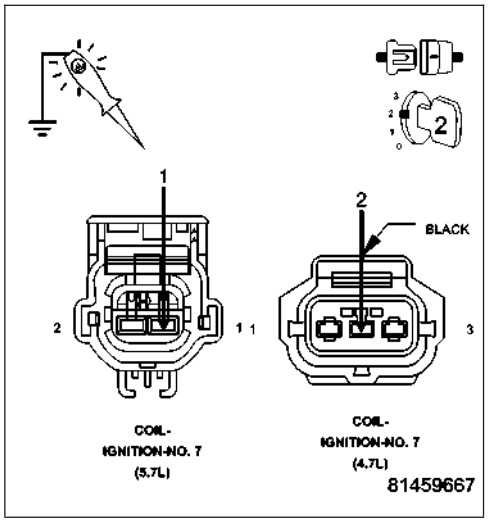
Disconnect the No.7 Ignition Coil harness connector.

Disconnect the No.7 Fuel Injector harness connector.

Ignition on, engine not running.

With the scan tool, actuate the ASD Relay.

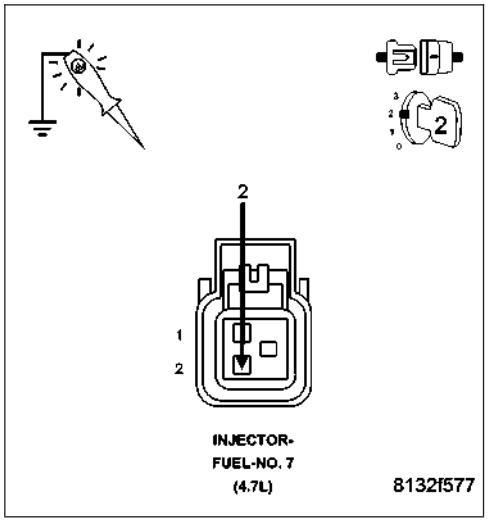
Using a 12-volt test light connected to ground, probe the (K342), (A955) ASD Relay Output circuit in the Ignition Coil harness connector and Fuel Injector harness connector while the relay is actuating.



Does the test light illuminate brightly?

Yes >> Go To 4

No >> Repair the excessive resistance or short to ground in the (K342), (A955) ASD Relay Output circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



4. IGNITION SYSTEM OPERATION

Turn the ignition off.

Connect the Ignition Coil No.7 harness connector.

Remove the Ignition Coil.

Leave the Fuel Injector harness connector of the cylinder being tested disconnected.

Install a spark tester on the Ignition Coil.

While cranking the engine observe the spark coming from the spark tester.

Is good spark present?

Yes >> Go To 5

No >> Go To 14

NOTE: Connect the Fuel Injector harness connector before continuing.

P0307-CYLINDER 7 MISFIRE (CONTINUED)

5. SPARK PLUG

Turn the ignition off.

Remove the Spark Plug.

Inspect the Spark Plug for the following conditions.

- Cracks
- Carbon Tracking
- Foreign Material
- Gap size out of specifications
- Loose or broke electrode

NOTE: Lightly tap the bottom of the spark plug on a solid surface. The electrode in the spark plug should not move.

Were any of the above conditions present?

Yes >> Replace the Spark Plug.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6

---

6. FUEL PRESSURE CHECK

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Install a fuel pressure gauge to the fuel rail.

Start the engine and observe the fuel pressure reading.

NOTE: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Choose a conclusion that best matches your fuel pressure reading.

Within Specification
Go To 7

Below Specification
Go To 12

Above Specification
Replace the fuel filter/pressure regulator.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0307-CYLINDER 7 MISFIRE (CONTINUED)

7. FUEL PRESSURE LEAK DOWN

NOTE: Before continuing visually and physically inspect the fuel delivery system for external leaks or damage. Repair / replace as necessary.

Turn the ignition off.

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Install special tool #6539 (5/16″) or #6631 (3/8″) fuel line adapter.

Install the fuel pressure gauge.

Start the engine and allow the fuel system to reach maximum pressure.

Turn the ignition off.

NOTE: Fuel specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Using special tool #C4390, Hose Clamp Pliers, pinch the rubber fuel line between the fuel pressure gauge and the engine.

Monitor the fuel pressure gauge for a minimum of 5 minutes.

NOTE: The pressure should not fall below 241 KPa (35 psi).

Does the pressure fall below the listed specification?

Yes >> Replace the leaking Fuel Injector(s).
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8

---

8. FUEL INJECTOR OPERATION

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

CAUTION: After each Fuel Injector actuation, start the engine to clean the cylinder of fuel. Failure to do so could cause engine damage.

Remove special tool #C4390.

Start the engine and allow the fuel pressure to reach maximum pressure.

Ignition on, engine not running.

Using the scan tool, actuate the No.7 Fuel Injector.

Monitor the fuel pressure gauge.

Does the fuel pressure gauge indicate a drop in fuel pressure?

Yes >> Go To 9

No >> Go To 10

NOTE: Turn the ignition off, remove the Fuel Pressure gauge, and connect the fuel lines before continuing.

P0307-CYLINDER 7 MISFIRE (CONTINUED)

9. ENGINE MECHANICAL

Check for any of the following conditions/mechanical problems.
ENGINE VACUUM - must be at least 13 inches in neutral
ENGINE VALVE TIMING - must be within specifications
ENGINE COMPRESSION - must be within specifications
ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks.
ENGINE PCV SYSTEM - must flow freely
TORQUE CONVERTER STALL SPEED - must be within specifications
POWER BRAKE BOOSTER - no internal vacuum leaks
FUEL - must be free of contamination
CAM LOBES - must not be worn excessively
CYLINDER LEAKAGE TEST - must be within specifications
VALVE SPRINGS - cannot be weak or broken

Are there any engine mechanical problems?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

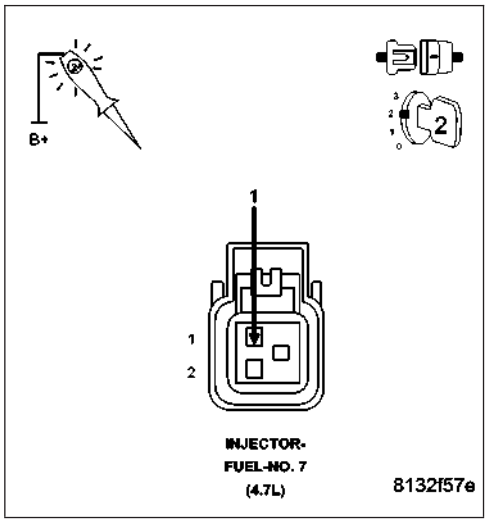
No >> Go To 17

---

10. FUEL INJECTOR

Turn the ignition off.
Disconnect the No.7 Fuel Injector harness connector.
Ignition on, engine not running.

NOTE: When a Misfire is detected for a particular cylinder, the PCM will shut down that cylinders Injector Control circuit.
With the scan tool, erase DTCs.
Using a 12-volt test light connected to 12-volts, probe the (K26) Injector Control No.7 circuit.
With the scan tool, actuate the Fuel Injector.



Does the test light blink/flicker?

Yes >> Replace the Fuel Injector.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 11

P0307-CYLINDER 7 MISFIRE (CONTINUED)

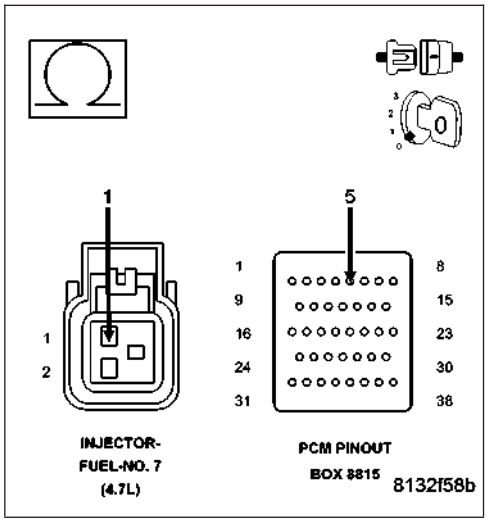
11. (K26) INJECTOR CONTROL NO.7 CIRCUIT

Turn the ignition off.

Disconnect the C1 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Check the (K26) Injector Control No.7 circuit for an open, short to ground, and short to voltage.



Was a problem found with the (K26) Injector Control No.7 circuit?

Yes >> Repair the excessive resistance or short in the (K26) Injector Control No.7 circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 17

---

12. FUEL SUPPLY LINE RESTRICTED

Turn the ignition off.

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Raise vehicle on hoist, and disconnect the fuel pressure line at the fuel pump module.

Install special tool #6539 (5/16″) #6631(3/8″) fuel line adapter and the fuel pressure gauge between the fuel supply line and the fuel pump module.

Ignition on, engine not running.

With the scan tool, actuate the ASD Fuel System test and observe the fuel pressure gauge.

NOTE: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Is the fuel pressure within specification?

Yes >> Repair or replace fuel supply line as necessary.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 13

P0307-CYLINDER 7 MISFIRE (CONTINUED)

13. FUEL PUMP INLET STRAINER

Turn the ignition off.

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Remove the Fuel Pump Module and inspect the Fuel Inlet Strainer.

Is the Fuel Inlet Strainer plugged?

Yes >> Replace the Fuel Pump Inlet Strainer.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Before continuing, check the Fuel Pump Module harness connector terminals for corrosion, damage, or terminal push out. Make sure the ground circuit is functional. Repair as necessary. Replace the Fuel Pump Module.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

14. IGNITION WIRE

NOTE: If the vehicle being tested does not have an ignition wire answer YES to this test and continue.

Turn the ignition off.

Remove the ignition wire.

Measure the resistance of the ignition wire.

Is the resistance below 10K ohms?

Yes >> Go To 15

No >> Replace the Ignition Wire.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

15. IGNITION COIL

Disconnect the No.7 Ignition Coil harness connector.

Remove the Fuel Pump Relay.

Using a 12-volt test light connected to 12-volts, probe the (K97) Coil Control No.7 circuit.

Crank the engine for 5 seconds while observing the test light.

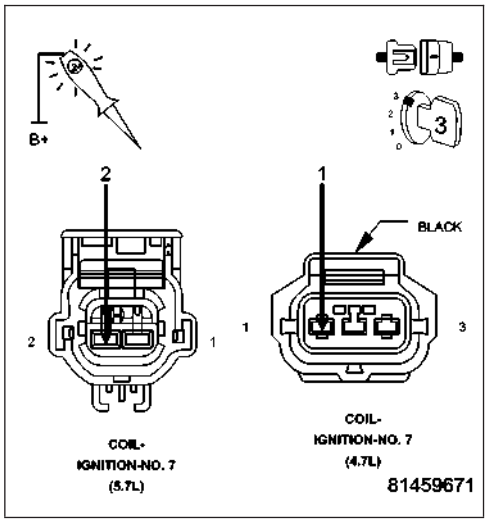
NOTE: The primary resistance of the 4.7L Ignition coil is 0.6 to 0.9 of an ohm at 77°F (25°C).

NOTE: 5.7L Primary Ignition Coil resistance is 0.558 to 0.682 of an ohm at 77°F (25°C).

Does the test light brightly blink/flicker?

Yes >> Replace the Ignition Coil.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 16



P0307-CYLINDER 7 MISFIRE (CONTINUED)

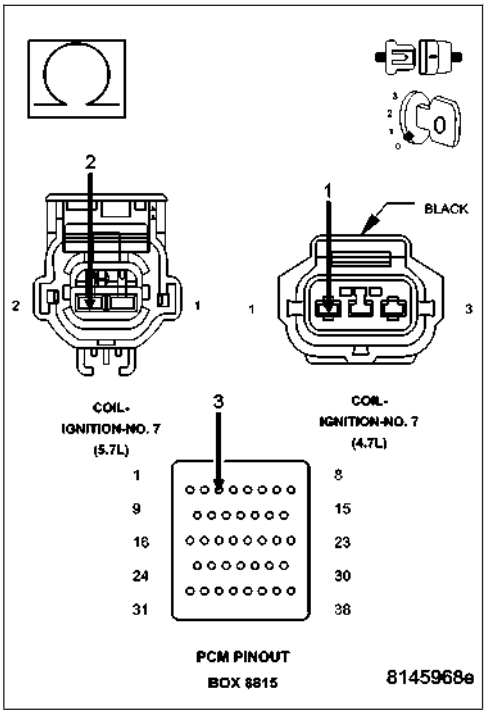
16. (K97) COIL CONTROL NO.7 CIRCUIT

Turn the ignition off.

Disconnect the C1 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Check the (K97) Coil Control No.7 circuit for an open, short to ground, and short to voltage.



Was a problem found with the (K97) Coil Control No.7 circuit?

Yes >> Repair the (K97) Coil Control No.7 circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 17

17. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

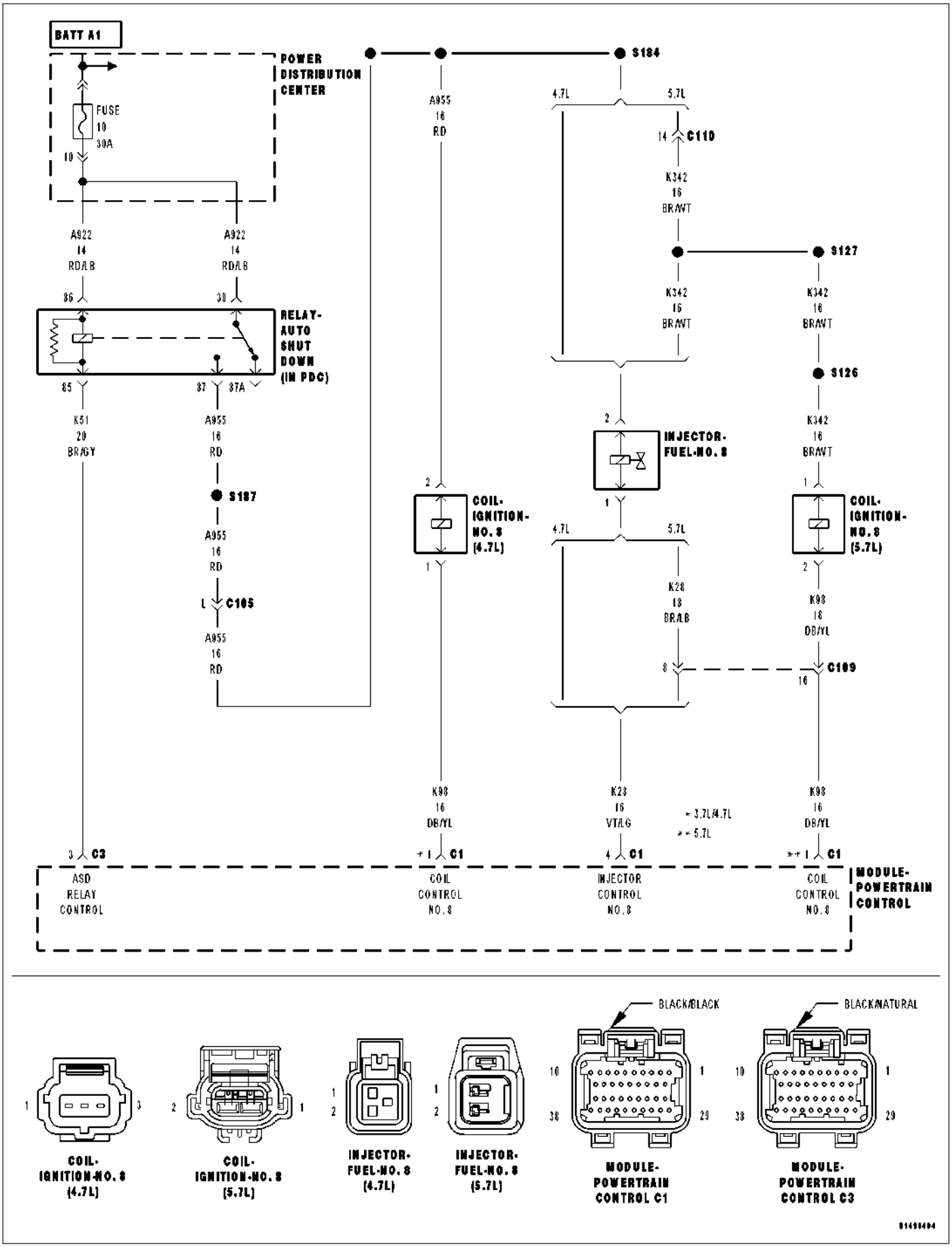
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0308-CYLINDER 8 MISFIRE



P0308-CYLINDER 8 MISFIRE (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Any time the engine is running, and the adaptive numerator has been successfully updated.
- **Set Condition:**
  When more than 2% (2.5% LEV) misfire rate is measured during two trips, or with 10% to 30% misfire rate during on trip. Three good trips to clear the MIL.

Possible Causes
(K342), (A955) ASD RELAY OUTPUT CIRCUIT
(K28) INJECTOR CONTROL NO.8 CIRCUIT
(K98) COIL CONTROL NO.8 CIRCUIT
IGNITION WIRE
SPARK PLUG
IGNITION COIL
FUEL PUMP INLET STRAINER PLUGGED
RESTRICTED FUEL SUPPLY LINE
FUEL PUMP MODULE
FUEL PRESSURE LEAK DOWN
FUEL INJECTOR
ENGINE MECHANICAL
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. CYLINDER MIS-FIRE CONDITION ACTIVE

Engine running.

Observe the WHICH CYLINDER IS MISFIRING screen for at least one minute with a scan tool.

Is there a misfire present at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0308-CYLINDER 8 MISFIRE (CONTINUED)

2. VISUAL INSPECTION

NOTE: Anything that affects the speed of the crankshaft can cause a misfire DTC.

NOTE: When a Misfire is detected for a particular cylinder, the PCM will shut down that cylinders Injector Control circuit.

- Visually inspect the engine for any of the following conditions.
- Worn serpentine belt
- Binding Engine-Driven accessories: A/C Compressor, P/S Pump, Water pump.
- Misalignment of the Water pump, P/S Pump and A/C Compressor pulleys
- Corroded PCM power and ground circuits.
- Improper CKP, CMP, MAP, and TP Sensor mounting
- Poor connector/terminal to component connection. i.e., CKP sensor, Fuel Injector, Ign coil, etc.
- Vacuum leaks
- Restricted Air Induction system or Exhaust system.
- Internal engine component failures.

Were any of the above conditions present?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

P0308-CYLINDER 8 MISFIRE (CONTINUED)

3. (K342), (A955) ASD RELAY OUTPUT CIRCUIT

NOTE: The circuit id (K342) is used on vehicles equipped with a 5.7L engine and the (A955) circuit id is used with the 4.7L engines.

Turn the ignition off.

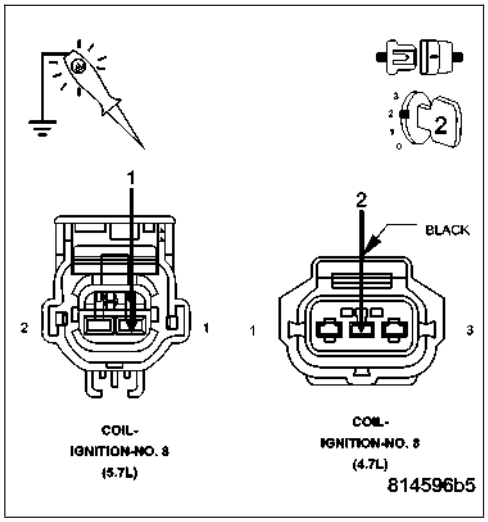
Disconnect the No.8 Ignition Coil harness connector.

Disconnect the No.8 Fuel Injector harness connector.

Ignition on, engine not running.

With the scan tool, actuate the ASD Relay.

Using a 12-volt test light connected to ground, probe the (K342), (A955) ASD Relay Output circuit in the Ignition Coil harness connector and Fuel Injector harness connector while the relay is actuating.

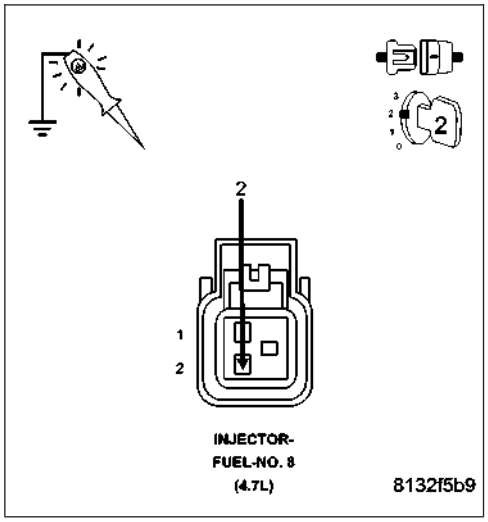


Does the test light illuminate brightly?

Yes >> Go To 4

No >> Repair the excessive resistance or short to ground in the (K342), (A955) ASD Relay Output circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



4. IGNITION SYSTEM OPERATION

Turn the ignition off.

Connect the Ignition Coil No.8 harness connector.

Remove the Ignition Coil.

Leave the Fuel Injector harness connector of the cylinder being tested disconnected.

Install a spark tester on the Ignition Coil.

While cranking the engine observe the spark coming from the spark tester.

NOTE: A crisp blue spark that is able to jump the gap of the spark tester should be generated.

Is good spark present?

Yes >> Go To 5

No >> Go To 14

NOTE: Connect the Fuel Injector harness connector before continuing.

P0308-CYLINDER 8 MISFIRE (CONTINUED)

5. SPARK PLUG

Turn the ignition off.

Remove the Spark Plug.

Inspect the Spark Plug for the following conditions.

- Cracks
- Carbon Tracking
- Foreign Material
- Gap size out of specifications
- Loose or broke electrode

NOTE: Lightly tap the bottom of the spark plug on a solid surface. The electrode in the spark plug should not move.

Were any of the above conditions present?

Yes >> Replace the Spark Plug.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6

---

6. FUEL PRESSURE CHECK

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Install a fuel pressure gauge to the fuel rail.

Start the engine and observe the fuel pressure reading.

NOTE: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Choose a conclusion that best matches your fuel pressure reading.

Within Specification
Go To 7

Below Specification
Go To 12

Above Specification
Replace the fuel filter/pressure regulator.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0308-CYLINDER 8 MISFIRE (CONTINUED)

7. FUEL PRESSURE LEAK DOWN

NOTE: Before continuing visually and physically inspect the fuel delivery system for external leaks or damage. Repair / replace as necessary.

Turn the ignition off.

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Install special tool #6539 (5/16″) or #6631 (3/8″) fuel line adapter.

Install the fuel pressure gauge.

Start the engine and allow the fuel system to reach maximum pressure.

Turn the ignition off.

NOTE: Fuel specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Using special tool #C4390, Hose Clamp Pliers, pinch the rubber fuel line between the fuel pressure gauge and the engine.

Monitor the fuel pressure gauge for a minimum of 5 minutes.

NOTE: The pressure should not fall below 241 KPa (35 psi).

Does the pressure fall below the listed specification?

Yes >> Replace the leaking Fuel Injector(s).
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8

---

8. FUEL INJECTOR OPERATION

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

CAUTION: After each Fuel Injector actuation, start the engine to clean the cylinder of fuel. Failure to do so could cause engine damage.

Remove special tool #C4390.

Start the engine and allow the fuel pressure to reach maximum pressure.

Ignition on, engine not running.

Using the scan tool, actuate the No.8 Fuel Injector.

Monitor the fuel pressure gauge.

Does the fuel pressure gauge indicate a drop in fuel pressure?

Yes >> Go To 9

No >> Go To 10

NOTE: Turn the ignition off, remove the Fuel Pressure gauge, and connect the fuel lines before continuing.

P0308-CYLINDER 8 MISFIRE (CONTINUED)

9. ENGINE MECHANICAL

Check for any of the following conditions/mechanical problems.
ENGINE VACUUM - must be at least 13 inches in neutral
ENGINE VALVE TIMING - must be within specifications
ENGINE COMPRESSION - must be within specifications
ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks.
ENGINE PCV SYSTEM - must flow freely
TORQUE CONVERTER STALL SPEED - must be within specifications
POWER BRAKE BOOSTER - no internal vacuum leaks
FUEL - must be free of contamination
CAM LOBES - must not be worn excessively
CYLINDER LEAKAGE TEST - must be within specifications
VALVE SPRINGS - cannot be weak or broken

Are there any engine mechanical problems?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

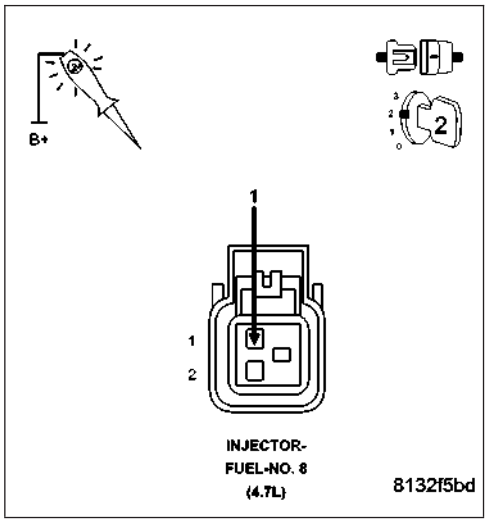
No >> Go To 17

---

10. FUEL INJECTOR

Turn the ignition off.
Disconnect the No.8 Fuel Injector harness connector.
Ignition on, engine not running.

NOTE: When a Misfire is detected for a particular cylinder, the PCM will shut down that cylinders Injector Control circuit.
With the scan tool, erase DTCs.
Using a 12-volt test light connected to 12-volts, probe the (K28) Injector Control No.8 circuit.
With the scan tool, actuate the Fuel Injector.



Does the test light blink/flicker?

Yes >> Replace the Fuel Injector.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 11

P0308-CYLINDER 8 MISFIRE (CONTINUED)

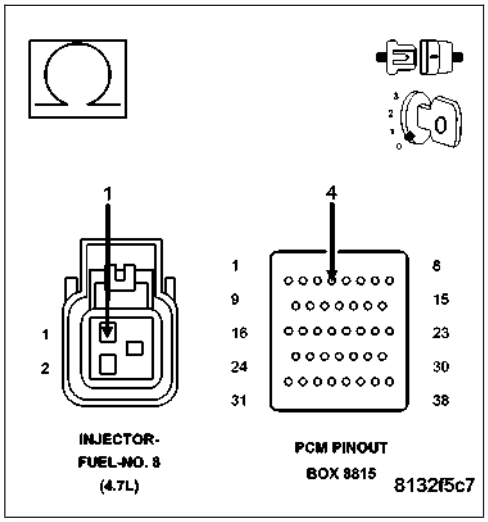
11. (K28) INJECTOR CONTROL NO.8 CIRCUIT

Turn the ignition off.

Disconnect the C1 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Check the (K28) Injector Control No.8 circuit for an open, short to ground, and short to voltage.



Was a problem found with the (K28) Injector Control No.8 circuit?

Yes >> Repair the excessive resistance or short in the (K28) Injector Control No.8 circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 17

---

12. FUEL SUPPLY LINE RESTRICTED

Turn the ignition off.

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Raise vehicle on hoist, and disconnect the fuel pressure line at the fuel pump module.

Install special tool #6539 (5/16″) #6631(3/8″) fuel line adapter and the fuel pressure gauge between the fuel supply line and the fuel pump module.

Ignition on, engine not running.

With the scan tool, actuate the ASD Fuel System test and observe the fuel pressure gauge.

NOTE: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Is the fuel pressure within specification?

Yes >> Repair or replace fuel supply line as necessary.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 13

P0308-CYLINDER 8 MISFIRE (CONTINUED)

13. FUEL PUMP INLET STRAINER

Turn the ignition off.

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Remove the Fuel Pump Module and inspect the Fuel Inlet Strainer.

Is the Fuel Inlet Strainer plugged?

Yes >> Replace the Fuel Pump Inlet Strainer.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Before continuing, check the Fuel Pump Module harness connector terminals for corrosion, damage, or terminal push out. Make sure the ground circuit is functional. Repair as necessary. Replace the Fuel Pump Module.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

14. IGNITION WIRE

NOTE: If the vehicle being tested does not have an ignition wire answer YES to this test and continue.

Turn the ignition off.

Remove the ignition wire.

Measure the resistance of the ignition wire.

Is the resistance below 10K ohms?

Yes >> Go To 15

No >> Replace the Ignition Wire.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

15. IGNITION COIL

Disconnect the No.8 Ignition Coil harness connector.

Remove the Fuel Pump Relay.

Using a 12-volt test light connected to 12-volts, probe the (K98) Coil Control No.8 circuit.

Crank the engine for 5 seconds while observing the test light.

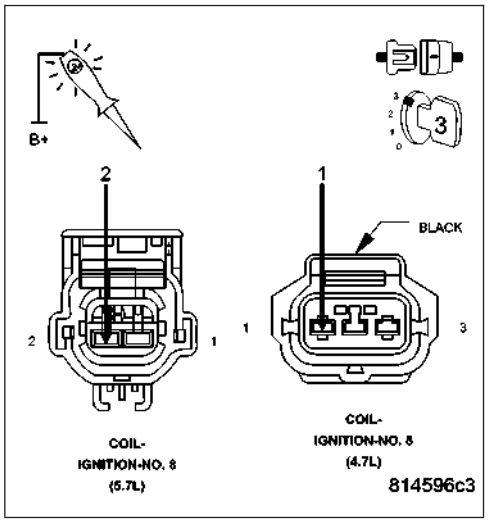
NOTE: The primary resistance of the 4.7L Ignition coil is 0.6 to 0.9 of an ohm at 77°F (25°C).

NOTE: 5.7L Primary Ignition Coil resistance is 0.558 to 0.682 of an ohm at 77°F (25°C).

Does the test light brightly blink/flicker?

Yes >> Replace the Ignition Coil.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 16



P0308-CYLINDER 8 MISFIRE (CONTINUED)

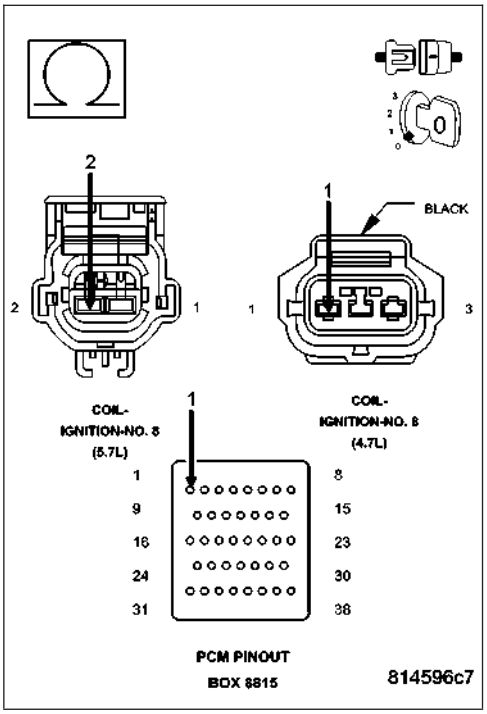
16. (K98) COIL CONTROL NO.8 CIRCUIT

Turn the ignition off.

Disconnect the C1 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Check the (K98) Coil Control No.8 circuit for an open, short to ground, and short to voltage.



Was a problem found with the (K98) Coil Control No.8 circuit?

Yes >> Repair the (K98) Coil Control No.8 circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 17

17. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

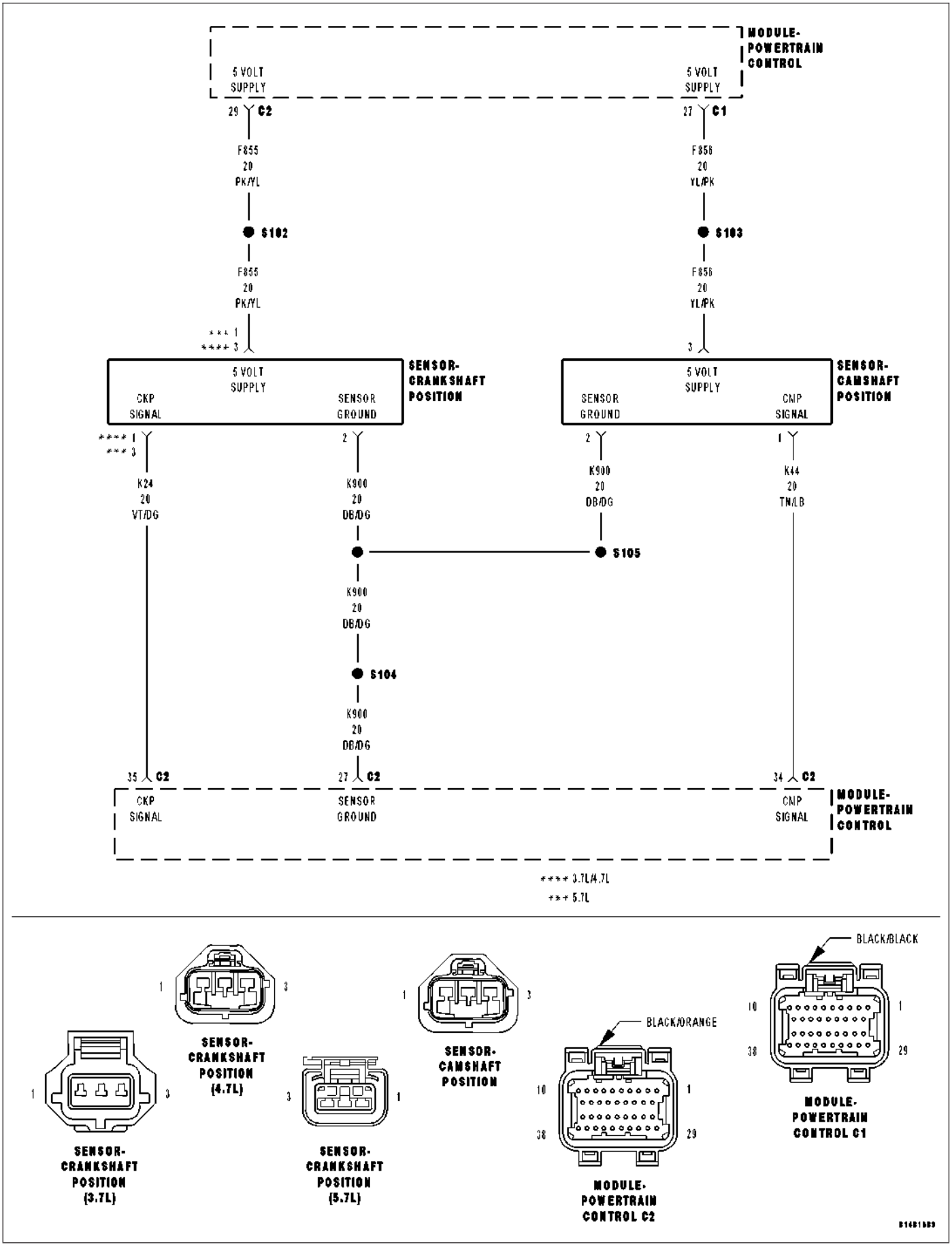
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0315-NO CRANK SENSOR LEARNED



P0315-NO CRANK SENSOR LEARNED (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Under closed throttle decel and A/C off. ECT above 75°C (167°F). Engine start time is greater than 50 seconds.
- **Set Condition:**
  One of the CKP sensor target windows has more than 2.86% variance from the reference. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
TONE WHEEL/PULSE RING
WIRE HARNESS
CRANKSHAFT POSITION SENSOR

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, clear DTCs, PCM battery disconnect to reset the PCM.

Start the engine.

If the MIL has not yet illuminated, test drive the vehicle to try to get the code to reset.

Does the code reset while cranking or during the test drive?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0315-NO CRANK SENSOR LEARNED (CONTINUED)

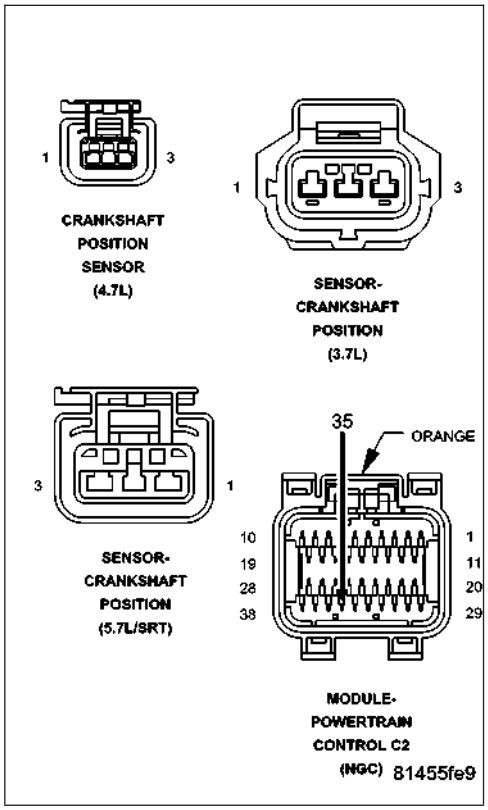
2. WIRE HARNESS INSPECTION

Turn the ignition off.

Visually inspect the CKP wire harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the CKP wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Make sure the Crankshaft Position Sensor is properly installed and the mounting bolt(s) are torqued to the proper specification.



Were any of the above conditions present?

Yes >> Repair as necessary
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

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3. TONE WHEEL/FLEX PLATE INSPECTION

Remove the Crankshaft Position Sensor.

Inspect the Tone Wheel/Flex Plate slots for damage, foreign material, or excessive movement.

Were any problems found?

Yes >> Repair or replace the Tone Wheel/Flex Plate as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

---

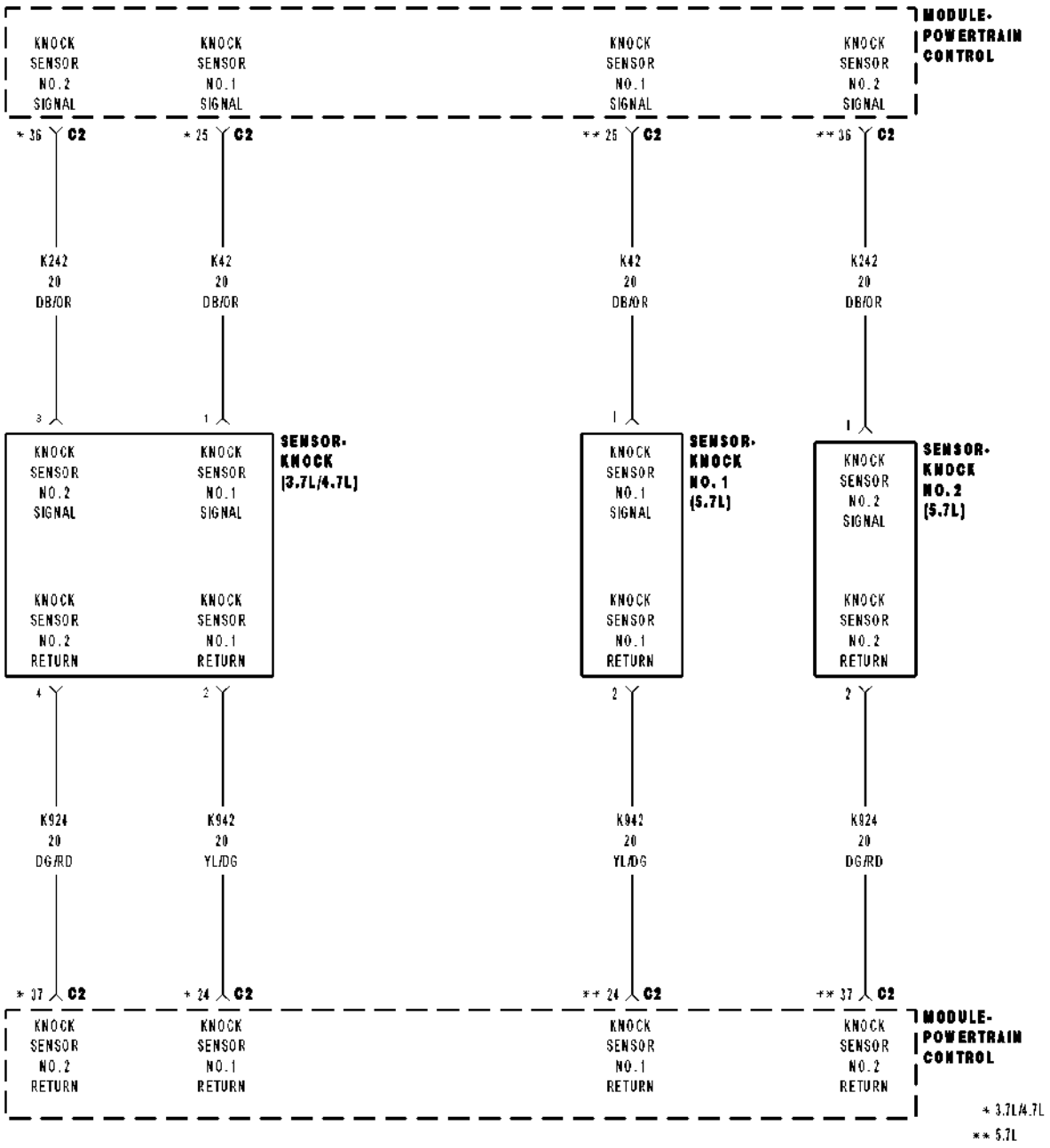
4. CRANKSHAFT POSITION SENSOR

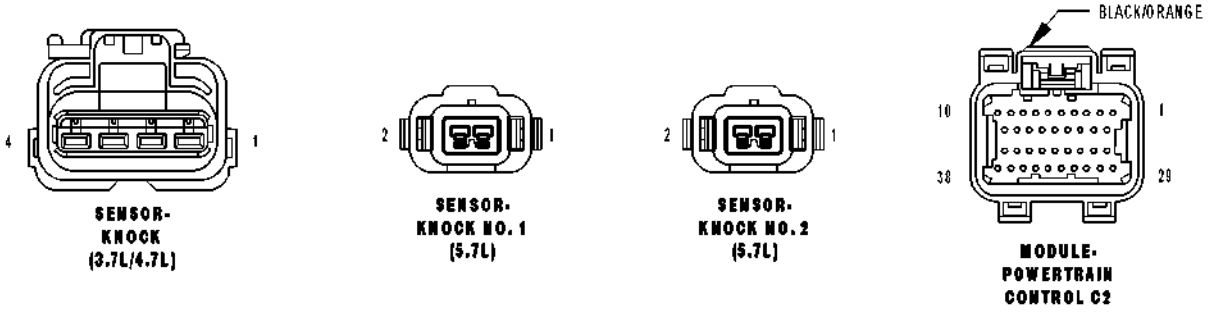
If there are no possible causes remaining, view repair.

Repair

Replace the Crankshaft Position Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0325-KNOCK SENSOR 1 CIRCUIT





P0325-KNOCK SENSOR 1 CIRCUIT (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Engine running.
- **Set Condition:**
  The Knock Sensor circuit voltage falls below a minimum value at idle or deceleration. The minimum value is from a look-up table internal to the PCM and is based on engine RPM. DTC will also set if the sensor voltage goes above 5.0 volts. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K42) KNOCK SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K42) KNOCK SENSOR NO.1 SIGNAL CIRCUIT OPEN
(K942) KNOCK SENSOR NO.1 RETURN CIRCUIT OPEN
(K42) KNOCK SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO THE (K942) KNOCK SENSOR NO.1 RETURN CIRCUIT
(K42) KNOCK SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO GROUND
KNOCK SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0325-KNOCK SENSOR 1 CIRCUIT (CONTINUED)

2. (K42) KNOCK SENSOR NO.1 SIGNAL SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

Disconnect the Knock Sensor harness connector.

Disconnect the C2 PCM harness connector.

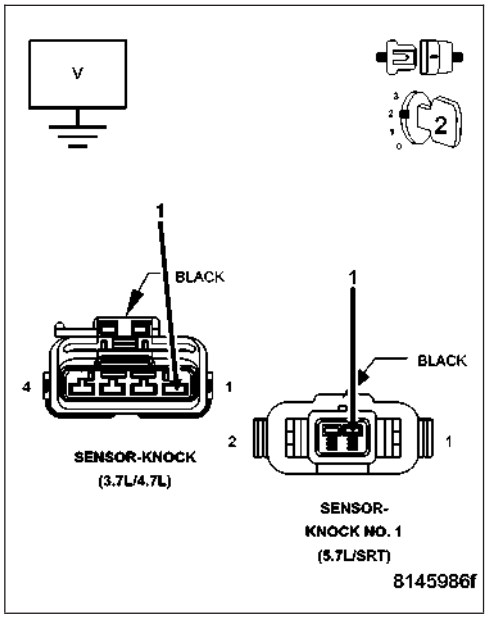
Ignition on, engine not running.

Measure the voltage on the (K42) Knock Sensor No.1 Signal circuit in the Knock Sensor harness connector.

Is the voltage above 2.0 volts?

Yes >> Repair the short to battery voltage in the (K42) Knock Sensor No.1 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3



3. (K42) KNOCK SENSOR NO.1 SIGNAL CIRCUIT OPEN

Turn the ignition off.

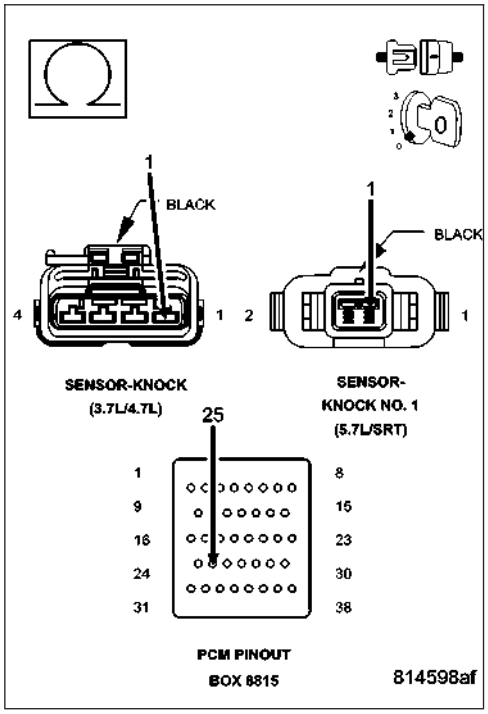
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K42) Knock Sensor No.1 Signal circuit from the Knock Sensor harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 4

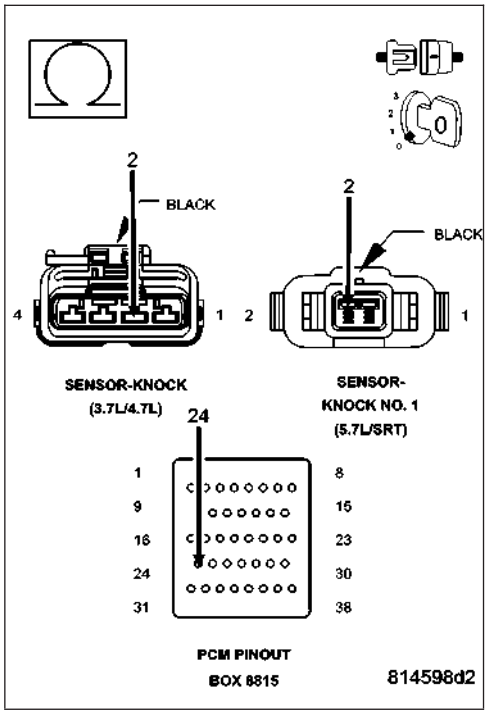
No >> Repair the open in the (K42) Knock Sensor No.1 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P0325-KNOCK SENSOR 1 CIRCUIT (CONTINUED)

4. (K942) KNOCK SENSOR NO.1 RETURN CIRCUIT OPEN

Measure the resistance of the (K942) Knock Sensor No.1 Return circuit from the Knock Sensor harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

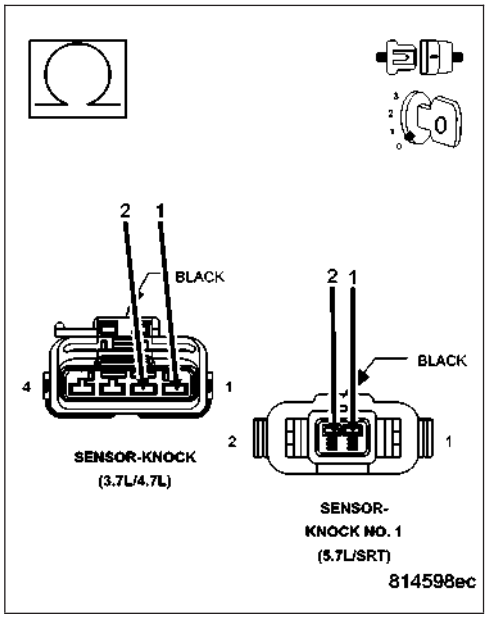
Yes >> Go To 5

No >> Repair the open in the (K942) Knock Sensor No.1 Return circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

5. (K42) KNOCK SENSOR NO.1 SIGNAL SHORTED TO THE (K942) KNOCK SENSOR NO.1 RETURN CIRCUIT

Measure the resistance between the (K42) Knock Sensor No.1 Signal circuit and the (K942) Knock Sensor No.1 Return circuit in the Knock Sensor harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short between the (K42) Knock Sensor No.1 Signal circuit and the (K942) Knock Sensor No.1 Return circuit.

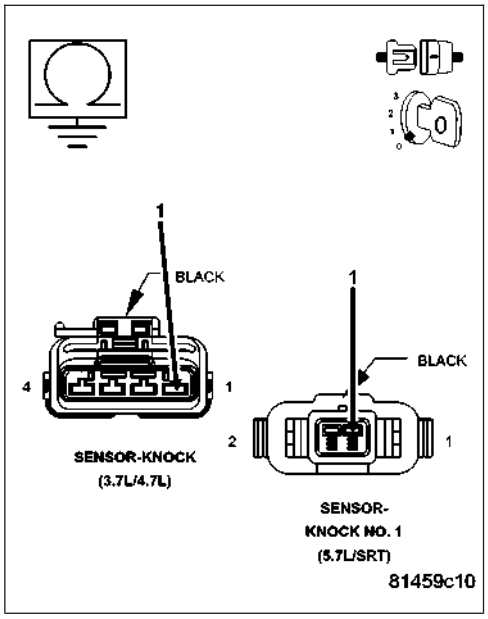
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6

P0325-KNOCK SENSOR 1 CIRCUIT (CONTINUED)

6. (K42) KNOCK SENSOR NO.1 SIGNAL SHORTED TO GROUND

Measure the resistance between ground and the (K42) Knock Sensor No.1 Signal circuit in the Knock Sensor harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K42) Knock Sensor No.1 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 7

7. KNOCK SENSOR

Replace the Knock Sensor.
Ignition on, engine not running.
With the scan tool, erase DTC.
Attempt to operate the vehicle using the information noted in the Freeze Frame.
With the scan tool, read DTCs.

Does the scan tool display the DTC that was previously erased?

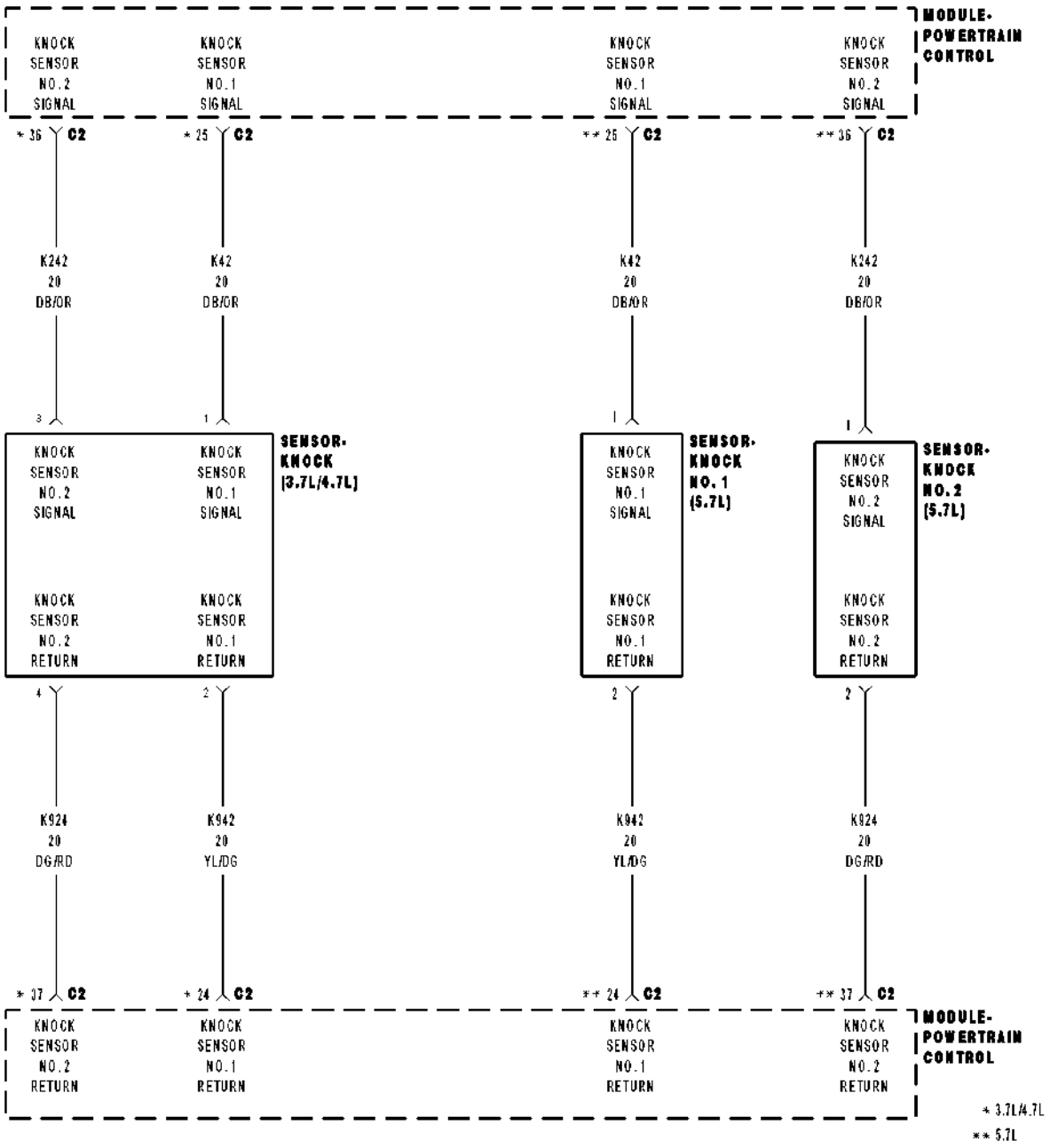
Yes >>

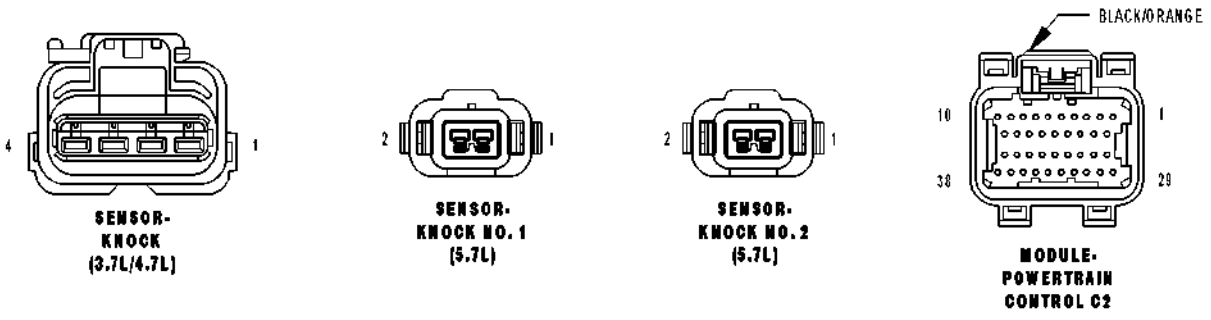
NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary. Replace and program the Powertrain Control Module per Service Information.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Test Complete.

P0330-KNOCK SENSOR 2 CIRCUIT





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P0330-KNOCK SENSOR 2 CIRCUIT (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Engine running
- **Set Condition:**The Knock Sensor circuit voltage falls below a minimum value at idle or deceleration. The minimum value is from a look-up table internal to the PCM and is based on engine RPM. DTC well also set if the sensor voltage goes above 5.0 volts. One Trip Fault. Three good trips to turn off the MIL. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K242) KNOCK SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K242) KNOCK SENSOR NO.2 SIGNAL CIRCUIT OPEN
(K924) KNOCK SENSOR NO.2 RETURN CIRCUIT OPEN
(K242) KNOCK SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO THE (K924) KNOCK SENSOR NO.2 RETURN CIRCUIT
(K242) KNOCK SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO GROUND
KNOCK SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0330-KNOCK SENSOR 2 CIRCUIT (CONTINUED)

2. (K242) KNOCK SENSOR NO.2 SIGNAL SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

Disconnect the No.2 Knock Sensor harness connector.

Disconnect the C2 PCM harness connector.

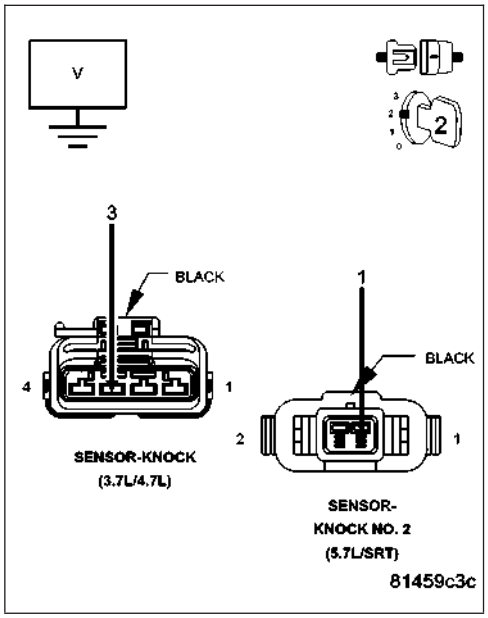
Ignition on, engine not running.

Measure the voltage on the (K242) Knock Sensor No.2 Signal circuit in the Knock Sensor harness connector.

Is the voltage above 2.0 volts?

Yes >> Repair the short to battery voltage in the (K242) Knock Sensor No.2 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3



3. (K242) KNOCK SENSOR NO.2 SIGNAL CIRCUIT OPEN

Turn the ignition off.

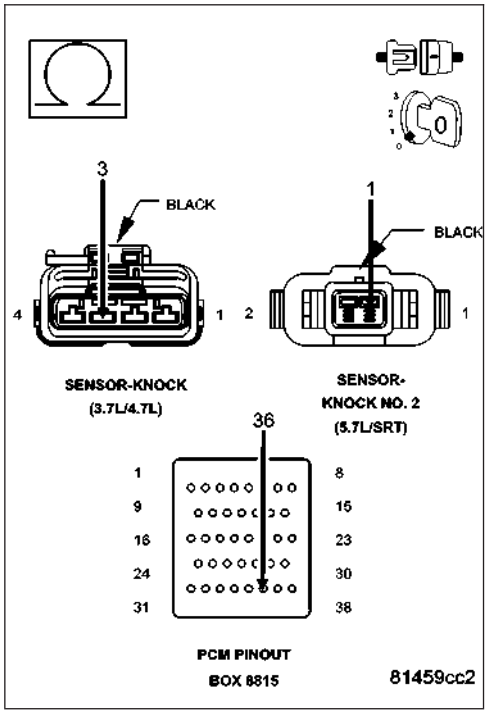
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K242) Knock Sensor No.2 Signal circuit from the Knock Sensor harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 4

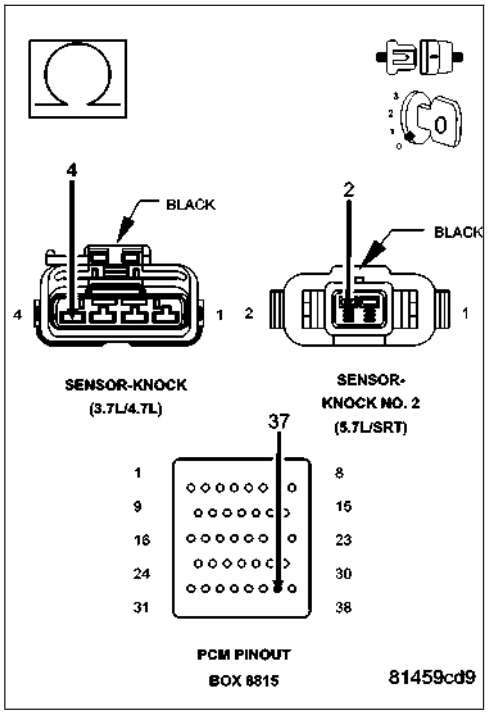
No >> Repair the open in the (K242) Knock Sensor No.2 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P0330-KNOCK SENSOR 2 CIRCUIT (CONTINUED)

4. (K924) KNOCK SENSOR NO.2 RETURN CIRCUIT OPEN

Measure the resistance of the (K924) Knock Sensor No.2 Return circuit from the Knock Sensor harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

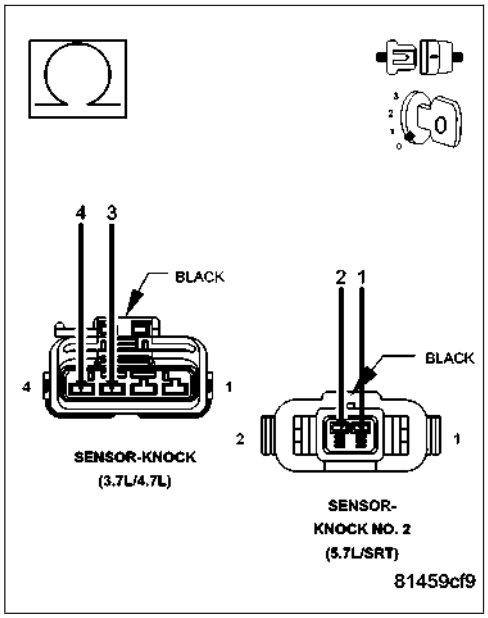
Yes >> Go To 5

No >> Repair the open in the (K924) Knock Sensor No.2 Return circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

5. (K242) KNOCK SENSOR NO.2 SIGNAL SHORTED TO THE (K924) KNOCK SENSOR NO.2 RETURN CIRCUIT

Measure the resistance between the (K242) Knock Sensor No.2 Signal circuit and the (K924) Knock Sensor No.2 Return circuit in the Knock Sensor harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short between the (K242) Knock Sensor No.2 Signal circuit and the (K924) Knock Sensor No.2 Return circuit.

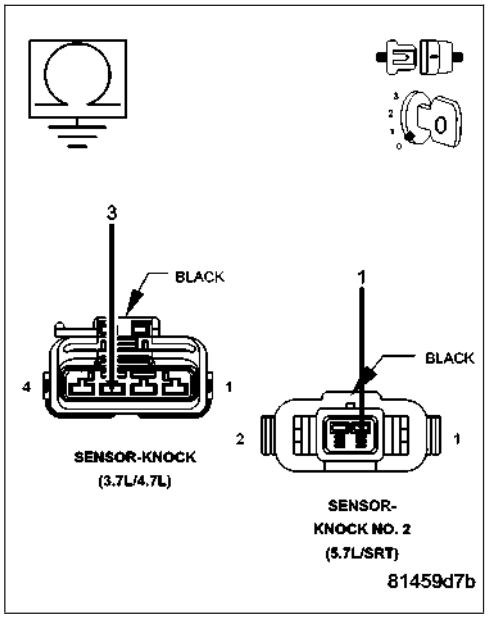
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6

P0330-KNOCK SENSOR 2 CIRCUIT (CONTINUED)

6. (K242) KNOCK SENSOR NO.2 SIGNAL SHORTED TO GROUND

Measure the resistance between ground and the (K242) Knock Sensor No.2 Signal circuit in the Knock Sensor harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K242) Knock Sensor No.2 Signal circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 7

---

7. KNOCK SENSOR

Replace the Knock Sensor.

Ignition on, engine not running.

With the scan tool, erase DTC.

Attempt to operate the vehicle using the information noted in the Freeze Frame.

With the scan tool, read DTCs.

Does the scan tool display the DTC that was previously erased?

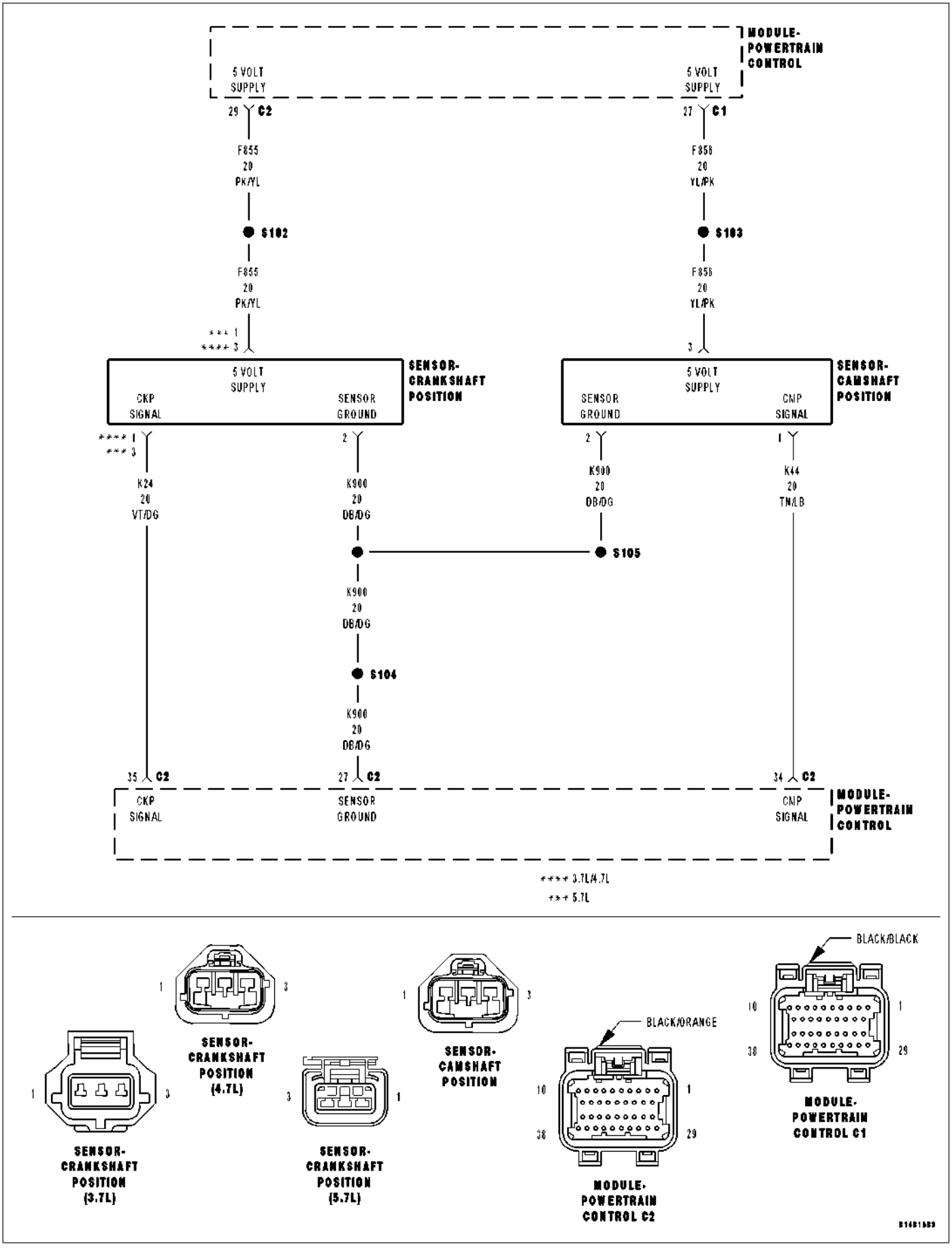
Yes >>

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary. Replace and program the Powertrain Control Module per Service Information.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Test Complete.

P0335-CRANKSHAFT POSITION SENSOR CIRCUIT



P0335-CRANKSHAFT POSITION SENSOR CIRCUIT (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Engine cranking.
- **Set Condition:**
  No CKP signal is present during engine cranking, and at least 8 camshaft position sensor signals have occurred. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO BATTERY VOLTAGE
(F855) 5-VOLT SUPPLY CIRCUIT OPEN
(F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K24) CKP SIGNAL CIRCUIT OPEN
(K24) CKP SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K24) CKP SIGNAL CIRCUIT SHORTED GROUND
(K24) CKP SIGNAL CIRCUIT SHORTED TO THE (F855) 5-VOLT SUPPLY CIRCUIT
(K900) SENSOR GROUND CIRCUIT OPEN
CRANKSHAFT POSITION SENSOR
CAMSHAFT POSITION SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Crank the engine.
Ignition on, engine not running.
With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Go To 14

P0335-CRANKSHAFT POSITION SENSOR CIRCUIT (CONTINUED)

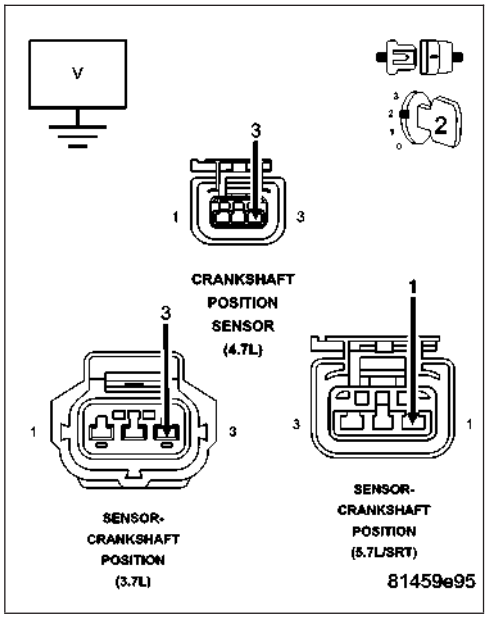
2. (F855) 5-VOLT SUPPLY CIRCUIT

Turn the ignition off.

Disconnect the CKP Sensor harness connector.

Ignition on, engine not running.

Measure the voltage on the (F855) 5-volt Supply circuit in the CKP Sensor harness connector.



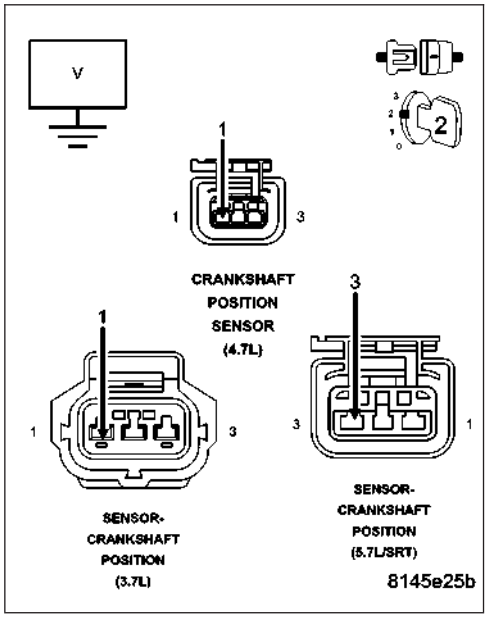
Is the voltage between 4.5 and 5.2 volts?

Yes >> Go To 3

No >> Go To 10

3. (K24) CKP SIGNAL CIRCUIT

Measure the voltage on the (K24) CKP Signal circuit in the CKP Sensor harness connector.



Is the voltage between 4.5 and 5.0 volts?

Yes >> Go To 4

No >> Go To 7

P0335-CRANKSHAFT POSITION SENSOR CIRCUIT (CONTINUED)

4. (K900) SENSOR GROUND CIRCUIT OPEN

Turn the ignition off.

Disconnect the C2 PCM harness connector.

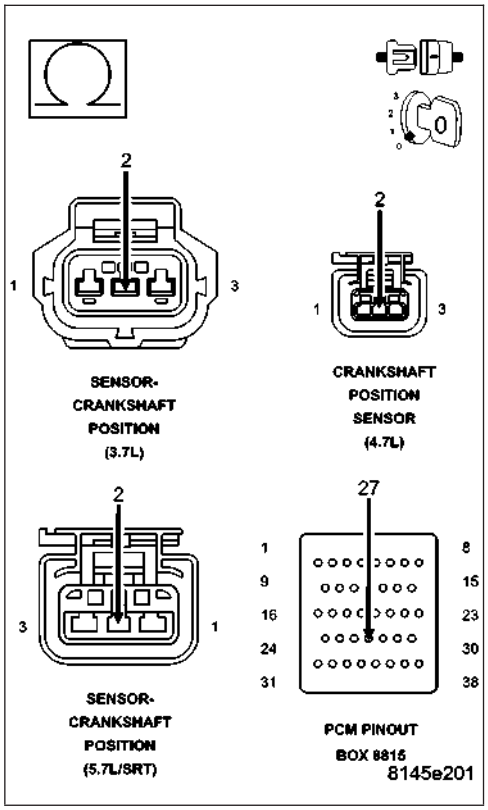
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K900) Sensor ground circuit from the CKP Sensor harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 5

No >> Repair the open in the (K900) Sensor ground circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



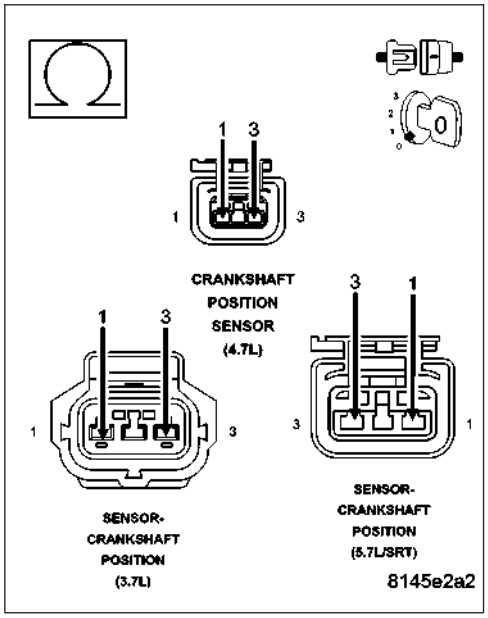
5. (K24) CKP SIGNAL CIRCUIT SHORTED TO THE (F855) 5-VOLT SUPPLY CIRCUIT

Measure the resistance between the (K24) CKP Signal circuit and the (F855) 5-volt Supply circuit in the CKP Sensor harness connector.

Is the resistance below 5.0 ohms?

Yes >> Repair the short between the (K24) CKP Signal circuit and the (F855) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6



P0335-CRANKSHAFT POSITION SENSOR CIRCUIT (CONTINUED)

6. CRANKSHAFT POSITION SENSOR

NOTE: Inspect the slots on the flywheel for damage. If a problem is found repair as necessary.

If there are no possible causes remaining, view repair.

Repair

Replace the Crankshaft Position Sensor.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

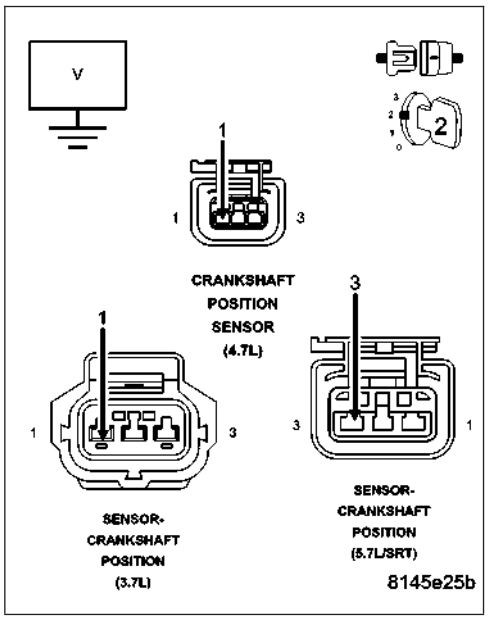
7. (K24) CKP SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

Disconnect the C2 PCM harness connector.

Ignition on, engine not running.

Measure the voltage on the (K24) CKP Signal circuit in the CKP Sensor harness connector.



Is the voltage above 0 volts?

Yes >> Repair the short to battery voltage in the (K24) CKP Signal circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8

P0335-CRANKSHAFT POSITION SENSOR CIRCUIT (CONTINUED)

8. (K24) CKP SIGNAL CIRCUIT OPEN

Turn the ignition off.

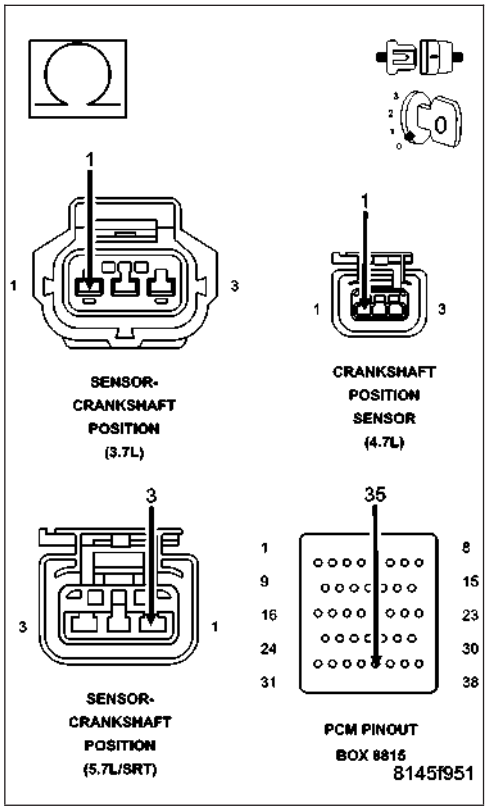
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K24) CKP Signal circuit from the CKP Sensor harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 9

No >> Repair the open in the (K24) CKP Signal circuit. Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



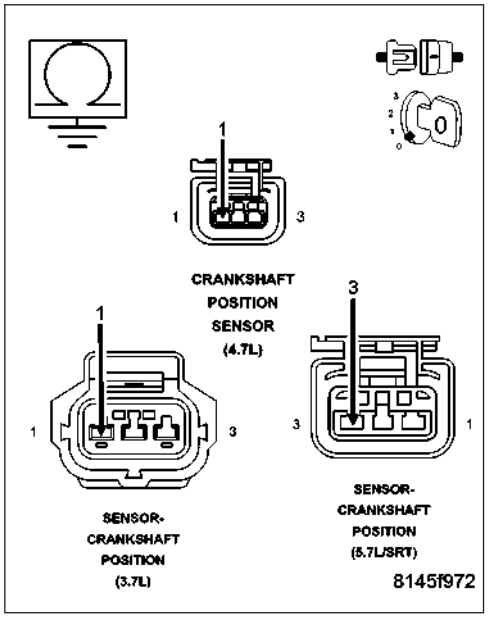
9. (K24) CKP SIGNAL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K24) CKP Signal circuit in the CKP Sensor harness connector.

Is the resistance below 5.0 ohms?

Yes >> Repair the short to ground in the (K24) CKP Signal circuit. Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 13



P0335-CRANKSHAFT POSITION SENSOR CIRCUIT (CONTINUED)

10. (F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

Disconnect the C2 PCM harness connector.

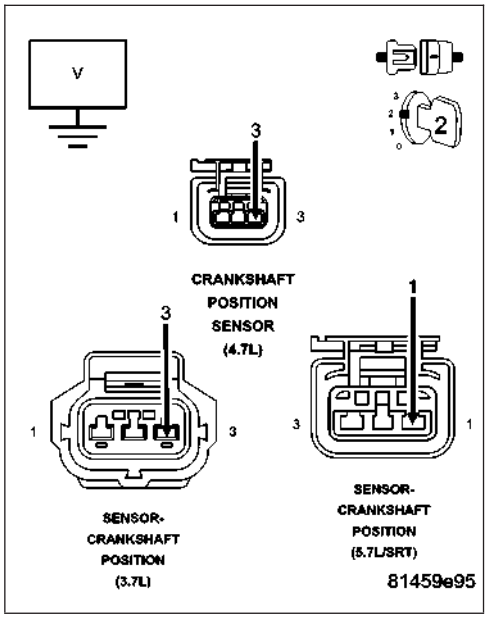
Ignition on, engine not running.

Measure the voltage on the (F855) 5-volt Supply circuit in the CKP Sensor harness connector.

Is the voltage above 0 volts?

Yes >> Repair the short to battery voltage in the (F855) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 11



11. (F855) 5-VOLT SUPPLY CIRCUIT OPEN

Turn the ignition off.

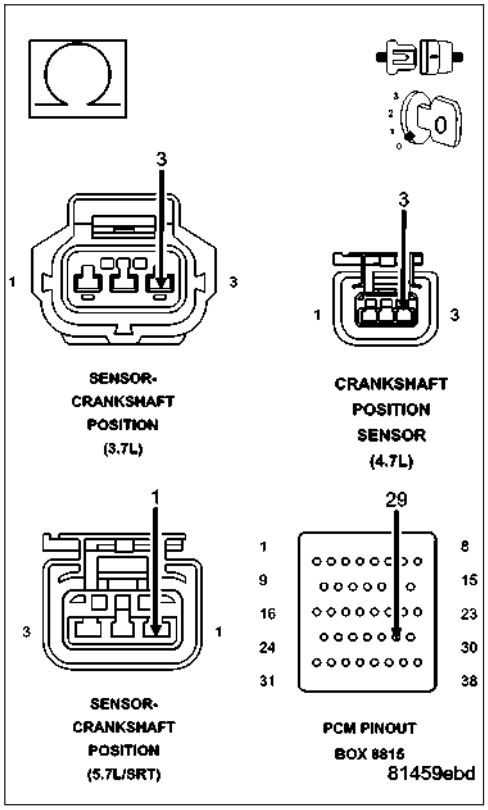
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (F855) 5-volt Supply circuit from the CKP Sensor harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 12

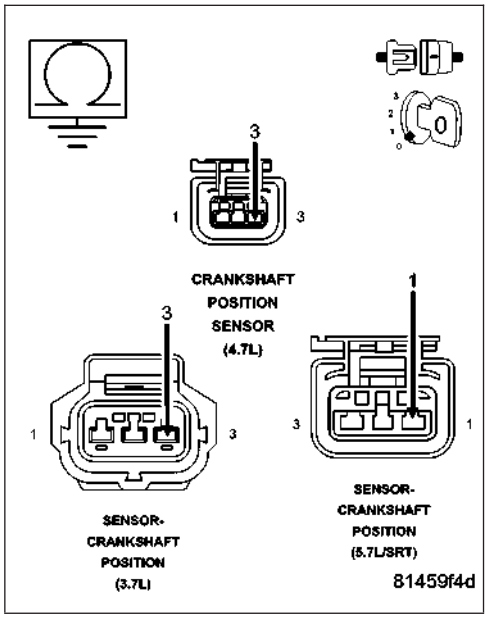
No >> Repair the open in the (F855) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P0335-CRANKSHAFT POSITION SENSOR CIRCUIT (CONTINUED)

12. (F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (F855) 5-volt Supply circuit in the CKP Sensor harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (F855) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 13

---

13. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0335-CRANKSHAFT POSITION SENSOR CIRCUIT (CONTINUED)

14. ERRATIC CKP SENSOR SIGNAL

Turn the ignition off.

With a lab scope probe and the Miller special tool #6801, backprobe the (K24) CKP Signal circuit in the CKP harness connector.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Ignition on, engine not running.

Wiggle the related wire harness and lightly tap on the Crank Position Sensor.

Observe the lab scope screen.

Look for any pulses generated by the CKP Sensor.

Allow the engine to idle.

Observe the lab scope screen.

Did the CKP Sensor generate any erratic pulses?

Yes >> Inspect the related wire harness and replace the Crankshaft Position Sensor if no wiring problems were found.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 15

---

15. ERRATIC CMP SIGNAL

Turn the ignition off.

With a lab scope probe and the Miller special tool #6801, backprobe the (K44) CMP Signal circuit in the CMP harness connector.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Ignition on, engine not running.

Wiggle the related wire harness and lightly tap on the Cam Position Sensor.

Observe the lab scope screen.

Look for any pulses generated by the CMP Sensor.

Allow the engine to idle.

Observe the lab scope screen.

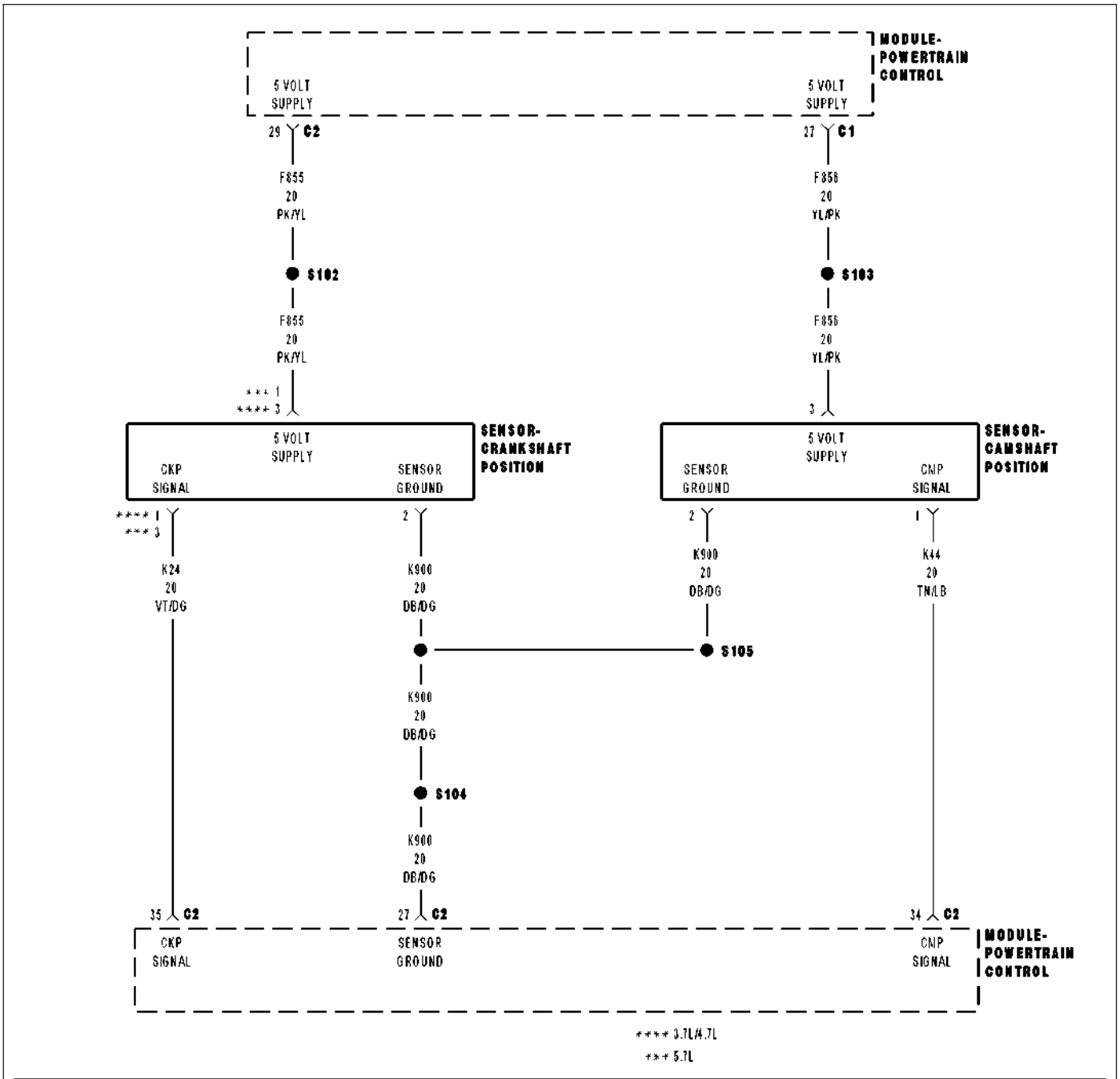
Did the CMP Sensor generate any pulses?

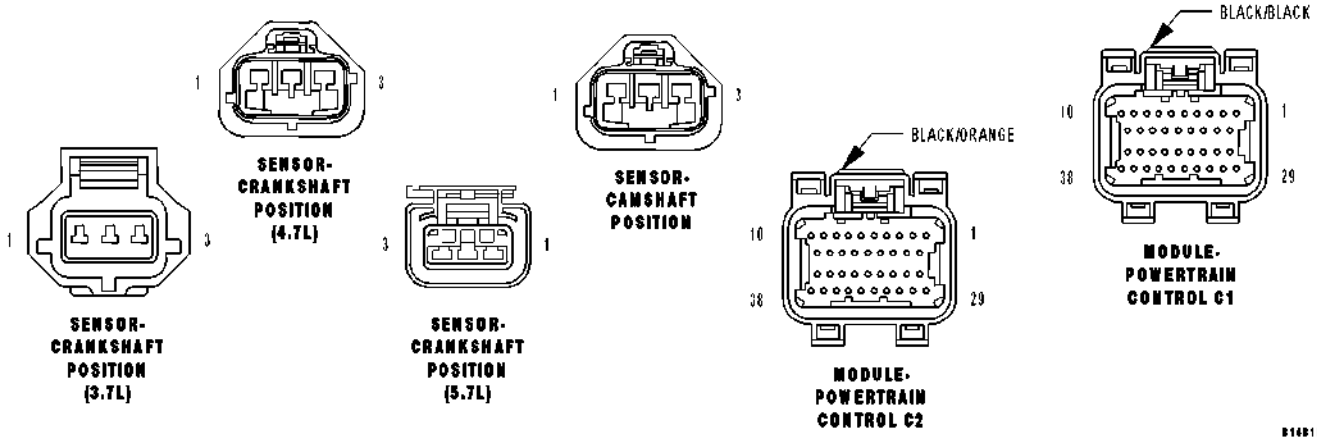
Yes >> Inspect the related wire harness and replace the Camshaft Position Sensor if no wiring problems were found.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Test complete, the conditions that set this DTC are not present at this time.

P0339-CRANKSHAFT POSITION SENSOR INTERMITTENT





P0339-CRANKSHAFT POSITION SENSOR INTERMITTENT (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  While cranking the engine and with the engine running.
- **Set Condition:**
  When the CKP Sensor failure counter reaches 20. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(F855) 5-VOLT SUPPLY CIRCUIT OPEN
(F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K24) CKP SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K24) CKP SIGNAL CIRCUIT OPEN
(K24) CKP SIGNAL CIRCUIT SHORTED TO GROUND
(K24) CKP SIGNAL CIRCUIT SHORTED TO THE (F855) 5-VOLT SUPPLY CIRCUIT
CRANKSHAFT POSITION SENSOR
TONE WHEEL/PULSE RING
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. CHECKING CRANKSHAFT POSITION SENSOR SIGNAL WITH A LAB SCOPE

Turn the ignition off.

With a lab scope probe and the Miller special tool #6801, backprobe the (K24) CKP Signal circuit in the Sensor harness connector.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Ignition on, engine not running.

Observe the lab scope screen.

Start the engine.

Observe the lab scope screen.

Are there any irregular or missing signals?

Yes >> Go To 3

No >> Go To 8

P0339-CRANKSHAFT POSITION SENSOR INTERMITTENT (CONTINUED)

3. WIRE HARNESS INSPECTION

Turn the ignition off.

Visually inspect the related wire harness including the ground circuit. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

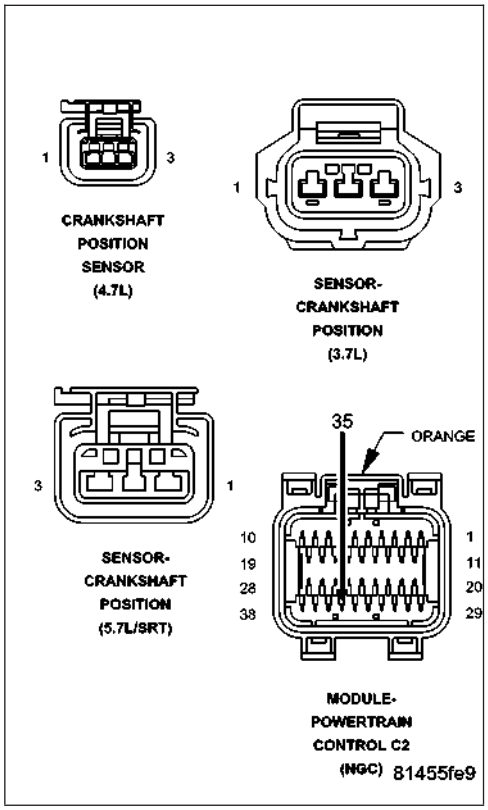
Make sure the Crankshaft Position Sensor and the Camshaft Position Sensor are properly installed and the mounting bolt(s) are torqued to the proper specification.

Refer to any TSBs that may apply.

Were any of the above conditions present?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4



4. (F855) 5-VOLT SUPPLY CIRCUIT OPEN OR SHORTED TO GROUND

Disconnect the CKP Sensor connector.

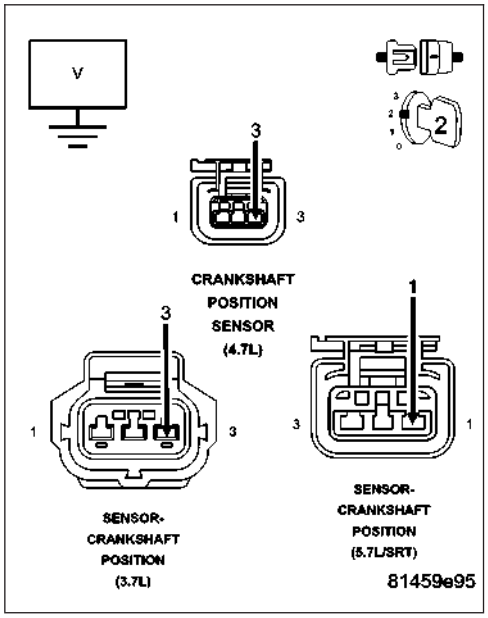
Ignition on, engine not running.

Measure the voltage on the (F855) 5-volt Supply circuit in the Sensor harness connector.

Is the voltage between 4.5 and 5.2 volts?

Yes >> Go To 5

No >> Repair the open or short to ground in the (F855) 5-volt Supply circuit. Use Miller special tool #8815 when checking for an open circuit to prevent PCM harness connector terminal damage.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P0339-CRANKSHAFT POSITION SENSOR INTERMITTENT (CONTINUED)

5. TONE WHEEL/FLEX PLATE INSPECTION

Turn the ignition off.

Carefully disconnect the Negative Battery (Ground) cable.

Remove the Crankshaft Position Sensor.

Inspect the Tone Wheel/Flex Plate slots for damage, foreign material, or excessive movement.

Were any problems found?

Yes >> Repair or replace the Tone Wheel/Flex Plate as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6

---

6. CHECKING CAMSHAFT POSITION SENSOR SIGNAL WITH A LAB SCOPE

Install the CKP Sensor and connect the battery cable.

NOTE: An intermittent condition in the Cam Position Sensor can cause the P0339 to set.
With the a lab scope probe and the Miller special tool #6801, backprobe the (K44) CMP Signal circuit in the Sensor harness connector.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Ignition on, engine not running.

Wiggle the related wire harness and lightly tap on the Cam Position Sensor.

Observe the lab scope screen.

Start the engine.

Observe the lab scope screen.

Are there any irregular or missing signals?

Yes >> Replace the Cam Position Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 7

---

7. CRANKSHAFT POSITION SENSOR

If there are no possible causes remaining, view repair.

Repair

Replace the Crankshaft Position Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0339-CRANKSHAFT POSITION SENSOR INTERMITTENT (CONTINUED)

8. (K24) CKP SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

Disconnect the C2 PCM harness connector.

Disconnect the CKP Sensor harness connector.

Ignition on, engine not running.

Measure the voltage on the (K24) CKP Signal circuit in the Sensor harness connector.

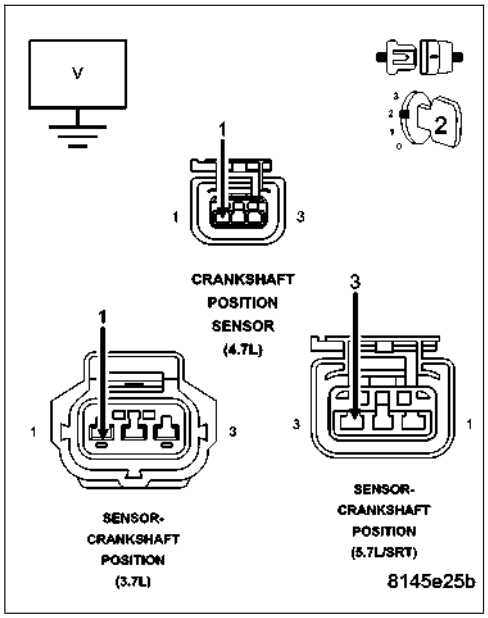
Wiggle the related wire harness while taking this measurement.

Is the voltage above 0 volts?

Yes >> Repair the short to battery voltage in the (K24) CKP Signal circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 9



9. (K24) CKP SIGNAL CIRCUIT OPEN

Turn the ignition off.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance in the (K24) CKP Signal circuit from the CKP harness connector to the appropriate terminal of special tool #8815.

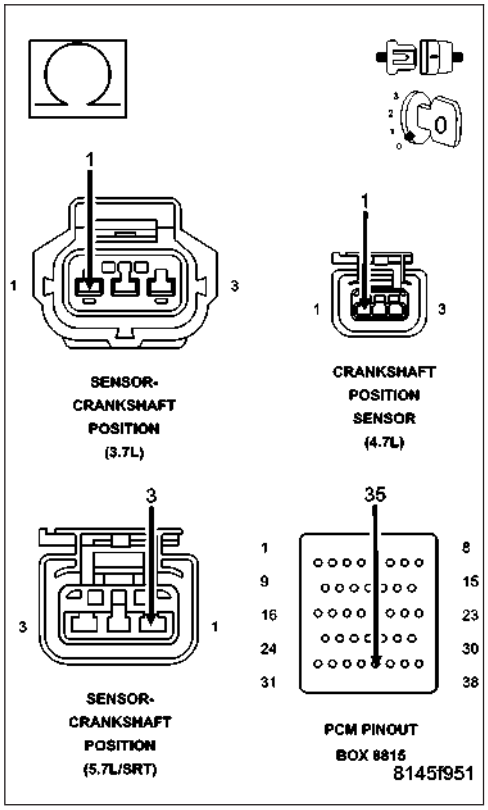
Wiggle the wire harness while taking this measurement.

Is the resistance below 1.0 ohm?

Yes >> Go To 10

No >> Repair the excessive resistance in the (K24) CKP Signal circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P0339-CRANKSHAFT POSITION SENSOR INTERMITTENT (CONTINUED)

10. (K24) CKP SIGNAL CIRCUIT SHORTED TO GROUND

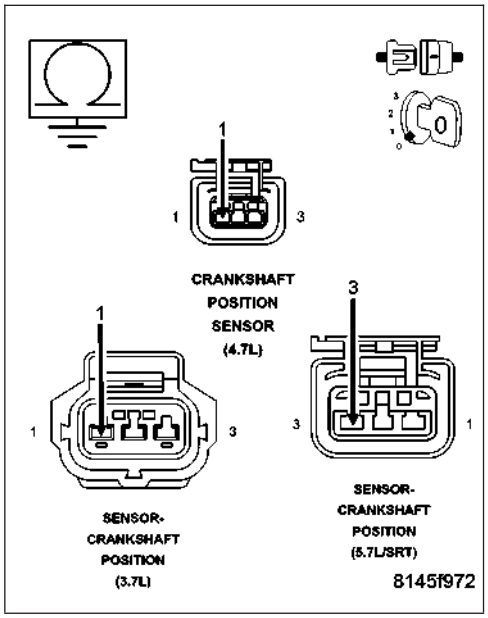
Measure the resistance between ground and the (K24) CKP Signal circuit in the CKP Sensor harness connector.

Wiggle the related wire harness while monitoring the resistance value.

Does the resistance ever go below 100 ohms?

Yes >> Repair the short to ground in the (K24) Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 11



11. (K24) CKP SIGNAL CIRCUIT SHORTED TO THE (F855) 5-VOLT SUPPLY CIRCUIT

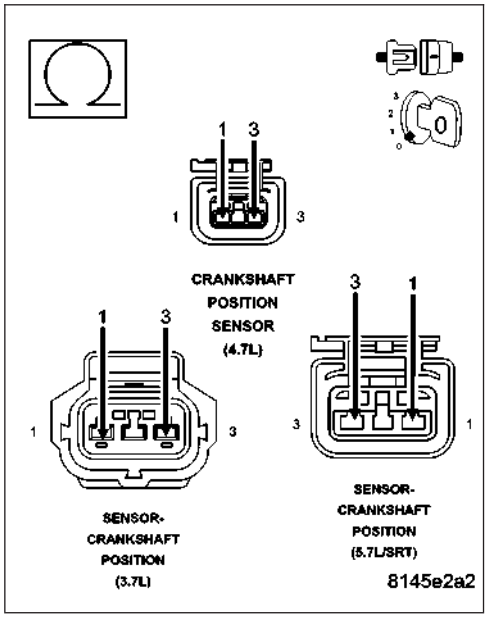
Measure the resistance between the (F855) 5-volt Supply circuit and the (K24) CKP Signal circuit in the CKP harness connector.

Wiggle the related wire harness while taking this measurement.

Is the resistance below 5.0 ohms?

Yes >> Repair the short between the (F855) 5-volt Supply circuit and the (K24) CKP Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 12



P0339-CRANKSHAFT POSITION SENSOR INTERMITTENT (CONTINUED)

12. **PCM**

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

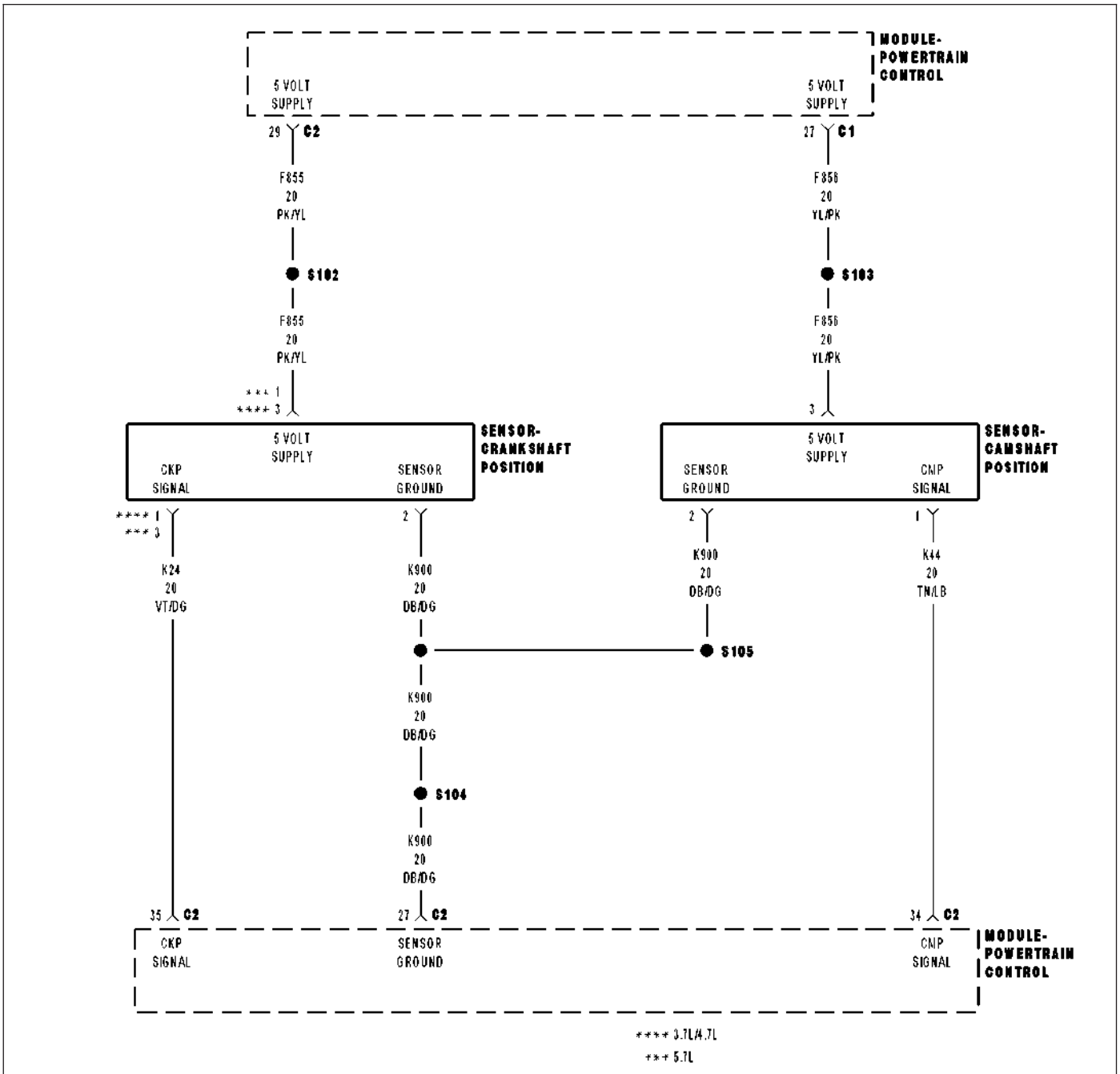
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

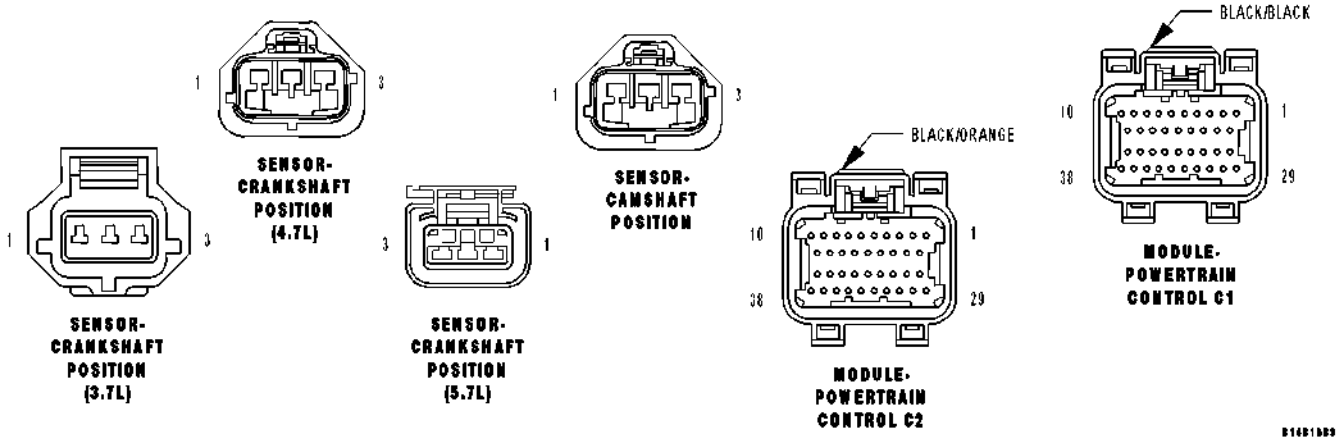
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0340-CAMSHAFT POSITION SENSOR CIRCUIT





P0340-CAMSHAFT POSITION SENSOR CIRCUIT (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  During engine cranking and with the engine running. Battery voltage greater than 10 volts.
- **Set Condition:**
  At least 5 seconds or 2.5 engine revolutions have elapsed with crankshaft position sensor signals present but no camshaft position sensor signal. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO BATTERY VOLTAGE
(F856) 5-VOLT SUPPLY CIRCUIT OPEN
(F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K44) CMP SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K44) CMP SIGNAL CIRCUIT OPEN
(K44) CMP SIGNAL CIRCUIT SHORTED GROUND
(K44) CMP SIGNAL SHORTED TO THE (F856) 5-VOLT SUPPLY CIRCUIT
(K900) SENSOR GROUND CIRCUIT OPEN
CAMSHAFT POSITION SENSOR
CRANKSHAFT POSITION SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Crank the engine.
Ignition on, engine not running.
With a scan tool read the DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Go To 14

P0340-CAMSHAFT POSITION SENSOR CIRCUIT (CONTINUED)

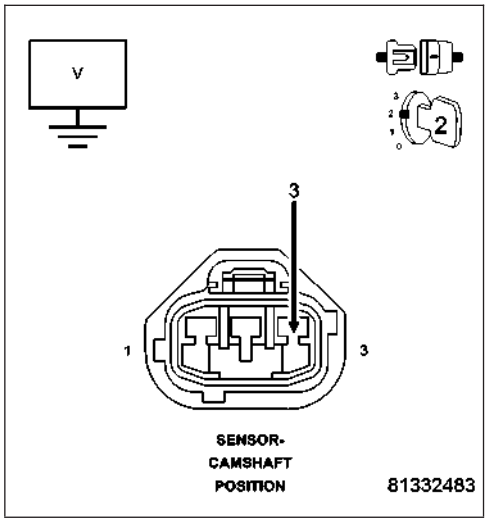
2. (F856) 5-VOLT SUPPLY CIRCUIT

Turn the ignition off.

Disconnect the CMP Sensor harness connector.

Ignition on, engine not running.

Measure the voltage on the (F856) 5-volt Supply circuit in the CMP Sensor harness connector.



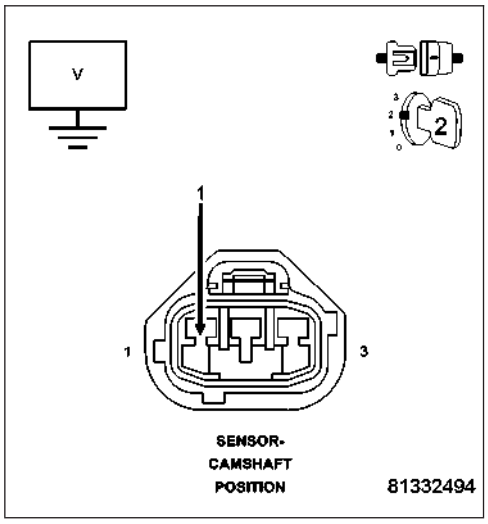
Is the voltage between 4.5 and 5.2 volts?

Yes >> Go To 3

No >> Go To 10

3. (K44) CMP SIGNAL CIRCUIT

Measure the voltage on the (K44) CMP Signal circuit in the CMP Sensor harness connector.



Is the voltage between 4.5 and 5.0 volts?

Yes >> Go To 4

No >> Go To 7

P0340-CAMSHAFT POSITION SENSOR CIRCUIT (CONTINUED)

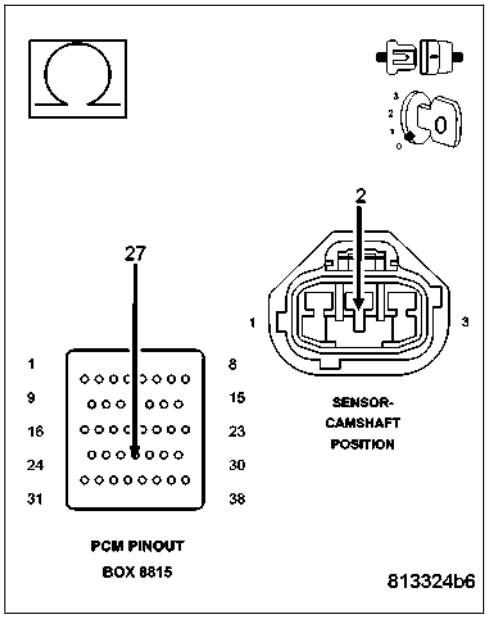
4. (K900) SENSOR GROUND CIRCUIT OPEN

Turn the ignition off.

Disconnect the C2 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K900) Sensor ground circuit from the CMP Sensor harness connector to the appropriate terminal of special tool #8815.



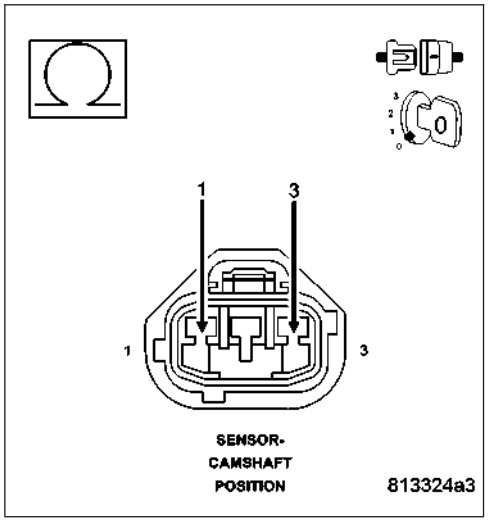
Is the resistance below 5.0 ohms?

Yes >> Go To 5

No >> Repair the open in the (K900) Sensor ground circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

5. (K44) CMP SIGNAL SHORTED TO THE (F856) 5-VOLT SUPPLY CIRCUIT

Measure the resistance between the (K44) CMP Signal circuit and the (F856) 5-volt Supply circuit in the CMP Sensor harness connector.



Is the resistance below 5.0 ohms?

Yes >> Repair the short between the (K44) CMP Signal circuit and the (F856) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6

6. CAMSHAFT POSITION SENSOR

NOTE: Inspect the Camshaft sprocket for damage per the Service Information. If a problem is found repair as necessary.

If there are no possible causes remaining, view repair.

Repair

Replace the Camshaft Position Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0340-CAMSHAFT POSITION SENSOR CIRCUIT (CONTINUED)

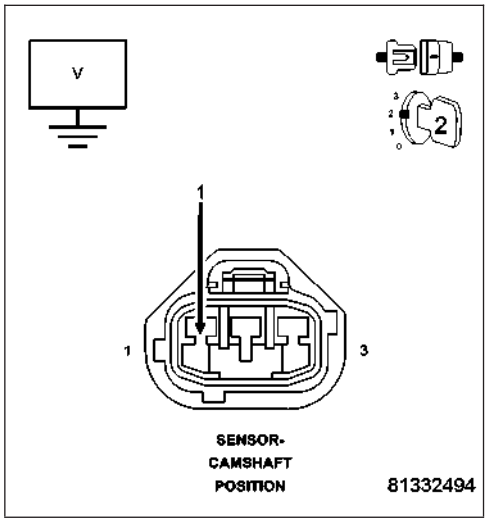
7. (K44) CMP SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

Disconnect the C2 PCM harness connector.

Ignition on, engine not running.

Measure the voltage on the (K44) CMP Signal circuit in the CMP Sensor harness connector.



Is the voltage above 0 volts?

Yes >> Repair the short to battery voltage in the (K44) CMP Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

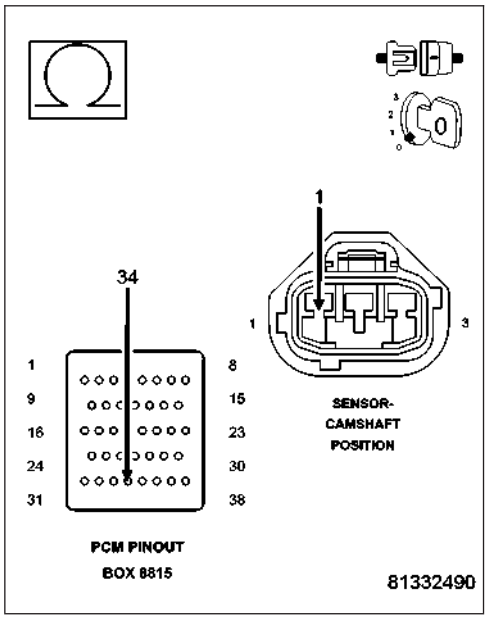
No >> Go To 8

8. (K44) CMP SIGNAL CIRCUIT OPEN

Turn the ignition off.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K44) CMP Signal circuit from the CMP Sensor harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

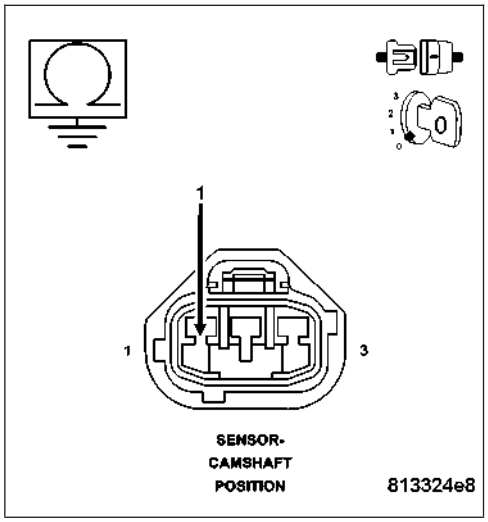
Yes >> Go To 9

No >> Repair the open in the (K44) CMP Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0340-CAMSHAFT POSITION SENSOR CIRCUIT (CONTINUED)

9. (K44) CMP SIGNAL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K44) CMP Signal circuit in the CMP Sensor harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K44) CMP Signal circuit
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 10

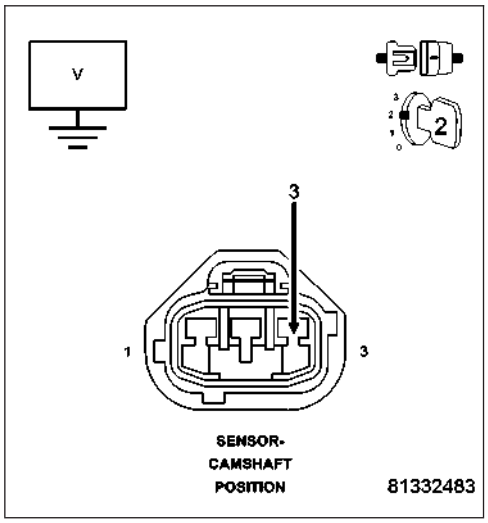
10. (F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

Disconnect the C1 PCM harness connector.

Ignition on, engine not running.

Measure the voltage on the (F856) 5-volt Supply circuit in the CMP Sensor harness connector.



Is the voltage above 0 volts?

Yes >> Repair the short to battery voltage in the (F856) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 11

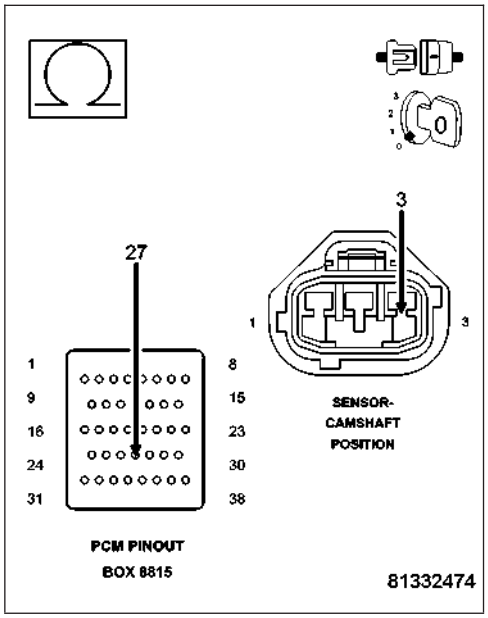
P0340-CAMSHAFT POSITION SENSOR CIRCUIT (CONTINUED)

11. (F856) 5-VOLT SUPPLY CIRCUIT OPEN

Turn the ignition off.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (F856) 5-volt Supply circuit between the CMP Sensor harness connector to the appropriate terminal of special tool #8815.



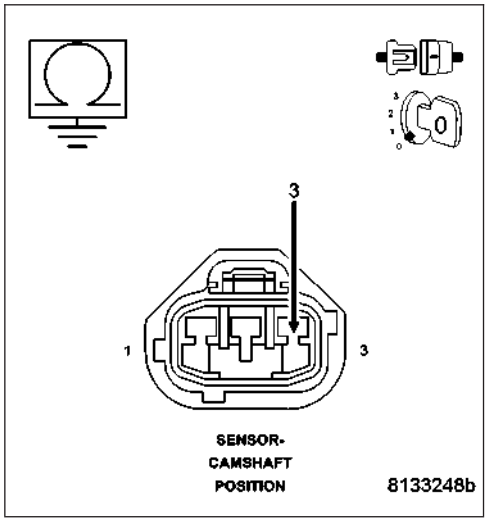
Is the resistance below 5.0 ohms?

Yes >> Go To 12

No >> Repair the open in the (F856) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

12. (F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (F856) 5-volt Supply circuit in the CMP Sensor harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (F856) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 13

P0340-CAMSHAFT POSITION SENSOR CIRCUIT (CONTINUED)

13. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

14. ERRATIC CMP SIGNAL

With a lab scope probe and the Miller special tool #6801, back probe the (K44) CMP Signal circuit in the CMP harness connector.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Ignition on, engine not running.

Wiggle the related wire harness and lightly tap the Camshaft Position Sensor.

Observe the lab scope screen.

Allow the engine to idle.

Observe the lab scope screen.

Did the CMP Sensor generate any erratic pulses?

Yes >> Replace the Camshaft Position Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 15

---

15. ERRATIC CKP SIGNAL

Turn the ignition off.

With a lab scope probe and the Miller special tool #6801, backprobe the (K24) CKP Signal circuit in the CKP harness connector.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Ignition on, engine not running.

Wiggle the related wire harness and lightly tap on the Crankshaft Position Sensor.

Observe the lab scope screen.

Allow the engine to idle.

Observe the lab scope screen.

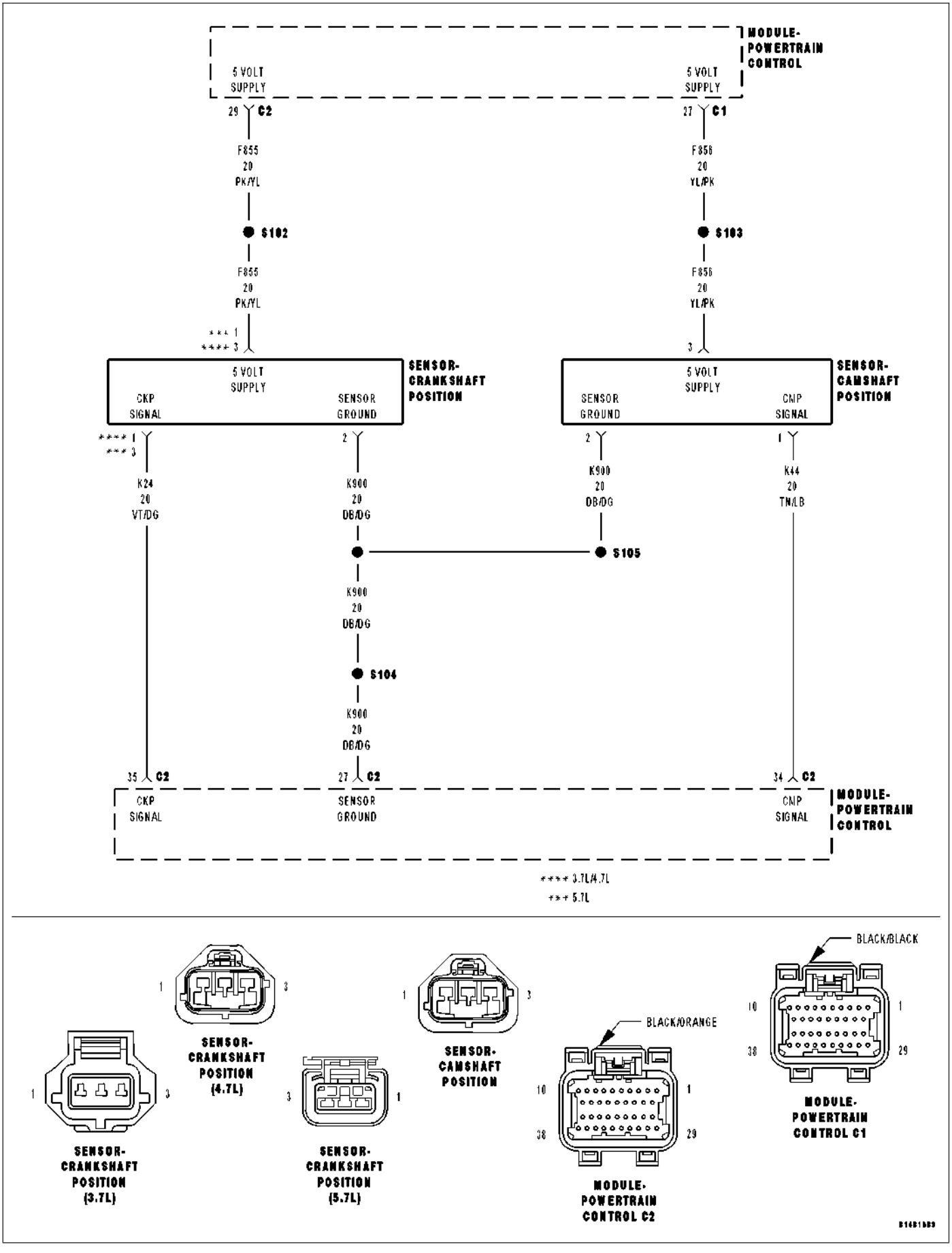
Did the CKP Sensor generate any erratic pulses?

Yes >> Replace the Crankshaft Position Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Test complete, the conditions that set this DTC are not present at this time

---

P0344-CAMSHAFT POSITION SENSOR INTERMITTENT



P0344-CAMSHAFT POSITION SENSOR INTERMITTENT (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  While cranking the engine and engine running.
- **Set Condition:**
  When the failure counter reaches 20. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(F856) 5-VOLT SUPPLY CIRCUIT OPEN
(F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K44) CMP SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K44) CMP SIGNAL CIRCUIT OPEN
(K44) CMP SIGNAL CIRCUIT SHORTED TO GROUND
(K44) CMP SIGNAL CIRCUIT SHORTED TO THE (F856) 5-VOLT SUPPLY CIRCUIT
TONE WHEEL/PULSE RING
CAMSHAFT POSITION SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. CHECKING CAMSHAFT POSITION SENSOR SIGNAL WITH A LAB SCOPE

Turn the ignition off.

With a lab scope probe and the Miller special tool #6801, backprobe the (K44) CMP Signal circuit in the CMP harness connector.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Ignition on, engine not running.

Observe the lab scope screen.

Start the engine.

Observe the lab scope screen.

Are there any irregular or missing signals?

Yes >> Go To 3

No >> Go To 8

P0344-CAMSHAFT POSITION SENSOR INTERMITTENT (CONTINUED)

3. WIRE HARNESS INSPECTION

Turn the ignition off.

Visually inspect the related wire harness including the ground circuit. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

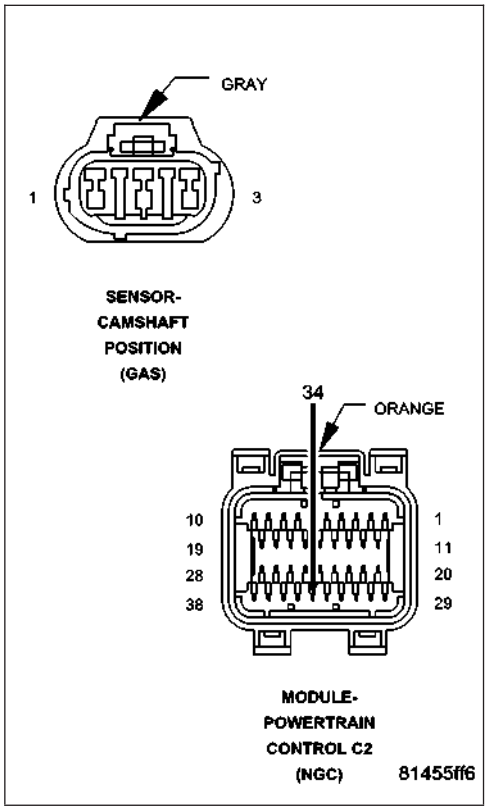
Make sure the Crankshaft Position Sensor and the Camshaft Position Sensor are properly installed and the mounting bolt(s) are torqued to the proper specification.

Refer to any TSBs that may apply.

Were any of the above conditions present?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4



4. (F856) 5-VOLT SUPPLY CIRCUIT OPEN OR SHORTED TO GROUND

Disconnect the CMP Sensor connector.

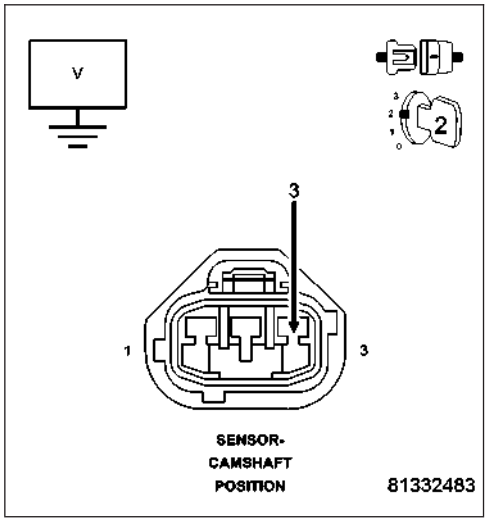
Ignition on, engine not running.

Measure the voltage on the (F856) 5-volt Supply circuit in the CMP harness connector.

Is the voltage between 4.5 and 5.2 volts?

Yes >> Go To 5

No >> Repair the open or short to ground in the (F856) 5-volt Supply circuit. Use Miller special tool #8815 when checking for an open circuit to prevent PCM harness connector terminal damage.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P0344-CAMSHAFT POSITION SENSOR INTERMITTENT (CONTINUED)

5. TONE WHEEL/PULSE RING INSPECTION

Turn the ignition off.

Carefully disconnect the Battery Ground cable.

Remove the Camshaft Position Sensor.

Inspect the Tone Wheel/Pulse Ring for damage, foreign material, or excessive movement.

Were any problems found?

Yes >> Repair or replace the Tone Wheel/Pulse Ring as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6

---

6. CHECKING CRANKSHAFT POSITION SENSOR SIGNAL WITH A LAB SCOPE

NOTE: An intermittent condition in the Crank Position Sensor can cause the P0344 to set.

Install the CMP Sensor and connect the Battery cable.

With a lab scope probe and the Miller special tool #6801, backprobe the (K24) CKP Signal circuit in the CKP harness connector.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Ignition on, engine not running.

Wiggle the related wire harness and lightly tap on the Crank Position Sensor.

Observe the lab scope screen.

Start the engine.

Observe the lab scope screen.

Are there any irregular or missing signals?

Yes >> Replace the Crank Position Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 7

---

7. CAMSHAFT POSITION SENSOR

If there are no possible causes remaining, view repair.

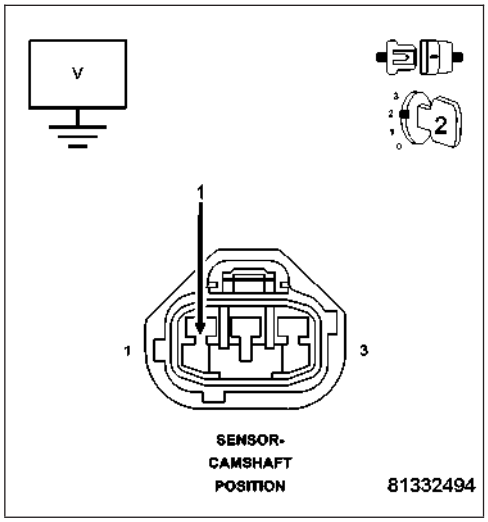
Repair

Replace the Camshaft Position Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0344-CAMSHAFT POSITION SENSOR INTERMITTENT (CONTINUED)

8. (K44) CMP SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.
Disconnect the CMP Sensor connector.
Disconnect the C2 PCM harness connector.
Ignition on, engine not running.
Measure the voltage on the (K44) CMP Signal circuit.
Wiggle the related wire harness while taking this measurement.



Does the voltage ever increase above 0 volts?

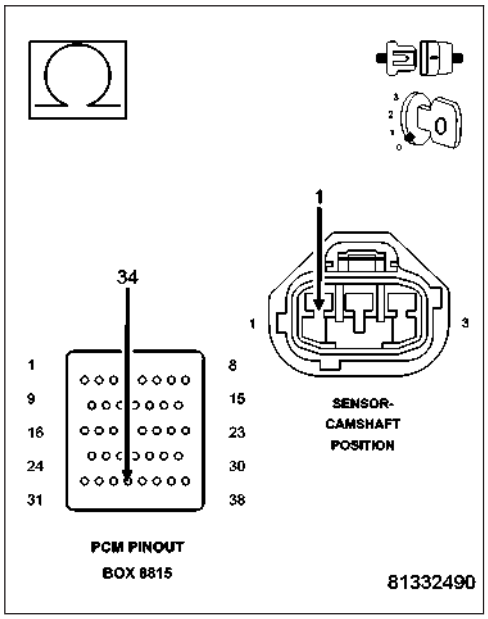
Yes >> Repair the short to battery voltage in the (K44) CMP Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 9

9. (K44) CMP SIGNAL CIRCUIT OPEN

Turn the ignition off.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.
Measure the resistance in the (K44) CMP Signal circuit from the CMP harness connector to the appropriate terminal of special tool #8815.
Wiggle the related wire harness while taking this measurement.



Is the resistance below 5.0 ohms?

Yes >> Go To 10

No >> Repair the excessive resistance in the (K44) CMP Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0344-CAMSHAFT POSITION SENSOR INTERMITTENT (CONTINUED)

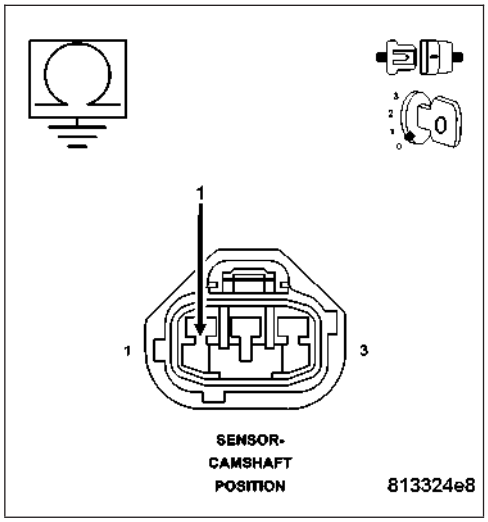
10. (K44) CMP SIGNAL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K44) CMP Signal circuit in the CMP Sensor harness connector.
Wiggle the related wire harness while monitoring the resistance value.

Does the resistance ever go below 100 ohms?

Yes >> Repair the short to ground in the (K44) CMP Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 11



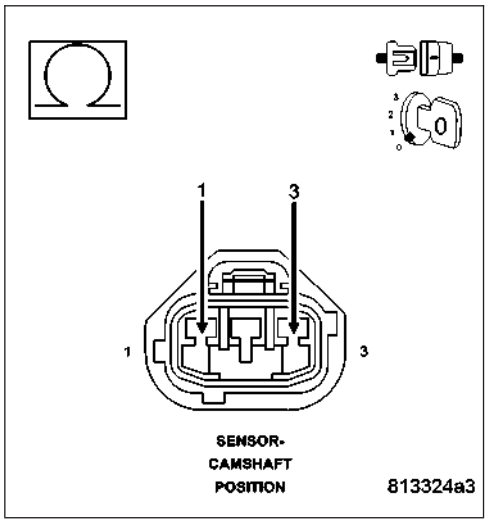
11. (K44) CMP SIGNAL CIRCUIT SHORTED TO THE (F856) 5-VOLT SUPPLY CIRCUIT

Measure the resistance between the (F856) 5-volt Supply circuit and the (K44) CMP Signal circuit in the CMP harness connector.
Wiggle the related wire harness while taking this measurement.

Is the resistance below 5.0 ohms?

Yes >> Repair the short between the (F856) 5-volt Supply circuit and the (K44) CMP Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 12



12. PCM

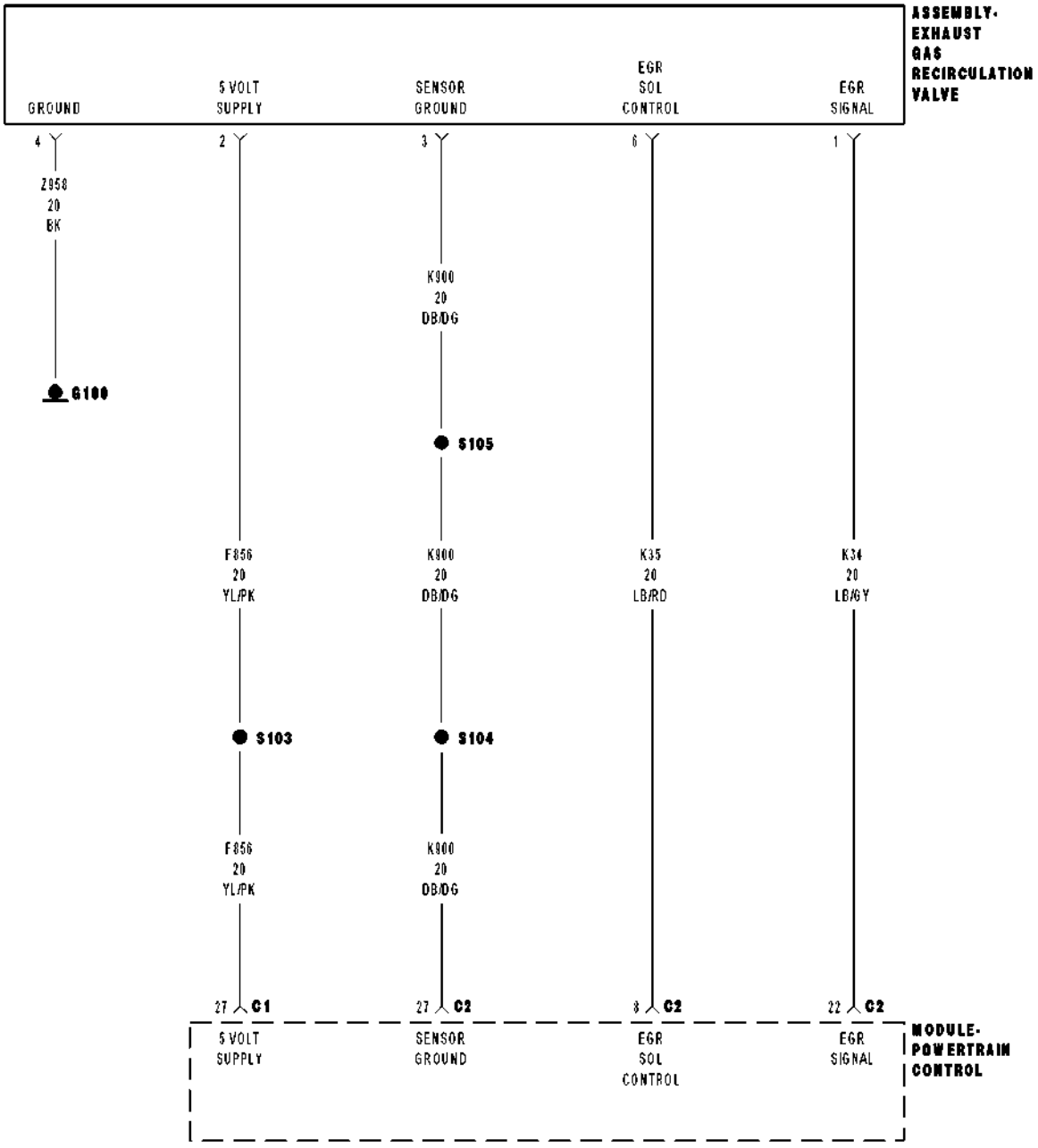
NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

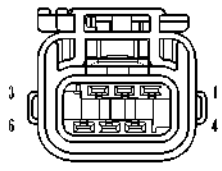
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

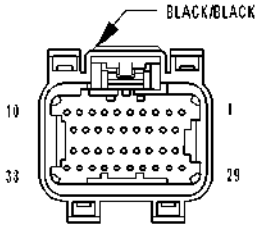
No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0401-EGR SYSTEM PERFORMANCE

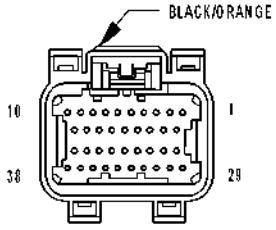




ASSEMBLY-
EXHAUST GAS
RECIRCULATION
VALVE



MODULE-
POWERTRAIN
CONTROL C1



MODULE-
POWERTRAIN
CONTROL C2

814046bd

P0401-EGR SYSTEM PERFORMANCE (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

Exhaust gas recirculation is a method of reducing emissions of oxides of nitrogen. As the inert exhaust gas is recirculated, the mixture absorbs heat in the combustion chamber without interacting with the fuel/air mixture and reduces the formation of NOx emissions. After the EGR monitor conditions are met, the EGR valve is turned on and off momentarily. The EGR monitor calculated the difference in engine roughness from the EGR off condition to the EGR condition. This engine combustion stability difference as measured by engine roughness is the measure of a functional EGR system.

- **When Monitored:**
  Engine running for greater than two minutes with the Engine Coolant Temp greater than 70°C (158°F). EGR active. Less than 8500 feet. Ambient temperature greater than -6°C (20°F).
- **Set Condition:**
  The PCM closes the EGR valve while monitoring the O2 Sensor signal. Once a closed EGR fueling sample has been established the PCM then ramps in EGR and additional fueling while monitoring the O2 sensor signal in the open state. A fueling sample is again established. The PCM then compares the different O2 Sensor signal readings (fueling samples). If a larger than expected variation is detected, a soft failure is recorded. Three soft failures set a one trip failure. After two failed trips, a DTC is set and the MIL is illuminated.

Possible Causes
(Z958) EGR SOLENOID GROUND CIRCUIT OPEN
(K35) EGR SOLENOID CONTROL CIRCUIT SHORTED TO GROUND
(K35) EGR SOLENOID CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K35) EGR SOLENOID CONTROL CIRCUIT OPEN
EGR SOLENOID ASSEMBLY
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0401-EGR SYSTEM PERFORMANCE (CONTINUED)

2. EGR OPERATION

NOTE: If the vehicle is running rough at idle (scan tool not actuating) follow the yes path to continue.
Turn all accessories off.
Start the engine.
Allow the engine to reach normal operating temperature.
With the scan tool, enter Engine System Test, then EGR System Test.
Actuate the FLOW function in the EGR System Test.

Did the engine run rough or stall?

Yes >> Go To 3
No >> Go To 6

---

3. EGR VALVE OPEN AT IDLE

Turn the ignition off.
Disconnect the EGR Solenoid Assembly harness connector.
Start engine. Attempt to allow the engine to idle.

Does the engine run rough or stall?

Yes >> Inspect the EGR tube assembly. If OK, replace the EGR valve.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)
No >> Go To 4

---

4. EGR VALVE ASSEMBLY INSPECTION

Inspect the EGR Assembly for the following.
Gasket(s) for leaking
Damage and/or holes in the EGR tube(s)
Carbon build up on or near the EGR pintle and passage ways.
Obstruction in the EGR tubes.

Were any problem found?

Yes >> Repair or replace the EGR Assembly as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)
No >> Go To 5

P0401-EGR SYSTEM PERFORMANCE (CONTINUED)

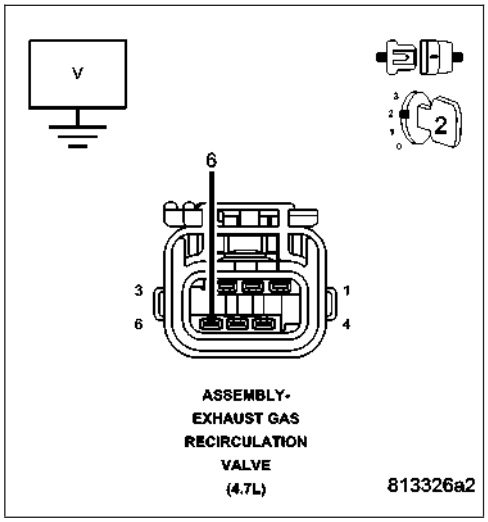
5. (K35) EGR SOLENOID CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

Disconnect the EGR Solenoid harness connector.

Ignition on, engine not running.

Measure the voltage on the (K35) EGR Solenoid Control circuit in the EGR Solenoid connector.



Is the voltage above 1.0 volt?

Yes >> Repair the short to battery voltage in the (K35) EGR Solenoid Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

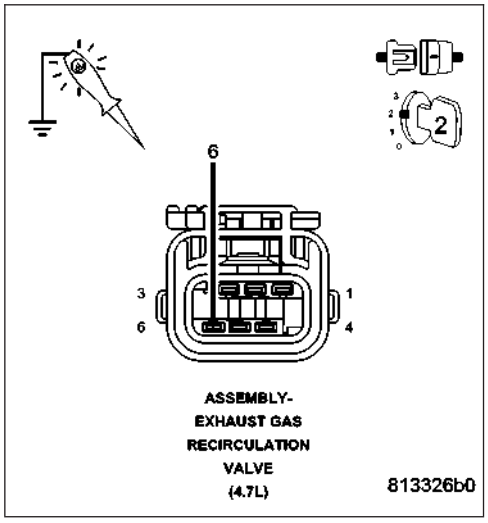
No >> Go To 10

6. EGR SOLENOID ASSEMBLY

Disconnect the EGR Solenoid harness connector.

Using a 12-volt test light, jump across the (K35) EGR Solenoid Control terminal and the (Z958) Ground terminal in the EGR Solenoid harness connector.

With the scan tool, actuate the EGR solenoid.



Does the 12-volt test light flash on and off?

Yes >> Inspect the tube(s) for obstructions and damage, repair as necessary. If OK, replace the EGR Solenoid Assembly.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

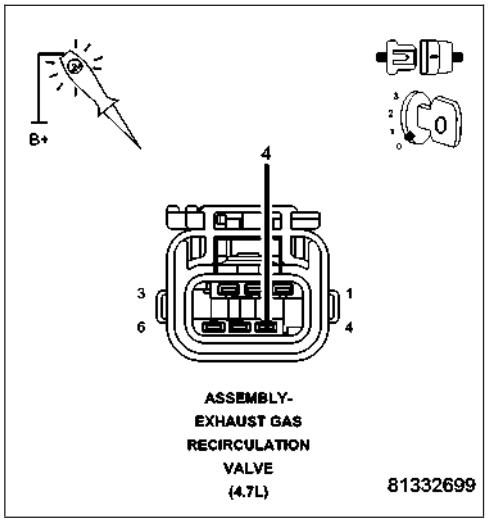
No >> Go To 7

P0401-EGR SYSTEM PERFORMANCE (CONTINUED)

7. (Z958) EGR SOLENOID GROUND CIRCUIT OPEN

Turn the ignition off.

Using a 12-volt test light connected to battery voltage, probe the (Z958) EGR Solenoid ground circuit in the EGR Solenoid harness connector.



Does the 12-volt test light illuminate brightly?

Yes >> Go To 8

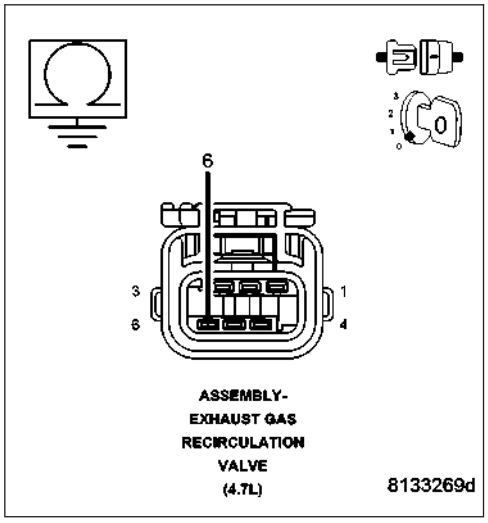
No >> Repair the open in the (Z958) EGR Solenoid ground circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

8. (K35) EGR SOLENOID CONTROL CIRCUIT SHORTED TO GROUND

Disconnect the C2 PCM harness connector.

Measure the resistance between ground and the (K35) EGR Solenoid Control circuit in the EGR Solenoid harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K35) EGR Solenoid Control circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

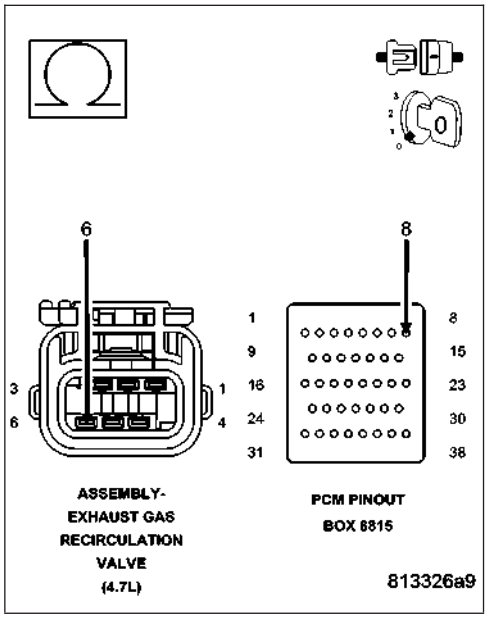
No >> Go To 9

P0401-EGR SYSTEM PERFORMANCE (CONTINUED)

9. (K35) EGR SOLENOID CONTROL CIRCUIT OPEN

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K35) EGR Solenoid Control circuit from the EGR Solenoid harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 10

No >> Repair the open in the (K35) EGR Solenoid Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

10. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

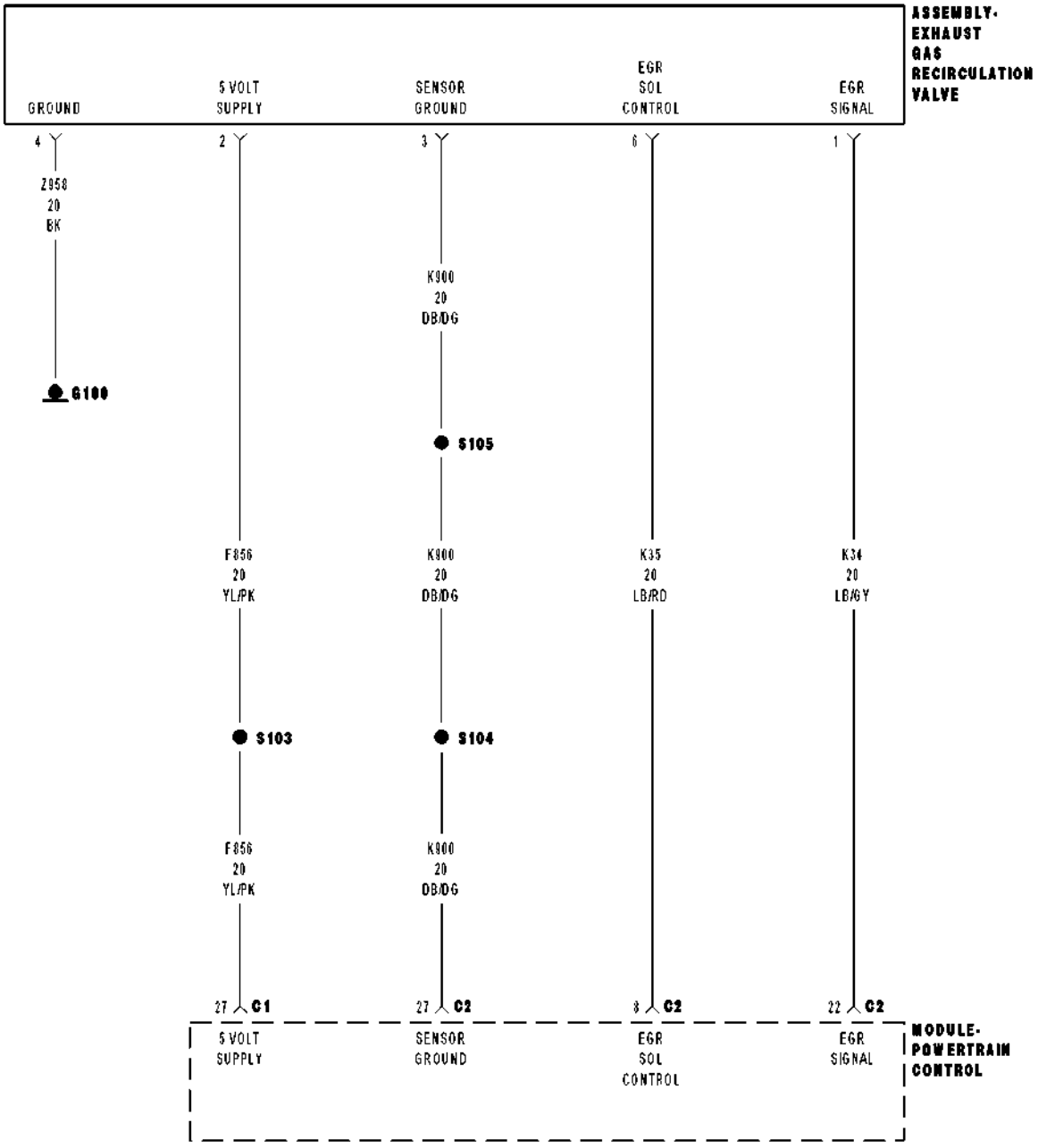
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

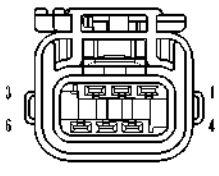
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

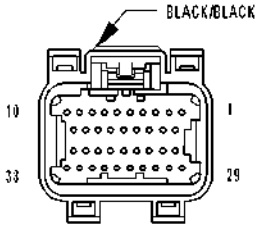
No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0403-EGR SOLENOID CIRCUIT

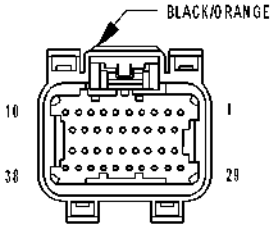




ASSEMBLY-
EXHAUST GAS
RECIRCULATION
VALVE



MODULE-
POWERTRAIN
CONTROL C1



MODULE-
POWERTRAIN
CONTROL C2

P0403-EGR SOLENOID CIRCUIT (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Engine running. Battery voltage greater than 10 volts.
- **Set Condition:**
  The EGR solenoid control circuit is not in the expected state when requested to operate by the PCM. One Trip Fault.

Possible Causes
(Z958) EGR SOLENOID GROUND CIRCUIT OPEN
(K35) EGR SOLENOID CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K35) EGR SOLENOID CONTROL CIRCUIT SHORTED TO GROUND
(K35) EGR SOLENOID CONTROL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT
(K35) EGR SOLENOID CONTROL CIRCUIT OPEN
EGR SOLENOID ASSEMBLY
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.
With a scan tool, read DTCs.

Is the DTC active at this time?

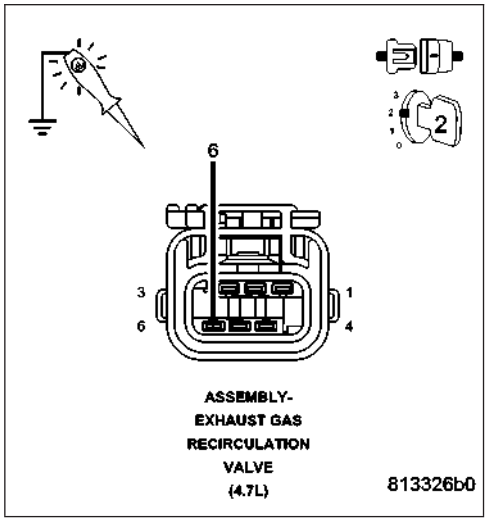
Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. EGR SOLENOID ASSEMBLY

Turn the ignition off.
Disconnect the EGR Solenoid harness connector.
Ignition on, engine not running.
Turn off all accessories.
Using a 12-volt test light connected to the (Z958) EGR Solenoid ground circuit, probe the (K35) EGR Solenoid Control circuit.
With a scan tool, actuate the EGR solenoid.



Does the 12-volt test light flash on and off?

Yes >> Replace the EGR Solenoid Assembly.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

P0403-EGR SOLENOID CIRCUIT (CONTINUED)

3. (Z958) EGR SOLENOID GROUND CIRCUIT OPEN

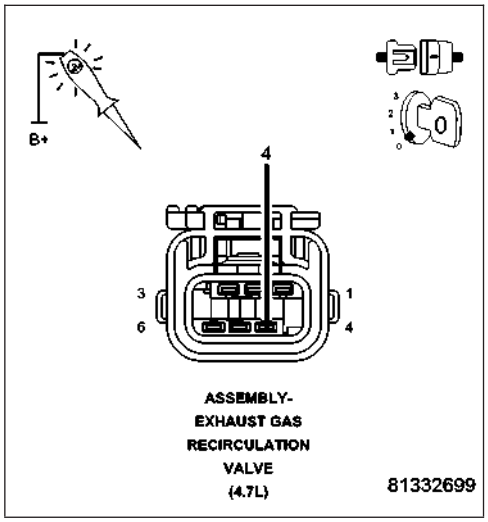
Turn the ignition off.

Using a 12-volt test light connected to the 12-volts, probe the (Z958) EGR Solenoid ground circuit in the EGR Solenoid harness connector.

Does the test light illuminate brightly?

Yes >> Go To 4

No >> Repair the open in the (Z958) EGR Solenoid ground circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



4. (K35) EGR SOLENOID CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE

Ignition on, engine not running.

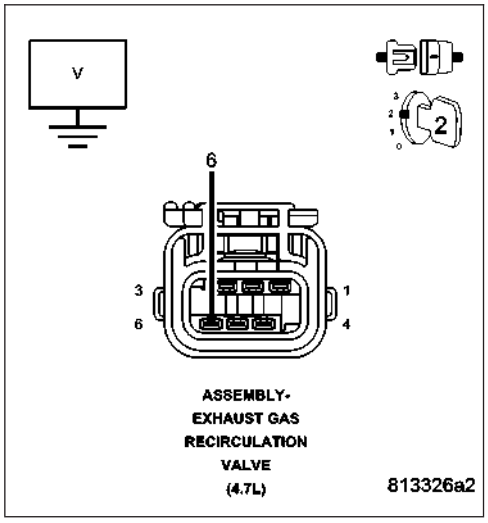
Disconnect the C2 PCM harness connector.

Measure the voltage on the (K35) EGR Solenoid Control circuit in the EGR Solenoid connector.

Is the voltage above 1.0 volt?

Yes >> Repair the short to battery voltage in the (K35) EGR Solenoid Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5



P0403-EGR SOLENOID CIRCUIT (CONTINUED)

5. (K35) EGR SOLENOID CONTROL CIRCUIT SHORTED TO GROUND

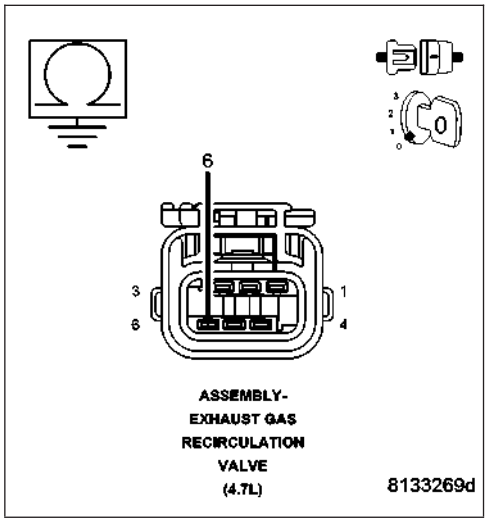
Turn the ignition off.

Measure the resistance between ground and the (K35) EGR Solenoid Control circuit in the EGR Solenoid harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K35) EGR Solenoid Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6



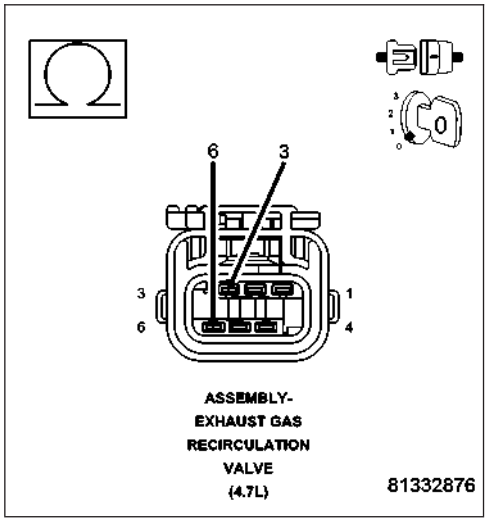
6. (K35) EGR SOLENOID CONTROL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT

Measure the resistance between the (K35) EGR Solenoid Control circuit and the (K900) Sensor ground circuit in the EGR Solenoid connector.

Is the resistance below 5.0 ohms?

Yes >> Repair the short between the (K900) Sensor ground circuit and the (K35) EGR Solenoid Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

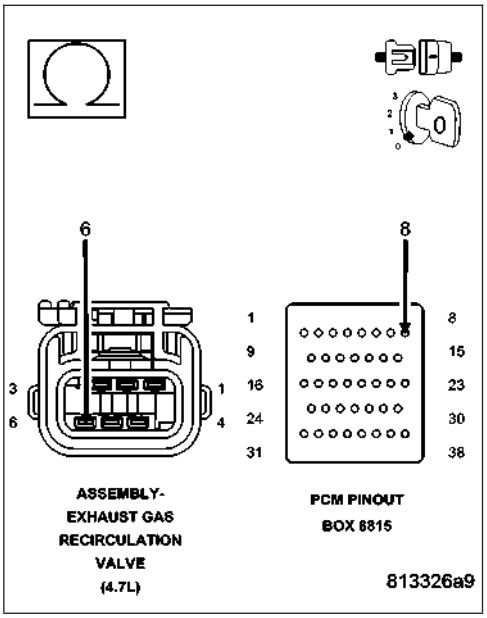
No >> Go To 7



P0403-EGR SOLENOID CIRCUIT (CONTINUED)

7. (K35) EGR SOLENOID CONTROL CIRCUIT OPEN

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.
Measure the resistance of the (K35) EGR Solenoid Control circuit from the EGR Solenoid harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 8

No >> Repair the open in the (K35) EGR Solenoid Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

8. PCM

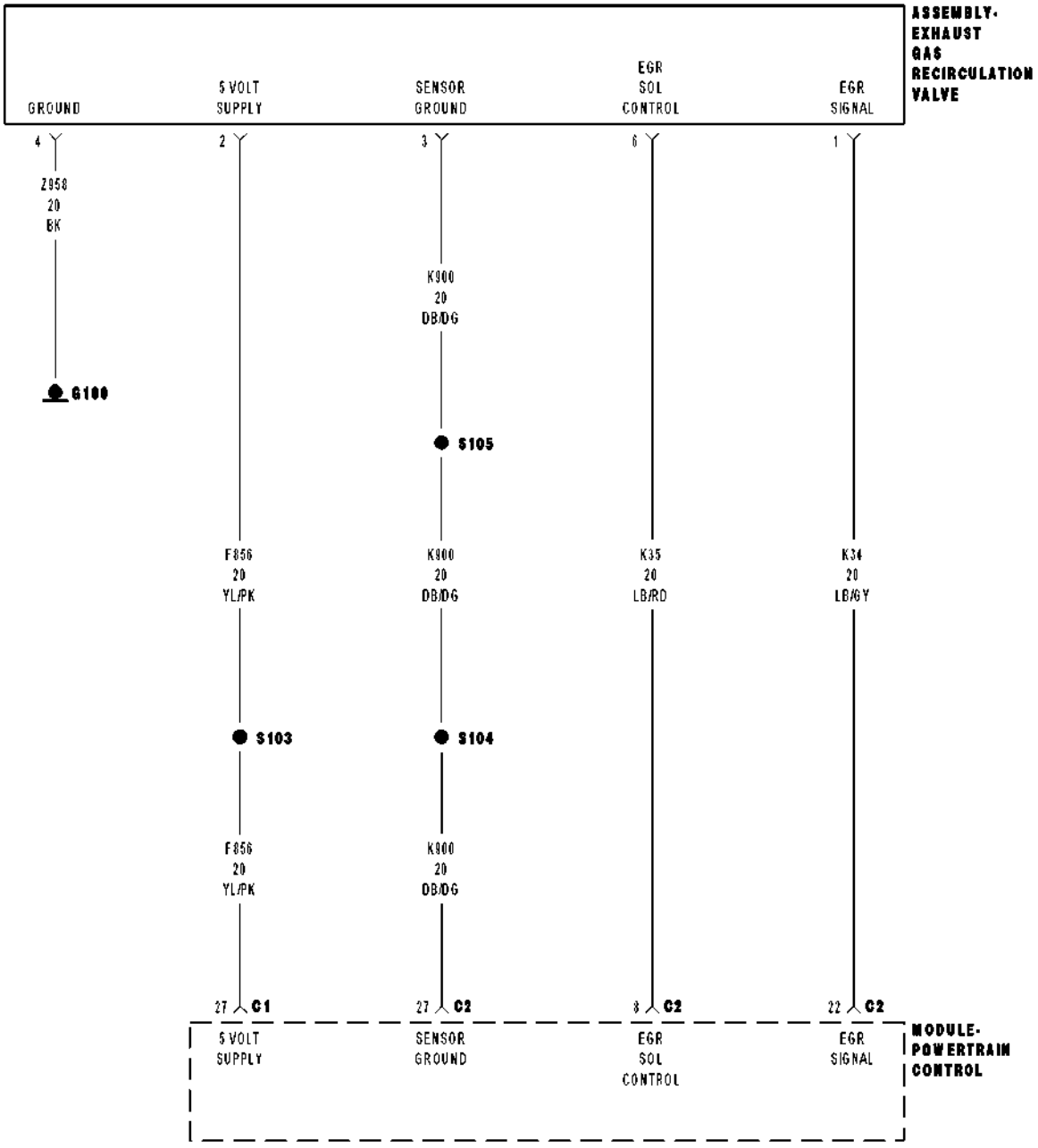
NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

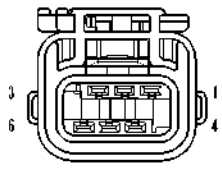
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

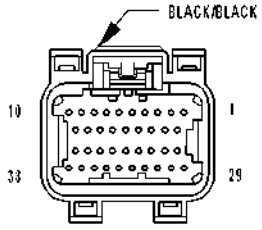
No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0404-EGR POSITION SENSOR PERFORMANCE

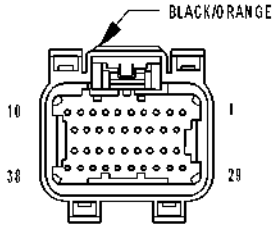




ASSEMBLY-
EXHAUST GAS
RECIRCULATION
VALVE



MODULE-
POWERTRAIN
CONTROL C1



MODULE-
POWERTRAIN
CONTROL C2

P0404-EGR POSITION SENSOR PERFORMANCE (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The EGR valve has a position sensor and the EGR position rationality is designed to make sure that the valve moves freely within its operating range. Closed valve position reference check verifies that the valve is within its allowable upper and lower limits. The EGR position rationality test looks for a sustained error relative to commanded valve position.

- **When Monitored:**
  Engine running.
- **Set Condition:**
  The EGR flow or valve movement is not what is expected.

Possible Causes
EXCESSIVE RESISTANCE IN THE (F856) 5-VOLT SUPPLY CIRCUIT
(K35) EGR SOLENOID CONTROL CIRCUIT
(K34) EGR SENSOR SIGNAL CIRCUIT OPEN
(K34) EGR SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
(K900) SENSOR GROUND CIRCUIT OPEN
EGR SOLENOID ASSEMBLY
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.
With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. EGR POSITION VOLTAGE

NOTE: Diagnose all other EGR DTC(s) before continuing.
Start the engine.
With a scan tool, read the EGR Position Sensor voltage.

Choose a conclusion that best matches the EGR voltage reading.

Below 3.5 volts
Go To 3

Between 3.5 volts to 4.3 volts
Go To 5

Above 4.3 volts
Go To 6

P0404-EGR POSITION SENSOR PERFORMANCE (CONTINUED)

3. EXCESSIVE RESISTANCE IN THE (F856) 5-VOLT SUPPLY CIRCUIT

Turn the ignition off.

Disconnect the EGR Solenoid harness connector.

Disconnect the C1 PCM harness connector.

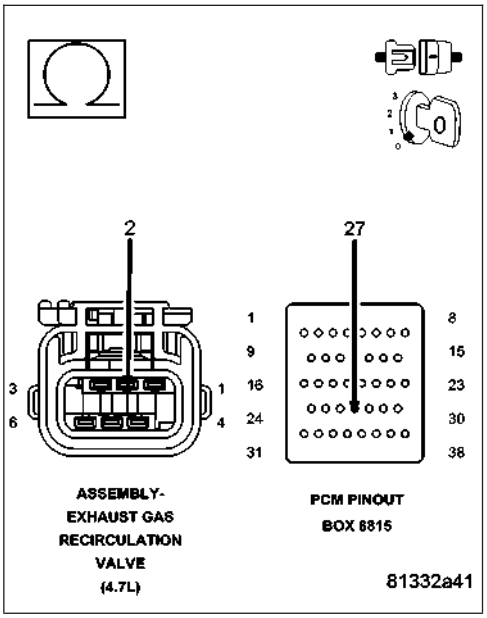
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (F856) 5-volt Supply circuit from the EGR Solenoid harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 4

No >> Repair the excessive resistance in the (F856) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



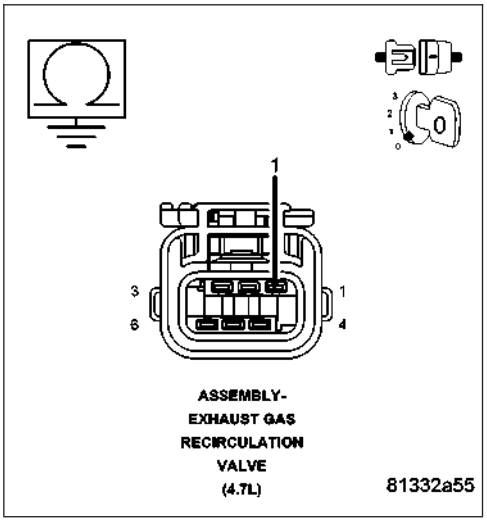
4. (K34) EGR SENSOR SIGNAL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K34) EGR Sensor Signal circuit in the EGR Solenoid harness connector.

Is the resistance below 5.0 ohms?

Yes >> Repair the short to ground in the (K34) EGR Sensor Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace the EGR Assembly.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P0404-EGR POSITION SENSOR PERFORMANCE (CONTINUED)

5. (K35) EGR SOLENOID CONTROL CIRCUIT

Ignition on, engine not running.
With the scan tool, actuate the EGR Solenoid.
Allow the EGR Solenoid to actuate for at least 15 seconds.
Feel the EGR Solenoid for operation.
Stop actuation.

Does EGR Solenoid operate while actuating and then turn off when actuation test is stopped?

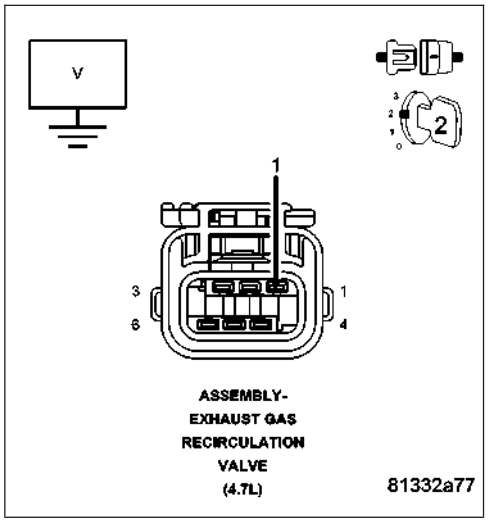
a. Yes
Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Refer to the P0403-EGR Control Circuit diagnostic procedure and continue.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

6. (K34) EGR SENSOR SIGNAL CIRCUIT

Turn the ignition off.
Disconnect the EGR Solenoid harness connector.
Ignition on, engine not running.
Measure the voltage of the (K34) EGR Sensor Signal circuit in the EGR Solenoid harness connector.



Is the voltage above 4.30 volts?

Yes >> Go To 7
No >> Go To 8

P0404-EGR POSITION SENSOR PERFORMANCE (CONTINUED)

7. (K900) SENSOR GROUND CIRCUIT OPEN

Turn the ignition off.

Disconnect the C2 PCM harness connector.

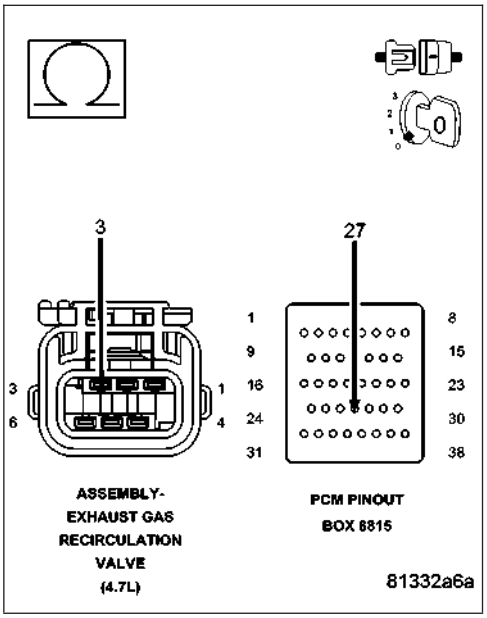
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K900) Sensor ground circuit from the EGR Solenoid harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Replace the EGR Assembly.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Repair the open in the (K900) Sensor ground circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



8. (K34) EGR SENSOR SIGNAL CIRCUIT OPEN

Turn the ignition off.

Disconnect the C2 PCM harness connector.

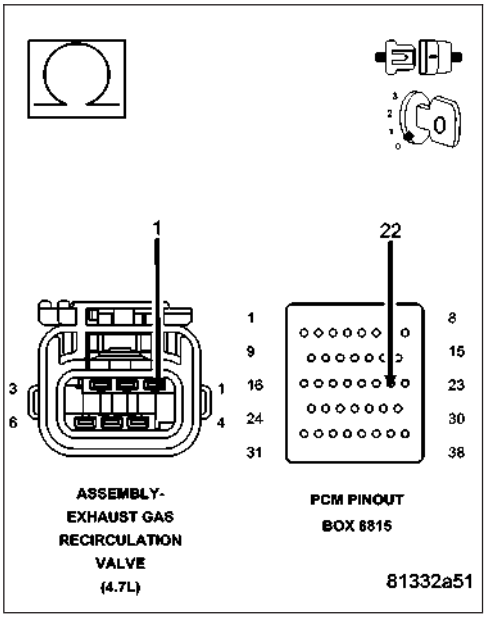
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K34) EGR Sensor Signal circuit from the EGR Solenoid harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 9

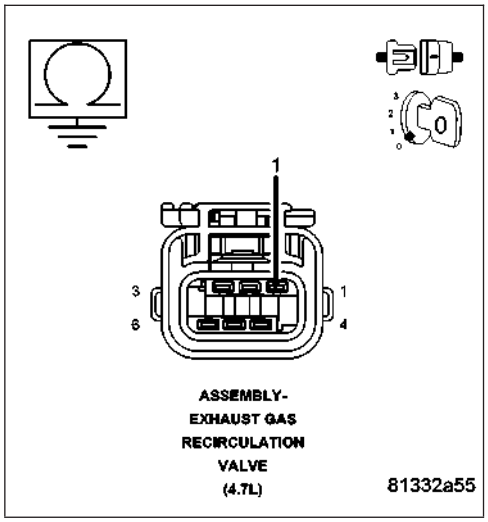
No >> Repair the open in the (K34) EGR Sensor Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P0404-EGR POSITION SENSOR PERFORMANCE (CONTINUED)

9. (K34) EGR SENSOR SIGNAL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K34) EGR Sensor Signal circuit in the EGR Solenoid harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K34) EGR Sensor Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 10

---

10. PCM

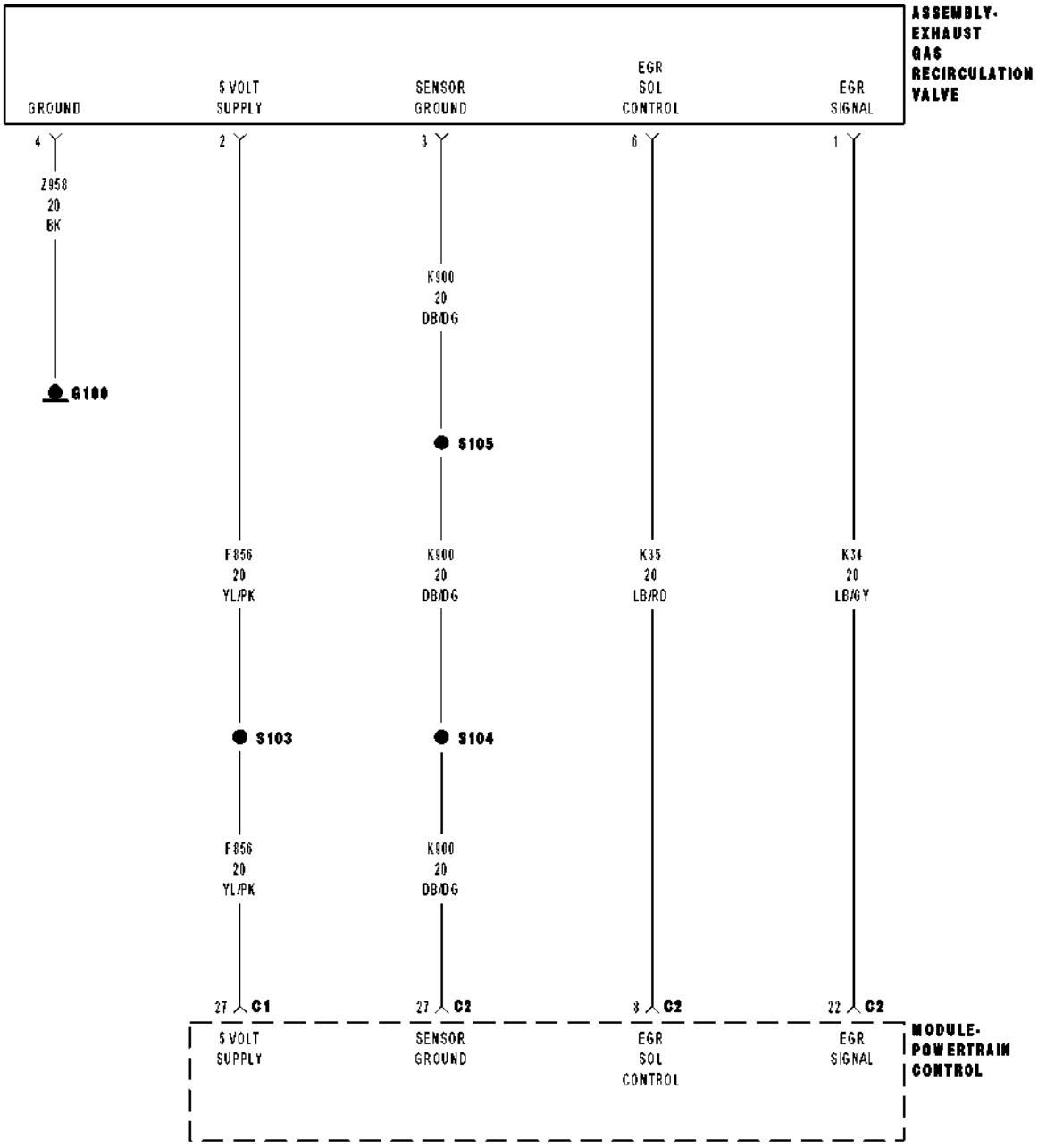
NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

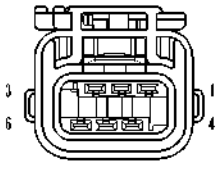
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

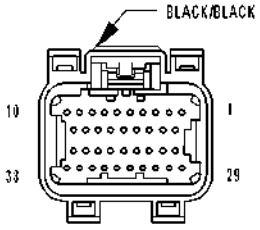
No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0405-EGR POSITION SENSOR CIRCUIT LOW

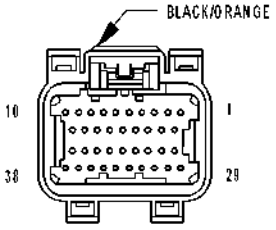




ASSEMBLY-
EXHAUST GAS
RECIRCULATION
VALVE



MODULE-
POWERTRAIN
CONTROL C1



MODULE-
POWERTRAIN
CONTROL C2

P0405-EGR POSITION SENSOR CIRCUIT LOW (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. Battery voltage above 10.0 volts.
- **Set Condition:**
  EGR Position Sensor Signal is less than 0.1 of a volt. One trip Fault.

Possible Causes
(F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(F856) 5-VOLT SUPPLY CIRCUIT OPEN
(K34) EGR POSITION SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
(K34) EGR POSITION SENSOR SIGNAL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT
EGR POSITION SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. EGR POSITION SENSOR BELOW 0.2 OF A VOLT

Ignition on, engine not running.

With a scan tool, read the EGR Position Sensor voltage.

Is the voltage below 0.2 of a volt?

Yes >> Go To 2

No >> Go To 9

---

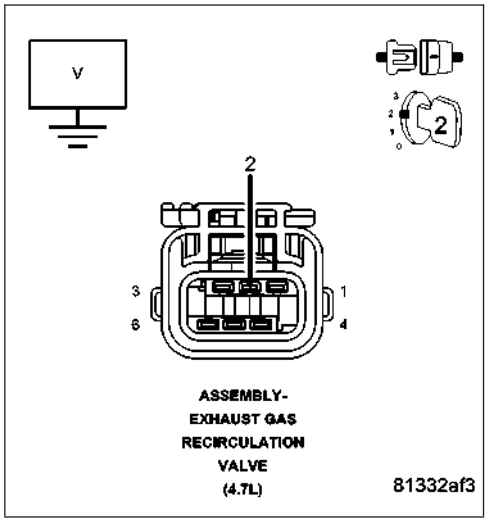
2. (F856) 5-VOLT SUPPLY CIRCUIT

Turn the ignition off.

Disconnect the EGR Solenoid harness connector.

Ignition on, engine not running.

Measure the voltage of the (F856) 5-volt Supply circuit in the EGR Solenoid harness connector.



Is the voltage between 4.5 to 5.2 volts?

Yes >> Go To 3

No >> Go To 6

P0405-EGR POSITION SENSOR CIRCUIT LOW (CONTINUED)

3. EGR POSITION

With the scan tool, monitor the EGR Position Sensor voltage.

Is the voltage above 4.5 volts?

Yes >> Replace the EGR Solenoid Assembly.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

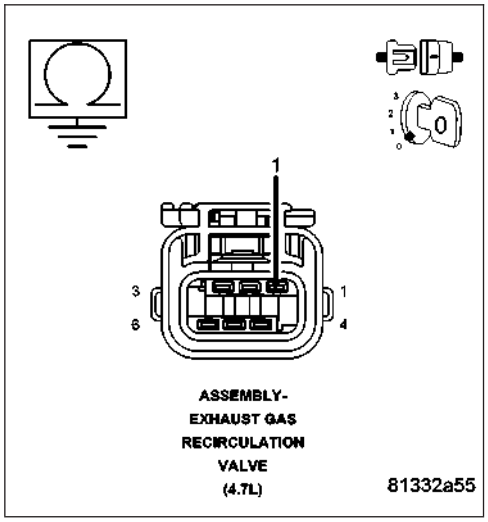
---

4. (K34) EGR POSITION SENSOR SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the C2 PCM harness connector.

Measure the resistance between ground and the (K34) EGR Position Sensor Signal circuit in the EGR Solenoid harness connector.



Is the resistance below 100 ohms?

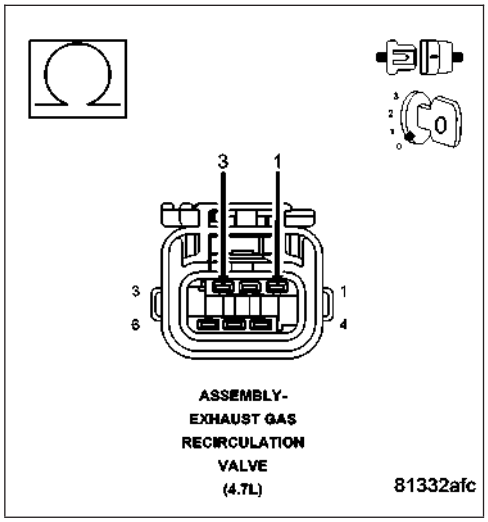
Yes >> Repair the short to ground circuit in the (K34) EGR Position Sensor Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

---

5. (K34) EGR SENSOR SIGNAL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT

Measure the resistance between the (K34) EGR Position Sensor Signal circuit and (K900) Sensor ground circuit in the EGR Solenoid harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short between the (K900) Sensor ground and the (K34) EGR Position Sensor Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8

P0405-EGR POSITION SENSOR CIRCUIT LOW (CONTINUED)

6. (F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Turn the ignition off.

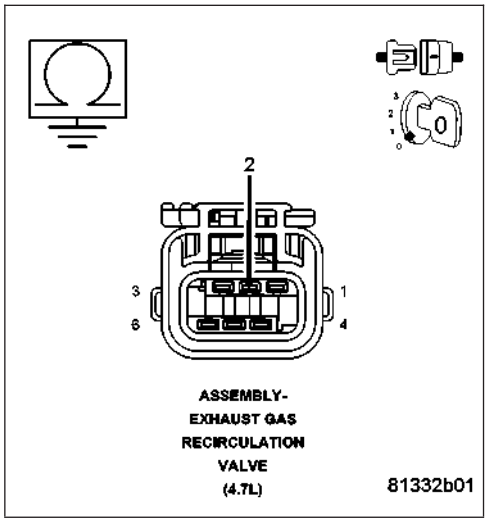
Disconnect the C1 PCM harness connector.

Measure the resistance between ground and the (F856) 5-volt Supply circuit in the EGR Solenoid harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (F856) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 7



7. (F856) 5-VOLT SUPPLY CIRCUIT OPEN

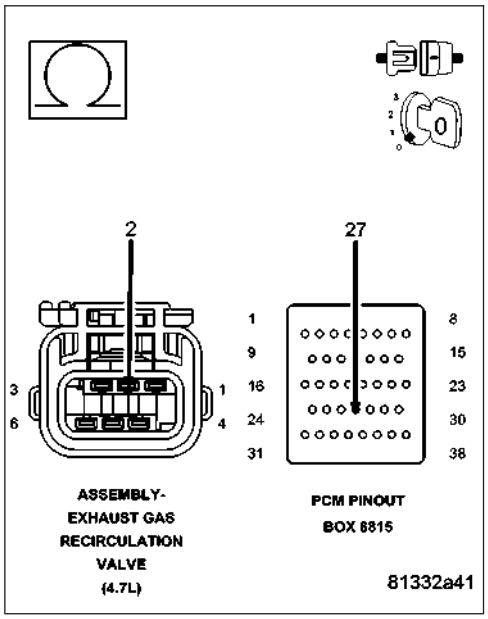
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (F856) 5-volt Supply circuit from the EGR Solenoid harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 8

No >> Repair the open in the (F856) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P0405-EGR POSITION SENSOR CIRCUIT LOW (CONTINUED)

8. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

9. EGR POSITION SENSOR SWEEP

NOTE: The engine will run rough and possibly stall in the following test. Feather the accelerator pedal to keep the engine from stalling.

Start the engine.

With the scan tool, enter System Test and then EGR System Test. Push the 4=VARIABLE function.

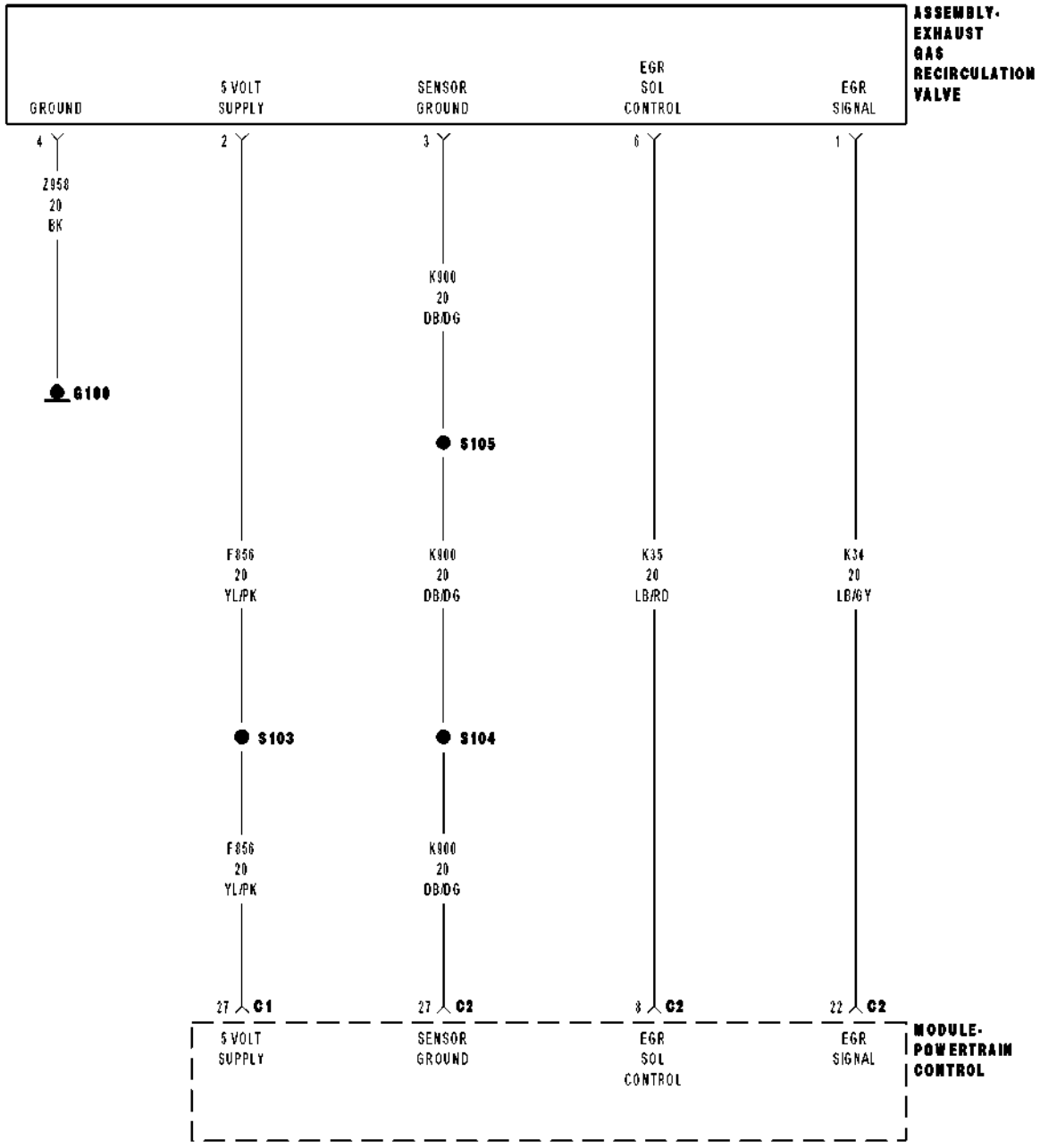
Monitor the EGR voltage while slowly pushing the up arrow.

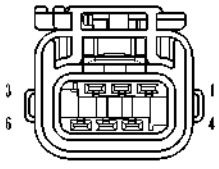
Is the voltage change smooth?

Yes >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

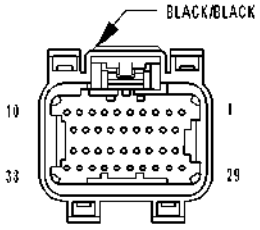
No >> Replace the EGR Solenoid Assembly.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0406-EGR POSITION SENSOR CIRCUIT HIGH

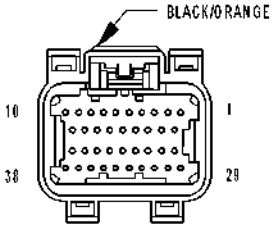




ASSEMBLY-
EXHAUST GAS
RECIRCULATION
VALVE



MODULE-
POWERTRAIN
CONTROL C1



MODULE-
POWERTRAIN
CONTROL C2

814046bd

P0406-EGR POSITION SENSOR CIRCUIT HIGH (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. Battery voltage greater than 10 volts.
- **Set Condition:**
  EGR position sensor signal is greater than 4.89. One trip Fault.

Possible Causes
(K34) EGR POSITION SENSOR SIGNAL CIRCUIT SHORTED TO THE (F856) 5-VOLT SUPPLY CIRCUIT
(K34) EGR POSITION SENSOR SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K34) EGR POSITION SENSOR SIGNAL CIRCUIT OPEN
(K900) SENSOR GROUND CIRCUIT OPEN
EGR SOLENOID ASSEMBLY
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. EGR POSITION SENSOR VOLTAGE ABOVE 4.5 VOLTS

Start the engine.

With the scan tool, read the EGR Position Sensor voltage.

Is the voltage above 4.5 volts?

Yes >> Go To 2

No >> Go To 8

---

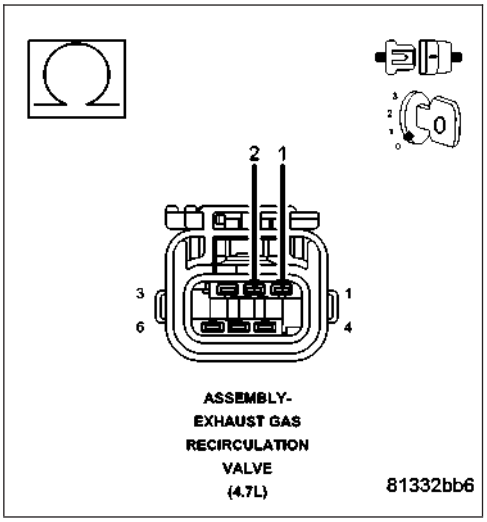
2. (K34) EGR POSITION SENSOR SIGNAL CIRCUIT SHORTED TO THE (F856) 5-VOLT SUPPLY CIRCUIT

Turn the ignition off.

Disconnect the EGR Solenoid harness connector.

Disconnect the C1 and C2 PCM harness connectors.

Measure the resistance between the (K34) EGR Position Sensor Signal circuit and the (F856) 5-volt Supply circuit in the EGR Solenoid harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short between the (K34) EGR Position Sensor Signal circuit and the (F856) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

P0406-EGR POSITION SENSOR CIRCUIT HIGH (CONTINUED)

3. (K34) EGR POSITION SENSOR SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE

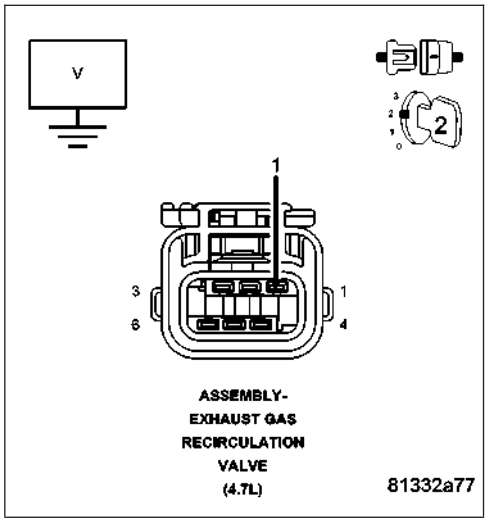
Ignition on, engine not running.

Measure the voltage on the (K34) EGR Sensor Signal circuit in the EGR Solenoid harness connector.

Is the voltage above 0 volts?

Yes >> Repair the short to battery voltage in the (K34) EGR Position Sensor Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4



4. EGR SOLENOID ASSEMBLY

Turn the ignition off.

Connect the PCM harness connectors.

Connect a jumper wire between the (K34) EGR Position Sensor Signal circuit and the (K900) Sensor ground circuit.

With the scan tool, monitor the EGR Position Sensor voltage.

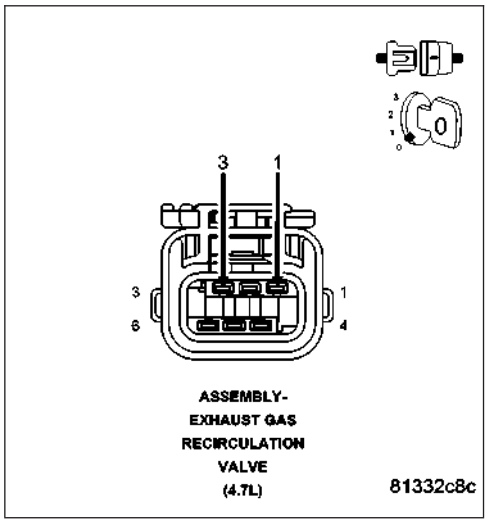
Ignition on, engine not running.

Is the voltage below 0.5 of a volt?

Yes >> Replace the EGR Solenoid Assembly.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

NOTE: Remove the jumper wire before continuing.



P0406-EGR POSITION SENSOR CIRCUIT HIGH (CONTINUED)

5. (K34) EGR POSITION SENSOR SIGNAL CIRCUIT OPEN

Turn the ignition off.

Disconnect the C2 PCM harness connector.

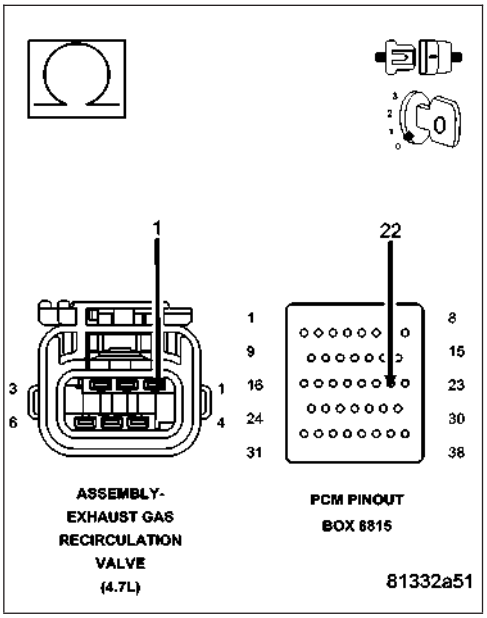
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K34) EGR Position Sensor Signal circuit from the EGR Solenoid harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 6

No >> Repair the open in the (K34) EGR Position Sensor Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



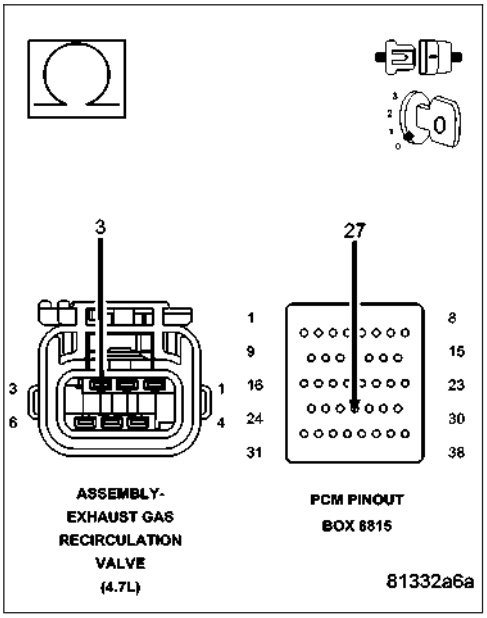
6. (K900) SENSOR GROUND CIRCUIT OPEN

Measure the resistance of the (K900) Sensor ground circuit from the EGR Solenoid harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 30 ohms?

Yes >> Go To 7

No >> Repair the open in the (K900) Sensor ground circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P0406-EGR POSITION SENSOR CIRCUIT HIGH (CONTINUED)

7. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

8. EGR POSITION SENSOR SWEEP

NOTE: The engine will run rough and possibly stall in the following test. Feather the accelerator pedal to keep the engine from stalling.

Start the engine.

With the scan tool, enter System Test and then EGR System Test. Push the 4=VARIABLE function.

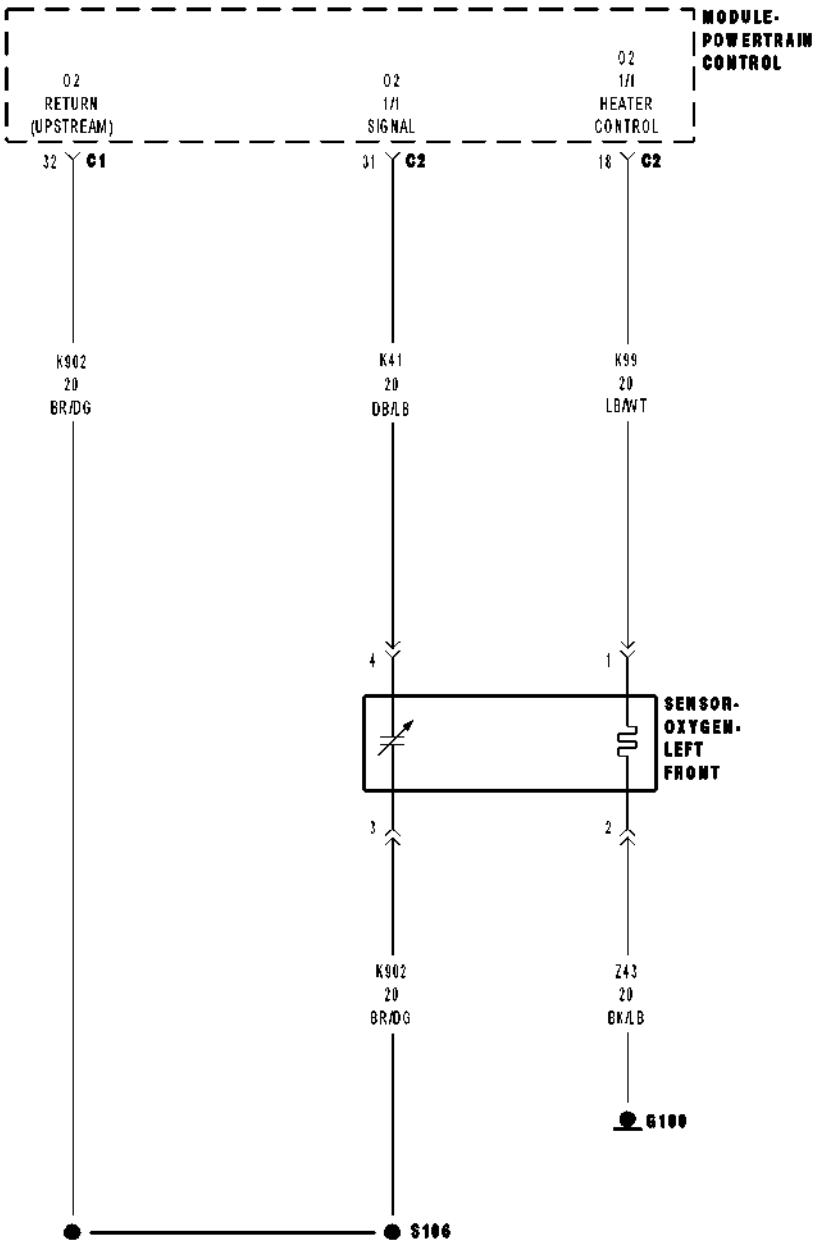
Monitor the EGR voltage while slowly pushing the up arrow.

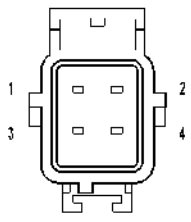
Is the voltage change smooth?

Yes >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

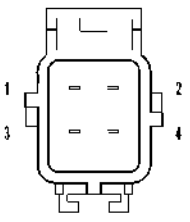
No >> Replace the EGR Solenoid Assembly.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0420-CATALYST 1/1 EFFICIENCY

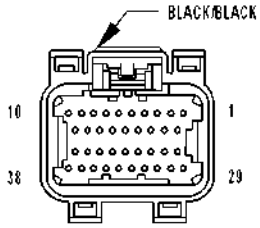




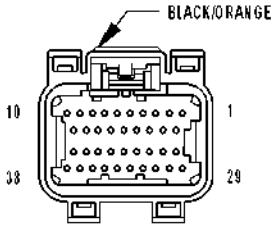
SENSOR-
OXYGEN-
LEFT
FRONT
(5.7L)



SENSOR-
OXYGEN-
LEFT
FRONT
(4.7L)



MODULE-
POWERTRAIN
CONTROL C1



MODULE-
POWERTRAIN
CONTROL C2

B14826ca

P0420-CATALYST 1/1 EFFICIENCY (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The upstream O2 sensor is used to detect the amount of oxygen in the exhaust gas before the gas enters the catalytic converter. During the catalyst/O2 monitor test, the response rate (cycles/second) of the upstream O2 sensor determines the sensor's ability to achieve the tailpipe emissions limits. The response rate of the downstream O2 sensor relative to the upstream O2 sensor response rate measures the catalyst's ability to store oxygen and is used to infer the catalyst's ability to achieve the tailpipe emissions limits.

- **When Monitored:**
  After engine warm up to 70°C (158°F), 180 seconds of open throttle operation, at a speed greater than 18 mph and less than 55 mph, with the engine at 1200-1700 rpm and MAP vacuum between 15.0 and 21.0 inches of mercury (Hg).
- **Set Condition:**
  As catalyst efficiency deteriorates, the switch rate of the downstream O2 sensor approaches that of the upstream O2 sensor. If at any point during the test the switch ratio reaches a predetermined value a counter is incremented by one. Three good trips to turn off the MIL.

Possible Causes
EXHAUST LEAK
ENGINE MECHANICAL CONDITION
AGING O2 SENSOR
CATALYTIC CONVERTER

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: A new rear O2 Sensor along with an aging front O2 Sensor may cause the DTC to set. Review the repair history of the vehicle before continuing.

NOTE: If an O2 Sensor DTC set along with the Catalytic Converter Efficiency DTC diagnose the O2 Sensor DTC(s) before continuing.

NOTE: Check for contaminants that may have damaged the O2 Sensor and Catalytic Converter: contaminated fuel, unapproved silicone, oil and coolant, repair necessary.

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0420-CATALYST 1/1 EFFICIENCY (CONTINUED)

2. VISUALLY INSPECT CATALYTIC CONVERTER

Inspect the Catalytic Converter for the following damage.
Damaged Catalytic Converter, dents or holes.
Severe discoloration caused by overheating the Catalytic Converter.
Catalytic Converter broken internally.
Leaking Catalytic Converter.

Were any problems found?

Yes >> Replace the Catalytic Converter. Repair the condition that may have caused the failure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

---

3. EXHAUST LEAK

Start the engine.
Inspect the exhaust for leaks between the engine and the 1/1 O2 Sensor.
Inspect the exhaust for leaks between the engine and the 1/2 O2 Sensor.

Are there any exhaust leaks?

Yes >> Repair or replace the leaking exhaust parts as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

---

4. ENGINE MECHANICAL CONDITION

Check the exhaust for excessive smoke caused by an internal problem in the engine.

Is an engine mechanical condition present?

Yes >> Repair the engine mechanical condition as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

---

5. AGING O2 SENSOR

A new rear O2 Sensor along with an aging front O2 Sensor may cause the DTC to set.
Review the vehicles repair history.

Has the rear O2 Sensor been replaced without replacing the front O2 Sensor?

Yes >> Replace the Front O2 Sensor as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6

---

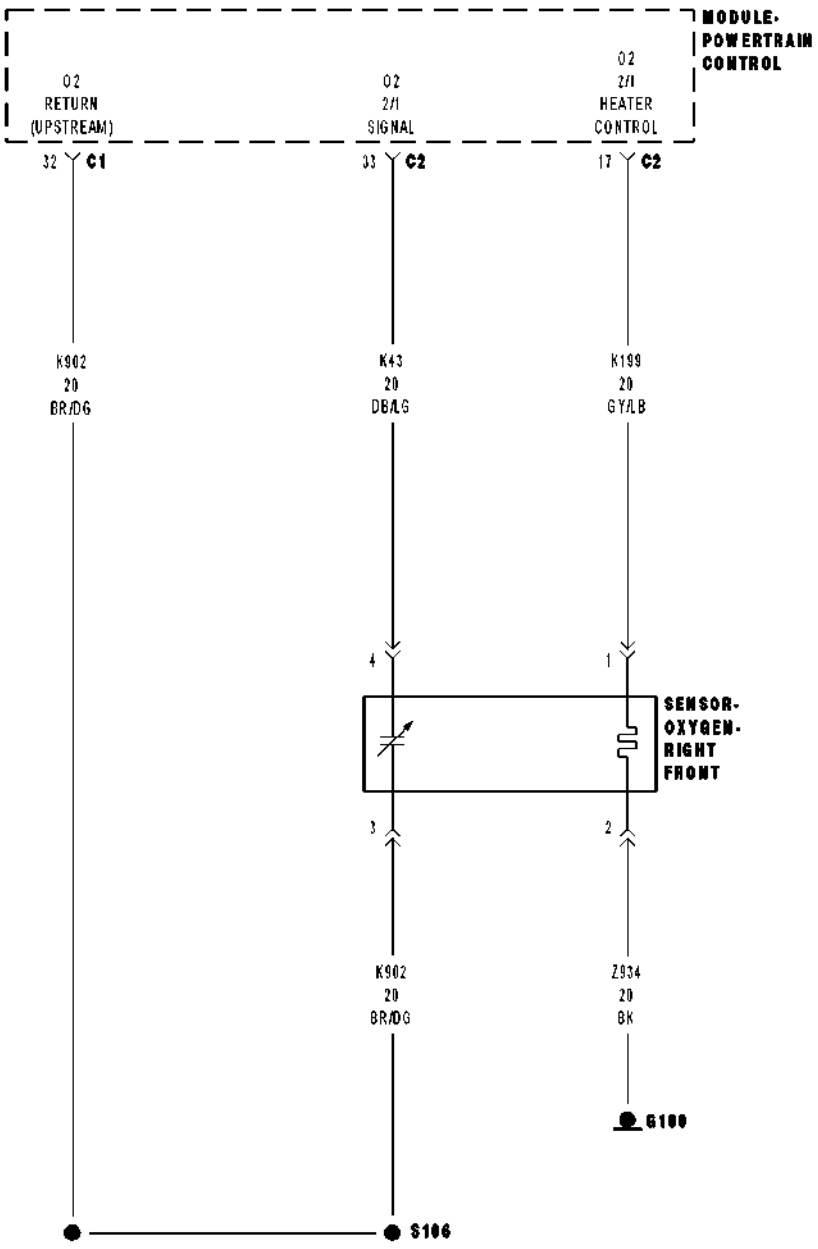
6. CATALYTIC CONVERTER

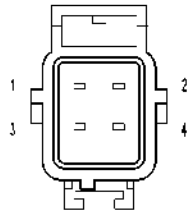
If there are no possible cause remaining, view repair.

Repair

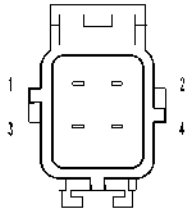
Replace the Catalytic Converter.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0430-CATALYST 2/1 EFFICIENCY

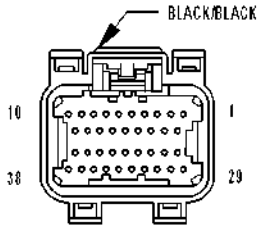




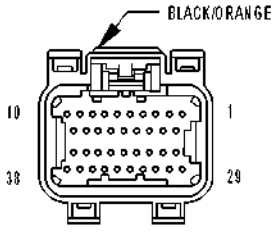
SENSOR-
OXYGEN-
RIGHT
FRONT
(3.7L/5.7L)



SENSOR-
OXYGEN-
RIGHT
FRONT
(4.7L)



MODULE-
POWERTRAIN
CONTROL C1



MODULE-
POWERTRAIN
CONTROL C2

P0430-CATALYST 2/1 EFFICIENCY (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The upstream O2 sensor is used to detect the amount of oxygen in the exhaust gas before the gas enters the catalytic converter. During the catalyst/O2 monitor test, the response rate (cycles/second) of the upstream O2 sensor determines the sensor's ability to achieve the tailpipe emissions limits. The response rate of the downstream O2 sensor relative to the upstream O2 sensor response rate measures the catalyst's ability to store oxygen and is used to infer the catalyst's ability to achieve the tailpipe emissions limits.

- **When Monitored:**
  After engine warm up to 147 deg. F, 180 seconds of open throttle operation, at a speed greater than 20 mph, with the engine at 1200-1700 rpm and MAP vacuum between 15.0 and 21.0 inches of mercury (Hg).
- **Set Condition:**
  As catalyst efficiency deteriorates, the switch rate of the downstream O2 sensor approaches that of the upstream O2 sensor. If at any point during the test the switch ratio reaches a predetermined value a counter is incremented by one. Three good trips to turn off the MIL.

Possible Causes
EXHAUST LEAK
ENGINE MECHANICAL CONDITION
AGING O2 SENSOR
CATALYTIC CONVERTER

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: A new rear O2 Sensor along with an aging front O2 Sensor may cause the DTC to set. Review the repair history of the vehicle before continuing.

NOTE: If an O2 Sensor DTC set along with the Catalytic Converter Efficiency DTC diagnose the O2 Sensor DTC(s) before continuing.

NOTE: Check for contaminants that may have damaged the O2 Sensor and Catalytic Converter: contaminated fuel, unapproved silicone, oil and coolant, repair necessary.

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0430-CATALYST 2/1 EFFICIENCY (CONTINUED)

2. VISUALLY INSPECT CATALYTIC CONVERTER

Inspect the Catalytic Converter for the following damage.
Damaged Catalytic Converter, dents or holes.
Severe discoloration caused by overheating the Catalytic Converter.
Catalytic Converter broken internally.
Leaking Catalytic Converter.

Were any problems found?

Yes >> Replace the Catalytic Converter. Repair the condition that may have caused the failure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

---

3. EXHAUST LEAK

Start the engine.
Inspect the exhaust for leaks between the engine and the 2/1 O2 Sensor.
Inspect the exhaust for leaks between the engine and the 2/2 O2 Sensor.

Are there any exhaust leaks?

Yes >> Repair or replace the leaking exhaust parts as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

---

4. ENGINE MECHANICAL CONDITION

Check the exhaust for excessive smoke caused by an internal problem in the engine.

Is an engine mechanical condition present?

Yes >> Repair the engine mechanical condition as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

---

5. AGING O2 SENSOR

A new rear O2 Sensor along with an aging front O2 Sensor may cause the DTC to set.
Review the vehicles repair history.

Has the rear O2 Sensor been replaced without replacing the front O2 Sensor?

Yes >> Replace the 2/1 O2 Sensor as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6

---

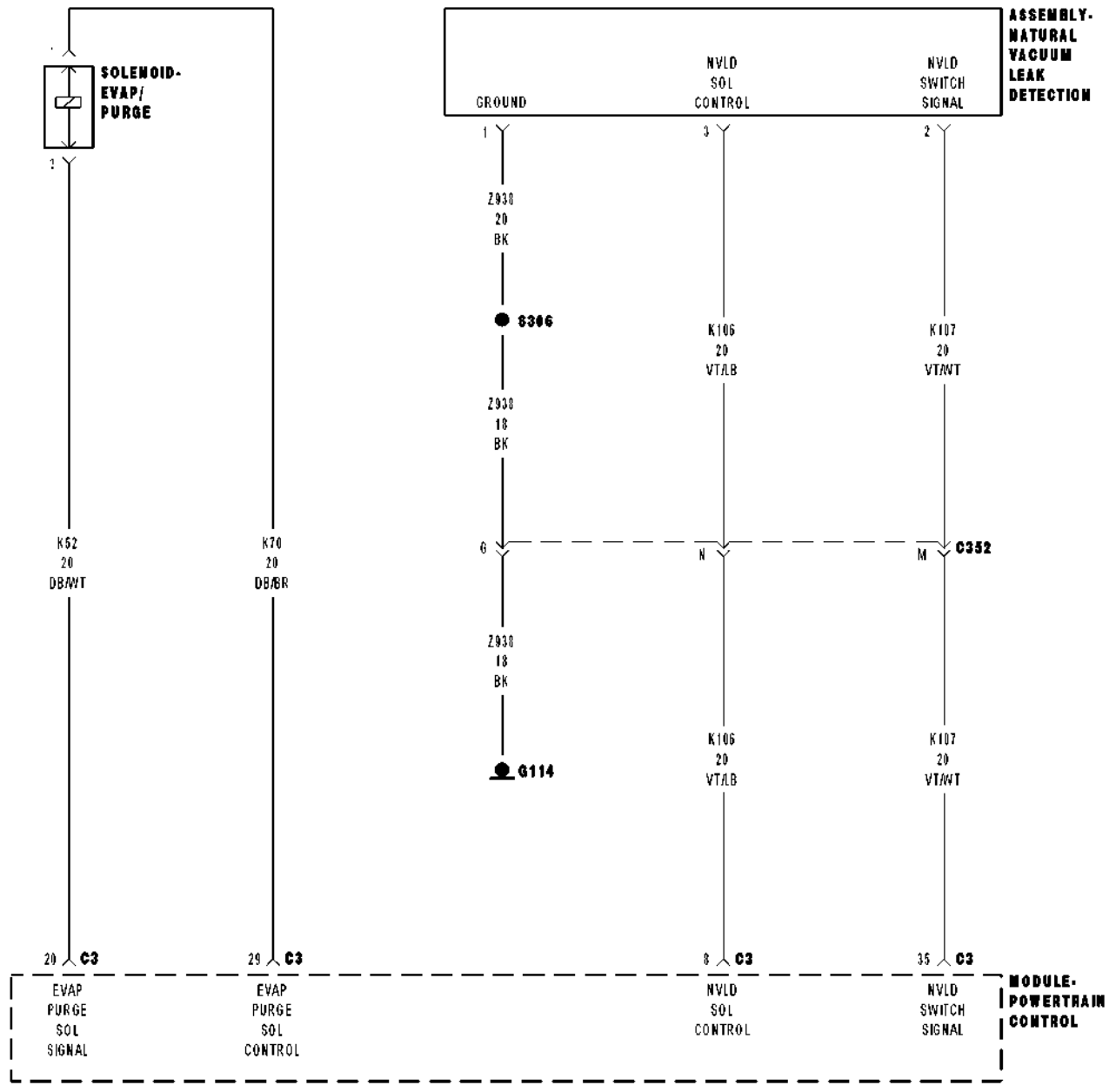
6. CATALYTIC CONVERTER

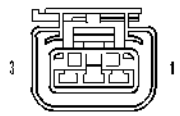
If there are no possible cause remaining, view repair.

Repair

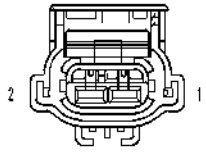
Replace the Catalytic Converter.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0440-GENERAL EVAP SYSTEM FAILURE

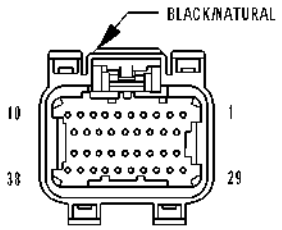




ASSEMBLY-
NATURAL
VACUUM
LEAK
DETECTION



SOLENOID-
EVAP/
PURGE



MODULE-
POWERTRAIN
CONTROL C3

81696718

P0440-GENERAL EVAP SYSTEM FAILURE (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The theory behind the Natural Vacuum Leak Detection (NVLD) is adherence to the Ideal Gas Law. Pressure in a sealed vessel will change linearly as a function of the temperature of the gas in the vessel. Even small leaks will allow the pressure in the vessel to come to equilibrium with the atmospheric pressure. After key-off and a calibrated amount of time, cool down from operating temperatures or diurnal ambient temperature the system pressure will force the system to go negative or draw a vacuum if there is no leak. When the vacuum level reaches 1" H2O (0.25 KPA) the NVLD vacuum switch closes. This sends a signal to the NGC freezing a timer and registering a pass. If a switch closure is not detected an assessment of leak size will be made.

- **When Monitored:**
  Engine Running. Fuel Level greater than 12%. Ambient Temperature between 4°C and 32°C (39°F and 89°F).
- **Set Condition:**
  The PCM does not see the NVLD switch close during the medium/large leak test. The PCM then will increase the vacuum supply to the EVAP system by increasing flow through the EVAP Purge valve. If the switch does not close with an increase in vacuum an error is detected. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
EVAP PURGE SOLENOID VACUUM SUPPLY
(Z938) GROUND CIRCUIT OPEN
(K107) NVLD SWITCH SIGNAL CIRCUIT OPEN
EVAPORATIVE EMISSION LEAK DETECTION
NVLD ASSEMBLY
EVAP PURGE SOLENOID
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: If any of the following DTCs are set (P0443, P0452, P0453, P0498 or P0499) diagnose them first before continuing with P0440.

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0440-GENERAL EVAP SYSTEM FAILURE (CONTINUED)

2. VISUAL AND PHYSICAL INSPECTION

Turn the ignition off.
Perform a visual and physical inspection of the entire Evaporative Emission system.
Check for the following conditions:
- Hoses disconnected or left off
- Holes or cracks
- Loose seal points
- Evidence of damaged components
- Incorrect routing of hoses and tubes
- Fuel Cap left off or bad gasket seal

Were any of the above conditions found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

---

3. EVAP VACUUM SUPPLY HOSE INSPECTION

Carefully inspect the Evap Purge Solenoid vacuum supply hose for proper routing.
Check for a pinched or plugged hose from the throttle body to the Purge Solenoid.
Make sure the vacuum port at the throttle body is free from any blockage.

Were any problems found?

Yes >> Repair the vacuum supply, hose/tube as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

---

4. CHECKING EVAP PURGE SOLENOID FUNCTIONALITY

Disconnect the vacuum supply hoses form the EVAP Purge Solenoid.
Using a hand vacuum pump, apply 10 in Hg to the ″CAN″ side of the EVAP Purge Solenoid.
Ignition on, engine not running.
Observe the vacuum gauge.
With the scan tool, actuate the EVAP Purge Solenoid.

Does the vacuum drop when the solenoid is actuated?

Yes >> Go To 5

No >> Replace the Evap Purge Solenoid.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0440-GENERAL EVAP SYSTEM FAILURE (CONTINUED)

5. NVLD SWITCH OPERATION

Connect the previously disconnected vacuum hose.

Start the engine.

Allow the engine to idle.

Using the scan tool, perform the NVLD FORCED MONITOR TEST.

Monitor the NVLD Switch state.

NOTE: As the test runs, the NVLD Switch should go from an OPEN state to a CLOSED state and then return to OPEN when the test is complete.

Did the NVLD Switch operate as described above?

Yes >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6

---

6. VERIFY EVAPORATIVE EMISSION LEAK

To continue testing you will need Miller Tool #8404 Evaporative Emission Leak Detector (EELD).

WARNING: Keep lit cigarettes, sparks, flames, and other ignition sources away from the test area to prevent the ignition of explosive gases. Keep the test area well ventilated.

NOTE: The fuel tank should have between 20% and 80% of fuel tank capacity to properly test the Evap system.

Connect the red power lead of EELD to the battery positive terminal and the black ground lead to battery negative terminal.

Block the vent hose of the EVAP Canister.

Connect shop air to the EELD.

Set the smoke/air control switch to AIR.

Insert the tester's AIR supply tip (clear hose) into the .040 orifice on the tester's control panel.

Press the remote smoke/air start button.

Position the red flag on the air flow meter so it is aligned with the indicator ball.

When the calibration is complete, release the remote button. The EELD flow meter is now calibrated in liters per minute.

Install the service port adapter #8404-14 on the vehicle's service port (if equipped) or install the #8404-ADP into the filter line.

Connect the Air supply hose from the EELD to the service port (if equipped) or to the #8404-ADP adapter.

Press the remote button to activate AIR flow.

Compare the flow meter indicator ball reading to the red flag.

ABOVE the red flag indicates a leak present.

BELOW the red flag indicates a sealed system.

Is the indicator ball above the red flag?

Yes >> Go To 7

No >> Go To 8

P0440-GENERAL EVAP SYSTEM FAILURE (CONTINUED)

7. EVAPORATIVE EMISSION LEAK DETECTION

NOTE: A thorough visual inspection of the Evap system hoses, tubes, and connections may save time in your diagnosis. Look for any physical damage or signs of wetness at connections. The strong smell of fuel vapors may aid diagnosis also.

To continue testing, you will need Miller Tool #8404 Evaporative Emissions Leak Detector (EELD).

Remove the Air supply hose from the service port or the #8404-ADP adapter.

Connect the SMOKE supply tip (black hose) to the service port (if equipped) or to the #8404-ADP adapter.

Set the smoke/air control switch to SMOKE.

NOTE: The flow meter indicator ball will not move at this point.

Press the remote smoke/air start button.

NOTE: Make sure that smoke has filled the EVAP system by continuing to press the remote smoke/air start button, remove the vehicle fuel cap, and wait for the smoke to exit. Once smoke is indicated reinstall the fuel cap.

NOTE: For optimal performance, introduce smoke into the system for an additional 60 seconds; continue introducing smoke at 15 second intervals, as necessary.

While still holding the remote smoke/air start button, use the white light (#8404-CLL) to follow the EVAP system path, and look for the source of the leak indicated by exiting smoke.

If a leak is concealed from view (i.e., top of fuel tank), release the remote smoke/air start button, and use the ultra-violet (UV) black light #8404-UVL and the yellow goggles 8404-20 to look for residual traces of dye that are left behind by the smoke.

The exiting smoke deposits a residual fluid that is either bright green or bright yellow in color when viewed with a UV light.

NOTE: Carefully inspect the vent side of the EVAP Canister. Due to the filtering system in the canister the smoke or dye may or may not be visible. Introducing smoke into the filtered side of the canister may assist in locating the leak.

Was a leak found?

Yes >> Repair or replace the leaking component as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 11

P0440-GENERAL EVAP SYSTEM FAILURE (CONTINUED)

8. NVLD ASSEMBLY

Turn the ignition off.

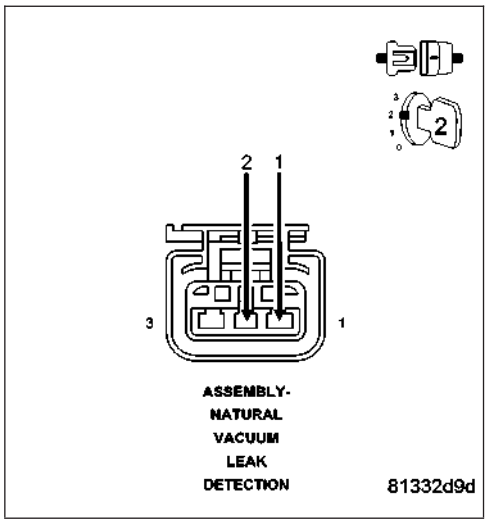
Disconnect the NVLD electrical harness connector.

Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

Connect a jumper wire between the (K107) NVLD Switch Signal circuit and the (Z938) Ground circuit in the NVLD electrical harness connector.

Monitor the NVLD Switch state on the scan tool.



Does the Switch change from OPEN to CLOSED when the jumper wire is installed?

Yes >> Replace the NVLD Assembly.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

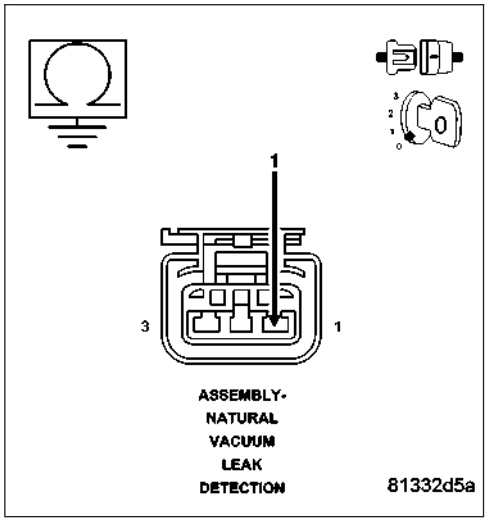
No >> Go To 9

NOTE: Remove the jumper wire before continuing.

9. (Z938) GROUND CIRCUIT OPEN

Turn the ignition off.

Measure the resistance between the (Z938) Ground circuit and ground.



Is the resistance below 5.0 ohms?

Yes >> Go To 10

No >> Repair the open in the (Z938) Ground circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE).

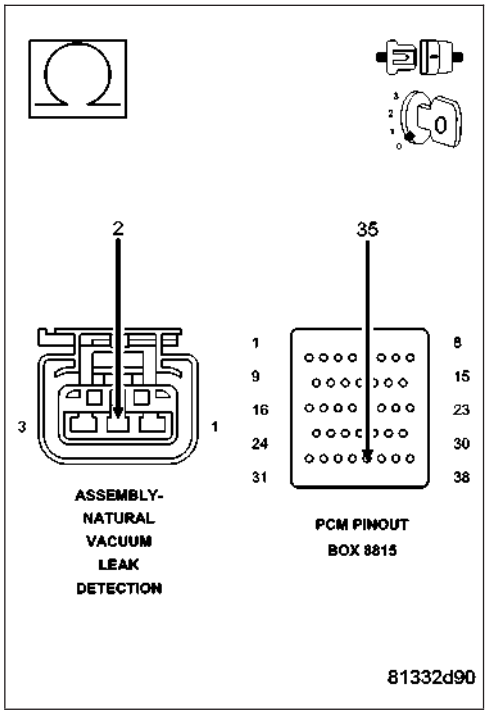
P0440-GENERAL EVAP SYSTEM FAILURE (CONTINUED)

10. (K107) NVLD SWITCH SIGNAL CIRCUIT OPEN

Disconnect the C3 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K107) NVLD Switch Signal circuit from the NVLD electrical harness connector to the appropriate terminal of the special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 11

No >> Repair the open in the (K107) Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

11. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

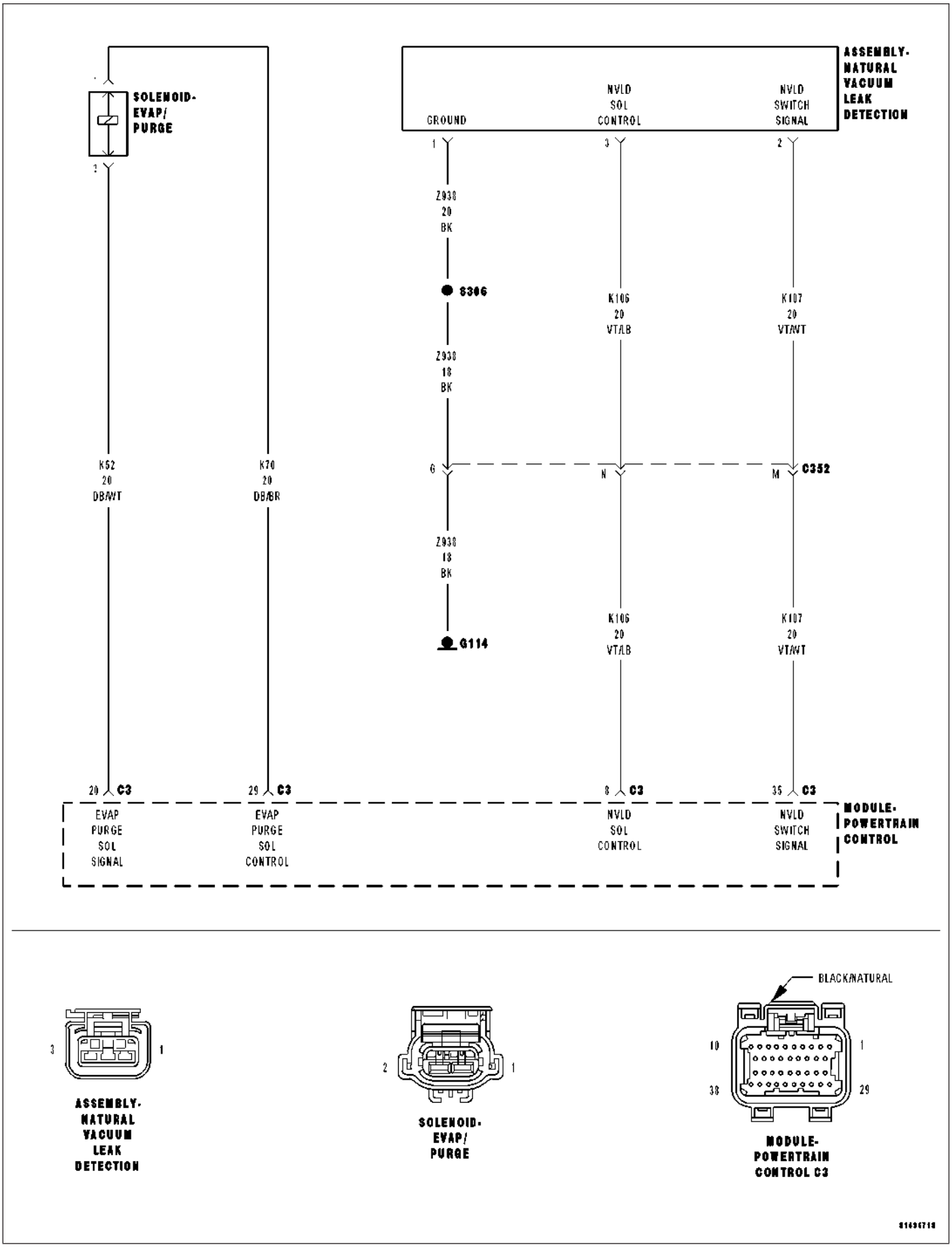
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0441-EVAP PURGE SYSTEM PERFORMANCE



P0441-EVAP PURGE SYSTEM PERFORMANCE (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Cold start test. Engine Running. Small Leak Test Passed.
- **Set Condition:**
  The PCM activates the EVAP Purge solenoid gradually increases to maximum flow. During flow, the PCM looks for the NVLD switch to close. If the PCM does not see the NVLD switch close at maximum flow an error is detected. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
EVAP PURGE SOLENOID VACUUM SUPPLY
EVAP PURGE SOLENOID

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: If any of the following DTCs are set (P0443, P0452, P0453, P0498 or P0499) diagnose them first before continuing with P0441.

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. CHECKING EVAP PURGE SOLENOID FUNCTIONALITY

NOTE: After disconnecting the Evap Purge vacuum connections, inspect the lines and solenoid for any signs of contamination or foreign materials.

Using a hand vacuum pump, apply 10 in Hg to ″CAN″ side of the EVAP Purge Solenoid.

Ignition on, engine not running.

Observe the vacuum gauge.

With the scan tool, actuate the EVAP Purge Solenoid.

Does the vacuum drop when the solenoid is actuated?

Yes >> Go To 3

No >> Replace the Evap Purge Solenoid.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

NOTE: Remove the vacuum pump before continuing.

P0441-EVAP PURGE SYSTEM PERFORMANCE (CONTINUED)

3. EVAP VACUUM SUPPLY HOSE INSPECTION

Turn the ignition off.

Carefully inspect the Evap Purge Solenoid vacuum supply hose for proper routing.

Check for a pinched or plugged hose from the throttle body to the Purge Solenoid.

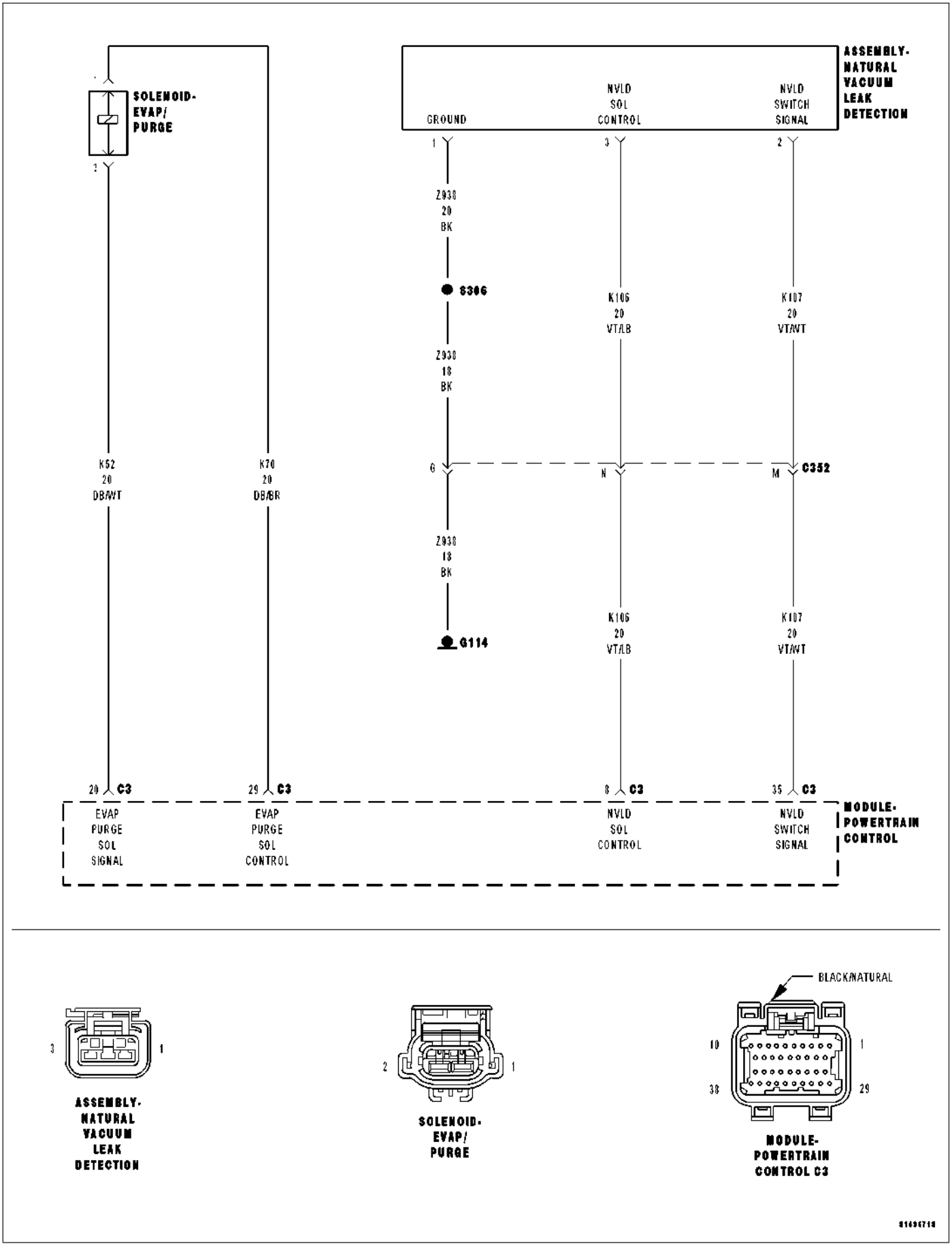
Inspect the vacuum port at the throttle body for any damage or plugging.

Were any problems found?

Yes >> Repair the vacuum supply hose/tube as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0442-EVAP PURGE SYSTEM MEDIUM LEAK



P0442-EVAP PURGE SYSTEM MEDIUM LEAK (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The theory behind the Natural Vacuum Leak Detection (NVLD) is adherence to the Ideal Gas Law. Pressure in a sealed vessel will change linearly as a function of the temperature of the gas in the vessel. Even small leaks will allow the pressure in the vessel to come to equilibrium with the atmospheric pressure. After key-off and a calibrated amount of time, cool down from operating temperatures or diurnal ambient temperature the system pressure will force the system to go negative or draw a vacuum if there is no leak. When the vacuum level reaches 1" H2O (0.25 KPA) the NVLD vacuum switch closes. This sends a signal to the NGC freezing a timer and registering a pass. If a switch closure is not detected an assessment of leak size will be made.

- **When Monitored:**
  Engine Running. Cold start test. Fuel Level greater than 12%. Ambient Temperature between 4°C and 32°C (39°F and 89°F) Close Loop fuel system. Test runs when small leak test is maturing.
- **Set Condition:**
  The PCM activates the EVAP Purge Solenoid to pull the EVAP system into a vacuum to close the NVLD switch. Once the NVLD switch is closed, the PCM turns the EVAP Purge solenoid off to seal the EVAP system. If the NVLD switch reopens before the calibrated amount of time for a Medium leak an error is detected. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
EVAP PURGE SYSTEM LEAK
EVAP PURGE SOLENOID
NVLD SWITCH

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: Since a hot vehicle can conceal a leak, it is best to perform this test at room temperature.

NOTE: A loose gas cap could have caused this DTC to set. Make sure gas cap is tight and in good condition. Make sure the gas cap meets OEM specifications.

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0442-EVAP PURGE SYSTEM MEDIUM LEAK (CONTINUED)

2. VISUAL AND PHYSICAL INSPECTION

Perform a visual and physical inspection of the entire Evaporative Emission system.

Check for the follow conditions:

- Holes or cracks
- Loose seal points
- Evidence of damaged components
- Incorrect routing of hoses and tubes
- Fuel Cap gasket seal

Were any of the above conditions found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

---

3. VERIFY EVAPORATIVE EMISSION LEAK

To continue testing you will need Miller Tool #8404A Evaporative Emission Leak Detector (EELD).

WARNING: Keep lit cigarettes, sparks, flames, and other ignition sources away from the test area to prevent the ignition of explosive gases. Keep the test area well ventilated.

NOTE: The fuel tank should have between 20% and 80% of fuel tank capacity to properly test the Evap system.

Connect the red power lead of the EELD to the battery positive terminal and the black ground lead to battery negative terminal.

Block the vent hose of the canister if using the service port.

Connect shop air to the EELD.

Set the smoke/air control switch to AIR.

Insert the tester's AIR supply tip (clear hose) into the appropriate calibration orifice on the tester's control panel (based on DTC leak size).

Press the remote smoke/air start button.

Position the red flag on the air flow meter so it is aligned with the indicator ball.

When the calibration is complete, release the remote button. The EELD flow meter is now calibrated in liters per minute to the size leak indicated by the DTC set in the PCM.

Install the service port adapter #8404-14 on the vehicle's service port and block the vent hose of the EVAP Canister (if equipped) or install the #8404-ADP service adaptor into the filter line.

Connect the Air supply hose from the EELD to the service port (if equipped) or to the #8404-ADP adapter.

Press the remote button to activate AIR flow.

NOTE: Larger volume fuel tanks, lower fuel levels or if the vehicle is equipped with a Flow Management Valve may indicate high flow and will require 4 to 5 minutes to fill.

Compare the flow meter indicator ball reading to the red flag.

ABOVE the red flag indicates a leak present.

BELOW the red flag indicates a sealed system.

Is the indicator ball above the red flag?

Yes >> Go To 4

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0442-EVAP PURGE SYSTEM MEDIUM LEAK (CONTINUED)

4. EVAPORATIVE EMISSION LEAK DETECTION

NOTE: A thorough visual inspection of the Evap system hoses, tubes, and connections may save time in your diagnosis. Look for any physical damage or signs of wetness at connections. The strong smell of fuel vapors may also aid diagnosis.

To continue testing, you will need Miller Tool #8404A Evaporative Emissions Leak Detector (EELD).

Remove the Air supply hose from the service port (if equipped) or from the #8404-ADP adapter.

Connect the SMOKE supply tip (black hose) to the service port (if equipped) or to the #8404-ADP adapter.

Set the smoke/air control switch to SMOKE.

NOTE: The flow meter indicator ball will not move in the smoke mode.

Press the remote smoke/air start button.

NOTE: Make sure that smoke has filled the EVAP system by continuing to press the remote smoke/air start button, remove the vehicle fuel cap, and wait for the smoke to exit. Once smoke is indicated reinstall the fuel cap.

NOTE: For optimal performance, introduce smoke into the system for an additional 60 seconds; continue introducing smoke at 15 second intervals, as necessary.

While still holding the remote smoke/air start button, use the white light (#8404-CLL) to follow the EVAP system path, and look for the source of the leak indicated by exiting smoke.

If a leak is concealed from view (i.e., top of fuel tank), release the remote smoke/air start button, and use the ultra-violet (UV) black light #8404-UVL and the yellow goggles 8404-20 to look for residual traces of dye that is left behind by the smoke.

The exiting smoke deposits a residual fluid that is either bright green or bright yellow in color when viewed with a UV light.

NOTE: Carefully inspect the vent side of the EVAP Canister. Due to the filtering system in the canister the smoke may not be as thick. Introducing smoke into the filtered side of the canister may assist in locating the leak.

Was a leak found?

Yes >> Repair or replace the leaking component as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

---

5. EVAP PURGE SOLENOID OPERATION

NOTE: After disconnecting the Evap Purge Solenoid vacuum connections, inspect the lines and solenoid for any signs of contamination from the EVAP Canister. This may indicate a faulty check valve. Replace/repair as necessary.

Turn the ignition off.

Disconnect the vacuum hoses at the Evap Purge Solenoid.

Using a hand vacuum pump, apply 10 in Hg to the ″CAN″ of the EVAP Purge Solenoid.

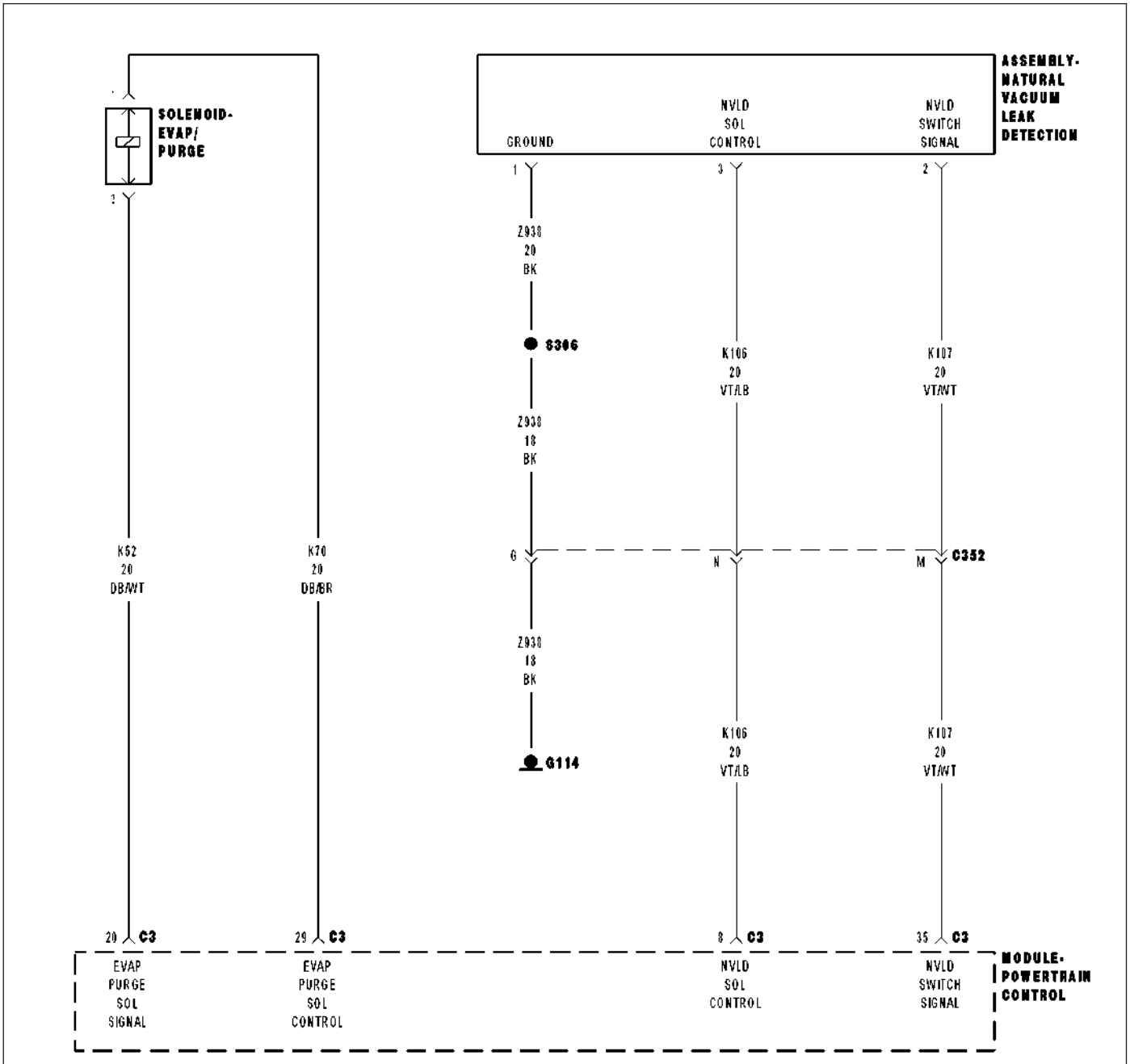
NOTE: Monitor the vacuum gauge for at least 15 seconds.

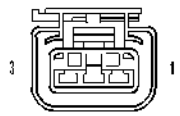
Does the EVAP Purge Solenoid hold vacuum?

Yes >> Test Complete.

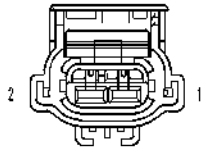
No >> Replace the Evap Purge Solenoid.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0443-EVAP PURGE SOLENOID CIRCUIT

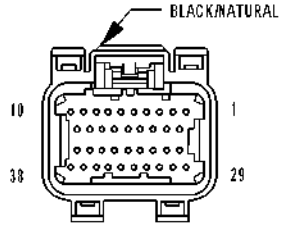




ASSEMBLY-
NATURAL
VACUUM
LEAK
DETECTION



SOLENOID-
EVAP/
PURGE



MODULE-
POWERTRAIN
CONTROL C3

81696718

P0443-EVAP PURGE SOLENOID CIRCUIT (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  The ignition on or engine running. Battery voltage greater than 10 volts.
- **Set Condition:**
  The PCM will set a trouble code if the actual state of the solenoid does not match the intended state. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K52) EVAP PURGE CONTROL CIRCUIT OPEN
(K52) EVAP PURGE SOLENOID CONTROL CIRCUIT SHORTED TO GROUND
(K70) EVAP PURGE SOLENOID SIGNAL CIRCUIT OPEN
(K70) EVAP PURGE SOLENOID SIGNAL CIRCUIT SHORTED TO GROUND
EVAP PURGE SOLENOID
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With the scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

2. EVAP PURGE SOLENOID OPERATION

Turn the ignition off.

Disconnect the EVAP Purge Solenoid harness connector.

Ignition on, engine not running.

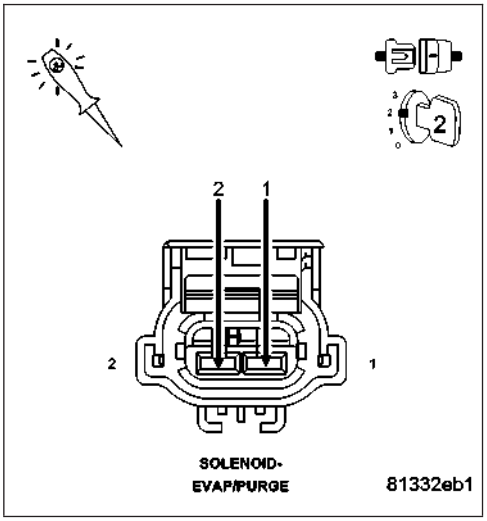
Using a 12-volt test light, jump across the (K52) Evap Purge Solenoid Control circuit and (K70) Evap Purge Solenoid Signal circuit in the EVAP Purge Solenoid harness connector.

With a scan tool, actuate the EVAP Purge Solenoid.

Does the test light flash on and off?

Yes >> Replace the EVAP Purge Solenoid.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3



P0443-EVAP PURGE SOLENOID CIRCUIT (CONTINUED)

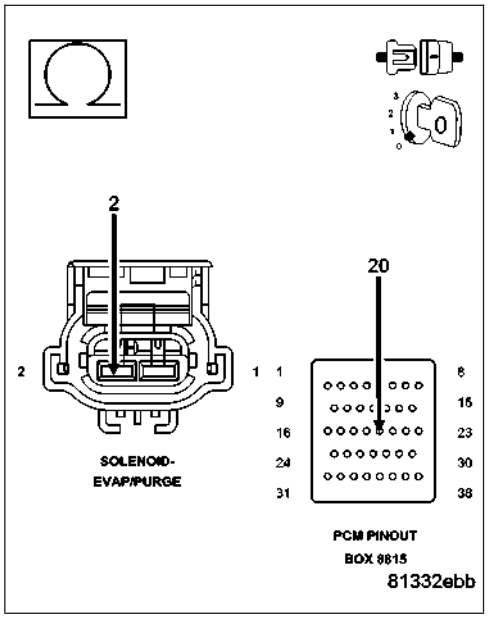
3. (K52) EVAP PURGE SOLENOID CONTROL CIRCUIT OPEN

Turn the ignition off.

Disconnect the C3 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K52) Evap Purge Solenoid Control circuit from the Evap Purge Solenoid harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

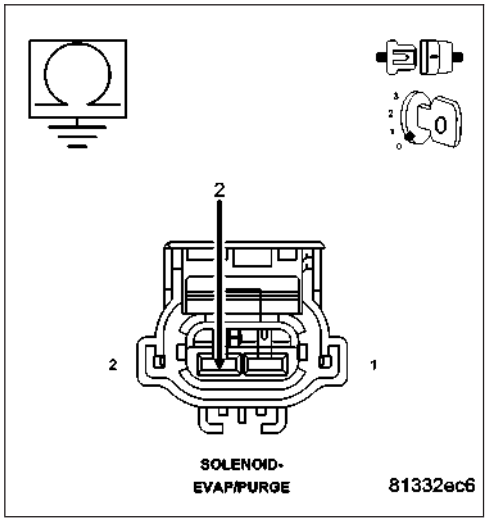
Yes >> Go To 4

No >> Repair the open in the (K52) EVAP Purge Solenoid Control circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

4. (K52) EVAP PURGE SOLENOID CONTROL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K52) Evap Purge Solenoid Control circuit in the Evap Purge Solenoid harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K52) EVAP Purge Solenoid Control circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

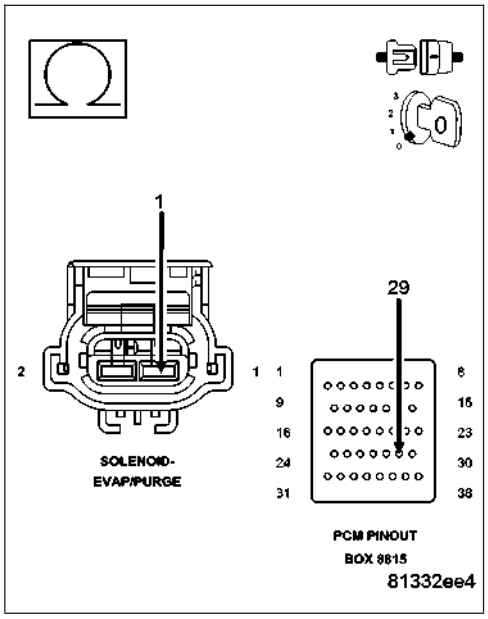
No >> Go To 5

P0443-EVAP PURGE SOLENOID CIRCUIT (CONTINUED)

5. (K70) EVAP PURGE SOLENOID SIGNAL CIRCUIT OPEN

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K70) Evap Purge Solenoid Signal circuit from the EVAP Purge Solenoid harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

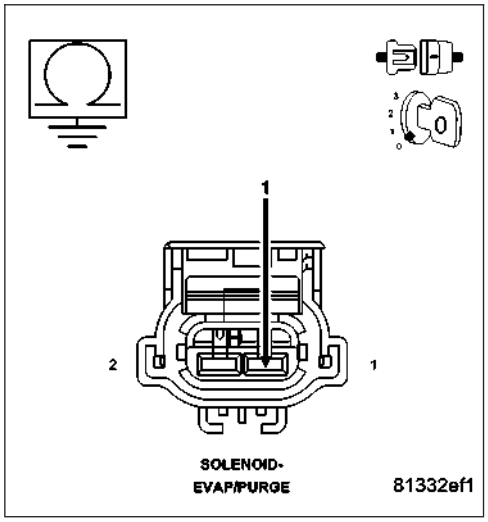
Yes >> Go To 6

No >> Repair the open in the (K70) Evap Purge Solenoid Signal circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

6. (K70) EVAP PURGE SOLENOID SIGNAL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K70) Evap Purge Solenoid Signal circuit in the Evap Purge Solenoid harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K70) Evap Purge Solenoid Signal circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 7

P0443-EVAP PURGE SOLENOID CIRCUIT (CONTINUED)

7. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

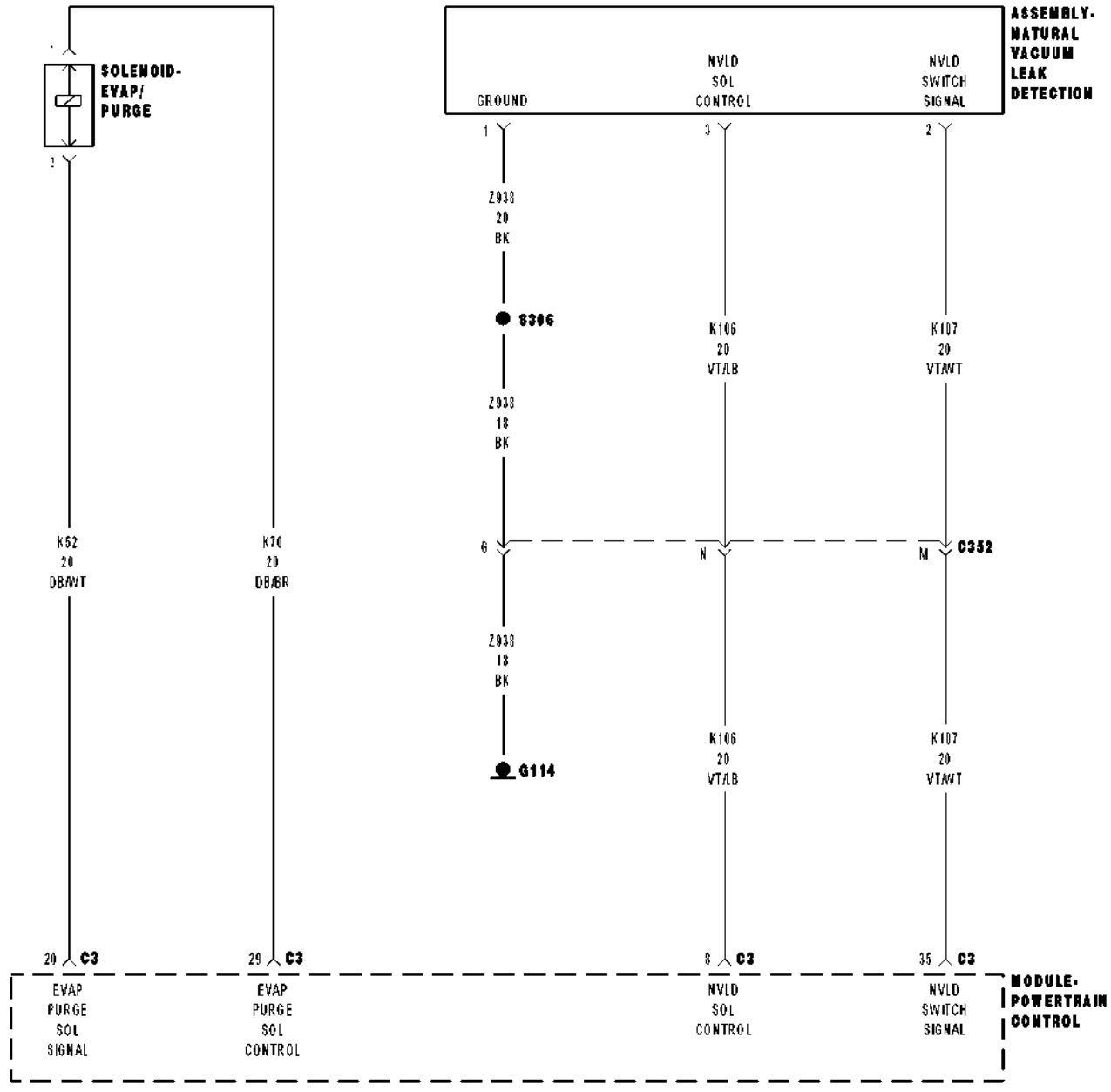
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

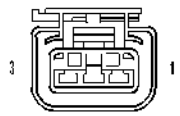
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

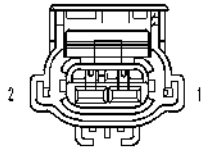
No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0452-NVLD PRESSURE SWITCH STUCK CLOSED

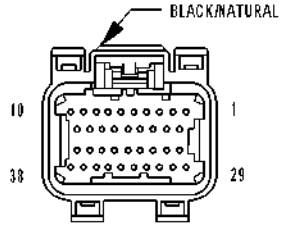




ASSEMBLY-
NATURAL
VACUUM
LEAK
DETECTION



SOLENOID-
EVAP/
PURGE



MODULE-
POWERTRAIN
CONTROL C3

81696718

P0452-NVLD PRESSURE SWITCH STUCK CLOSED (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Immediately after the engine has been started.
- **Set Condition:**
  The PCM activates the NLVD Solenoid. If PCM does not see NVLD switch open an error is detected. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K52) EVAP PURGE SOLENOID CONTROL CIRCUIT SHORTED TO GROUND
(K107) NVLD SWITCH SIGNAL CIRCUIT SHORTED TO GROUND
NVLD ASSEMBLY
EVAP PURGE SOLENOID
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

2. EVAP PURGE SOLENOID OPERATION

Turn the ignition off.

Disconnect the EVAP Purge Solenoid harness connector.

Ignition on, engine not running.

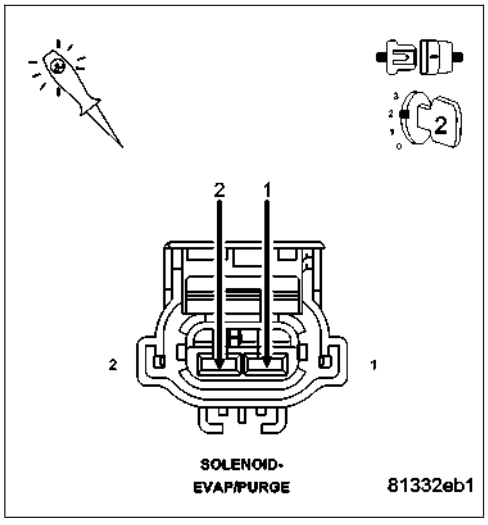
Using a 12-volt test light, jump across the Evap Purge Solenoid harness connector.

With the scan tool, actuate the EVAP Purge Solenoid.

Does the test light flash on and off?

Yes >> Go To 3

No >> Go To 7



P0452-NVLD PRESSURE SWITCH STUCK CLOSED (CONTINUED)

3. EVAP PURGE SOLENOID LEAKS/STUCK OPEN

Turn the ignition off.

Connect the Evap Purge Solenoid harness connector.

Disconnect the vacuum hoses at the Evap Purge Solenoid.

NOTE: After disconnecting the Evap Purge Solenoid vacuum connections, inspect the lines and solenoid for any signs of contamination from the EVAP Canister. This may indicate a faulty check valve. Replace/repair as necessary.

Using a hand vacuum pump, apply 10 in Hg to the ″CAN″ of the EVAP Purge Solenoid.

NOTE: Monitor the vacuum gauge for at least 15 seconds.

Does the EVAP Purge Solenoid hold vacuum?

Yes >> Go To 4

No >> Replace the Evap Purge Solenoid.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

4. NVLD SWITCH OPERATION

Ignition on, engine not running.

Using the scan tool, monitor the NVLD Switch State with the vacuum pump still installed and holding vacuum.

Does the scan tool display the NVLD state OPEN?

Yes >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

NOTE: Remove the vacuum pump and connect the vacuum hose before continuing.

---

5. NVLD ASSEMBLY

Disconnect the NVLD electrical connector.

Does the Switch change from CLOSED to OPEN?

Yes >> Replace the NVLD Assembly.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6

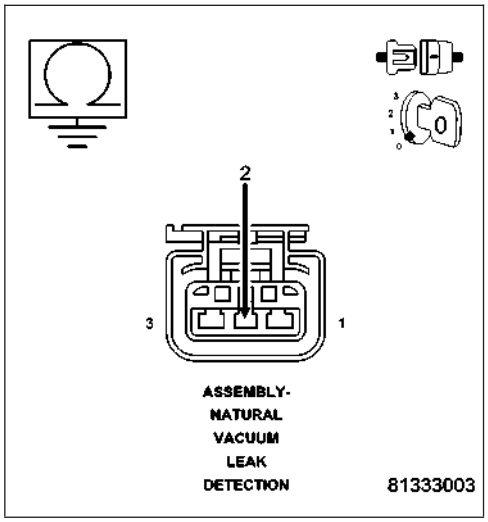
P0452-NVLD PRESSURE SWITCH STUCK CLOSED (CONTINUED)

6. (K107) SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the C3 PCM harness connector.

Measure the resistance between ground and the (K107) NVLD Switch Signal circuit in the NVLD Assembly harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K107) NVLD Switch Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

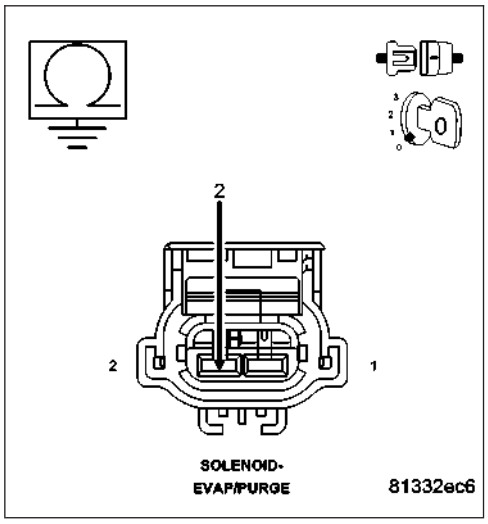
No >> Go To 8

7. (K52) EVAP PURGE SOLENOID CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the C3 PCM harness connector.

Measure the resistance between ground and the (K52) Evap Purge Solenoid Control circuit in the EVAP Purge Solenoid harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K52) Evap Purge Sol Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8

8. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

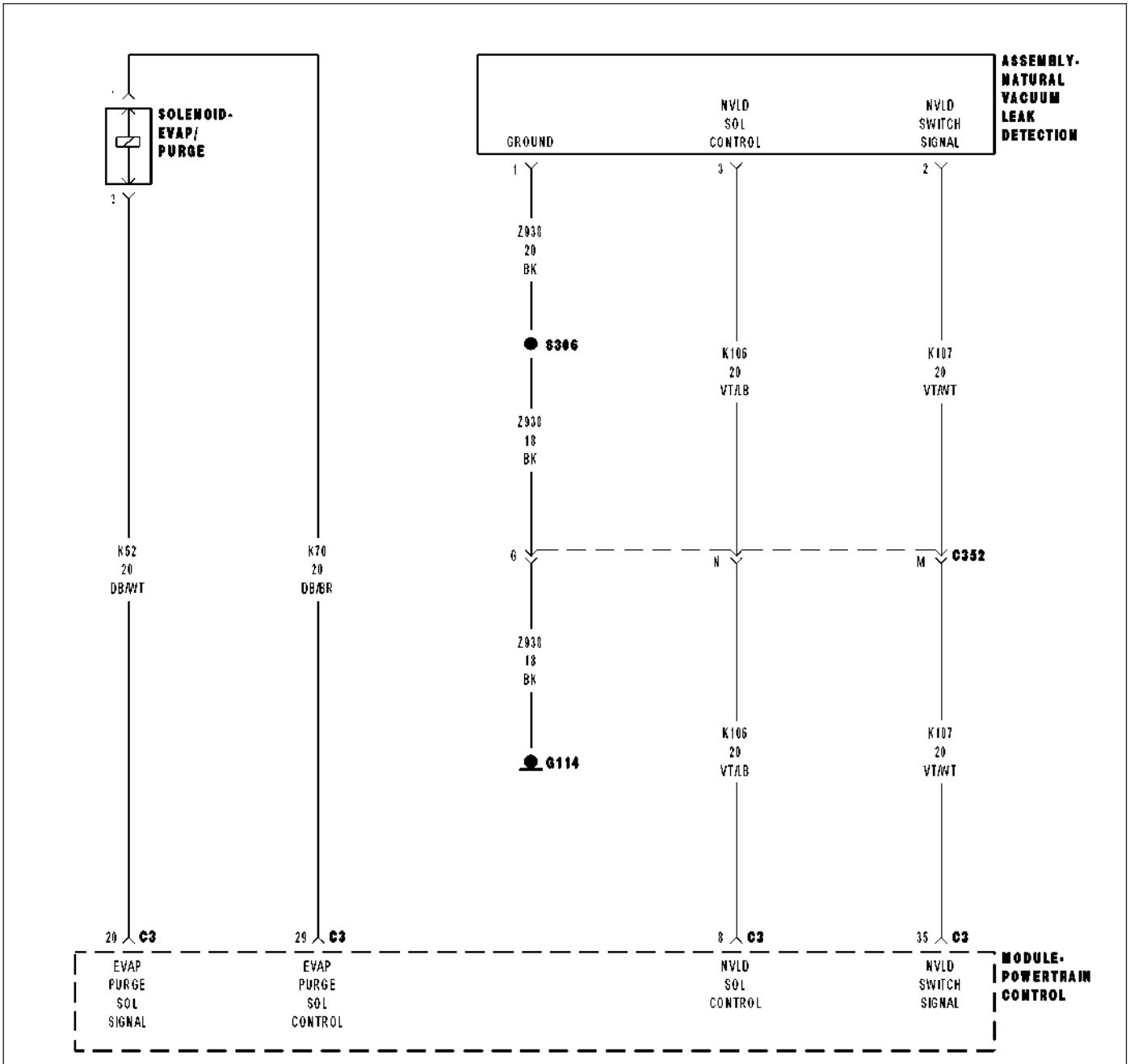
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

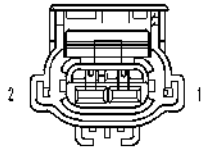
Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

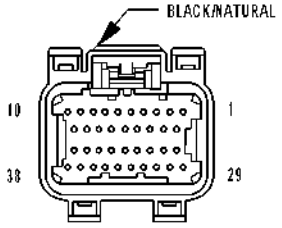
P0453-NVLD PRESSURE SWITCH STUCK OPEN



ASSEMBLY-
NATURAL
VACUUM
LEAK
DETECTION



SOLENOID-
EVAP/
PURGE



MODULE-
POWERTRAIN
CONTROL C3

81696718

P0453-NVLD PRESSURE SWITCH STUCK OPEN (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Engine running.
- **Set Condition:**
  If the PCM does not see the NVLD switch close during test an error is detected. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K107) NVLD SWITCH SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K107) NVLD SWITCH SIGNAL CIRCUIT OPEN
(K107) NVLD SWITCH SIGNAL CIRCUIT SHORTED TO THE (K106) NVLD SOLENOID CONTROL CIRCUIT
(Z938) GROUND CIRCUIT OPEN
NVLD ASSEMBLY
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. NVLD SWITCH OPERATION

Start the engine.

Allow the engine to idle.

Using a scan tool, perform the NVLD FORCED MONITOR TEST.

Monitor the NVLD Switch state.

NOTE: As the test runs, the NVLD Switch should go from an OPEN state to a CLOSED state and then return to OPEN when the test is complete.

Did the NVLD Switch operate as described above?

Yes >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 2

P0453-NVLD PRESSURE SWITCH STUCK OPEN (CONTINUED)

2. NVLD ASSEMBLY

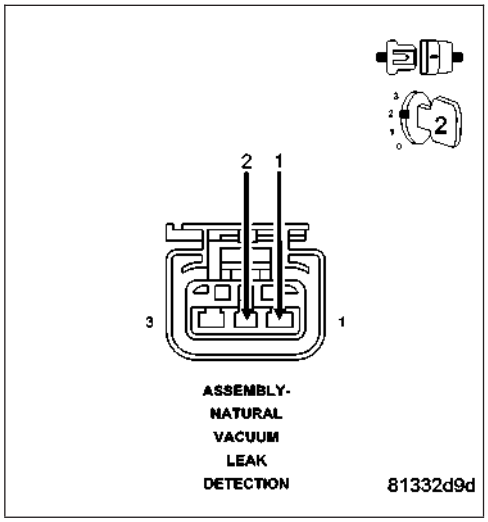
Turn the ignition off.

Disconnect the NVLD electrical harness connector.

Ignition on, engine not running.

Monitor the NVLD Switch state on the scan tool.

Connect a jumper wire between the (K107) NVLD Switch Signal circuit and the (Z938) Ground circuit in the NVLD harness connector.



Does the Switch change from OPEN to CLOSED with the jumper wire installed?

Yes >> Replace the NVLD Assembly.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

NOTE: Remove the jumper wire before continuing.

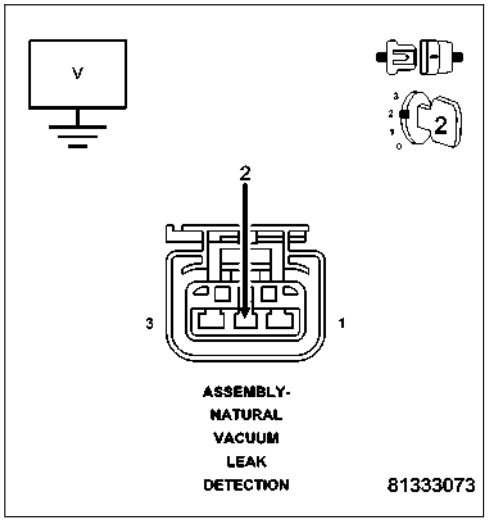
3. (K107) NVLD SWITCH SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

Disconnect the C3 PCM harness connector.

Ignition on, engine not running.

Measure the voltage on the (K107) NVLD Switch Signal circuit in the NVLD electrical harness connector.



Is the voltage above 0 volts?

Yes >> Repair the short to battery voltage in the (K107) NVLD Switch Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

P0453-NVLD PRESSURE SWITCH STUCK OPEN (CONTINUED)

4. (K107) NVLD SWITCH SIGNAL CIRCUIT OPEN

Turn the ignition off.

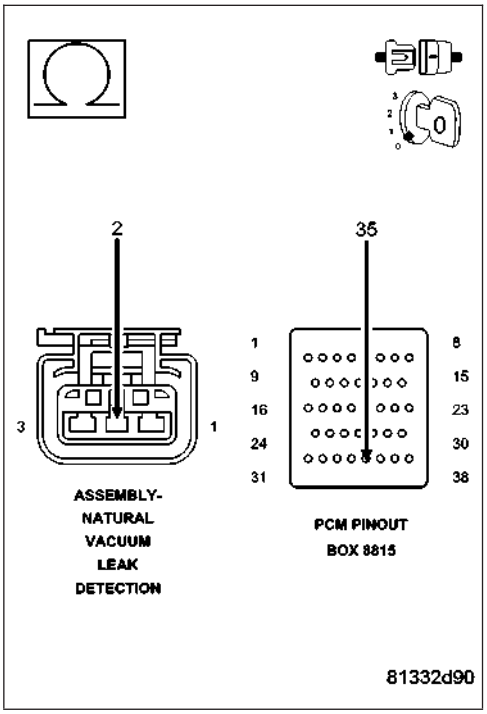
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K107) NVLD Switch Signal circuit from the NVLD electrical harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 5

No >> Repair the open in the (K107) NVLD Switch Signal circuit. Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



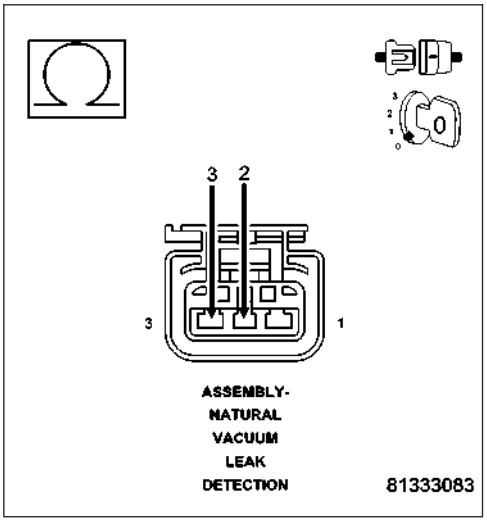
5. (K107) NVLD SWITCH SIGNAL CIRCUIT SHORTED TO THE (K106) NVLD SOLENOID CONTROL CIRCUIT

Measure the resistance between the (K107) NVLD Switch Signal circuit and the (K106) NVLD Solenoid Control circuit in the NVLD electrical harness connector.

Is the resistance below 5.0 ohms?

Yes >> Repair the short between the (K107) NVLD Switch Signal circuit and the (K106) NVLD Solenoid Control circuit. Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

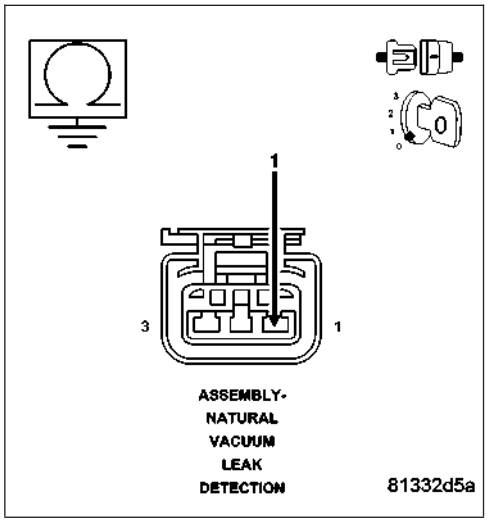
No >> Go To 6



P0453-NVLD PRESSURE SWITCH STUCK OPEN (CONTINUED)

6. (Z938) GROUND CIRCUIT OPEN

Measure the resistance between the (Z938) Ground circuit and ground.



Is the resistance below 5.0 ohms?

Yes >> Go To 7

No >> Repair the open in the (Z938) Ground circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

7. PCM

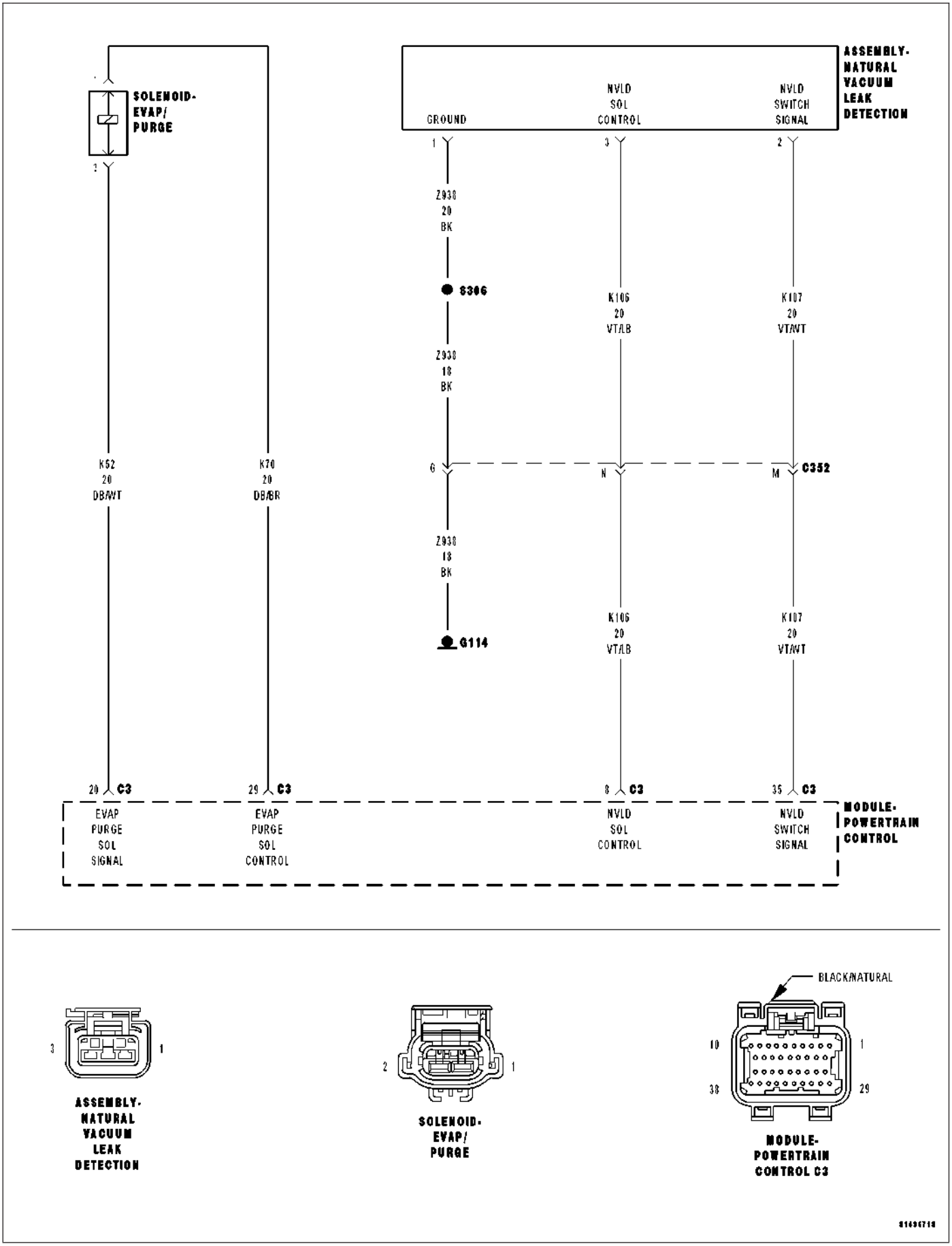
NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0455-EVAP PURGE SYSTEM LARGE LEAK



P0455-EVAP PURGE SYSTEM LARGE LEAK (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The theory behind the Natural Vacuum Leak Detection (NVLD) is adherence to the Ideal Gas Law. Pressure in a sealed vessel will change linearly as a function of the temperature of the gas in the vessel. Even small leaks will allow the pressure in the vessel to come to equilibrium with the atmospheric pressure. After key-off and a calibrated amount of time, cool down from operating temperatures or diurnal ambient temperature the system pressure will force the system to go negative or draw a vacuum if there is no leak. When the vacuum level reaches 1" H2O (0.25 KPA) the NVLD vacuum switch closes. This sends a signal to the NGC freezing a timer and registering a pass. If a switch closure is not detected an assessment of leak size will be made.

- **When Monitored:**
  Engine Running. Cold start test. Fuel Level greater than 12%. Ambient Temperature between 4°C and 32°C (39°F and 89°F) Close Loop fuel system. Test runs when small leak test is maturing.
- **Set Condition:**
  The PCM activates the EVAP Purge Solenoid to pull the EVAP system into a vacuum to close the NVLD switch. Once the NVLD switch is closed, the PCM turns the EVAP Purge solenoid off to seal the EVAP system. If the NVLD switch reopens before the calibrated amount of time for a Large leak an error is detected. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
EVAP PURGE SYSTEM LEAK
EVAP PURGE SOLENOID
NVLD SWITCH

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Check for any related TSBs before continuing.

NOTE: Since a hot vehicle can conceal a leak, it is best to perform this test at room temperature.

NOTE: A loose gas cap could have caused this DTC to set. Make sure gas cap is tight and in good condition. Ensure the gas cap meets OEM specifications.

Ignition on, engine not running.

With a scan tool, read DTCs and record the related Freeze Frame data.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0455-EVAP PURGE SYSTEM LARGE LEAK (CONTINUED)

2. VISUAL AND PHYSICAL INSPECTION

Perform a visual and physical inspection of the entire Evaporative Emission system.

Check for the follow conditions:

- Holes or cracks
- Loose seal points
- Evidence of damaged components
- Incorrect routing of hoses and tubes
- Fuel Cap gasket seal

Were any of the above conditions found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

---

3. VERIFY EVAPORATIVE EMISSION LEAK

To continue testing you will need Miller Tool #8404A Evaporative Emission Leak Detector (EELD).

WARNING: Keep lit cigarettes, sparks, flames, and other ignition sources away from the test area to prevent the ignition of explosive gases. Keep the test area well ventilated.

NOTE: The fuel tank should have between 20% and 80% of fuel tank capacity to properly test the Evap system.

Connect the red power lead of the EELD to the battery positive terminal and the black ground lead to battery negative terminal.

Block the vent hose of the canister if using the service port.

Connect shop air to the EELD.

Set the smoke/air control switch to AIR.

Insert the tester's AIR supply tip (clear hose) into the appropriate calibration orifice on the tester's control panel (based on DTC leak size).

Press the remote smoke/air start button.

Position the red flag on the air flow meter so it is aligned with the indicator ball.

When the calibration is complete, release the remote button. The EELD flow meter is now calibrated in liters per minute to the size leak indicated by the DTC set in the PCM.

Install the service port adapter #8404-14 on the vehicle's service port and block the vent hose of the EVAP Canister (if equipped) or install the #8404-ADP service adaptor into the filter line.

Connect the Air supply hose from the EELD to the service port (if equipped) or to the #8404-ADP adapter.

Press the remote button to activate AIR flow.

NOTE: Larger volume fuel tanks, lower fuel levels or if the vehicle is equipped with a Flow Management Valve may indicate high flow and will require 4 to 5 minutes to fill.

Compare the flow meter indicator ball reading to the red flag.

ABOVE the red flag indicates a leak present.

BELOW the red flag indicates a sealed system.

Is the indicator ball above the red flag?

Yes >> Go To 4

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0455-EVAP PURGE SYSTEM LARGE LEAK (CONTINUED)

4. EVAPORATIVE EMISSION LEAK DETECTION

NOTE: A thorough visual inspection of the Evap system hoses, tubes, and connections may save time in your diagnosis. Look for any physical damage or signs of wetness at connections. The strong smell of fuel vapors may aid diagnosis also.

To continue testing, you will need Miller Tool #8404A Evaporative Emissions Leak Detector (EELD).

Remove the Air supply hose from the service port (if equipped) or from the #8404-ADP adapter.

Connect the SMOKE supply tip (black hose) to the service port (if equipped) or to the #8404-ADP adapter.

Set the smoke/air control switch to SMOKE.

NOTE: The flow meter indicator ball will not move in the smoke mode.

Press the remote smoke/air start button.

NOTE: Make sure that smoke has filled the EVAP system by continuing to press the remote smoke/air start button, remove the vehicle fuel cap, and wait for the smoke to exit. Once smoke is indicated reinstall the fuel cap.

NOTE: For optimal performance, introduce smoke into the system for an additional 60 seconds; continue introducing smoke at 15 second intervals, as necessary.

While still holding the remote smoke/air start button, use the white light (#8404-CLL) to follow the EVAP system path, and look for the source of the leak indicated by exiting smoke.

If a leak is concealed from view (i.e., top of fuel tank), release the remote smoke/air start button, and use the ultra-violet (UV) black light #8404-UVL and the yellow goggles 8404-20 to look for residual traces of dye that is left behind by the smoke.

The exiting smoke deposits a residual fluid that is either bright green or bright yellow in color when viewed with a UV light.

NOTE: Carefully inspect the vent side of the EVAP Canister. Due to the filtering system in the canister the smoke may not be as thick. Introducing smoke into the filtered side of the canister may assist in locating the leak.

Was a leak found?

Yes >> Repair or replace the leaking component as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

---

5. EVAP PURGE SOLENOID OPERATION

NOTE: After disconnecting the Evap Purge Solenoid vacuum connections, inspect the lines and solenoid for any signs of contamination from the EVAP Canister. This may indicate a faulty check valve. Replace/repair as necessary.

Turn the ignition off.

Disconnect the vacuum hoses at the Evap Purge Solenoid.

Using a hand vacuum pump, apply 10 in Hg to the ″CAN″ of the EVAP Purge Solenoid.

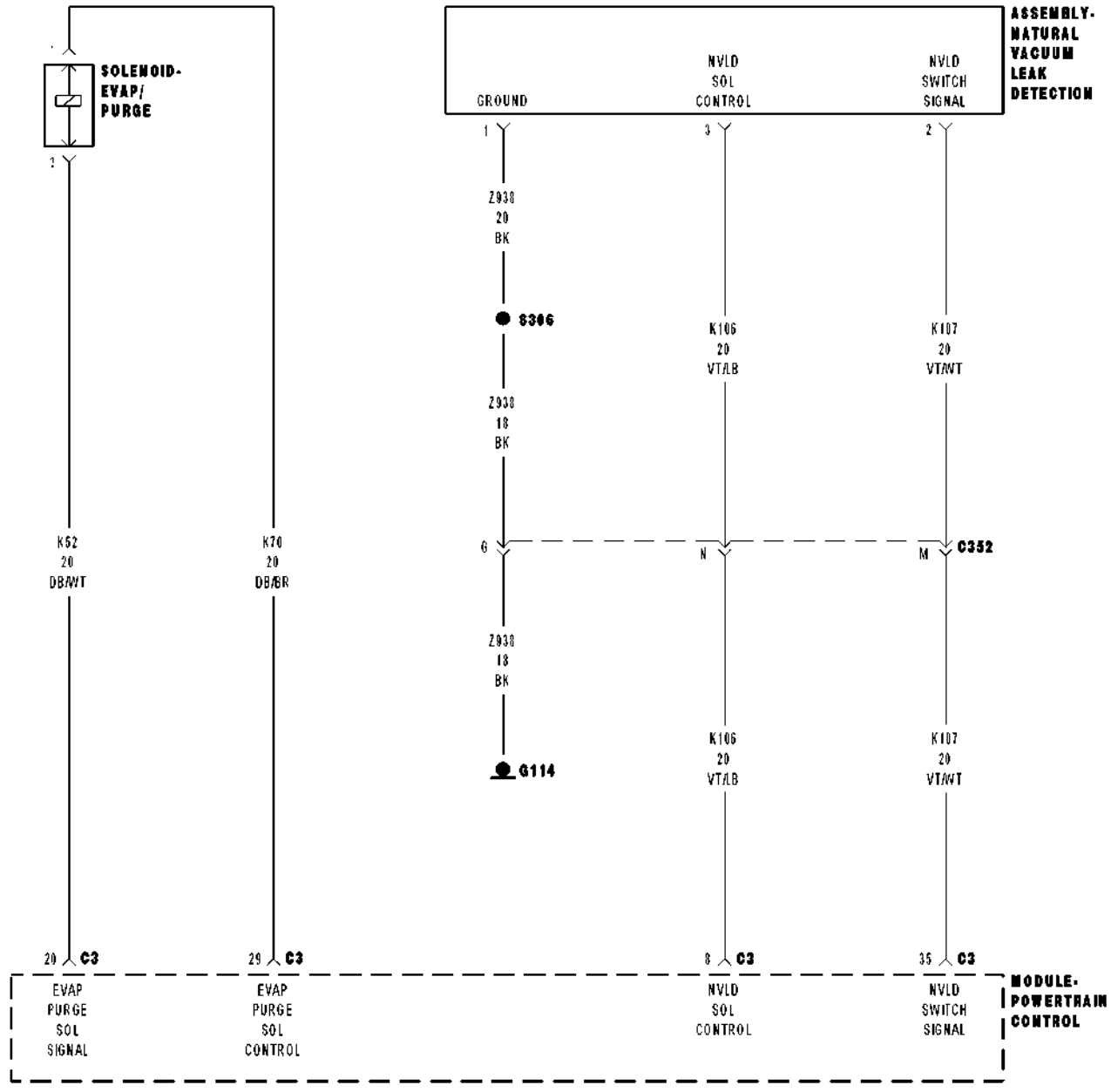
NOTE: Monitor the vacuum gauge for at least 15 seconds.

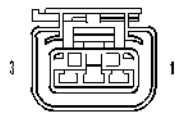
Does the EVAP Purge Solenoid hold vacuum?

Yes >> Test Complete.

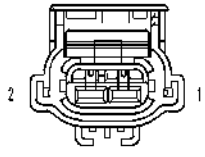
No >> Replace the Evap Purge Solenoid.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0456-EVAP PURGE SYSTEM SMALL LEAK

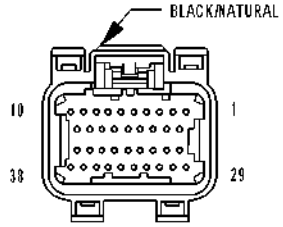




ASSEMBLY-
NATURAL
VACUUM
LEAK
DETECTION



SOLENOID-
EVAP/
PURGE



MODULE-
POWERTRAIN
CONTROL C3

81696718

P0456-EVAP PURGE SYSTEM SMALL LEAK (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The theory behind the Natural Vacuum Leak Detection (NVLD) is adherence to the Ideal Gas Law. Pressure in a sealed vessel will change linearly as a function of the temperature of the gas in the vessel. Even small leaks will allow the pressure in the vessel to come to equilibrium with the atmospheric pressure. After key-off and a calibrated amount of time, cool down from operating temperatures or diurnal ambient temperature the system pressure will force the system to go negative or draw a vacuum if there is no leak. When the vacuum level reaches 1" H2O (0.25 KPA) the NVLD vacuum switch closes. This sends a signal to the NGC freezing a timer and registering a pass. If a switch closure is not detected an assessment of leak size will be made.

- **When Monitored:**
  Ignition off. Fuel Level less than 88%. Ambient Temperature between 4°C and 43°C (39°F and 109°F) Close Loop fuel system.
- **Set Condition:**
  Due to temperature changes, a vacuum is created in the fuel tank and EVAP system. With the EVAP system sealed, the PCM monitors the NVLD switch. If the NVLD switch does not close within a calibrated time allowance, an error is detected by the PCM. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
EVAP PURGE SYSTEM LEAK
EVAP PURGE SOLENOID

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: Since a hot vehicle can conceal a leak, it is best to perform this test at room temperature.

NOTE: A loose gas cap could have caused this DTC to set. Make sure gas cap is tight and in good condition. Make sure the gas cap meets OEM specifications.

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0456-EVAP PURGE SYSTEM SMALL LEAK (CONTINUED)

2. VISUAL AND PHYSICAL INSPECTION

Perform a visual and physical inspection of the entire Evaporative Emission system.

Check for the follow conditions:

- Holes or cracks
- Loose seal points
- Evidence of damaged components
- Incorrect routing of hoses and tubes
- Fuel Cap gasket seal

Were any of the above conditions found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

---

3. VERIFY EVAPORATIVE EMISSION LEAK

To continue testing you will need Miller Tool #8404A Evaporative Emission Leak Detector (EELD).

WARNING: Keep lit cigarettes, sparks, flames, and other ignition sources away from the test area to prevent the ignition of explosive gases. Keep the test area well ventilated.

NOTE: The fuel tank should have between 20% and 80% of fuel tank capacity to properly test the Evap system.

Connect the red power lead of the EELD to the battery positive terminal and the black ground lead to battery negative terminal.

Block the vent hose of the canister if using the service port.

Connect shop air to the EELD.

Set the smoke/air control switch to AIR.

Insert the tester's AIR supply tip (clear hose) into the appropriate calibration orifice on the tester's control panel (based on DTC leak size).

Press the remote smoke/air start button.

Position the red flag on the air flow meter so it is aligned with the indicator ball.

When the calibration is complete, release the remote button. The EELD flow meter is now calibrated in liters per minute to the size leak indicated by the DTC set in the PCM.

Install the service port adapter #8404-14 on the vehicle's service port and block the vent hose of the EVAP Canister (if equipped) or install the #8404-ADP service adaptor into the filter line.

Connect the Air supply hose from the EELD to the service port (if equipped) or to the #8404-ADP adapter.

Press the remote button to activate AIR flow.

NOTE: Larger volume fuel tanks, lower fuel levels or if the vehicle is equipped with a Flow Management Valve may indicate high flow and will require 4 to 5 minutes to fill.

Compare the flow meter indicator ball reading to the red flag.

ABOVE the red flag indicates a leak present.

BELOW the red flag indicates a sealed system.

Is the indicator ball above the red flag?

Yes >> Go To 4

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0456-EVAP PURGE SYSTEM SMALL LEAK (CONTINUED)

4. EVAPORATIVE EMISSION LEAK DETECTION

NOTE: A thorough visual inspection of the Evap system hoses, tubes, and connections may save time in your diagnosis. Look for any physical damage or signs of wetness at connections. The strong smell of fuel vapors may also aid diagnosis.

To continue testing, you will need Miller Tool #8404A Evaporative Emissions Leak Detector (EELD).

Remove the Air supply hose from the service port (if equipped) or from the #8404-ADP adapter.

Connect the SMOKE supply tip (black hose) to the service port (if equipped) or to the #8404-ADP adapter.

Set the smoke/air control switch to SMOKE.

NOTE: The flow meter indicator ball will not move in the smoke mode.

Press the remote smoke/air start button.

NOTE: Make sure that smoke has filled the EVAP system by continuing to press the remote smoke/air start button, remove the vehicle fuel cap, and wait for the smoke to exit. Once smoke is indicated reinstall the fuel cap.

NOTE: For optimal performance, introduce smoke into the system for an additional 60 seconds; continue introducing smoke at 15 second intervals, as necessary.

While still holding the remote smoke/air start button, use the white light (#8404-CLL) to follow the EVAP system path, and look for the source of the leak indicated by exiting smoke.

If a leak is concealed from view (i.e., top of fuel tank), release the remote smoke/air start button, and use the ultra-violet (UV) black light #8404-UVL and the yellow goggles 8404-20 to look for residual traces of dye that is left behind by the smoke.

The exiting smoke deposits a residual fluid that is either bright green or bright yellow in color when viewed with a UV light.

NOTE: Carefully inspect the vent side of the EVAP Canister. Due to the filtering system in the canister the smoke may not be as thick. Introducing smoke into the filtered side of the canister may assist in locating the leak.

Was a leak found?

Yes >> Repair or replace the leaking component as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

---

5. EVAP PURGE SOLENOID OPERATION

NOTE: After disconnecting the Evap Purge Solenoid vacuum connections, inspect the lines and solenoid for any signs of contamination from the EVAP Canister. This may indicate a faulty check valve. Replace/repair as necessary.

Turn the ignition off.

Disconnect the vacuum hoses at the Evap Purge Solenoid.

Using a hand vacuum pump, apply 10 in Hg to the ″CAN″ of the EVAP Purge Solenoid.

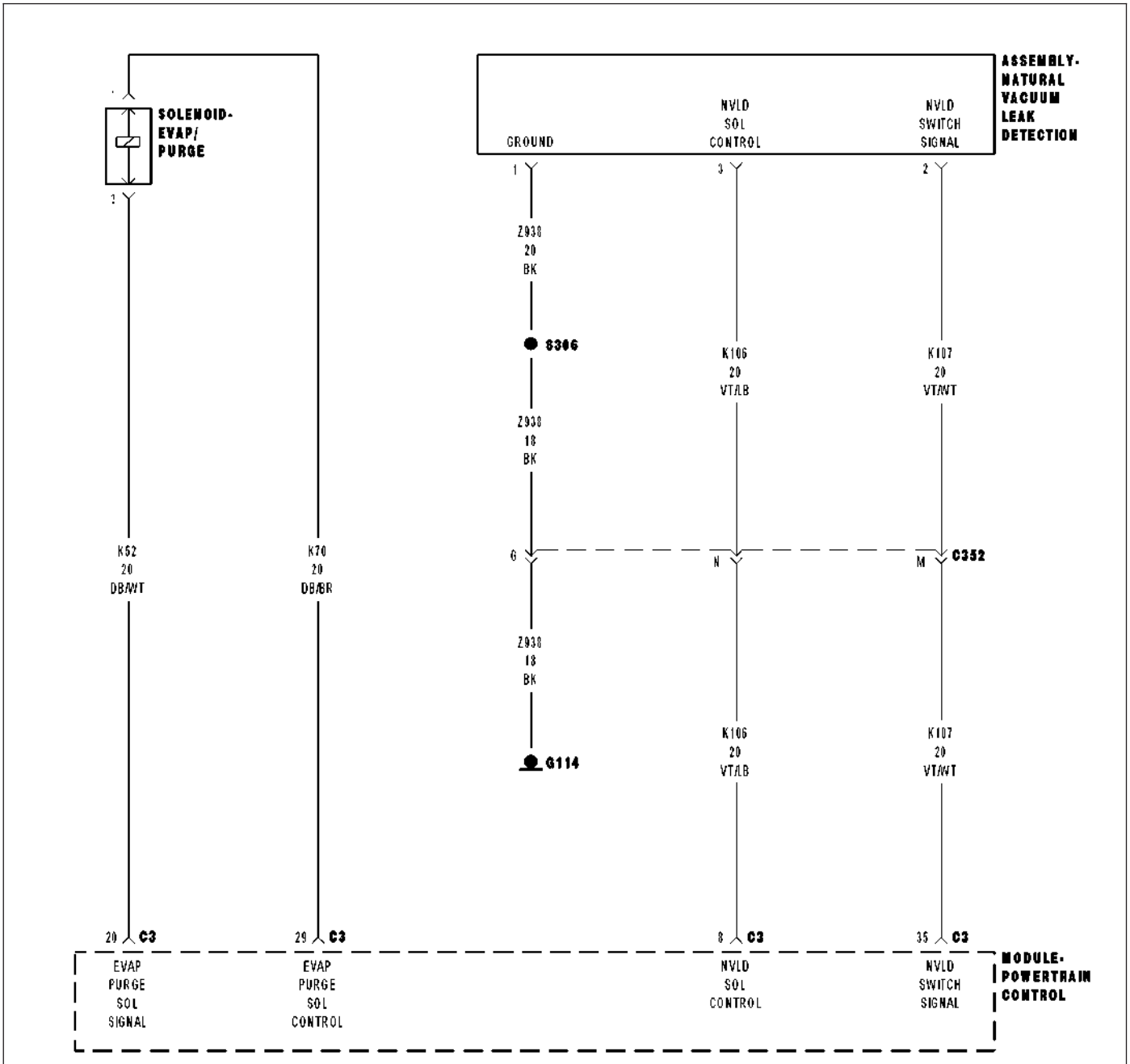
NOTE: Monitor the vacuum gauge for at least 15 seconds.

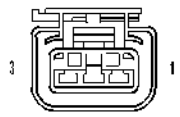
Does the EVAP Purge Solenoid hold vacuum?

Yes >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

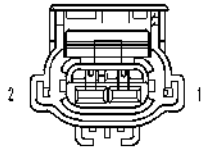
No >> Replace the Evap Purge Solenoid.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0457-LOOSE FUEL CAP

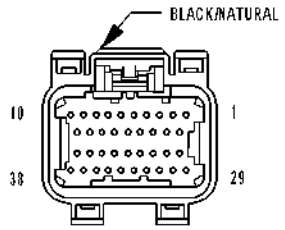




ASSEMBLY-
NATURAL
VACUUM
LEAK
DETECTION



SOLENOID-
EVAP/
PURGE



MODULE-
POWERTRAIN
CONTROL C3

81696718

P0457-LOOSE FUEL CAP (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

Fuel level is recorded when the ignition key is turned off and is compared to the fuel level when the ignition key is turned back on. The PCM recognizes an increase in fuel level and will fail the Medium leak test because the fuel cap is broken or not installed properly. GAS CAP will be displayed in odometer to inform the owner that the cap is off of loose.

- **When Monitored:**
  Ignition on. Ambient Temperature between 4°C and 32°C (39°F and 89°F) Close Loop fuel system. Test runs after the medium leak test is inconclusive and the PCM has senses a fuel increase.
- **Set Condition:**
  The PCM activates the EVAP Purge Solenoid to pull the EVAP system into a vacuum to close the NVLD switch. Once the NVLD switch is closed, the PCM turns the EVAP Purge Solenoid off to seal the EVAP system. If the NVLD switch reopens before the calibrated amount of time after a fuel tank fill, an error is detected. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
LOOSE OR MISSING FUEL CAP
FUEL FILL CAP
NVLD SWITCH
EVAP PURGE SOLENOID
EVAP PURGE SYSTEM MEDIUM LEAK

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING) .

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. LOOSE OR MISSING FUEL FILL CAP

Inspect the fuel fill cap.

Inspect the cap for any abnormal defects.

Was the cap off, missing, or broken?

Yes >> Properly install the fuel fill cap and proceed to step 3.

No >> Go To 4

P0457-LOOSE FUEL CAP (CONTINUED)

3. NVLD SERVICE TEST

With the scan tool perform the NVLD Service Test.

Does the NVLD Service Test pass?

Yes >> Test complete.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

---

4. VERIFY EVAPORATIVE EMISSION LEAK

To continue testing you will need Miller Tool #8404A Evaporative Emission Leak Detector (EELD).

WARNING: Keep lit cigarettes, sparks, flames, and other ignition sources away from the test area to prevent the ignition of explosive gases. Keep the test area well ventilated.

NOTE: The fuel tank should have between 20% and 80% of fuel tank capacity to properly test the Evap system.

Connect the red power lead of the EELD to the battery positive terminal and the black ground lead to battery negative terminal.

Block the vent hose of the canister if using the service port.

Connect shop air to the EELD.

Set the smoke/air control switch to AIR.

Insert the tester's AIR supply tip (clear hose) into the appropriate calibration orifice on the tester's control panel (based on DTC leak size).

Press the remote smoke/air start button.

Position the red flag on the air flow meter so it is aligned with the indicator ball.

When the calibration is complete, release the remote button. The EELD flow meter is now calibrated in liters per minute to the size leak indicated by the DTC set in the PCM.

Install the service port adapter #8404-14 on the vehicle's service port and block the vent hose of the EVAP Canister (if equipped) or install the #8404-ADP service adaptor into the filter line.

Connect the Air supply hose from the EELD to the service port (if equipped) or to the #8404-ADP adapter.

Press the remote button to activate AIR flow.

NOTE: Larger volume fuel tanks, lower fuel levels or if the vehicle is equipped with a Flow Management Valve may indicate high flow and will require 4 to 5 minutes to fill.

Compare the flow meter indicator ball reading to the red flag.

ABOVE the red flag indicates a leak present.

BELOW the red flag indicates a sealed system.

Is the indicator ball above the red flag?

Yes >> Go To 5

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0457-LOOSE FUEL CAP (CONTINUED)

5. EVAPORATIVE EMISSION LEAK DETECTION

NOTE: A thorough visual inspection of the Evap system hoses, tubes, and connections may save time in your diagnosis. Look for any physical damage or signs of wetness at connections. The strong smell of fuel vapors may also aid diagnosis.

To continue testing, you will need Miller Tool #8404A Evaporative Emissions Leak Detector (EELD).

Remove the Air supply hose from the service port (if equipped) or from the #8404-ADP adapter.

Connect the SMOKE supply tip (black hose) to the service port (if equipped) or to the #8404-ADP adapter.

Set the smoke/air control switch to SMOKE.

NOTE: The flow meter indicator ball will not move in the smoke mode.

Press the remote smoke/air start button.

NOTE: Make sure that smoke has filled the EVAP system by continuing to press the remote smoke/air start button, remove the vehicle fuel cap, and wait for the smoke to exit. Once smoke is indicated reinstall the fuel cap.

NOTE: For optimal performance, introduce smoke into the system for an additional 60 seconds; continue introducing smoke at 15 second intervals, as necessary.

While still holding the remote smoke/air start button, use the white light (#8404-CLL) to follow the EVAP system path, and look for the source of the leak indicated by exiting smoke.

If a leak is concealed from view (i.e., top of fuel tank), release the remote smoke/air start button, and use the ultra-violet (UV) black light #8404-UVL and the yellow goggles 8404-20 to look for residual traces of dye that is left behind by the smoke.

The exiting smoke deposits a residual fluid that is either bright green or bright yellow in color when viewed with a UV light.

NOTE: Carefully inspect the vent side of the EVAP Canister. Due to the filtering system in the canister the smoke may not be as thick. Introducing smoke into the filtered side of the canister may assist in locating the leak.

Was a leak found?

Yes >> Repair or replace the leaking component as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6

---

6. EVAP PURGE SOLENOID OPERATION

NOTE: After disconnecting the Evap Purge Solenoid vacuum connections, inspect the lines and solenoid for any signs of contamination from the EVAP Canister. This may indicate a faulty check valve. Replace/repair as necessary.

Turn the ignition off.

Disconnect the vacuum hoses at the Evap Purge Solenoid.

Using a hand vacuum pump, apply 10 in Hg to the ″CAN″ of the EVAP Purge Solenoid.

NOTE: Monitor the vacuum gauge for at least 15 seconds.

Does the EVAP Purge Solenoid hold vacuum?

Yes >> Go To 7.

No >> Replace the Evap Purge Solenoid.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0457-LOOSE FUEL CAP (CONTINUED)

7. NVLD SWITCH OPERATION

Reconnect all vacuum hoses.

Start the engine.

Allow the engine to idle.

Using the scan tool, perform the NVLD FORCED MONITOR TEST.

Monitor the NVLD Switch.

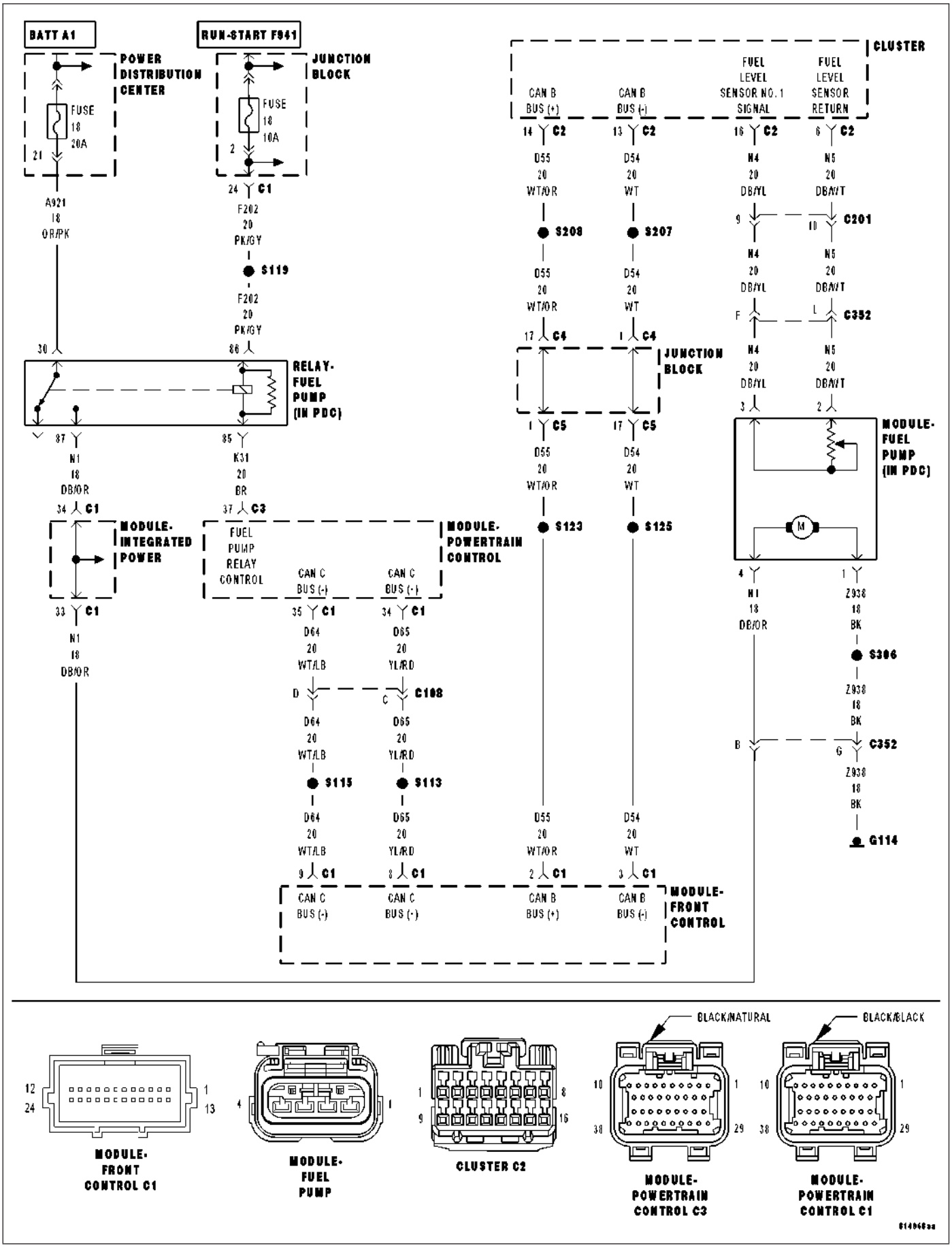
NOTE: As the test runs, the NVLD Switch should go from an OPEN state to CLOSED. After the vacuum is released form the EVAP system the Switch state will return to OPEN.

Did the NVLD Switch operate as described above?

Yes >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

No >> Replace the NVLD Assembly.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0461-FUEL LEVEL SENSOR 1 PERFORMANCE



P0461-FUEL LEVEL SENSOR 1 PERFORMANCE (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The fuel level rationality will set a fault for a fuel level reading that does not change over an accumulated mileage threshold to keep stuck high or stuck low fuel levels from disabling OBD monitors. If the vehicle is fitted with a saddle tank fuel system this feature includes diagnostics for both of the sending units and diagnostics for a siphon tube that has become disconnected or plugged. The power up test looks to see a large enough fuel level voltage change from the last key-off to the following engine run. The engine run test looks to see a fuel level voltage change over an accumulated mileage.

- **When Monitored:**
  TEST No.1: With the ignition on, the fuel level is compared to the previous key down after a 20 second delay.
  TEST No.2: The PCM monitors the fuel level at ignition on.
- **Set Condition:**
  TEST No.1: If the PCM does not see a difference in fuel level of greater than 0.1 volt the test will fail. TEST No.2: If the PCM does not see a change in the fuel level of .1765 over a set amount of miles the test will fail. Three good trips to turn off the MIL.

Possible Causes
(N4) FUEL LEVEL SIGNAL CIRCUIT OPEN
(N4) FUEL LEVEL SIGNAL CIRCUIT SHORTED TO GROUND
(N5) FUEL LEVEL SENSOR RETURN CIRCUIT OPEN
FUEL TANK
FUEL LEVEL SENSOR

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: Diagnose any CAN - C or CAN - B Communication DTCs before continuing.

NOTE: Diagnose P0462 or P0463 first, if set along with P0461.

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. VISUALLY INSPECT FUEL TANK

Visually inspect the Fuel Tank for damage that may restrict the Fuel Sending Unit float from moving.

Is the Fuel Tank OK?

Yes >> Go To 3

No >> Replace the Fuel Tank as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0461-FUEL LEVEL SENSOR 1 PERFORMANCE (CONTINUED)

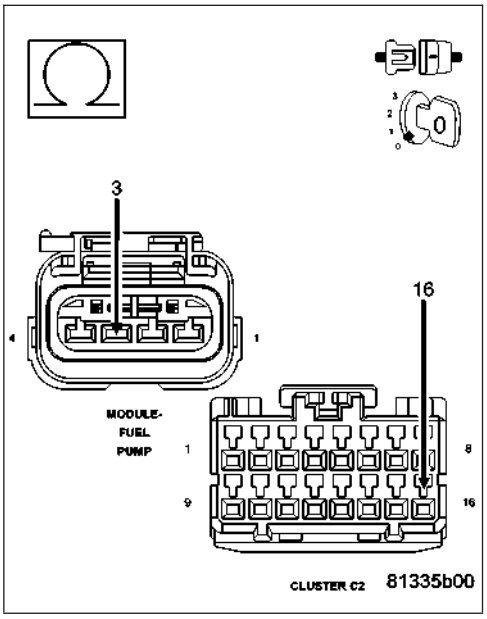
3. (N4) FUEL LEVEL SIGNAL CIRCUIT OPEN

Turn the ignition off.

Disconnect the Fuel Pump Module harness connector.

Disconnect the C2 Cluster harness connectors.

Measure the resistance of the (N4) Fuel Level Signal circuit from the Fuel Pump Module harness connector to the C2 Cluster harness connector.



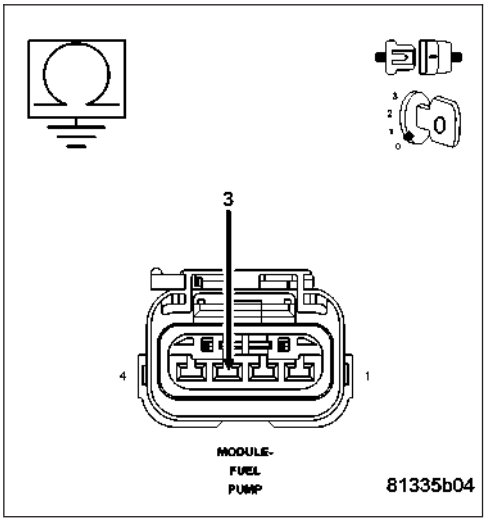
Is the resistance below 5.0 ohms?

Yes >> Go To 4

No >> Repair the open in the (N4) Fuel Level Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

4. (N4) FUEL LEVEL SIGNAL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (N4) Fuel Level Signal circuit in the Fuel Pump Module harness connector.



Is the resistance below 100 ohms?

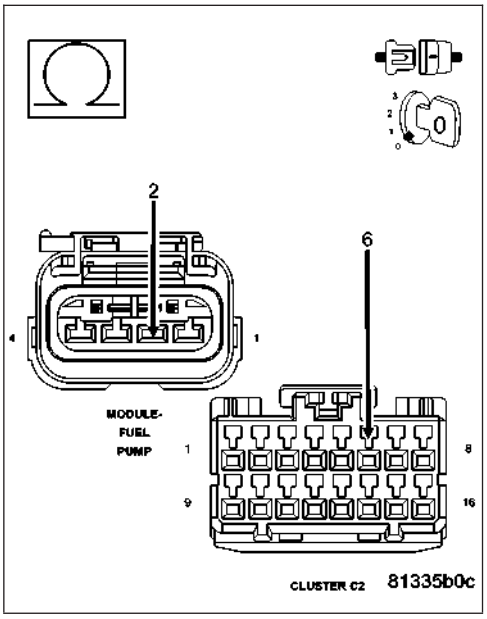
Yes >> Repair the short to ground in the (N4) Fuel Level Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

P0461-FUEL LEVEL SENSOR 1 PERFORMANCE (CONTINUED)

5. (N5) FUEL LEVEL SENSOR RETURN CIRCUIT OPEN

Measure the resistance of the (N5) Fuel Level Sensor Return circuit from the Fuel Pump Module harness connector to the C2 Cluster harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go To 6

No >> Repair the open in the (N5) Fuel Level Sensor Return circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

6. INTERNAL INSPECTION OF THE FUEL TANK

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Remove the Fuel Tank per Service Information.

Remove the Fuel Pump Module.

Visually inspect the inside of the Fuel Tank for any obstructions or deformities.

Inspect the Fuel Pump Module Float arm for damage.

Were any problems found?

Yes >> Repair or replace as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 7

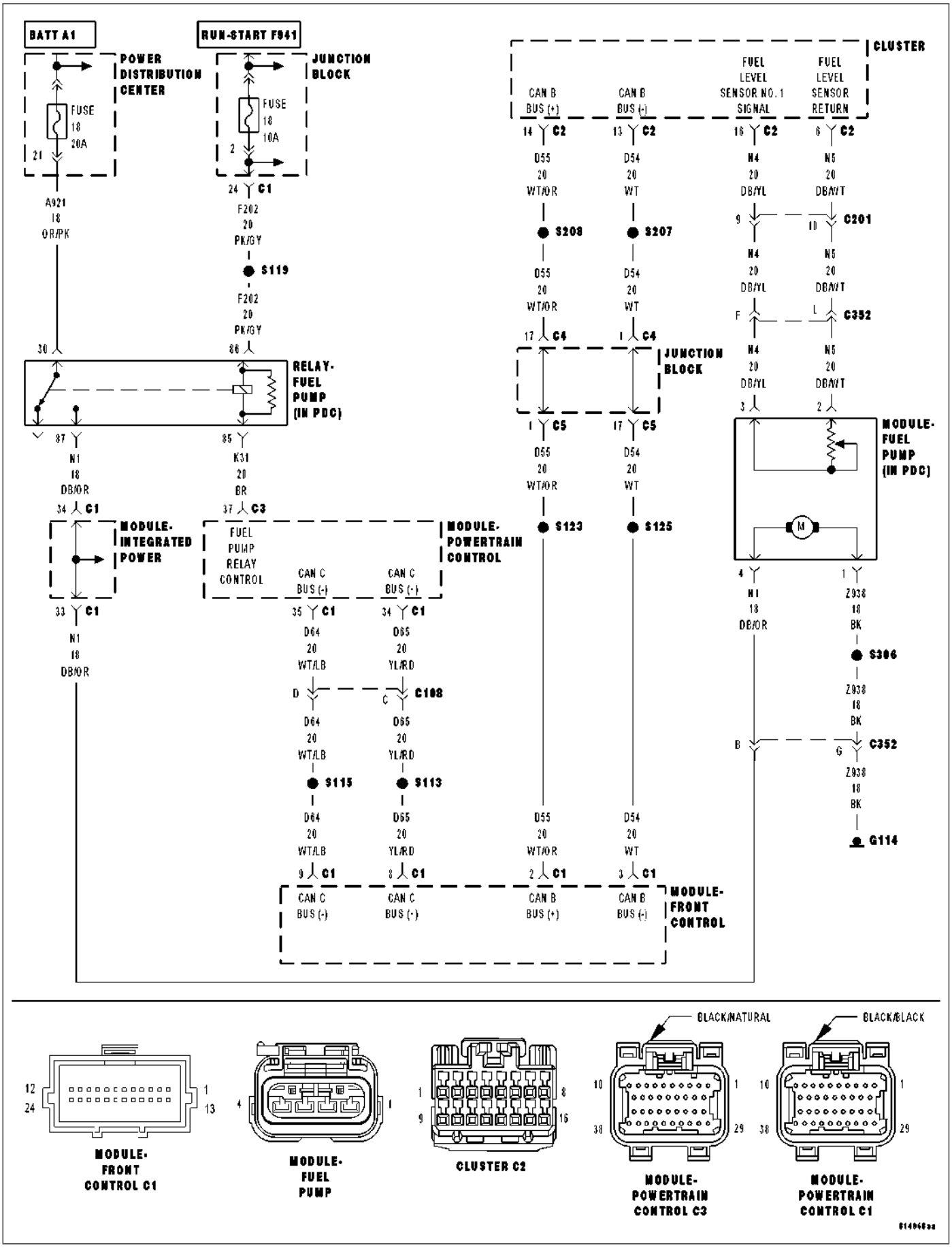
7. FUEL LEVEL SENSOR

If there are no possible causes remaining, view repair.

Repair

Replace the Fuel Level Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0462-FUEL LEVEL SENSOR 1 CIRCUIT LOW



P0462-FUEL LEVEL SENSOR 1 CIRCUIT LOW (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on and battery voltage above 10.4 volts.
- **Set Condition:**
  The fuel level sensor signal voltage goes below 0.4 of a volt for more than 90 seconds. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(N4) FUEL LEVEL SIGNAL CIRCUIT SHORTED TO GROUND
(N4) FUEL LEVEL SIGNAL CIRCUIT SHORTED TO THE (N5) FUEL LEVEL SENSOR RETURN CIRCUIT
FUEL LEVEL SENSOR
INSTRUMENT CLUSTER

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

Diagnostic Test

1. FUEL LEVEL SENSOR VOLTAGE BELOW 0.4 OF A VOLT

NOTE: Diagnose any CAN - B or CAN -C Communication DTCs before continuing.
Ignition on, engine not running.
With the scan tool, read the Fuel Level Sensor voltage.

Is the Fuel Level Sensor voltage below 0.4 of a volt?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

---

2. FUEL LEVEL SENSOR

Turn the ignition off.
Disconnect the Fuel Pump Module harness connector.
Ignition on, engine not running.
With the scan tool, read the Fuel Level Sensor voltage.

Did the Fuel Level Sensor voltage change from below 0.4 of a volt to above 4.0 volts?

Yes >> Replace the Fuel Level Sensor.
Perform BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go To 3

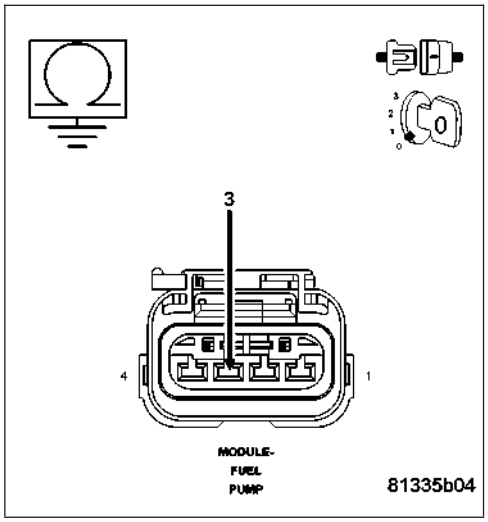
P0462-FUEL LEVEL SENSOR 1 CIRCUIT LOW (CONTINUED)

3. (N4) FUEL LEVEL SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the C2 Cluster harness connectors.

Measure the resistance between ground and the (N4) Fuel Level Signal circuit in the Fuel Pump Module harness connector.



Is the resistance below 100 ohms?

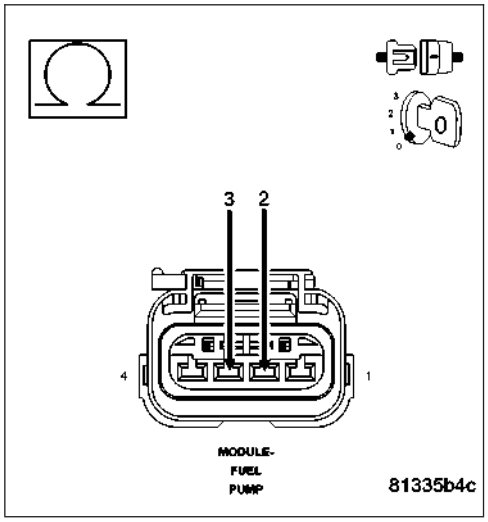
Yes >> Repair the short to ground in the (N4) Fuel Level Signal circuit.

Perform BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go To 4

4. (N4) FUEL LEVEL SIGNAL CIRCUIT SHORTED TO THE (N5) FUEL LEVEL SENSOR RETURN CIRCUIT

Measure the resistance between the (N4) Fuel Level Signal circuit and the (N5) Fuel Level Sensor Return circuit in the Fuel Pump Module harness connector.



Is the resistance below 5.0 ohms?

Yes >> Repair the short between the (N5) Fuel Level Sensor Return circuit and the (N4) Fuel Level Signal circuit.

Perform BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go To 5

5. INSTRUMENT CLUSTER

NOTE: Before continuing, check the Instrument Cluster harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

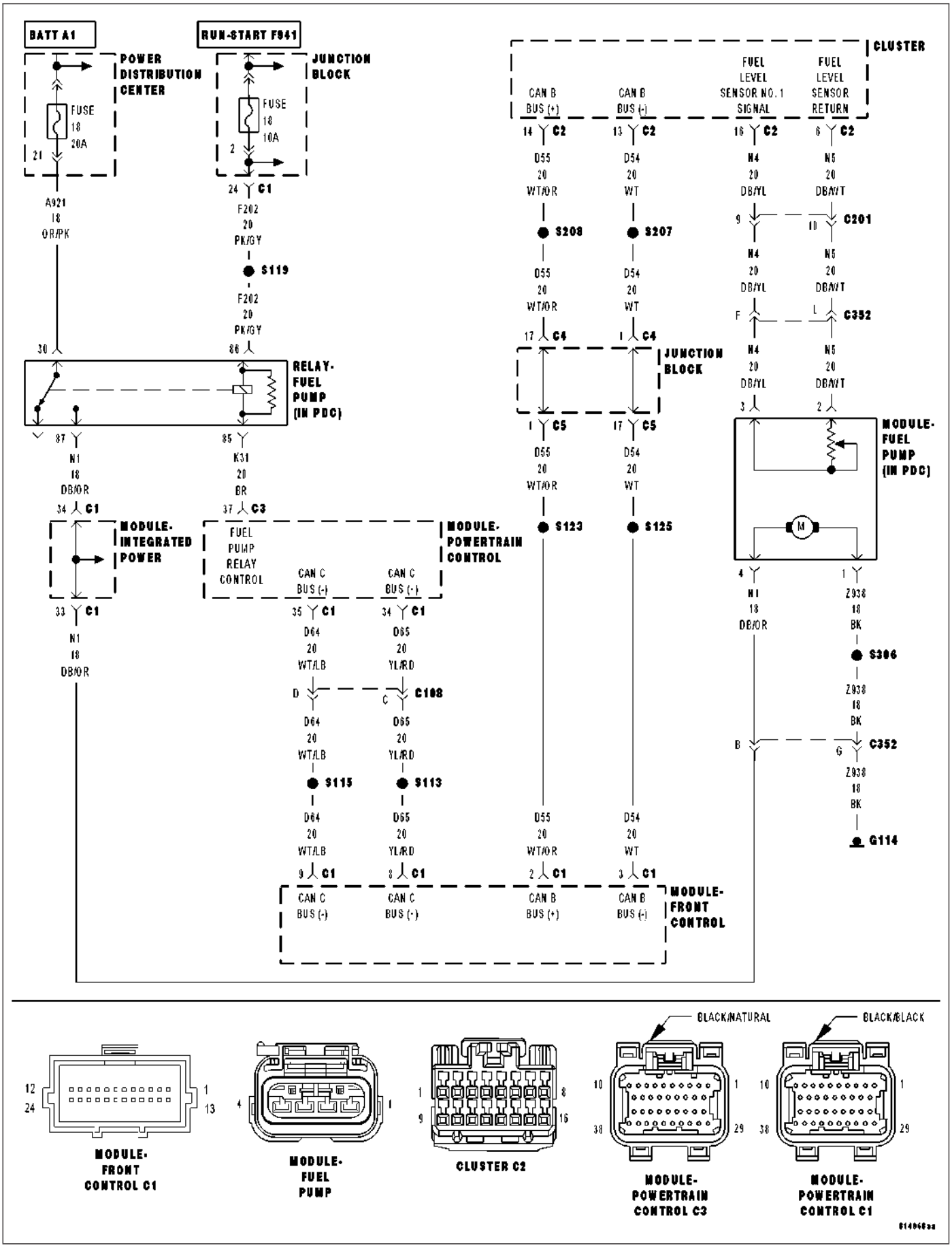
Yes >> Repair as necessary.

Perform BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Replace and program the Instrument Cluster per Service Information.

Perform BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

P0463-FUEL LEVEL SENSOR 1 CIRCUIT HIGH



P0463-FUEL LEVEL SENSOR 1 CIRCUIT HIGH (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on and battery voltage above 10.4 volts.
- **Set Condition:**
  The fuel level sensor signal voltage at the PCM goes above 4.9 volts for more than 90 seconds. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(N4) FUEL LEVEL SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(N4) FUEL LEVEL SIGNAL CIRCUIT OPEN
(N5) FUEL LEVEL SENSOR RETURN CIRCUIT OPEN
FUEL LEVEL SENSOR
INSTRUMENT CLUSTER

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. FUEL LEVEL SENSOR VOLTS ABOVE 4.9 VOLTS

NOTE: Diagnose any CAN - B and CAN - C Communication DTCs before continuing.
Ignition on, engine not running.

With a scan tool, read the Fuel Level Sensor voltage.

Is the Fuel Level Sensor voltage above 4.9 volts?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

P0463-FUEL LEVEL SENSOR 1 CIRCUIT HIGH (CONTINUED)

2. FUEL LEVEL SENSOR

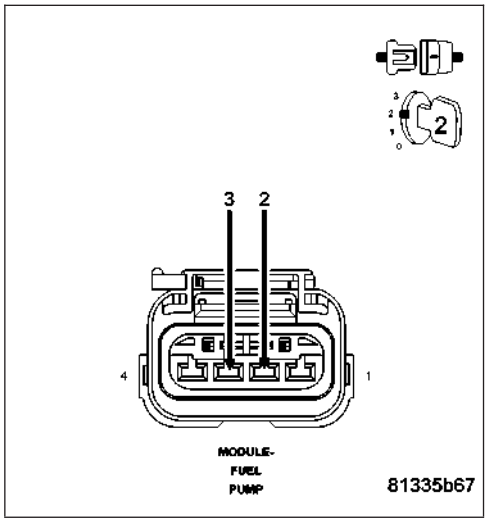
Turn the ignition off.

Disconnect the Fuel Pump Module electrical harness connector.

Ignition on, engine not running.

Connect a jumper wire between the (N4) Fuel Level Signal circuit and the (N5) Fuel Level Sensor Return circuit in the Fuel Pump Module harness connector.

With the scan tool, read the Fuel Level Sensor voltage.



Did the Fuel Level Sensor voltage change from above 4.8 volts to below 0.4 of a volt with the jumper wire installed?

Yes >> Replace the Fuel Level Sensor.
Perform BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go To 3

NOTE: Remove the jumper wire before continuing.

---

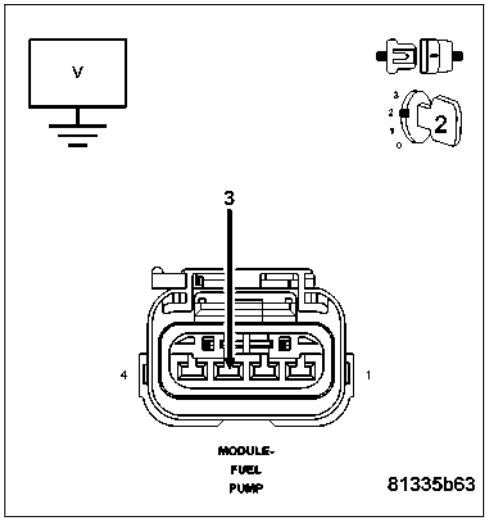
3. (N4) FUEL LEVEL SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

Disconnect the C2 Cluster harness connector.

Ignition on, engine not running.

Measure the voltage on the (N4) Fuel Level Signal circuit in the Fuel Pump Module harness connector.



Is the voltage above 0 volts?

Yes >> Repair the short to battery voltage in the (N4) Fuel Level Signal circuit.
Perform BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

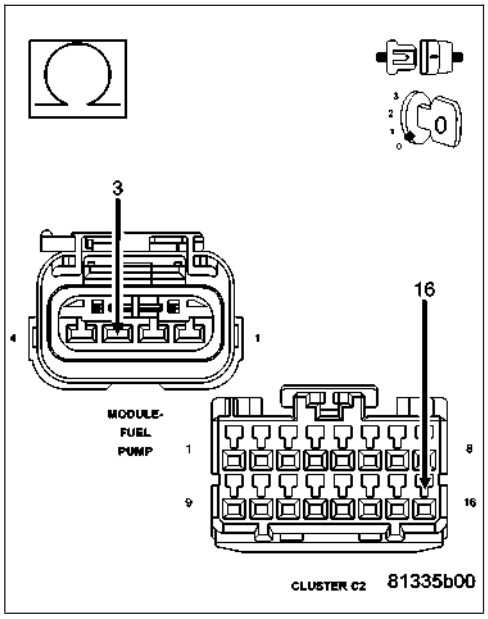
No >> Go To 4

P0463-FUEL LEVEL SENSOR 1 CIRCUIT HIGH (CONTINUED)

4. (N4) FUEL LEVEL SIGNAL CIRCUIT OPEN

Turn the ignition off.

Measure the resistance of the (N4) Fuel Level Signal circuit from the Fuel Pump Module harness connector to the C2 Cluster harness connector.



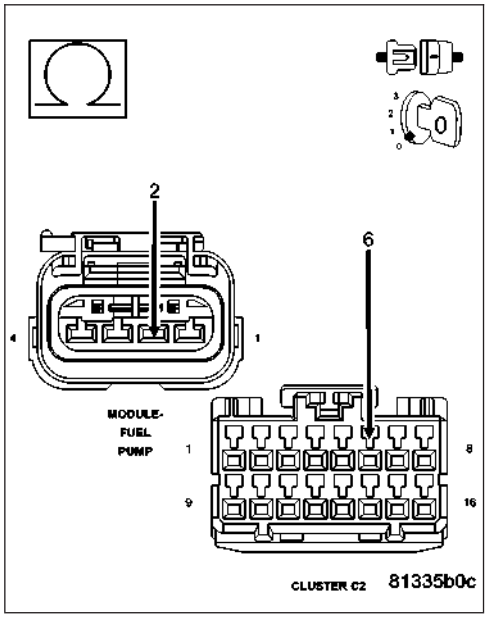
Is the resistance below 5.0 ohms?

Yes >> Go To 5

No >> Repair the open in the (N4) Fuel Level Signal circuit.
Perform BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

5. (N5) FUEL LEVEL SENSOR RETURN CIRCUIT OPEN

Measure the resistance of the (N5) Fuel Level Sensor Return circuit from the Fuel Pump Module harness connector to the C2 Cluster harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go To 6

No >> Repair the open in the (N5) Fuel Level Sensor Return circuit.
Perform BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

P0463-FUEL LEVEL SENSOR 1 CIRCUIT HIGH (CONTINUED)

6. INSTRUMENT CLUSTER

NOTE: Before continuing, check the Instrument Cluster harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

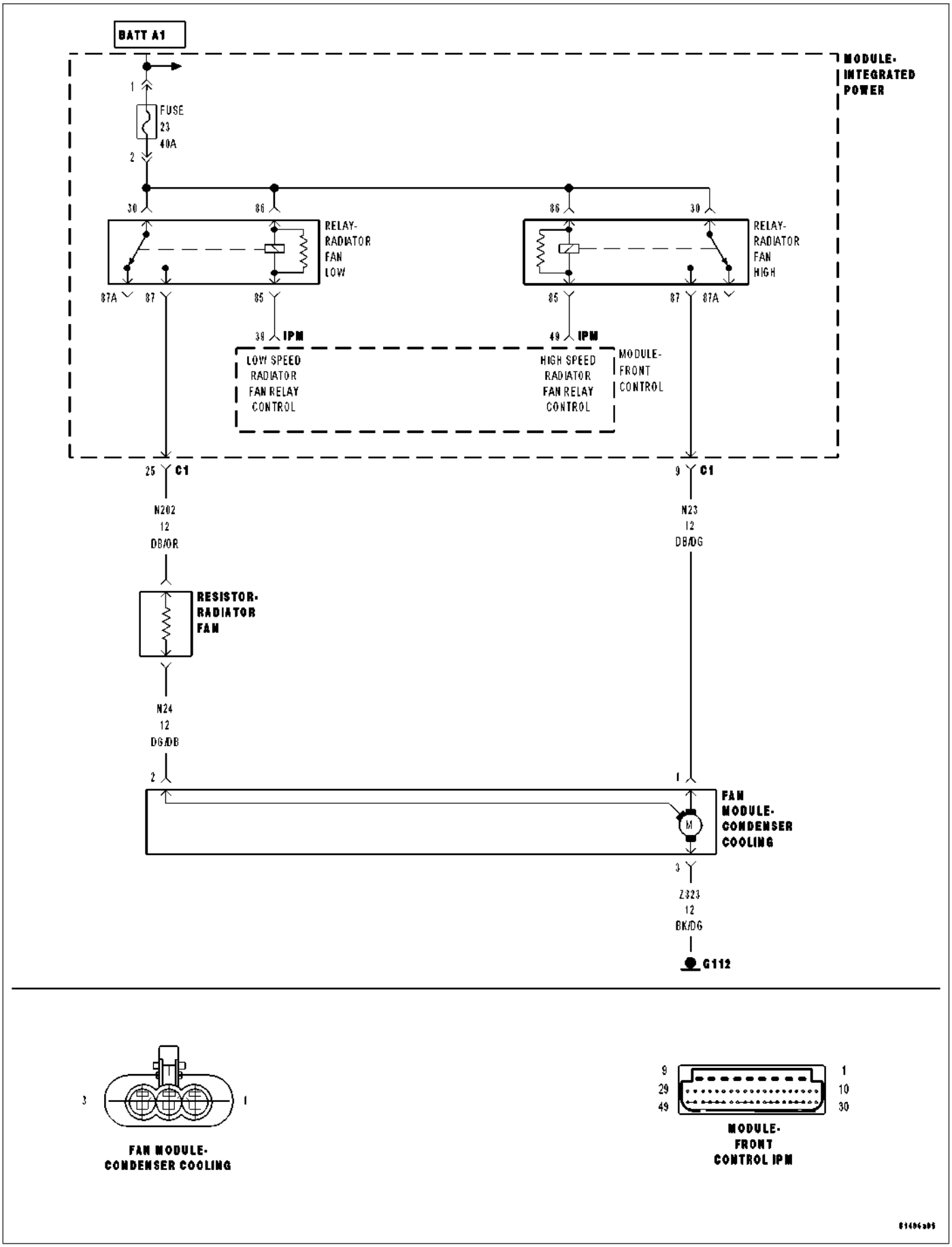
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Replace and program the Instrument Cluster per Service Information.
Perform BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

P0480-COOLING FAN 1 CONTROL CIRCUIT



P0480-COOLING FAN 1 CONTROL CIRCUIT (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. Battery voltage greater than 10 volts.
- **Set Condition:**
  An open or shorted circuit is detected in the radiator fan relay control circuit. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
INTERNAL (A16) FUSED B+ CIRCUITS
(N201) COOOLING FAN NO.1 RELAY CONTROL CIRCUIT OPEN
(N201) COOOLING FAN NO.1 RELAY CONTROL CIRCUIT SHORTED TO GROUND
LOW SPEED RADIATOR FAN RELAY
FRONT CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. LOW SPEED RADIATOR FAN RELAY OPERATION

Ignition on, engine not running.

With a scan tool, actuate the Low Speed Radiator Fan Relay.

Is the Cooling Fan Relay operating?

Yes >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 2

---

2. (A16) FUSED B+ CIRCUITS

Turn the ignition off.

Remove the Low Speed Radiator Fan Relay.

Using a 12-volt test light connected to ground, probe the (A16) Fused B+ circuits.

Does the test light illuminate brightly?

Yes >> Go To 3

No >> Repair the open or short to ground in the (A16) Fused B+ circuits. Inspect the related fuse and repair as necessary.
Perform BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

P0480-COOLING FAN 1 CONTROL CIRCUIT (CONTINUED)

3. LOW SPEED RADIATOR FAN RELAY RESISTANCE

Measure the resistance of the Low Speed Radiator Fan Relay Coil.

Is the resistance between 60 to 80 ohms?

Yes >> Go To 4

No >> Replace the Low Speed Radiator Fan Relay.
Perform BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

---

4. (N201) COOLING FAN NO.1 CONTROL CIRCUIT OPEN

Disconnect the IPM FCM 49 way harness connector.

Measure the resistance of the (N201) Cooling Fan No.1 Relay Control circuit from the Relay to the IPM FCM 49 way harness connector.

Is the resistance below 5.0 ohms?

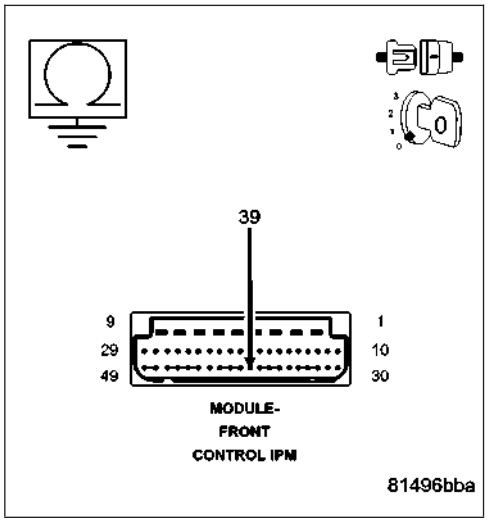
Yes >> Go To 5

No >> Repair the open in the (N201) Cooing Fan No.1 Relay Control circuit.
Perform BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

---

5. (N201) COOLING FAN NO.1 CONTROL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (N201) Cooling Fan No.1 Relay Control circuit at the IPM FCM 49 way harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (N201) Cooling Fan No.1 Relay Control circuit.
Perform BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go To 6

P0480-COOLING FAN 1 CONTROL CIRCUIT (CONTINUED)

6. FRONT CONTROL MODULE

NOTE: Before continuing, check the FCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

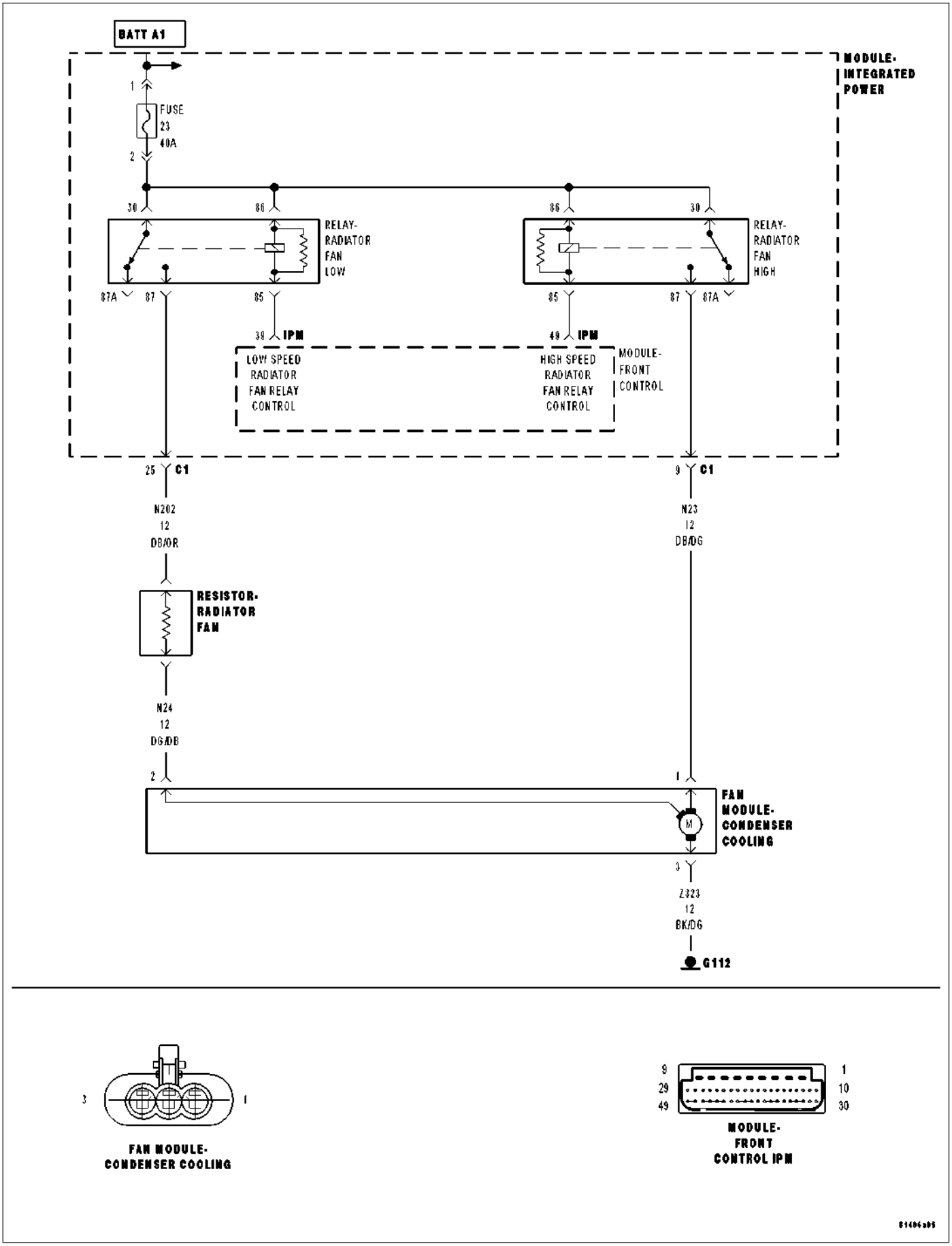
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Replace Front Control Module per Service Information.
Perform BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

P0481-COOLING FAN 2 CONTROL CIRCUIT



P0481-COOLING FAN 2 CONTROL CIRCUIT (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. Battery voltage greater than 10 volts.
- **Set Condition:**
  An open or shorted circuit is detected in the radiator fan relay control circuit. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(A16) FUSED B+ CIRCUITS
(N112) COOOLING FAN NO.2 RELAY CONTROL CIRCUIT OPEN
(N112) COOOLING FAN NO.2 RELAY CONTROL CIRCUIT SHORTED TO GROUND
HIGH SPEED RADIATOR FAN RELAY
FRONT CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. HIGH SPEED RADIATOR FAN RELAY OPERATION

Ignition on, engine not running.

With a scan tool, actuate the High Speed Radiator Fan Relay.

Is the Cooling Fan Relay operating?

Yes >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 2

---

2. (A16) FUSED B+ CIRCUITS

Turn the ignition off.

Remove the High Speed Radiator Fan Relay.

Using a 12-volt test light connected to ground, probe the (A16) Fused B+ circuits in the Relay connection.

Is the voltage above 11.0 volts?

Yes >> Go To 3

No >> Repair the open or short to ground in the (A16) Fused B+ circuits. Inspect the related fuse and repair as necessary.
Perform BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

P0481-COOLING FAN 2 CONTROL CIRCUIT (CONTINUED)

3. HIGH SPEED RADIATOR FAN RELAY RESISTANCE

Measure the resistance of the High Speed Radiator Fan Relay Coil.

Is the resistance between 60 to 80 ohms?

Yes >> Go To 4

No >> Replace the Relay.
Perform BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

---

4. (N112) COOLING FAN NO.2 CONTROL CIRCUIT OPEN

Disconnect the IPM FCM 49 way harness connector.

Measure the resistance of the (N112) Cooling Fan No.2 Relay Control circuit from the Relay connection to the IPM FCM 49 way harness connector.

Is the resistance below 5.0 ohms?

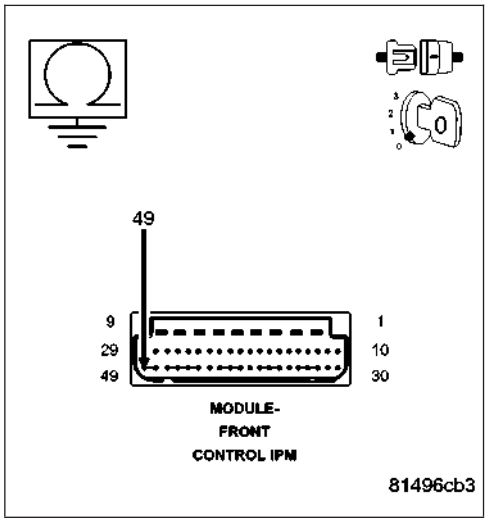
Yes >> Go To 5

No >> Repair the open in the (N112) Cooling Fan No.2 Relay Control circuit.
Perform BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

---

5. (N112) COOLING FAN NO.2 CONTROL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (N112) Cooling Fan No.2 Relay Control circuit at the IPM FCM 49 way harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (N112) Cooling Fan No.2 Relay Control circuit.
Perform BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go To 6

P0481-COOLING FAN 2 CONTROL CIRCUIT (CONTINUED)

6. FRONT CONTROL MODULE

NOTE: Before continuing, check the FCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

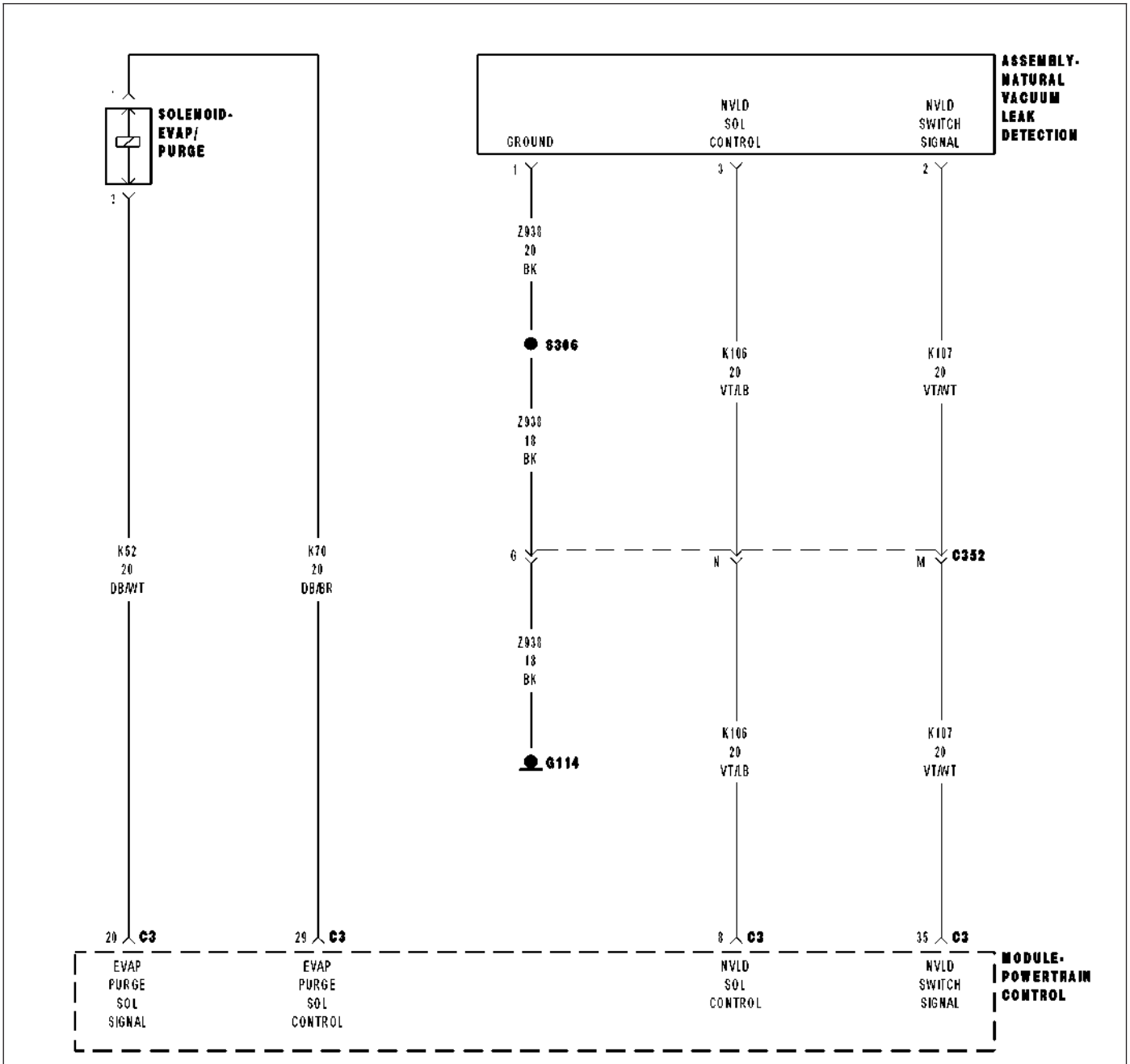
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

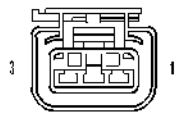
Were there any problems found?

Yes >> Repair as necessary.
Perform BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

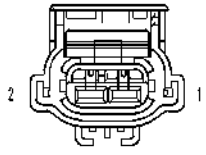
No >> Replace the Front Control Module per Service Information.
Perform BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

P0498-NVLD CANISTER VENT VALVE SOLENOID CIRCUIT LOW

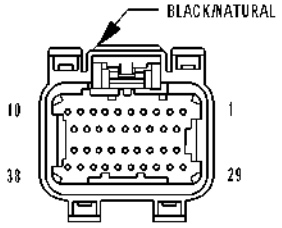




ASSEMBLY-
NATURAL
VACUUM
LEAK
DETECTION



SOLENOID-
EVAP/
PURGE



MODULE-
POWERTRAIN
CONTROL C3

81496718

P0498-NVLD CANISTER VENT VALVE SOLENOID CIRCUIT LOW (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Engine running.
- **Set Condition:**
  The PCM detects a short in the NVLD Canister vent solenoid circuits. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K106) NVLD SOLENOID CONTROL CIRCUIT SHORTED TO GROUND
NVLD ASSEMBLY
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.
With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

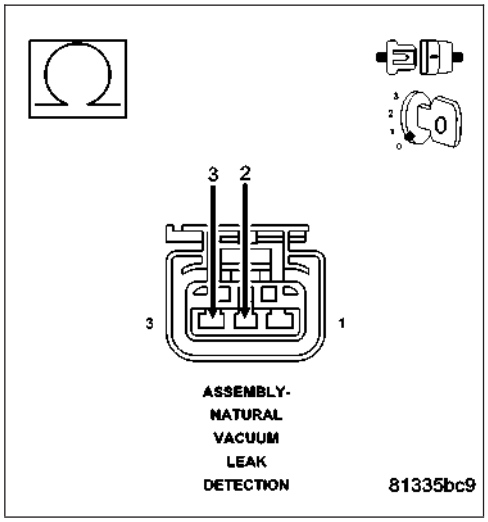
2. NVLD SOLENOID

Turn the ignition off.
Disconnect the NVLD electrical harness connector.
Measure the resistance of the NVLD Solenoid Coil.

Is the resistance between 7.5 to 8.5 ohms?

Yes >> Go To 3

No >> Replace the NVLD Assembly.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P0498-NVLD CANISTER VENT VALVE SOLENOID CIRCUIT LOW (CONTINUED)

3. (K106) NVLD SOLENOID CONTROL CIRCUIT SHORTED TO GROUND

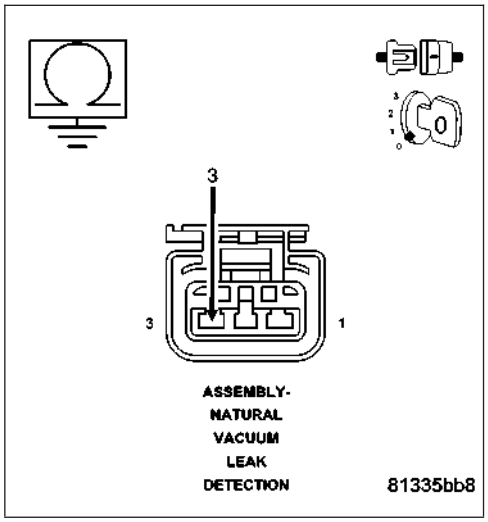
Disconnect the C3 PCM harness connector.

Measure the resistance between ground and the (K106) NVLD Solenoid Control circuit in the NVLD electrical harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K106) NVLD Solenoid Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4



4. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

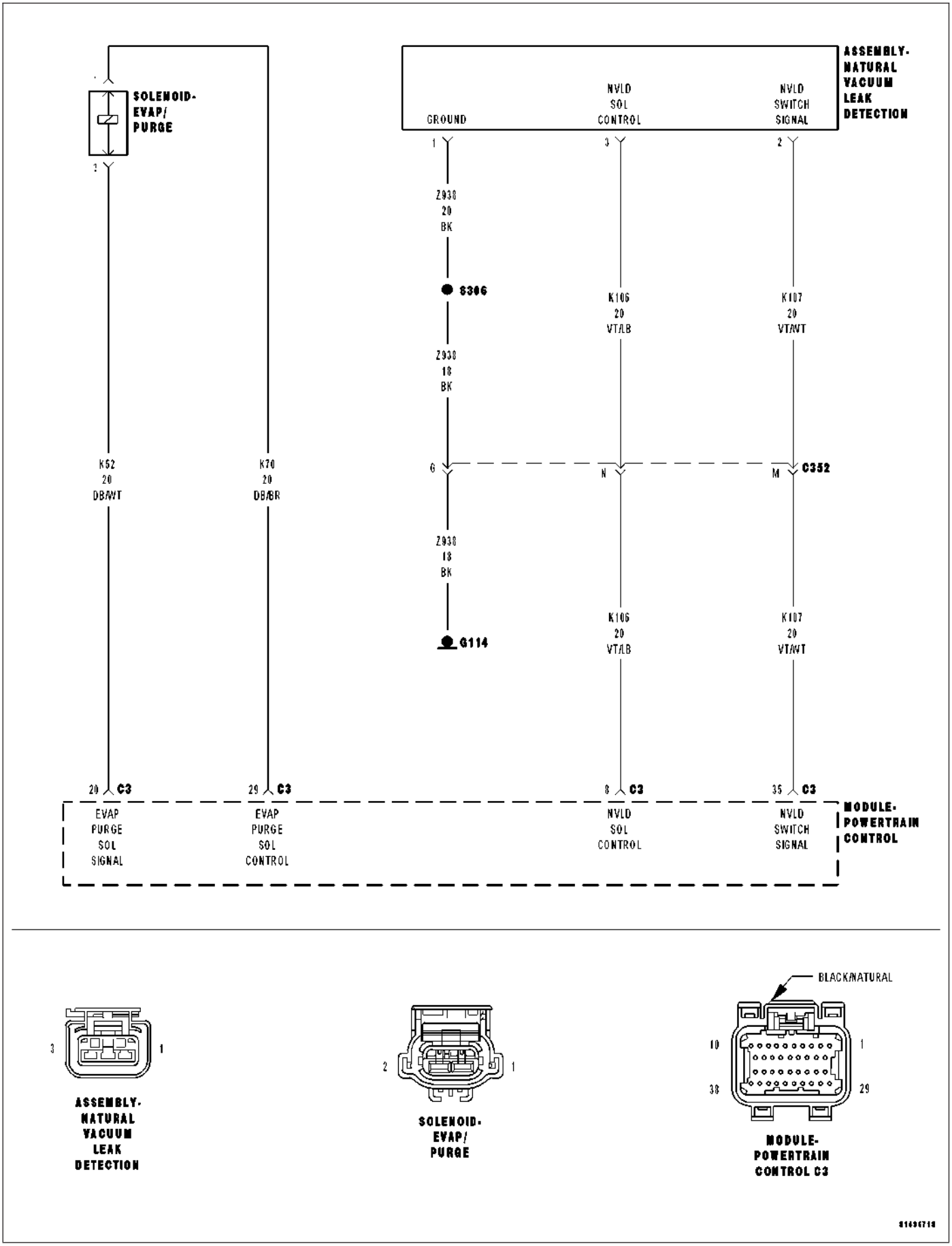
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0499-NVLD CANISTER VENT VALVE SOLENOID CIRCUIT HIGH



P0499-NVLD CANISTER VENT VALVE SOLENOID CIRCUIT HIGH (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Engine running.
- **Set Condition:**
  The PCM detects an open in the NVLD Canister vent solenoid circuits for more than 9.375 seconds. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K106) NVLD SOLENOID CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K106) NVLD SOLENOID CONTROL CIRCUIT OPEN
(Z938) GROUND CIRCUIT OPEN
NVLD SOLENOID
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.
With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

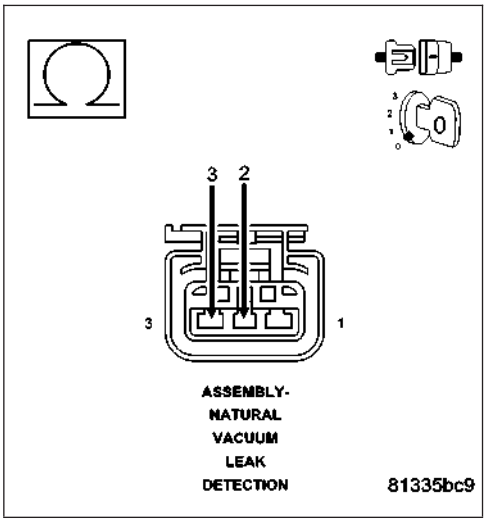
2. NVLD SOLENOID

Turn the ignition off.
Disconnect the NVLD Assembly harness connector.
Measure the resistance of the NVLD Solenoid coil.

Is the resistance between 7.5 to 8.5 ohms?

Yes >> Go To 3

No >> Replace the NVLD Assembly.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



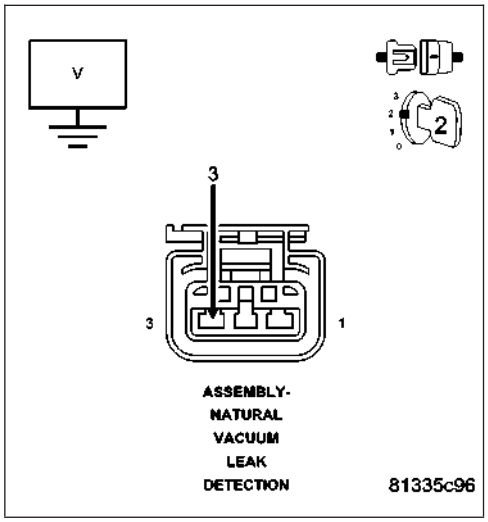
P0499-NVLD CANISTER VENT VALVE SOLENOID CIRCUIT HIGH (CONTINUED)

3. (K106) NVLD SOLENOID CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE

Disconnect the PCM harness connectors.

Take this measurement with the Ignition in the off (lock) position and in the Ignition on, engine off position.

Measure the voltage on the (K106) NVLD Solenoid Control circuit in the NVLD Assembly harness connector.



Is the voltage above 0 volts?

Yes >> Repair the short to battery voltage in the (K106) NVLD Solenoid Control circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

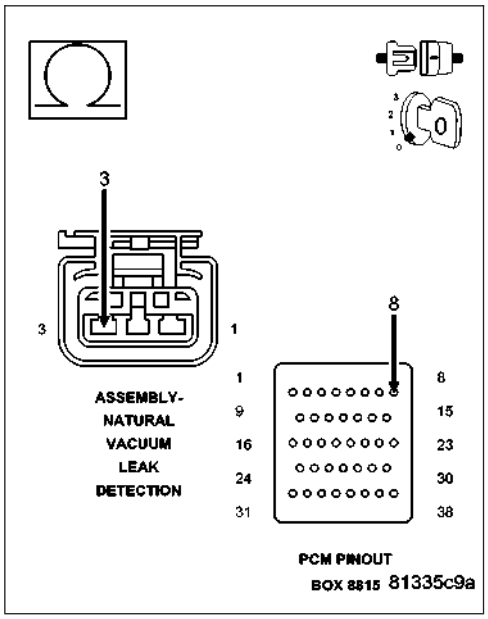
No >> Go To 4

4. (K106) NVLD SOLENOID CONTROL CIRCUIT OPEN

Turn the ignition off.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K106) NVLD Solenoid Control circuit from the NVLD Assembly harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 5

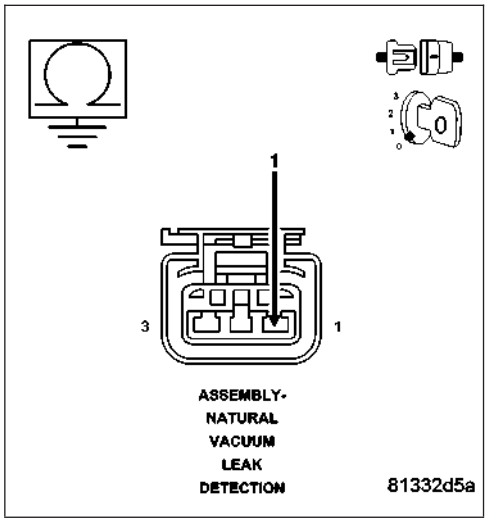
No >> Repair the open in the (K106) NVLD Solenoid Control circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0499-NVLD CANISTER VENT VALVE SOLENOID CIRCUIT HIGH (CONTINUED)

5. (Z938) GROUND CIRCUIT OPEN

Measure the resistance between the (Z938) Ground circuit and ground.



Is the resistance below 5.0 ohms?

Yes >> Go To 6

No >> Repair the open in the (Z938) Ground circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

6. PCM

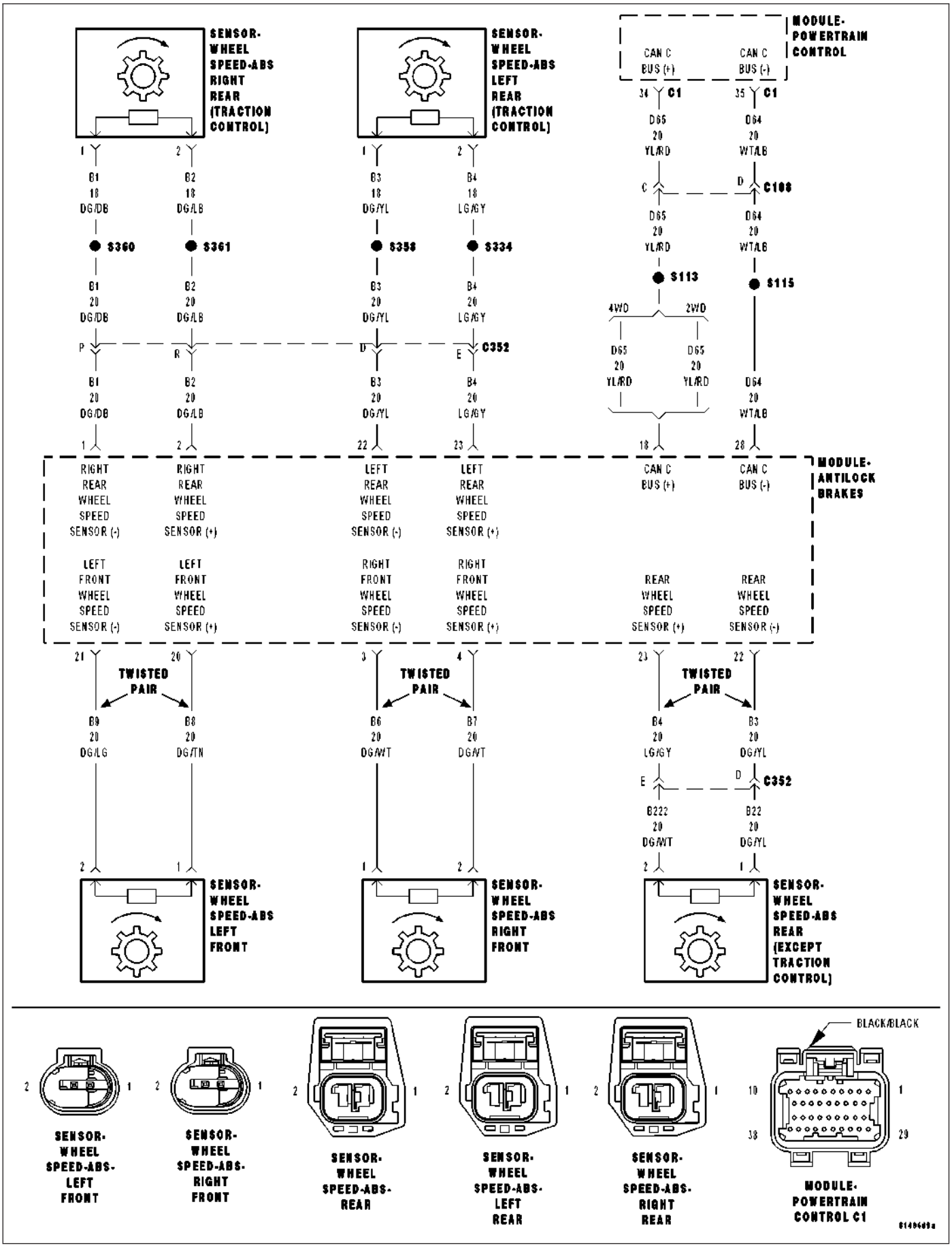
NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0501-VEHICLE SPEED SENSOR 1 PERFORMANCE



P0501-VEHICLE SPEED SENSOR 1 PERFORMANCE (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The vehicle speed sensor rationality is a continuous test that monitors the vehicle speed sensor for lack of activity. The rationality will not run if a limp-in exists for MAP, Throttle Position, and Engine Coolant Temperature. If vehicle speed sensor is below a minimum threshold for a period of time after the vehicle is operated at a sufficient load, a failure will be indicated.

- **When Monitored:**
  With the engine running, transmission not in park or neutral, brakes not applied, and engine rpm greater than 1500.
- **Set Condition:**
  This code will set if no vehicle speed signal is received from the ABS Module for more than 11 seconds for 2 consecutive trips. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
ACTIVE BUS OR COMMUNICATION DTCS
TIRE CIRCUMFERENCE
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

NOTE: Check for any Bus Communication DTCs. If no Bus or Communication DTCs are set, check for active DTCs stored in the Anti-Lock Brake Module. Any bus or communication DTCs or VSS DTCs in the Anti-Lock Brake Module must be properly diagnosed before continuing.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. VISUAL INSPECTION

NOTE: This code can set due to tire circumference differences and from the front or rear wheels being on a slippery surface while the opposite tires are not.

This code may also set on a hard acceleration on loose gravel or during other off road driving conditions.

Check tire pressure of all the tires.

Check tire wear on all the tires.

Ask the customer what the road and driving conditions were like when the fault set.

Were any problems found?

Yes >> Repair as necessary. If the code set during a front OR rear wheel spin condition, no repair is necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

P0501-VEHICLE SPEED SENSOR 1 PERFORMANCE (CONTINUED)

3. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

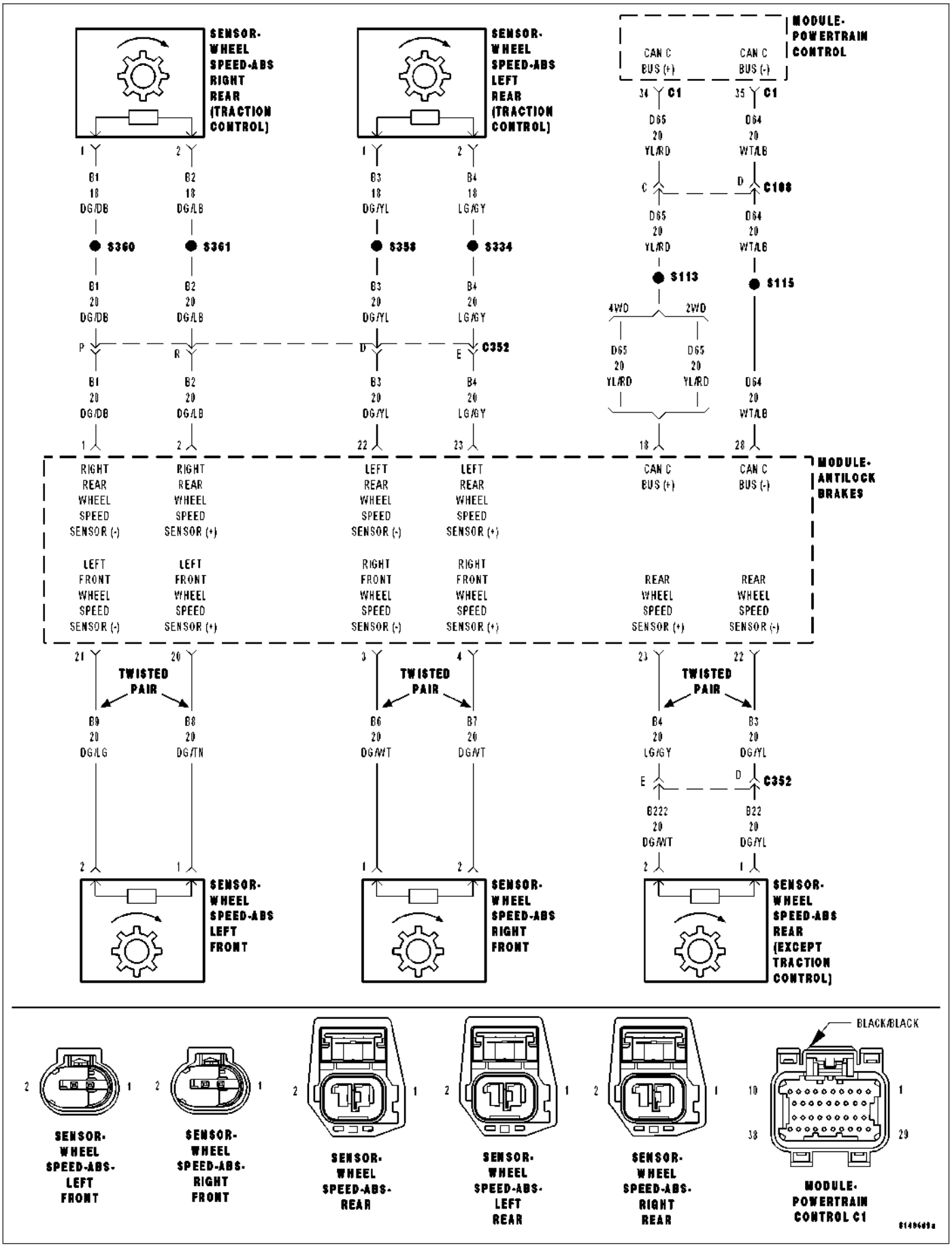
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0503-VEHICLE SPEED SENSOR 1 ERRATIC



P0503-VEHICLE SPEED SENSOR 1 ERRATIC (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The vehicle speed sensor rationality is a continuous test that monitors the vehicle speed sensor for lack of activity. The rationality will not run if a limp-in exists for MAP, Throttle Position, and Engine Coolant Temperature. If vehicle speed sensor is below a minimum threshold for a period of time after the vehicle is operated at a sufficient load, a failure will be indicated.

- **When Monitored:**
  Ignition on and battery voltage greater than 10 volts. Transmission in Drive or Reverse.
- **Set Condition:**
  Vehicle speed signal is erratic during road load conditions. Two Trip Fault for non ETC vehicles and One Trip Fault for ETC vehicles. Three good trips to turn off the MIL.

Possible Causes
ACTIVE BUS OR COMMUNICATION DTCS
TIRE CIRCUMFERENCE
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

NOTE: Check for any Bus Communication DTCs. If no Bus or Communication DTCs are set, check for active DTCs stored in the Anti-Lock Brake Module. Any bus or communication DTCs or VSS DTCs in the Anti-Lock Brake Module must be properly diagnosed before continuing.

With a scan tool, read DTCs and record the related Freeze Frame data.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. VISUAL INSPECTION

NOTE: This code can set due to tire circumference differences and from the front or rear wheels being on a slippery surface while the opposite tires are not.

This code may also set on a hard acceleration on loose gravel or during other off road driving conditions.

Check tire pressure of all the tires.

Check tire wear on all the tires.

Ask the customer what the road and driving conditions were like when the fault set.

Were any problems found?

Yes >> Repair as necessary. If the code set during a front OR rear wheel spin condition, no repair is necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

P0503-VEHICLE SPEED SENSOR 1 ERRATIC (CONTINUED)

3. **PCM**

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0506-IDLE SPEED PERFORMANCE LOWER THAN EXCEPTED

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The objective of the Idle “Speed Rationality is to monitor the ability to achieve and maintain a steady idle condition. The monitor will judge the functionality of the idle speed control system by monitoring RPM during idle. If RPM does not come within a calibrated deadband of target idle speed, a timer is started. If the timer reaches its maximum threshold without any sign of the RPM trending towards control, a soft failure is generated.

- **When Monitored:**
  With the engine running at idle, MAF <250 mg/tdc, air temp >-17.8°C (0°F) and <-7°C (19.4°F) enable after coolant temp >70°C (158°F) or air temp >-7°C (19.4°F), coolant temp >-7°C (19.4°F) <130°C (266°F), canister purge <100% duty cycle, and no VSS, MAF/MAP, ECT, TPS, ETC, CRK Sensor DTCs nor any fuel system or injector DTCs.
- **Set Condition:**
  Engine speed is 100 RPM or more below idle speed for 7 seconds. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
AIR INDUCTION SYSTEM
THROTTLE BODY
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: If any other DTCs are present, they must be diagnosed and repaired before continuing this test.
Ignition on, engine not running.
With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. AIR INDUCTION SYSTEM

Inspect the Air Induction System for the following problems.
Restrictions: Dirty Air Cleaner, Foreign material trapped in the air intake tube, etc.
Leaks: Air Intake tube connection, Air Cleaner housing, etc.

Were any problems found?

Yes >> Repair or replace as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

P0506-IDLE SPEED PERFORMANCE LOWER THAN EXCEPTED (CONTINUED)

3. THROTTLE BODY OPERATION

Inspect the throttle body for carbon build up, other restrictions, and a bent throttle plate using a straight edge.

If the throttle plate does not close entirely it may be bent and needs to be replaced.

Verify that the throttle cable between the Accelerator Pedal and APPS is not binding.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

While the vehicle is running, lightly tap on ETC Motor, with your hand, and listen for idle to raise.

Were any problems found or does the idle fluctuate while tapping on the ETC Motor?

Yes >> Repair or replace as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

---

4. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0507-IDLE SPEED PERFORMANCE HIGHER THAN EXCEPTED

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The objective of the Idle “Speed Rationality is to monitor the ability to achieve and maintain a steady idle condition. The monitor will judge the functionality of the idle speed control system by monitoring RPM during idle. If RPM does not come within a calibrated deadband of target idle speed, a timer is started. If the timer reaches its maximum threshold without any sign of the RPM trending towards control, a soft failure is generated.

- **When Monitored:**
  With the engine running at idle, MAF <250 mg/tdc, air temp >-17.8°C (0°F) and <-7°C (19.4°F) enable after coolant temp >70°C (158°F) or air temp >-7°C (19.4°F), coolant temp >-7°C (19.4°F) <130°C (266°F), canister purge <100% duty cycle, and no VSS, MAF/MAP, ECT, TPS, ETC, CRK Sensor DTCs nor any fuel system or injector DTCs.
- **Set Condition:**
  Engine speed is 200 RPM or more above idle speed for 7 seconds. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
AIR INDUCTION SYSTEM
VACUUM LEAKS
THROTTLE BODY
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: If any other DTCs are present, they must be diagnosed and repaired before continuing this test.
Ignition on, engine not running.
With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. AIR INDUCTION SYSTEM

Inspect the Air Induction System for the following problems.
Restrictions: Dirty Air Cleaner, Foreign material trapped in the air intake tube, etc.
Leaks: Air Intake tube connection, Air Cleaner housing, etc.

Were any problems found?

Yes >> Repair or replace as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

P0507-IDLE SPEED PERFORMANCE HIGHER THAN EXCEPTED (CONTINUED)

3. VACUUM LEAKS

Start the engine.
Inspect the vehicle for external vacuum leaks.
Inspect the engine for internal leaks.

Were any vacuum leaks found or does the idle fluctuate while tapping on the ETC Motor?

Yes >> Repair the vacuum leak as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

---

4. THROTTLE BODY OPERATION

Inspect the throttle body for carbon build up, other restrictions, and a bent throttle plate using a straight edge.
If the throttle plate does not close entirely it may be bent and needs to be replaced.
Verify that the throttle cable between the Accelerator Pedal and APPS is not binding.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.
While the vehicle is running, lightly tap on ETC Motor, with your hand, and listen for idle to fluctuate.

Were any problems found?

Yes >> Repair or replace as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

---

5. PCM

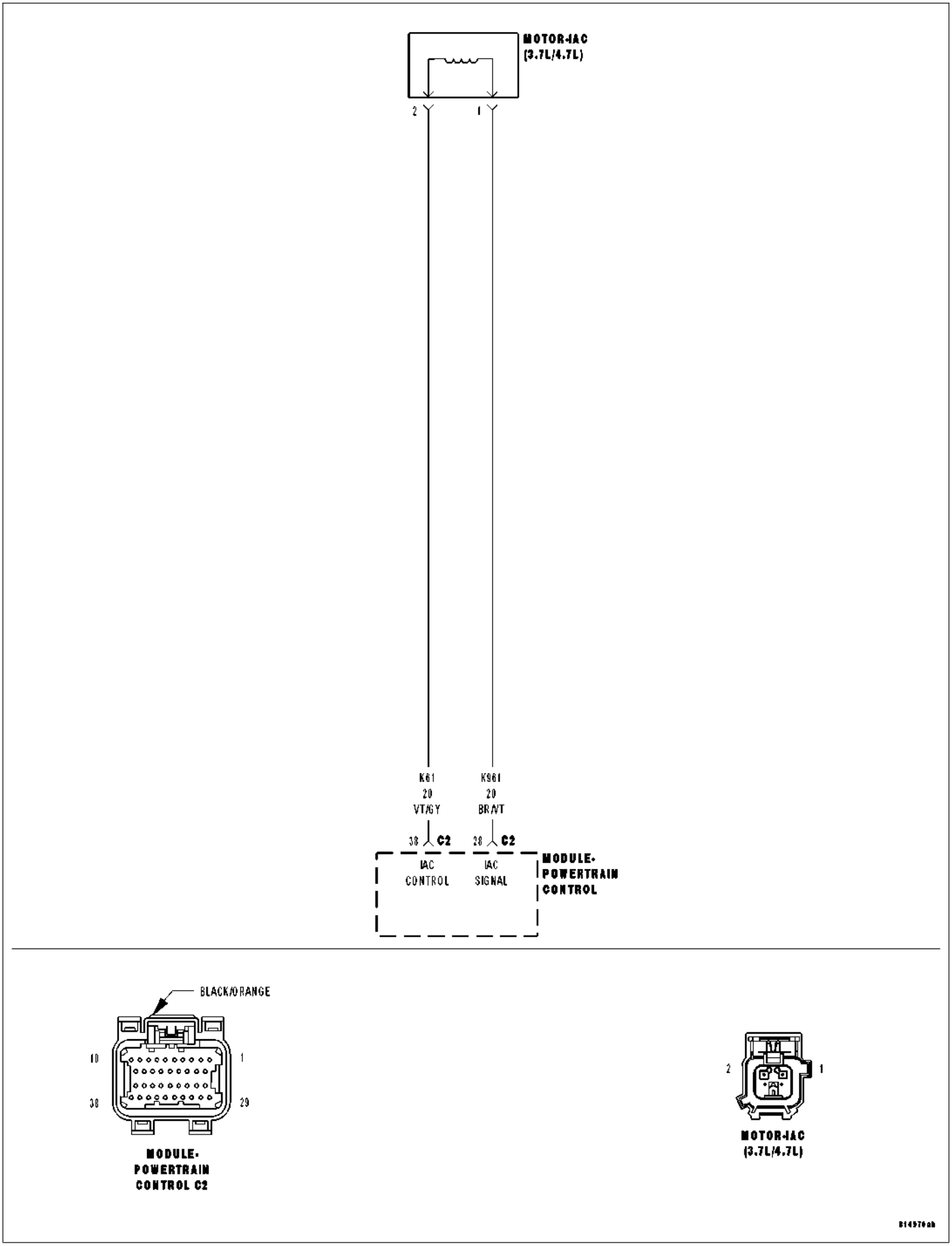
NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0508-IDLE AIR CONTROL VALVE SENSE CIRCUIT LOW



P0508-IDLE AIR CONTROL VALVE SENSE CIRCUIT LOW (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Engine running. Battery voltage greater than 10 volts. IAC motor operating.
- **Set Condition:**
  The PCM senses a short to ground or battery voltage on any of the Linear Idle Air Control (LIAC) control circuits for 2.75 seconds while the IAC motor is active. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K61) IAC CONTROL CIRCUIT SHORTED TO GROUND
(K961) IAC SIGNAL CIRCUIT OPEN
(K961) IAC SIGNAL CIRCUIT SHORTED TO GROUND
(K61) IAC CONTROL CIRCUIT OPEN
IAC MOTOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. IAC MOTOR OPERATION

NOTE: If the engine will not idle, maintain an engine speed between 800 and 1500 RPM.
Start the engine.
Allow the engine to idle.
With a scan tool, read the IAC Current.

Is the IAC Current below 146 mA?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

2. IAC MOTOR

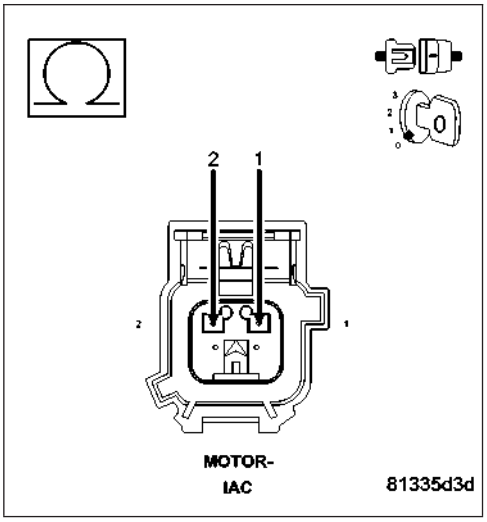
Turn the ignition off.
Disconnect the IAC Motor harness connector.
Remove the IAC Motor.

NOTE: Inspect the IAC air passages for restrictions and damage to the IAC valve.
Measure the resistance across the IAC Motor pin terminals (component).

Is the resistance 9.7 +/- 1.0 ohms?

Yes >> Go To 3

No >> Replace the IAC Motor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



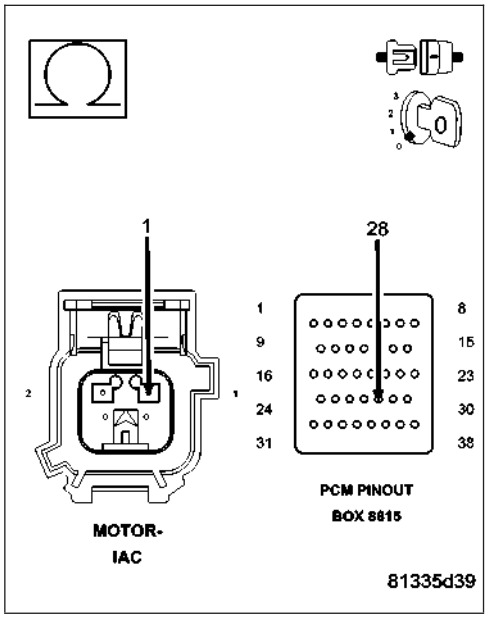
P0508-IDLE AIR CONTROL VALVE SENSE CIRCUIT LOW (CONTINUED)

3. (K961) IAC SIGNAL CIRCUIT OPEN

Disconnect the C2 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K961) IAC Signal circuit from the IAC Motor harness connector to the appropriate terminal of special tool #8815.



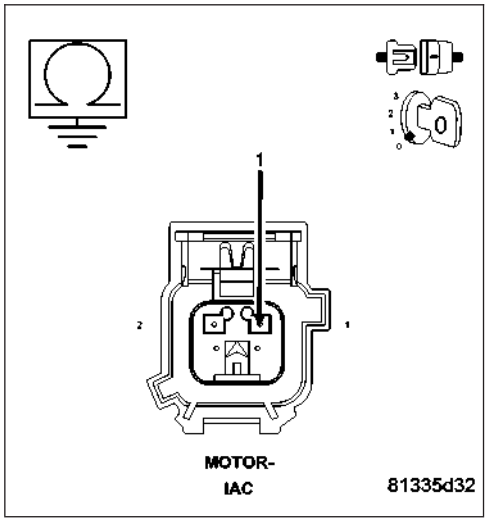
Is the resistance below 5.0 ohms?

Yes >> Go To 4

No >> Repair the open in the (K961) IAC Signal circuit. Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

4. (K961) IAC SIGNAL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K961) IAC Signal circuit in the IAC Motor harness connector.



Is the resistance below 100 ohms?

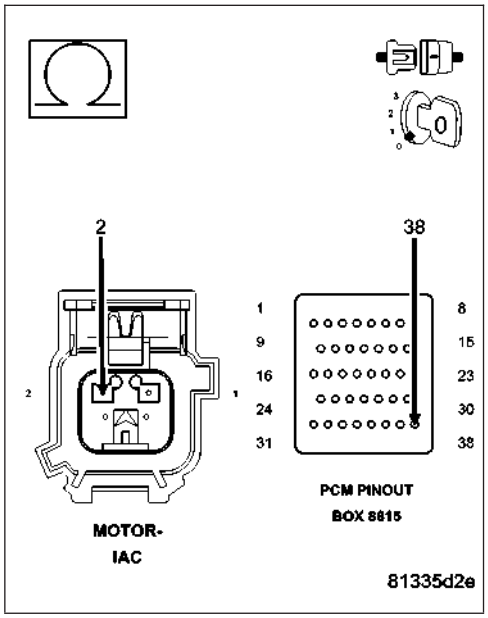
Yes >> Repair the short to ground in the (K961) IAC Signal circuit. Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

P0508-IDLE AIR CONTROL VALVE SENSE CIRCUIT LOW (CONTINUED)

5. (K61) IAC CONTROL CIRCUIT OPEN

Measure the resistance of the (K61) IAC Control circuit from the IAC Motor harness connector to the appropriate terminal of special tool #8815.



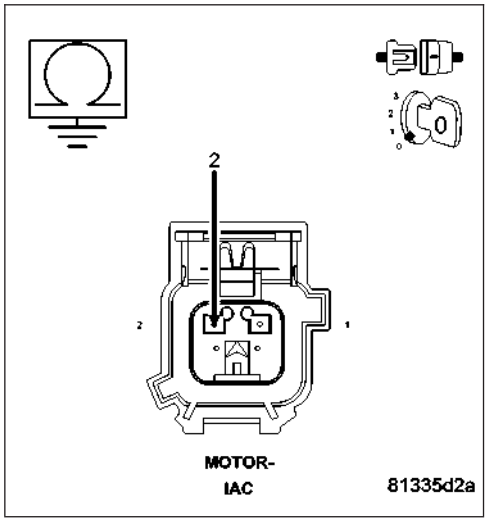
Is the resistance below 5.0 ohms?

Yes >> Go To 6

No >> Repair the open in the (K61) IAC Control circuit. Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

6. (K61) IAC CONTROL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K61) IAC Control circuit in the IAC Motor harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K61) IAC Control circuit. Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 7

P0508-IDLE AIR CONTROL VALVE SENSE CIRCUIT LOW (CONTINUED)

7. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

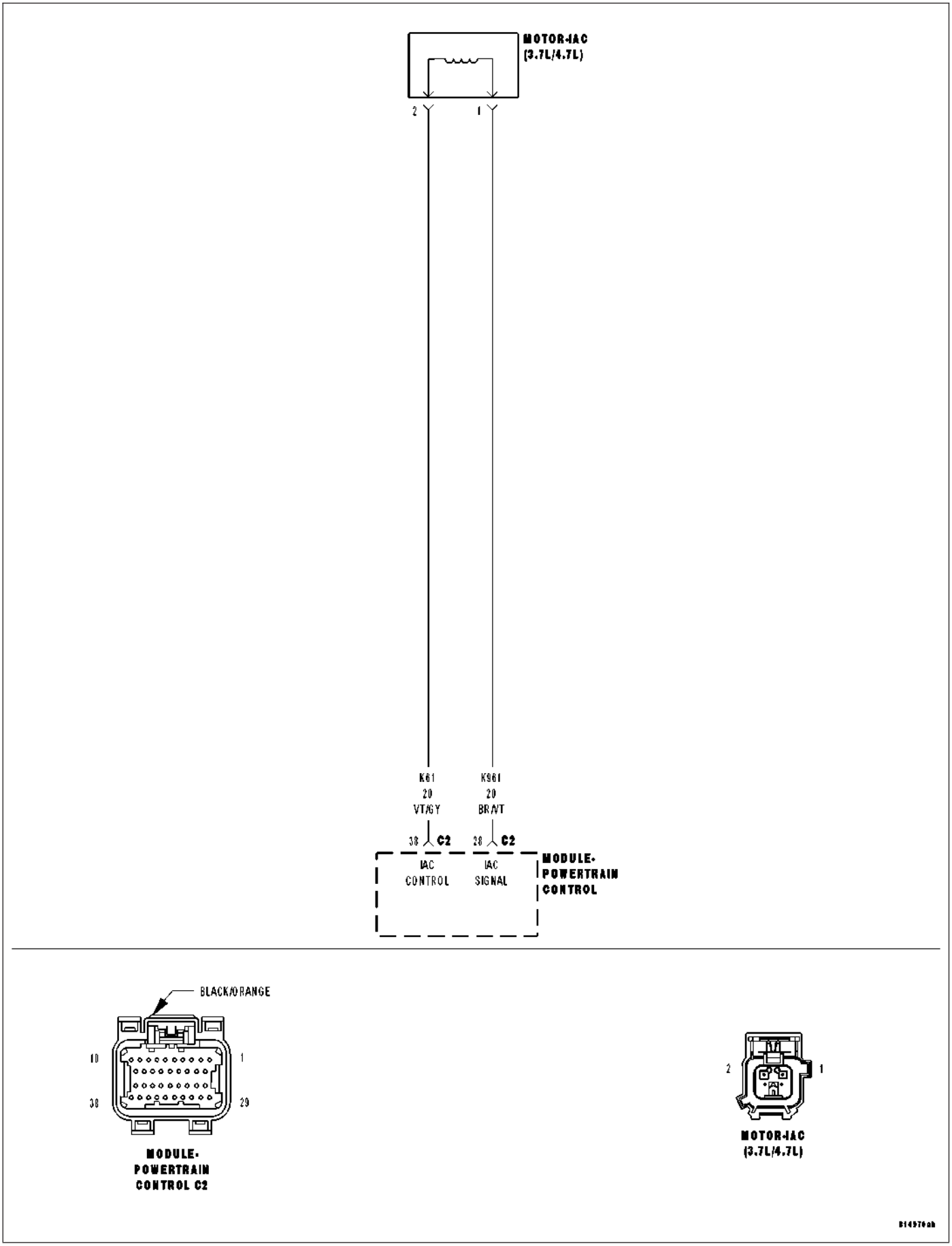
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0509-IDLE AIR CONTROL VALVE SENSE CIRCUIT HIGH



P0509-IDLE AIR CONTROL VALVE SENSE CIRCUIT HIGH (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Engine running. Battery voltage greater than 10 volts. IAC motor operating.
- **Set Condition:**
  The PCM senses a short to ground or battery voltage on any of the Linear Idle Air Control (LIAC) control circuits for 2.75 seconds while the IAC motor is active. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K961) IAC RETURN CIRCUIT SHORTED TO BATTERY VOLTAGE
(K61) IAC CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K61) IAC CONTROL CIRCUIT SHORTED TO THE (K961) IAC RETURN CIRCUIT
IAC MOTOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. IAC MOTOR OPERATION

NOTE: If the engine will not idle, maintain an engine speed between 800 and 1500 RPM.
Start the engine.
Allow the engine to idle.
With a scan tool, read the IAC Current.

Is the IAC Current above 999 mA?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. IAC MOTOR

Turn the ignition off.
Disconnect the IAC Motor harness connector.
With the scan tool, monitor the IAC Current.
Ignition on, engine not running.

Does the scan tool display IAC Current at 0 mA?

Yes >> Replace the IAC Motor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

P0509-IDLE AIR CONTROL VALVE SENSE CIRCUIT HIGH (CONTINUED)

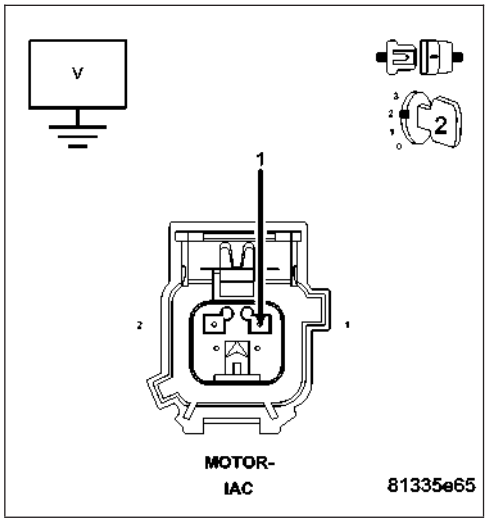
3. (K961) IAC SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

Disconnect the C2 PCM harness connector.

Ignition on, engine not running.

Measure the voltage on the (K961) IAC Signal circuit in the IAC Motor harness connector.



Is the voltage above 0.5 of a volt?

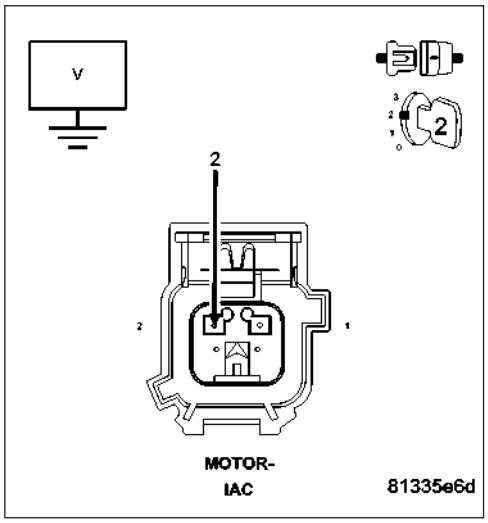
Yes >> Repair the short to battery voltage in the (K961) IAC Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

4. (K61) IAC CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

Measure the voltage on the (K61) IAC Control circuit in the IAC Motor harness connector.



Is the voltage above 0.5 of a volt?

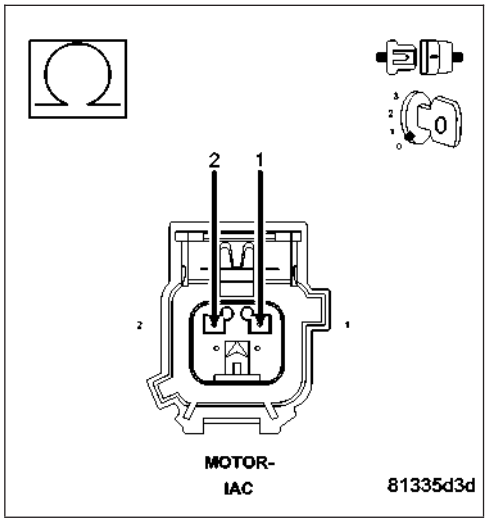
Yes >> Repair the short to battery voltage in the (K61) IAC Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

P0509-IDLE AIR CONTROL VALVE SENSE CIRCUIT HIGH (CONTINUED)

5. (K61) IAC CONTROL CIRCUIT SHORTED TO THE (K961) IAC RETURN CIRCUIT

Measure the resistance across the (K961) IAC Signal circuit and the (K61) IAC Control circuit in the IAC Motor harness connector.



Is the resistance below 5.0 ohms?

Yes >> Repair the short between the (K961) IAC Signal circuit and the (K61) IAC Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6

6. PCM

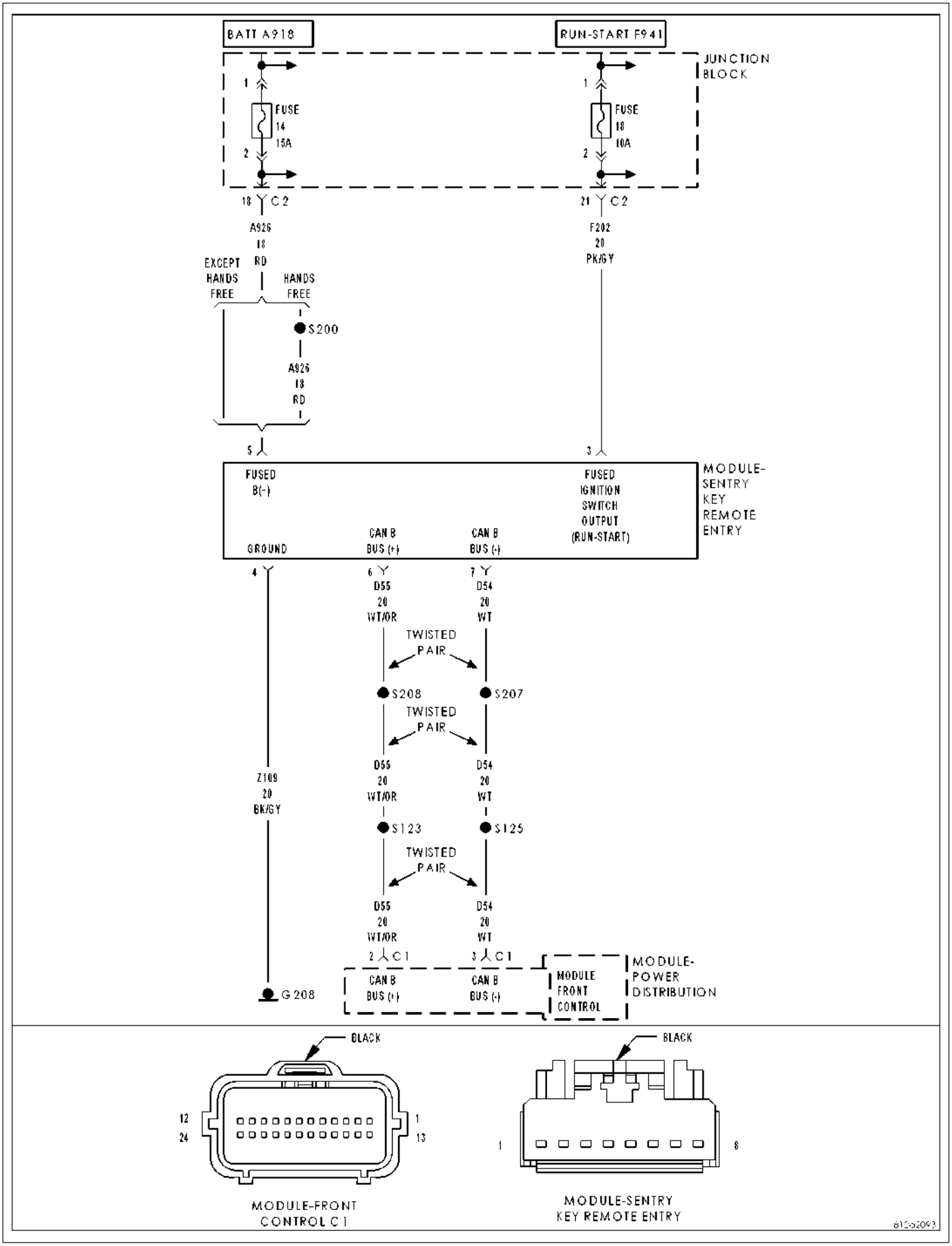
NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0513-INVALID SKIM KEY



P0513-INVALID SKIM KEY (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  The PCM detects an invalid SKREEM key. One Trip Fault.

Possible Causes
INCORRECT VIN PROGRAMMED IN THE PCM
NO COMMUNICATION WITH SKREEM
NO VIN PROGRAMMED IN THE PCM
IGNITION KEY
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With the scan tool, read the PCM DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Go To 6

---

2. NO COMMUNICATION WITH SKREEM

With the scan tool, attempt to communicate with the SKREEM.

Can the scan tool communicate with the SKREEM?

Yes >> Go To 3

No >> Refer to Section 8 - Electrical VEHICLE THEFT SECURITY - ELECTRICAL DIAGNOSTICS and perform the appropriate Diagnostic Procedure.
Perform SKREEM VERIFICATION. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

---

3. SKREEM TROUBLE CODES SET

With the scan tool, check for SKREEM DTCs.

Are any DTCs present in the SKREEM?

Yes >> Refer to Section 8 - Electrical VEHICLE THEFT SECURITY - ELECTRICAL DIAGNOSTICS and perform the appropriate Diagnostic Procedure.
Perform SKREEM VERIFICATION. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> Go To 4

P0513-INVALID SKIM KEY (CONTINUED)

4. VIN PROGRAMMED INTO PCM

With the scan tool, display the VIN that is programmed in the PCM.

Has a VIN been programmed into the PCM?

Yes >> Go To 5

No >> Program the correct VIN into the PCM and retest.
Perform SKREEM VERIFICATION. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

---

5. PCM

Turn the ignition off.
Replace and program the SKREEM per Service Information.
Ignition on, engine not running.
With the scan tool, erase all SKREEM and PCM DTCs.
Attempt to start and idle the engine.
With the scan tool, read the PCM DTCs.

Does the scan tool display this code?

Yes >> NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary. Replace and program the Powertrain Control Module per Service Information.
Perform SKREEM VERIFICATION. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> Test Complete.

---

6. IGNITION KEY

NOTE: You must obtain the SKREEM pin number.

NOTE: This DTC could have been set if the SKREEM harness connector was disconnected, or if the SKREEM was replaced recently.

NOTE: All keys that the customer uses for this vehicle must be tested to verify they are operating properly.
Ignition on, engine not running.
Verify the correct VIN is programmed into the PCM and SKREEM.
Turn the ignition off.
With each customer key turn the ignition key on and crank the engine to start.
With the scan tool, read the PCM DTCs. Look for P0513.

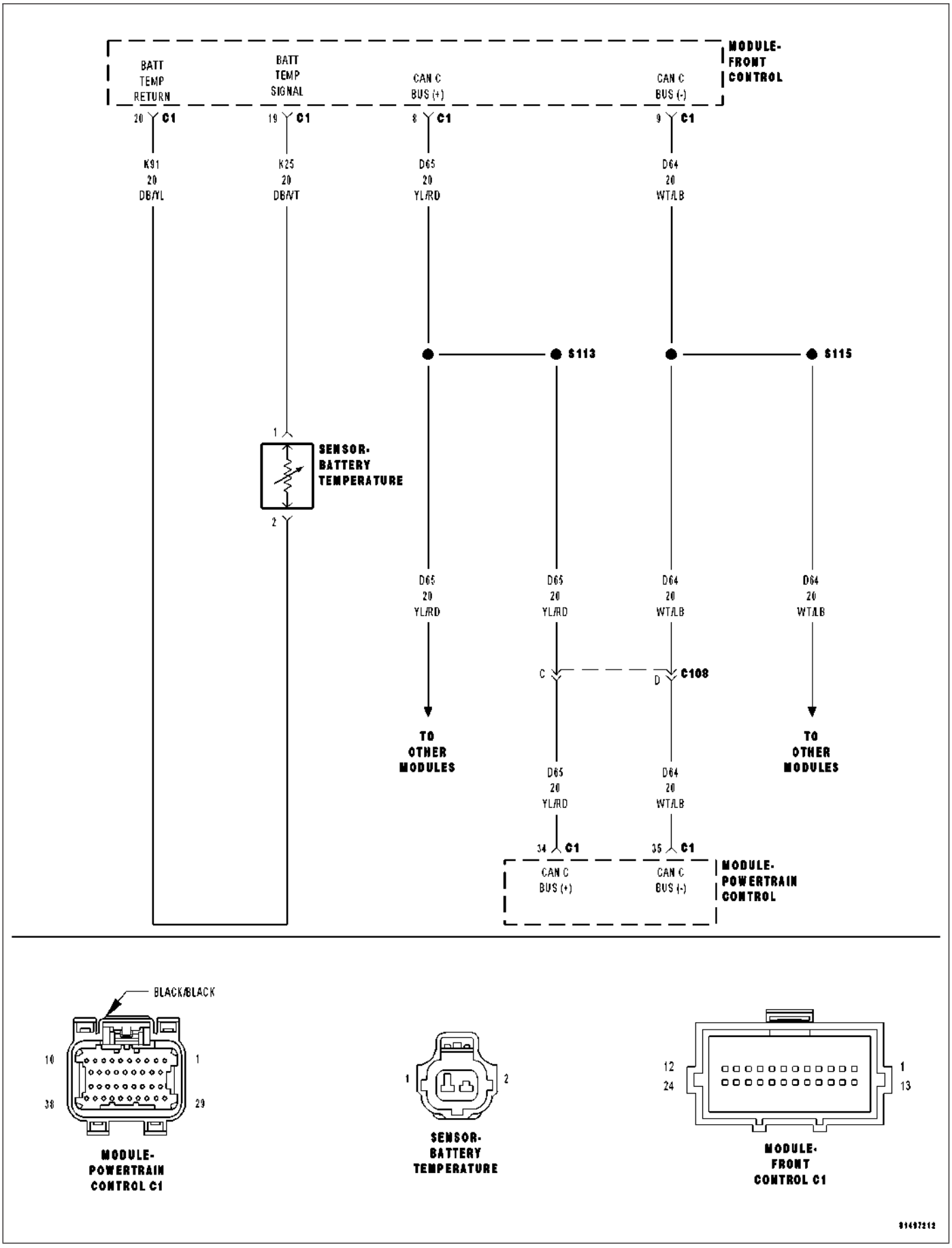
Is the DTC P0513 still active?

Yes >> Replace the Ignition Key.
Perform SKREEM VERIFICATION. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE)

No >> Test Complete.

NOTE: If this DTC cannot be reset, it could have been an actual theft attempt.

P0516-BATTERY TEMPERATURE SENSOR CIRCUIT LOW



P0516-BATTERY TEMPERATURE SENSOR CIRCUIT LOW (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on and battery voltage greater than 10 volts
- **Set Condition:**
  Battery temperature sensor voltage below 0.039 of a volt. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K25) BATT TEMP SIGNAL CIRCUIT SHORTED TO GROUND
(K25) BATT TEMP SIGNAL CIRCUIT SHORTED TO THE (K91) BATT TEMP RETURN CIRCUIT
BATTERY TEMPERATURE SENSOR
FRONT CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. BATTERY TEMP SENSOR VOLTAGE BELOW 0.5 OF A VOLT

Ignition on, engine not running.

With the scan tool, monitor Battery Temperature Sensor volts.

Is the voltage below 0.5 of a volt?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. BATTERY TEMPERATURE SENSOR

Ignition on, engine not running.

With the scan tool, read the Battery Temp Sensor Voltage value.

Disconnect the Battery Temperature Sensor harness connector.

Did the Battery Temperature Voltage value change from below 1.0 volt to above 4.5 volts?

Yes >> Replace the Battery Temperature Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

P0516-BATTERY TEMPERATURE SENSOR CIRCUIT LOW (CONTINUED)

3. (K25) BATT TEMP SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

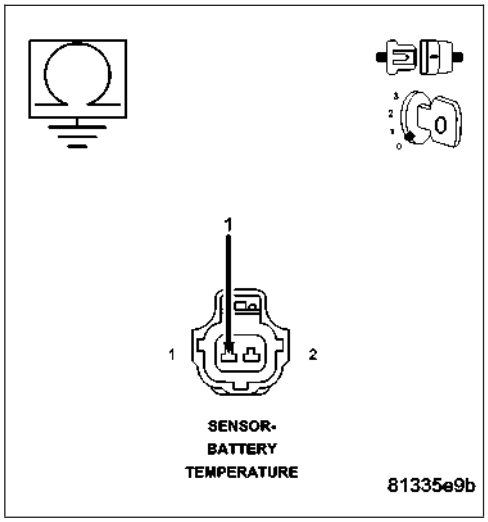
Disconnect the C1 FCM harness connector.

Measure the resistance between ground and the (K25) Batt Temp Signal circuit in the Battery Temp Sensor harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K25) Batt Temp Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4



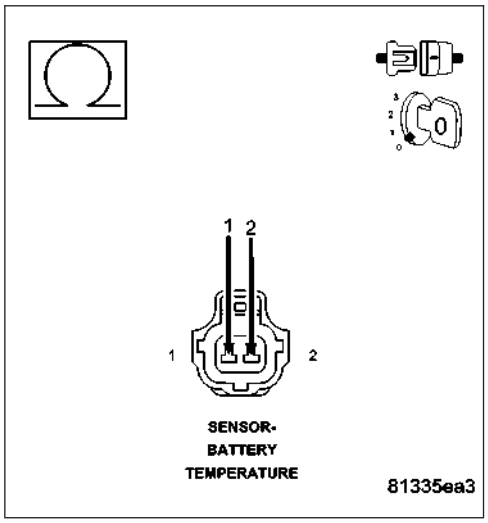
4. (K25) BATT TEMP SIGNAL CIRCUIT SHORTED TO THE (K91) BATT TEMP RETURN CIRCUIT

Measure the resistance between the (K25) Batt Temp Signal circuit and the (K91) Batt Temp Return circuit in the Battery Temp Sensor harness connector.

Is the resistance below 5.0 ohms?

Yes >> Repair the short between the (K91) Batt Temp Return circuit and the (K25) Batt Temp Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5



5. FRONT CONTROL MODULE

NOTE: Before continuing, check the FCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

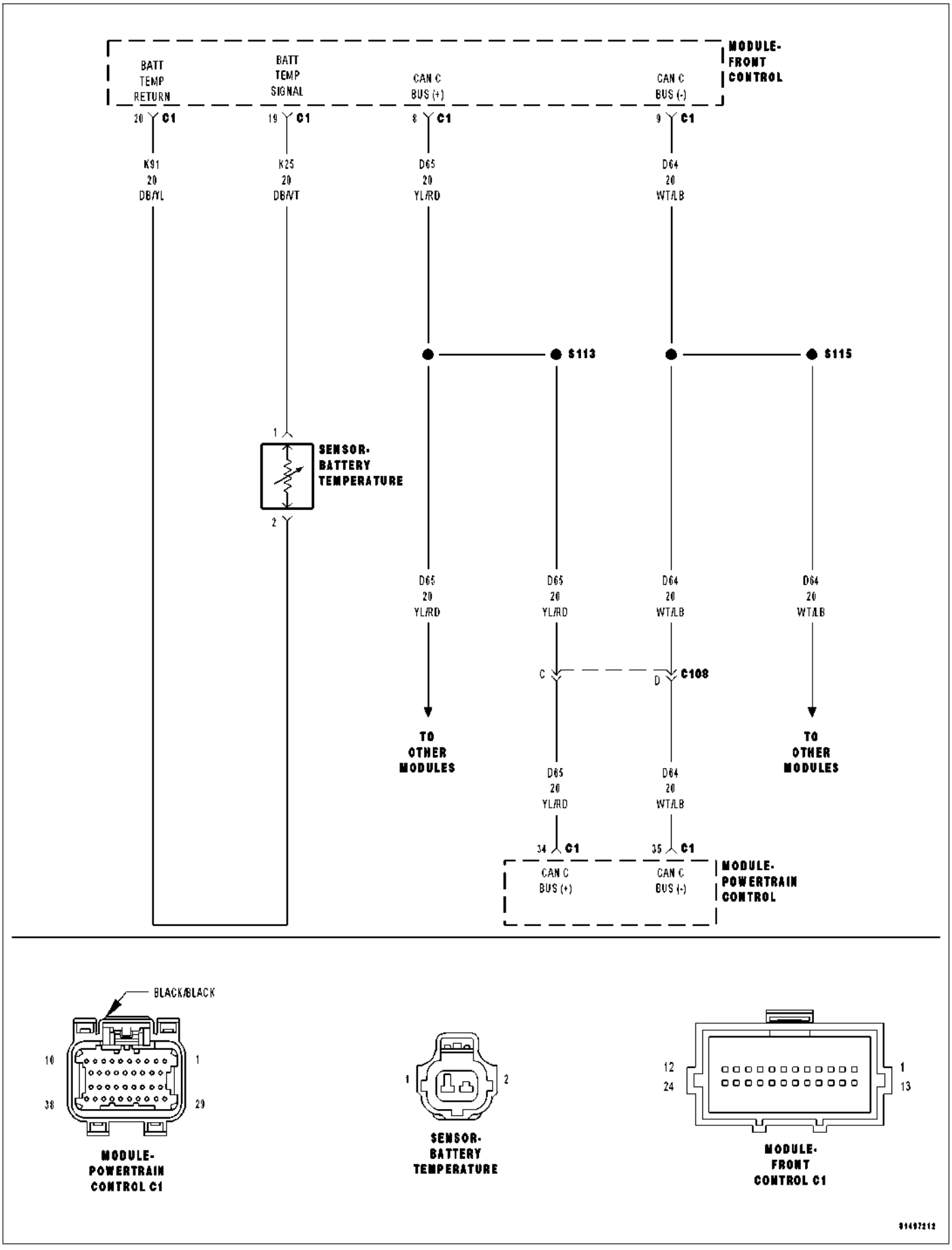
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Replace and program the Front Control Module per Service Information.
Perform BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

P0517-BATTERY TEMPERATURE SENSOR CIRCUIT HIGH



P0517-BATTERY TEMPERATURE SENSOR CIRCUIT HIGH (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on and battery voltage greater than 10 volts.
- **Set Condition:**
  Battery temperature voltage above 4.94 volts. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K25) BATT TEMP SENSOR SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K25) BATT TEMP SIGNAL CIRCUIT OPEN
(K91) BATT TEMP RETURN CIRCUIT OPEN
BATTERY TEMPERATURE SENSOR
FRONT CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. BATTERY TEMPERATURE SENSOR VOLTAGE ABOVE 4.8 VOLTS

NOTE: Diagnose any CAN - C Communication DTCs before continuing.

Ignition on, engine not running.

With a scan tool, monitor the Battery Temperature Sensor voltage.

Is the voltage above 4.9 volts?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0517-BATTERY TEMPERATURE SENSOR CIRCUIT HIGH (CONTINUED)

2. BATTERY TEMPERATURE SENSOR

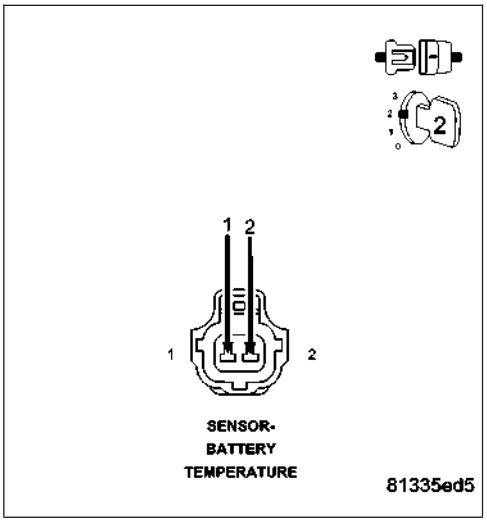
Turn the ignition off.

Disconnect the Battery Temperature Sensor harness connector.

Ignition on, engine not running.

With the scan tool, read the Battery Temp Voltage value.

Connect a jumper wire between the (K25) Batt Temp Signal circuit and the (K91) Batt Temp Return circuit in the Battery Temp Sensor harness connector.



Did the Battery Temp voltage value change from greater than 4.5 volts to less than 1.0 volt with the jumper wire installed?

Yes >> Replace the Battery Temperature Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

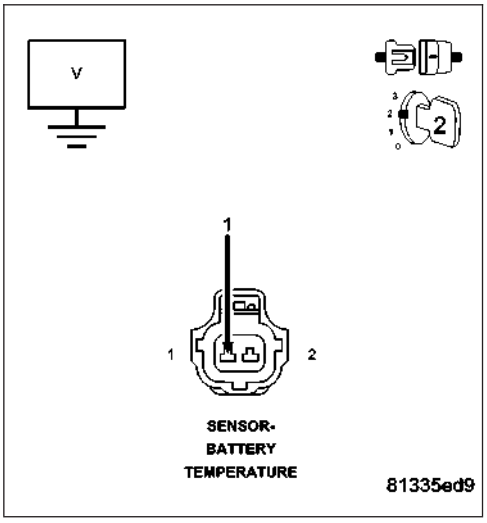
NOTE: Remove the jumper wire before continuing.

3. (K25) BATT TEMP SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

Disconnect the C1 FCM harness connector.

Measure the voltage on the (K25) Batt Temp Signal circuit in the Battery Temp Sensor harness connector.



Is the voltage above 5.2 volts?

Yes >> Repair the short to battery voltage in the (K25) Batt Temp Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

P0517-BATTERY TEMPERATURE SENSOR CIRCUIT HIGH (CONTINUED)

4. (K25) BATT TEMP SIGNAL CIRCUIT OPEN

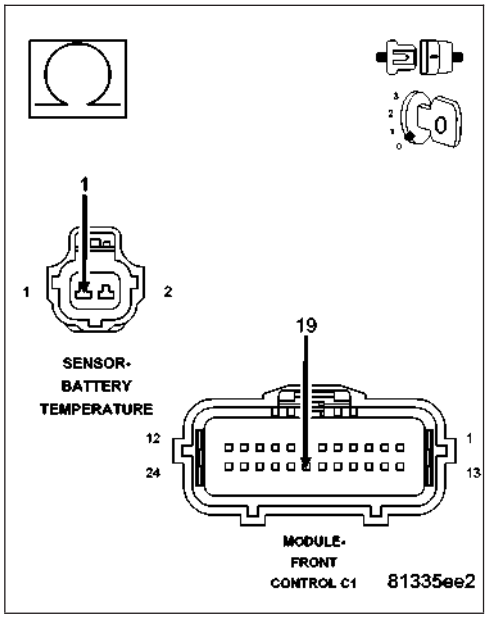
Turn the ignition off.

Measure the resistance of the (K25) Batt Temp Signal circuit from the Battery Temp Sensor harness connector to the C1 FCM harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 5

No >> Repair the open in the (K25) Batt Temp Signal circuit. Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



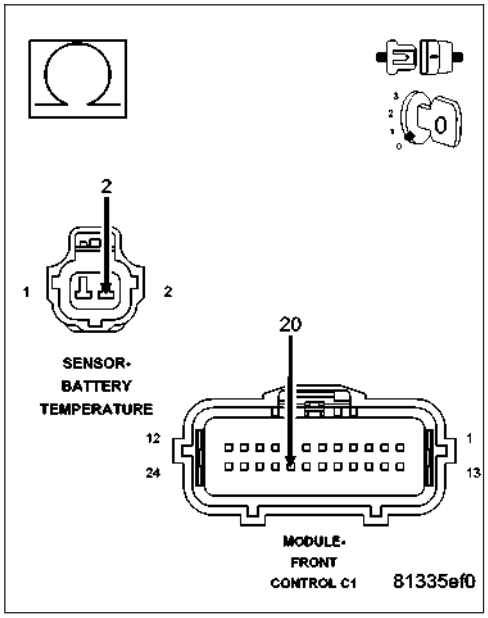
5. (K91) BATT TEMP RETURN CIRCUIT OPEN

Measure the resistance in the (K91) Batt Temp Return circuit from the Sensor connector to the C1 FCM harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 6

No >> Repair the open in the (K91) Batt Temp Return circuit. Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P0517-BATTERY TEMPERATURE SENSOR CIRCUIT HIGH (CONTINUED)

6. FRONT CONTROL MODULE

NOTE: Before continuing, check the FCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

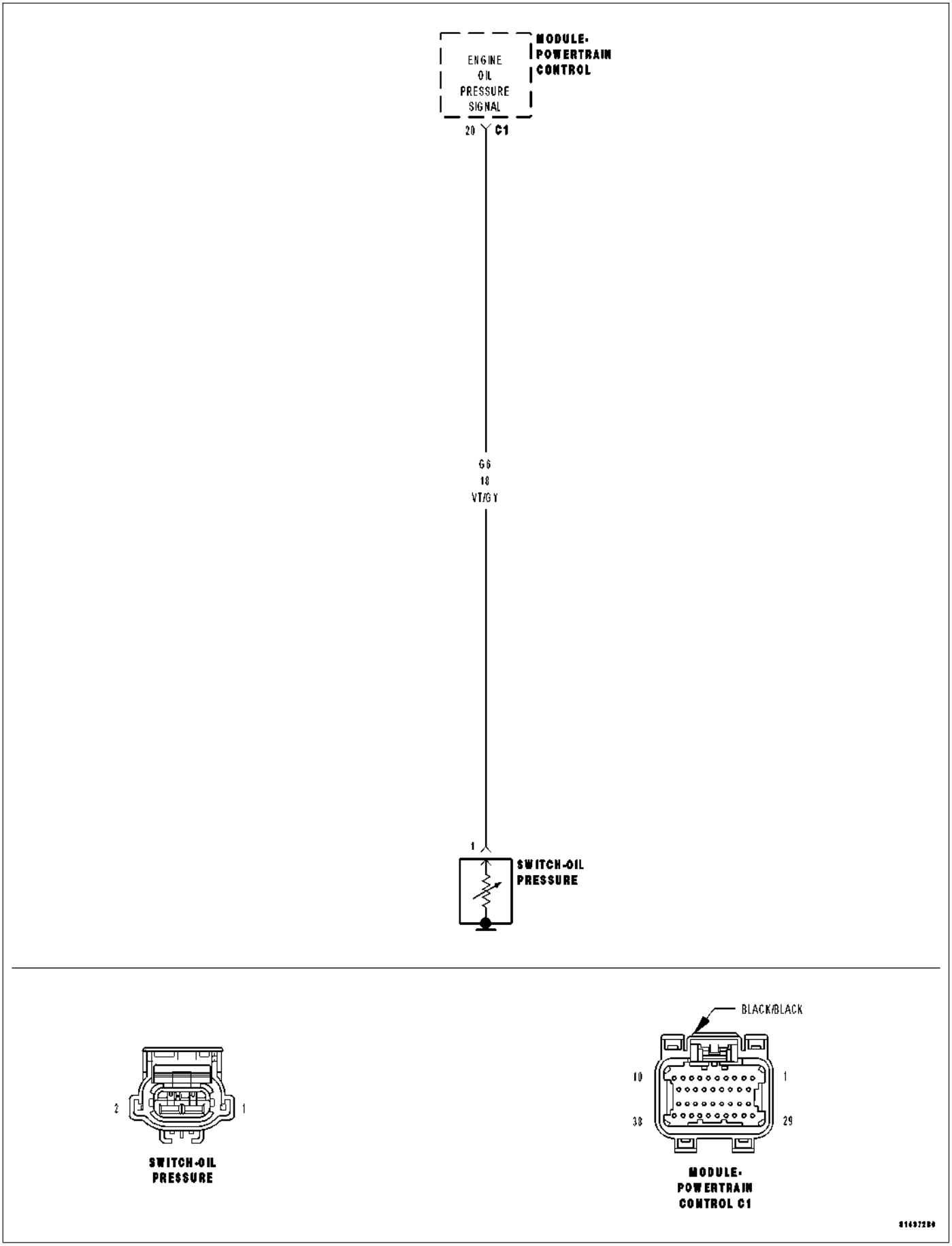
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Replace and program the Front Control Module per Service Information.
Perform BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

P0522-OIL PRESSURE TOO LOW



P0522-OIL PRESSURE TOO LOW (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition key on and battery voltage above 10.4 volts.
- **Set Condition:**
  The oil pressure sensor voltage at PCM goes below 0.1 of a volt for 0.5 of a second. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(G6) OIL PRESSURE SIGNAL CIRCUIT OPEN
(G6) OIL PRESSURE SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(G6) OIL PRESSURE SIGNAL CIRCUIT SHORTED TO GROUND
OIL PRESSURE SWITCH
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0522-OIL PRESSURE TOO LOW (CONTINUED)

2. OIL PRESSURE SWITCH

Turn the ignition off.

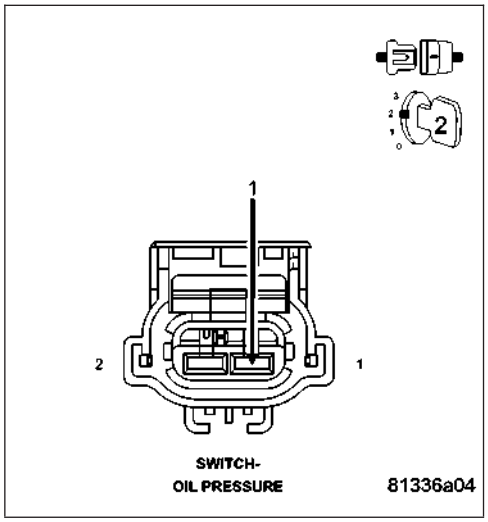
Disconnect the Oil Pressure Switch harness connector.

Ignition on, engine not running.

Connect a jumper wire to the (G6) Oil Pressure Signal circuit in the Sensor harness connector.

With the scan tool monitor the Oil Pressure Switch state.

Touch the other end of the jumper wire to a known good Ground several times.



Did the Oil Pressure Switch state change from High to Low when connecting and disconnecting the jumper wire to ground?

Yes >> Replace the Oil Pressure Switch.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

NOTE: Remove the jumper wire before continuing.

---

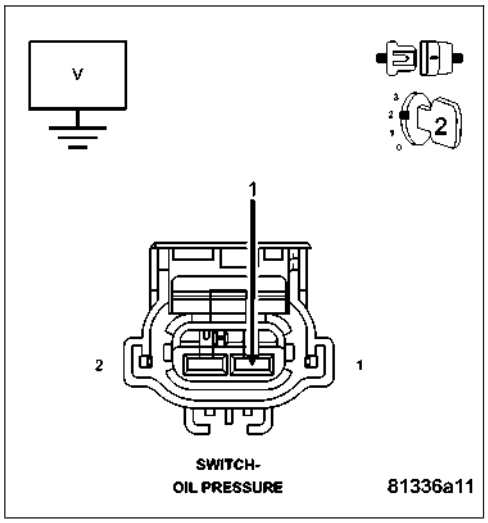
3. (G6) OIL PRESSURE SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

Disconnect the C1 PCM harness connector.

Ignition on, engine not running.

Measure the voltage on the (G6) Oil Pressure Signal circuit in the Switch harness connector.



Is the voltage above 0 volts?

Yes >> Repair the short to battery voltage on the (G6) Oil Pressure Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

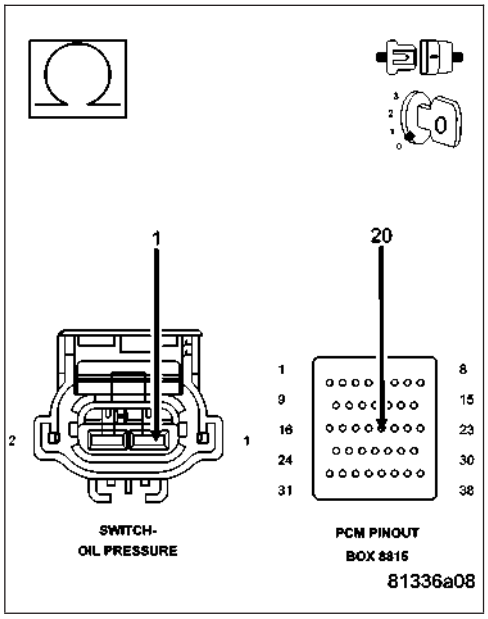
No >> Go To 4

P0522-OIL PRESSURE TOO LOW (CONTINUED)

4. (G6) OIL PRESSURE SWITCH SIGNAL CIRCUIT OPEN

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (G6) Oil Pressure Signal circuit from the Oil Pressure Switch harness connector to the appropriate terminal of special tool #8815.



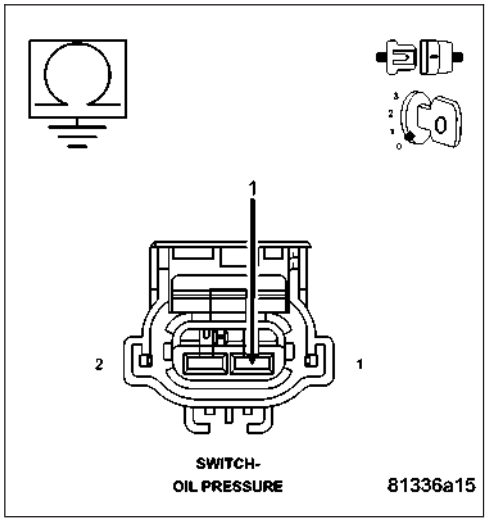
Is the resistance below 5.0 ohms?

Yes >> Go To 5

No >> Repair the open in the (G6) Oil Pressure Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

5. (G6) SIGNAL CIRCUIT SHORTED TO GROUND

Measure the resistance between a known good ground and the (G6) Oil Pressure Signal circuit in the Switch connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (G6) Oil Pressure Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6

P0522-OIL PRESSURE TOO LOW (CONTINUED)

6. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

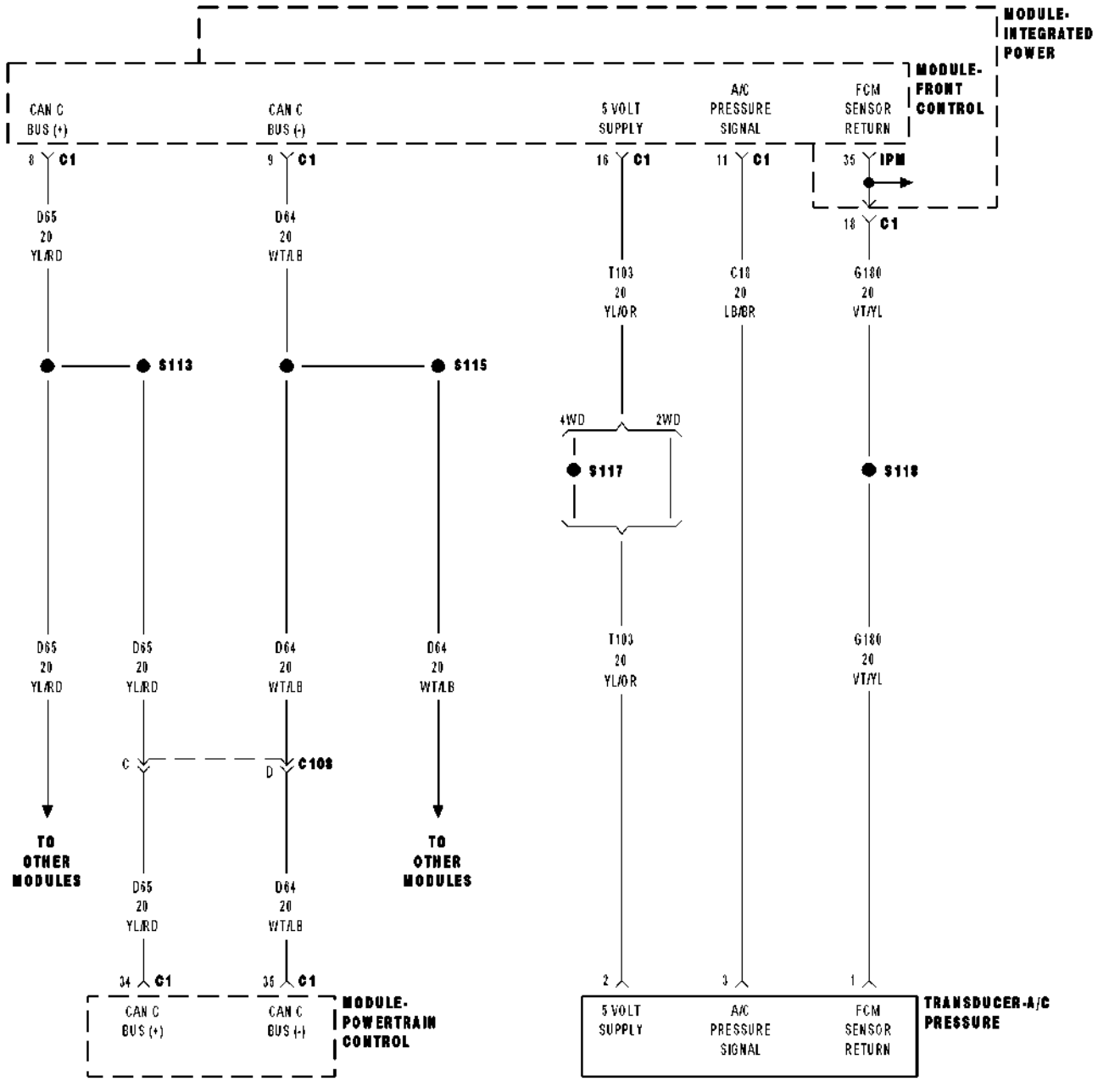
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

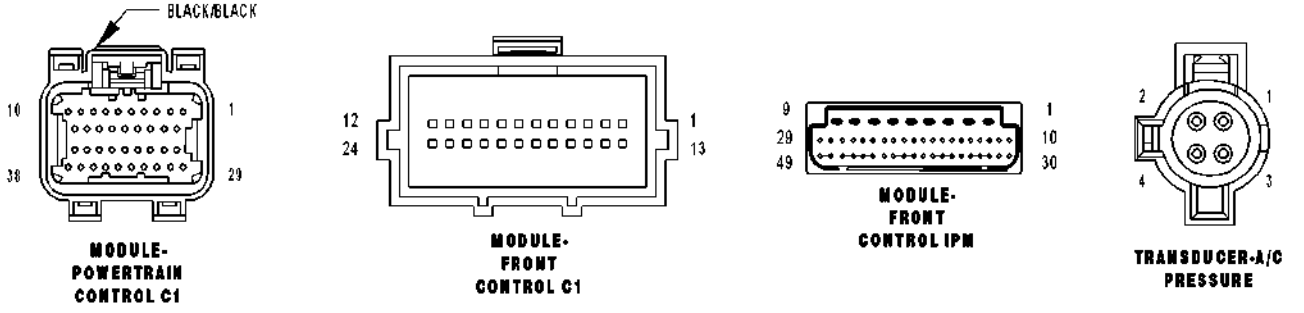
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0532-A/C PRESSURE SENSOR CIRCUIT LOW





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P0532-A/C PRESSURE SENSOR CIRCUIT LOW (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Engine running, AC is learned, and AC Clutch Relay energized.
- **Set Condition:**
  The A/C pressure transducer signal voltage at the PCM goes below 0.58 of a volt for 2.6 seconds. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(T103) 5-VOLT SUPPLY CIRCUIT OPEN
(T103) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
A/C PRESSURE TRANSDUCER
(C18) A/C PRESSURE SIGNAL CIRCUIT SHORTED TO GROUND
(C18) A/C PRESSURE SIGNAL CIRCUIT SHORTED TO THE (G180) SENSOR RETURN CIRCUIT
FRONT CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. A/C PRESSURE TRANSDUCER VOLTAGE BELOW 0.6 OF A VOLT

NOTE: Make sure the A/C refrigerant System is properly charged per Service Information.

Start the engine.

With a scan tool, read the A/C Pressure Sensor voltage.

Is the voltage below 0.6 of a volt?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

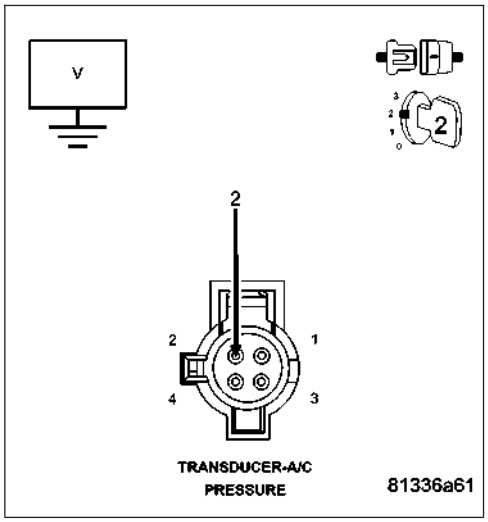
2. (T103) 5-VOLT SUPPLY CIRCUIT

Turn the ignition off.

Disconnect the A/C Pressure Transducer harness connector.

Ignition on, engine not running.

Measure the voltage on the (T103) 5-volt Supply circuit in the A/C Pressure Transducer harness connector.



Is the voltage between 4.5 to 5.2 volts?

Yes >> Go To 3

No >> Go To 6

P0532-A/C PRESSURE SENSOR CIRCUIT LOW (CONTINUED)

3. A/C PRESSURE TRANSDUCER

With the scan tool, monitor the A/C Pressure Transducer voltage.

Is the voltage above 0.6 of a volt?

Yes >> Replace the A/C Pressure Transducer.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

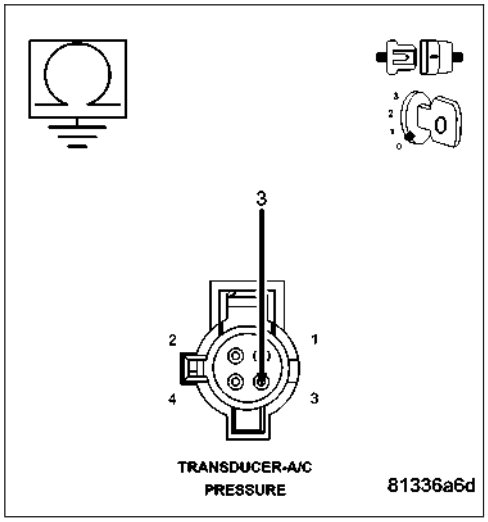
No >> Go To 4

4. (C18) A/C PRESSURE SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the C1 FCM harness connector.

Measure the resistance between ground and the (C18) A/C Pressure Signal circuit in the A/C Pressure Transducer harness connector.



Is the resistance below 100 ohms?

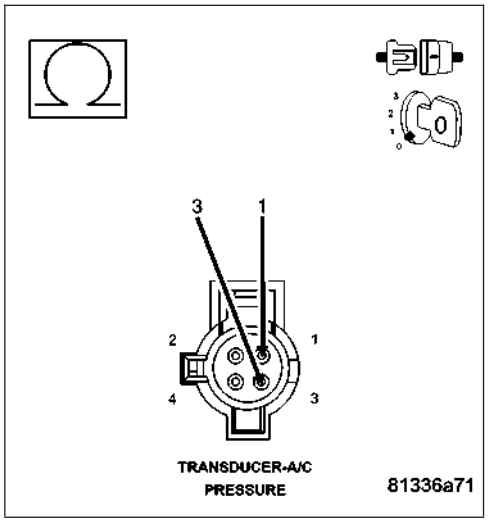
Yes >> Repair the short to ground in the (C18) A/C Pressure Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

5. (C18) A/C PRESSURE SIGNAL CIRCUIT SHORTED TO THE (G180) SENSOR RETURN CIRCUIT

Disconnect the C3 FCM harness connector.

Measure the resistance between the (C18) A/C Pressure Signal circuit and the (G180) Sensor Return circuit in the A/C Pressure Transducer harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short between the (G180) Sensor Return circuit and the (C18) A/C Pressure Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8

P0532-A/C PRESSURE SENSOR CIRCUIT LOW (CONTINUED)

6. (T103) 5-VOLT SUPPLY CIRCUIT OPEN

Turn the ignition off.

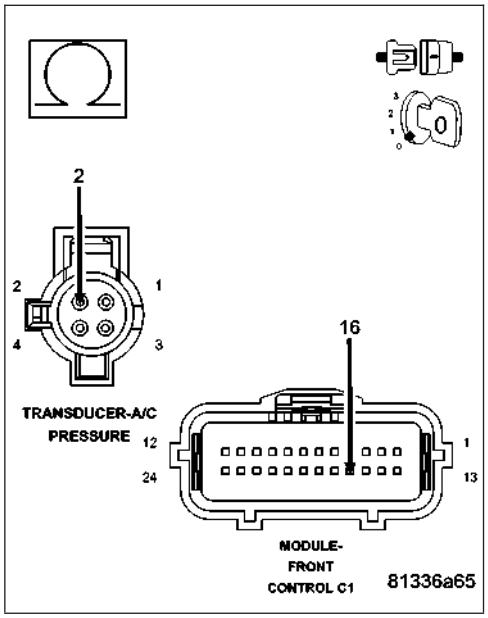
Disconnect the C1 FCM harness connector.

Measure the resistance of the (T103) 5-volt Supply circuit from the A/C Pressure Transducer harness connector to the C1 FCM harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 7

No >> Repair the open in the (T103) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



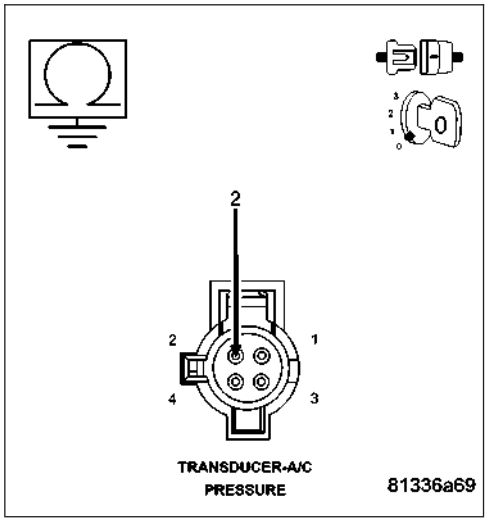
7. (T103) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (T103) 5-volt Supply circuit in the A/C Pressure Transducer harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (T103) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8



P0532-A/C PRESSURE SENSOR CIRCUIT LOW (CONTINUED)

8. FRONT CONTROL MODULE

NOTE: Before continuing, check the FCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

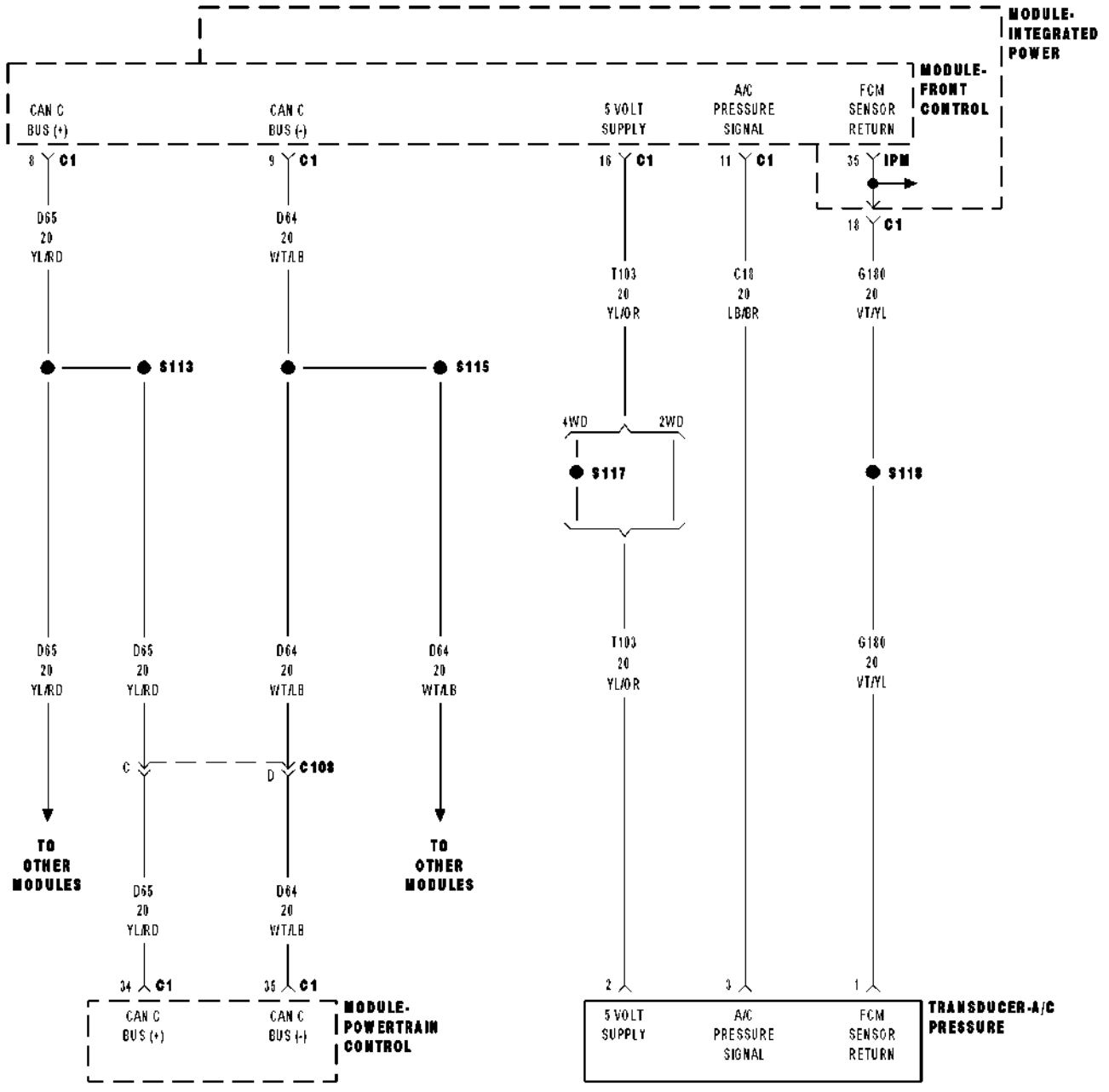
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

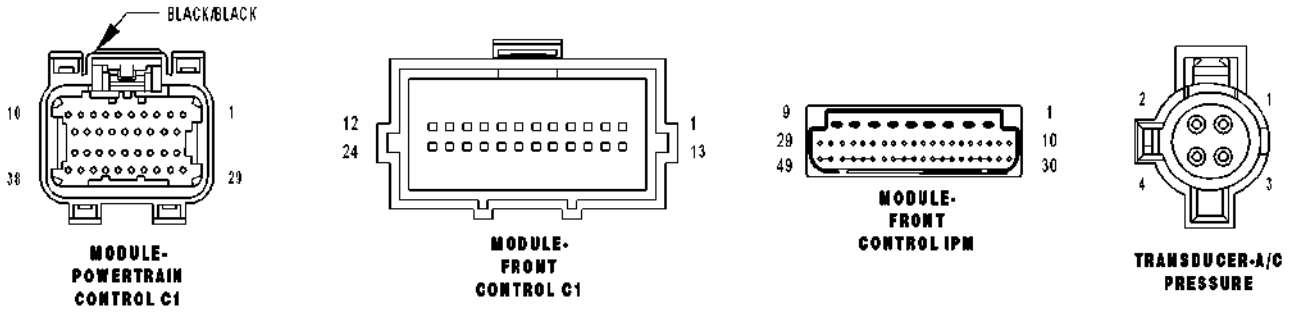
Were there any problems found?

Yes >> Repair as necessary.
Perform BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Replace and program the Front Control Module per Service Information.
Perform BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

P0533-A/C PRESSURE SENSOR CIRCUIT HIGH





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P0533-A/C PRESSURE SENSOR CIRCUIT HIGH (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Engine running and the AC Clutch Relay energized.
- **Set Condition:**
  The A/C pressure transducer signal at the PCM goes above 4.92 volts. One trip Fault. Three good trips to turn off the MIL.

Possible Causes
(C18) A/C PRESSURE SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(C18) A/C PRESSURE SIGNAL CIRCUIT OPEN
(C18) A/C PRESSURE SIGNAL CIRCUIT SHORTED TO THE (T103) 5-VOLT SUPPLY CIRCUIT
(G180) SENSOR RETURN CIRCUIT OPEN
A/C PRESSURE TRANSDUCER
FCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. A/C PRESSURE TRANSDUCER VOLTAGE ABOVE 4.9 VOLTS

NOTE: Make sure the A/C refrigerant System is properly charged per Service Information.

Start the engine.

With a scan tool, read the A/C Pressure Sensor voltage.

Is the voltage above 4.9 volts?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0533-A/C PRESSURE SENSOR CIRCUIT HIGH (CONTINUED)

2. A/C PRESSURE TRANSDUCER

Turn the ignition off.

Disconnect the A/C Pressure Transducer harness connector.

Connect a jumper wire between the (C18) A/C Pressure Signal circuit and the (G180) Sensor Return circuit in the Transducer harness connector.

Ignition on, engine not running.

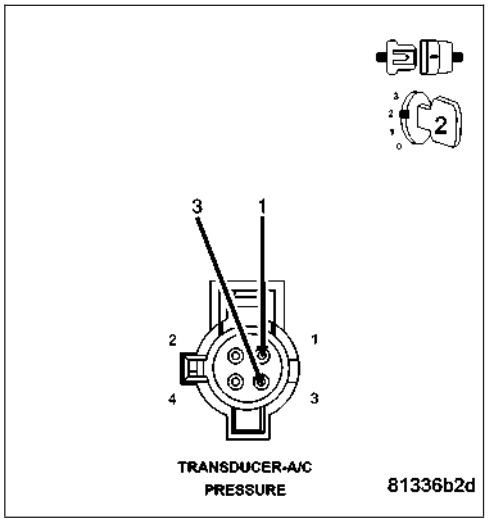
With the scan tool, monitor the A/C Pressure Transducer voltage.

Is the voltage below 1.0 volt with the jumper wire installed?

Yes >> Replace the A/C Pressure Transducer.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

NOTE: Remove the jumper wire before continuing.



3. (C18) A/C PRESSURE SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

Disconnect the C1 FCM harness connector.

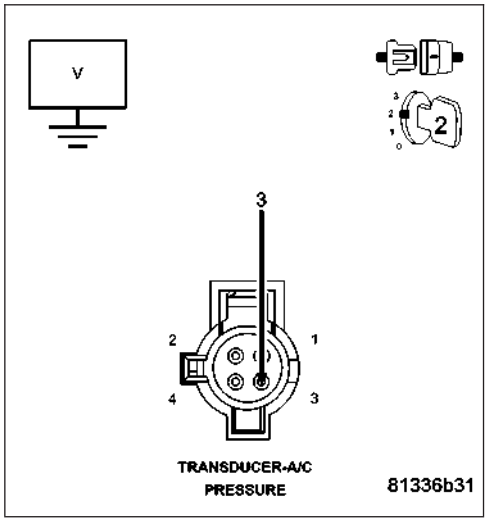
Ignition on, engine not running.

Measure the voltage on the (C18) A/C Pressure Signal circuit in the A/C Pressure Transducer harness connector.

Is the voltage above 0 volts?

Yes >> Repair the short to battery voltage in the (C18) A/C Pressure Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4



P0533-A/C PRESSURE SENSOR CIRCUIT HIGH (CONTINUED)

4. (C18) A/C PRESSURE SIGNAL CIRCUIT OPEN

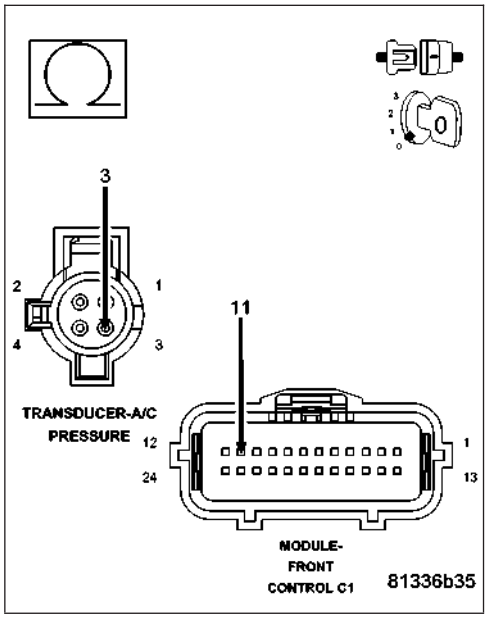
Turn the ignition off.

Measure the resistance of the (C18) A/C Pressure Signal circuit from the A/C Pressure Transducer harness connector to the C1 FCM harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 5

No >> Repair the open in the (C18) A/C Pressure Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



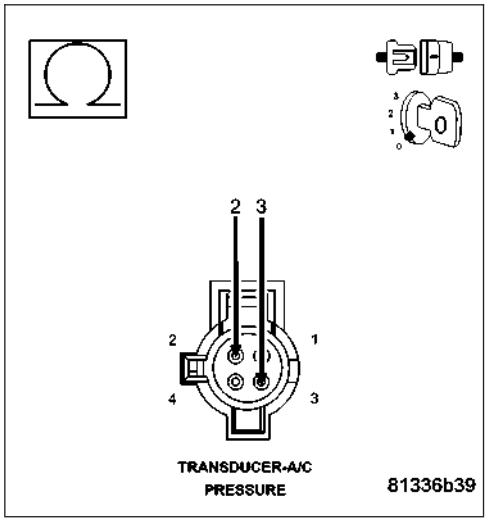
5. (C18) A/C PRESSURE SIGNAL CIRCUIT SHORTED TO THE (T103) 5-VOLT SUPPLY CIRCUIT

Measure the resistance between the (C18) A/C Pressure Signal circuit and the (T103) 5-volt Supply circuit in the A/C Pressure Transducer harness connector.

Is the resistance below 5.0 ohms?

Yes >> Repair the short between the (T103) 5-volt Supply circuit and the (C18) A/C Pressure Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6

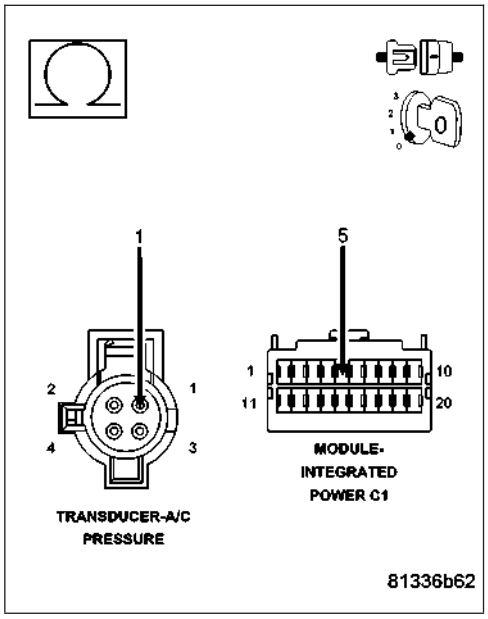


P0533-A/C PRESSURE SENSOR CIRCUIT HIGH (CONTINUED)

6. (G180) SENSOR RETURN CIRCUIT OPEN

Disconnect the C3 FCM harness connector.

Measure the resistance of the (G180) Sensor Return circuit from the A/C Pressure Sensor harness connector to the C3 FCM harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go To 7

No >> Repair the open in the (G180) Sensor Return circuit
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

7. FRONT CONTROL MODULE

NOTE: Before continuing, check the FCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

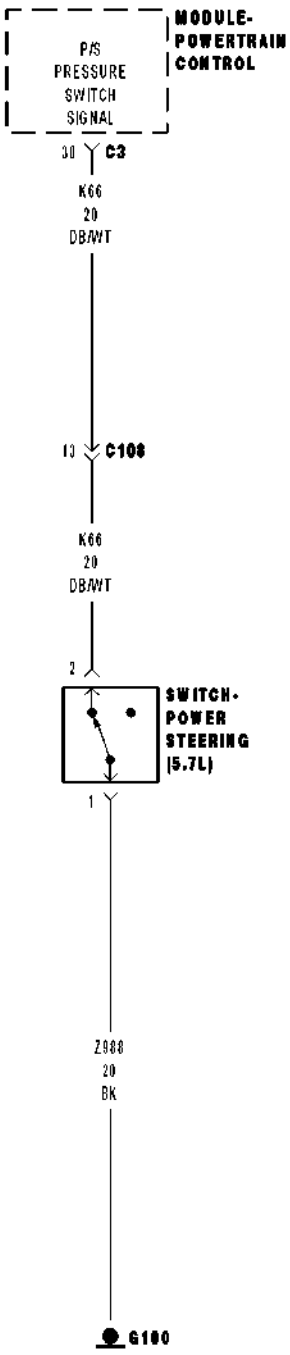
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

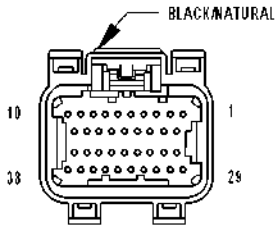
Were there any problems found?

Yes >> Repair as necessary.
Perform BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

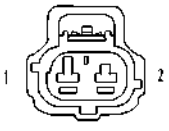
No >> Replace and program the Front Control Module per Service Information.
Perform BODY VERIFICATION TEST - VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

P0551-POWER STEERING PRESSURE SWITCH PERFORMANCE





MODULE-
POWERTRAIN
CONTROL C3



SWITCH-
POWER
STEERING
PRESSURE
(5.7L)

81497ba4

P0551-POWER STEERING PRESSURE SWITCH PERFORMANCE (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The power steering switch is used to enable quick spark and fuel corrections for high power steering loads to maintain target idle speed. The power steering switch rationality monitors the switch input during high vehicle speed conditions when the steering wheel cannot be turned far enough to reach the high-pressure switch point. If the power steering switch input remains at a high-pressure condition at high vehicle speeds, a failure timer will increment.

- **When Monitored:**
  With the ignition key on and engine running.
- **Set Condition:**
  With the vehicle above 40 mph for over 30 seconds, the power steering pressure switch remains open. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K66) P/S SWITCH SIGNAL CIRCUIT OPEN
(K66) P/S SWITCH SIGNAL CIRCUIT SHORTED TO GROUND
(Z988) GROUND CIRCUIT OPEN
POWER STEERING PRESSURE SWITCH
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.
With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0551-POWER STEERING PRESSURE SWITCH PERFORMANCE (CONTINUED)

2. POWER STEERING PRESSURE SWITCH

Turn the ignition off.

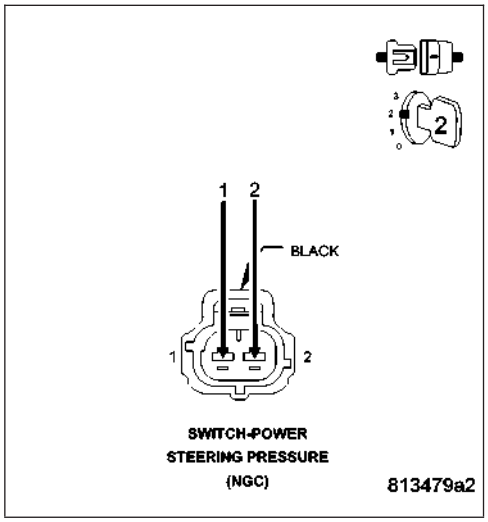
Disconnect the Power Steering Pressure Switch harness connector.

Ignition on, engine not running.

Connect a jumper wire to the (K66) P/S Switch Signal circuit at the harness connector.

Use the scan tool to monitor the Power Steering Pressure Switch status.

Touch the other end of the jumper wire to the (Z988) Ground circuit at the Power Steering Pressure Switch harness connector several times.



Did the Power Steering Pressure Switch status change from High to Low when connecting and disconnecting the jumper wire?

Yes >> Replace the Power Steering Pressure Switch.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

NOTE: Remove the jumper wire before continuing.

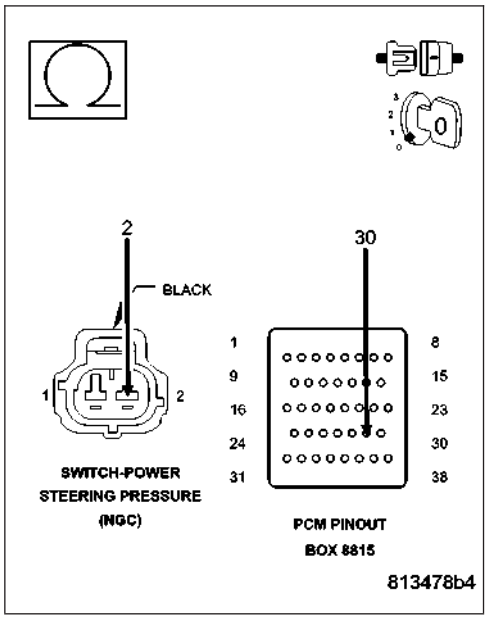
3. (K66) P/S SWITCH SIGNAL CIRCUIT OPEN

Turn the ignition off.

Disconnect the C3 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure resistance of (K66) P/S Switch Signal circuit from the Power Steering Pressure Switch harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

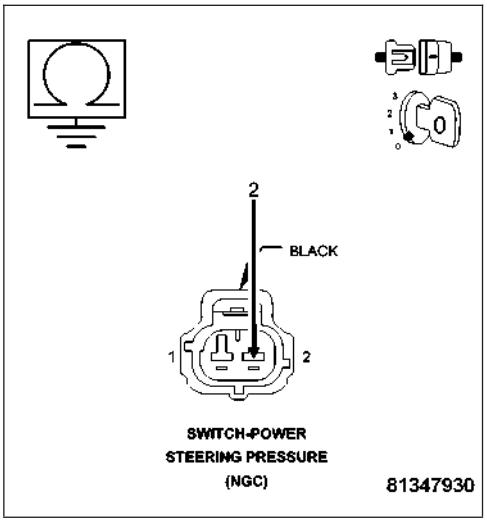
Yes >> Go To 4

No >> Repair the open in the (K66) P/S Switch Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0551-POWER STEERING PRESSURE SWITCH PERFORMANCE (CONTINUED)

4. (K66) P/S SWITCH SIGNAL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K66) P/S Switch Signal circuit in the Switch connector.



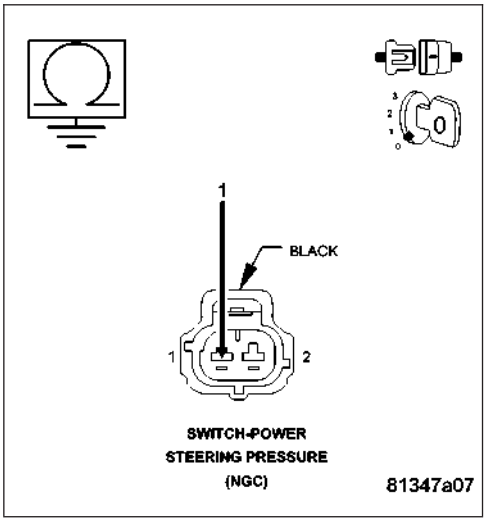
Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K66) P/S Switch Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

5. (Z988) GROUND CIRCUIT OPEN

Measure the resistance between Ground and the (Z988) Ground circuit in the Power Steering Pressure Switch connector.



Is the resistance below 100 ohms?

Yes >> Go To 6

No >> Repair the open in the (Z988) Ground circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

6. PCM

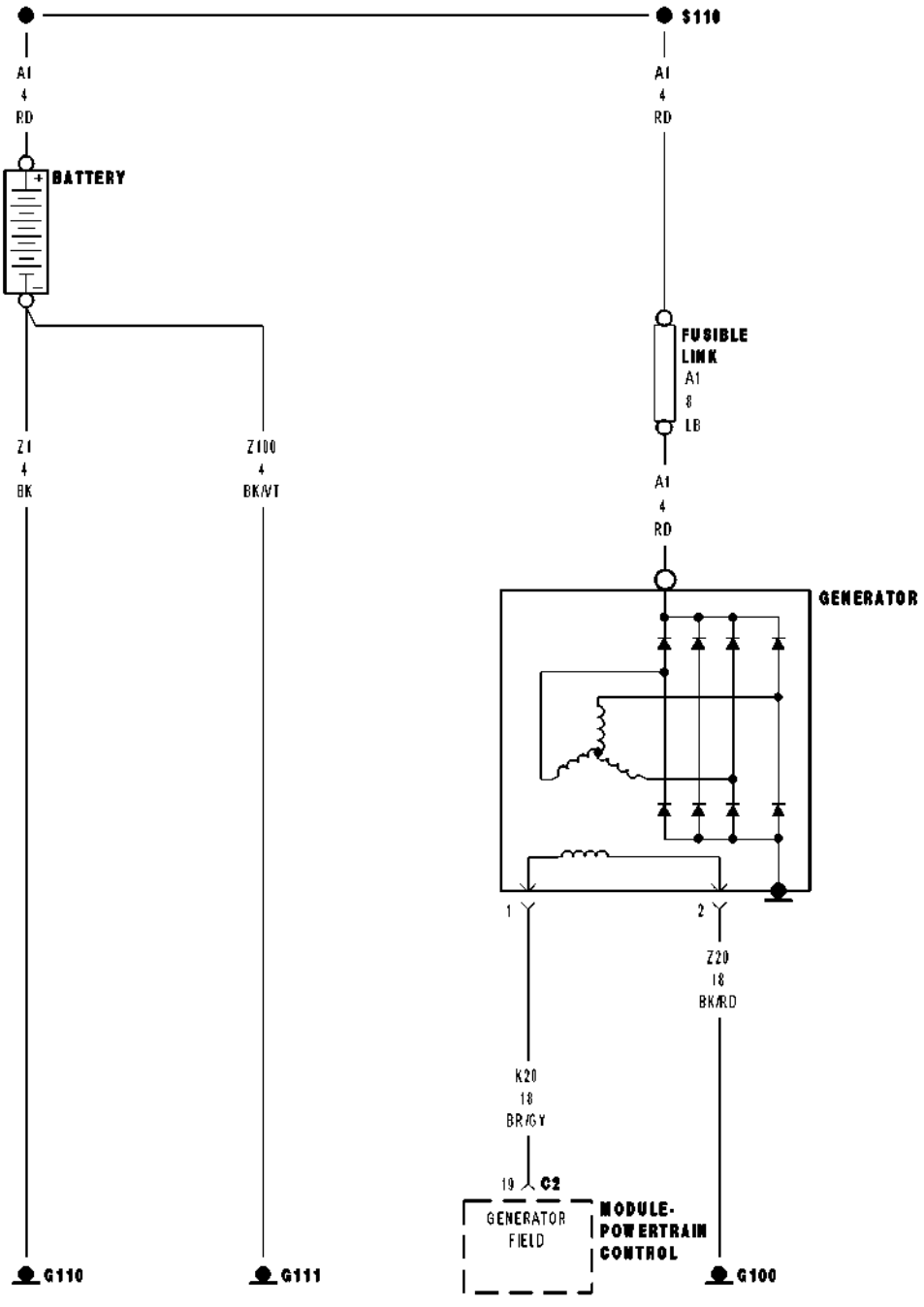
NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

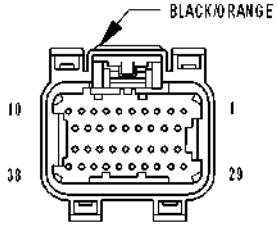
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

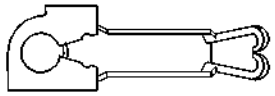
P0562-BATTERY VOLTAGE LOW



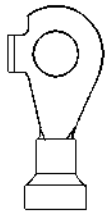


MODULE-
POWERTRAIN
CONTROL C2

GENERATOR



BATTERY
(+)



GENERATOR

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P0562-BATTERY VOLTAGE LOW (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  The engine running. The engine speed greater than 1000 RPM.
- **Set Condition:**
  Battery voltage is 1 volt less than desired voltage for a set period of time. One Trip Fault. ETC light is flashing.

Possible Causes
RESISTANCE IN THE (A1) BATTERY POSITIVE CIRCUIT
RESISTANCE IN THE GENERATOR CASE GROUND
GENERATOR OPERATION
(K20) GENERATOR FIELD CONTROL CIRCUIT OPEN
(K20) GENERATOR FIELD CONTROL CIRCUIT SHORTED TO GROUND
(Z20) GROUND CIRCUIT OPEN
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: Make sure the Battery is in good condition. Using the Midtronics Battery Tester, test the Battery before continuing.

NOTE: Inspect the vehicle for after market accessories that may exceed the Generator System output.
Turn the ignition off.

NOTE: Make sure the generator drive belt is in good operating condition.

NOTE: Inspect the fuses in the IPM. If an open fuse is found, use the wire diagram/schematic as a guide, inspect the wiring and connectors for damage.
Ignition on, engine not running.

With the scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0562-BATTERY VOLTAGE LOW (CONTINUED)

2. (A1) B+ CIRCUIT HIGH RESISTANCE

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

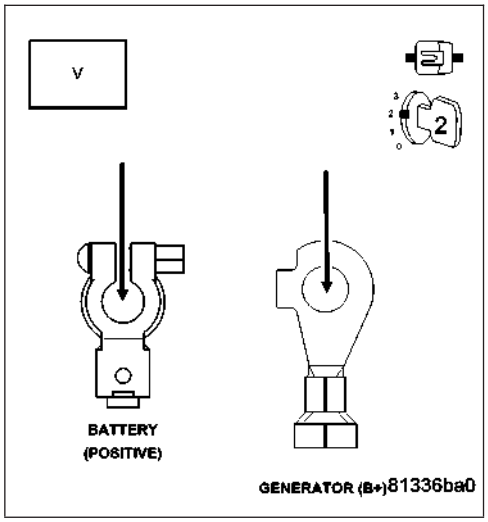
NOTE: Make sure all wires are clear of the engine's moving parts.
Measure the voltage between the (A1) B+ Terminal at the Generator and the Battery + Post.

Start the engine.

Is the voltage above 0.4 of a volt?

Yes >> Repair the excessive resistance in the (A1) B+ circuit between the Generator and Battery.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3



3. GENERATOR CASE GROUND HIGH RESISTANCE

Ignition on, engine not running.

Start the engine.

Allow the engine to reach normal operating temperature.

NOTE: Make sure all wires are clear of the engine's moving parts.
Measure the voltage between the Generator case and Battery ground post.

Is the voltage above 0.1 of a volt?

Yes >> Repair excessive resistance in the Generator Ground between the Generator Case and Battery ground side.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

4. GENERATOR OPERATION

Turn the ignition off.

Disconnect the Generator Field harness connector.

Using a 12-volt test light, jump it across the Generator Field harness connector.

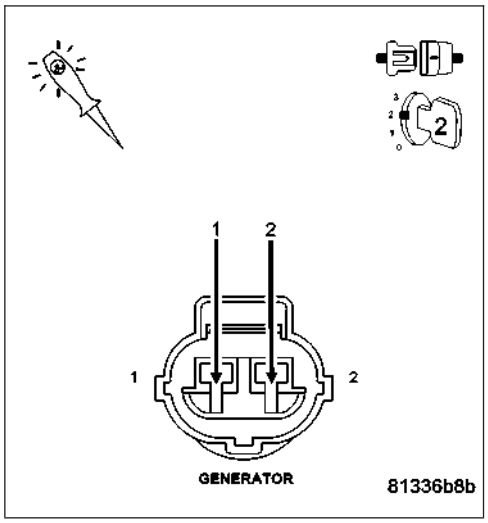
Ignition on, engine not running.

With the scan tool, actuate the Gen Field Control circuit.

Does the test light illuminate brightly and flash on and off?

Yes >> Replace the Generator.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5



P0562-BATTERY VOLTAGE LOW (CONTINUED)

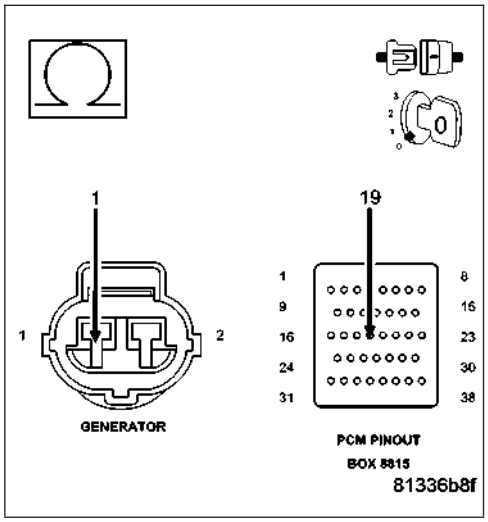
5. (K20) GENERATOR FIELD CONTROL CIRCUIT OPEN

Turn the ignition off.

Disconnect the C2 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K20) Gen Field Control circuit from the Generator harness connector to the appropriate terminal of the special tool #8815.



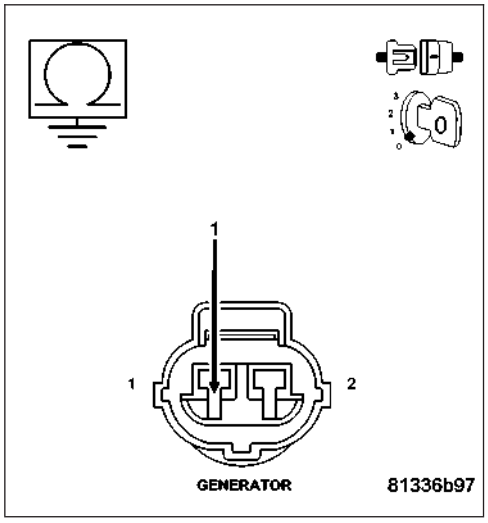
Is the resistance below 5.0 ohms?

Yes >> Go To 6

No >> Repair the open in the (K20) Gen Field Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

6. (K20) GENERATOR FIELD CONTROL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K20) Gen Field Control circuit in the Generator Field harness connector.



Is the resistance below 100 ohms?

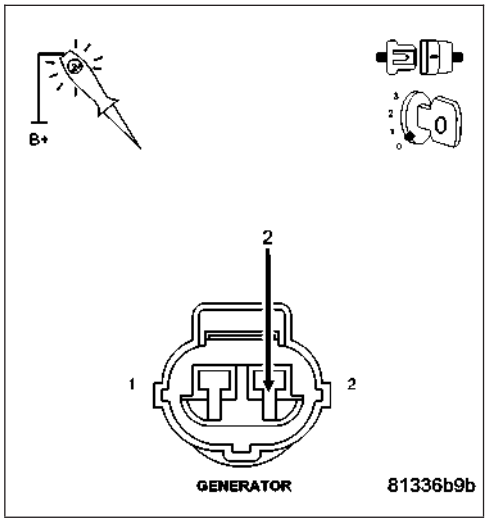
Yes >> Repair the short to ground in the (K20) Gen Field Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 7

P0562-BATTERY VOLTAGE LOW (CONTINUED)

7. (Z20) GROUND CIRCUIT OPEN

Using a 12-volt test light connected to 12-volts, probe the (Z20) Ground circuit in the Generator Field harness connector.



Does the test light illuminate brightly?

Yes >> Go To 8

No >> Repair the open in the (Z20) Ground circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

8. PCM

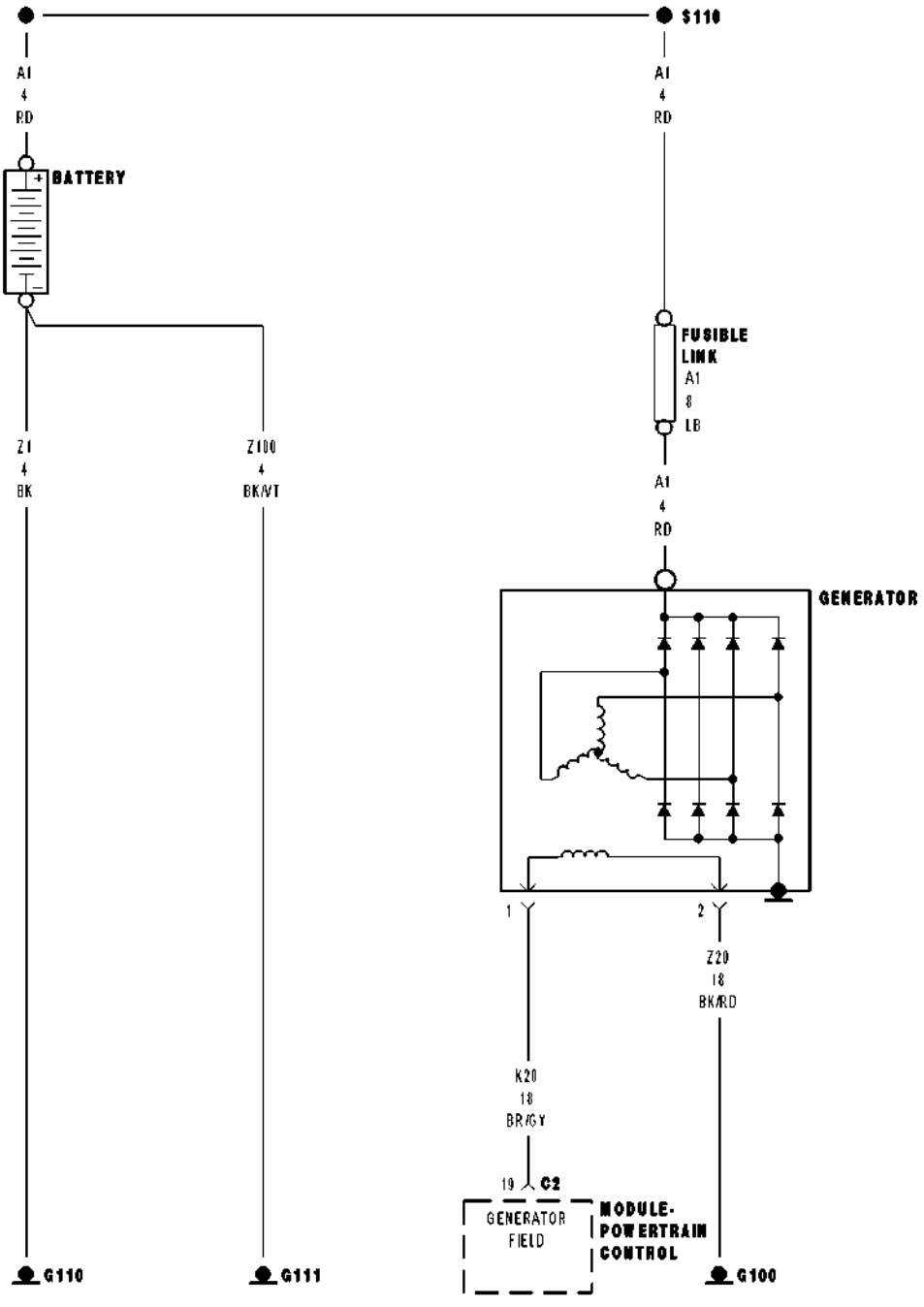
NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

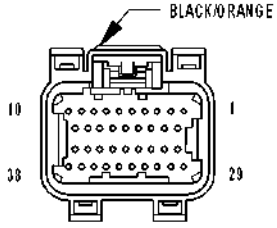
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

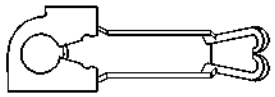
P0563-BATTERY VOLTAGE HIGH



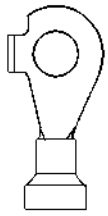


MODULE-
POWERTRAIN
CONTROL C2

GENERATOR



BATTERY
(+)



GENERATOR

81497b2b

P0563-BATTERY VOLTAGE HIGH (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. Engine RPM greater than 1000 RPM. With no other charging system codes set.
- **Set Condition:**
  Battery voltage is 1 volt greater than desired voltage for more than 10 seconds. Battery voltage greater than 15.75 volts. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K20) GENERATOR FIELD CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE
GENERATOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: Make sure the Battery is in good condition. Using the Midtronics Battery Tester, test the Battery before continuing.

NOTE: Inspect the vehicle for after market accessories that may exceed the Generator System output.
Turn the ignition off.

NOTE: Make sure the generator drive belt is in good operating condition.

NOTE: Inspect the fuses in the IPM. If a fuse is open use the wire diagram/schematic as a guide, inspect the wiring and connectors for damage.
Ignition on, engine not running.
With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0563-BATTERY VOLTAGE HIGH (CONTINUED)

2. GENERATOR OPERATION

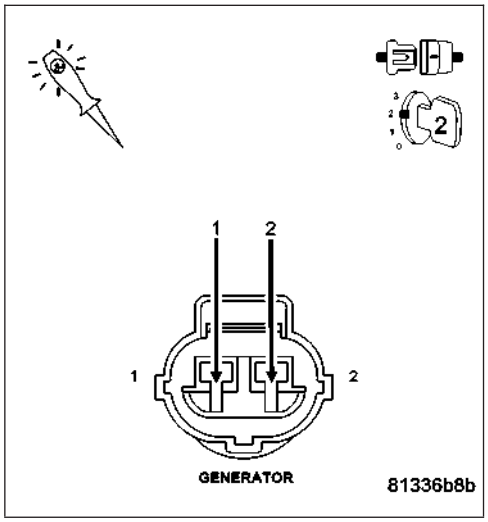
Turn the ignition off.

Disconnect the Generator Field harness connector.

Using a 12-volt test light, jump across the Generator Field harness connector.

Ignition on, engine not running.

With the scan tool, actuate the Generator Field Driver.



Does the test light illuminate brightly and flash on and off?

Yes >> Replace the Generator.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

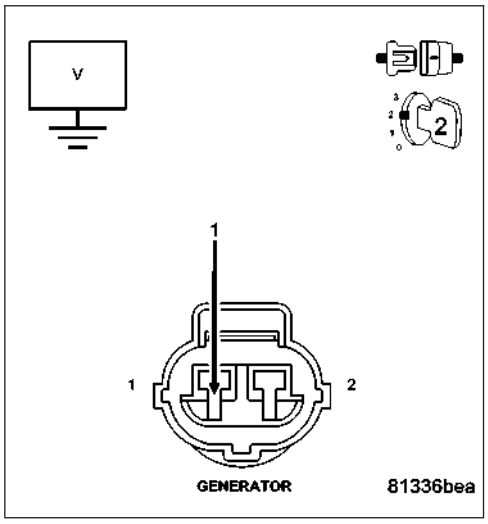
3. (K20) FIELD CIRCUIT SHORTED BATTERY VOLTAGE

Turn the ignition off.

Disconnect the C2 PCM harness connector.

Ignition on, engine not running.

Measure the voltage on the (K20) Gen Field Control circuit at the Generator Field harness connector.



Is the voltage above 1.0 volt?

Yes >> Repair the short to battery voltage in the (K20) Gen Field Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

4. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

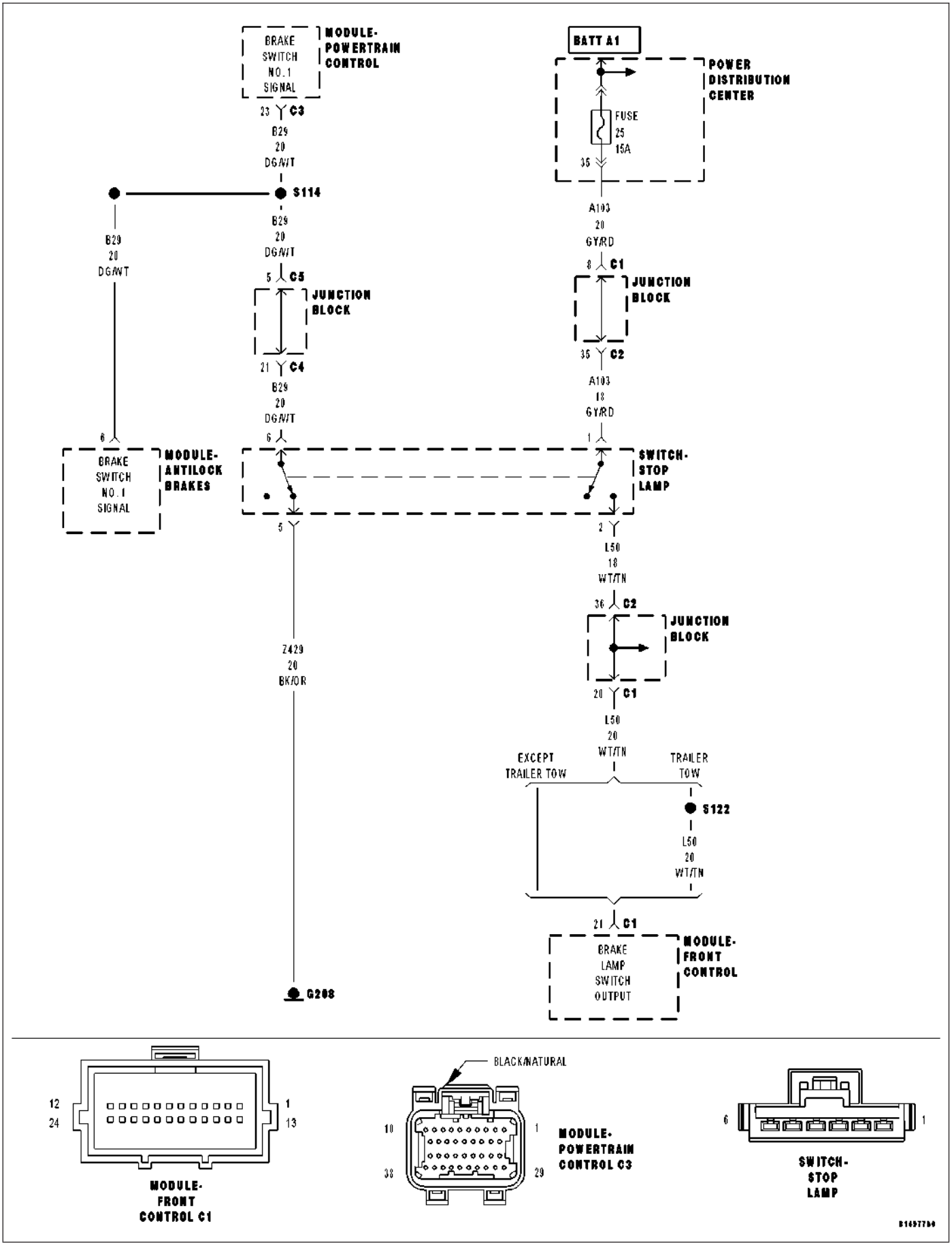
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0571-BRAKE SWITCH 1 PERFORMANCE



P0571-BRAKE SWITCH 1 PERFORMANCE (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The brake switch rationality checks both failure modes of the brake switch. The brake switch stuck on test checks for a high vehicle speed condition where the brake switch is unexpectedly depressed. The brake switch stuck off test checks for repeated vehicle stop maneuvers without the brake switch depressed.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  If the output of Brake Switch No.1 to the PCM looks like it is not applied, while Brake Lamp Switch Output circuit is applied the fault will mature in 60ms. Two Trip Fault.

Possible Causes
(B29) BRAKE SWITCH NO.1 SIGNAL SHORTED TO GROUND
(L50) BRAKE LAMP SWITCH OUTPUT CIRCUIT OPEN
(L50) BRAKE LAMP SWITCH OUTPUT CIRCUIT SHORTED TO GROUND
(Z429) GROUND CIRCUIT OPEN
STOP LAMP SWITCH
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: Make sure the Stop Lamp Switch is properly adjusted before continuing.

NOTE: Make sure the Stop Lamp Switch is properly wired, such as (B29) Brake Switch No.1 and (L50) Brake Lamp Switch Output circuit are not switched at the harness connector.

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0571-BRAKE SWITCH 1 PERFORMANCE (CONTINUED)

2. (B29) BRAKE SWITCH NO.1 SIGNAL SHORTED TO GROUND

Turn the ignition off.

Disconnect the Stop Lamp Switch harness connector.

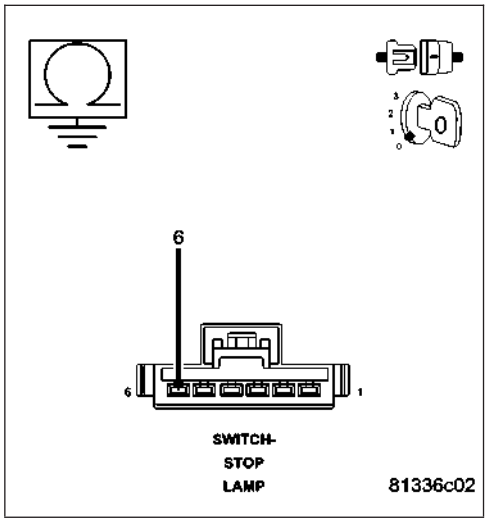
Disconnect the C3 PCM harness connector.

Measure the resistance between ground and the (B29) Brake Switch No.1 Signal circuit in the Stop Lamp Switch harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (B29) Brake Switch No.1 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3



3. (L50) BRAKE LAMP SWITCH OUTPUT CIRCUIT OPEN

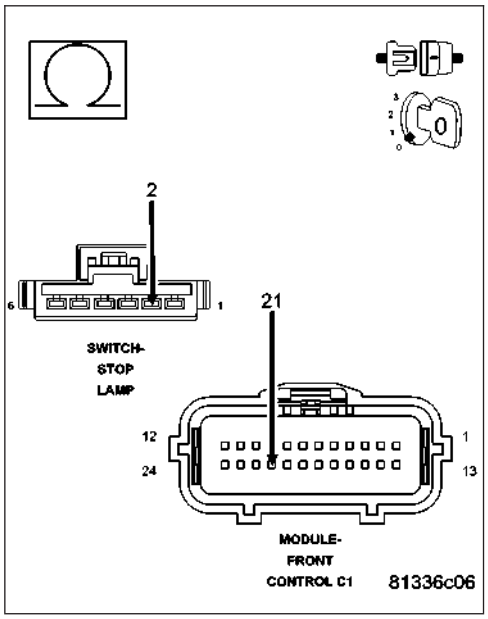
Disconnect the C1 FCM harness connector.

Measure the resistance of the (L50) Brake Lamp Switch Output circuit from the Stop Lamp Switch harness connector to the C1 FCM harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 4

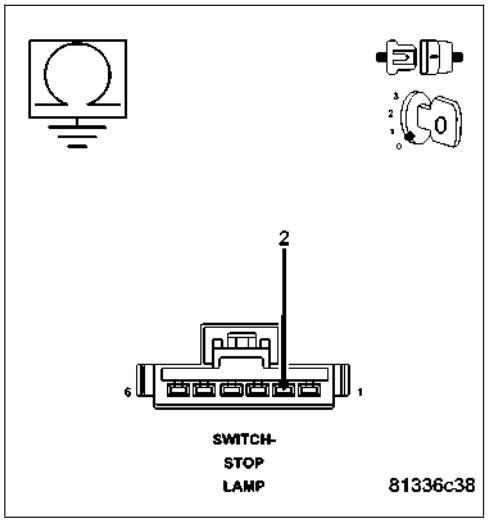
No >> Repair the open in the (L50) Brake Lamp Switch Output circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P0571-BRAKE SWITCH 1 PERFORMANCE (CONTINUED)

4. (L50) BRAKE LAMP SWITCH OUTPUT CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (L50) Brake Lamp Switch Output circuit in the Stop Lamp Switch harness connector.



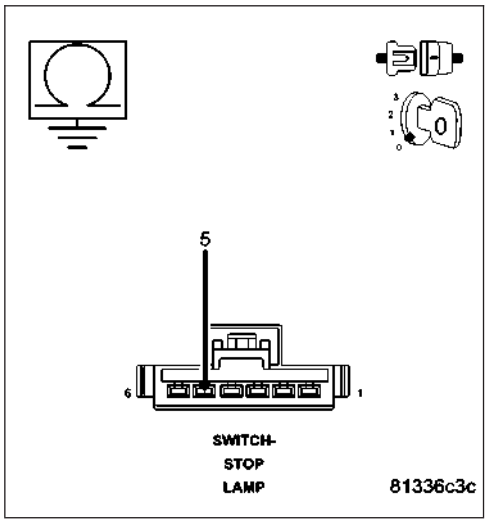
Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (L50) Brake Lamp Switch Output circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

5. (Z429) GROUND CIRCUIT OPEN

Measure the resistance between ground and the (Z429) Ground circuit in the Stop Lamp Switch harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go To 6

No >> Repair the open in the (Z429) Ground circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

6. STOP LAMP SWITCH

Measure the resistance between the (Z429) Ground circuit terminal and the (B29) Brake Switch No.1 Signal terminal in the Stop Lamp Switch.

Next, measure the resistance between the (A103) Fused B+ circuit terminal and the (L50) Brake Lamp Switch Output terminal in the Stop Lamp Switch.

Apply and release the Stop Lamp Switch while monitoring the ohmmeter.

Does the resistance change from below 5.0 ohms to an open circuit for one or both of the measurements taken?

Yes >> Go To 7

No >> Replace the Stop Lamp Switch.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0571-BRAKE SWITCH 1 PERFORMANCE (CONTINUED)

7. **PCM**

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

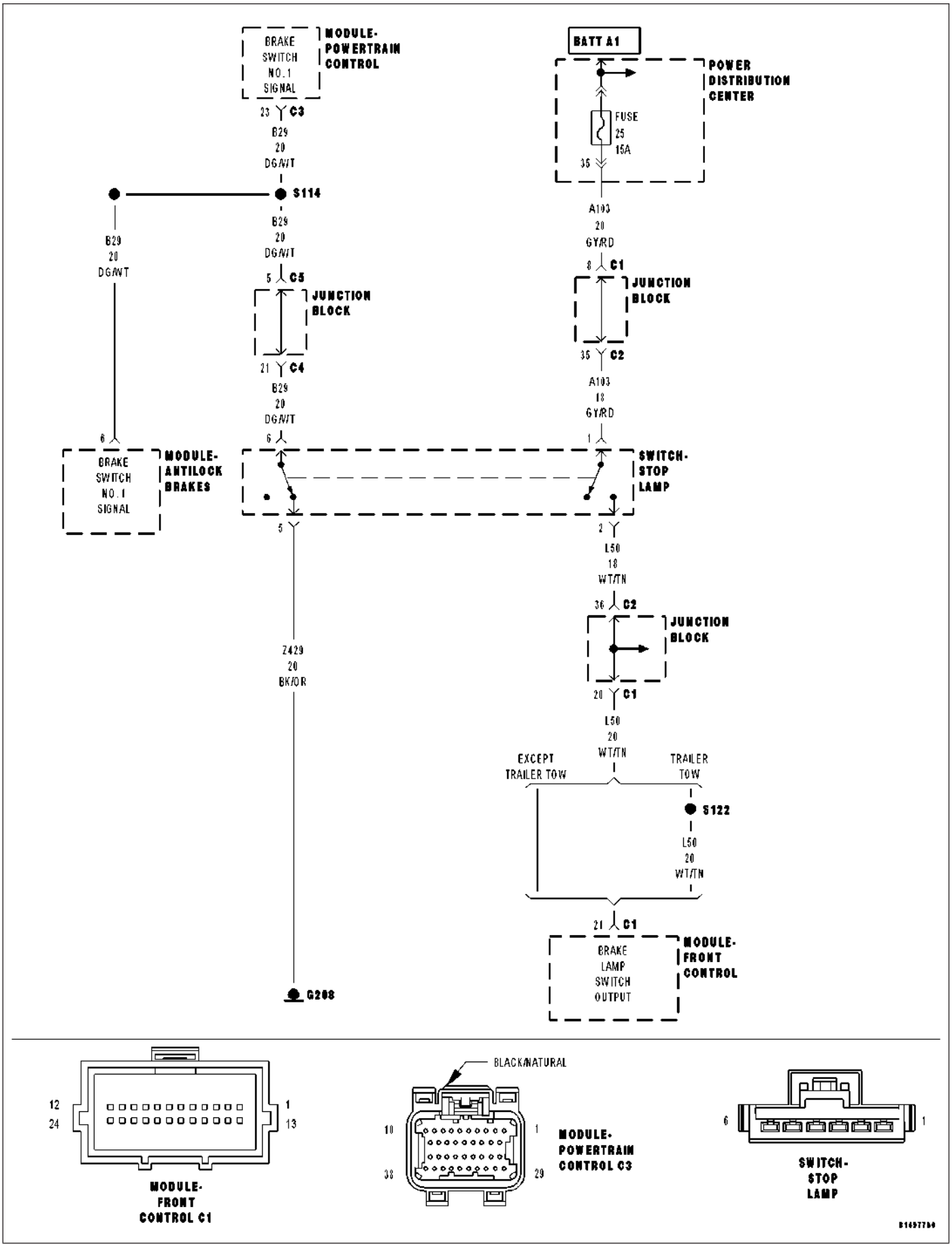
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0572-BRAKE SWITCH 1 STUCK ON



P0572-BRAKE SWITCH 1 STUCK ON (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  When the PCM recognizes Brake Switch No.1 is mechanically stuck in the low/on position. Two Trip Fault. Three Global Good Trips to Clear.

Possible Causes
(B29) BRAKE SWITCH NO.1 SIGNAL CIRCUIT SHORTED TO GROUND
(L50) BRAKE LAMP SWITCH OUTPUT CIRCUIT OPEN
STOP LAMP SWITCH
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: Verify battery voltage is greater than 10 volts.
With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. STOP LAMP SWITCH

Turn the ignition off.

Remove the Stop Lamp Switch and disconnect the harness connector.

Measure the resistance between the (Z429) Ground circuit terminal and the (B29) Brake Switch No.1 Signal terminal in the Stop Lamp Switch.

Measure the resistance between the (A103) Fused B+ circuit terminal and the (L50) Brake Lamp Switch Output terminal in the Stop Lamp Switch.

Apply and release the Stop Lamp Switch while monitoring the ohmmeter.

Does the resistance change from below 5.0 ohms to an open circuit?

Yes >> Go To 3

No >> Replace the Stop Lamp Switch.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

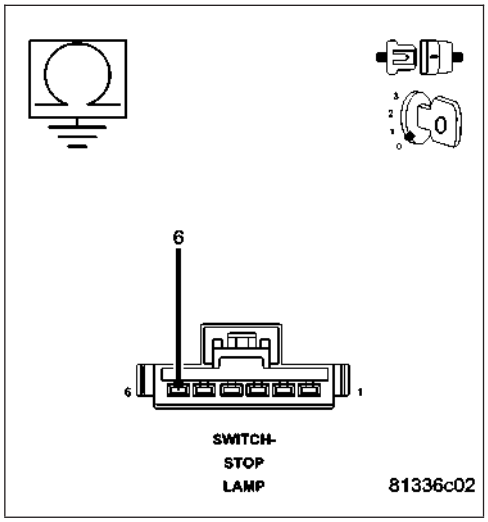
P0572-BRAKE SWITCH 1 STUCK ON (CONTINUED)

3. (B29) BRAKE SWITCH NO.1 SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the C3 PCM harness connector.

Measure the resistance between ground and the (B29) Brake Switch No.1 Signal circuit in the Stop Lamp Switch harness connector.



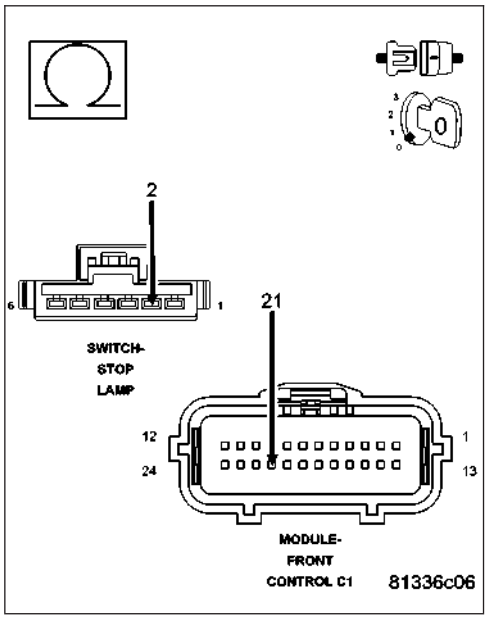
Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (B29) Brake Switch No.1 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

4. (L50) BRAKE LAMP SWITCH OUTPUT CIRCUIT OPEN

Measure the resistance of the (L50) Brake Lamp Switch Output circuit from the Stop Lamp Switch harness connector to the C1 FCM harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go To 5

No >> Repair the open in the (L50) Brake Lamp Switch Output circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0572-BRAKE SWITCH 1 STUCK ON (CONTINUED)

5. **PCM**

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

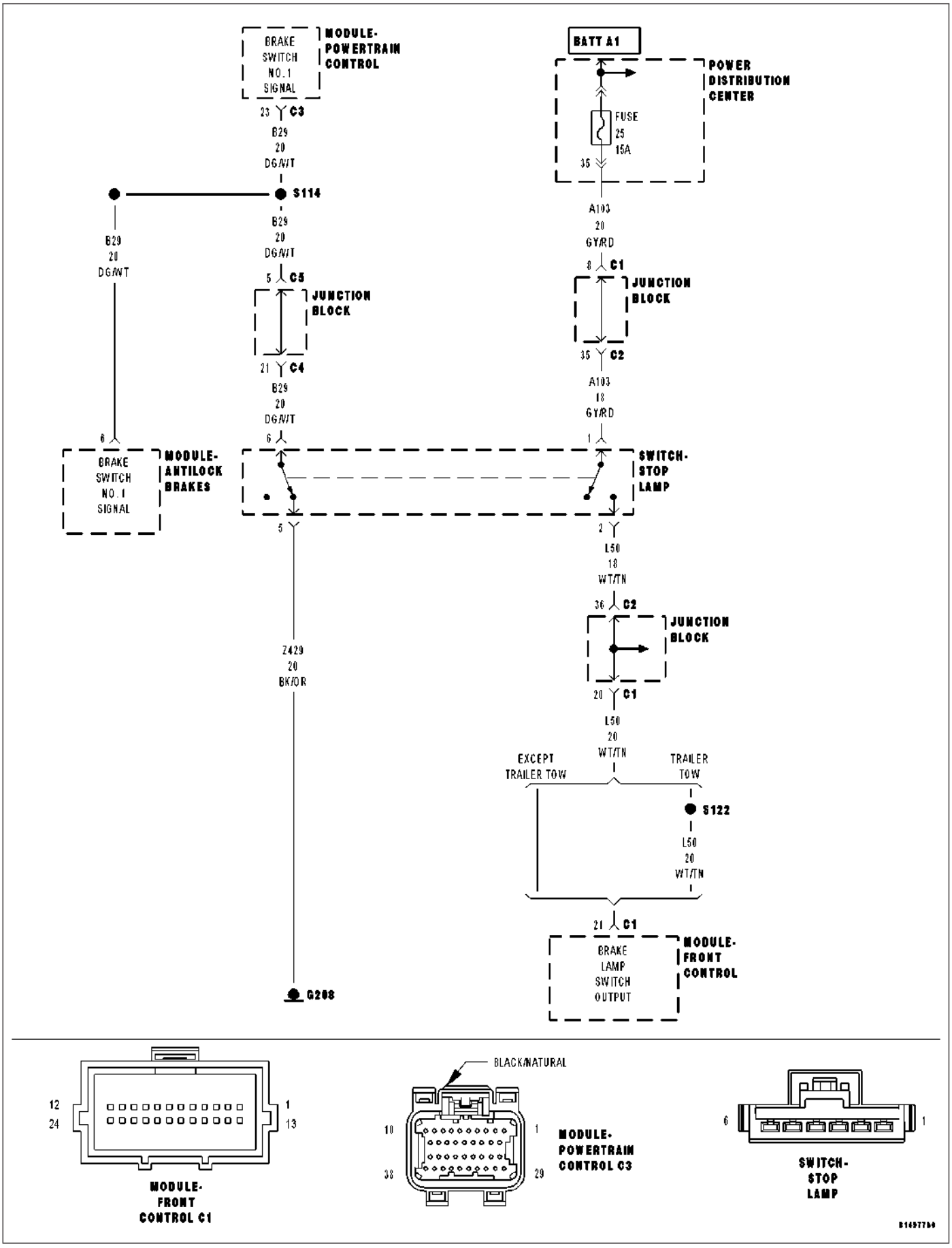
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0573-BRAKE SWITCH 1 STUCK OFF



P0573-BRAKE SWITCH 1 STUCK OFF (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  When the PCM recognizes Brake Switch No.1 is stuck in the high/off position. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(B29) BRAKE SWITCH NO.1 SIGNAL CIRCUIT OPEN
(L50) BRAKE LAMP SWITCH OUTPUT CIRCUIT SHORTED TO GROUND
(Z429) GROUND CIRCUIT OPEN
STOP LAMP SWITCH
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. STOP LAMP SWITCH

Turn the ignition off.

Disconnect the Stop Lamp Switch harness connector.

Measure the resistance between the (Z429) Ground circuit terminal and the (B29) Brake Switch No.1 Signal circuit terminal in the Stop Lamp Switch.

Apply and release the Brake Lamp Switch while monitoring the ohmmeter.

Does the resistance change from below 5.0 ohms to an open circuit?

Yes >> Go To 3

No >> Replace the Stop Lamp Switch.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0573-BRAKE SWITCH 1 STUCK OFF (CONTINUED)

3. (B29) BRAKE SWITCH NO.1 SIGNAL CIRCUIT OPEN

Turn the ignition off.

Disconnect the C3 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

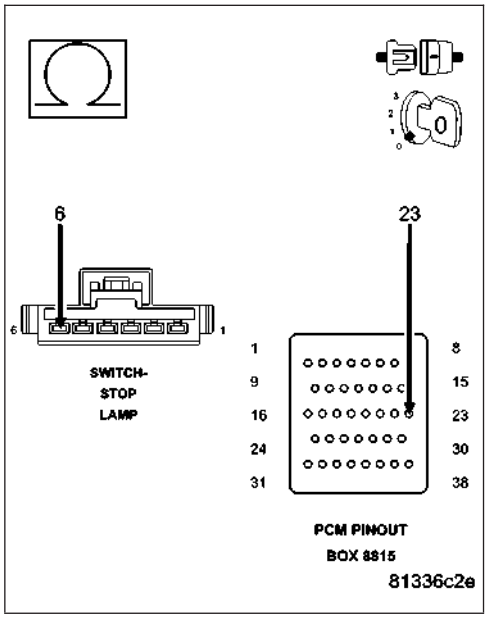
Measure the resistance of the (B29) Brake Switch No.1 Signal circuit from the Stop Lamp Switch harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 4

No >> Repair the open in the (B29) Brake Switch No.1 Signal circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



4. (L50) BRAKE LAMP SWITCH OUTPUT CIRCUIT SHORTED TO GROUND

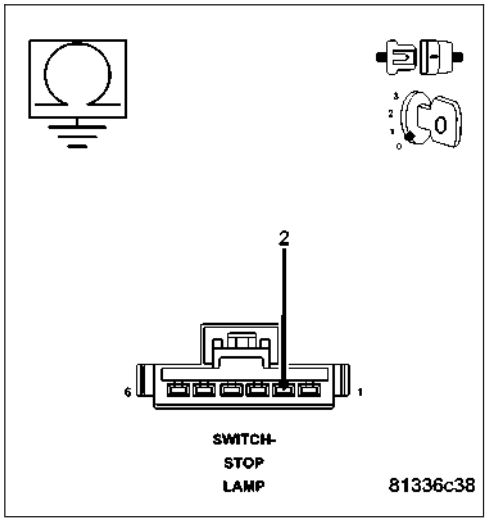
Measure the resistance between ground and the (L50) Brake Lamp Switch Output circuit in the Stop Lamp Switch harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (L50) Brake Lamp Switch Output circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

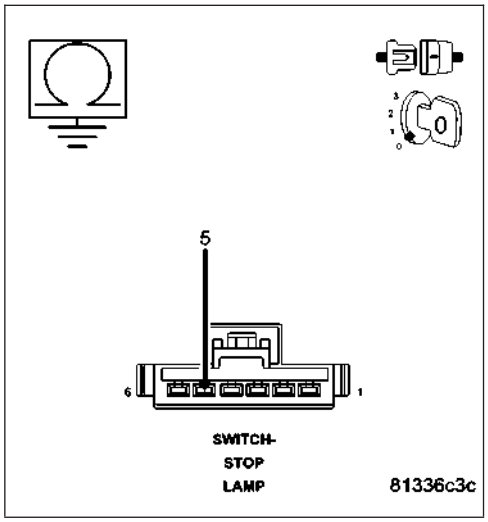
No >> Go To 5



P0573-BRAKE SWITCH 1 STUCK OFF (CONTINUED)

5. (Z429) GROUND CIRCUIT OPEN

Measure the resistance between the (Z429) Ground circuit and ground in the Stop Lamp Switch harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go To 6

No >> Repair the open in the (Z429) Ground circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

6. PCM

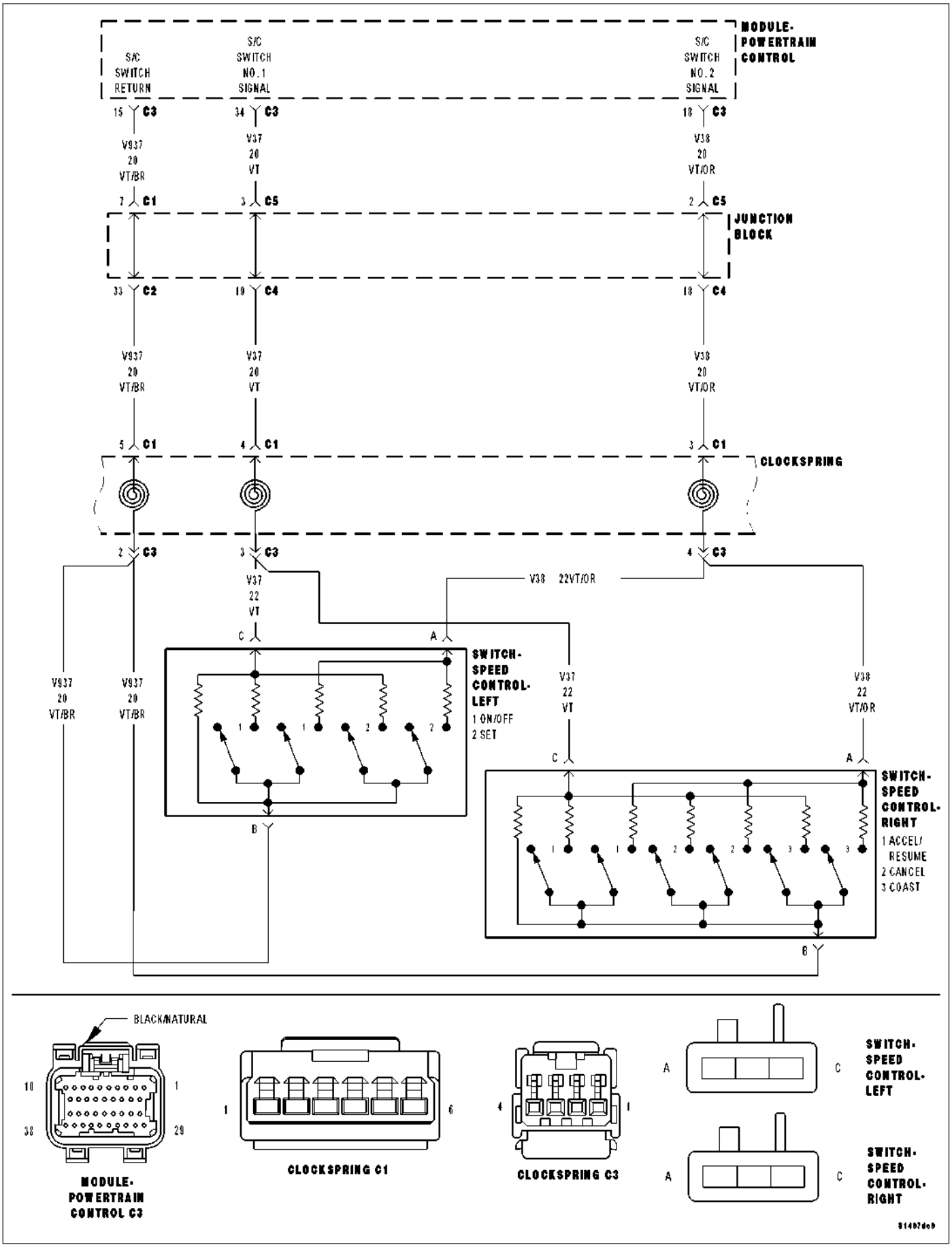
NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0579-SPEED CONTROL SWITCH 1 PERFORMANCE (5.7L)



P0579-SPEED CONTROL SWITCH 1 PERFORMANCE (5.7L) (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition key on.
- **Set Condition:**
  Cruise switch voltage output is not out of range but it does not equal any of the values for any of the button positions.

Possible Causes
(V37) S/C SWITCH NO.1 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(V37) S/C SWITCH NO.1 SIGNAL CIRCUIT OPEN
(V937) SWITCH RETURN CIRCUIT OPEN
(V37) S/C SWITCH NO.1 SIGNAL CIRCUIT SHORTED TO GROUND
(V37) S/C SWITCH NO.1 SIGNAL CIRCUIT SHORTED TO THE (V937) SWITCH RETURN CIRCUIT
CLOCKSPRING
SPEED CONTROL SWITCH
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. SPEED CONTROL SWITCH STATUS

Start the engine.
With a scan tool, monitor each which function for the Speed Control Switches.
Notice the voltage reading when no buttons are pressed.
Press and release each Speed Control Button.
- Resume/Accel
- Cancel
- Decel (Coast)
- On/Off
- Set

Does each switch function change status when pressing and then depressing each switch?

Yes >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 2

P0579-SPEED CONTROL SWITCH 1 PERFORMANCE (5.7L) (CONTINUED)

2. SPEED CONTROL SWITCH

Turn the ignition off.

Remove and disconnect the Speed Control Switches from the steering wheel per Service Information.

Measure the resistance across each Speed Control Switch.

Monitor the ohmmeter while pressing each function button on each switch.

The following resistance specs are taken between terminals (V37) S/C Switch No.1 Signal and (V937) S/C Switch Return circuits of the Switch when holding the switch button in the following position

Not pressing any switch - 20.5 kohms

On/Off - 0.47 kohms

Set - 5.49 kohms

Coast - 2.94 kohms

Cancel - 1.24 kohms

Resume/Accel - 15.4 kohms

Does the function on the Speed Control Switches have the correct resistance value?

Yes >> Go To 3

No >> Replace the Speed Control Switch that had the incorrect resistance value.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

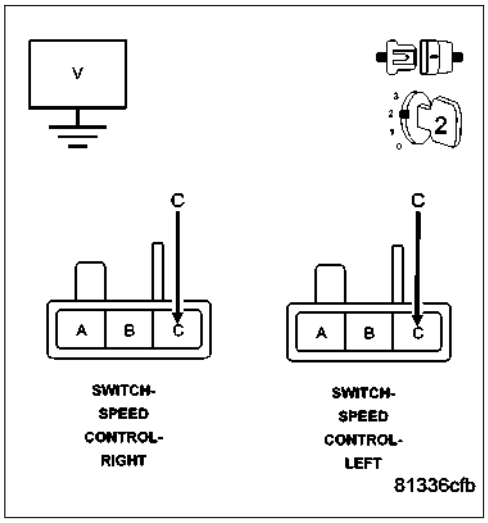
---

3. (V37) S/C SWITCH NO.1 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE

Disconnect the C3 PCM harness connector.

Ignition on, engine not running.

Measure the voltage on the (V37) S/C Switch No.1 Signal circuit in the Speed Control harness connector.



Is the voltage above 5.0 volts?

Yes >> Repair the short to battery voltage in the (V37) S/C Switch No.1 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

P0579-SPEED CONTROL SWITCH 1 PERFORMANCE (5.7L) (CONTINUED)

4. CLOCKSPRING

Turn the ignition off.

Disconnect the upper and lower clockspring harness connectors per Service Information.

Measure the resistance of the (V37) S/C Switch No.1 Signal circuit between the upper and lower clockspring harness connectors.

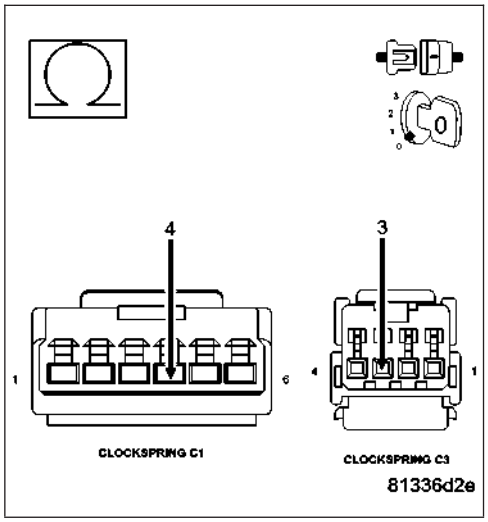
Measure the resistance of the (V937) Switch Return circuit between the upper and lower clockspring harness connectors.

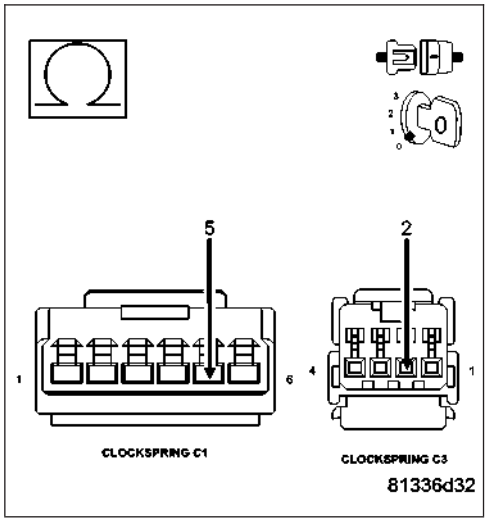
Is the resistance above 5.0 ohms?

Yes >> Replace the Clockspring per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

NOTE: Connect the Clockspring harness connectors per Service Information before continuing.





P0579-SPEED CONTROL SWITCH 1 PERFORMANCE (5.7L) (CONTINUED)

5. (V37) S/C SWITCH NO.1 SIGNAL CIRCUIT OPEN

NOTE: The measurement must be taken from both Speed Control Switch harness connectors.

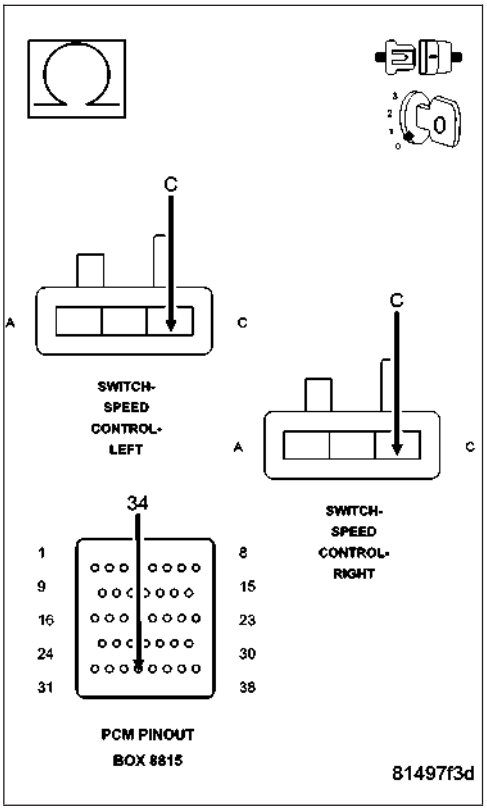
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (V37) S/C Switch No.1 Signal circuit from the Speed Control harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms for both measurements?

Yes >> Go To 6

No >> Repair the open in the (V37) S/C Switch No.1 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



6. (V937) SWITCH RETURN CIRCUIT OPEN

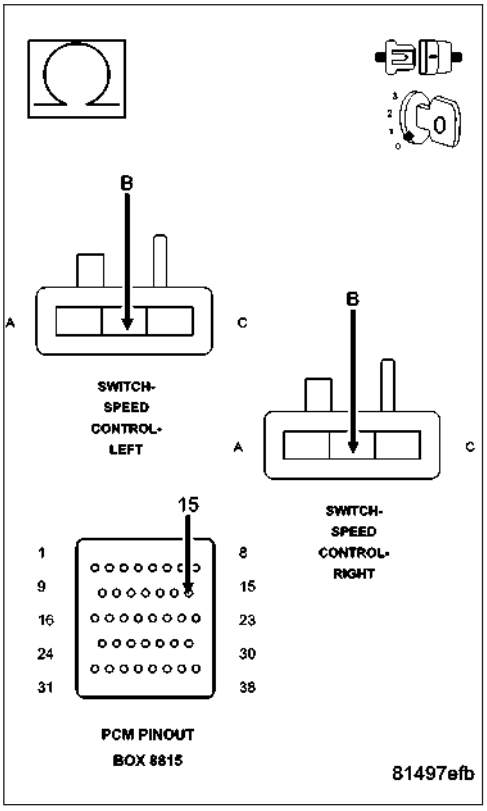
NOTE: The measurement must be taken from both Speed Control Switch harness connectors.

Measure the resistance of the (V937) Switch Return circuit from the Speed Control harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms for both measurements?

Yes >> Go To 7

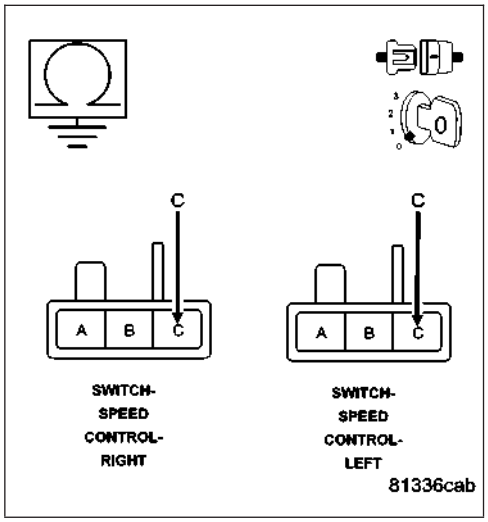
No >> Repair the open in the (V937) Switch Return circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P0579-SPEED CONTROL SWITCH 1 PERFORMANCE (5.7L) (CONTINUED)

7. (V37) S/C NO.1 SWITCH SIGNAL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (V37) S/C Switch No.1 Signal circuit in the Speed Control harness connector.



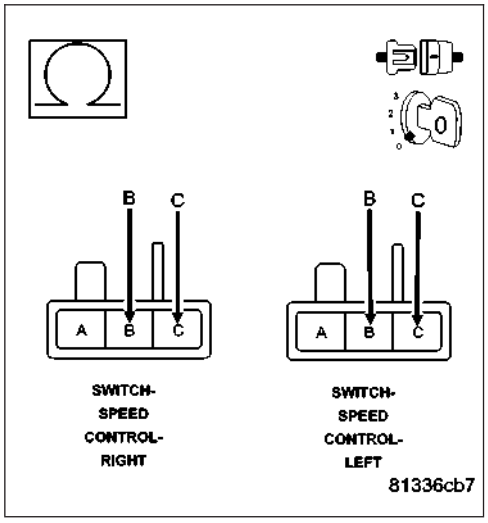
Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (V37) S/C Switch No.1 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8

8. (V37) S/C SWITCH NO.1 SIGNAL CIRCUIT SHORTED TO THE (V937) S/C SWITCH RETURN CIRCUIT

Measure the resistance between the (V37) S/C Switch No.1 Signal circuit and the (V937) S/C Switch Return circuit in the Speed Control harness connector.



Is the resistance below 5.0 ohms?

Yes >> Repair the short between the (V37) S/C Switch No.1 Signal circuit and the (V937) Switch Return circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 9

P0579-SPEED CONTROL SWITCH 1 PERFORMANCE (5.7L) (CONTINUED)

9. SPEED CONTROL SWITCH VOLTAGE VALUES

Connect the C3 PCM harness connector and the S/C Switch harness connectors.

Allow the engine to idle.

With a scan tool, monitor the S/C Switch voltage readings.

SWITCH POSITION	SWITCH No.1 VOLTAGE VALUE	SWITCH No.2 VOLATGE VALUE
NO SWITCHES PRESSED	4.31 to 4.78 volts	4.31 to 4.78 volts
ON/OFF PRESSED	0.59 and 1.13 volts	3.53 and 3.92 volts
RES/ACCEL PRESSED	3.88 to 4.17 volts	2.04 to 2.47 volts
SET PRESSED	3.16 to 3.56 volts	1.17 to 1.56 volts
COAST PRESSED	2.57 to 2.94 volts	0.77 to 1.09 volts
CANCEL PRESSED	1.59 to 1.99 volts	2.84 to 3.25 volts

Take these same voltage measurements with a voltmeter by back probing the (V37) S/C Switch No.1 Signal circuit and the (V38) S/C Switch No.2 Signal circuit at the switches.

Compare the voltage readings on the voltmeter to what the scan tool displayed.

Are the voltage readings out of the listed specification and is there less than a 0.2 of a volt difference between the voltmeter switch values and the scan tool switch value?

Yes >> Replace the Speed Control Switch.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 10

---

10. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

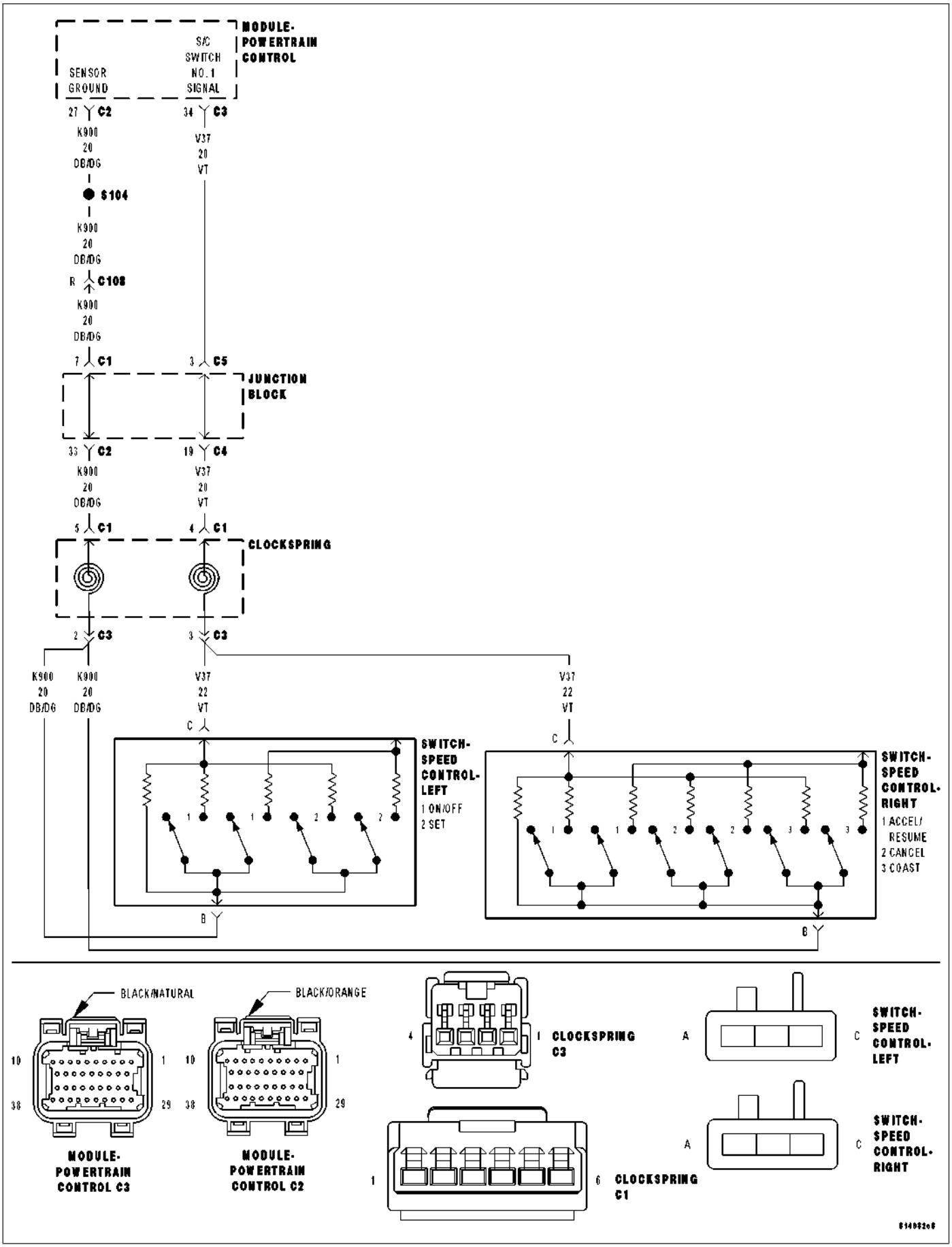
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0580-SPEED CONTROL SWITCH 1 CIRCUIT LOW (3.7L, 4.7L)



P0580-SPEED CONTROL SWITCH 1 CIRCUIT LOW (3.7L, 4.7L) (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition key on. Battery voltage above 10 volts.
- **Set Condition:**
  When switch voltage is less than 0.43 of a volt for 2 minutes. One trip fault. Three good trips to turn off the MIL.

Possible Causes
(V37) S/C SIGNAL NO.1 CIRCUIT SHORTED TO GROUND
(V37) S/C SIGNAL NO.1 CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT
CLOCKSPRING
SPEED CONTROL ON/OFF SWITCH
SPEED CONTROL RESUME/ACCEL SWITCH
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. SPEED CONTROL SWITCH VOLTAGE LOW

NOTE: Do not press any of the Speed Control Switch buttons.
Ignition on, engine not running.
With a scan tool, read the Speed Control voltage.

Is the Speed Control voltage below 1.0 volt?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. SPEED CONTROL ON/OFF SWITCH

Ignition on, engine not running.
With the scan tool, monitor the Speed Control Switch voltage.
Disconnect the Speed Control On/Off Switch harness connector per Service Information.

Did the voltage change to above 4.7 volts?

Yes >> Replace the Speed Control On/Off Switch.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

P0580-SPEED CONTROL SWITCH 1 CIRCUIT LOW (3.7L, 4.7L) (CONTINUED)

3. SPEED CONTROL RESUME/ACCEL SWITCH

With the scan tool, monitor the Speed Control Switch voltage.

Disconnect the Speed Control Resume/Accel Switch harness connector.

Did the voltage change to above 4.7 volts?

Yes >> Replace the Speed Control Resume/Accel Switch.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

---

4. CLOCKSPRING

Turn the ignition off.

Disconnect the C1 Clockspring 6-way harness connector (instrument panel wiring side) per Service Information.

Ignition on, engine not running.

With the scan tool, read the S/C Switch voltage.

Did the S/C Switch volts change to 5.0 volts?

Yes >> Replace the Clockspring.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

---

5. (V37) S/C NO.1 SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Connect the C1 Clockspring harness connector per Service Information.

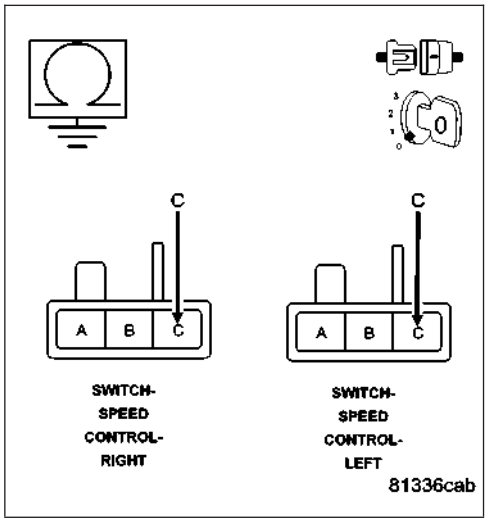
Disconnect the C2 and C3 PCM harness connectors.

Measure the resistance between ground and the (V37) S/C Signal circuit in the Switch harness connectors.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (V37) S/C Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

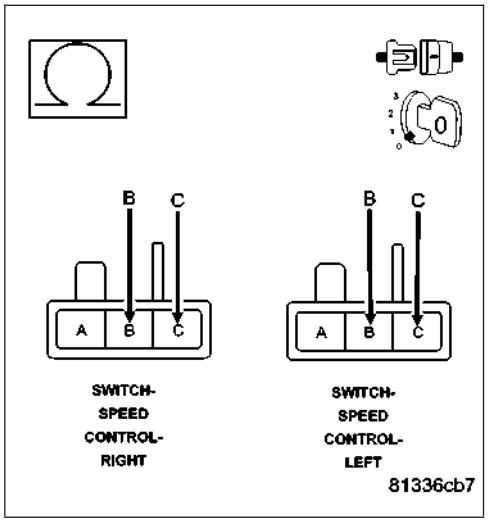
No >> Go To 6



P0580-SPEED CONTROL SWITCH 1 CIRCUIT LOW (3.7L, 4.7L) (CONTINUED)

6. (V37) S/C SIGNAL NO.1 CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT

Measure the resistance between the (K900) Sensor ground circuit and the (V37) S/C Signal No.1 circuit in the Speed Control Switch harness connectors.



Is the resistance below 5.0 ohms?

Yes >> Repair the short between the (V37) S/C Signal No.1 circuit and the (K900) Sensor ground circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 7

---

7. PCM

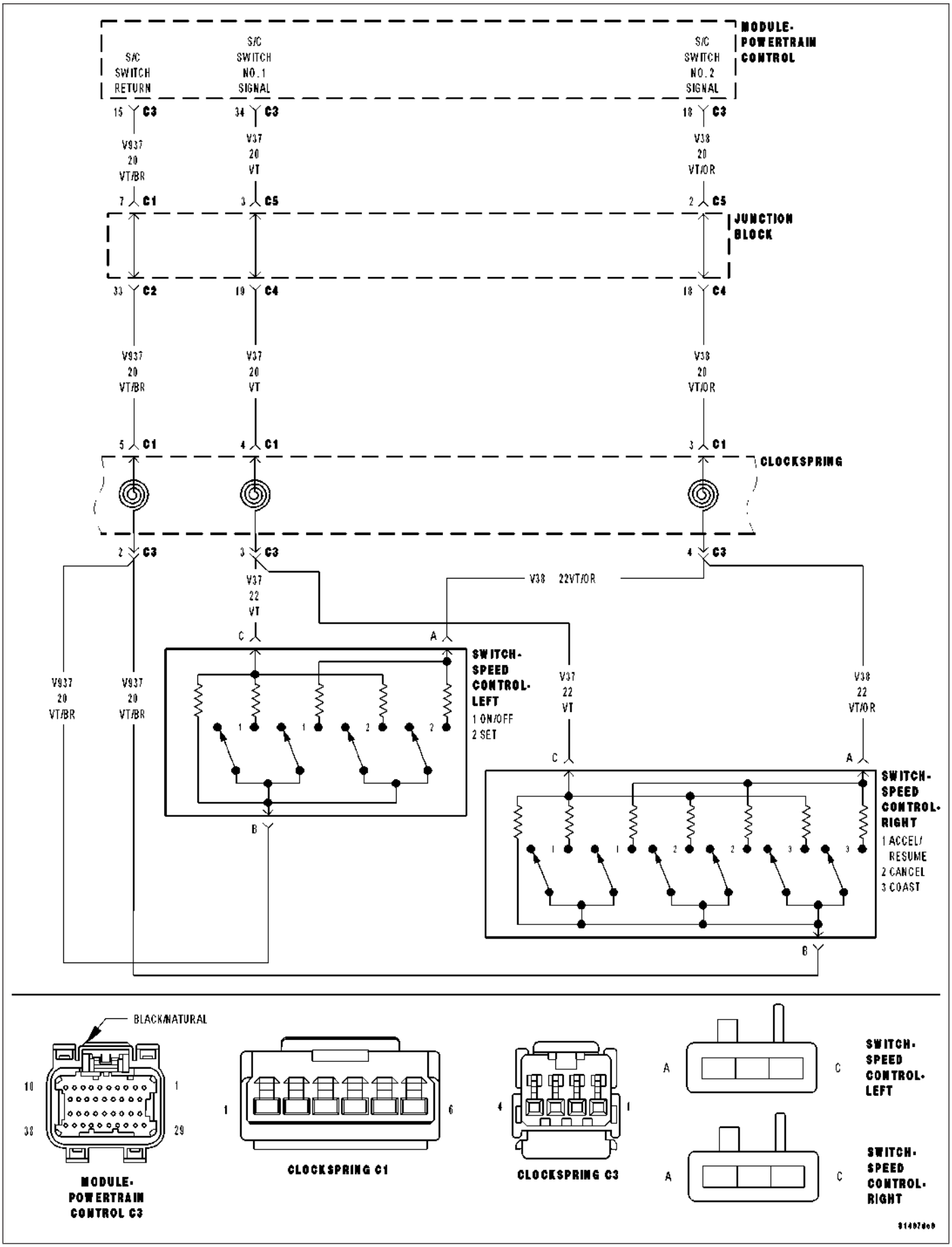
NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0580-SPEED CONTROL SWITCH 1 CIRCUIT LOW (5.7L)



P0580-SPEED CONTROL SWITCH 1 CIRCUIT LOW (5.7L) (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition key on.
- **Set Condition:**
  Speed control switch input No.1 is below the minimum acceptable voltage at the PCM. One trip fault.

Possible Causes
(V37) S/C SWITCH NO.1 SIGNAL CIRCUIT SHORTED TO THE (V937) S/C SWITCH RETURN
(V37) S/C SWITCH NO.1 SIGNAL CIRCUIT SHORTED TO GROUND
CLOCKSPRING
SPEED CONTROL ON/OFF SWITCH
SPEED CONTROL RESUME/ACCEL SWITCH
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. SPEED CONTROL SWITCH VOLTAGE LOW

NOTE: Do not press any of the Speed Control Switch buttons.
Ignition on, engine not running.
With a scan tool, read the Speed Control voltage.

Is the Speed Control voltage below 1.0 volt?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0580-SPEED CONTROL SWITCH 1 CIRCUIT LOW (5.7L) (CONTINUED)

2. SPEED CONTROL SWITCHES

Turn the ignition off.

Remove and disconnect the Speed Control Switches from the steering wheel per Service Information.

Measure the resistance across each Speed Control Switch.

Monitor the ohmmeter while pressing each function button on each switch.

The following resistance specs are taken between terminals (V37) S/C Switch No.1 Signal and (V937) S/C Switch Return circuits of the Switch when holding the switch button in the following positions.

Not pressing any switch - 20.5 kohms

On/Off - 0.47 kohms

Set - 5.49 kohms

Coast - 2.94 kohms

Cancel - 1.24 kohms

Resume/Accel - 15.4 kohms

Does the function on the Speed Control Switches have the correct resistance value?

Yes >> Go To 3

No >> Replace the Speed Control Switch that had the incorrect resistance value.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

3. SPEED CONTROL ON/OFF SWITCH

Connect the Resume/Accel Switch.

Ignition on, engine not running.

With the scan tool, monitor the Speed Control Switch voltage.

Disconnect the Speed Control On/Off Switch harness connector.

Did the voltage change to above 4.8 volts?

Yes >> Replace the Speed Control On/Off Switch.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

---

4. SPEED CONTROL RESUME/ACCEL SWITCH

With the scan tool, monitor the Speed Control Switch voltage.

Disconnect the Speed Control Resume/Accel Switch harness connector per Service Information.

Did the voltage change to above 4.8 volts?

Yes >> Replace the Speed Control Resume/Accel Switch.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

P0580-SPEED CONTROL SWITCH 1 CIRCUIT LOW (5.7L) (CONTINUED)

5. CLOCKSPRING

Turn the ignition off.
Disconnect the C1 Clockspring harness connector per Service Information.
Ignition on, engine not running.
With the scan tool, read the S/C Switch voltage.

Did the S/C Switch volts change to 5.0 volts?

Yes >> Replace the Clockspring.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

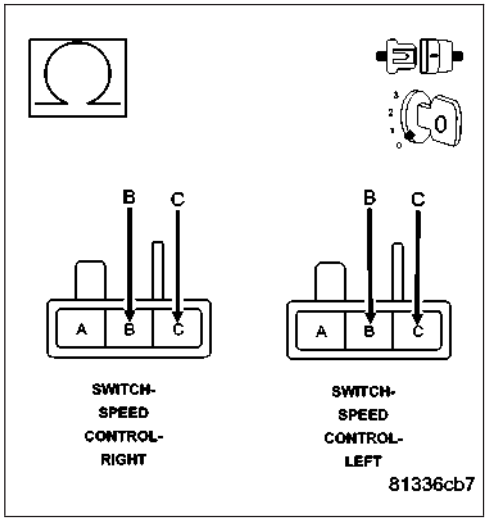
No >> Go To 6

---

6. (V37) S/C SWITCH NO.1 SIGNAL CIRCUIT SHORTED TO THE (V937) S/C SWITCH RETURN CIRCUIT

Turn the ignition off.
Connect the Clockspring harness connectors per Service Information.
Disconnect the C3 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.
Measure the resistance between the (V937) S/C Switch Return circuit and the (V37) S/C Switch No.1 Signal circuit at the Speed Control Switch.



Is the resistance below 5.0 ohms?

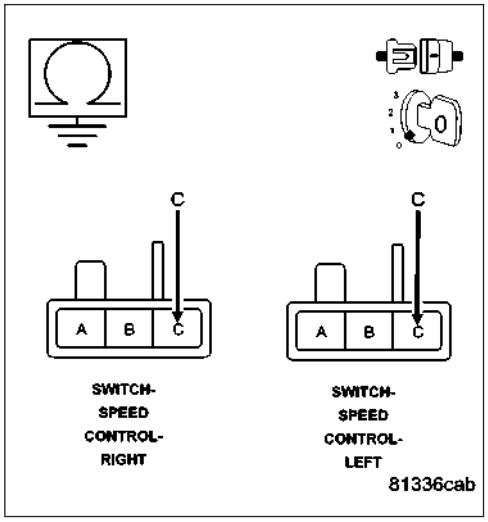
Yes >> Repair the short between the (V37) S/C Switch No.1 Signal circuit and the (V937) S/C Switch Return circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 7

---

7. (V37) S/C SWITCH NO.1 SIGNAL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (V37) S/C Switch No.1 Signal circuit in the Switch harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (V37) S/C Switch No.1 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8

P0580-SPEED CONTROL SWITCH 1 CIRCUIT LOW (5.7L) (CONTINUED)

8. SPEED CONTROL SWITCH VOLTAGE VALUES

Connect the C3 PCM harness connector and the S/C Switch harness connectors.

Allow the engine to idle.

With a scan tool, monitor the S/C Switch voltage readings.

SWITCH POSITION	SWITCH No.1 VOLTAGE VALUE	SWITCH No.2 VOLATGE VALUE
NO SWITCHES PRESSED	4.31 to 4.78 volts	4.31 to 4.78 volts
ON/OFF PRESSED	0.59 and 1.13 volts	3.53 and 3.92 volts
RES/ACCEL PRESSED	3.88 to 4.17 volts	2.04 to 2.47 volts
SET PRESSED	3.16 to 3.56 volts	1.17 to 1.56 volts
COAST PRESSED	2.57 to 2.94 volts	0.77 to 1.09 volts
CANCEL PRESSED	1.59 to 1.99 volts	2.84 to 3.25 volts

Take these same voltage measurements with a voltmeter by back probing the (V37) S/C Switch No.1 Signal circuit at the switches.

Compare the voltage readings on the voltmeter to what the scan tool displayed.

Are the voltage readings out of the listed specification and is there less than a 0.2 of a volt difference between the voltmeter switch values and the scan tool switch value?

Yes >> Replace the Speed Control Switch.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 9

9. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

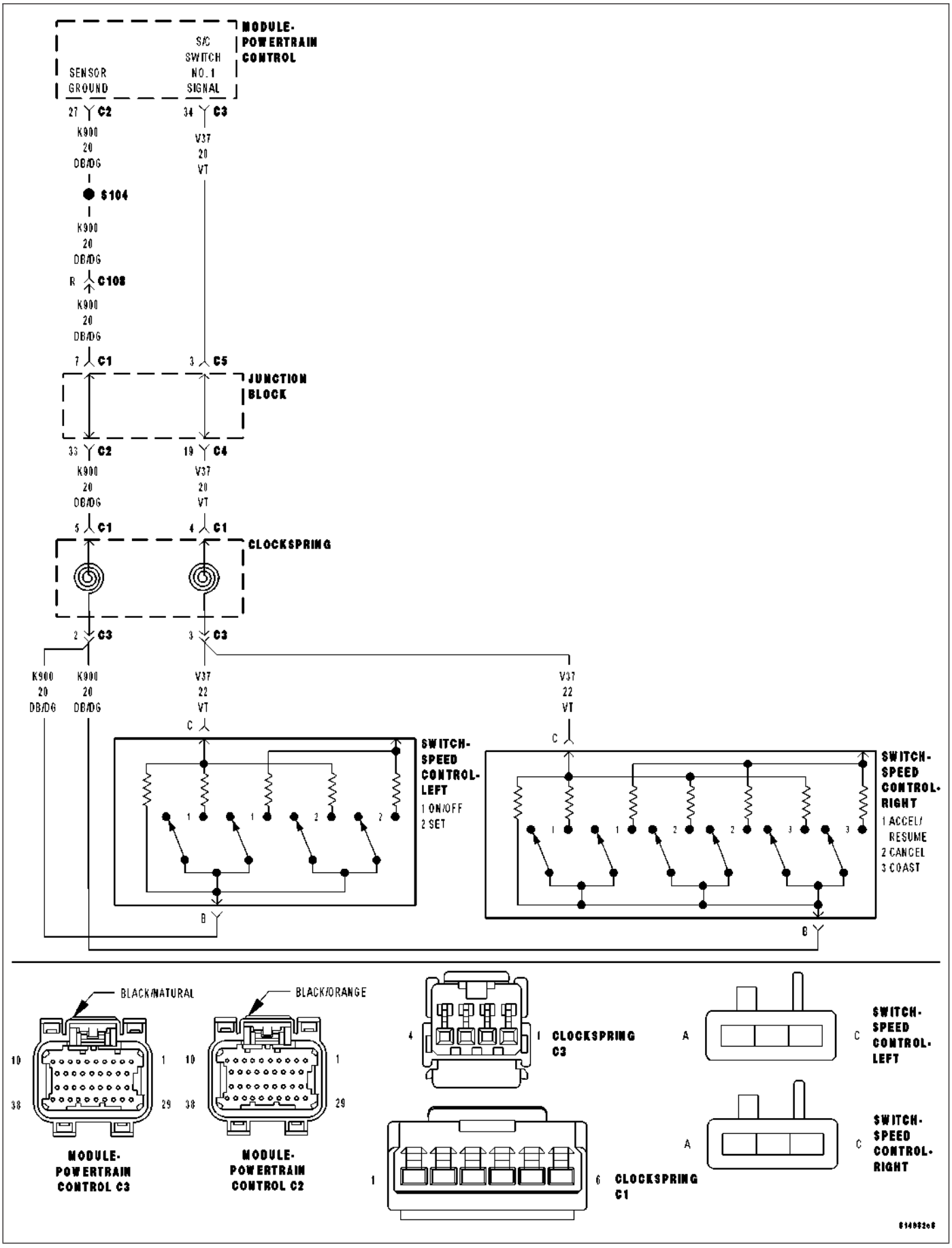
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0581-SPEED CONTROL SWITCH 1 CIRCUIT HIGH (3.7L, 4.7L)



P0581-SPEED CONTROL SWITCH 1 CIRCUIT HIGH (3.7L, 4.7L) (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition key on. Battery voltage above 10 volts.
- **Set Condition:**
  The PCM detects an open or short to voltage in the Speed Control Switch Signal circuit. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(V37) S/C SWITCH NO.1 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(V37) S/C SWITCH NO.1 SIGNAL CIRCUIT OPEN BETWEEN PCM AND CLOCKSPRING
(K900) SENSOR GROUND CIRCUIT OPEN BETWEEN PCM AND CLOCKSPRING
(K900) SENSOR GROUND CIRCUIT OPEN BETWEEN CLOCKSPRING AND S/C SWITCH
(V37) S/C SWITCH NO.1 SIGNAL CIRCUIT OPEN BETWEEN CLOCKSPRING AND S/C SWITCH
CLOCKSPRING
SPEED CONTROL SWITCH
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. SPEED CONTROL SWITCH VOLTAGE HIGH

NOTE: Do not press any of the Speed Control Switch buttons.
Ignition on, engine not running.
With a scan tool, read the Speed Control voltage.

Is the Speed Control voltage above 4.8 volts?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0581-SPEED CONTROL SWITCH 1 CIRCUIT HIGH (3.7L, 4.7L) (CONTINUED)

2. SPEED CONTROL SWITCHES

Turn the ignition off.

Remove the Speed Control Switches from the steering wheel.

Measure the resistance across each Speed Control Switch.

Monitor the ohmmeter while pressing each function button on each switch.

Resume/Accel - 15.4 kohms

Cancel - 1.24 kohms

Coast - 2.94 kohms

On/Off - 0.47 kohms

Set - 5.49 kohms

Does the function on the Speed Control Switches have the correct resistance value?

Yes >> Go To 3

No >> Replace the Speed Control Switch that had the incorrect resistance value.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

3. CLOCKSPRING

Disconnect the C1 and C3 Clockspring harness connector per Service Information.

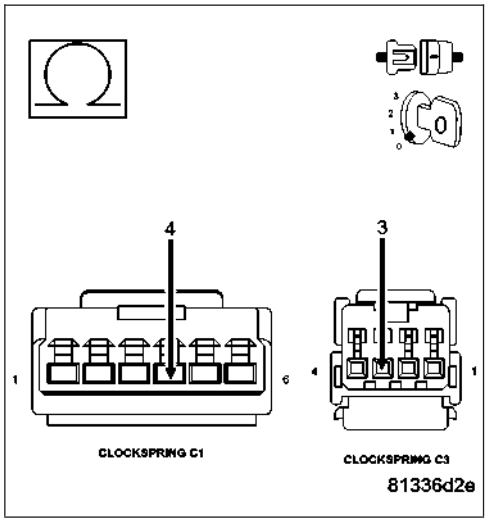
Measure the resistance of the (K900) Sensor ground circuit between theC1 and C3 Clockspring harness connectors.

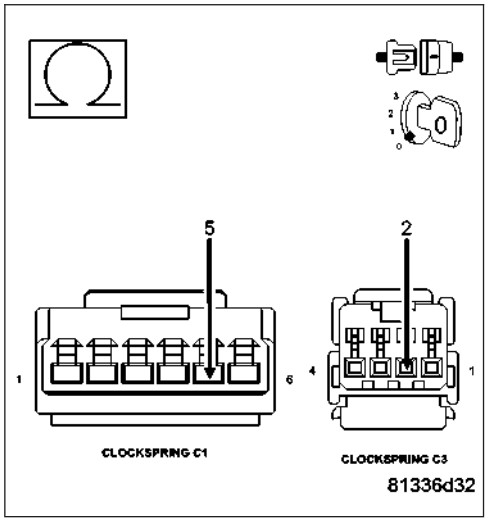
Measure the resistance of the (V37) S/C Switch No.1 Signal circuit between the C1 and C3 Clockspring harness connectors.

Was the resistance above 5.0 ohms for either circuit?

Yes >> Replace the Clockspring.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4





P0581-SPEED CONTROL SWITCH 1 CIRCUIT HIGH (3.7L, 4.7L) (CONTINUED)

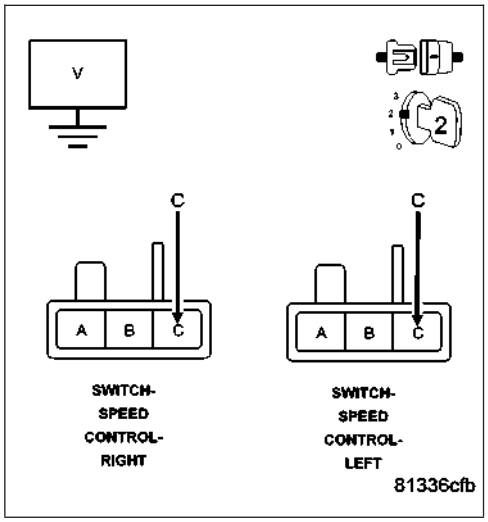
4. (V37) S/C SWITCH NO.1 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE

Connect the Clockspring harness connectors per Service Information.

Disconnect the C2 and C3 PCM harness connectors.

Ignition on, engine not running.

Measure the voltage on the (V37) S/C Switch No.1 Signal circuit in the Speed Control harness connector.



Is the voltage above 5.3 volts?

Yes >> Repair the short to battery voltage in the (V37) S/C Switch No.1 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

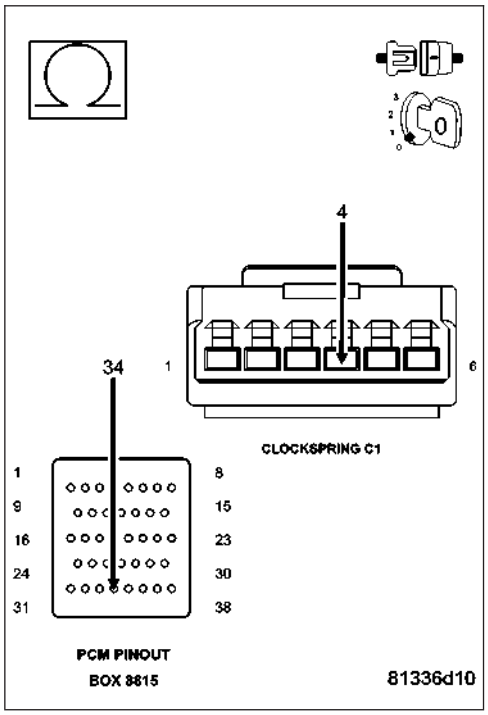
5. (V37) S/C SWITCH NO.1 SIGNAL CIRCUIT OPEN BETWEEN PCM AND CLOCKSPRING

Turn the ignition off.

Disconnect the C1 and C3 Clockspring harness connectors per Service Information.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (V37) S/C Switch No.1 Signal circuit from the C1 Clockspring harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

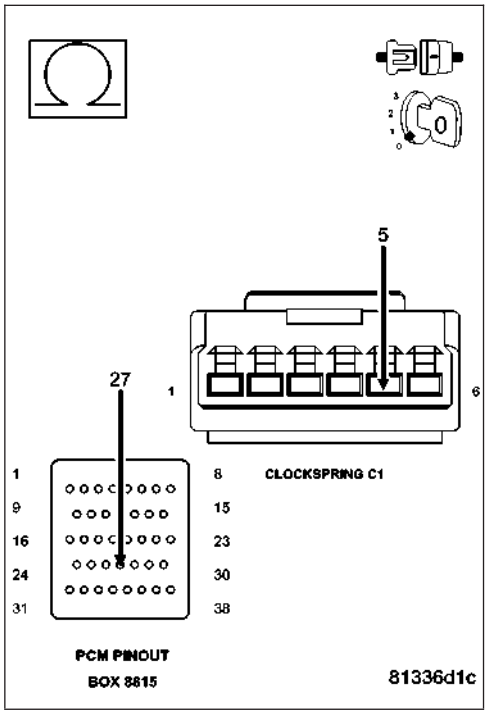
Yes >> Go To 6

No >> Repair the open in the (V37) S/C Switch No.1 Signal circuit between the PCM and Clockspring.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0581-SPEED CONTROL SWITCH 1 CIRCUIT HIGH (3.7L, 4.7L) (CONTINUED)

6. (K900) SENSOR GROUND CIRCUIT OPEN BETWEEN PCM AND CLOCKSPRING

Measure the resistance of the (K900) Sensor ground circuit from the C1 Clockspring harness connector to the appropriate terminal of special tool #8815.



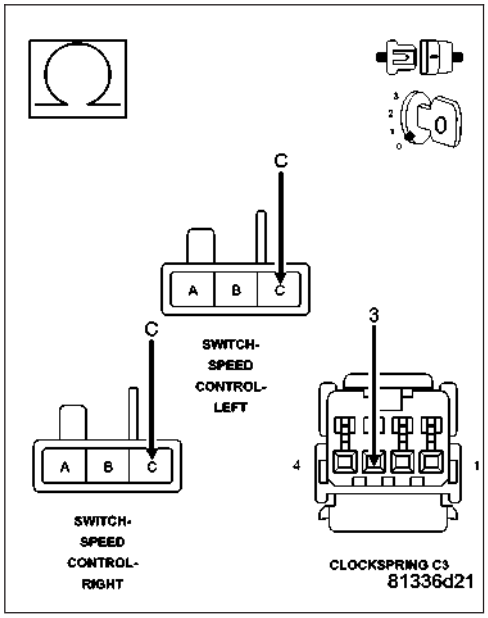
Is the resistance below 5.0 ohms?

Yes >> Go To 7

No >> Repair the open (K900) Sensor ground circuit between the PCM and Clockspring.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

7. (V37) S/C SWITCH NO.1 SIGNAL CIRCUIT OPEN BETWEEN CLOCKSPRING AND S/C SWITCH

Measure the resistance of the (V37) S/C Switch No.1 Signal circuit from the C3 Clockspring harness connector to the On/Off switch harness connector.



Is the resistance below 5.0 ohms?

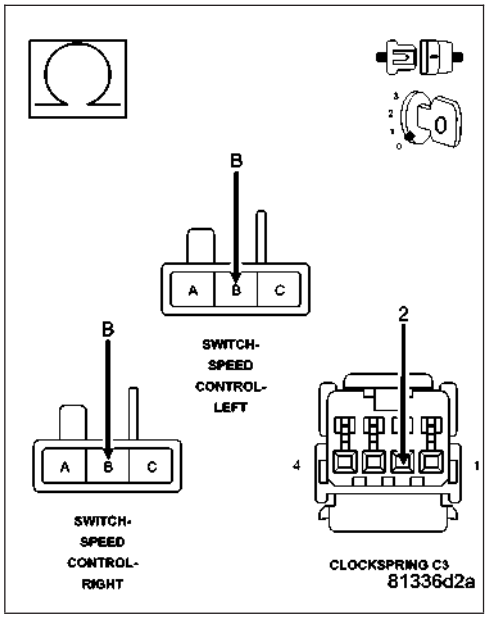
Yes >> Go To 8

No >> Repair the open in the (V37) S/C Switch No.1 Signal circuit, Clockspring to S/C Switch.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0581-SPEED CONTROL SWITCH 1 CIRCUIT HIGH (3.7L, 4.7L) (CONTINUED)

8. (K900) SENSOR GROUND CIRCUIT OPEN BETWEEN CLOCKSPRING AND S/C SWITCH

Measure the resistance of the (K900) Sensor ground circuit from the On/Off Switch 2-way harness connector to the C3 Clockspring harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go To 9

No >> Repair the open in the (K900) Sensor ground circuit between the Clockspring and S/C Switch.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

9. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

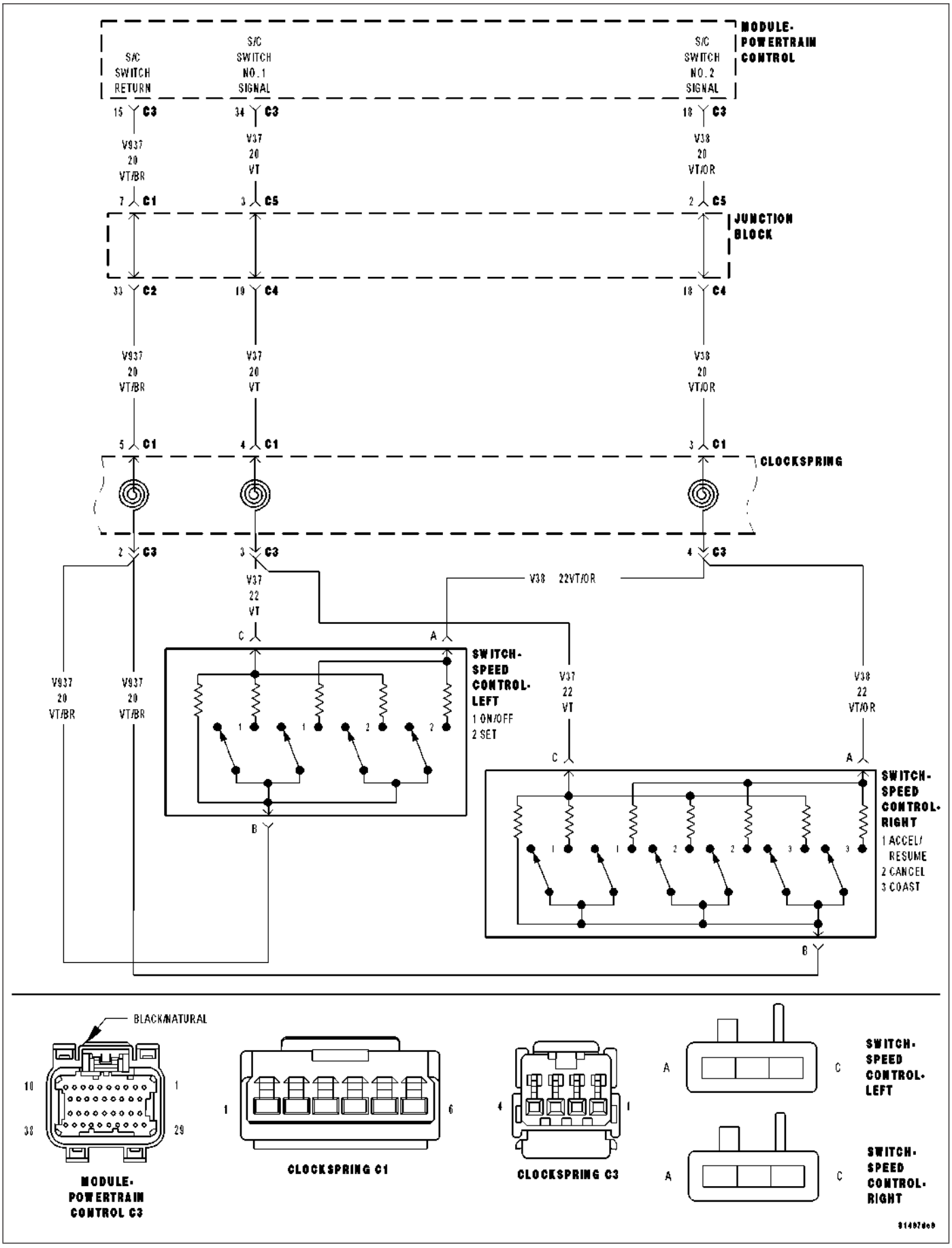
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0581-SPEED CONTROL SWITCH 1 CIRCUIT HIGH (5.7L)



P0581-SPEED CONTROL SWITCH 1 CIRCUIT HIGH (5.7L) (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition key on.
- **Set Condition:**
  Speed control switch input above the maximum acceptable voltage at the PCM. One trip fault.

Possible Causes
(V37) S/C SWITCH NO.1 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(V37) S/C SWITCH NO.1 SIGNAL CIRCUIT OPEN
(V937) SWITCH RETURN CIRCUIT OPEN
CLOCKSPRING
SPEED CONTROL SWITCH
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. SPEED CONTROL SWITCH VOLTAGE HIGH

NOTE: Do not press any of the Speed Control Switch buttons.

Ignition on, engine not running.

With a scan tool, read the Speed Control voltage.

Is the Speed Control voltage above 4.8 volts?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0581-SPEED CONTROL SWITCH 1 CIRCUIT HIGH (5.7L) (CONTINUED)

2. SPEED CONTROL SWITCHES

Turn the ignition off.

Remove and disconnect the Speed Control Switches from the steering wheel.

Measure the resistance across each Speed Control Switch.

Monitor the ohmmeter while pressing each function button on each switch.

The following resistance specs are taken between terminals (V37) S/C Switch No.1 Signal and (V937) S/C Switch Return circuits of the Switch when holding the switch button in the following position

Not pressing any switch - 20.5 kohms

On/Off - 0.47 kohms

Set - 5.49 kohms

Coast - 2.94 kohms

Cancel - 1.24 kohms

Resume/Accel - 15.4 kohms

Does the function on the Speed Control Switches have the correct resistance value?

Yes >> Go To 3

No >> Replace the Speed Control Switch that had the incorrect resistance value.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0581-SPEED CONTROL SWITCH 1 CIRCUIT HIGH (5.7L) (CONTINUED)

3. CLOCKSPRING

Disconnect the C1 and C3 Clockspring harness connector per Service Information.

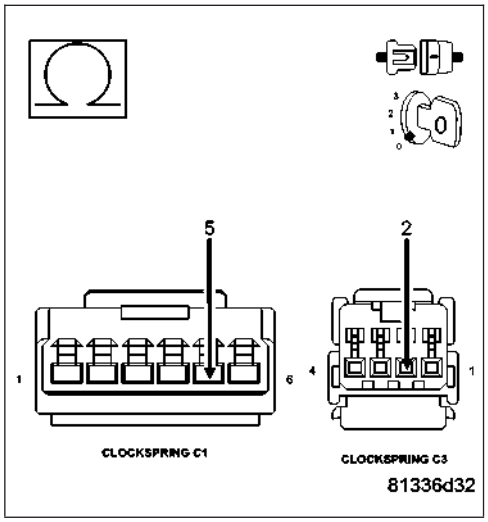
Measure the resistance of the (V937) Switch Return circuit between the C1 and C3 Clockspring harness connectors.

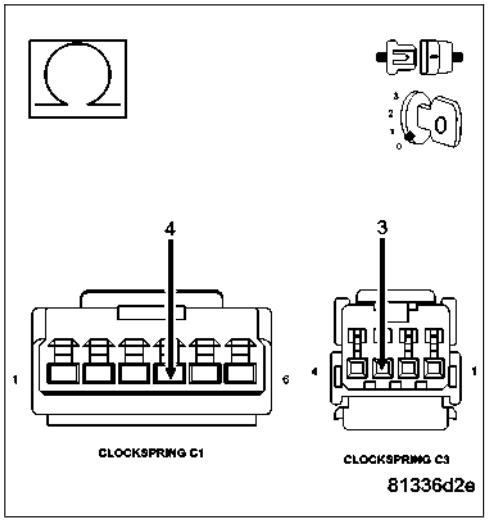
Measure the resistance of the (V37) S/C Switch No.1 Signal circuit between the C1 and C3 Clockspring harness connectors.

Was the resistance above 5.0 ohms for either circuit?

Yes >> Replace the clockspring.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4





4. (V37) S/C SWITCH NO.1 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE

Connect the Clockspring harness connectors per Service Information.

Disconnect the C3 PCM harness connector.

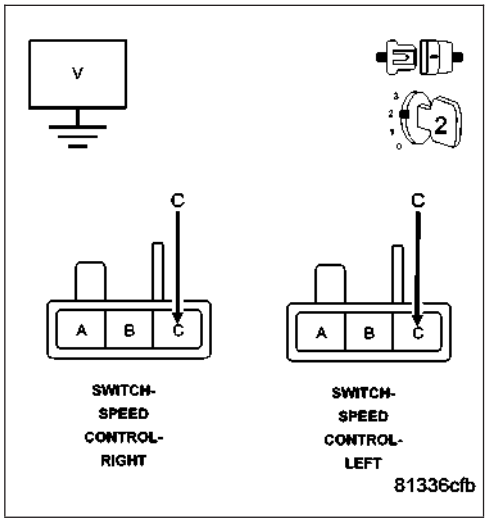
Ignition on, engine not running.

Measure the voltage on the (V37) S/C Switch No.1 Signal circuit in the Speed Control harness connector.

Is the voltage above 5.2 volts?

Yes >> Repair the short to battery voltage in the (V37) S/C Switch No.1 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5



P0581-SPEED CONTROL SWITCH 1 CIRCUIT HIGH (5.7L) (CONTINUED)

5. (V37) S/C SWITCH NO.1 SIGNAL CIRCUIT OPEN

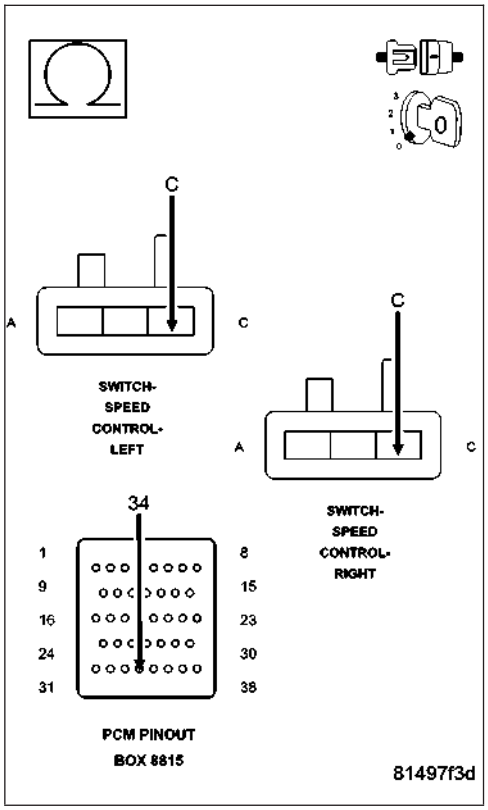
NOTE: The measurement must be taken from both Speed Control Switch harness connectors.
Turn the ignition off.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.
Measure the resistance of the (V37) S/C Switch No.1 Signal circuit from the Speed Control harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 6

No >> Repair the open in the (V37) S/C Switch No.1 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



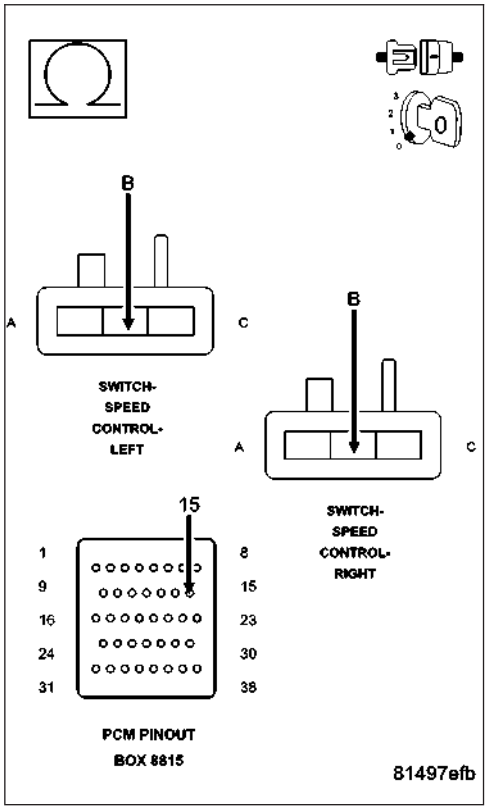
6. (V937) SWITCH RETURN CIRCUIT OPEN

NOTE: The measurement must be taken from both Speed Control Switch harness connectors.
Measure the resistance of the (V937) Switch Return circuit from the Speed Control harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 7

No >> Repair the open in the (V937) Switch Return circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P0581-SPEED CONTROL SWITCH 1 CIRCUIT HIGH (5.7L) (CONTINUED)

7. SPEED CONTROL SWITCH VOLTAGE VALUES

Connect the C3 PCM harness connector and the S/C Switch harness connectors.

Allow the engine to idle.

With a scan tool, monitor the S/C Switch voltage readings.

SWITCH POSITION	SWITCH No.1 VOLTAGE VALUE	SWITCH No.2 VOLATGE VALUE
NO SWITCHES PRESSED	4.31 to 4.78 volts	4.31 to 4.78 volts
ON/OFF PRESSED	0.59 and 1.13 volts	3.53 and 3.92 volts
RES/ACCEL PRESSED	3.88 to 4.17 volts	2.04 to 2.47 volts
SET PRESSED	3.16 to 3.56 volts	1.17 to 1.56 volts
COAST PRESSED	2.57 to 2.94 volts	0.77 to 1.09 volts
CANCEL PRESSED	1.59 to 1.99 volts	2.84 to 3.25 volts

Take these same voltage measurements with a voltmeter by back probing the (V37) S/C Switch No.1 Signal circuit at the switches.

Compare the voltage readings on the voltmeter to what the scan tool displayed.

Are the voltage readings out of the listed specification and is there less than a 0.2 of a volt difference between the voltmeter switch values and the scan tool switch value?

Yes >> Replace the Speed Control Switch.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8

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8. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

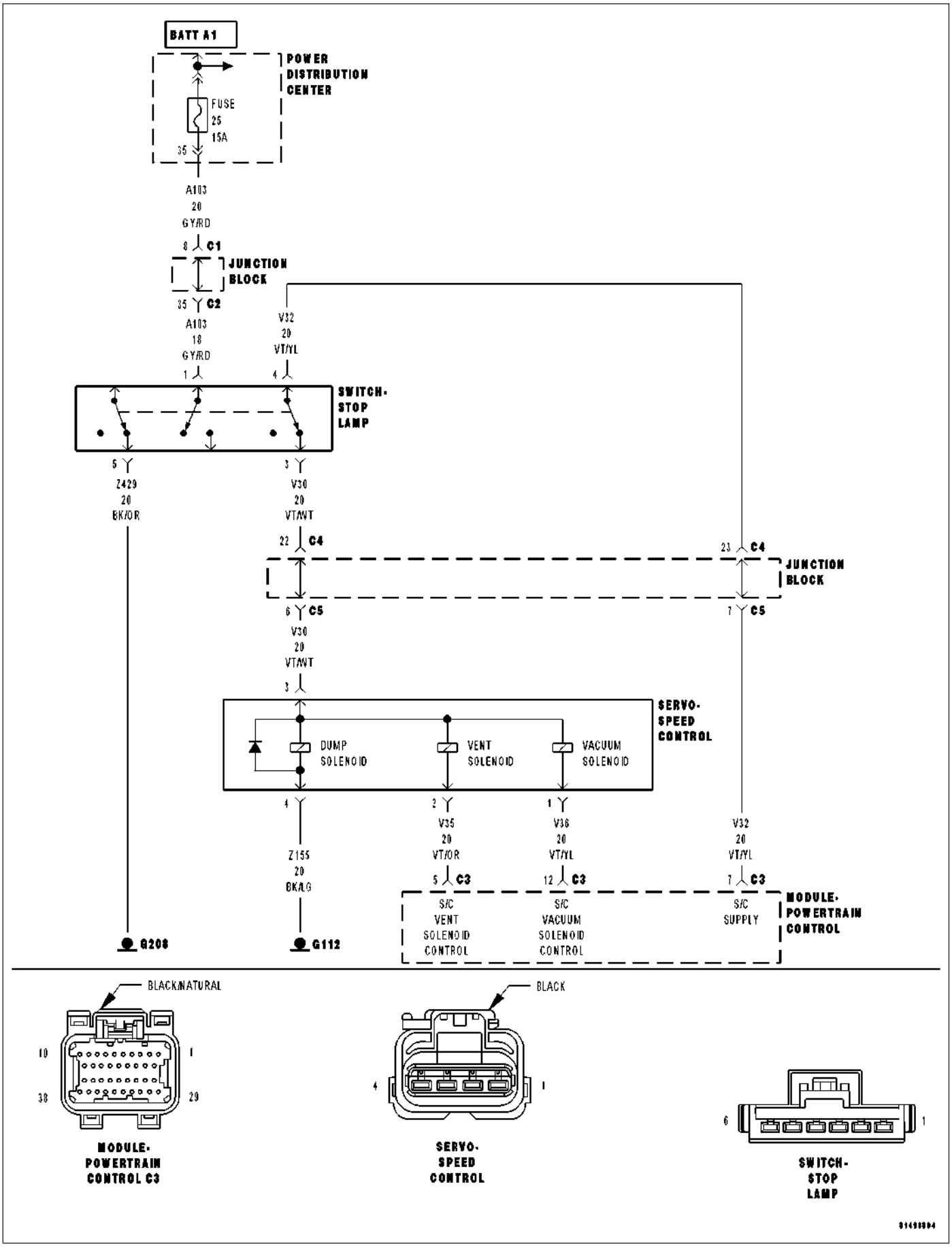
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0586-SPEED CONTROL VACUUM CONTROL CIRCUIT



P0586-SPEED CONTROL VACUUM CONTROL CIRCUIT (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on and battery voltage greater than 10 volts.
- **Set Condition:**
  An open or shorted condition detected in the Speed control vacuum solenoid control circuit. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(V32) S/C SUPPLY CIRCUIT OPEN
(V32) S/C SUPPLY SHORT TO GROUND
(V36) S/C VACUUM SOL CONTROL CIRCUIT SHORTED TO GROUND
(V36) S/C VACUUM SOL CONTROL CIRCUIT OPEN
(Z155) GROUND CIRCUIT OPEN
SPEED CONTROL VACUUM SOLENOID
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. SPEED CONTROL VACUUM CONTROL

Ignition on, engine not running.

With the scan tool, read DTCs and record the related Freeze Frame data.

With the scan tool, actuate the Speed Control Vacuum Solenoid and note operation.

Does the Speed Control Vacuum Solenoid actuate properly?

Yes >> Refer to the INTERMITTENT CONDITION symptom in the Driveability category.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 2

---

2. (V30) S/C BRAKE SWITCH OUTPUT CIRCUIT

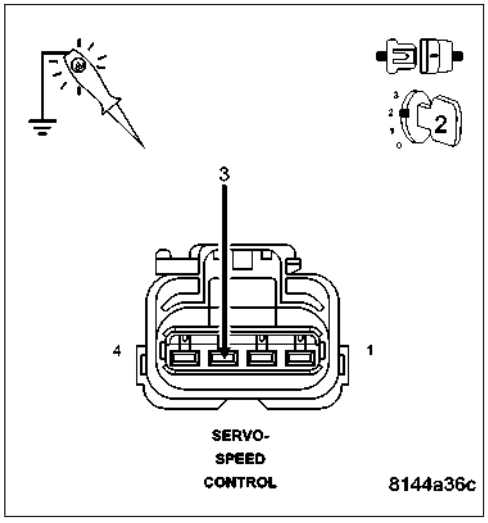
Turn the ignition off.

Disconnect the S/C Servo harness connector.

Ignition on, engine not running.

Using the scan tool, actuate the S/C Vacuum Solenoid.

Using a test light connected to ground, probe the (V30) S/C Brake Switch Output circuit in the S/C Servo harness connector.



Does the test light illuminate brightly and flash on and off?

Yes >> Go To 5

No >> Go To 3

P0586-SPEED CONTROL VACUUM CONTROL CIRCUIT (CONTINUED)

3. (V32) S/C SUPPLY CIRCUIT

Turn the ignition off.

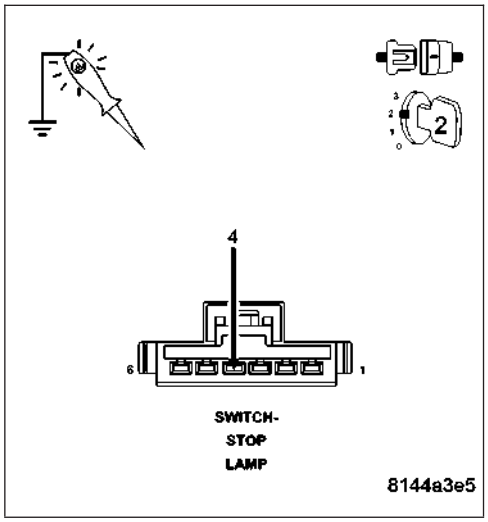
Connect the S/C Servo harness connector.

Disconnect the Stop Lamp Switch harness connector.

Ignition on, engine not running.

Using the scan tool, actuate the S/C Vacuum Solenoid.

Using a test light connected to ground, probe the (V32) S/C Supply circuit in the Stop Lamp Switch harness connector.



Does the test light illuminate brightly?

Yes >> Go To 4

No >> Go To 8

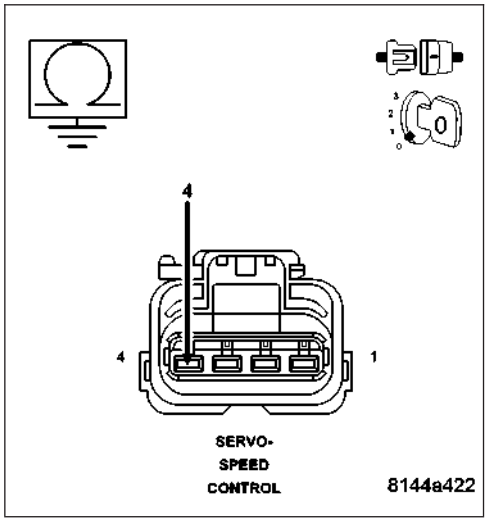
---

4. (Z155) S/C GROUND CIRCUIT OPEN

Turn the ignition off.

Disconnect the S/C Servo harness connector.

Measure the resistance of the (Z155) S/C Ground circuit at the S/C Servo harness connector to ground.



Is the resistance below 5.0 ohms?

Yes >> Go To 5

No >> Repair the open in the (Z155) S/C Ground circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0586-SPEED CONTROL VACUUM CONTROL CIRCUIT (CONTINUED)

5. SPEED CONTROL VACUUM SOLENOID

Ignition on, engine not running.

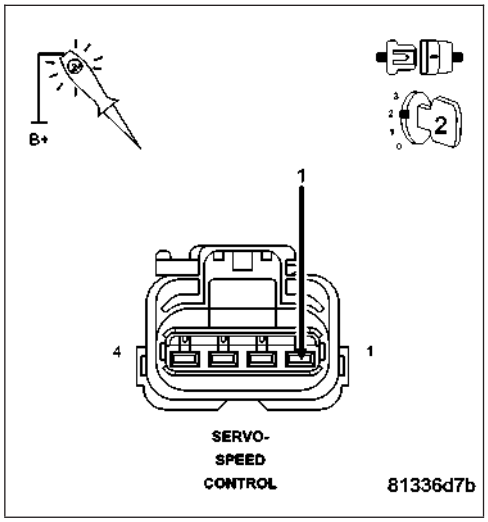
With the scan tool, actuate the Speed Control Vacuum Solenoid.

Using a 12-volt test light connected to battery voltage, probe the (V36) S/C Vacuum Control circuit.

Does the test light illuminate brightly and flash on and off?

Yes >> Replace the Speed Control Servo.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6



6. (V36) S/C VACUUM SOL CONTROL CIRCUIT OPEN

Turn the ignition off.

Disconnect the C3 PCM harness connector.

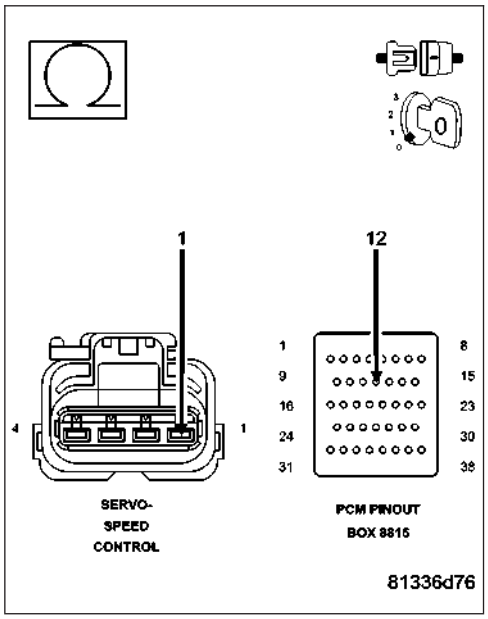
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (V36) S/C Vacuum Sol Control circuit from the Speed Control Servo harness connector to the appropriate terminal of special tool # 8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 7

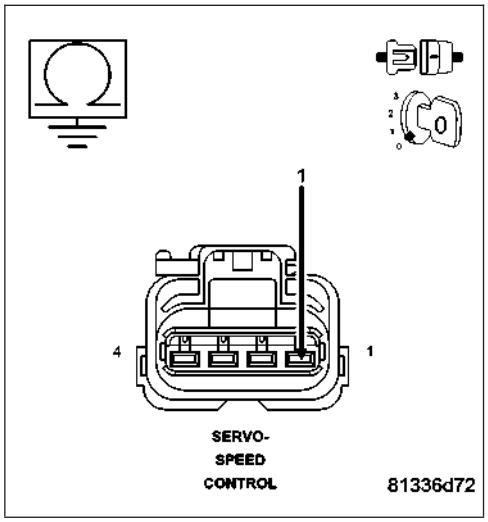
No >> Repair the open/high resistance in the (V36) S/C Vacuum Sol Control circuit.
Perform POWERTRAIN VERIFICATION TEST VER - 4. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P0586-SPEED CONTROL VACUUM CONTROL CIRCUIT (CONTINUED)

7. (V36) SPEED CONTROL VACUUM SOLENOID CONTROL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (V36) S/C Vacuum Solenoid Control circuit at the Speed Control Servo harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (V36) S/C Vacuum Sol Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 10

---

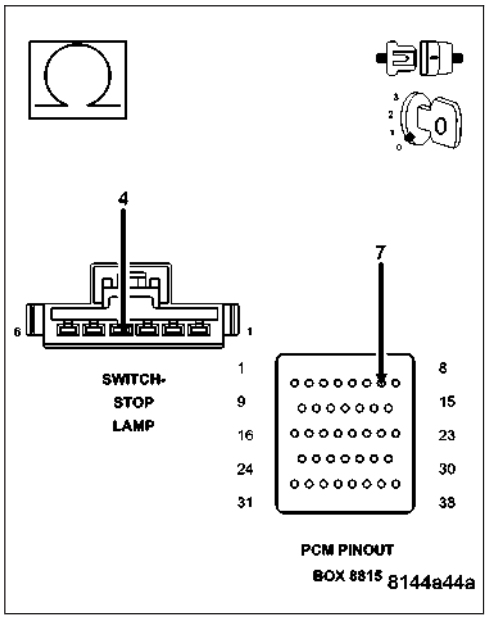
8. (V32) S/C SUPPLY OPEN

Turn the ignition off.

Disconnect the C3 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (V32) S/C Supply circuit from the Stop Lamp Switch harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

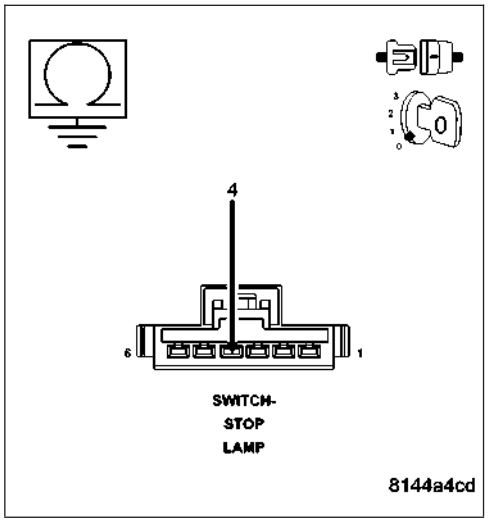
Yes >> Go To 9

No >> Repair the open/high resistance in the (V32) S/C Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0586-SPEED CONTROL VACUUM CONTROL CIRCUIT (CONTINUED)

9. (V32) S/C SUPPLY CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (V32) S/C Supply circuit at the Speed Control Servo harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (V32) S/C Supply circuit. Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 10

10. PCM

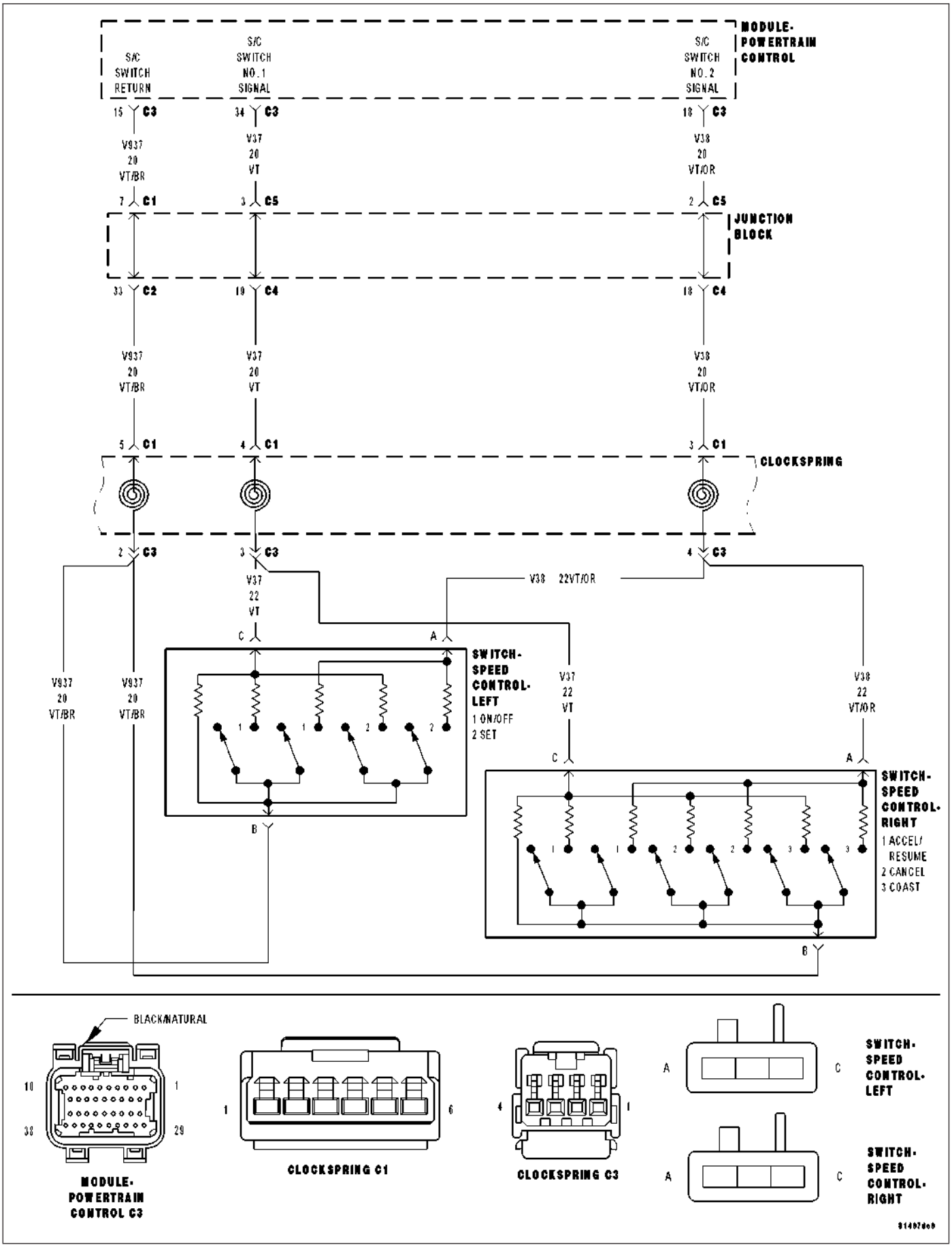
NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0585-SPEED CONTROL SWITCH 1/2 CORRELATION (5.7L)



P0585-SPEED CONTROL SWITCH 1/2 CORRELATION (5.7L) (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  Cruise Switch inputs are not coherent with each other. Example: PCM is reading Switch No.1 as Accel and Switch No.2 as Coast at the same time. One trip fault.

Possible Causes
S/C SWITCH SIGNAL CIRCUITS SHORTED TO BATTERY VOLTAGE
RESISTANCE IN THE S/C SWITCH SIGNAL CIRCUITS
RESISTANCE IN THE (V937) SWITCH RETURN CIRCUIT
S/C SWITCH SIGNAL CIRCUITS SHORTED TO THE (V937) SWITCH RETURN CIRCUIT
(V37) S/C SWITCH NO.1 SIGNAL CIRCUIT SHORTED TO THE (V38) S/C SWITCH NO.2 SIGNAL CIRCUIT
S/C SWITCH SIGNAL CIRCUITS SHORTED TO GROUND
CLOCKSPRING
SPEED CONTROL ON/OFF SWITCH
SPEED CONTROL RESUME/ACCEL SWITCH
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

NOTE: This DTC may be the result of pressing two Speed Control Switch buttons simultaneously for more than 450 msec.

Ask the customer if it is possible that two buttons were pressed at the same time before this DTC set. If this is the case, no repair is necessary.

Is the DTC active a this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. SPEED CONTROL ON/OFF SWITCH

With the scan tool, monitor the Speed Control Switch voltage.

Disconnect the Speed Control On/Off Switch harness connector.

Did the voltage change to above 4.8 volts?

Yes >> Replace the Speed Control On/Off Switch.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

P0585-SPEED CONTROL SWITCH 1/2 CORRELATION (5.7L) (CONTINUED)

3. SPEED CONTROL RESUME/ACCEL SWITCH

With the scan tool, monitor the Speed Control Switch voltage.

Disconnect the Speed Control Resume/Accel Switch harness connector.

Did the voltage change to above 4.8 volts?

Yes >> Replace the Speed Control Resume/Accel Switch.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

---

4. SPEED CONTROL SWITCHES

Turn the ignition off.

Remove and disconnect the Speed Control Switches from the steering wheel per Service Information.

Measure the resistance across each Speed Control Switch.

Monitor the ohmmeter while pressing each function button on each switch.

The following resistance specs are taken between terminals (V38) S/C Switch No.2 Signal and (V937) S/C Switch Return circuits of the Switch when holding the switch button in the following position.

Not pressing any switch - 20.5 kohms

On/Off - 8.87 kohms

Set - 0.825 kohms

Coast - 0.47 kohms

Cancel - 3.92 kohms

Resume/Accel - 1.87 kohms

The following resistance specs are taken between terminals (V37) S/C Switch No.1 Signal and (V937) S/C Switch Return circuits of the Switch when holding the switch button in the following position

Not pressing any switch - 20.5 kohms

On/Off - 0.47 kohms

Set - 5.49 kohms

Coast - 2.94 kohms

Cancel - 1.24 kohms

Resume/Accel - 15.4 kohms

Does the function on the Speed Control Switches have the correct resistance value?

Yes >> Go To 5

No >> Replace the Speed Control Switch that had the incorrect resistance value.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0585-SPEED CONTROL SWITCH 1/2 CORRELATION (5.7L) (CONTINUED)

5. S/C SWITCH SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE

Disconnect the C3 PCM harness connector.

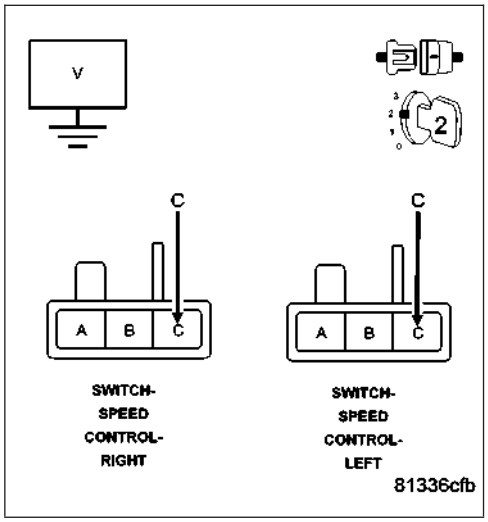
Measure the voltage on the (V37) and (V38) S/C Switch Signal circuits at both Speed Control harness connectors.

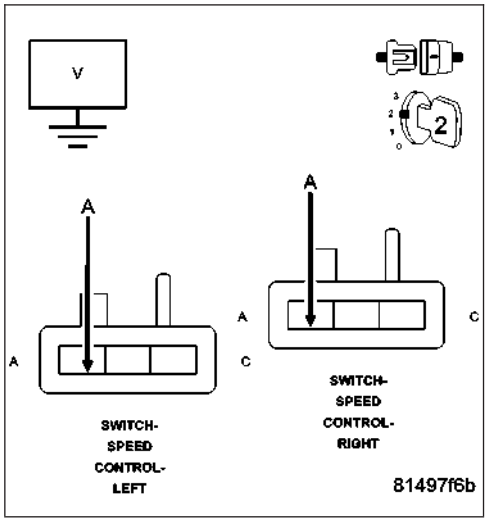
Is the voltage above 5.0 volts?

Yes >> Repair the short to battery voltage in the (V37) or (V38) S/C Switch Signal circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6





P0585-SPEED CONTROL SWITCH 1/2 CORRELATION (5.7L) (CONTINUED)

6. CLOCKSPRING

Turn the ignition off.

Disconnect the C1 and C3 Clockspring harness connectors per Service Information.

Measure the resistance of the (V37) and (V38) S/C Switch Signal circuits between the C1 and C3 Clockspring harness connectors.

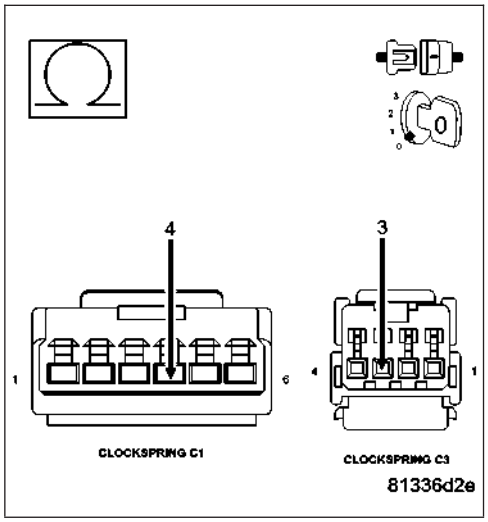
Measure the resistance of the (V937) Switch Return circuit between the C1 and C3 Clockspring harness connectors.

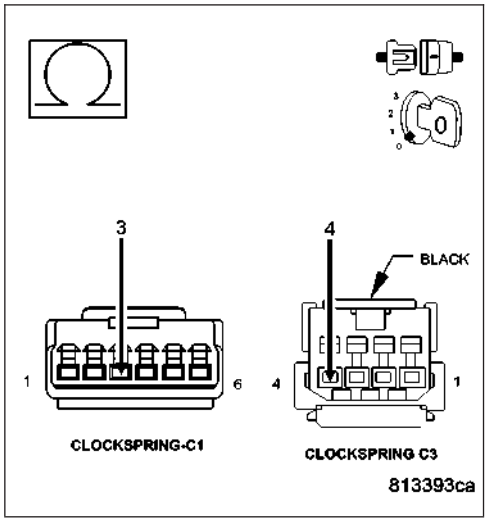
Is the resistance above 5.0 ohms?

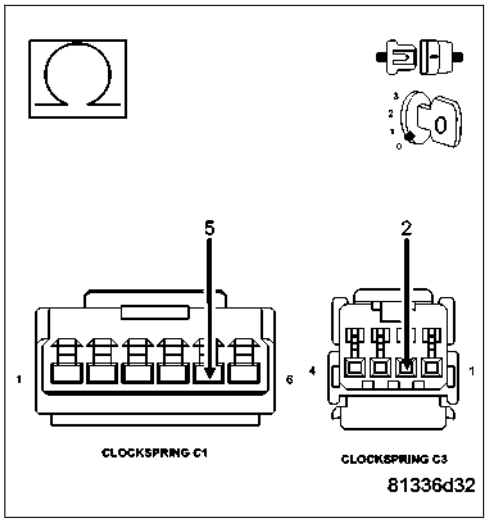
Yes >> Replace the Clockspring per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 7

NOTE: Connect the Clockspring harness connectors per Service Information before continuing.







P0585-SPEED CONTROL SWITCH 1/2 CORRELATION (5.7L) (CONTINUED)

7. S/C SWITCH SIGNAL CIRCUIT OPEN

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

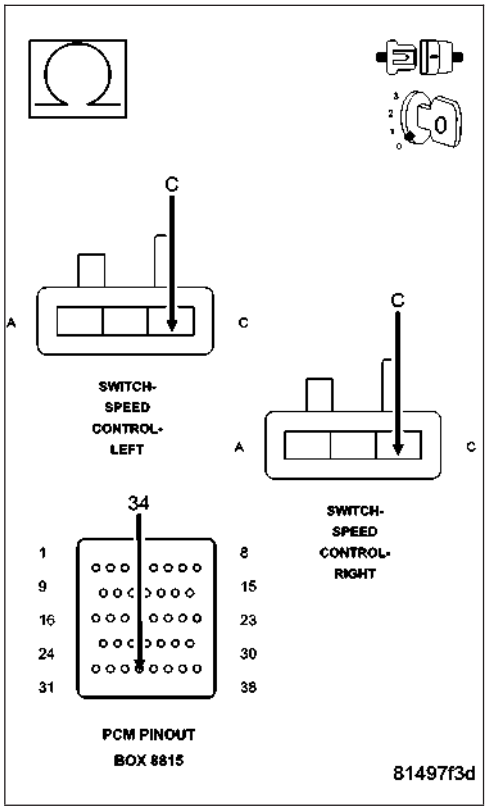
Measure the resistance of the (V37) and (V38) S/C Switch Signal circuits from both Speed Control harness connectors to the appropriate terminals of special tool #8815.

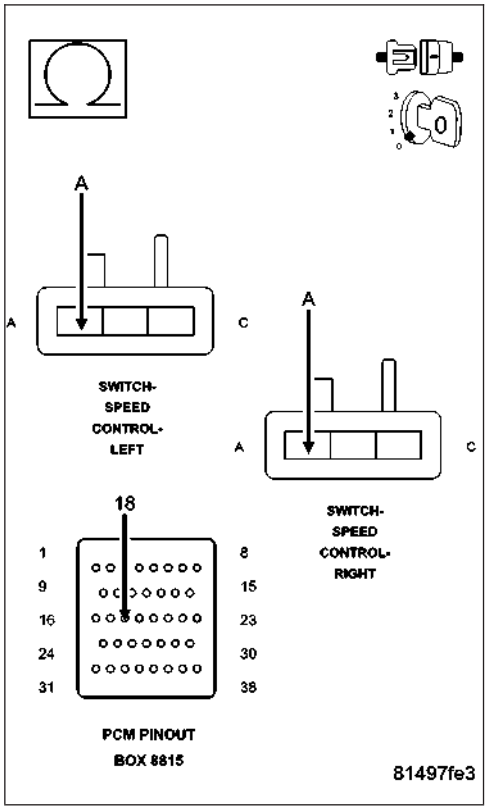
Is the resistance below 5.0 ohms for each measurement?

Yes >> Go To 8

No >> Repair the excessive resistance in the (V37) or (V38) S/C Switch Signal circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)





P0585-SPEED CONTROL SWITCH 1/2 CORRELATION (5.7L) (CONTINUED)

8. (V937) SWITCH RETURN CIRCUIT OPEN

NOTE: The measurement must be taken from both Speed Control Switch harness connectors.

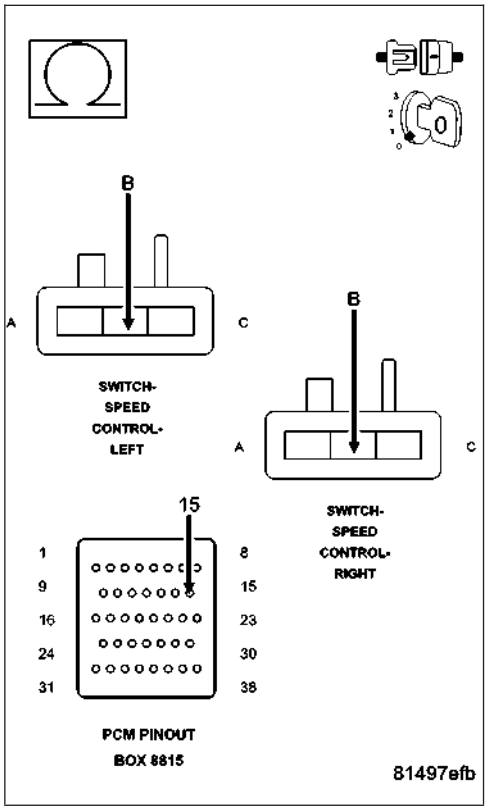
Measure the resistance of the (V937) Switch Return circuit from both Speed Control harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms for both measurements?

Yes >> Go To 9

No >> Repair the excessive resistance in the (V937) Switch Return circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P0585-SPEED CONTROL SWITCH 1/2 CORRELATION (5.7L) (CONTINUED)

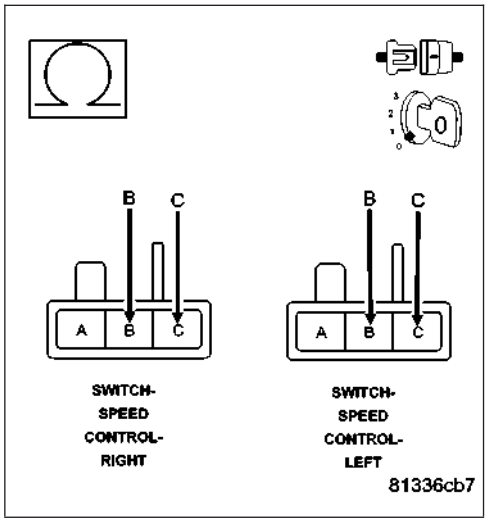
9. S/C SWITCH SIGNAL CIRCUITS SHORTED TO THE (V937) SWITCH RETURN CIRCUIT

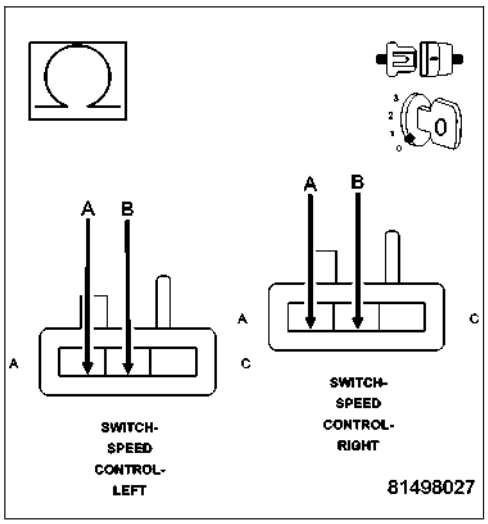
Measure the resistance between the (V937) Switch Return circuit and both of the (V37) and (V38) S/C Switch Signal circuits in the Speed Control harness connector.

Is the resistance below 5.0 ohms?

Yes >> Repair the short between the (V937) Switch Return circuit and the (V37) or (V38) S/C Switch Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 10





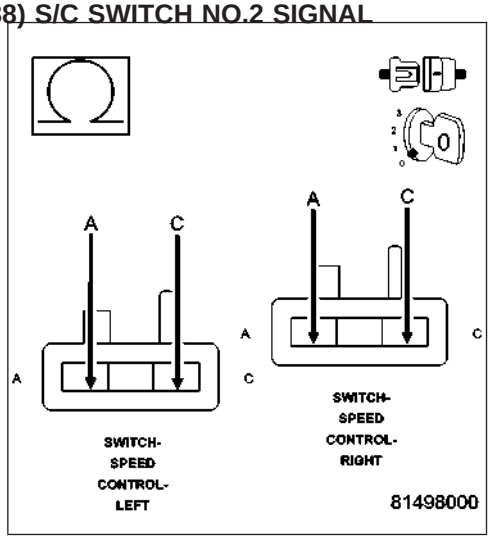
10. (V37) S/C SWITCH NO.1 SIGNAL CIRCUIT SHORTED TO THE (V38) S/C SWITCH NO.2 SIGNAL CIRCUIT

Measure the resistance between the (V37) S/C Switch No.1 Signal circuit and the (V38) S/C Switch No.2 Signal circuit at both Speed Control harness connectors.

Is the resistance below 100 ohms for each circuit?

Yes >> Repair the short between the (V38) S/C Switch No.2 Signal circuit and the (V37) S/C Switch No.1 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 11



P0585-SPEED CONTROL SWITCH 1/2 CORRELATION (5.7L) (CONTINUED)

11. S/C SWITCH SIGNAL CIRCUITS SHORTED TO GROUND

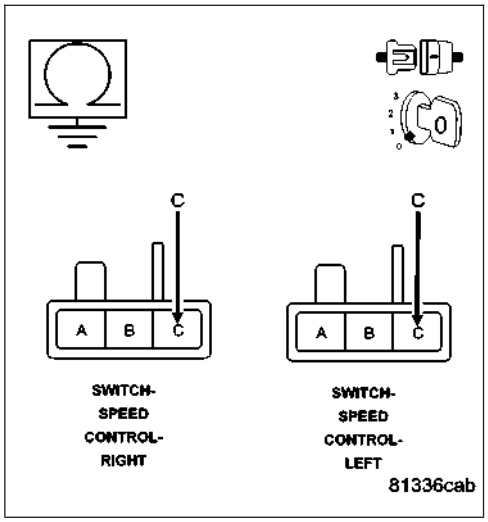
Measure the resistance between ground and the (V37) and (V38) S/C Switch Signal circuits at both Switch harness connectors.

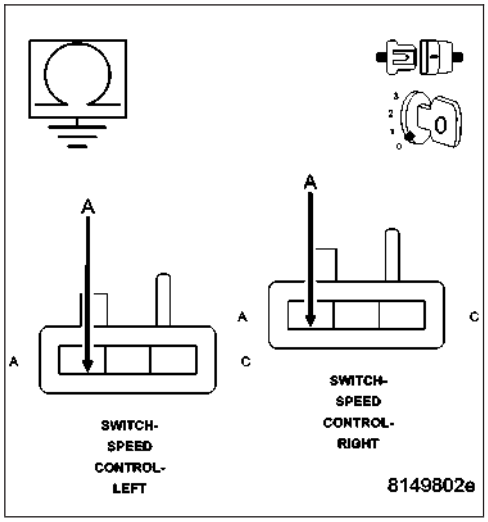
Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (V37) or (V38) S/C Switch Signal circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 12





P0585-SPEED CONTROL SWITCH 1/2 CORRELATION (5.7L) (CONTINUED)

12. SPEED CONTROL SWITCH VOLTAGE VALUES

Connect the C3 PCM harness connector and the S/C Switch harness connectors.

Allow the engine to idle.

With a scan tool, monitor the S/C Switch voltage readings.

SWITCH POSITION	SWITCH No.1 VOLTAGE VALUE	SWITCH No.2 VOLATGE VALUE
NO SWITCHES PRESSED	4.31 to 4.78 volts	4.31 to 4.78 volts
ON/OFF PRESSED	0.59 and 1.13 volts	3.53 and 3.92 volts
RES/ACCEL PRESSED	3.88 to 4.17 volts	2.04 to 2.47 volts
SET PRESSED	3.16 to 3.56 volts	1.17 to 1.56 volts
COAST PRESSED	2.57 to 2.94 volts	0.77 to 1.09 volts
CANCEL PRESSED	1.59 to 1.99 volts	2.84 to 3.25 volts

Take these same voltage measurements with a voltmeter by back probing the (V37) S/C Switch No.1 Signal circuit and the (V38) S/C Switch No.2 Signal circuit at the switches.

Compare the voltage readings on the voltmeter to what the scan tool displayed.

Are the voltage readings out of the listed specification and is there less than a 0.2 of a volt difference between the voltmeter switch values and the scan tool switch values?

Yes >> Replace the Speed Control Switch.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 13

---

13. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

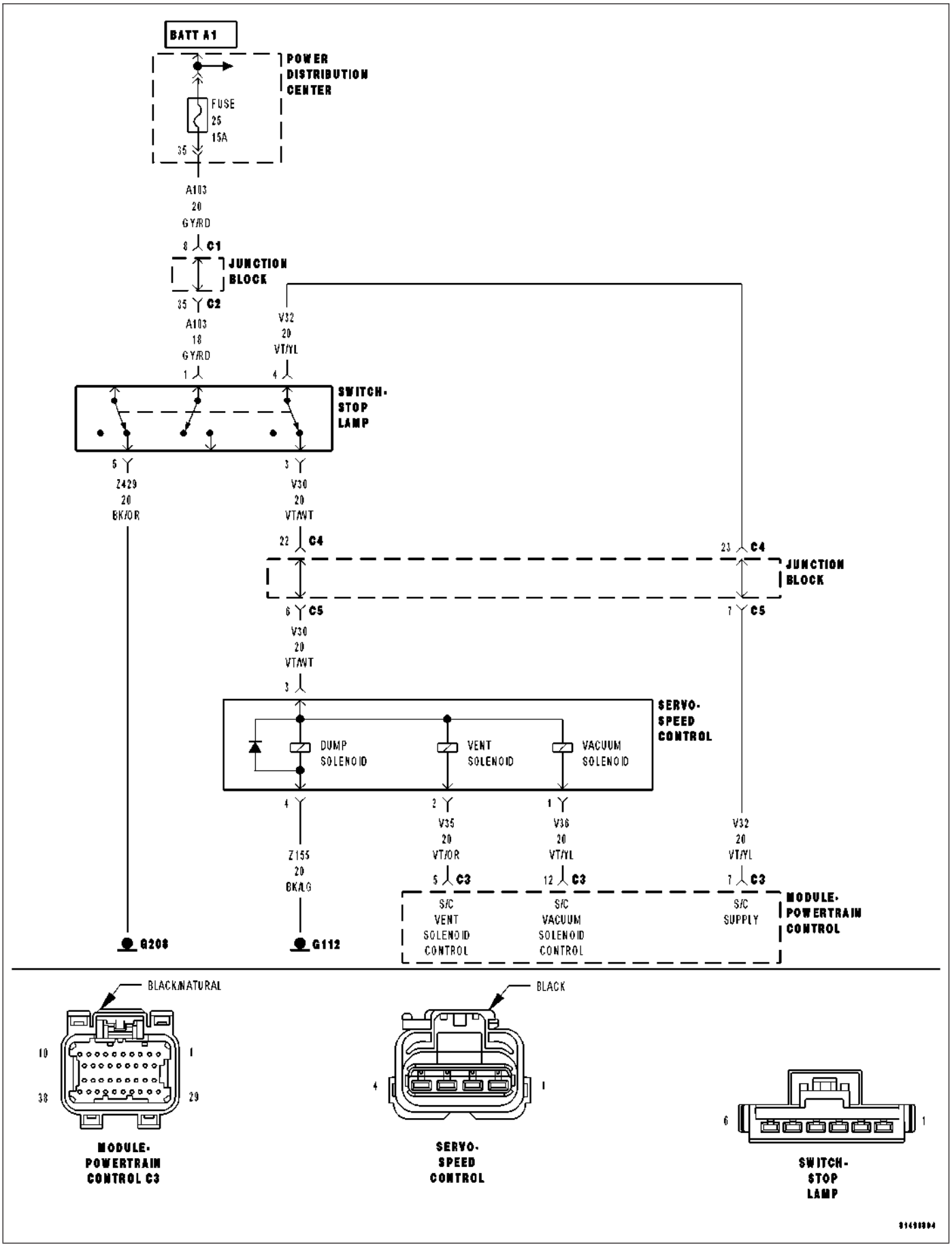
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0586-SPEED CONTROL VENT CONTROL CIRCUIT



P0586-SPEED CONTROL VENT CONTROL CIRCUIT (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on and battery voltage greater than 10 volts.
- **Set Condition:**
  An open or shorted condition detected in the Speed control vent solenoid control circuit. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(V32) S/C SUPPLY CIRCUIT OPEN
(V32) S/C SUPPLY SHORT TO GROUND
(V35) S/C VENT SOL CONTROL CIRCUIT SHORTED TO GROUND
(V35) S/C VENT SOL CONTROL CIRCUIT OPEN
(Z155) GROUND CIRCUIT OPEN
SPEED CONTROL VACUUM SOLENOID
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. SPEED CONTROL VENT CONTROL

Ignition on, engine not running.

With the scan tool, read DTCs and record the related Freeze Frame data.

With the scan tool, actuate the Speed Control Vent Solenoid and note operation.

Does the Speed Control Vacuum Solenoid actuate properly?

Yes >> Refer to the INTERMITTENT CONDITION symptom in the Driveability category.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 2

---

2. (V30) S/C BRAKE SWITCH OUTPUT CIRCUIT

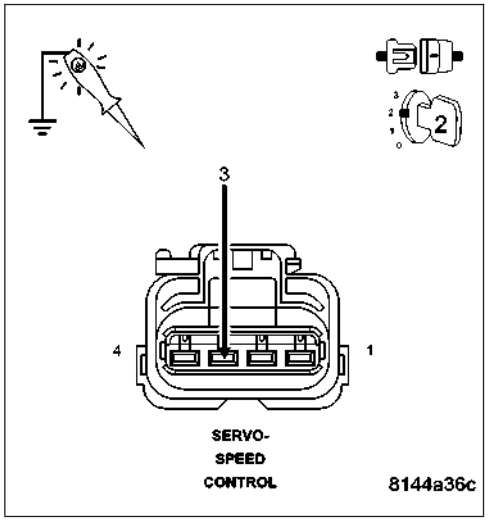
Turn the ignition off.

Disconnect the S/C Servo harness connector.

Ignition on, engine not running.

Using the scan tool, actuate the S/C Vent Solenoid.

Using a test light connected to ground, probe the (V30) S/C Brake Switch Output circuit in the S/C Servo harness connector.



Does the test light illuminate brightly and flash on and off?

Yes >> Go To 5

No >> Go To 3

P0586-SPEED CONTROL VENT CONTROL CIRCUIT (CONTINUED)

3. (V32) S/C SUPPLY CIRCUIT

Turn the ignition off.

Connect the S/C Servo harness connector.

Disconnect the Stop Lamp Switch harness connector.

Ignition on, engine not running.

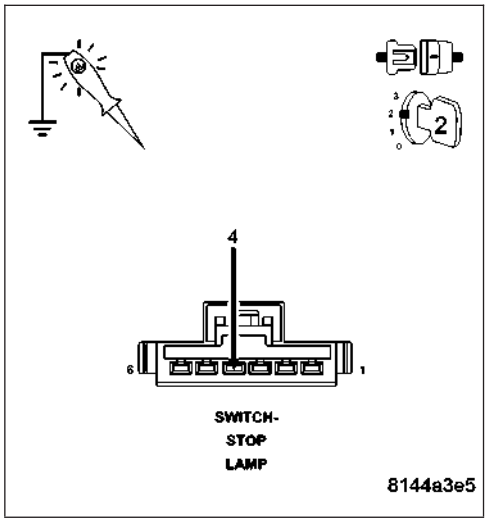
Using the scan tool, actuate the S/C Vent Solenoid.

Using a test light connected to ground, probe the (V32) S/C Supply circuit in the Stop Lamp Switch harness connector.

Does the test light illuminate brightly?

Yes >> Go To 4

No >> Go To 8



4. (Z155) S/C GROUND CIRCUIT OPEN

Turn the ignition off.

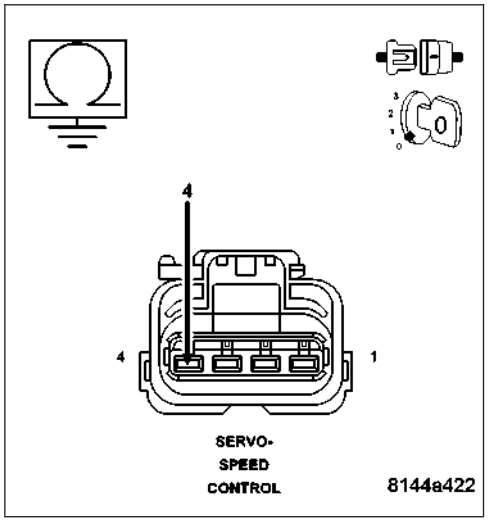
Disconnect the S/C Servo harness connector.

Measure the resistance of the (Z155) S/C Ground circuit at the S/C Servo harness connector to ground.

Is the resistance below 5.0 ohms?

Yes >> Go To 5

No >> Repair the open in the (Z155) S/C Ground circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



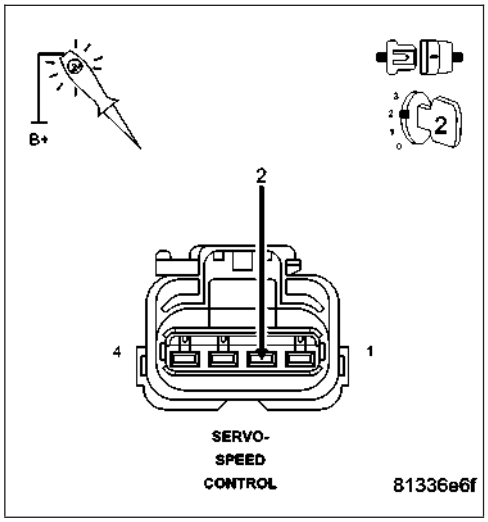
P0586-SPEED CONTROL VENT CONTROL CIRCUIT (CONTINUED)

5. SPEED CONTROL VENT SOLENOID

Ignition on, engine not running.

With the scan tool, actuate the Speed Control Vent Solenoid.

Using a 12-volt test light connected to battery voltage, probe the (V36) S/C Vent Control circuit.



Does the test light illuminate brightly and flash on and off?

Yes >> Replace the Speed Control Servo.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6

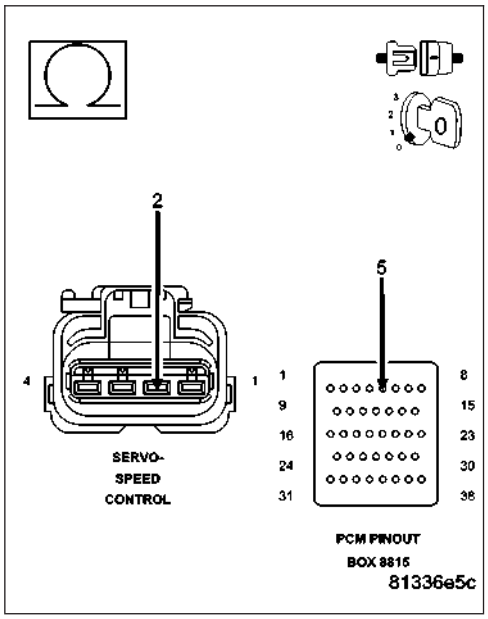
6. (V35) S/C VENT CONTROL CIRCUIT OPEN

Turn the ignition off.

Disconnect the C3 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (V35) S/C Vent Sol Control circuit from the Speed Control Servo harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

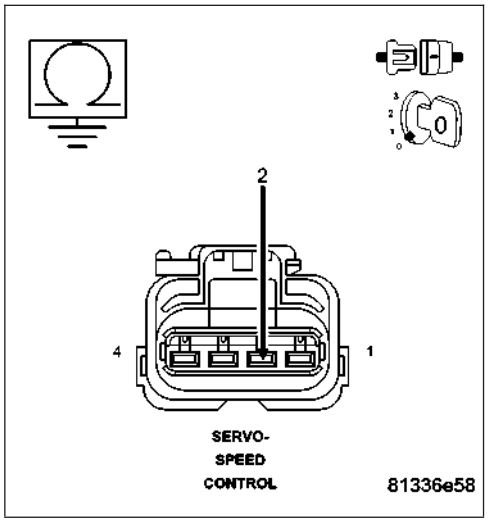
Yes >> Go To 7

No >> Repair the open/high resistance in the (V35) S/C Vent Sol Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0586-SPEED CONTROL VENT CONTROL CIRCUIT (CONTINUED)

7. (V35) SPEED CONTROL VENT SOLENOID CONTROL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (V35) S/C Vent Solenoid Control circuit at the Speed Control Servo harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (V35) S/C Vent Sol Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 10

---

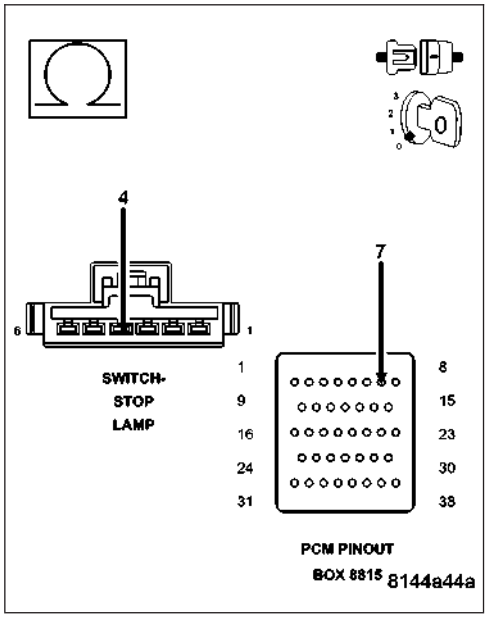
8. (V32) S/C SUPPLY OPEN

Turn the ignition off.

Disconnect the C3 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (V32) S/C Supply circuit from the Stop Lamp Switch harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

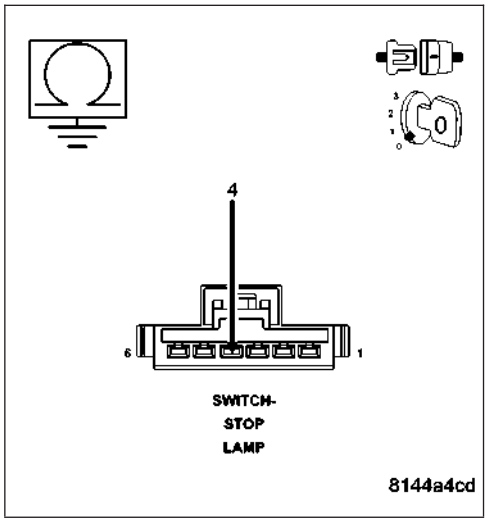
Yes >> Go To 9

No >> Repair the open/high resistance in the (V32) S/C Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0586-SPEED CONTROL VENT CONTROL CIRCUIT (CONTINUED)

9. (V32) S/C SUPPLY CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (V32) S/C Supply circuit at the Speed Control Servo harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (V32) S/C Supply circuit. Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 10

10. PCM

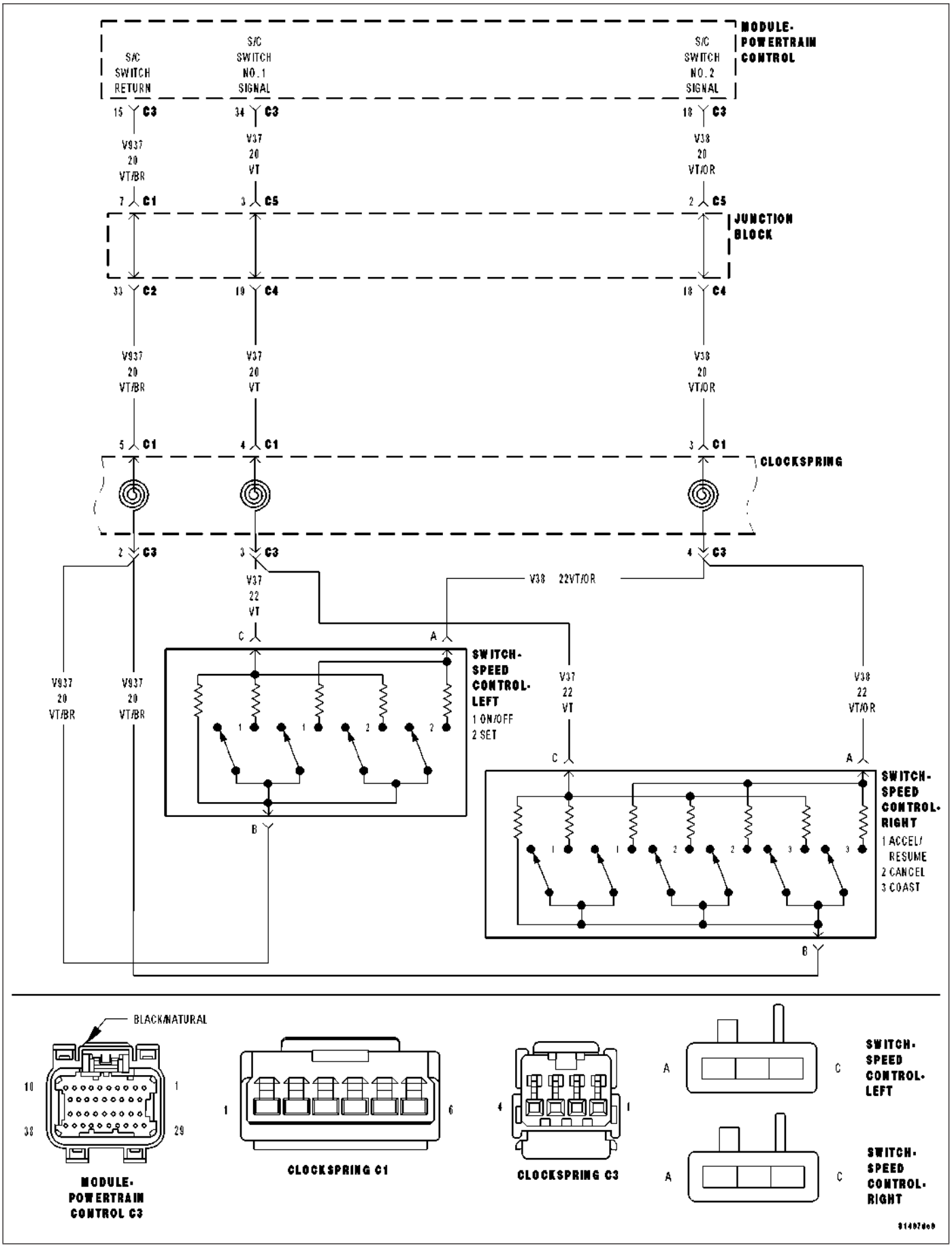
NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0591-SPEED CONTROL SWITCH 2 PERFORMANCE



P0591-SPEED CONTROL SWITCH 2 PERFORMANCE (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition key on.
- **Set Condition:**
  Cruise switch voltage output is not out of range but it does not equal any of the values for any of the button positions.

Possible Causes
(V38) S/C SWITCH NO.2 SIGNAL CIRCUIT OPEN
(V38) S/C SWITCH NO.2 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(V937) SWITCH RETURN CIRCUIT OPEN
(V38) S/C SWITCH NO.2 SIGNAL CIRCUIT SHORTED TO GROUND
(V38) S/C SWITCH NO.2 SIGNAL CIRCUIT SHORTED TO THE (V937) SWITCH RETURN CIRCUIT
SPEED CONTROL SWITCH
CLOCKSPRING
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. SPEED CONTROL SWITCH STATUS

Start the engine.
With a scan tool, monitor each which function for the Speed Control Switches.
Press and release each Speed Control Button.
- Resume/Accel
- Cancel
- Decel (Coast)
- On/Off
- Set

Does each switch function change status when pressing and then depressing each switch?

Yes >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 2

P0591-SPEED CONTROL SWITCH 2 PERFORMANCE (CONTINUED)

2. SPEED CONTROL SWITCHES

Turn the ignition off.

Remove the Speed Control Switches from the steering wheel.

Measure the resistance across each Speed Control Switch.

Monitor the ohmmeter while pressing each function button on each switch.

The following resistance specs are taken between terminals (V38) S/C Switch No.2 Signal and (V937) S/C Switch Return circuits of the Switch when holding the switch button in the following position.

Not pressing any switch - 20.5 kohms

On/Off - 8.87 kohms

Set - 0.825 kohms

Coast - 0.47 kohms

Cancel - 3.92 kohms

Resume/Accel - 1.87 kohms

The following resistance specs are taken between terminals (V37) S/C Switch No.1 Signal and (V937) S/C Switch Return circuits of the Switch when holding the switch button in the following position

Not pressing any switch - 20.5 kohms

On/Off - 0.47 kohms

Set - 5.49 kohms

Coast - 2.94 kohms

Cancel - 1.24 kohms

Resume/Accel - 15.4 kohms

Does the function on the Speed Control Switches have the correct resistance value?

Yes >> Go To 3

No >> Replace the Speed Control Switch that had the incorrect resistance value.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

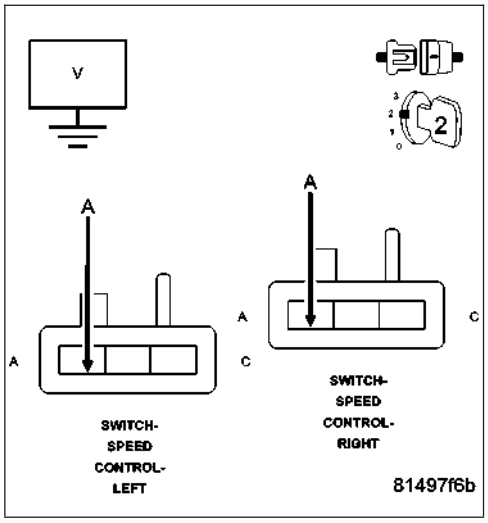
---

3. (V38) S/C SWITCH NO.2 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE

Disconnect the C3 PCM harness connector.

Ignition on, engine not running.

Measure the voltage of the (V38) S/C Switch No.2 Signal circuit in the S/C Switch harness connector.



Is the voltage above 5.0 volts?

Yes >> Repair the short to battery voltage in the (V38) S/C Switch No.2 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

P0591-SPEED CONTROL SWITCH 2 PERFORMANCE (CONTINUED)

4. CLOCKSPRING

Turn the ignition off.

Disconnect the C1 and C3 Clockspring harness connectors per Service Information.

Measure the resistance of the (V38) S/C Switch No.2 Signal circuit between the C1 and C3 Clockspring harness connectors.

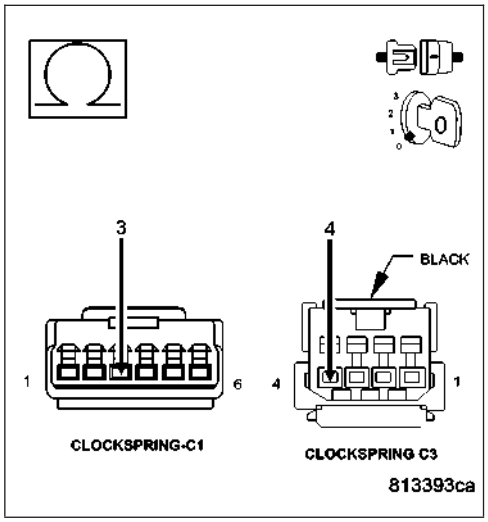
Measure the resistance of the (V937) Switch Return circuit between the C1 and C3 Clockspring harness connectors.

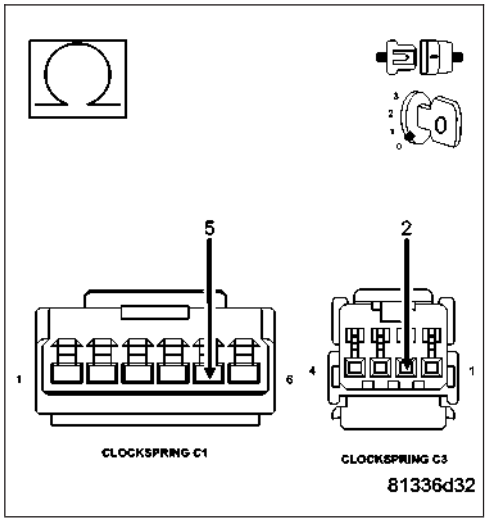
Is the resistance above 5.0 ohms?

Yes >> Replace the Clockspring per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

NOTE: Connect the Clockspring harness connectors per Service Information before continuing.





P0591-SPEED CONTROL SWITCH 2 PERFORMANCE (CONTINUED)

5. (V38) S/C SWITCH NO.2 SIGNAL CIRCUIT OPEN

Turn the ignition off.

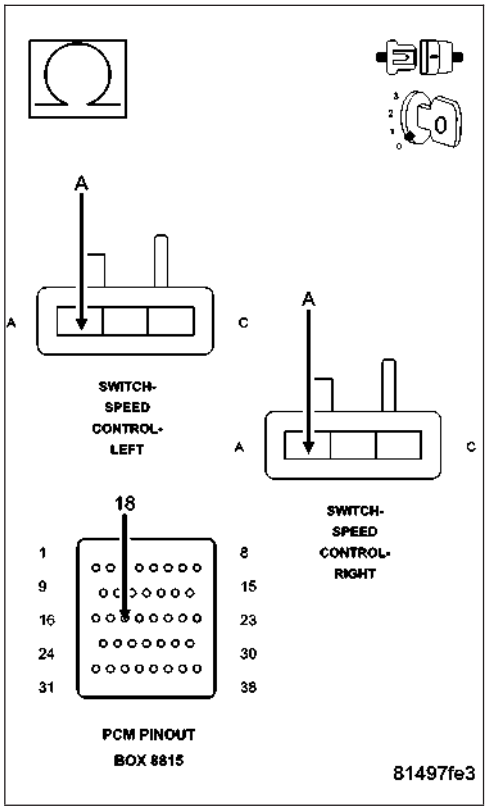
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (V38) S/C Switch No.2 Signal circuit from both Speed Control harness connectors to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms for both measurements?

Yes >> Go To 6

No >> Repair the open in the (V38) S/C Switch No.2 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



6. (V937) SWITCH RETURN OPEN

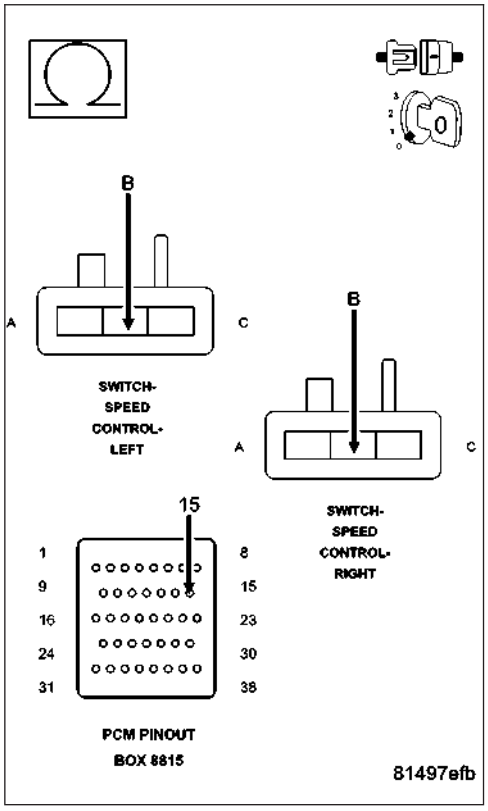
NOTE: The measurement must be taken from both Speed Control Switch harness connectors.

Measure the resistance of the (V937) Switch Return circuit from the Speed Control harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms for both measurement?

Yes >> Go To 7

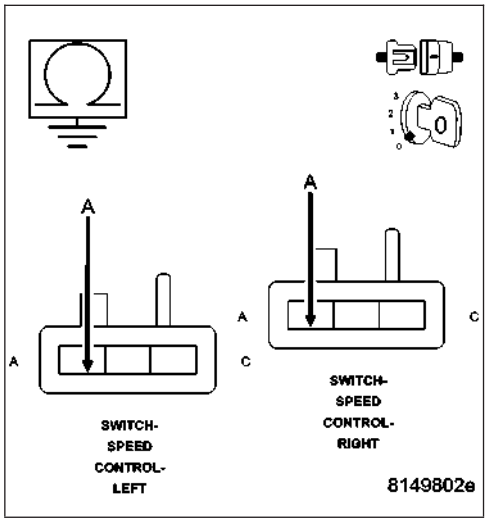
No >> Repair the open in the (V937) Switch Return circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P0591-SPEED CONTROL SWITCH 2 PERFORMANCE (CONTINUED)

7. (V38) S/C SWITCH NO.2 SIGNAL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (V38) S/C Switch No.2 Signal circuit in the Speed Control harness connector.



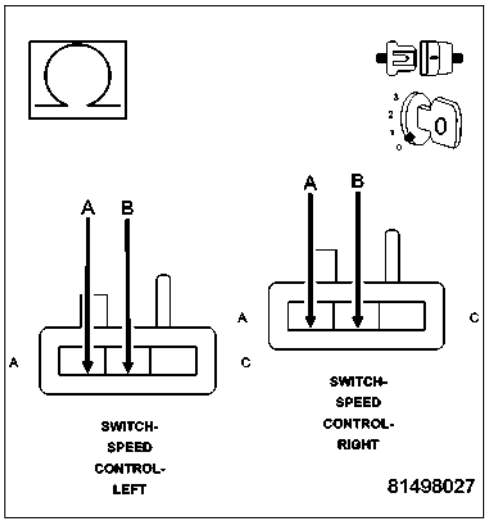
Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (V38) S/C Switch No.2 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8

8. (V38) S/C SWITCH NO.2 SIGNAL CIRCUIT SHORTED TO THE (V937) SWITCH RETURN CIRCUIT

Measure the resistance between the (V38) S/C Switch No.2 Signal circuit and the (V937) Switch Return circuit in the Speed Control harness connector.



Is the resistance below 5.0 ohms?

Yes >> Repair the short between the (V38) S/C Switch No.2 Signal circuit and the (V937) Switch Return circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 9

P0591-SPEED CONTROL SWITCH 2 PERFORMANCE (CONTINUED)

9. SPEED CONTROL SWITCH VOLTAGE VALUES

Connect the C3 PCM harness connector and the S/C Switch harness connectors.

Allow the engine to idle.

With a scan tool, monitor the S/C Switch voltage readings.

SWITCH POSITION	SWITCH No.1 VOLTAGE VALUE	SWITCH No.2 VOLATGE VALUE
NO SWITCHES PRESSED	4.31 to 4.78 volts	4.31 to 4.78 volts
ON/OFF PRESSED	0.59 and 1.13 volts	3.53 and 3.92 volts
RES/ACCEL PRESSED	3.88 to 4.17 volts	2.04 to 2.47 volts
SET PRESSED	3.16 to 3.56 volts	1.17 to 1.56 volts
COAST PRESSED	2.57 to 2.94 volts	0.77 to 1.09 volts
CANCEL PRESSED	1.59 to 1.99 volts	2.84 to 3.25 volts

Take these same voltage measurements with a voltmeter by back probing the (V37) S/C Switch No.1 Signal circuit and the (V38) S/C Switch No.2 Signal circuit at the switches.

Compare the voltage readings on the voltmeter to what the scan tool displayed.

Are the voltage readings out of the listed specification and is there less than a 0.2 of a volt difference between the voltmeter switch values and the scan tool switch values?

Yes >> Replace the Speed Control Switch.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 10

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10. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

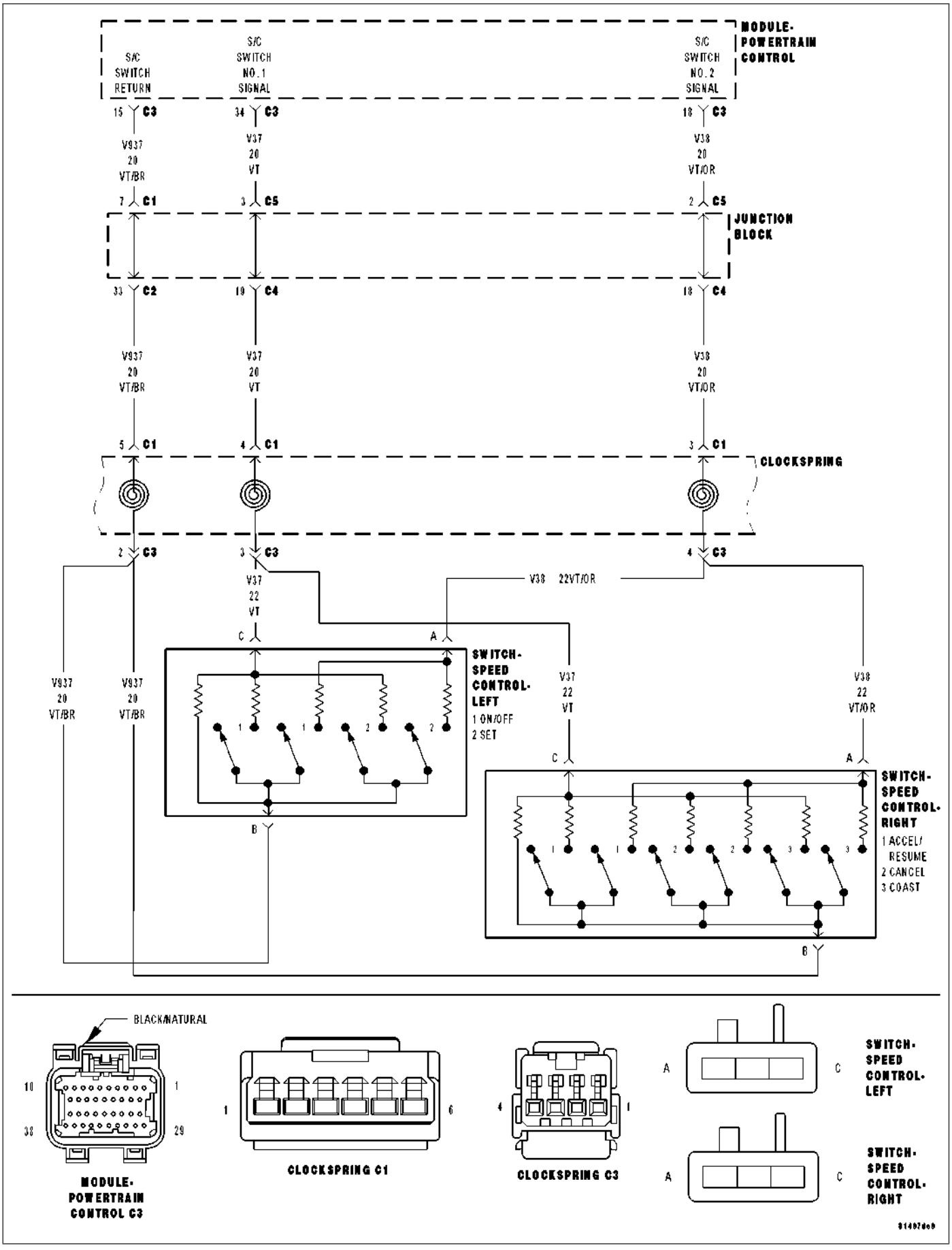
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0592-SPEED CONTROL SWITCH 2 CIRCUIT LOW



P0592-SPEED CONTROL SWITCH 2 CIRCUIT LOW (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition key on.
- **Set Condition:**
  Speed control switch input No.2 is below the minimum acceptable voltage at the PCM. One trip fault.

Possible Causes
(V38) S/C SWITCH NO.2 SIGNAL CIRCUIT SHORTED TO GROUND
(V38) S/C SWITCH NO.2 SIGNAL CIRCUIT SHORTED TO THE (V937) SWITCH RETURN CIRCUIT
CLOCKSPRING
SPEED CONTROL RESUME/ACCEL SWITCH
SPEED CONTROL ON/OFF SWITCH
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. SPEED CONTROL SWITCH VOLTAGE LOW

NOTE: Do not press any of the Speed Control Switch buttons.
Ignition on, engine not running.
With a scan tool, read the Speed Control voltage.

Is the Speed Control voltage below 1.0 volt?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

2. SPEED CONTROL ON/OFF SWITCH

With the scan tool, monitor the Speed Control Switch voltage.
Disconnect the Speed Control On/Off Switch harness connector.

Did the voltage change to above 4.7 volts?

Yes >> Replace the Speed Control On/Off Switch.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

3. SPEED CONTROL RESUME/ACCEL SWITCH

With the scan tool, monitor the Speed Control Switch voltage.
Disconnect the Speed Control Resume/Accel Switch harness connector.

Did the voltage change to above 4.7 volts?

Yes >> Replace the Speed Control Resume/Accel Switch.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

P0592-SPEED CONTROL SWITCH 2 CIRCUIT LOW (CONTINUED)

4. CLOCKSPRING

Turn the ignition off.
Disconnect the C1 Clockspring harness connector per Service Information.
Ignition on, engine not running.
With the scan tool, read the S/C Switch voltage.

Did the S/C Switch volts change to 5.0 volts?

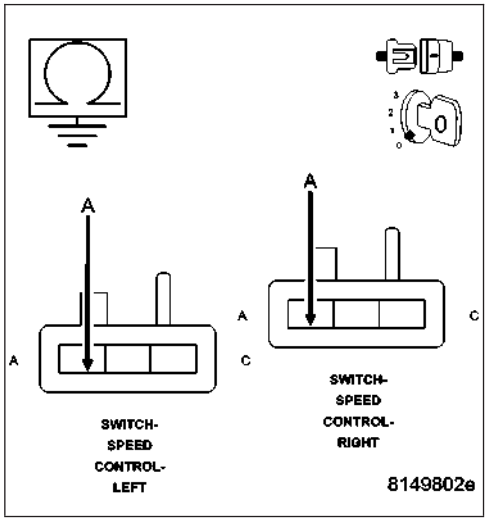
Yes >> Replace the Clockspring.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

5. (V38) S/C SWITCH NO.2 SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.
Connect the Clockspring harness connectors per Service Information.
Disconnect the C3 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.
Measure the resistance between ground and the (V38) S/C Switch No.2 Signal circuit to the appropriate terminal of special tool #8815.



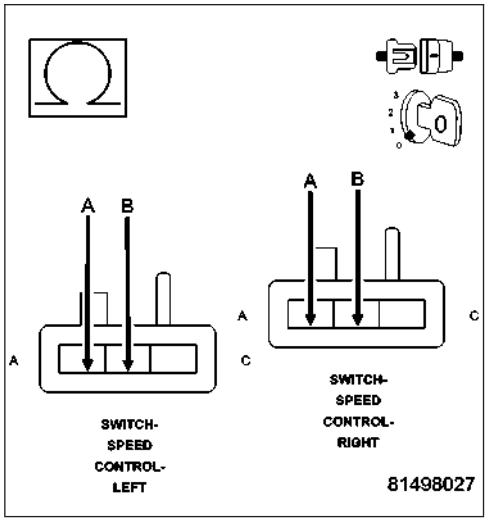
Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (V38) S/C Switch No.2 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6

6. (V38) S/C SWITCH NO.2 SIGNAL CIRCUIT SHORTED TO THE (V937) SWITCH RETURN CIRCUIT

Measure the resistance between the (V937) Switch Return circuit and the (V38) S/C Switch No.2 Signal circuit in the Speed Control Switch.



Is the resistance below 5.0 ohms?

Yes >> Repair the short between the (V38) S/C Switch No.2 Signal circuit and the (V937) Switch Return circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 7

P0592-SPEED CONTROL SWITCH 2 CIRCUIT LOW (CONTINUED)

7. SPEED CONTROL SWITCH VOLTAGE VALUES

Connect the C3 PCM harness connector and the S/C Switch harness connectors.

Allow the engine to idle.

With a scan tool, monitor the S/C Switch voltage readings.

SWITCH POSITION	SWITCH No.1 VOLTAGE VALUE	SWITCH No.2 VOLATGE VALUE
NO SWITCHES PRESSED	4.31 to 4.78 volts	4.31 to 4.78 volts
ON/OFF PRESSED	0.59 and 1.13 volts	3.53 and 3.92 volts
RES/ACCEL PRESSED	3.88 to 4.17 volts	2.04 to 2.47 volts
SET PRESSED	3.16 to 3.56 volts	1.17 to 1.56 volts
COAST PRESSED	2.57 to 2.94 volts	0.77 to 1.09 volts
CANCEL PRESSED	1.59 to 1.99 volts	2.84 to 3.25 volts

Take these same voltage measurements with a voltmeter by back probing the (V38) S/C Switch No.2 Signal circuit at the switches.

Compare the voltage readings on the voltmeter to what the scan tool displayed.

Are the voltage readings out of the listed specification and is there less than a 0.2 of a volt difference between the voltmeter switch values and the scan tool switch values?

Yes >> Replace the Speed Control Switch.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8

---

8. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

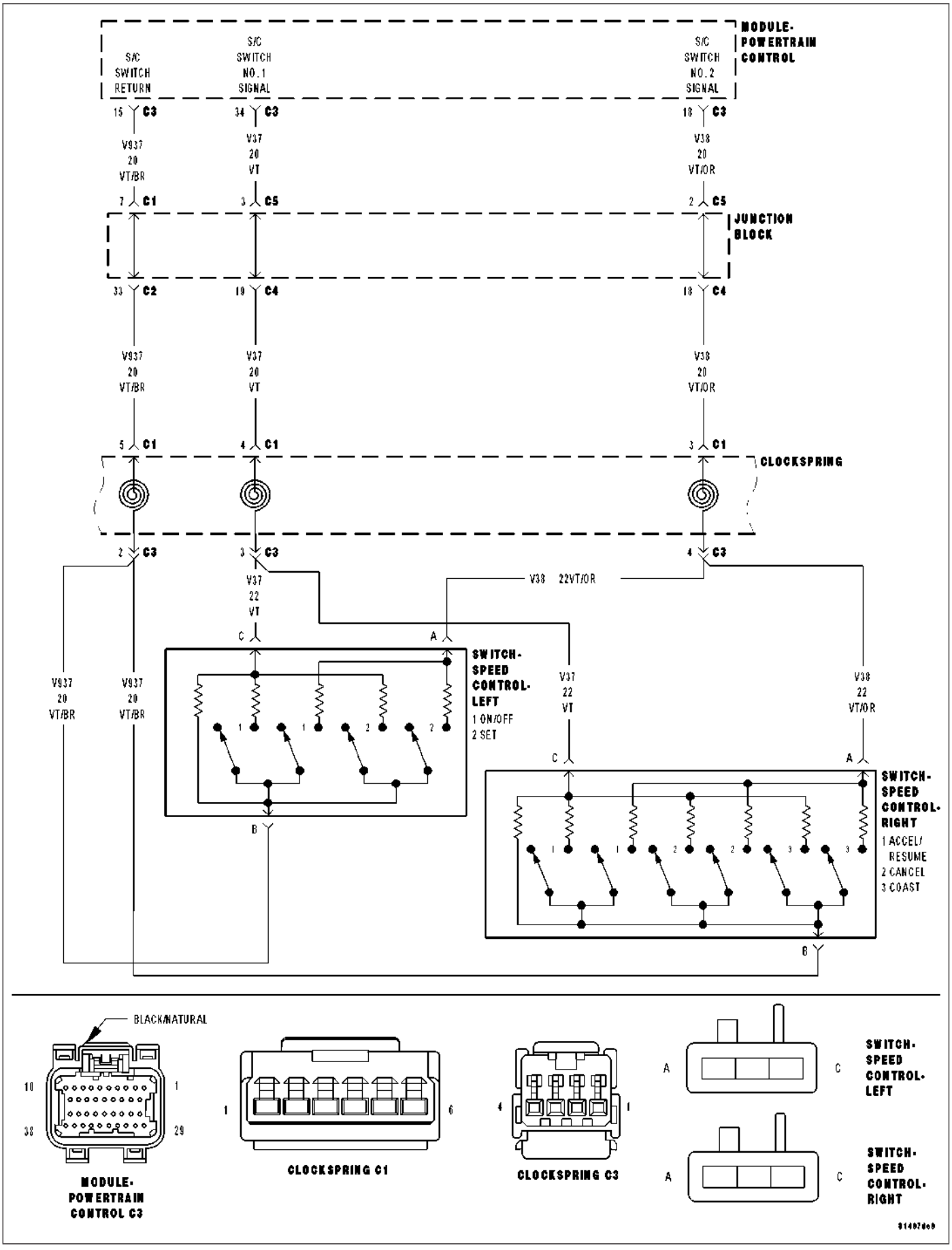
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0593-SPEED CONTROL SWITCH 2 CIRCUIT HIGH



P0593-SPEED CONTROL SWITCH 2 CIRCUIT HIGH (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition key on.
- **Set Condition:**
  Speed Control Switch No.2 input above the maximum acceptable voltage at the PCM. One trip fault.

Possible Causes
(V38) S/C SIGNAL NO.2 CIRCUIT SHORTED TO VOLTAGE
(V38) S/C SWITCH NO.2 SIGNAL CIRCUIT OPEN BETWEEN THE PCM AND CLOCKSPRING
(V937) SWITCH RETURN CIRCUIT OPEN BETWEEN PCM AND CLOCKSPRING
(V38) S/C SWITCH NO.2 SIGNAL CIRCUIT OPEN BETWEEN THE CLOCKSPRING AND S/C SWITCH
(V937) SWITCH RETURN CIRCUIT OPEN BETWEEN CLOCKSPRING AND S/C SWITCH
CLOCKSPRING
SPEED CONTROL SWITCH
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. SPEED CONTROL SWITCH VOLTAGE HIGH

NOTE: Do not press any of the Speed Control Switch buttons.
Ignition on, engine not running.
With a scan tool, read the Speed Control voltage.

Is the Speed Control voltage above 4.8 volts?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0593-SPEED CONTROL SWITCH 2 CIRCUIT HIGH (CONTINUED)

2. SPEED CONTROL SWITCHES

Disconnect and remove the Speed Control Switches from the steering wheel.

Measure the resistance across each Speed Control Switch.

Monitor the ohmmeter while pressing each function button on each switch.

The following resistance specs are taken between terminals (V38) S/C Switch No.2 Signal and (V937) S/C Switch Return circuits of the Switch when holding the switch button in the following position.

Not pressing any switch - 20.5 kohms

On/Off - 8.87 kohms

Set - 0.825 kohms

Coast - 0.47 kohms

Cancel - 3.92 kohms

Resume/Accel - 1.87 kohms

Does the function on the Speed Control Switches have the correct resistance value?

Yes >> Go To 3

No >> Replace the Speed Control Switch that had the incorrect resistance value.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0593-SPEED CONTROL SWITCH 2 CIRCUIT HIGH (CONTINUED)

3. CLOCKSPRING

Disconnect the C1 and C3 Clockspring harness connectors per Service Information.

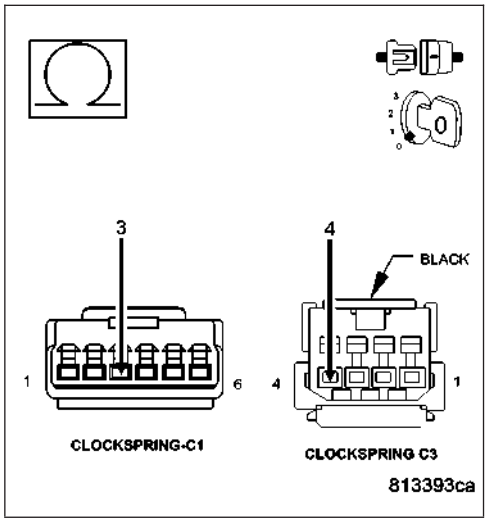
Measure the resistance of the (V937) Switch Return circuit between the upper and lower clockspring harness connectors.

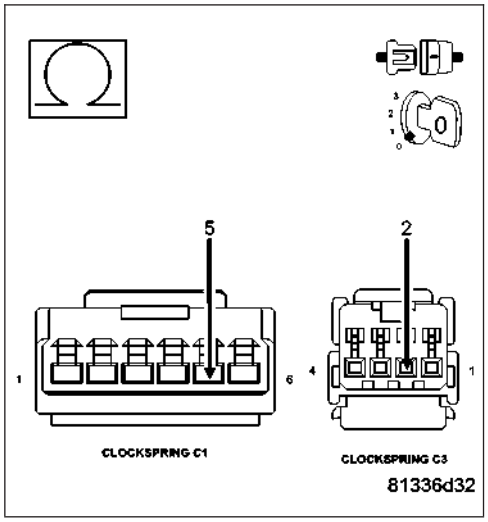
Measure the resistance of the (V38) S/C Switch No.2 Signal circuit between the C1 and C3 Clockspring harness connectors.

Was the resistance above 5.0 ohms for either circuit?

Yes >> Replace the clockspring.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4





4. (V38) SIGNAL NO.2 CIRCUIT SHORTED TO BATTERY VOLTAGE

Connect the C1 and C3 Clockspring harness connectors per Service Information.

Disconnect the C3 PCM harness connector.

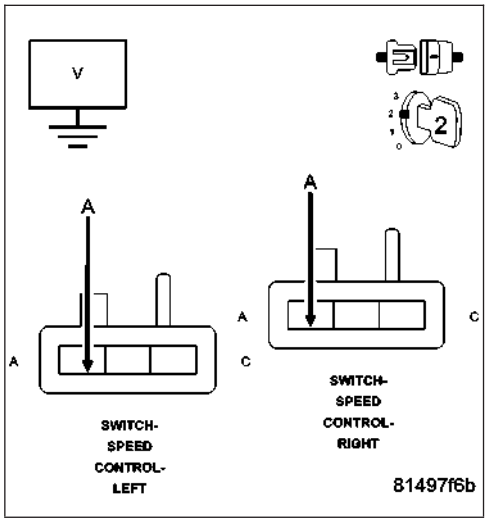
Measure the voltage on the (V38) S/C Signal No.2 circuit in the Speed Control harness connector.

Ignition on, engine not running.

Is the voltage above 5.2 volts?

Yes >> Repair the short to battery voltage in the (V38) S/C Signal No.2 circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5



P0593-SPEED CONTROL SWITCH 2 CIRCUIT HIGH (CONTINUED)

5. (V38) S/C SWITCH NO.2 SIGNAL CIRCUIT OPEN

Turn the ignition off.

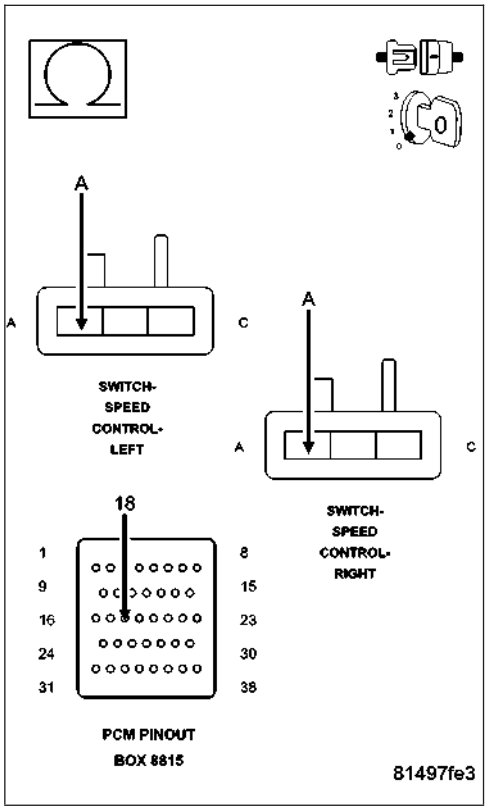
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (V38) S/C Switch No.2 Signal circuit from the both Switch harness connectors to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 6

No >> Repair the open in the (V38) S/C Switch No.2 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



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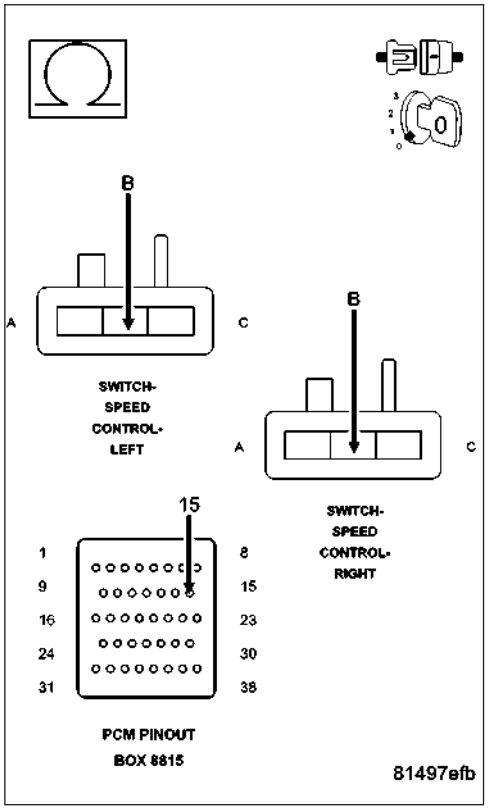
6. (V937) SWITCH RETURN CIRCUIT OPEN

Measure the resistance of the (V937) Switch Return circuit from the both Switch harness connectors to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 7

No >> Repair the open in the (V937) Switch Return circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P0593-SPEED CONTROL SWITCH 2 CIRCUIT HIGH (CONTINUED)

7. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

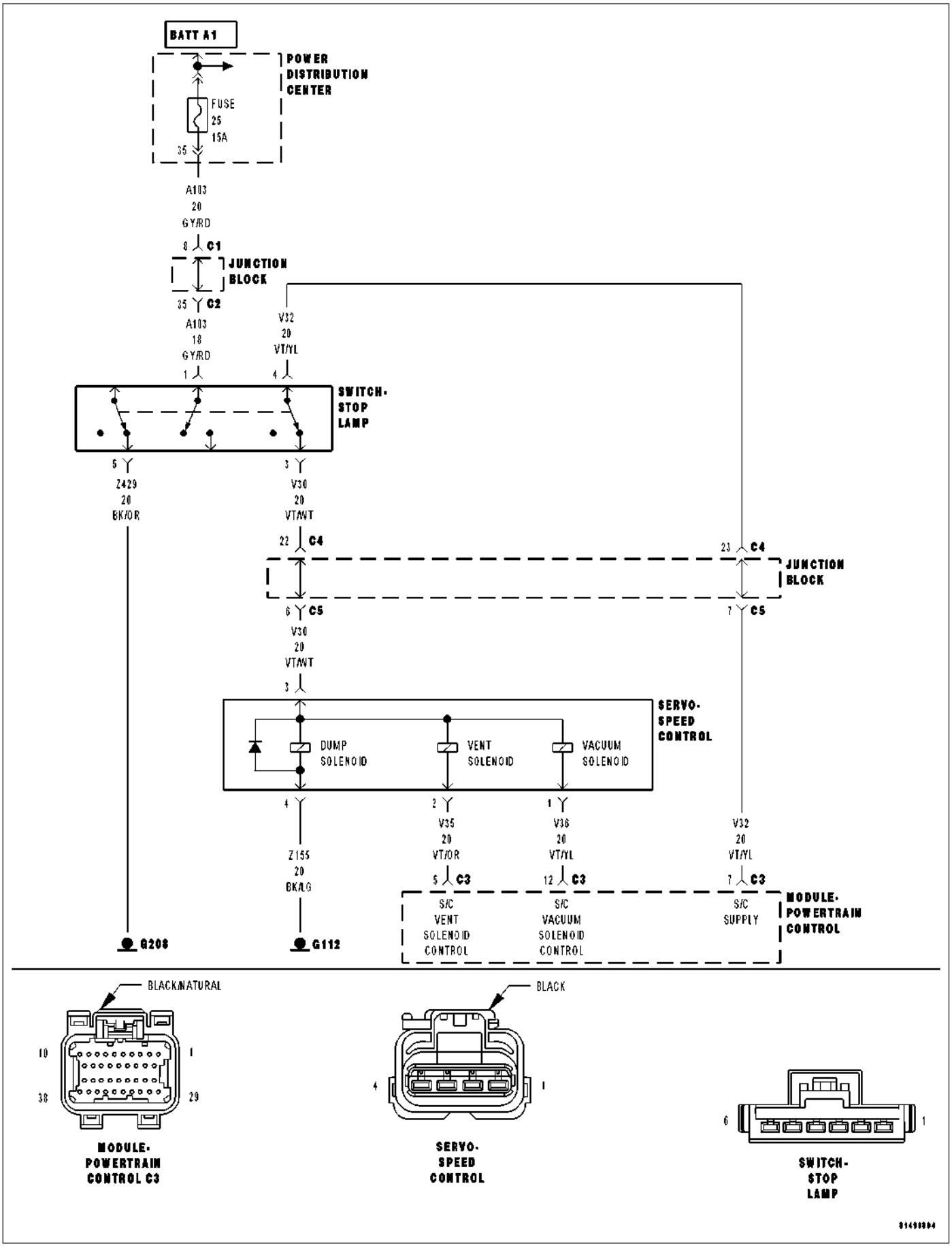
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0594-SPEED CONTROL SERVO POWER RELAY CIRCUIT



P0594-SPEED CONTROL SERVO POWER RELAY CIRCUIT (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition key on. The speed control switched on.
- **Set Condition:**
  The speed control power supply circuit is either open or shorted to ground for more than 2.6 seconds. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(V32) S/C SUPPLY CIRCUIT OPEN
(V32) S/C SUPPLY CIRCUIT SHORTED TO GROUND
(V30) S/C BRAKE SWITCH OUTPUT CIRCUIT OPEN
(V30) S/C BRAKE SWITCH OUTPUT CIRCUIT SHORTED TO GROUND
STOP LAMP SWITCH
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: If this code is setting on a vehicle that doesn't have a S/C Servo, flash the correct code into the PCM or the wrong PCM may have previously been installed.

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

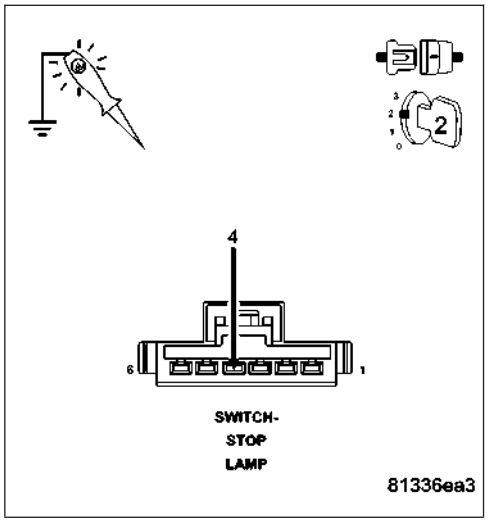
---

2. (V32) S/C SUPPLY CIRCUIT

Turn the ignition off.

Disconnect the Stop Lamp Switch harness connector.

Using a 12-volt test light connected to ground, probe the (V32) S/C Supply circuit in the Switch harness connector while holding the Cruise Switch in the ON position.



Does the test light illuminate brightly?

Yes >> Go To 3

No >> Go To 7

P0594-SPEED CONTROL SERVO POWER RELAY CIRCUIT (CONTINUED)

3. STOP LAMP SWITCH

Disconnect and remove the Stop Lamp Switch.

Measure the resistance across the (V32) S/C Supply circuit terminal and the (V30) S/C Brake Switch Output circuit terminal in the Stop Lamp Switch.

Push the Plunger of the Switch in and let it out.

Does the resistance change from below 5.0 ohms to an open circuit?

Yes >> Go To 4

No >> Replace the Stop Lamp Switch.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

4. (V30) S/C BRAKE SWITCH OUTPUT

Turn the ignition off.

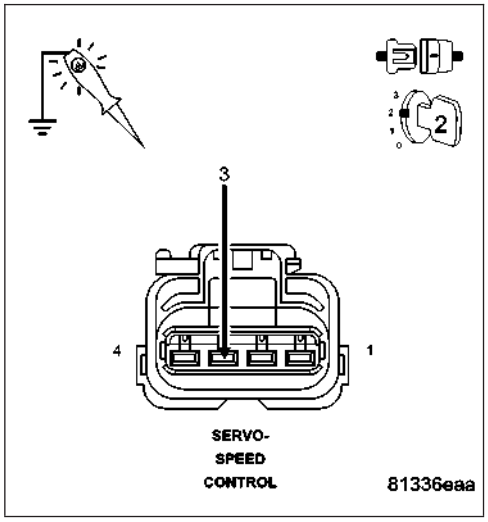
Connect the Stop Lamp Switch harness connector and install the Switch.

Disconnect the Speed Control Servo harness connector.

Ignition on, engine not running.

NOTE: It is necessary to PRESS and HOLD the Speed Control Switch in the ON position while checking for voltage.

Using a 12-volt test light connected to ground, probe the (V30) S/C Brake Switch Output circuit in the Servo Harness connector.



Does the test light illuminate brightly?

Yes >> Replace the S/C Servo.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

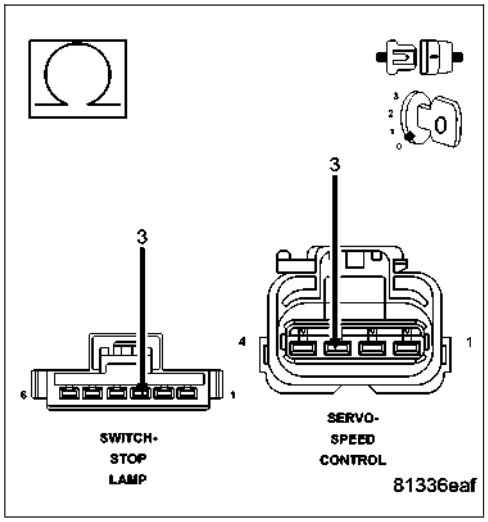
No >> Go To 5

5. (V30) S/C BRAKE SWITCH OUTPUT CIRCUIT OPEN

Turn the ignition off.

Disconnect the Brake Lamp Switch harness connector.

Measure the resistance of the (V30) S/C Brake Switch Output circuit from the Stop Lamp Switch harness connector to the S/C Servo harness connector.



Is the resistance below 5.0 ohms?

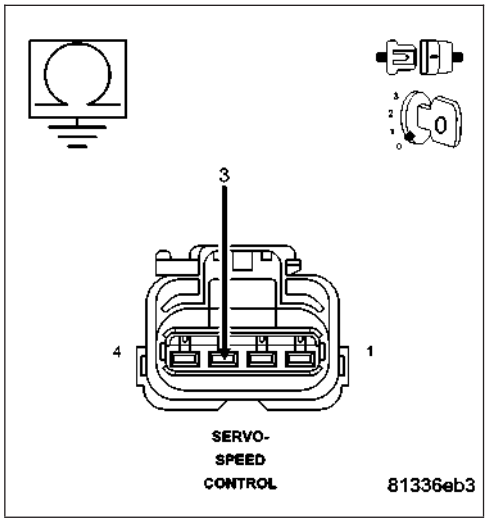
Yes >> Repair the excessive resistance in the (V30) S/C Brake Switch Output circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6

P0594-SPEED CONTROL SERVO POWER RELAY CIRCUIT (CONTINUED)

6. (V30) S/C BRAKE SWITCH OUTPUT CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (V30) S/C Brake Switch Output circuit in the Speed Control Servo harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (V30) S/C Brake Switch Output circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 9

---

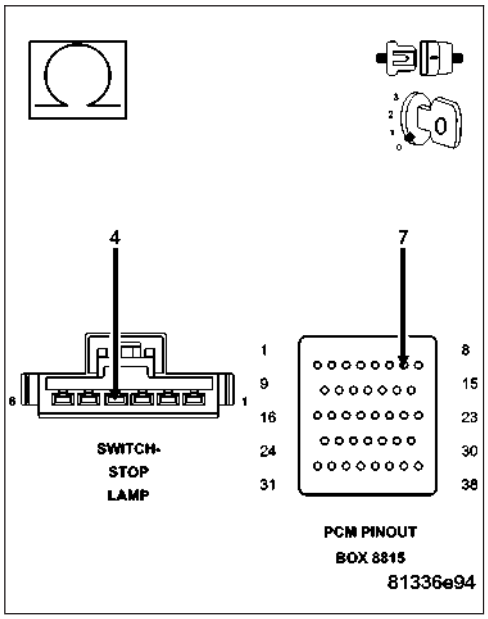
7. (V32) S/C SUPPLY CIRCUIT OPEN

Turn the ignition off.

Disconnect the C3 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (V32) S/C Supply circuit from the Stop Lamp Switch harness connector to the appropriate terminal of special tool #8815.



Is the resistance above 5.0 ohms?

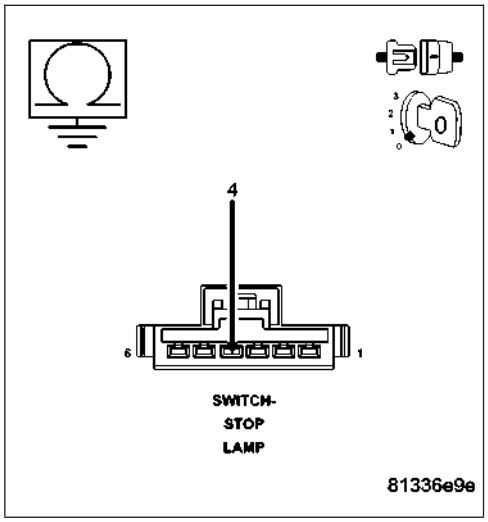
Yes >> Repair the open in the (V32) S/C Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8

P0594-SPEED CONTROL SERVO POWER RELAY CIRCUIT (CONTINUED)

8. (V32) S/C SUPPLY CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (V32) S/C Supply circuit in the Stop Lamp Switch harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (V32) S/C Supply circuit. Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 9

9. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0600-SERIAL COMMUNICATION LINK

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  Internal Bus communication failure between processors. One Trip Fault. Three Global Good Trips to Clear.

Possible Causes
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. PCM

NOTE: Diagnose any CMP or CKP Sensor faults before continuing. Check for intermittent loose CMP or CKP connections.

The Powertrain Control Module is reporting internal errors, view repair to continue.

Repair

Replace and program the Powertrain Control Module per Service Information.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0601-INTERNAL MEMORY CHECKSUM INVALID

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  Internal checksum for software failed, does not match calculated value. One Trip Fault, Three Good Trips to clear.

Possible Causes
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. PCM

NOTE: Diagnose any CMP or CKP Sensor faults before continuing. Check for intermittent loose CMP or CKP connections.

The Powertrain Control Module is reporting internal errors, view repair to continue.

Repair

Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0606-INTERNAL ECM PROCESSOR

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Engine running.
- **Set Condition:**
  When the PCM recognizes an internal failure to communicate with the ECM or the CMP and CKP Sensor count periods are too short. One trip fault. ETC light is flashing.

Possible Causes
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. PCM

NOTE: Diagnose any CMP or CKP Sensor faults before continuing. Check for intermittent loose CMP or CKP connections.

The Powertrain Control Module is reporting internal errors, view repair to continue.

Repair

Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P060B-ETC A/D GROUND PERFORMANCE

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the Throttle Motor is powered.
- **Set Condition:**
  When A2D reading does not return to ground within a set period of time of test activation, this fault sets. The test typically runs a couple of times per second, and is the reason why APP2 signal spikes to ground a couple of times per second in normal running. Reprogramming the module may not always fix this fault. ETC lamp will flash.

Possible Causes
PCM NEEDS TO BE PROGRAMMED
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. PROGRAM THE POWERTRAIN CONTROL MODULE

Verify the PCM is at the latest calibration (flash level).

NOTE: An intermittent loss of power to the PCM without performing an ETC Relearn procedure may cause this DTC to set.

NOTE: Diagnose any other DTCs that may have set with the P060B.

Flash the Powertrain Control Module per Service Information if any updates are available.

Start the engine.

Allow the engine to reach normal operating temperature.

Operate the accelerator pedal. (do not exceed 3500 rpm)

With a scan tool, read DTCs.

Does this DTC reset by itself?

Yes >> Replace and reprogram the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Test Complete.

P060D-ETC LEVEL 2 APP PERFORMANCE

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Throttle motor is powered and no matured faults related to APP Sensors.
- **Set Condition:**
  When secondary software determines that APPS 1 and APPS 2 signals do not match for a period of time. ETC lamp will flash

Possible Causes
PCM NEEDS TO BE PROGRAMMED
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. PROGRAM THE POWERTRAIN CONTROL MODULE

Verify the PCM is at the latest calibration (flash level).

NOTE: An intermittent loss of power to the PCM without performing an ETC Relearn procedure may cause this DTC to set.

Flash the Powertrain Control Module per Service Information if any updates are available.

Start the engine.

Allow the engine to reach normal operating temperature.

Operate the accelerator pedal. (do not exceed 3500 rpm)

With a scan tool, read DTCs.

NOTE: Diagnose any other DTCs that may have set with the P060D.

Does this DTC reset by itself?

Yes >> Replace and reprogram the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Test Complete.

P060E-ETC LEVEL 2 TPS PERFORMANCE

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Throttle motor is powered and no matured faults related to TP Sensors.
- **Set Condition:**
  When secondary software determines that TPS 1 and TPS 2 signals do not match for a period of time. ETC lamp will flash.

Possible Causes
PCM NEEDS TO BE PROGRAMMED
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. PROGRAM THE POWERTRAIN CONTROL MODULE

Verify the PCM is at the latest calibration (flash level).

NOTE: An intermittent loss of power to the PCM without performing an ETC Relearn procedure may cause this DTC to set.

Flash the Powertrain Control Module per Service Information if any updates are available.

Start the engine.

Allow the engine to reach normal operating temperature.

Operate the accelerator pedal. (do not exceed 3500 rpm)

With a scan tool, read DTCs.

NOTE: Diagnose any other DTCs that may have set with the P060E.

Does this DTC reset by itself?

Yes >> Replace and reprogram the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Test Complete.

P060F-ETC LEVEL 2 ECT PERFORMANCE

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Throttle motor is powered and no matured faults related to the Engine Coolant Temp Sensor.
- **Set Condition:**
  When secondary software determines that the Coolant Temperature is implausible for a period of time. ETC lamp will flash.

Possible Causes
PCM NEEDS TO BE PROGRAMMED
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. PROGRAM THE POWERTRAIN CONTROL MODULE

NOTE: Diagnose any Engine Coolant Temperature Sensor DTCs before continuing.
Verify the PCM is at the latest calibration (flash level).

NOTE: An intermittent loss of power to the PCM without performing an ETC Relearn procedure may cause this DTC to set.
Flash the Powertrain Control Module per Service Information if any updates are available.
Start the engine.
Allow the engine to reach normal operating temperature.
Operate the accelerator pedal. (do not exceed 3500 rpm)
With a scan tool, read DTCs.

NOTE: Diagnose any other DTCs that may have set with the P060F.

Does this DTC reset by itself?

Yes >> Replace and reprogram the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Test Complete.

P061A-ETC LEVEL 2 TORQUE PERFORMANCE

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Throttle motor is powered.
- **Set Condition:**
  When secondary software determines that the customer requested output is not being achieved by the engine for a period of time. ETC lamp will flash.

Possible Causes
PCM NEEDS TO BE PROGRAMMED
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. PROGRAM THE POWERTRAIN CONTROL MODULE

NOTE: Check the engine for air/vacuum leaks and diagnose any Fuel System Lean/Rich as well as MAP Sensor DTCs before continuing.
Verify the PCM is at the latest calibration (flash level).

NOTE: An intermittent loss of power to the PCM without performing an ETC Relearn procedure may cause this DTC to set.
Flash the Powertrain Control Module per Service Information if any updates are available.
Start the engine.
Allow the engine to reach normal operating temperature.
Operate the accelerator pedal. (do not exceed 3500 rpm)
With a scan tool, read DTCS.

NOTE: Diagnose any other DTCs that may have set with the P061A.

Does this DTC reset by itself?

Yes >> Replace and reprogram the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Test Complete.

P061C-ETC LEVEL 2 RPM PERFORMANCE

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Throttle motor is powered and no camshaft or crankshaft electrical signal related DTCs are set.
- **Set Condition:**
  When secondary software determines that the engine speed is implausible for a period of time. ETC lamp will flash.

Possible Causes
PCM NEEDS TO BE PROGRAMMED
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. PROGRAM THE POWERTRAIN CONTROL MODULE

NOTE: Diagnose any Camshaft Position and Crankshaft Position Sensor DTCs before continuing.
Verify the PCM is at the latest calibration (flash level).

NOTE: An intermittent loss of power to the PCM without performing an ETC Relearn procedure may cause this DTC to set.
Flash the Powertrain Control Module per Service Information if any updates are available.
Start the engine.
Allow the engine to reach normal operating temperature.
Operate the accelerator pedal. (do not exceed 3500 rpm)
With a scan tool, read DTCs.

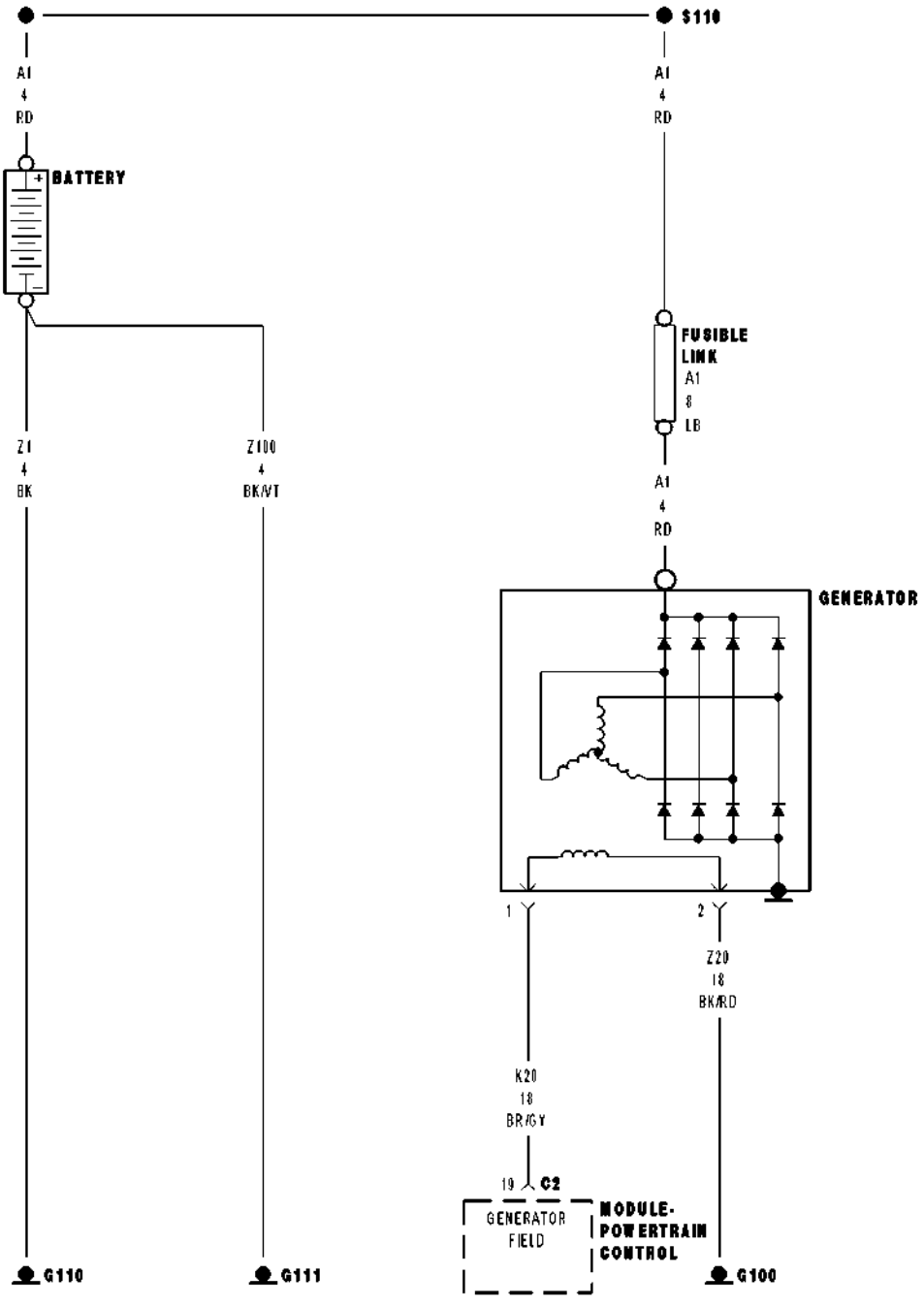
NOTE: Diagnose any other DTCs that may have set with the P061C.

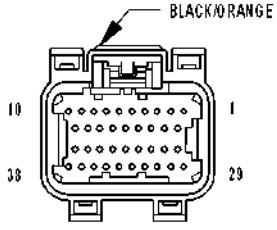
Does this DTC reset by itself?

Yes >> Replace and reprogram the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Test Complete.

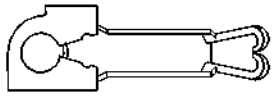
P0622-GENERATOR FIELD CONTROL CIRCUIT



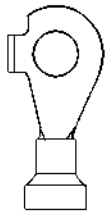


MODULE-
POWERTRAIN
CONTROL C2

GENERATOR



BATTERY
(+)



GENERATOR

81497f2b

P0622-GENERATOR FIELD CONTROL CIRCUIT (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. Engine running.
- **Set Condition:**
  When the PCM tries to regulate the generator field with no result during monitoring. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K20) GEN FIELD CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K20) GEN FIELD CONTROL CIRCUIT OPEN
(K20) GEN FIELD CONTROL CIRCUIT SHORTED TO GROUND
(Z20) GROUND CIRCUIT OPEN
GENERATOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

2. GENERATOR OPERATION

Turn the ignition off.

Disconnect the Generator Field harness connector.

Using a 12-volt test light, jump it across the Generator Field harness connector.

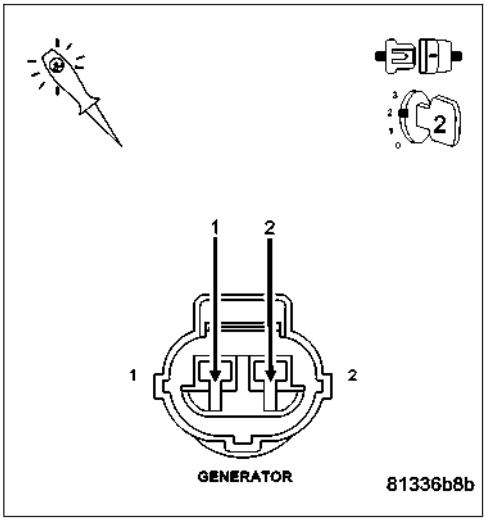
Ignition on, engine not running.

With the scan tool, actuate the Generator Field Control circuit.

Does the test light illuminate brightly and flash on and off?

Yes >> Replace the Generator.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3



P0622-GENERATOR FIELD CONTROL CIRCUIT (CONTINUED)

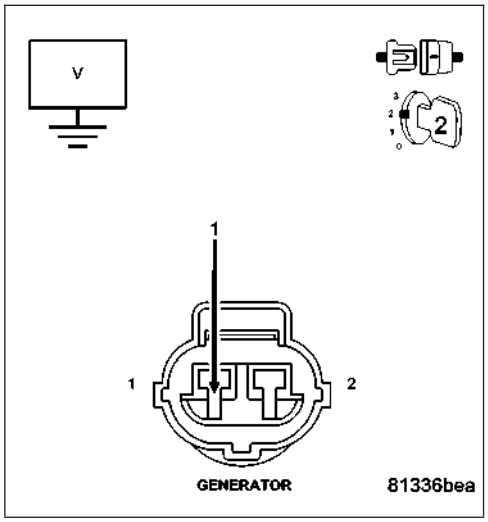
3. (K20) GEN FIELD CIRCUIT SHORTED BATTERY VOLTAGE

Turn the ignition off.

Disconnect the C2 PCM harness connector.

Ignition on, engine not running.

Measure the voltage on the (K20) Gen Field Control circuit in the Generator Field harness connector.



Is the voltage above 1.0 volt?

Yes >> Repair the short to battery voltage in the (K20) Gen Field Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

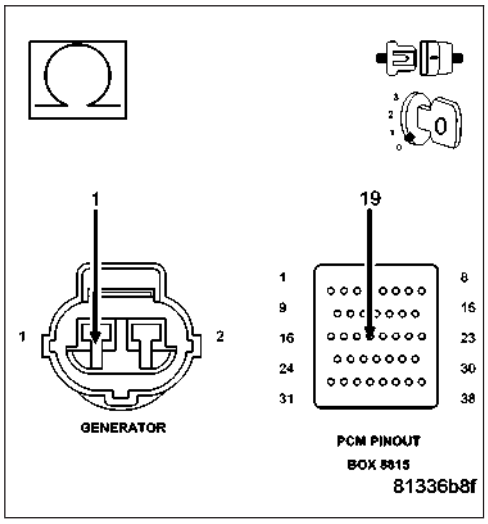
No >> Go To 4

4. (K20) GEN FIELD CIRCUIT OPEN

Turn the ignition off.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K20) Gen Field Control circuit from the Generator Field harness connector to appropriate terminal of the special tool #8815.



Is the resistance below 5.0 ohms?

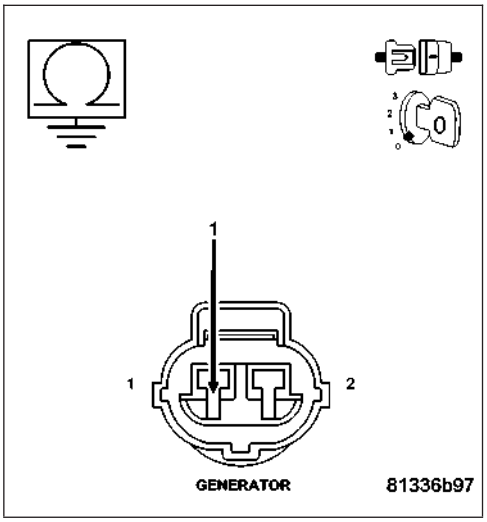
Yes >> Go To 5

No >> Repair the open in the (K20) Gen Field Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0622-GENERATOR FIELD CONTROL CIRCUIT (CONTINUED)

5. (K20) GEN FIELD CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K20) Gen Field Control circuit in the Generator Field harness connector.



Is the resistance below 100 ohms?

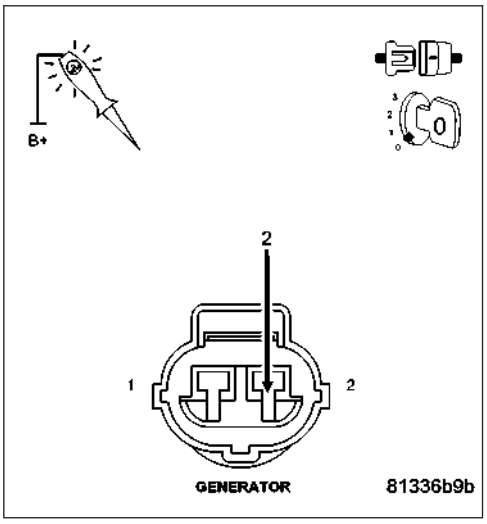
Yes >> Repair the short to ground in the (K20) Gen Field Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6

---

6. (Z20) GROUND CIRCUIT OPEN

Using a 12-volt test light connected to battery voltage, probe the (Z20) Ground circuit in the Gen Field harness connector.



Does the test light illuminate brightly?

Yes >> Go To 7

No >> Repair the open in the (Z20) Ground circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

7. PCM

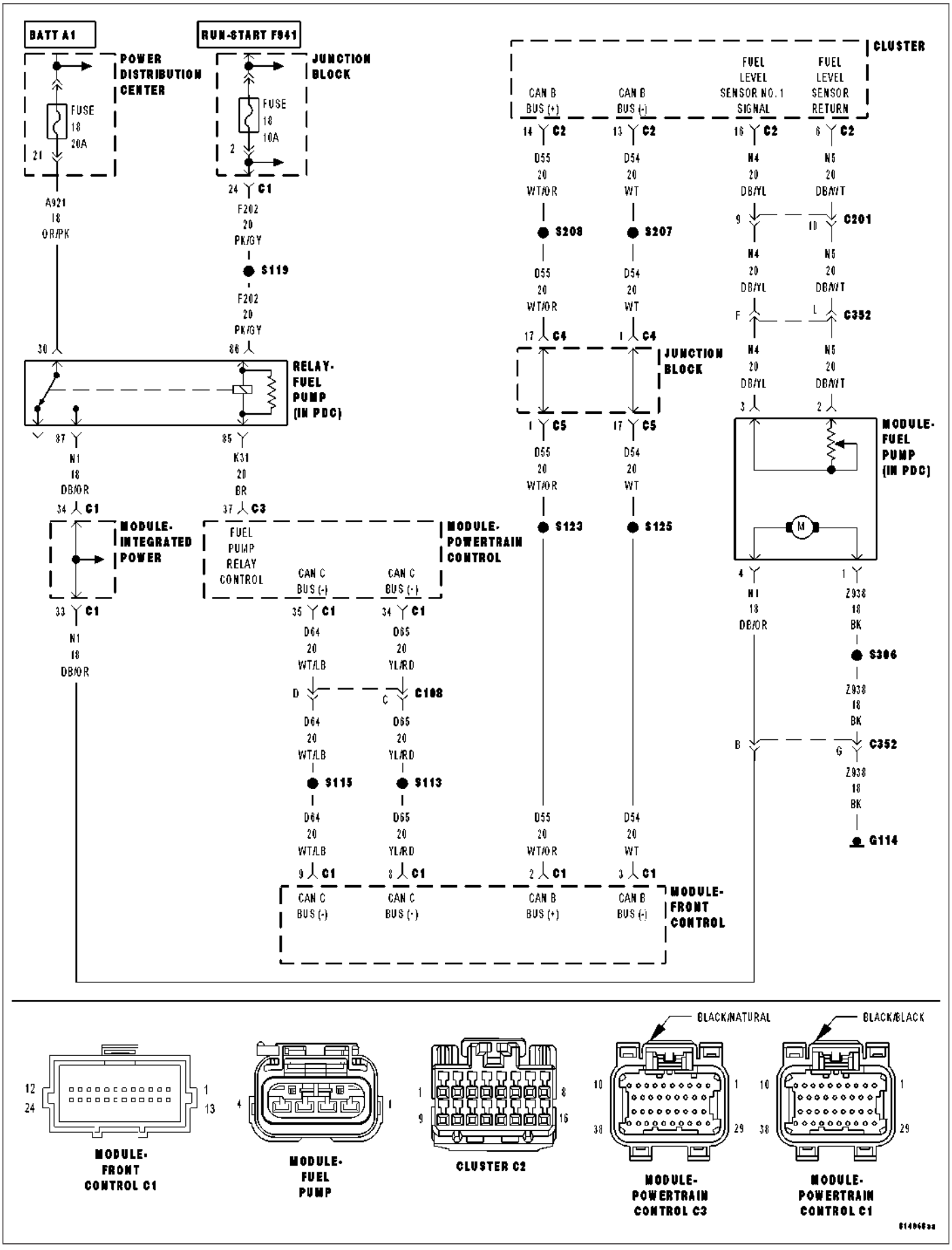
NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0627-FUEL PUMP RELAY CIRCUIT



P0627-FUEL PUMP RELAY CIRCUIT (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. Battery voltage greater than 10.4 volts and the ASD sense switch is on.
- **Set Condition:**
  Actual Fuel Pump Relay state is not equal to desired state. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(F202) FUSED IGNITION SWITCH OUTPUT CIRCUIT
(K31) FUEL PUMP RELAY CONTROL CIRCUIT
(K31) FUEL PUMP RELAY CONTROL CIRCUIT SHORTED TO GROUND
FUEL PUMP RELAY
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. FUEL PUMP RELAY OPERATION

Ignition on, engine not running.

With a scan tool, actuate the Fuel Pump Relay.

Is the Fuel Pump Relay operating?

Yes >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 2

---

2. FUEL PUMP RELAY

Turn the ignition off.

Remove the Fuel Pump Relay from the IPM.

Measure the resistance of the Fuel Pump Relay Coil.

Is the resistance between 70 to 90 ohms?

Yes >> Go To 3

No >> Replace the Fuel Pump Relay.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0627-FUEL PUMP RELAY CIRCUIT (CONTINUED)

3. (F202) FUSED IGNITION SWITCH OUTPUT CIRCUIT

Ignition on, engine not running.

Using a 12-volt test light connected to ground, probe the (F202) Fused Ignition Switch Output circuit.

Does the test light illuminate brightly?

Yes >> Go To 4

No >> Repair the open or short to ground in the (F202) Fused Ignition Switch Output circuit. Inspect the related fuse and repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

4. (K31) FUEL PUMP RELAY CONTROL CIRCUIT OPEN

Turn the ignition off.

Disconnect the C3 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K31) Fuel Pump Relay Control circuit from the IPM to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 5

No >> Repair the open in the (K31) Fuel Pump Relay Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

5. (K31) FUEL PUMP RELAY CONTROL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K31) Fuel Pump Relay Control circuit in the IPM.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K31) Fuel Pump Relay Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6

---

6. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P062C-ETC LEVEL 2 MPH PERFORMANCE

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Throttle motor is powered and no vehicle speed related DTCs have matured.
- **Set Condition:**
  When secondary software determines that the vehicle speed is implausible for a period of time. ETC lamp will flash.

Possible Causes
PCM NEEDS TO BE PROGRAMMED
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. PROGRAM THE POWERTRAIN CONTROL MODULE

Verify the PCM is at the latest calibration (flash level).

NOTE: An intermittent loss of power to the PCM without performing an ETC Relearn procedure may cause this DTC to set.

Flash the Powertrain Control Module per Service Information if any updates are available.

Start the engine.

Allow the engine to reach normal operating temperature.

Operate the accelerator pedal. (do not exceed 3500 rpm)

With a scan tool, read DTCs.

NOTE: Diagnose any other DTCs that may have set with the P062C.

Does this DTC reset by itself?

Yes >> Replace and reprogram the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Test Complete.

P0630-VIN NOT PROGRAMMED IN PCM

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  At initialization.
- **Set Condition:**
  The VIN has not been programmed into the PCM. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
PROGRAMMING VIN INTO PCM
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. PROGRAMMING VIN INTO THE PCM

Ignition on, engine not running.

Using the scan tool, program VIN into the PCM.

Start the engine.

NOTE: If the engine will not start, crank the engine over for 15 seconds. Crank at least 2 times with the ignition switch returning to the off position each time.

Allow the engine to reach normal operating temperature.

With the scan tool, read DTCs.

Does the DTC reset?

Yes >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> The VIN has been successfully programmed into the PCM. Test is complete.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0632-ODOMETER NOT PROGRAMMED IN PCM

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  Odometer is not programed into the PCM. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
PROGRAMMING MILEAGE INTO THE PCM
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. PROGRAMMING MILEAGE INTO THE PCM

Ignition on, engine not running.
With the scan tool, erase DTCs.
Using a scan tool, program the mileage into the PCM.
Start the engine.
Allow the engine to reach normal operating temperature.
With a scan tool, read DTCs.

Does the DTC reset?

Yes >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> The mileage has been successfully programmed into the PCM. Test is complete.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0633-SKIM SECRET KEY NOT STORED IN PCM

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  The SKIM Key information has not been programmed into the PCM. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
PROGRAMMING SKIM KEY INTO THE PCM
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. PROGRAMMING SKIM KEY INTO THE PCM

Ignition on, engine not running.

With a scan tool, erase DTCs.

Using the scan tool, program the SKIM Key information into the PCM.

Start the engine.

NOTE: If the engine will not start, crank the engine over for 15 seconds. Crank at least 2 times with the ignition switch returning to the off position each time.

Allow the engine to reach normal operating temperature.

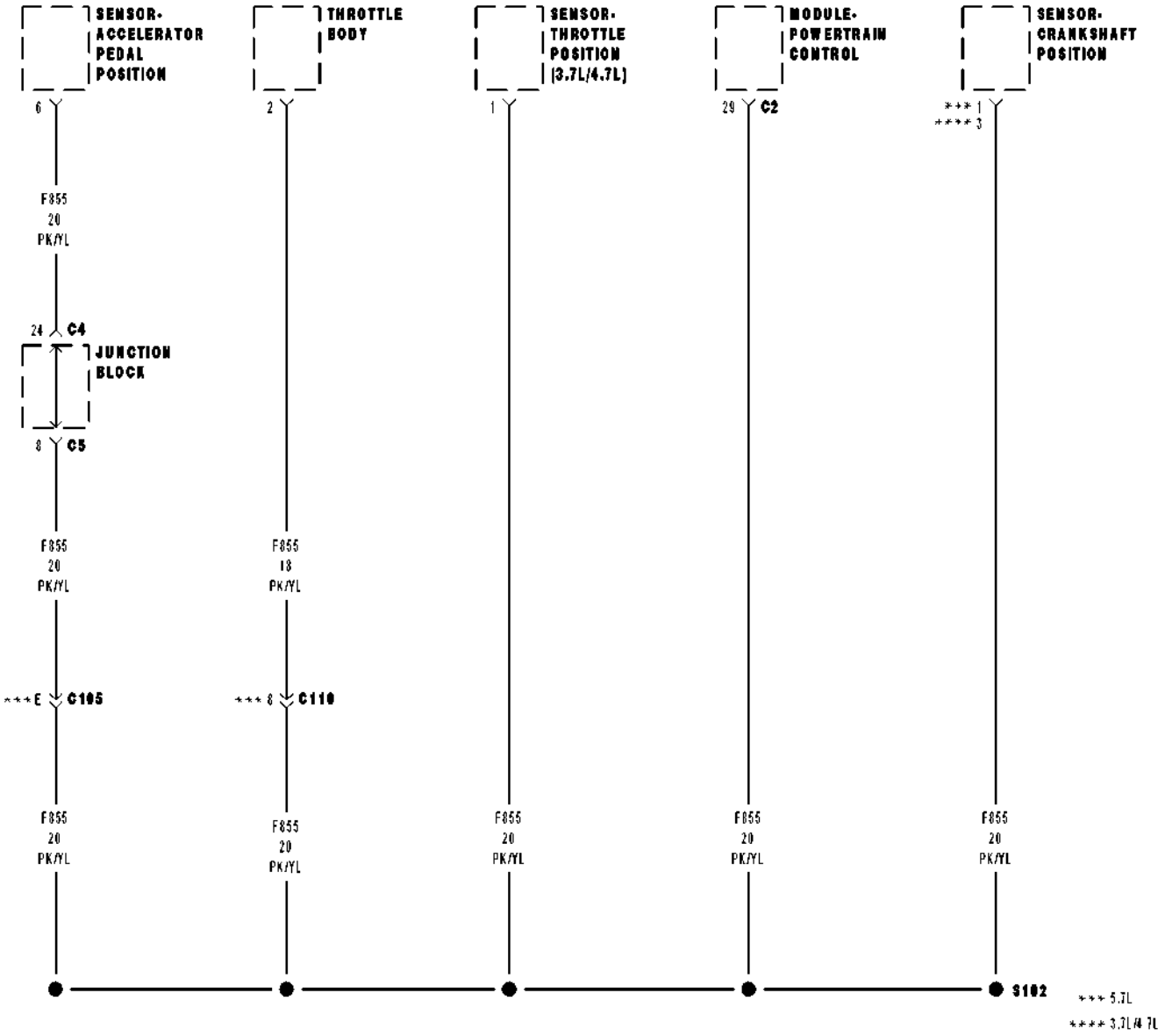
With the scan tool, read DTCs.

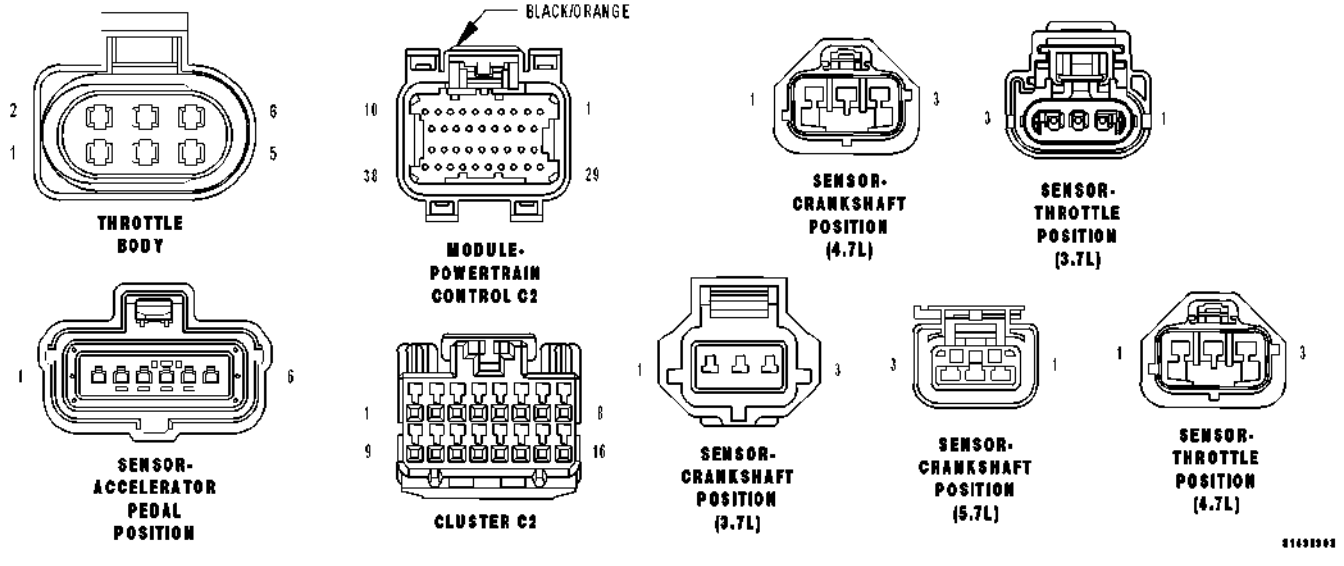
Does the DTC reset?

Yes >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> The SKIM KEY information has been successfully programmed into the PCM. Test is complete.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0642-SENSOR REFERENCE VOLTAGE 1 CIRCUIT LOW





P0642-SENSOR REFERENCE VOLTAGE 1 CIRCUIT LOW (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  When the PCM recognizes the Primary 5-volt Supply circuit voltage is too low. One Trip Fault. ETC light is flashing.

Possible Causes
(F855) PRIMARY 5-VOLT SUPPLY SHORTED TO GROUND
SENSOR SHORTED TO GROUND
5-VOLT SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, read DTCs.

NOTE: Improperly installed aftermarket accessories can cause this DTC to set. Check for wiring added by customer.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. (F855) PRIMARY 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the C2 PCM harness connector.

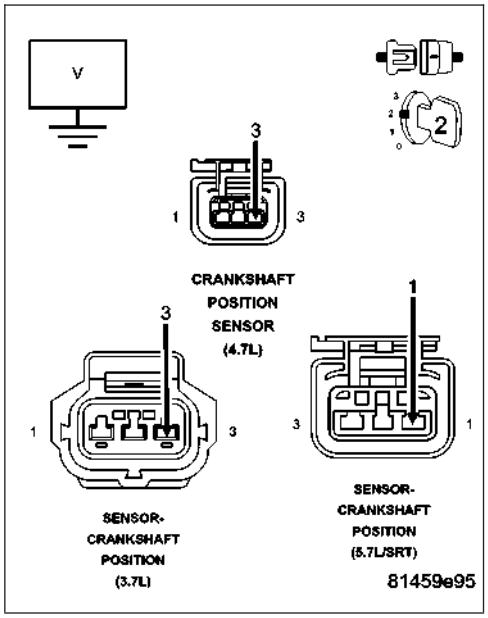
Disconnect all the Sensors that share the (F855) Primary 5-volt Supply circuit.

Measure the resistance between ground and the (F855) Primary 5-volt Supply circuit in the CKP Sensor harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (F855) Primary 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3



P0642-SENSOR REFERENCE VOLTAGE 1 CIRCUIT LOW (CONTINUED)

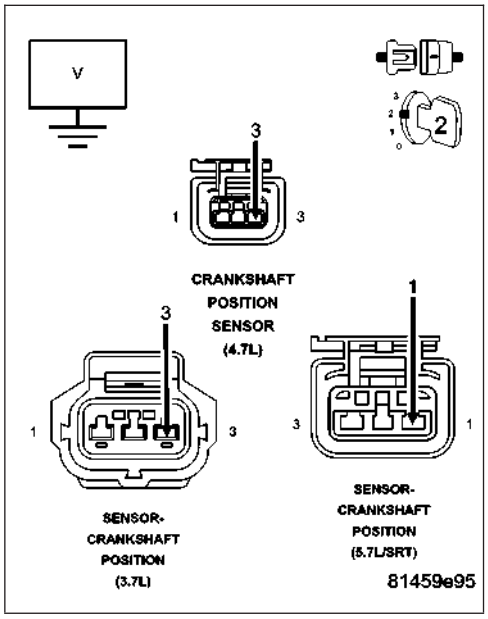
3. 5-VOLT SENSOR

Turn the ignition off.

Reconnect all the previously disconnected Sensors except for the CKP Sensor harness connector.

Ignition on, engine not running.

Measure the voltage on the (F855) Primary 5-volt Supply circuit in the CKP Sensor harness connector.



Is the voltage below 4.5 volts?

Yes >> Go To 4

No >> Replace the CKP Sensor.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

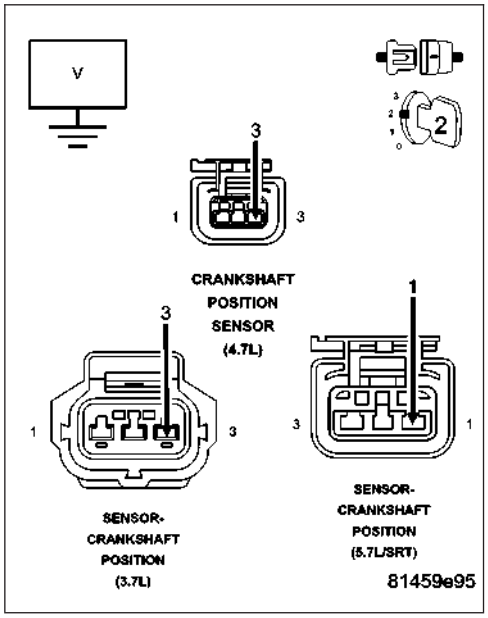
4. 5-VOLT SENSOR SHORTED TO GROUND

Measure the voltage on the (F855) Primary 5-volt Supply circuit at the CKP Sensor harness connector.

CAUTION: You must Turn the Ignition OFF when disconnecting any of the Sensor harness connectors and Turn the Ignition On to check the voltage readings.

While monitoring the voltage, disconnect each Sensor harness connector that shares the (F855) Primary 5-volt Supply circuit, one at a time.

NOTE: Reconnect all the Sensors and clear all trouble codes before continuing.



Does the voltage increase above 4.5 volts when disconnecting any of the remaining Sensors?

Yes >> Replace the Sensor that causes the (F855) Primary 5-volt Supply circuit voltage to increase when disconnected.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

P0642-SENSOR REFERENCE VOLTAGE 1 CIRCUIT LOW (CONTINUED)

5. **PCM**

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

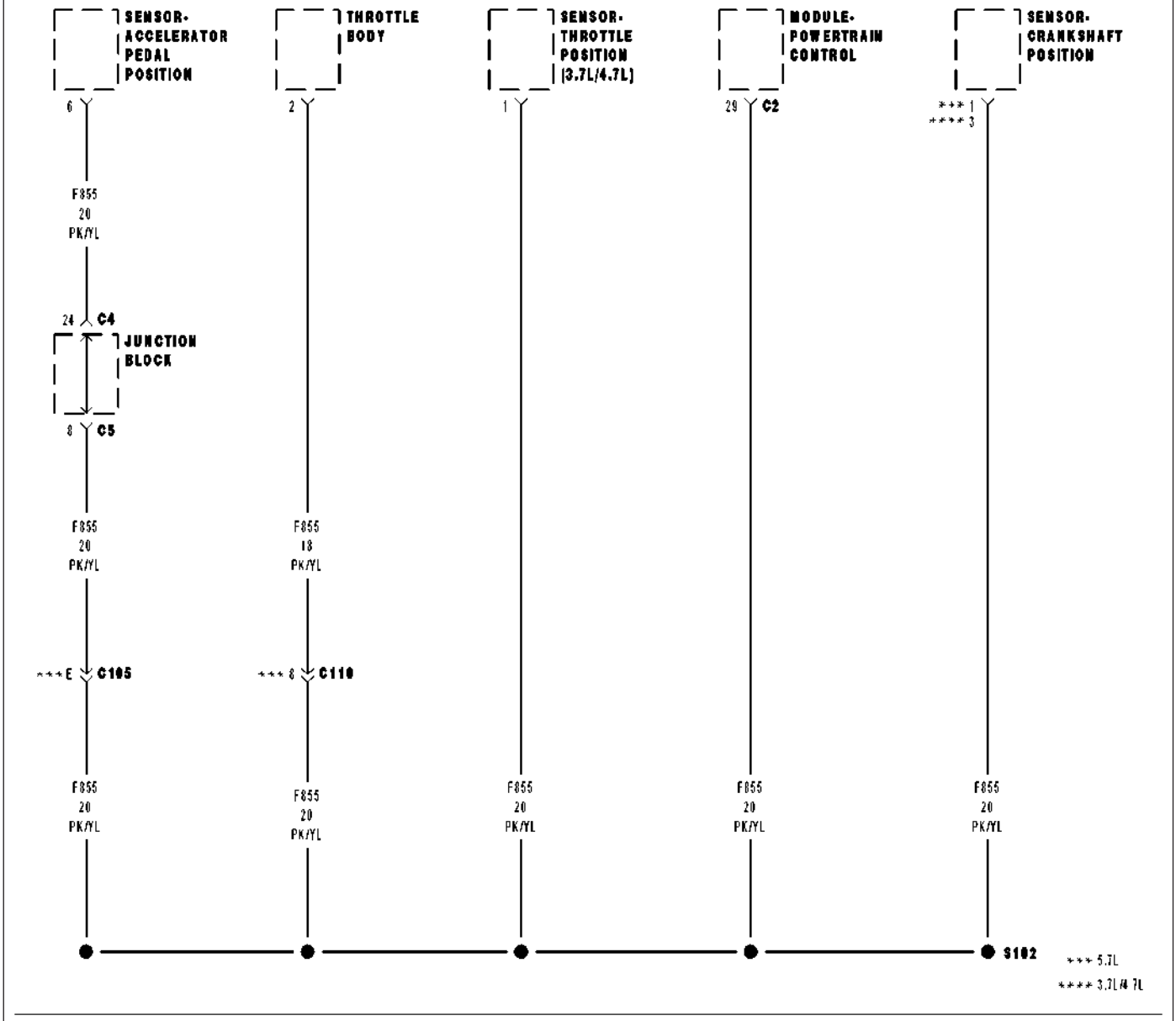
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

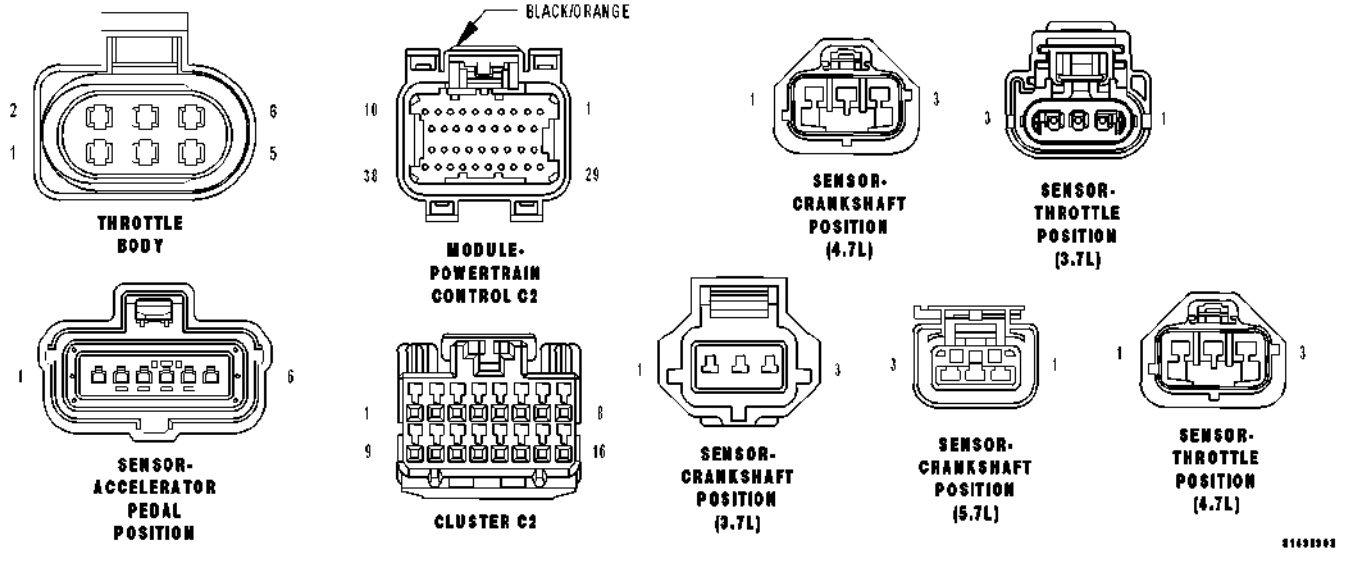
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0643-PRIMARY 5-VOLT SUPPLY CIRCUIT HIGH





P0643-PRIMARY 5-VOLT SUPPLY CIRCUIT HIGH (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  When the PCM recognizes the Primary 5-volt Supply circuit voltage is too high. One Trip Fault. ETC light is flashing.

Possible Causes
(F855) PRIMARY 5-VOLT SUPPLY SHORTED TO BATTERY VOLTAGE
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. (F855) PRIMARY 5-VOLT SUPPLY SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

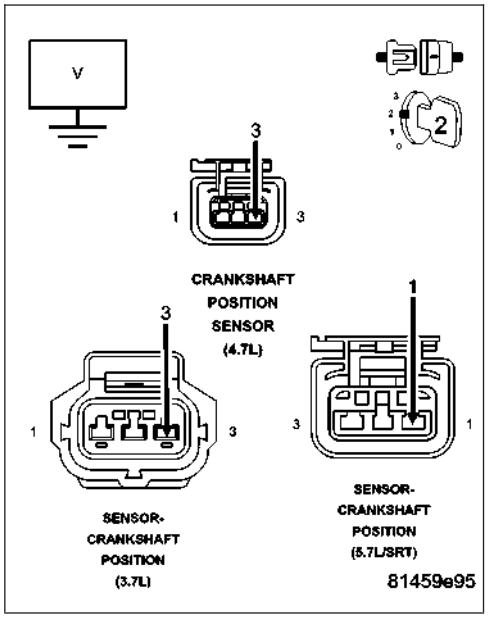
Disconnect the C2 PCM harness connector.

Disconnect all the Sensors that share the (F855) Primary 5-volt Supply circuit.

NOTE: Improperly installed aftermarket accessories can cause this DTC to set. Check for wiring added by customer.

Ignition on, engine not running.

Measure the voltage on the (F855) Primary 5-volt Supply circuit at the CKP Sensor harness connector.



Is the voltage above 5.2 volts?

Yes >> Repair the short to battery voltage in the (F855) Primary 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

P0643-PRIMARY 5-VOLT SUPPLY CIRCUIT HIGH (CONTINUED)

3. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

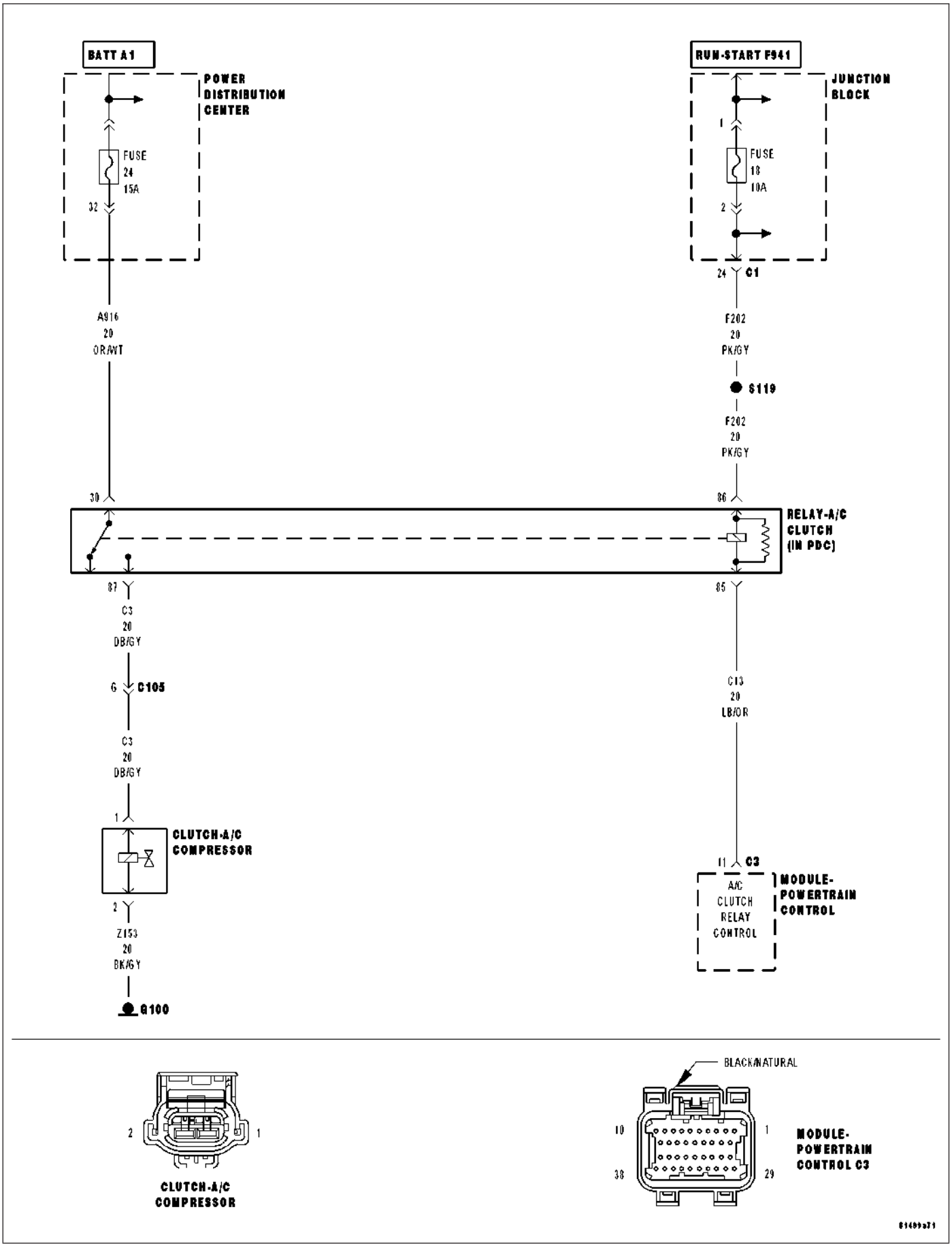
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0645-A/C CLUTCH RELAY CIRCUIT



P0645-A/C CLUTCH RELAY CIRCUIT (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on. Battery voltage greater than 10 volts. A/C Switch on.
- **Set Condition:**
  An open or shorted condition is detected in the A/C clutch relay control circuit. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(F202) FUSED IGNITION SWITCH OUTPUT CIRCUIT
(C13) A/C CLUTCH RELAY CONTROL CIRCUIT OPEN
(C13) A/C CLUTCH RELAY CONTROL CIRCUIT SHORTED TO GROUND
A/C CLUTCH RELAY
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. A/C CLUTCH RELAY OPERATION

Ignition on, engine not running.

With a scan tool, actuate the A/C Clutch Relay.

Is the A/C Clutch Relay operating?

Yes >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 2

---

2. A/C CLUTCH RELAY RESISTANCE

Turn the ignition off.

Remove the A/C Clutch Relay from the IPM.

Measure the resistance of the A/C Clutch Relay Coil.

Is the resistance between 60 to 80 ohms?

Yes >> Go To 3

No >> Replace the A/C Clutch Relay.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0645-A/C CLUTCH RELAY CIRCUIT (CONTINUED)

3. (F202) FUSED IGNITION SWITCH OUTPUT CIRCUIT

Ignition on, engine not running.

Using a 12-volt test light connected to ground, probe the (F202) Fused Ignition Switch Output circuit in the connection.

Does the test light illuminate brightly?

Yes >> Go To 4

No >> Repair the open or short to ground in the (F202) Fused Ignition Switch Output circuit. Check and replace any open fuses.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

4. (C13) A/C CLUTCH RELAY CONTROL CIRCUIT OPEN

Turn the ignition off.

Disconnect the C3 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (C13) A/C Clutch Relay Control circuit from the relay connection to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 5

No >> Repair the open in the (C13) A/C Clutch Relay Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

5. (C13) A/C CLUTCH RELAY CONTROL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (C13) A/C Clutch Relay Control circuit at the IPM.

Is the resistance below 5.0 ohms?

Yes >> Repair the short to ground in the (C13) A/C Relay Clutch Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6

---

6. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

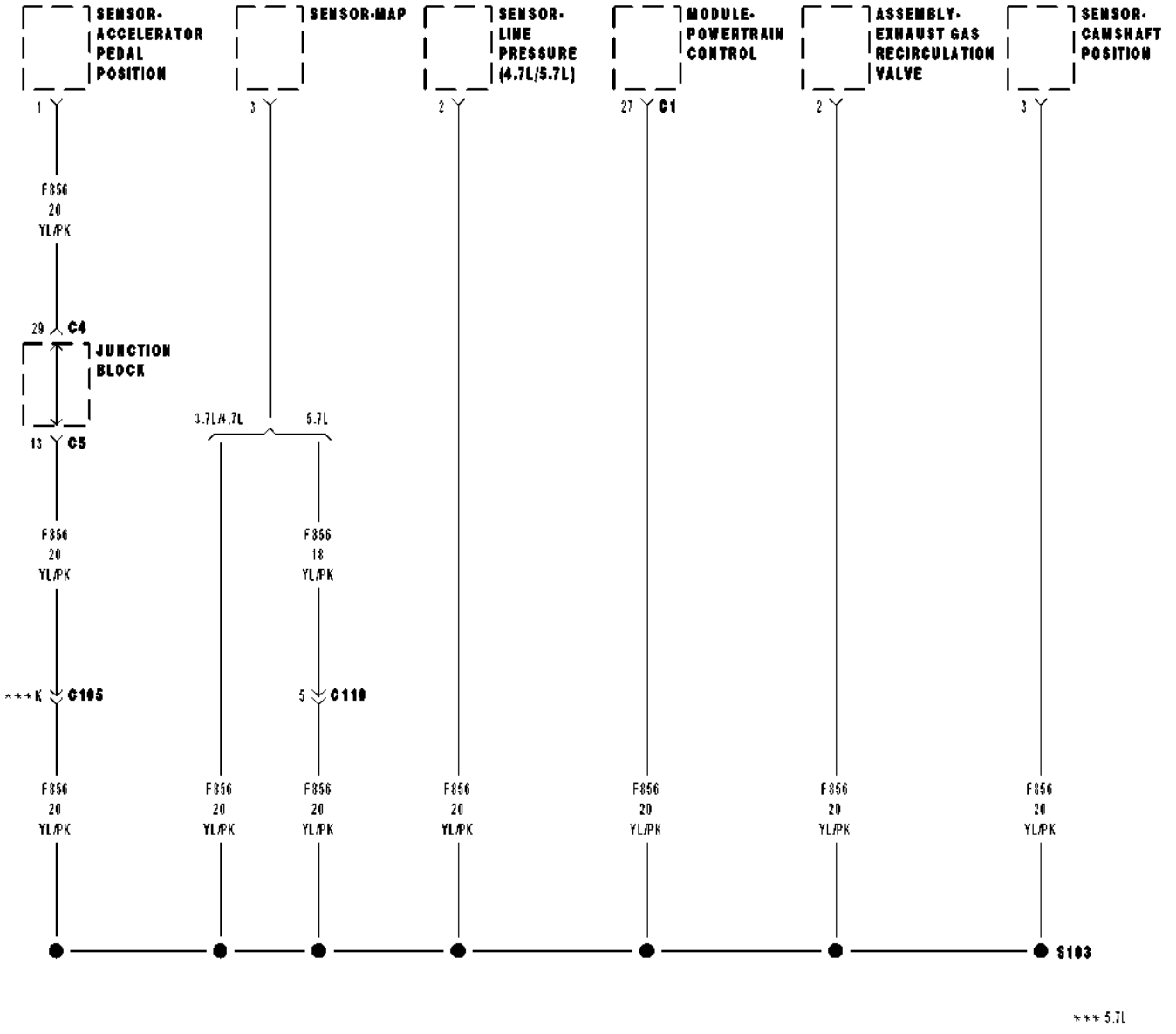
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

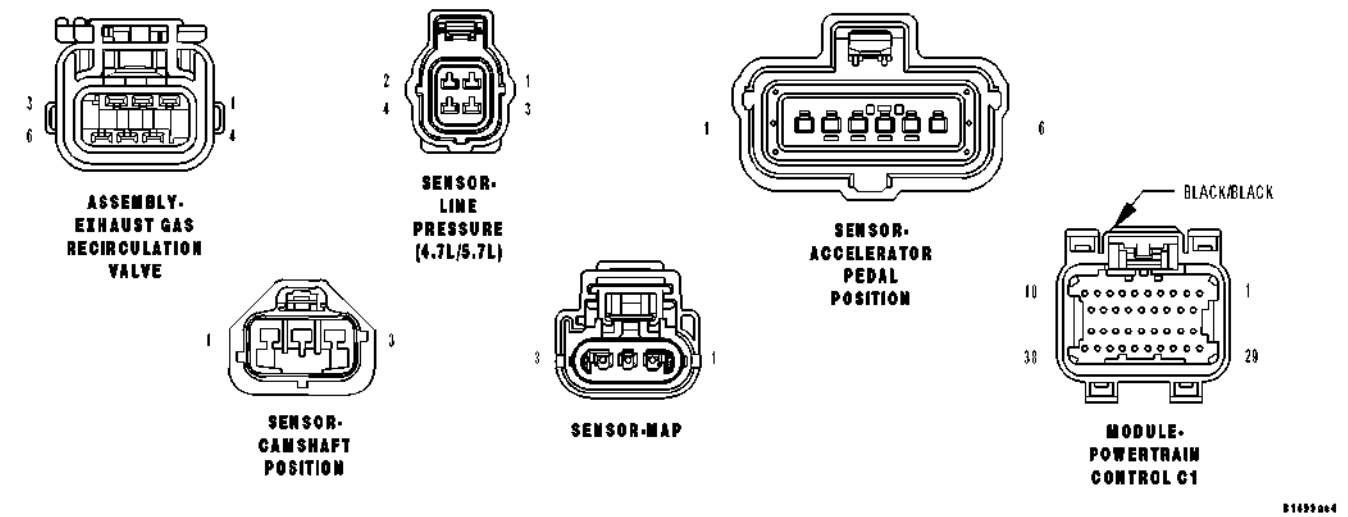
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0652-SENSOR REFERENCE VOLTAGE 2 CIRCUIT LOW





P0652-SENSOR REFERENCE VOLTAGE 2 CIRCUIT LOW (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  When the PCM recognizes the Auxiliary 5-volt Supply circuit voltage is too low. One Trip Fault. ETC light is flashing.

Possible Causes
(F856) AUXILIARY 5-VOLT SUPPLY SHORTED TO GROUND
SENSOR SHORTED TO GROUND
CAM POSITION SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, read DTCs.

NOTE: Improperly installed aftermarket accessories can cause this DTC to set. Check for wiring added by customer.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

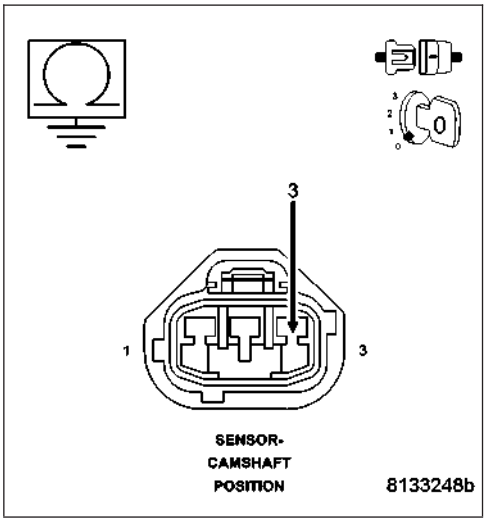
2. (F856) AUXILIARY 5-VOLT SUPPLY SHORTED TO GROUND

Turn the ignition off.

Disconnect the C1 PCM harness connector.

Disconnect all the Sensors that share the (F856) Auxiliary 5-volt Supply circuit.

Measure the resistance between ground and the (F856) Auxiliary 5-volt Supply circuit in the CMP Sensor harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (F856) Auxiliary 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

P0652-SENSOR REFERENCE VOLTAGE 2 CIRCUIT LOW (CONTINUED)

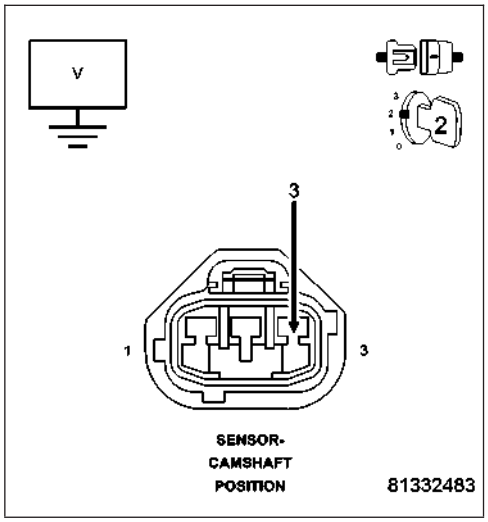
3. CMP SENSOR

Turn the ignition off.

Reconnect all the previously disconnected Sensors except for the CMP Sensor harness connector.

Ignition on, engine not running.

Measure the voltage on the (F856) Auxiliary 5-volt Supply circuit in the CMP Sensor harness connector.



Is the voltage below 4.5 volts?

Yes >> Go To 4

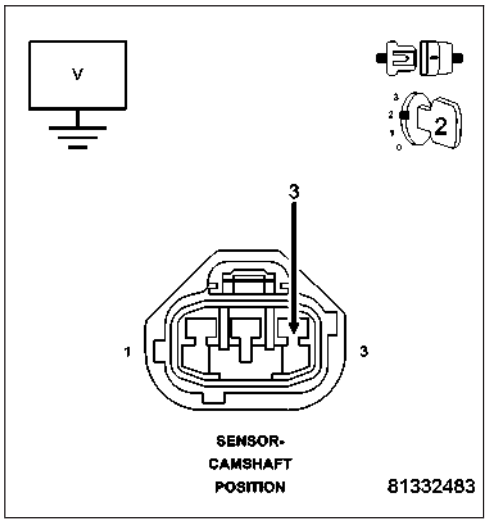
No >> Replace the Cam Position Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

4. 5-VOLT SENSOR SHORTED TO GROUND

Measure the voltage on the (F856) Auxiliary 5-volt Supply circuit at the CMP Sensor harness connector.

CAUTION: You must Turn the Ignition OFF when disconnecting any of the Sensor harness connectors and Turn the Ignition On to check the voltage readings.

While monitoring the voltage, disconnect each Sensor harness connector that shares the (F856) Auxiliary 5-volt Supply circuit, one at a time.



Does the voltage increase above 4.5 volts when disconnecting any of the Sensor harness connectors?

Yes >> Replace the Sensor that causes the (F856) Auxiliary 5-volt Supply circuit voltage to increase when disconnected.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

5. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

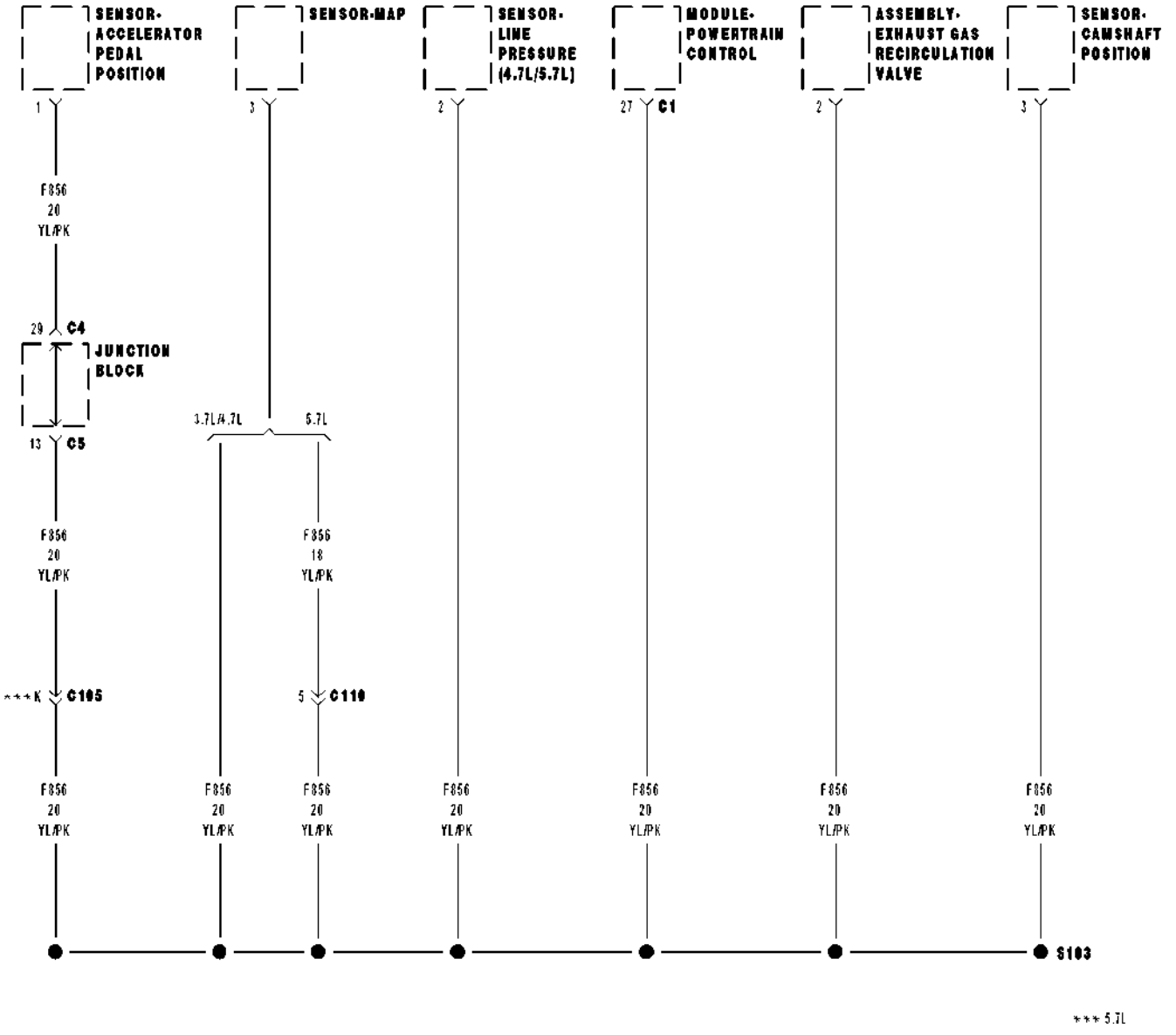
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

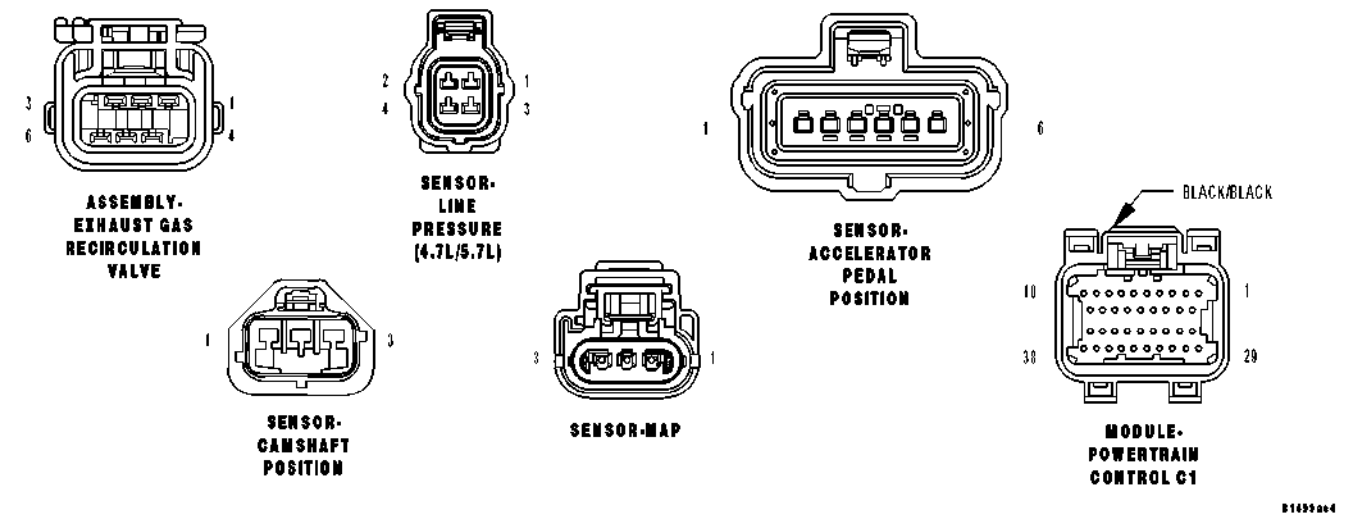
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0653-SENSOR REFERENCE VOLTAGE 2 CIRCUIT HIGH





P0653-SENSOR REFERENCE VOLTAGE 2 CIRCUIT HIGH (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  When the PCM recognizes the Auxiliary 5-volt Supply circuit voltage is too high. One Trip Fault. ETC light is flashing.

Possible Causes
(F856) AUXILIARY 5-VOLT SUPPLY SHORTED TO BATTERY VOLTAGE
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. (F856) AUXILIARY 5-VOLT SUPPLY SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

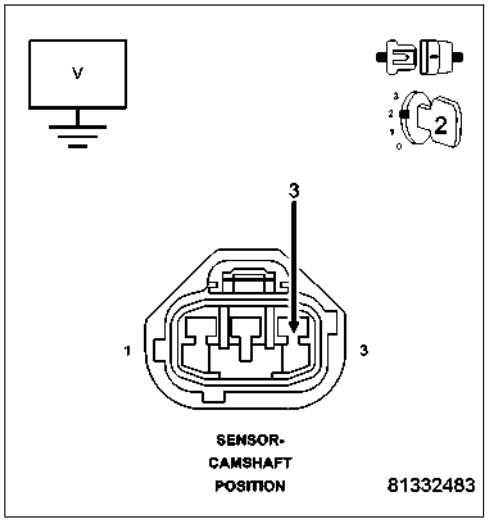
Disconnect the C1 PCM harness connector.

Disconnect all the Sensors that share the (F856) Auxiliary 5-volt Supply circuit.

NOTE: Improperly installed aftermarket accessories can cause this DTC to set. Check for wiring added by customer.

Ignition on, engine not running.

Measure the voltage on the (F856) Auxiliary 5-volt Supply circuit at the CMP Sensor harness connector.



Is the voltage above 0 volts?

Yes >> Repair the short to battery voltage in the (F856) Auxiliary 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

P0653-SENSOR REFERENCE VOLTAGE 2 CIRCUIT HIGH (CONTINUED)

3. **PCM**

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

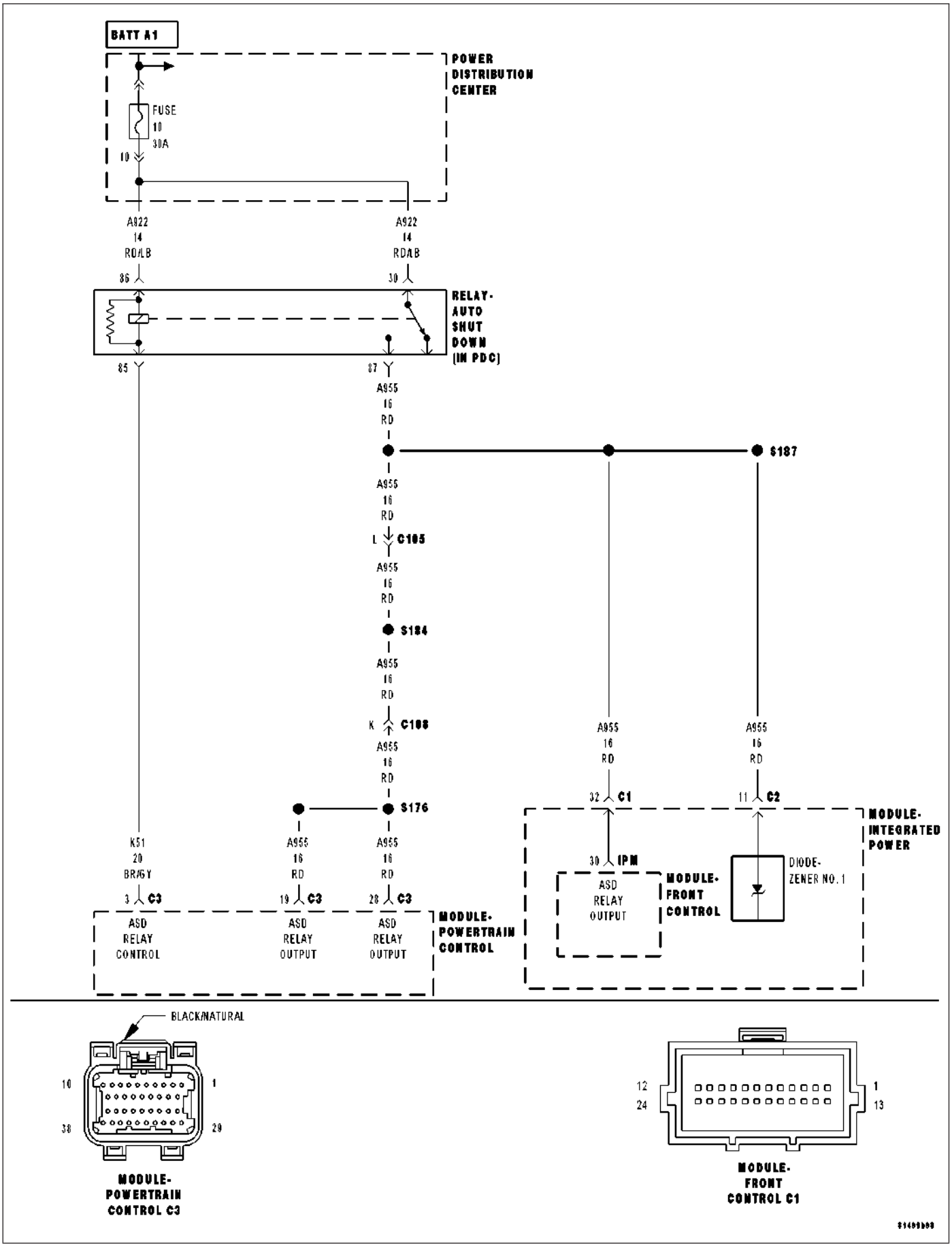
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0685-AUTO SHUTDOWN RELAY CONTROL CIRCUIT



P0685-AUTO SHUTDOWN RELAY CONTROL CIRCUIT (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With ignition on. Battery voltage above 10 volts.
- **Set Condition:**
  The actual ASD state is not equal to the desired ASD state. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(A922) FUSED B+ CIRCUITS
(K51) ASD RELAY CONTROL CIRCUIT OPEN
(K51) ASD RELAY CONTROL CIRCUIT SHORTED TO GROUND
ASD RELAY
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ASD RELAY OPERATION

Ignition on, engine not running.

With a scan tool, actuate the ASD Relay.

Is the ASD Relay operating?

Yes >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 2

---

2. (A922) FUSED B+ CIRCUITS

Turn the ignition off.

Remove the ASD Relay from the IPM.

Using a 12-volt test light connected to ground, probe the (A922) Fused B+ circuits in the IPM.

Does the test light illuminate brightly?

Yes >> Go To 3

No >> Repair the open or short to ground in the (A922) Fused B+ circuits. Inspect and replace any open fuses.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

3. ASD RELAY

Measure the resistance of the ASD Relay Coil.

Is the resistance between 60 to 80 ohms?

Yes >> Go To 4

No >> Replace the ASD Relay.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0685-AUTO SHUTDOWN RELAY CONTROL CIRCUIT (CONTINUED)

4. (K51) ASD RELAY CONTROL CIRCUIT OPEN

Disconnect the C3 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K51) ASD Relay Control circuit from the IPM to the appropriate terminals of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 5

No >> Repair the open in the (K51) ASD Relay Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

5. (K51) ASD RELAY CONTROL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K51) ASD Relay Control circuit in the IPM.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K51) ASD Relay Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6

---

6. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

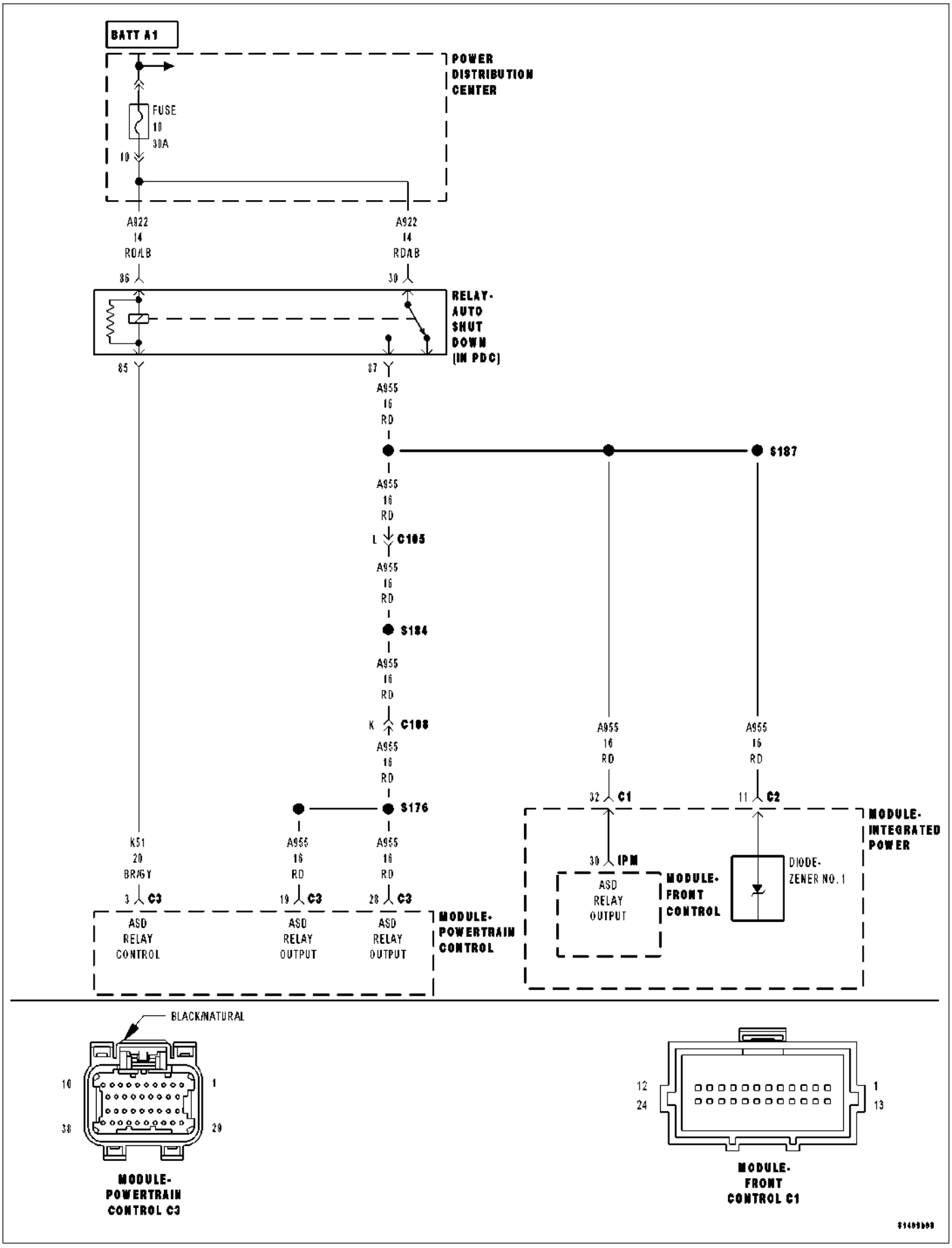
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0688-AUTO SHUTDOWN RELAY SENSE CIRCUIT LOW



P0688-AUTO SHUTDOWN RELAY SENSE CIRCUIT LOW (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With ignition key on. Battery voltage greater than 10 volts.
- **Set Condition:**
  No voltage sensed at the PCM when the ASD relay is energized. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(A922) FUSED B+ CIRCUITS
(A955) ASD RELAY OUTPUT CIRCUIT OPEN
ASD RELAY
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. VERIFY ASD DTC

NOTE: Diagnose P0685 - Auto Shutdown Relay Control Circuit first if it set along with this DTC.
With a scan tool, erase the DTC.

Attempt to start the engine. If the engine will not start, crank the engine for at least 15 seconds. It may be necessary to repeat several times.

Does the DTC reset?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. ENGINE OPERATION

Attempt to start the engine.

Does the engine start?

Yes >> Go To 3

No >> Go To 4

P0688-AUTO SHUTDOWN RELAY SENSE CIRCUIT LOW (CONTINUED)

3. (A955) ASD RELAY OUTPUT CIRCUIT OPEN

Turn the ignition off.

Remove the ASD Relay.

Disconnect the C3 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (A955) ASD Relay Output circuit from the Relay connection to the appropriate terminals of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 7

No >> Repair the open in the (A955) ASD Relay Output circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

4. ASD RELAY

Turn the ignition off.

Install a substitute relay in place of the ASD Relay.

Ignition on, engine not running.

With a scan tool, erase DTCs.

Attempt to start the engine.

With a scan tool, read DTCs.

Does the DTC reset?

Yes >> Go To 5

No >> Replace the ASD Relay.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

5. (A922) FUSED B+ CIRCUITS

Turn the ignition off.

Using a 12-volt test light connected to ground, probe the (A922) Fused B+ circuits at the Relay connection.

Does the test light illuminate brightly?

Yes >> Go To 6

No >> Repair the open or short to ground in the (A922) Fused B+ circuits. Inspect the related fuse and repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0688-AUTO SHUTDOWN RELAY SENSE CIRCUIT LOW (CONTINUED)

6. (A955) ASD RELAY OUTPUT CIRCUIT OPEN

Disconnect the C3 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (A955) ASD Relay Output circuit from the Relay connection to the appropriate terminals of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 7

No >> Repair the open in the (A955) ASD Relay Output circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

7. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

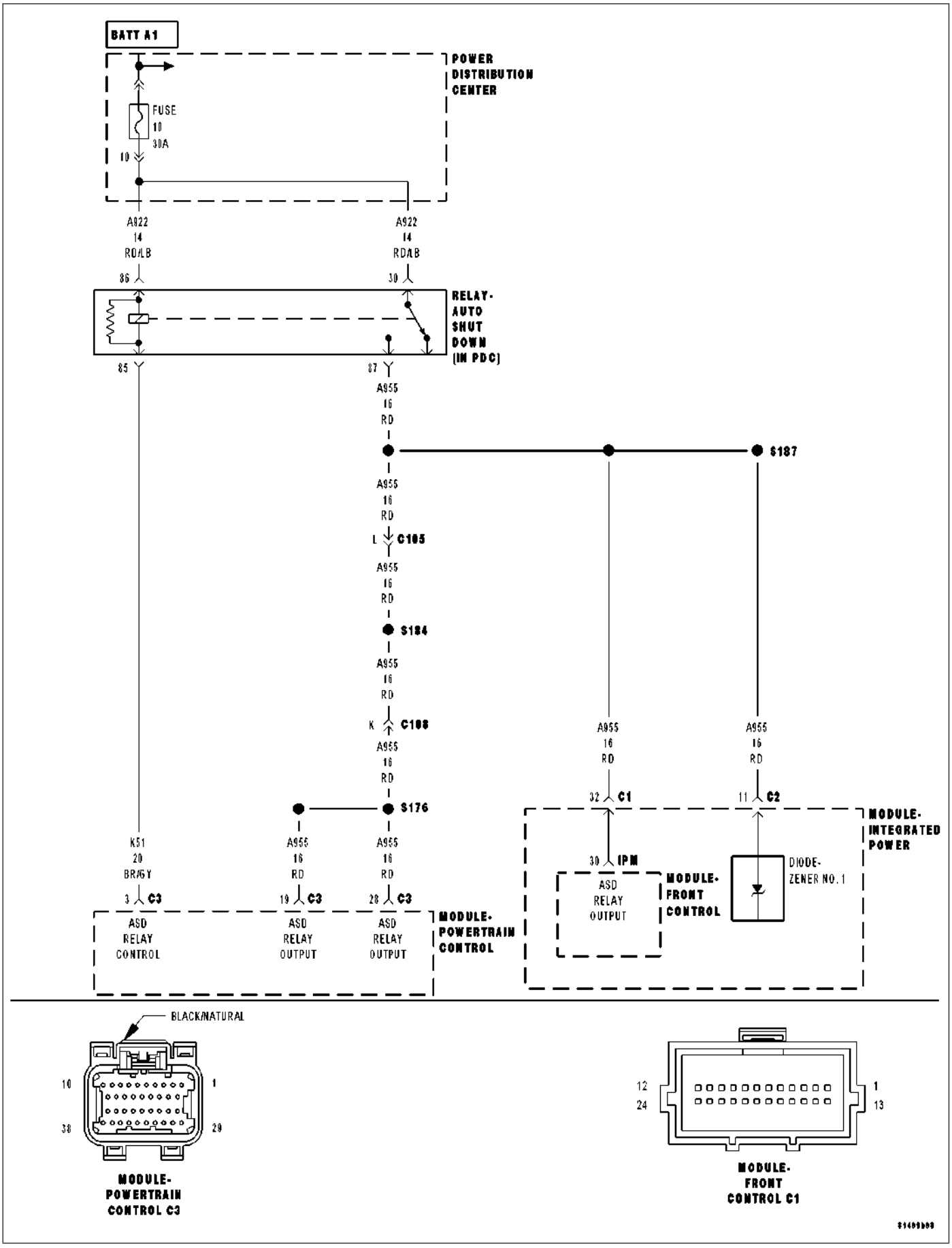
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0689-AUTO SHUTDOWN RELAY SENSE CIRCUIT LOW



P0689-AUTO SHUTDOWN RELAY SENSE CIRCUIT LOW (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on. Battery voltage between 9 and 16 volts and the ASD Relay is powered on.
- **Set Condition:**
  The ASD Output circuit voltage drops below an acceptable value at the FCM. The circuit is continuously monitored.

Possible Causes
(A922) FUSED B+ CIRCUITS
(A955) ASD RELAY OUTPUT CIRCUIT OPEN
(A955) ASD RELAY OUTPUT CIRCUIT SHORTED TO GROUND
ASD RELAY
FCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: P0685 and P0688 ASD Relay Control circuit DTCs must be diagnosed before continuing.
Ignition on, engine not running.
With a scan tool read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. (A922) FUSED B+ CIRCUITS

Turn the ignition off.
Remove the ASD Relay from the IPM.
Using a 12-volt test light connected to ground, probe the (A922) Fused B+ circuits in the IPM.

Does the test light illuminate brightly?

Yes >> Go To 3

No >> Repair the open or short to ground in the (A922) Fused B+ circuits. Inspect the related fuse and repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0689-AUTO SHUTDOWN RELAY SENSE CIRCUIT LOW (CONTINUED)

3. (A955) ASD RELAY OUTPUT CIRCUIT OPEN

Disconnect the C1 FCM harness connector.

Measure the resistance of the (A955) ASD Relay Output circuit from the Relay terminal to the C1 FCM harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 4

No >> Repair the open in the (A955) ASD Relay Output circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

4. (A955) ASD RELAY OUTPUT CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (A955) ASD Relay Output circuit at the Relay terminals.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (A955) ASD Relay Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

---

5. ASD RELAY

Measure the resistance of the ASD Relay Coil between terminals 86 and 85.

Is the resistance between 60 and 80 ohms?

Yes >> Go To 6

No >> Replace the ASD Relay.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

6. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

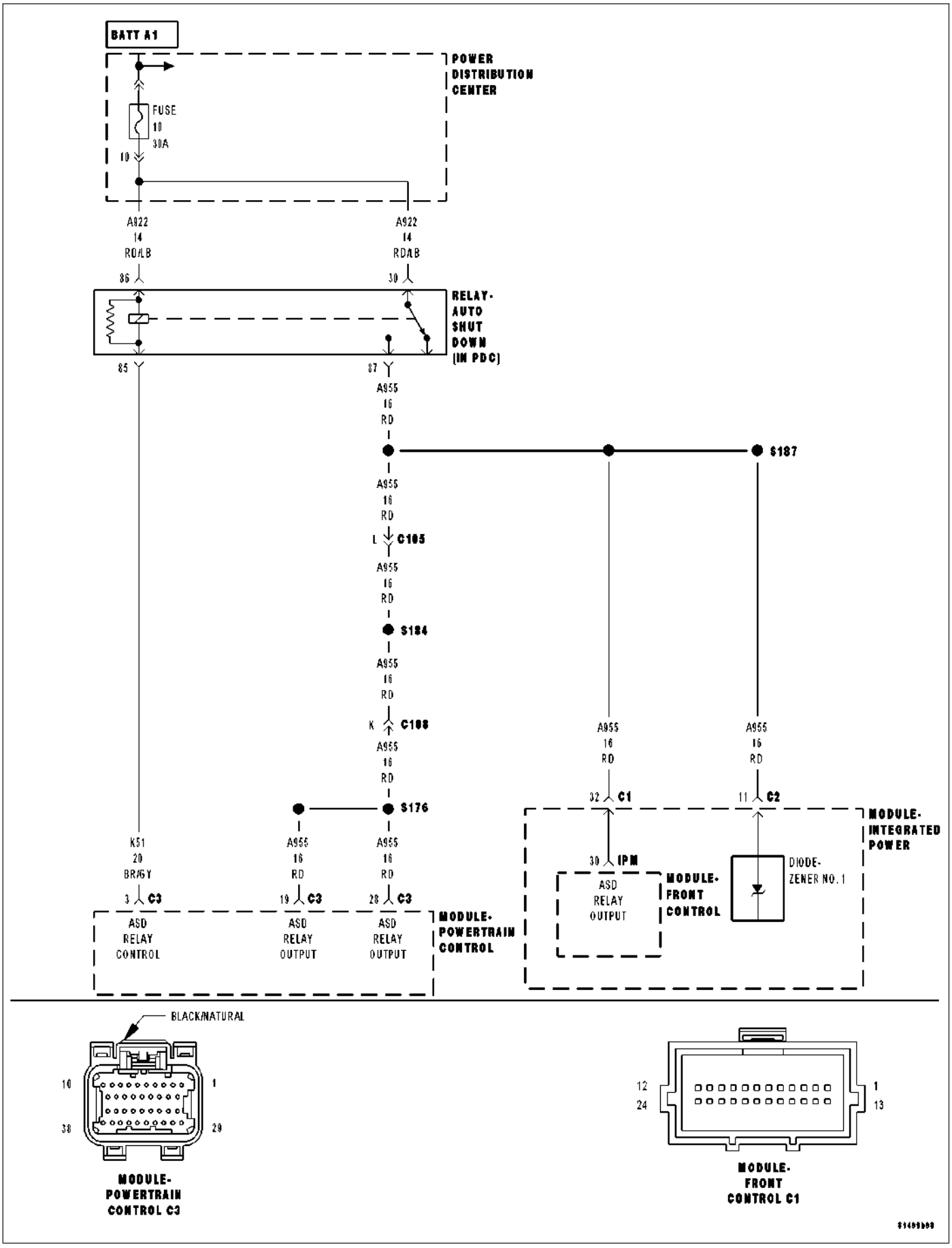
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0690-AUTO SHUTDOWN RELAY SENSE CIRCUIT HIGH



P0690-AUTO SHUTDOWN RELAY SENSE CIRCUIT HIGH (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on and battery voltage greater than 10 volts.
- **Set Condition:**
  If the FCM detects high voltage on the ASD Relay Sense circuit for more than 3.5 seconds.

Possible Causes
(A955) ASD RELAY OUTPUT CIRCUIT SHORTED TO VOLTAGE
ASD RELAY
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: P0685 and P0688 ASD Relay Control circuit DTCs must be diagnosed before continuing.
Ignition on, engine not running.
With a scan tool read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. (A955) ASD RELAY OUTPUT CIRCUIT CHECK

Turn the ignition off.
Remove the ASD Relay.
Ignition on, engine not running.
Measure the voltage on the (A955) ASD Relay Output circuit at the Relay connection.

Is the voltage above 1.0 volt?

Yes >> Go To 3

No >> Go To 4

P0690-AUTO SHUTDOWN RELAY SENSE CIRCUIT HIGH (CONTINUED)

3. (A955) ASD RELAY OUTPUT CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the IPM FCM 49 way harness connector.

Measure the voltage of the (A955) ASD Relay Output Circuit at the Relay connection.

Is the voltage above 1.0 volts?

Yes >> Repair the short to voltage in the (A955) ASD Relay Output circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace the Front Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

4. ASD RELAY

Install the ASD Relay.

Ignition on, engine not running.

Disconnect the No.1 Fuel Injector harness connector.

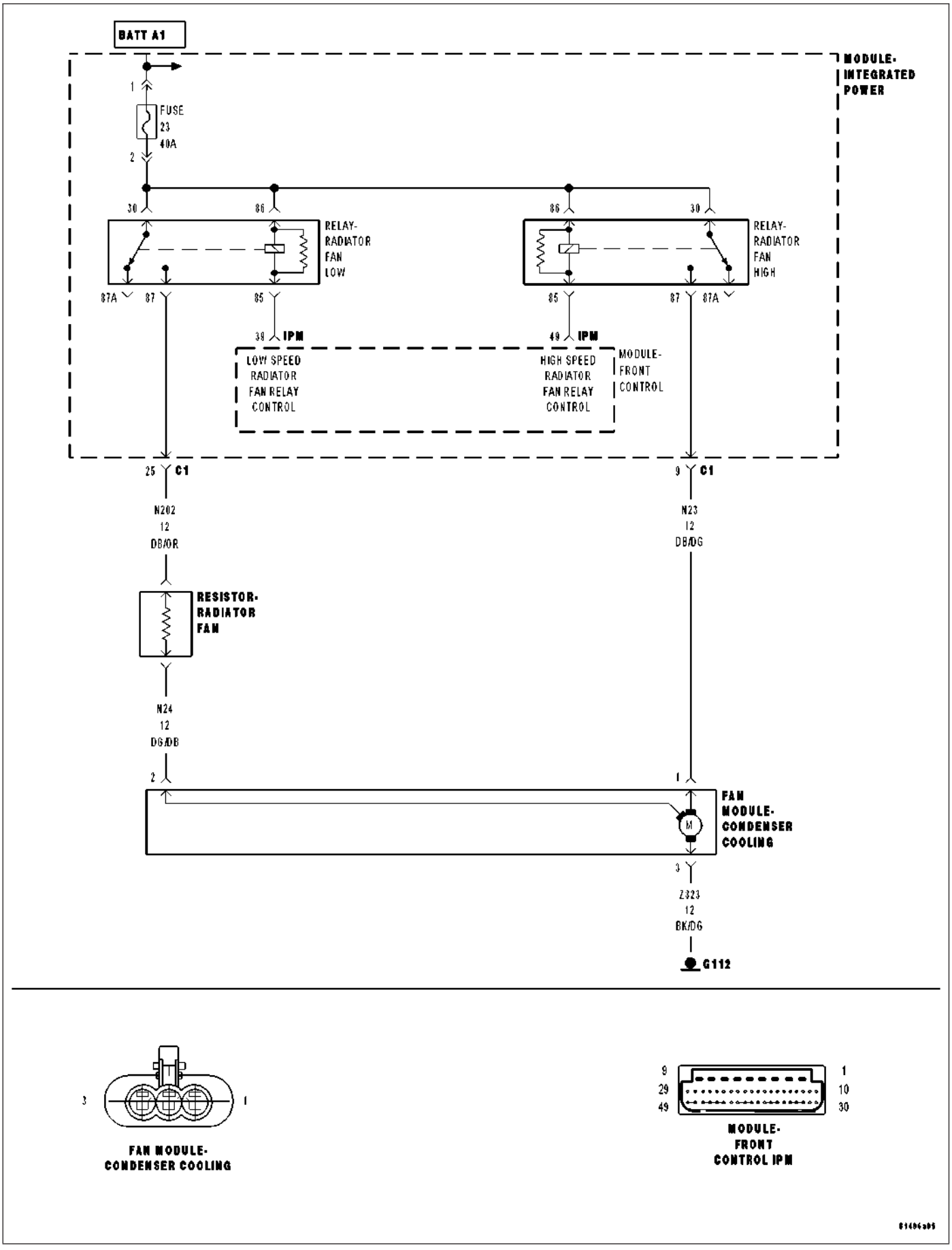
Using a 12-volt test light connected to ground, probe the (A955) ASD Relay Output circuit at the No.1 Fuel Injector harness connector.

Does the test light illuminate brightly?

Yes >> Replace the ASD Relay.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace Front Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0691-COOLING FAN 1 RELAY CONTROL CIRCUIT LOW



P0691-COOLING FAN 1 RELAY CONTROL CIRCUIT LOW (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on with the Cooling fan No.1 Relay actuated.
- **Set Condition:**
  The FCM recognizes and open or short to ground in the Cooling Fan Relay No.1 Control circuit.

Possible Causes
(A16) FUSED B+ CIRCUIT
(N201) LOW SPEED FAN RELALY CONTROL CIRCUIT OPEN
(N201) LOW SPEED FAN RELALY CONTROL CIRCUIT SHORTED TO GROUND
LOW SPEED RADIATOR FAN RELAY
FCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. LOW SPEED RADIATOR FAN RELAY OPERATION

Ignition on, engine not running.

With a scan tool, actuate the Low Speed Radiator Fan Relay.

Is the Cooling Fan Relay operating?

Yes >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 2

---

2. (A16) FUSED B+ CIRCUITS

Turn the ignition off.

Remove the Low Speed Radiator Fan Relay.

Using a 12-volt test light connected to ground, probe the (A16) Fused B+ circuits.

Is the voltage above 11.0 volts?

Yes >> Go To 3

No >> Repair the open or short to ground in the (A16) Fused B+ circuits. Inspect the related fuse and repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

3. LOW SPEED RADIATOR FAN RELAY RESISTANCE

Measure the resistance of the Low Speed Radiator Fan Relay Coil.

Is the resistance between 60 to 80 ohms?

Yes >> Go To 4

No >> Replace the Low Speed Radiator Fan Relay.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0691-COOLING FAN 1 RELAY CONTROL CIRCUIT LOW (CONTINUED)

4. (N201) COOLING FAN NO.1 CONTROL CIRCUIT OPEN

Disconnect the IPM FCM 49 way harness connector.

Measure the resistance of the (N201) Cooling Fan No.1 Relay Control circuit from the Relay to the IPM FCM 49 way harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 5

No >> Repair the open in the (N201) Cooing Fan No.1 Relay Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

5. (N201) COOLING FAN NO.1 CONTROL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (N201) Cooling Fan No.1 Relay Control circuit at the Relay connection.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (N201) Cooling Fan No.1 Relay Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6

---

6. FRONT CONTROL MODULE

NOTE: Before continuing, check the FCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

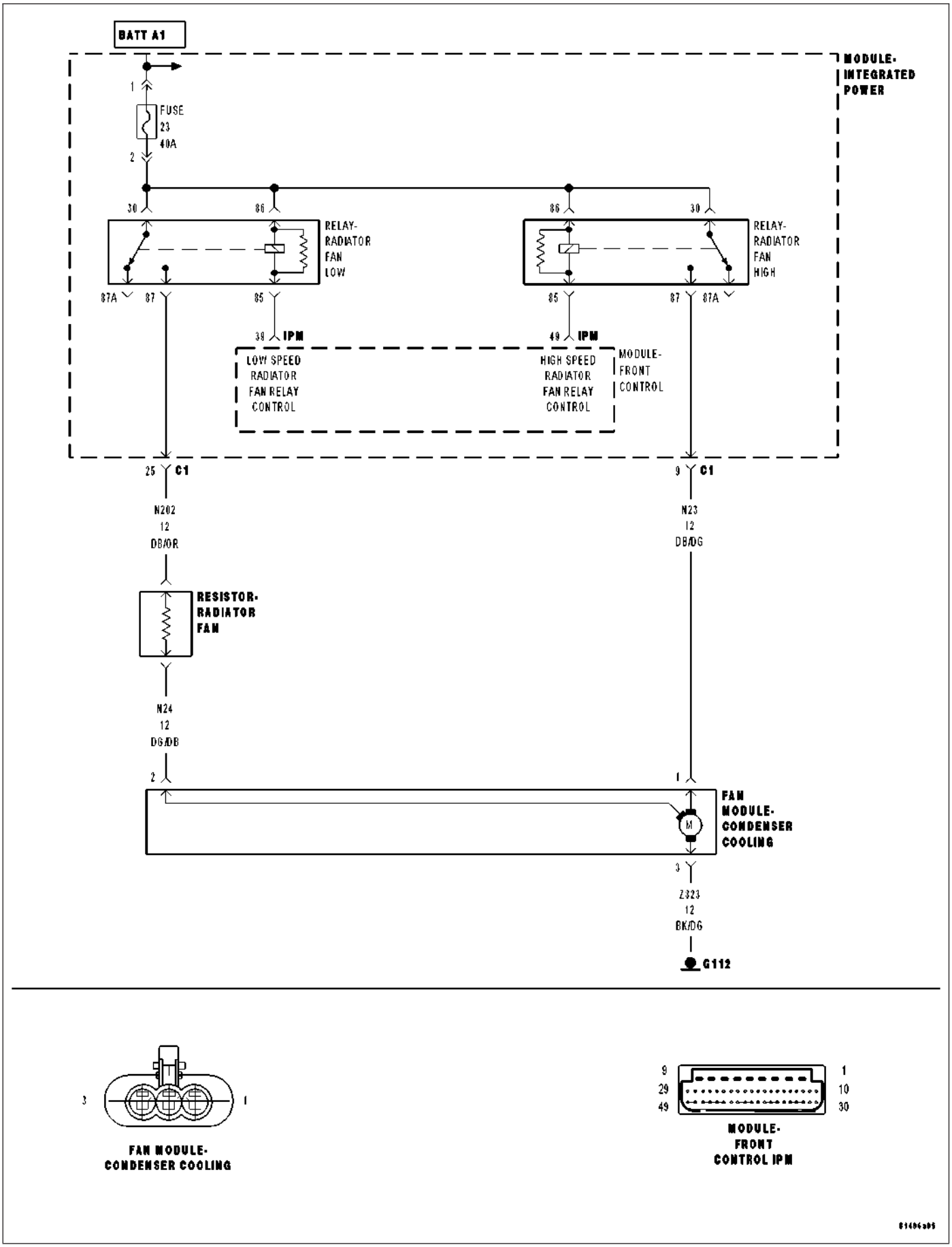
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Replace Front Control Module per Service Information.
Perform BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

P0692-COOLING FAN 1 RELAY CONTROL CIRCUIT HIGH



P0692-COOLING FAN 1 RELAY CONTROL CIRCUIT HIGH (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on with the Cooling Fan No.1 Relay powered on.
- **Set Condition:**
  The FCM detects the Cooling Fan No.1 Relay voltage above the acceptable voltage at the FCM. The circuit is continuously monitored.

Possible Causes
(N201) COOLING FAN NO.1 RELAY CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE
LOW SPEED RADIATOR FAN RELAY
FRONT CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. LOW SPEED RADIATOR FAN RELAY OPERATION

Ignition on, engine not running.
With a scan tool, actuate the Low Speed Radiator Fan Relay.

Is the Cooling Fan Relay operating?

Yes >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 2

---

2. (N201) COOLING FAN NO.1 RELAY CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.
Remove the Low Speed Radiator Fan Relay.
Disconnect the IPM FCM 49 way harness connector.
Ignition on, engine not running.
Measure the voltage on the (N201) Cooling Fan No.1 Relay Control Circuit at the Relay terminal.

Is the voltage above 0 volts?

Yes >> Repair the short to battery voltage in the (N201) Cooling Fan No.1 Relay Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

---

3. LOW SPEED RADIATOR FAN RELAY RESISTANCE

Measure the resistance of the Low Speed Radiator Fan Relay Coil.

Is the resistance between 60 to 80 ohms?

Yes >> Go To 4

No >> Replace the Low Speed Radiator Fan Relay.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0692-COOLING FAN 1 RELAY CONTROL CIRCUIT HIGH (CONTINUED)

4. FRONT CONTROL MODULE

NOTE: Before continuing, check the FCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

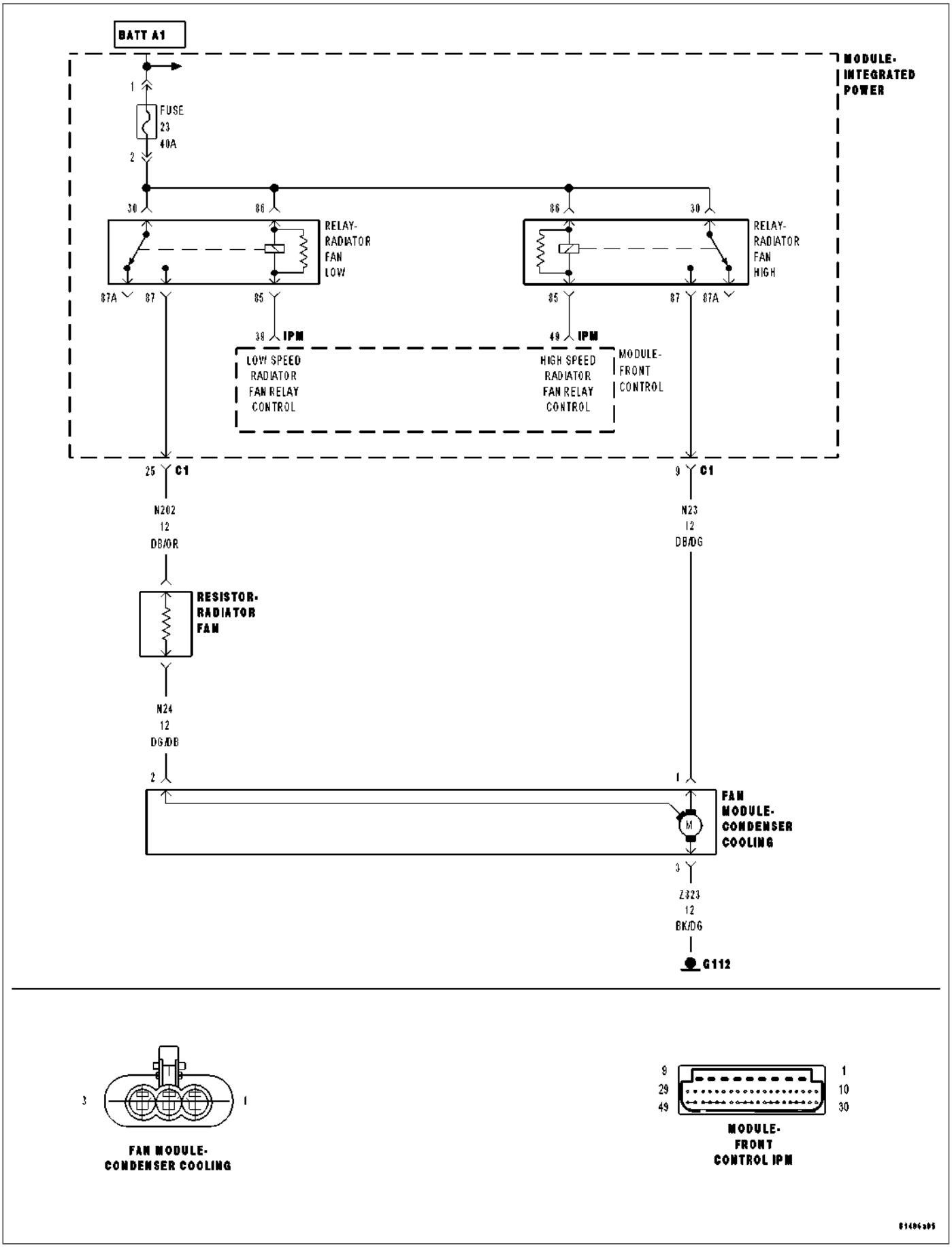
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Replace Front Control Module per Service Information.
Perform BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

P0693-COOLING FAN 2 RELAY CONTROL CIRCUIT LOW



P0693-COOLING FAN 2 RELAY CONTROL CIRCUIT LOW (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on and the High Speed Radiator Fan Relay is powered on.
- **Set Condition:**
  The FCM detects and open or short in the Cooling Fan No.2 Relay Control circuit. The circuit is continuously monitored.

Possible Causes
(A16) FUSED B+ CIRCUITS
(N112) COOOLING FAN NO.2 RELAY CONTROL CIRCUIT OPEN
(N112) COOOLING FAN NO.2 RELAY CONTROL CIRCUIT SHORTED TO GROUND
HIGH SPEED RADIATOR FAN RELAY
FRONT CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. HIGH SPEED RADIATOR FAN RELAY OPERATION

Ignition on, engine not running.

With a scan tool, actuate the High Speed Radiator Fan Relay.

Is the Cooling Fan Relay operating?

Yes >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 2

---

2. (A16) FUSED B+ CIRCUITS

Turn the ignition off.

Remove the High Speed Radiator Fan Relay.

Using a 12-volt test light connected to ground, probe the (A16) Fused B+ circuits in the Relay connection.

Is the voltage above 11.0 volts?

Yes >> Go To 3

No >> Repair the open or short to ground in the (A16) Fused B+ circuits. Inspect the related fuse and repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0693-COOLING FAN 2 RELAY CONTROL CIRCUIT LOW (CONTINUED)

3. HIGH SPEED RADIATOR FAN RELAY RESISTANCE

Measure the resistance of the High Speed Radiator Fan Relay Coil.

Is the resistance between 60 to 80 ohms?

Yes >> Go To 4

No >> Replace the Relay.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

4. (N112) COOLING FAN NO.2 CONTROL CIRCUIT OPEN

Disconnect the IPM FCM 49 way harness connector.

Measure the resistance of the (N112) Cooling Fan No.2 Relay Control circuit from the Relay connection to the IPM FCM 49 way harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 5

No >> Repair the open in the (N112) Cooling Fan No.2 Relay Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

5. (N112) COOLING FAN NO.2 CONTROL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (N112) Cooling Fan No.2 Relay Control circuit at the Relay connection.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (N112) Cooling Fan No.2 Relay Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6

---

6. FRONT CONTROL MODULE

NOTE: Before continuing, check the FCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

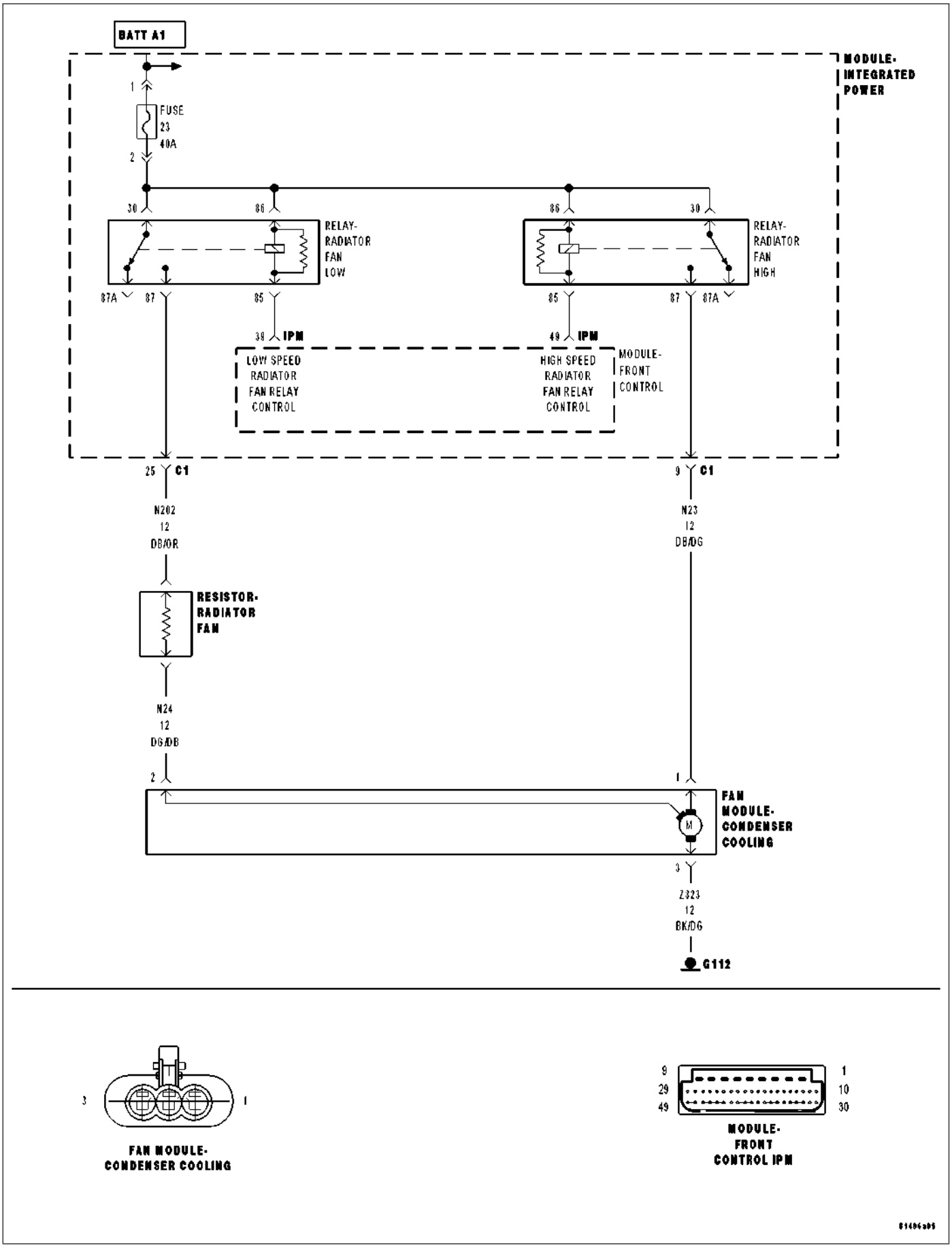
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Replace the Front Control Module per Service Information.
Perform BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

P0694-COOLING FAN 2 RELAY CONTROL CIRCUIT HIGH



P0694-COOLING FAN 2 RELAY CONTROL CIRCUIT HIGH (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on with the Cooling Fan No.2 Relay powered on.
- **Set Condition:**
  The FCM detects the Cooling Fan No.2 Relay voltage above the acceptable voltage at the FCM. The circuit is continuously monitored.

Possible Causes
(N112) COOLING FAN NO.2 RELAY CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE
HIGH SPEED RADIATOR FAN RELAY
FRONT CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. LOW SPEED RADIATOR FAN RELAY OPERATION

Ignition on, engine not running.
With a scan tool, actuate the High Speed Radiator Fan Relay.

Is the Cooling Fan Relay operating?

Yes >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 2

---

2. (N112) COOLING FAN NO.2 RELAY CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.
Remove the High Speed Radiator Fan Relay.
Disconnect the IPM FCM 49 way harness connector.
Ignition on, engine not running.
Measure the voltage on the (N112) Cooling Fan No.2 Relay Control Circuit at the Relay terminal.

Is the voltage above 0 volts?

Yes >> Repair the short to battery voltage in the (N112) Cooling Fan No.2 Relay Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

---

3. HIGH SPEED RADIATOR FAN RELAY RESISTANCE

Measure the resistance of the High Speed Radiator Fan Relay Coil.

Is the resistance between 60 to 80 ohms?

Yes >> Go To 4

No >> Replace the High Speed Radiator Fan Relay.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0694-COOLING FAN 2 RELAY CONTROL CIRCUIT HIGH (CONTINUED)

4. FRONT CONTROL MODULE

NOTE: Before continuing, check the FCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Replace Front Control Module per Service Information.
Perform BODY VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

P0700-TRANSMISSION CONTROL SYSTEM (MIL REQUEST)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on and battery voltage greater than 10 volts.
- **Set Condition:**
  An active DTC is stored in the TCM. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
DTC PRESENT IN THE TRANSMISSION CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. DTC PRESENT IN EATX CONTROLLER

This is an informational DTC letting you know that a DTC(s) is stored in the Transmission Control Module.

Erase this DTC from the PCM after all Transmission DTC(s) have been repaired.

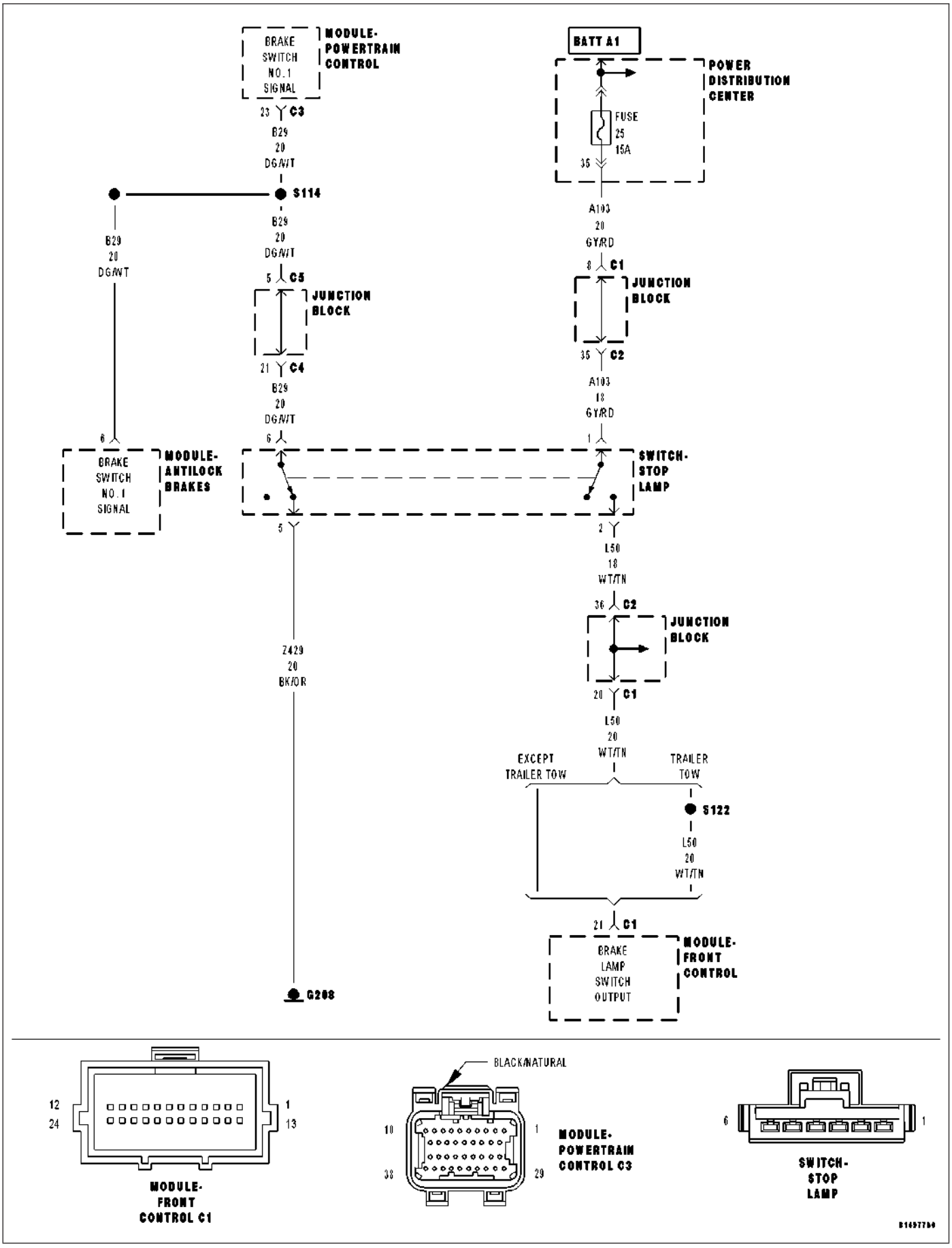
Using a scan tool, read the Transmission Controller DTC and refer to the Transmission Category and perform the appropriate symptom.

PCM Diagnostic Information complete.

Continue

Test Complete.

P0703-BRAKE SWITCH 2 PERFORMANCE



P0703-BRAKE SWITCH 2 PERFORMANCE (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  When the PCM recognizes Brake Switch No.2 voltage is not equal to the applied value at the PCM when Brake Switch No.1 is applied. This could be a normal condition. If this condition is seen repeatedly by the PCM the fault is set. Cruise will not work for the rest of the key cycle.

Possible Causes
(A103) FUSED B+ CIRCUIT
(L50) BRAKE LAMP SWITCH OUTPUT CIRCUIT OPEN
(L50) BRAKE LAMP SWITCH OUTPUT CIRCUIT SHORTED TO BATTERY VOLTAGE
(L50) BRAKE LAMP SWITCH OUTPUT CIRCUIT SHORTED TO GROUND
(B29) BRAKE SWITCH NO.1 SIGNAL CIRCUIT OPEN
STOP LAMP SWITCH
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: Make sure the Stop Lamp Switch is adjusted properly before continuing.

NOTE: Make sure the Stop Lamp Switch is properly wired, such as (B29) Brake Switch No.1 and (L50) Brake Lamp Switch Output are not switched at the harness connector.

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

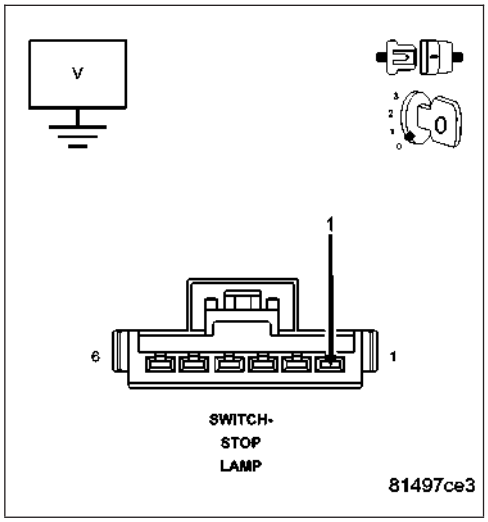
P0703-BRAKE SWITCH 2 PERFORMANCE (CONTINUED)

2. (A103) FUSED B+ CIRCUIT

Turn the ignition off.

Disconnect the Stop Lamp Switch harness connector.

Using a 12-volt test light connected to ground, probe the (A103) Fused B+ circuit in the Stop Lamp Switch harness connector.



Does the test light illuminate brightly?

Yes >> Go To 3

No >> Repair the open or short to ground in the (A103) Fused B+ circuit. Inspect the related fuse and repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

3. STOP LAMP SWITCH

Turn the ignition off.

Measure the resistance between the (A103) Fused B+ circuit terminal and the (L50) Brake Lamp Switch Output terminal in the Stop Lamp Switch.

Measure the resistance between the (Z429) Ground circuit terminal and the (K29) Brake Switch No.1 Signal terminal in the Stop Lamp Switch.

Apply and release the Stop Lamp Switch while monitoring the ohmmeter.

Does the resistance change from below 5.0 ohms to open circuit for each circuit check?

Yes >> Go To 4

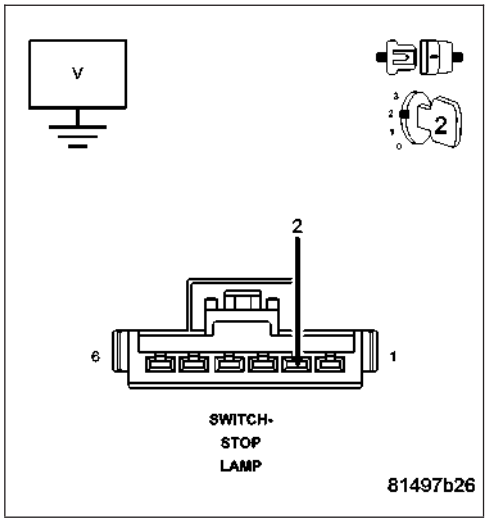
No >> Replace the Stop Lamp Switch.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

4. (L50) BRAKE LAMP SWITCH OUTPUT CIRCUIT SHORTED TO BATTERY VOLTAGE

Disconnect the C1 FCM harness connector.

Measure the voltage on the (L50) Brake Lamp Switch Output circuit in the Stop Lamp Switch harness connector.

Ignition on, engine not running.



Is the voltage above 0 volts?

Yes >> Repair the short to battery voltage in the (L50) Brake Lamp Switch Output circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

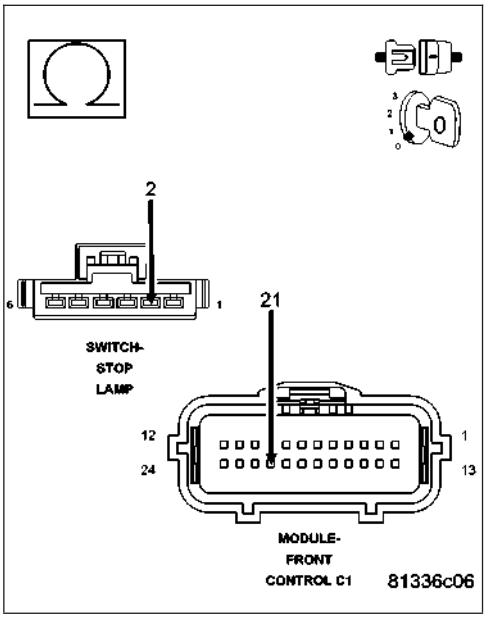
No >> Go To 5

P0703-BRAKE SWITCH 2 PERFORMANCE (CONTINUED)

5. (L50) BRAKE LAMP SWITCH OUTPUT CIRCUIT OPEN

Turn the ignition off.

Measure the resistance of the (L50) Brake Lamp Switch Output circuit from the Stop Lamp Switch harness connector to the C1 FCM harness connector.



Is the resistance below 5.0 ohms?

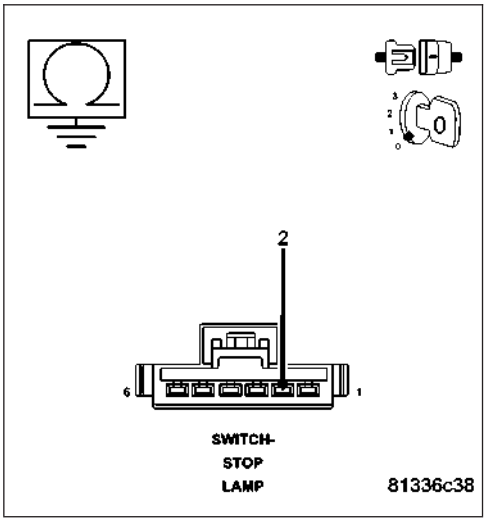
Yes >> Go To 6

No >> Repair the open in the (L50) Brake Lamp Switch Output circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

6. (L50) BRAKE LAMP SWITCH OUTPUT CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (L50) Brake Lamp Switch Output circuit in the Stop Lamp Switch harness connector.



Is the resistance below 5.0 ohms?

Yes >> Repair the short to ground in the (L50) Brake Lamp Switch Output circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

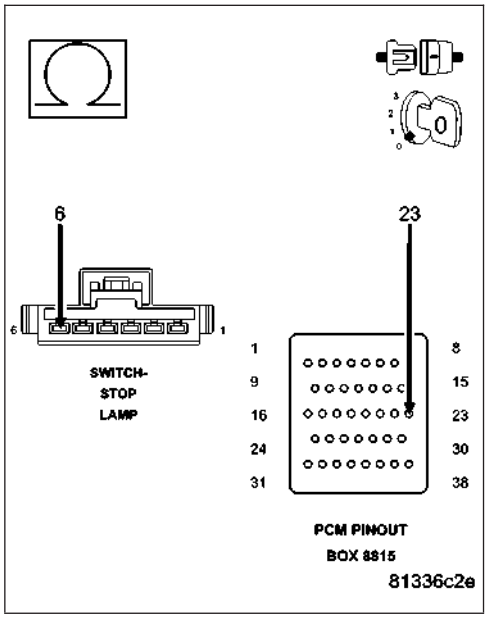
No >> Go To 7

P0703-BRAKE SWITCH 2 PERFORMANCE (CONTINUED)

7. (B29) BRAKE SWITCH NO.1 SIGNAL CIRCUIT OPEN

Disconnect the C3 PCM harness connector.

Measure the resistance of the (B29) Brake Switch No.1 Signal circuit from the Stop Lamp Switch harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 8

No >> Repair the open in the (B29) Brake Switch No.1 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

8. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

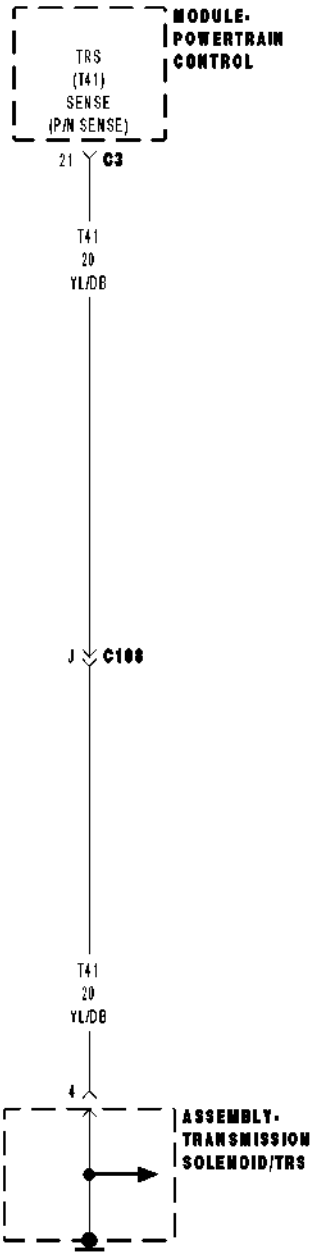
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

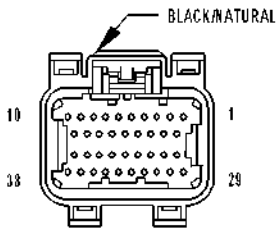
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

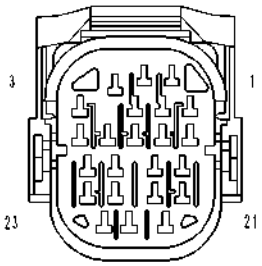
No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0850-PARK/NEUTRAL SWITCH PERFORMANCE





MODULE-
POWERTRAIN
CONTROL C3



ASSEMBLY-
TRANSMISSION
SOLENOID/TRS
(4.7L/5.7L)

B143a00a

P0850-PARK/NEUTRAL SWITCH PERFORMANCE (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The Park Neutral switch rationality test is enabled only for vehicles equipped with a 4/5 speed automatic transmission. This diagnostic checks if the park/neutral switch is incorrectly stuck in the neutral position during driving conditions by comparing Vehicle Speed, Engine Speed, Throttle Position, and Pressure Ratio to the fail thresholds and by looking at the state of the Park/Neutral Switch. The stuck in drive condition is not explicitly checked as the starter relay does not energize and therefore render the vehicle inoperable.

- **When Monitored:**
  Continuously with the transmission in Park, Neutral, or Drive and NOT in Limp-in mode.
- **Set Condition:**
  This code will set if the PCM detects an incorrect Park/Neutral switch state for a given mode of vehicle operation. One trip fault. Three good trips to turn off the MIL.

Possible Causes
TRS (T41) SENSE (P/N SENSE) CIRCUIT OPEN
TRS (T41) SENSE (P/N SENSE) CIRCUIT SHORTED TO GROUND
TRANSMISSION RANGE SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. P/N & D/R NOT IN CORRECT POSITION

NOTE: Check the TCM for DTCs, if P0706 is set in the TCM diagnose the TCM code before continuing.
Ignition on, engine not running.

With the scan tool, read the Park/Neutral Position Switch input state.

While moving the gear selector through all gear positions (Park to 1 and back to Park), monitor the scan tool display.

Did the scan tool display show P/N and D/R in the correct gear positions?

Yes >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 2

P0850-PARK/NEUTRAL SWITCH PERFORMANCE (CONTINUED)

2. TRS (T41) SENSE (P/N SENSE) CIRCUIT OPEN

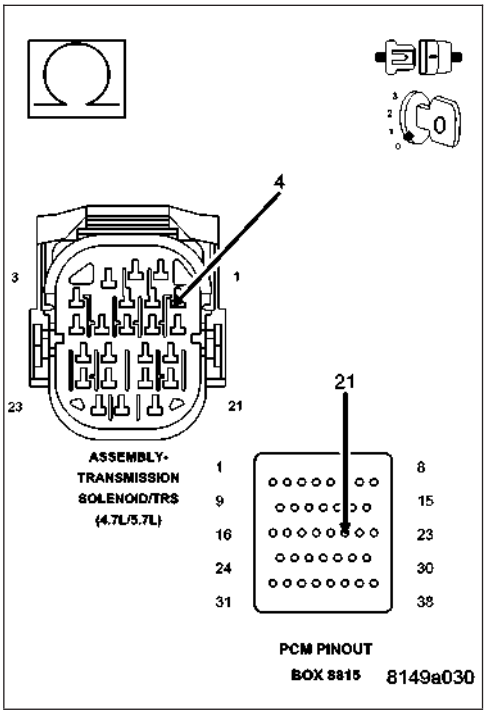
Turn the ignition off.

Disconnect the C3 PCM harness connector.

Disconnect the Transmission Range Sensor harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the TRS (T41) Sense (P/N Sense) circuit from the TRS harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

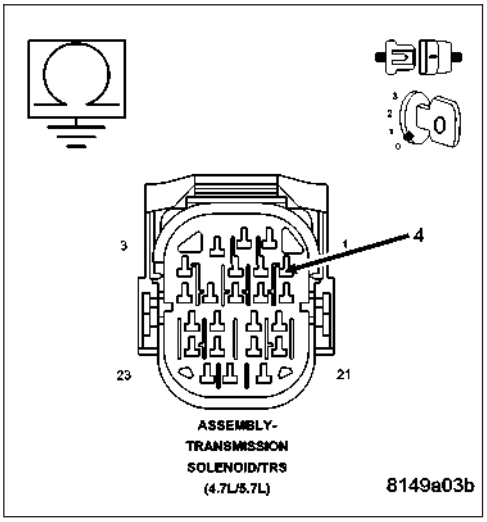
Yes >> Go To 3

No >> Repair the open in the TRS (T41) Sense (P/N Sense) circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

3. TRS (T41) SIGNAL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the TRS (T41) Sense (P/N Sense) circuit at the TRS harness connector.



Is the resistance above 100k ohms?

Yes >> Go To 4

No >> Repair the short to ground in the TRS (T41) Sense (P/N Sense) circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P0850-PARK/NEUTRAL SWITCH PERFORMANCE (CONTINUED)

4. TRANSMISSION RANGE SENSOR

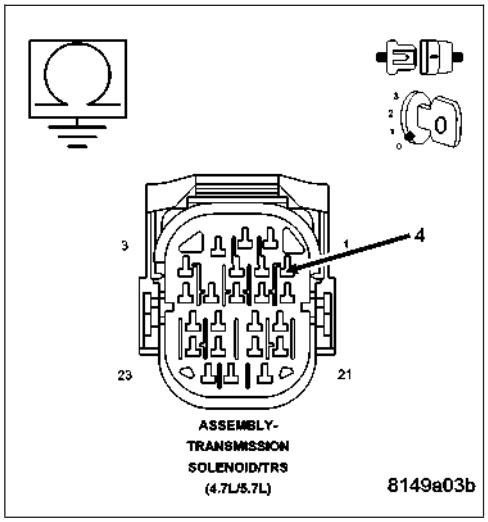
Measure the resistance between ground and the (T41) TRS Sense (P/N Sense) circuit while moving the gear selector through each gear in the TRS connector.

NOTE: The circuit is grounded in Park and Neutral and open in the other positions.

Did the resistance change from above 100 kohms (open) to below 10.0 ohms (grounded)?

Yes >> Go To 5

No >> Replace the Transmission Range Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



5. PCM

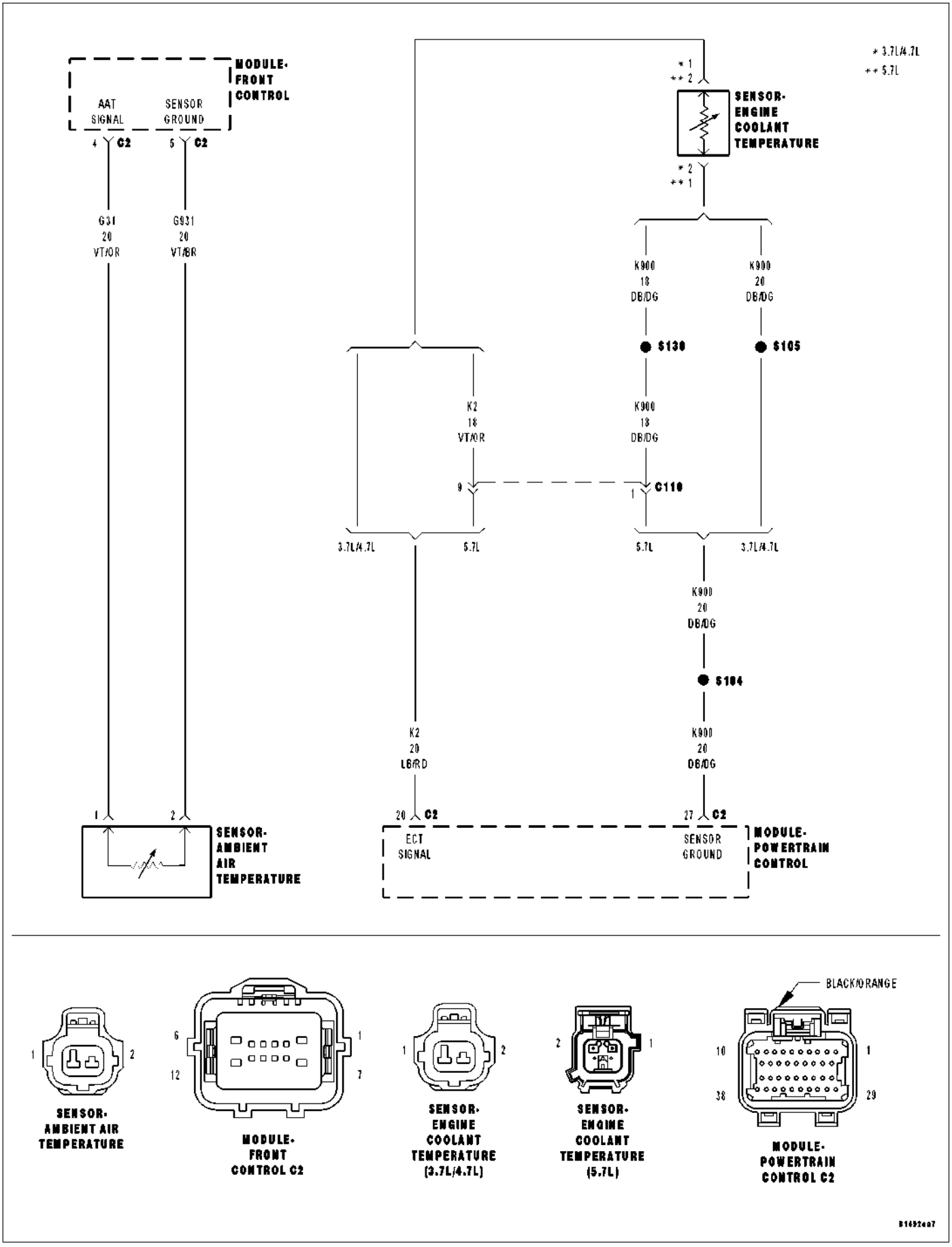
NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P1115-GENERAL TEMPERATURE RATIONALITY



P1115-GENERAL TEMPERATURE RATIONALITY (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

The General Temperature Rationality looks at the outputs of the three temperature sensors and compare them under cold start conditions. Following a start to run delay time, the outputs of the ambient, engine coolant, and intake air temperature sensors will be compared. If two sensors agree but not the third, the third sensor is declared as irrational. If all three sensors are irrational the General Temperature Sensor Rationality is failed.

- **When Monitored:**
  Ignition on and battery voltage greater than 10 volts.
- **Set Condition:**
  Ambient Air, Engine Coolant, and Intake Air Temp sensor inputs are compared under cold start conditions. After start up the temp readings are monitored. If two of the three readings agree and the third doesn't, a DTC is stored. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
EXCESSIVE RESISTANCE IN THE SENSOR SIGNAL CIRCUIT
EXCESSIVE RESISTANCE IN THE (K900) SENSOR GROUND CIRCUIT
TEMPERATURE SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, read the DTCs.

NOTE: All ECT, Intake Air, and Ambient Air Temperature Sensor codes must be diagnosed and repaired before continuing.

NOTE: In cold weather, this DTC could be set by a high powered block heater and no repair would be required.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. TEMPERATURE SENSOR CIRCUIT

With a scan tool, read the ECT, Ambient Air Temp, and Intake Air Temp Sensor temp values.

Start the engine.

Allow the engine to reach normal operating temperature while monitoring the three Sensor temperature values.

Is the temperature for each of the Sensors increasing properly?

Yes >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

P1115-GENERAL TEMPERATURE RATIONALITY (CONTINUED)

3. TEMPERATURE SENSOR

Ignition on, engine not running.

Disconnect the suspected sensor.

Connect a jumper wire between the Sensor Signal circuit and the (K900) Sensor ground circuit.

With the scan tool, read the voltage of the suspected Sensor.

Did the voltage reading start at 4.8 to 5.0 volts and decrease to 0 volts when the jumper wire was installed?

Yes >> Replace the Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

NOTE: Remove the jumper wire before continuing.

---

4. EXCESSIVE RESISTANCE IN THE TEMPERATURE SENSOR SIGNAL CIRCUIT

Turn the ignition off.

Disconnect the PCM harness connectors.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the Sensor Signal circuit from the Sensor harness connector to the appropriate terminal of special tool #8815.

Is the resistance above 5.0 ohms.

Yes >> Repair the excessive resistance in the Temperature Sensor Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

---

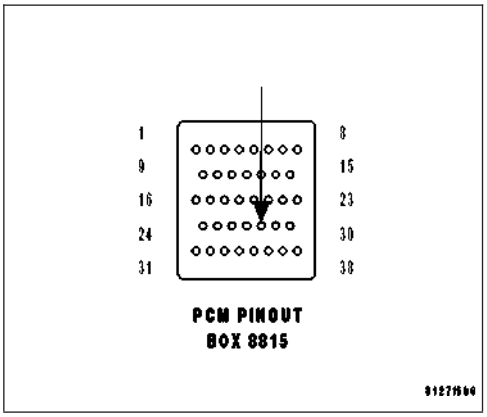
5. EXCESSIVE RESISTANCE IN THE (K900) SENSOR GROUND CIRCUIT

Measure the resistance of the (K900) Sensor ground circuit from the Sensor harness connector to the appropriate terminal of special tool #8815.

Is the resistance above 5.0 ohms.

Yes >> Repair the excessive resistance in the (K900) Sensor ground circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6



P1115-GENERAL TEMPERATURE RATIONALITY (CONTINUED)

6. **PCM**

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

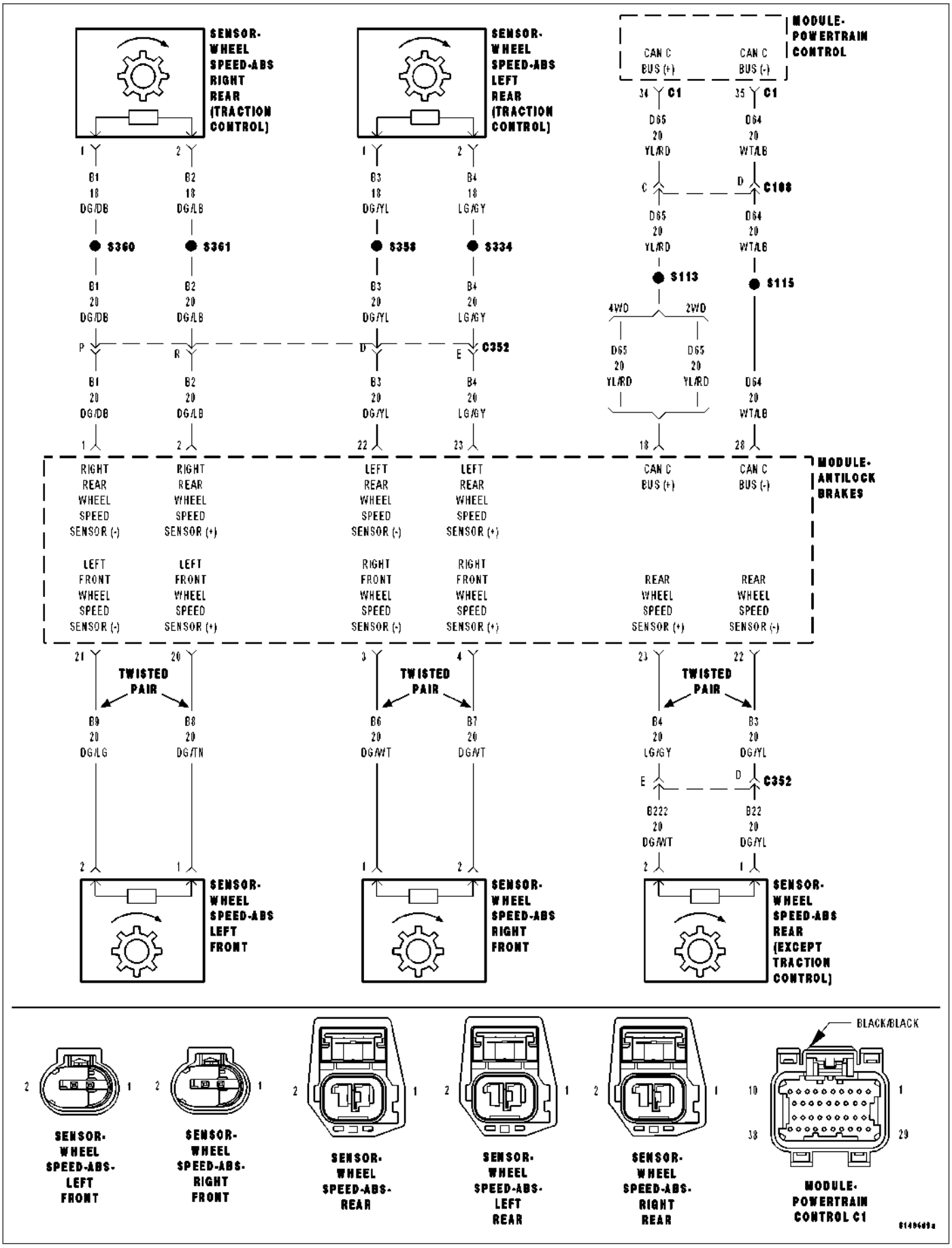
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P1501-VEHICLE SPEED SENSOR 1/2 CORRELATION - DRIVE WHEELS



P1501-VEHICLE SPEED SENSOR 1/2 CORRELATION - DRIVE WHEELS (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on and vehicle moving. Cruise is learned and customer is trying to use the Cruise.
- **Set Condition:**
  The PCM recognizes rear wheel speed is greater than front wheel speed.

Possible Causes
ACTIVE BUS OR COMMUNICATION DTCS
TIRE CIRCUMFERENCE
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

NOTE: Check for any Bus Communication DTCs. If no Bus Communication DTCs are set, check for active DTCs stored in the Ant-Lock Brake Module. Any Bus Communication DTCs or VSS DTCs in the Ant-Lock Brake Module must be properly diagnosed before continuing.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. VISUAL INSPECTION

NOTE: This code can set due to tire circumference differences and from the front or rear wheels being on a slippery surface while the opposite tires are not.

This code may also set on a hard acceleration on loose gravel or during other off road driving conditions.

Check tire pressure of all the tires.

Check tire wear on all the tires.

Ask the customer what the road and driving conditions were like when the fault set.

Were any problems found?

Yes >> Repair as necessary. If the code set during a front OR rear wheel spin condition, no repair is necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

P1501-VEHICLE SPEED SENSOR 1/2 CORRELATION - DRIVE WHEELS (CONTINUED)

3. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

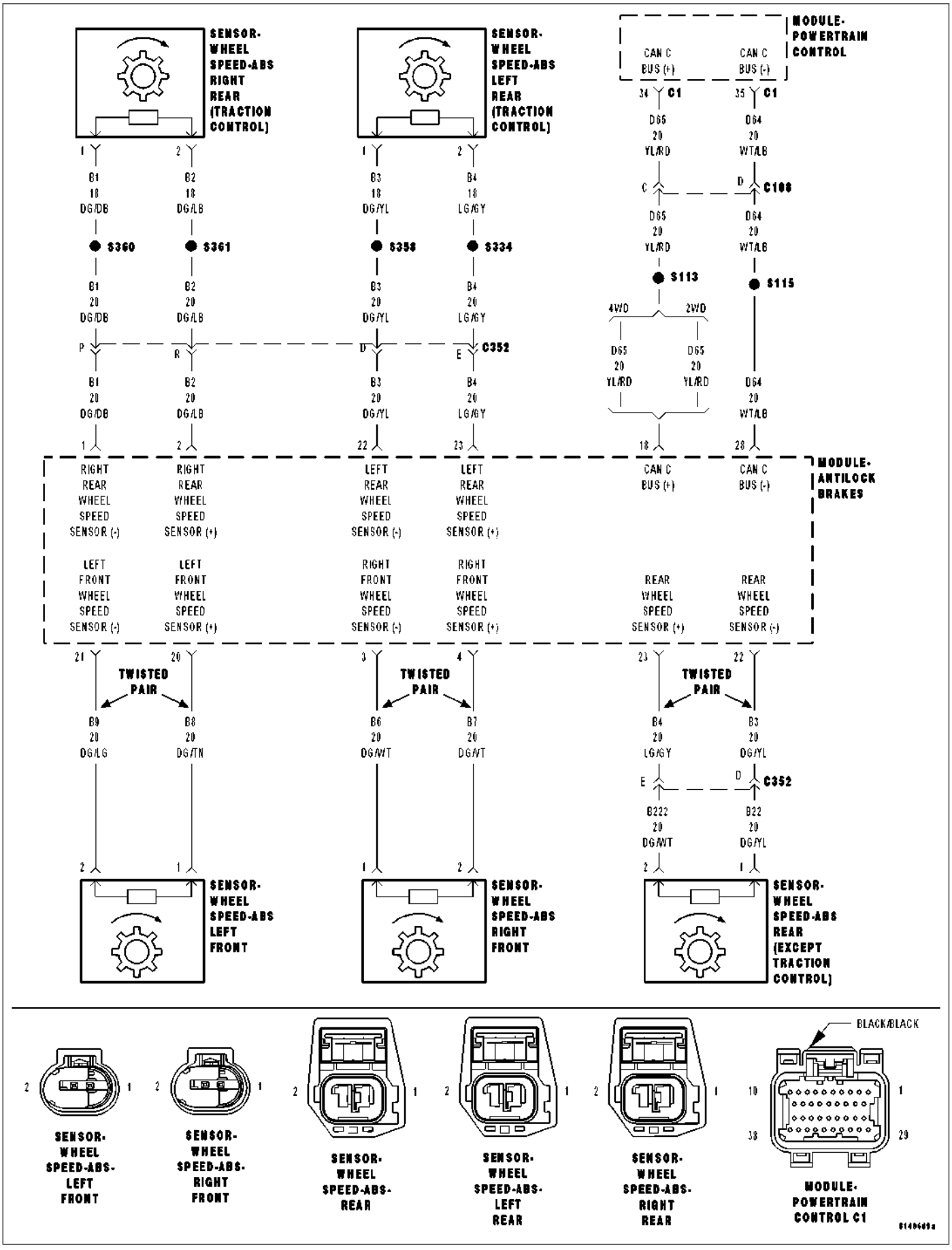
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P1502-VEHICLE SPEED SENSOR 1/2 CORRELATION - NON DRIVE WHEELS



P1502-VEHICLE SPEED SENSOR 1/2 CORRELATION - NON DRIVE WHEELS (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on and vehicle moving. Brake pedal must not be applied.
- **Set Condition:**
  The PCM recognizes front axle speed is greater than rear axle speed.

Possible Causes
ACTIVE BUS OR COMMUNICATION DTCS
TIRE CIRCUMFERENCE
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

NOTE: Check for any Bus Communication DTCs. If no Bus Communication DTCs are set, check for active DTCs stored in the Ant-Lock Brake Module. Any Bus Communication DTCs or VSS DTCs in the Ant-Lock Brake Module must be properly diagnosed before continuing.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. VISUAL INSPECTION

NOTE: This code can set due to tire circumference differences and from the front or rear wheels being on a slippery surface while the opposite tires are not.

This code may also set on a hard acceleration on loose gravel or during other off road driving conditions.

Check tire pressure of all the tires.

Check tire wear on all the tires.

Ask the customer what the road and driving conditions were like when the fault set.

Were any problems found?

Yes >> Repair as necessary. If the code set during a front OR rear wheel spin condition, no repair is necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

P1502-VEHICLE SPEED SENSOR 1/2 CORRELATION - NON DRIVE WHEELS (CONTINUED)

3. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

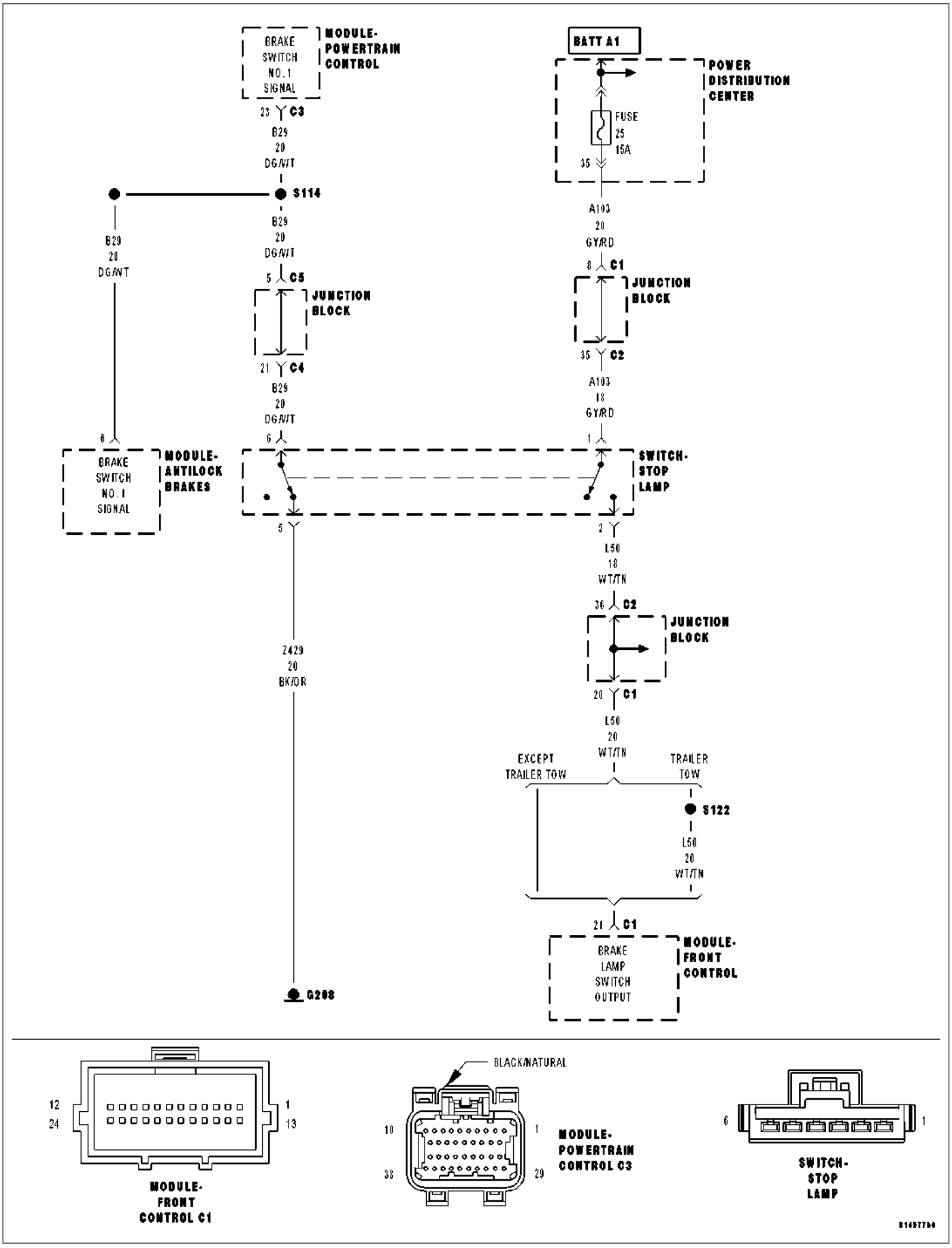
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P1572-BRAKE PEDAL STUCK ON



P1572-BRAKE PEDAL STUCK ON (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on. In plant mode only.
- **Set Condition:**
  PCM recognizes the Brake Pedal could not electrically indicate the applied (On) position with both switch inputs. One trip fault.

Possible Causes
(B29) BRAKE SWITCH NO.1 SIGNAL CIRCUIT OPEN
(L50) BRAKE LAMP SWITCH OUTPUT CIRCUIT OPEN
STOP LAMP SWITCH
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: Make sure the Stop Lamp Switch is adjusted properly before continuing.
Ignition on, engine not running.
With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. STOP LAMP SWITCH OPERATION

Turn the ignition off.
Disconnect the Stop Lamp Switch harness connector.
Measure the resistance between the (Z429) Ground circuit terminal and the (B29) Brake Switch No.1 Signal terminal in the Stop Lamp Switch.
Apply and release the Stop Lamp Switch while monitoring the ohmmeter.

Does the resistance change from below 5.0 ohms to open circuit when pressing and releasing the brake pedal switch?

Yes >> Go To 3

No >> Replace the Stop Lamp Switch.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P1572-BRAKE PEDAL STUCK ON (CONTINUED)

3. STOP LAMP SWITCH OPERATION

Measure the resistance between the (A103) Fused B+ terminal and the (L50) Brake Lamp Switch Output circuit terminal in the Stop Lamp Switch.

Apply and release the Stop Lamp Switch while monitoring the ohmmeter.

Does the resistance change from below 5.0 ohms to open circuit when pressing and releasing the Stop Lamp switch?

Yes >> Go To 4

No >> Replace the Stop Lamp Switch.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

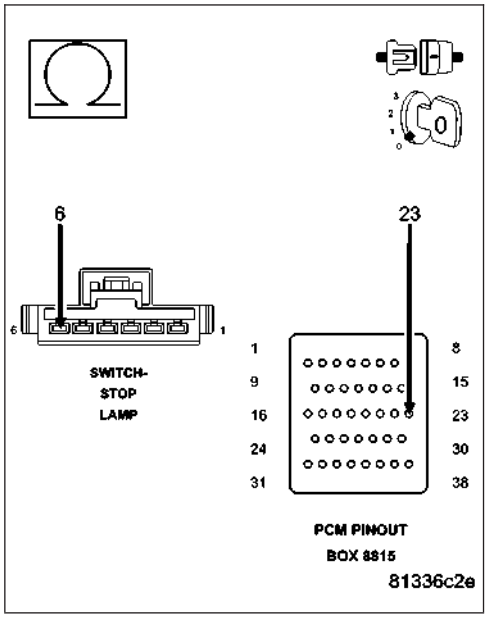
---

4. (B29) BRAKE SWITCH NO.1 SIGNAL CIRCUIT OPEN

Disconnect the C3 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (B29) Brake Switch No.1 Signal circuit from the Stop Lamp Switch harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 5

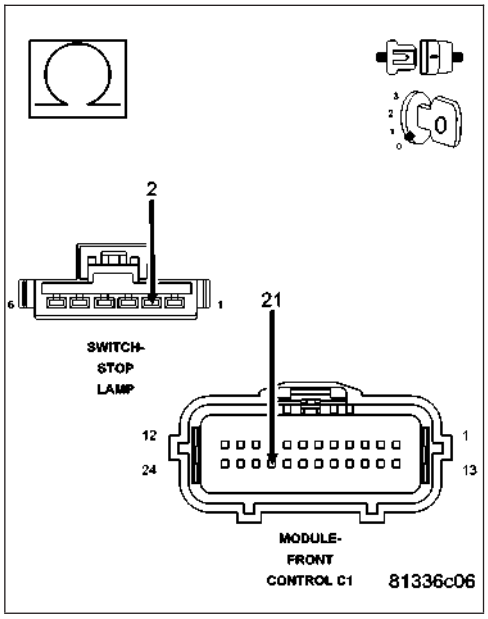
No >> Repair the open in the (B29) Brake Switch No.1 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P1572-BRAKE PEDAL STUCK ON (CONTINUED)

5. (L50) BRAKE LAMP SWITCH OUTPUT CIRCUIT OPEN

Disconnect the C1 FCM harness connector.

Measure the resistance of the (L50) Brake Lamp Switch Output circuit from the Stop Lamp Switch harness connector to the C1 FCM harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go To 6

No >> Repair the open in the (L50) Brake Lamp Switch Output circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

6. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

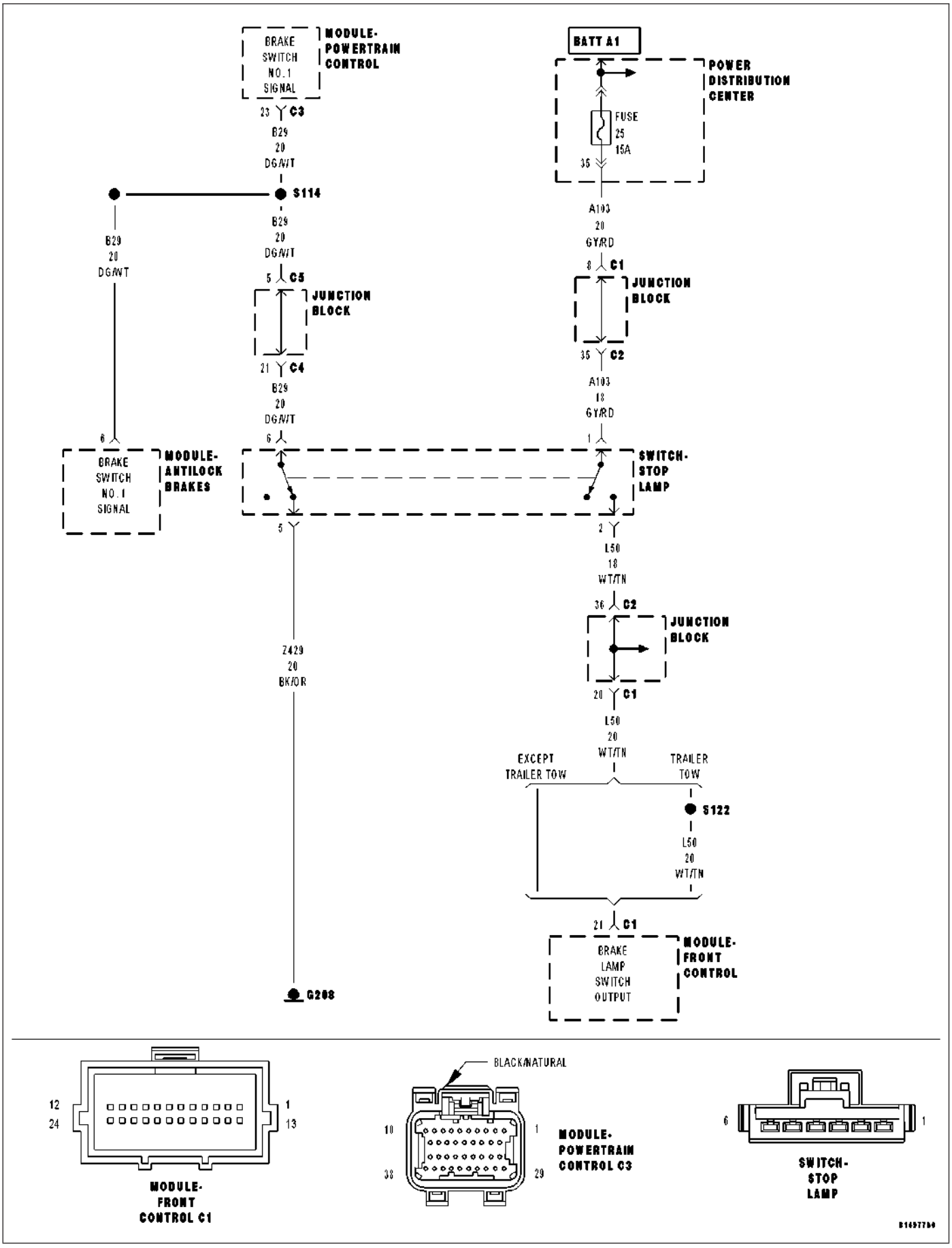
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P1573-BRAKE PEDAL STUCK OFF



P1573-BRAKE PEDAL STUCK OFF (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on, In plant mode passed the Applied test.
- **Set Condition:**
  PCM recognizes the Brake Pedal could not electronically indicate the released (Off) position with both switches. If P1572 sets, P1573 will also set. One trip fault.

Possible Causes
(L50) BRAKE LAMP SWITCH OUTPUT CIRCUIT SHORTED TO BATTERY VOLTAGE
(B29) BRAKE SWITCH NO.1 SIGNAL CIRCUIT SHORTED TO GROUND
STOP LAMP SWITCH
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: Make sure the Stop Lamp Switch is adjusted properly before continuing.
Ignition on, engine not running.
With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. STOP LAMP SWITCH OPERATION

Turn the ignition off.
Disconnect the Stop Lamp Switch harness connectors.
Measure the resistance between the (Z429) Ground circuit terminal and the (B29) Brake Switch No.1 Signal terminal in the Stop Lamp Switch.
Apply and release the Stop Lamp Switch while monitoring the ohmmeter.

Does the resistance change from below 5.0 ohms to an open circuit when pressing and releasing the brake switch?

Yes >> Go To 3

No >> Replace the Stop Lamp Switch.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P1573-BRAKE PEDAL STUCK OFF (CONTINUED)

3. STOP LAMP SWITCH OPERATION

Measure the resistance between the (A103) Fused B+ circuit terminal and the (L50) Brake Lamp Switch Output terminal in the Stop Lamp Switch.

Apply and release the Stop Lamp Switch while monitoring the ohmmeter.

Does the resistance change from below 5.0 ohms to an open circuit when pressing and releasing the Stop Lamp switch?

Yes >> Go To 4

No >> Replace the Stop Lamp Switch.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

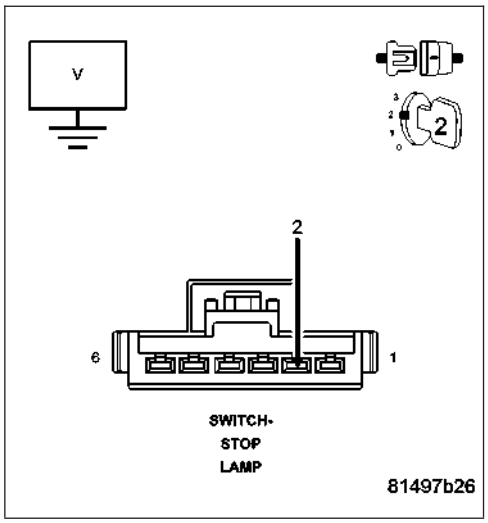
---

4. (L50) BRAKE LAMP SWITCH OUTPUT CIRCUIT SHORTED TO BATTERY VOLTAGE

Disconnect the C1 FCM harness connector.

Ignition on, engine not running.

Measure the voltage on the (L50) Brake Lamp Switch Output circuit in the Stop Lamp Switch harness connector.



Is the voltage above 1.0 volt?

Yes >> Repair the short to battery voltage in the (L50) Brake Lamp Switch Output circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

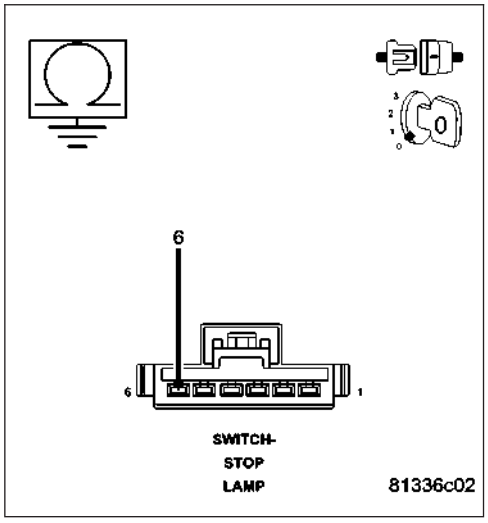
---

5. (B29) BRAKE SWITCH NO.1 SIGNAL CIRCUIT SHORTED TO GROUND

Disconnect the C3 PCM harness connector.

Turn the ignition off.

Measure the resistance between ground and the (B29) Brake Switch No.1 Signal circuit in the Stop Lamp Switch harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (B29) Brake Switch No.1 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6

P1573-BRAKE PEDAL STUCK OFF (CONTINUED)

6. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

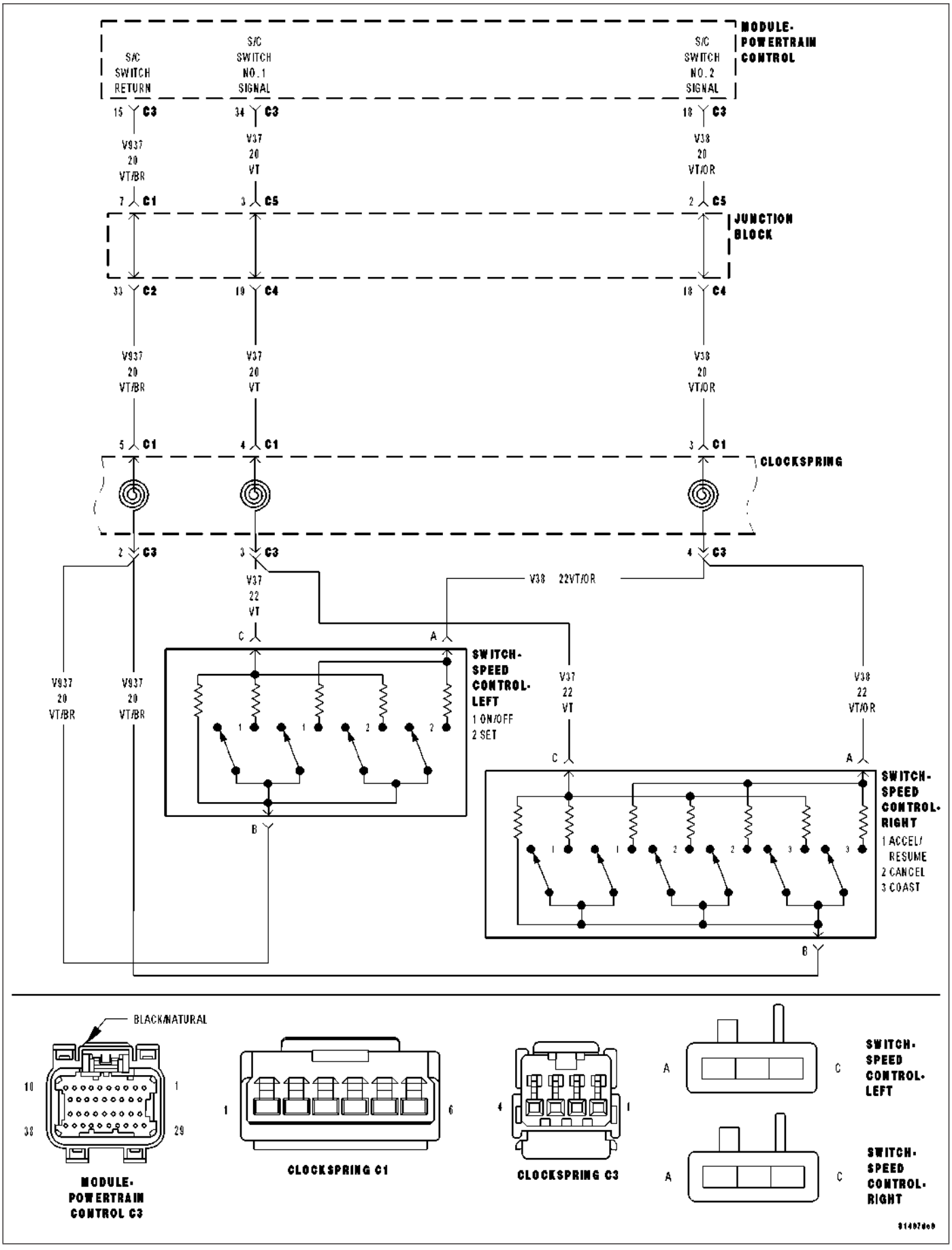
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P1593-SPEED CONTROL SWITCH 1/2 STUCK



P1593-SPEED CONTROL SWITCH 1/2 STUCK (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  One of the S/C Switches is mechanically stuck in the On/Off, Resume/Accel, or Set position for too long. One trip fault.

Possible Causes
(V37) S/C SWITCH NO.1 SIGNAL CIRCUIT OPEN
(V38) S/C SWITCH NO.2 SIGNAL CIRCUIT OPEN
(V937) SWITCH RETURN CIRCUIT OPEN
(V37) S/C SWITCH NO.1 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(V38) S/C SWITCH NO.2 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(V37) S/C SWITCH NO.1 SIGNAL CIRCUIT SHORTED TO GROUND
(V38) S/C SWITCH NO.2 SIGNAL CIRCUIT SHORTED TO GROUND
(V37) S/C SWITCH NO.1 SIGNAL CIRCUIT SHORTED TO THE (V937) S/C SWITCH RETURN CIRCUIT
(V38) S/C SWITCH NO.2 SIGNAL CIRCUIT SHORTED TO THE (V937) S/C SWITCH RETURN CIRCUIT
SPEED CONTROL SWITCH
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. SPEED CONTROL SWITCH NO.1 STUCK

Start the engine.

With a scan tool, monitor each switch function for the Speed Control Switches.

Press and release each Speed Control Button.

Is Switch No.1 Stuck?

Yes >> Replace the Speed Control Switch.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 2

P1593-SPEED CONTROL SWITCH 1/2 STUCK (CONTINUED)

2. SPEED CONTROL SWITCH STATUS

Start the engine.

With a scan tool, monitor each switch function for the Speed Control Switches.

Press and release each Speed Control Button.

- Resume/Accel
- Cancel
- Decel (Coast)
- On/Off
- Set

Does each switch function change status when pressing and releasing each switch?

Yes >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

---

3. SPEED CONTROL SWITCHES

Turn the ignition off.

Remove the Speed Control Switches from the steering wheel.

Measure the resistance across each Speed Control Switch.

Monitor the ohmmeter while pressing each function button on each switch.

The following resistance specs are taken between terminals (V38) S/C Switch No.2 Signal and (V937) S/C Switch Return circuit of the Switch when holding the switch button in the following position.

On/Off - 8.87 kohms

Set - 0.825 kohms

Coast - 0.47 kohms

Cancel - 3.92 kohms

Resume/Accel - 1.87 kohms

The following resistance specs are taken between terminals (V37) S/C Switch No.1 Signal and (V937) S/C Switch Return circuits of the Switch when holding the switch button in the following position

On/Off - 0.47 kohms

Set - 5.49 kohms

Coast - 2.94 kohms

Cancel - 1.24 kohms

Resume/Accel - 15.4 kohms

Does the function on the Speed Control Switches have the correct resistance value?

Yes >> Go To 4

No >> Replace the Speed Control Switch that had the incorrect resistance value.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P1593-SPEED CONTROL SWITCH 1/2 STUCK (CONTINUED)

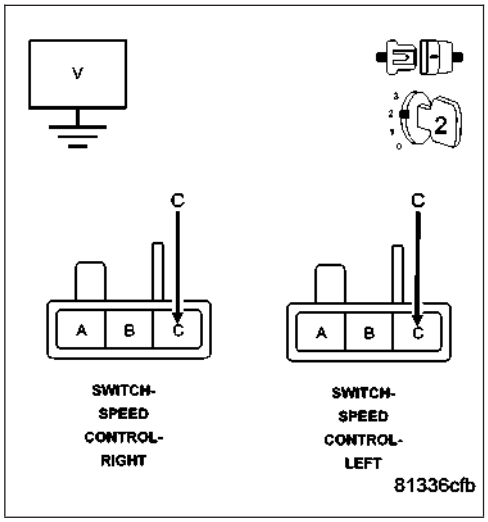
4. (V37) S/C SWITCH NO.1 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

Disconnect the C3 PCM harness connector.

Ignition on, engine not running.

Measure the voltage of the (V37) S/C Switch No.1 Signal circuit in the S/C Switch harness connector.



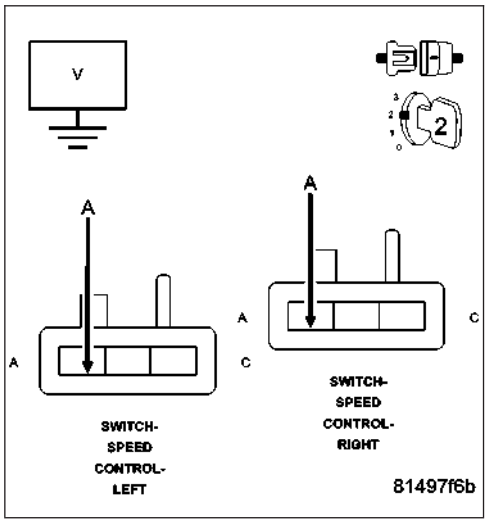
Is the voltage above 5.0 volts?

Yes >> Repair the short to voltage in the (V37) S/C Switch No.1 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

5. (V38) S/C SWITCH NO.2 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE

Measure the voltage of the (V38) S/C Switch No.2 Signal circuit in the S/C Switch harness connector.



Is the voltage above 5.0 volts?

Yes >> Repair the short to voltage in the (V38) S/C Switch No.2 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6

P1593-SPEED CONTROL SWITCH 1/2 STUCK (CONTINUED)

6. (V37) S/C SWITCH NO.1 SIGNAL CIRCUIT OPEN

Turn the ignition off.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

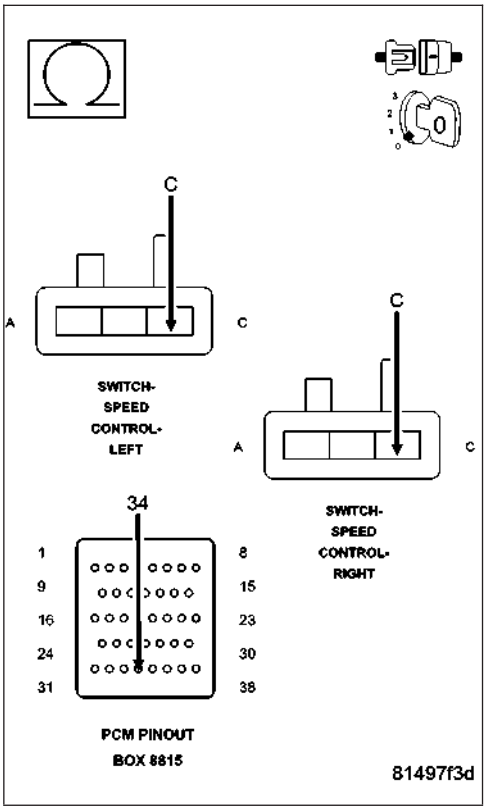
Measure the resistance of the (V37) S/C Switch No.1 Signal circuit from both Speed Control harness connectors to the appropriate terminals of special tool #8815.

Is the resistance below 5.0 ohms for both measurements?

Yes >> Go To 7

No >> Repair the open in the (V37) S/C Switch No.1 Signal circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



7. (V38) S/C SWITCH NO.2 SIGNAL CIRCUIT OPEN

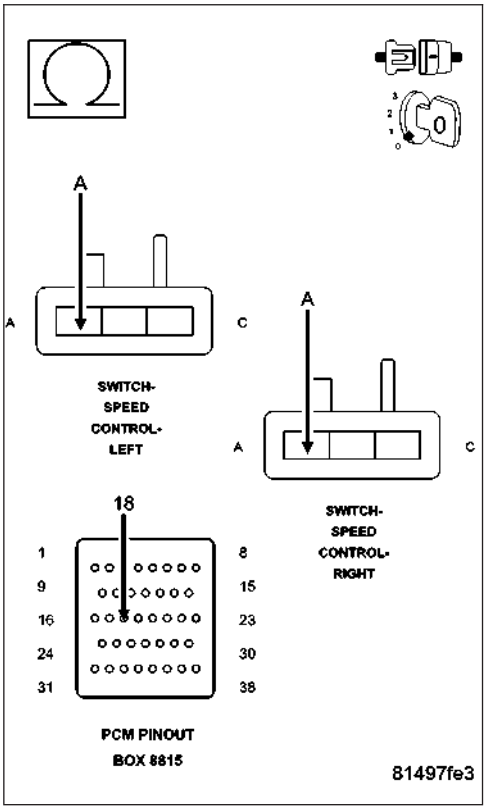
Measure the resistance of the (V38) S/C Switch No.2 Signal circuit from both Speed Control harness connectors to the appropriate terminals of special tool #8815.

Is the resistance below 5.0 ohms for both measurements?

Yes >> Go To 8

No >> Repair the open in the (V38) S/C Switch No.2 Signal circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P1593-SPEED CONTROL SWITCH 1/2 STUCK (CONTINUED)

8. (V937) SWITCH RETURN OPEN

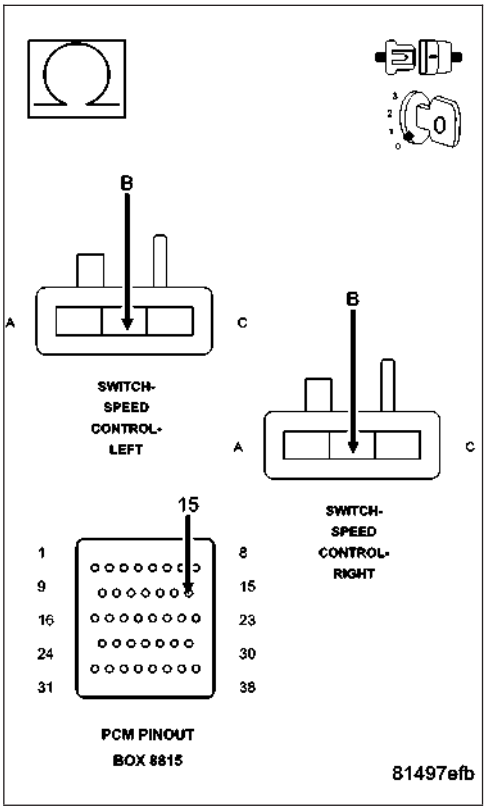
NOTE: The measurement must be taken from both Speed Control Switch harness connectors.

Measure the resistance of the (V937) Switch Return circuit from the Speed Control harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms for both measurements?

Yes >> Go To 9

No >> Repair the open in the (V937) Switch Return circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



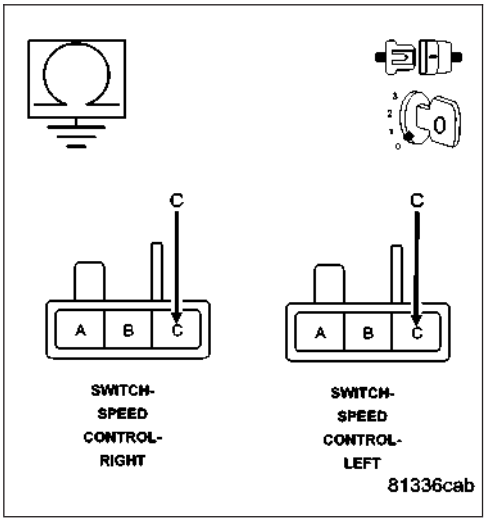
9. (V37) S/C SWITCH NO.1 SIGNAL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (V37) S/C Switch No.1 Signal circuit in the Speed Control harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (V37) S/C Switch No.1 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

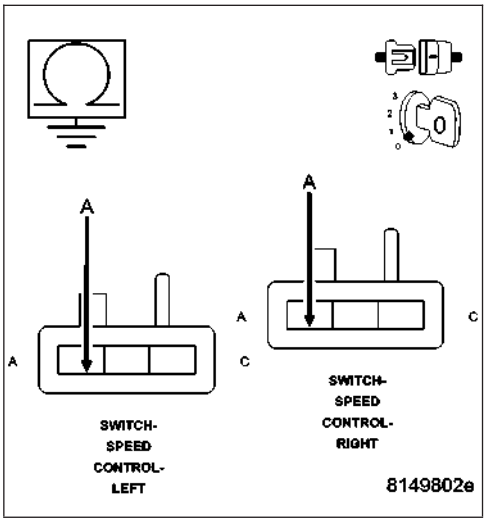
No >> Go To 10



P1593-SPEED CONTROL SWITCH 1/2 STUCK (CONTINUED)

10. (V38) S/C SWITCH NO.2 SIGNAL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (V38) S/C Switch No.2 Signal circuit in the Speed Control harness connector.



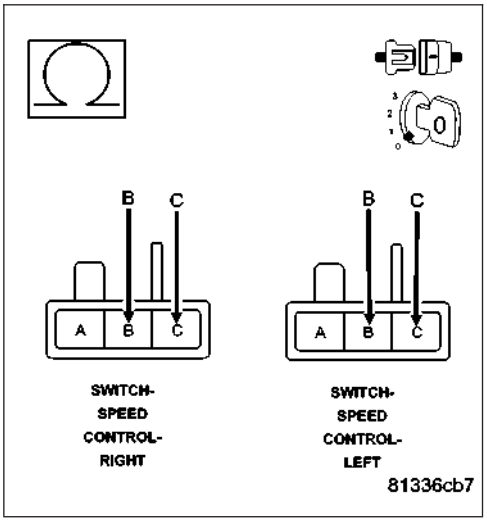
Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (V38) S/C Switch No.2 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 11

11. (V37) S/C SWITCH NO.1 SIGNAL CIRCUIT SHORTED TO THE (V937) SWITCH RETURN CIRCUIT

Measure the resistance between the (V37) S/C Switch No.1 Signal circuit and the (V937) Switch Return circuit in the Speed Control harness connector.



Is the resistance below 5.0 ohms?

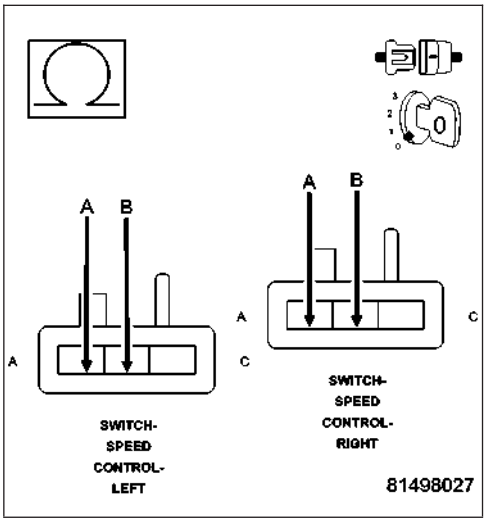
Yes >> Repair the short between the (V937) Switch Return circuit and the (V37) S/C Switch No.1 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 12

P1593-SPEED CONTROL SWITCH 1/2 STUCK (CONTINUED)

12. (V38) S/C SWITCH NO.2 SIGNAL CIRCUIT SHORTED TO THE (V937) SWITCH RETURN CIRCUIT

Measure the resistance between the (V38) S/C Switch No.2 Signal circuit and the (V937) Switch Return circuit in the Speed Control harness connector.



Is the resistance below 5.0 ohms?

Yes >> Repair the short between the (V937) Switch Return circuit and the (V38) S/C Switch No.2 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 13

---

13. SPEED CONTROL SWITCH VOLTAGE VALUES

Connect the C3 PCM harness connector and the S/C Switch harness connectors.
Allow the engine to idle.
With a scan tool, monitor the S/C Switch voltage readings.

SWITCH POSITION	SWITCH No.1 VOLTAGE VALUE	SWITCH No.2 VOLATGE VALUE
NO SWITCHES PRESSED	4.31 to 4.78 volts	4.31 to 4.78 volts
ON/OFF PRESSED	0.59 and 1.13 volts	3.53 and 3.92 volts
RES/ACCEL PRESSED	3.88 to 4.17 volts	2.04 to 2.47 volts
SET PRESSED	3.16 to 3.56 volts	1.17 to 1.56 volts
COAST PRESSED	2.57 to 2.94 volts	0.77 to 1.09 volts
CANCEL PRESSED	1.59 to 1.99 volts	2.84 to 3.25 volts

Take these same voltage measurements with a voltmeter by back probing the (V37) S/C Switch No.1 Signal circuit and the (V38) S/C Switch No.2 Signal circuit at the switches.
Compare the voltage readings on the voltmeter to what the scan tool displayed.

Are the voltage readings out of the listed specification and do you less than a 0.2 of a volt difference between the voltmeter switch values and the scan tool switch value?

Yes >> Replace the Speed Control Switch.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 14

P1593-SPEED CONTROL SWITCH 1/2 STUCK (CONTINUED)

14. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

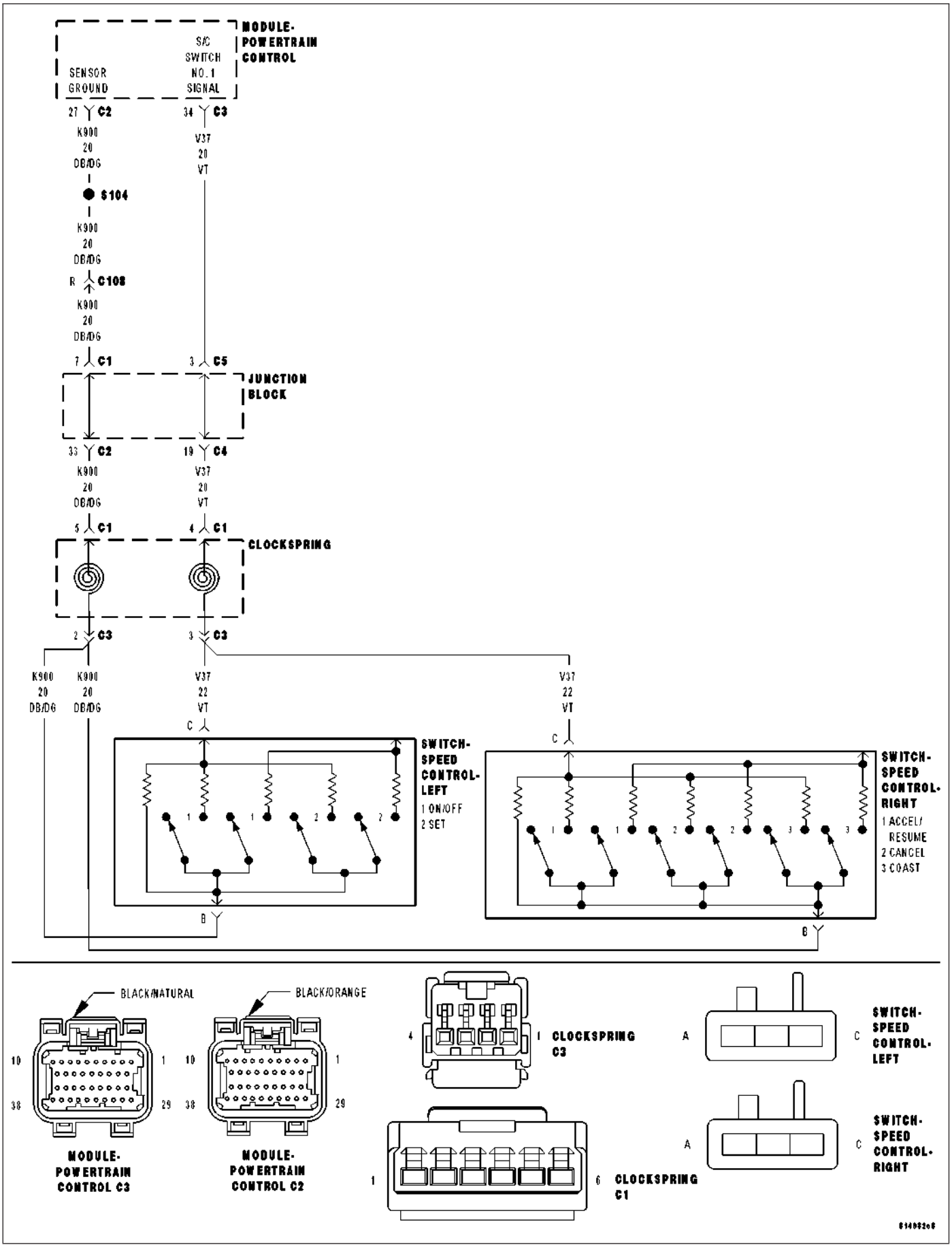
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P1593-SPEED CONTROL SWITCH 1 STUCK (3.7L, 4.7L)



P1593-SPEED CONTROL SWITCH 1 STUCK (3.7L, 4.7L) (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  S/C Switch No.1 is mechanically stuck in the On/Off, Resume/Accel, or Set position for too long. One trip fault.

Possible Causes
(V37) S/C SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(V37) S/C SIGNAL CIRCUIT OPEN
(K900) SENSOR GROUND OPEN
(V37) S/C SIGNAL CIRCUIT SHORTED TO GROUND
(V37) S/C SIGNAL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND
SPEED CONTROL SWITCH
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. SPEED CONTROL SWITCH STATUS

Start the engine.
With a scan tool, monitor each which function for the Speed Control Switches.
Press and release each Speed Control Button.
- Resume/Accel
- Cancel
- Decel (Coast)
- On/Off
- Set

Does each switch function change status when pressing each switch?

Yes >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 2

P1593-SPEED CONTROL SWITCH 1 STUCK (3.7L, 4.7L) (CONTINUED)

2. SPEED CONTROL SWITCHES

Turn the ignition off.

Disconnect and remove the Speed Control Switches from the steering wheel per Service Information.

Measure the resistance across each Speed Control Switch.

Monitor the ohmmeter while pressing each function button on each switch.

Resume/Accel - 15.4 kohms

Cancel - 1.24 kohms

Coast - 2.94 kohms

On/Off -0.47 kohms

Set - 5.49 kohms

Does the function on the Speed Control Switches have the correct resistance value?

Yes >> Go To 3

No >> Replace the Speed Control Switch that had the incorrect resistance value.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

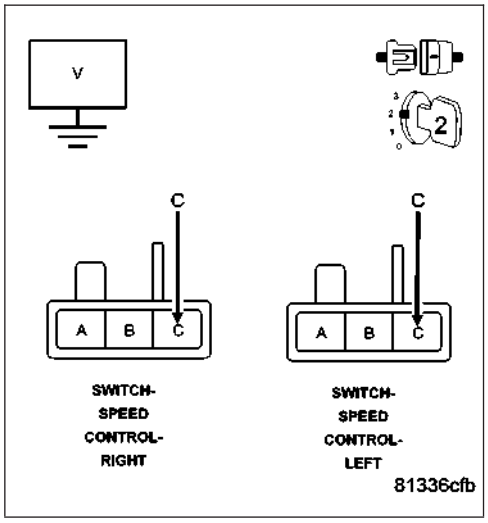
---

3. (V37) S/C SWITCH NO.1 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

Disconnect the C2 and C3 PCM harness connectors.

Measure the voltage of the (V37) S/C Switch No.1 Signal circuit in the Speed Control harness connector.



Is the voltage above 5.0 volts?

Yes >> Repair the short to battery voltage in the (V37) S/C Signal No.1 circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

P1593-SPEED CONTROL SWITCH 1 STUCK (3.7L, 4.7L) (CONTINUED)

4. (V37) S/C SWITCH NO.1 SIGNAL CIRCUIT OPEN

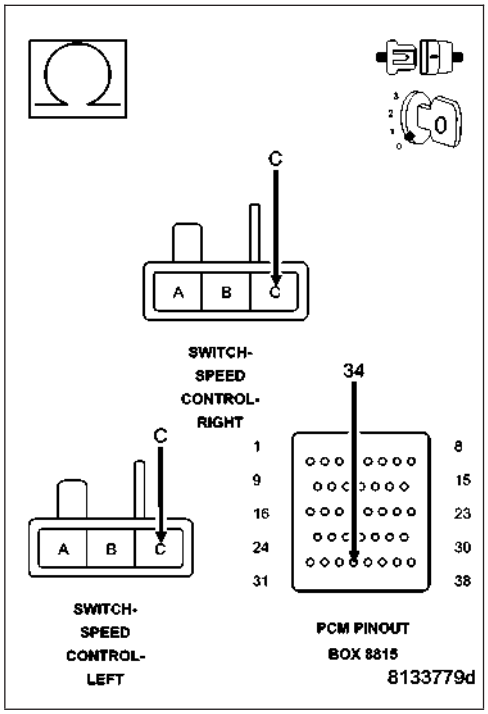
NOTE: The measurement must be taken from both Speed Control Switch harness connectors.
Turn the ignition off.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.
Measure the resistance of the (V37) S/C Switch No.1 Signal circuit from the Speed Control harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms for both measurements?

Yes >> Go To 5

No >> Repair the open in the (V37) S/C Switch No.1 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



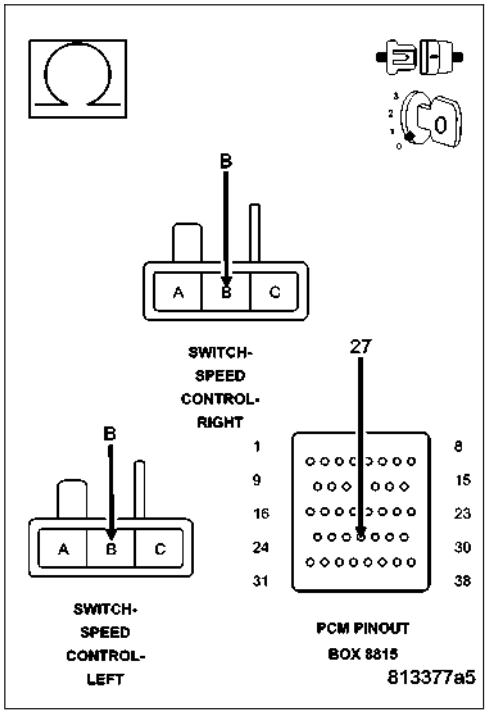
5. (K900) SENSOR GROUND CIRCUIT OPEN

NOTE: The measurement must be taken from both Speed Control Switch harness connectors.
Measure the resistance of the (K900) Sensor ground circuit from the Speed Control harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms for both measurements?

Yes >> Go To 6

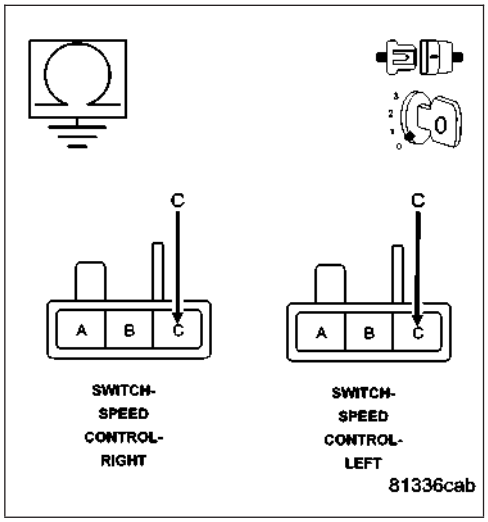
No >> Repair the open in the (K900) Sensor ground circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P1593-SPEED CONTROL SWITCH 1 STUCK (3.7L, 4.7L) (CONTINUED)

6. (V37) S/C SWITCH NO.1 SIGNAL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (V37) S/C Switch No.1 Signal circuit in the Speed Control harness connector.



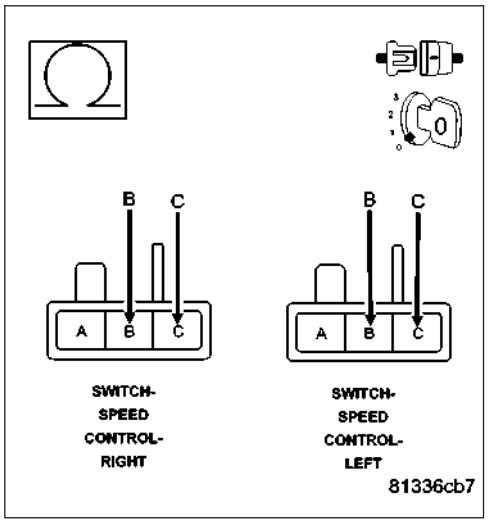
Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (V37) S/C Switch No.1 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 7

7. (V37) S/C SWITCH NO.1 SIGNAL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT

Measure the resistance between the (V37) S/C Switch No.1 Signal circuit and the (K900) Sensor ground circuit in the Speed Control harness connector.



Is the resistance below 5.0 ohms?

Yes >> Repair the short between the (V37) S/C Switch No.1 Signal circuit and the (K900) Sensor ground circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8

8. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P1602–PCM NOT PROGRAMMED

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on and battery voltage greater than 10 volts.
- **Set Condition:**
  The PCM has not been programmed.

Possible Causes
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. PCM PROGRAMMED

Ignition on, engine not running.
With a scan tool, erase DTCs.
With a scan tool program the PCM.
Start the engine.
Allow the engine to reach normal operating temperature.
With a scan tool, read DTCs.

Does the DTC reset?

Yes >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> The PCM has been successfully programmed. Test is complete.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P1603-PCM INTERNAL DUAL-PORT RAM COMMUNICATION FAILURE

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on and battery voltage greater than 10 volts.
- **Set Condition:**
  Internal PCM failure detected. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
PCM FUSED IGNITION SWITCH CIRCUITS
PCM INTERNAL

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. PCM IGNITION CIRCUITS

Turn the ignition off.

Disconnect the C1 PCM harness connector.

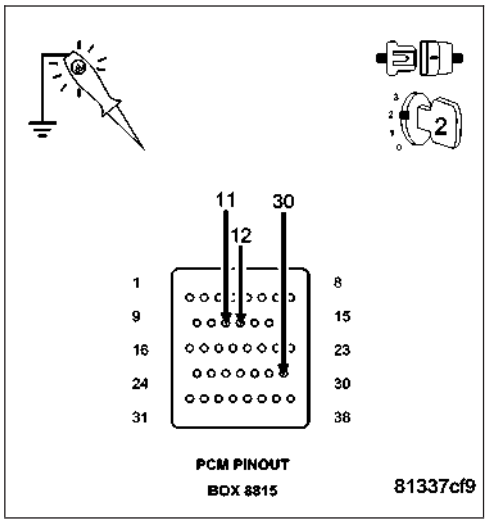
Ignition on, engine not running.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

With a 12-volt test light connected to ground and with special tool #8815 installed, probe the (F1), (F202), and (F924) Fused Ignition Switch circuits.

Perform the above check with the Ignition key in the off lock position, Ignition on, engine not running position, and during cranking.

Wiggle the related wire harness while probing the special tool with the test light to try to interrupt the circuit.



Does the test light illuminate brightly?

Yes >> Go To 2

No >> Repair the open or excessive resistance in the (F1), (F202), and (F924) Fused Ignition Switch (Offf, Run, Start) circuits. Inspect the related fuse, if the fuse is open check the circuits for a short to ground. Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P1603-PCM INTERNAL DUAL-PORT RAM COMMUNICATION FAILURE (CONTINUED)

2. **PCM**

The Powertrain Control Module is reporting internal errors.

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P1604-PCM INTERNAL DUAL-PORT RAM READ/WRITE INTEGRITY FAILURE

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on and battery voltage greater than 10 volts.
- **Set Condition:**
  Internal PCM failure detected. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
PCM FUSED IGNITION SWITCH CIRCUITS
PCM INTERNAL

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. PCM IGNITION CIRCUITS

Turn the ignition off.

Disconnect the C1 PCM harness connector.

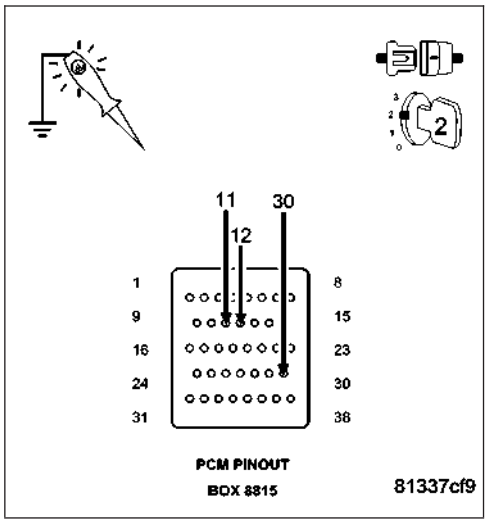
Ignition on, engine not running.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

With a 12-volt test light connected to ground and with special tool #8815 installed, probe the (F1), (F202), and (F924) Fused Ignition Switch circuits.

Perform the above check with the Ignition key in the off lock position, Ignition on, engine not running position, and during cranking.

Wiggle the related wire harness while probing the special tool with the test light to try to interrupt the circuit.



Does the test light illuminate brightly?

Yes >> Go To 2

No >> Repair the open or excessive resistance in the (F1), (F202), and (F924) Fused Ignition Switch (Off, Run, Start) circuits. Inspect the related fuse, if the fuse is open check the circuits for a short to ground.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P1604-PCM INTERNAL DUAL-PORT RAM READ/WRITE INTEGRITY FAILURE (CONTINUED)

2. **PCM**

The Powertrain Control Module is reporting internal errors.

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P1607-PCM INTERNAL SHUTDOWN TIMER RATIONALITY

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on and battery voltage greater than 10 volts.
- **Set Condition:**
  Internal PCM failure detected. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
PCM FUSED IGNITION SWITCH CIRCUITS
PCM INTERNAL

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. PCM IGNITION CIRCUITS

Turn the ignition off.

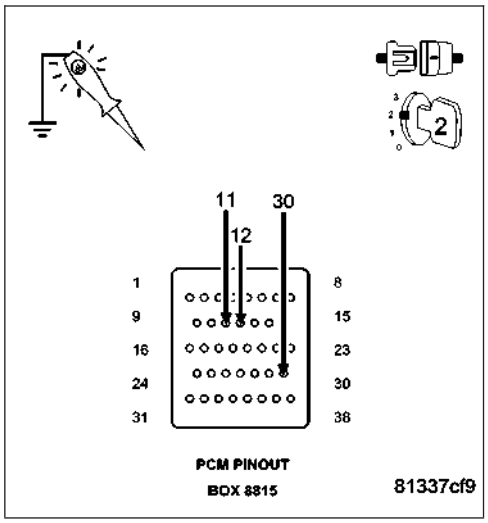
Disconnect the C1 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

With a 12-volt test light connected to ground and with special tool #8815 installed, probe the (F1), (F202), and (F924) Fused Ignition Switch circuits.

Perform the above check with the Ignition key in the off lock position, Ignition on, engine not running position, and during cranking.

Wiggle the related wire harness while probing the special tool with the test light to try to interrupt the circuit.



Does the test light illuminate brightly?

Yes >> Go To 2

No >> Repair the open or excessive resistance in the (F1), (F202), and (F924) Fused Ignition Switch (Off, Run, Start) circuits. Inspect the related fuse, if the fuse is open check the circuits for a short to ground.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. PCM

The Powertrain Control Module is reporting internal errors.

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

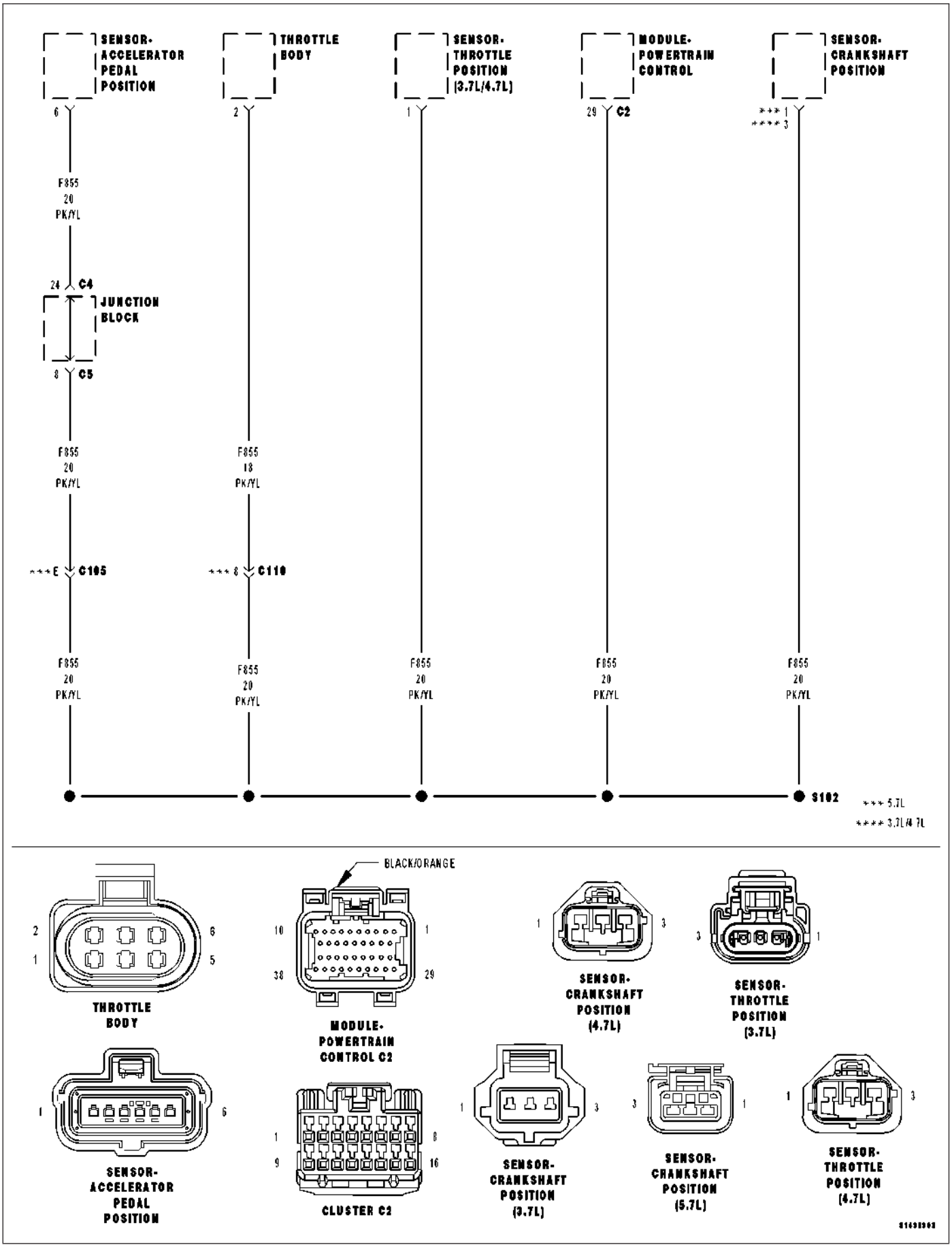
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P1618-SENSOR REFERENCE VOLTAGE 1 CIRCUIT ERRATIC



P1618-SENSOR REFERENCE VOLTAGE 1 CIRCUIT ERRATIC (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  When the PCM recognizes the Primary 5-volt Supply circuit voltage is varying too much too quickly. One Trip Fault. ETC light is flashing.

Possible Causes
(F855) PRIMARY 5-VOLT SUPPLY SHORTED TO GROUND
(F855) PRIMARY 5-VOLT SUPPLY SHORTED TO BATTERY VOLTAGE
(F855) PRIMARY 5-VOLT SUPPLY CIRCUIT OPEN
5-VOLT SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. (F855) PRIMARY 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND

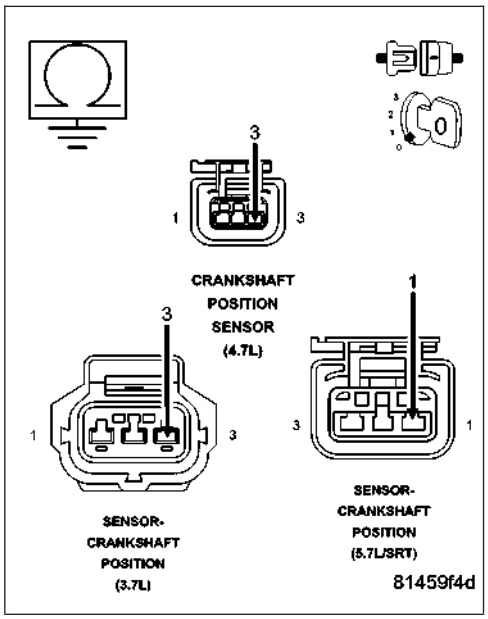
Turn the ignition off.

Disconnect the C2 PCM harness connector.

Disconnect all the Sensors that share the (F855) Primary 5-volt Supply circuit.

NOTE: This code can be caused by the improper installation of after market accessories that may be causing excessive noise on the (F855) 5-volt Supply circuit.

Measure the resistance between ground and the (F855) Primary 5-volt Supply circuit in the CKP Sensor harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (F855) Primary 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

P1618-SENSOR REFERENCE VOLTAGE 1 CIRCUIT ERRATIC (CONTINUED)

3. SENSOR SHORTED TO GROUND

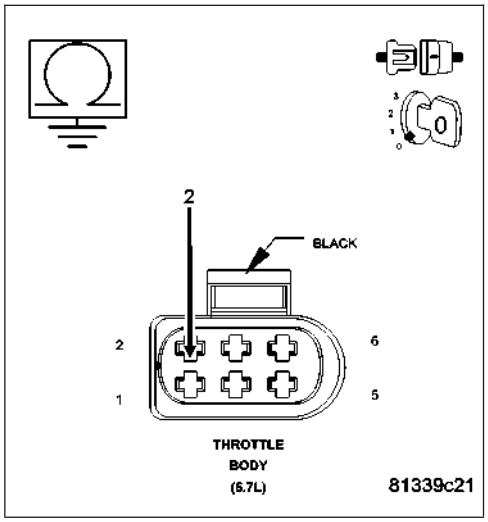
Connect the C2 PCM harness connector and all the previously disconnected Sensor except for the CKP Sensor harness connector.

Ignition on, engine not running.

Measure the voltage on the (F855) Primary 5-volt Supply circuit at the Throttle Body harness connector.

CAUTION: You must Turn the Ignition Off when disconnecting any of the Sensor harness connectors and Turn the Ignition On to check the voltage readings.

While monitoring the voltage, disconnect each Sensor harness connector that shares the (F855) Primary 5-volt Supply circuit, one at a time.



Does the voltage increase above 4.5 volts when disconnecting any of the Sensor harness connectors?

Yes >> Replace the Sensor that causes the (F855) Primary 5-volt Supply circuit voltage to increase when disconnected.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

---

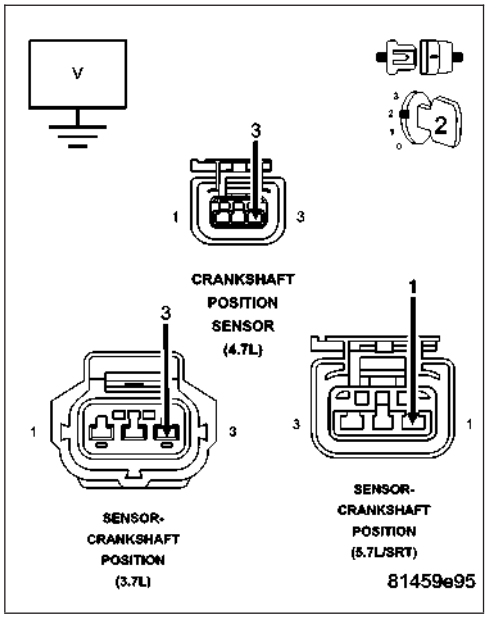
4. 5-VOLT SENSOR

Turn the ignition off.

Connect all the previously disconnected Sensors except for the CKP Sensor harness connector.

Ignition on, engine not running.

Measure the voltage on the (F855) Primary 5-volt Supply circuit at the CKP Sensor harness connector.



Is the voltage between 4.8 and 5.2 volts?

Yes >> Replace the Crank Position Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

P1618-SENSOR REFERENCE VOLTAGE 1 CIRCUIT ERRATIC (CONTINUED)

5. (F855) PRIMARY 5-VOLT SUPPLY SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

Disconnect the C2 PCM harness connector.

Disconnect all the Sensors that share the (F855) Primary 5-volt Supply circuit.

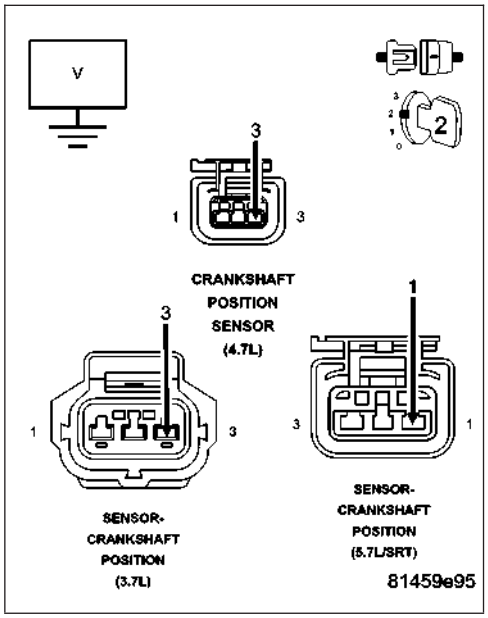
Ignition on, engine not running.

Measure the voltage on the (F855) Primary 5-volt Supply circuit in the CKP Sensor harness connector.

Is the voltage above 0 volts?

Yes >> Repair the short to battery voltage in the (F855) Primary 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6



6. (F855) PRIMARY 5-VOLT SUPPLY CIRCUIT OPEN

Turn the ignition off.

Reconnect all the sensors that were disconnected in the previous step except for the CKP Sensor harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

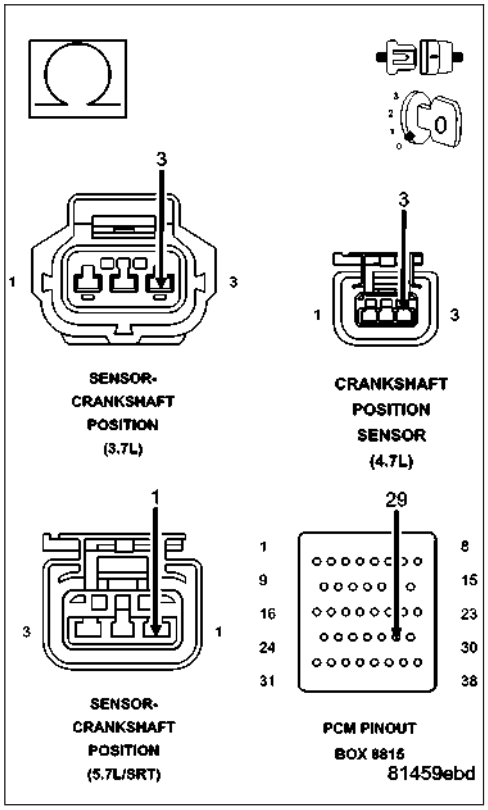
Measure the resistance in the (F855) Primary 5-volt Supply circuit from the Sensor harness connector to the appropriate terminal of special tool #8815.

It may be necessary to perform this test from every sensor that uses the (F855) Primary 5-volt Supply circuit.

Is the resistance below 5.0 ohms?

Yes >> Go To 7

No >> Repair the open in the (F855) Primary 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P1618-SENSOR REFERENCE VOLTAGE 1 CIRCUIT ERRATIC (CONTINUED)

7. **PCM**

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

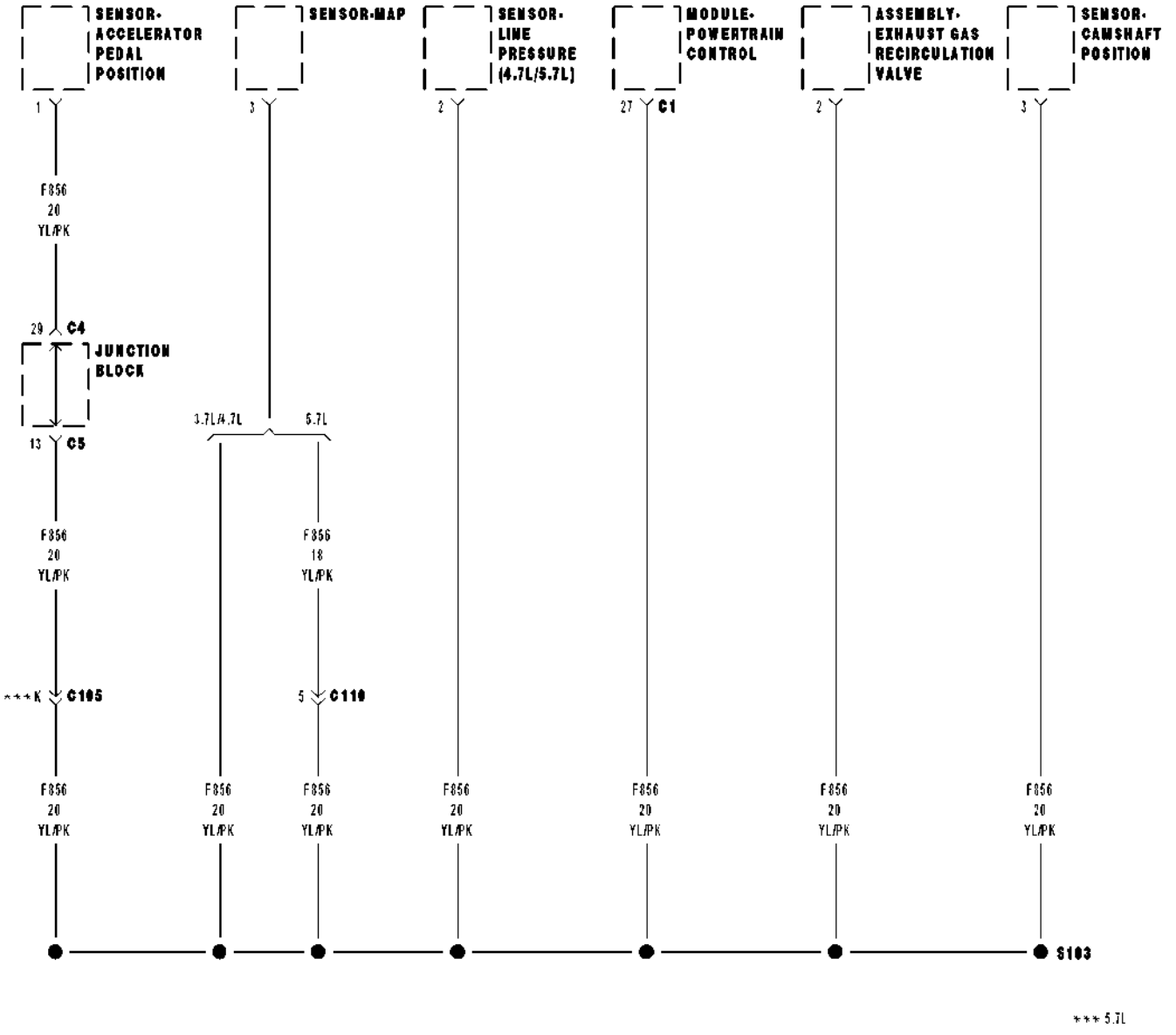
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

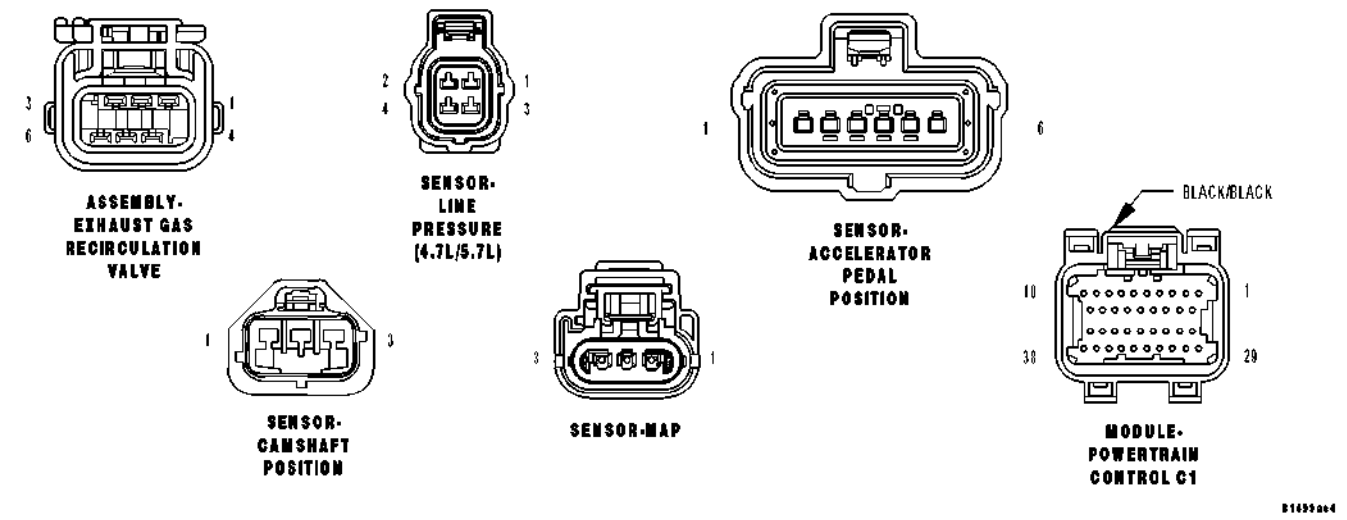
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P1628-SENSOR REFERENCE VOLTAGE 2 CIRCUIT ERRATIC





P1628-SENSOR REFERENCE VOLTAGE 2 CIRCUIT ERRATIC (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  When the PCM recognizes the Auxiliary 5-volt Supply circuit voltage is varying too much too quickly. One Trip Fault. ETC light is flashing.

Possible Causes
(F856) AUXILIARY 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(F856) AUXILIARY 5-VOLT SUPPLY CIRCUIT SHORTED TO BATTERY VOLTAGE
(F856) AUXILIARY 5-VOLT SUPPLY CIRCUIT OPEN
5-VOLT SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. (F856) AUXILIARY 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND

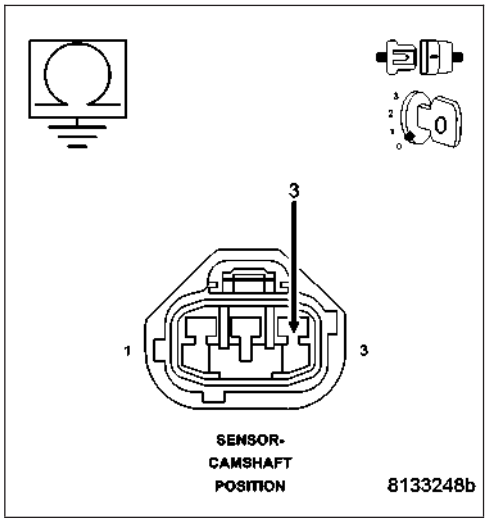
Turn the ignition off.

Disconnect the C1 PCM harness connector.

Disconnect all the Sensors that share the (F856) Auxiliary 5-volt Supply circuit.

NOTE: This code can be caused by the improper installation of after market accessories that may be causing excessive noise on the (F856) 5-volt Supply circuit.

Measure the resistance between ground and the (F856) Auxiliary 5-volt Supply circuit at the CMP Sensor harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (F856) Auxiliary 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

P1628-SENSOR REFERENCE VOLTAGE 2 CIRCUIT ERRATIC (CONTINUED)

3. SENSOR SHORTED TO GROUND

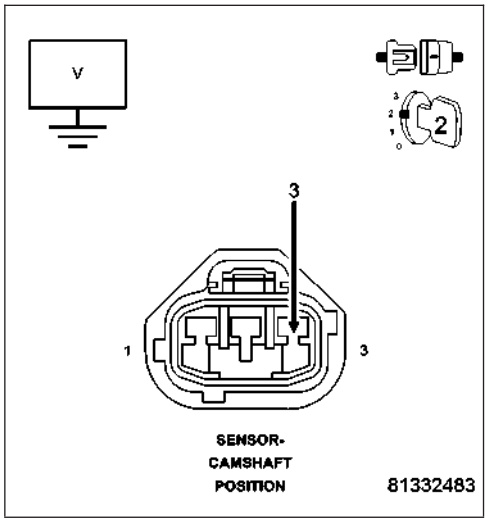
Connect the C1 PCM harness connector and all the previously disconnected Sensor except for the CMP Sensor harness connector.

Ignition on, engine not running.

Measure the voltage on the (F856) Auxiliary 5-volt Supply circuit in the CMP Sensor harness connector.

CAUTION: You must Turn the Ignition OFF when disconnecting any of the Sensor harness connectors and Turn the Ignition On to check the voltage readings.

While monitoring the voltage, disconnect each Sensor harness connector that shares the (F856) Auxiliary 5-volt Supply circuit, one at a time.



Does the voltage increase above 4.5 volts when disconnecting any of the Sensor harness connectors?

Yes >> Replace the Sensor that causes the (F856) Auxiliary 5-volt Supply circuit voltage to increase when disconnected.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

---

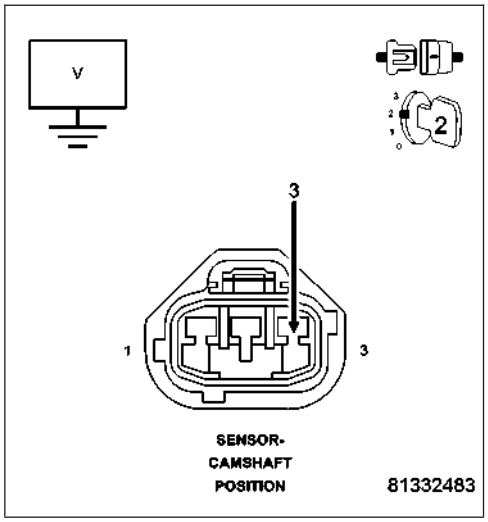
4. 5-VOLT SENSOR

Turn the ignition off.

Connect all the previously disconnected Sensors except for the CMP Sensor harness connector.

Ignition on, engine not running.

Measure the voltage on the (F856) Auxiliary 5-volt Supply circuit in the CMP Sensor harness connector.



Is the voltage below 4.5 volts?

Yes >> Go To 5

No >> Replace the Cam Position Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P1628-SENSOR REFERENCE VOLTAGE 2 CIRCUIT ERRATIC (CONTINUED)

5. (F856) AUXILIARY 5-VOLT SUPPLY CIRCUIT SHORTED TO BATTERY VOLTAGE

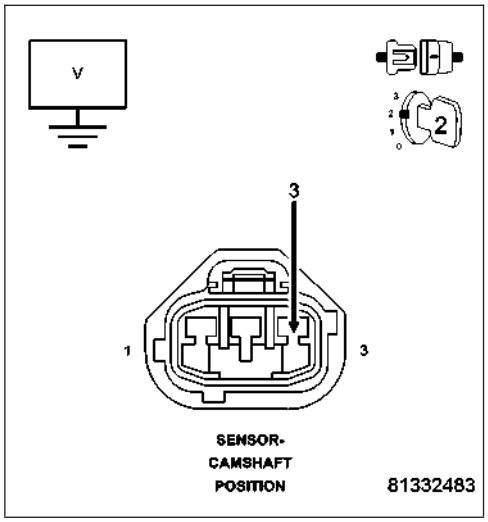
Turn the ignition off.

Disconnect the C1 PCM harness connector.

Disconnect all the Sensors that share the (F856) Auxiliary 5-volt Supply circuit.

Ignition on, engine not running.

Measure the voltage on the (F856) Auxiliary 5-volt Supply circuit at the CMP Sensor harness connector.



Is the voltage above 0 volts?

Yes >> Repair the short to battery voltage in the (F856) Auxiliary 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6

6. (F856) AUXILIARY 5-VOLT SUPPLY CIRCUIT OPEN

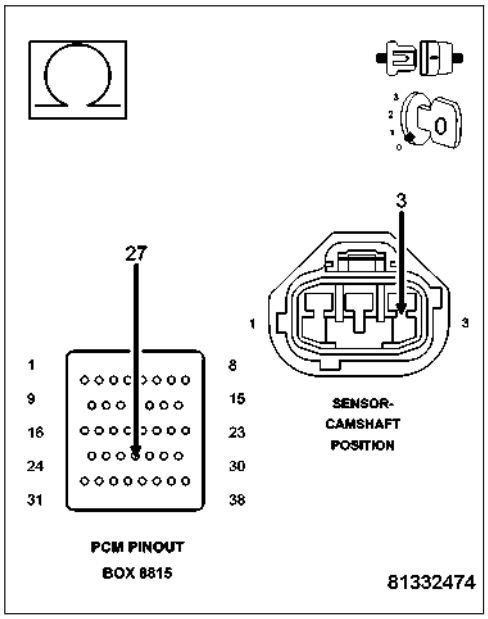
Turn the ignition off.

Reconnect all the sensors that were disconnected in the previous step except the CMP Sensor harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance in the (F856) Auxiliary 5-volt Supply circuit from the Sensor harness connector to the appropriate terminal of special tool #8815.

It may be necessary to perform this test from every sensor that uses the (F856) Auxiliary 5-volt Supply circuit.



Is the resistance below 5.0 ohms?

Yes >> Go To 7

No >> Repair the open in the (F856) Auxiliary 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P1628-SENSOR REFERENCE VOLTAGE 2 CIRCUIT ERRATIC (CONTINUED)

7. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P1696-EEPROM MEMORY WRITE DENIED/INVALID

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on.
- **Set Condition:**
  An attempt to program/write to the internal EEPROM failed, Also checks at power down. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. SCAN TOOL DISPLAYS A WRITE FAILURE

With a scan tool, perform the SRI Memory Test.

Does scan tool display Write Failure?

Yes >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 2

---

2. SCAN TOOL DISPLAYS A WRITE REFUSED

With the a scan tool, perform the SRI Memory Test.

Does the scan tool display Write Refused?

Yes >> Go To 3

No >> Go To 4

---

3. PCM REFUSED 2ND TEST

With a scan tool, perform the SRI Memory Test a third time.

NOTE: Retest the SRI Memory two more times.

Does the scan tool display Write Refused again?

Yes >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Test Complete.

---

4. SCAN TOOL DISPLAYS SRI MILEAGE INVALID

With a scan tool, perform the SRI Memory Test.

Does the scan tool display SRI Mileage Invalid?

Yes >> Update the mileage and retest the SRI Memory.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

P1696-EEPROM MEMORY WRITE DENIED/INVALID (CONTINUED)

5. COMPARE SRI MILEAGE WITH ODOMETER

Compare the SRI Mileage stored with the Instrument Panel Odometer.

Is the mileage within the specified range displayed on the scan tool?

Yes >> Test Complete.

No >> Update the mileage and retest the SRI Memory.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P1697-EMR (SRI) MILEAGE NOT STORED

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on.
- **Set Condition:**
  An attempt to program/write to the internal EEPROM failed, Also checks at powerdown. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. SCAN TOOL DISPLAYS A WRITE FAILURE

With a scan tool, perform the SRI Memory Test.

Does scan tool display Write Failure?

Yes >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 2

---

2. SCAN TOOL DISPLAYS A WRITE REFUSED

With the a scan tool, perform the SRI Memory Test.

Does the scan tool display Write Refused?

Yes >> Go To 3

No >> Go To 4

---

3. PCM REFUSED 2ND TEST

With a scan tool, perform the SRI Memory Test a third time.

NOTE: Retest the SRI Memory two more times.

Does the scan tool display Write Refused again?

Yes >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Test Complete.

---

4. SCAN TOOL DISPLAYS SRI MILEAGE INVALID

With a scan tool, perform the SRI Memory Test.

Does the scan tool display SRI Mileage Invalid?

Yes >> Update the mileage and retest the SRI Memory.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

P1697-EMR (SRI) MILEAGE NOT STORED (CONTINUED)

5. COMPARE SRI MILEAGE WITH ODOMETER

Compare the SRI Mileage stored with the Instrument Panel Odometer.

Is the mileage within the specified range displayed on the scan tool?

Yes >> Test Complete.

No >> Update the mileage and retest the SRI Memory.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2072-ELECTRONIC THROTTLE CONTROL SYSTEM - ICE BLOCKAGE

For the Engine circuit diagram (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  The PCM recognizes the Throttle plate is stuck during extremely cold Ambient Temperature operation. The throttle plate goes through a de-icing procedure. If the throttle blade still doesn't move this fault sets. The MIL will not illuminate. The vehicle will be in Limp home condition, limiting rpm and vehicle speed.

Possible Causes
THROTTLE PLATE FROZEN

Diagnostic Test

1. THROTTLE BODY INSPECTION

Ignition on, engine not running.

With a scan tool, read DTCs and record the related Freeze Frame data.

NOTE: This DTC sets in extreme cold Ambient Temperatures with the throttle plate stuck by the time the vehicle gets to the dealership the condition may be corrected.

NOTE: Diagnose any other DTCs that may also be set before continuing.

Turn the ignition off.

Remove the Air Cleaner Assembly from the Throttle Body.

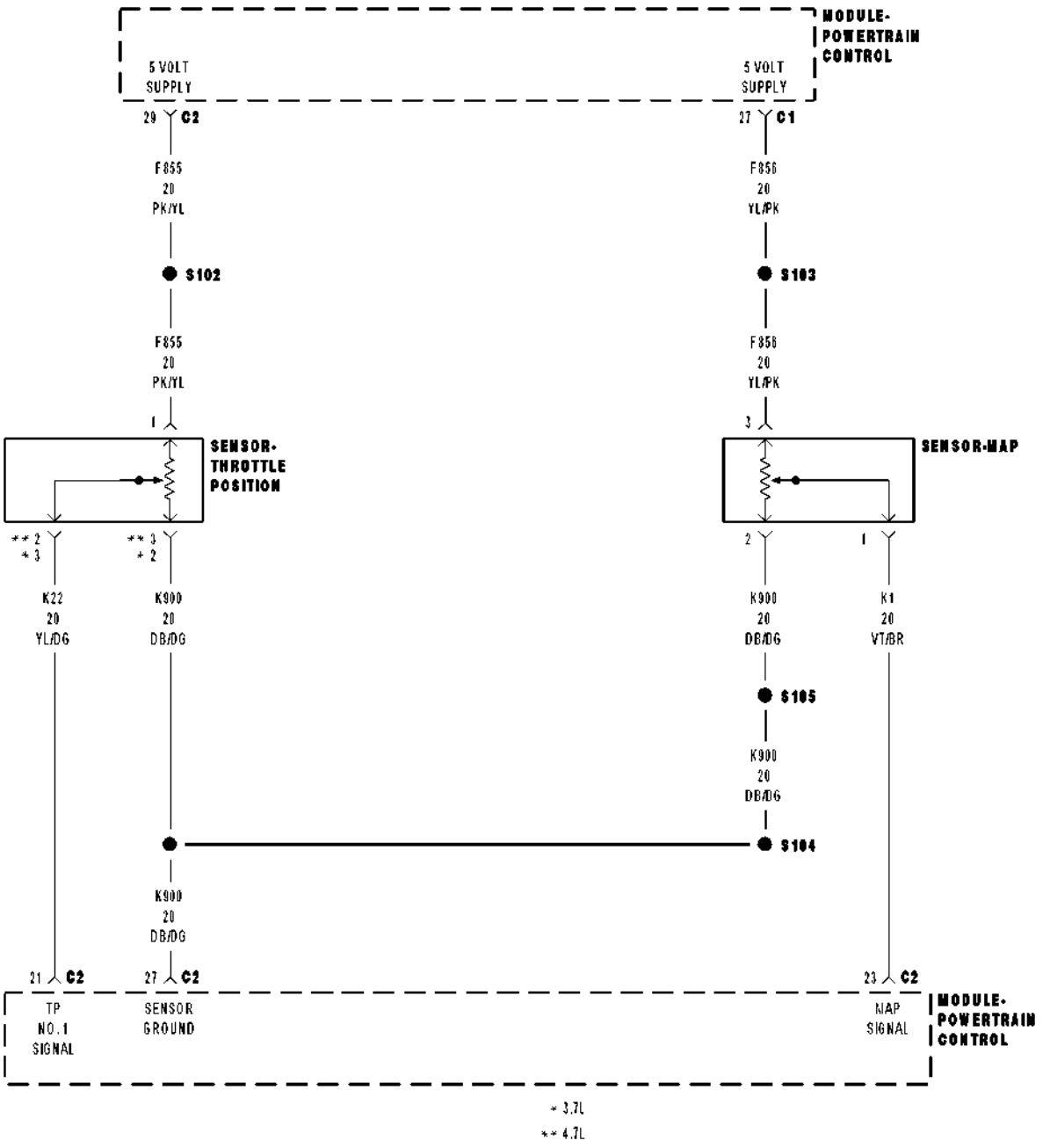
Check for any signs of a foreign material (ice or dirt) on the Throttle Plate or in the bore causing the Throttle Plate to stick.

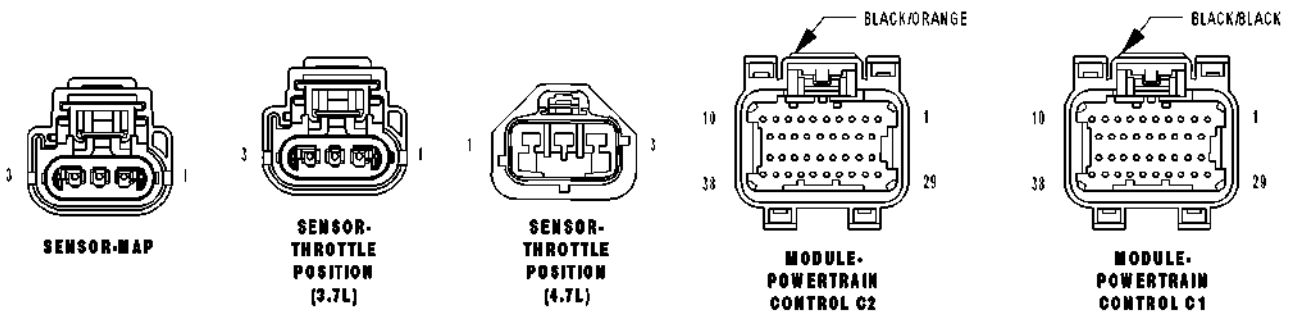
Is the throttle blade still stuck because it is frozen?

Yes >> Allow the Throttle Body to thaw naturally in a room temperature climate.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Test Complete.

P2074-MAP/TPS CORRELLATION - HIGH AIRFLOW/VACUUM LEAK DETECTED





P2074-MAP/TPS CORRELLATION - HIGH AIRFLOW/VACUUM LEAK DETECTED (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Theory of Operation

This DTC sets when an unexpected high intake manifold air flow condition exists that can lead to increased engine speed and puts the NGC into a High Air flow Protection limiting mode. The High Air flow Protection feature includes RPM limits for when a Throttle and/or MAP sensor limp-in fault is present.

- **When Monitored:**
  During all drive modes
- **Set Condition:**
  If vacuum drops below 1.5″Hg with engine RPM greater than 2000 RPM and closed throttle. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
VACUUM LEAK
RESISTANCE IN THE (F856) 5-VOLT SUPPLY CIRCUIT
(F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
RESISTANCE IN THE (K1) MAP SIGNAL CIRCUIT
(K1) MAP SIGNAL CIRCUIT SHORTED TO GROUND
RESISTANCE IN THE (F855) 5-VOLT SUPPLY CIRCUIT
(F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
RESISTANCE IN THE (K22) TP SENSOR NO.1 SIGNAL CIRCUIT
(K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO GROUND
RESISTANCE IN THE (K900) SENSOR GROUND CIRCUIT
MAP SENSOR
THROTTLE POSITION SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: Diagnose any TP Sensor or MAP Sensor component DTCs before continuing.

NOTE: If the P0501 - No Vehicle Speed Signal is set long with this DTC, refer to the P0501 diagnostics before continuing.

NOTE: The throttle plate and linkage should be free from binding and carbon build up.

NOTE: Make sure the throttle plate is at the idle position.

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2074-MAP/TPS CORRELLATION - HIGH AIRFLOW/VACUUM LEAK DETECTED (CONTINUED)

2. VACUUM LEAK

NOTE: This code is enabled on engines with a plastic intake manifold and is intended to shut down the engine if a large crack occurs.

NOTE: A large vacuum leak is most likely the cause of this DTC.

Inspect the Intake Manifold for leaks and cracks.

Inspect the Power Brake Booster for any vacuum leaks.

Inspect the PCV system for proper operation and vacuum leaks.

Inspect the throttle plate to see if it is bent and will close entirely, if it is bent it may need to be replaced.

Inspect the MAP Sensor for proper installation.

Verify the engine is free from any mechanical failures.

Were any vacuum leaks found?

Yes >> Repair the vacuum leak as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

---

3. MAP SENSOR OPERATION

Start the engine.

With a scan tool, monitor the MAP Sensor voltage.

Snap the throttle.

Does the MAP Sensor voltage vary from below 2.0 volts at idle to above 3.5 volts at wide open throttle?

Yes >> Go To 4

No >> Go To 11

---

4. TP SENSOR OPERATION

Ignition on, engine not running.

With a scan tool, monitor the TP Sensor voltage while slowly pressing the throttle pedal from closed to wide open throttle.

Does voltage start at approximately 0.8 of a volt and go above 3.5 volts with a smooth transition?

Yes >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

P2074-MAP/TPS CORRELLATION - HIGH AIRFLOW/VACUUM LEAK DETECTED (CONTINUED)

5. EXCESSIVE RESISTANCE IN THE (F855) 5-VOLT SUPPLY CIRCUIT

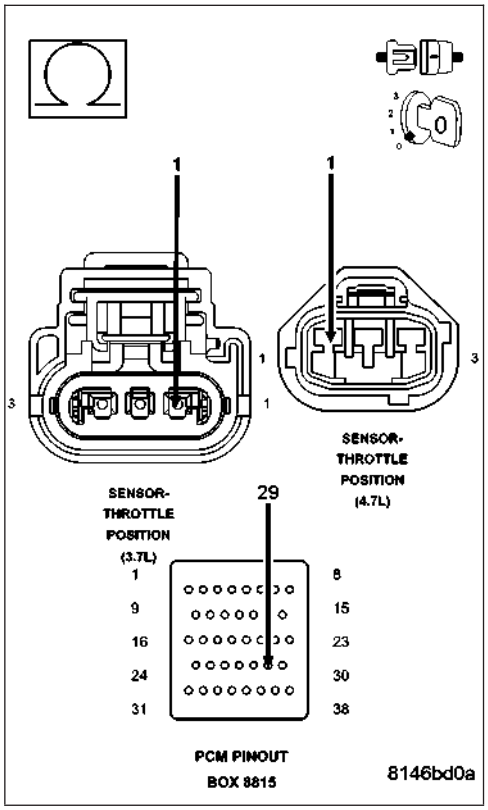
Turn the ignition off.

Disconnect the TP Sensor harness connector.

Disconnect the C2 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (F855) 5-volt Supply circuit from the TP Sensor harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

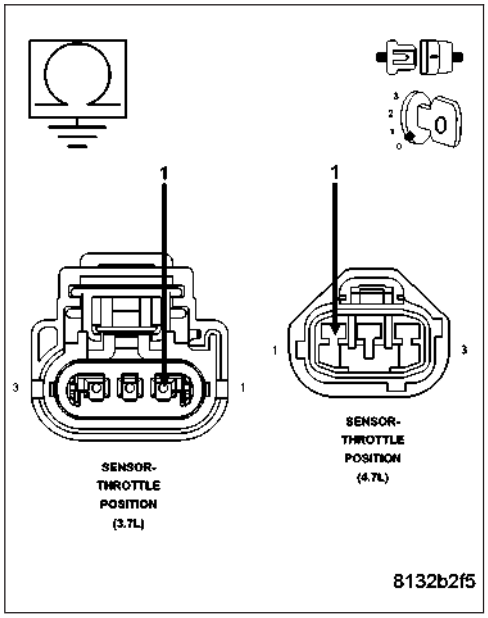
Yes >> Go To 6

No >> Repair the excessive resistance in the (F855) 5-volt Supply circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

6. (F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and (F855) 5-volt Supply circuit in the TP Sensor harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (F855) 5-volt Supply circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 7

P2074-MAP/TPS CORRELLATION - HIGH AIRFLOW/VACUUM LEAK DETECTED (CONTINUED)

7. THROTTLE POSITION SENSOR

Connect the C2 PCM harness connector.

Ignition on, engine not running.

With a scan tool, monitor the TP Sensor voltage.

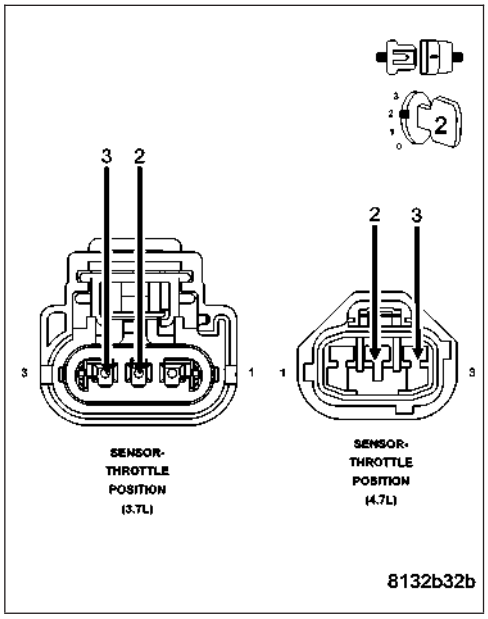
Connect a jumper wire between the (K22) TP Sensor No.1 Signal circuit and the (K900) Sensor ground circuit in the Sensor harness connector.

Does the TP Sensor voltage change from approximately 4.9 volts to below 0.5 of a volt with the jumper wire installed?

Yes >> Replace the Throttle Position Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8

NOTE: Remove the jumper wire before continuing.



8. EXCESSIVE RESISTANCE IN THE (K22) TP NO.1 SIGNAL CIRCUIT

Turn the ignition off.

Disconnect the C2 PCM harness connector.

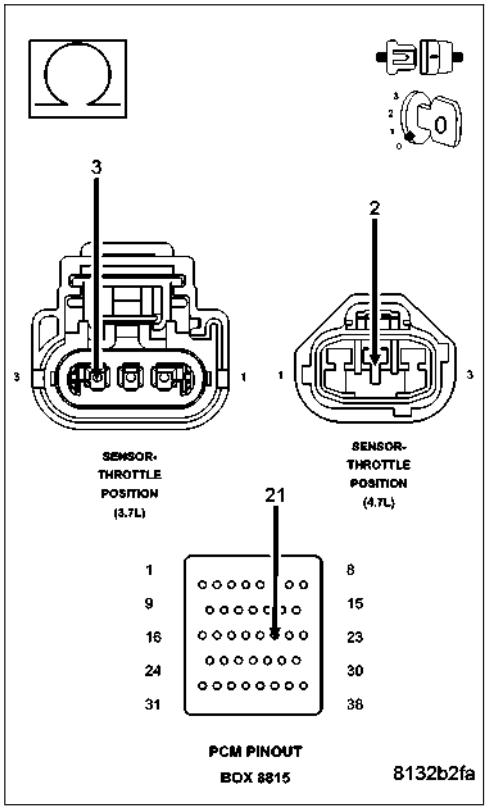
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K22) TP Sensor No.1 Signal circuit from the TP Sensor harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 9

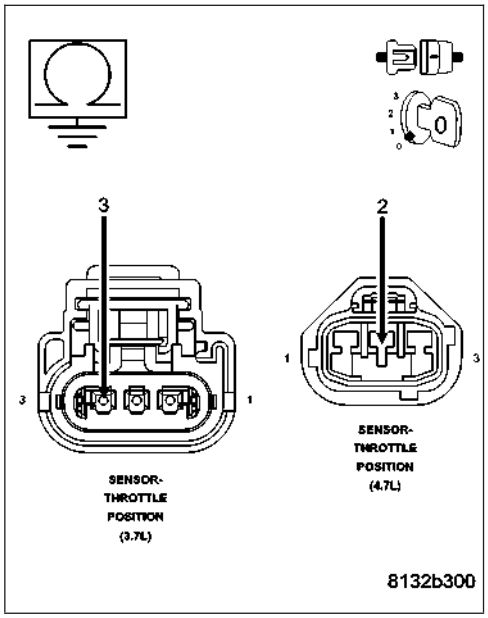
No >> Repair the excessive resistance in the (K22) TP Sensor No.1 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P2074-MAP/TPS CORRELLATION - HIGH AIRFLOW/VACUUM LEAK DETECTED (CONTINUED)

9. (K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K22) TP Sensor No.1 Signal circuit in the TP Sensor harness connector.



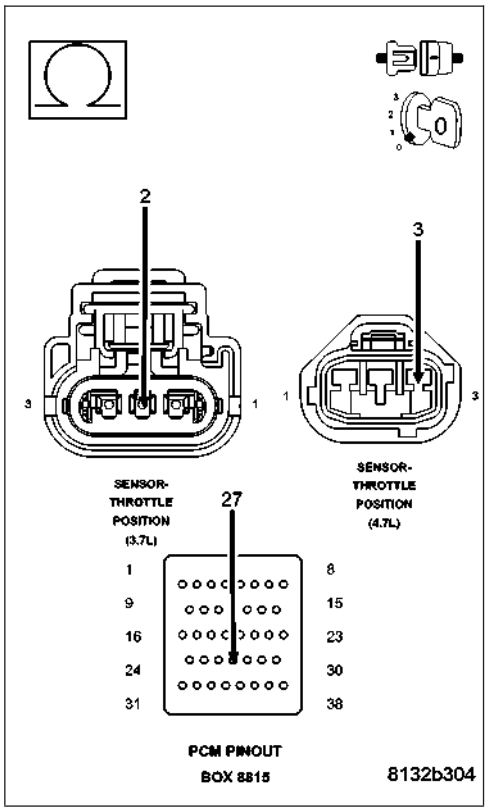
Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K22) TP Sensor No.1 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 10

10. EXCESSIVE RESISTANCE IN THE (K900) SENSOR GROUND CIRCUIT

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.
Measure the resistance of the (K900) Sensor ground circuit from the TP Sensor harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 17

No >> Repair the excessive resistance in the (K900) Sensor ground circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2074-MAP/TPS CORRELLATION - HIGH AIRFLOW/VACUUM LEAK DETECTED (CONTINUED)

11. EXCESSIVE RESISTANCE IN THE (F856) 5-VOLT SUPPLY CIRCUIT

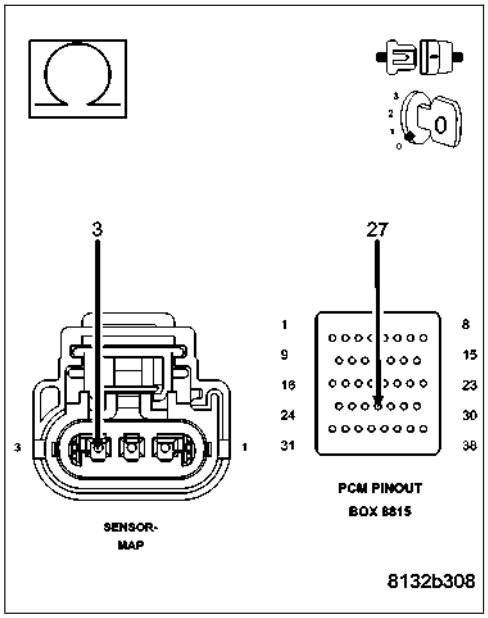
Turn the ignition off.

Disconnect the MAP Sensor harness connector.

Disconnect the C1 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (F856) 5-volt Supply circuit from the MAP Sensor harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

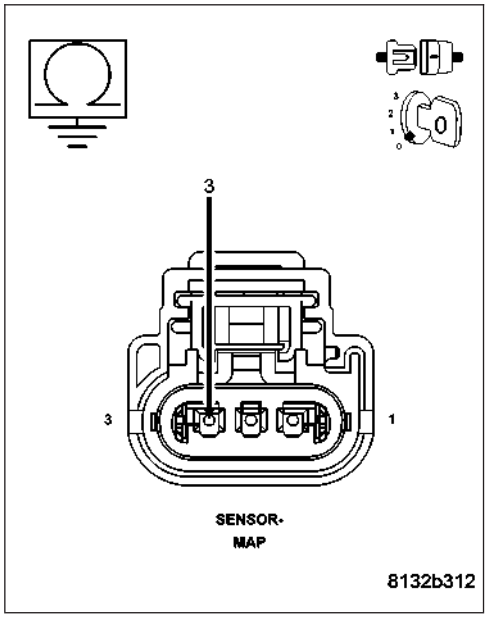
Yes >> Go To 12

No >> Repair the excessive resistance in the (F856) 5-volt Supply circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

12. (F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (F856) 5-volt Supply circuit in the MAP Sensor harness connector.



Is the resistance above 100k ohms?

Yes >> Go To 13

No >> Repair the short to ground in the (F856) 5-volt Supply circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2074-MAP/TPS CORRELLATION - HIGH AIRFLOW/VACUUM LEAK DETECTED (CONTINUED)

13. MAP SENSOR

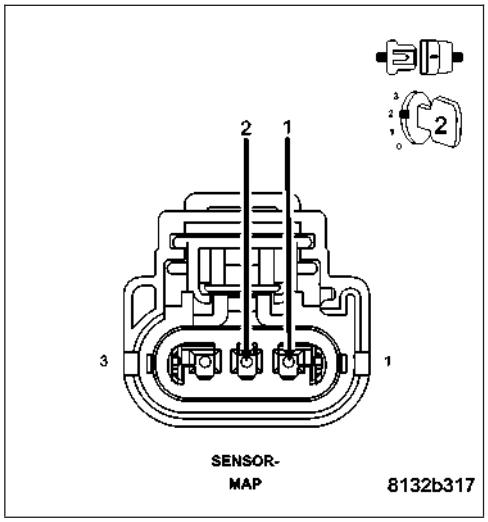
Turn the ignition off.

Connect the C1 PCM harness connector.

Ignition on, engine not running.

With a scan tool, monitor the MAP Sensor voltage.

Connect a jumper wire between the (K1) MAP Signal circuit and the (K900) Sensor ground circuit.



Does the scan tool display MAP voltage from approximately 4.9 volts to below 0.5 of a volt with the jumper wire installed?

Yes >> Replace the MAP Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 14

NOTE: Remove the jumper wire before continuing.

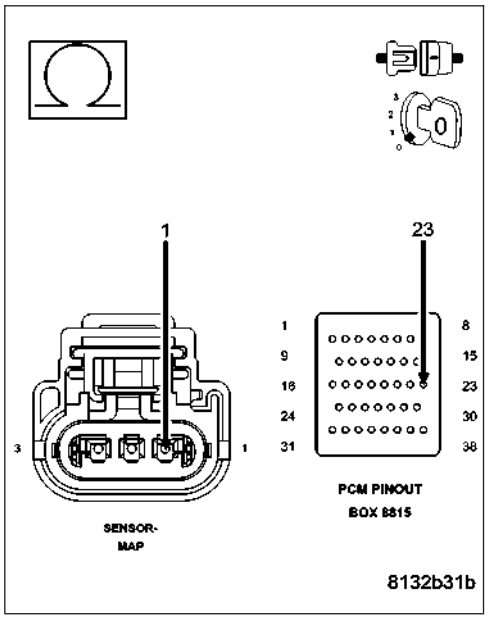
14. EXCESSIVE RESISTANCE IN THE (K1) MAP SIGNAL CIRCUIT

Turn the ignition off.

Disconnect the C2 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K1) MAP Signal circuit from the MAP Sensor harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

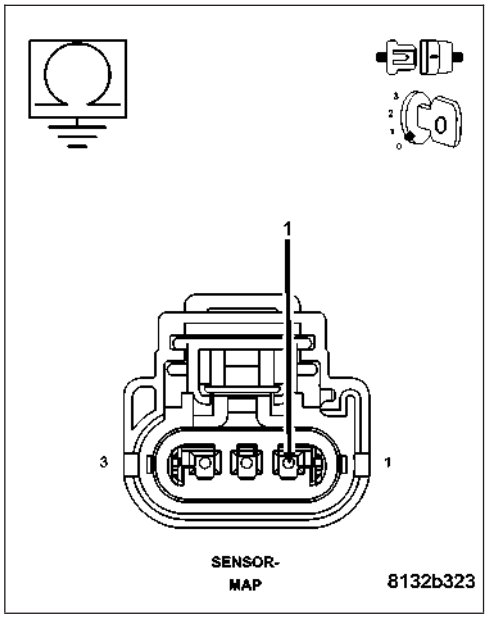
Yes >> Go To 15

No >> Repair the excessive resistance in the (K1) MAP Signal circuit
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2074-MAP/TPS CORRELLATION - HIGH AIRFLOW/VACUUM LEAK DETECTED (CONTINUED)

15. (K1) MAP SIGNAL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K1) MAP Signal circuit in the MAP Sensor harness connector.



Is the resistance below 100 ohms?

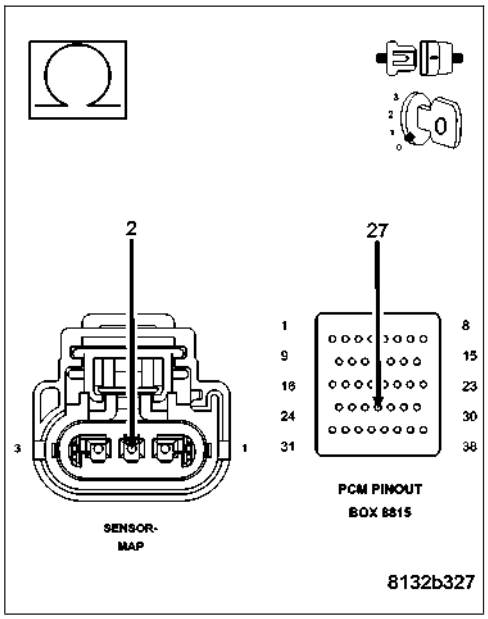
Yes >> Repair the short to ground in the (K1) MAP Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 16

16. EXCESSIVE RESISTANCE IN THE (K900) SENSOR GROUND CIRCUIT

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K900) Sensor ground circuit from the MAP Sensor harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 17

No >> Repair the excessive resistance in the (K900) Sensor ground circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2074-MAP/TPS CORRELLATION - HIGH AIRFLOW/VACUUM LEAK DETECTED (CONTINUED)

17. **PCM**

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

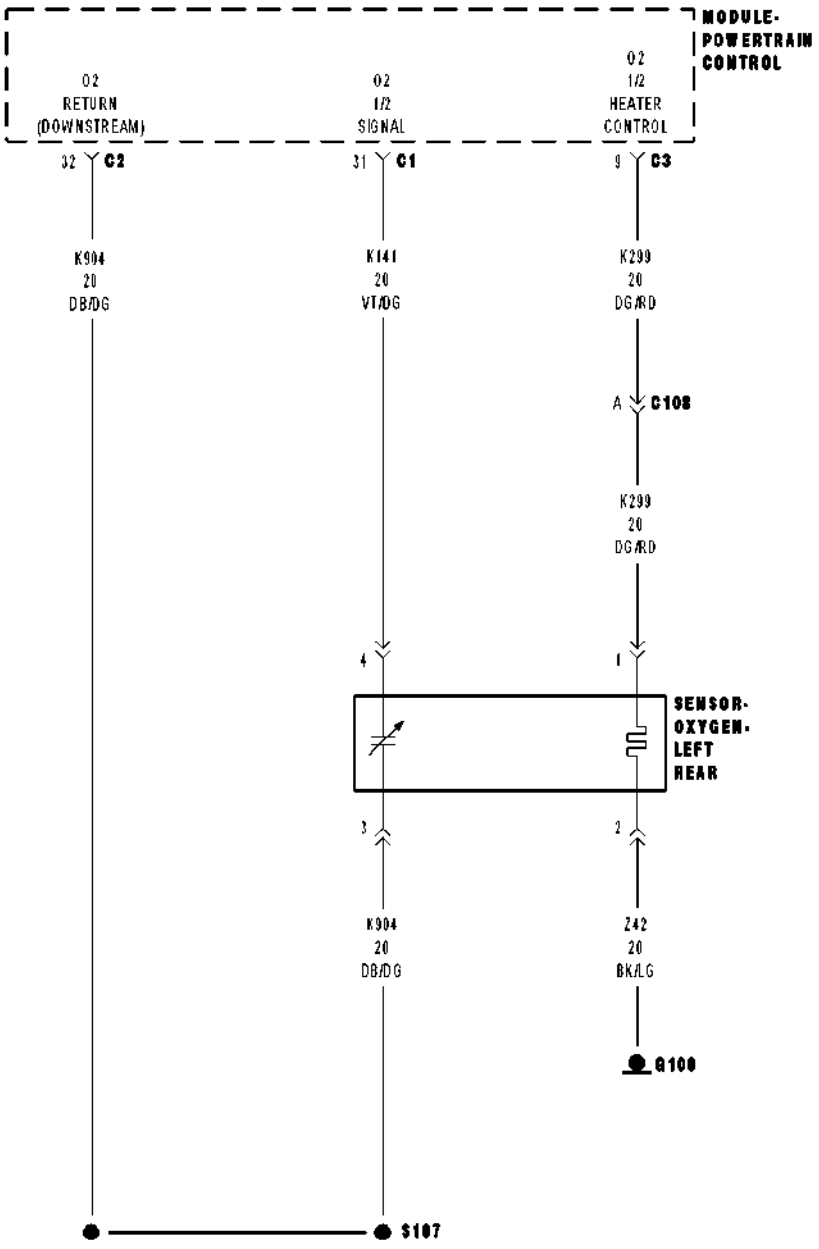
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

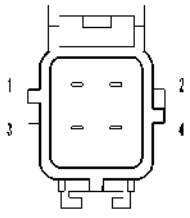
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

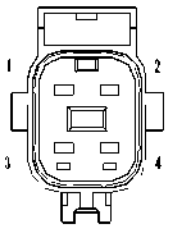
No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2096-DOWNSTREAM FUEL TRIM SYSTEM 1 LEAN

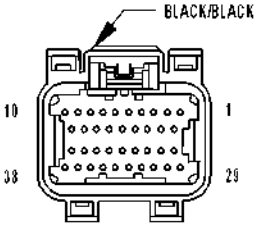




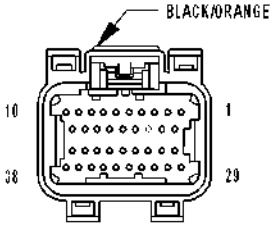
SENSOR-
OXYGEN-
LEFT
REAR
(3.7L)



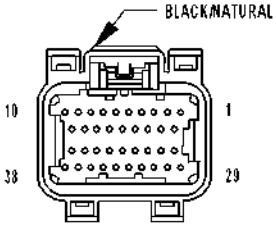
SENSOR-
OXYGEN-
LEFT
REAR
(4.7L/5.7L)



MODULE-
POWERTRAIN
CONTROL C1



MODULE-
POWERTRAIN
CONTROL C2



MODULE-
POWERTRAIN
CONTROL C3

8148295c

P2096-DOWNSTREAM FUEL TRIM SYSTEM 1 LEAN (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the engine running in closed loop mode, the ambient/battery temperature above (-7°C) 20°F, altitude below 8500 ft.
- **Set Condition:**
  If the PCM multiplies short term compensation by long term adaptive as well as a purge fuel multiplier and the result is below a certain value for 30 seconds over two trips, a freeze frame is stored, the MIL illuminates and a trouble code is stored. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
EXHAUST LEAK
ENGINE MECHANICAL
1/2 O2 SENSOR
(K141) O2 SENSOR 1/2 SIGNAL CIRCUIT
(K299) O2 1/2 HEATER CONTROL CIRCUIT
(K904) O2 RETURN DOWNSTREAM CIRCUIT
FUEL CONTAMINATION

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: Check the vehicle repair history. If the 1/2 O2 has been replaced make sure that the O2 sensor was properly installed and meets OEM specification.

NOTE: Check for contaminants that may have damaged the O2 Sensor: contaminated fuel, unapproved silicone, oil and coolant.

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2096-DOWNSTREAM FUEL TRIM SYSTEM 1 LEAN (CONTINUED)

2. EXHAUST LEAK

Turn the ignition off.

WARNING: To avoid personal injury from the exhaust system being hot, allow the exhaust to cool down to a safe temperature before performing a physical inspection. Failure to follow these instructions can result in personal injury or death.

Visually and Physically inspect the exhaust system for holes, cracks and blockage in the exhaust system.

Is the exhaust system is good condition?

Yes >> Go To 3

No >> Repair or Replace as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

3. ENGINE MECHANICAL

Check for any of the following conditions/mechanical problems.
AIR INDUCTION SYSTEM - must be free from leaks
ENGINE VACUUM - must be at least 13 inches in neutral
ENGINE VALVE TIMING - must be within specifications
ENGINE COMPRESSION - must be within specifications
ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks
ENGINE PCV SYSTEM - must flow freely
TORQUE CONVERTER STALL SPEED - must be within specifications
POWER BRAKE BOOSTER - no internal vacuum leaks
FUEL - must be free of contamination
FUEL INJECTOR - plugged or restricted injector; control wire not connected to correct injector

Are there any engine mechanical problems?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

P2096-DOWNSTREAM FUEL TRIM SYSTEM 1 LEAN (CONTINUED)

4. O2 SENSOR

Ignition on, engine not running.

Disconnect the 1/2 O2 Sensor harness connector.

With the scan tool, monitor the 1/2 O2 Sensor voltage.

The O2 Sensor voltage should read 5.0 volts on the scan tool with the connector disconnected.

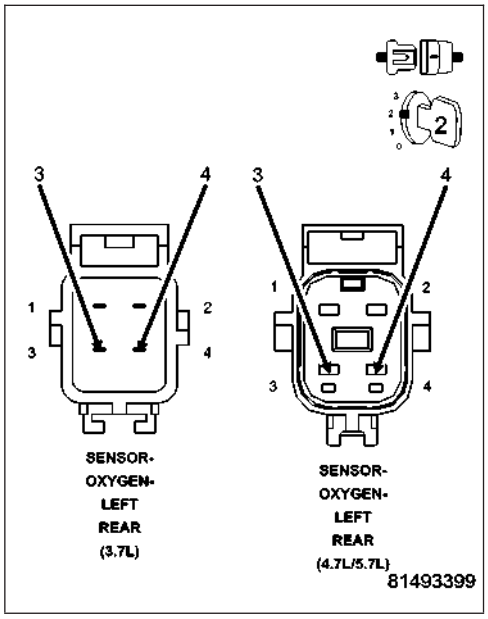
Using a jumper wire, jump the (K141) O2 Sensor 1/2 Signal circuit to the (K904) O2 Return Downstream circuit in the O2 Sensor harness connector.

NOTE: The voltage should drop from 5.0 volts to 2.5 volts with the jumper wire in place.

Did the O2 Sensor volts change from 5.0 volts to 2.5 volts?

Yes >> Replace the O2 Sensor
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5



P2096-DOWNSTREAM FUEL TRIM SYSTEM 1 LEAN (CONTINUED)

5. (K141) O2 SENSOR 1/2 SIGNAL CIRCUIT

Remove the jump wire.

Ignition on, engine not running.

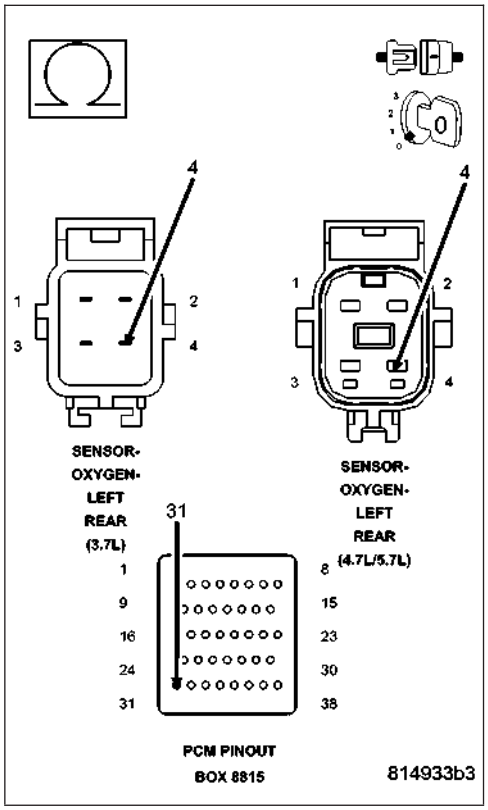
With the scan tool, monitor the 1/2 O2 Sensor voltage.

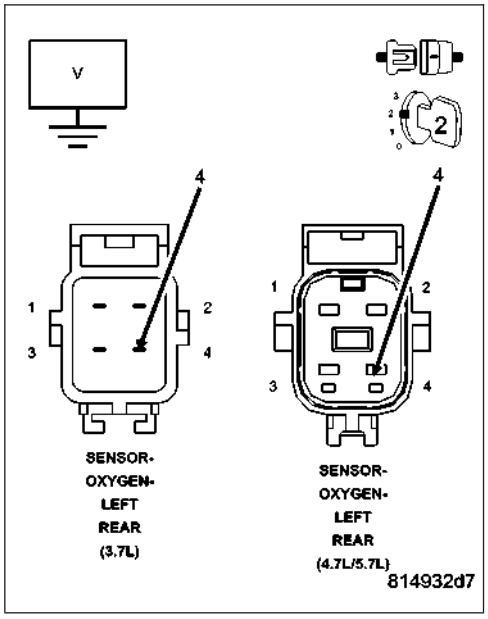
Is the voltage above 4.8 volts?

Yes >> Go To 6

No >> Check the (K141) O2 Sensor 1/2 Signal circuit for an open or short to voltage. Inspect the O2 Sensor connector and the PCM harness connector. If OK, replace and program the Powertrain Control Module per Service Information.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)





P2096-DOWNSTREAM FUEL TRIM SYSTEM 1 LEAN (CONTINUED)

6. (K299) O2 SENSOR 1/2 HEATER CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the C3 PCM harness connector.

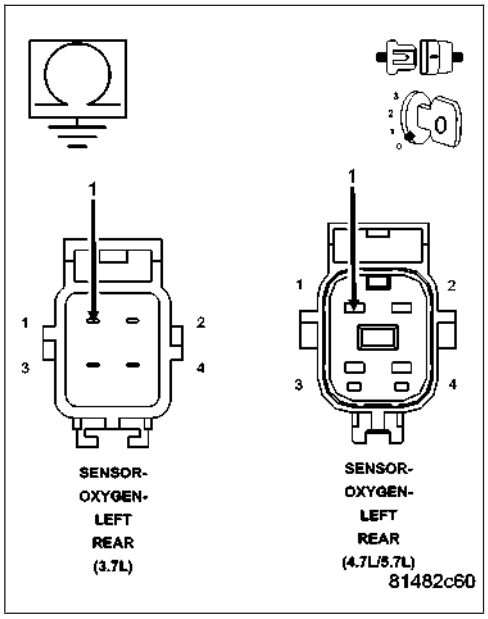
Measure the resistance between ground and the (K299) O2 Sensor 1/2 Heater Control circuit from the O2 Sensor harness connector.

Is the resistance below 5.0 ohms?

Yes >> Repair the short to ground in the (K299) O2 Sensor 1/2 Heater Control circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 7



P2096-DOWNSTREAM FUEL TRIM SYSTEM 1 LEAN (CONTINUED)

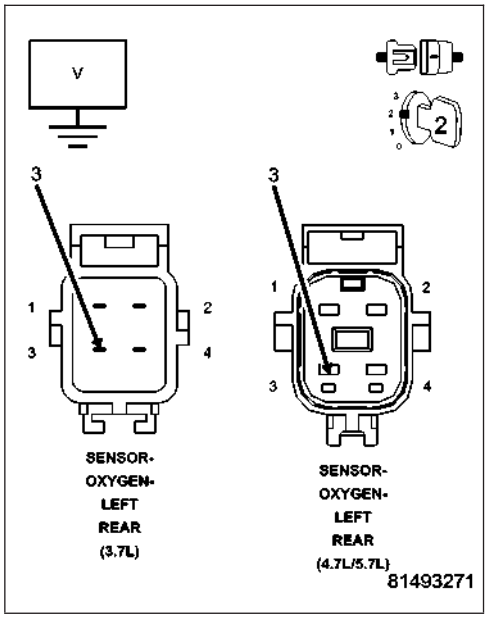
7. (K904) O2 RETURN DOWNSTREAM CIRCUIT

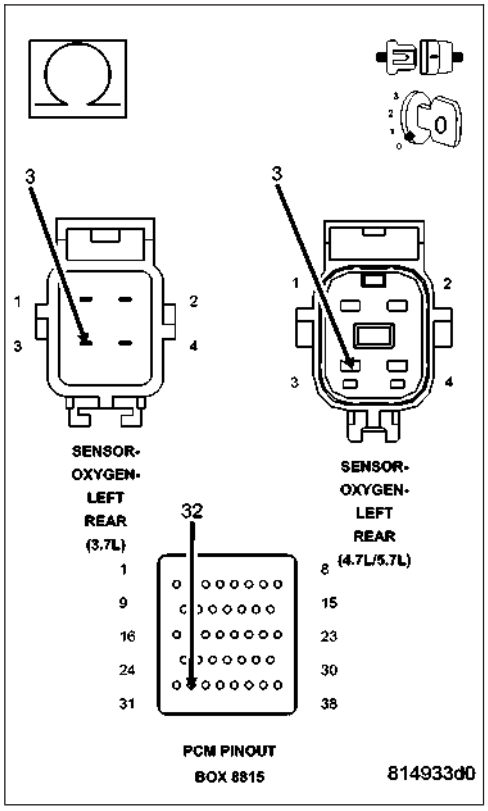
Measure the voltage on the (K904) O2 Return Downstream circuit in the O2 Sensor harness connector.

Is the voltage at 2.5 volts?

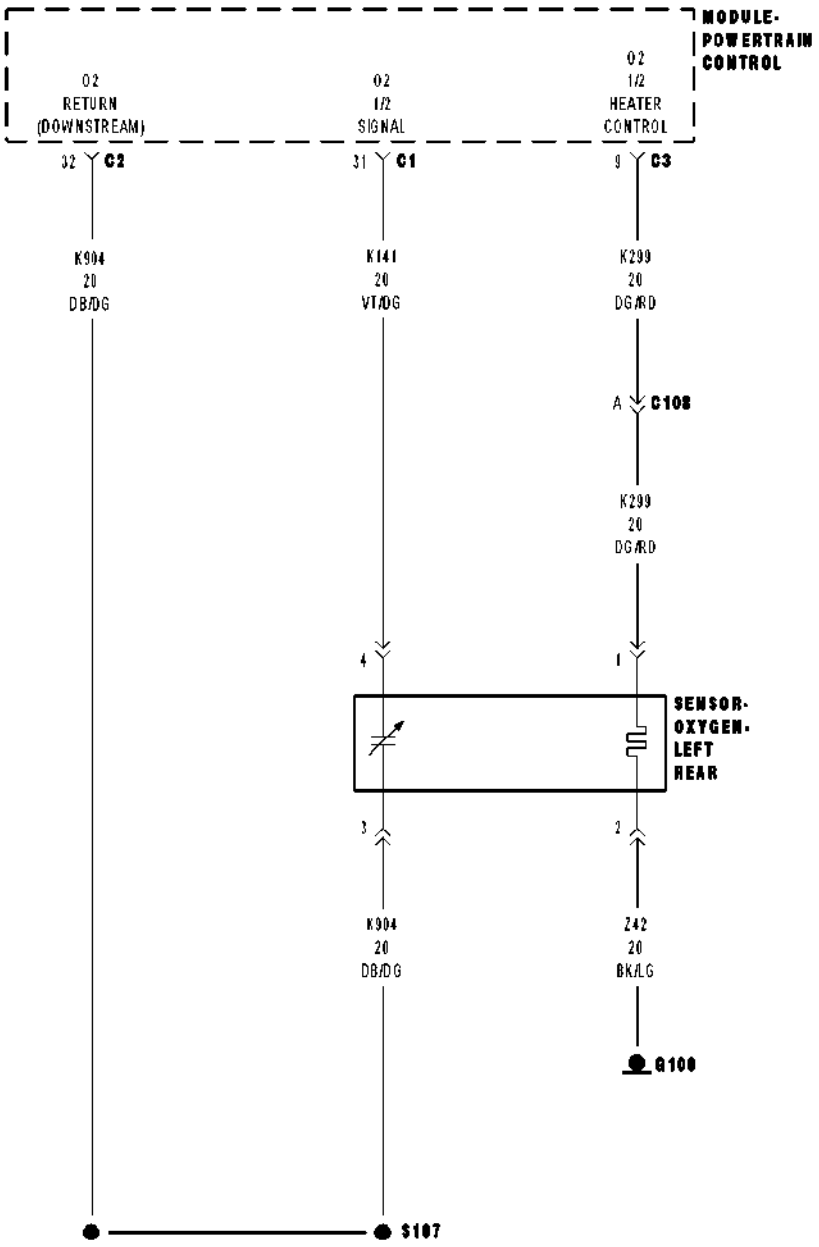
Yes >> Check the fuel system for contaminants.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

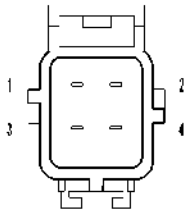
No >> Check the (K904) O2 Return Downstream circuit for a short to ground, open, or short to voltage. Inspect the O2 Sensor connector and the PCM harness connector. If OK, replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



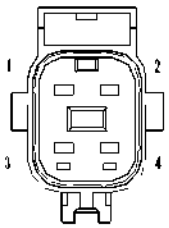


P2097-DOWNSTREAM FUEL TRIM SYSTEM 1 RICH

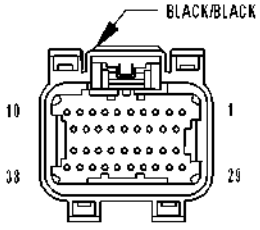




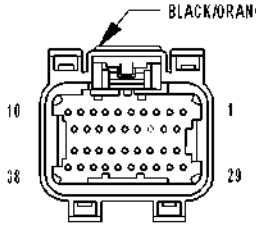
SENSOR-
OXYGEN-
LEFT
REAR
(3.7L)



SENSOR-
OXYGEN-
LEFT
REAR
(4.7L/5.7L)



MODULE-
POWERTRAIN
CONTROL C1



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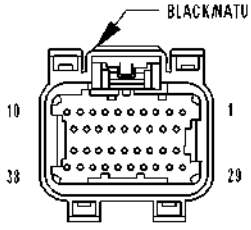
POWERTRAIN
CONTROL C2



MODULE-
POWERTRAIN
CONTROL C3

8148295c

P2097-DOWNSTREAM FUEL TRIM SYSTEM 1 RICH (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the engine running in closed loop mode, the ambient/battery temperature above (-7°) 20°F, altitude below 8500 ft.
- **Set Condition:**
  If the PCM multiplies short term compensation by long term adaptive as well as a purge fuel multiplier and the result is below a certain value for 30 seconds over two trips, a freeze frame is stored, the MIL illuminates and a trouble code is stored. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
EXHAUST LEAK
ENGINE MECHANICAL
1/2 O2 SENSOR
(K141) O2 SENSOR 1/2 SIGNAL CIRCUIT
(K299) O2 HEATER 1/2 CONTROL CIRCUIT
(K904) O2 RETURN DOWNSTREAM CIRCUIT
FUEL CONTAMINATION

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: Check the vehicle repair history. If the 1/2 O2 has been replaced make sure that the O2 sensor was properly installed and meets OEM specification.

NOTE: Check for contaminants that may have damaged the O2 Sensor: contaminated fuel, unapproved silicone, oil and coolant.

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2097-DOWNSTREAM FUEL TRIM SYSTEM 1 RICH (CONTINUED)

2. EXHAUST LEAK

Turn the ignition off.

WARNING: To avoid personal injury from the exhaust system being hot, allow the exhaust to cool down to a safe temperature before performing a physical inspection. Failure to follow these instructions can result in personal injury or death.

Visually and Physically inspect the exhaust system for holes, cracks and blockage in the exhaust system.

Is the exhaust system is good condition?

Yes >> Go To 3

No >> Repair or Replace as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

3. ENGINE MECHANICAL

Check for any of the following conditions/mechanical problems
AIR INDUCTION SYSTEM - must be free from leaks.
ENGINE VACUUM - must be at least 13 inches in neutral
ENGINE VALVE TIMING - must be within specifications
ENGINE COMPRESSION - must be within specifications
ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks
ENGINE PCV SYSTEM - must flow freely
TORQUE CONVERTER STALL SPEED - must be within specifications
POWER BRAKE BOOSTER - no internal vacuum leaks
FUEL - must be free of contamination
FUEL INJECTOR - plugged or restricted injector; control wire not connected to correct injector

Are there any engine mechanical problems?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

P2097-DOWNSTREAM FUEL TRIM SYSTEM 1 RICH (CONTINUED)

4. O2 SENSOR

Ignition on, engine not running.

Disconnect the 1/2 O2 Sensor harness connector.

With the scan tool, monitor the 1/2 O2 Sensor voltage.

The O2 Sensor voltage should read 5.0 volts on the scan tool with the connector disconnected.

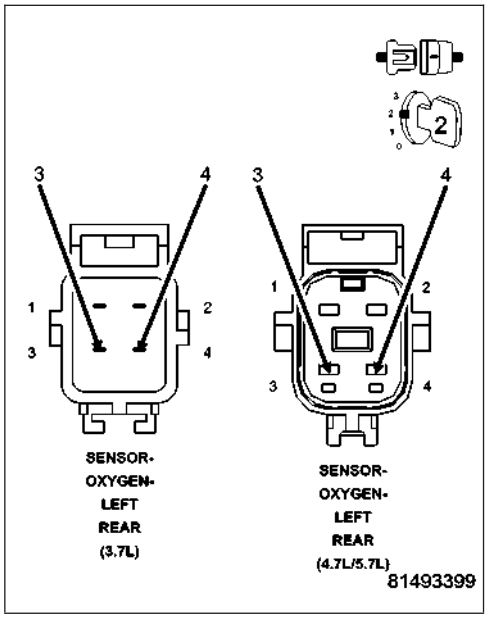
Using a jumper wire, jump the (K141) O2 Sensor 1/2 Signal circuit to the (K904) O2 Return Downstream circuit in the O2 Sensor harness connector.

NOTE: The voltage should drop from 5.0 volts to 2.5 volts with the jumper wire in place.

Did the O2 Sensor volts change from 5.0 volts to 2.5 volts?

Yes >> Replace the O2 Sensor
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5



P2097-DOWNSTREAM FUEL TRIM SYSTEM 1 RICH (CONTINUED)

5. (K141) O2 SENSOR 1/2 SIGNAL CIRCUIT

Remove the jump wire.

Ignition on, engine not running.

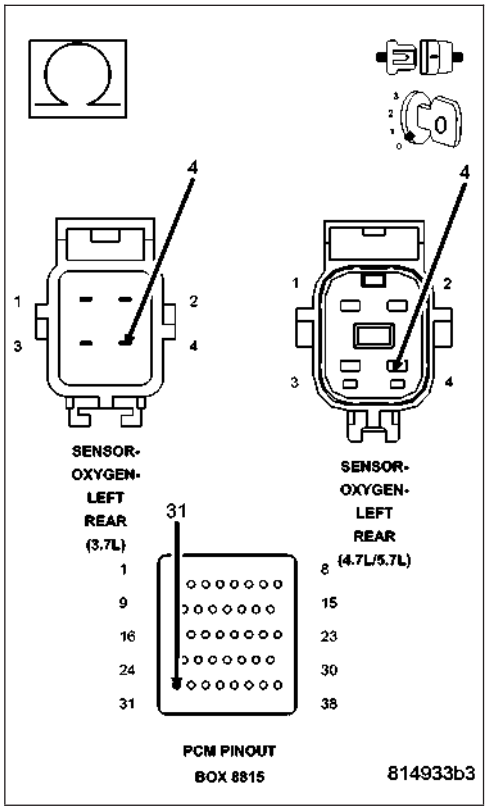
With the scan tool, monitor the 1/2 O2 Sensor voltage.

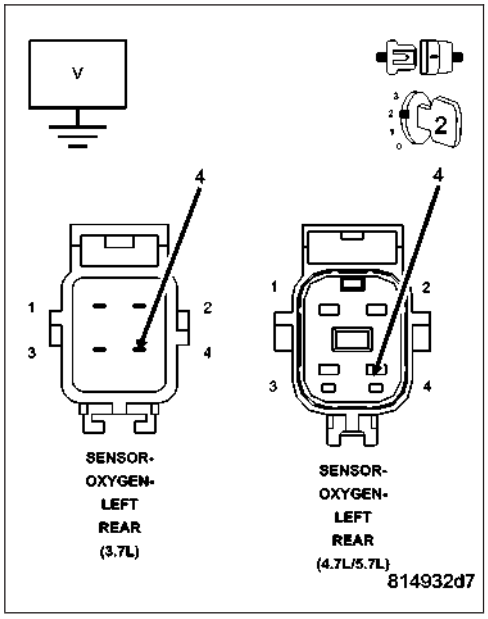
Is the voltage above 4.8 volts?

Yes >> Go To 6

No >> Check the (K141) O2 Sensor 1/2 Signal circuit for an open or short to voltage. Inspect the O2 Sensor connector and the PCM harness connector. If OK, replace and program the Powertrain Control Module per Service Information.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)





P2097-DOWNSTREAM FUEL TRIM SYSTEM 1 RICH (CONTINUED)

6. (K299) O2 SENSOR 1/2 HEATER CONTROL CIRCUIT OPEN

Turn the ignition off.

Disconnect the C3 PCM harness connector.

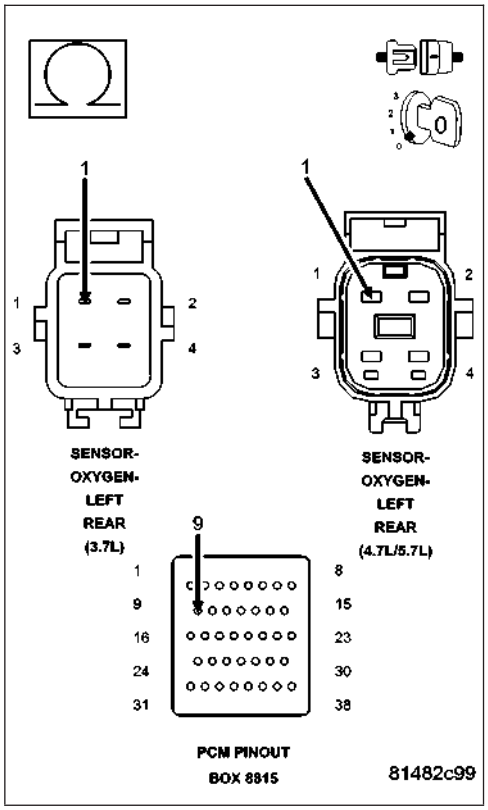
Measure the resistance of the (K299) O2 Sensor 1/2 Heater Control circuit from the O2 Sensor harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 7

No >> Repair the open in the (K299) O2 Sensor 1/2 Heater Control circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P2097-DOWNSTREAM FUEL TRIM SYSTEM 1 RICH (CONTINUED)

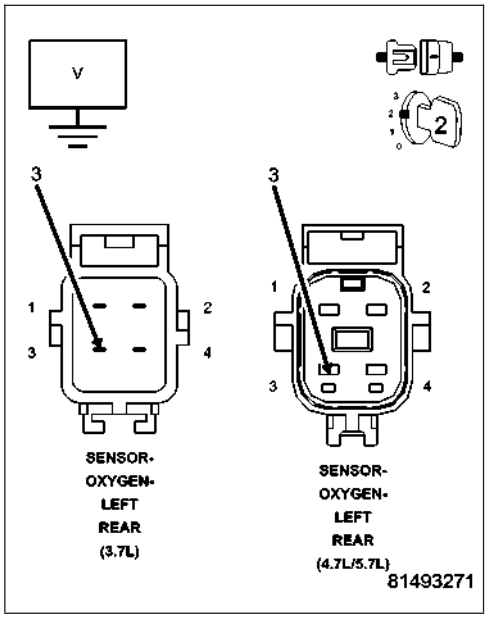
7. (K904) O2 RETURN DOWNSTREAM CIRCUIT

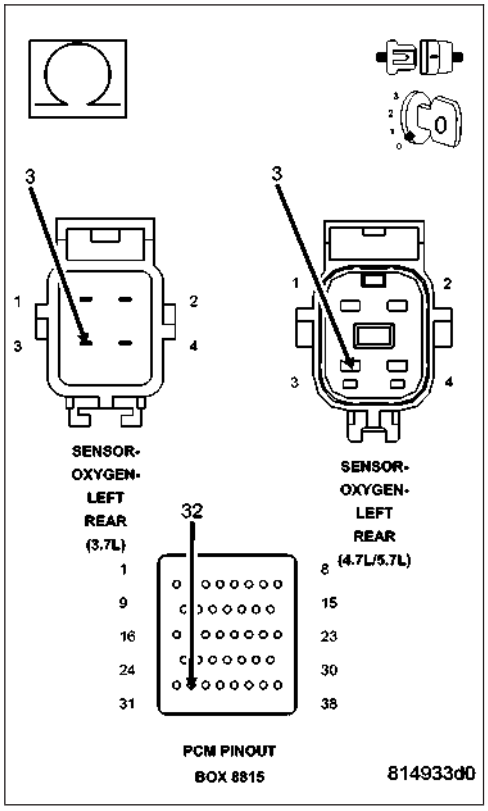
Measure the voltage on the (K904) O2 Return Downstream circuit in the O2 Sensor harness connector.

Is the voltage at 2.5 volts?

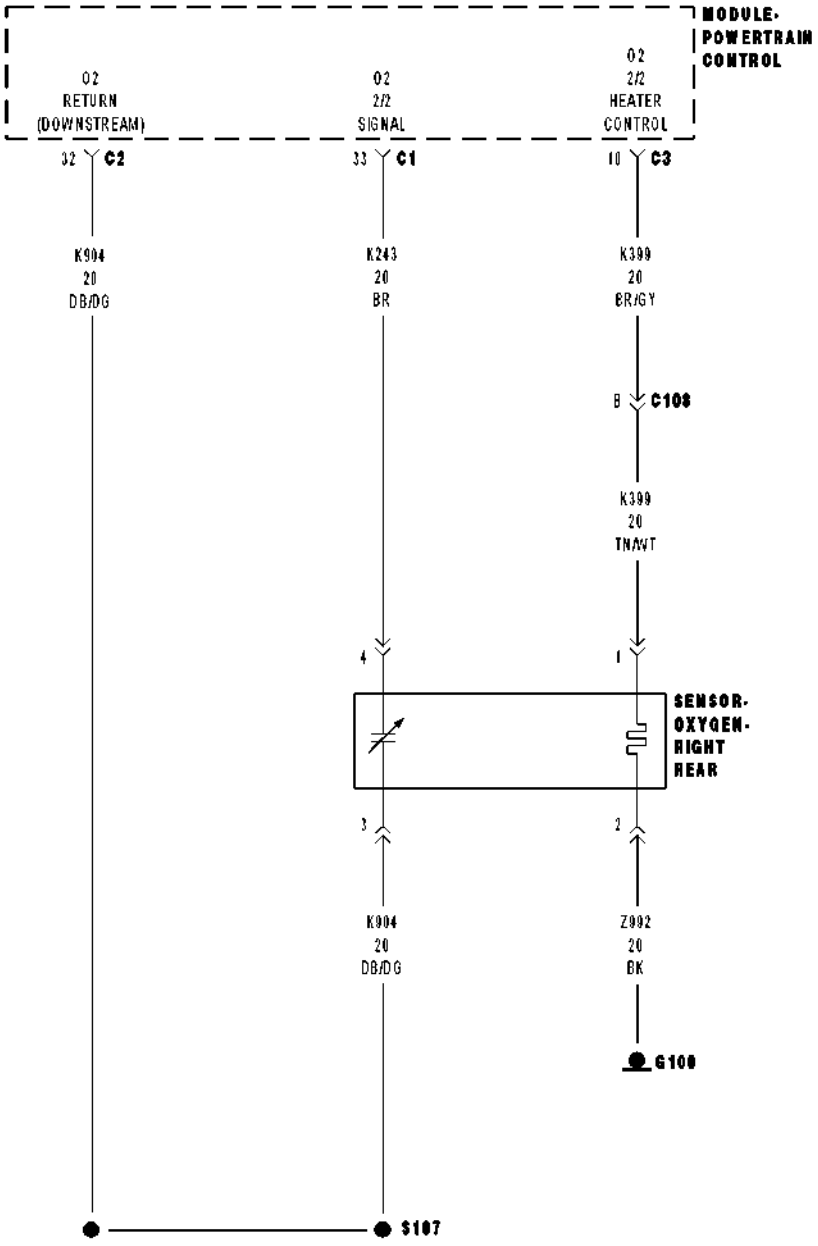
Yes >> Check the fuel system for contaminants.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

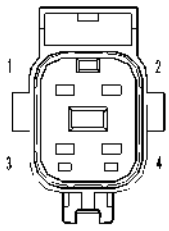
No >> Check the (K904) O2 Return Downstream circuit for a short to ground, open, or short to voltage. Inspect the O2 Sensor connector and the PCM harness connector. If OK, replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



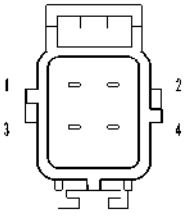


P2098-DOWNSTREAM FUEL TRIM SYSTEM 2 LEAN

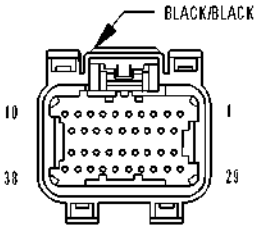




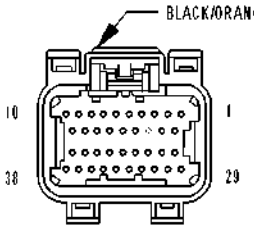
SENSOR-
OXYGEN-
RIGHT
REAR
(3.7L/5.7L)



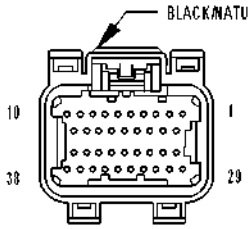
SENSOR-
OXYGEN-
RIGHT
REAR
(4.7L)



MODULE-
POWERTRAIN
CONTROL C1



MODULE-
POWERTRAIN
CONTROL C2



MODULE-
POWERTRAIN
CONTROL C3

81483cc8

P2098-DOWNSTREAM FUEL TRIM SYSTEM 2 LEAN (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the engine running in closed loop mode, the ambient/battery temperature above (-7°C) 20°F, altitude below 8500 ft and fuel level greater than 15%.
- **Set Condition:**
  If the PCM multiplies short term compensation by long term adaptive and a certain percentage is exceeded for two trips, a freeze frame is stored, the MIL illuminates and a trouble code is stored. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
EXHAUST LEAK
ENGINE MECHANICAL
2/2 O2 SENSOR
(K243) O2 2/2 SIGNAL CIRCUIT
(K399) O2 HEATER 2/2 CONTROL CIRCUIT
(K904) O2 RETURN DOWNSTREAM CIRCUIT
FUEL CONTAMINATION

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: Check the vehicle repair history. If the 2/2 O2 has been replaced make sure that the O2 sensor was properly installed and meets OEM specification.

NOTE: Check for contaminants that may have damaged the O2 Sensor: contaminated fuel, unapproved silicone, oil and coolant.

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2098-DOWNSTREAM FUEL TRIM SYSTEM 2 LEAN (CONTINUED)

2. EXHAUST LEAK

Turn the ignition off.

WARNING: To avoid personal injury from the exhaust system being hot, allow the exhaust to cool down to a safe temperature before performing a physical inspection. Failure to follow these instructions can result in personal injury or death.

Visually and Physically inspect the exhaust system for holes, cracks and blockage in the exhaust system.

Is the exhaust system is good condition?

Yes >> Go To 3

No >> Repair or Replace as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

3. ENGINE MECHANICAL

Check for any of the following conditions/mechanical problems.
AIR INDUCTION SYSTEM - must be free from leaks
ENGINE VACUUM - must be at least 13 inches in neutral
ENGINE VALVE TIMING - must be within specifications
ENGINE COMPRESSION - must be within specifications
ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks
ENGINE PCV SYSTEM - must flow freely
TORQUE CONVERTER STALL SPEED - must be within specifications
POWER BRAKE BOOSTER - no internal vacuum leaks
FUEL - must be free of contamination
FUEL INJECTOR - plugged or restricted injector; control wire not connected to correct injector

Are there any engine mechanical problems?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

P2098-DOWNSTREAM FUEL TRIM SYSTEM 2 LEAN (CONTINUED)

4. O2 SENSOR

Ignition on, engine not running.

Disconnect the 2/2 O2 Sensor harness connector.

With the scan tool, monitor the 2/2 O2 Sensor voltage.

The O2 Sensor voltage should read 5.0 volts on the scan tool with the connector disconnected.

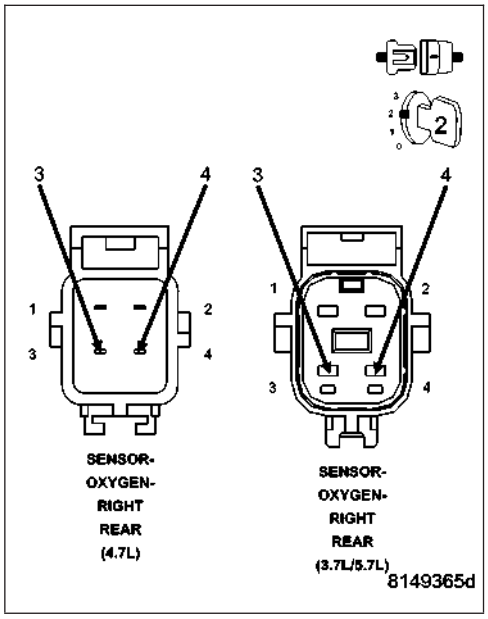
Using a jumper wire, jump the (K243) O2 Sensor 2/2 Signal circuit to the (K904) O2 Return Downstream circuit in the O2 Sensor harness connector.

NOTE: The voltage should drop from 5.0 volts to 2.5 volts with the jumper wire in place.

Did the O2 Sensor volts change from 5.0 volts to 2.5 volts?

Yes >> Replace the O2 Sensor
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5



P2098-DOWNSTREAM FUEL TRIM SYSTEM 2 LEAN (CONTINUED)

5. (K243) O2 SENSOR 2/2 SIGNAL CIRCUIT

Remove the jump wire.

Ignition on, engine not running.

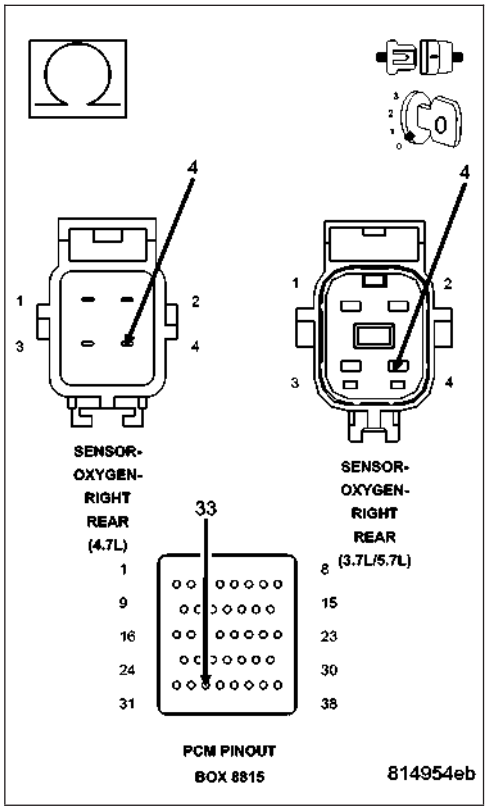
With the scan tool, monitor the O2 Sensor voltage.

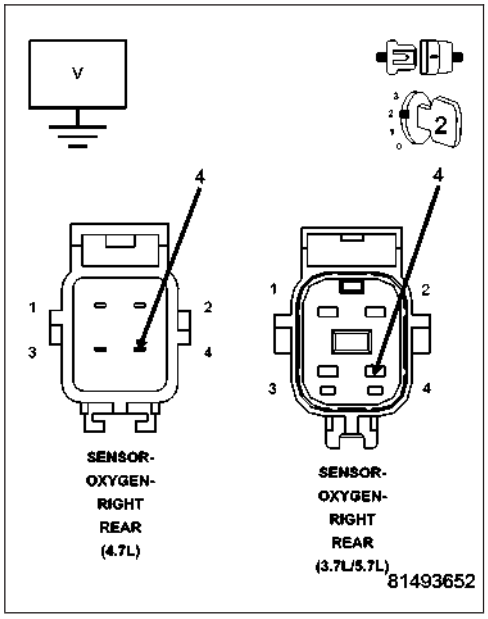
Is the voltage above 4.8 volts?

Yes >> Go To 6

No >> Check the (K243) O2 Sensor 2/2 Signal circuit for a open or short to voltage. Inspect the O2 Sensor connector and the PCM harness connector. If OK, replace and program the Powertrain Control Module per Service Information.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)





P2098-DOWNSTREAM FUEL TRIM SYSTEM 2 LEAN (CONTINUED)

6. (K399) O2 SENSOR 2/2 HEATER CONTROL CIRCUIT SHORT TO GROUND

Turn the ignition off.

Disconnect the C3 PCM harness connector.

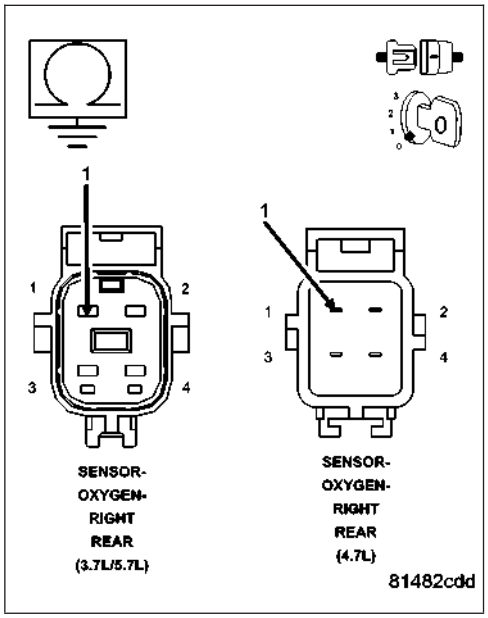
Measure the resistance between ground and the (K399) O2 Sensor 2/2 Heater Control circuit in the O2 Sensor harness connector.

Is the resistance below 5.0 ohms?

Yes >> Repair the short to ground in the (K399) O2 Sensor 2/2 Heater Control circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 7



P2098-DOWNSTREAM FUEL TRIM SYSTEM 2 LEAN (CONTINUED)

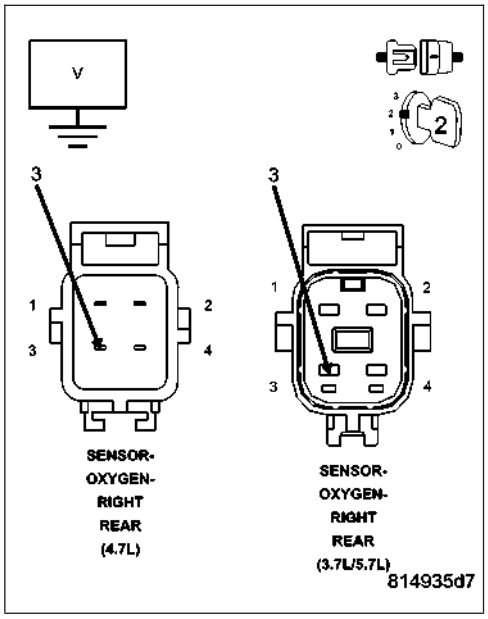
7. (K904) O2 RETURN DOWNSTREAM CIRCUIT

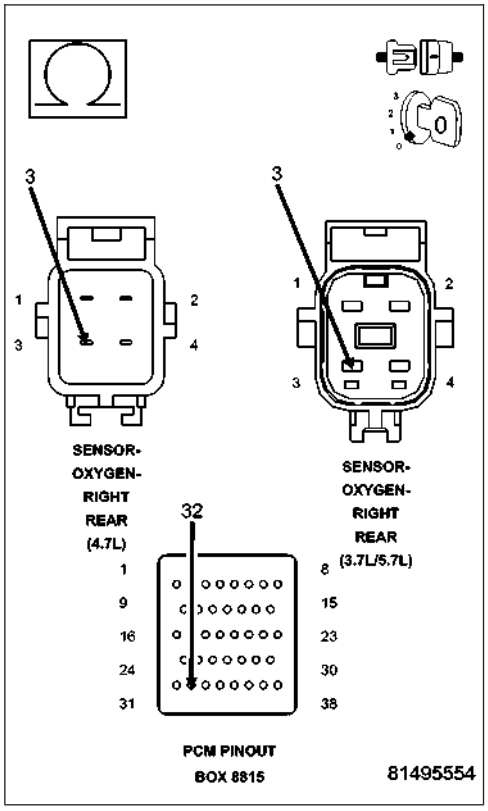
Measure the voltage on the (K904) O2 Return Downstream circuit in the O2 Sensor harness connector.

Is the voltage at 2.5 volts?

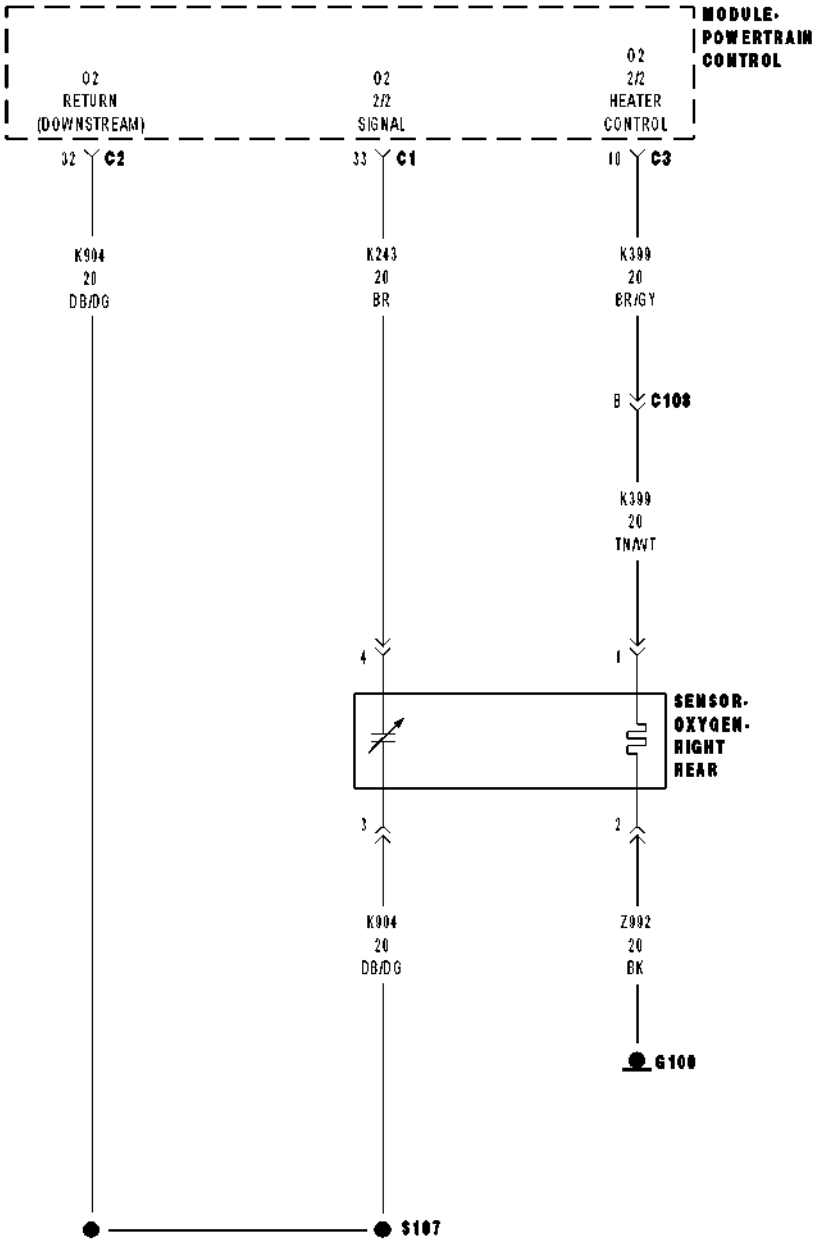
Yes >> Check the fuel system for contaminants.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

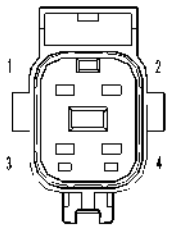
No >> Check the (K904) O2 Return Downstream circuit for a short to ground, open, or short to voltage. Inspect the O2 Sensor connector and the PCM harness connector. If OK, replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



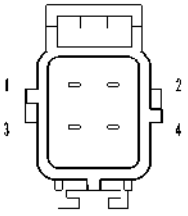


P2099-DOWNSTREAM FUEL TRIM SYSTEM 2 RICH

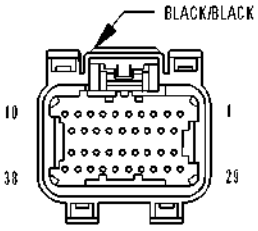




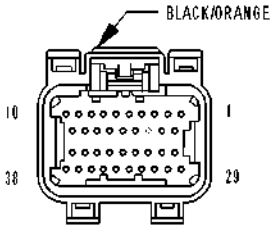
SENSOR-
OXYGEN-
RIGHT
REAR
(3.7L/5.7L)



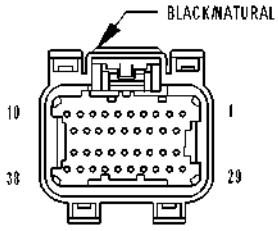
SENSOR-
OXYGEN-
RIGHT
REAR
(4.7L)



MODULE-
POWERTRAIN
CONTROL C1



MODULE-
POWERTRAIN
CONTROL C2



MODULE-
POWERTRAIN
CONTROL C3

81483cc8

P2099-DOWNSTREAM FUEL TRIM SYSTEM 2 RICH (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the engine running in closed loop mode, the ambient/battery temperature above (-7°C) 20°F, altitude below 8500 ft.
- **Set Condition:**
  If the PCM multiplies short term compensation by long term adaptive as well as a purge fuel multiplier and the result is below a certain value for 30 seconds over two trips, a freeze frame is stored, the MIL illuminates and a trouble code is stored. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
EXHAUST LEAK
ENGINE MECHANICAL
2/2 O2 SENSOR
(K342) O2 SENSOR 2/2 SIGNAL CIRCUIT
(K399) O2 SENSOR 2/2 HEATER CONTROL CIRCUIT
(K904) O2 RETURN DOWNSTREAM CIRCUIT
FUEL CONTAMINATION

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: Check the vehicle repair history. If the 2/2 O2 has been replaced make sure that the O2 sensor was properly installed and meets OEM specification.

NOTE: Check for contaminants that may have damaged the O2 Sensor: contaminated fuel, unapproved silicone, oil and coolant.

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2099-DOWNSTREAM FUEL TRIM SYSTEM 2 RICH (CONTINUED)

2. EXHAUST LEAK

Turn the ignition off.

WARNING: To avoid personal injury from the exhaust system being hot, allow the exhaust to cool down to a safe temperature before performing a physical inspection. Failure to follow these instructions can result in personal injury or death.

Visually and Physically inspect the exhaust system for holes, cracks and blockage in the exhaust system.

Is the exhaust system is good condition?

Yes >> Go To 3

No >> Repair or Replace as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

3. ENGINE MECHANICAL

Check for any of the following conditions/mechanical problems.
AIR INDUCTION SYSTEM - must be free from leaks
ENGINE VACUUM - must be at least 13 inches in neutral
ENGINE VALVE TIMING - must be within specifications
ENGINE COMPRESSION - must be within specifications
ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks
ENGINE PCV SYSTEM - must flow freely
TORQUE CONVERTER STALL SPEED - must be within specifications
POWER BRAKE BOOSTER - no internal vacuum leaks
FUEL - must be free of contamination
FUEL INJECTOR - plugged or restricted injector; control wire not connected to correct injector

Are there any engine mechanical problems?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

P2099-DOWNSTREAM FUEL TRIM SYSTEM 2 RICH (CONTINUED)

4. O2 SENSOR

Ignition on, engine not running.

Disconnect the 2/2 O2 Sensor harness connector.

With the scan tool, monitor the 2/2 O2 Sensor voltage.

The O2 Sensor voltage should read 5.0 volts on the scan tool with the connector disconnected.

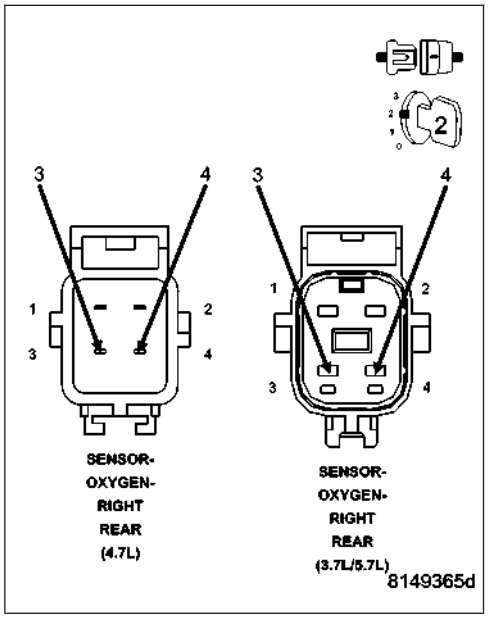
Using a jumper wire, jump the (K243) O2 Signal 2/2 circuit to the (K904) O2 Return Downstream circuit in the O2 Sensor harness connector.

NOTE: The voltage should drop from 5.0 volts to 2.5 volts with the jumper wire in place.

Did the O2 Sensor volts change from 5.0 volts to 2.5 volts?

Yes >> Replace the O2 Sensor
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5



P2099-DOWNSTREAM FUEL TRIM SYSTEM 2 RICH (CONTINUED)

5. (K243) O2 SENSOR 2/2 SIGNAL CIRCUIT

Remove the jump wire.

Ignition on, engine not running.

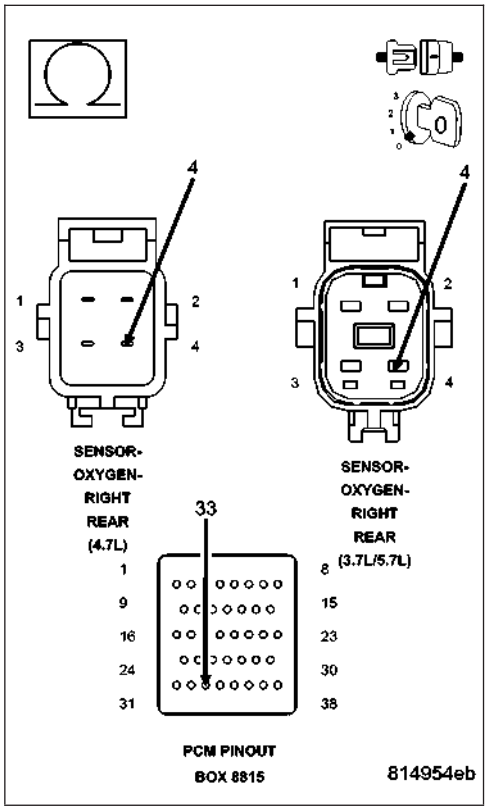
With the scan tool, monitor the 2/2 O2 Sensor voltage.

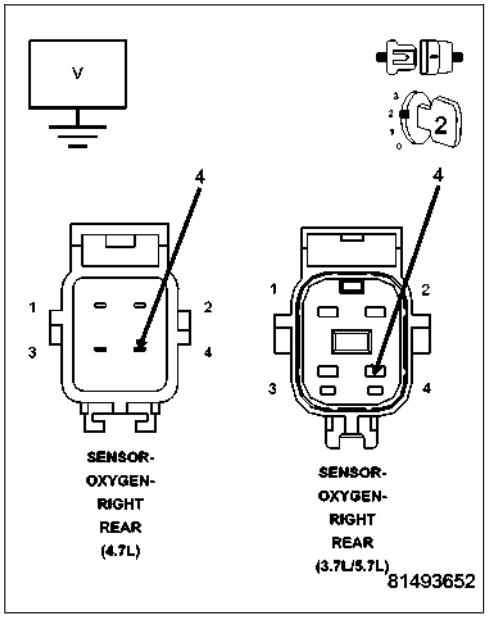
Is the voltage above 4.8 volts?

Yes >> Check the (K243) O2 Sensor 2/2 Signal circuit for an open or short to battery voltage. Inspect the O2 Sensor connector and the PCM harness connector. If OK, replace and program the Powertrain Control Module per Service Information.

No >> Go To 6

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)





P2099-DOWNSTREAM FUEL TRIM SYSTEM 2 RICH (CONTINUED)

6. (K399) O2 SENSOR 2/2 HEATER CONTROL CIRCUIT OPEN

Turn the ignition off.

Disconnect the C3 PCM harness connector.

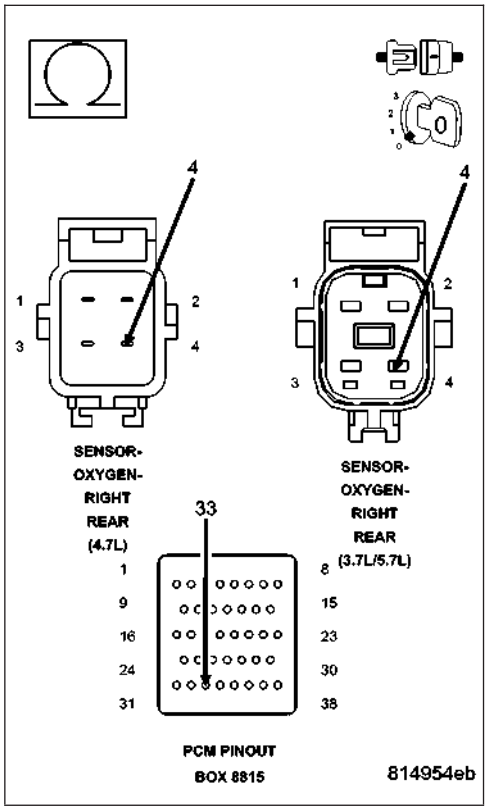
Measure the resistance of the (K399) O2 Sensor 2/2 Heater Control circuit from the O2 Sensor harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 7

No >> Repair the open in the (K399) O2 Sensor 2/2 Heater Control circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P2099-DOWNSTREAM FUEL TRIM SYSTEM 2 RICH (CONTINUED)

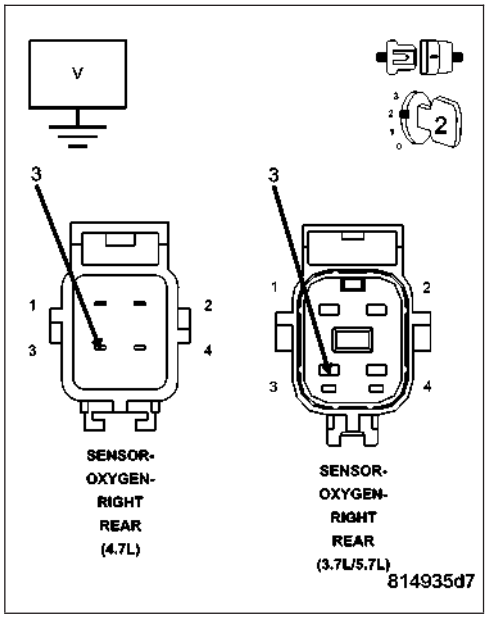
7. (K904) O2 RETURN DOWNSTREAM CIRCUIT

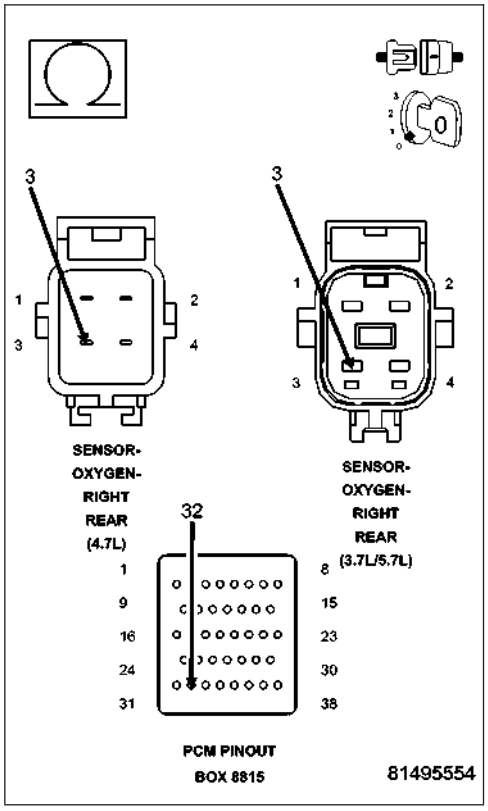
Measure the voltage on the (K904) O2 Return Downstream circuit in the O2 Sensor harness connector.

Is the voltage at 2.5 volts?

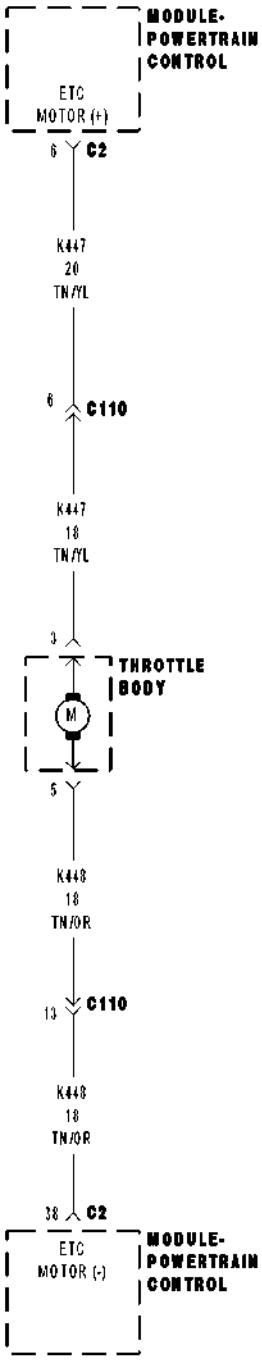
Yes >> Check the fuel system for contaminants.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

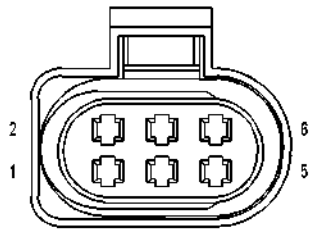
No >> Check the (K904) O2 Return Downstream circuit for a short to ground, open, or short to voltage. Inspect the O2 Sensor connector and the PCM harness connector. If OK, replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



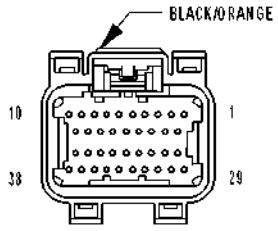


P2100-ELECTRONIC THROTTLE CONTROL MOTOR CIRCUIT





THROTTLE
BODY



MODULE-
POWERTRAIN
CONTROL C2

B169a46a

P2100-ELECTRONIC THROTTLE CONTROL MOTOR CIRCUIT (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on and the ETC Motor is not in Limp Home mode.
- **Set Condition:**
  When the PCM detects an internal error or a short between the ETC Motor- and ETC Motor + circuits in the ETC Motor Driver. One trip fault. ETC light is flashing.

Possible Causes
THROTTLE PLATE / BORE INSPECTION
(K447) ETC POSITIVE CIRCUIT SHORTED TO BATTERY VOLTAGE
(K448) ETC NEGATIVE CIRCUIT SHORTED TO BATTERY VOLTAGE
(K447) ETC POSITIVE CIRCUIT SHORTED TO THE (K448) ETC NEGATIVE CIRCUIT
(K447) ETC POSITIVE CIRCUIT OPEN
(K447) ETC POSITIVE CIRCUIT SHORTED TO GROUND
(K448) ETC NEGATIVE CIRCUIT OPEN
(K448) ETC NEGATIVE CIRCUIT SHORTED TO GROUND
LOW BATTERY VOLTAGE
ETC MOTOR/THROTTLE BODY
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

NOTE: If the P2100 is intermittent, it is possible that the controller is overheating in extreme hot temperatures, and this is considered a normal protection operation. No repair is necessary.

NOTE: Low battery voltage can also cause excessive current draw, in very hot and very cold ambient temperatures. Make sure the battery can pass a Load test before continuing.

With a scan tool, read DTCs.

Look closely at the temperatures at which this DTC set.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2100-ELECTRONIC THROTTLE CONTROL MOTOR CIRCUIT (CONTINUED)

2. THROTTLE PLATE INSPECTION

Turn the ignition off.

Remove the Air Cleaner Assembly from the Throttle Body.

Check for any signs of a foreign material (ice or dirt) on the Throttle Plate or in the bore causing the Throttle Plate to stick.

Were any signs of foreign material or scoring of the throttle plate or bore found?

Yes >> Remove the debris if possible or replace the Throttle Body Assembly. Disconnect the Battery when replacing the Throttle Body Assembly. After installation is complete, use a scan tool and select the ETC RELEARN function.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE) d

No >> Go To 3

---

3. (K447) ETC POSITIVE CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

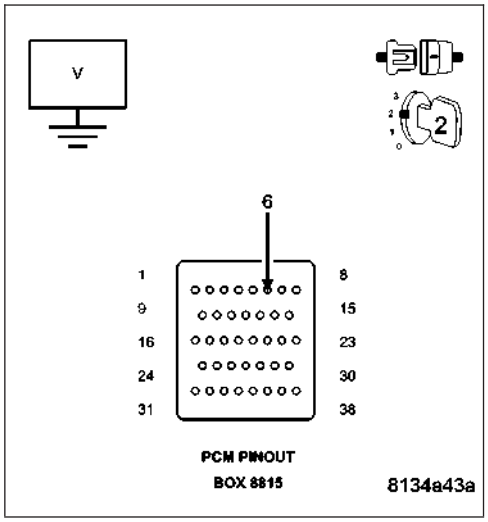
Disconnect the Throttle Body harness connector.

Disconnect the C2 PCM harness connector.

Ignition on, engine not running.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform the diagnostics.

With a 12-volt test light connected to ground, probe the (K447) ETC Positive circuit at the appropriate terminal of special tool #8815.



Does the test light illuminate brightly?

Yes >> Repair the short to battery voltage on the (K447) ETC Positive circuit.

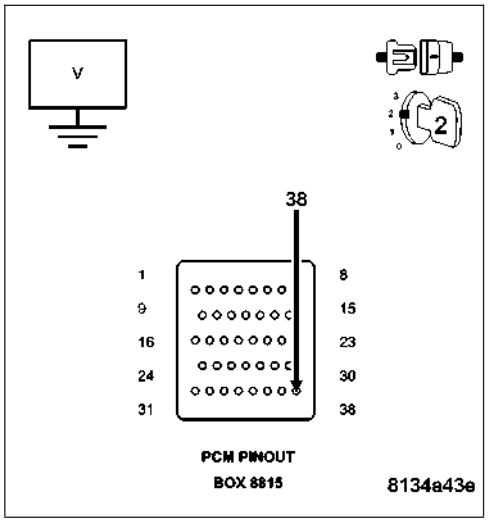
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

---

4. (K448) ETC NEGATIVE CIRCUIT SHORTED TO BATTERY VOLTAGE

Using a 12-volt test light connected to ground, probe the (K448) ETC Negative circuit at the appropriate terminal of special tool #8815.



Does the test light illuminate brightly?

Yes >> Repair the short to battery voltage in the (K448) ETC Negative circuit.

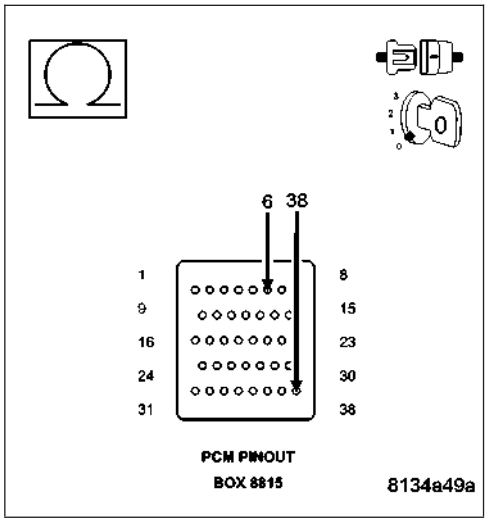
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

P2100-ELECTRONIC THROTTLE CONTROL MOTOR CIRCUIT (CONTINUED)

5. (K447) ETC POSITIVE CIRCUIT SHORTED TO THE (K448) ETC NEGATIVE CIRCUIT

Measure the resistance between the (K447) ETC Positive circuit and the (K448) ETC Negative circuit at the appropriate terminals of special tool #8815.



Is the resistance below 100 ohms?

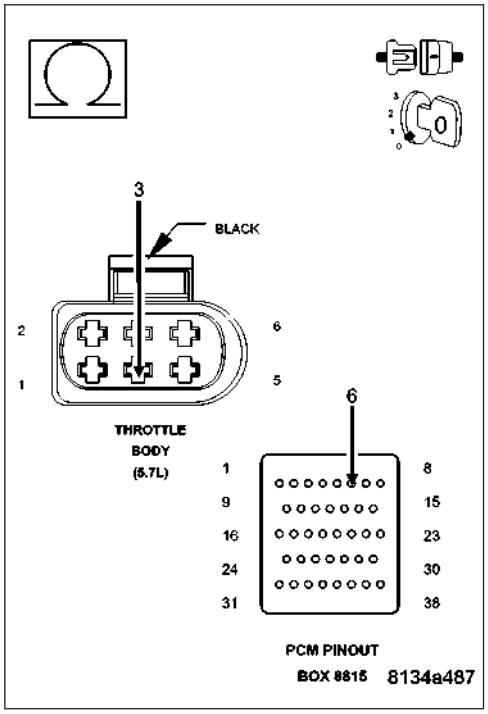
Yes >> Repair the short to between the (K447) ETC Positive circuit and the (K448) ETC Negative circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6

6. (K447) ETC POSITIVE CIRCUIT OPEN

Turn the ignition off.

Measure the resistance of the (K447) ETC Positive circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 7

No >> Repair the open in the (K447) ETC Positive circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2100-ELECTRONIC THROTTLE CONTROL MOTOR CIRCUIT (CONTINUED)

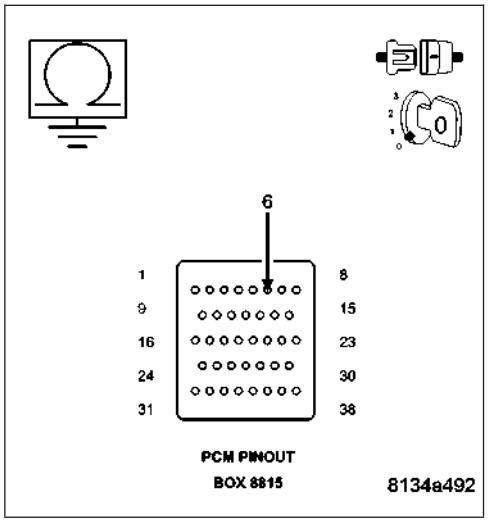
7. (K447) ETC POSITIVE CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K447) ETC Positive circuit between the appropriate terminals of special tool #8815.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K447) ETC Positive circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8



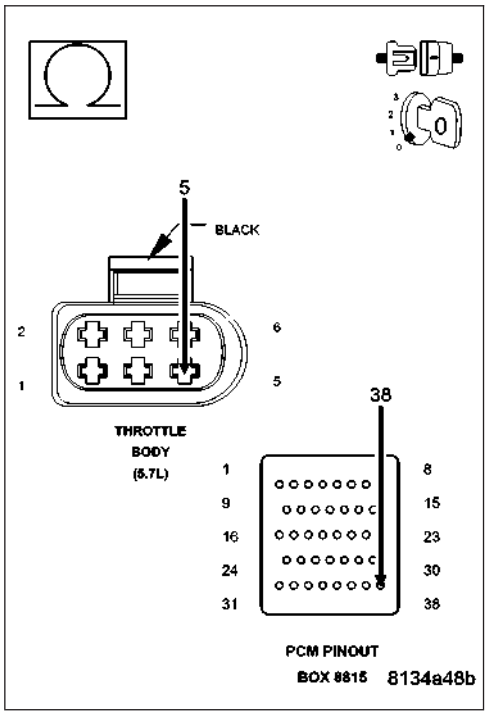
8. (K448) ETC NEGATIVE CIRCUIT OPEN

Measure the resistance of the (K448) ETC Negative circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 9

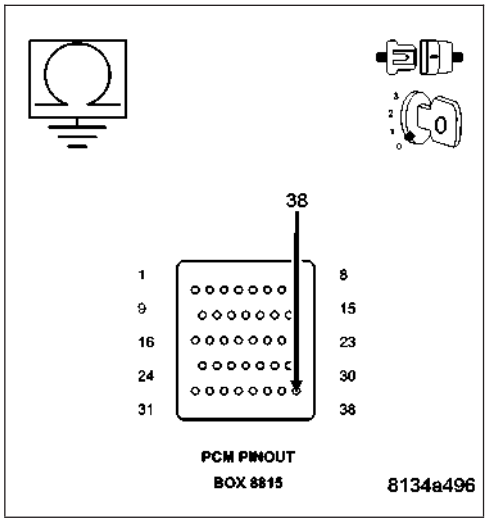
No >> Repair the open in the (K448) ETC Negative circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P2100-ELECTRONIC THROTTLE CONTROL MOTOR CIRCUIT (CONTINUED)

9. (K448) ETC NEGATIVE CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K448) ETC Negative circuit using the appropriate terminal of special tool #8815.



Is the resistance below 100 ohms?

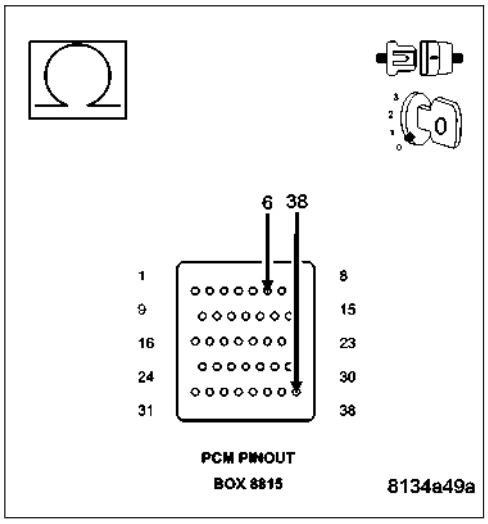
Yes >> Repair the short to ground in the (K448) ETC Negative circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 10

---

10. ETC MOTOR

NOTE: Take the following measurement using special tool #8815 to avoid possible damage to the Throttle Body harness connector.
Measure the resistance of the ETC Motor between the (K447) ETC Positive circuit and the (K448) ETC Negative circuit at the appropriate terminals of special tool #8815.



Is the resistance between 2.5 and 25 ohms at closed throttle?

Yes >> Go To 11

No >> Replace the Throttle Body Assembly. Disconnect the Battery when replacing the Throttle Body Assembly. After installation is complete, use a scan tool and select the ETC RELEARN function.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

11. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2101-ELECTRONIC THROTTLE CONTROL MOTOR PERFORMANCE

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the vehicle running, ETC Motor not in Limp Home mode, and the TPS adaptation is complete.
- **Set Condition:**
  The PCM recognizes too large of an error between the actual position of the Throttle Plate and the Set Point position. One trip fault and the code will set within 5 seconds. Three good trips to turn off the MIL ETC light is flashing.

Possible Causes
THROTTLE BODY ASSEMBLY
LOW BATTERY VOLTAGE
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: Before continuing visually inspect the throttle blade and bore for any obstructions. Icing of the throttle body may have caused this code to set.

NOTE: Low battery voltage can also cause excessive current draw, in very hot and very cold ambient temperature. Make sure the battery can pass a Load test before continuing.

NOTE: Diagnose any 5-Volt Supply, Battery, and TP Sensor DTCs before continuing.

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. THROTTLE PLATE INSPECTION

Turn the ignition off.

Remove the Air Cleaner Assembly from the Throttle Body.

Check for any signs of a foreign material (ice or dirt) on the Throttle Plate or in the bore causing the Throttle Plate to stick.

Manually open and close the throttle plate using your hands.

Does the Throttle Plate move?

Yes >> Go To 3

No >> Remove the debris if possible or replace the Throttle Body Assembly. Disconnect the Battery when replacing the Throttle Body Assembly. After installation is complete, use a scan tool and select the ETC RELEARN function.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2101-ELECTRONIC THROTTLE CONTROL MOTOR PERFORMANCE (CONTINUED)

3. THROTTLE POSITION WITHIN 2° DEGREES OF DESIRED THROTTLE POSITION

Start the engine.

Allow the engine to reach normal operating temperature.

With a scan tool, monitor the Actual Throttle Position and Desired Throttle Position.

Compare the Actual Throttle Position and the Set Point Throttle Position.

Is the Actual Throttle Position within 2° degrees of the Desired Throttle Position?

Yes >> Go To 4

No >> Replace the Throttle Body Assembly. Disconnect the Battery when replacing the Throttle Body Assembly. After installation is complete, use a scan tool and select the ETC RELEARN function.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

4. ETC OPERATION

Ignition on, engine not running.

With a scan tool, actuate the Electronic Throttle Control Motor.

NOTE: It may be necessary to use a mirror to see the throttle blade.
Observe the throttle blade.

NOTE: Make sure the motion of the throttle blade is smooth and that it opens and closes.

Did the ETC motor operate properly?

Yes >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace the Throttle Body Assembly. Disconnect the Battery when replacing the Throttle Body Assembly. After installation is complete, use a scan tool and select the ETC RELEARN function.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2106-ELECTRONIC THROTTLE CONTROL SYSTEM - FORCED LIMITED POWER

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  This DTC sets for OBDII MIL illumination purposes. This DTC will always have associated DTCs indicating a system failure. Engine speed is being limited and/or throttle motor is power free.

Possible Causes
OTHER DTCS RELATED TO ETC HAVE SET

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, read DTCs.

NOTE: This is only an informational DTC. This code should set along with other DTCs. The other DTC(s) may be in history or active at the same the P2106 sets. All other DTCs must be properly diagnosed before continuing.

The RPM or power are limited when P2106 sets for safety reasons because other ETC related DTCs have set.

After repairing the DTC(s), did the P2106 return?

Yes >> Check the PCM power and ground circuits if they are OK, replace and program the Powertrain Control Module per Service Information.

No >> Test Complete.

P2107-ELECTRONIC THROTTLE CONTROL MODULE PROCESSOR

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  Internal PCM failure. Module will attempt to reset, so you will be able to hear the throttle relearning. If the condition is continuous, the vehicle may not be driveable. One trip fault. ETC light is flashing.

Possible Causes
POWERTRAIN CONTROL MODULE NEEDS TO BE REPROGRAMMED

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING) .

Diagnostic Test

1. REPROGRAM THE POWERTRAIN CONTROL MODULE

Check for any related TSBs.

Verify the PCM is at the latest calibration (flash level).

NOTE: An intermittent loss of power to the PCM without performing an ETC Relearn procedure may cause this DTC to set.

Flash the Powertrain Control Module per Service Information if any updates are available.

Start the engine.

Allow the engine to reach normal operating temperature.

Operate the accelerator pedal. (do not exceed 3500 rpm)

Test drive the vehicle for 10 miles on a flat road surface.

Does this DTC reset?

Yes >> Replace and reprogram the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Test Complete.

P2108-ELECTRONIC THROTTLE CONTROL MODULE PERFORMANCE

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  Internal PCM failure. Customer may experience an extended cranking condition with limited driving and a rough idle. One trip fault and the code will set within 5 seconds. ETC light is flashing.

Possible Causes
POWERTRAIN CONTROL MODULE NEEDS TO BE REPROGRAMMED

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. REPROGRAM THE POWERTRAIN CONTROL MODULE

Check for any related TSBs.

Verify the PCM is at the latest calibration (flash level).

NOTE: Inspect the Intake Manifold components for vacuum leaks, repair as necessary

NOTE: An intermittent loss of power to the PCM without performing an ETC Relearn procedure may cause this DTC to set.

NOTE: Diagnose any other DTCs that may have set with the P2108.

Flash the Powertrain Control Module per Service Information if any updates are available.

Start the engine.

Allow the engine to reach normal operating temperature.

Operate the accelerator pedal. (do not exceed 3500 rpm)

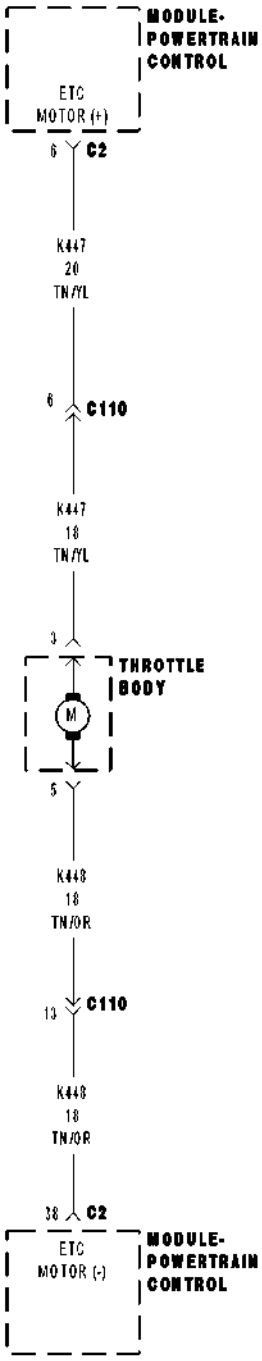
Test drive the vehicle for 10 miles on a flat road surface.

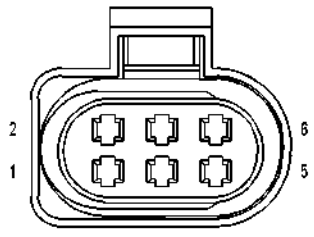
Does this DTC reset by itself?

Yes >> Replace and reprogram the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

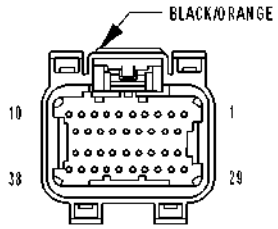
No >> Test Complete.

P2110-ELECTRONIC THROTTLE CONTROL - FORCED LIMITED RPM





THROTTLE
BODY



MODULE-
POWERTRAIN
CONTROL C2

B169a46a

P2110-ELECTRONIC THROTTLE CONTROL - FORCED LIMITED RPM (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on and ETC motor is working.
- **Set Condition:**
  When the PCM requests to limit engine speed if PWM is too high for 20.5 seconds and before P2118 sets. One trip fault and the code will set within 5 seconds. ETC light is illuminated.

Possible Causes
THROTTLE PLATE STUCK
(K447) ETC POSITIVE CIRCUIT OPEN
(K448) ETC NEGATIVE CIRCUIT OPEN
(K447) ETC POSITIVE CIRCUIT SHORTED TO GROUND
(K448) ETC NEGATIVE CIRCUIT SHORTED TO GROUND
ETC MOTOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool read DTCs.

In the Freeze Frame data, look at the temperature at which the fault occurred. If it occurred in extreme cold temperatures, Icing of the throttle body may have caused this code to set.

NOTE: Diagnose any TP Sensor faults, 5-Volt Supply faults, and Battery Voltage High or Low DTCs before continuing.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. THROTTLE PLATE STUCK

Turn the ignition off.

Remove the Air Cleaner Assembly from the Throttle Body.

Check for any signs of a foreign material (ice or dirt) causing the Throttle to stick.

Manually open and close the throttle plate using your hands.

Does the Throttle Plate move?

Yes >> Go To 3

No >> Remove the debris if possible or replace the Throttle Body Assembly if signs of physical damage are present. Disconnect the Battery when replacing the Throttle Body Assembly. After installation is complete, use a scan tool and select the ETC RELEARN function.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2110-ELECTRONIC THROTTLE CONTROL - FORCED LIMITED RPM (CONTINUED)

3. (K447) ETC POSITIVE CIRCUIT OPEN

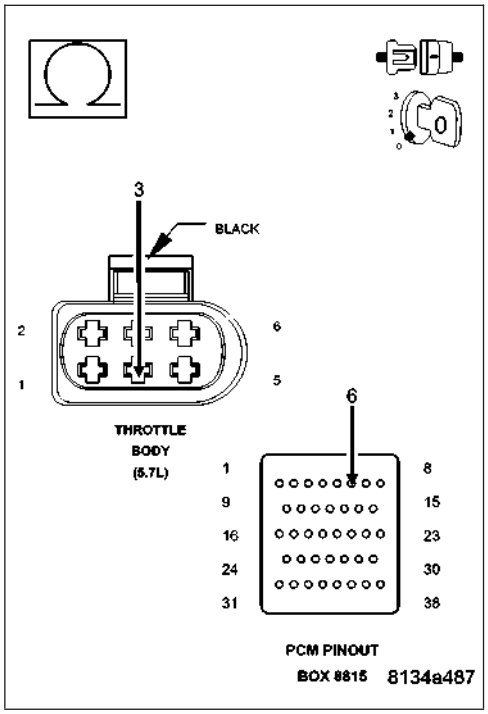
Turn the ignition off.

Disconnect the Throttle Body harness connector.

Disconnect the C2 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K447) ETC Positive circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.



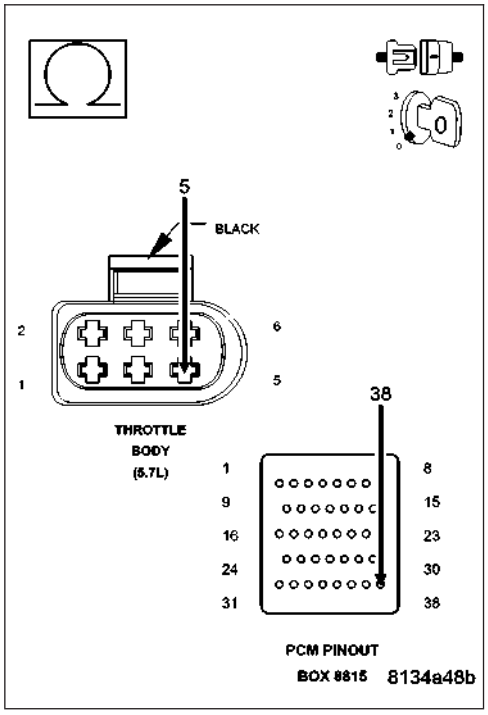
Is the resistance below 5.0 ohms?

Yes >> Go To 4

No >> Repair the open in the (K447) ETC Positive circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

4. (K448) ETC NEGATIVE CIRCUIT OPEN

Measure the resistance of the (K448) ETC Negative circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

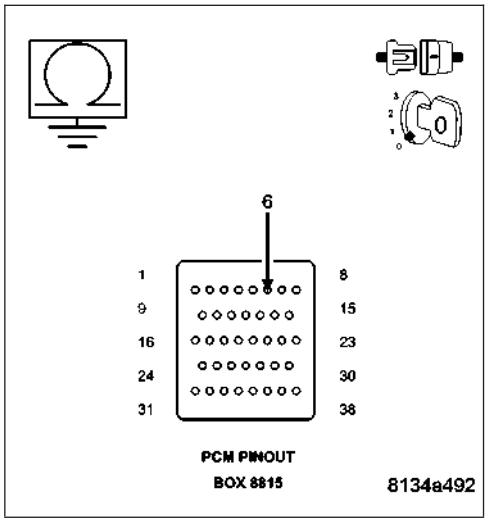
Yes >> Go To 5

No >> Repair the open in the (K448) ETC Negative circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2110-ELECTRONIC THROTTLE CONTROL - FORCED LIMITED RPM (CONTINUED)

5. (K447) ETC POSITIVE CIRCUIT SHORTED TO GROUND

Measure the resistance between a known good ground and the (K447) ETC Positive circuit at the appropriate terminal of special tool #8815.



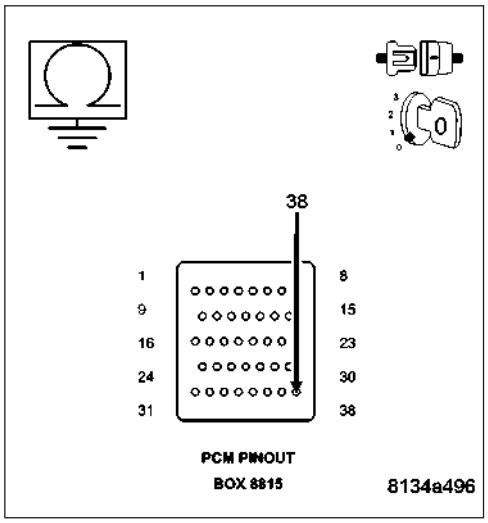
Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K447) ETC Positive circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6

6. (K448) ETC NEGATIVE CIRCUIT SHORTED TO GROUND

Measure the resistance between a known good ground and the (K448) ETC Negative circuit at the appropriate terminal of special tool #8815.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K448) ETC Negative circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

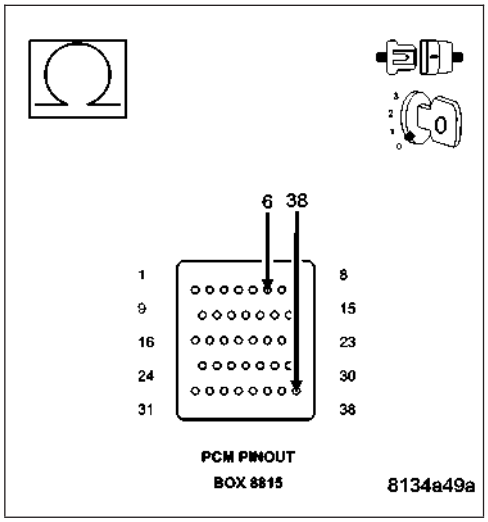
No >> Go To 7

P2110-ELECTRONIC THROTTLE CONTROL - FORCED LIMITED RPM (CONTINUED)

7. ETC MOTOR

NOTE: Take the following measurement using special tool #8815 to avoid possible damage to the Throttle Body harness connector.

Measure the resistance of the ETC Motor between the (K447) ETC Positive circuit and the (K448) ETC Negative circuit at the appropriate terminals of special tool #8815.



Is the resistance between 2.5 and 25 ohms at closed throttle?

Yes >> Go To 8

No >> Replace the Throttle Body Assembly. Disconnect the Battery when replacing the Throttle Body Assembly. After installation is complete, use a scan tool and select the ETC RELEARN function.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

8. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

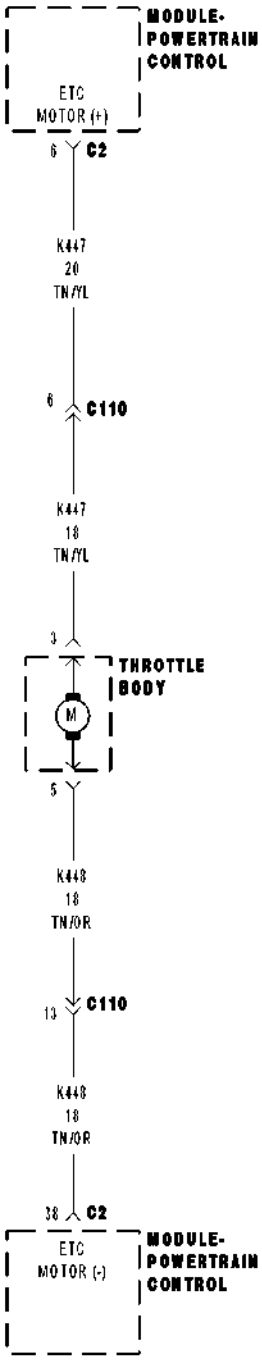
Yes >> Repair as necessary.

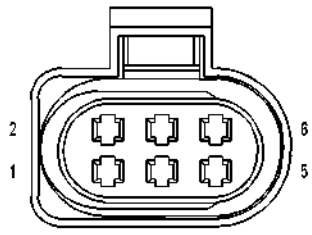
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.

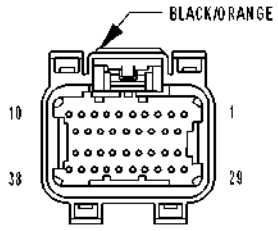
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2111-ELECTRONIC THROTTLE CONTROL - UNABLE TO CLOSE





THROTTLE
BODY



MODULE-
POWERTRAIN
CONTROL C2

B169a46a

P2111-ELECTRONIC THROTTLE CONTROL - UNABLE TO CLOSE (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on and battery voltage greater than 10 volts.
- **Set Condition:**
  Just after key on, the throttle is opened and closed to test the system. If the TP Sensor does not return to Limp Home Position at the end of this test, this DTC will set. One trip fault and the code will set within 5 seconds. ETC light is flashing.

Possible Causes
THROTTLE PLATE STUCK ABOVE LIMP HOME POSITION
TP SENSOR NO.1 AND TP SENSOR NO.2 BOTH READ 2.5 VOLTS
(K447) ETC POSITIVE CIRCUIT SHORTED TO BATTERY VOLTAGE
(K447) ETC POSITIVE CIRCUIT OPEN
(K448) ETC NEGATIVE CIRCUIT OPEN
(K447) ETC POSITIVE CIRCUIT SHORTED TO GROUND
(K448) ETC NEGATIVE CIRCUIT SHORTED TO GROUND
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: Maximum engine speed could be reduced while this fault is active, it just depends where the throttle gets stuck.

Ignition on, engine not running.

NOTE: The PCM tests the ETC Motor by opening and closing the Throttle Plate before starting the engine. If during this test the Throttle plate does not return to the closed position this DTC sets.

With a scan tool read DTCs.

NOTE: Diagnose any TP Sensor or 5-Volt Supply DTCs before continuing.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2111-ELECTRONIC THROTTLE CONTROL - UNABLE TO CLOSE (CONTINUED)

2. THROTTLE PLATE STUCK OPEN

Turn the ignition off.

NOTE: The PCM tests the ETC Motor by opening and closing the Throttle Plate before starting the engine. If during this test the Throttle plate does not return to the closed position this DTC sets.

Remove the Air Cleaner Assembly from the Throttle Body.

Check for any signs of a foreign material causing the Throttle to remain open.

Using a scan tool actuate the ETC Motor.

Does the Throttle Plate move?

Yes >> Go To 3

No >> Remove the debris if possible or replace the Throttle Body Assembly if signs of physical damage are present. Disconnect the Battery when replacing the Throttle Body Assembly. After installation is complete, use a scan tool and perform the ETC RELEARN function.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

3. TP SENSOR NO.1 AND TP SENSOR NO.2 BOTH EQUAL 2.5 VOLTS

With a scan tool, perform the Throttle Follower test while reading both TP Sensor voltage readings.

Are both TP Sensor readings stuck at 2.5 volts?

Yes >> Check the TP Sensor Signal circuits for excessive resistance, being shorted to each other, or shorted to the Sensor Return circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

---

4. (K447) ETC POSITIVE CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

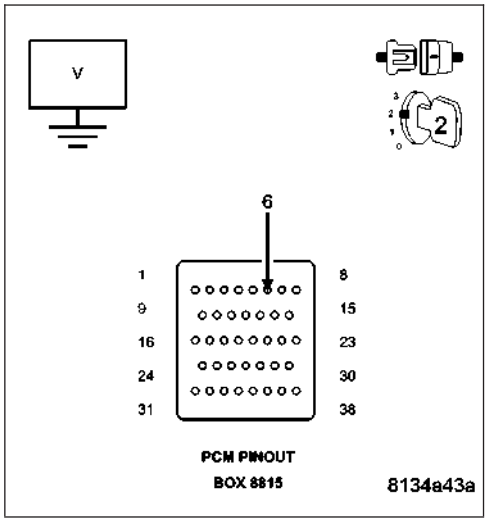
Disconnect the Throttle Body harness connector.

Disconnect the C2 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform the diagnostics.

Ignition on, engine not running.

With a 12-volt test light connected to ground, probe the (K447) ETC Positive circuit at the appropriate terminal of special tool #8815.



Does the test light illuminate brightly?

Yes >> Repair the short to battery voltage on the (K447) ETC Positive circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

P2111-ELECTRONIC THROTTLE CONTROL - UNABLE TO CLOSE (CONTINUED)

5. (K447) ETC POSITIVE CIRCUIT OPEN

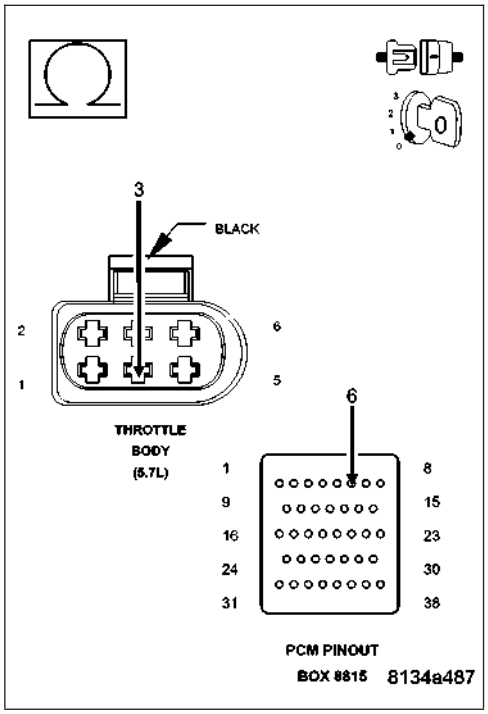
Turn the ignition off.

Measure the resistance of the (K447) ETC Positive circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 6

No >> Repair the open in the (K447) ETC Positive circuit. Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



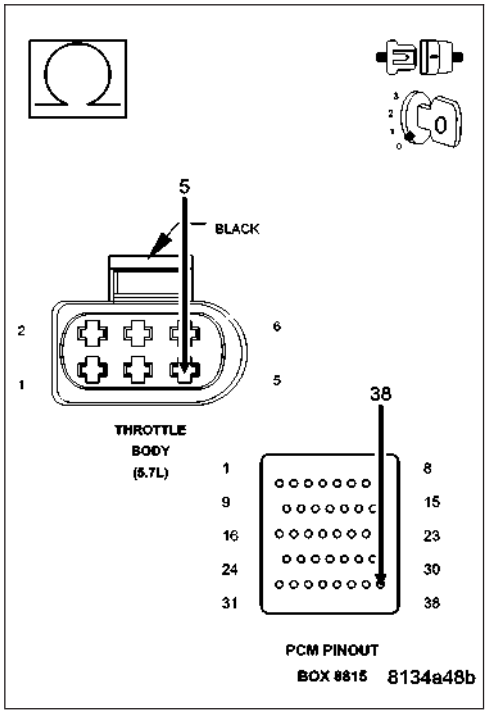
6. (K448) ETC NEGATIVE CIRCUIT OPEN

Measure the resistance of the (K448) ETC Negative circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 7

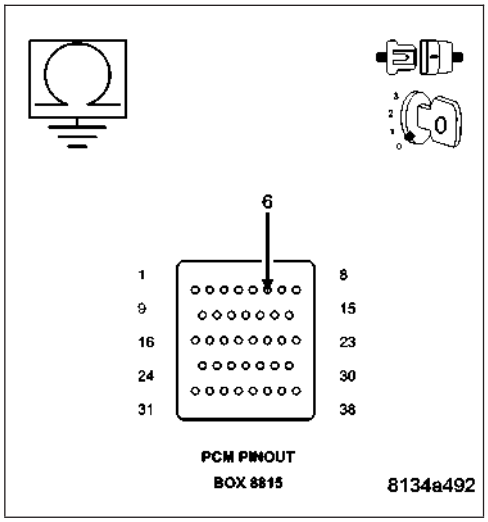
No >> Repair the open in the (K448) ETC Negative circuit. Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P2111-ELECTRONIC THROTTLE CONTROL - UNABLE TO CLOSE (CONTINUED)

7. (K447) ETC POSITIVE CIRCUIT SHORTED TO GROUND

Measure the resistance between a known good ground and the (K447) ETC Positive circuit at the appropriate terminal of special tool #8815.



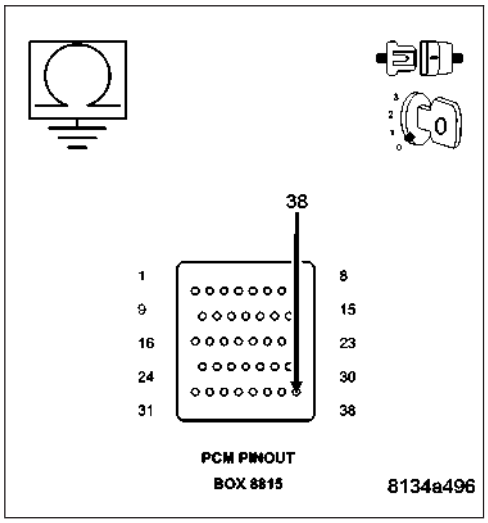
Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K447) ETC Positive circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8

8. (K448) ETC NEGATIVE CIRCUIT SHORTED TO GROUND

Measure the resistance between a known good ground and the (K448) ETC Negative circuit at the appropriate terminal of special tool #8815.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K448) ETC Negative circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 9

9. PCM

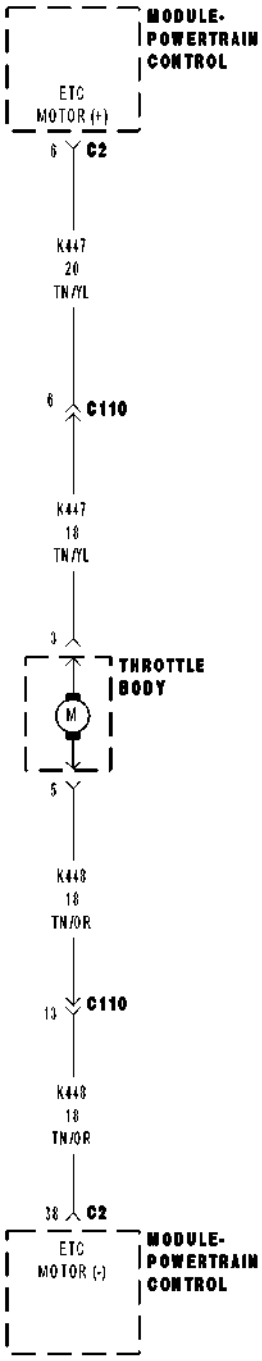
NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

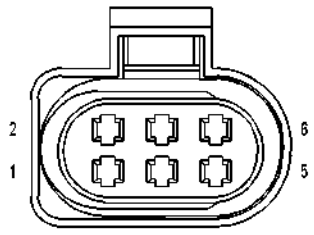
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

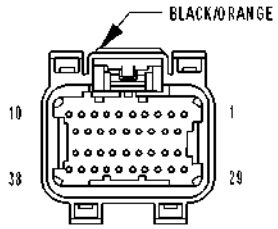
No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2112-ELECTRONIC THROTTLE CONTROL - UNABLE TO OPEN





THROTTLE
BODY



MODULE-
POWERTRAIN
CONTROL C2

B169a46a

P2112-ELECTRONIC THROTTLE CONTROL - UNABLE TO OPEN (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on and battery voltage greater than 10 volts.
- **Set Condition:**
  Just after key on, the throttle is opened and closed to test the system. If the TP Sensor does not return to Limp Home Position at the end of this test, this DTC will set. One trip fault and the code will set within 5 seconds. ETC light is flashing.

Possible Causes
THROTTLE PLATE STUCK AT OR BELOW LIMP HOME POSITION
(K448) ETC NEGATIVE CIRCUIT SHORTED TO BATTERY VOLTAGE
(K447) ETC POSITIVE CIRCUIT OPEN
(K448) ETC NEGATIVE CIRCUIT OPEN
(K447) ETC POSITIVE CIRCUIT SHORTED TO GROUND
(K448) ETC NEGATIVE CIRCUIT SHORTED TO GROUND
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

NOTE: The PCM tests the ETC Motor by opening and closing the Throttle Plate before starting the engine. If during this test the Throttle plate does not return to the closed position this DTC sets.

With a scan tool read DTCs.

NOTE: Diagnose any TP Sensor, Battery Voltage, and 5-Volt Supply DTCs before continuing.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2112-ELECTRONIC THROTTLE CONTROL - UNABLE TO OPEN (CONTINUED)

2. THROTTLE PLATE STUCK OPEN

Turn the ignition off.

NOTE: The PCM tests the ETC Motor by opening and closing the Throttle Plate before starting the engine. If during this test the Throttle plate does not open this DTC sets.

Remove the Air Cleaner Assembly from the Throttle Body.

Check for any signs of a foreign material causing the Throttle to remain open.

Using a scan tool actuate the ETC Motor.

Does the Throttle Plate move?

Yes >> Go To 3

No >> Remove the debris if possible or replace the Throttle Body Assembly. Disconnect the Battery when replacing the Throttle Body Assembly. After installation is complete, use a scan tool and select the ETC RELEARN function.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

3. (K448) ETC NEGATIVE CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

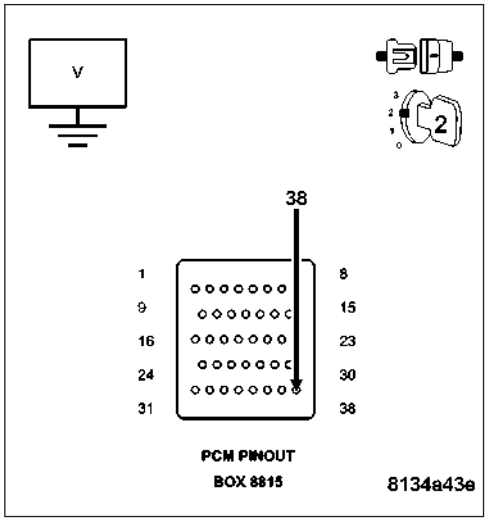
Disconnect the Throttle Body harness connector.

Disconnect the C2 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Ignition on, engine not running.

With a 12-volt test light connected to ground, probe the (K448) ETC Negative circuit at the appropriate terminal of special tool #8815.



Does the test light illuminate brightly?

Yes >> Repair the short to battery voltage on the (K448) ETC Negative circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

P2112-ELECTRONIC THROTTLE CONTROL - UNABLE TO OPEN (CONTINUED)

4. (K447) ETC POSITIVE CIRCUIT OPEN

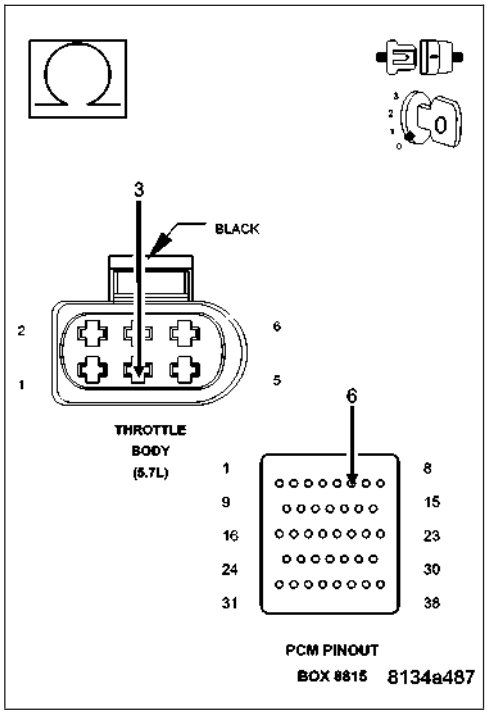
Turn the ignition off.

Measure the resistance of the (K447) ETC Positive circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 5

No >> Repair the open in the (K447) ETC Positive circuit. Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



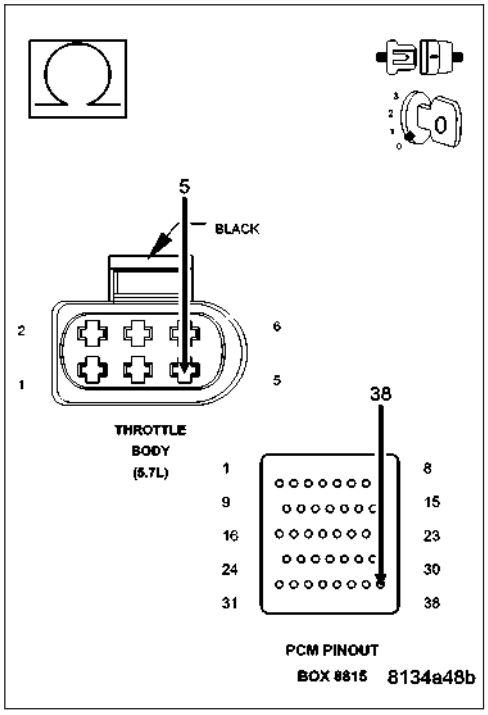
5. (K448) ETC NEGATIVE CIRCUIT OPEN

Measure the resistance of the (K448) ETC Negative circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 6

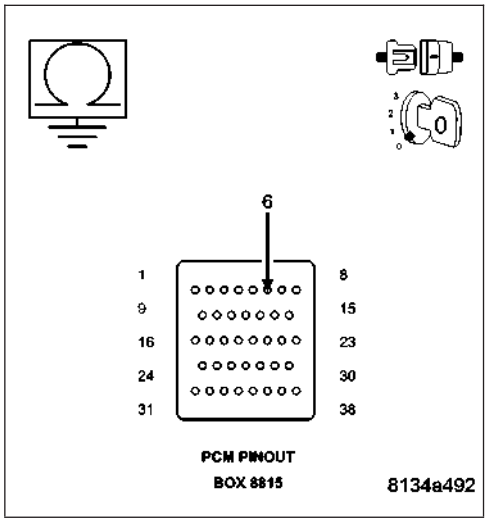
No >> Repair the open in the (K448) ETC Negative circuit. Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P2112-ELECTRONIC THROTTLE CONTROL - UNABLE TO OPEN (CONTINUED)

6. (K447) ETC POSITIVE CIRCUIT SHORTED TO GROUND

Measure the resistance between a known good ground and the (K447) ETC Positive circuit at the appropriate terminal of special tool #8815.



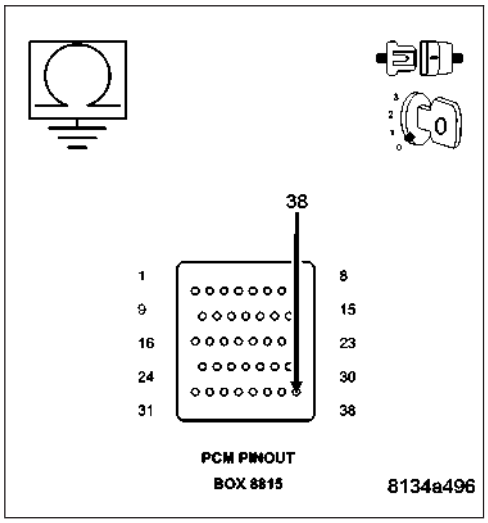
Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K447) ETC Positive circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 7

7. (K448) ETC NEGATIVE CIRCUIT SHORTED TO GROUND

Measure the resistance between a known good ground and the (K448) ETC Negative circuit at the appropriate terminal of special tool #8815.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K448) ETC Negative circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8

8. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2115-ACCELERATOR PEDAL POSITION SENSOR 1 MINIMUM STOP PERFORMANCE

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on. During in plant mode the APP Sensors need to be checked to make sure that idle and full pedal travel can be reached on both sensors. The test for P2115 is only enabled once test for P2166 has passed.
- **Set Condition:**
  APPS No.1 has failed to achieve the required minimum value during In Plant testing. One trip fault and the code will set within 5 seconds. Engine will only idle.

Possible Causes
IN PLANT TEST FAILURE
APPS RELEARN

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. IN PLANT TEST FAILURE

Ignition on, engine not running.

NOTE: This DTC is set when the APP Sensors are learned in plant but do not reach the Minimum or Maximum voltage range.

With a scan tool read DTCs.

With the scan tool, erase DTCs.

Start the engine.

With the scan tool, read DTCs.

NOTE: Diagnose any APPS out of Range and 5-Volt Supply DTCs before continuing.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. APPS RELEARN

With a scan tool select the ETC RELEARN function.

Next, erase DTCs.

Start the engine.

Does the DTC return?

Yes >> Replace the APPS Assembly per Service Information. After installation is complete, use a scan tool and select the ETC RELEARN function.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Test Complete.

P2116-ACCELERATOR PEDAL POSITION SENSOR 2 MINIMUM STOP PERFORMANCE

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on. During in plant mode the APP Sensors need to be checked to make sure that idle and full pedal travel can be reached on both sensors. The test for P2116 is only enabled once test for P2167 has passed.
- **Set Condition:**
  APPS No.2 has failed to achieve the required minimum value during In Plant testing. One trip fault and the code will be stored within 5 seconds. Engine will only idle.

Possible Causes
IN PLANT TEST FAILURE
APPS RELEARN

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. IN PLANT TEST FAILURE

Ignition on, engine not running.

NOTE: This DTC is set when the APP Sensors are learned in plant but do not reach the Minimum or Maximum voltage range.

With a scan tool read DTCs and record the related Freeze Frame data.

With a scan tool, erase DTCs.

Start the engine.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. APPS RELEARN

With a scan tool select the ETC RELEARN function.

Next, erase DTCs.

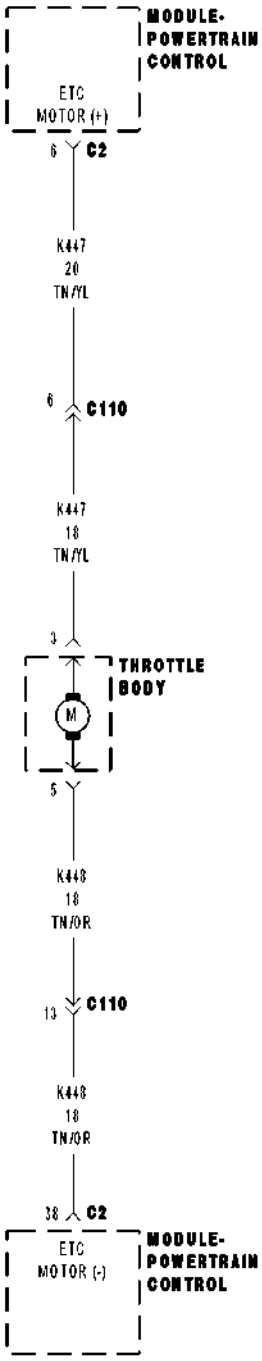
Start the engine.

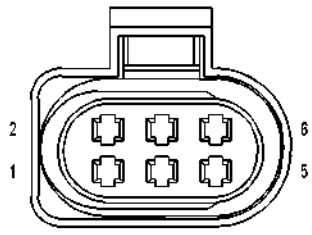
Does the DTC return?

Yes >> Replace the APPS Assembly per Service Information. After installation is complete, use a scan tool and select the ETC RELEARN function.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

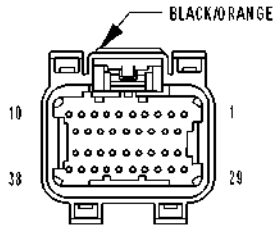
No >> Test Complete.

P2118-ELECTRONIC THROTTLE CONTROL MOTOR CIRCUIT





THROTTLE
BODY



MODULE-
POWERTRAIN
CONTROL C2

B169a46a

P2118-ELECTRONIC THROTTLE CONTROL MOTOR CIRCUIT (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on and the ETC Motor is not in Limp Home mode.
- **Set Condition:**
  When the PCM detects an internal error or a short between the ETC Motor- and ETC Motor + circuits in the ETC Motor Driver. One trip fault. ETC light is flashing.

Possible Causes
THROTTLE PLATE / BORE INSPECTION
(K447) ETC POSITIVE CIRCUIT SHORTED TO BATTERY VOLTAGE
(K448) ETC NEGATIVE CIRCUIT SHORTED TO BATTERY VOLTAGE
(K447) ETC POSITIVE CIRCUIT SHORTED TO THE (K448) ETC NEGATIVE CIRCUIT
(K447) ETC POSITIVE CIRCUIT OPEN
(K447) ETC POSITIVE CIRCUIT SHORTED TO GROUND
(K448) ETC NEGATIVE CIRCUIT OPEN
(K448) ETC NEGATIVE CIRCUIT SHORTED TO GROUND
ETC MOTOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

NOTE: If the P2118 is intermittent, it is possible that the controller is overheating in extreme hot temperatures, and this is considered a normal protection operation. No repair is necessary.

With a scan tool, read DTCs.

Look closely at the temperatures at which this DTC set.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2118-ELECTRONIC THROTTLE CONTROL MOTOR CIRCUIT (CONTINUED)

2. THROTTLE PLATE INSPECTION

Turn the ignition off.

Remove the Air Cleaner Assembly from the Throttle Body.

Check for any signs of a foreign material (ice or dirt) on the Throttle Plate or in the bore causing the Throttle Plate to stick.

Were any signs of foreign material or scoring of the throttle plate or bore found?

Yes >> Remove the debris if possible or replace the Throttle Body Assembly. Disconnect the Battery when replacing the Throttle Body Assembly. After installation is complete, use a scan tool and select the ETC RELEARN function.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

---

3. (K447) ETC POSITIVE CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

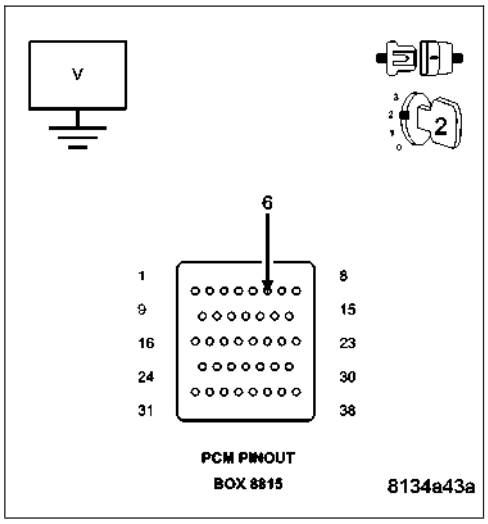
Disconnect the Throttle Body harness connector.

Disconnect the C2 PCM harness connector.

Ignition on, engine not running.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

With a 12-volt test light connected to ground, probe the (K447) ETC Positive circuit at the appropriate terminal of special tool #8815.



Does the test light illuminate brightly?

Yes >> Repair the short to battery voltage on the (K447) ETC Positive circuit.

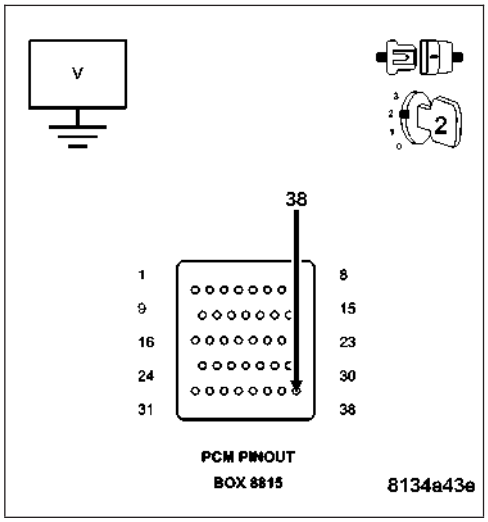
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

---

4. (K448) ETC NEGATIVE CIRCUIT SHORTED TO BATTERY VOLTAGE

Using a 12-volt test light connected to ground, probe the (K448) ETC Negative circuit at the appropriate terminal of special tool #8815.



Does the test light illuminate brightly?

Yes >> Repair the short to battery voltage in the (K448) ETC Negative circuit.

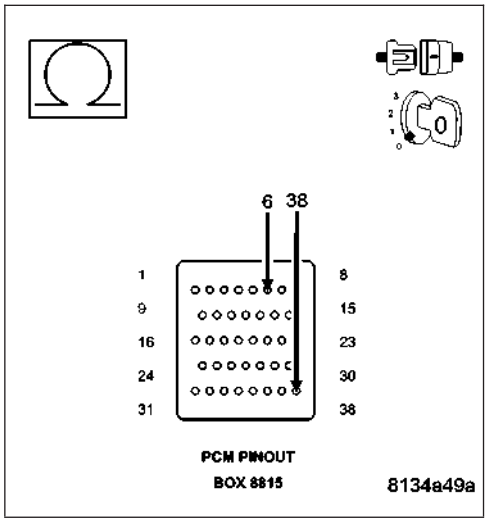
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

P2118-ELECTRONIC THROTTLE CONTROL MOTOR CIRCUIT (CONTINUED)

5. (K447) ETC POSITIVE CIRCUIT SHORTED TO THE (K448) ETC NEGATIVE CIRCUIT

Measure the resistance between the (K447) ETC Positive circuit and the (K448) ETC Negative circuit at the appropriate terminals of special tool #8815.



Is the resistance below 100 ohms?

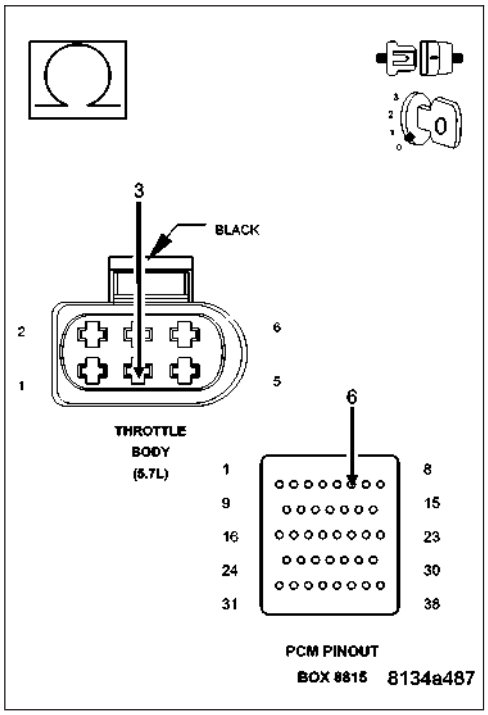
Yes >> Repair the short to between the (K447) ETC Positive circuit and the (K448) ETC Negative circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6

6. (K447) ETC POSITIVE CIRCUIT OPEN

Turn the ignition off.

Measure the resistance of the (K447) ETC Positive circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 7

No >> Repair the open in the (K447) ETC Positive circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2118-ELECTRONIC THROTTLE CONTROL MOTOR CIRCUIT (CONTINUED)

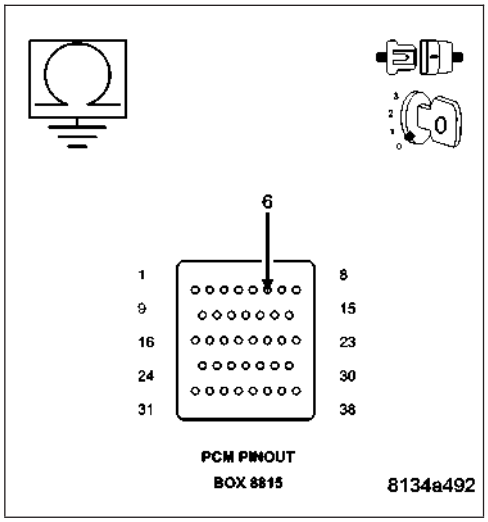
7. (K447) ETC POSITIVE CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K447) ETC Positive circuit between the appropriate terminals of special tool #8815.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K447) ETC Positive circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8



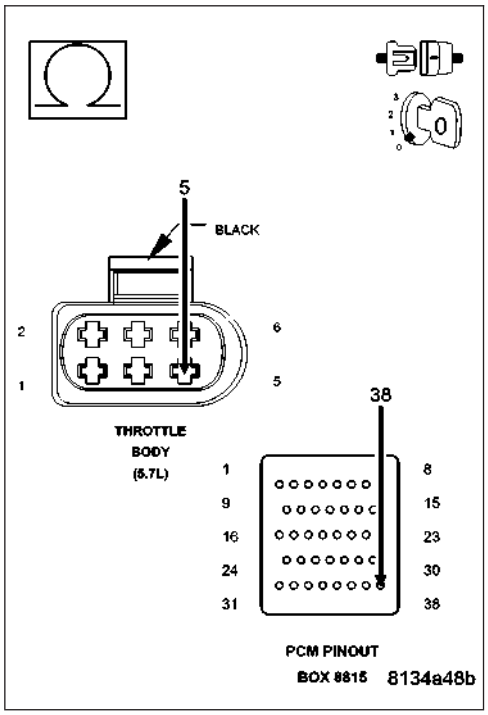
8. (K448) ETC NEGATIVE CIRCUIT OPEN

Measure the resistance of the (K448) ETC Negative circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 9

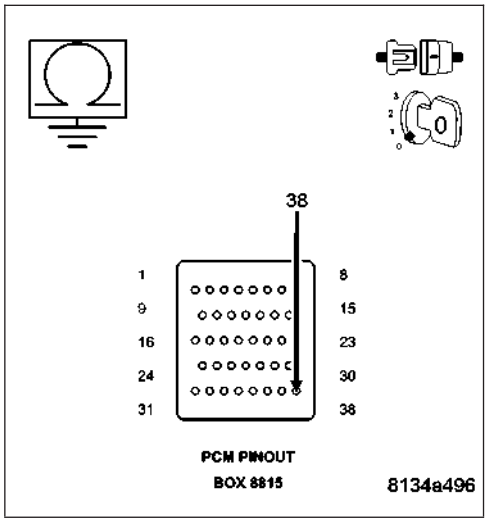
No >> Repair the open in the (K448) ETC Negative circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P2118-ELECTRONIC THROTTLE CONTROL MOTOR CIRCUIT (CONTINUED)

9. (K448) ETC NEGATIVE CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K448) ETC Negative circuit between the appropriate terminals of special tool #8815.



Is the resistance below 100 ohms?

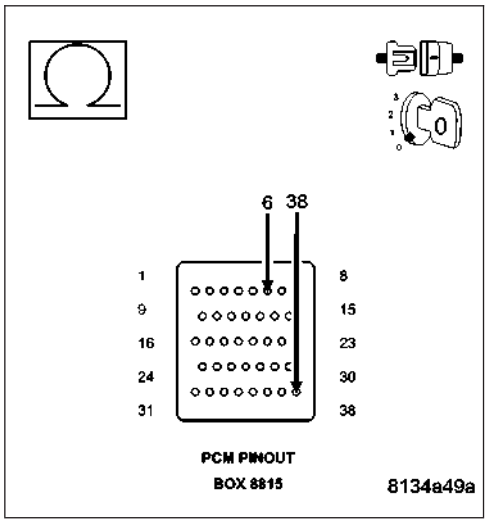
Yes >> Repair the short to ground in the (K448) ETC Negative circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 10

---

10. ETC MOTOR

NOTE: Take the following measurement using special tool #8815 to avoid possible damage to the Throttle Body harness connector.
Measure the resistance of the ETC Motor between the (K447) ETC Positive circuit and the (K448) ETC Negative circuit at the appropriate terminals of special tool #8815.



Is the resistance between 2.5 and 25 ohms at closed throttle?

Yes >> Go To 11

No >> Replace the Throttle Body Assembly. Disconnect the Battery when replacing the Throttle Body Assembly. After installation is complete, use a scan tool and select the ETC RELEARN function.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

11. PCM

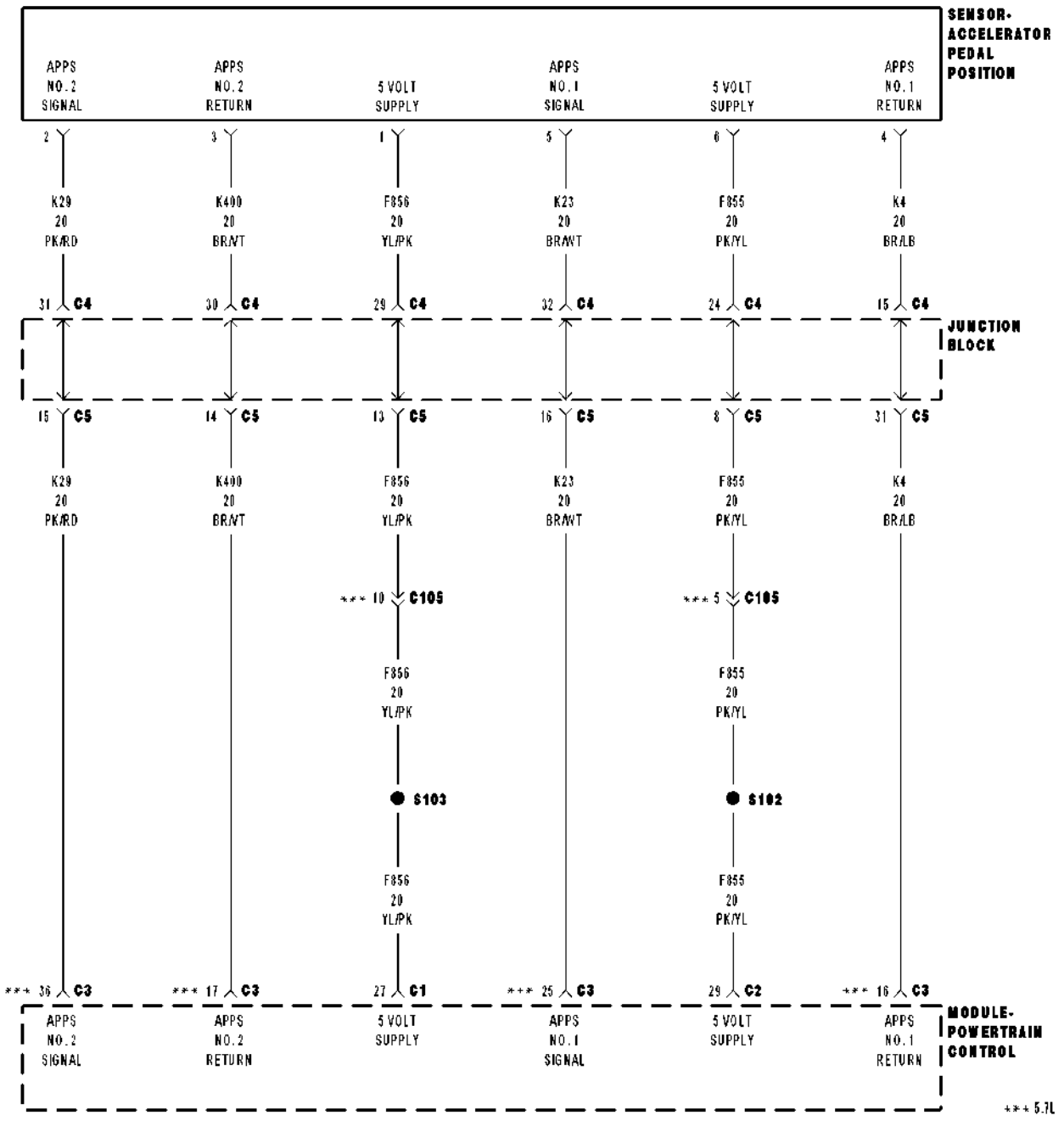
NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

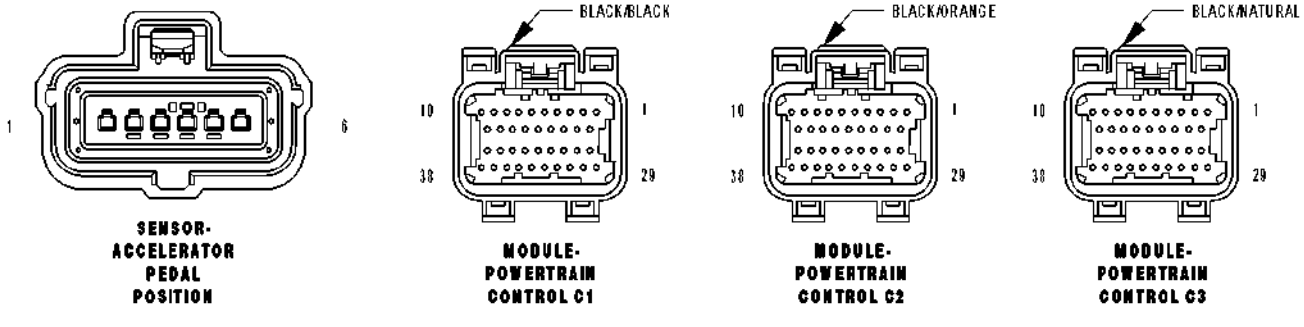
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2122-ACCELERATOR PEDAL POSITION SENSOR 1 CIRCUIT LOW





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P2122-ACCELERATOR PEDAL POSITION SENSOR 1 CIRCUIT LOW (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on and no other APPS No.1 DTCs present.
- **Set Condition:**
  When the APP Sensor No.1 voltage is too low. Engine will additionally idle if the brake pedal is pressed or has failed. Acceleration rate and Engine output are limited. One trip fault and the code will set within 5 seconds. ETC light is flashing.

Possible Causes
(F855) 5-VOLT SUPPLY CIRCUIT OPEN
(F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K23) APP SENSOR NO.1 SIGNAL CIRCUIT OPEN
(K23) APP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO GROUND
(K23) APP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO THE (K4) APP SENSOR NO.1 RETURN CIRCUIT
(K23) APP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO THE (K400) APP SENSOR NO.2 RETURN CIRCUIT
APP SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. APP SENSOR BELOW 0.25 OF A VOLT

Ignition on, engine not running.

With a scan tool, read the APP Sensor No.1 voltage.

Is the voltage below 0.25 of a volt?

Yes >> Go To 2

No >> Go To 11

---

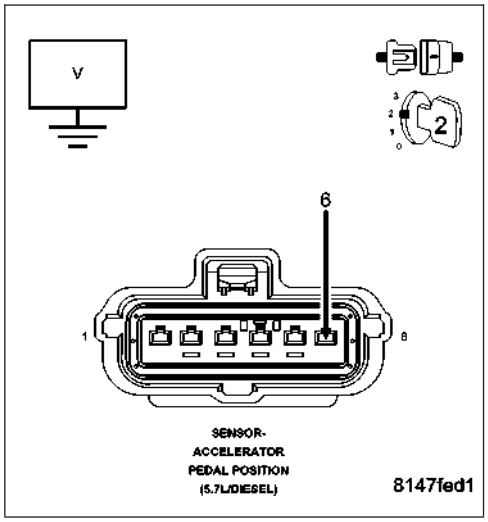
2. (F855) 5-VOLT SUPPLY CIRCUIT

Turn the ignition off.

Disconnect the APP Sensor harness connector.

Ignition on, engine not running.

Measure the voltage on the (F855) 5-volt Supply circuit in the APP Sensor harness connector.



Is the voltage between 4.5 and 5.2 volts?

Yes >> Go To 3

No >> Go To 8

P2122-ACCELERATOR PEDAL POSITION SENSOR 1 CIRCUIT LOW (CONTINUED)

3. ACCELERATOR PEDAL POSITION SENSOR

Connect a jumper wire between the (F855) 5-volt Supply circuit and the (K23) APP Sensor No.1 Signal circuit in the Sensor harness connector.

With a scan tool, monitor the APP Sensor No.1 voltage.

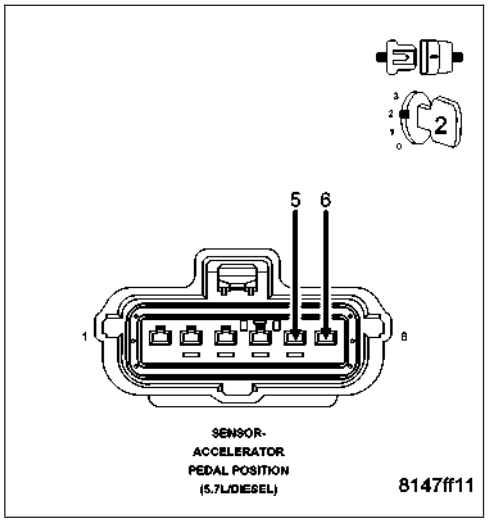
Is the voltage above 4.5 volts?

Yes >> Replace the APP Sensor Assembly per Service Information. After installation is complete, use a scan tool and select the ETC RELEARN function to relearn the APPS values.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

NOTE: Remove the jumper wire before continuing.



4. (K23) APP SENSOR NO.1 SIGNAL CIRCUIT OPEN

Turn the ignition off.

Disconnect the C3 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

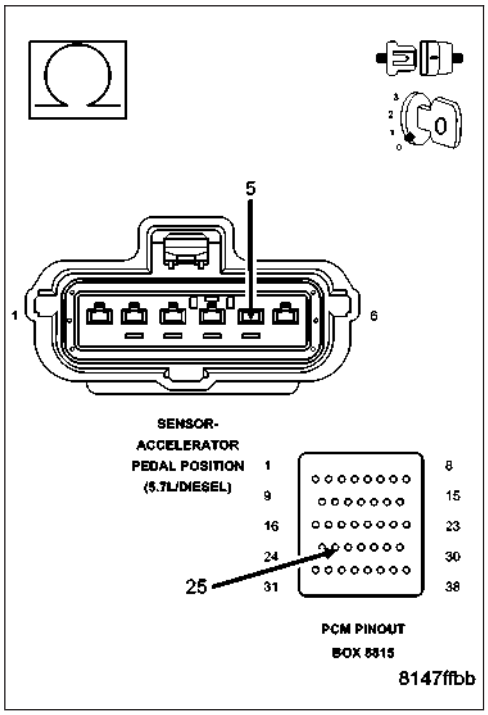
Measure the resistance of the (K23) APP Sensor No.1 Signal circuit from the APP Sensor harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 5

No >> Repair the open in the (K23) APP Sensor No.1 Signal circuit.

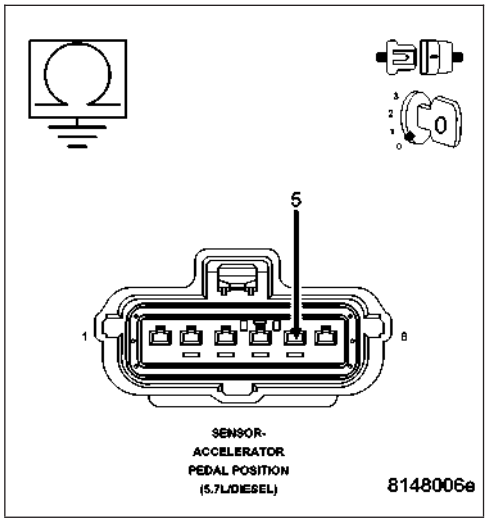
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P2122-ACCELERATOR PEDAL POSITION SENSOR 1 CIRCUIT LOW (CONTINUED)

5. (K23) APP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K23) APP Sensor No.1 Signal circuit in the APP Sensor harness connector.



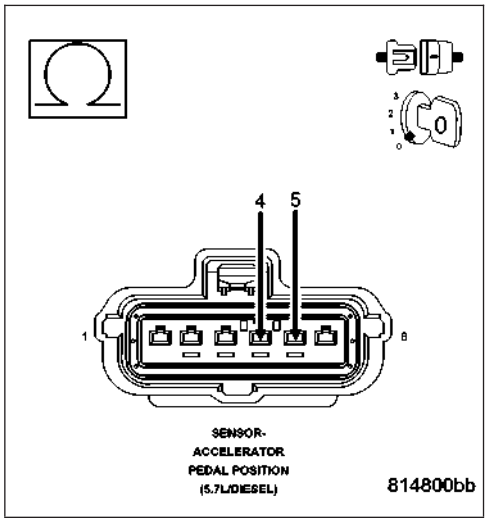
Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K23) APP Sensor No.1 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6

6. (K23) APP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO THE (K4) APP SENSOR NO.1 RETURN CIRCUIT

Measure the resistance between the (K23) APP Sensor No.1 Signal circuit and the (K4) Sensor No.1 Return circuit at the APP Sensor harness connector.



Is the resistance below 100 ohms?

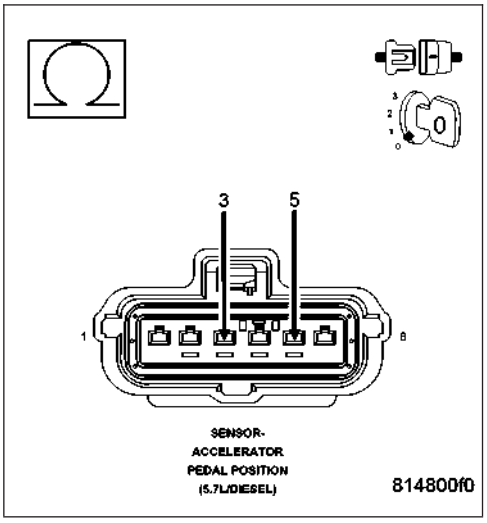
Yes >> Repair the short between the (K4) App Sensor No.1 Return circuit and the (K23) APP Sensor No.1 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 7

P2122-ACCELERATOR PEDAL POSITION SENSOR 1 CIRCUIT LOW (CONTINUED)

7. (K23) APP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO THE (K400) APP SENSOR NO.2 RETURN CIRCUIT

Measure the resistance between the (K23) APP Sensor No.1 Signal circuit and the (K400) Sensor No.2 Return circuit in the APP Sensor harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short between the (K400) App Sensor No.2 Return circuit and the (K23) APP Sensor No.1 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 10

---

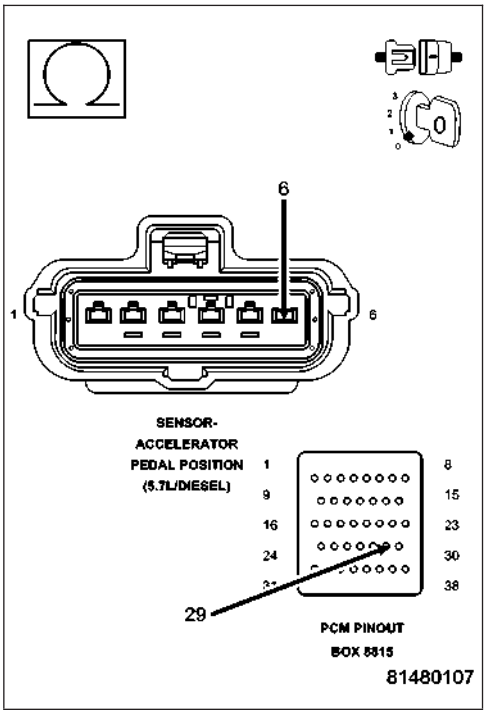
8. (F855) 5-VOLT SUPPLY CIRCUIT OPEN

Turn the ignition off.

Disconnect the C2 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (F855) 5-volt Supply circuit from the Sensor harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

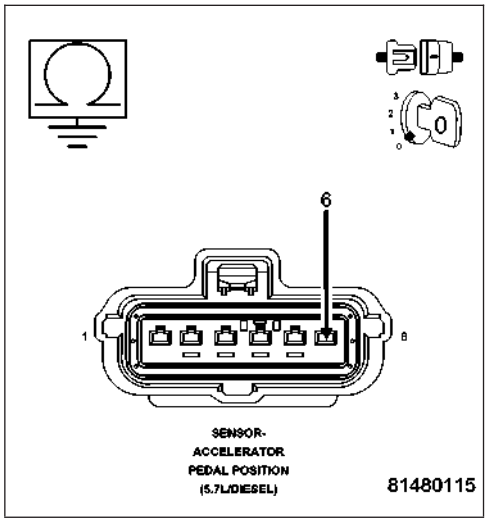
Yes >> Go To 9

No >> Repair the open in the (F855) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2122-ACCELERATOR PEDAL POSITION SENSOR 1 CIRCUIT LOW (CONTINUED)

9. (F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (F855) 5-volt Supply circuit in the APP Sensor harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (F855) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 10

10. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

11. APP SENSOR SWEEP

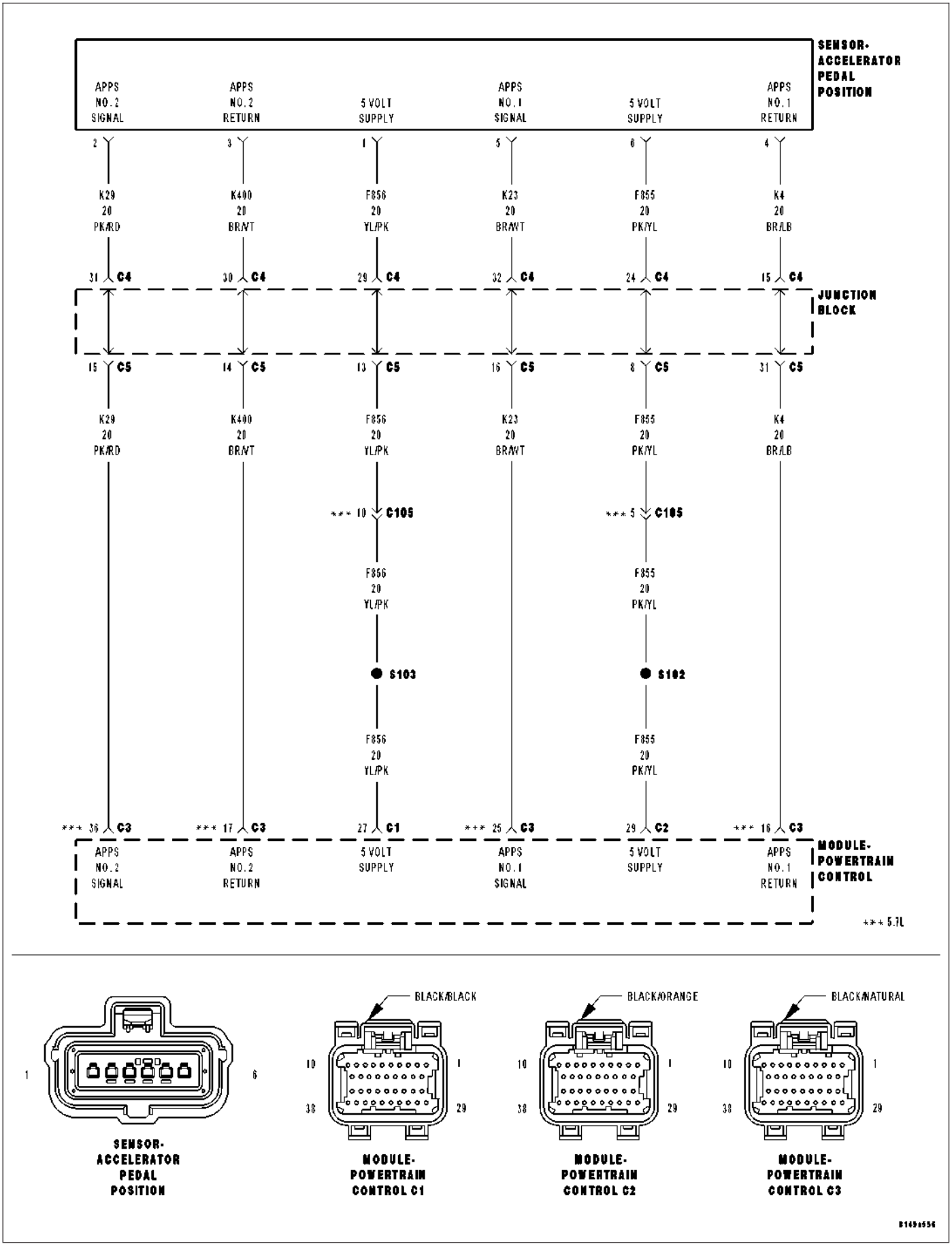
Ignition on, engine not running.
With a scan tool, monitor the APP Sensor No.1 voltage.
Slowly press the Accelerator pedal down.

Does voltage start at approximately 0.45 of a volt and go above 4.6 volts with a smooth transition?

Yes >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace the APP Sensor Assembly per Service Information. After installation is complete, use a scan tool and select the ETC RELEARN function to relearn the APPS values.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2123-ACCELERATOR PEDAL POSITION SENSOR 1 CIRCUIT HIGH



SENSOR-
ACCELERATOR
PEDAL
POSITION

MODULE-
POWERTRAIN
CONTROL C1

MODULE-
POWERTRAIN
CONTROL C2

MODULE-
POWERTRAIN
CONTROL C3

B149a556

P2123-ACCELERATOR PEDAL POSITION SENSOR 1 CIRCUIT HIGH (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on and no other APPS No.1 DTCs present.
- **Set Condition:**
  When APP Sensor No.1 voltage is too high. Engine will additionally idle if the brake pedal is pressed or has failed. Acceleration rate and Engine output are limited. One trip fault and the code will set within 5 seconds. ETC light is flashing.

Possible Causes
(K23) APP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K23) APP SENSOR NO.1 SIGNAL SHORTED TO THE (F855) 5-VOLT SUPPLY CIRCUIT
(K23) APP SENSOR NO.1 SIGNAL SHORTED TO THE (F856) 5-VOLT SUPPLY CIRCUIT
(K4) APP SENSOR NO.1 RETURN CIRCUIT OPEN
APP SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. APPS NO.1 VOLTAGE ABOVE 4.8 VOLTS

Ignition on, engine not running.

With a scan tool, read the APP Sensor No.1 voltage.

Is the voltage above 4.8 volts?

Yes >> Go To 2

No >> Go To 8

---

2. ACCELERATOR PEDAL POSITION SENSOR

Turn the ignition off.

Disconnect the APP Sensor harness connector.

Ignition on, engine not running.

With a scan tool, monitor the Accelerator Pedal Position Sensor voltage.

Is the voltage between 4.5 and 5.2 volts?

Yes >> Go To 3

No >> Replace the APP Sensor Assembly per Service Information. After installation is complete, use a scan tool and select the ETC RELEARN function to relearn the APPS values.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2123-ACCELERATOR PEDAL POSITION SENSOR 1 CIRCUIT HIGH (CONTINUED)

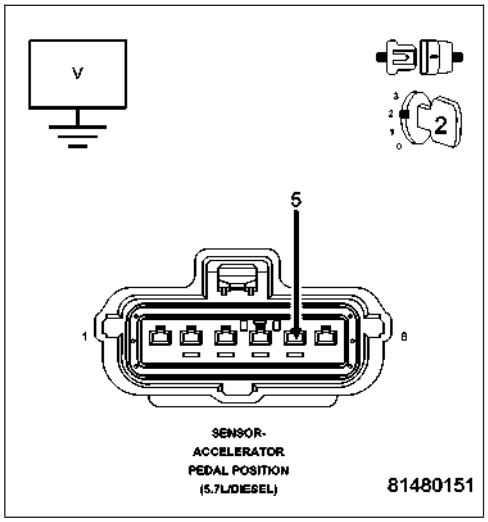
3. (K23) APP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

Disconnect the C1, C2, and C3 PCM harness connectors.

Ignition on, engine not running.

Measure the voltage on the (K23) APP Sensor No.1 Signal circuit in the APP Sensor harness connector.



Is the voltage above 0 volts?

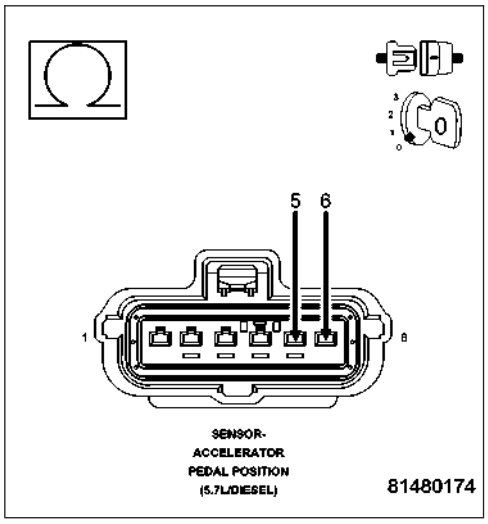
Yes >> Repair the short to battery voltage in the (K23) APP Sensor No.1 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

4. (K23) APPS NO.1 SIGNAL CIRCUIT SHORTED TO THE (F855) 5-VOLT SUPPLY CIRCUIT

Turn the ignition off.

Measure the resistance between the (K23) APP Sensor No.1 Signal circuit and the (F855) 5-volt Supply circuit in the APP Sensor harness connector.



Is the resistance below 100 ohms?

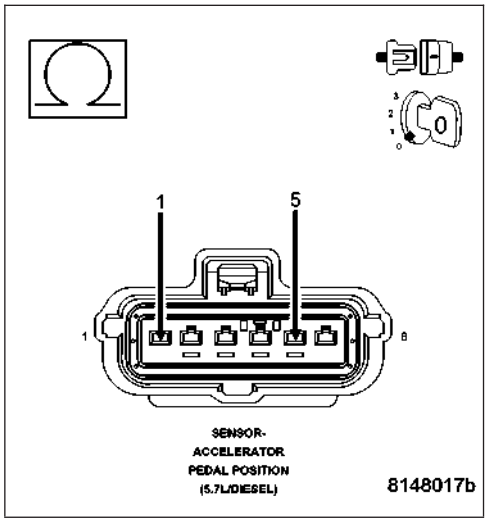
Yes >> Repair the short between the (K23) APP Sensor No.1 Signal circuit and the (F855) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

P2123-ACCELERATOR PEDAL POSITION SENSOR 1 CIRCUIT HIGH (CONTINUED)

5. (K23) APPS NO.1 SIGNAL CIRCUIT SHORTED TO THE (F856) 5-VOLT SUPPLY CIRCUIT

Measure the resistance between the (K23) APP Sensor No.1 Signal circuit and the (F856) 5-volt Supply circuit in the APP Sensor harness connector.



Is the resistance below 100 ohms?

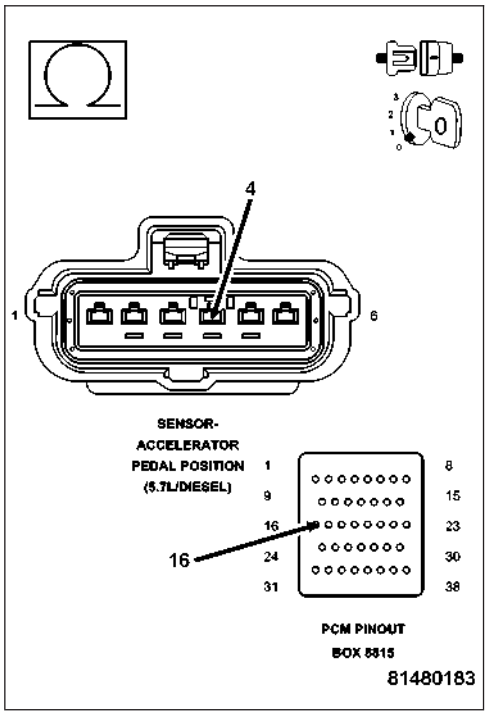
Yes >> Repair the short between the (K23) APP Sensor No.1 Signal circuit and the (F856) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6

6. (K4) APP SENSOR NO.1 RETURN CIRCUIT OPEN

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K4) APP Sensor No.1 Return circuit from the APP Sensor harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 7

No >> Repair the open in the (K4) APP Sensor No.1 Return circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2123-ACCELERATOR PEDAL POSITION SENSOR 1 CIRCUIT HIGH (CONTINUED)

7. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

8. APP SENSOR NO.1 SWEEP

Ignition on, engine not running.

With a scan tool, monitor the Accelerator Pedal Position Sensor voltage.

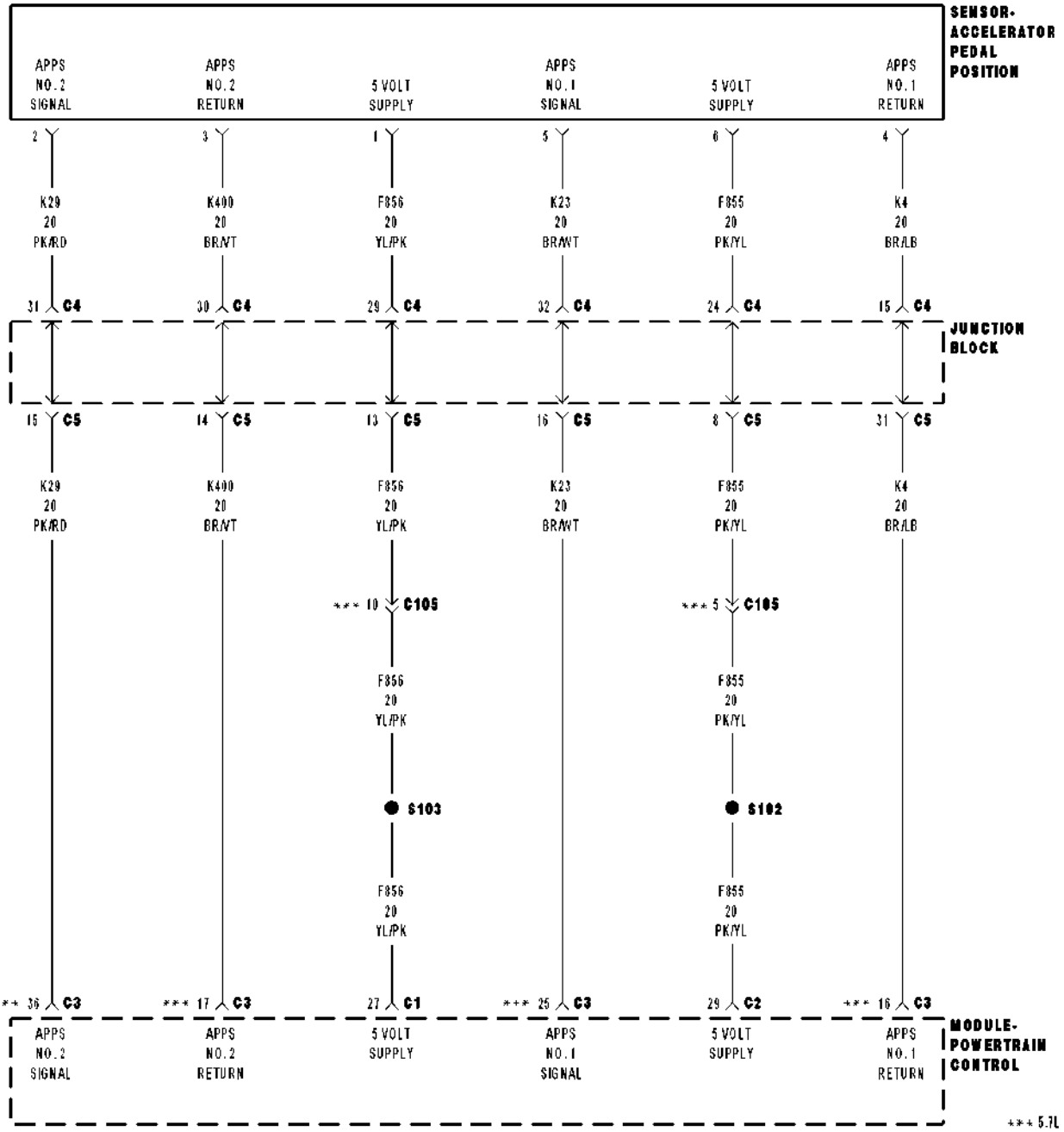
Slowly press the Accelerator Pedal down.

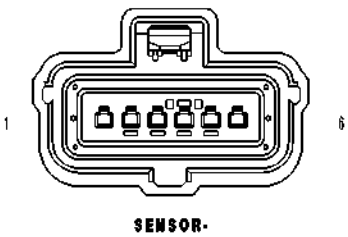
Does voltage start at approximately 0.45 of a volt and go above 4.6 volts with a smooth transition?

Yes >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

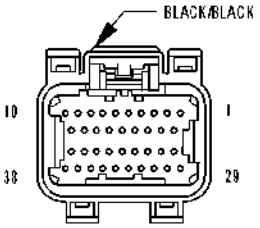
No >> Replace the APP Sensor Assembly per Service Information. After installation is complete, use a scan tool and select the ETC RELEARN function to relearn the APPS values.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2127-ACCELERATOR PEDAL POSITION SENSOR 2 CIRCUIT LOW

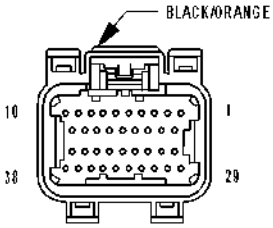




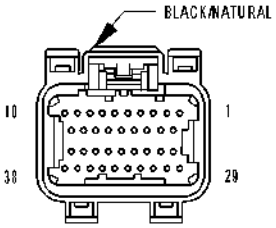
SENSOR-
ACCELERATOR
PEDAL
POSITION



MODULE-
POWERTRAIN
CONTROL C1



MODULE-
POWERTRAIN
CONTROL C2



MODULE-
POWERTRAIN
CONTROL C3

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P2127-ACCELERATOR PEDAL POSITION SENSOR 2 CIRCUIT LOW (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on and no other APPS No.2 DTCs present.
- **Set Condition:**
  When the APP Sensor No.2 voltage is too low. Engine will only idle if the Brake pedal is Pressed or has failed. Acceleration rate and Engine output are limited. One trip fault and the code will set within 5 seconds. ETC light is flashing.

Possible Causes
(F856) 5-VOLT SUPPLY CIRCUIT OPEN
(F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K29) APP SENSOR NO.2 SIGNAL CIRCUIT OPEN
(K29) APP SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO GROUND
(K29) APP SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO THE (K4) APP SENSOR NO.1 RETURN CIRCUIT
(K29) APP SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO THE (K400) APP SENSOR NO.2 RETURN CIRCUIT
APP SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. APP SENSOR BELOW 0.25 OF A VOLT

Ignition on, engine not running.

With a scan tool, read the APP Sensor No.1 voltage.

NOTE: Sensor No. 2 is pulled low by the PCM as part of its system testing. This test happens a couple of times a second. So you can expect to see voltages close to zero occasionally with a normal sensor.

Is the voltage consistently below 0.25 of a volt?

Yes >> Go To 2

No >> Go To 11

P2127-ACCELERATOR PEDAL POSITION SENSOR 2 CIRCUIT LOW (CONTINUED)

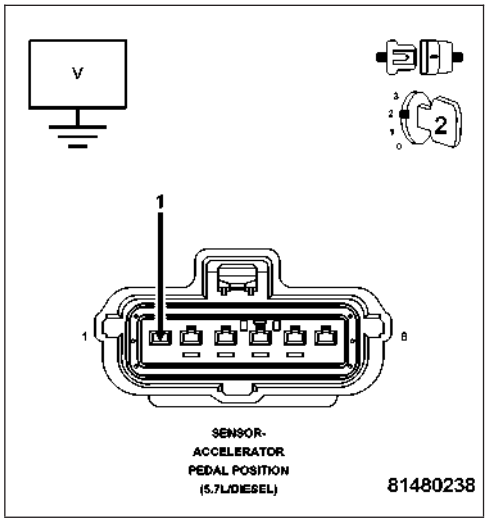
2. (F856) 5-VOLT SUPPLY CIRCUIT

Turn the ignition off.

Disconnect the APP Sensor harness connector.

Ignition on, engine not running.

Measure the voltage on the (F856) 5-volt Supply circuit in the APP Sensor harness connector.



Is the voltage between 4.5 and 5.2 volts?

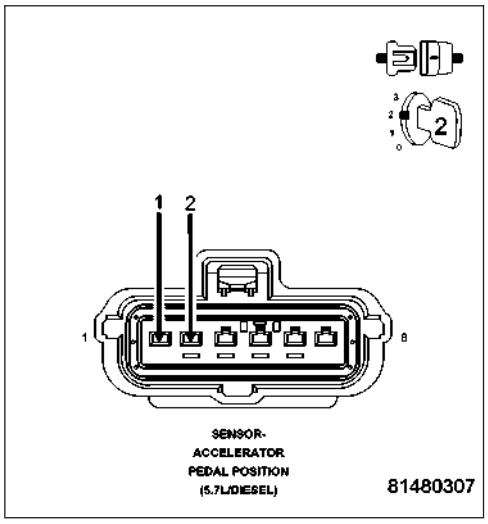
Yes >> Go To 3

No >> Go To 8

3. ACCELERATOR PEDAL POSITION SENSOR

Connect a jumper wire between the (F856) 5-volt Supply circuit and the (K29) APP Sensor No.2 Signal circuit in the Sensor harness connector.

With a scan tool, monitor the APP Sensor No.2 voltage.



Is the voltage above 4.5 volts with the jumper wire installed?

Yes >> Replace the APP Sensor Assembly per Service Information. After installation is complete, use a scan tool and select the ETC RELEARN function to relearn the APPS values.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

NOTE: Remove the jumper wire before continuing.

P2127-ACCELERATOR PEDAL POSITION SENSOR 2 CIRCUIT LOW (CONTINUED)

4. (K29) APP SENSOR NO.2 SIGNAL CIRCUIT OPEN

Turn the ignition off.

Disconnect the C3 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

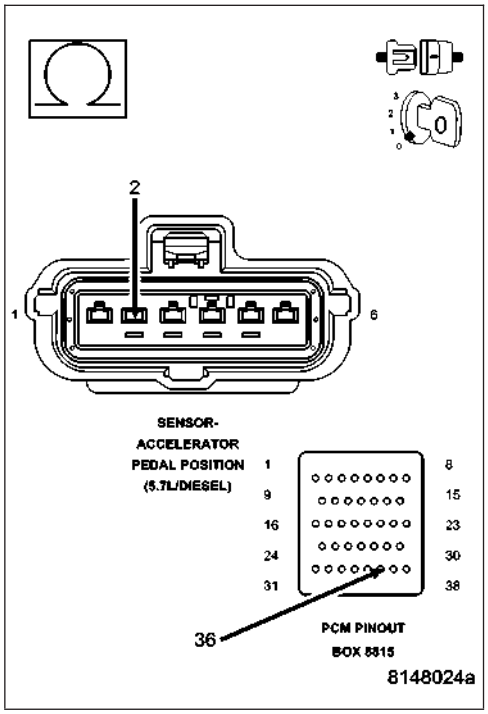
Measure the resistance of the (K29) APP Sensor No.2 Signal circuit from the APP Sensor harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 5

No >> Repair the open in the (K29) APP Sensor No.2 Signal circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



5. (K29) APP SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO GROUND

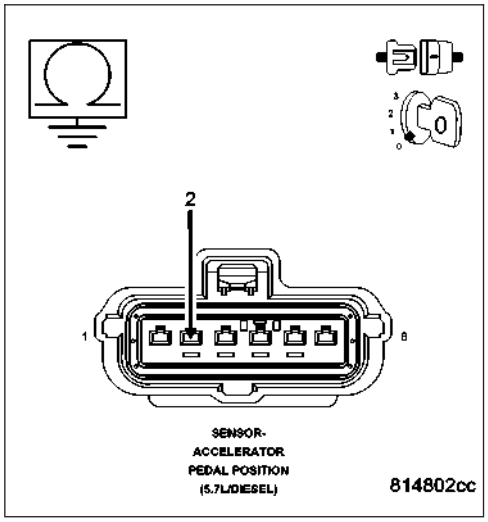
Measure the resistance between ground and the (K29) APP Sensor No.2 Signal circuit in the APP Sensor harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K29) APP Sensor No.2 Signal circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

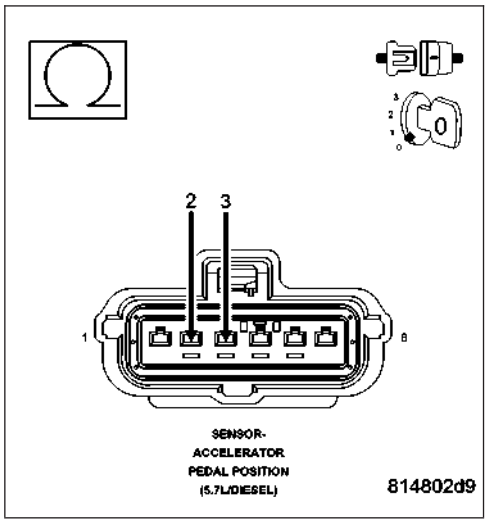
No >> Go To 6



P2127-ACCELERATOR PEDAL POSITION SENSOR 2 CIRCUIT LOW (CONTINUED)

6. (K29) APP SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO THE (K400) APP SENSOR NO.2 RETURN CIRCUIT

Measure the resistance between the (K29) APP Sensor No.2 Signal circuit and the (K400) Sensor No.2 Return circuit in the APP Sensor harness connector.



Is the resistance below 100 ohms?

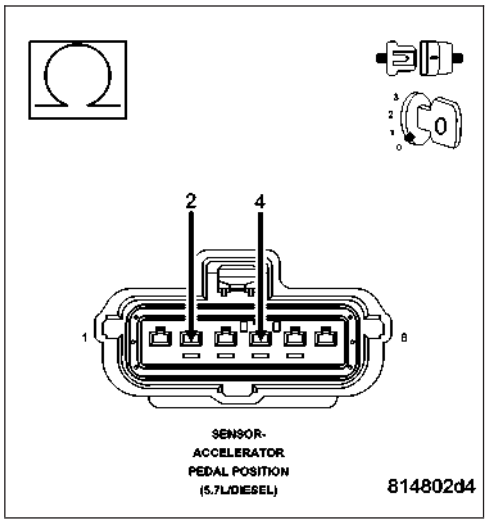
Yes >> Repair the short between the (K400) App Sensor No.2 Return circuit and the (K29) APP Sensor No.2 Signal circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 7

7. (K29) APP SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO THE (K4) APP SENSOR NO.1 RETURN CIRCUIT

Measure the resistance between the (K29) APP Sensor No.2 Signal circuit and the (K4) Sensor No.1 Return circuit in the APP Sensor harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short between the (K4) App Sensor No.1 Return circuit and the (K29) APP Sensor No.2 Signal circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 10

P2127-ACCELERATOR PEDAL POSITION SENSOR 2 CIRCUIT LOW (CONTINUED)

8. (F856) 5-VOLT SUPPLY CIRCUIT OPEN

Turn the ignition off.

Disconnect the C1 PCM harness connector.

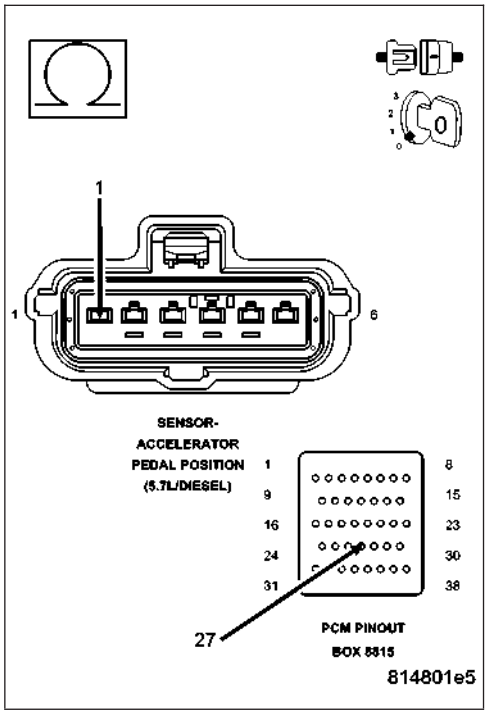
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (F856) 5-volt Supply circuit from the Sensor harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 9

No >> Repair the open in the (F856) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



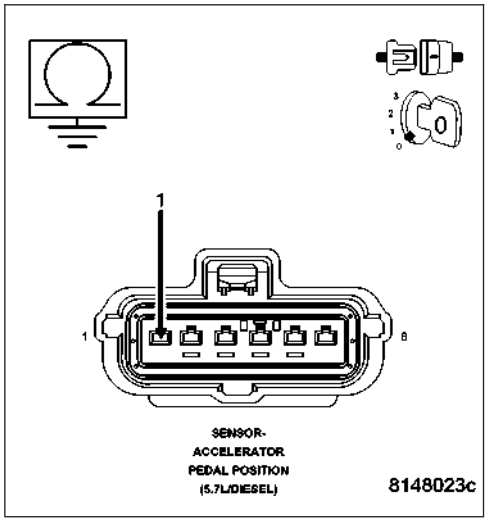
9. (F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (F856) 5-volt Supply circuit in the APP Sensor harness connector.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (F856) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 10



P2127-ACCELERATOR PEDAL POSITION SENSOR 2 CIRCUIT LOW (CONTINUED)

10. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

11. APP SENSOR SWEEP

Ignition on, engine not running.

With a scan tool, monitor the APP Sensor No.2 voltage.

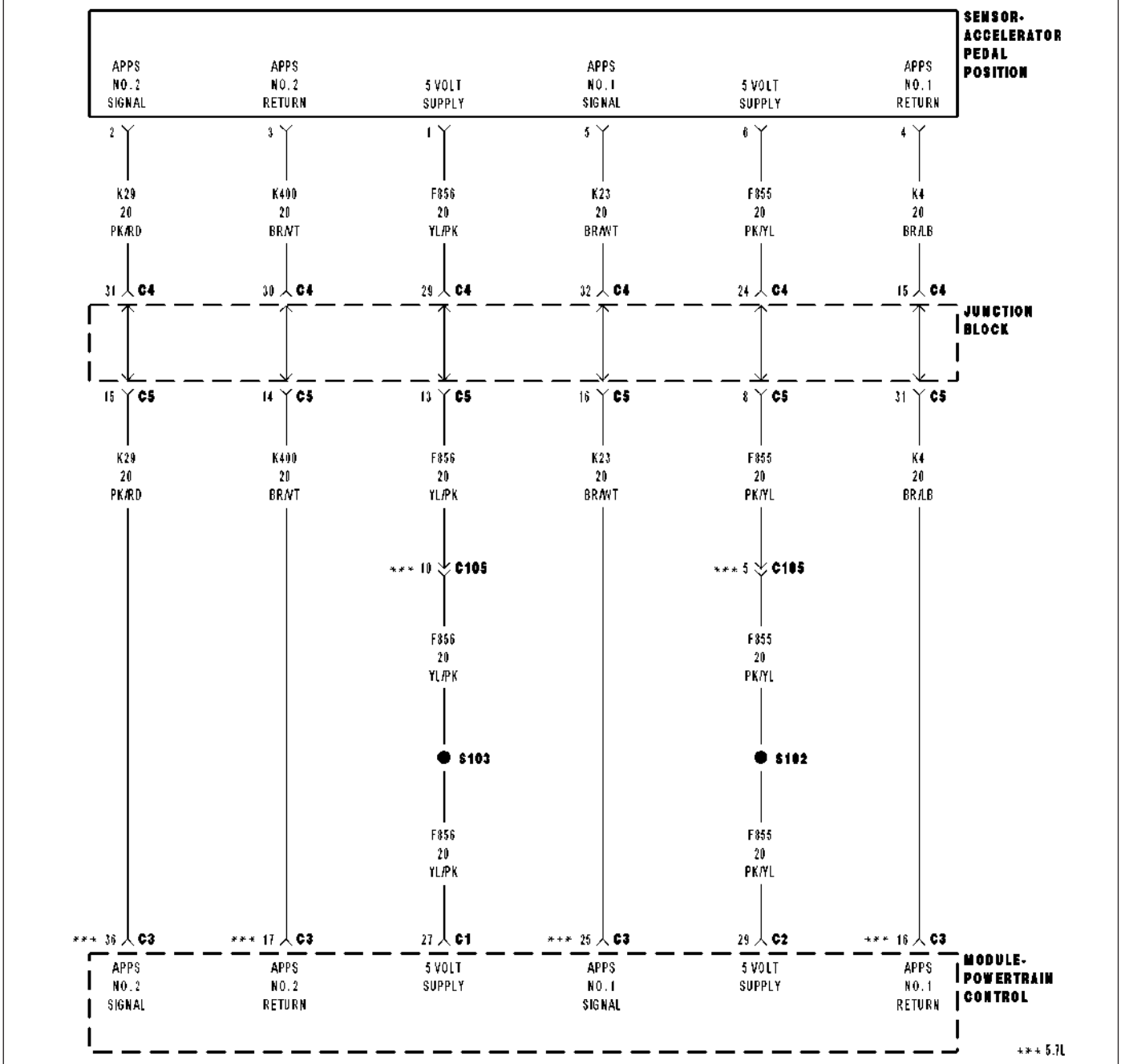
Slowly press the Accelerator pedal down.

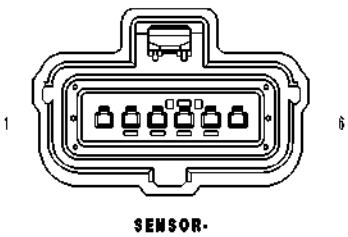
Does voltage start at approximately 0.22 of a volt and go above 2.31 volts with a smooth transition?

Yes >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

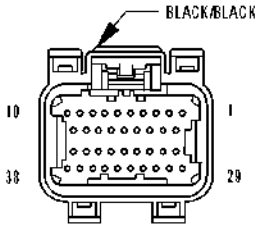
No >> Replace the APP Sensor Assembly per Service Information. After installation is complete, use a scan tool and select the ETC RELEARN function to relearn the APPS values.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2128-ACCELERATOR PEDAL POSITION SENSOR 2 CIRCUIT HIGH

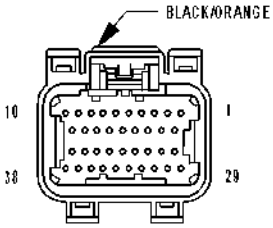




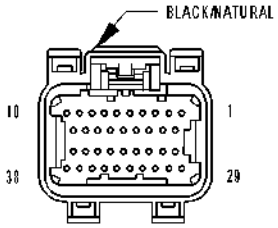
SENSOR-
ACCELERATOR
PEDAL
POSITION



MODULE-
POWERTRAIN
CONTROL C1



MODULE-
POWERTRAIN
CONTROL C2



MODULE-
POWERTRAIN
CONTROL C3

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P2128-ACCELERATOR PEDAL POSITION SENSOR 2 CIRCUIT HIGH (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on and no other APPS No.2 DTCs present.
- **Set Condition:**
  When APP Sensor No.2 voltage is too high. Idle is additionally forced any time the brake is applied or failed. Acceleration rate and Engine output are limited. One trip fault and the code will set within 5 seconds. ETC light is flashing.

Possible Causes
(K29) APP SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K29) APP SENSOR NO.2 SIGNAL SHORTED TO THE (F856) 5-VOLT SUPPLY CIRCUIT
(K29) APP SENSOR NO.2 SIGNAL SHORTED TO THE (F855) 5-VOLT SUPPLY CIRCUIT
(K400) APP SENSOR NO.2 RETURN CIRCUIT OPEN
APP SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. APPS NO.2 VOLTAGE ABOVE 3.0 VOLTS

Ignition on, engine not running.

With a scan tool, read the APP Sensor No.2 voltage.

NOTE: Diagnose any 5-Volt Supply DTCs before continuing.

Is the voltage above 3.0 volts?

Yes >> Go To 2

No >> Go To 8

---

2. ACCELERATOR PEDAL POSITION SENSOR

Turn the ignition off.

Disconnect the APP Sensor harness connector.

Ignition on, engine not running.

With a scan tool, monitor the Accelerator Pedal Position Sensor voltage.

Is the voltage above 3.0 volts?

Yes >> Go To 3

No >> Replace the APP Sensor Assembly per Service Information. After installation is complete, use a scan tool and select the ETC RELEARN function to relearn the APPS values.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2128-ACCELERATOR PEDAL POSITION SENSOR 2 CIRCUIT HIGH (CONTINUED)

3. (K29) APP SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

Disconnect the C3 PCM harness connector.

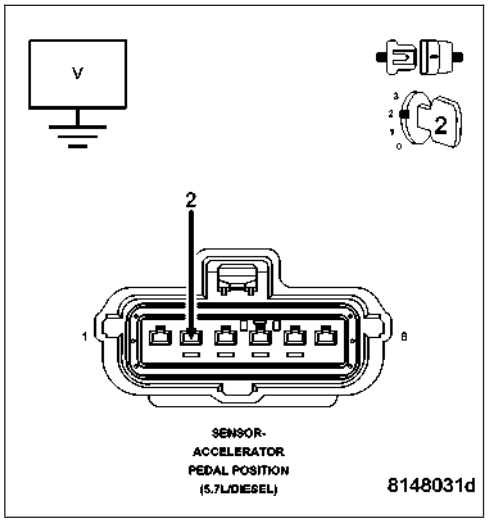
Ignition on, engine not running.

Measure the voltage on the (K29) APP Sensor No.2 Signal circuit in the APP Sensor harness connector.

Is the voltage above 5.2 volts?

Yes >> Repair the short to battery voltage in the (K29) APP Sensor No.2 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4



4. (K29) APPS NO.2 SIGNAL CIRCUIT SHORTED TO THE (F856) 5-VOLT SUPPLY CIRCUIT

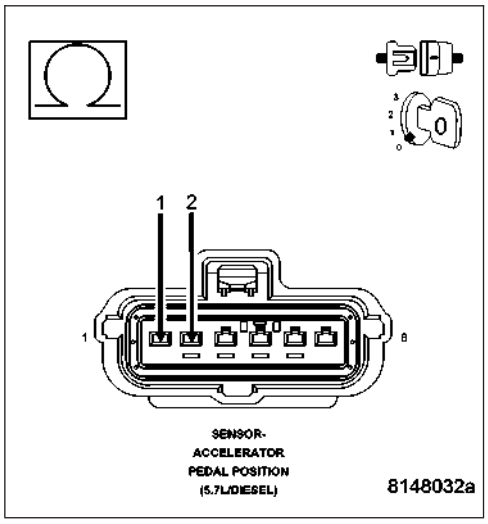
Turn the ignition off.

Measure the resistance between the (K29) APP Sensor No.2 Signal circuit and the (F856) 5-volt Supply circuit in the APP Sensor harness connector.

Is the resistance below 10 ohms?

Yes >> Repair the short between the (K29) APP Sensor No.2 Signal circuit and the (F856) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

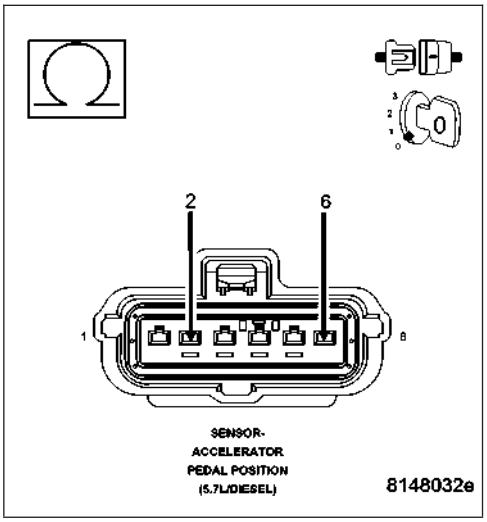
No >> Go To 5



P2128-ACCELERATOR PEDAL POSITION SENSOR 2 CIRCUIT HIGH (CONTINUED)

5. (K29) APPS NO.2 SIGNAL CIRCUIT SHORTED TO THE (F855) 5-VOLT SUPPLY CIRCUIT

Measure the resistance between the (K29) APP Sensor No.2 Signal circuit and the (F855) 5-volt Supply circuit in the APP Sensor harness connector.



Is the resistance below 10 ohms?

Yes >> Repair the short between the (K29) APP Sensor No.2 Signal circuit and the (F855) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

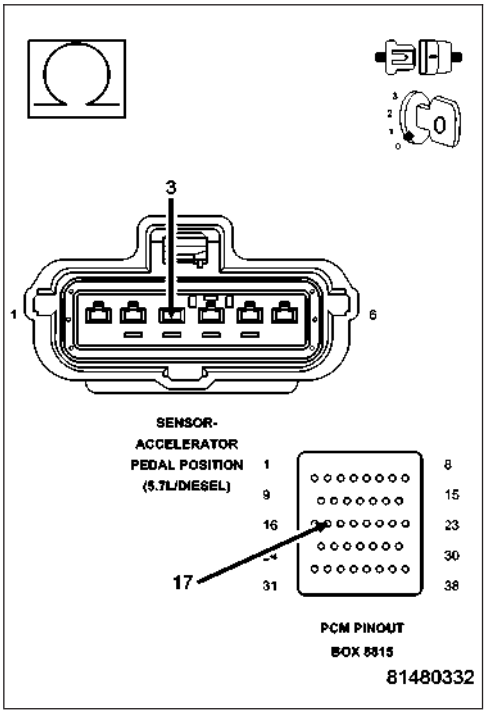
No >> Go To 6

---

6. (K400) APP SENSOR NO.2 RETURN CIRCUIT OPEN

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K400) APP Sensor No.2 Return circuit from the APP Sensor harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 7

No >> Repair the open in the (K400) APP Sensor No.2 Return circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2128-ACCELERATOR PEDAL POSITION SENSOR 2 CIRCUIT HIGH (CONTINUED)

7. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

8. APP SENSOR NO.2 SWEEP

Ignition on, engine not running.

With a scan tool, monitor the Accelerator Pedal Position Sensor voltage.

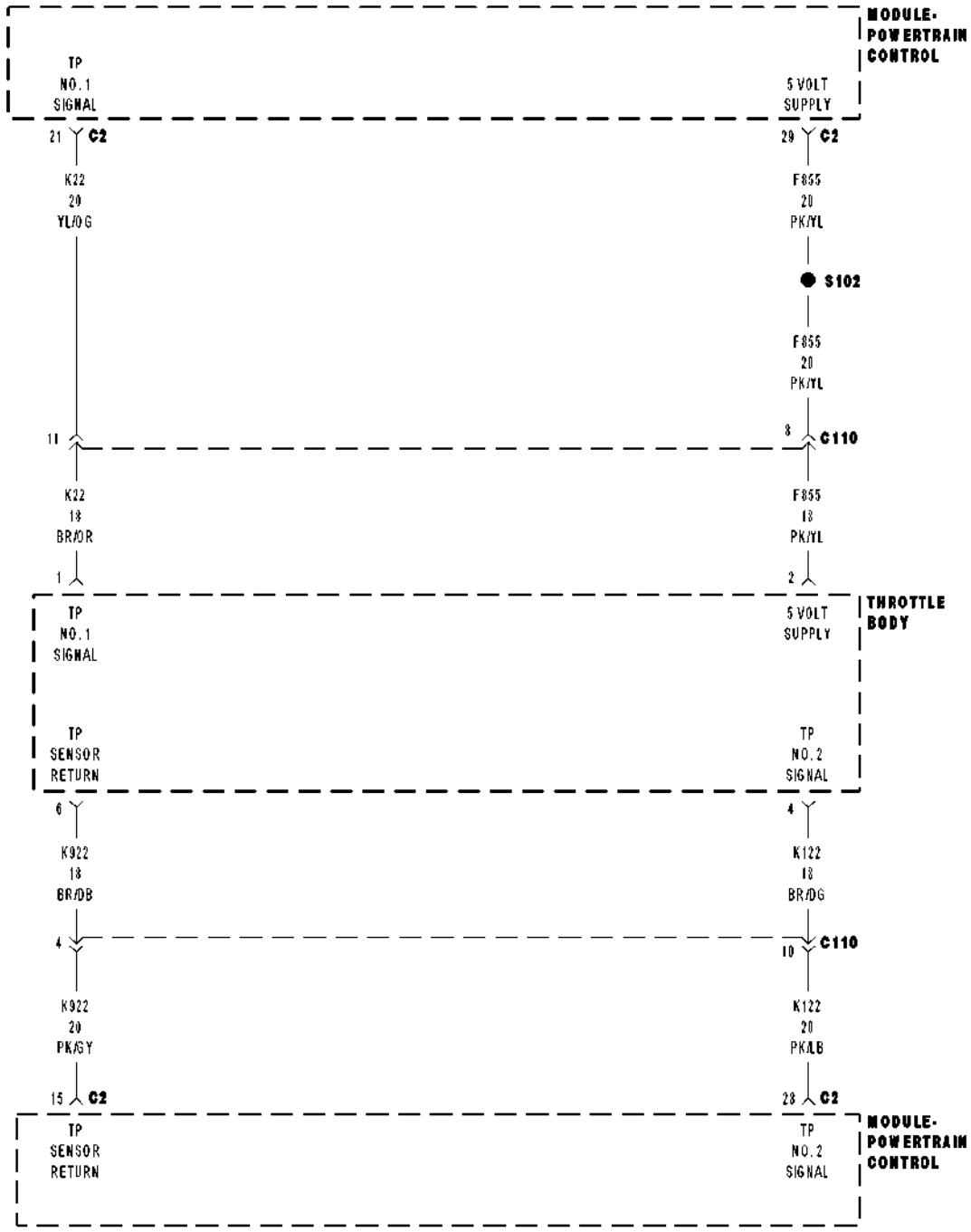
Slowly press the Accelerator Pedal down.

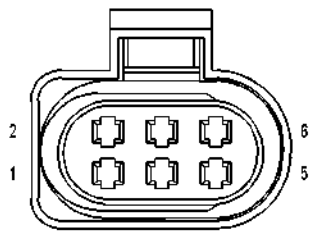
Does voltage start at approximately 0.22 of a volt and go above 2.31 volts with a smooth transition?

Yes >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

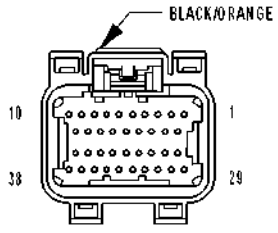
No >> Replace the APP Sensor Assembly per Service Information. After installation is complete, use a scan tool and select the ETC RELEARN function to relearn the APPS values.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2135-THROTTLE POSITION SENSOR 1/2 CORRELATION





THROTTLE
BODY



MODULE-
POWERTRAIN
CONTROL C2

B1492b1b

P2135-THROTTLE POSITION SENSOR 1/2 CORRELATION (CONTINUED)

For the Engine System Schematic circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on and no other DTCs present for TP Sensor No.1 or No.2.
- **Set Condition:**
  PCM recognizes TP Sensors No.1 and No.2 are not coherent. One trip fault and the code will set within 5 seconds. ETC light is illuminated.

Possible Causes
(K22) TP SENSOR NO.1 OR (K122) TP SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
RESISTANCE IN THE (K22) TP SENSOR NO.1 OR (K122) TP SENSOR NO.2 SIGNAL CIRCUIT
(K22) TP SENSOR NO.1 OR (K122) TP SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO GROUND
RESISTANCE IN THE (F855) 5-VOLT SUPPLY CIRCUIT
(F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
RESISTANCE IN THE (K922) SENSOR GROUND CIRCUIT
(K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO (K122) TP SENSOR NO.2 SIGNAL CIRCUIT
THROTTLE POSITION SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: The throttle plate and linkage should be free from binding and carbon build up.

NOTE: Make sure the throttle plate is at the idle position.
Ignition on, engine not running.

NOTE: Inspect the engine for vacuum leaks.
With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Go To 11

P2135-THROTTLE POSITION SENSOR 1/2 CORRELATION (CONTINUED)

2. (K22) TP SENSOR NO.1 OR (K122) TP SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

Disconnect the C2 PCM harness connector.

Disconnect the Throttle Body harness connector.

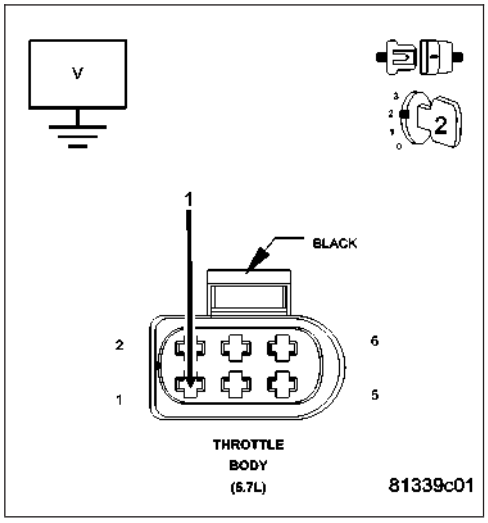
Ignition on, engine not running.

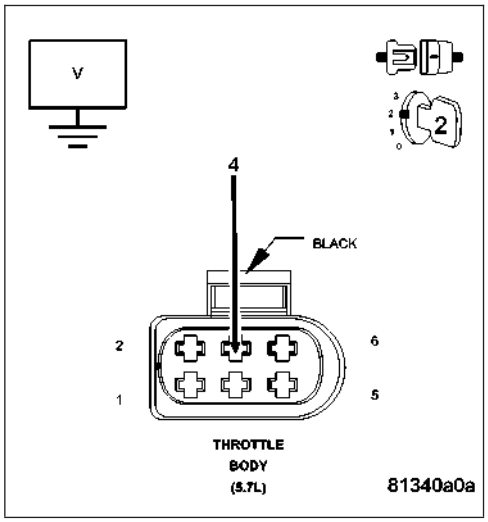
Measure the voltage on the (K22) TP No.1 Signal and the (K122) TP No.2 Signal circuits in the Throttle Body harness connector.

Is the voltage above 5.2 volts?

Yes >> Repair the short to battery voltage in the (K22) TP Sensor No.1 or (K122) TP Sensor No.2 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3





P2135-THROTTLE POSITION SENSOR 1/2 CORRELATION (CONTINUED)

3. THROTTLE POSITION SENSOR

Turn the ignition off.

Connect the C2 PCM harness connector.

Ignition on, engine not running.

With a scan tool, monitor the TP Sensor No.1 and No.2 voltage.

Connect a jumper wire between the (K922) Sensor Return circuit and the (K22) TP Sensor No.1 Signal circuit.

TP Sensor No.1 voltage should change from approximately 4.5 volts to 0.5 of a volt?

For TP Sensor No.2, connect a jumper wire between (F855) 5-volt supply circuit and the (K122) TP Sensor No.2 signal circuit.

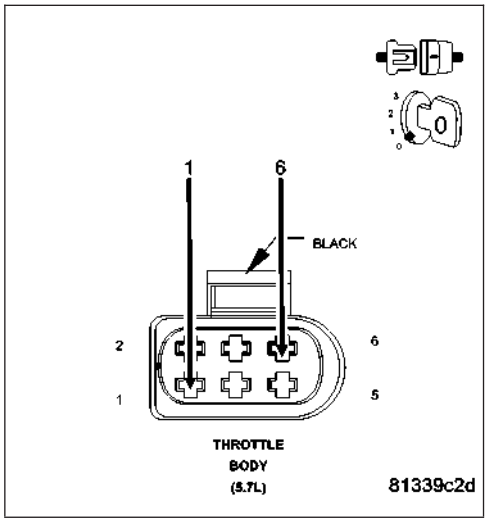
TP Sensor No.2 voltage should change from approximately 0 volts to 5.0 volts?

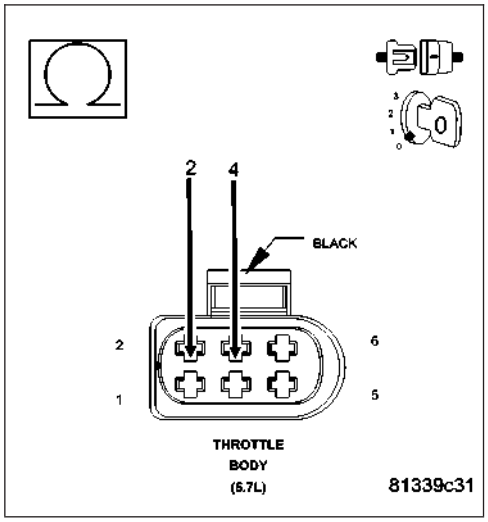
Is the voltage reading within the listed specification with the jumper wire installed?

Yes >> Replace the Throttle Body Assembly.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

NOTE: Remove the jumper wire before continuing.





P2135-THROTTLE POSITION SENSOR 1/2 CORRELATION (CONTINUED)

4. EXCESSIVE RESISTANCE IN THE (K22) TP SENSOR NO.1 OR (K122) TP SENSOR NO.2 SIGNAL CIRCUIT

Turn the ignition off.

Disconnect the C2 PCM harness connector.

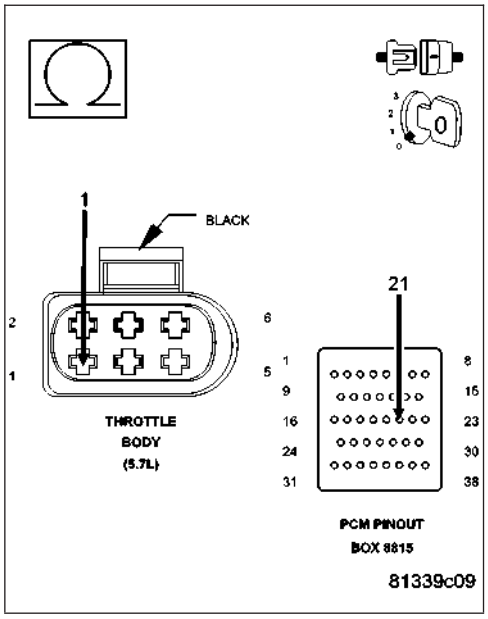
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

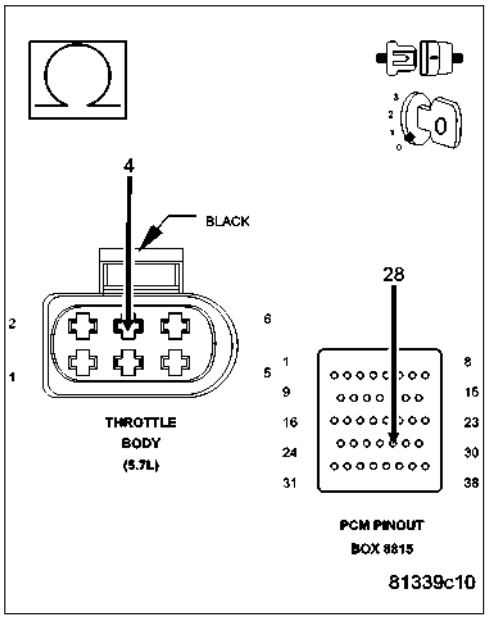
Measure the resistance of the (K22) TP Sensor No.1 Signal circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.Measure the resistance of the (K122) TP Sensor No.2 Signal circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms for each circuit?

Yes >> Go To 5

No >> Repair the excessive resistance in the (K22) TP Sensor No.1 or (K122) TP Sensor No.2 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)





P2135-THROTTLE POSITION SENSOR 1/2 CORRELATION (CONTINUED)

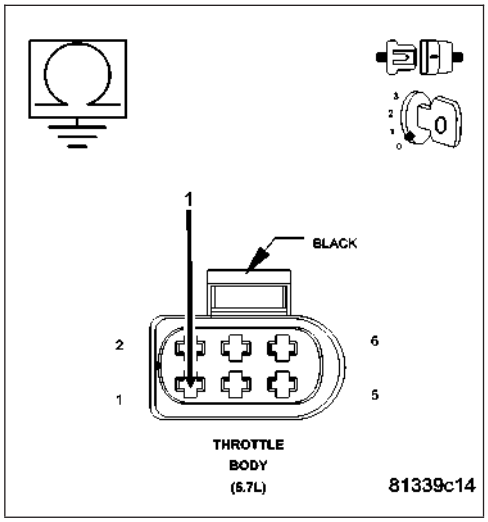
5. (K22) TP SENSOR NO.1 OR (K122) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO GROUND

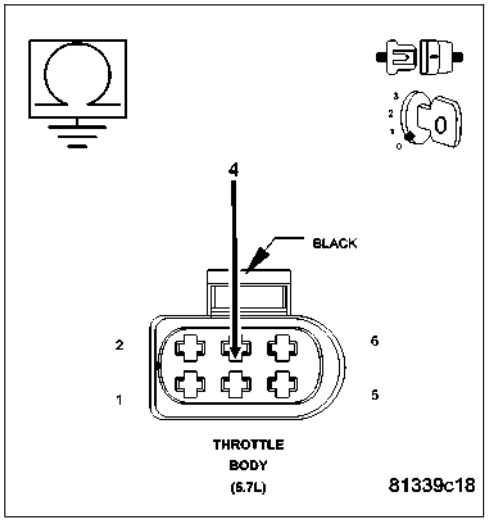
Measure the resistance between ground and the (K22) TP Sensor No.1 Signal circuit and the (K122) TP Sensor No.2 Signal circuit at the appropriate terminals of special tool #8815.

Is the resistance below 100 ohms for either circuit?

Yes >> Repair the short to ground in the (K22) TP No.1 Signal or (K122) TP No.2 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6





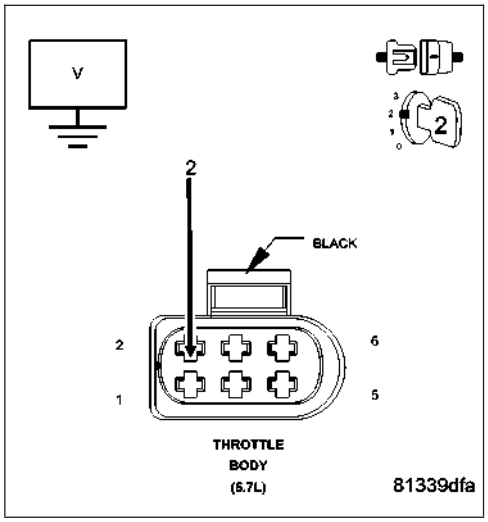
6. EXCESSIVE RESISTANCE IN THE (F855) 5-VOLT SUPPLY CIRCUIT

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.
Measure the resistance of the (F855) 5-volt Supply circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 7

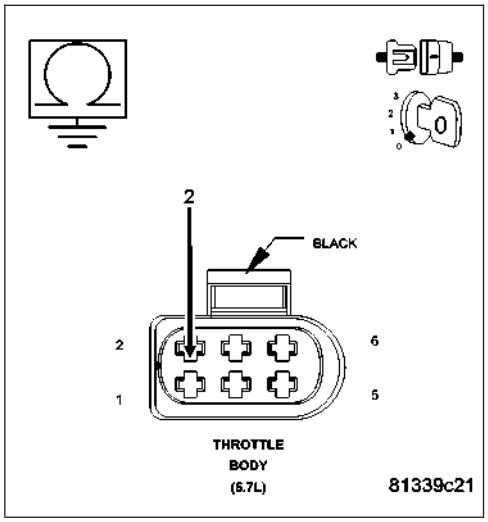
No >> Repair the excessive resistance in the (F855) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P2135-THROTTLE POSITION SENSOR 1/2 CORRELATION (CONTINUED)

7. (F855) 5-VOLT SUPPLY SHORTED TO GROUND

Measure the resistance between ground and the (F855) 5-volt Supply circuit at the appropriate terminals of special tool #8815.



Is the resistance below 100 ohms?

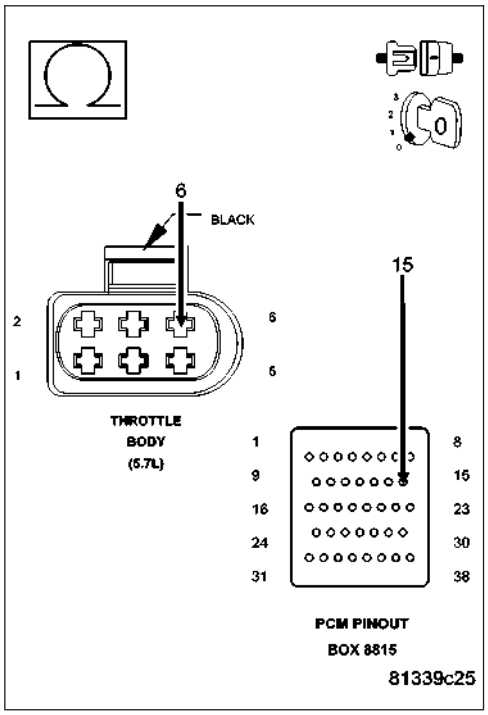
Yes >> Repair the short to ground in the (F855) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8

8. EXCESSIVE RESISTANCE IN THE (K922) SENSOR RETURN CIRCUIT

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K922) Sensor Return circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

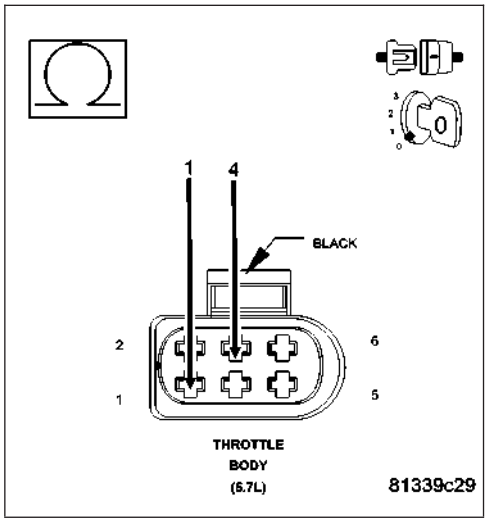
Yes >> Go To 9

No >> Repair the excessive resistance in the (K922) Sensor Return circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2135-THROTTLE POSITION SENSOR 1/2 CORRELATION (CONTINUED)

9. (K22) TP SENSOR NO.1 SIGNAL SHORTED TO (K122) TP SENSOR NO.2 SIGNAL

Measure the resistance between the (K22) TP Sensor No.1 Signal circuit and the (K122) TP Sensor No.2 Signal circuit between the appropriate terminals of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Repair the short between the (K122) TP Sensor No.2 Signal circuit and the (K22) TP Sensor No.1 Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 10

---

10. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

11. THROTTLE FOLLOWER TEST

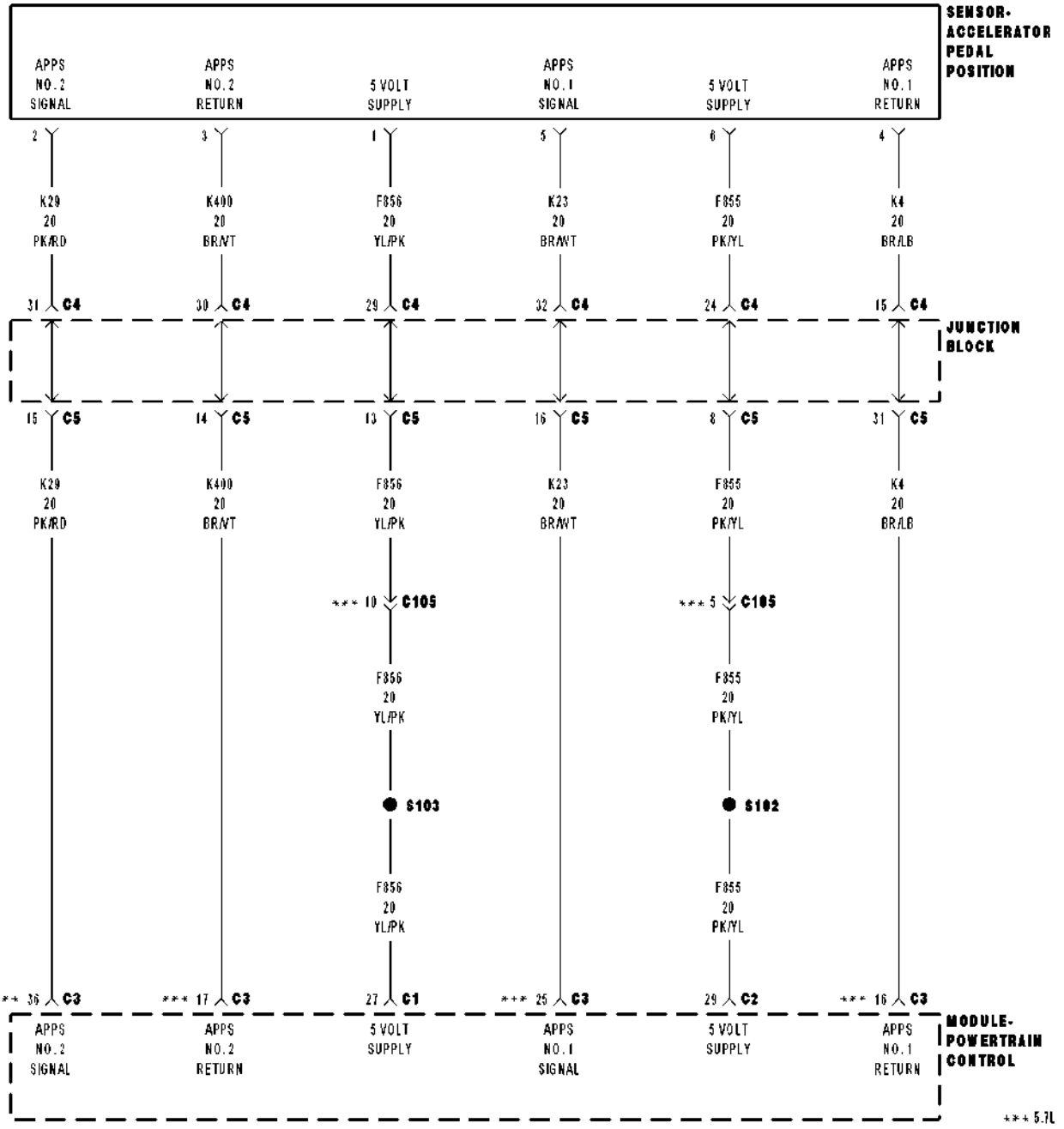
Ignition on, engine not running.
With a scan tool, perform the Throttle Follower Test and monitor the TP Sensor No.1 or No.2 voltage.
Slowly press the throttle pedal down.
The voltage for TP Sensor No.1 should start at approximately 0.8 of a volt and increase to above 4.2 volts.
The voltage for TP Sensor No.2 should start at approximately 4.2 volts and decrease to approximately 0.8 of a volt.

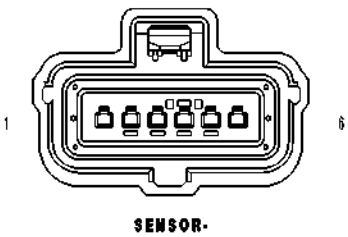
Is the voltage within the range of the listed specification for the appropriate Sensor?

Yes >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

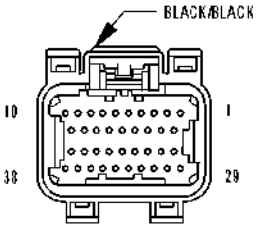
No >> Disconnect the Battery when replacing the Throttle Body Assembly. Replace the Throttle Body Assembly. After installation is complete, use a scan tool and select the ETC RELEARN function.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2138-ACCELERATOR PEDAL POSITION SENSOR 1/2 CORRELATION

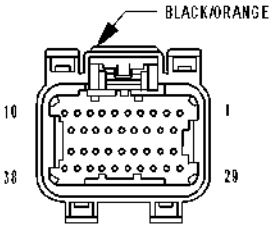




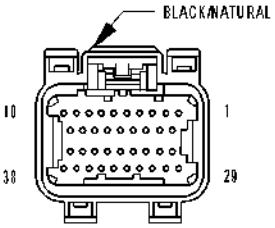
SENSOR-
ACCELERATOR
PEDAL
POSITION



MODULE-
POWERTRAIN
CONTROL C1



MODULE-
POWERTRAIN
CONTROL C2



MODULE-
POWERTRAIN
CONTROL C3

B149a556

P2138-ACCELERATOR PEDAL POSITION SENSOR 1/2 CORRELATION (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on and no APPS No.1 and APPS No.2 DTC present.
- **Set Condition:**
  APPS values No.1 and No.2 are not coherent. Idle is additionally forced when the brake pedal is pressed or failed. Acceleration rate and Engine output are limited. One trip fault and the code will set within 5 seconds. ETC light is flashing.

Possible Causes
EXCESSIVE RESISTANCE IN THE (F855) 5-VOLT SUPPLY CIRCUIT
EXCESSIVE RESISTANCE IN THE (F856) 5-VOLT SUPPLY CIRCUIT
EXCESSIVE RESISTANCE IN THE (K4) SENSOR NO.1 RETURN CIRCUIT
EXCESSIVE RESISTANCE IN THE (K400) SENSOR NO.2 RETURN CIRCUIT
EXCESSIVE RESISTANCE IN THE (K23) APP SENSOR NO.1 SIGNAL CIRCUIT
EXCESSIVE RESISTANCE IN THE (K29) APP SENSOR NO.2 SIGNAL CIRCUIT
APP SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.
With a scan tool, read DTCs.

NOTE: Repair any other 5-Volt Supply or APPS High and Low DTCs before diagnosing P2138.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2138-ACCELERATOR PEDAL POSITION SENSOR 1/2 CORRELATION (CONTINUED)

2. EXCESSIVE RESISTANCE IN THE (K23) APPS NO.1 SIGNAL CIRCUIT

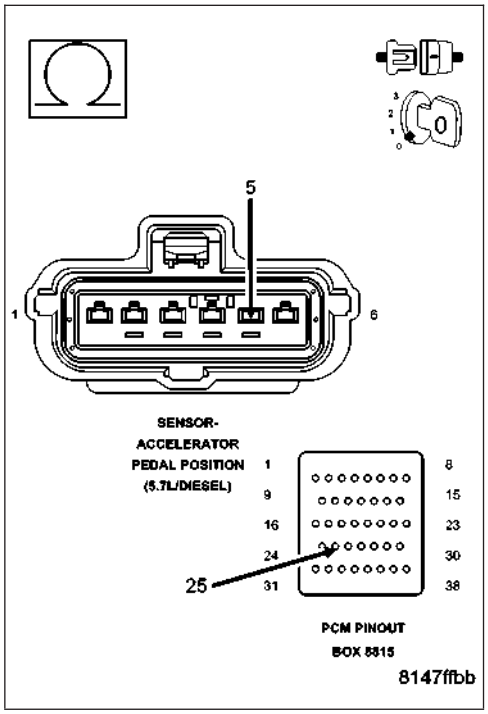
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Turn the ignition off.

Disconnect the C3 PCM harness connector.

Disconnect the APP Sensor harness connector.

Measure the resistance of (K23) APP Sensor No.1 Signal circuit from the APP Sensor harness connector to the appropriate terminals of special tool #8815.



Is the resistance below 5.0 ohms?

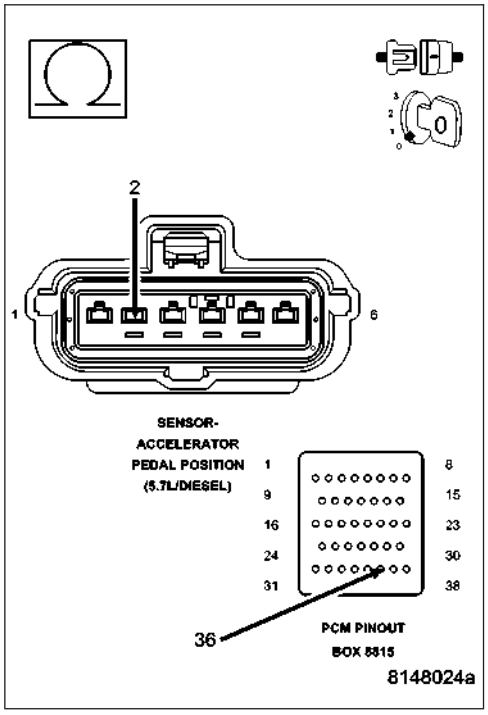
Yes >> Go To 3

No >> Repair the excessive resistance in the (K23) APP Sensor No.1 Signal circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

3. EXCESSIVE RESISTANCE IN THE (K29) APPS NO.2 SIGNAL CIRCUIT

Measure the resistance of (K29) APPS No.2 Signal circuit from the APP Sensor harness connector to the appropriate terminals of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 4

No >> Repair the excessive resistance in the (K29) APP Sensor No.2 Signal circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2138-ACCELERATOR PEDAL POSITION SENSOR 1/2 CORRELATION (CONTINUED)

4. EXCESSIVE RESISTANCE IN THE (F855) 5-VOLT SUPPLY CIRCUIT

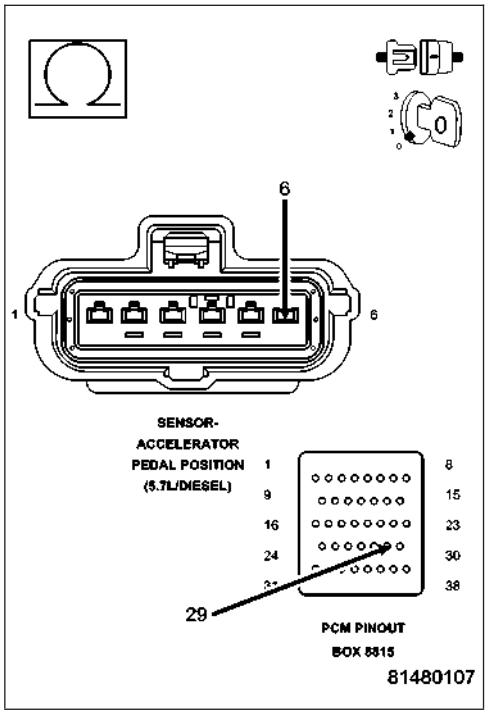
Disconnect the C2 PCM harness connector.

Measure the resistance of the (F855) 5-volt Supply circuit from the APP Sensor harness connector to the appropriate terminal of special tool #8815.

Is the resistance above 5.0 ohms?

Yes >> Repair the excessive resistance in the (F855) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5



5. EXCESSIVE RESISTANCE IN THE (F856) 5-VOLT SUPPLY CIRCUIT

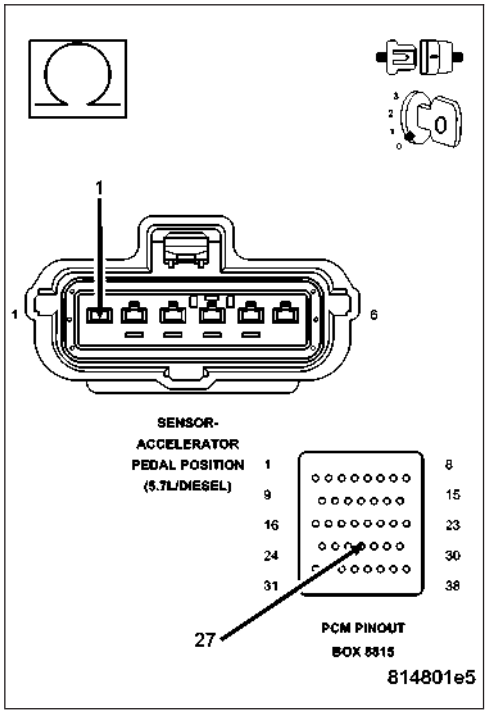
Disconnect the C1 PCM harness connector.

Measure the resistance of the (F856) 5-volt Supply circuit from the APP Sensor harness connector to the appropriate terminal of special tool #8815.

Is the resistance above 5.0 ohms?

Yes >> Repair the excessive resistance in the (F856) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6



P2138-ACCELERATOR PEDAL POSITION SENSOR 1/2 CORRELATION (CONTINUED)

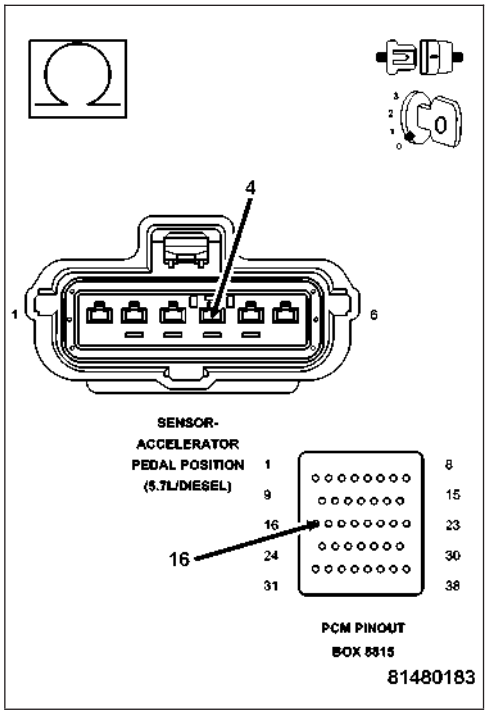
6. EXCESSIVE RESISTANCE IN THE (K4) SENSOR NO.1 RETURN CIRCUIT

Measure the resistance of the (K4) APP Sensor No.1 Return circuit from the APP Sensor harness connector to the appropriate terminal of special tool #8815.

Is the resistance above 5.0 ohms?

Yes >> Repair the excessive resistance in the (K4) Sensor No.1 Return circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 7



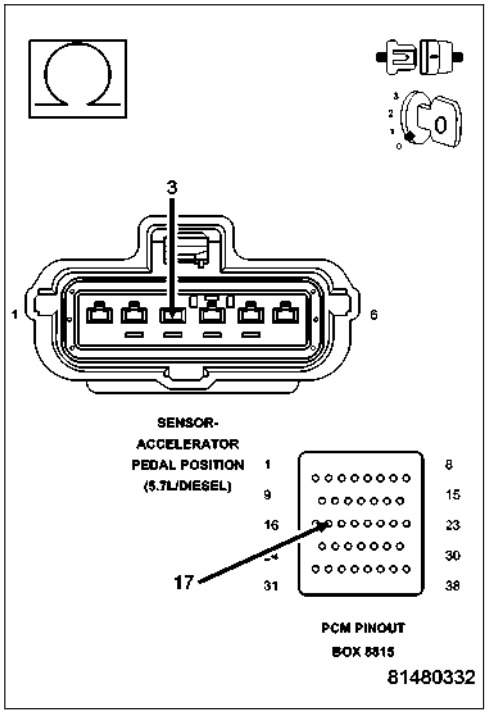
7. EXCESSIVE RESISTANCE IN THE (K400) SENSOR NO.2 RETURN CIRCUIT

Measure the resistance of the (K400) APP Sensor No.2 Return circuit from the APP Sensor harness connector to the appropriate terminal special tool #8815.

Is the resistance above 5.0 ohms?

Yes >> Repair the excessive resistance in the (K400) Sensor No.2 Return circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8



P2138-ACCELERATOR PEDAL POSITION SENSOR 1/2 CORRELATION (CONTINUED)

8. CHECKING APPS NO.1 AND NO.2 WITH A LAB SCOPE

Ignition on, engine not running.

Set up a lab scope in a way that you can view two graphs simultaneously.

Backprobe (K23) APP Sensor No.1 Signal circuit using Channel 1 at the APP Sensor harness connector.

Backprobe (K29) APP Sensor No.2 Signal circuit using Channel 2 at the APP Sensor harness connector.

Slowly press and release the Accelerator Pedal while monitoring the lab scope screen.

Does the scope pattern show any missing or erratic signals?

Yes >> Replace the APP Sensor Assembly per Service Information. After installation is complete, use a scan tool and select the ETC RELEARN function to relearn the APPS values.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 9

---

9. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

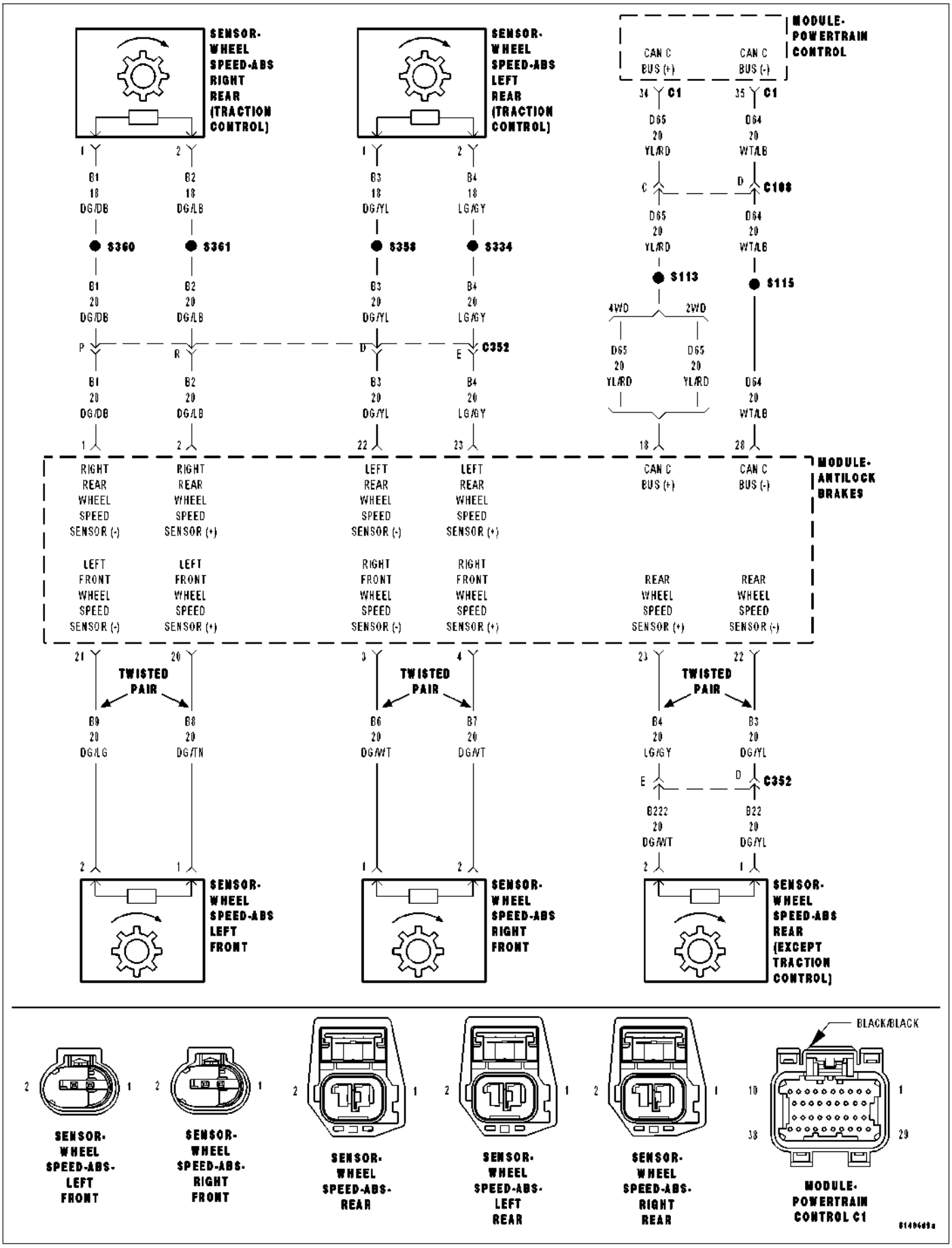
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2161-VEHICLE SPEED SENSOR 2 ERRATIC



P2161-VEHICLE SPEED SENSOR 2 ERRATIC (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  PCM recognizes Vehicle speed input No.2 erratic or high. VSS No.2 is based on the average of the Front Wheel Speeds. One trip fault and the code will set within 5 seconds. No MIL and No ETC light. Cruise is disabled.

Possible Causes
ACTIVE BUS OR COMMUNICATION DTCS
TIRE CIRCUMFERENCE
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

NOTE: Check for any Bus Communication DTCs. If no Bus or Communication DTCs are set, check for active DTCs stored in the Ant-Lock Brake Module. Any bus or communication DTCs or VSS DTCs in the Ant-Lock Brake Module must be properly diagnosed before continuing.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. VISUAL INSPECTION

NOTE: This code can set due to tire circumference differences and from the front or rear wheels being on a slippery surface while the opposite tires are not.

This code may also set on a hard acceleration on loose gravel or during other off road driving conditions.

Check tire pressure of all the tires.

Check tire wear on all the tires.

Ask the customer what the road and driving conditions were like when the fault set.

Were any problems found?

Yes >> Repair as necessary. If the code set during a front OR rear wheel spin condition, no repair is necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

P2161-VEHICLE SPEED SENSOR 2 ERRATIC (CONTINUED)

3. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2166-ACCELERATOR PEDAL POSITION SENSOR 1 MAXIMUM STOP PERFORMANCE

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on. During in plant mode the APP Sensors need to be checked to make sure that idle and full pedal travel can be reached on both sensors.
- **Set Condition:**
  APPS No.1 has failed to achieve the required maximum value during In Plant testing. One trip fault and the code will set within 5 seconds. Engine will only idle.

Possible Causes
IN PLANT TEST FAILURE
APPS RELEARN

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. IN PLANT TEST FAILURE

Ignition on, engine not running.

NOTE: This DTC is set when the APP Sensors are learned in plant but do not reach the Minimum or Maximum voltage range.

With a scan tool read DTCs.

With the scan tool, erase DTCs.

Start the engine.

With the scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. APPS RELEARN

With a scan tool select the ETC RELEARN function.

Next, erase DTCs.

Start the engine.

Does the DTC return?

Yes >> Replace the APPS Assembly per Service Information. After installation is complete, use a scan tool and select the ETC RELEARN function.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Test Complete.

P2167-ACCELERATOR PEDAL POSITION SENSOR 2 MAXIMUM STOP PERFORMANCE

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on. During in plant mode the APP Sensors need to be checked to make sure that idle and full pedal travel can be reached on both sensors.
- **Set Condition:**
  APPS No.2 has failed to achieve the required maximum value during In Plant testing. One trip fault and the code will set within 5 seconds. Engine will only idle.

Possible Causes
IN PLANT TEST FAILURE
APPS RELEARN

Diagnostic Test

1. IN PLANT TEST FAILURE

Ignition on, engine not running.

NOTE: This DTC is set when the APP Sensors are learned in plant but do not reach the Minimum or Maximum voltage range.

With a scan tool read DTCs.

With the scan tool, erase DTCs.

Start the engine.

With the scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. APPS RELEARN

With a scan tool select the ETC RELEARN function.

Next, erase DTCs.

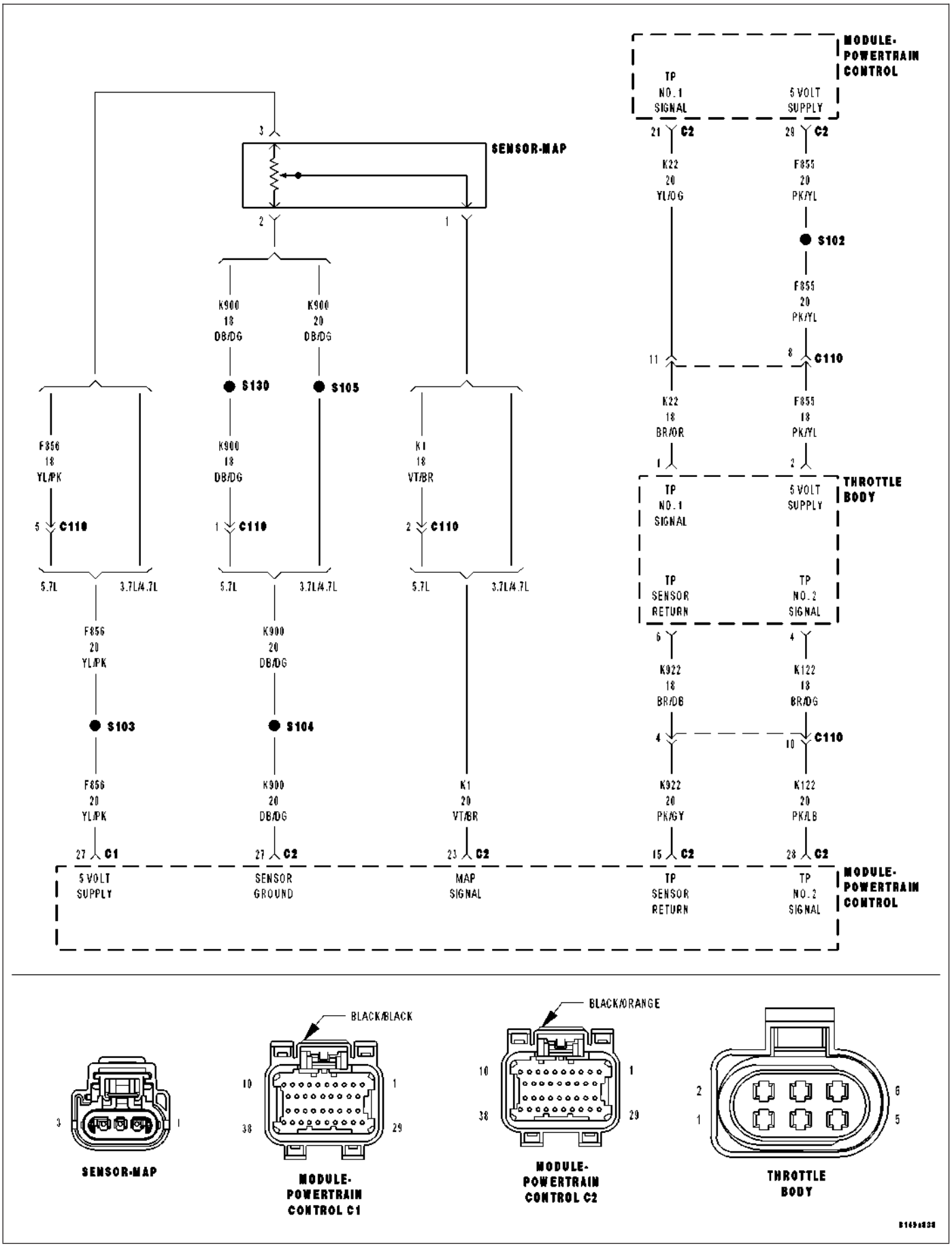
Start the engine.

Does the DTC return?

Yes >> Replace the APPS Assembly per Service Information. After installation is complete, use a scan tool and select the ETC RELEARN function.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Test Complete.

P2172-HIGH AIRFLOW/VACUUM LEAK DETECTED (INSTANTANEOUS ACCUMULATION)



SENSOR-MAP

MODULE-POWERTRAIN CONTROL C1

MODULE-POWERTRAIN CONTROL C2

THROTTLE BODY

P2172-HIGH AIRFLOW/VACUUM LEAK DETECTED (INSTANTANEOUS ACCUMULATION) (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on and engine running with no MAP Sensor DTCs.
- **Set Condition:**
  A large vacuum leak has been detected or both of the TP Sensors have failed based on their position being 2.5 volts and the calculated MAP value is less than the actual MAP minus an Offset value. One trip fault and the code will set within 5 seconds. ETC light will flash.

Possible Causes
VACUUM LEAK
RESISTANCE IN THE (F856) 5-VOLT SUPPLY CIRCUIT
(F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
RESISTANCE IN THE (K1) MAP SIGNAL CIRCUIT
(K1) MAP SIGNAL CIRCUIT SHORTED TO GROUND
RESISTANCE IN THE (K900) SENSOR GROUND CIRCUIT
RESISTANCE IN THE (F855) 5-VOLT SUPPLY CIRCUIT
(F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
RESISTANCE IN THE TP SENSOR SIGNAL CIRCUIT
TP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
RESISTANCE IN THE (K922) TP SENSOR RETURN CIRCUIT
MAP SENSOR
TP SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: The most likely cause of this DTC is a vacuum leak.

NOTE: Diagnose any 5-Volt Supply, TP Sensor, Fuel System Lean or Rich, or MAP Sensor DTCs before continuing.

NOTE: The throttle plate should be free from binding and carbon build up.

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2172-HIGH AIRFLOW/VACUUM LEAK DETECTED (INSTANTANEOUS ACCUMULATION) (CONTINUED)

2. VACUUM LEAK

NOTE: This code is enabled on engines with a plastic intake manifold and is intended to limit the maximum engine speed if a large crack occurs.

NOTE: A large vacuum leak is most likely the cause of this DTC.

Inspect the Intake Manifold and Throttle body for leaks and cracks.

Inspect the Power Brake Booster for any vacuum leaks.

Inspect the PCV system for proper operation or any vacuum leaks.

Inspect the MAP Sensor for proper installation.

Were any vacuum leaks found?

Yes >> Repair the vacuum leak as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

---

3. MAP SENSOR OPERATION

Start the engine.

With a scan tool, monitor the MAP Sensor voltage.

Snap the Accelerator pedal.

Does the MAP Sensor voltage vary from below 2.0 volts at idle to above 3.5 volts at Wide Open Throttle?

Yes >> Go To 4

No >> Go To 11

---

4. TP SENSOR OPERATION

Ignition on, engine not running.

With a scan tool, perform the Throttle Follower Test.

TP Sensor No.1 should start at approximately 0.8 of a volt and increase to 4.2 volts.

TP Sensor No.2 should start at approximately 4.2 volts and decrease to 0.8 of a volt.

Is the voltage transition smooth between the appropriate values?

Yes >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

P2172-HIGH AIRFLOW/VACUUM LEAK DETECTED (INSTANTANEOUS ACCUMULATION) (CONTINUED)

5. RESISTANCE IN THE (F855) 5-VOLT SUPPLY CIRCUIT

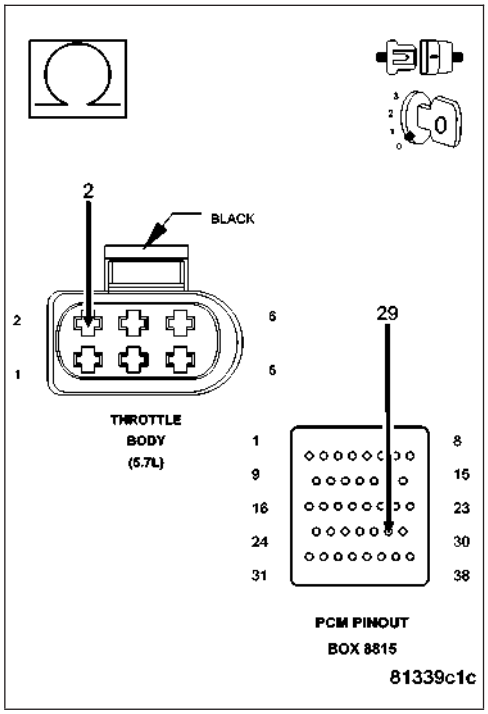
Turn the ignition off.

Disconnect the Throttle Body harness connector.

Disconnect the C2 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (F855) 5-volt Supply circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.



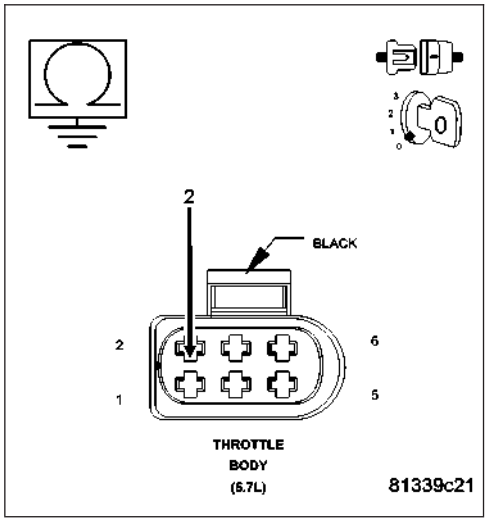
Is the resistance above 100 ohms?

Yes >> Go To 6

No >> Repair the excessive resistance in the (F855) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

6. (F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and (F855) 5-volt Supply circuit between the appropriate terminals of special tool #8815.



Is the resistance above 100 ohms?

Yes >> Go To 7

No >> Repair the short to ground in the (F855) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2172-HIGH AIRFLOW/VACUUM LEAK DETECTED (INSTANTANEOUS ACCUMULATION) (CONTINUED)

7. TP SENSOR

Connect the C2 PCM harness connector.

Ignition on, engine not running.

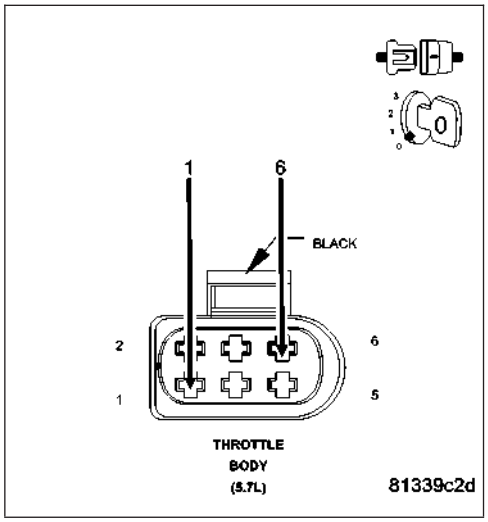
With a scan tool, monitor the TP Sensor voltage.

Connect a jumper wire between the (K22) TP Sensor No.1 Signal circuit and the (K922) Sensor Return circuit in the Throttle Body harness connector.

TP Sensor No.1 voltage should start at approximately 4.8 volts and decrease to 0.2 of a volt.

Connect a jumper wire between the (K122) TP Sensor No.2 Signal circuit and the (F855) 5-volt Supply circuit in the Throttle Body harness connector.

TP Sensor No.2 voltage should start at approximately 0 volts and increase to 4.8 to 5.2 volts.

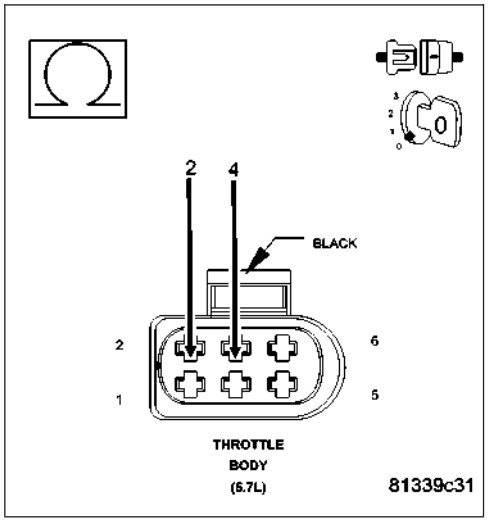


Does the TP Sensor voltage change to the appropriate voltage with the jumper wire installed?

Yes >> Disconnect the Battery before replacing the Throttle Body Assembly. Replace the Throttle Body Assembly. After installation is complete, use a scan tool and select the ETC RELEARN function

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8



P2172-HIGH AIRFLOW/VACUUM LEAK DETECTED (INSTANTANEOUS ACCUMULATION) (CONTINUED)

8. RESISTANCE IN THE TP SENSOR SIGNAL CIRCUIT

Turn the ignition off.

Disconnect the C2 PCM harness connector.

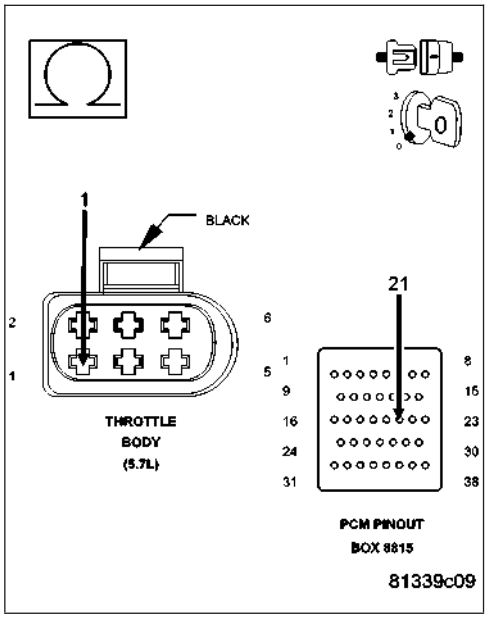
Measure the resistance of the (K22) and (K122) TP Signal circuits from the Throttle Body harness connector to the appropriate terminals of special tool #8815.

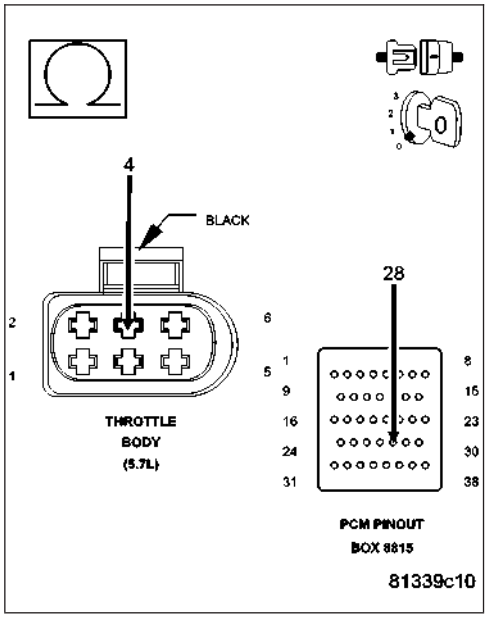
Is the resistance below 5.0 ohms for each circuit?

Yes >> Go To 9

No >> Repair the excessive resistance in the (K22) or (K122) TP Sensor Signal circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)





P2172-HIGH AIRFLOW/VACUUM LEAK DETECTED (INSTANTANEOUS ACCUMULATION) (CONTINUED)

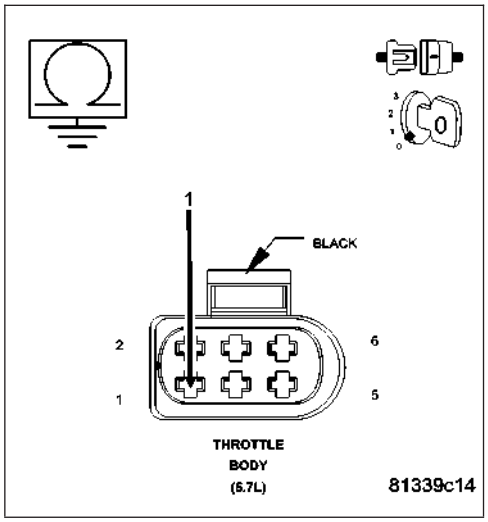
9. TP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND

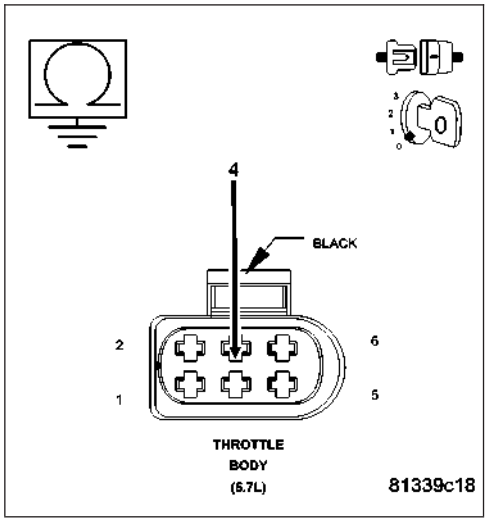
Measure the resistance between ground and the (K22) and (K122) TP Signal circuits at the appropriate terminals of special tool #8815.

Is the resistance above 100 ohms for each circuit?

Yes >> Go To 10

No >> Repair the short to ground in the (K22) or (K122) TP Sensor Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

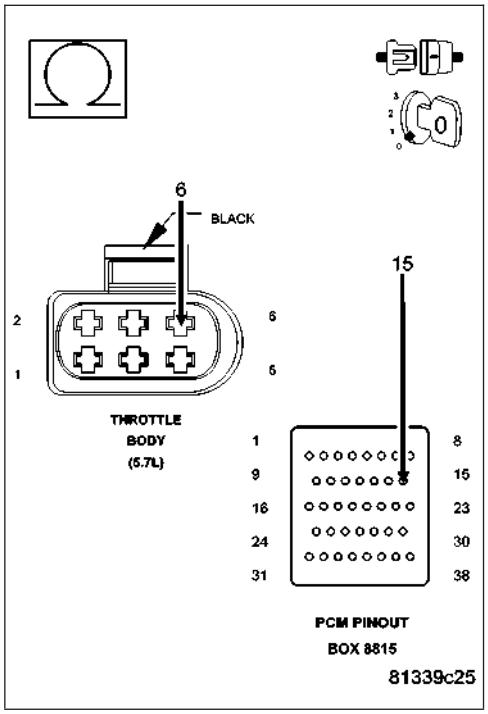




P2172-HIGH AIRFLOW/VACUUM LEAK DETECTED (INSTANTANEOUS ACCUMULATION) (CONTINUED)

10. RESISTANCE IN THE (K922) SENSOR RETURN CIRCUIT

Measure the resistance of the (K922) Sensor Return circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 17

No >> Repair the excessive resistance in the (K922) Sensor Return circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

11. RESISTANCE IN THE (F856) 5-VOLT SUPPLY CIRCUIT

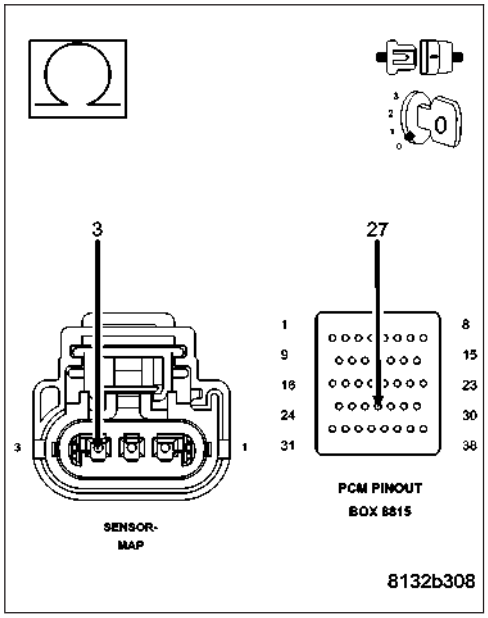
Turn the ignition off.

Disconnect the MAP Sensor harness connector.

Disconnect the C1 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (F856) 5-volt Supply circuit from the MAP Sensor harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

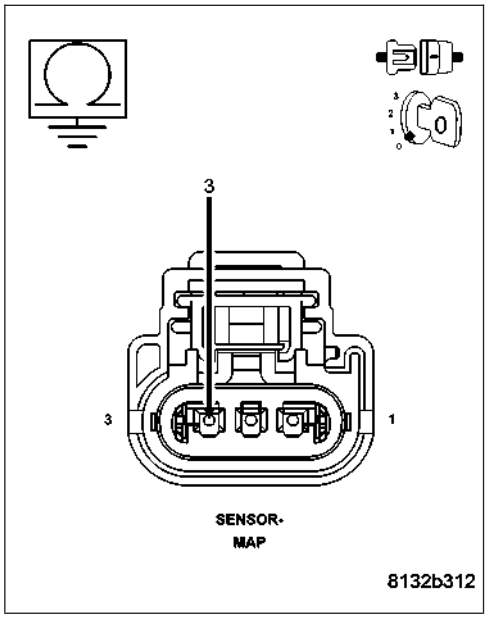
Yes >> Go To 12

No >> Repair the excessive resistance in the (F856) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2172-HIGH AIRFLOW/VACUUM LEAK DETECTED (INSTANTANEOUS ACCUMULATION) (CONTINUED)

12. (F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (F856) 5-volt Supply circuit in the MAP Sensor harness connector.



Is the resistance above 100k ohms?

Yes >> Go To 13

No >> Repair the short to ground in the (F856) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

13. MAP SENSOR

Connect the C1 PCM harness connector.

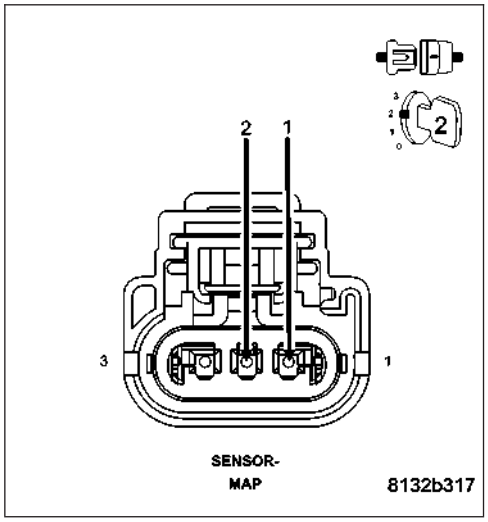
Ignition on, engine not running.

With a scan tool, monitor the MAP Sensor voltage.

Connect a jumper wire between the (K1) MAP Signal circuit and the (K900) Sensor ground circuit in the MAP Sensor harness connector.

Cycle the ignition switch from off to on.

With a scan tool, monitor the MAP Sensor voltage.



Does the scan tool display MAP voltage from approximately 4.9 volts to below 0.5 volt with the jumper wire installed?

Yes >> Replace the MAP Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 14

NOTE: Remove the jumper wire before continuing.

P2172-HIGH AIRFLOW/VACUUM LEAK DETECTED (INSTANTANEOUS ACCUMULATION) (CONTINUED)

14. RESISTANCE IN THE (K1) MAP SIGNAL CIRCUIT

Turn the ignition off.

Disconnect the C2 PCM harness connector.

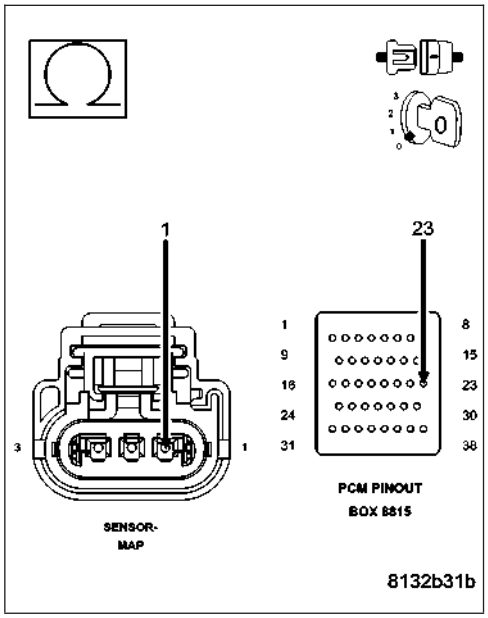
Measure the resistance of the (K1) MAP Signal circuit from the MAP Sensor harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 15

No >> Repair the excessive resistance in the (K1) MAP Signal circuit

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



15. (K1) MAP SIGNAL CIRCUIT SHORTED TO GROUND

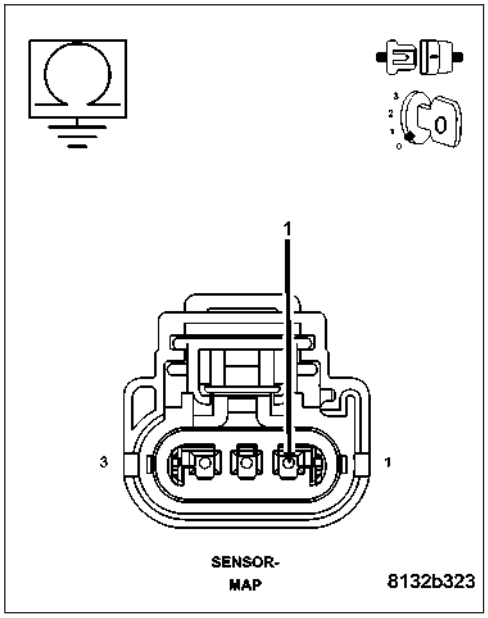
Measure the resistance between ground and the (K1) MAP Signal circuit in the MAP Sensor harness connector.

Is the resistance above 100k ohms?

Yes >> Go To 16

No >> Repair the short to ground in the (K1) MAP Signal circuit.

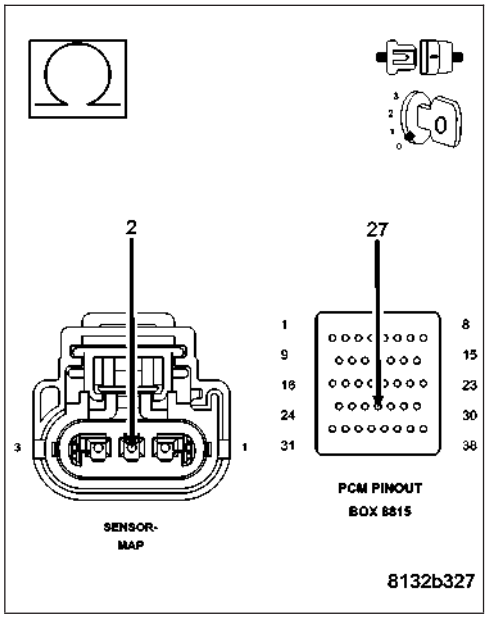
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P2172-HIGH AIRFLOW/VACUUM LEAK DETECTED (INSTANTANEOUS ACCUMULATION) (CONTINUED)

16. RESISTANCE IN THE (K900) SENSOR GROUND CIRCUIT

Measure the resistance of the (K900) Sensor ground circuit from the MAP Sensor harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 17

No >> Repair the excessive resistance in the (K900) Sensor ground circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

17. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

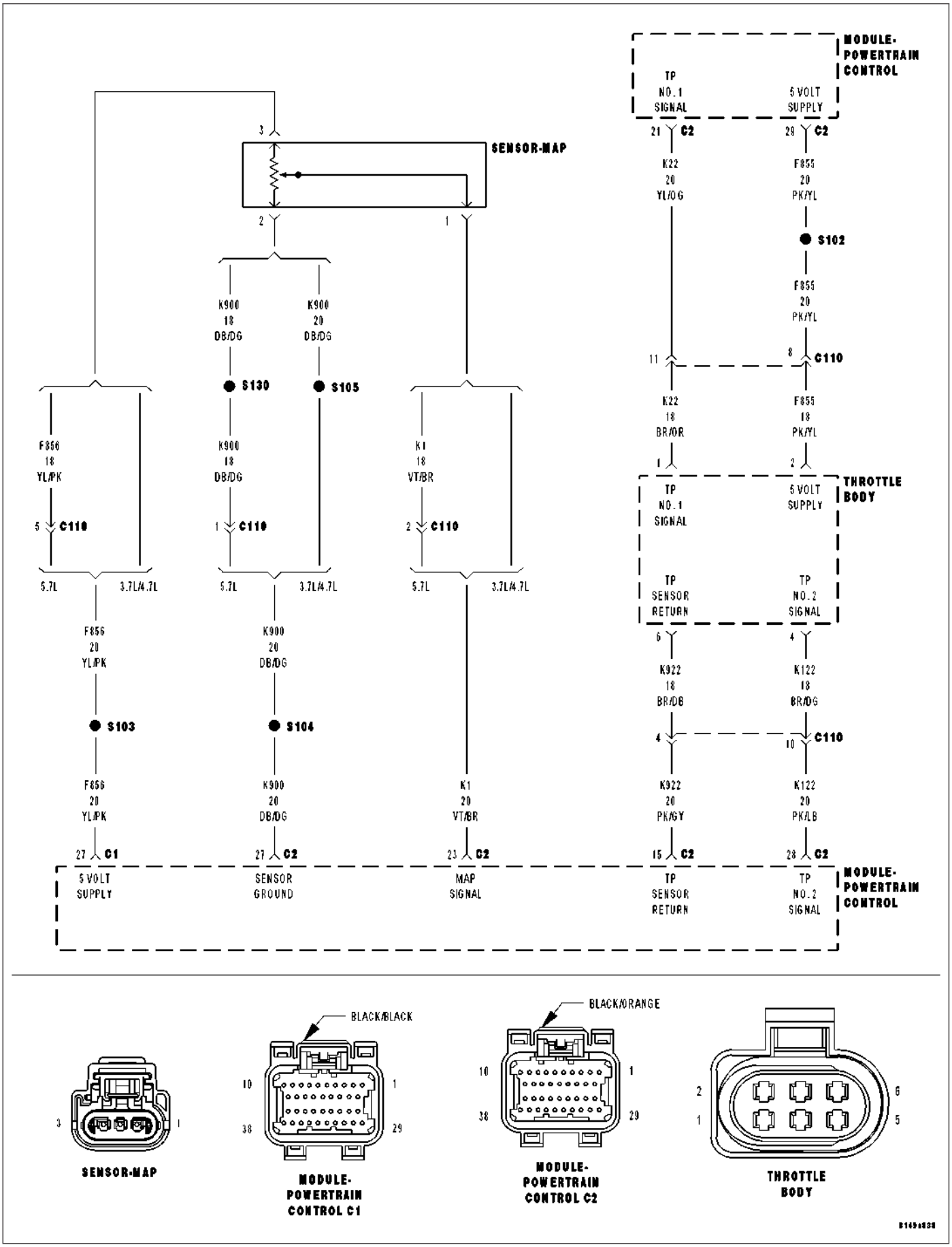
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2173-HIGH AIRFLOW/VACUUM LEAK DETECTED (SLOW ACCUMULATION)



P2173-HIGH AIRFLOW/VACUUM LEAK DETECTED (SLOW ACCUMULATION) (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on and engine running with no MAP Sensor DTCs.
- **Set Condition:**
  A large vacuum leak has been detected or both of the TP Sensors have failed based on their position being 2.5 volts and the calculated MAP value is less than the Gas Flow Adaptation value is too high. One trip fault the code will set within 5 seconds. ETC light will flash.

Possible Causes
VACUUM LEAK
RESISTANCE IN THE (F856) 5-VOLT SUPPLY CIRCUIT
(F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
RESISTANCE IN THE (K1) MAP SIGNAL CIRCUIT
(K1) MAP SIGNAL CIRCUIT SHORTED TO GROUND
RESISTANCE IN THE (K900) SENSOR GROUND CIRCUIT
RESISTANCE IN THE (F855) 5-VOLT SUPPLY CIRCUIT
(F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
RESISTANCE IN THE TP SENSOR SIGNAL CIRCUIT
TP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
RESISTANCE IN THE (K922) TP SENSOR RETURN CIRCUIT
MAP SENSOR
TP SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: The most likely cause of this DTC is a vacuum leak.

NOTE: Diagnose any 5-Volt Supply, TP Sensor, Oxygen Sensor, Fuel related, or MAP Sensor DTCs before continuing.

NOTE: The throttle plate should be free from binding and carbon build up.

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2173-HIGH AIRFLOW/VACUUM LEAK DETECTED (SLOW ACCUMULATION) (CONTINUED)

2. VACUUM LEAK

NOTE: This code is enabled on engines with a plastic intake manifold and is intended to limit the maximum engine speed if a large crack occurs.

NOTE: A large vacuum leak is most likely the cause of this DTC.

Inspect the Intake Manifold and Throttle body for leaks and cracks.

Inspect the Power Brake Booster for any vacuum leaks.

Inspect the PCV system for proper operation or any vacuum leaks.

Inspect the MAP Sensor for proper installation.

Were any vacuum leaks found?

Yes >> Repair the vacuum leak as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

---

3. MAP SENSOR OPERATION

Start the engine.

With a scan tool, monitor the MAP Sensor voltage.

Snap the Accelerator pedal.

Does the MAP Sensor voltage vary from below 2.0 volts at idle to above 3.5 volts at Wide Open Throttle?

Yes >> Go To 4

No >> Go To 11

---

4. TP SENSOR OPERATION

Ignition on, engine not running.

With a scan tool, perform the Throttle Follower Test.

TP Sensor No.1 should start at approximately 0.8 of a volt and increase to 4.2 volts.

TP Sensor No.2 should start at approximately 4.2 volts and decrease to 0.8 of a volt.

Is the voltage transition smooth between the appropriate values?

Yes >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

P2173-HIGH AIRFLOW/VACUUM LEAK DETECTED (SLOW ACCUMULATION) (CONTINUED)

5. RESISTANCE IN THE (F855) 5-VOLT SUPPLY CIRCUIT

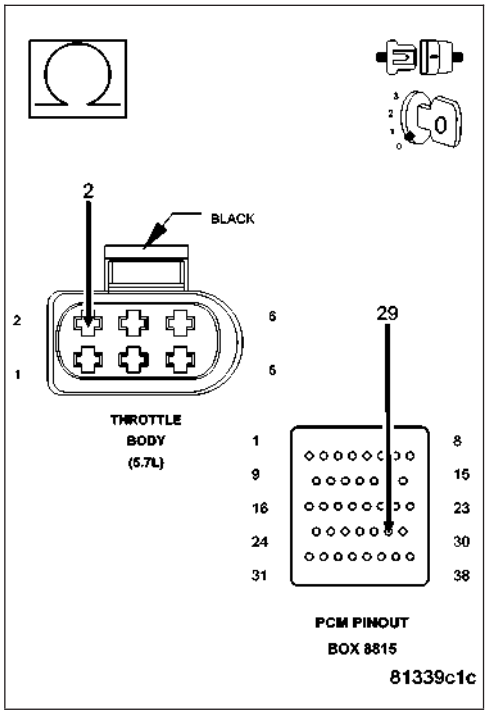
Turn the ignition off.

Disconnect the Throttle Body harness connector.

Disconnect the C2 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (F855) 5-volt Supply circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.



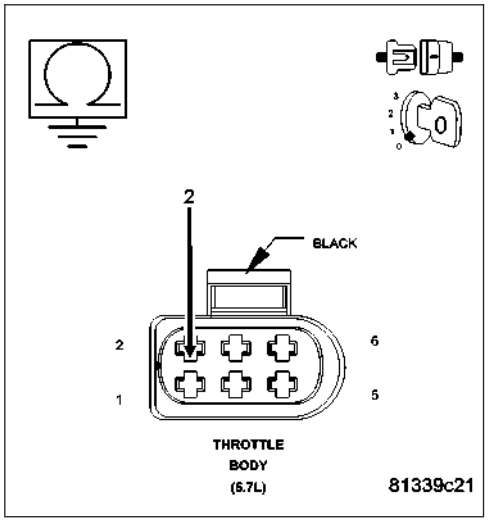
Is the resistance below 100 ohms?

Yes >> Go To 6

No >> Repair the excessive resistance in the (F855) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

6. (F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and (F855) 5-volt Supply circuit between the appropriate terminals of special tool #8815.



Is the resistance above 100 ohms?

Yes >> Go To 7

No >> Repair the short to ground in the (F855) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2173-HIGH AIRFLOW/VACUUM LEAK DETECTED (SLOW ACCUMULATION) (CONTINUED)

7. TP SENSOR

Connect the C2 PCM harness connector.

Ignition on, engine not running.

With a scan tool, monitor the TP Sensor voltage.

Connect a jumper wire between the (K22) TP Sensor No.1 Signal circuit and the (K922) Sensor Return circuit in the Throttle Body harness connector.

TP Sensor No.1 voltage should start at approximately 4.8 volts and decrease to 0.2 of a volt.

Connect a jumper wire between the (K122) TP Sensor No.2 Signal circuit and the (F855) 5-volt Supply circuit in the Throttle Body harness connector.

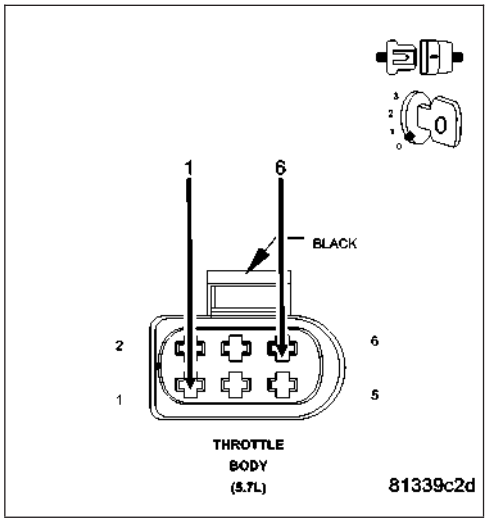
TP Sensor No.2 voltage should start at approximately 0 volts and increase to 4.8 to 5.2 volts.

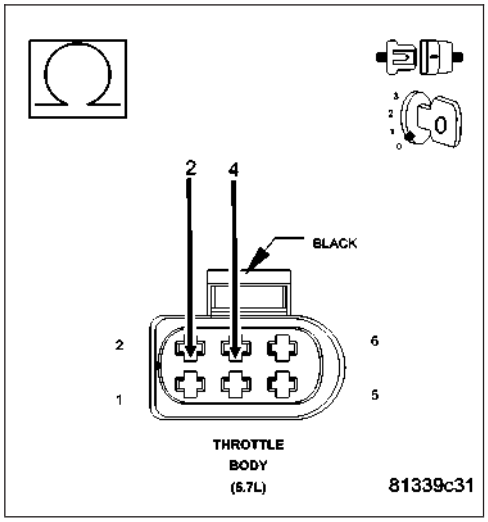
Does the TP Sensor voltage change to the appropriate voltage with the jumper wire installed?

Yes >> Disconnect the Battery before replacing the Throttle Body Assembly. Replace the Throttle Body Assembly. After installation is complete, use a scan tool and select the ETC RELEARN function

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8





P2173-HIGH AIRFLOW/VACUUM LEAK DETECTED (SLOW ACCUMULATION) (CONTINUED)

8. RESISTANCE IN THE TP SENSOR SIGNAL CIRCUIT

Turn the ignition off.

Disconnect the C2 PCM harness connector.

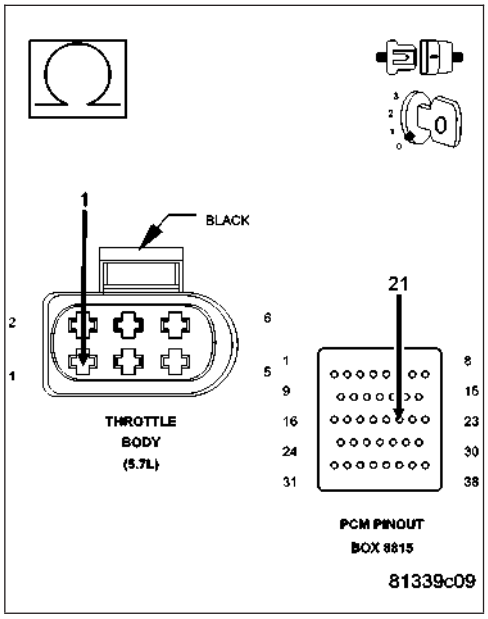
Measure the resistance of the (K22) and (K122) TP Signal circuits from the Throttle Body harness connector to the appropriate terminals of special tool #8815.

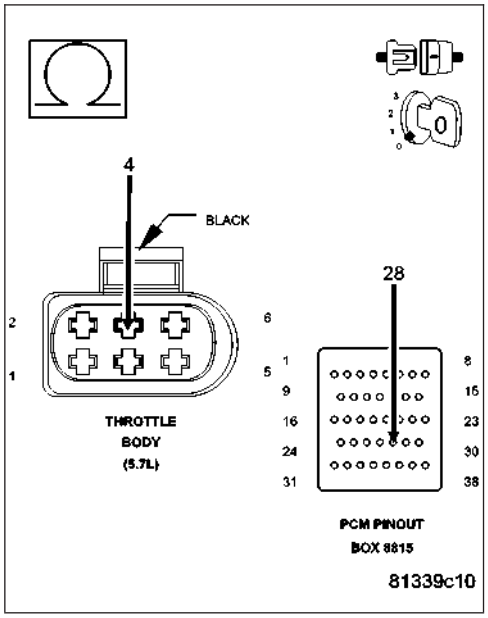
Is the resistance below 5.0 ohms for each circuit?

Yes >> Go To 9

No >> Repair the excessive resistance in the (K22) or (K122) TP Sensor Signal circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)





P2173-HIGH AIRFLOW/VACUUM LEAK DETECTED (SLOW ACCUMULATION) (CONTINUED)

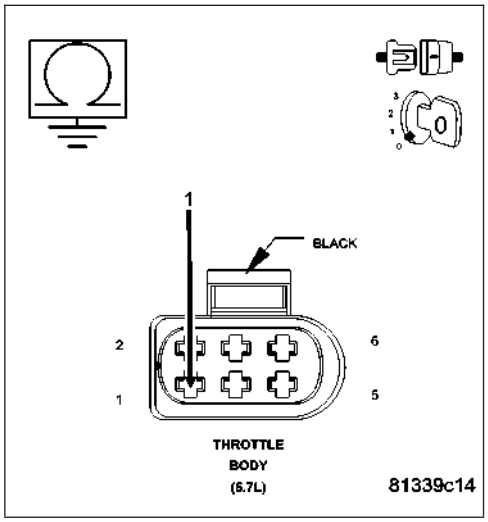
9. TP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND

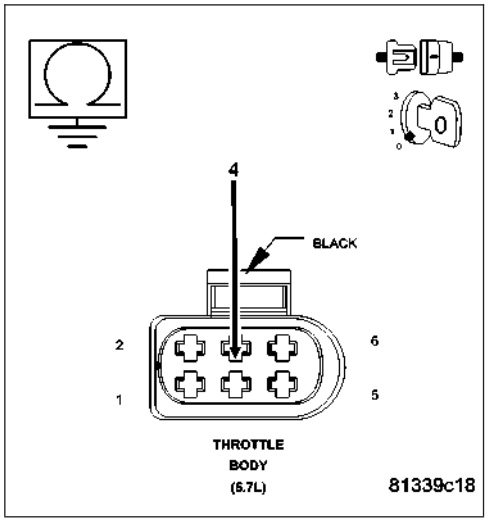
Measure the resistance between ground and the (K22) and (K122) TP Signal circuits at the appropriate terminals of special tool #8815.

Is the resistance above 100k ohms for each circuit?

Yes >> Go To 10

No >> Repair the short to ground in the (K22) or (K122) TP Sensor Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

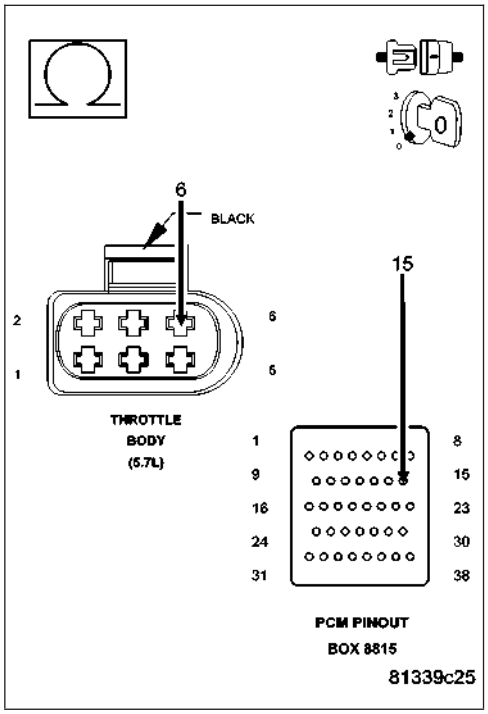




P2173-HIGH AIRFLOW/VACUUM LEAK DETECTED (SLOW ACCUMULATION) (CONTINUED)

10. RESISTANCE IN THE (K922) SENSOR RETURN CIRCUIT

Measure the resistance of the (K922) Sensor Return circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 17

No >> Repair the excessive resistance in the (K922) Sensor Return circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

11. RESISTANCE IN THE (F856) 5-VOLT SUPPLY CIRCUIT

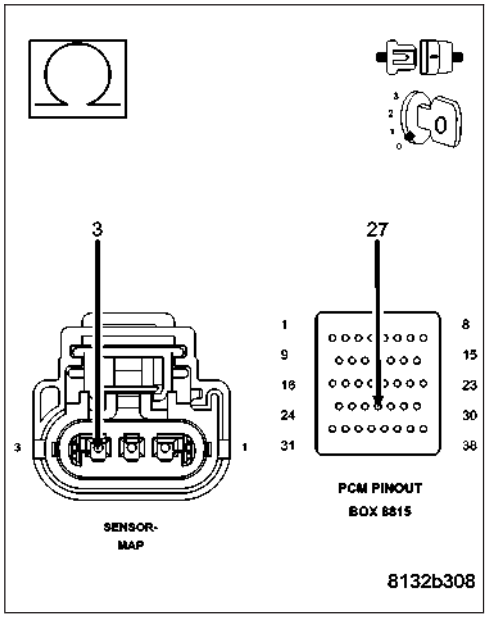
Turn the ignition off.

Disconnect the MAP Sensor harness connector.

Disconnect the C1 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (F856) 5-volt Supply circuit from the MAP Sensor harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

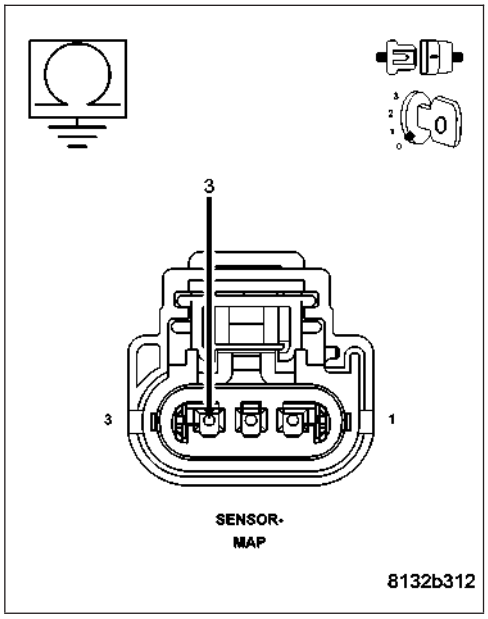
Yes >> Go To 12

No >> Repair the excessive resistance in the (F856) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2173-HIGH AIRFLOW/VACUUM LEAK DETECTED (SLOW ACCUMULATION) (CONTINUED)

12. (F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (F856) 5-volt Supply circuit in the MAP Sensor harness connector.



Is the resistance above 100k ohms?

Yes >> Go To 13

No >> Repair the short to ground in the (F856) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

13. MAP SENSOR

Connect the C1 PCM harness connector.

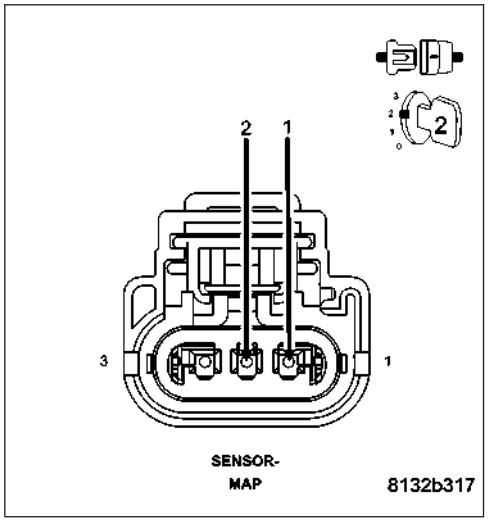
Ignition on, engine not running.

With a scan tool, monitor the MAP Sensor voltage.

Connect a jumper wire between the (K1) MAP Signal circuit and the (K900) Sensor ground circuit in the MAP Sensor harness connector.

Cycle the ignition switch from off to on.

With a scan tool, monitor the MAP Sensor voltage.



Does the scan tool display MAP voltage from approximately 4.9 volts to below 0.5 volt with the jumper wire installed?

Yes >> Replace the MAP Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 14

NOTE: Remove the jumper wire before continuing.

P2173-HIGH AIRFLOW/VACUUM LEAK DETECTED (SLOW ACCUMULATION) (CONTINUED)

14. RESISTANCE IN THE (K1) MAP SIGNAL CIRCUIT

Turn the ignition off.

Disconnect the C2 PCM harness connector.

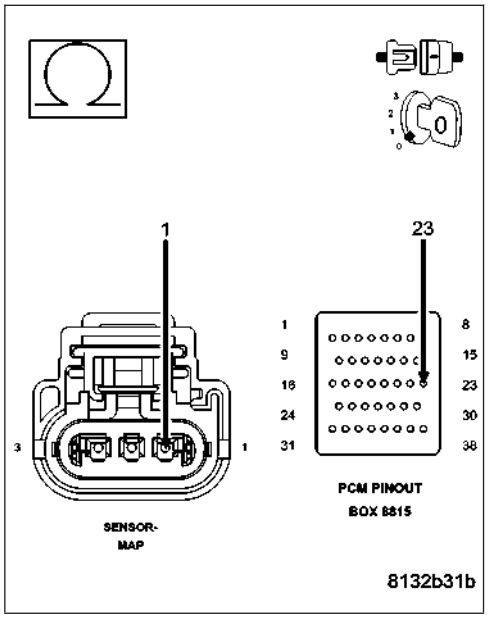
Measure the resistance of the (K1) MAP Signal circuit from the MAP Sensor harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 15

No >> Repair the excessive resistance in the (K1) MAP Signal circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



15. (K1) MAP SIGNAL CIRCUIT SHORTED TO GROUND

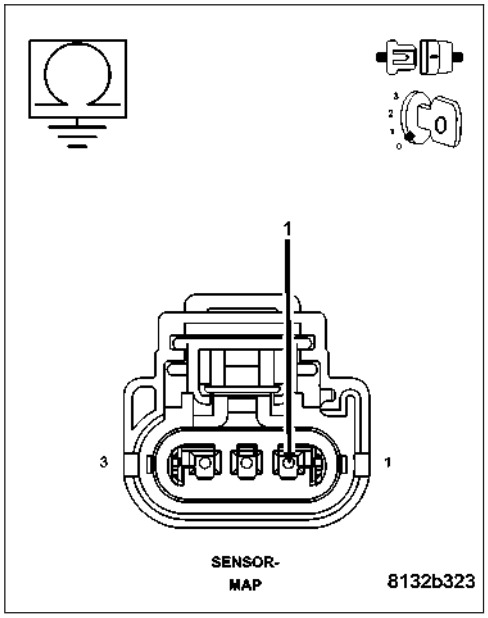
Measure the resistance between ground and the (K1) MAP Signal circuit at the MAP Sensor harness connector.

Is the resistance above 100k ohms?

Yes >> Go To 16

No >> Repair the short to ground in the (K1) MAP Signal circuit.

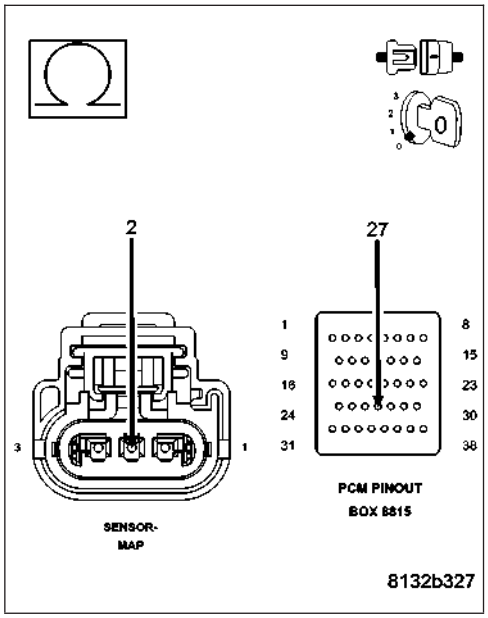
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P2173-HIGH AIRFLOW/VACUUM LEAK DETECTED (SLOW ACCUMULATION) (CONTINUED)

16. RESISTANCE IN THE (K900) SENSOR GROUND CIRCUIT

Measure the resistance of the (K900) Sensor ground circuit from the MAP Sensor harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 17

No >> Repair the excessive resistance in the (K900) Sensor ground circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

17. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

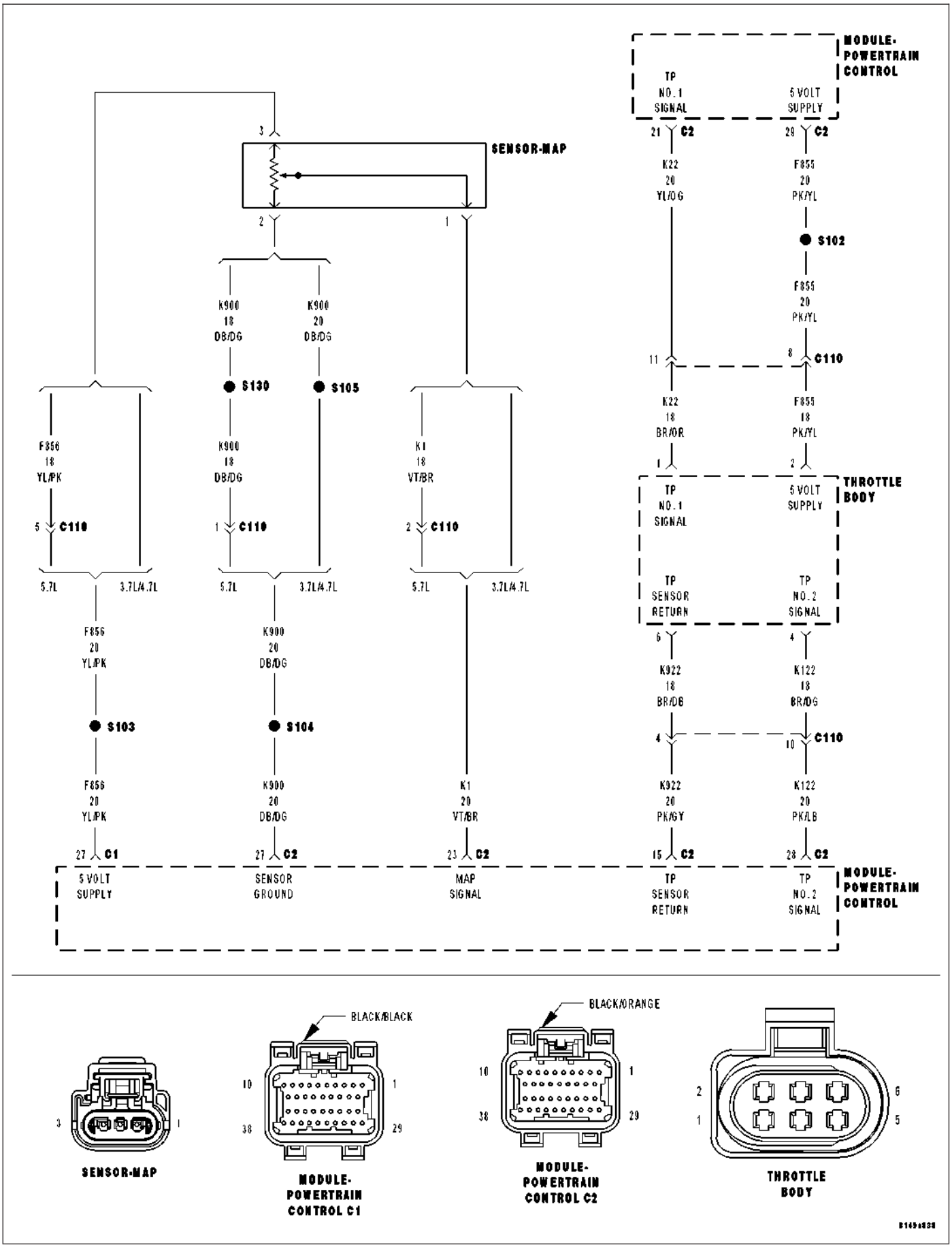
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2174-LOW AIRFLOW/RESTRICTION DETECTED (INSTANTANEOUS ACCUMULATION)



SENSOR-MAP

MODULE-POWERTRAIN CONTROL C1

MODULE-POWERTRAIN CONTROL C2

THROTTLE BODY

P2174-LOW AIRFLOW/RESTRICTION DETECTED (INSTANTANEOUS ACCUMULATION) (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on and engine running with no MAP Sensor DTCs.
- **Set Condition:**
  PCM calculated MAP value is greater than actual MAP value plus an offset value. One trip fault. Three good trips to turn of the mil. ETC light will flash.

Possible Causes
RESTRICTED AIR INLET SYSTEM
RESISTANCE IN THE (F856) 5-VOLT SUPPLY CIRCUIT
(F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
RESISTANCE IN THE (K1) MAP SIGNAL CIRCUIT
(K1) MAP SIGNAL CIRCUIT SHORTED TO GROUND
RESISTANCE IN THE (K900) SENSOR GROUND CIRCUIT
RESISTANCE IN THE (F855) 5-VOLT SUPPLY CIRCUIT
(F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
RESISTANCE IN THE TP SENSOR SIGNAL CIRCUIT
TP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
RESISTANCE IN THE (K922) TP SENSOR RETURN CIRCUIT
MAP SENSOR
TP SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: The most likely cause of this DTC is a plugged intake air system or dirty Throttle Body. Check for any TSB's before continuing.

NOTE: Diagnose any 5-Volt Supply, TP Sensor, Fuel System Lean or Rich, or MAP Sensor DTCs before continuing.

NOTE: The throttle plate should be free from binding and carbon build up.

NOTE: Question the customer about weather conditions, as ICE build up on the blade can cause this fault when ambient is around +4 to -10 Celsius range.

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2174-LOW AIRFLOW/RESTRICTION DETECTED (INSTANTANEOUS ACCUMULATION) (CONTINUED)

2. RESTRICTED AIR INLET SYSTEM

Turn the ignition off.
Remove the Air Cleaner Assembly.
Remove the Air Filter.
Inspect the Throttle Body opening for signs of any foreign materials.
Check the intake tube / aircleaner for obstructions - include snow packing questions to customer.

Were any restrictions found?

Yes >> Repair the restriction as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

---

3. MAP SENSOR OPERATION

Start the engine.
With a scan tool, monitor the MAP Sensor voltage.
Snap the Accelerator pedal.

Does the MAP Sensor voltage vary from below 2.0 volts at idle to above 3.5 volts at Wide Open Throttle?

Yes >> Go To 4

No >> Go To 11

---

4. TP SENSOR OPERATION

Ignition on, engine not running.
With a scan tool, perform the Throttle Follower Test.
TP Sensor No.1 should start at approximately 0.8 of a volt and increase to 4.2 volts.
TP Sensor No.2 should start at approximately 4.2 volts and decrease to 0.8 of a volt.

Is the voltage transition smooth between the appropriate values?

Yes >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

P2174-LOW AIRFLOW/RESTRICTION DETECTED (INSTANTANEOUS ACCUMULATION) (CONTINUED)

5. RESISTANCE IN THE (F855) 5-VOLT SUPPLY CIRCUIT

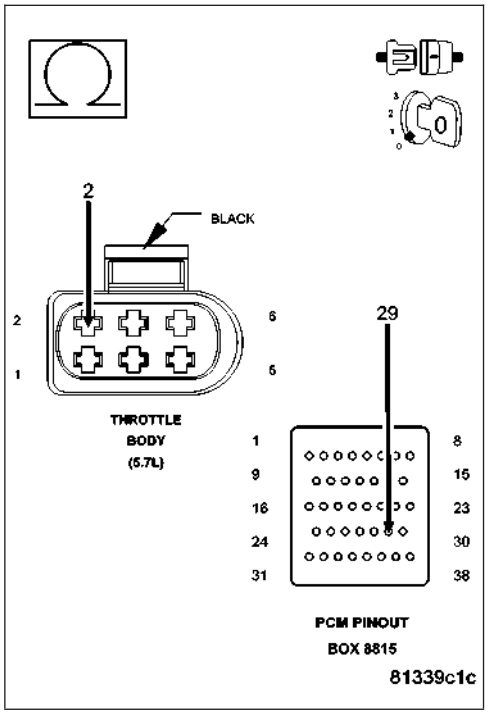
Turn the ignition off.

Disconnect the Throttle Body harness connector.

Disconnect the C2 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (F855) 5-volt Supply circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.



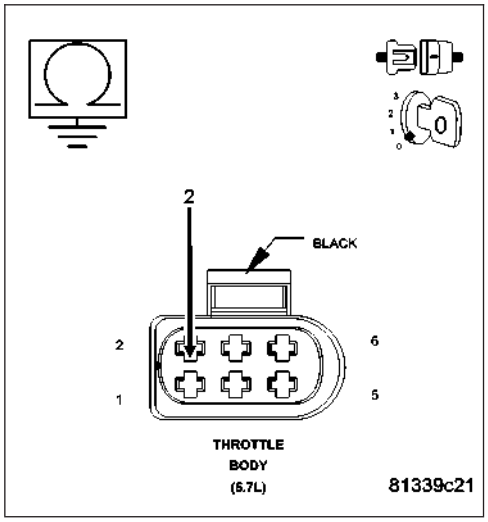
Is the resistance below 100 ohms?

Yes >> Go To 6

No >> Repair the excessive resistance in the (F855) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

6. (F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and (F855) 5-volt Supply circuit between the appropriate terminals of special tool #8815.



Is the resistance above 100k ohms?

Yes >> Go To 7

No >> Repair the short to ground in the (F855) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2174-LOW AIRFLOW/RESTRICTION DETECTED (INSTANTANEOUS ACCUMULATION) (CONTINUED)

7. TP SENSOR

Connect the PCM harness connectors.

Ignition on, engine not running.

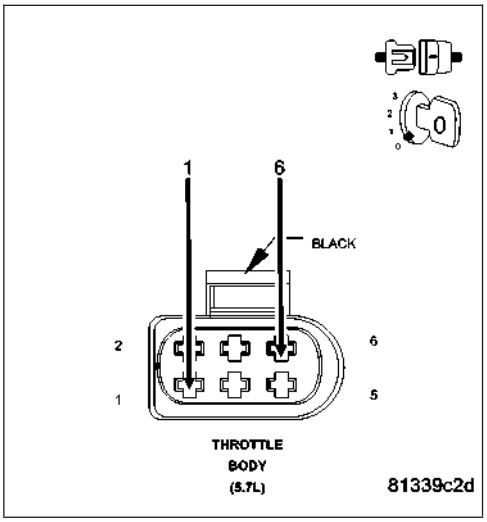
With a scan tool, monitor the TP Sensor voltage.

Connect a jumper wire between the (K22) TP Sensor No.1 Signal circuit and the (K922) Sensor Return circuit in the Throttle Body harness connector.

TP Sensor No.1 voltage should start at approximately 4.8 volts and decrease to 0.2 of a volt.

Connect a jumper wire between the (K122) TP Sensor No.2 Signal circuit and the (F855) 5-volt Supply circuit in the Throttle Body harness connector.

TP Sensor No.2 voltage should start at approximately 0 volts and increase to 4.8 to 5.2 volts.

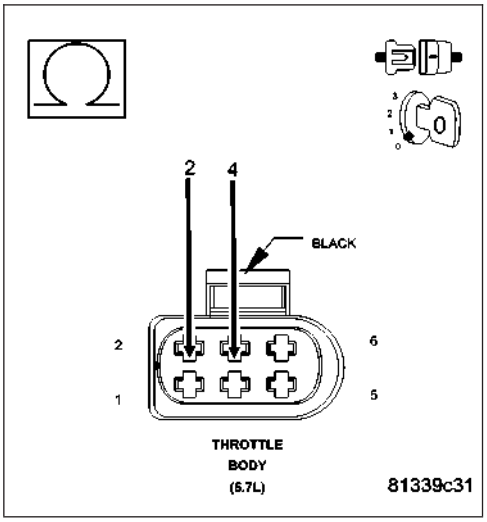


Does the TP Sensor voltage change to the appropriate voltage with the jumper wire installed?

Yes >> Disconnect the Battery before replacing the Throttle Body Assembly. Replace the Throttle Body Assembly. After installation is complete, use a scan tool and select the ETC RELEARN function

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8



P2174-LOW AIRFLOW/RESTRICTION DETECTED (INSTANTANEOUS ACCUMULATION) (CONTINUED)

8. RESISTANCE IN THE TP SENSOR SIGNAL CIRCUIT

Turn the ignition off.

Disconnect the C2 PCM harness connector.

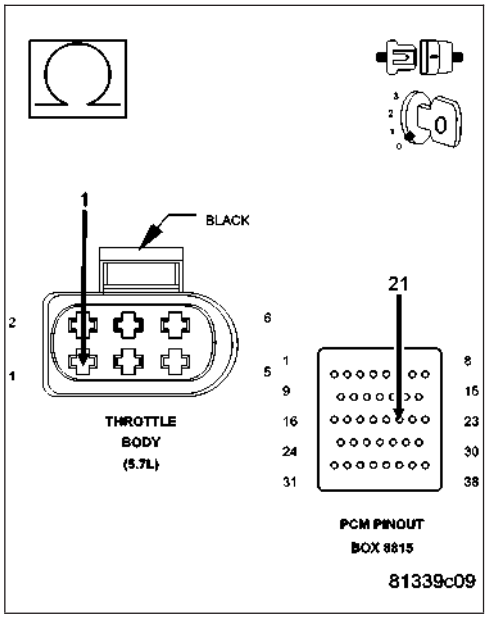
Measure the resistance of the (K22) and (K122) TP Signal circuits from the Throttle Body harness connector to the appropriate terminals of special tool #8815.

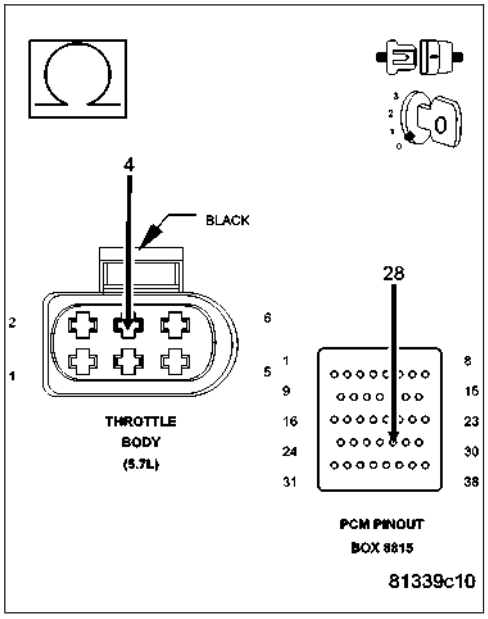
Is the resistance below 5.0 ohms for each circuit?

Yes >> Go To 9

No >> Repair the excessive resistance in the (K22) or (K122) TP Sensor Signal circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)





P2174-LOW AIRFLOW/RESTRICTION DETECTED (INSTANTANEOUS ACCUMULATION) (CONTINUED)

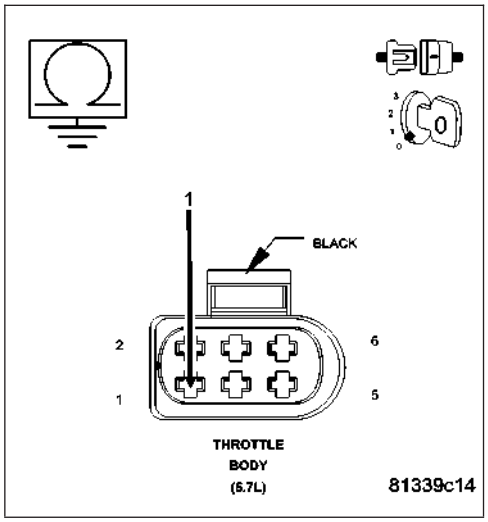
9. TP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND

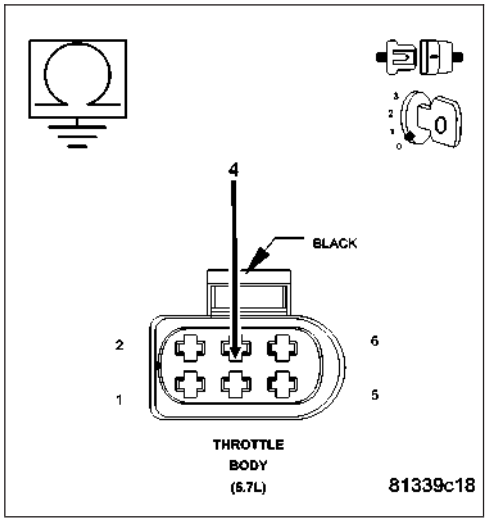
Measure the resistance between ground and the (K22) and (K122) TP Signal circuits at the appropriate terminals of special tool #8815.

Is the resistance above 100k ohms for each circuit?

Yes >> Go To 10

No >> Repair the short to ground in the (K22) or (K122) TP Sensor Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

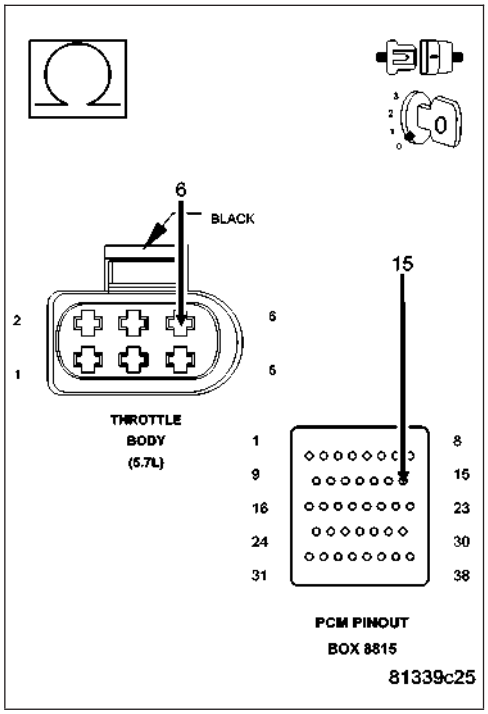




P2174-LOW AIRFLOW/RESTRICTION DETECTED (INSTANTANEOUS ACCUMULATION) (CONTINUED)

10. RESISTANCE IN THE (K922) SENSOR RETURN CIRCUIT

Measure the resistance of the (K922) Sensor Return circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 17

No >> Repair the excessive resistance in the (K922) Sensor Return circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

11. RESISTANCE IN THE (F856) 5-VOLT SUPPLY CIRCUIT

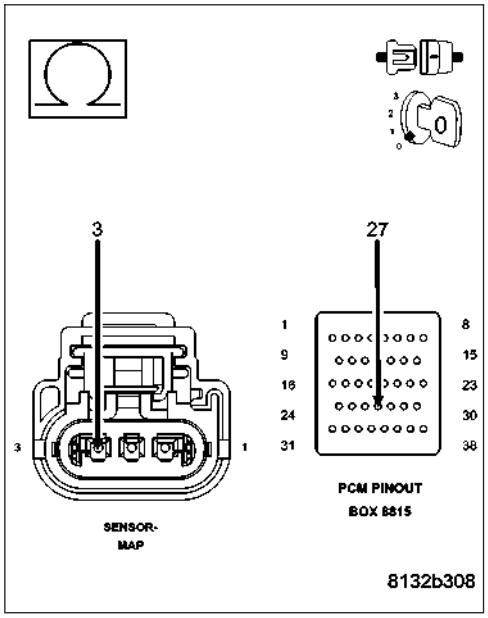
Turn the ignition off.

Disconnect the MAP Sensor harness connector.

Disconnect the C1 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (F856) 5-volt Supply circuit from the MAP Sensor harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

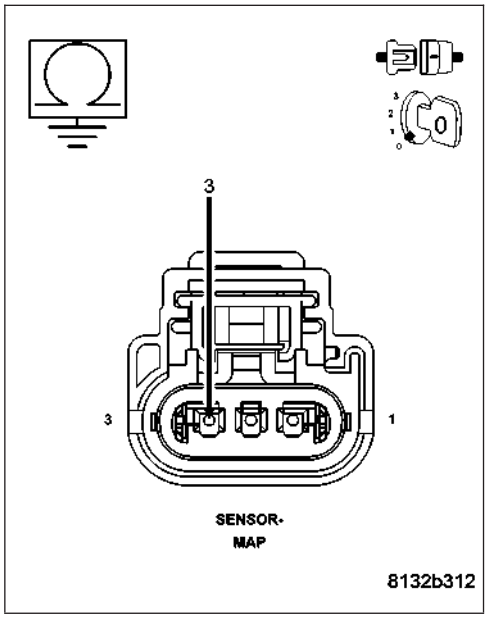
Yes >> Go To 12

No >> Repair the excessive resistance in the (F856) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2174-LOW AIRFLOW/RESTRICTION DETECTED (INSTANTANEOUS ACCUMULATION) (CONTINUED)

12. (F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (F856) 5-volt Supply circuit in the MAP Sensor harness connector.



Is the resistance above 100k ohms?

Yes >> Go To 13

No >> Repair the short to ground in the (F856) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

13. MAP SENSOR

Connect the PCM harness connectors.

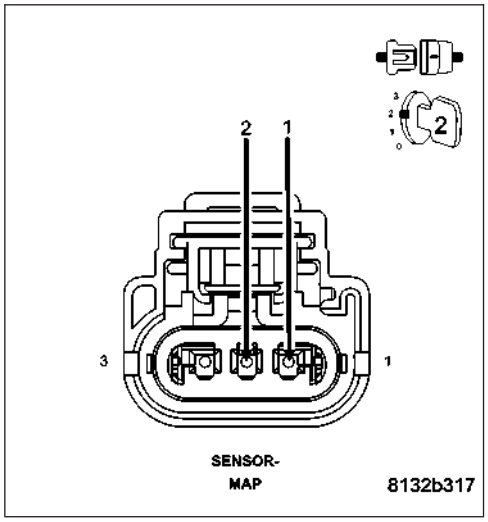
Ignition on, engine not running.

With a scan tool, monitor the MAP Sensor voltage.

Connect a jumper wire between the (K1) MAP Signal circuit and the (K900) Sensor ground circuit.

Cycle the ignition switch from off to on.

With a scan tool, monitor the MAP Sensor voltage.



Does the scan tool display MAP voltage from approximately 4.9 volts to below 0.5 volt with the jumper wire installed?

Yes >> Replace the MAP Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 14

NOTE: Remove the jumper wire before continuing.

P2174-LOW AIRFLOW/RESTRICTION DETECTED (INSTANTANEOUS ACCUMULATION) (CONTINUED)

14. RESISTANCE IN THE (K1) MAP SIGNAL CIRCUIT

Turn the ignition off.

Disconnect the C2 PCM harness connector.

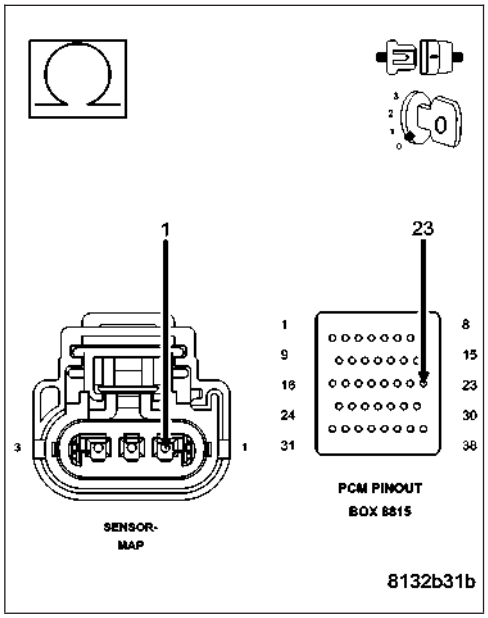
Measure the resistance of the (K1) MAP Signal circuit from the MAP Sensor harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 15

No >> Repair the excessive resistance in the (K1) MAP Signal circuit

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



15. (K1) MAP SIGNAL CIRCUIT SHORTED TO GROUND

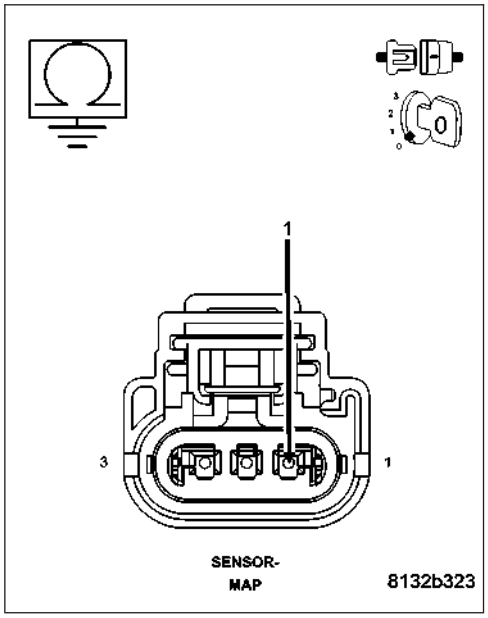
Measure the resistance between ground and the (K1) MAP Signal circuit in the MAP Sensor harness connector.

Is the resistance above 100k ohms?

Yes >> Go To 16

No >> Repair the short to ground in the (K1) MAP Signal circuit.

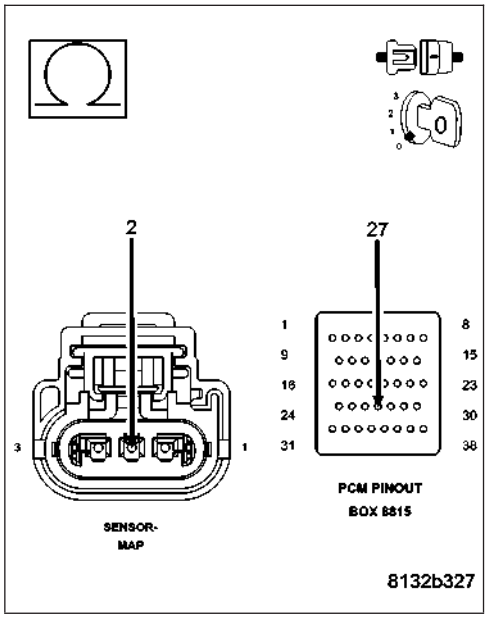
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P2174-LOW AIRFLOW/RESTRICTION DETECTED (INSTANTANEOUS ACCUMULATION) (CONTINUED)

16. RESISTANCE IN THE (K900) SENSOR GROUND CIRCUIT

Measure the resistance of the (K900) Sensor ground circuit from the MAP Sensor harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 17

No >> Repair the excessive resistance in the (K900) Sensor ground circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

17. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

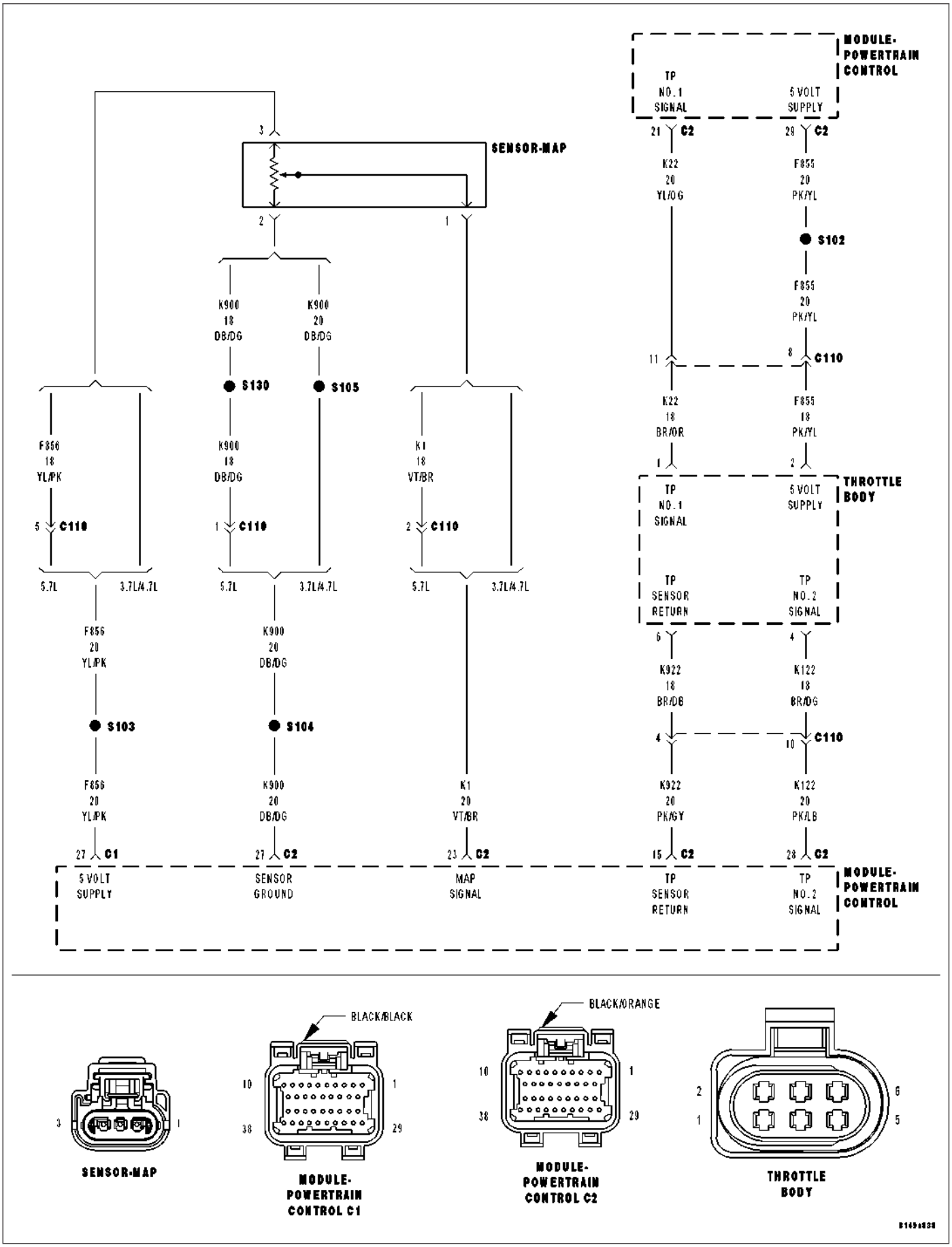
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2175-LOW AIRFLOW/RESTRICTION DETECTED (SLOW ACCUMULATION)



P2175-LOW AIRFLOW/RESTRICTION DETECTED (SLOW ACCUMULATION) (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on and engine running with no MAP Sensor DTCs.
- **Set Condition:**
  PCM calculated MAP value is greater than actual MAP value plus an offset value. One trip fault and the code will set within 5 seconds. Three good trips to turn of the mil. ETC light will flash.

Possible Causes
RESTRICTED AIR INLET SYSTEM
RESISTANCE IN THE (F856) 5-VOLT SUPPLY CIRCUIT
(F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
RESISTANCE IN THE (K1) MAP SIGNAL CIRCUIT
(K1) MAP SIGNAL CIRCUIT SHORTED TO GROUND
RESISTANCE IN THE (K900) SENSOR GROUND CIRCUIT
RESISTANCE IN THE (F855) 5-VOLT SUPPLY CIRCUIT
(F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
RESISTANCE IN THE TP SENSOR SIGNAL CIRCUIT
TP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
RESISTANCE IN THE (K922) TP SENSOR RETURN CIRCUIT
MAP SENSOR
TP SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: The most likely cause of this DTC is a plugged intake air system or dirty Throttle Body. Check for any TSB's before continuing.

NOTE: Diagnose any 5-Volt Supply, TP Sensor, Oxygen Sensor, Fuel related or MAP Sensor DTCs before continuing.

NOTE: The throttle plate should be free from binding and carbon build up.

NOTE: Question the customer about weather conditions, as ICE build up on the blade can cause this fault when ambient is around +4 to -10 Celsius range.

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2175-LOW AIRFLOW/RESTRICTION DETECTED (SLOW ACCUMULATION) (CONTINUED)

2. RESTRICTED AIR INLET SYSTEM

Turn the ignition off.
Remove the Air Cleaner Assembly.
Remove the Air Filter.
Inspect the Throttle Body opening for signs of any foreign materials.
Check the intake tube / air cleaner for obstructions - include snow packing questions to customer.

Were any restrictions found?

Yes >> Repair the restriction as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

---

3. MAP SENSOR OPERATION

Start the engine.
With a scan tool, monitor the MAP Sensor voltage.
Snap the Accelerator pedal.

Does the MAP Sensor voltage vary from below 2.0 volts at idle to above 3.5 volts at Wide Open Throttle?

Yes >> Go To 4

No >> Go To 11

---

4. TP SENSOR OPERATION

Ignition on, engine not running.
With a scan tool, perform the Throttle Follower Test.
TP Sensor No.1 should start at approximately 0.8 of a volt and increase to 4.2 volts.
TP Sensor No.2 should start at approximately 4.2 volts and decrease to 0.8 of a volt.

Is the voltage transition smooth between the appropriate values?

Yes >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

P2175-LOW AIRFLOW/RESTRICTION DETECTED (SLOW ACCUMULATION) (CONTINUED)

5. RESISTANCE IN THE (F855) 5-VOLT SUPPLY CIRCUIT

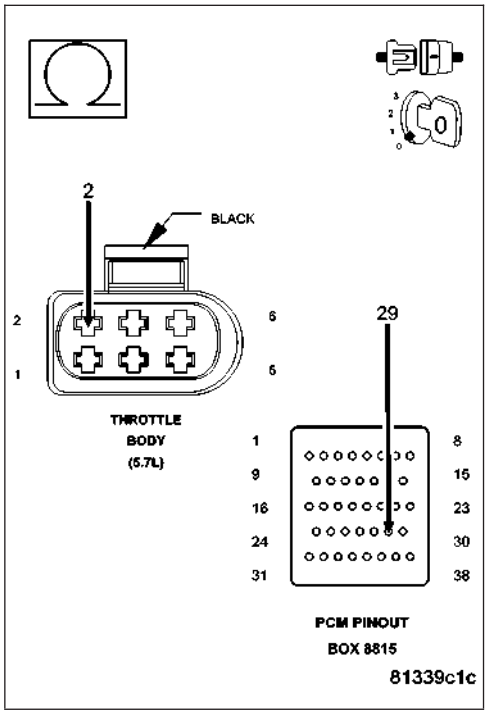
Turn the ignition off.

Disconnect the Throttle Body harness connector.

Disconnect the C2 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (F855) 5-volt Supply circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.



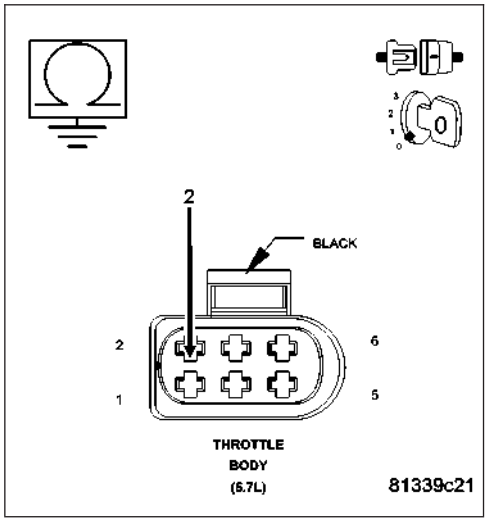
Is the resistance below 100 ohms?

Yes >> Go To 6

No >> Repair the excessive resistance in the (F855) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

6. (F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and (F855) 5-volt Supply circuit between the appropriate terminals of special tool #8815.



Is the resistance above 100k ohms?

Yes >> Go To 7

No >> Repair the short to ground in the (F855) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2175-LOW AIRFLOW/RESTRICTION DETECTED (SLOW ACCUMULATION) (CONTINUED)

7. TP SENSOR

Connect the PCM harness connector.

Ignition on, engine not running.

With a scan tool, monitor the TP Sensor voltage.

Connect a jumper wire between the (K22) TP Sensor No.1 Signal circuit and the (K922) Sensor Return circuit in the Throttle Body harness connector.

TP Sensor No.1 voltage should start at approximately 4.8 volts and decrease to 0.2 of a volt.

Connect a jumper wire between the (K122) TP Sensor No.2 Signal circuit and the (F855) 5-volt Supply circuit in the Throttle Body harness connector.

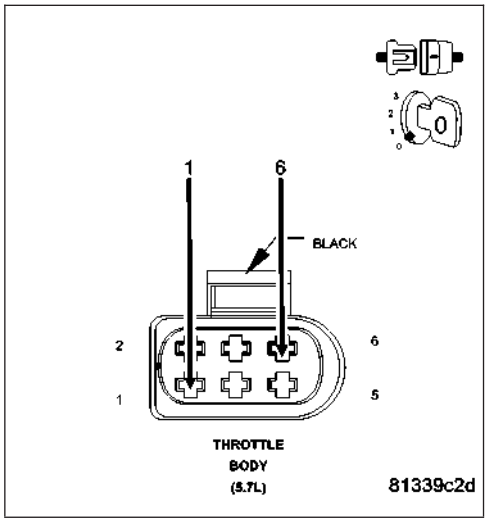
TP Sensor No.2 voltage should start at approximately 0 volts and increase to 4.8 to 5.2 volts.

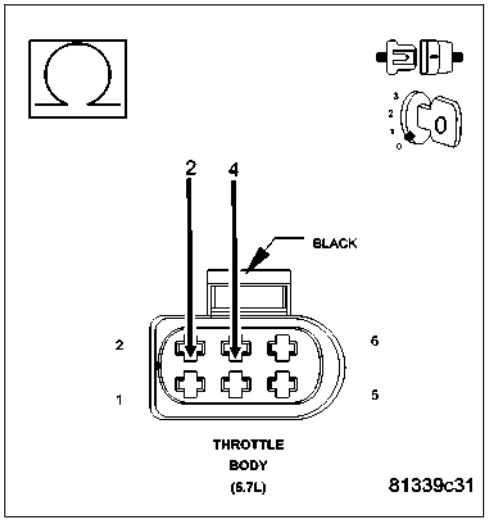
Does the TP Sensor voltage change to the appropriate voltage with the jumper wire installed?

Yes >> Disconnect the Battery before replacing the Throttle Body Assembly. Replace the Throttle Body Assembly. After installation is complete, use a scan tool and select the ETC RELEARN function

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8





P2175-LOW AIRFLOW/RESTRICTION DETECTED (SLOW ACCUMULATION) (CONTINUED)

8. RESISTANCE IN THE TP SENSOR SIGNAL CIRCUIT

Turn the ignition off.

Disconnect the C2 PCM harness connector.

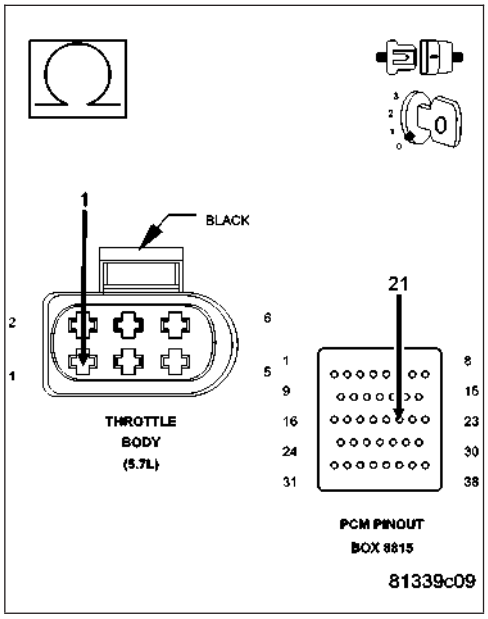
Measure the resistance of the (K22) and (K122) TP Signal circuits from the Throttle Body harness connector to the appropriate terminals of special tool #8815.

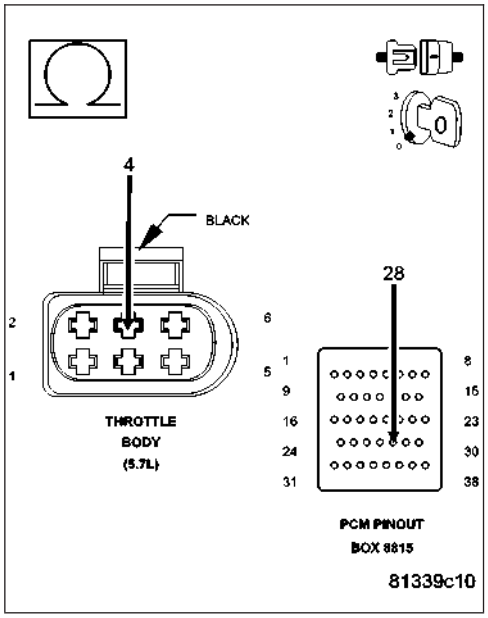
Is the resistance below 5.0 ohms for each circuit?

Yes >> Go To 9

No >> Repair the excessive resistance in the (K22) or (K122) TP Sensor Signal circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)





P2175-LOW AIRFLOW/RESTRICTION DETECTED (SLOW ACCUMULATION) (CONTINUED)

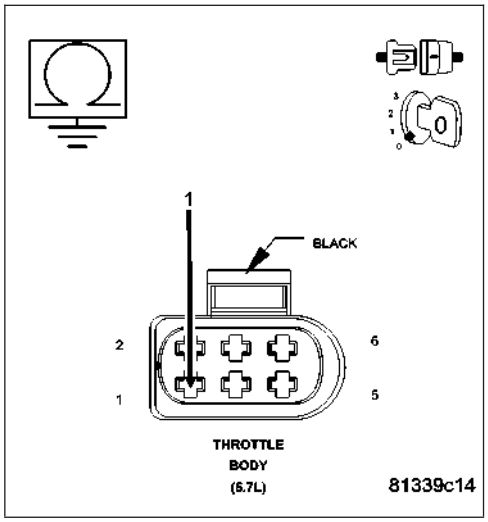
9. TP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND

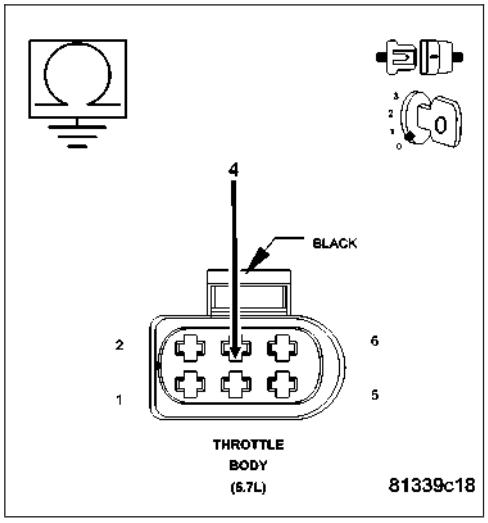
Measure the resistance between ground and the (K22) and (K122) TP Signal circuits at the appropriate terminals of special tool #8815.

Is the resistance above 100k ohms for each circuit?

Yes >> Go To 10

No >> Repair the short to ground in the (K22) or (K122) TP Sensor Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)





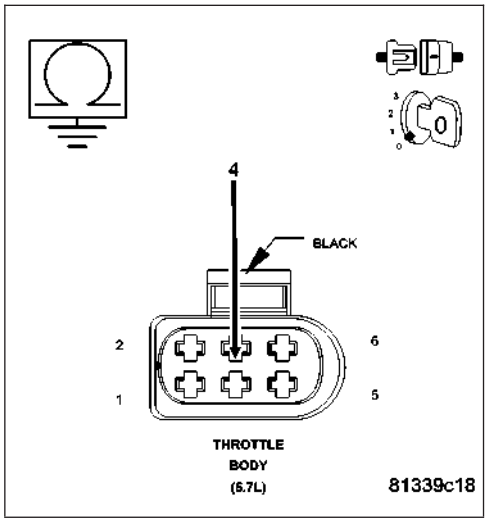
10. RESISTANCE IN THE (K922) SENSOR RETURN CIRCUIT

Measure the resistance of the (K922) Sensor Return circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 17

No >> Repair the excessive resistance in the (K922) Sensor Return circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P2175-LOW AIRFLOW/RESTRICTION DETECTED (SLOW ACCUMULATION) (CONTINUED)

11. RESISTANCE IN THE (F856) 5-VOLT SUPPLY CIRCUIT

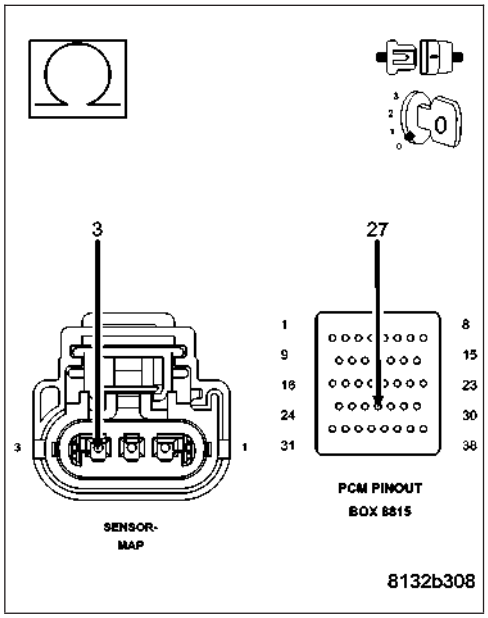
Turn the ignition off.

Disconnect the MAP Sensor harness connector.

Disconnect the C1 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (F856) 5-volt Supply circuit from the MAP Sensor harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

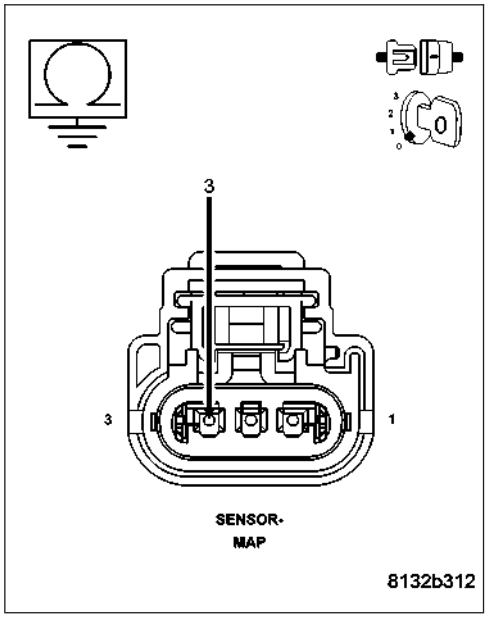
Yes >> Go To 12

No >> Repair the excessive resistance in the (F856) 5-volt Supply circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

12. (F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (F856) 5-volt Supply circuit in the MAP Sensor harness connector.



Is the resistance above 100k ohms?

Yes >> Go To 13

No >> Repair the short to ground in the (F856) 5-volt Supply circuit.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2175-LOW AIRFLOW/RESTRICTION DETECTED (SLOW ACCUMULATION) (CONTINUED)

13. MAP SENSOR

Connect the C1 PCM harness connector.

Ignition on, engine not running.

With a scan tool, monitor the MAP Sensor voltage.

Connect a jumper wire between the (K1) MAP Signal circuit and the (K900) Sensor ground circuit.

Cycle the ignition switch from off to on.

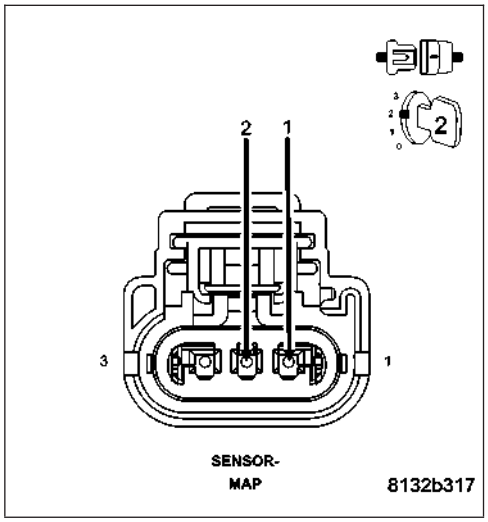
With a scan tool, monitor the MAP Sensor voltage.

Does the scan tool display MAP voltage from approximately 4.9 volts to below 0.5 volt with the jumper wire installed?

Yes >> Replace the MAP Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 14

NOTE: Remove the jumper wire before continuing.



14. RESISTANCE IN THE (K1) MAP SIGNAL CIRCUIT

Turn the ignition off.

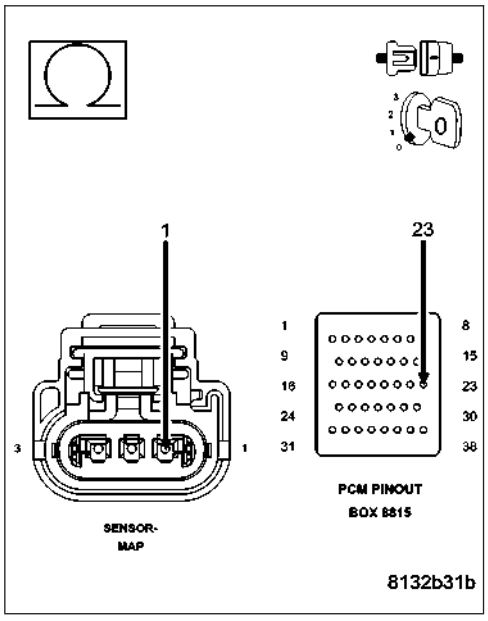
Disconnect the C2 PCM harness connector.

Measure the resistance of the (K1) MAP Signal circuit from the MAP Sensor harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 15

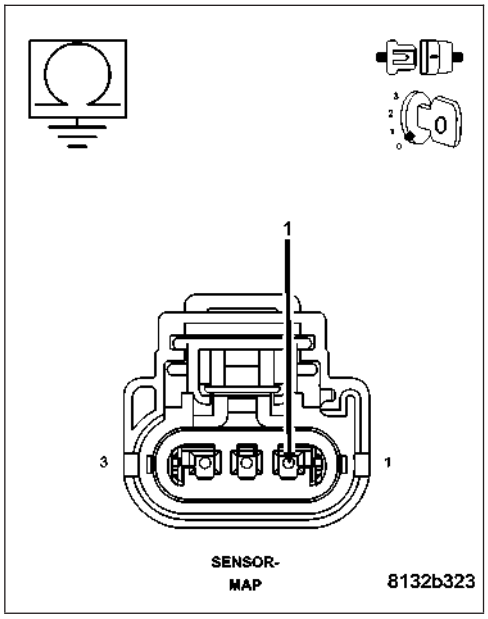
No >> Repair the excessive resistance in the (K1) MAP Signal circuit
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P2175-LOW AIRFLOW/RESTRICTION DETECTED (SLOW ACCUMULATION) (CONTINUED)

15. (K1) MAP SIGNAL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K1) MAP Signal circuit in the MAP Sensor harness connector.



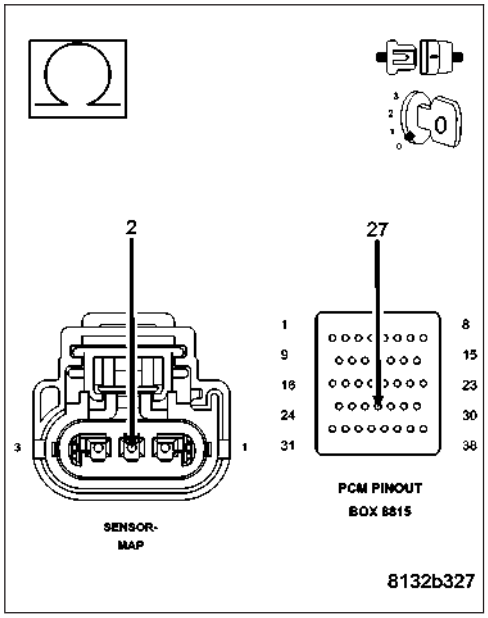
Is the resistance above 100k ohms?

Yes >> Go To 16

No >> Repair the short to ground in the (K1) MAP Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

16. RESISTANCE IN THE (K900) SENSOR GROUND CIRCUIT

Measure the resistance of the (K900) Sensor ground circuit from the MAP Sensor harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 17

No >> Repair the excessive resistance in the (K900) Sensor ground circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2175-LOW AIRFLOW/RESTRICTION DETECTED (SLOW ACCUMULATION) (CONTINUED)

17. **PCM**

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

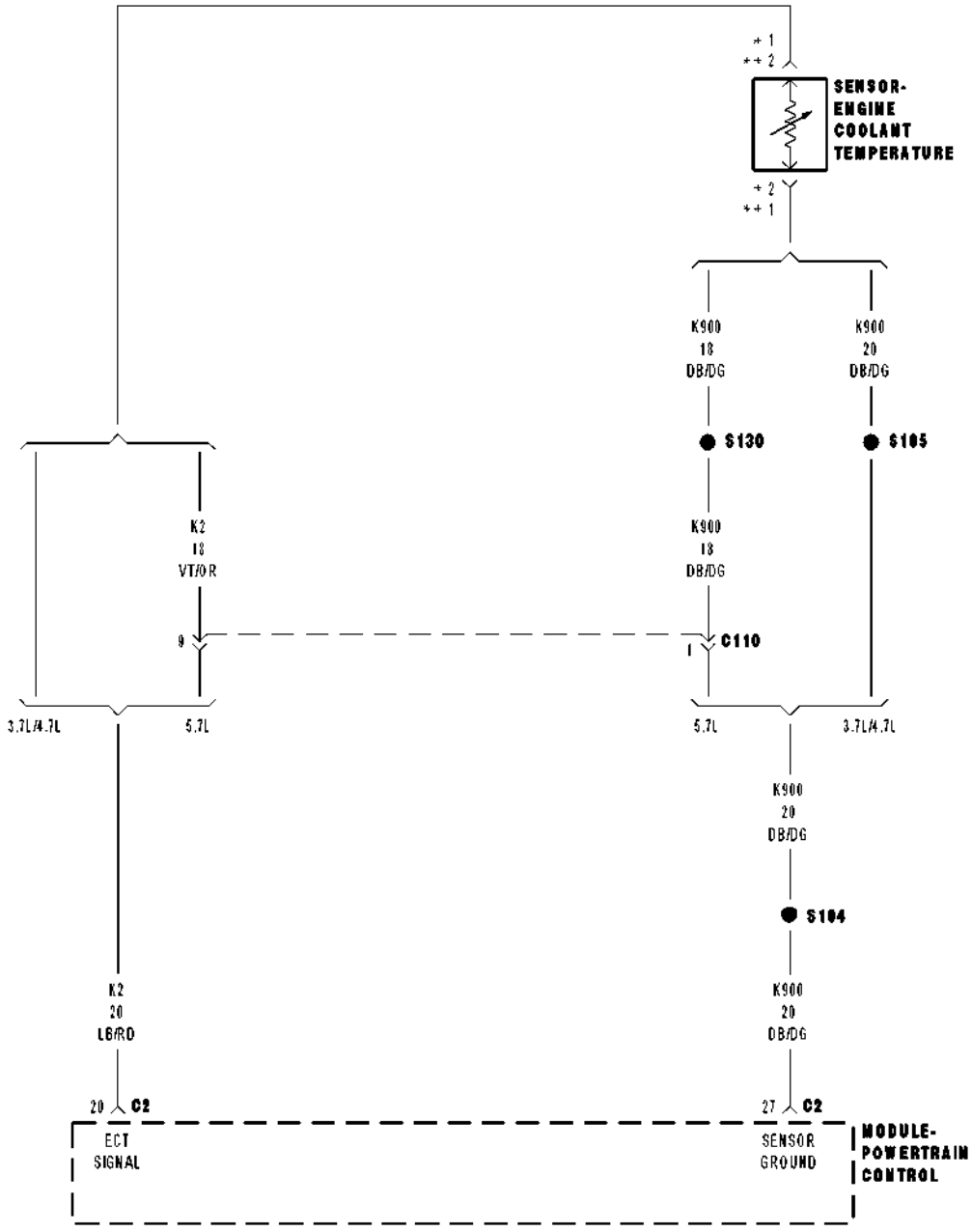
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

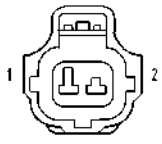
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

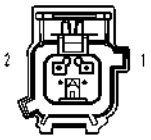
No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2181-COOLING SYSTEM PERFORMANCE

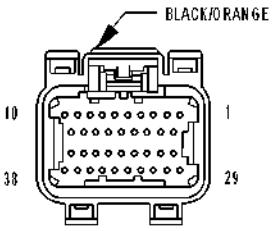




SENSOR-
ENGINE
COOLANT
TEMPERATURE
(3.7L/4.7L)



SENSOR-
ENGINE
COOLANT
TEMPERATURE
(5.7L)



MODULE-
POWERTRAIN
CONTROL C2

81492837

P2181-COOLING SYSTEM PERFORMANCE (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on, Engine running, and no ECT DTCs present.
- **Set Condition:**
  PCM recognizes that the ECT has failed its self coherence test. The coolant temp should only change at a certain rate, if this rate is too slow or too fast this fault will set. Two trip fault. Three good trips to clear MIL. ETC light will illuminate on first trip failure.

Possible Causes
LOW COOLANT LEVEL
(K2) ECT SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K2) ECT SIGNAL CIRCUIT OPEN
(K900) SENSOR GROUND CIRCUIT OPEN
(K2) ECT SIGNAL CIRCUIT SHORTED TO GROUND
(K2) ECT SIGNAL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND
THERMOSTAT
ECT SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

NOTE: If this code sets during extreme ambient temperatures, improper installation of a block heater could be the cause of this DTC.

With a scan tool, read DTCs.

Diagnose all other ECT and Cooling System codes before continuing.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2181-COOLING SYSTEM PERFORMANCE (CONTINUED)

2. LOW COOLANT LEVEL

NOTE: If a Engine Coolant Temperature (ECT) DTC is set along with this code, diagnose the ECT DTC first.

NOTE: Inspect the ECT terminals and related PCM terminals. Ensure the terminals are free from corrosion and damage.

NOTE: The best way to diagnose this DTC is to allow the vehicle to sit overnight outside in order to have a totally cold soaked engine.

NOTE: Extremely cold outside ambient temperatures may have caused this DTC to set.

NOTE: Need to make sure that no Cooling System DTCs are set or changes that would make the warm up much slower or much faster: broken water pump can set this, addition of aftermarket auxiliary cooler can set this DTC.

WARNING: Never open the cooling system when the engine is hot. The system is under pressure. Failure to follow these instructions can result in personal injury or death. Allow the engine to cool before opening the cooling system.

Inspect the coolant system for proper level and condition.

Is the coolant level and condition OK?

Yes >> Go To 3

No >> Inspect the vehicle for a coolant leak and add the necessary amount of coolant.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

3. THERMOSTAT

NOTE: This test works best if performed on a cold engine (cold soak).

Ignition on, engine not running.

With a scan tool, read the Eng Coolant Tmp Deg value. If the engine was allowed to sit overnight (cold soak), the temperature value should be a sensible value that is somewhere close to the ambient temperature.

NOTE: If engine coolant temperature is above 82°C (180°F), allow the engine to cool until 65°C (150°F) is reached.

Start the Engine.

During engine warm-up monitor the Eng Coolant Tmp Deg value. The temp deg value change should be a smooth transition from start up to normal operating temp 82°C (180°F). Also monitor the actual coolant temperature with a thermometer.

NOTE: As the engine warms up to operating temperature, the actual coolant temperature (thermometer reading) and the Eng Coolant Tmp Deg on the scan tool should stay relatively close to each other.

Using the appropriate service information, determine the proper opening temperature of the thermostat.

Did the thermostat open at the proper temperature?

Yes >> Go To 4

No >> Replace the thermostat.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2181-COOLING SYSTEM PERFORMANCE (CONTINUED)

4. ECT SENSOR

Connect a jumper between the (K2) ECT Signal circuit and the (K900) Sensor ground circuit in the ECT Sensor harness connector.

Turn the ignition off.

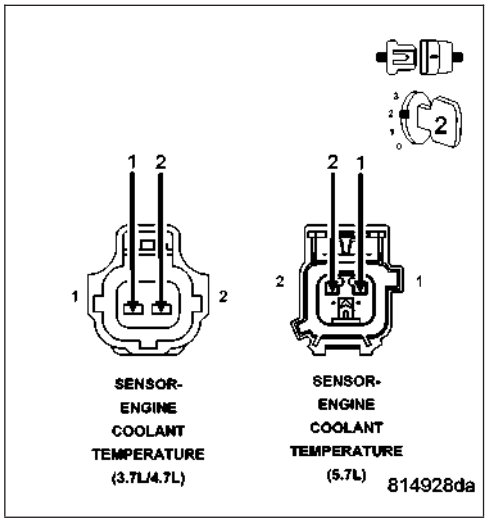
Disconnect the ECT Sensor harness connector.

With a scan tool, read the ECT voltage.

Is the voltage below 1.0 volt?

Yes >> Replace the ECT Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5



5. (K2) ECT SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

Disconnect the C2 PCM harness connector.

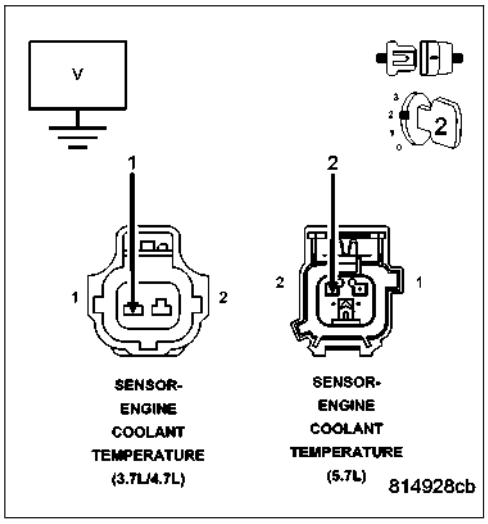
Ignition on, engine not running.

Measure the voltage on the (K2) ECT Signal circuit in the ECT Sensor harness connector.

Is the voltage above 5.2 volts?

Yes >> Repair the short to battery voltage in the (K2) ECT Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 6



P2181-COOLING SYSTEM PERFORMANCE (CONTINUED)

6. (K2) ECT SIGNAL CIRCUIT OPEN

Turn the ignition off.

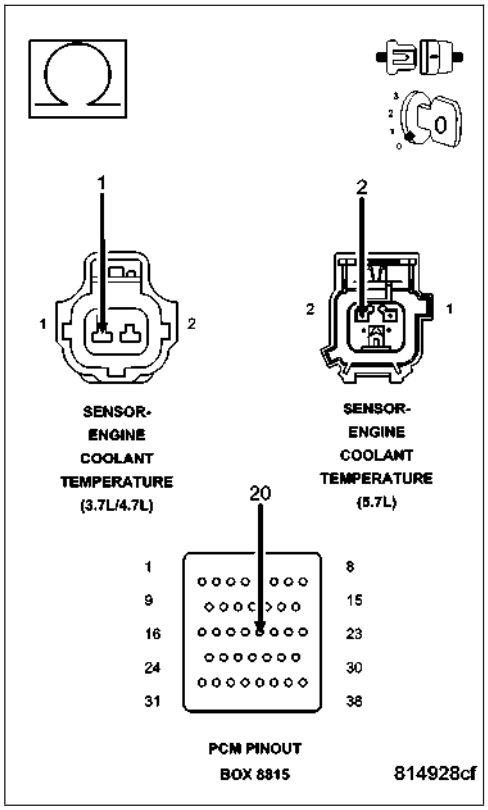
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K2) ECT Signal circuit from the ECT Sensor harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 7

No >> Repair the open in the (K2) ECT Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



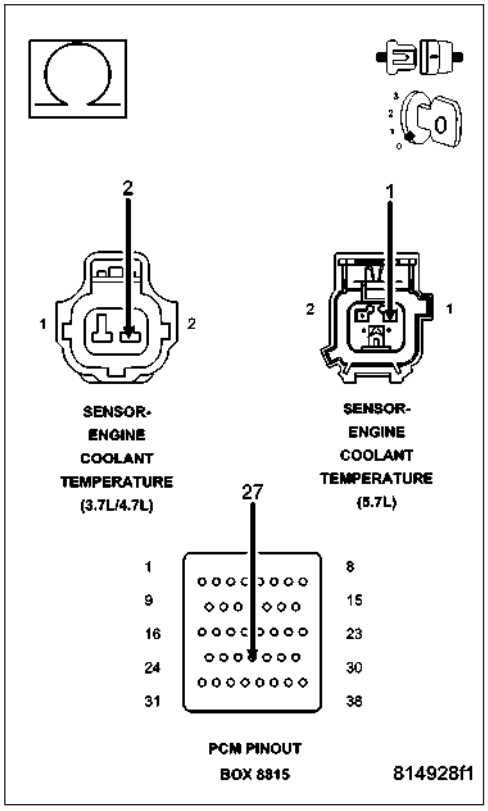
7. (K900) SENSOR GROUND CIRCUIT OPEN

Measure the resistance of the (K900) Sensor ground circuit from the ECT Sensor harness connector to the appropriate terminal of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Go To 8

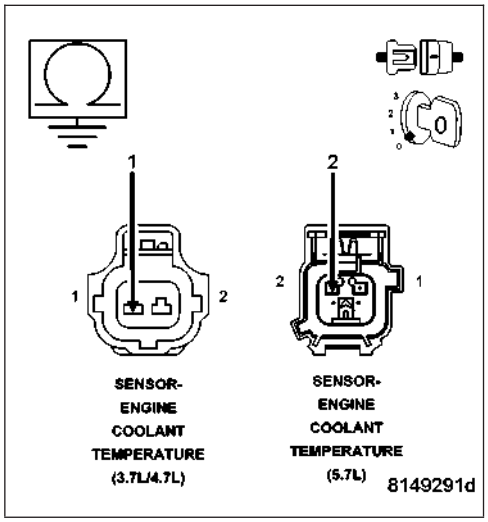
No >> Repair the open in the (K900) Sensor ground circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



P2181-COOLING SYSTEM PERFORMANCE (CONTINUED)

8. (K2) ECT SIGNAL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K2) ECT Signal circuit in the ECT Sensor harness connector.



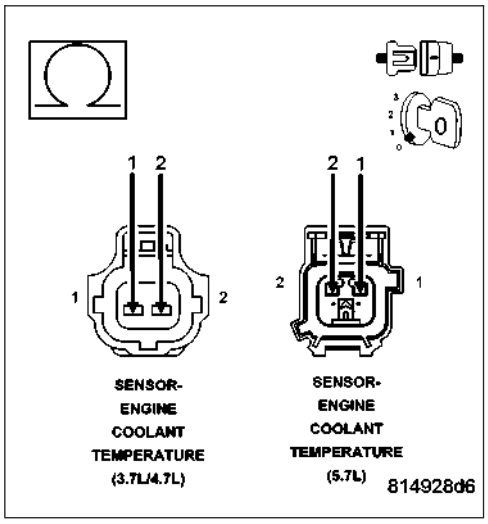
Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K2) ECT Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 9

9. (K2) ECT SIGNAL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT

Measure the resistance between the (K2) ECT Signal circuit and the (K900) Sensor ground circuit in the ECT Sensor harness connector.



Is the resistance below 5.0 ohms?

Yes >> Repair the short between the (K900) Sensor ground and the (K2) ECT Signal circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 10

10. PCM

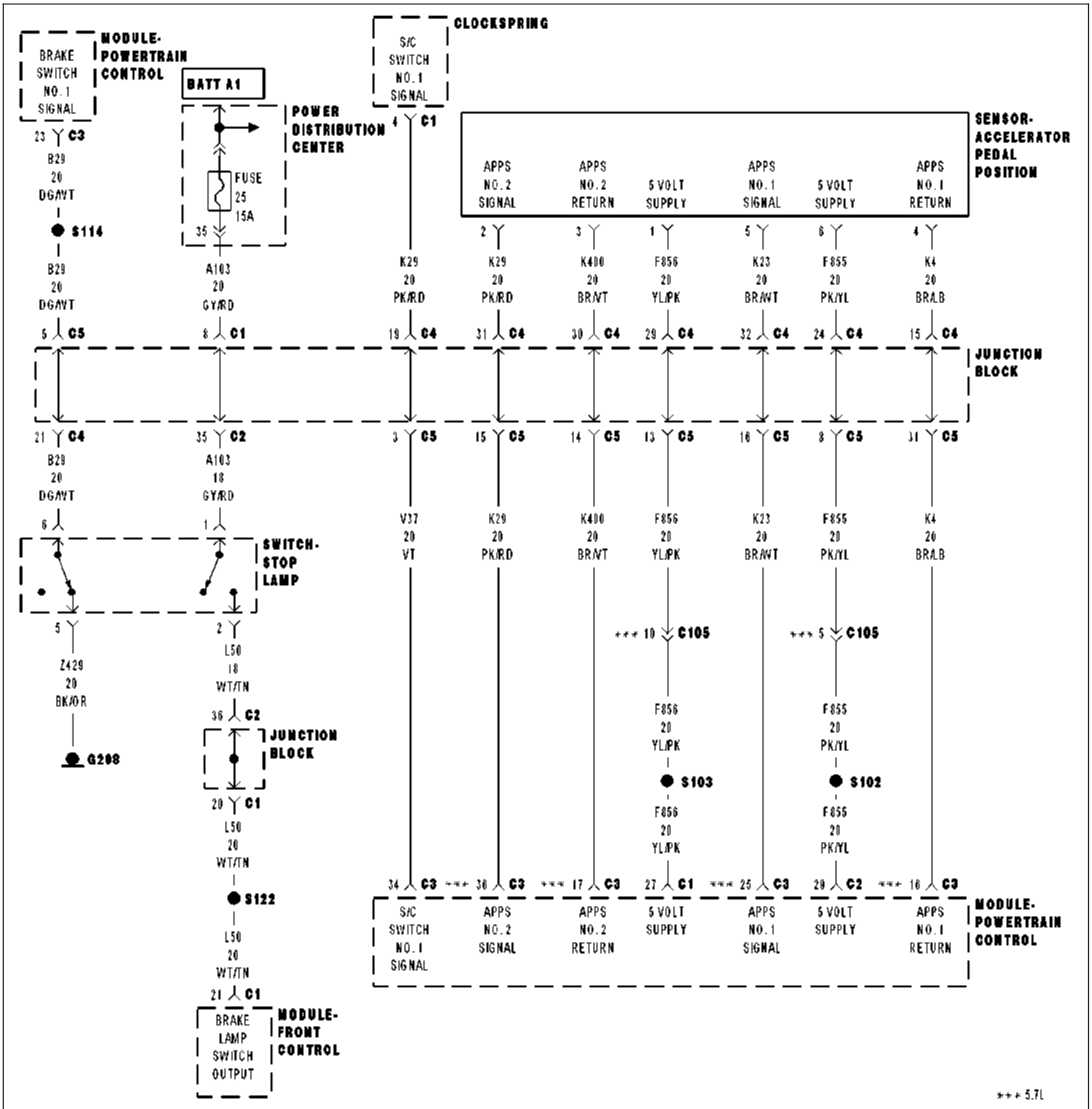
NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

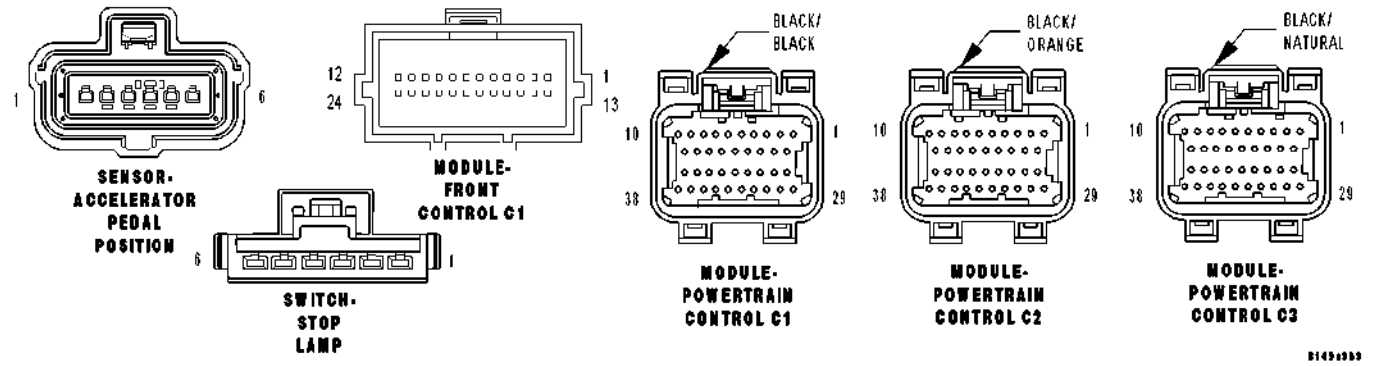
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2299-BRAKE PEDAL POSITION / ACCELERATOR PEDAL POSITION INCOMPATIBLE





P2299-BRAKE PEDAL POSITION / ACCELERATOR PEDAL POSITION INCOMPATIBLE (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on. No Break or APPS faults present.
- **Set Condition:**
  The PCM recognizes a brake application following the APPS showing a fixed pedal opening. Temporary or permanent. Internally the PCM will reduce throttle opening below driver demand. One trip fault and the code will be set within 5 seconds. ETC light will illuminate, the light will only stay illuminated while DTC is active.

Possible Causes
CUSTOMER PRESSING ACCLERATOR PEDAL, THEN PRESSING BRAKE PEDAL, AND CONTINUES TO HOLD THEM DOWN SIMULTANEOUSLY
STOP LAMP SWITCH
APP SENSOR

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. DTC INFORMATION

NOTE: If a pedal assembly becomes mechanically stuck the voltage output will stay fixed, if this is also Followed by a long application of the brakes this code will set.

NOTE: When this code sets the pedal position in the PCM software will ramp to idle. If the Pedal voltage changes OR the brake pedal is released, the pedal position in the PCM software will ramp up to the pedal position and the ETC light will go out.

With a scan tool, read DTCs and record the related Freeze Frame data.

Diagnose all other Stop Lamp Switch and APP Sensor codes before continuing.

This code can be set by a driver who uses both feet while driving, one for the Accelerator Pedal and the other for the Brake Pedal.

NOTE: The most likely cause of this DTC is caused by the customer Brake Torquing the engine by pressing the Accelerator pedal and the pressing the Brake Pedal.

Ask the driver of the vehicle if these conditions apply to their driving habits.

Are the listed conditions part of the customers driving habits?

Yes >> Advise the customer of what caused the DTC. This is normal operation of a ETC equipped vehicle because of safety issues.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 2

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2. STOP LAMP SWITCH OPERATION

With a scan tool, read both Stop Lamp Switch statuses while pressing and releasing the Brake Pedal.

Does the scan tool display the Pressed and Released while pressing and releasing the Pedal?

Yes >> Go To 3

No >> Check the Stop Lamp Switch for proper installation and check the related circuits for opens and shorts using the appropriate wiring diagram. If OK, replace the Stop Lamp Switch assembly.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2299-BRAKE PEDAL POSITION / ACCELERATOR PEDAL POSITION INCOMPATIBLE (CONTINUED)

3. APP SENSOR SWEEP

Ignition on, engine not running.

With a scan tool, monitor both APP Sensor voltage readings.

Slowly press the accelerator pedal from idle until it reaches the end stop near the floor.

APPS No.1 voltage should start at approximately 0.45 of a volt and increase to approximately 4.6 volts with a smooth transition.

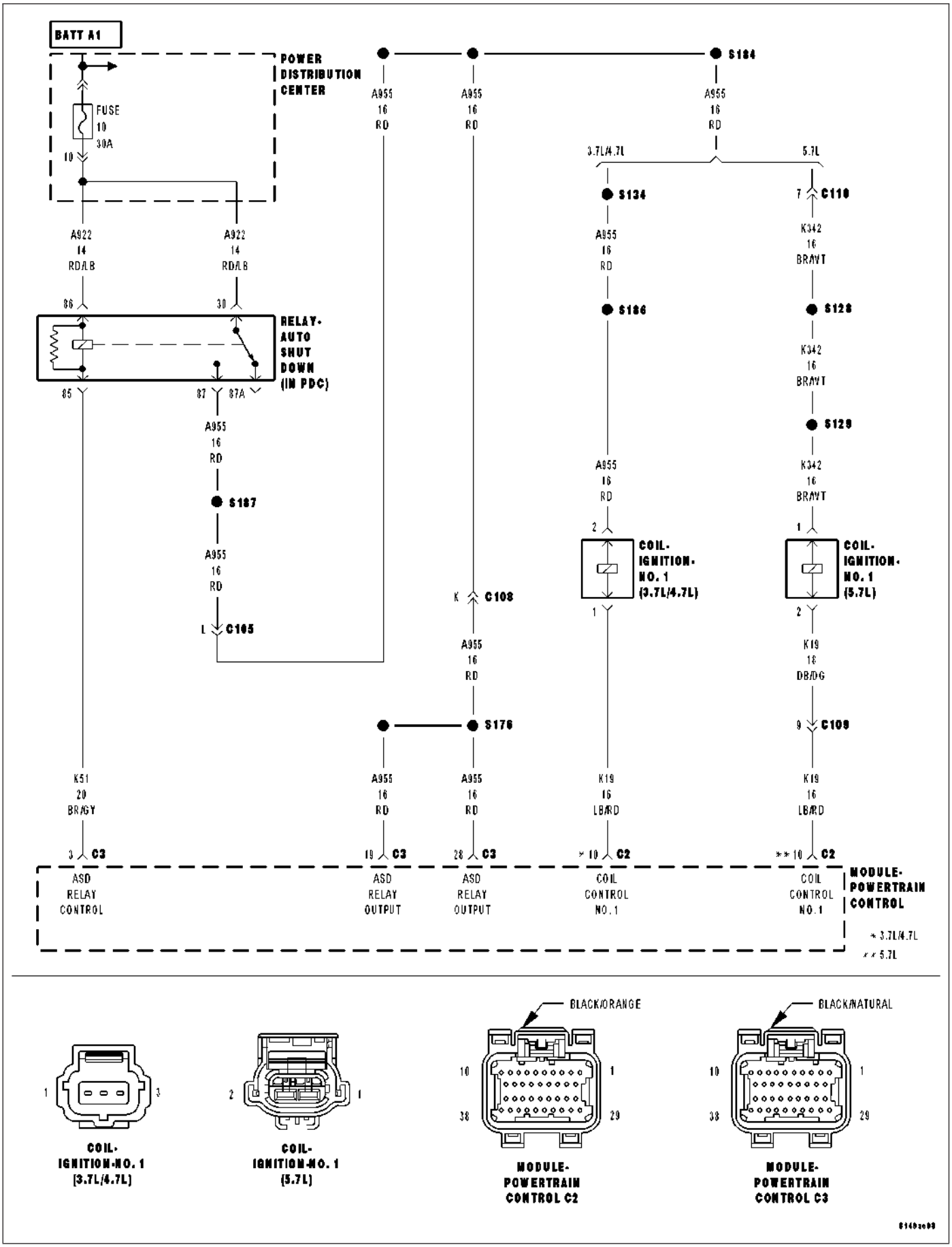
APPS No.2 voltage should start at approximately 0.22 of a volt and increase to approximately 2.31 volts with a smooth transition.

Does the voltage for the appropriate sensor follow the list specification?

Yes >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Check the Signal and Return circuits for opens and shorts. If OK, Replace the APP Sensor Assembly per Service Information. After installation is complete, with a scan tool select the ETC RELEARN function to relearn the APPS values.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2302-IGNITION COIL 1 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION



COIL- IGNITION-NO. 1 (3.7L/4.7L)

COIL- IGNITION-NO. 1 (5.7L)

MODULE- POWERTRAIN CONTROL C2

MODULE- POWERTRAIN CONTROL C3

8149e008

P2302-IGNITION COIL 1 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Engine running and battery voltage greater than 10 volts.
- **Set Condition:**
  If PCM detects that the secondary ignition burn time is incorrect, too short, or not present, an error is detected. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(A955), (K342) ASD RELAY OUTPUT CIRCUIT
(K19) COIL CONTROL NO.1 CIRCUIT OPEN
(K19) COIL CONTROL NO.1 CIRCUIT SHORTED TO GROUND
COIL ON PLUG
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

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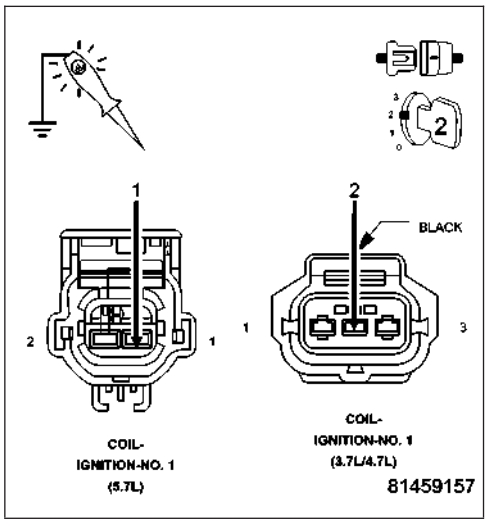
2. (A955), (K342) ASD RELAY OUTPUT CIRCUIT



NOTE: The circuit id (K342) is used with the 5.7L engines and the (A955) id is used with the 3.7L and 4.7L engines.

Turn the ignition off.

Disconnect the Coil on Plug harness connector.

Ignition on, engine not running.

With a scan tool, actuate the ASD Relay.

Using a 12-volt test light connected to ground, probe the (A955), (K342) ASD Relay Output circuit in the Coil on Plug harness connector.

Does the test light illuminate brightly?

Yes >> Go To 3

No >> Repair the open or short to ground in the (A955), (K342) ASD Relay Output circuit between the IPM and Coil harness connector.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

NOTE: Stop All Actuations.

P2302-IGNITION COIL 1 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)

3. COIL ON PLUG RESISTANCE

Turn the ignition off.

NOTE: The following resistance measurement should be taken at 70°-80° F.

Measure the resistance of the Coil on Plug.

4.7L and 3.7L Primary Ignition Coil resistance is 0.6 to 0.9 of an ohm at 77°F (25°C).

5.7L Primary Ignition Coil resistance is 0.558 to 0.682 of an ohm at 77°F (25°C).

Is the resistance within the given specification for the Ignition Coil being tested?

Yes >> Go To 4

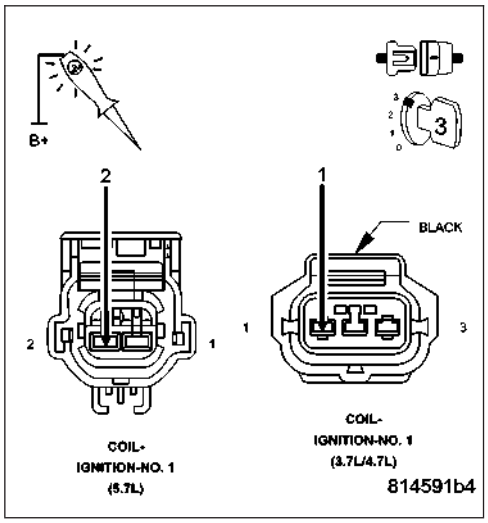
No >> Replace the Coil on plug.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

4. IGNITION COIL

Using a 12-volt test light connected to a 12-volt source, probe the (K19) Coil Control No.1 circuit.

Crank the engine for 5 seconds while observing the test light.



What is the condition of the test light while cranking the engine?

Brightly blinking.
Replace the Coil on plug.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

ON constantly.
Go To 5

OFF constantly.
Go To 6

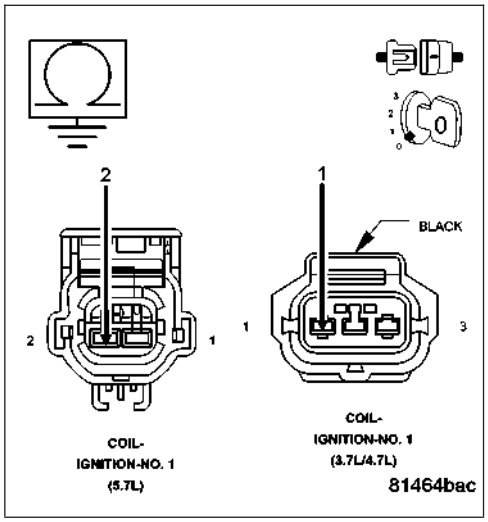
---

5. (K19) COIL CONTROL NO.1 CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the C2 PCM harness connector.

Measure the resistance between ground and the (K19) Coil Control No.1 circuit in the Coil on Plug harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K19) Coil Control No.1 circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 7

P2302-IGNITION COIL 1 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)

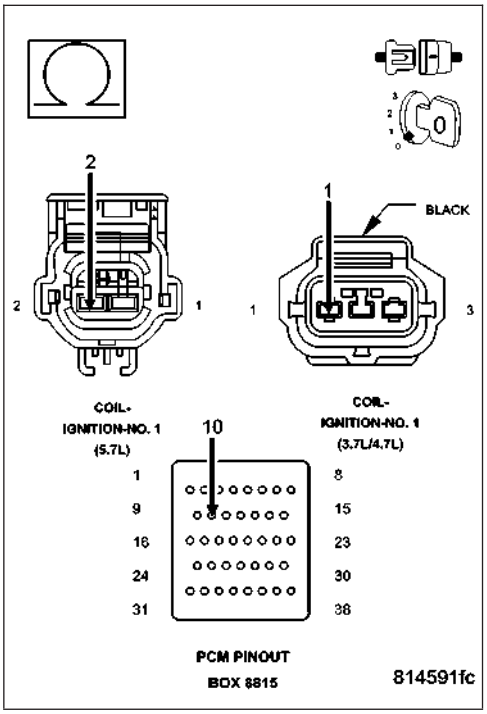
6. (K19) COIL CONTROL NO.1 CIRCUIT OPEN

Turn the ignition off.

Disconnect the C2 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K19) Coil Control No.1 circuit from the Coil on Plug harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 7

No >> Repair the open in the (K19) Coil Control No.1 circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

7. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

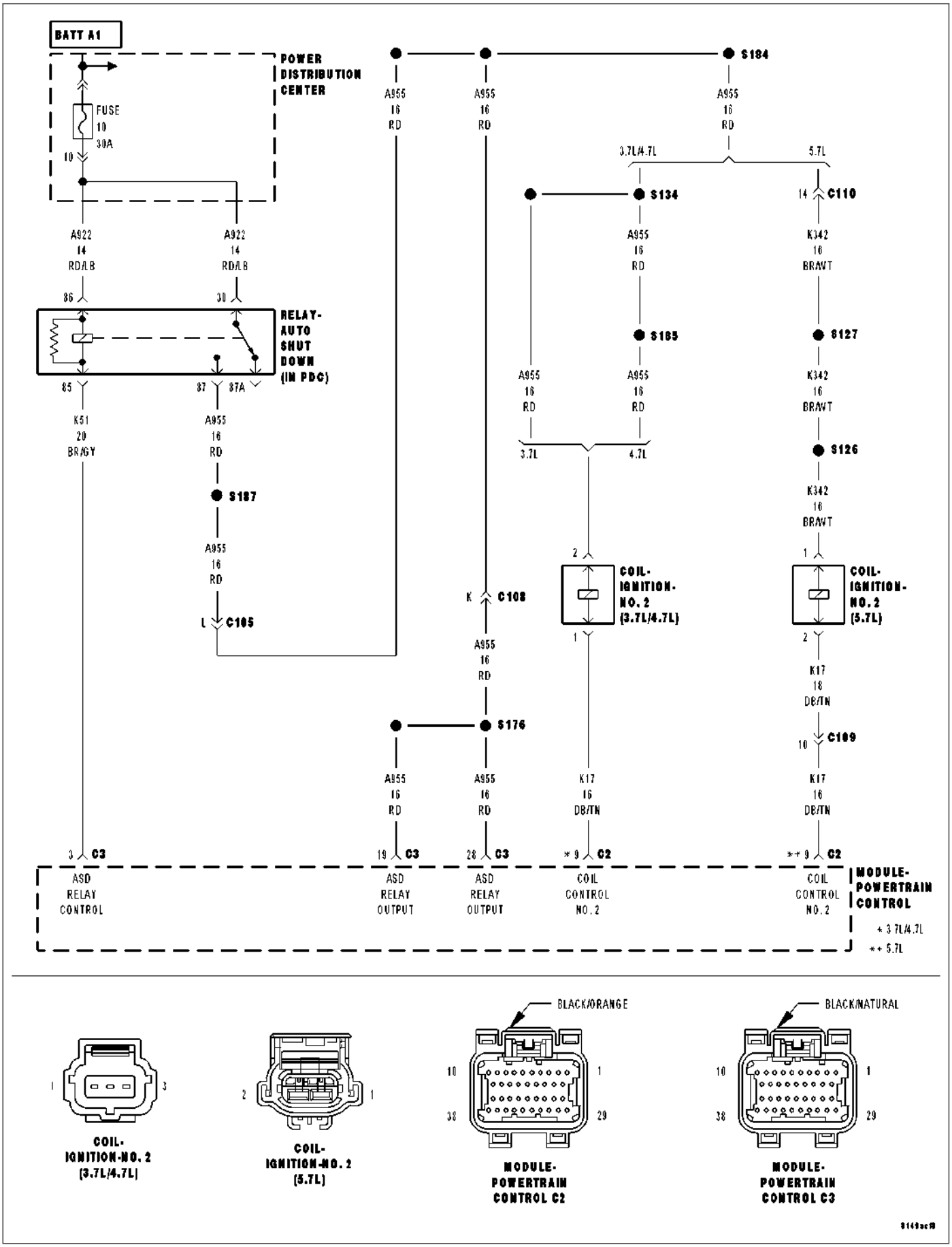
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2305-IGNITION COIL 2 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION



COIL- IGNITION-NO. 2 (3.7L/4.7L)

COIL- IGNITION-NO. 2 (5.7L)

MODULE- POWERTRAIN CONTROL C2

MODULE- POWERTRAIN CONTROL C3

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P2305-IGNITION COIL 2 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Engine running and battery voltage greater than 10 volts.
- **Set Condition:**
  If PCM detects that the secondary ignition burn time is incorrect, too short, or not present, an error is detected. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(A955), (K342) ASD RELAY OUTPUT CIRCUIT
(K17) COIL CONTROL NO.2 CIRCUIT OPEN
(K17) COIL CONTROL NO.2 CIRCUIT SHORTED TO GROUND
COIL ON PLUG
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. (A955), (K342) ASD RELAY OUTPUT CIRCUIT

NOTE: The circuit id (K342) is used with the 5.7L engines and the (A955) id is used with the 3.7L and 4.7L engines.

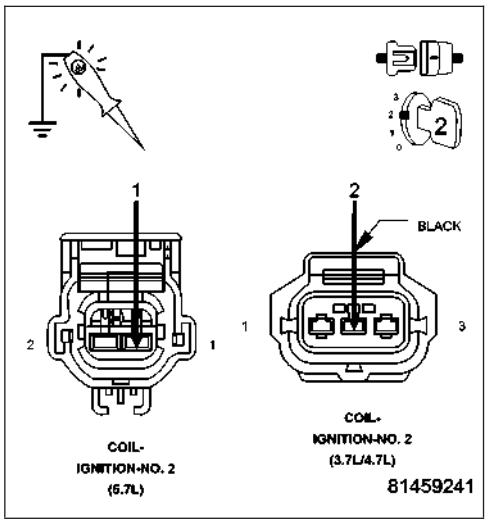
Turn the ignition off.

Disconnect the Coil on Plug harness connector.

Ignition on, engine not running.

With a scan tool, actuate the ASD Relay.

Using a 12-volt test light connected to ground, probe the (A955), (K342) ASD Relay Output circuit in the Coil on Plug harness connector.



Does the test light illuminate brightly?

Yes >> Go To 3

No >> Repair the open or short to ground in the (A955), (K342) ASD Relay Output circuit between the IPM and Coil harness connector.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

NOTE: Stop All Actuations.

P2305-IGNITION COIL 2 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)

3. COIL ON PLUG RESISTANCE

Turn the ignition off.

NOTE: The following resistance measurement should be taken at 70°-80° F.

Measure the resistance of the Coil on Plug.

4.7L and 3.7L Primary Ignition Coil resistance is 0.6 to 0.9 of an ohm at 77°F (25°C).

5.7L Primary Ignition Coil resistance is 0.558 to 0.682 of an ohm at 77°F (25°C).

Is the resistance within the given specification for the Ignition Coil being tested?

Yes >> Go To 4

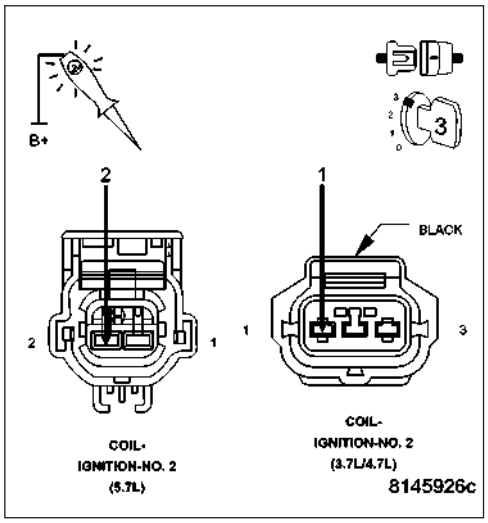
No >> Replace the Coil on plug.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

4. IGNITION COIL

Using a 12-volt test light connected to a 12-volt source, probe the (K17) Coil Control No.2 circuit.

Crank the engine for 5 seconds while observing the test light.



What is the state of the test light while cranking the engine?

Brightly blinking.
Replace the Coil on plug.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

ON constantly.
Go To 5

OFF constantly.
Go To 6

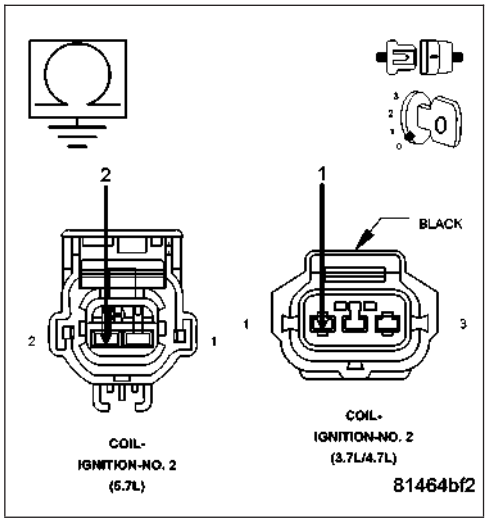
---

5. (K17) COIL CONTROL NO.2 CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the C2 PCM harness connector.

Measure the resistance between ground and the (K17) Coil Control No.2 circuit in the Coil on Plug harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K17) Coil Control No.2 circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 7

P2305-IGNITION COIL 2 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)

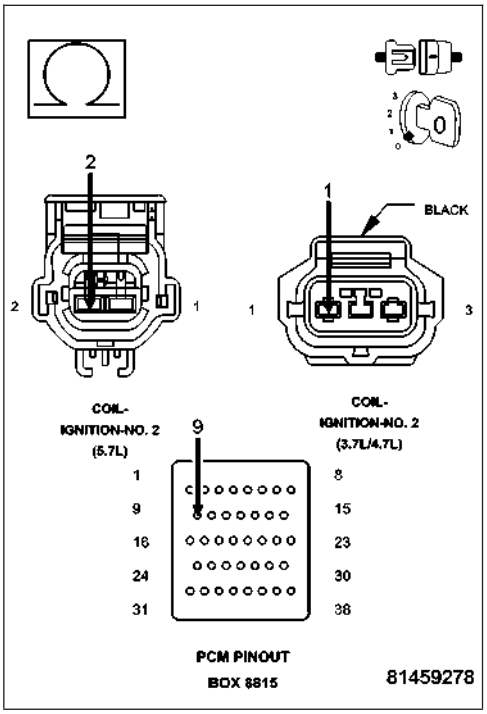
6. (K17) COIL CONTROL NO.2 CIRCUIT OPEN

Turn the ignition off.

Disconnect the C2 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K17) Coil Control No.2 circuit from the Coil on Plug harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 7

No >> Repair the open in the (K17) Coil Control No.2 circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

7. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

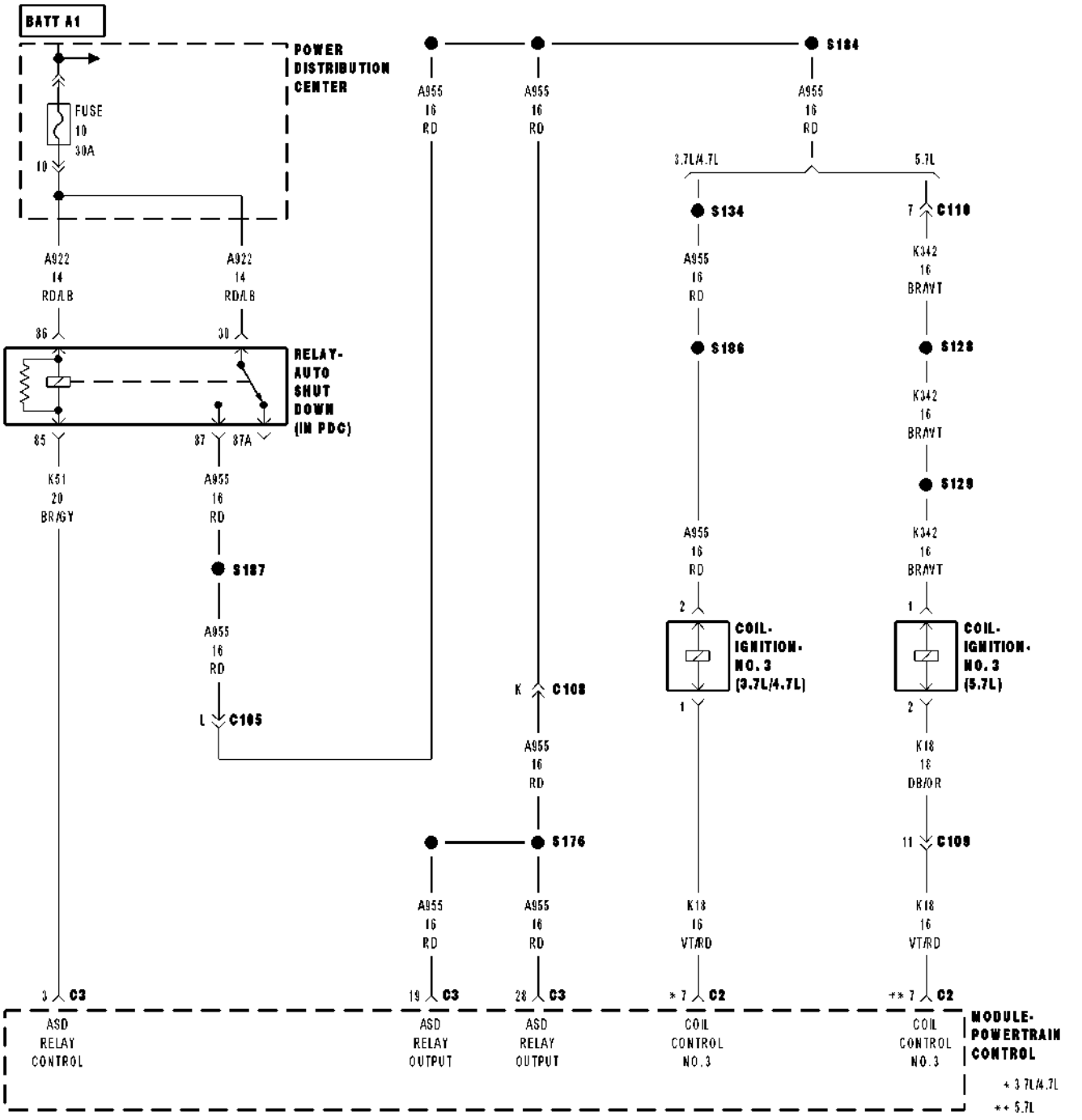
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

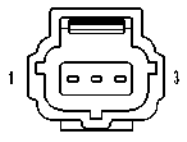
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

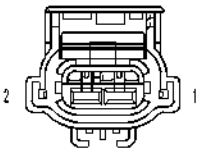
No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2308-IGNITION COIL 3 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION

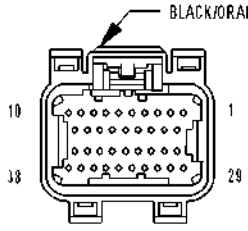




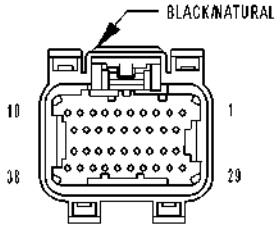
COIL- IGNITION-NO. 3 (3.7L/4.7L)



COIL- IGNITION-NO. 3 (5.7L)



MODULE- POWERTRAIN CONTROL C2



MODULE- POWERTRAIN CONTROL C3

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P2308-IGNITION COIL 3 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Engine running and battery voltage greater than 10 volts.
- **Set Condition:**
  If PCM detects that the secondary ignition burn time is incorrect, too short, or not present, an error is detected. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(A955), (K342) ASD RELAY OUTPUT CIRCUIT
(K18) COIL CONTROL NO.3 CIRCUIT OPEN
(K18) COIL CONTROL NO.3 CIRCUIT SHORTED TO GROUND
COIL ON PLUG
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. (A955), (K342) ASD RELAY OUTPUT CIRCUIT

NOTE: The circuit id (K342) is used with the 5.7L engines and the (A955) id is used with the 3.7L and 4.7L engines.

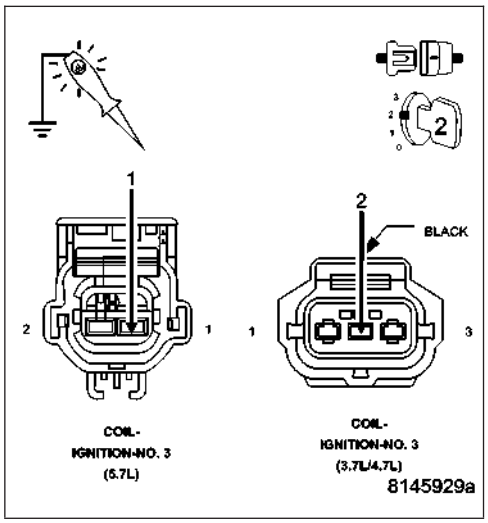
Turn the ignition off.

Disconnect the Coil on Plug harness connector.

Ignition on, engine not running.

With a scan tool, actuate the ASD Relay.

Using a 12-volt test light connected to ground, probe the (A955), (K342) ASD Relay Output circuit in the Coil on Plug harness connector.



Does the test light illuminate brightly?

Yes >> Go To 3

No >> Repair the open or short to ground in the (A955), (K342) ASD Relay Output circuit between the IPM and Coil harness connector.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

NOTE: Stop All Actuations.

P2308-IGNITION COIL 3 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)

3. COIL ON PLUG RESISTANCE

Turn the ignition off.

NOTE: The following resistance measurement should be taken at 70°-80° F.

Measure the resistance of the Coil on Plug.

4.7L and 3.7L Primary Ignition Coil resistance is 0.6 to 0.9 of an ohm at 77°F (25°C).

5.7L Primary Ignition Coil resistance is 0.558 to 0.682 of an ohm at 77°F (25°C).

Is the resistance within the given specification for the Ignition Coil being tested?

Yes >> Go To 4

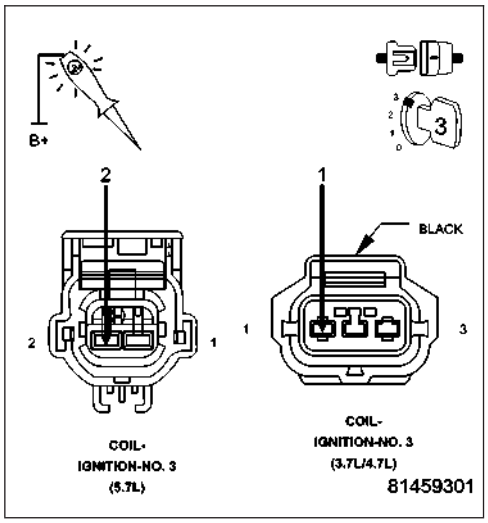
No >> Replace the Coil on plug.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

4. IGNITION COIL

Using a 12-volt test light connected to a 12-volt source, probe the (K18) Coil Control No.3 circuit.

Crank the engine for 5 seconds while observing the test light.



What is the state of the test light while cranking the engine?

Brightly blinking.
Replace the Coil on plug.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

ON constantly.
Go To 5

OFF constantly.
Go To 6

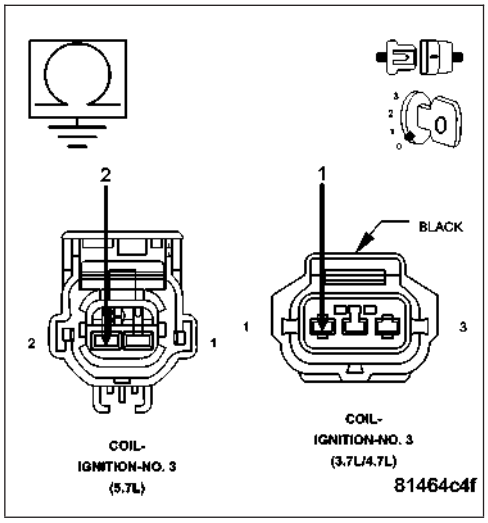
---

5. (K18) COIL CONTROL NO.3 CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the C2 PCM harness connector.

Measure the resistance between ground and the (K18) Coil Control No.3 circuit in the Coil on Plug harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K18) Coil Control No.3 circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 7

P2308-IGNITION COIL 3 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)

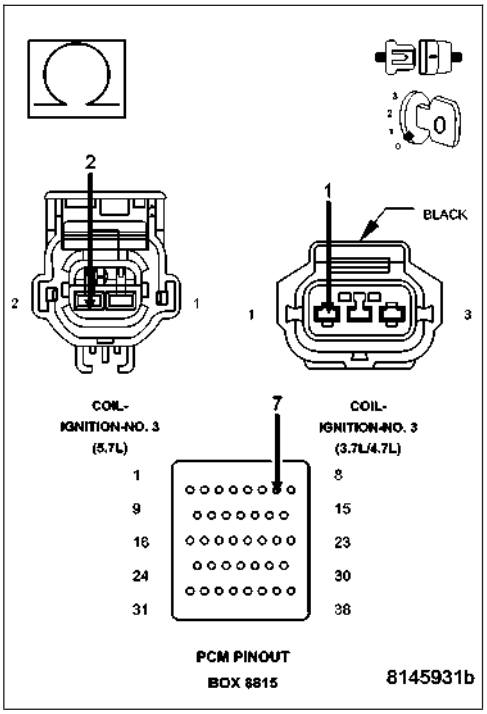
6. (K18) COIL CONTROL NO.3 CIRCUIT OPEN

Turn the ignition off.

Disconnect the C2 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K18) Coil Control No.3 circuit from the Coil on Plug harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 7

No >> Repair the open in the (K18) Coil Control No.3 circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

7. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

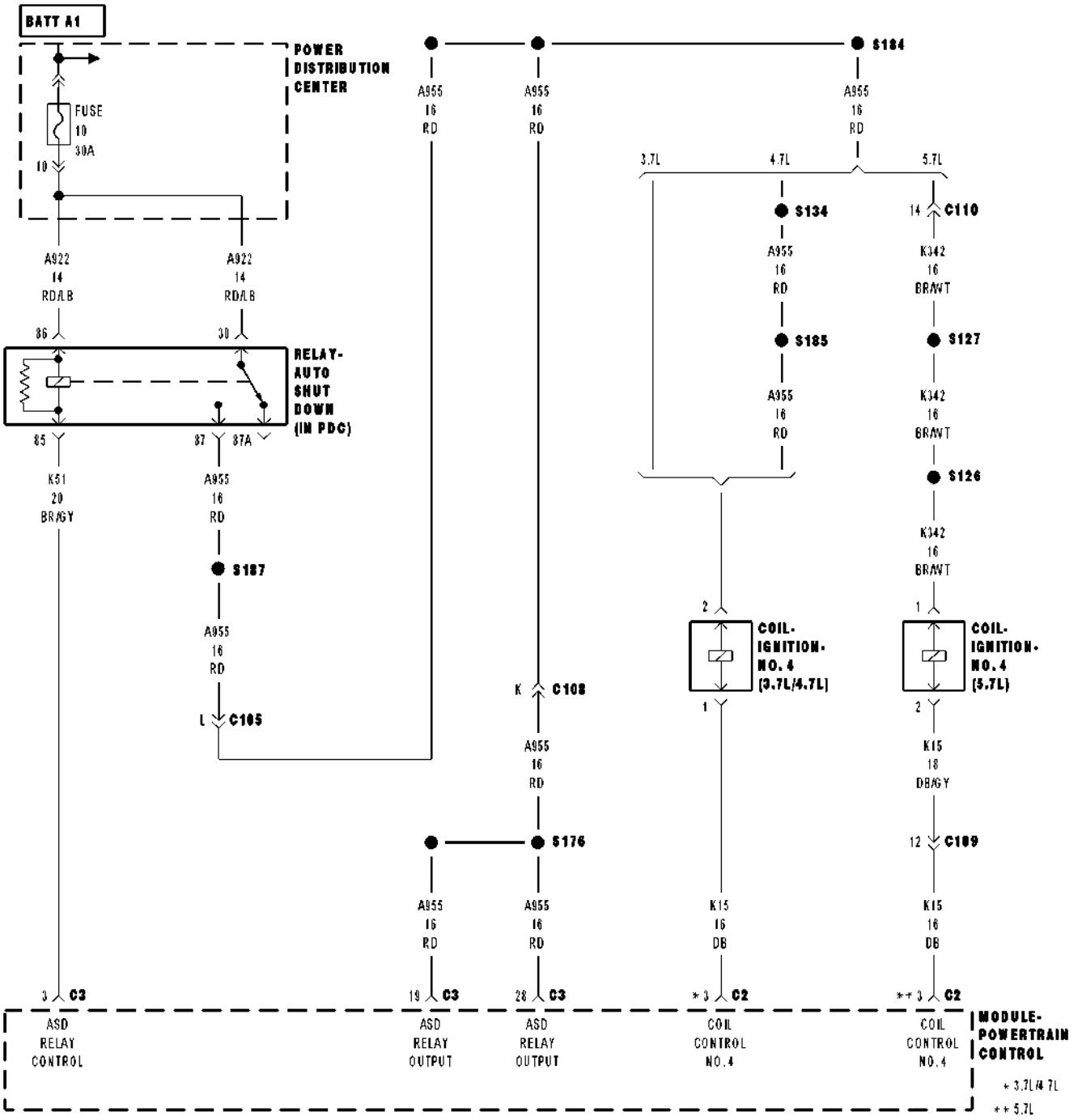
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

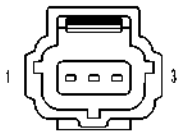
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

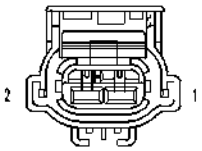
No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2311-IGNITION COIL 4 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION

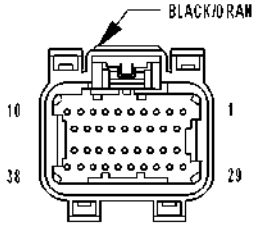




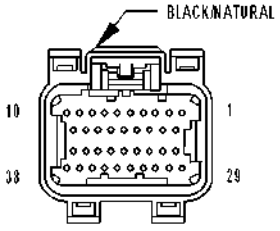
COIL- IGNITION-NO. 4 (3.7L/4.7L)



COIL- IGNITION-NO. 4 (5.7L)



MODULE- POWERTRAIN CONTROL C2



MODULE- POWERTRAIN CONTROL C3

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P2311-IGNITION COIL 4 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Engine running and battery voltage greater than 10 volts.
- **Set Condition:**
  If PCM detects that the secondary ignition burn time is incorrect, too short, or not present, an error is detected. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(A955), (K342) ASD RELAY OUTPUT CIRCUIT
(K15) COIL CONTROL NO.4 CIRCUIT OPEN
(K15) COIL CONTROL NO.4 CIRCUIT SHORTED TO GROUND
COIL ON PLUG
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, read DTCs.

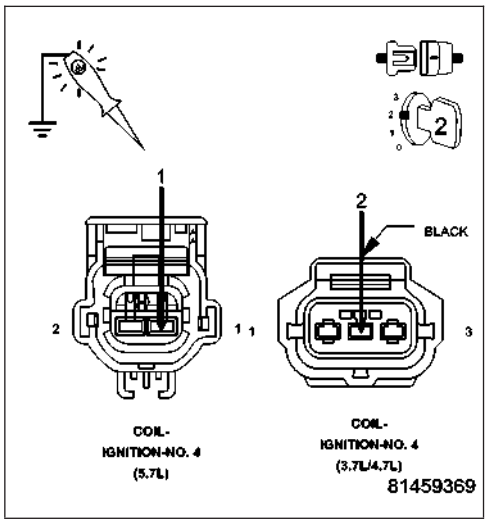
Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. (A955), (K342) ASD RELAY OUTPUT CIRCUIT



NOTE: The circuit id (K342) is used with the 5.7L engines and the (A955) id is used with the 3.7L and 4.7L engines.

Turn the ignition off.

Disconnect the Coil on Plug harness connector.

Ignition on, engine not running.

With a scan tool, actuate the ASD Relay.

Using a 12-volt test light connected to ground, probe the (A955), (K342) ASD Relay Output circuit in the Coil on Plug harness connector.

Does the test light illuminate brightly?

Yes >> Go To 3

No >> Repair the open or short to ground in the (A955), (K342) ASD Relay Output circuit between the IPM and Coil harness connector.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

NOTE: Stop All Actuations.

P2311-IGNITION COIL 4 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)

3. COIL ON PLUG RESISTANCE

Turn the ignition off.

NOTE: The following resistance measurement should be taken at 70°-80° F.

Measure the resistance of the Coil on Plug.

4.7L and 3.7L Primary Ignition Coil resistance is 0.6 to 0.9 of an ohm at 77°F (25°C).

5.7L Primary Ignition Coil resistance is 0.558 to 0.682 of an ohm at 77°F (25°C).

Is the resistance within the given specification for the Ignition Coil being tested?

Yes >> Go To 4

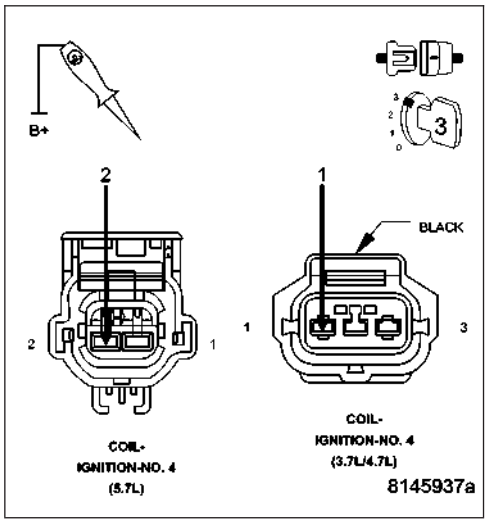
No >> Replace the Coil on plug.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

4. IGNITION COIL

Using a 12-volt test light connected to a 12-volt source, probe the (K15) Coil Control No.4 circuit.

Crank the engine for 5 seconds while observing the test light.



What is the state of the test light while cranking the engine?

Brightly blinking.
Replace the Coil on plug.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

ON constantly.
Go To 5

OFF constantly.
Go To 6

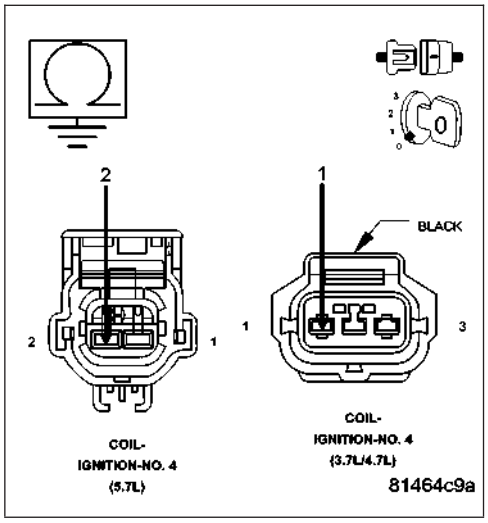
---

5. (K15) COIL CONTROL NO.4 CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the C2 PCM harness connector.

Measure the resistance between ground and the (K15) Coil Control No.4 circuit in the Coil on Plug harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K15) Coil Control No.4 circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 7

P2311-IGNITION COIL 4 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)

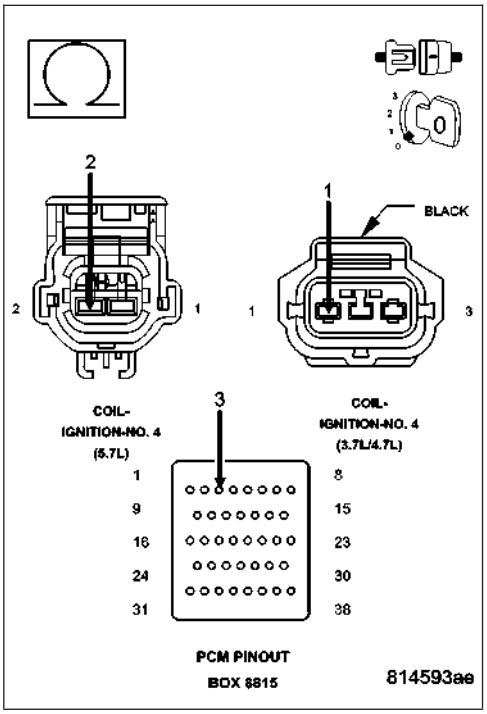
6. (K15) COIL CONTROL NO.4 CIRCUIT OPEN

Turn the ignition off.

Disconnect the C2 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K15) Coil Control No.4 circuit from the Coil on Plug harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 7

No >> Repair the open in the (K15) Coil Control No.4 circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

7. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

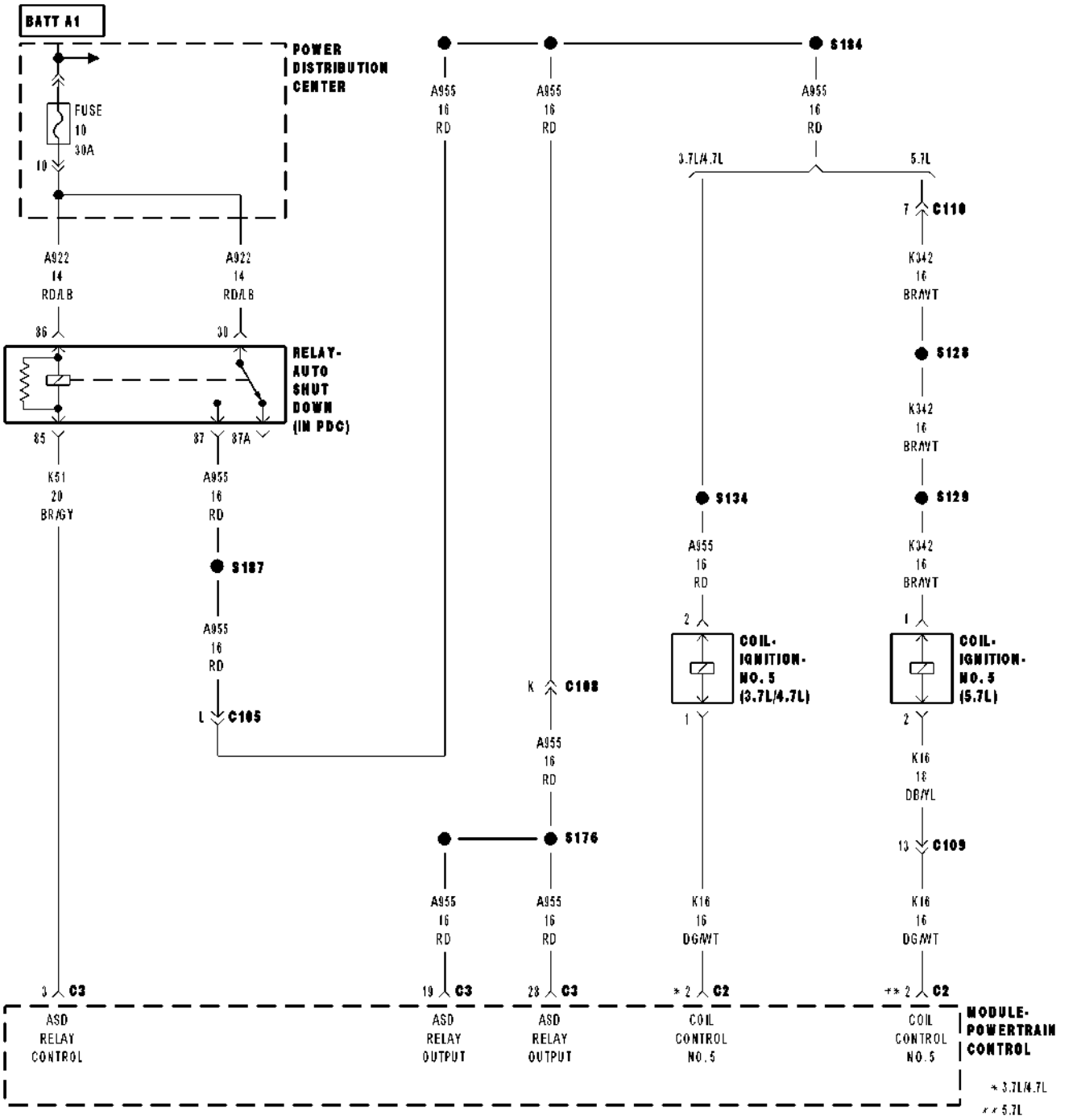
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

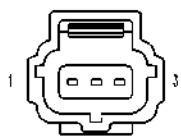
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

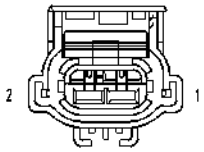
No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2314-IGNITION COIL 5 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION

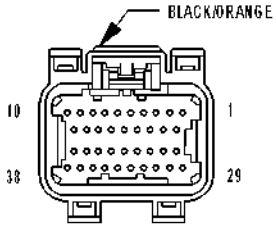




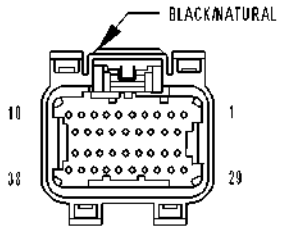
COIL-IGNITION-NO. 5 (3.7L/4.7L)



COIL-IGNITION-NO. 5 (5.7L)



MODULE-POWERTRAIN CONTROL C2



MODULE-POWERTRAIN CONTROL C3

8140ac2b

P2314-IGNITION COIL 5 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Engine running and battery voltage greater than 10 volts.
- **Set Condition:**
  If PCM detects that the secondary ignition burn time is incorrect, too short, or not present, an error is detected. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(A955), (K342) ASD RELAY OUTPUT CIRCUIT
(K16) COIL CONTROL NO.5 CIRCUIT OPEN
(K16) COIL CONTROL NO.5 CIRCUIT SHORTED TO GROUND
COIL ON PLUG
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. (A955), (K342) ASD RELAY OUTPUT CIRCUIT

NOTE: The circuit id (K342) is used with the 5.7L engines and the (A955) id is used with the 3.7L and 4.7L engines.

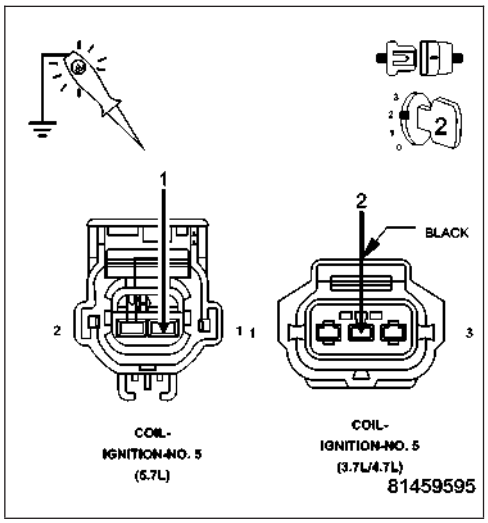
Turn the ignition off.

Disconnect the Coil on Plug harness connector.

Ignition on, engine not running.

With a scan tool, actuate the ASD Relay.

Using a 12-volt test light connected to ground, probe the (A955), (K342) ASD Relay Output circuit in the Coil on Plug harness connector.



Does the test light illuminate brightly?

Yes >> Go To 3

No >> Repair the open or short to ground in the (A955), (K342) ASD Relay Output circuit between the IPM and Coil harness connector.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

NOTE: Stop All Actuations.

P2314-IGNITION COIL 5 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)

3. COIL ON PLUG RESISTANCE

Turn the ignition off.

NOTE: The following resistance measurement should be taken at 70°-80° F.

Measure the resistance of the Coil on Plug.

4.7L and 3.7L Primary Ignition Coil resistance is 0.6 to 0.9 of an ohm at 77°F (25°C).

5.7L Primary Ignition Coil resistance is 0.558 to 0.682 of an ohm at 77°F (25°C).

Is the resistance within the given specification for the Ignition Coil being tested?

Yes >> Go To 4

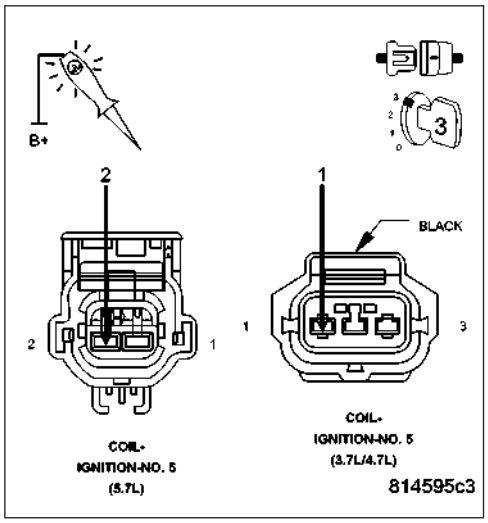
No >> Replace the Coil on plug.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

4. IGNITION COIL

Using a 12-volt test light connected to a 12-volt source, probe the (K16) Coil Control No.5 circuit.

Crank the engine for 5 seconds while observing the test light.



What is the state of the test light while cranking the engine?

Brightly blinking.
Replace the Coil on plug.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

ON constantly.
Go To 5

OFF constantly.
Go To 6

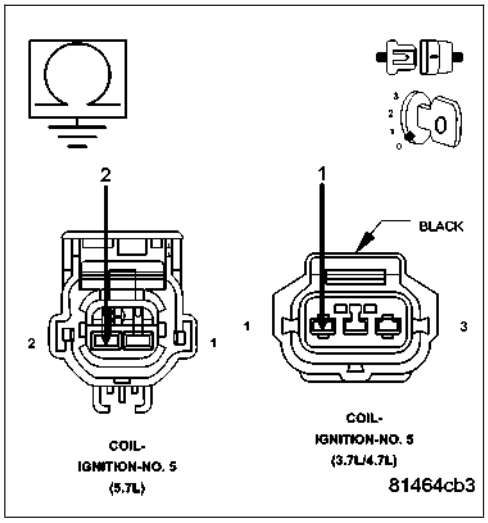
---

5. (K16) COIL CONTROL NO.5 CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the C2 PCM harness connector.

Measure the resistance between ground and the (K16) Coil Control No.5 circuit in the Coil on Plug harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K16) Coil Control No.5 circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 7

P2314-IGNITION COIL 5 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)

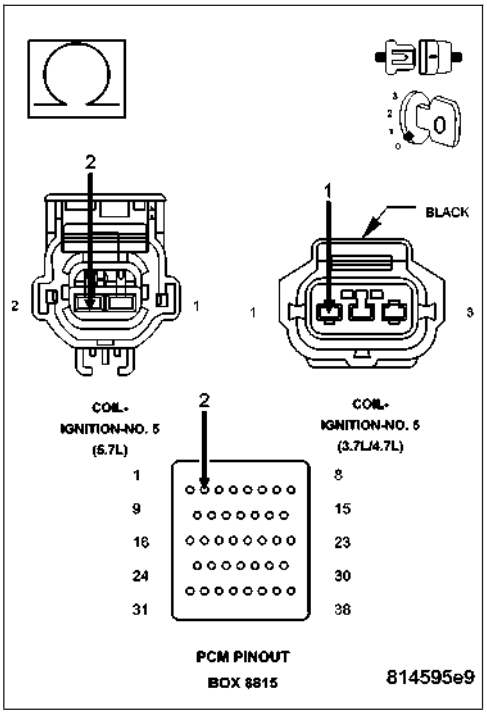
6. (K16) COIL CONTROL NO.5 CIRCUIT OPEN

Turn the ignition off.

Disconnect the C2 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K16) Coil Control No.5 circuit from the Coil on Plug harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 7

No >> Repair the open in the (K16) Coil Control No.5 circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

7. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

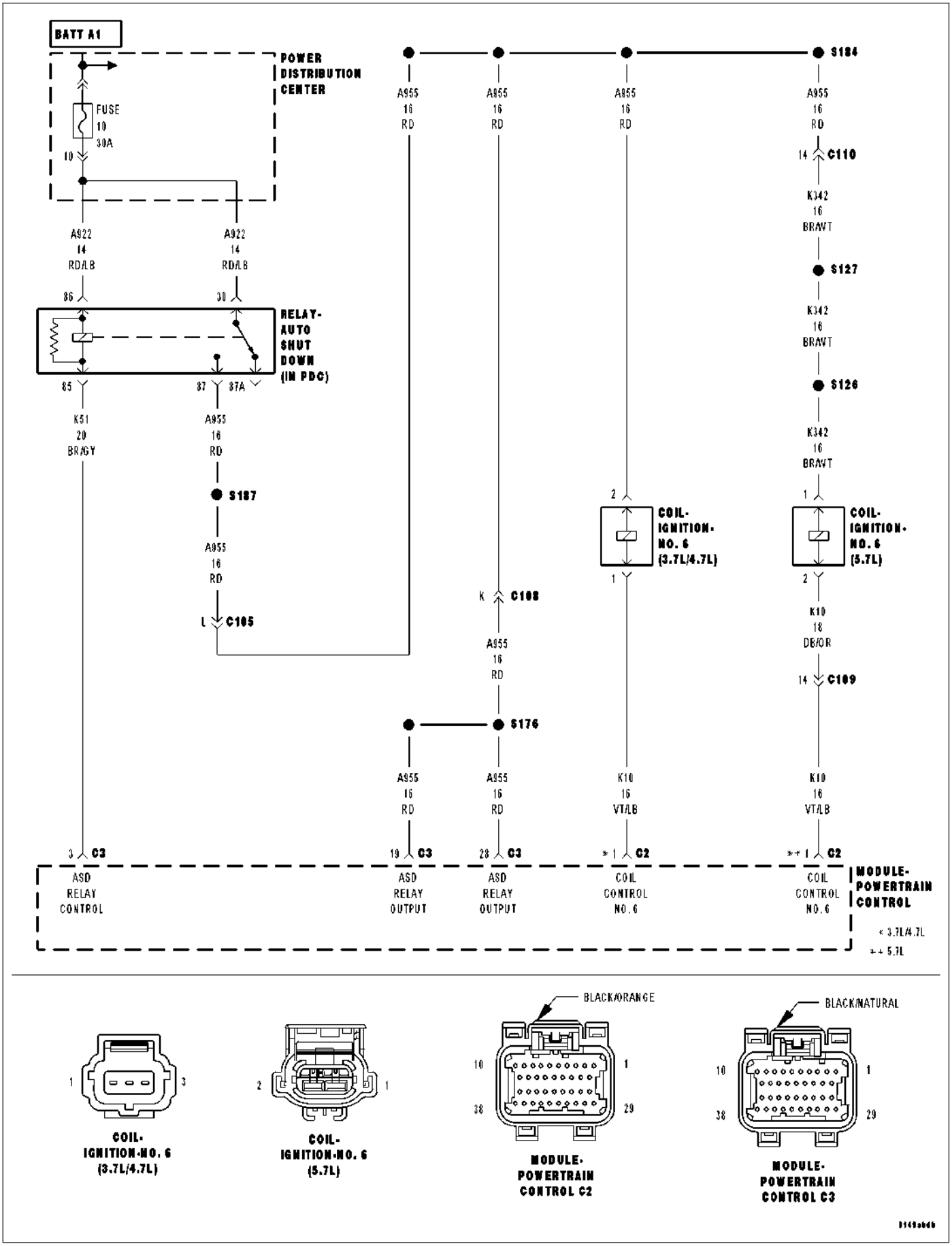
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2317-IGNITION COIL 6 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION



P2317-IGNITION COIL 6 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Engine running and battery voltage greater than 10 volts.
- **Set Condition:**
  If PCM detects that the secondary ignition burn time is incorrect, too short, or not present, an error is detected. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(A955), (K342) ASD RELAY OUTPUT CIRCUIT
(K10) COIL CONTROL NO.6 CIRCUIT OPEN
(K10) COIL CONTROL NO.6 CIRCUIT SHORTED TO GROUND
COIL ON PLUG
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. (A955), (K342) ASD RELAY OUTPUT CIRCUIT

NOTE: The circuit id (K342) is used with the 5.7L engines and the (A955) id is used with the 3.7L and 4.7L engines.

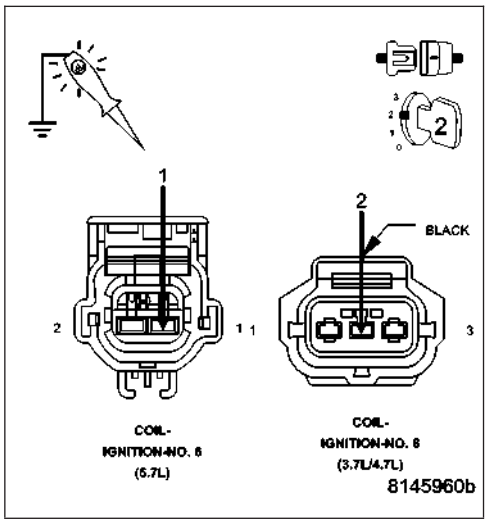
Turn the ignition off.

Disconnect the Coil on Plug harness connector.

Ignition on, engine not running.

With a scan tool, actuate the ASD Relay.

Using a 12-volt test light connected to ground, probe the (A955), (K342) ASD Relay Output circuit in the Coil on Plug harness connector.



Does the test light illuminate brightly?

Yes >> Go To 3

No >> Repair the open or short to ground in the (A955), (K342) ASD Relay Output circuit between the IPM and Coil harness connector.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

NOTE: Stop All Actuations.

P2317-IGNITION COIL 6 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)

3. COIL ON PLUG RESISTANCE

Turn the ignition off.

NOTE: The following resistance measurement should be taken at 70°-80° F.

Measure the resistance of the Coil on Plug.

4.7L and 3.7L Primary Ignition Coil resistance is 0.6 to 0.9 of an ohm at 77°F (25°C).

5.7L Primary Ignition Coil resistance is 0.558 to 0.682 of an ohm at 77°F (25°C).

Is the resistance within the given specification for the Ignition Coil being tested?

Yes >> Go To 4

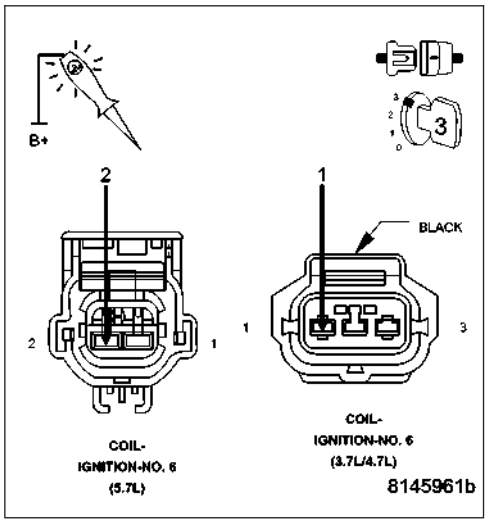
No >> Replace the Coil on plug.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

4. IGNITION COIL

Using a 12-volt test light connected to a 12-volt source, probe the (K10) Coil Control No.6 circuit.

Crank the engine for 5 seconds while observing the test light.



What is the state of the test light while cranking the engine?

Brightly blinking.
Replace the Coil on plug.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

ON constantly.
Go To 5

OFF constantly.
Go To 6

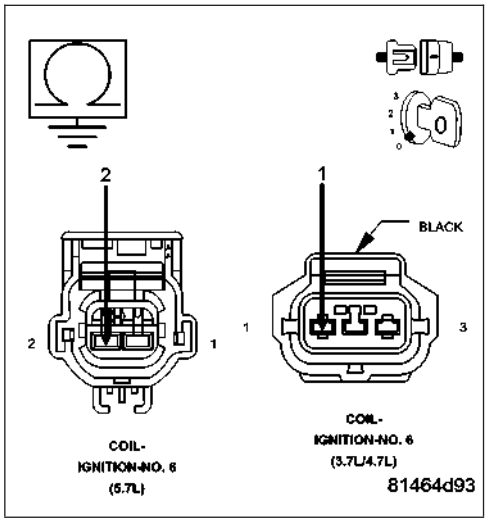
---

5. (K10) COIL CONTROL NO.6 CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the C2 PCM harness connector.

Measure the resistance between ground and the (K10) Coil Control No.6 circuit in the Coil on Plug harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K10) Coil Control No.6 circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 7

P2317-IGNITION COIL 6 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)

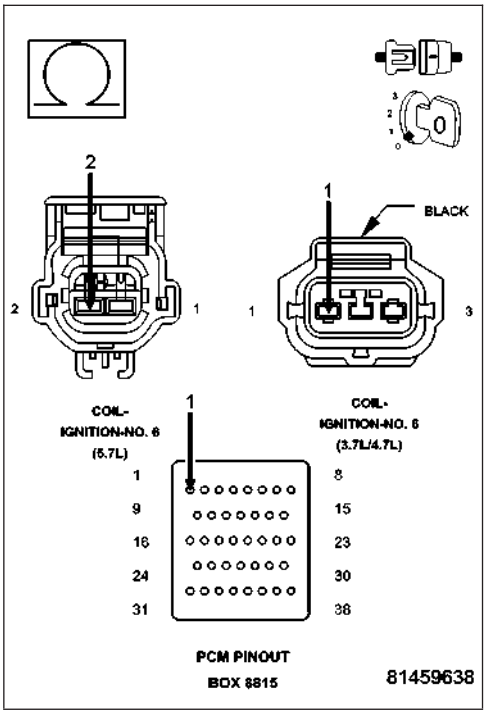
6. (K10) COIL CONTROL NO.6 CIRCUIT OPEN

Turn the ignition off.

Disconnect the C2 PCM harness connectors.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K10) Coil Control No.6 circuit from the Coil on Plug harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 7

No >> Repair the open in the (K10) Coil Control No.6 circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

7. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

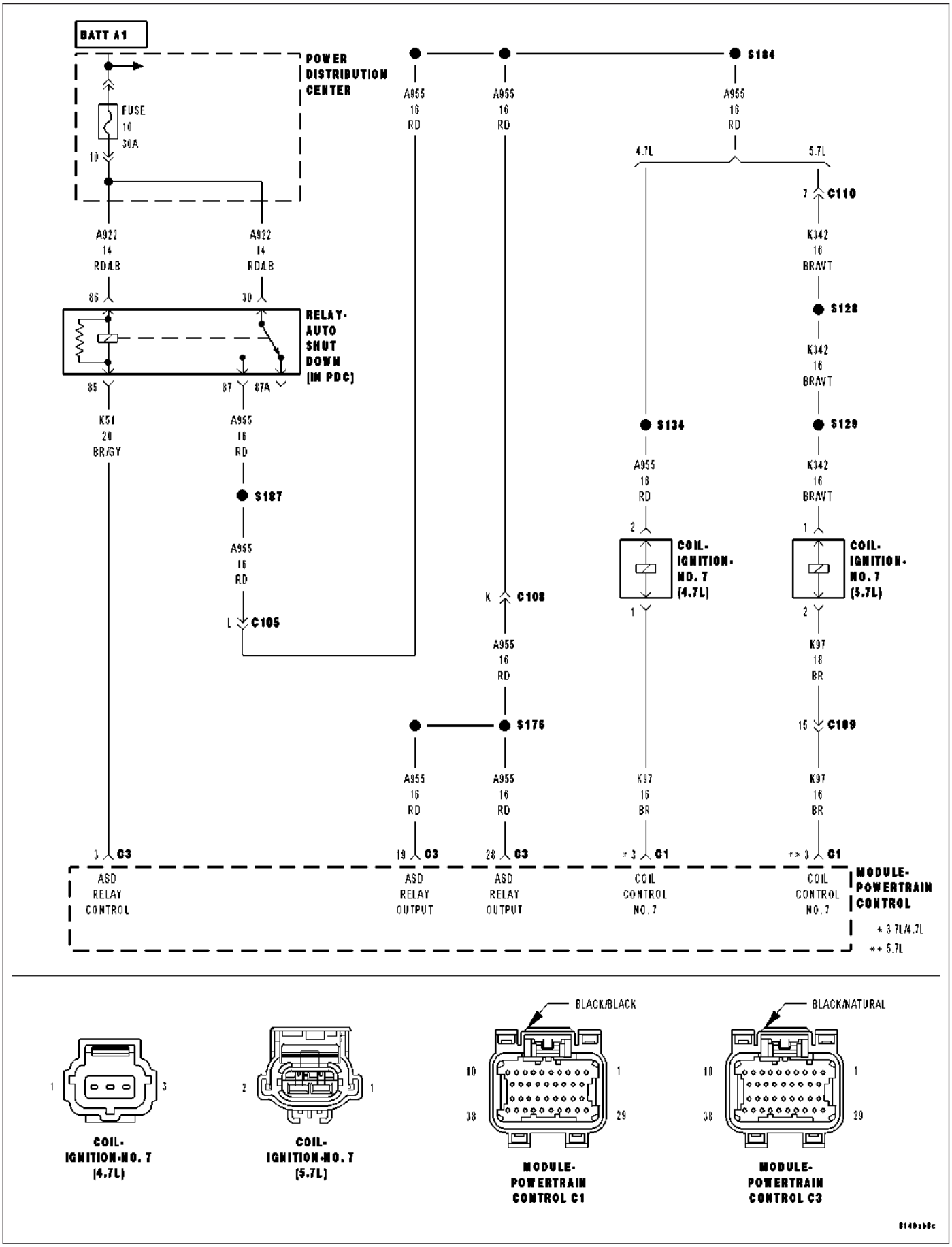
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2320-IGNITION COIL 7 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION



P2320-IGNITION COIL 7 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Engine running and battery voltage greater than 10 volts.
- **Set Condition:**
  If PCM detects that the secondary ignition burn time is incorrect, too short, or not present, an error is detected. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(A955), (K342) ASD RELAY OUTPUT CIRCUIT
(K97) COIL CONTROL NO.7 CIRCUIT OPEN
(K97) COIL CONTROL NO.7 CIRCUIT SHORTED TO GROUND
COIL ON PLUG
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, read DTCs.

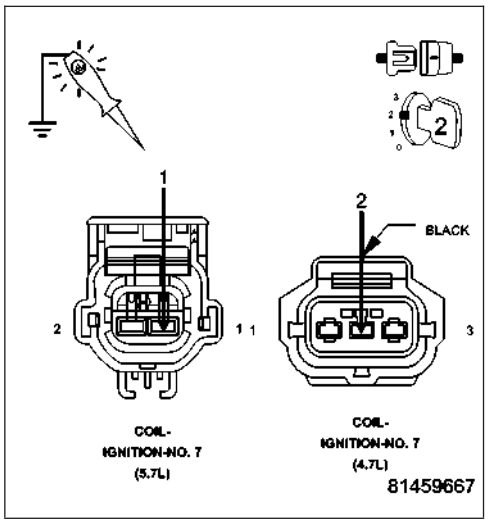
Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. (A955), (K342) ASD RELAY OUTPUT CIRCUIT



NOTE: The circuit id (K342) is used with the 5.7L engines and the (A955) id is used with the 4.7L engines.

Turn the ignition off.

Disconnect the Coil on Plug harness connector.

Ignition on, engine not running.

With a scan tool, actuate the ASD Relay.

Using a 12-volt test light connected to ground, probe the (A955), (K342) ASD Relay Output circuit in the Coil on Plug harness connector.

Does the test light illuminate brightly?

Yes >> Go To 3

No >> Repair the open or short to ground in the (A955), (K342) ASD Relay Output circuit between the IPM and Coil harness connector.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

NOTE: Stop All Actuations.

P2320-IGNITION COIL 7 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)

3. COIL ON PLUG RESISTANCE

Turn the ignition off.

NOTE: The following resistance measurement should be taken at 70°-80° F.

Measure the resistance of the Coil on Plug.

4.7L Primary Ignition Coil resistance is 0.6 to 0.9 of an ohm at 77°F (25°C).

5.7L Primary Ignition Coil resistance is 0.558 to 0.682 of an ohm at 77°F (25°C).

Is the resistance within the given specification for the Ignition Coil being tested?

Yes >> Go To 4

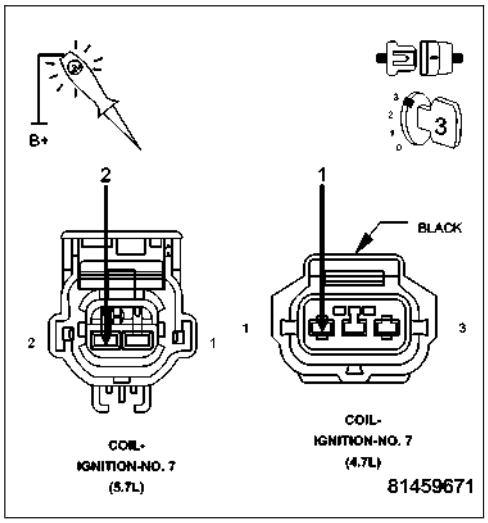
No >> Replace the Coil on plug.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

4. IGNITION COIL

Using a 12-volt test light connected to a 12-volt source, probe the (K97) Coil Control No.7 circuit.

Crank the engine for 5 seconds while observing the test light.



What is the state of the test light while cranking the engine?

Brightly blinking.
Replace the Coil on plug.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

ON constantly.
Go To 5

OFF constantly.
Go To 6

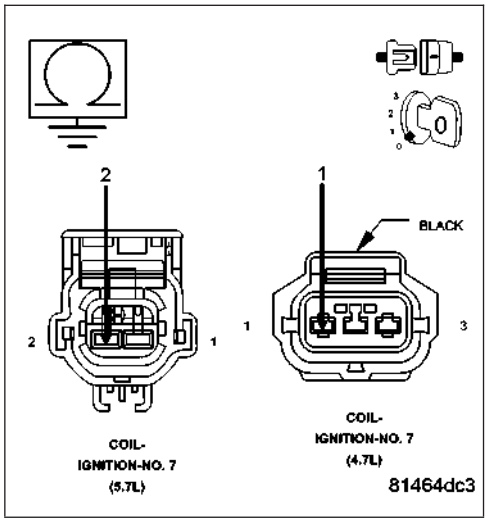
---

5. (K97) COIL CONTROL NO.7 CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the C1 PCM harness connector.

Measure the resistance between ground and the (K97) Coil Control No.7 circuit in the Coil on Plug harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K97) Coil Control No.7 circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 7

P2320-IGNITION COIL 7 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)

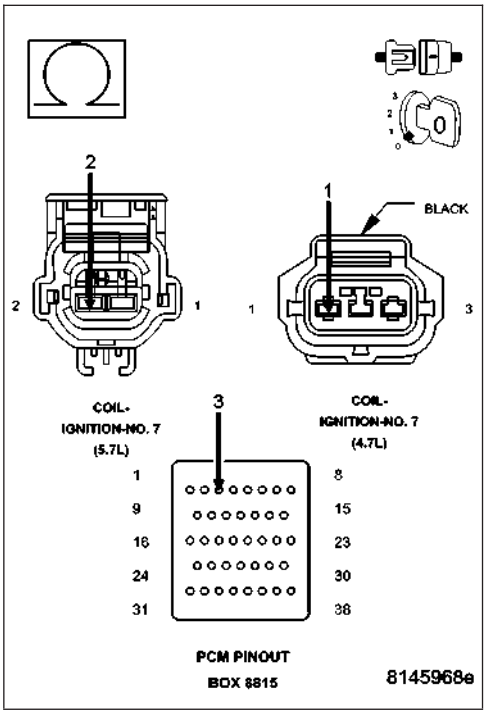
6. (K97) COIL CONTROL NO.7 CIRCUIT OPEN

Turn the ignition off.

Disconnect the C1 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K97) Coil Control No.7 circuit from the Coil on Plug connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 7

No >> Repair the open in the (K97) Coil Control No.7 circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

7. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

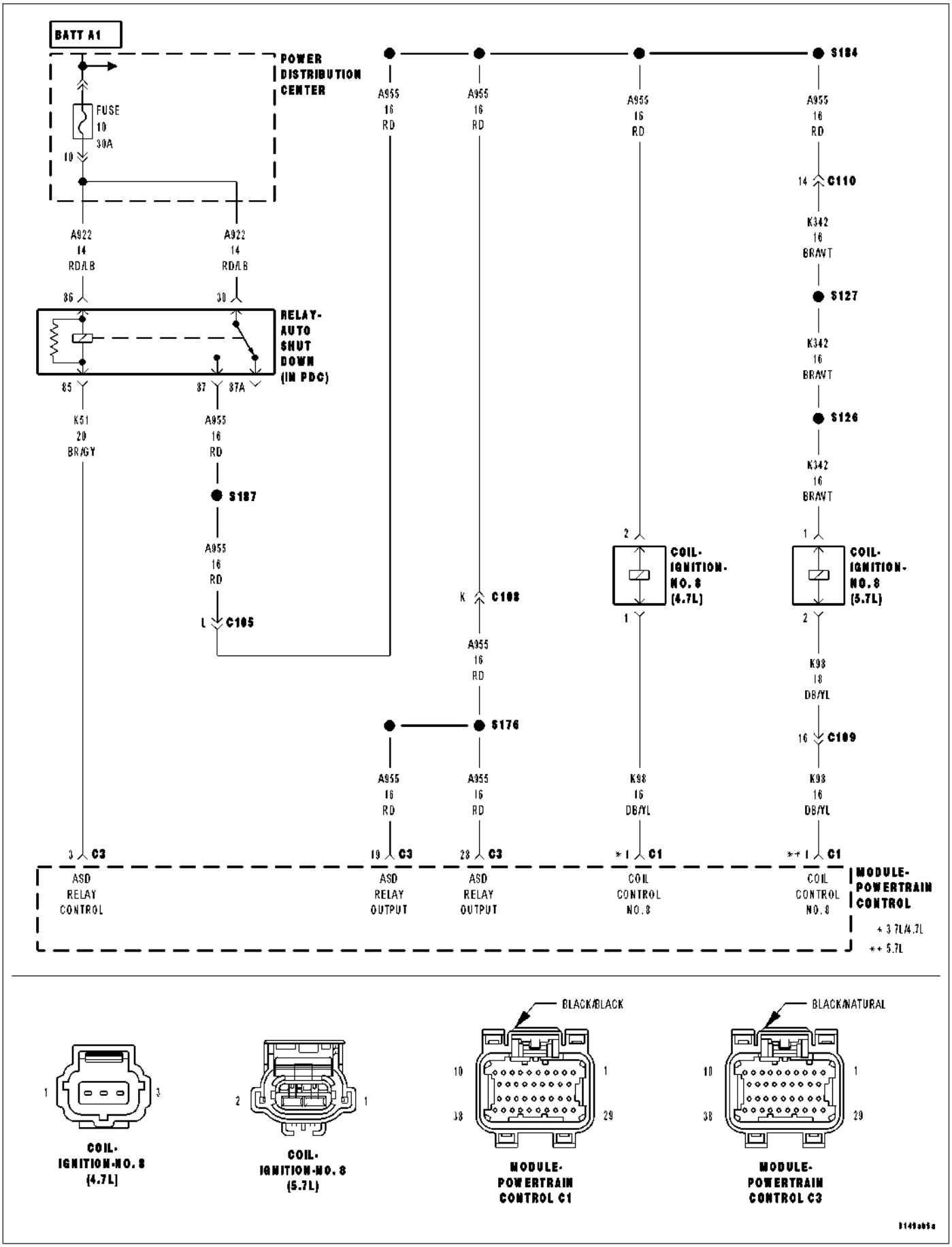
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2323-IGNITION COIL 8 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION



COIL- IGNITION-NO. 8 (4.7L)

COIL- IGNITION-NO. 8 (5.7L)

MODULE- POWERTRAIN CONTROL C1

MODULE- POWERTRAIN CONTROL C3

P2323-IGNITION COIL 8 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Engine running and battery voltage greater than 10 volts.
- **Set Condition:**
  If PCM detects that the secondary ignition burn time is incorrect, too short, or not present, an error is detected. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(A955), (K342) ASD RELAY OUTPUT CIRCUIT
(K98) COIL CONTROL NO.8 CIRCUIT OPEN
(K98) COIL CONTROL NO.8 CIRCUIT SHORTED TO GROUND
COIL ON PLUG
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, read DTCs.

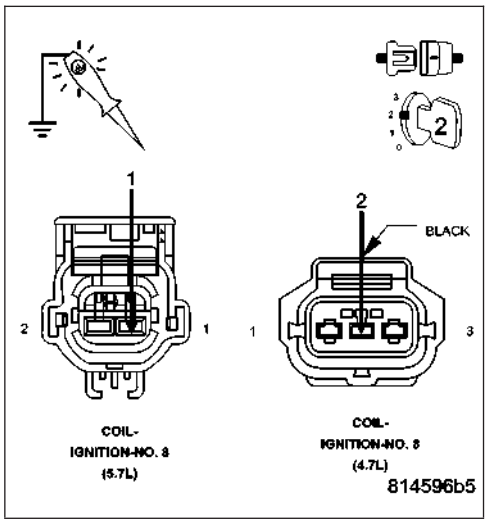
Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. (A955), (K342) ASD RELAY OUTPUT CIRCUIT



NOTE: The circuit id (K342) is used with the 5.7L engines and the (A955) id is used with the 4.7L engines.

Turn the ignition off.

Disconnect the Coil on Plug harness connector.

Ignition on, engine not running.

With a scan tool, actuate the ASD Relay.

Using a 12-volt test light connected to ground, probe the (A955), (K342) ASD Relay Output circuit in the Coil on Plug harness connector.

Does the test light illuminate brightly?

Yes >> Go To 3

No >> Repair the open or short to ground in the (A955), (K342) ASD Relay Output circuit between the IPM and Coil harness connector.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

NOTE: Stop All Actuations.

P2323-IGNITION COIL 8 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)

3. COIL ON PLUG RESISTANCE

Turn the ignition off.

NOTE: The following resistance measurement should be taken at 70°-80° F.

Measure the resistance of the Coil on Plug.

4.7L Primary Ignition Coil resistance is 0.6 to 0.9 of an ohm at 77°F (25°C).

5.7L Primary Ignition Coil resistance is 0.558 to 0.682 of an ohm at 77°F (25°C).

Is the resistance within the given specification for the Ignition Coil being tested?

Yes >> Go To 4

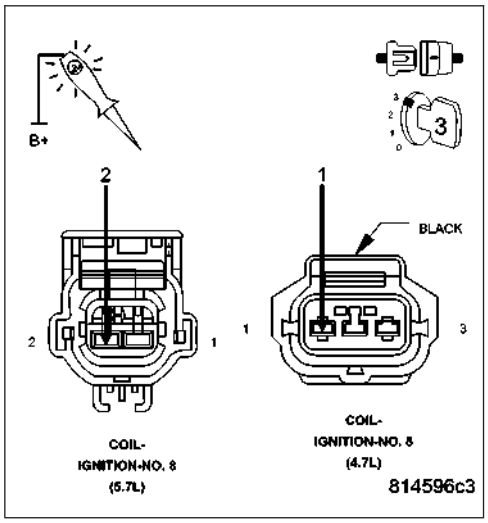
No >> Replace the Coil on plug.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

4. IGNITION COIL

Using a 12-volt test light connected to a 12-volt source, probe the (K98) Coil Control No.8 circuit.

Crank the engine for 5 seconds while observing the test light.



What is the state of the test light while cranking the engine?

Brightly blinking.
Replace the Coil on plug.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

ON constantly.
Go To 5

OFF constantly.
Go To 6

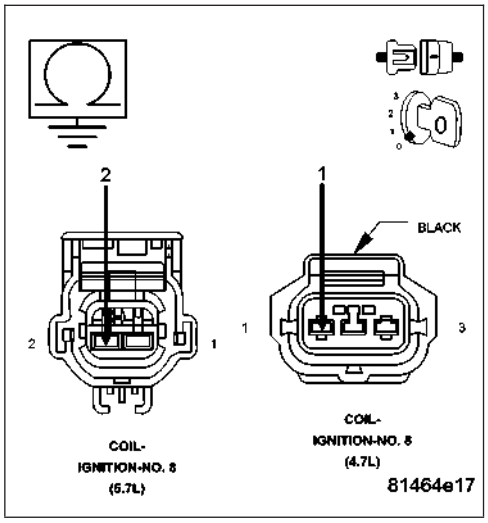
---

5. (K98) COIL CONTROL NO.8 CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the C1 PCM harness connector.

Measure the resistance between ground and the (K98) Coil Control No.8 circuit in the Coil on Plug harness connector.



Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K98) Coil Control No.8 circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 7

P2323-IGNITION COIL 8 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)

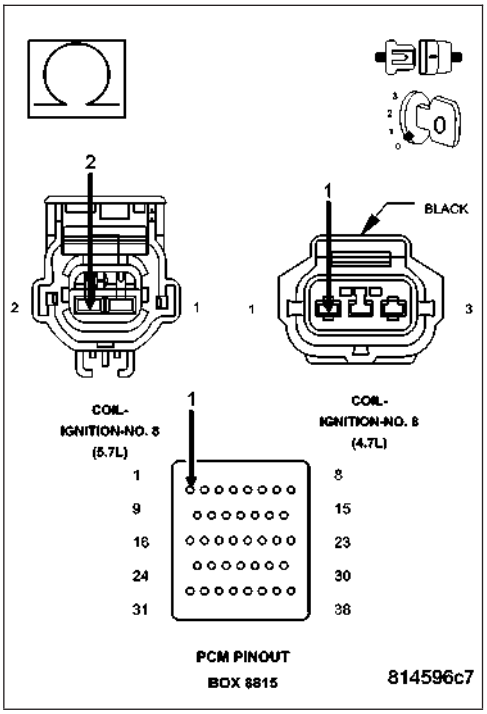
6. (K98) COIL CONTROL NO.8 CIRCUIT OPEN

Turn the ignition off.

Disconnect the C1 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K98) Coil Control No.8 circuit from the Coil on Plug harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Go To 7

No >> Repair the open in the (K98) Coil Control No.8 circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

7. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

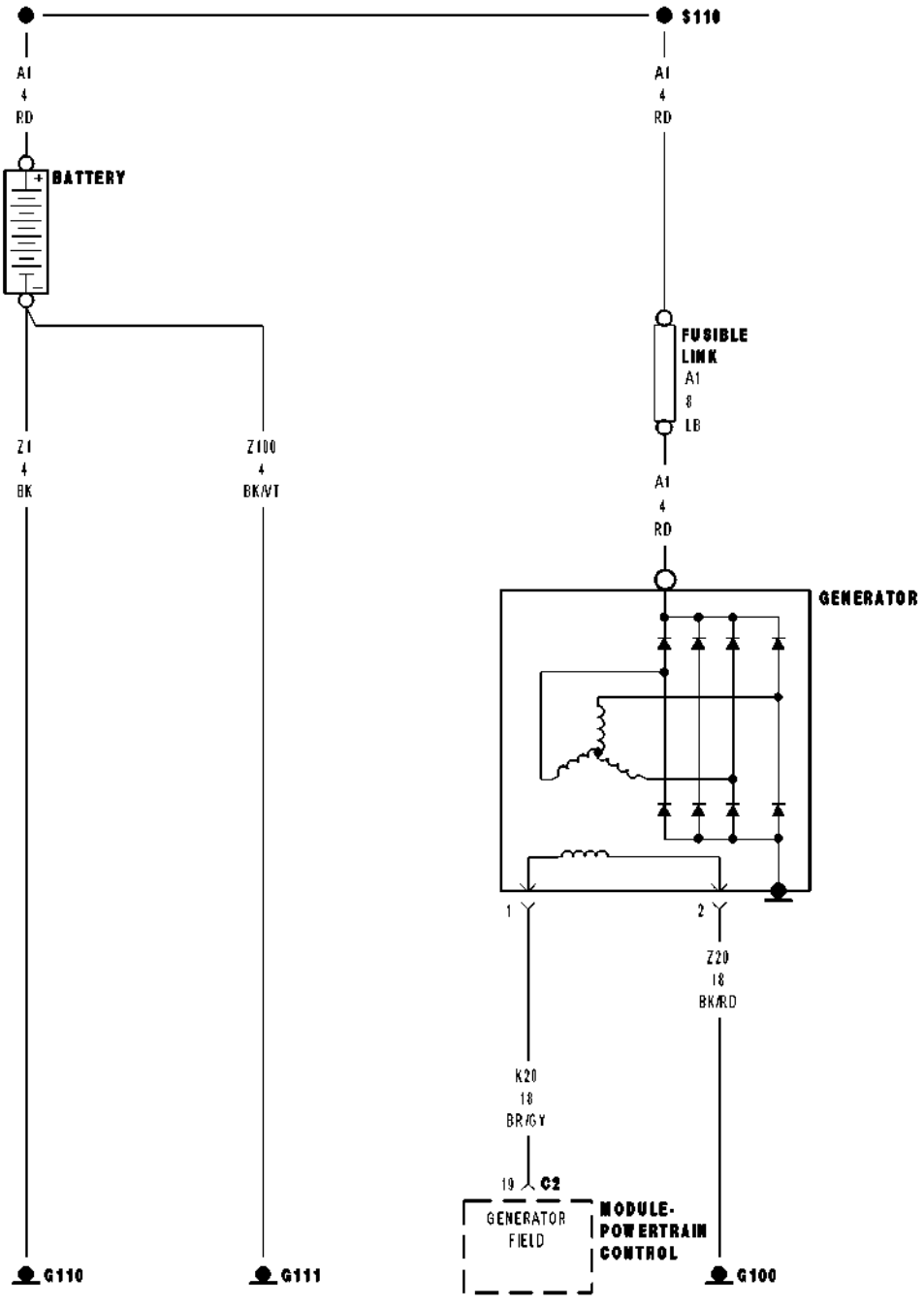
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

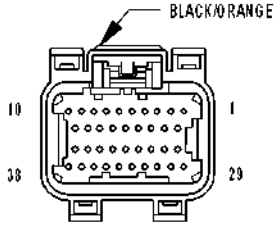
Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

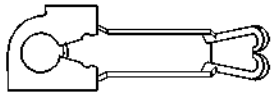
P2503-CHARGING SYSTEM OUTPUT LOW



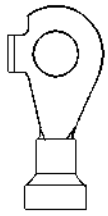


MODULE-
POWERTRAIN
CONTROL C2

GENERATOR



BATTERY
(+)



GENERATOR

81497828

P2503-CHARGING SYSTEM OUTPUT LOW (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  The engine running. The engine speed greater than 1157 RPM.
- **Set Condition:**
  The battery sensed voltage is 1 volt below the charging goal for 13.47 seconds. The PCM senses the battery voltage turns off the field driver and senses the battery voltage again. If the voltages are the same, the code is set. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
EXCESSIVE RESISTANCE IN THE BATTERY POSITIVE CIRCUIT
EXCESSIVE RESISTANCE IN THE CASE GROUND
(K20) GEN FIELD CONTROL CIRCUIT SHORTED TO VOLTAGE
(K20) GEN FIELD CONTROL CIRCUIT OPEN
(K20) GEN FIELD CONTROL CIRCUIT SHORTED TO GROUND
(Z20) GEN GROUND CIRCUIT OPEN
GENERATOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

NOTE: Inspect the vehicle for aftermarket accessories that may exceed the Generator System output.
Ignition on, engine not running.

NOTE: The battery must be fully charged.

NOTE: The Generator belt tension and condition must be checked before continuing.
With a scan tool, read DTCs.
With a scan tool, erase DTCs.
Start the engine.
Allow the idle to stabilize.
Ignition on, engine not running.
With the scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2503-CHARGING SYSTEM OUTPUT LOW (CONTINUED)

2. FUSED B+ CIRCUIT HIGH RESISTANCE

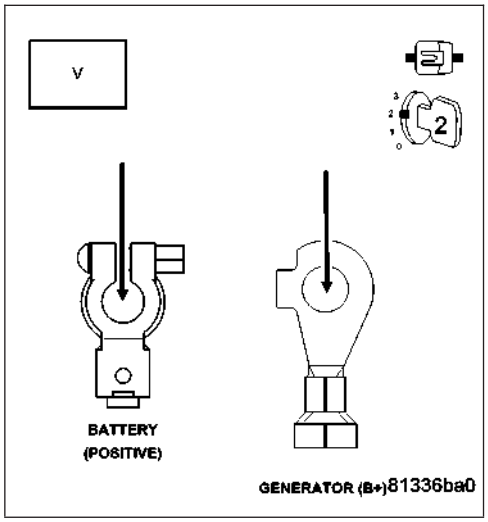
WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.
Ignition on, engine not running.

NOTE: Make sure all wires are clear of the engine's moving parts.
Measure the voltage between the Generator B+ Output Terminal and the Battery+ Post.
Start the engine.

Is the voltage above 0.4 of a volt?

Yes >> Repair the excessive resistance in the battery positive circuit between the Generator and Battery.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3



3. EXCESSIVE RESISTANCE IN THE CASE GROUND

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.
Start the engine.
Warm the engine to operating temperature.

NOTE: Make sure all wires are clear of the engine's moving parts.
Measure the voltage between the Generator Case and Battery ground post.

Is the voltage above 0.1 of a volt?

Yes >> Repair the excessive resistance in the Generator Case Ground.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

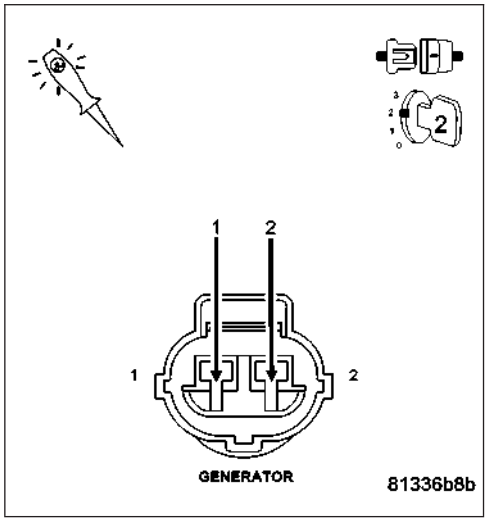
4. GENERATOR OPERATION

Turn the ignition off.
Disconnect the Generator Field harness connector.
Using a 12-volt test light, jump across the Generator Field harness connector.
Ignition on, engine not running.
With a scan tool, actuate the Generator Field Driver.

Does the test light illuminate brightly and flash on and off?

Yes >> Replace the Generator.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5



P2503-CHARGING SYSTEM OUTPUT LOW (CONTINUED)

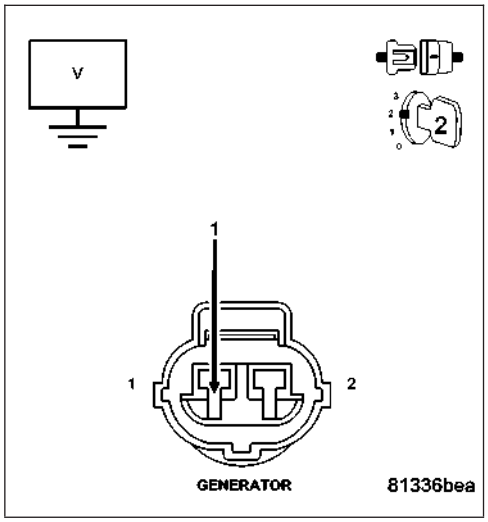
5. (K20) GEN FIELD CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

Disconnect the C2 PCM harness connector.

Ignition on, engine not running.

Measure the voltage on the (K20) Gen Field Control circuit in the Generator Field harness connector.



Is the voltage above 1.0 volt?

Yes >> Repair the short to battery voltage in the (K20) Gen Field Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

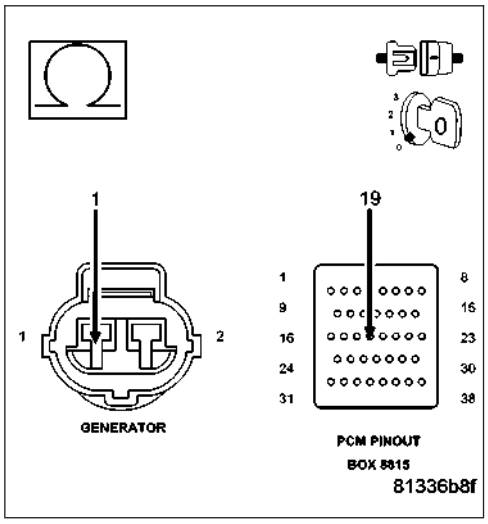
No >> Go To 6

6. (K20) FIELD CONTROL CIRCUIT OPEN

Turn the ignition off.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K20) Gen Field Control circuit from the Generator Field harness connector to the appropriate terminal of special tool #8815.



Is the resistance below 5.0 ohms?

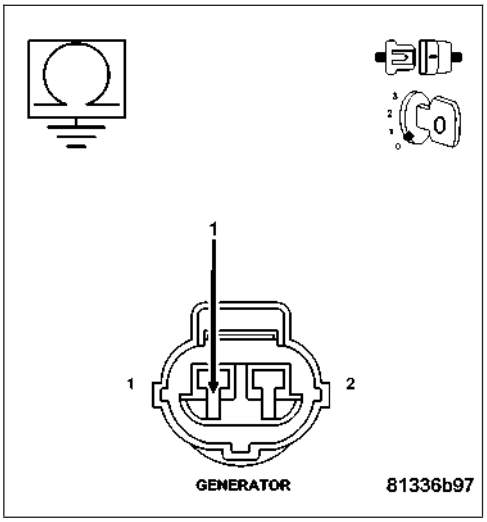
Yes >> Go To 7

No >> Repair the open in the (K20) Gen Field Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

P2503-CHARGING SYSTEM OUTPUT LOW (CONTINUED)

7. (K20) GEN FIELD CONTROL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K20) Gen Field Control circuit in the Generator Field harness connector.



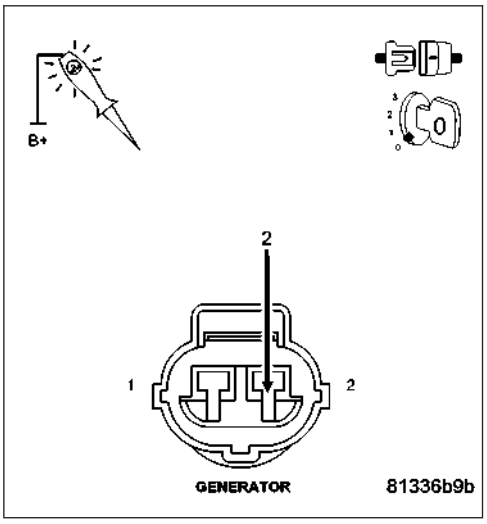
Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (K20) Gen Field Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8

8. (Z20) GROUND CIRCUIT OPEN

Using a 12-volt test light connected to battery voltage, probe the (Z20) Ground circuit in the Generator Field harness connector.



Does the test light illuminate brightly?

Yes >> Go To 9

No >> Repair the open in the (Z20) Generator Ground circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

9. PCM

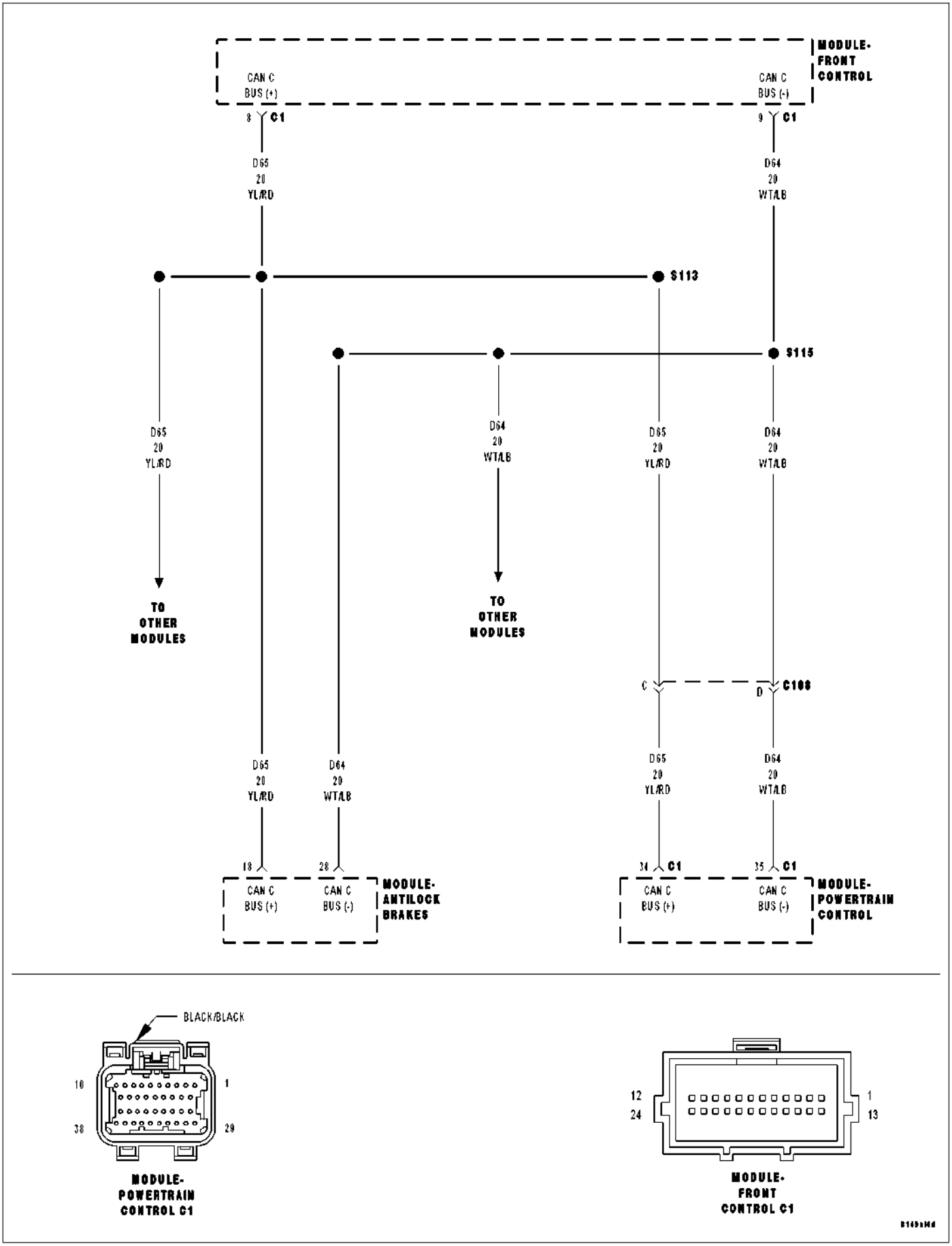
NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

U0001-CAN C BUS



U0001-CAN C BUS (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition run time is greater than 1 second. Battery voltage between 9 and 16 volts. Engine run time greater than 3 seconds.
- **Set Condition:**
  The PCM loses communication over the CAN C Bus circuit. The circuit is continuously monitored.

Possible Causes
CAN C BUS FAILURE OPEN OR SHORTED CONDITION
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, read FCM DTCs.

Is the DTC active at this time?

Yes >> Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

U0101-LOST COMMUNICATION WITH TCM

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition run time is greater than 1 second. Battery voltage between 9 and 16 volts. Engine run time greater than 3 seconds.
- **Set Condition:**
  The PCM doesn't receive a Bus Message from the Transmission Control Module for 7 consecutive seconds. The circuit is continuously monitored.

Possible Causes
CAN C BUS OPEN OR SHORTED CONDITION
PCM

Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

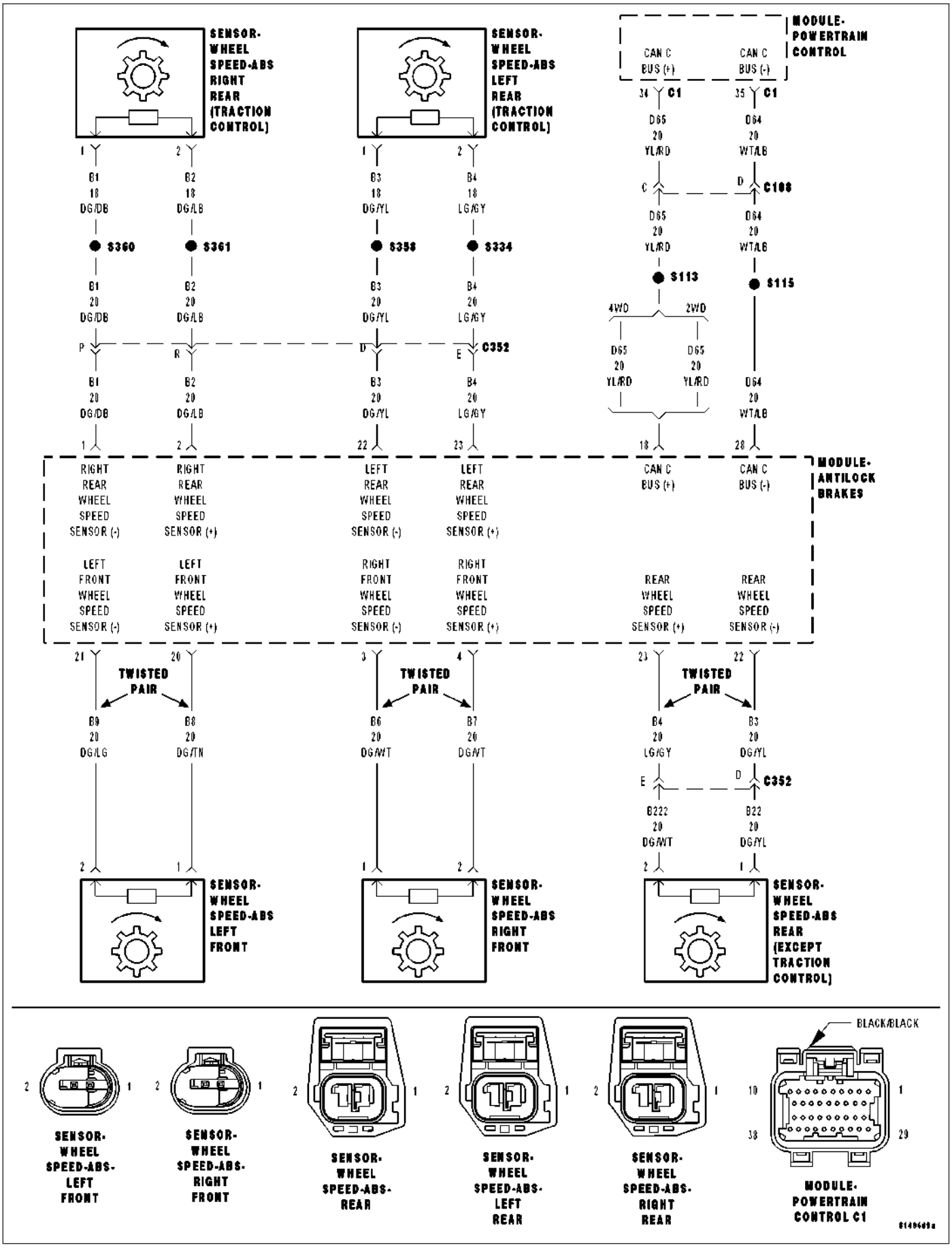
With a scan tool, read PCM DTCs.

Is the DTC active at this time?

Yes >> Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

U0121-LOST COMMUNICATION WITH ANTI-LOCK BRAKE MODULE



U0121-LOST COMMUNICATION WITH ANTI-LOCK BRAKE MODULE (CONTINUED)
For a complete wiring diagram**Refer to Section 8W**.

- **When Monitored:**
  Ignition run time is greater than 1 second. Battery voltage between 9 and 16 volts. Engine run time greater than 3 seconds.
- **Set Condition:**
  The PCM doesn't receive an ABS message over the CAN C circuit for 7 consecutive seconds. The circuit is continuously monitored.

Possible Causes
CAN C BUS OPEN OR SHORTED CONDITION
ABS MODULE
PCM

Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

Diagnostic Test

1. ACTIVE DTC

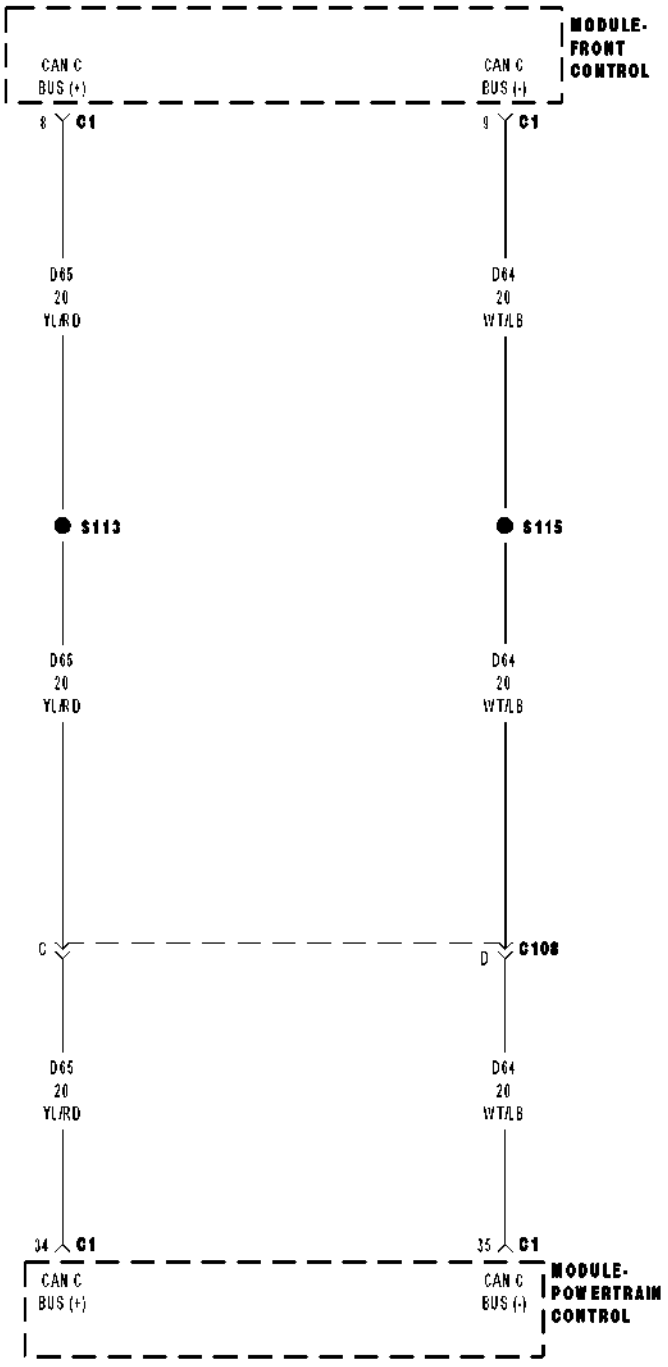
Ignition on, engine not running.
With a scan tool, read PCM DTCs.

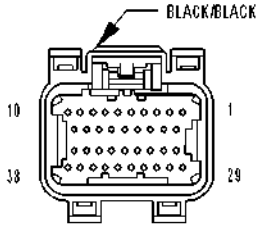
Is the DTC active at this time?

Yes >> Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

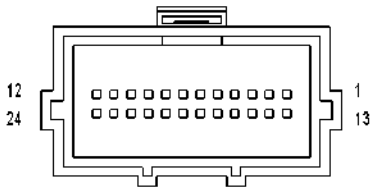
No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE





MODULE-
POWERTRAIN
CONTROL C1



MODULE-
FRONT
CONTROL C1

U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition run time is greater than 1 second. Battery voltage between 9 and 16 volts.
- **Set Condition:**
  The PCM doesn't receive a FCM message over the CAN C circuit for 7 consecutive seconds. The circuit is continuously monitored.

Possible Causes
CAN C BUS OPEN OR SHORTED CONDITION
FRONT CONTROL MODULE
PCM

Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

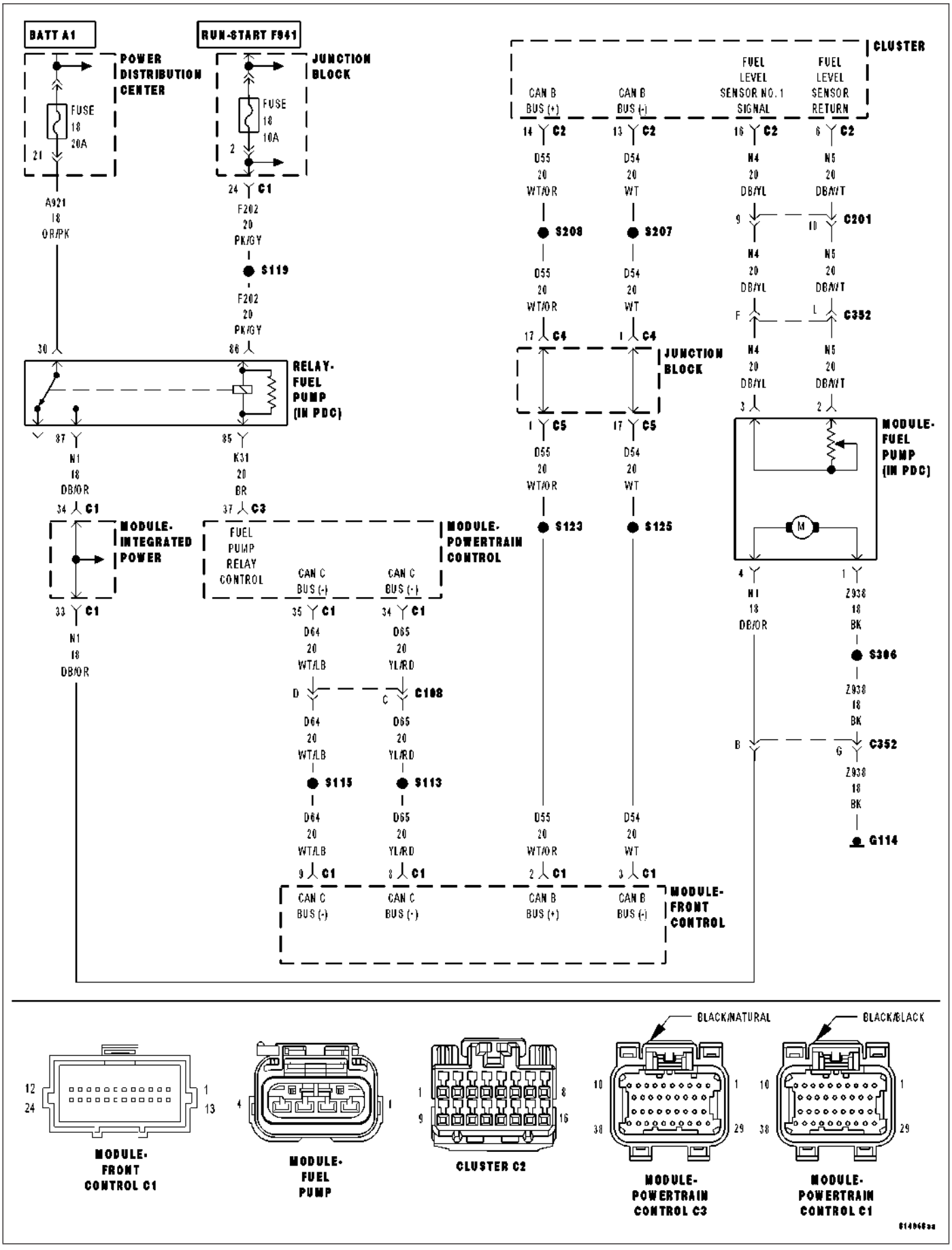
With a scan tool, read PCM DTCs.

Is the DTC active at this time?

Yes >> Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

U110C-NO FUEL LEVEL BUS MESSAGE RECEIVED



U110C-NO FUEL LEVEL BUS MESSAGE RECEIVED (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  When the PCM does not receive a fuel level signal from the FCM over the CAN C circuit. The circuit is constantly monitored.

Possible Causes
CAN C BUS CIRCUIT OPEN OR SHORTED
FRONT CONTROL MODULE
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING) .

Theory of Operation

The fuel level signal is a direct input to the Cluster. The fuel level signal is sent to the FCM over the CAN B bus circuit. The NGC receives the fuel level signal from the FCM over the CAN C bus circuit.

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With the scan tool read Powertrain DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE ALSO ACTIVE

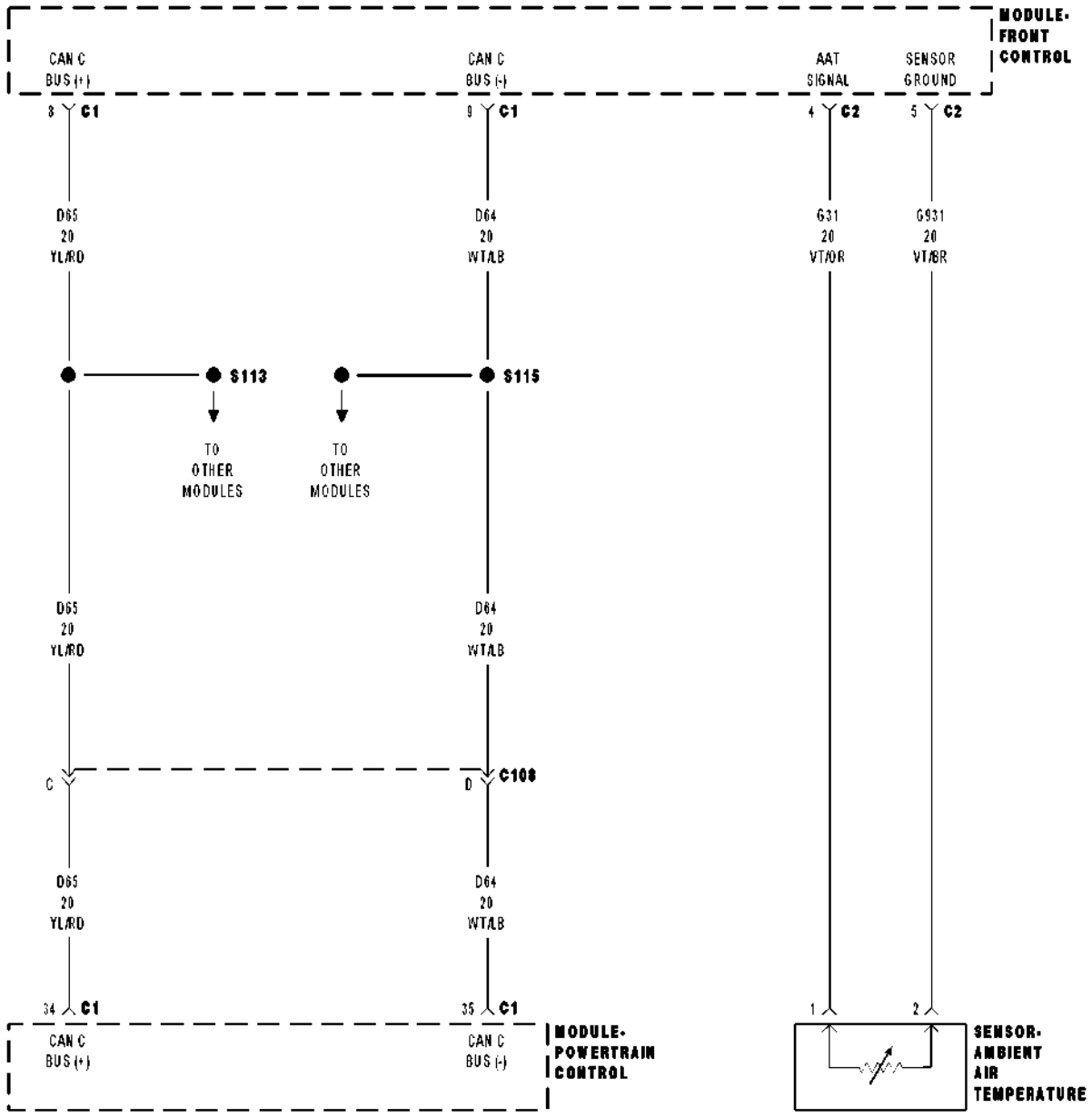
With the scan tool read DTCs.

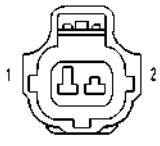
Is the U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE also set?

Yes >> Follow the diagnostics for U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

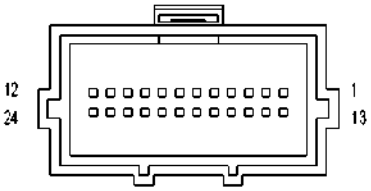
No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

U110E-LOST AMBIENT TEMPERATURE MESSAGE

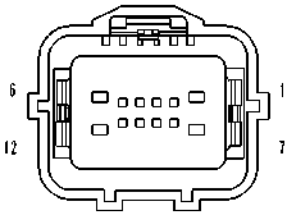




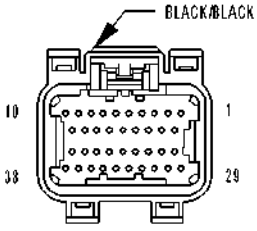
SENSOR-
AMBIENT AIR
TEMPERATURE



MODULE-
FRONT
CONTROL C1



MODULE-
FRONT
CONTROL C2



MODULE-
POWERTRAIN
CONTROL C1

81482ea3

U110E-LOST AMBIENT TEMPERATURE MESSAGE (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  The PCM doesn't receive the ambient temperature signal over the CAN C bus from the FCM. The circuit is continuously monitored.

Possible Causes
CAN C BUS CIRCUIT OPEN OR SHORTED
FRONT CONTROL MODULE
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Theory of Operation

The ambient temperature sensor signal is a direct input to the FCM. The FCM sends the PCM the ambient temperature signal over the CAN C bus.

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With the scan tool read Powertrain DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE ALSO ACTIVE

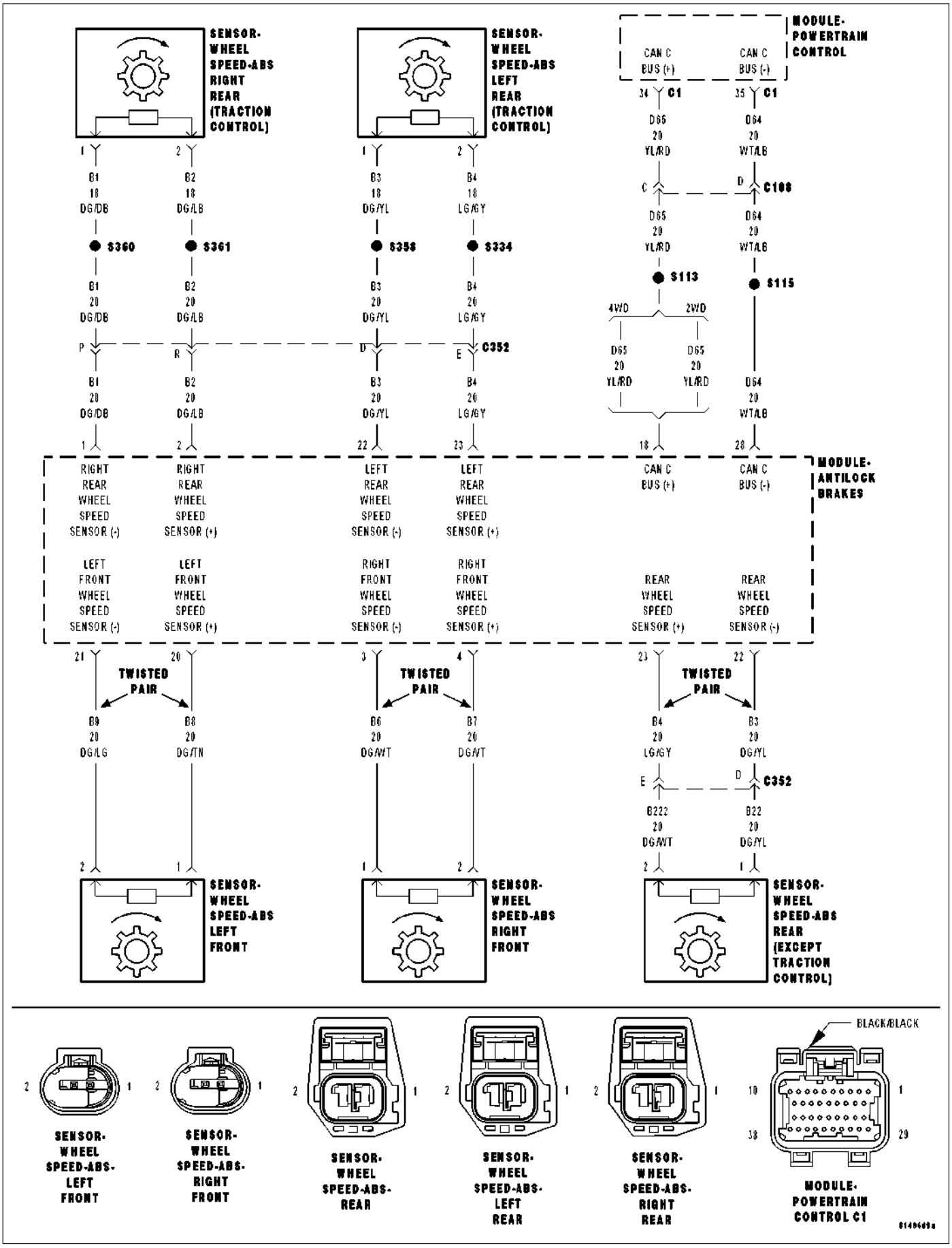
With the scan tool read DTCs.

Is the U0141-NO BUS MESSAGE RECEIVED FROM THE FCM also set?

Yes >> Follow the diagnostics for U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

U1110-LOST VEHICLE SPEED MESSAGE



U1110-LOST VEHICLE SPEED MESSAGE (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  The PCM doesn't receive a vehicle speed signal from the Anti-lock brake Module over the CAN C bus.

Possible Causes
CAN C BUS CIRCUIT OPEN OR SHORTED
ANTI-LOCK BRAKE MODULE
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING) .

Theory of Operation

The PCM receives the vehicle speed signal over the CAN C bus from the Anti-lock Brake Module.

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.
With the scan tool read Powertrain DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. U0121-LOST COMMUNICATION WITH ABS MODULE ALSO SET

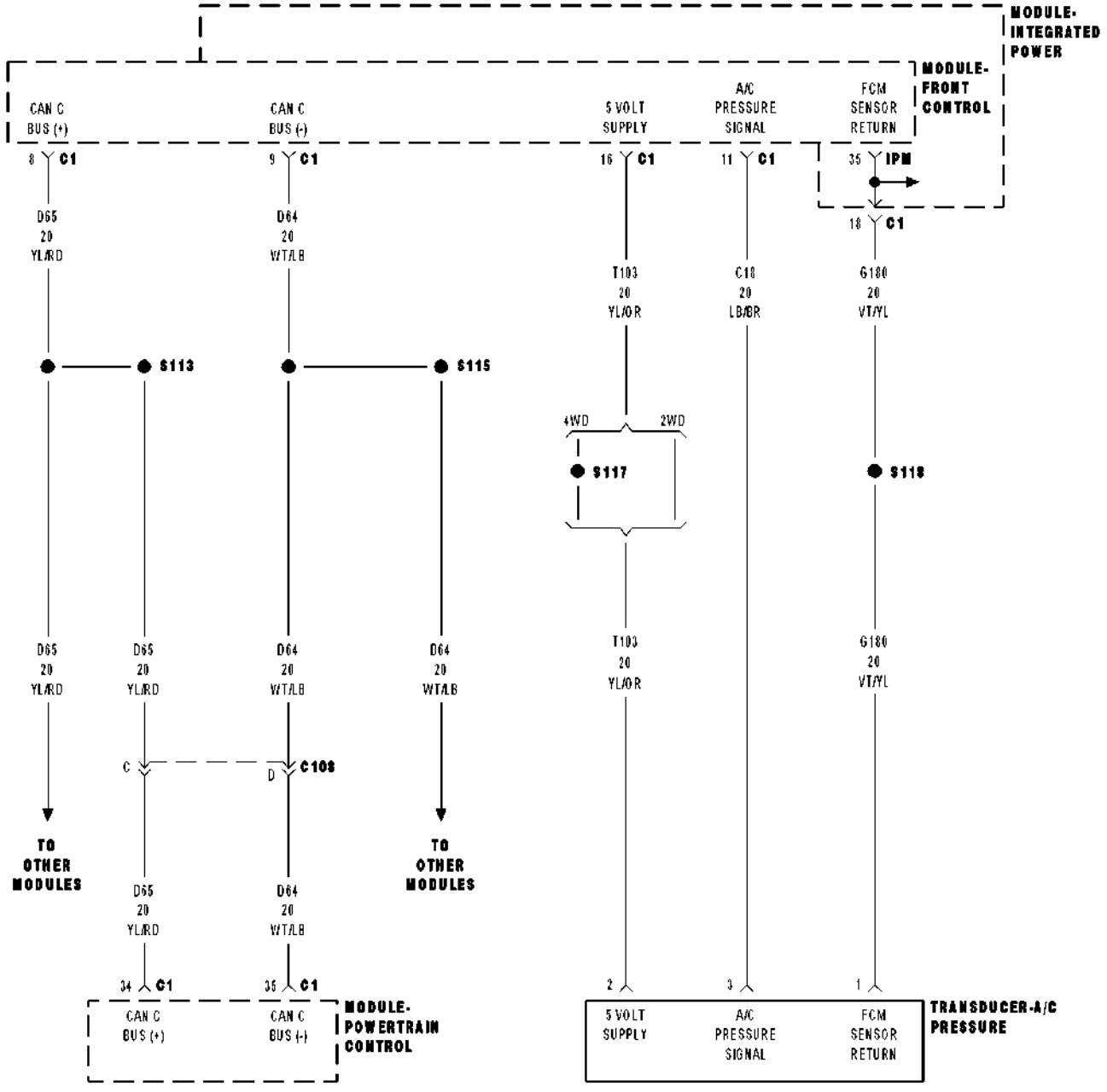
With the scan tool continue reading DTCs.

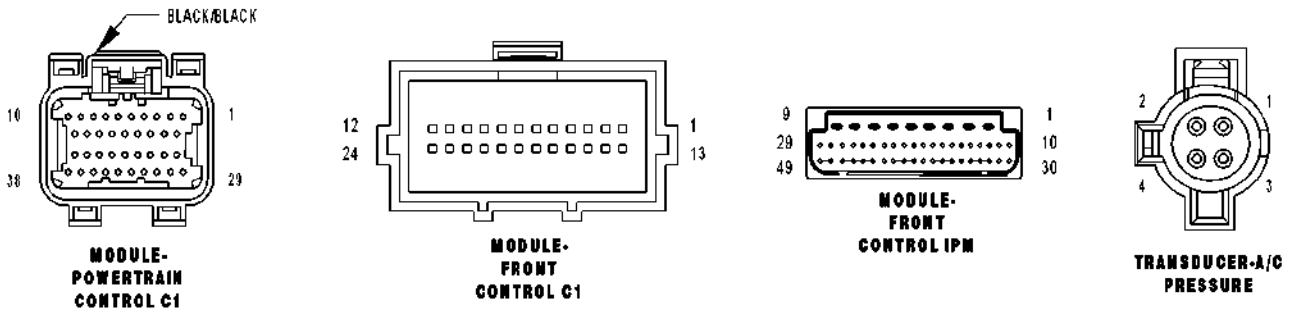
Is the U0121-LOST COMMUNICATION WITH ABS MODULE also set?

Yes >> Follow the diagnostics for U0121-LOST COMMUNICATION WITH ABS MODULE
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

U1113-LOST A/C PRESSURE MESSAGE





U1113-LOST A/C PRESSURE MESSAGE (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  The PCM doesn't receive the a/c pressure signal over the CAN C bus from the FCM. The circuit is continuously monitored.

Possible Causes
CAN C BUS CIRCUIT OPEN OR SHORTED
FRONT CONTROL MODULE
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Theory of Operation

The A/C Pressure Transducer signal is a direct input to the FCM. The FCM sends the PCM the aA/C Pressure Transducer signal over the CAN C bus.

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With the scan tool read Powertrain DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE ALSO ACTIVE

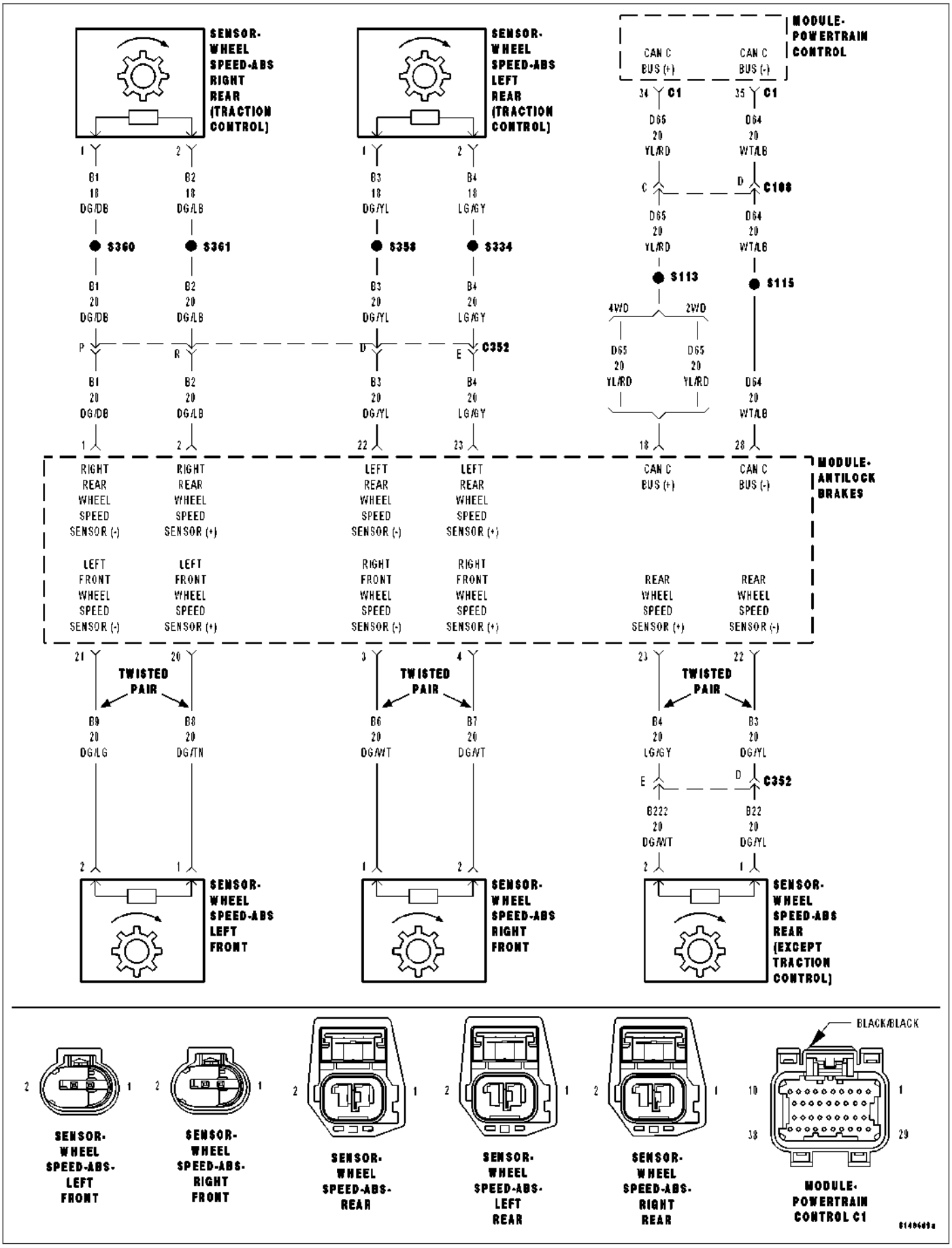
With the scan tool read DTCs.

Is the U0141-NO BUS MESSAGE RECEIVED FROM THE FCM also set?

Yes >> Follow the daignostics for U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

U1120-LOST WHEEL DISTANCE MESSAGE



U1120-LOST WHEEL DISTANCE MESSAGE (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  The PCM doesn't receive a wheel distance message from the Anti-lock brake Module or FCM (NON-ABS) over the CAN C bus.

Possible Causes
CAN C BUS CIRCUIT OPEN OR SHORTED
ANTI-LOCK BRAKE MODULE
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Theory of Operation

The PCM receives the vehicle speed signal over the CAN C bus from the Anti-lock Brake Module or FCM (NON-ABS).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With the scan tool read Powertrain DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. U0121-LOST COMMUNICATION WITH ABS MODULE/P0141–LOST COMMUNICATION WITH FCM ALSO SET

NOTE: If the vehicle is not equipped with ABS the VSS signal will come from the FCM.

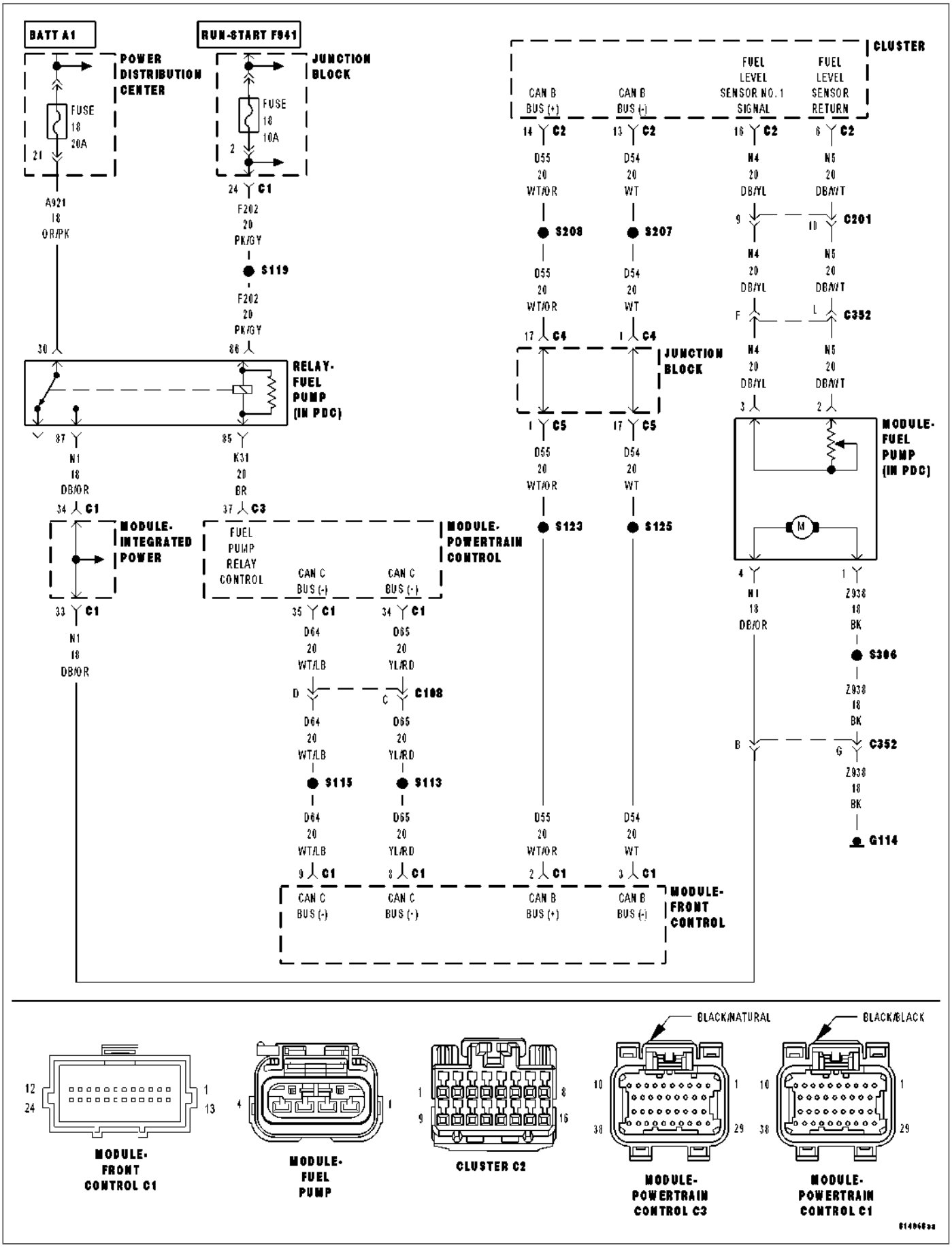
With the scan tool, read the appropriate module for DTCs.

Is the U0121-LOST COMMUNICATION WITH ABS MODULE/P0141–Lost Communicate With FCM also set?

Yes >> Perform the appropriate diagnostic test.Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

U1403-IMPLAUSIBLE FUEL LEVEL SIGNAL



U1403-IMPLAUSIBLE FUEL LEVEL SIGNAL (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  The fuel level message the PCM is receiving is implausible. The circuit is continuously monitored.

Possible Causes
CAN B OPEN OR SHORTED
CLUSTER MODULE
FRONT CONTROL MODULE
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Theory of Operation

The Front Control Module isn't receiving a fuel level signal over CAN B from the Cluster Module. The FCM has to send the PCM a fuel level signal over CAN C. The signal the FCM sends over CAN C is implausible.

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.
With a scan tool read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. CAN B BUS HARDWARE DTCS ALSO ACTIVE

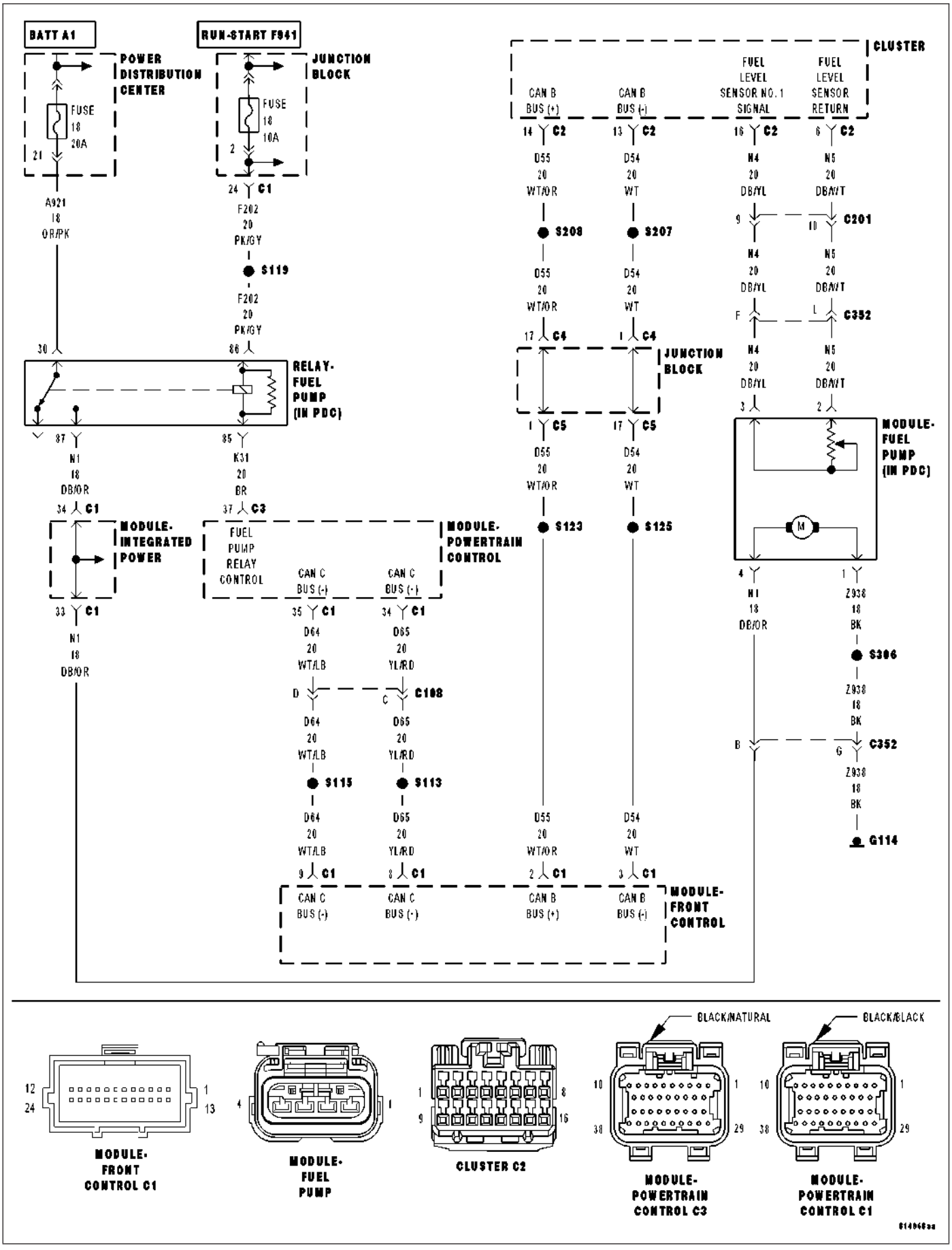
With a scan tool check for DTCs in the FCM.

Are any CAN B Hardware related DTCs active at this time?

Yes >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the appropriate diagnostic procedures.
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

U1411-IMPLAUSIBLE FUEL VOLUME SIGNAL RECEIVED



U1411-IMPLAUSIBLE FUEL VOLUME SIGNAL RECEIVED (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  The fuel volumel message the PCM is receiving is implausible. The circuit is continuously monitored.

Possible Causes
CAN B OPEN OR SHORTED
CLUSTER MODULE
FRONT CONTROL MODULE
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Theory of Operation

The Front Control Module isn't receiveing a fuel volume signal over CAN B from the Cluster Module. The FCM has to send the PCM a fuel volume signal over CAN C. The signal the FCM sends over CAN C is implausible.

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.
With a scan tool read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. CAN B BUS HARWARE DTCS ALSO ACTIVE

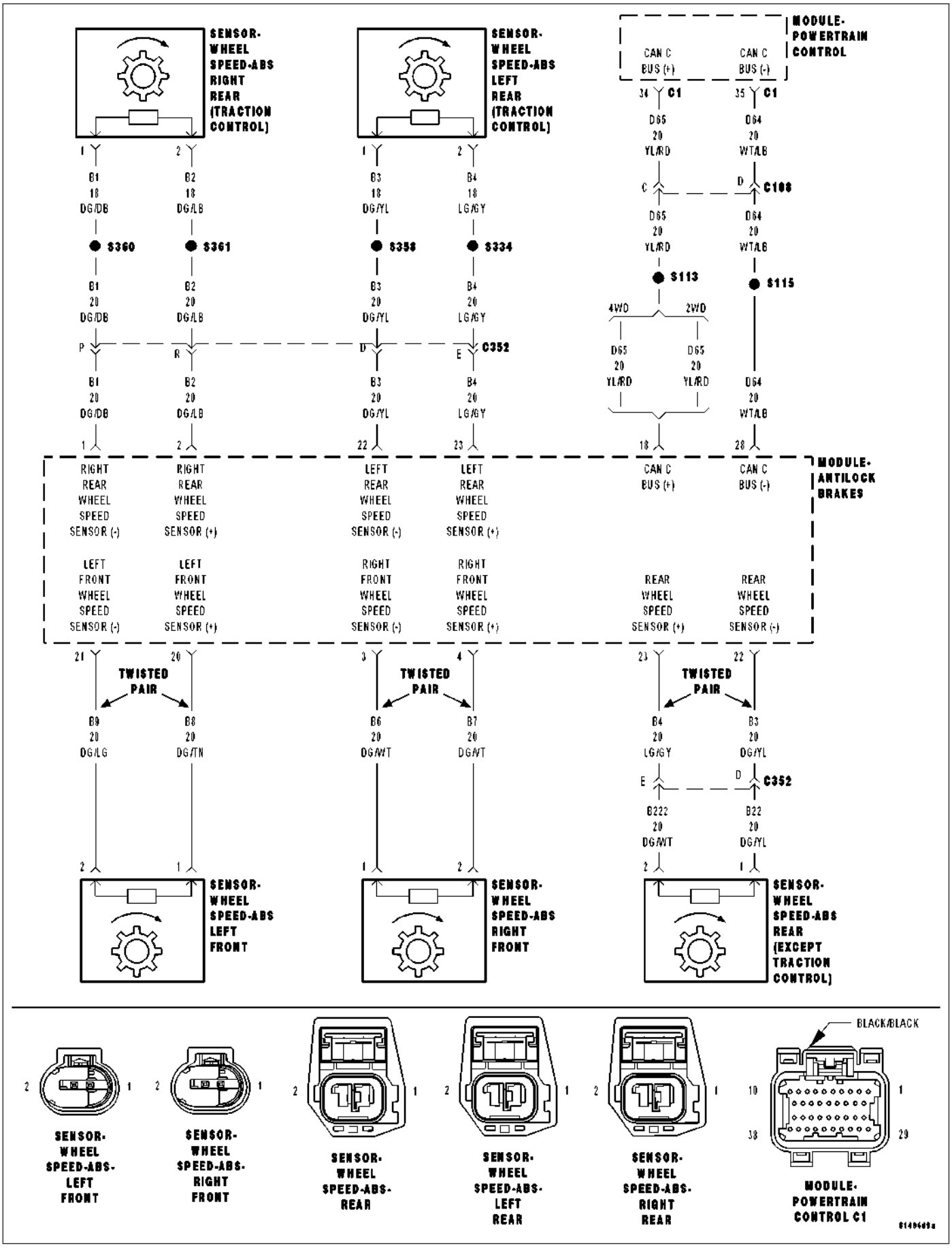
With a scan tool check for DTCs in the FCM.

Are any CAN B Hardware related DTCs active at this time?

Yes >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the appropriate diagnostic procedures.
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

U1412-IMPLAUSIBLE VEHICLE SPEED SIGNAL RECEIVED



U1412-IMPLAUSIBLE VEHICLE SPEED SIGNAL RECEIVED (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  The PCM gets an implausible signal over the CAN C circuit from the ABS Module. The circuit is continuously monitored.

Possible Causes
CAN C BUS CIRCUIT SHORTED
CAN C BUS CIRCUIT OPEN
ABS MODULE
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Theory of Operation

The ABS Module sends vehicle speed information over the CAN C Bus circuit to the PCM.

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.
With a scan tool, read DTCs.

Is the U1412-IMPLAUSIBLE VEHICLE SPEED SIGNAL RECEIVED active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. U0001-NO COMMUNICATION ON THE CAN C BUS CIRCUIT IS ACTIVE

Continue reading DTCs.

Is the U0001-NO COMMUNICATION ON THE CAN C BUS CIRCUIT ACTIVE at this time?

Yes >> Refer to the Diagnostic Procedure for the U0001-NO COMMUNICATION ON THE CAN C BUS CIRCUIT.

No >> Go To 3

U1412-IMPLAUSIBLE VEHICLE SPEED SIGNAL RECEIVED (CONTINUED)

3. ABS MODULE IS ACTIVE ON THE CAN C BUS

With the scan tool, select ECU View.

Verify that the ABS Module active on the bus.

Is the ABS Module active on the bus?

Yes >> Go To 4

No >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for No Response diagnostic procedures.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

---

4. ACTIVE DTCS IN THE FCM

With the scan tool, select ECU View and select FCM.

With the scan tool, read active DTCs.

Is the U0001-NO COMMUNICATION ON THE CAN C BUS CIRCUIT ACTIVE in the FCM at this time?

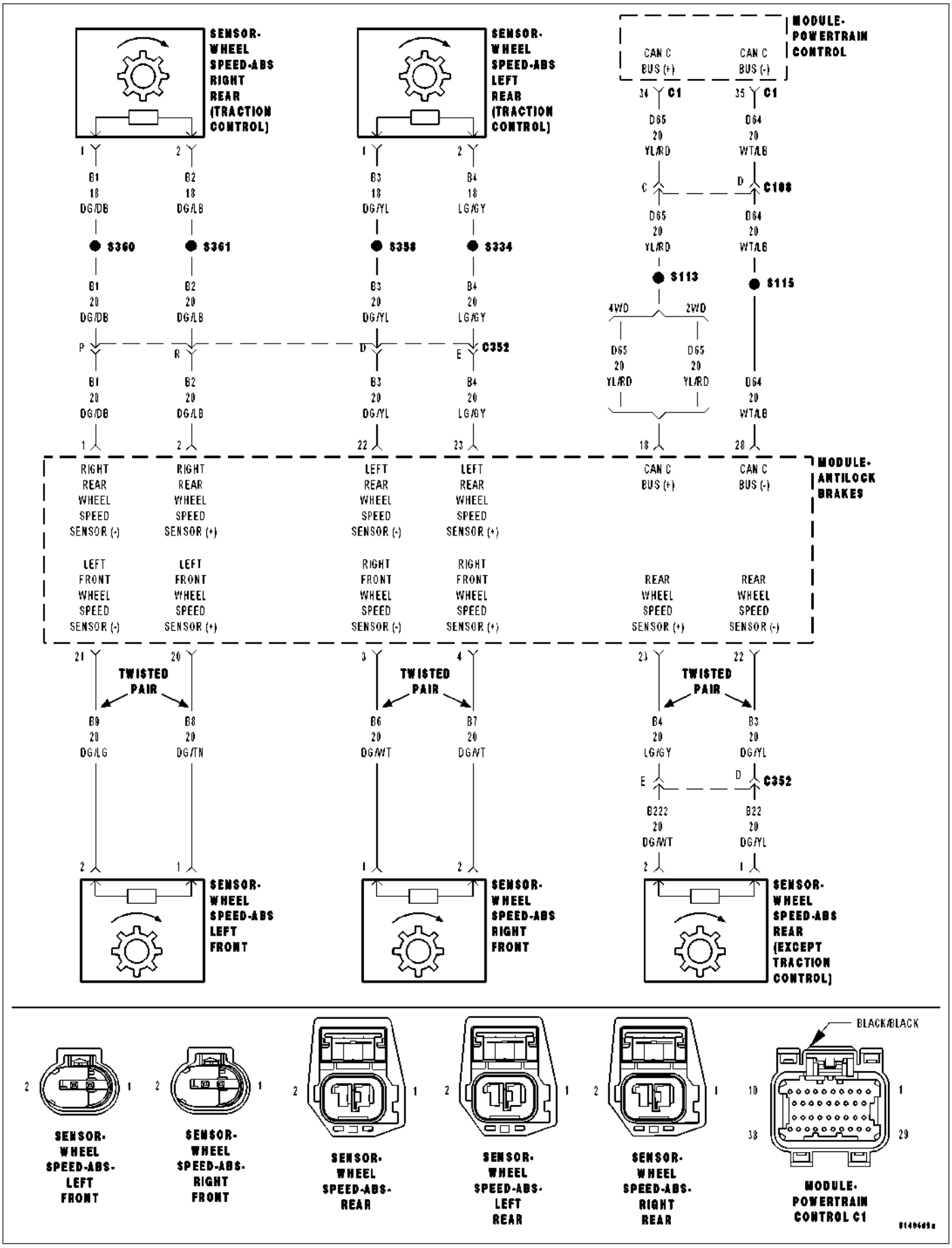
Yes >> Replace the ABS Module per Service Information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Replace and program the Powertrain Control Module per Service Information.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

U1417-IMPLAUSIBLE LEFT WHEEL DISTANCE SIGNAL RECEIVED



U1417-IMPLAUSIBLE LEFT WHEEL DISTANCE SIGNAL RECEIVED (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  The PCM gets an implausible signal over the CAN C circuit from the ABS Module. The circuit is continuously monitored.

Possible Causes
VEHICLE SPEED SENSOR FAULT ACTIVE IN ANTI-LOCK BRAKE MODULE
CAN C BUS CIRCUIT SHORTED
CAN C BUS CIRCUIT OPEN
ABS MODULE
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Theory of Operation

The ABS Module sends an implausible distance signal over the CAN C Bus circuit to the PCM.

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.
With a scan tool, read DTCs.

Is the U1417-IMPLAUSIBLE LEFT WHEEL DISTANCE SIGNAL RECEIVED active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. ABS MODULE IS ACTIVE ON THE CAN C BUS

With the scan tool, select ECU View.
Verify that the ABS Module active on the bus.

Is the ABS Module active on the bus?

Yes >> Go To 3

No >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for No Response diagnostic procedures.
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

U1417-IMPLAUSIBLE LEFT WHEEL DISTANCE SIGNAL RECEIVED (CONTINUED)

3. DTCS STORED OR ACTIVE IN THE ABS MODULE

Check for DTCs in the ABS Module.

Are any DTCs active or stored in the ABS Module?

Yes >> Refer to section 5 - BRAKES - ABS ELECTRICAL DIAGNOSTICS and perform the diagnostics for the DTCs in the ABS Module.
Perform ABS VERIFICATION TEST – VER 1 (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go to 4

---

4. ACTIVE DTCS IN THE FCM

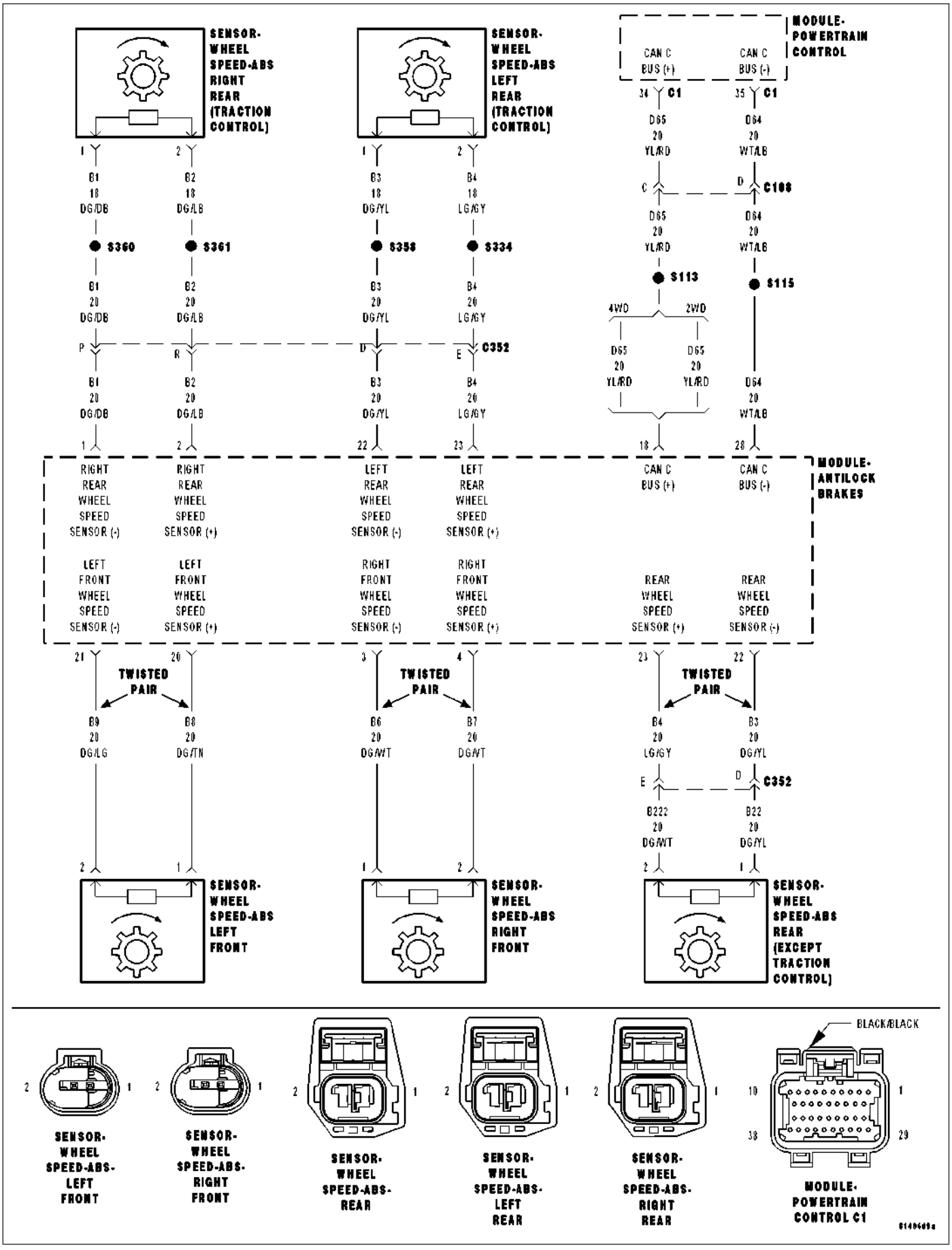
With the scan tool, select ECU View and select FCM.
With the scan tool, read active DTCs.

Are any Communication DTCs active in the FCM relating to the ABS System?

Yes >> Replace the ABS Module per Service Information.
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

U1418-IMPLAUSIBLE RIGHT WHEEL DISTANCE SIGNAL RECEIVED



U1418-IMPLAUSIBLE RIGHT WHEEL DISTANCE SIGNAL RECEIVED (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Ignition on.
- **Set Condition:**
  The PCM gets an implausible signal over the CAN C circuit from the ABS Module. The circuit is continuously monitored.

Possible Causes
VEHICLE SPEED SENSOR FAULT ACTIVE IN ANTI-LOCK BRAKE MODULE
CAN C BUS CIRCUIT SHORTED
CAN C BUS CIRCUIT OPEN
ABS MODULE
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Theory of Operation

The ABS Module sends an implausible distance signal over the CAN C Bus circuit to the PCM.

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.
With a scan tool, read DTCs.

Is the U1418-IMPLAUSIBLE RIGHT WHEEL DISTANCE SIGNAL RECEIVED active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. ABS MODULE IS ACTIVE ON THE CAN C BUS

With the scan tool, select ECU View.
Verify that the ABS Module active on the bus.

Is the ABS Module active on the bus?

Yes >> Go To 3

No >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for No Response diagnostic procedures.
Perform BODY VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

U1418-IMPLAUSIBLE RIGHT WHEEL DISTANCE SIGNAL RECEIVED (CONTINUED)

3. DTCS STORED OR ACTIVE IN THE ABS MODULE

Check for DTCs in the ABS Module.

Are any DTCs active or stored in the ABS Module?

Yes >> Refer to section 5 - BRAKES - ABS ELECTRICAL DIAGNOSTICS and perform the diagnostics for the DTCs in the ABS Module.
Perform ABS VERIFICATION TEST – VER 1 (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go to 4

---

4. ACTIVE DTCS IN THE FCM

With the scan tool, select ECU View and select FCM.
With the scan tool, read active DTCs.

Are any Communication DTCs active in the FCM relating to the ABS System?

Yes >> Replace the ABS Module per Service Information.
Perform ABS VERIFICATION TEST – VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

*5.7L INTERMITTENT NO CRANK CONDITION

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
ETC STARTER INHIBIT

Diagnostic Test

1. ETC STARTER INHIBIT

NOTE: This 5.7L engine will try to relearn ETC position when the key is left in the on position for an extended period of time and will not allow the starter to crank during this procedure. This procedure can take up to 2.5 seconds.

To verify the cause of the no crank condition or delayed crank use the scan tool, and read the ETC Starter Inhibit mileage.

The controller will store the mileage at which the no start condition occurred because of the ETC testing procedure.

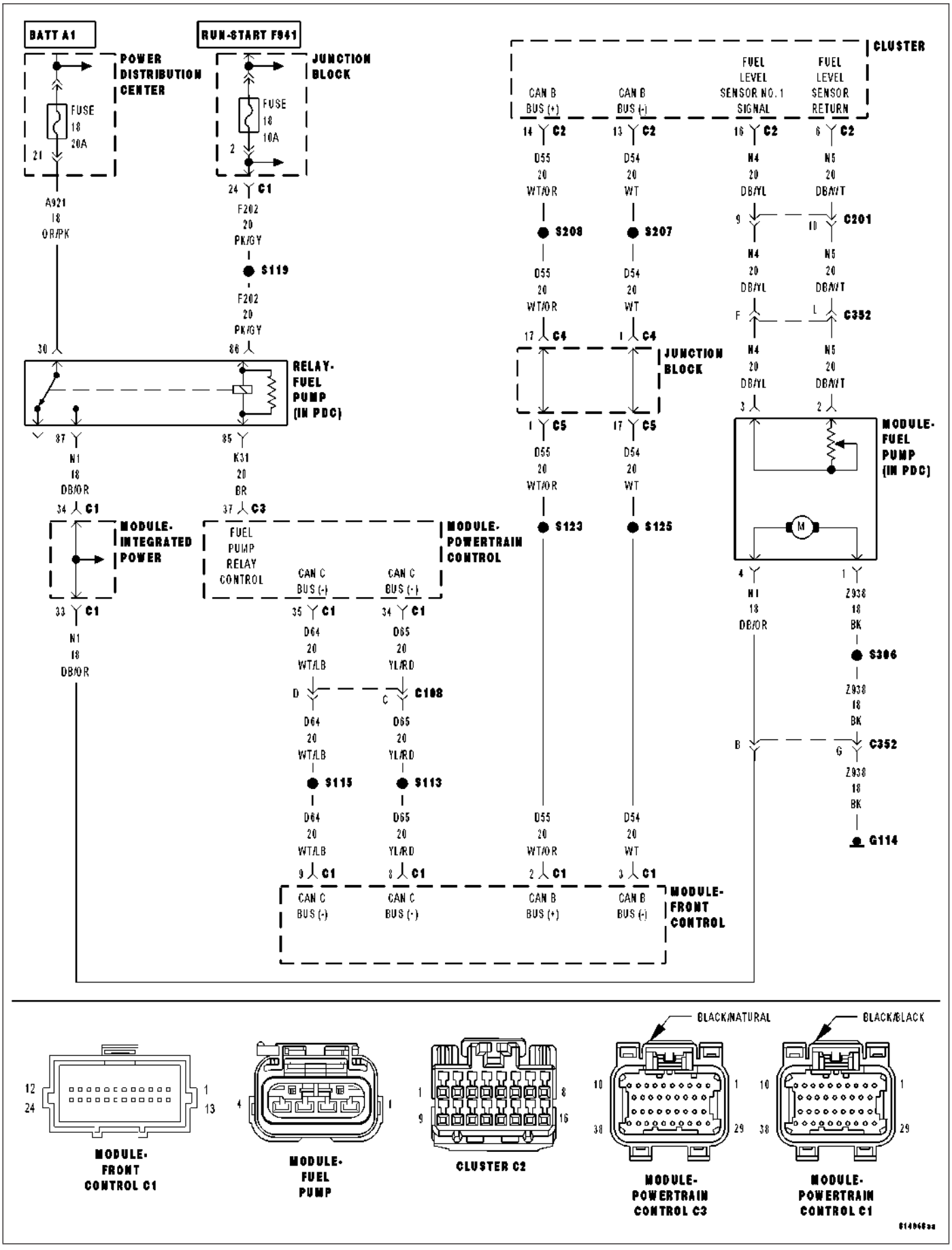
This is considered normal operation for a vehicle equipped with an Electronic Throttle Control System and no repairs are necessary.

Is a mileage stored under the ETC Starter Inhibit?

Yes >> Test Complete.

No >> Refer to the appropriate diagnostic procedure for further assistance.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

*CHECKING THE FUEL DELIVERY SYSTEM



***CHECKING THE FUEL DELIVERY SYSTEM (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
RESTRICTED FUEL SUPPLY LINE
FUEL PUMP INLET STRAINER PLUGGED
(N1) FUEL PUMP RELAY OUTPUT CIRCUIT OPEN
FUEL PUMP RELAY
FUEL PUMP

Diagnostic Test

1. FUEL PUMP OPERATION

Ignition on, engine not running.

With a scan tool, actuate the Fuel System test.

NOTE: It may be necessary to use a mechanics stethoscope in the next step.
Listen for fuel pump operation at the fuel tank.

CAUTION: Stop All Actuations.

Does the Fuel Pump operate?

Yes >> Go To 2

No >> Go To 5

---

2. FUEL PRESSURE

Turn the ignition off.

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.
Install a fuel pressure gauge at the engine.

Ignition on, engine not running.

With the scan tool, actuate the ASD Fuel System test and observe the fuel pressure gauge.

NOTE: NOTE: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

CAUTION: Stop All Actuations.

Choose a conclusion that best matches your fuel pressure reading.

Below Specification
Go To 3

Within Specification
Test Complete.

Above Specification
Replace the fuel filter/fuel pressure regulator.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

***CHECKING THE FUEL DELIVERY SYSTEM (CONTINUED)**

3. RESTRICTED FUEL SUPPLY LINE

Turn the ignition off.

WARNING: The fuel system is under a constant pressure even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released.

Raise vehicle on hoist, and disconnect the fuel pressure line at the fuel pump module.

Install special tool #6539 (5/16″) or #6631(3/8″) fuel line adapter and the fuel pressure gauge between the fuel supply line and the fuel pump module.

Ignition on, engine not running.

With the scan tool, actuate the ASD Fuel System test and observe the fuel pressure gauge.

NOTE: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

CAUTION: Stop All Actuations.

Is the fuel pressure within specification now?

Yes >> Repair/replace fuel supply line as necessary.
Perform the POWERTRAIN VERIFICATION TEST.. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

---

4. CHECKING FUEL INLET STRAINER

Turn the ignition off.

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Remove the Fuel Pump Module and inspect the Fuel Inlet Strainer.

Is the Fuel Inlet Strainer plugged?

Yes >> Replace the Fuel Pump Inlet Strainer.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace the Fuel Pump Module.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

5. (N1) FUEL PUMP RELAY OUTPUT CIRCUIT OPEN

Turn the ignition off.

Remove the Fuel Pump Relay from the IPM.

Disconnect the Fuel Pump Module harness connector.

Measure the resistance of the (N1) Fuel Pump Relay Output circuit from the relay connector to the fuel pump module connector.

Is the resistance below 5.0 ohms?

Yes >> Replace the Fuel Pump Relay.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Repair the open in the (N1) Fuel Pump Relay Output circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

*HARD START FUEL SYSTEM

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
FUEL CONTAMINATION
RESTRICTED FUEL SUPPLY LINE
FUEL PUMP INLET STRAINER PLUGGED
FUEL PUMP MODULE
FUEL INJECTOR(S)

Diagnostic Test

1. CHECKING FUEL PRESSURE

Turn the ignition off.

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Install a fuel pressure gauge at the engine.

Ignition on, engine not running.

With a scan tool, actuate the ASD Fuel System test and observe the fuel pressure gauge.

NOTE: NOTE: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Choose a conclusion that best matches your fuel pressure reading.

Below Specification
Go To 2

Within Specification
Go To 4

---

2. RESTRICTED FUEL SUPPLY LINE

Turn the ignition off.

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Raise vehicle on hoist, and disconnect the fuel supply line at the fuel pump module.

Install special tool #6539 (5/16″) #6631(3/8″) fuel line adapter and the fuel pressure gauge between the fuel supply line and the fuel pump module.

Ignition on, engine not running.

With the scan tool, actuate the ASD Fuel System test and observe the fuel pressure gauge.

NOTE: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Is the fuel pressure within specification?

Yes >> Visually and physically inspect the fuel supply lines between the fuel tank and the fuel rail. Repair/replace as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

***HARD START FUEL SYSTEM (CONTINUED)**

3. CHECKING THE FUEL INLET STRAINER

Turn the ignition off.

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Remove the Fuel Pump Module and inspect the Fuel Inlet Strainer.

Is the Fuel Inlet Strainer plugged?

Yes >> Replace the Fuel Pump Inlet Strainer.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace the Fuel Pump Module.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

4. FUEL PUMP MODULE

NOTE: Before continuing visually and physically inspect the fuel delivery system for external leaks or damage. Repair / replace as necessary.

Turn the ignition off.

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Install special tool #6539 (5/16″) or #6631 (3/8″) fuel line adapter.

Install the fuel pressure gauge.

Start the engine and allow the fuel system to reach maximum pressure.

Turn the ignition off.

NOTE: Fuel specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Using special tool #C4390, Hose Clamp Pliers, pinch the rubber fuel line between the fuel pressure gauge and the engine.

Monitor the fuel pressure gauge for a minimum of 5 minutes.

NOTE: The pressure should not fall below 241 KPa (35 psi)

Does the fuel pressure drop?

Yes >> Replace Fuel Pump Module.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

***HARD START FUEL SYSTEM (CONTINUED)**

5. FUEL INJECTOR(S)

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Remove special tool #C4390.

Start the engine and allow the fuel system to reach maximum pressure.

Turn the ignition off.

NOTE: Fuel specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Move special tool #C4390, Hose Clamp Pliers, from between the fuel pressure gauge and the engine to between the fuel pressure gauge and fuel pump module.

Monitor the fuel pressure gauge for a minimum of 5 minutes.

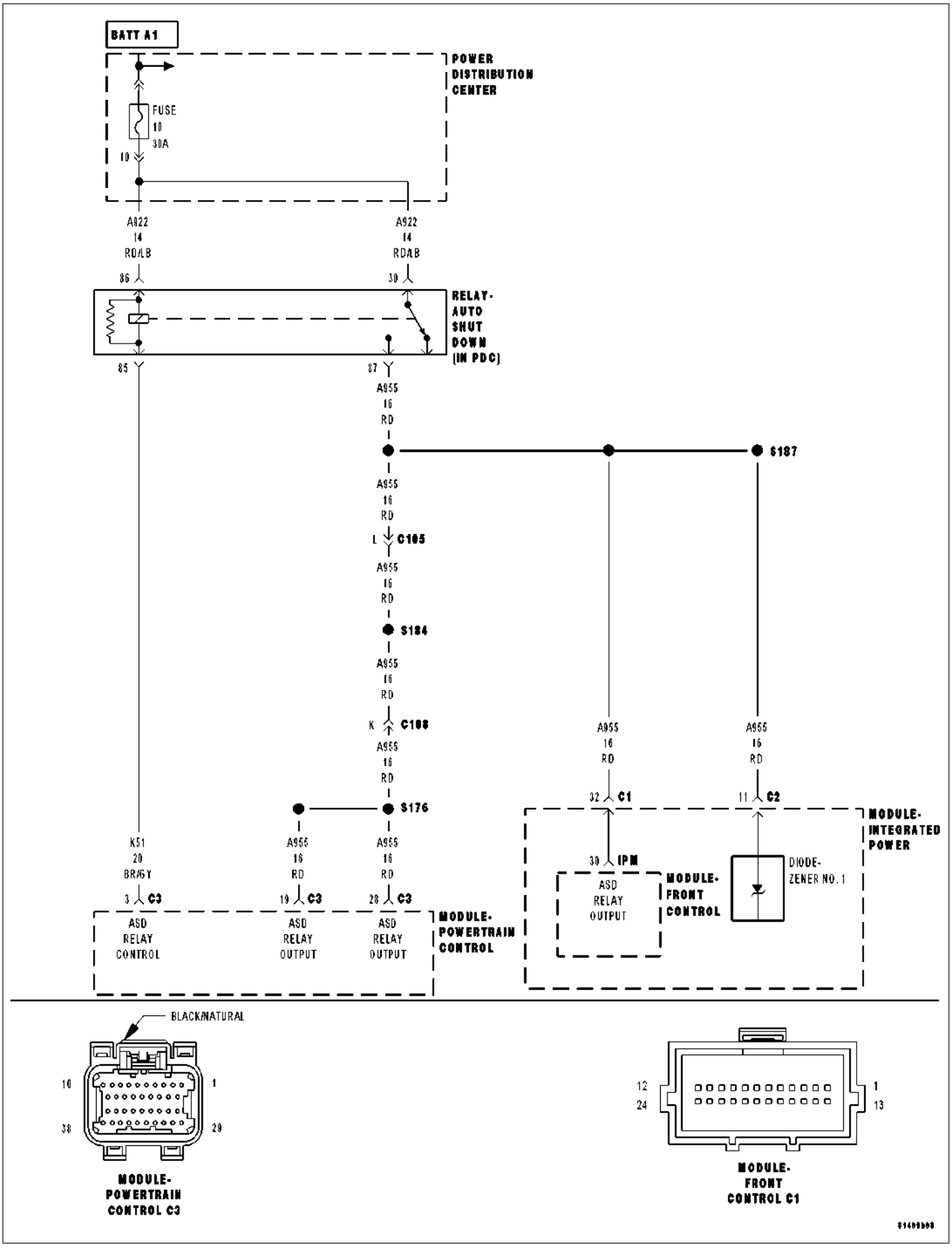
NOTE: The pressure should not fall below 241 KPa (35 psi)

Does the fuel pressure drop?

Yes >> Replace the leaking fuel injectors.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Check the fuel for contaminants.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

*ENGINE CRANKS BUT DOES NOT START



***ENGINE CRANKS BUT DOES NOT START (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
NO START PRE-TEST
POWERTRAIN FUSES OPEN
SECONDARY INDICATORS PRESENT
ENGINE MECHANICAL
(A955) ASD RELAY OUTPUT CIRCUIT OPEN
FUEL CONTAMINATION

Diagnostic Test

1. NO START PRE-TEST

NOTE: The following list of items must be checked before continuing with any no start tests.

The battery must be fully charged and in good condition. A low charged battery may produce invalid test results. If the battery is low, charge the battery and then attempt to start the vehicle by cranking the engine for 15 seconds, 3 consecutive times.

This will allow any DTCs to set that may have been erased due to a dead battery.

Try to communicate with PCM if not able to communicate check fuses.

Make sure the Powers and Ground to the PCM are OK.

Make sure the PCM communicates with the scan tool and that there are no DTCs stored in the PCM memory. If the PCM reports a No Response condition, refer to section 8 Electrical Electronic Control Module Electrical Diagnostics for the proper tests.

Read the PCM DTCs with the scan tool. If any DTCs are present, they must be repaired before continuing with any other No Start diagnostic tests. Refer to the Table of Contents for the related P-code that is reported by the PCM.

Make sure that the Bus is functional. Attempt to communicate with the Instrument Cluster and VTSS, If you are unable to establish communications refer to 8 Electrical Electronic Control Module Electrical Diagnostics for the proper Diagnostic procedures.

The Sentry Key Immobilizer System must be operating properly. Check for proper communication with the scan tool and check for DTCs that may be stored in the Sentry Key Immobilizer Module (SKREEM). Repair the DTC(s) before continuing.

If no DTCs are found, using the scan tool, select Clear PCM (BATT Disconnect).

Crank the engine several times. Using the scan tool, read DTCs. If a DTC is present perform the DTC diagnostics before continuing.

Were any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 2

***ENGINE CRANKS BUT DOES NOT START (CONTINUED)**

2. OPEN FUSE

Check for any open fuses in the IPM or Junction Block that may be related to the No Start condition.

Are any of the fuses open?

Yes >> Replace the open fuse and check the related circuit(s) for a short to ground.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

---

3. SECONDARY INDICATORS PRESENT

Ignition on, engine not running.

With the scan tool, under DTCs & Related Functions, read the Secondary Indicators while cranking the engine.

Are there any Secondary Indicators present while cranking the engine?

Yes >> Refer to the Engine Electrical Diagnostics group and perform the tests related to the secondary indicator that is reported by the scan tool.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

---

4. ENGINE MECHANICAL

Check for any of the following conditions/mechanical problems.

ENGINE VALVE TIMING - must be within specifications, check for broken timing components

ENGINE COMPRESSION - must be within specifications

ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks.

Are there any engine mechanical problems?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 5

---

5. (A955) ASD RELAY OUTPUT CIRCUIT OPEN

Turn the ignition off.

Remove the ASD relay from the IPM.

Disconnect the C3 PCM harness connector.

Verify the ASD Relay is getting voltage on the Fused B+ circuits before continuing.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the ASD Relay Output circuit from the ASD Relay connector to the appropriate terminals of special tool #8815, Ignition coil, and the fuel injectors.

Is the resistance below 5.0 ohms?

Yes >> Go To 6

No >> Repair the open in the (A955)) ASD Relay Output circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

***ENGINE CRANKS BUT DOES NOT START (CONTINUED)**

6. FUEL PUMP DELIVERY

Verify that the Fuel tank is not empty before continuing.

Follow the diagnostics for Checking Fuel Delivery in the Driveability section of this manual.

Was the No Start condition solved after following the above diagnostic test?

Yes >> Test Complete.

No >> Check for contamination/water in the fuel. Make sure the fuel being used in this vehicle meets manufactures Fuel Requirement, refer to the service manual.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

*FUEL PRESSURE LEAK DOWN

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
FUEL PUMP MODULE
FUEL INJECTOR(S)

Diagnostic Test

1. FUEL PUMP MODULE

NOTE: Before continuing visually and physically inspect the fuel delivery system for external leaks or damage. Repair / replace as necessary.

Turn the ignition off.

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Install special tool #6539 (5/16″) or #6631 (3/8″) fuel line adapter.

Install the fuel pressure gauge.

Start the engine and allow the fuel system to reach maximum pressure.

Turn the ignition off.

NOTE: Fuel specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Using special tool #C4390, Hose Clamp Pliers, pinch the rubber fuel line between the fuel pressure gauge and the engine.

Monitor the fuel pressure gauge for a minimum of 5 minutes.

NOTE: The pressure should not fall below 241 KPa (35 psi)

Does the fuel pressure drop?

Yes >> Replace Fuel Pump Module.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 2

***FUEL PRESSURE LEAK DOWN (CONTINUED)**

2. **FUEL INJECTOR(S)**

WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Remove special tool #C4390.

Start the engine and allow the fuel system to reach maximum pressure.

Turn the ignition off.

NOTE: NOTE: Fuel specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Move special tool #C4390, Hose Clamp Pliers, from between the fuel pressure gauge and the engine to between the fuel pressure gauge and fuel pump module.

Monitor the fuel pressure gauge for a minimum of 5 minutes.

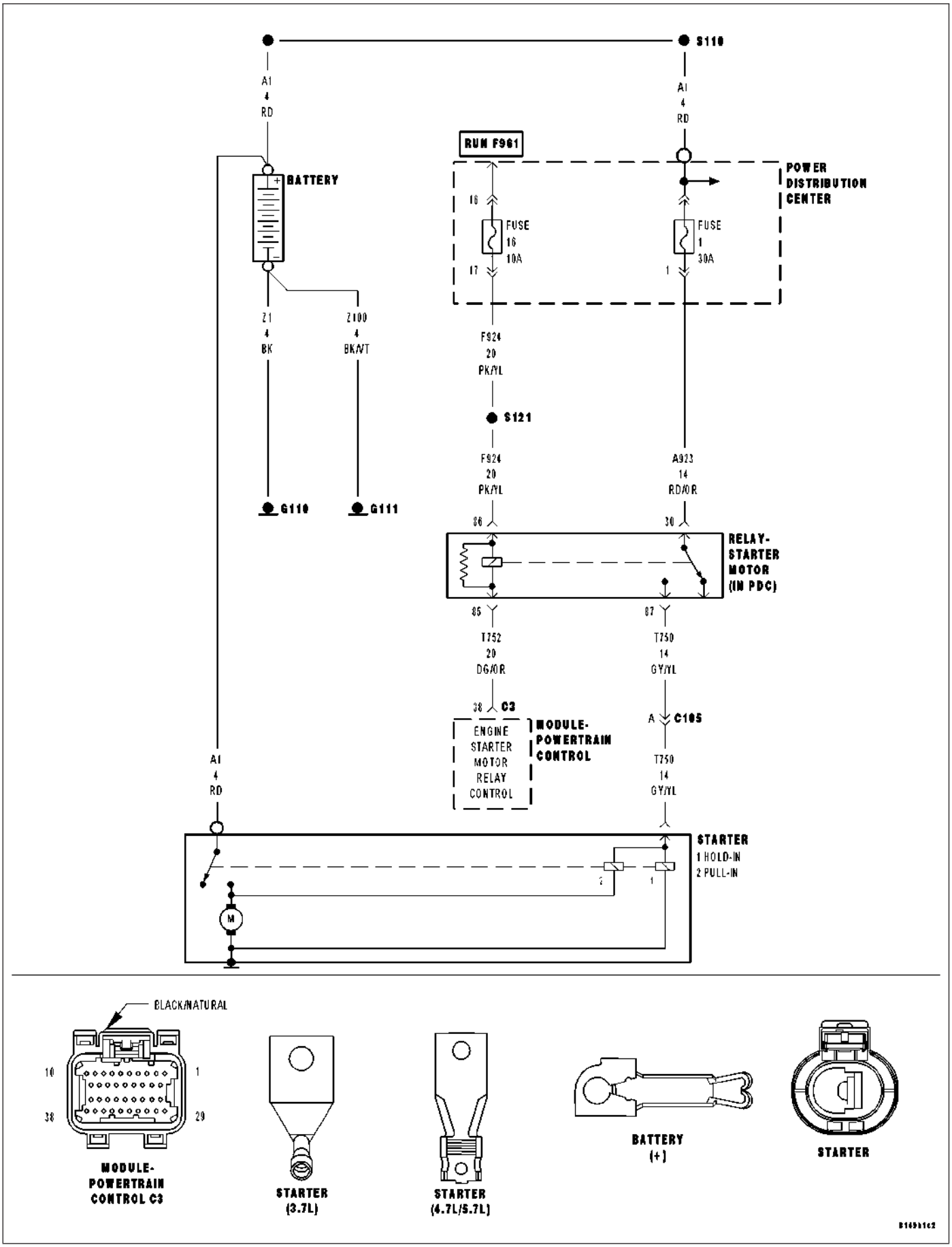
NOTE: The pressure should not fall below 241 KPa (35 psi)

Does the fuel pressure drop?

Yes >> Replace the leaking fuel injectors.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Test Complete.

*NO CRANK CONDITION



***NO CRANK CONDITION (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
MECHANICAL CONDITION
BATTERY CIRCUIT RESISTANCE TOO HIGH
(F924) FUSED IGNITION SWITCH OUTPUT CIRCUIT
(A923) FUSED B+ CIRCUIT OPEN
(T752) STARTER RELAY CONTROL CIRCUIT OPEN
(T750) STARTER RELAY OUTPUT CIRCUIT OPEN
TRANSMISSION RANGE SENSOR
STARTER RELAY
STARTER

Diagnostic Test

1. MECHANICAL CONDITION

NOTE: Verify the battery is fully charged and capable of passing a load test before continuing.

WARNING: Make sure the battery is disconnected, then wait two minutes before proceeding. Failure to do so may result in personal injury or possible death.

Turn the engine over by hand to make sure the engine is not seized.

Is the engine able to turn over?

Yes >> Go To 2

No >> Repair the mechanical condition preventing the starter motor from cranking.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

2. TRANSMISSION RANGE SENSOR

Turn the ignition off.

Disconnect the TRS harness connectors.

Move the Gear selector through all gear positions, from Park to 1st and back.

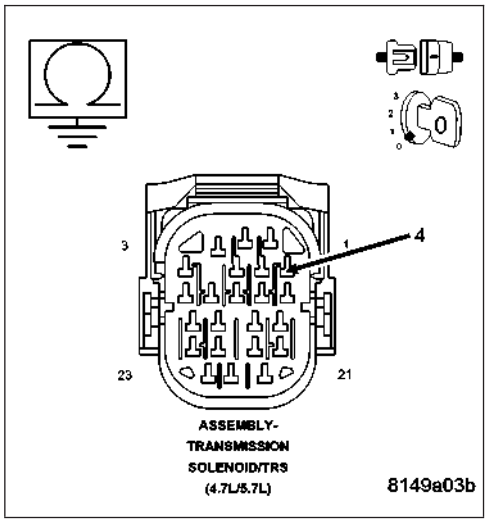
While moving the gear selector through each gear, measure the resistance between ground and the TRS (T41) Sense (P/NSense) circuit at the TRS connector.

NOTE: The circuit is grounded in Park and Neutral and open in the other positions.

Did the resistance change from above 100 kohms (open) to below 10.0 ohms (grounded) ?

Yes >> Go To 3

No >> Replace the Transmission Range Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)



***NO CRANK CONDITION (CONTINUED)**

3. EXCESSIVE RESISTANCE IN THE BATTERY CIRCUIT

Turn the ignition off.

Check the Battery Cables for excessive resistance using the service information procedure.

Did either Battery Cable have a voltage drop greater than 0.2 of a volt?

Yes >> Repair the excessive resistance in the Battery circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 4

---

4. STARTER RELAY

Turn ignition off.

Remove the Starter Relay from IPM.

CAUTION: The Parking Brake must be on and the Transmission must be in park for a vehicle equipped with an automatic transmission.

WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Briefly connect a jumper wire between (A923) Fused B+ circuit and the (T750) Starter Relay Output circuit.

Did the Starter Motor crank the engine?

Yes >> Go To 5

No >> Go To 7

---

5. (F924) FUSED IGNITION SWITCH OUTPUT CIRCUIT

Ignition on, engine not running.

Using a 12-volt test light, probe the (F924) Fused Ignition Switch Output circuit in the Starter Relay connector.

While observing 12-volt test light, hold ignition key in the start position.

Does the test light illuminate brightly?

Yes >> Go To 6

No >> Repair the excessive resistance in the (F924) Fused Ignition Switch Output circuit. Inspect related fuses and repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

6. (T752) STARTER RELAY CONTROL CIRCUIT OPEN

Turn the ignition off.

Remove the Starter Relay from the IPM.

Disconnect the C3 PCM harness connector.

Measure the resistance in the (T752) Starter Relay Control circuit from the Relay terminal to the appropriate terminals of special tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Replace the Starter Motor Relay.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Repair the open in the (T752) Starter Relay Control circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

***NO CRANK CONDITION (CONTINUED)**

7. (A923) FUSED B+ CIRCUIT OPEN

Turn the ignition off.

Using a 12-volt test light connected to ground, probe the (A923) Fused B+ circuit at the Starter Relay terminal.

Does the test light illuminate brightly?

Yes >> Go To 8

No >> Repair the excessive resistance in the (A923) Fused B+ circuit. Inspect related fuses and repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

8. (T750) STARTER RELAY OUTPUT CIRCUIT OPEN

Disconnect the Starter Relay Output connector from the Starter Solenoid.

Measure the resistance of the (T750) Starter Relay Output circuit between the Relay and the Solenoid harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 9

No >> Repair the open in the Starter Relay Output circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

9. STARTER

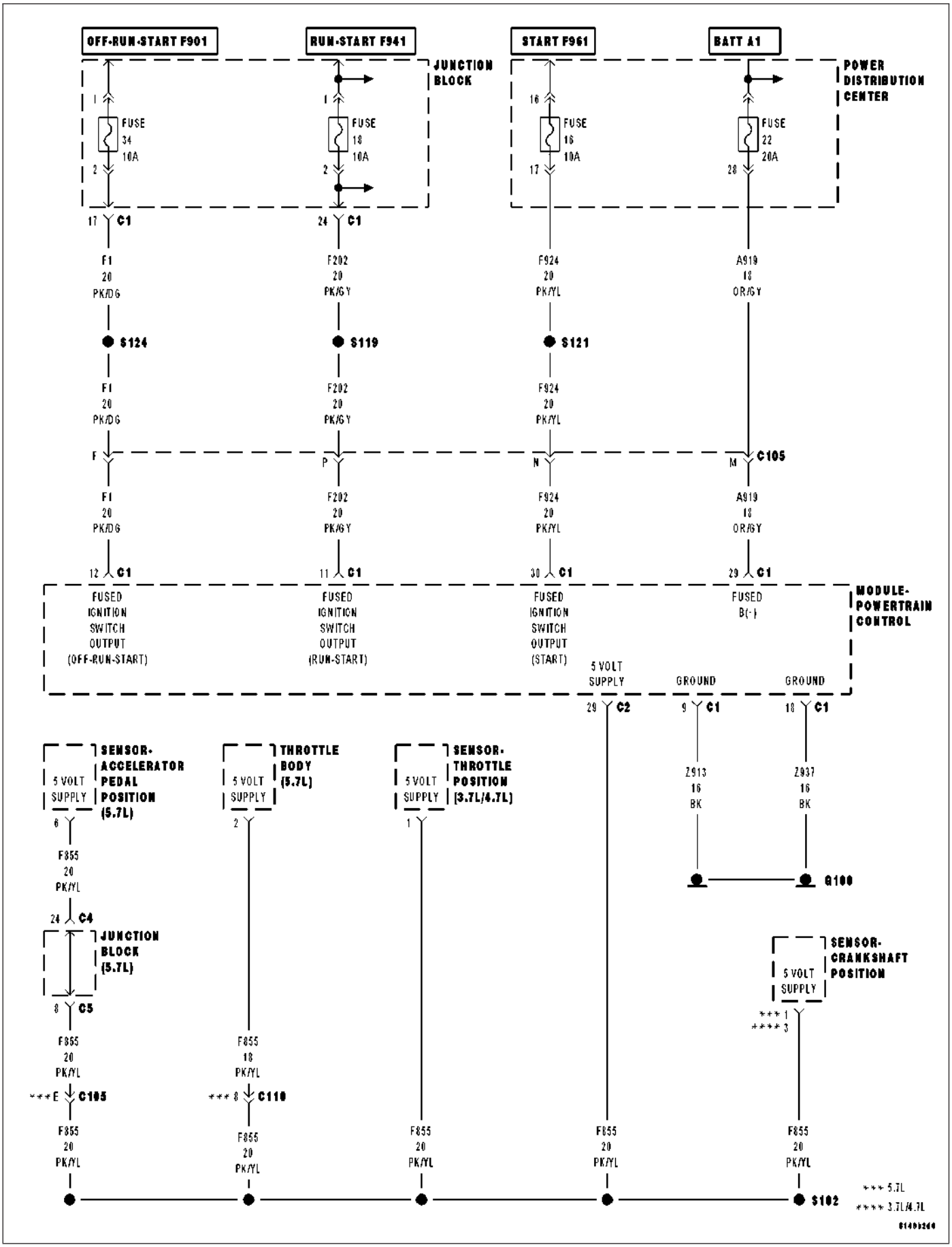
If there are no other possible causes remaining, review repair.

Repair

Replace the Starter.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

*NO RESPONSE WITH A NO START CONDITION



***NO RESPONSE WITH A NO START CONDITION (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
(A919) PCM FUSED B+ CIRCUIT
(F1), (F202), AND (F924) PCM FUSED IGNITION SWITCH OUTPUT CIRCUITS
(Z913) AND (Z937) PCM GROUND CIRCUITS
CRANKSHAFT POSITION SENSOR
(F855) 5-VOLT SENSOR OPEN/SHORTED
(F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
PCM

Diagnostic Test

1. (A919) PCM FUSED B+ CIRCUIT

NOTE: The scan tool and cable must be operating properly for the results of this test to be valid.

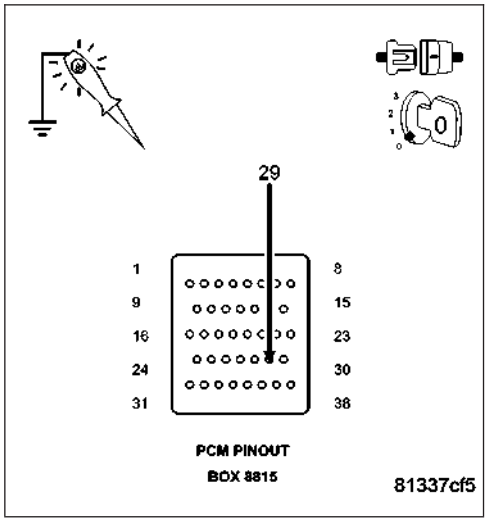
NOTE: Make sure the ignition switch was on while trying to communicate with the PCM.

Turn the ignition off.

Disconnect the C1 PCM harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Using a 12-volt test light connected to ground probe the appropriate terminal of special tool #8815.



Does the test light illuminate brightly?

Yes >> Go To 2

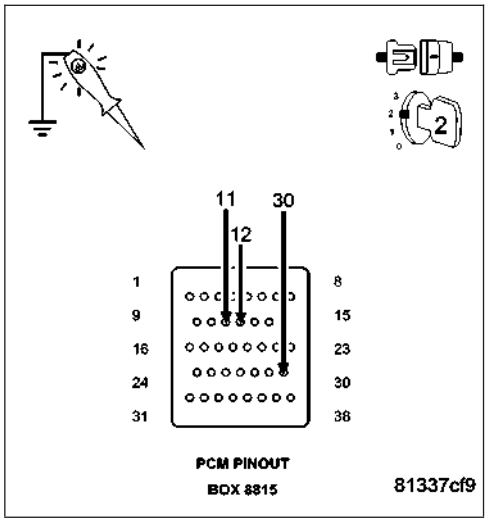
No >> Repair the open or short to ground in the (A919) Fused B+ circuit. Inspect and replace fuses as necessary.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

***NO RESPONSE WITH A NO START CONDITION (CONTINUED)**

2. (F1), (F202), AND (F924) PCM FUSED IGNITION SWITCH CIRCUITS

Using a 12-volt test light connected to ground, probe the PCM Fused Ignition Switch Output circuit in the appropriate terminals of special tool #8815.



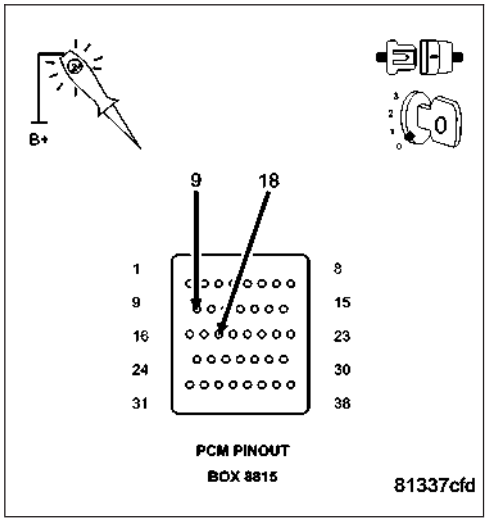
Does the test light illuminate brightly?

Yes >> Go To 3

No >> Repair the (F1), (F202), and (F924) Ignition Switch Output circuit. Inspect and replace fuses as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

3. (Z913) (Z937) PCM GROUND CIRCUITS

Using a 12-volt test light connected to battery voltage, probe the (Z913) (Z937) PCM ground circuits in the appropriate terminals of special tool #8815.



Does the test light illuminate brightly?

Yes >> Go To 4

No >> Repair the (Z913) (Z937) PCM ground circuits.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

***NO RESPONSE WITH A NO START CONDITION (CONTINUED)**

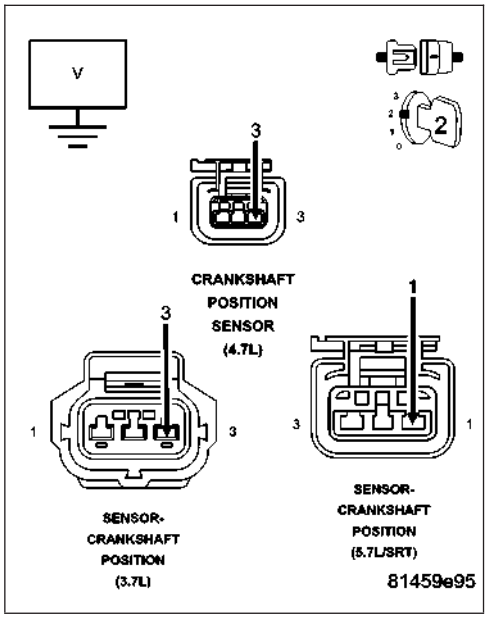
4. (F855) 5-VOLT SUPPLY CIRCUIT

Turn the ignition off.
Connect the C1 PCM harness connector.
Disconnect the Crankshaft Position Sensor harness connector.
Ignition on, engine not running.
Measure the voltage on the (F855) 5-volt Supply circuit.

Is the voltage between 4.5 and 5.2 volts?

Yes >> Go To 5

No >> Go To 6



***NO RESPONSE WITH A NO START CONDITION (CONTINUED)**

5. CKP SENSOR

Turn the ignition off.

Disconnect the TP Sensor or Throttle Body harness connector.

Ignition on, engine not running.

Measure the voltage on the (F855) 5-volt Supply circuit in the TP Sensor or Throttle Body harness connector.

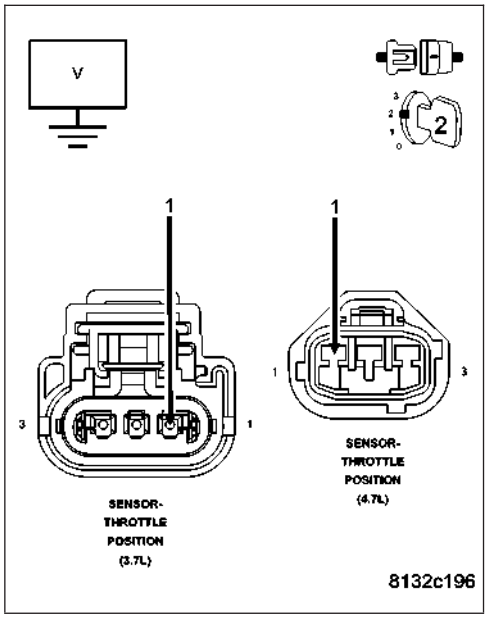
Is the voltage between 4.5 and 5.2 volts?

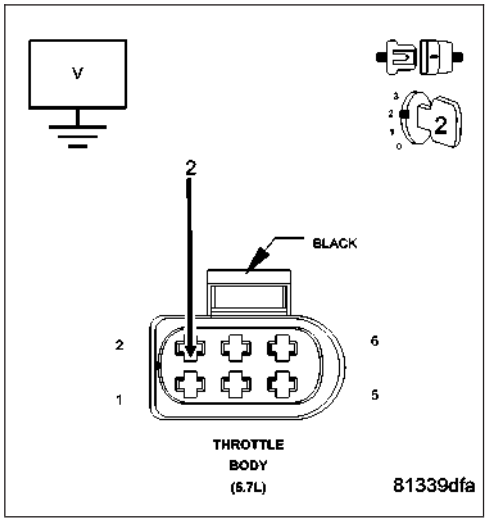
Yes >> If communication is available with a PCM on a like vehicle, replace and program the Powertrain Control Module per Service Information.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace the Crankshaft Position Sensor.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)





***NO RESPONSE WITH A NO START CONDITION (CONTINUED)**

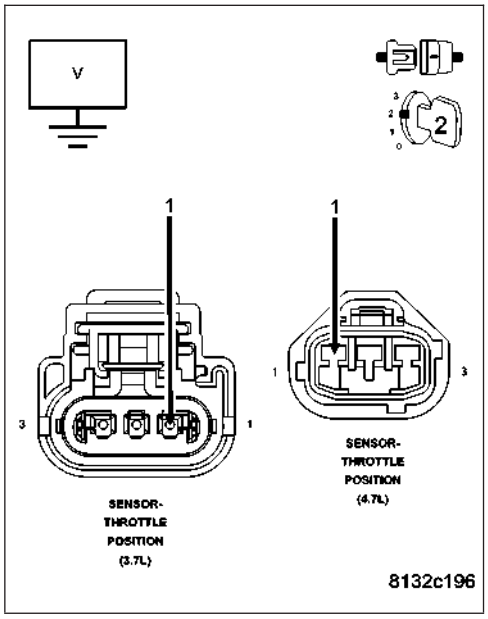
6. (F855) 5-VOLT SENSOR OPEN/SHORTED

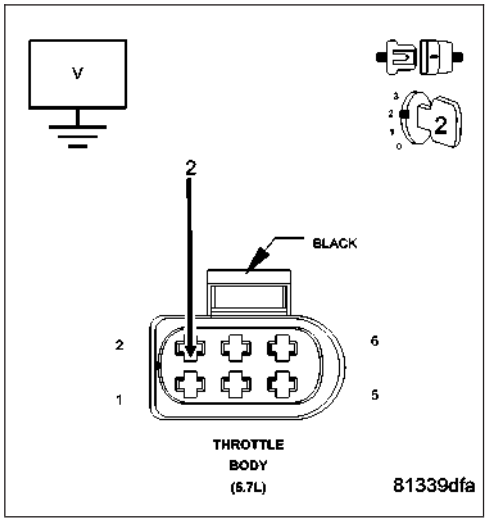
Turn the ignition off.
Disconnect the TP Sensor/Throttle Body harness connector.
Ignition on, engine not running.
Measure the voltage on the (F855) 5-volt Supply circuit.
Disconnect all the sensors that use the (F855) 5-volt Supply circuit.

Did the voltage return to 4.5 to 5.2 volts when disconnecting any of the sensors.

Yes >> Replace the sensor that is pulling down the (F855) 5-volt supply.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 7





7. (F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Turn the ignition off.
Disconnect PCM harness connectors.
Disconnect all the sensors that share the (F855) 5-volt Supply circuit.
Measure the resistance between ground and the (F855) 5-volt Supply circuit at one of the sensor harness connectors.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (F855) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 8

***NO RESPONSE WITH A NO START CONDITION (CONTINUED)**

8. (F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Disconnect all the sensors that share the (F856) 5-volt Supply circuit.

Measure the resistance between ground and the (F856) 5-volt Supply circuit at one of the sensor harness connectors.

Is the resistance below 100 ohms?

Yes >> Repair the short to ground in the (F856) 5-volt Supply circuit.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 9

---

9. PCM

NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Replace and program the Powertrain Control Module per Service Information.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

*START AND STALL CONDITION

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Possible Causes
CURRENT PCM DTCS
CURRENT SKIM DTCS
THROTTLE POSITION SENSOR SWEEP
TP SENSOR NO.1 VOLTAGE GREATER THAN 0.92 VOLTS WITH THROTTLE CLOSED
ECT SENSOR
OTHER POSSIBLE CAUSES FOR START AND STALL CONDITON
FUEL CONTAMINATION

Diagnostic Test

1. CHECKING DTCS

Ignition on, engine not running.

With a scan tool, read DTCs.

Are any DTCs present?

Yes >> Refer to the appropriate Diagnostic Procedure.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 2

---

2. CHECKING SKREEM DTCS

NOTE: If you are unable to communicate with the SKIM/SKREEM, refer to the VEHICLE THEFT AND SECURITY ELECTRICAL DIAGNOSTICS in Section 8 and perform the appropriate diagnostics.

With the scan tool, read the SKIM codes.

Are there any SKIM DTCs?

Yes >> Refer to the Sentry Key Vehicle Theft Security Electrical Diagnostics in Section 8.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 3

---

3. TP SENSOR SWEEP

Ignition on, engine not running.

With the scan tool read TP Sensor voltage.

While monitoring the scan tool, slowly open and close the Throttle on vehicles equipped with a 3.7L or 4.7L engine.

On vehicles equipped with a 5.7L engine, using a scan tool perform the pedal follower test and monitor both TP Sensor voltage readings.

Was the voltage change smooth?

Yes >> Go To 4

No >> Replace the Throttle Position Sensor on a 3.7L and 4.7L engines or the Throttle Body Assembly on a 5.7L engine.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

***START AND STALL CONDITION (CONTINUED)**

4. TP SENSOR NO.1 VOLTAGE GREATER THAN 0.92 VOLTS WITH THROTTLE CLOSED

With the scan tool, read Throttle Position Sensor No.1 voltage.

Throttle must be against its stop.

Is the voltage 0.92 or less with the Throttle closed?

Yes >> Go To 5

No >> Check for a binding throttle condition. If OK, replace the Throttle Position Sensor or the Throttle Body Assembly on a 5.7L.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

5. ECT SENSOR OPERATION

NOTE: For this test to be valid, the thermostat must be operating correctly.

NOTE: This test works best if performed on a cold engine (cold soaked).

NOTE: If the vehicle was allowed to sit over night with no engine start, coolant temperature should be near ambient temperatures.

Ignition on, engine not running.

With the scan tool, read the ECT value.

NOTE: If engine coolant temperature is above 82° C (180° F), allow the engine to cool until 65° C (150° F) is reached.

Start the engine.

During engine warm-up, monitor the Engine Coolant Temperature value. The temperature value change should be a smooth transition from start up to normal operating temp 82° C (180° F). The value should reach at least 82° C (180° F).

Did the Engine Temperature value increase smoothly and did it reach at least 82° C (180° F)?

Yes >> Go To 6

No >> Replace the Engine Coolant Temperature Sensor.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

---

6. OTHER POSSIBLE CAUSES OF START AND STALL CONDITION

The following additional items should be checked as a possible cause for a start and stall condition.

Refer to any Technical Service Bulletins (TSBs) that may apply to the symptom.

The exhaust system must be free of any restrictions.

The engine compression must be within specifications.

The engine valve timing must be within specifications.

The engine must be free from vacuum leaks.

The throttle body must be free of carbon buildup and dirt.

Do any of the above conditions exist?

Yes >> Repair as necessary.
Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

No >> Go To 7

***START AND STALL CONDITION (CONTINUED)**

7. FUEL PUMP DELIVERY

Verify that the Fuel tank is not empty before continuing.

Follow the diagnostics for Checking Fuel Delivery in this manual.

Was the No Start condition solved after following the above diagnostic test?

Yes >> Test Complete.

No >> Check for contamination/water in the fuel. Ensure the fuel being used in this vehicle meets manufactures Fuel Requirement, refer to the service manual.

Perform the POWERTRAIN VERIFICATION TEST. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

STANDARD PROCEDURE

POWERTRAIN VERIFICATION TEST

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

Diagnostic Test

1. SELECTING THE PROPER VERIFICATION TEST

The following verification test are for different repairs. Select the appropriate Verification test for the repair that has been completed.

Speed Control repair
Go To 2

Charging System repair
Go To 3

NVLD System repair
Go To 4

All other repairs
Go To 5

POWERTRAIN VERIFICATION TEST (CONTINUED)

2. POWERTRAIN VERIFICATION TEST 1

NOTE: If this vehicle is equipped with an Electronic Throttle Control system, and the APP Sensors, PCM, or Throttle Body Assembly have been replaced, use the scan tool to perform the ETC RELEARN function.

NOTE: 2. After completing the Powertrain Verification Test the Transmission Verification Test must be performed.

NOTE: 3. If the PCM has been replaced and the correct VIN and mileage have not been programmed, a DTC will set in the ABS Module, Airbag Module and the SKIM/SKREEM.

NOTE: 4. If the vehicle is equipped with a Sentry Key Remote Entry, Secret Key data must be updated. Refer to the Service Information for the PCM, SKIM/SKREEM and the Transponder (ignition key) for programming information.

5. Inspect the vehicle to make sure that all engine components are properly installed and connected.
6. Connect the scan tool to the data link connector and erase all codes.
7. Turn the speed control ON (if equipped, cruise light will be on).
8. Depress and release the SET Switch when the vehicle speed is greater than 35 MPH. The speed control should engage and hold the selected speed.
9. Press and hold the RESUME/ACCEL Switch. The vehicle speed should increase by at least 2 MPH.
10. Press and hold the COAST switch. The vehicle speed should decrease.
11. Using caution, press and release the brake pedal. The speed control should disengage.
12. Bring the vehicle speed back up to 35 MPH.
13. Press the RESUME/ACCEL switch. The speed control should resume the previously set speed.
14. Hold down the SET switch. The vehicle should decelerate.
15. Make sure vehicle speed is greater than 35 mph and release the SET Switch. The vehicle should adjust and set a new vehicle speed.
16. Press and release the CANCEL switch. The speed control should disengage.
17. Bring the vehicle speed back up above 35 mph and engage speed control.
18. Turn the Speed Control Off. (Cruise light will be off). The speed control should disengage.

NOTE: OVERSHOOT/UNDERSHOOT FOLLOWING SPEED CONTROL SET.

20. If the vehicle operator repeatedly presses and releases the SET button with their foot off of the accelerator (referred to as ″lift foot set″), the vehicle may accelerate and exceed the desired set speed by up to 5 mph (8 km/h).
21. It may also decelerate to less than the desired set speed, before finally achieving the desired set speed.
22. The Speed Control System has an adaptive strategy that compensates for vehicle-to-vehicle variations in speed control cable lengths.
23. When the speed control is set with the vehicles operators foot off of the accelerator pedal, the speed control thinks there is excessive speed control cable slack and adapts accordingly.
24. If the ″lift foot sets″ are continually used, a speed control overshoot/undershoot condition will develop.
25. To ″unlearn″ the overshoot/undershoot condition, the vehicle operator has to press and release the set button while maintaining the desired set speed using the accelerator pedal (not decelerating or accelerating).
26. Then turn the cruise control switch to the OFF position (or press the CANCEL button if equipped) after waiting 10 seconds.
27. This procedure must be performed approximately 10-15 times to completely unlearn the overshoot/undershoot condition.

Did the Speed Control pass the above test?

Yes >> Repair is complete.

No >> Check for any related Technical Service Bulletins and/or refer to the appropriate Diagnostic Procedure.

POWERTRAIN VERIFICATION TEST (CONTINUED)

3. POWERTRAIN VERIFICATION TEST 2

1. If this vehicle is equipped with an Electronic Throttle Control system, and the APP Sensors, PCM, or Throttle Body Assembly has been replaced use a scan tool to perform the ETC RELEARN function.

NOTE: 2. After completing the Powertrain Verification Test the Transmission Verification Test must be performed.

NOTE: 3. If the PCM has been replaced and the correct VIN and mileage have not been programmed, a DTC will set in the ABS Module, Airbag Module and the SKIM/SKREEM.

NOTE: 4. If the vehicle is equipped with a Sentry Key Remote Entry, Secret Key data must be updated. Refer to the Service Information for the PCM, SKIM/SKREEM and the Transponder (ignition key) for programming information.

5. Inspect the vehicle to make sure that all components related to the repair are properly installed and connected.
6. With the scan tool, clear DTCs.
7. Perform generator output test. Refer to the appropriate service information as necessary.
8. Start the engine and set engine speed to 2000 RPM for at least thirty seconds.
9. Cycle the ignition key off and on.
10. With the scan tool, read the DTCs.

Are any DTCs or symptoms remaining?

Yes >> Check for any Technical Service Bulletins and/or refer to the appropriate Diagnostic Procedure.

No >> Repair is complete.

---

4. POWERTRAIN VERIFICATION TEST 3

1. Install the Miller Tool #8404 Evaporative Emission Leak Detector (EELD) according to the instructions in the previous DTC table.
2. Set the smoke/air control switch to AIR.
3. Insert the tester's AIR supply tip (clear hose) into the appropriate calibration orifice on the tester's control panel (based on DTC leak size).
4. Press the remote smoke/air start button.
5. Position the red flag on the air flow meter so it is aligned with the indicator ball.
6. When the calibration is complete, release the remote button. The EELD flow meter is now calibrated in liters per minute to the size of leak indicated by the DTC set in the PCM.
7. Install the service port adapter #8404-14 on the vehicle's service port.
8. Connect the Air supply hose from the EELD to the vehicle.
9. Press the remote button to activate AIR flow.

NOTE: 10. Larger volume fuel tanks, lower fuel levels or if the vehicle is equipped with a Flow Management Valve may indicate high flow and will require 4 to 5 minutes to fill.

11. Compare the flow meter indicator ball reading to the red flag.
12. ABOVE the red flag indicates a leak present.
13. BELOW the red flag indicates a sealed system.

NOTE: If this vehicle is equipped with an Electronic Throttle Control system, and the APP Sensors, PCM, or Throttle Body Assembly have been replaced, use the scan tool to perform the ETC RELEARN function.

15. If the indicator ball shows a leak present, perform the smoke test indicated in the previous test and identify the leak and repair. Perform this verification test when the repair is complete.

Did the indicator ball indicate the a leak is present?

Yes >> Repeat the DTC test to identify the leak and repair.

No >> Repair is complete.

POWERTRAIN VERIFICATION TEST (CONTINUED)

5. POWERTRAIN VERIFICATION TEST 4

NOTE: 1. After completing the Powertrain Verification Test the Transmission Verification Test must be performed.

NOTE: 2. If the PCM has been replaced and the correct VIN and mileage have not been programmed, a DTC will set in the ABS Module, Airbag Module and the SKIM/SKREEM.

NOTE: 3. If the vehicle is equipped with a Sentry Key Remote Entry, Secret Key data must be updated. Refer to the Service Information for the PCM, SKIM/SKREEM and the Transponder (ignition key) for programming information.

NOTE: 4. If this vehicle is equipped with an Electronic Throttle Control system, and the APP Sensors, PCM, or Throttle Body Assembly have been replaced, use the scan tool to perform the ETC RELEARN function.

NOTE: 5. When replacing an O2 Sensor, the PCM RAM memory must be cleared, either by disconnecting the PCM C1 connector or momentarily disconnecting the Battery negative terminal.

6. The NGC learns the characteristics of each O2 heater element and these old values should be cleared when installing a new O2 sensor. The customer may experience driveability issues if this is not performed.

7. Inspect the vehicle to make sure that all engine components are properly installed and connected. Reassemble and reconnect components as necessary.

8. Connect the scan tool to the data link connector.

9. Make sure the fuel tank has at least a quarter tank of fuel. Turn off all accessories.

10. If the Catalyst was replaced, with the scan tool go to the Miscellaneous Menu Option ″Catalyst Replaced″ and press enter.

11. If a Comprehensive Component DTC was repaired, perform steps 12 - 14. If a Major OBDII Monitor DTC was repaired skip those steps and continue verification.

12. After the ignition has been off for at least 10 seconds, restart the vehicle and run 2 minutes.

13. With the scan tool, monitor the appropriate pre-test enabling conditions until all conditions have been met. Once the conditions have been met, switch screen to the appropriate OBDII monitor, (Audible beeps when the monitor is running).

14. If the repaired OBDII trouble code has reset or was seen in the monitor while on the road test, the repair is not complete. Check for any related technical service bulletins or flash updates and return to Engine Electrical Diagnostic List.

15. If the conditions cannot be duplicated, erase all DTCs with the Scan tool.

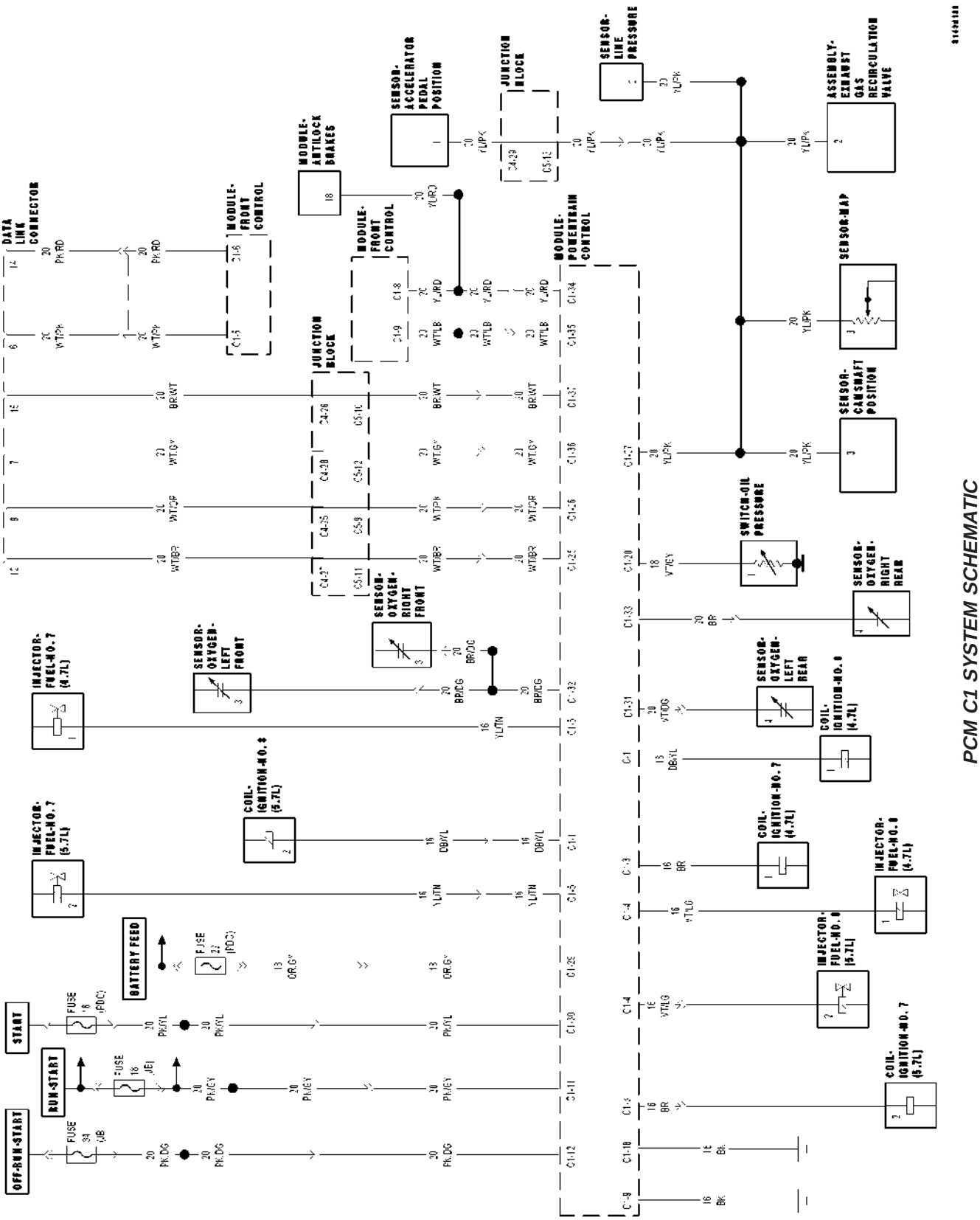
16. If another DTC has set, return to the Engine Electrical Diagnostic List and follow the path specified for that DTC.

Did the OBDII Monitor run successfully and has the Good Trip Counter changed to one or more?

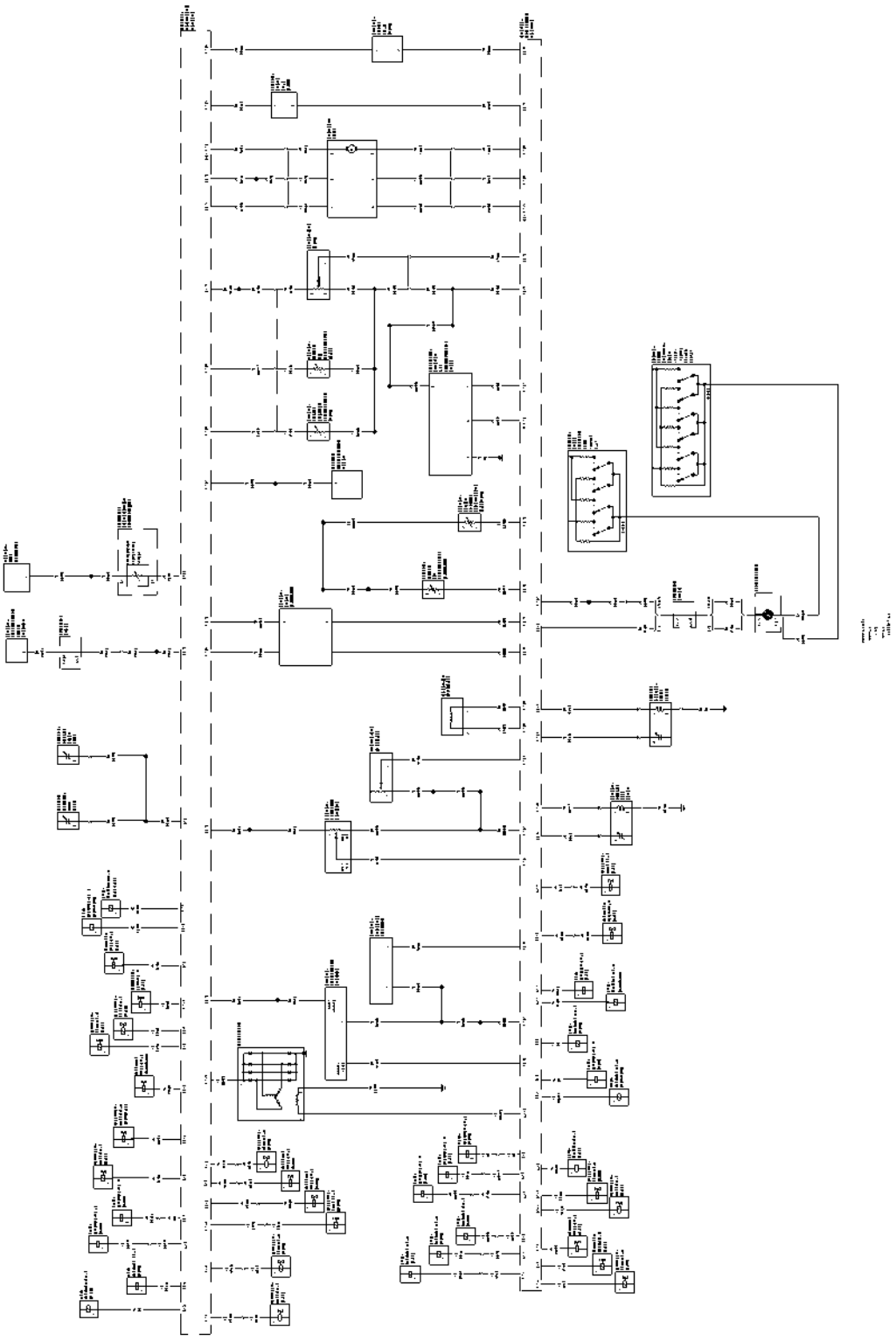
Yes >> Repair is complete.

No >> Check for any related Technical Service Bulletins and/or refer to the appropriate Diagnostic Procedure.

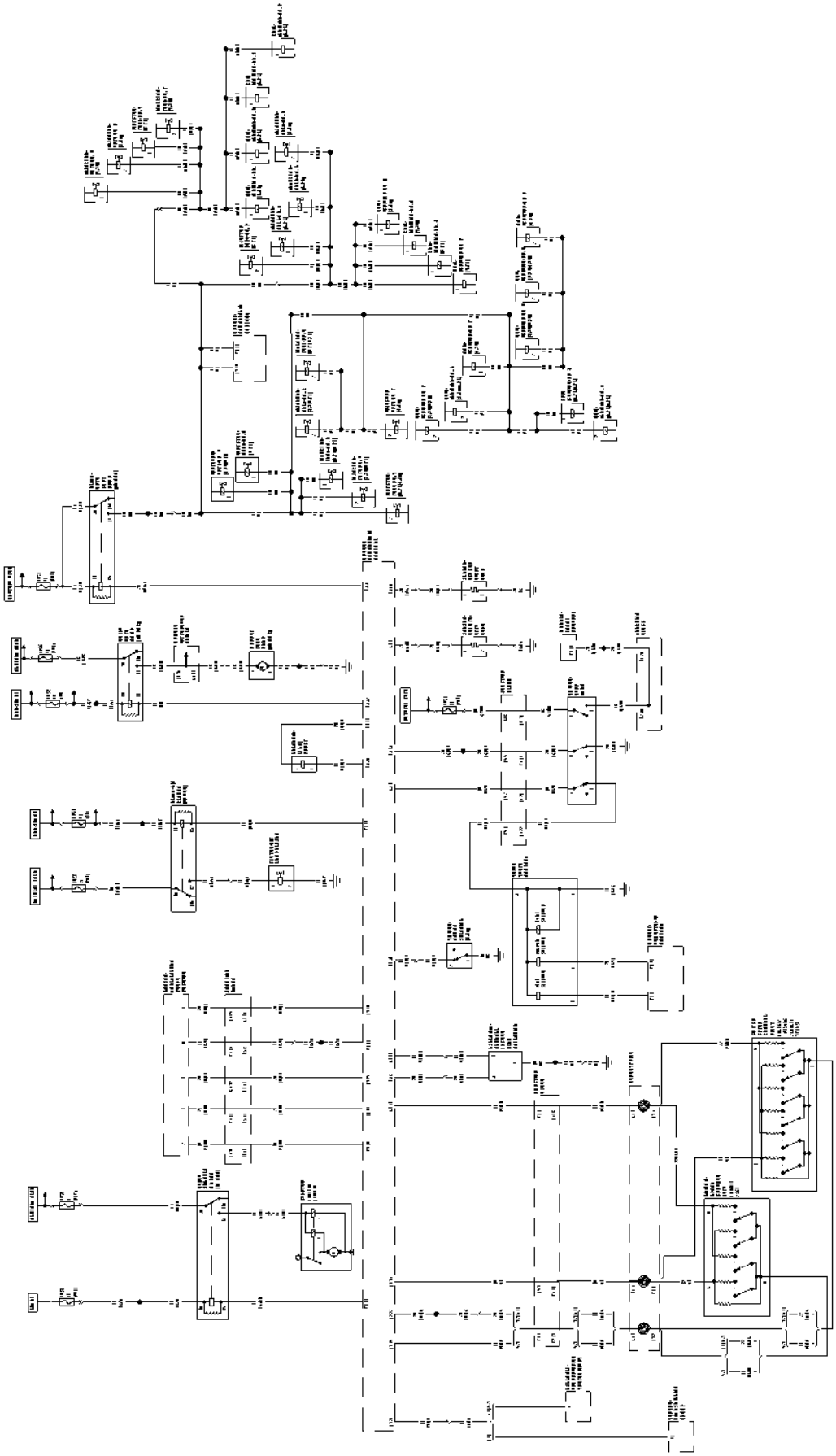
SCHEMATICS AND DIAGRAMS



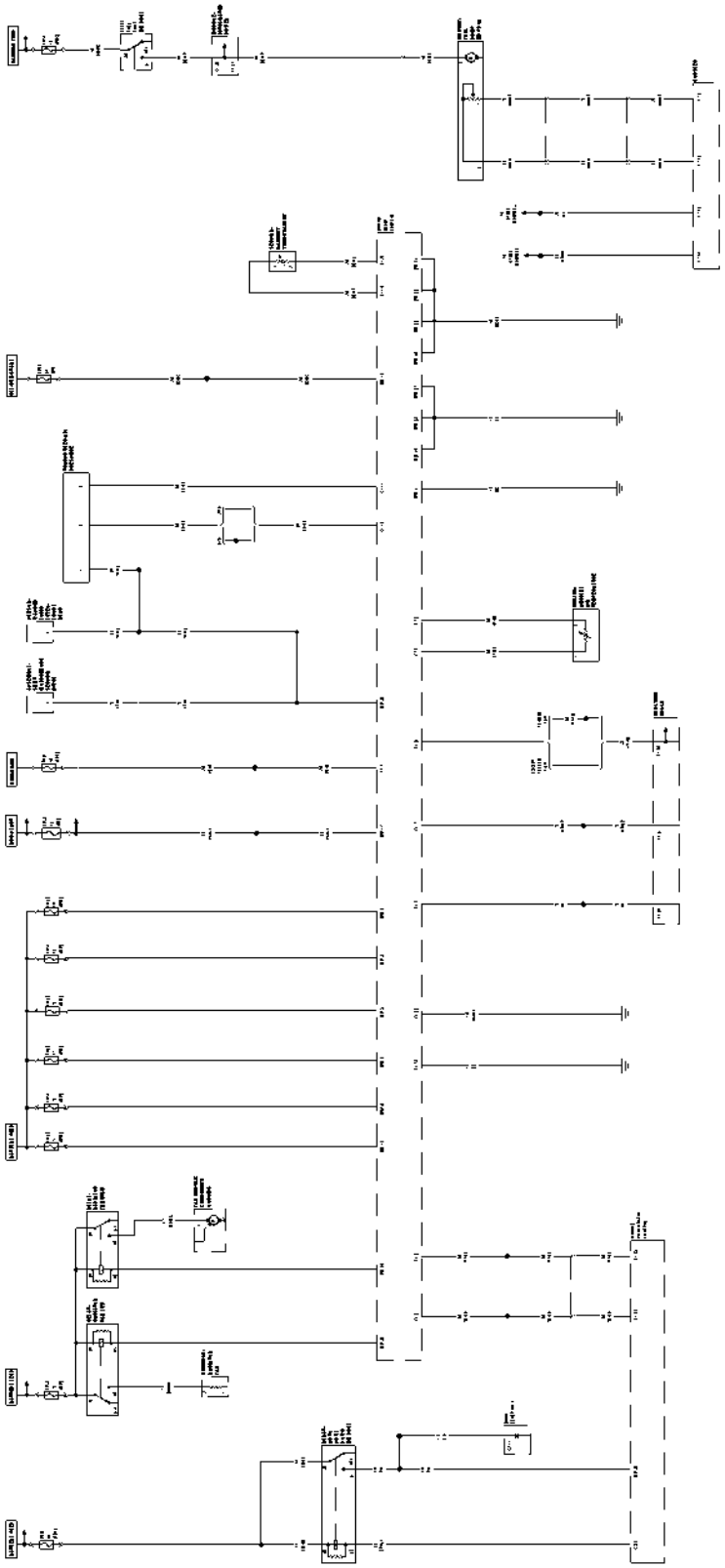
PCM C1 SYSTEM SCHEMATIC



PCM C2 SYSTEM SCHEMATIC



PCM C3 SYSTEM SCHEMATIC



FCM IPM POWERTRAIN SCHEMATIC

ENGINE - 3.7L SERVICE INFORMATION

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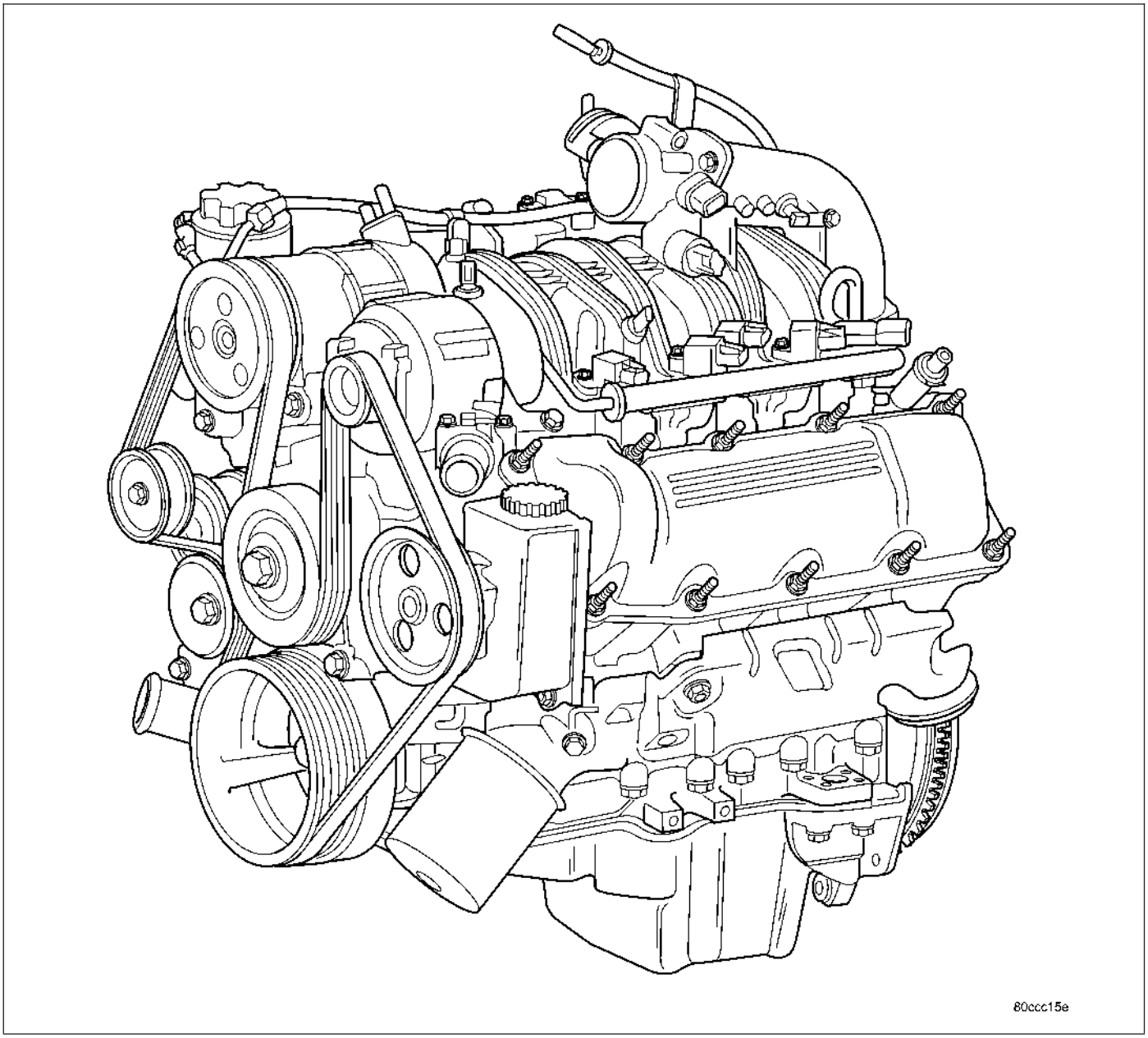
ENGINE - 3.7L SERVICE INFORMATION

DESCRIPTION



The 3.7 liter (226 CID) six-cylinder engine is an 90° single overhead camshaft engine. The cast iron cylinder block is made up of two different components; the first component is the cylinder bore and upper block, the second component is the bedplate that comprises the lower portion of the cylinder block and houses the lower half of the crankshaft main bearings. The cylinders are numbered from front to rear with the left bank being numbered 1,3, and 5 and the right bank being numbered 2,4, and 6. The firing order is 1–6–5–4–3–2. The engine serial number is located at the right front side of the engine block

DIAGNOSIS AND TESTING

ENGINE DIAGNOSIS - INTRODUCTION

Engine diagnosis is helpful in determining the causes of malfunctions not detected and remedied by routine maintenance.

These malfunctions may be classified as either performance (e.g., engine idles rough and stalls) or mechanical (e.g., a strange noise).

(Refer to 9 - ENGINE - DIAGNOSIS AND TESTING) - PERFORMANCE and (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING) - MECHANICAL for possible causes and corrections of malfunctions. Refer to 14 - FUEL SYSTEM for the fuel system diagnosis.

Additional tests and diagnostic procedures may be necessary for specific engine malfunctions that can not be isolated with the Service Diagnosis charts. Information concerning additional tests and diagnosis is provided within the following diagnosis:

- Cylinder Compression Pressure Test (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)
- Cylinder Combustion Pressure Leakage Test (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).
- Engine Cylinder Head Gasket Failure Diagnosis (Refer to 9 - ENGINE/CYLINDER HEAD - DIAGNOSIS AND TESTING).
- Intake Manifold Leakage Diagnosis (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - DIAGNOSIS AND TESTING).

ENGINE DIAGNOSIS - PERFORMANCE

CONDITION	POSSIBLE CAUSE	CORRECTION
ENGINE WILL NOT START	1. Weak battery	1. Charge or replace as necessary.
	2. Corroded or loose battery connections.	2. Clean and tighten battery connections. Apply a coat of light mineral grease to the terminals.
	3. Faulty starter.	3. (Refer to 8 - ELECTRICAL/ STARTING - DIAGNOSIS AND TESTING).
	4. Faulty coil or control unit.	4. (Refer to 8 - ELECTRICAL/ IGNITION CONTROL/IGNITION COIL - REMOVAL).
	5. Incorrect spark plug gap.	5. (Refer to 8 - ELECTRICAL/ IGNITION CONTROL/SPARK PLUG - CLEANING).
	6. Incorrect right bank cam timing.	6. Refer to engine timing in this section.
	7. Dirt or water in fuel system.	7. Clean system and replace fuel filter.
	8.Faulty fuel pump, relay or wiring.	8.Repair or replace as necessary.
	9. Faulty cam or crank sensor	9. Refer to Ignition system.

CONDITION	POSSIBLE CAUSE	CORRECTION
ENGINE STALLS OR ROUGH IDLE	1. Vacuum leak.	1. Inspect intake manifold and vacuum hoses, repair or replace as necessary.
	2. Faulty crank position sensor	Replace crank position sensor
	3. Faulty coil.	3. (Refer to 8 - ELECTRICAL/ IGNITION CONTROL/IGNITION COIL - REMOVAL)
	4. Incorrect cam timing.	4. (Refer to 9 - ENGINE/VALVE TIMING - STANDARD PROCEDURE)
1. ENGINE LOSS OF POWER	1. Dirty or incorrectly gapped spark plugs.	1. (Refer to 8 - ELECTRICAL/ IGNITION CONTROL/SPARK PLUG - CLEANING).
	2. Dirt or water in fuel system.	2. Clean system and replace fuel filter.
	3. Faulty fuel pump.	3. (Refer to 14 - FUEL SYSTEM/ FUEL DELIVERY/FUEL PUMP - DIAGNOSIS AND TESTING).
	4. Blown cylinder head gasket.	4. Replace cylinder head gasket.
	5. Low compression.	5. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING), repair as necessary.
	6. Burned, warped or pitted valves.	6. Replace as necessary.
	7. Plugged or restricted exhaust system.	7. Inspect and replace as necessary.
	8. Faulty coil.	8. (Refer to 8 - ELECTRICAL/ IGNITION CONTROL/IGNITION COIL - REMOVAL).
	9. Incorrect cam timing.	9. Refer to Engine Timing in this section.
1. ENGINE MISSES ON ACCELERATION	1. Spark plugs dirty or incorrectly gapped.	1. (Refer to 8 - ELECTRICAL/ IGNITION CONTROL/SPARK PLUG - CLEANING).
	2. Dirt in fuel system.	2. Clean fuel system.
	3. Burned, warped or pitted valves.	3. Replace as necessary.
	4. Faulty coil.	4. (Refer to 8 - ELECTRICAL/ IGNITION CONTROL/IGNITION COIL - REMOVAL).
1. ENGINE MISSES AT HIGH SPEED	1. Spark plugs dirty or incorrectly gapped.	1. (Refer to 8 - ELECTRICAL/ IGNITION CONTROL/SPARK PLUG - CLEANING).
	2. Faulty coil.	2. (Refer to 8 - ELECTRICAL/ IGNITION CONTROL/IGNITION COIL - REMOVAL).
	3. Dirt or water in fuel system.	3. Clean system and replace fuel filter.

ENGINE DIAGNOSIS - MECHANICAL

CONDITION	POSSIBLE CAUSES	CORRECTIONS
NOISY VALVES	1. High or low oil level in crankcase.	1. (Refer to 9 - ENGINE/ LUBRICATION/OIL - STANDARD PROCEDURE)
	2. Thin or diluted oil.	2. Change oil and filter.
	3. Low oil pressure.	3. Check oil pump, if Ok, check rod and main bearings for excessive wear.
	4. Dirt in lash adjusters.	4. Replace as necessary.
	5. Worn rocker arms.	5. Replace as necessary.
	6. Worn lash adjusters	6. Replace as necessary.
	7. Worn valve guides.	7. (Refer to 9 - ENGINE/CYLINDER HEAD/INTAKE/EXHAUST VALVES & SEATS - STANDARD PROCEDURE)
	8. Excessive runout of valve seats on valve faces.	8. (Refer to 9 - ENGINE/CYLINDER HEAD/INTAKE/EXHAUST VALVES & SEATS - STANDARD PROCEDURE)
CONNECTING ROD NOISE	1. Insufficient oil supply.	1. (Refer to 9 - ENGINE/ LUBRICATION/OIL - STANDARD PROCEDURE)
	2. Low oil pressure.	2. Check oil pump, if Ok, check rod and main bearings for excessive wear.
	3. Thin or diluted oil.	3. Change oil and filter.
	4. Excessive bearing clearance.	4. Replace as necessary.
	5. Connecting rod journal out-of-round.	5. Service or replace crankshaft.
	6. Misaligned connecting rods.	6. Replace bent connecting rods.
MAIN BEARING NOISE	1. Insufficient oil supply.	1. (Refer to 9 - ENGINE/ LUBRICATION/OIL - STANDARD PROCEDURE)
	2. Low oil pressure.	2. Check oil pump, if Ok, check rod and main bearings for excessive wear.
	3. Thin or diluted oil.	3. Change oil and filter.
	4. Excessive bearing clearance.	4. Replace as necessary.
	5. Excessive end play.	5. Check thrust washers for wear.
	6. Crankshaft journal out-of round.	6. Service or replace crankshaft.
	7. Loose flywheel or torque converter.	7. Tighten to correct torque

ENGINE DIAGNOSIS - LUBRICATION

CONDITION	POSSIBLE CAUSES	CORRECTION
OIL LEAKS	1. Gaskets and O-Rings.	1.
	(a) Misaligned or damaged.	(a) Replace as necessary.
	(b) Loose fasteners, broken or porous metal parts.	(b) Tighten fasteners, Repair or replace metal parts.
	2. Crankshaft rear seal	2. Replace as necessary (Refer to 9 - ENGINE/ENGINE BLOCK/ CRANKSHAFT OIL SEAL - REAR - REMOVAL)
	3. Crankshaft seal flange. Scratched, nicked or grooved.	3. Polish or replace crankshaft.
	4. Oil pan flange cracked.	4. Replace oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL)
	5. Timing chain cover seal, damaged or misaligned.	5. Replace seal (Refer to 9 - ENGINE/ENGINE BLOCK/ CRANKSHAFT OIL SEAL - FRONT - REMOVAL)
	6. Scratched or damaged vibration damper hub.	6. Polish or replace damper.
OIL PRESSURE DROP	1. Low oil level.	1. Check and correct oil level.
	2. Faulty oil pressure sending unit.	2. Replace sending unit (Refer to 9 - ENGINE/LUBRICATION/OIL PRESSURE SENSOR/SWITCH - REMOVAL)
	3. Low oil pressure.	3. Check oil pump and bearing clearance.
	4. Clogged oil filter.	4. Replace oil filter (Refer to 9 - ENGINE/LUBRICATION/OIL FILTER - REMOVAL)
	5. Worn oil pump.	5. Replace oil pump (Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - REMOVAL)
	6. Thin or diluted oil.	6. Change oil and filter.
	7. Excessive bearing clearance.	7. Replace as necessary.
	8. Oil pump relief valve stuck.	8. Replace oil pump (Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - REMOVAL)
	9. Oil pick up tube loose, damaged or clogged.	9. Replace as necessary.

CONDITION	POSSIBLE CAUSES	CORRECTION
OIL PUMPING AT RINGS; SPARK PLUGS FOULING	1. Worn or damaged rings.	1. Hone cylinder bores and replace rings.
	2. Carbon in oil ring slots.	2. Replace rings (Refer to 9 - ENGINE/ENGINE BLOCK/PISTON RINGS - STANDARD PROCEDURE)
	3. Incorrect ring size installed.	3. Replace rings (Refer to 9 - ENGINE/ENGINE BLOCK/PISTON RINGS - STANDARD PROCEDURE)
	4. Worn valve guides.	4. Ream guides and replace valves (Refer to 9 - ENGINE/CYLINDER HEAD/INTAKE/EXHAUST VALVES & SEATS - REMOVAL)
	5. Leaking valve guide seals.	5. Replace valve guide seals.

CYLINDER COMPRESSION PRESSURE

The results of a cylinder compression pressure test can be utilized to diagnose several engine malfunctions.

Ensure the battery is completely charged and the engine starter motor is in good operating condition. Otherwise the indicated compression pressures may not be valid for diagnosis purposes.

1. Clean the spark plug recesses with compressed air.
2. Remove the spark plugs.
3. Secure the throttle in the wide-open position.
4. Disable the fuel system (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - DESCRIPTION).
5. Remove the Automatic Shutdown (ASD) relay (Refer to 8 - ELECTRICAL/IGNITION CONTROL/AUTO SHUT DOWN RELAY - REMOVAL).
6. Insert a compression pressure gauge and rotate the engine with the engine starter motor for three revolutions.
7. Record the compression pressure on the 3rd revolution. Continue the test for the remaining cylinders.
8. Refer (Refer to 9 - ENGINE - SPECIFICATIONS) for the correct engine compression pressures.

CYLINDER COMBUSTION PRESSURE LEAKAGE

The combustion pressure leakage test provides an accurate means for determining engine condition.

Combustion pressure leakage testing will detect:

- Exhaust and intake valve leaks (improper seating).
- Leaks between adjacent cylinders or into water jacket.
- Any causes for combustion/compression pressure loss.

1. Check the coolant level and fill as required. DO NOT install the radiator cap.
2. Start and operate the engine until it attains normal operating temperature, then turn the engine OFF.
3. Remove the spark plugs.
4. Remove the oil filler cap.
5. Remove the air cleaner hose.
6. Calibrate the tester according to the manufacturer's instructions. The shop air source for testing should maintain 483 kPa (70 psi) minimum, 1,379 kPa (200 psi) maximum and 552 kPa (80 psi) recommended.
7. Perform the test procedures on each cylinder according to the tester manufacturer's instructions. Set piston of cylinder to be tested at TDC compression,While testing, listen for pressurized air escaping through the throttle body, tailpipe and oil filler cap opening. Check for bubbles in the radiator coolant.

All gauge pressure indications should be equal, with no more than 25% leakage.

FOR EXAMPLE: At 552 kPa (80 psi) input pressure, a minimum of 414 kPa (60 psi) should be maintained in the cylinder.

Refer to CYLINDER COMBUSTION PRESSURE LEAKAGE DIAGNOSIS CHART .

CYLINDER COMBUSTION PRESSURE LEAKAGE DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSE	CORRECTION
AIR ESCAPES THROUGH THROTTLE BODY	Intake valve bent, burnt, or not seated properly	Inspect valve and valve seat. Reface or replace, as necessary. Inspect valve springs. Replace as necessary.
AIR ESCAPES THROUGH TAILPIPE	Exhaust valve bent, burnt, or not seated properly	Inspect valve and valve seat. Reface or replace, as necessary. Inspect valve springs. Replace as necessary.
AIR ESCAPES THROUGH RADIATOR	Head gasket leaking or cracked cylinder head or block	Remove cylinder head and inspect. Replace defective part
MORE THAN 50% LEAKAGE FROM ADJACENT CYLINDERS	Head gasket leaking or crack in cylinder head or block between adjacent cylinders	Remove cylinder head and inspect. Replace gasket, head, or block as necessary
MORE THAN 25% LEAKAGE AND AIR ESCAPES THROUGH OIL FILLER CAP OPENING ONLY	Stuck or broken piston rings; cracked piston; worn rings and/or cylinder wall	Inspect for broken rings or piston. Measure ring gap and cylinder diameter, taper and out-of-round. Replace defective part as necessary

STANDARD PROCEDURE

REPAIR DAMAGED OR WORN THREADS

CAUTION: Be sure that the tapped holes maintain the original center line.

Damaged or worn threads can be repaired. Essentially, this repair consists of:

- Drilling out worn or damaged threads.
- Tapping the hole with a special Heli-Coil Tap, or equivalent.
- Installing an insert into the tapped hole to bring the hole back to its original thread size.

FORM-IN-PLACE GASKETS AND SEALERS

There are numerous places where form-in-place gaskets are used on the engine. Care must be taken when applying form-in-place gaskets to assure obtaining the desired results. **Do not use form-in-place gasket material unless specified.** Bead size, continuity, and location are of great importance. Too thin a bead can result in leakage while too much can result in spill-over which can break off and obstruct fluid feed lines. A continuous bead of the proper width is essential to obtain a leak-free gasket.

There are numerous types of form-in-place gasket materials that are used in the engine area. Mopar® Engine RTV GEN II, Mopar® ATF-RTV, and Mopar® Gasket Maker gasket materials, each have different properties and can not be used in place of the other.

MOPAR® ENGINE RTV GEN II

Mopar® Engine RTV GEN II is used to seal components exposed to engine oil. This material is a specially designed black silicone rubber RTV that retains adhesion and sealing properties when exposed to engine oil. Moisture in the air causes the material to cure. This material is available in three ounce tubes and has a shelf life of one year. After one year this material will not properly cure. Always inspect the package for the expiration date before use.

MOPAR® ATF RTV

Mopar® ATF RTV is a specifically designed black silicone rubber RTV that retains adhesion and sealing properties to seal components exposed to automatic transmission fluid, engine coolants, and moisture. This material is available in three ounce tubes and has a shelf life of one year. After one year this material will not properly cure. Always inspect the package for the expiration date before use.

MOPAR® GASKET MAKER

Mopar® Gasket Maker is an anaerobic type gasket material. The material cures in the absence of air when squeezed between two metallic surfaces. It will not cure if left in the uncovered tube. The anaerobic material is for use between two machined surfaces. Do not use on flexible metal flanges.

MOPAR® GASKET SEALANT

Mopar® Gasket Sealant is a slow drying, permanently soft sealer. This material is recommended for sealing threaded fittings and gaskets against leakage of oil and coolant. Can be used on threaded and machined parts under all temperatures. This material is used on engines with multi-layer steel (MLS) cylinder head gaskets. This material also will prevent corrosion. Mopar® Gasket Sealant is available in a 13 oz. aerosol can or 4oz./16 oz. can w/applicator.

FORM-IN-PLACE GASKET AND SEALER APPLICATION

Assembling parts using a form-in-place gasket requires care but it's easier than using precut gaskets.

Mopar® Gasket Maker material should be applied sparingly 1 mm (0.040 in.) diameter or less of sealant to one gasket surface. Be certain the material surrounds each mounting hole. Excess material can easily be wiped off. Components should be torqued in place within 15 minutes. The use of a locating dowel is recommended during assembly to prevent smearing material off the location.

Mopar® Engine RTV GEN II or ATF RTV gasket material should be applied in a continuous bead approximately 3 mm (0.120 in.) in diameter. All mounting holes must be circled. For corner sealing, a 3.17 or 6.35 mm (1/8 or 1/4 in.) drop is placed in the center of the gasket contact area. Uncured sealant may be removed with a shop towel. Components should be torqued in place while the sealant is still wet to the touch (within 10 minutes). The usage of a locating dowel is recommended during assembly to prevent smearing material off the location.

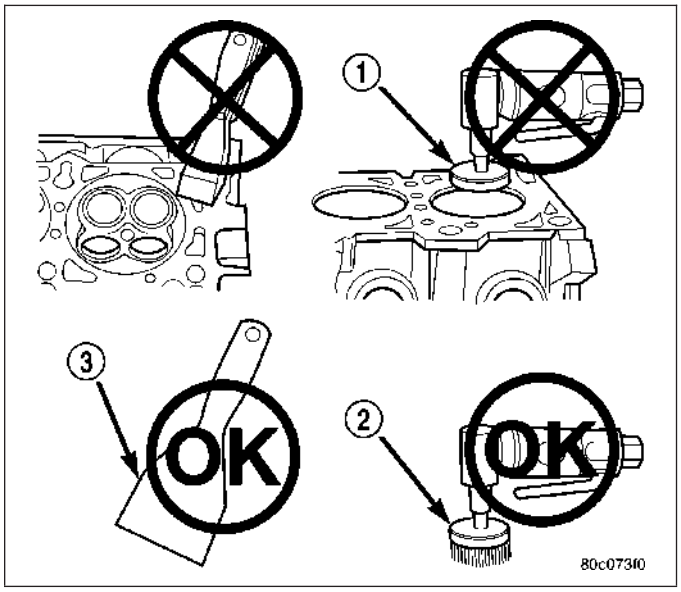
Mopar® Gasket Sealant in an aerosol can should be applied using a thin, even coat sprayed completely over both surfaces to be joined, and both sides of a gasket. Then proceed with assembly. Material in a can w/applicator can be brushed on evenly over the sealing surfaces. Material in an aerosol can should be used on engines with multi-layer steel gaskets.

ENGINE GASKET SURFACE PREPARATION

To ensure engine gasket sealing, proper surface preparation must be performed, especially with the use of aluminum engine components and multi-layer steel cylinder head gaskets.

Never use the following to clean gasket surfaces:

- Metal scraper.
- Abrasive pad or paper to clean cylinder block and head.
- High speed power tool with an abrasive pad or a wire brush (1).



NOTE: Multi-Layer Steel (MLS) head gaskets require a scratch free sealing surface.

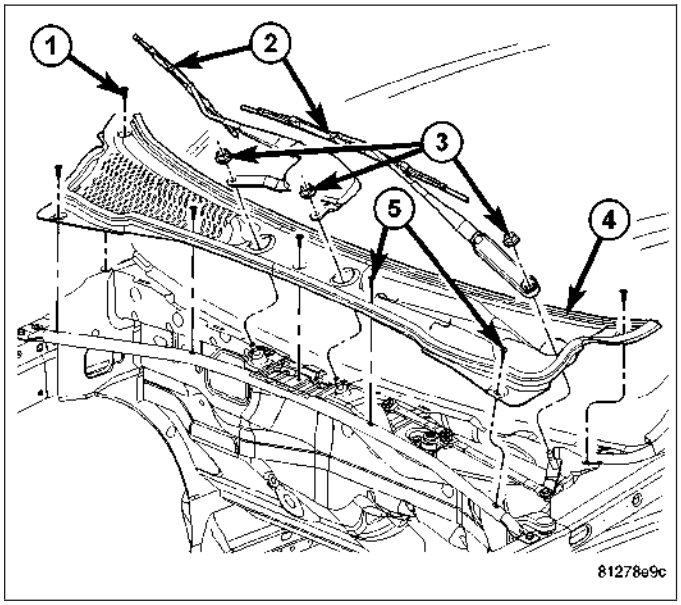
Only use the following for cleaning gasket surfaces:

- Solvent or a commercially available gasket remover
- Plastic or wood scraper (3).
- Drill motor with 3M Roloc™ Bristle Disc (white or yellow) (2).

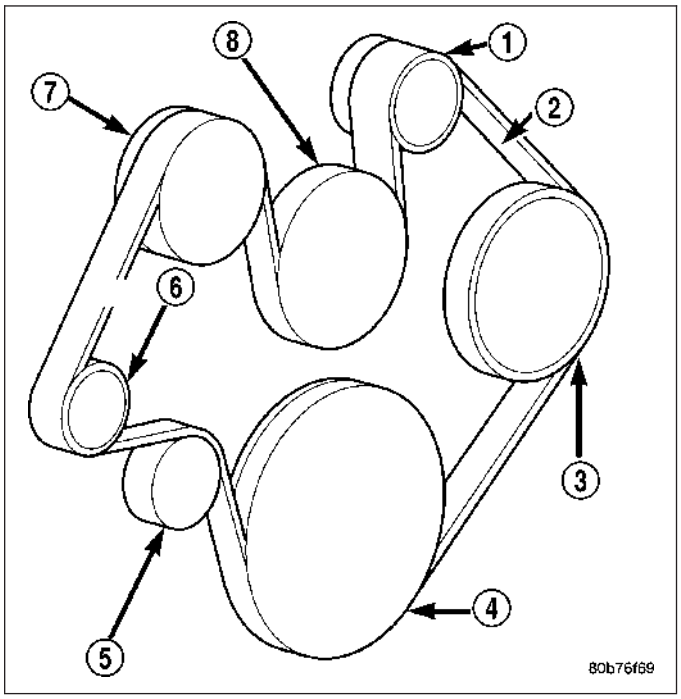
CAUTION: Excessive pressure or high RPM (beyond the recommended speed), can damage the sealing surfaces. The mild (white, 120 grit) bristle disc is recommended. If necessary, the medium (yellow, 80 grit) bristle disc may be used on cast iron surfaces with care.

REMOVAL - ENGINE

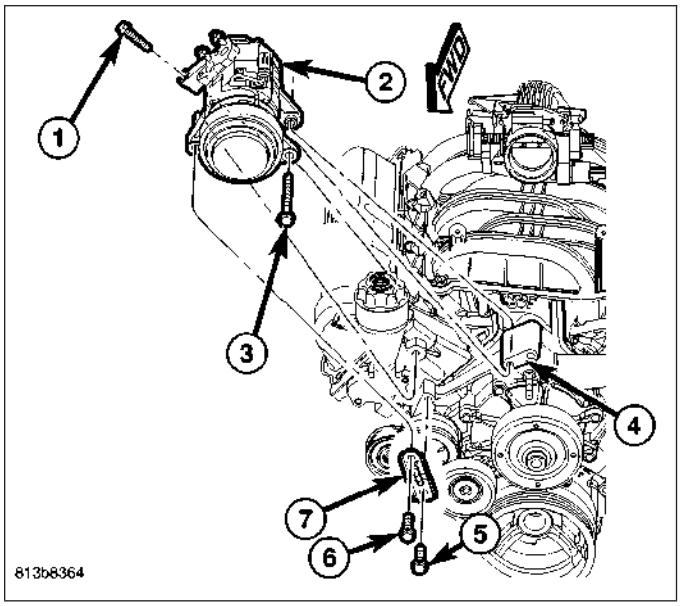
1. Remove the cowl grille (4).
2. Release fuel rail pressure (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - STANDARD PROCEDURE) then disconnect the fuel supply quick connect fitting at the fuel rail (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/QUICK CONNECT FITTING - STANDARD PROCEDURE).



3. Disconnect the battery negative cable.
4. Remove air cleaner assembly.
5. Remove fan shroud with viscous fan assembly.
6. Remove drive belt (2).



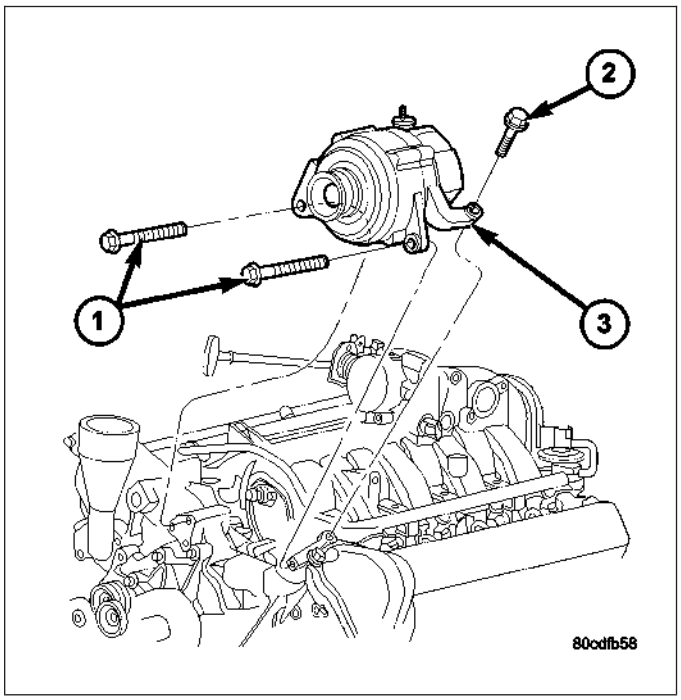
7. Remove A/C compressor (2) and secure away from engine.



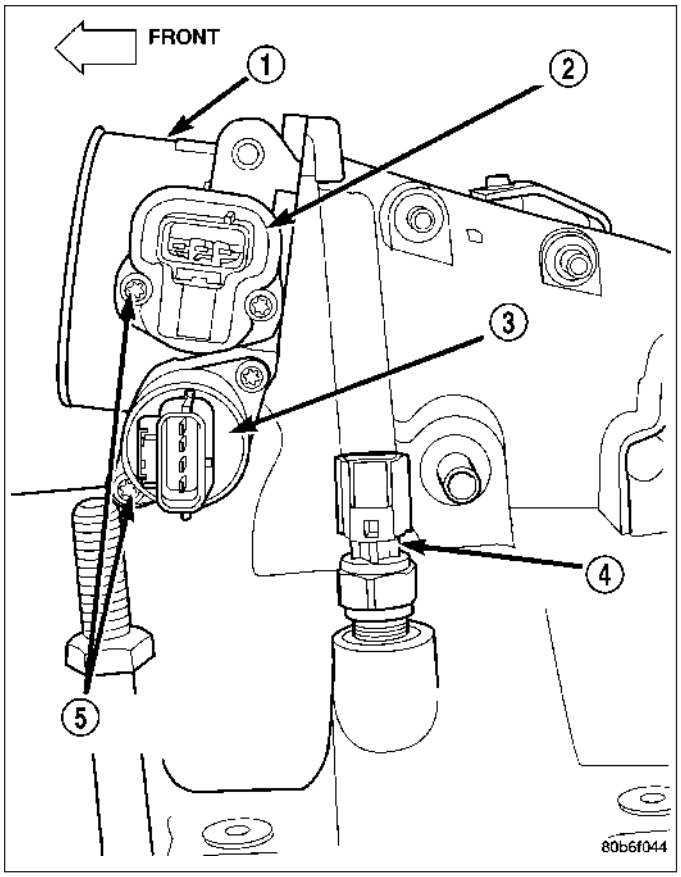
8. Remove generator (3) and secure away from engine.

NOTE: Do NOT remove the phenolic pulley from the P/S pump. It is not required for P/S pump removal.

9. Remove power steering pump with lines attached and secure away from engine.
10. Drain cooling system.
11. Disconnect the heater hoses from the engine.
12. Disconnect heater hoses from heater core and remove hose assembly.
13. Disconnect throttle and speed control cables.
14. Remove upper radiator hose from engine.
15. Remove lower radiator hose from engine.
16. Remove radiator/cooling module assembly.
17. Disconnect the engine to body ground straps at the left side of cowl.



18. Disconnect the engine wiring harness at the following points:
    - Intake air temperature (IAT) sensor (4)
    - Fuel Injectors
    - Throttle Position (TPS) Switch (2)
    - Idle Air Control (IAC) Motor (3)
    - Engine Oil Pressure Switch
    - Engine Coolant Temperature (ECT) Sensor
    - Manifold Absolute Pressure MAP) Sensor
    - Camshaft Position (CMP) Sensor
    - Coil Over Plugs
    - Crankshaft Position Sensor
19. Remove coil over plugs.

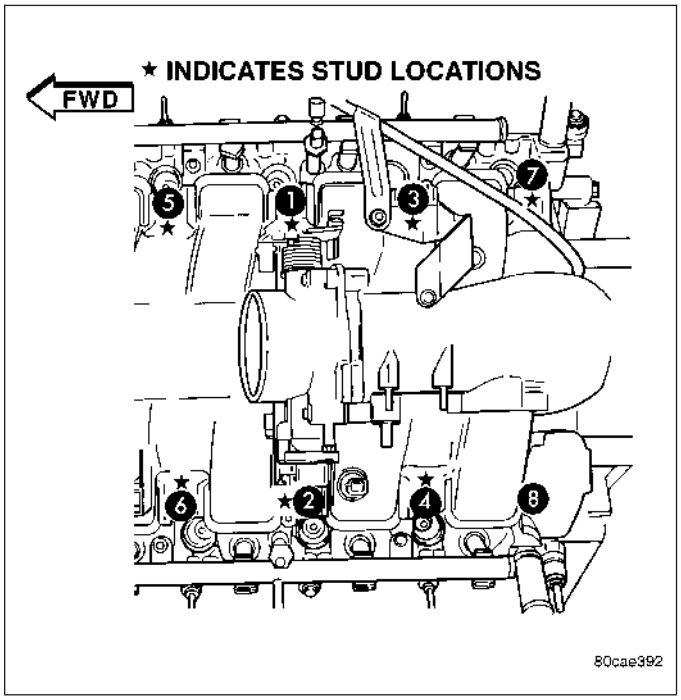


20. Remove fuel rail and secure away from engine.

NOTE: It is not necessary to release the quick connect fitting from the fuel supply line for engine removal.

21. Remove the PCV hose.
22. Remove the breather hoses.
23. Remove the vacuum hose for the power brake booster.
24. Disconnect knock sensors.
25. Remove engine oil dipstick tube.
26. Remove intake manifold.
27. Install engine lifting fixture,special tool#8247, using original fasteners from the removed intake manifold, and fuel rail. Torque to factory specifications.

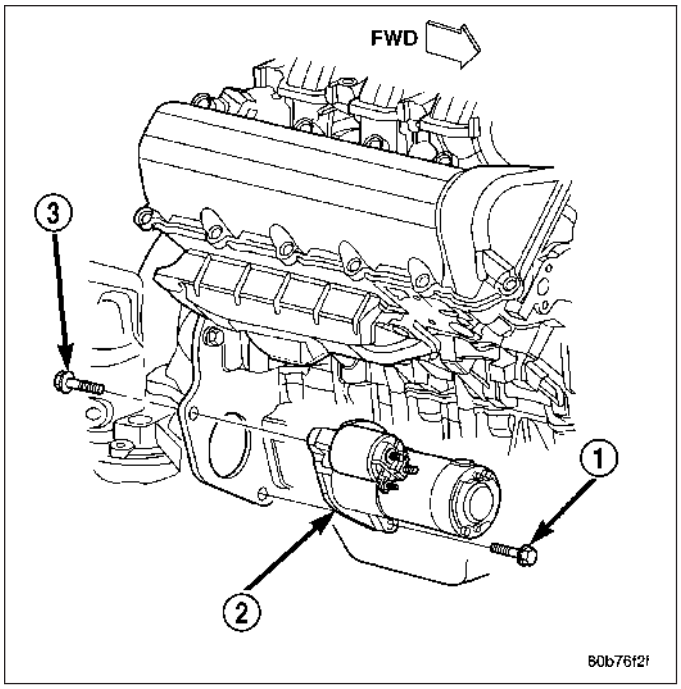
NOTE: Recheck bolt torque for engine lift plate before removing engine.

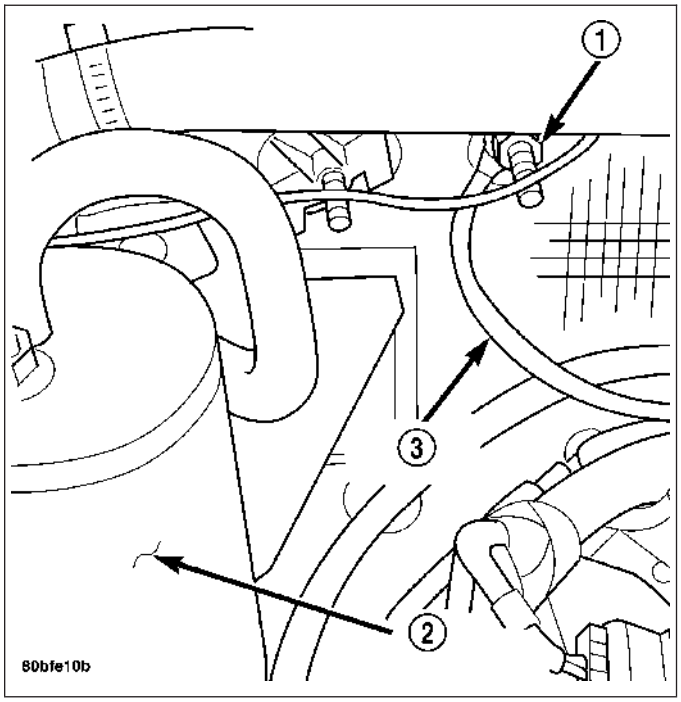


28. Disconnect oxygen sensor wiring.
29. Disconnect crankshaft postion sensor.
30. Disconnect the engine block heater power cable, if equipped.
31. Disconnect the front propshaft at the front differential and secure out of way.

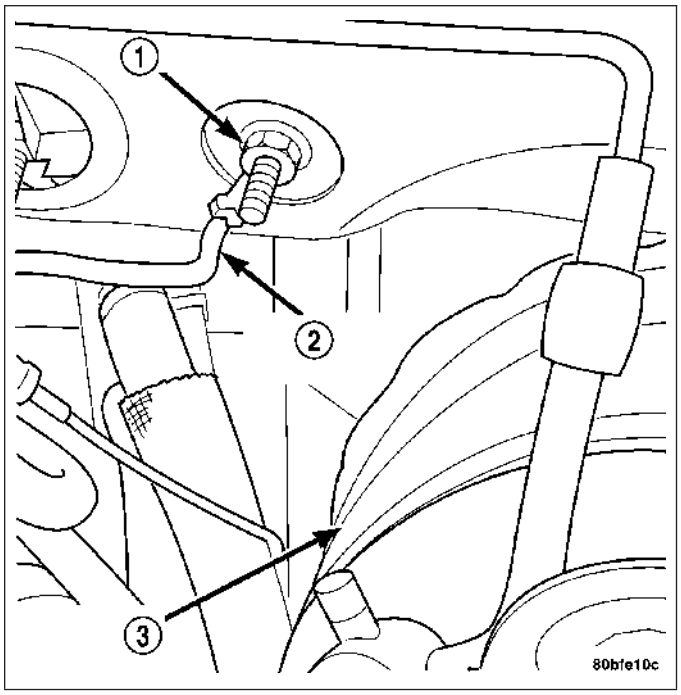
NOTE: It is necessary to disconnect the front propshaft for access to the starter and left side exhaust flange.

32. Remove the starter (2).

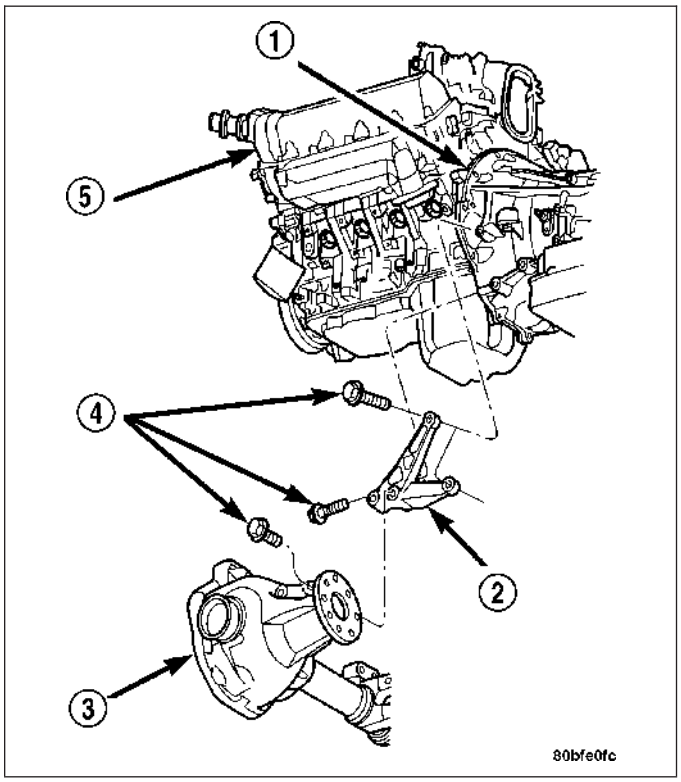




33. Remove the ground straps from the left (2) and right (3) side of the block.

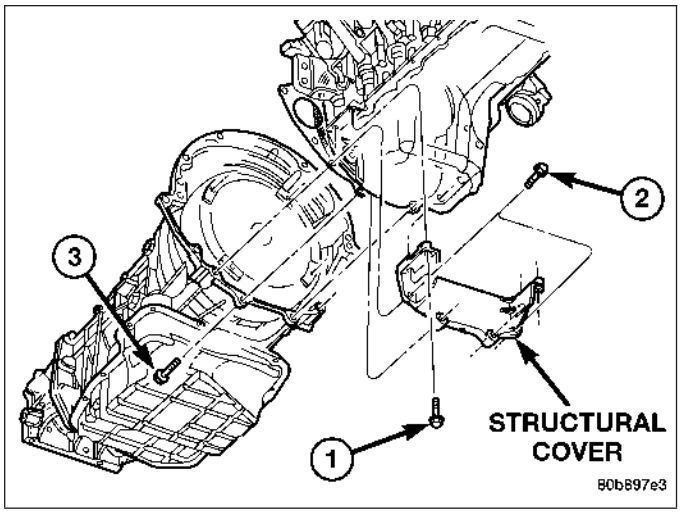


34. Remove the axle isolator bracket (2).

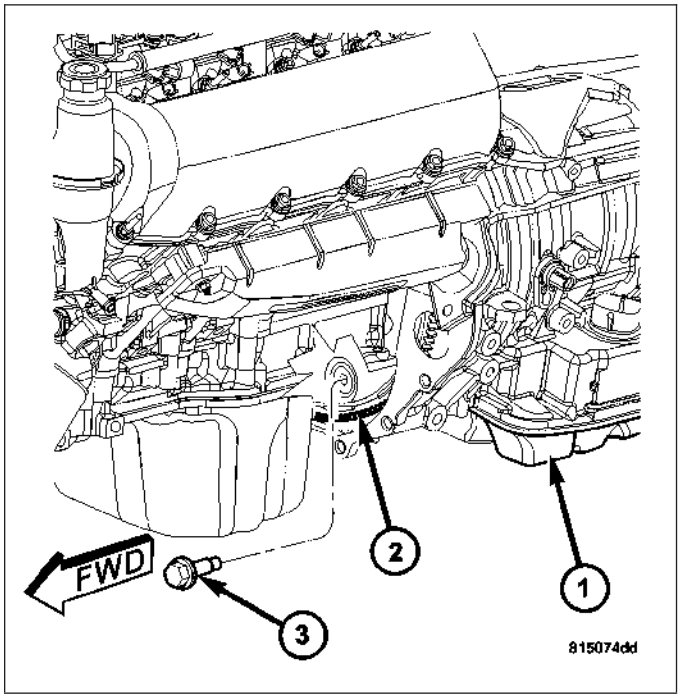


35. Remove the structural cover.
36. Disconnect the right and left exhaust pipes at the manifolds and from the crossover, and remove from the vehicle.

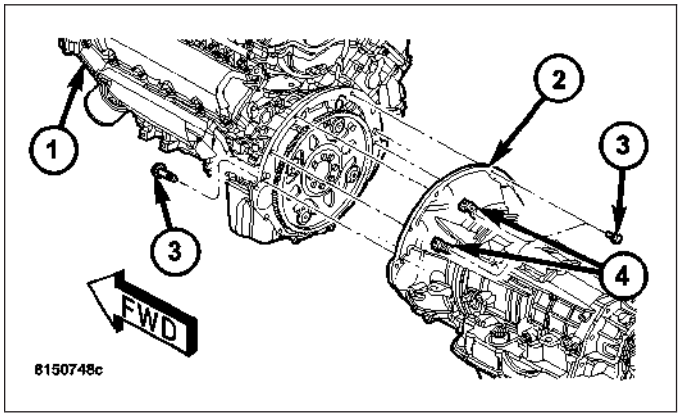
NOTE: The exhaust clamps at the manifolds cannot be reused. New clamps must be used or leaks may occur.



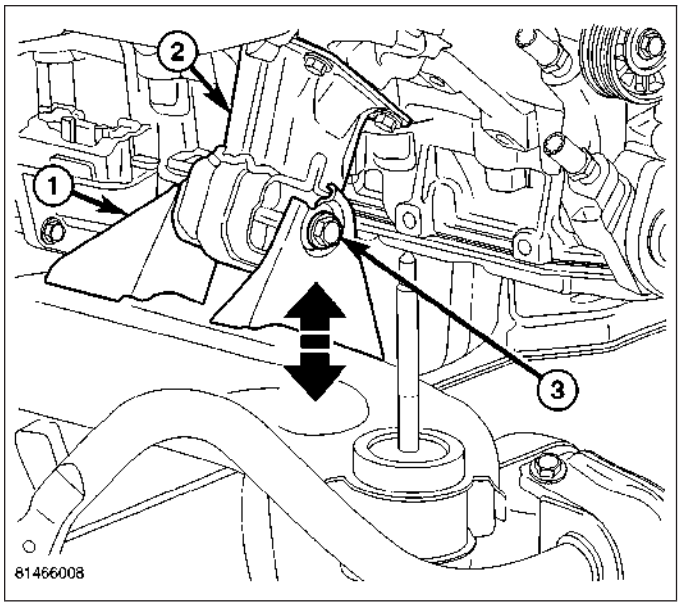
37. Remove torque convertor bolts (3), and mark location for reassembly.



38. Remove transmission bellhousing to engine bolts (3).

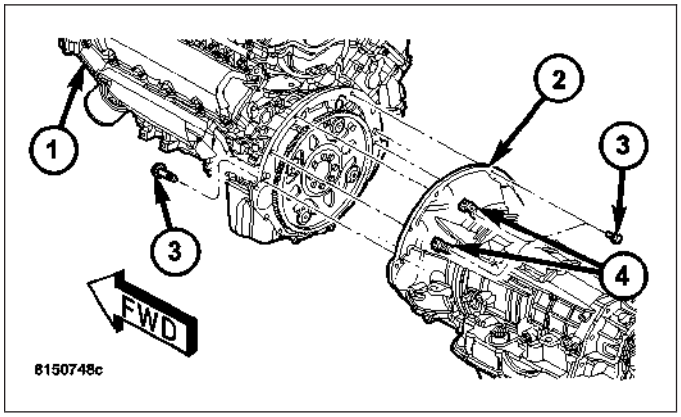


39. Remove left and right engine mount thru bolts (3).
40. Lower the vehicle.
41. Support the transmission with a suitable jack.
42. Connect a suitable engine hoist to the engine lift plate.
43. Remove engine from vehicle.

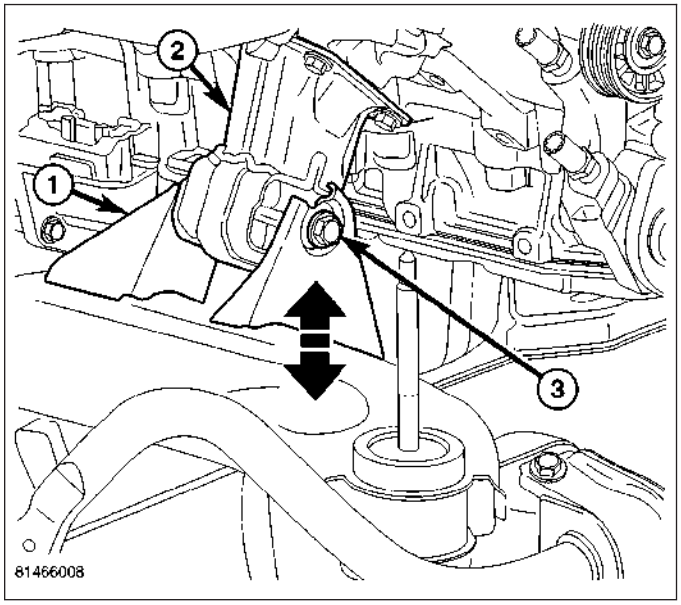


INSTALLATION - ENGINE

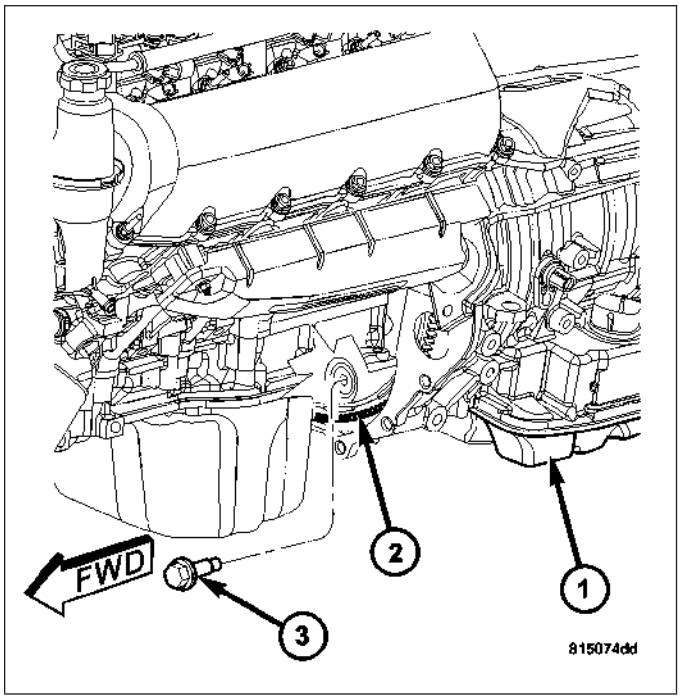
1. Position the engine in the vehicle.
2. Install the transmission bellhousing to engine mounting bolts (3). Tighten the bolts to 41 N·m (30ft. lbs.)



3. Install the engine mount thru bolts (3).



4. Install the torque convertor bolts (3).

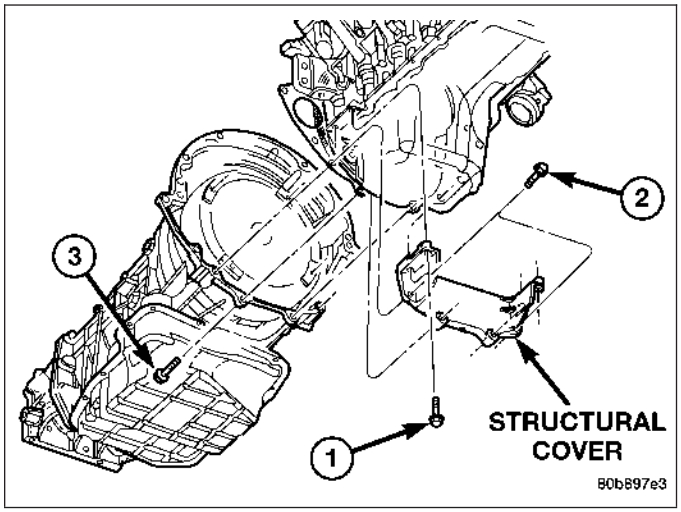


CAUTION: The structural cover requires a specific torque sequence. Failure to follow this sequence may cause severe damage to the cover.

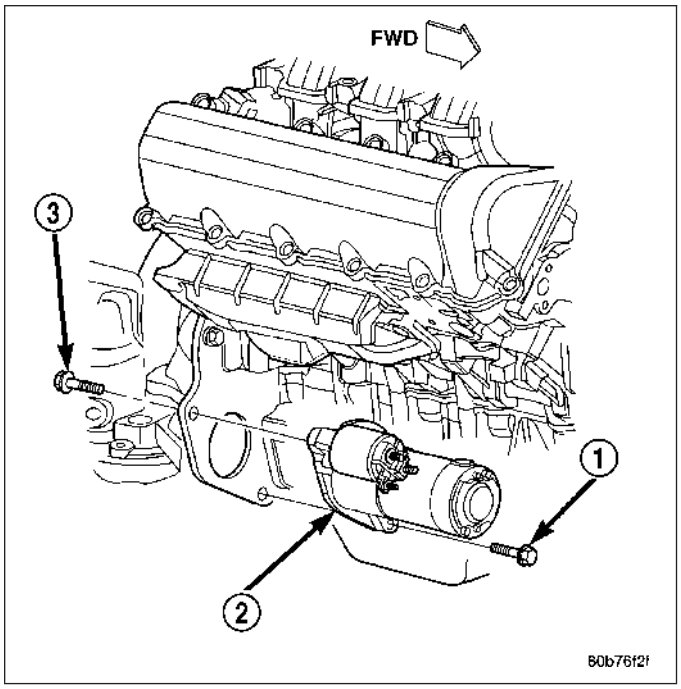
5. Install the structural cover.

NOTE: New clamps must be used on exhaust manifold flanges. Failure to use new clamps may result in exhaust leaks.

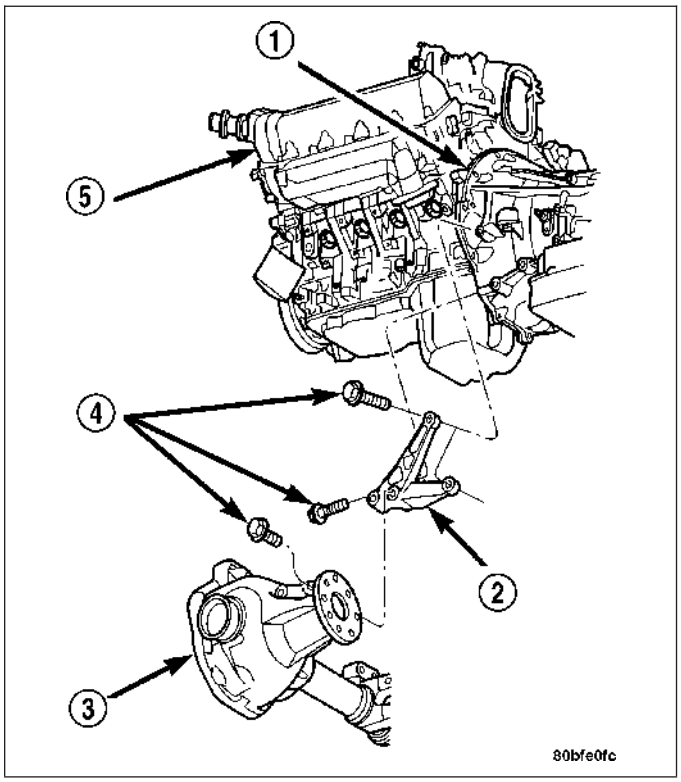
6. Install the left and right exhaust pipes.



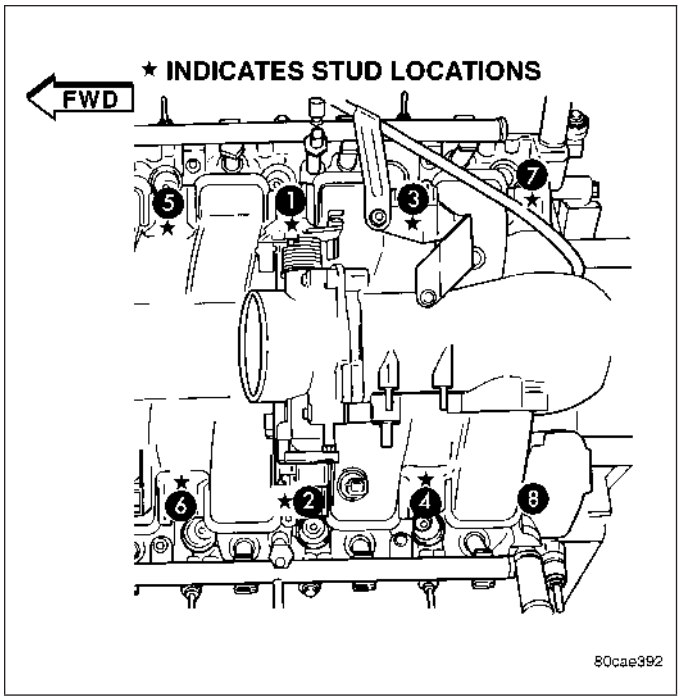
7. Install the starter (2).
8. Connect the crankshaft position sensor.
9. Install the engine block heater power cable, if equipped.



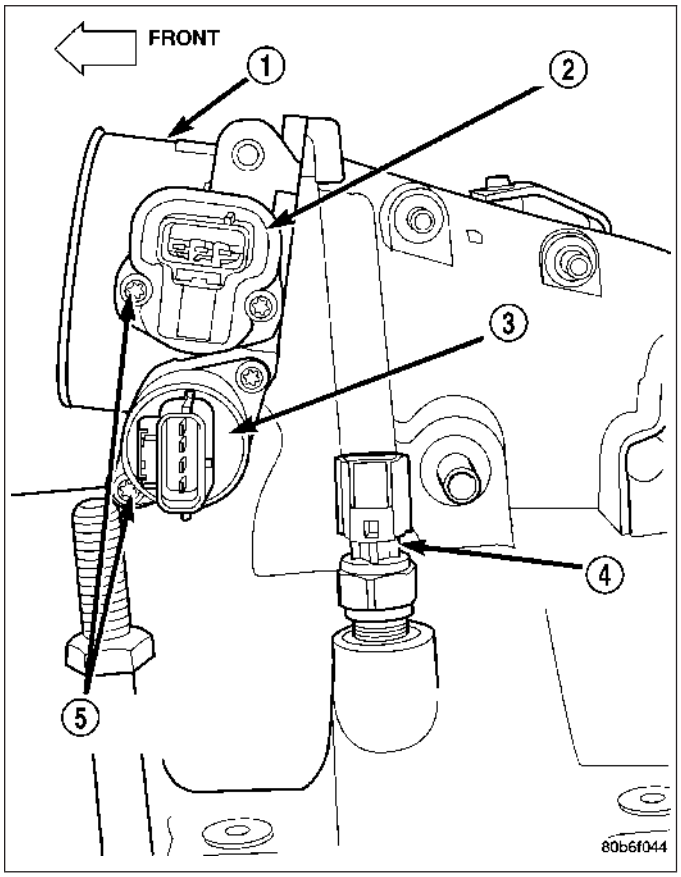
10. Install the axle isolator bracket (2).
11. Connect the left and right oxygen sensors.
12. Remove the engine lift plate.
13. Connect the knock sensors.
14. Connect the engine to body ground straps at the left side of the cowl.



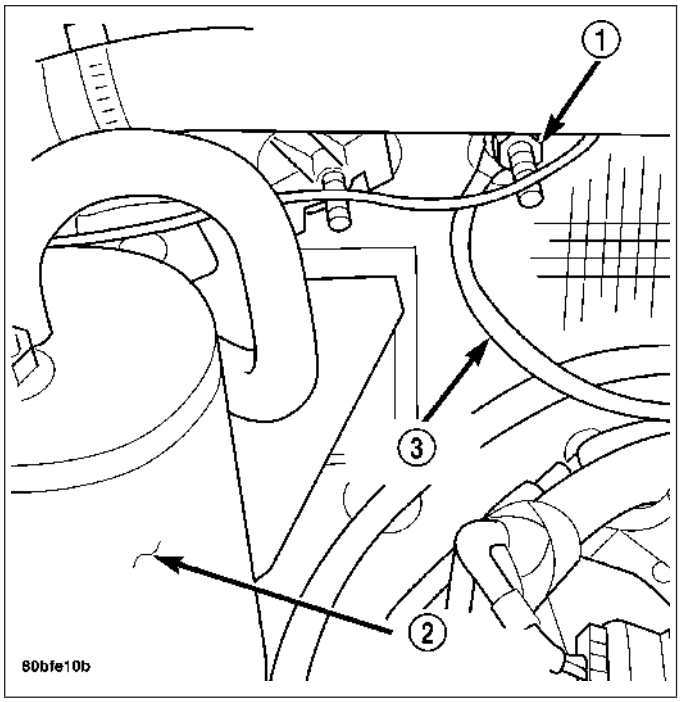
15. Install the intake manifold using the sequence provided.
16. Install the engine oil dipstick tube.
17. Install the power brake booster vacuum hose.
18. Install the breather hoses.
19. Install the PCV hose.
20. Install the fuel rail.
21. Install the coil over plugs.



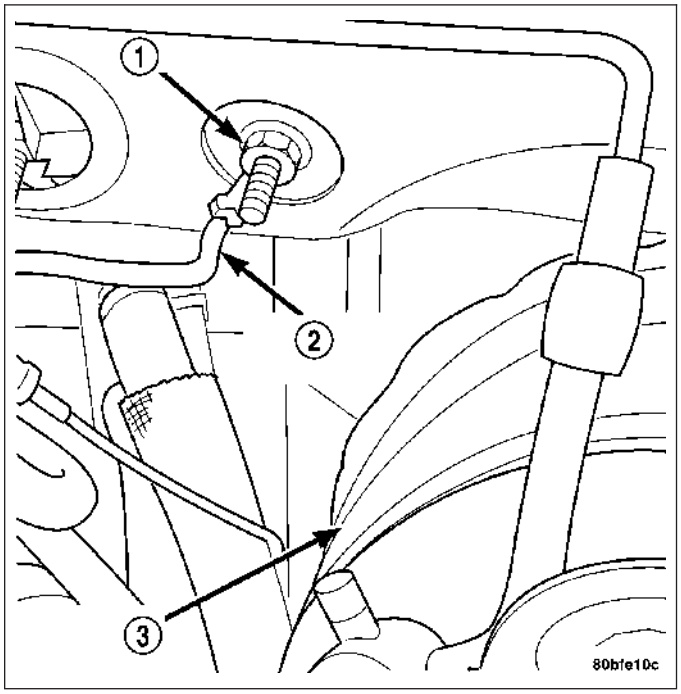
22. Connect the engine wiring harness at the following points:
    - Intake air temperature (IAT) sensor (4)
    - Fuel Injectors
    - Throttle Position (TPS) Switch (2)
    - Idle Air Control (IAC) Motor (3)
    - Engine Oil Pressure Switch
    - Engine Coolant Temperature (ECT) Sensor
    - Manifold Absolute Pressure MAP) Sensor
    - Camshaft Position (CMP) Sensor
    - Coil Over Plugs
    - Crankshaft Position Sensor



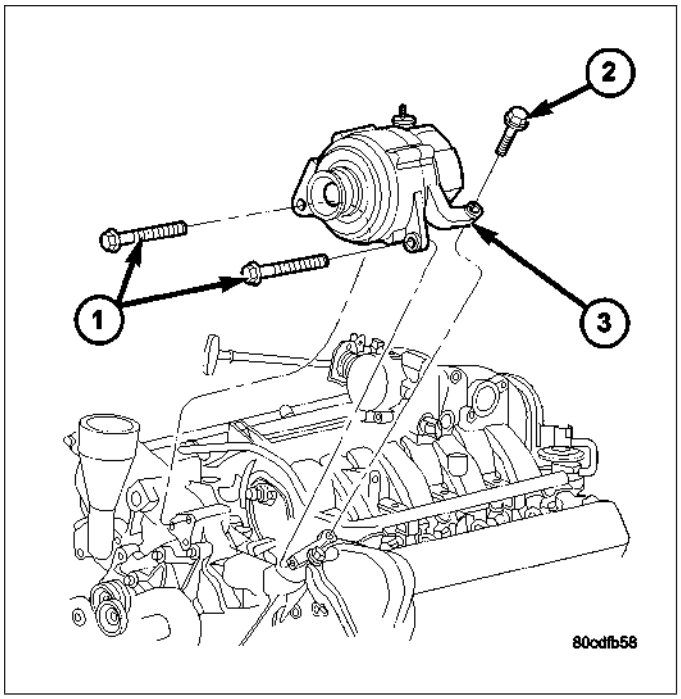
23. Connect the ground straps on the right (3)side of the engine.



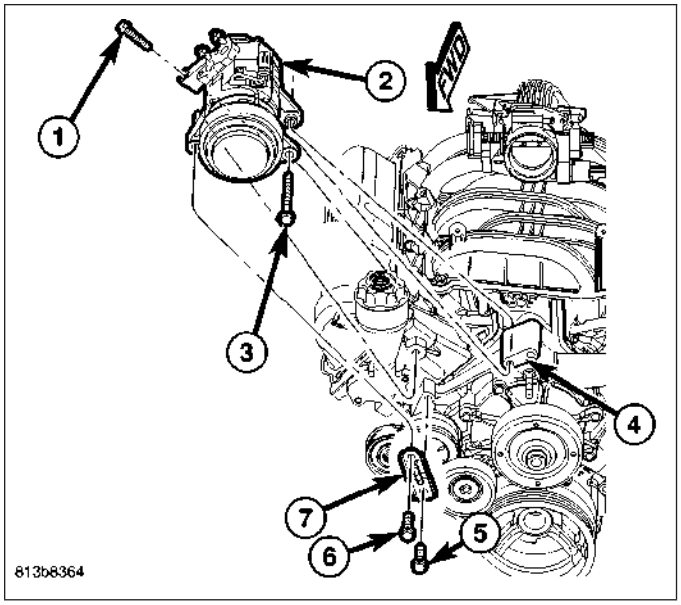
24. Connect the ground straps on the left (2) side of the engine.



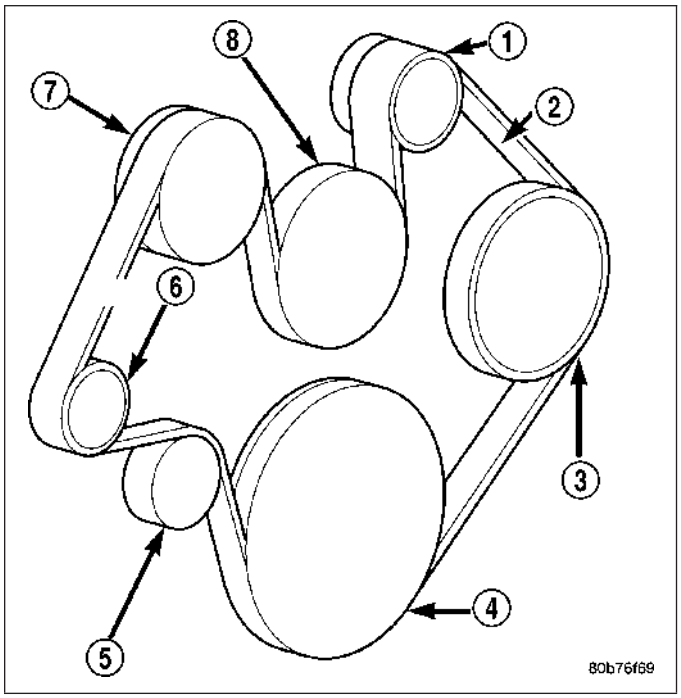
25. Reinstall the radiator/cooling module assembly.
26. Connect lower radiator hose.
27. Connect upper radiator hose.
28. Connect throttle and speed control cables.
29. Install the heater hose assembly.
30. Install coolant recovery bottle.
31. Install the power steering pump.
32. Install the generator (3).



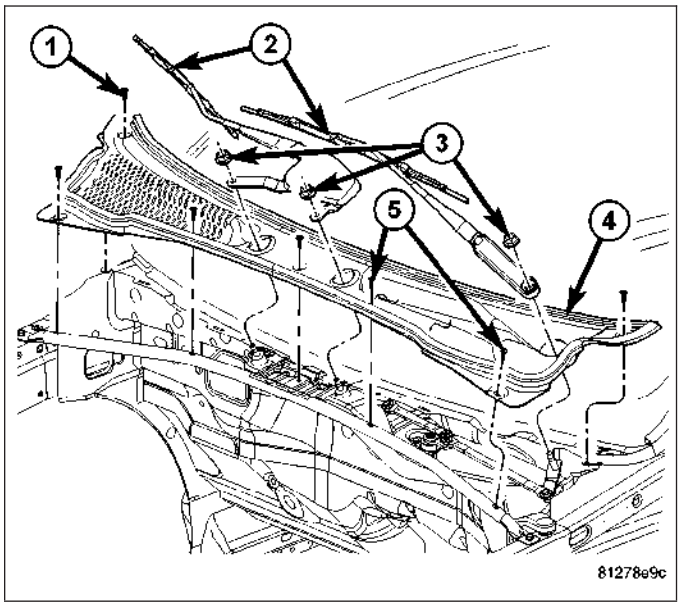
33. Install the A/C compressor (2).



34. Install the drive belt (2).
35. Install the fan shroud with the viscous fan assembly.
36. Recharge the A/C system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/REFRIGERANT - STANDARD PROCEDURE).



37. Install the cowl grille (4).
38. Install the air cleaner assembly.
39. Refill the engine cooling system.
40. Check and fill engine oil.
41. Connect the battery negative cable.
42. Start the engine and check for leaks.



SPECIFICATIONS

SPECIFICATIONS - 3.7L ENGINE

GENERAL SPECIFICATIONS

DESCRIPTION	SPECIFICATION	
Type	90° SOHC V6 12 Valve	
Number of Cylinders	6	
Firing Order	1-6-5-4-3-2	
Lead Cylinder	No. 1 Left Bank	
Compression Ratio	9.6:1	
Max. Variation Between Cylinders	25%	
	Metric	**Standard**
Displacement	3.7 Liters	226 Cubic Inches
Bore	93.0 mm	3.66 in.
Stroke	90.8 mm	3.40 in.
Horsepower	211 @ 5200 RPM	
Torque	236ft. lbs.@4000 PRM	
Compression Pressure	1172-1551 kPa	170-225 psi

CYLINDER BLOCK

DESCRIPTION	SPECIFICATION	
	Metric	**Standard**
Bore Diameter	93.013 ± .0075 mm	3.6619 ± 0.0003 in.
Out of Round (MAX)	0.076 mm	0.003 in.
Taper (MAX)	0.051 mm	0.002 in.

PISTONS

DESCRIPTION	SPECIFICATION	
	Metric	**Standard**
Diameter	92.975 mm	3.6605 in.
Weight	365.0 grams	12.87 oz
Ring Groove Diameter		
No. 1	85.37 - 83.13 mm	3.282 - 3.273 in
No. 2	82.833 - 83.033 mm	3.261 - 3.310 in.
No. 3	83.88 - 84.08 mm	3.302 - 3.310 in.

PISTON PINS

DESCRIPTION	SPECIFICATION	
	Metric	**Standard**
Clearance In Piston	0.006 - 0.015 mm	0.0002 - 0.0005 in.
Diameter	24.017 - 24.020 mm	0.9455 - 0.9456 in.

PISTON RINGS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Ring Gap		
Top Compression Ring	0.20 - 0.36 mm	0.0079 - 0.0142 in.
Second Compression Ring	0.37 - 0.63 mm	0.0146 - 0.0249 in.
Oil Control (Steel Rails)	0.25 - 0.76 mm	0.0099 - 0.30 in.
Side Clearance		
Top Compression Ring	.051 - .094 mm	0.0020 - 0.0037 in.
Second Compression Ring	0.040 - 0.080 mm	0.0016 - 0.0031 in.
Oil Ring (Steel Ring)	.019 - .229 mm	.0007 - .0091 in.
Ring Width		
Top Compression Ring	1.472 - 1.490 mm	0.057 - 0.058 in.
Second Compression Ring	1.472 - 1.490 mm	0.057 - 0.058 in.
Oil Ring (Steel Rails)	0.445 - 0.470 mm	0.017 - 0.018 in.

CONNECTING RODS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Bearing Clearance	0.006 - 0.044 mm	0.0002 - 0.0017 in.
Side Clearance	0.10 - 0.35 mm	0.004 - 0.0138 in.
Piston Pin Clearance	.015 - .028 mm	0.0006 - 0.0011 in.
Bearing Bore Out of Round (MAX)	0.004 mm	0.0002 in.
Total Weight (Less Bearing)	612 grams	21.588 ounces

CRANKSHAFT

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Main Bearing Journal Diameter	63.488 - 63.512 mm	2.4996 - 2.5005 in.
Bearing Clearance	0.002 - 0.046 mm	0.00008 - 0.0018 in.
Out of Round (MAX)	0.005 mm	0.0002 in.
Taper (MAX)	0.006 mm	0.0004 in.
End Play	0.052 - 0.282 mm	0.0021 - 0.0112 in.
End Play (MAX)	0.282 mm	0.0112 in.
Connecting Rod Journal Diameter	57.908 - 57.892 mm	2.2798 - 2.2792 in.
Bearing Clearance	0.006 - 0.044	0.0002 - 0.0011 in.
Out of Round (MAX)	0.005 mm	0.0002 in.
Taper (MAX)	0.006 mm	0.0002 in.

CAMSHAFT

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Bore Diameter	26.02 - 26.04 mm	1.0245 - 1.0252 in.
Bearing Journal Diameter	25.975 - 25.995 mm	1.0227 - 1.0235 in.
Bearing Clearance	0.025 - 0.065 mm	0.001 - 0.0026 in.
Bearing Clearance (MAX)	0.065 mm	0.0026 in.
End Play	.075 - .200 mm	0.003 - 0.0079 in.
End Play (MAX)	.200 mm	0.0079 in.

VALVE TIMING

DESCRIPTION	SPECIFICATION
Intake	
Opens (BTDC)	5.6°
Closes (ATDC)	240.1°
Duration	245.7°
Exhaust	
Opens (BTDC)	241.5°
Closes (ATDC)	20.1°
Duration	261.6°
Valve Overlap	25.7°

VALVES

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Face Angle	45° - 45.5°	
Head Diameter		
Intake	48.52 - 48.78 mm	1.9103 - 1.9205 in.
Exhaust	36.87 - 37.13 mm	1.4516 - 1.4618 in.
Length (Overall)		
Intake	113.45 - 114.21 mm	4.4666 - 4.4965 in.
Exhaust	114.92 - 115.68 mm	4.5244 - 4.5543 in.
Stem Diameter		
Intake	6.931 - 6.957 mm	0.2729 - 0.2739 in.
Exhaust	6.902 - 6.928 mm	0.2717 - 0.2728 in.
Stem-to-Guide Clearance		
Intake	0.018 - 0.069 mm	0.0008 - 0.0028 in.
Exhaust	0.047 - 0.098 mm	0.0019 - 0.0039 in.
Max. Allowable Stem-to-Guide Clearance (Rocking Method)		
Intake	0.069 mm	0.0028 in.
Exhaust	0.098 mm	0.0039 in.
Valve Lift (Zero Lash)		
Intake	12.00 mm	0.472 in.
Exhaust	12.00 mm	0.472 in.

VALVE SPRING

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Free Length (Approx)		
Intake	48.18 mm	1.896 in.
Exhaust - w/damper	48.2 mm	1.897 in.
Spring Force (Valve Closed)		
Intake	332.0 - 368.0 N @ 40.12 mm	74.63 - 82.72 lbs. @ 1.5795 in.
Exhaust - (without damper)	356 - 394 N @ 39.12 mm	80.031 - 88.57 lbs. @ 1.54 in.
Spring Force (Valve Open)		
Intake	948.0 - 1038.0 N @ 28.12 mm	213.2 - 233.8 lbs. @ 1.107 in.
Exhaust - without damper	974 - 956 N @ 27.12 mm	218.8 - 215.1 lbs. @ 1.067 in.
Number of Coils		
Intake	7.30	
Exhaust	7.15	
Wire Diameter		
Intake	4.77 × 3.80mm	0.1878 × 0.1496 in.
Exhaust	4.66 × 3.72mm	0.1843 × .1464 in.
Installed Height (Spring Seat to Bottom of Retainer) Nominal		
Intake	40.12 mm	1.579 in.
Exhaust - w/damper	40.12 mm	1.579 in.

CYLINDER HEAD

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Gasket Thickness (Compressed)	0.7 mm	(0.0276 in.)
Valve Seat Angle	44.5° - 45.0°	
Valve Seat Runout (MAX)	0.051 mm	0.002 in.
Valve Seat Width		
Intake	1.75 - 2.36 mm	0.0698 - 0.0928 in.
Exhaust	1.71 - 2.32 mm	0.0673 - 0.0911 in.
Guide Bore Diameter (Std.)	6.975 - 7.00 mm	0.2747 - 0.2756 in.
Cylinder Head Warpage (Flatness)	0.0508 mm	0.002 in.

OIL PUMP

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Clearance Over Rotors/End Face (MAX)	0.095 mm	0.0038 in.
Cover Out - of -Flat (MAX)	0.025 mm	0.001 in.
Inner and Outer Rotor Thickness	12.02 mm	0.4731 in.
Outer Rotor to pocket (Diametral) clearance (MAX)	.235 mm	.0093 in.
Outer Rotor Diameter (MIN)	85.925 mm	0.400 in.
Tip Clearance Between Rotors (MAX)	0.150 mm	0.006 in.

OIL PRESSURE

SPECIFICATION	SPECIFICATION	
	Metric	Standard
At Curb Idle Speed (MIN)*	25 kPa	4 psi
@ 3000 rpm	170 - 758 kPa	25 - 110 psi
*** CAUTION: If pressure is zero at curb idle, DO NOT run engine at 3000 rpm.**		

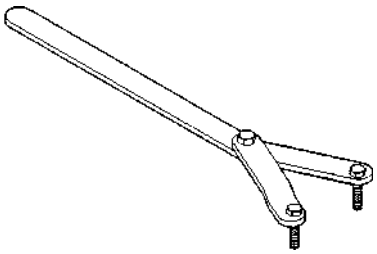
TORQUE

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Camshaft			
Non - Oiled Sprocket Bolt	122	90	-
Bearing Cap Bolts	11	-	100
Counterbalance Shaft Retaining Bbolt	28	-	250
Timing Chain Cover Bolts	58	43	-
Connecting Rod Cap Bolts	27	20	-
	PLUS 90° TURN		
Bed Plate Bolts	Refer to Procedure		
Crankshaft Damper Bolt	175	130	-
Cylinder Head Bolts			
M11 Bolts	Refer To Procedure		
M8 Bolts	Refer To Procedure		
Cylinder Head Cover Bolts	12	-	105
Exhaust Manifold Bolts	25	18	-
Exhaust Manifold Heat Shield Nuts	8	-	72
	Then loosen 45°		
Flexplate Bolts	95	70	-
Engine Mount Bracket to Block Bolts	61	45	-
Rear Mount to Transmission Bolts	46	34	-
Generator Mounting Bolts			
M10 Bolts	54	40	-
M8 Bolts	28	-	250

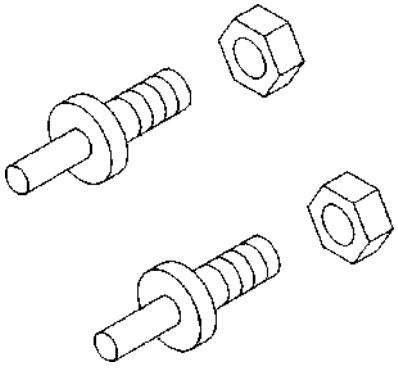
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Intake Manifold Bolts	12	-	105
	Refer to Procedure for Tightening Sequence		
Oil Pan Bolts	15	-	130
Oil Pan Drain Plug	34	25	-
Oil Pump Bolts	28	-	250
Oil Pump Cover Bolts	12	-	105
Oil Pickup Tube Bolt and Nut	28	-	250
Oil Dipstick Tube to Engine Block Bolt	15	-	130
Oil Fill Tube Bolts	12	-	105
Timing Chain Guide Bolts	28	-	250
Timing Chain Tensioner Arm	28	-	250
Hydraulic Tensioner Bolts	28	-	250
Timing Chain Primary Tensioner Bolts	28	-	250
Timing Drive Idler Sprocket Bolt	34	25	-
Thermostat Housing Bolts	12	-	105
Water Pump Bolts	58	43	-

SPECIAL TOOLS

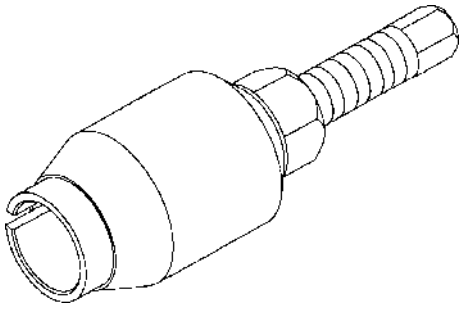
3.7L ENGINE



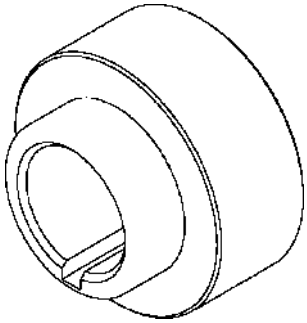
Spanner Wrench - 6958



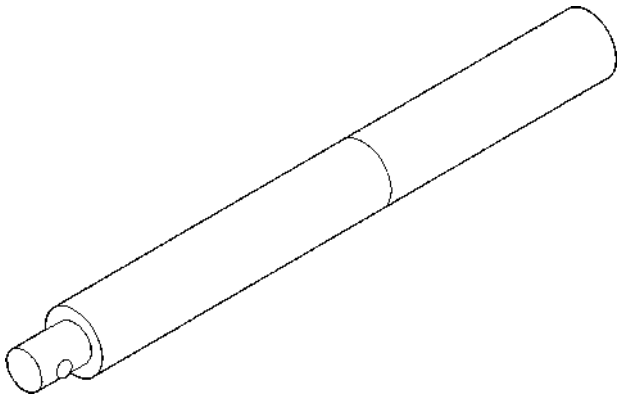
Adapter Pins 8346



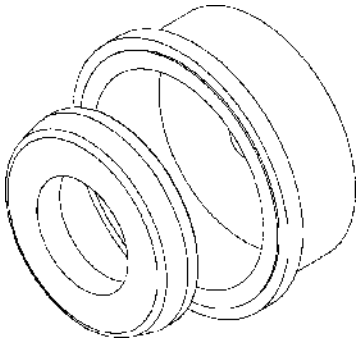
Front Crankshaft Seal Remover 8511



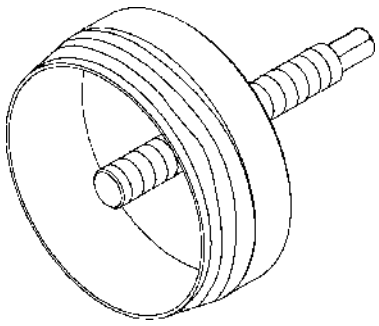
Front Crankshaft Seal Installer 8348



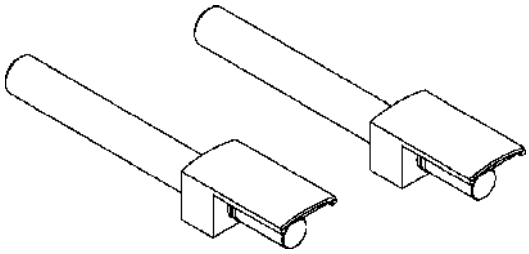
HANDLE C-4171



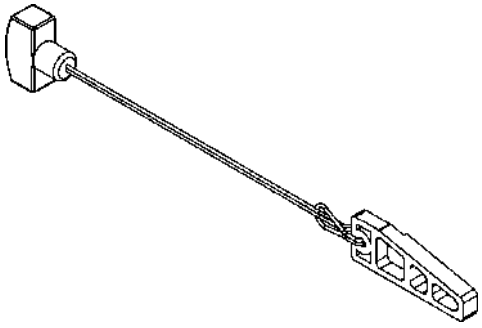
Rear Crankshaft Seal Installer 8349



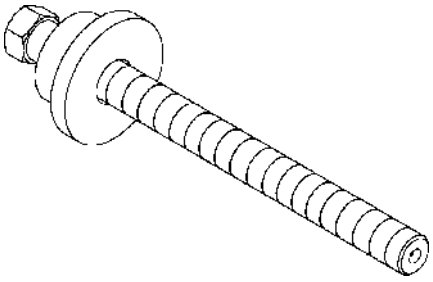
Rear Crankshaft Seal Remover 8506



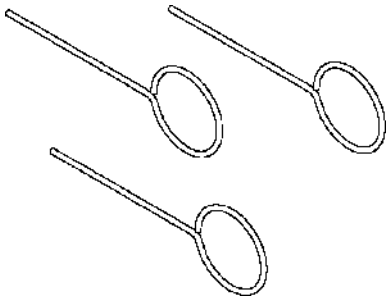
Connecting Rod Guides 8507



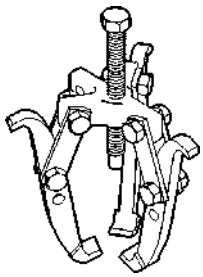
Chain Tensioner



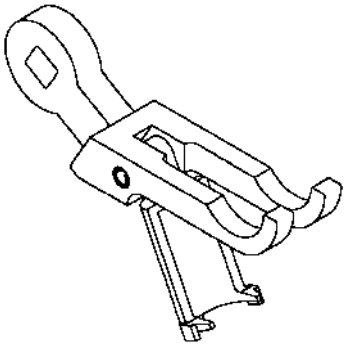
Crankshaft Damper Installer 8512



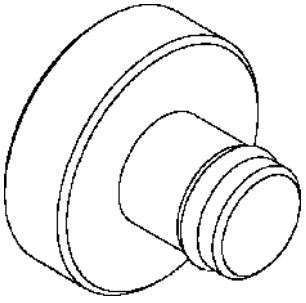
Chain Tensioner Pins 8514



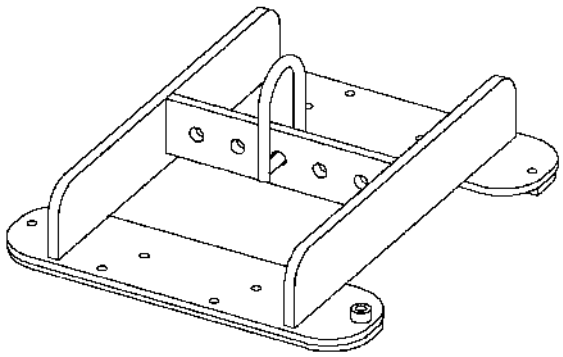
Puller 1026



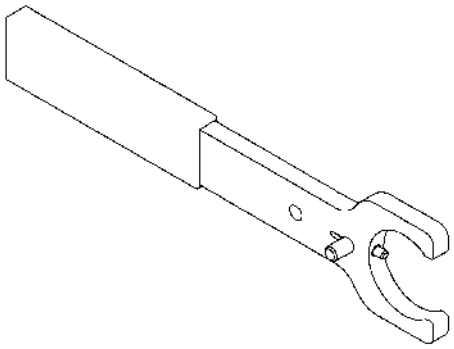
VALVE SPRING COMPRESSOR 8426



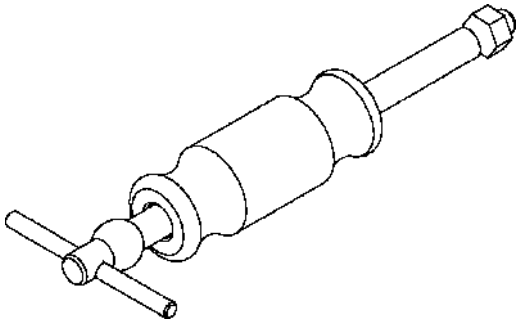
Crankshaft Damper Removal Insert 8513 - A



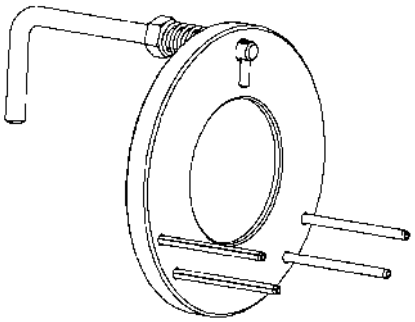
ENGINE LIFTING FIXTURE 8427



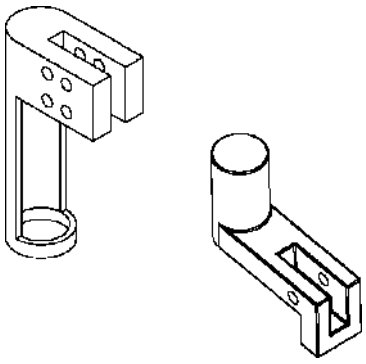
CAMSHAFT HOLDER 8428



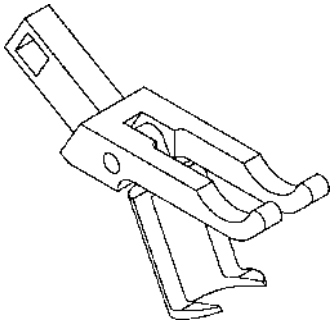
Idler Shaft Remover 8517



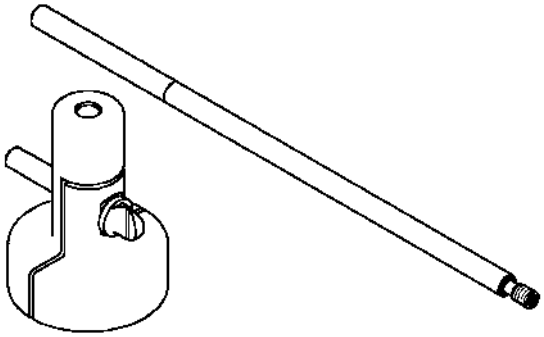
HOLDER SECONDARY CAMSHAFT CHAIN 8429



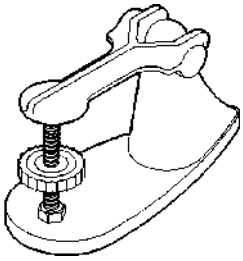
Valve Spring Compressor Adapters 8519



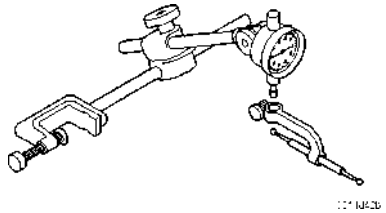
Remover, Rocker Arm 8516



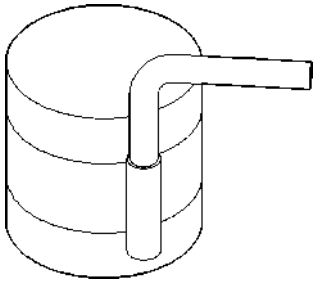
INSTALLER COUNTER BALANCE SHAFT 8641



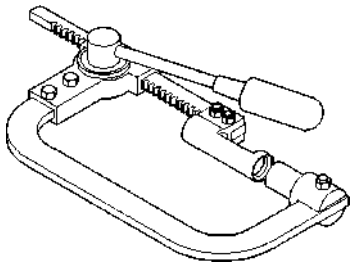
Valve Spring Tester C-647



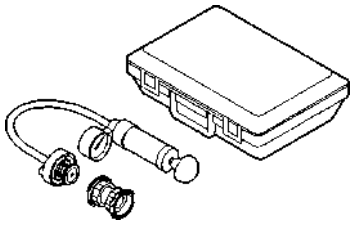
Dial Indicator C-3339



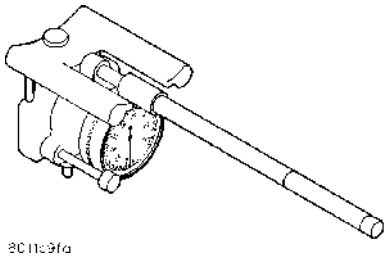
Piston Ring Compressor C-385



Valve Spring Compressor C-3422-B

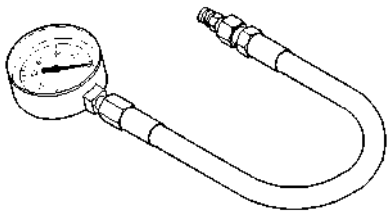


Pressure Tester Kit 7700

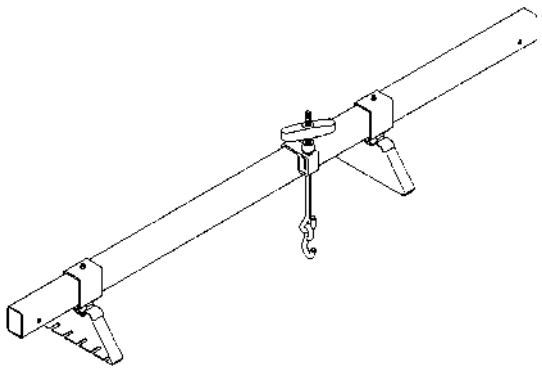


Indicator, Cylinder Bore C-119

Bloc–Chek–Kit C-3685–A



Oil Pressure Gauge C-3292



ENGINE SUPPORT FIXTURE 8534

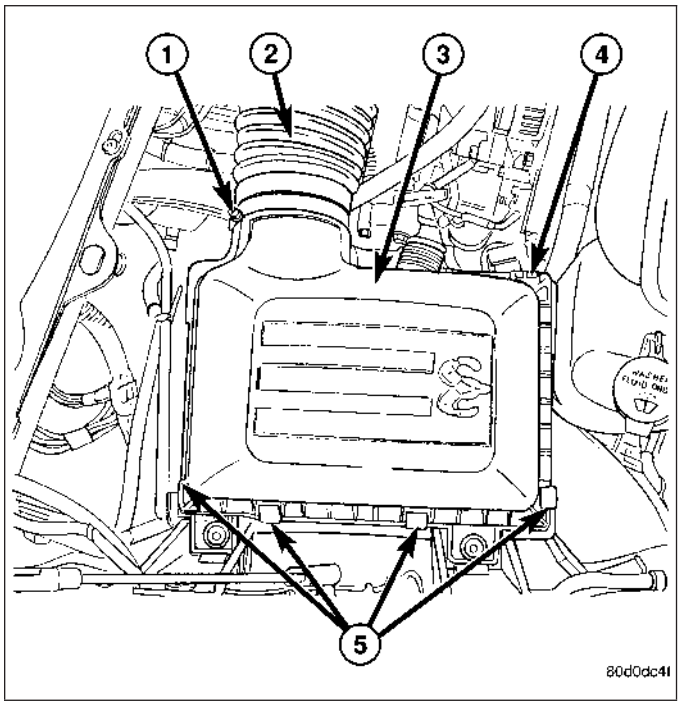
CLEANER-AIR ELEMENT

REMOVAL

Filter Element Only

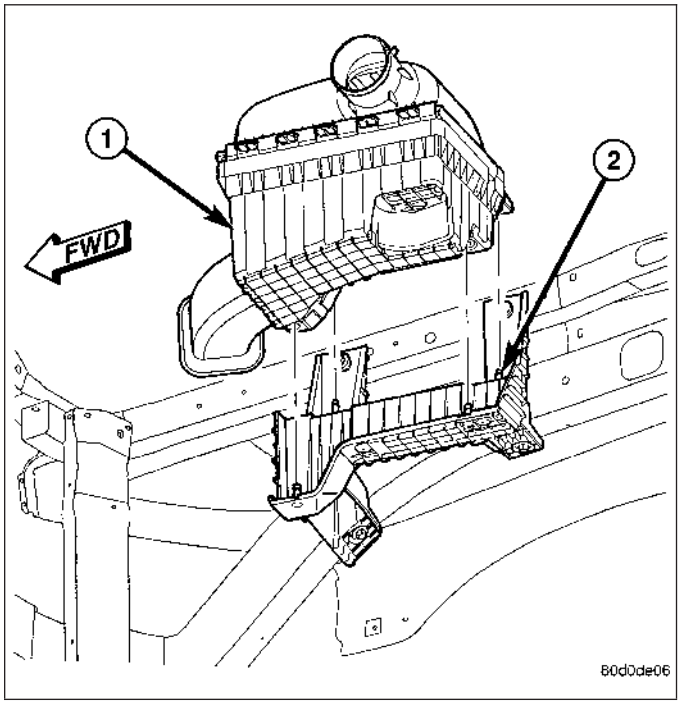
Housing removal is not necessary for element (filter) replacement.

1. Loosen clamp (1) and disconnect air duct at air cleaner cover (3).
2. Pry over 4 spring clips (5) from housing cover (spring clips retain cover to housing).
3. Release housing cover (3) from locating tabs on housing and remove cover (3).
4. Remove air cleaner element (filter) from housing.
5. Clean inside of housing before replacing element.



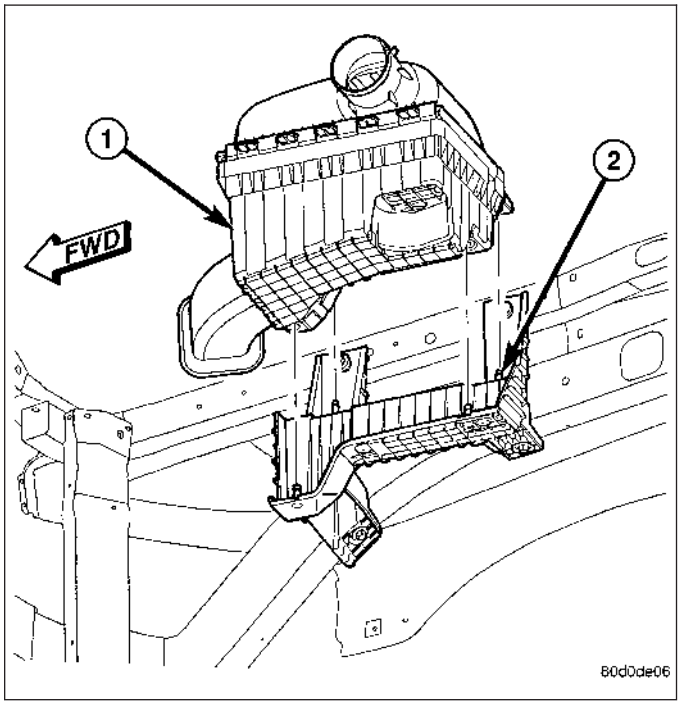
Housing Assembly

1. Loosen clamp and disconnect air duct at air cleaner cover.
2. Lift entire housing assembly (1) from 4 locating pins (2).



INSTALLATION

1. Install filter element into housing (1).
2. Position housing cover into housing locating tabs.
3. Pry up 4 spring clips and lock cover to housing.
4. Install air duct to air cleaner cover and tighten hose clamp to 3 N·m (30 in. lbs.) torque.
5. If any other hose clamps were removed from air intake system, tighten them to 3.4 N·m (30 in. lbs.) torque.
6. If any bolts were removed from air resonator housing or air intake tubing, tighten them to 4.5 N·m (40 in. lbs.) torque.



CYLINDER HEAD

DESCRIPTION

CYLINDER HEAD

The cylinder heads are made of an aluminum alloy. The cylinder head features two valves per cylinder with pressed in powdered metal valve guides. The cylinder heads also provide enclosures for the timing chain drain, necessitating unique left and right cylinder heads.

VALVE GUIDE SEALS

The valve guide seals are made of rubber and incorporate an integral steel valve spring seat. The integral garter spring maintains consistent lubrication control to the valve stems.

DIAGNOSIS AND TESTING

CYLINDER HEAD GASKET

A cylinder head gasket leak can be located between adjacent cylinders or between a cylinder and the adjacent water jacket.

Possible indications of the cylinder head gasket leaking between adjacent cylinders are:

- Loss of engine power
- Engine misfiring
- Poor fuel economy

Possible indications of the cylinder head gasket leaking between a cylinder and an adjacent water jacket are:

- Engine overheating
- Loss of coolant
- Excessive steam (white smoke) emitting from exhaust
- Coolant foaming

CYLINDER-TO-CYLINDER LEAKAGE TEST

To determine if an engine cylinder head gasket is leaking between adjacent cylinders, follow the procedures in Cylinder Compression Pressure Test (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING). An engine cylinder head gasket leaking between adjacent cylinders will result in approximately a 50 - 70% reduction in compression pressure.

CYLINDER-TO-WATER JACKET LEAKAGE TEST

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING WITH COOLANT PRESSURE CAP REMOVED.

VISUAL TEST METHOD

With the engine cool, remove the coolant pressure cap. Start the engine and allow it to warm up until thermostat opens.

If a large combustion/compression pressure leak exists, bubbles will be visible in the coolant.

COOLING SYSTEM TESTER METHOD

WARNING: WITH COOLING SYSTEM TESTER IN PLACE, PRESSURE WILL BUILD UP FAST. EXCESSIVE PRESSURE BUILT UP, BY CONTINUOUS ENGINE OPERATION, MUST BE RELEASED TO A SAFE PRESSURE POINT. NEVER PERMIT PRESSURE TO EXCEED 138 kPa (20 psi).

Install Cooling System Tester 7700 or equivalent to pressure cap neck. Start the engine and observe the tester's pressure gauge. If gauge pulsates with every power stroke of a cylinder a combustion pressure leak is evident.

CHEMICAL TEST METHOD

Combustion leaks into the cooling system can also be checked by using Bloc-Chek Kit C-3685-A or equivalent. Perform test following the procedures supplied with the tool kit.

DIAGNOSIS AND TESTING - HYDRAULIC LASH ADJUSTER

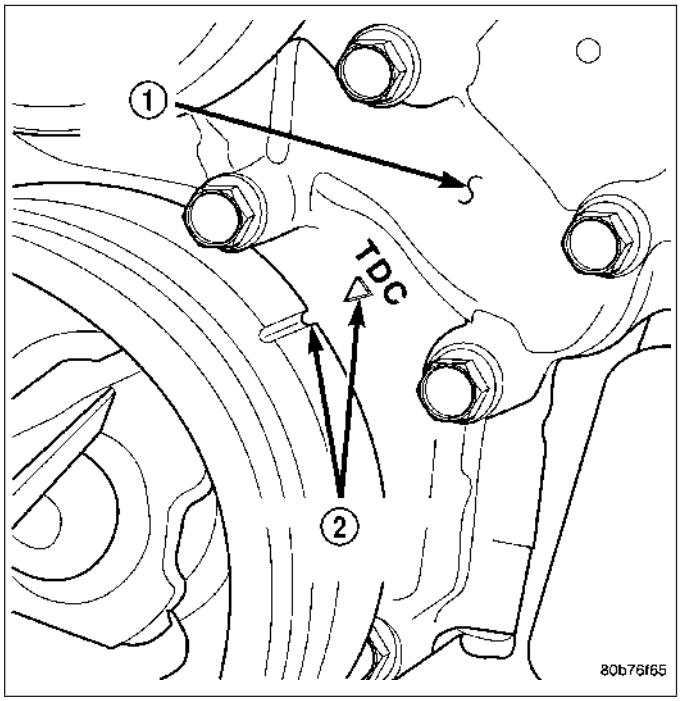
A tappet-like noise may be produced from several items. Check the following items.

1. Engine oil level too high or too low. This may cause aerated oil to enter the adjusters and cause them to be spongy.
2. Insufficient running time after rebuilding cylinder head. Low speed running up to 1 hour may be required.
3. Turn engine off and let set for a few minutes before restarting. Repeat this several times after engine has reached normal operating temperature.
4. Low oil pressure.
5. The oil restrictor in cylinder head gasket or the oil passage to the cylinder head is plugged with debris.
6. Air ingested into oil due to broken or cracked oil pump pick up.
7. Worn valve guides.
8. Rocker arm ears contacting valve spring retainer.
9. Rocker arm loose, adjuster stuck or at maximum extension and still leaves lash in the system.
10. Oil leak or excessive cam bore wear in cylinder head.
11. Faulty lash adjuster.
    a. Check lash adjusters for sponginess while installed in cylinder head and cam on camshaft at base circle. Depress part of rocker arm over adjuster. Normal adjusters should feel firm when pressed quickly. When pressed very slowly, lash adjusters should collapse.
    b. Remove suspected lash adjusters, and replace.
    c. Before installation, make sure adjusters are full of oil. This can be verified by little plunger travel when lash adjuster is depressed quickly.

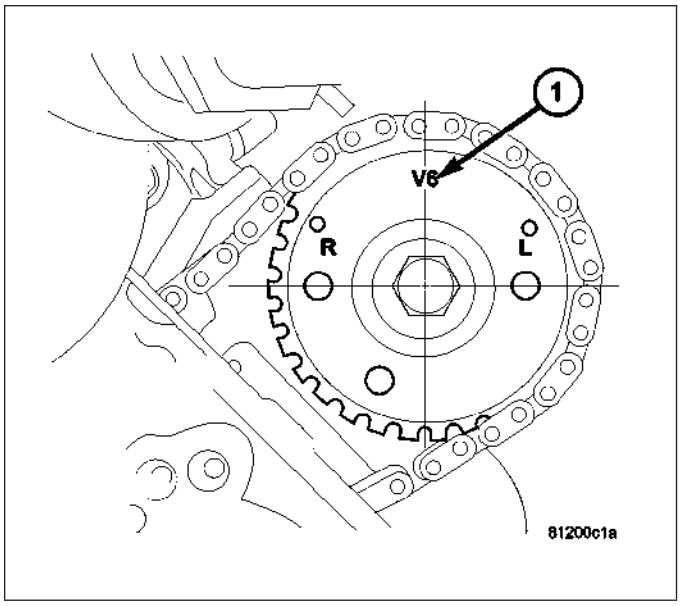
REMOVAL

CYLINDER HEAD - LEFT

1. Disconnect the negative cable from the battery.
2. Raise the vehicle on a hoist.
3. Disconnect the exhaust pipe at the left side exhaust manifold.
4. Drain the engine coolant (Refer to 7 - COOLING - STANDARD PROCEDURE).
5. Lower the vehicle.
6. Remove the intake manifold (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).
7. Remove the master cylinder and booster assembly (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/POWER BRAKE BOOSTER - REMOVAL).
8. Remove the cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).
9. Remove the fan shroud and fan blade assembly (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - REMOVAL).
10. Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
11. Remove the power steering pump and set aside.
12. Rotate the crankshaft until the damper timing mark is aligned with TDC indicator mark (2).



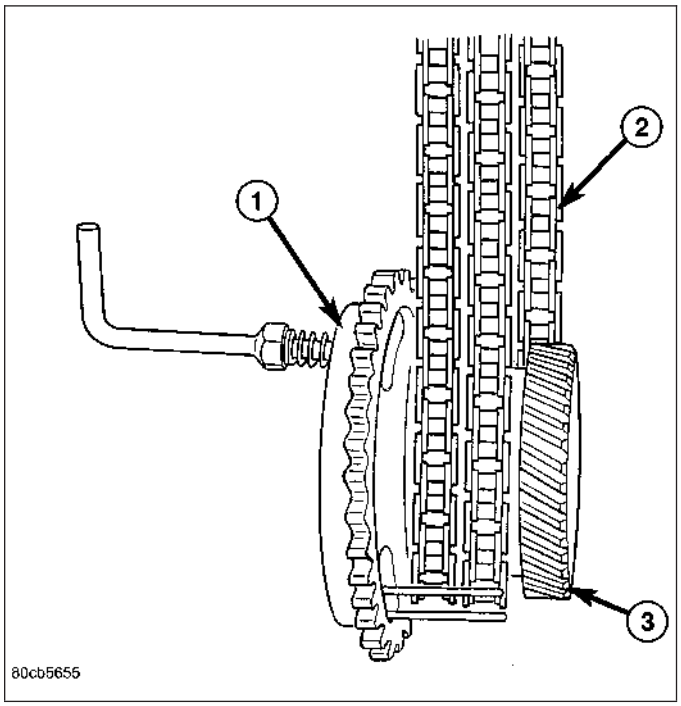
13. Verify the V6 mark (1) on the camshaft sprocket is at the 12 o'clock position, with the No. 1 cylinder at TDC on the exhaust stroke.. Rotate the crankshaft one turn if necessary.
14. Remove the crankshaft damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL).
15. Remove the timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL)



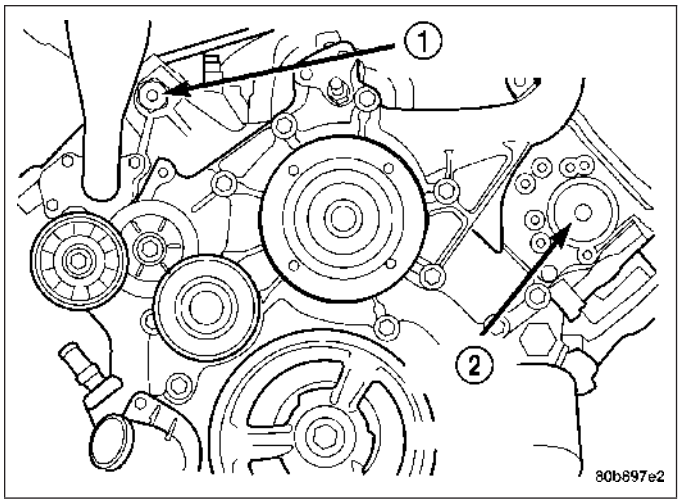
16. Lock the secondary timing chains (2) to the idler sprocket using Special Tool 8429 Timing Chain Holding Fixture (1).

NOTE: Mark the secondary timing chain prior to removal to aid in installation.

17. Mark the secondary timing chain (2), one link on each side of the V6 mark on the camshaft drive gear.
18. Remove the left side secondary chain tensioner (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).



19. Remove the cylinder head access plug (1) and (2).
20. Remove the left side secondary chain guide (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).



21. Remove the retaining bolt and the camshaft drive gear.

CAUTION: Do not allow the engine to rotate. Severe damage to the valve train can occur.

CAUTION: Do not overlook the four smaller bolts at the front of the cylinder head. Do not attempt to remove the cylinder head without removing these four bolts.

NOTE: The cylinder head is attached to the cylinder block with twelve bolts.

22. Remove the cylinder head retaining bolts.
23. Remove the cylinder head and gasket. Discard the gasket.

CAUTION: Do not lay the cylinder head on its gasket sealing surface, due to the design of the cylinder head gasket any distortion to the cylinder head sealing surface may prevent the gasket from properly sealing resulting in leaks.

CYLINDER HEAD - RIGHT

1. Disconnect battery negative cable.
2. Raise the vehicle on a hoist.
3. Disconnect the exhaust pipe at the right side exhaust manifold.
4. Drain the engine coolant (Refer to 7 - COOLING - STANDARD PROCEDURE)
5. Lower the vehicle.
6. Remove the intake manifold (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).
7. Remove the cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).
8. Remove the radiator fan (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - REMOVAL).
9. Remove oil fill housing from cylinder head.
10. Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
11. Rotate the crankshaft until the damper timing mark is aligned with TDC indicator mark.
12. Verify the V6 mark on the camshaft sprocket is at the 12 o'clock position. Rotate the crankshaft one turn if necessary.
13. Remove the crankshaft damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL).
14. Remove the timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).
15. Lock the secondary timing chains to the idler sprocket using Special Tool 8429 Timing Chain Holding Fixture.

NOTE: Mark the secondary timing chain prior to removal to aid in installation.

16. Mark the secondary timing chain, one link on each side of the V6 mark on the camshaft drive gear.
17. Remove the right side secondary chain tensioner (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).
18. Remove the cylinder head access plug.
19. Remove the right side secondary chain guide (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).

CAUTION: The nut on the right side camshaft sprocket should not be removed for any reason, as the sprocket and camshaft sensor target wheel is serviced as an assembly. If the nut was removed retorque nut to 5 N·m (44 in. lbs.).

20. Remove the retaining bolt and the camshaft drive gear.

CAUTION: Do not allow the engine to rotate. severe damage to the valve train can occur.

CAUTION: Do not overlook the four smaller bolts at the front of the cylinder head. Do not attempt to remove the cylinder head without removing these four bolts.

CAUTION: Do not hold or pry on the camshaft target wheel for any reason. A damaged target wheel can result in a vehicle no start condition.

NOTE: The cylinder head is attached to the cylinder block with twelve bolts.

21. Remove the cylinder head retaining bolts.
22. Remove the cylinder head and gasket. Discard the gasket.

CAUTION: Do not lay the cylinder head on its gasket sealing surface, do to the design of the cylinder head gasket any distortion to the cylinder head sealing surface may prevent the gasket from properly sealing resulting in leaks.

INSPECTION

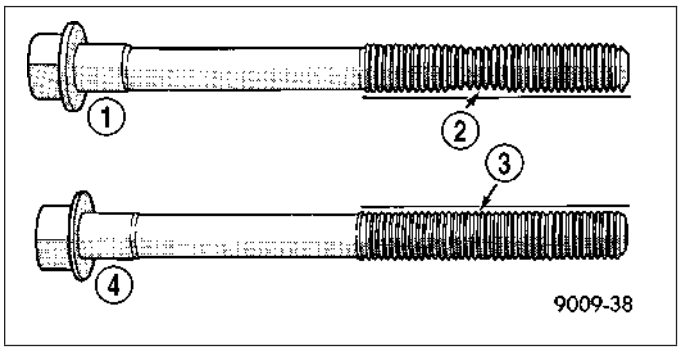
1. Inspect the cylinder head for out-of-flatness, using a straightedge and a feeler gauge. If tolerances exceed 0.0508 mm (0.002 in.) replace the cylinder head.
2. Inspect the valve seats for damage. Service the valve seats as necessary.
3. Inspect the valve guides for wear, cracks or looseness. If either condition exist, replace the cylinder head.

INSTALLATION

CYLINDER HEAD - LEFT

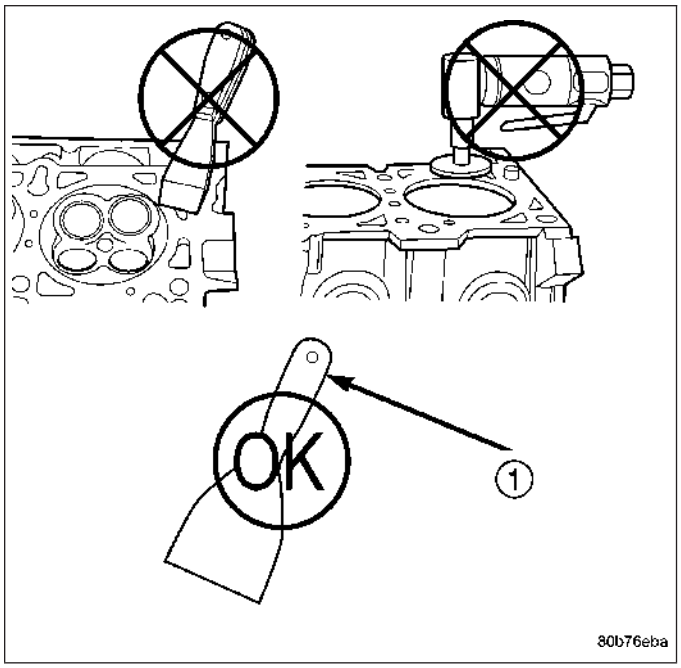
NOTE: The cylinder head bolts are tightened using a torque plus angle procedure. The bolts must be examined BEFORE reuse. If the threads are necked down the bolts should be replaced.

Necking can be checked by holding a straight edge against the threads (2). If all the threads do not contact the scale, the bolt should be replaced.



CAUTION: When cleaning cylinder head and cylinder block surfaces, DO NOT use a metal scraper because the surfaces could be cut or ground. Use only a wooden or plastic scraper (1).

1. Clean the cylinder head and cylinder block mating surfaces.



2. Position the new cylinder head gasket on the locating dowels.

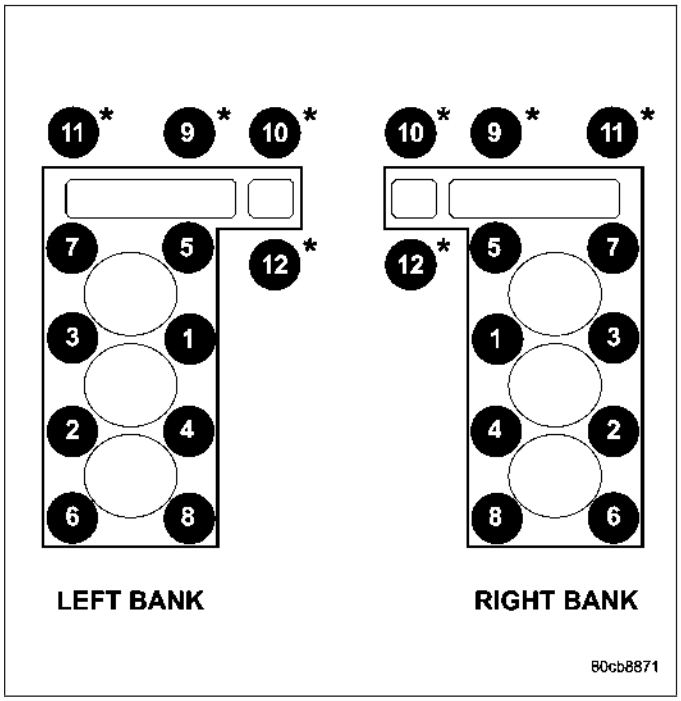
CAUTION: When installing cylinder head, use care not damage the tensioner arm or the guide arm.

3. Position the cylinder head onto the cylinder block. Make sure the cylinder head seats fully over the locating dowels.

NOTE: The four smaller cylinder head mounting bolts require sealant to be added to them before installing. Failure to do so may cause leaks. The locations are identified wit *.

4. Lubricate the cylinder head bolt threads with clean engine oil and install the eight M11 bolts.
5. Coat the four M8 cylinder head bolts with **Mopar® Lock and Seal Adhesive** then install the bolts.

NOTE: The cylinder head bolts are tightened using an angle torque procedure, however, the bolts are not a torque-to-yield design.



6. Tighten the bolts in sequence using the following steps and torque values:
   - Step 1: Tighten bolts 1-8, 27 N·m (20 ft. lbs.).
   - Step 2: Verify that bolts 1-8, all reached 27 N·m (20 ft. lbs.), by repeating step 1 without loosening the bolts. Tighten bolts 9 thru 12 to 14 N·m (10 ft. lbs.).
   - Step 3: Tighten bolts 1-8, 90 degrees.
   - Step 4: Tighten bolts 1-8, 90 degrees, again. Tighten bolts 9-12, 26 N·m (19 ft. lbs.)
7. Position the secondary chain onto the camshaft drive gear, making sure one marked chain link is on either side of the V6 mark on the gear then using Special Tool 8428 Camshaft Wrench, position the gear onto the camshaft.

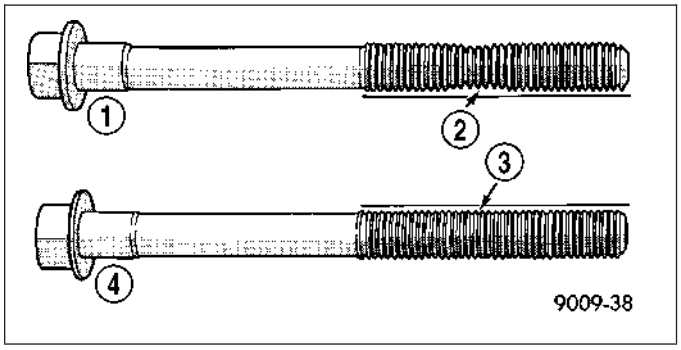
CAUTION: Remove excess oil from camshaft sprocket retaining bolt before reinstalling bolt. Failure to do so may cause over-torqueing of bolt resulting in bolt failure.

8. Install the camshaft drive gear retaining bolt.
9. Install the left side secondary chain guide (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).
10. Install the cylinder head access plug.
11. Re-set and install the left side secondary chain tensioner (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION)
12. Remove Special Tool 8429.
13. Install the timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION)
14. Install the crankshaft damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION). Tighten damper bolt 175 N·m (130 Ft. Lbs.).
15. Install the power steering pump.
16. Install the fan blade assembly and fan shroud (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - INSTALLATION).
17. Install the cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).
18. Install the master cylinder and booster assembly (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/POWER BRAKE BOOSTER - INSTALLATION).
19. Install the intake manifold (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).
20. Refill the cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
21. Raise the vehicle.
22. Install the exhaust pipe onto the left exhaust manifold (Refer to 11 - EXHAUST SYSTEM/EXHAUST PIPE - INSTALLATION).
23. Lower the vehicle.
24. Connect the negative cable to the battery.
25. Start the engine and check for leaks.

CYLINDER HEAD - RIGHT

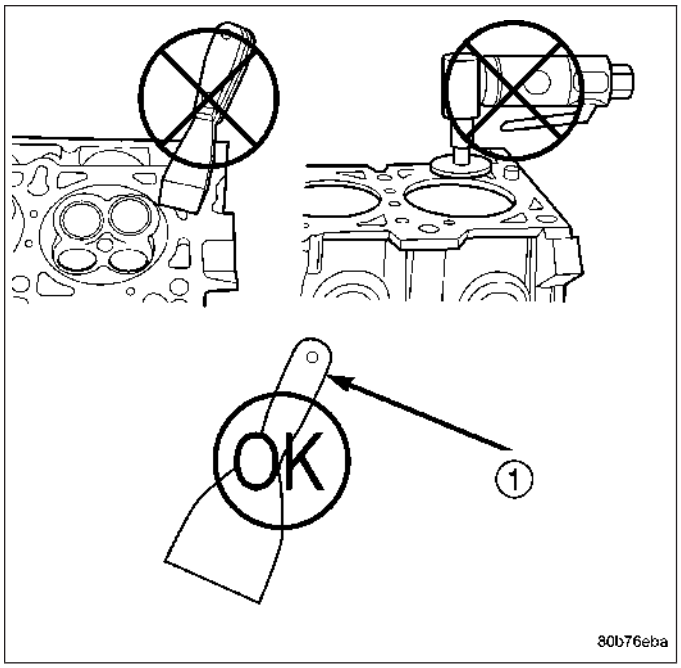
NOTE: The cylinder head bolts (4) are tightened using a torque plus angle procedure. The bolts must be examined BEFORE reuse. If the threads are necked down the bolts should be replaced.

Necking can be checked by holding a straight edge against the threads (2). If all the threads do not contact the scale, the bolt should be replaced.



CAUTION: When cleaning cylinder head and cylinder block surfaces, DO NOT use a metal scraper because the surfaces could be cut or ground. Use only a wooden or plastic scraper (1).

1. Clean the cylinder head and cylinder block mating surfaces.



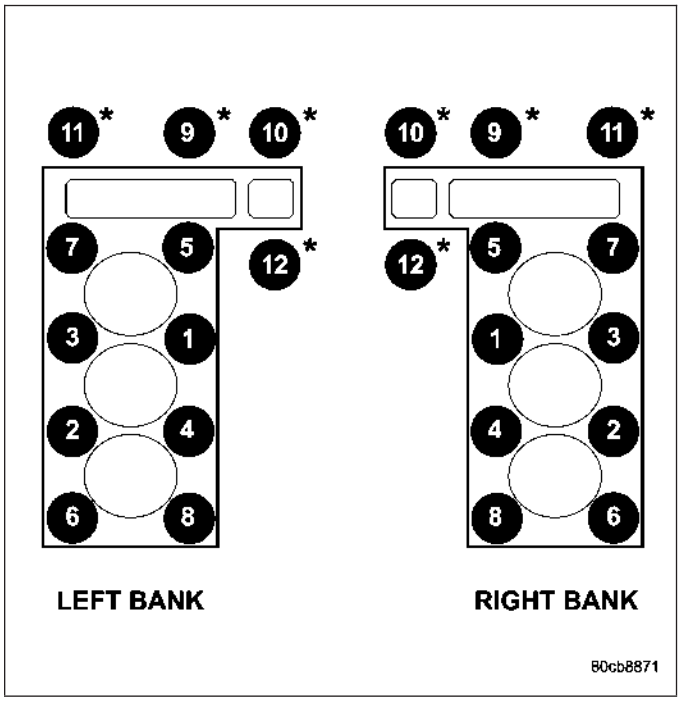
2. Position the new cylinder head gasket on the locating dowels.

CAUTION: When installing cylinder head, use care not damage the tensioner arm or the guide arm.

3. Position the cylinder head onto the cylinder block. Make sure the cylinder head seats fully over the locating dowels.

NOTE: The four M8 cylinder head mounting bolts require sealant to be added to them before installing. Failure to do so may cause leaks.

4. Lubricate the cylinder head bolt threads with clean engine oil and install the eight M10 bolts.
5. Coat the four M8 cylinder head bolts with **Mopar Lock and Seal Adhesive** then install the bolts.



NOTE: The cylinder head bolts are tightened using an angle torque procedure, however, the bolts are not a torque-to-yield design.

6. Tighten the bolts in sequence using the following steps and torque values:
   - Step 1: Tighten bolts 1-8, 27 N·m (20 ft. lbs.).
   - Step 2: Verify that bolts 1-8, all reached 27 N·m (20 ft. lbs.), by repeating step 1 without loosening the bolts. Tighten bolts 9 thru 12 to 14 N·m (10 ft. lbs.).
   - Step 3: Tighten bolts 1-8, 90 °.
   - Step 4: Tighten bolts 1-8, 90 °, again. Tighten bolts 9-12, 26 N·m (19 ft. lbs.)

CAUTION: The nut on the right side camshaft sprocket should not be removed for any reason, as the sprocket and camshaft sensor target wheel is serviced as an assembly. If the nut was removed retorque nut to 5 N·m (60 in. lbs.).

7. Position the secondary chain onto the camshaft drive gear, making sure one marked chain link is on either side of the V6 mark on the gear then using Tool 8428 Camshaft Wrench, position the gear onto the camshaft.

CAUTION: Remove excess oil from camshaft sprocket retaining bolt before reinstalling bolt. Failure to do so may cause over-torquing of bolt resulting in bolt failure.

8. Install the camshaft drive gear retaining bolt.
9. Install the right side secondary chain guide (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).
10. Install the cylinder head access plug.
11. Re-set and install the right side secondary chain tensioner (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).
12. Remove Special Tool 8429.
13. Install the timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION).
14. Install the crankshaft damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION). Tighten damper bolt 175 N·m (130 Ft. Lbs.).
15. Install accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).
16. Install the radiator fan and shroud (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - INSTALLATION).
17. Install the cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).
18. Install the intake manifold (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION).
19. Install oil fill housing onto cylinder head.
20. Refill the cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
21. Raise the vehicle.
22. Install the exhaust pipe onto the right exhaust manifold.
23. Lower the vehicle.
24. Reconnect battery negative cable.
25. Start the engine and check for leaks.

CAMSHAFT(S)

DESCRIPTION

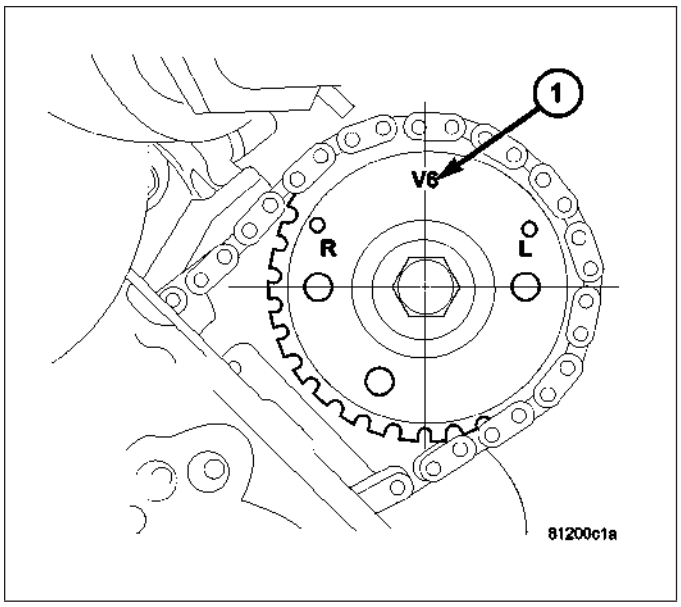
The camshafts consist of powdered metal steel lobes which are sinter-bonded to a steel tube. Four bearing journals are machined into the camshaft. Camshaft end play is controlled by two thrust walls that border the nose piece journal.

REMOVAL

REMOVAL - LEFT

CAUTION: When the timing chain is removed and the cylinder heads are still installed, DO NOT forcefully rotate the camshafts or crankshaft independently of each other. Severe valve and/or piston damage can occur.

CAUTION: When removing the cam sprocket, timing chains or camshaft, Failure to use Special Tool 8379 will result in hydraulic tensioner ratchet over extension, requiring timing chain cover removal to reset the tensioner ratchet.



1. Remove cylinder head cover (Refer to 9 - ENGINE/ CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).
2. Set engine to TDC cylinder No. 1, camshaft sprocket V6 marks (1) at the 12 o'clock position.
3. Mark one link on the secondary timing chain on both sides of the V6 mark on the camshaft sprocket to aid in installation.

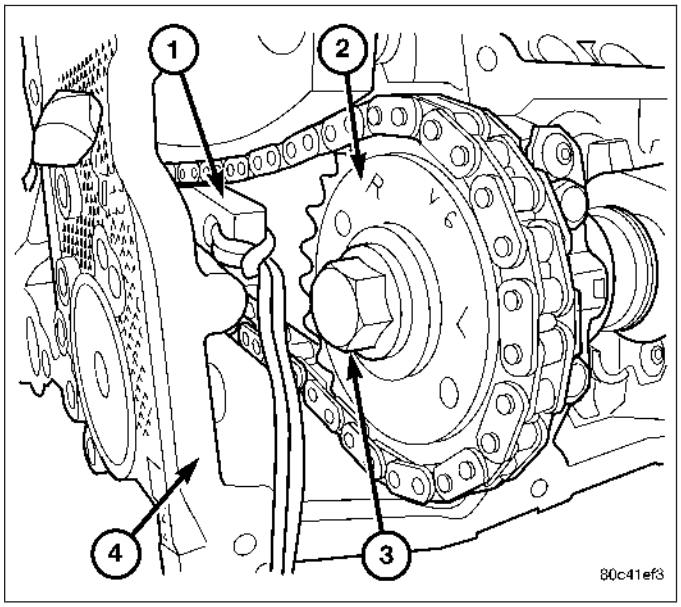
CAUTION: Do not hold or pry on the camshaft target wheel (Located on the right side camshaft sprocket) for any reason, Severe damage will occur to the target wheel resulting in a vehicle no start condition.

4. Loosen but **DO NOT** remove the camshaft sprocket retaining bolt. Leave the bolt snug against the sprocket.

NOTE: The timing chain tensioners must be secured prior to removing the camshaft sprockets. Failure to secure tensioners will allow the tensioners to extend, requiring timing chain cover removal in order to reset tensioners.

CAUTION: Do not force wedge past the narrowest point between the chain strands. Damage to the tensioners may occur.

5. Position Special Tool 8379 timing chain wedge (1) between the timing chain strands, tap the tool to securely wedge the timing chain against the tensioner arm and guide.

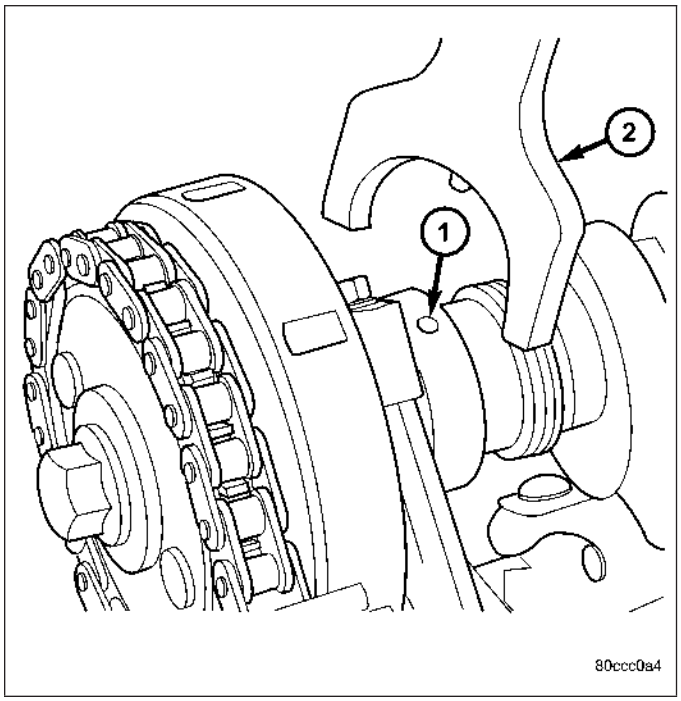


6. Hold the camshaft with Special Tool 8428 Camshaft Wrench (2), while removing the camshaft sprocket bolt and sprocket.
7. Using Special Tool 8428 Camshaft Wrench (2), gently allow the camshaft to rotate 5° clockwise until the camshaft is in the neutral position (no valve load).
8. Starting at the outside working inward, loosen the camshaft bearing cap retaining bolts 1/2 turn at a time. Repeat until all load is off the bearing caps.

CAUTION: DO NOT STAMP OR STRIKE THE CAMSHAFT BEARING CAPS. SEVERE DAMAGE WILL OCCUR TO THE BEARING CAPS.

NOTE: When the camshaft is removed the rocker arms may slide downward, mark the rocker arms before removing camshaft.

9. Remove the camshaft bearing caps and the camshaft.



CAMSHAFT-RIGHT

CAUTION: When the timing chain is removed and the cylinder heads are still installed, DO NOT forcefully rotate the camshafts or crankshaft independently of each other. Severe valve and/or piston damage can occur.

CAUTION: When removing the cam sprocket, timing chains or camshaft, Failure to use special tool 8379 will result in hydraulic tensioner ratchet over extension, Requiring timing chain cover removal to re-set the tensioner ratchet.

1. Remove the cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).
2. Set engine to TDC cylinder No. 1, camshaft sprocket V6 marks at the 12 o'clock position.
3. Mark one link on the secondary timing chain on both sides of the V6 mark on the camshaft sprocket to aid in installation.

CAUTION: Do not hold or pry on the camshaft target wheel for any reason, Severe damage will occur to the target wheel. A damaged target wheel could cause a vehicle no start condition.

4. Loosen but **DO NOT** remove the camshaft sprocket retaining bolt. Leave bolt snug against sprocket.

NOTE: The timing chain tensioners must be secured prior to removing the camshaft sprockets. Failure to secure tensioners will allow the tensioners to extend, requiring timing chain cover removal in order to reset tensioners.

CAUTION: Do not force wedge past the narrowest point between the chain strands. Damage to the tensioners may occur.

5. Position Tool 8379 timing chain wedge between the timing chain strands. Tap the tool to securely wedge the timing chain against the tensioner arm and guide.
6. Remove the camshaft position sensor.

7. Hold the camshaft with Tool 8428 Camshaft Wrench, while removing the camshaft sprocket bolt and sprocket.
8. Starting at the outside working inward, loosen the camshaft bearing cap retaining bolts 1/2 turn at a time. Repeat until all load is off the bearing caps.

CAUTION: DO NOT STAMP OR STRIKE THE CAMSHAFT BEARING CAPS. SEVERE DAMAGE WILL OCCUR TO THE BEARING CAPS.

NOTE: When the camshaft is removed the rocker arms may slide downward, mark the rocker arms before removing camshaft.

9. Remove the camshaft bearing caps and the camshaft.

INSTALLATION

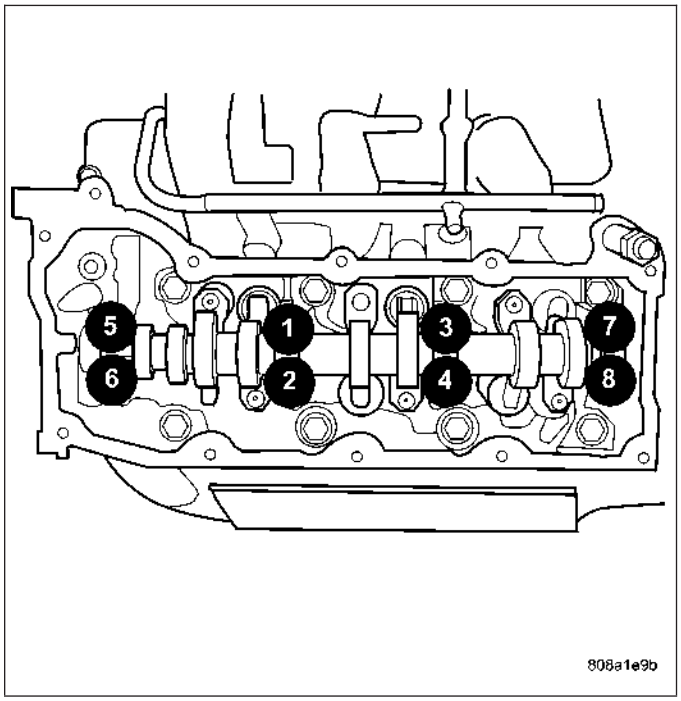
INSTALLATION - LEFT

1. Lubricate camshaft journals with clean engine oil.

NOTE: Position the left side camshaft so that the camshaft sprocket dowel is near the 1 o'clock position, This will place the camshaft at the neutral position easing the installation of the camshaft bearing caps.

2. Position the camshaft into the cylinder head.
3. Install the camshaft bearing caps, hand tighten the retaining bolts.

NOTE: Caps should be installed so that the stamped numbers on the caps are in numerical order, (1 thru 4) from the front to the rear of the engine. All caps should be installed so that the stamped arrows on the caps point toward the front of the engine.



4. Working in 1/2 turn increments, tighten the bearing cap retaining bolts starting with the middle cap working outward.
5. Torque the camshaft bearing cap retaining bolts to 11 N·m (100 in. lbs.).
6. Position the camshaft drive gear into the timing chain aligning the V6 mark between the two marked chain links (Two links marked during removal).
7. Using Tool 8428 Camshaft Wrench, rotate the camshaft until the camshaft sprocket dowel is aligned with the slot in the camshaft sprocket. Install the sprocket onto the camshaft.

CAUTION: Remove excess oil from camshaft sprocket bolt. Failure to do so can cause bolt over-torque resulting in bolt failure.

8. Remove excess oil from bolt, then install the camshaft sprocket retaining bolt and hand tighten.
9. Remove Special Tool 8379 timing chain wedge.
10. Using Special Tool 6958 spanner wrench with adapter pins 8346, torque the camshaft sprocket retaining bolt to 122 N·m (90 ft. lbs.).
11. Install the cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).

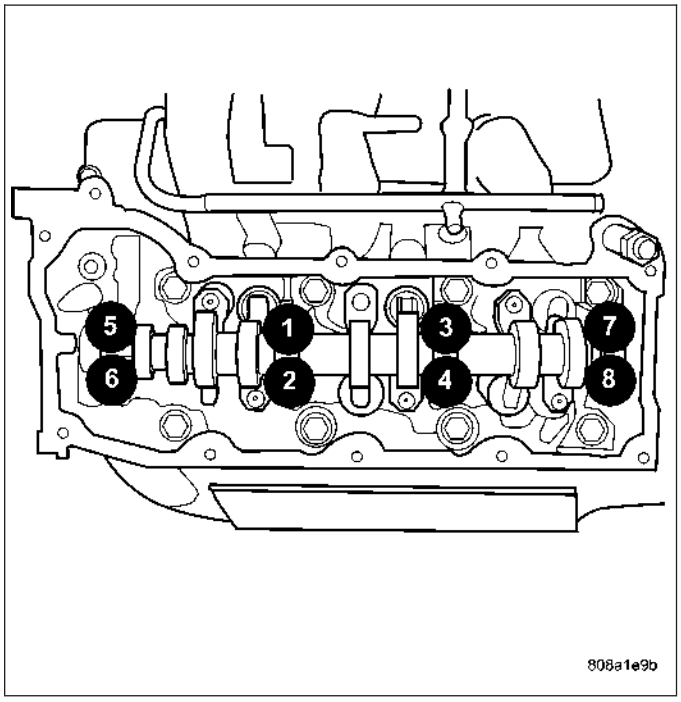
CAMSHAFT-RIGHT

1. Lubricate camshaft journals with clean engine oil.

NOTE: Position the right side camshaft so that the camshaft sprocket dowel is near the 10 o'clock position, This will place the camshaft at the neutral position easing the installation of the camshaft bearing caps.

2. Position the camshaft into the cylinder head.
3. Install the camshaft bearing caps, hand tighten the retaining bolts.

NOTE: Caps should be installed so that the stamped numbers on the caps are in numerical order, (1 thru 4) from the front to the rear of the engine. All caps should be installed so that the stamped arrows on the caps point toward the front of the engine.



4. Working in 1/2 turn increments, tighten the bearing cap retaining bolts starting with the middle cap working outward as shown.
5. Torque the camshaft bearing cap retaining bolts to 11 N·m (100 in. lbs.).
6. Position the camshaft drive gear into the timing chain aligning the V6 mark between the two marked chain links (Two links marked during removal).
7. Using Special Tool 8428 Camshaft Wrench, rotate the camshaft until the camshaft sprocket dowel is aligned with the slot in the camshaft sprocket. Install the sprocket onto the camshaft.

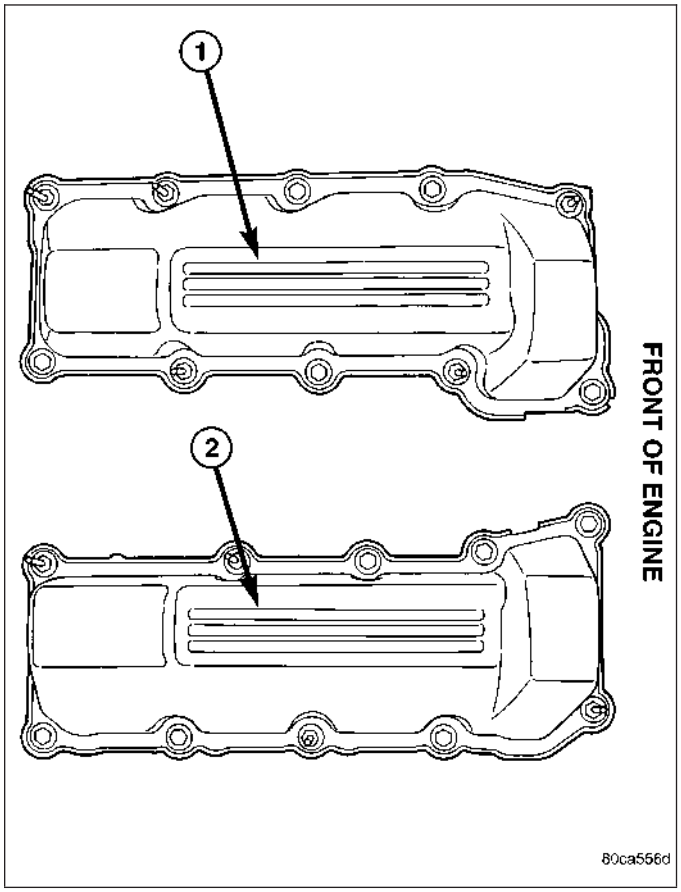
CAUTION: Remove excess oil from camshaft sprocket bolt. Failure to do so can cause bolt over-torque resulting in bolt failure.

8. Remove excess oil from camshaft sprocket bolt, then install the camshaft sprocket retaining bolt and hand tighten.
9. Remove timing chain wedge Ttool 8379.
10. Using Tool 6958 spanner wrench with adapter pins 8346, torque the camshaft sprocket retaining bolt to 122 N·m (90 ft. lbs.).
11. Install the camshaft position sensor.
12. Install the cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).

COVER(S)-CYLINDER HEAD

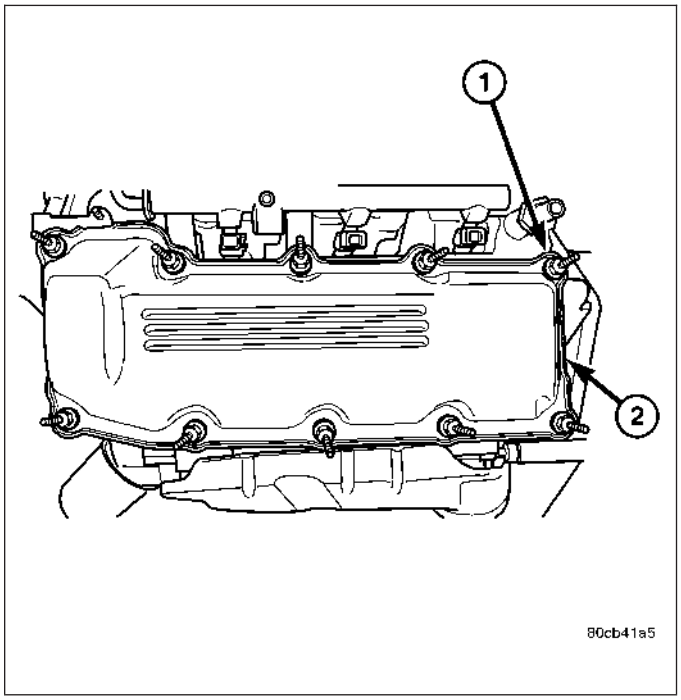
DESCRIPTION

The cylinder head covers (1,2) are made of glass re-enforced thermoset plastic, and are not interchangable from side-to-side.



REMOVAL

1. Disconnect negative cable from battery.
2. Remove the resonator assemble and air inlet hose.
3. Disconnect injector connectors and un-clip the injector harness.
4. Route injector harness in front of cylinder head cover (2).
5. Disconnect the left side breather tube and remove the breather tube.
6. Remove the cylinder head cover mounting bolts (1).
7. Remove cylinder head cover and gasket.



NOTE: The gasket may be used again, providing no cuts, tears, or deformation has occurred.

INSTALLATION

CAUTION: Do not use harsh cleaners to clean the cylinder head covers. Severe damage to covers may occur.

NOTE: The gasket may be used again, provided no cuts, tears, or deformation has occurred.

1. Clean cylinder head cover and both sealing surfaces. Inspect and replace gasket as necessary.
2. Tighten cylinder head cover bolts and double ended studs to 12 N·m (105 in. lbs.).
3. Install left side breather and connect breather tube.
4. Connect injector electrical connectors and injector harness retaining clips.
5. Install the resonator and air inlet hose.
6. Connect negative cable to battery.

VALVES & SEATS - INTAKE/EXHAUST

DESCRIPTION

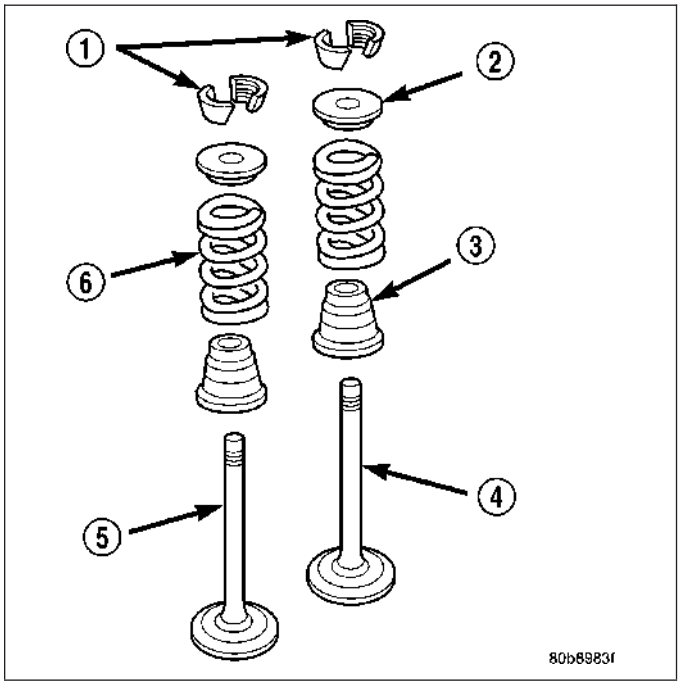
The valves are made of heat resistant steel and have chrome plated stems to prevent scuffing. Each valve is actuated by a roller rocker arm which pivots on a stationary lash adjuster. All valves use three bead lock keepers to retain the springs and promote valve rotation.

STANDARD PROCEDURE

REFACING

NOTE: Valve seats that are worn or burned can be reworked, provided that correct angle and seat width are maintained. Otherwise the cylinder head must be replaced.

NOTE: When refacing valves and valve seats, it is important that the correct size valve guide pilot be used for reseating stones. A true and complete surface must be obtained.



1. Using a suitable dial indicator measure the center of the valve seat Total run out must not exceed 0.051 mm (0.002 in).
2. Apply a small amount of Prussian blue to the valve seat, insert the valve (4) or (5) into the cylinder head, while applying light pressure on the valve rotate the valve. Remove the valve and examine the valve face. If the blue is transferred below the top edge of the valve face, lower the valve seat using a 15 degree stone. If the blue is transferred to the bottom edge of the valve face, raise the valve seat using a 65 degree stone.
3. When the seat is properly positioned the width of the intake seat must be 1.75 - 2.36 mm (0.0689 - 0.0928 in.) and the exhaust seat must be 1.71 - 2.32 mm (0.0673 - 0.0911 in.).
4. Check the valve spring installed height after refacing the valve (4) and (5) and seat. The installed height for both intake and exhaust valve springs must not exceed 40.74 mm (1.6039 in.).

5. The valve seat and valve face must maintain a face angle of 44.5 - 45 ° angle.

REMOVAL

NOTE: The cylinder heads must be removed in order to perform this procedure.

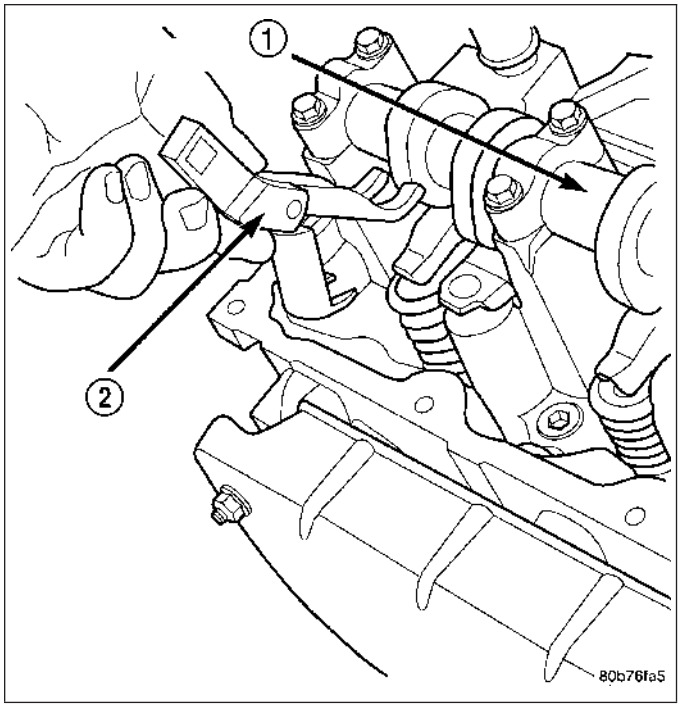
1. Remove rocker arms and lash adjusters (Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARM / ADJUSTER ASSY - REMOVAL).
2. Remove the camshaft bearing caps and the camshaft.

NOTE: All six valve springs and valves are removed in the same manner; this procedure only covers one valve and valve spring.

3. Using Tool C-3422–B or C-3422–C Valve Spring Compressor and Tool 8519 Adapter (2), compress the valve spring.

NOTE: It may be necessary to tap the top of the valve spring to loosen the spring retainers locks enough to be removed.

4. Remove the two spring retainer lock halves.



NOTE: the valve spring is under tension use care when releasing the valve spring compressor.

5. Remove the valve spring compressor (2).
6. Remove the spring retainer, and the spring.

NOTE: Check for sharp edges on the keeper grooves. Remove any burrs from the valve stem before removing the valve from the cylinder head.

7. Remove the valve from the cylinder head.

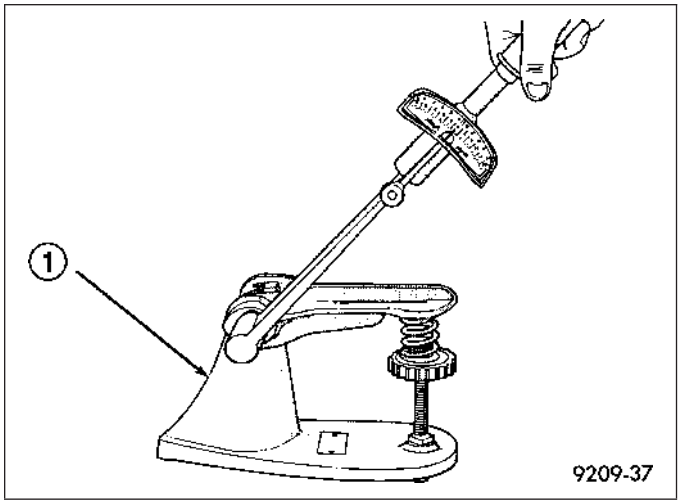
NOTE: The valve stem seals are common between intake and exhaust.

8. Remove the valve stem seal. Mark the valve for proper installation.

TESTING VALVE SPRINGS

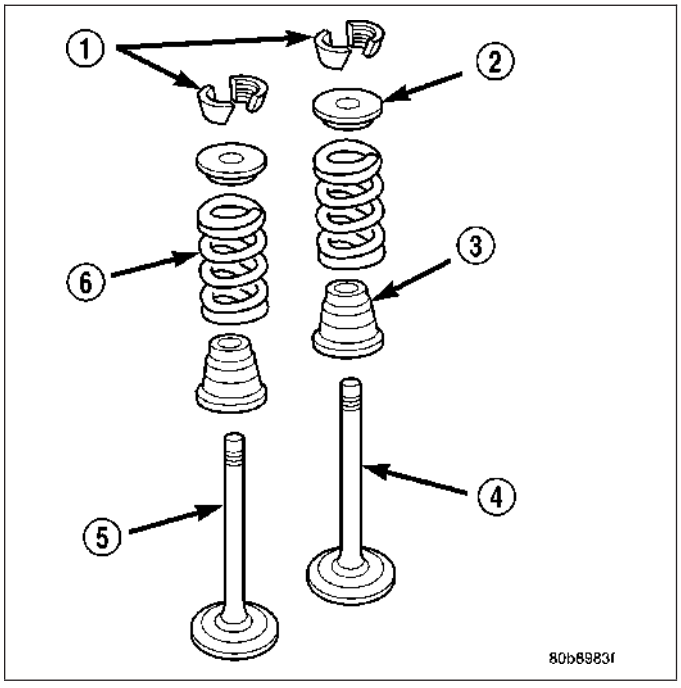
NOTE: Whenever the valves are removed from the cylinder head it is recommended that the valve springs be inspected and tested for reuse.

Inspect the valve springs for physical signs of wear or damage. Turn table of Tool C-647 (1) until surface is in line with the 40.12 mm (1.579 in.) mark on the threaded stud and the zero mark on the front. Place spring over the stud on the table and lift compressing lever to set tone device. Pull on torque wrench until a Ping is heard. Take reading on torque wrench at this instant. Multiply this reading by two. This will give the spring load at test length. Fractional measurements are indicated on the table for finer adjustments. Refer to Specifications Section to obtain specified height and allowable tensions. Replace any springs that do not meet specifications.

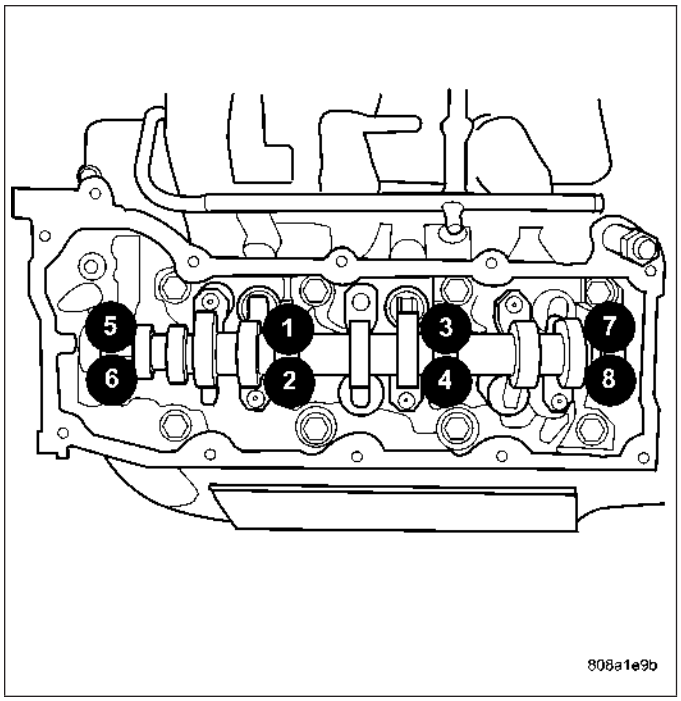


INSTALLATION

1. Coat the valve stem with clean engine oil and insert it into the cylinder head.
2. Install the valve stem seal (3). Make sure the seal is fully seated and that the garter spring at the top of the seal is intact.
3. Install the spring and the spring retainer (2).
4. Using the valve spring compressor, compress the spring (6) and install the two valve spring retainer halves (1).
5. Release the valve spring compressor and make sure the two spring retainer halves (1) and the spring retainer (2) are fully seated.
6. Lubricate the camshaft journal with clean engine oil then position the camshaft, with the sprocket dowel on the left camshaft at 11 o'clock and the right camshaft at 12 o'clock, then position the camshaft bearing caps.



7. Install the camshaft bearing cap retaining bolts. Tighten the bolts 9-13 N·m (100 in. lbs.) in 1/2 turn increments in the sequence shown.
8. Position the hydraulic lash adjusters and rocker arms (Refer to 9 - ENGINE/CYLINDER HEAD/ ROCKER ARM / ADJUSTER ASSY - INSTALLATION).



ARM-ROCKER

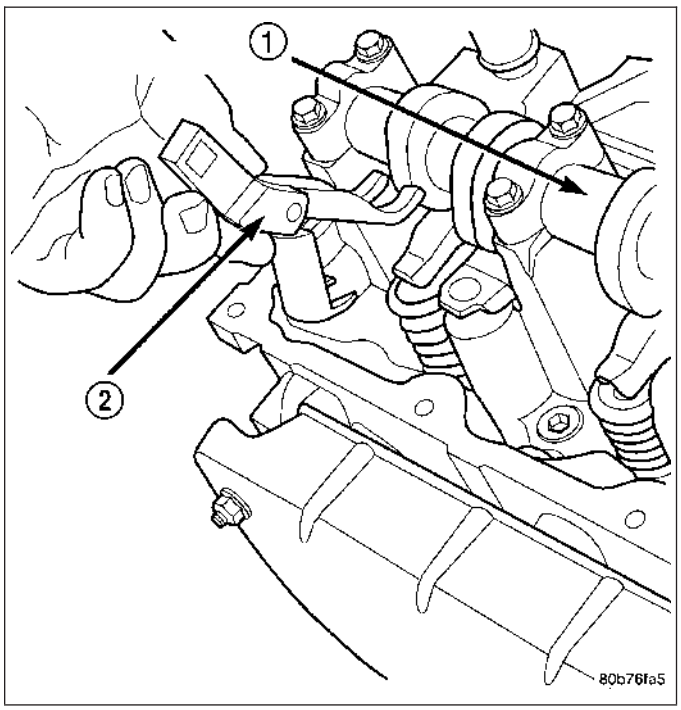
DESCRIPTION

The rocker arms are steel stampings with an integral roller bearing. The rocker arms incorporate a 0.5 mm oil hole in the lash adjuster socket for roller and camshaft lubrication.

REMOVAL

NOTE: Disconnect the battery negative cable to prevent accidental starter engagement.

1. Remove the cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).
2. For rocker arm removal on cylinder No. 4, Rotate the crankshaft until cylinder No. 1 is at BDC intake stroke.
3. For rocker arm removal on cylinder No. 1, Rotate the crankshaft until cylinder No. 1 is at BDC combustion stroke.
4. For rocker arm removal on cylinders No. 3 and No. 5, Rotate the crankshaft until cylinder No. 1 is at TDC exhaust stroke.
5. For rocker arm removal on cylinders No. 2 and No. 6, Rotate the crankshaft until cylinder No. 1 is at TDC ignition stroke.
6. Using special Tool 8516 Rocker Arm Remover (2), press downward on the valve spring, remove rocker arm.

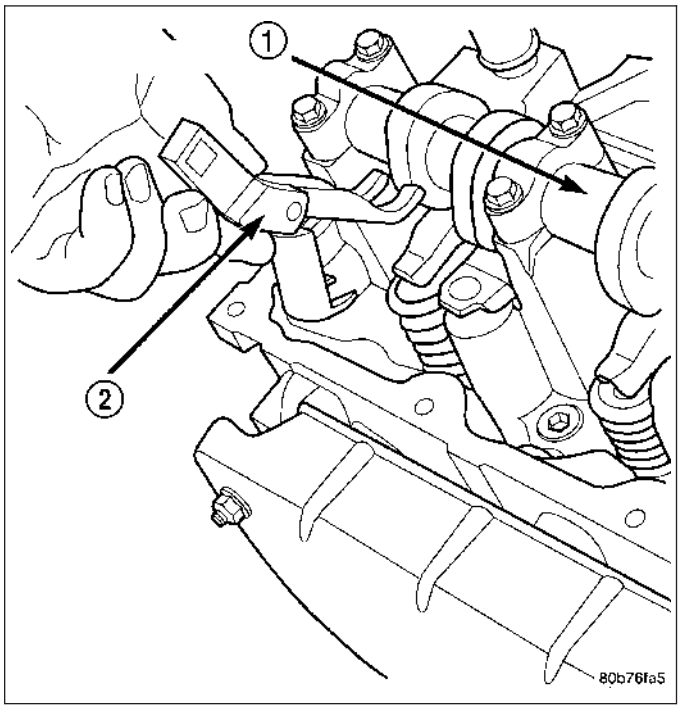


INSTALLATION

1. Using Tool 8516 (2) press downward on the valve spring, install rocker arm.

CAUTION: Make sure the rocker arms are installed with the concave pocket over the lash adjusters. Failure to do so may cause severe damage to the rocker arms and/or lash adjusters.

NOTE: Coat the rocker arms with clean engine oil prior to installation.



2. For rocker arm installation on cylinders No. 4, Rotate the crankshaft until cylinder No. 1 is at BDC intake stroke.
3. For rocker arm installation on cylinder No. 1, Rotate the crankshaft until cylinder No. 1 is at BDC combustion stroke.
4. For rocker arm installation on cylinders No. 3 and No. 5, Rotate the crankshaft until cylinder No. 1 is at TDC exhaust stroke.
5. For rocker arm installation on cylinders No. 2 and No. 6, Rotate the crankshaft until cylinder No. 1 is at TDC ignition stroke.
6. Install the cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).

SEALS-VALVE GUIDE

DESCRIPTION

The valve guide seals are made of rubber and incorporate an integral steel valve spring seat. The integral garter spring maintains consistent lubrication control to the valve stems.

SPRINGS-VALVE

DESCRIPTION

The valve springs are made from high strength chrome silicon steel. The springs are NOT common for intake and exhaust applications. The valve spring seat is integral with the valve stem seal, which is a positive type seal to control lubrication.

REMOVAL

1. Remove the cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).
2. Using Special Tool 8516 Valve Spring Compressor, remove the rocker arms and the hydraulic lash adjusters.
3. Remove the spark plug for the cylinder the valve spring and seal are to be removed from.
4. Apply shop air to the cylinder to hold the valves in place when the spring is removed.

NOTE: All six valve springs and seals are removed in the same manner; this procedure only covers one valve seal and valve spring.

5. Using Special Tool 8387 Valve Spring Compressor, compress the valve spring.

NOTE: It may be necessary to tap the top of the valve spring to loosen the spring retainers locks enough to be removed.

6. Remove the two spring retainer lock halves.

NOTE: the valve spring is under tension use care when releasing the valve spring compressor.

7. Remove the valve spring compressor.

NOTE: The valve springs are NOT common between intake and exhaust.

8. Remove the spring retainer, and the spring.
9. Remove the valve stem seal.

NOTE: The valve stem seals are common between intake and exhaust.

INSTALLATION

NOTE: All six valve springs and seals are removed in the same manner; this procedure only covers one valve seal and valve spring.

1. Apply shop air to the cylinder to hold the valves in place while the spring is installed.

NOTE: The valve stem seals are common between intake and exhaust.

2. Install the valve stem seal.

NOTE: The valve springs are NOT common between intake and exhaust.

3. Install the spring retainer, and the spring.
4. Using Special Tool 8387 Valve Spring Compressor, compress the valve spring.
5. Install the two spring retainer lock halves.

NOTE: the valve spring is under tension use care when releasing the valve spring compressor.

6. Remove the valve spring compressor.
7. Disconnect the shop air to the cylinder.
8. Install the spark plug for the cylinder the valve spring and seal was installed on.
9. Using Special Tool 8516 Valve Spring Compressor, install the rocker arms and the hydraulic lash adjusters.
10. Install the cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).

ENGINE BLOCK

DESCRIPTION

The cylinder block is made of cast iron. The block is a closed deck design with the left bank forward. To provide high rigidity and improved NVH an enhanced compacted graphite bedplate is bolted to the block. The block design allows coolant flow between the cylinders bores, and an internal coolant bypass to a single poppet inlet thermostat is included in the cast aluminum front cover.

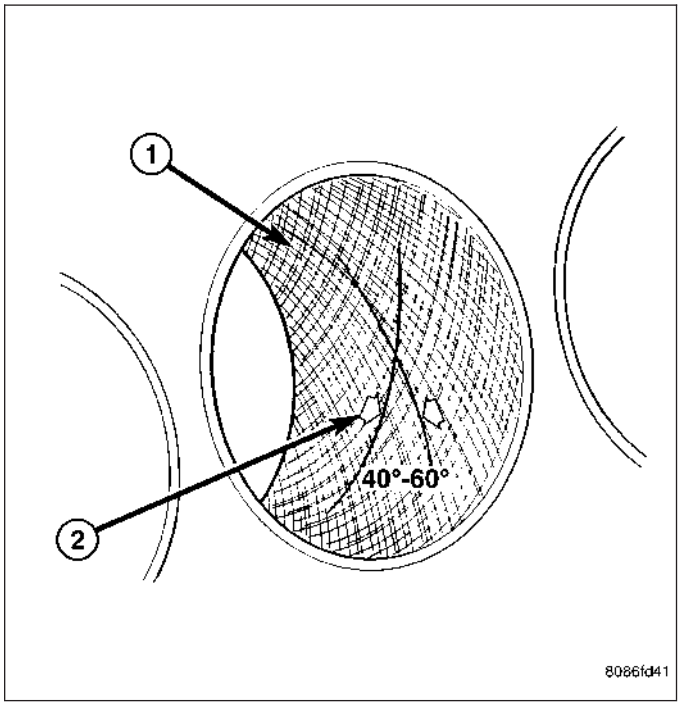
STANDARD PROCEDURE - CYLINDER BORE HONING

Before honing, stuff plenty of clean shop towels under the bores and over the crankshaft to keep abrasive materials from entering the crankshaft area.

1. Used carefully, the Cylinder Bore Sizing Hone C-823, equipped with 220 grit stones, is the best tool for this job. In addition to deglazing, it will reduce taper and out-of-round, as well as removing light scuffing, scoring and scratches. Usually, a few strokes will clean up a bore and maintain the required limits.

CAUTION: DO NOT use rigid type hones to remove cylinder wall glaze.

2. Deglazing of the cylinder walls may be done if the cylinder bore is straight and round. Use a cylinder surfacing hone, Honing Tool C-3501, equipped with 280 grit stones (C-3501-3810). about 20-60 strokes, depending on the bore condition, will be sufficient to provide a satisfactory surface. Using honing oil C-3501-3880, or a light honing oil, available from major oil distributors.



CAUTION: DO NOT use engine or transmission oil, mineral spirits, or kerosene.

3. Honing should be done by moving the hone up and down fast enough to get a crosshatch pattern. The hone marks should INTERSECT at 50° to 60° for proper seating of rings.
4. A controlled hone motor speed between 200 and 300 RPM is necessary to obtain the proper crosshatch angle (1). The number of up and down strokes per minute can be regulated to get the desired 50° to 60° angle (2). Faster up and down strokes increase the crosshatch angle.
5. After honing, it is necessary that the block be cleaned to remove all traces of abrasive. Use a brush to wash parts with a solution of hot water and detergent. Dry parts thoroughly. Use a clean, white, lint-free cloth to check that the bore is clean. Oil the bores after cleaning to prevent rusting.

CLEANING

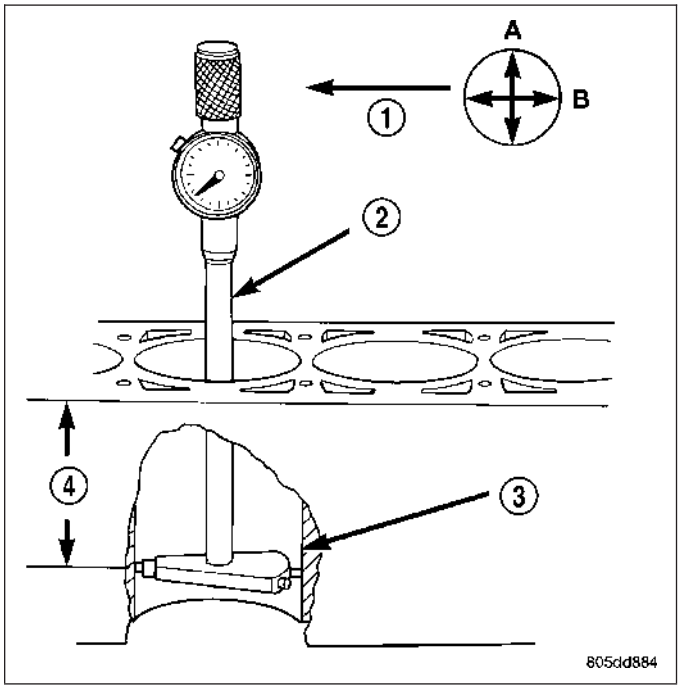
Thoroughly clean the oil pan and engine block gasket surfaces.

Use compressed air to clean out:

- The galley at the oil filter adaptor hole.
- The front and rear oil galley holes.
- The feed holes for the crankshaft main bearings.

Once the block has been completely cleaned, apply Loctite PST pipe sealant with Teflon 592 to the threads of the front and rear oil galley plugs. Tighten the 1/4 inch NPT plugs to 20 N·m (177 in. lbs.) torque. Tighten the 3/8 inch NPT plugs to 27 N·m (240 in. lbs.) torque.

INSPECTION

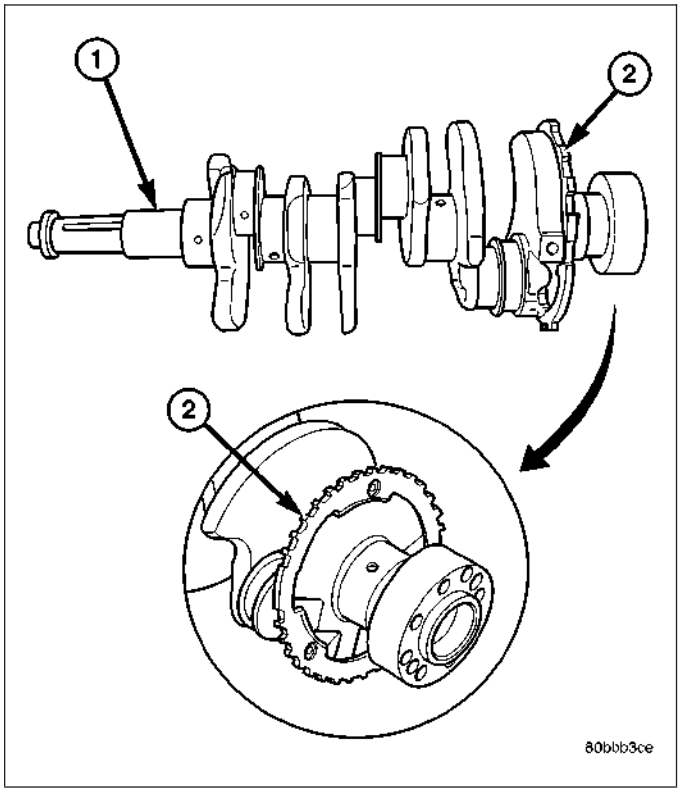


1. It is mandatory to use a dial bore gauge (2) to measure each cylinder bore diameter. To correctly select the proper size piston, a cylinder bore gauge, capable of reading in 0.003 mm (.0001 in.) INCREMENTS is required. If a bore gauge is not available, do not use an inside micrometer.
2. Measure the inside diameter of the cylinder bore at three levels below top of bore. Start perpendicular (across or at 90 degrees) to the axis of the crankshaft and then take two additional reading.
3. Measure the cylinder bore diameter crosswise to the cylinder block near the top of the bore. Repeat the measurement near the middle of the bore, then repeat the measurement near the bottom of the bore.
4. Determine taper by subtracting the smaller diameter from the larger diameter.
5. Rotate measuring device 90° and repeat steps above.
6. Determine out-of-roundness by comparing the difference between each measurement.
7. If cylinder bore taper does not exceed 0.025 mm (0.001 inch) and out-of-roundness does not exceed 0.025 mm (0.001 inch), the cylinder bore can be honed. If the cylinder bore taper or out- of-round condition exceeds these maximum limits, the cylinder block must be replaced. A slight amount of taper always exists in the cylinder bore after the engine has been in use for a period of time.

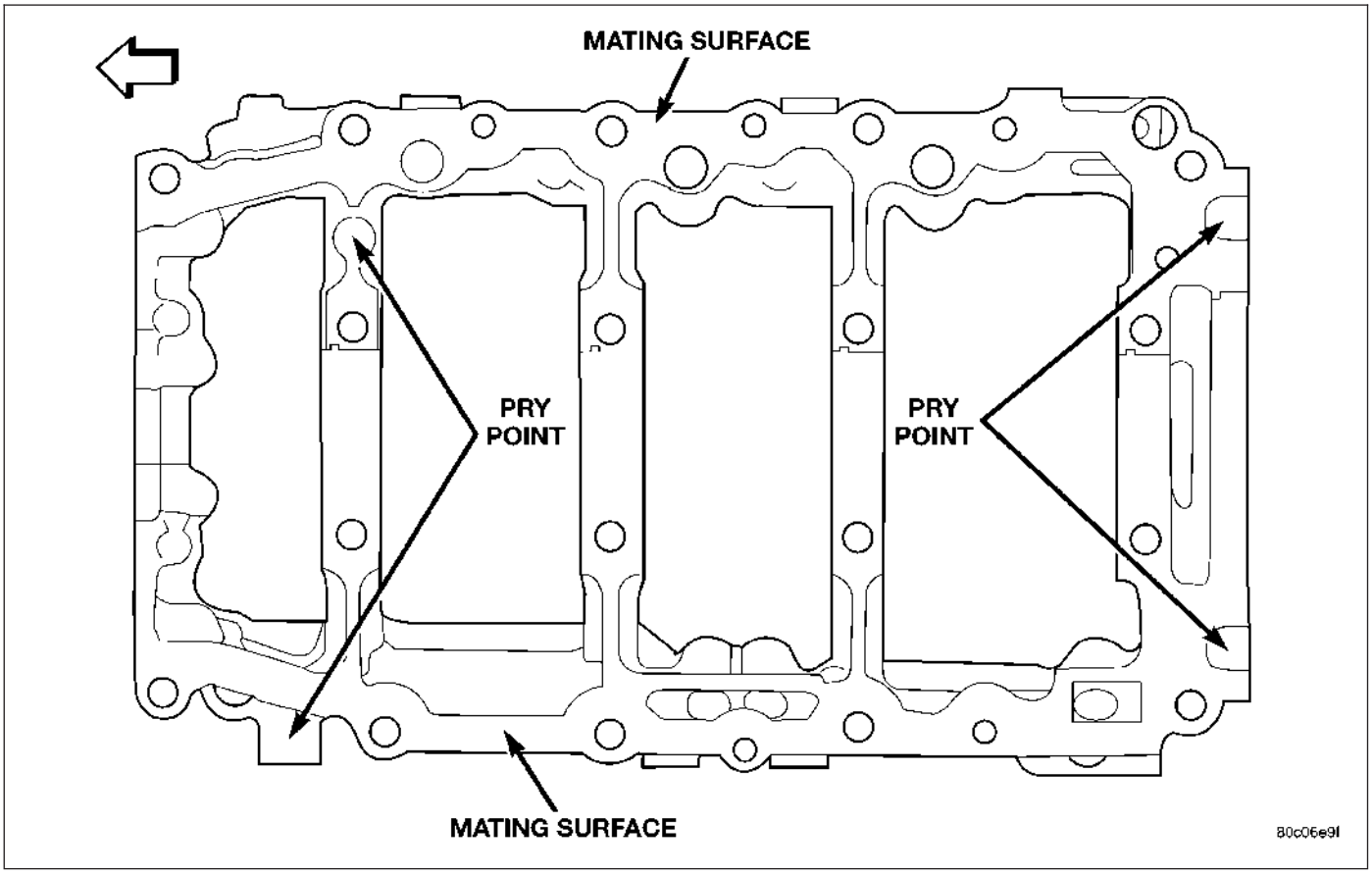
CRANKSHAFT

DESCRIPTION

The crankshaft (1) is constructed of nodular cast iron. The crankshaft is a three throw split pin design with six counterweights for balancing purposes. The crankshaft is supported by four select fit main bearings with the No. 2 serving as the thrust washer location. The main journals of the crankshaft are cross drilled to improve rod bearing lubrication. The No. 6 counterweight has provisions for crankshaft position sensor target wheel mounting. The select fit main bearing markings are located on the rear side of the target wheel (2). The crankshaft oil seals are one piece design. The front oil seal is retained in the timing chain cover, and the rear seal is pressed in to a bore formed by the cylinder block and the bedplate assembly.



REMOVAL



NOTE: To remove the crankshaft from the engine, the engine must be removed from the vehicle.

1. Remove the engine (Refer to 9 - ENGINE - REMOVAL).
2. Remove the engine oil pump (Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - REMOVAL).

CAUTION: DO NOT pry on the oil pan gasket when removing the oil pan, The oil pan gasket is mounted to the cylinder block in three locations and will remain attached to block when removing oil pan. Gasket can not be removed with oil pan.

3. Remove the bedplate mounting bolts. Note the location of the two stud bolts for installation.
4. Remove the connecting rods from the crankshaft.

CAUTION: The bedplate to cylinder block mating surface is a critical sealing surface. Do not pry on or damage this surface in anyway.

NOTE: The bedplate contains the lower main bearing halves. Use care when handling bedplate as not to drop or damage bearing halves. Installing main bearing halves in the wrong position will cause severe damage to the crankshaft.

NOTE: The bedplate has pry points (1) cast into it. Use these points only.

5. Carefully pry on the pry points (1) to loosen the bedplate then remove the bedplate.

CAUTION: When removing the crankshaft, use care not to damage bearing surfaces on the crankshaft.

6. Remove the crankshaft.

7. Remove the crankshaft tone wheel.

INSPECTION

NOTE: Thoroughly inspect the connecting rod bearing bores and main bearing bores for scoring, blueing or severe scratches. Further disassembly may be required.

If connecting rod bearing bores show damage, the cylinder heads must be removed to service the piston and rod assemblies. If the bedplate or the cylinder block main bearing bores show damage the engine must be replaced.

1. If required, remove the main bearing halves from the cylinder block and bedplate.
2. Thoroughly clean the bedplate to cylinder block sealing surfaces and main bearing bores. Remove all oil and sealant residue.
3. Inspect the bedplate main bearing bores for cracks, scoring or severe blueing. If either condition exists the engine must be replaced.
4. Inspect the crankshaft thrust washers for scoring, scratches, wear or blueing. If either condition exist replace the thrust washers.
5. Inspect the oil pan gasket/windage tray for splits, tears or cracks in the gasket sealing surfaces. Replace gasket as necessary.

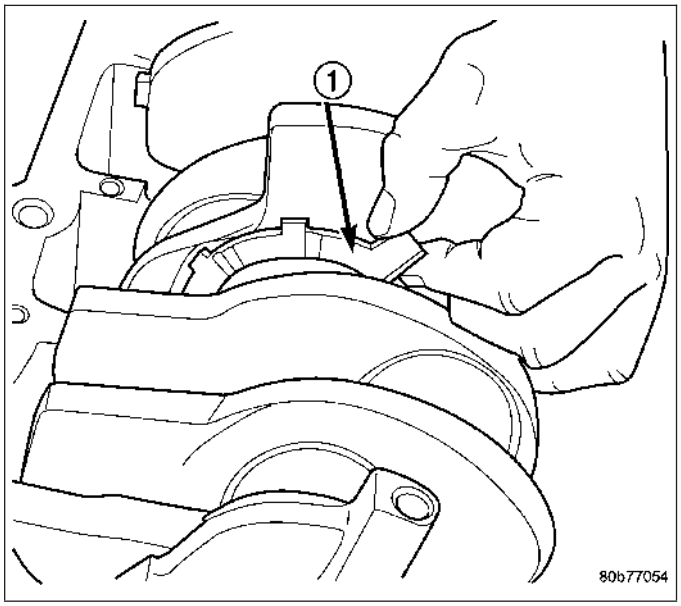
INSTALLATION

CAUTION: Main bearings are select fit. Refer to Crankshaft Main Bearings in this section for proper bearing selections.

CAUTION: When installing crankshaft, use care not to damage bearing surfaces on the crankshaft.

NOTE: Apply sealant to the tone wheel retaining screws prior to installation.

1. Lubricate upper main bearing halves with clean engine oil.
2. Install the crankshaft tone wheel. Torque the mounting screws to 15 N·m (11 ft. lbs.).
3. Position crankshaft in cylinder block.
4. Install the thrust washers (1).

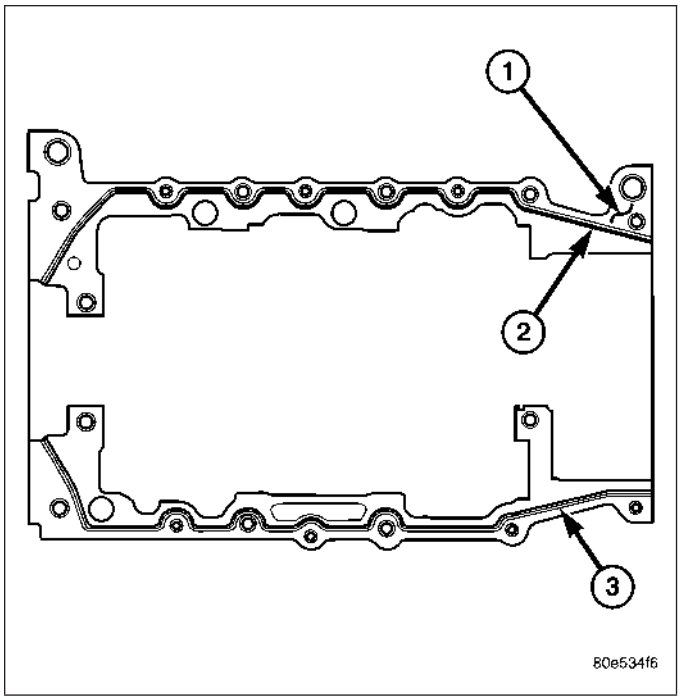


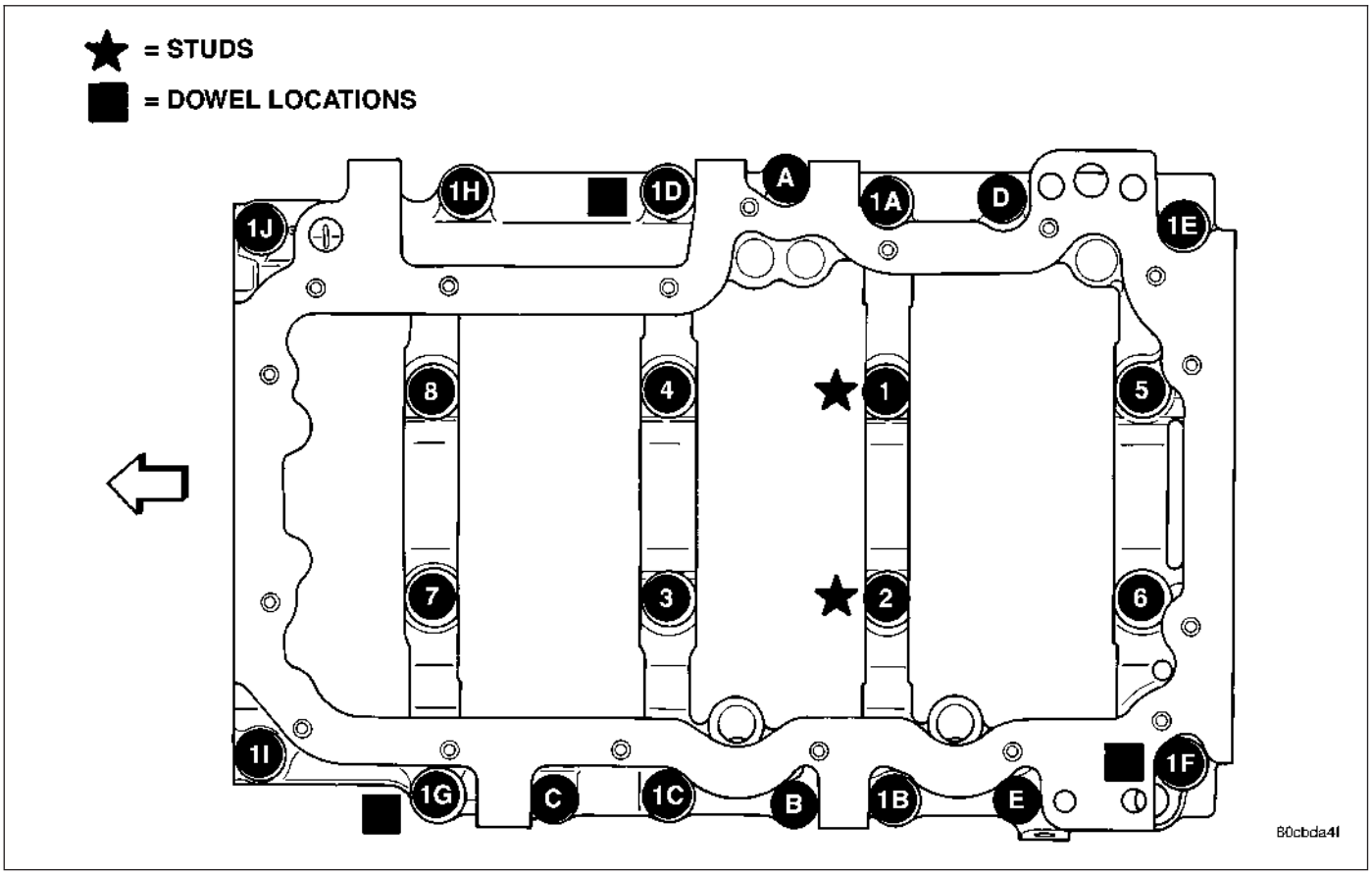
CAUTION: The bedplate to cylinder block mating surface must be coated with Mopar® Engine RTV sealant prior to installation. Failure to do so will cause severe oil leaks.

NOTE: Make sure that the bedplate and cylinder block sealing surfaces are clean and free of oil or other contaminants. Contaminants on the sealing surfaces may cause main bearing distortion and/or oil leaks.

5. Apply a 2.5mm (0.100 inch) bead of Mopar® Engine RTV sealant to the cylinder block-to-bedplate mating surface (1) and (2).
6. Coat the crankshaft main bearing journals with clean engine oil and position the bedplate onto the cylinder block.

NOTE: Lubricate the bedplate retaining bolts with clean engine oil prior to installation.





7. Install the bedplate retaining bolts, making sure to place the stud bolts in the correct location, Torque the bolts in the sequence shown.
   - Hand tighten bolts **1D,1G and 1F** until the bedplate contacts the block.
   - Tighten bolts **1A - 1J** to 54 N·m (40 ft. lbs.)
   - Tighten bolts **1 - 8** to 7 N·m (5 ft. lbs.)
   - Turn bolts **1 - 8** an additional 90°.

- Tighten bolts **A - E** 27 N·m (20 ft. lbs.).

8. Measure crankshaft end play.
9. Install the connecting rods and measure side clearance (Refer to 9 - ENGINE/ENGINE BLOCK/PISTON & CONNECTING ROD - STANDARD PROCEDURE).
10. Install oil pump (Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - INSTALLATION).
11. Install the engine (Refer to 9 - ENGINE - INSTALLATION).

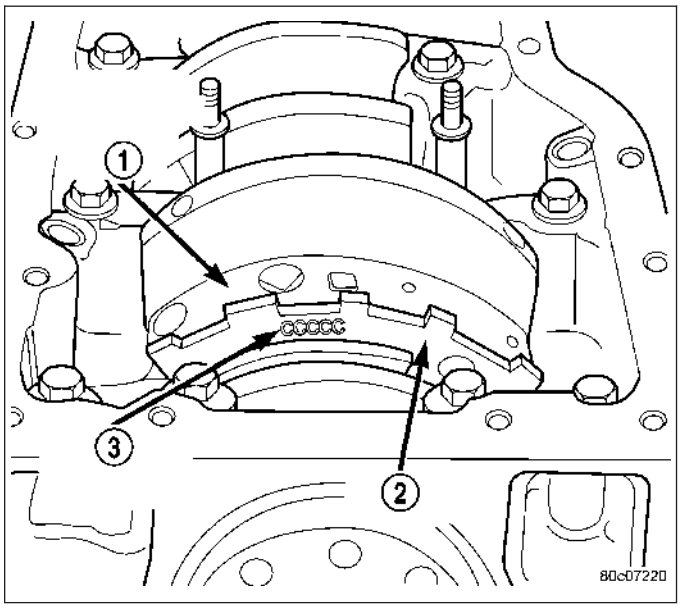
BEARINGS-CRANKSHAFT MAIN

STANDARD PROCEDURE

MAIN BEARING FITTING

SELECT FIT IDENTIFICATION

The main bearings are “select fit” to achieve proper oil clearances. For main bearing selection, the crankshaft position sensor target wheel (2) has grade identification marks (3) stamped into it. These marks are read from left to right, corresponding with journal number 1, 2, 3, 4. The crankshaft position sensor target wheel (2) is mounted to the number 6 counter weight (1) on the crankshaft.



INSPECTION

Wipe the inserts clean and inspect for abnormal wear patterns and for metal or other foreign material imbedded in the lining. Normal main bearing insert wear patterns are illustrated.

Inspect the back of the inserts for fractures, scrapings or irregular wear patterns.

Inspect the upper insert locking tabs for damage.

Replace all damaged or worn bearing inserts.

MAIN BEARING JOURNAL DIAMETER (CRANKSHAFT REMOVED)

Remove the crankshaft from the cylinder block (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT - REMOVAL).

Clean the oil off the main bearing journal.

Determine the maximum diameter of the journal with a micrometer. Measure at two locations 90° apart at each end of the journal.

The maximum allowable taper is 0.008mm (0.0004 inch.) and maximum out of round is 0.005mm (0.002 inch). Compare the measured diameter with the journal diameter specification (Main Bearing Fitting Chart). Select inserts required to obtain the specified bearing-to-journal clearance.

Install the crankshaft into the cylinder block (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT - INSTALLATION).

Check crankshaft end play.

CRANKSHAFT MAIN BEARING SELECTION

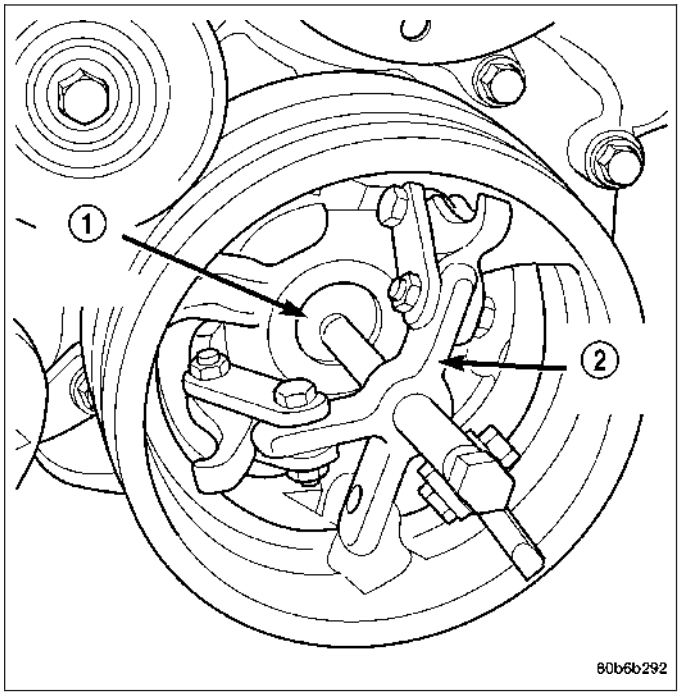
1. Service main bearings are available in four grades. The chart below identifies the four service grades available.

Crankshaft Marking	**JOURNAL SIZE SIZE mm (in.)**	
″R″ Size	63.488 - 63.496 mm (2.4995 - 2.4998 in.)	
″S″ Size	63.496 - 63.500 mm (2.4998 - 2.4999 in.)	
″T″ Size	63.500 - 63.504 mm (2.4999 - 2.501 in.)	
″U″ Size	63.504 - 63.512 mm (2.5001 - 2.5004 in.)	
Bearing size		
Bearing Code	Size	Application
Upper Bearing		
A	.2.443 - 2.447 mm (.0961 - .0963 in.)	Use with crankshaft size ″R″
B	2.439 - 2.443 mm (0.960 - .0961 in.)	Use with crankshaft ″S, T″
C	2.435 - 2.439 mm (.0958 - .0960 in.)	Use with crankshaft ″U″
Lower Bearing Main ″1″ and ″4″		
″1″	2.441 - 2.447 mm (.0961 -.0963 in.)	Use with crankshaft ″R, S″
″2″	2.435 - 2.441 mm (.0958 - .0962 in.)	Use with crankshaft ″T, U″
Lower Main Bearing ″2″ and ″3″		
″3″	2.429 - 2.435 mm (.0956 - .0958 in.)	Use with crankshaft ″R, S″
″4″	2.423 - 2.429 mm (.0953 - .0956 in.)	Use with crankshaft ″T, U″
Bearing Clearances		
Main ″1, 4″		
Crankshaft ″R″	.004 - .034 mm (.00015 - .0013 in.)	
Crankshaft ″S″	.004 - .030 mm (.00015 - .0011 in.)	
Crankshaft ″T″	.006 - .032 mm (.0002 - .0012 in.)	
Crankshaft ″U″	.002 - .032 mm (.00007 -. 0012 in.)	
Main ″2, 3″		
Crankshaft ″R″	.016 - .046 mm (.0006 - .0018 in.)	
Crankshaft ″S″	.016 - .042 mm (.00062 - .016 in.)	
Crankshaft ″T″	.018 - .044 mm (.0007 - .0017 in.)	
Crankshaft ″U″	.014 - .044 mm (.0005 - .0017 in.)	

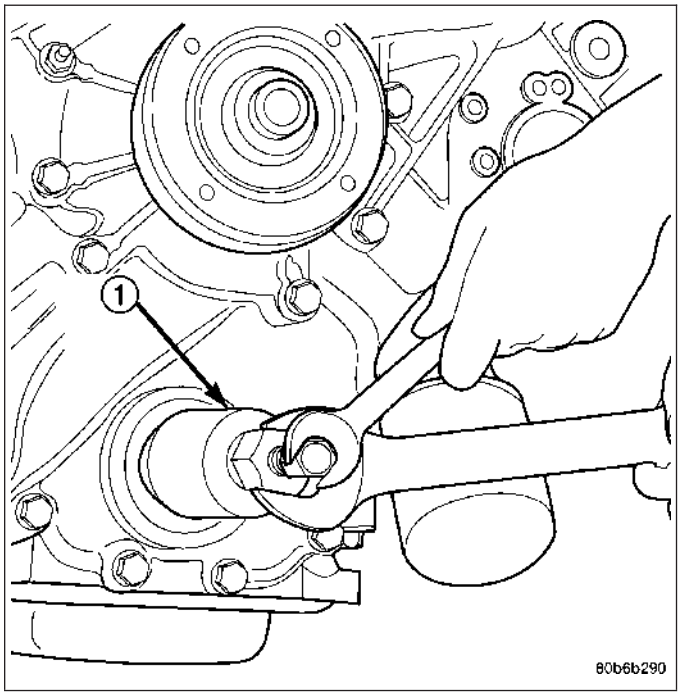
SEAL-CRANKSHAFT OIL - FRONT

REMOVAL

1. Disconnect negative cable from battery.
2. Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
3. Remove A/C compressor mouning fasteners and set aside.
4. Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
5. Remove upper radiator hose.
6. Disconnect electrical connector for fan mounted inside radiator shroud.
7. Remove radiator cooling fan (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - REMOVAL).
8. Remove crankshaft damper bolt.
9. Remove damper using Special Tools 8513 Insert (1) and Tool 1026 Three Jaw Puller (2).



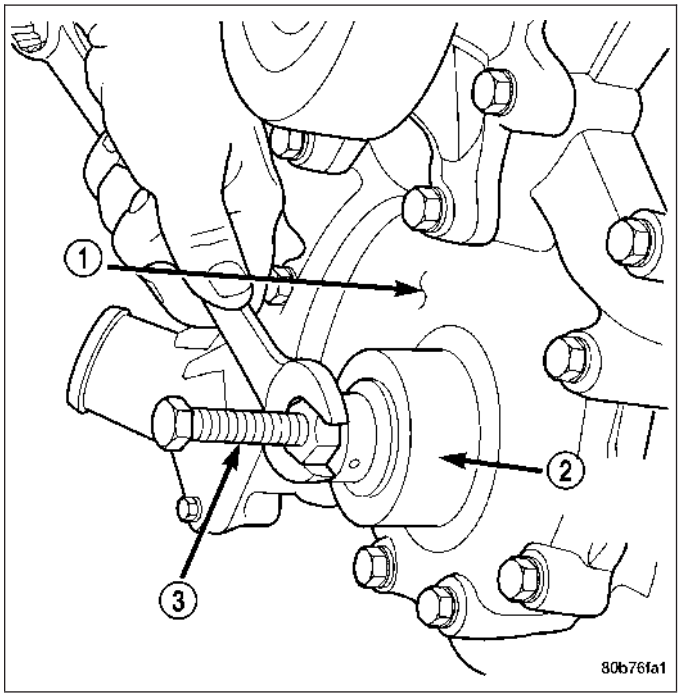
10. Using Special Tool 8511 (1), remove crankshaft front seal.



INSTALLATION

CAUTION: To prevent severe damage to the Crankshaft, Damper or Special Tool 8512, thoroughly clean the damper bore and the crankshaft nose before installing Damper.

1. Using Special Tool 8348 (2) and 8512 (3) , install crankshaft front seal.
2. Install vibration damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION).
3. Install radiator cooling fan and shroud (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - INSTALLATION).
4. Install upper radiator hose.
5. Install A/C compressor and tighten fasteners to 54 N·m (40 ft. lbs.).
6. Install accessory drive belt (Refer to 7 - COOLING/ ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).
7. Refill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
8. Connect negative cable to battery.



CRANKSHAFT OIL SEAL - REAR

DIAGNOSIS AND TESTING - REAR SEAL AREA LEAKS

Since it is sometimes difficult to determine the source of an oil leak in the rear seal area of the engine, a more involved inspection is necessary. The following steps should be followed to help pinpoint the source of the leak.

If the leakage occurs at the crankshaft rear oil seal area:

1. Disconnect the battery.
2. Raise the vehicle.
3. Remove torque converter or clutch housing cover and inspect rear of block for evidence of oil. Use a black light to check for the oil leak:
   a. Circular spray pattern generally indicates seal leakage or crankshaft damage.
   b. Where leakage tends to run straight down, possible causes are a porous block, distributor seal, camshaft bore cup plugs, oil galley pipe plugs, oil filter runoff, and main bearing cap to cylinder block mating surfaces. See Engine, for proper repair procedures of these items.
4. If no leaks are detected, pressurized the crankcase as outlined in the section, Inspection (Engine oil Leaks in general)

CAUTION: Do not exceed 20.6 kPa (3 psi).

5. If the leak is not detected, very slowly turn the crankshaft and watch for leakage. If a leak is detected between the crankshaft and seal while slowly turning the crankshaft, it is possible the crankshaft seal surface is damaged. The seal area on the crankshaft could have minor nicks or scratches that can be polished out with emery cloth.

CAUTION: Use extreme caution when crankshaft polishing is necessary to remove minor nicks or scratches. The crankshaft seal flange is specially machined to complement the function of the rear oil seal.

6. For bubbles that remain steady with shaft rotation, no further inspection can be done until disassembled. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING), under the Oil Leak row, for components inspections on possible causes and corrections.
7. After the oil leak root cause and appropriate corrective action have been identified, (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT OIL SEAL - REAR - REMOVAL).

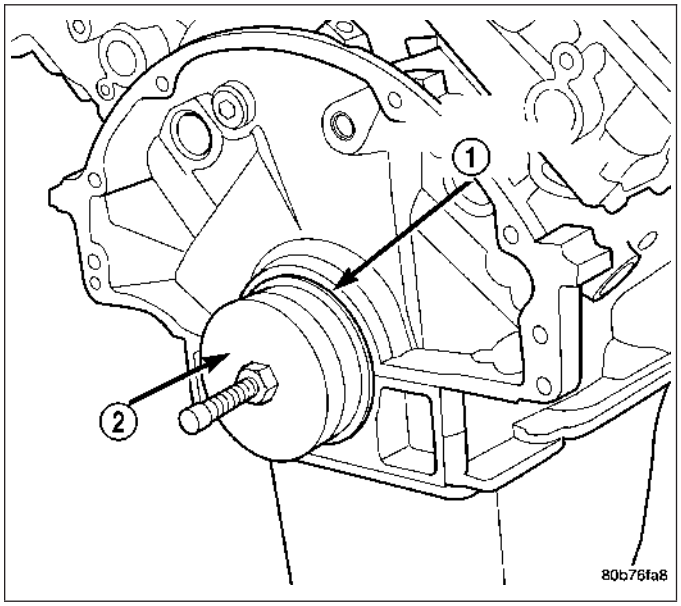
REMOVAL

NOTE: This procedure can be performed in vehicle.

1. If being preformed in vehicle, remove the transmission.
2. Remove the flexplate (Refer to 9 - ENGINE/ENGINE BLOCK/FLEX PLATE - REMOVAL).

NOTE: The crankshaft oil seal (1) CAN NOT be reused after removal.

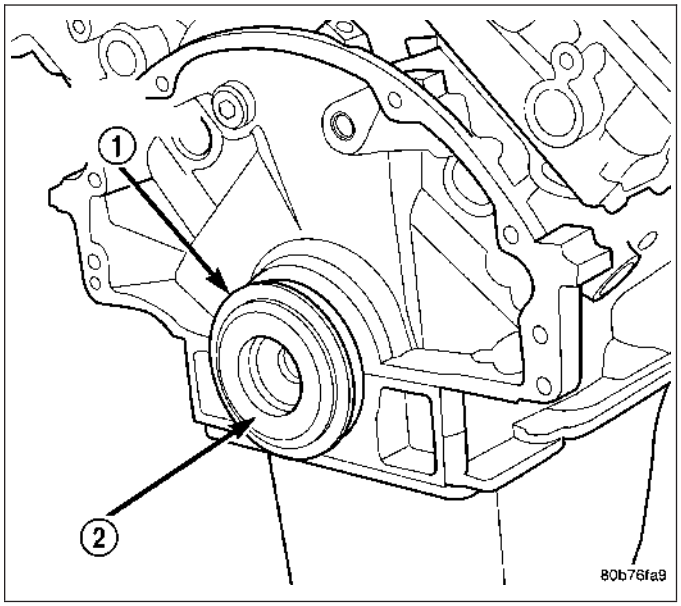
NOTE: The crankshaft rear oil seal remover Special Tool 8506 (2) must be installed deeply into the seal. Continue to tighten the removal tool into the seal until the tool can not be turned farther. Failure to install tool correctly the first time will cause tool to pull free of seal without removing seal from engine.



3. Using Special Tool 8506 (2) , remove the crankshaft rear oil seal (1).

INSTALLATION

1. Lubricate the crankshaft flange with engine oil.
2. Position the magnetic seal guide Special Tool 8349-2 (2) onto the crankshaft rear face. Then position the crankshaft rear oil seal (1) onto the guide.



3. Using Special Tools 8349 Crankshaft Rear Oil Seal Installer (2) and C-4171 Driver Handle (3), with a hammer, tap the seal (1) into place. Continue to tap on the driver handle until the seal installer seats against the cylinder block crankshaft bore.
4. Install the flexplate (Refer to 9 - ENGINE/ENGINE BLOCK/FLEX PLATE - INSTALLATION).
5. Install the transmission.

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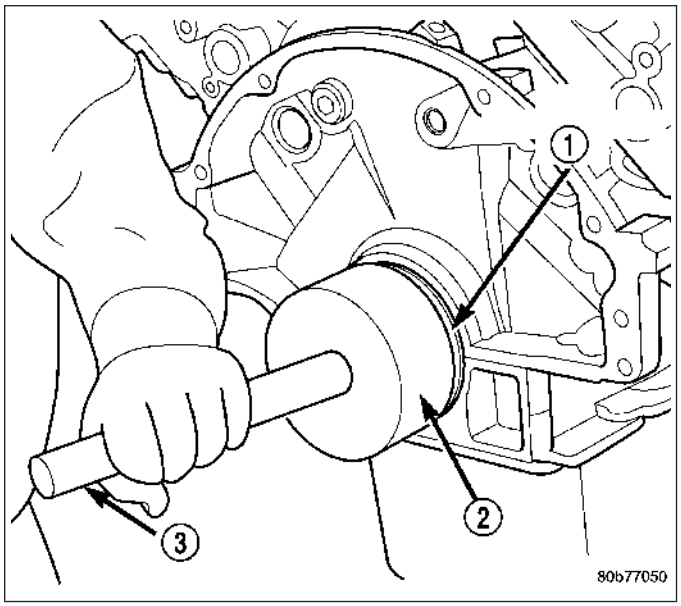
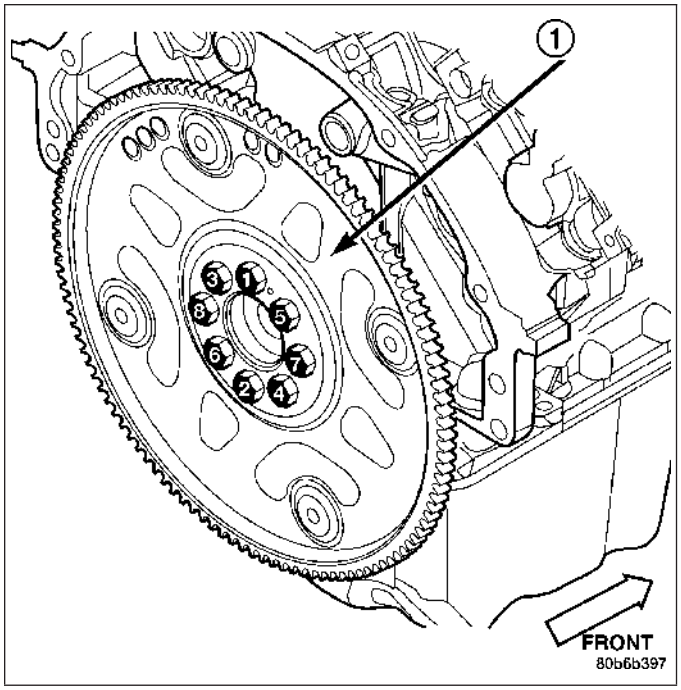


FLEX PLATE

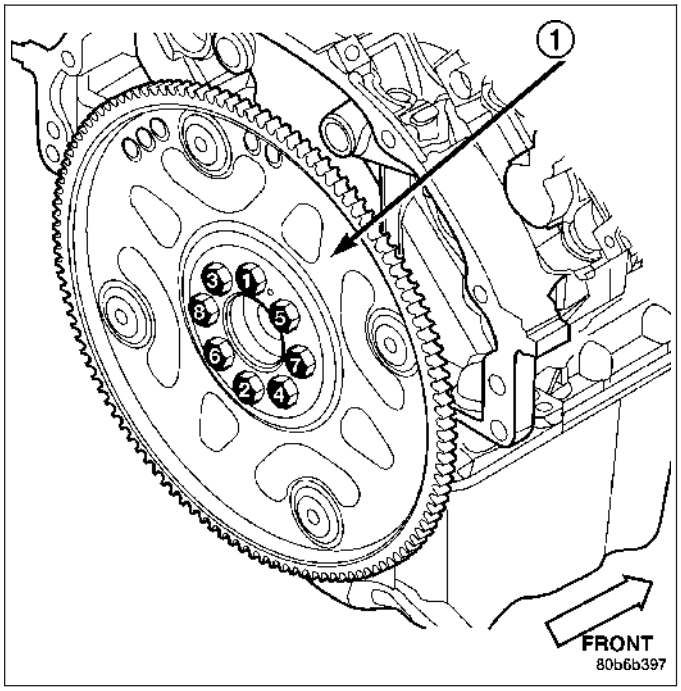
REMOVAL

1. Remove the transmission. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - REMOVAL).
2. Remove the bolts using the sequence provided.
3. Remove the flexplate.



INSTALLATION

1. Position the flexplate onto the crankshaft and install the bolts hand tight.
2. Tighten the flexplate retaining bolts to 95 N·m (70 ft. lbs.) in the sequence shown.
3. Install the transmission. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - INSTALLATION).

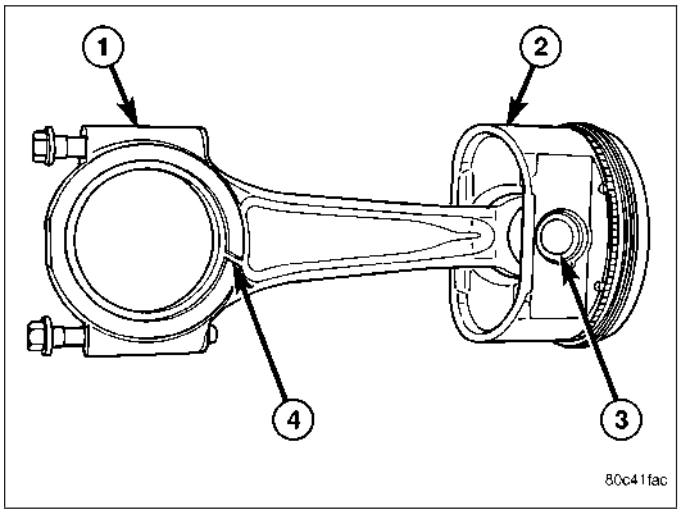


ROD-PISTON & CONNECTING

DESCRIPTION

CAUTION: Do not use a metal stamp to mark connecting rods as damage may result, instead use ink or a scratch awl.

The pistons (2) are made of a high strength aluminum alloy. The connecting rods are made of forged powdered metal, with a “fractured cap” design (1). A full floating piston pin (3) is used to attach the piston to the connecting rod.



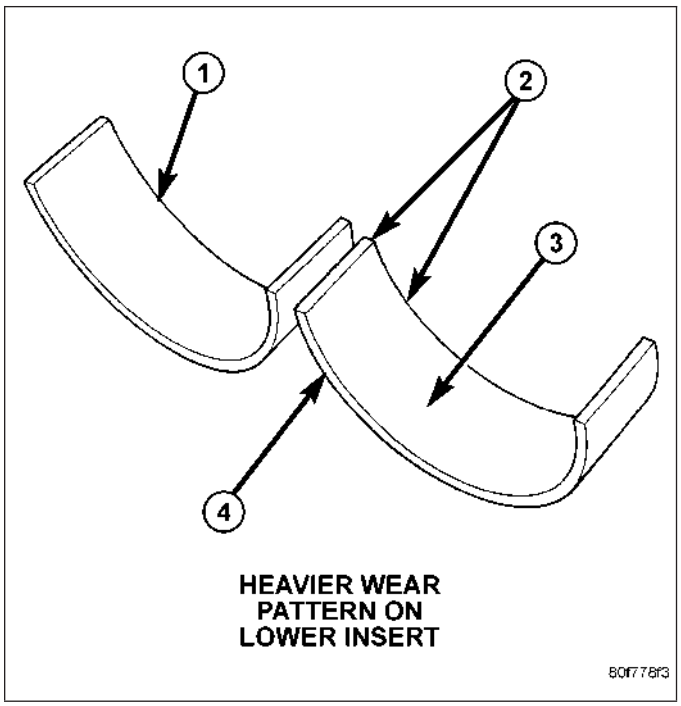
STANDARD PROCEDURE

CONNECTING ROD BEARING FITTING

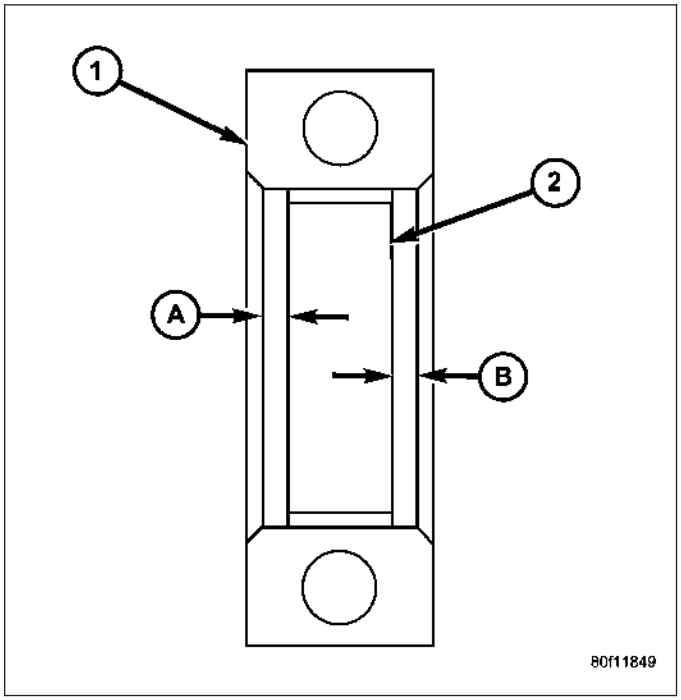
Inspect the connecting rod bearings for scoring (10 and (3). Check the bearings for normal wear patterns, scoring, grooving, fatigue and pitting. Replace any bearing that shows abnormal wear.

Inspect the connecting rod journals for signs of scoring, nicks and burrs.

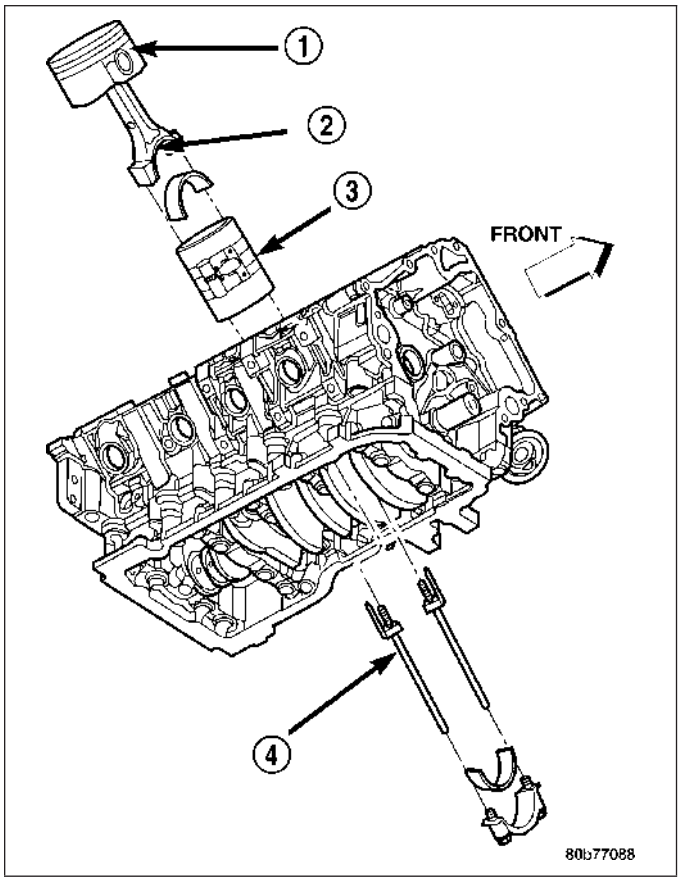
Misaligned or bent connecting rods can cause abnormal wear on pistons, piston rings, cylinder walls, connecting rod bearings and crankshaft connecting rod journals. If wear patterns or damage to any of these components indicate the probability of a misaligned connecting rod, inspect it for correct rod alignment. Replace misaligned, bent or twisted connecting rods.



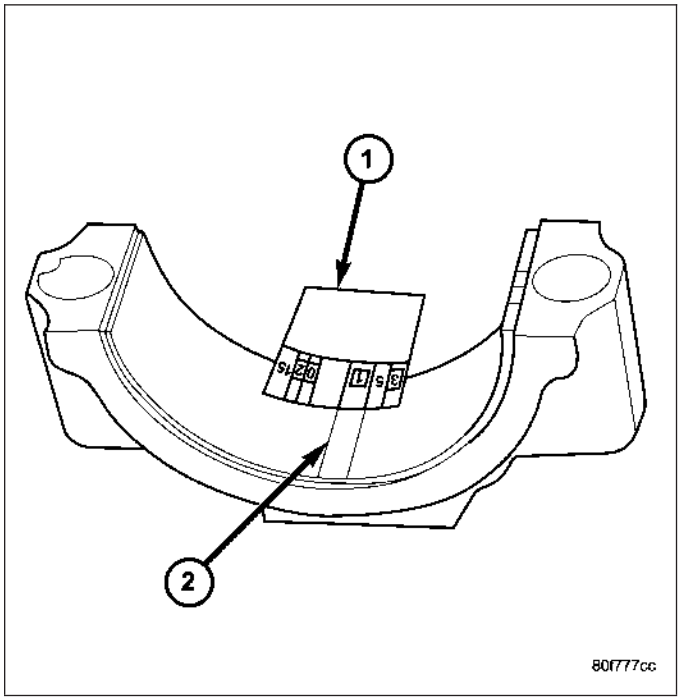
1. Wipe the oil from the connecting rod journal.
2. Lubricate the upper bearing insert (2) and position in connecting rod (1). Center bearing insert in connecting rod
3. Measure at point A and point B. Measurement should be less then .50mm (.0196 in.).



4. Use piston ring compressor (3) and Guide Pins Special Tool 8507 (4) to install the rod and piston assemblies. The oil slinger slots in the rods must face front of the engine. The “F”’s (1) near the piston wrist pin bore should point to the front of the engine.



5. Install the lower bearing insert in the bearing cap. Center bearing insert in connecting rod. The lower insert must be dry. Place strip of Plastigage (1) across full width of the lower insert at the center of bearing cap. Plastigage must not crumble in use. If brittle, obtain fresh stock.
6. Install bearing cap and connecting rod on the journal and tighten bolts to 27 N·m (20 ft. lbs.) plus a 90° turn. DO NOT rotate crankshaft. Plastigage will smear, resulting in inaccurate indication.
7. Remove the bearing cap and determine amount of bearing-to-journal clearance by measuring the width of compressed Plastigage (2). Refer to Engine Specifications for the proper clearance. **Plastigage should indicate the same clearance across the entire width of the insert. If the clearance varies, it may be caused by either a tapered journal, bent connecting rod or foreign material trapped between the insert and cap or rod.**
8. If the correct clearance is indicated, replacement of the bearing inserts is not necessary. Remove the Plastigage from crankshaft journal and bearing insert. Proceed with installation.



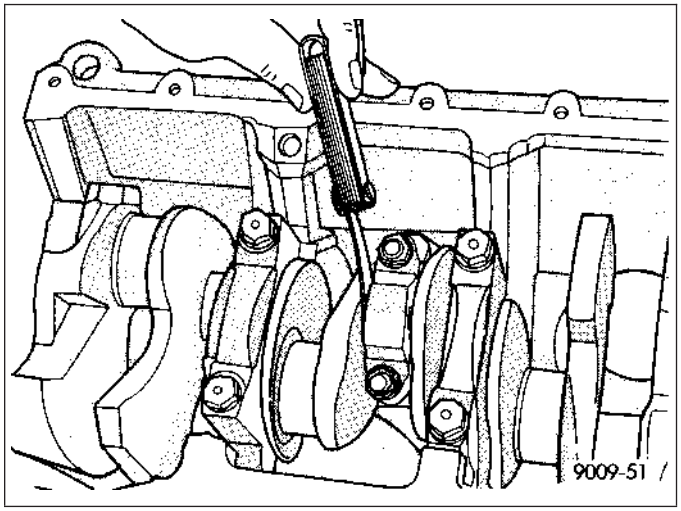
9. If bearing-to-journal clearance exceeds the specification, determin which services bearing set to use the bearing sizes are as follows:

Bearing Mark	SIZE	USED WITH JOURNAL SIZE
.025 US	.025 mm (.001 in.)	57.883-57.867 mm (2.2788-2.2783 in.)
Std.	STANDARD	57.908-57.892 mm (2.2798-2.2792 in.)
.250 US	.250 mm (.010 in.)	57.658-57.646 mm (2.2700-2.2695 in.)

CAUTION: Connecting Rod Bolts are Torque to Yield Bolts and Must Not Be Reused. Always replace the Rod Bolts whenever they are loosened or removed.

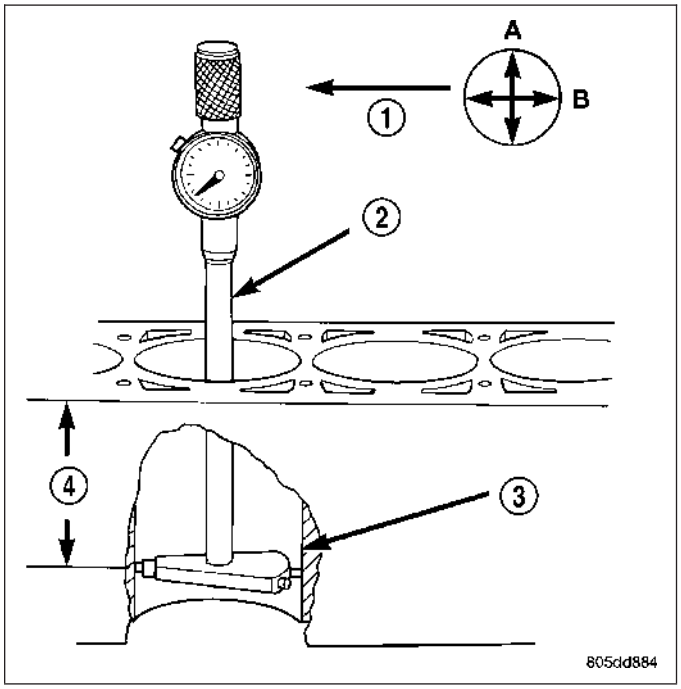
10. Repeat the Plastigage measurement to verify your bearing selection prior to final assembly.
11. Once you have selected the proper insert, install the insert and cap. Tighten the connecting rod bolts to 27 N·m (20 ft. lbs.) plus a 90° turn.

Slide snug-fitting feeler gauge between the connecting rod and crankshaft journal flange. Refer to Engine Specifications for the proper clearance. Replace the connecting rod if the side clearance is not within specification.

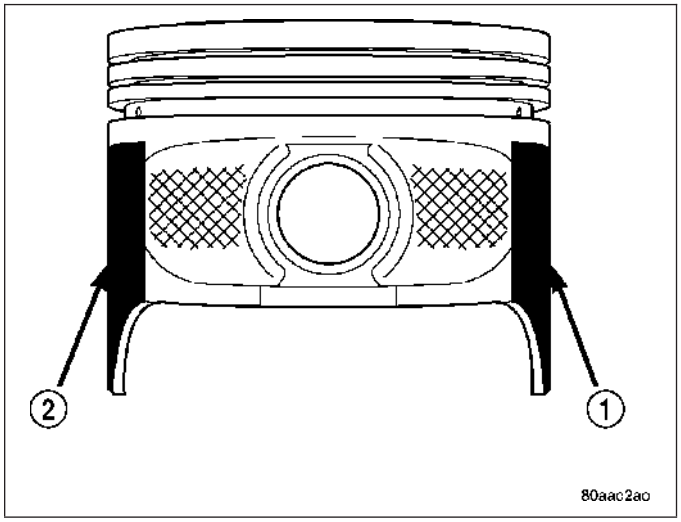


PISTON FITTING

1. To correctly select the proper size piston, a cylinder bore gauge (2), capable of reading in 0.003 mm (.0001 in.) INCREMENTS is required. If a bore gauge is not available, do not use an inside micrometer.
2. Measure the inside diameter of the cylinder bore at a point 38.0 mm (1.5 inches) below top of bore (4). Start perpendicular (across or at 90 degrees) to the axis of the crankshaft at point A and then take an additional bore reading 90 degrees to that at point B.



3. The coated pistons will be serviced with the piston pin and connecting rod pre-assembled.
4. The coating material (1) and (2) is applied to the piston after the final piston machining process. Measuring the outside diameter of a coated piston will not provide accurate results. Therefore measuring the inside diameter of the cylinder bore with a dial Bore Gauge is **MANDATORY**. To correctly select the proper size piston, a cylinder bore gauge capable of reading in 0.003 mm (.0001 in.) increments is required.
5. Piston installation into the cylinder bore requires slightly more pressure than that required for non-coated pistons. The bonded coating on the piston will give the appearance of a line-to-line fit with the cylinder bore.



REMOVAL

1. Disconnect negative cable from battery.
2. Remove the following components:
   - Oil pan and gasket/windage tray (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).
   - Cylinder head(s) (Refer to 9 - ENGINE/CYLINDER HEAD - REMOVAL) and (Refer to 9 - ENGINE/CYLINDER HEAD - REMOVAL).
3. If necessary, remove top ridge of cylinder bores with a reliable ridge reamer before removing pistons from cylinder block. **Be sure to keep tops of pistons covered during this operation.** Pistons and connecting rods must be removed from top of cylinder block. When removing piston and connecting rod assemblies from the engine, rotate crankshaft so the each connecting rod is centered in cylinder bore.

CAUTION: DO NOT use a number stamp or a punch to mark connecting rods or caps, as damage to connecting rods could occur

NOTE: Connecting rods and bearing caps are not interchangeable and should be marked before removing to ensure correct reassembly.

4. Mark connecting rod and bearing cap positions using a permanent ink marker or scribe tool.

CAUTION: Care must be taken not to damage the fractured rod and cap joint face surfaces, as engine damage may occur.

5. Remove connecting rod cap. Install Special Tool 8507 Connecting Rod Guides into the connecting rod being removed. Remove piston from cylinder bore. Repeat this procedure for each piston being removed.

CAUTION: Care must be taken not to nick crankshaft journals, as engine damage may occur

6. Immediately after piston and connecting rod removal, install bearing cap on the mating connecting rod to prevent damage to the fractured cap and rod surfaces.

CLEANING

CAUTION: DO NOT use a wire wheel or other abrasive cleaning devise to clean the pistons or connecting rods. The pistons have a Moly coating, this coating must not be damaged.

1. Using a suitable cleaning solvent clean the pistons in warm water and towel dry.
2. Use a wood or plastic scraper to clean the ring land grooves.

CAUTION: DO NOT remove the piston pin from the piston and connecting rod assembly.

INSPECTION

Check the connecting rod journal for excessive wear, taper and scoring (Refer to 9 - ENGINE/ENGINE BLOCK/ PISTON & CONNECTING ROD - STANDARD PROCEDURE)

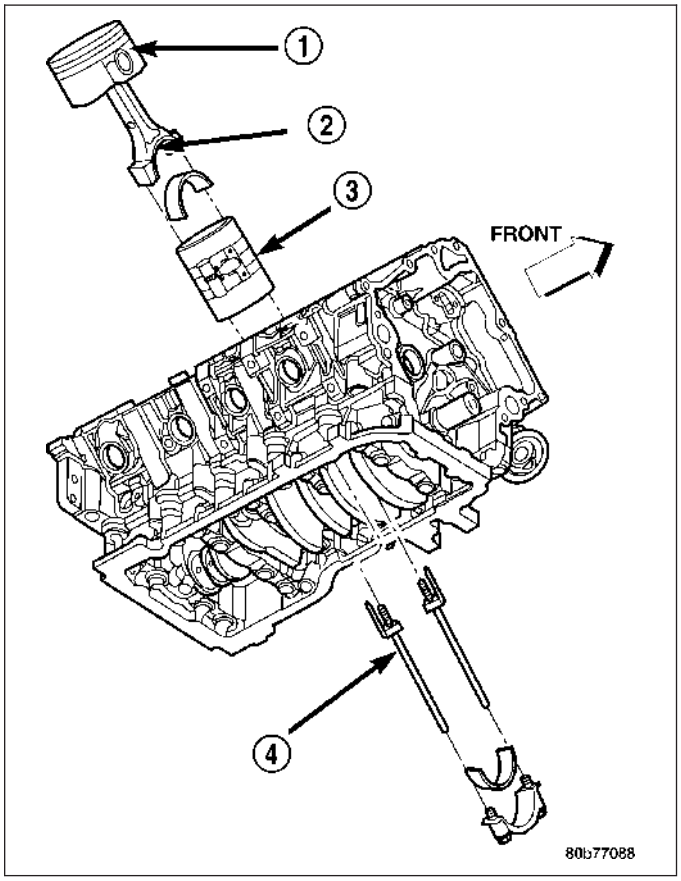
Check the connecting rod for signs of twist or bending.

Check the piston for taper and elliptical shape before it is fitted into the cylinder bore (Refer to 9 - ENGINE/ENGINE BLOCK/PISTON & CONNECTING ROD - STANDARD PROCEDURE).

Check the piston for scoring, or scraping marks in the piston skirts. Check the ring lands for cracks and/or deterioration.

INSTALLATION

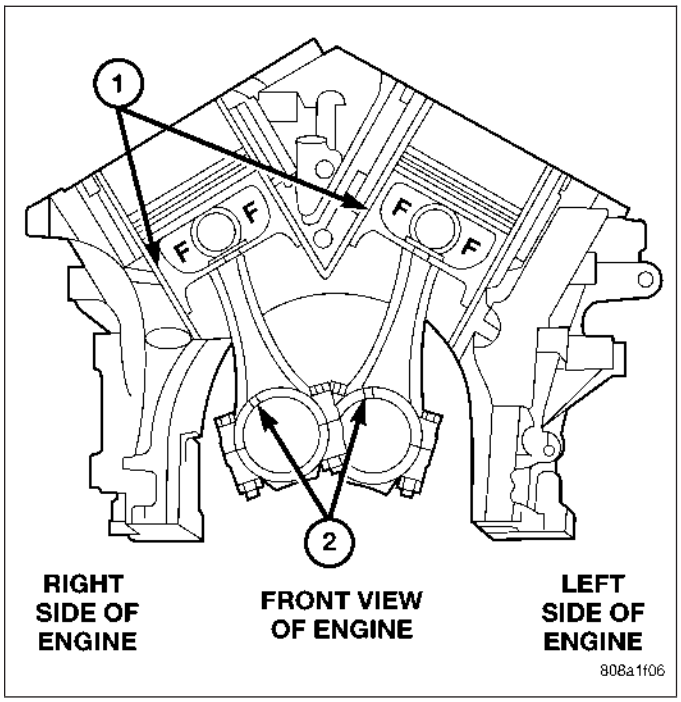
1. Before installing piston and connecting rod assemblies into the bore, install the piston rings.
2. Immerse the piston head and rings in clean engine oil. Position a ring compressor (3) over the piston and rings. Tighten ring compressor (3). **Ensure position of rings do not change during this operation.**
3. Position bearing onto connecting rod. Ensure that hole in bearing shell aligns with hole in connecting rod. Lubricate bearing surface with clean engine oil.
4. Install Special Tool 8507 Connecting Rod Guides (4) into connecting rod bolt threads.



5. The pistons are marked on the piston pin bore surface with an raised “F” (1) indicating installation position. This mark must be pointing toward the front of engine on both cylinder banks. The connecting rod oil slinger slot faces the front of the engine.
6. Wipe cylinder bore clean and lubricate with engine oil.
7. Rotate crankshaft until connecting rod journal is on the center of cylinder bore. Insert rod and piston into cylinder bore and carefully position connecting rod guides over crankshaft journal.
8. Tap piston down in cylinder bore using a hammer handle. While at the same time, guide connecting rod into position on rod journal.

CAUTION: Connecting Rod Bolts are Torque to Yield Bolts and Must Not Be Reused. Always replace the Rod Bolts whenever they are loosened or removed.

9. Lubricate rod bolts and bearing surfaces with engine oil. Install connecting rod cap and bearing. Tighten bolts to 27 N·m (20 ft. lbs.) plus 90°.
10. Install the following components:



- Cylinder head(s) (Refer to 9 - ENGINE/CYLINDER HEAD - INSTALLATION).
- Timing chain and cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).
- Cylinder head covers (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).
- Oil pan and gasket/windage tray. (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).

11. Fill crankcase with proper engine oil to correct level.
12. Connect negative cable to battery.

RINGS-PISTON

STANDARD PROCEDURE

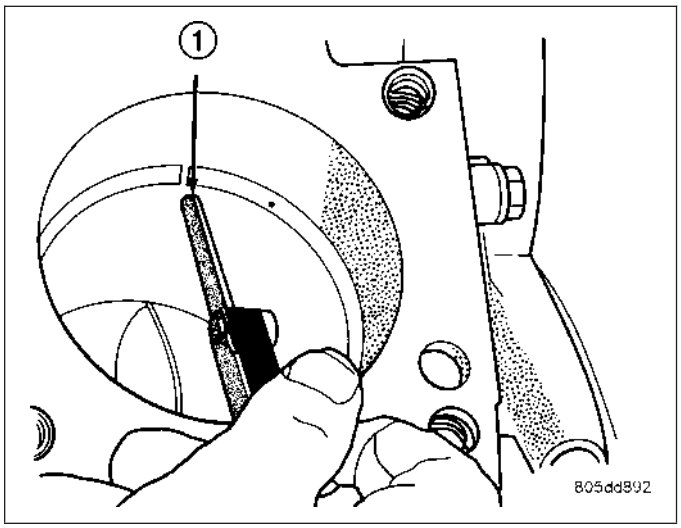
PISTON RING FITTING

Before reinstalling used rings or installing new rings, the ring clearances must be checked.

1. Wipe the cylinder bore clean.
2. Insert the ring in the cylinder bore.

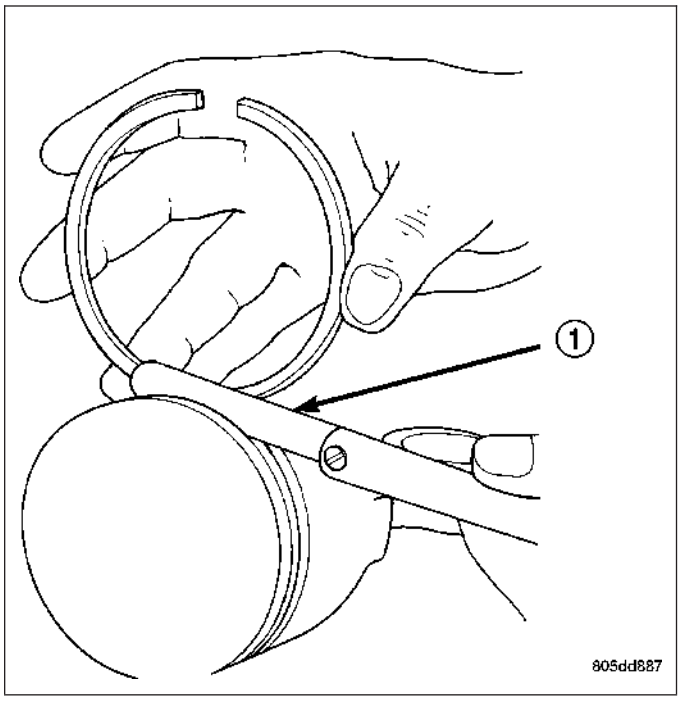
NOTE: The ring gap measurement must be made with the ring positioned at least 12mm (0.50 inch.) from bottom of cylinder bore.

3. Using a piston, to ensure that the ring is squared in the cylinder bore, slide the ring downward into the cylinder.
4. Using a feeler gauge (1), check the ring end gap. Replace any rings not within specification.



PISTON RING SIDE CLEARANCE

NOTE: Make sure the piston ring grooves are clean and free of nicks and burrs.

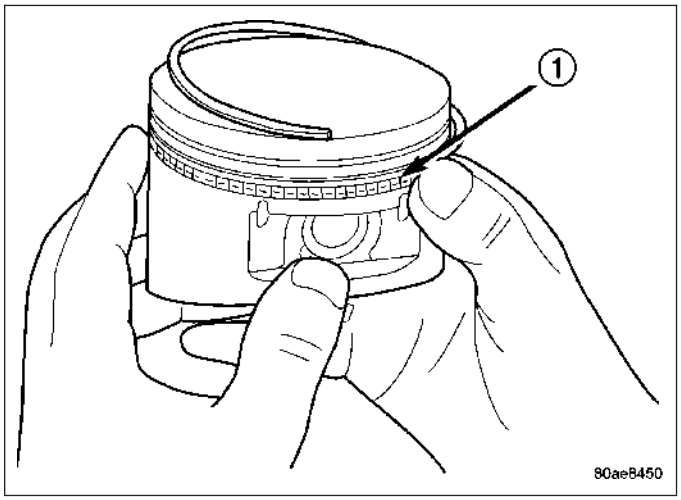


PISTON RING SPECIFICATION CHART

Ring Position	Groove Clearance	Maximum Clearance
Upper Ring	.051-.094 mm (0.0020-.0037 in.)	0.11 mm (0.004 in.)
Intermediate Ring	0.04-0.08 mm (0.0016-0.0031 in.)	0.10 mm (0.004 in.)
Oil Control Ring (Steel Rails)	.019-.229 mm (.0007-.0090 in.)	.25 mm (0.010 in.)
Ring Position	**Ring Gap**	**Wear Limit**
Upper Ring	0.20-0.36 mm (0.0079-0.0142 in.)	0.43 mm (0.0017 in.)
Intermediate Ring	0.37-0.63 mm (0.0146-0.0249 in.)	0.74 mm (0.029 in.)
Oil Control Ring (Steel Rail)	0.025-0.76 mm (0.0099- 0.03 in.)	1.55 mm (0.061 in.)

5. Measure the ring side clearance as shown make sure the feeler gauge (1) fits snugly between the ring land and the ring. Replace any ring not within specification.

6. Rotate the ring around the piston, the ring must rotate in the groove with out binding.
7. The No. 1 and No. 2 piston rings have a different cross section. Ensure No. 2 ring is installed with manufacturers I.D. mark (Dot) facing up, towards top of the piston.

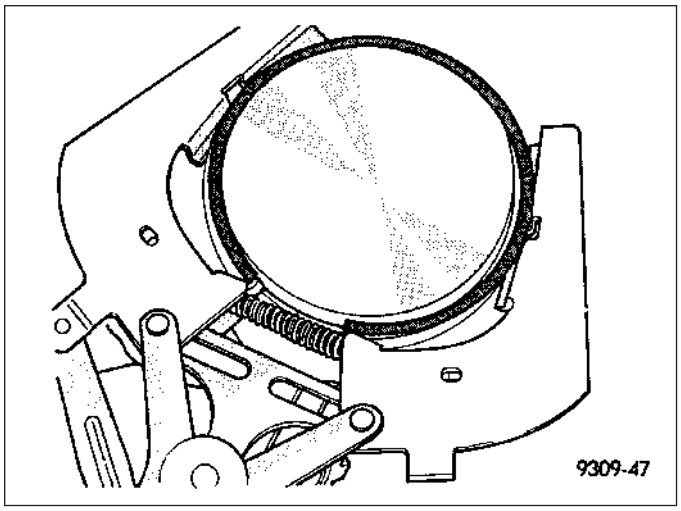


NOTE: Piston rings are installed in the following order:

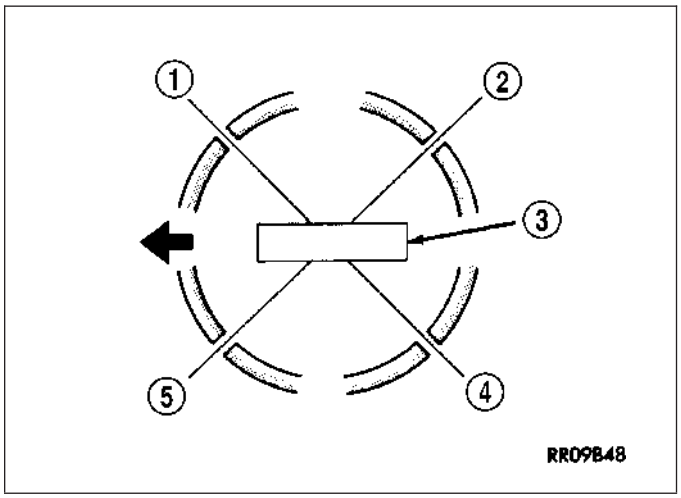
- **Oil ring expander.**
- **Upper oil ring side rail (1).**
- **Lower oil ring side rail.**
- **No. 2 Intermediate piston ring.**
- **No. 1 Upper piston ring.**

8. Install the oil ring expander.
9. Install upper side rail by placing one end between the piston ring groove and the expander ring. Hold end firmly and press down the portion to be installed until side rail is in position. Repeat this step for the lower side rail.

10. Install No. 2 intermediate piston ring using a piston ring installer.
11. Install No. 1 upper piston ring using a piston ring installer.



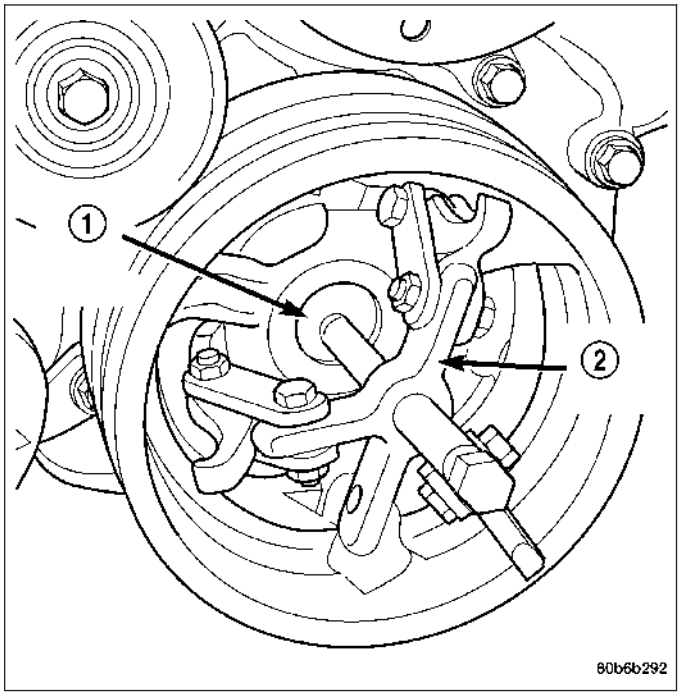
12. Position piston ring end gaps as shown in. It is important that expander ring gap is at least 45° from the side rail gaps, but not on the piston pin center or on the thrust direction.



DAMPER-CRANKSHAFT

REMOVAL

1. Disconnect negative cable from battery.
2. Remove radiator fan (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - REMOVAL).
3. Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
4. Remove crankshaft damper bolt.
5. Remove damper using Special Tools 8513 Insert (1) and 1026 Three Jaw Puller (2).

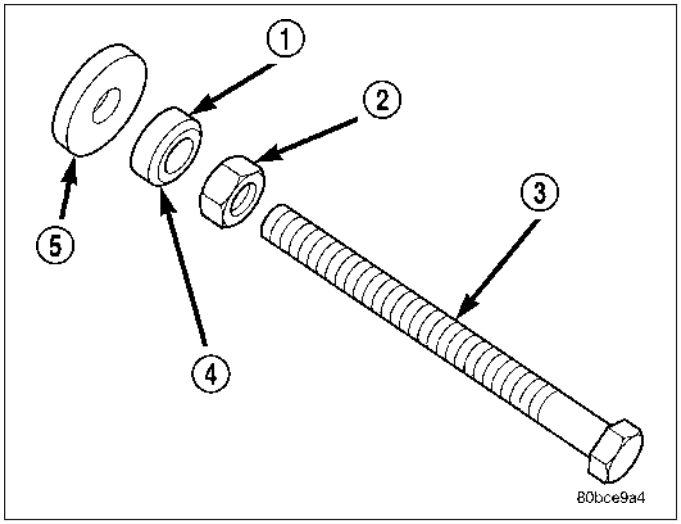


INSTALLATION

CAUTION: To prevent severe damage to the Crankshaft, Damper or Special Tool 8512–A, thoroughly clean the damper bore and the crankshaft nose before installing Damper.

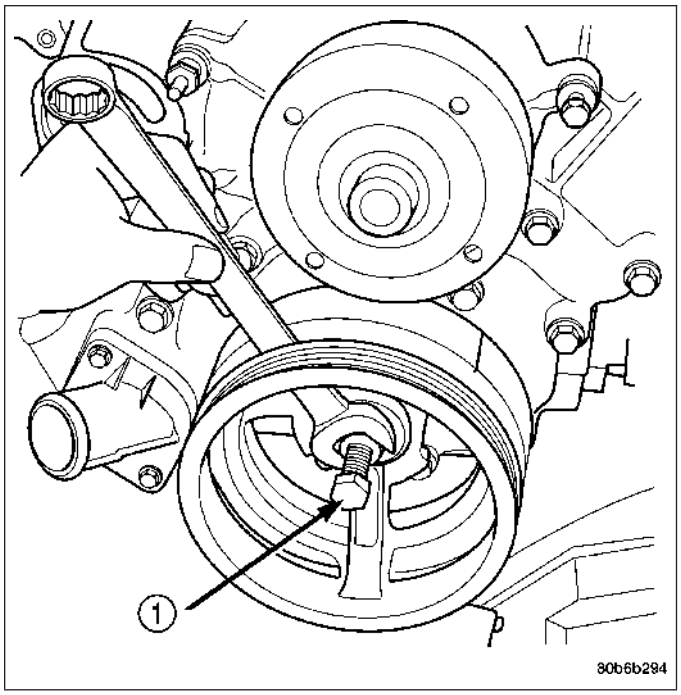
1. Align crankshaft damper slot with key in crankshaft. Slide damper onto crankshaft slightly.

CAUTION: Special Tool 8512–A, is assembled in a specific sequence. Failure to assemble this tool in this sequence can result in tool failure and severe damage to either the tool or the crankshaft.



2. Assemble Special Tool 8512–A as follows, The nut (2) is threaded onto the threaded rod (3) first. Then the roller bearing (1) is placed onto the threaded rod (The hardened bearing surface of the bearing **MUST**face the nut (4)). Then the hardened washer (5) slides onto the threaded rod. Once assembled coat the threaded rod's threads with Mopar® Nickel Anti-Seize or equivalent.

3. Using Special Tool 8512–A, press damper onto crankshaft.
4. Install then tighten crankshaft damper bolt to 175 N·m (130 ft. lbs.).
5. Install radiator fan (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - INSTALLATION).
6. Install accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION)
7. Connect negative cable to battery.



COVER-STRUCTURAL

DESCRIPTION

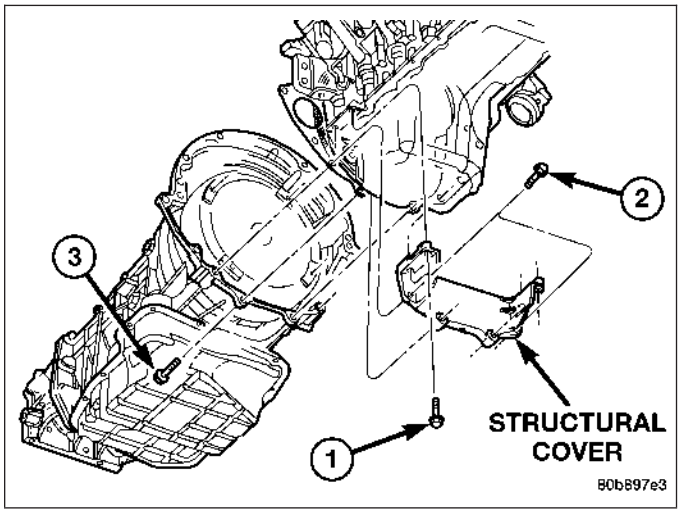
The structural dust cover is made of die cast aluminum and joins the lower half of the transmission bell housing to the engine bedplate.

OPERATION

The structural cover provides additional powertrain stiffness and reduces noise and vibration.

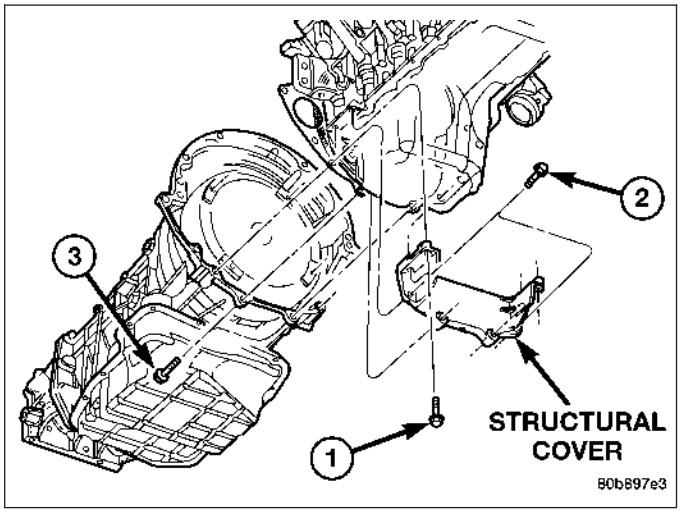
REMOVAL

1. Raise vehicle on hoist.
2. Remove the left hand exhaust pipe from exhaust manifold.
3. Loosen the right hand exhaust manifold-to-exhaust pipe retaining bolts.
4. Remove the eight bolts (1,2,3) retaining structural cover in the sequence shown.
5. Pivot the exhaust pipe downward and remove the structural cover.



INSTALLATION

CAUTION: The structural cover must be installed as described in the following steps. Failure to do so will cause severe damage to the cover.



1. Position the structural cover in the vehicle.
2. Install all bolts (1,2,3) retaining the cover-to-engine. DO NOT tighten the bolts at this time.
3. Install the four cover-to-transmission bolts. Do NOT tighten at this time.

CAUTION: The structural cover must be held tightly against both the engine and the transmission bell housing during tightening sequence. Failure to do so may cause damage to the cover.

4. Starting with the two rear cover-to-engine bolts, tighten bolts (1) to 54 N·m (40 ft. lbs.), then tighten bolts (2) and (3) to 54 N·m (40 ft. lbs.) in the sequence shown.
5. Install the exhaust pipe on left hand exhaust manifold.
6. Tighten exhaust manifold-to-exhaust pipe retaining bolts to 20 - 26 N·m (15-20 ft. lbs.).

MOUNT-ENGINE FRONT

REMOVAL

2WD

1. Disconnect the negative cable from the battery.

CAUTION: Remove the viscous fan before raising engine. Failure to do so may cause damage to the fan blade, fan clutch and fan shroud.

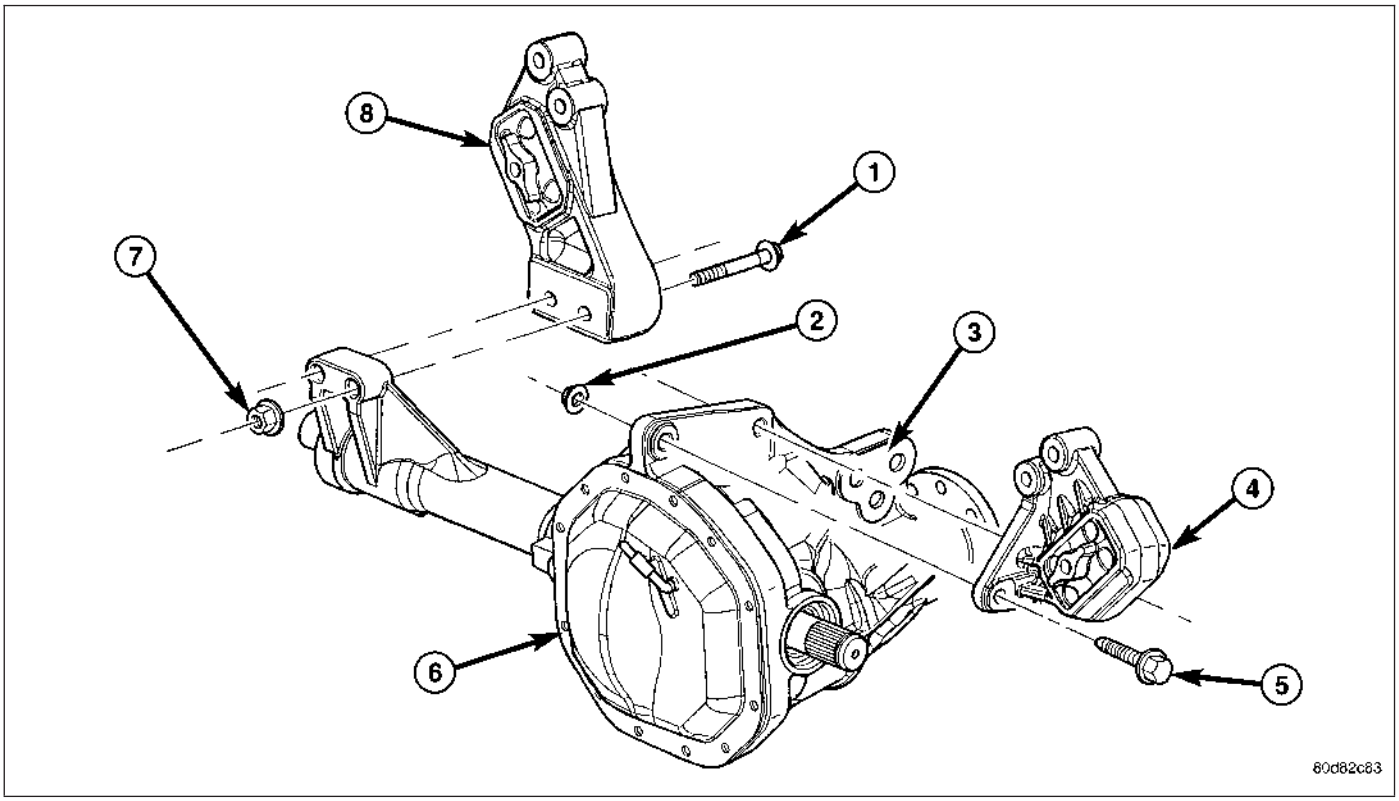
2. Remove the viscous fan (Refer to 7 - COOLING/ENGINE/FAN DRIVE VISCOUS CLUTCH - REMOVAL).
3. Raise the vehicle.
4. Remove the engine oil filter.
5. Remove the oil drain trough.
6. Support the engine with a suitable jack and a block of wood across the full width of the engine oil pan.
7. Support the front axle with a suitable jack.
8. Remove the (4) bolts that attach the engine mounts to the front axle.
9. Remove the (3) bolts that attach the front axle to the left engine bracket.
10. Lower the front axle.
11. Remove the through bolts
12. Raise the engine far enough to be able to remove the left and right engine mounts.
13. Remove the (8) mount to engine attaching bolts
14. Remove the engine mounts.

4WD

1. Disconnect the negative cable from the battery.

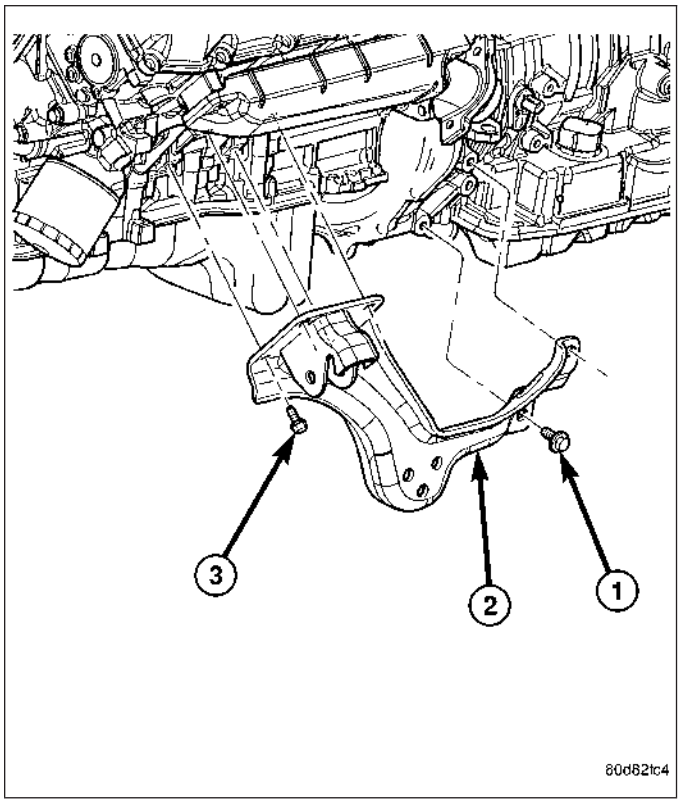
CAUTION: Remove the viscous fan before raising engine. Failure to do so may cause damage to the fan blade, fan clutch and fan shroud.

2. Remove the viscous fan (Refer to 7 - COOLING/ENGINE/FAN DRIVE VISCOUS CLUTCH - REMOVAL).
3. Raise the vehicle.
4. Remove the skid plate.
5. Remove the front crossmember.
6. Remove the engine oil filter.
7. Remove the oil drain trough.
8. Support the engine with a suitable jack and a block of wood across the full width of the engine oil pan.
9. Support the front axle with a suitable jack.
10. Remove the (4) bolts that attach the engine mounts to the front axle.



11. Remove the (3) bolts that attach the front axle to the left engine bracket.
12. Lower the front axle.
13. Remove the (6) through bolts
14. Raise the engine far enough to be able to remove the left and right engine mounts.

15. Remove the engine mounts.

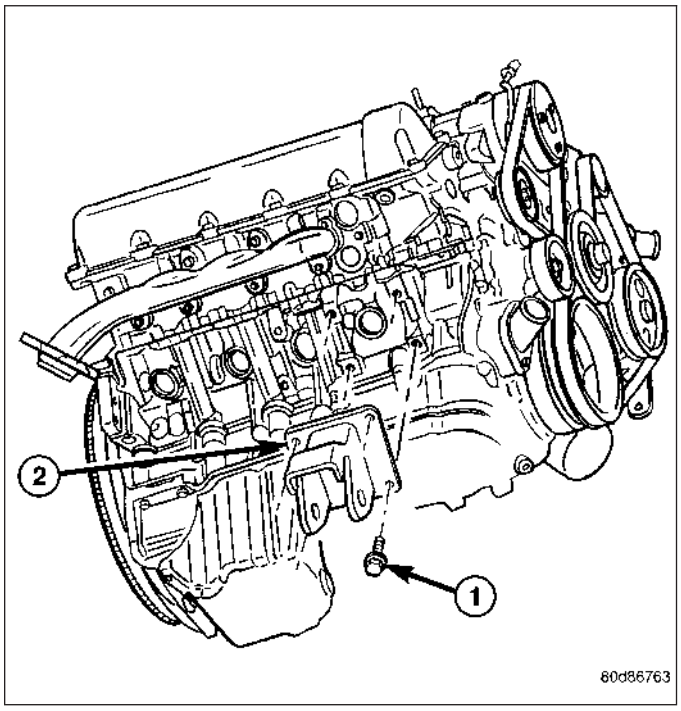


INSTALLATION

2WD

NOTE: For mount to engine block and left engine bracket to front axle bolts, apply Mopar® Lock and Seal Adhesive, Medium Strength Threadlocker.

1. Install the right and left side engine mounts to the engine block with (8) bolts. Torque bolts to 54 N·m (40 ft. lbs.).
2. Insert the (2) through bolts into the right and left side engine mounts and loose assemble the two nuts onto the through bolts.
3. Lower the engine until the through bolts rest onto the slots in the frame brackets.
4. Tighten the through bolt nuts to 94 N·m (70 ft. lbs.).
5. Install the oil drain trough.
6. Install the engine oil filter.
7. Lower the vehicle.

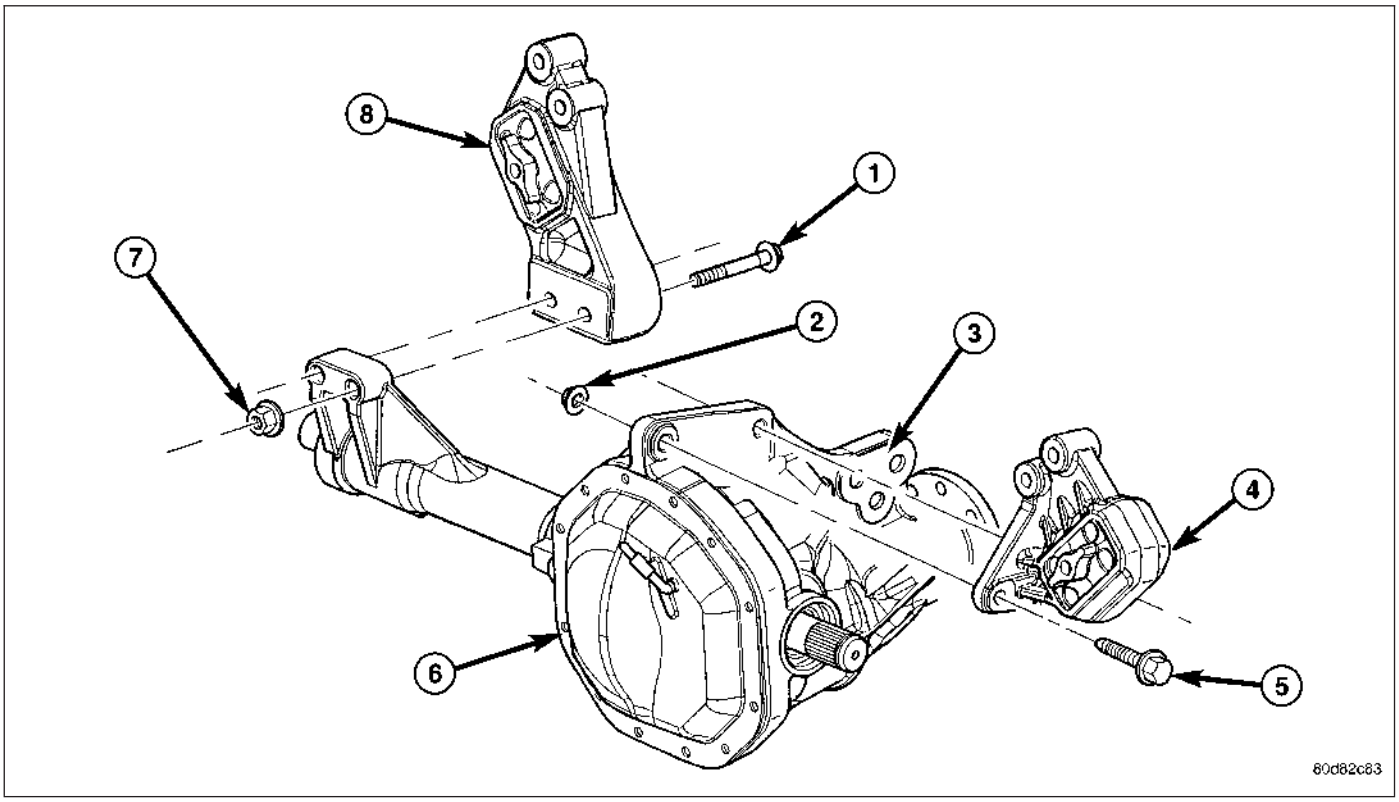


8. Install the viscous fan (Refer to 7 - COOLING/ENGINE/FAN DRIVE VISCOUS CLUTCH - REMOVAL).
9. Reconnect the negative battery cable.

4WD

NOTE: For mount to engine block and left engine bracket to front axle bolts, apply Mopar® Lock and Seal Adhesive, Medium Strength Threadlocker.

1. Install the right and left side engine mounts to the front axle. Torque nuts to 94 N·m (70 ft. lbs.).
2. Raise the front axle into the frame and install the left and right side through bolts. Torque nuts to 94 N·m (70 ft. lbs.).
3. Insert the two upper through bolts into the right and left side engine mounts and loose assemble the two nuts onto the through bolts.
4. Lower the engine until the left and right side engine brackets rest on the through bolts, and the lower engine bracket through holes align with the engine mounts, and the left engine bracket holes align with the front axle slots.

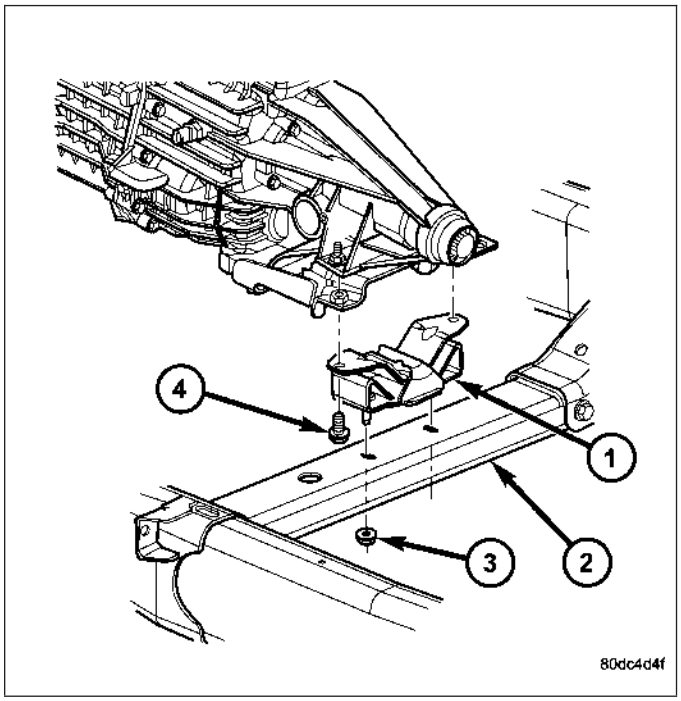


5. Loose assemble the (3) bolts that attach the front axle to the left engine bracket.
6. Loose assemble the lower through bolts.
7. Torque the nuts for the (4) through bolts to 101 N·m (75 ft. lbs.).
8. Torque the (3) bolts that attach the front axle to the left engine bracket to 101 N·m (75 ft. lbs.).
9. Install the oil drain trough.
10. Install the engine oil filter.
11. Install the front crossmember.
12. Install the skid plate.
13. Lower the vehicle.
14. Install the viscous fan (Refer to 7 - COOLING/ENGINE/FAN DRIVE VISCOUS CLUTCH - REMOVAL).
15. Reconnect the negative battery cable.

MOUNT-ENGINE REAR

REMOVAL

1. Raise the vehicle on a hoist.
2. Using a suitable jack, support transmission.
3. Remove the nuts from the transmission mount.
4. Remove the two bolts that attach the transmission mount to the engine bracket.
5. Raise the transmission enough to remove the mount from the crossmember.
6. Remove the mount.



INSTALLATION

NOTE: Threadlocking compound must be applied to the bolts before installation.

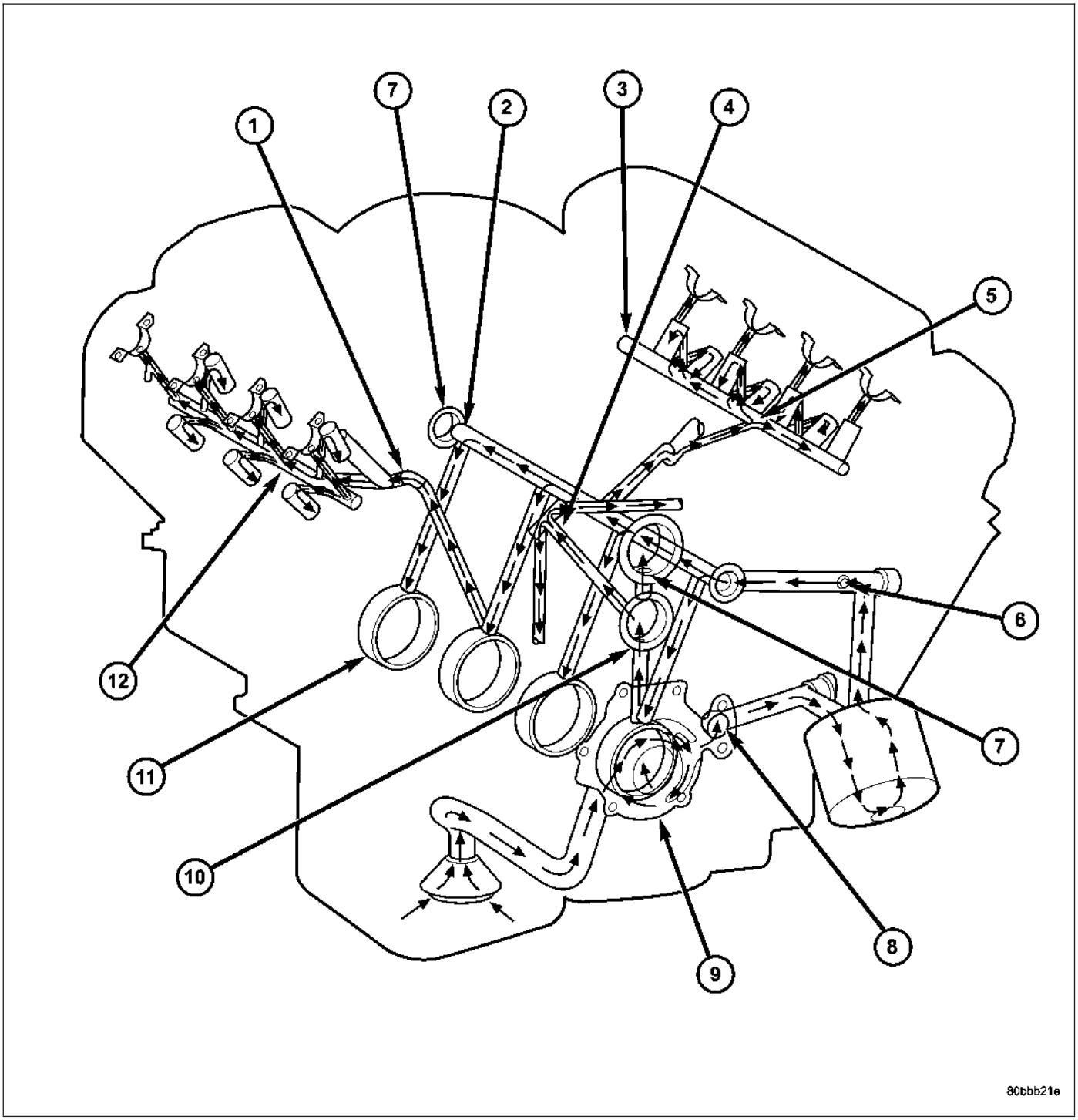
1. Install the two bolts that attach the transmission mount to the transmission bracket.
2. Torque the bolts to 61N·m (45 ft.lbs.) torque.
3. Lower the transmission so the transmission mount rests on the crossmember, and the studs of the transmission mount are aligned in the slots in the crossmember.
4. Install the nuts onto the transmission mount studs through the crossmember access slot.
5. Torque the nuts to 54N·m (40 ft. lbs.).

LUBRICATION

DESCRIPTION

The lubrication system is a full flow filtration pressure feed type.

OPERATION



1 - OIL FLOW TO RIGHT CYLINDER HEAD
2 - CYLINDER BLOCK MAIN OIL GALLERY
3 - LEFT CYLINDER HEAD OIL GALLERY
4 - OIL FLOW TO BOTH SECONDARY TENSIONERS
5 - OIL FLOW TO LEFT CYLINDER HEAD
6 - OIL PRESSURE SENSOR LOCATION
7 - OIL FLOW TO COUNTER BALANCE SHAFT
8 - OIL PUMP OUTLET TO CYLINDER BLOCK
9 - OIL PUMP
10 - OIL FLOW TO CRANKSHAFT MAIN JOURNALS
11 - CRANKSHAFT MAIN BEARING JOURNALS
12 - RIGHT CYLINDER HEAD OIL GALLERY

Oil from the oil pan is pumped by a gerotor type oil pump directly mounted to the crankshaft nose. Oil pressure is controlled by a relief valve mounted inside the oil pump housing.

The camshaft exhaust valve lobes and rocker arms are lubricated through a small hole in the rocker arm; oil flows through the lash adjuster then through the rocker arm and onto the camshaft lobe. Due to the orientation of the rocker arm, the camshaft intake lobes are not lubed in the same manner as the exhaust lobes. The intake lobes are lubed through internal passages in the camshaft. Oil flows through a bore in the No. 3 camshaft bearing bore, and as the camshaft turns, a hole in the camshaft aligns with the hole in the camshaft bore allowing engine oil to enter the camshaft tube. The oil then exits through 1.6mm (0.063 in.) holes drilled into the intake lobes, lubricating the lobes and the rocker arms.

Engine Lubrication Flow Chart - Block: Table 1

FROM	TO
Oil Pickup Tube	Oil Pump
Oil Pump	Oil Filter
Oil Filter	Block Main Oil Gallery
Block Main Oil Gallery	1. Crankshaft Main Journal 2. Left Cylinder Head* 3. Right Cylinder Head* 4. Counterbalance Shaft Rear Journal
Crankshaft Main Journals	Crankshaft Rod Journals
Crankshaft Number One Main Journal	1. Front Timing Chain Idler Shaft 2. Counterbalance Shaft - Front Journal 3. Both Secondary Chain Tensioners
Left Cylinder Head	Refer to Engine Lubrication Flow Chart - Cylinder Heads: Table 2
Right Cylinder Head	Refer to Engine Lubrication Flow Chart - Cylinder Heads: Table 2
* The cylinder head gaskets have an oil restricter to control oil flow to the cylinder heads	

Engine Lubrication Flow Chart - Cylinder Heads: Table 2

FROM	TO
Cylinder Head Oil Port (in bolt hole)	Diagonal Cross Drilling to Main Oil Gallery
Main Oil Gallery (drilled through head from rear to front)	1. Base of Camshaft Towers 2. Lash Adjuster Towers
Base of Camshaft Towers	Vertical Drilling Through Tower to Camshaft Bearings**
Lash Adjuster Towers	Diagonal Drillings to Hydraulic Lash Adjuster Pockets
** The number three camshaft bearing journal feeds oil into the hollow camshaft tubes. Oil is routed to the intake lobes, which have oil passages drilled into them to lubricate the rocker arms.	

DIAGNOSIS AND TESTING

ENGINE OIL LEAK

Begin with a thorough visual inspection of the engine, particularly at the area of the suspected leak. If an oil leak source is not readily identifiable, the following steps should be followed:

1. Do not clean or degrease the engine at this time because some solvents may cause rubber to swell, temporarily stopping the leak.
2. Add an oil soluble dye (use as recommended by manufacturer). Start the engine and let idle for approximately 15 minutes. Check the oil dipstick to make sure the dye is thoroughly mixed as indicated with a bright yellow color under a black light.
3. Using a black light, inspect the entire engine for fluorescent dye, particularly at the suspected area of oil leak. If the oil leak is found and identified, repair per service manual instructions.
4. If dye is not observed, drive the vehicle at various speeds for approximately 24 km (15 miles), and repeat inspection.If the oil leak source is not positively identified at this time, proceed with the air leak detection test method.

Air Leak Detection Test Method

1. Disconnect the breather cap to air cleaner hose at the breather cap end. Cap or plug breather cap nipple.
2. Remove the PCV valve from the cylinder head cover. Cap or plug the PCV valve grommet.
3. Attach an air hose with pressure gauge and regulator to the dipstick tube.

CAUTION: Do not subject the engine assembly to more than 20.6 kPa (3 PSI) of test pressure.

4. Gradually apply air pressure from 1 psi to 2.5 psi maximum while applying soapy water at the suspected source. Adjust the regulator to the suitable test pressure that provide the best bubbles which will pinpoint the leak source. If the oil leak is detected and identified, repair per service manual procedures.
5. If the leakage occurs at the rear oil seal area, refer to the section, Inspection for Rear Seal Area Leak.
6. If no leaks are detected, turn off the air supply and remove the air hose and all plugs and caps. Install the PCV valve and breather cap hose.
7. Clean the oil off the suspect oil leak area using a suitable solvent. Drive the vehicle at various speeds approximately 24 km (15 miles). Inspect the engine for signs of an oil leak by using a black light.

INSPECTION FOR REAR SEAL AREA LEAKS

Since it is sometimes difficult to determine the source of an oil leak in the rear seal area of the engine, a more involved inspection is necessary. The following steps should be followed to help pinpoint the source of the leak.

If the leakage occurs at the crankshaft rear oil seal area:

1. Disconnect the battery.
2. Raise the vehicle.
3. Remove torque converter or clutch housing cover and inspect rear of block for evidence of oil. Use a black light to check for the oil leak:
   a. Circular spray pattern generally indicates seal leakage or crankshaft damage.
   b. Where leakage tends to run straight down, possible causes are a porous block, distributor seal, camshaft bore cup plugs oil galley pipe plugs, oil filter runoff, and main bearing cap to cylinder block mating surfaces.
4. If no leaks are detected, pressurize the crankcase as outlined in the, Inspection (Engine oil Leaks in general)

CAUTION: Do not exceed 20.6 kPa (3 psi).

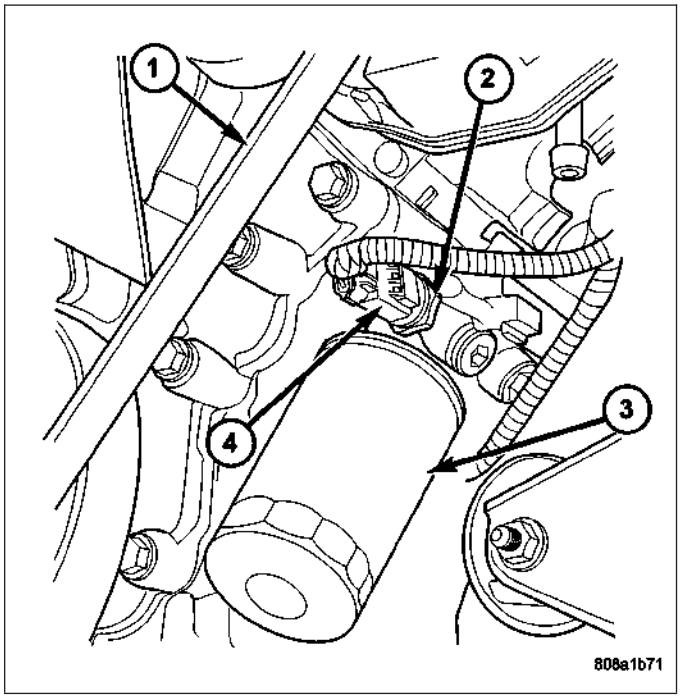
5. If the leak is not detected, very slowly turn the crankshaft and watch for leakage. If a leak is detected between the crankshaft and seal while slowly turning the crankshaft, it is possible the crankshaft seal surface is damaged. The seal area on the crankshaft could have minor nicks or scratches that can be polished out with emery cloth.

CAUTION: Use extreme caution when crankshaft polishing is necessary to remove minor nicks and scratches. The crankshaft seal flange is especially machined to complement the function of the rear oil seal.

6. For bubbles that remain steady with shaft rotation, no further inspection can be done until disassembled.

CHECKING ENGINE OIL PRESSURE

1. Remove oil pressure sending unit (2) and install gauge assembly C-3292.
2. Run engine until thermostat opens.
3. Oil Pressure:
   - Curb Idle - 25 kPa (4 psi) minimum
   - 3000 rpm - 170 - 758 kPa (25 - 110 psi)
4. If oil pressure is 0 at idle, shut off engine. Check for a clogged oil pick-up screen or a pressure relief valve stuck open.



REAR SEAL AREA LEAKS

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If the leakage occurs at the crankshaft rear oil seal area:

1. Disconnect the battery.
2. Raise the vehicle.
3. Remove torque converter or clutch housing cover and inspect rear of block for evidence of oil. Use a black light to check for the oil leak:
   a. Circular spray pattern generally indicates seal leakage or crankshaft damage.
   b. Where leakage tends to run straight down, possible causes are a porous block, camshaft bore cup plugs, oil galley pipe plugs, oil filter runoff, and main bearing cap to cylinder block mating surfaces. See Engine, for proper repair procedures of these items.
4. If no leaks are detected, pressurized the crankcase as outlined in the section, Inspection (Engine oil Leaks in general)

CAUTION: Do not exceed 20.6 kPa (3 psi).

5. If the leak is not detected, very slowly turn the crankshaft and watch for leakage. If a leak is detected between the crankshaft and seal while slowly turning the crankshaft, it is possible the crankshaft seal surface is damaged. The seal area on the crankshaft could have minor nicks or scratches that can be polished out with emery cloth.

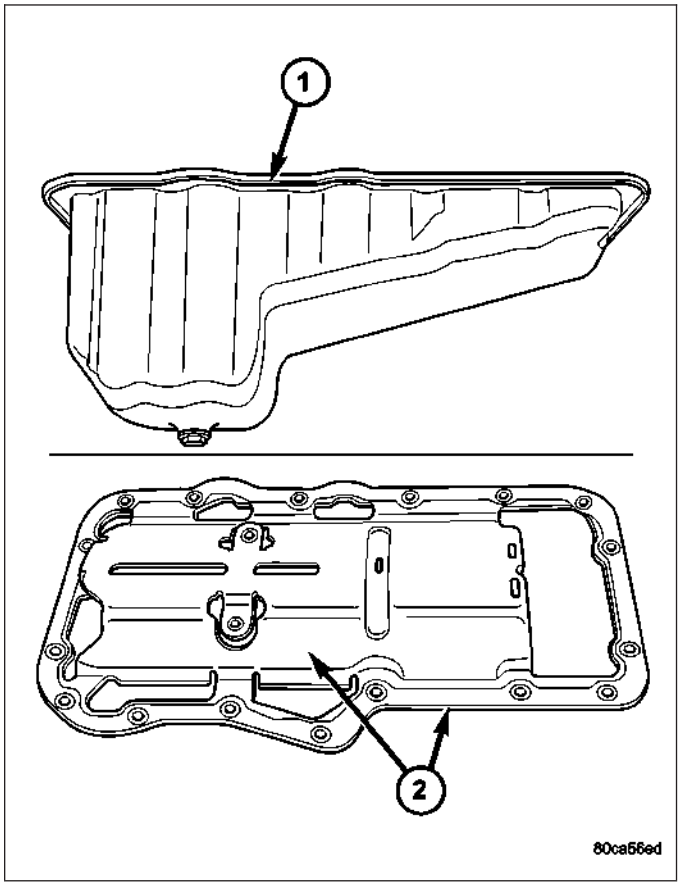
CAUTION: Use extreme caution when crankshaft polishing is necessary to remove minor nicks or scratches. The crankshaft seal flange is specially machined to complement the function of the rear oil seal.

6. For bubbles that remain steady with shaft rotation, no further inspection can be done until disassembled. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING) , under the Oil Leak, for components inspections on possible causes and corrections.
7. After the oil leak root cause and appropriate corrective action have been identified, (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT OIL SEAL - REAR - REMOVAL).

PAN-ENGINE OIL

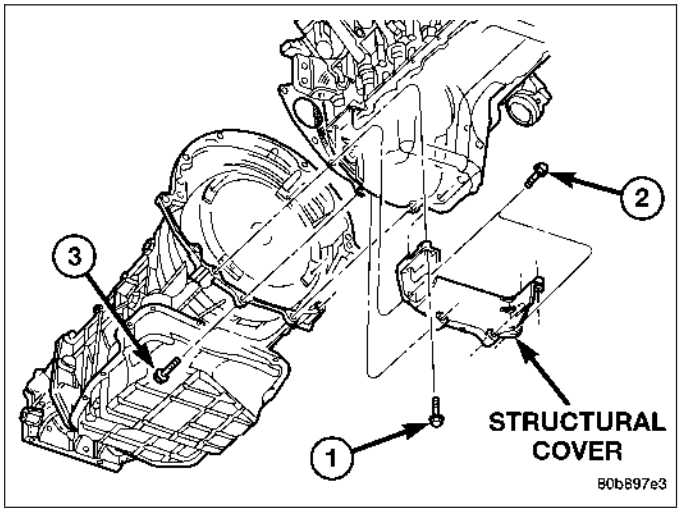
DESCRIPTION

The engine oil pan (1) is made of laminated steel and has a single plane sealing surface. The sandwich style oil pan gasket has an integrated windage tray (2) and steel carrier. The sealing area of the gasket is molded with rubber and is designed to be reused as long as the gasket is not cut, torn or ripped.



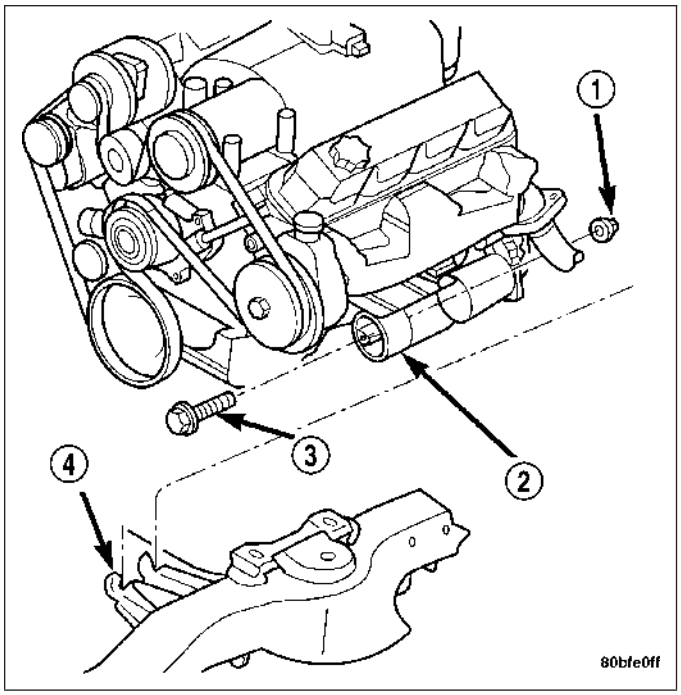
REMOVAL

1. Disconnect negative battery cable.
2. Drain the cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
3. Remove the radiator fan (Refer to 7 - COOLING/ ENGINE/RADIATOR FAN - REMOVAL).
4. Remove the intake manifold (Refer to 9 - ENGINE/ MANIFOLDS/INTAKE MANIFOLD - REMOVAL).
5. Install Tool 8534 **Do not raise engine at this time.**
6. Raise vehicle on hoist.
7. Disconnect exhaust pipe at exhaust manifolds.
8. Remove the structural cover (Refer to 9 - ENGINE/ ENGINE BLOCK/STRUCTURAL COVER - REMOVAL). using sequence shown.

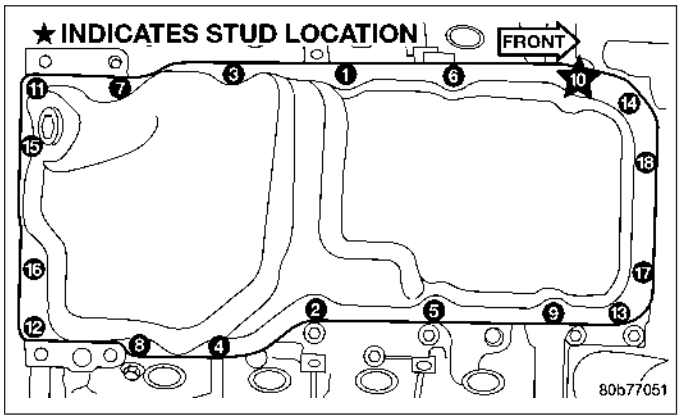


9. Drain engine oil and remove oil filter.
10. Position suitable jack under engine.
11. Remove both left and right side engine mount through bolts (1) and (3).
12. Raise engine to provide clearance to remove oil pan.
13. Place blocks of wood between engine brackets and lower mounts to provide stability to engine.

NOTE: Do not pry on oil pan or oil pan gasket. Gasket is mounted to engine and does not come out with oil pan.



14. Remove the oil pan mounting bolts and oil pan.
15. Unbolt oil pump pickup tube and remove tube and oil pan gasket from engine.



CLEANING

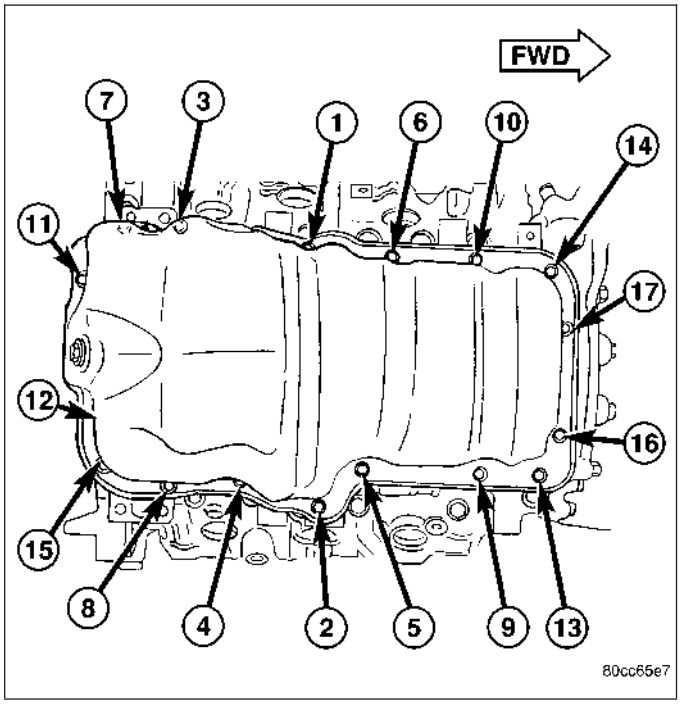
1. Clean oil pan in solvent and wipe dry with a clean cloth.
2. Clean the oil pan gasket surface. **DO NOT** use a grinder wheel or other abrasive tool to clean sealing surface.
3. Clean oil screen and tube thoroughly in clean solvent.

INSPECTION

1. Inspect oil drain plug and plug hole for stripped or damaged threads. Repair as necessary.
2. Inspect the oil pan mounting flange for bends or distortion. Straighten flange, if necessary.

INSTALLATION

1. Clean the oil pan gasket mating surface of the bedplate and oil pan.
2. Inspect integrated oil pan gasket, and replace as necessary.
3. Position the integrated oil pan gasket/windage tray assembly.
4. Install the oil pickup tube
5. If removed, install stud at position No. 9.
6. Install the mounting bolt and nuts. Tighten nuts to 28 N·m (20 ft. lbs.).
7. Position the oil pan and install the mounting bolts. Tighten the mounting bolts to 15 N·m (11 ft. lbs.) in the sequence shown.
8. Install structural dust cover, if equipped.
9. Lower the engine into mounts using Special Tool 8534.
10. Install both the left and right side engine mount through bolts. Tighten the nuts to 68 N·m (50 ft. lbs.).
11. Remove Special Tool 8534.



12. Install the intake manifold (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION).
13. Fill engine oil.
14. Reconnect the negative battery cable.
15. Start engine and check for leaks.

SENSOR/SWITCH-OIL PRESSURE

DESCRIPTION

The 3 wire, solid-state engine oil pressure sensor (sending unit) is located in an engine oil pressure gallery.

OPERATION

The oil pressure sensor uses three circuits. They are:

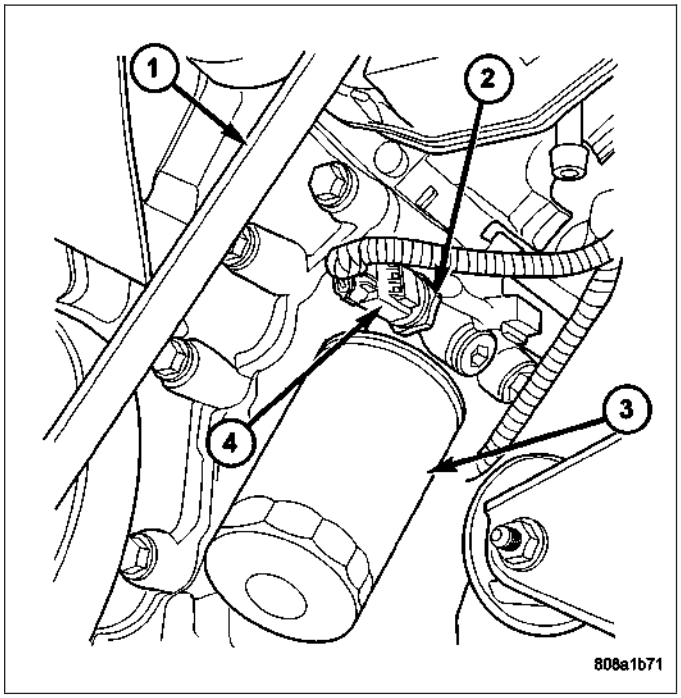
- A 5 volt power supply from the Powertrain Control Module (PCM)
- A sensor ground through the PCM's sensor return
- A signal to the PCM relating to engine oil pressure

The oil pressure sensor has a 3 wire electrical function very much like the Manifold Absolute Pressure (MAP) sensor. Meaning different pressures relate to different output voltages.

A 5 volt supply is sent to the sensor from the PCM to power up the sensor. The sensor returns a voltage signal back to the PCM relating to engine oil pressure. This signal is then transferred (bussed) to the instrument panel on either a CCD or PCI bus circuit (depending on vehicle line) to operate the oil pressure gauge and the check gauges lamp. Ground for the sensor is provided by the PCM through a low-noise sensor return.

REMOVAL

1. Disconnect the negative cable from the battery.
2. Raise vehicle on hoist.
3. Remove front splash shield.
4. Disconnect oil pressure sender connector (4).
5. Remove the pressure sender (2).



INSTALLATION

1. Install oil pressure sender.
2. Connect oil pressure sender wire.
3. Install front splash shield.
4. Lower vehicle.
5. Connect the negative battery cable.

PUMP-ENGINE OIL

REMOVAL

1. Remove the oil pan and pick-up tube (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).
2. Remove the timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).
3. Remove the timing chains and tensioners (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).
4. Remove the four bolts, primary timing chain tensioner and the oil pump.

DISASSEMBLY

1. Remove oil pump cover screws and lift off cover plate.
2. Remove pump inner and outer rotors.

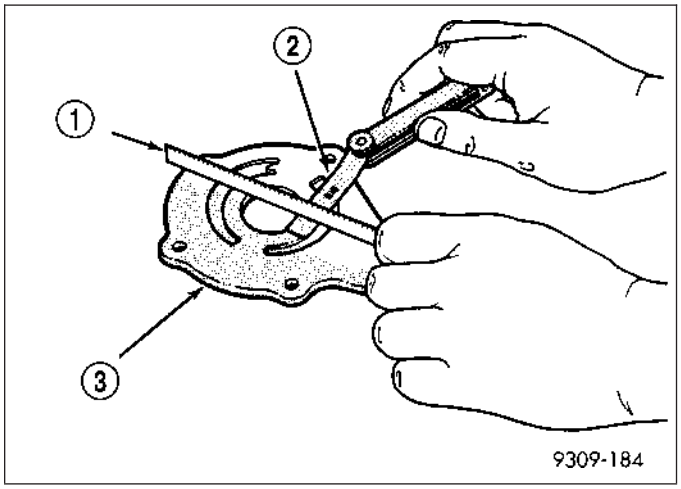
NOTE: Once the oil pressure relief valve, cup plug, and pin are removed, the pump assembly must be replaced.

3. If it is necessary to remove the pressure relief valve, drive the roll pin from pump housing and remove cup plug, spring and valve.

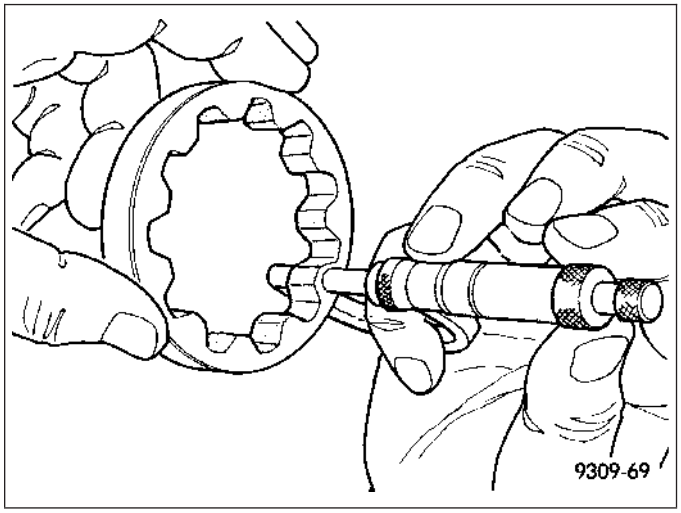
INSPECTION

CAUTION: Oil pump pressure relief valve and spring should not be removed from the oil pump. If these components are disassembled and or removed from the pump the entire oil pump assembly must be replaced.

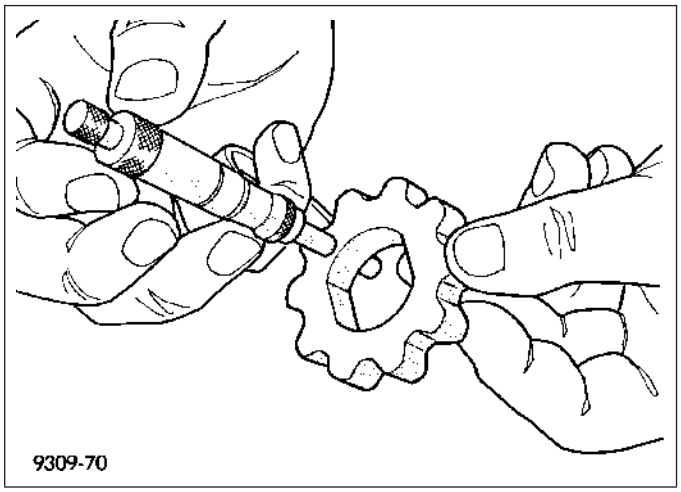
1. Clean all parts thoroughly. Mating surface of the oil pump housing should be smooth. If the pump cover is scratched or grooved the oil pump assembly should be replaced.
2. Lay a straight edge (1) across the pump cover surface. If a 0.025 mm (0.001 in.) feeler gauge (2) can be inserted between the cover and the straight edge the oil pump assembly should be replaced.



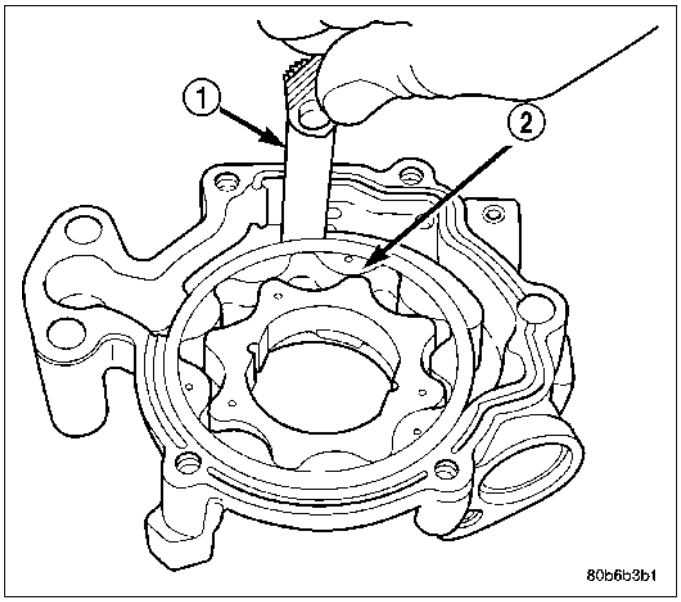
3. Measure the thickness of the outer rotor. If the outer rotor thickness measures at 12.005 mm (0.472 in.) or less the oil pump assembly must be replaced.



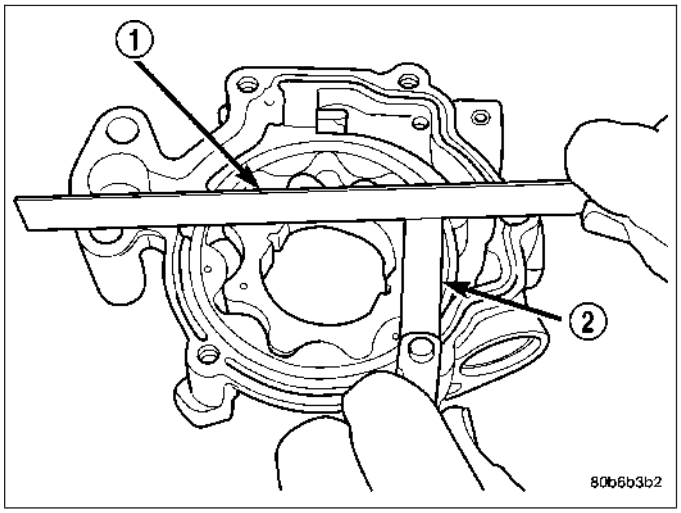
4. Measure the diameter of the outer rotor. If the outer rotor diameter measures at 85.925 mm (3.382 in.) or less the oil pump assembly must be replaced.
5. Measure the thickness of the inner rotor. If the inner rotor thickness measures at 12.005 mm (0.472 in.) or less then the oil pump assembly must be replaced.



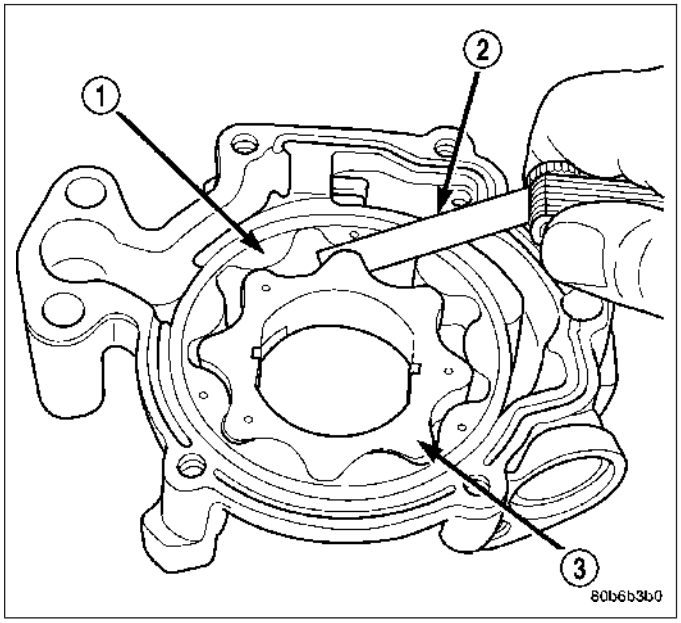
6. Slide outer rotor (1) into the body of the oil pump. Press the outer rotor to one side of the oil pump body and measure clearance between the outer rotor and the body. If the measurement is 0.235mm (0.009 in.) or more the oil pump assembly must be replaced.



7. Install the inner rotor in the into the oil pump body. Measure the clearance between the inner and outer rotors. If the clearance between the rotors is .150 mm (0.006 in.) or more the oil pump assembly must be replaced.



8. Place a straight edge (1) across the body of the oil pump (between the bolt holes), if a feeler gauge (2) of .095 mm (0.0038 in.) or greater can be inserted between the straightedge and the rotors, the pump must be replaced.



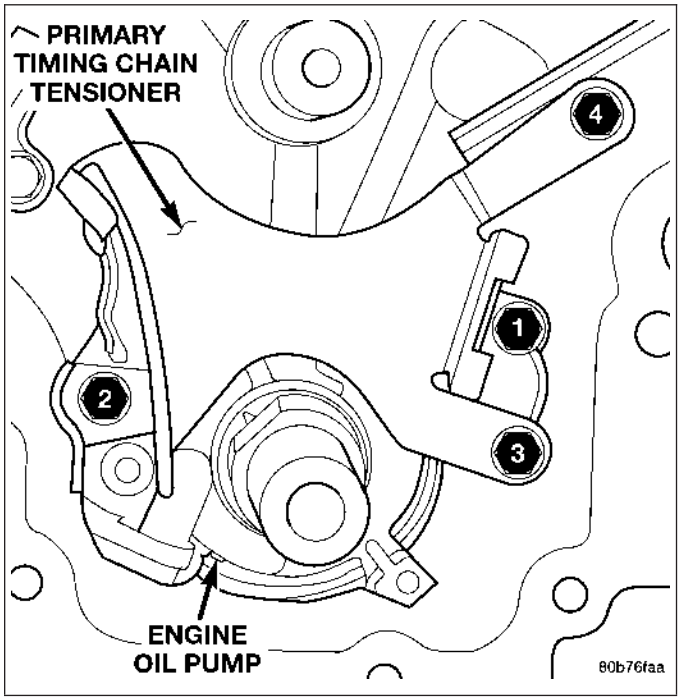
NOTE: The 3.7 Oil pump is released as an assembly. There are no DaimlerChrysler part numbers for Sub-Assembly components. In the event the oil pump is not functioning or out of specification it must be replaced as an assembly.

ASSEMBLY

1. Wash all parts in a suitable solvent and inspect carefully for damage or wear.
2. Install inner and outer rotors
3. Install oil pump cover plate and install cover bolts and tighten them to 12 N·m (105 in. lbs.).
4. Prime oil pump before installation by filling rotor cavity with engine oil.
5. If oil pressure is low and pump is within specifications, inspect for worn engine bearings or other causes for oil pressure loss.

INSTALLATION

1. Position the oil pump onto the crankshaft and install one oil pump retaining bolts.
2. Position the primary timing chain tensioner and install three retaining bolts.
3. Tighten the oil pump and primary timing chain tensioner retaining bolts to 28 N·m (250 in. lbs.) in the sequence shown.
4. Install the secondary timing chain tensioners and timing chains (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).
5. Install the timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION).
6. Install the pick-up tube and oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).



FILTER-ENGINE OIL

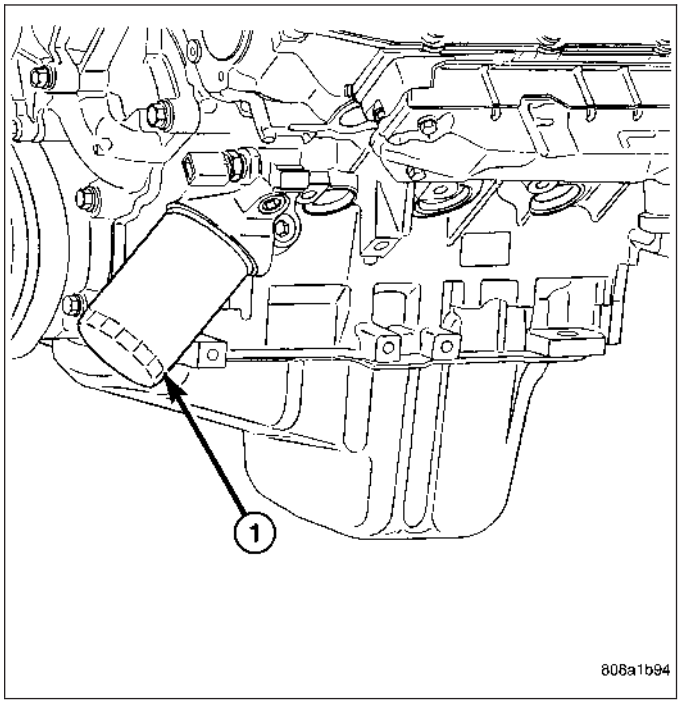
REMOVAL

All engines are equipped with a high quality full-flow, disposable type oil filter (1). DaimlerChrysler Corporation recommends a Mopar® or equivalent oil filter be used.

1. Position a drain pan under the oil filter.
2. Using a suitable oil filter wrench loosen filter.
3. Rotate the oil filter (1) counterclockwise to remove it from the cylinder block oil filter boss.
4. When filter separates from cylinder block oil filter boss, tip gasket end upward to minimize oil spill. Remove filter from vehicle.

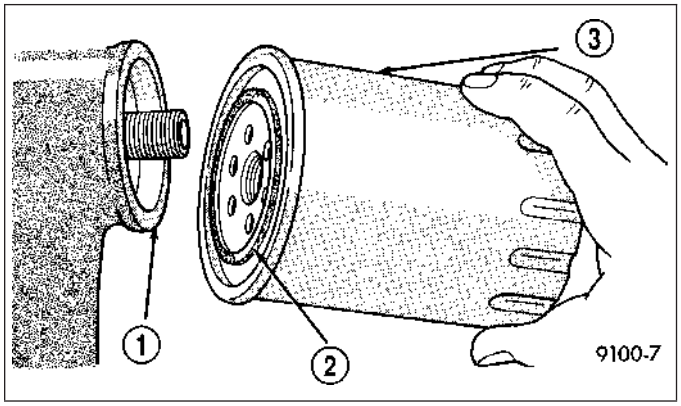
NOTE: Make sure filter gasket was removed with filter.

5. With a wiping cloth, clean the gasket sealing surface of oil and grime.



INSTALLATION

1. Lightly lubricate oil filter gasket (2) with engine oil.
2. Thread filter onto adapter nipple. When gasket makes contact with sealing surface (1), hand tighten filter (2) one full turn, do not over tighten.
3. Add oil, verify crankcase oil level and start engine. Inspect for oil leaks.

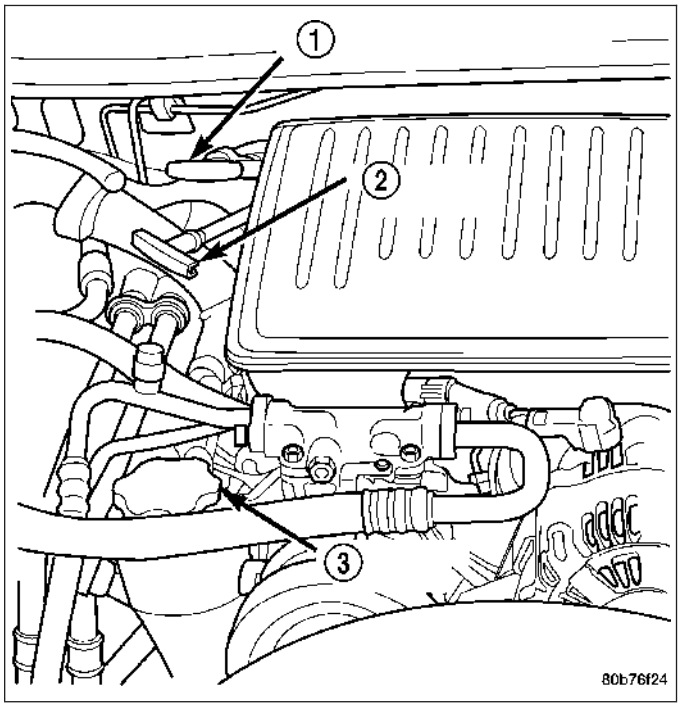


OIL

STANDARD PROCEDURE

ENGINE OIL SERVICE

The engine oil level indicator (2) is located at the right rear of the engine on the 3.7L engines..



CRANKCASE OIL LEVEL INSPECTION

CAUTION: Do not overfill crankcase with engine oil, pressure loss or oil foaming can result.

Inspect engine oil level approximately every 800 kilometers (500 miles). Unless the engine has exhibited loss of oil pressure, run the engine for about five minutes before checking oil level. Checking engine oil level on a cold engine is not accurate.

To ensure proper lubrication of an engine, the engine oil must be maintained at an acceptable level. The acceptable levels are indicated between the ADD and SAFE marks on the engine oil dipstick.

1. Position vehicle on level surface.
2. With engine OFF, allow approximately ten minutes for oil to settle to bottom of crankcase, remove engine oil dipstick.
3. Wipe dipstick clean.
4. Install dipstick and verify it is seated in the tube.
5. Remove dipstick, with handle held above the tip, take oil level reading.
6. Add oil only if level is below the ADD mark on dipstick.

ENGINE OIL CHANGE

Change engine oil at mileage and time intervals described in Maintenance Schedules.

Run engine until achieving normal operating temperature.

1. Position the vehicle on a level surface and turn engine off.
2. Hoist and support vehicle on safety stands.
3. Remove oil fill cap.
4. Place a suitable drain pan under crankcase drain.

5. Remove drain plug from crankcase and allow oil to drain into pan. Inspect drain plug threads for stretching or other damage. Replace drain plug if damaged.
6. Install drain plug in crankcase.
7. Lower vehicle and fill crankcase with specified type and amount of engine oil described in this section.
8. Install oil fill cap.
9. Start engine and inspect for leaks.
10. Stop engine and inspect oil level.

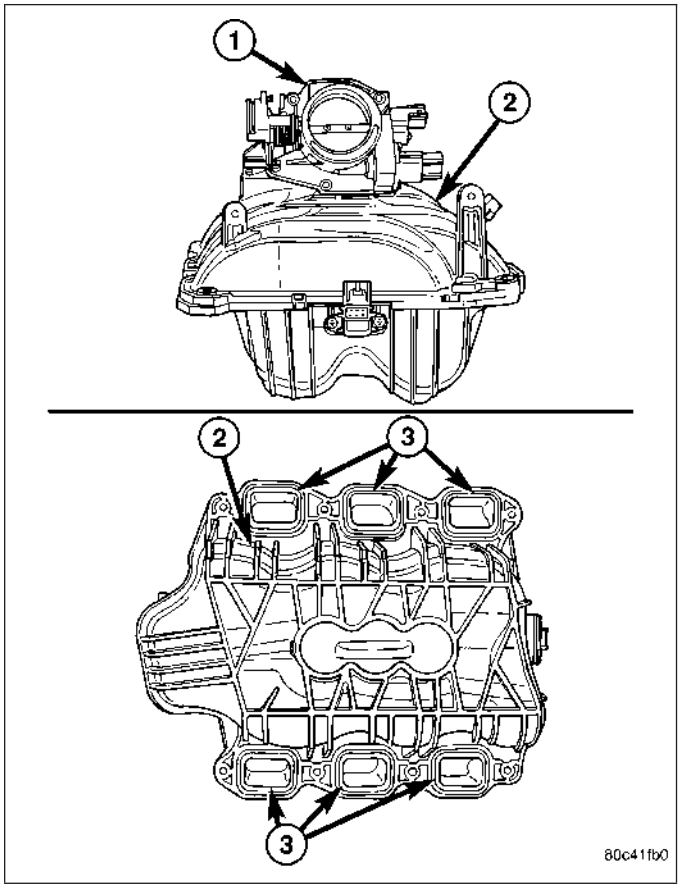
USED ENGINE OIL DISPOSAL

Care should be exercised when disposing used engine oil after it has been drained from a vehicle engine. Refer to the WARNING at beginning of this section.

MANIFOLD-INTAKE

DESCRIPTION

The intake manifold (2) is made of a composite material and features 300 mm (11.811 in.) long runners which maximizes low end torque. The intake manifold (2) uses single plane sealing which consist of six individual press in place port gaskets to prevent leaks. The throttle body (1) attaches directly to the intake manifold (2). Eight studs and two bolts are used to fasten the intake to the head.



DIAGNOSIS AND TESTING

INTAKE MANIFOLD LEAKS

An intake manifold air leak is characterized by lower than normal manifold vacuum. Also, one or more cylinders may not be functioning.

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING. DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR THE FAN. DO NOT WEAR LOOSE CLOTHING.

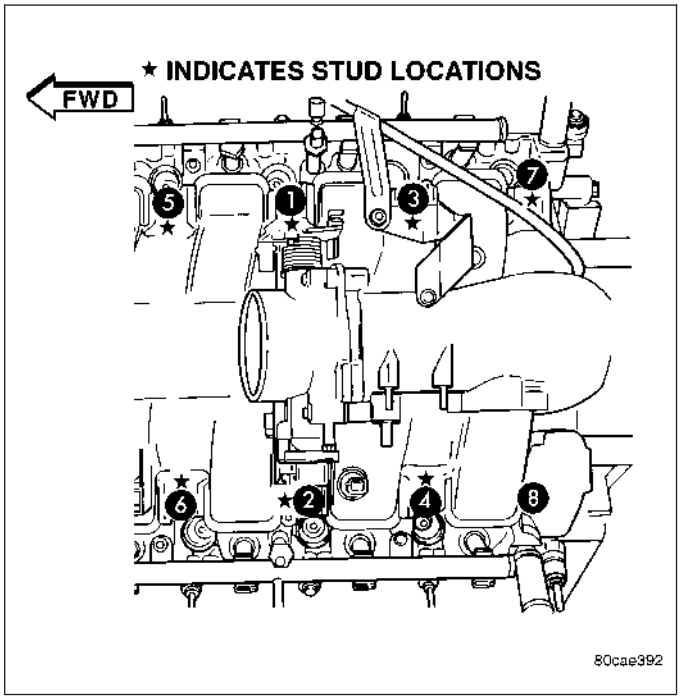
1. Start the engine.
2. Spray a small stream of water (spray bottle) at the suspected leak area.
3. If engine RPM'S change, the area of the suspected leak has been found.
4. Repair as required.

REMOVAL

1. Disconnect negative cable from battery.
2. Remove resonator assembly and air inlet hose.
3. Disconnect throttle and speed control cables.
4. Disconnect electrical connectors for the following components: Refer to FUEL SYSTEM for component locations.
   - Manifold Absolute Pressure (MAP) Sensor
   - Intake Air Temperature (IAT) Sensor
   - Throttle Position (TPS) Sensor
   - Coolant Temperature (CTS) Sensor
   - Idle Air Control (IAC) Motor
5. Disconnect vapor purge hose, brake booster hose, speed control servo hose, positive crankcase ventilation (PCV) hose.
6. Disconnect generator electrical connections.
7. Disconnect air conditioning compressor electrical connections.
8. Disconnect left and right radio suppressor straps.
9. Disconnect and remove ignition coil towers.
10. Remove top oil dipstick tube retaining bolt and ground strap.
11. Bleed fuel system (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - STANDARD PROCEDURE).
12. Remove fuel rail.
13. Remove throttle body assembly and mounting bracket.
14. Drain cooling system below coolant temperature level (Refer to 7 - COOLING - STANDARD PROCEDURE).
15. Remove the heater hoses from the engine front cover and the heater core.
16. Unclip and remove heater hoses and tubes from intake manifold.
17. Remove coolant temperature sensor (Refer to 7 - COOLING/ENGINE/ENGINE COOLANT TEMP SENSOR - REMOVAL) .
18. Remove intake manifold retaining fasteners in reverse order of tightening sequence.
19. Remove intake manifold.

INSTALLATION

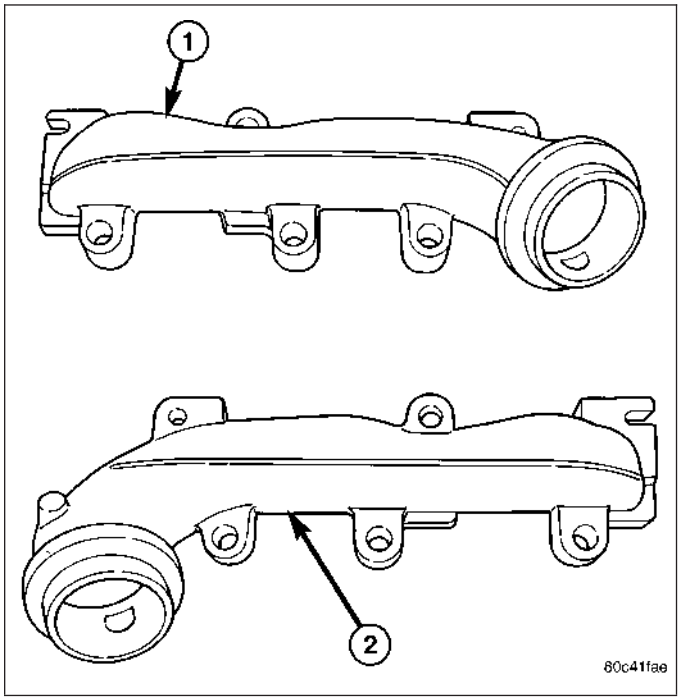
1. Install intake manifold gaskets.
2. Install intake manifold.
3. Install intake manifold retaining bolts and tighten in sequence shown in to 12 N·m (105 in. lbs.).
4. Install left and right radio suppressor straps.
5. Install throttle body assembly.
6. Connect throttle cable and speed control cable to throttle body.
7. Install fuel rail.
8. Install ignition coil towers.
9. Position and install heater hoses and tubes onto intake manifold.
10. Install the heater hoses to the heater core and engine front cover.
11. Connect electrical connectors for the following components:
    - Manifold Absolute Pressure (MAP) Sensor
    - Intake Air Temperature (IAT) Sensor
    - Throttle Position (TPS) Sensor
    - Coolant Temperature (CTS) Sensor
    - Idle Air Control (IAC) Motor
    - Ignition coil towers
    - Fuel injectors
12. Install top oil dipstick tube retaining bolt and ground strap.
13. Connect generator electrical connections.
14. Connect Vapor purge hose, Brake booster hose, Speed control servo hose, Positive crankcase ventilation (PCV) hose.
15. Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
16. Install resonator assembly and air inlet hose.
17. Connect negative cable to battery.



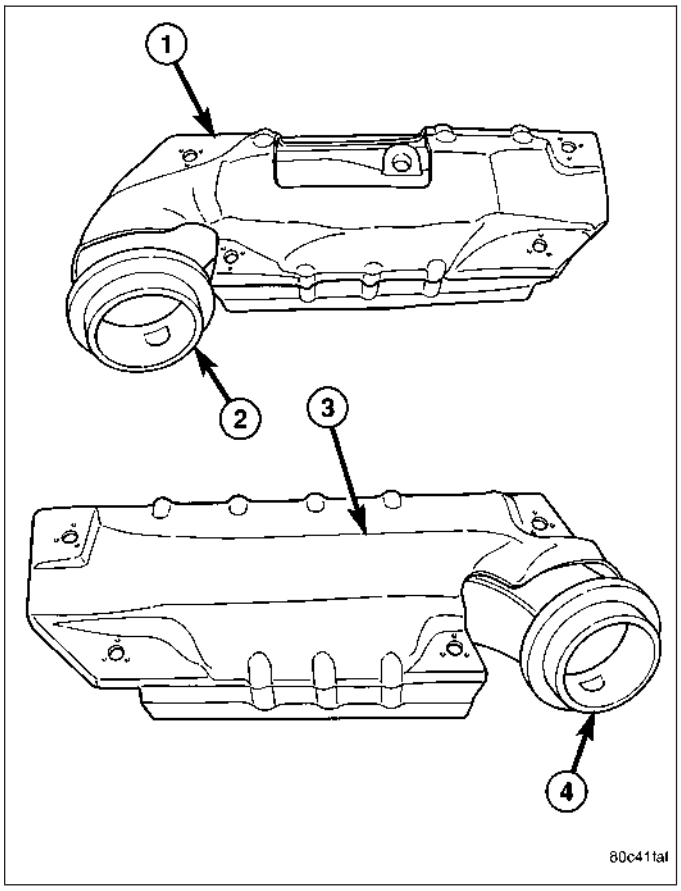
MANIFOLD-EXHAUST

DESCRIPTION

The exhaust manifolds(1 and 2) are log style with a patented flow enhancing design to maximize performance. The exhaust manifolds are made of high silicon molybdenum cast iron. A perforated core graphite exhaust manifold gasket is used to improve sealing to the cylinder head.



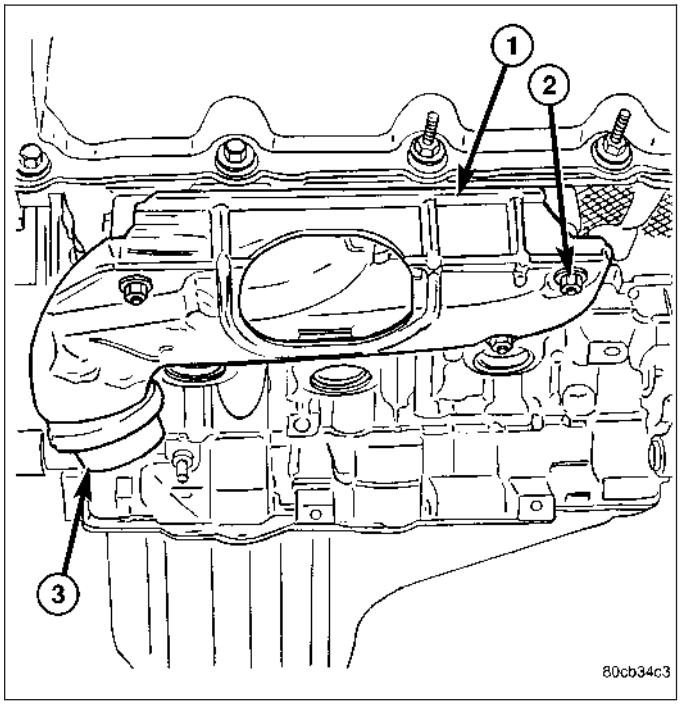
The exhaust manifolds are covered by a three layer laminated heat shield (1 and 3) for thermal protection and noise reduction. The heat shields(1 and 3) are fastened with a torque prevailing nut that is backed off slightly to allow for the thermal expansion of the exhaust manifold.



REMOVAL

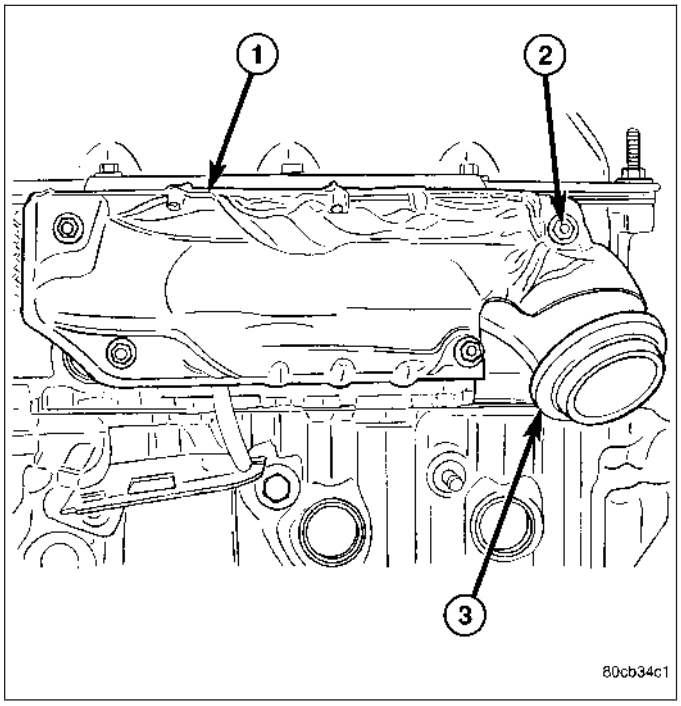
RIGHT EXHAUST MANIFOLD

1. Disconnect the negative cable from the battery.
2. Raise and support the vehicle.
3. Remove the bolts and nuts attaching the exhaust pipe to the engine exhaust manifold.
4. Lower the vehicle.
5. Remove the exhaust heat shield (1).
6. Remove bolts, nuts (2) and washers attaching manifold to cylinder head.
7. Remove manifold and gasket from the cylinder head.



LEFT EXHAUST MANIFOLD

1. Disconnect the negative cable from the battery.
2. Raise and support the vehicle.
3. Remove the bolts and nuts attaching the exhaust pipe to the engine exhaust manifold.
4. Lower the vehicle.
5. Remove the exhaust heat shields (1).
6. Remove bolts, nuts (2) and washers attaching manifold to cylinder head.
7. Remove manifold and gasket from the cylinder head.



INSTALLATION

RIGHT EXHAUST MANIFOLD

CAUTION: If the studs came out with the nuts when removing the engine exhaust manifold, install new studs. Apply sealer on the coarse thread ends. Water leaks may develop at the studs if this precaution is not taken.

1. Position the engine exhaust manifold and gasket on the two studs located on the cylinder head. Install conical washers and nuts on these studs.
2. Install remaining conical washers. Starting at the center arm and working outward, tighten the bolts and nuts to 25 N·m (18 ft. lbs.) torque.
3. Install the exhaust heat shields.
4. Raise and support the vehicle.

CAUTION: Over tightening heat shield fasteners, may cause shield to distort and/or crack.

5. Assemble exhaust pipe to manifold and secure with bolts, nuts and retainers. Tighten the bolts and nuts to 34 N·m (25 ft. lbs.) torque.

LEFT EXHAUST MANIFOLD

CAUTION: If the studs came out with the nuts when removing the engine exhaust manifold, install new studs. Apply sealer on the coarse thread ends. Water leaks may develop at the studs if this precaution is not taken.

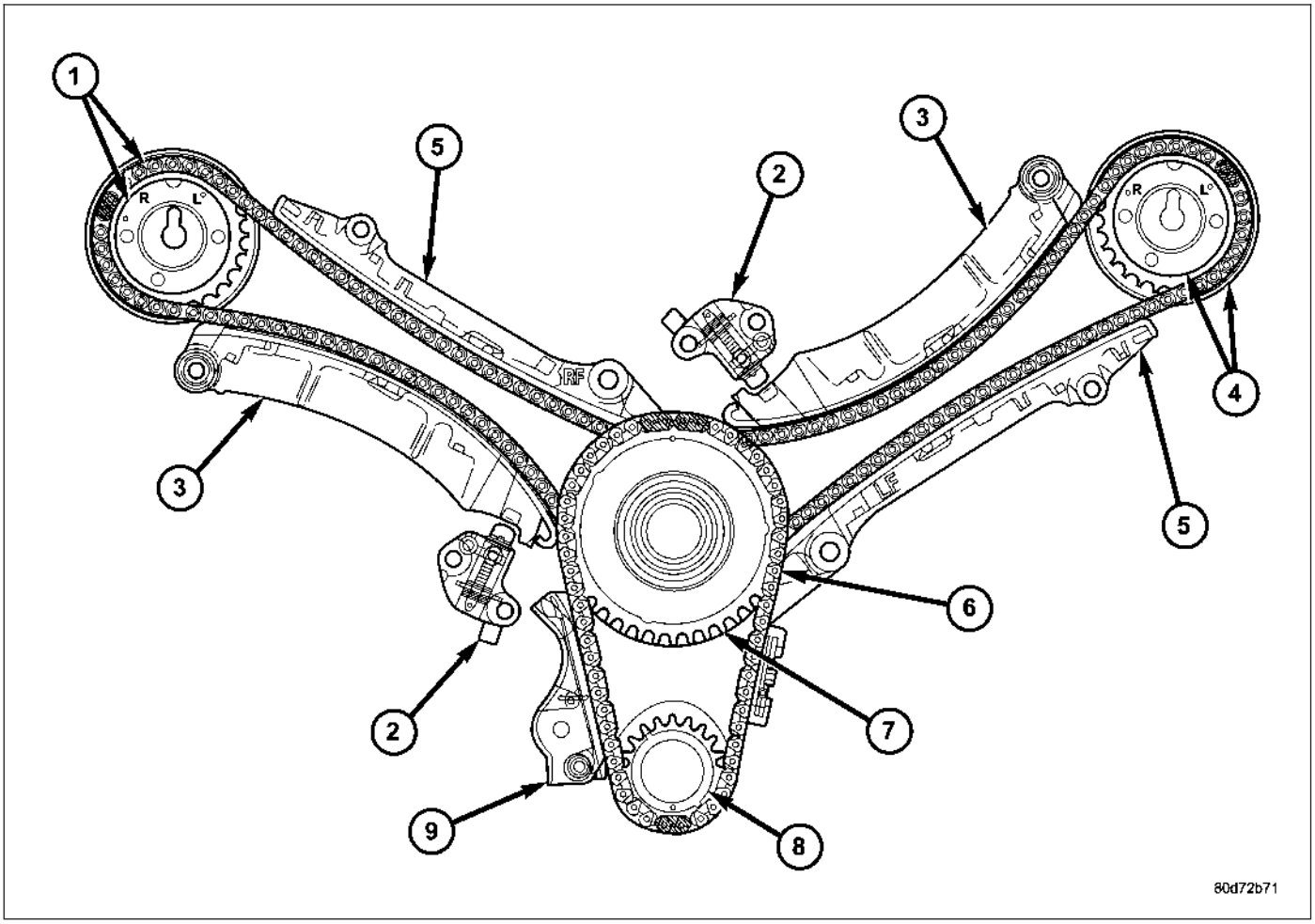
1. Position the engine exhaust manifold and gasket on the two studs located on the cylinder head. Install conical washers and nuts on these studs.
2. Install remaining conical washers. Starting at the center arm and working outward, tighten the bolts and nuts to 25 N·m (18 ft. lbs.) torque.
3. Install the exhaust heat shields.
4. Raise and support the vehicle.

CAUTION: Over tightening heat shield fasteners, may cause shield to distort and/or crack.

5. Assemble exhaust pipe to manifold and secure with bolts, nuts and retainers. Tighten the bolts and nuts to 34 N·m (25 ft. lbs.) torque.

VALVE TIMING

DESCRIPTION



Timing Drive System

1 - RIGHT CAMSHAFT SPROCKET AND SECONDARY CHAIN
2 - SECONDARY TIMING CHAIN TENSIONER (LEFT AND RIGHT SIDE NOT INTERCHANGEABLE)
3 - SECONDARY TENSIONER ARM
4 - LEFT CAMSHAFT SPROCKET AND SECONDARY CHAIN
5 - CHAIN GUIDE (LEFT AND RIGHT SIDE ARE NOT INTERCHANGEABLE)
6 - PRIMARY CHAIN
7 - IDLER SPROCKET
8 - CRANKSHAFT SPROCKET
9 - PRIMARY CHAIN TENSIONER

The timing drive system has been designed to provide quiet performance and reliability to support a **non-free wheeling** engine. Specifically the intake valves are non-free wheeling and can be easily damaged with forceful engine rotation if camshaft-to-crankshaft timing is incorrect. The timing drive system consists of a primary chain, two secondary timing chain drives and a counterbalance shaft drive.

OPERATION

The primary timing chain is a single inverted tooth chain type. The primary chain drives the large 50 tooth idler sprocket directly from a 25 tooth crankshaft sprocket. Primary chain motion is controlled by a pivoting leaf spring tensioner arm and a fixed guide. The arm and the guide both use nylon plastic wear faces for low friction and long wear. The primary chain receives oil splash lubrication from the secondary chain drive and designed oil pump leakage. The idler sprocket assembly connects the primary chain drive, secondary chain drives, and the counterbalance shaft. The idler sprocket assembly consists of two integral 26 tooth sprockets a 50 tooth sprocket and a helical gear that is press-fit to the assembly. The spline joint for the 50 tooth sprocket is a non serviceable press fit anti rattle

type. A spiral ring is installed on the outboard side of the 50 tooth sprocket to prevent spline disengagement. The idler sprocket assembly spins on a stationary idler shaft. The idler shaft is a light press-fit into the cylinder block. A large washer on the idler shaft bolt and the rear flange of the idler shaft are used to control sprocket thrust movement. Pressurized oil is routed through the center of the idler shaft to provide lubrication for the two bushings used in the idler sprocket assembly.

There are two secondary drive chains, both are roller type, one to drive the camshaft in each SOHC cylinder head. There are no shaft speed changes in the secondary chain drive system. Each secondary chain drives a 26 tooth cam sprocket directly from the 26 tooth sprocket on the idler sprocket assembly. A fixed chain guide and a hydraulic oil damped tensioner are used to maintain tension in each secondary chain system. The hydraulic tensioners for the secondary chain systems are fed pressurized oil from oil reservoir pockets in the block. Each tensioner incorporates a controlled leak path through a device known as a vent disc located in the nose of the piston to manage chain loads. Each tensioner also has a mechanical ratchet system that limits chain slack if the tensioner piston bleeds down after engine shut down. The tensioner arms and guides also utilize nylon wear faces for low friction and long wear. The secondary timing chains receive lubrication from a small orifice in the tensioners. This orifice is protected from clogging by a fine mesh screen which is located on the back of the hydraulic tensioners.

STANDARD PROCEDURE

MEASURING TIMING CHAIN WEAR

NOTE: This procedure must be performed with the timing chain cover removed.

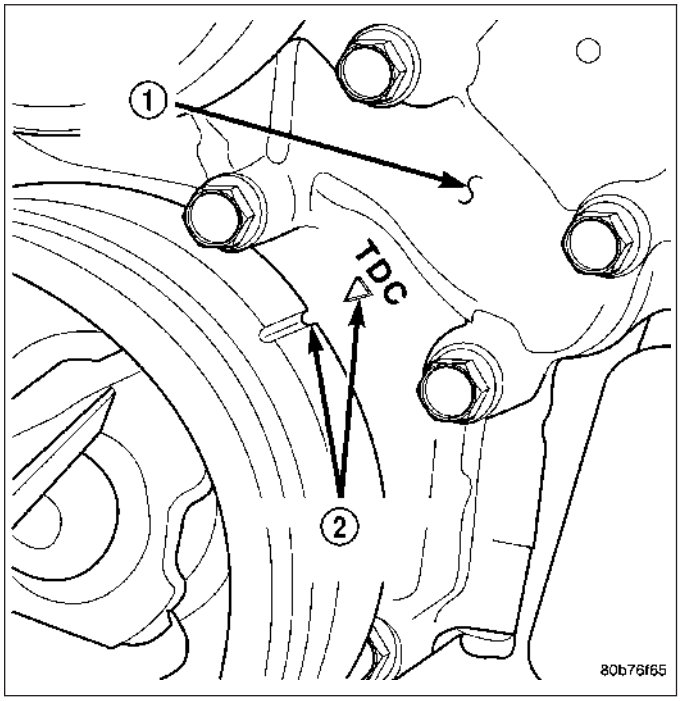
1. Remove the timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).
2. To determine if the secondary timing chains are worn, rotate the engine clockwise until maximum tensioner piston extension is obtained. Measure the distance between the secondary timing chain tensioner housing and the step ledge on the piston. The measurement at point (A) must be less than 15mm (.5906 inches).
3. If the measurement exceeds the specification the secondary timing chains are worn and require replacement (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).

SERVICE PROCEDURE - TIMING VERIFICATION

CAUTION: The 3.7L is a non free-wheeling design engine. Therefore, correct engine timing is critical.

NOTE: Components referred to as left hand or right hand are as viewed from the drivers position inside the vehicle.

NOTE: The blue link plates on the chains and the dots on the camshaft drive sprockets may not line up during the timing verification procedure. The blue link plates are lined up with the sprocket dots only when re-timing the complete timing drive. Once the timing drive is rotated blue link-to-dot alignment is no longer valid.

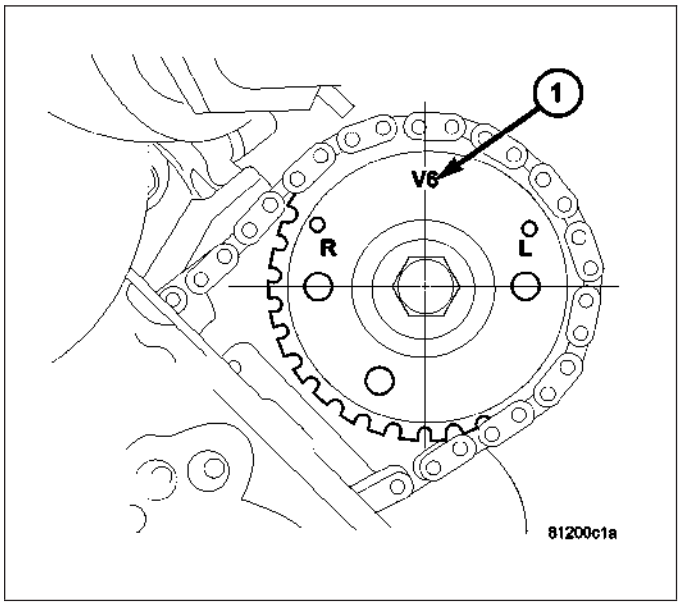


Engine base timing can be verified by the following procedure:

1. Remove the cylinder head covers. Refer to the procedure in this section.

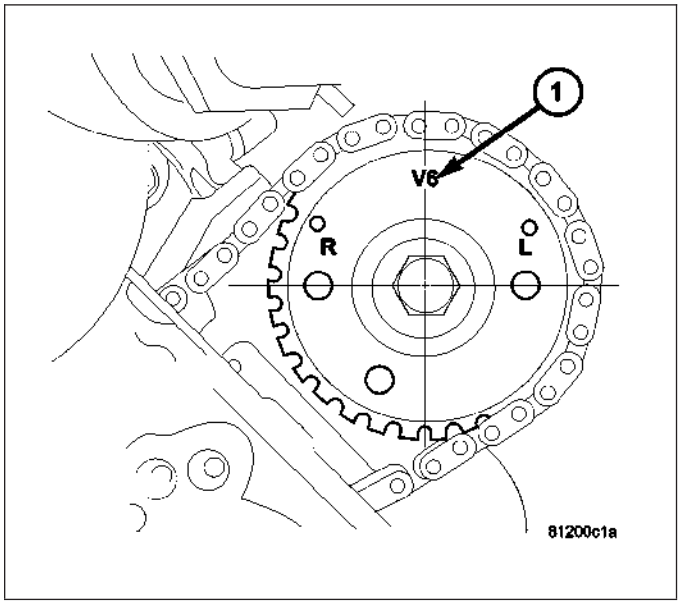
2. Using a mirror, locate the TDC arrow (2) on the front cover (1). Rotate the crankshaft until the mark on the crankshaft damper is aligned with the TDC arrow on the front cover. The engine is now at TDC.

3. Note the location of the V6 mark (1) stamped into the camshaft drive gears. If the V6 mark on each camshaft drive gear is at the twelve o'clock position, the engine is at TDC on the exhaust stroke. If the V6 mark on each gear is at the six o'clock position, the engine is at TDC on the compression stroke.
4. If both of the camshaft drive gears are off in the same or opposite directions, the primary chain or both secondary chains are at fault. Refer to Timing Chain and Sprockets procedure in this section.
5. If only one of the camshaft drive gears is off and the other is correct, the problem is confined to one secondary chain. Refer to Single camshaft timing, in this procedure.
6. If both camshaft drive gear V6 marks are at the twelve o'clock or the six o'clock position the engine base timing is correct. Reinstall the cylinder head covers.

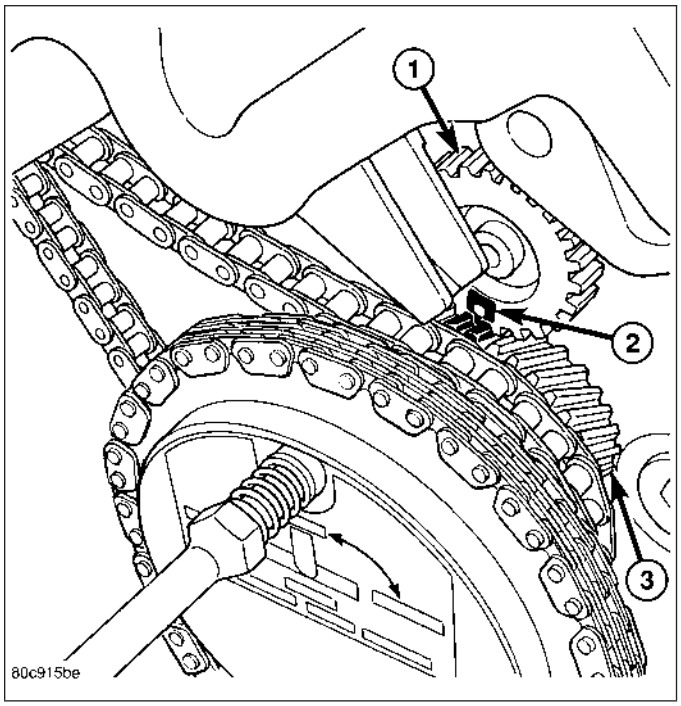


COUNTER BALANCE SHAFT TIMING

1. Ensure that the engine is at TDC with both camshaft sprocket V6 marks (1) in the 12 o'clock position.



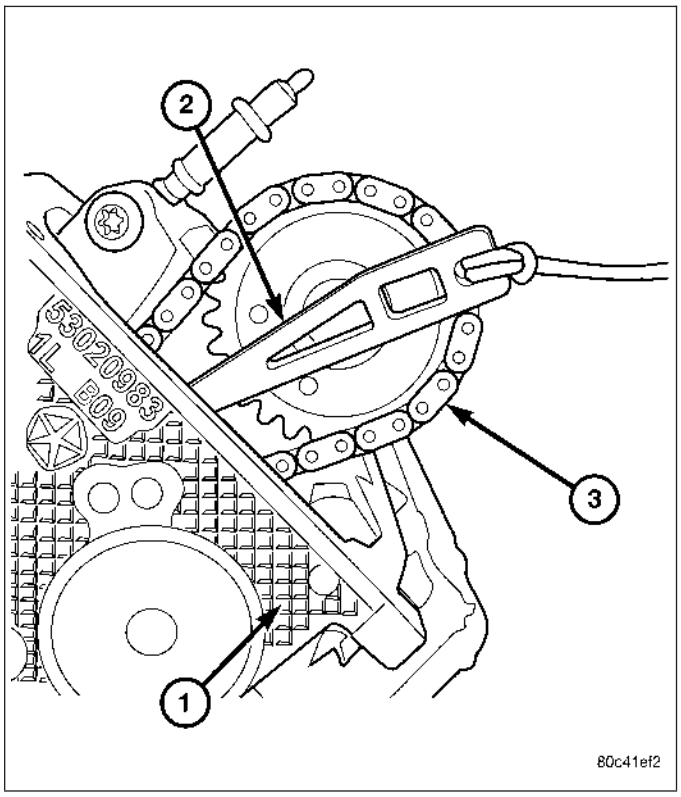
2. Look down the left cylinder head chain cavity. The timing dot on the counter balance shaft drive gear should be in the 6 o'clock position (2).



TIMING - SINGLE CAMSHAFT

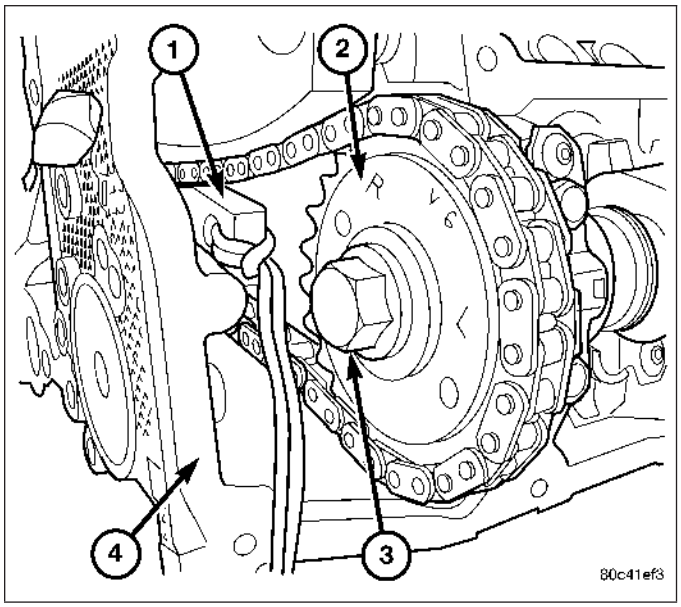
NOTE: to adjust the timing on one camshaft, preform the following procedure.

1. Using Chain Tensioner Wedge, Special Tool 8379 (2), stabilize the secondary chain drive (3). For reference purposes, mark the chain-to-sprocket position.



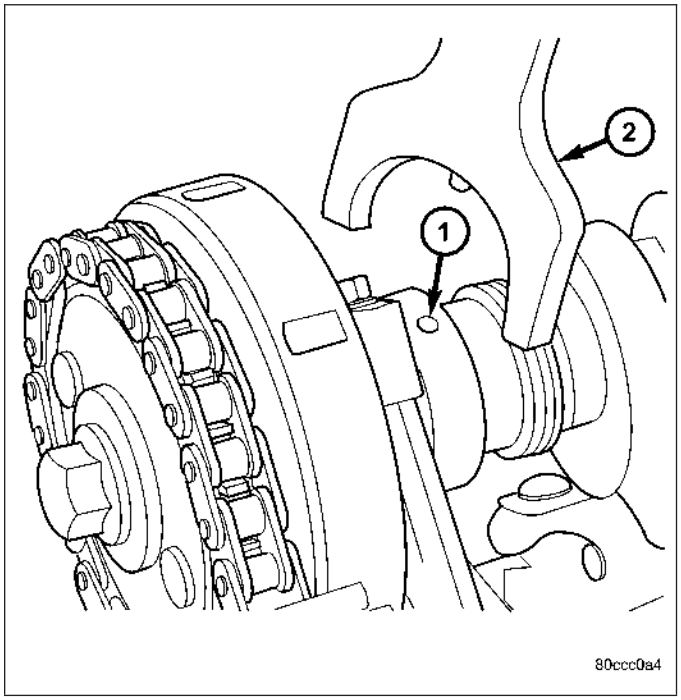
2. Remove the camshaft drive gear retaining bolt.

3. Carefully remove the camshaft drive gear (2) from the camshaft.
4. Re-index the camshaft drive gear in the chain until the V6 mark is at the same position as the V6 mark on the opposite camshaft drive gear.

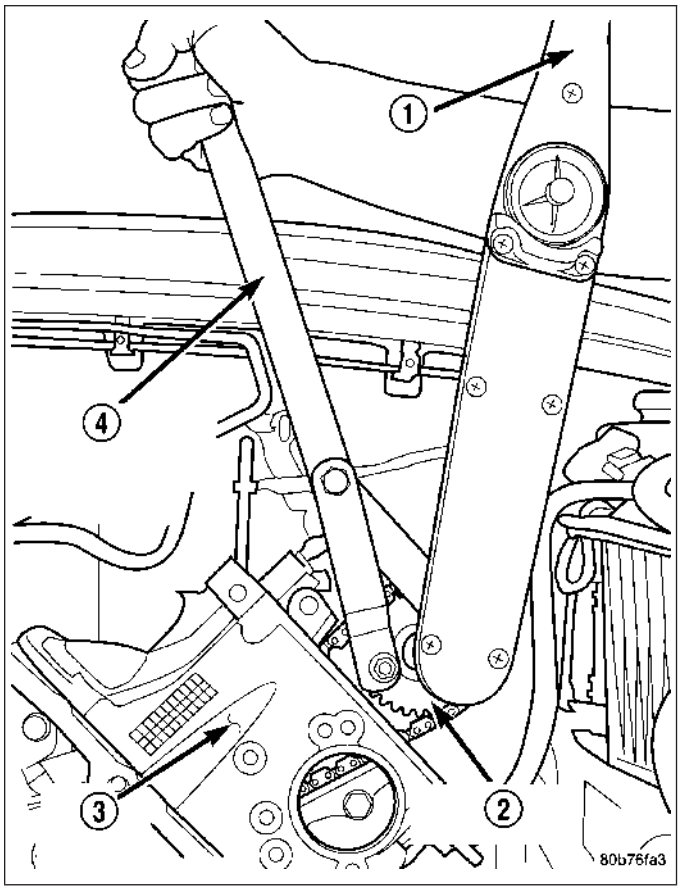


5. Using Special Tool 8428 Camshaft Wrench (2), rotate the camshaft until the alignment dowel on the camshaft is aligned with the slot in the camshaft drive gear.

CAUTION: Remove excess oil from camshaft sprocket retaining bolt before reinstalling bolt. Failure to do so may cause over-torqueing of bolt resulting in bolt failure.



6. Position the camshaft drive gear onto the camshaft, remove oil from bolt then install the retaining bolt. Using Special Tools, Spanner Wrench 6958 with Adapter Pins 8346 (4) and a suitable torque wrench (1), tighten retaining bolt to 122 N·m (90 ft. Lbs.).
7. Remove Special Tool 8379.
8. Rotate the crankshaft two full revolutions, then verify that the camshaft drive gear V6 marks are in fact aligned.
9. Install the cylinder head covers (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).

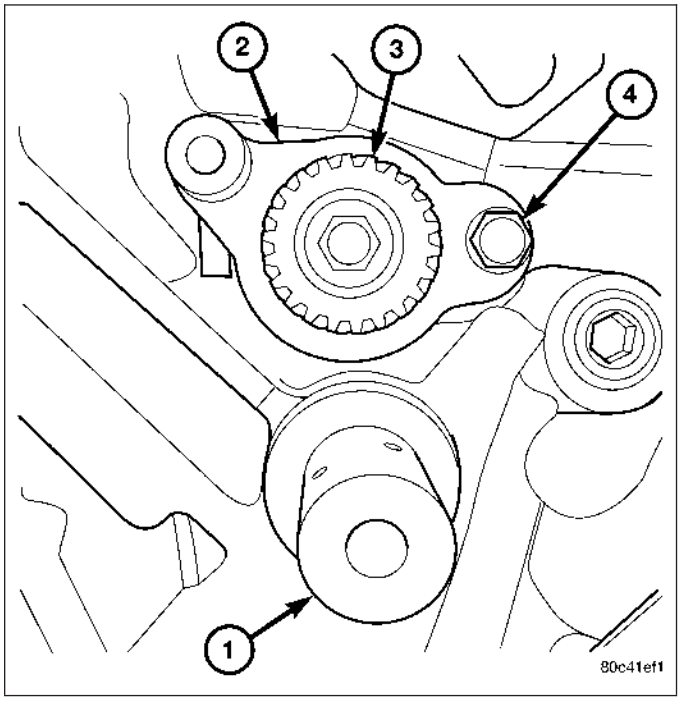


SHAFT-BALANCE

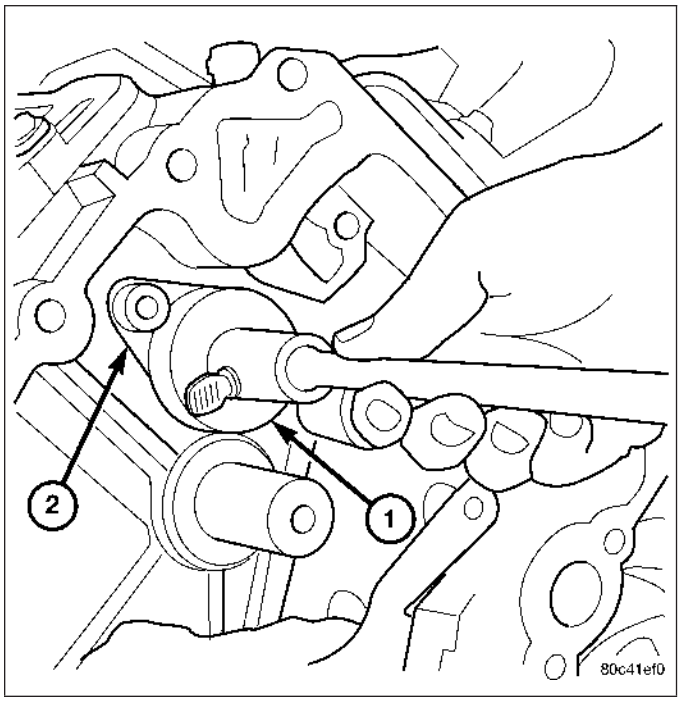
REMOVAL

1. Remove the primary and secondary timing chains. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).

NOTE: The balance shaft and gear are serviced as an assembly. Do not attempt to remove the gear from the balance shaft.Remove the retaining bolt (4) from the counterbalance shaft thrust plate (2).



2. Using Special Tool 8641 Counterbalance shaft remover/installer tool (1), remove the counterbalance shaft from the engine.



INSTALLATION

NOTE: The balance shaft and gear are serviced as an assembly. Do not attempt to remove the gear from the balance shaft.

1. Coat counterbalance shaft bearing journals with clean engine oil.

NOTE: The balance shaft is heavy, and care should be used when installing shaft, so bearings are not damaged.

2. Using Special Tool 8641 Counterbalance shaft remover/installer tool, carefully install counterbalance shaft into engine.
3. Install Counterbalance shaft thrust plate retaining bolt finger tight.Do not tighten bolt at this time.
4. Position the right side of the thrust plate with the right chain guide bolt, install bolt finger tight.
5. Torque the thrust plate retaining bolt to 28 N·m (250 in. lbs.).
6. Remove the chain guide bolt so that guide can be installed.

IDLER SHAFT

REMOVAL

1. Remove the primary and secondary timing chains and sprockets. Refer to procedure in this section.

NOTE: To remove the idler shaft, it is necessary to tap threads into the shaft, to install the removal tool.

2. Using a 12 mm X 1.75 tap, cut threads in the idler shaft center bore.
3. Cover the radiator core with a suitable cover.

CAUTION: Use care when removing the idler shaft, Do not strike the radiator cooling fins with the slide hammer.

4. Using Special Tool 8517 Slide Hammer, remove the idler shaft.

INSTALLATION

1. Thoroughly clean the idler shaft bore.
2. Position the idler shaft in the bore.

NOTE: The two lubrication holes in the idler shaft do not require any special alignment.

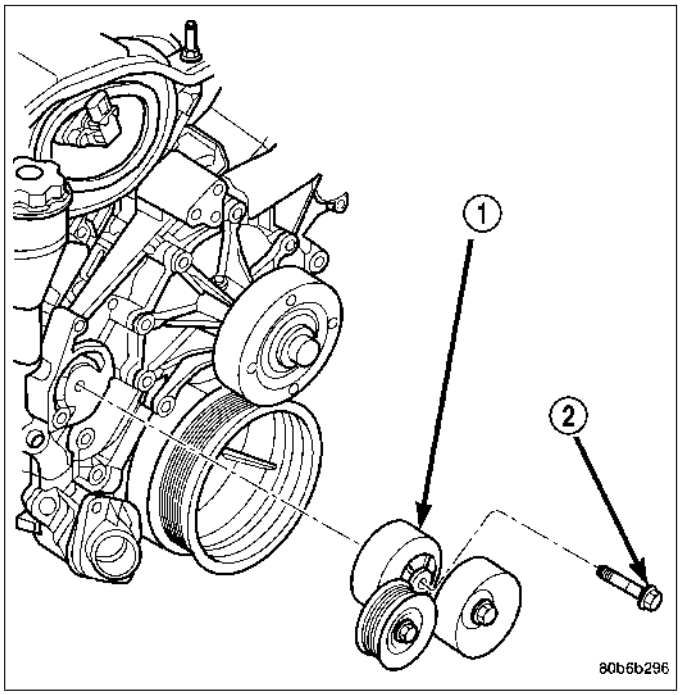
NOTE: Before using the retaining bolt to install the idler shaft, coat the threads and the pilot on the idler shaft, with clean engine oil.

3. Using the primary idler sprocket retaining bolt and washer, carefully draw the idler shaft into the bore until fully seated.
4. Coat the idler shaft with clean engine oil.
5. Install the timing chains and sprockets. Refer to procedure in this section.

COVER - TIMING

REMOVAL

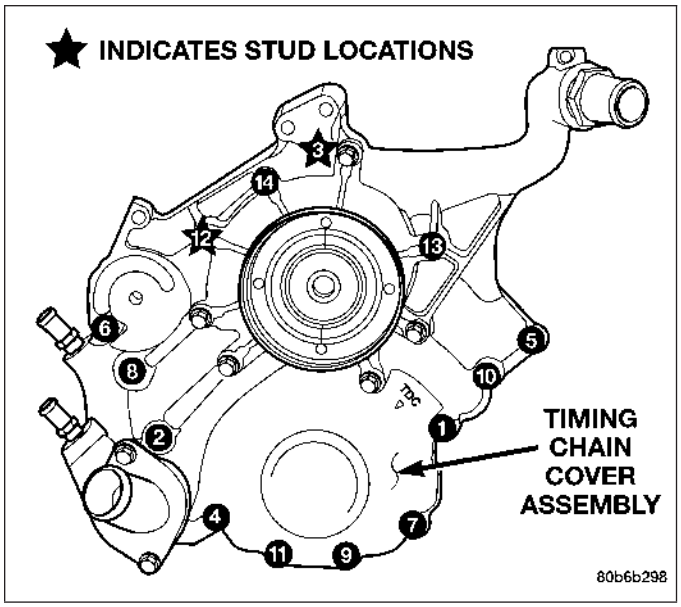
1. Disconnect the battery negative cable.
2. Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
3. Remove electric cooling fan and fan shroud assembly.
4. Remove radiator fan (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - REMOVAL).
5. Disconnect both heater hoses at timing cover.
6. Disconnect lower radiator hose at engine.
7. Remove accessory drive belt tensioner assembly (1).
8. Remove crankshaft damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL).
9. Remove the generator (Refer to 8 - ELECTRICAL/CHARGING/GENERATOR - REMOVAL).
10. Remove A/C compressor (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/A/C COMPRESSOR - REMOVAL).



CAUTION: The 3.7L engine uses an anerobic sealer instead of a gasket to seal the front cover to the engine block, from the factory. For service, Mopar® Grey Engine RTV sealant must be substituted.

NOTE: It is not necessary to remove the water pump for timing cover removal.

11. Remove the bolts holding the timing cover to engine block.
12. Remove the timing cover.



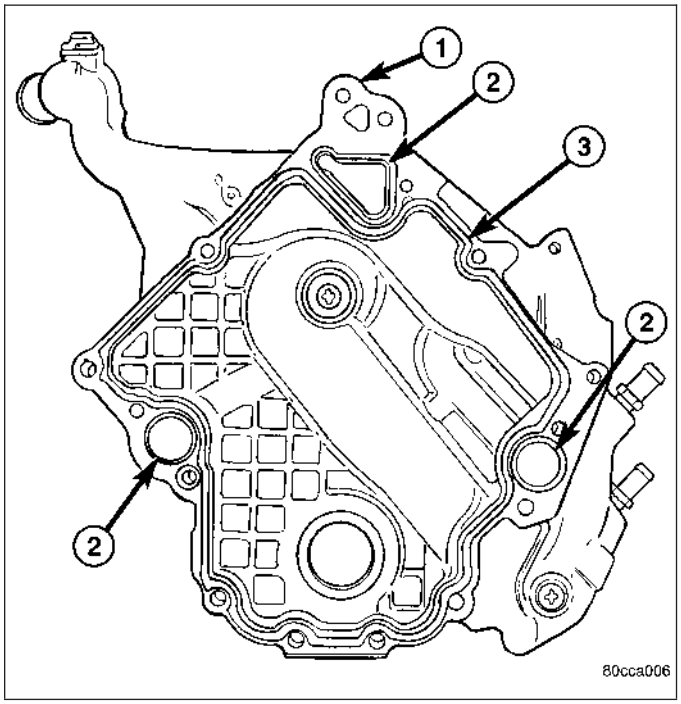
INSTALLATION

CAUTION: Do not use oil based liquids to clean timing cover or block surfaces. Use only rubbing alcohol, along with plastic or wooden scrapers. Use no wire brushes or abrasive wheels or metal scrapers, or damage to surfaces could result.

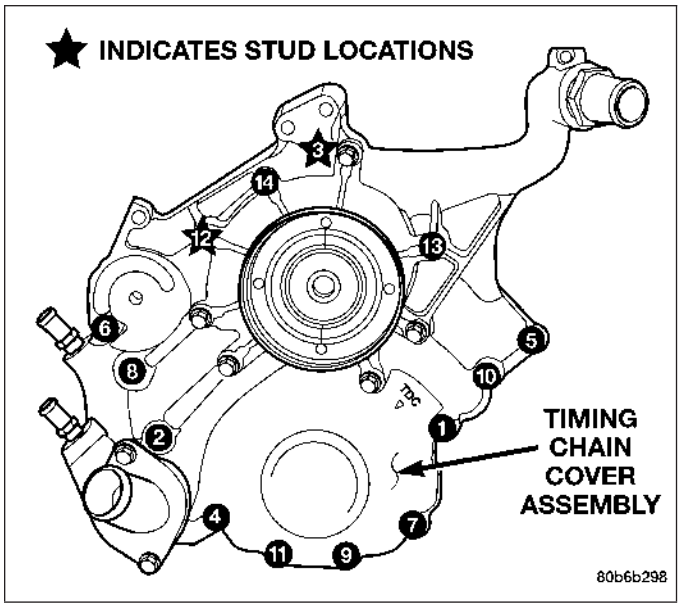
1. Clean timing chain cover and block surface using rubbing alcohol.

CAUTION: The 3.7L uses a special anerobic sealer instead of a gasket to seal the timing cover to the engine block, from the factory. For service repairs, Mopar® Engine RTV must be used as a substitute.

2. Inspect the water passage o-rings (2) for any damage, and replace as necessary.
3. Apply Mopar® Engine RTV sealer to front cover as shown (3) using a 3 to 4mm thick bead.



4. Install cover. Tighten fasteners in sequence as shown in to 58 N·m (43 ft. lbs.).
5. Install crankshaft damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION).
6. Install the A/C compressor (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/A/C COMPRESSOR - INSTALLATION).
7. Install the generator (Refer to 8 - ELECTRICAL/CHARGING/GENERATOR - INSTALLATION).
8. Install accessory drive belt tensioner (Refer to 7 - COOLING/ACCESSORY DRIVE/BELT TENSIONERS - INSTALLATION).
9. Install radiator upper and lower hoses.
10. Install both heater hoses.
11. Install radiator fan (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - INSTALLATION).

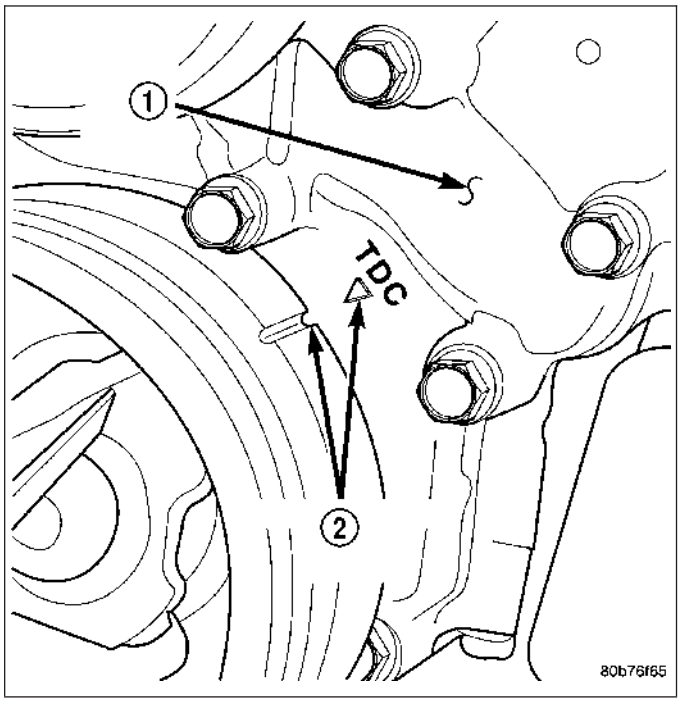


12. Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
13. Connect the battery negative cable.

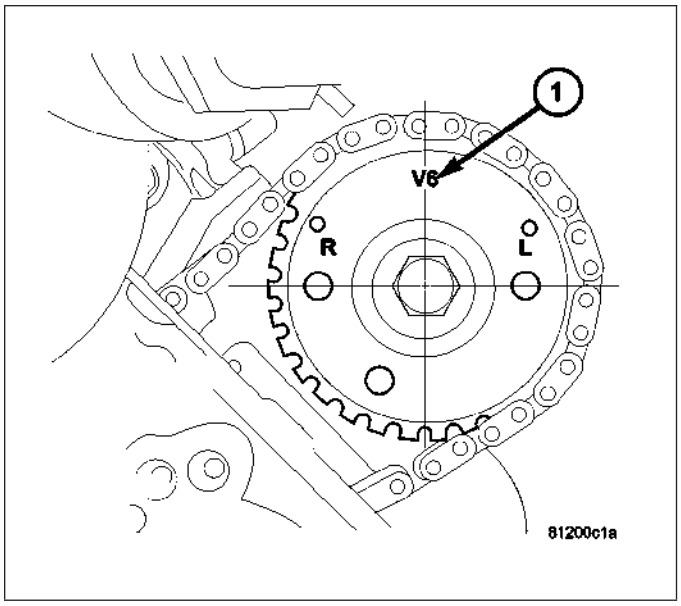
TIMING CHAIN & SPROCKETS

REMOVAL

1. Disconnect negative cable from battery.
2. Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
3. Remove right and left cylinder head covers (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).
4. Remove radiator fan (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - REMOVAL).
5. Rotate engine until timing mark (2) on crankshaft damper aligns with TDC mark on timing chain cover (1).



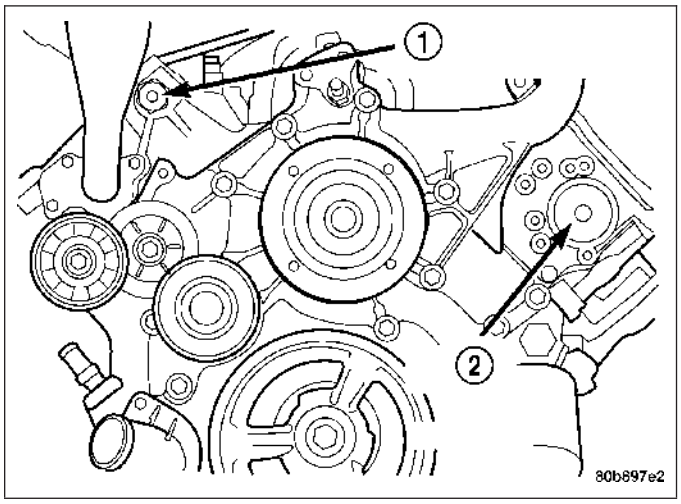
6. Make sure the camshaft sprocket “V6” marks (1) are at the 12 o’clock position (No. 1 TDC exhaust stroke).
7. Remove power steering pump (Refer to 19 - STEERING/PUMP - REMOVAL).



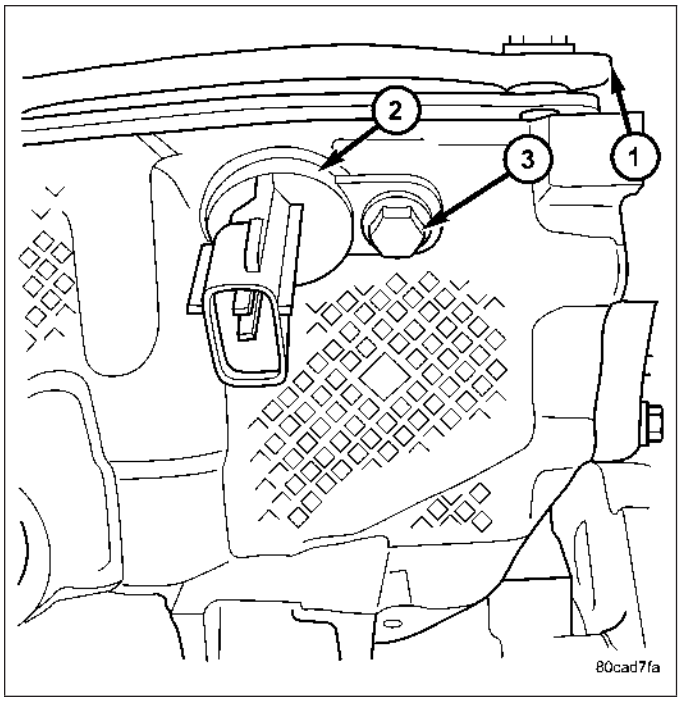
8. Remove access plugs (1 and 2) from left and right cylinder heads for access to chain guide fasteners.
9. Remove the oil fill housing to gain access to the right side tensioner arm fastener.
10. Remove crankshaft damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL) and timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).
11. Collapse and pin primary chain tensioner.

CAUTION: Plate behind left secondary chain tensioner could fall into oil pan. Therefore, cover pan opening.

12. Remove secondary chain tensioners.

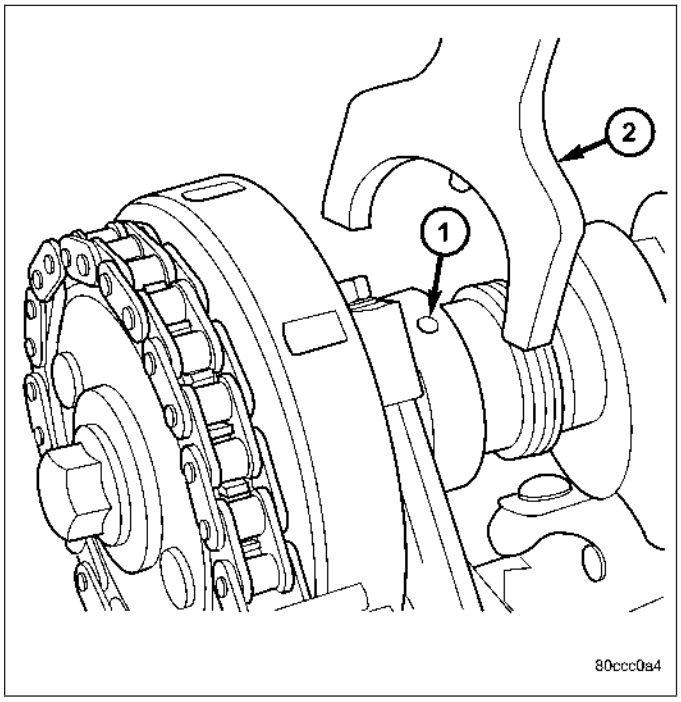


13. Remove camshaft position sensor (2).



CAUTION: Care should be taken not to damage camshaft target wheel. Do not hold target wheel while loosening or tightening camshaft sprocket. Do not place the target wheel near a magnetic source of any kind. A damaged or magnetized target wheel could cause a vehicle no start condition.

CAUTION: Do not forcefully rotate the camshafts or crankshaft independently of each other. Damaging intake valve to piston contact will occur. Ensure negative battery cable is disconnected to guard against accidental starter engagement.



14. Remove left and right camshaft sprocket bolts.
15. While holding the left camshaft steel tube with Special Tool 8428 Camshaft Wrench (2) , remove the left camshaft sprocket. Slowly rotate the camshaft approximately 5 degrees clockwise to a neutral position.
16. While holding the right camshaft steel tube with Special Tool 8428 Camshaft Wrench (2), remove the right camshaft sprocket.
17. Remove idler sprocket assembly bolt.
18. Slide the idler sprocket assembly and crank sprocket forward simultaneously to remove the primary and secondary chains.
19. Remove both pivoting tensioner arms and chain guides.
20. Remove primary chain tensioner.

INSPECTION

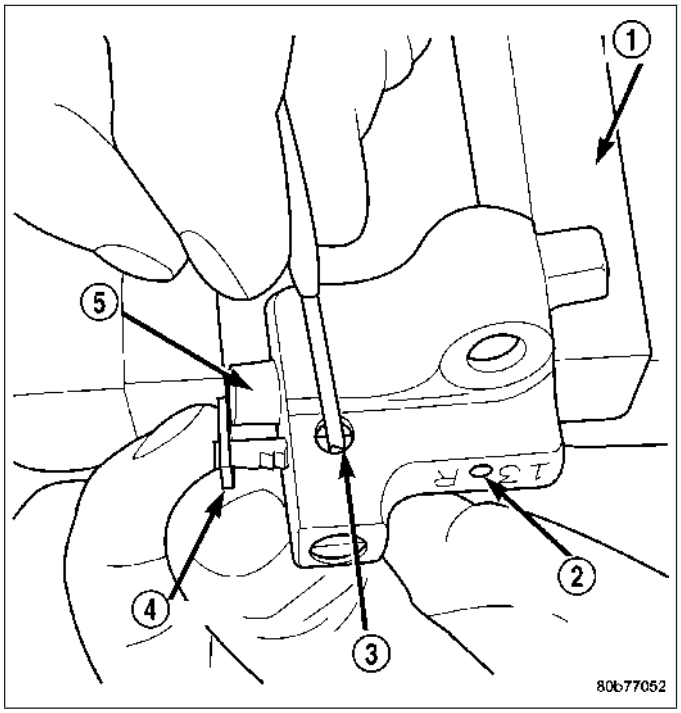
Inspect the following components:

- Sprockets for excessive tooth wear. Some tooth markings are normal and not a cause for sprocket replacement.

- Idler sprocket assembly bushing and shaft for excessive wear.
- Idler sprocket assembly spline joint. The joint should be tight with no backlash or axial movement.
- Chain guides and tensioner arms. Replace these parts if grooving in plastic face is more than 1 mm (0.039 in.) deep. If plastic face is severely grooved or melted, the tensioner lube jet may be clogged. The tensioner should be replaced.
- Secondary chain tensioner piston and ratcheting device. Inspect for evidence of heavy contact between tensioner piston and tensioner arm. If this condition exist the tensioner tensioner arm and chain should be replaced.
- Primary chain tensioner plastic faces. Replace as required.

INSTALLATION

1. Using a vise, lightly compress the secondary chain tensioner piston until the piston step (5) is flush with the tensioner body. Using a pin or suitable tool, release ratchet pawl (4) by pulling pawl back against spring force through access hole on side of tensioner. While continuing to hold pawl back, Push ratchet device to approximately 2 mm from the tensioner body. Install Special Tool 8514 lock pin (2) into hole on front of tensioner. Slowly open vise to transfer piston spring force to lock pin.
2. Position primary chain tensioner over oil pump and insert bolts into lower two holes on tensioner bracket. Tighten bolts to 28 N·m (250 in. lbs.).
3. Install right side chain tensioner arm. Install Torx® bolt. Tighten Torx® bolt to 28 N·m (250 in. lbs.).

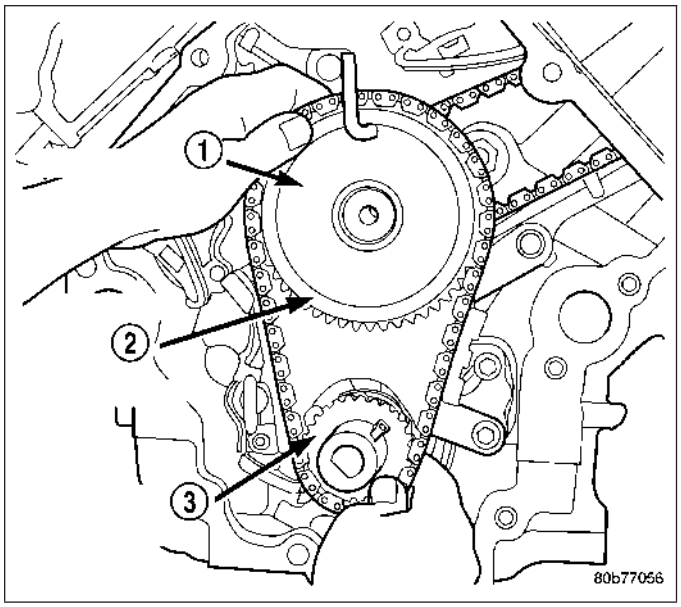


CAUTION: The silver bolts retain the guides to the cylinder heads and the black bolts retain the guides to the engine block.

4. Install the left side chain guide. Tighten the bolts to 28 N·m (250 in. lbs.).
5. Install left side chain tensioner arm, and Torx® bolt. Tighten Torx® bolt to 28 N·m (250 in. lbs.).
6. Install the right side chain guide. Tighten the bolts to 28 N·m (250 in. lbs.).

7. Install both secondary chains onto the idler sprocket (2). Align two plated links on the secondary chains to be visible through the two lower openings on the idler sprocket (4 o'clock and 8 o'clock). Once the secondary timing chains are installed, position special tool 8429 (1) to hold chains in place for installation.
8. Align primary chain double plated links with the timing mark at 12 o'clock on the idler sprocket. Align the primary chain single plated link with the timing mark at 6 o'clock on the crankshaft sprocket.
9. Lubricate idler shaft and bushings with clean engine oil.

NOTE: The idler sprocket must be timed to the counterbalance shaft drive gear before the idler sprocket is fully seated.

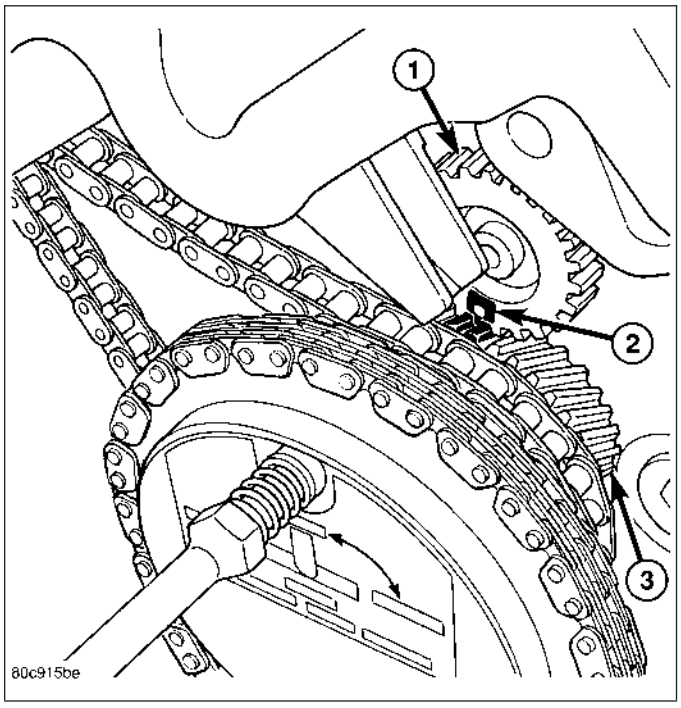


10. Install all chains, crankshaft sprocket, and idler sprocket as an assembly. After guiding both secondary chains through the block and cylinder head openings, affix chains with a elastic strap or equivalent. This will maintain tension on chains to aid in installation. Align the timing mark (2) on the idler sprocket gear (3) to the timing mark on the counterbalance shaft drive gear (1), then seat idler sprocket fully. Before installing idler sprocket bolt, lubricate washer with oil, and tighten idler sprocket assembly retaining bolt to 34 N·m (25 ft. lbs.).

NOTE: It will be necessary to slightly rotate camshafts for sprocket installation.

11. Align left camshaft sprocket "L" dot to plated link on chain.
12. Align right camshaft sprocket "R" dot to plated link on chain.

CAUTION: Remove excess oil from the camshaft sprocket bolt. Failure to do so can result in overtorque of bolt resulting in bolt failure.



13. Remove Special Tool 8429, then attach both sprockets to camshafts. Remove excess oil from bolts, then Install sprocket bolts, but do not tighten at this time.
14. Verify that all plated links are aligned with the marks on all sprockets and the "V6" marks on camshaft sprockets are at the 12 o'clock position.

CAUTION: Ensure the plate between the left secondary chain tensioner and block is correctly installed.

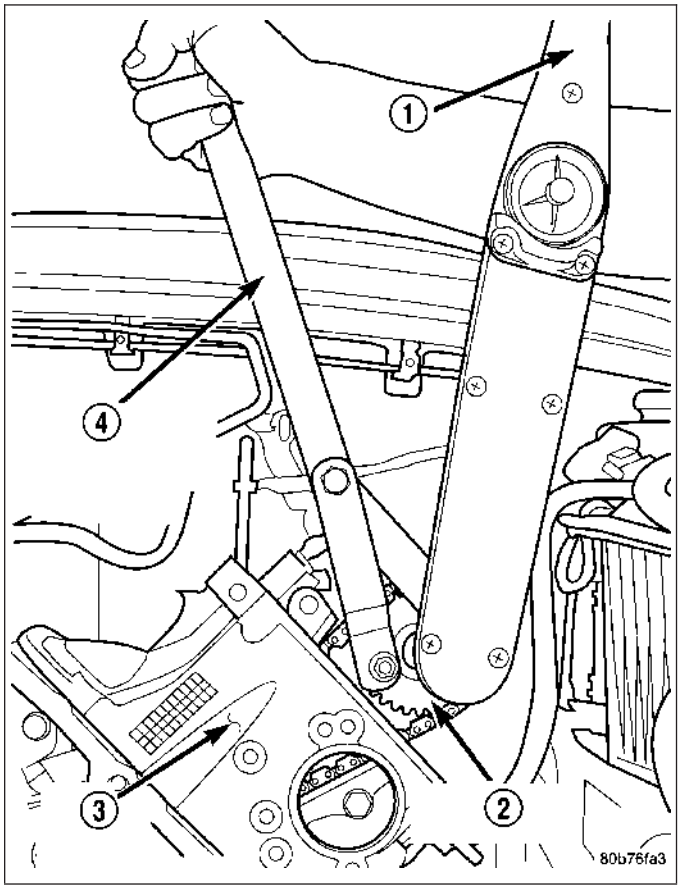
15. Install both secondary chain tensioners. Tighten bolts to 28 N·m (250 in. lbs.).

NOTE: Left and right secondary chain tensioners are not common.

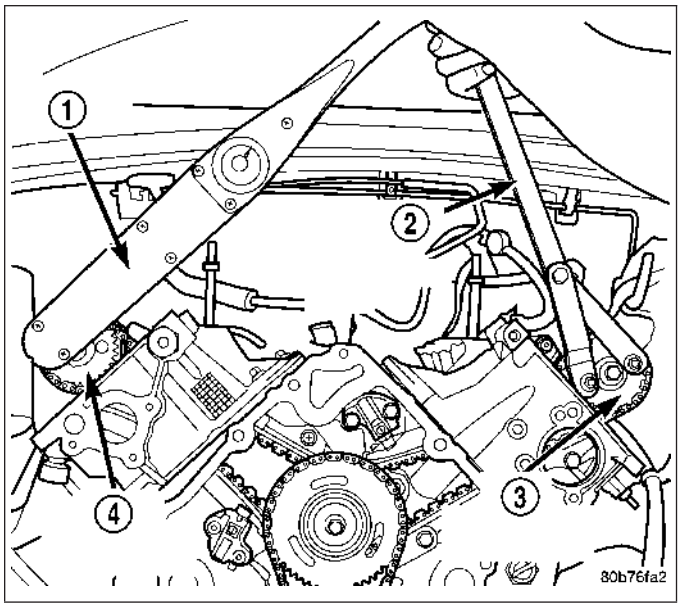
16. Remove all locking pins (3) from tensioners.

CAUTION: After pulling locking pins out of each tensioner, DO NOT manually extend the tensioner(s) ratchet. Doing so will over tension the chains, resulting in noise and/or high timing chain loads.

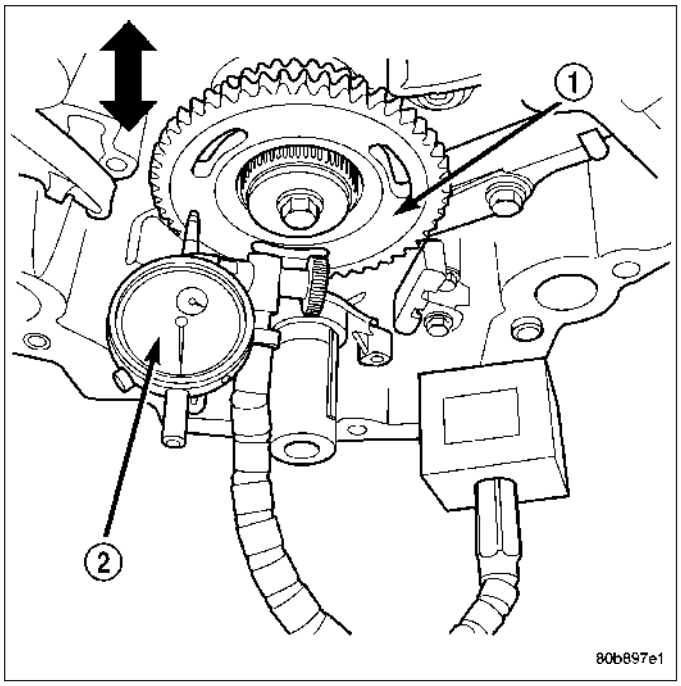
17. Using Special Tool 6958, Spanner with Adaptor Pins 8346 (4) , tighten left. camshaft sprocket bolts to 122 N·m (90 ft. lbs.).



18. Using Special Tool 6958, Spanner with Adaptor Pins 8346 (2) , tighten right camshaft sprocket bolts to 122 N·m (90 ft. lbs.).
19. Rotate engine two full revolutions. Verify timing marks are at the follow locations:
    - primary chain idler sprocket dot is at 12 o'clock
    - primary chain crankshaft sprocket dot is at 6 o'clock
    - secondary chain camshaft sprockets "V6" marks are at 12 o'clock
    - counterbalancer shaft drive gear dot is aligned to the idler sprocket gear dot
20. Lubricate all three chains with engine oil.

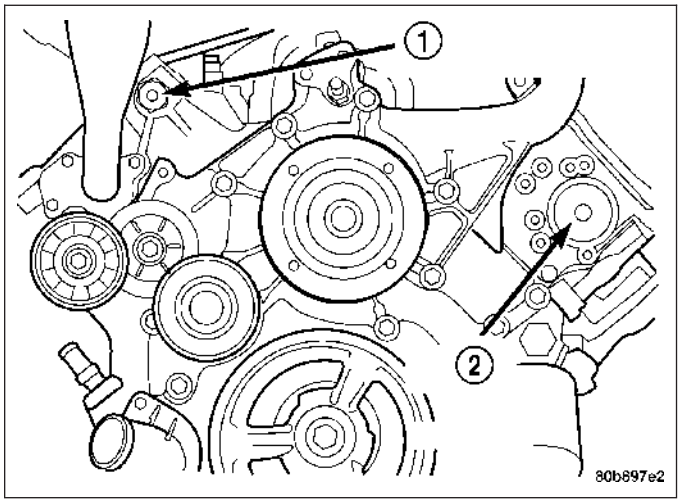


21. After installing all chains, it is recommended that the idler gear end play be checked. The end play must be within 0.10 -0.25 mm (0.004 - 0.010 in.). If not within specification, the idler gear (1) must be replaced.
22. Install timing chain cover and crankshaft damper (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION) and (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION).
23. Install cylinder head covers (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).



NOTE: Before installing threaded plug in right cylinder head, the plug must be coated with sealant to prevent leaks.

24. Coat the large threaded access plug (2) with **Mopar® Thread Sealant with Teflon**, then install into the right cylinder head and tighten to 81 N·m (60 ft. lbs.).
25. Install the oil fill housing.
26. Install access plug (1) in left cylinder head.
27. Install power steering pump (Refer to 19 - STEERING/PUMP - INSTALLATION).
28. Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
29. Connect negative cable to battery.



ENGINE - 4.7L SERVICE INFORMATION

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ENGINE - 4.7L SERVICE INFORMATION

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - ENGINE DIAGNOSIS - INTRODUCTION

Engine diagnosis is helpful in determining the causes of malfunctions not detected and remedied by routine maintenance.

These malfunctions may be classified as either performance (e.g., engine idles rough and stalls) or mechanical (e.g., a strange noise).

(Refer to 9 - ENGINE - DIAGNOSIS AND TESTING) - PERFORMANCE and (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)—MECHANICAL for possible causes and corrections of malfunctions. (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - DIAGNOSIS AND TESTING) and (Refer to 14 - FUEL SYSTEM/FUEL INJECTION - DIAGNOSIS AND TESTING) for the fuel system diagnosis.

Additional tests and diagnostic procedures may be necessary for specific engine malfunctions that can not be isolated with the Service Diagnosis charts. Information concerning additional tests and diagnosis is provided within the following diagnosis:

- Cylinder Compression Pressure Test (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).
- Cylinder Combustion Pressure Leakage Test (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).
- Engine Cylinder Head Gasket Failure Diagnosis (Refer to 9 - ENGINE/CYLINDER HEAD - DIAGNOSIS AND TESTING).
- Intake Manifold Leakage Diagnosis (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - DIAGNOSIS AND TESTING).

DIAGNOSIS AND TESTING - ENGINE DIAGNOSIS - PERFORMANCE

CONDITION	POSSIBLE CAUSE	CORRECTION
ENGINE WILL NOT START	1. Weak battery	1. Charge or replace as necessary.
	2. Corroded or loose battery connections.	2. Clean and tighten battery connections. Apply a coat of light mineral grease to the terminals.
	3. Faulty starter.	3. (Refer to 8 - ELECTRICAL/STARTING - DIAGNOSIS AND TESTING).
	4. Faulty coil or control unit.	4. (Refer to 8 - ELECTRICAL/IGNITION CONTROL/IGNITION COIL - REMOVAL).
	5. Incorrect spark plug gap.	5. (Refer to 8 - ELECTRICAL/IGNITION CONTROL/SPARK PLUG - CLEANING).
	6. Dirt or water in fuel system.	6. Clean system and replace fuel filter.
	7. Faulty fuel pump, relay or wiring.	7. Repair or replace as necessary.

CONDITION	POSSIBLE CAUSE	CORRECTION
ENGINE STALLS OR ROUGH IDLE	1. Idle speed set to low.	1. (Refer to 14 - FUEL SYSTEM/ FUEL INJECTION/IDLE AIR CONTROL MOTOR - REMOVAL).
	2. Idle mixture too lean or too rich.	2. Refer to Powertrain Diagnosis Information.
	3. Vacuum leak.	3. Inspect intake manifold and vacuum hoses, repair or replace as necessary.
	4. Faulty coil.	4. (Refer to 8 - ELECTRICAL/ IGNITION CONTROL/IGNITION COIL - REMOVAL).
	5. Incorrect engine timing.	5. (Refer to 9 - ENGINE/VALVE TIMING - STANDARD PROCEDURE).
ENGINE LOSS OF POWER	1. Dirty or incorrectly gapped spark plugs.	1. (Refer to 8 - ELECTRICAL/ IGNITION CONTROL/SPARK PLUG - CLEANING).
	2. Dirt or water in fuel system.	2. Clean system and replace fuel filter.
	3. Faulty fuel pump.	3. Refer to the Appropriate Diagnostic Information
	4. Blown cylinder head gasket.	4. Replace cylinder head gasket.
	5. Low compression.	5. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).
	6. Burned, warped or pitted valves.	6. Replace as necessary.
	7. Plugged or restricted exhaust system.	7. Inspect and replace as necessary.
	8. Faulty coil.	8. (Refer to 8 - ELECTRICAL/ IGNITION CONTROL/IGNITION COIL - REMOVAL).
ENGINE MISSES ON ACCELERATION	1. Spark plugs dirty or incorrectly gapped.	1. (Refer to 8 - ELECTRICAL/ IGNITION CONTROL/SPARK PLUG - CLEANING).
	2. Dirt in fuel system.	2. Clean fuel system.
	3. Burned, warped or pitted valves.	3. Replcae as necessary.
	4. Faulty coil.	4. (Refer to 8 - ELECTRICAL/ IGNITION CONTROL/IGNITION COIL - REMOVAL).
ENGINE MISSES AT HIGH SPEED	1. Spark plugs dirty or incorrectly gapped.	1. (Refer to 8 - ELECTRICAL/ IGNITION CONTROL/SPARK PLUG - CLEANING).
	2. Faulty coil.	2. (Refer to 8 - ELECTRICAL/ IGNITION CONTROL/IGNITION COIL - REMOVAL).
	3. Dirt or water in fuel system.	3. Clean system and replace fuel filter.

DIAGNOSIS AND TESTING - ENGINE DIAGNOSIS - MECHANICAL

CONDITION	POSSIBLE CAUSES	CORRECTIONS
NOISY VALVES	1. High or low oil level in crankcase.	1. (Refer to LUBRICATION & MAINTENANCE - SPECIFICATIONS)
	2. Thin or diluted oil.	2. Change oil and filter.
	3. Low oil pressure.	3. Check oil pump, if Ok, check rod and main bearings for excessive wear.
	4. Dirt in lash adjusters.	4. Replace as necessary.
	5. Worn rocker arms.	5. Replace as necessary.
	6. Worn lash adjusters	6. Replace as necessary.
	7. Worn valve guides.	7. (Refer to 9 - ENGINE/CYLINDER HEAD/INTAKE/EXHAUST VALVES & SEATS - STANDARD PROCEDURE)
	8. Excessive runout of valve seats on valve faces.	8. (Refer to 9 - ENGINE/CYLINDER HEAD/INTAKE/EXHAUST VALVES & SEATS - STANDARD PROCEDURE)
CONNECTING ROD NOISE	1. Insufficient oil supply.	1. (Refer to LUBRICATION & MAINTENANCE - SPECIFICATIONS)
	2. Low oil pressure.	2. Check oil pump, if Ok, check rod and main bearings for excessive wear.
	3. Thin or diluted oil.	3. Change oil and filter.
	4. Excessive bearing clearance.	4. Replace as necessary.
	5. Connecting rod journal out-of-round.	5. Service or replace crankshaft.
	6. Misaligned connecting rods.	6. Replace bent connecting rods.
MAIN BEARING NOISE	1. Insufficient oil supply.	1. (Refer to LUBRICATION & MAINTENANCE - SPECIFICATIONS)
	2. Low oil pressure.	2. Check oil pump, if Ok, check rod and main bearings for excessive wear.
	3. Thin or diluted oil.	3. Change oil and filter.
	4. Excessive bearing clearance.	4. Replace as necessary.
	5. Excessive end play.	5. Check thrust washers for wear.
	6. Crankshaft journal out-of round.	6. Service or replace crankshaft.
	7. Loose flywheel or torque converter.	7. Tighten to correct torque

DIAGNOSIS AND TESTING - ENGINE DIAGNOSIS - LUBRICATION

CONDITION	POSSIBLE CAUSES	CORRECTION
OIL LEAKS	1. Gaskets and O-Rings.	1.
	(a) Misaligned or damaged.	(a) Replace as necessary.
	(b) Loose fasteners, broken or porous metal parts.	(b) Tighten fasteners, Repair or replace metal parts.
	2. Crankshaft rear seal	2. Replace as necessary (Refer to 9 - ENGINE/ENGINE BLOCK/ CRANKSHAFT OIL SEAL - REAR - REMOVAL).
	3. Crankshaft seal flange. Scratched, nicked or grooved.	3. Polish or replace crankshaft.
	4. Oil pan flange cracked.	4. Replace oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).
	5. Timing chain cover seal, damaged or misaligned.	5. Replace seal (Refer to 9 - ENGINE/ENGINE BLOCK/ CRANKSHAFT OIL SEAL - FRONT - REMOVAL).
	6. Scratched or damaged vibration damper hub.	6. Polish or replace damper.
OIL PRESSURE DROP	1. Low oil level.	1. Check and correct oil level.
	2. Faulty oil pressure sending unit.	2. Replace sending unit (Refer to 9 - ENGINE/LUBRICATION/OIL PRESSURE SENSOR/SWITCH - REMOVAL).
	3. Low oil pressure.	3. Check oil pump and bearing clearance.
	4. Clogged oil filter.	4. Replace oil filter (Refer to 9 - ENGINE/LUBRICATION/OIL FILTER - REMOVAL).
	5. Worn oil pump.	5. Replace oil pump (Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - REMOVAL).
	6. Thin or diluted oil.	6. Change oil and filter.
	7. Excessive bearing clearance.	7. Replace as necessary.
	8. Oil pump relief valve stuck.	8. Replace oil pump (Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - REMOVAL).
	9. Oil pick up tube loose, damaged or clogged.	9. Replace as necessary.

CONDITION	POSSIBLE CAUSES	CORRECTION
OIL PUMPING AT RINGS; SPARK PLUGS FOULING	1. Worn or damaged rings.	1. Hone cylinder bores and replace rings.
	2. Carbon in oil ring slots.	2. Replace rings (Refer to 9 - ENGINE/ENGINE BLOCK/PISTON RINGS - STANDARD PROCEDURE).
	3. Incorrect ring size installed.	3. Replace rings (Refer to 9 - ENGINE/ENGINE BLOCK/PISTON RINGS - STANDARD PROCEDURE).
	4. Worn valve guides.	4. Ream guides and replace valves (Refer to 9 - ENGINE/CYLINDER HEAD/INTAKE/EXHAUST VALVES & SEATS - STANDARD PROCEDURE).
	5. Leaking valve guide seals.	5. Replace valve guide seals.

DIAGNOSIS AND TESTING - CYLINDER COMPRESSION PRESSURE

The results of a cylinder compression pressure test can be utilized to diagnose several engine malfunctions.

Ensure the battery is completely charged and the engine starter motor is in good operating condition. Otherwise the indicated compression pressures may not be valid for diagnosis purposes.

1. Clean the spark plug recesses with compressed air.
2. Remove the spark plugs.
3. Disable the fuel system (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - DESCRIPTION).
4. Remove the ASD relay (Refer to 8 - ELECTRICAL/IGNITION CONTROL/AUTO SHUT DOWN RELAY - REMOVAL).
5. Insert a compression pressure gauge and rotate the engine with the engine starter motor for three revolutions.
6. Record the compression pressure on the 3rd revolution. Continue the test for the remaining cylinders.
7. (Refer to 9 - ENGINE - SPECIFICATIONS) for the correct engine compression pressures.

DIAGNOSIS AND TESTING - CYLINDER COMBUSTION PRESSURE LEAKAGE

The combustion pressure leakage test provides an accurate means for determining engine condition.

Combustion pressure leakage testing will detect:

- Exhaust and intake valve leaks (improper seating).
- Leaks between adjacent cylinders or into water jacket.
- Any causes for combustion/compression pressure loss.

1. Check the coolant level and fill as required. DO NOT install the radiator cap.
2. Start and operate the engine until it attains normal operating temperature, then turn the engine OFF.
3. Remove the spark plugs.
4. Remove the oil filler cap.
5. Remove the air cleaner hose.
6. Calibrate the tester according to the manufacturer's instructions. The shop air source for testing should maintain 483 kPa (70 psi) minimum, 1,379 kPa (200 psi) maximum and 552 kPa (80 psi) recommended.
7. Perform the test procedures on each cylinder according to the tester manufacturer's instructions. Set piston of cylinder to be tested at TDC compression,While testing, listen for pressurized air escaping through the throttle body, tailpipe and oil filler cap opening. Check for bubbles in the radiator coolant.

All gauge pressure indications should be equal, with no more than 25% leakage.

FOR EXAMPLE: At 552 kPa (80 psi) input pressure, a minimum of 414 kPa (60 psi) should be maintained in the cylinder.

Refer to CYLINDER COMBUSTION PRESSURE LEAKAGE DIAGNOSIS CHART .

CYLINDER COMBUSTION PRESSURE LEAKAGE DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSE	CORRECTION
AIR ESCAPES THROUGH THROTTLE BODY	Intake valve bent, burnt, or not seated properly	Inspect valve and valve seat. Reface or replace, as necessary. Inspect valve springs. Replace as necessary.
AIR ESCAPES THROUGH TAILPIPE	Exhaust valve bent, burnt, or not seated properly	Inspect valve and valve seat. Reface or replace, as necessary. Inspect valve springs. Replace as necessary.
AIR ESCAPES THROUGH RADIATOR	Head gasket leaking or cracked cylinder head or block	Remove cylinder head and inspect. Replace defective part
MORE THAN 50% LEAKAGE FROM ADJACENT CYLINDERS	Head gasket leaking or crack in cylinder head or block between adjacent cylinders	Remove cylinder head and inspect. Replace gasket, head, or block as necessary
MORE THAN 25% LEAKAGE AND AIR ESCAPES THROUGH OIL FILLER CAP OPENING ONLY	Stuck or broken piston rings; cracked piston; worn rings and/or cylinder wall	Inspect for broken rings or piston. Measure ring gap and cylinder diameter, taper and out-of-round. Replace defective part as necessary

STANDARD PROCEDURE

STANDARD PROCEDURE - REPAIR DAMAGED OR WORN THREADS

CAUTION: Be sure that the tapped holes maintain the original center line.

Damaged or worn threads can be repaired. Essentially, this repair consists of:

- Drilling out worn or damaged threads.
- Tapping the hole with a special Heli-Coil Tap, or equivalent.
- Installing an insert into the tapped hole to bring the hole back to its original thread size.

STANDARD PROCEDURE - FORM-IN-PLACE GASKETS AND SEALERS

There are numerous places where form-in-place gaskets are used on the engine. Care must be taken when applying form-in-place gaskets to assure obtaining the desired results. **Do not use form-in-place gasket material unless specified.** Bead size, continuity, and location are of great importance. Too thin a bead can result in leakage while too much can result in spill-over which can break off and obstruct fluid feed lines. A continuous bead of the proper width is essential to obtain a leak-free gasket.

There are numerous types of form-in-place gasket materials that are used in the engine area. Mopar® Engine RTV GEN II, Mopar® ATF-RTV, and Mopar® Gasket Maker gasket materials, each have different properties and can not be used in place of the other.

MOPAR® ENGINE RTV GEN II

Mopar® Engine RTV GEN II is used to seal components exposed to engine oil. This material is a specially designed black silicone rubber RTV that retains adhesion and sealing properties when exposed to engine oil. Moisture in the air causes the material to cure. This material is available in three ounce tubes and has a shelf life of one year. After one year this material will not properly cure. Always inspect the package for the expiration date before use.

MOPAR® ATF RTV

Mopar® ATF RTV is a specifically designed black silicone rubber RTV that retains adhesion and sealing properties to seal components exposed to automatic transmission fluid, engine coolants, and moisture. This material is available in three ounce tubes and has a shelf life of one year. After one year this material will not properly cure. Always inspect the package for the expiration date before use.

MOPAR® GASKET MAKER

Mopar® Gasket Maker is an anaerobic type gasket material. The material cures in the absence of air when squeezed between two metallic surfaces. It will not cure if left in the uncovered tube. The anaerobic material is for use between two machined surfaces. Do not use on flexible metal flanges.

MOPAR® GASKET SEALANT

Mopar® Gasket Sealant is a slow drying, permanently soft sealer. This material is recommended for sealing threaded fittings and gaskets against leakage of oil and coolant. Can be used on threaded and machined parts under all temperatures. This material is used on engines with multi-layer steel (MLS) cylinder head gaskets. This material also will prevent corrosion. Mopar® Gasket Sealant is available in a 13 oz. aerosol can or 4oz./16 oz. can w/applicator.

FORM-IN-PLACE GASKET AND SEALER APPLICATION

Assembling parts using a form-in-place gasket requires care but it's easier than using precut gaskets.

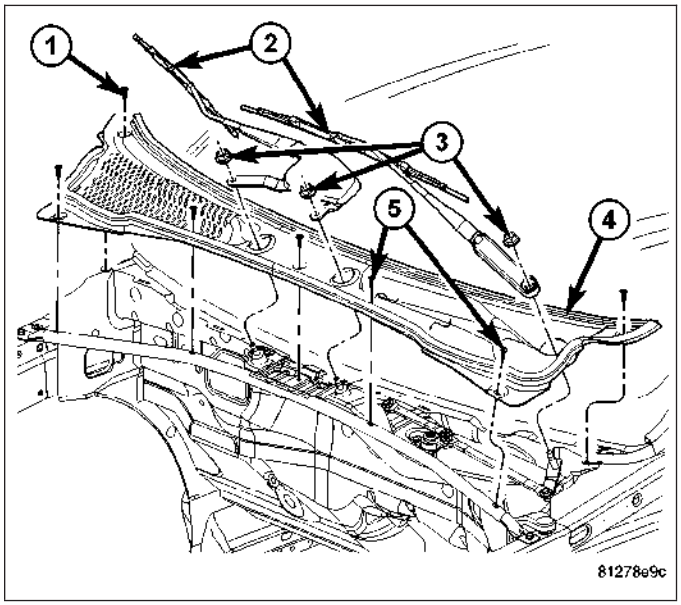
Mopar® Gasket Maker material should be applied sparingly 1 mm (0.040 in.) diameter or less of sealant to one gasket surface. Be certain the material surrounds each mounting hole. Excess material can easily be wiped off. Components should be torqued in place within 15 minutes. The use of a locating dowel is recommended during assembly to prevent smearing material off the location.

Mopar® Engine RTV GEN II or ATF RTV gasket material should be applied in a continuous bead approximately 3 mm (0.120 in.) in diameter. All mounting holes must be circled. For corner sealing, a 3.17 or 6.35 mm (1/8 or 1/4 in.) drop is placed in the center of the gasket contact area. Uncured sealant may be removed with a shop towel. Components should be torqued in place while the sealant is still wet to the touch (within 10 minutes). The usage of a locating dowel is recommended during assembly to prevent smearing material off the location.

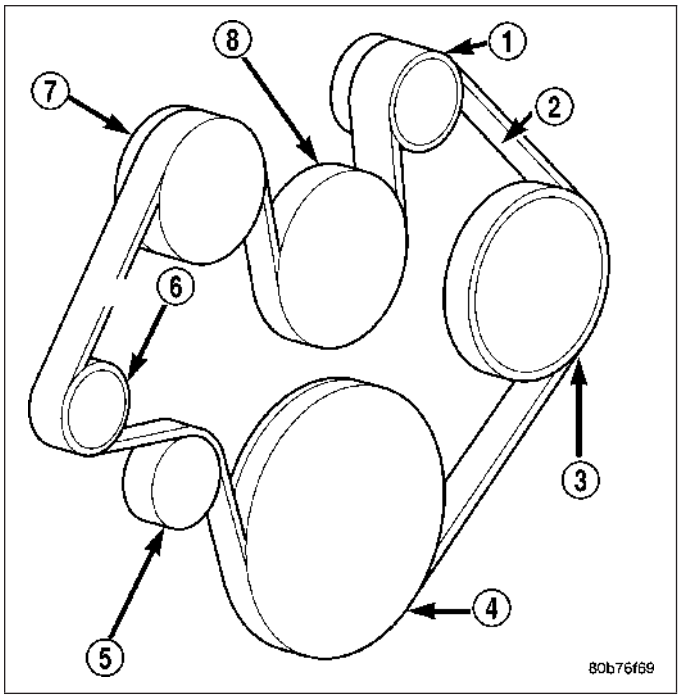
Mopar® Gasket Sealant in an aerosol can should be applied using a thin, even coat sprayed completely over both surfaces to be joined, and both sides of a gasket. Then proceed with assembly. Material in a can w/applicator can be brushed on evenly over the sealing surfaces. Material in an aerosol can should be used on engines with multi-layer steel gaskets.

REMOVAL - ENGINE

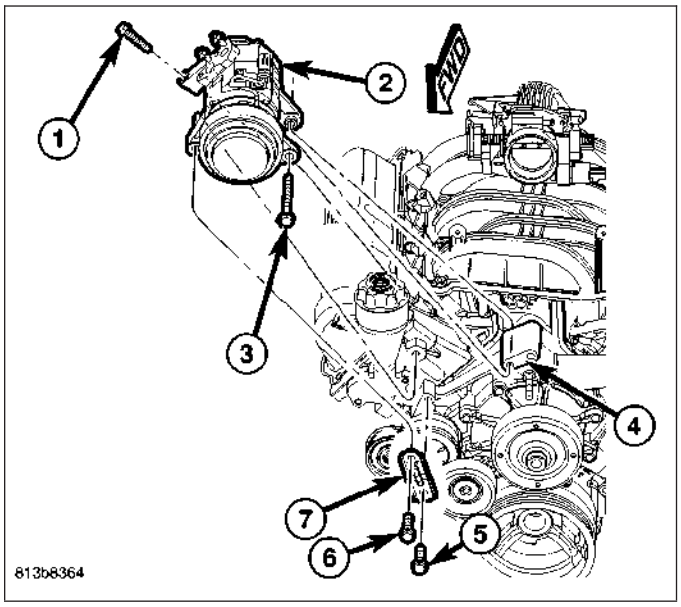
1. Remove the cowl grille (4).
2. Release fuel rail pressure (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - STANDARD PROCEDURE) then disconnect the fuel supply quick connect fitting at the fuel rail (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/QUICK CONNECT FITTING - STANDARD PROCEDURE).



3. Disconnect the battery negative cable.
4. Remove air cleaner assembly.
5. Remove fan shroud with viscous fan assembly.
6. Remove drive belt (2).



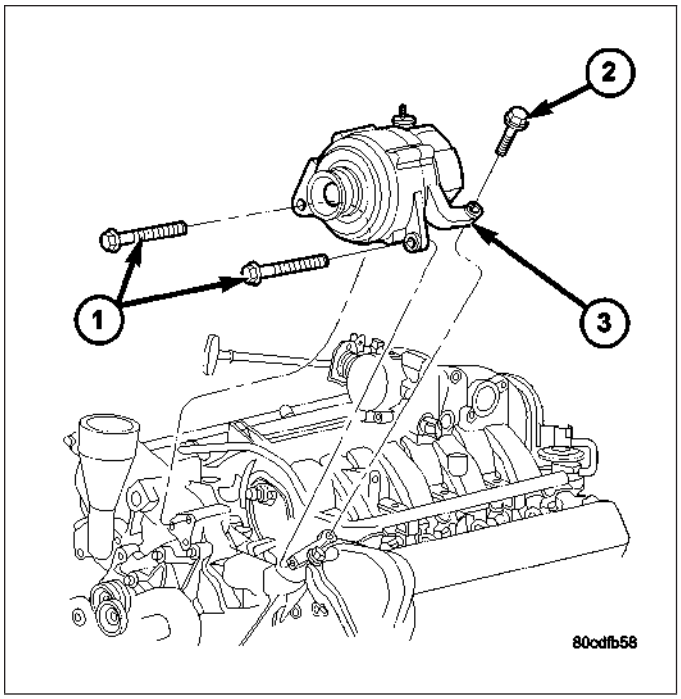
7. Remove A/C compressor (2) and secure away from engine.



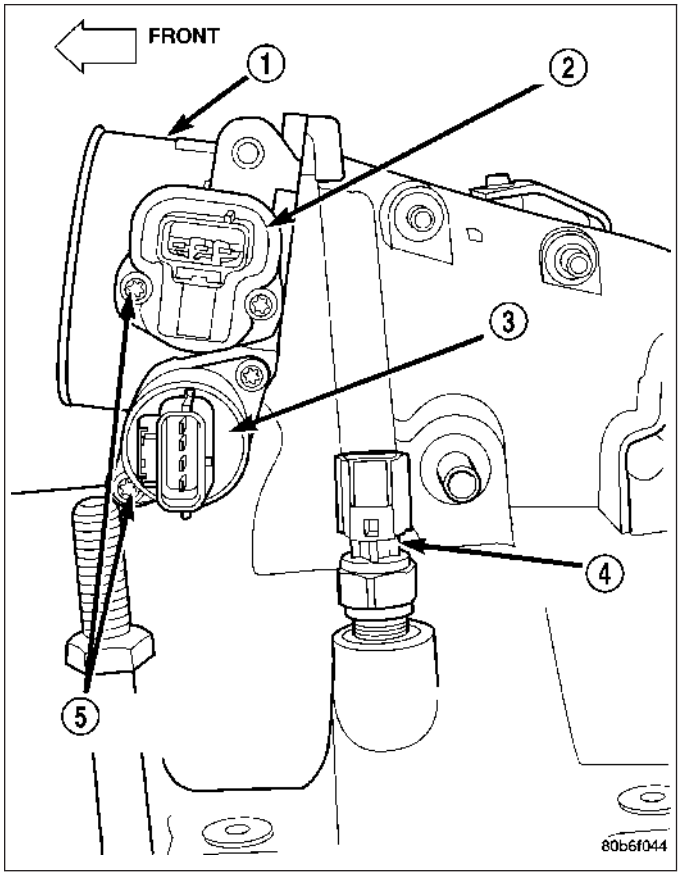
8. Remove generator (3) and secure away from engine.

NOTE: Do NOT remove the phenolic pulley from the P/S pump. It is not required for P/S pump removal.

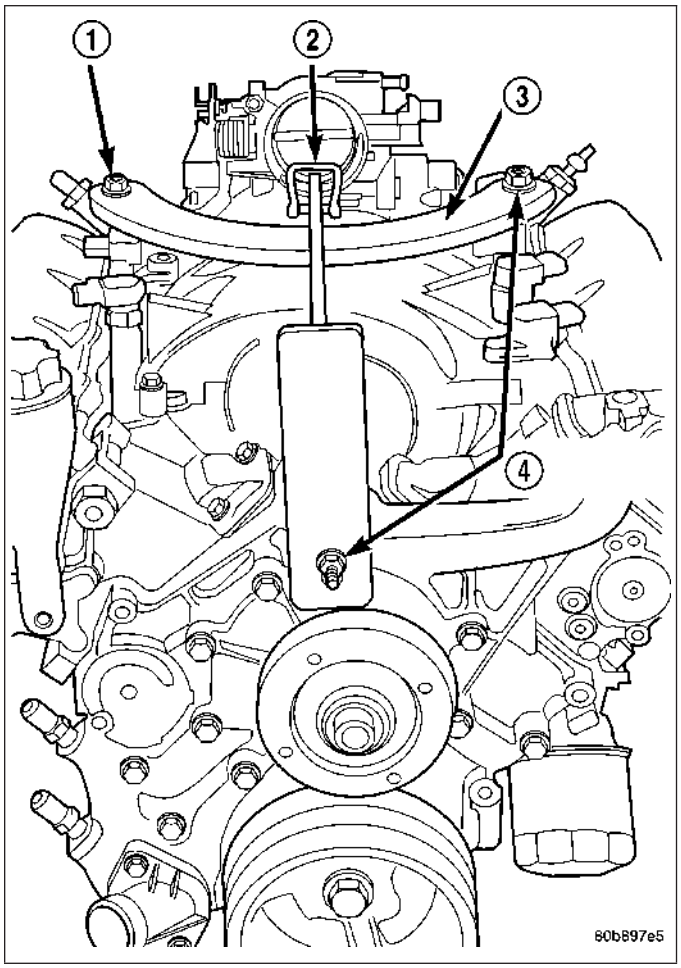
9. Remove power steering pump with lines attached and secure away from engine.
10. Drain cooling system.
11. Disconnect the heater hoses from the engine.
12. Disconnect heater hoses from heater core and remove hose assembly.
13. Disconnect throttle and speed control cables.
14. Remove upper radiator hose from engine.
15. Remove lower radiator hose from engine.
16. Remove radiator/cooling module assembly.
17. Disconnect the engine to body ground straps at the left side of cowl.



18. Disconnect the engine wiring harness at the following points:
    - Intake air temperature (IAT) sensor (4)
    - Fuel Injectors
    - Throttle Position (TPS) Switch (2)
    - Idle Air Control (IAC) Motor (3)
    - Engine Oil Pressure Switch
    - Engine Coolant Temperature (ECT) Sensor
    - Manifold Absolute Pressure MAP) Sensor
    - Camshaft Position (CMP) Sensor
    - Coil Over Plugs
    - Crankshaft Position Sensor
19. Remove coil over plugs.



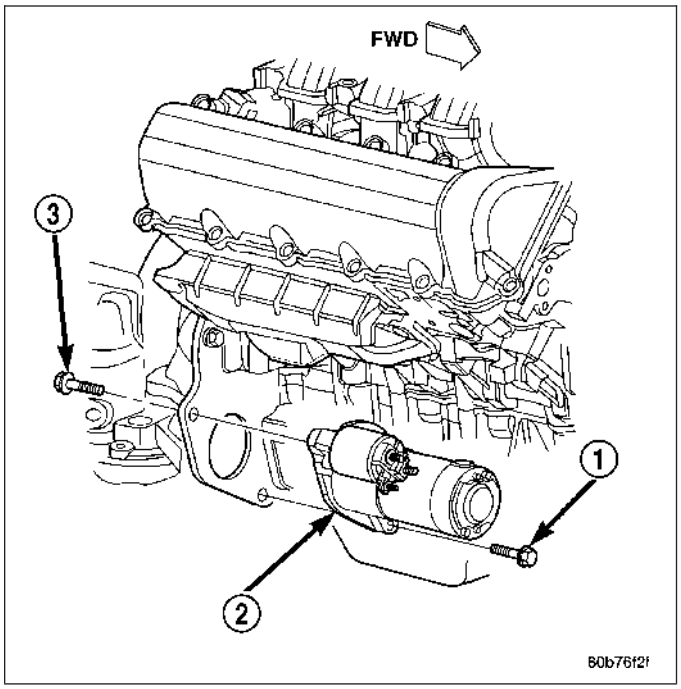
20. Remove the vacuum hose for the power brake booster.
21. Disconnect knock sensors.
22. Remove engine oil dipstick tube.
23. Install Special Tools 8400 Lifting Studs, into the cylinder heads.
24. Install Engine Lifting Fixture (3) Special Tool # 8347 following these steps.
    - Holding the lifting fixture at a slight angle, slide the large bore in the front plate over the hex portion of the lifting stud.
    - Position the two remaining fixture arms onto the two Special Tools 8400 Lifting Studs, in the cylinder heads.
    - Pull foward and upward on the lifting fixture so that the lifting stud rest in the slotted area below the large bore.
    - Secure the lifting fixture to the three studs using three 7/16 – 14 N/C locknuts.
    - Make sure the lifting loop in the lifting fixture is in the last hole (closest to the throttle body) to minimize the angle of engine during removal.



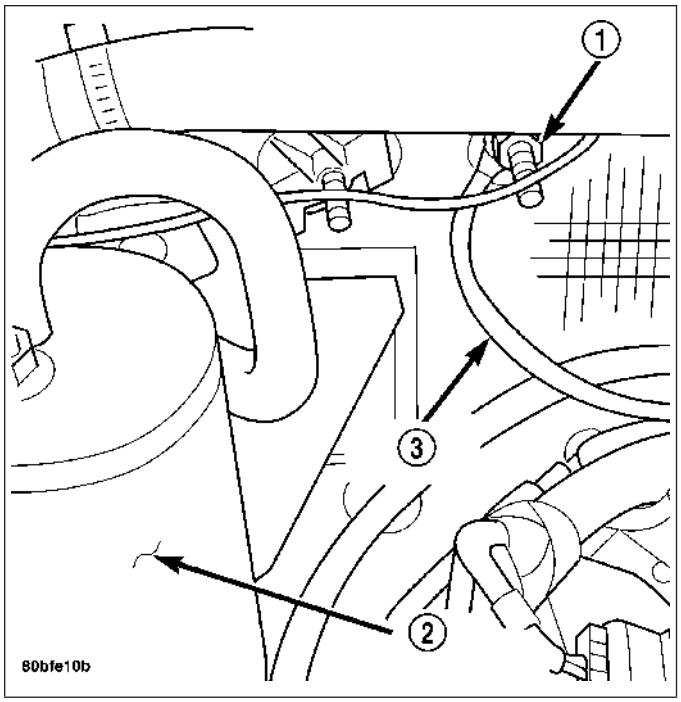
25. Disconnect oxygen sensor wiring.
26. Disconnect crankshaft postion sensor.
27. Disconnect the engine block heater power cable, if equipped.
28. Disconnect the front propshaft at the front differential and secure out of way.

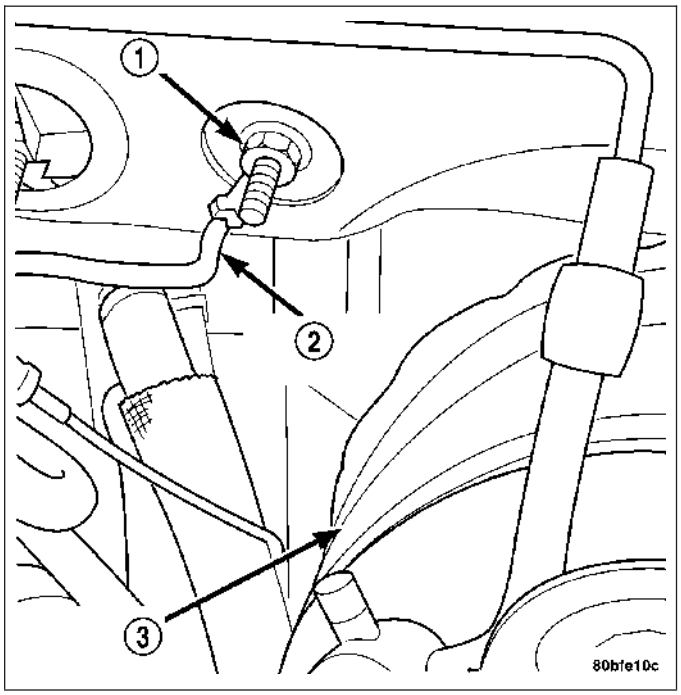
NOTE: It is necessary to disconnect the front propshaft for access to the starter and left side exhaust flange.

29. Remove the starter (2).

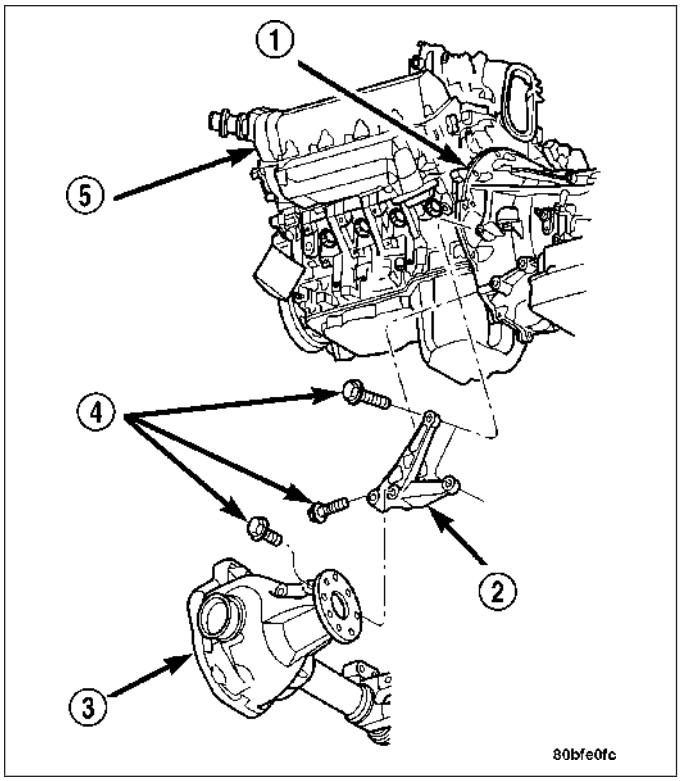


30. Remove the ground straps from the left (2) and right (3) side of the block.



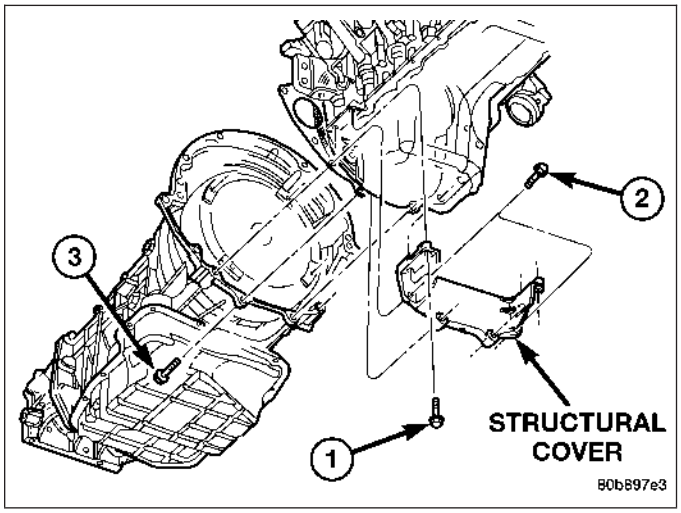


31. Remove the axle isolator bracket (2).

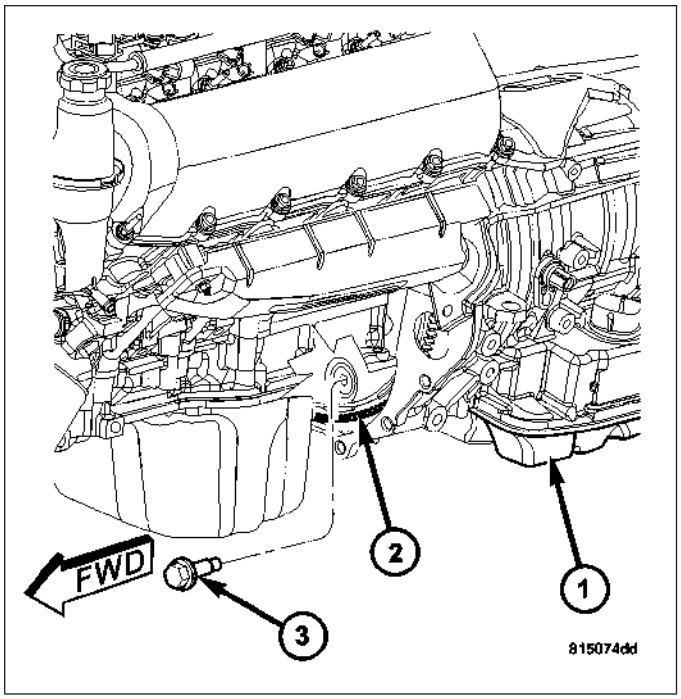


32. Remove the structural cover.
33. Disconnect the right and left exhaust pipes at the manifolds and from the crossover, and remove from the vehicle.

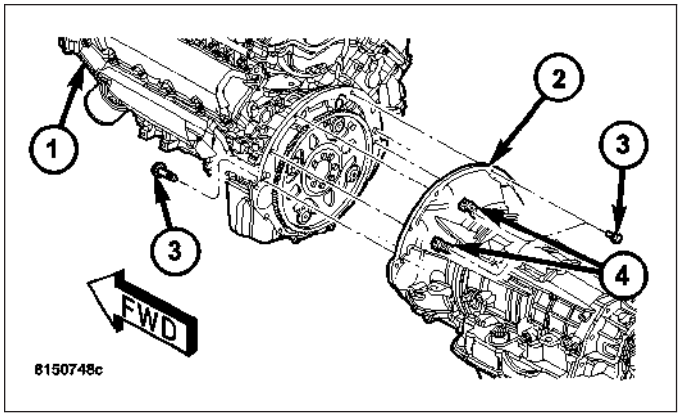
NOTE: The exhaust clamps at the manifolds cannot be reused. New clamps must be used or leaks may occur.



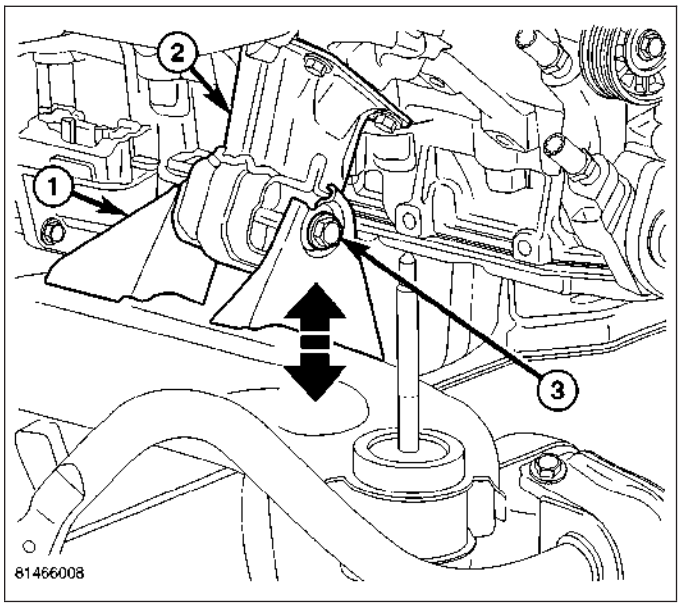
34. Remove torque convertor bolts (3), and mark location for reassembly.



35. Remove transmission bellhousing to engine bolts (3).

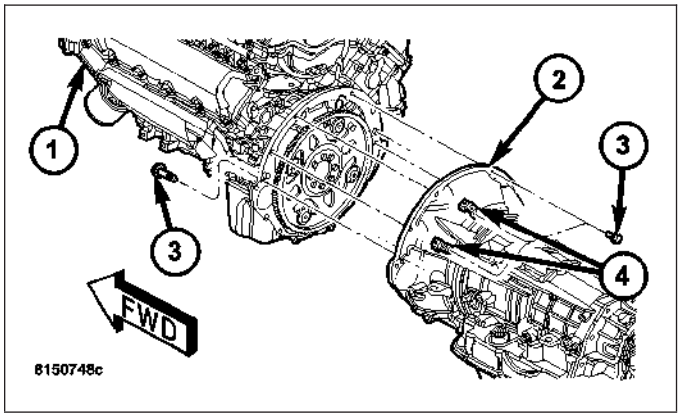


36. Remove left and right engine mount thru bolts (3).
37. Lower the vehicle.
38. Support the transmission with a suitable jack.
39. Connect a suitable engine hoist to the engine lift plate.
40. Remove engine from vehicle.

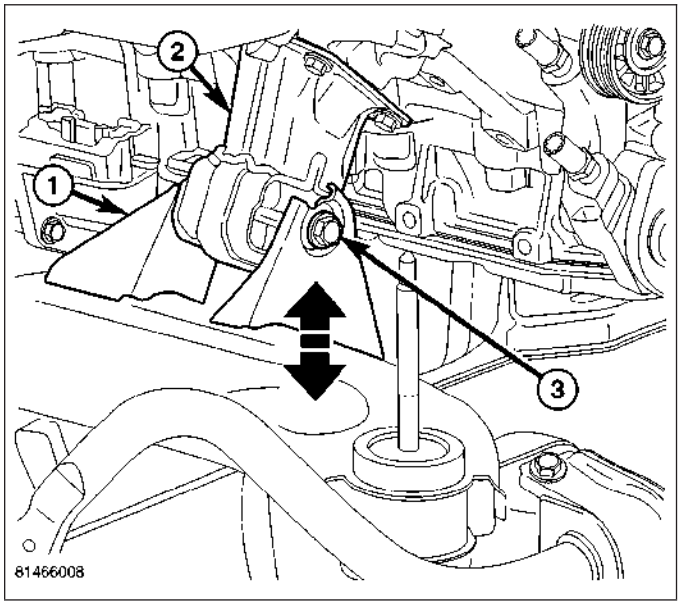


INSTALLATION - ENGINE

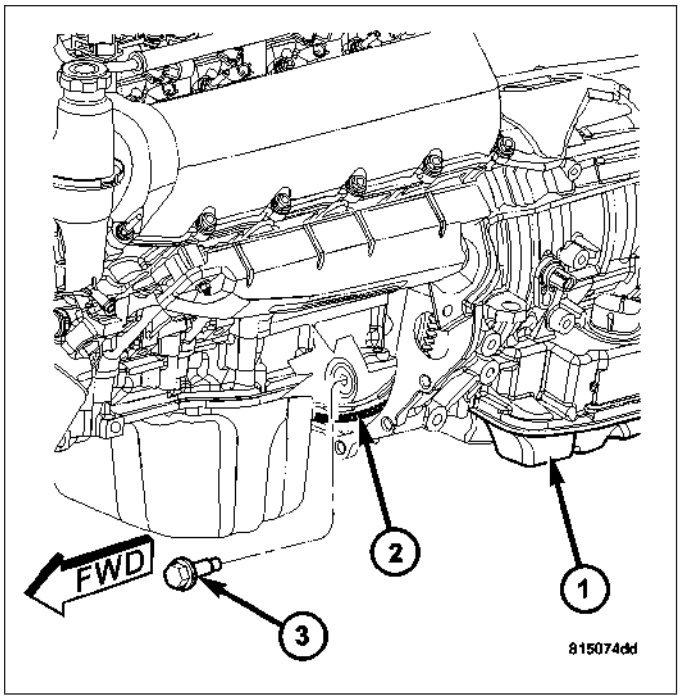
1. Position the engine in the vehicle.
2. Install the transmission bellhousing to engine mounting bolts (3). Tighten the bolts to 41 N·m (30ft. lbs.)



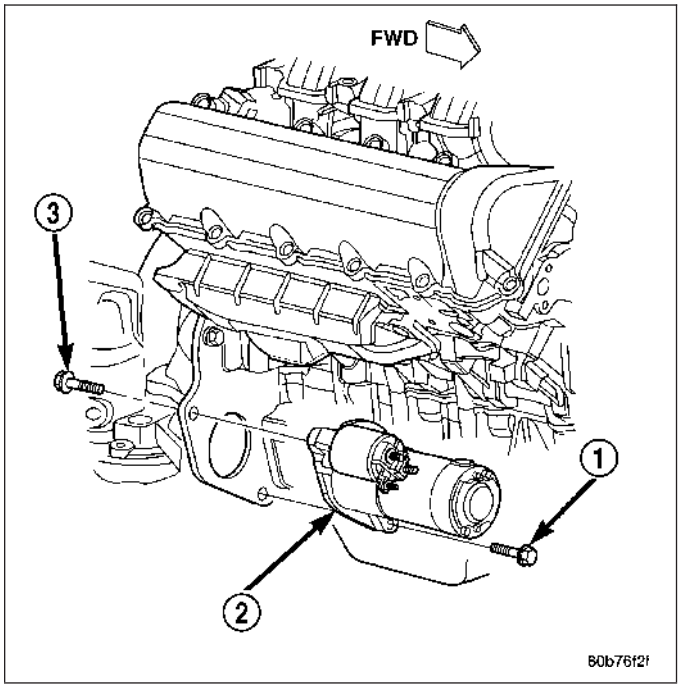
3. Install the engine mount thru bolts (3).



4. Install the torque convertor bolts (3).



5. Install the starter (2).
6. Connect the crankshaft position sensor.
7. Install the engine block heater power cable, if equipped.

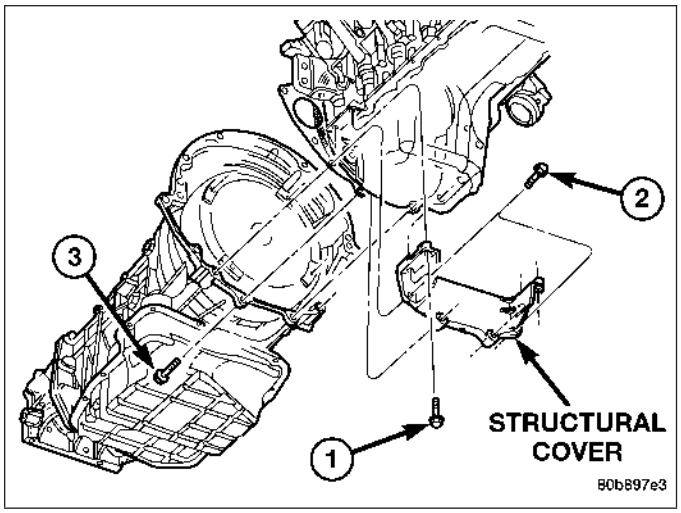


CAUTION: The structural cover requires a specific torque sequence. Failure to follow this sequence may cause severe damage to the cover.

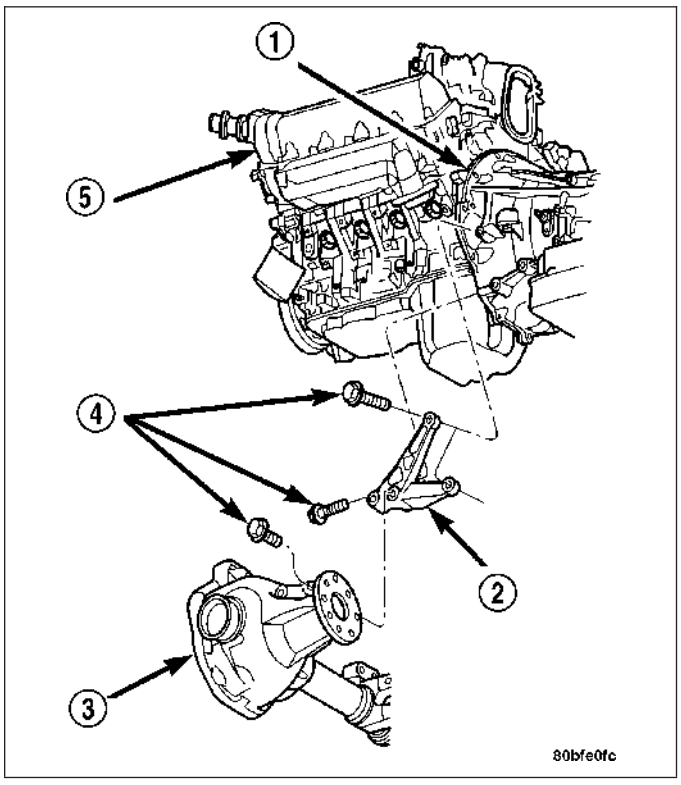
8. Install the structural cover.

NOTE: New clamps must be used on exhaust manifold flanges. Failure to use new clamps may result in exhaust leaks.

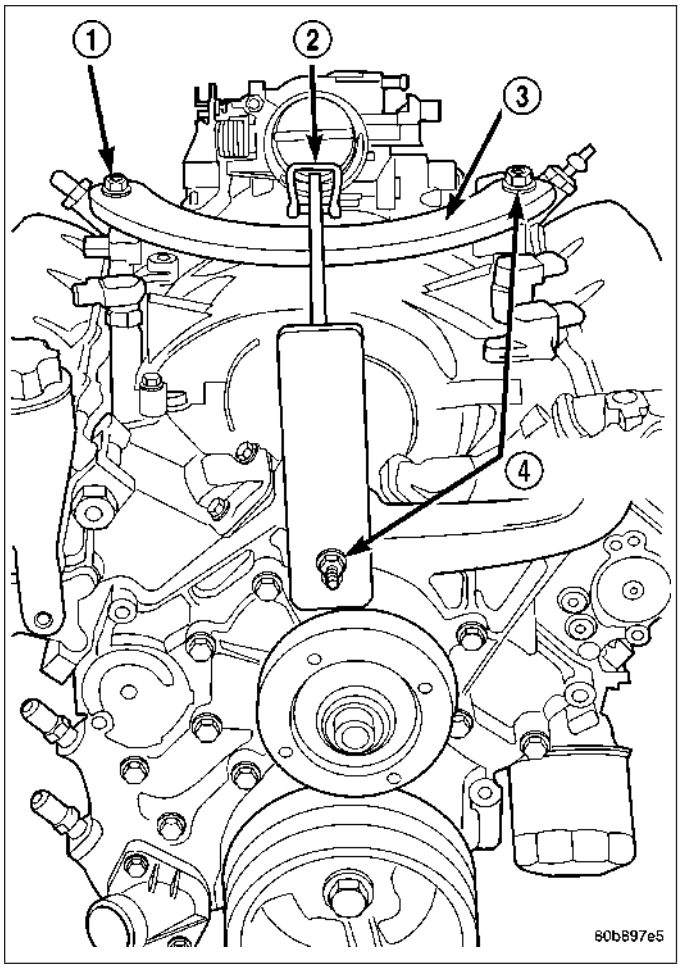
9. Install the left and right exhaust pipes.



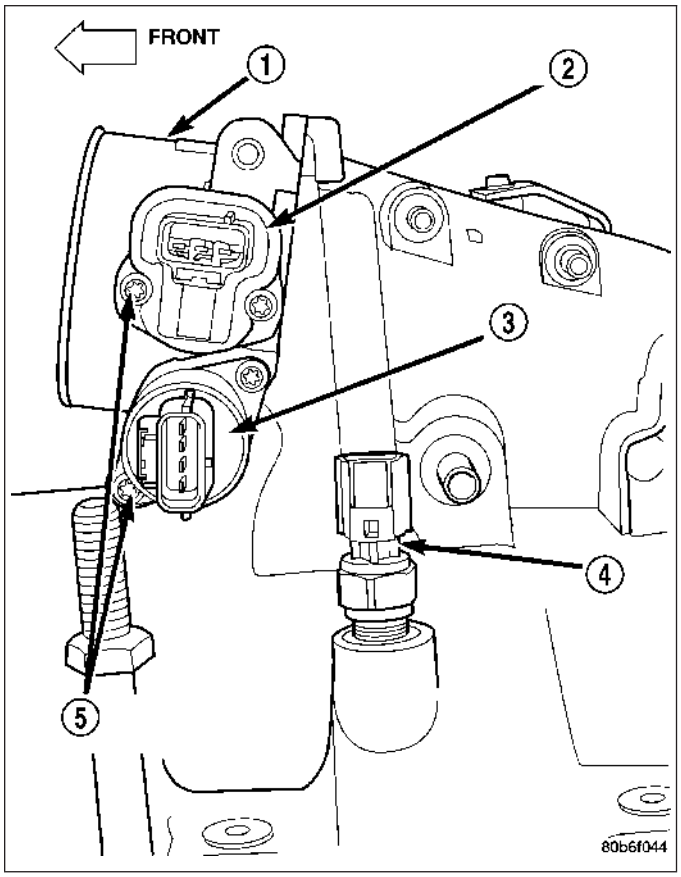
10. Install the axle isolator bracket (2).
11. Connect the left and right oxygen sensors.
12. Connect the knock sensors.
13. Connect the engine to body ground straps at the left side of the cowl.



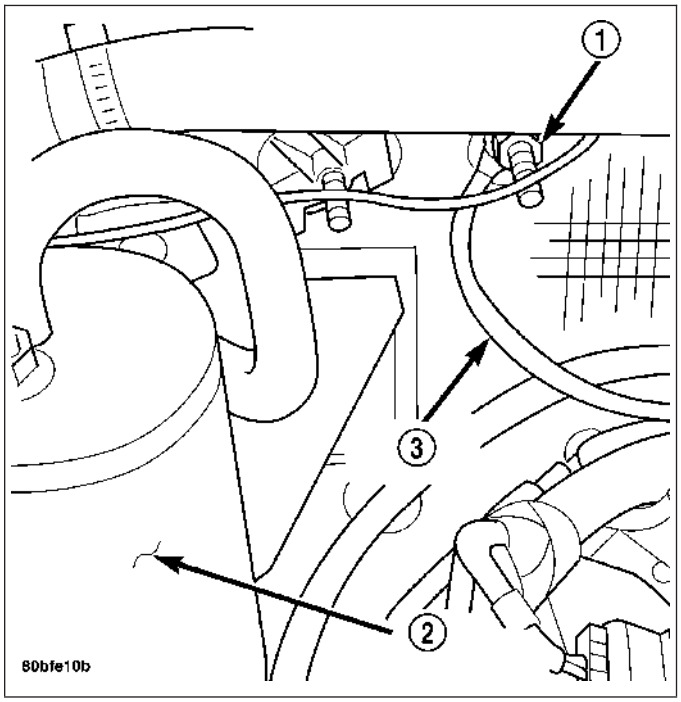
14. Remove Engine Lifting Fixture (3) Special Tool 8347.
15. Remove Special Tools 8400 Lifting Studs.
16. Install the engine oil dipstick tube.
17. Install the power brake booster vacuum hose.
18. Install the breather hoses.
19. Install the PCV hose.
20. Install the fuel rail.
21. Install the coil over plugs.



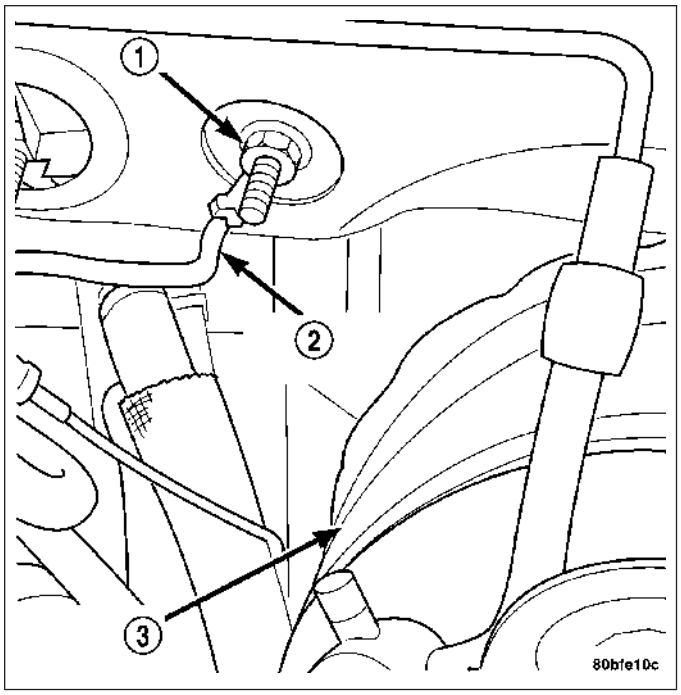
22. Connect the engine wiring harness at the following points:
    - Intake air temperature (IAT) sensor (4)
    - Fuel Injectors
    - Throttle Position (TPS) Switch (2)
    - Idle Air Control (IAC) Motor (3)
    - Engine Oil Pressure Switch
    - Engine Coolant Temperature (ECT) Sensor
    - Manifold Absolute Pressure MAP) Sensor
    - Camshaft Position (CMP) Sensor
    - Coil Over Plugs
    - Crankshaft Position Sensor



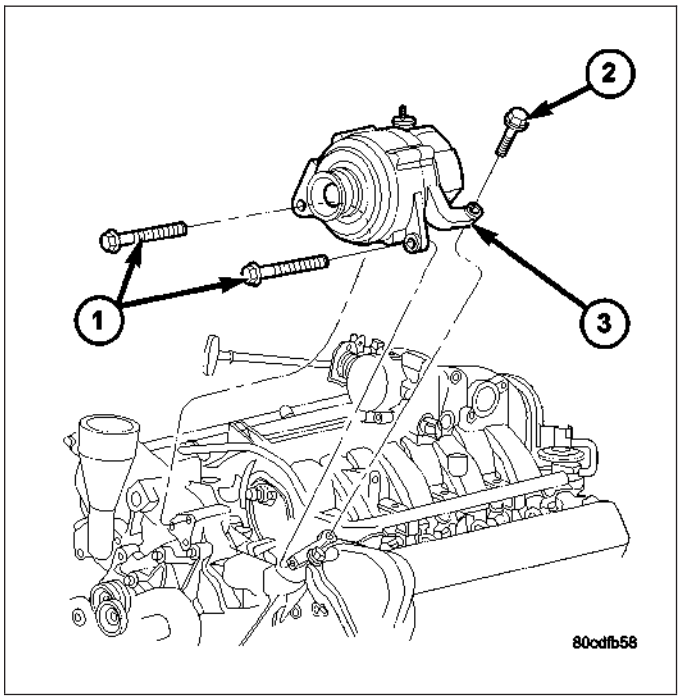
23. Connect the ground straps on the right (3)side of the engine.



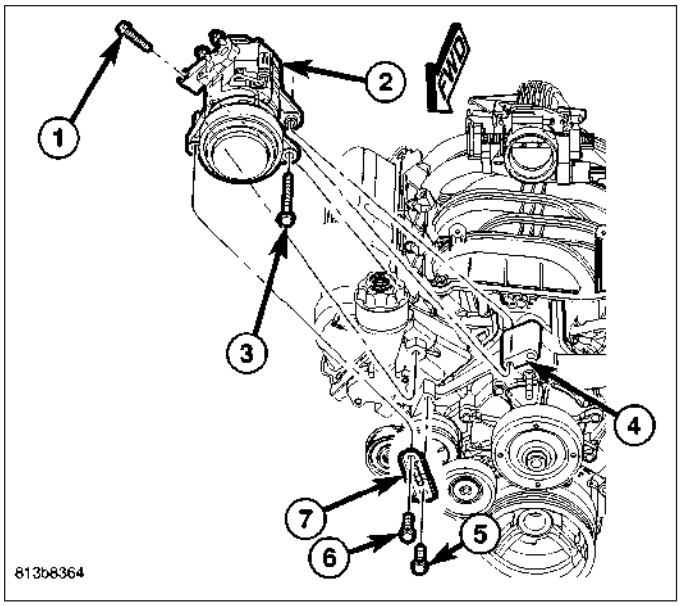
24. Connect the ground straps on the left (2) side of the engine.



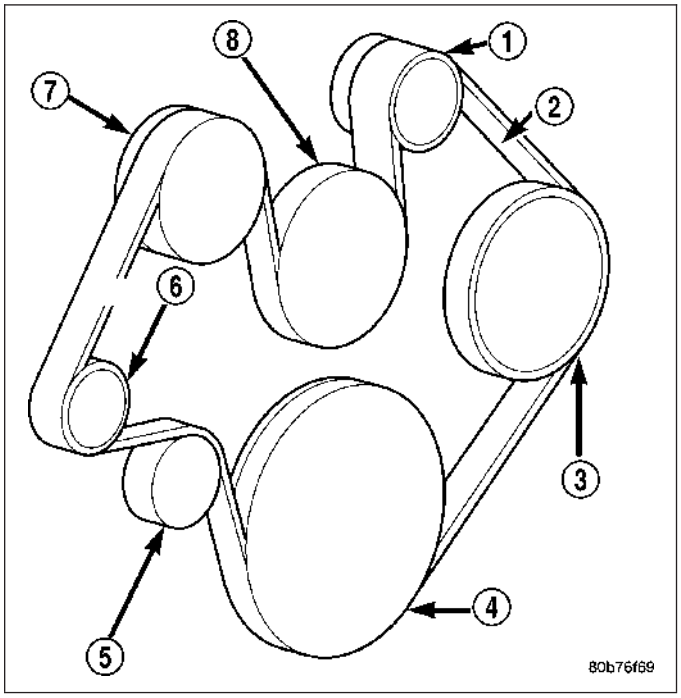
25. Reinstall the radiator assembly.
26. Connect lower radiator hose.
27. Connect upper radiator hose.
28. Connect throttle and speed control cables.
29. Install the heater hose assembly.
30. Install coolant recovery bottle.
31. Install the power steering pump.
32. Install the generator (3).



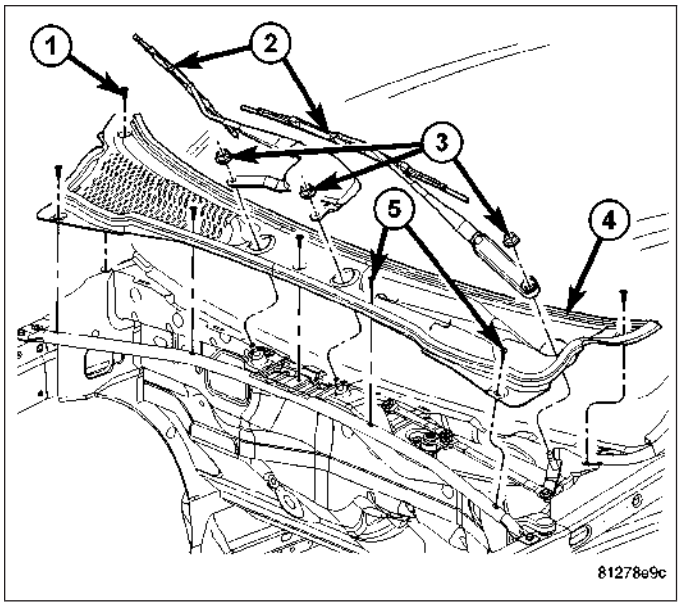
33. Install the A/C compressor (2).



34. Install the drive belt (2).
35. Install the fan shroud with the viscous fan assembly.
36. Recharge the A/C system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/REFRIGERANT - STANDARD PROCEDURE).



37. Install the cowl grille (4).
38. Install the air cleaner assembly.
39. Refill the engine cooling system.
40. Check and fill engine oil.
41. Connect the battery negative cable.
42. Start the engine and check for leaks.



SPECIFICATIONS

SPECIFICATIONS - 4.7L ENGINE

GENERAL DESCRIPTION

DESCRIPTION	SPECIFICATION
Engine Type	90° SOHC V-8 16-Valve
Displacement	4.7 Liters / 4701 cc 287 (Cubic Inches)
Bore	93.0 mm (3.66 in.)
Stroke	86.5 mm (3.40 in.)
Compression Ratio	9.0:1
Horsepower	235 BHP @ 4800 RPM
Torque	295 LB-FT @ 3200 RPM
Lead Cylinder	#1 Left Bank
Firing Order	1-8-4-3-6-5-7-2

CYLINDER BLOCK

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Bore Diameter	93.010 ± .0075 mm	3.6619 ± 0.0003 in.
Out of Round (MAX)	0.076 mm	0.003 in.
Taper (MAX)	0.051 mm	0.002 in.

PISTONS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Diameter	92.975 mm	3.6605 in.
Weight	366 grams	12.9 oz
Ring Groove Diameter		
No. 1	83.37 - 83.13 mm	3.282 - 3.273 in
No. 2	82.833 - 83.033 mm	3.261 - 3.310 in.
No. 3	83.88 - 84.08 mm	3.302 - 3.310 in.

PISTON PINS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Clearance In Piston	0.010 - 0.019 mm	0.0004 - 0.0008 in.
Diameter	24.013 - 24.016 mm	0.9454 - 0.9455 in.

PISTON RINGS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Ring Gap		
Top Compression Ring	0.20 - 0.36 mm	0.0079 - 0.0142 in.
Second Compression Ring	0.37 - 0.63 mm	0.0146 - 0.0249 in.
Oil Control (Steel Rails)	0.25 - 0.76 mm	0.0099 - 0.30 in.
Side Clearance		
Top Compression Ring	.051 - .094 mm	0.0020 - 0.0037 in.
Second Compression Ring	0.040 - 0.080 mm	0.0016 - 0.0031 in.
Oil Ring (Steel Ring)	.019 - .229 mm	.0007 - .0091 in.
Ring Width		
Top Compression Ring	1.472 - 1.490 mm	0.057 - 0.058 in.
Second Compression Ring	1.472 - 1.490 mm	0.057 - 0.058 in.
Oil Ring (Steel Rails)	0.445 - 0.470 mm	0.017 - 0.018 in.

CONNECTING RODS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Bearing Clearance	0.015 - 0.055 mm	0.0006 - 0.0022 in.
Side Clearance	0.10 - 0.35 mm	0.004 - 0.0138 in.
Piston Pin Bore Diameter (Interference Fit)	.025 - .048 mm	0.001 - 0.0019 in.
Bearing Bore Out of Round (MAX)	0.004 mm	0.0002 in.
Total Weight (Less Bearing)	555 grams	19.5771 ounces

CRANKSHAFT

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Main Bearing Journal Diameter	63.488 - 63.512 mm	2.4996 - 2.5005 in.
Bearing Clearance	0.004 - 0.034 mm	0.0002 - 0.0013 in.
Out of Round (MAX)	0.005 mm	0.0004 in.
Taper (MAX)	0.008 mm	0.0004 in.
End Play	0.052 - 0.282 mm	0.0021 - 0.0112 in.
End Play (MAX)	0.282 mm	0.0112 in.
Connecting Rod Journal Diameter	50.992 - 51.008 mm	2.0076 - 2.0082 in.
Bearing Clearance	0.010 - 0.048	0.0004 - 0.0019 in.
Out of Round (MAX)	0.005 mm	0.0002 in.
Taper (MAX)	0.008 mm	0.0004 in.

CAMSHAFT

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Bore Diameter	26.02 - 26.04 mm	1.0245 - 1.0252 in.
Bearing Journal Diameter	25.975 - 25.995 mm	1.0227 - 1.0235 in.
Bearing Clearance	0.025 - 0.065 mm	0.001 - 0.0026 in.
Bearing Clearance (MAX)	0.065 mm	0.0026 in.
End Play	.075 - .200 mm	0.003 - 0.0079 in.
End Play (MAX)	.200 mm	0.0079 in.

VALVE TIMING

DESCRIPTION	SPECIFICATION
Intake	
Opens (BTDC)	4.4°
Closes (ATDC)	239.1°
Duration	243.5°
Exhaust	
Opens (BTDC)	240.5°
Closes (ATDC)	13.2°
Duration	253.70°
Valve Overlap	17.6°

VALVES

DESCRIPTION	SPECIFICATION
Face Angle	45° - 45.5°
Head Diameter	
Intake	48.52 - 48.78 mm (1.9103 - 1.9205 in.)
Exhaust	36.87 - 37.13 mm (1.4516 - 1.4618 in.)
Length (Overall)	
Intake	113.45 - 114.21 mm (4.4666 - 4.4965)
Exhaust	114.92 - 115.68 mm (4.5244 - 4.5543 in.)
Stem Diameter	
Intake	6.931 - 6.957 mm (0.2729 - 0.2739 in.)
Exhaust	6.902 - 6.928 mm (0.2717 - 0.2728 in.)
Stem - to - Guide Clearance	
Intake	0.018 - 0.069 mm (0.0008 - 0.0028 in.)
Exhaust	0.047 - 0.098 mm (0.0019 - 0.0039 in.)
Max. Allowable Stem - to - Guide Clearance (Rocking Method)	
Intake	0.069 mm (0.0028 in.)
Exhaust	0.098 mm (0.0039 in.)
Valve Lift (Zero Lash)	
Intake	11.25 mm (0.443 in.)
Exhaust	10.90 mm (0.4292 in.)

VALVE SPRING

DESCRIPTION	SPECIFICATION
Free Length (Approx)	
Intake	49.0 mm (1.9291 in.)
Exhaust	49.0 mm (1.9291 in.)
Spring Force (Valve Closed)	
Intake and Exhaust	313.0 - 354.0 N @ 40.12 mm (70.365 - 79.582 lbs. @ 1.5795 in.)
Spring Force (Valve Open)	
Intake and Exhaust	776.0 - 870.0 N @ 28.88 mm (174.451 - 195.583 lbs. @ 1.137 in.)
Number of Coils	
Intake	7.3
Exhaust	7.3
Wire Diameter	
Intake and Exhaust	4.6 × 3.67mm (0.1811 - 0.1445 in.)
Installed Height (Spring Seat to Bottom of Retainer) Nominal	
Intake	40.12 mm (1.579 in.)
Exhaust	40.12 mm (1.579 in.)

CYLINDER HEAD

DESCRIPTION	SPECIFICATION
Gasket Thickness (Compressed)	0.7 mm (0.0276 in.)
Valve Seat Angle	44.5° - 45.0°
Valve Seat Runout (MAX)	0.051 mm (0.002 in.)
Valve Seat Width	
Intake	1.75 - 2.36 mm (0.0698 - 0.0928 in.)
Exhaust	1.71 - 2.32 mm (0.0673 - 0.0911 in.)
Guide Bore Diameter (Std.)	6.975 - 7.00 mm (0.2747 - 0.2756 in.)
Cylinder Head Warpage (Flatness)	0.0508 mm (0.002 in.)

OIL PUMP

DESCRIPTION	SPECIFICATION
Clearance Over Rotors/End Face (MAX)	0.095 mm (0.0038 in.)
Cover Out - of -Flat (MAX)	0.025 mm (0.001 in.)
Inner and Outer Rotor Thickness	12.02 mm (0.4731 in.)
Outer Rotor to pocket (Diametral) clearance (MAX)	.235 mm (.0093 in.)
Outer Rotor Diameter (MIN)	85.925 mm (0.400 in.)
Tip Clearance Between Rotors (MAX)	0.150 mm (0.006 in.)

OIL PRESSURE

SPECIFICATION	SPECIFICATION
At Curb Idle Speed (MIN)*	48 kPa (7 psi)
@ 3000 rpm	240 - 725 kPa (35 - 105 psi)
*** CAUTION: If pressure is zero at curb idle, DO NOT run engine at 3000 rpm.**	

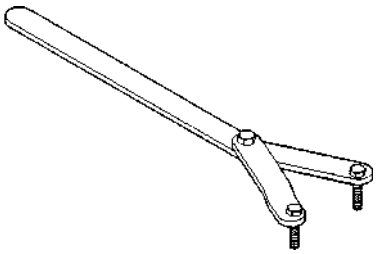
TORQUE

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Camshaft			
Non - Oiled Sprocket Bolt	122	90	—
Bearing Cap Bolts	11	—	100
Timing Chain Cover—Bolts	58	43	—
Connecting Rod Cap—Bolts	27	20	—
	PLUS 90° TURN		
Bed Plate—Bolts	Refer to Procedure		
Cylinder Head—Bolts	Refer to Procedure		
Crankshaft Damper—Bolt	175	130	—
Cylinder Head Cover—Bolts	12	—	105
Exhaust Manifold—Bolts	25	18	—
Exhaust Manifold Heat Shield—Nuts	8	—	72
	Then loosen 45°		
Flexplate—Bolts	60	45	—
Engine Mount Bracket to Block—Bolts	61	45	—
Rear Mount to Transmission—Bolts	46	34	—
Generator Mounting—Bolts			
M10 Bolts	54	40	—
M8 Bolts	28	—	250
Intake Manifold—Bolts	12	—	105
	Refer to Procedure for Tightening Sequence		
Oil Pan—Bolts	15	—	130
Oil Pan—Drain Plug	34	25	—
Oil Pump—Bolts	28	—	250

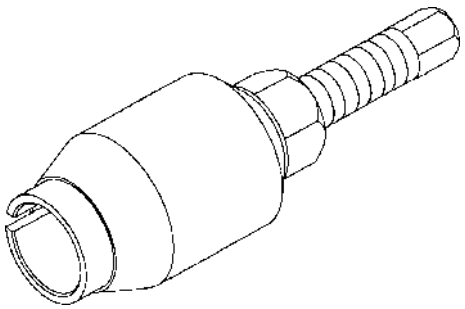
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Oil Pump Cover—Bolts	12	—	105
Oil Pickup Tube—Bolt and Nut	28	—	250
Oil Dipstick Tube to Engine Block—Bolt	15	—	130
Oil Fill Tube—Bolts	12	—	105
Timing Chain Guide—Bolts	28	—	250
Timing Chain Tensioner Arm—Special Pin Bolt	17	—	150
Hydraulic Tensioner—Bolts	28	—	250
Timing Chain Primary Tensioner—Bolts	28	—	250
Timing Drive Idler Sprocket—Bolt	34	25	—
Thermostat Housing—Bolts	13	—	115
Water Pump—Bolts	58	43	—

SPECIAL TOOLS

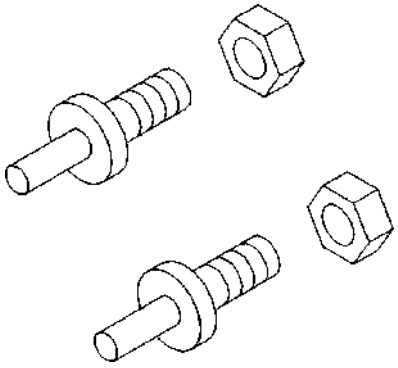
4.7L ENGINE



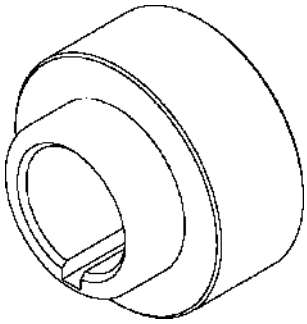
Spanner Wrench 6958



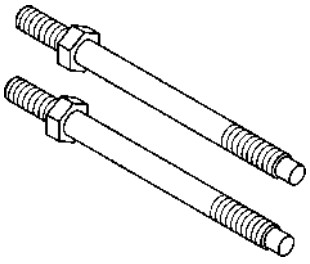
Front Crankshaft Seal Remover 8511



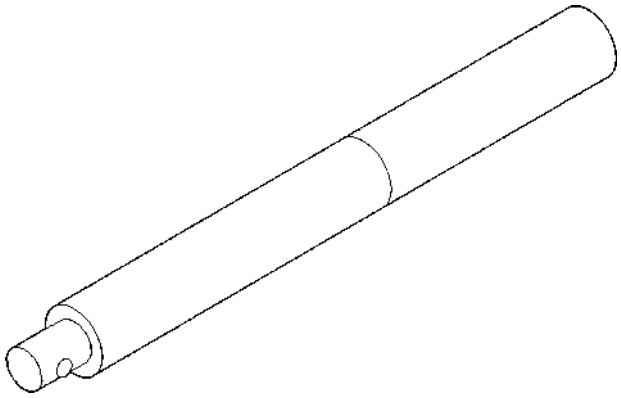
Adapter Pins 8346



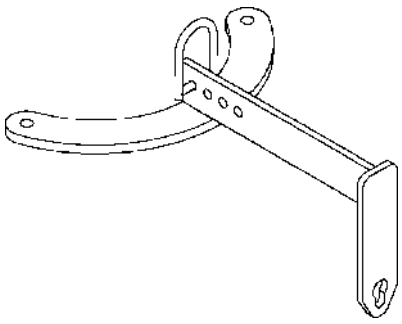
Front Crankshaft Seal Installer 8348



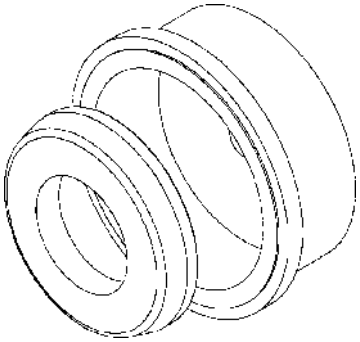
Engine Lifting Studs 8400



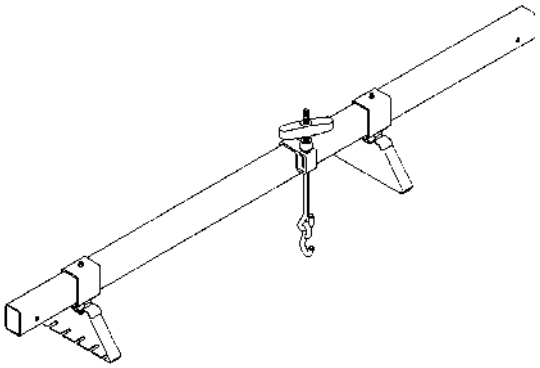
HANDLE C-4171



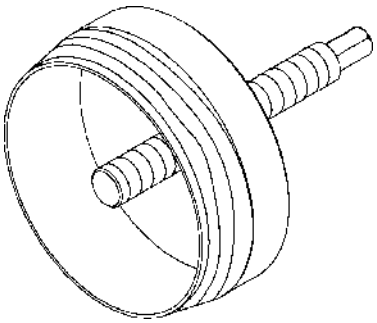
Engine Lift Fixture 8347



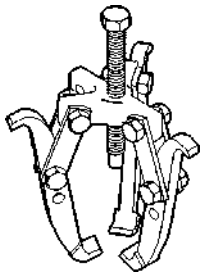
Rear Crankshaft Seal Installer 8349



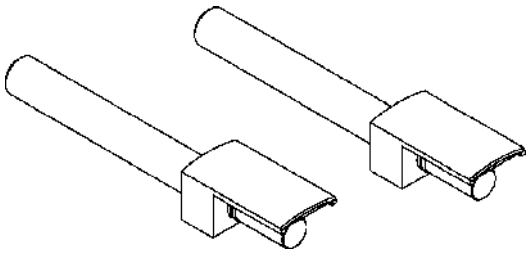
ENGINE SUPPORT FIXTURE 8534



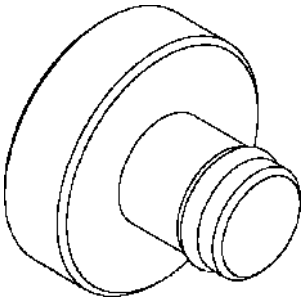
Rear Crankshaft Seal Remover 8506



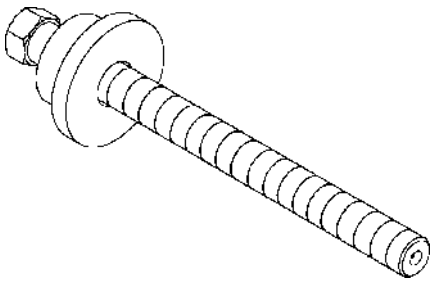
Puller 1026



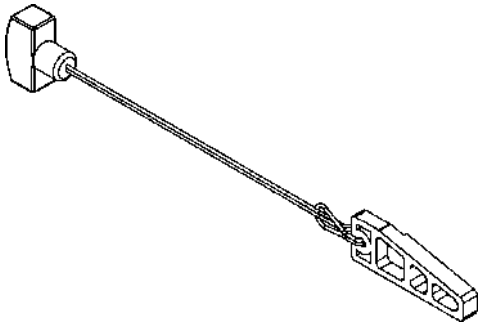
Connecting Rod Guides 8507



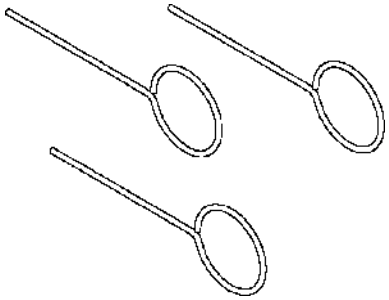
Crankshaft Damper Removal Insert 8513



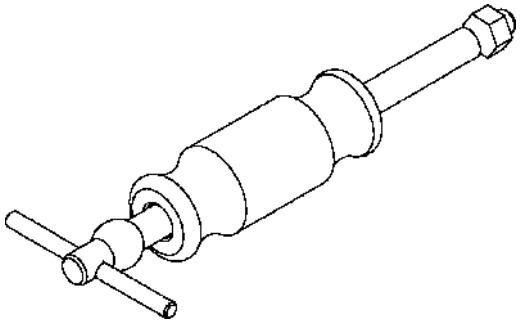
Crankshaft Damper Installer 8512



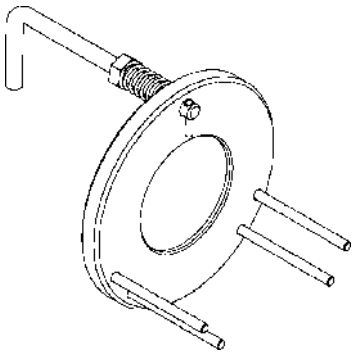
Chain Tensioner Wedge 8379



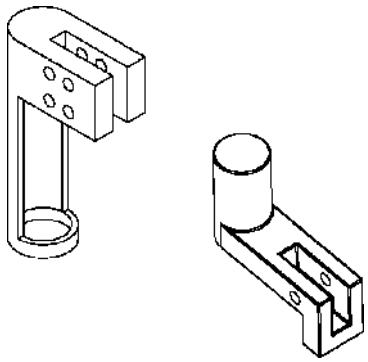
Chain Tensioner Pins 8514



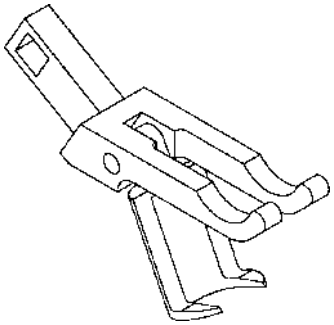
Idler Shaft Remover 8517



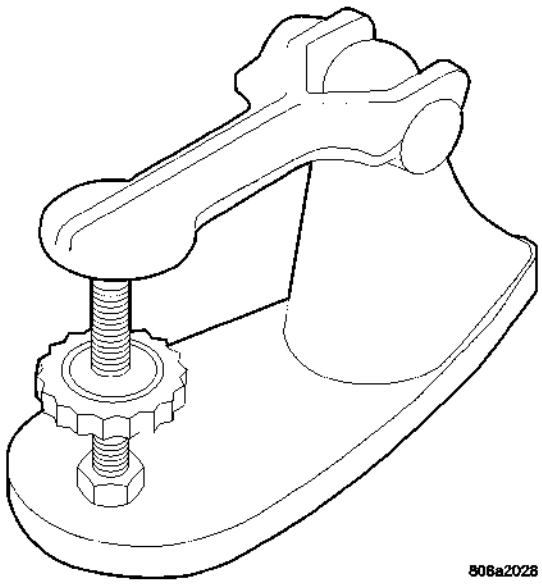
Secondary Chain Holder 8515



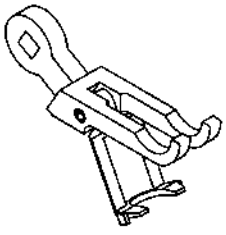
Valve Spring Compressor Adapters 8519



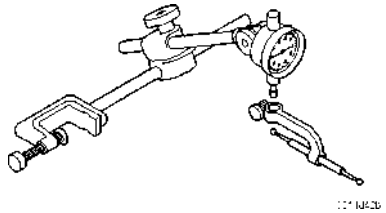
Remover, Rocker Arm 8516



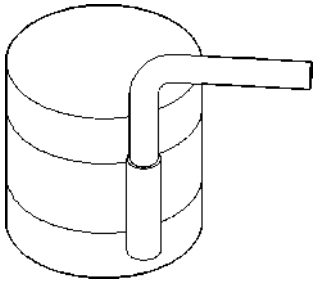
Valve Spring Tester C-647



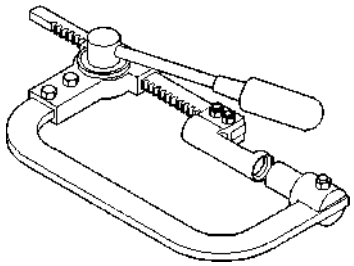
Valve Spring Compressor 8387



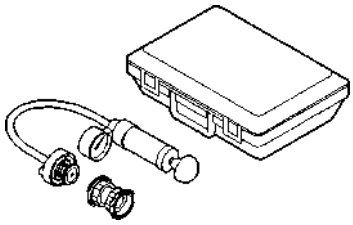
DIAL INDICATOR C-3339



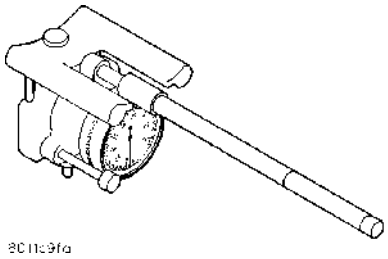
Piston Ring Compressor C-385



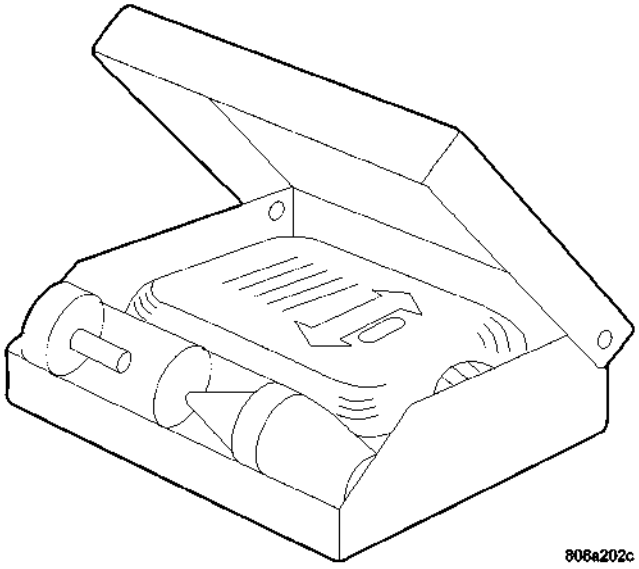
COMPRESSOR VALVE SPRING C-3422-C

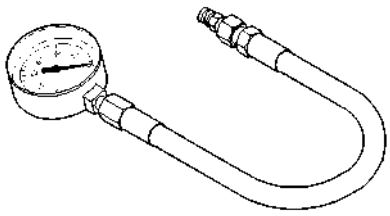


Pressure Tester Kit 7700



INDICATOR CYLINDER BORE C-119





GAUGE OIL PRESSURE - C-3292

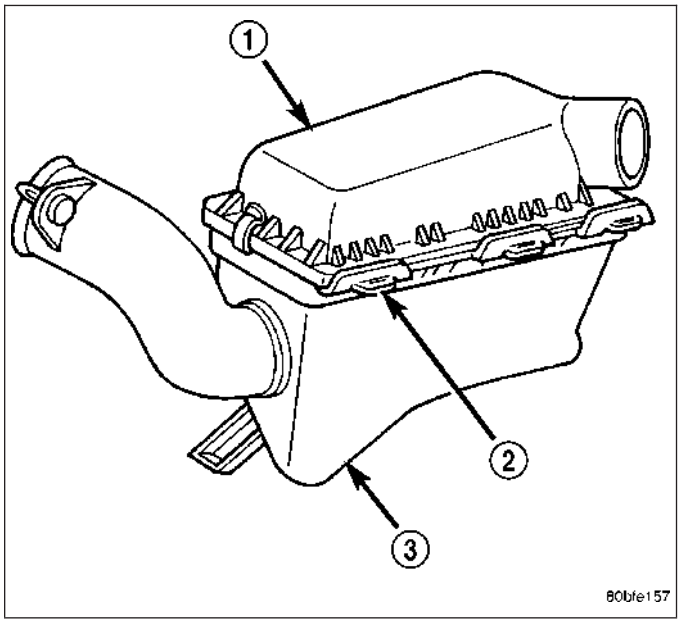
BLOC-CHEK KIT C-3685

CLEANER-AIR ELEMENT

REMOVAL

Housing removal is not necessary for element (filter) replacement.

1. Pry up spring clips from housing cover (spring clips retain cover to housing).
2. Release housing cover from locating tabs on housing and remove cover.
3. Remove air cleaner element (filter) from housing.
4. Clean inside of housing before replacing element.



INSTALLATION

1. Install element into housing.
2. Position housing cover into housing locating tabs.
3. Pry up spring clips and lock cover to housing.

CYLINDER HEAD

DESCRIPTION

DESCRIPTION - CYLINDER HEAD

The cylinder heads are made of an aluminum alloy. The cylinder head features two valves per cylinder with pressed in powdered metal valve guides. The cylinder heads also provide enclosures for the timing chain drain, necessitating unique left and right cylinder heads.

DESCRIPTION - VALVE GUIDES

The valve guides are made of powered metal and are pressed into the cylinder head. The guides are not replaceable or serviceable, and valve guide reaming is not recommended. If the guides are worn beyond acceptable limits, replace the cylinder heads.

DIAGNOSIS AND TESTING

CYLINDER HEAD GASKET

A cylinder head gasket leak can be located between adjacent cylinders or between a cylinder and the adjacent water jacket.

Possible indications of the cylinder head gasket leaking between adjacent cylinders are:

- Loss of engine power
- Engine misfiring
- Poor fuel economy

Possible indications of the cylinder head gasket leaking between a cylinder and an adjacent water jacket are:

- Engine overheating
- Loss of coolant
- Excessive steam (white smoke) emitting from exhaust
- Coolant foaming

CYLINDER-TO-CYLINDER LEAKAGE TEST

To determine if an engine cylinder head gasket is leaking between adjacent cylinders, follow the procedures in Cylinder Compression Pressure Test (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING). An engine cylinder head gasket leaking between adjacent cylinders will result in approximately a 50 - 70% reduction in compression pressure.

CYLINDER-TO-WATER JACKET LEAKAGE TEST

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING WITH COOLANT PRESSURE CAP REMOVED.

VISUAL TEST METHOD

With the engine cool, remove the coolant pressure cap. Start the engine and allow it to warm up until thermostat opens.

If a large combustion/compression pressure leak exists, bubbles will be visible in the coolant.

COOLING SYSTEM TESTER METHOD

WARNING: WITH COOLING SYSTEM TESTER IN PLACE, PRESSURE WILL BUILD UP FAST. EXCESSIVE PRESSURE BUILT UP, BY CONTINUOUS ENGINE OPERATION, MUST BE RELEASED TO A SAFE PRESSURE POINT. NEVER PERMIT PRESSURE TO EXCEED 138 kPa (20 psi).

Install Cooling System Tester 7700 or equivalent to pressure cap neck. Start the engine and observe the tester's pressure gauge. If gauge pulsates with every power stroke of a cylinder a combustion pressure leak is evident.

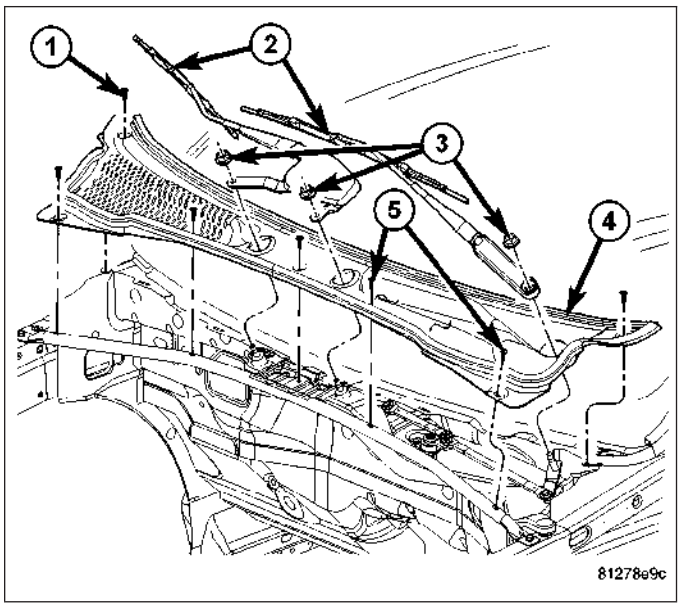
CHEMICAL TEST METHOD

Combustion leaks into the cooling system can also be checked by using Bloc-Chek Kit C-3685-A or equivalent. Perform test following the procedures supplied with the tool kit.

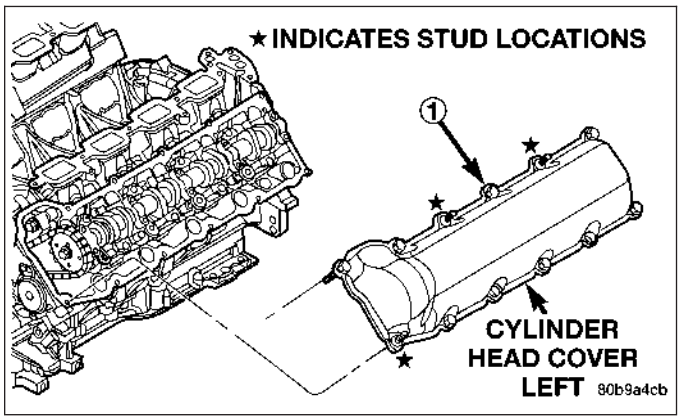
REMOVAL

REMOVAL - LEFT CYLINDER HEAD

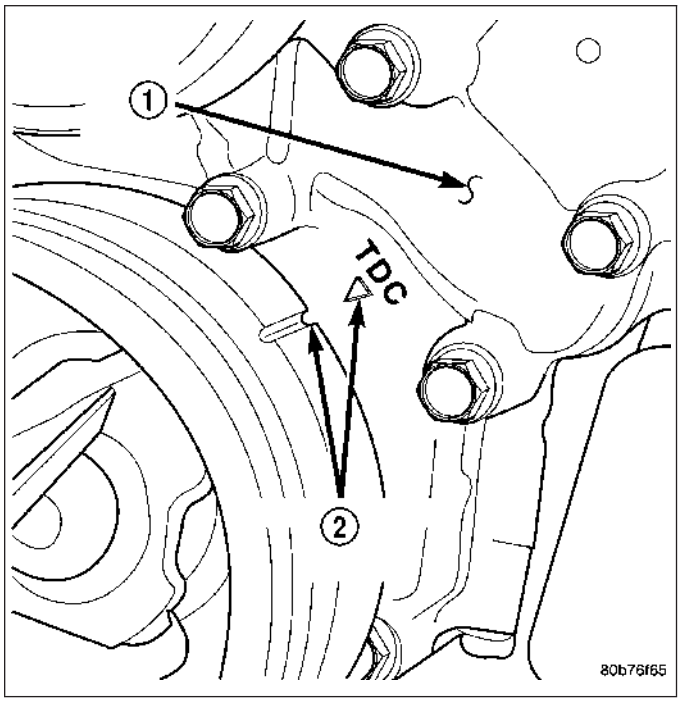
1. Remove the cowl grille (4).

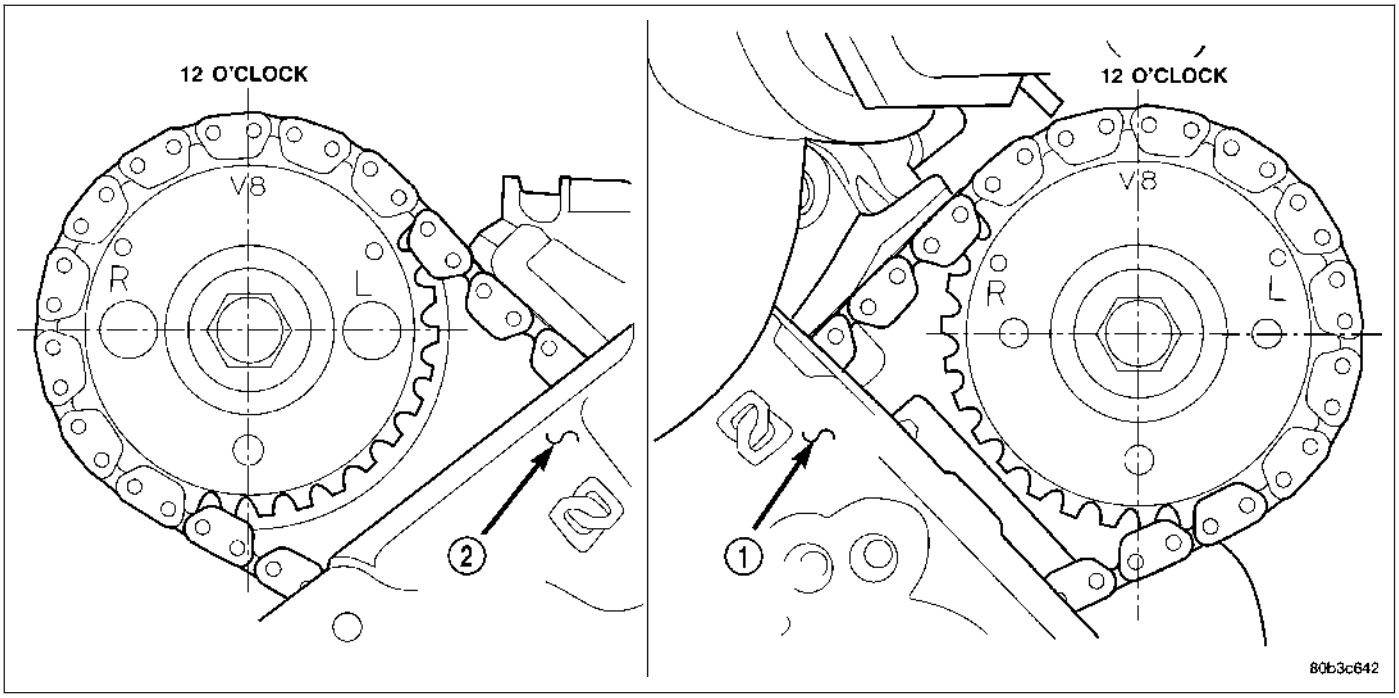


2. Disconnect the negative cable from the battery.
3. Raise the vehicle on a hoist.
4. Disconnect the exhaust pipe at the left side exhaust manifold.
5. Drain the engine coolant.
6. Remove the intake manifold (Refer to 9 - ENGINE/ MANIFOLDS/INTAKE MANIFOLD - REMOVAL).
7. Remove the master cylinder and booster assembly. Refer to section 5 brakes.
8. Remove the cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).



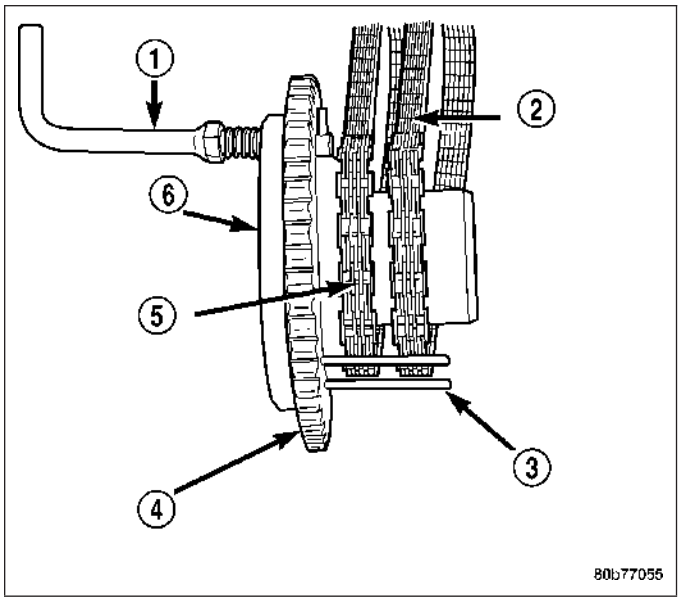
9. Remove the fan shroud and fan blade assembly (Refer to 7 - COOLING/ENGINE/FAN DRIVE VISCOUS CLUTCH - REMOVAL).
10. Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
11. Remove the power steering pump and set aside.
12. Rotate the crankshaft until the damper timing mark is aligned with TDC indicator mark.

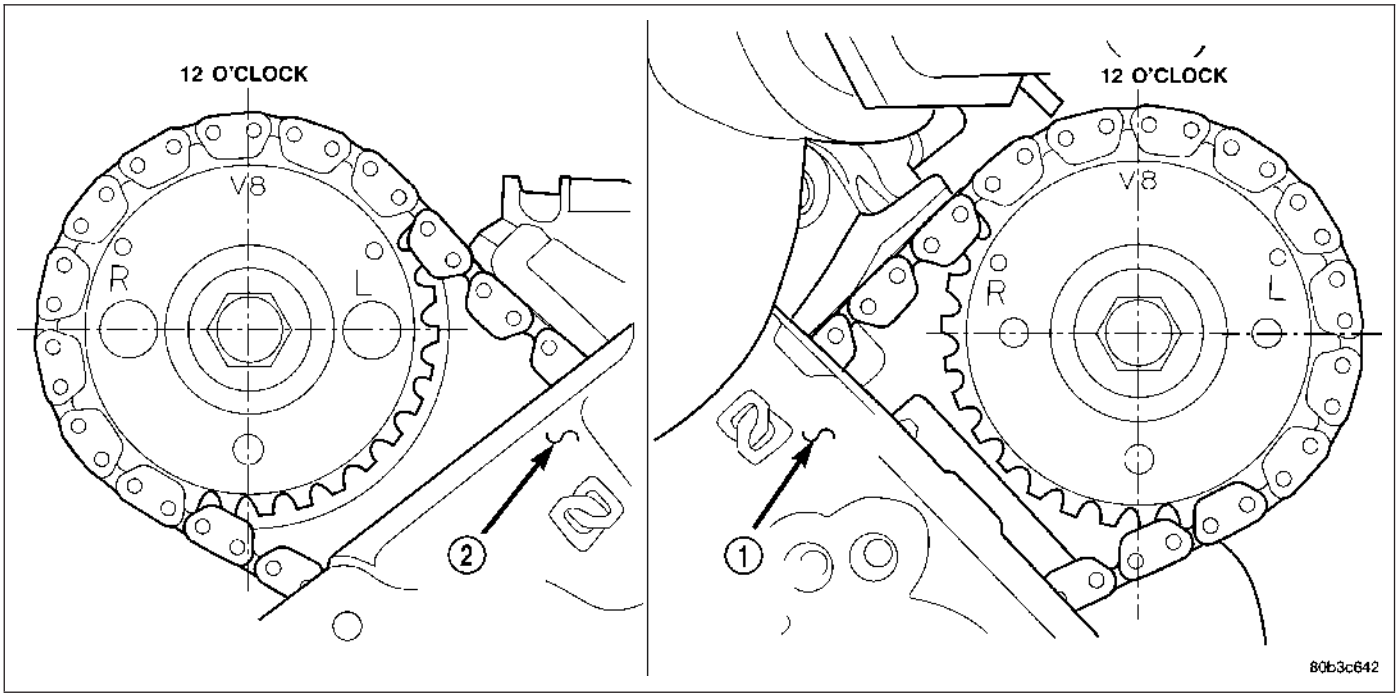




13. Verify the V8 mark on the camshaft sprocket is at the 12 o'clock position. Rotate the crankshaft one turn if necessary.
14. Remove the crankshaft damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL).
15. Remove the timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).

16. Lock the secondary timing chains to the idler sprocket using Special Tool 8515.



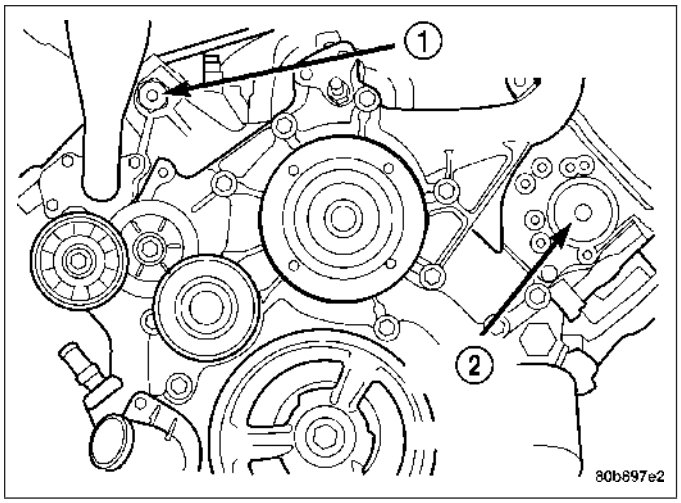


NOTE: Mark the secondary timing chain prior to removal to aid in installation.

17. Mark the secondary timing chain, one link on each side of the V8 mark on the camshaft drive gear.
18. Remove the left side secondary chain tensioner (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).

19. Remove the cylinder head access plug (2).
20. Remove the left side secondary chain guide (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).
21. Remove the retaining bolt and the camshaft drive gear.

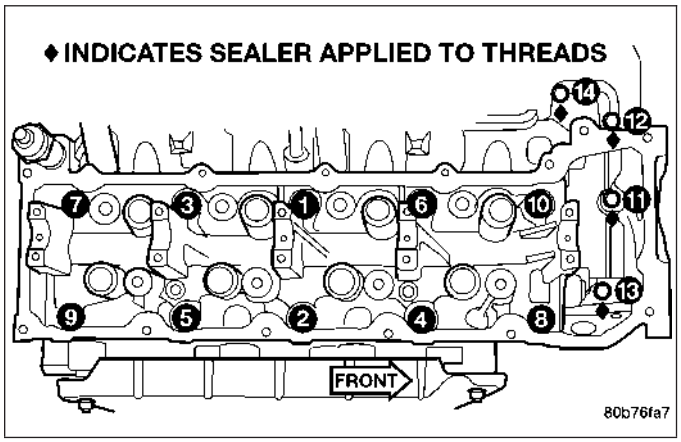
CAUTION: Do not allow the engine to rotate. Severe damage to the valve train can occur.



CAUTION: Do not overlook the four smaller bolts at the front of the cylinder head. Do not attempt to remove the cylinder head without removing these four bolts.

NOTE: The cylinder head is attached to the cylinder block with fourteen bolts.

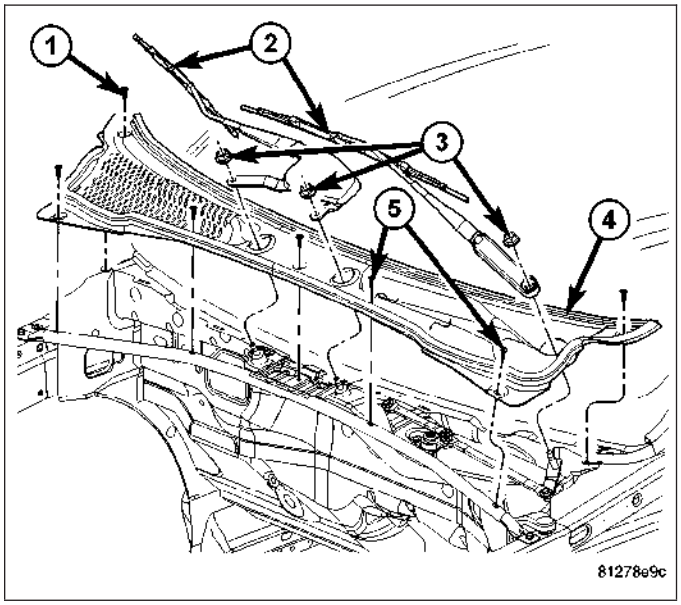
22. Remove the cylinder head retaining bolts using the sequence provided.
23. Remove the cylinder head and gasket. Discard the gasket.



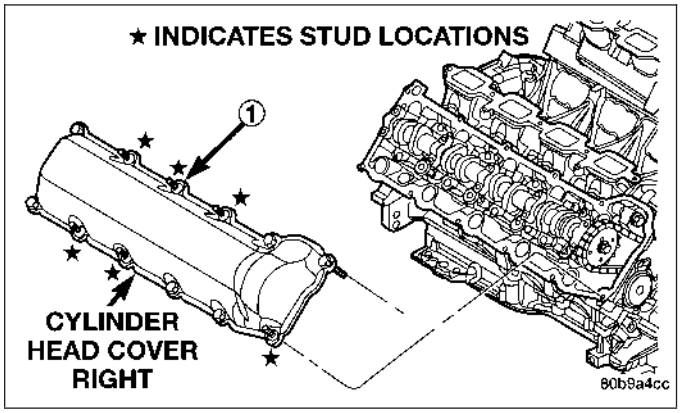
CAUTION: Do not lay the cylinder head on its gasket sealing surface, due to the design of the cylinder head gasket any distortion to the cylinder head sealing surface may prevent the gasket from properly sealing resulting in leaks.

REMOVAL - RIGHT CYLINDER HEAD

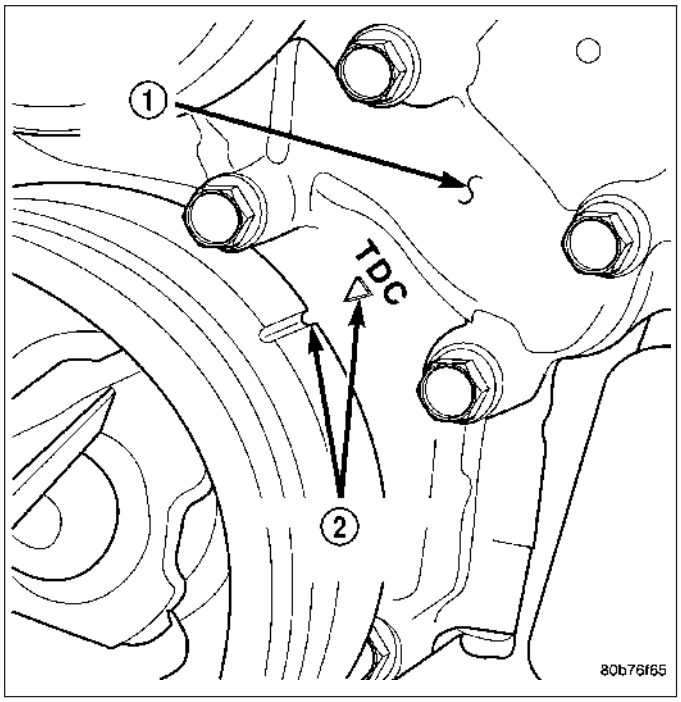
1. Remove the cowl grille (4).

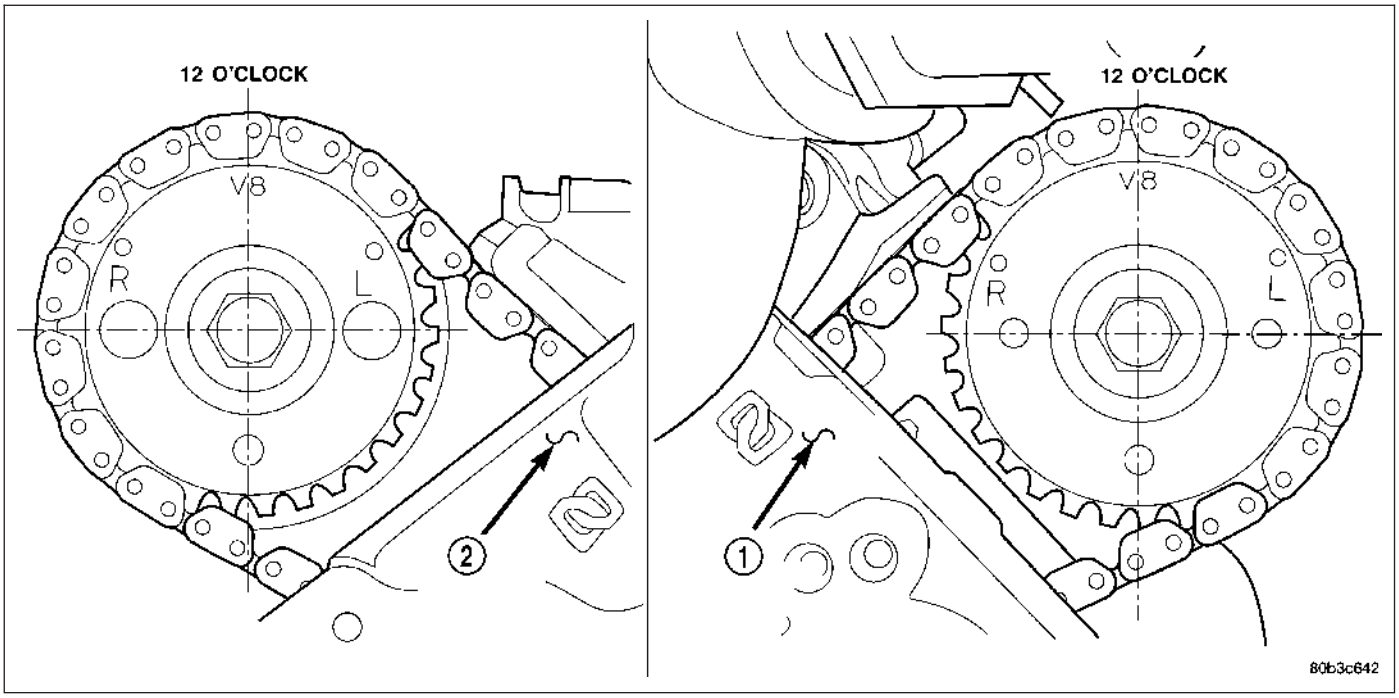


2. Disconnect battery negitive cable.
3. Disconnect the exhaust pipe at the right side exhaust manifold.
4. Drain the engine coolant (Refer to 7 - COOLING - STANDARD PROCEDURE).
5. Remove the intake manifold (Refer to 9 - ENGINE/ MANIFOLDS/INTAKE MANIFOLD - REMOVAL).
6. Remove the cylinder head cover (1) (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).



7. Remove the fan shroud (Refer to 7 - COOLING/ ENGINE/FAN DRIVE VISCOUS CLUTCH - REMOVAL).
8. Remove oil fill housing from cylinder head.
9. Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
10. Rotate the crankshaft until the damper timing mark is aligned with TDC indicator mark (2).



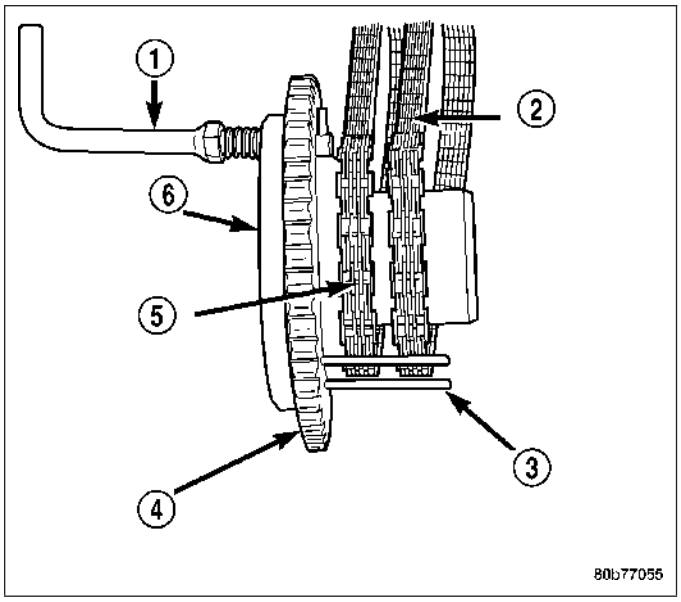


11. Verify the V8 mark on the camshaft sprocket is at the 12 o'clock position (2). Rotate the crankshaft one turn if necessary.
12. Remove the crankshaft damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL).
13. Remove the timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).

14. Lock the secondary timing chains to the idler sprocket using Special Tool 8515 (6).

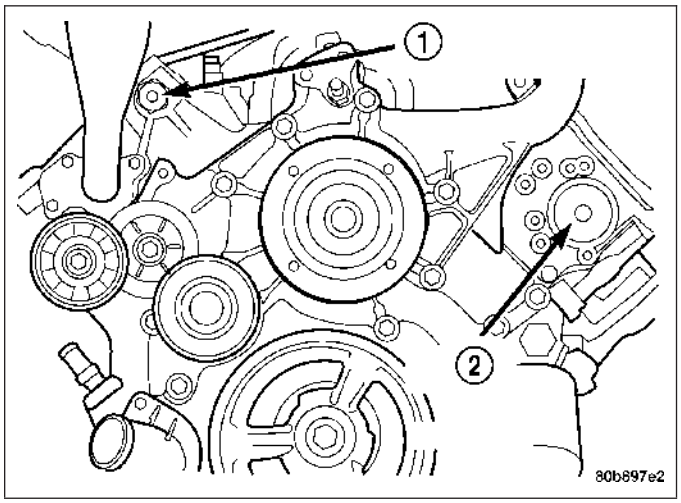
NOTE: Mark the secondary timing chain prior to removal to aid in installation.

15. Mark the secondary timing chain, one link on each side of the V8 mark on the camshaft drive gear.
16. Remove the right side secondary chain tensioner (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).



17. Remove the cylinder head access plug (1).
18. Remove the right side secondary chain guide (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).
19. Remove the retaining bolt and the camshaft drive gear.

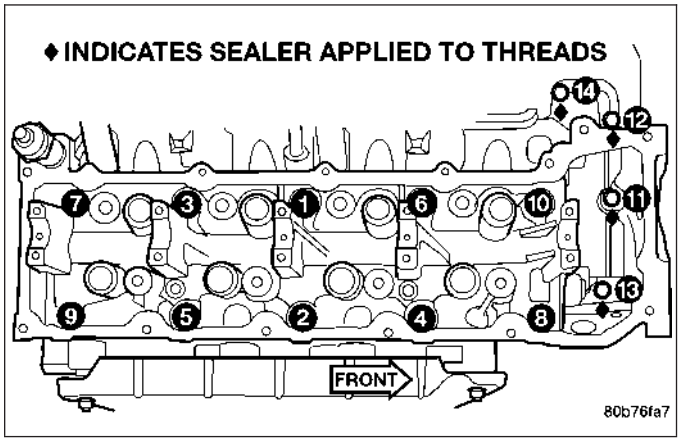
CAUTION: Do not allow the engine to rotate. severe damage to the valve train can occur.



CAUTION: Do not overlook the four smaller bolts at the front of the cylinder head. Do not attempt to remove the cylinder head without removing these four bolts.

CAUTION: Do not hold or pry on the camshaft target wheel for any reason. A damaged target wheel can result in a vehicle no start condition.

NOTE: The cylinder head is attached to the cylinder block with fourteen bolts.



20. Remove the cylinder head retaining bolts using the sequence provided.
21. Remove the cylinder head and gasket. Discard the gasket.

CAUTION: Do not lay the cylinder head on its gasket sealing surface, do to the design of the cylinder head gasket any distortion to the cylinder head sealing surface may prevent the gasket from properly sealing resulting in leaks.

CLEANING

To ensure engine gasket sealing, proper surface preparation must be performed, especially with the use of aluminum engine components. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

INSPECTION

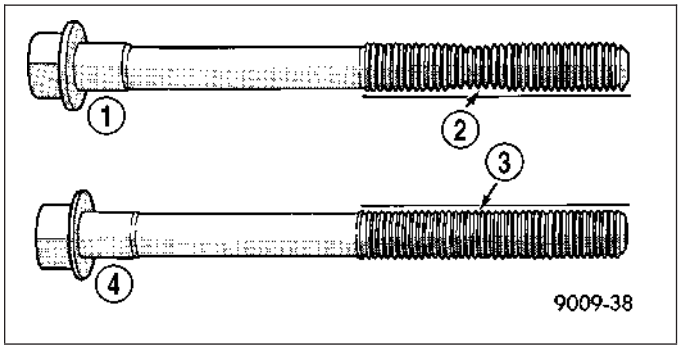
1. Inspect the cylinder head for out-of-flatness, using a straightedge and a feeler gauge. If tolerances exceed 0.0508 mm (0.002 in.) replace the cylinder head.
2. Inspect the valve seats for damage. Service the valve seats as necessary.
3. Inspect the valve guides for wear, cracks or looseness. If either condition exist, replace the cylinder head.

INSTALLATION

INSTALLATION - LEFT CYLINDER HEAD

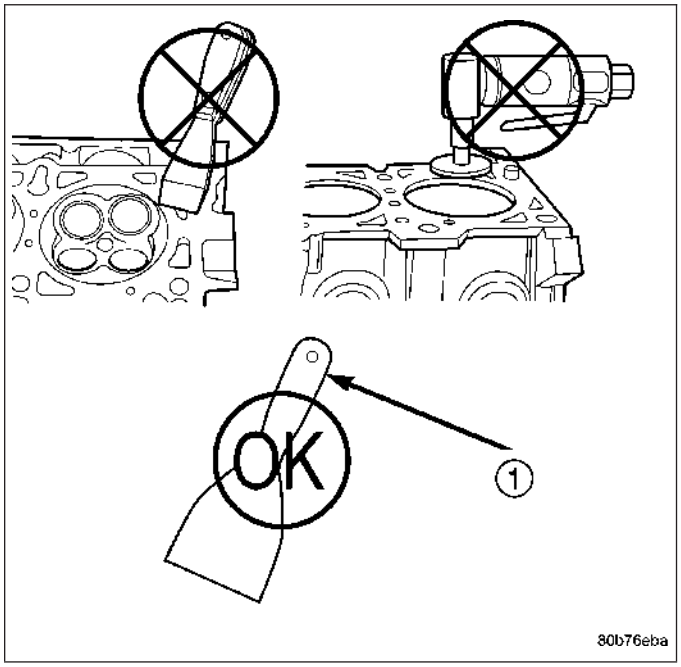
NOTE: The cylinder head bolts are tightened using a torque plus angle procedure. The bolts must be examined BEFORE reuse. If the threads are necked down (2) the bolts should be replaced.

Necking can be checked by holding a straight edge against the threads. If all the threads do not contact the scale, the bolt should be replaced.

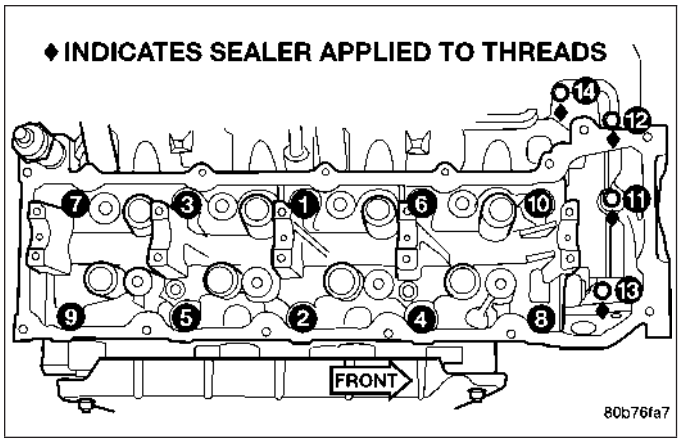


CAUTION: When cleaning cylinder head and cylinder block surfaces, DO NOT use a metal scraper because the surfaces could be cut or ground. Use only a wooden or plastic scraper (1).

1. Clean the cylinder head and cylinder block mating surfaces.



2. Position the new cylinder head gasket on the locating dowels.



CAUTION: When installing cylinder head, use care not damage the tensioner arm or the guide arm.

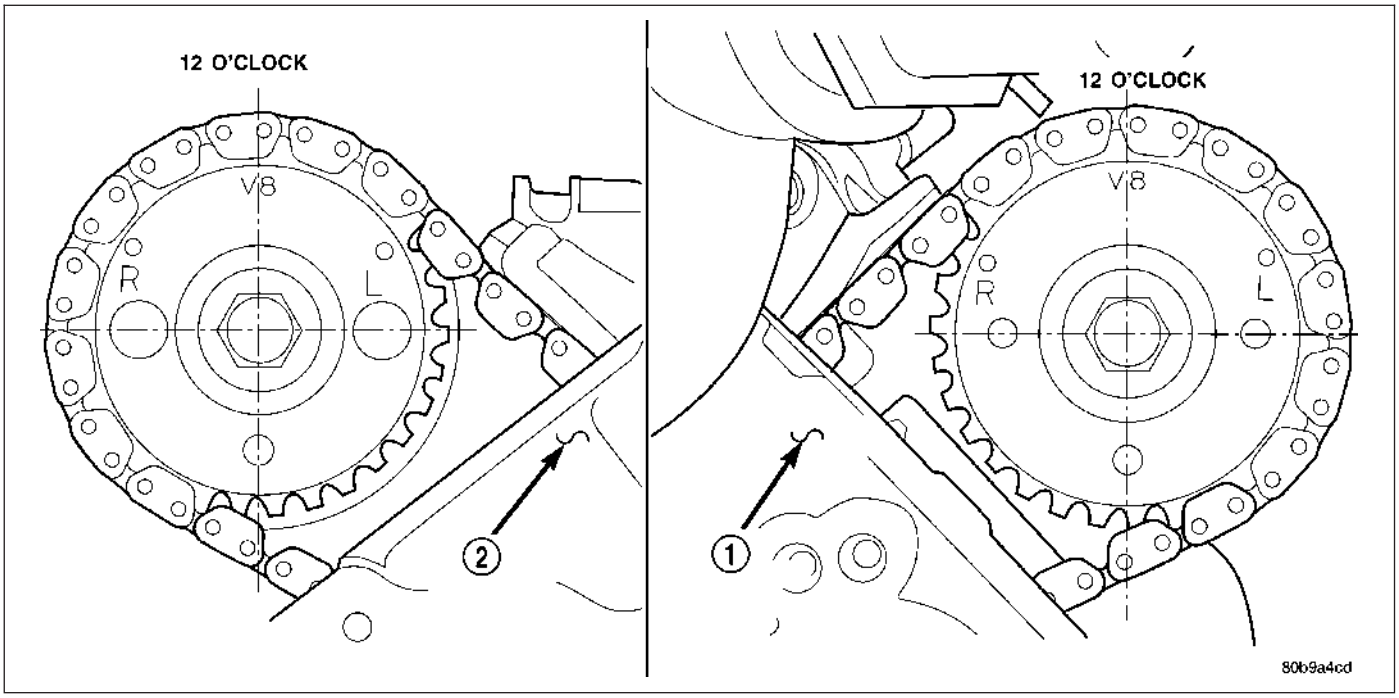
3. Position the cylinder head onto the cylinder block. Make sure the cylinder head seats fully over the locating dowels.

NOTE: The four smaller cylinder head mounting bolts require sealant to be added to them before installing. Failure to do so may cause leaks.

4. Lubricate the cylinder head bolt threads with clean engine oil and install the ten M11 bolts.
5. Coat the four M8 cylinder head bolts with **Mopar® Lock and Seal Adhesive** then install the bolts.

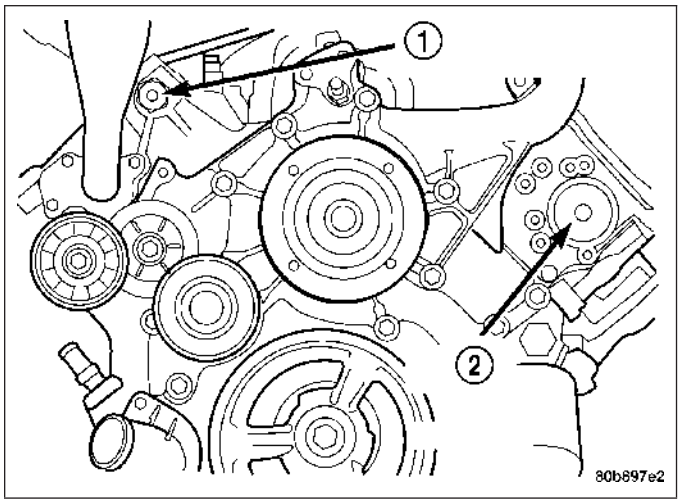
NOTE: The cylinder head bolts are tightened using an angle torque procedure, however, the bolts are not a torque-to-yield design.

6. Tighten the bolts in sequence using the following steps and torque values:
   - Step 1: Tighten bolts 1–10, 20 N·m (15 ft. lbs.).
   - Step 2: Tighten bolts 1–10, 47 N·m (35 ft. lbs.). Tighten bolts 11–14, 25 N·m (18 ft. lbs.).
   - Step 3: Tighten bolts 1–10, 90 degrees. Tighten bolts 11–14, 30 N·m (22 ft. lbs.).

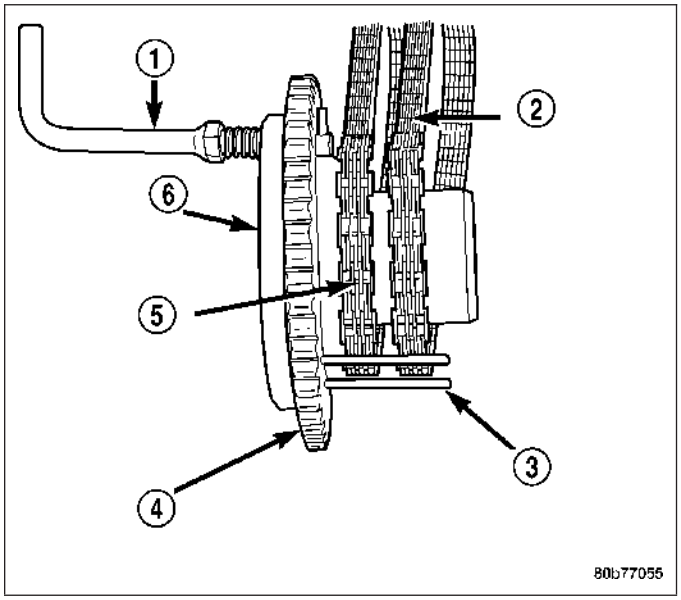


7. Position the secondary chain onto the camshaft drive gear, making sure one marked chain link is on either side of the V8 mark on the gear and position the gear onto the camshaft.
8. Install the camshaft drive gear retaining bolt.
9. Install the left side secondary chain guide (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).

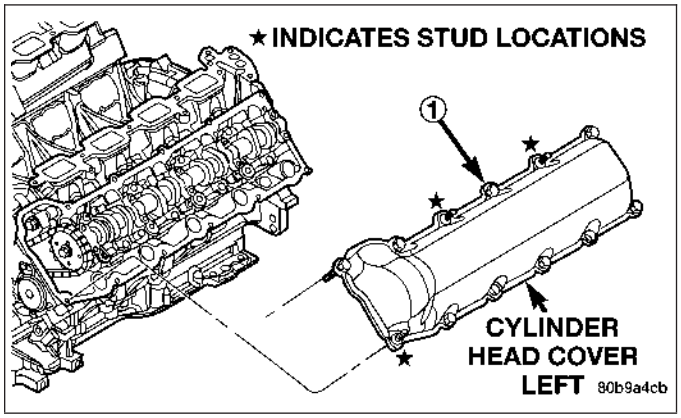
10. Install the cylinder head access plug (2).
11. Re-set and Install the left side secondary chain tensioner (Refer to 9 - ENGINE/VALVE TIMING/ TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).



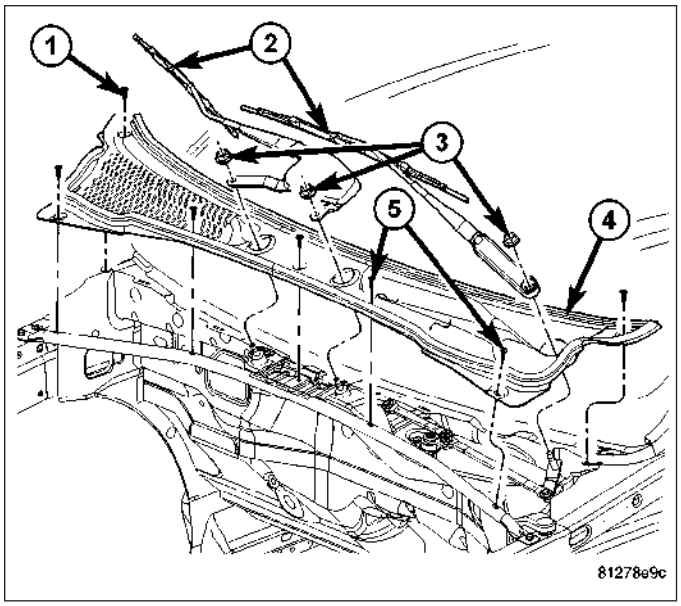
12. Remove Special Tool 8515 (6).
13. Install the timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION).
14. Install the crankshaft damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION).
15. Install the power steering pump.
16. Install the fan blade assembly and fan shroud (Refer to 7 - COOLING/ENGINE/FAN DRIVE VISCOUS CLUTCH - INSTALLATION).



17. Install the cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).
18. Install the intake manifold (Refer to 9 - ENGINE/ MANIFOLDS/INTAKE MANIFOLD - INSTALLATION).
19. Install the exhaust pipe onto the left exhaust manifold.



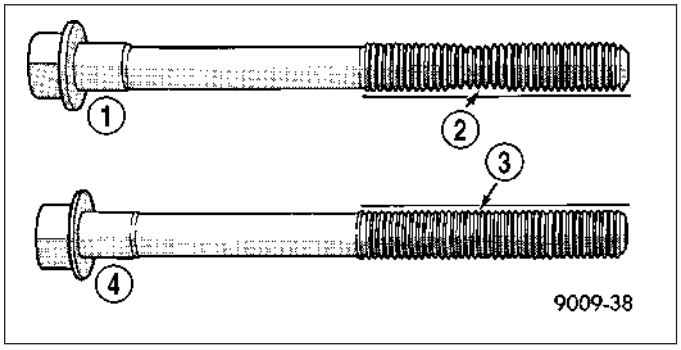
20. Install the cowl grille (4).
21. Refill the cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
22. Connect the negative cable to the battery.
23. Start the engine and check for leaks.



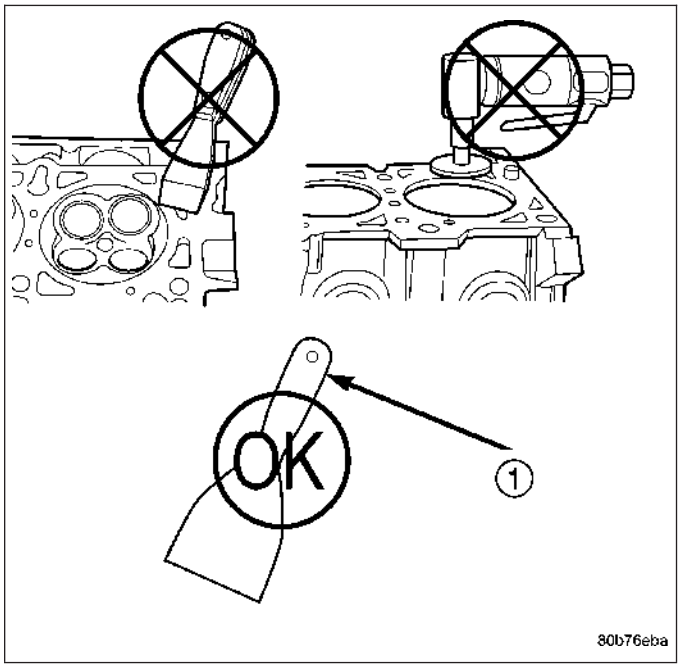
INSTALLATION - RIGHT CYLINDER HEAD

NOTE: The cylinder head bolts are tightened using a torque plus angle procedure. The bolts must be examined BEFORE reuse. If the threads are necked down (2) the bolts should be replaced.

Necking (2) can be checked by holding a straight edge against the threads. If all the threads do not contact the scale (2), the bolt should be replaced.

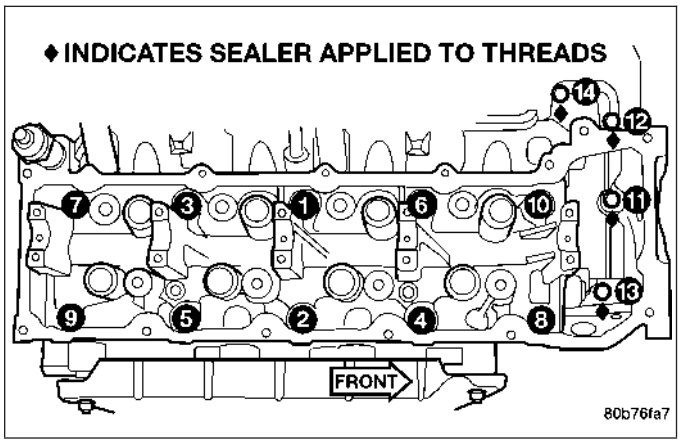


CAUTION: When cleaning cylinder head and cylinder block surfaces, DO NOT use a metal scraper because the surfaces could be cut or ground. Use only a wooden or plastic scraper (1).



1. Clean the cylinder head and cylinder block mating surfaces.

2. Position the new cylinder head gasket on the locating dowels.



CAUTION: When installing cylinder head, use care not damage the tensioner arm or the guide arm.

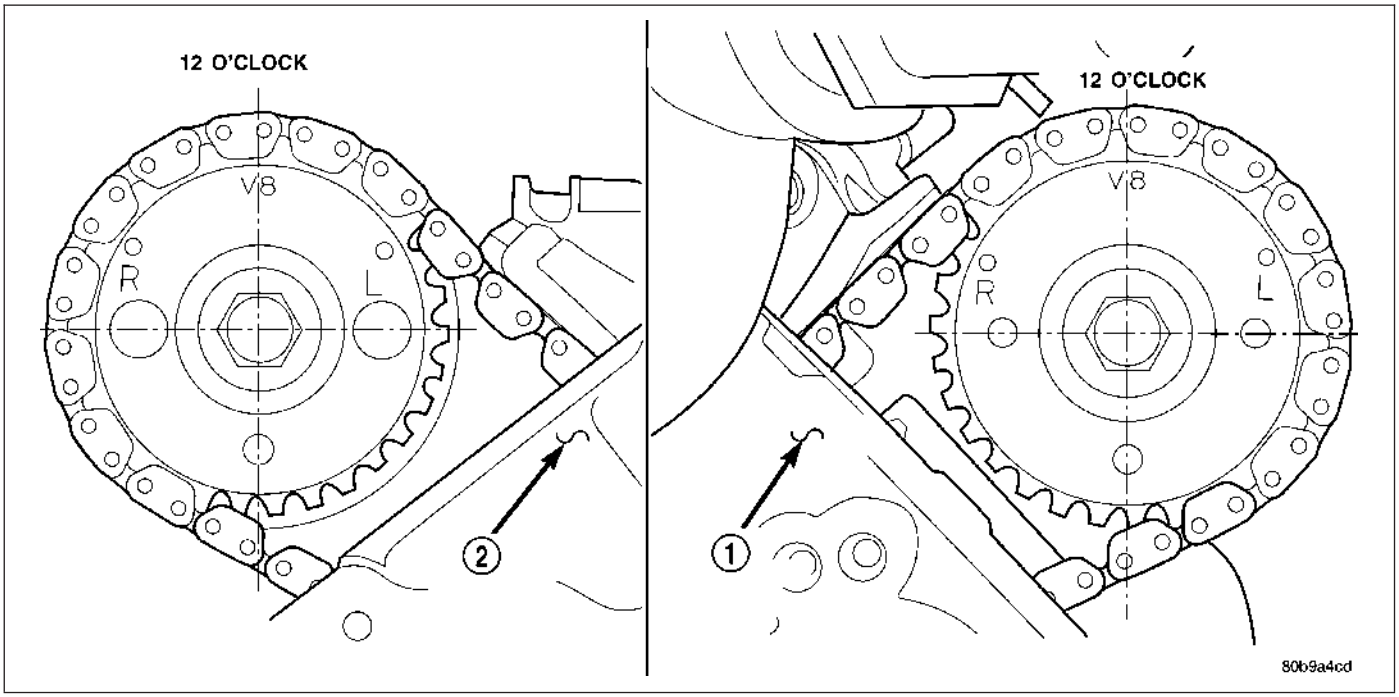
3. Position the cylinder head onto the cylinder block. Make sure the cylinder head seats fully over the locating dowels.

NOTE: The four smaller cylinder head mounting bolts require sealant to be added to them before installing. Failure to do so may cause leaks.

4. Lubricate the cylinder head bolt threads with clean engine oil and install the ten M10 bolts.
5. Coat the four M8 cylinder head bolts with **Mopar® Lock and Seal Adhesive** then install the bolts.

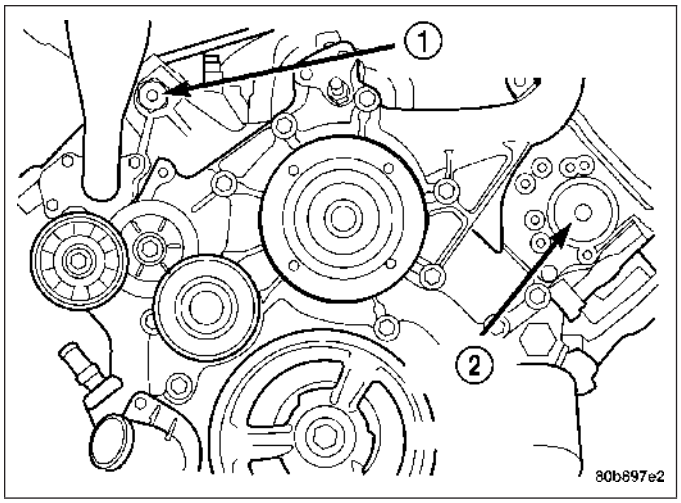
NOTE: The cylinder head bolts are tightened using an angle torque procedure, however, the bolts are not a torque-to-yield design.

6. Tighten the bolts in sequence using the following steps and torque values:
   - Step 1: Tighten bolts 1–10, 20 N·m (15 ft. lbs.).
   - Step 2: Tighten bolts 1–10, 47 N·m (35 ft. lbs.). Tighten bolts 11–14, 25 N·m (18 ft. lbs.).
   - Step 3: Tighten bolts 1–10, 90 degrees. Tighten bolts 11–14, 30 N·m (22 ft. lbs.).

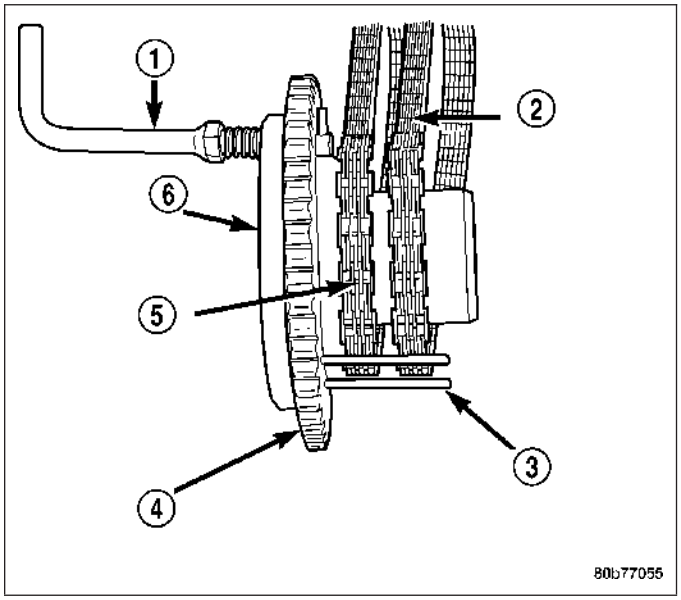


7. Position the secondary chain onto the camshaft drive gear, making sure one marked chain link is on either side of the V8 mark on the gear (2) and position the gear onto the camshaft.
8. Install the camshaft drive gear retaining bolt.
9. Install the right side secondary chain guide (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION).

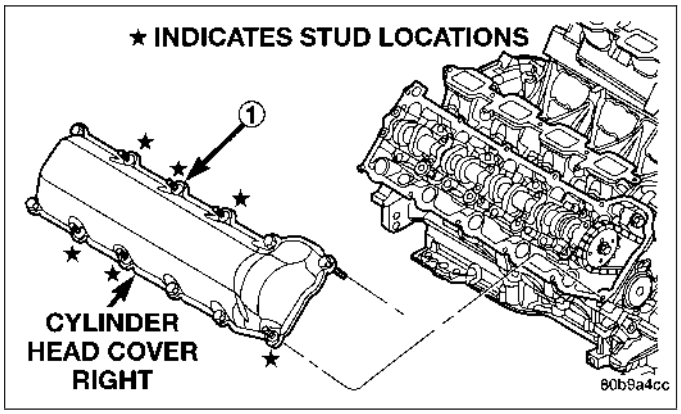
10. Install the right side cylinder head access plug (1).
11. Re-set and install the right side secondary chain tensioner.



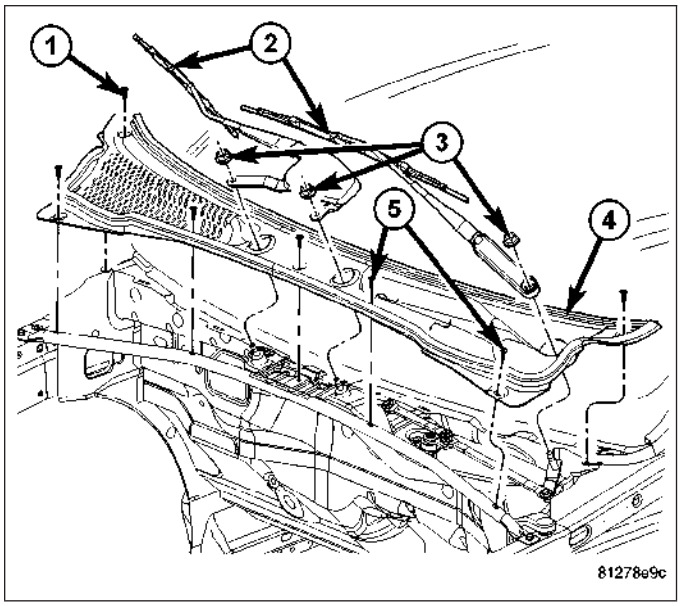
12. Remove Special Tool 8515 (6).
13. Install the timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION).
14. Install the crankshaft damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION).
15. Install accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).
16. Install the fan shroud.



17. Install the cylinder head cover (1) (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).
18. Install the intake manifold (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION).
19. Install the exhaust pipe onto the right exhaust manifold.
20. Install oil fill housing onto cylinder head.



21. Install the cowl grille (4).
22. Refill the cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
23. Reconnect battery negative cable.
24. Start the engine and check for leaks.



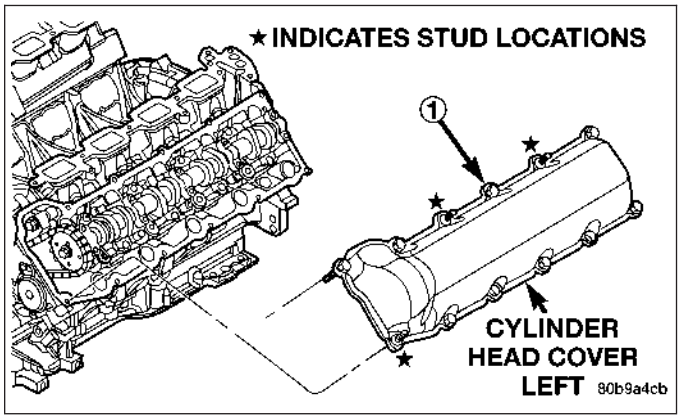
CAMSHAFT - LEFT

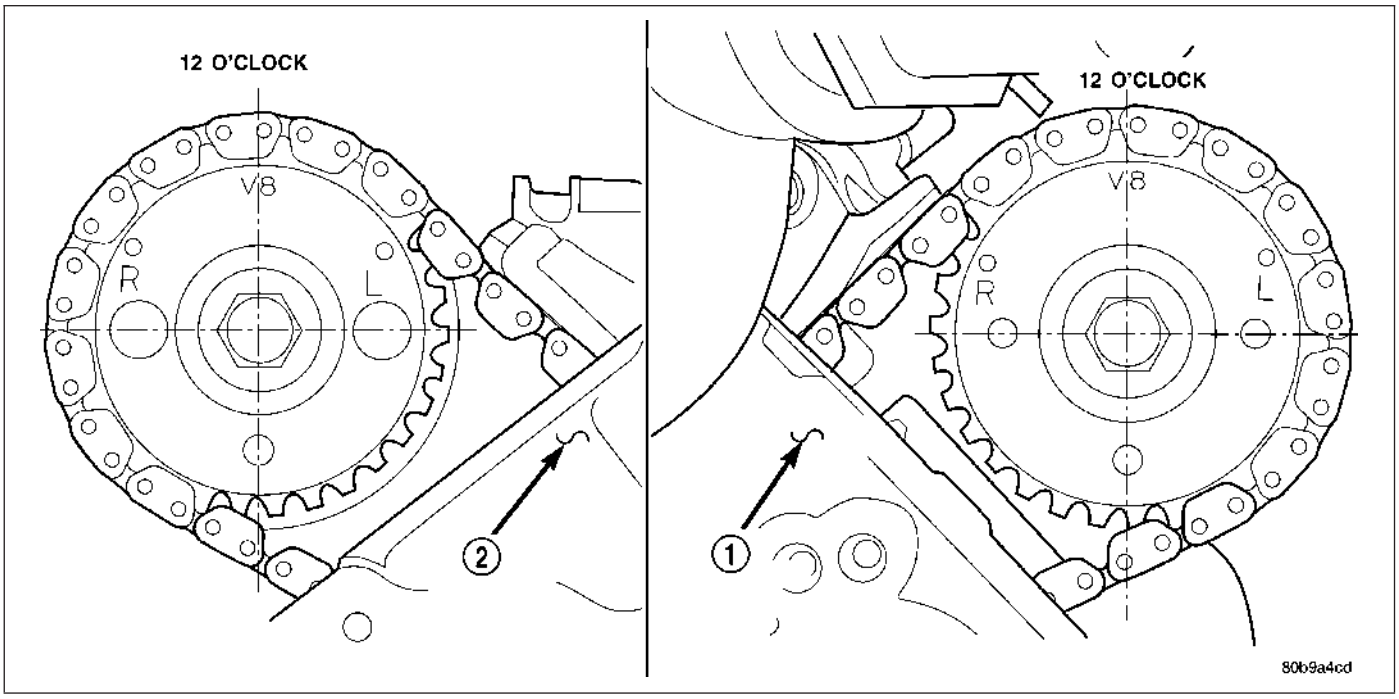
DESCRIPTION

The camshafts consist of powdered metal steel lobes which are sinter-bonded to a steel tube. A steel post or nose piece is friction-welded to the steel camshaft tube. Five bearing journals are machined into the camshaft, four on the steel tube and one on the steel nose piece. Camshaft end play is controlled by two thrust walls that border the nose piece journal. Engine oil enters the hollow camshafts at the third journal and lubricates every intake lobe rocker through a drilled passage in the intake lobe.

REMOVAL

1. Remove cylinder head cover (1) (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).





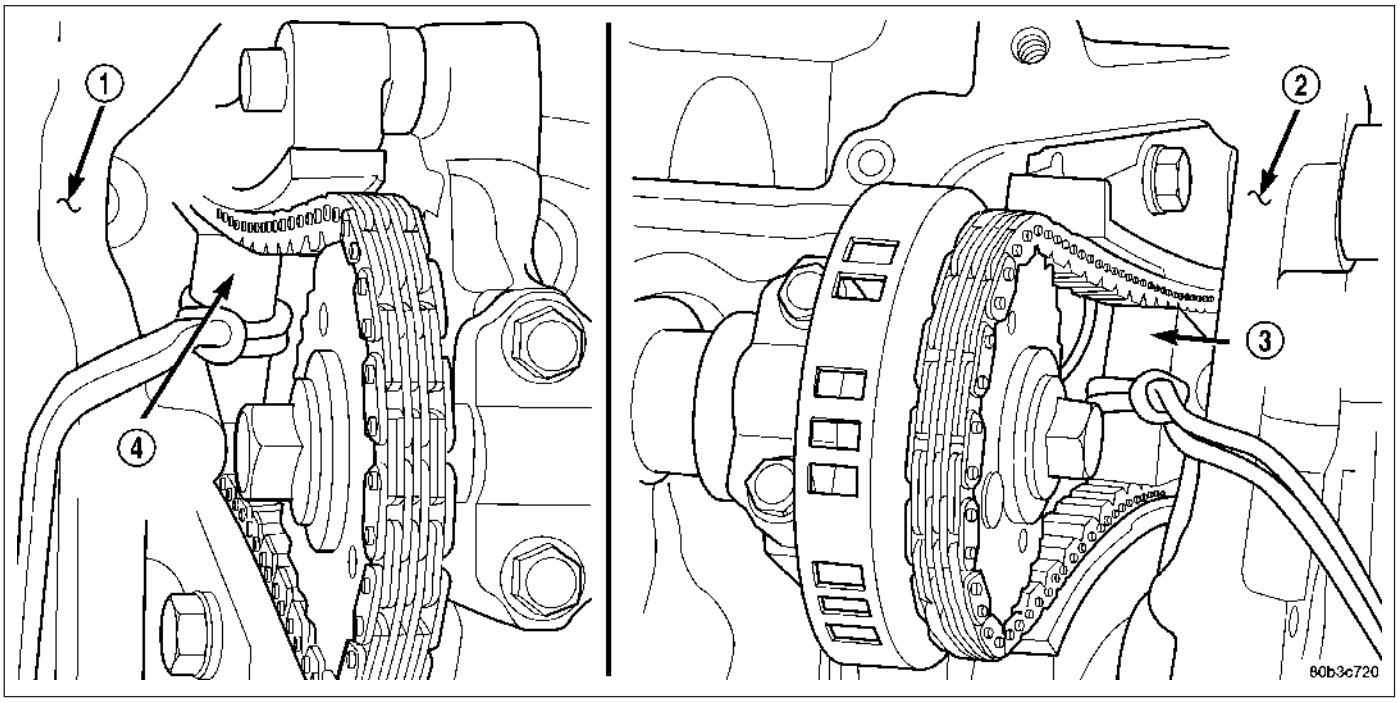
CAUTION: When the timing chain is removed and the cylinder heads are still installed, DO NOT forcefully rotate the camshafts or crankshaft independently of each other. Severe valve and/or piston damage can occur.

CAUTION: When removing the cam sprocket, timing chains or camshaft, Failure to use Special Tool 8350 will result in hydraulic tensioner ratchet over extension, requiring timing chain cover removal to reset the tensioner ratchet.

2. Set engine to TDC cylinder #1, camshaft sprocket V8 marks at the 12 o'clock position (1).
3. Mark one link on the secondary timing chain on both sides of the V8 mark on the camshaft sprocket to aid in installation.

CAUTION: Do not hold or pry on the camshaft target wheel (Located on the right side camshaft sprocket) for any reason, Severe damage will occur to the target wheel resulting in a vehicle no start condition.

4. Loosen but **DO NOT** remove the camshaft sprocket retaining bolt. Leave the bolt snug against the sprocket.



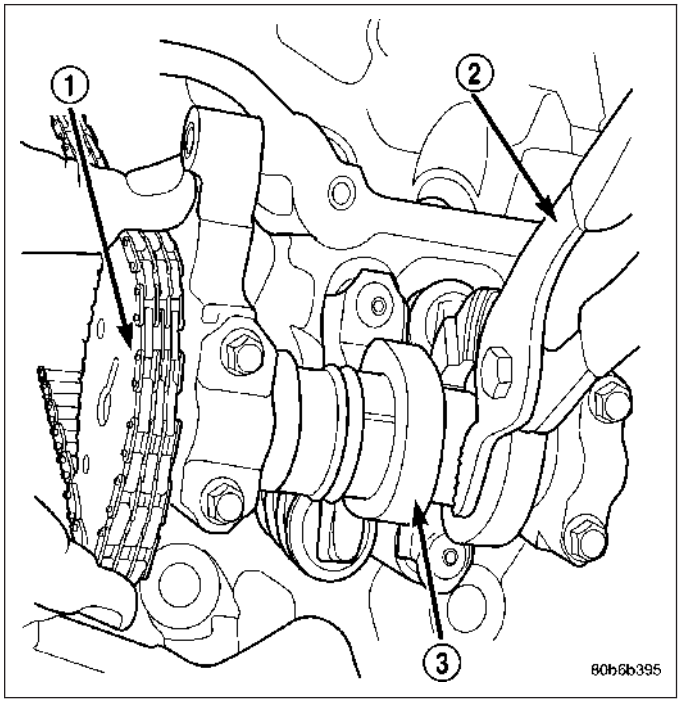
NOTE: The timing chain tensioners must be secured prior to removing the camshaft sprockets. Failure to secure tensioners will allow the tensioners to extend, requiring timing chain cover removal in order to reset tensioners.

CAUTION: Do not force wedge past the narrowest point between the chain strands. Damage to the tensioners may occur.

5. Position Special Tool 8350 (4) timing chain wedge between the timing chain strands, tap the tool to securely wedge the timing chain against the tensioner arm and guide.

NOTE: When gripping the camshaft, place the pliers on the tube portion of the camshaft only. Do not grip the lobes or the sprocket areas.

6. Hold the camshaft (3) with adjustable pliers (2) while removing the camshaft sprocket bolt and sprocket (1).
7. Using the pliers, gently allow the camshaft to rotate 15° clockwise until the camshaft is in the neutral position (no valve load).

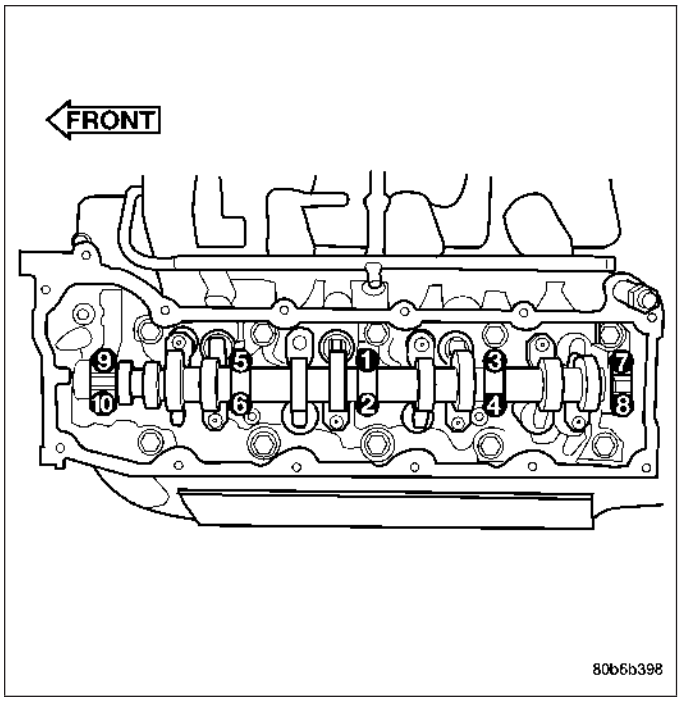


8. Starting at the outside working inward, loosen the camshaft bearing cap retaining bolts 1/2 turn at a time. Repeat until all load is off the bearing caps.

CAUTION: DO NOT STAMP OR STRIKE THE CAMSHAFT BEARING CAPS. SEVERE DAMAGE WILL OCCUR TO THE BEARING CAPS.

NOTE: When the camshaft is removed the rocker arms may slide downward, mark the rocker arms before removing camshaft.

9. Remove the camshaft bearing caps and the camshaft.

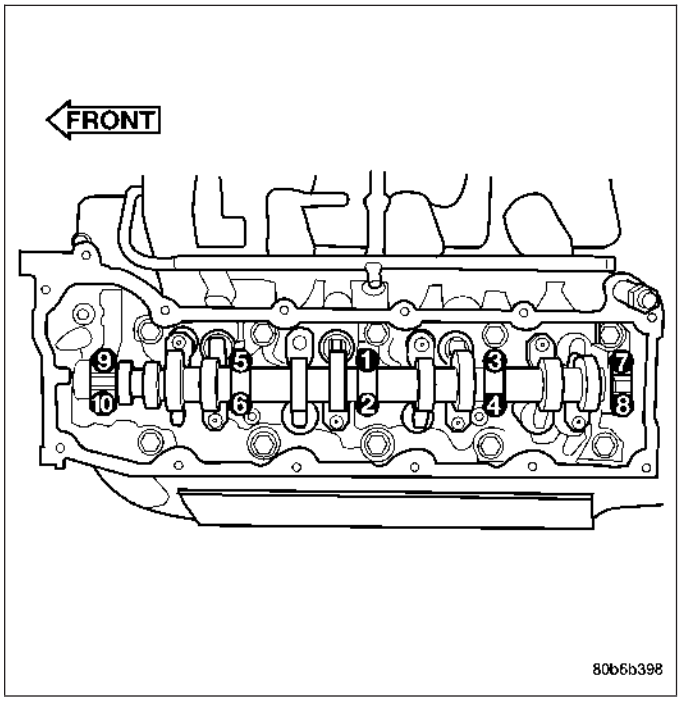


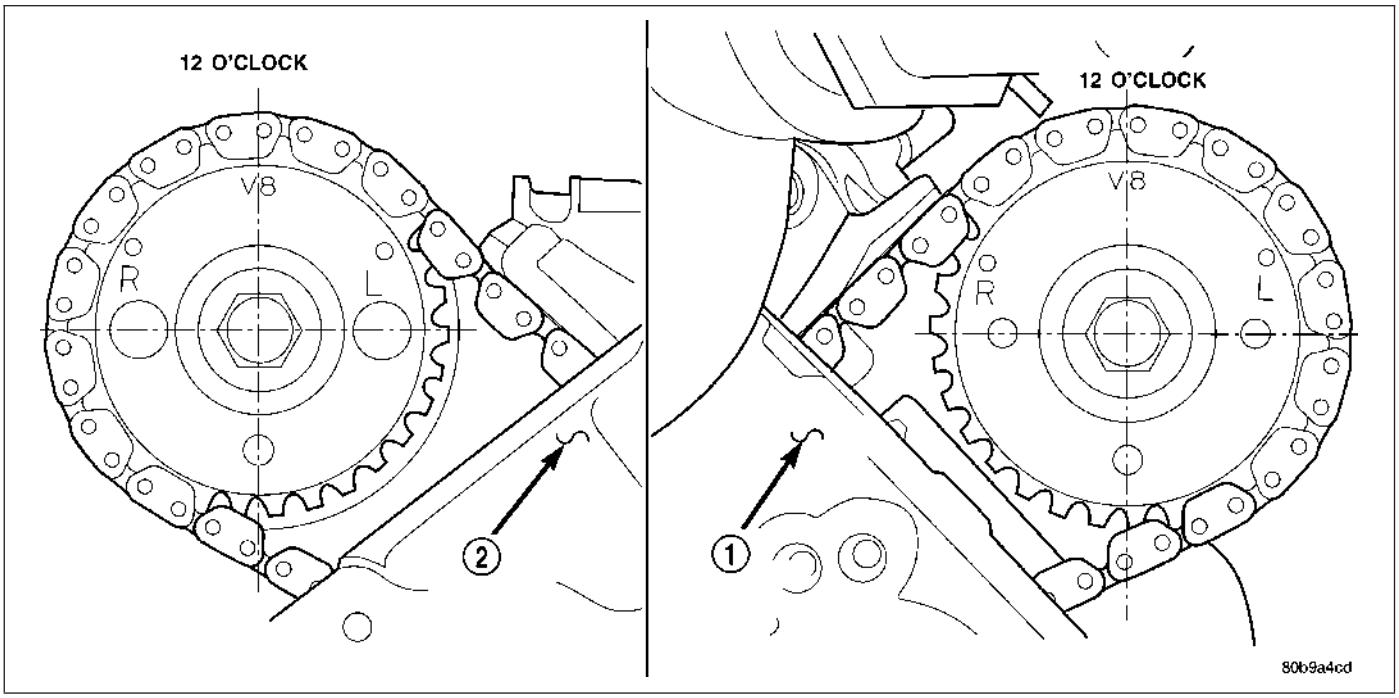
INSTALLATION

1. Lubricate camshaft journals with clean engine oil.

NOTE: Position the left side camshaft so that the camshaft sprocket dowel is near the 1 o'clock position, This will place the camshaft at the neutral position easing the installation of the camshaft bearing caps.

2. Position the camshaft into the cylinder head.
3. Install the camshaft bearing caps, hand tighten the retaining bolts.
4. Working in ½ turn increments, tighten the bearing cap retaining bolts starting with the middle cap working outward.
5. Torque the camshaft bearing cap retaining bolts to 11 N·m (100 in. lbs.).





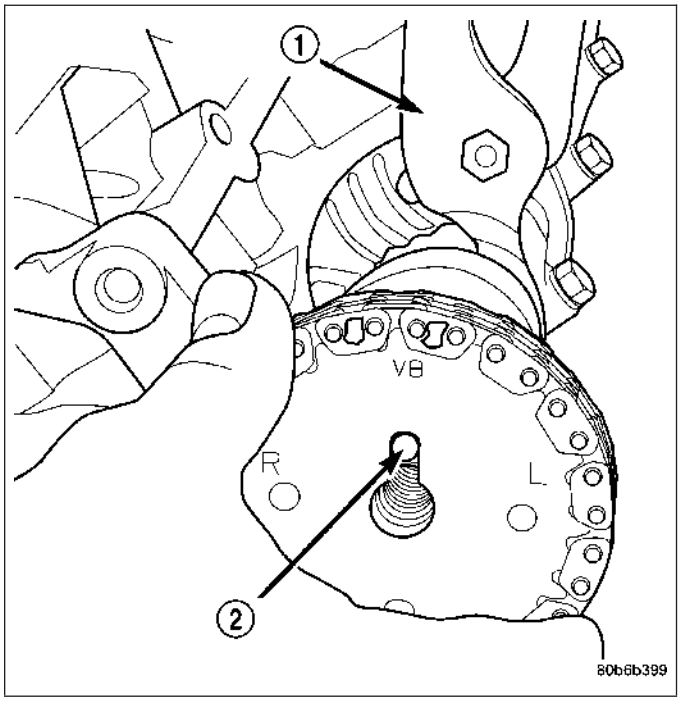
6. Position the camshaft drive gear into the timing chain aligning the V8 mark between the two marked chain links (Two links marked during removal) (1).

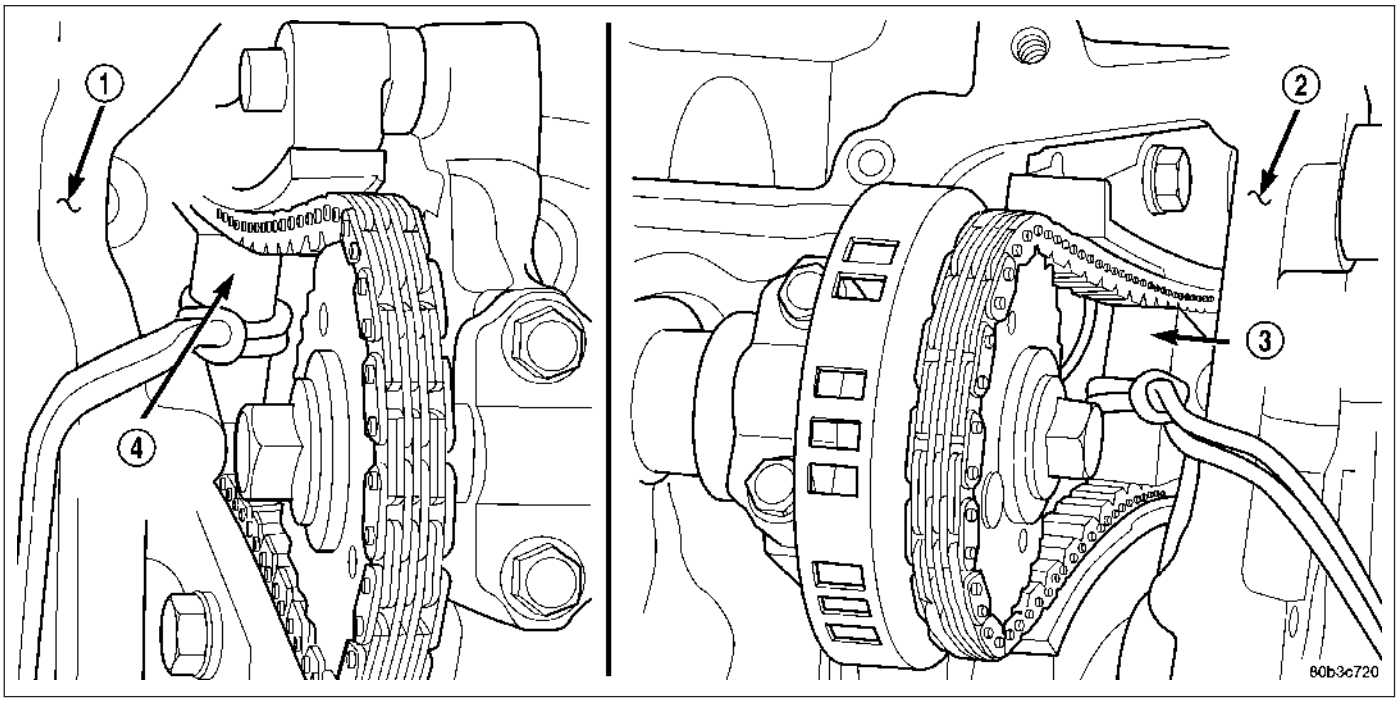
NOTE: When gripping the camshaft, place the pliers on the tube portion of the camshaft only. Do not grip the lobes or the sprocket areas.

7. Using the adjustable pliers (1), rotate the camshaft until the camshaft sprocket dowel (2) is aligned with the slot in the camshaft sprocket. Install the sprocket onto the camshaft.

CAUTION: Remove excess oil from camshaft sprocket bolt. Failure to do so can cause bolt over-torque resulting in bolt failure.

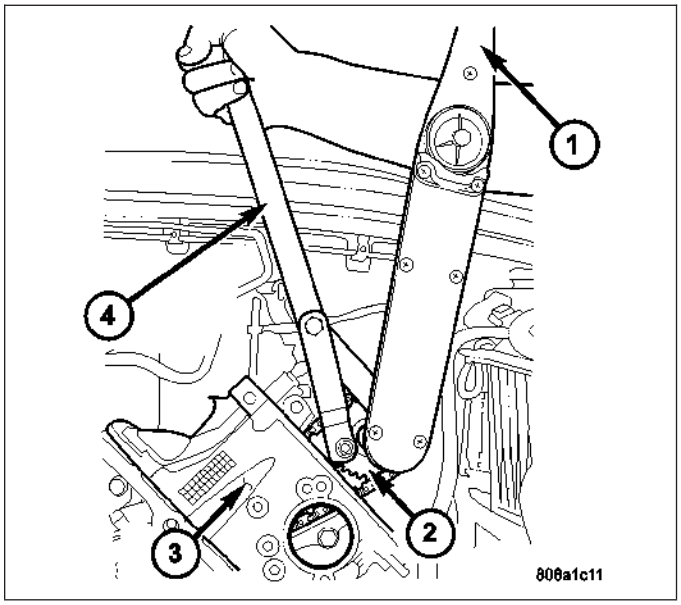
8. Remove excess oil from bolt, then install the camshaft sprocket retaining bolt and hand tighten.



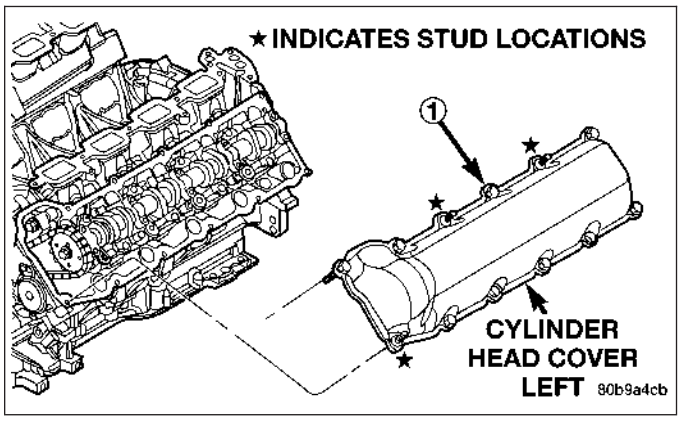


9. Remove Special Tool 8350 timing chain wedge (4).

10. Using Special Tool 6958 spanner wrench (4)with adapter pins 8346, torque the camshaft sprocket retaining bolt (2) to 122 N·m (90 ft. lbs.).



11. Install the cylinder head cover (1).



CAMSHAFT - RIGHT

DESCRIPTION

The camshafts consist of powdered metal steel lobes which are sinter-bonded to a steel tube. A steel post or nose piece is friction-welded to the steel camshaft tube. Five bearing journals are machined into the camshaft, four on the steel tube and one on the steel nose piece. Camshaft end play is controlled by two thrust walls that border the nose piece journal. Engine oil enters the hollow camshafts at the third journal and lubricates every intake lobe rocker through a drilled passage in the intake lobe.

REMOVAL

CAUTION: When the timing chain is removed and the cylinder heads are still installed, DO NOT forcefully rotate the camshafts or crankshaft independently of each other. Severe valve and/or piston damage can occur.

CAUTION: When removing the cam sprocket, timing chains or camshaft, Failure to use special tool 8350 will result in hydraulic tensioner ratchet over extension, Requiring timing chain cover removal to re-set the tensioner ratchet.

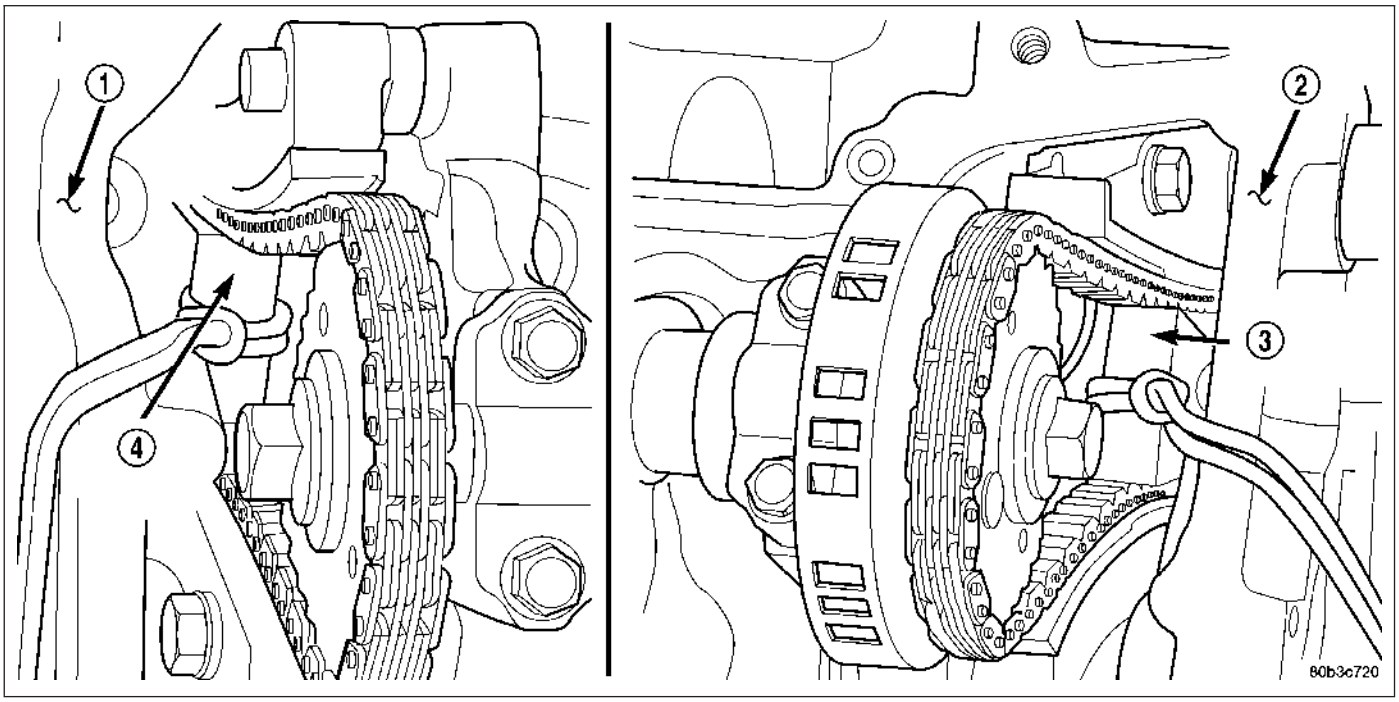
1. Remove the cylinder head covers (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).
2. Set engine to TDC cylinder #1, camshaft sprocket V8 marks at the 12 o'clock position.
3. Mark one link on the secondary timing chain on both sides of the V8 mark on the camshaft sprocket to aid in installation.

CAUTION: Do not hold or pry on the camshaft target wheel for any reason, Severe damage will occur to the target wheel. A damaged target wheel could cause a vehicle no start condition.

4. Loosen but **DO NOT** remove the camshaft sprocket retaining bolt. Leave bolt snug against sprocket.

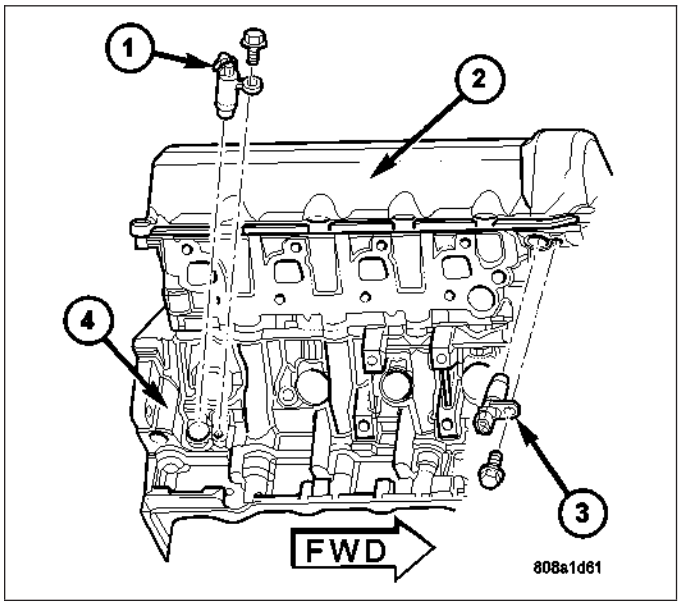
NOTE: The timing chain tensioners must be secured prior to removing the camshaft sprockets. Failure to secure tensioners will allow the tensioners to extend, requiring timing chain cover removal in order to reset tensioners.

CAUTION: Do not force wedge past the narrowest point between the chain strands. Damage to the tensioners may occur.



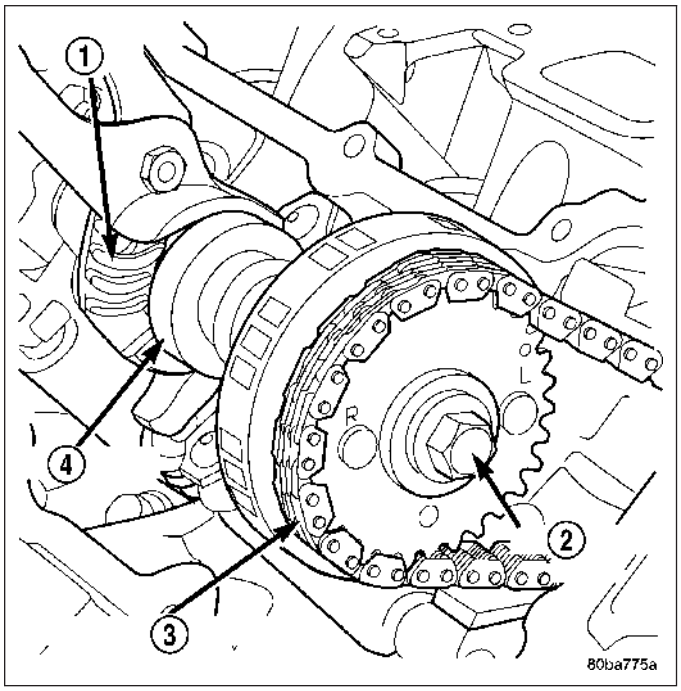
5. Position Special Tool 8350 timing chain wedge between the timing chain strands. Tap the tool to securely wedge the timing chain against the tensioner arm and guide.

6. Remove the camshaft position sensor.



NOTE: When gripping the camshaft, place the pliers on the tube portion of the camshaft only. Do not grip the lobes or the sprocket areas.

7. Hold the camshaft with adjustable pliers while removing the camshaft sprocket bolt and sprocket.
8. Using the pliers, gently allow the camshaft to rotate 45° counter-clockwise until the camshaft is in the neutral position (no valve load).



9. Starting at the outside working inward, loosen the camshaft bearing cap retaining bolts 1/2 turn at a time. Repeat until all load is off the bearing caps.

CAUTION: DO NOT STAMP OR STRIKE THE CAMSHAFT BEARING CAPS. SEVERE DAMAGE WILL OCCUR TO THE BEARING CAPS.

NOTE: When the camshaft is removed the rocker arms may slide downward, mark the rocker arms before removing camshaft.

10. Remove the camshaft bearing caps and the camshaft.

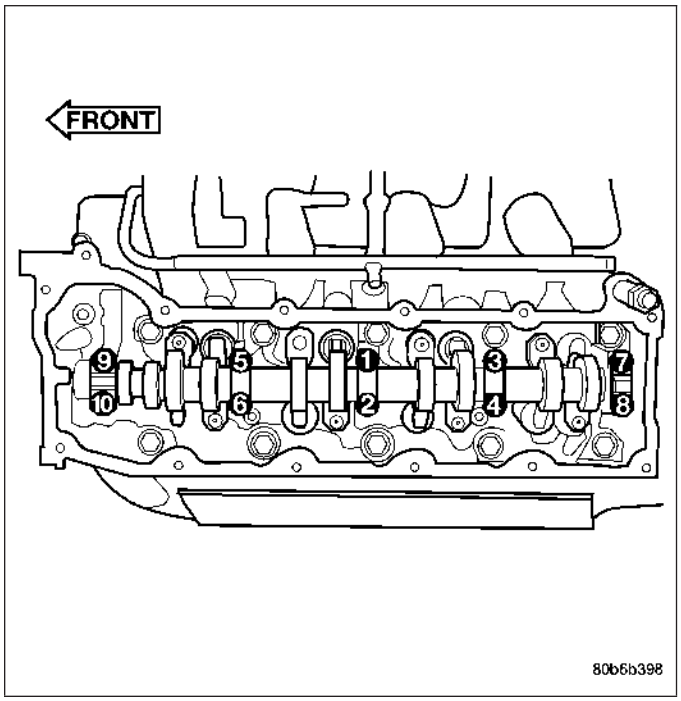
INSTALLATION

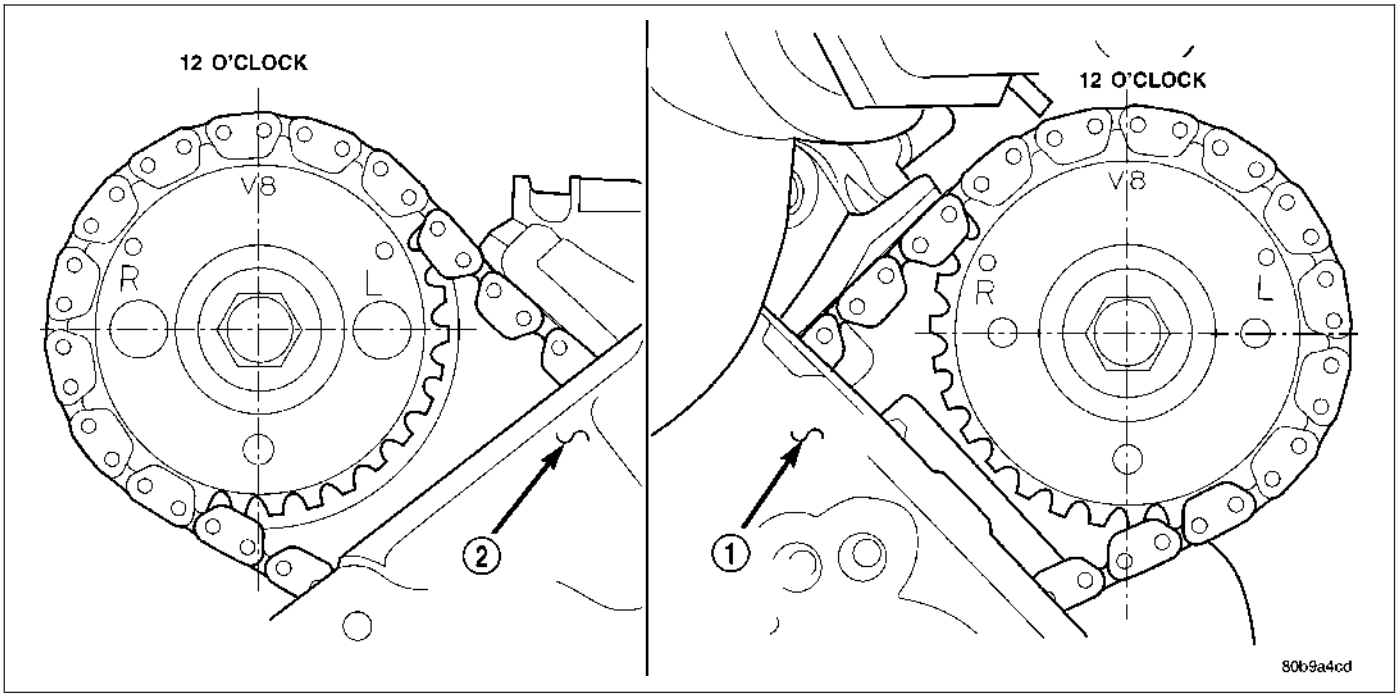
1. Lubricate camshaft journals with clean engine oil.

NOTE: Position the right side camshaft so that the camshaft sprocket dowel is near the 10 o'clock position, This will place the camshaft at the neutral position easing the installation of the camshaft bearing caps.

2. Position the camshaft into the cylinder head.

3. Install the camshaft bearing caps, hand tighten the retaining bolts.
4. Working in 1/2 turn increments, tighten the bearing cap retaining bolts starting with the middle cap working outward.
5. Torque the camshaft bearing cap retaining bolts to 11 N·m (100 in. lbs.).

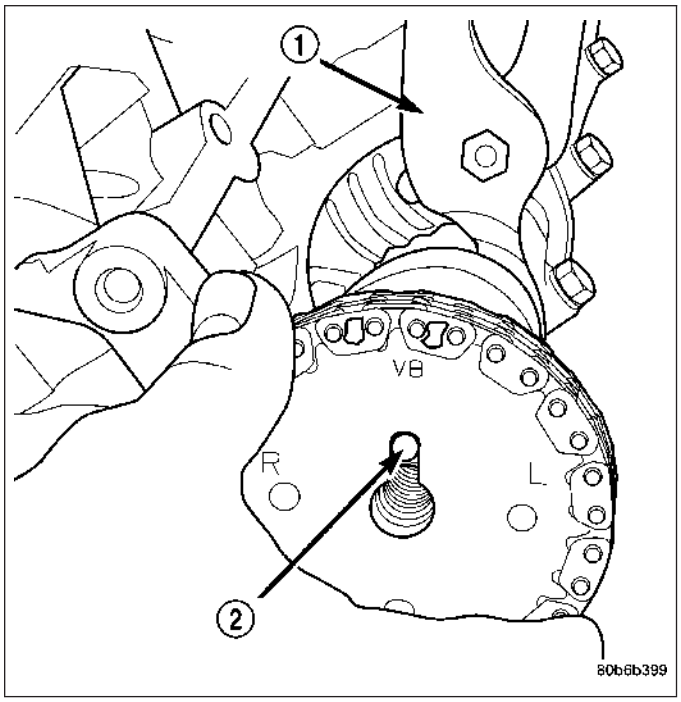




6. Position the camshaft drive gear into the timing chain aligning the V8 mark between the two marked chain links (Two links marked during removal).

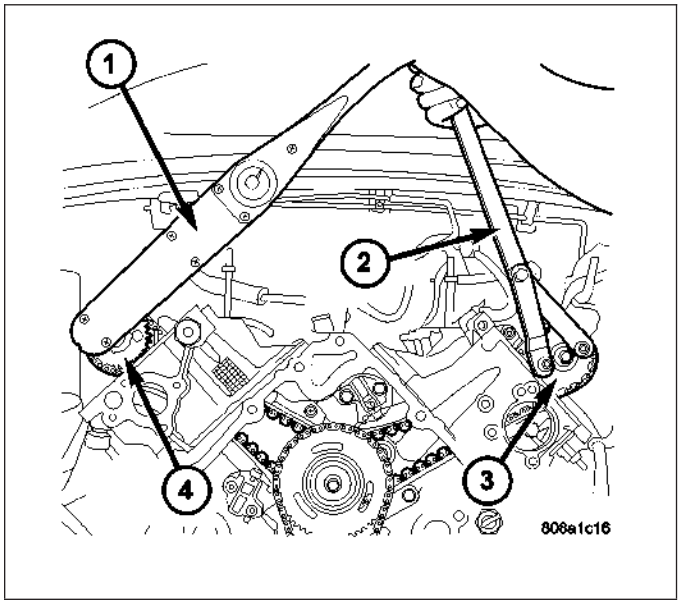
NOTE: When gripping the camshaft, place the pliers on the tube portion of the camshaft only. Do not grip the lobes or the sprocket areas.

7. Using the adjustable pliers, rotate the camshaft until the camshaft sprocket dowel is aligned with the slot in the camshaft sprocket. Install the sprocket onto the camshaft.



CAUTION: Remove excess oil from camshaft sprocket bolt. Failure to do so can cause bolt over-torque resulting in bolt failure.

8. Remove excess oil from camshaft sprocket bolt, then install the camshaft sprocket retaining bolt and hand tighten.
9. Remove timing chain wedge special tool 8350.
10. Using Special Tool 6958 spanner wrench with adapter pins 8346 , torque the camshaft sprocket retaining bolt to 122 N·m (90 ft. lbs.).



11. Install the camshaft position sensor.
12. Install the cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).

COVER - CYLINDER HEAD

DESCRIPTION

The cylinder head covers are made of injection molded thermo-set plastic, and are not interchangeable from side-to-side. It is imperative that nothing rest on the cylinder head covers. Prolonged contact with other items may wear a hole in the cylinder head cover.

REMOVAL

REMOVAL - RIGHT SIDE

1. Disconnect battery negative cable.
2. Remove air cleaner assembly, resonator assembly and air inlet hose.
3. Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
4. Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
5. Remove air conditioning compressor retaining bolts and move compressor to the left.
6. Remove heater hoses.
7. Disconnect injector and ignition coil connectors.
8. Disconnect and remove positive crankcase ventilation (PCV) hose.
9. Remove oil fill tube.
10. Un-clip injector and ignition coil harness and move away from cylinder head cover.
11. Remove right rear breather tube and filter assembly.
12. Remove cylinder head cover retaining bolts.
13. Remove cylinder head cover.

NOTE: The gasket may be used again, provided no cuts, tears, or deformation has occurred.

REMOVAL - LEFT SIDE

1. Disconnect negative cable from battery.
2. Remove the resonator assemble and air inlet hose.
3. Disconnect injector connectors and un-clip the injector harness.
4. Route injector harness in front of cylinder head cover.
5. Disconnect the left side breather tube and remove the breather tube.
6. Remove the cylinder head cover mounting bolts.
7. Remove cylinder head cover and gasket.

NOTE: The gasket may be used again, provided no cuts, tears, or deformation has occurred.

CLEANING

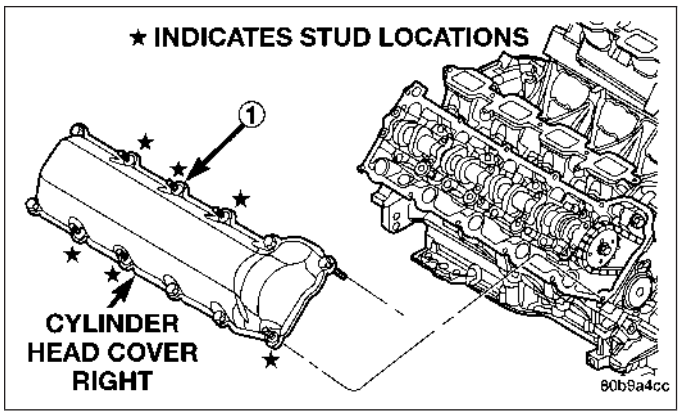
Clean cylinder head cover gasket surface.

Clean head rail, if necessary.

INSTALLATION

INSTALLATION - RIGHT SIDE

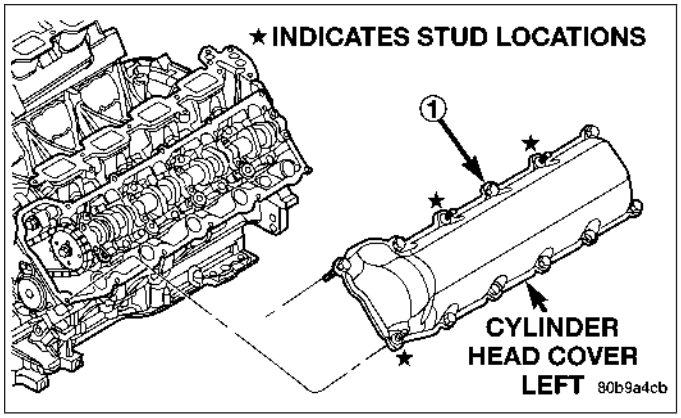
CAUTION: Do not use harsh cleaners to clean the cylinder head covers. Severe damage to covers may occur.



1. Clean cylinder head cover and both sealing surfaces. Inspect and replace gasket as necessary.
2. Install cylinder head cover and hand start all fasteners (1). Verify that all double ended studs are in the correct location shown in.
3. Tighten cylinder head cover bolts and double ended studs to 12 N·m (105 in. lbs).
4. Install right rear breather tube and filter assembly.
5. Connect injector, ignition coil electrical connectors and harness retaining clips.
6. Install the oil fill tube.
7. Install PCV hose.
8. Install heater hoses.
9. Install air conditioning compressor retaining bolts.
10. Install accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).
11. Fill Cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
12. Install air cleaner assembly, resonator assembly and air inlet hose.
13. Connect battery negative cable.

INSTALLATION - LEFT SIDE

CAUTION: Do not use harsh cleaners to clean the cylinder head covers. Severe damage to covers may occur.



1. Clean cylinder head cover and both sealing surfaces. Inspect and replace gasket as necessary.
2. Install cylinder head cover and hand start all fasteners. Verify that all studs are in the correct location shown in.
3. Tighten cylinder head cover bolts (1) and double ended studs to 12 N·m (105 in. lbs.).
4. Install left side breather and connect breather tube.
5. Connect injector electrical connectors and injector harness retaining clips.
6. Install the resonator and air inlet hose.
7. Connect negative cable to battery.

VALVES & SEATS - INTAKE/EXHAUST

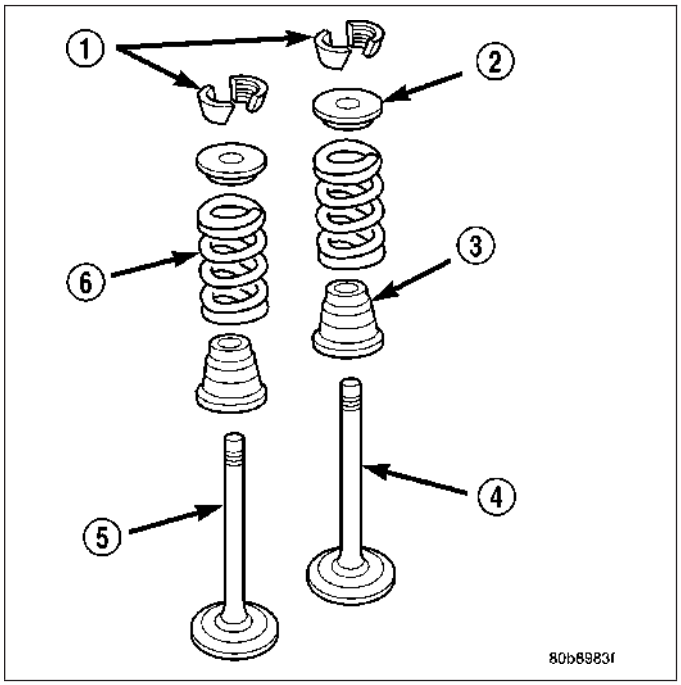
DESCRIPTION

The valves are made of heat resistant steel and have chrome plated stems to prevent scuffing. Each valve is actuated by a roller rocker arm which pivots on a stationary lash adjuster. All valves use three bead lock keepers to retain the springs and promote valve rotation.

STANDARD PROCEDURE - REFACING

NOTE: Valve seats that are worn or burned can be reworked, provided that correct angle and seat width are maintained. Otherwise the cylinder head must be replaced.

NOTE: When refacing valves (4) and valve seats, it is important that the correct size valve guide pilot be used for reseating stones. A true and complete surface must be obtained.



1. Using a suitable dial indicator measure the center of the valve seat Total run out must not exceed 0.051 mm (0.002 in).
2. Apply a small amount of Prussian blue to the valve seat, insert the valve into the cylinder head, while applying light pressure on the valve rotate the valve. Remove the valve and examine the valve face. If the blue is transferred below the top edge of the valve face, lower the valve seat using a 15 degree stone. If the blue is transferred to the bottom edge of the valve face, raise the valve seat using a 65 degree stone.
3. When the seat is properly positioned the width of the intake seat must be 1.75 - 2.36 mm (0.0689 - 0.0928 in.) and the exhaust seat must be 1.71 - 2.32 mm (0.0673 - 0.0911 in.).
4. Check the valve spring (6) installed height after refacing the valve and seat. The installed height for both intake and exhaust valve springs must not exceed 40.74 mm (1.6039 in.).
5. The valve seat and valve face must maintain a face angle of 44.5 - 45 ° angle .

ROCKER ARM-VALVE

DESCRIPTION

The rocker arms are steel stampings with an integral roller bearing. The rocker arms incorporate a 2.8 mm (0.11 inch) oil hole in the lash adjuster socket for roller and camshaft lubrication.

DIAGNOSIS AND TESTING - HYDRAULIC LASH ADJUSTER

A tappet-like noise may be produced from several items. Check the following items.

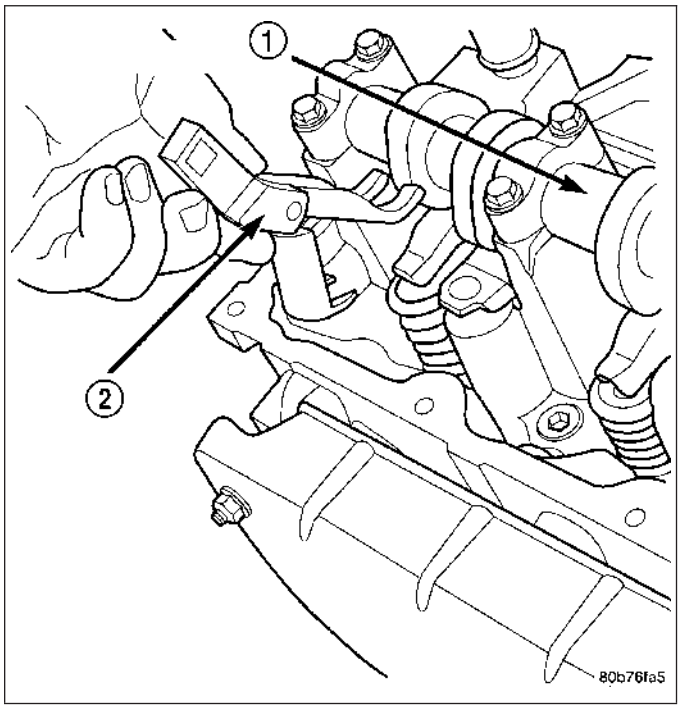
1. Engine oil level too high or too low. This may cause aerated oil to enter the adjusters and cause them to be spongy.
2. Insufficient running time after rebuilding cylinder head. Low speed running up to 1 hour may be required.
3. Turn engine off and let set for a few minutes before restarting. Repeat this several times after engine has reached normal operating temperature.
4. Low oil pressure.
5. The oil restrictor in cylinder head gasket or the oil passage to the cylinder head is plugged with debris.

6. Air ingested into oil due to broken or cracked oil pump pick up.
7. Worn valve guides.
8. Rocker arm ears contacting valve spring retainer.
9. Rocker arm loose, adjuster stuck or at maximum extension and still leaves lash in the system.
10. Oil leak or excessive cam bore wear in cylinder head.
11. Faulty lash adjuster.
    a. Check lash adjusters for sponginess while installed in cylinder head and cam on camshaft at base circle. Depress part of rocker arm over adjuster. Normal adjusters should feel very firm. Spongy adjusters can be bottomed out easily.
    b. Remove suspected lash adjusters, and replace.
    c. Before installation, make sure adjusters are at least partially full of oil. This can be verified by little or no plunger travel when lash adjuster is depressed.

REMOVAL

NOTE: Disconnect the battery negative cable to prevent accidental starter engagement.

1. Remove the cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).
2. For rocker arm removal on cylinders 3 and 5 Rotate the crankshaft until cylinder #1 is at TDC exhaust stroke.
3. For rocker arm removal on cylinders 2 and 8 Rotate the crankshaft until cylinder #1 is at TDC compression stroke.
4. For rocker arm removal on cylinders 4 and 6 Rotate the crankshaft until cylinder #3 is at TDC compression stroke.
5. For rocker arm removal on cylinders 1 and 7 Rotate the crankshaft until cylinder #2 is at TDC compression stroke.
6. Using special tool 8516 Rocker Arm Remover (2), press downward on the valve spring, remove rocker arm.



INSTALLATION

CAUTION: Make sure the rocker arms are installed with the concave pocket over the lash adjusters. Failure to do so may cause severe damage to the rocker arms and/or lash adjusters.

NOTE: Coat the rocker arms with clean engine oil prior to installation.

1. For rocker arm installation on cylinders 3 and 5 Rotate the crankshaft until cylinder #1 is at TDC exhaust stroke.
2. For rocker arm installation on cylinders 2 and 8 Rotate the crankshaft until cylinder #1 is at TDC compression stroke.
3. For rocker arm installation on cylinders 4 and 6 Rotate the crankshaft until cylinder #3 is at TDC compression stroke.
4. For rocker arm installation on cylinders 1 and 7 Rotate the crankshaft until cylinder #2 is at TDC compression stroke.
5. Using special tool 8516 press downward on the valve spring, install rocker arm.

6. Install the cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).

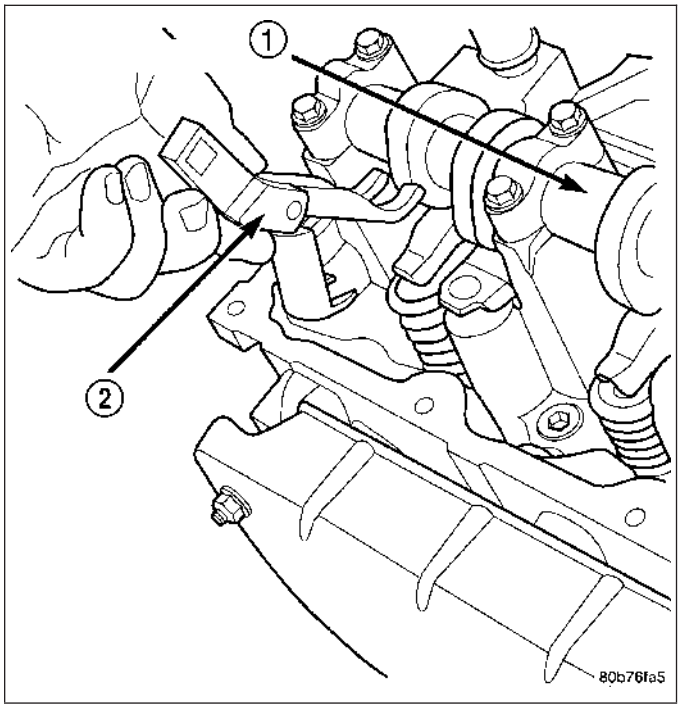
SPRINGS-VALVE

DESCRIPTION

The valve springs are made from high strength chrome silicon steel. The springs are common for intake and exhaust applications. The valve spring seat is integral with the valve stem seal, which is a positive type seal to control lubrication.

REMOVAL

1. Remove the cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).
2. Using Special Tool 8516 Rocker Arm Remover (2), remove the rocker arms and the hydraulic lash adjusters.
3. Remove the spark plug for the cylinder the valve spring and seal are to be removed from.
4. Apply shop air to the cylinder to hold the valves in place when the spring is removed



NOTE: All eight valve springs and seals are removed in the same manner; this procedure only covers one valve seal and valve spring.

5. Using Special Tool 8387 Valve Spring Compressor, compress the valve spring.

NOTE: It may be necessary to tap the top of the valve spring to loosen the spring retainers locks enough to be removed.

6. Remove the two spring retainer lock halves.

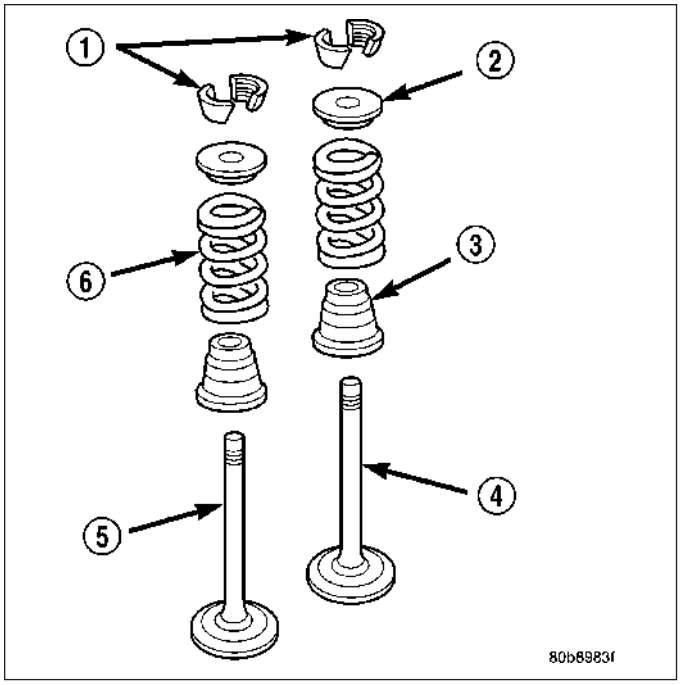
NOTE: the valve spring is under tension use care when releasing the valve spring compressor.

7. Remove the valve spring compressor.
8. Remove the spring retainer, and the spring.
9. Remove the valve stem seal.

NOTE: The valve stem seals are common between intake and exhaust.

INSTALLATION

1. Coat the valve stem with clean engine oil and install the valve stem seal. Make sure the seal is fully seated and that the garter spring at the top of the seal is intact.
2. Install the spring (6) and the spring retainer (2).
3. Using Special Tool 8387 Valve Spring Compressor, compress the spring and install the two valve spring retainer halves.
4. Release the valve spring compressor and make sure the two spring retainer halves and the spring retainer are fully seated.
5. Position the hydraulic lash adjusters and rocker arms.
6. Install the cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).



SEALS-VALVE GUIDE

DESCRIPTION

The valve stem seals are made of rubber and incorporate an integral steel valve spring seat. The integral garter spring maintains consistent lubrication control to the valve stems.

ENGINE BLOCK

DESCRIPTION

The cylinder block is made of cast iron. The block is a closed deck design with the left bank forward. To provide high rigidity and improved NVH an enhanced compacted graphite bedplate is bolted to the block. The block design allows coolant flow between the cylinders bores, and an internal coolant bypass to a single poppet inlet thermostat is included in the cast aluminum front cover.

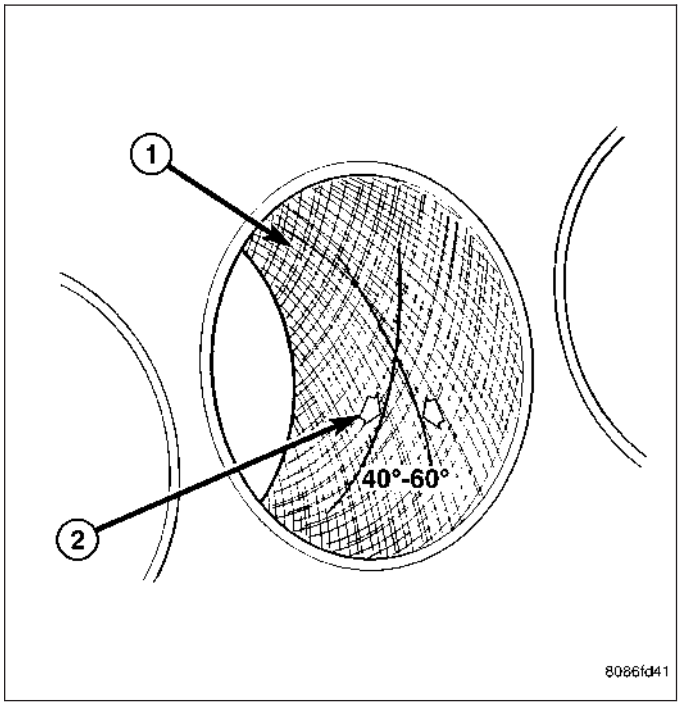
STANDARD PROCEDURE - CYLINDER BORE HONING

Before honing, stuff plenty of clean shop towels under the bores and over the crankshaft to keep abrasive materials from entering the crankshaft area.

1. Used carefully, the Cylinder Bore Sizing Hone C-823, equipped with 220 grit stones, is the best tool for this job. In addition to deglazing, it will reduce taper and out-of-round, as well as removing light scuffing, scoring and scratches. Usually, a few strokes will clean up a bore and maintain the required limits.

CAUTION: DO NOT use rigid type hones to remove cylinder wall glaze.

2. Deglazing of the cylinder walls may be done if the cylinder bore is straight and round. Use a cylinder surfacing hone, Honing Tool C-3501, equipped with 280 grit stones (C-3501-3810). about 20-60 strokes, depending on the bore condition, will be sufficient to provide a satisfactory surface. Using honing oil C-3501-3880, or a light honing oil, available from major oil distributors.



CAUTION: DO NOT use engine or transmission oil, mineral spirits, or kerosene.

3. Honing should be done by moving the hone up and down fast enough to get a crosshatch pattern (1). The hone marks should INTERSECT at 50° to 60° for proper seating of rings (2).
4. A controlled hone motor speed between 200 and 300 RPM is necessary to obtain the proper crosshatch angle. The number of up and down strokes per minute can be regulated to get the desired 50° to 60° angle. Faster up and down strokes increase the crosshatch angle.
5. After honing, it is necessary that the block be cleaned to remove all traces of abrasive. Use a brush to wash parts with a solution of hot water and detergent. Dry parts thoroughly. Use a clean, white, lint-free cloth to check that the bore is clean. Oil the bores after cleaning to prevent rusting.

CLEANING

Thoroughly clean the oil pan and engine block gasket surfaces.

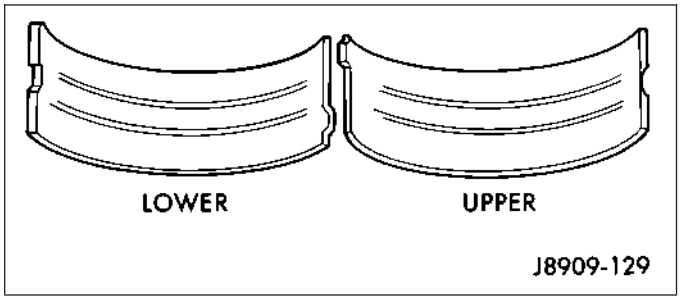
Use compressed air to clean out:

- The galley at the oil filter adaptor hole.
- The front and rear oil galley holes.
- The feed holes for the crankshaft main bearings.

Once the block has been completely cleaned, apply Loctite PST pipe sealant with Teflon 592 to the threads of the front and rear oil galley plugs. Tighten the plugs to 34 N·m (25 ft. lbs.) torque.

BEARINGS-CONNECTING ROD

STANDARD PROCEDURE - CONNECTING ROD BEARING FITTING



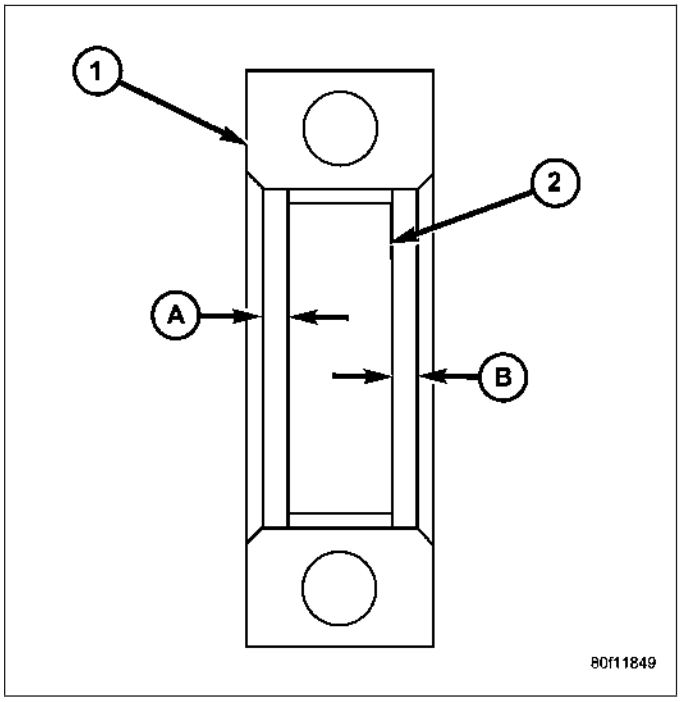
Inspect the connecting rod bearings for scoring. Check the bearings for normal wear patterns, scoring, grooving, fatigue and pitting. Replace any bearing that shows abnormal wear.

Inspect the connecting rod journals for signs of scoring, nicks and burrs.

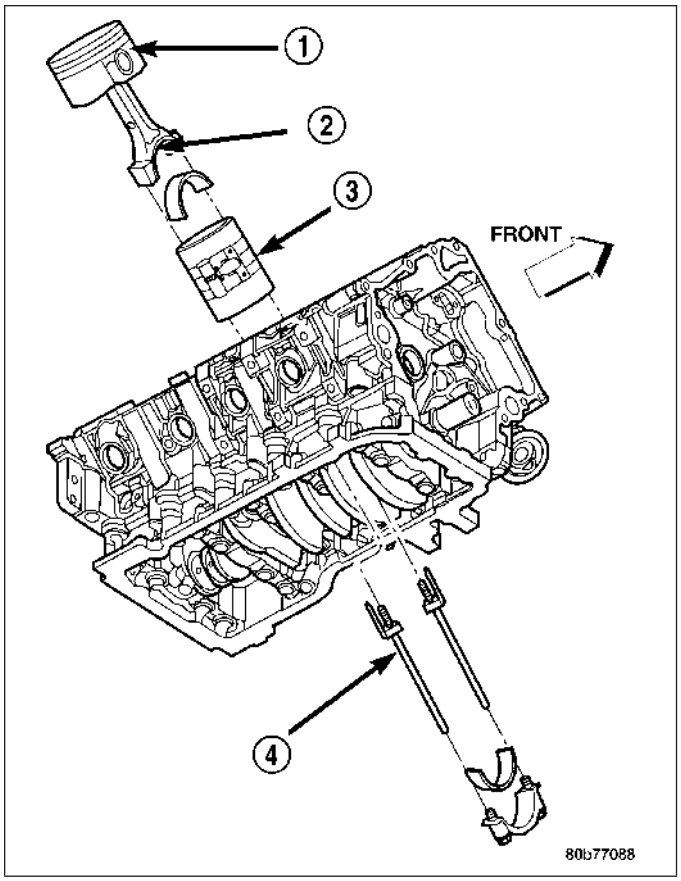
Misaligned or bent connecting rods can cause abnormal wear on pistons, piston rings, cylinder walls, connecting rod bearings and crankshaft connecting rod journals. If wear patterns or damage to any of these components indicate the probability of a misaligned connecting rod, inspect it for correct rod alignment. Replace misaligned, bent or twisted connecting rods.

1. Wipe the oil from the connecting rod journal.

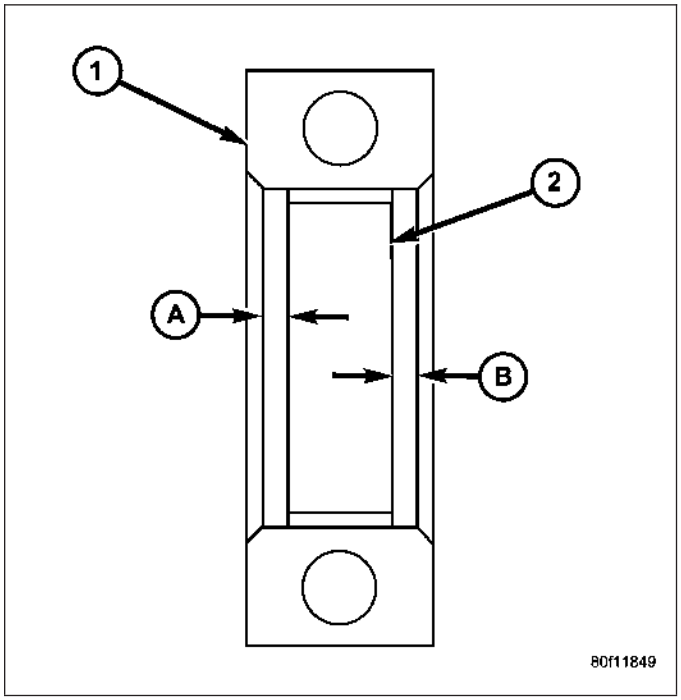
2. Lubricate the upper bearing insert (2) and install in connecting rod (1). **Center bearing insert (2) in connecting rod.**



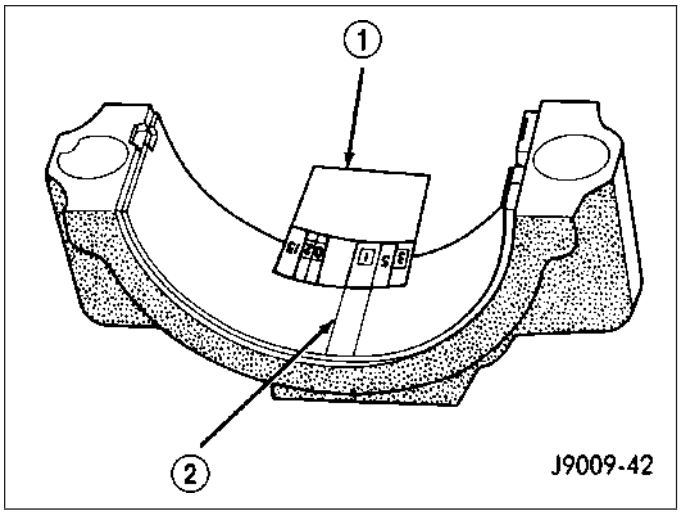
3. Use piston ring compressor (3) and Guide Pins Special Tool 8507 (4) to install the rod and piston assemblies. The oil slinger slots in the rods must face front of the engine. The “F”’s near the piston wrist pin bore should point to the front of the engine.



4. Install the lower bearing insert in the bearing cap **Center bearing insert (2) in connecting rod (1).**. The lower insert must be dry. Place strip of Plastigage across full width of the lower insert at the center of bearing cap. Plastigage must not crumble in use. If brittle, obtain fresh stock.



5. Install bearing cap and connecting rod on the journal and tighten bolts to 27 N·m (20 ft. lbs.) plus a 90° turn. DO NOT rotate crankshaft. Plastigage will smear, resulting in inaccurate indication.
6. Remove the bearing cap and determine amount of bearing-to-journal clearance by measuring the width of compressed Plastigage (2). Refer to Engine Specifications for the proper clearance. **Plastigage should indicate the same clearance across the entire width of the insert. If the clearance varies, it may be caused by either a tapered journal, bent connecting rod or foreign material trapped between the insert and cap or rod.**
7. If the correct clearance is indicated, replacement of the bearing inserts is not necessary. Remove the Plastigage (2) from crankshaft journal and bearing insert. Proceed with installation.



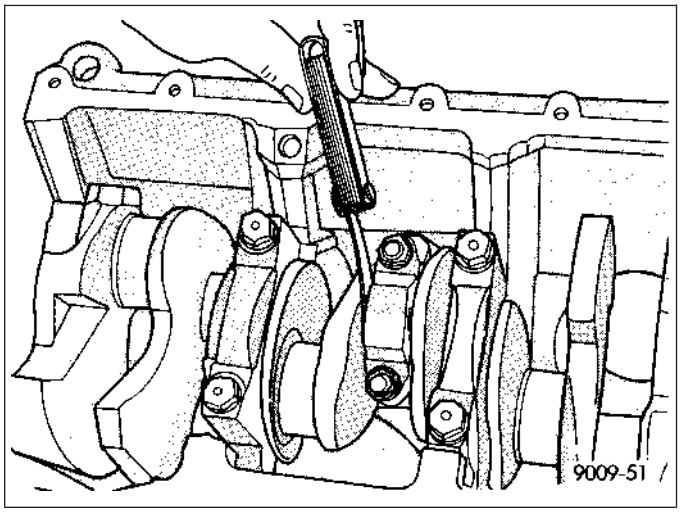
Bearing Mark	SIZE	USED WITH JOURNAL SIZE
.025 US	.025 mm (.001 in.)	50.983-50.967 mm (2.0073-2.0066 in.)
Std.	STANDARD	50.992-51.008 mm (2.0076-2.0082 in.)
.250 US	.250 mm (.010 in.)	50.758-50.742 mm (1.9984-1.9978 in.)

8. If bearing-to-journal clearance exceeds the specification, determine which service bearing set to use, using the following bearing sizes:

CAUTION: Connecting Rod Bolts are Torque to Yield Bolts and Must Not Be Reused. Always replace the Rod Bolts whenever they are loosened or removed.

9. Repeat the Plastigage measurement to verify your bearing selection prior to final assembly.
10. Once you have selected the proper insert, install the insert and cap. Tighten the connecting rod bolts to 27 N·m (20 ft. lbs.) plus a 90° turn.

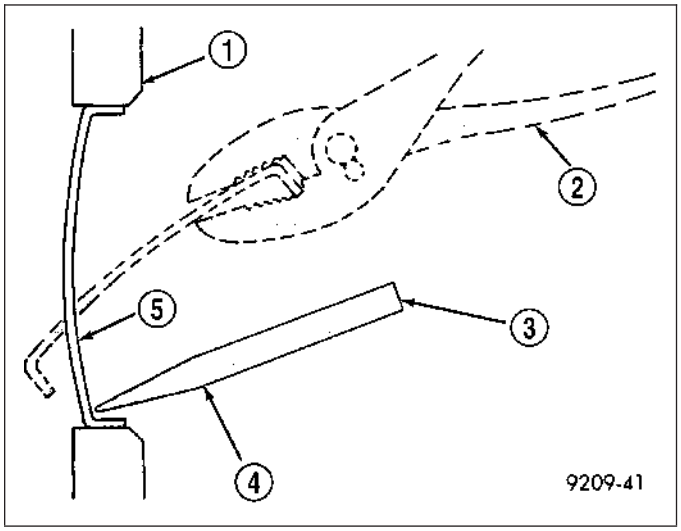
Slide snug-fitting feeler gauge between the connecting rod and crankshaft journal flange. Refer to Engine Specifications for the proper clearance. Replace the connecting rod if the side clearance is not within specification.



PLUGS - CORE

REMOVAL

1. Drain the cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
2. Using a blunt tool such as a drift or a screw driver and a hammer, strike the bottom edge of the cup plug (5).
3. Using a suitable pair of pliers, grasp the core plug (2) and remove.



INSTALLATION

NOTE: Thoroughly clean core plug bore, remove all of the old sealer.

1. Coat the edges of the engine core plug and the core plug bore with Mopar Gasket Maker, or equivalent.

NOTE: It is not necessary to wait for the sealant to cure on the core plugs. The cooling system can be filled and the vehicle returned to service immediately.

2. Using proper plug driver, drive core plug into the core plug bore. The sharp edge of the core plug should be at least 0.50 mm (0.020 in.) inside the lead in chamfer.
3. Refill the cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).

CRANKSHAFT

DESCRIPTION

The crankshaft is constructed of nodular cast iron. The crankshaft is a crosshaped four throw design with eight counterweights for balancing purposes. The crankshaft is supported by five select fit main bearings with the number three serving as the thrust washer location. The main journals of the crankshaft are cross drilled to improve rod bearing lubrication. The number eight counterweight has provisions for crankshaft position sensor target wheel mounting. The select fit main bearing markings are located on the rear side of the target wheel. The crankshaft oil seals are one piece design. The front oil seal is retained in the timing chain cover, and the rear seal is pressed in to a bore formed by the cylinder block and the bedplate assembly.

REMOVAL

NOTE: To remove the crankshaft from the engine, the engine must be removed from the vehicle.

1. Remove the engine. (Refer to 9 - ENGINE - REMOVAL).
2. Remove the engine oil pump. (Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - REMOVAL).

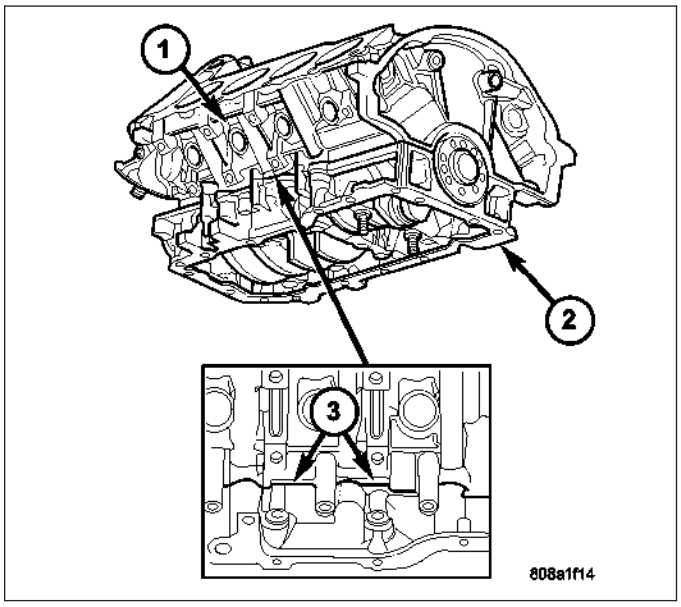
CAUTION: DO NOT pry on the oil pan gasket when removing the oil pan, The oil pan gasket is mounted to the cylinder block in three locations and will remain attached to block when removing oil pan. Gasket can not be removed with oil pan.

3. Remove oil pan. (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).
4. Remove the oil pump pickup tube and oil pan gasket /windage tray.
5. Remove the bedplate mounting bolts. Note the location of the three stud bolts for installation.
6. Remove the connecting rods from the crankshaft.

CAUTION: The bedplate to cylinder block mating surface is a critical sealing surface. Do not pry on or damage this surface in anyway.

NOTE: The bedplate contains the lower main bearing halves. Use care when handling bedplate as not to drop or damage bearing halves. Installing main bearing halves in the wrong position will cause sever damage to the crankshaft.

NOTE: The bedplate has pry points cast into it. Use these points only. The pry points are on both the left and right sides, only the left side is shown.



7. Carefully pry on the pry points to loosen the bedplate then remove the bedplate.

CAUTION: When removing the crankshaft, use care not to damage bearing surfaces on the crankshaft.

8. Remove the crankshaft.
9. Remove the crankshaft target wheel.

INSPECTION

NOTE: Thoroughly inspect the connecting rod bearing bores and main bearing bores for scoring, blueing or severe scratches. Further disassembly may be required.

If connecting rod bearing bores show damage, the cylinder heads must be removed to service the piston and rod assemblies. If the bedplate or the cylinder block main bearing bores show damage the engine must be replaced.

1. If required, remove the main bearing halves from the cylinder block and bedplate.
2. Thoroughly clean the bedplate to cylinder block sealing surfaces and main bearing bores. Remove all oil and sealant residue.
3. Inspect the bedplate main bearing bores for cracks, scoring or severe blueing. If either condition exists the engine must be replaced.
4. Inspect the crankshaft thrust washers for scoring, scratches, wear or blueing. If either condition exist replace the thrust washer.
5. Inspect the oil pan gasket/windage tray for splits, tears or cracks in the gasket sealing surfaces. Replace gasket as necessary.

INSTALLATION

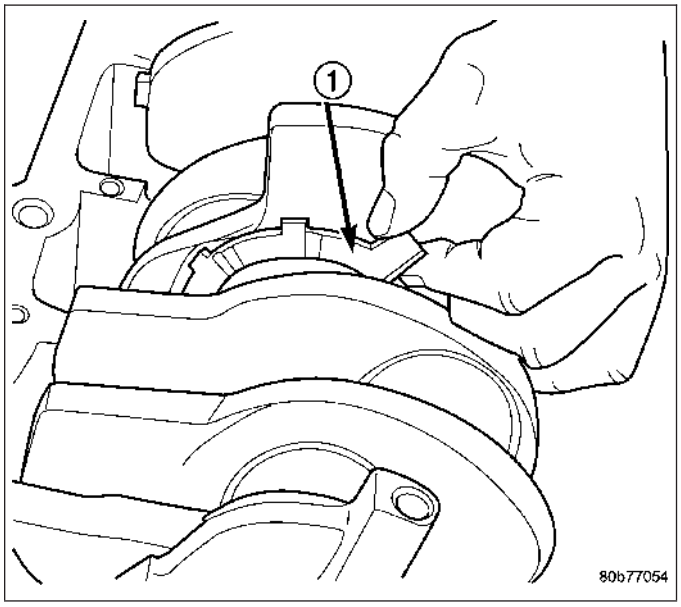
CAUTION: Main bearings are select fit. (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT MAIN BEARINGS - STANDARD PROCEDURE) for proper bearing selections.

1. Lubricate upper main bearing halves with clean engine oil.

CAUTION: When installing crankshaft, use care not to damage bearing surfaces on the crankshaft.

NOTE: Apply sealant to the target wheel retaining screws prior to installation.

2. Install the crankshaft target wheel. Torque the mounting screws to 15 N·m (12 ft. lbs.).
3. Position crankshaft in cylinder block.
4. Install the thrust washers (1).

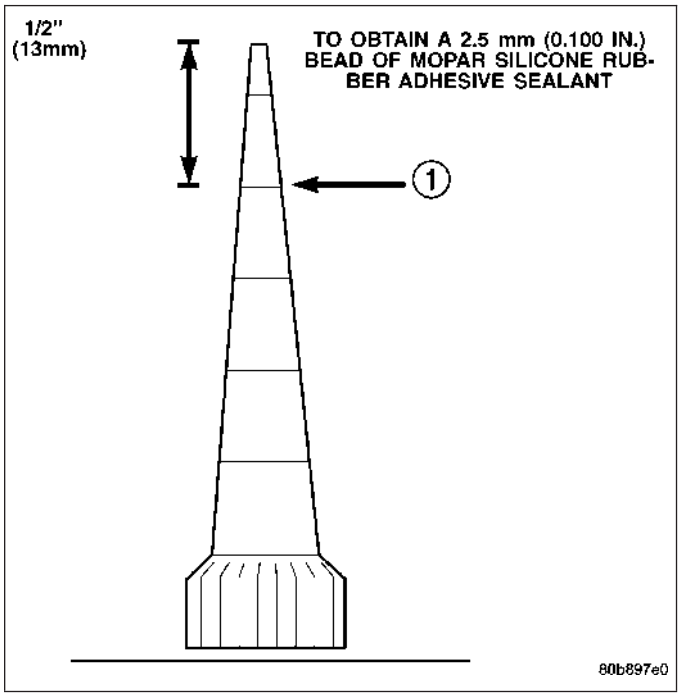


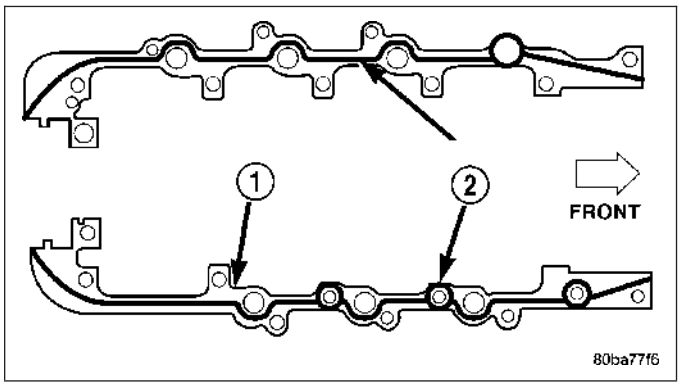
CAUTION: The bedplate to cylinder block mateing surface must be coated with sealant prior to installation. Failure to do so will cause severe oil leaks.

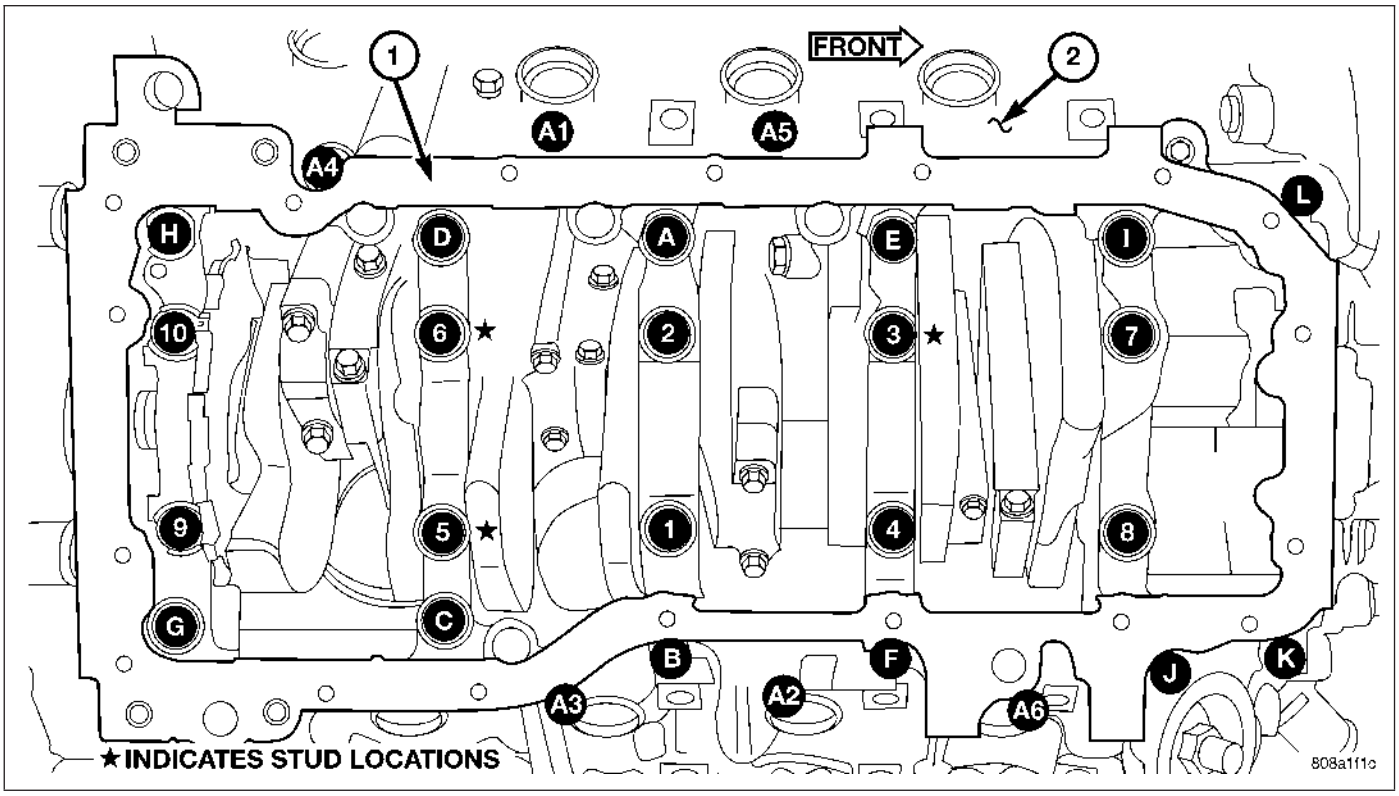
NOTE: The installation time to install the bedplate after the sealant has been applied is critical.

NOTE: Make sure that the bedplate and cylinder block sealing surfaces are clean and free of oil or other contaminants. Contaminants on the sealing surfaces may cause main bearing distortion and/or oil leaks.

5. Apply a 2.5mm (0.100 inch) bead of Mopar® Gen II Silicone Rubber Adhesive sealant (2) to the cylinder block-to-bedplate mating surface (1) as shown.
6. Coat the crankshaft main bearing journals with clean engine oil and position the bedplate onto the cylinder block.

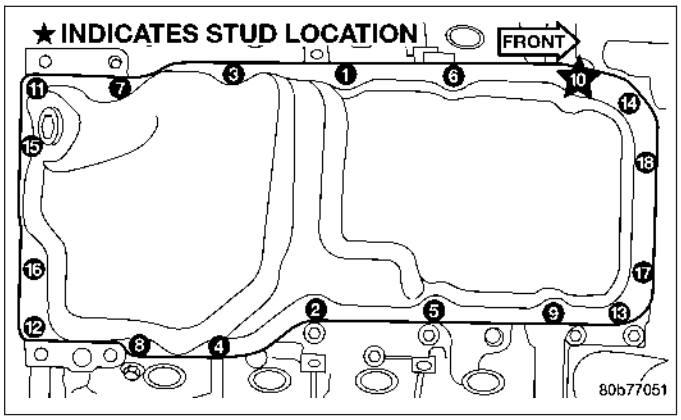






NOTE: Lubricate the bedplate retaining bolts with clean engine oil prior to installation.

7. Install the bedplate retaining bolts, making sure to place the stud bolts in the correct location, Torque the bolts in the sequence shown.
   - Tighten bolts **A – L** to 54 N·m (40 ft. lbs.)
   - Tighten bolts **1–10** to 2.8 N·m (25 in. lbs.)
   - Turn bolts **1–10** an additional 90°.
   - Tighten bolts **A1– A6** to 27 N·m (20 ft. lbs.)
8. Measure crankshaft end play. (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT - STANDARD PROCEDURE).
9. Install the connecting rods and measure side clearance. (Refer to 9 - ENGINE/ENGINE BLOCK/CONNECTING ROD BEARINGS - STANDARD PROCEDURE).
10. Position the oil pan gasket/windage tray, using a new o-ring, install the oil pickup tube. Torque the bolt to 28N·n (20 ft. lbs.) torque the nuts to 28N·m (20 ft. lbs.).
11. Install the oil pan. Torque the retaining bolts to 15 N·m (11 ft. lbs.) in the sequence shown.
12. Install the engine (Refer to 9 - ENGINE - INSTALLATION).



BEARINGS - CRANKSHAFT MAIN

STANDARD PROCEDURE - CRANKSHAFT MAIN BEARING - FITTING

MAIN BEARING JOURNAL DIAMETER (CRANKSHAFT REMOVED)

Crankshaft removed from the cylinder block.

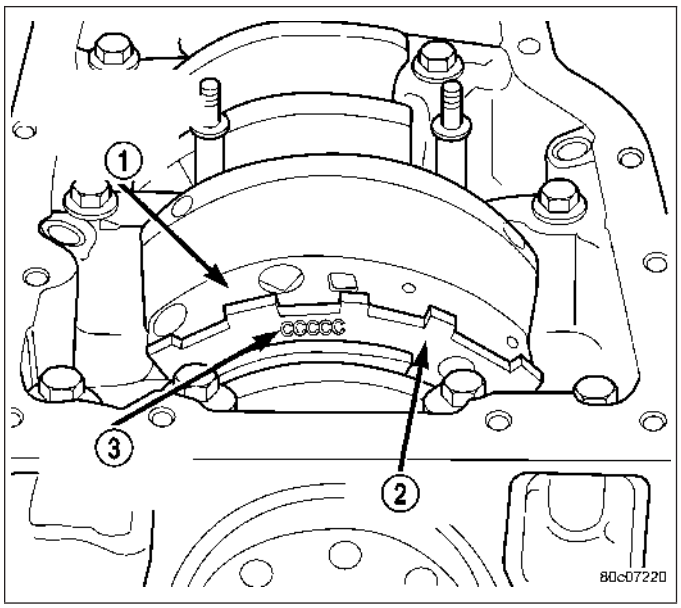
Clean the oil off the main bearing journal.

Determine the maximum diameter of the journal with a micrometer. Measure at two locations 90° apart at each end of the journal.

The maximum allowable taper is 0.008mm (0.0004 inch.) and maximum out of round is 0.005mm (0.002 inch). Compare the measured diameter with the journal diameter specification (Main Bearing Fitting Chart). Select inserts required to obtain the specified bearing-to-journal clearance.

CRANKSHAFT MAIN BEARING SELECTION

The main bearings are “select fit” to achieve proper oil clearances. For main bearing selection, the crankshaft position sensor target wheel has grade identification marks stamped into it (2). These marks are read from left to right, corresponding with journal number 1, 2, 3, 4 and 5. The crankshaft position sensor target wheel (2) is mounted to the number 8 counter weight (1) on the crankshaft.



NOTE: Service main bearings are coded. These codes identify what size (grade) the bearing is.

MAIN BEARING SELECTION CHART - 4.7L

GRADE MARKING	SIZE mm (in.)	FOR USE WITH JOURNAL SIZE
A	0.008 mm U/S (0.0004 in.) U/S	63.488–63.496 mm (2.4996–2.4999 in.)
B	NOMINAL	63.496–63.504 mm (2.4999–2.5002 in.)
C	0.008 mm O/S (0.0004 in.) O/S	63.504–63.512 mm (2.5002–2.5005 in.)

INSPECTION

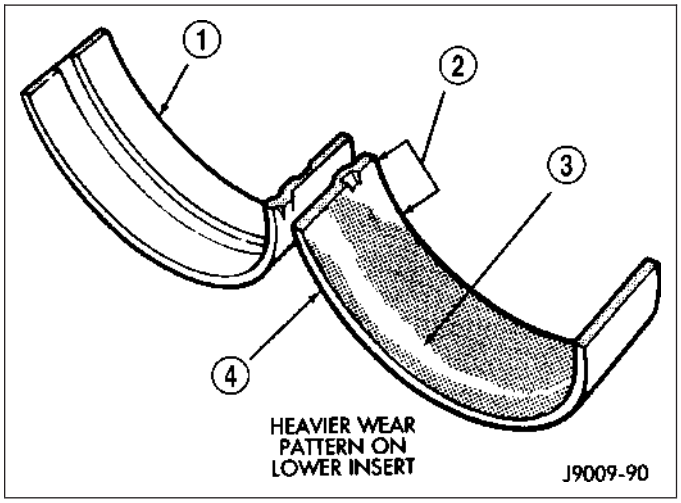
Wipe the inserts clean and inspect for abnormal wear patterns and for metal or other foreign material imbedded in the lining. Normal main bearing insert wear patterns are illustrated.

NOTE: If any of the crankshaft journals are scored, the crankshaft must be repaired or replaced.

Inspect the back of the inserts for fractures, scrapings or irregular wear patterns.

Inspect the upper insert locking tabs for damage.

Replace all damaged or worn bearing inserts.



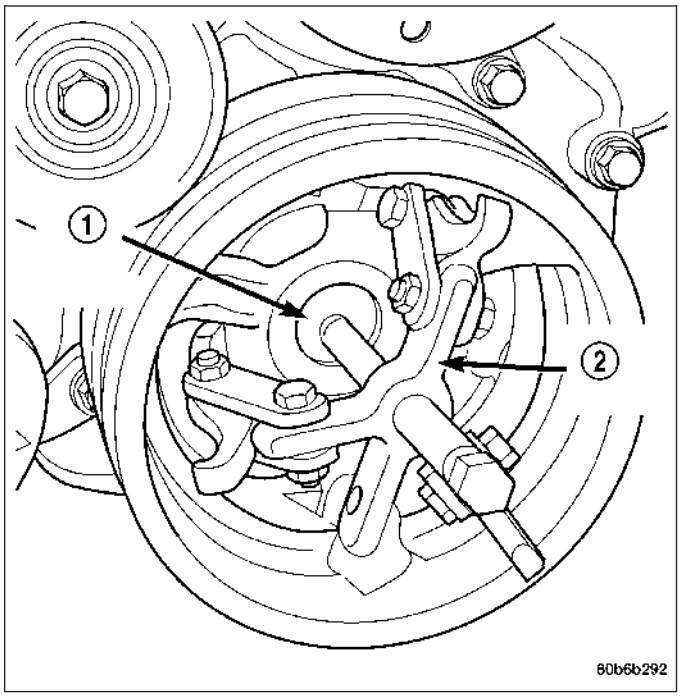
SEAL - CRANKSHAFT OIL - FRONT

REMOVAL

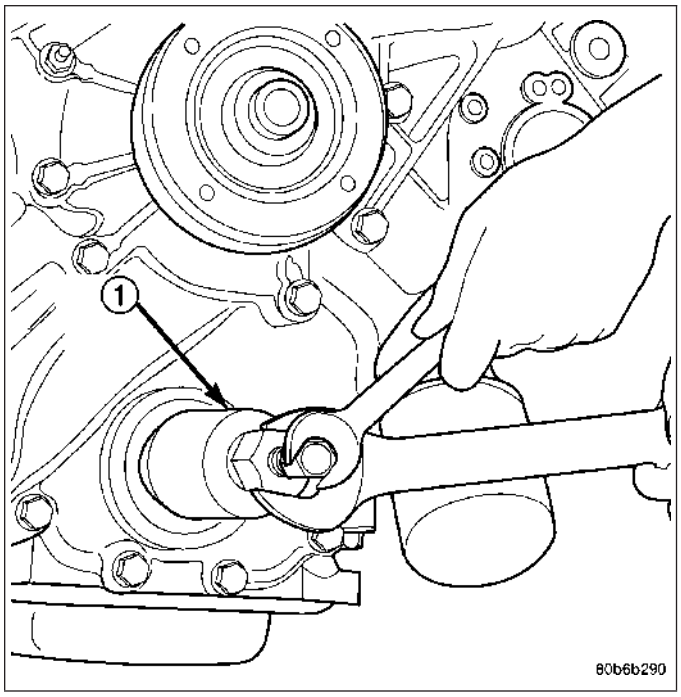
1. Disconnect negative cable from battery.
2. Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
3. Remove A/C compressor mouning fasteners and set aside.
4. Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
5. Remove upper radiator hose.
6. Disconnect electrical connector for fan mounted inside radiator shroud.
7. Remove radiator shroud attaching fasteners.

NOTE: Transmission cooler line snaps into shroud lower right hand corner.

8. Remove radiator cooling fan and shroud (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - REMOVAL).
9. Remove crankshaft damper bolt.
10. Remove damper using Special Tools 8513 Insert and 1026 Three Jaw Puller (2).



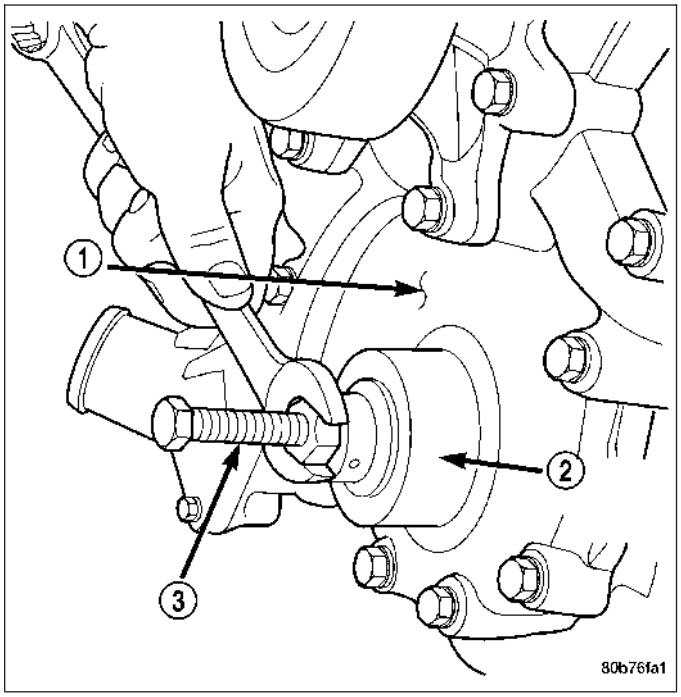
11. Using Special Tool 8511 (1), remove crankshaft front seal.



INSTALLATION

CAUTION: To prevent severe damage to the Crankshaft, Damper or Special Tool 8512, thoroughly clean the damper bore and the crankshaft nose before installing Damper.

1. Using Special Tool 8348 and 8512 (2,3), install crankshaft front seal.
2. Install vibration damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION).
3. Install radiator cooling fan and shroud (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - INSTALLATION).
4. Install upper radiator hose.
5. Install A/C compressor and tighten fasteners to 54 N·m (40 ft. lbs.).
6. Install accessory drive belt refer (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).
7. Refill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
8. Connect negative cable to battery.



SEAL - CRANKSHAFT OIL - REAR

DIAGNOSIS AND TESTING - REAR SEAL AREA LEAKS

Since it is sometimes difficult to determine the source of an oil leak in the rear seal area of the engine, a more involved inspection is necessary. The following steps should be followed to help pinpoint the source of the leak.

If the leakage occurs at the crankshaft rear oil seal area:

1. Disconnect the battery.
2. Raise the vehicle.
3. Remove torque converter or clutch housing cover and inspect rear of block for evidence of oil. Use a black light to check for the oil leak:
   a. Circular spray pattern generally indicates seal leakage or crankshaft damage.
   b. Where leakage tends to run straight down, possible causes are a porous block, distributor seal, camshaft bore cup plugs, oil galley pipe plugs, oil filter runoff, and main bearing cap to cylinder block mating surfaces. See Engine, for proper repair procedures of these items.
4. If no leaks are detected, pressurized the crankcase as outlined in the section, Inspection (Engine oil Leaks in general)

CAUTION: Do not exceed 20.6 kPa (3 psi).

5. If the leak is not detected, very slowly turn the crankshaft and watch for leakage. If a leak is detected between the crankshaft and seal while slowly turning the crankshaft, it is possible the crankshaft seal surface is damaged. The seal area on the crankshaft could have minor nicks or scratches that can be polished out with emery cloth.

CAUTION: Use extreme caution when crankshaft polishing is necessary to remove minor nicks or scratches. The crankshaft seal flange is specially machined to complement the function of the rear oil seal.

6. For bubbles that remain steady with shaft rotation, no further inspection can be done until disassembled. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING), under the Oil Leak row, for components inspections on possible causes and corrections.
7. After the oil leak root cause and appropriate corrective action have been identified, (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT OIL SEAL - REAR - REMOVAL).

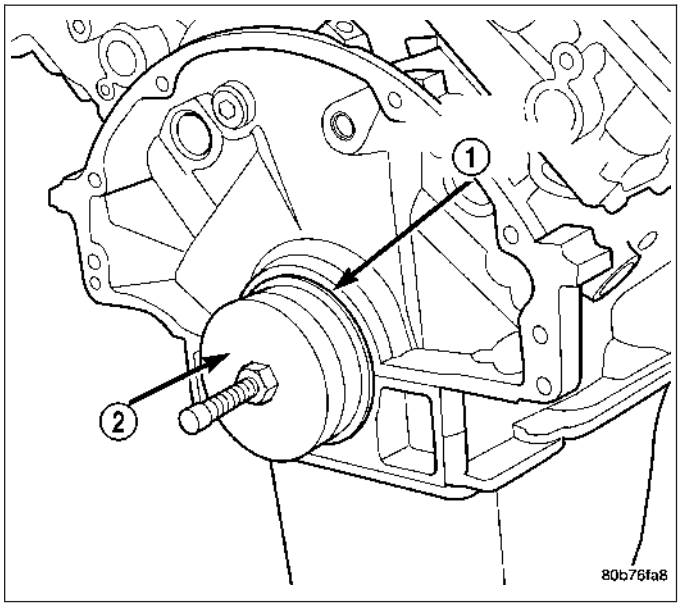
REMOVAL

NOTE: This procedure can be performed in vehicle.

1. If being performed in vehicle, remove the transmission.
2. Remove the flexplate (Refer to 9 - ENGINE/ENGINE BLOCK/FLEX PLATE - REMOVAL).

NOTE: The crankshaft oil seal CAN NOT be reused after removal.

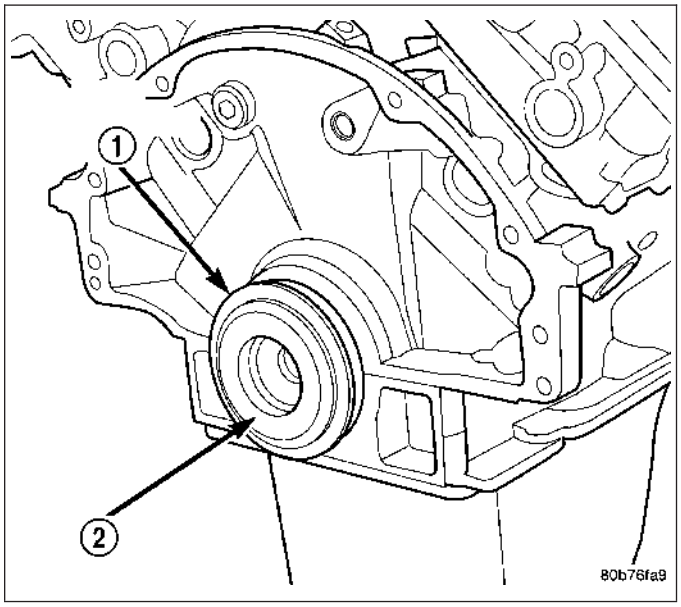
NOTE: The crankshaft rear oil seal remover Special Tool 8506 must be installed deeply into the seal. Continue to tighten the removal tool into the seal until the tool can not be turned farther. Failure to install tool correctly the first time will cause tool to pull free of seal without removing seal from engine.



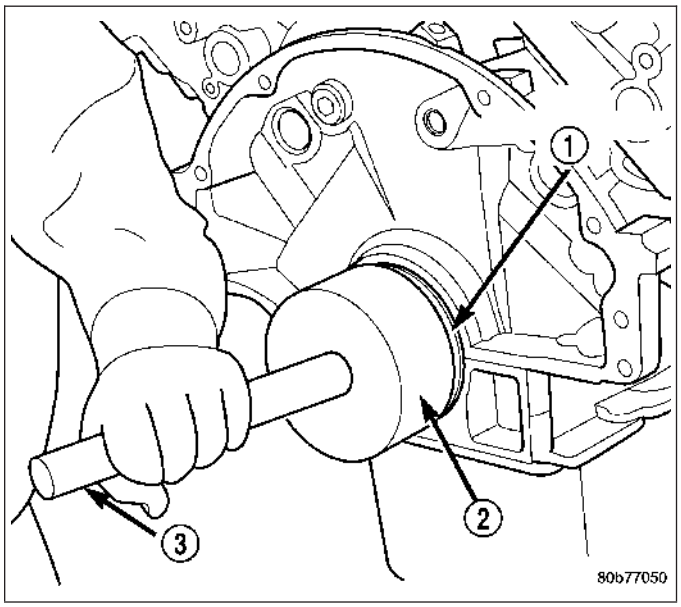
3. Using Special Tool 8506 (2), remove the crankshaft rear oil seal (1)

INSTALLATION

1. Lubricate the crankshaft flange with engine oil.
2. Position the magnetic seal guide Special Tool 8349-2 onto the crankshaft rear face. Then position the crankshaft rear oil seal (1) onto the guide (2).



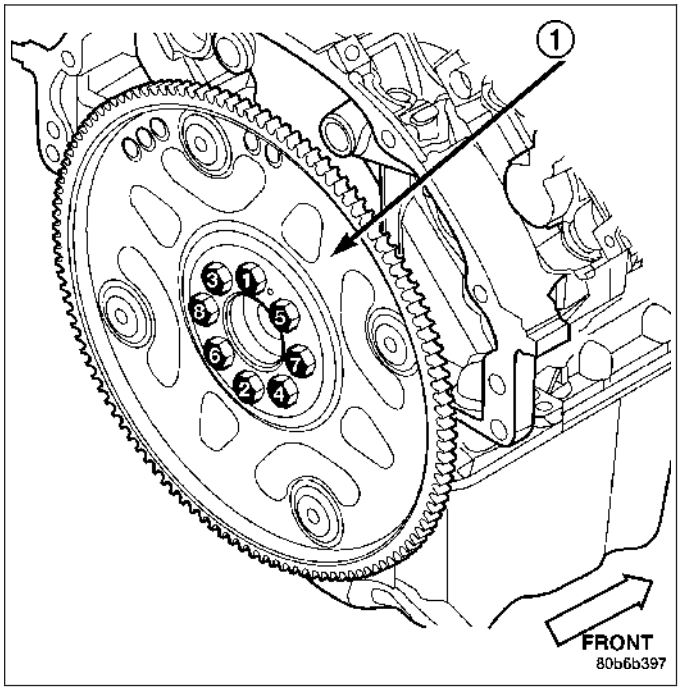
3. Using Special Tools 8349 Crankshaft Rear Oil Seal Installer (2) and C-4171 Driver Handle (3), with a hammer, tap the seal (1) into place. Continue to tap on the driver handle until the seal installer seats against the cylinder block crankshaft bore.
4. Install the flexplate.
5. Install the transmission.



FLEX PLATE

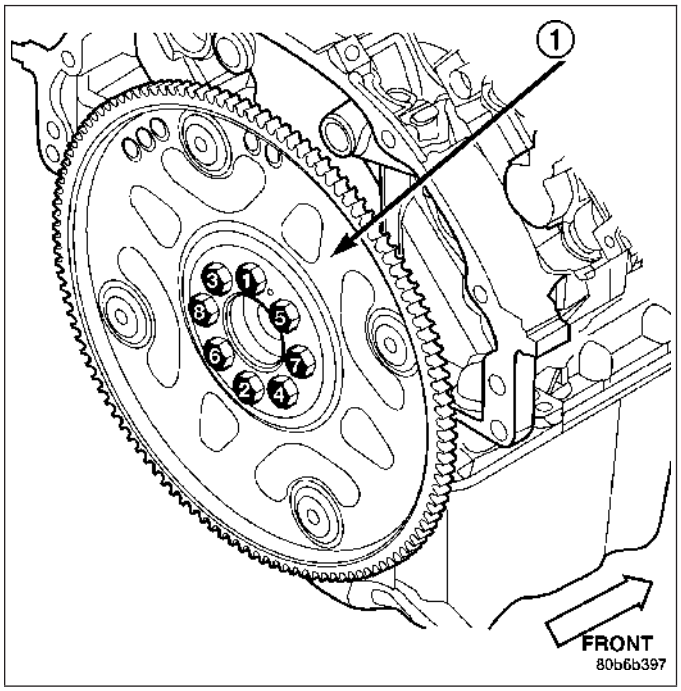
REMOVAL

1. Remove the transmission. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - REMOVAL).
2. Remove the bolts and flexplate (1).



INSTALLATION

1. Position the flexplate onto the crankshaft and install the bolts hand tight.
2. Tighten the flexplate retaining bolts to 60 N·m (45 ft. lbs.) in the sequence shown.
3. Install the transmission. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - INSTALLATION).



ROD - PISTON & CONNECTING

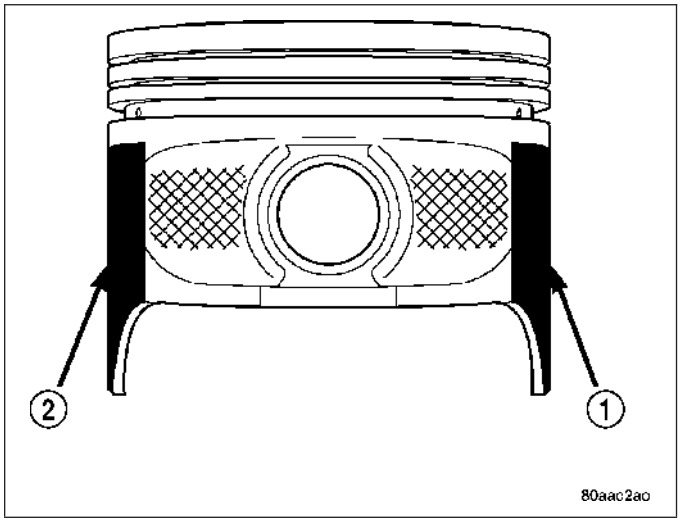
DESCRIPTION

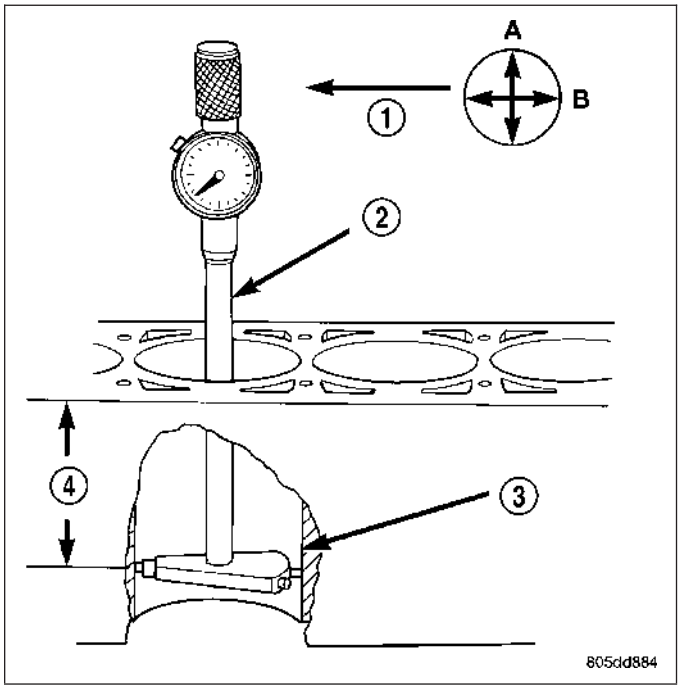
CAUTION: Do not use a metal stamp to mark connecting rods as damage may result, instead use ink or a scratch awl.

The pistons are made of a high strength aluminum alloy. The anodized top ring groove and crown has been replaced with a coated top ring that is blue in color on the bottom surface. Piston skirts are coated with a solid lubricant (Molykote) to reduce friction and provide scuff resistance. The connecting rods are made of forged powdered metal, with a “fractured cap” design. A pressed fit piston pin is used to attach the piston and connecting rod.

STANDARD PROCEDURE - PISTON FITTING

1. To correctly select the proper size piston, a cylinder bore gauge, capable of reading in 0.003 mm (.0001 in.) INCREMENTS is required. If a bore gauge is not available, do not use an inside micrometer.
2. Measure the inside diameter of the cylinder bore at a point 38.0 mm (1.5 inches) below top of bore. Start perpendicular (across or at 90 degrees) to the axis of the crankshaft at point A and then take an additional bore reading 90 degrees to that at point B.
3. The coated pistons will be serviced with the piston pin and connecting rod pre-assembled.
4. The coating material is applied to the piston after the final piston machining process. Measuring the outside diameter of a coated piston will not provide accurate results. Therefore measuring the inside diameter of the cylinder bore with a dial Bore Gauge is **MANDATORY**. To correctly select the proper size piston, a cylinder bore gauge capable of reading in 0.003 mm (.0001 in.) increments is required.
5. Piston installation into the cylinder bore requires slightly more pressure than that required for non-coated pistons. The bonded coating on the piston will give the appearance of a line-to-line fit with the cylinder bore.





REMOVAL

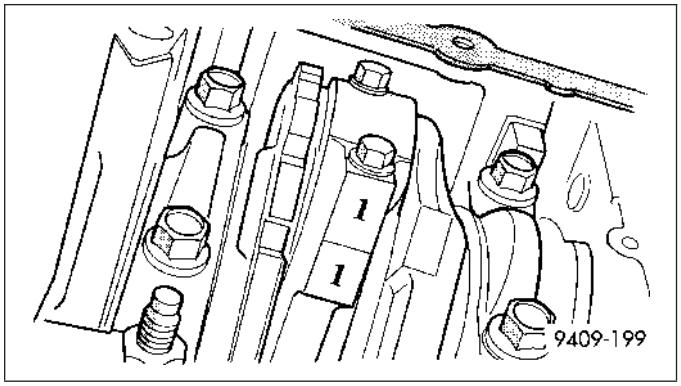
1. Disconnect negative cable from battery.
2. Remove the following components:
   - Oil pan and gasket/windage tray (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).
   - Cylinder head covers (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL) and (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).
   - Timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).
   - Cylinder head(s) (Refer to 9 - ENGINE/CYLINDER HEAD - REMOVAL) and (Refer to 9 - ENGINE/CYLINDER HEAD - REMOVAL).
3. If necessary, remove top ridge of cylinder bores with a reliable ridge reamer before removing pistons from cylinder block. **Be sure to keep tops of pistons covered during this operation.** Pistons and connecting rods must be removed from top of cylinder block. When removing piston and connecting rod assemblies from the engine, rotate crankshaft so the each connecting rod is centered in cylinder bore.

CAUTION: DO NOT use a number stamp or a punch to mark connecting rods or caps, as damage to connecting rods could occur

NOTE: Connecting rods and bearing caps are not interchangeable and should be marked before removing to ensure correct reassembly.

4. Mark connecting rod and bearing cap positions using a permanent ink marker or scribe tool.

CAUTION: Care must be taken not to damage the fractured rod and cap joint face surfaces, as engine damage may occur.



5. Remove connecting rod cap. Install Special Tool 8507 Connecting Rod Guides into the connecting rod being removed. Remove piston from cylinder bore. Repeat this procedure for each piston being removed.

CAUTION: Care must be taken not to nick crankshaft journals, as engine damage may occur

6. Immediately after piston and connecting rod removal, install bearing cap on the mating connecting rod to prevent damage to the fractured cap and rod surfaces.
7. Carefully remove piston rings from piston(s), starting from the top ring down.

CLEANING

CAUTION: DO NOT use a wire wheel or other abrasive cleaning devise to clean the pistons or connecting rods. The pistons have a Moly coating, this coating must not be damaged.

1. Using a suitable cleaning solvent clean the pistons in warm water and towel dry.
2. Use a wood or plastic scraper to clean the ring land grooves.

CAUTION: DO NOT remove the piston pin from the piston and connecting rod assembly.

INSPECTION

Check the connecting rod journal for excessive wear, taper and scoring (Refer to 9 - ENGINE/ENGINE BLOCK/ CONNECTING ROD BEARINGS - STANDARD PROCEDURE).

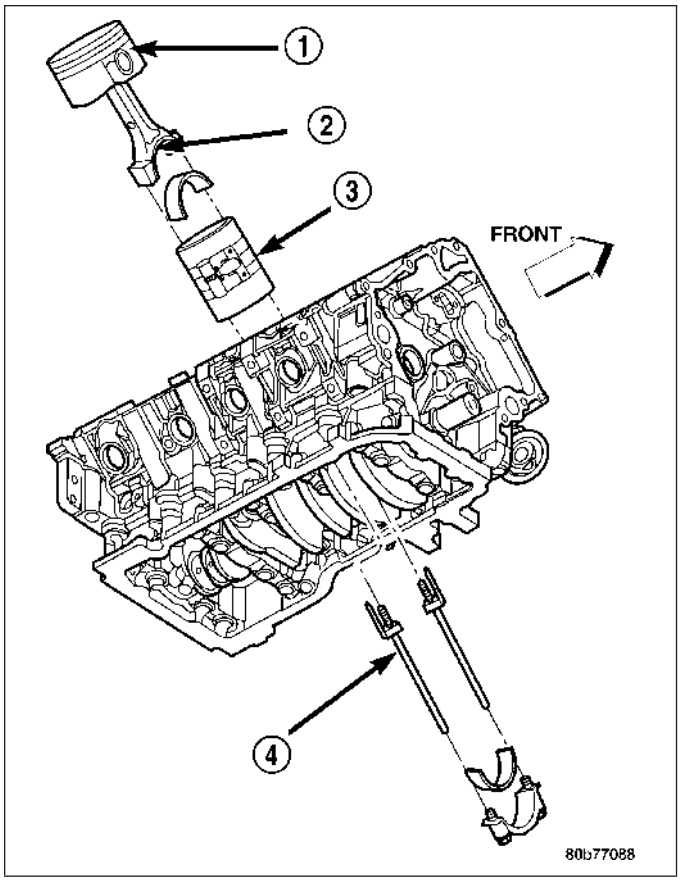
Check the connecting rod for signs of twist or bending.

Check the piston for taper and elliptical shape before it is fitted into the cylinder bore (Refer to 9 - ENGINE/ENGINE BLOCK/PISTON & CONNECTING ROD - STANDARD PROCEDURE).

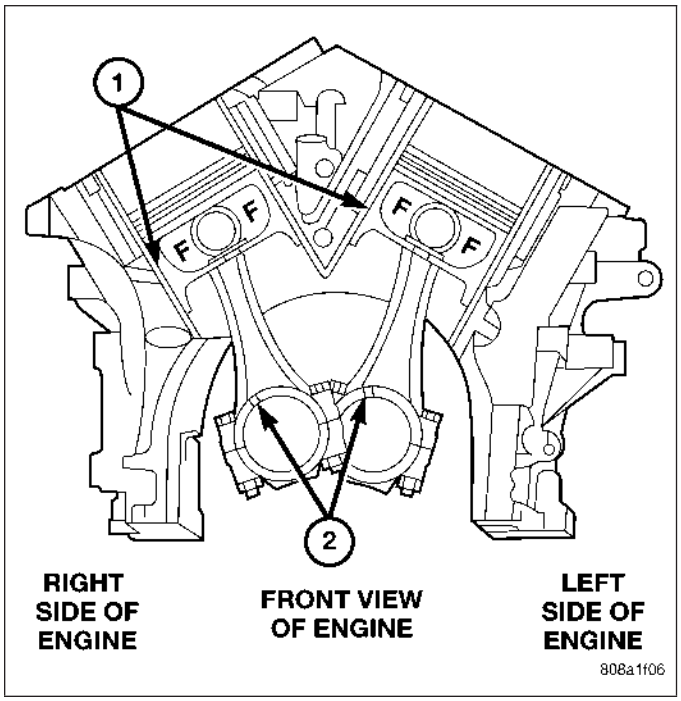
Check the piston for scoring, or scraping marks in the piston skirts. Check the ring lands for cracks and/or deterioration.

INSTALLATION

1. Before installing piston and connecting rod assemblies into the bore, install the piston rings.
2. Immerse the piston head and rings in clean engine oil. Position a ring compressor (3) over the piston and rings. Tighten ring compressor. **Ensure position of rings do not change during this operation.**
3. Position bearing onto connecting rod. Ensure that hole in bearing shell aligns with hole in connecting rod. Lubricate bearing surface with clean engine oil.
4. Install Special Tool 8507 Connecting Rod Guides (4) into connecting rod bolt threads.



5. The pistons are marked on the piston pin bore surface with an raised “F” indicating installation position (1). This mark must be pointing toward the front of engine on both cylinder banks. The connecting rod oil slinger slot faces the front of the engine.
6. Wipe cylinder bore clean and lubricate with engine oil.
7. Rotate crankshaft until connecting rod journal is on the center of cylinder bore. Insert rod and piston into cylinder bore and carefully position connecting rod guides over crankshaft journal.
8. Tap piston down in cylinder bore using a hammer handle. While at the same time, guide connecting rod into position on rod journal.



CAUTION: Connecting Rod Bolts are Torque to Yield Bolts and Must Not Be Reused. Always replace the Rod Bolts whenever they are loosened or removed.

9. Lubricate rod bolts and bearing surfaces with engine oil. Install connecting rod cap and bearing. Tighten bolts to 27 N·m (20 ft. lbs.) plus 90°.
10. Install the following components:
    - Cylinder head(s). (Refer to 9 - ENGINE/CYLINDER HEAD - INSTALLATION).
    - Timing chain and cover. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION).
    - Cylinder head covers (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).
    - Oil pan and gasket/windage tray. (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).
11. Fill crankcase with proper engine oil to correct level.
12. Connect negative cable to battery.

RINGS - PISTON

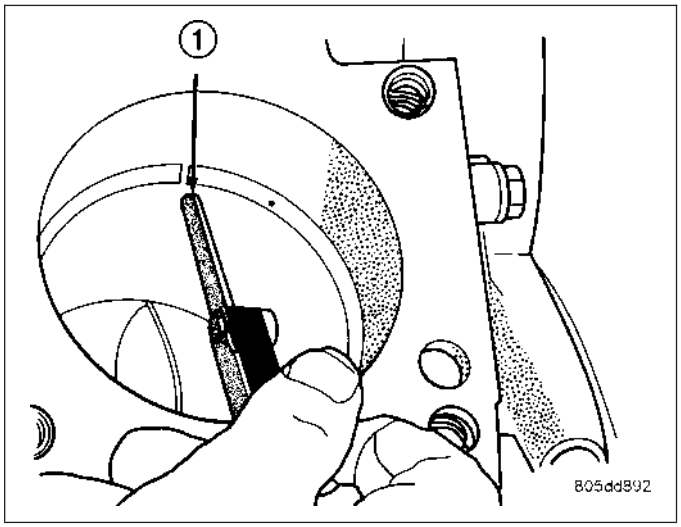
STANDARD PROCEDURE - PISTON RING FITTING

Before reinstalling used rings or installing new rings, the ring clearances must be checked.

1. Wipe the cylinder bore clean.
2. Insert the ring in the cylinder bore.

NOTE: The ring gap measurement must be made with the ring positioned at least 12mm (0.50 inch.) from bottom of cylinder bore.

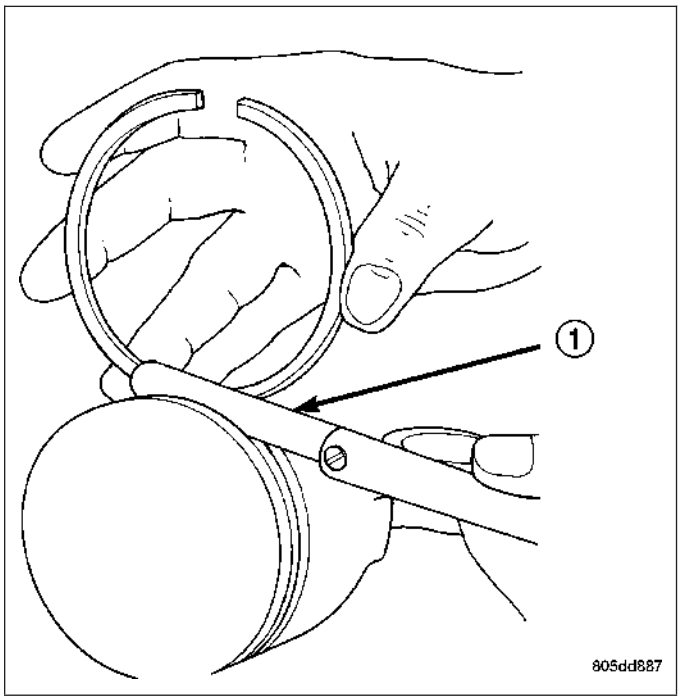
3. Using a piston, to ensure that the ring is squared in the cylinder bore, slide the ring downward into the cylinder.



4. Using a feeler gauge (1) check the ring end gap. Replace any rings not within specification.

PISTON RING SIDE CLEARANCE

NOTE: Make sure the piston ring grooves are clean and free of nicks and burrs.

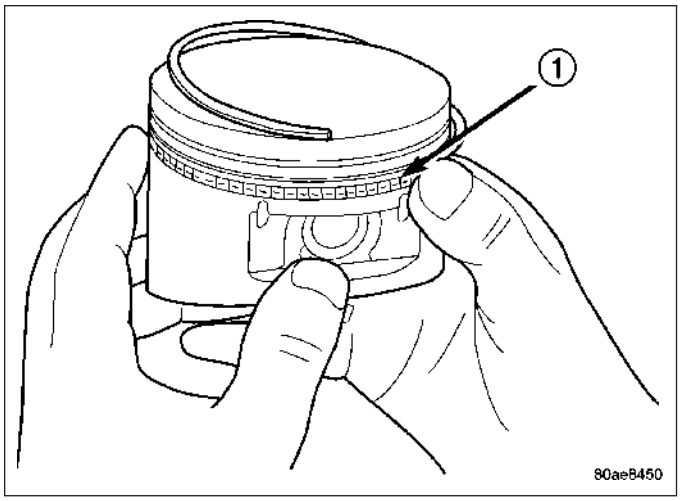


5. Measure the ring side clearance as shown make sure the feeler gauge (1) fits snugly between the ring land and the ring. Replace any ring not within specification.
6. Rotate the ring around the piston, the ring must rotate in the groove with out binding.

PISTON RING SPECIFICATION CHART

Ring Position	Groove Clearance	Maximum Clearance
Upper Ring	.051-.094 mm (0.0020-.0037 in.)	0.11 mm (0.004 in.)
Intermediate Ring	0.04-0.08 mm (0.0016-0.0031 in.)	0.10 mm (0.004 in.)
Oil Control Ring (Steel Rails)	.019-.229 mm (.0007-.0090 in.)	.25 mm (0.010 in.)
Ring Position	**Ring Gap**	**Wear Limit**
Upper Ring	0.20-0.36 mm (0.0079-0.0142 in.)	0.43 mm (0.0017 in.)
Intermediate Ring	0.37-0.63 mm (0.0146-0.0249 in.)	0.74 mm (0.029 in.)
Oil Control Ring (Steel Rail)	0.025-0.76 mm (0.0099- 0.03 in.)	1.55 mm (0.061 in.)

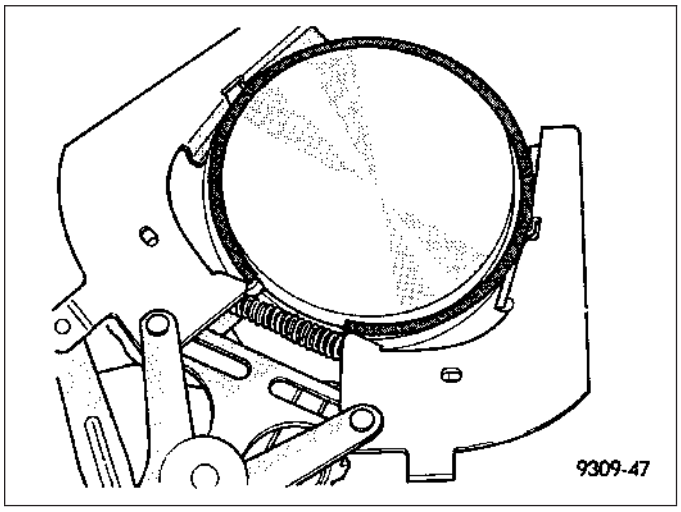
7. The No. 1 and No. 2 piston rings have a different cross section. Ensure No. 2 ring is installed with manufacturers I.D. mark (Dot) facing up, towards top of the piston.



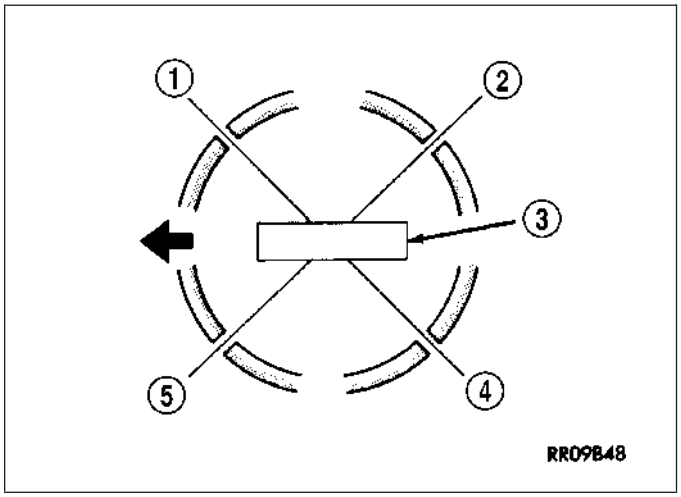
NOTE: Piston rings are installed in the following order:
- **Oil ring expander.**
- **Upper oil ring side rail.**
- **Lower oil ring side rail.**
- **No. 2 Intermediate piston ring.**
- **No. 1 Upper piston ring.**

8. Install the oil ring expander.
9. Install upper side rail (1) by placing one end between the piston ring groove and the expander ring. Hold end firmly and press down the portion to be installed until side rail is in position. Repeat this step for the lower side rail.

10. Install No. 2 intermediate piston ring using a piston ring installer.
11. Install No. 1 upper piston ring using a piston ring installer.



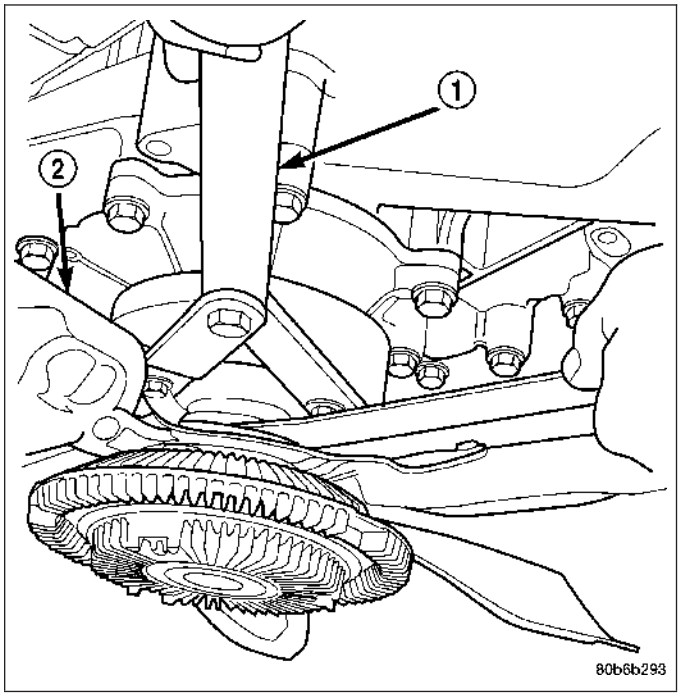
12. Position piston ring end gaps as shown in. It is important that expander ring gap (5) is at least 45° from the side rail gaps, but not on the piston pin center or on the thrust direction.



DAMPER - CRANKSHAFT

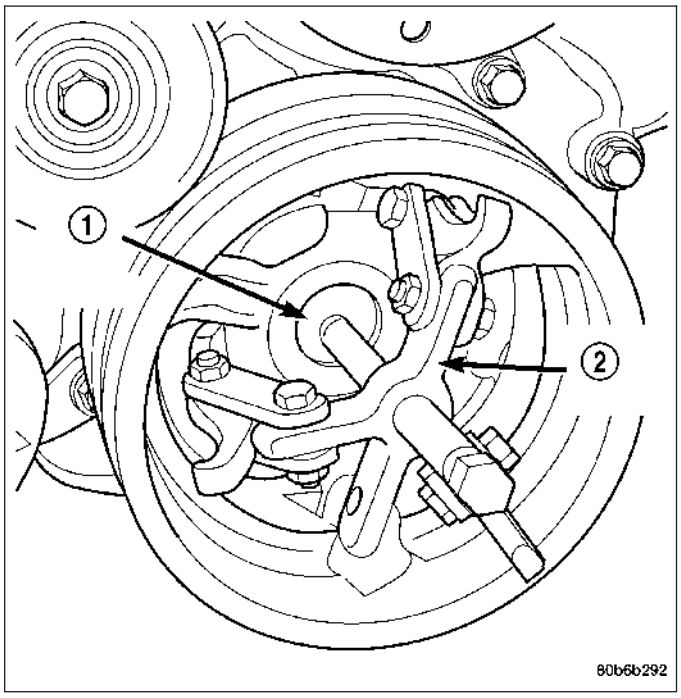
REMOVAL

1. Disconnect negative cable from battery.
2. Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
3. Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
4. Remove radiator upper hose.
5. Remove upper fan shroud.
6. Using Special Tools 6958 Spanner with Adapter Pins 8346 (1), loosen fan and viscous assembly from water pump.
7. Remove fan and viscous assembly.
8. Disconnect electrical connector for fan mounted inside radiator shroud.



NOTE: Transmission cooler line snaps into shroud lower right hand corner.

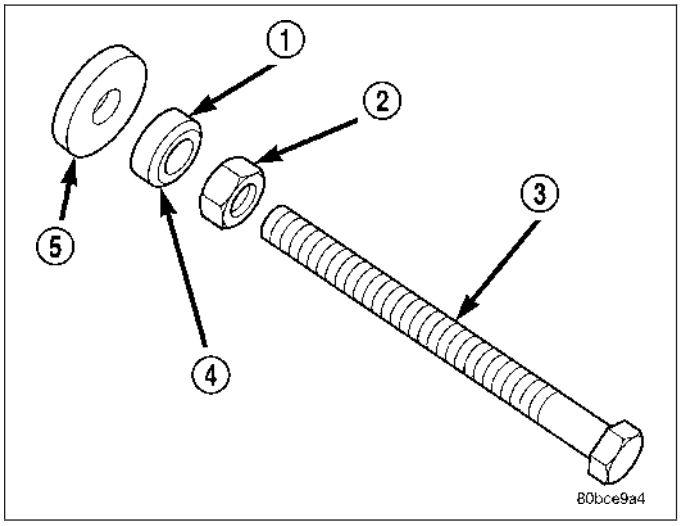
9. Remove crankshaft damper bolt.
10. Remove damper using Special Tools 8513 Insert and 1026 Three Jaw Puller (2).



INSTALLATION

CAUTION: To prevent severe damage to the Crankshaft, Damper or Special Tool 8512–A, thoroughly clean the damper bore and the crankshaft nose before installing Damper.

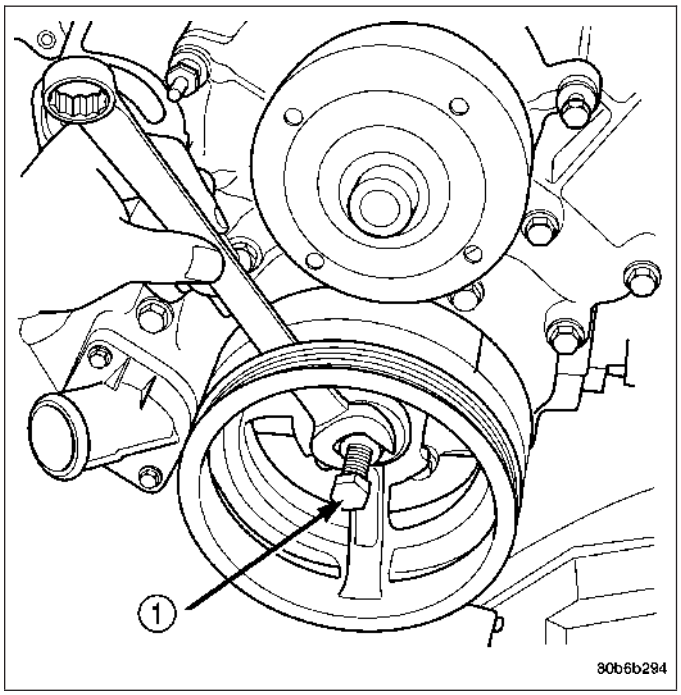
1. Align crankshaft damper slot with key in crankshaft. Slide damper onto crankshaft slightly.



CAUTION: Special Tool 8512–A, is assembled in a specific sequence. Failure to assemble this tool in this sequence can result in tool failure and severe damage to either the tool or the crankshaft.

2. Assemble Special Tool 8512–A as follows, The nut (2) is threaded onto the shaft first. Then the roller bearing (1) is placed onto the threaded rod (3) (The hardened bearing surface of the bearing (1) **MUST**face the nut (2). Then the hardened washer (5)slides onto the threaded rod. Once assembled coat the threaded rod's threads with Mopar® Nickel Anti-Seize or equivalent.

3. Using Special Tool 8512–A, press damper onto crankshaft (1).
4. Install then tighten crankshaft damper bolt to 175 N·m (130 ft. lbs.).
5. Install fan blade assembly (Refer to 7 - COOLING/ ENGINE/FAN DRIVE VISCOUS CLUTCH - INSTALLATION).
6. Install radiator upper shroud and tighten fasteners to 11 N·m (95 in. lbs.).
7. Connect electrical connector for shroud fan.
8. Install radiator upper hose.
9. Install accessory drive belt (Refer to 7 - COOLING/ ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).
10. Refill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
11. Connect negative cable to battery.



COVER - STRUCTURAL

DESCRIPTION

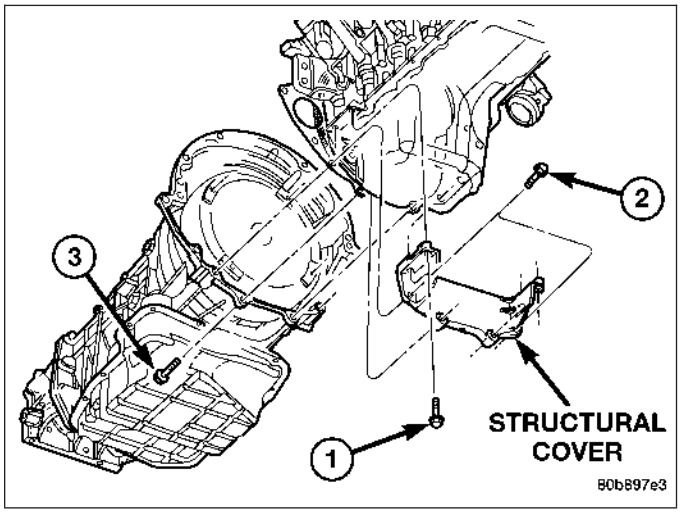
The structural dust cover is made of die cast aluminum and joins the lower half of the transmission bell housing to the engine bedplate.

OPERATION

The structural cover provides additional powertrain stiffness and reduces noise and vibration.

REMOVAL

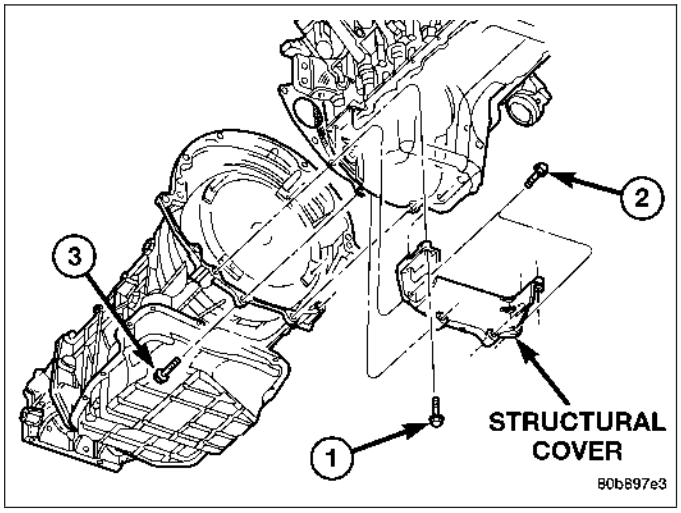
1. Raise vehicle on hoist.
2. Remove the left hand exhaust pipe from exhaust manifold.
3. Loosen the right hand exhaust manifold-to-exhaust pipe retaining bolts.
4. Remove the eight bolts (1,2,3) retaining structural cover in the sequence shown.
5. Pivot the exhaust pipe downward and remove the structural cover.



INSTALLATION

CAUTION: The structural cover must be installed as described in the following steps. Failure to do so will cause severe damage to the cover.

1. Position the structural cover in the vehicle.
2. Install all four bolts retaining the cover-to-engine. DO NOT tighten the bolts at this time.
3. Install the four cover-to-transmission bolts. Do NOT tighten at this time.



CAUTION: The structural cover must be held tightly against both the engine and the transmission bell housing during tightening sequence. Failure to do so may cause damage to the cover.

4. Starting with the two rear cover-to-engine bolts, tighten bolts (1) to 54 N·m (40 ft. lbs.), then tighten bolts (2) and (3) to 54 N·m (40 ft. lbs.) in the sequence shown.
5. Install the exhaust pipe on left hand exhaust manifold.
6. Tighten exhaust manifold-to-exhaust pipe retaining bolts to 20–26 N·m (15–20 ft. lbs.).

ENGINE MOUNTING

REMOVAL

2WD

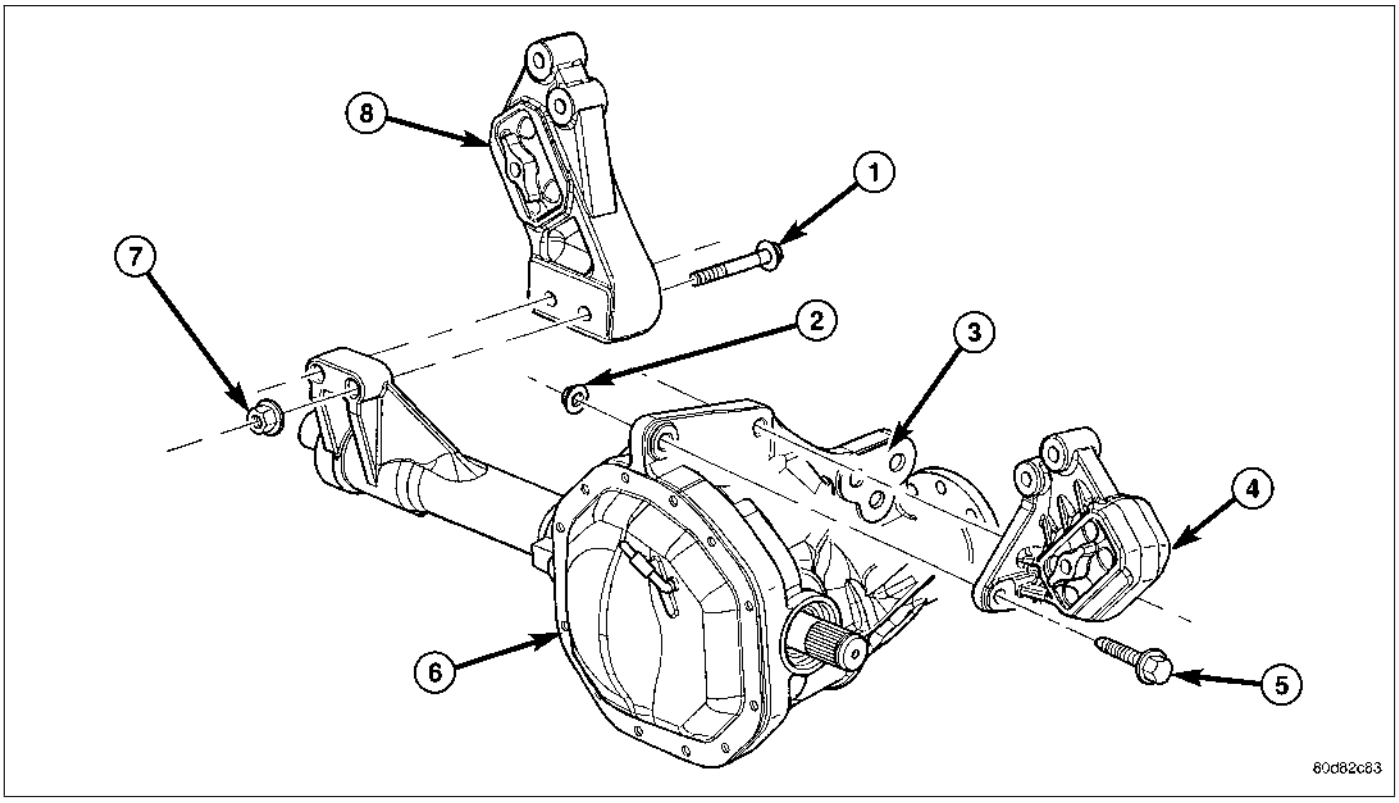
1. Disconnect the negative cable from the battery.

CAUTION: Remove the viscous fan before raising engine. Failure to do so may cause damage to the fan blade, fan clutch and fan shroud.

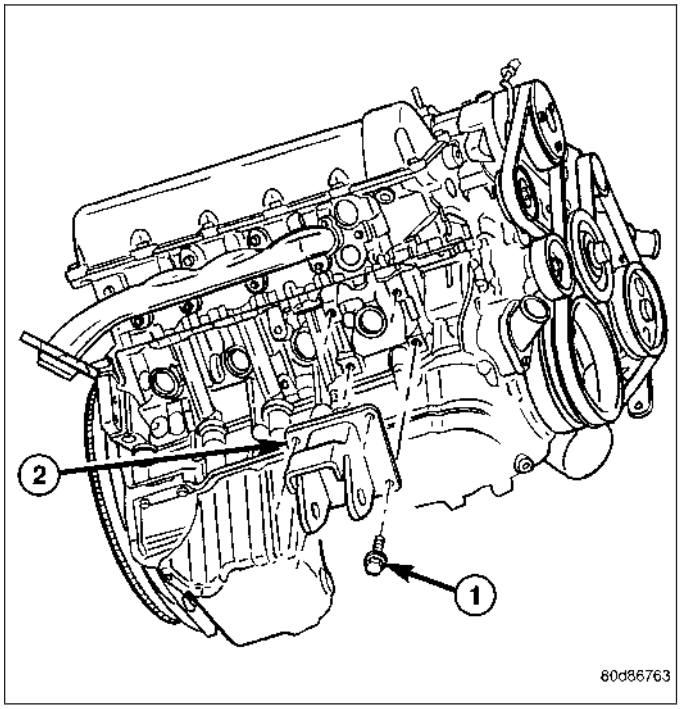
2. Remove the viscous fan (Refer to 7 - COOLING/ENGINE/FAN DRIVE VISCOUS CLUTCH - REMOVAL).
3. Raise the vehicle.
4. Remove the engine oil filter.
5. Remove the oil drain trough.
6. Support the engine with a suitable jack and a block of wood across the full width of the engine oil pan.
7. Support the front axle with a suitable jack.
8. Remove the (4) bolts that attach the engine mounts to the front axle.
9. Remove the (3) bolts that attach the front axle to the left engine bracket.
10. Lower the front axle.
11. Remove the through bolts
12. Raise the engine far enough to be able to remove the left and right engine mounts.
13. Remove the (8) mount to engine attaching bolts
14. Remove the engine mounts.

4WD

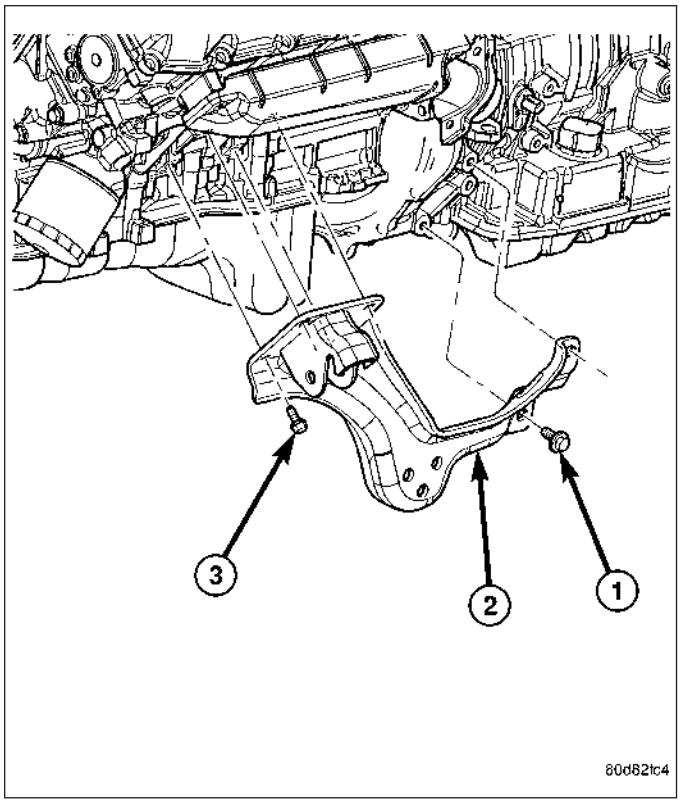
1. Disconnect the negative cable from the battery.
2. Remove the viscous fan.
3. Raise the vehicle.
4. Remove the skid plate.
5. Remove the front crossmember.
6. Remove the engine oil filter.
7. Remove the oil drain trough.
8. Support the engine with a suitable jack and a block of wood across the full width of the engine oil pan.
9. Support the front axle with a suitable jack.
10. Remove the (4) bolts that attach the engine mounts to the front axle.



11. Remove the (3) bolts that attach the front axle to the left engine bracket.
12. Lower the front axle.
13. Remove the (6) through bolts
14. Raise the engine far enough to be able to remove the left and right engine mounts.



15. Remove the engine mounts.



INSTALLATION

2WD

NOTE: For mount to engine block and left engine bracket to front axle bolts, apply Mopar® Lock and Seal Adhesive, Medium Strength Threadlocker.

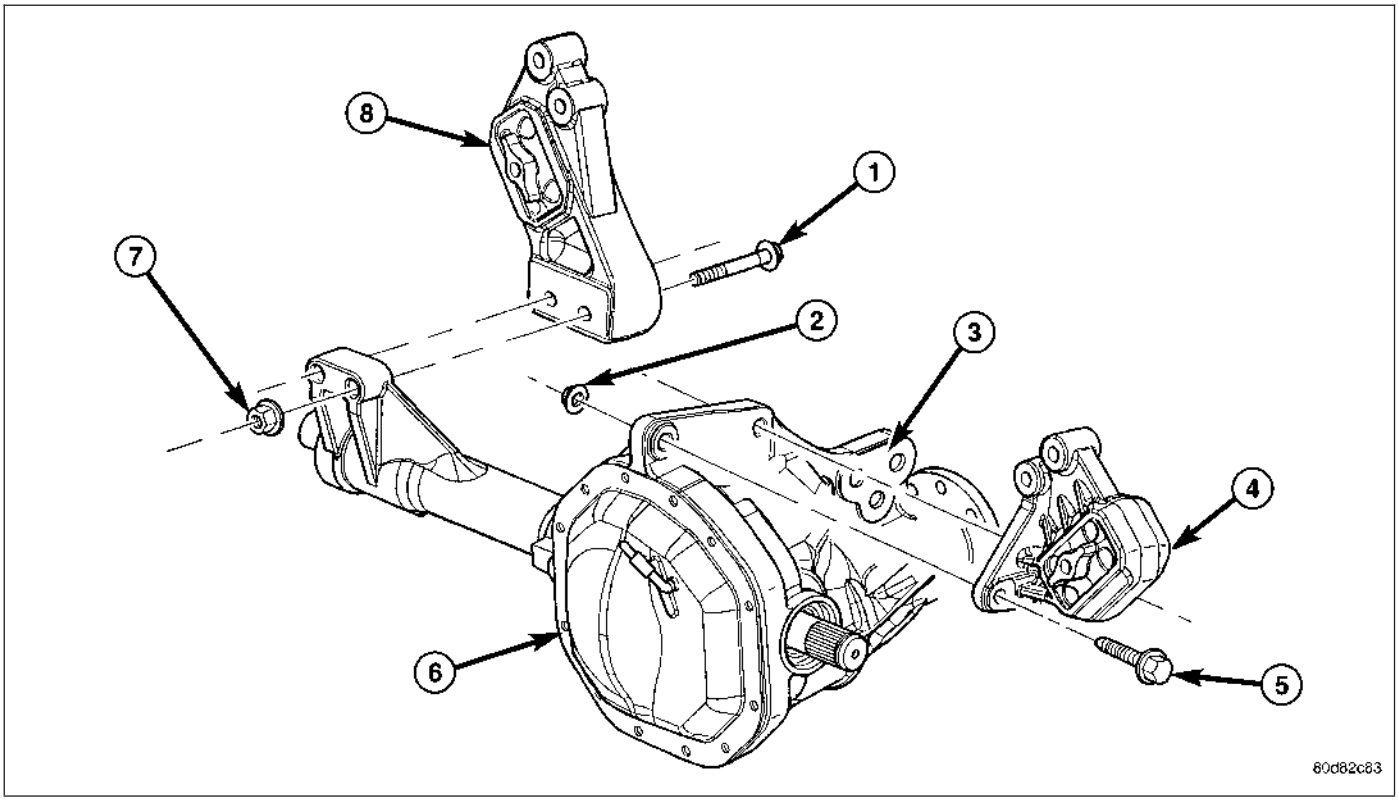
1. Install the right and left side engine mounts to the engine block with (8) bolts. Torque bolts to 54 N·m (40 ft. lbs.).
2. Insert the (2) through bolts into the right and left side engine mounts and loose assemble the two nuts onto the through bolts.
3. Lower the engine until the through bolts rest onto the slots in the frame brackets.
4. Tighten the through bolt nuts to 94 N·m (70 ft. lbs.).
5. Install the oil drain trough.
6. Install the engine oil filter.
7. Lower the vehicle.
8. Install the viscous fan (Refer to 7 - COOLING/ENGINE/FAN DRIVE VISCOUS CLUTCH - REMOVAL).
9. Reconnect the negative battery cable.

4WD

NOTE: For mount to engine block and left engine bracket to front axle bolts, apply Mopar® Lock and Seal Adhesive, Medium Strength Threadlocker.

1. Install the right and left side engine mounts to the front axle. Torque nuts to 94 N·m (70 ft. lbs.).
2. Raise the front axle into the frame and install the left and right side through bolts. Torque nuts to 94 N·m (70 ft. lbs.).
3. Insert the two upper through bolts into the right and left side engine mounts and loose assemble the two nuts onto the through bolts.

4. Lower the engine until the left and right side engine brackets rest on the through bolts, and the lower engine bracket through holes align with the engine mounts, and the left engine bracket holes align with the front axle slots.



5. Loose assemble the (3) bolts that attach the front axle to the left engine bracket.
6. Loose assemble the lower through bolts.
7. Torque the nuts for the (4) through bolts to 101 N·m (75 ft. lbs.).
8. Torque the (3) bolts that attach the front axle to the left engine bracket to 101 N·m (75 ft. lbs.).
9. Install the oil drain trough.
10. Install the engine oil filter.
11. Install the front crossmember.
12. Install the skid plate.
13. Lower the vehicle.
14. Install the viscous fan (Refer to 7 - COOLING/ENGINE/FAN DRIVE VISCOUS CLUTCH - REMOVAL).
15. Reconnect the negative battery cable.

ENGINE MOUNTING-FRONT

REMOVAL

1. Disconnect the negative cable from the battery.

CAUTION: Remove the fan blade, fan clutch and fan shroud before raising engine. Failure to do so may cause damage to the fan blade, fan clutch and fan shroud.

2. Remove the fan blade, fan clutch and fan shroud (Refer to 7 - COOLING/ENGINE/FAN DRIVE VISCOUS CLUTCH - REMOVAL).
3. Remove the engine oil filter.
4. Support the engine with a suitable jack and a block of wood across the full width of the engine oil pan.

5. Remove the four (4) cylinder block-to-insulator mount bolts and the nut from the engine insulator mount through bolt (4x2 Vehicles only).
6. Remove the three (3) cylinder block-to-insulator mount bolts and loosen the nut from the engine insulator mount through bolt (4x4 Vehicles only).
7. Using the jack, raise the engine high enough to remove the engine insulator mount through bolt and the insulator mount.

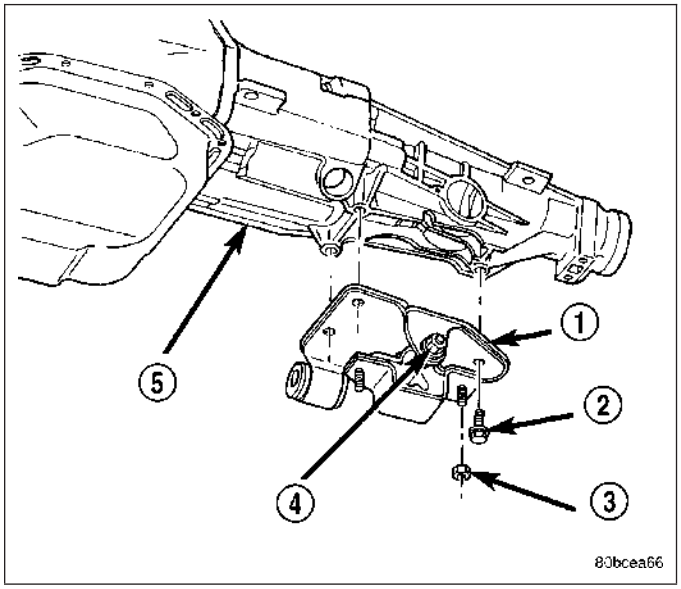
INSTALLATION

1. Position the insulator mount and install the insulator mount through bolt.
2. Lower the engine until the four cylinder block-to-insulator mount bolts can be installed.
3. Remove the jack and block of wood.
4. Torque the cylinder block-to-insulator mount bolts to 61N·m (45 ft. lbs.).
5. Install and torque the through bolt retaining nut to 61N·m (45 ft. lbs.).
6. Install the fan blade, fan clutch and fan shroud.

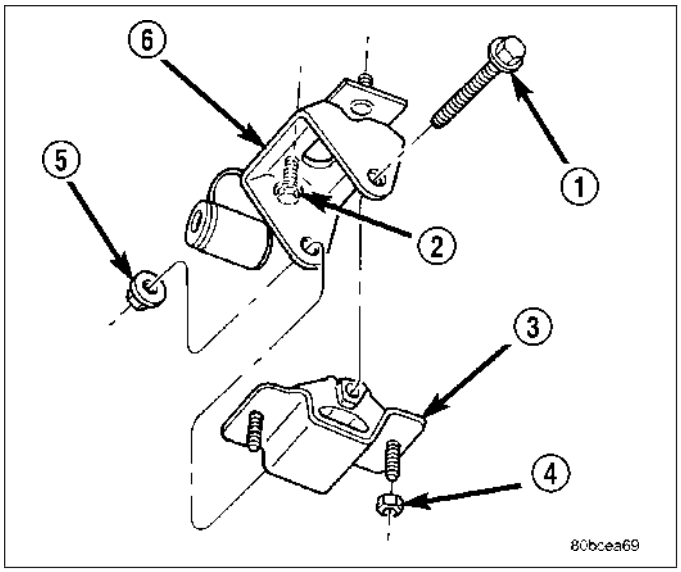
MOUNTING-ENGINE REAR

REMOVAL

1. Raise vehicle on hoist.
2. Using a suitable jack, support transmission.
3. Remove the nut from the insulator mount through bolt (Manual transmission and 4x2 automatic transmission only).
4. Remove the four bolts and washers retaining the mount to the transmission (4x4 automatic transmission only).

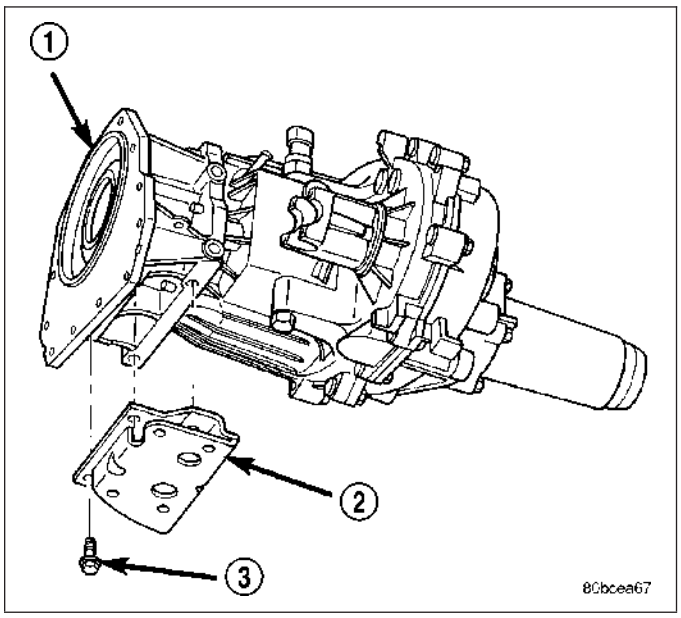


5. Raise the transmission enough to remove the through bolt (Manual transmission and 4x2 automatic transmission only).



6. Raise the transmission and remove the bolts retaining the mount to the crossmember (4x4 automatic transmission only).

7. Remove the two nuts retaining the isolator to the crossmember (Manual transmission and 4x2 automatic transmission only).
8. Remove the bolts (two bolts manual transmission-)(three bolts 4x2 automatic transmission) retaining the insulator bracket to the transmission.

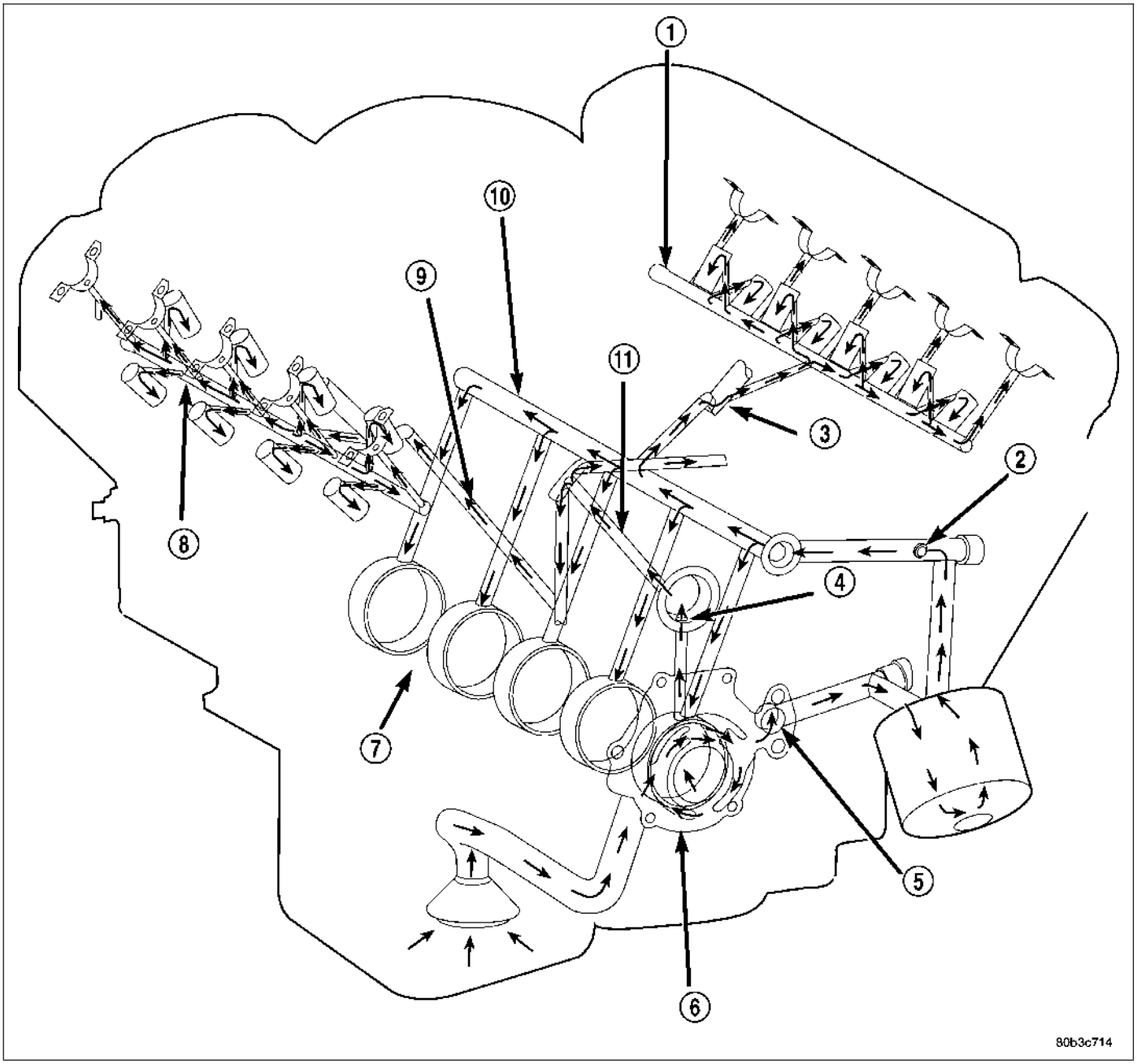


INSTALLATION

1. Follow the removal procedure in the reverse order.
2. Tighten the through bolt retaining nut to 101 N·m (75 ft. lbs.).
3. Tighten the isolator bracket to transmission retaining bolts (Manual transmission and 4x2 automatic transmission only) to 68 N·m (50 ft. lbs.).
4. Tighten the mount bracket to transmission retaining bolts (4x4 automatic transmission only) to 68 N·m (50 ft. lbs.).
5. Tighten the isolator mount to crossmember retaining nuts (Manual transmission and 4x2 automatic transmission only) to 41 N·m (30 ft. lbs.).
6. Tighten the mount bracket to crossmember retaining bolts (4x4 automatic transmission only) to 28 N·m (250 in. lbs.).

LUBRICATION

DESCRIPTION



The lubrication system is a full flow filtration pressure feed type.

OPERATION

Oil from the oil pan is pumped by a gerotor type oil pump directly mounted to the crankshaft nose. Oil pressure is controlled by a relief valve mounted inside the oil pump housing.

The camshaft exhaust valve lobes and rocker arms are lubricated through a small hole in the rocker arm; oil flows through the lash adjuster then through the rocker arm and onto the camshaft lobe. Due to the orentation of the rocker arm, the camshaft intake lobes are not lubed in the same manner as the exhaust lobes. The intake lobes are lubed through internal passages in the camshaft. Oil flows through a bore in the number 3 camshaft bearing bore, and as the camshaft turns, a hole in the camshaft aligns with the hole in the camshaft bore allowing engine oil to

enter the camshaft tube. The oil then exits through 1.6mm (0.063 in.) holes drilled into the intake lobes, lubricating the lobes and the rocker arms.

Engine Lubrication Flow Chart—Block: Table 1

FROM	TO
Oil Pickup Tube	Oil Pump
Oil Pump	Oil Filter
Oil Filter	Block Main Oil Gallery
Block Main Oil Gallery	1. Crankshaft Main Journal 2. Left Cylinder Head* 3. Right Cylinder Head*
Crankshaft Main Journals	Crankshaft Rod Journals
Crankshaft Number One Main Journal	1.Front Timing Chain Idler Shaft 2.Both Secondary Chain Tensioners
Left Cylinder Head	See Table 2
Right Cylinder Head	See Table 2
* The cylinder head gaskets have an oil restricter to control oil flow to the cylinder heads.	

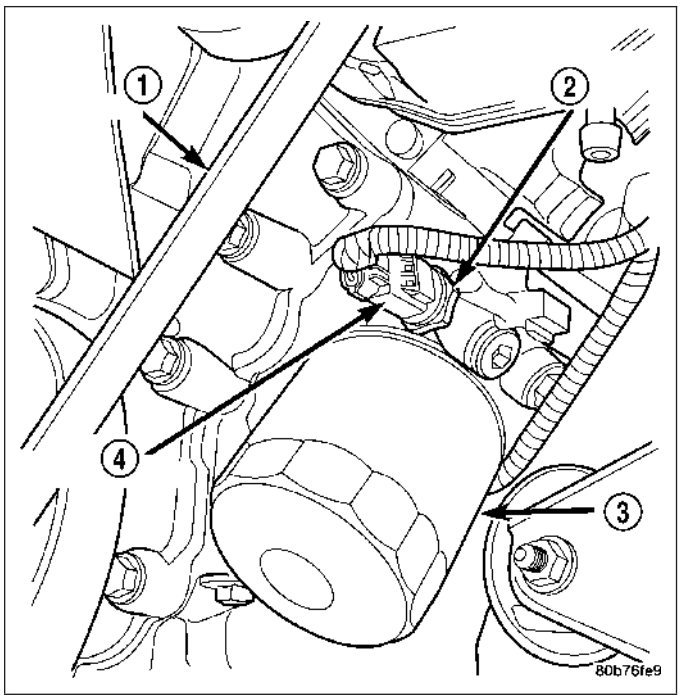
Engine Lubrication Flow Chart—Cylinder Heads: Table 2

FROM	TO
Cylinder Head Oil Port (in bolt hole)	Diagonal Cross Drilling to Main Oil Gallery
Main Oil Gallery (drilled through head from rear to front)	1. Base of Camshaft Towers 2. Lash Adjuster Towers
Base of Camshaft Towers	Vertical Drilling Through Tower to Camshaft Bearings**
Lash Adjuster Towers	Diagonal Drillings to Hydraulic Lash Adjuster Pockets
** The number three camshaft bearing journal feeds oil into the hollow camshaft tubes. Oil is routed to the intake lobes, which have oil passages drilled into them to lubricate the rocker arms.	

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - ENGINE OIL PRESSURE

1. Remove oil pressure sending unit and install gauge assembly C-3292.
2. Run engine until thermostat opens.
3. Oil Pressure:
   - Curb Idle—25 Kpa (4 psi) minimum
   - 3000 rpm—170 - 550 KPa (25 - 80 psi)
4. If oil pressure is 0 at idle, shut off engine. Check for a clogged oil pick-up screen or a pressure relief valve stuck open.



DIAGNOSIS AND TESTING - ENGINE OIL LEAK

Begin with a thorough visual inspection of the engine, particularly at the area of the suspected leak. If an oil leak source is not readily identifiable, the following steps should be followed:

1. Do not clean or degrease the engine at this time because some solvents may cause rubber to swell, temporarily stopping the leak.
2. Add an oil soluble dye (use as recommended by manufacturer). Start the engine and let idle for approximately 15 minutes. Check the oil dipstick to make sure the dye is thoroughly mixed as indicated with a bright yellow color under a black light.
3. Using a black light, inspect the entire engine for fluorescent dye, particularly at the suspected area of oil leak. If the oil leak is found and identified, repair per service manual instructions.
4. If dye is not observed, drive the vehicle at various speeds for approximately 24 km (15 miles), and repeat inspection.If the oil leak source is not positively identified at this time, proceed with the air leak detection test method.

Air Leak Detection Test Method

1. Disconnect the breather cap to air cleaner hose at the breather cap end. Cap or plug breather cap nipple.
2. Remove the PCV valve from the cylinder head cover. Cap or plug the PCV valve grommet.
3. Attach an air hose with pressure gauge and regulator to the dipstick tube.

CAUTION: Do not subject the engine assembly to more than 20.6 kPa (3 PSI) of test pressure.

4. Gradually apply air pressure from 1 psi to 2.5 psi maximum while applying soapy water at the suspected source. Adjust the regulator to the suitable test pressure that provide the best bubbles which will pinpoint the leak source. If the oil leak is detected and identified, repair per service manual procedures.
5. If the leakage occurs at the rear oil seal area, refer to the section, Inspection for Rear Seal Area Leak.
6. If no leaks are detected, turn off the air supply and remove the air hose and all plugs and caps. Install the PCV valve and breather cap hose.

7. Clean the oil off the suspect oil leak area using a suitable solvent. Drive the vehicle at various speeds approximately 24 km (15 miles). Inspect the engine for signs of an oil leak by using a black light.

INSPECTION FOR REAR SEAL AREA LEAKS

Since it is sometimes difficult to determine the source of an oil leak in the rear seal area of the engine, a more involved inspection is necessary. The following steps should be followed to help pinpoint the source of the leak.

If the leakage occurs at the crankshaft rear oil seal area:

1. Disconnect the battery.
2. Raise the vehicle.
3. Remove torque converter or clutch housing cover and inspect rear of block for evidence of oil. Use a black light to check for the oil leak:
   a. Circular spray pattern generally indicates seal leakage or crankshaft damage.
   b. Where leakage tends to run straight down, possible causes are a porous block, distributor seal, camshaft bore cup plugs oil galley pipe plugs, oil filter runoff, and main bearing cap to cylinder block mating surfaces.
4. If no leaks are detected, pressurize the crankcase as outlined in the, Inspection (Engine oil Leaks in general)

CAUTION: Do not exceed 20.6 kPa (3 psi).

5. If the leak is not detected, very slowly turn the crankshaft and watch for leakage. If a leak is detected between the crankshaft and seal while slowly turning the crankshaft, it is possible the crankshaft seal surface is damaged. The seal area on the crankshaft could have minor nicks or scratches that can be polished out with emery cloth.

CAUTION: Use extreme caution when crankshaft polishing is necessary to remove minor nicks and scratches. The crankshaft seal flange is especially machined to complement the function of the rear oil seal.

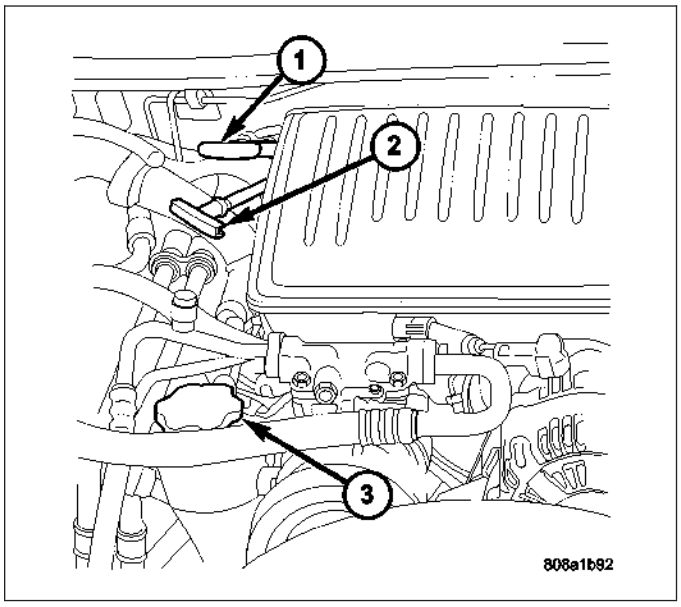
6. For bubbles that remain steady with shaft rotation, no further inspection can be done until disassembled.

OIL

STANDARD PROCEDURE

ENGINE OIL SERVICE

The engine oil level indicator is located at the right rear of the engine on the 4.7L engines..



CRANKCASE OIL LEVEL INSPECTION

CAUTION: Do not overfill crankcase with engine oil, pressure loss or oil foaming can result.

Inspect engine oil level approximately every 800 kilometers (500 miles). Unless the engine has exhibited loss of oil pressure, run the engine for about five minutes before checking oil level. Checking engine oil level on a cold engine is not accurate.

To ensure proper lubrication of an engine, the engine oil must be maintained at an acceptable level. The acceptable levels are indicated between the ADD and SAFE marks on the engine oil dipstick.

1. Position vehicle on level surface.
2. With engine OFF, allow approximately ten minutes for oil to settle to bottom of crankcase, remove engine oil dipstick.
3. Wipe dipstick clean.
4. Install dipstick and verify it is seated in the tube.
5. Remove dipstick, with handle held above the tip, take oil level reading.
6. Add oil only if level is below the ADD mark on dipstick.

ENGINE OIL CHANGE

Change engine oil at mileage and time intervals described in Maintenance Schedules.

Run engine until achieving normal operating temperature.

1. Position the vehicle on a level surface and turn engine off.
2. Hoist and support vehicle on safety stands.
3. Remove oil fill cap.
4. Place a suitable drain pan under crankcase drain.
5. Remove drain plug from crankcase and allow oil to drain into pan. Inspect drain plug threads for stretching or other damage. Replace drain plug if damaged.
6. Install drain plug in crankcase.
7. Lower vehicle and fill crankcase with specified type and amount of engine oil described in this section.
8. Install oil fill cap.
9. Start engine and inspect for leaks.
10. Stop engine and inspect oil level.

NOTE: Care should be exercised when disposing used engine oil after it has been drained from a vehicle engine. Refer to the WARNING at beginning of this section.

FILTER - ENGINE OIL

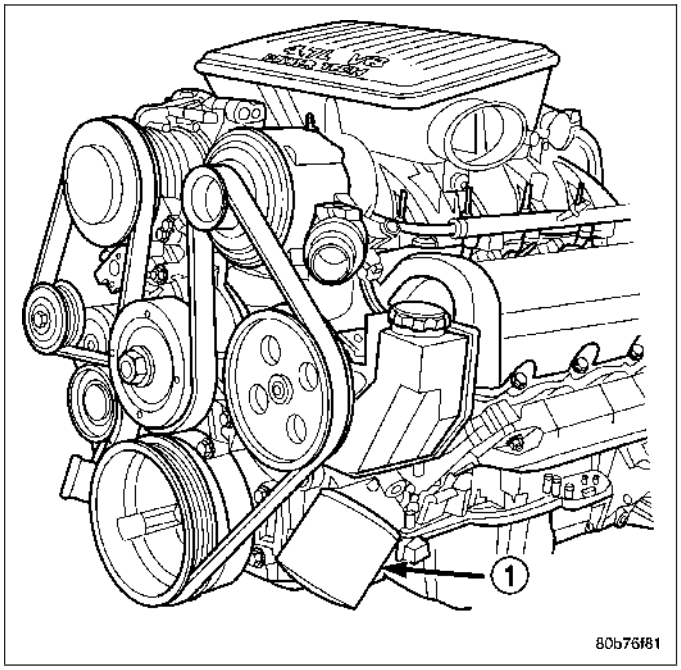
REMOVAL

All engines are equipped with a high quality full-flow, disposable type oil filter. DaimlerChrysler Corporation recommends a Mopar® or equivalent oil filter be used.

1. Position a drain pan under the oil filter.
2. Using a suitable oil filter wrench loosen filter.
3. Rotate the oil filter counterclockwise to remove it from the cylinder block oil filter boss.
4. When filter separates from cylinder block oil filter boss, tip gasket end upward to minimize oil spill. Remove filter from vehicle.

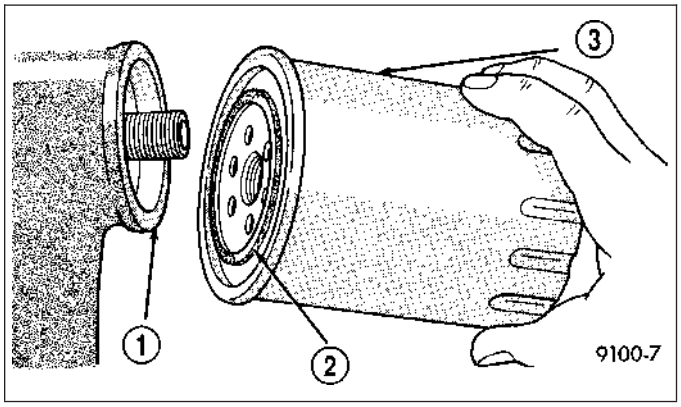
NOTE: Make sure filter gasket was removed with filter.

5. With a wiping cloth, clean the gasket sealing surface of oil and grime.



INSTALLATION

1. Lightly lubricate oil filter gasket (2) with engine oil.
2. Thread filter (3) onto adapter nipple. When gasket makes contact with sealing surface, hand tighten filter one full turn, do not over tighten.
3. Add oil, verify crankcase oil level and start engine. Inspect for oil leaks.



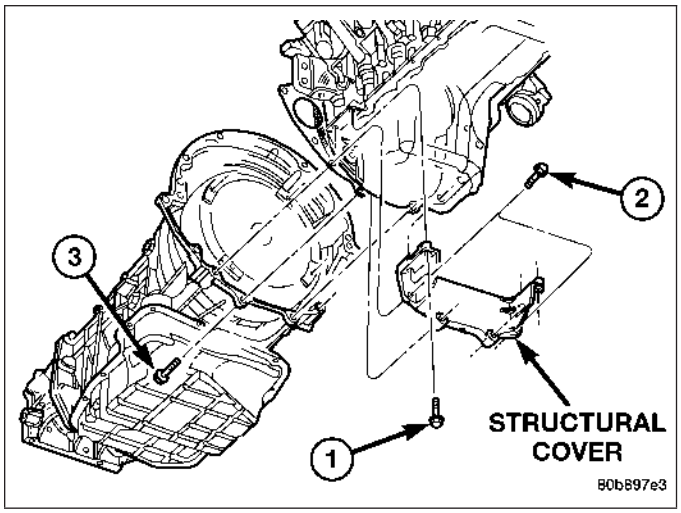
PAN-ENGINE OIL

REMOVAL

REMOVAL - 4X2

1. Drain the cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
2. Remove the upper fan shroud.
3. Remove the throttle body resonator and air inlet hose.
4. Remove the intake manifold (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).
5. Raise vehicle on hoist.
6. Disconnect exhaust pipe at exhaust manifolds.

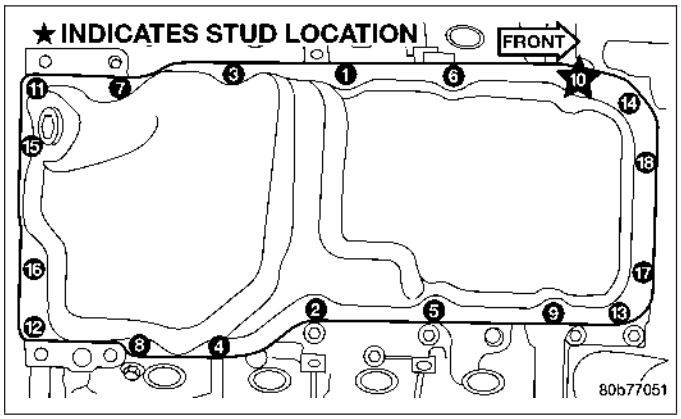
7. Remove the structural dust cover (Refer to 9 - ENGINE/ENGINE BLOCK/STRUCTURAL COVER - REMOVAL) using sequence shown.



8. Drain engine oil and remove oil filter.
9. Position suitable jack under engine.
10. Remove both left and right side engine mount through bolts.
11. Raise engine to provide clearance to remove oil pan.
12. Place blocks of wood between engine brackets and lower mounts to provide stability to engine.

NOTE: Do not pry on oil pan or oil pan gasket. Gasket is mounted to engine and does not come out with oil pan.

13. Remove the oil pan mounting bolts and oil pan.



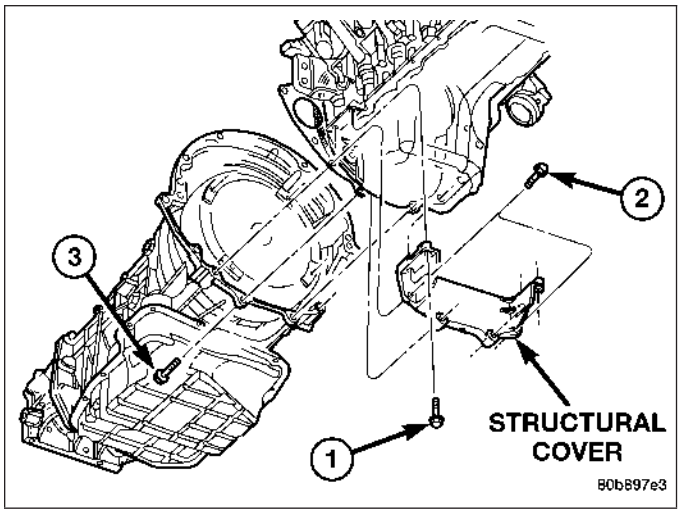
14. Unbolt oil pump pickup tube and remove tube and oil pan gasket from engine.

REMOVAL - 4X4

NOTE: 4X4 vehicles equipped with a 4.7L engine must have the front axle removed before the oil pan can be removed.

1. Remove the front axle from vehicle. Refer to DIFFERENTIAL AND DRIVELINE.

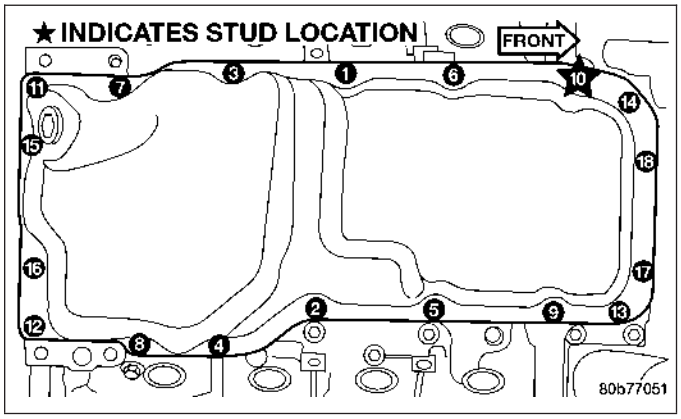
2. Remove the structural dust cover (Refer to 9 - ENGINE/ENGINE BLOCK/STRUCTURAL COVER - REMOVAL) using sequence shown.



3. Drain the engine oil and remove oil filter.

NOTE: Do not pry on oil pan or oil pan gasket. Gasket is mounted to engine and does not come out with oil pan.

4. Remove the oil pan mounting bolts and oil pan.

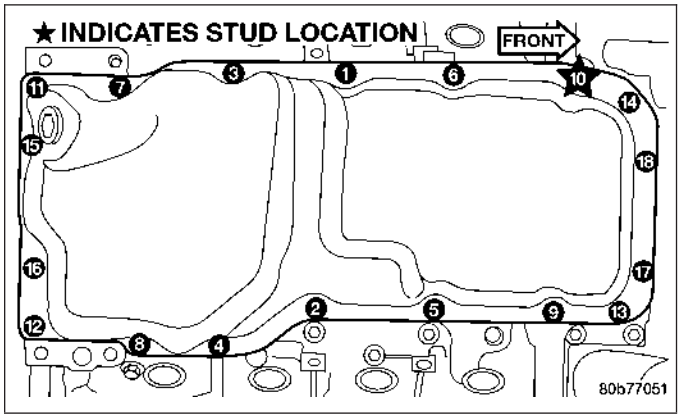


5. Unbolt oil pump pickup tube and remove tube and oil pan gasket from engine.

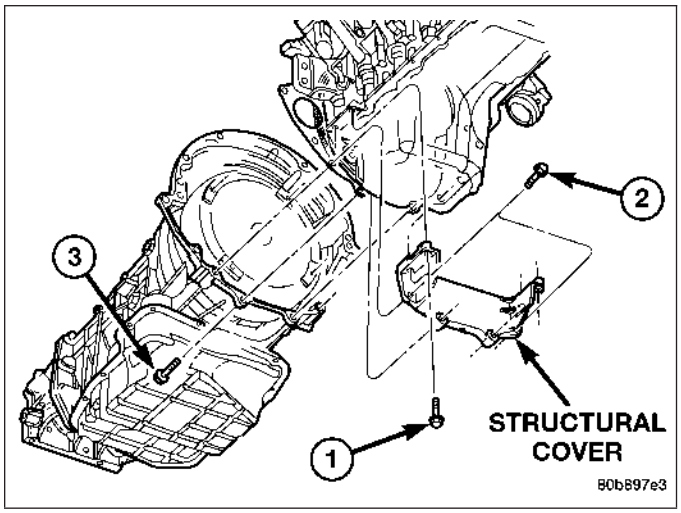
INSTALLATION

INSTALLATION - 4X2

1. Clean the oil pan gasket mating surface of the bedplate and oil pan.
2. Position the oil pan gasket and pickup tube with new o-ring. Install the mounting bolt and nuts. Tighten bolt and nuts to 28 N·m (20 ft. lbs.).
3. Position the oil pan and install the mounting bolts. Tighten the mounting bolts to 15 N·m (11 ft. lbs.) in the sequence shown.
4. Raise the engine and remove the blocks of wood.
5. Lower engine and install both the left and right side engine mount through bolts. Tighten the nuts to 68 N·m (50 ft. lbs.).
6. Remove jack and install oil filter.

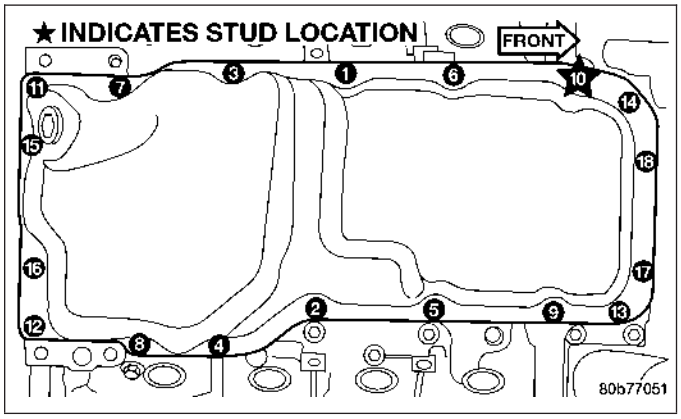


7. Install structural dust cover (Refer to 9 - ENGINE/ ENGINE BLOCK/STRUCTURAL COVER - INSTALLATION).
8. Install exhaust pipe onto exhaust manifolds.
9. Lower vehicle.
10. Install intake manifold (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION).
11. Install throttle body resonator and air inlet hose.
12. Install upper fan shroud.
13. Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
14. Fill engine oil.
15. Start engine and check for leaks.

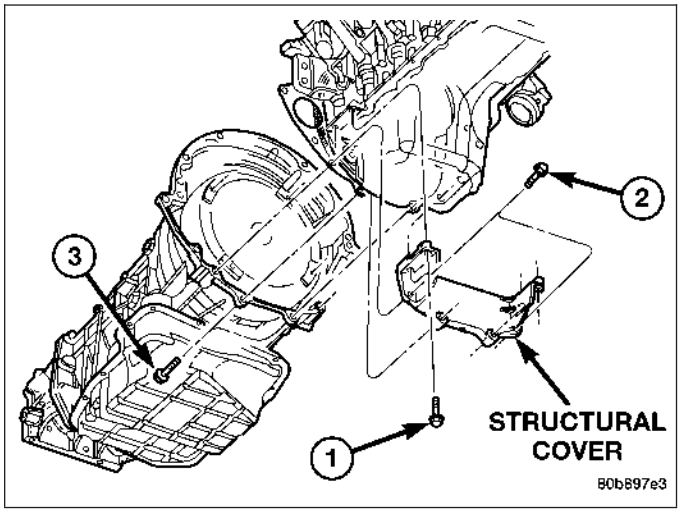


INSTALLATION - 4X4

1. Clean the oil pan gasket mating surface of the bedplate and oil pan.
2. Position the oil pan gasket and pickup tube with new o-ring. Install the mounting bolt and nuts. Tighten bolt and nuts to 28 N·m (20 ft. lbs.).
3. Position the oil pan and install the mounting bolts. Tighten the mounting bolts to 15 N·m (11 ft. lbs.) in the sequence shown.



4. Install structural dust cover (Refer to 9 - ENGINE/ ENGINE BLOCK/STRUCTURAL COVER - INSTALLATION).
5. Install oil filter.
6. Install front axle. Refer to DIFFERENTIAL AND DRIVELINE.
7. Lower vehicle.
8. Fill engine oil.
9. Start engine check for leaks.



SWITCH - OIL PRESSURE

DESCRIPTION

The 3–wire, electrical/mechanical engine oil pressure sensor (sending unit) is located in an engine oil pressure gallery.

OPERATION

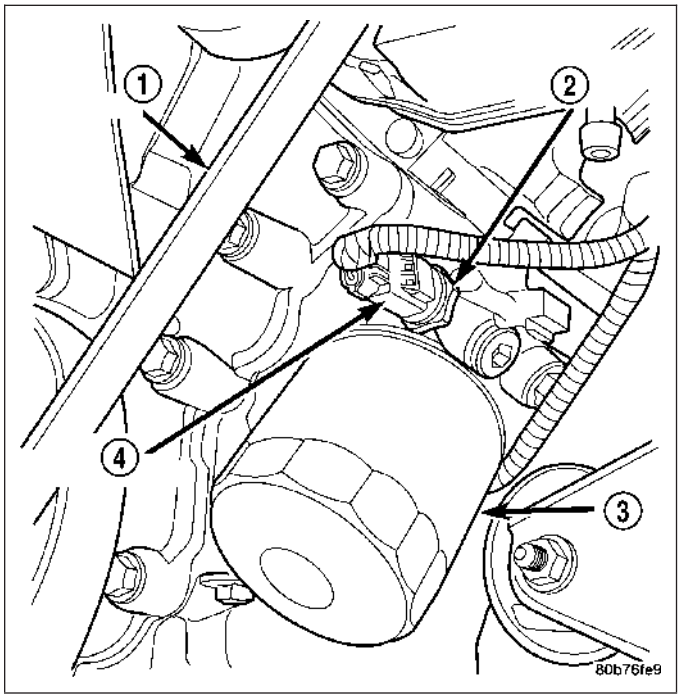
The oil pressure sensor uses two circuits. They are:

- A signal to the PCM relating to engine oil pressure
- A sensor ground through the PCM's sensor return

The oil pressure sensor returns a voltage signal back to the PCM relating to engine oil pressure. This signal is then transferred (bussed) to the instrument panel on a CCD bus circuit to operate the oil pressure gauge and the check gauges lamp. Ground for the sensor is provided by the PCM through a low-noise sensor return.

REMOVAL

1. Disconnect the negative cable from the battery.
2. Raise vehicle on hoist.
3. Remove front splash shield.
4. Disconnect oil pressure sender wire (4).
5. Remove the pressure sender (2).



INSTALLATION

1. Install oil pressure sender.
2. Connect oil pressure sender wire.
3. Install front splash shield.
4. Lower vehicle.
5. Connect the negative battery cable.

PUMP - ENGINE OIL

REMOVAL

1. Remove the oil pan and pick-up tube (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).
2. Remove the timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).

3. Remove the timing chains and tensioners (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).
4. Remove the four bolts, primary timing chain tensioner and the oil pump.

DISASSEMBLY

1. Remove oil pump cover screws and lift off cover plate.
2. Remove pump inner and outer rotors.

NOTE: Once the oil pressure relief valve, cup plug, and pin are removed, the pump assembly must be replaced.

3. If it is necessary to remove the pressure relief valve, drive the roll pin from pump housing and remove cup plug, spring and valve.

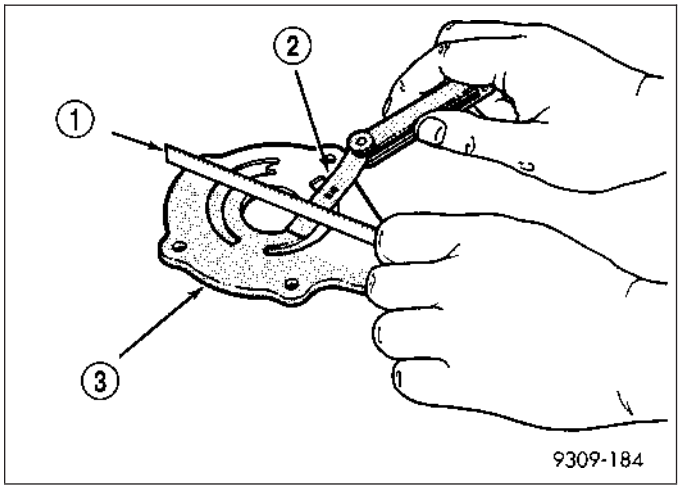
CLEANING

1. Wash all parts in a suitable solvent.

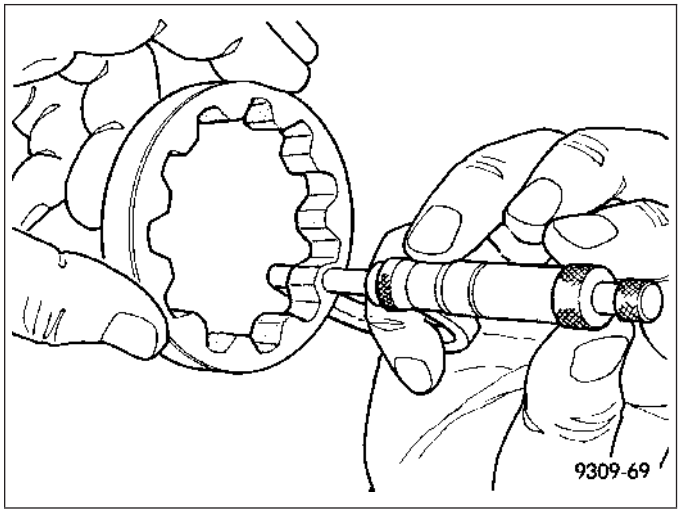
INSPECTION

CAUTION: Oil pump pressure relief valve and spring should not be removed from the oil pump. If these components are disassembled and or removed from the pump the entire oil pump assembly must be replaced.

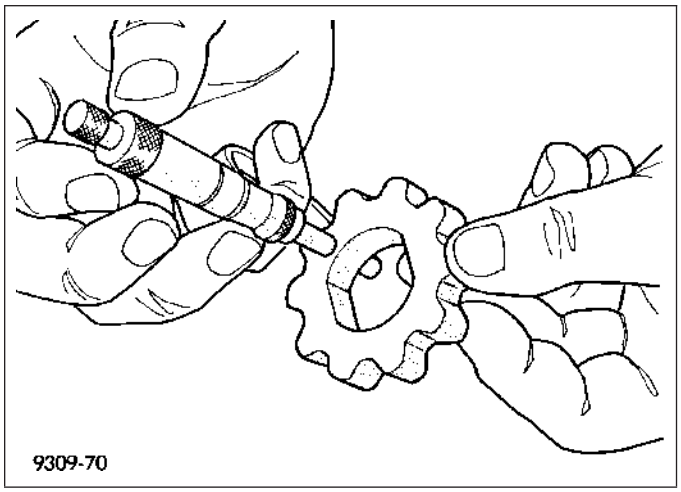
1. Clean all parts thoroughly. Mating surface of the oil pump housing should be smooth. If the pump cover is scratched or grooved the oil pump assembly should be replaced.
2. Lay a straight edge across the pump cover surface (3). If a 0.025 mm (0.001 in.) feeler gauge (2) can be inserted between the cover and the straight edge the oil pump assembly should be replaced.



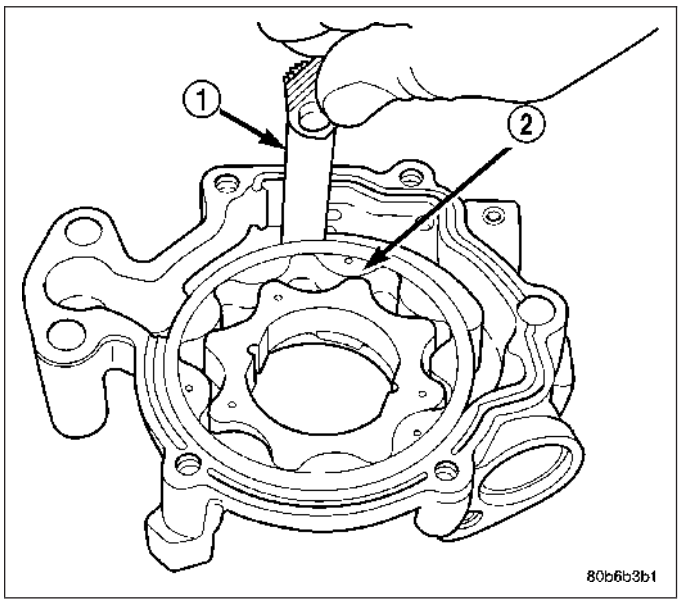
3. Measure the thickness of the outer rotor. If the outer rotor thickness measures at 12.005 mm (0.472 in.) or less the oil pump assembly must be replaced.
4. Measure the diameter of the outer rotor. If the outer rotor diameter measures at 85.925 mm (3.382 in.) or less the oil pump assembly must be replaced.



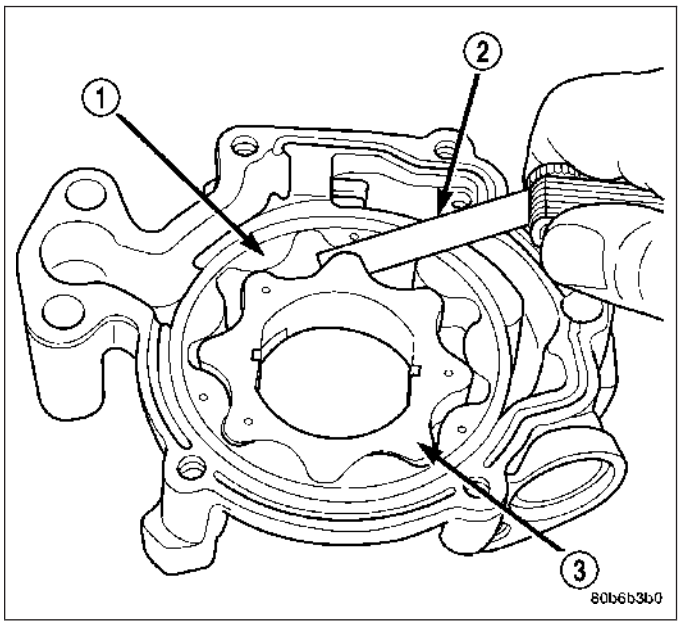
5. Measure the thickness of the inner rotor. If the inner rotor thickness measures at 12.005 mm (0.472 in.) or less then the oil pump assembly must be replaced.



6. Slide outer rotor (2) into the body of the oil pump. Press the outer rotor to one side of the oil pump body and measure clearance between the outer rotor and the body. If the measurement is 0.235mm (0.009 in.) or more the oil pump assembly must be replaced.

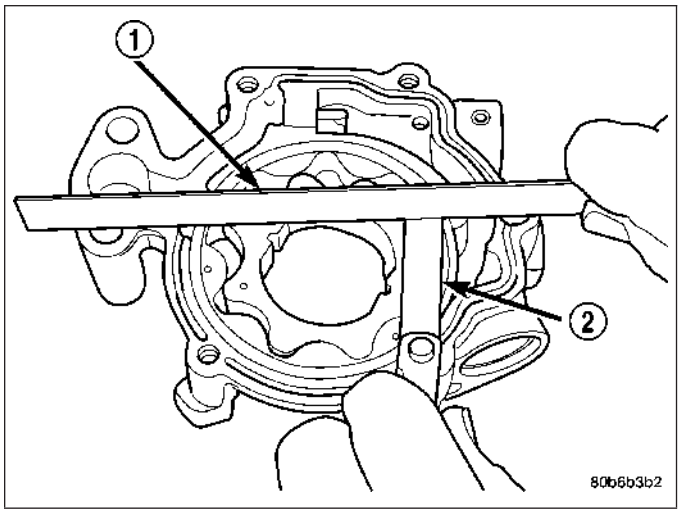


7. Install the inner rotor in the into the oil pump body. Measure the clearance between the inner (3) and outer (1) rotors. If the clearance between the rotors is .150 mm (0.006 in.) or more the oil pump assembly must be replaced.



8. Place a straight edge (1) across the body of the oil pump (between the bolt holes), if a feeler gauge (2) of .095 mm (0.0038 in.) or greater can be inserted between the straightedge and the rotors, the pump must be replaced.

NOTE: The 3.7L/4.7L Oil pump is released as an assembly. There are no DaimlerChrysler part numbers for Sub-Assembly components. In the event the oil pump is not functioning or out of specification it must be replaced as an assembly.

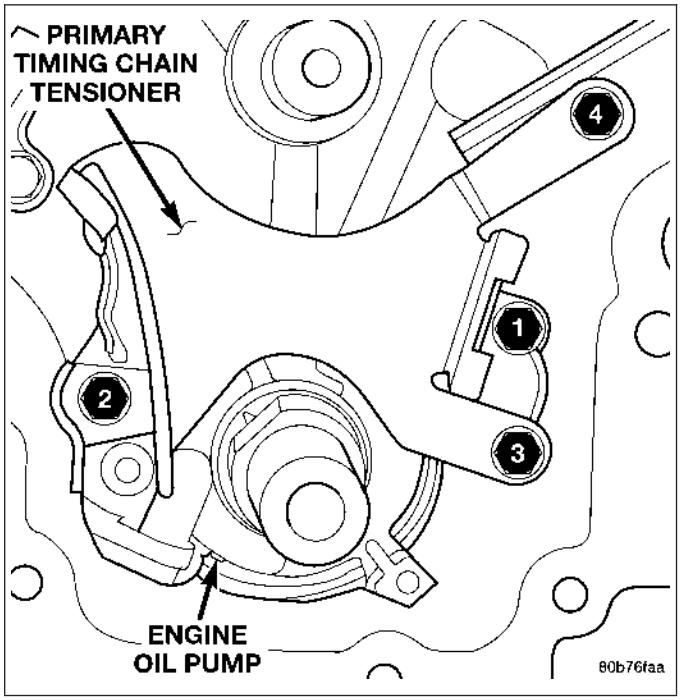


ASSEMBLY

1. Wash all parts in a suitable solvent and inspect carefully for damage or wear.
2. Install inner and outer rotors
3. Install oil pump cover plate and install cover bolts and tighten them to 12 N·m (105 in. lbs.).
4. Prime oil pump before installation by filling rotor cavity with engine oil.
5. If oil pressure is low and pump is within specifications, inspect for worn engine bearings or other causes for oil pressure loss.

INSTALLATION

1. Position the oil pump onto the crankshaft and install one oil pump retaining bolts.
2. Position the primary timing chain tensioner and install three retaining bolts.
3. Tighten the oil pump and primary timing chain tensioner retaining bolts to 28 N·m (250 in. lbs.) in the sequence shown.
4. Install the secondary timing chain tensioners and timing chains (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).
5. Install the timing chain cover (Refer to 9 - ENGINE/ VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION).
6. Install the pick-up tube and oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).



MANIFOLD - INTAKE

DESCRIPTION

The intake manifold is made of a composite material and features long runners which maximizes low end torque. The intake manifold uses single plane sealing which consist of eight individual press in place port gaskets to prevent leaks. Eight studs and two bolts are used to fasten the intake to the head.

DIAGNOSIS AND TESTING - INTAKE MANIFOLD LEAKAGE

An intake manifold air leak is characterized by lower than normal manifold vacuum. Also, one or more cylinders may not be functioning.

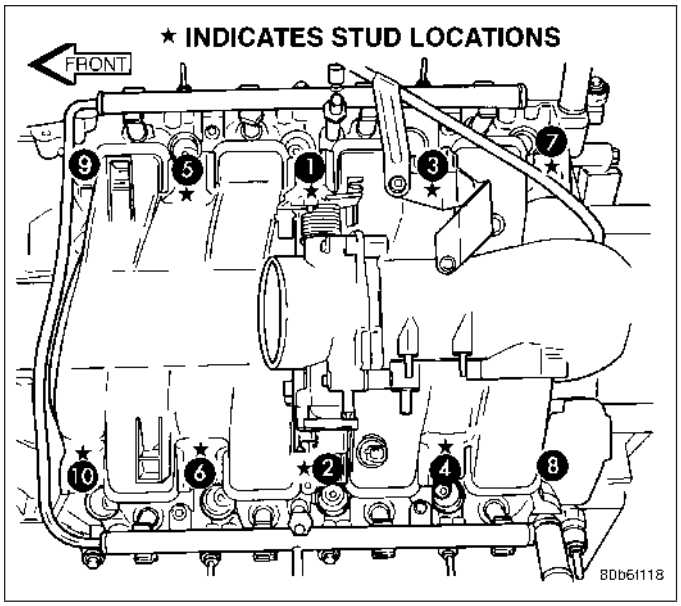
WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING. DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR THE FAN. DO NOT WEAR LOOSE CLOTHING.

1. Start the engine.
2. Spray a small stream of water at the suspected leak area.
3. If a change in RPM is observed the area of the suspected leak has been found.
4. Repair as required.

REMOVAL

1. Disconnect negative cable from battery.
2. Remove the wiper module (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER MODULE - REMOVAL).
3. Remove resonator assembly and air inlet hose.
4. Disconnect throttle and speed control cables.
5. Disconnect electrical connectors for the following components:
   - Manifold Absolute Pressure (MAP) Sensor
   - Intake Air Temperature (IAT) Sensor
   - Throttle Position (TPS) Sensor
   - Coolant Temperature (CTS) Sensor
   - Idle Air Control (IAC) Motor
6. Disconnect brake booster hose and positive crankcase ventilation (PCV) hose.
7. Disconnect generator electrical connections.
8. Disconnect air conditioning compressor electrical connections.
9. Disconnect left and right radio suppressor straps.
10. Disconnect and remove ignition coil towers (Refer to 8 - ELECTRICAL/IGNITION CONTROL/IGNITION COIL - REMOVAL).
11. Remove top oil dipstick tube retaining bolt and ground strap.
12. Bleed fuel system (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - STANDARD PROCEDURE).
13. Remove fuel rail (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/FUEL RAIL - REMOVAL).
14. Remove throttle body assembly and mounting bracket.
15. Drain cooling system below coolant temperature level (Refer to 7 - COOLING - STANDARD PROCEDURE).
16. Remove the heater hoses from the engine front cover and the heater core.
17. Unclip and remove heater hoses and tubes from intake manifold.
18. Remove coolant temperature sensor (Refer to 7 - COOLING/ENGINE/ENGINE COOLANT TEMPERATURE SENSO - REMOVAL).

19. Remove intake manifold retaining fasteners in reverse order of tightening sequence.
20. Remove intake manifold.



CLEANING

NOTE: There is NO approved repair procedure for the intake manifold. If severe damage is found during inspection, the intake manifold must be replaced.

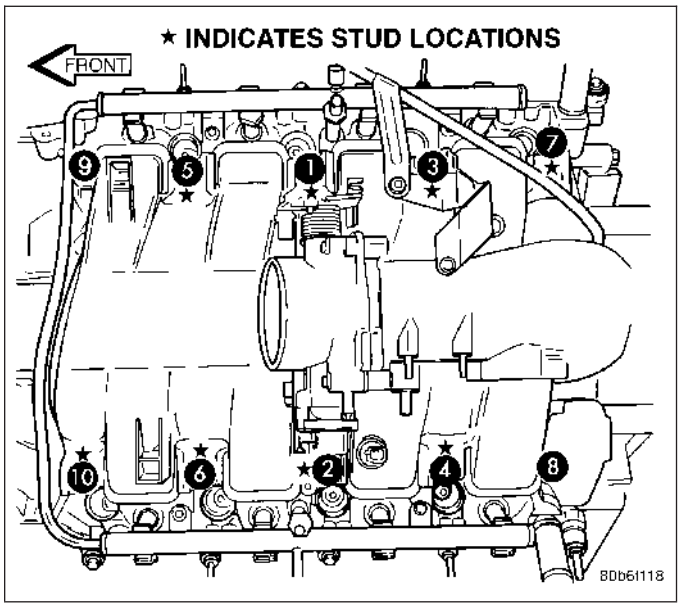
Before installing the intake manifold thoroughly clean the mating surfaces. Use a suitable cleaning solvent, then air dry.

INSPECTION

1. Inspect the intake sealing surface for cracks, nicks and distortion.
2. Inspect the intake manifold vacuum hose fittings for looseness or blockage.
3. Inspect the manifold to throttle body mating surface for cracks, nicks and distortion.

INSTALLATION

1. Install intake manifold gaskets.
2. Position intake manifold.
3. Install intake manifold retaining bolts and tighten in sequence shown in to 12 N·m (105 in. lbs.).



4. Install left and right radio suppressor straps.
5. Install throttle body assembly.
6. Install throttle cable bracket.
7. Connect throttle cable and speed control cable to throttle body.
8. Install fuel rail (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/FUEL RAIL - INSTALLATION).
9. Install ignition coil towers (Refer to 8 - ELECTRICAL/IGNITION CONTROL/IGNITION COIL - INSTALLATION).
10. Position and install heater hoses and tubes onto intake manifold.
11. Install the heater hoses to the heater core and engine front cover.
12. Connect electrical connectors for the following components:
    - Manifold Absolute Pressure (MAP) Sensor
    - Intake Air Temperature (IAT) Sensor
    - Throttle Position (TPS) Sensor
    - Coolant Temperature (CTS) Sensor
    - Idle Air Control (IAC) Motor
    - Ignition coil towers
    - Fuel injectors
13. Install top oil dipstick tube retaining bolt and ground strap.
14. Connect generator electrical connections.
15. Connect Brake booster hose and Positive crankcase ventilation (PCV) hose.
16. Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
17. Install the wiper module (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER MODULE - INSTALLATION).
18. Install resonator assembly and air inlet hose.
19. Connect negative cable to battery.

MANIFOLD - EXHAUST

DESCRIPTION

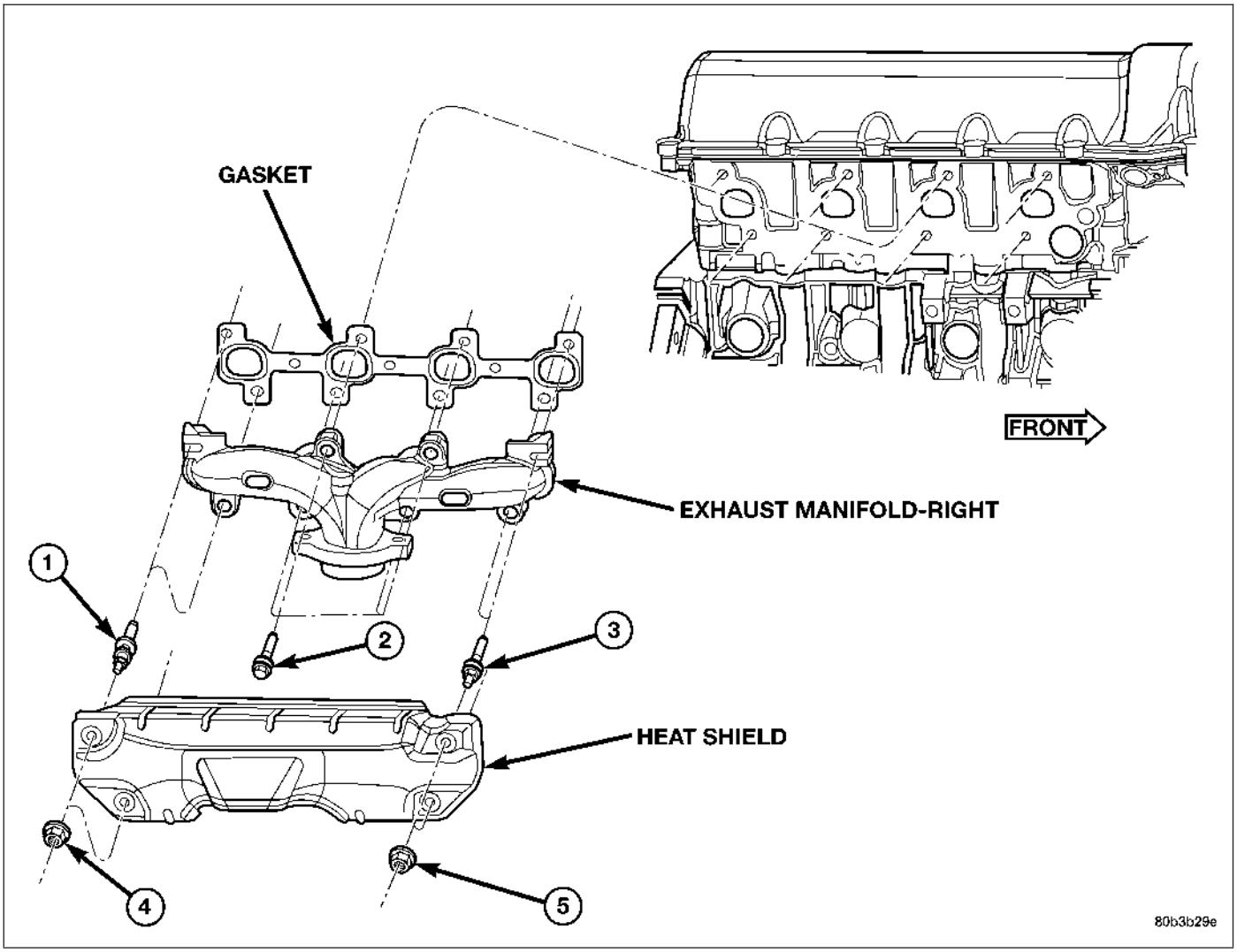
The exhaust manifolds are log style with a patented flow enhancing design to maximize performance. The exhaust manifolds are made of high silicon molybdenum cast iron. A perforated core graphite exhaust manifold gasket is used to improve sealing to the cylinder head. The exhaust manifolds are covered by a three layer laminated heat shield for thermal protection and noise reduction. The heat shields are fastened with a torque prevailing nut that is backed off slightly to allow for the thermal expansion of the exhaust manifold.

REMOVAL

RIGHT EXHAUST MANIFOLD

1. Disconnect negative cable for battery.
2. Remove air cleaner assembly, resonator assembly and air inlet hose.
3. Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
4. Remove A/C compressor (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/A/C COMPRESSOR - REMOVAL).
5. Remove A/C accumulator support bracket fastener.
6. Drain coolant below heater hose level (Refer to 7 - COOLING - STANDARD PROCEDURE).
7. Remove heater hoses at engine.
8. Remove fasteners attaching exhaust manifold heat shield.
9. Remove heat shield.
10. Remove upper exhaust manifold attaching fasteners.
11. Raise vehicle on hoist.
12. Disconnect exhaust pipe from manifold.

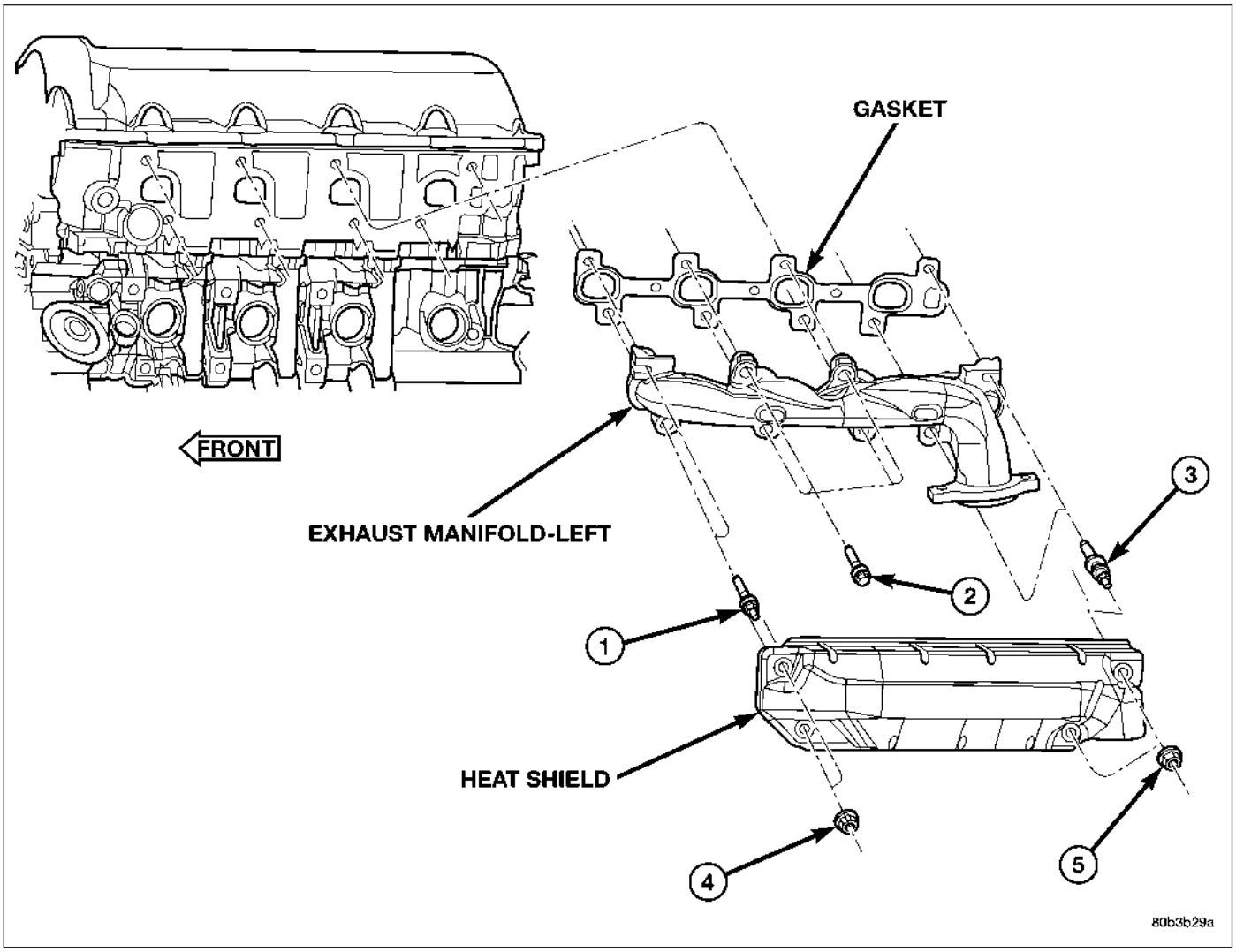
13. Remove fasteners attaching starter. Move starter aside.
14. Remove lower exhaust manifold attaching fasteners.



15. Remove exhaust manifold and gasket. Manifold is removed from below the engine compartment.

LEFT EXHAUST MANIFOLD

1. Disconnect negative cable for battery.
2. Hoist vehicle.
3. Disconnect exhaust pipe at manifold.
4. Lower vehicle.
5. Remove the front two exhaust heat shield retaining fasteners. Raise vehicle and remove the fasteners at rear of heat shield.



6. Remove heat shield.
7. Lower vehicle and remove the upper exhaust manifold retaining bolts.
8. Raise vehicle and remove the lower exhaust manifold retaining bolts.
9. Remove exhaust manifold and gasket. Manifold is removed from below the engine compartment.

CLEANING

1. Clean the exhaust manifold using a suitable cleaning solvent, then allow to air dry.
2. Clean all gasket residue from the manifold mating surface.

INSPECTION

1. Inspect the exhaust manifold for cracks in the mating surface and at every mounting bolt hole.
2. Using a straight edge and a feeler gauge, check the mating surface for warp and twist.
3. Inspect the manifold to exhaust pipe mating surface for cracks, gouges, or other damage that would prevent sealing.

INSTALLATION

RIGHT EXHAUST MANIFOLD

1. Install exhaust manifold and gasket from below engine compartment.
2. Install lower exhaust manifold fasteners. DO NOT tighten until all fasteners are in place.

3. Lower vehicle and install upper exhaust manifold fasteners. Tighten all manifold bolts starting at center and working outward to 25 N·m (18 ft. lbs.).

CAUTION: Over tightening heat shield fasteners, may cause shield to distort and/or crack.

4. Install exhaust manifold heat shield. Tighten fasteners to 8 N·m (72 in. lbs.), then loosen 45 degrees.
5. Install starter and fasteners.
6. Connect exhaust pipe to manifold.
7. Connect heater hoses at engine.
8. Install fastener attaching A/C accumulator.
9. Install A/C compressor and fasteners.
10. Install accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).
11. Install air cleaner assembly, resonator assembly and air inlet hose.
12. Install battery and connect cables.
13. Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).

LEFT EXHAUST MANIFOLD

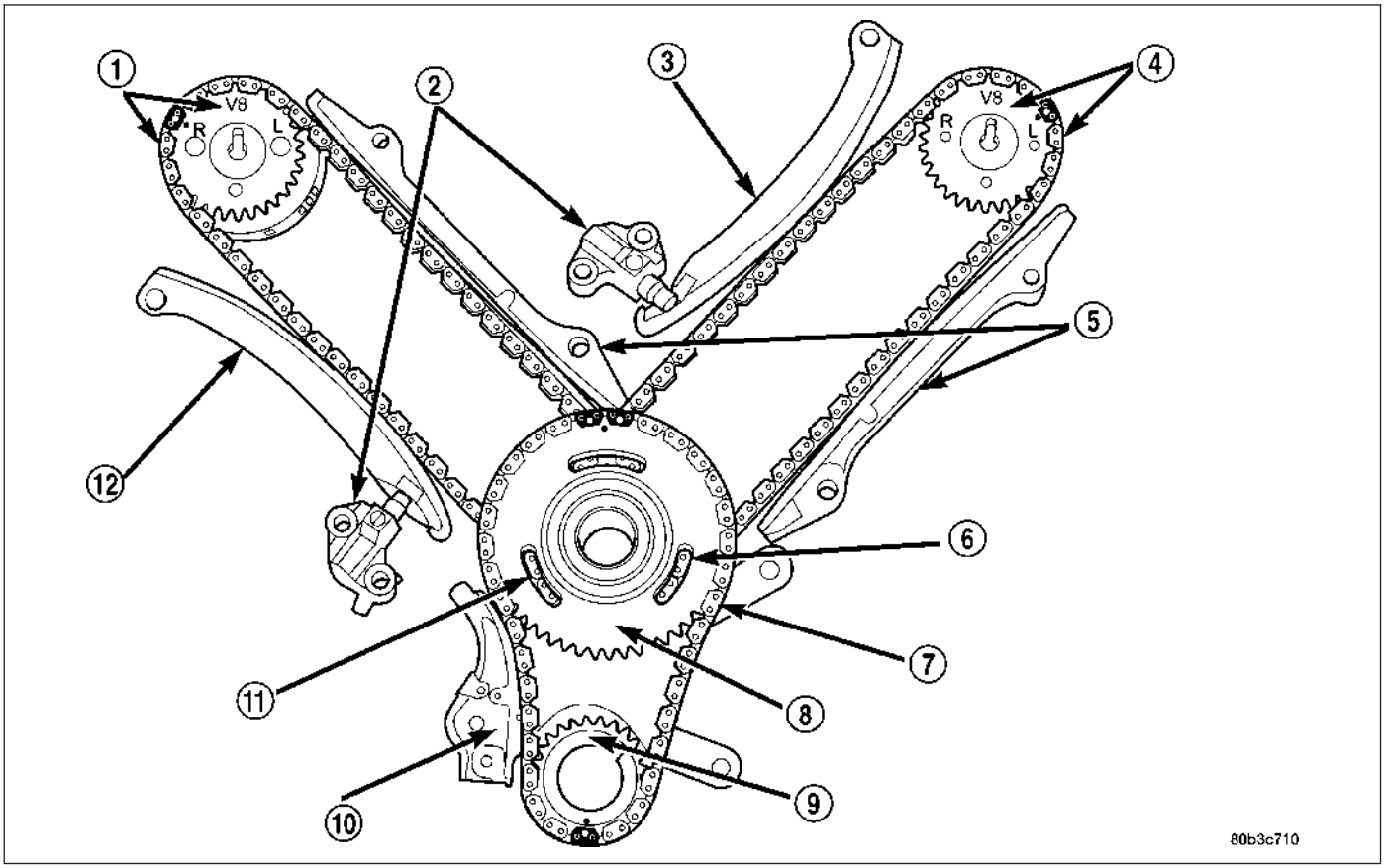
1. Install exhaust manifold and gasket from below engine compartment.
2. Install lower exhaust manifold fasteners. DO NOT tighten until all fasteners are in place.
3. Lower vehicle and install upper exhaust manifold fasteners. Tighten all manifold bolts starting at center and working outward to 25 N·m (18 ft. lbs.).

CAUTION: Over tightening heat shield fasteners, may cause shield to distort and/or crack.

4. Install exhaust manifold heat shield. Tighten fasteners to 8 N·m (72 in. lbs.), then loosen 45 degrees.
5. Connect exhaust pipe to manifold.
6. Connect negative cable to battery.

VALVE TIMING

DESCRIPTION - TIMING DRIVE SYSTEM



The timing drive system has been designed to provide quiet performance and reliability to support a **non-free wheeling** engine. Specifically the intake valves are non-free wheeling and can be easily damaged with forceful engine rotation if camshaft-to-crankshaft timing is incorrect. The timing drive system consists of a primary chain and two secondary timing chain drives.

OPERATION - TIMING DRIVE SYSTEM

The primary timing chain is a single inverted tooth type. The primary chain drives the large fifty tooth idler sprocket directly from a 25 tooth crankshaft sprocket. Primary chain motion is controlled by a pivoting leaf spring tensioner arm and a fixed guide. The arm and the guide both use nylon plastic wear faces for low friction and long wear. The primary chain receives oil splash lubrication from the secondary chain drive and oil pump leakage. The idler sprocket assembly connects the primary and secondary chain drives. The idler sprocket assembly consists of two integral thirty tooth sprockets and a fifty tooth sprocket that is splined to the assembly. The spline joint is a non – serviceable press fit anti rattle type. The idler sprocket assembly spins on a stationary idler shaft. The idler shaft is press-fit into the cylinder block. A large washer on the idler shaft bolt and the rear flange of the idler shaft are used to control sprocket thrust movement. Pressurized oil is routed through the center of the idler shaft to provide lubrication for the two bushings used in the idler sprocket assembly.

There are two secondary drive chains, both are inverted tooth type, one to drive the camshaft in each SOHC cylinder head. There are no shaft speed changes in the secondary chain drive system. Each secondary chain drives a thirty tooth cam sprocket directly from the thirty tooth sprocket on the idler sprocket assembly. A fixed chain guide and a hydraulic oil damped tensioner are used to maintain tension in each secondary chain system. The hydraulic tensioners for the secondary chain systems are fed pressurized oil from oil reservoir pockets in the block. Each tensioner also has a mechanical ratchet system that limits chain slack if the tensioner piston bleeds down after engine shut down. The tensioner arms and guides also utilize nylon wear faces for low friction and long wear. The secondary timing chains receive lubrication from a small orifice in the tensioners. This orifice is protected from clogging by a fine mesh screen which is located on the back of the hydraulic tensioners.

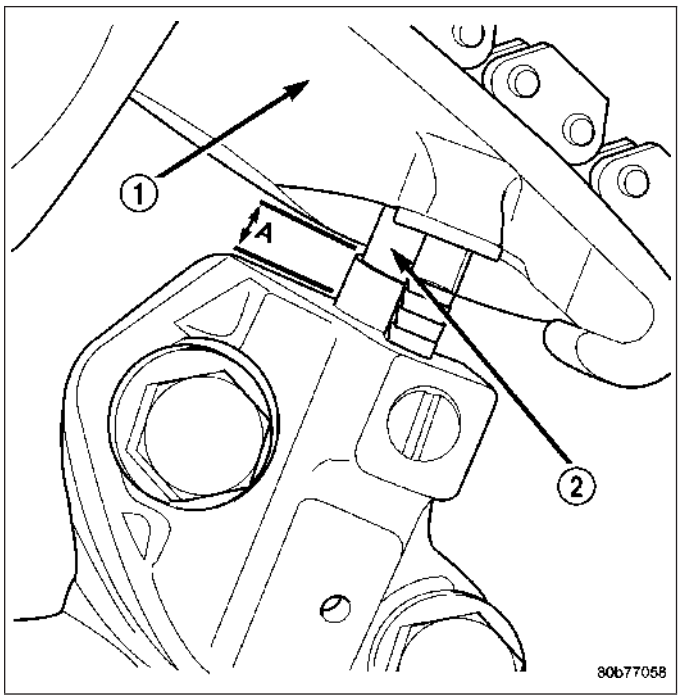
STANDARD PROCEDURE

STANDARD PROCEDURE - MEASURING TIMING CHAIN WEAR

NOTE: This procedure must be performed with the timing chain cover removed.

1. Remove the timing chain cover. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).
2. To determine if the secondary timing chains are worn, rotate the engine clockwise until maximum tensioner piston (2) extension is obtained. Measure the distance between the secondary timing chain tensioner housing and the step ledge on the piston. The measurement at point (A) must be less than 15mm (0.5906 inches).
3. If the measurement exceeds the specification the secondary timing chains are worn and require replacement. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).

NOTE: If the secondary chains are to be replaced the primary chain must also be replaced.



STANDARD PROCEDURE - ENGINE TIMING - VERIFICATION

CAUTION: The 4.7L is a non free-wheeling design engine. Therefore, correct engine timing is critical.

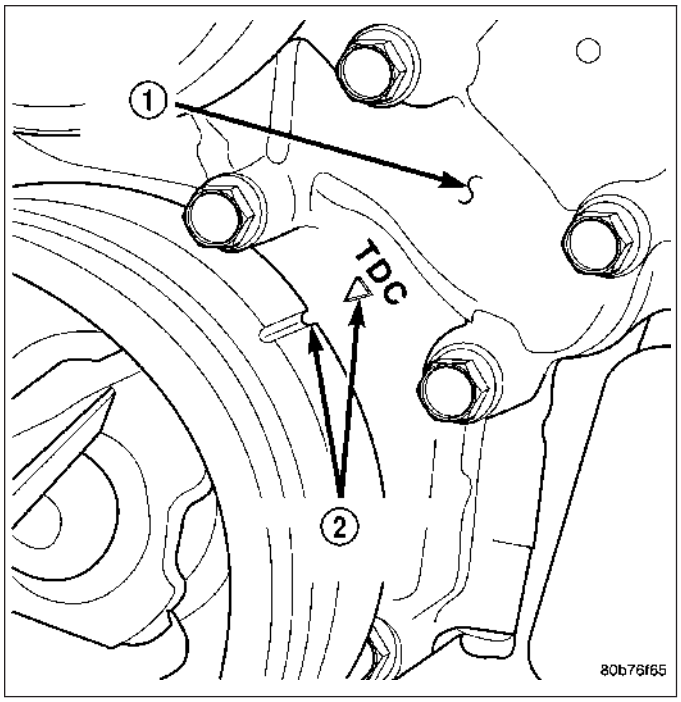
NOTE: Components referred to as left hand or right hand are as viewed from the drivers position inside the vehicle.

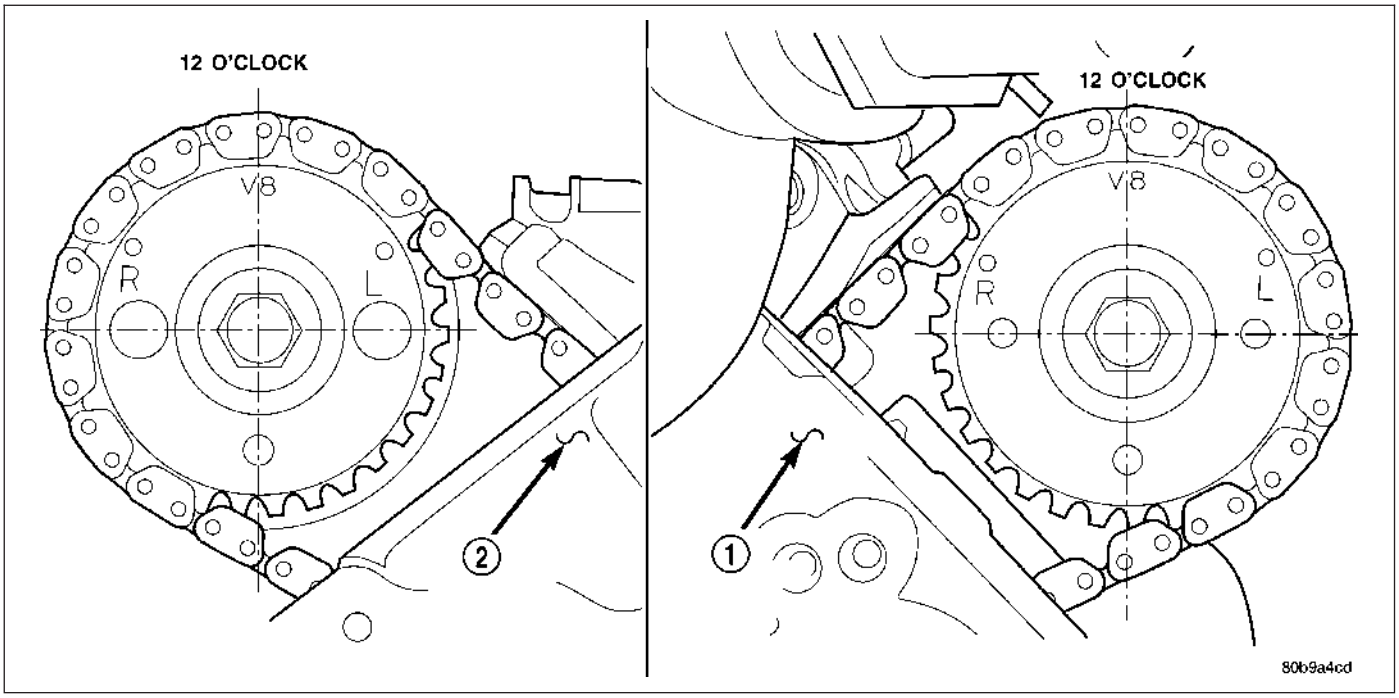
NOTE: The blue link plates on the chains and the dots on the camshaft drive sprockets may not line up during the timing verification procedure. The blue link plates are lined up with the sprocket dots only when re-timing the complete timing drive. Once the timing drive is rotated blue link-to-dot alignment is no longer valid.

Engine base timing can be verified by the following procedure:

1. Remove the cylinder head covers (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).

2. Using a mirror, locate the TDC arrow on the front cover. Rotate the crankshaft until the mark on the crankshaft damper is aligned with the TDC arrow on the front cover. The engine is now at TDC.

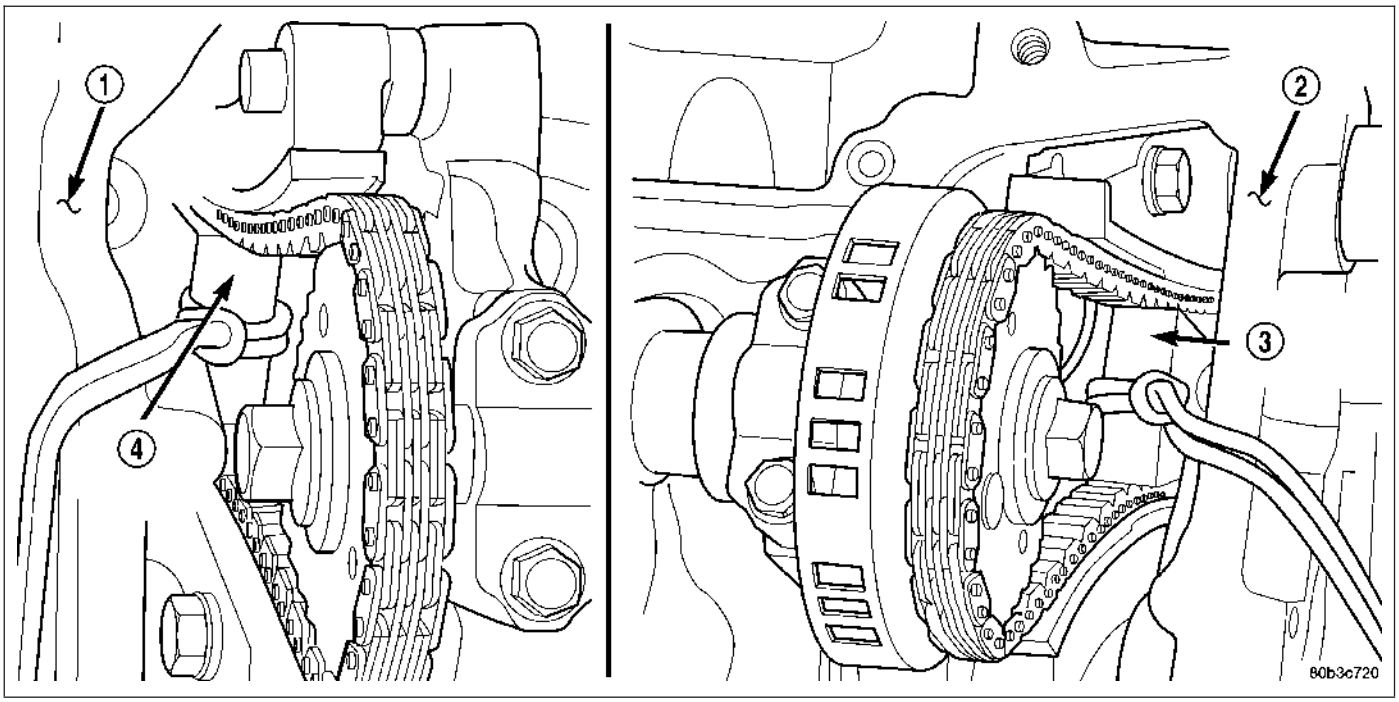




3. Note the location of the V8 mark stamped into the camshaft drive gears. If the V8 mark on each camshaft drive gear is at the twelve o'clock position, the engine is at TDC (cylinder #1) on the exhaust stroke. If the V8 mark on each gear is at the six o'clock position, the engine is at TDC (cylinder #1) on the compression stroke.
4. If both of the camshaft drive gears are off in the same or opposite directions, the primary chain or both secondary chains are at fault. Refer to Timing Chain and Sprockets procedure in this section.
5. If only one of the camshaft drive gears is off and the other is correct, the problem is confined to one secondary chain. Refer to Single camshaft timing, in this procedure.
6. If both camshaft drive gear V8 marks are at the twelve o'clock or the six o' clock position the engine base timing is correct. Reinstall the cylinder head covers.

SINGLE CAMSHAFT TIMING

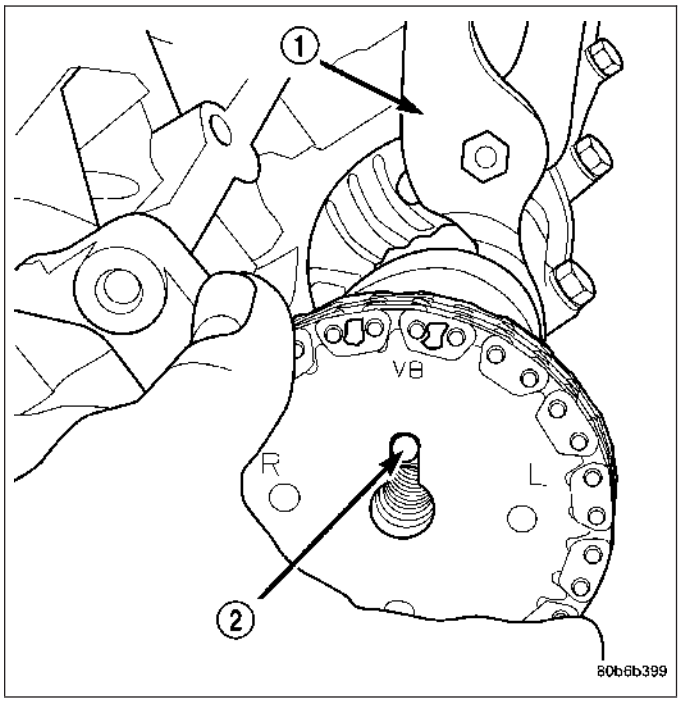
NOTE: to adjust the timing on one camshaft, peform the following procedure.



1. Using Chain Tensioner Wedge, special tool 8350 (3), stabilize the secondary chain drive. For reference purposes, mark the chain-to-sprocket position.
2. Remove the camshaft drive gear retaining bolt.
3. Carefully remove the camshaft drive gear from the camshaft.
4. Re-index the camshaft drive gear in the chain until the V8 mark is at the same position as the V8 mark on the opposite camshaft drive gear.

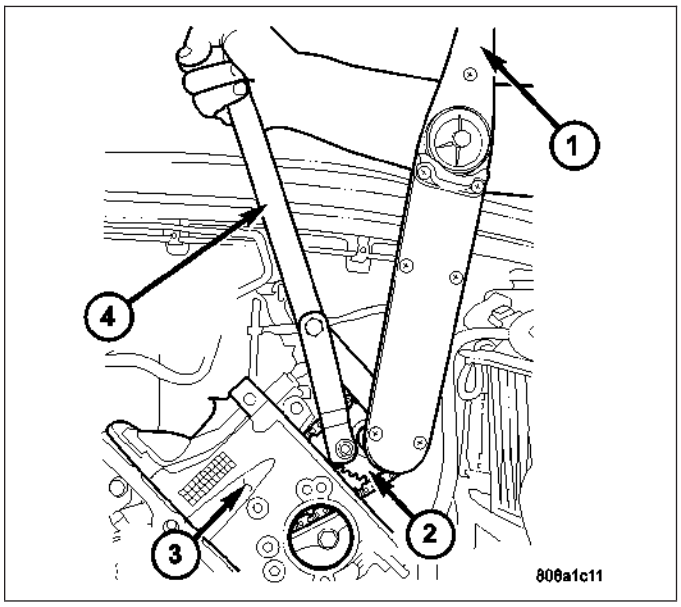
NOTE: When gripping the camshaft, place the pliers on the tube portion of the camshaft only. Do not grip the lobes or the sprocket areas.

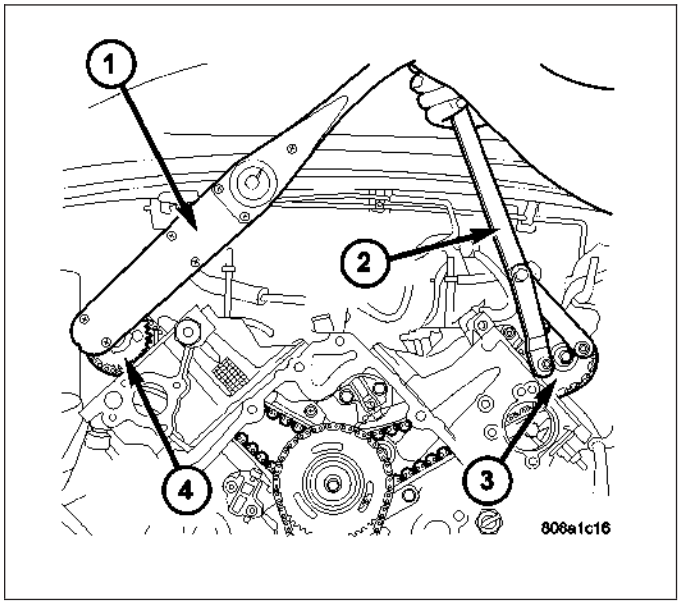
5. Using a suitable pair of adjustable pliers (1), rotate the camshaft until the alignment dowel (2) on the camshaft is aligned with the slot in the camshaft drive gear.

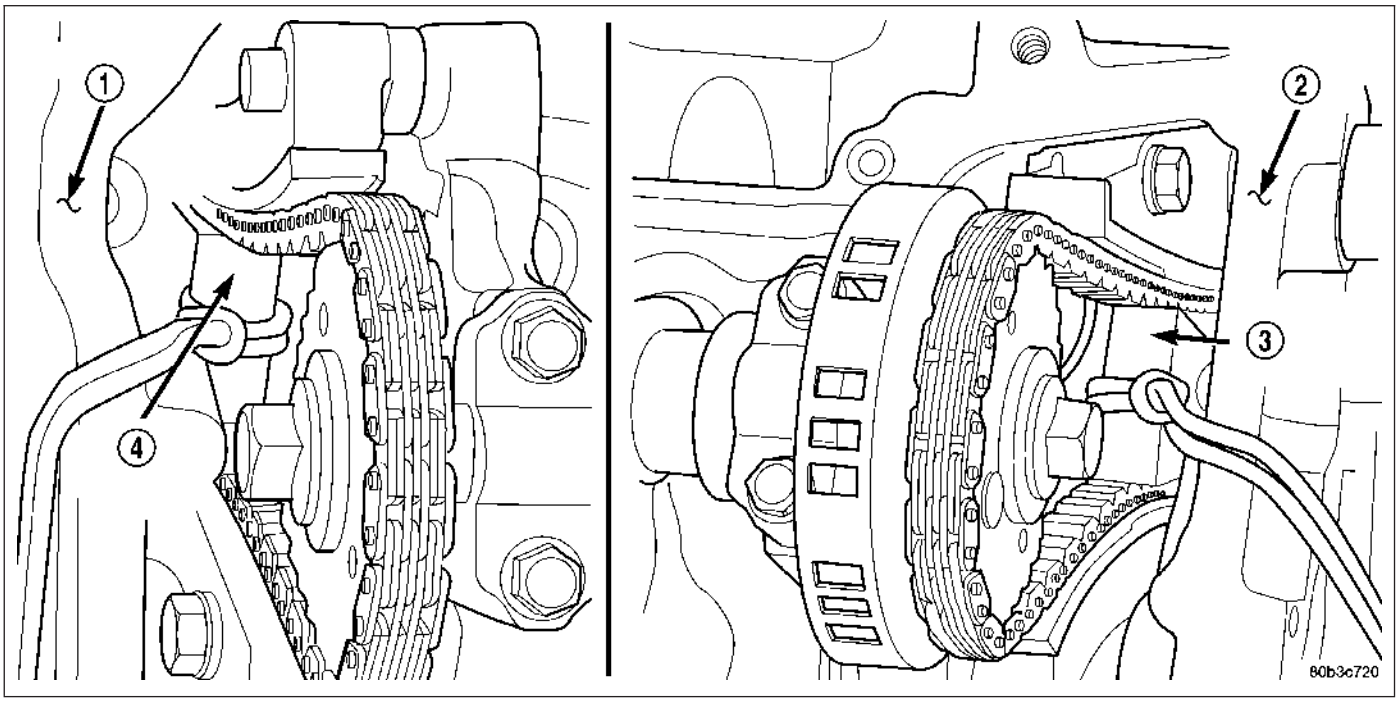


CAUTION: Remove excess oil from camshaft sprocket retaining bolt before reinstalling bolt. Failure to do so may cause over-torqueing of bolt resulting in bolt failure.

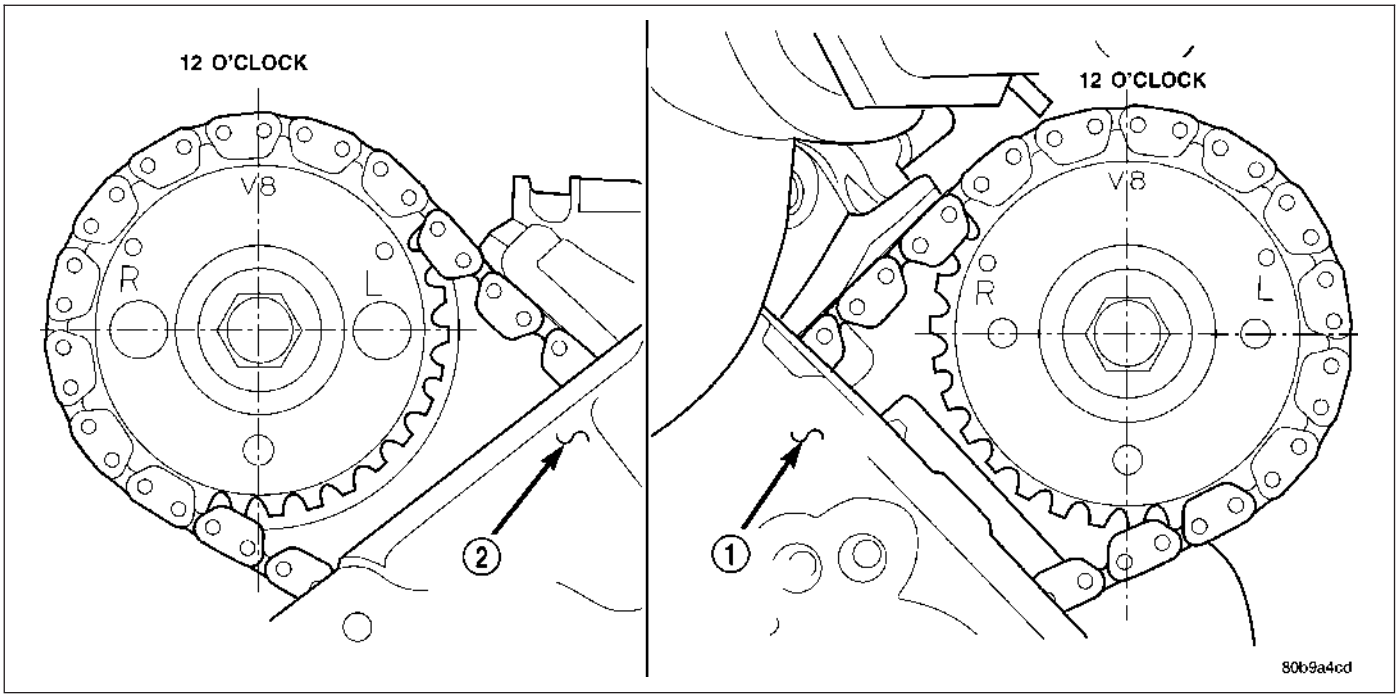
6. Position the camshaft drive gear onto the camshaft, remove oil from bolt then install the retaining bolt. Using Special Tools, Spanner Wrench 6958 with Adapter Pins 8346 and a suitable torque wrench (1), Tighten retaining bolt to 122N·m (90 ft. Lbs.).







7. Remove special tool 8350 (3,4).

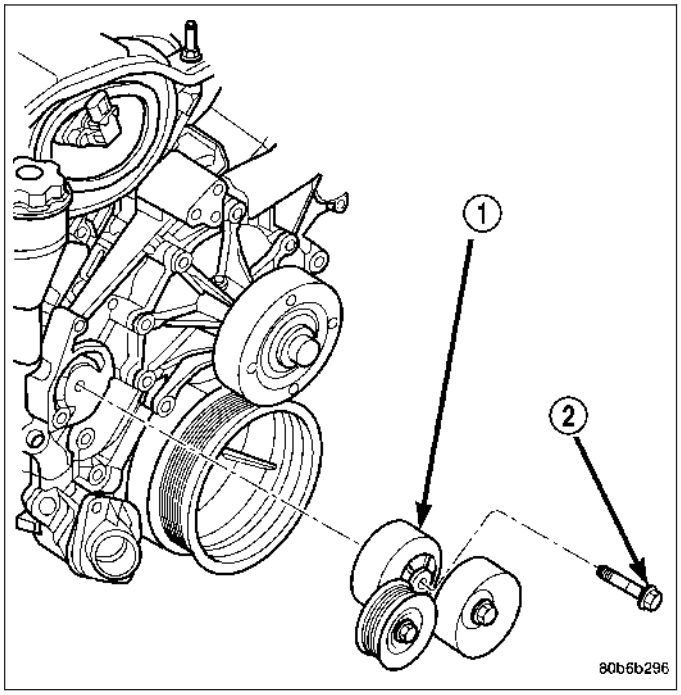


8. Rotate the crankshaft two full revolutions, then reverify that the camshaft drive gear V8 marks are in fact aligned.
9. Install the cylinder head covers (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).

COVER(S)-TIMING BELT / CHAIN

REMOVAL

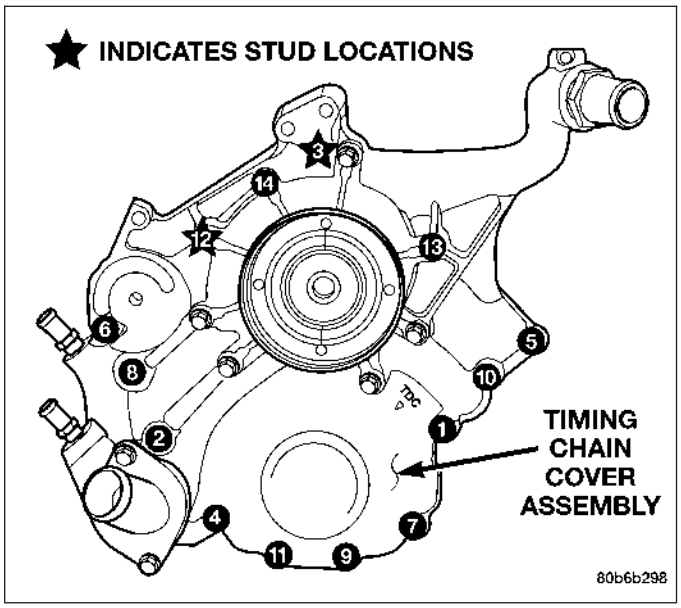
1. Disconnect the battery negative cable.
2. Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
3. Disconnect both heater hoses at timing cover.
4. Disconnect lower radiator hose at engine.
5. Remove crankshaft damper (Refer to 9 - ENGINE/ ENGINE BLOCK/VIBRATION DAMPER - REMOVAL).
6. Remove accessory drive belt tensioner assembly (1).
7. Remove the generator and A/C compressor.



CAUTION: The 4.7L engine uses an RTV sealer instead of a gasket to seal the front cover to the engine block, from the factory. For service, Mopar® Grey Engine RTV sealant must be substituted.

NOTE: It is not necessary to remove the water pump for timing cover removal.

8. Remove the bolts holding the timing cover to engine block.
9. Remove cover.



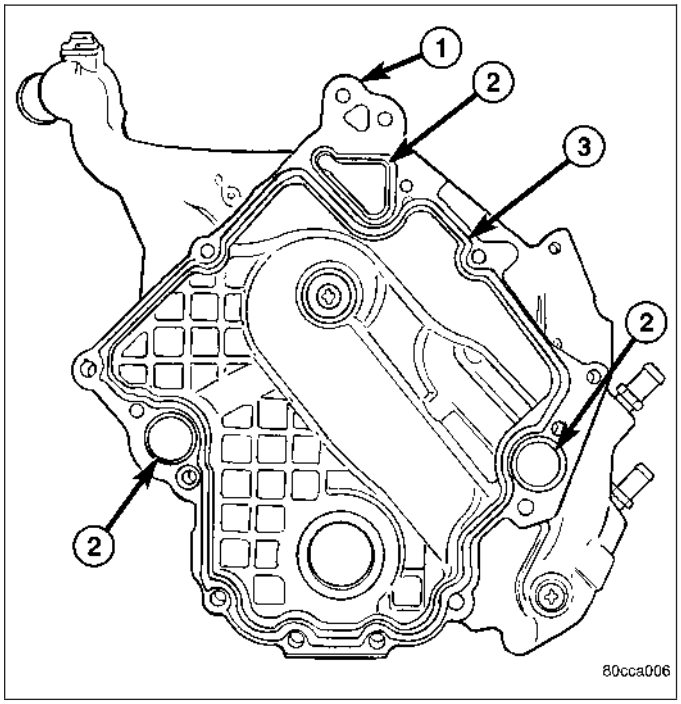
INSTALLATION

CAUTION: Do not use oil based liquids to clean timing cover or block surfaces. Use only rubbing alcohol, along with plastic or wooden scrapers. Use no wire brushes or abrasive wheels or metal scrapers, or damage to surfaces could result.

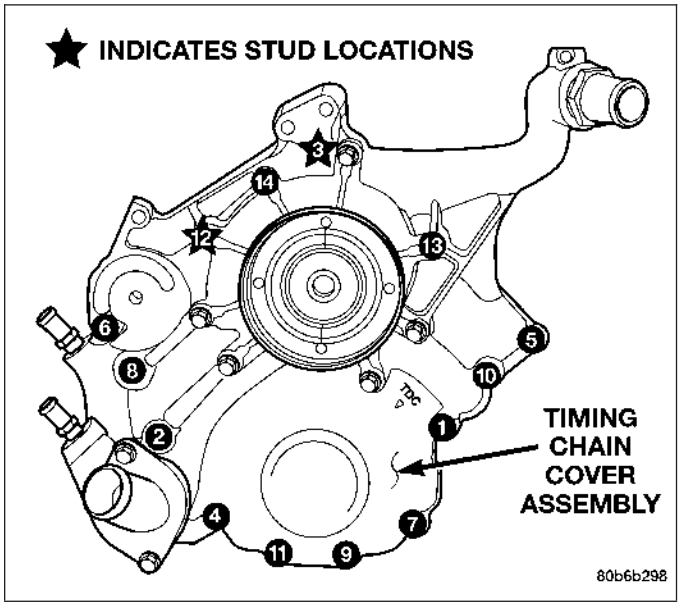
1. Clean timing chain cover and block surface using rubbing alcohol.

CAUTION: The 4.7L can use a special RTV sealer instead of a carrier gasket to seal the timing cover to the engine block, from the factory. For service repairs, Mopar® Grey Engine RTV must be used as a substitute, if RTV is present. If the front cover being used has no provisions for the water passage o-rings, then Mopar® Grey Engine RTV must be applied around the water passages.

2. Inspect the water passage o-rings, if equipped for any damage, and replace as necessary.
3. Apply Mopar® Grey Engine RTV sealer to the front cover following the path above, using a 3 to 4mm thick bead.



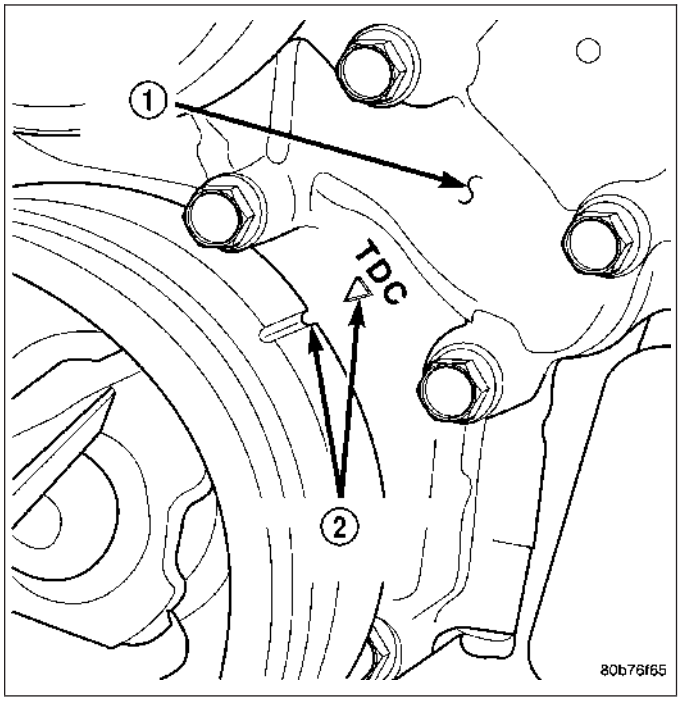
4. Install cover. Tighten flange head fasteners in sequence as shown in to 58 N·m (43 ft. lbs.).
5. Install the A/C compressor and generator.
6. Install crankshaft damper (Refer to 9 - ENGINE/ ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION).
7. Install accessory drive belt tensioner assembly. Tighten fastener to 54 N·m (40 ft. lbs.).
8. Install lower radiator hose.
9. Install both heater hoses.
10. Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
11. Connect the battery negative cable.

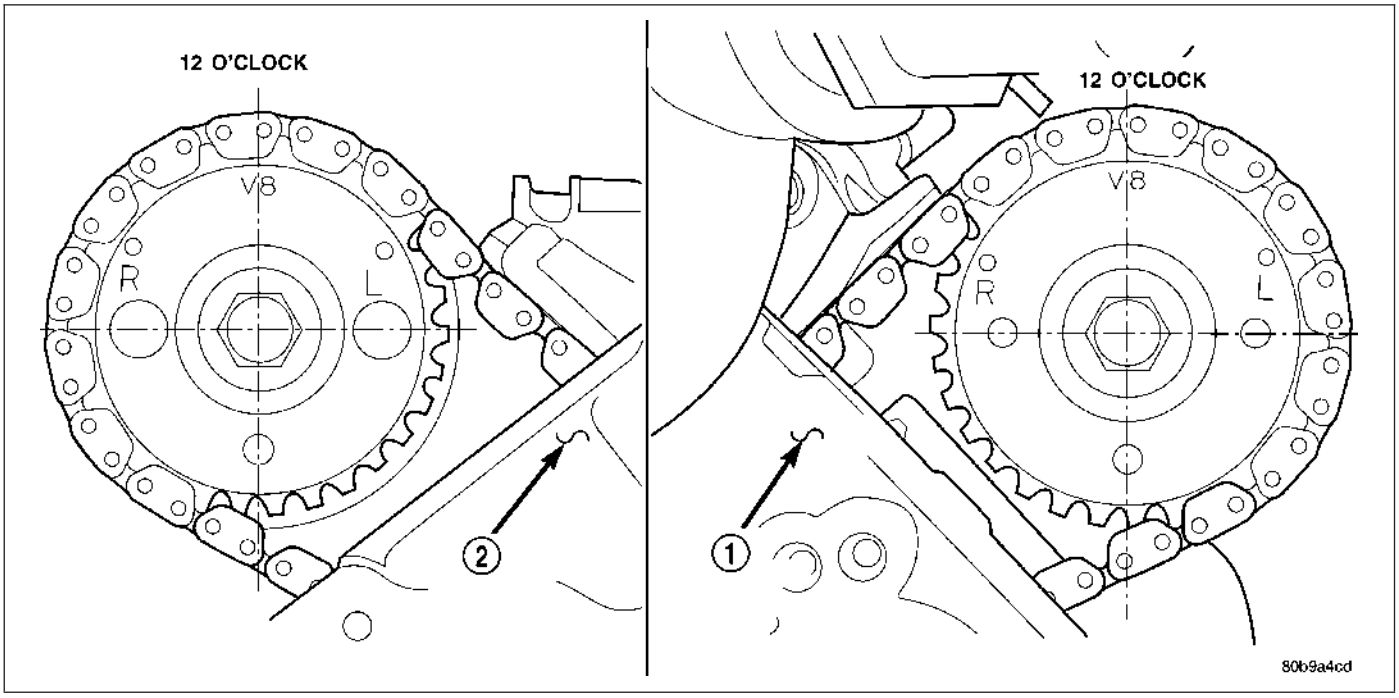


TIMING CHAIN & SPROCKETS

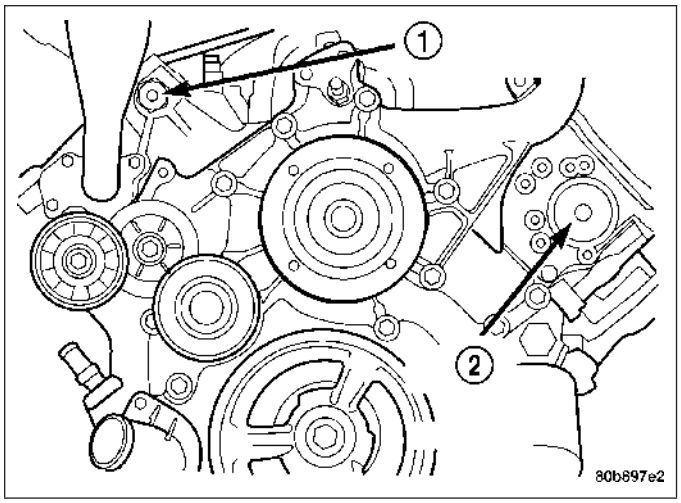
REMOVAL

1. Disconnect negative cable from battery.
2. Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
3. Remove right and left cylinder head covers (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).
4. Remove radiator fan shroud.
5. Rotate engine until timing mark (2) on crankshaft damper aligns with TDC mark on timing chain cover (2) (#1 cylinder exhaust stroke) and the camshaft sprocket “V8” marks are at the 12 o’clock position (1,2).





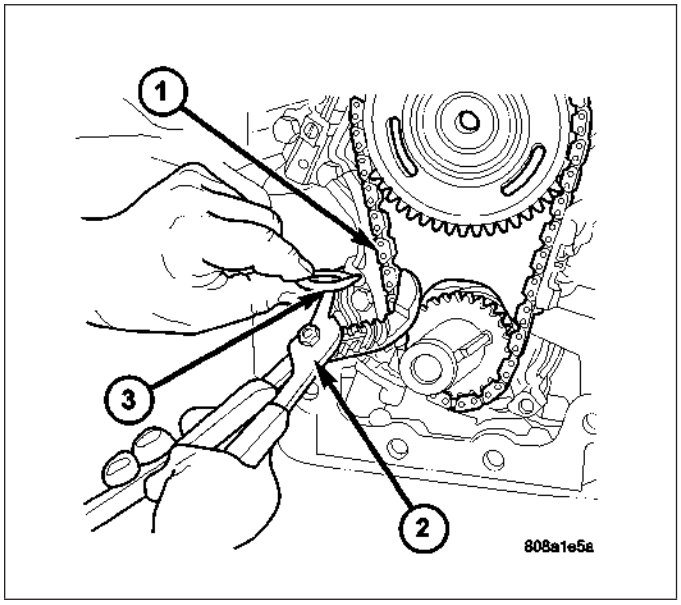
6. Remove power steering pump (Refer to 19 - STEERING/PUMP - REMOVAL).
7. Remove access plugs (1,2) from left and right cylinder heads for access to chain guide fasteners.
8. Remove the oil fill housing to gain access to the right side tensioner arm fastener.
9. Remove crankshaft damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL) and timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).



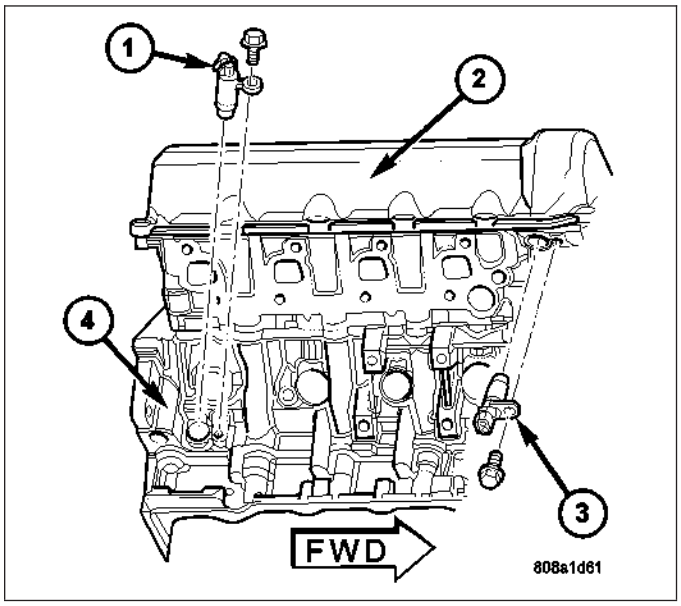
10. Collapse and pin primary chain tensioner (1).

CAUTION: Plate behind left secondary chain tensioner could fall into oil pan. Therefore, cover pan opening.

11. Remove secondary chain tensioners.



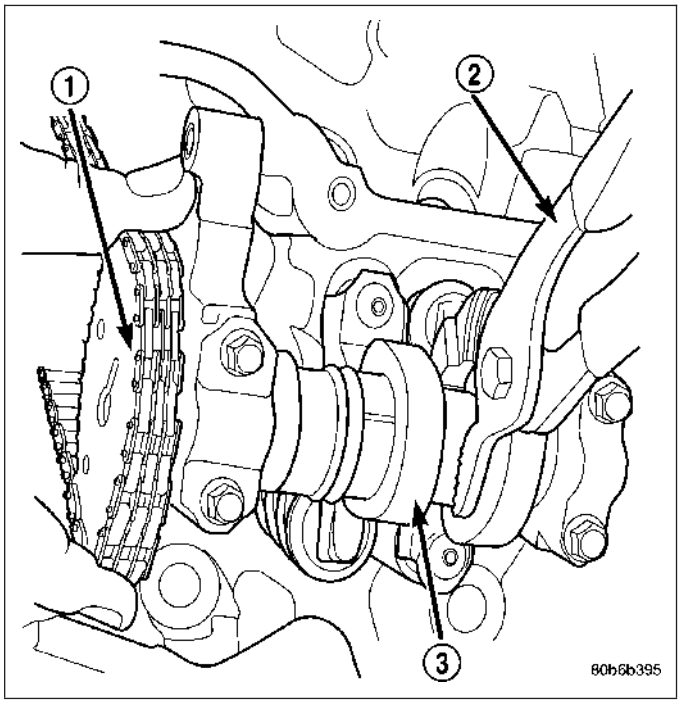
12. Remove camshaft position sensor (1) from right cylinder head.

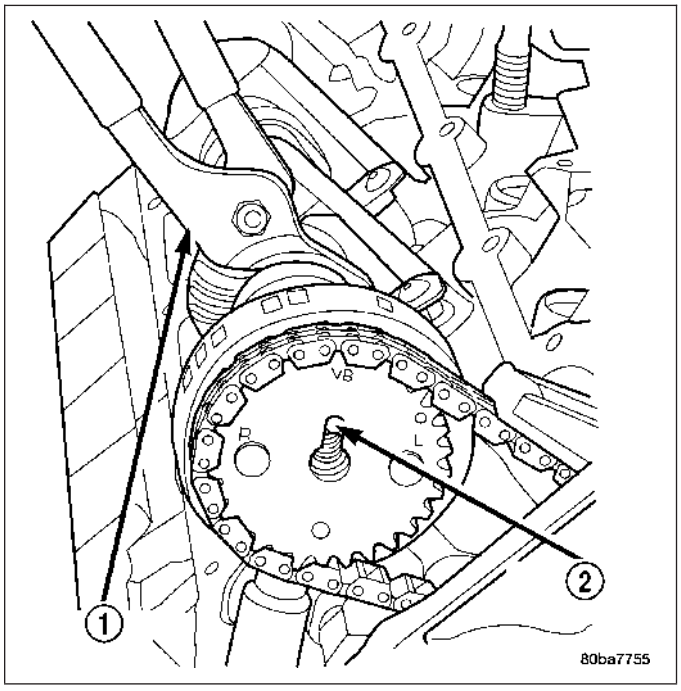


CAUTION: Care should be taken not to damage camshaft target wheel. Do not hold target wheel while loosening or tightening camshaft sprocket. Do not place the target wheel near a magnetic source of any kind. A damaged or magnetized target wheel could cause a vehicle no start condition.

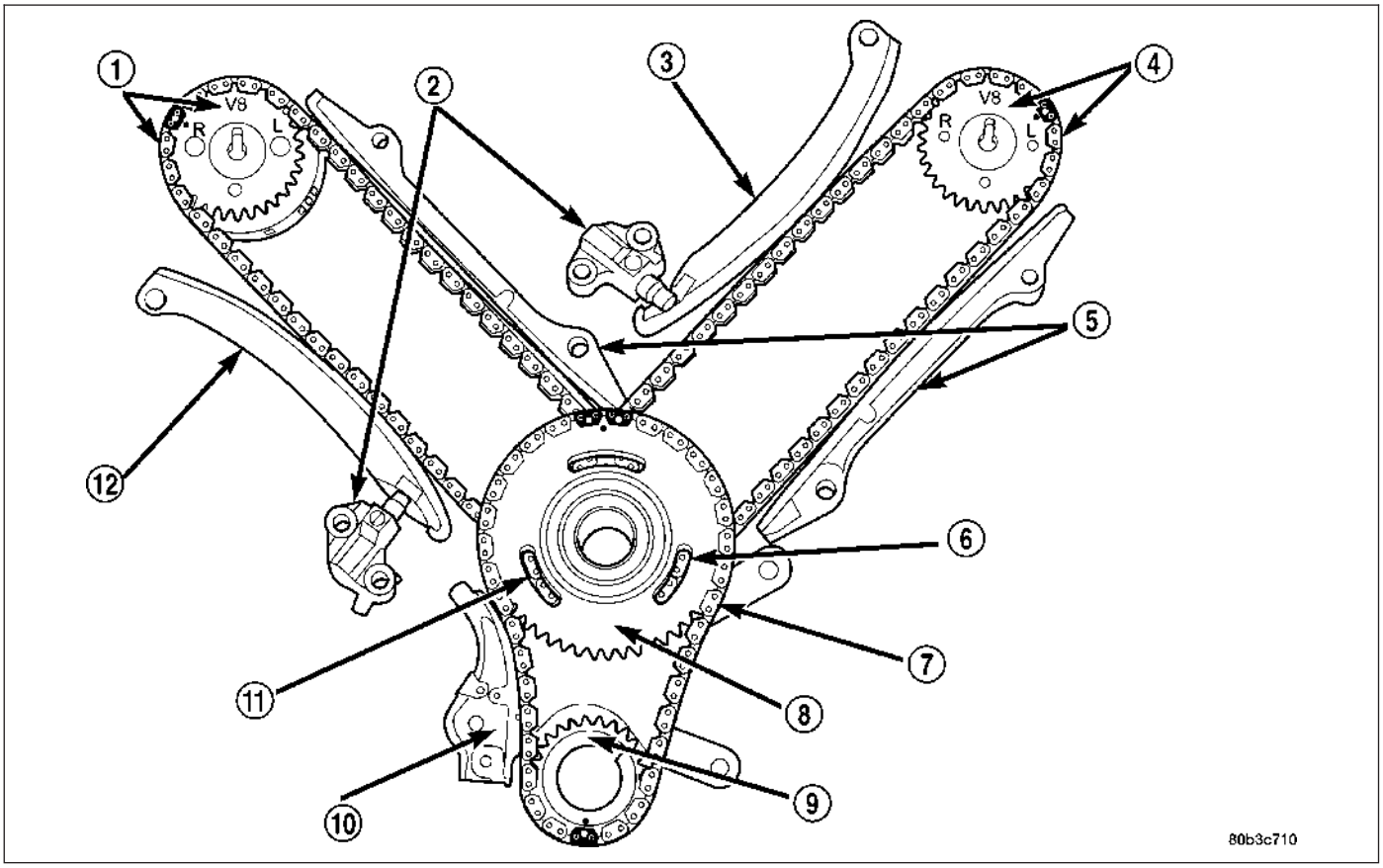
CAUTION: Do not forcefully rotate the camshafts or crankshaft independently of each other. Damaging intake valve to piston contact will occur. Ensure negative battery cable is disconnected to guard against accidental starter engagement.

13. Remove left and right camshaft sprocket bolts.
14. While holding the left camshaft steel tube with adjustable pliers (1), remove the left camshaft sprocket. Slowly rotate the camshaft approximately 15 degrees clockwise to a neutral position.
15. While holding the right camshaft steel tube with adjustable pliers (1), remove the right camshaft sprocket. Slowly rotate the camshaft approximately 45 degrees counterclockwise to a neutral position.
16. Remove idler sprocket assembly bolt.
17. Slide the idler sprocket assembly and crank sprocket forward simultaneously to remove the primary and secondary chains.
18. Remove both pivoting tensioner arms and chain guides.
19. Remove chain tensioner.





INSPECTION

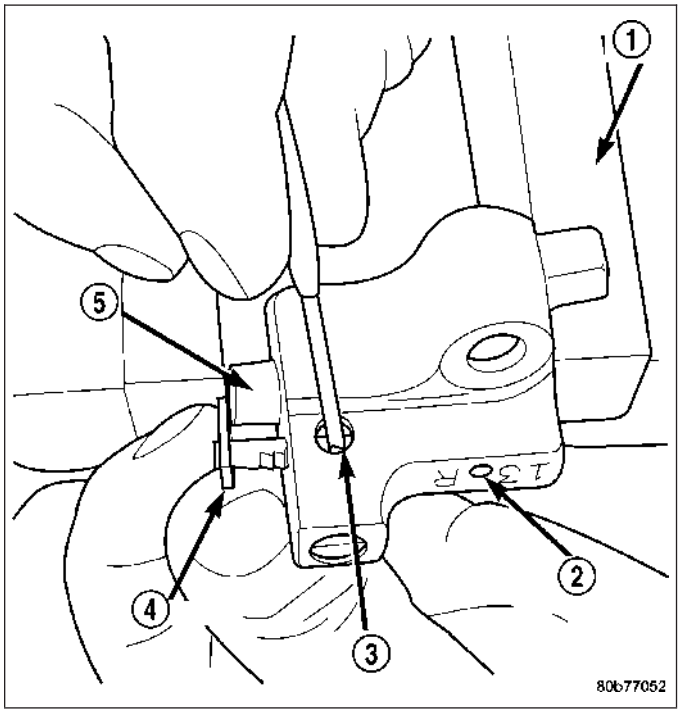


Inspect the following components:

- Sprockets for excessive tooth wear. Some tooth markings are normal and not a cause for sprocket replacement.
- Idler sprocket assembly bushing and shaft for excessive wear.
- Idler sprocket assembly spline joint. The joint should be tight with no backlash or axial movement.
- Chain guides and tensioner arms. Replace these parts if grooving in plastic face is more than 1 mm (0.039 in.) deep. If plastic face is severely grooved or melted, the tensioner lube jet may be clogged. The tensioner should be replaced.
- Secondary chain tensioner piston and ratcheting device. Inspect for evidence of heavy contact between tensioner piston and tensioner arm. If this condition exist the tensioner and tensioner arm should be replaced.
- Primary chain tensioner plastic faces. Replace as required.

INSTALLATION

1. Using a vise, lightly compress the secondary chain tensioner piston until the piston step is flush with the tensioner body. Using a pin or suitable tool, release ratchet pawl by pulling pawl back against spring force through access hole on side of tensioner. While continuing to hold pawl back, Push ratchet device to approximately 2 mm from the tensioner body. Install Special Tool 8514 lock pin (3) into hole on front of tensioner (2). Slowly open vise to transfer piston spring force to lock pin.



2. Position primary chain tensioner over oil pump and insert bolts into lower two holes on tensioner bracket. Tighten bolts to 28 N·m (250 in. lbs.).

CAUTION: Overtightening the tensioner arm torx® bolt can cause severe damage to the cylinder head. Tighten torx® bolt to specified torque only.

3. Install right side chain tensioner arm. Apply Mopar® Lock N, Seal to torx® bolt, tighten bolt to 17 N·m (150 in. lbs.).

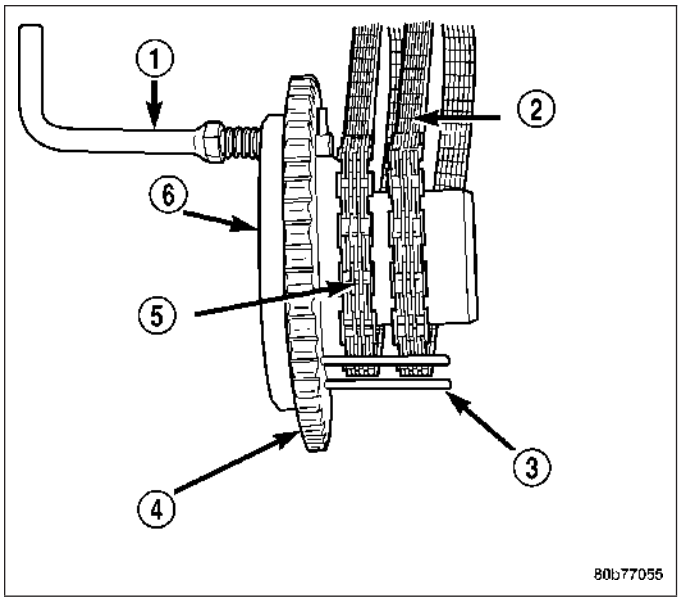
NOTE: The silver bolts retain the guides to the cylinder heads and the black bolts retain the guides to the engine block.

4. Install the left side chain guide. Tighten the bolts to 28 N·m (250 in. lbs.).

CAUTION: Overtightening the tensioner arm torx® bolt can cause severe damage to the cylinder head. Tighten torx® bolt to specified torque only.

5. Install left side chain tensioner arm. Apply Mopar® Lock N, Seal to torx® bolt, tighten bolt to 17 N·m (150 in. lbs.).
6. Install the right side chain guide. Tighten the bolts to 28 N·m (250 in. lbs.).

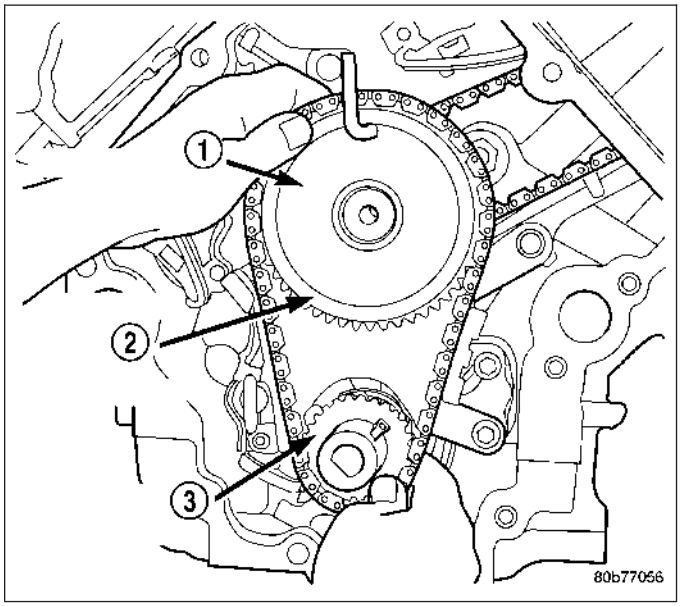
7. Install both secondary chains onto the idler sprocket. Align two plated links on the secondary chains to be visible through the two lower openings on the idler sprocket (4 o'clock and 8 o'clock). Once the secondary timing chains are installed, position special tool 8515 (6) to hold chains in place for installation.
8. Align primary chain double plated links with the timing mark at 12 o'clock (1) on the idler sprocket. Align the primary chain single plated link with the timing mark at 6 o'clock on the crankshaft sprocket (3).



9. Lubricate idler shaft and bushings with clean engine oil.
10. Install all chains, crankshaft sprocket, and idler sprocket as an assembly. After guiding both secondary chains through the block and cylinder head openings, affix chains with a elastic strap or the equivalent, This will maintain tension on chains to aid in installation.

NOTE: It will be necessary to slightly rotate camshafts for sprocket installation.

11. Align left camshaft sprocket "L" dot to plated link on chain.
12. Align right camshaft sprocket "R" dot to plated link on chain.



CAUTION: Remove excess oil from the camshaft sprocket bolt. Failure to do so can result in over-torque of bolt resulting in bolt failure.

13. Remove Special Tool 8515, then attach both sprockets to camshafts. Remove excess oil from bolts, then Install sprocket bolts, but do not tighten at this time.
14. Verify that all plated links are aligned with the marks on all sprockets and the "V8" marks on camshaft sprockets are at the 12 o'clock position.

CAUTION: Ensure the plate between the left secondary chain tensioner and block is correctly installed.

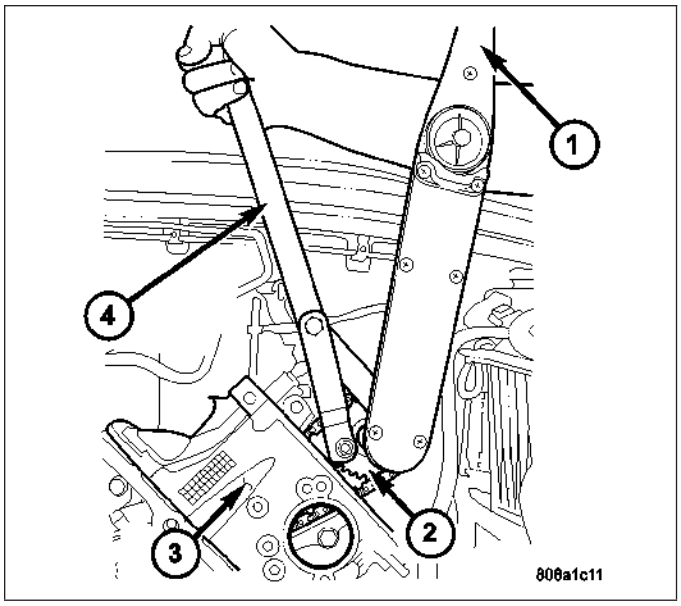
15. Install both secondary chain tensioners. Tighten bolts to 28 N·m (250 in. lbs.).

NOTE: Left and right secondary chain tensioners are not common.

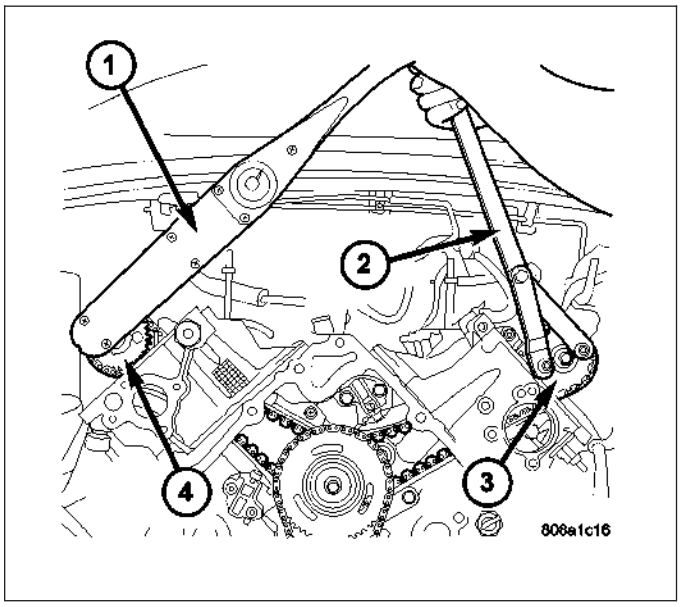
16. Before installing idler sprocket bolt, lubricate washer with oil, and tighten idler sprocket assembly retaining bolt to 34 N·m (25 ft. lbs.).
17. Remove all locking pins (3) from tensioners.

CAUTION: After pulling locking pins out of each tensioner, DO NOT manually extend the tensioner(s) ratchet. Doing so will over tension the chains, resulting in noise and/or high timing chain loads.

18. Using Special Tool 6958, Spanner with Adaptor Pins 8346, tighten left (3) and right (4), camshaft sprocket bolts to 122 N·m (90 ft. lbs.).
19. Rotate engine two full revolutions. Verify timing marks are at the follow locations:
    - primary chain idler sprocket dot is at 12 o'clock
    - primary chain crankshaft sprocket dot is at 6 o'clock
    - secondary chain camshaft sprockets "V8" marks are at 12 o'clock
20. Lubricate all three chains with engine oil.



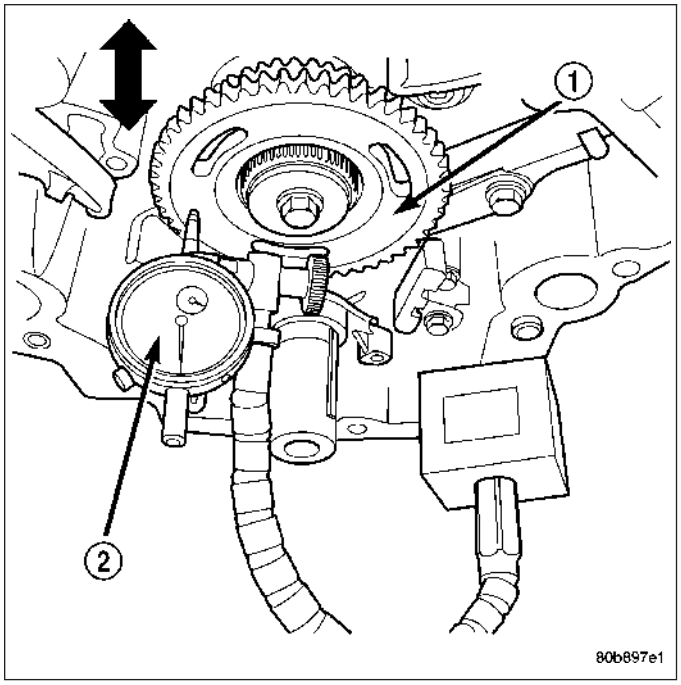
21. After installing all chains, it is recommended that the idler gear (1) end play be checked. The end play must be within 0.10–0.25 mm (0.004–0.010 in.). If not within specification, the idler gear must be replaced.



22. Install timing chain cover (Refer to 9 - ENGINE/ VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION) and crankshaft damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION).
23. Install cylinder head covers (Refer to 9 - ENGINE/ CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).

NOTE: Before installing threaded plug in right cylinder head, the plug must be coated with sealant to prevent leaks.

24. Coat the large threaded access plug with **Mopar® Thread Sealant with Teflon**, then install into the right cylinder head and tighten to 81 N·m (60 ft. lbs.).
25. Install the oil fill housing.
26. Install access plug in left cylinder head.



27. Install power steering pump (Refer to 19 - STEERING/PUMP - INSTALLATION).
28. Install radiator fan shroud.
29. Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
30. Connect negative cable to battery.

SHAFT-IDLER

REMOVAL

1. Remove the primary and secondary timing chains and sprockets (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL) .

NOTE: To remove the idler shaft, it is necessary to tap threads into the shaft, to install the removal tool.

2. Using a 12 mm X 1.75 tap, cut threads in the idler shaft center bore.
3. Cover the radiator core with a suitable cover.

CAUTION: Use care when removing the idler shaft, Do not strike the radiator cooling fins with the slide hammer.

4. Using Special Tool 8517 Slide Hammer, remove the idler shaft.

INSTALLATION

1. Thoroughly clean the idler shaft bore.
2. Position the idler shaft in the bore.

NOTE: The two lubrication holes in the idler shaft do not require any special alignment.

NOTE: Before using the retaining bolt to install the idler shaft, coat the threads and the pilot on the idler shaft, with clean engine oil.

3. Using the primary idler sprocket retaining bolt and washer, carefully draw the idler shaft into the bore until fully seated.
4. Coat the idler shaft with clean engine oil.
5. Install the timing chains and sprockets (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION) .

ENGINE - 5.7L SERVICE INFORMATION

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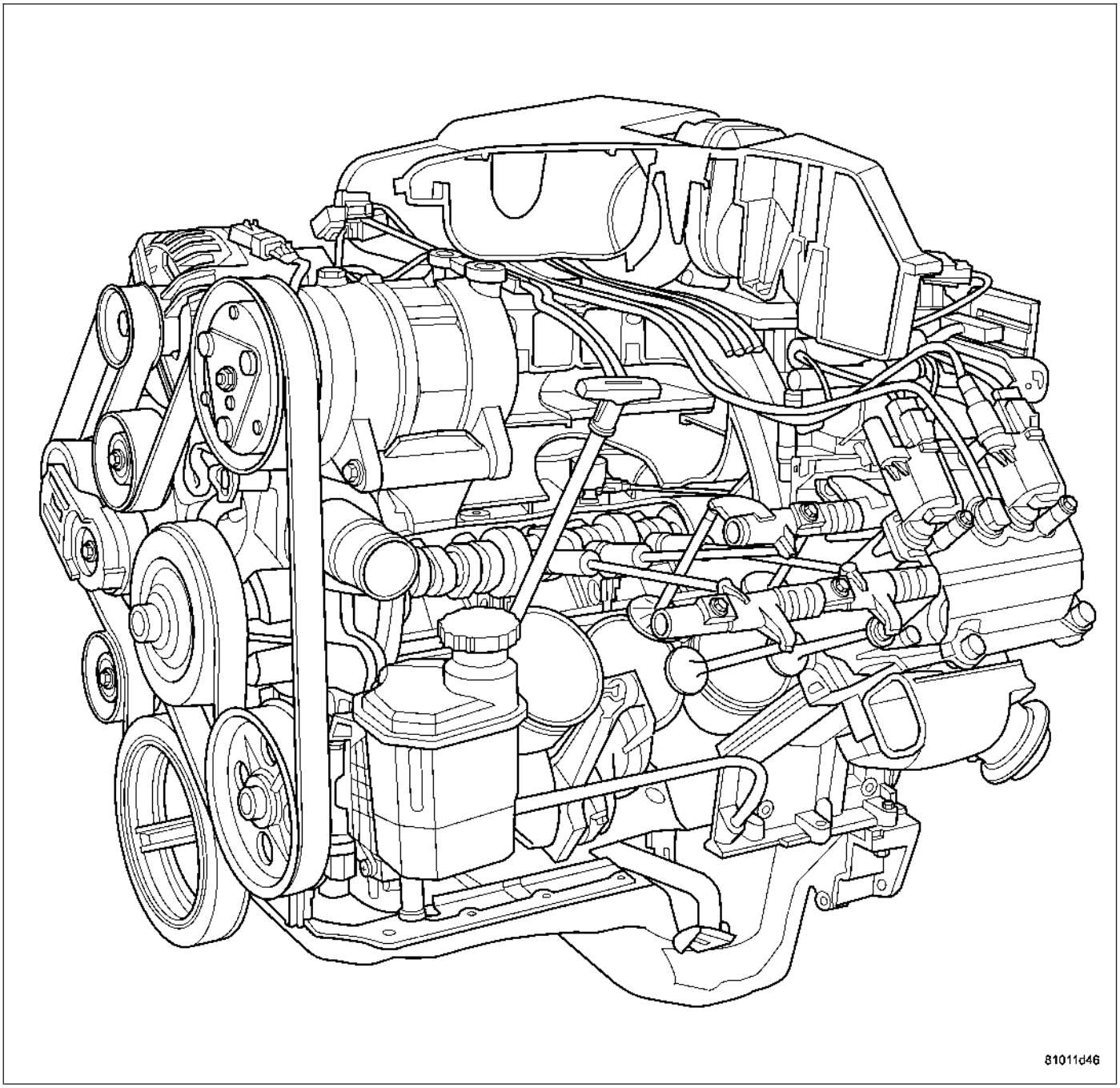
ENGINE - 5.7L SERVICE INFORMATION

DESCRIPTION



The 5.7L engine (345 CID) eight-cylinder engine is a 90° V-Type lightweight, deep skirt cast iron block, aluminum heads, single cam, overhead valve engine with hydraulic roller tappets. The heads incorporate splayed valves with a hemispherical style combustion chamber and dual spark plugs. The cylinders are numbered from front to rear; 1, 3, 5, 7 on the left bank and 2, 4, 6, 8 on the right bank. The firing order is 1-8-4-3-6-5-7-2.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - ENGINE DIAGNOSIS - INTRODUCTION

Engine diagnosis is helpful in determining the causes of malfunctions not detected and remedied by routine maintenance.

These malfunctions may be classified as either performance (e.g., engine idles rough and stalls) or mechanical (e.g., a strange noise).

(Refer to 9 - ENGINE - DIAGNOSIS AND TESTING) - PERFORMANCE and (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)—MECHANICAL for possible causes and corrections of malfunctions. (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - DIAGNOSIS AND TESTING) and (Refer to 14 - FUEL SYSTEM/FUEL INJECTION - DIAGNOSIS AND TESTING) for the fuel system diagnosis.

Additional tests and diagnostic procedures may be necessary for specific engine malfunctions that can not be isolated with the Service Diagnosis charts. Information concerning additional tests and diagnosis is provided within the following diagnosis:

- Cylinder Compression Pressure Test (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).
- Cylinder Combustion Pressure Leakage Test (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).
- Engine Cylinder Head Gasket Failure Diagnosis (Refer to 9 - ENGINE/CYLINDER HEAD - DIAGNOSIS AND TESTING).
- Intake Manifold Leakage Diagnosis (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - DIAGNOSIS AND TESTING).

DIAGNOSIS AND TESTING - ENGINE DIAGNOSIS - PERFORMANCE

CONDITION	POSSIBLE CAUSE	CORRECTION
ENGINE WILL NOT START	1. Weak battery	1. Charge or replace as necessary.
	2. Corroded or loose battery connections.	2. Clean and tighten battery connections. Apply a coat of light mineral grease to the terminals.
	3. Faulty starter.	3. (Refer to 8 - ELECTRICAL/STARTING - DIAGNOSIS AND TESTING).
	4. Incorrect spark plug gap.	4. (Refer to 8 - ELECTRICAL/IGNITION CONTROL/SPARK PLUG - CLEANING).
	5. Dirt or water in fuel system.	5. Clean system and replace fuel filter.
	6. Faulty fuel pump, relay or wiring.	6. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)
ENGINE STALLS OR ROUGH IDLE	1. Idle speed set to low.	1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)
	2. Vacuum leak.	2. Inspect intake manifold and vacuum hoses, repair or replace as necessary.
	3. Incorrect engine timing.	3. (Refer to 9 - ENGINE/VALVE TIMING - STANDARD PROCEDURE).

CONDITION	POSSIBLE CAUSE	CORRECTION
ENGINE LOSS OF POWER	1. Dirty or incorrectly gapped spark plugs.	1. Replace spark plugs.
	2. Dirt or water in fuel system.	2. Clean system and replace fuel filter.
	3. Blown cylinder head gasket.	3. Replace cylinder head gasket.
	4. Low compression.	4. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).
	5. Burned, warped or pitted valves.	5. Replace as necessary.
	6. Plugged or restricted exhaust system.	6. Inspect and replace as necessary.

DIAGNOSIS AND TESTING - ENGINE DIAGNOSIS - MECHANICAL

CONDITION	POSSIBLE CAUSES	CORRECTIONS
NOISY VALVES	1. High or low oil level in crankcase.	1. (Refer to LUBRICATION & MAINTENANCE - SPECIFICATIONS)
	2. Thin or diluted oil.	2. Change oil and filter.
	3. Low oil pressure.	3. Check oil pump, if Ok, check rod and main bearings for excessive wear.
	4. Dirt in lash adjusters.	4. Replace as necessary.
	5. Worn rocker arms.	5. Replace as necessary.
	6. Worn lash adjusters	6. Replace as necessary.
	7. Worn valve guides.	7. (Refer to 9 - ENGINE/CYLINDER HEAD/INTAKE/EXHAUST VALVES & SEATS - STANDARD PROCEDURE)
	8. Excessive runout of valve seats on valve faces.	8. (Refer to 9 - ENGINE/CYLINDER HEAD/INTAKE/EXHAUST VALVES & SEATS - STANDARD PROCEDURE)
CONNECTING ROD NOISE	1. Insufficient oil supply.	1. (Refer to LUBRICATION & MAINTENANCE - SPECIFICATIONS)
	2. Low oil pressure.	2. Check oil pump, if Ok, check rod and main bearings for excessive wear.
	3. Thin or diluted oil.	3. Change oil and filter.
	4. Excessive bearing clearance.	4. Replace as necessary.
	5. Connecting rod journal out-of-round.	5. Service or replace crankshaft.
	6. Misaligned connecting rods.	6. Replace bent connecting rods.

CONDITION	POSSIBLE CAUSES	CORRECTIONS
MAIN BEARING NOISE	1. Insufficient oil supply.	1. (Refer to LUBRICATION & MAINTENANCE - SPECIFICATIONS)
	2. Low oil pressure.	2. Check oil pump, if Ok, check rod and main bearings for excessive wear.
	3. Thin or diluted oil.	3. Change oil and filter.
	4. Excessive bearing clearance.	4. Replace as necessary.
	5. Excessive end play.	5. Check thrust washers for wear.
	6. Crankshaft journal out-of round.	6. Service or replace crankshaft.
	7. Loose flywheel or torque converter.	7. Tighten to correct torque

DIAGNOSIS AND TESTING - CYLINDER COMPRESSION PRESSURE

The results of a cylinder compression pressure test can be utilized to diagnose several engine malfunctions.

Ensure the battery is completely charged and the engine starter motor is in good operating condition. Otherwise the indicated compression pressures may not be valid for diagnosis purposes.

1. Clean the spark plug recesses with compressed air.
2. Remove the spark plugs.
3. Disable the fuel system (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - DESCRIPTION).
4. Remove the ASD relay (Refer to 8 - ELECTRICAL/IGNITION CONTROL/AUTO SHUT DOWN RELAY - REMOVAL).
5. Insert a compression pressure gauge and rotate the engine with the engine starter motor for three revolutions.
6. Record the compression pressure on the 3rd revolution. Continue the test for the remaining cylinders.
7. (Refer to 9 - ENGINE - SPECIFICATIONS) for the correct engine compression pressures.

DIAGNOSIS AND TESTING - CYLINDER COMBUSTION PRESSURE LEAKAGE

The combustion pressure leakage test provides an accurate means for determining engine condition.

Combustion pressure leakage testing will detect:

- Exhaust and intake valve leaks (improper seating).
- Leaks between adjacent cylinders or into water jacket.
- Any causes for combustion/compression pressure loss.

1. Check the coolant level and fill as required. DO NOT install the radiator cap.
2. Start and operate the engine until it attains normal operating temperature, then turn the engine OFF.
3. Remove the spark plugs.
4. Remove the oil filler cap.
5. Remove the air cleaner hose.
6. Calibrate the tester according to the manufacturer's instructions. The shop air source for testing should maintain 483 kPa (70 psi) minimum, 1,379 kPa (200 psi) maximum and 552 kPa (80 psi) recommended.
7. Perform the test procedures on each cylinder according to the tester manufacturer's instructions. Set piston of cylinder to be tested at TDC compression,While testing, listen for pressurized air escaping through the throttle body, tailpipe and oil filler cap opening. Check for bubbles in the radiator coolant.

All gauge pressure indications should be equal, with no more than 25% leakage.

FOR EXAMPLE: At 552 kPa (80 psi) input pressure, a minimum of 414 kPa (60 psi) should be maintained in the cylinder.

Refer to CYLINDER COMBUSTION PRESSURE LEAKAGE DIAGNOSIS CHART .

CYLINDER COMBUSTION PRESSURE LEAKAGE DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSE	CORRECTION
AIR ESCAPES THROUGH THROTTLE BODY	Intake valve bent, burnt, or not seated properly	Inspect valve and valve seat. Reface or replace, as necessary. Inspect valve springs. Replace as necessary.
AIR ESCAPES THROUGH TAILPIPE	Exhaust valve bent, burnt, or not seated properly	Inspect valve and valve seat. Reface or replace, as necessary. Inspect valve springs. Replace as necessary.
AIR ESCAPES THROUGH RADIATOR	Head gasket leaking or cracked cylinder head or block	Remove cylinder head and inspect. Replace defective part
MORE THAN 50% LEAKAGE FROM ADJACENT CYLINDERS	Head gasket leaking or crack in cylinder head or block between adjacent cylinders	Remove cylinder head and inspect. Replace gasket, head, or block as necessary
MORE THAN 25% LEAKAGE AND AIR ESCAPES THROUGH OIL FILLER CAP OPENING ONLY	Stuck or broken piston rings; cracked piston; worn rings and/or cylinder wall	Inspect for broken rings or piston. Measure ring gap and cylinder diameter, taper and out-of-round. Replace defective part as necessary

DIAGNOSIS AND TESTING - ENGINE DIAGNOSIS - LUBRICATION

CONDITION	POSSIBLE CAUSES	CORRECTION
OIL LEAKS	1. Gaskets and O-Rings. (a) Misaligned or damaged. (b) Loose fasteners, broken or porous metal parts. 2. Crankshaft rear seal 3. Crankshaft seal flange. Scratched, nicked or grooved. 4. Oil pan flange cracked. 5.Front cover seal, damaged or misaligned. 6. Scratched or damaged vibration damper hub. 7. Crankshaft Rear Flange Microporosity	1. (a) Replace as necessary. (b) Tighten fasteners, Repair or replace metal parts. 2. Replace as necessary. 3. Polish or replace crankshaft. 4. Replace oil pan. 5. Replace seal. 6. Polish or replace damper. 7. Replace Crankshaft
OIL PRESSURE DROP	1. Low oil level. 2. Faulty oil pressure sending unit. 3. Low oil pressure. 4. Clogged oil filter. 5. Worn oil pump. 6. Thin or diluted oil. 7. Excessive bearing clearance. 8. Oil pump relief valve stuck. 9. Oil pickup tube loose or damaged.	1. Check and correct oil level. 2. Replace sending unit. 3. Check pump and bearing clearance. 4. Replace oil filter. 5. Replace as necessary. 6. Change oil and filter. 7. Replace as necessary. 8. Replace oil pump. 9. Replace as necessary.

CONDITION	POSSIBLE CAUSES	CORRECTION
OIL PUMPING AT RINGS; SPARK PLUGS FOULING	1. Worn or damaged rings.	1. Hone cylinder bores and replace rings.
	2. Carbon in oil ring slots.	2. Replace rings.
	3. Incorrect ring size installed.	3. Replace rings.
	4. Worn valve guides.	4. Ream guides and replace valves.
	5. Leaking intake gasket.	5. Replace intake gaskets.
	6. Leaking valve guide seals.	6. Replace valve guide seals.

DIAGNOSIS AND TESTING - ENGINE DIAGNOSIS - MECHANICAL

ENGINE MECHANICAL DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSES	CORRECTION
NOISY VALVES/LIFTERS	1. High or low oil level in crankcase	1. Check for correct oil level. Adjust oil level by draining or adding as needed
	2. Thin or diluted oil	2. Change oil. (Refer to 9 - ENGINE/LUBRICATION/OIL - STANDARD PROCEDURE)
	3. Low oil pressure	3. Check engine oil level. If ok, Perform oil pressure test. (Refer to 9 - ENGINE/LUBRICATION - DIAGNOSIS AND TESTING) for engine oil pressure test/ specifications
	4. Dirt in tappets/lash adjusters	4. Clean/replace hydraulic tappets/lash adjusters
	5. Bent push rod(s)	5. Install new push rods
	6. Worn rocker arms	6. Inspect oil supply to rocker arms and replace worn arms as needed
	7. Worn tappets/lash adjusters	7. Install new hydraulic tappets/lash adjusters
	8. Worn valve guides	8. Inspect all valve guides and replace as necessary
	9. Excessive runout of valve seats or valve faces	9. Grind valves and seats

CONDITION	POSSIBLE CAUSES	CORRECTION
CONNECTING ROD NOISE	1. Insufficient oil supply	1. Check engine oil level.
	2. Low oil pressure	2. Check engine oil level. If ok, Perform oil pressure test. (Refer to 9 - ENGINE/LUBRICATION - DIAGNOSIS AND TESTING) engine oil pressure test/specifications
	3. Thin or diluted oil	3. Change oil to correct viscosity. (Refer to 9 - ENGINE/ LUBRICATION/OIL - STANDARD PROCEDURE) for correct procedure/engine oil specifications
	4. Excessive connecting rod bearing clearance	4. Measure bearings for correct clearance with plasti-gage. Repair as necessary
	5. Connecting rod journal out of round	5. Replace crankshaft or grind journals
	6. Misaligned connecting rods	6. Replace bent connecting rods
MAIN BEARING NOISE	1. Insufficient oil supply	1. Check engine oil level.
	2. Low oil pressure	2. Check engine oil level. If ok, Perform oil pressure test. (Refer to 9 - ENGINE/LUBRICATION - DIAGNOSIS AND TESTING)
	3. Thin or diluted oil	3. Change oil to correct viscosity.
	4. Excessive main bearing clearance	4. Measure bearings for correct clearance. Repair as necessary
	5. Excessive end play	5. Check crankshaft thrust bearing for excessive wear on flanges
	6. Crankshaft main journal out of round or worn	6. Grind journals or replace crankshaft
	7. Loose flywheel or torque converter	7. Inspect crankshaft, flexplate/ flywheel and bolts for damage. Tighten to correct torque
LOW OIL PRESSURE	1. Low oil level	1. Check oil level and fill if necessary
	2. Faulty oil pressure sending unit	2. Install new sending unit
	3. Clogged oil filter	3. Install new oil filter
	4. Worn oil pump	4. Replace oil pump assembly.
	5. Thin or diluted oil	5. Change oil to correct viscosity.
	6. Excessive bearing clearance	6. Measure bearings for correct clearance
	7. Oil pump relief valve stuck	7. Remove valve to inspect, clean and reinstall
	8. Oil pickup tube loose, broken, bent or clogged	8. Inspect oil pickup tube and pump, and clean or replace if necessary
	9. Oil pump cover warped or cracked	9. Install new oil pump

CONDITION	POSSIBLE CAUSES	CORRECTION
OIL LEAKS	1. Misaligned or deteriorated gaskets	1. Replace gasket
	2. Loose fastener, broken or porous metal part	2. Tighten, repair or replace the part
	3. Front or rear crankshaft oil seal leaking	3. Replace seal
	4. Leaking oil gallery plug or cup plug	4. Remove and reseal threaded plug. Replace cup style plug
EXCESSIVE OIL CONSUMPTION OR SPARK PLUGS OIL FOULED	1. CCV System malfunction	1. (Refer to 25 - EMISSIONS CONTROL/EVAPORATIVE EMISSIONS - DESCRIPTION) for correct operation
	2. Defective valve stem seal(s)	2. Repair or replace seal(s)
	3. Worn or broken piston rings	3. Hone cylinder bores. Install new rings
	4. Scuffed pistons/cylinder walls	4. Hone cylinder bores and replace pistons as required
	5. Carbon in oil control ring groove	5. Remove rings and de-carbon piston
	6. Worn valve guides	6. Inspect/replace valve guides as necessary
	7. Piston rings fitted too tightly in grooves	7. Remove rings and check ring end gap and side clearance. Replace if necessary

STANDARD PROCEDURE

STANDARD PROCEDURE - REPAIR DAMAGED OR WORN THREADS

CAUTION: Be sure that the tapped holes maintain the original center line.

Damaged or worn threads can be repaired. Essentially, this repair consists of:

- Drilling out worn or damaged threads.
- Tapping the hole with a special Heli-Coil Tap, or equivalent.
- Installing an insert into the tapped hole to bring the hole back to its original thread size.

STANDARD PROCEDURE - HYDROSTATIC LOCK

CAUTION: DO NOT use the starter motor to rotate the crankshaft. Severe damage could occur.

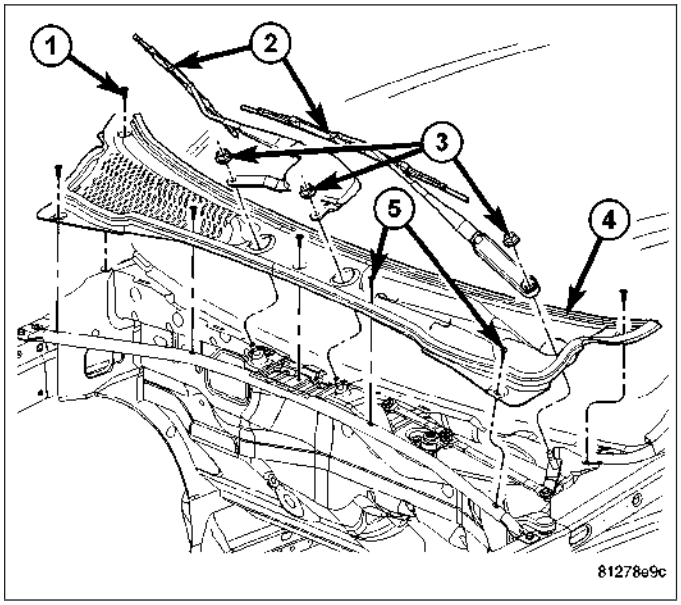
When an engine is suspected of hydrostatic lock (regardless of what caused the problem), follow the steps below.

1. Perform the Fuel Pressure Release Procedure (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - STANDARD PROCEDURE).
2. Disconnect the negative cable(s) from the battery.
3. Inspect air cleaner, induction system, and intake manifold to ensure system is dry and clear of foreign material.
4. Place a shop towel around the spark plugs to catch any fluid that may possibly be under pressure in the cylinder head. Remove the spark plugs.
5. With all spark plugs removed, rotate the crankshaft using a breaker bar and socket.
6. Identify the fluid in the cylinders (coolant, fuel, oil, etc.).
7. Be sure all fluid has been removed from the cylinders.

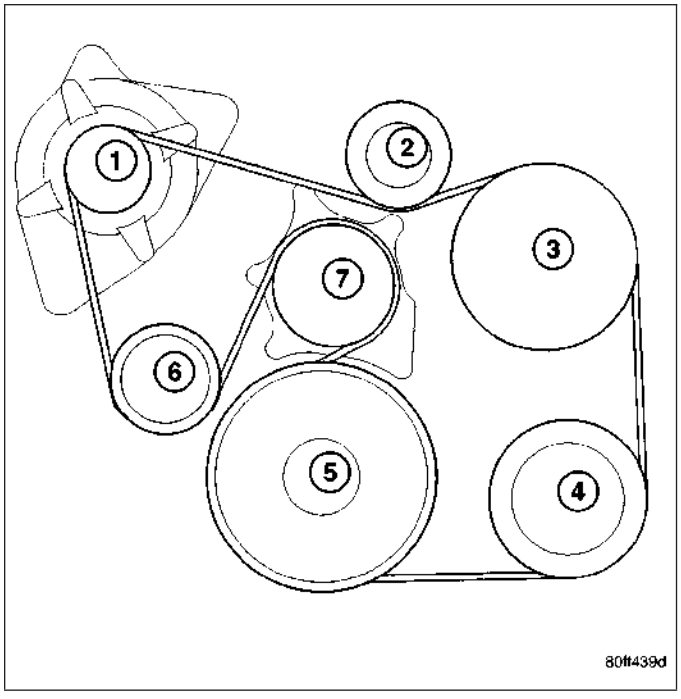
8. Repair engine or components as necessary to prevent this problem from occurring again.
9. Squirt a small amount of engine oil into the cylinders to lubricate the walls. This will prevent damage on restart.
10. Install new spark plugs. Tighten the spark plugs to 41 N·m (30 ft. lbs.) torque.
11. Drain engine oil. Remove and discard the oil filter.
12. Install the drain plug. Tighten the plug to 34 N·m (25 ft. lbs.) torque.
13. Install a new oil filter.
14. Fill engine crankcase with the specified amount and grade of oil. (Refer to LUBRICATION & MAINTENANCE - SPECIFICATIONS).
15. Connect the negative cable(s) to the battery.
16. Start the engine and check for any leaks.

REMOVAL

1. Remove the cowl grille (4).
2. Perform the Fuel System Pressure Release procedure (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - STANDARD PROCEDURE).
3. Disconnect the battery negative cable.
4. Remove the air cleaner resonator and duct work as an assembly.
5. Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).

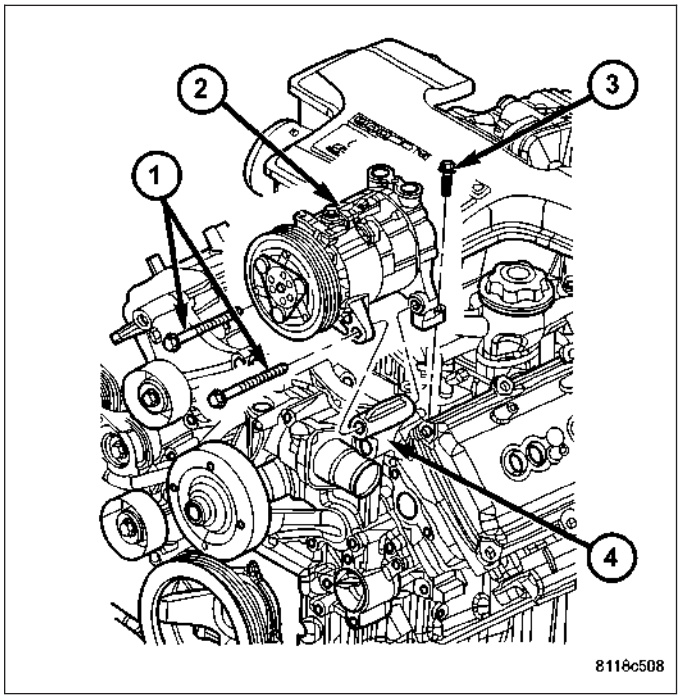


6. Remove the accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
7. Remove the viscous fan/drive (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - REMOVAL).
8. Remove the upper crossmember and top core support.
9. Remove the condenser (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/A/C CONDENSER - REMOVAL).



10. Remove radiator (Refer to 7 - COOLING/ENGINE/RADIATOR - REMOVAL).

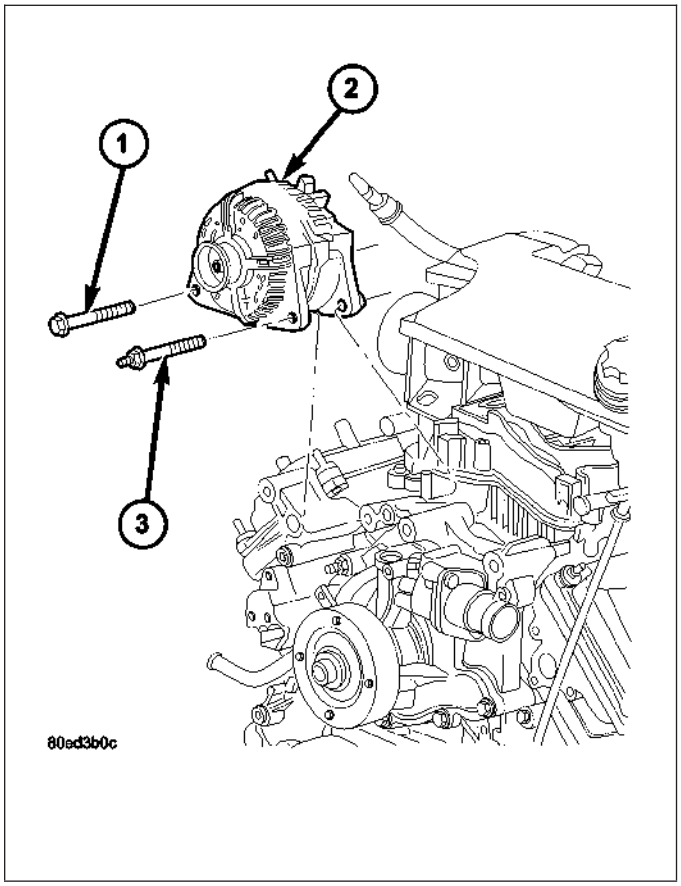
11. Evacuate the refrigerant (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE).
12. Remove the A/C compressor (2) with the lines attached. Secure compressor out of the way.



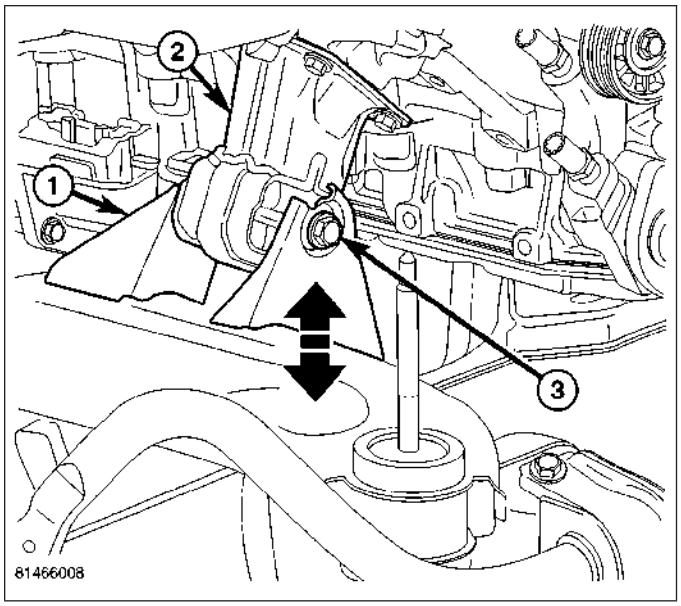
13. Remove generator assembly (2) (Refer to 8 - ELECTRICAL/CHARGING/GENERATOR - REMOVAL).
14. Remove the intake manifold and IAFM as an assembly (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).
15. Disconnect the heater hoses.

NOTE: It is not necessary to disconnect P/S hoses from pump, for P/S pump removal.

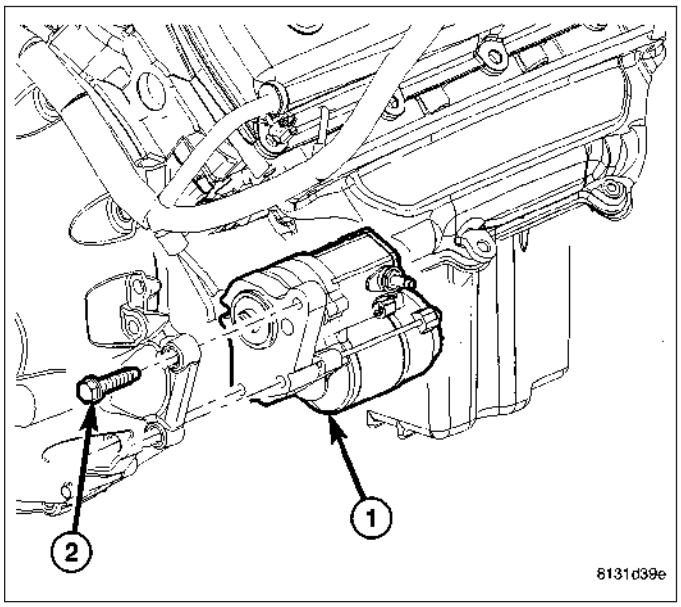
16. Remove the power steering pump and set aside.
17. Disconnect the fuel supply line (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/QUICK CONNECT FITTING - STANDARD PROCEDURE).
18. Raise and support the vehicle on a hoist and drain the engine oil.



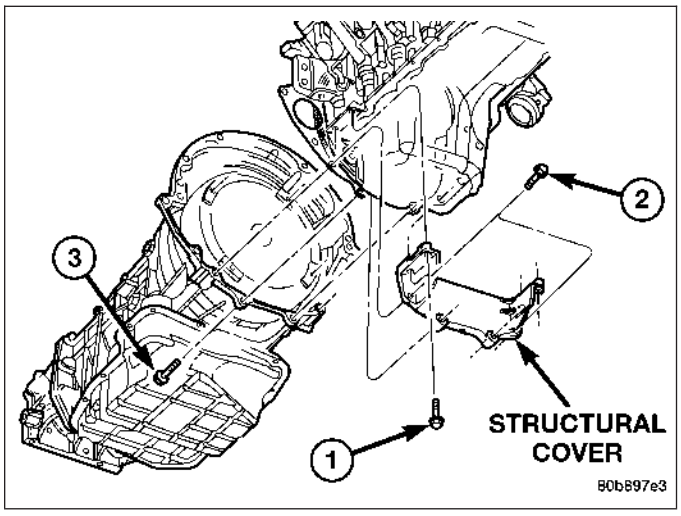
19. Remove engine front mount thru-bolt nuts (3).
20. Disconnect the transmission oil cooler lines from their retainers at the oil pan bolts.
21. Disconnect exhaust pipe at manifolds.



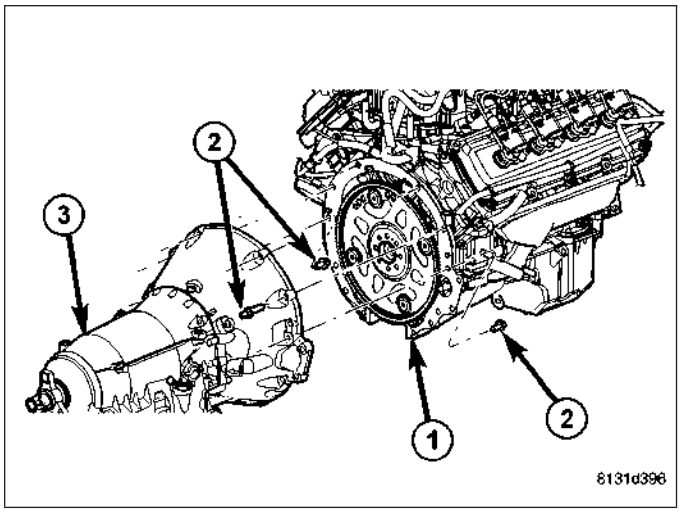
22. Disconnect the starter wires. Remove starter motor (1) (Refer to 8 - ELECTRICAL/STARTING/ STARTER MOTOR - REMOVAL).



23. Remove the structural dust cover and transmission inspection cover, (Refer to 9 - ENGINE/ENGINE BLOCK/STRUCTURAL COVER - REMOVAL).

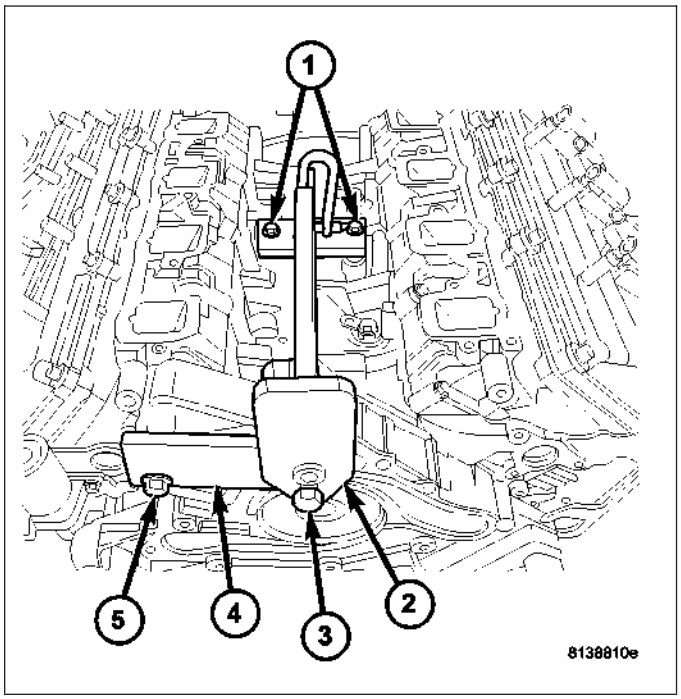


24. Remove drive plate to converter bolts (Automatic transmission equipped vehicles).
25. Remove transmission bell housing to engine block bolts (2).



NOTE: Do not use air tools to install engine lift fixture (2) special tool # 8984.

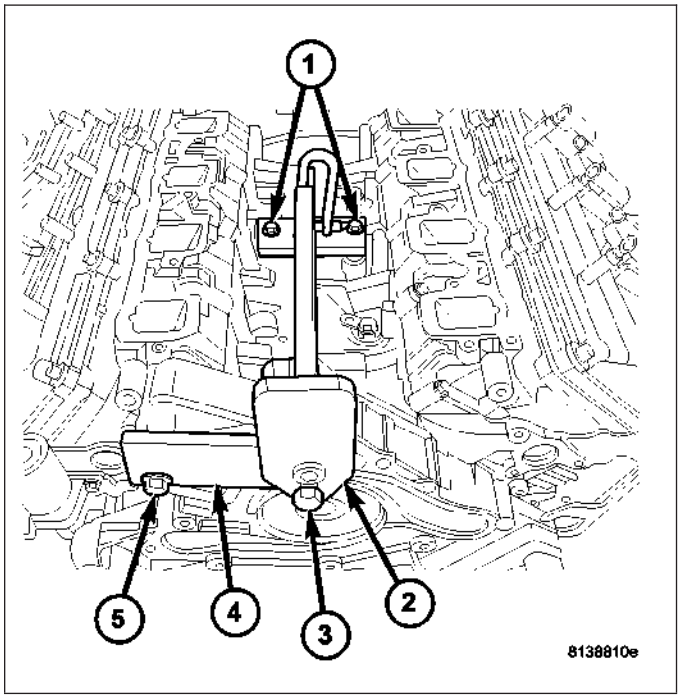
26. Install engine lift fixture (2), special tool # 8984. **Do not use adapter (4)**
27. Separate engine from transmission, remove engine from vehicle, and install engine assembly on a repair stand.



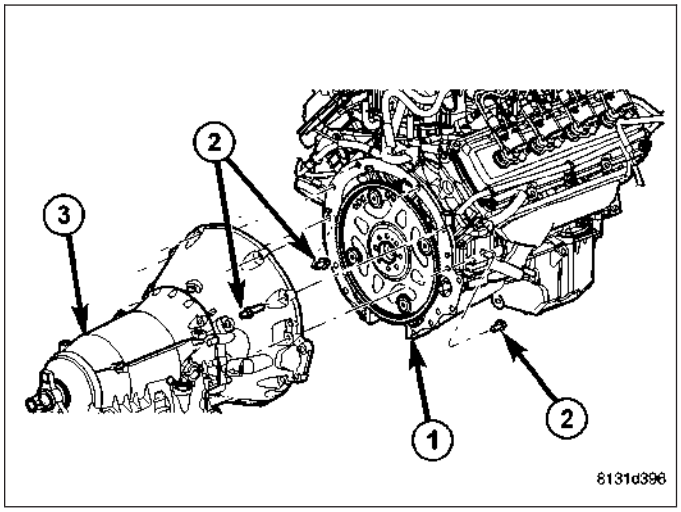
INSTALLATION

NOTE: Do not use air tools to install engine lift fixture (2) special tool # 8984.

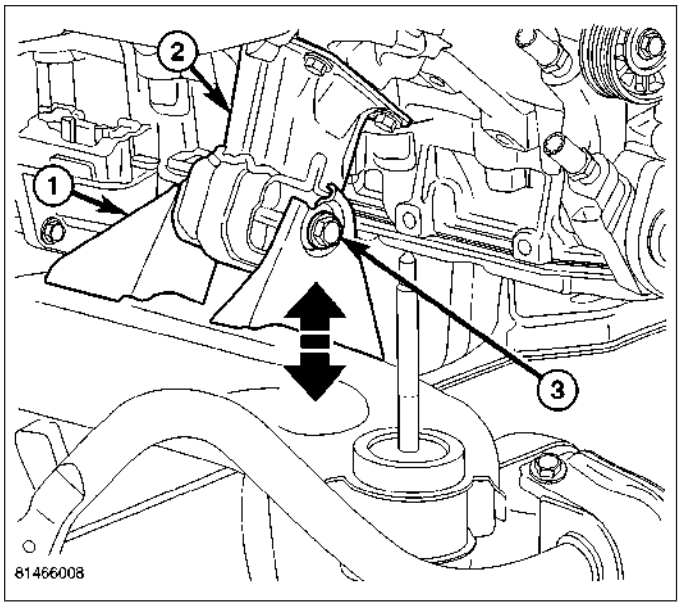
1. Install engine lift fixture (2), special tool # 8984. **Do not use adapter (4).**
2. Position the engine in the engine compartment.



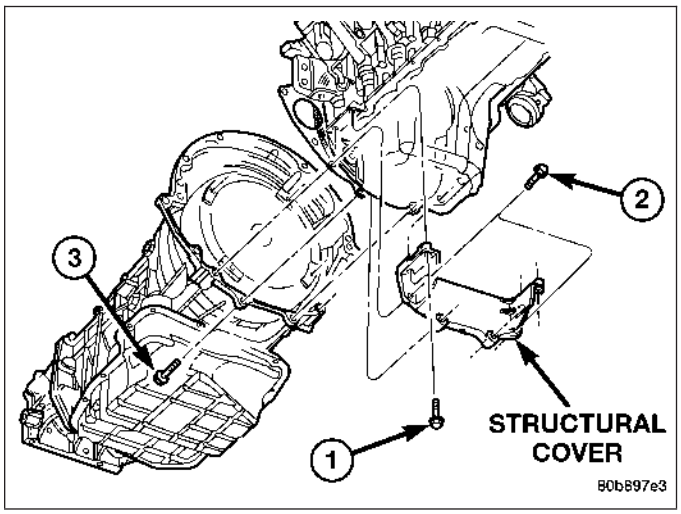
3. Lower engine into compartment and align engine with transmission.
4. Lower engine assembly until engine mount through bolts rest in mount brackets.
5. Install remaining transmission to engine block mounting bolts (2)and tighten.



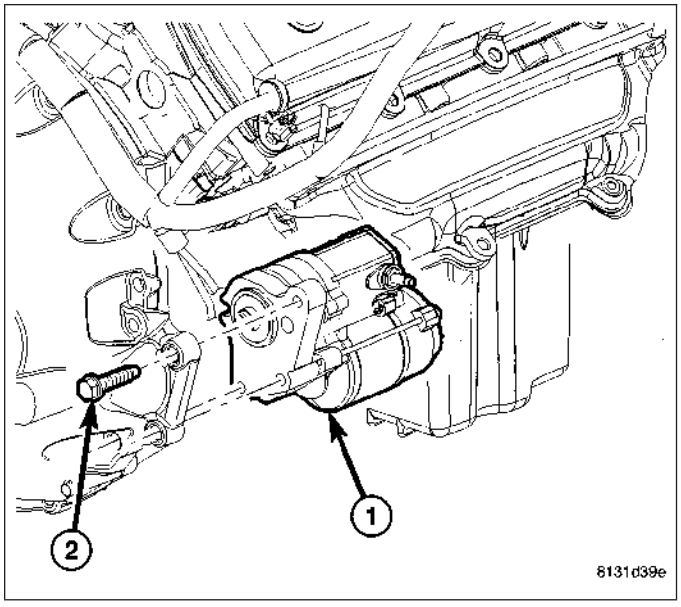
6. Tighten engine mount thru bolts (3).
7. Install drive plate to torque converter bolts.



8. Install the structural dust cover, (Refer to 9 - ENGINE/ENGINE BLOCK/STRUCTURAL COVER - INSTALLATION).

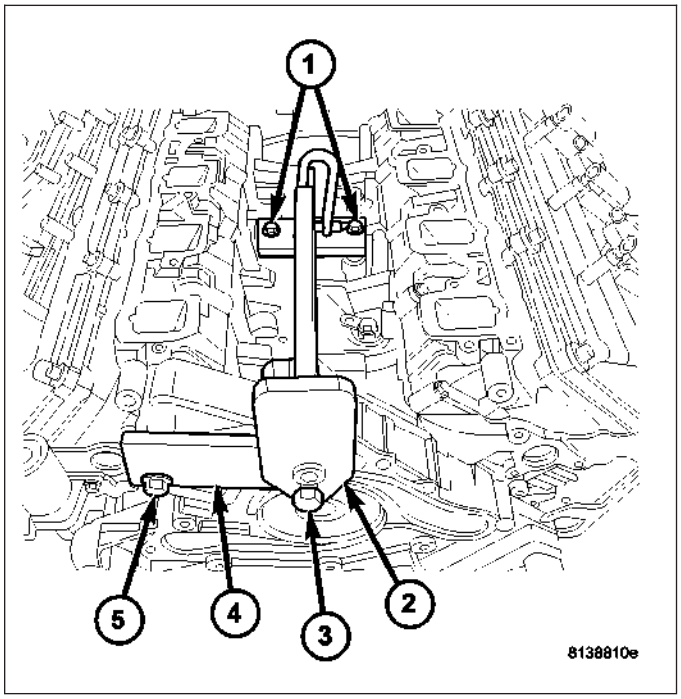


9. Install the starter (1) and connect the starter wires (Refer to 8 - ELECTRICAL/STARTING/STARTER MOTOR - INSTALLATION).

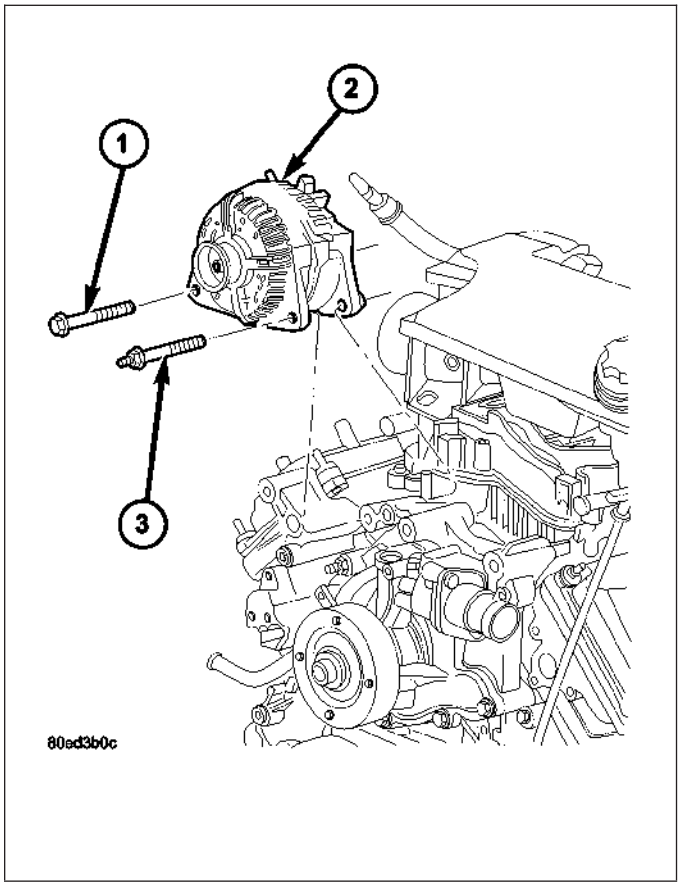


10. Install exhaust pipe to manifold.

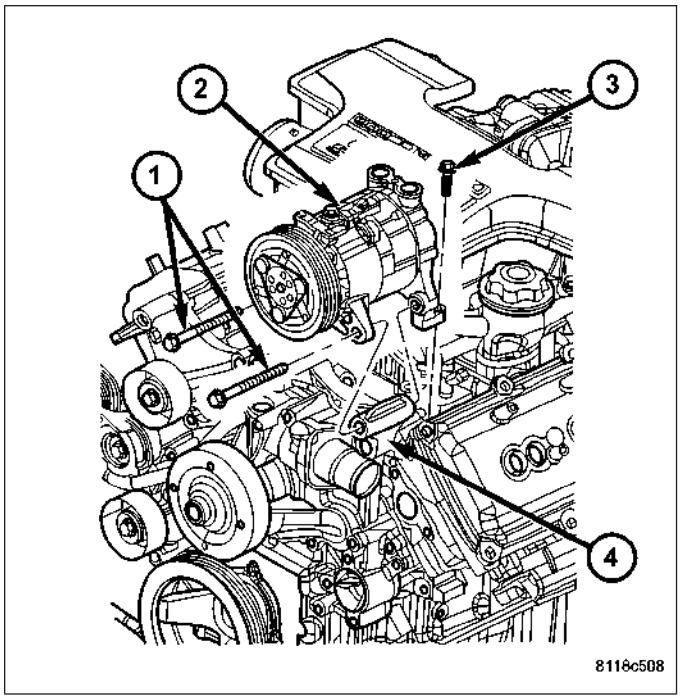
11. Remove engine lift fixture (2), special tool # 8984.
12. Connect the fuel supply line (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/QUICK CONNECT FITTING - STANDARD PROCEDURE).
13. Reinstall the power steering pump.
14. Connect the heater hoses.
15. Install the intake manifold.
16. Using a new gasket, install throttle body (Refer to 14 - FUEL SYSTEM/FUEL INJECTION/THROTTLE BODY - INSTALLATION).



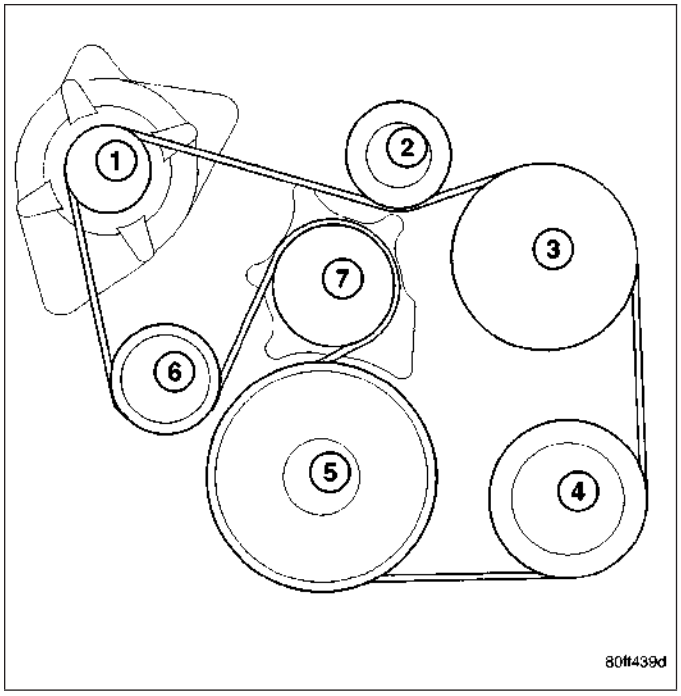
17. Install the generator (2) and wire connections (Refer to 8 - ELECTRICAL/CHARGING/GENERATOR - INSTALLATION).



18. Install a/c compressor (2) and lines (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/A/C COMPRESSOR - INSTALLATION).

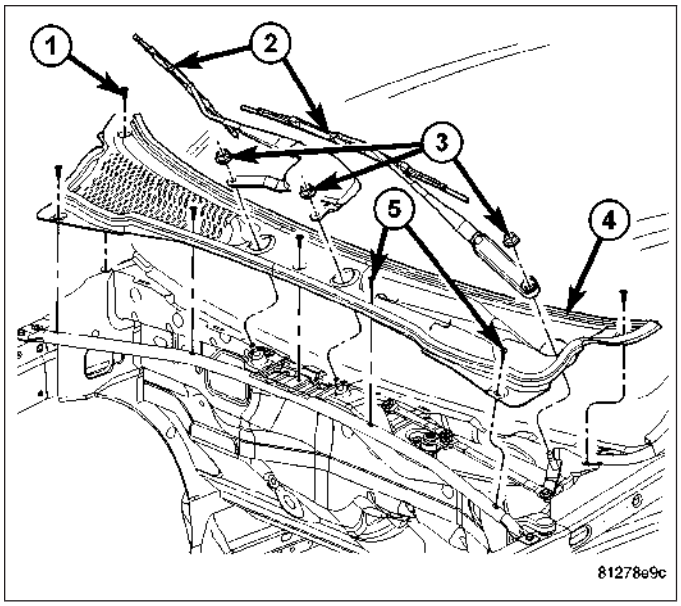


19. Install the accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).
20. Install radiator (Refer to 7 - COOLING/ENGINE/ RADIATOR - INSTALLATION).
21. Connect the radiator lower hose.
22. Connect the transmission oil cooler lines to the radiator.
23. Install the fan shroud.
24. Install the fan (Refer to 7 - COOLING/ENGINE/ RADIATOR FAN - INSTALLATION).
25. Connect the radiator upper hose.
26. Install the condenser (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/A/C CONDENSER - INSTALLATION).
27. Install upper radiator support crossmember.
28. Install the washer bottle.



29. Charge the refigerant (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE).

30. Install the cowl grille (4).
31. Install the air cleaner resonator and duct work..
32. Add engine oil to crankcase (Refer to LUBRICATION & MAINTENANCE/FLUID TYPES - SPECIFICATIONS).
33. Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
34. Connect battery negative cable.
35. Start engine and inspect for leaks.
36. Road test vehicle.



SPECIFICATIONS

5.7L ENGINE

GENERAL DESCRIPTION

DESCRIPTION	SPECIFICATION
Engine Type	90° V-8 OHV
Displacement	5.7 Liters 345 (Cubic Inches)
Bore	99.5 mm (3.91 in.)
Stroke	90.9 mm (3.58 in.)
Compression Ratio	9.6:1
Firing Order	1-8-4-3-6-5-7-2
Lubrication	Pressure Feed - Full Flow Filtration
Cooling System	Liquid Cooled - Forced Circulation
Cylinder Block	Cast Iron
Cylinder Head	Aluminum
Crankshaft	Nodular Iron
Camshaft	Hollow Assembled Camshaft
Pistons	Aluminum Alloy
Connecting Rods	Powdered Metal

CYLINDER BLOCK

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Cylinder Bore Diameter	99.50 mm	3.917 in.
Out of Round (MAX)	0.0076 mm	0003 in.
Taper (MAX)	0.0127 mm	0.0005 in.
Lifter Bore Diameter	21.45 - 21.425 mm	0.8444 - 0.8435 in.

PISTONS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Clearance Measured at 38.0 mm (1.5 in.) Below Deck	0.0215 - 0.0485 mm	0.0008 - 0.0019 in.
Ring Groove Diameter		
Groove #1	89.6 - 89.8 mm	3.527 - 3.535 in.
Groove #2	88.1 - 88.3 mm	3.468 - 3.476 in.
Weight	413 grams	14.56 oz
Piston Length	54.70 - 55.30	2.153 - 2.177 in.
Ring Groove Width		
No. 1	1.51 - 1.54 mm	0.0594 - 0.0606 in
No. 2	1.51 - 1.53 mm	0.0594 - 0.0602 in.
No. 3	3.030 - 3.055 mm	0.1192 - 0.1202 in.

PISTON PINS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Clearance In Piston	0.009 - 0.018 mm	0.00035 - 0.0007 in.
Diameter	24.0 - 24.003 mm	0.9448 - 0.9449 in.
Length	70.53 - 71.03 mm	2.78 - 2.80 in.

PISTON RINGS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Ring Gap		
Top Compression Ring	0.23 - 0.38 mm	0.0090 - 0.0149 in.
Second Compression Ring	0.35 - 0.60 mm	0.0137 - 0.0236 in.
Oil Control (Steel Rails)	0.15 - 0.66 mm	0.0059 - 0.0259 in.
Side Clearance		
Top Compression Ring	.02 - .068 mm	0.0007 - 0.0026 in.
Second Compression Ring	0.02 - 0.058 mm	0.0007 - 0.0022 in.
Oil Ring (Steel Ring)	.019 - .229 mm	.0007 - .0091 in.
Ring Width		
Top Compression Ring	1.472 - 1.490 mm	0.0579 - 0.0586 in.
Second Compression Ring	1.472 - 1.490 mm	0.0579 - 0.0586 in.
Oil Ring (Steel Rails)	0.447 - 0.473 mm	0.0175 - 0.0186 in.

CONNECTING RODS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Piston Pin Bore Diameter	23.955 - 23.975 mm	0.9431 - 0.9438 in.
Side Clearance	0.10 - 0.35 mm	0.003 - 0.0137 in.

CRANKSHAFT

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Main Bearing Journal Diameter	64.988 - 65.012 mm	2.5585 - 2.5595 in.
Bearing Clearance	0.023 - 0.051 mm	0.0009 - 0.002 in.
Out of Round (MAX)	0.005 mm	0.0002 in.
Taper (MAX)	0.003 mm	0.0001 in.
End Play	0.052 - 0.282 mm	0.002 - 0.011 in.
End Play (MAX)	0.282 mm	0.011 in.
Connecting Rod Journal Diameter	53.992 - 54.008 mm	2.125 - 2.126 in.
Bearing Clearance	0.020 - 0.060 mm	0.0007 - 0.0023 in.
Out of Round (MAX)	0.005 mm	0.0002 in.
Taper (MAX)	0.003 mm	0.0001 in.

CAMSHAFT

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Bearing Journal Diameter		
No. 1	58.2 mm	2.29 in.
No. 2	57.8 mm	2.27 in.
No. 3	57.4 mm	2.26 in.
No. 4	57.0 mm	2.24 in.
No. 5	43.633 mm	1.72 in.
Bearing To Journal Clearance Standard		
No. 1	0.040 - 0.080 mm	.0015 - .003 in.
No. 2	0.050 -0.090 mm	0.0019 - .0035 in.
No. 3	0.040 - 0.080 mm	.0015 - .003 in.
No. 4	0.050 - 0.090 mm	0.0019 - .0035 in.
No. 5	0.040 - 0.080 mm	.0015 - .003 in.
Camshaft End Play	.080 - 0.290mm	0.0031 - 0.0114 in.

VALVE TIMING

DESCRIPTION	SPECIFICATION
Intake	
Opens (BTDC)	7.0°
Closes (ATDC)	253.0°
Exhaust	
Opens (BTDC)	233°
Closes (ATDC)	27°
Duration	253.70°
Valve Overlap	34°

CYLINDER HEAD

DESCRIPTION	SPECIFICATION
Valve Seat Angle	44.5° - 45.0°
Valve Seat Runout (MAX)	0.05 mm (0.0019 in.)
Valve Seat Width (Finish)	
Intake	1.018 - 1.62 mm (0.0464 - 0.0637 in.)
Exhaust	1.48 - 1.92 mm (0.0582 - 0.0755 in.)
Guide Bore Diameter (Std.)	7.975 - 8.00 mm (0.313 - 0.314 in.)

HYDRAULIC TAPPETS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Body Diameter	21.387 - 21.405 mm	0.8420 - 0.8427 in.
Clearance (To Bore)	0.020 - 0.063 mm	0.0007 - 0.0024 in.
Dry Lash	3.0 mm (at the valve)	0.1181 in.

VALVES

DESCRIPTION	SPECIFICATION
Face Angle	45.0° - 45.5°
Head Diameter	
Intake	50.67 - 50.93 mm (1.99 - 2.00 in.)
Exhaust	39.27 - 39.53 mm (1.54 - 1.55 in.)
Length (Overall)	
Intake	123.38 - 123.76 mm (4.857 - 4.872 in.)
Exhaust	120.475 - 120.855 mm (4.743 - 4.758 in.)
Stem Diameter	
Intake	7.935 - 7.953 mm (0.312 - 0.313 in.)
Exhaust	7.905 - 7.925 mm (0.311 - 0.312 in.)
Stem - to - Guide Clearance	
Intake	0.022 - 0.065 mm (0.0008 - 0.0025 in.)
Exhaust	0.050 - 0.095 mm (0.0019 - 0.0037 in.)
Valve Lift (@ Zero Lash)	
Intake	12.0 mm (0.472 in.)
Exhaust	11.70 mm (0.460 in.)

VALVE SPRING

DESCRIPTION	SPECIFICATION
Spring Force (Valve Closed) Intake and Exhaust	418.0 N +/- 30.0 N @ 46 mm (93.0 lbs +/- 7.0 lbs. @ 1.811 in.)
Spring Force (Valve Open) Intake and Exhaust	1077.0 N +/- 47.0 N @ 33.6 mm. (242.0 lbs. +/- 11 lbs. @ 1.322 in.)
Free Length (approx)	57.3 mm (2.256 in.)
Number of Coils Intake and Exhaust	7.4
Wire Diameter Intake and Exhaust	5.39 × 4.52 mm (0.212 - 0.177 in.)
Installed Height (Spring Seat to Bottom of Retainer) Intake and Exhaust	46.0 mm (1.81 in.)

OIL PUMP

DESCRIPTION	SPECIFICATION
Clearance Over Rotors (MAX)	0.095 mm (0.0038 in.)
Outer Rotor to Pump Body Clearance (MAX)	.235 mm (.009 in.)
Tip Clearance Between Rotors (MAX)	0.150 mm (0.006 in.)

OIL PRESSURE

SPECIFICATION	SPECIFICATION
At Curb Idle Speed (MIN)*	25 kPa (4 psi)
@ 3000 rpm	170 - 758 kPa (25 - 110 psi)
*** CAUTION: If pressure is zero at curb idle, DO NOT run engine**	

TORQUE

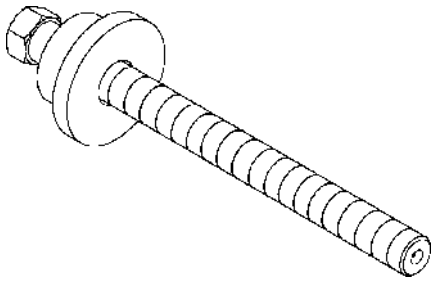
TORQUE CHART 5.7L ENGINE

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Block Pipe Plugs (1/4 NPT)	20	—	177
(3/8 NPT)	27	—	240
Camshaft Sprocket—Bolt	122	90	—
Camshaft Tensioner Plate—Bolts	28	—	250
Timing Chain Case Cover—Bolts	28	—	250
Lifting Stud	55	40	—
Connecting Rod Cap—Bolts	21 plus 90° Turn	15 plus 90° Turn	—
Main Bearing Cap—Bolts M-12	27 plus 90° Turn	—	—
Crossbolts M-8	28	—	—
Cylinder Head—Bolts M-12 Bolts			
Step 1	34	25	—
Step 2	54	40	—
Step 3	Turn 90°	Turn 90°	—
M-8 Bolts			—
Step 1	20	15	—
Step 2	34	25	—
Cylinder Head Cover—Bolts	8	—	70
Exhaust Manifold to Cylinder Head	25	—	220
Flexplate to crankshaft—Bolts	95	70	—
Flywheel to crankshaft—Bolts	75	55	—
Front Insulator—Through bolt/nut	95	70	—
Front Insulator to Support Bracket			
—Stud Nut (4WD)	41	30	—
—Through Bolt/Nut (4WD)	102	75	—
Front Insulator to Block—Bolts (2WD)	95	70	—
Generator—Mounting Bolt	55	40	—
Intake Manifold—Bolts	Refer to Procedure		
Lifter Guide Holder	12	—	106
Oil Pan Bolts	12	-	105
Oil Dipstick Tube	12	—	105
Oil Pan—Drain Plug	34	25	—
Oil Pump—Attaching Bolts	28	—	250
Oil Pump Pickup Tube – Bolt and Nut	28	—	250
Rear Seal Retainer Attaching Bolts	15	—	132
Rear Insulator to Bracket—Through-Bolt (2WD)	68	50	—

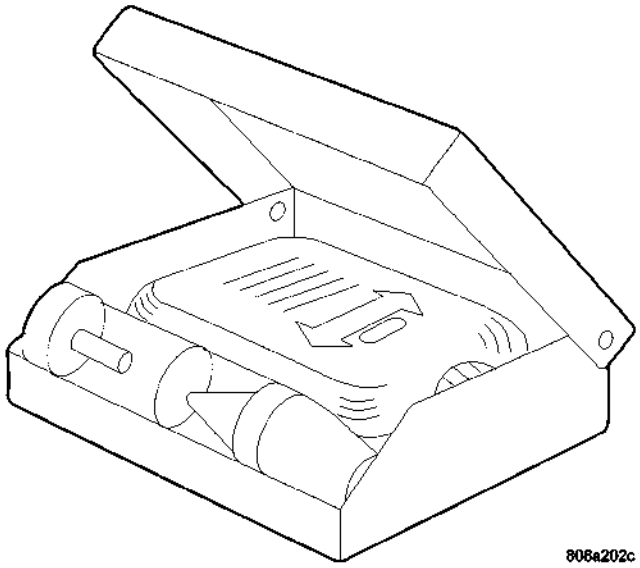
DESCRIPTION	N·m	Ft.	In.
Rear Insulator to Crossmember Support Bracket—Nut (2WD)	41	30	—
Rear Insulator to Crossmember—Nuts (4WD)	68	50	—
Rear Insulator to Transmission—Bolts (4WD)	68	50	—
Rear Insulator Bracket—Bolts (4WD Automatic)	68	50	—
Rear Support Bracket to Crossmember Flange—Nuts	41	30	—
Rear Support Plate to Transfer Case—Bolts	41	30	—
Rocker Arm—Bolts	22	—	195
Spark Plugs	—	—	—
Thermostat Housing—Bolts	28	—	250
Throttle Body—Bolts	12	—	105
Transfer Case to Insulator Mounting Plate—Nuts	204	105	—
Transmission Support Bracket—Bolts (2WD)	68	50	—
Vibration Damper—Bolt	176	129	—
Water Pump to Timing Chain Case Cover—Bolts	28	—	250

SPECIAL TOOLS

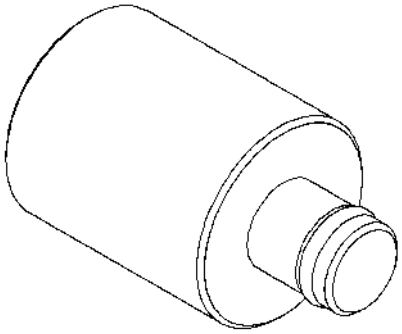
5.7L ENGINE



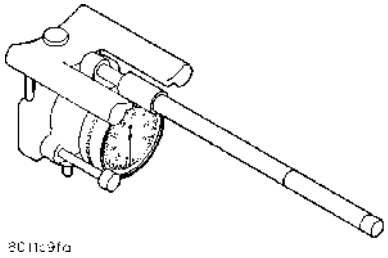
Crankshaft Damper Installer 8512



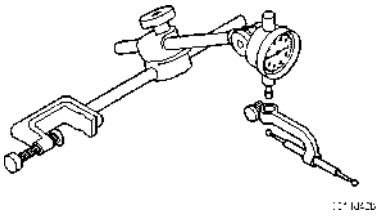
BLOC-CHEK KIT C-3685



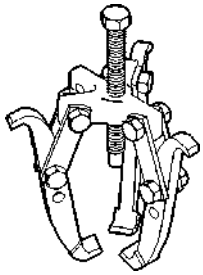
CRANKSHAFT DAMPER REMOVER INSERT - 8513-A



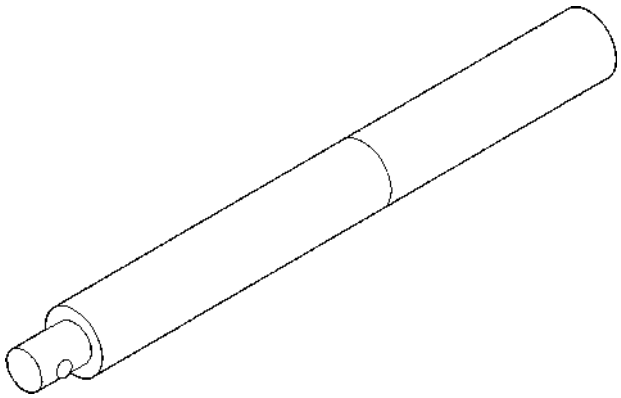
Bore Size Indicator C-119



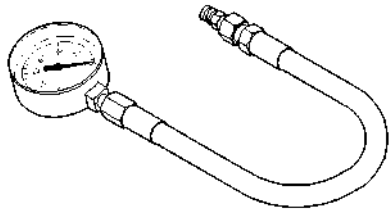
Dial Indicator C-3339



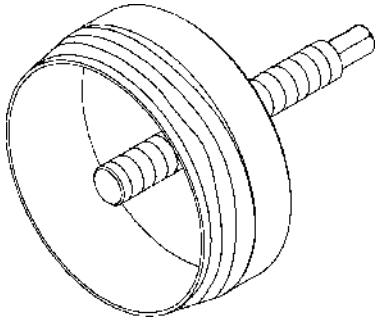
Puller 1023



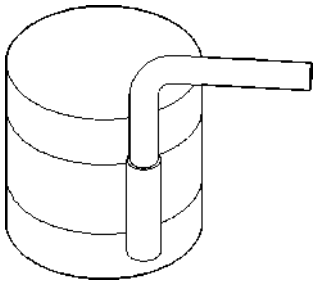
Handle C-4171



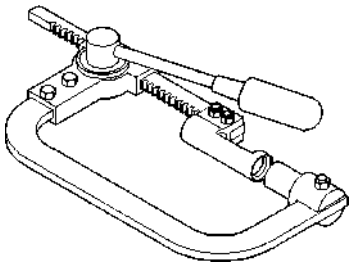
Oil Pressure Gauge C-3292



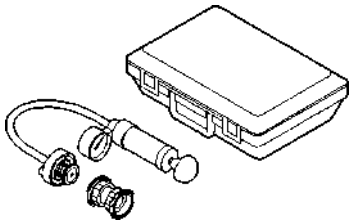
Rear Crankshaft Seal Remover 8506



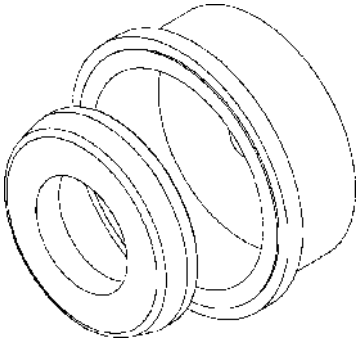
Piston Ring Compressor C-385



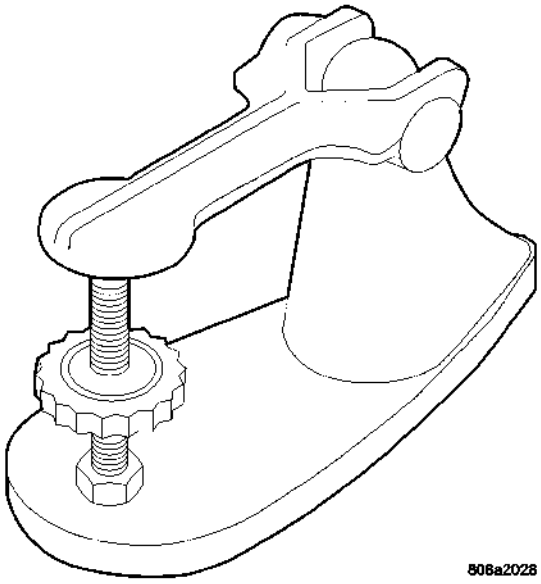
Valve Spring Compressor C-3422-B



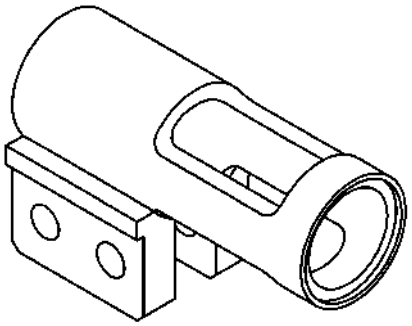
Pressure Tester Kit 7700



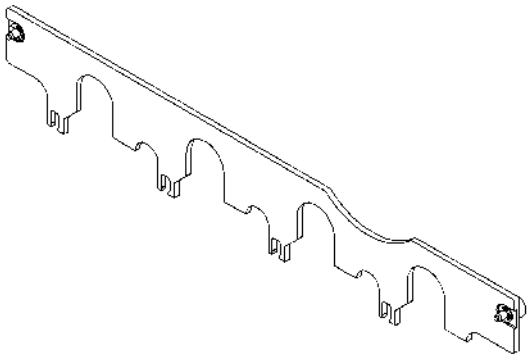
Rear Crankshaft Seal Installer 8349



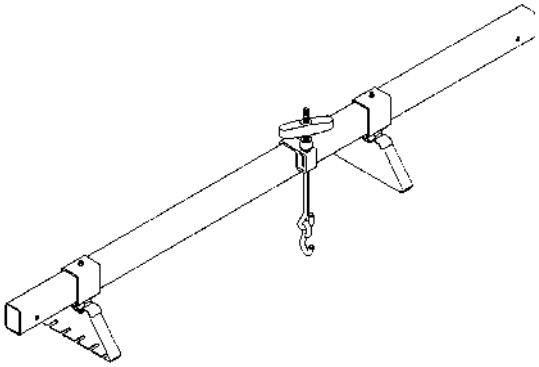
Valve Spring Tester C-647



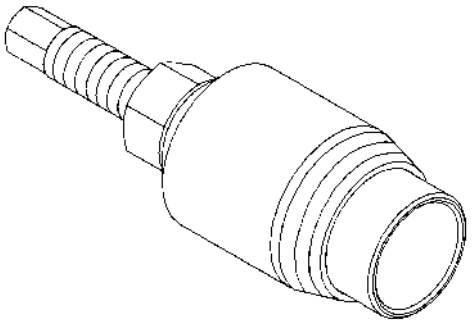
Adapter, Valve Spring Compressor Off-vehicle 8464



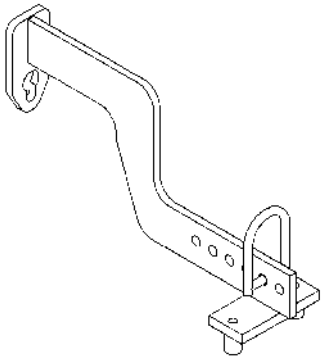
PUSHROD RETAINING PLATE - 9070



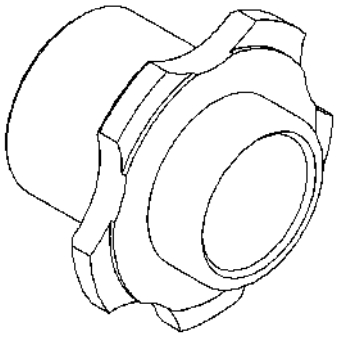
ENGINE SUPPORT FIXTURE 8534



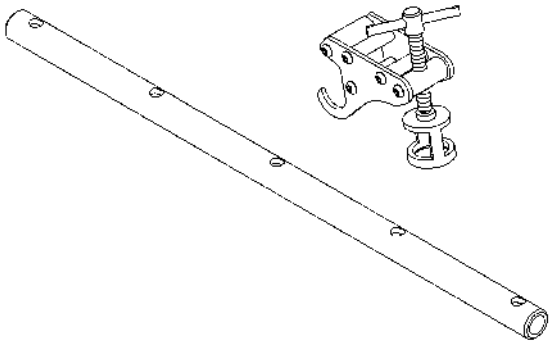
FRONT CRANK SEAL REMOVER - 9071



ENGINE LIFT FIXTURE 8984



FRONT CRANK SEAL INSTALLER 9072



VALVE SPRING COMPRESSOR - 9065

AIR INTAKE SYSTEM

REMOVAL

Filter Element Only

Housing removal is not necessary for element (filter) replacement.

1. Loosen clamp and disconnect air duct at air cleaner cover.
2. Pry over 4 spring clips (5) from housing cover (3) (spring clips retain cover to housing).
3. Release housing cover (3) from locating tabs (4) on housing and remove cover (3).
4. Remove air cleaner element (filter) from housing.
5. Clean inside of housing before replacing element.

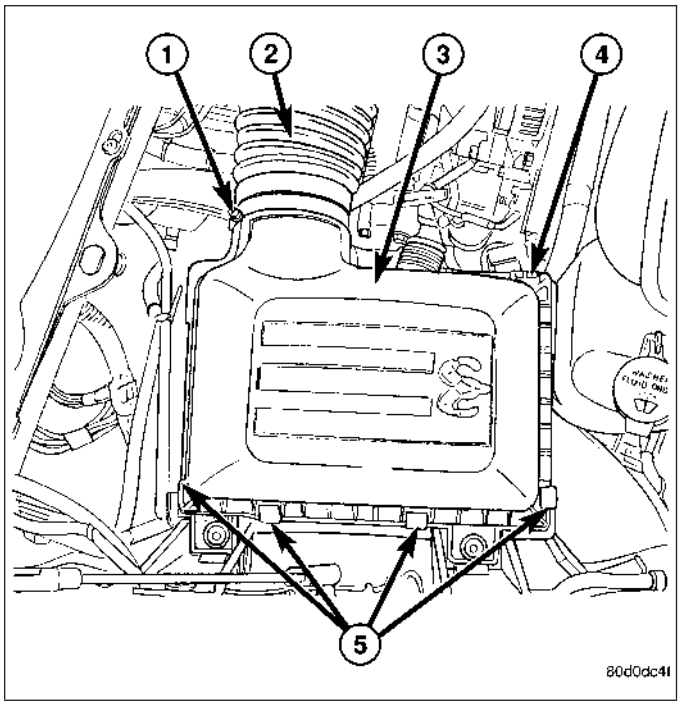


Fig. 1 AIR CLEANER COVER

1 - CLAMP
2 - AIR DUCT
3 - AIR CLEANER COVER
4 - LOCATING TABS
5 - CLIPS (4)

Housing Assembly

1. Loosen clamp and disconnect air duct at air cleaner cover.
2. Lift entire housing (1) assembly from 4 locating pins (2).

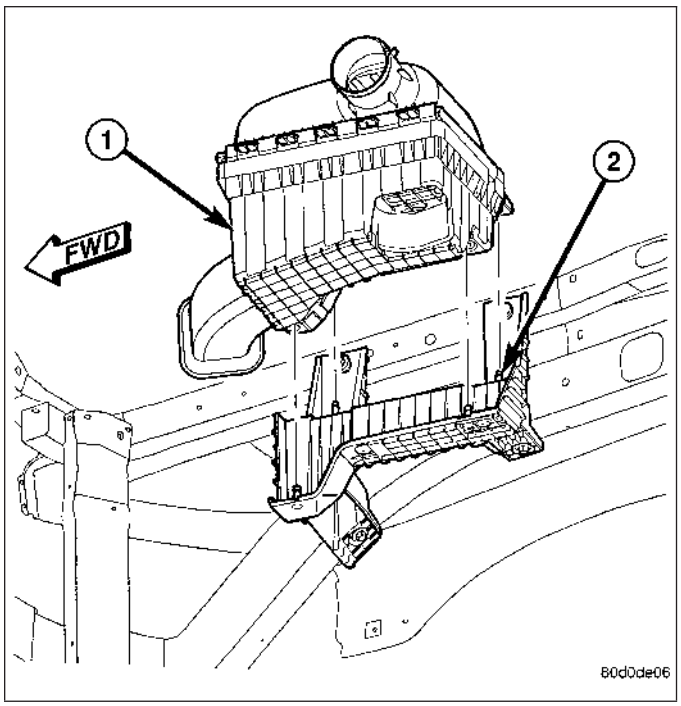
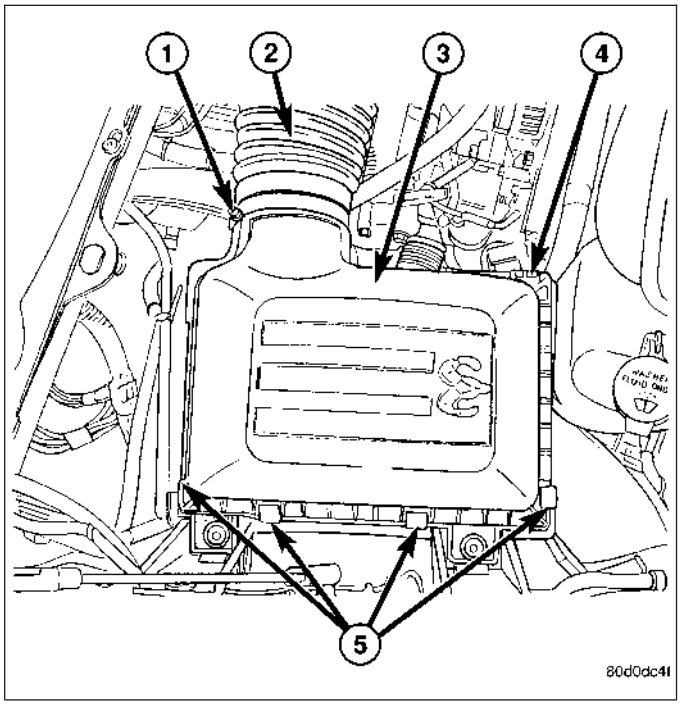


Fig. 2 AIR CLEANER HOUSING

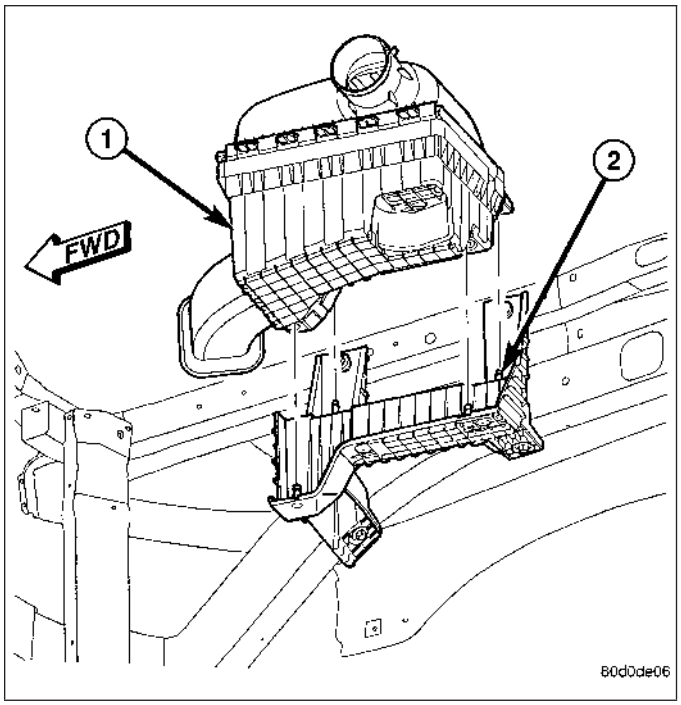
1 - AIR CLEANER HOUSING ASSEMBLY
2 - LOCATING PINS (4)

INSTALLATION

1. Install filter element into housing.
2. Position housing cover into housing locating tabs (4).
3. Pry up 4 spring clips(5) and lock cover to housing.
4. Install air duct to air cleaner cover and tighten hose clamp to 3 N·m (30 in. lbs.) torque.
5. If any other hose clamps were removed from air intake system, tighten them to 3.4 N·m (30 in. lbs.) torque.
6. If any bolts were removed from air resonator housing or air intake tubing, tighten them to 4.5 N·m (40 in. lbs.) torque.



7. Install filter housing (1) into locating pins (2).



CYLINDER HEAD

OPERATION—CYLINDER HEAD

The cylinder head closes the combustion chamber allowing the pistons to compress the air fuel mixture to the correct ratio for ignition. The valves located in the cylinder head open and close to either allow clean air into the combustion chamber or to allow the exhaust gases out, depending on the stroke of the engine.

DIAGNOSIS AND TESTING - CYLINDER HEAD GASKET FAILURE

A cylinder head gasket leak can be located between adjacent cylinders or between a cylinder and the adjacent water jacket.

- Possible indications of the cylinder head gasket leaking between adjacent cylinders are:
  - Loss of engine power
  - Engine misfiring
  - Poor fuel economy
- Possible indications of the cylinder head gasket leaking between a cylinder and an adjacent water jacket are:
  - Engine overheating
  - Loss of coolant
  - Excessive steam (white smoke) emitting from exhaust
  - Coolant foaming

CYLINDER-TO-CYLINDER LEAKAGE TEST

To determine if an engine cylinder head gasket is leaking between adjacent cylinders, follow the procedures in Cylinder Compression Pressure Test in this section. An engine cylinder head gasket leaking between adjacent cylinders will result in approximately a 50–70% reduction in compression pressure.

CYLINDER-TO-WATER JACKET LEAKAGE TEST

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING WITH COOLANT PRESSURE CAP REMOVED.

VISUAL TEST METHOD

With the engine cool, remove the coolant pressure cap. Start the engine and allow it to warm up until thermostat opens.

If a large combustion/compression pressure leak exists, bubbles will be visible in the coolant.

COOLING SYSTEM TESTER METHOD

WARNING: WITH COOLING SYSTEM TESTER IN PLACE, PRESSURE WILL BUILD UP FAST. EXCESSIVE PRESSURE BUILT UP, BY CONTINUOUS ENGINE OPERATION, MUST BE RELEASED TO A SAFE PRESSURE POINT. NEVER PERMIT PRESSURE TO EXCEED 138 kPa (20 psi).

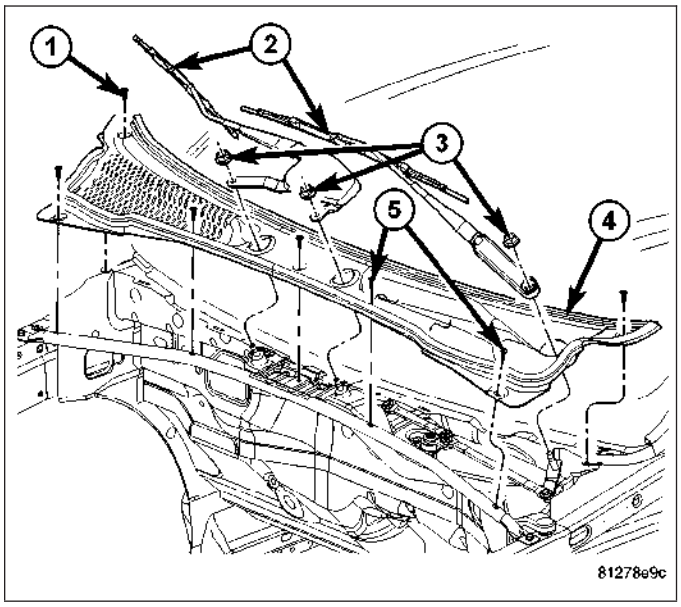
Install Cooling System Tester 7700 or equivalent to pressure cap neck. Start the engine and observe the tester's pressure gauge. If gauge pulsates with every power stroke of a cylinder a combustion pressure leak is evident.

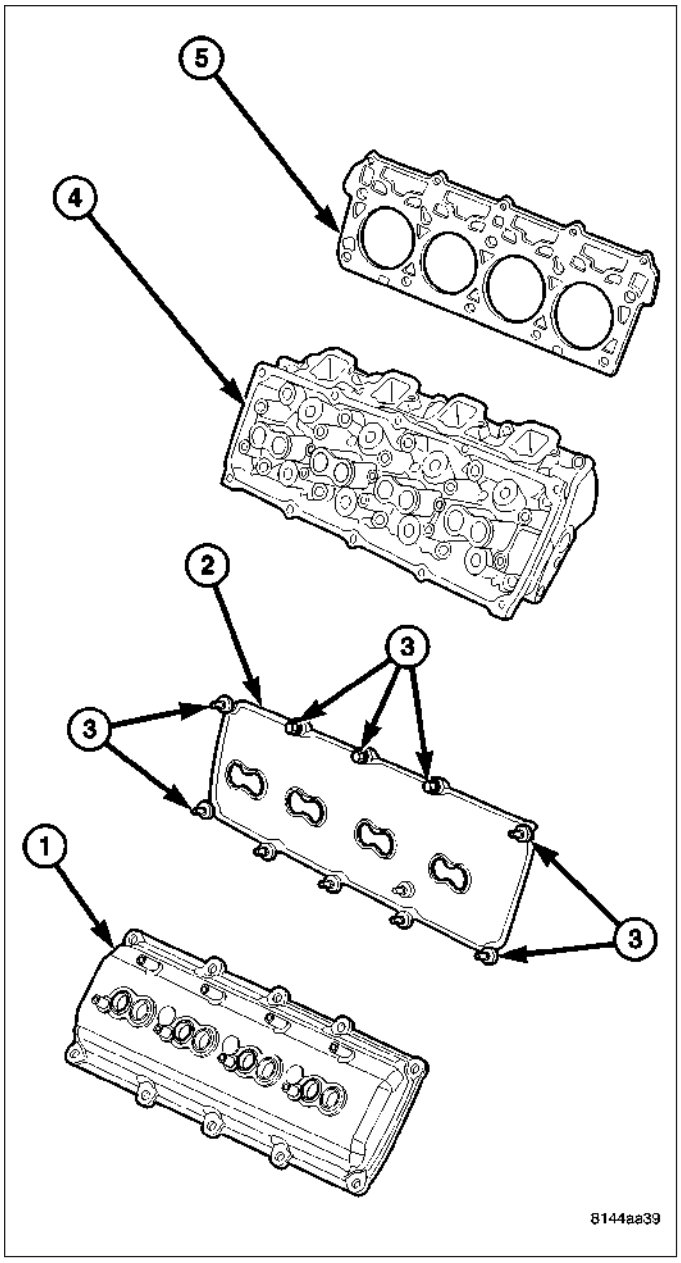
CHEMICAL TEST METHOD

Combustion leaks into the cooling system can also be checked by using Bloc-Chek Kit C-3685-A or equivalent. Perform test following the procedures supplied with the tool kit.

REMOVAL

1. Remove cowl grille (4).

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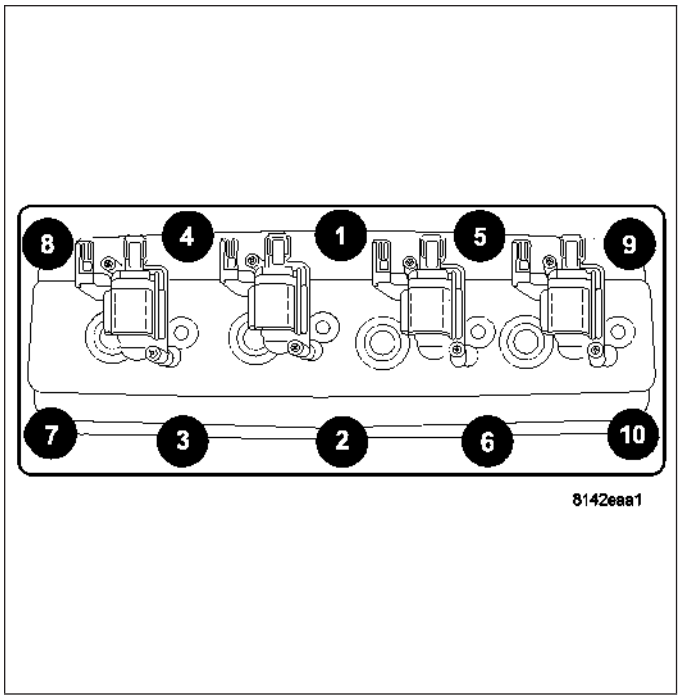
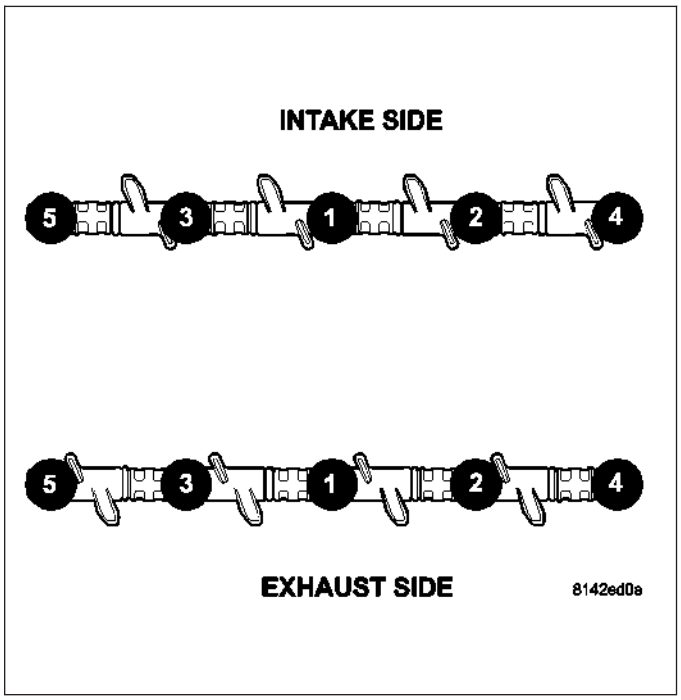
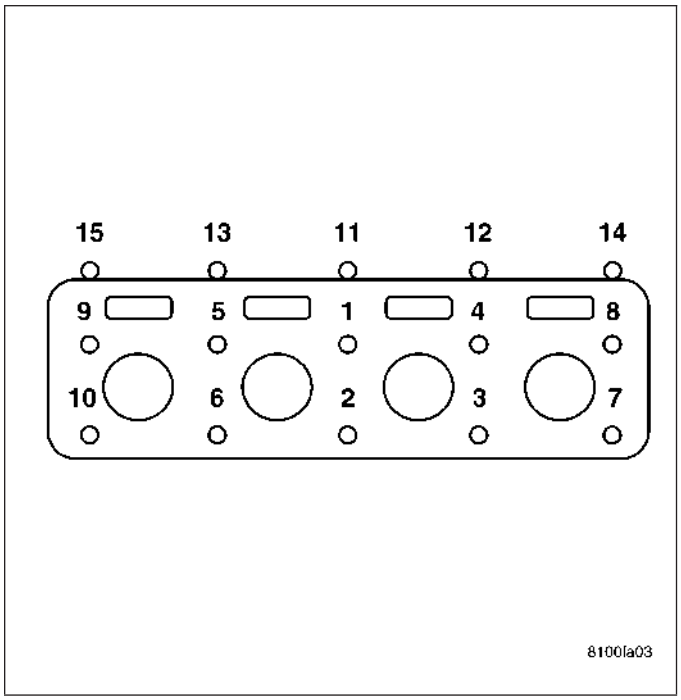
2. Perform the Fuel System Pressure Release procedure (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - STANDARD PROCEDURE). Disconnect the fuel supply line (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/QUICK CONNECT FITTING - STANDARD PROCEDURE).
3. Disconnect the battery negative cable.
4. Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
5. Remove the air cleaner resonator and duct work (Refer to 9 - ENGINE/AIR INTAKE SYSTEM - REMOVAL).
6. Remove closed crankcase ventilation system.
7. Disconnect the exhaust at the exhaust manifolds.
8. Disconnect the evaporation control system.
9. Disconnect heater hoses.
10. Remove the power steering pump.
11. Remove cylinder head covers (1), using the sequence provided, and gaskets (2). (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL)
    .
12. Remove intake manifold and throttle body as an assembly. (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).
13. Remove rocker arm assemblies and push rods. Identify to ensure installation in original locations. (Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARM / ADJUSTER ASSY - REMOVAL).





14. Remove the head bolts from each cylinder head, using the sequence provided, and remove cylinder heads. Discard the cylinder head gasket.



CLEANING

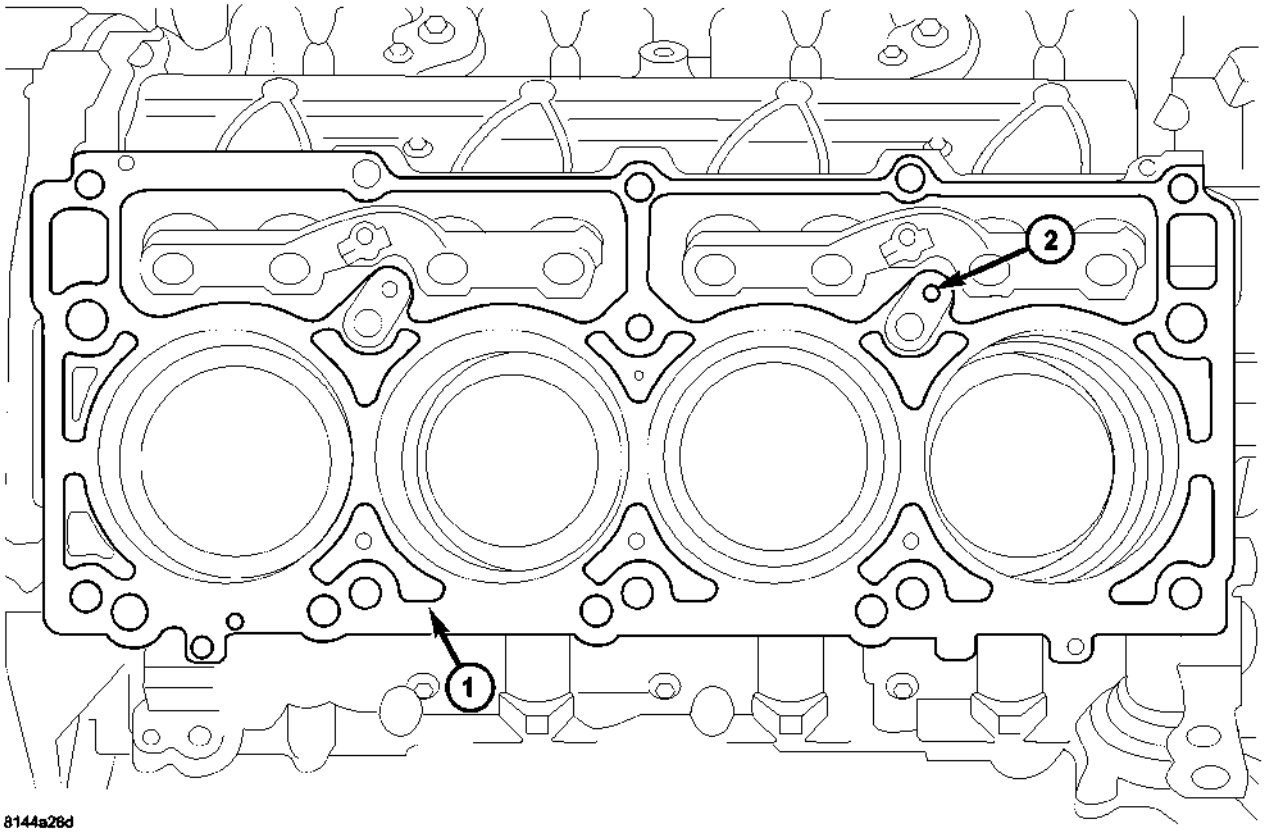
Clean all surfaces of cylinder block and cylinder heads.

Clean cylinder block front and rear gasket surfaces using a suitable solvent.

INSPECTION

1. Inspect the cylinder head for out-of-flatness, using a straightedge and a feeler gauge. If tolerances exceed 0.0508 mm (0.002 in.) replace the cylinder head.
2. Inspect the valve seats for damage. Service the valve seats as necessary.
3. Inspect the valve guides for wear, cracks or looseness. If either condition exist, replace the cylinder head.
4. Inspect pushrods. Replace worn or bent pushrods.

INSTALLATION

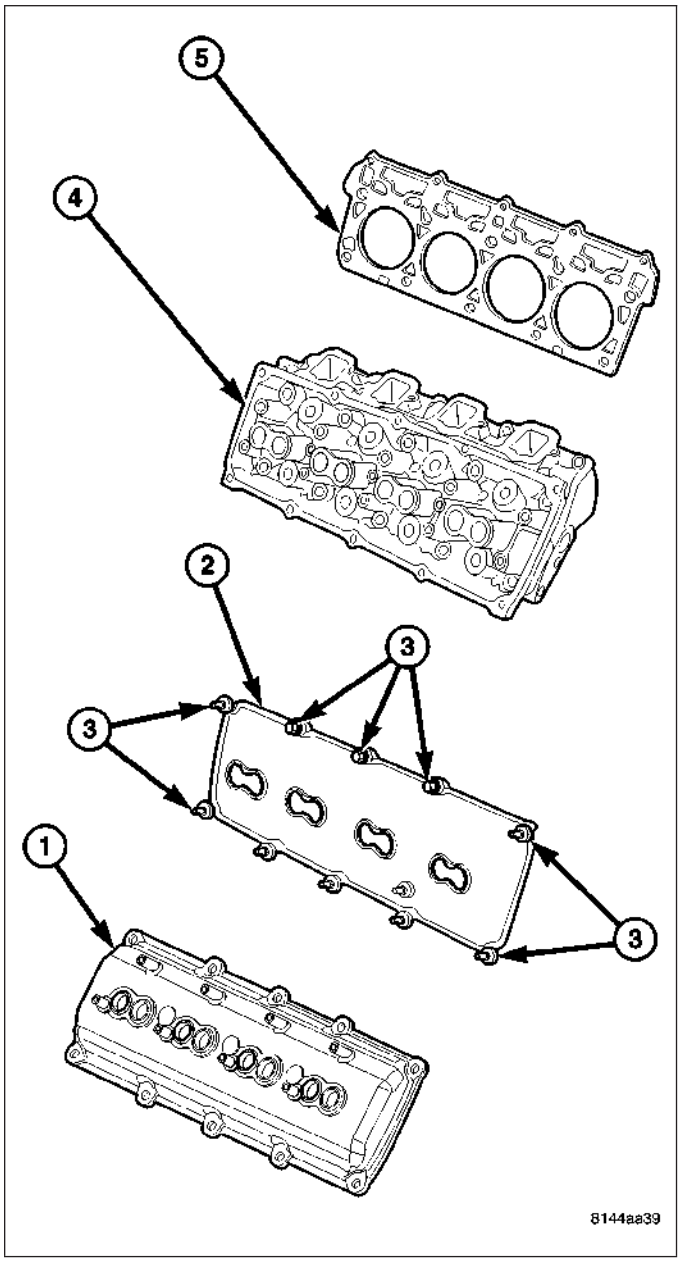


1. Clean all surfaces of cylinder block and cylinder heads.
2. Clean cylinder block front and rear gasket surfaces using a suitable solvent.

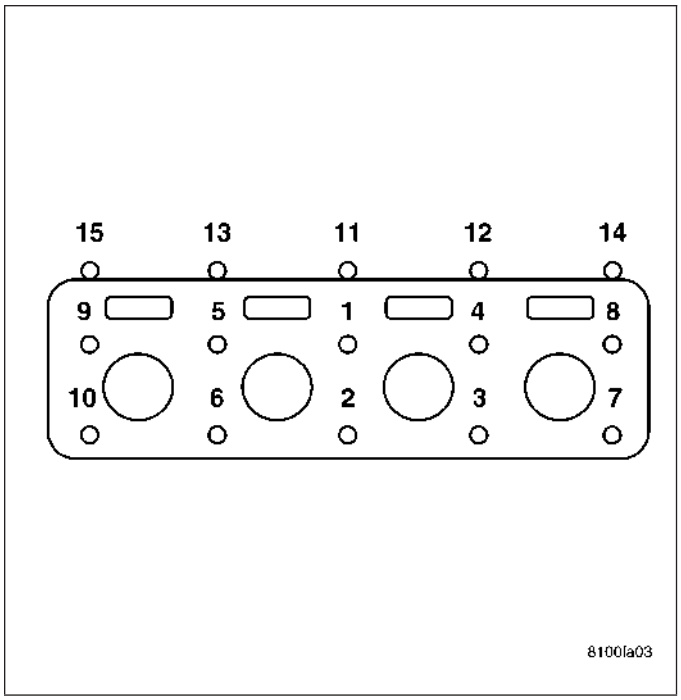
CAUTION: The head gaskets (1) are not interchangeable between left and right sides. They are marked “L” and “R” to indicate left and right sides.

CAUTION: The head gaskets (1) are marked “TOP” to indicate which side goes up.

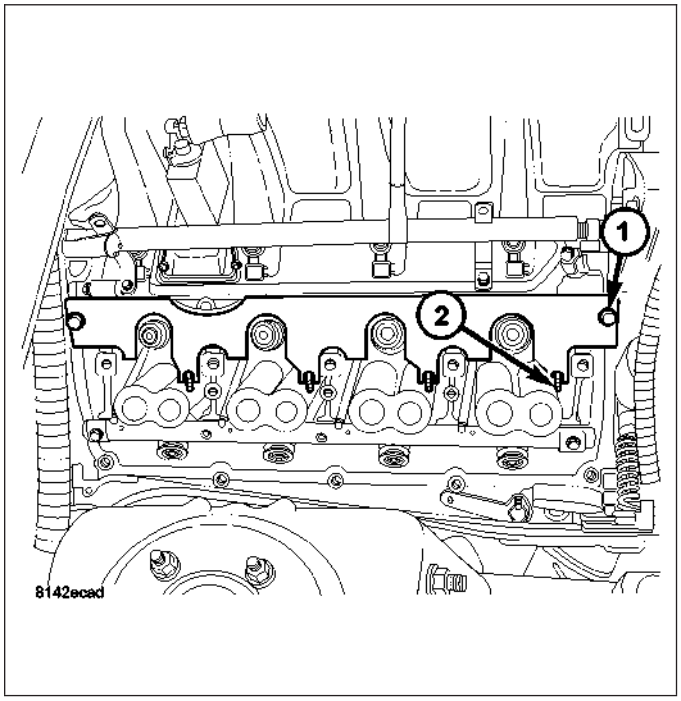
3. Position new cylinder head gaskets (5) onto the cylinder block.
4. Position cylinder heads (4) onto head gaskets (5) and cylinder block.

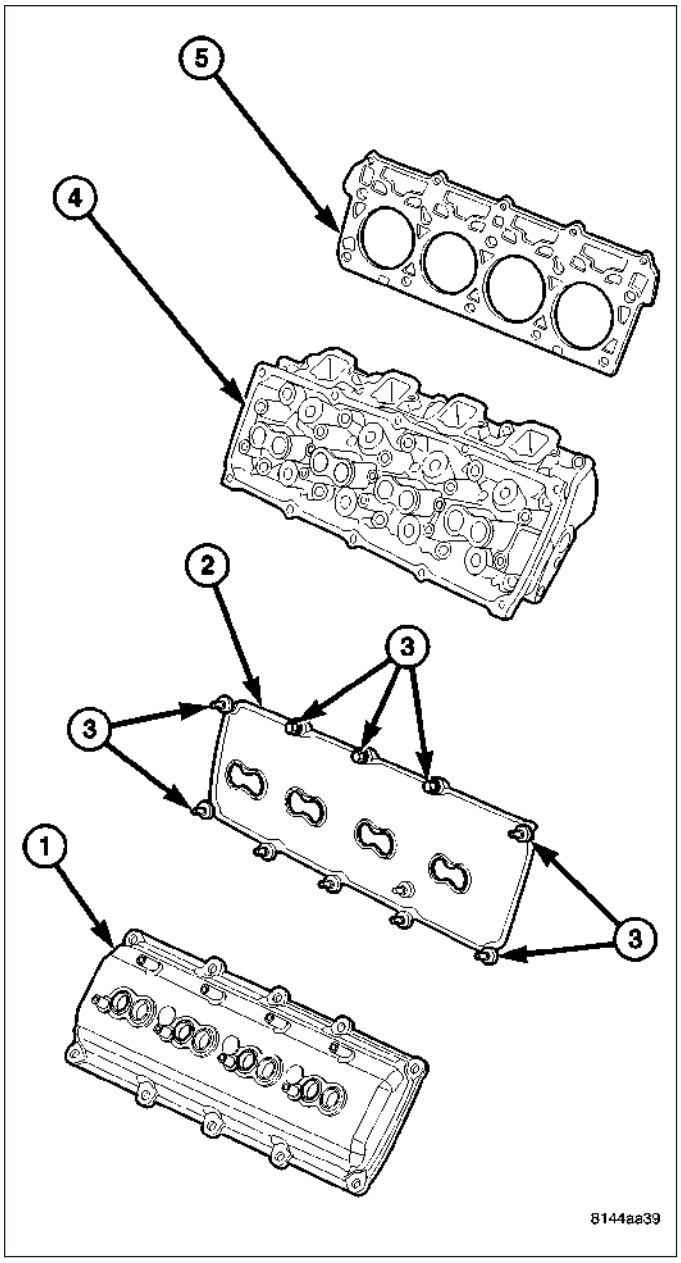


5. Tighten the cylinder head bolts in three steps using the sequence provided :
   - Step 1— Snug tighten M12 cylinder head bolts, in sequence, to 34 N·m (25 ft. lbs.) and M8 bolts to 20 N·m (15 ft. lbs.) torque.
   - Step 2— Tighten M12 cylinder head bolts, in sequence, to 54 N·m (40 ft. lbs.) and verify M8 bolts to 20 N·m (15 ft. lbs.) torque..
   - Step 3— Turn M12 cylinder head bolts, in sequence, 90 degrees and tighten M8 bolts to 34 N·m (25 ft. lbs.) torque.



6. Install push rods and rocker arm assemblies in their original position, using pushrod retaining plate (1) special tool# 9070. (Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARM / ADJUSTER ASSY - INSTALLATION).
7. Install the intake manifold and throttle body assembly (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION).
8. If required, adjust spark plugs to specifications. Install the plugs.
9. Connect the heater hoses.
10. Install the fuel supply line.
11. Install the power steering pump.
12. Install the drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

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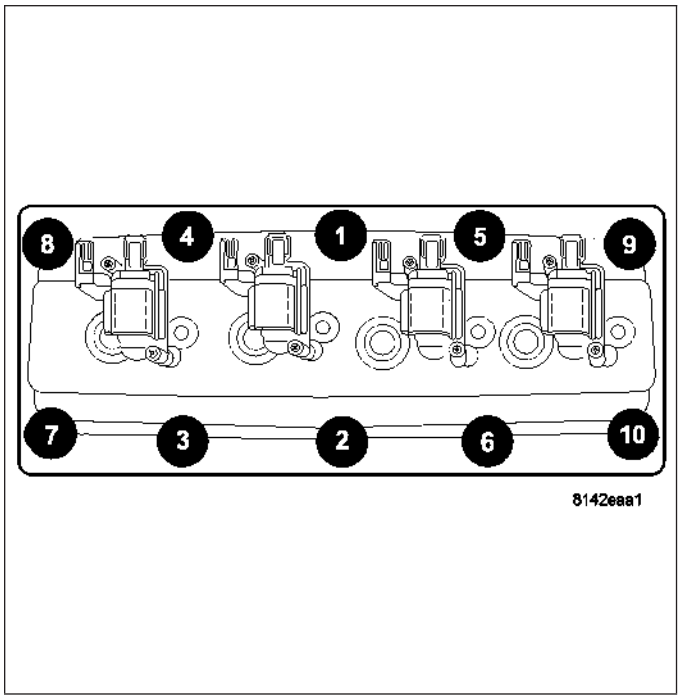
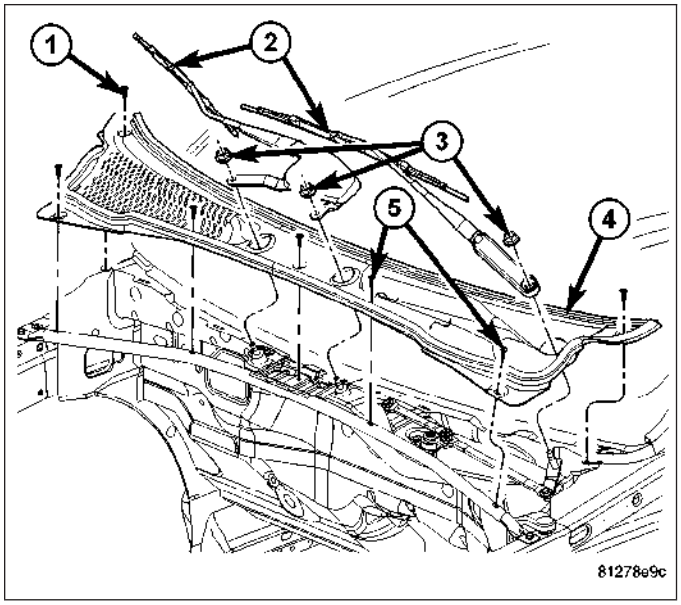
13. Install cylinder head covers (1) (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).
14. Connect the evaporation control system.
15. Install the air cleaner (Refer to 9 - ENGINE/AIR INTAKE SYSTEM - INSTALLATION).



16. Install cowl grille (4).
17. Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
18. Connect the negative cable to the battery.
19. Start engine check for leaks.

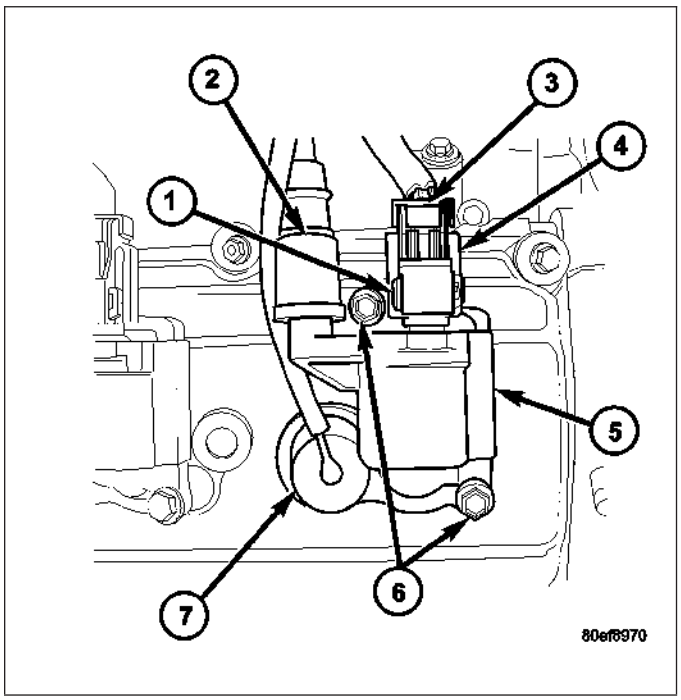


COVER-CYLINDER HEAD

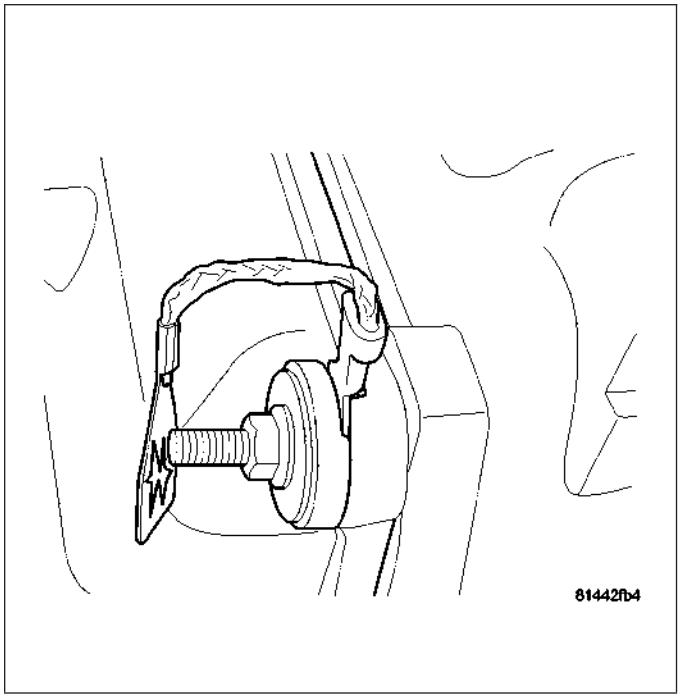
REMOVAL

1. Disconnect battery negative cable.

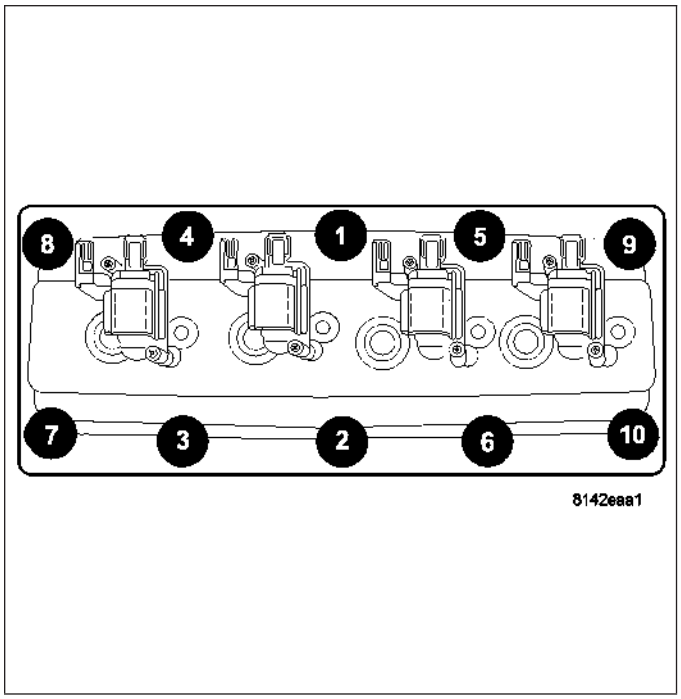
2. Disconnect coil on plug connectors (4).



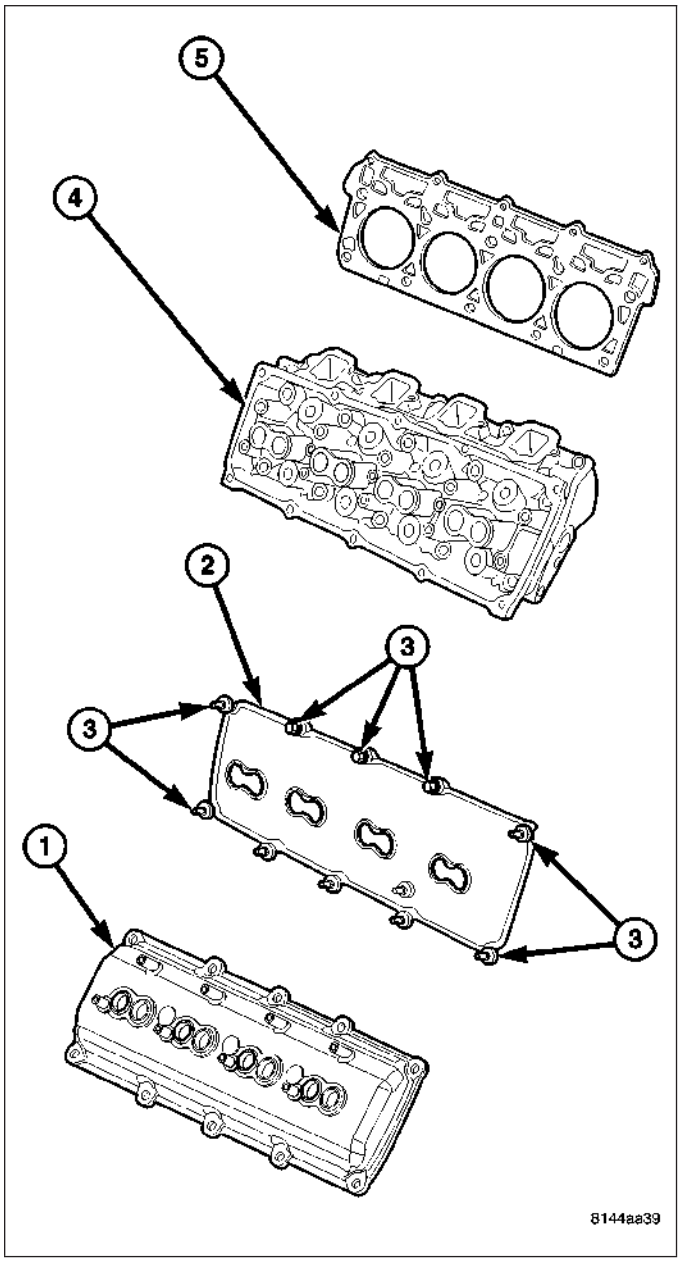
CAUTION: The ground straps must be installed in the same location as removed. The covers are machined to accept the ground straps in those locations only.



3. Remove cylinder head cover retaining bolts, and ground straps.



4. Remove cylinder head cover (1).



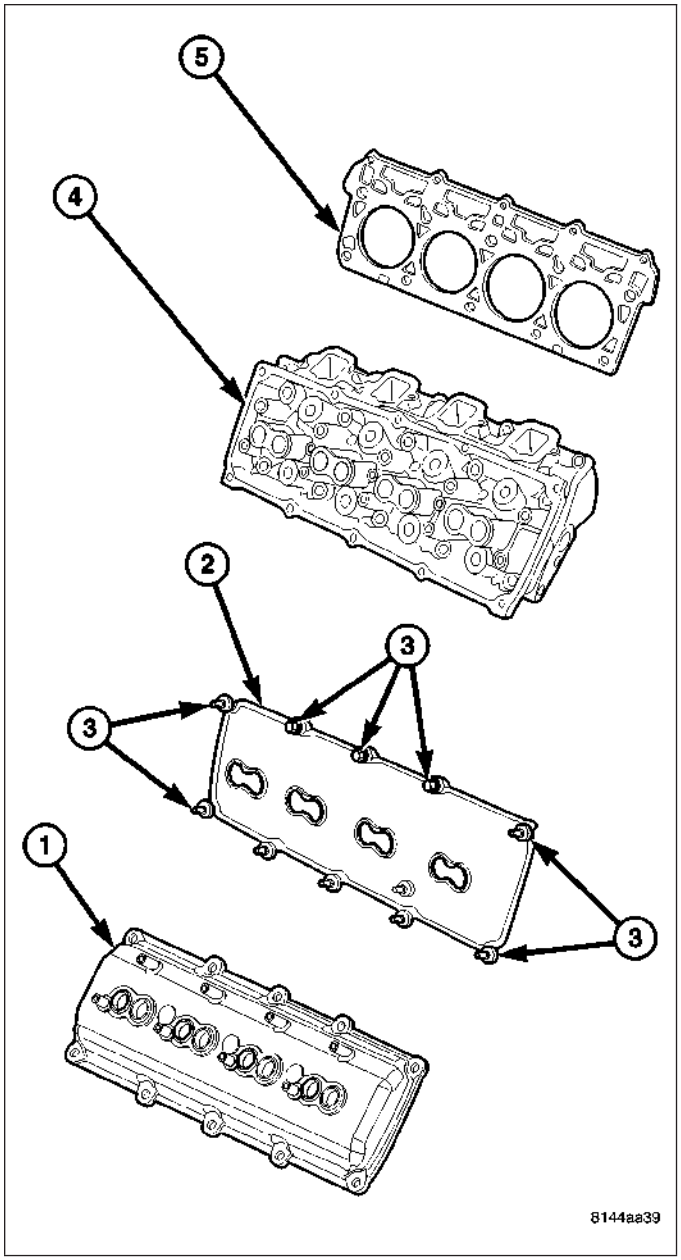
NOTE: The gasket (2) may be used again, provided no cuts, tears, or deformation has occurred.

INSTALLATION

CAUTION: Do not use harsh cleaners to clean the cylinder head covers. Severe damage to covers may occur.

CAUTION: DO NOT allow other components including the wire harness to rest on or against the engine cylinder head cover. Prolonged contact with other objects may wear a hole in the cylinder head cover.

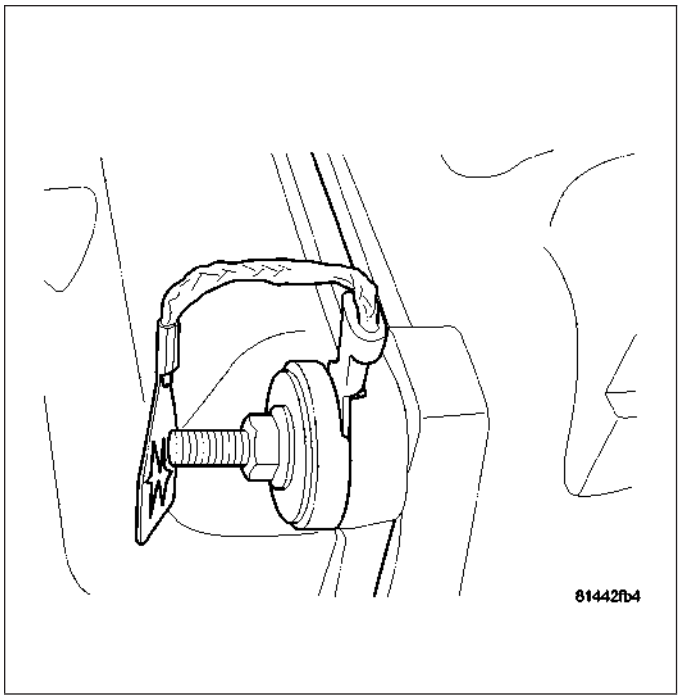
1. Clean cylinder head cover (1) and both sealing surfaces (1,4,). Inspect and replace gasket (2) as necessary.



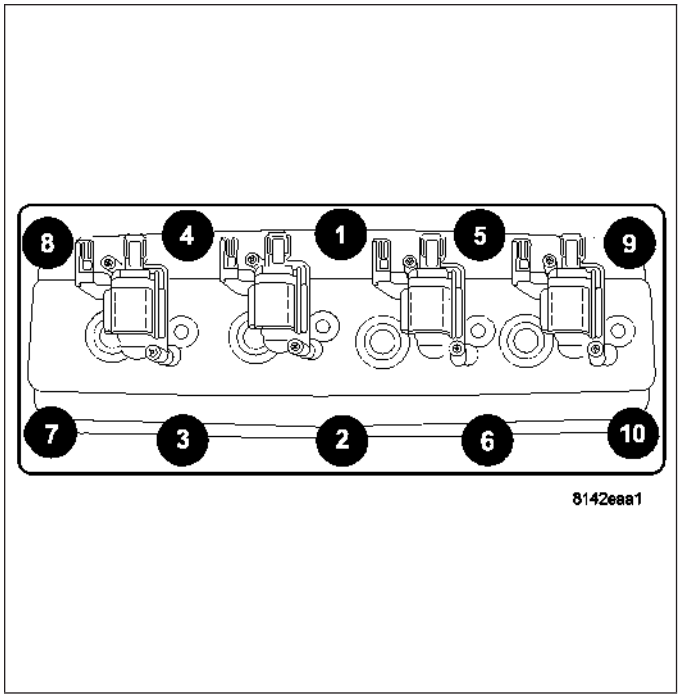
2. Install cylinder head cover and hand start all fasteners. Verify that all double ended studs are in the correct location and install left and right ground straps.

CAUTION: The ground straps must be installed in the same location as removed. The covers are machined to accept the ground straps in those locations only.

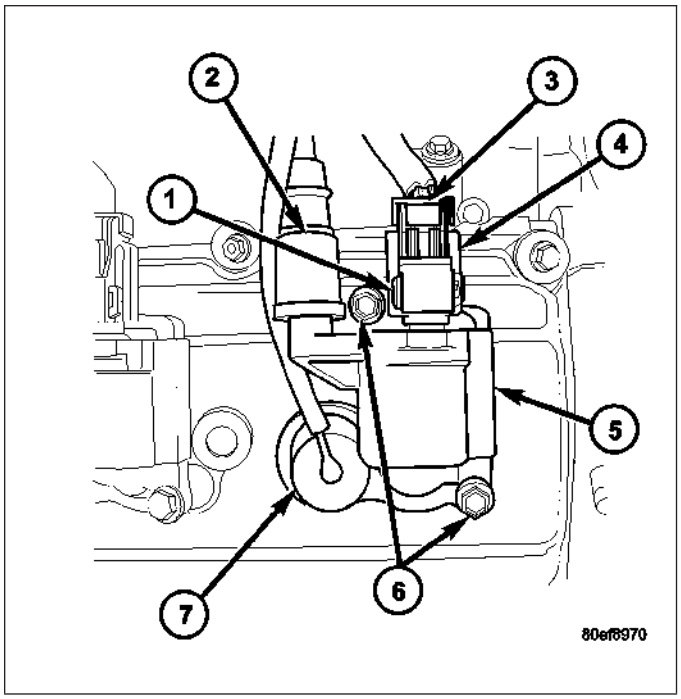
NOTE: The right hand ground strap is located on the front inboard stud. The left hand ground strap is located on the rear inboard stud.



3. Tighten cylinder head cover bolts and double ended studs to 8 N·m (70 in. lbs). Begin torque sequence in the middle of head cover and torque bolts moving outward in a crisscross pattern from top to bottom.



4. Install ignition coil on plug (5) , and torque fasteners (6) to 12 N·m (105 in. lbs)
5. Connect, ignition coil electrical connectors (4).
6. Install PCV hose.
7. Connect battery negative cable.



VALVES & SEATS - INTAKE/EXHAUST

DESCRIPTION

DESCRIPTION - VALVE GUIDES

The valve guides are made of powered metal and are pressed into the cylinder head. The guides are not replaceable or serviceable, and valve guide reaming is not recommended. If the guides are worn beyond acceptable limits, replace the cylinder heads.

DESCRIPTION

Both the intake and exhaust valves are made of steel. The intake valve is 50.93 mm (2.00 inches) in diameter and the exhaust valve is 39.53 mm (1.55 inches) in diameter. All valves use three bead lock keepers to retain the springs and promote valve rotation.

STANDARD PROCEDURE - REFACING

NOTE: Valve seats that are worn or burned can be reworked, provided that correct angle and seat width are maintained. Otherwise the cylinder head must be replaced.

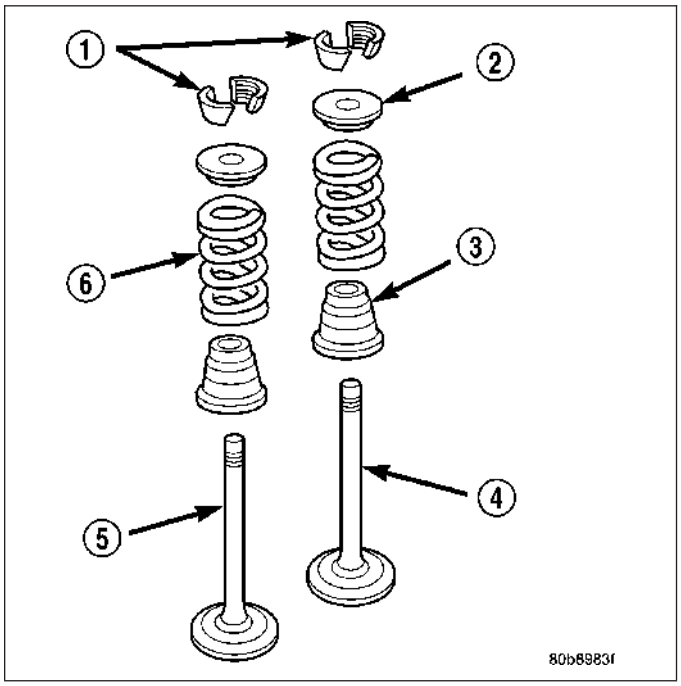
NOTE: When refacing valves and valve seats, it is important that the correct size valve guide pilot be used for reseating stones. A true and complete surface must be obtained.

1. Using a suitable dial indicator measure the center of the valve seat Total run out must not exceed 0.051 mm (0.002 in).
2. Apply a small amount of Prussian blue to the valve seat, insert the valve into the cylinder head, while applying light pressure on the valve rotate the valve. Remove the valve and examine the valve face. If the blue is transferred below the top edge of the valve face, lower the valve seat using a 15 degree stone. If the blue is transferred to the bottom edge of the valve face, raise the valve seat using a 65 degree stone.
3. When the seat is properly positioned the width of the intake seat must be 1.018 - 1.62 mm (0.0464 - 0.0637 in.) and the exhaust seat must be 1.48 - 1.92 mm (0.058 - 0.075 in.).
4. Check the valve spring installed height after refacing the valve and seat. The installed height for both intake and exhaust valve springs must not exceed 46.0 mm (1.81 in.).

VALVE FACE AND VALVE SEAT ANGLE CHART

DESCRIPTION	SPECIFICATION
SEAT WIDTH	
INTAKE	1.018 - 1.62 mm (0.0464 - 0.0637 in.)
EXHAUST	1.48 - 1.92 mm (0.058 - 0.075 in.)
FACE ANGLE (INT. AND EXT.)	45° - 45½°
SEAT ANGLE (INT. AND EXT.)	44½° - 45°

5. The valve seat must maintain an angle of 44.5 – 45.0 degrees angle.
6. The valve face must maintain a face angle of 45.0 – 45.5 degrees angle.



REMOVAL

1. Remove the cylinder head (Refer to 9 - ENGINE/CYLINDER HEAD - REMOVAL).
2. Compress valve springs using Valve Spring Compressor Tool special tool # C-3422and adapter 8464.
3. Remove valve retaining locks, valve spring retainers, valve stem seals and valve springs.
4. Before removing valves, remove any burrs from valve stem lock grooves to prevent damage to the valve guides. Identify valves to ensure installation in original location.

INSTALLATION

1. Clean valves thoroughly. Discard burned, warped and cracked valves.
2. Remove carbon and varnish deposits from inside of valve guides with a reliable guide cleaner.
3. Measure valve stems for wear. If wear exceeds 0.051 mm (0.002 inch), replace the valve.
4. Coat valve stems with lubrication oil and insert them in cylinder head.
5. If valves or seats are reground, check valve stem height. If valve is too long, replace cylinder head.
6. Install new seals on all valve guides. Install valve springs and valve retainers.

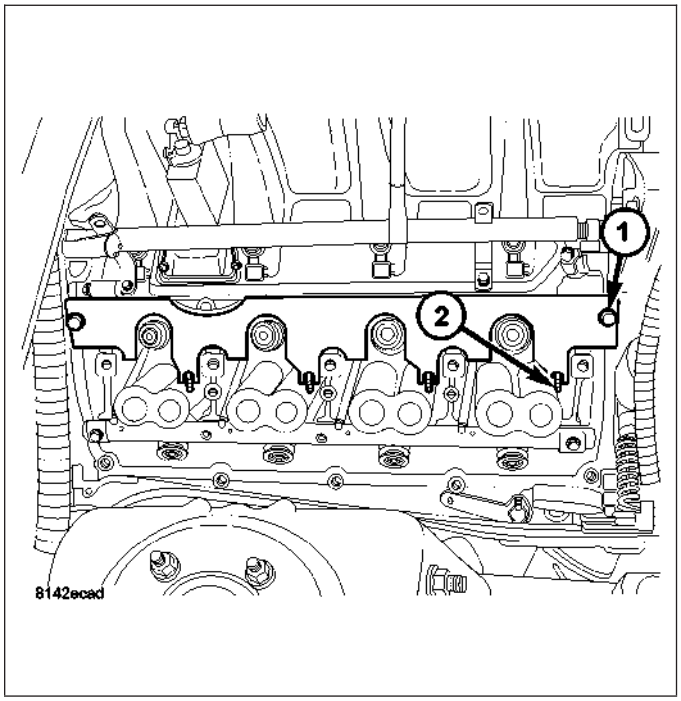
7. Compress valve springs with Valve Spring Compressor Tool special tool # C- 3422and adapter 8464, install locks and release tool. If valves and/or seats are ground, measure the installed height of springs. Make sure the measurement is taken from bottom of spring seat in cylinder head to the bottom surface of spring retainer.
8. Install cylinder head (Refer to 9 - ENGINE/CYLINDER HEAD - INSTALLATION).

ROCKER ARM

REMOVAL

1. Remove cylinder head cover. (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL)

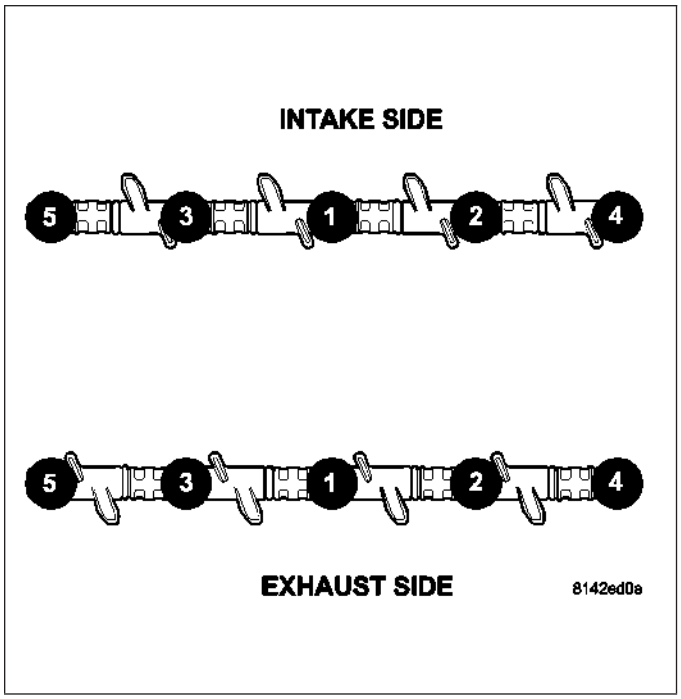
2. Install pushrod retaining plate special tool 9070.



3. Loosen the rocker shafts using the following sequence: **Center, center-left, center-right, left, right,**.

CAUTION: The rocker shaft assemblies are not interchangeable between intake and exhaust. The intake rocker arms are marked with an "I".

4. Remove the rocker shafts. Note location for reassembly.



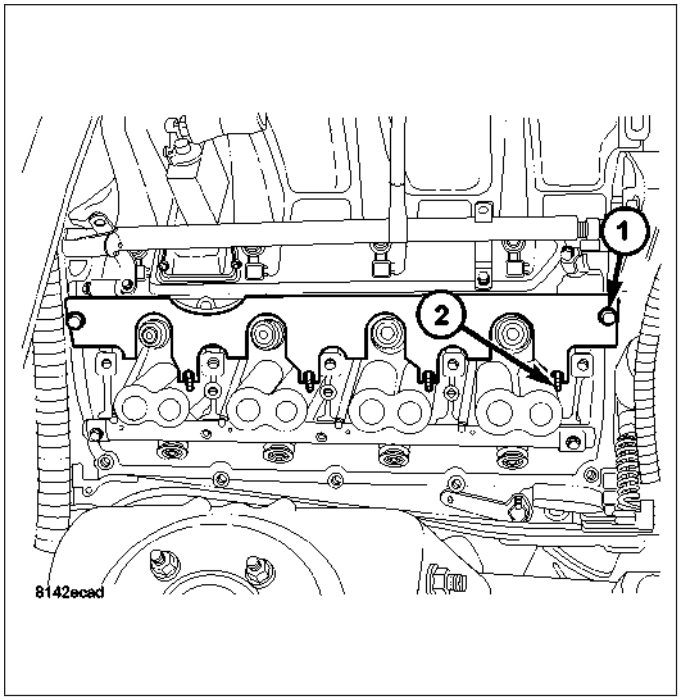
CAUTION: The longer push rods are for the exhaust side, and the shorter push rods are for intake side.

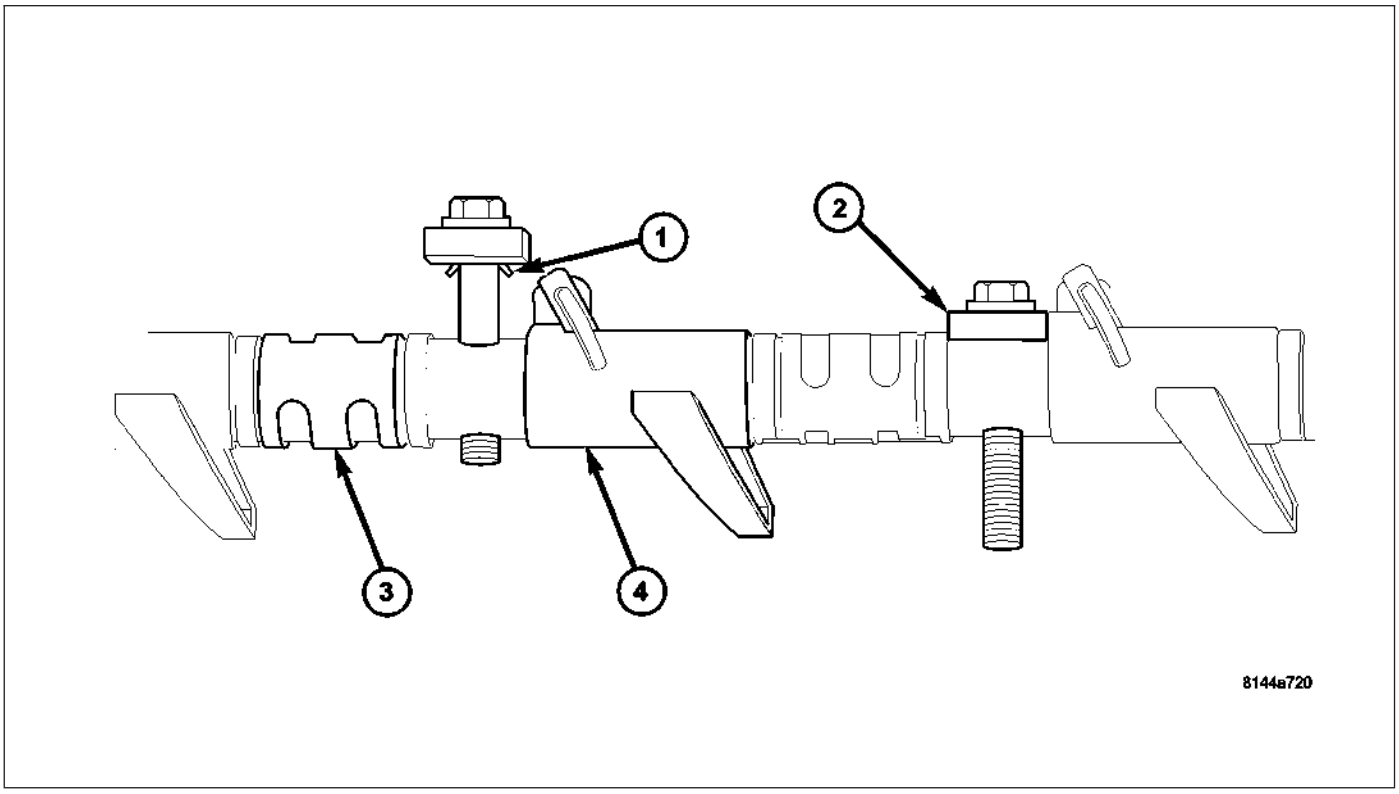
5. Remove the pushrods. Note pushrod location for reassembly.

INSTALLATION

CAUTION: The longer push rods are for the exhaust side, and the shorter push rods are for intake side.

1. Install the push rods in the same order as removed.
2. Install the pushrod retaining plate (1) special tool 9070.





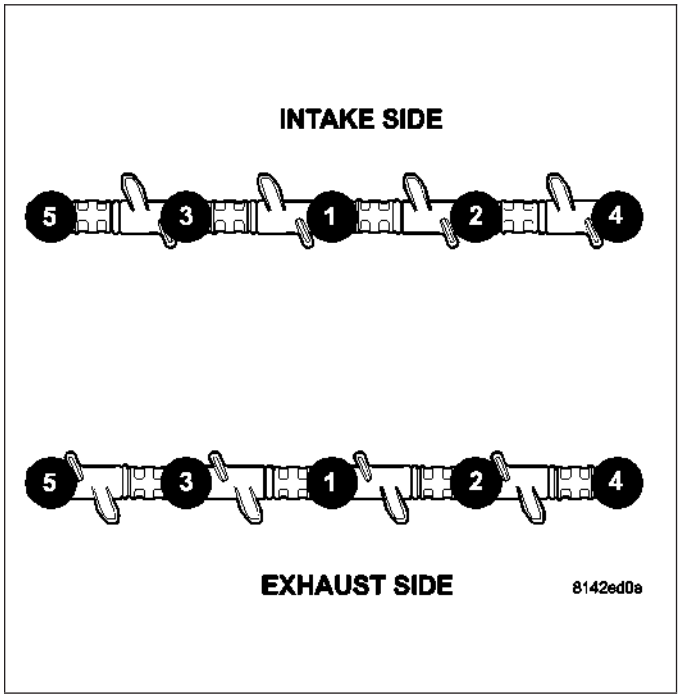
CAUTION: Ensure that retainers (2) and rocker arms (4) are not overlapped when torquing bolts.

CAUTION: Verify that pushrod is installed into rocker arm (4) and tappet correctly while installing rocker shaft assembly. Recheck after rocker shaft has been torqued to specification.

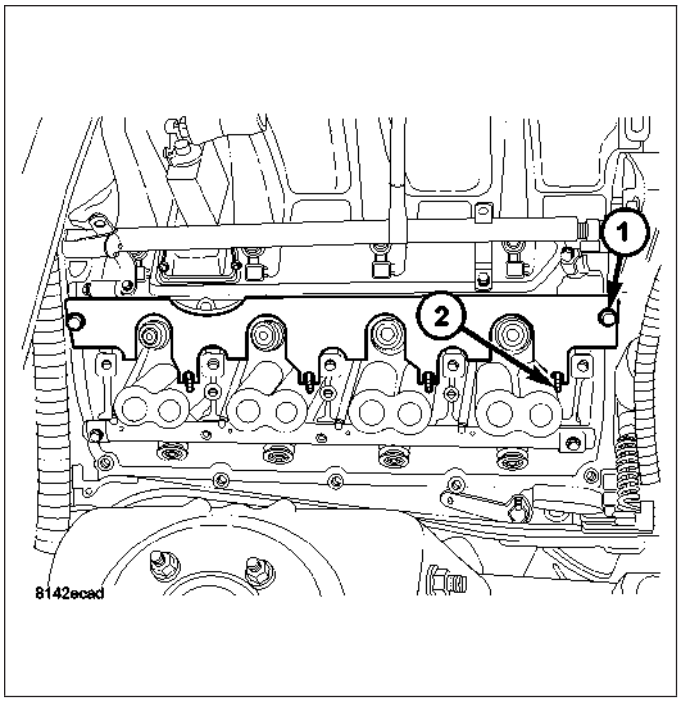
CAUTION: The rocker shaft assemblies are not interchangeable between intake and exhaust. The intake rocker arms are marked with the letter "I".

3. Install rocker shaft assemblies in the same order as removed.
4. Tighten the rocker shaft bolts to 22 N·m (195 in. lbs.) torque,using the sequence provided.

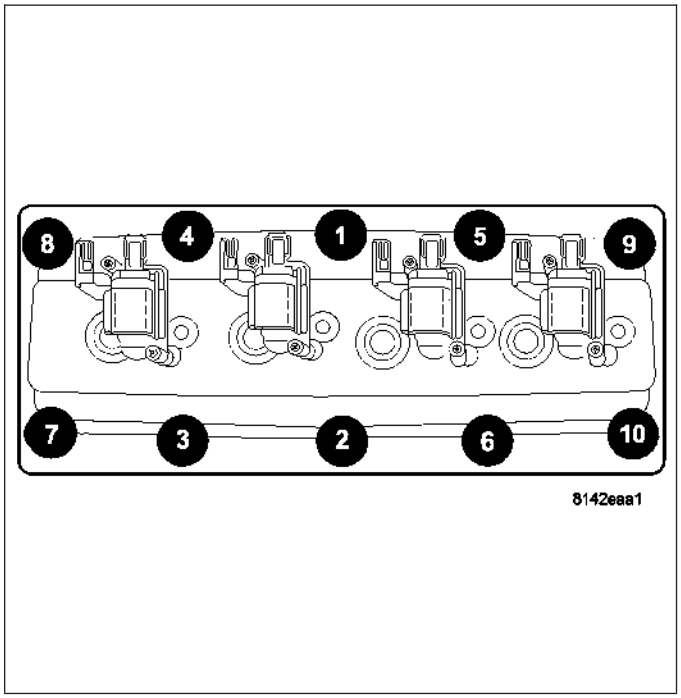
CAUTION: DO NOT rotate or crank the engine during or immediately after rocker arm installation. Allow the hydraulic roller tappets adequate time to bleed down (about 5 minutes).



5. Remove pushrod retaining plate (1) special tool 9070.



6. Install cylinder head cover (Refer to 9 - ENGINE/ CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).



SEALS-VALVE GUIDE

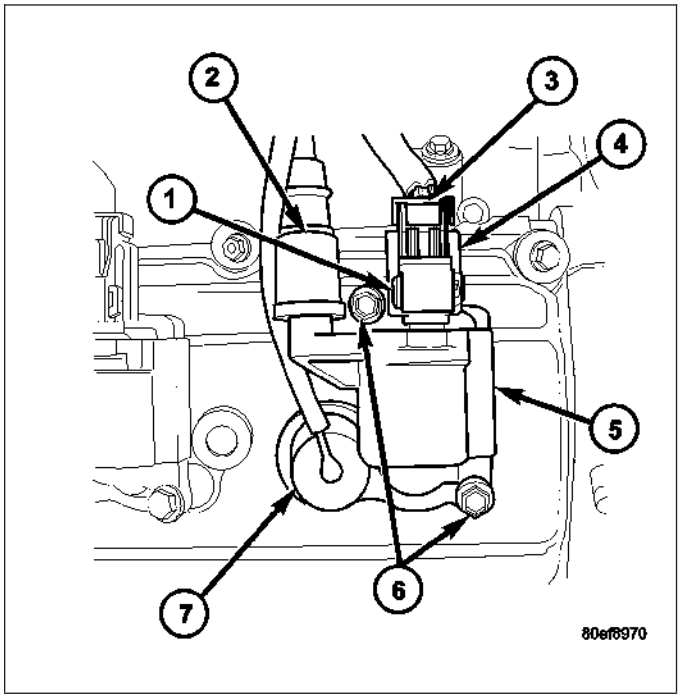
DESCRIPTION

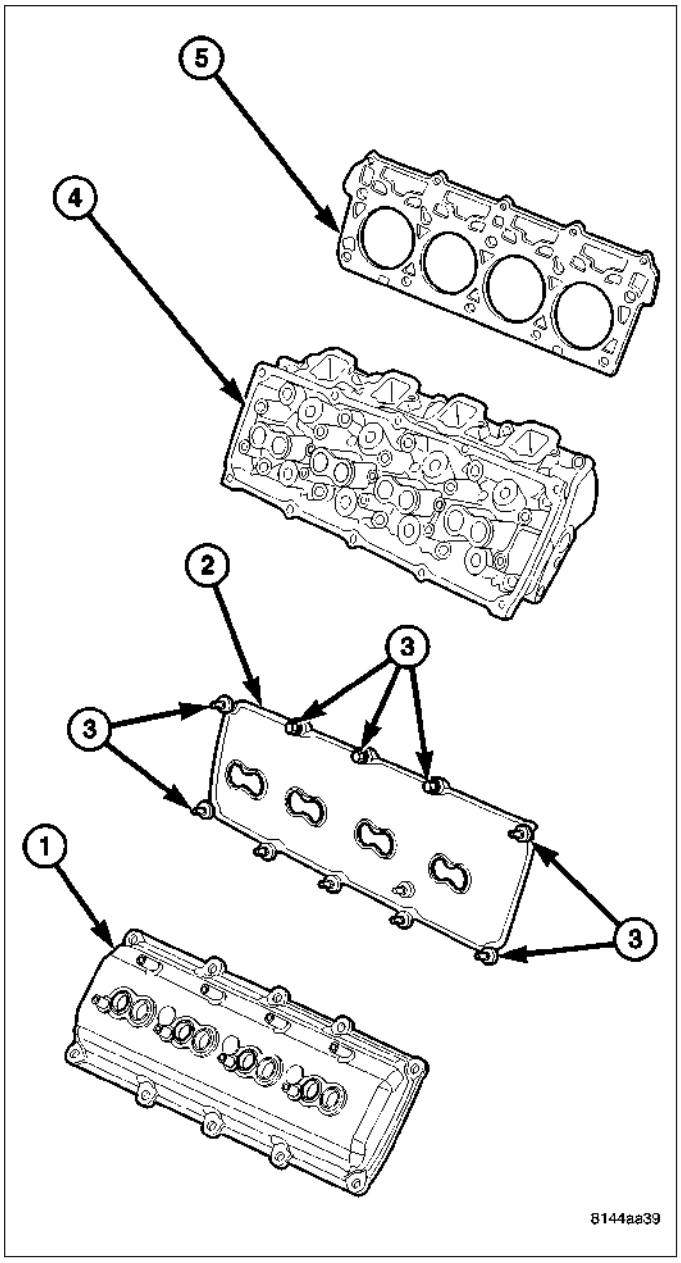
The valve guide seals are made of rubber and incorporate an integral steel valve spring seat. The integral garter spring maintains consistent lubrication control to the valve stems.

SPRINGS-VALVE

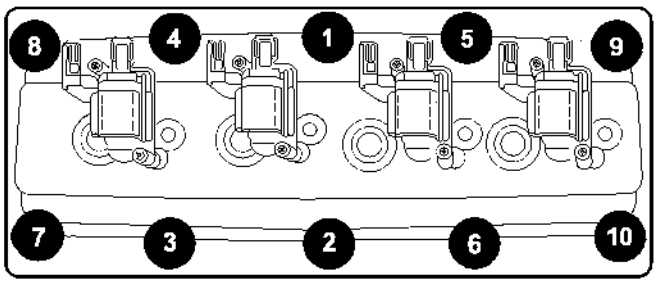
REMOVAL

1. Disconnect negative battery cable.
2. Remove air cleaner assembly.
3. Remove air intake resonator.
4. Remove spark plug cables.
5. Remove ignition coil connectors (4).
6. Remove ignition coils (5).
7. Remove one spark plug.



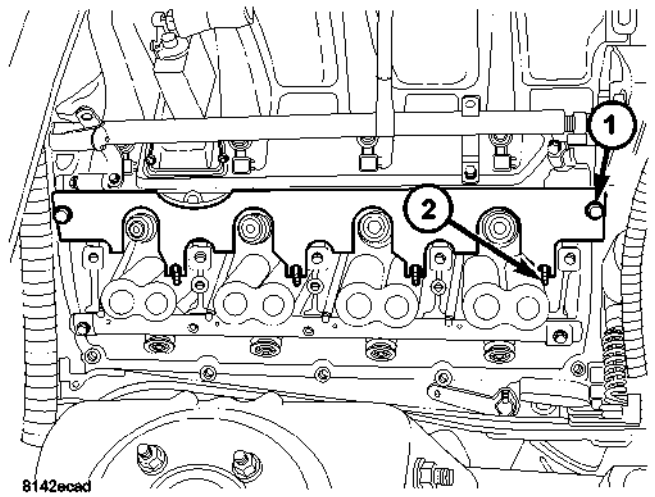

5
4
2
3
3
1
3
8144aa39

8. Remove cylinder head cover (1) using the sequence shown (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).

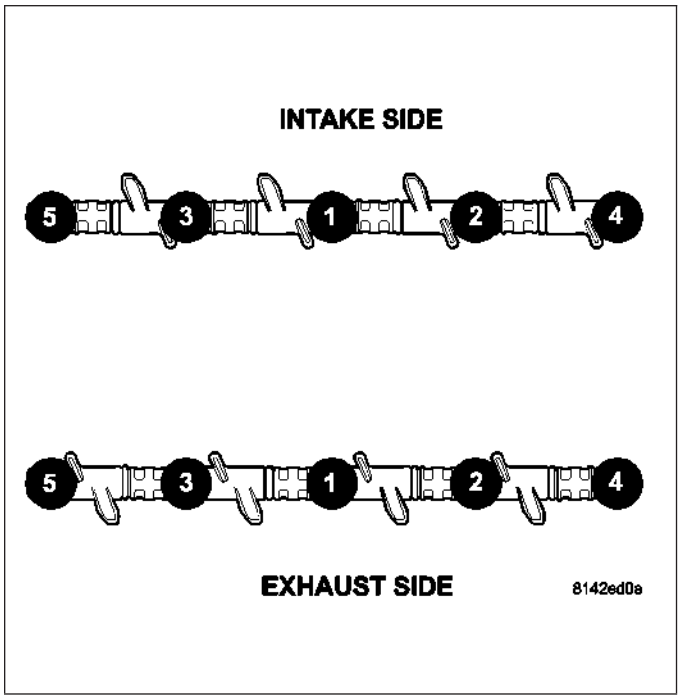


CAUTION: The piston must be at TDC, and both valves closed on the cylinder to be serviced.

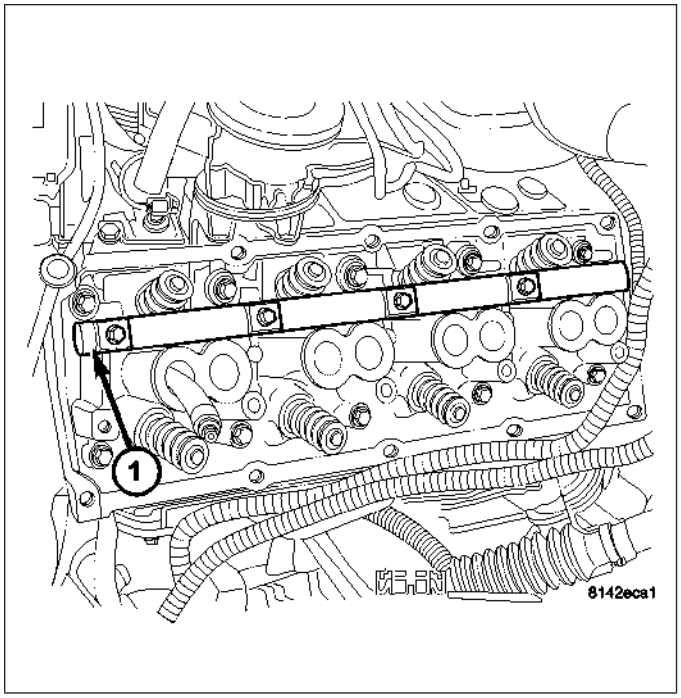
NOTE: If removing intake valve spring, install special tool# 9070, pushrod retaining plate (1), to retain the intake pushrods (2).

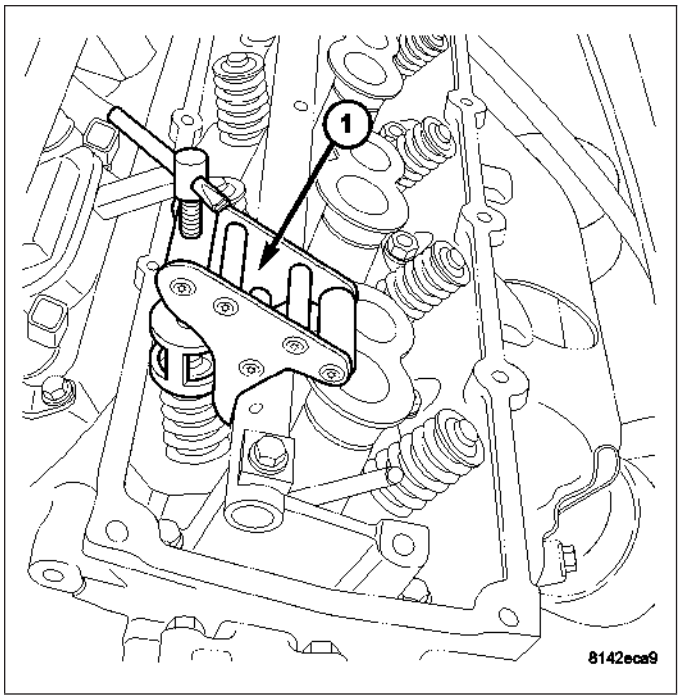


9. Remove exhaust/intake rocker arm shafts using the sequence shown.



10. Install rocker arm shaft (1) special tool# 9065.




1
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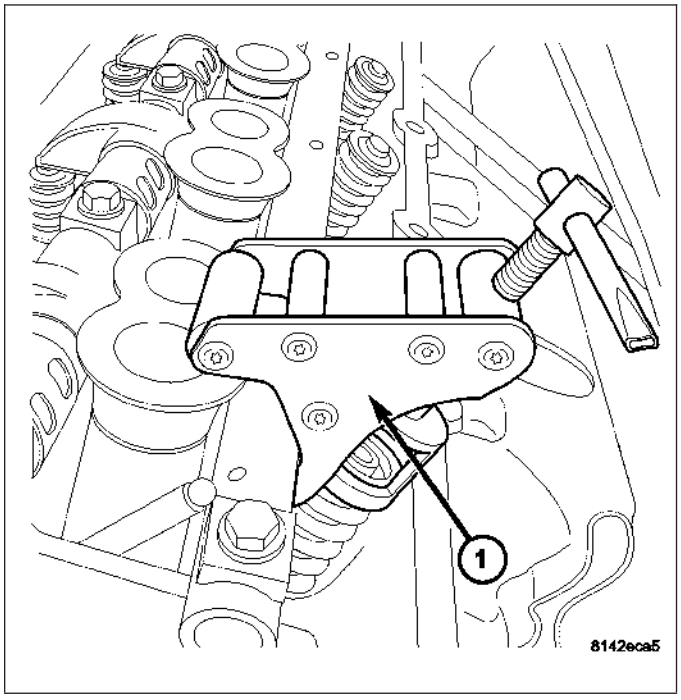
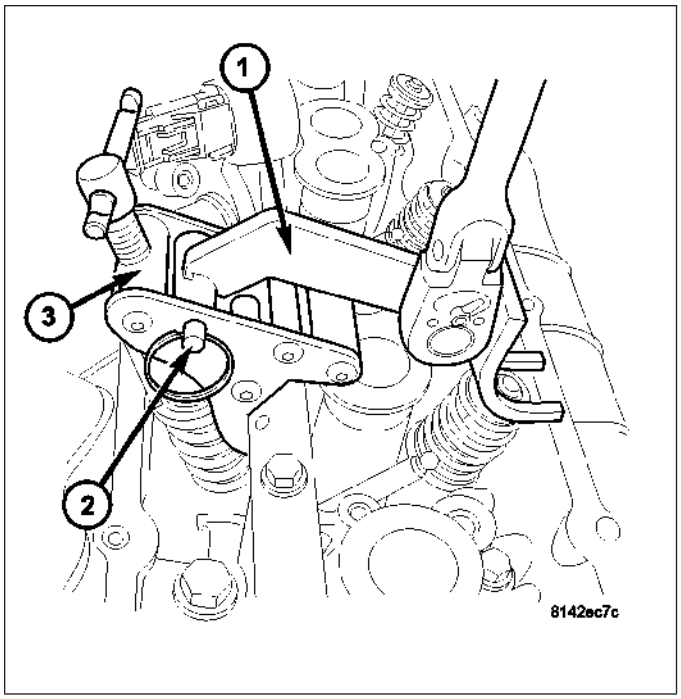
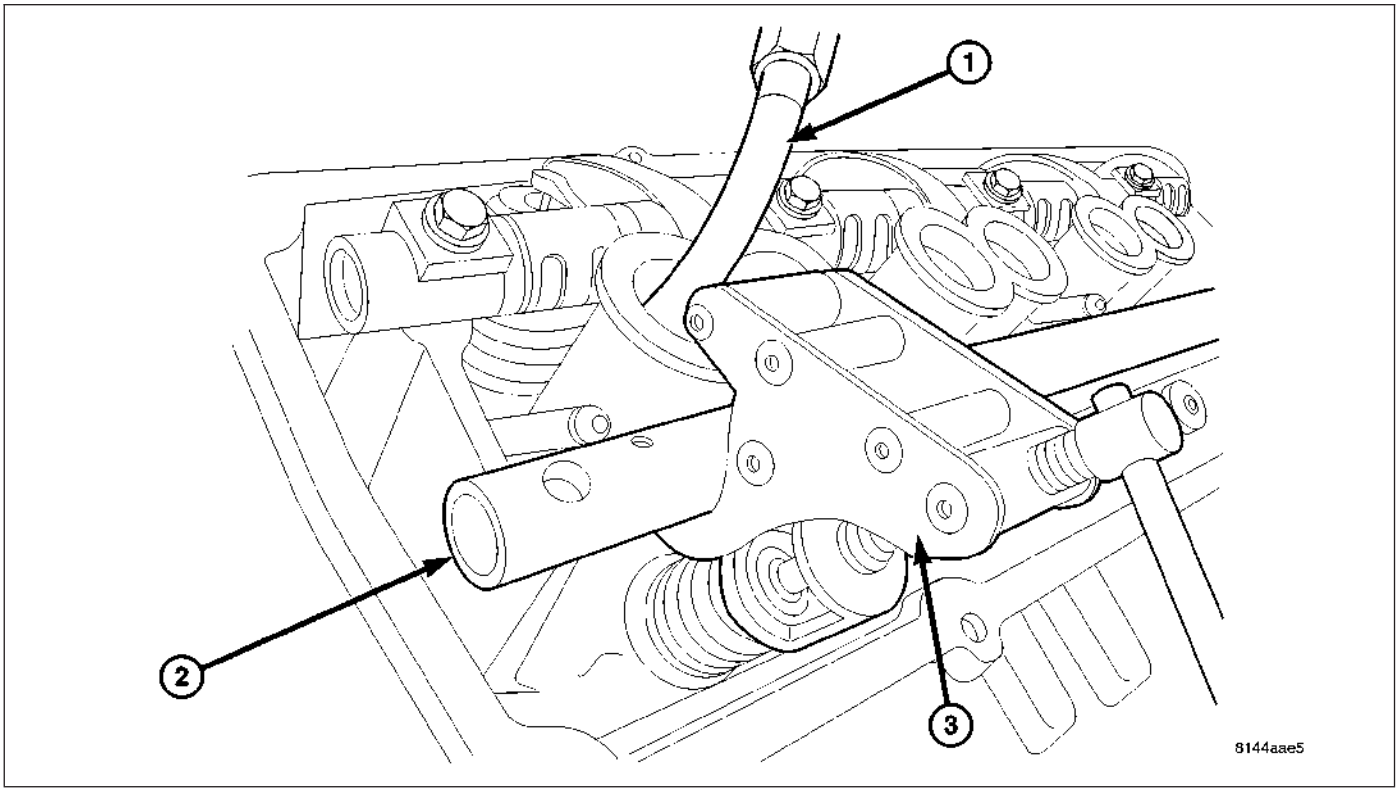

1
8142eca5

11. Install spring compressor (1,3,), special tool# 9065, and exhaust adapter arm (1) tool # 9065if needed.

NOTE: All valve springs and seals are removed in the same manner.





12. Insert air hose (1) into spark plug hole and charge cylinder with air.

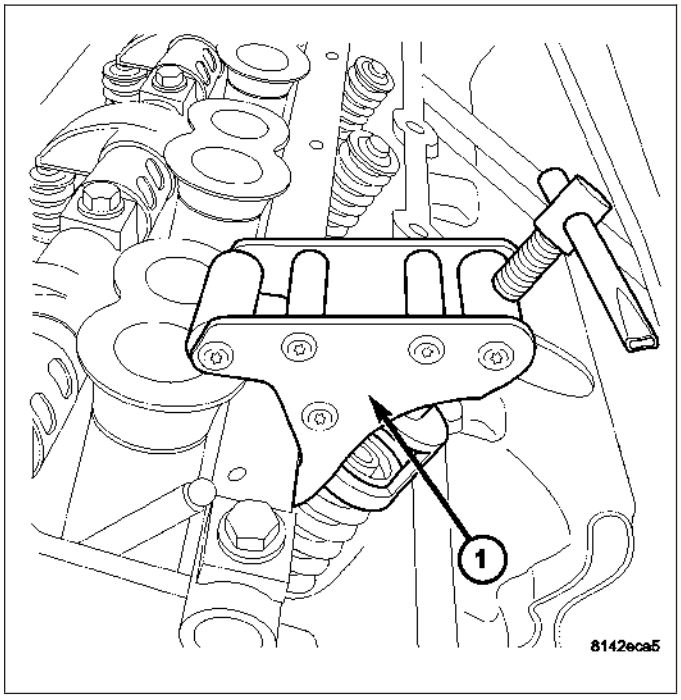
NOTE: Tap the top of the valve spring retainer to loosen the spring retainers locks.

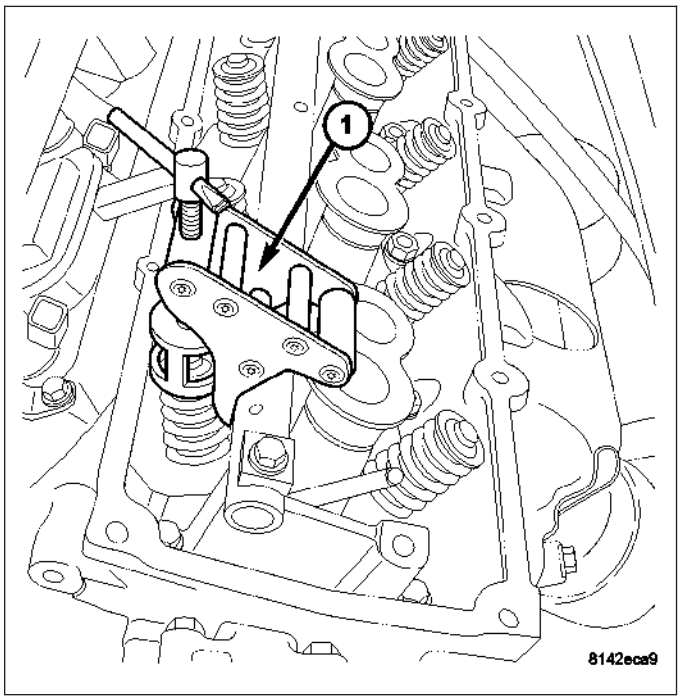
13. Compress valve spring with valve spring compessor (3) tool # 9065and remove valve retainer locks.
14. Release spring compressor (3) and remove valve spring.

NOTE: The valve springs are interchangeable between intake and exhaust.

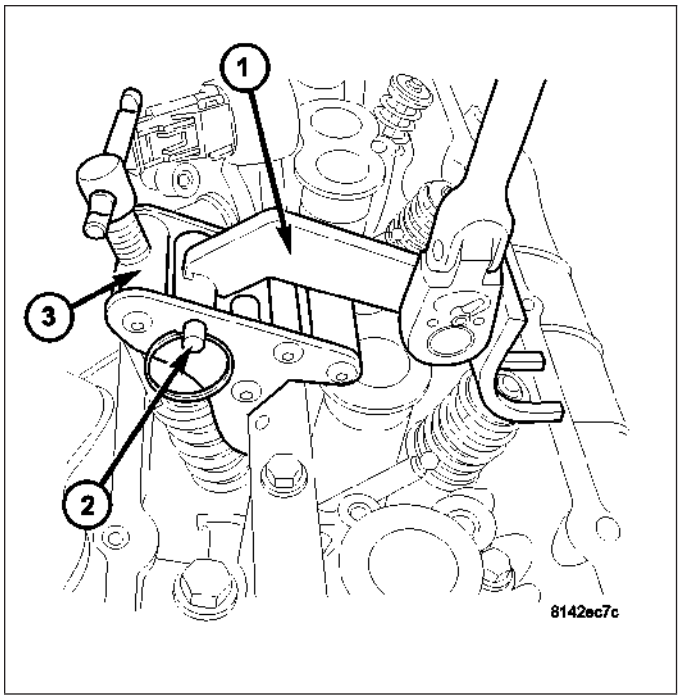
15. Remove valve seal.

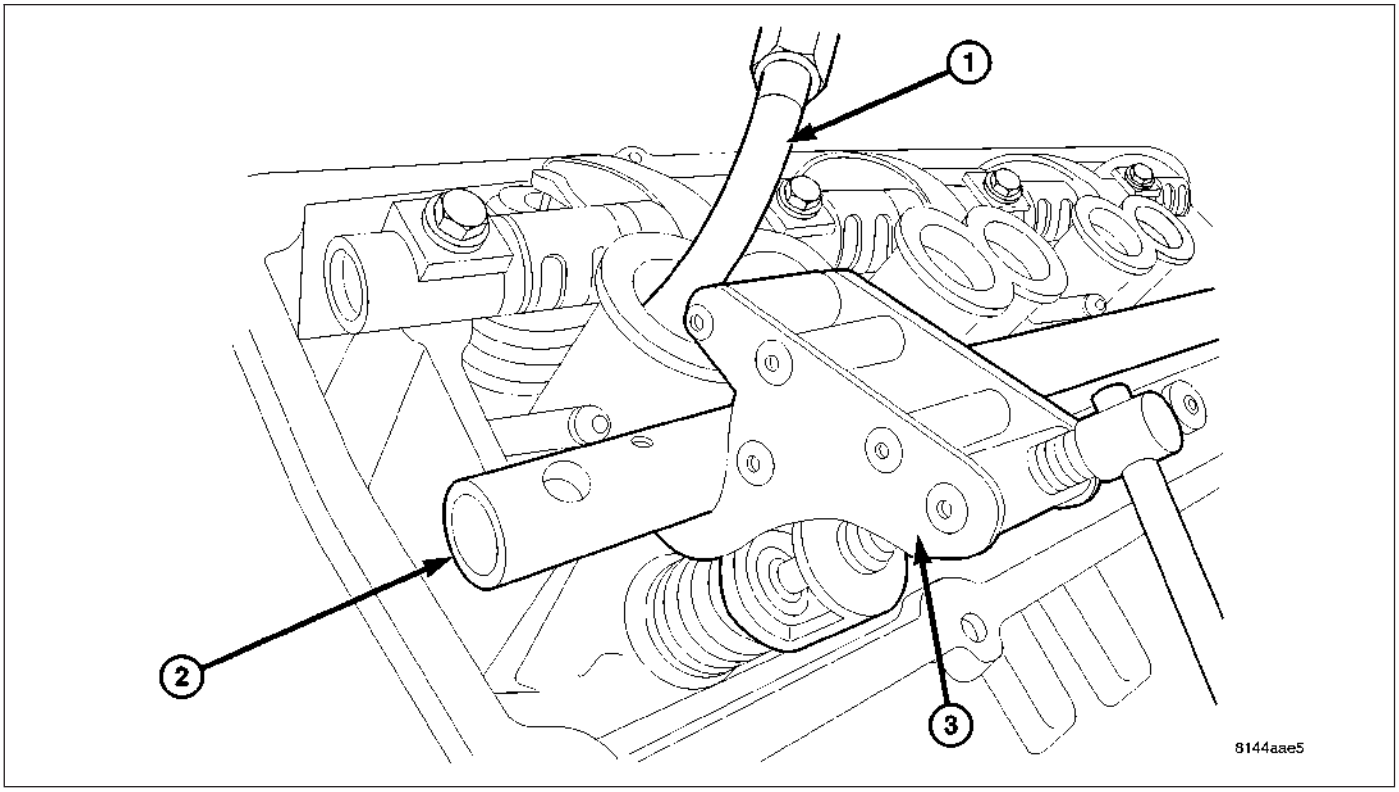
INSTALLATION





1. Install valve seal.
2. Install valve spring.
3. Using special tool# 9065 (1,3,), compress valve spring and install valve spring retainer and locks.

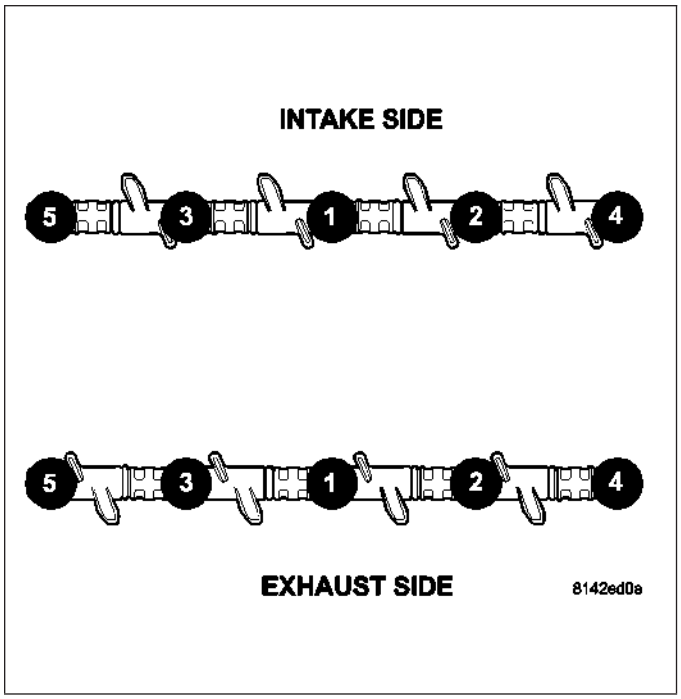




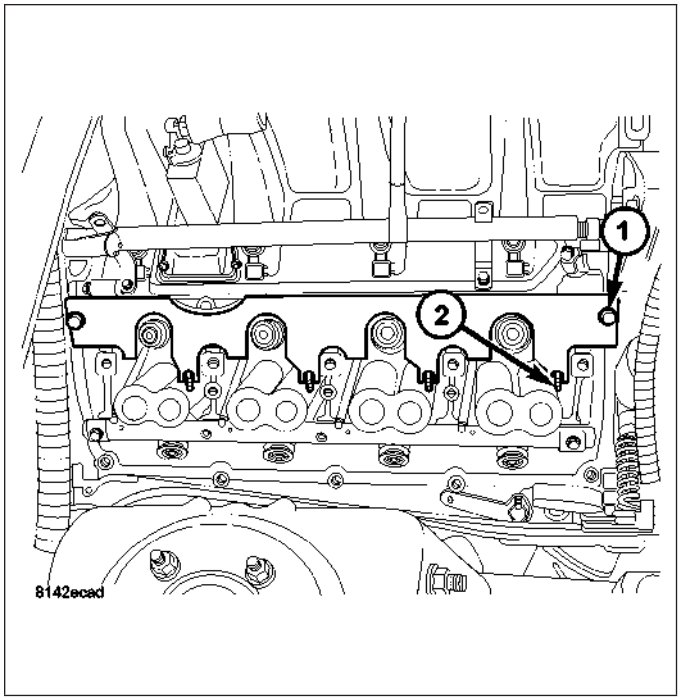
4. Release air charge in cylinder (1).
5. Remove spring compressor tool # 9065 (3).

CAUTION: Verify that the pushrods are fully seated into lifter and rocker arm. Recheck after rocker arm shaft has been torqued to specification.

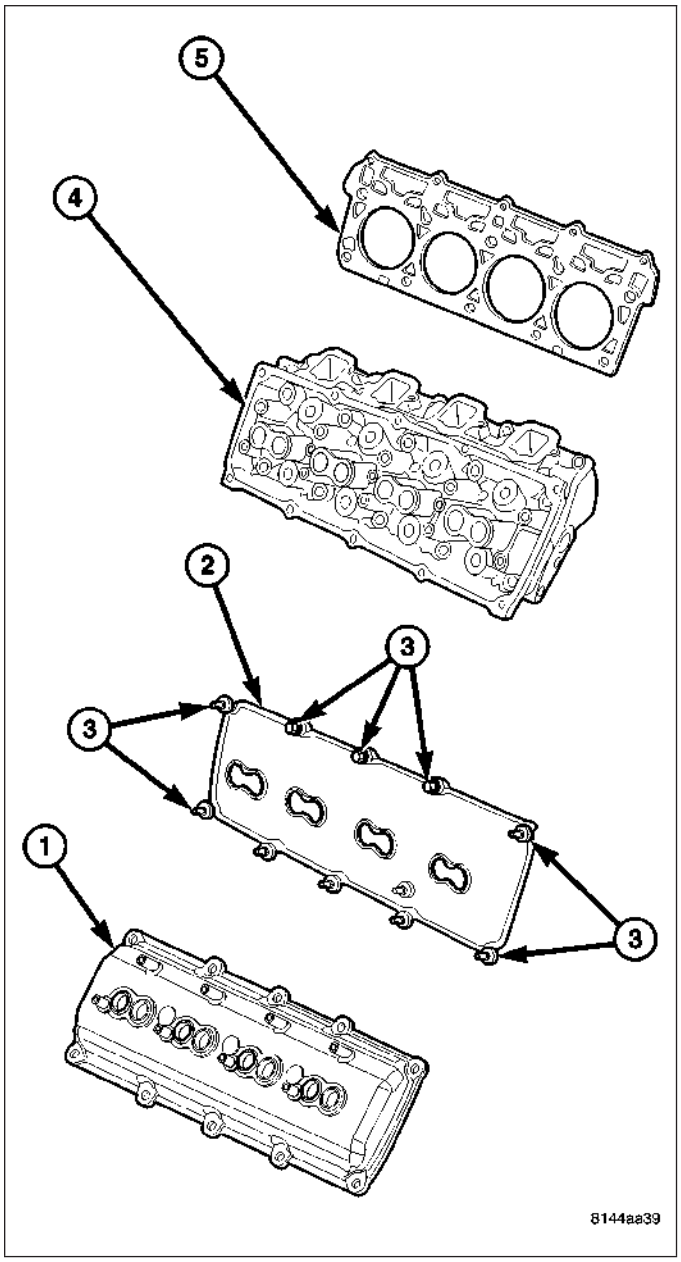
6. Install rocker arm shaft and pushrods (Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARM / ADJUSTER ASSY - INSTALLATION).
7. Tighten the rocker shaft bolts to 22 N·m (195 in. lbs.) torque, using the rocker shaft torque sequence.



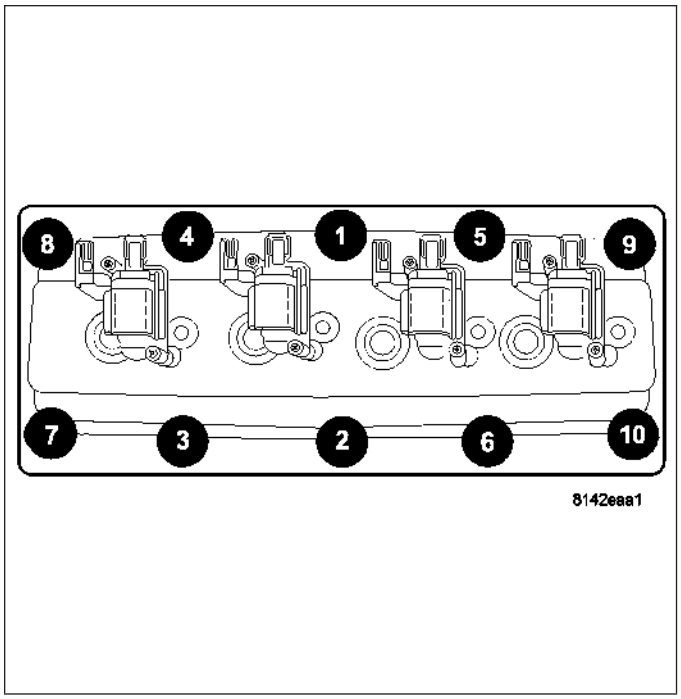
8. Remove special tool# 9070, pushrod retaining plate (1), if used.



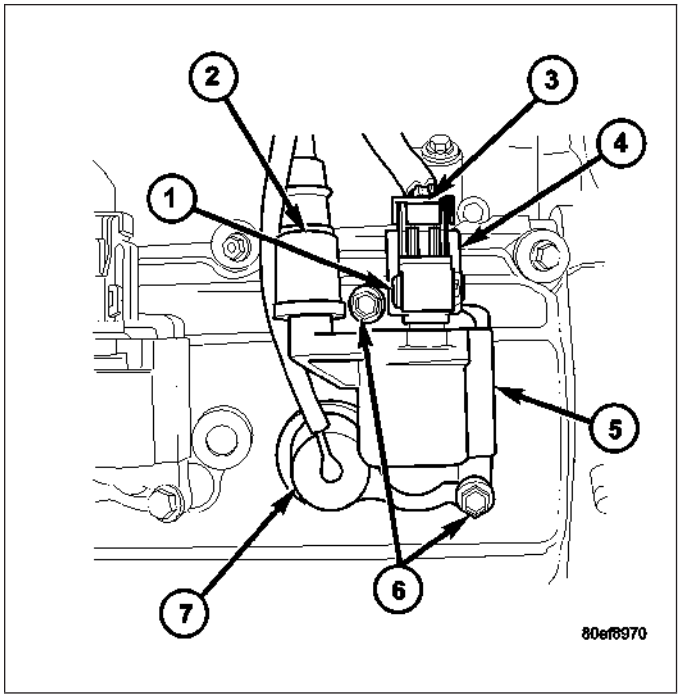
9. Install cylinder head cover (1).



10. Tighten cylinder head cover bolts and double ended studs (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION) .
11. Install spark plugs.



12. Install ignition coil on plug (5), and torque fasteners (6) to 12 N·m (105 in. lbs)
13. Install ignition coil connectors (4).
14. Install spark plug cables.
15. Install air intake resonator.
16. Install air cleaner assembly.
17. Connect negative battery cable.



ENGINE BLOCK

CLEANING

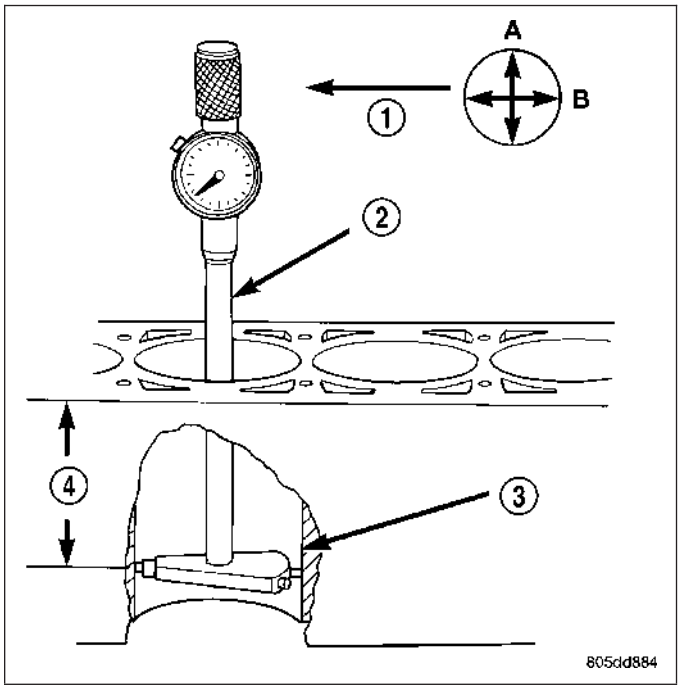
Thoroughly clean the oil pan and engine block gasket surfaces.

Use compressed air to clean out:

- The galley at the oil filter adaptor hole.
- The front and rear oil galley holes.
- The feed holes for the crankshaft main bearings.

Once the block has been completely cleaned, apply Loctite PST pipe sealant with Teflon 592 to the threads of the front and rear oil galley plugs. Tighten the 1/4 inch NPT plugs to 20 N·m (177 in. lbs.) torque. Tighten the 3/8 inch NPT plugs to 27 N·m (240 in. lbs.) torque.

INSPECTION



1. It is mandatory to use a dial bore gauge to measure each cylinder bore diameter. To correctly select the proper size piston, a cylinder bore gauge, capable of reading in 0.003 mm (.0001 in.) INCREMENTS is required. If a bore gauge is not available, do not use an inside micrometer.
2. Measure the inside diameter of the cylinder bore at three levels below top of bore. Start perpendicular (across or at 90 degrees) to the axis of the crankshaft and then take two additional reading.
3. Measure the cylinder bore diameter crosswise to the cylinder block near the top of the bore. Repeat the measurement near the middle of the bore, then repeat the measurement near the bottom of the bore.
4. Determine taper by subtracting the smaller diameter from the larger diameter.
5. Rotate measuring device 90° and repeat steps above.
6. Determine out-of-roundness by comparing the difference between each measurement.
7. If cylinder bore taper does not exceed 0.025 mm (0.001 inch) and out-of-roundness does not exceed 0.025 mm (0.001 inch), the cylinder bore can be honed. If the cylinder bore taper or out- of-round condition exceeds these maximum limits, the cylinder block must be replaced. A slight amount of taper always exists in the cylinder bore after the engine has been in use for a period of time.

CAMSHAFT

REMOVAL

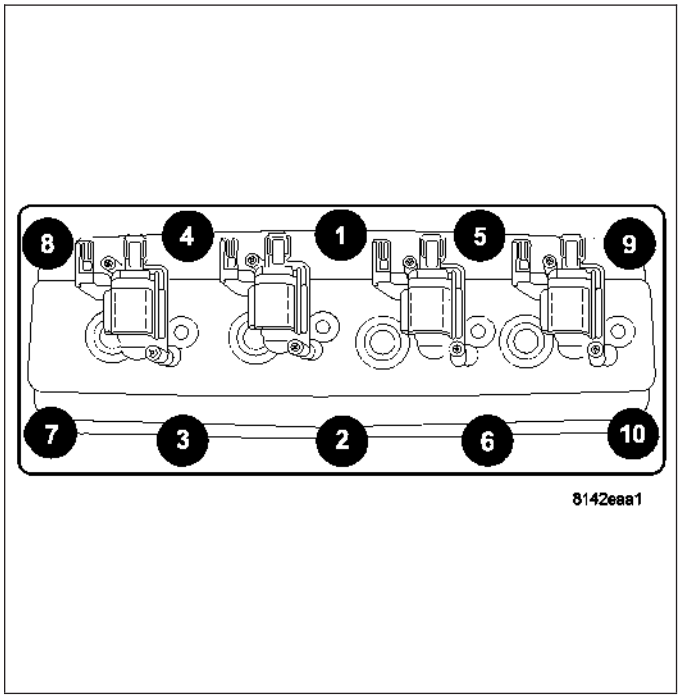
REMOVAL - CAMSHAFT CORE HOLE PLUG

CAUTION: Do not damage the rear surface of the camshaft or the core plug sealing surface, when removing the core plug.

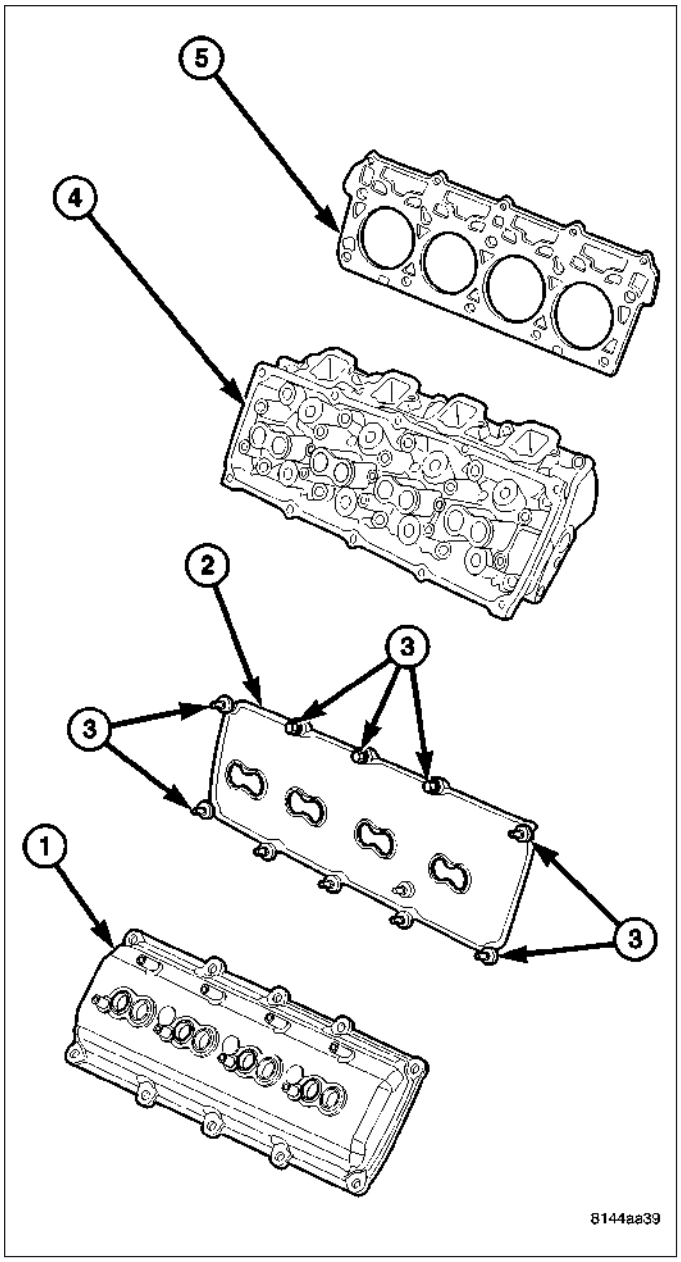
1. Remove the rear cam bearing core plug.

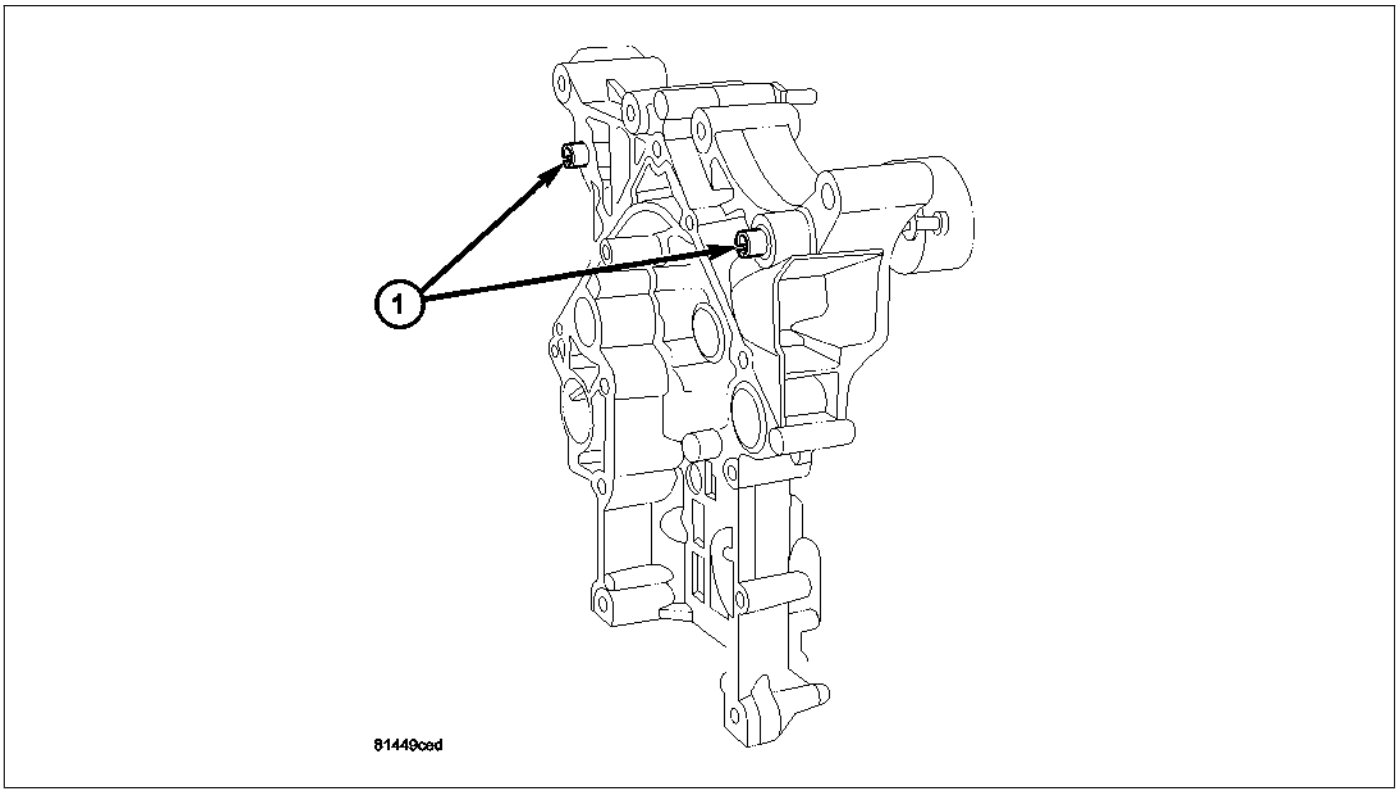
REMOVAL - CAMSHAFT

1. Remove the battery negative cable.
2. Remove the air cleaner assembly. (Refer to 9 - ENGINE/AIR INTAKE SYSTEM - REMOVAL)
3. Drain coolant. (Refer to 7 - COOLING - STANDARD PROCEDURE)
4. Remove the accessory drive belt. (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL)
5. Remove the generator.
6. Remove the A/C compressor, and set aside.
7. Remove the radiator (Refer to 7 - COOLING/ENGINE/RADIATOR - REMOVAL).
8. Remove intake manifold (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).
9. Remove cylinder head covers (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).



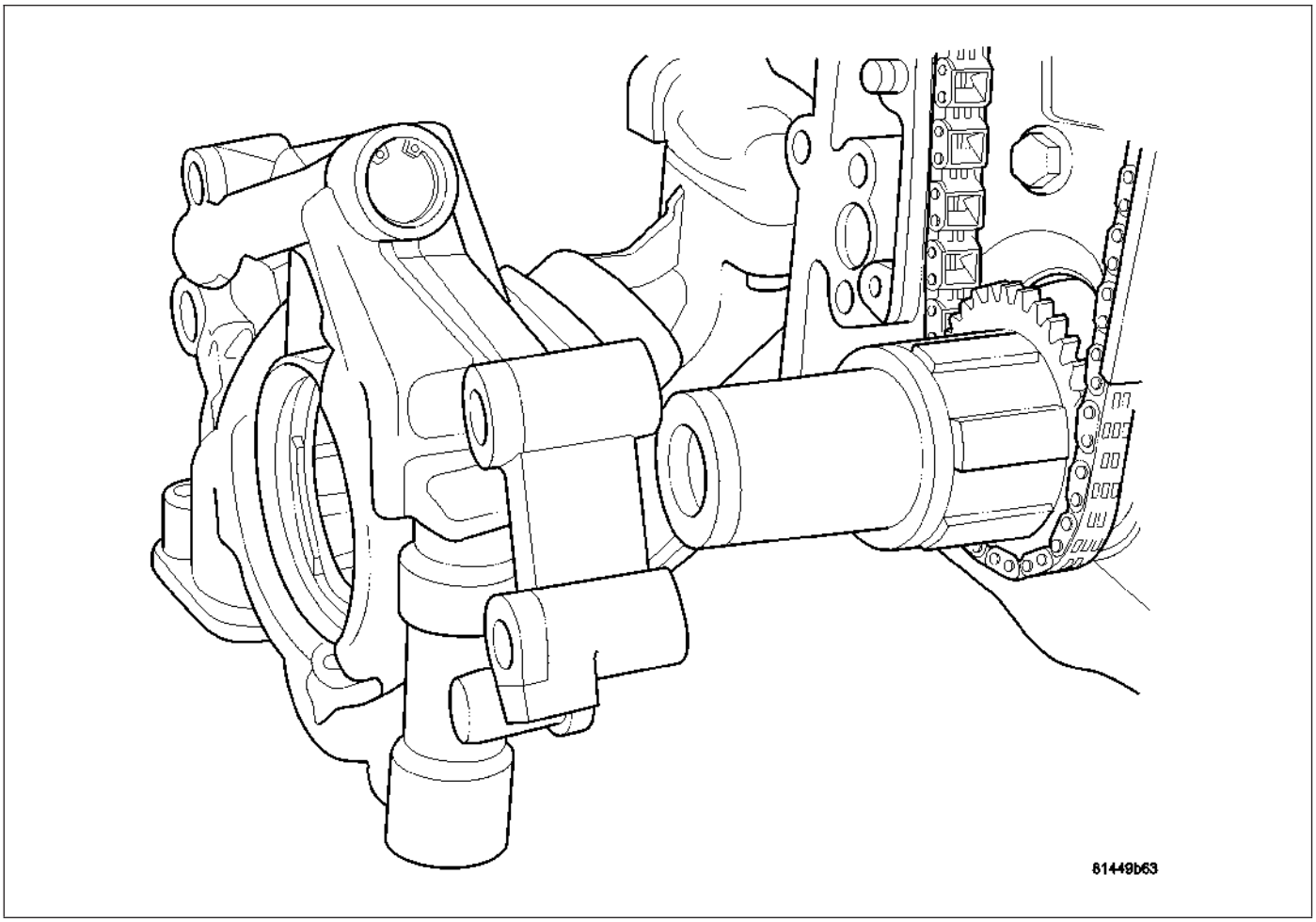
10. Remove both left and right cylinder heads (4) (Refer to 9 - ENGINE/CYLINDER HEAD - REMOVAL).
11. Remove the oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).





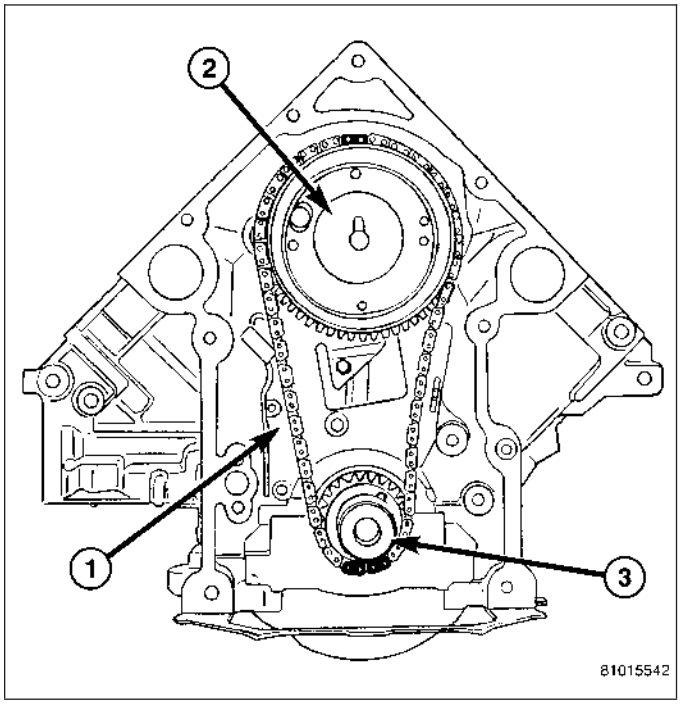
12. Remove timing case cover (1) (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).

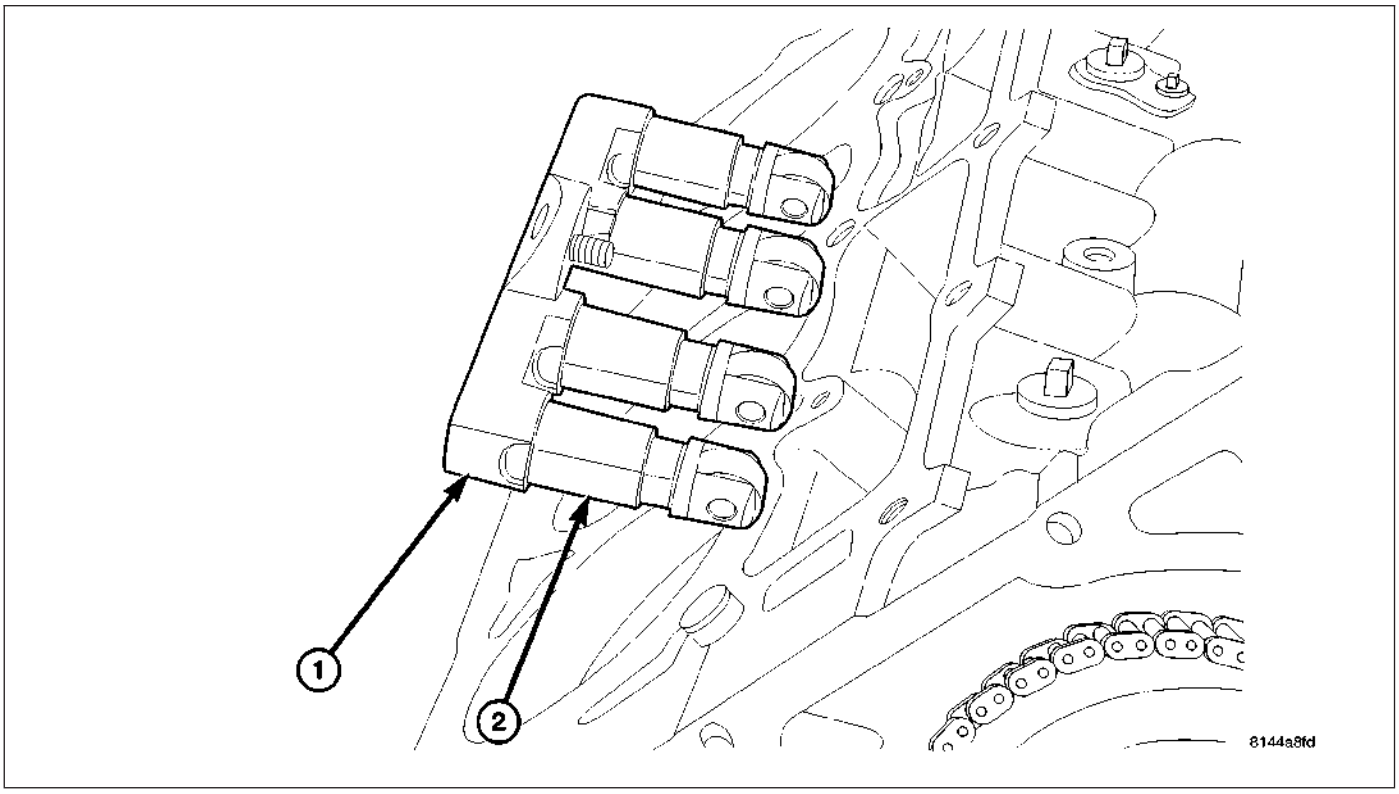
13. Remove the oil pick up tube.



14. Remove the oil pump (figure 2) (Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - REMOVAL).

15. Remove timing chain (2) (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).
16. Remove camshaft tensioner/thrust plate assembly.

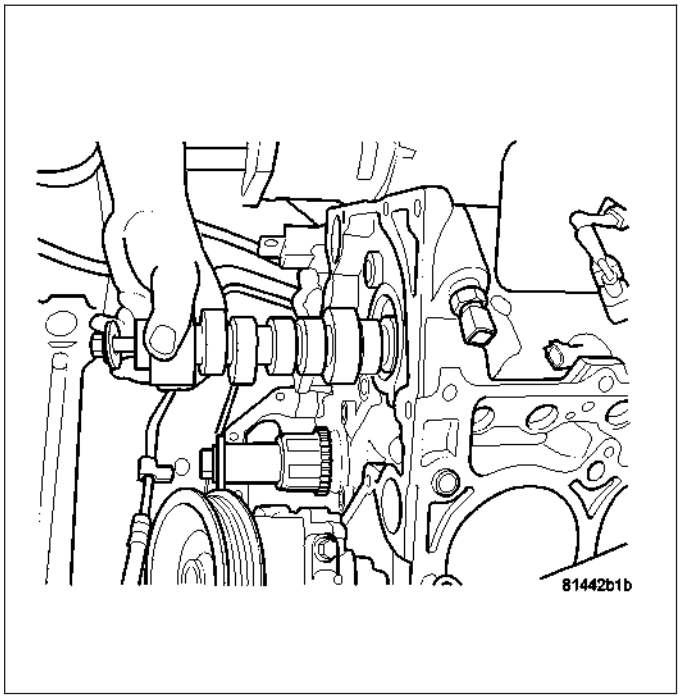




NOTE: Identify lifters to ensure installation in original location.

17. Remove the tappets (2) and retainer (1) assembly.

18. Install a long bolt into front of camshaft to aid in removal of the camshaft. Remove camshaft, being careful not to damage cam bearings with the cam lobes (figure 5).



INSPECTION

1. The cam bearings are not serviceable. Do not attempt to replace cam bearings for any reason.

INSTALLATION

INSTALLATION - CAMSHAFT CORE HOLE PLUG

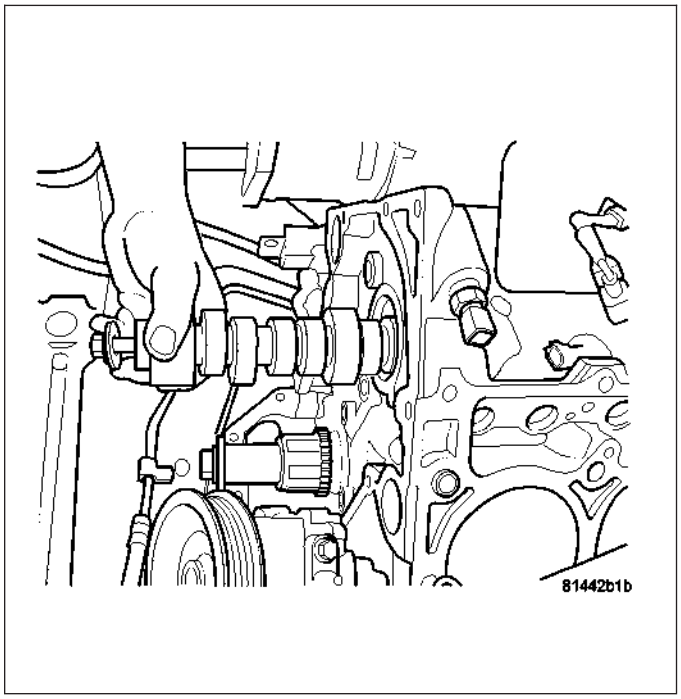
1. Clean core hole in block.

NOTE: Do not apply adhesive to the new core hole plug. A new plug will have adhesive pre-applied.

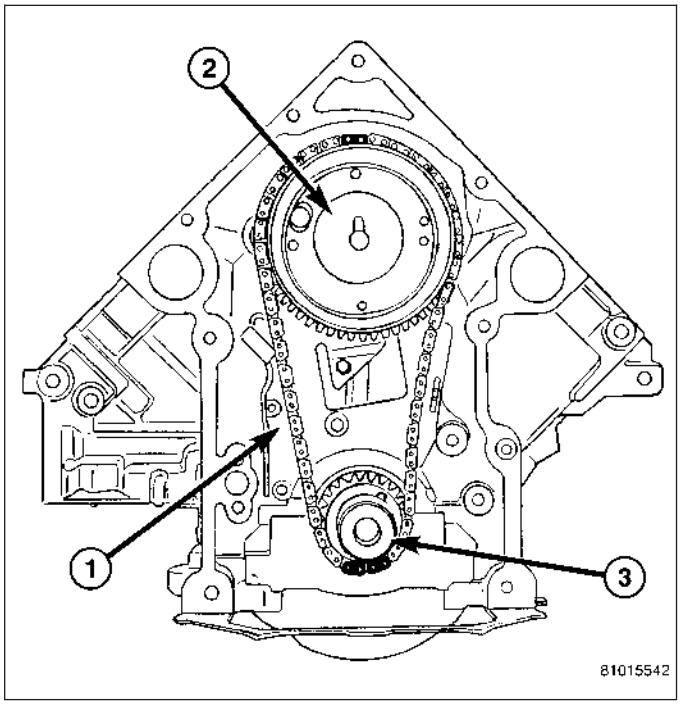
2. Install a new core hole plug at the rear of camshaft, using suitable flat faced tool. The plug must be fully seated on the cylinder block shoulder.

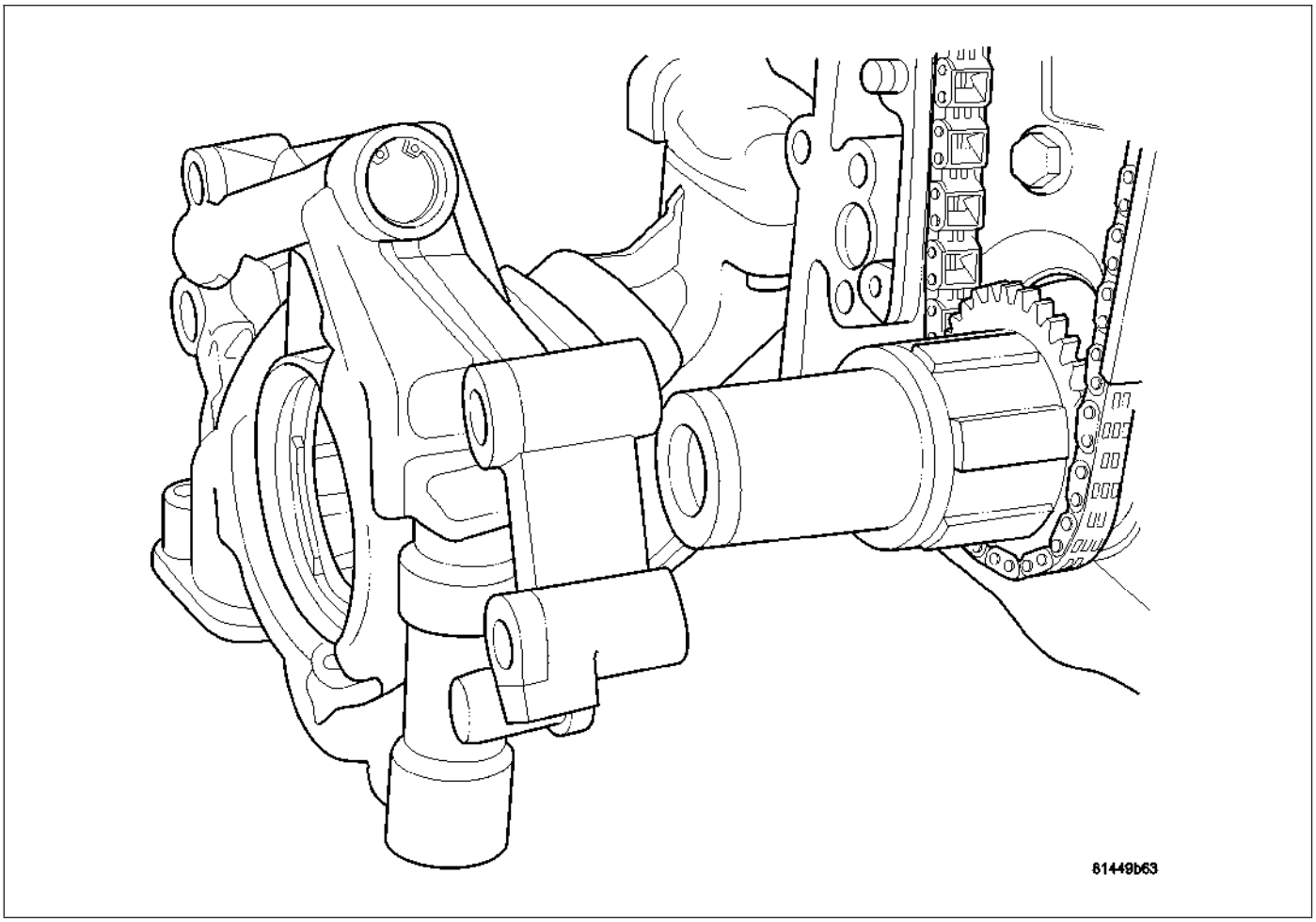
INSTALLATION - CAMSHAFT

1. Lubricate camshaft lobes and camshaft bearing journals and insert the camshaft (figure1).

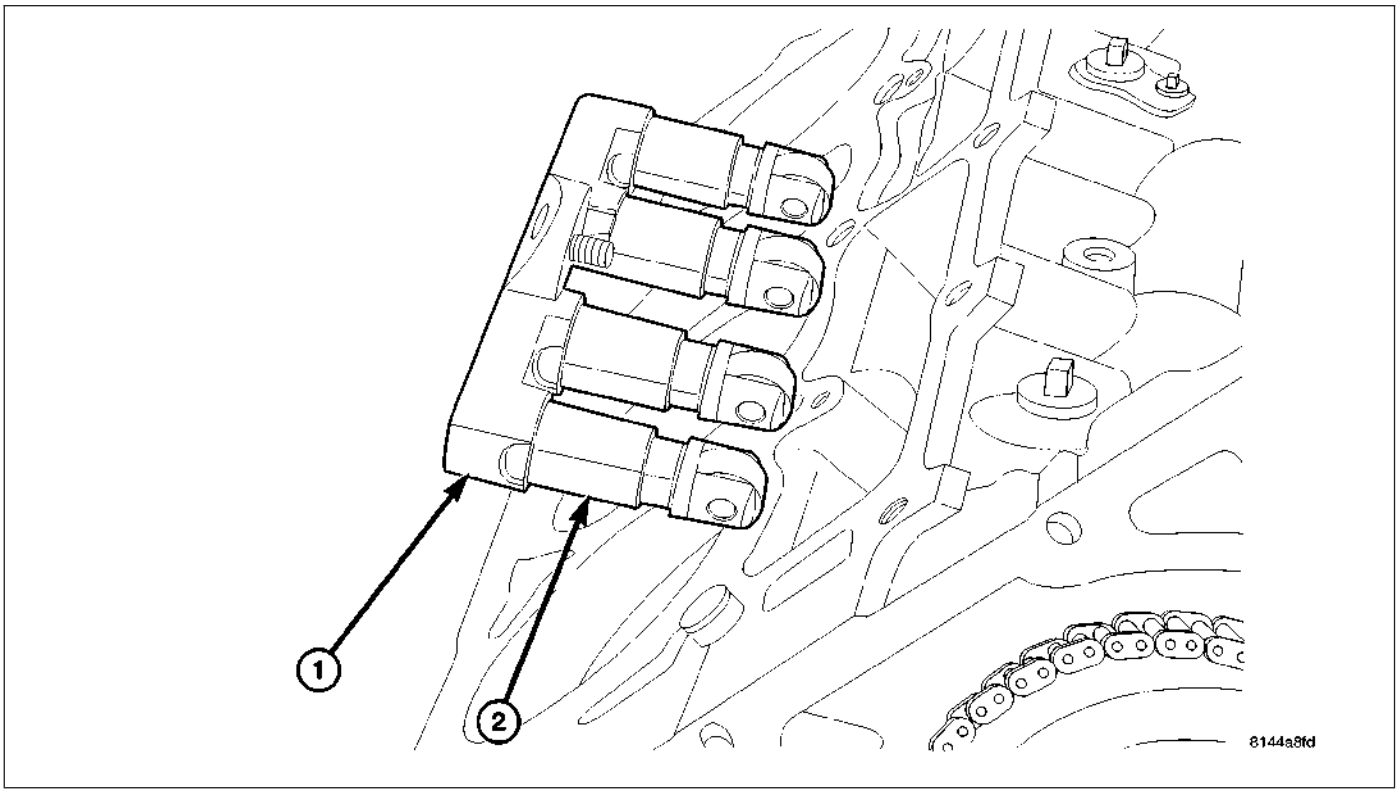


2. Install camshaft Tensioner plate assembly. Tighten bolts to 28 N·m (250 in. lbs.) torque.
3. Install timing chain and sprockets (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).
4. Measure camshaft end play (Refer to 9 - ENGINE - SPECIFICATIONS). If not within limits install a new thrust plate.



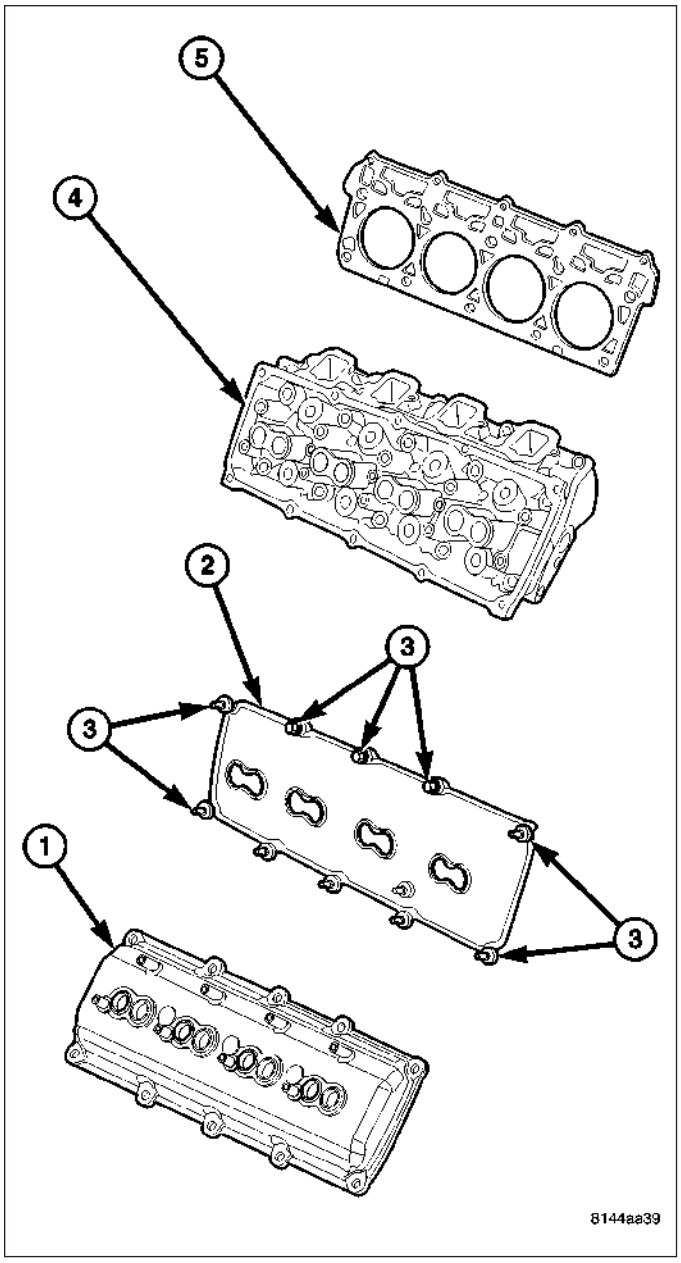


5. Install the oil pump (figure2) (Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - INSTALLATION).
6. Install the oil pick up tube.

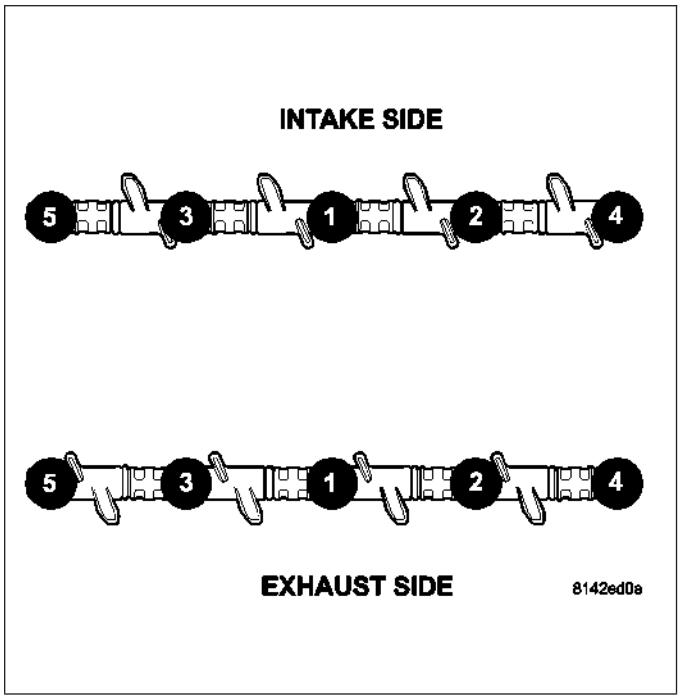


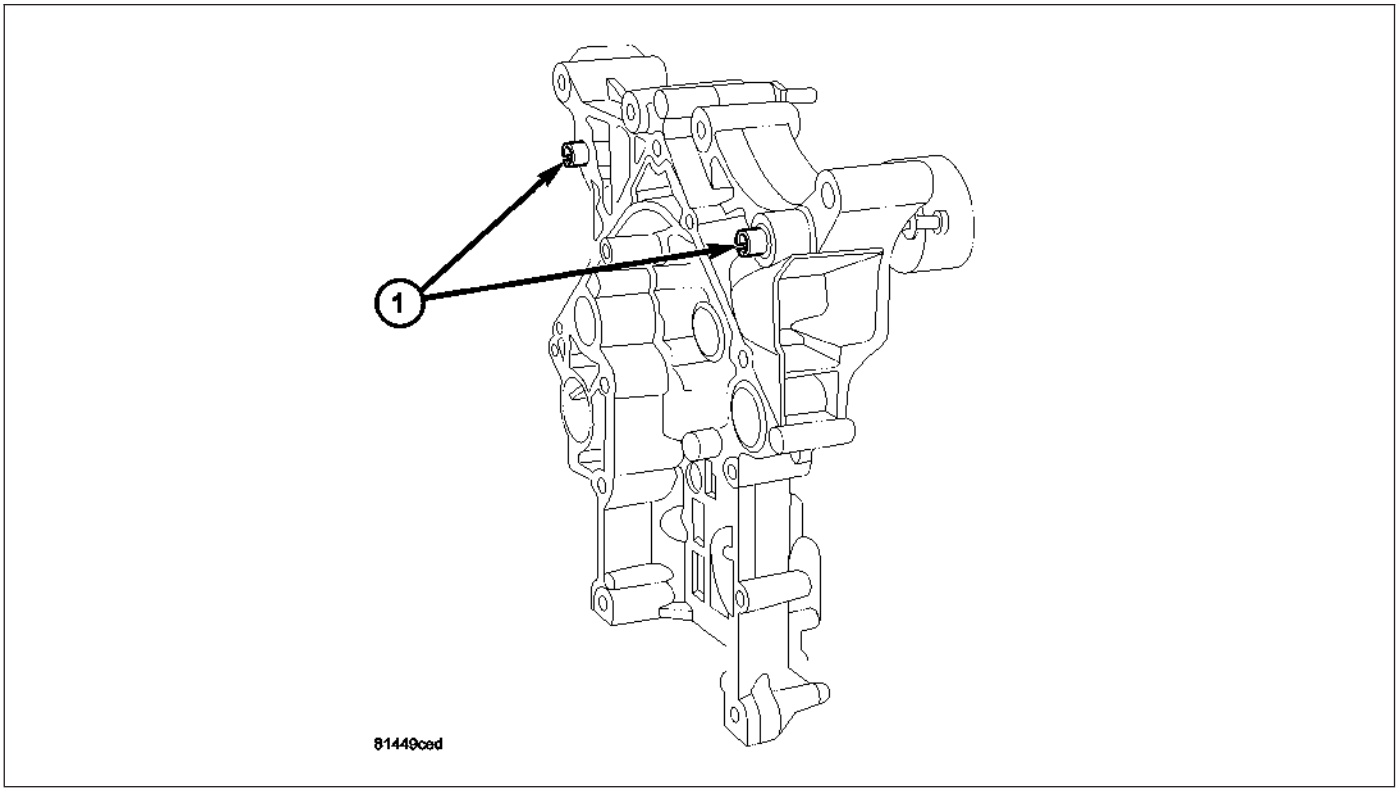
7. Each tappet reused must be installed in the same position from which it was removed. **When camshaft is replaced, all of the tappets must be replaced.**
8. Install tappets (2) and retaining yoke assembly (1). (Refer to 9 - ENGINE/ENGINE BLOCK/HYDRAULIC LIFTERS (CAM IN BLOCK) - INSTALLATION).

9. Install both left and right cylinder heads (4) (Refer to 9 - ENGINE/CYLINDER HEAD - INSTALLATION).
10. Install pushrods.



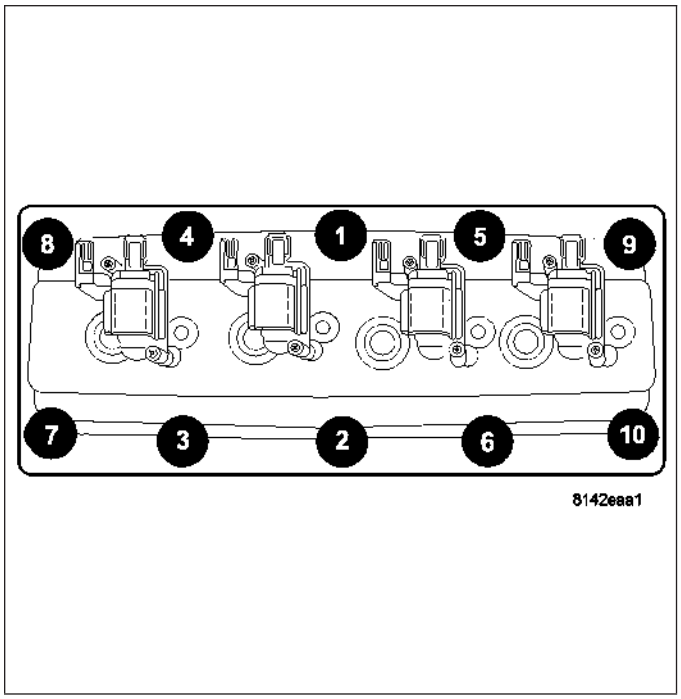
11. Install rocker arms (Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARM / ADJUSTER ASSY - INSTALLATION).



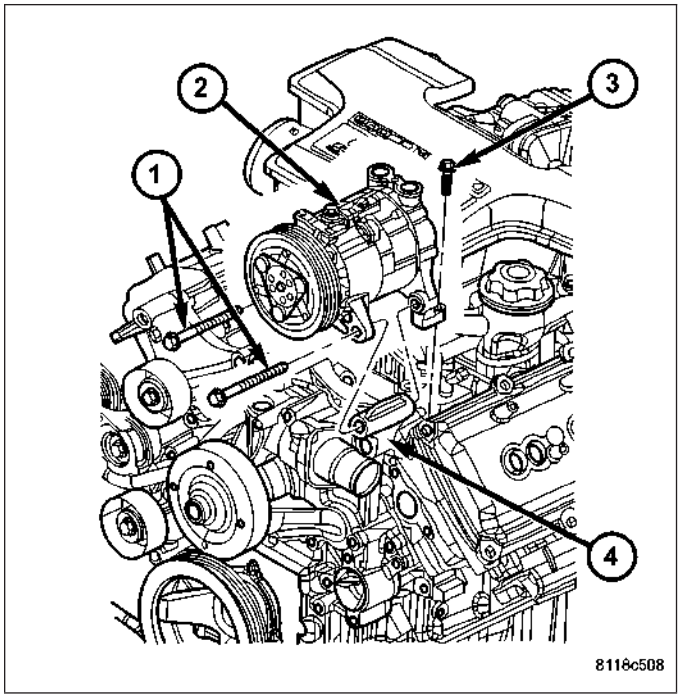


12. Install timing case cover (figure4) (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION).
13. Install the oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).

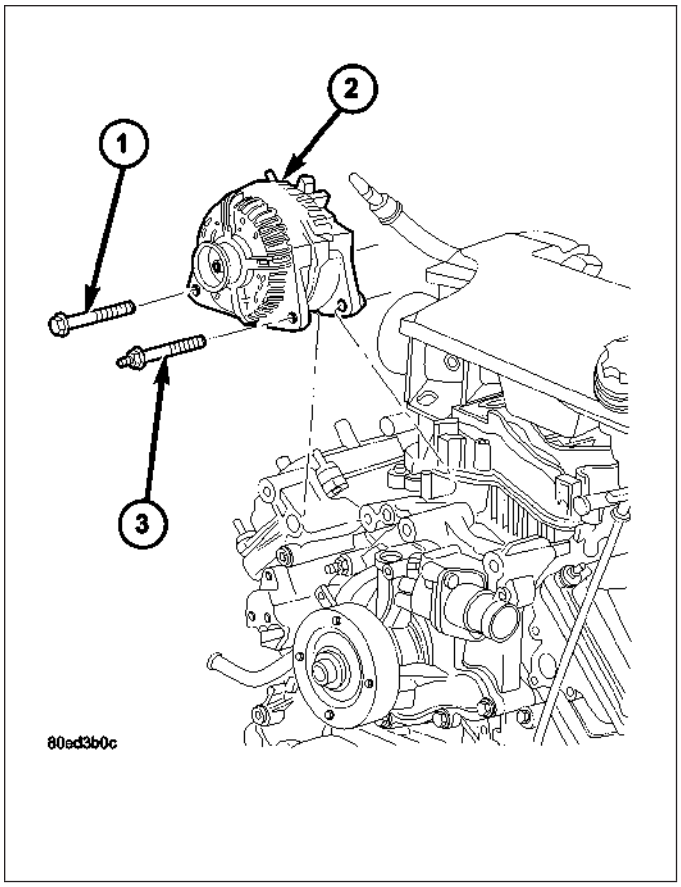
14. Install cylinder head covers (Refer to 9 - ENGINE/ CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).



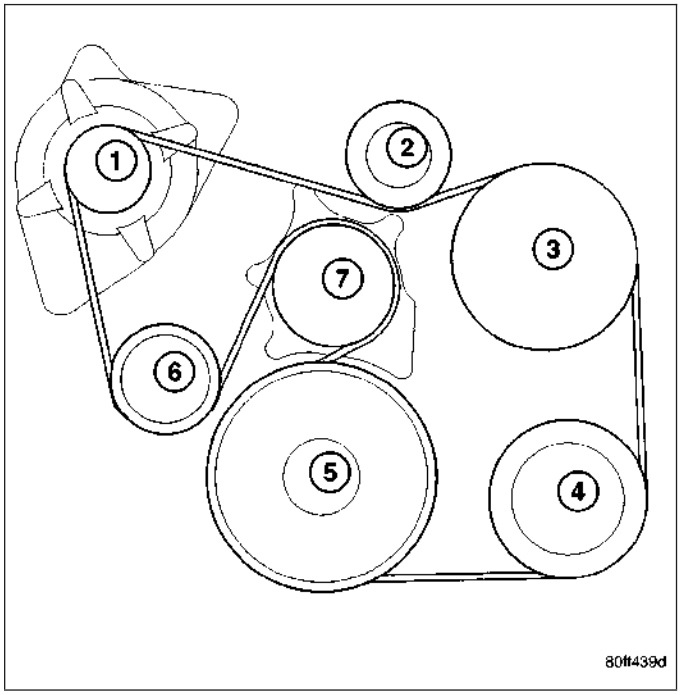
15. Install intake manifold (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION).
16. Install the A/C compressor (2).



17. Install the generator (2).



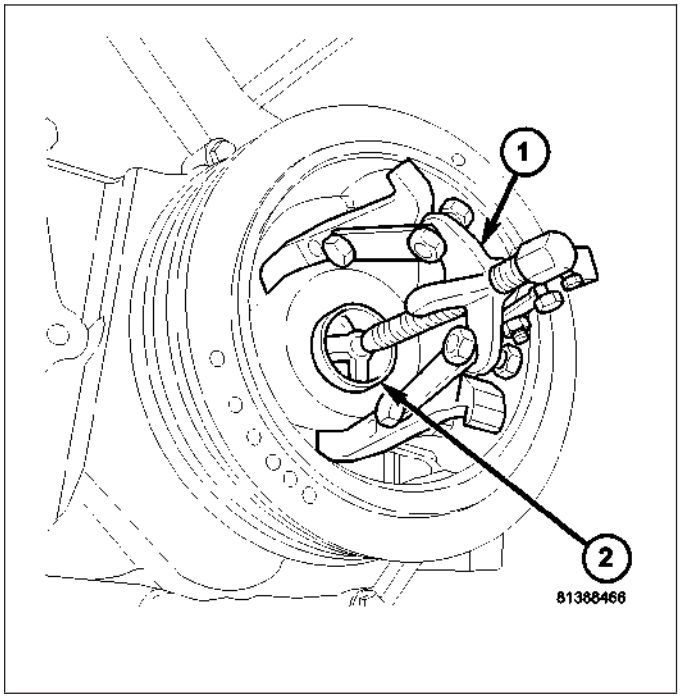
18. Install the accessory drive belt. (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).
19. Install the radiator (Refer to 7 - COOLING/ENGINE/RADIATOR - INSTALLATION).
20. Install the air cleaner assembly. (Refer to 9 - ENGINE/AIR INTAKE SYSTEM - INSTALLATION)
21. Install the battery negative cable.
22. Refill coolant. (Refer to 7 - COOLING - STANDARD PROCEDURE)
23. Refill engine oil.
24. Start engine and check for leaks.



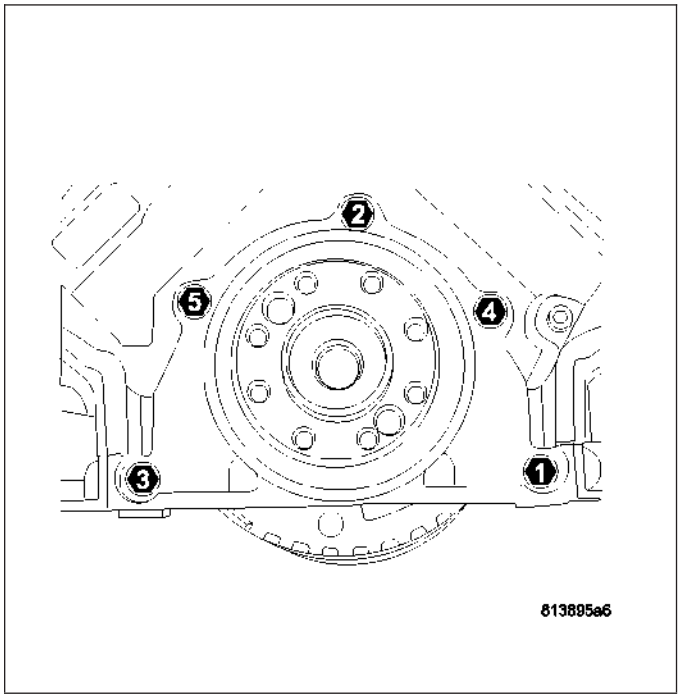
CRANKSHAFT

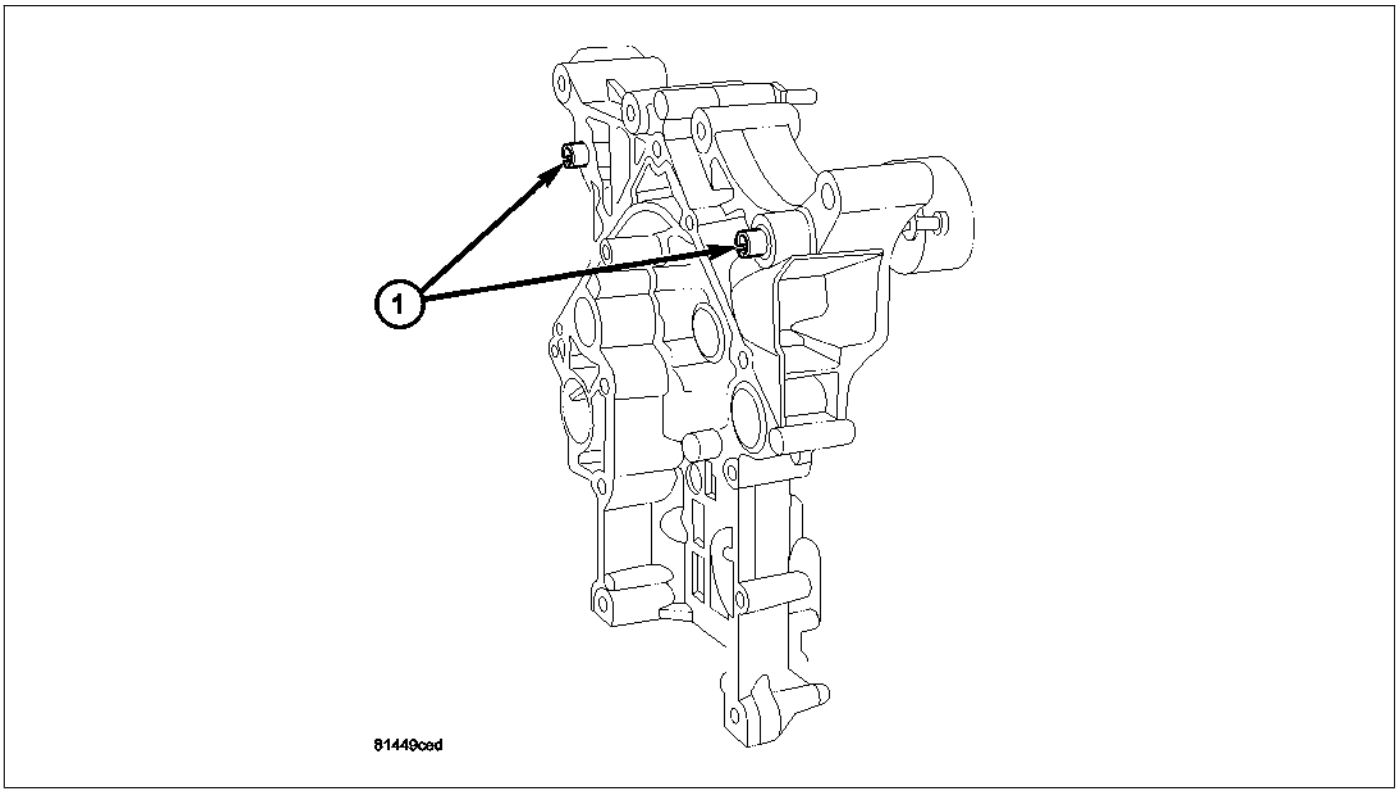
REMOVAL

1. Remove the vibration damper (1) (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL).

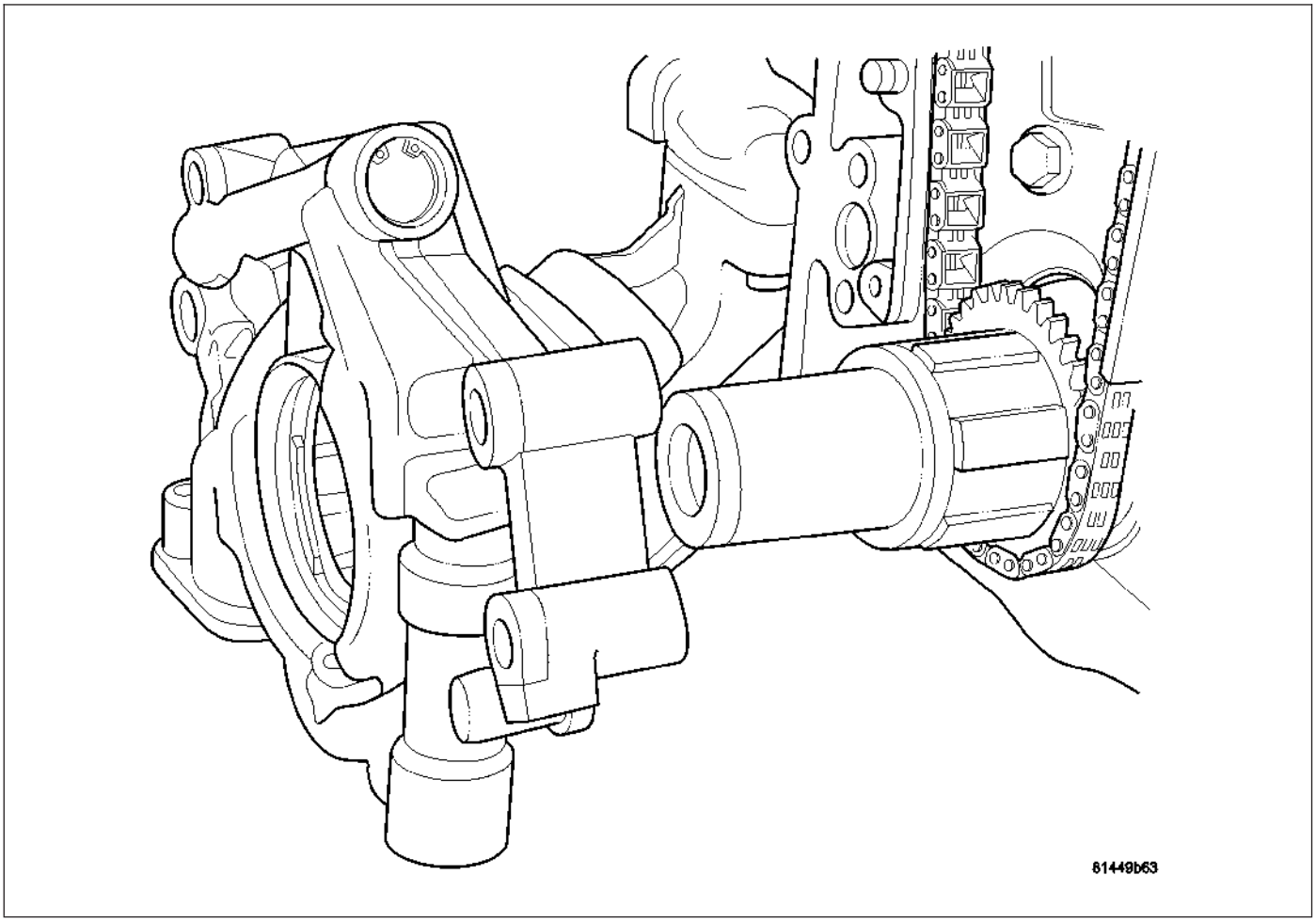


2. Remove the rear oil seal retainer (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT REAR OIL SEAL RETAINE - REMOVAL).
3. Remove the oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).
4. Remove the oil pump pickup.
5. Remove the windage tray/oil pan gasket.



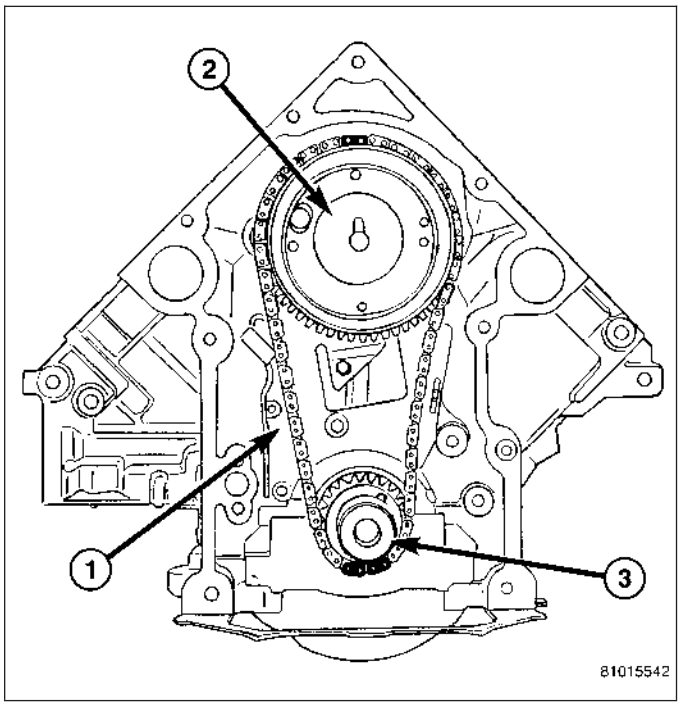


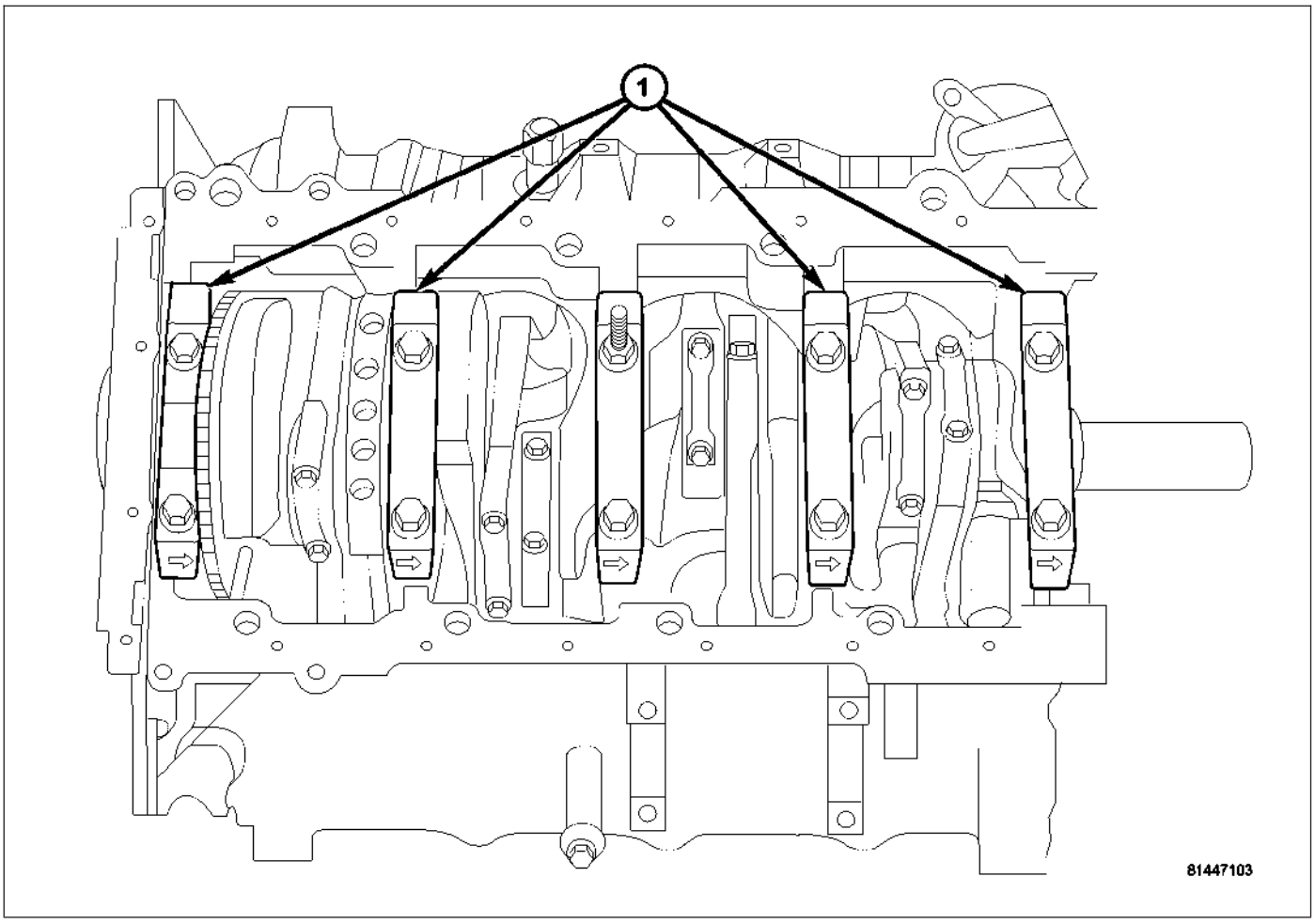
6. Remove the timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).



7. Remove the oil pump (Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - REMOVAL).

8. Remove the timing drive (2) (Refer to 9 - ENGINE/ VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).

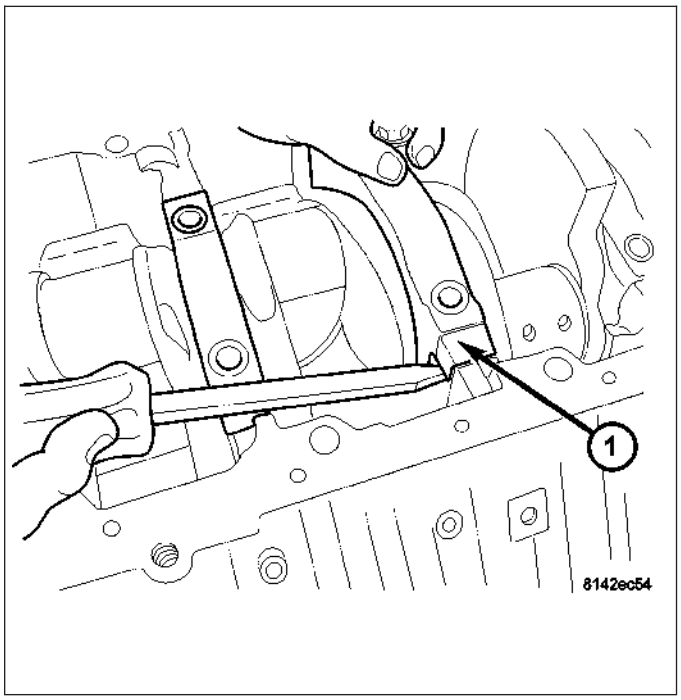


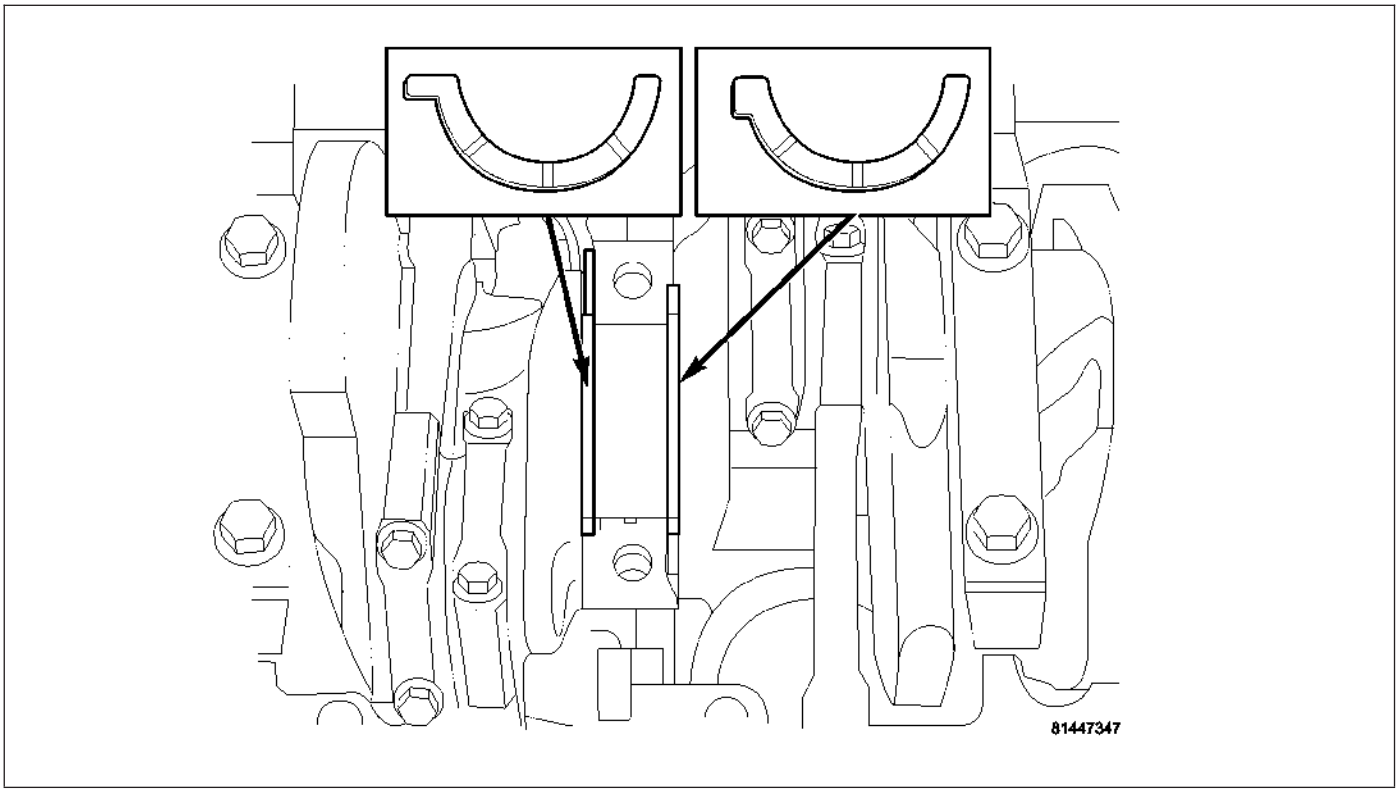


9. Identify rod bearing caps before removal. Remove rod bearing caps with bearings.

10. Identify main bearing caps (1) before removal.

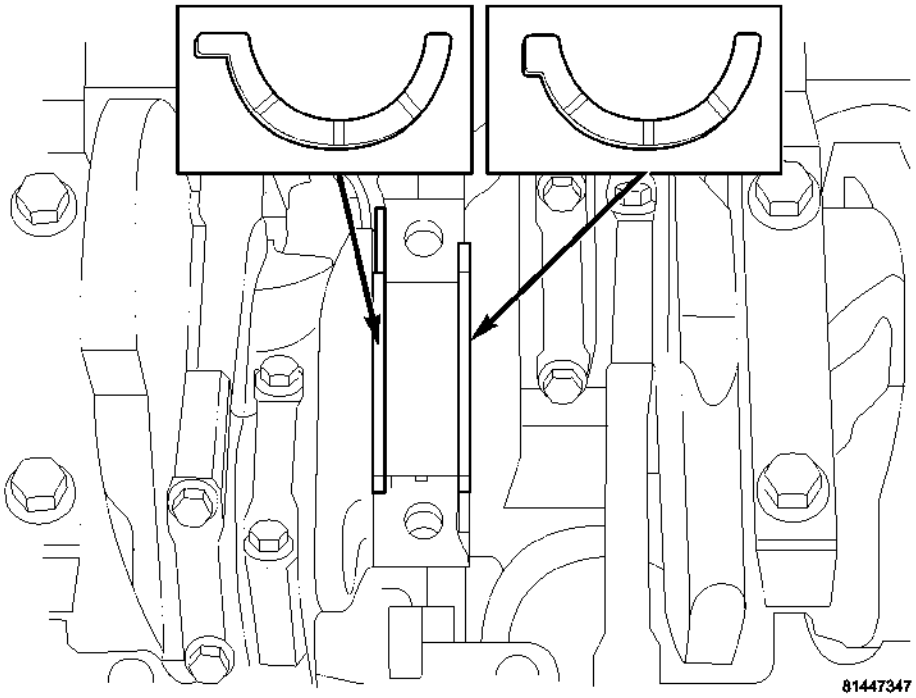
11. Remove main bearing caps (1) and bearings one at a time.



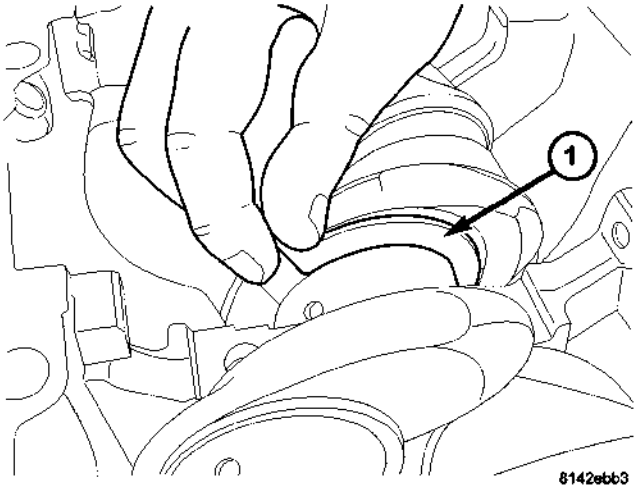


12. Remove the thrust washers.
13. Remove the crankshaft out of the block.

INSTALLATION

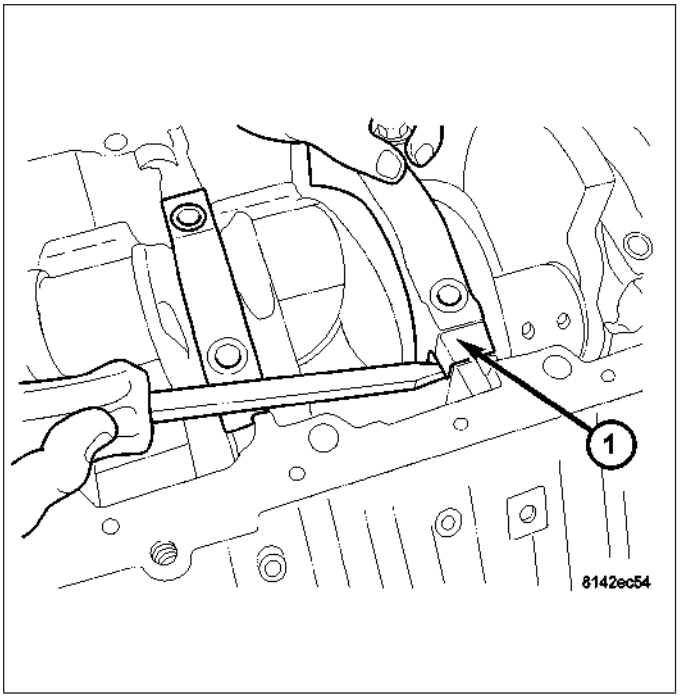


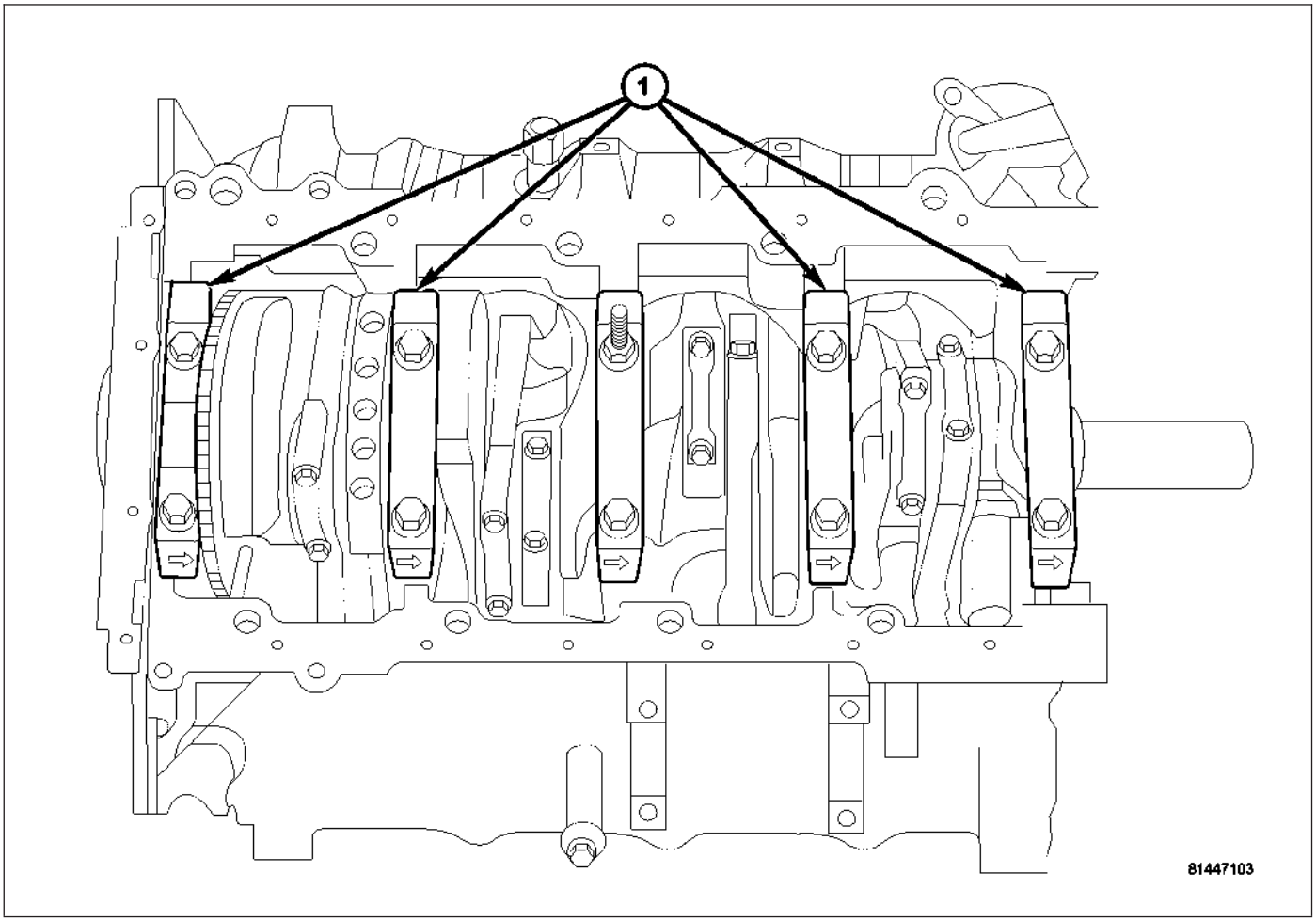
1. Select the proper main bearings (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT MAIN BEARINGS - STANDARD PROCEDURE).
2. Install main bearings in block and caps, and lubricate bearings.
3. Position the crankshaft into the cylinder block.
4. Install the thrust washers (1).



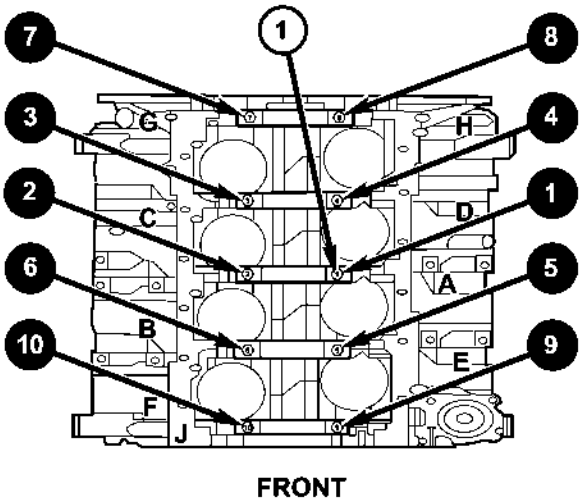
NOTE: The main cap crossbolts are torqued after final torque of the main cap bolts. Always use a new washer/seal on crossbolts.

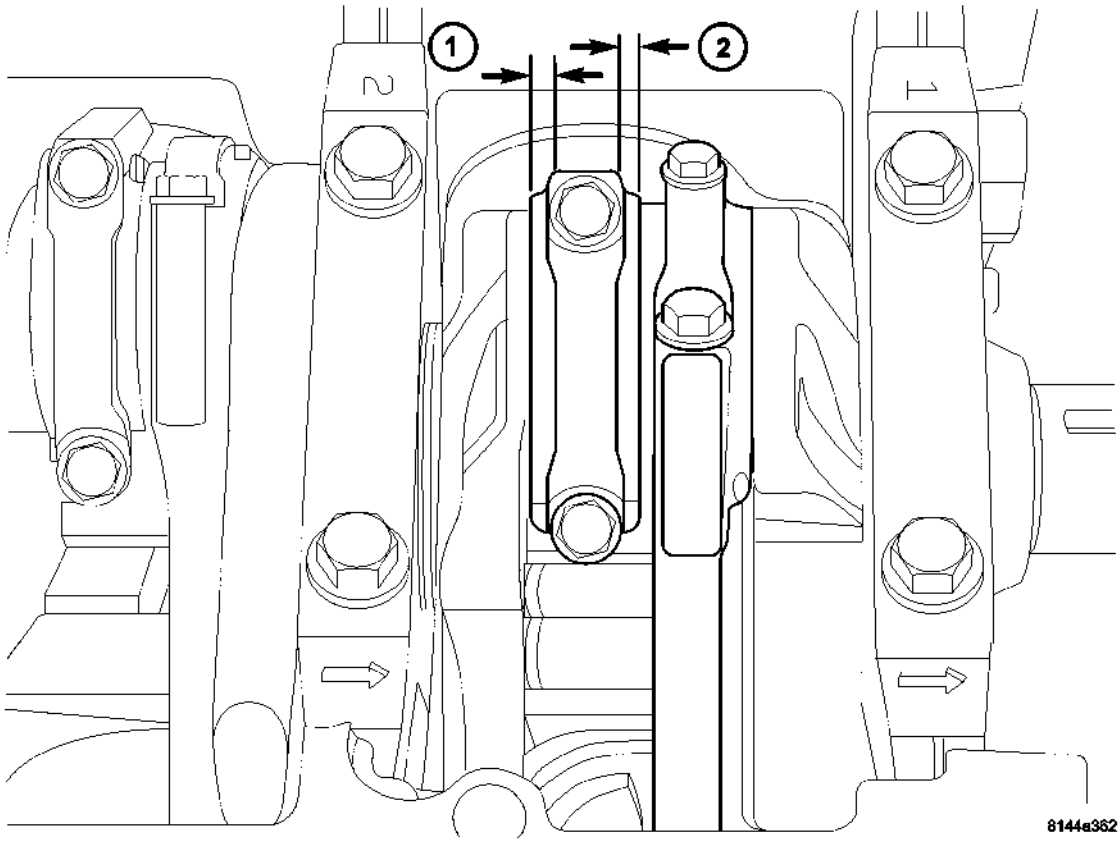
5. Clean and oil all cap bolts. Install all main bearing caps (1). Install all cap bolts and alternately tighten in two steps using the following sequence.





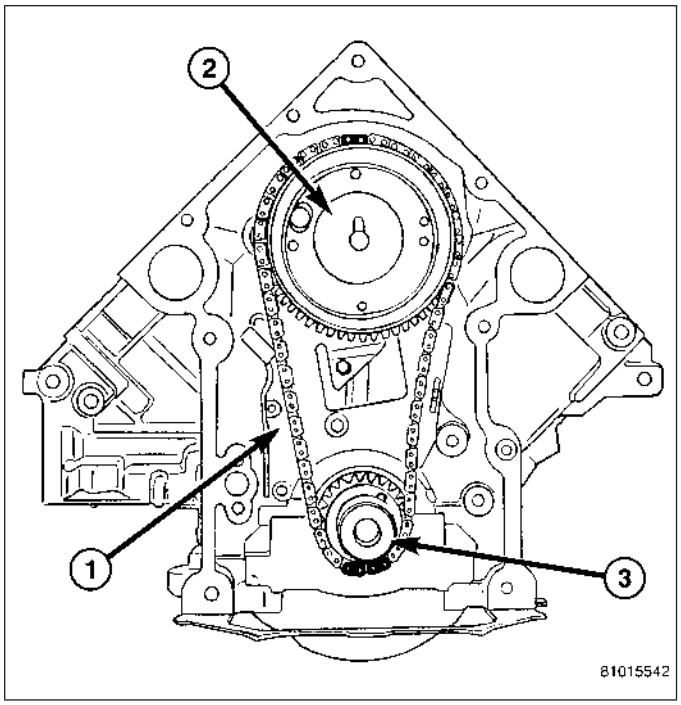
6. • Step 1 – 27 N·m (20ft. lbs.) torque.
7. • Step 2 – Turn main cap bolts an additional 90°.
8. Install the crossbolts with new washer/gasket. Starting with crossbolt A torque each crossbolt to 28 N·m (21ft. lbs.)torque.
9. Repeat crossbolt torque procedure.
10. Measure crankshaft end play (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT MAIN BEARINGS - STANDARD PROCEDURE).

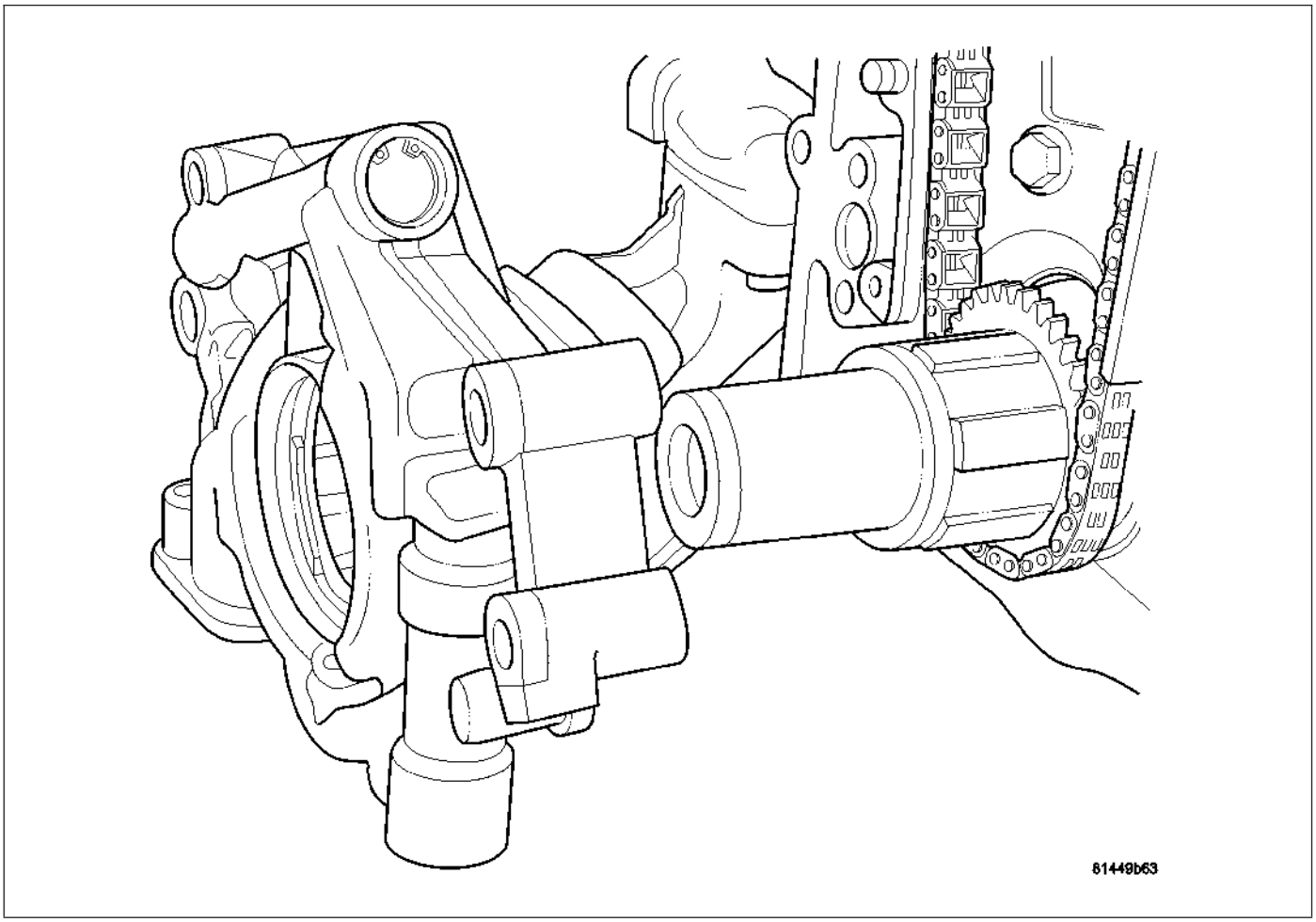




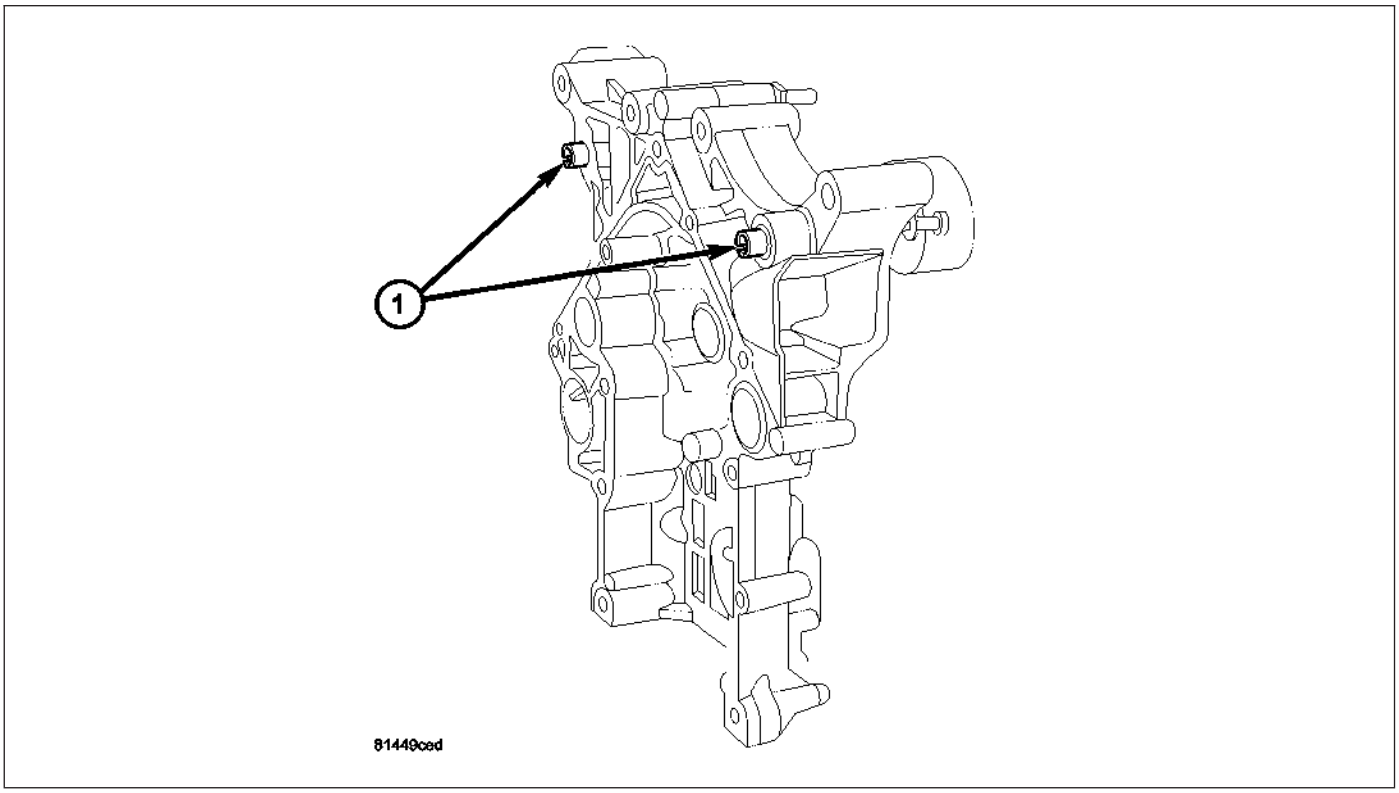
11. Position the connecting rods onto the crankshaft and install the rod bearing caps (Refer to 9 - ENGINE/ENGINE BLOCK/PISTON & CONNECTING ROD - INSTALLATION).

12. Install timing drive (2) (Refer to 9 - ENGINE/ VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).



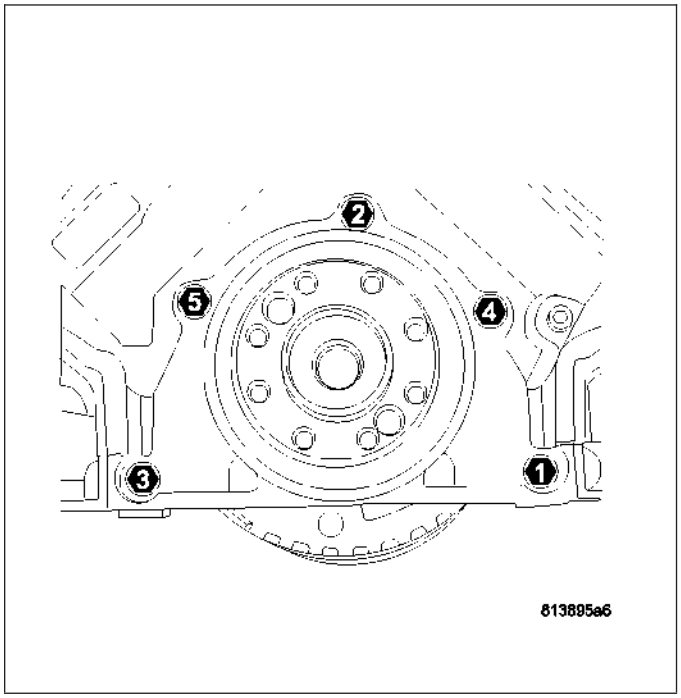


13. Install oil pump (Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - INSTALLATION).



14. Install the timing chain cover (1) (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION).

15. Install the rear main seal and retainer (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT REAR OIL SEAL RETAINE - INSTALLATION).
16. Install the windage tray/oil pan gasket.
17. Install the oil pick up tube.
18. Install the oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).
19. Install the vibration damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION).
20. Install the engine (Refer to 9 - ENGINE - INSTALLATION).



BEARINGS-CRANKSHAFT MAIN

STANDARD PROCEDURE - CRANKSHAFT MAIN BEARING - FITTING

MAIN BEARING JOURNAL DIAMETER (CRANKSHAFT REMOVED)

Crankshaft removed from the cylinder block.

Clean the oil off the main bearing journal.

Determine the maximum diameter of the journal with a micrometer. Measure at two locations 90° apart at each end of the journal.

The maximum allowable taper is 0.008mm (0.0004 inch.) and maximum out of round is 0.005mm (0.0002 inch). Compare the measured diameter with the journal diameter specification (Main Bearing Fitting Chart). Select inserts required to obtain the specified bearing-to-journal clearance.

CRANKSHAFT MAIN BEARING SELECTION

The main bearings are “select fit” to achieve proper oil clearances. For main bearing selection, the crankshaft counterweight has grade identification marks stamped into it. These marks are read from left to right, corresponding with journal number 1, 2, 3, 4 and 5.

NOTE: Service main bearings are coded. These codes identify what size (grade) the bearing is.

MAIN BEARING SELECTION CHART - 5.7L

GRADE MARKING	SIZE mm (in.)	FOR USE WITH JOURNAL SIZE
A	0.008 mm U/S (0.0004 in.) U/S	64.988–64.995 mm (2.5585– 2.5588in.)
B	NOMINAL	64.996–65.004 mm (2.5588–2.5592 in.)
C	0.008 mm O/S (0.0004 in.) O/S	65.005–65.012 mm (2.5592–2.5595 in.)

INSPECTION

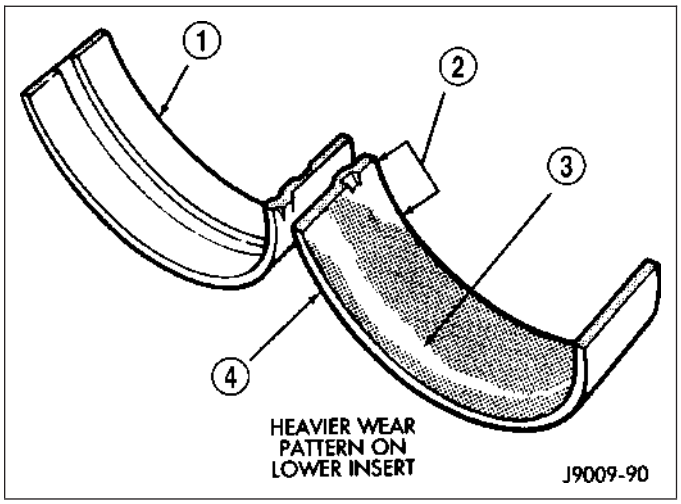
Wipe the inserts clean and inspect for abnormal wear patterns and for metal or other foreign material imbedded in the lining. Normal main bearing insert wear patterns are illustrated.

NOTE: If any of the crankshaft journals are scored, the crankshaft must be repaired or replaced.

Inspect the back of the inserts for fractures, scrapings or irregular wear patterns.

Inspect the upper insert locking tabs for damage.

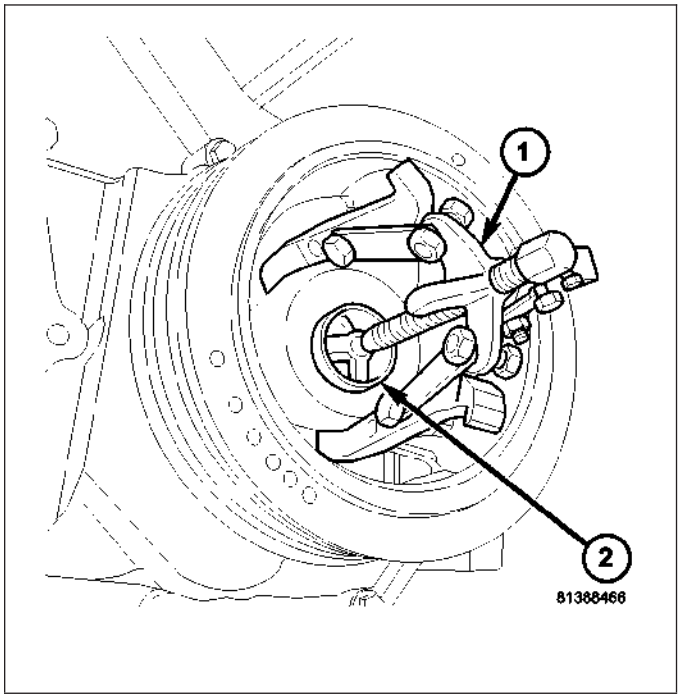
Replace all damaged or worn bearing inserts.



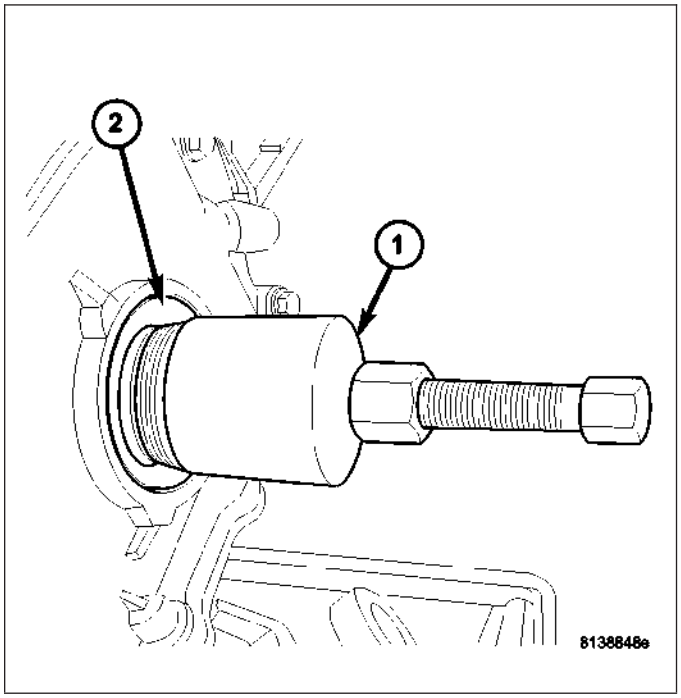
SEAL-CRANKSHAFT OIL-FRONT

REMOVAL

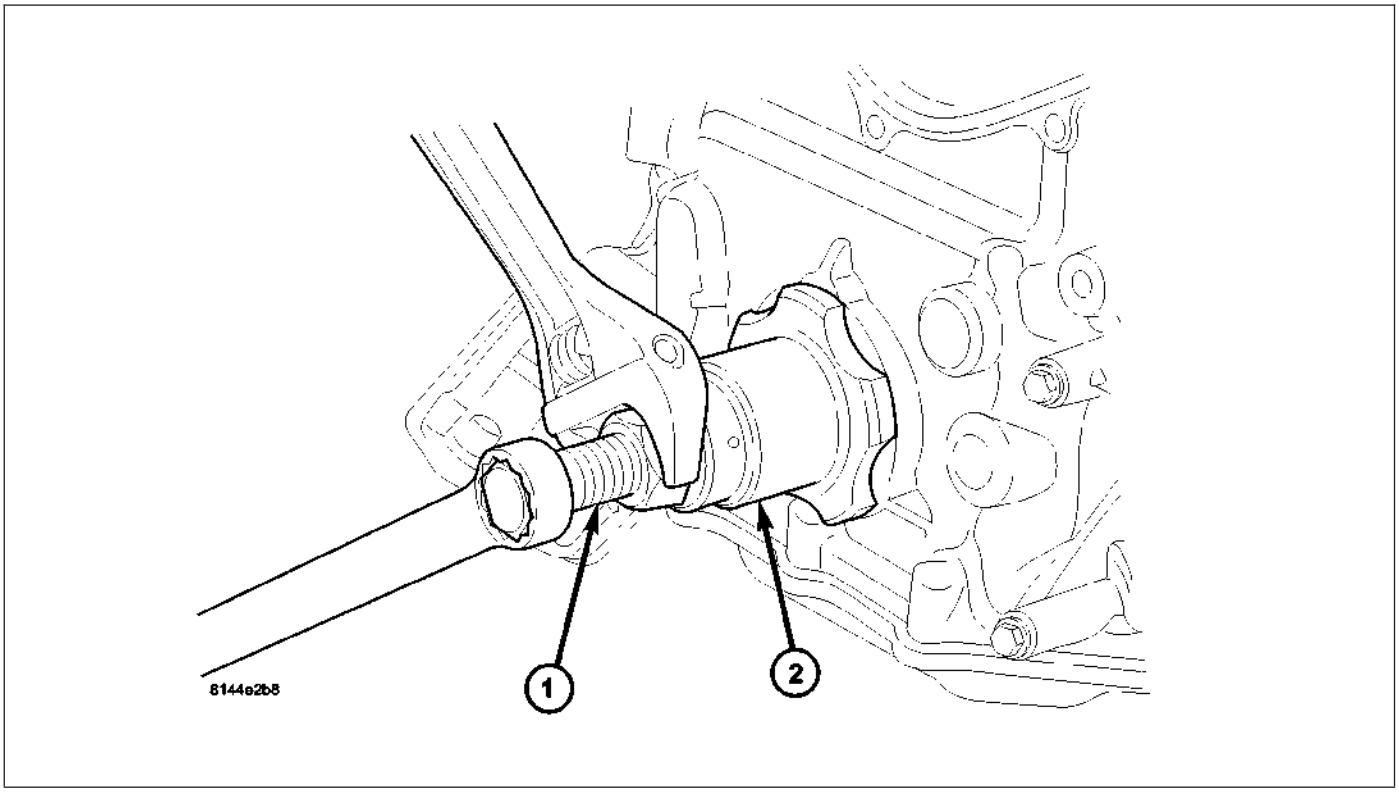
1. Disconnect negative cable from battery.
2. Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
3. Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
4. Remove upper radiator hose.
5. Remove radiator shroud attaching fasteners.
6. Remove radiator cooling fan and shroud (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - REMOVAL).
7. Remove crankshaft damper bolt.
8. Remove damper using Special Tools 8513A Insert (2) and 1023 Three Jaw Puller (1) (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL).



9. Using Special Tool 9071 (1), remove crankshaft front seal (2).



INSTALLATION



CAUTION: The front crankshaft seal must be installed dry. Do not apply lubricant to sealing lip or to outer edge.

1. Using Special Tool 8348 and 8512A, install crankshaft front seal.

CAUTION: To prevent severe damage to the Crankshaft or Damper, thoroughly clean the damper bore and the crankshaft nose before installing Damper.

2. Install vibration damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION).
3. Install radiator cooling fan and shroud (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - INSTALLATION).
4. Install upper radiator hose.
5. Install accessory drive belt refer (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).
6. Refill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
7. Connect negative cable to battery.

SEAL-CRANKSHAFT OIL-REAR

DIAGNOSIS AND TESTING - REAR SEAL AREA LEAKS

Since it is sometimes difficult to determine the source of an oil leak in the rear seal area of the engine, a more involved inspection is necessary. The following steps should be followed to help pinpoint the source of the leak.

If the leakage occurs at the crankshaft rear oil seal area:

1. Disconnect the battery.
2. Raise the vehicle.
3. Remove torque converter or clutch housing cover and inspect rear of block for evidence of oil. Use a black light to check for the oil leak:
   a. Circular spray pattern generally indicates seal leakage or crankshaft damage.

b. Where leakage tends to run straight down, possible causes are a porous block, camshaft bore cup plugs, oil galley pipe plugs, oil filter runoff, and main bearing cap to cylinder block mating surfaces. See Engine, for proper repair procedures of these items.

4. If no leaks are detected, pressurized the crankcase as outlined in the section, Inspection (Engine oil Leaks in general)

CAUTION: Do not exceed 20.6 kPa (3 psi).

5. If the leak is not detected, very slowly turn the crankshaft and watch for leakage. If a leak is detected between the crankshaft and seal while slowly turning the crankshaft, it is possible the crankshaft seal surface is damaged. The seal area on the crankshaft could have minor nicks or scratches that can be polished out with emery cloth.

CAUTION: Use extreme caution when crankshaft polishing is necessary to remove minor nicks or scratches. The crankshaft seal flange is specially machined to complement the function of the rear oil seal.

6. For bubbles that remain steady with shaft rotation, no further inspection can be done until disassembled. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING), under the Oil Leak row, for components inspections on possible causes and corrections.
7. After the oil leak root cause and appropriate corrective action have been identified, (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT OIL SEAL - REAR - REMOVAL).

REMOVAL

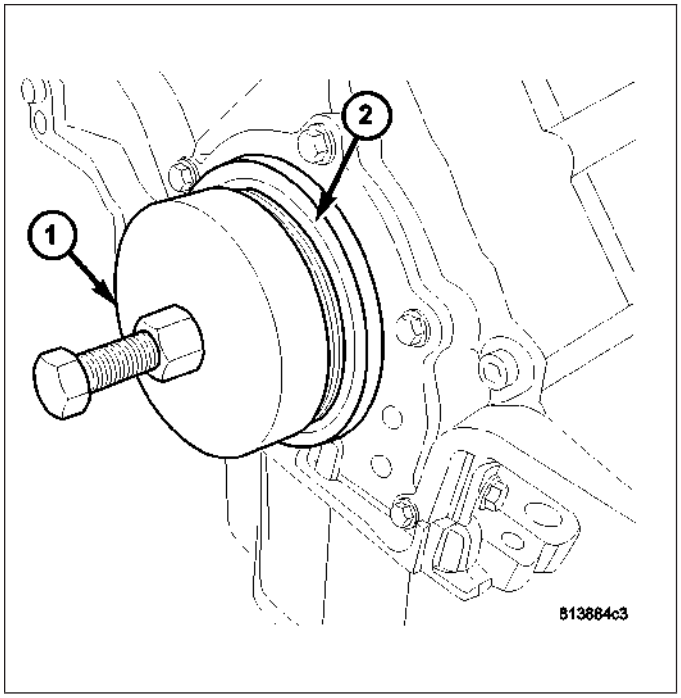
NOTE: This procedure can be performed in vehicle.

1. If being performed in vehicle, remove the transmission.
2. Remove the flexplate (Refer to 9 - ENGINE/ENGINE BLOCK/FLEX PLATE - REMOVAL).

NOTE: The crankshaft oil seal CAN NOT be reused after removal.

NOTE: The crankshaft rear oil seal remover Special Tool 8506 must be installed deeply into the seal. Continue to tighten the removal tool into the seal until the tool can not be turned farther. Failure to install tool correctly the first time will cause tool to pull free of seal without removing seal from engine.

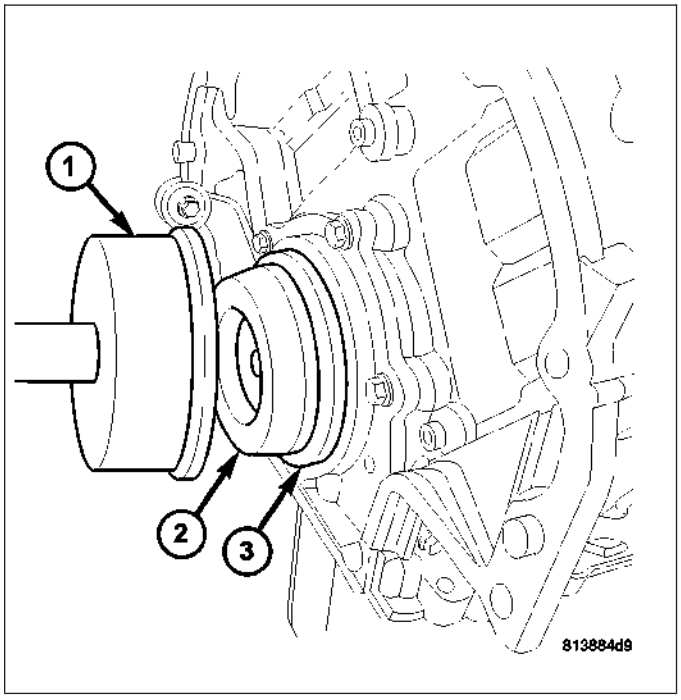
3. Using Special Tool 8506 (1), remove the crankshaft rear oil seal (2).



INSTALLATION

CAUTION: The rear seal must be installed dry for proper operation. Do not lubricate the seal lip or outer edge.

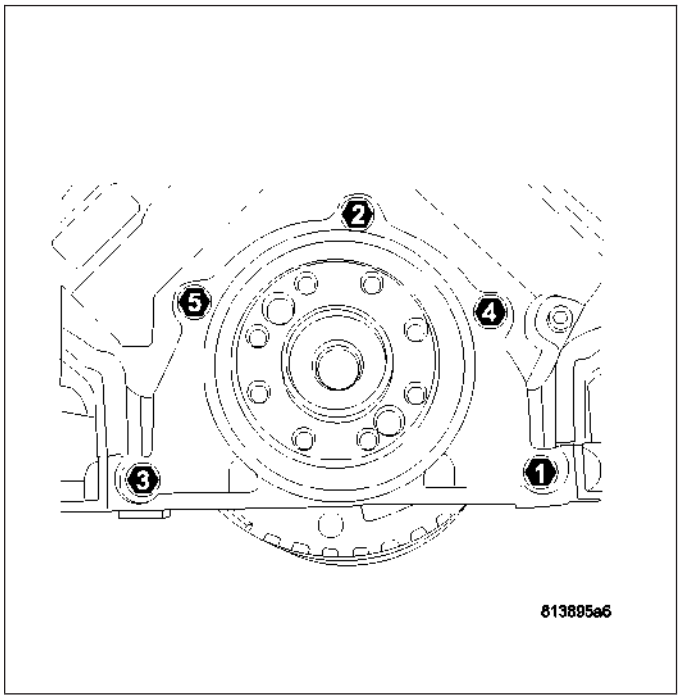
1. Position the plastic seal guide (2) onto the crankshaft rear face. Then position the crankshaft rear oil seal (3) onto the guide.
2. Using Special Tools 8349 Crankshaft Rear Oil Seal Installer (1) and C-4171 Driver Handle, with a hammer, tap the seal (3) into place. Continue to tap on the driver handle until the seal installer seats against the cylinder block crankshaft bore.
3. Install the flexplate. (Refer to 9 - ENGINE/ENGINE BLOCK/FLEX PLATE - INSTALLATION).
4. Install the transmission.



RETAINER-CRANK REAR OIL - SEAL

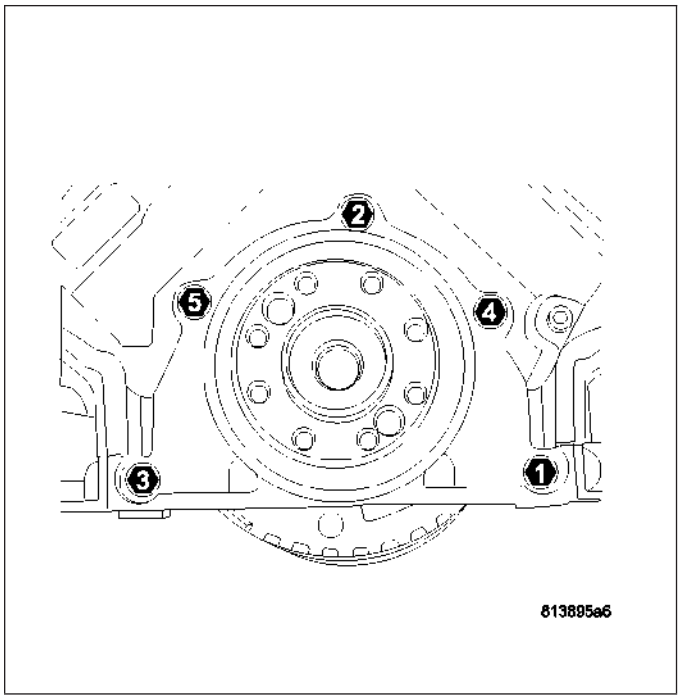
REMOVAL

1. Disconnect negative cable from battery.
2. Remove the transmission.
3. Remove the drive plate / flywheel.
4. Remove the oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).
5. Remove the rear oil seal retainer mounting bolts.
6. Carefully remove the retainer from the engine block.



INSTALLATION

1. Throughly clean all gasket resdue from the engine block.
2. Use extream care and clean all gasket resdue from the retainer.
3. Position the gasket onto the retainer.
4. Position the retainer onto the engine block.
5. Install the retainer mounting bolts. Tighten the bolts to 15 N·m (132 in. lbs.) using the procedure shown.

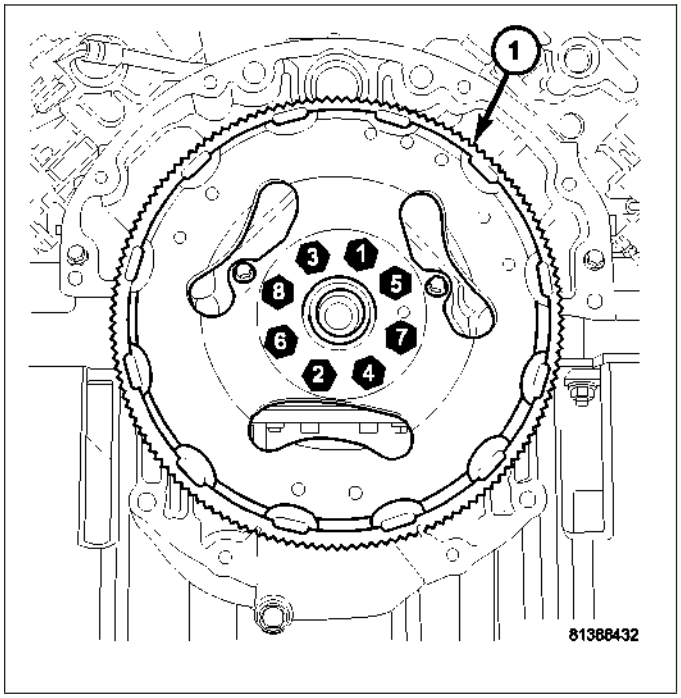


6. Install the oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).
7. Install the drive plate / flywheel.
8. Install the transmission.
9. Check and verify engine oil level.
10. Start engine and check for leaks.

FLEX PLATE

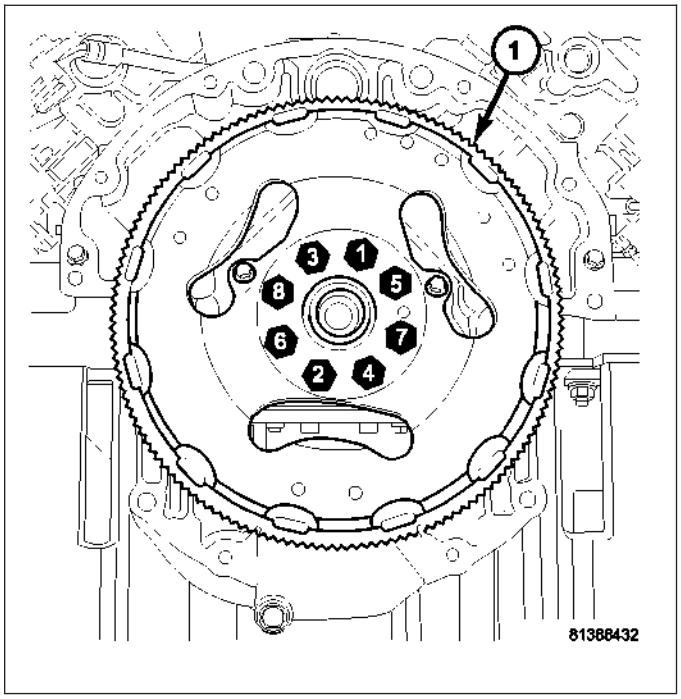
REMOVAL

1. Remove the transmission. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - REMOVAL).
2. Remove the bolts and flexplate (1).



INSTALLATION

1. Position the flexplate or flywheel onto the crankshaft and install the bolts hand tight.
2. **For automatic transmissions:** Tighten the flexplate retaining bolts to 95 N·m (70 ft. lbs.).



3. Install the transmission. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - INSTALLATION).

TAPPETS-HYDRAULIC ROLLER

DIAGNOSIS AND TESTING - HYDRAULIC TAPPETS

Before disassembling any part of the engine to correct tappet noise, check the oil pressure. If vehicle has no oil pressure gauge, install a reliable gauge at the pressure sending-unit. The pressure should be between 207-552 kPa (30-70 psi) at 3,000 RPM.

Check the oil level after the engine reaches normal operating temperature. Allow 5 minutes to stabilize oil level, check dipstick. The oil level in the pan should never be above the FULL mark or below the ADD OIL mark on dipstick. Either of these two conditions could be responsible for noisy tappets.

OIL LEVEL

HIGH

If oil level is above the FULL mark, it is possible for the connecting rods to dip into the oil. With the engine running, this condition could create foam in the oil pan. Foam in oil pan would be fed to the hydraulic tappets by the oil pump causing them to lose length and allow valves to seat noisily.

LOW

Low oil level may allow oil pump to take in air. When air is fed to the tappets, they lose length, which allows valves to seat noisily. Any leaks on intake side of oil pump through which air can be drawn will create the same tappet action. Check the lubrication system from the intake strainer to the pump cover, including the relief valve retainer cap. When tappet noise is due to aeration, it may be intermittent or constant, and usually more than one tappet will be noisy. When oil level and leaks have been corrected, operate the engine at fast idle. Run engine for a sufficient time to allow all of the air inside the tappets to be bled out.

TAPPET NOISE DIAGNOSIS

1. To determine source of tappet noise, crank over engine with cylinder head covers removed.
2. Feel each valve spring or rocker arm to detect noisy tappet. The noisy tappet will cause the affected spring and/or rocker arm to vibrate or feel rough in operation.

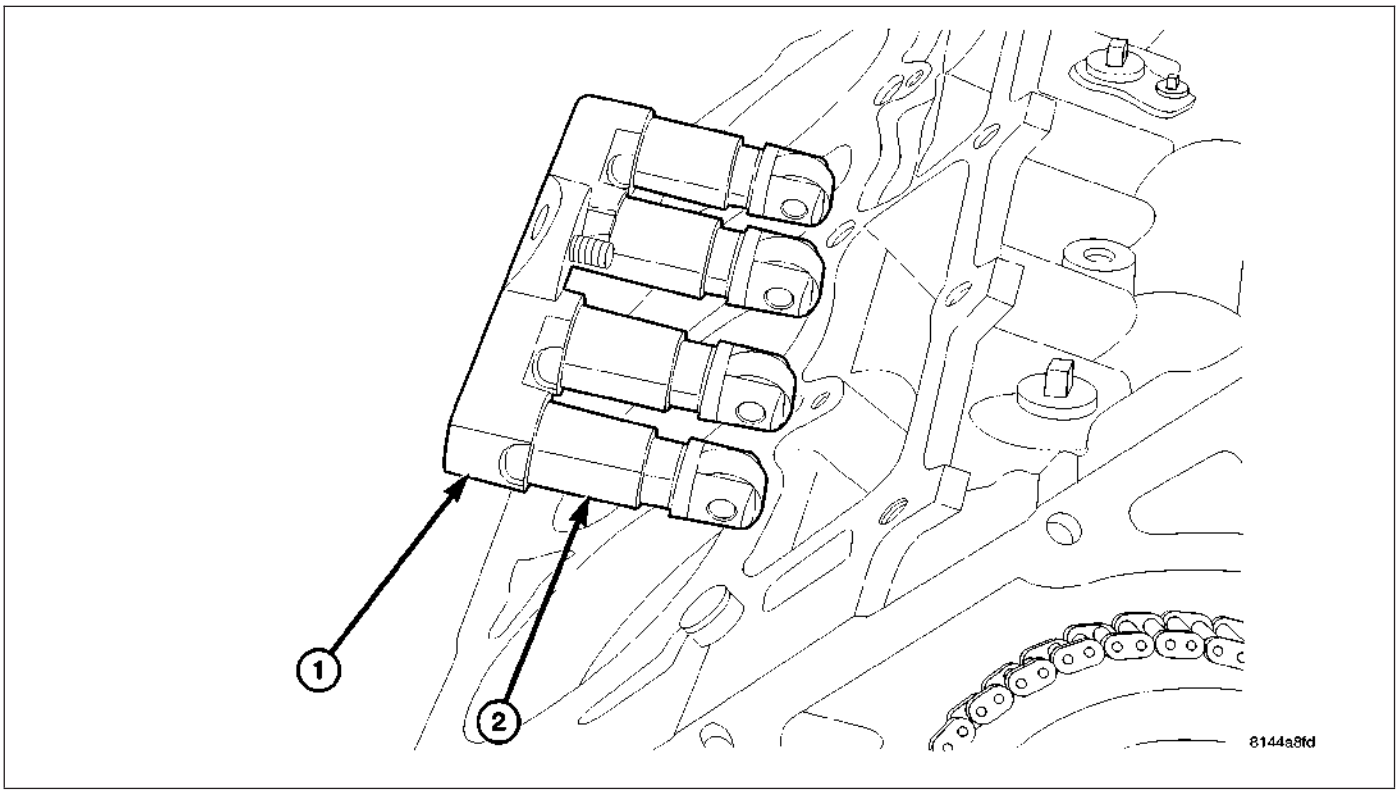
NOTE: Worn valve guides or cocked springs are sometimes mistaken for noisy tappets. If such is the case, noise may be dampened by applying side thrust on the valve spring. If noise is not appreciably reduced, it can be assumed the noise is in the tappet. Inspect the rocker arm push rod sockets and push rod ends for wear.

3. Valve tappet noise ranges from light noise to a heavy click. A light noise is usually caused by excessive leak-down around the unit plunger, or by the plunger partially sticking in the tappet body cylinder. The tappet should be replaced. A heavy click is caused by a tappet check valve not seating, or by foreign particles wedged between the plunger and the tappet body. This will cause the plunger to stick in the down position. This heavy click will be accompanied by excessive clearance between the valve stem and rocker arm as valve closes. In either case, tappet assembly should be removed for inspection and cleaning.
4. The valve train generates a noise very much like a light tappet noise during normal operation. Care must be taken to ensure that tappets are making the noise. If more than one tappet seems to be noisy, it's probably not the tappets.

REMOVAL

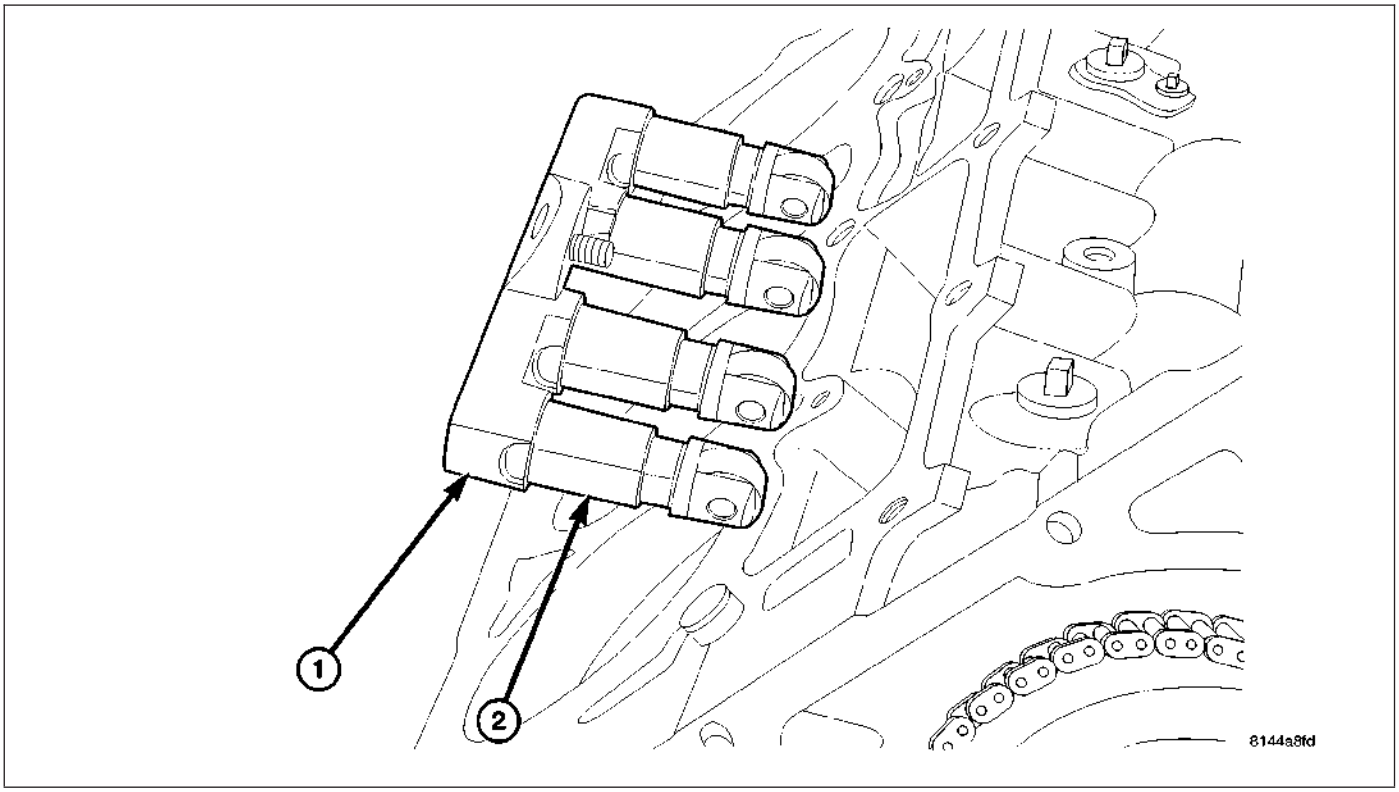
1. Disconnect the negative cable from the battery.
2. Remove the air cleaner (Refer to 9 - ENGINE/AIR INTAKE SYSTEM - REMOVAL).
3. Remove intake manifold (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).
4. Remove cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).
5. Remove rocker arm assembly and push rods (Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARM / ADJUSTER ASSY - REMOVAL). Identify push rods to ensure installation in original location.

6. Remove the cylinder head (Refer to 9 - ENGINE/CYLINDER HEAD - REMOVAL).



7. Remove bolt from tappet retainer (1).
8. Remove tappet retainer (1).
9. Pull tappet out of bore with a twisting motion. If all tappets are to be removed and reused, identify tappets to ensure installation in original location.
10. Check camshaft lobes for abnormal wear.

INSTALLATION



1. Lubricate tappets.
2. Install tappets in their original positions.
3. Install tappet retainer (1). Install the tappet retainer bolt and tighten to 12 N·m (106 in. lbs.) torque.
4. Install cylinder head (Refer to 9 - ENGINE/CYLINDER HEAD - INSTALLATION).
5. Install pushrods and rocker arm assembly (Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARM / ADJUSTER ASSY - INSTALLATION).
6. Install cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).
7. Install intake manifold (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION).
8. Install the air cleaner (Refer to 9 - ENGINE/AIR INTAKE SYSTEM - INSTALLATION).
9. Connect the negative cable to the battery.

CAUTION: To prevent damage to valve mechanism, engine must not be run above fast idle until all hydraulic tappets have filled with oil and have become quiet.

10. Road test vehicle and check for leaks.

PISTON & CONNECTING ROD

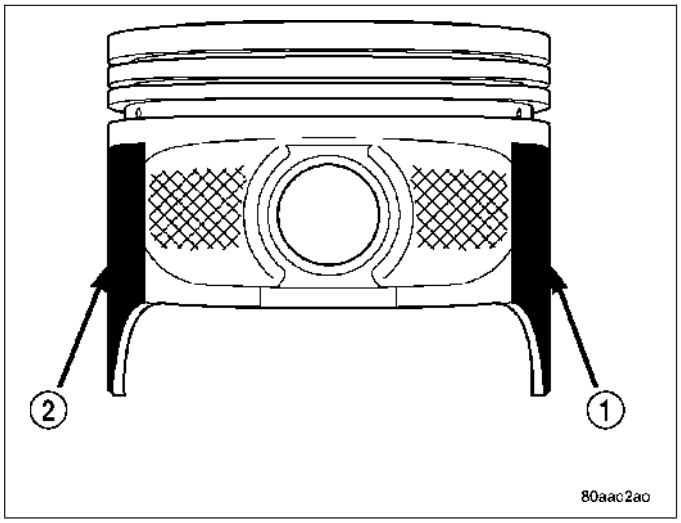
DESCRIPTION

CAUTION: Do not use a metal stamp to mark connecting rods as damage may result, instead use ink or a scratch awl.

The pistons are made of a high strength aluminum alloy. Piston skirts are coated with a solid lubricant (Molykote) to reduce friction and provide scuff resistance. The piston top ring groove and land is anodized. The connecting rods are made of forged powdered metal, with a “fractured cap” design. A pressed fit piston pin is used to attach the piston and connecting rod.

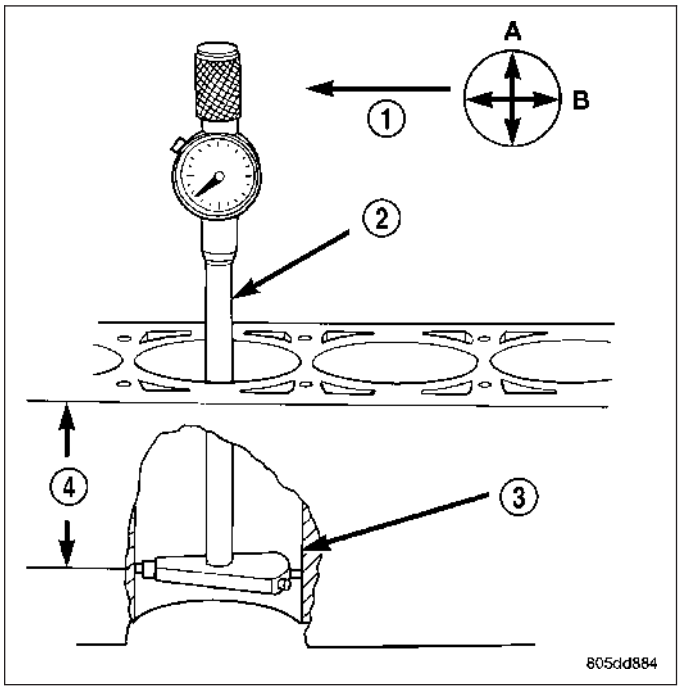
STANDARD PROCEDURE - PISTON FITTING

1. To correctly select the proper size piston, a cylinder bore gauge, capable of reading in 0.003 mm (.0001 in.) INCREMENTS is required. If a bore gauge is not available, do not use an inside micrometer.
2. Measure the inside diameter of the cylinder bore at a point 38.0 mm (1.5 inches) below top of bore. Start perpendicular (across or at 90 degrees) to the axis of the crankshaft at point A and then take an additional bore reading 90 degrees to that at point B.
3. The coated pistons will be serviced with the piston pin and connecting rod pre-assembled. The piston-rod assembly is specific for the left cylinder bank (odd numbered) and the right cylinder bank (even numbered) and must not be interchanged.
4. The coating material is applied to the piston after the final piston machining process. Measuring the outside diameter of a coated piston will not provide accurate results. Therefore measuring the inside diameter of the cylinder bore with a dial Bore Gauge is **MANDATORY**. To correctly select the proper size piston, a cylinder bore gauge capable of reading in 0.003 mm (.0001 in.) increments is required.
5. Piston installation into the cylinder bore requires slightly more pressure than that required for non-coated pistons. The bonded coating on the piston will give the appearance of a line-to-line fit with the cylinder bore.



REMOVAL

1. Disconnect negative cable from battery.
2. Remove the following components:
   - Oil pan and gasket/windage tray (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).
   - Cylinder head covers (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL) and (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).
   - Timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).
   - Cylinder head(s) (Refer to 9 - ENGINE/CYLINDER HEAD - REMOVAL) and (Refer to 9 - ENGINE/CYLINDER HEAD - REMOVAL).
3. If necessary, remove top ridge of cylinder bores with a reliable ridge reamer before removing pistons from cylinder block. **Be sure to keep tops of pistons covered during this operation.** Pistons and connecting rods must be removed from top of cylinder block. When removing piston and connecting rod assemblies from the engine, rotate crankshaft so the each connecting rod is centered in cylinder bore.

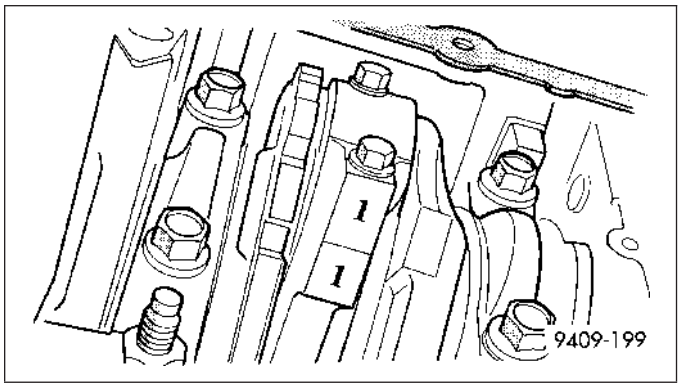


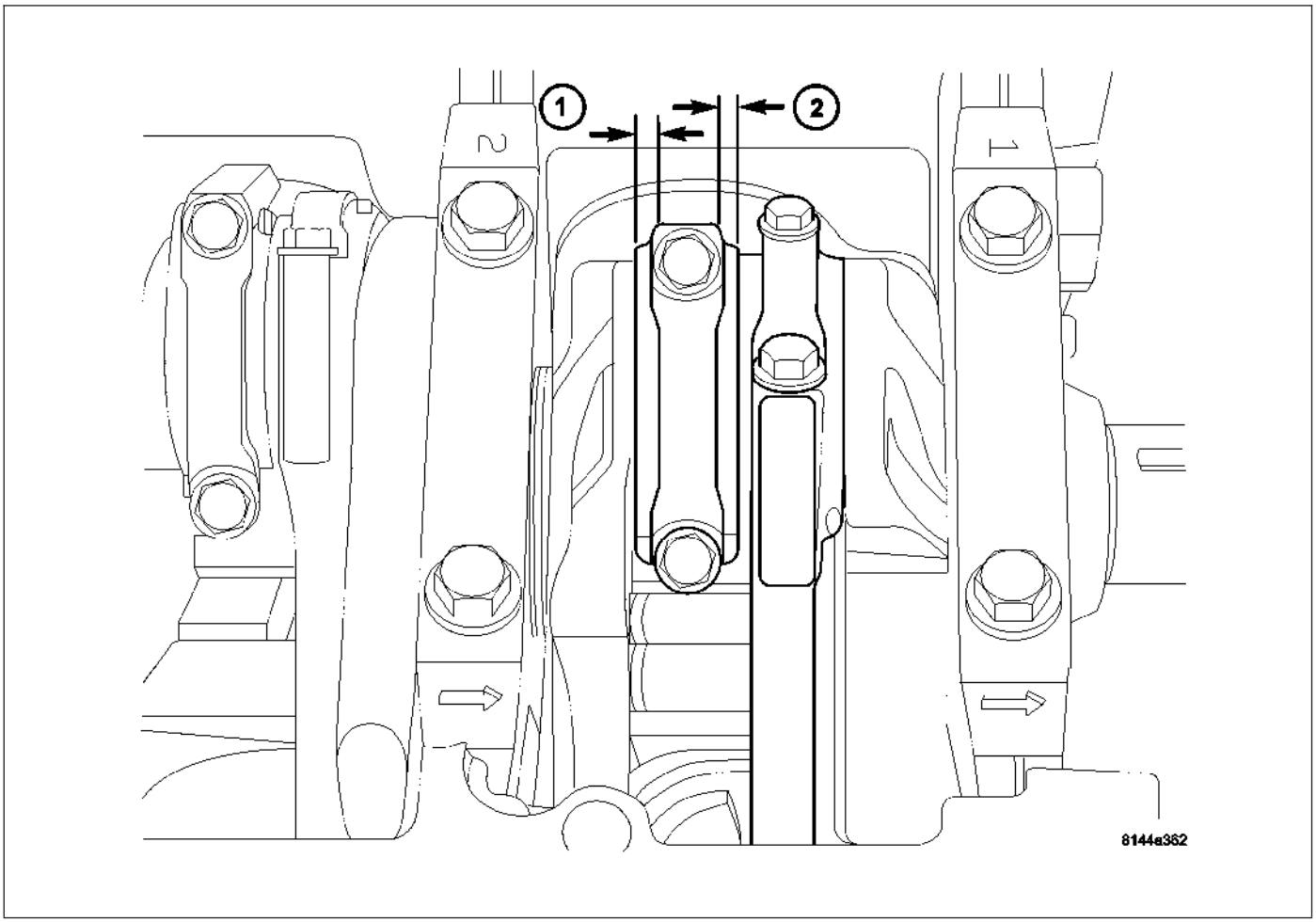
CAUTION: DO NOT use a number stamp or a punch to mark connecting rods or caps, as damage to connecting rods could occur

NOTE: Connecting rods and bearing caps are not interchangeable and should be marked before removing to ensure correct reassembly.

4. Mark connecting rod and bearing cap positions using a permanent ink marker or scribe tool.

CAUTION: Care must be taken not to damage the fractured rod and cap joint face surfaces, as engine damage may occur.





5. Remove connecting rod cap. Install Special Tool 8507 Connecting Rod Guides into the connecting rod being removed. Remove piston from cylinder bore. Repeat this procedure for each piston being removed.

CAUTION: Care must be taken not to nick crankshaft journals, as engine damage may occur

6. Immediately after piston and connecting rod removal, install bearing cap on the mating connecting rod to prevent damage to the fractured cap and rod surfaces.

7. Carefully remove piston rings from piston(s), starting from the top ring down.

CLEANING

CAUTION: DO NOT use a wire wheel or other abrasive cleaning devise to clean the pistons or connecting rods. The pistons have a Moly coating, this coating must not be damaged.

1. Using a suitable cleaning solvent clean the pistons in warm water and towel dry.
2. Use a wood or plastic scraper to clean the ring land grooves.

CAUTION: DO NOT remove the piston pin from the piston and connecting rod assembly.

INSPECTION

Check the connecting rod journal for excessive wear, taper and scoring (Refer to 9 - ENGINE/ENGINE BLOCK/ CONNECTING ROD BEARINGS - STANDARD PROCEDURE).

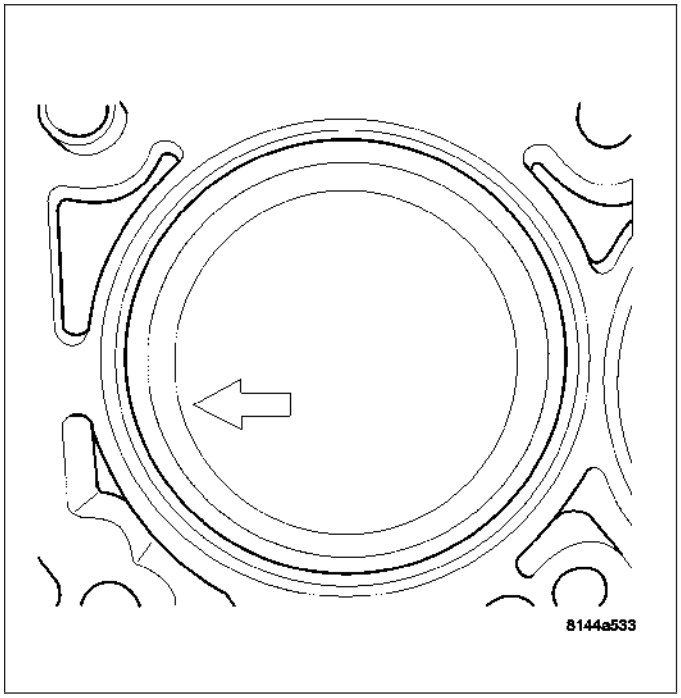
Check the connecting rod for signs of twist or bending.

Check the piston for taper and elliptical shape before it is fitted into the cylinder bore (Refer to 9 - ENGINE/ENGINE BLOCK/PISTON & CONNECTING ROD - STANDARD PROCEDURE).

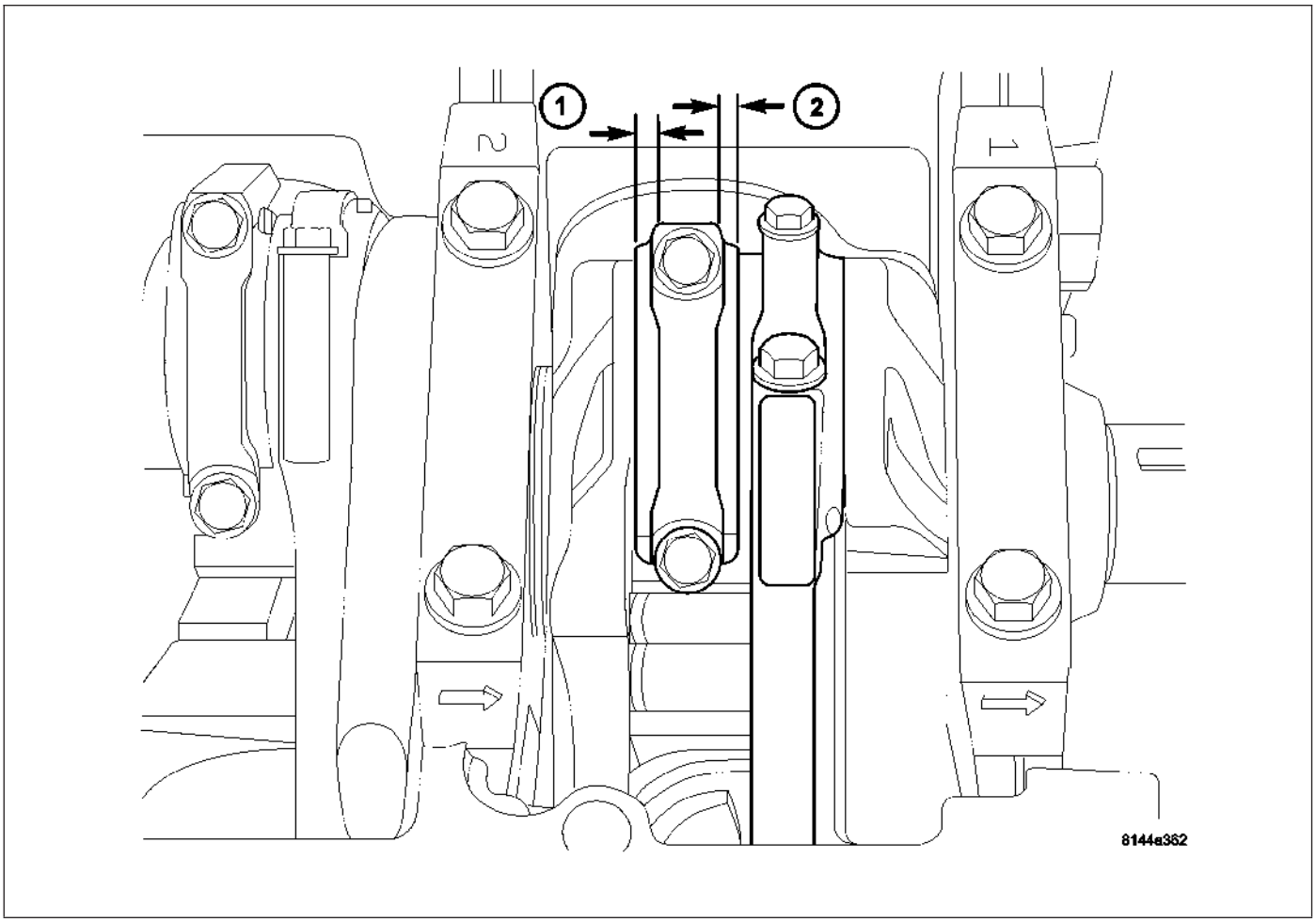
Check the piston for scoring, or scraping marks in the piston skirts. Check the ring lands for cracks and/or deterioration.

INSTALLATION

1. Before installing piston and connecting rod assemblies into the bore, install the piston rings (Refer to 9 - ENGINE/ENGINE BLOCK/PISTON RINGS - STANDARD PROCEDURE).
2. Immerse the piston head and rings in clean engine oil. Position a ring compressor over the piston and rings. Tighten ring compressor. **Ensure position of rings do not change during this operation.**
3. Position bearing onto connecting rod. Lubricate bearing surface with clean engine oil.
4. Install Special Tool 8507 Connecting Rod Guides into connecting rod bolt threads.
5. The pistons are marked on the piston pin bore surface with an raised “F” or arrow on top of piston indicating installation position. This mark must be pointing toward the front of engine on both cylinder banks.
6. Wipe cylinder bore clean and lubricate with engine oil.



7. Rotate crankshaft until connecting rod journal is on the center of cylinder bore. Insert rod and piston into cylinder bore and carefully position connecting rod guides over crankshaft journal.
8. Tap piston down in cylinder bore using a hammer handle. While at the same time, guide connecting rod into position on rod journal.



CAUTION: Connecting Rod Bolts are Torque to Yield Bolts and Must Not Be Reused. Always replace the Rod Bolts whenever they are loosened or removed.

9. Lubricate rod bolts and bearing surfaces with engine oil. Install connecting rod cap and bearing. Tighten bolts to 21 N·m (15 ft. lbs.) plus a 90° turn.

10. Install the following components:
    - Cylinder head(s). (Refer to 9 - ENGINE/CYLINDER HEAD - INSTALLATION).
    - Cylinder head covers (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).
    - Install the intake manifold.
    - Oil pan and gasket/windage tray. (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).
11. Fill crankcase with proper engine oil to correct level.
12. Connect negative cable to battery.

RINGS-PISTON

STANDARD PROCEDURE - PISTON RING FITTING

Before reinstalling used rings or installing new rings, the ring clearances must be checked.

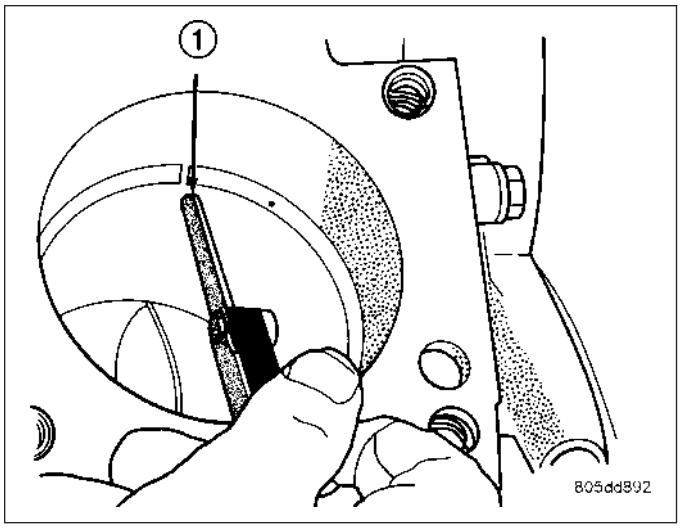
1. Wipe the cylinder bore clean.
2. Insert the ring in the cylinder bore.

NOTE: The ring gap measurement must be made with the ring positioned at least 12mm (0.50 inch.) from bottom of cylinder bore.

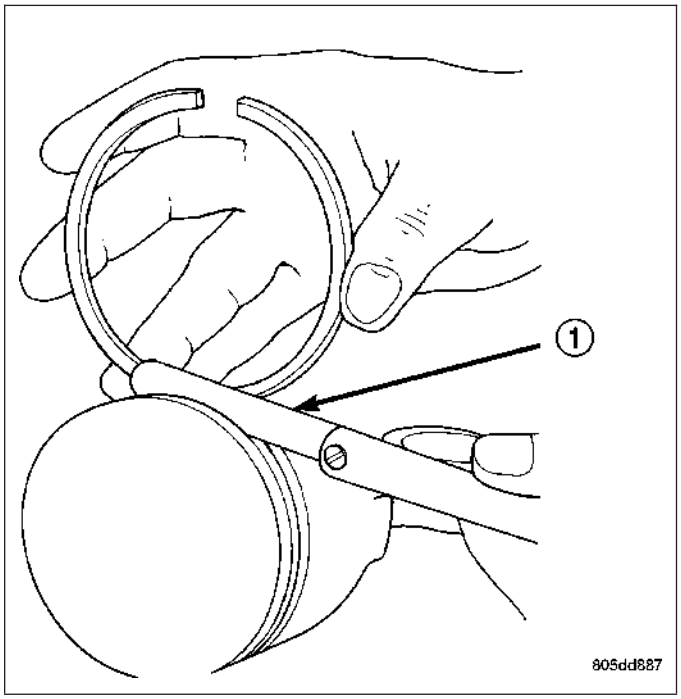
3. Using a piston, to ensure that the ring is squared in the cylinder bore, slide the ring downward into the cylinder.
4. Using a feeler gauge check the ring end gap. Replace any rings not within specification.

PISTON RING SIDE CLEARANCE

NOTE: Make sure the piston ring grooves are clean and free of nicks and burrs.



5. Measure the ring side clearance as shown make sure the feeler gauge fits snugly between the ring land and the ring. Replace any ring not within specification.
6. Rotate the ring around the piston, the ring must rotate in the groove with out binding.



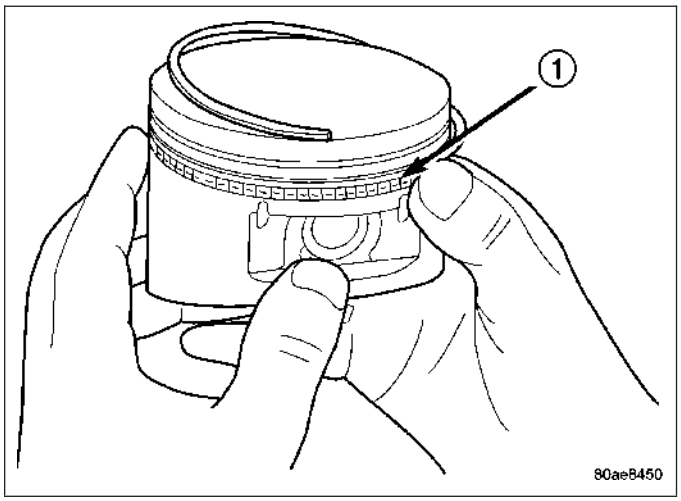
PISTON RING SPECIFICATION CHART

Ring Position	Ring/Groove Side Clearance	Maximum Clearance
Upper Ring	0.02-0.07mm (0.0008- 0.0028 in.)	0.11mm (0.004 in.)
Intermediate Ring	0.02-0.06 mm (0.0008-0.0023 in.)	0.10mm (0.004 in.)
Ring Position	**Ring Gap**	**Wear Limit**
Upper Ring	0.23-0.38mm (0.0090-0.0149 in.)	0.43mm (0.017 in.)
Intermediate Ring	0.35-0.60mm (0.0137-0.0236 in.)	0.74mm (0.029 in.)
Oil Control Ring (Steel Rail)	0.015-0.66mm (0.0059- 0.0259 in.)	0.76mm (0.030 in.)

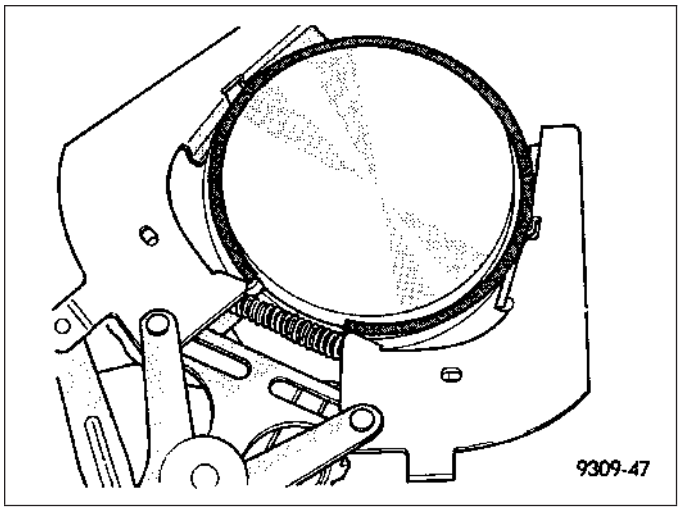
7. The No. 1 and No. 2 piston rings have a different cross section. Ensure No. 2 ring is installed with manufacturers I.D. mark (Dot) facing up, towards top of the piston.

NOTE: Piston rings are installed in the following order:
- **Oil ring expander.**
- **Lower oil ring side rail.**
- **Upper oil ring side rail.**
- **No. 2 Intermediate piston ring.**
- **No. 1 Upper piston ring.**

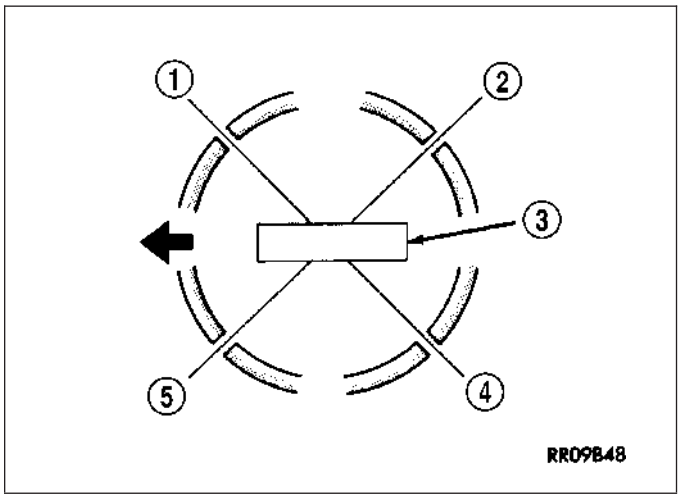
8. Install the oil ring expander.
9. Install upper side rail by placing one end between the piston ring groove and the expander ring. Hold end firmly and press down the portion to be installed until side rail is in position. Repeat this step for the lower side rail.



10. Install No. 2 intermediate piston ring using a piston ring installer.
11. Install No. 1 upper piston ring using a piston ring installer.



12. Position piston ring end gaps as shown in. It is important that expander ring gap is at least 45° from the side rail gaps, but not on the piston pin center or on the thrust direction.

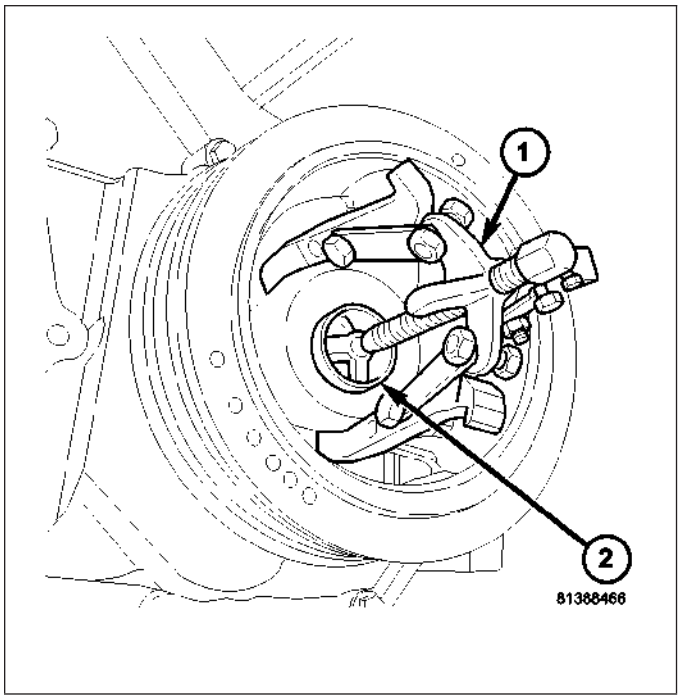


DAMPER-CRANKSHAFT

REMOVAL

1. Disconnect negative cable from battery.
2. Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
3. Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
4. Remove radiator upper hose.
5. Remove fan shroud (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - REMOVAL).
6. Remove crankshaft damper bolt.

7. Remove damper using Special Tools 8513A Insert and 1023 Three Jaw Puller.



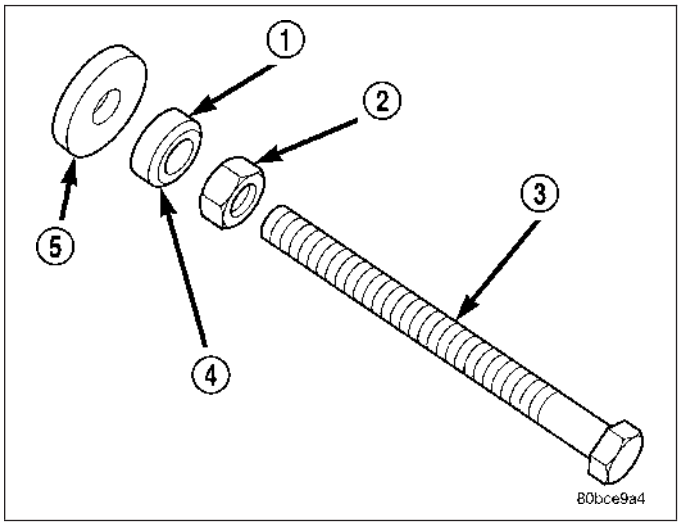
INSTALLATION

CAUTION: To prevent severe damage to the Crankshaft, Damper or Special Tool 8512–A, thoroughly clean the damper bore and the crankshaft nose before installing Damper.

1. Slide damper onto crankshaft slightly.

CAUTION: Special Tool 8512–A, is assembled in a specific sequence. Failure to assemble this tool in this sequence can result in tool failure and severe damage to either the tool or the crankshaft.

2. Assemble Special Tool 8512–A as follows, The nut is threaded onto the shaft first. Then the roller bearing is placed onto the threaded rod (The hardened bearing surface of the bearing **MUST**face the nut). Then the hardened washer slides onto the threaded rod. Once assembled coat the threaded rod's threads with Mopar® Nickel Anti-Seize or (Loctite No. 771).



3. Using Special Tool 8512–A, press damper onto crankshaft.
4. Install then tighten crankshaft damper bolt to 176 N·m (129 ft. lbs.).
5. Install fan blade assembly (Refer to 7 - COOLING/ENGINE/FAN DRIVE VISCOUS CLUTCH - INSTALLATION).
6. Install radiator upper shroud and tighten fasteners to 11 N·m (95 in. lbs.).
7. Install radiator upper hose.
8. Install accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).
9. Refill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
10. Connect negative cable to battery.

COVER-STRUCTURAL

DESCRIPTION

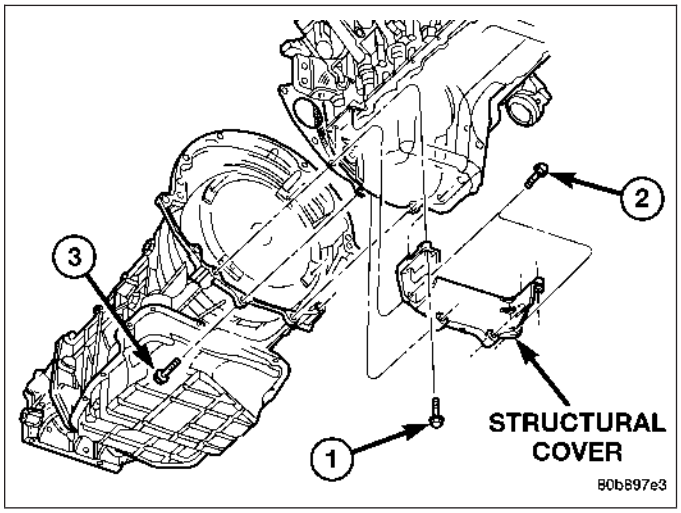
The structural dust cover is made of die cast aluminum and joins the lower half of the transmission bell housing to the engine.

OPERATION

The structural cover provides additional powertrain stiffness and reduces noise and vibration.

REMOVAL

1. Raise vehicle on hoist.
2. Remove the bolts retaining structural cover (1).
3. Remove transmission mount to crossmember fasteners.
4. Using suitable jack, lift transmission enough to gain clearance for structural cover removal.
5. Remove the structural cover.



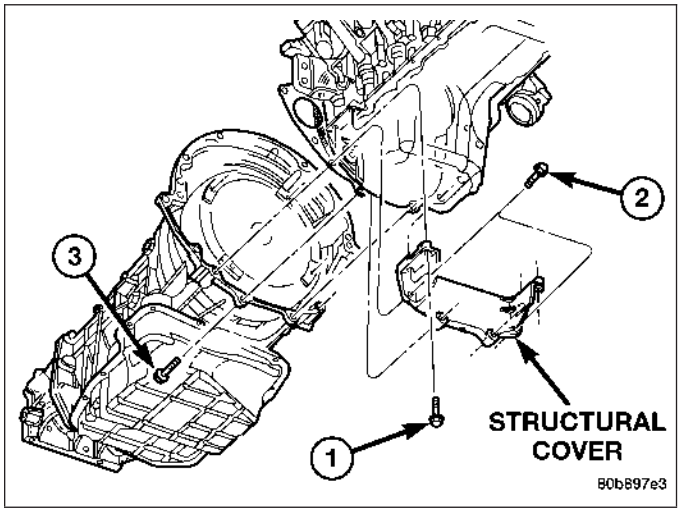
INSTALLATION

CAUTION: The structural cover must be installed as described in the following steps. Failure to do so will cause severe damage to the cover.

1. Position the structural cover in the vehicle.
2. Install all four bolts retaining the cover-to-engine. DO NOT tighten the bolts at this time.
3. Install the four cover-to-transmission bolts. Do NOT tighten at this time.

CAUTION: The structural cover must be held tightly against both the engine and the transmission bell housing during tightening sequence. Failure to do so may cause damage to the cover.

4. Torque the (4)structural dust cover bolts that go into the transmission to 6-11 N·m (50-100 in.lbs.).
5. Torque the (4) structural dust cover bolts that go into the engine block to 6-11 N·m (50-100 in.lbs.).
6. Starting with the two rear cover-to-engine bolts, tighten bolts (1) to 54 N·m (40 ft. lbs.), then tighten bolts (2) and (3) to 54 N·m (40 ft. lbs.) in the sequence shown.
7. Lower transmission onto crossmember, and remove jack.
8. Install transmission mount to crossmember fasteners, and torque (Refer to 9 - ENGINE/ENGINE MOUNTING/REAR MOUNT - INSTALLATION).
9. Install the exhaust pipe on left hand exhaust manifold, if removed.



10. Tighten exhaust manifold-to-exhaust pipe retaining bolts to 20–26 N·m (15–20 ft. lbs.).

ENGINE MOUNTING-FRONT

REMOVAL

2WD

1. Disconnect negative battery cable.
2. Raise vehicle.
3. Remove engine mount through bolts.
4. Raise engine using engine support fixture special tool # 8534.
5. Remove engine mount to insulator bolts.
6. Remove insulator from engine.

4WD

1. Disconnect the negative cable from the battery.
2. Raise the vehicle.
3. Remove the skid plate.
4. Remove the front crossmember.
5. Remove the engine oil filter.
6. Support the engine using engine support fixture, special tool # 8534.
7. Support the front axle with a suitable jack.
8. Remove the (4) bolts that attach the engine mounts to the front axle.
9. Remove the (3) bolts that attach the front axle to the left engine bracket.
10. Lower the front axle.
11. Remove the (6) through bolts
12. Raise the engine far enough to be able to remove the left and right engine mounts.
13. Remove the engine mounts.

INSTALLATION

2WD

1. Install insulator on the engine.

NOTE: For mount to engine block and left engine bracket to front axle bolts, apply Mopar® Lock and Seal Adhesive, Medium Strength Threadlocker.

2. Install upper and lower mount mounting bolts. Tighten bolts to 61 N·m (45 ft. lbs.).
3. Lower the engine using engine support fixture special tool # 8534.
4. Install mount through bolts.
5. Tighten through bolts on both sides to 61 N·m (45 ft. lbs.).
6. Lower vehicle.
7. Connect negative battery cable.

4WD

NOTE: For mount to engine block and left engine bracket to front axle bolts, apply Mopar® Lock and Seal Adhesive, Medium Strength Threadlocker.

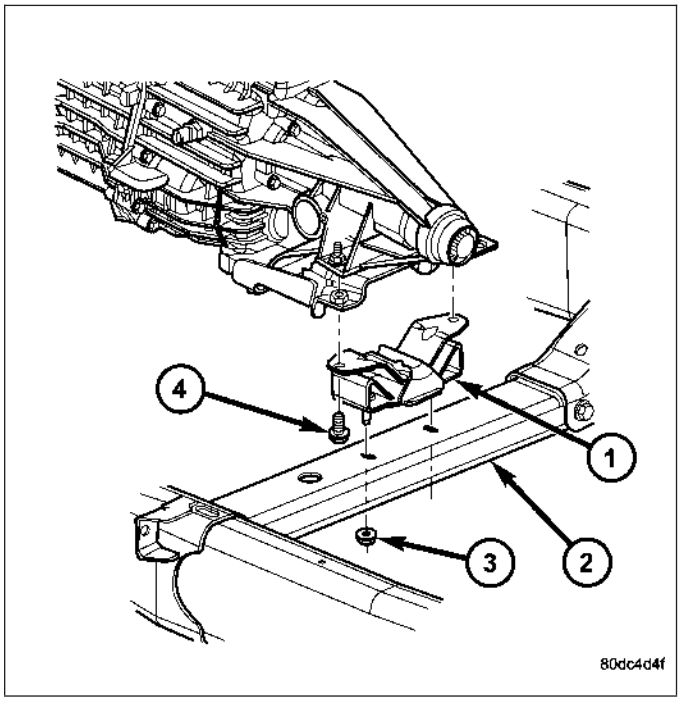
1. Install the right and left side engine mounts to the front axle. Torque nuts to 94 N·m (70 ft. lbs.).
2. Raise the front axle into the frame and install the left and right side through bolts. Torque nuts to 94 N·m (70 ft. lbs.).

3. Insert the two upper through bolts into the right and left side engine mounts and loose assemble the two nuts onto the through bolts.
4. Lower the engine using engine support fixture special tool # 8534, until the left and right side engine brackets rest on the through bolts, and the lower engine bracket through holes align with the engine mounts, and the left engine bracket holes align with the front axle slots.
5. Loose assemble the (3) bolts that attach the front axle to the left engine bracket.
6. Loose assemble the lower through bolts.
7. Torque the nuts for the (4) through bolts to 101 N·m (75 ft. lbs.).
8. Torque the (3) bolts that attach the front axle to the left engine bracket to 101 N·m (75 ft. lbs.).
9. Install the engine oil filter, if removed.
10. Install the front crossmember.
11. Install the skid plate.
12. Lower the vehicle.
13. Reconnect the negative battery cable.

MOUNTING-ENGINE REAR

REMOVAL

1. Raise the vehicle on a hoist.
2. Using a suitable jack, support transmission.
3. Remove the nuts from the transmission mount.
4. Remove the bolts that attach the transmission mount to the engine bracket.
5. Raise the transmission enough to remove the mount from the crossmember.
6. Remove the mount.



INSTALLATION

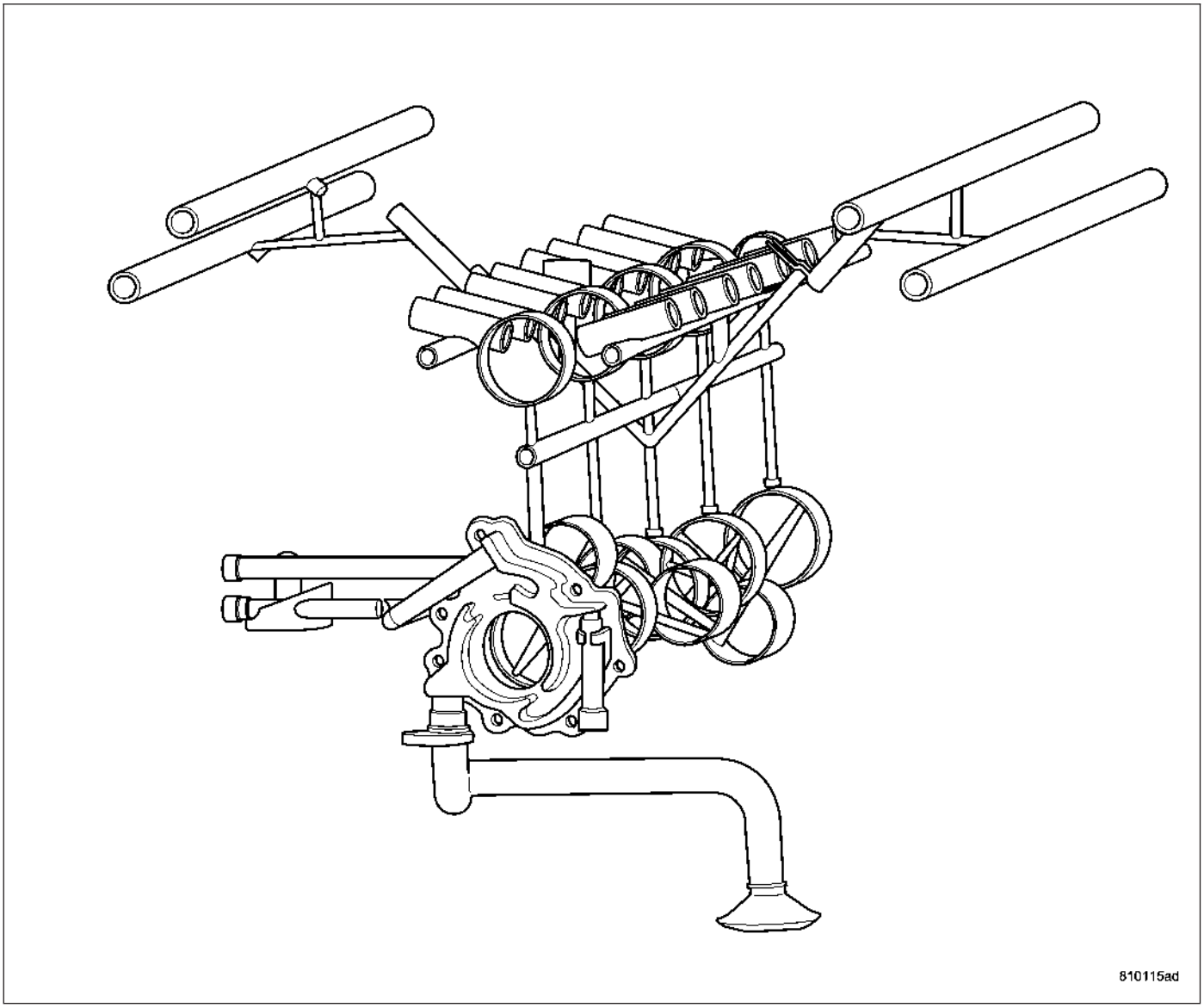
NOTE: Threadlocking compound must be applied to the bolts before installation.

1. Install the two bolts that attach the transmission mount to the transmission bracket.
2. Torque the bolts to 61N·m (45 ft.lbs.) torque.
3. Lower the transmission so the transmission mount rests on the crossmember, and the studs of the transmission mount are aligned in the slots in the crossmember.
4. Install the nuts onto the transmission mount studs through the crossmember access slot.

5. Torque the nuts to 54N·m (40 ft. lbs.).

LUBRICATION

DESCRIPTION



The lubrication system is a full flow filtration pressure feed type.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - CHECKING ENGINE OIL PRESSURE

1. Remove oil pressure sending unit and install gauge assembly C-3292.
2. Run engine until thermostat opens.
3. Oil Pressure:
   - Curb Idle–25 kPa (4 psi) minimum
   - 3000 rpm–170 - 758 kPa (25 - 110 psi)
4. If oil pressure is 0 at idle, shut off engine. Check for a clogged oil pick-up screen or a pressure relief valve stuck open.

DIAGNOSIS AND TESTING - ENGINE OIL LEAK

Begin with a thorough visual inspection of the engine, particularly at the area of the suspected leak. If an oil leak source is not readily identifiable, the following steps should be followed:

1. Do not clean or degrease the engine at this time because some solvents may cause rubber to swell, temporarily stopping the leak.
2. Add an oil soluble dye (use as recommended by manufacturer). Start the engine and let idle for approximately 15 minutes. Check the oil dipstick to make sure the dye is thoroughly mixed as indicated with a bright yellow color under a black light.
3. Using a black light, inspect the entire engine for fluorescent dye, particularly at the suspected area of oil leak. If the oil leak is found and identified, repair per service manual instructions.
4. If dye is not observed, drive the vehicle at various speeds for approximately 24 km (15 miles), and repeat inspection.**If the oil leak source is not positively identified at this time**, proceed with the air leak detection test method.

Air Leak Detection Test Method

1. Remove the PCV valve from the IAFM. Cap or plug the PCV valve grommet.
2. Attach an air hose with pressure gauge and regulator to the dipstick tube.

CAUTION: Do not subject the engine assembly to more than 20.6 kPa (3 PSI) of test pressure.

3. Gradually apply air pressure from 1 psi to 2.5 psi maximum while applying soapy water at the suspected source. Adjust the regulator to the suitable test pressure that provide the best bubbles which will pinpoint the leak source. If the oil leak is detected and identified, repair per service manual procedures.
4. If the leakage occurs at the rear oil seal area, refer to the section, Inspection for Rear Seal Area Leak.
5. If no leaks are detected, turn off the air supply and remove the air hose and all plugs and caps. Install the PCV valve.
6. Clean the oil off the suspect oil leak area using a suitable solvent. Drive the vehicle at various speeds approximately 24 km (15 miles). Inspect the engine for signs of an oil leak by using a black light.

INSPECTION FOR REAR SEAL AREA LEAKS

Since it is sometimes difficult to determine the source of an oil leak in the rear seal area of the engine, a more involved inspection is necessary. The following steps should be followed to help pinpoint the source of the leak.

If the leakage occurs at the crankshaft rear oil seal area:

1. Disconnect the battery.
2. Raise the vehicle.
3. Remove torque converter or clutch housing cover and inspect rear of block for evidence of oil. Use a black light to check for the oil leak:
   a. Circular spray pattern generally indicates seal leakage or crankshaft damage.
   b. Where leakage tends to run straight down, possible causes are a porous block, distributor seal, camshaft bore cup plugs oil galley pipe plugs, oil filter runoff, and main bearing cap to cylinder block mating surfaces.
4. If no leaks are detected, pressurize the crankcase as outlined in the, Inspection (Engine oil Leaks in general)

CAUTION: Do not exceed 20.6 kPa (3 psi).

5. If the leak is not detected, very slowly turn the crankshaft and watch for leakage. If a leak is detected between the crankshaft and seal while slowly turning the crankshaft, it is possible the crankshaft seal surface is damaged. The seal area on the crankshaft could have minor nicks or scratches that can be polished out with emery cloth.

CAUTION: Use extreme caution when crankshaft polishing is necessary to remove minor nicks and scratches. The crankshaft seal flange is especially machined to complement the function of the rear oil seal.

6. For bubbles that remain steady with shaft rotation, no further inspection can be done until disassembled.

OIL

STANDARD PROCEDURE - ENGINE OIL SERVICE

The engine oil level indicator is located at the left hand of the engine on the 5.7L engines.

CRANKCASE OIL LEVEL INSPECTION

CAUTION: Do not overfill crankcase with engine oil, pressure loss or oil foaming can result.

Inspect engine oil level approximately every 800 kilometers (500 miles). Unless the engine has exhibited loss of oil pressure, run the engine for about ten minutes before checking oil level. Checking engine oil level on a cold engine is not accurate.

To ensure proper lubrication of an engine, the engine oil must be maintained at an acceptable level. The acceptable levels are indicated between the ADD and SAFE marks on the engine oil dipstick.

1. Position vehicle on level surface.
2. With engine OFF, allow approximately five minutes for oil to settle to bottom of crankcase, remove engine oil dipstick.
3. Wipe dipstick clean.
4. Install dipstick and verify it is seated in the tube.
5. Remove dipstick, with handle held above the tip, take oil level reading.
6. Add oil only if level is below the ADD mark on dipstick.

ENGINE OIL CHANGE

Change engine oil at mileage and time intervals described in Maintenance Schedules (Refer to LUBRICATION & MAINTENANCE/MAINTENANCE SCHEDULES - DESCRIPTION).

Run engine until achieving normal operating temperature.

1. Position the vehicle on a level surface and turn engine off.
2. Hoist and support vehicle on safety stands.
3. Remove oil fill cap.
4. Place a suitable drain pan under crankcase drain.
5. Remove drain plug from crankcase and allow oil to drain into pan. Inspect drain plug threads for stretching or other damage. Replace drain plug if damaged.
6. Install drain plug in crankcase. Torque to 34 N·m (25 ft. lbs.).
7. Lower vehicle and fill crankcase with specified type and amount of engine oil described in this section.
8. Install oil fill cap.
9. Start engine and inspect for leaks.
10. Stop engine and inspect oil level.

NOTE: Care should be exercised when disposing used engine oil after it has been drained from a vehicle engine. Refer to the WARNING at beginning of this section.

FILTER-ENGINE OIL

REMOVAL

All engines are equipped with a high quality full-flow, disposable type oil filter. DaimlerChrysler Corporation recommends a Mopar® or equivalent oil filter be used.

1. Position a drain pan under the oil filter.
2. Using a suitable oil filter wrench loosen filter.
3. Rotate the oil filter counterclockwise to remove it from the cylinder block oil filter boss.

4. When filter separates from cylinder block oil filter boss, tip gasket end upward to minimize oil spill. Remove filter from vehicle.

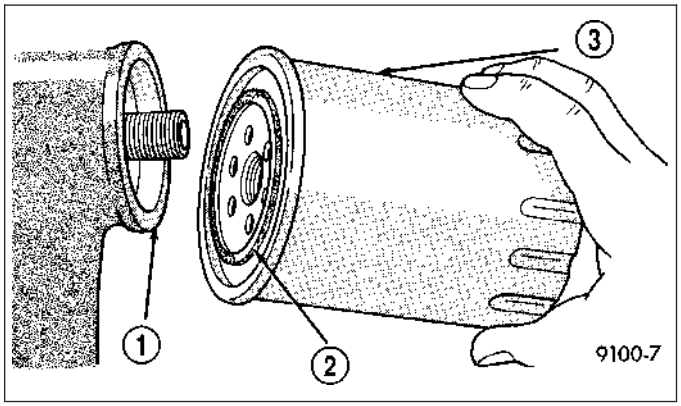
NOTE: Make sure filter gasket was removed with filter.

5. With a wiping cloth, clean the gasket sealing surface of oil and grime.

INSTALLATION

1. Lightly lubricate oil filter gasket with engine oil.

2. Thread filter onto adapter nipple. When gasket makes contact with sealing surface, hand tighten filter one half turn, or 180°,do not over tighten.



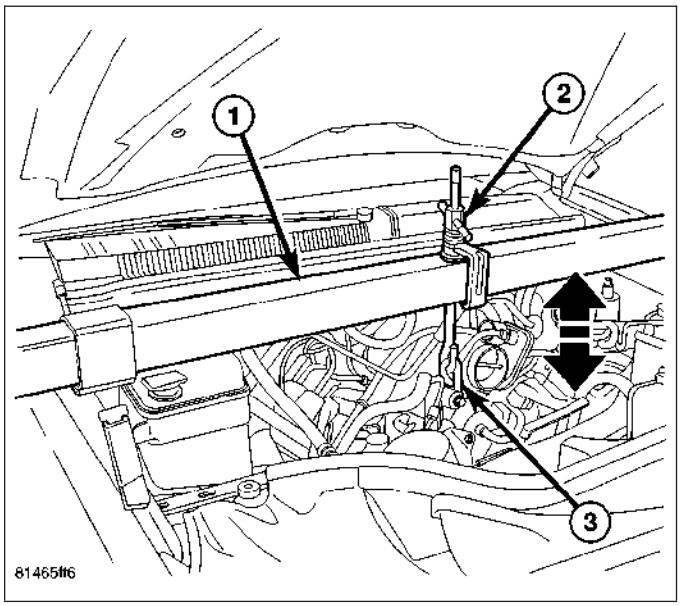
3. Add oil, verify crankcase oil level and start engine. Inspect for oil leaks.

PAN-ENGINE OIL

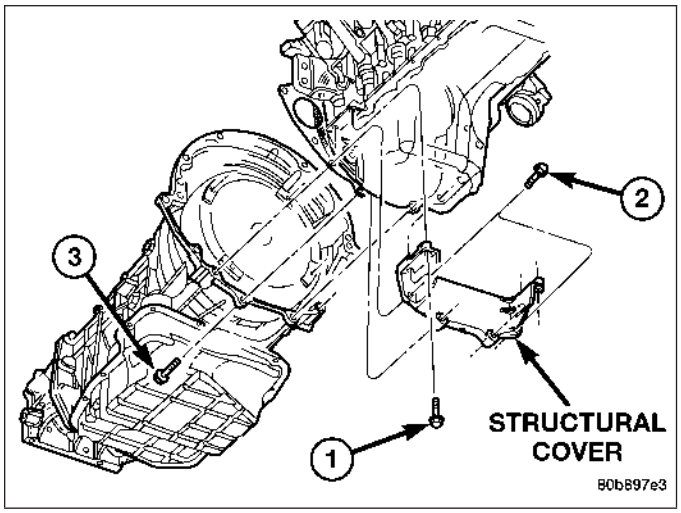
REMOVAL

4X2

1. Disconnect the negative battery cable.
2. Loosen both left and right side engine mount through bolts. Do not remove bolts.
3. Install engine support fixture (1) special tool # 8534. **Do not raise engine at this time.**



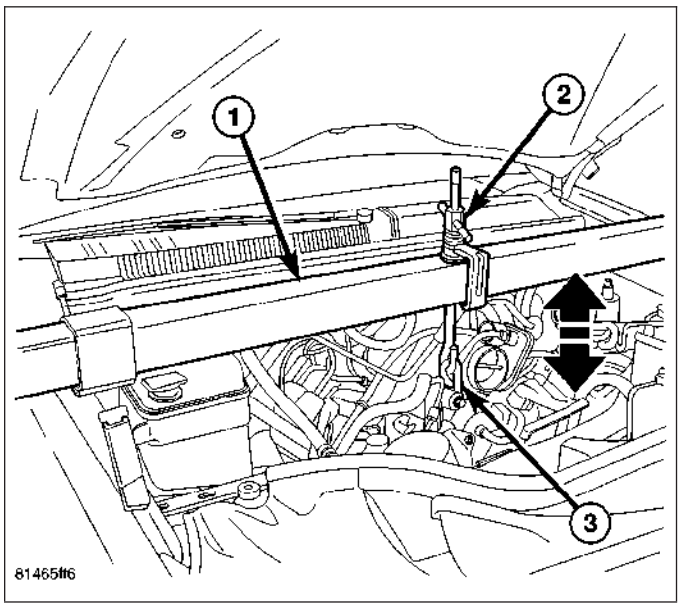
4. Remove the structural dust cover. (Refer to 9 - ENGINE/ENGINE BLOCK/STRUCTURAL COVER - REMOVAL).
5. Remove fan and fan shroud.
6. Drain engine oil.
7. Remove the front crossmember (Refer to 13 - FRAME & BUMPERS/FRAME/FRONT CROSSMEMBER - REMOVAL).



8. Raise engine using special tool (1) # 8534 to provide clearance to remove oil pan.

NOTE: Do not pry on oil pan or oil pan gasket. Gasket is integral to engine windage tray and does not come out with oil pan.

NOTE: If more clearance is needed to remove oil pan, the transmission mount can be removed, and the transmission raised to gain clearance.

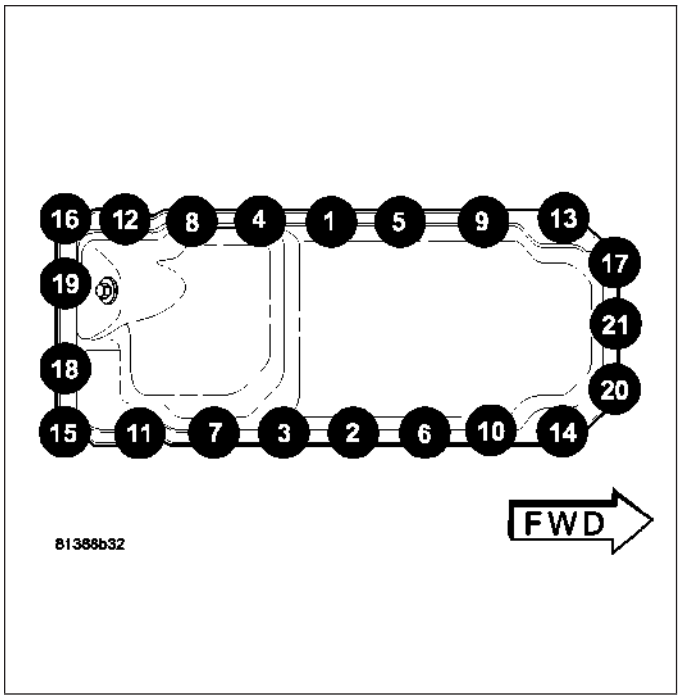


NOTE: The double ended oil pan studs must be installed in the same location that they were removed from.

9. Remove the oil pan mounting bolts using the sequence provided.
10. Unbolt oil pump pickup tube and remove tube.

NOTE: When the oil pan is removed, a new integral windage tray and gasket assembly must be installed. The old gasket cannot be reused.

11. Discard the integral windage tray and gasket and replace.



4X4

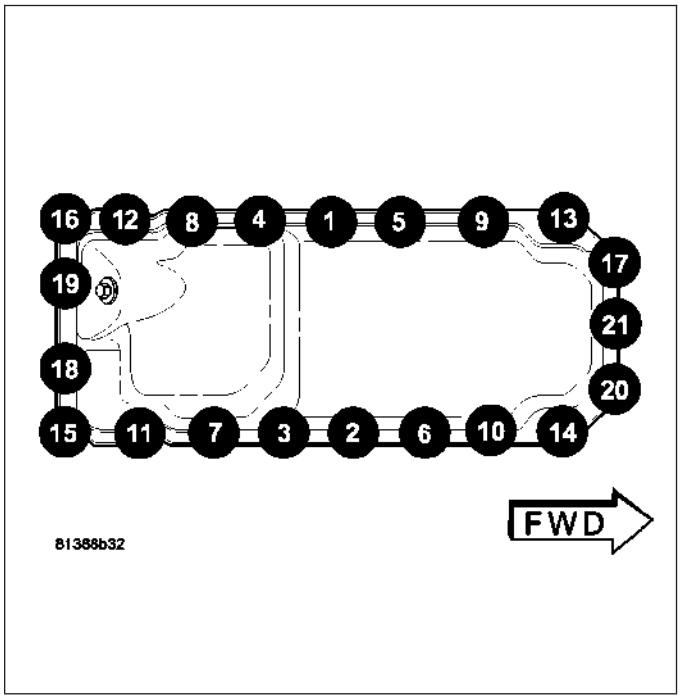
1. Follow all steps for 4X2 removal.
2. Unbolt and lower the steering rack, without disconnecting the lines.

NOTE: The front axle must be lowered to remove the oil pan on 4X4 vehicles.

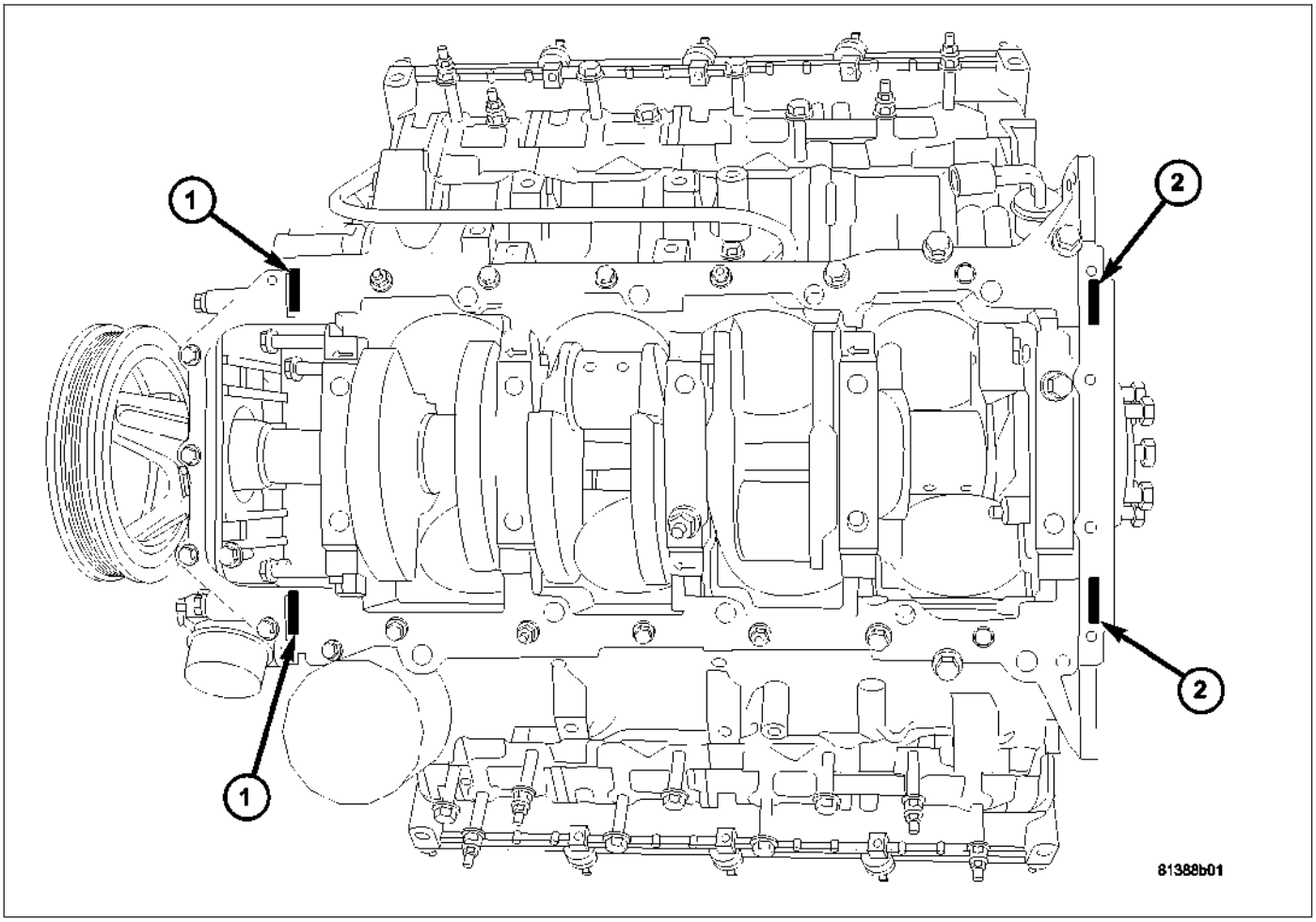
3. Remove the front driveshaft at the axle. Mark for reassembly.
4. Support the front axle.
5. Remove the right and left axle to mount, bolts.
6. Lower axle.
7. Remove the oil pan mounting bolts and oil pan.
8. Unbolt oil pump pickup tube and remove tube.

NOTE: When the oil pan is removed, a new integral windage tray and gasket assembly must be installed. The old gasket cannot be reused.

9. Discard the integral windage tray and gasket and replace.



INSTALLATION



1. Clean the oil pan gasket mating surface of the block and oil pan.

NOTE: Mopar® Engine RTV must be applied to the 4 T-joints (1,2), (area where front cover, rear retainer, block, and oil pan gasket meet). The bead of RTV should cover the bottom of the gasket. This area is approximately 4.5 mm x 25 mm in each of the 4 T-joint locations.

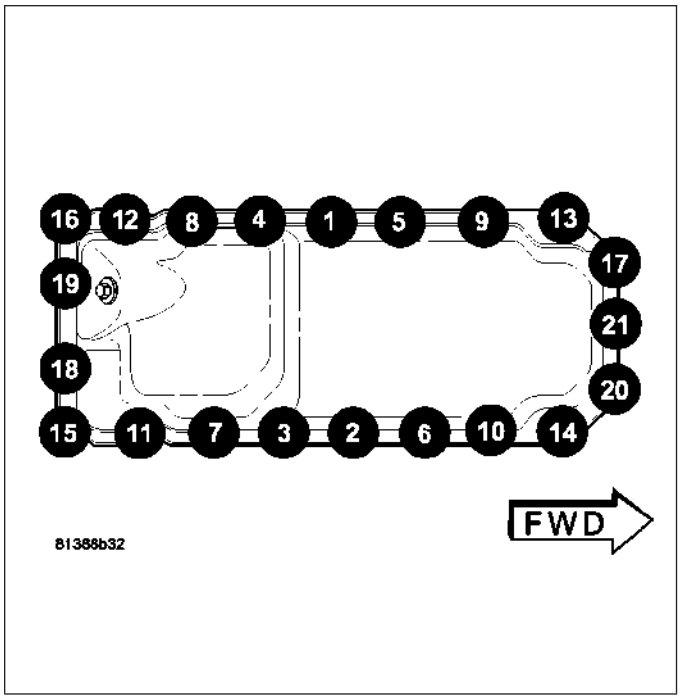
2. Apply Mopar® Engine RTV at the 4 T- joints.

NOTE: When the oil pan is removed, a new integral windage tray and gasket assembly must be installed. The old gasket cannot be reused.

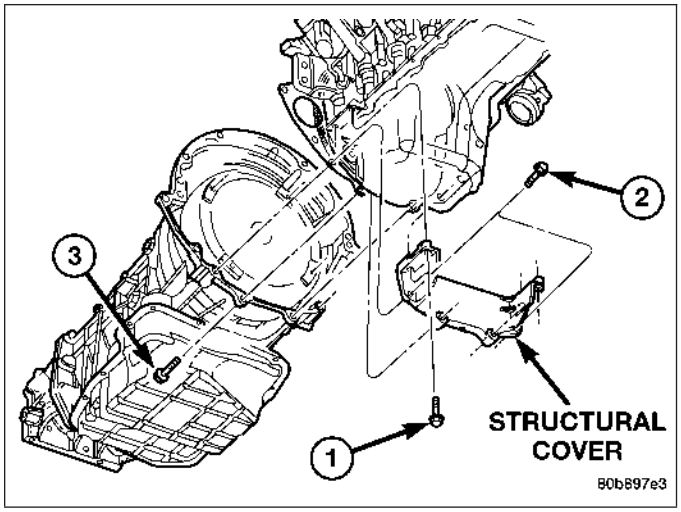
3. Install a new integral windage tray and gasket.
4. Reinstall the oil pump pickup tube with new o-ring. Tighten tube to pump fasteners to 28 N·m (250 in. lbs.).

NOTE: The double ended oil pan studs must be installed in the same location that they were removed from.

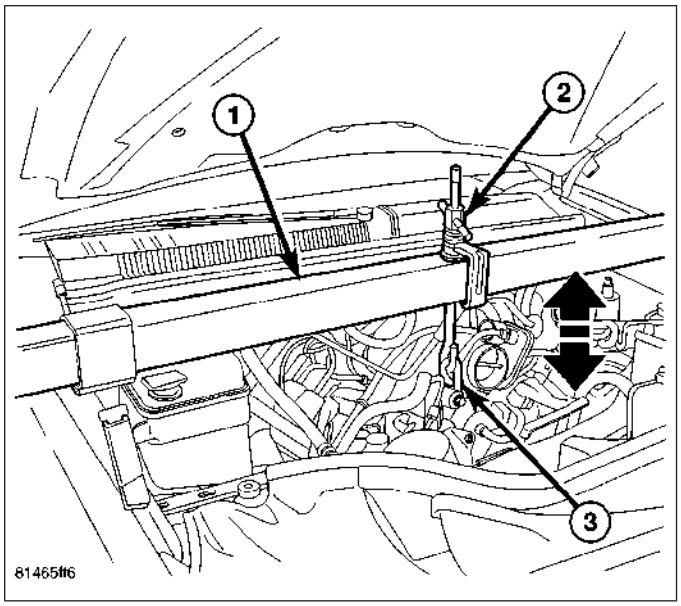
5. Position the oil pan and install the mounting bolts and studs.. Tighten the mounting bolts to 12 N·m (105 in.lbs.).



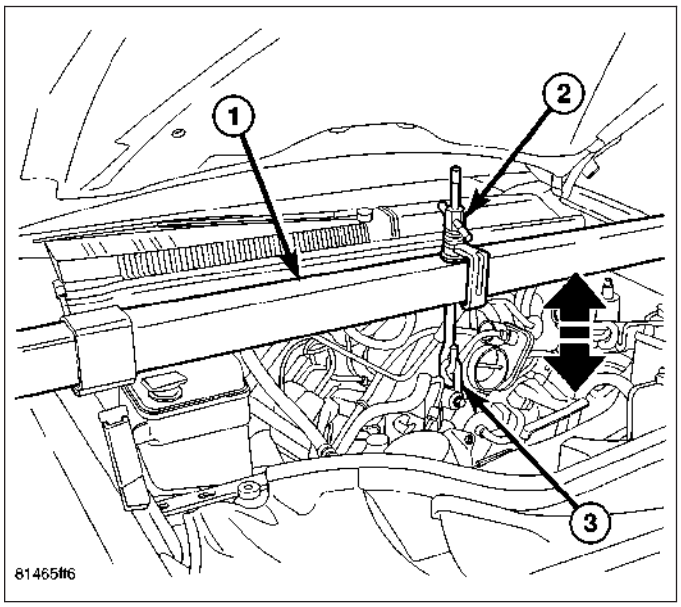
6. Install the structural cover. (Refer to 9 - ENGINE/ ENGINE BLOCK/STRUCTURAL COVER - INSTALLATION).



7. Lower the engine into mounts using special tool # 8534 (1).
8. Install both the left and right side engine mount through bolts. Tighten the nuts to 68 N·m (50 ft. lbs.).
9. Reinstall the front axle, if removed.
10. Install the steering rack, if removed.
11. Install the rear transmission mount, if removed.

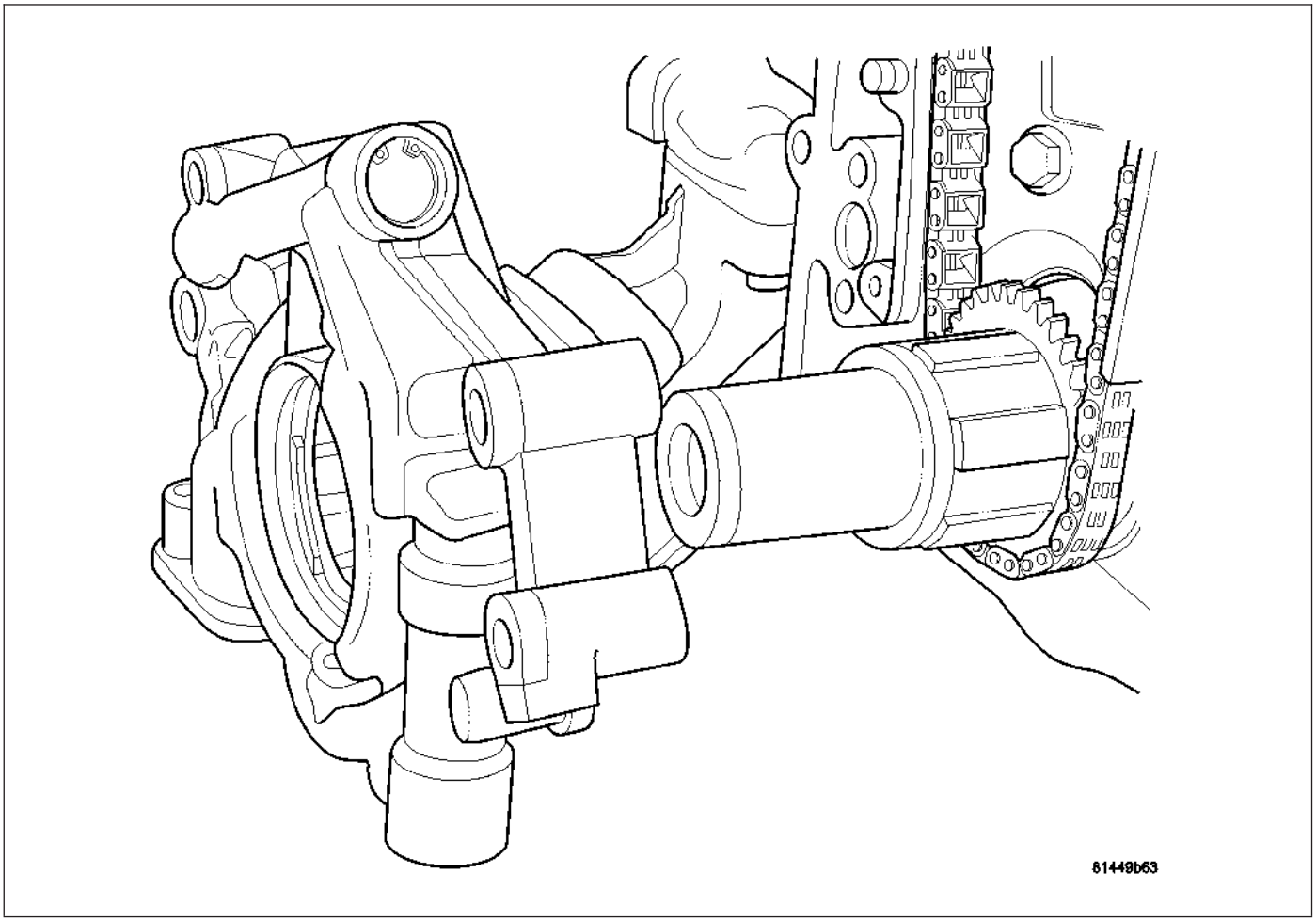


12. Remove special tool # 8534 (1).
13. Install the front crossmember (Refer to 13 - FRAME & BUMPERS/FRAME/FRONT CROSSMEMBER - INSTALLATION).
14. Install the fan shroud and fan.
15. Fill engine oil.
16. Reconnect the negative battery cable.
17. Start engine and check for leaks.



PUMP-ENGINE OIL

REMOVAL



1. Remove the oil pan and pick-up tube (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).
2. Remove the timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).
3. Remove the four bolts, and the oil pump.

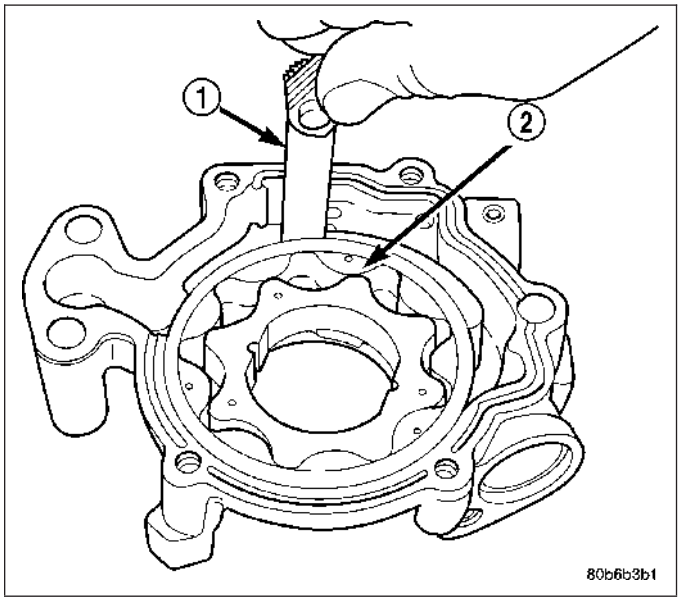
CLEANING

1. Wash all parts in a suitable solvent.

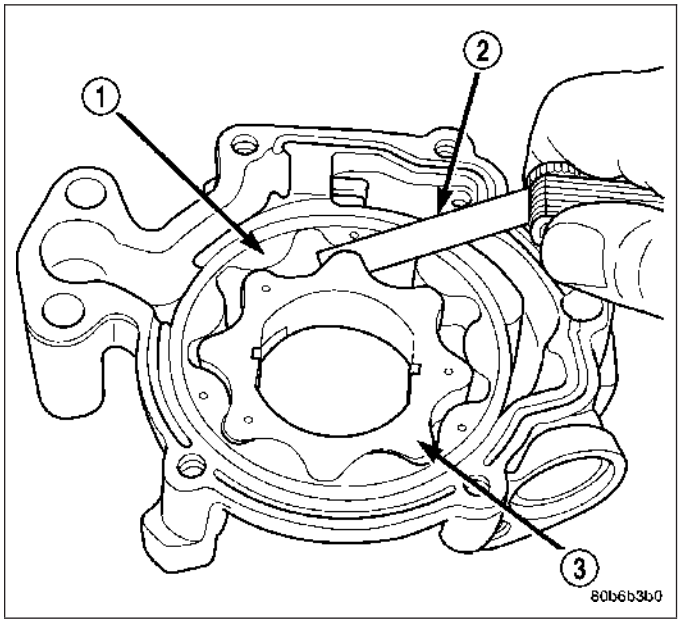
INSPECTION

CAUTION: Oil pump pressure relief valve and spring should not be removed from the oil pump. If these components are disassembled and or removed from the pump the entire oil pump assembly must be replaced.

1. Remove the pump cover.
2. Clean all parts thoroughly. Mating surface of the oil pump housing should be smooth. If the pump cover is scratched or grooved the oil pump assembly should be replaced.
3. Slide outer rotor into the body of the oil pump. Press the outer rotor to one side of the oil pump body and measure clearance between the outer rotor (2) and the body. If the measurement is 0.235mm (0.009 in.) or more the oil pump assembly must be replaced.

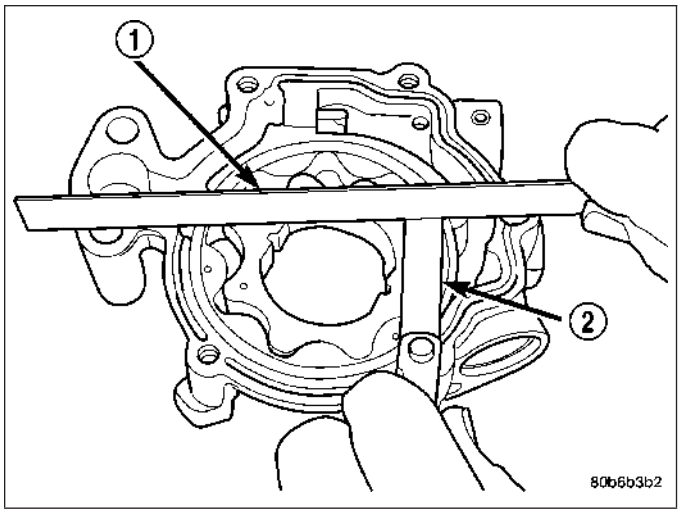


4. Install the inner rotor in the into the oil pump body. Measure the clearance between the inner (3) and outer rotors (1). If the clearance between the rotors is .150 mm (0.006 in.) or more the oil pump assembly must be replaced.

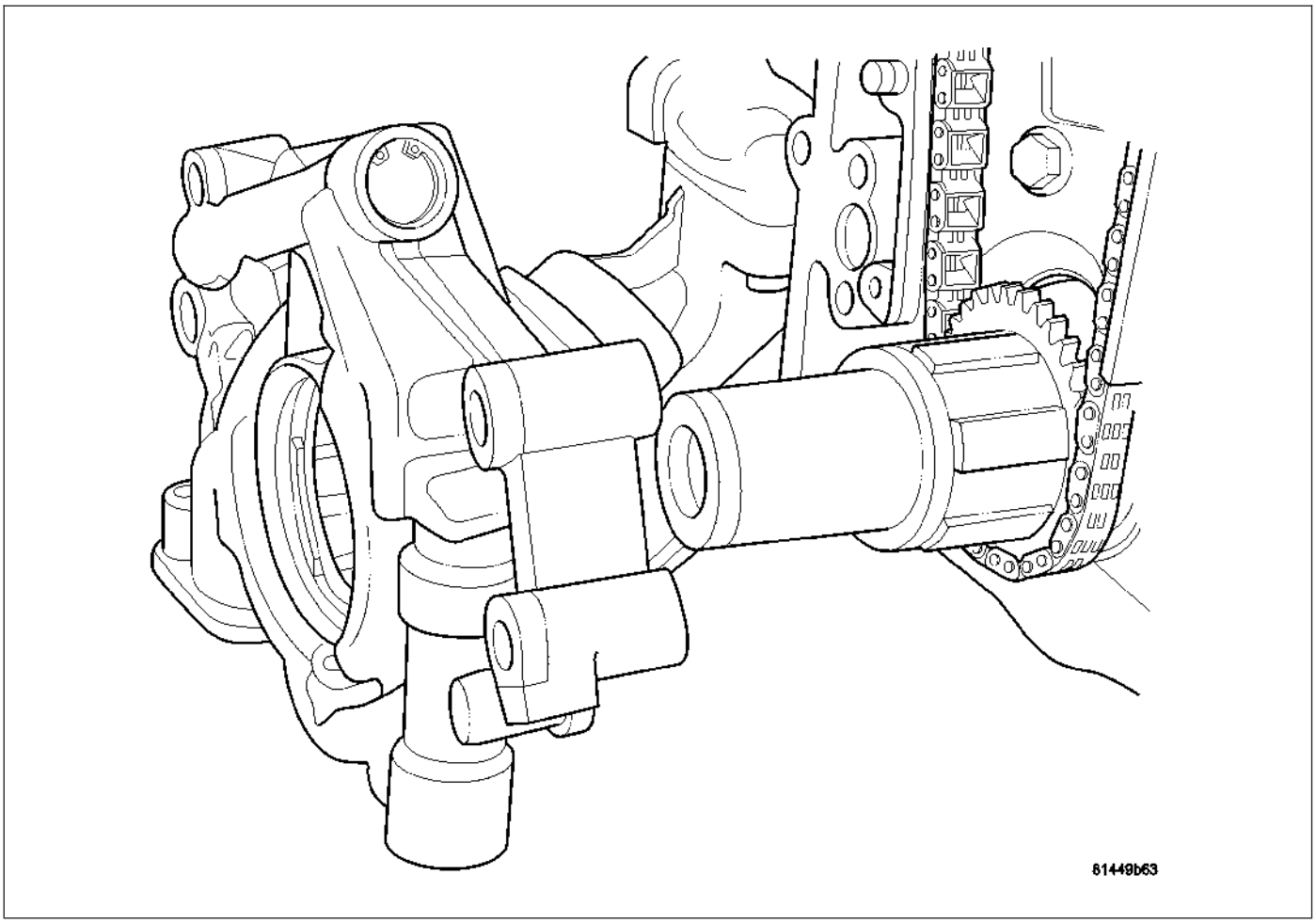


5. Place a straight edge (1) across the body of the oil pump (between the bolt holes), if a feeler gauge (2) of .095 mm (0.0038 in.) or greater can be inserted between the straightedge and the rotors, the pump must be replaced.
6. Reinstall the pump cover. Torque fasteners to 15 N·m (132 in. lbs.).

NOTE: The 5.7 Oil pump is released as an assembly. There are no DaimlerChrysler part numbers for Sub-Assembly components. In the event the oil pump is not functioning or out of specification it must be replaced as an assembly.



INSTALLATION



1. Position the oil pump onto the crankshaft and install the 4 oil pump retaining bolts.
2. Tighten the oil pump retaining bolts to 28 N·m (250 in. lbs.).
3. Install the timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION).
4. Install the pick-up tube and oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).

INTAKE MANIFOLD

DESCRIPTION

The intake manifold is made of a composite material and features long runners which maximizes low end torque. The intake manifold uses single plane sealing which consist of eight individual press in place port gaskets to prevent leaks.

DIAGNOSIS AND TESTING - INTAKE MANIFOLD LEAKAGE

An intake manifold air leak is characterized by lower than normal manifold vacuum. Also, one or more cylinders may not be functioning.

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING. DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR THE FAN. DO NOT WEAR LOOSE CLOTHING.

1. Start the engine.
2. Spray a small stream of water at the suspected leak area.
3. If a change in RPM is observed the area of the suspected leak has been found.
4. Repair as required.

REMOVAL

1. Disconnect negative cable from battery.
2. Remove the wiper module (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER MODULE - REMOVAL).
3. Remove resonator assembly and air inlet hose.
4. Disconnect electrical connectors for the following components:
   - Manifold Absolute Pressure (MAP) Sensor
   - Intake Air Temperature (IAT) Sensor
   - Throttle Position (TPS) Sensor
   - Coolant Temperature (CTS) Sensor
5. Disconnect brake booster hose and positive crankcase ventilation (PCV) hose.
6. Remove generator and set aside.

NOTE: It is not necessary to remove lines or remove freon from A/C compressor.

7. Remove air conditioning compressor and set aside..
8. Bleed fuel system (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - STANDARD PROCEDURE).
9. Remove intake manifold retaining fasteners in a crisscross pattern starting from the outside bolts and ending at the middle bolts.
10. Remove intake manifold and IAFM as an assembly.

CLEANING

NOTE: There is NO approved repair procedure for the intake manifold. If severe damage is found during inspection, the intake manifold must be replaced.

Before installing the intake manifold thoroughly clean the mating surfaces. Use a suitable cleaning solvent, then air dry.

INSPECTION

1. Inspect the intake sealing surface for cracks, nicks and distortion.
2. Inspect the intake manifold vacuum hose fittings for looseness or blockage.

INSTALLATION

1. Install intake manifold seals.
2. Position intake manifold and IAFM.
3. Install intake manifold retaining bolts, and tighten in sequence from the middle bolts towards the outside in a crisscross pattern. Torque fasteners to 12 N·m (105 in. lbs.).
4. Connect electrical connectors for the following components:
   - Manifold Absolute Pressure (MAP) Sensor
   - Intake Air Temperature (IAT) Sensor
   - Throttle Position (TPS) Sensor
   - Coolant Temperature (CTS) Sensor
   - Idle Air Control (IAC) Motor
5. Install generator.
6. Install A/C compressor.
7. Connect Brake booster hose and Positive crankcase ventilation (PCV) hose.
8. Install the wiper module (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER MODULE - INSTALLATION).
9. Install resonator assembly and air inlet hose.
10. Connect negative cable to battery.

MANIFOLD - EXHAUST

DESCRIPTION

The exhaust manifolds are log style with a patented flow enhancing design to maximize performance. The exhaust manifolds are made of high silicon molybdenum cast iron. A multi-layer stainless steel exhaust manifold gasket is used to improve sealing to the cylinder head. The exhaust manifolds are covered by a three layer laminated heat shield for thermal protection and noise reduction. The heat shields are fastened with a torque prevailing nut that is backed off slightly to allow for the thermal expansion of the exhaust manifold, with the exception of the nut, which also secures the oil dipstick tube bracket. That nut should not be backed off.

OPERATION

The exhaust manifolds collect the engine exhaust exiting the combustion chambers, then channels the exhaust gases to the exhaust pipes attached to the manifolds.

REMOVAL

EXHAUST MANIFOLD

1. Disconnect negative battery cable.
2. Raise vehicle.
3. Remove exhaust pipe to manifold bolts.
4. Remove engine mount thru bolts.
5. Lower vehicle.
6. Install engine support fixture special tool #8534.
7. Raise engine enough to remove manifolds.

CAUTION: Do not damage engine harness while raising the engine.

8. Remove heat shield.
9. Remove manifold bolts.
10. Remove manifold and gasket.

CLEANING

Clean mating surfaces on cylinder head and manifold. Wash with solvent and blow dry with compressed air.

INSPECTION

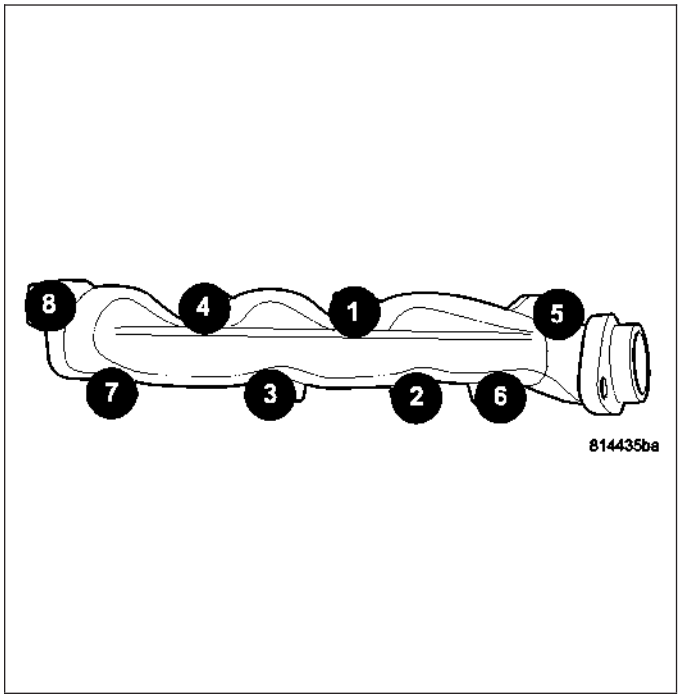
Inspect manifold for cracks.

Inspect mating surfaces of manifold for flatness with a straight edge. Gasket surfaces must be flat within 0.2 mm per 300 mm (0.008 inch per foot).

INSTALLATION

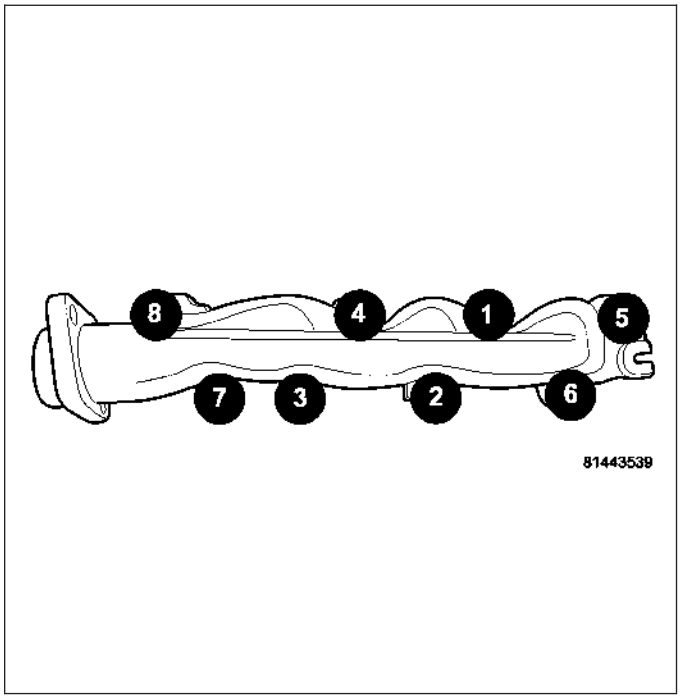
EXHAUST MANIFOLD

1. Install manifold gasket and manifold.
2. Install manifold bolts and tighten to 25 N·m (18 ft. lbs.).
3. Install heat shield and tighten nuts to 8 N·m (70 in. lbs.).
4. Lower engine.



CAUTION: Do not damage engine harness while lowering the engine.

5. Remove engine support fixture from engine.
6. Raise vehicle.
7. Install and tighten right and left side engine mount through bolts.
8. Install exhaust flange to pipe bolts.
9. Lower vehicle.
10. Connect negative battery cable.



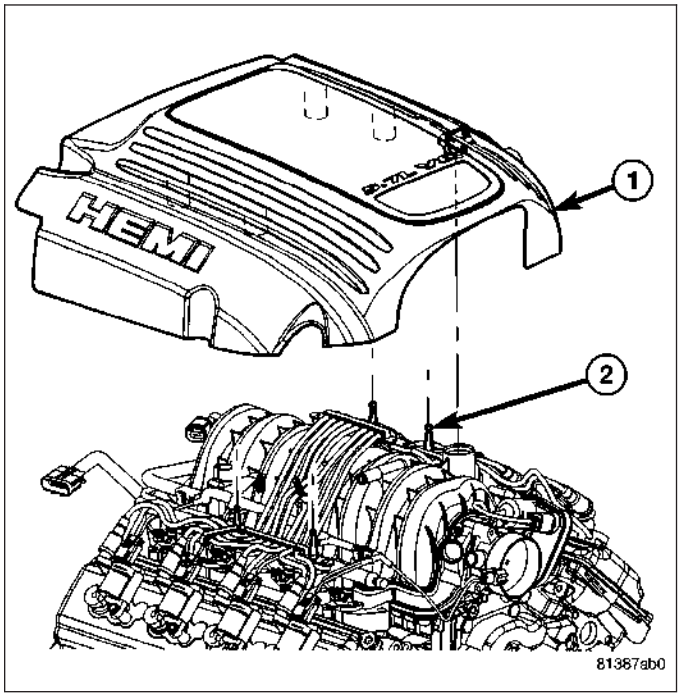
COVER-TIMING

REMOVAL

1. Disconnect the battery negative cable.
2. Remove the engine cover (1).
3. Remove air cleaner assembly.
4. Drain cooling system.
5. Remove accessory drive belt.
6. Remove fan and fan drive assembly (Refer to 7 - COOLING/ENGINE/FAN DRIVE VISCOUS CLUTCH - REMOVAL).
7. Remove coolant bottle and washer bottle.
8. Remove fan shroud.

NOTE: It is not necessary to disconnect A/C lines or discharge freon.

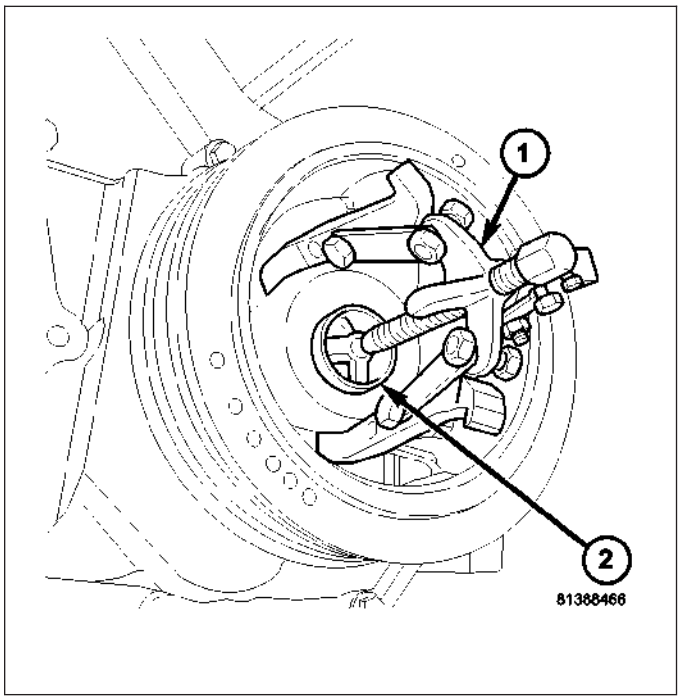
9. Remove A/C compressor and set aside.

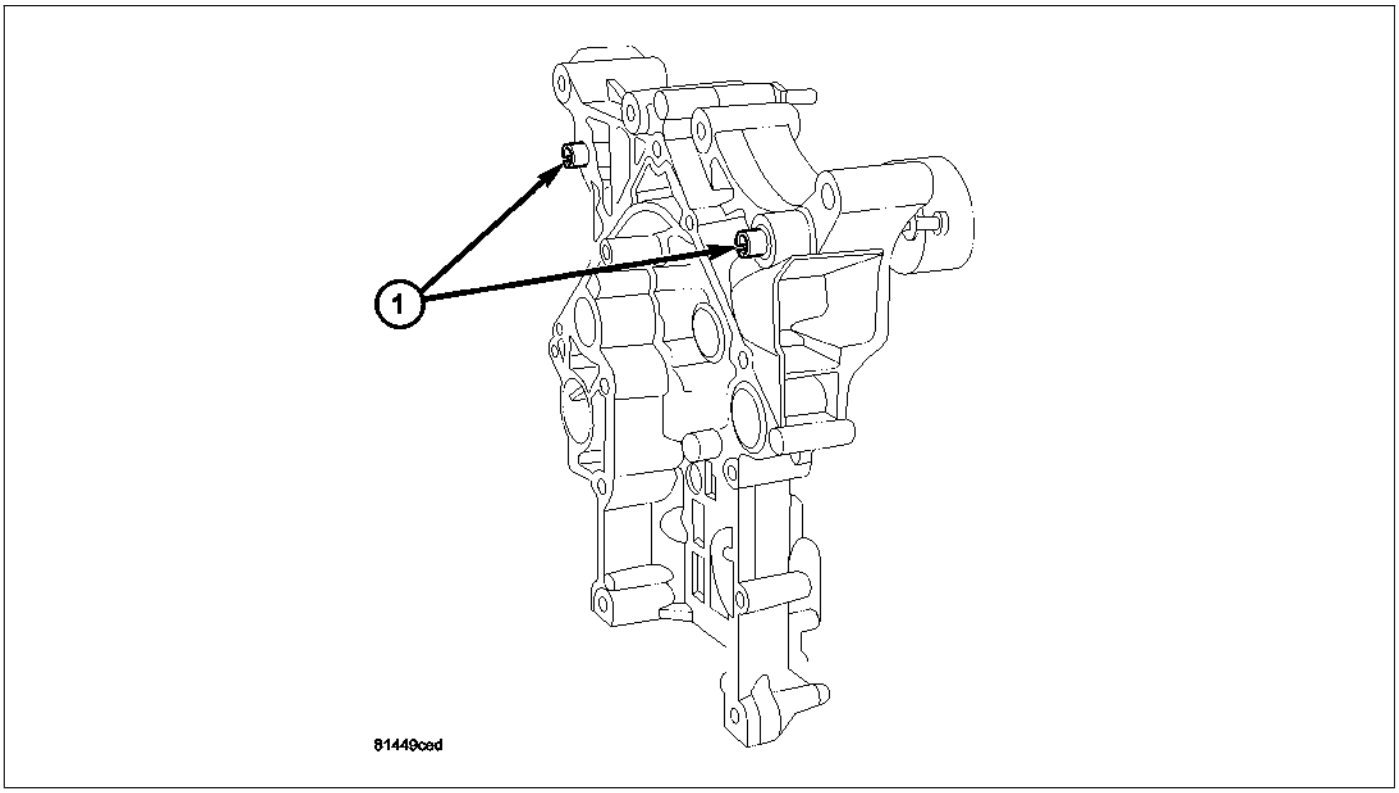


10. Remove the generator.
11. Remove upper radiator hose.
12. Disconnect both heater hoses at timing cover.
13. Disconnect lower radiator hose at engine.
14. Remove accessory drive belt tensioner and both idler pulleys.
15. Remove crankshaft damper (2) (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL).

NOTE: Do not remove the hoses from the power steering pump.

16. Remove power steering pump and set aside.



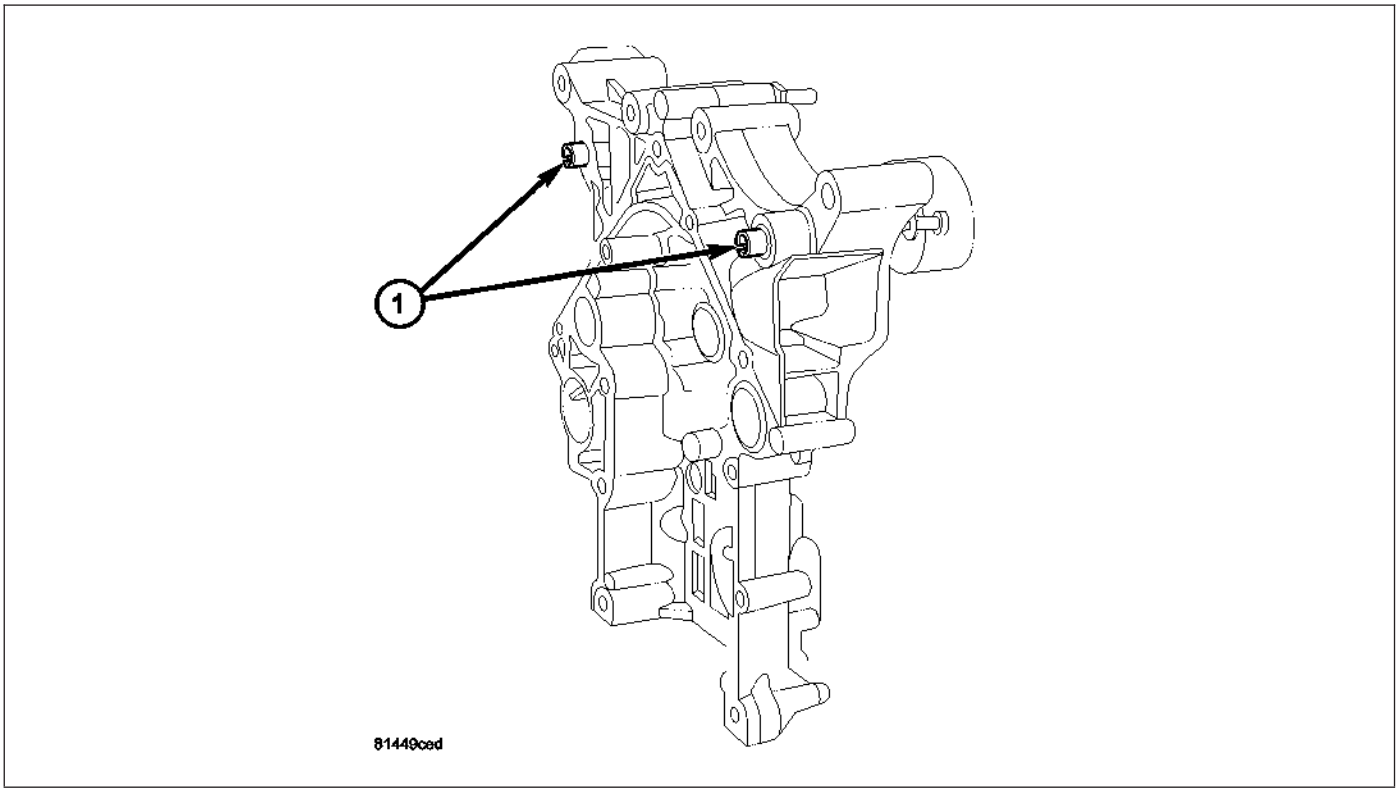


17. Remove the dipstick support bolt.
18. Drain the engine oil.
19. Remove the oil pan and pick up tube (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).

NOTE: It is not necessary to remove water pump for timing cover removal.

20. Remove timing cover bolts and remove cover.
21. Verify that timing cover slide bushings (1) are located in timing cover.

INSTALLATION



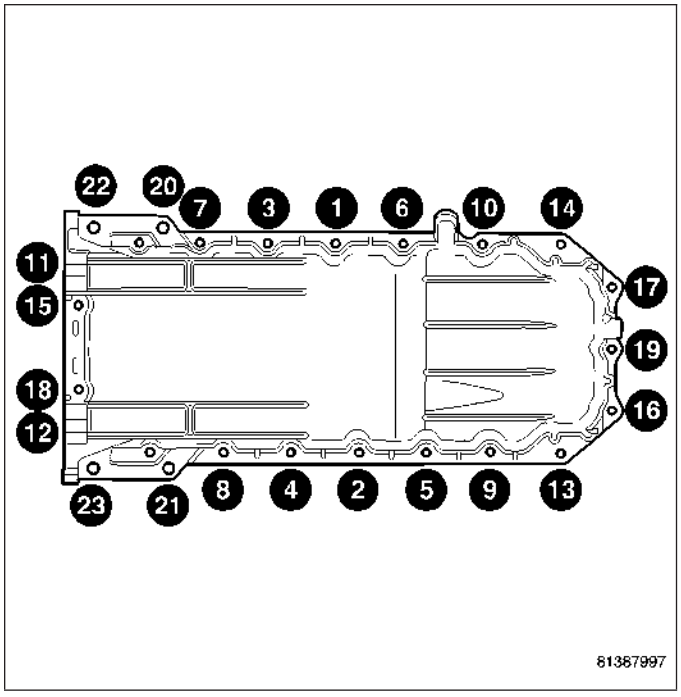
1. Clean timing chain cover and block surface.

NOTE: Always install a new gasket on timing cover.

2. Verify that the slide bushings (1) are installed in timing cover.
3. Install cover and new gasket. Tighten fasteners to 28 N·m (250 in. lbs.).

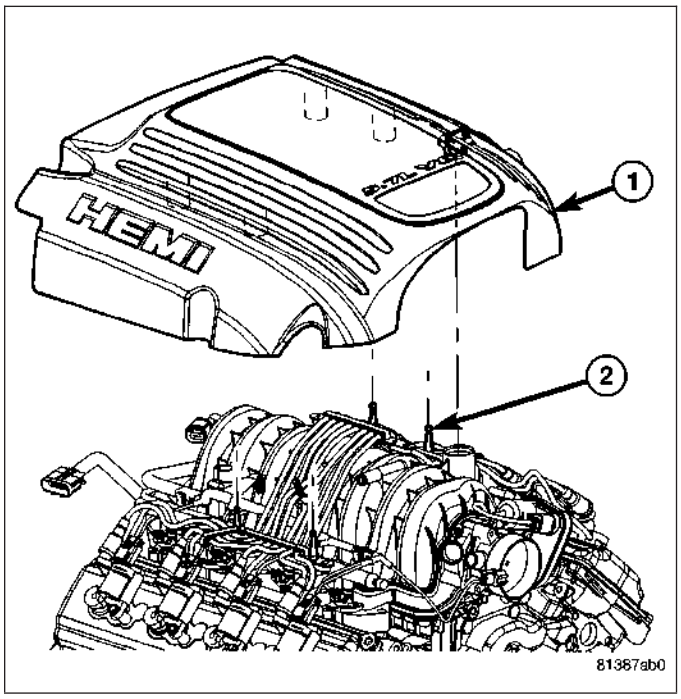
NOTE: The large lifting stud is torqued to 55 N·m (40 ft. lbs.).

4. Install the oil pan and pick up tube (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).
5. Install the A/C compressor.
6. Install the generator.
7. Install power steering pump.
8. Install the dipstick support bolt.
9. Install the thermostat housing.
10. Install crankshaft damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION).



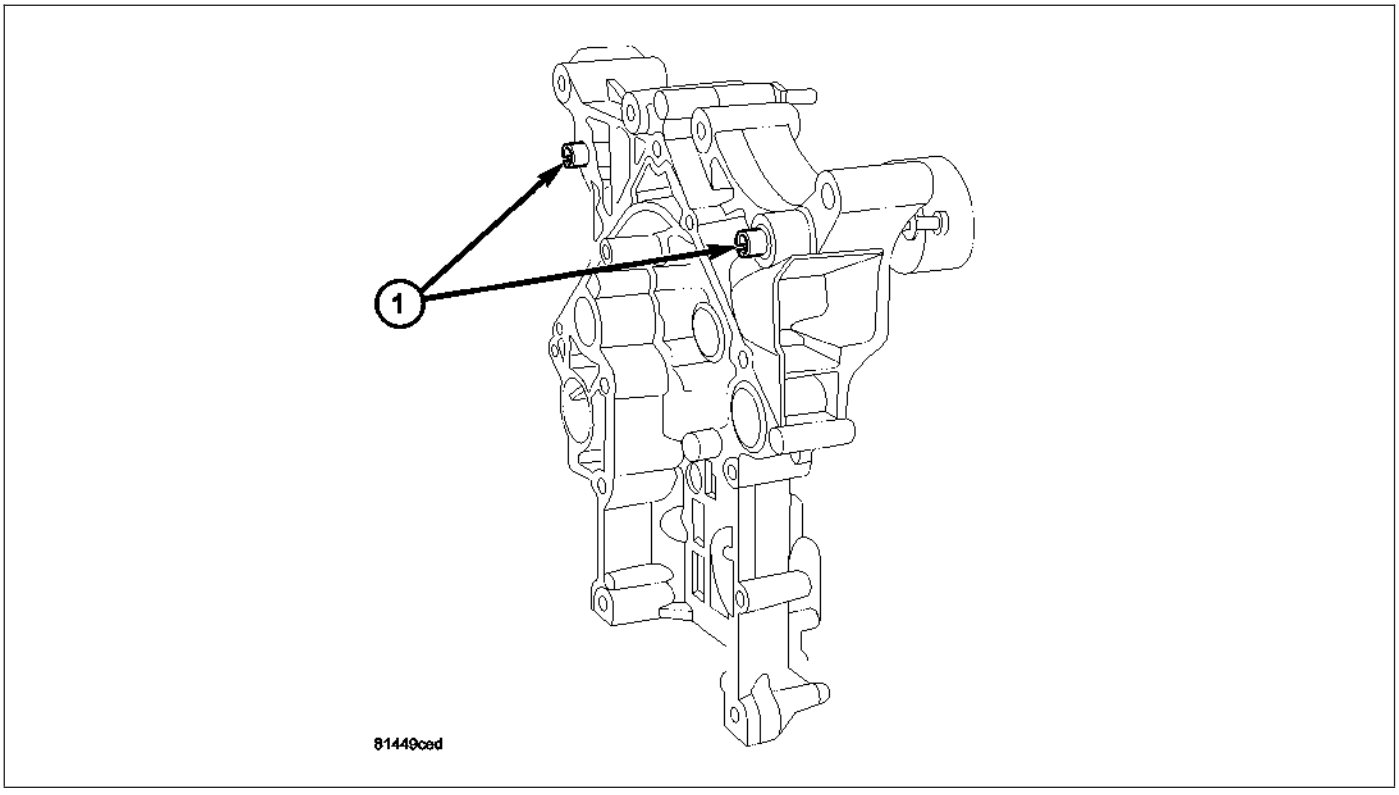
11. Install accessory drive belt tensioner assembly and both idler pulleys.

12. Install radiator lower hose.
13. Install both heater hoses.
14. Install radiator fan shroud.
15. Install the fan and fan drive assembly
16. Install the accessory drive belt.
17. Install the coolant bottle and washer bottle.
18. Install the upper radiator hose.
19. Install the air cleaner assembly.
20. Fill cooling system.
21. Refill engine oil.
22. Connect the battery negative cable.
23. Install the engine cover (1).



TIMING CHAIN & SPROCKETS

REMOVAL

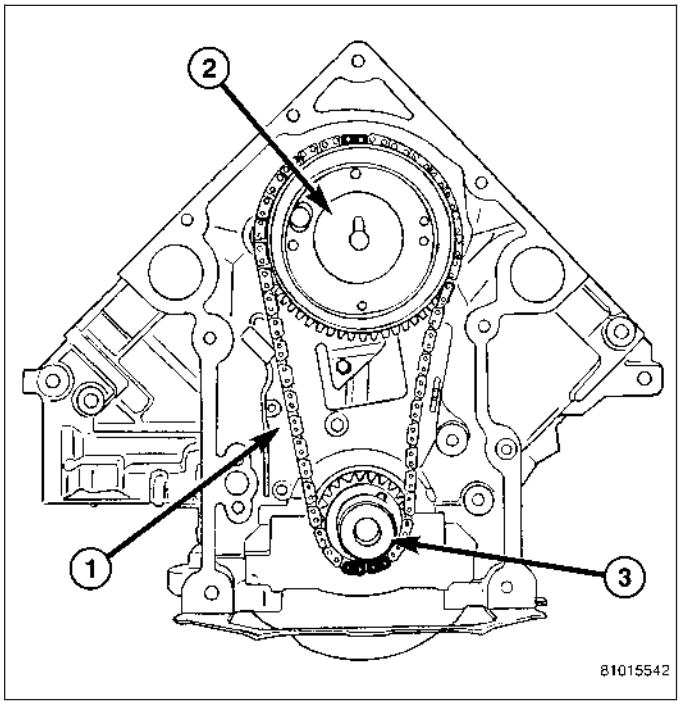


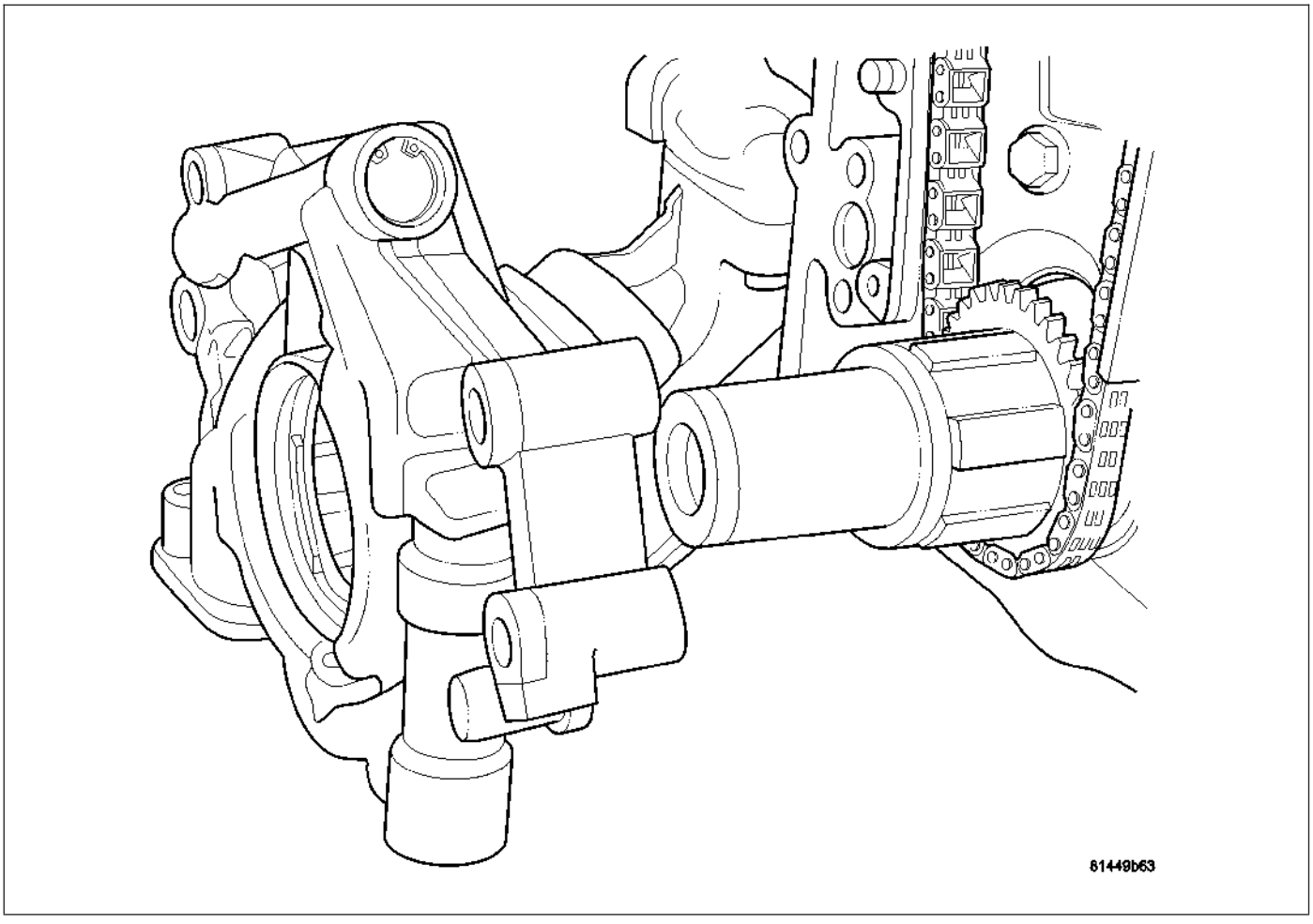
1. Disconnect battery negative cable.
2. Drain cooling system.

3. Remove Timing Chain Cover (1).

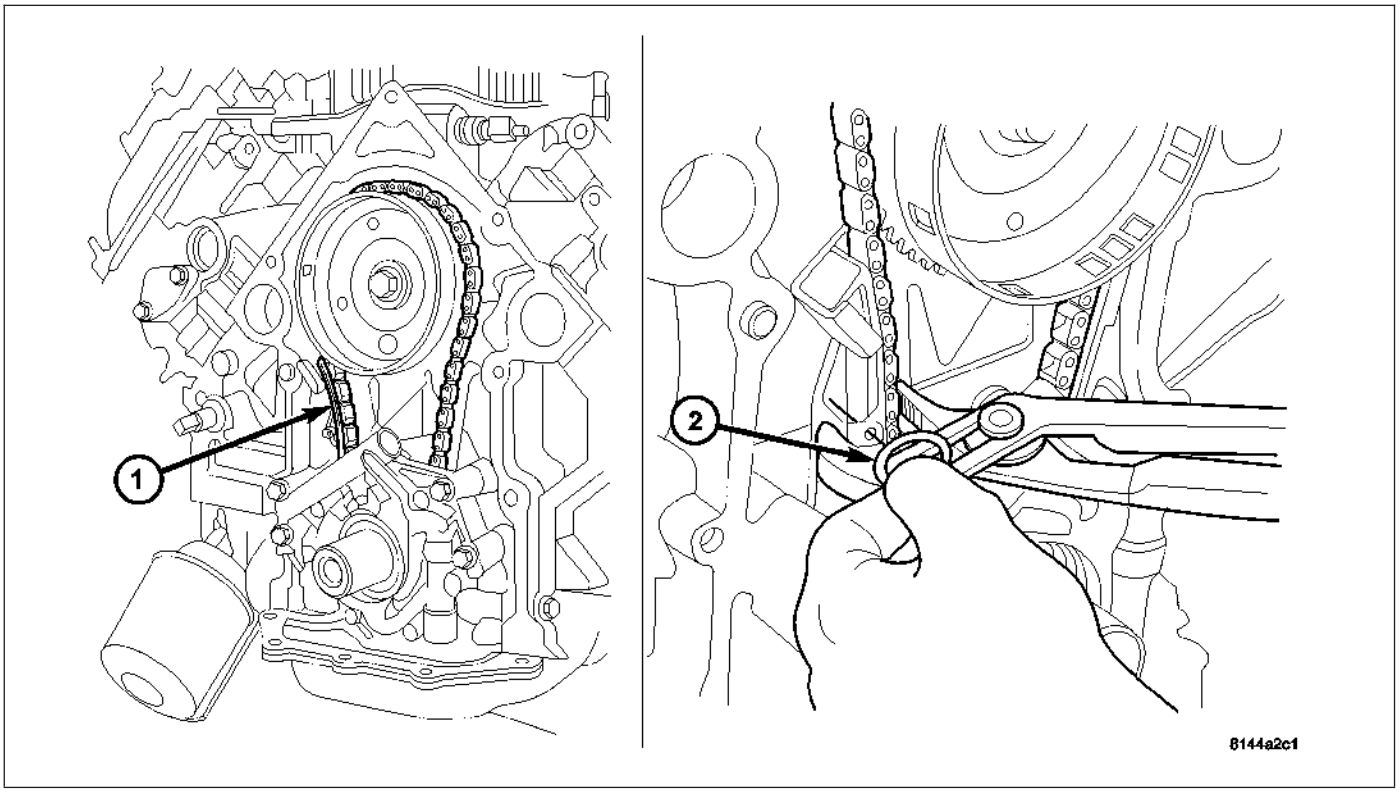
4. Re-install the vibration damper bolt finger tight. Using a suitable socket and breaker bar, rotate the crankshaft to align timing chain sprockets and keyways as shown.

CAUTION: The camshaft pin and the slot in the cam sprocket must be clocked at 12:00 (2). The crankshaft keyway must be clocked at 2:00 (3). The crankshaft sprocket must be installed so that the dots and or paint marking is at 6:00.



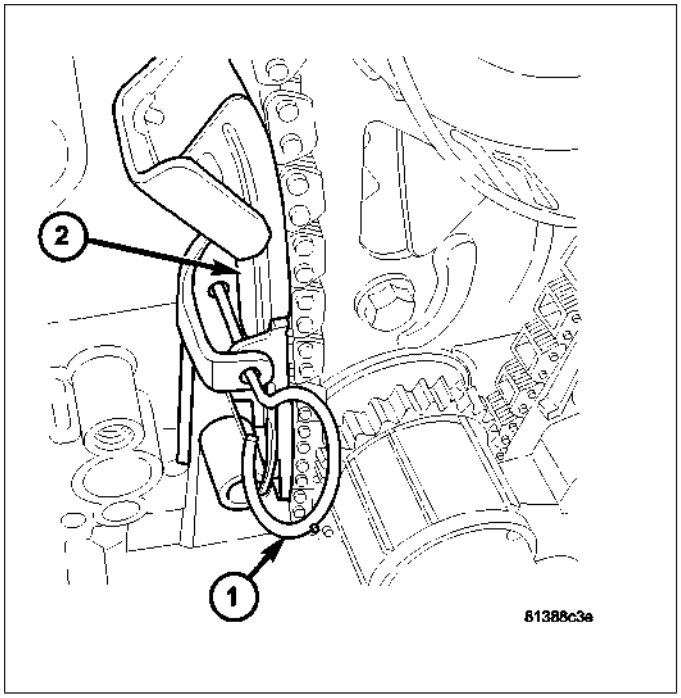


5. Remove oil pump.

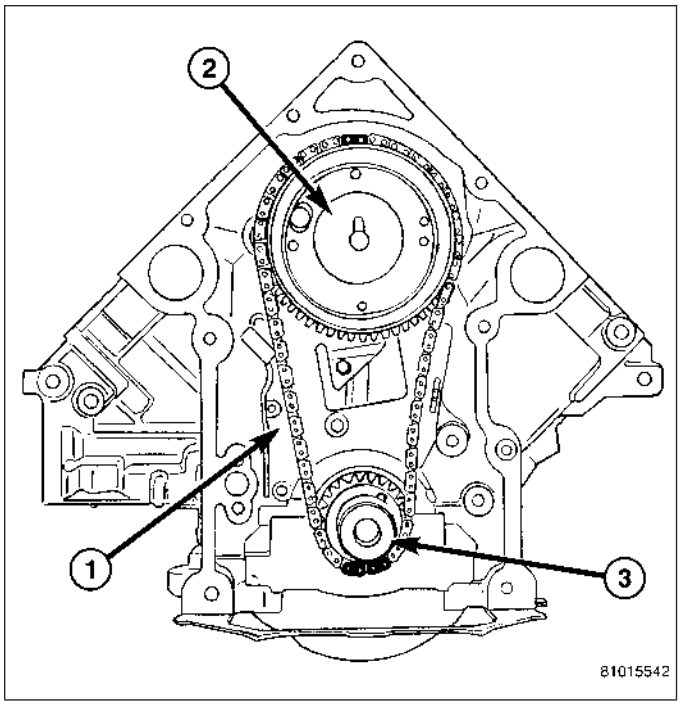


6. Retract tensioner shoe (1) until hole in shoe lines up with hole in bracket..

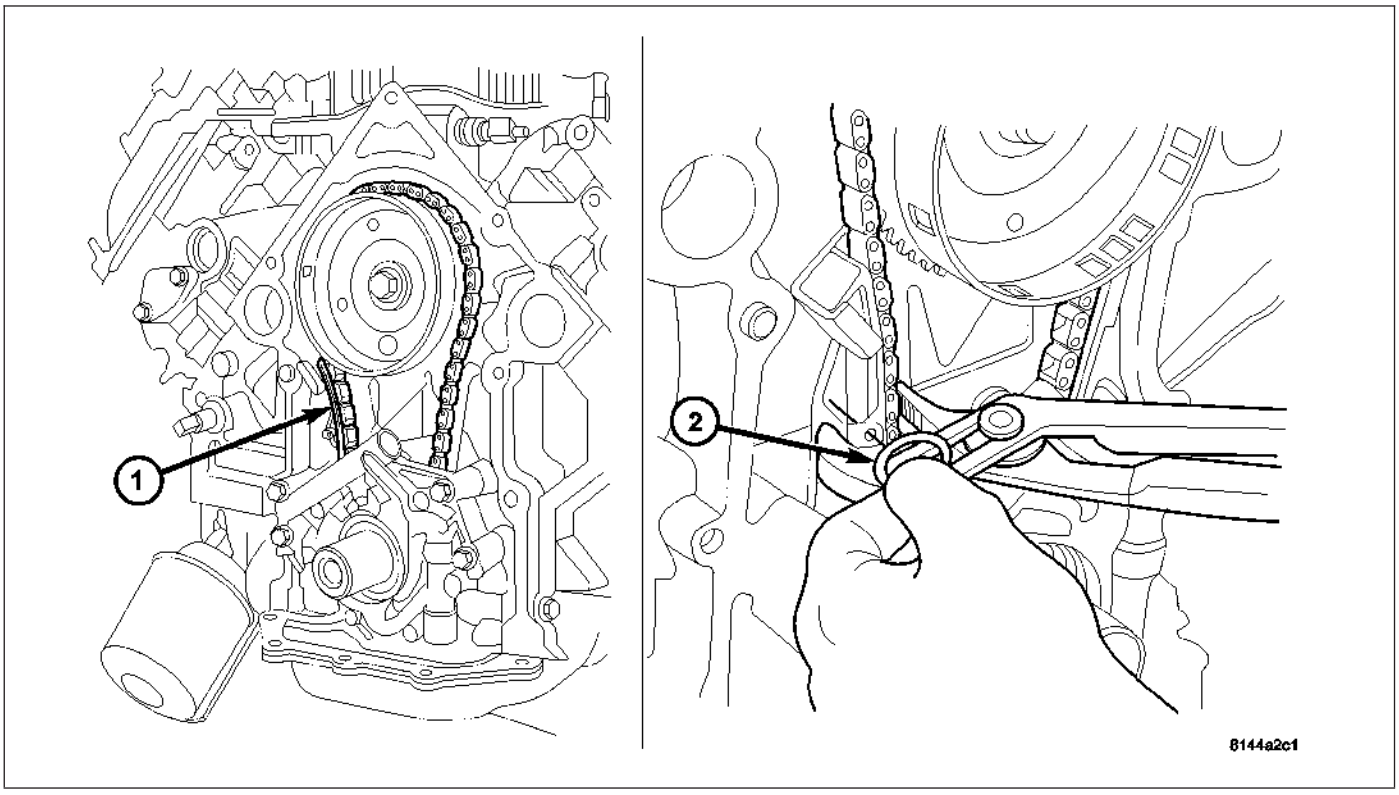
7. Slide a suitable pin (2) into the holes.



8. Remove camshaft sprocket attaching bolt and remove timing chain with crankshaft and camshaft sprockets (2).
9. If tensioner assembly is to be replaced, remove the tensioner to block bolts and remove tensioner assembly.



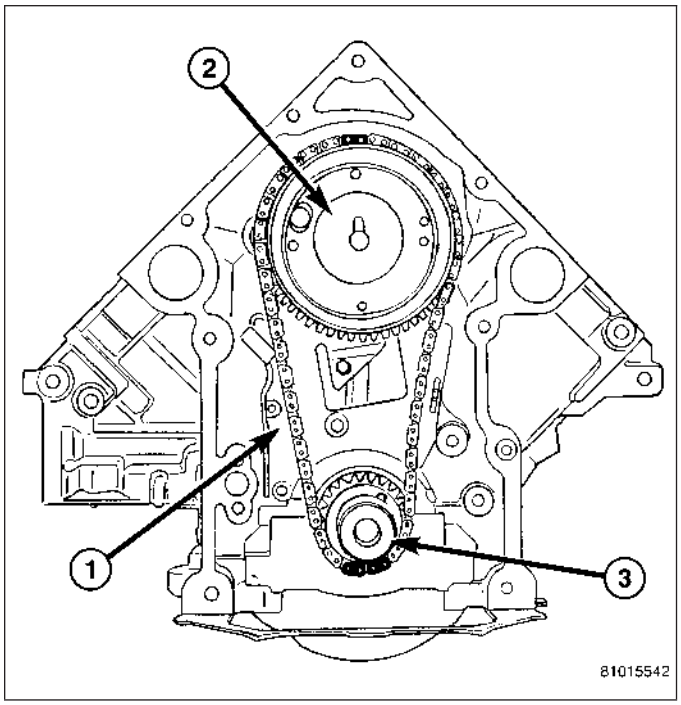
INSTALLATION



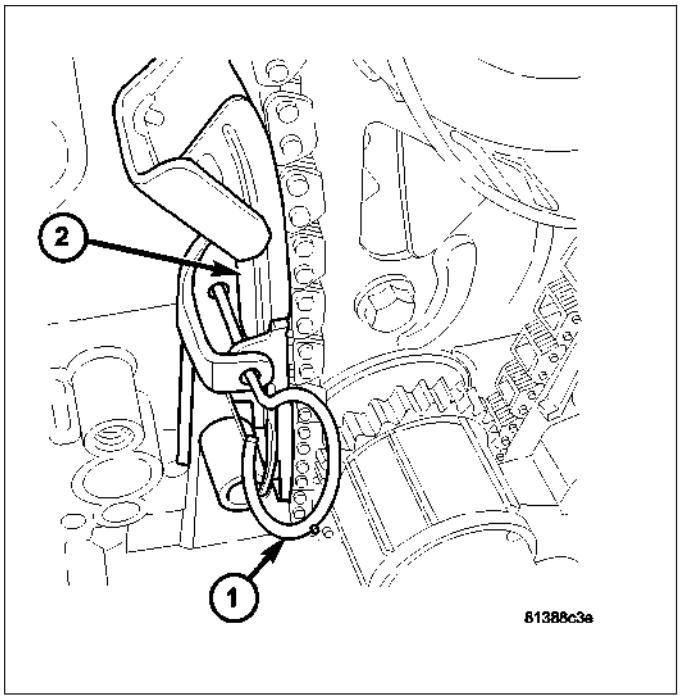
1. If tensioner (1) assembly is being replaced, install tensioner and mounting bolts. Torque bolts to 28 N·m (250 in. lbs.).
2. Retract tensioner (2) if required.

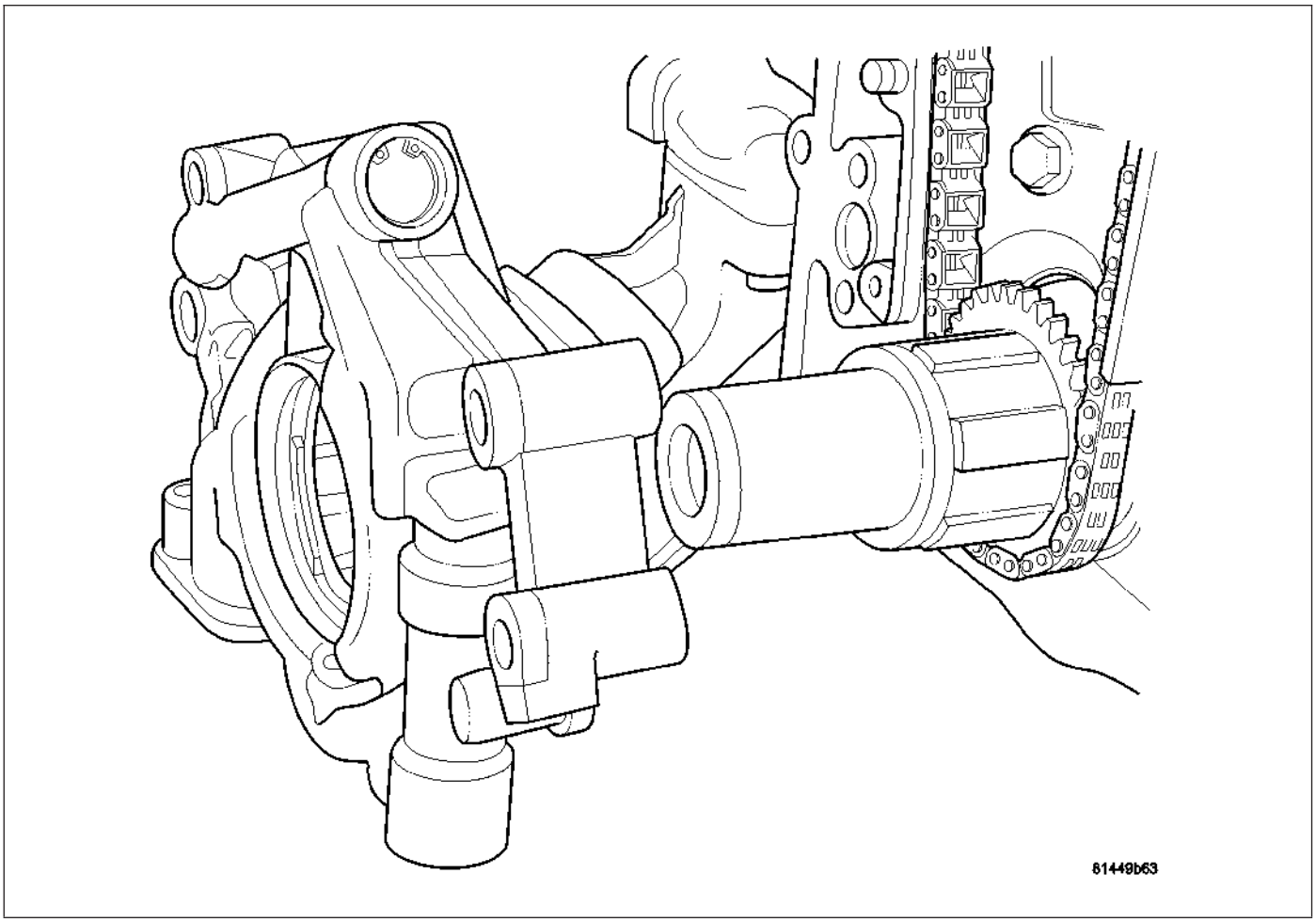
CAUTION: The timing chain must be installed with the single plated link aligned with the dot and or paint marking on the camshaft sprocket. The crankshaft sprocket is aligned with the dot and or paint marking on the sprocket between two plated timing chain links.

CAUTION: The camshaft pin and the slot in the cam sprocket must be clocked at 12:00. The crankshaft keyway must be clocked at 2:00. The crankshaft sprocket must be installed so that the dots and or paint marking is at 6:00.

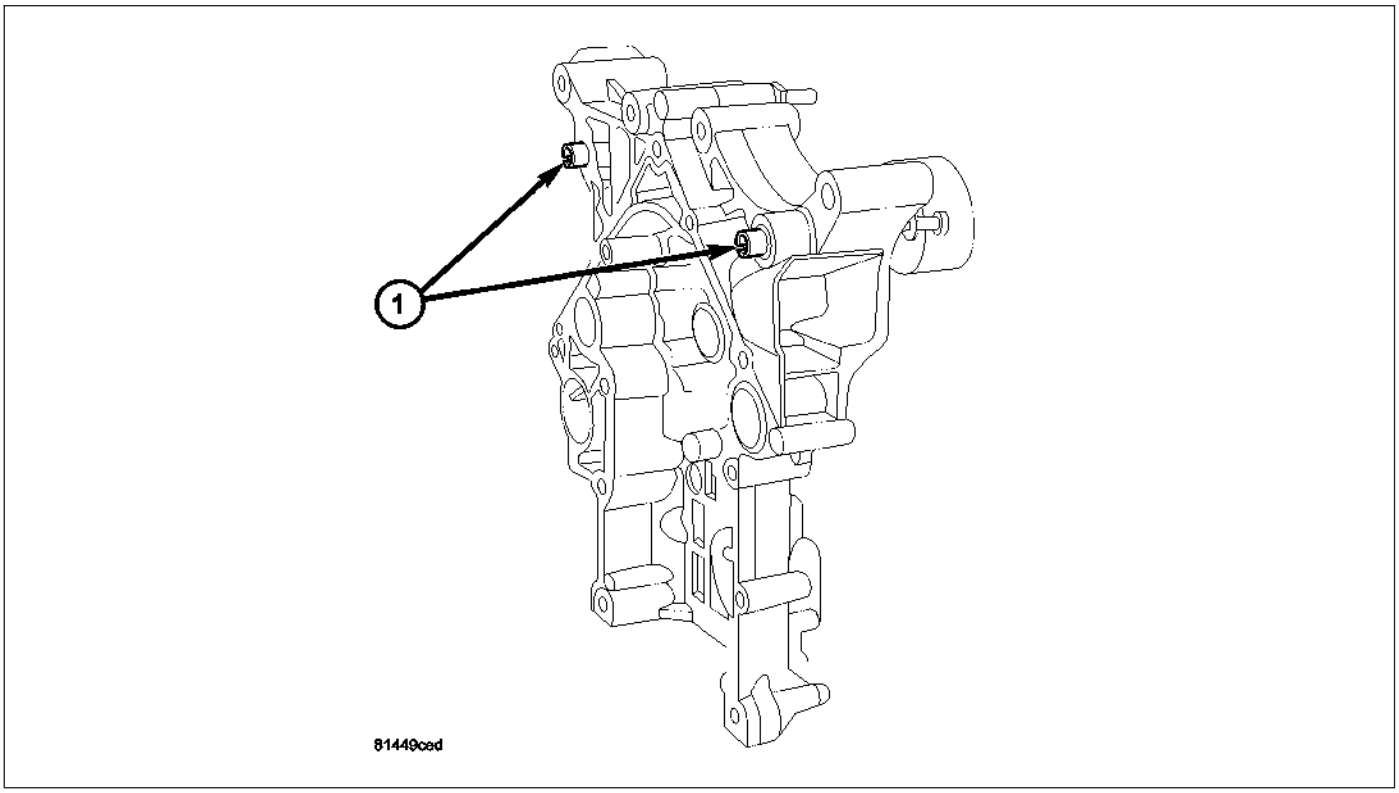


3. Place both camshaft sprocket and crankshaft sprocket on the bench with timing marks on exact imaginary center line through both camshaft and crankshaft bores.
4. Place timing chain around both sprockets.
5. Lift sprockets and chain (keep sprockets tight against the chain in position as shown).
6. Slide both sprockets (2,3) evenly over their respective shafts and check alignment of timing marks.
7. Install the camshaft bolt. Tighten the bolt to 122 N·m (90 ft. lbs.) torque.
8. **Remove tensioner pin. (1)** Again, verify alignment of timing marks.





9. Install the oil pump (Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - INSTALLATION).
10. Install the oil pan and pick up (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).



11. Install the timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION).
12. Refill engine oil.
13. Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
14. Connect battery negative cable.
15. Start engine and check for oil and coolant leaks.

TENSIONER - TIMING CHAIN

DESCRIPTION

The timing chain tensioner is a stamped steel constant tension mechanical design. It is mounted to the front of the engine, behind the timing chain drive.

OPERATION

The timing chain tension is maintained by routing the timing chain through the tensioner assembly. A nylon covered spring steel arm presses on the timing chain maintaining the correct chain tension.

EXHAUST SYSTEM

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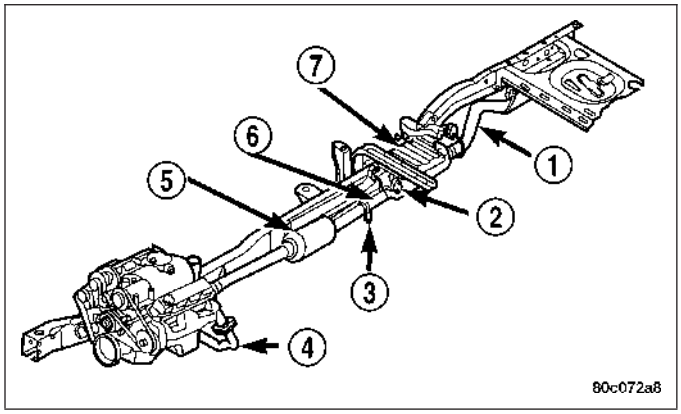
EXHAUST SYSTEM

DESCRIPTION

CAUTION: Avoid application of rust prevention compounds or undercoating materials to exhaust system floor pan exhaust heat shields. Light overspray near the edges is permitted. Application of coating will result in excessive floor pan temperatures and objectionable fumes.



The gasoline engine exhaust system consists of engine exhaust manifolds, exhaust pipes (4) , catalytic converter(s) (5), extension pipe (if needed) (6), exhaust heat shields (7), muffler and exhaust tailpipe (1).

The exhaust system must be properly aligned to prevent stress, leakage and body contact. Minimum clearance between any exhaust component and the body or frame is 25.4 mm (1.0 in.). If the system contacts any body panel, it may amplify objectionable noises from the engine or body.

OPERATION

The exhaust system channels exhaust gases from the engine and away from the vehicle.

DIAGNOSIS AND TESTING

EXHAUST SYSTEM

EXHAUST SYSTEM DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSE	CORRECTION
EXCESSIVE EXHAUST NOISE	1. Leaks at pipe joints.	1. Tighten clamps to specified torque at leaking joints (Refer to 11 - EXHAUST SYSTEM - SPECIFICATIONS).
	2. Burned or blown out muffler.	2. Replace muffler assembly (Refer to 11 - EXHAUST SYSTEM/ MUFFLER - REMOVAL). Check exhaust system.
	3. Burned or rusted-out exhaust pipe.	3. Replace exhaust pipe (Refer to 11 - EXHAUST SYSTEM/EXHAUST PIPE - REMOVAL).
	4. Exhaust pipe leaking at manifold flange.	4. Tighten connection attaching nuts (Refer to 11 - EXHAUST SYSTEM - SPECIFICATIONS).
	5. Exhaust manifold cracked or broken.	5. Replace exhaust manifold (Refer to 9 - ENGINE/MANIFOLDS/ EXHAUST MANIFOLD - REMOVAL).
	6. Leak between exhaust manifold and cylinder head.	6. Tighten exhaust manifold to cylinder head stud nuts or bolts (Refer to 9 - ENGINE - SPECIFICATIONS).
	7. Restriction in muffler or tailpipe.	7. Remove restriction, if possible. Replace muffler or tailpipe, as necessary.
	8. Exhaust system contacting body or chassis.	8. Re-align exhaust system to clear surrounding components.
LEAKING EXHAUST GASES	1. Leaks at pipe joints.	1. Tighten/replace clamps at leaking joints (Refer to 11 - EXHAUST SYSTEM - SPECIFICATIONS).

SPECIFICATIONS

TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Exhaust Clamp Nuts (All)	42	31	-
Exhaust Pipe to Manifold Nuts	34	25	-
Heat Shield Nuts	7	-	60
Muffler Hanger Bolts	23	-	200
Tailpipe Hanger Bolt	23	-	200

CONVERTER-CATALYTIC

DESCRIPTION

California emissions vehicles incorporate mini catalytic converters into the exhaust system. These catalytic converters are made of stainless steel designed to operate at extremely high temperatures.

OPERATION

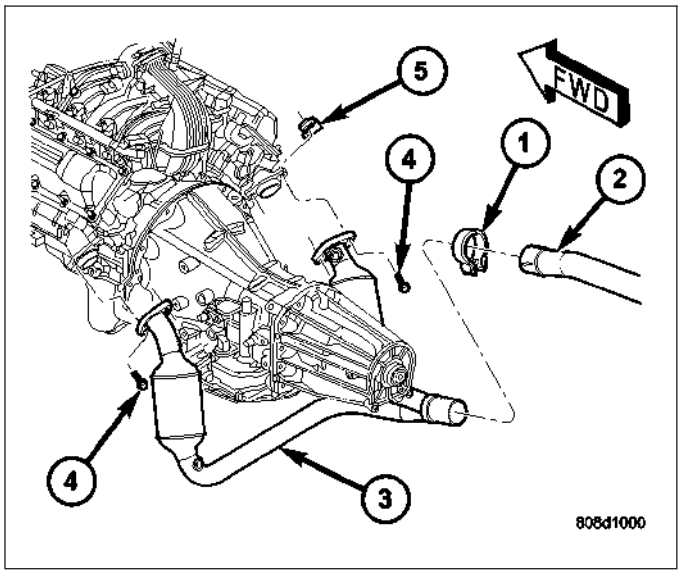
The catalytic converter captures and burns any unburned fuel mixture exiting the combustion chambers during the exhaust stroke of the engine. This process aids in reducing emissions output.

REMOVAL

3.7L/4.7L ENGINE

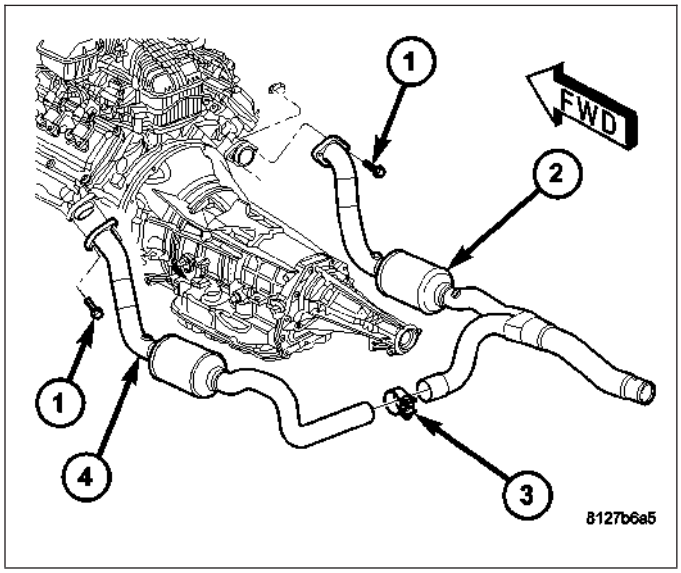
CAUTION: When servicing or replacing exhaust system components, disconnect the oxygen sensor connector(s). Allowing the exhaust to hang by the oxygen sensor wires will damage the harness and/or sensor.

1. Raise and support the vehicle.
2. Saturate all exhaust bolts and nuts with Mopar® Rust Penetrant. Allow 5 minutes for penetration.
3. DIsconnect the oxygen senor electrical connectors.
4. Remove the catalytic converter-to-manifold bolts (5).
5. Remove the clamp (1) holding the catalytic converter (3) to the exhaust pipe(s) (2).
6. If present, grind tack weld.
7. Remove the clamp holding the catalytic converter flange to the muffler or extension pipe.
8. Remove the catalytic converter. You may have to loosen up other sections of the exhaust system.



5.7L ENGINE

CAUTION: When servicing or replacing exhaust system components, disconnect the oxygen sensor connector(s). Allowing the exhaust to hang by the oxygen sensor wires will damage the harness and/or sensor.



1. Raise and support the vehicle.
2. Saturate all exhaust bolts and nuts with Mopar® Rust Penetrant. Allow 5 minutes for penetration.
3. Remove the clamp (3) holding the LH catalytic converter (4) to the RH catalytic converter (2).
4. If present, grind any tack welds.
5. Remove the catalytic converter-to-manifold bolts (1).
6. Remove the LH catalytic converter (4) from the RH catalytic converter (2).
7. Remove the clamp holding the RH catalytic converter (2) to the exhaust pipe(s).
8. If present, grind tack weld.
9. Remove the RH catalytic converter (2) from the extension pipe.
10. You may have to loosen up other sections of the exhaust system.

INSPECTION

Look at the stainless steel body of the converter, inspect for bulging or other distortion that could be a result of overheating. If the converter has a heat shield attached make sure it is not bent or loose.

If you suspect internal damage to the catalyst, tapping the bottom of the catalyst with a rubber mallet may indicate a damaged core.

INSTALLATION

3.7L/4.7L ENGINE

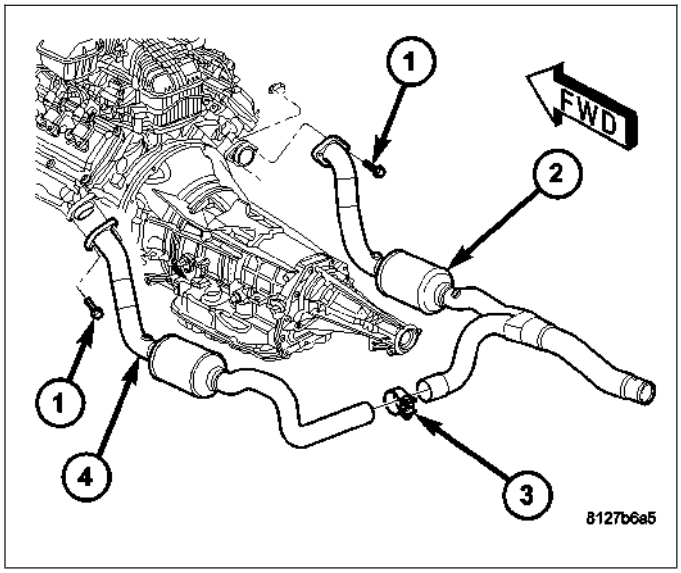
CAUTION: When servicing or replacing exhaust system components, disconnect the oxygen sensor connector(s). Allowing the exhaust to hang by the oxygen sensor wires will damage the harness and/or sensor.

1. Make sure the catayltic converter pipe is free of burrs.
2. Insert the catalytic converter into the exhaust pipe.
3. Make sure the alignment tang is fully seated in the alignment slot.
4. If other sections of the exhaust system where loosened in removal, refer to that information for the tightening procedures.

5. At the catalytic converter-to-extension pipe connection, install the clamp and nuts. Tighten the clamp nuts to 41 N·m (30 ft. lbs.) torque.
6. Lower the vehicle.
7. Start the engine, inspect for exhaust leaks. Repair exhaust leaks as necessary.
8. Check the exhaust system for contact with the body panels. Make the necessary adjustments, if necessary.

5.7L ENGINE

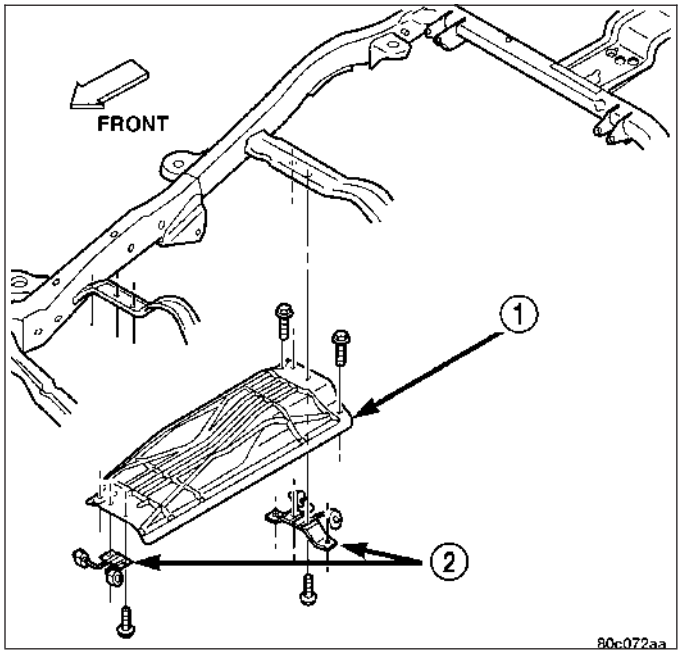
1. Raise and support the vehicle.
2. Remove any burrs from the RH (2) and LH (4) catalytic converter.
3. Insert the RH (2) catalytic converter into the exhaust pipe.
4. Position the RH catalytic converter-to-exhaust pipe clamp. Do not tighten at this time.
5. Make sure the alignment tang is seated in the alignment slot.
6. Insert the LH catalytic converter 4) into the RH catalytic converter (2).
7. Make sure the alignment tang is seated in the alignment slot.
8. Position theLH catalytic converter-to-RH catalytic converter clamp (3). Do not tighten at this time.
9. Install the LH and RH catalytic comverters (2 and 4) to the exhaust manifold. TIghten bolts to 34 N·m (24 lbs. ft.)
10. Connect the oxygen sensor electrical connectors.
11. Tighten exhaust clamps to 42 N·m (31 lbs. ft).
12. If other sections of the exhaust system where loosened in removal, refer to that information for the tightening procedures.
13. Lower the vehicle.
14. Start the engine, inspect for exhaust leaks. Repair exhaust leaks as necessary.
15. Check the exhaust system for contact with the body panels. Make the necessary adjustments, if necessary.



SHIELDS-HEAT

DESCRIPTION

There are two types of heat shields (1) used. One is stamped steel the other is molded foil sheets. The shields attach to the vehicle around the exhaust system.

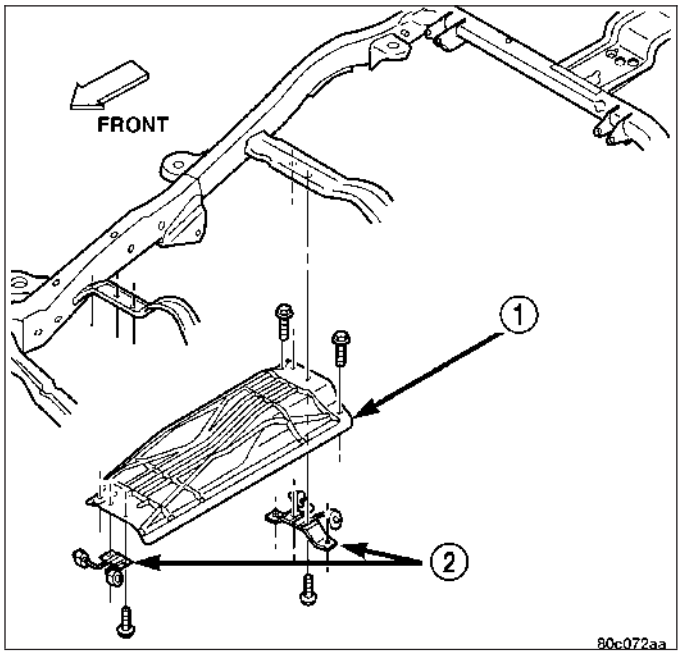


OPERATION

The heat shields prevent heat from the exhaust system from entering the passenger area and other areas where the heat can cause damage to other components.

REMOVAL

1. Raise and support the vehicle.
2. Remove the screws and nuts holding the heat shields (1) to the frame and floor pan. When removing muffler heat shield, the muffler front and rear support hangers (2) must be removed first. **Be sure to disconnect both oxygen sensor connectors.**
3. Slide the heat shield (1) out around the exhaust system.



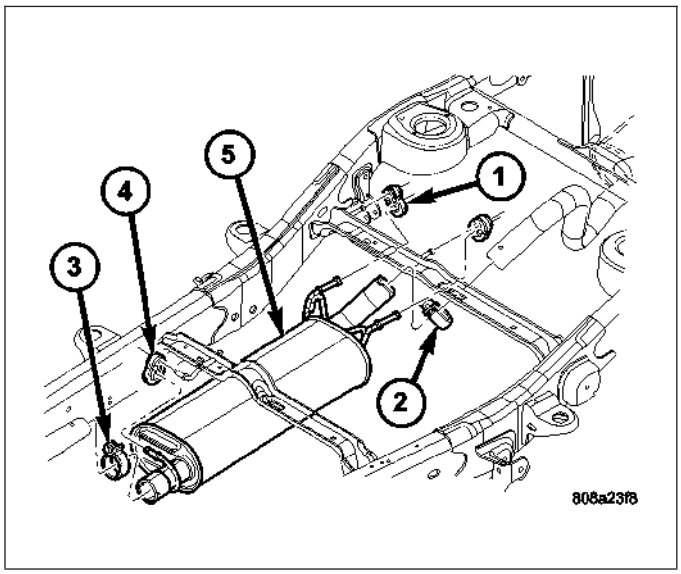
INSTALLATION

1. Position the heat shields to the floor pan or the frame and install the screws and nuts.
2. Tighten the screws/nuts to 7 N·m (60 in. lbs.) torque. Tighten the muffler hangers to 23 N·m (200 in. lbs.)
3. Lower the vehicle.

MUFFLER

DESCRIPTION

All engines use a stainless steel muffler (1) to control exhaust noise levels and exhaust back pressure.

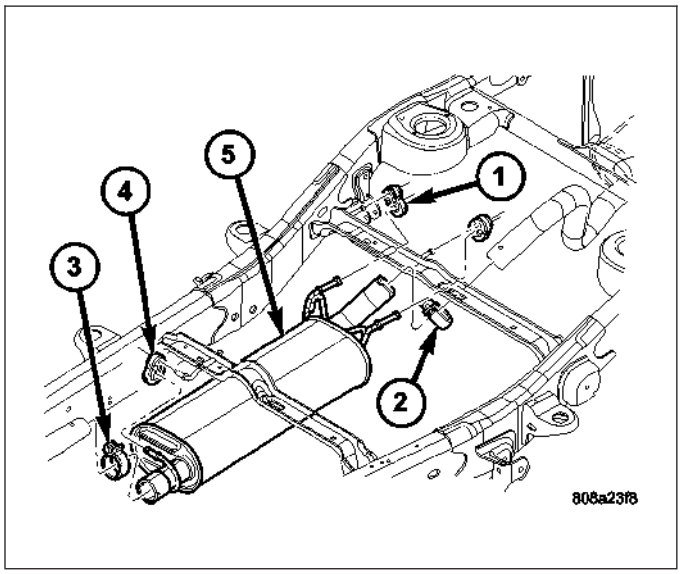


OPERATION

The muffler is designed to muffle the sound of the exhaust as if leaves the engine.

REMOVAL

1. Raise vehicle on hoist.
2. Remove the exhaust pipe (Refer to 11 - EXHAUST SYSTEM/EXHAUST PIPE - REMOVAL).
3. Remove the muffler-to-catalytic converter clamp (3).
4. Remove the muffler isolators (1 and 4).
5. Remove the muffler (5) from the catalytic converter.



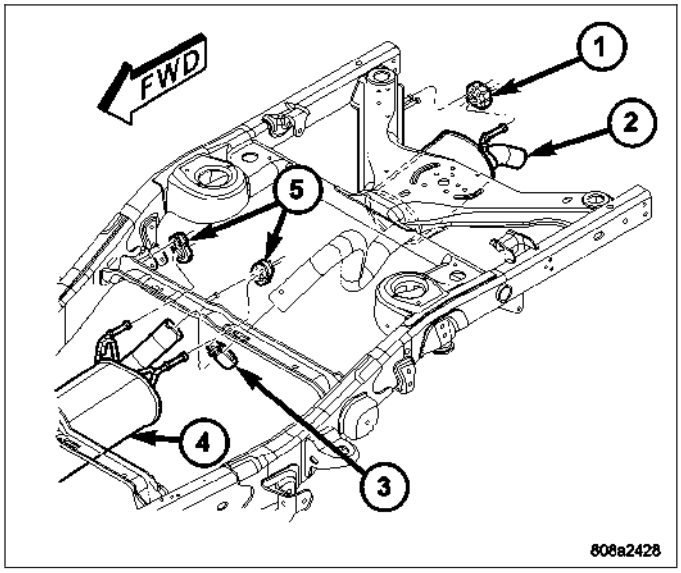
INSTALLATION

1. Install muffler to the catalytic converter.
2. Make sure the alignment tang seats in the alignment slot.
3. Install exhaust clamp. Do not tightern at this time.
4. Install muffler isolators.
5. Install exhaust pipe (Refer to 11 - EXHAUST SYSTEM/EXHAUST PIPE - INSPECTION).
6. Align muffler and exhaust pipe. Tighten exhaust clamp nuts to 42 N·m (31 ft. lbs.).
7. Check the exhaust system for contact with body panels. Make the necessary adjustmens, if necessary.
8. Lower vehicle.
9. Start engine and check for exhaust leaks.Repair exhaust leaks as necessary.

TAILPIPE

DESCRIPTION

The tailpipe is made of stainless steel and attaches to the muffler.



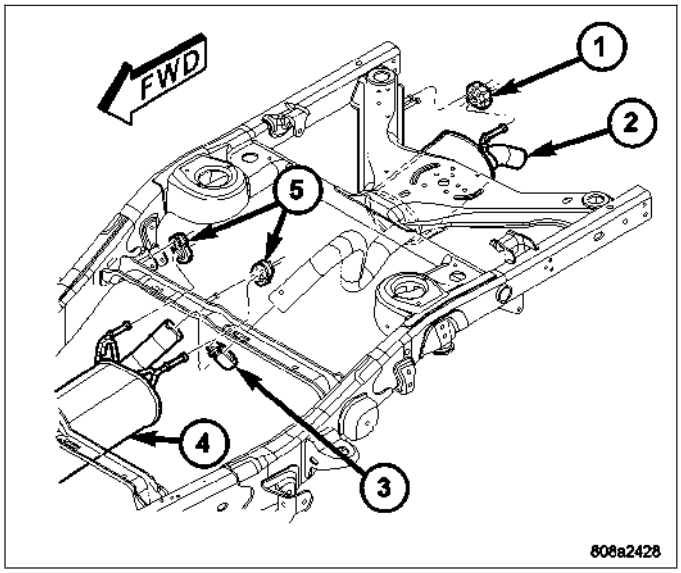
OPERATION

The tailpipe channels the exhaust out of the muffler and out from under the vehicle to control noise and prevent exhaust gas fumes from entering the passenger compartment.

REMOVAL

WARNING: IF TORCHES ARE USED WHEN WORKING ON THE EXHAUST SYSTEM, WEAR PROTECTIVE EYE COVERING AND DO NOT ALLOW THE FLAME NEAR THE FUEL LINES.

CAUTION: When servicing or replacing exhaust system components, be sure to disconnect all oxygen sensor connectors. Allowing the exhaust system to hang by the harness will damage the wiring and/or sensor.



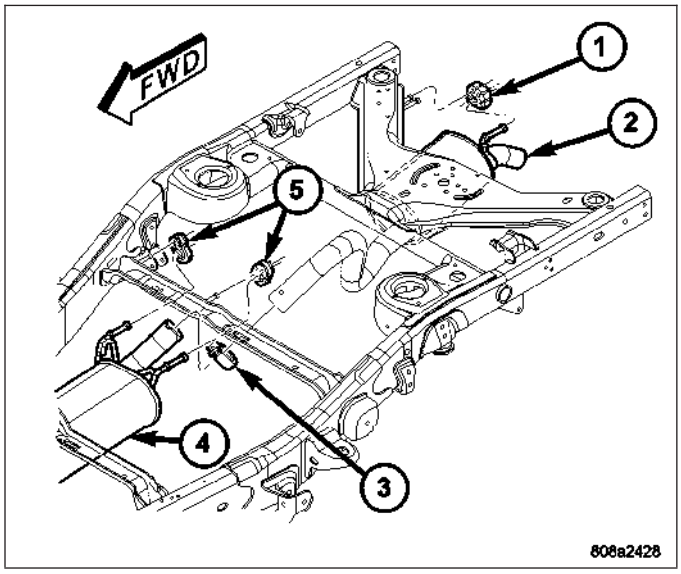
1. Raise and support the vehicle.
2. Saturate the bolts and nuts with Mopar® Rust Penetrant. Allow 5 minutes for penetration.
3. Remove the exhaust pipe-to-muffler clamp (3).
4. Grind any tack weld, if present.
5. Remove the exhaust pipe insulators (1).
6. Remove the rear muffler insulators (5) if necessary.
7. If necessary, heat connection with an oxygen/acetylene torch and twist tailpipe out of muffler.
8. Remove the exhaust pipe (2) from the muffler (4).

INSPECTION

Discard rusted clamps, broken or worn supports and attaching parts. Replace a component with original equipment parts, or equivalent. This will assure proper alignment with other parts in the system and provide acceptable exhaust noise levels.

INSTALLATION

1. Remove any burrs from the exhaust pipe (2).
2. Connect the exhaust pipe (2) to the muffler (4).
3. Make sure that the alignment tang is seated in the alignment slot.
4. Install the muffler-to-exhaust pipe clamp. Do not tighten at thia time.
5. Install the rear muffler insulators (5), if removed.
6. Install the tail pipe insulators (1)
7. Check the exhaust system for contact with the body panels. Make the necessary adjustments, if necessary.
8. Tighten muffler-to-exhaust pipe clamp to 42 N·m (31 ft. lbs.).
9. Lower the vehicle.
10. Start the engine, inspect for exhaust leaks. Repair exhaust leaks as necessary.



FRAME & BUMPERS

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FRAME & BUMPERS

SPECIFICATIONS

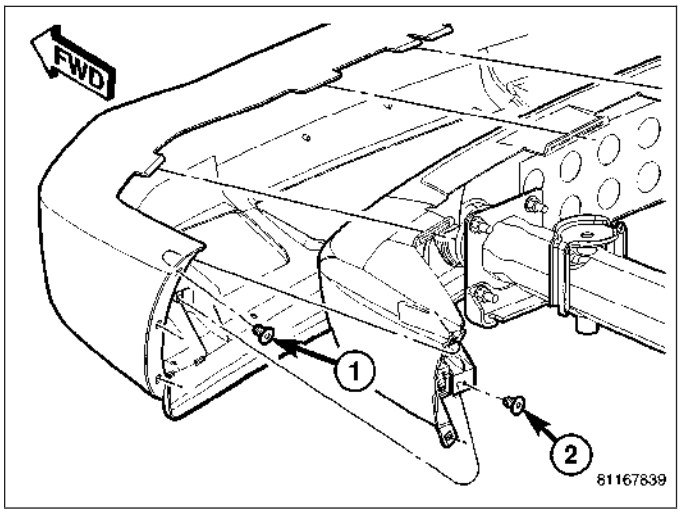
TORQUE

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Front bumper reinforcement nuts	109	80	—
Front cab mount bolt	81	60	—
Front crossmember bolts/nuts	102	75	—
Front tow hook bracket nuts	109	80	—
Front tow hook/bumper reinforcement nuts	109	80	—
Fuel tank skid plate bolts - inboard	41	30	—
Fuel tank skid plate bolts - outboard	37	27	—
Lower radiator crossmember bolts	28	21	—
Trailer hitch bolts/nuts	183	135	—
Transfer case skid plate bolts	23	17	—

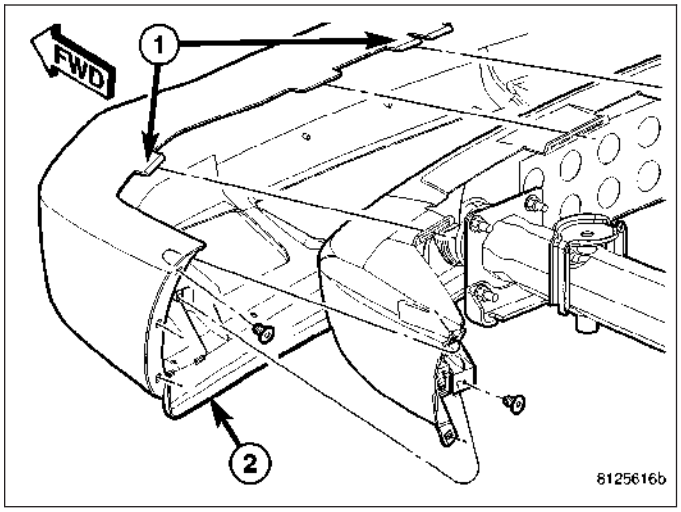
FASCIA-FRONT

REMOVAL

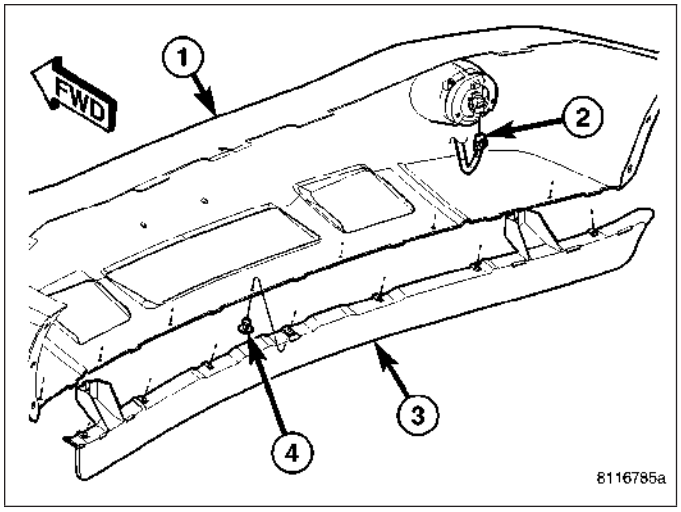
1. Remove the grille. (Refer to 23 - BODY/EXTERIOR/GRILLE - REMOVAL)
2. Remove the headlamps. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HEADLAMP UNIT - REMOVAL)
3. Remove the wheel well screws (1) and (2).



4. Release the upper tabs (1) and remove the fascia.

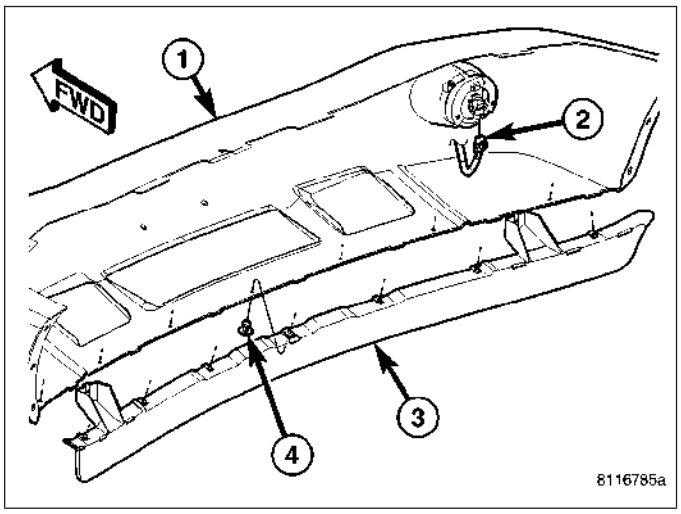


5. Remove the screws (4) and remove the air dam (3).

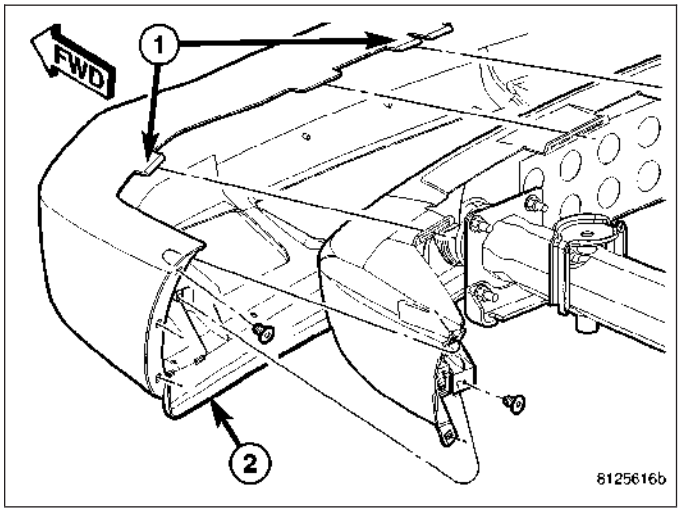


INSTALLATION

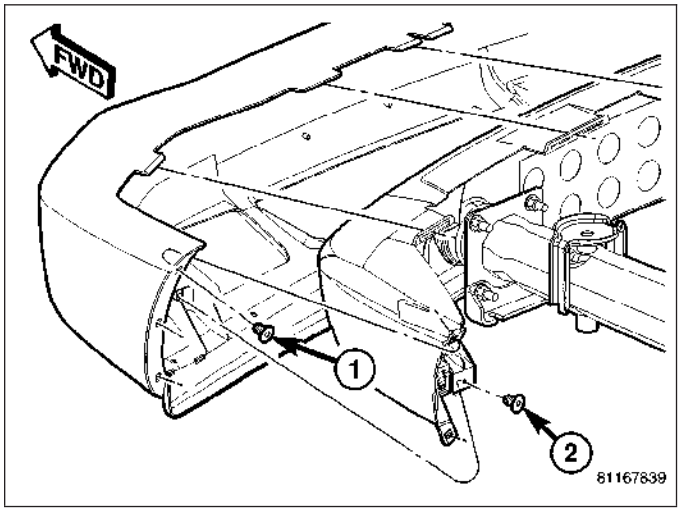
1. Install the air dam (3) and install the screws (4).



2. Position fascia on bumper.
3. Seat the tabs (1) fully.



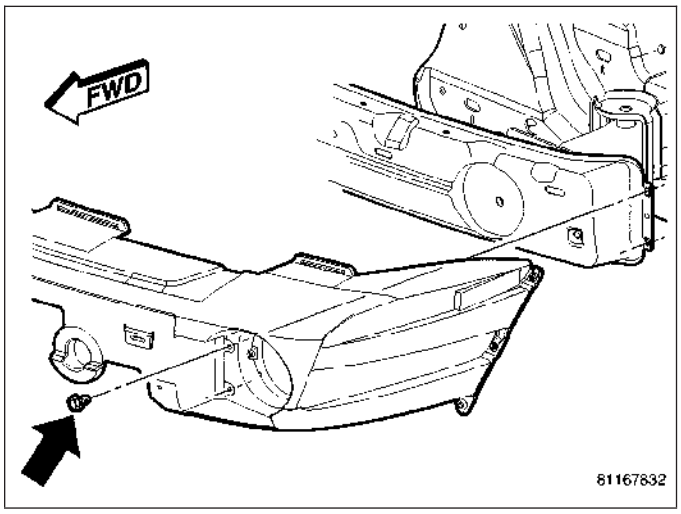
4. Install the screws (1) and (2) attaching the fascia to the bumper.
5. Install the headlamps. (Refer to 8 - ELECTRICAL/ LAMPS/LIGHTING - EXTERIOR/HEADLAMP UNIT - INSTALLATION)
6. Install the grille. (Refer to 23 - BODY/EXTERIOR/ GRILLE - INSTALLATION)



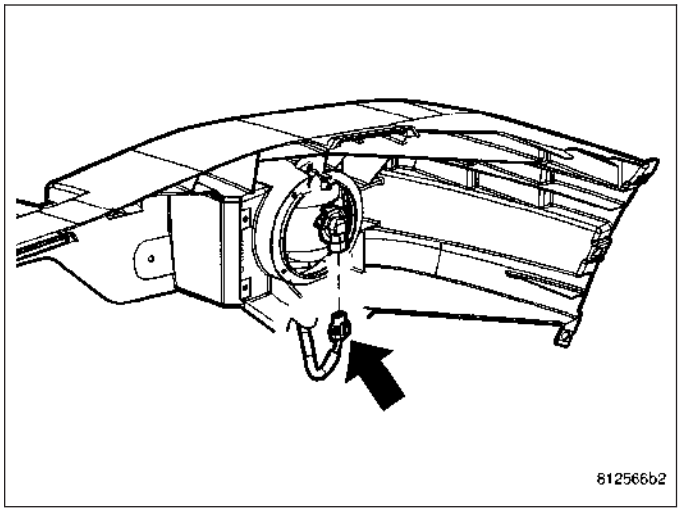
SUPPORT-FRONT FASCIA

REMOVAL

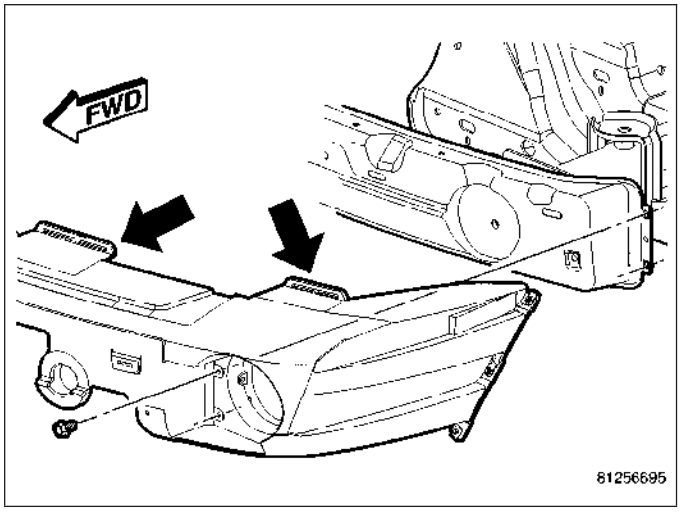
1. Remove the front fascia. (Refer to 13 - FRAME & BUMPERS/BUMPERS/FRONT FASCIA - REMOVAL)
2. Remove the front bolts next to the fog lights.



3. Disconnect the fog lamp electrical connectors, if equipped.

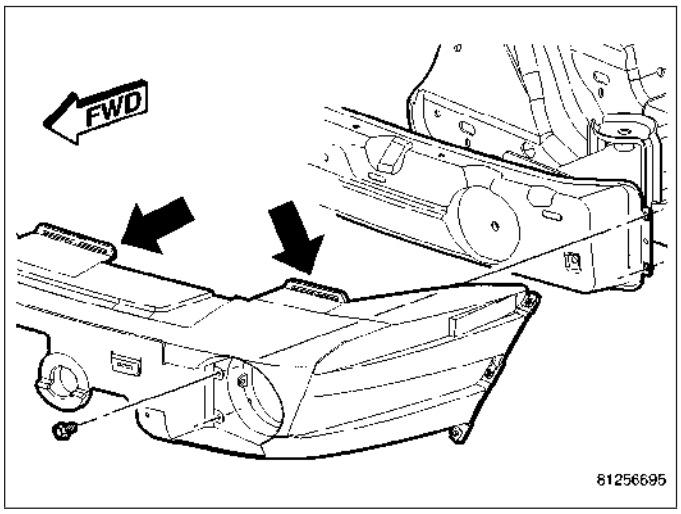


4. Release the tabs and remove the bumper.
5. Remove the fog lamps from the bumper as necessary. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/FOG LAMP UNIT - REMOVAL)

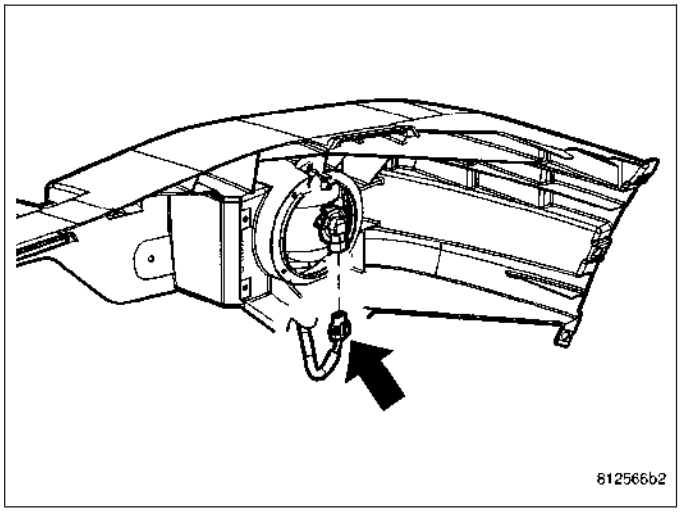


INSTALLATION

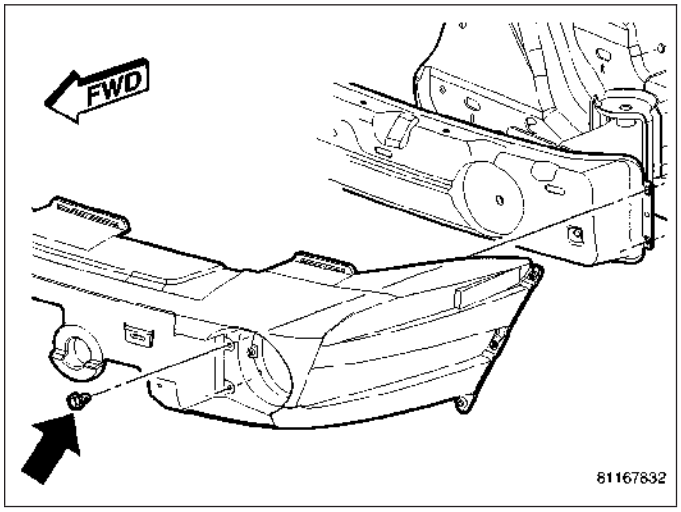
1. Install the fog lamps into the bumper, if necessary. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/FOG LAMP UNIT - INSTALLATION)
2. Position the bumper onto the bumper support and seat the tabs fully.



3. Connect the fog lamp electrical connectors, if equipped.



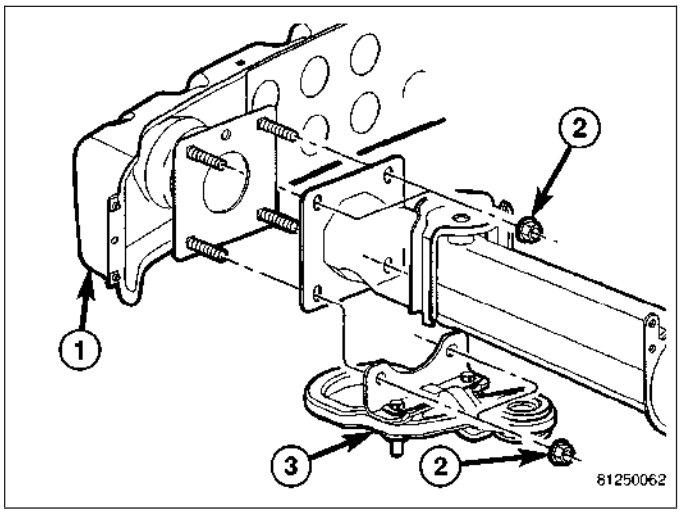
4. Install the front bolts next to the fog lamps.
5. Install the fascia. (Refer to 13 - FRAME & BUMPERS/BUMPERS/FRONT FASCIA - INSTALLATION)



BUMPER-FRONT

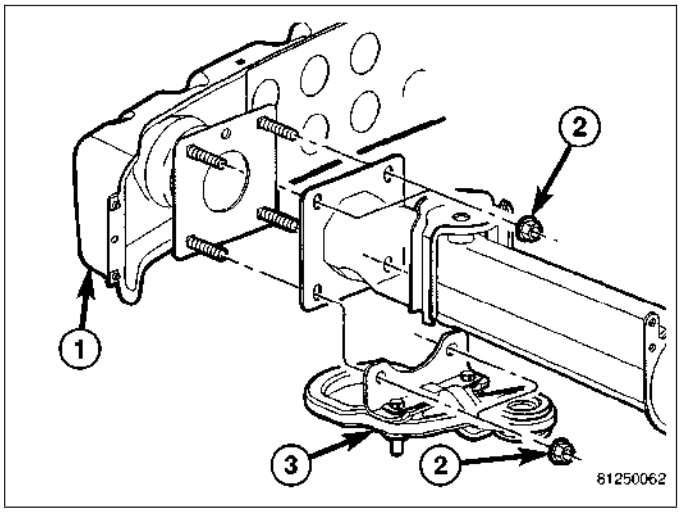
REMOVAL

1. Remove the bumper. (Refer to 13 - FRAME & BUMPERS/BUMPERS/FRONT BUMPER - REMOVAL)
2. Remove the eight nuts (2) and remove the bumper reinforcement (1).



INSTALLATION

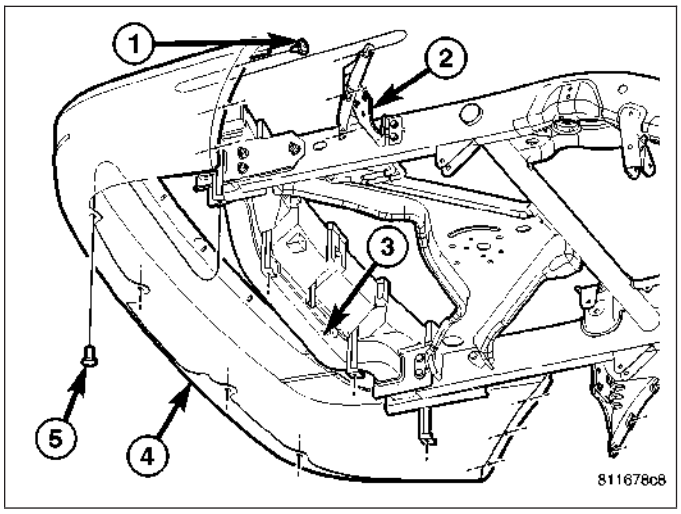
1. Install the bumper support (1) and install the nuts (2).
2. Tighten the nuts to 109 N·m (80 ft. lbs.).
3. Install the front bumper. (Refer to 13 - FRAME & BUMPERS/BUMPERS/FRONT BUMPER - INSTALLATION)



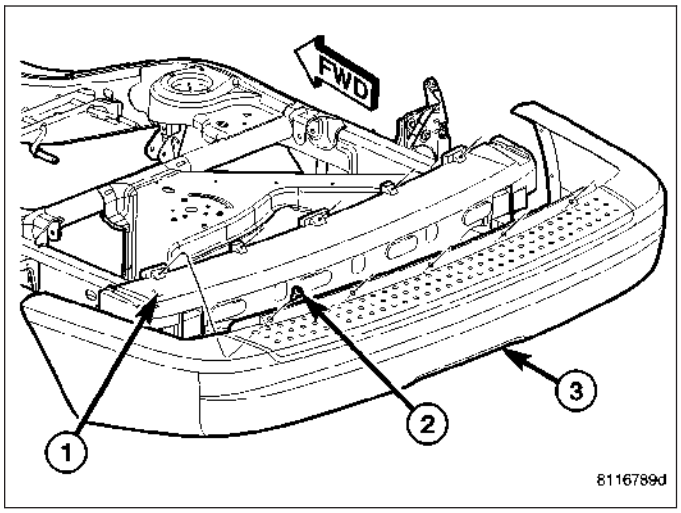
FASCIA-REAR

REMOVAL

1. Raise and support the vehicle.
2. Remove the screws (1) securing the fascia to the support brackets (2).
3. Remove the lower push pin fasteners (5).

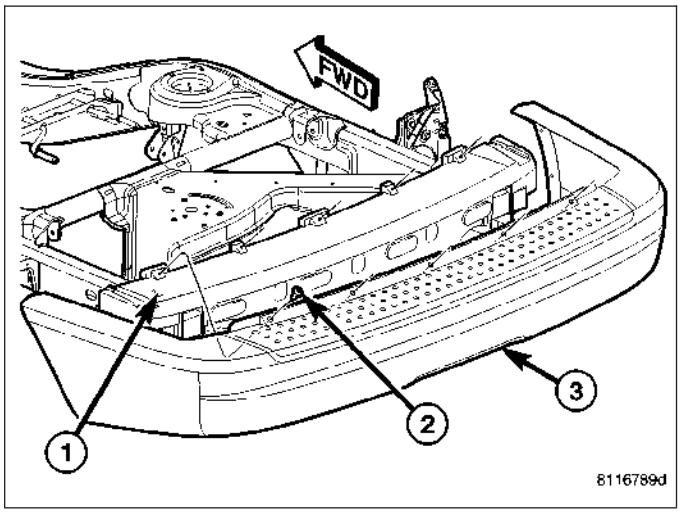


4. Open the liftgate and remove the upper push pin fasteners (2).
5. Remove the fascia (3).

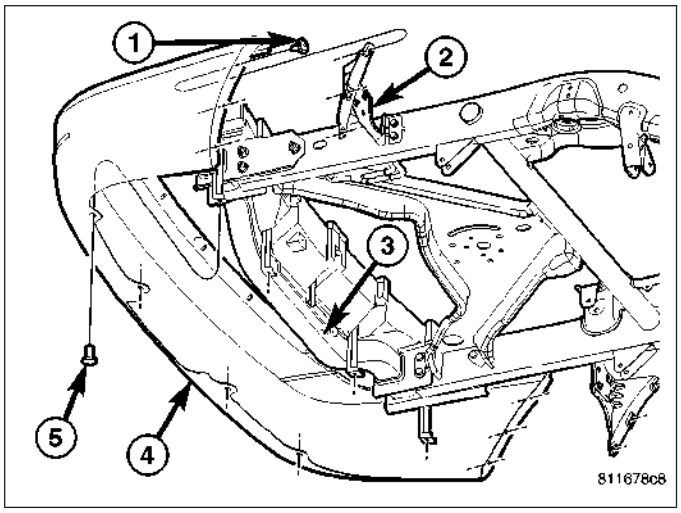


INSTALLATION

1. Position the fascia (3) and install the push pin fasteners (2).



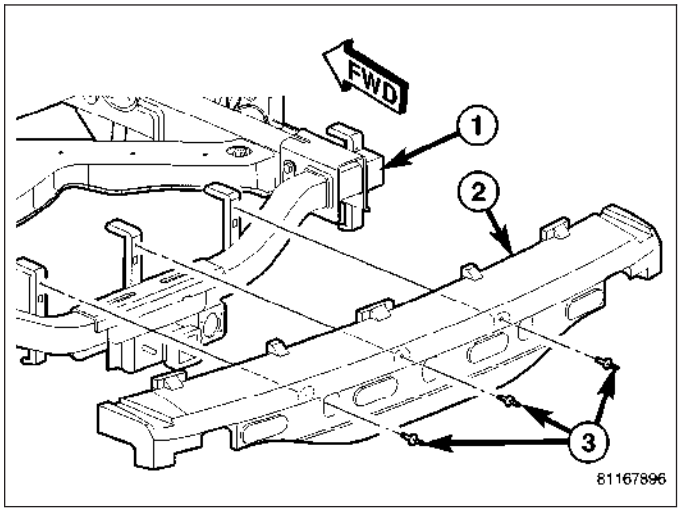
2. Install the lower push pin fasteners (5).
3. Install the screws (1) securing the fascia to the support brackets (2).



SUPPORT-REAR BUMPER

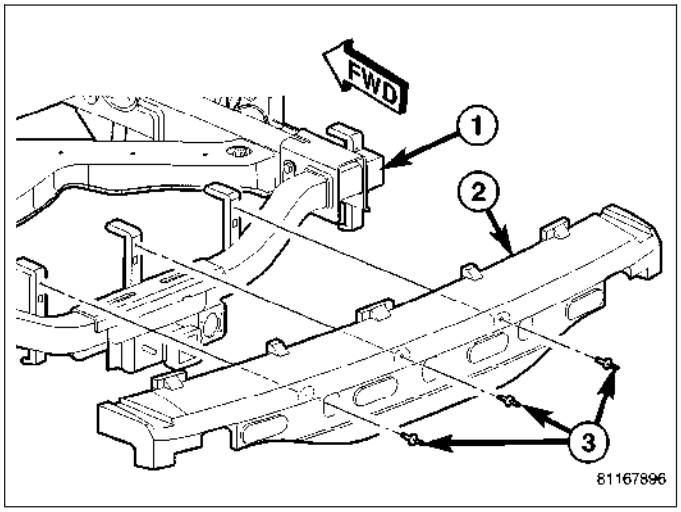
REMOVAL

1. Remove the rear fascia. (Refer to 13 - FRAME & BUMPERS/BUMPERS/REAR FASCIA - REMOVAL)
2. Remove the rivets (3) and remove the foam bumper support.



INSTALLATION

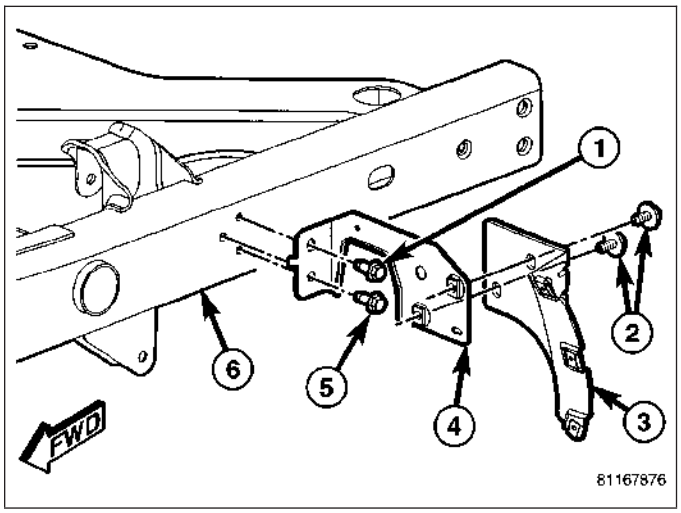
1. Position the foam support (2) and install new rivets (3).
2. Install the rear fascia. (Refer to 13 - FRAME & BUMPERS/BUMPERS/REAR FASCIA - INSTALLATION)



BRACKET-REAR FASCIA

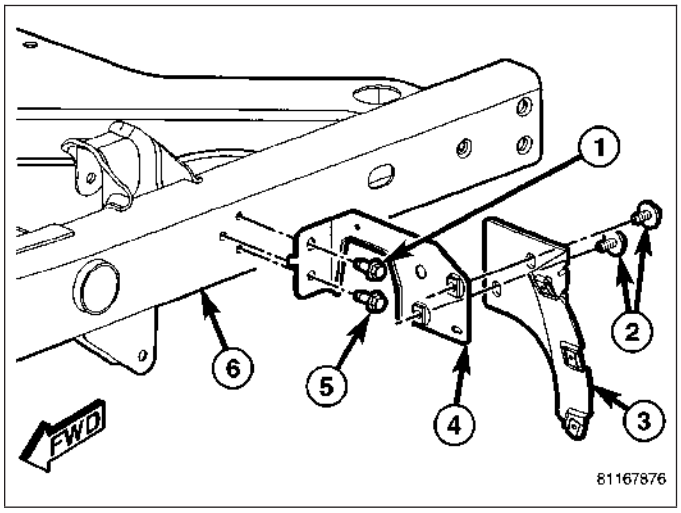
REMOVAL

1. Remove the fascia. (Refer to 13 - FRAME & BUMPERS/BUMPERS/REAR FASCIA - REMOVAL)
2. Remove the bolts (1), (2) and (5) and remove the brackets (3) and (4).



INSTALLATION

1. Install the brackets (3) and (4) and install the bolts (1), (2) and (5).
2. Install the fascia. (Refer to 13 - FRAME & BUMPERS/BUMPERS/REAR FASCIA - INSTALLATION)



FRAME

WARNING

SAFETY PRECAUTIONS AND WARNINGS

WARNING: Before performing any welding operations disconnect and isolate the battery negative (ground) cable and disconnect all wire harness connectors from the airbag control module (acm). Failure to take the proper precautions could result in accidental airbag deployment and other possible damage to the supplemental restraint system circuits and components.

- **Use eye protection when grinding or welding metal, serious eye injury can result.**
- **Before proceeding with frame repair involving grinding or welding, verify that vehicle fuel system is not leaking or in contact with repair area, personal injury can result.**
- **Do not allow open flame or heat and metal spatter from arc welding, to contact plastic body panels. Fire or explosion can result.**
- **When welded frame components are replaced, ensure complete penetration weld is achieved during installation. If not, dangerous operating conditions can result.**
- **Stand clear of cables or chains on pulling equipment during frame straightening operations, personal injury can result.**
- **Do not venture under a hoisted vehicle that is not supported on safety stands, personal injury can result.**
- **No heat may be used if frame straightening is required. The use of heat is acceptable in those situations where the part being heated will be replaced. Failure to follow these instructions may result in personal injury.**

CAUTION: Do not reuse damaged fasteners, quality of repair would be suspect. Failure to use only production fasteners or fasteners of equivalent hardness can result in loosening or failure. Do not drill any holes in the frame that are not specifically outlined in this or other, DaimlerChrysler procedure as frame rail failure can result.

STANDARD PROCEDURE

FRONT FRAME RAIL TIP REPLACEMENT

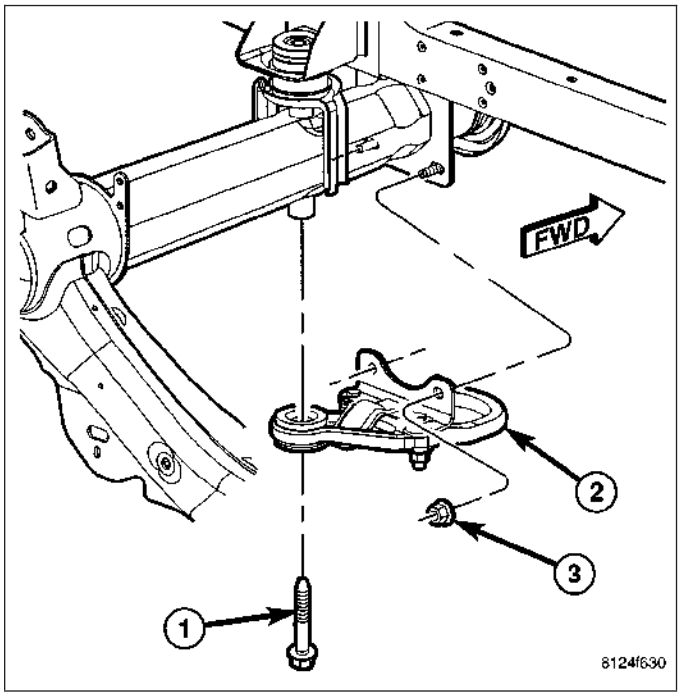
CAUTION: This procedure is designed to replace the front frame rail tips that have been damaged in the crush initiator zones. Prior to any cutting, the vehicle must be mounted on the appropriate frame repair equipment (“frame rack”), checked with three dimensional measuring equipment, and the necessary pull corrections made without the use of heat. (Refer to 13 - FRAME & BUMPERS/FRAME - SPECIFICATIONS - FRAME DIMENSION)

- **If damage remains in the frame beyond the area covered by this service part after the pull, the frame must be replaced in its entirety.**
- **If damage to the front body structure is evident, repair the Front End Sheet Metal (FESM) fender rails as necessary. (Refer to 13 - FRAME & BUMPERS/FRAME - STANDARD PROCEDURE - HYDROFORM FENDER RAIL REPAIR)**
- **Inspect all body mount bolts for damage and repair if necessary. (Refer to 23 - BODY/EXTERIOR/BODY ISOLATORS - REMOVAL & INSTALLATION)**

CAUTION: Inspect the tire winch assembly for damage. If any one or more of the following are evident, replace the winch assembly.

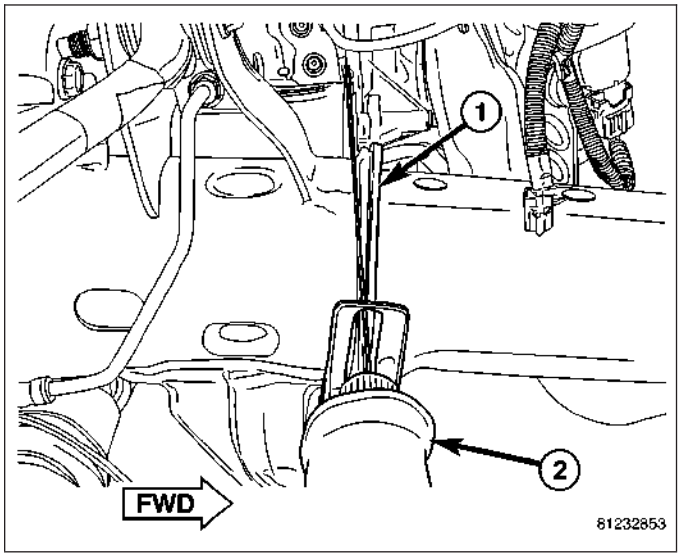
- **Indications of cracked or bulging plastic.**
- **Housing flanges are bent or cracked.**
- **If winch was loose before repair.**
- **If the rivet heads are separated from the housing in any way.**

1. Before proceeding with this repair procedure review the required service warnings and precautions. (Refer to 13 - FRAME & BUMPERS/FRAME - WARNING)
2. Disconnect and isolate the battery negative cable.
3. Remove the front wheelhouse splash shield. (Refer to 23 - BODY/EXTERIOR/FRONT WHEELHOUSE SPLASH SHIELD - REMOVAL)
4. Remove the front bumper. (Refer to 13 - FRAME & BUMPERS/BUMPERS/FRONT BUMPER - REMOVAL)
5. Remove the washer bottle, if required.
6. Remove the front cab mount bolt (1) to the Front End Sheet Metal (FESM) bracket and the lower bumper support nuts (3) attaching the tow hook (2), if equipped.

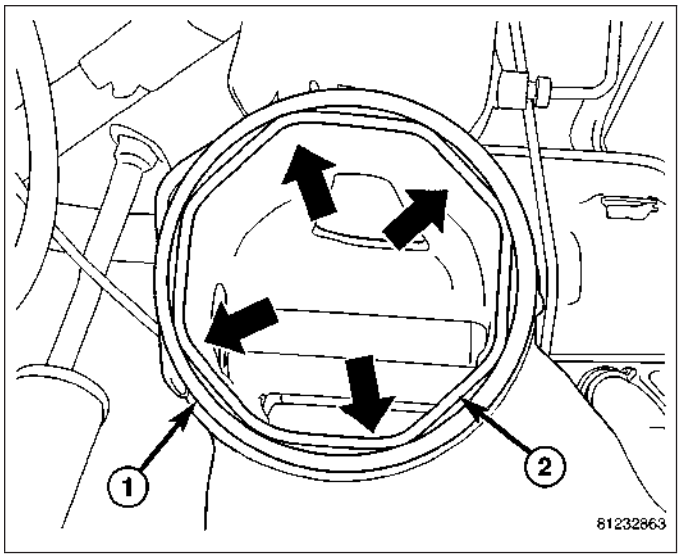


CAUTION: Do not use any flame or plasma cutting equipment to cut the frame in the next step. This is due to the inaccurate nature of the cut-line and the fact that the high temperatures achieved during the flame or plasma cutting will change the metal characteristics and may weaken the frame and/or repair location.

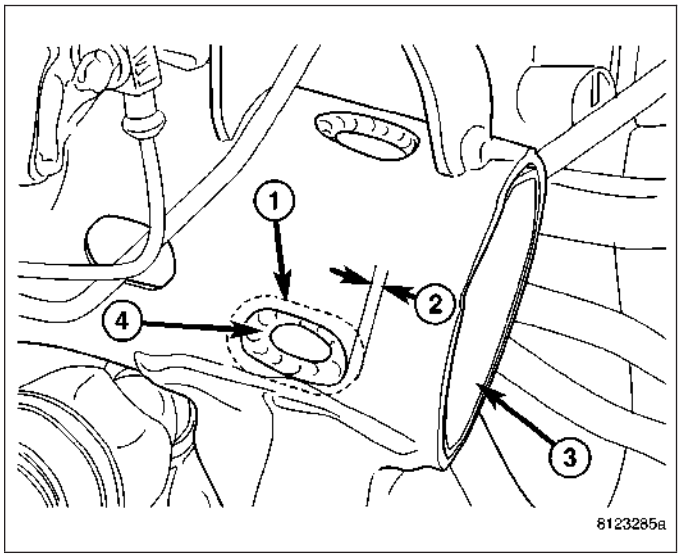
7. Using a reciprocating saw (2) or equivalent, carefully cut and remove the damaged frame rail tip behind the stop bracket (1).



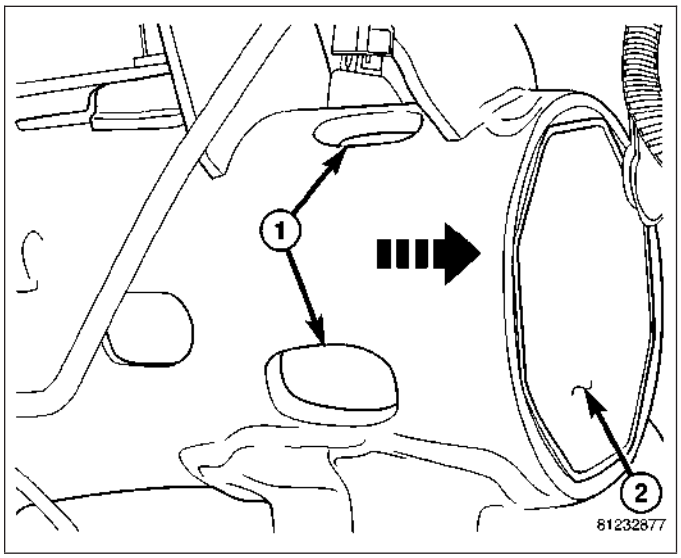
8. Remove the brake lines as necessary, to gain access to the upper fillet welds. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/BRAKE LINES - REMOVAL)
9. For the right side rail tip, remove the oil filter to gain access to the inner fillet weld.
10. Remove the four puddle welds attaching the remaining frame tip section (2) to the frame (1) at the locations indicated. (Right side shown, left side similar.)



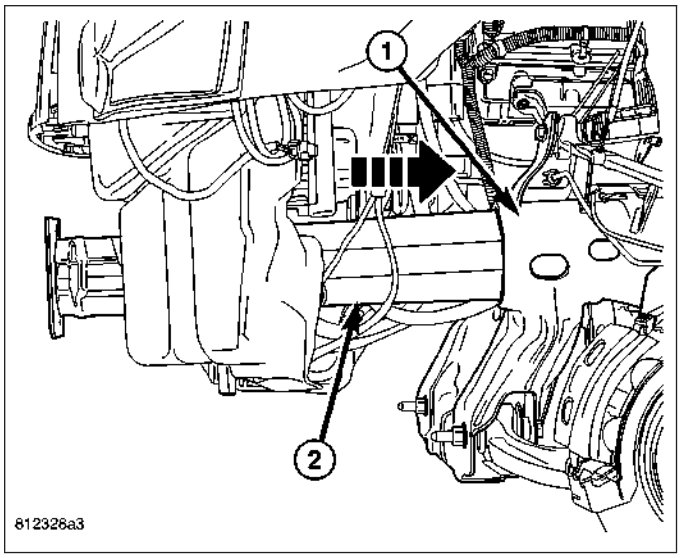
11. Using a plasma cutter, remove the welds (4) by cutting along the outside edge of the weld (1) approximately 1/8 in. (2).



12. With the puddle welds (1) removed, remove the remaining piece of the frame tip (2) from within the frame rail and discard.
13. Smooth and square the cut edges of the original frame.
14. Remove any burrs at the holes (1) and frame edges.



15. Dry fit the new rail (2) to verify alignment, fit and make any adjustments as necessary.
16. Remove all internal and external OEM e-coat within 51 mm (2.0 in.) of the weld joint on the replacement tip and the existing frame rail.



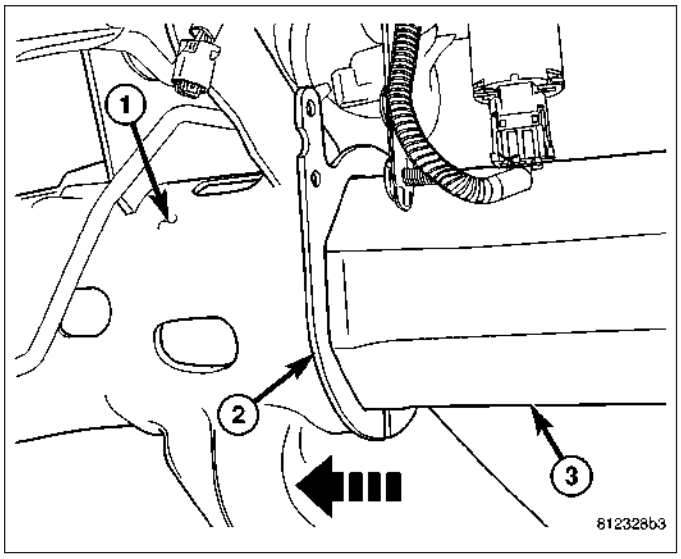
NOTE: Any burned surface coatings will need to be removed prior to application of corrosion preventative coatings.

CAUTION: Shield the surrounding area and components from exposure to the welding spatter and heat.

17. Loosely install the lower FESM insulator and cab mounting bolt.
18. Position the stop bracket (2) against the frame rail (1).

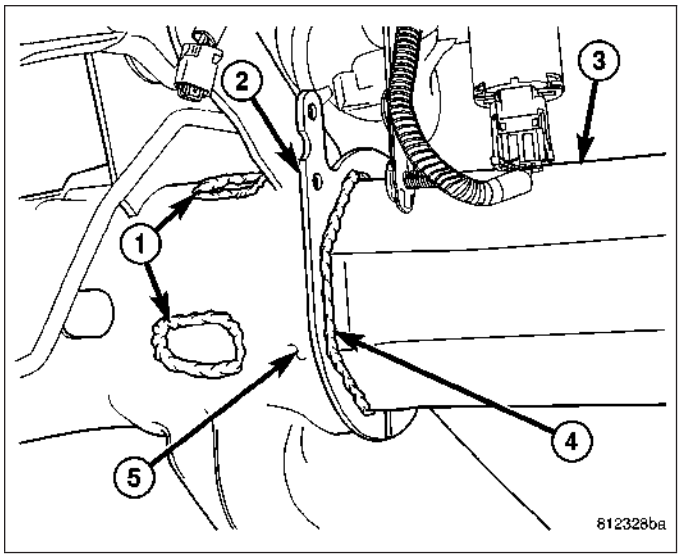
NOTE: If replacing the drivers's side tip, the stop bracket mounting tab will not be utilized. The stop bracket may be rotated about the narrow end of the trip and repositioned so interference of tab with other parts is avoided. The mounting tab my also be cut off.

NOTE: If replacing the passenger's side tip, the stop bracket mounting tab may be utilized if the vehicle is equipped with optional rear AC system.



19. Using the appropriate measuring equipment, verify the front end sheet metal bracket's location in all three (X,Y, and Z) planes of space, and adjust if required. (Refer to 13 - FRAME & BUMPERS/FRAME - SPECIFICATIONS - FRAME DIMENSION)

CAUTION: Shield the surrounding area and components from exposure to the welding spatter and heat.



20. When correctly fitted, tack the three upper ring fillet welds (1) to hold the tip (3) in position, then complete the ring fillet welds (1).

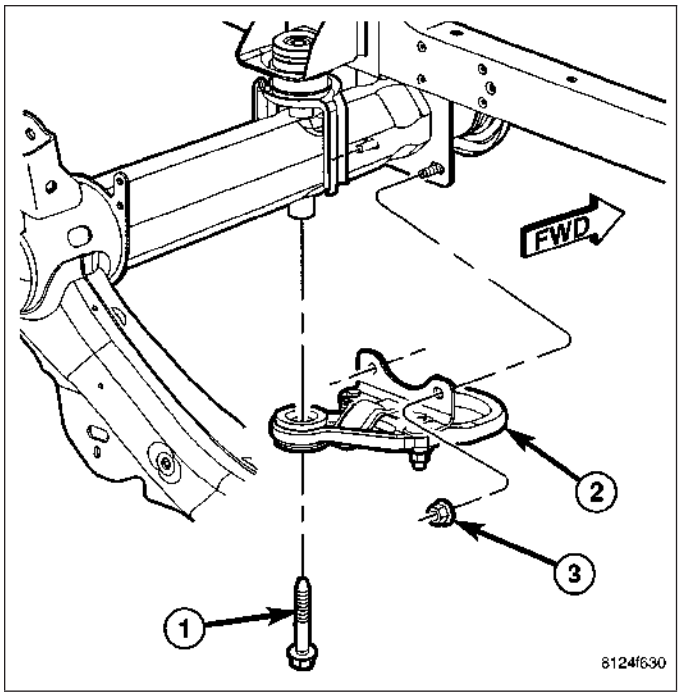
NOTE: Ring-fillet welds may be filled in with weld material if an improved cosmetic appearance is desired.

21. Confirm alignment of the replacement frame rail tip.
22. Final welding should be performed in a skip (stitch) type method to minimize the heat buildup and frame distortion, utilizing the Weld Process Specifications at the end of this section. The preferred method is GMAW (MIG). (Refer to 13 - FRAME & BUMPERS/FRAME - SPECIFICATIONS - WELDING)
    a. Apply root pass welds to the root joint (5) behind the stop bracket (2), one quadrant at a time, switching to the opposite side of the frame for each quadrant.
    b. Apply root pass welds to the root joint in front (4) of the stop bracket (2), one quadrant at a time, switching to the opposite side of the frame for each quadrant.
    c. Clean the welds of any flux and other impurities before proceeding with the cover pass welds.
    d. Apply the cover pass welds in the same manner as described above.
23. Confirm alignment of the replacement frame rail tip.

NOTE: Any burned surface coatings will need to be removed prior to application of corrosion preventative coatings.

24. Dress the welded area and apply corrosion resistant coatings inside and out.
    a. Apply etch-primer to the inside of the frame rail repair area.
    b. Inside the rail, inject a creeping wax based rust inhibitor compound through the existing holes in the frame ensuring 100% coverage including the space between the original frame rail and the reinforcing sleeve.
    c. Apply a durable top coat to the outside of the repair area.

25. Install the tow hook assembly (2), if equipped, and install the two lower bumper support nuts (3).
26. Tighten the nuts (3) to 109 N·m (80 ft. lbs.).
27. Install the front body mount bolt (1) and tighten to 81 N·m (60 ft. lbs.).



28. Install the front bumper. (Refer to 13 - FRAME & BUMPERS/BUMPERS/FRONT BUMPER - INSTALLATION)
29. Install the front wheelhouse splash shield. (Refer to 23 - BODY/EXTERIOR/FRONT WHEELHOUSE SPLASH SHIELD - INSTALLATION)

HYDROFORM FENDER RAIL REPAIR

CAUTION: This repair procedure assumes damage to the right or left hydroform fender rail. Prior to any repairs, the vehicle must be mounted on the appropriate frame repair equipment ("frame rack"), checked with three dimensional measuring equipment, and necessary pull corrections made. If damage exists in the hydroform fender rail, or cab beyond the area covered by this service procedure after dimensional corrections are made, the hydroform must be replaced in its entirety. Refer to 23 - BODY/BODY STRUCTURE/ WELD LOCATIONS - SPECIFICATIONS, when replacing the entire hydroform.

CAUTION: Inspect the tire winch assembly for damage. If any one or more of the following are evident, replace the winch assembly.
- **Indications of cracked or bulging plastic.**
- **Housing flanges are bent or cracked.**
- **If winch was loose before repair.**
- **If the rivet heads are separated from the housing in any way.**

1. Before proceeding with this repair procedure review the required service warnings and precautions. (Refer to 13 - FRAME & BUMPERS/FRAME - WARNING)
2. Disconnect and isolate the battery negative cable.
3. Remove the front wheelhouse splash shield. (Refer to 23 - BODY/EXTERIOR/FRONT WHEELHOUSE SPLASH SHIELD - REMOVAL)
4. Remove the fender. (Refer to 23 - BODY/EXTERIOR/FRONT FENDER - REMOVAL)
5. Remove the A/C condenser, if required. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/A/C CONDENSER - REMOVAL)
6. Remove the A/C lines, if required. Refer to the Heating and Air Conditioning section of the manual for recommended procedures.

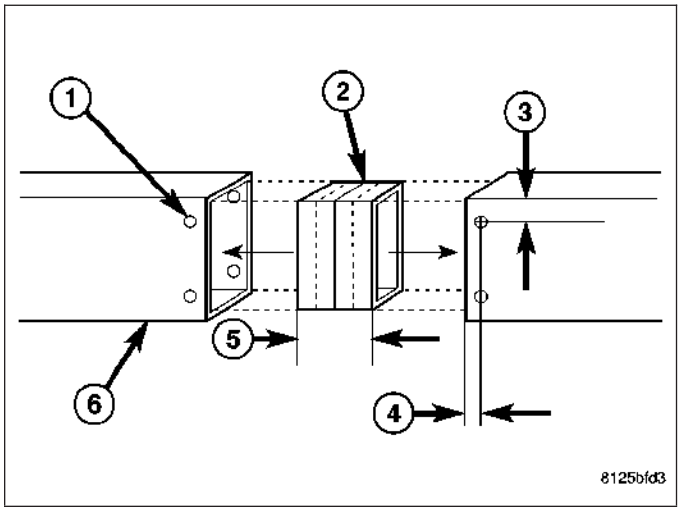
7. Remove the radiator assembly. (Refer to 7 - COOLING/ENGINE/RADIATOR - REMOVAL)
8. Remove the air cleaner and support bracket, if required. (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER ELEMENT - REMOVAL)
9. Remove the integrated power module. (Refer to 8 - ELECTRICAL/POWER DISTRIBUTION/INTEGRATED POWER MODULE - REMOVAL)
10. Remove the bolts and position aside the wire harness and grounds, if required.
11. Remove the upper radiator crossmember. (Refer to 23 - BODY/EXTERIOR/UPPER RADIATOR CROSSMEMBER - REMOVAL)
12. Remove the headlamp unit. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HEADLAMP UNIT - REMOVAL)
13. Remove the front cab mount to the Front End Sheet Metal bracket (FESM) bolt.
14. Remove the bolts attaching the lower radiator crossmember to the hydroform fender rail.

CAUTION: Do not use any flame or plasma cutting equipment to cut the frame in this procedure. The inaccurate and high temperatures achieved during flame or plasma cutting will change the metal characteristics and may weaken the frame and/or repair location.

15. Using a reciprocating saw or equivalent, cut the fender rail and shotgun at a straight and square section of the hydroform and remove.
16. Smooth and square the cut edges.
17. Using the damaged structure as a reference cut the service part at the same location as the first cut. Smooth and square the cut edges.

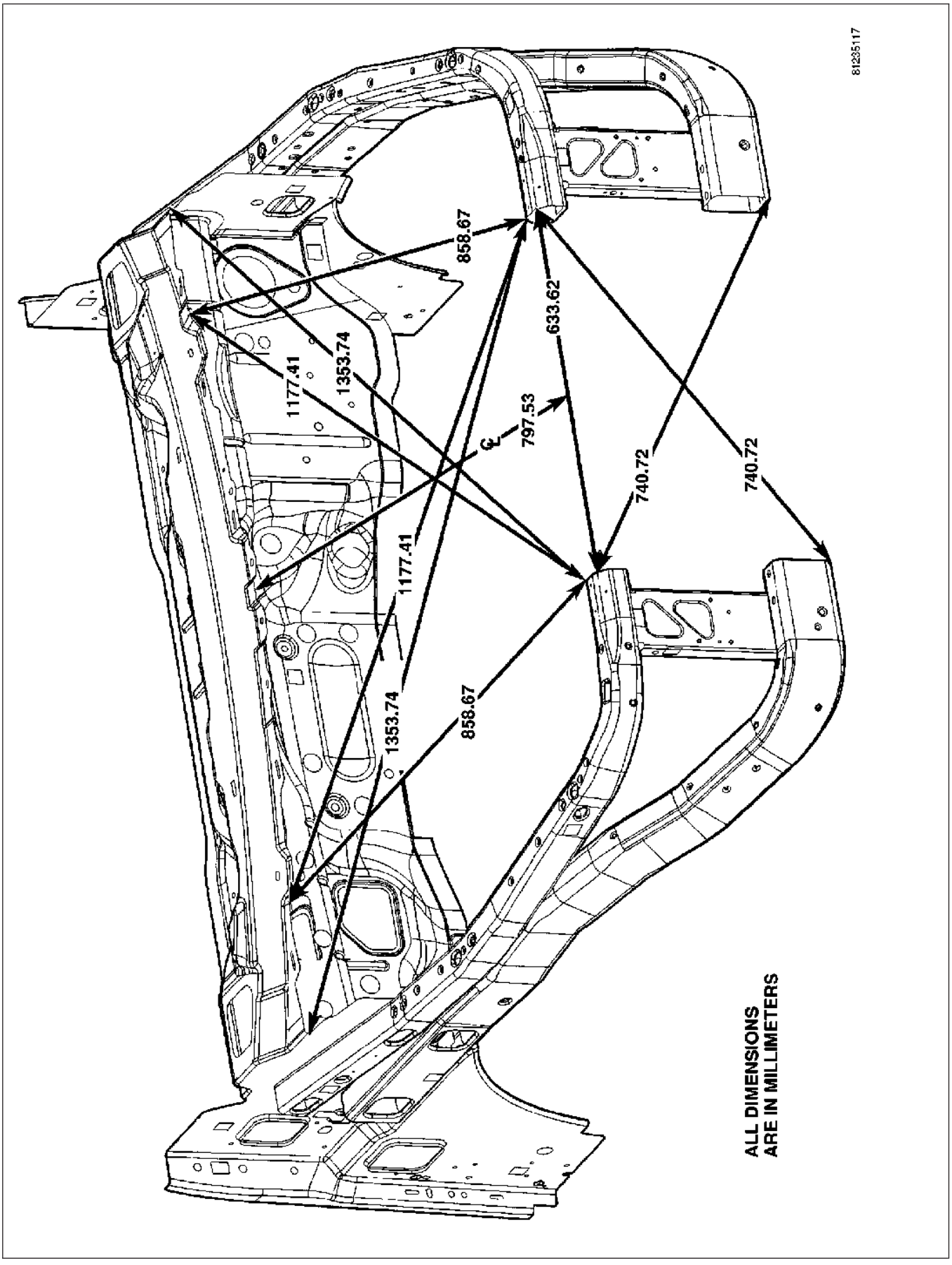
NOTE: The repair structure should butt up to the remaining structure and provide the same overall vehicle geometry.

18. Fabricate 51 mm (2.0 in.) long repair inserts (5) using scrap from the old structure or the replacement part. It will be necessary to split the inserts on each of their four sides to fit into the hydroform.
19. Remove any paint or e-coat from the inserts and also to the interior and exterior of the hydroforms.
20. Cut plug weld holes (1) as described below.
    - On the upper rail, cut one 13 mm (0.5 in.) hole (1) on each side of the rail, 25 mm (1.0 in.) from the butt joint of the tubes (4).
    - On the lower rail, cut one 13 mm (0.5 in.) hole (1) on the top and bottom sides of the rail 25 mm (1.0 in.) from the butt joint of the tube (4).
    - On the lower rail, cut two 13 mm (0.5 in.) holes (1) on the inner and outer sides of the rail 25 mm (1.0 in.) from the butt joint of the tube (4).



CAUTION: Shield the surrounding area and components from exposure to the welding spatter and heat.

21. Install the insert (2) 1” into the replacement part (6) and tack into place with a weld. (Refer to 13 - FRAME & BUMPERS/FRAME - SPECIFICATIONS - WELDING)


81235117
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633.62
1353.74
1177.41
797.53
740.72
740.72
1177.41
1353.74
858.67
ALL DIMENSIONS
ARE IN MILLIMETERS

22. Insert the service part into place and using the appropriate measuring equipment, verify the front end sheet metal bracket's location in all three (X,Y, and Z) planes of space.

23. Complete all 360° plug welds.

NOTE: Before the final welding, use three dimensional measuring equipment to ensure the part is in the correct location. Verify that tap plate extrusion at the bottom of the vertical post lines up with the isolator and hole in the frame perch mount. Also ensure the lower radiator closure tube is bolted into the forward shotgun ends.

24. Complete welding by making a 360° butt weld around the fender rails.
25. Metal finish the exposed welds on the hydroforms.
26. Dress the welded area and apply corrosion resistant coatings inside and out.
    a. Inside the rail, inject a creeping wax based rust inhibitor compound to the inside of the hydroforms ensuring 100% coverage including the mating face between the fender rail sections and insert such that corrosion protection is restored in the internal cavity.
    b. Apply a durable top coat to the outside of the repair area.
27. Install the front cab mount bolt if previously removed and tighten to 81 N·m (60 ft. lbs.).
28. Install the lower radiator crossmember bolts and tighten to 28 N·m (21 ft. lbs.).
29. Install the headlamp unit. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HEADLAMP UNIT - INSTALLATION)
30. Install the upper radiator crossmember. (Refer to 23 - BODY/EXTERIOR/UPPER RADIATOR CROSSMEMBER - INSTALLATION)
31. Install the wire harness and ground if previously removed and install the bolts.
32. Install the integrated power module, if previously removed. (Refer to 8 - ELECTRICAL/POWER DISTRIBUTION/ INTEGRATED POWER MODULE - INSTALLATION)
33. Install the air cleaner bracket and air cleaner, if previously removed. (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER ELEMENT - INSTALLATION)
34. Install the radiator assembly. (Refer to 7 - COOLING/ENGINE/RADIATOR - INSTALLATION)
35. Install the A/C lines, if previously removed. Refer to the Heating and Air Conditioning section of the manual for the recommended procedures.
36. Install the A/C condenser, if previously removed. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/ A/C CONDENSER - INSTALLATION)
37. Install the fender. (Refer to 23 - BODY/EXTERIOR/FRONT FENDER - INSTALLATION)
38. Install the front wheelhouse splash shield. (Refer to 23 - BODY/EXTERIOR/FRONT WHEELHOUSE SPLASH SHIELD - INSTALLATION)
39. Reconnect the battery ground.

SPECIFICATIONS

WELD PROCESS

CAUTION: All welds should conform to DaimlerChrysler vehicle engineering process standard “ps 9472”.

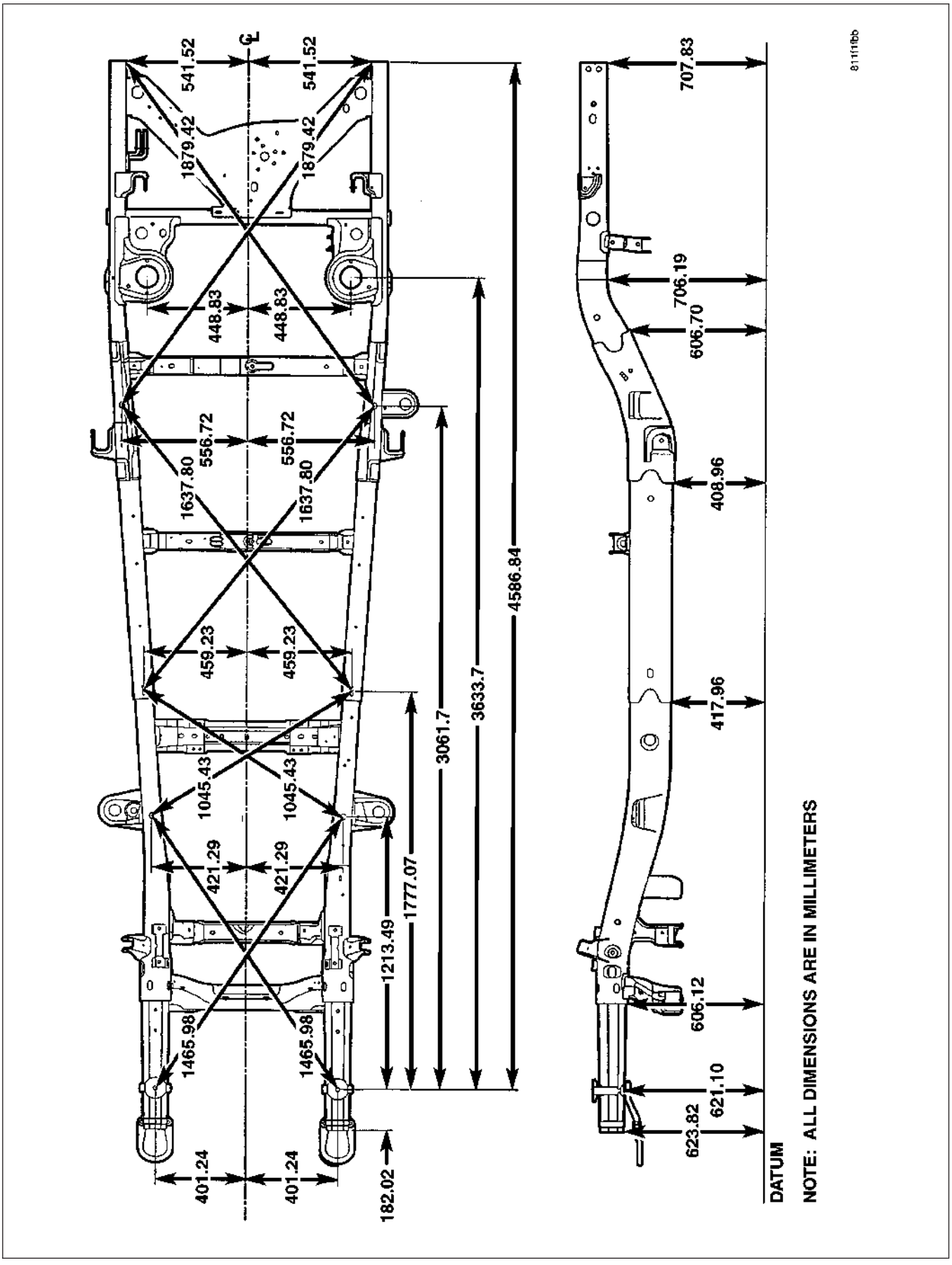
WELDING PARAMETERS

WELDING PROCESS	FLUX CORED ARC	GAS METAL ARC (MIG)*	SHIELDED METAL ARC (STICK)
Material Thickness	3.7 mm to 4.2 mm	3.7 mm to 4.2 mm	3.7 mm to 4.2 mm
Electrode Type	Lincoln Electrical Co. Product #: NR-211 MP **(Do Not Substitute)**	AWS ER70S-3 **(Do Not Substitute)**	** AWS E 7018
Electrodes Size Inches	.045 Tubular	.035 Solid	3/32″
Electrode Stick Out	3/8″ - 1/2″	1/2″ - 5/8″	N/A
Polarity	Electrode ″-″ Work Piece ″+″	Electrode ″+″ Work Piece ″-″	Electrode ″+″ Work Piece ″-″
Shielding Gas	Self Shielded	75% Ar 25% CO2	Self Shielded
Gas Flow Rate	N/A	25 - 35 CFM	N/A
Wire Feed Speed (inches per minute)	110 - 130 Vertical Down 70 - 90 Flat & Overhead	245 - 250 Vertical Down 210 - 225 Flat & Overhead	N/A
Approximate Amperage			
Vertical	110 - 130	175	85 (3/32″ Diameter)
Flat & Overhead	70 - 90	155	90 (3/32″ Diameter)
Voltage	15 - 18	19 - 20	N/A
Direction of Welding			
Vertical	Vertical Down Hill (only)	Vertical Down Hill (only)	Vertical - Up Hill (only)
Flat & Overhead	Flat - Push or Drag	Flat - Push or Drag	Flat - Drag

***First choice - Gas Metal Arc Welding Process:** Butt joints - apply two layers (passes) of weld metal. First pass should only fill approximately ½ the thickness. Vertical position welds - maintain electrode wire at leading edge of weld puddle while traveling down hill to produce maximum penetration into the sleeve. These techniques work for FCAW as well.

****E7018** new electrodes may be exposed to the atmosphere for up to ten hours with no harmful effect. Reconditioning schedules should come from the manufacturer.

FRAME DIMENSIONS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1777.07
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3633.7
4586.84
707.83
706.19
606.70
408.96
417.96
606.12
621.10
623.82
DATUM
NOTE: ALL DIMENSIONS ARE IN MILLIMETERS

Frame dimensions are listed in metric scale. All dimensions are from center to center of Principal Locating Point (PLP), or from center to center of PLP and fastener location.

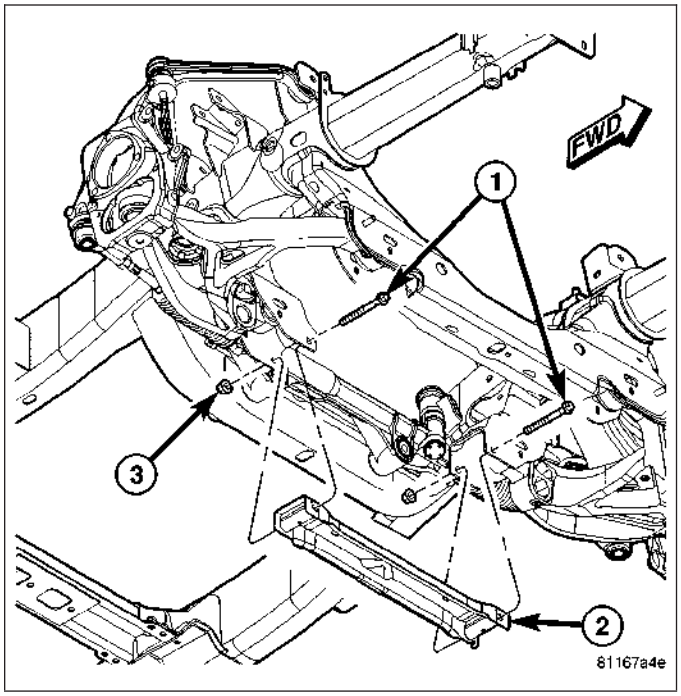
VEHICLE PREPARATION

Position the vehicle on a frame alignment rack, refer to instructions provided with equipment being used. Adjust the vehicle PLP heights to the specified dimension above the work surface (datum line). Vertical dimensions can be taken from the datum line to the locations indicated were applicable.

CROSSMEMBER-UNDERBODY

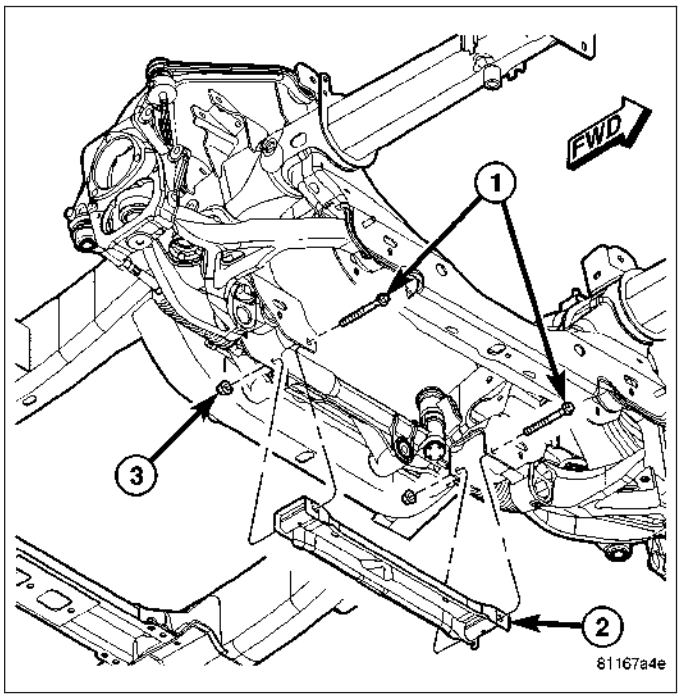
REMOVAL

1. Raise and support the vehicle.
2. Remove the bolts (1) and nuts (3) and remove the crossmember (2).



INSTALLATION

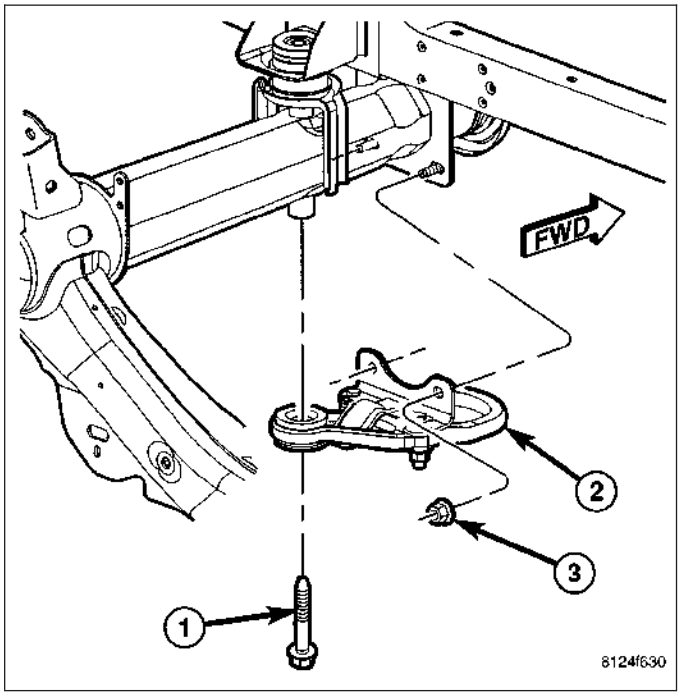
1. Install the crossmember (2).
2. Install the bolts (1) and nuts (3).
3. Tighten the bolts and nuts to 102 N·m (75 ft. lbs.).



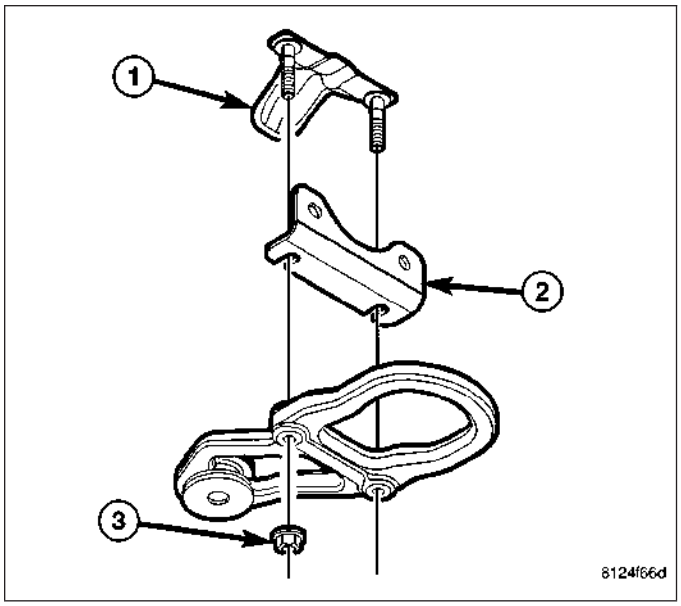
HOOK-TOW

REMOVAL

1. Remove the front body mount bolt (1).

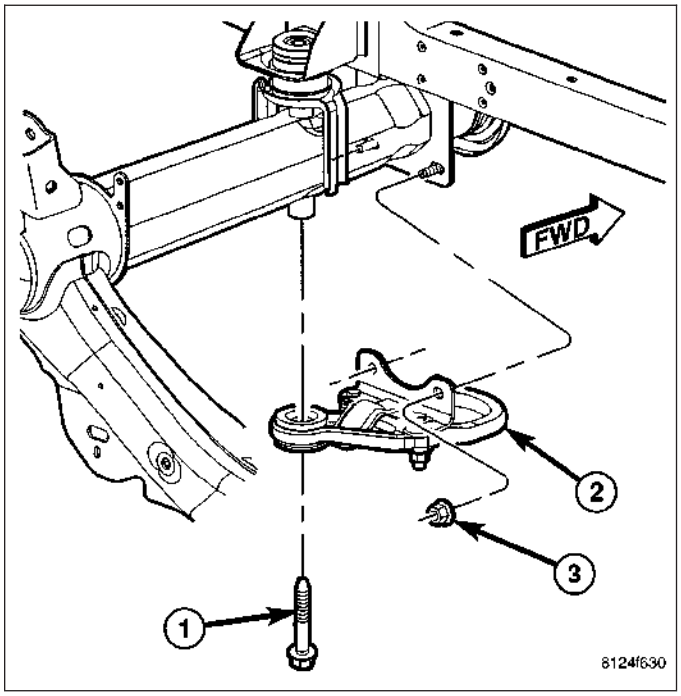


2. Remove the nuts (3) and remove the tow hook.

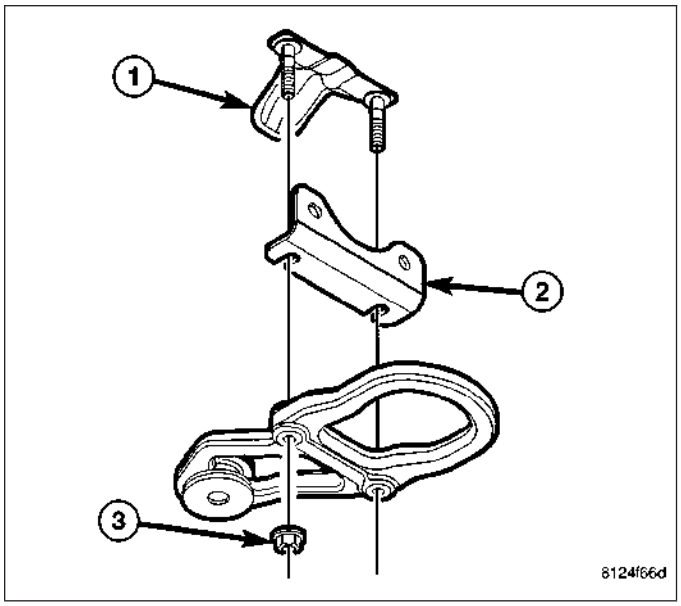


INSTALLATION

1. Install the support brackets and install the bumper support nuts (3).
2. Tighten the nuts (3) to 109 N·m (80 ft. lbs.).
3. Install the front body mount bolt (1) and tighten to 81 N·m (60 ft. lbs.).



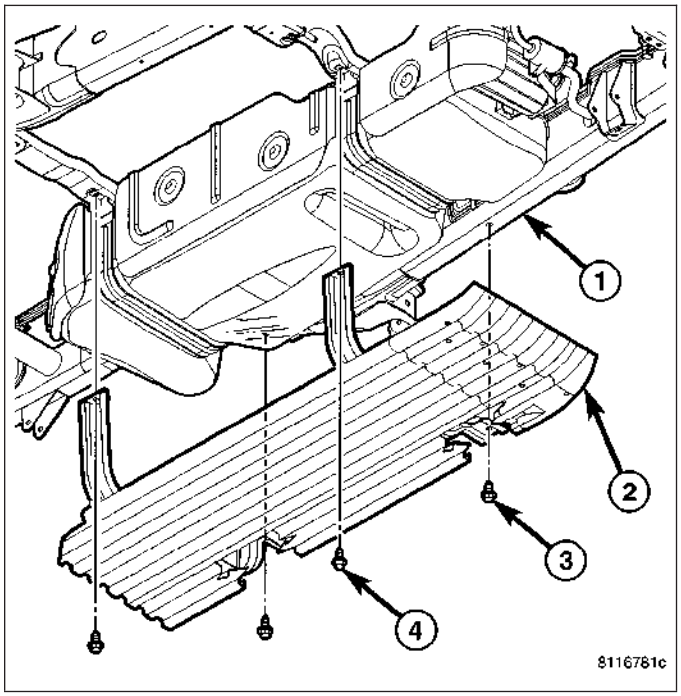
4. Install the support bracket (2) nuts (3) and tighten to 109 N·m (80 ft. lbs.).



SKID PLATE-FUEL TANK

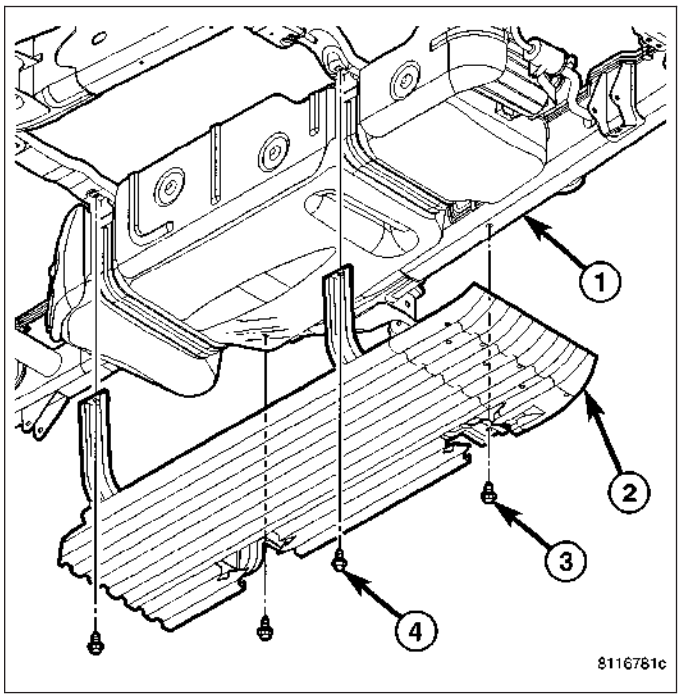
REMOVAL

1. Raise and support the vehicle.
2. Support the skid plate with a suitable lifting device.
3. Remove inboard bolts (4).
4. Remove bolts (3) that attach skid plate to frame side rail and remove the skid plate.



INSTALLATION

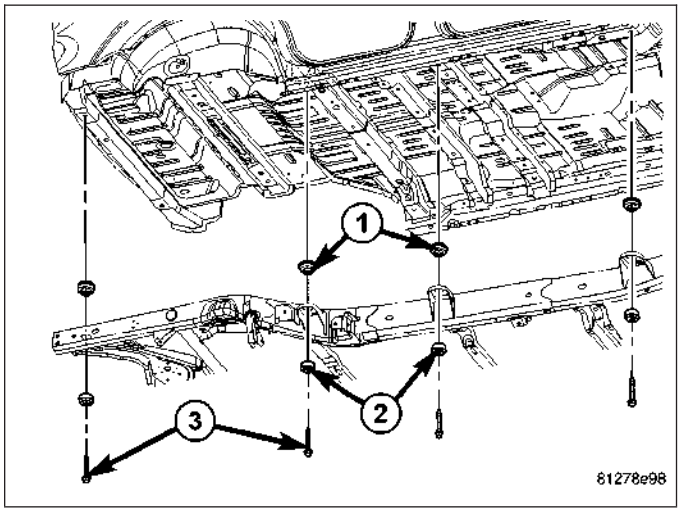
1. Position and support skid plate under fuel tank.
2. Install inboard bolts and tighten to 41 N·m (30 ft. lbs.).
3. Install bolts attaching skid plate to frame side rail and tighten to 37 N·m (27 ft. lbs.).



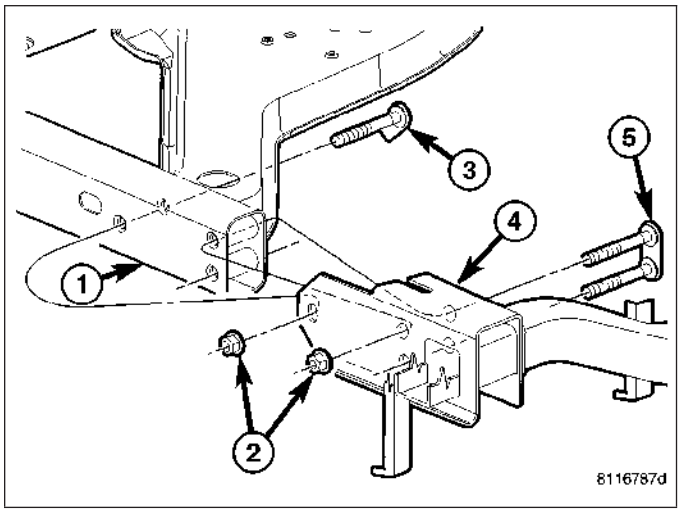
RECEIVER KIT-TRAILER TOW

REMOVAL

1. Remove the rear bumper. (Refer to 13 - FRAME & BUMPERS/BUMPERS/REAR BUMPER - REMOVAL)
2. Remove the rear cab to frame bolts (3) and rebound cushions (2) to remove the front hitch bolt.

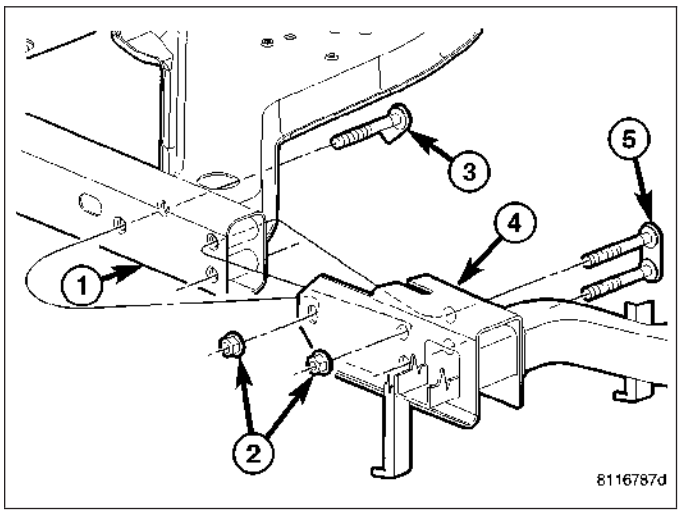


3. Support trailer hitch on a suitable lifting device.
4. Disconnect the trailer electrical wiring electrical connector.
5. Remove the bolts (3 and 5) and nuts (2) attaching trailer hitch (4) to frame rails (1).
6. Separate trailer hitch (4) from vehicle.

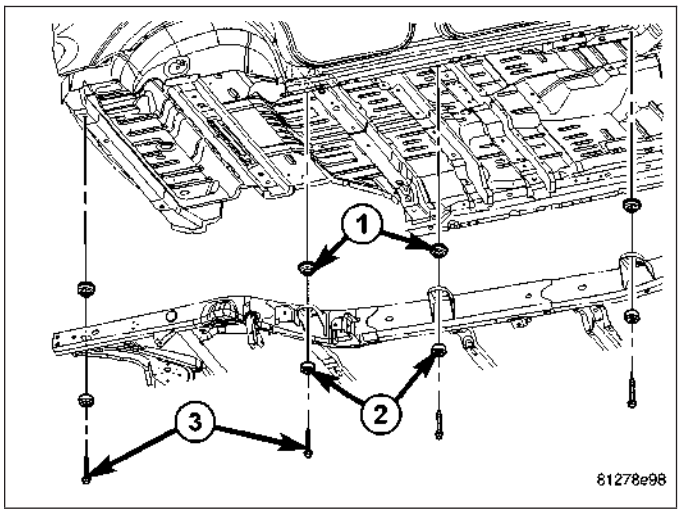


INSTALLATION

1. Position trailer hitch on vehicle.
2. Install the bolts and nuts (2, 3 and 5) attaching trailer hitch to frame rail and tighten to 183 N·m (135 ft. lbs.).
3. Connect the trailer wiring electrical connector.



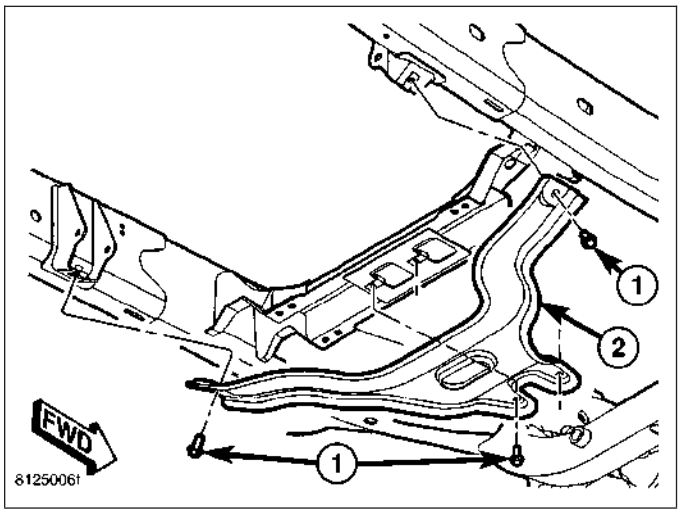
4. Install the rear body rebound cushions (2) and cab mounting bolts (3) and tighten to 81 N·m (60 ft. lbs.).
5. Install the rear bumper. (Refer to 13 - FRAME & BUMPERS/BUMPERS/REAR BUMPER - INSTALLATION)



SKID PLATE-TRANSFER CASE

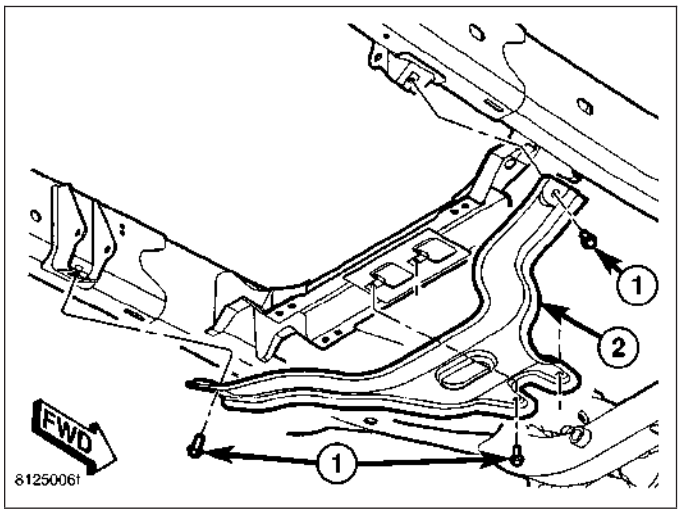
REMOVAL

1. Remove the bolts (1) and remove the skid plate (2).



INSTALLATION

1. Position the skid plate (2) on the vehicle.
2. Install the bolts (1) and tighten to 23 N·m (17 ft. lbs.).



FUEL SYSTEM

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FUEL DELIVERY

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FUEL DELIVERY

STANDARD PROCEDURE - FUEL SYSTEM PRESSURE RELEASE

Use following procedure if the fuel injector rail is, or is not equipped with a fuel pressure test port.

1. Remove fuel fill cap.
2. Remove fuel pump relay from Power Distribution Center (PDC). For location of relay, refer to label on underside of PDC cover.
3. Start and run engine until it stalls.
4. Attempt restarting engine until it will no longer run.
5. Turn ignition key to OFF position.

CAUTION: Steps 1, 2, 3 and 4 must be performed to relieve high pressure fuel from within fuel rail. Do not attempt to use following steps to relieve this pressure as excessive fuel will be forced into a cylinder chamber.

6. Unplug connector from any fuel injector.
7. Attach one end of a jumper wire with alligator clips (18 gauge or smaller) to either injector terminal.
8. Connect other end of jumper wire to positive side of battery.
9. Connect one end of a second jumper wire to remaining injector terminal.

CAUTION: Powering an injector for more than a few seconds will permanently damage the injector.

10. Momentarily touch other end of jumper wire to negative terminal of battery for no more than a few seconds.
11. Place a rag or towel below fuel line quick-connect fitting at fuel rail.
12. Disconnect quick-connect fitting at fuel rail. Refer to Quick-Connect Fittings.
13. Return fuel pump relay to PDC.
14. One or more Diagnostic Trouble Codes (DTC's) may have been stored in PCM memory due to fuel pump relay removal. A diagnostic scan tool must be used to erase a DTC.

SPECIFICATIONS

FUEL SYSTEM PRESSURE

58 psi +/- 2 psi

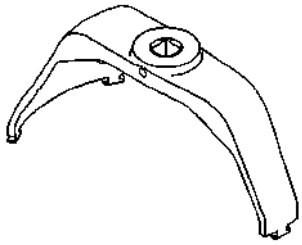
TORQUE - FUEL SYSTEM

DESCRIPTION	N-m	Ft. Lbs.	In. Lbs.
Accelerator Pedal Bracket Mounting	12	-	105
Accelerator Pedal Position Sensor Mounting Nuts - 5.7L	3	-	30
Crankshaft Position Sensor - 3.7L	28	21	-
Crankshaft Position Sensor - 4.7L	28	21	-
Crankshaft Position Sensor - 5.7L	12	-	105 (+/-20)
Camshaft Position Sensor - 3.7L	12	-	106
Camshaft Position Sensor - 4.7L	12	-	106
Camshaft Position Sensor - 5.7L	12	9	105 (+/-) 20
Engine Coolant Temperature Sensor - 3.7L	11	-	96
Engine Coolant Temperature Sensor - 4.7L	11	-	96

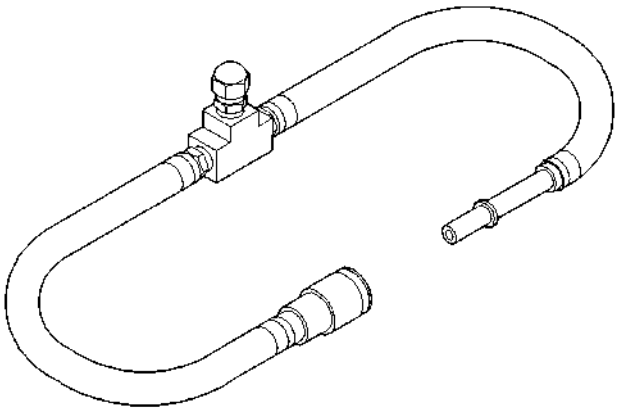
DESCRIPTION	N-m	Ft. Lbs.	In. Lbs.
Engine Coolant Temperature Sensor - 5.7L	11	-	96
Fuel Filler Hose Clamp	3	-	30
Fuel Filler Housing-to-Body Screws	2	-	17
Fuel Rail Mounting Bolts - 3.7L	11	-	100
Fuel Rail Mounting Bolts - 4.7L	11	-	100
Fuel Rail Mounting Bolts - 5.7L	11	-	100
Fuel Tank Mounting Straps	41	30	-
IAC Motor Mounting Screws - 3.7L	7	-	60
IAC Motor Mounting Screws - 4.7L	7	-	60
NVLD Pump Mounting Bolt	8.5	-	75
Map Sensor Mounting Screws - 3.7L	3	-	25
Map Sensor Mounting Screws - 4.7L	3	-	25
PCM-to-Mounting Bracket Mounting Screws	4	-	35
Power Steering Pressure Switch - 3.7L	14-22	-	124-195
Power Steering Pressure Switch - 4.7L	14-22	-	124-195
TPS Mounting Screws - 3.7L	7	-	60
TPS Mounting Screws - 4.7L	7	-	60
Throttle Body Mounting Bolts - 3.7L	11	-	100
Throttle Body Mounting Bolts - 4.7L	12	-	105
Throttle Body Mounting Bolts - 5.7L	12	-	105
Oxygen Sensors	30	22	-

SPECIAL TOOLS

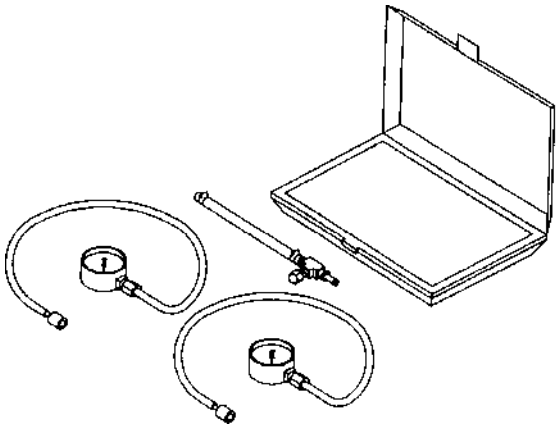
FUEL SYSTEM



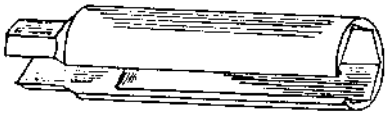
LOCKRING REMOVER/INSTALLER #9340



ADAPTERS, FUEL PRESSURE TEST - #6539 AND/OR #6631



TEST KIT, FUEL PRESSURE #5069



O2S (OXYGEN SENSOR) REMOVER/INSTALLER - #C-4907

SENSOR-FUEL LEVEL SENDING UNIT

DESCRIPTION

Refer to Fuel Pump Module for information.

LINES, FUEL

DESCRIPTION

Also refer to Quick-Connect Fittings.

WARNING: THE FUEL SYSTEM MAY BE UNDER A CONSTANT PRESSURE (EVEN WITH THE ENGINE OFF). BEFORE SERVICING ANY FUEL SYSTEM HOSES, FITTINGS, LINES, OR MOST COMPONENTS, FUEL SYSTEM PRESSURE MUST BE RELEASED. REFER TO THE FUEL SYSTEM PRESSURE RELEASE PROCEDURE.

The lines/tubes/hoses used on fuel injected vehicles are of a special construction. This is due to the higher fuel pressures and the possibility of contaminated fuel in this system. If it is necessary to replace these lines/tubes/hoses, only those marked EFM/EFI may be used.

If equipped: The hose clamps used to secure rubber hoses on fuel injected vehicles are of a special rolled edge construction. This construction is used to prevent the edge of the clamp from cutting into the hose. Only these rolled edge type clamps may be used in this system. All other types of clamps may cut into the hoses and cause high-pressure fuel leaks.

Use new original equipment type hose clamps.

FITTING, QUICK CONNECT

DESCRIPTION

Different types of quick-connect fittings are used to attach the various fuel system components, lines and tubes. These are: a single-button type, a two-button type, a pinch type, a single-tab type, a two-tab type or a plastic retainer ring type. Some are equipped with safety latch clips. Some may require the use of a special tool for disconnection and removal. Refer to Quick-Connect Fittings Removal/Installation for more information.

CAUTION: Before separating a quick-connect fitting, pay attention to what type of fitting is being used by referring to Quick-Connect Fitting Removal. This will prevent unnecessary fitting or fitting latch breakage.

CAUTION: The interior components (o-rings, clips) of quick-connect fittings are not serviced separately, but new plastic spacers and latches are available for some types. If service parts are not available, do not attempt to repair the damaged fitting or fuel line (tube). If repair is necessary, replace the complete fuel line (tube) assembly.

STANDARD PROCEDURE - QUICK-CONNECT FITTINGS

Different types of quick-connect fittings are used to attach the various fuel system components, lines and tubes. These are: a single-button type, a two-button type, a pinch type, a single-tab type, a two-tab type or a plastic retainer ring type. Some are equipped with safety latch clips. Some may require the use of a special tool for disconnection and removal.

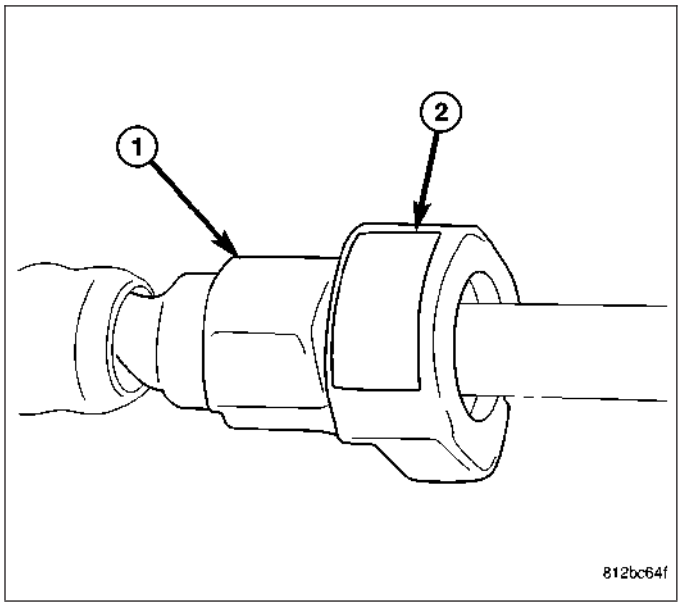
DISCONNECTING

WARNING: THE FUEL SYSTEM IS UNDER A CONSTANT PRESSURE (EVEN WITH ENGINE OFF). BEFORE SERVICING ANY FUEL SYSTEM HOSE, FITTING OR LINE, FUEL SYSTEM PRESSURE MUST BE RELEASED. REFER TO FUEL SYSTEM PRESSURE RELEASE PROCEDURE.

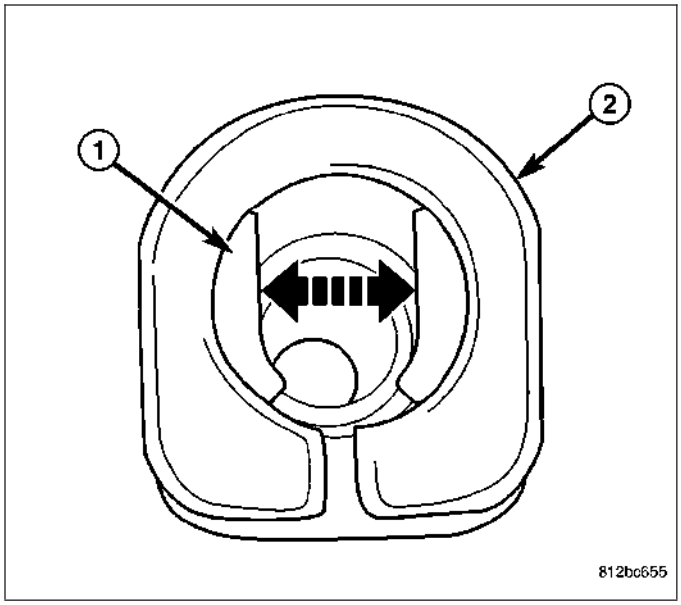
CAUTION: Before separating a quick-connect fitting, pay attention to what type of fitting is being used by referring to Quick-Connect Fitting Removal. This will prevent unnecessary fitting or fitting latch breakage.

CAUTION: The interior components (o-rings, clips) of quick-connect fittings are not serviced separately, but new plastic spacers and latches are available for some types. If service parts are not available, do not attempt to repair the damaged fitting or fuel line (tube). If repair is necessary, replace the complete fuel line (tube) assembly.

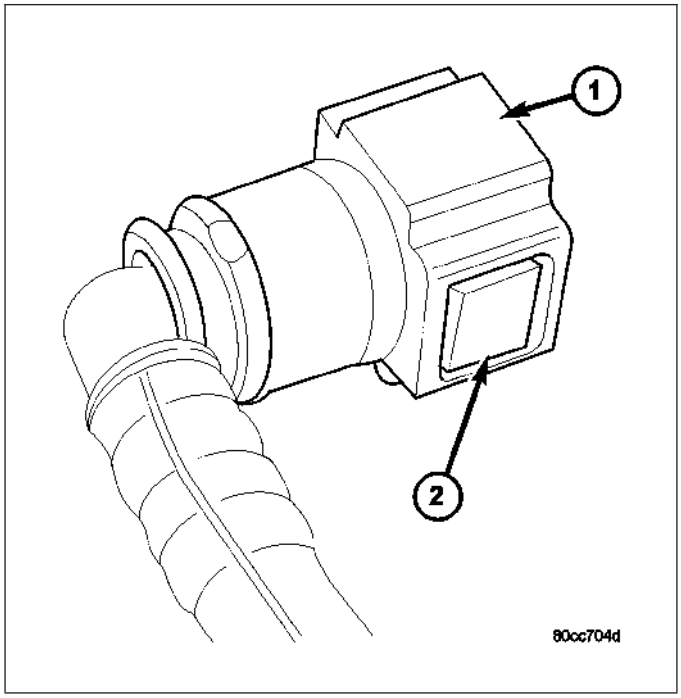
1. Perform fuel pressure release procedure. Refer to Fuel Pressure Release Procedure.
2. Disconnect negative battery cable from battery.
3. Clean fitting of any foreign material before disassembly.
4. **Single–Button Type Fitting:** This type of fitting is equipped with a single push-button (2) located on the quick-connect fitting.



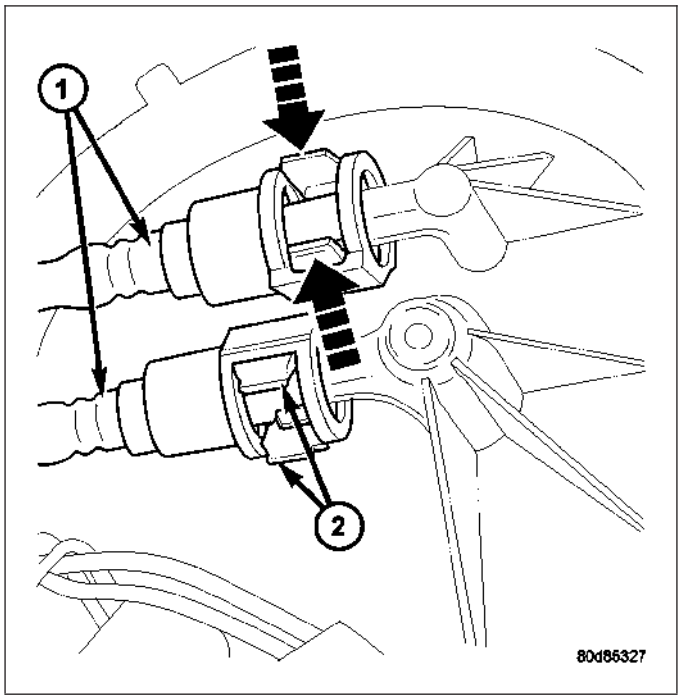
5. The push-button is attached to two internal latches (1). To disconnect, press on push-button with your thumb and unlatch fitting from fuel line. Special tools are not required for disconnection. **DO NOT ATTEMPT TO PRY OR PULL UP ON PUSH-BUTTON. LATCHES WILL BE BROKEN.**



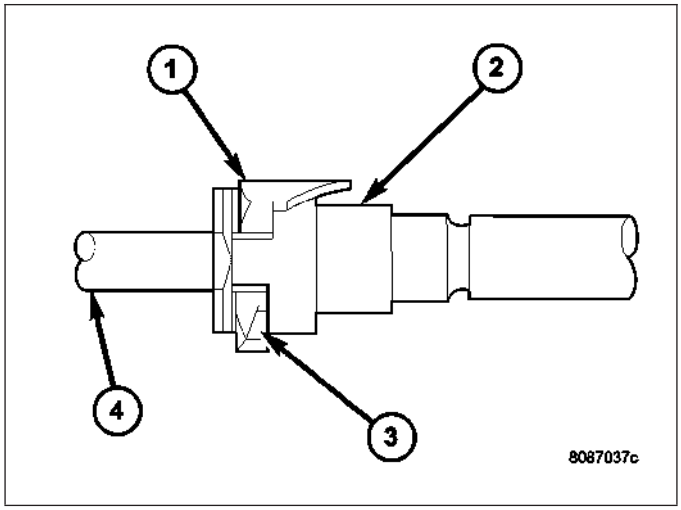
6. Perform fuel pressure release procedure. Refer to Fuel Pressure Release Procedure.
7. Disconnect negative battery cable from battery.
8. Clean fitting of any foreign material before disassembly.
9. **2–Button Type Fitting:** This type of fitting (1) is equipped with a push-button located on each side of quick-connect fitting (2). Press on both buttons simultaneously for removal. Special tools are not required for disconnection.



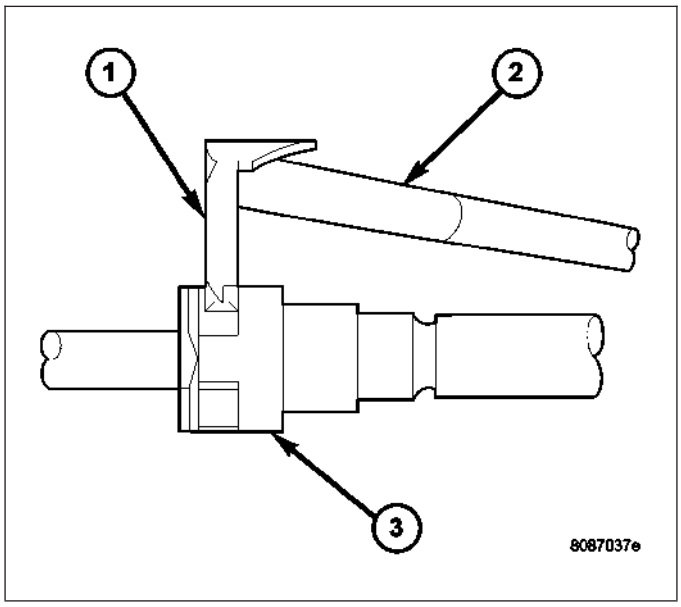
10. **Pinch-Type Fitting:** This fitting (1) is equipped with two finger tabs (2). Pinch both tabs together while removing fitting. Special tools are not required for disconnection.



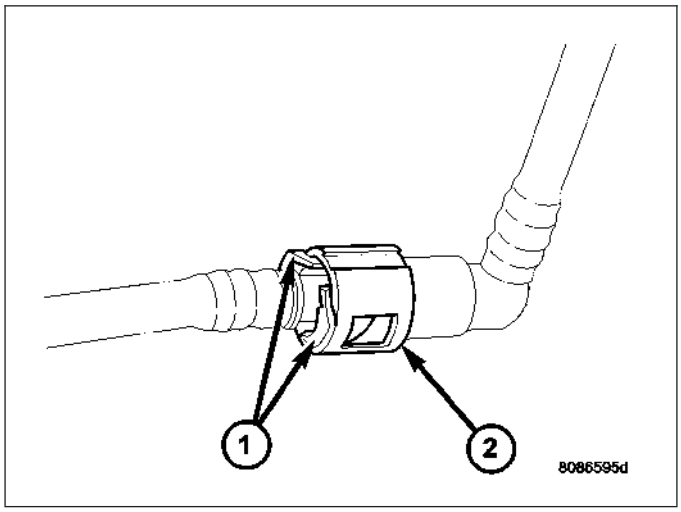
11. **Single-Tab Type Fitting:** This type of fitting (3) is equipped with a single pull tab (1). The tab is removable. After tab is removed, quick-connect fitting can be separated from fuel system component. Special tools are not required for disconnection.



12. Press release tab on side of fitting to release pull tab (1). **If release tab is not pressed prior to releasing pull tab, pull tab will be damaged.**
13. While pressing release tab on side of fitting, use screwdriver (2) to pry up pull tab.
14. Raise pull tab until it separates from quick-connect fitting.



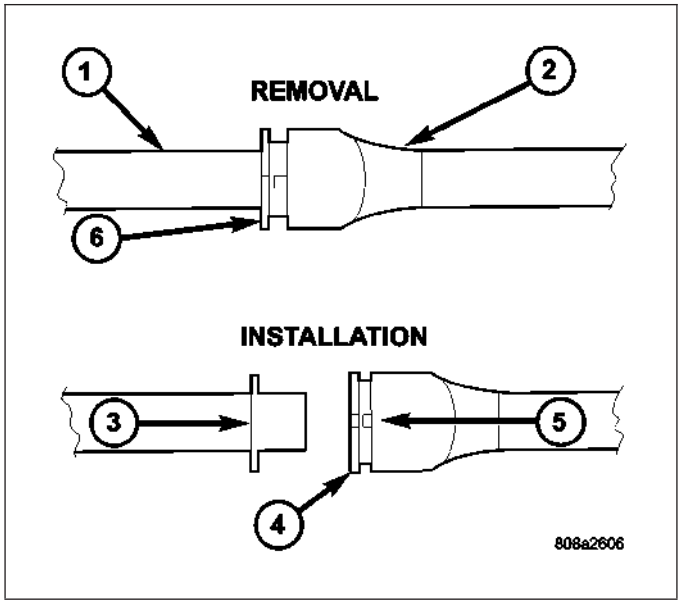
15. **Two-Tab Type Fitting:** This type of fitting (2) is equipped with tabs located on both sides of fitting (1). The tabs are supplied for disconnecting quick-connect fitting from component being serviced.
    a. To disconnect quick-connect fitting, squeeze plastic retainer tabs (1) against sides of quick-connect fitting with your fingers. Tool use is not required for removal and may damage plastic retainer.
    b. Pull fitting from fuel system component being serviced.
    c. The plastic retainer will remain on component being serviced after fitting is disconnected. The o-rings and spacer will remain in quick-connect fitting connector body.



16. **Plastic Retainer Ring Type Fitting:** This type of fitting can be identified by the use of a full-round plastic retainer ring (4) usually black in color.

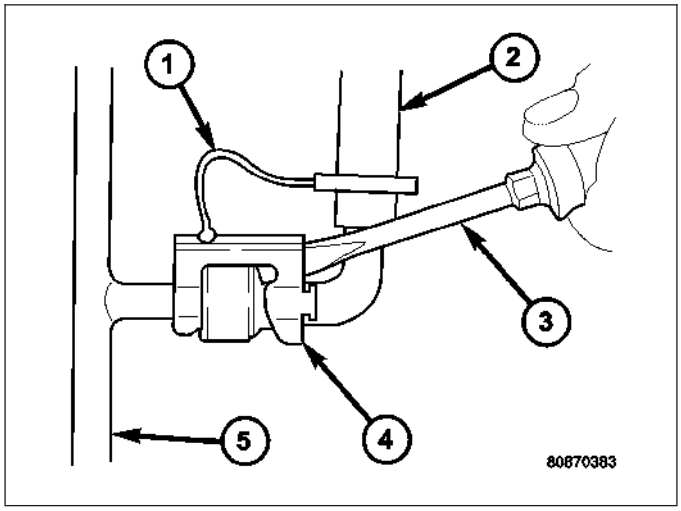
    a. To release fuel system component from quick-connect fitting, firmly push fitting towards component being serviced while firmly pushing plastic retainer ring into fitting (6). With plastic ring depressed, pull fitting from component. **The plastic retainer ring must be pressed squarely into fitting body. If this retainer is cocked during removal, it may be difficult to disconnect fitting. Use an open-end wrench on shoulder of plastic retainer ring to aid in disconnection.**

    b. After disconnection, plastic retainer ring will remain with quick-connect fitting connector body.

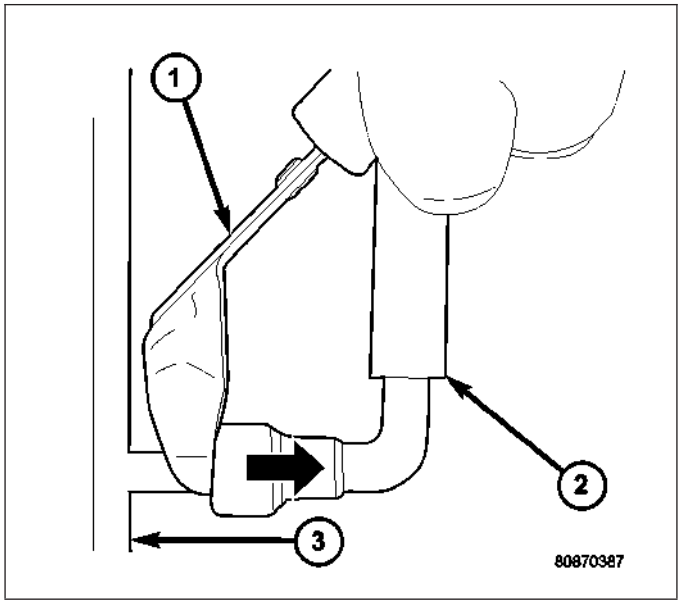


    c. Inspect fitting connector body, plastic retainer ring and fuel system component for damage. Replace as necessary.

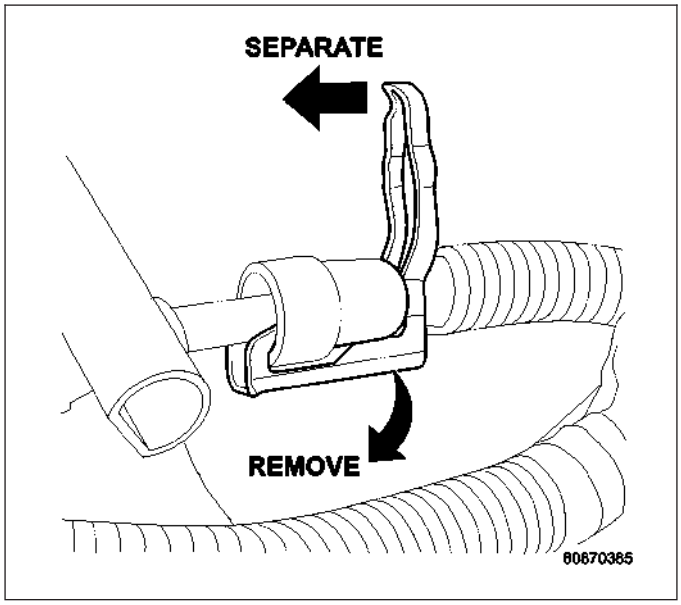
17. **Latch Clips — Type 1:** Depending on vehicle model and engine, 2 different types of safety latch clips are used. Type-1 (4) is tethered to fuel line and type-2 is not. A special tool will be necessary to disconnect fuel line after latch clip is removed. The latch clip may be used on certain fuel line/fuel rail connection, or to join fuel lines together.
18. Pry up on latch clip with a screwdriver (3).
19. Slide latch clip toward fuel rail while lifting with screwdriver.



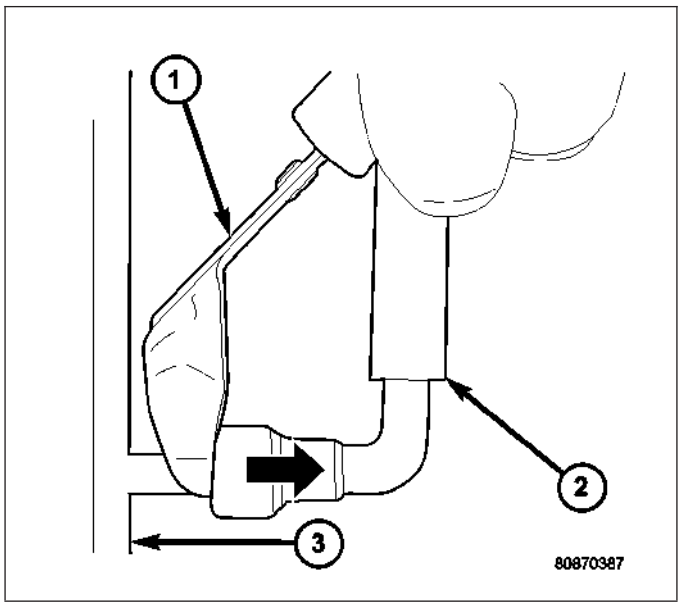
20. Insert special fuel line removal tool (Snap-On number FIH 9055-1 or equivalent) into fuel line (1). Use tool to release locking fingers in end of line.
21. With special tool still inserted, pull fuel line from fuel rail.
22. After disconnection, locking fingers will remain within quick-connect fitting at end of fuel line.
23. Disconnect quick-connect fitting from fuel system component being serviced.



24. **Latch Clips — Type 2:** Depending on vehicle model and engine, 2 different types of safety latch clips are used. Type-1 is tethered to fuel line and type-2 is not. A special tool will be necessary to disconnect fuel line after latch clip is removed. The latch clip may be used on certain fuel line/fuel rail connection, or to join fuel lines together.
25. Type 2: Separate and unlatch 2 small arms (1) on end of clip and swing away from fuel line.
26. Slide latch clip toward fuel rail while lifting with screwdriver.



27. Insert special fuel line removal tool (Snap-On number FIH 9055-1 or equivalent) into fuel line (1). Use tool to release locking fingers in end of line.
28. With special tool still inserted, pull fuel line from fuel rail.
29. After disconnection, locking fingers will remain within quick-connect fitting at end of fuel line.
30. Disconnect quick-connect fitting from fuel system component being serviced.



CONNECTING

1. Inspect quick-connect fitting body and fuel system component for damage. Replace as necessary.
2. Prior to connecting quick-connect fitting to component being serviced, check condition of fitting and component. Clean parts with a lint-free cloth. Lubricate with clean engine oil.
3. Insert quick-connect fitting into fuel tube or fuel system component until built-on stop on fuel tube or component rests against back of fitting.
4. Continue pushing until a click is felt.
5. Single-tab type fitting: Push new tab down until it locks into place in quick-connect fitting.
6. Verify a locked condition by firmly pulling on fuel tube and fitting (15-30 lbs.).
7. Latch Clip Equipped: Install latch clip (snaps into position). **If latch clip will not fit, this indicates fuel line is not properly installed to fuel rail (or other fuel line). Recheck fuel line connection.**
8. Connect negative cable to battery.
9. Start engine and check for leaks.

PUMP-FUEL

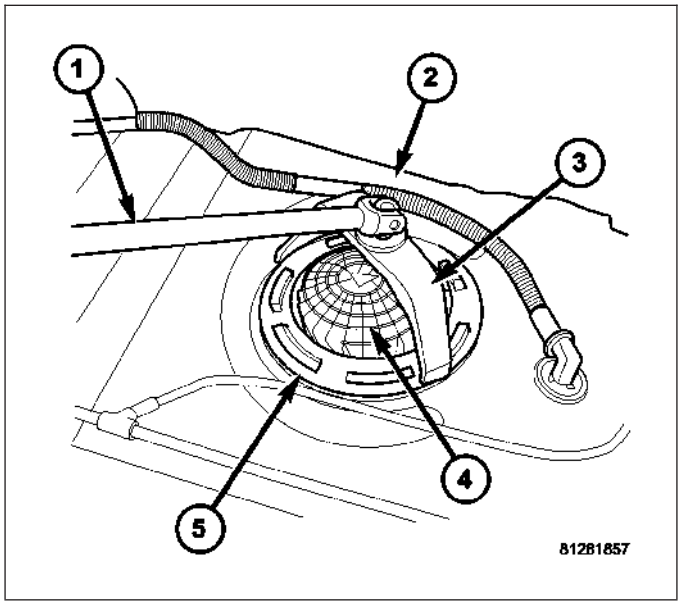
DESCRIPTION

Refer to Fuel Pump Module for information.

MODULE-FUEL PUMP

DESCRIPTION

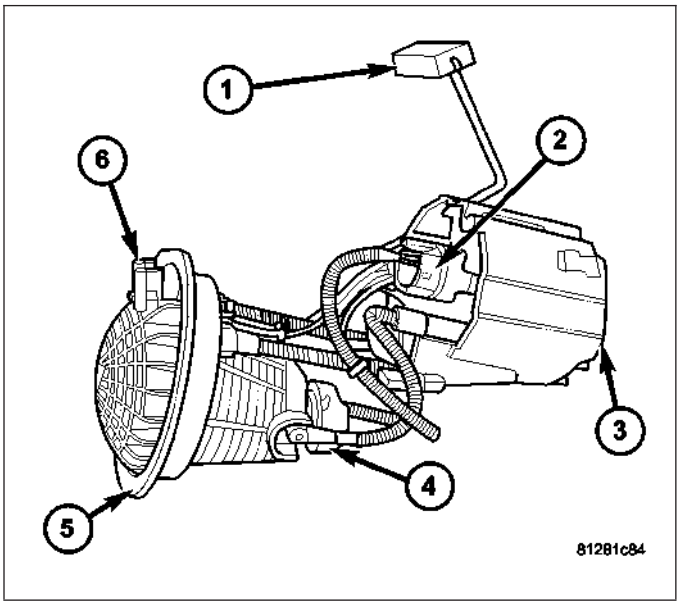
The fuel pump module assembly (4) is located on the top of the fuel tank (2).



The module assembly (5) contains the following components:

- An internal fuel filter
- A separate fuel pick-up, or inlet filter (3)
- A fuel pressure regulator (4)
- An electric fuel pump (2)
- A lockring to retain pump module to tank
- A soft gasket between tank flange and module
- A fuel gauge sending unit (fuel level sensor) (1)
- Fuel line connection (6)

If the fuel gauge sending unit , electrical fuel pump, primary inlet filter, fuel filter or fuel pressure regulator require service, the fuel pump module must be replaced.



Electric Fuel Pump

The electric fuel pump is located inside of the fuel pump module. A 12 volt, permanent magnet, electric motor powers the fuel pump. The electric fuel pump is not a separate, serviceable component.

Fuel Filters

Two fuel filters are used. One is located at the bottom of the fuel pump module. The other is located inside the module. A separate frame mounted fuel filter is not used with any engine.

Both fuel filters are designed for extended service. They do not require normal scheduled maintenance. Filters should only be replaced if a diagnostic procedure indicates to do so.

Fuel Pressure Regulator

The fuel pressure regulator is located within fuel pump module.

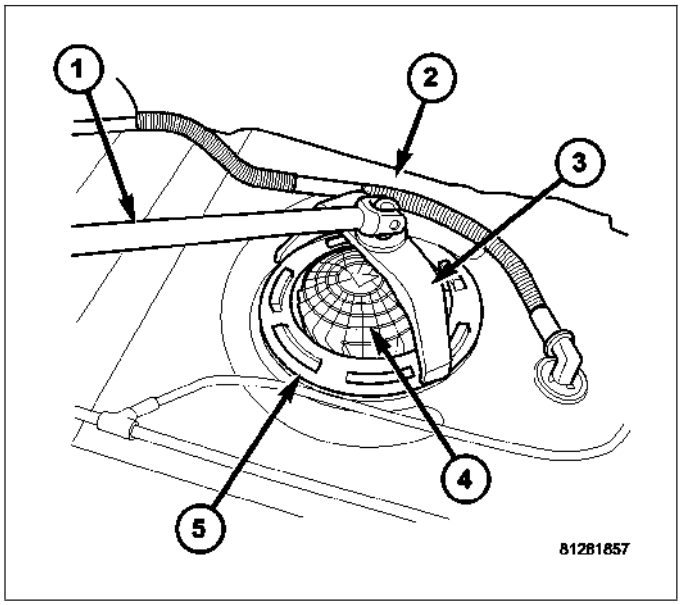
Fuel Gauge Sending Unit (Fuel level sensor)

The fuel gauge sending unit (fuel level sensor) is attached to the side of the fuel pump module. The sending unit consists of a float, an arm, and a variable resistor track (card).

REMOVAL

WARNING: THE FUEL SYSTEM IS UNDER A CONSTANT PRESSURE (EVEN WITH THE ENGINE OFF). BEFORE SERVICING THE FUEL PUMP MODULE, THE FUEL SYSTEM PRESSURE MUST BE RELEASED.

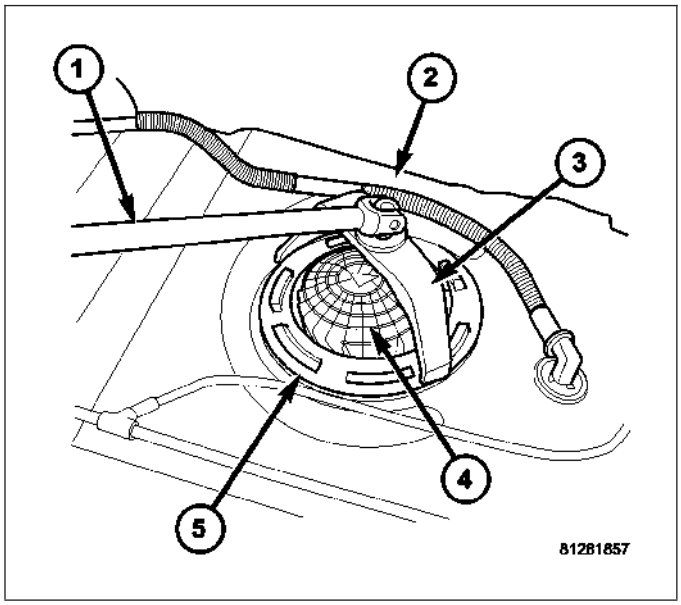
1. Drain and remove fuel tank. Refer to Fuel Tank Removal/Installation.
2. Note rotational position of module before attempting removal. An indexing arrow is located on top of module for this purpose.
3. Position Special Tool 9340 (3) into notches on outside edge of lockring (5).
4. Install 1/2 inch drive breaker bar (1) to tool 9340 (3).
5. Rotate breaker bar counter-clockwise to remove lockring.
6. Remove lockring. The module will spring up slightly when lockring is removed.
7. Remove module from fuel tank. Be careful not to bend float arm while removing.



INSTALLATION

CAUTION: Whenever the fuel pump module is serviced, the rubber seal (gasket) must be replaced.

1. Using a new seal (gasket), position fuel pump module into opening in fuel tank.
2. Position lockring (5) over top of fuel pump module.
3. Rotate module until embossed alignment arrow points to center alignment mark. This step must be performed to prevent float from contacting side of fuel tank. Also be sure fuel fitting on top of pump module is pointed to drivers side of vehicle.
4. Install Special Tool 9340 (3) to lockring.
5. Install 1/2 inch drive breaker (1) into Special Tool 9340 (3).
6. Tighten lockring (clockwise) until all seven notches have engaged.
7. Install fuel tank. Refer to Fuel Tank Removal/Installation.



RAIL-FUEL

DESCRIPTION

The fuel injector rail is used to mount the fuel injectors to the engine.

OPERATION

High pressure from the fuel pump is routed to the fuel rail. The fuel rail then supplies the necessary fuel to each individual fuel injector.

A quick-connect fitting with a safety latch clip is used to attach the fuel line to the fuel rail.

The fuel rail is not repairable.

CAUTION: The left and right sections of the fuel rail are connected with either a flexible connecting hose, or joints. Do not attempt to separate the rail halves at these connecting hose or joints. Due to the design of the connecting hose or joint, it does not use any clamps. Never attempt to install a clamping device of any kind to the hose or joint. When removing the fuel rail assembly for any reason, be careful not to bend or kink the connecting hose or joint.

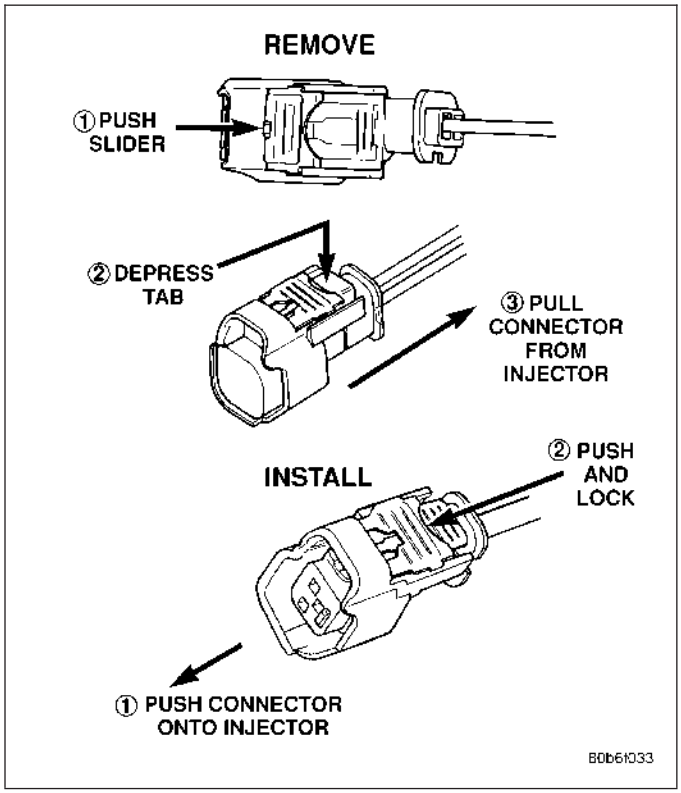
REMOVAL

3.7L V-6

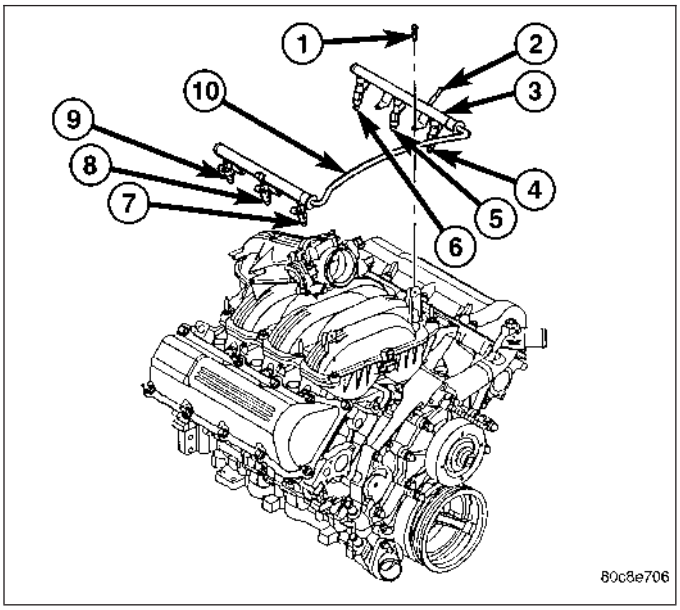
WARNING: THE FUEL SYSTEM IS UNDER CONSTANT PRESSURE EVEN WITH ENGINE OFF. BEFORE SERVICING FUEL RAIL, FUEL SYSTEM PRESSURE MUST BE RELEASED.

CAUTION: The left and right fuel rails are replaced as an assembly. Do not attempt to separate rail halves at connector tubes. Due to design of tubes, it does not use any clamps. Never attempt to install a clamping device of any kind to tubes. When removing fuel rail assembly for any reason, be careful not to bend or kink tubes.

1. Remove fuel tank filler tube cap.
2. Perform Fuel System Pressure Release Procedure.
3. Remove negative battery cable at battery.
4. Remove air duct at throttle body air box.
5. Remove air box at throttle body.
6. Remove air resonator mounting bracket at front of throttle body (2 bolts).
7. Disconnect fuel line latch clip and fuel line at fuel rail. A special tool will be necessary for fuel line disconnection. Refer to Quick-Connect Fittings.
8. Remove necessary vacuum lines at throttle body.
9. Disconnect electrical connectors at all 6 fuel injectors. Refer to graphic. Push red colored slider away from injector (1). While pushing slider, depress tab (2) and remove connector (3) from injector. The factory fuel injection wiring harness is numerically tagged (INJ 1, INJ 2, etc.) for injector position identification. If harness is not tagged, note wiring location before removal.
10. Disconnect electrical connectors at all throttle body sensors.
11. Remove 6 ignition coils. Refer to Ignition Coil Removal/Installation.



12. Remove four fuel rail mounting bolts (1).
13. Gently rock and pull **left** side of fuel rail until fuel injectors just start to clear machined holes in cylinder head. Gently rock and pull **right** side of rail until injectors just start to clear cylinder head holes. Repeat this procedure (left/right) until all injectors have cleared cylinder head holes.
14. Remove fuel rail (with injectors attached) from engine.
15. If fuel injectors are to be removed, refer to Fuel Injector Removal/Installation.

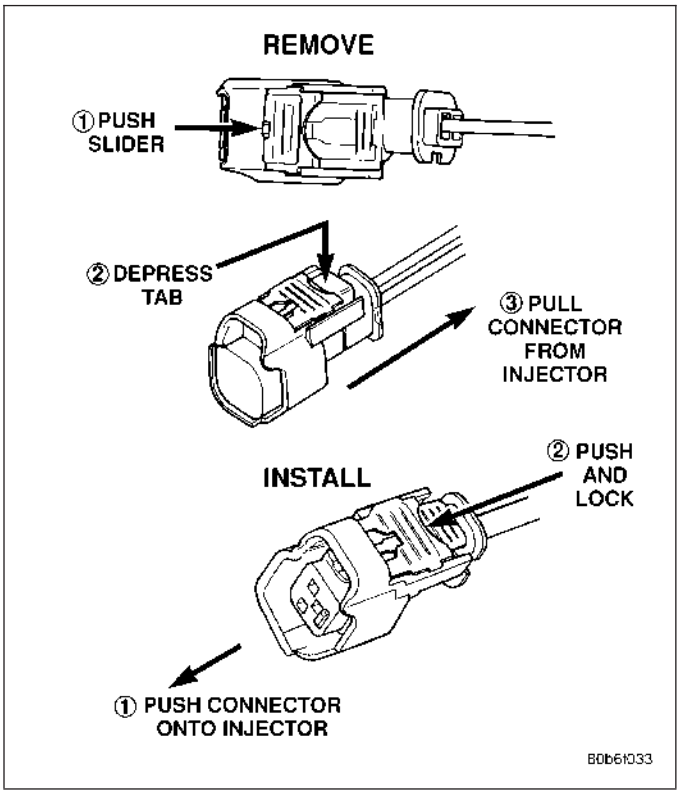


4.7L V-8

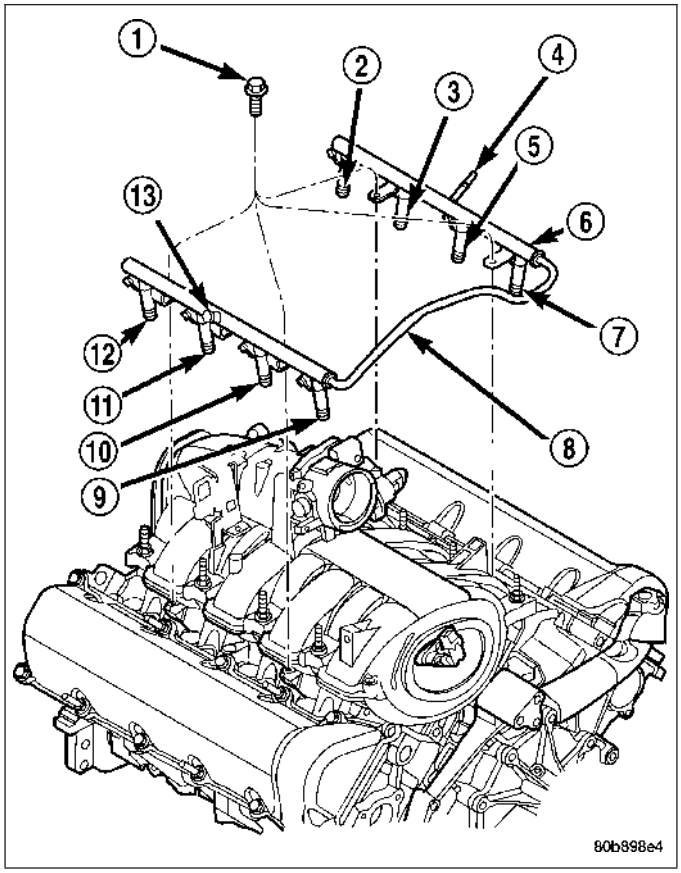
WARNING: THE FUEL SYSTEM IS UNDER CONSTANT PRESSURE EVEN WITH ENGINE OFF. BEFORE SERVICING FUEL RAIL, FUEL SYSTEM PRESSURE MUST BE RELEASED.

CAUTION: The left and right fuel rails are replaced as an assembly. Do not attempt to separate rail halves at connector tubes. Due to design of tubes, it does not use any clamps. Never attempt to install a clamping device of any kind to tubes. When removing fuel rail assembly for any reason, be careful not to bend or kink tubes.

1. Remove fuel tank filler tube cap.
2. Perform Fuel System Pressure Release Procedure.
3. Remove negative battery cable at battery.
4. Remove air duct at throttle body air box.
5. Remove air box at throttle body.
6. Remove air resonator mounting bracket at front of throttle body (2 bolts).
7. Disconnect fuel line latch clip and fuel line at fuel rail. A special tool will be necessary for fuel line disconnection. Refer to Quick-Connect Fittings.
8. Remove necessary vacuum lines at throttle body.
9. Disconnect electrical connectors at all 8 fuel injectors. Refer to graphic. Push red colored slider away from injector (1). While pushing slider, depress tab (2) and remove connector (3) from injector. The factory fuel injection wiring harness is numerically tagged (INJ 1, INJ 2, etc.) for injector position identification. If harness is not tagged, note wiring location before removal.
10. Disconnect electrical connectors at all throttle body sensors.
11. Remove 8 ignition coils. Refer to Ignition Coil Removal/Installation.



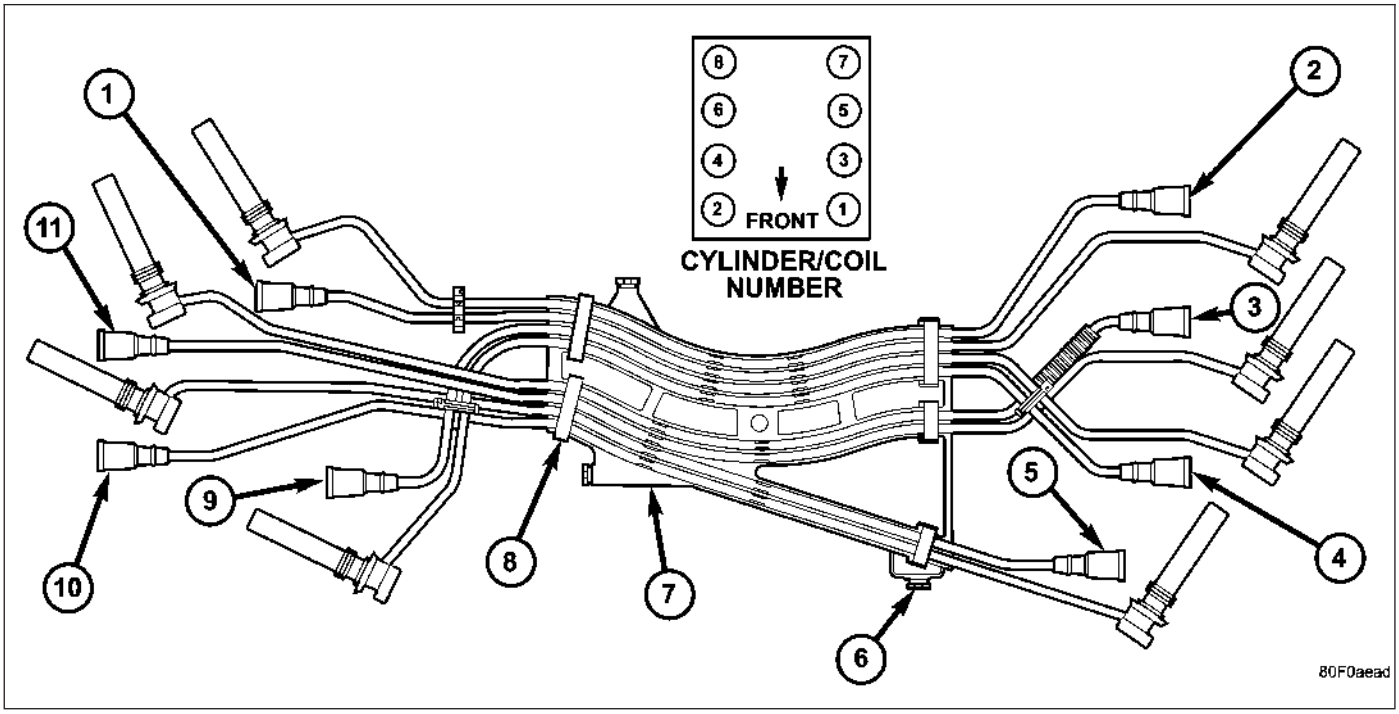
12. Remove 4 fuel rail mounting bolts (1).
13. Gently rock and pull **left** side of fuel rail until fuel injectors just start to clear machined holes in cylinder head. Gently rock and pull **right** side of rail until injectors just start to clear cylinder head holes. Repeat this procedure (left/right) until all injectors have cleared cylinder head holes.
14. Remove fuel rail (with injectors attached) from engine.
15. If fuel injectors are to be removed, refer to Fuel Injector Removal/Installation.



5.7L V-8

WARNING: THE FUEL SYSTEM IS UNDER CONSTANT PRESSURE EVEN WITH ENGINE OFF. BEFORE SERVICING FUEL RAIL, FUEL SYSTEM PRESSURE MUST BE RELEASED.

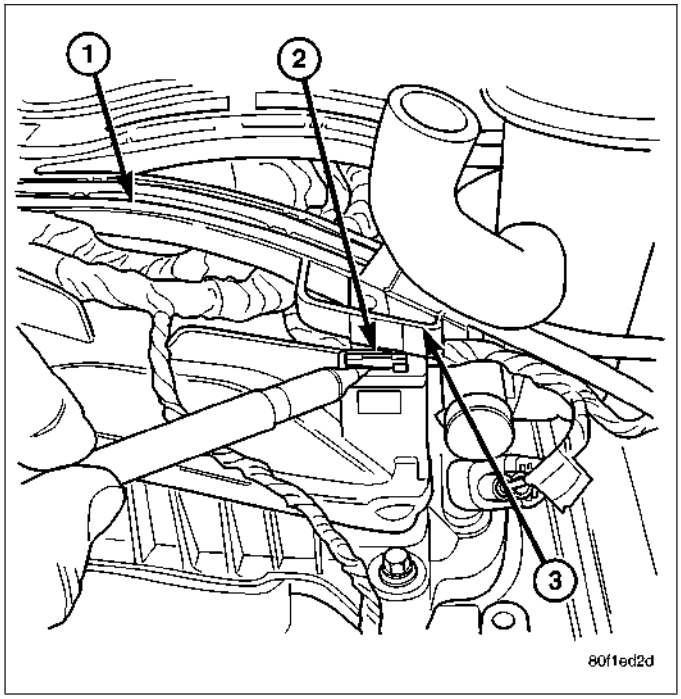
CAUTION: The left and right fuel rails are replaced as an assembly. Do not attempt to separate rail halves at connector tube. Due to design of tube, it does not use any clamps. Never attempt to install a clamping device of any kind to tube. When removing fuel rail assembly for any reason, be careful not to bend or kink tube.



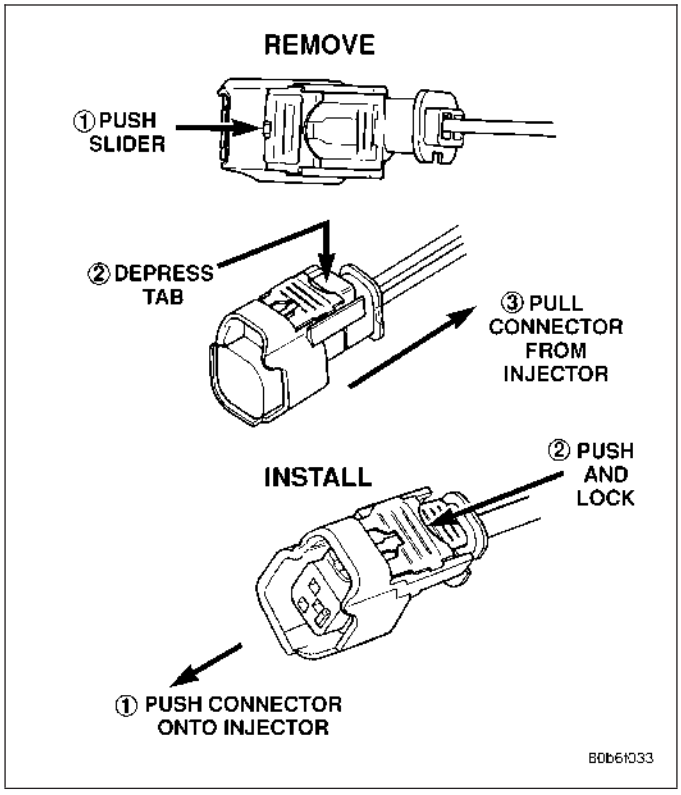
1 - #8 COIL-TO- #5 SPARK PLUG (MARKED 5/8)
2 - #5 COIL-TO- #8 SPARK PLUG (MARKED 5/8)
3 - #7 COIL-TO- #4 SPARK PLUG (MARKED 4/7)
4 - #3 COIL-TO- #2 SPARK PLUG (MARKED 2/3)
5 - #1 COIL-TO- #6 SPARK PLUG (MARKED 1/6)
6 - CLIPS (TRAY-TO-MANIFOLD RETENTION)
7 - CABLE TRAY
8 - CLIPS (SPARK PLUG CABLE-TO-TRAY- RETENTION)
9 - #2 COIL-TO- #3 SPARK PLUG (MARKED 2/3)
10 - #6 COIL-TO- #1 SPARK PLUG (MARKED 1/6)
11 - #4 COIL-TO- #7 SPARK PLUG (MARKED 4/7)

1. Remove fuel tank filler tube cap.
2. Perform Fuel System Pressure Release Procedure.
3. Remove negative battery cable at battery.
4. Remove flex tube (air cleaner housing to engine).
5. Remove air resonator box at throttle body.
6. Disconnect all spark plug cables from all spark plugs and ignition coils. Do not remove cables from cable routing tray. Note original cable positions while removing.

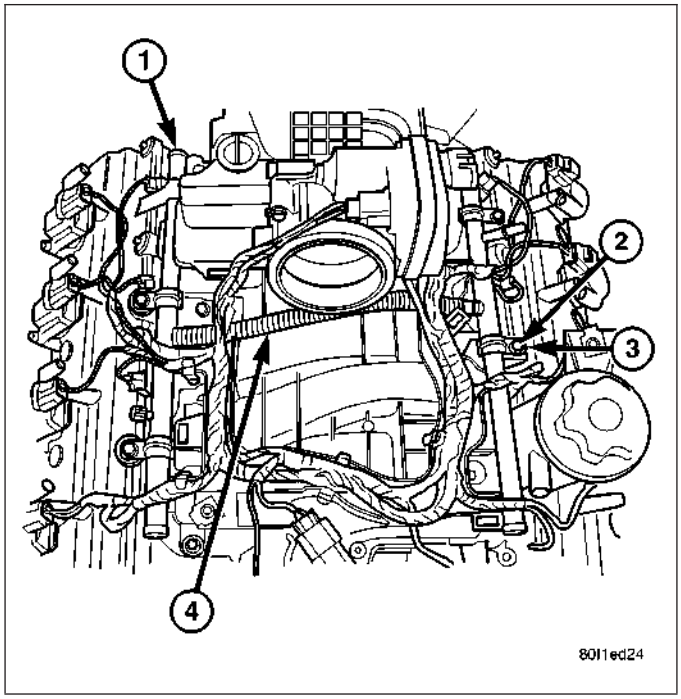
7. Remove spark plug cable tray from engine by releasing 4 retaining clips (2). Remove tray and cables from engine as an assembly.
8. Disconnect electrical connectors at all 8 ignition coils. Refer to Ignition Coil Removal/Installation.
9. Disconnect fuel line latch clip and fuel line at fuel rail. A special tool will be necessary for fuel line disconnection. Refer to Quick-Connect Fittings.



10. Disconnect electrical connectors at all 8 fuel injectors. Refer to graphic.. Push red colored slider away from injector (1). While pushing slider, depress tab (2) and remove connector (3) from injector. The factory fuel injection wiring harness is numerically tagged (INJ 1, INJ 2, etc.) for injector position identification. If harness is not tagged, note wiring location before removal.
11. Disconnect electrical connectors at all throttle body sensors.



12. Remove four fuel rail mounting bolts (2) and hold-own clamps.
13. Gently rock and pull **left** side of fuel rail until fuel injectors just start to clear machined holes in intake manifold. Gently rock and pull **right** side of rail until injectors just start to clear intake manifold head holes. Repeat this procedure (left/right) until all injectors have cleared machined holes.
14. Remove fuel rail (with injectors attached) from engine.



15. If fuel injectors are to be removed, refer to Fuel Injector Removal/Installation.

INSTALLATION

3.7L V-6

1. If fuel injectors are to be installed, refer to Fuel Injector Removal/Installation.
2. Clean out fuel injector machined bores in intake manifold.
3. Apply a small amount of engine oil to each fuel injector o-ring. This will help in fuel rail installation.
4. Position fuel rail/fuel injector assembly to machined injector openings in cylinder head.
5. Guide each injector into cylinder head. Be careful not to tear injector o-rings.
6. Push **right** side of fuel rail down until fuel injectors have bottomed on cylinder head shoulder. Push **left** fuel rail down until injectors have bottomed on cylinder head shoulder.
7. Install 4 fuel rail mounting bolts and tighten. Refer to torque specifications.
8. Install 6 ignition coils. Refer to Ignition Coil Removal/Installation.
9. Connect electrical connectors to throttle body.
10. Connect electrical connectors at all fuel injectors. Refer to graphic. Push connector onto injector (1) and then push and lock red colored slider (2). Verify connector is locked to injector by lightly tugging on connector.
11. Connect necessary vacuum lines to throttle body.
12. Install air resonator mounting bracket near front of throttle body (2 bolts).
13. Connect fuel line latch clip and fuel line to fuel rail. Refer to Quick-Connect Fittings.
14. Install air box to throttle body.
15. Install air duct to air box.
16. Connect battery cable to battery.
17. Start engine and check for leaks.

4.7L V-8

1. If fuel injectors are to be installed, refer to Fuel Injector Removal/Installation.
2. Clean out fuel injector machined bores in intake manifold.
3. Apply a small amount of engine oil to each fuel injector o-ring. This will help in fuel rail installation.
4. Position fuel rail/fuel injector assembly to machined injector openings in cylinder head.

5. Guide each injector into cylinder head. Be careful not to tear injector o-rings.
6. Push **right** side of fuel rail down until fuel injectors have bottomed on cylinder head shoulder. Push **left** fuel rail down until injectors have bottomed on cylinder head shoulder.
7. Install 4 fuel rail mounting bolts and tighten. Refer to torque specifications.
8. Install 8 ignition coils. Refer to Ignition Coil Removal/Installation.
9. Connect electrical connectors to throttle body.
10. Connect electrical connectors at all fuel injectors. Refer to graphic. Push connector onto injector (1) and then push and lock red colored slider (2). Verify connector is locked to injector by lightly tugging on connector.
11. Connect necessary vacuum lines to throttle body.
12. Install air resonator mounting bracket near front of throttle body (2 bolts).
13. Connect fuel line latch clip and fuel line to fuel rail. Refer to Quick-Connect Fittings.
14. Install air box to throttle body.
15. Install air duct to air box.
16. Connect battery cable to battery.
17. Start engine and check for leaks.

5.7L V-8

1. If fuel injectors are to be installed, refer to Fuel Injector Removal/Installation.
2. Clean out fuel injector machined bores in intake manifold.
3. Apply a small amount of engine oil to each fuel injector o-ring. This will help in fuel rail installation.
4. Position fuel rail/fuel injector assembly to machined injector openings in intake manifold.
5. Guide each injector into intake manifold. Be careful not to tear injector o-rings.
6. Push **right** side of fuel rail down until fuel injectors have bottomed on shoulders. Push **left** fuel rail down until injectors have bottomed on shoulders.
7. Install 4 fuel rail holdown clamps and 4 mounting bolts. Refer to Torque Specifications.
8. Position spark plug cable tray and cable assembly to intake manifold. Snap 4 cable tray retaining clips into intake manifold.
9. Install all cables to spark plugs and ignition coils.
10. Connect electrical connector to throttle body.
11. Install electrical connectors to all 8 ignition coils. Refer to Ignition Coil Removal/Installation.
12. Connect electrical connector to throttle body.
13. Connect electrical connectors at all fuel injectors. Refer to graphic. Push connector onto injector (1) and then push and lock red colored slider (2). Verify connector is locked to injector by lightly tugging on connector.
14. Connect fuel line latch clip and fuel line to fuel rail. Refer to Quick-Connect Fittings.
15. Install air resonator to throttle body (2 bolts).
16. Install flexible air duct to air box.
17. Connect battery cable to battery.
18. Start engine and check for leaks.

TANK-FUEL

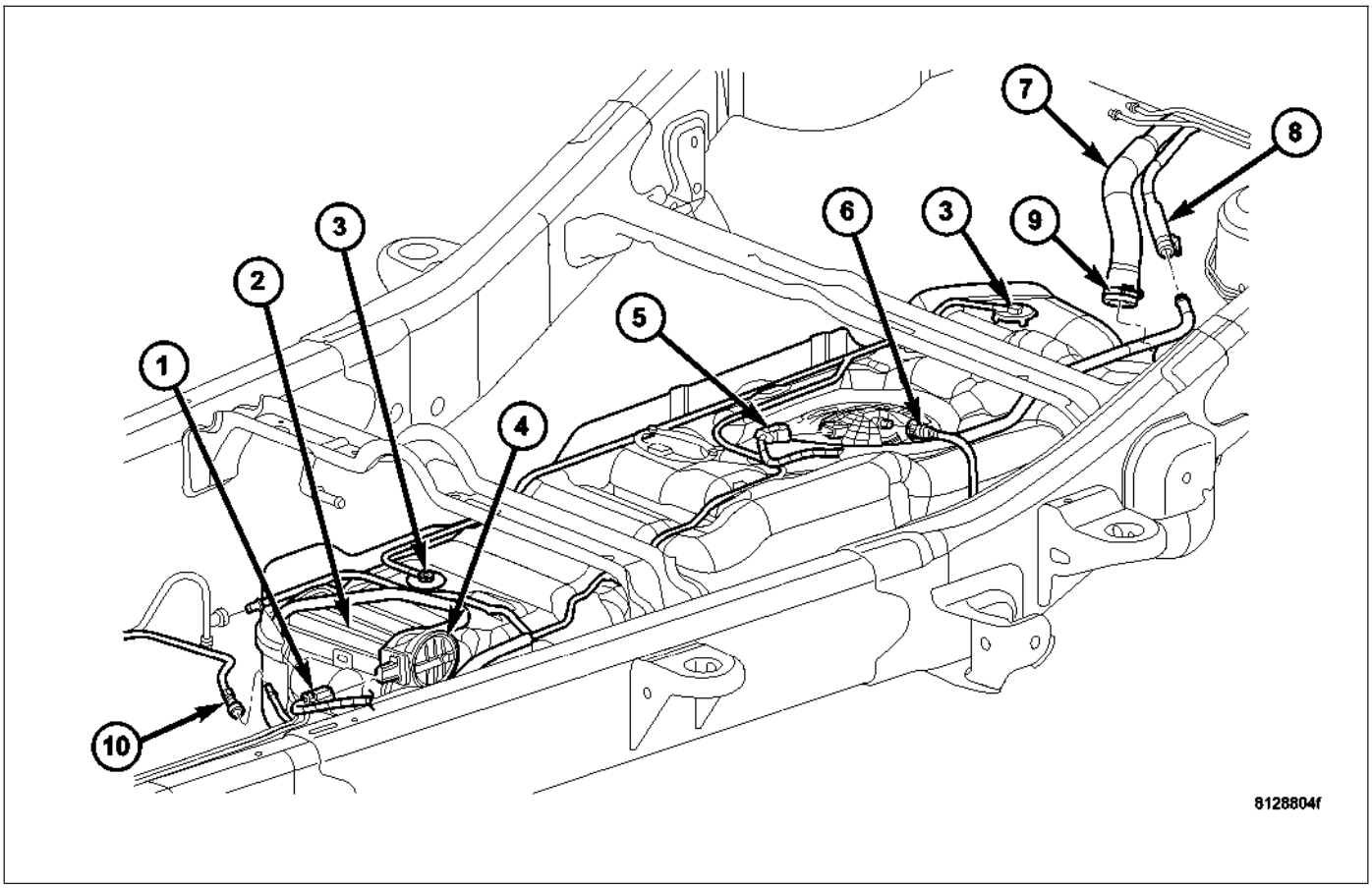
DESCRIPTION

The fuel tank is constructed of a plastic material. Its main functions are for fuel storage and for placement of the fuel pump module, and (if equipped) certain ORVR components.

REMOVAL

Fuel Tank Draining

WARNING: THE FUEL SYSTEM MAY BE UNDER CONSTANT FUEL PRESSURE EVEN WITH THE ENGINE OFF. THIS PRESSURE MUST BE RELEASED BEFORE SERVICING FUEL TANK.



Two different procedures may be used to drain fuel tank: through the fuel fill fitting on tank, or using the DRB® scan tool.

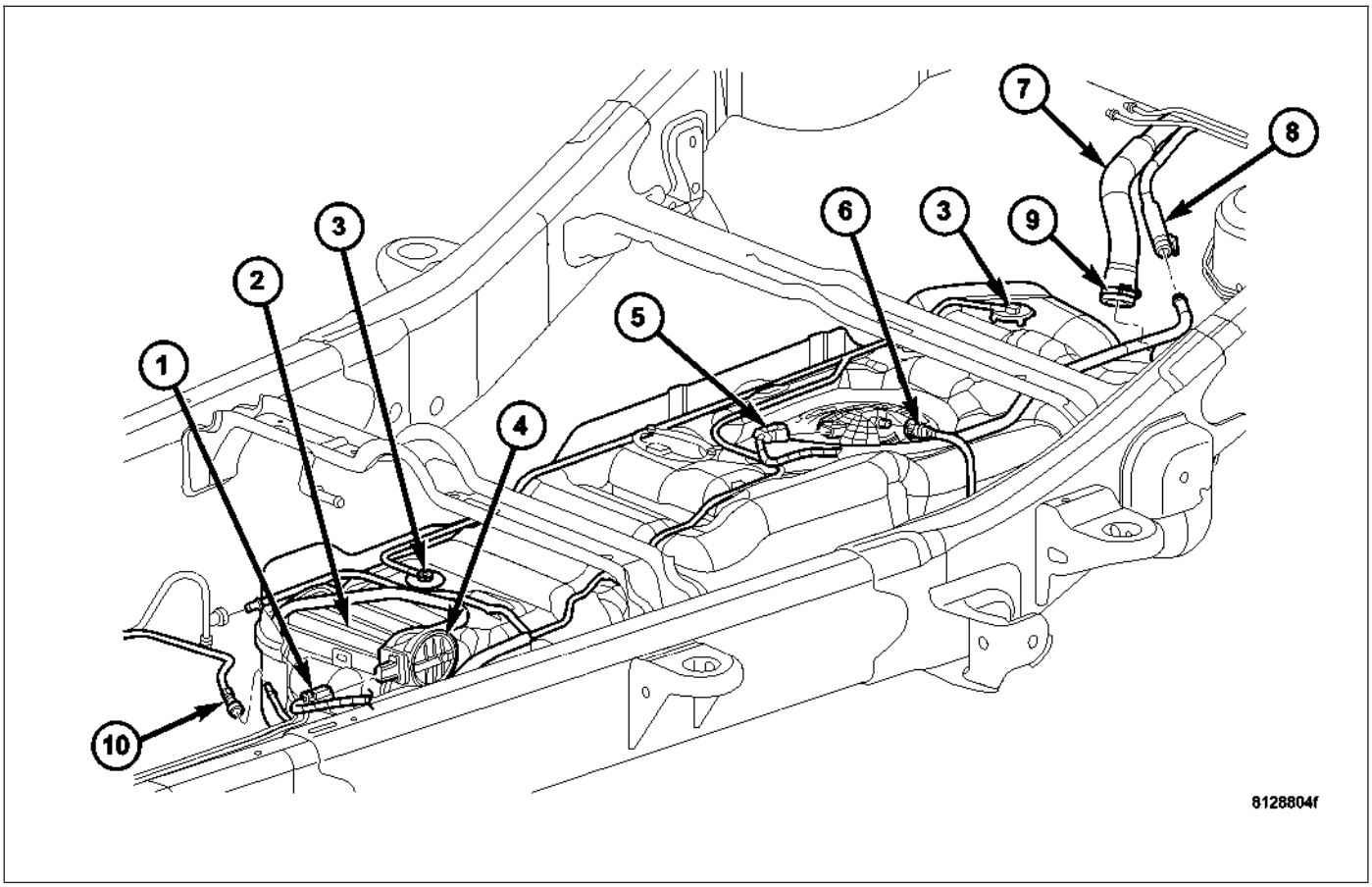
The quickest draining procedure involves removing the rubber fuel fill hose (7) from fuel tank fitting.

As an alternative procedure, the electric fuel pump may be activated allowing tank to be drained at fuel rail connection. Refer to DRB scan tool for fuel pump activation procedures. Before disconnecting fuel line at fuel rail, release fuel pressure. Refer to the Fuel System Pressure Release Procedure for procedures. Attach end of special test hose tool number 6541, 6539, 6631 or 6923 at fuel rail disconnection (tool number will depend on model and/or engine application). Position opposite end of this hose tool to an approved gasoline draining station. Activate fuel pump and drain tank until empty.

If electric fuel pump is not operating, fuel must be drained through fuel fill fitting at tank. Refer to following procedures.

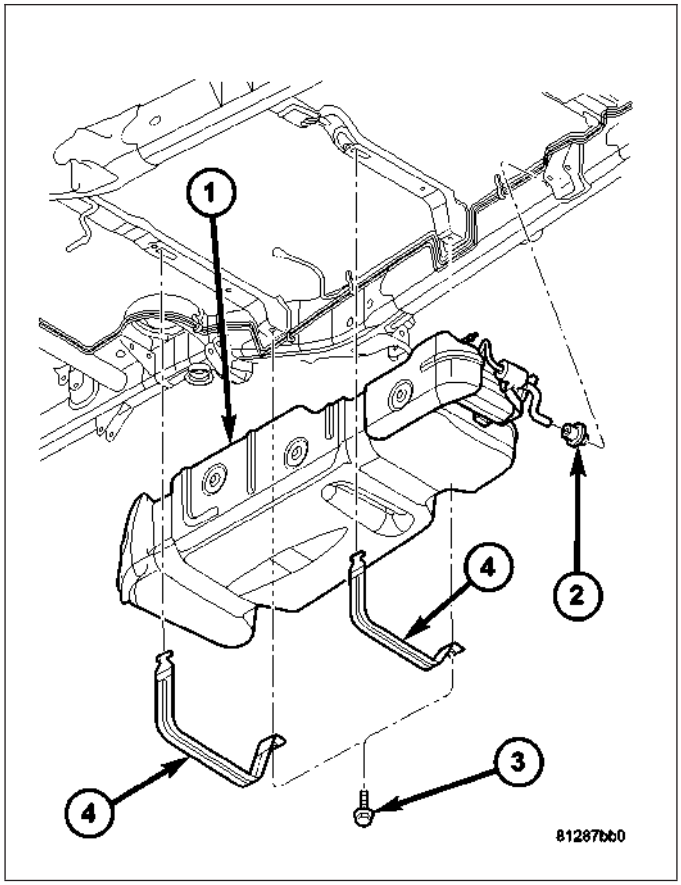
1. Release fuel system pressure.
2. Raise vehicle.
3. If equipped, remove fuel tank skid plate.
4. Thoroughly clean area around fuel fill fitting and rubber fuel fill hose (7) at rear of fuel tank.
5. Loosen clamp (9) and disconnect rubber fuel fill hose at fuel tank fitting. Using an approved gas holding tank, drain fuel tank through this fitting.

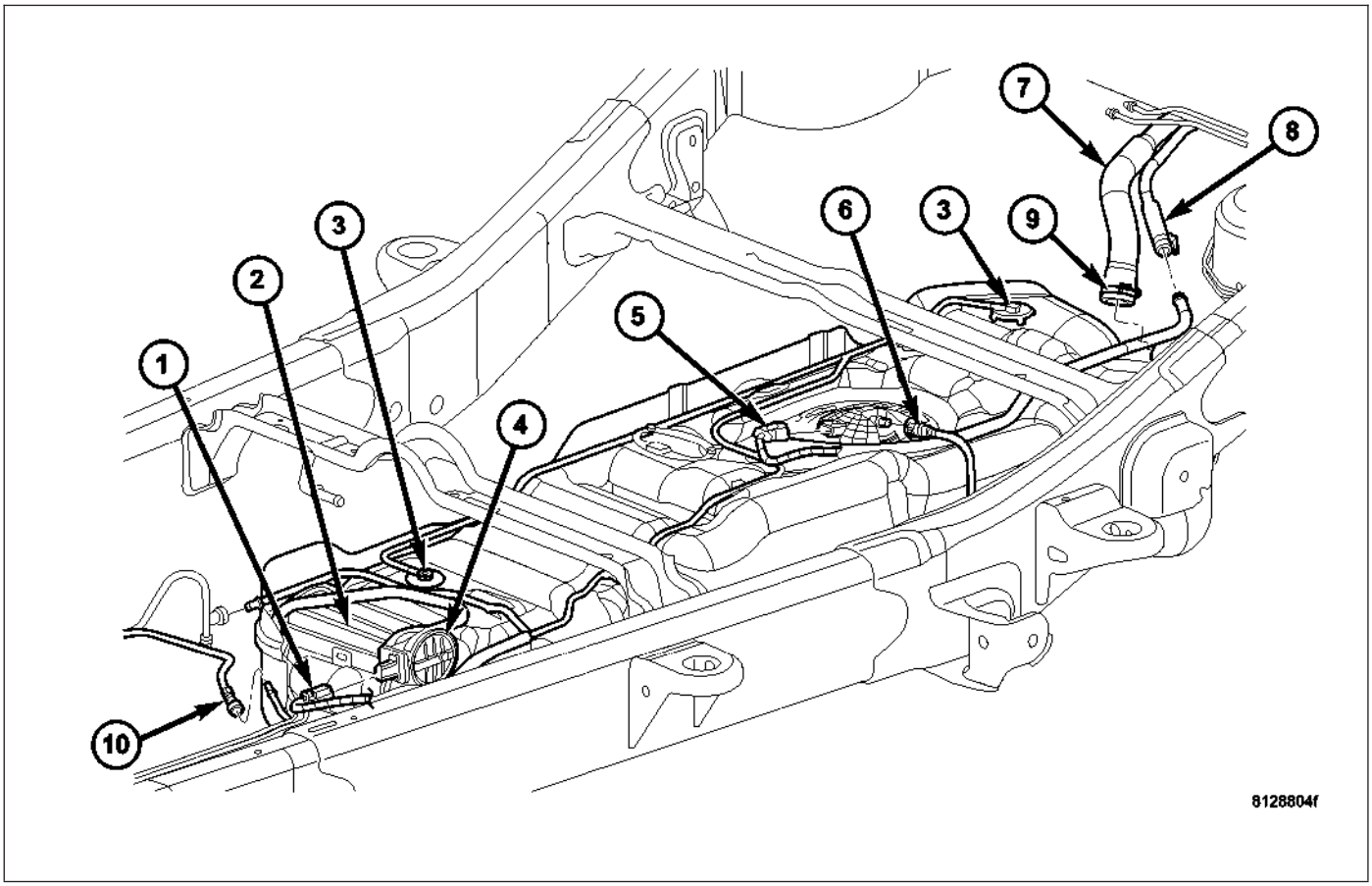
Tank Removal



1. Loosen clamp and disconnect rubber fuel vent hose (8) at tank fitting.
2. Support tank with a hydraulic jack.

3. Remove two fuel tank strap bolts (3) and remove both tank support straps (4).





4. Carefully lower tank a few inches and disconnect fuel pump module electrical connector (5) at top of tank. To disconnect electrical connector: Push upward on red colored tab to unlock. Push on black colored tab while removing connector.
5. Disconnect fuel line (6) at fuel pump module fitting by pressing on tabs at side of quick-connect fitting.
6. Disconnect NVLD, ORVR and EVAP lines (10) at front of tank.
7. Continue to lower tank for removal.
8. If fuel tank is to be replaced, remove fuel pump module from tank. Refer to Fuel Pump Module Removal/Installation procedures.

INSTALLATION

1. If fuel tank is to be replaced, install fuel pump module into tank. Refer to Fuel Pump Module Removal/Installation procedures.
2. Position fuel tank to hydraulic jack.
3. Raise tank until positioned near body.
4. Connect EVAP, ORVR and NVLD lines at front of tank.
5. Connect fuel pump module electrical connector at top of tank.
6. Connect fuel line quick-connect fitting to pump module.
7. Continue raising tank until positioned snug to body.
8. Install and position both tank support straps. Install two fuel tank strap bolts and tighten. Refer to Torque Specifications.
9. Connect rubber fill and vent hoses to fuel tank fittings and tighten hose clamps.
10. If equipped, install fuel tank skid plate.
11. Lower vehicle.
12. Fill fuel tank with fuel.
13. Start engine and check for fuel leaks near top of module.

FILTER-INLET

DESCRIPTION

Refer to Fuel Pump Module for information.

REGULATOR-FUEL PRESSURE

DESCRIPTION

Refer to Fuel Pump Module for information.

FILTER-FUEL

DESCRIPTION

Refer to Fuel Pump Module for information.

FUEL INJECTION

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PEDAL-ACCELERATOR (EXC. CODE XAP)

REMOVAL

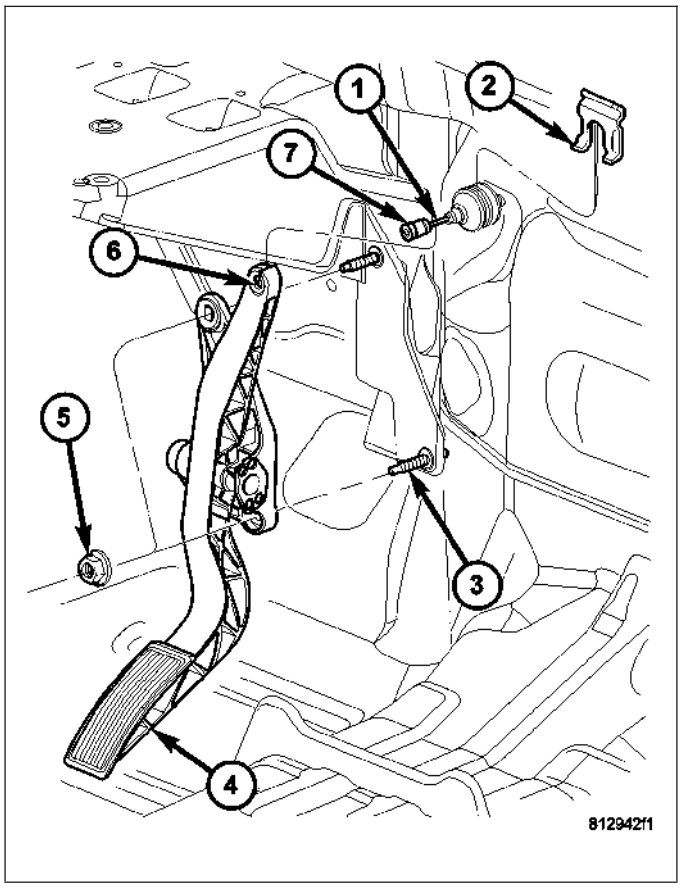
Without APPS

The following procedure applies only to vehicles without the Adjustable Pedal Package (code XAP). It also applies to vehicles **not equipped** with an accelerator pedal position sensor.

The accelerator pedal is serviced as a complete assembly including the bracket.

The accelerator cable is connected to the upper part of the accelerator pedal arm by a plastic retainer (clip) (7). This plastic retainer snaps into the top of the accelerator pedal arm.

1. From inside the vehicle, hold up accelerator pedal. Remove plastic cable retainer (clip) (7) and throttle cable core wire from upper end of accelerator pedal arm (6). Plastic cable retainer (clip) snaps into pedal arm.
2. Remove two accelerator pedal mounting bracket nuts (5). Remove accelerator pedal assembly (4).

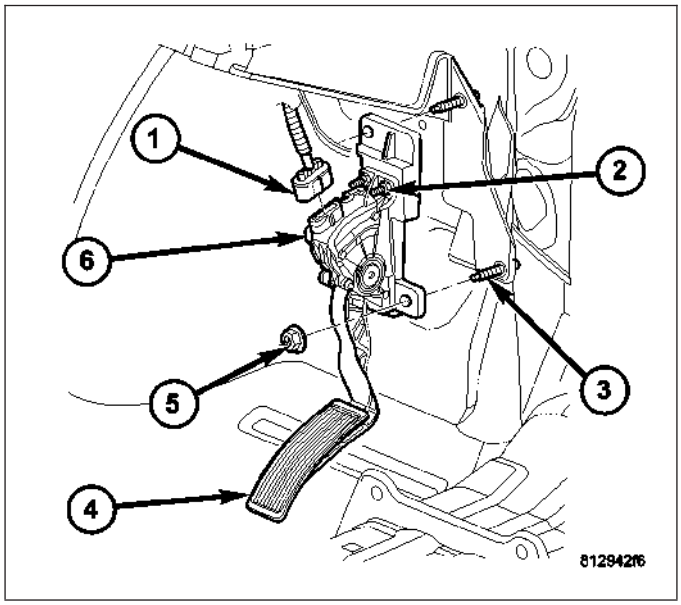


With APPS

The following procedure applies only to vehicles without the Adjustable Pedal Package (code XAP). It also applies to vehicles **equipped** with an accelerator pedal position sensor (6).

The accelerator pedal (4) is serviced as a complete assembly including the bracket.

1. Disconnect electrical connector (1) at APPS (6).
2. Remove two accelerator pedal mounting bracket nuts (5). Remove accelerator pedal assembly (4).



INSTALLATION

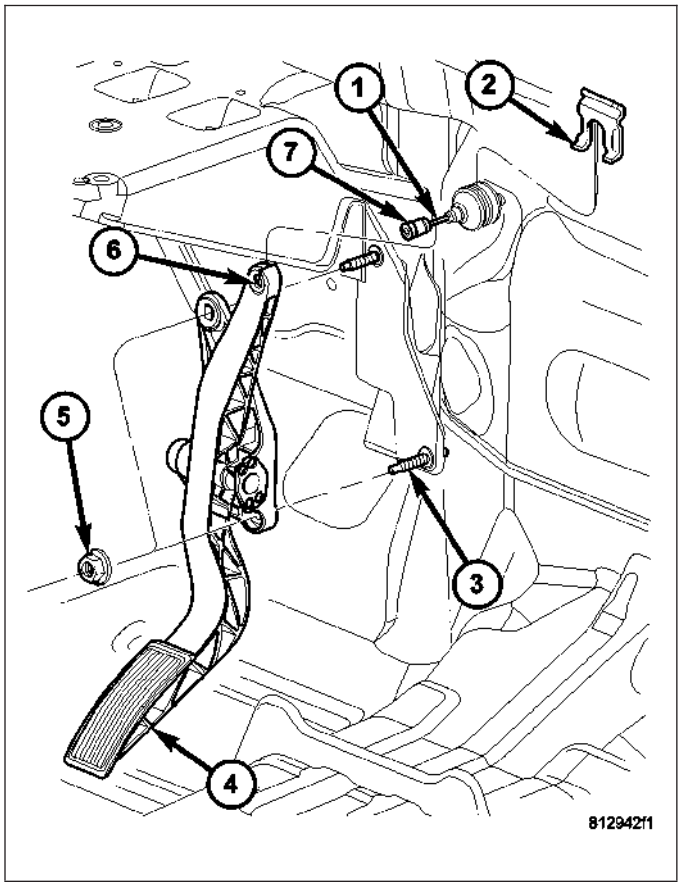
Without APPS

The following procedure applies only to vehicles without the Adjustable Pedal Package (code XAP). It also applies to vehicles **not equipped** with an accelerator pedal position sensor.

The accelerator pedal is serviced as a complete assembly including the bracket.

The accelerator cable is connected to the upper part of the accelerator pedal arm by a plastic retainer (clip) (7). This plastic retainer snaps into the top of the accelerator pedal arm.

1. Place accelerator pedal assembly (4) over two mounting studs (3).
2. Install and tighten two mounting nuts (5). Refer to Torque Specifications.
3. Slide throttle cable into opening slot (6) in top of pedal arm.
4. Push plastic cable retainer (clip) (7) into accelerator pedal arm opening until it snaps into place.
5. Before starting engine, operate accelerator pedal to check for any binding.

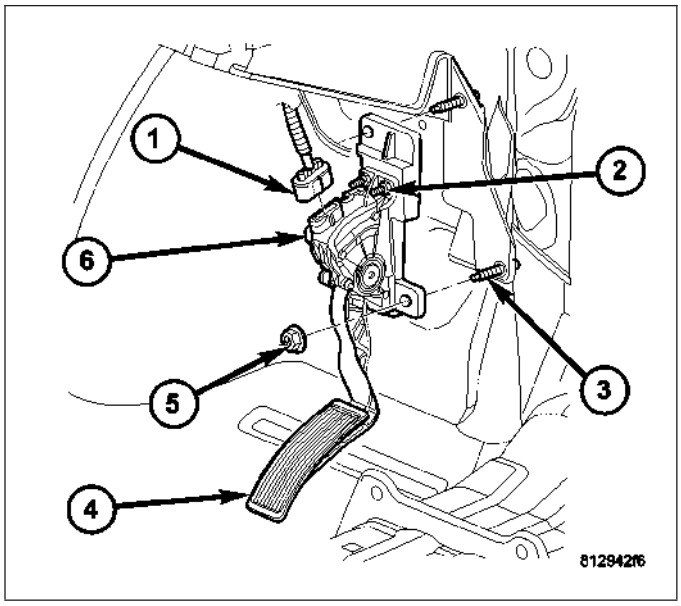


With APPS

The following procedure applies only to vehicles without the Adjustable Pedal Package (code XAP). It also applies to vehicles **equipped** with an accelerator pedal position sensor (6).

The accelerator pedal is serviced as a complete assembly including the bracket.

1. Place accelerator pedal assembly (4) over two mounting studs (3).
2. Install and tighten two mounting nuts (5). Refer to Torque Specifications.
3. Install electrical connector (1) to APPS (6).
4. A Scan Tool may be used to learn electrical parameters. Go to the Miscellaneous menu, and then select ETC Learn.
5. If the previous step is not performed, a Diagnostic Trouble Code (DTC) will be set.
6. If necessary, use a scan tool to erase any Diagnostic Trouble Codes (DTC's) from PCM.
7. Before starting engine, operate accelerator pedal to check for any binding.

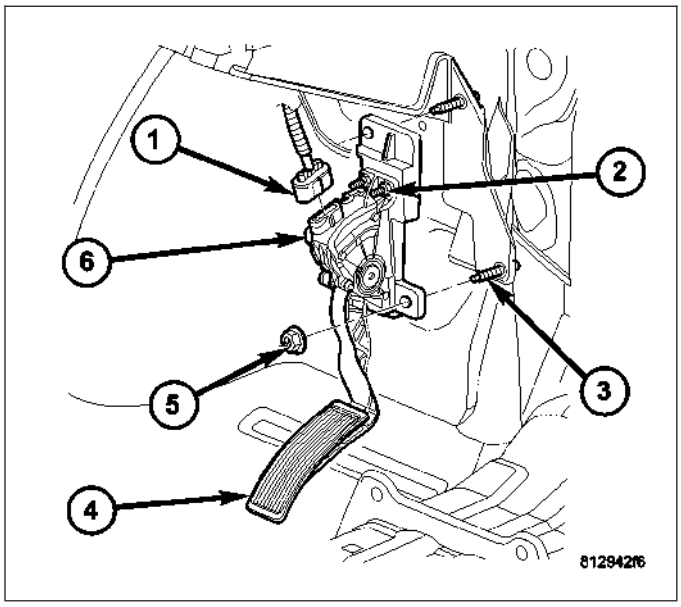


SENSOR-ACCELERATOR PEDAL POSIT

DESCRIPTION

The Accelerator Pedal Position Sensor (APPS) (6) is attached to the accelerator pedal assembly (4) under the instrument panel.

The APPS is used only with the 5.7L V-8 engine.



OPERATION

The Accelerator Pedal Position Sensor (APPS) is a linear potentiometer. It provides the Powertrain Control Module (PCM) with a DC voltage signal proportional to the angle, or position of the accelerator pedal. The APPS signal is translated (along with other sensors) to place the throttle plate (within the throttle body) to a pre-determined position.

REMOVAL

Refer to Accelerator Pedal for Removal and Installation procedures.

INSTALLATION

Refer to Accelerator Pedal for Removal and Installation procedures.

SENSOR-CRANKSHAFT POSITION

DESCRIPTION

3.7L V-6

The Crankshaft Position (CKP) sensor is mounted into the right rear side of the cylinder block. It is positioned and bolted into a machined hole.

4.7L V-8

The Crankshaft Position (CKP) sensor is mounted into the right rear side of the cylinder block. It is positioned and bolted into a machined hole.

5.7L V-8

The Crankshaft Position (CKP) sensor is mounted into the right rear side of the cylinder block. It is positioned and bolted into a machined hole.

OPERATION

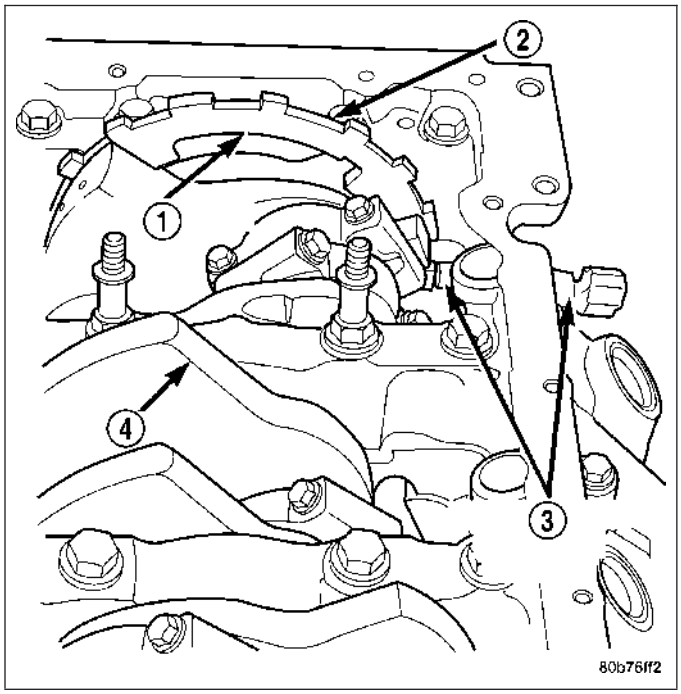
3.7L V-6

Engine speed and crankshaft position are provided through the CKP (Crankshaft Position) sensor. The sensor generates pulses that are the input sent to the Powertrain Control Module (PCM). The PCM interprets the sensor input to determine the crankshaft position. The PCM then uses this position, along with other inputs, to determine injector sequence and ignition timing.

The sensor (3) is a hall effect device combined with an internal magnet. It is also sensitive to steel within a certain distance from it.

A tonewheel (targetwheel) is bolted to the engine crankshaft (1). This tonewheel has sets of notches (2) at its outer edge.

The notches cause a pulse to be generated when they pass under the sensor. The pulses are the input to the PCM.



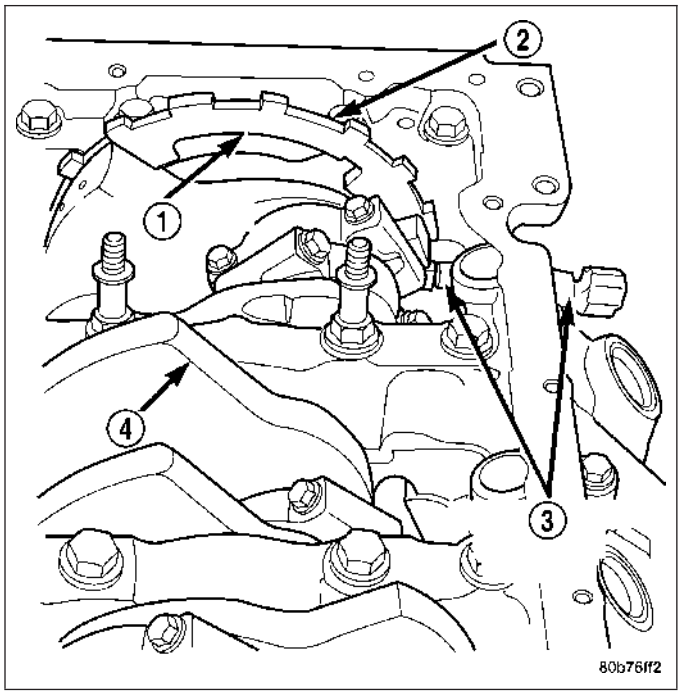
4.7L V-8

Engine speed and crankshaft position are provided through the crankshaft position sensor. The sensor generates pulses that are the input sent to the powertrain control module (PCM). The PCM interprets the sensor input to determine the crankshaft position. The PCM then uses this position, along with other inputs, to determine injector sequence and ignition timing.

The sensor (3) is a hall effect device combined with an internal magnet. It is also sensitive to steel within a certain distance from it.

On the 4.7L V–8 engine, a tonewheel (1) is bolted to the engine crankshaft. This tonewheel has sets of notches (2) at its outer edge.

The notches cause a pulse to be generated when they pass under the sensor. The pulses are the input to the PCM.



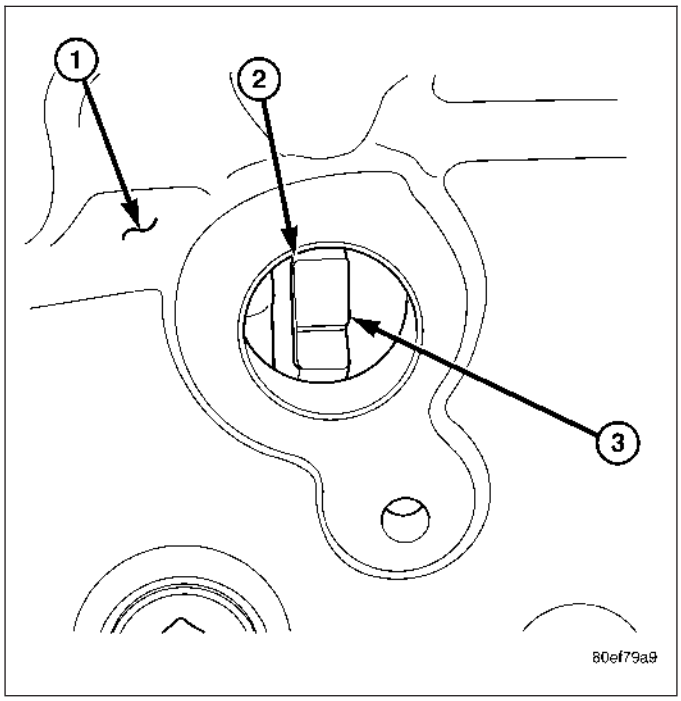
5.7L V-8

Engine speed and crankshaft position are provided through the crankshaft position sensor. The sensor generates pulses that are the input sent to the powertrain control module (PCM). The PCM interprets the sensor input to determine the crankshaft position. The PCM then uses this position, along with other inputs, to determine injector sequence and ignition timing.

The sensor is a hall effect device combined with an internal magnet. It is also sensitive to steel within a certain distance from it.

On the 5.7L V–8 engine, a tonewheel is bolted to the engine crankshaft. This tonewheel has sets of notches (3) at its outer edge.

The notches cause a pulse to be generated when they pass under the sensor. The pulses are the input to the PCM.

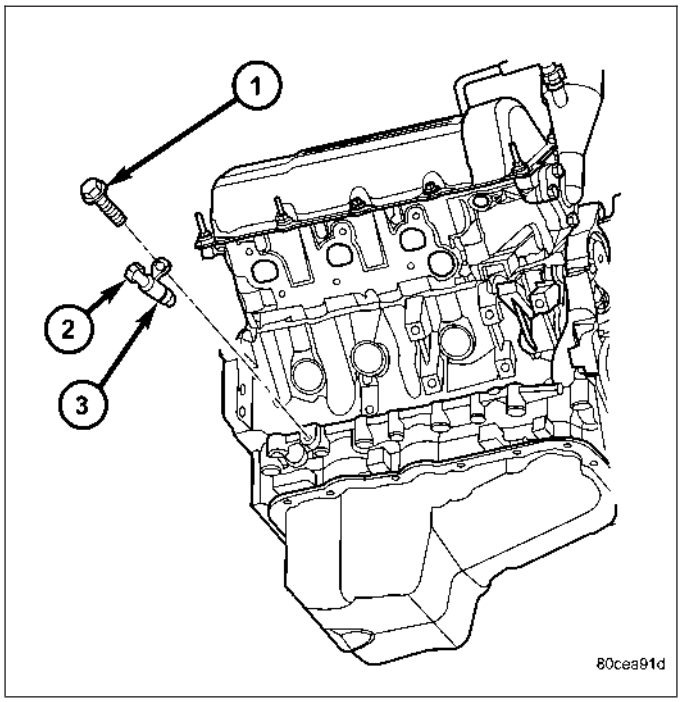


REMOVAL

3.7L V-6

The Crankshaft Position (CKP) sensor (2) is mounted into the right rear side of the cylinder block. It is positioned and bolted into a machined hole.

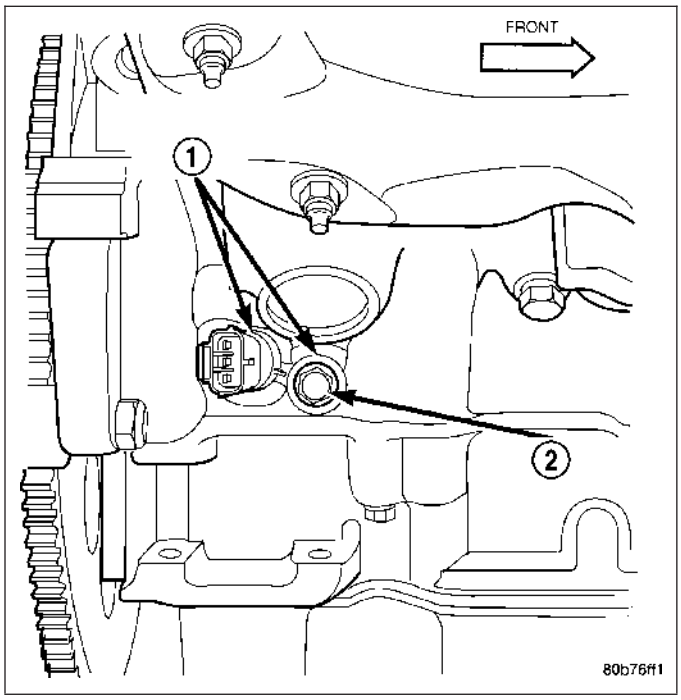
1. Raise vehicle.
2. Disconnect sensor electrical connector.
3. Remove sensor mounting bolt (1).
4. Carefully twist sensor from cylinder block.
5. Check condition of sensor o-ring (3).



4.7L V-8

The Crankshaft Position (CKP) sensor (1) is located at the right-rear side of the engine cylinder block. It is positioned and bolted into a machined hole in the engine block.

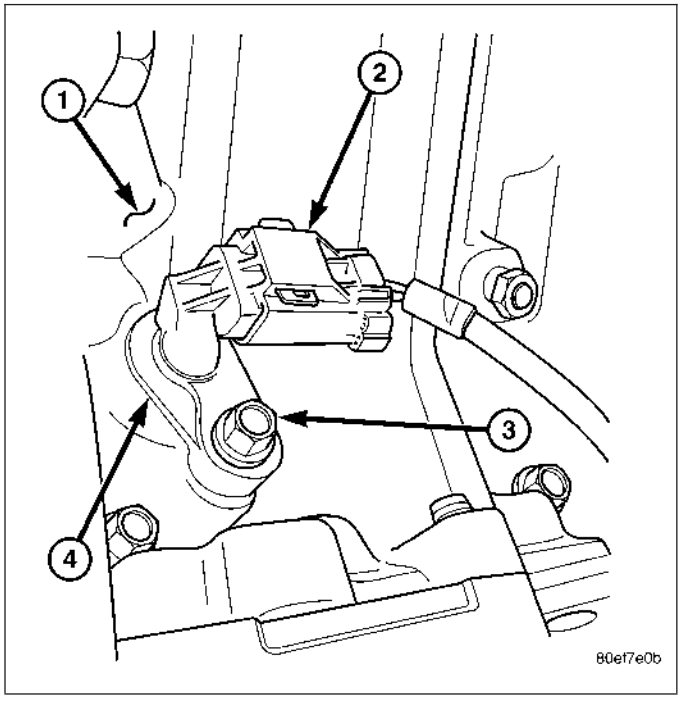
1. Raise vehicle.
2. Disconnect CKP electrical connector at sensor.
3. Remove CKP mounting bolt (2).
4. Carefully twist sensor from cylinder block.
5. Remove sensor from vehicle.
6. Check condition of sensor o-ring.



5.7L V-8

The Crankshaft Position (CKP) sensor (4) is located at the right-rear side of the engine cylinder block (1). It is positioned and bolted into a machined hole in the engine block.

1. Raise vehicle.
2. Disconnect CKP electrical connector (2) at sensor.
3. Remove CKP mounting bolt (3).
4. Carefully twist sensor from cylinder block.
5. Remove sensor from vehicle.
6. Check condition of sensor o-ring.



INSTALLATION

3.7L V-6

1. Clean out machined hole in engine block.
2. Apply a small amount of engine oil to sensor o-ring.
3. Install sensor into engine block with a slight rocking and twisting action.

CAUTION: Before tightening sensor mounting bolt, be sure sensor is completely flush to cylinder block. If sensor is not flush, damage to sensor mounting tang may result.

4. Install mounting bolt and tighten to 28 N·m (21 ft. lbs.) torque.
5. Connect electrical connector to sensor.
6. Lower vehicle.

4.7L V-8

1. Clean out machined hole in engine block.
2. Apply a small amount of engine oil to sensor o-ring.
3. Install sensor into engine block with a slight rocking and twisting action.

CAUTION: Before tightening sensor mounting bolt, be sure sensor is completely flush to cylinder block. If sensor is not flush, damage to sensor mounting tang may result.

4. Install mounting bolt and tighten to 28 N·m (21 ft. lbs.) torque.
5. Connect electrical connector to sensor.
6. Lower vehicle.

5.7L V-8

1. Clean out machined hole in engine block.
2. Apply a small amount of engine oil to sensor o-ring.
3. Install sensor into engine block with a slight rocking and twisting action.

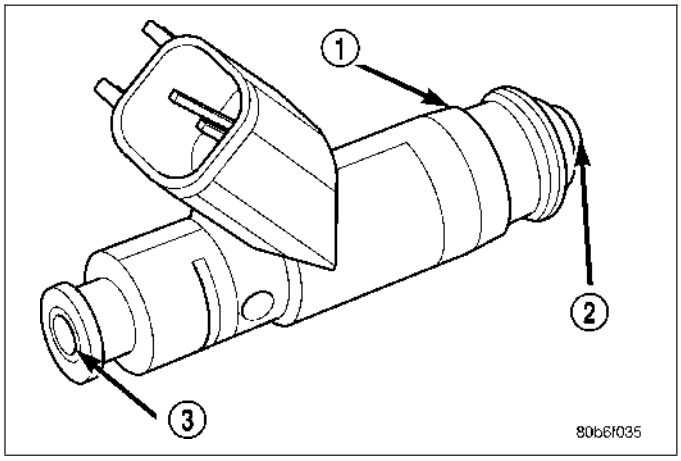
CAUTION: Before tightening sensor mounting bolt, be sure sensor is completely flush to cylinder block. If sensor is not flush, damage to sensor mounting tang may result.

4. Install mounting bolt and tighten to 28 N·m (21 ft. lbs.) torque.
5. Connect electrical connector to sensor.
6. Lower vehicle.

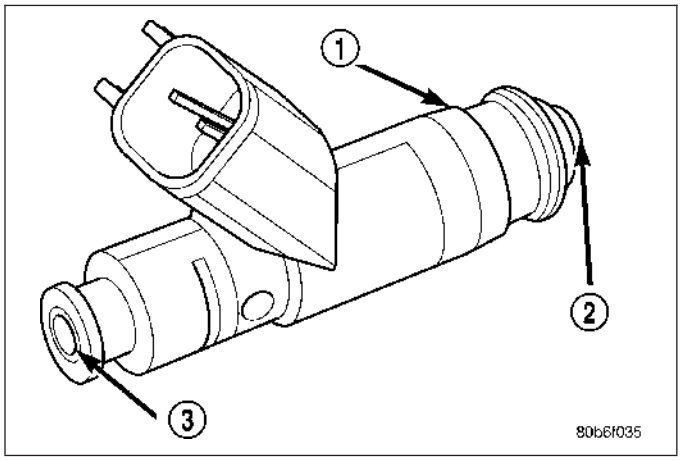
INJECTOR-FUEL

DESCRIPTION

An individual fuel injector (1) is used for each individual cylinder.



OPERATION - FUEL INJECTOR



The top (fuel entry) end of the injector (3) is attached into an opening on the fuel rail.

The fuel injectors are electrical solenoids. The injector contains a pintle that closes off an orifice at the nozzle end. When electric current is supplied to the injector, the armature and needle move a short distance against a spring, allowing fuel to flow out the orifice. Because the fuel is under high pressure, a fine spray is developed in the shape of a pencil stream. The spraying action atomizes the fuel, adding it to the air entering the combustion chamber.

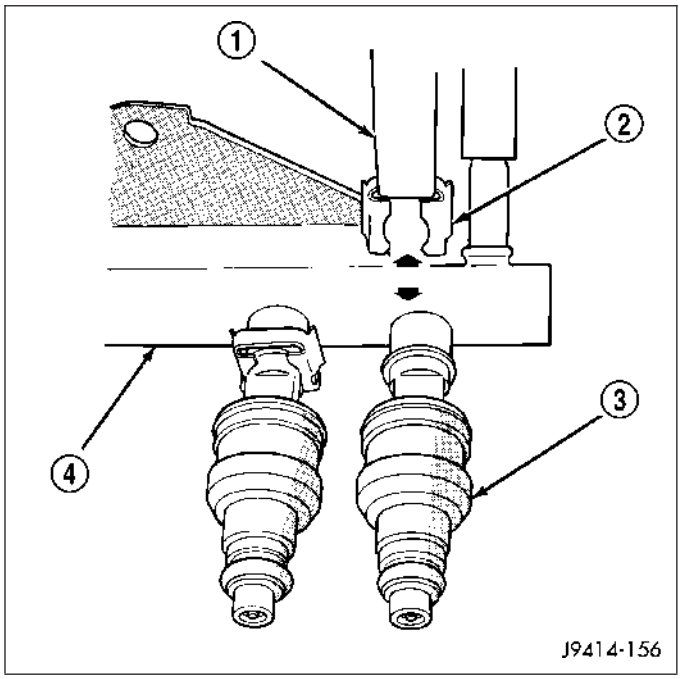
The nozzle (outlet) ends of the injectors (2) are positioned into openings in the intake manifold just above the intake valve ports of the cylinder head. The engine wiring harness connector for each fuel injector is equipped with an attached numerical tag (INJ 1, INJ 2 etc.). This is used to identify each fuel injector.

The injectors are energized individually in a sequential order by the Powertrain Control Module (PCM). The PCM will adjust injector pulse width by switching the ground path to each individual injector on and off. Injector pulse width is the period of time that the injector is energized. The PCM will adjust injector pulse width based on various inputs it receives.

Battery voltage is supplied to the injectors through the ASD relay.

The PCM determines injector pulse width based on various inputs.

REMOVAL



1. Remove fuel rail. Refer to Fuel Injector Rail Removal.
2. Disconnect clip(s) that retain fuel injector(s) to fuel rail (2).

INSTALLATION

1. Install fuel injector(s) into fuel rail assembly and install retaining clip(s).
2. If same injector(s) is being reinstalled, install new o-ring(s).
3. Apply a small amount of clean engine oil to each injector o-ring. This will aid in installation.

4. Install fuel rail. Refer to Fuel Rail Installation.
5. Start engine and check for fuel leaks.

RELAY-FUEL PUMP

DESCRIPTION

The 5–pin, 12–volt, fuel pump relay is located in the Power Distribution Center (PDC). Refer to the label on the PDC cover for relay location.

OPERATION

The Powertrain Control Module (PCM) energizes the electric fuel pump through the fuel pump relay. The fuel pump relay is energized by first applying battery voltage to it when the ignition key is turned ON, and then applying a ground signal to the relay from the PCM.

Whenever the ignition key is turned ON, the electric fuel pump will operate. But, the PCM will shut-down the ground circuit to the fuel pump relay in approximately 1–3 seconds unless the engine is operating or the starter motor is engaged.

REMOVAL

The fuel pump relay is located in the Power Distribution Center (PDC). Refer to label on PDC cover for relay location.

1. Remove PDC cover.
2. Remove relay from PDC.
3. Check condition of relay terminals and PDC connector terminals for damage or corrosion. Repair if necessary before installing relay.
4. Check for pin height (pin height should be the same for all terminals within the PDC connector). Repair if necessary before installing relay.

INSTALLATION

The fuel pump relay is located in the Power Distribution Center (PDC). Refer to label on PDC cover for relay location.

1. Install relay to PDC.
2. Install cover to PDC.

MOTOR-IDLE AIR CONTROL

DESCRIPTION

A separate IAC motor is not used with the 5.7L V-8 engine.

The IAC stepper motor is mounted to the throttle body, and regulates the amount of air bypassing the control of the throttle plate. As engine loads and ambient temperatures change, engine rpm changes. A pintle on the IAC stepper motor protrudes into a passage in the throttle body, controlling air flow through the passage. The IAC is controlled by the Powertrain Control Module (PCM) to maintain the target engine idle speed.

OPERATION

A separate IAC motor is not used with the 5.7L V-8 engine.

At idle, engine speed can be increased by retracting the IAC motor pintle and allowing more air to pass through the port, or it can be decreased by restricting the passage with the pintle and diminishing the amount of air bypassing the throttle plate.

The IAC is called a stepper motor because it is moved (rotated) in steps, or increments. Opening the IAC opens an air passage around the throttle blade which increases RPM.

The PCM uses the IAC motor to control idle speed (along with timing) and to reach a desired MAP during decel (keep engine from stalling).

The IAC motor has 4 wires with 4 circuits. Two of the wires are for 12 volts and ground to supply electrical current to the motor windings to operate the stepper motor in one direction. The other 2 wires are also for 12 volts and ground to supply electrical current to operate the stepper motor in the opposite direction.

To make the IAC go in the opposite direction, the PCM just reverses polarity on both windings. If only 1 wire is open, the IAC can only be moved 1 step (increment) in either direction. To keep the IAC motor in position when no movement is needed, the PCM will energize both windings at the same time. This locks the IAC motor in place.

In the IAC motor system, the PCM will count every step that the motor is moved. This allows the PCM to determine the motor pintle position. If the memory is cleared, the PCM no longer knows the position of the pintle. So at the first key ON, the PCM drives the IAC motor closed, regardless of where it was before. This zeros the counter. From this point the PCM will back out the IAC motor and keep track of its position again.

When engine rpm is above idle speed, the IAC is used for the following:

- Off-idle dashpot (throttle blade will close quickly but idle speed will not stop quickly)
- Deceleration air flow control
- A/C compressor load control (also opens the passage slightly before the compressor is engaged so that the engine rpm does not dip down when the compressor engages)
- Power steering load control

The PCM can control polarity of the circuit to control direction of the stepper motor.

IAC Stepper Motor Program: The PCM is also equipped with a memory program that records the number of steps the IAC stepper motor most recently advanced to during a certain set of parameters. For example: The PCM was attempting to maintain a 1000 rpm target during a cold start-up cycle. The last recorded number of steps for that may have been 125. That value would be recorded in the memory cell so that the next time the PCM recognizes the identical conditions, the PCM recalls that 125 steps were required to maintain the target. This program allows for greater customer satisfaction due to greater control of engine idle.

Another function of the memory program, which occurs when the power steering switch (if equipped), or the A/C request circuit, requires that the IAC stepper motor control engine rpm, is the recording of the last targeted steps into the memory cell. The PCM can anticipate A/C compressor loads. This is accomplished by delaying compressor operation for approximately 0.5 seconds until the PCM moves the IAC stepper motor to the recorded steps that were loaded into the memory cell. Using this program helps eliminate idle-quality changes as loads change. Finally, the PCM incorporates a ″No-Load″ engine speed limiter of approximately 1800 - 2000 rpm, when it recognizes that the TPS is indicating an idle signal and IAC motor cannot maintain engine idle.

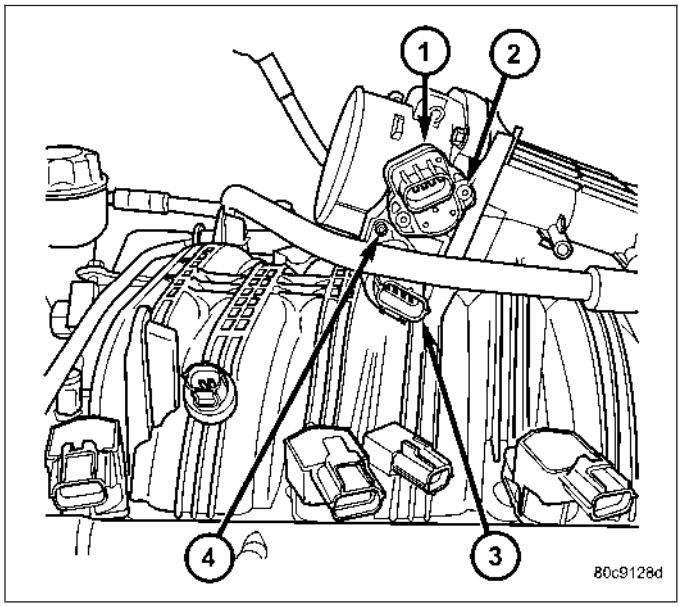
A (factory adjusted) set screw is used to mechanically limit the position of the throttle body throttle plate. **Never attempt to adjust the engine idle speed using this screw.** All idle speed functions are controlled by the IAC motor through the PCM.

REMOVAL

3.7L V-6

The Idle Air Control (IAC) motor (3) is located on the side of the throttle body.

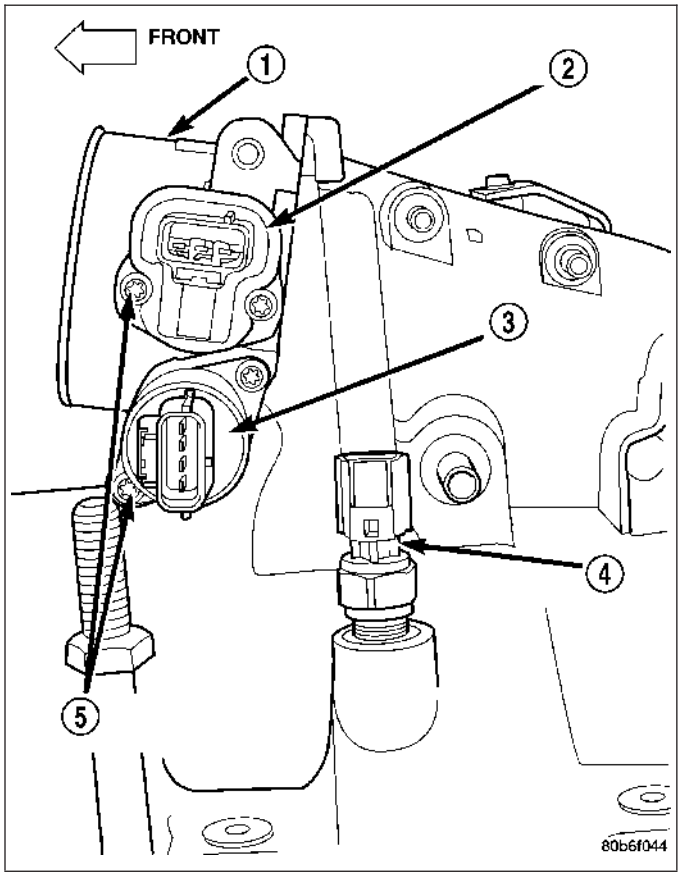
1. Remove air resonator box at throttle body.
2. Disconnect electrical connector from IAC motor.
3. Remove two mounting bolts (screws).
4. Remove IAC motor from throttle body.



4.7L V-8

The Idle Air Control (IAC) motor (3) is located on the side of the throttle body.

1. Remove air resonator box at throttle body.
2. Disconnect electrical connector from IAC motor.
3. Remove two mounting bolts (screws).
4. Remove IAC motor from throttle body.



5.7L V-8

The IAC motor is not serviceable on the 5.7L V-8 engine.

INSTALLATION

3.7L V-6

1. Install IAC motor to throttle body.
2. Install and tighten two mounting bolts (screws) to 7 N·m (60 in. lbs.) torque.
3. Install electrical connector.
4. Install air resonator to throttle body.

4.7L V-8

1. Install IAC motor to throttle body.
2. Install and tighten two mounting bolts (screws) to 7 N·m (60 in. lbs.) torque.
3. Install electrical connector.
4. Install air resonator to throttle body.

5.7L V-8

The IAC motor is not serviceable on the 5.7L V-8 engine.

SENSOR-INTAKE AIR TEMPERATURE

DESCRIPTION

The 2–wire Intake Manifold Air Temperature (IAT) sensor is installed in the intake manifold with the sensor element extending into the air stream.

The IAT sensor is a two-wire Negative Thermal Coefficient (NTC) sensor. Meaning, as intake manifold temperature increases, resistance (voltage) in the sensor decreases. As temperature decreases, resistance (voltage) in the sensor increases.

OPERATION

The IAT sensor provides an input voltage to the Powertrain Control Module (PCM) indicating the density of the air entering the intake manifold based upon intake manifold temperature. At key-on, a 5–volt power circuit is supplied to the sensor from the PCM. The sensor is grounded at the PCM through a low-noise, sensor-return circuit.

The PCM uses this input to calculate the following:

- Injector pulse-width
- Adjustment of spark timing (to help prevent spark knock with high intake manifold air-charge temperatures)

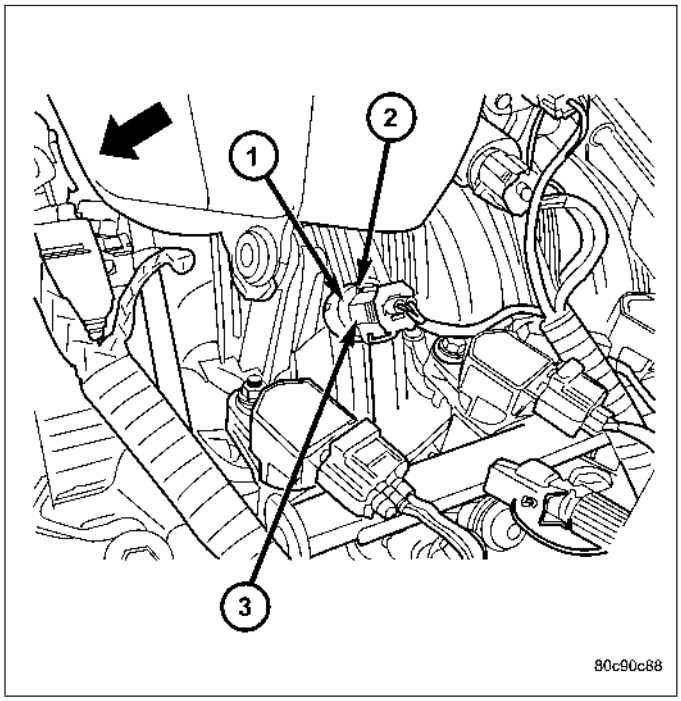
The resistance values of the IAT sensor is the same as for the Engine Coolant Temperature (ECT) sensor.

REMOVAL

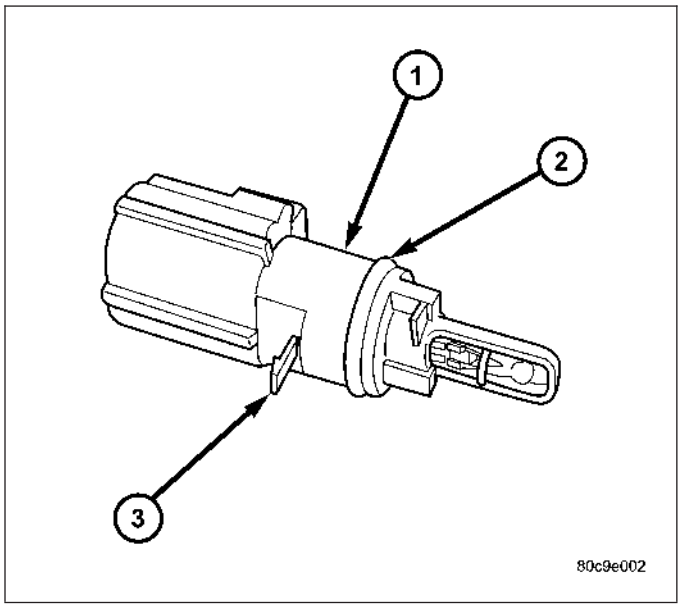
3.7L V-6

The intake manifold air temperature (IAT) sensor (1) is installed into the left side of intake manifold plenum.

1. Disconnect electrical connector (3) from IAT sensor.
2. Clean dirt from intake manifold at sensor base.



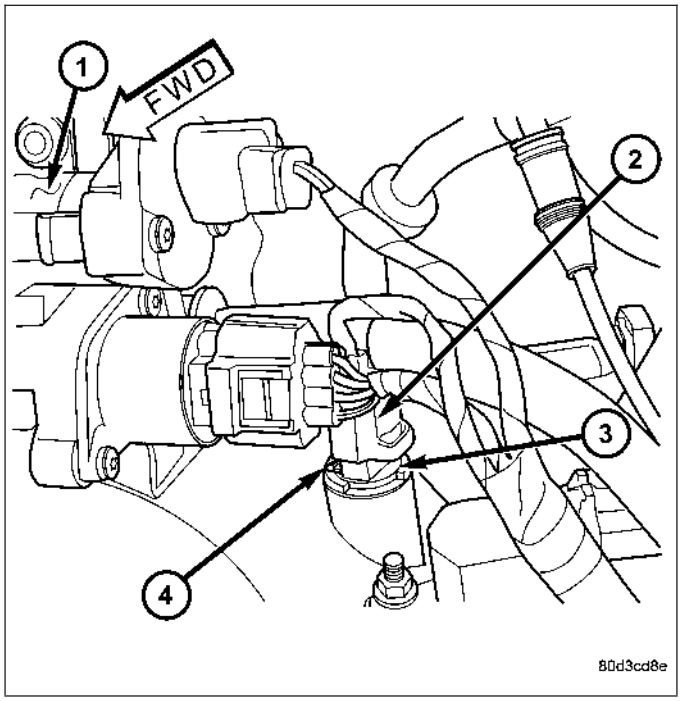
3. Gently lift on small plastic release tab (3) and rotate sensor about 1/4 turn counter-clockwise for removal.
4. Check condition of sensor o-ring (2).



4.7L V-8

The intake manifold air temperature (IAT) sensor (3) is installed into the left side of intake manifold plenum.

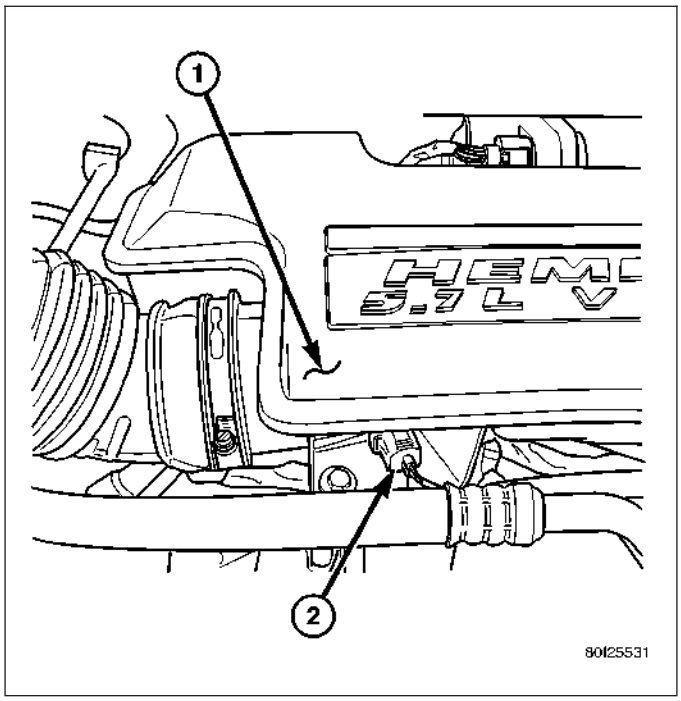
1. Disconnect electrical connector from IAT sensor.
2. Clean dirt from intake manifold at sensor base.
3. Gently lift on small plastic release tab (4) and rotate sensor about 1/4 turn counter-clockwise for removal.
4. Check condition of sensor o-ring.



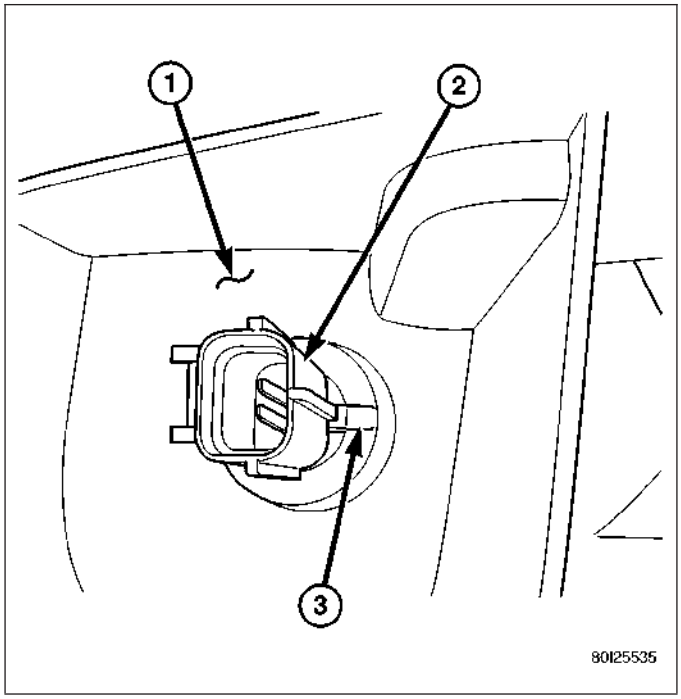
5.7L V-8

The intake manifold air temperature (IAT) sensor is installed into the front of the intake manifold air box plenum (2).

1. Disconnect electrical connector (2) from IAT sensor.
2. Clean dirt from intake manifold at sensor base.



3. Gently lift on small plastic release tab (3) and rotate sensor about 1/4 turn counter-clockwise for removal.
4. Check condition of sensor o-ring.



INSTALLATION

3.7L V-6

1. Check condition of sensor o-ring.
2. Clean sensor mounting hole in intake manifold.
3. Position sensor into intake manifold and rotate clockwise until past release tab.
4. Install electrical connector.

4.7L V-8

1. Check condition of sensor o-ring.
2. Clean sensor mounting hole in intake manifold.
3. Position sensor into intake manifold and rotate clockwise until past release tab.
4. Install electrical connector.

5.7L V-8

1. Check condition of sensor o-ring.
2. Clean sensor mounting hole in intake manifold.
3. Position sensor into intake manifold and rotate clockwise until past release tab.
4. Install electrical connector.

SENSOR-MAP

DESCRIPTION

3.7L V-6

The Manifold Absolute Pressure (MAP) sensor is mounted into the front of the intake manifold with 2 screws.

4.7L V-8

The Manifold Absolute Pressure (MAP) sensor is mounted into the front of the intake manifold with 2 screws.

5.7L V-8

The Manifold Absolute Pressure (MAP) sensor is mounted to the front of the intake manifold air plenum box.

OPERATION

The MAP sensor is used as an input to the Powertrain Control Module (PCM). It contains a silicon based sensing unit to provide data on the manifold vacuum that draws the air/fuel mixture into the combustion chamber. The PCM requires this information to determine injector pulse width and spark advance. When manifold absolute pressure (MAP) equals Barometric pressure, the pulse width will be at maximum.

A 5 volt reference is supplied from the PCM and returns a voltage signal to the PCM that reflects manifold pressure. The zero pressure reading is 0.5V and full scale is 4.5V. For a pressure swing of 0–15 psi, the voltage changes 4.0V. To operate the sensor, it is supplied a regulated 4.8 to 5.1 volts. Ground is provided through the low-noise, sensor return circuit at the PCM.

The MAP sensor input is the number one contributor to fuel injector pulse width. The most important function of the MAP sensor is to determine barometric pressure. The PCM needs to know if the vehicle is at sea level or at a higher altitude, because the air density changes with altitude. It will also help to correct for varying barometric pressure. Barometric pressure and altitude have a direct inverse correlation; as altitude goes up, barometric goes down. At key-on, the PCM powers up and looks at MAP voltage, and based upon the voltage it sees, it knows the current barometric pressure (relative to altitude). Once the engine starts, the PCM looks at the voltage again, continuously every 12 milliseconds, and compares the current voltage to what it was at key-on. The difference between current voltage and what it was at key-on, is manifold vacuum.

During key-on (engine not running) the sensor reads (updates) barometric pressure. A normal range can be obtained by monitoring a known good sensor.

As the altitude increases, the air becomes thinner (less oxygen). If a vehicle is started and driven to a very different altitude than where it was at key-on, the barometric pressure needs to be updated. Any time the PCM sees Wide Open Throttle (WOT), based upon Throttle Position Sensor (TPS) angle and RPM, it will update barometric pressure in the MAP memory cell. With periodic updates, the PCM can make its calculations more effectively.

The PCM uses the MAP sensor input to aid in calculating the following:

- Manifold pressure
- Barometric pressure
- Engine load
- Injector pulse-width
- Spark-advance programs
- Shift-point strategies (certain automatic transmissions only)
- Idle speed
- Decel fuel shutoff

The MAP sensor signal is provided from a single piezoresistive element located in the center of a diaphragm. The element and diaphragm are both made of silicone. As manifold pressure changes, the diaphragm moves causing the element to deflect, which stresses the silicone. When silicone is exposed to stress, its resistance changes. As manifold vacuum increases, the MAP sensor input voltage decreases proportionally. The sensor also contains electronics that condition the signal and provide temperature compensation.

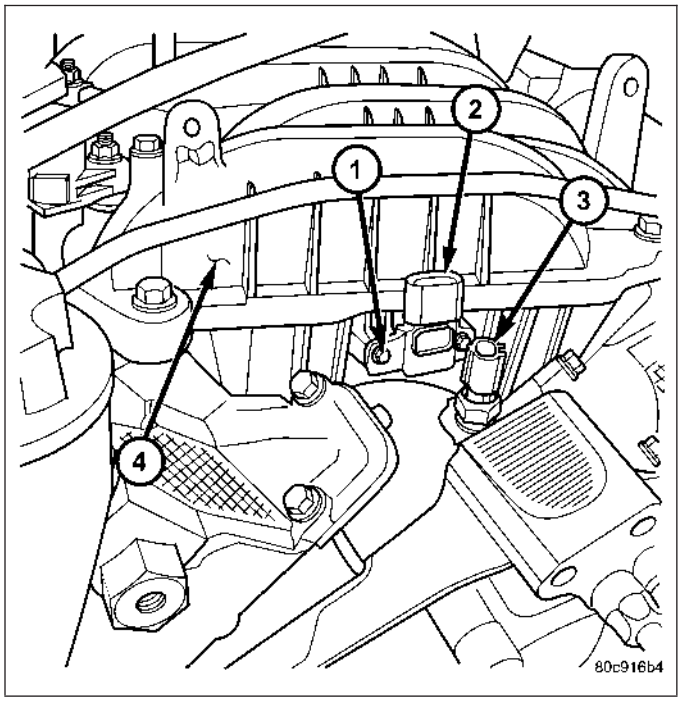
The PCM recognizes a decrease in manifold pressure by monitoring a decrease in voltage from the reading stored in the barometric pressure memory cell. The MAP sensor is a linear sensor; meaning as pressure changes, voltage changes proportionately. The range of voltage output from the sensor is usually between 4.6 volts at sea level to as low as 0.3 volts at 26 in. of Hg. Barometric pressure is the pressure exerted by the atmosphere upon an object. At sea level on a standard day, no storm, barometric pressure is approximately 29.92 in Hg. For every 100 feet of altitude, barometric pressure drops 0.10 in. Hg. If a storm goes through, it can change barometric pressure from what should be present for that altitude. You should know what the average pressure and corresponding barometric pressure is for your area.

REMOVAL

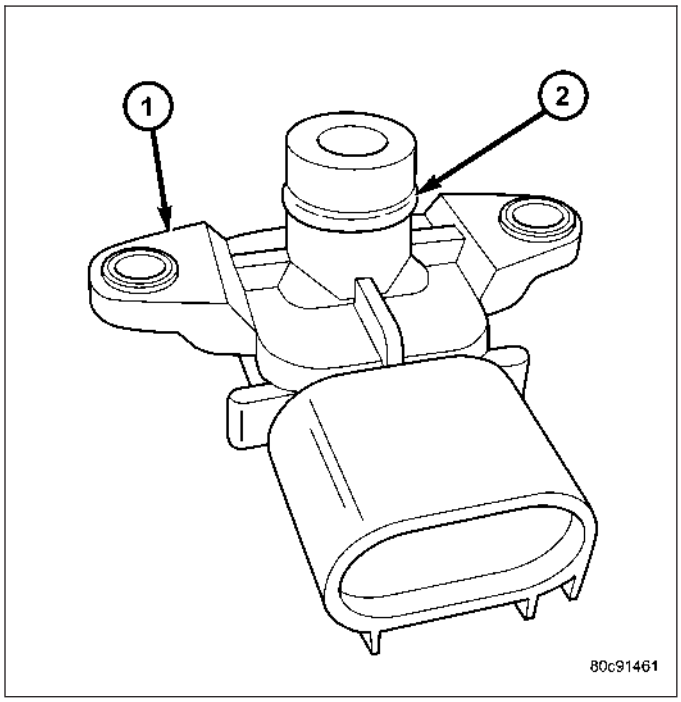
3.7L V-6

The Manifold Absolute Pressure (MAP) sensor (2) is mounted into the front of the intake manifold.

1. Disconnect electrical connector at sensor.
2. Clean area around MAP sensor.
3. Remove two sensor mounting screws (1).
4. Remove MAP sensor from intake manifold.



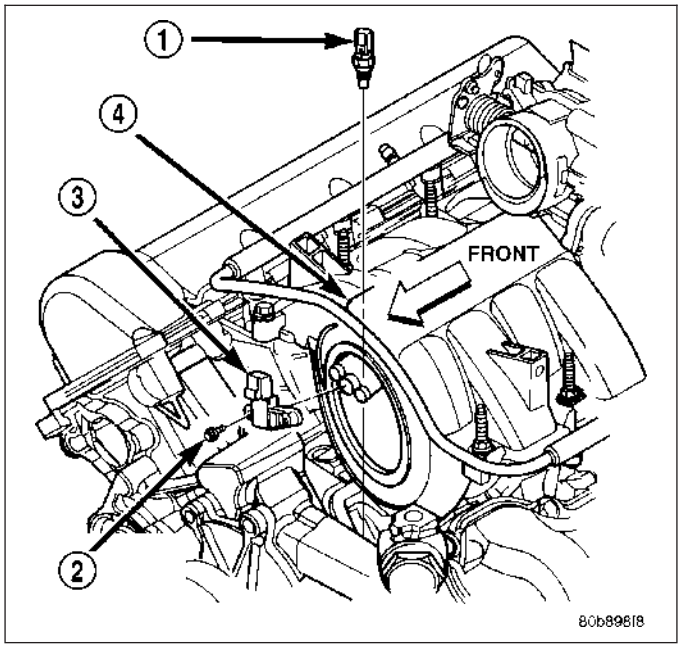
5. Check condition of sensor o-ring (2)
   .



4.7L V-8

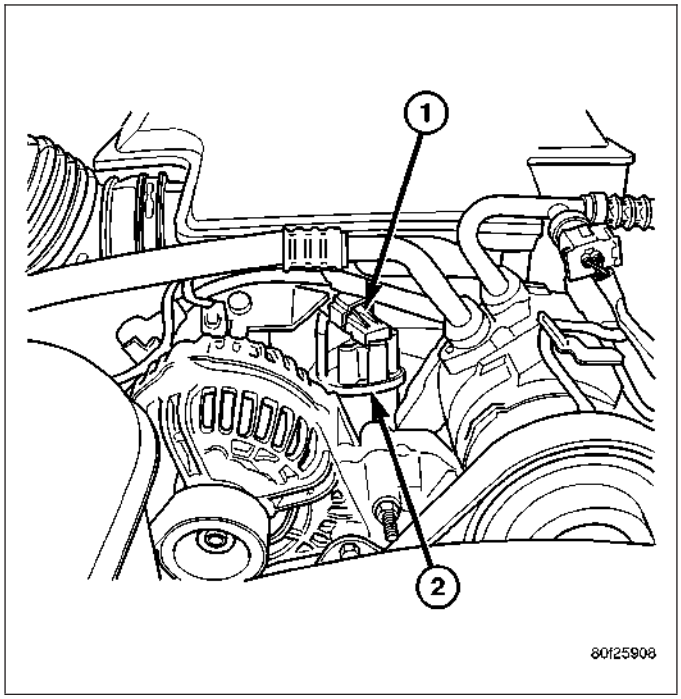
The MAP sensor (3) is located on the front of the intake manifold. An o-ring seals the sensor to the intake manifold.

1. Disconnect electrical connector at sensor.
2. Clean area around MAP sensor.
3. Remove two sensor mounting bolts (2).
4. Remove MAP sensor from intake manifold.
5. Check condition of sensor o-ring.

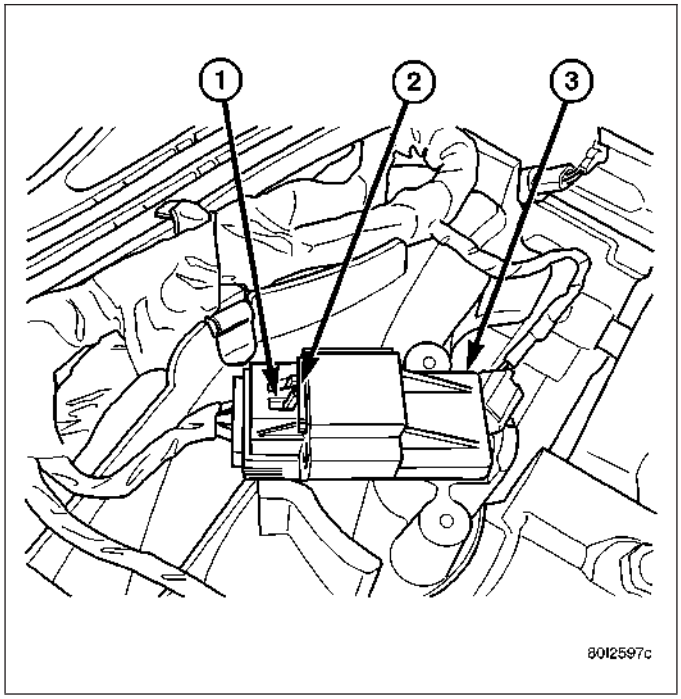


5.7L V-8

The Manifold Absolute Pressure (MAP) sensor (1) is mounted to the front of the intake manifold air plenum box.



1. Disconnect electrical connector at sensor by sliding release lock out (1). Press down on lock tab (2) for removal.
2. Rotate sensor 1/4 turn counter-clockwise for removal.
3. Check condition of sensor o-ring.



INSTALLATION

3.7L V-6

The Manifold Absolute Pressure (MAP) sensor is mounted into the front of the intake manifold. An o-ring is used to seal the sensor to the intake manifold.

1. Clean MAP sensor mounting hole at intake manifold.
2. Check MAP sensor o-ring seal for cuts or tears.
3. Position sensor into manifold.
4. Install MAP sensor mounting bolts (screws). Refer to Torque Specifications.
5. Connect electrical connector.

4.7L V-8

The MAP sensor is located on the front of the intake manifold. An o-ring seals the sensor to the intake manifold.

1. Clean MAP sensor mounting hole at intake manifold.
2. Check MAP sensor o-ring seal for cuts or tears.
3. Position sensor into manifold.
4. Install MAP sensor mounting bolts (screws). Refer to Torque Specifications.
5. Connect electrical connector.

5.7L V-8

The Manifold Absolute Pressure (MAP) sensor is mounted to the front of the intake manifold air plenum box.

1. Clean MAP sensor mounting hole at intake manifold.
2. Check MAP sensor o-ring seal for cuts or tears.
3. Position sensor into manifold.
4. Rotate sensor 1/4 turn clockwise for installation.
5. Connect electrical connector.

SENSOR-OXYGEN

DESCRIPTION

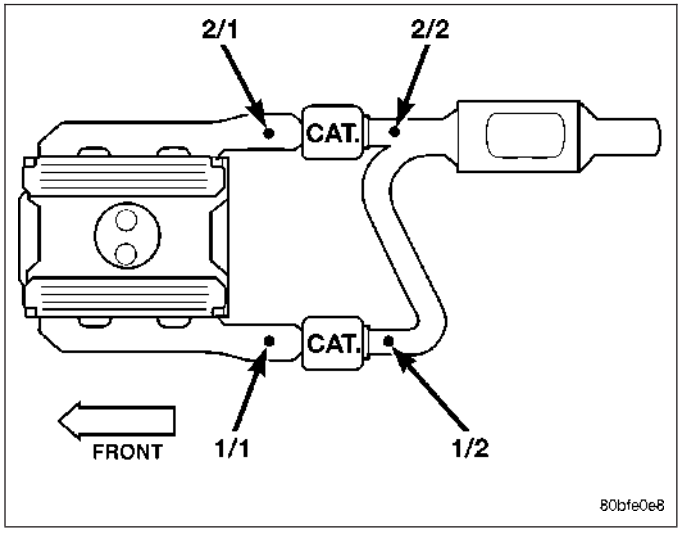
The Oxygen Sensors (O2S) are attached to, and protrude into the vehicle exhaust system. Depending on the engine or emission package, the vehicle may use a total of either 2 or 4 sensors.

Federal Emission Packages : Two sensors are used: upstream (referred to as 1/1) and downstream (referred to as 1/2). With this emission package, the upstream sensor (1/1) is located just before the main catalytic convertor. The downstream sensor (1/2) is located just after the main catalytic convertor.

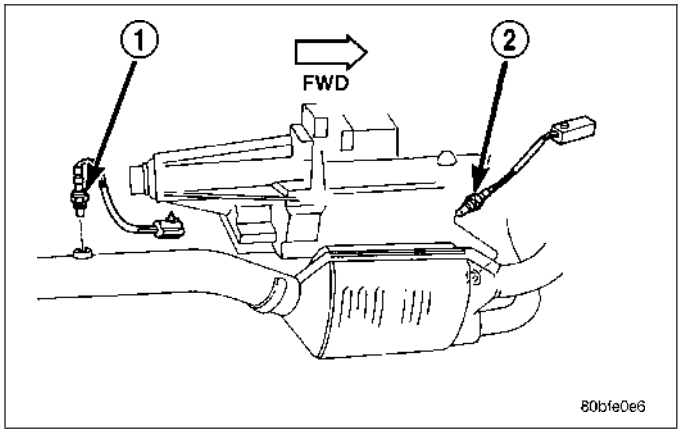
California Emission Packages: On this emissions package, 4 sensors are used: 2 upstream (referred to as 1/1 and 2/1) and 2 downstream (referred to as 1/2 and 2/2). With this emission package, the right upstream sensor (2/1) is located in the right exhaust downpipe just before the mini-catalytic convertor. The left upstream sensor (1/1) is located in the left exhaust downpipe just before the mini-catalytic convertor. The right downstream sensor (2/2) is located in the right exhaust downpipe just after the mini-catalytic convertor, and before the main catalytic convertor. The left downstream sensor (1/2) is located in the left exhaust downpipe just after the mini-catalytic convertor, and before the main catalytic convertor.

REMOVAL

Refer to graphic for typical O2S (oxygen sensor) locations if equipped with four oxygen sensors.



Refer to graphic for typical O2S (oxygen sensor) locations if equipped with two oxygen sensors.



CAUTION: Never apply any type of grease to the oxygen sensor electrical connector, or attempt any soldering of the sensor wiring harness.

WARNING: THE EXHAUST MANIFOLD, EXHAUST PIPES AND CATALYTIC CONVERTER BECOME VERY HOT DURING ENGINE OPERATION. ALLOW ENGINE TO COOL BEFORE REMOVING OXYGEN SENSOR.

1. Raise and support vehicle.
2. Disconnect wire connector from O2S sensor.

CAUTION: When disconnecting sensor electrical connector, do not pull directly on wire going into sensor.

3. Remove O2S sensor with an oxygen sensor removal and installation tool.
4. Clean threads in exhaust pipe using appropriate tap.

INSTALLATION

Threads of new oxygen sensors are factory coated with anti-seize compound to aid in removal. **DO NOT add any additional anti-seize compound to threads of a new oxygen sensor.**

1. Install O2S sensor. Tighten to 30 N·m (22 ft. lbs.) torque.
2. Connect O2S sensor wire connector.
3. Lower vehicle.

THROTTLE BODY

DESCRIPTION

The throttle body is located on the intake manifold. Fuel does not enter the intake manifold through the throttle body. Fuel is sprayed into the manifold by the fuel injectors.

OPERATION

Filtered air from the air cleaner enters the intake manifold through the throttle body. The throttle body contains an air control passage controlled by an Idle Air Control (IAC) motor. The air control passage is used to supply air for idle conditions. A throttle valve (plate) is used to supply air for above idle conditions.

5.7L V-8 Engine:

The throttle body on the 5.7L engine is an electrically controlled unit. A mechanical cable is not used to connect the throttle body to the accelerator pedal. The Accelerator Pedal Position Sensor (APPS) along with inputs from other sensors sets the throttle blade to pre-determined positions.

Except 5.7L V-8 Engine:

Certain sensors are attached to the throttle body. The accelerator pedal cable, speed control cable and transmission control cable (when equipped) are connected to the throttle body linkage arm.

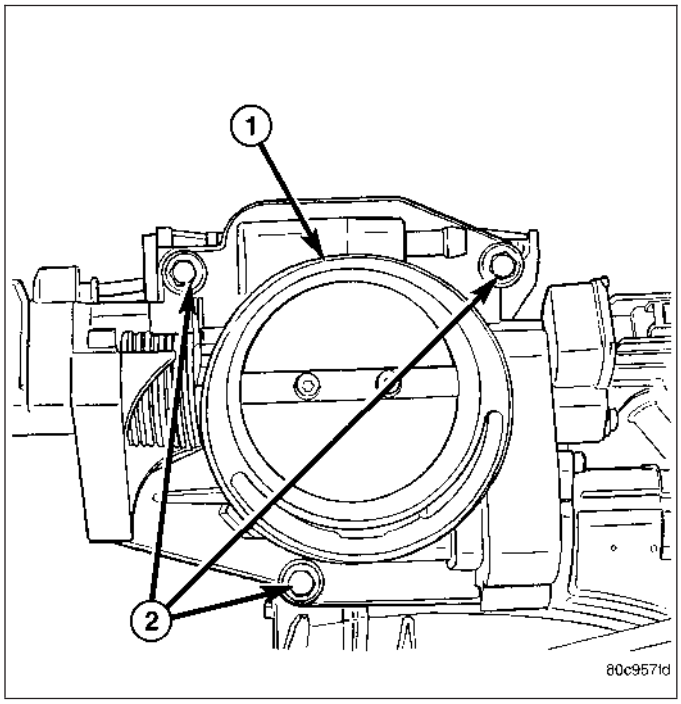
A (factory adjusted) set screw is used to mechanically limit the position of the throttle body throttle plate. **Never attempt to adjust the engine idle speed using this screw.** All idle speed functions are controlled by the PCM.

REMOVAL

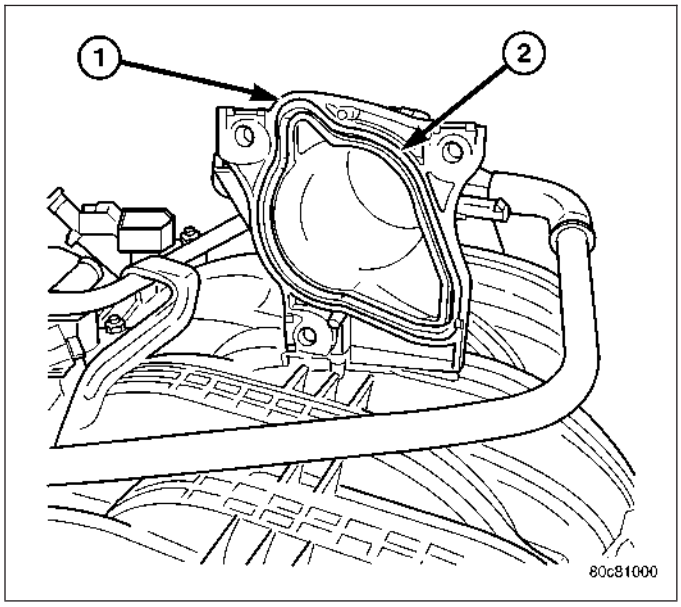
3.7L V-6

A (factory adjusted) set screw is used to mechanically limit the position of the throttle body throttle plate. **Never attempt to adjust the engine idle speed using this screw.** All idle speed functions are controlled by the Powertrain Control Module (PCM).

1. Remove air cleaner tube at throttle body.
2. Disconnect throttle body electrical connectors at IAC motor and TPS.
3. Remove all control cables from throttle body (lever) arm. Refer to the Accelerator Pedal and Throttle Cable section for removal/installation procedures.
4. Disconnect necessary vacuum lines at throttle body.
5. Remove three throttle body mounting bolts (2).
6. Remove throttle body from intake manifold.

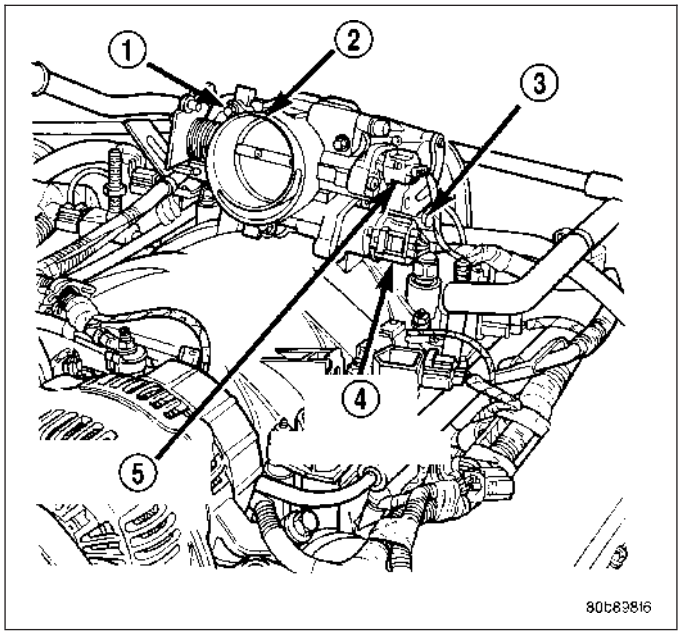


7. Check condition of old throttle body-to-intake manifold o-ring (2).



4.7L V-8

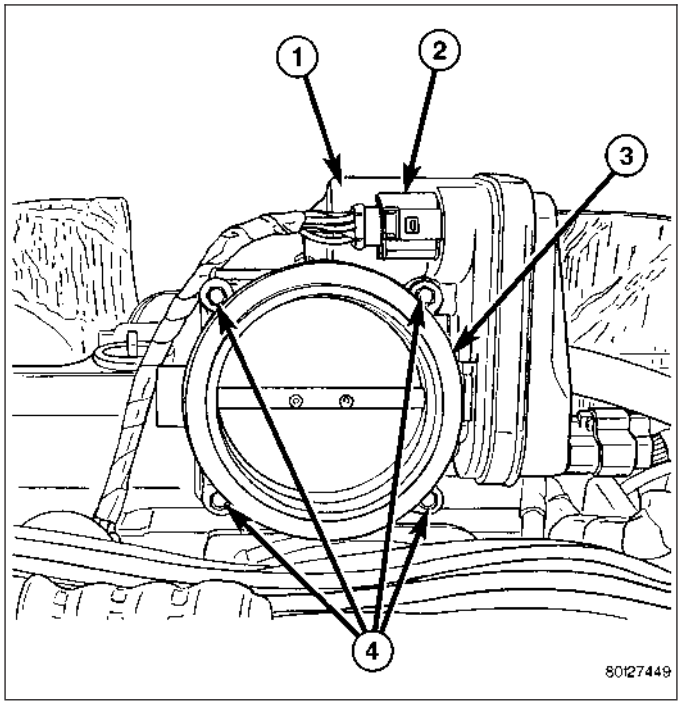
1. Remove air duct and air resonator box at throttle body.
2. Disconnect throttle body electrical connectors at IAC motor and TPS (3) , (4), and (5).
3. Remove vacuum line at throttle body.
4. Remove all control cables from throttle body (lever) arm. Refer to Accelerator Pedal and Throttle Cable.
5. Remove three throttle body mounting bolts (1).
6. Remove throttle body from intake manifold.



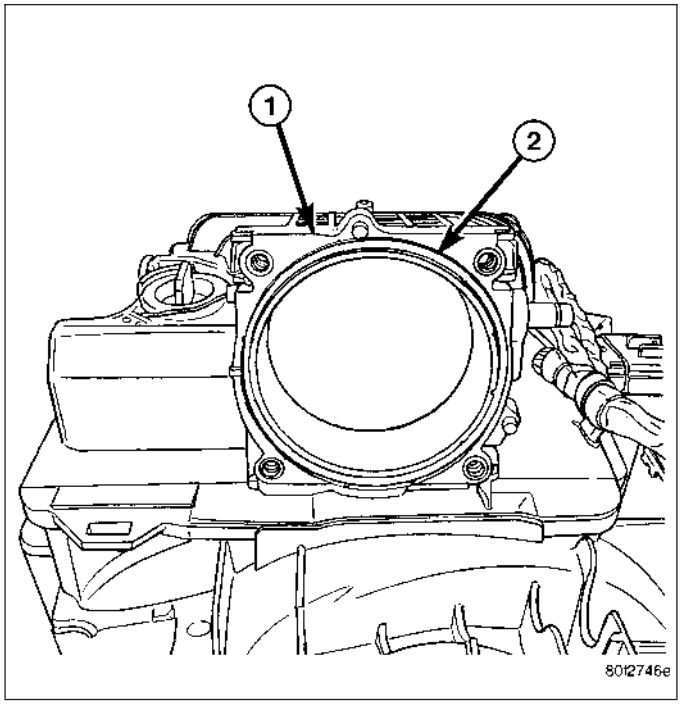
5.7L V-8

CAUTION: Do not use spray (carb) cleaners on any part of the throttle body. Do not apply silicone lubricants to any part of the throttle body.

1. Remove air duct and air resonator box at throttle body.
2. Disconnect electrical connector at throttle body (2).
3. Remove four throttle body mounting bolts (4).
4. Remove throttle body from intake manifold.



5. Check condition of throttle body o-ring (2).



INSTALLATION

3.7L V-6

1. Check condition of throttle body-to-intake manifold o-ring. Replace as necessary.
2. Clean mating surfaces of throttle body and intake manifold.
3. Install throttle body-to-intake manifold o-ring.
4. Install throttle body to intake manifold.
5. Install 3 mounting bolts. Tighten bolts to 12 N·m (105 in. lbs.) torque.
6. Install control cables.
7. Install electrical connectors.
8. Install necessary vacuum lines.
9. Install air plenum.

4.7L V-8

1. Clean throttle body-to-intake manifold o-ring.
2. Clean mating surfaces of throttle body and intake manifold.
3. Install throttle body to intake manifold by positioning throttle body to manifold alignment pins.
4. Install three mounting bolts. Tighten bolts to 12 N·m (105 in. lbs.) torque.
5. Install control cables.
6. Install vacuum line to throttle body.
7. Install electrical connectors.
8. Install air plenum.

5.7L V-8

CAUTION: Do not use spray (carb) cleaners on any part of the throttle body. Do not apply silicone lubricants to any part of the throttle body.

1. Clean and check condition of throttle body-to-intake manifold o-ring.
2. Clean mating surfaces of throttle body and intake manifold.

3. Install throttle body to intake manifold by positioning throttle body to manifold alignment pins.
4. Install 4 mounting bolts. Refer to Torque Specifications.
5. Install electrical connector.
6. Install air plenum.
7. A Scan Tool may be used to learn electrical parameters. Go to the Miscellaneous menu, and then select ETC Learn.
8. If the previous step is not performed, a Diagnostic Trouble Code (DTC) will be set.
9. If necessary, use a scan tool to erase any Diagnostic Trouble Codes (DTC's) from PCM.

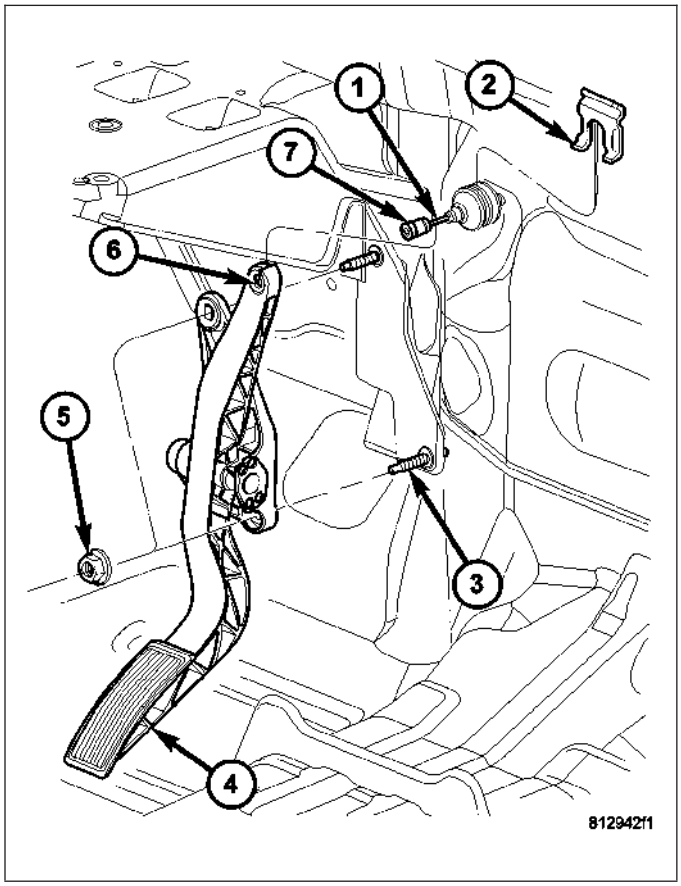
CABLE-THROTTLE CONTROL

REMOVAL

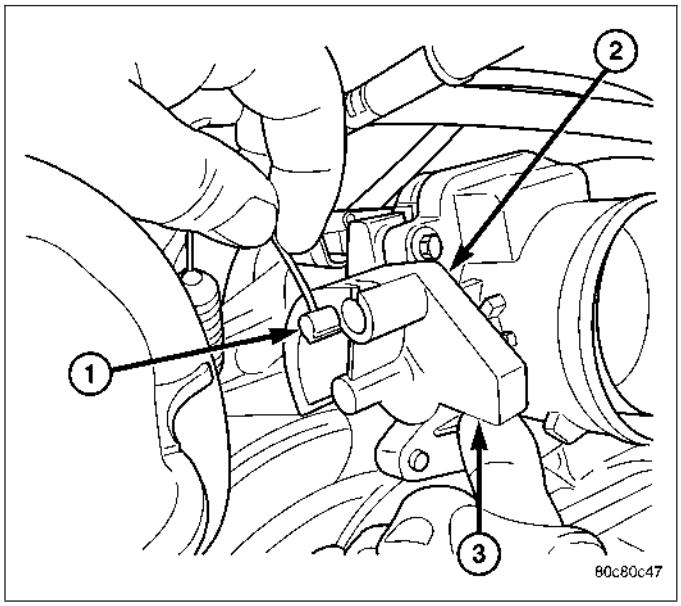
3.7L V-6

CAUTION: Be careful not to damage or kink cable core wire (within cable sheathing) while servicing accelerator pedal or throttle cable.

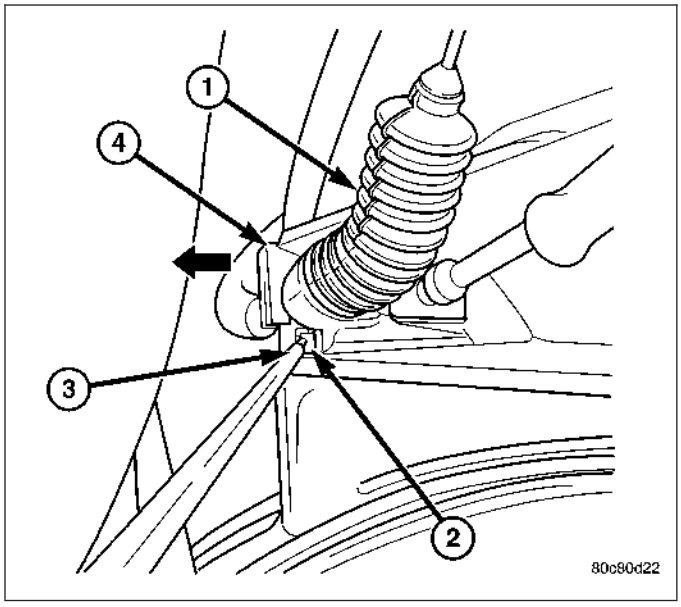
1. From inside vehicle, hold up accelerator pedal. Remove plastic cable retainer (clip) (7) and throttle cable core wire from upper end of pedal arm (6). Plastic cable retainer snaps into top of pedal arm.
2. Remove cable core wire at pedal arm.
3. From inside vehicle, remove metal clip (2) holding cable to dashpanel.
4. Remove air resonator box at throttle body.
5. Unsnap cable from dashpanel routing clip.
6. Remove cable housing from dash panel and pull into engine compartment
   .



7. Hold throttle in wide open position. While held in this position, slide throttle cable pin (1) from throttle body bellcrank.



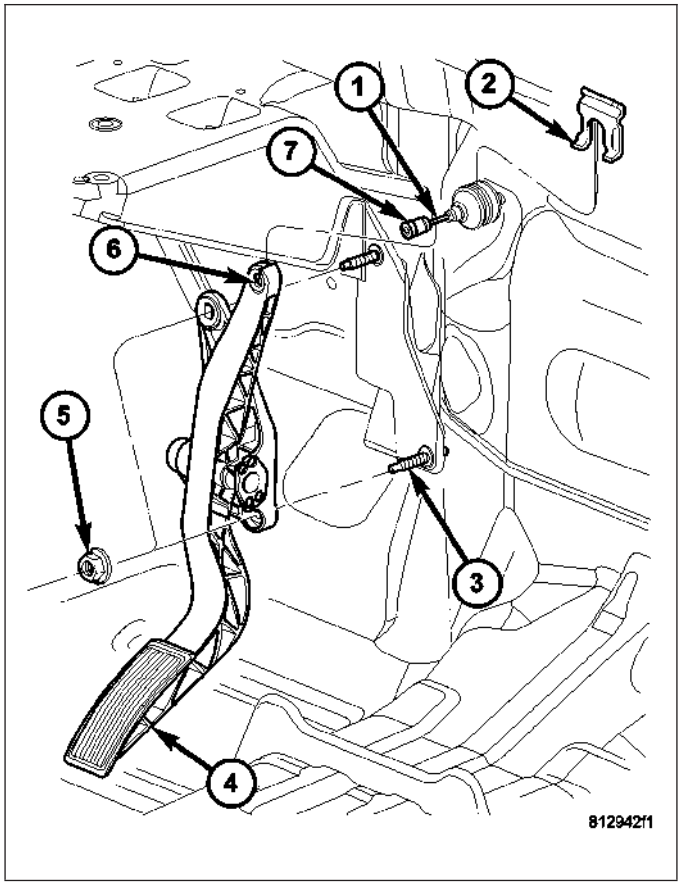
8. Using a pick or small screwdriver (3), press release tab (2) to release plastic cable mount from bracket. **Press on tab only enough to release cable from bracket. If tab is pressed too much, it will be broken.** Slide plastic mount (4) towards right side of vehicle to remove throttle cable from throttle body bracket.
9. Remove throttle cable from vehicle.



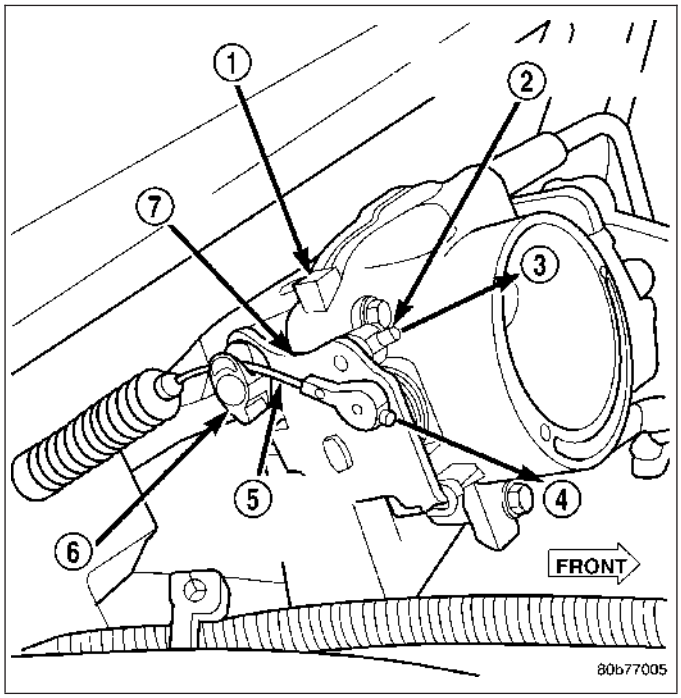
4.7L V-8

CAUTION: Be careful not to damage or kink cable core wire (within cable sheathing) while servicing accelerator pedal or throttle cable.

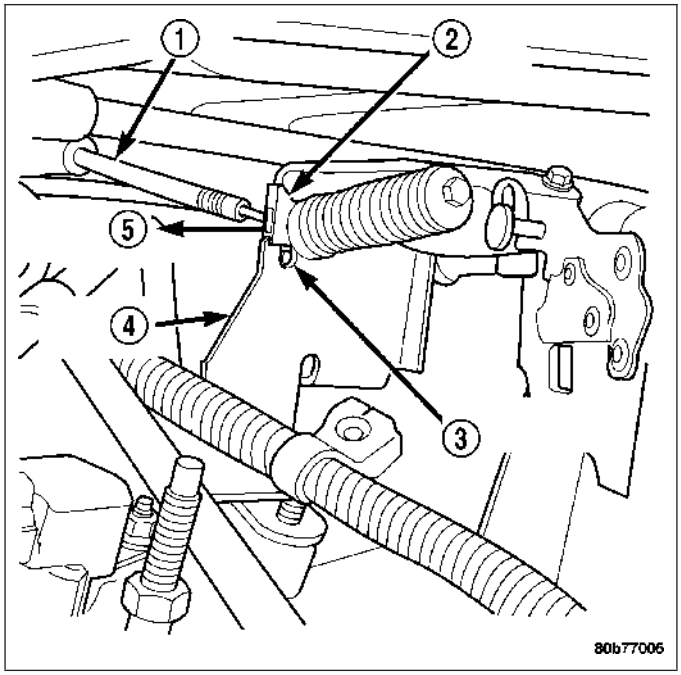
1. From inside vehicle, hold up accelerator pedal. Remove plastic cable retainer (clip) (7) and throttle cable core wire from upper end of pedal arm (6). Plastic cable retainer (clip) snaps into pedal arm.
2. Remove cable core wire at pedal arm.
3. From inside vehicle, remove cable clip (2) holding cable to dashpanel.
4. Remove air box at throttle body.
5. Unsnap cable from dashpanel routing clip.
6. Remove cable housing from dash panel and pull into engine compartment.



7. Using finger pressure only, disconnect accelerator cable connector at throttle body bellcrank pin by pushing connector off bellcrank pin towards front of vehicle (4). **DO NOT try to pull connector off perpendicular to bellcrank pin. Connector will be broken.**
8. Lift accelerator cable from top of cable cam (6).



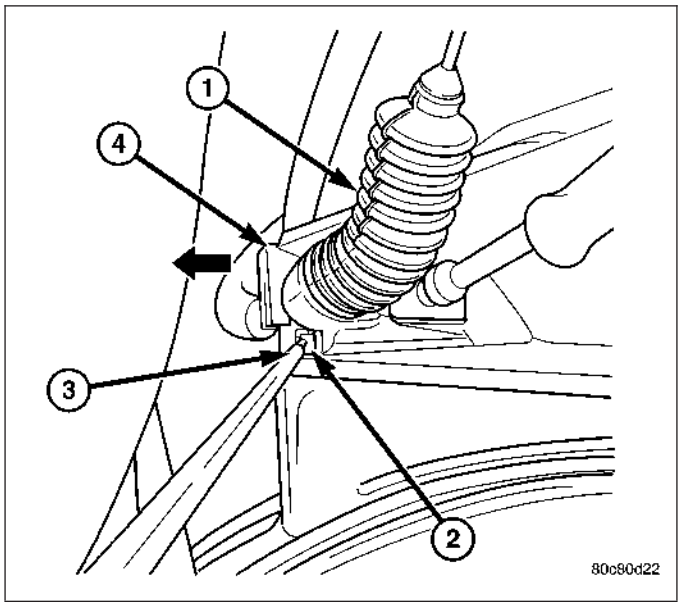
9. Press tab (3) to release plastic cable mount from bracket. **Press on tab only enough to release cable from bracket. If tab is pressed too much, it will be broken.** Slide plastic mount (2) towards passenger side of vehicle to remove cable from bracket.
10. Remove throttle cable from vehicle.



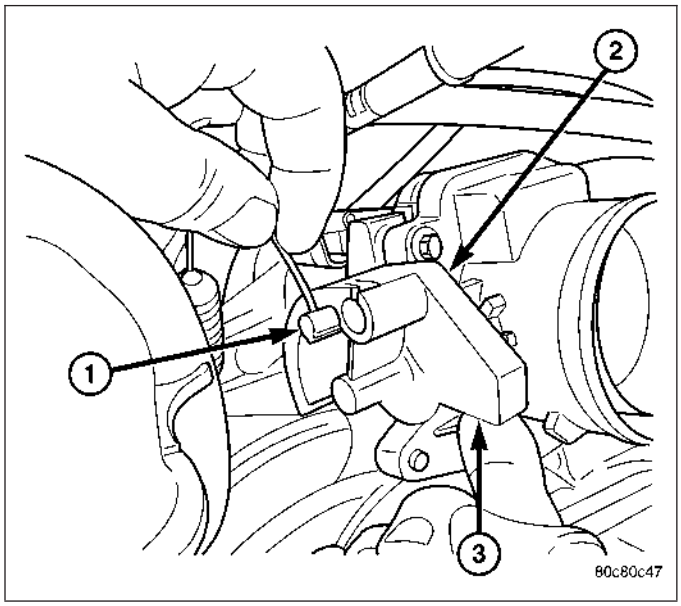
INSTALLATION

3.7L V-6

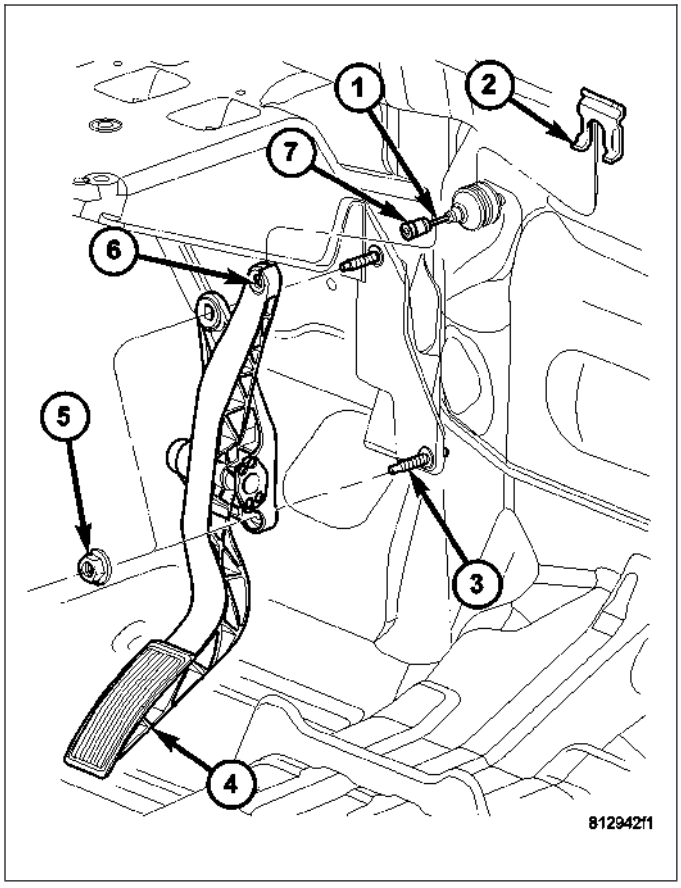
1. Slide accelerator cable plastic mount into throttle body mounting bracket. Continue sliding until release tab (2) is aligned to hole in mounting bracket.



2. Hold throttle in wide open position. While held in this position, slide throttle cable pin (1) into throttle body bellcrank.
3. Push cable housing into rubber grommet and through opening in dash panel.

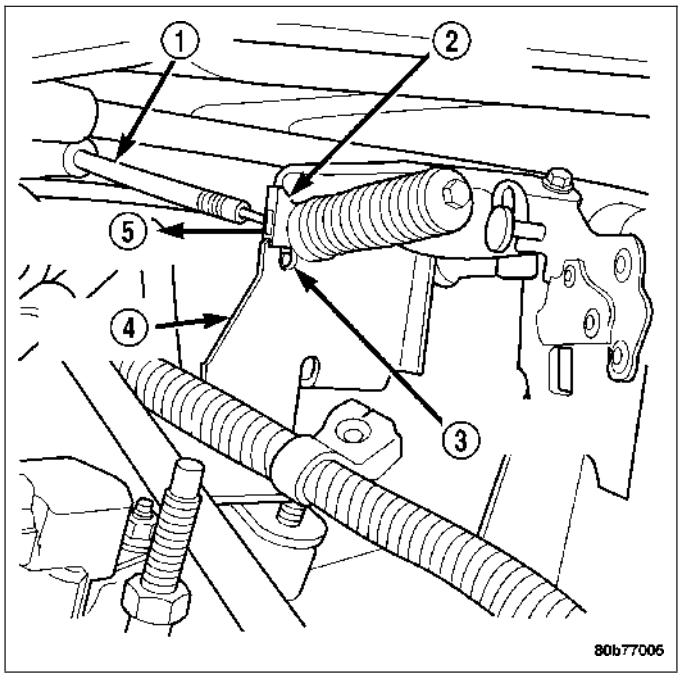


4. From inside vehicle, install metal clip (2) holding cable to dashpanel.
5. From inside vehicle, slide throttle cable core wire into opening (slot) in top of pedal arm.
6. Push plastic cable retainer (clip) (7) into pedal arm opening (6) until it snaps in place.
7. Install air resonator tube to throttle body.
8. Before starting engine, operate accelerator pedal to check for any binding.

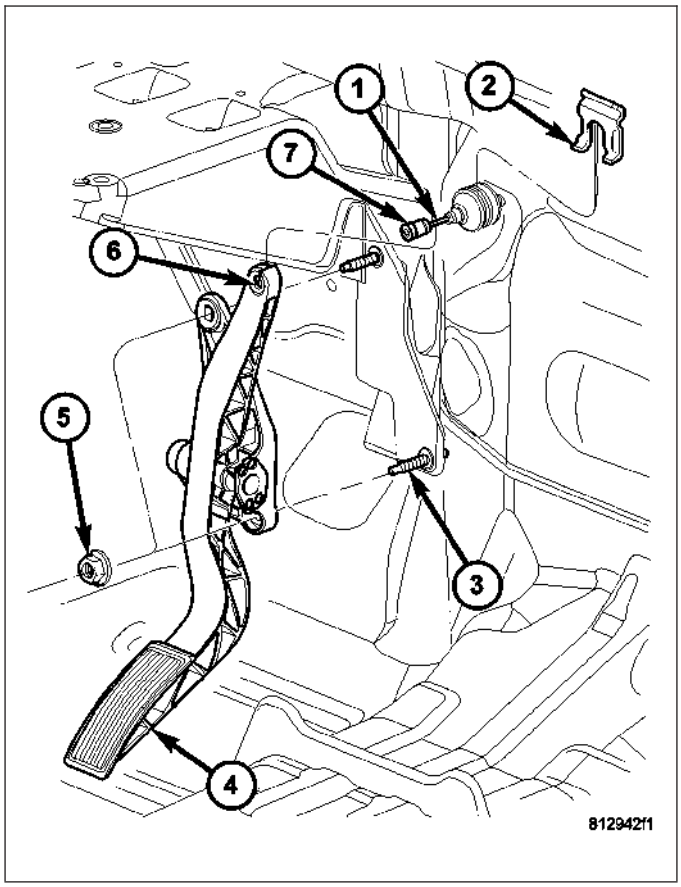


4.7L V-8

1. Slide accelerator cable plastic mount into bracket. Continue sliding until tab (3) is aligned to hole in mounting bracket.
2. Route accelerator cable over top of cable cam.
3. Connect cable end to throttle body bellcrank pin (snaps on rearward).
4. Slide rubber grommet away from plastic cable housing.
5. Install rubber grommet into dash panel until seated.
6. Push cable housing into rubber grommet and through opening in dash panel.



7. From inside vehicle, install clip (2) holding cable to dashpanel.
8. From inside vehicle, slide throttle cable core wire into opening (6) in top of pedal arm.
9. Push cable retainer (clip) (7) into pedal arm opening (6) until it snaps in place.
10. Snap cable into dashpanel routing clip.
11. Install air resonator tube to throttle body.
12. Before starting engine, operate accelerator pedal to check for any binding.



SENSOR-THROTTLE POSITION

DESCRIPTION

The 3-wire Throttle Position Sensor (TPS) is mounted on the throttle body and is connected to the throttle blade shaft.

The 5.7L V-8 engine does not use a separate TPS on the throttle body.

OPERATION

The 5.7L V-8 engine does not use a separate Throttle Position Sensor (TPS) on the throttle body.

The 3–wire TPS provides the Powertrain Control Module (PCM) with an input signal (voltage) that represents the throttle blade position of the throttle body. The sensor is connected to the throttle blade shaft. As the position of the throttle blade changes, the output voltage of the TPS changes.

The PCM supplies approximately 5 volts to the TPS. The TPS output voltage (input signal to the PCM) represents the throttle blade position. The PCM receives an input signal voltage from the TPS. This will vary in an approximate range of from .26 volts at minimum throttle opening (idle), to 4.49 volts at wide open throttle. Along with inputs from other sensors, the PCM uses the TPS input to determine current engine operating conditions. In response to engine operating conditions, the PCM will adjust fuel injector pulse width and ignition timing.

The PCM needs to identify the actions and position of the throttle blade at all times. This information is needed to assist in performing the following calculations:

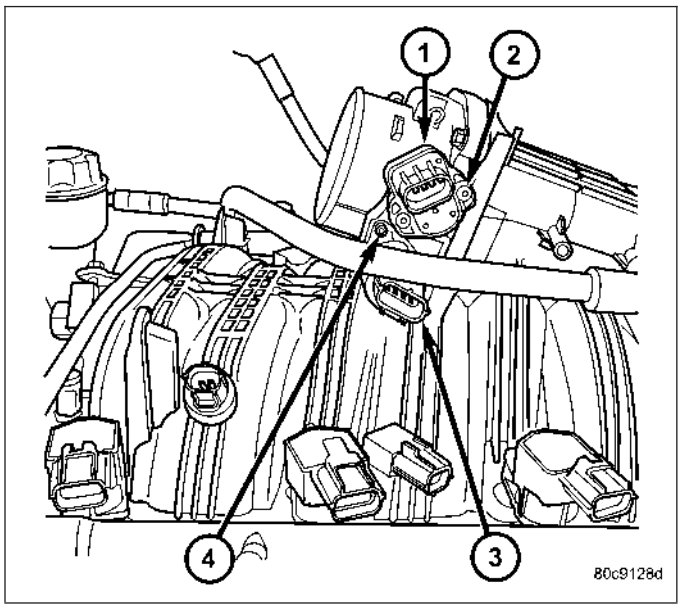
- Ignition timing advance
- Fuel injection pulse-width
- Idle (learned value or minimum TPS)
- Off-idle (0.06 volt)
- Wide Open Throttle (WOT) open loop (2.608 volts above learned idle voltage)
- Deceleration fuel lean out
- Fuel cutoff during cranking at WOT (2.608 volts above learned idle voltage)
- A/C WOT cutoff (certain automatic transmissions only)

REMOVAL

3.7L V6

The Throttle Position Sensor (TPS) is mounted to the throttle body (1).

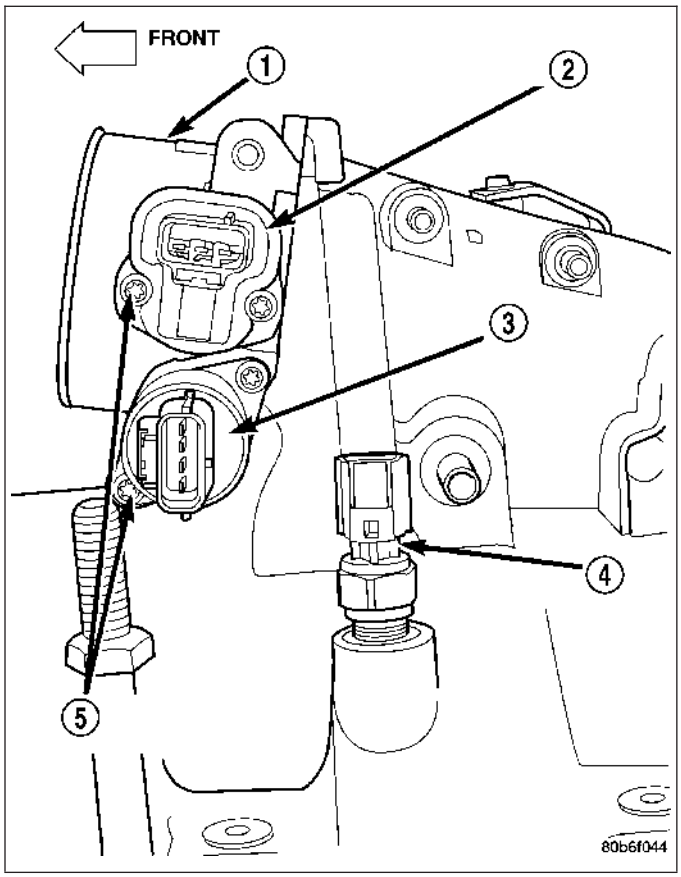
1. Remove air resonator tube at throttle body.
2. Disconnect TPS electrical connector.
3. Remove two TPS mounting screws (2).
4. Remove TPS.



4.7L V-8

The TPS is located on the throttle body (2).

1. Remove air duct and tube at throttle body.
2. Disconnect TPS electrical connector.
3. Remove two TPS mounting bolts (screws) (5).
4. Remove TPS from throttle body.



5.7L V-8

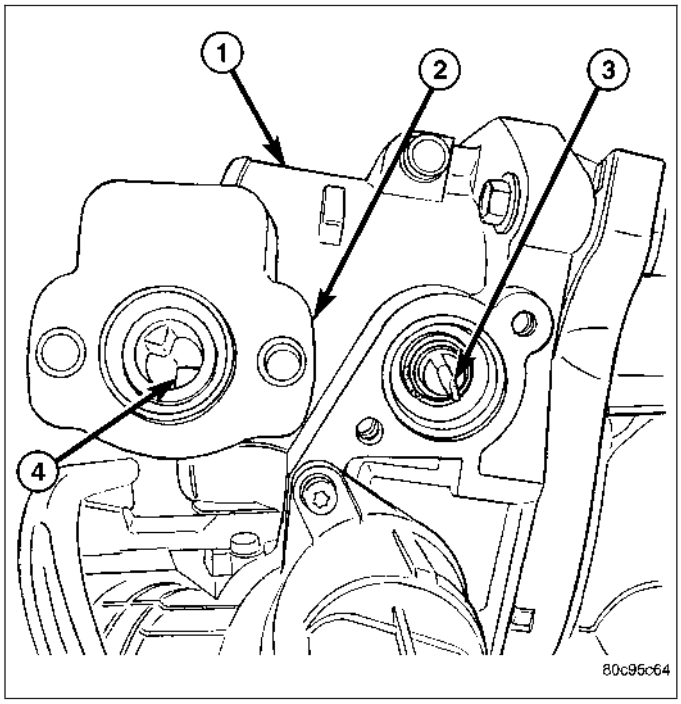
The 5.7L V-8 engine **does not use** a separate Throttle Position Sensor (TPS) on the throttle body.

INSTALLATION

3.7L V-6

The throttle shaft end of throttle body (3) slides into a socket in TPS (4). The TPS must be installed so that it can be rotated a few degrees. (If sensor will not rotate, install sensor with throttle shaft on other side of socket tangs). The TPS will be under slight tension when rotated.

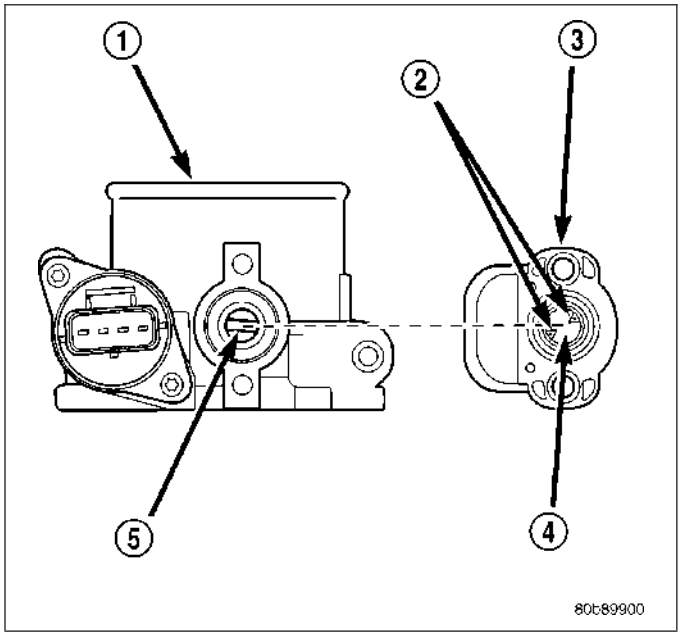
1. Install TPS and retaining screws.
2. Tighten screws to 7 N·m (60 in. lbs.) torque.
3. Connect TPS electrical connector to TPS.
4. Manually operate throttle (by hand) to check for any TPS binding before starting engine.
5. Install air cleaner tube to throttle body.



4.7L V-8

The throttle shaft end of throttle body (5) slides into a socket in TPS (4). The TPS must be installed so that it can be rotated a few degrees. If sensor will not rotate, install sensor with throttle shaft on other side of socket tangs. The TPS will be under slight tension when rotated.

1. Install TPS and two retaining bolts.
2. Tighten bolts to 7 N·m (60 in. lbs.) torque.
3. Manually operate throttle control lever by hand to check for any binding of TPS.
4. Connect TPS electrical connector to TPS.
5. Install air duct/air box to throttle body.



STEERING

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STEERING

DESCRIPTION

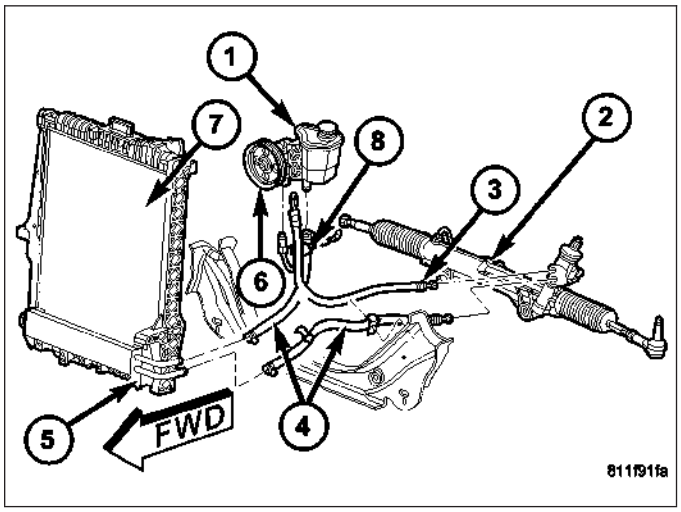
Power steering systems consist of:

- Steering column
- Rack and pinion steering gear
- Intermediate Shaft
- Belt driven hydraulic steering pump
- Pump pressure and return hoses
- Oil Cooler

OPERATION

The steering column shaft is attached to the gear pinion. The rotation of the pinion moves the gear rack (2) from side-to-side. This lateral action of the rack pushes and pulls the tie rods to change the direction of the front wheels.

Power assist is provided by an engine mounted hydraulic pump (1), the pump supplies hydraulic fluid pressure to the steering gear (2). All vehicles are equipped with an oil cooler (5).



DIAGNOSIS AND TESTING

POWER STEERING SYSTEM

There is some noise in all power steering systems. One of the most common is a hissing sound evident at a standstill parking. Or when the steering wheel is at the end of it's travel. Hiss is a high frequency noise similar to that of a water tap being closed slowly. The noise is present in all valves that have a high velocity fluid passing through an orifice. There is no relationship between this noise and steering performance.

STEERING NOISE

CONDITION	POSSIBLE CAUSES	CORRECTION
OBJECTIONAL HISS OR WHISTLE	1. Steering intermediate shaft to dash panel seal.	1. Check and repair seal at dash panel.
	2. Noisy valve in power steering gear.	2. Replace steering gear.
RATTLE OR CLUNK	1. Gear mounting bolts loose.	1. Tighten bolts to specification.
	2. Loose or damaged suspension components.	2. Inspect and repair suspension.
	3. Internal gear noise.	3. Replace steering gear.
	4. Pressure hose in contact with other components.	4. Reposition hose.
	5. Loose or damaged intermediate shaft or column.	5. Inspect and repair or replace.
CHIRP OR SQUEAL	1. Loose belt.	1. Adjust or replace.
WHINE OR GROWL	1. Low fluid level.	1. Fill to proper level.
	2. Pressure hose in contact with other components.	2. Reposition hose.
	3. Internal pump noise.	3. Replace pump.
SUCKING AIR SOUND	1. Loose return line clamp.	1. Replace clamp.
	2. O-ring missing or damaged on hose fitting.	2. Replace o-ring.
	3. Low fluid level.	3. Fill to proper level.
	4. Air leak between pump and reservoir.	4. Repair as necessary.
	5. Reservoir cap not installed correctly.	5. Install reservoir cap correctly.
SCRUBBING OR KNOCKING	1. Wrong tire size.	1. Verify tire size.
	2. Wrong gear.	2. Verify gear.

BINDING AND STICKING

CONDITION	POSSIBLE CAUSE	CORRECTION
DIFFICULT TO TURN WHEEL STICKS OR BINDS	1. Low fluid level.	1. Fill to proper level.
	2. Tire pressure.	2. Adjust tire pressure.
	3. Steering components (ball joints/tie rod ends).	3 Inspect and repair as necessary.
	4. Loose belt.	4. Adjust or replace.
	5. Low pump pressure.	5. Pressure test and replace if necessary.
	6. Column shaft coupler binding.	6. Replace coupler.
	7. Steering gear worn.	7. Replace gear.

INSUFFICIENT ASST. OR POOR RETURN TO CENTER

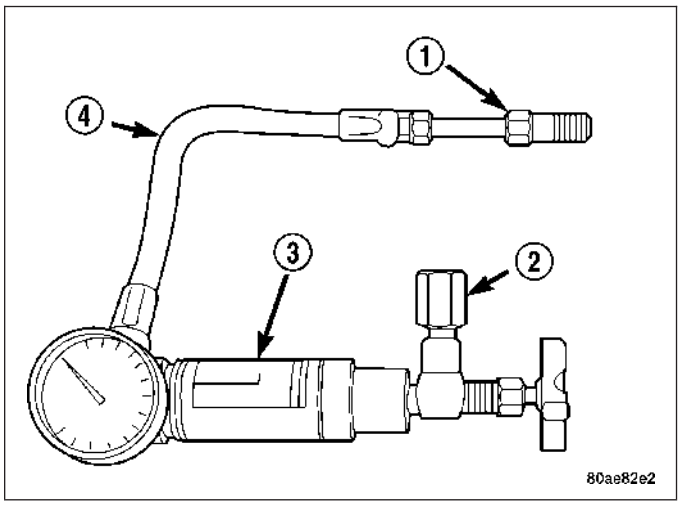
CONDITION	POSSIBLE CAUSE	CORRECTION
HARD TURNING OR MOMENTARY INCREASE IN TURNING EFFORT	1. Tire pressure.	1. Adjust tire pressure.
	2. Low fluid level.	2. Fill to proper level.
	3. Loose belt.	3. Adjust or replace.
	4. Low pump pressure.	4. Pressure test and repair as necessary.
	5. Internal gear leak.	5. Replace gear.
STEERING WHEEL DOES NOT WANT TO RETURN TO CENTER POSITION	1. Tire pressure.	1. Adjust tire pressure.
	2. Wheel alignment.	2. Align front end.
	3. Lack of lubrication.	3. Inspect and lubricate suspension compnents.
	4. High friction in steering gear.	4. Replace gear.

LOOSE STEERING AND VEHICLE LEAD

CONDITION	POSSIBLE CAUSE	CORRECTION
EXCESSIVE PLAY IN STEERING WHEEL	1. Worn or loose suspension or steering components.	1. Inspect and repair as necessary.
	2. Worn or loose wheel bearings.	2. Inspect and repair or adjust bearings.
	3. Steering gear mounting.	3. Tighten gear mounting bolts to specification.
	4. Gear out of adjustment.	4. Replace gear.
	5. Worn or loose steering coupler.	5. Inspect and replace as necessary.
VEHICLE PULLS OR LEADS TO ONE SIDE.	1. Tire Pressure.	1. Adjust tire pressure.
	2. Radial tire lead.	2. Rotate tires.
	3. Brakes dragging.	3. Repair as necessary.
	4. Wheel alignment.	4. Align front end.

POWER STEERING FLOW AND PRESSURE

The following procedure is used to test the operation of the power steering system on the vehicle. This test will provide the gallons per minute (GPM) or flow rate of the power steering pump along with the maximum relief pressure. Perform test any time a power steering system problem is present. This test will determine if the power steering pump or power steering gear is not functioning properly. The following pressure and flow test is performed using Power Steering Analyzer Tool kit 6815 (3) Adapter Kit 6893 and 6825A.



FLOW AND PRESSURE TEST

1. Check the power steering belt to ensure it is in good condition and adjusted properly.
2. Connect pressure gauge hose from the Power Steering Analyzer to Tube 6825A.
3. Connect Adapter 6826 to Power Steering Analyzer test valve end.
4. Disconnect the high pressure hose from the power steering pump.
5. Connect the tube to the pump hose fitting.
6. Connect the power steering hose from the steering gear to the adapter.
7. Open the test valve completely.
8. Start engine and let idle long enough to circulate power steering fluid through flow/pressure test gauge and to get air out of the fluid. Then shut off engine.
9. Check fluid level, add fluid as necessary. Start engine again and let idle.
10. Gauge should read below 862 kPa (125 psi), if above, inspect the hoses for restrictions and repair as necessary. The initial pressure reading should be in the range of 345-552 kPa (50-80 psi).
11. Increase the engine speed to 1500 RPM and read the flow meter. If the flow rate (GPM) is below specification, (refer to pump specification chart for GPM) the pump should be replaced.

CAUTION: The following test procedure involves testing maximum pump pressure output and flow control valve operation. Do not leave valve closed for more than three seconds as the pump could be damaged.

12. Close valve fully three times and record highest pressure indicated each time. **All three readings must be above specifications and within 345 kPa (50 psi) of each other.**
    - Pressures above specifications but not within 345 kPa (50 psi) of each other, replace pump.
    - Pressures within 345 kPa (50 psi) of each other but below specifications, replace pump.
13. Open the test valve and turn the steering wheel to the extreme left and right positions three times against the stops. Record the highest pressure reading at each position. Compare readings to the pump specifications chart. If pressures readings are not within 50 psi of each other, the gear is leaking internally and must be replaced.

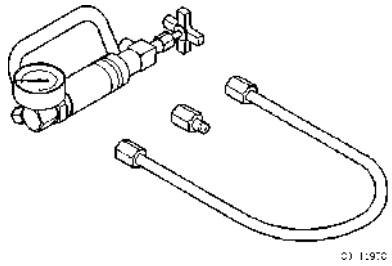
CAUTION: Do not force the pump to operate against the stops for more than 2 to 3 seconds at a time because, pump damage will result.

PUMP SPECIFICATION

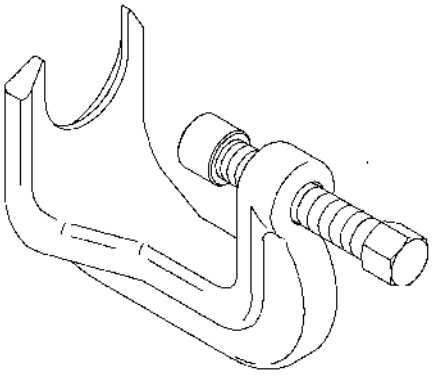
ENGINE	RELIEF PRESSURE ± 50	FLOW RATE (GPM) AT 1500 RPM
3.7L & 4.7L	12411 kPa (1800 psi)	2.7 - 3.1 GPM
5.7L	12411 kPa (1800 psi)	2.9 - 3.3 GPM

SPECIAL TOOLS

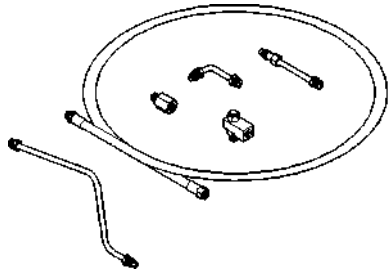
POWER STEERING PUMP



Analyzer Set, Power Steering Flow/Pressure 6815



PULLER - 8677



Adapters, Power Steering Flow/Pressure Tester 6893

ADAPTER, POWER STEERING FLOW/PRESSURE - 6825A

COLUMN

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COLUMN

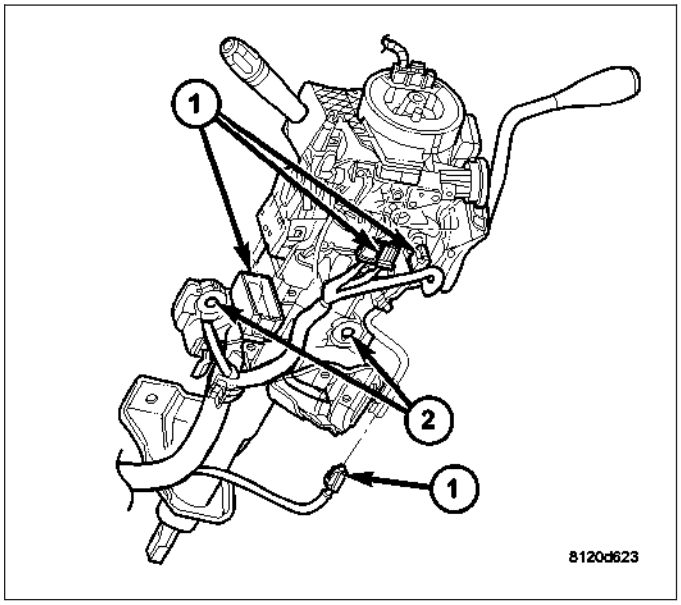
DESCRIPTION

The tilt and standard column has been designed to be serviced as an assembly; less wiring (1), switches, shrouds, steering wheel, etc. Most steering column components can be serviced without removing the steering column from the vehicle.

To service the steering wheel, switches or airbag, refer to Restraints and follow all WARNINGS and CAUTIONS.

NOTE: When servicing the steering wheel after removing the old bolt a new bolt must be used when installing.

NOTE: When servicing the steering coupler a new bolt must be used when installing.



WARNING: THE AIRBAG SYSTEM IS A SENSITIVE, COMPLEX ELECTRO-MECHANICAL UNIT. BEFORE ATTEMPTING TO DIAGNOSE, REMOVE OR INSTALL THE AIRBAG SYSTEM COMPONENTS YOU MUST FIRST DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE. THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE. FAILURE TO DO SO COULD RESULT IN ACCIDENTAL DEPLOYMENT OF THE AIRBAG AND POSSIBLE PERSONAL INJURY. THE FASTENERS, SCREWS, AND BOLTS, ORIGINALLY USED FOR THE AIRBAG COMPONENTS, HAVE SPECIAL COATINGS AND ARE SPECIFICALLY DESIGNED FOR THE AIRBAG SYSTEM. THEY MUST NEVER BE REPLACED WITH ANY SUBSTITUTES. ANYTIME A NEW FASTENER IS NEEDED, REPLACE WITH THE CORRECT FASTENERS PROVIDED IN THE SERVICE PACKAGE OR FASTENERS LISTED IN THE PARTS BOOKS.

CAUTION: Do not hammer on steering column shaft. This may cause damage to the shaft or bearing.

CAUTION: Do not attempt to remove or modify the park lock slider or link.

CAUTION: Do not attempt to remove the pivot bolts to disassemble the tilting mechanism. Do not remove shaft lock plate or plate retainer. This will damage the column.

DIAGNOSIS AND TESTING

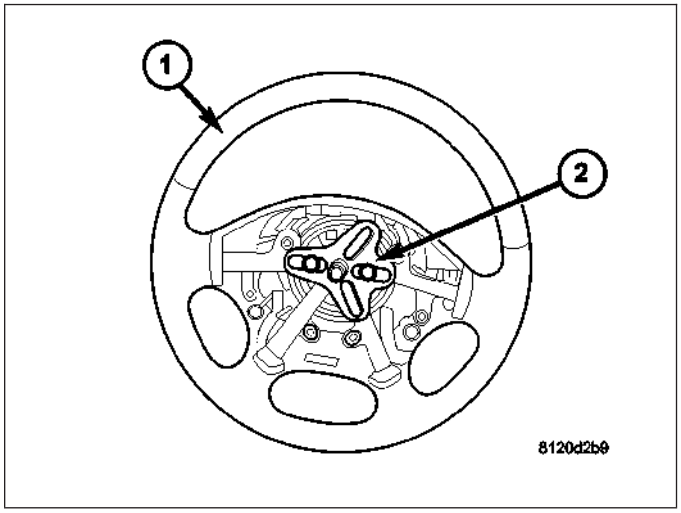
STEERING COLUMN

If the vehicle is involved in a front end collision/the air bag has deployed the column must be inspected. This inspection will determine if the Column has collapsed. Inspect the column mounting capsules visually and manually push and pull them to check for separation or fractures. If capsules are fractured or have moved the column MUST be replaced.

REMOVAL

WARNING: BEFORE SERVICING THE STEERING COLUMN THE AIRBAG SYSTEM MUST BE DISARMED. REFER TO ELECTRICAL RESTRAINT SYSTEM FOR SERVICE PROCEDURES. FAILURE TO DO SO MAY RESULT IN ACCIDENTAL DEPLOYMENT OF THE AIRBAG AND POSSIBLE PERSONAL INJURY.

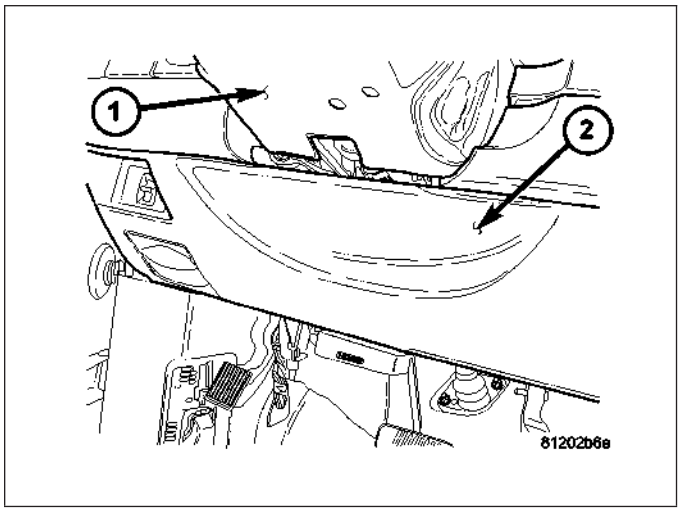
CAUTION: All fasteners must be torqued to specification to ensure proper operation of the steering column.



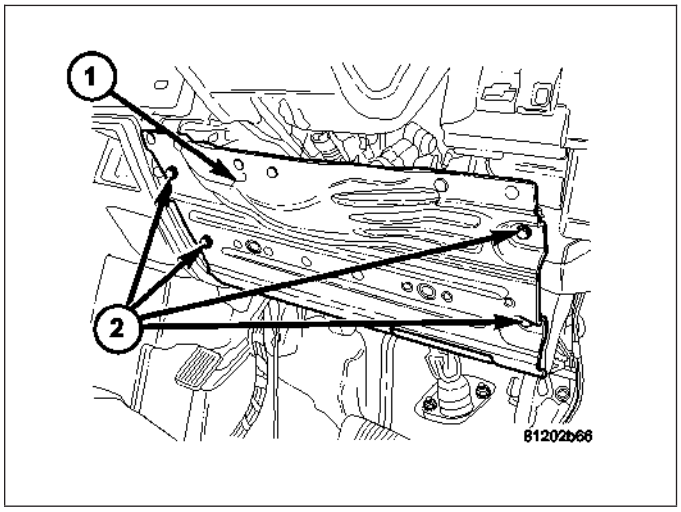
1. Position the front wheels **straight ahead**.
2. Disconnect the negative (ground) cable from the battery.
3. Remove the airbag, (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - REMOVAL).
4. Remove the steering wheel (1) with special tool CJ98–1 (2) or an appropriate steering wheel puller.

CAUTION: Ensure the puller bolts are fully engaged into the steering wheel and not into the clockspring, before attempting to remove the wheel. Failure to do so may damage the steering wheel/clockspring.

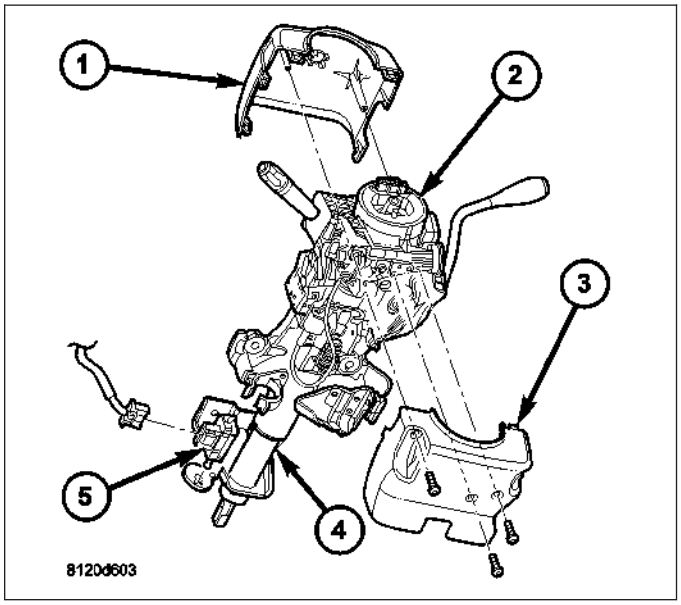
5. Remove the steering column (1) opening cover (2) (Refer to 23 - BODY/INSTRUMENT PANEL/ STEERING COLUMN OPENING COVER - REMOVAL).



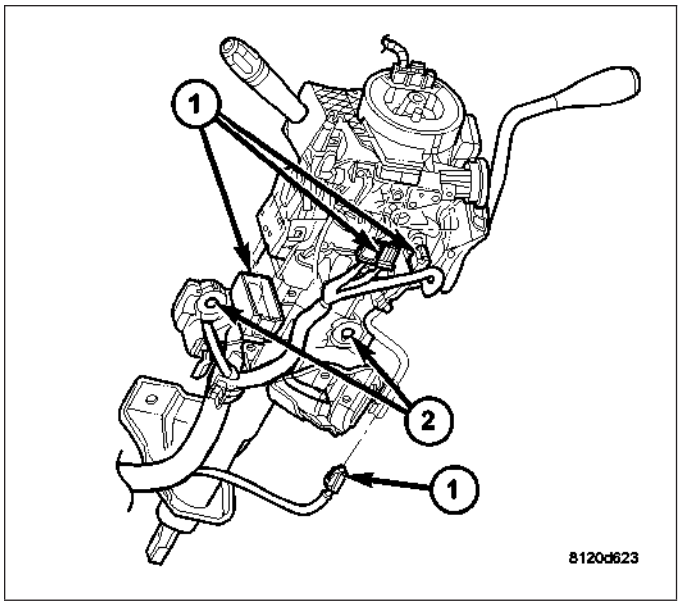
6. Remove the steering column opening reinforcement (1).



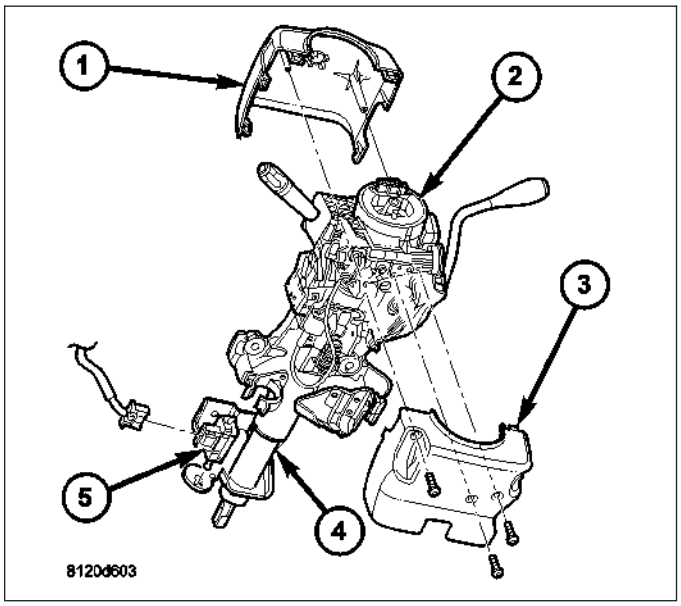
7. Remove the tilt lever.
8. Remove the upper (1) and lower (3) column shrouds.
9. Remove the clock spring (2), (Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCKSPRING - REMOVAL).



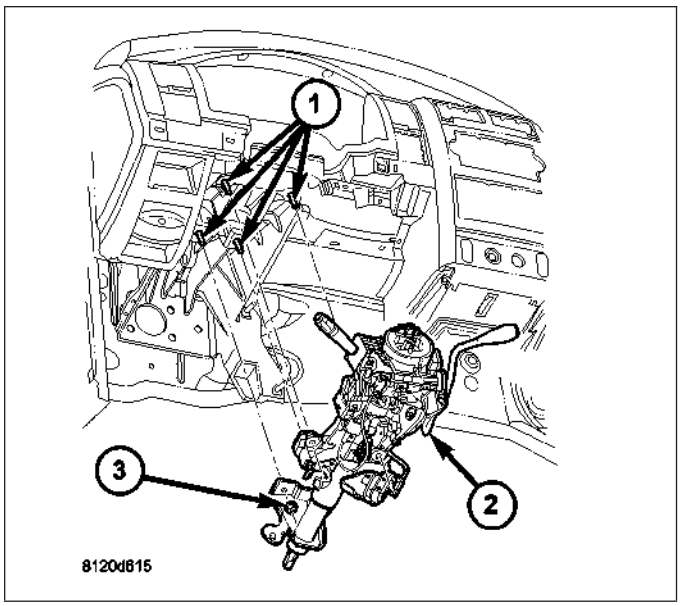
10. Disconnect the wiring harness connectors (1) to the column.
11. Remove the shift cable from the column shift lever actuator (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 32RH/GEAR SHIFT CABLE - REMOVAL).
12. Release the shift cable from the column bracket and remove it from the bracket.
13. Remove the SKIM module in order to disconnect the electrical connector.
14. Remove the upper steering shaft coupler bolt and slide the shaft down.



15. Remove the brake light switch (5) and discard (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/BRAKE LAMP SWITCH - REMOVAL).



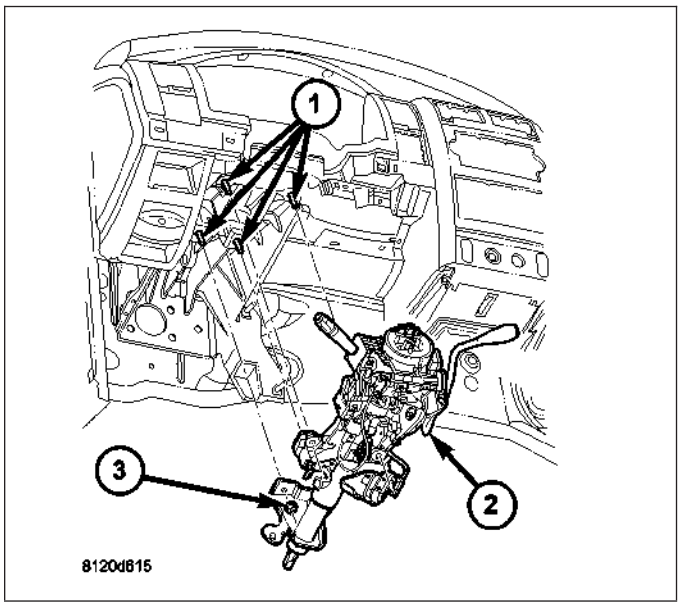
16. Remove the four steering column mounting nuts (3).
17. Lower the column from the mounting studs (1).
18. Remove the steering column assembly (2) from the vehicle.



INSTALLATION

WARNING: BEFORE SERVICING THE STEERING COLUMN THE AIRBAG SYSTEM MUST BE DISARMED. REFER TO ELECTRICAL RESTRAINT SYSTEM FOR SERVICE PROCEDURES. FAILURE TO DO SO MAY RESULT IN ACCIDENTAL DEPLOYMENT OF THE AIRBAG AND POSSIBLE PERSONAL INJURY.

CAUTION: All fasteners must be torqued to specification to ensure proper operation of the steering column.

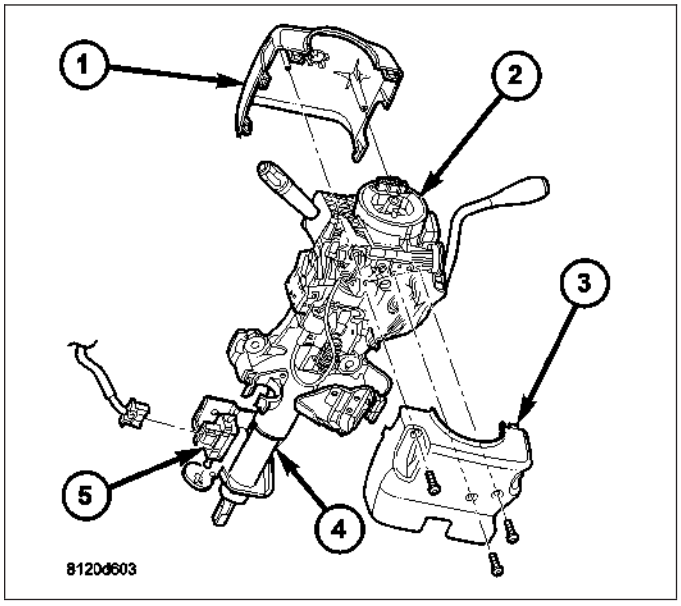


1. Position the steering column (2) on the dash panel support (1) and loosely install the mounting nuts (3).
2. Firmly slide the steering column (2) upward against the studs (1) in dash panel and hand tighten the nuts (3).
3. Install the steering shaft coupler on the steering shaft and loosely install a **new** bolt.
4. Center steering column (2) in dash opening and tighten mounting nuts (3) to 28 N·m (250 in. lbs.).

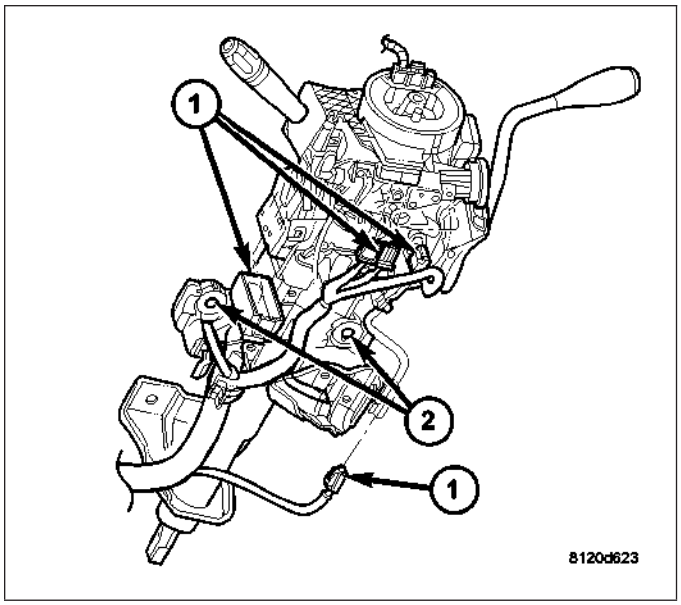
NOTE: Torque the upper left nut first then the lower right nut. Then torque the lower left nut then the upper right nut.

NOTE: A new bolt must be used for reinstallation.

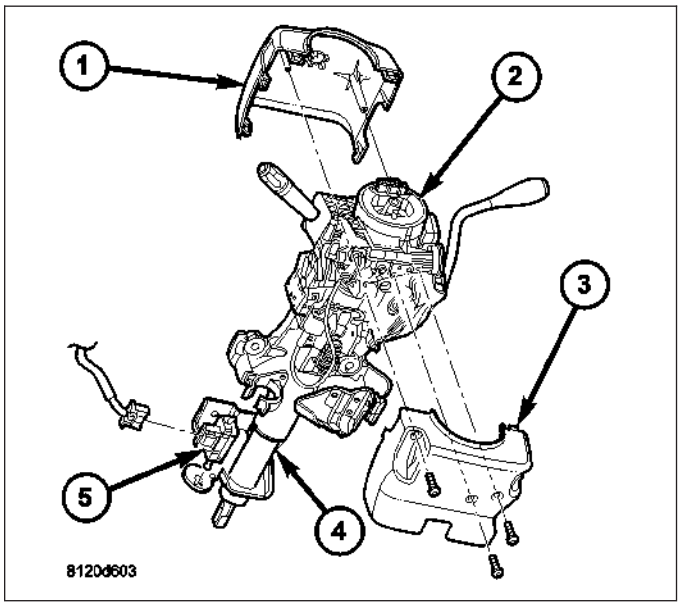
5. Tighten the coupler bolt to 38 N·m (28 ft. lbs.).
6. Install a new brake light switch (5) (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/ BRAKE LAMP SWITCH - REMOVAL).
7. Install the shifter cable. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 32RH/GEAR SHIFT CABLE - INSTALLATION)



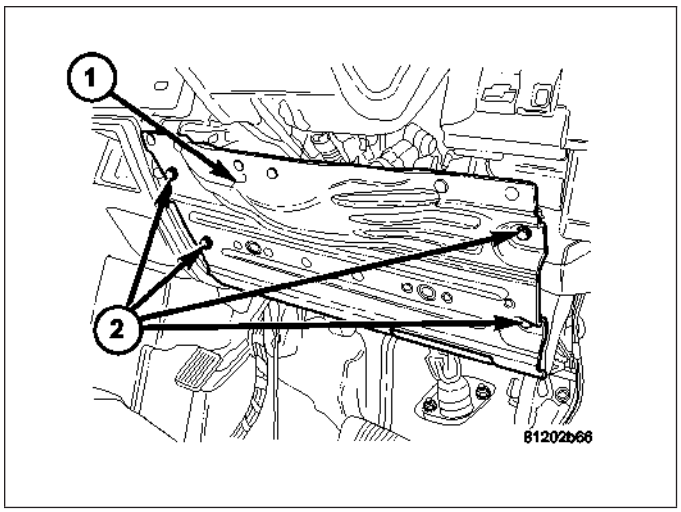
8. Connect the wiring harness (1) to the column (2).
9. Install the SKIM module.
10. Install the clockspring (Refer to 8 - ELECTRICAL/ RESTRAINTS/CLOCKSPRING - REMOVAL).



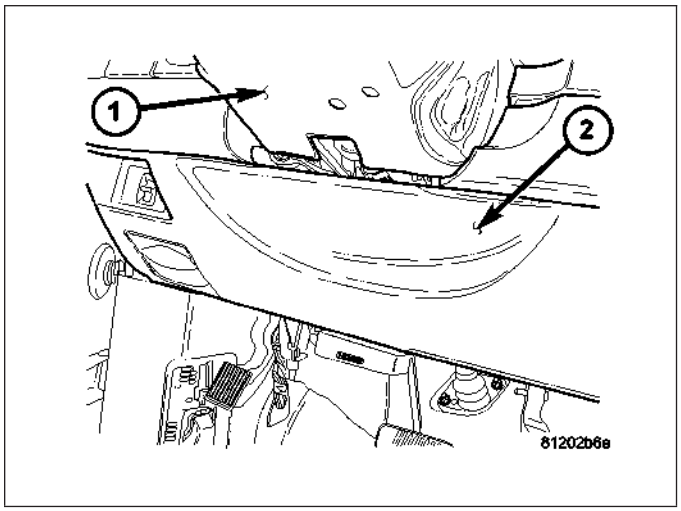
11. Install the shrouds (1&3).



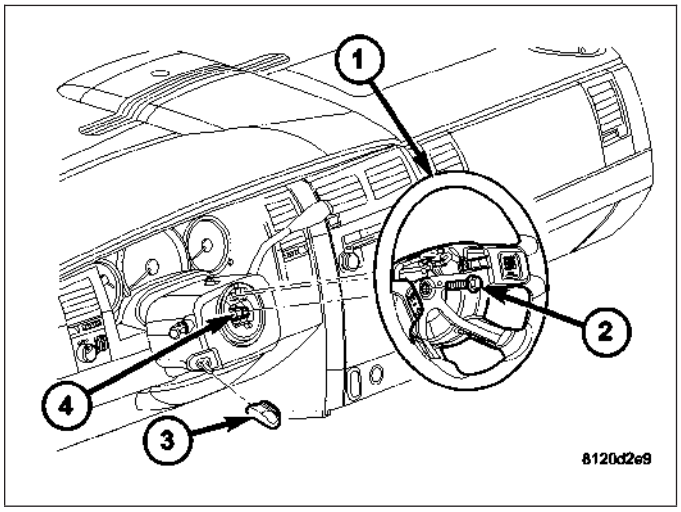
12. Install the steering column opening reinforcement (1).



13. Install the steering column opening cover (2) (Refer to 23 - BODY/INSTRUMENT PANEL/ STEERING COLUMN OPENING COVER - INSTALLATION).



14. Align the spline on the steering wheel hub to shaft (4).
15. Then install the steering wheel (1) and install a **new** bolt (2). Tighten the bolt to 61 N·m (45 ft. lbs.).
16. Install the airbag (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - INSTALLATION).
17. Install the tilt lever handle.
18. Install the negative battery terminal.
19. Test the operation of the horn, Electronic PRNDL Indicator, lights and any other functions that are steering column operated.



SPECIFICATIONS

TORQUE CHART

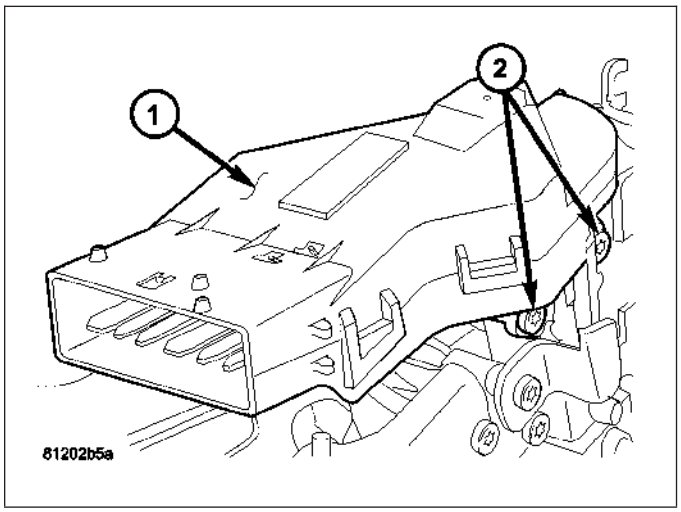
TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Tilt Lever Release Knob Bracket Mounting Screws	4.5	—	40
Gear Shift Lever Assembly Mounting Screws	12	—	105
Steering Column Mounting Nuts	28	—	250
Steering Wheel Bolt	61	45	—
Steering Coupler Shaft Upper Pinch Bolt	38	28	—
Steering Coupler Shaft Lower Pinch Bolt	38	28	—
Toe Plate Nuts	12	—	105

SWITCH-IGNITION

DESCRIPTION

The ignition switch (1) is located on the steering column. It is used as the main on/off switching device for most electrical components. The mechanical key cylinder is used to engage/disengage the electrical ignition switch.



OPERATION

Vehicles equipped with an automatic transmission and a steering column mounted shifter: an interlock device is located within the shift cable. This interlock device is used to lock the transmission shifter in the PARK position when the key cylinder is in any position and the brake pedal is not depressed.

DIAGNOSIS AND TESTING

IGNITION SWITCH

TEST AND REPAIR

If the key removal effort is excessive on a vehicle with a automatic transmission first adjust the shift linkage, (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 46RE/GEAR SHIFT CABLE - ADJUSTMENTS).

If the ignition switch effort is excessive remove the ignition key cylinder from the steering column. (Refer to 19 - STEERING/COLUMN/LOCK CYLINDER HOUSING - REMOVAL). Check the turning effort of the key cylinder. If the ignition key cylinder effort is excessive replace the key cylinder. If the ignition key cylinder operates properly look for the following conditions.

REMOVAL

SERVICE PRECAUTIONS

Safety goggles should be worn at all times when working on steering columns.

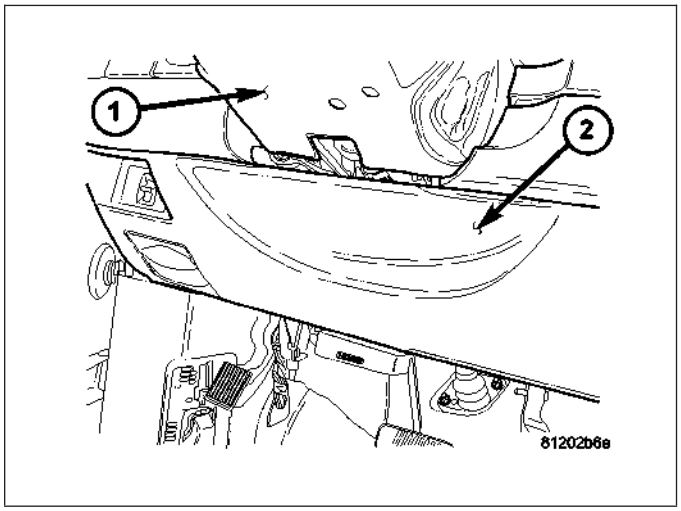
To service the steering wheel, switches or airbag, Refer to Electrical Restraints and follow all WARNINGS and CAUTIONS.

WARNING: THE AIRBAG SYSTEM IS A SENSITIVE, COMPLEX ELECTRO-MECHANICAL UNIT. BEFORE ATTEMPTING TO DIAGNOSE, REMOVE OR INSTALL THE AIRBAG SYSTEM COMPONENTS YOU MUST FIRST DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE. THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE. FAILURE TO DO SO COULD RESULT IN ACCIDENTAL DEPLOYMENT OF THE AIRBAG AND POSSIBLE PERSONAL INJURY. THE FASTENERS, SCREWS, AND BOLTS, ORIGINALLY USED FOR THE AIRBAG COMPONENTS, HAVE SPECIAL COATINGS AND ARE SPECIFICALLY DESIGNED FOR THE AIRBAG SYSTEM. THEY MUST NEVER BE REPLACED WITH ANY SUBSTITUTES. ANYTIME A NEW FASTENER IS NEEDED, REPLACE WITH THE CORRECT FASTENERS PROVIDED IN THE SERVICE PACKAGE OR FASTENERS LISTED IN THE PARTS BOOKS.

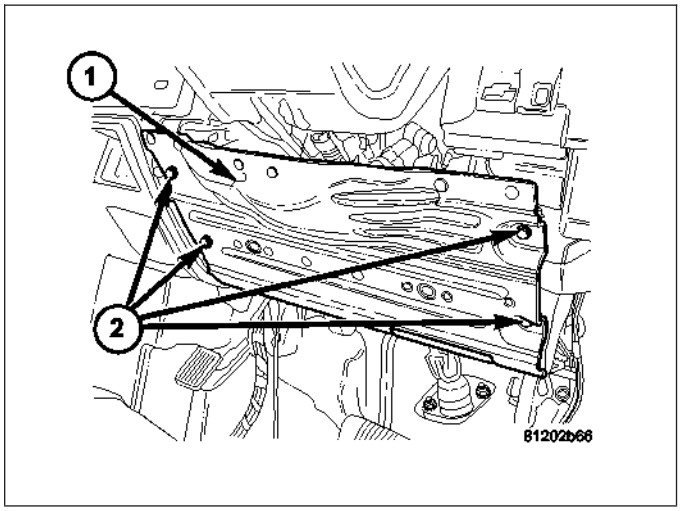
CAUTION: Do not hammer on steering column shaft. This may cause damage to the shaft or bearing.

CAUTION: Do not attempt to remove the pivot bolts to disassemble the tilting mechanism.

1. Remove the steering column opening cover (2).

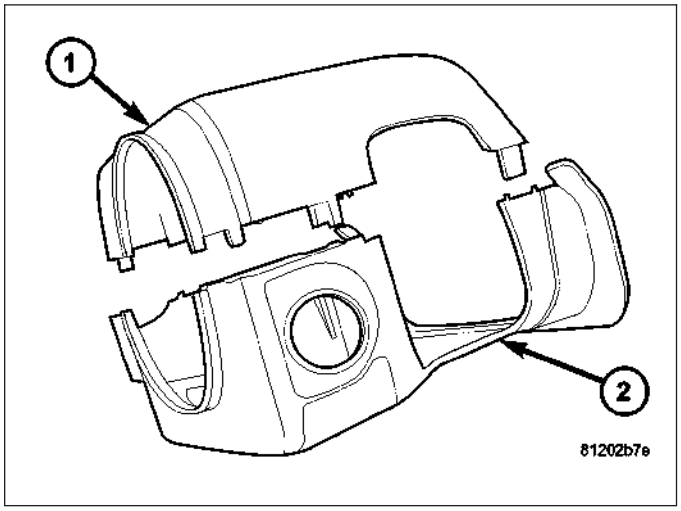


2. Remove the steering column opening reinforcement (1).

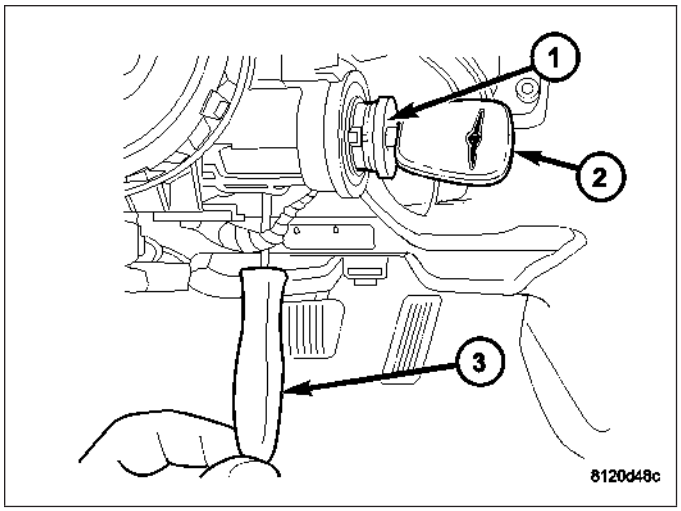


The ignition key must be in the key cylinder for cylinder removal. The key cylinder must be removed first before removing ignition switch.

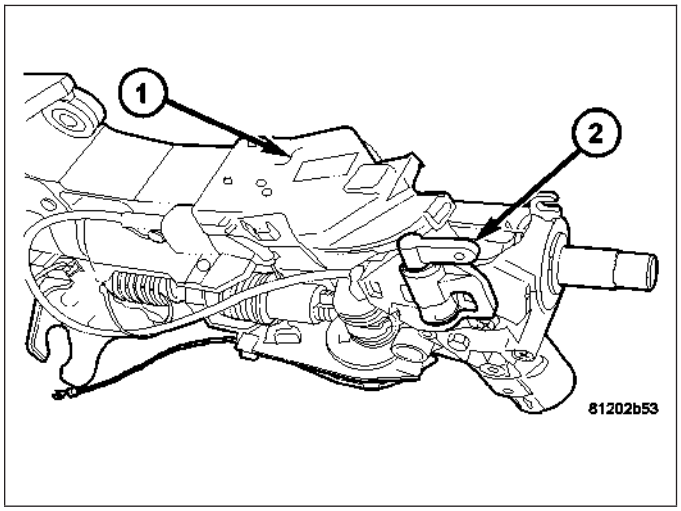
3. Remove the negative (ground) cable from the battery.
4. Disable the airbag, (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - REMOVAL).
5. Remove the lower and upper shrouds (1&2).



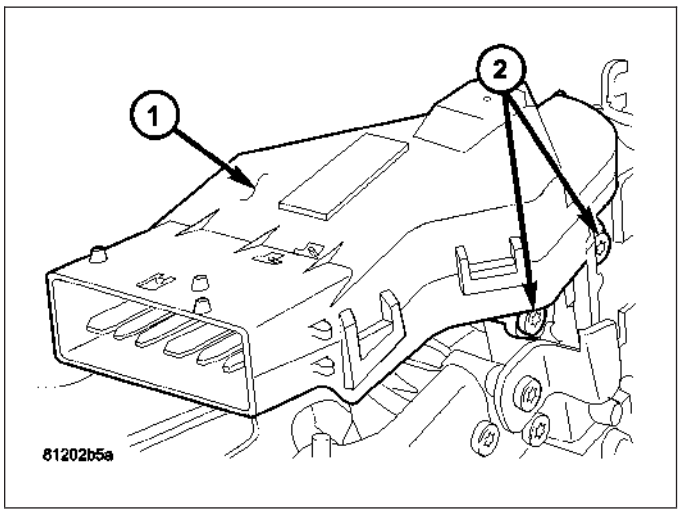
6. Remove key cylinder. (Refer to 19 - STEERING/ COLUMN/LOCK CYLINDER HOUSING - REMOVAL).



7. Disconnect the lower clockspring connectors.
8. Remove the wire retainer from the tilt lever bracket (2).
9. Remove the tilt lever mounting screws to gain access to the ignition switch mounting screws.

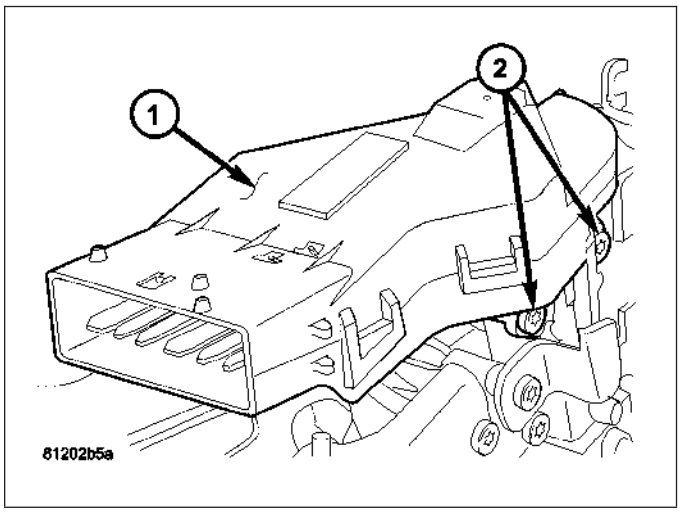


10. Disconnect the electrical connector at rear of ignition switch (1).
11. Remove ignition switch mounting screws (2).
12. Using a small screwdriver, push on locking tab and remove switch from steering column.

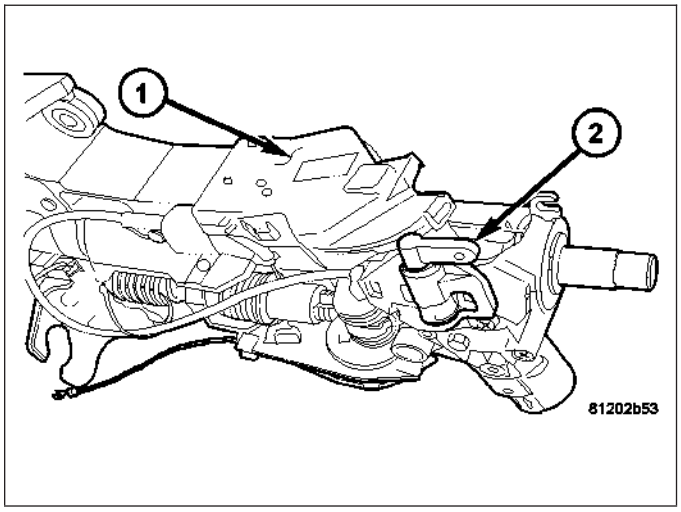


INSTALLATION

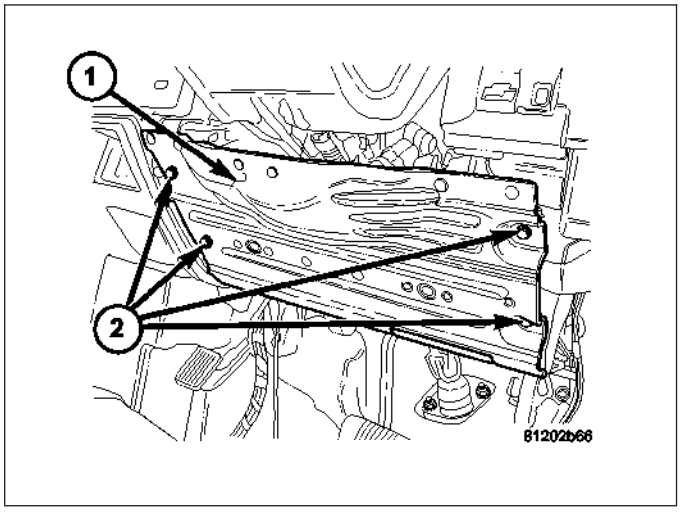
1. Before installing ignition switch (1), rotate the slot in the switch to the ON position.
2. Connect the electrical connector to rear of the ignition switch. Make sure that locking tabs are fully seated into wiring connector.
3. Position switch to column and install the mounting screws (2). Tighten screw to 3 N·m (26 in. lbs.).



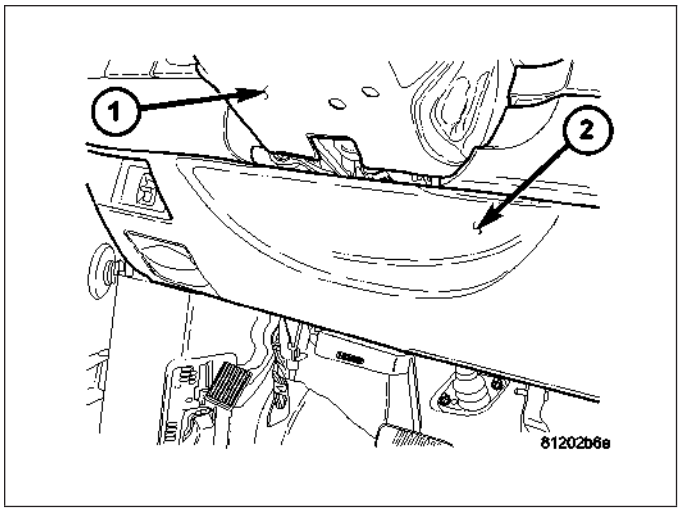
4. Install the tilt lever bracket (2) mounting screws. Tighten screws to 4.5 N·m (40 in. lbs.).
5. Position the wire retainer into the tilt lever bracket.
6. Reconnect the lower clockspring connectors.



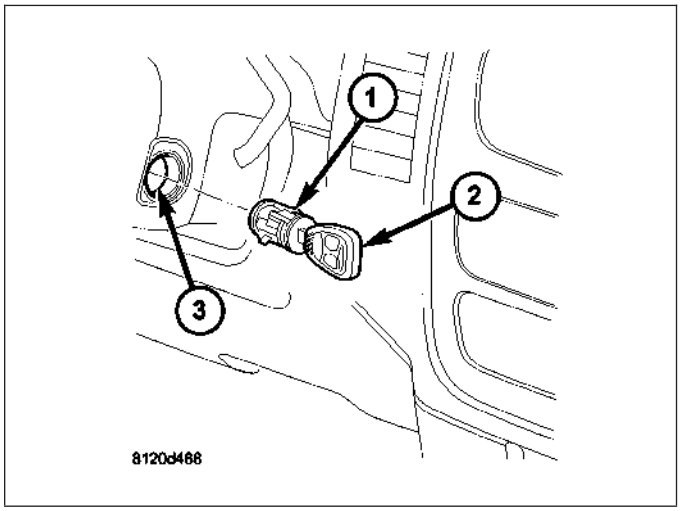
7. Install the steering column opening reinforcement (1).



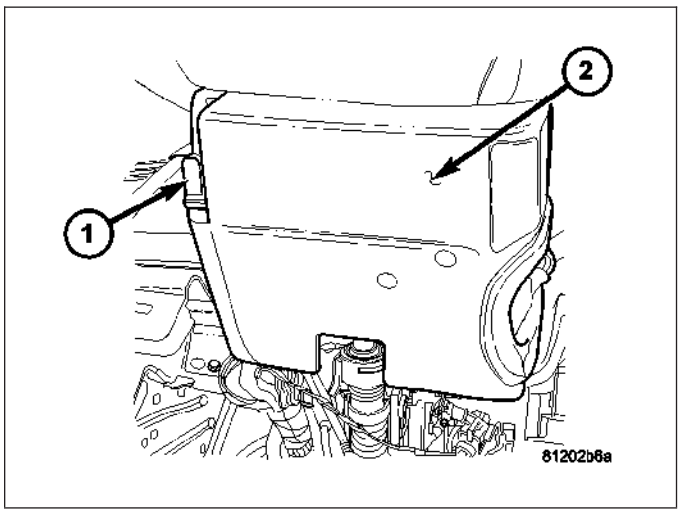
8. Install the steering column opening cover (2).



9. Install the key cylinder (1) with the key (2) in the cylinder (1).



10. Install steering column upper and lower shrouds (2).
11. Install the tilt lever knob (1).
12. Enable the airbag system. (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - INSTALLATION).



KEY-IN IGNITION SWITCH

DESCRIPTION

The key-in ignition switch is integral to the ignition switch, which is mounted on the left side of the steering column. It closes a path to ground for the Central Timer Module (CTM) when the ignition key is inserted in the ignition key cylinder and the driver door ajar switch is closed (driver door is open). The key-in ignition switch opens the ground path when the key is removed from the ignition key cylinder. The ground path is also opened when the driver door ajar switch is open (driver door is closed).

The key-in ignition switch cannot be repaired and, if faulty or damaged, the entire ignition switch must be replaced, (Refer to 19 - STEERING/COLUMN/IGNITION SWITCH - REMOVAL).

DIAGNOSIS AND TESTING

IGNITION SWITCH AND KEY LOCK CYLINDER

ELECTRICAL DIAGNOSIS

For ignition switch electrical schematics, refer to the appropriate section in Wiring Diagrams.

MECHANICAL DIAGNOSIS (KEY DIFFICULT TO ROTATE)

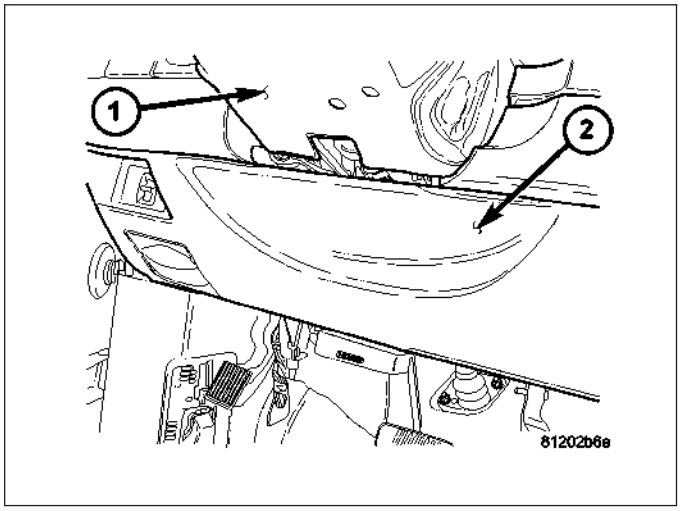
Vehicles equipped with an automatic transmission and a steering column mounted shifter: an interlock device is located within the steering column. This interlock device is used to lock the transmission shifter in the PARK position when the key cylinder is in any position and the brake pedal is not depressed.

Vehicles equipped with a manual transmission and a floor mounted shifter: on certain models, a lever is located on the steering column behind the ignition key cylinder. The lever must be manually operated to allow rotation of the ignition key cylinder to any position. If it is difficult to rotate the key to any position, the lever mechanism may be defective. This mechanism is not serviceable. If repair is necessary, the steering column assembly must be replaced. (Refer to 19 - STEERING/COLUMN - REMOVAL).

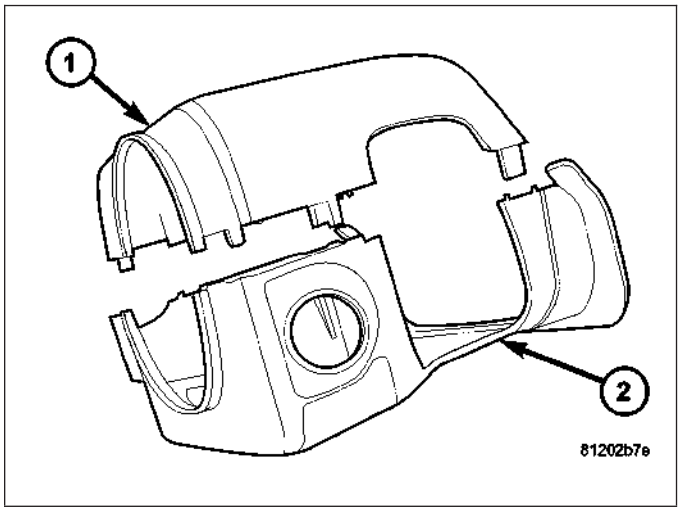
KEY/LOCK CYLINDER

REMOVAL

1. Disconnect negative cable from battery.
2. Remove the steering column opening cover (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - REMOVAL).

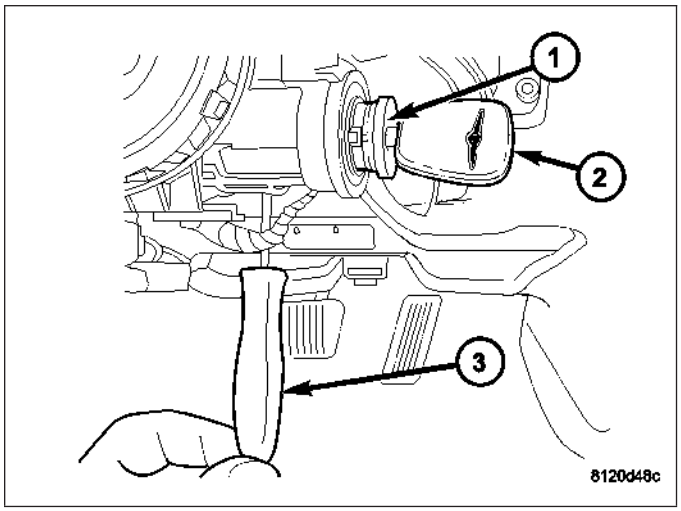


3. Remove the tilt lever handle.
4. Remove the lower shroud (2) from steering column.
5. Place shifter in PARK position.

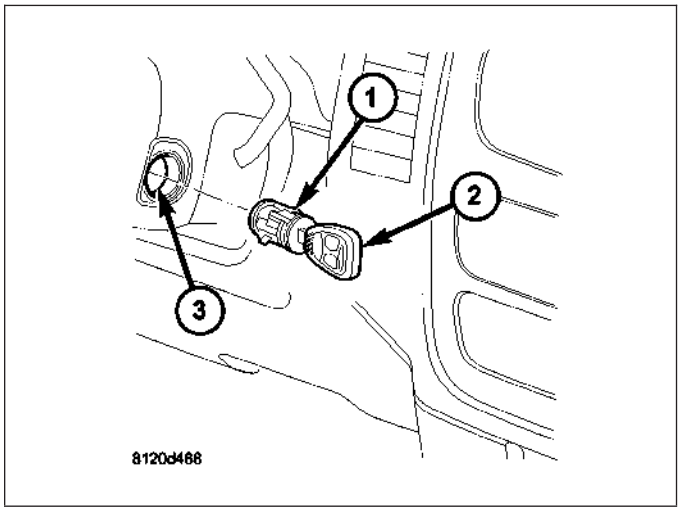


The ignition key (2) must be in the key cylinder (1) for cylinder removal.

6. A retaining pin is located at side of key cylinder assembly.
   a. Rotate key (2) to RUN position.
   b. Press in on retaining pin with a small punch (3) , while pulling key cylinder (1) from ignition switch.



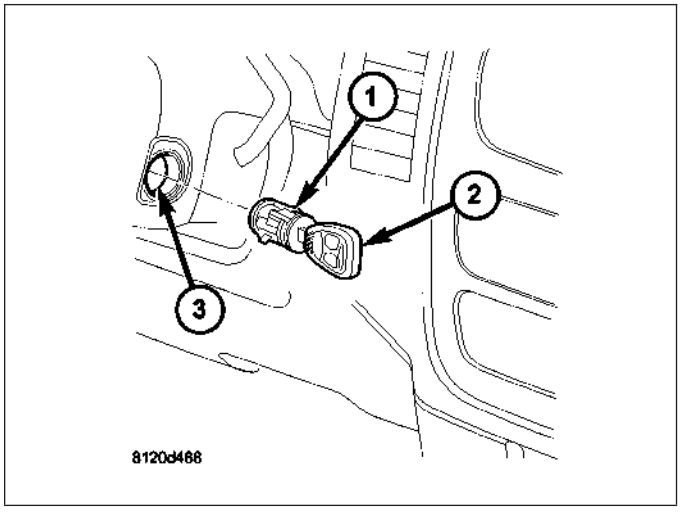
7. Remove the key (2) and key cylinder (1) from the column (3).



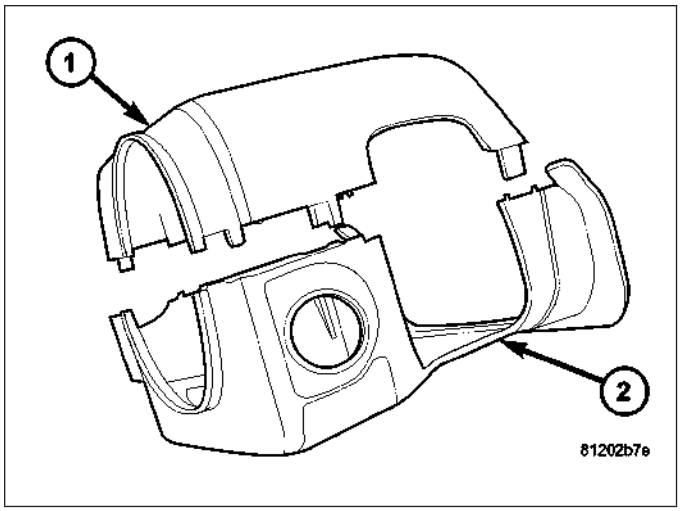
INSTALLATION

The ignition key (2) must be in the key cylinder (1) for cylinder installation.

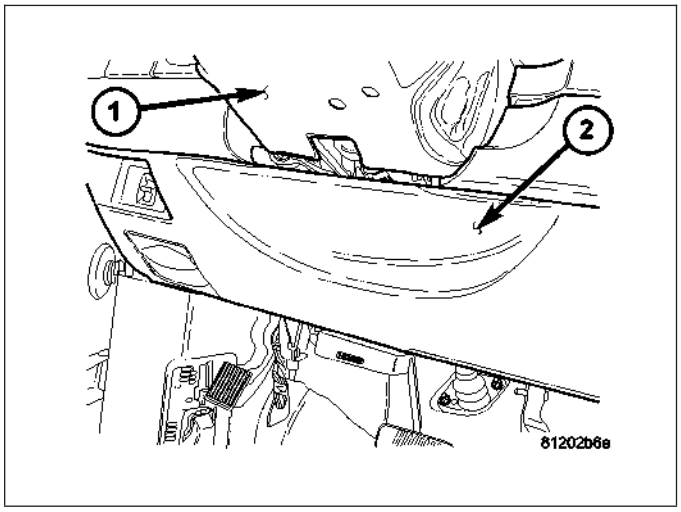
1. Install the key cylinder (1) into the housing (3) using care to align the end of the key cylinder with the ignition switch.
2. Push the key cylinder (1) in until it clicks.



3. Replace the lower shroud.
4. Install the tilt lever handle.



5. Install the steering column opening cover (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - INSTALLATION).

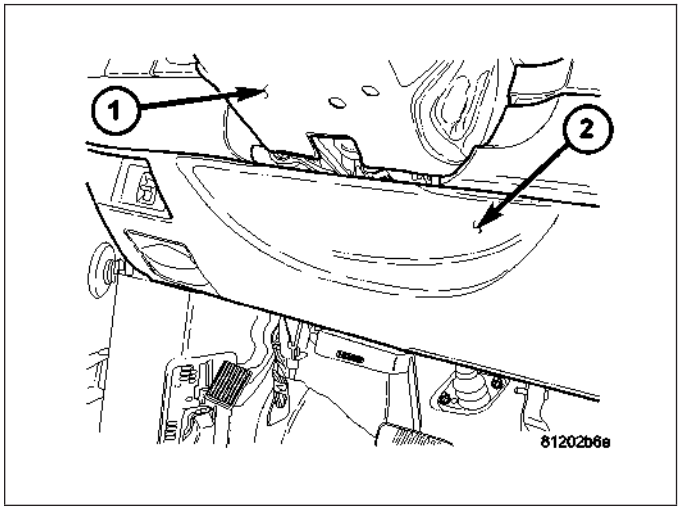


6. Reconnect the battery.

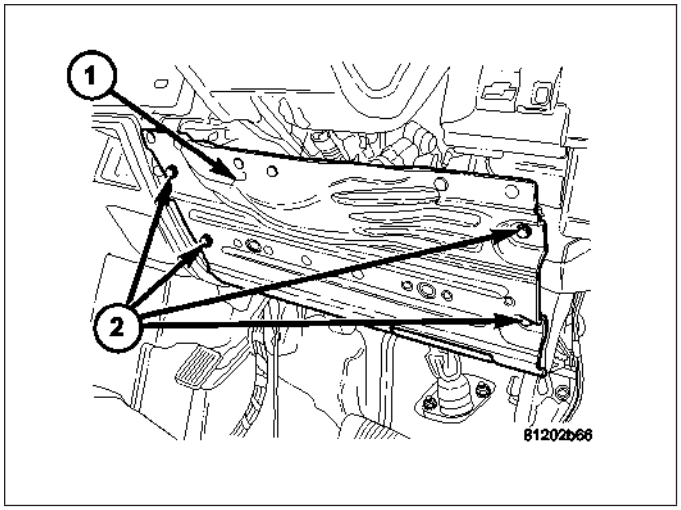
GEAR SHIFT LEVER

REMOVAL

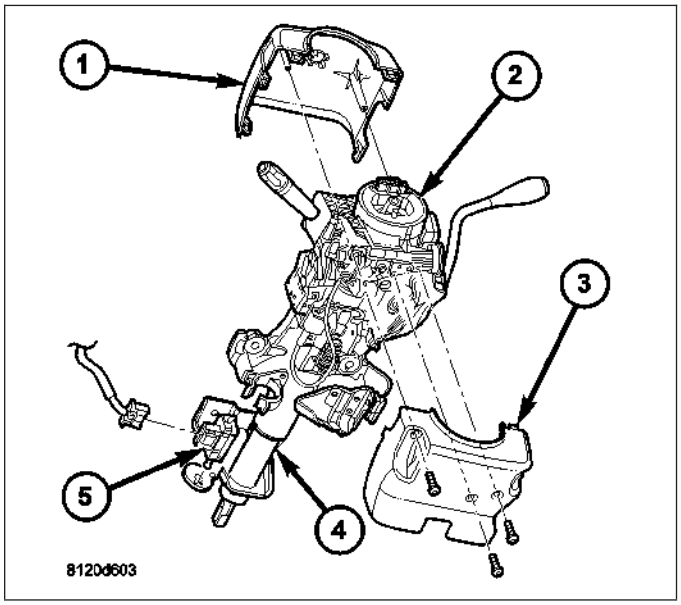
1. Remove the steering column opening cover (2). (Refer to 23 - BODY/INSTRUMENT PANEL/KNEE BLOCKER - REMOVAL).



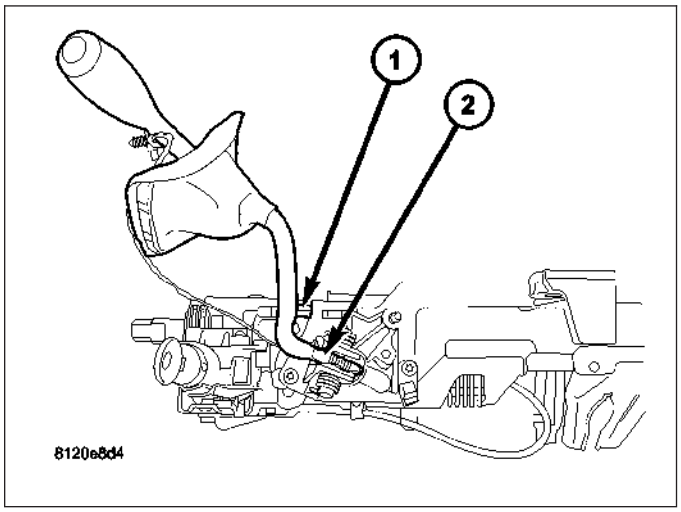
2. Remove the steering column opening reinforcement (1).



3. Remove the tilt lever knob.
4. Remove the upper (1) and lower (3) column shroud.
5. Remove and discard the brake light switch (5).
6. Loosen the column bolts and lower the column enough to allow clearance for the gear shift lever removal.
7. Disconnect the tow/haul switch harness.

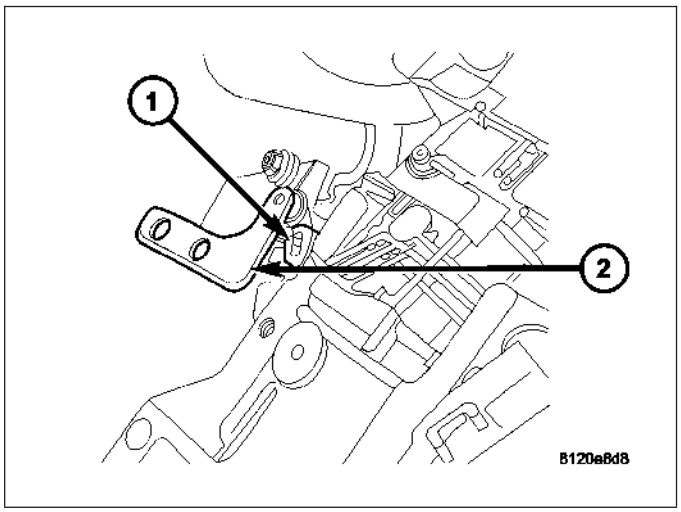


8. Disconnect the shift cable from the shift lever (2).
9. Remove the SKIM.
10. Remove the gear shift lever mounting screws and remove the lever (2).
11. Remove the blocker pin (1) from the inhibit link slot.



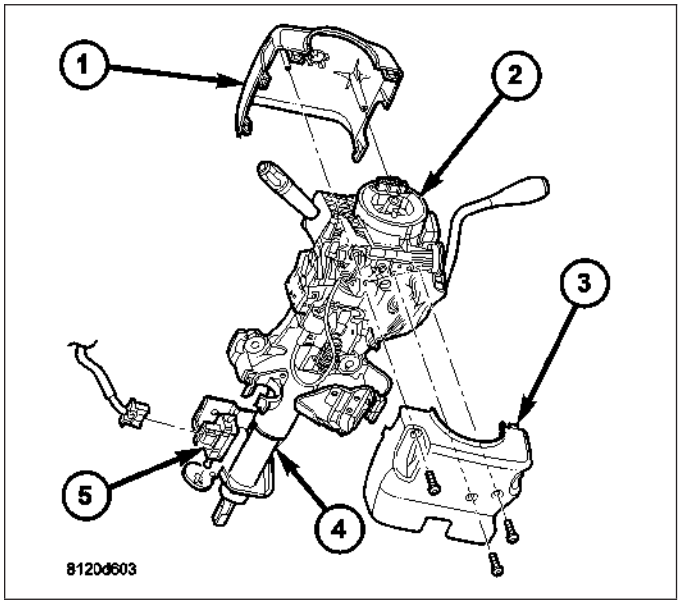
INSTALLATION

1. Install the lever assembly (2) using care to install the pin in the blocker to slider slot (1) and install the mounting screws and tighten to 12 N·m (105 in. lbs.).
2. Cycle the key from ACC to RUN and ensure that the blocker does not stick or bind.
3. Turn the key to the OFF position and ensure that the shifter will not pull from the PARK position.
4. Connect the tow/haul switch harness.

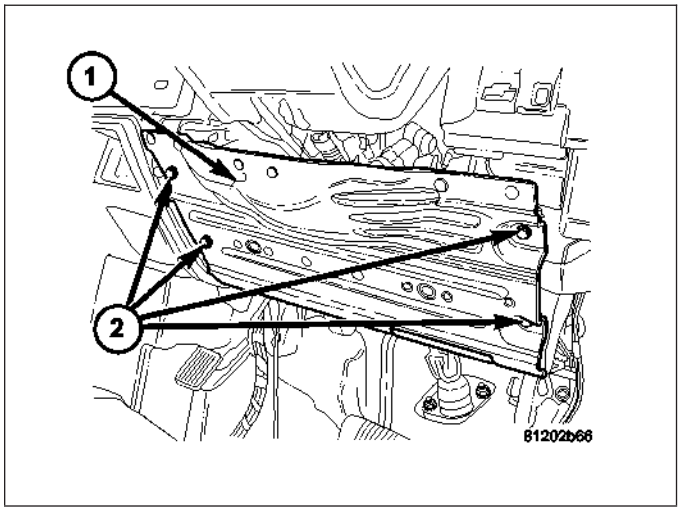


NOTE: Route and tie off harness to original location.

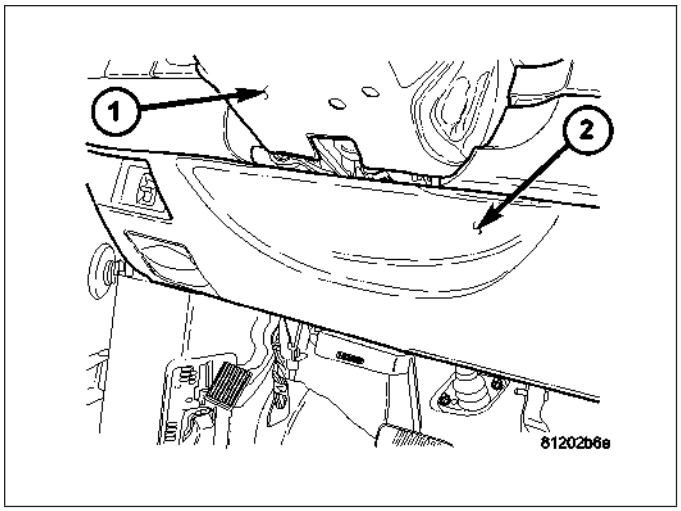
5. Connect the shift cable to the lever.
6. Ensure the gear shift lever and transmission are in the PARK position and snap the cable adjust clip in place.
7. Install a new brake light switch (5) (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/ BRAKE LAMP SWITCH - INSTALLATION).
8. Install the SKIM and halo.
9. Install the upper (1) and lower (3) column shroud.
10. Install the tilt lever knob.
11. Install the column back into place and tighten the four nuts to 28 N·m (250 in. lbs.).



12. Install the steering column opening reinforcement (1). (Refer to 23 - BODY/INSTRUMENT PANEL/ KNEE BLOCKER - INSTALLATION).



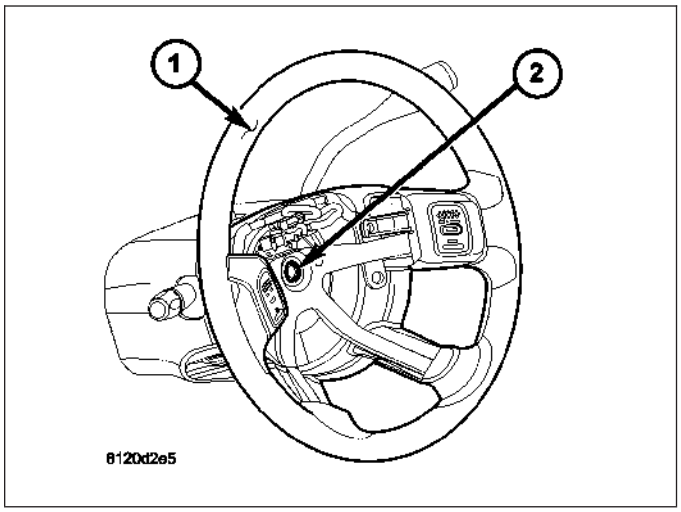
13. Install the steering column opening cover (2).



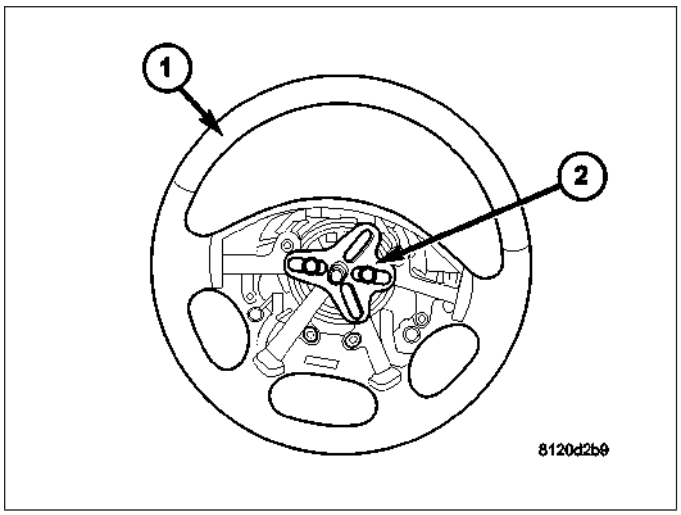
STEERING WHEEL

REMOVAL

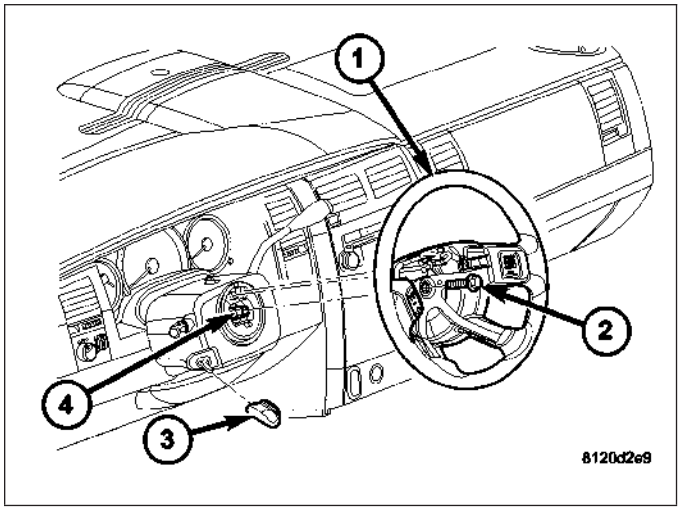
1. Disable and remove the driver's side airbag. (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIR-BAG - REMOVAL).
2. Partially remove the steering wheel bolt (2) and leave the bolt in the column.



3. Install puller CJ98-1(2) or equivalent using the top of the bolt to push on.



4. Remove and discard the steering wheel bolt (2).
5. Remove the steering wheel (1).



INSTALLATION

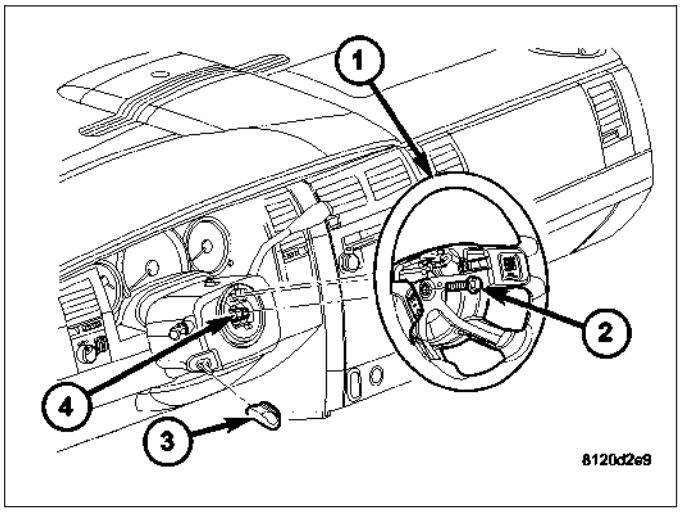
NOTE: Do not reuse the old steering wheel bolt (2) (a new bolt must be used)

NOTE: Make sure to align the spline on the steering wheel hub to the column shaft.

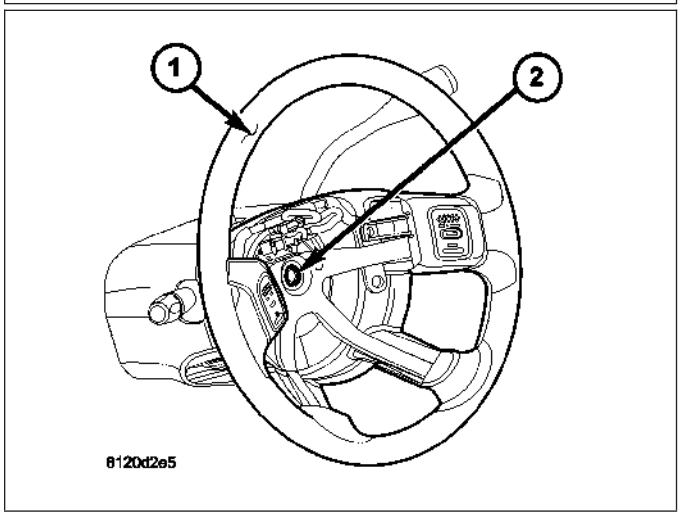
1. Install steering wheel (1) to the column (4).

NOTE: Be certain that the steering wheel mounting bolt is tightened to the proper torque specification to ensure proper clockspring operation.

2. Install the new steering wheel bolt (2). Tighten the bolt to 61 N·m (45 ft. lbs.).



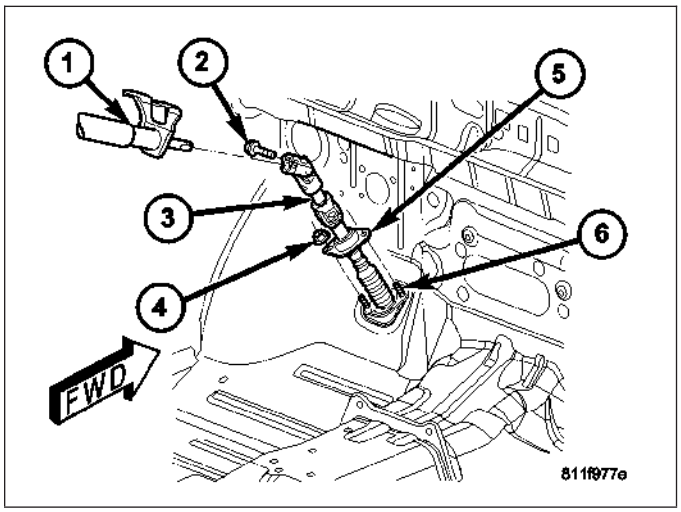
3. Install the driver's side air bag to the steering wheel (1). (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - INSTALLATION).



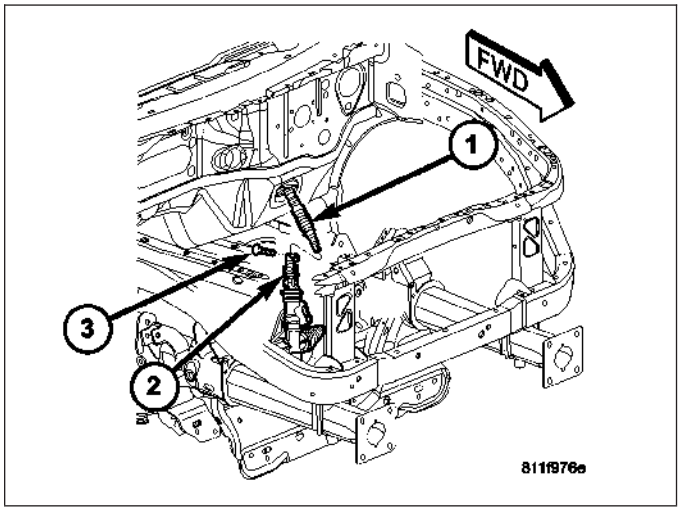
STEERING COUPLING SHAFT

REMOVAL

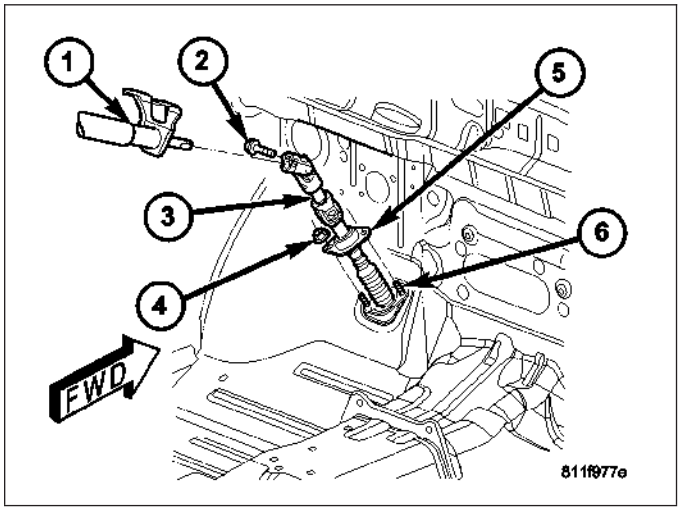
1. Disconnect the negative battery cable.
2. Lock the steering wheel with the tire in the straight position.
3. Remove and discard the upper pinch bolt (2) from the upper coupling at the cloumn (1).
4. Lower the steering coupler shaft (3) from the column (1).
5. Remove the toe plate (5) nuts (4).



6. Remove and discard the lower coupler pinch bolt (3) from the lower steering coupling shaft (1) at the steering gear.



7. Remove the steering coupling shaft from the vehicle.

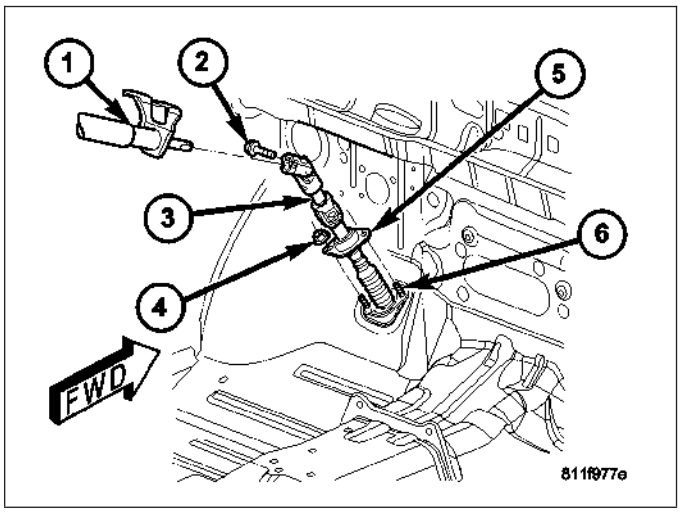


INSTALLATION

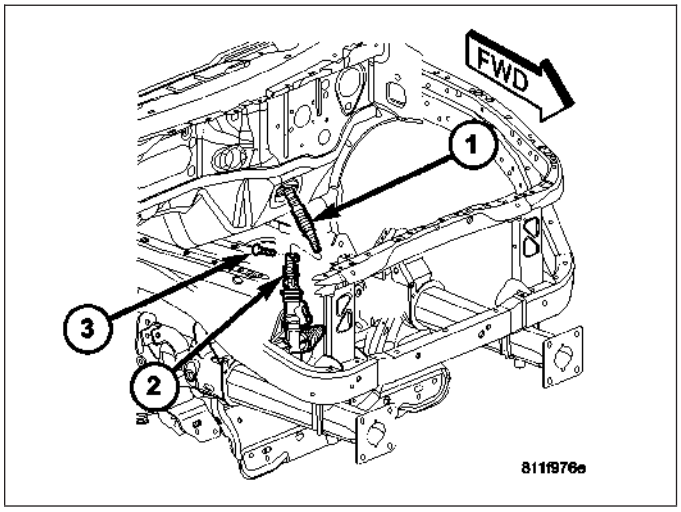
1. Install the upper steering coupling shaft (3) to the vehicle.

NOTE: Note: A new steering coupling shaft pinch bolt for the upper and lower shafts must be used.

2. Install the upper coupling to the column.
3. Install the upper pinch bolt (2) use a new bolt and tighten to 38 N.m (28 ft.lbs).
4. Install the toe plate (5) nuts (4) and tighten to 12 N.m (105 in.lbs).



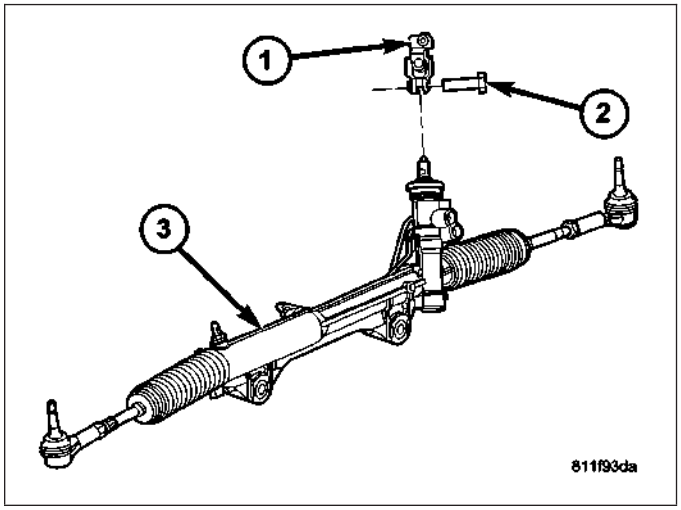
5. Install the shaft (1) to the lower coupling (2).
6. Install the lower pinch bolt (3) use new bolt and tighten to 38 N.m (28 ft.lbs).
7. Unlock the steering wheel.
8. Reconnect the negative battery cable.



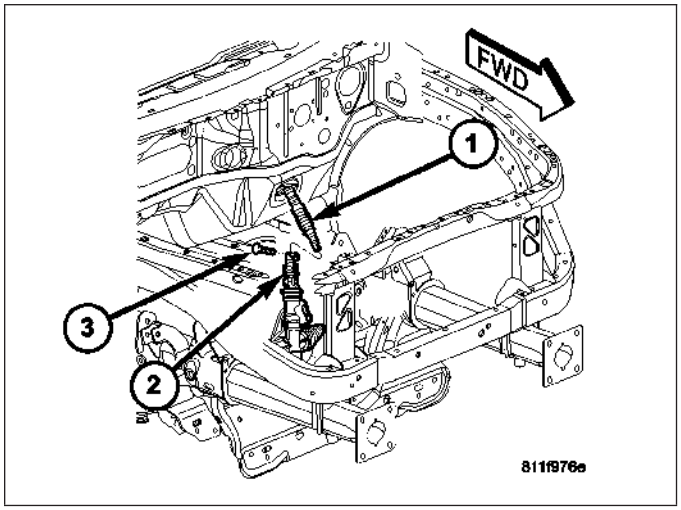
LOWER STEERING COUPLING

REMOVAL

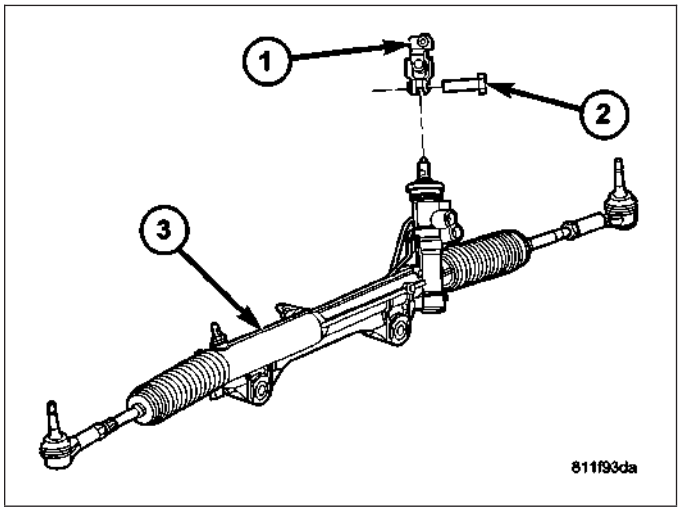
1. Disconnect the negative battery cable.
2. Raise and support the vehicle.
3. Lock the steering wheel with the tire in the straight position.
4. Remove and discard the upper coupling (1) pinch bolt (2).



5. Remove and discard the lower coupling (2) pinch bolt (3).

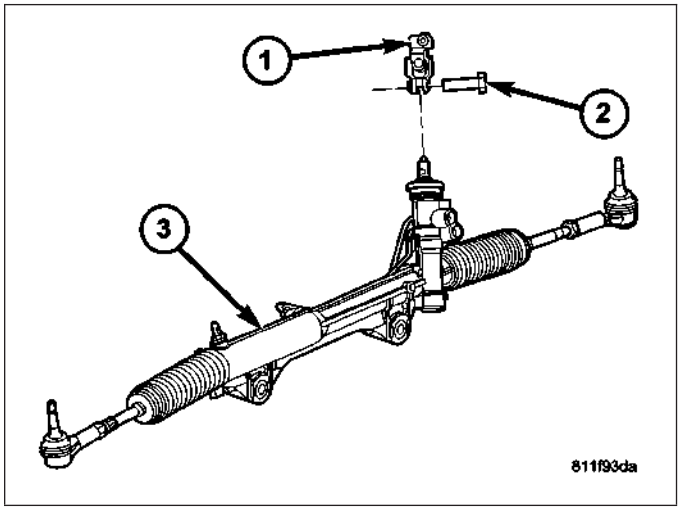


6. Remove the lower steering shaft coupling (1) from the steering gear (3).



INSTALLATION

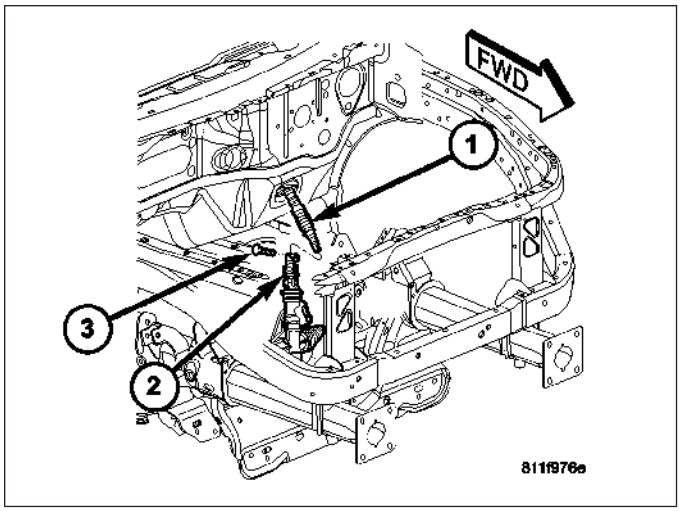
1. Install the coupling (1) to the steering gear (3).



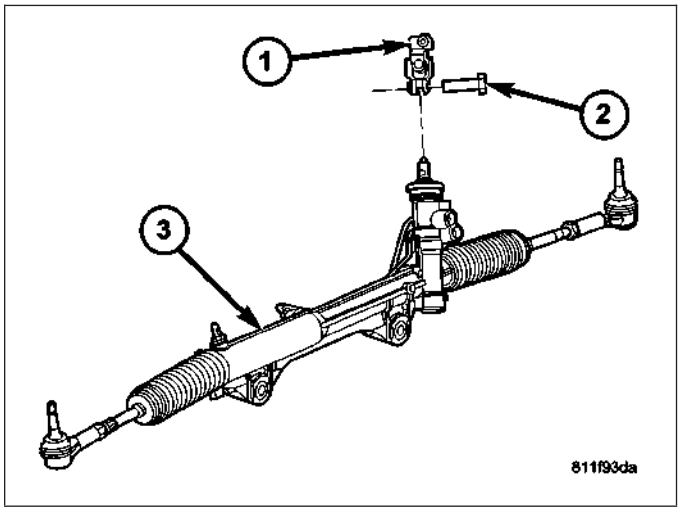
2. Install the other end of the coupling (2) to the steering shaft (1).

NOTE: New pinch bolts must be used for reinstallation.

3. Install the upper pinch bolt (3) and tighten to 38 N·m (28 ft. lbs.).



4. Install the lower pinch bolt (2) and tighten to 38 N·m (28 ft. lbs.).
5. Lower the vehicle.
6. Reconnect the negative battery cable.
7. Unlock the steering wheel.



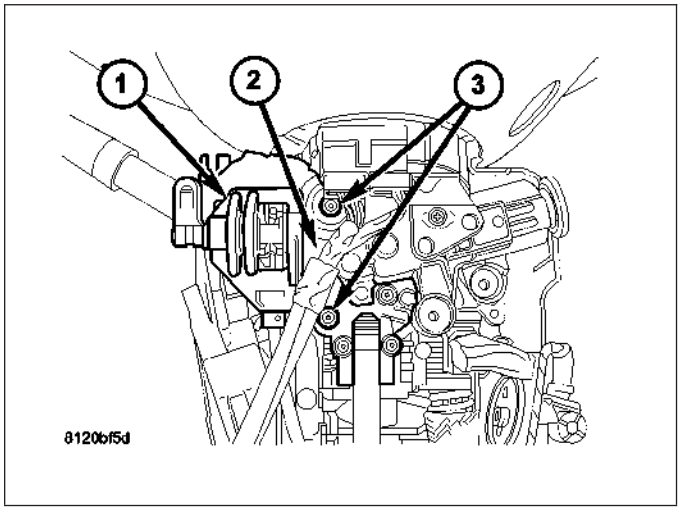
TILT LEVER KNOB RELEASE

REMOVAL

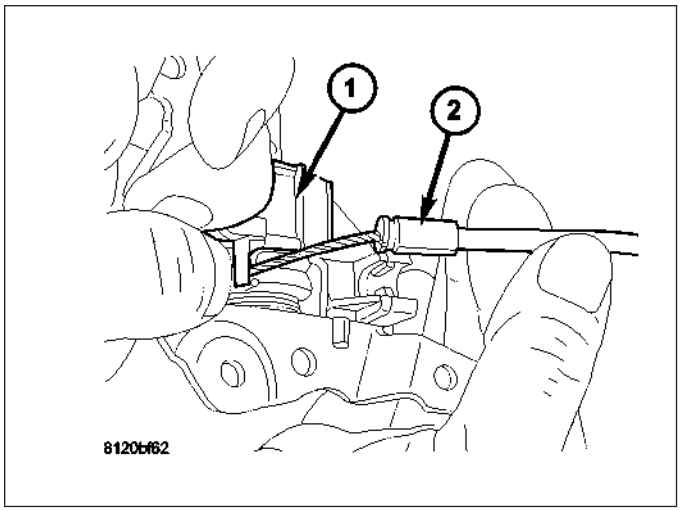
1. Remove the tilt lever handle.
2. Remove the steering column opening cover (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - REMOVAL).
3. Remove the lower shroud.

NOTE: Use special care not to pry on the clockspring electrical connector when removing or installing the mounting screw located next to the clockspring.

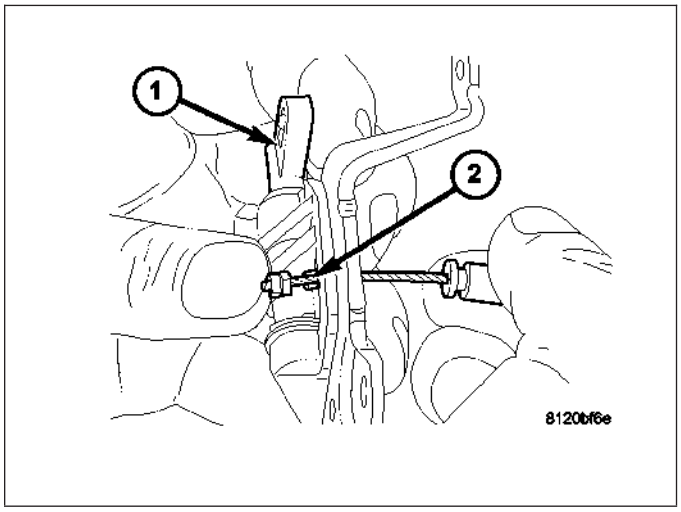
4. Remove the two mounting screws (3) from the tilt lever knob release bracket (1).
5. Disconnect the electrical harness plastic mounting tab (2) from the the bracket (1).



6. Unsnap the cable (2) from the bracket (1).

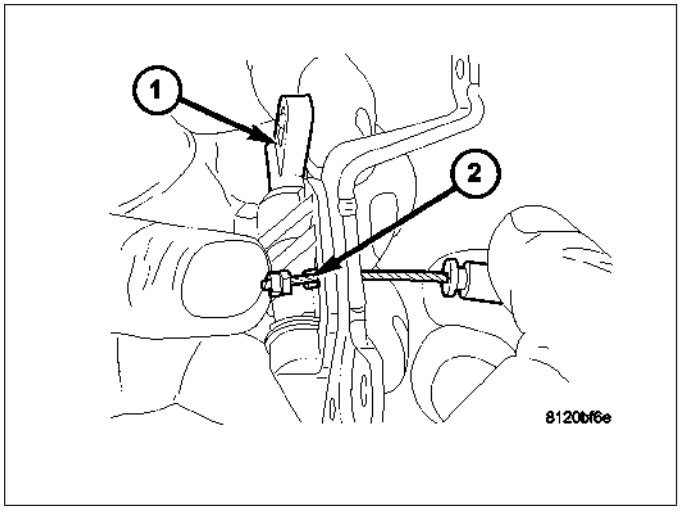


7. Remove the end of the cable (2) from the tilt lever knob release bracket (1).

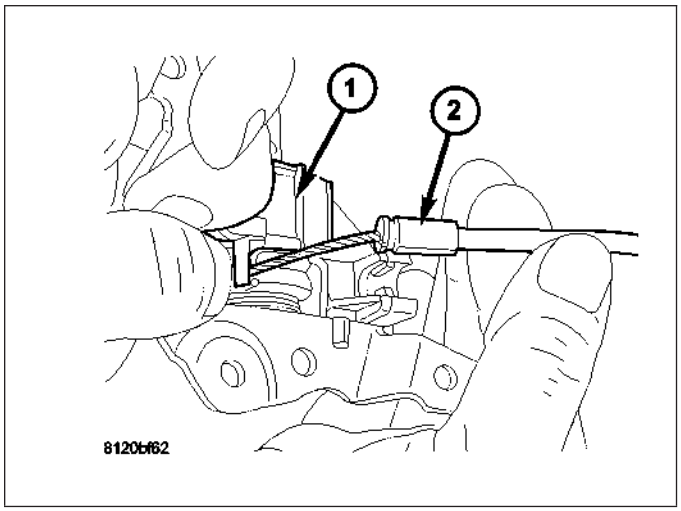


INSTALLATION

1. Route the cable (2) into the tilt lever release knob bracket (1).

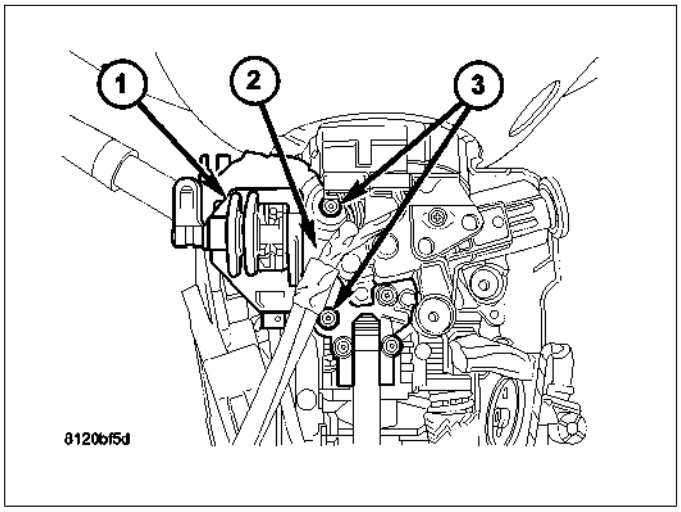


2. Snap the cable end (2) into the bracket (1).



NOTE: Use special care not to pry on the clockspring electrical connector when removing or installing the mounting screw located next to the clockspring.

NOTE: New screws should be used when installing the tilt lever release knob bracket to the column.



3. Install the tilt lever release knob bracket (1) to the column and install the two new mounting screws (3). Tighten the two new screws to 4.5 N·m (40 in. lbs.).
4. Install the electrical harness plastic mounting tab (2) to the bracket (1).
5. Install the lower shroud.
6. Install the steering column opening cover (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - INSTALLATION).
7. Install the tilt lever handle.

GEAR

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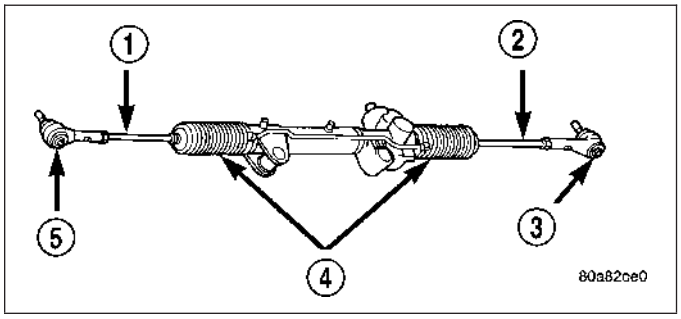
GEAR

DESCRIPTION

A rack and pinion steering gears is made up of two main components, the pinon shaft and the rack. Other components are the outer tie rod ends (3&5), inner tie rod ends (1&2), Mounting Bushings and the boots (4). The gear cannot be adjusted or internally serviced. If a malfunction or a fluid leak occurs, the gear must be replaced as an assembly. The only serviceable component on the steering gear is the outer tie rod ends (3&5).

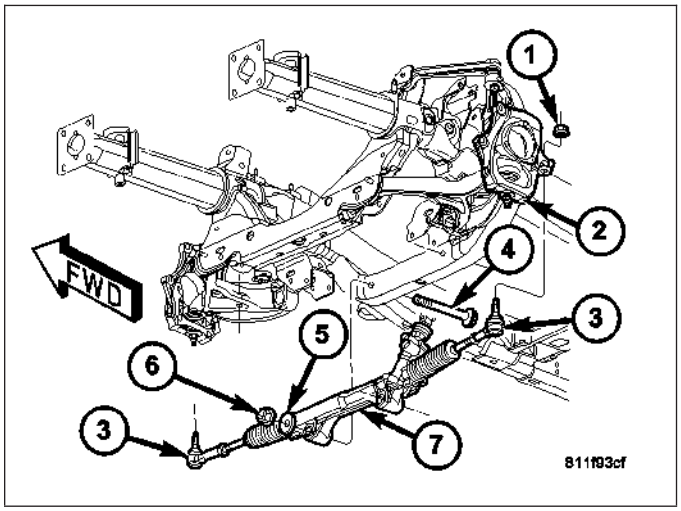


OPERATION

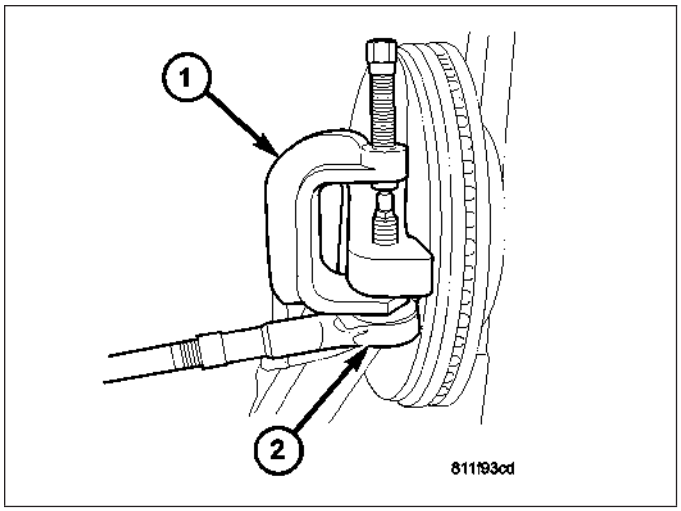
The steering column shaft is attached to the gear pinion. The rotation of the pinion moves the gear rack from side-to-side. This lateral action of the rack pushes and pulls the tie rods to change the direction of the front wheels.

REMOVAL

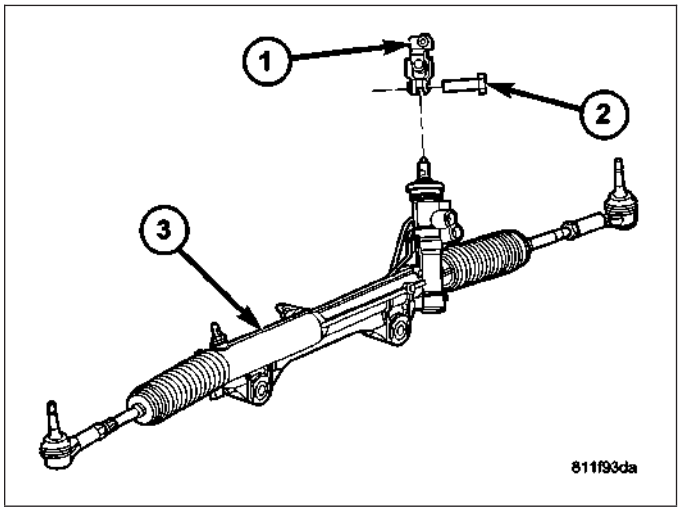
1. Siphon out as much power steering fluid as possible from the pump.
2. Lock the steering wheel.
3. Raise and support the vehicle.
4. Remove the front tires.
5. Remove the nuts (1) from the tie rod ends (3).



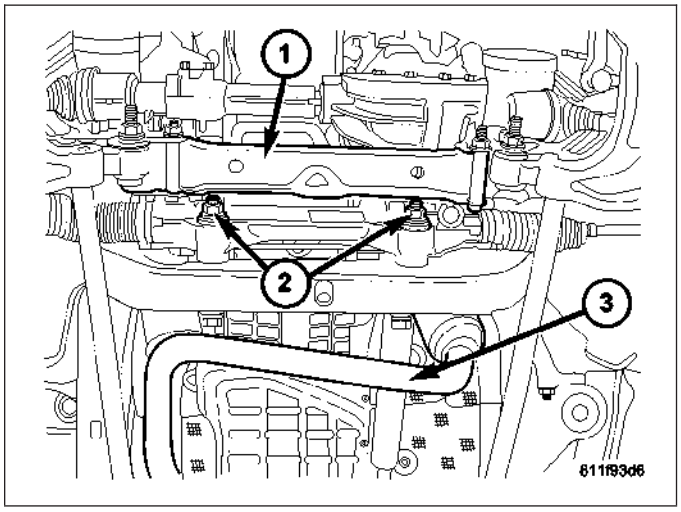
6. Separate tie rod ends (2) from the knuckles with Puller 8677 (1) (Refer to 19 - STEERING/LINKAGE/TIE ROD END - REMOVAL).



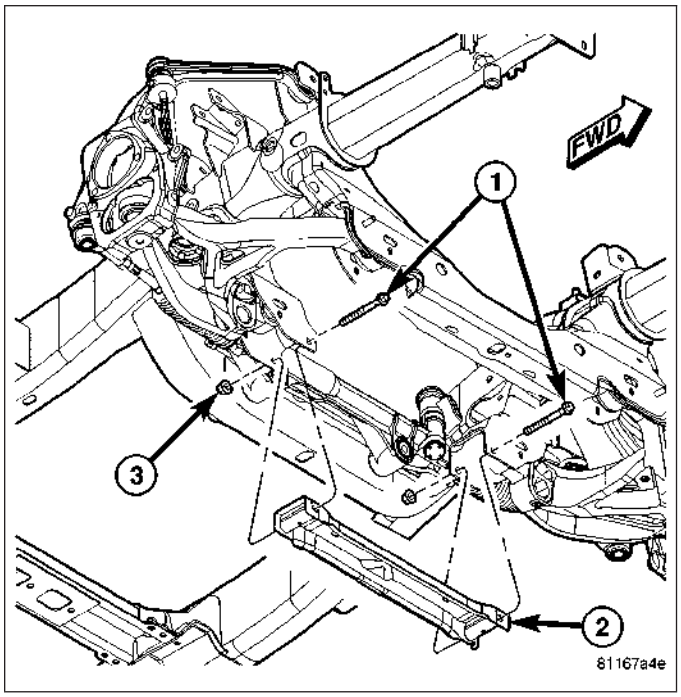
7. Remove the steering gear pinch bolt (2).
8. Remove the lower steering coupling (1) from the steering gear (3).
9. Turn the steering gear to the full right position.



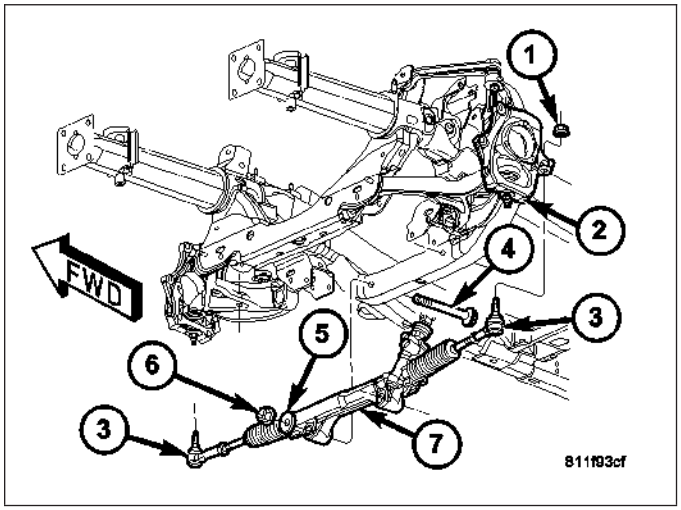
10. Remove the exhaust Y-pipe (3) **3.7L & 4.7L engines only.**.
11. Remove the power steering lines from the gear. (Refer to 19 - STEERING/PUMP/HOSES - REMOVAL), (Refer to 19 - STEERING/PUMP/HOSES - REMOVAL).



12. Remove the front crossmember (2) (Refer to 13 - FRAME & BUMPERS/FRAME/FRONT CROSSMEMBER - REMOVAL).



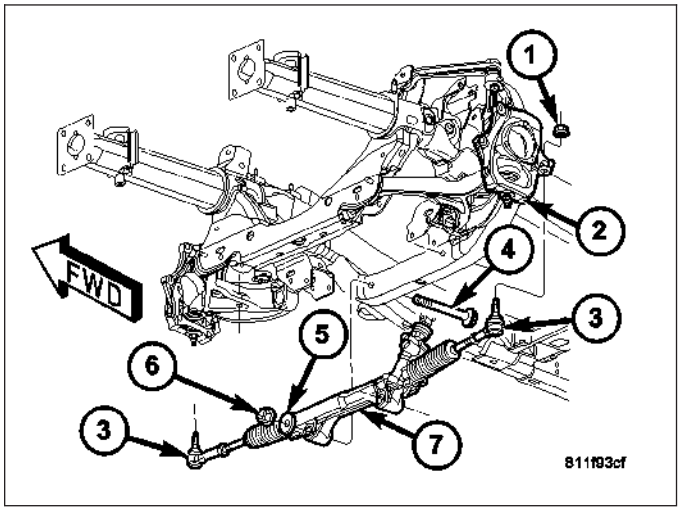
13. Remove the steering gear mounting bolts (4), washers (5) and nuts (6).
14. Tip the gear (7) forward to allow clearance and move to the right then tip the gear downward on the left side to remove from the vehicle.



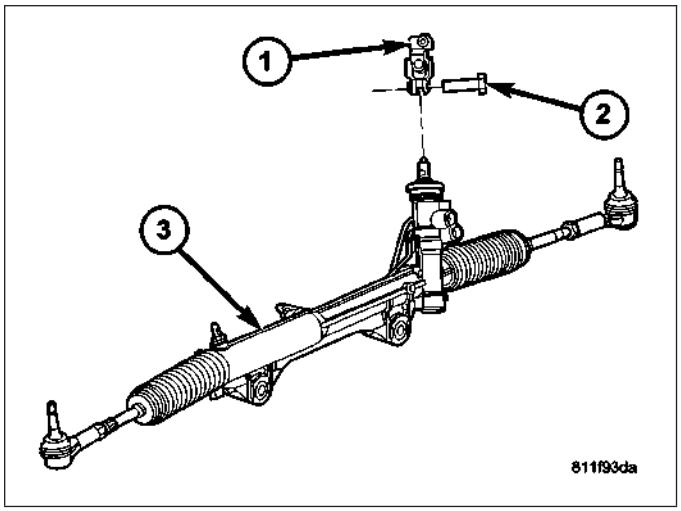
INSTALLATION

NOTE: Before installing gear inspect the bushings and replace if worn or damaged, also use new gear mounting bolts and nuts.

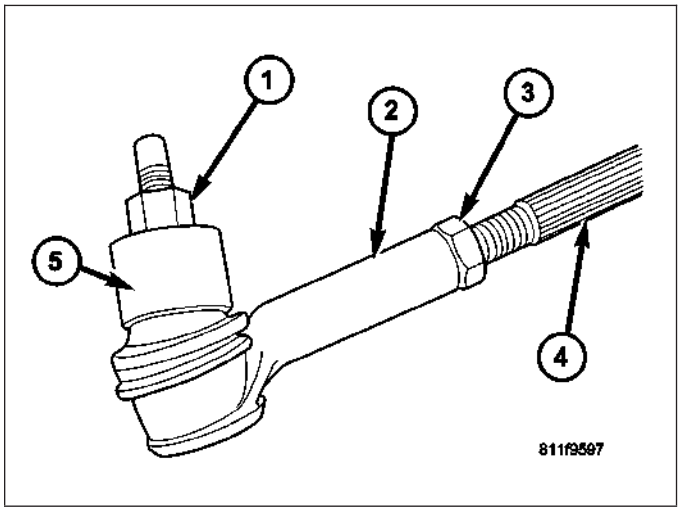
1. Install gear (7) to the vehicle and tighten mounting nuts and bolts (4&6) to 258 N·m (190 ft. lbs.).
2. Install power steering lines to steering gear and tighten the pressure hose to 38 N·m (28 ft. lbs.) and tighten the return hose to 65 N·m (48 ft. lbs.). (Refer to 19 - STEERING/PUMP/HOSES - INSTALLATION), (Refer to 19 - STEERING/PUMP/HOSES - INSTALLATION).



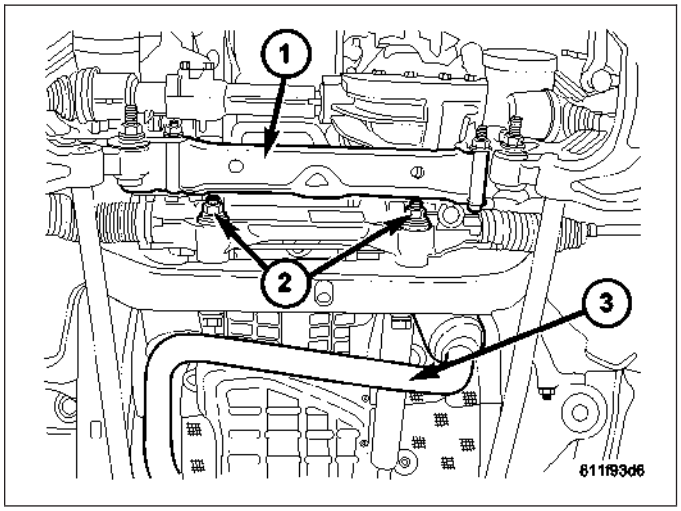
3. Slide the shaft coupler (1) onto gear (3). Install **new** bolt (2) and tighten to 49 N·m (36 ft. lbs.).



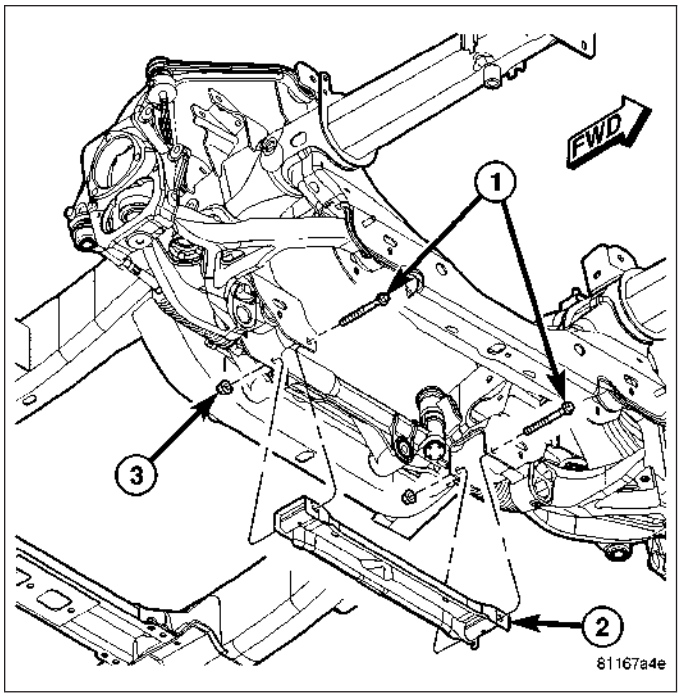
4. Clean tie rod end studs and knuckle tapers (5).
5. Install tie rod ends (2) into the steering knuckles (5) and tighten the nuts (1) to 75 N·m (55 ft. lbs.). (Refer to 19 - STEERING/LINKAGE/TIE ROD END - INSTALLATION).



6. Install the Y-pipe (3) **3.7L & 4.7L engines only**.



7. Install the front crossmember (2) (Refer to 13 - FRAME & BUMPERS/FRAME/FRONT CROSSMEMBER - INSTALLATION).
8. Install the front tires.
9. Remove the support and lower the vehicle.
10. Unlock the steering wheel.
11. Fill system with fluid, (Refer to 19 - STEERING/ PUMP - STANDARD PROCEDURE).
12. Adjust the toe position. (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE).



SPECIFICATIONS

TORQUE CHART

TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Rack and Pinion Steering Gear Gear to Frame Bolts	258	190	—
Rack and Pinion Steering Gear Intermediate Shaft Bolt	38	28	—
Tie Rod End Knuckle Nut	75	55	—
Tie Rod End Jam Nut	130	96	—
Power Steering Line Pressure Line	38	28	—
Power Steering Line Return Line	65	48	—

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LINKAGE

DIAGNOSIS AND TESTING

OUTER TIE ROD END

NOTE: If the outer tie rod end is equipped with a lubrication fitting, grease the joint then road test the vehicle before performing test.

1. Raise the front of the vehicle. Place safety floor stands under both lower control arms as far outboard as possible. Lower the vehicle to allow the stands to support some or all of the vehicle weight.
2. Remove the front tires.
3. Mount a dial indicator solidly to the vehicle steering knuckle and then zero the dial indicator.
4. Position indicator plunger on the topside of the outer tie rod end.

NOTE: The dial indicator plunger must be perpendicular to the machined surface of the outer tie rod end.

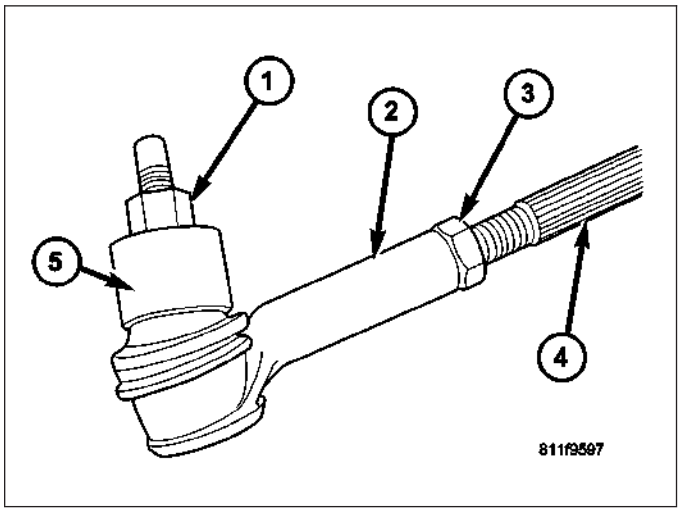
5. Position a pry bar in order to pry downwards on the outer tie rod end.
6. If the travel exceeds 0.5 mm (0.020 in.), replace the outer tie rod end (Refer to 19 - STEERING/LINKAGE/TIE ROD END - REMOVAL).
7. If the outer tie rod end is within specs reinstall the front tires (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).

TIE ROD END

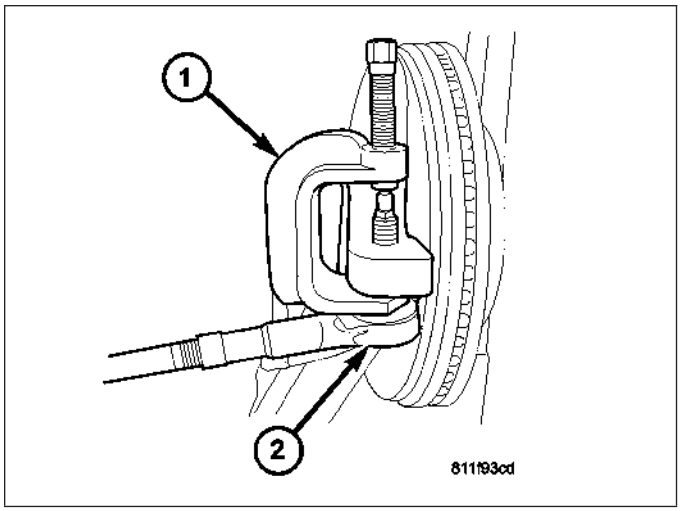
REMOVAL - OUTER TIE ROD END

NOTE: Do not twist the boot anytime during removal or installation.

1. Loosen the jam nut (3).
2. Remove the outer tie rod end (2) nut (1) from the ball stud.



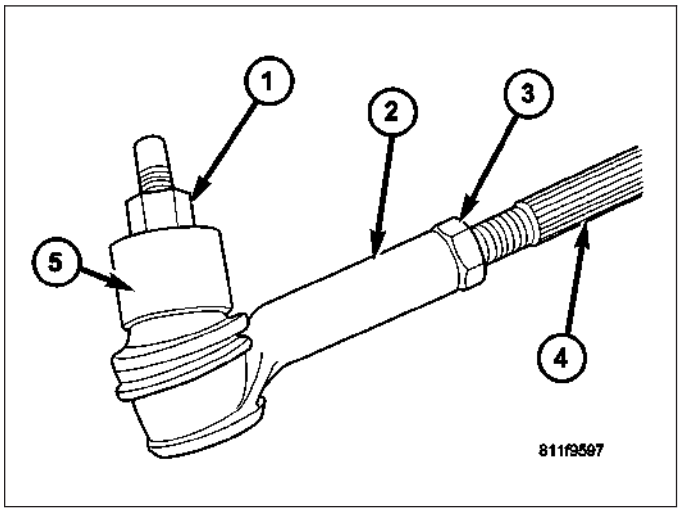
3. Separate the outer tie rod end (2) from the knuckle with Remover 8677 (1).
4. Unthread the outer tie rod end from the inner tie rod. **Count the number of turns when removing the tie rod end, This will give a good starting point when reassembiling and toe adjustment.**



INSTALLATION - OUTER TIE ROD END

NOTE: Do not twist the boot at anytime during removal or installation.

1. Thread the outer tie rod end (2) onto the inner tie rod (4), to it's original position.
2. Install the outer tie rod end into the steering knuckle (5).
3. Tighten the ball stud nut (1) on the ball stud to 75 N·m (55 ft. lbs.).
4. Set wheel toe pattern, (Refer to 2 - SUSPENSION/ WHEEL ALIGNMENT - STANDARD PROCEDURE).
5. Tighten jam nut (3) to 130 N·m (96 ft. lbs.).



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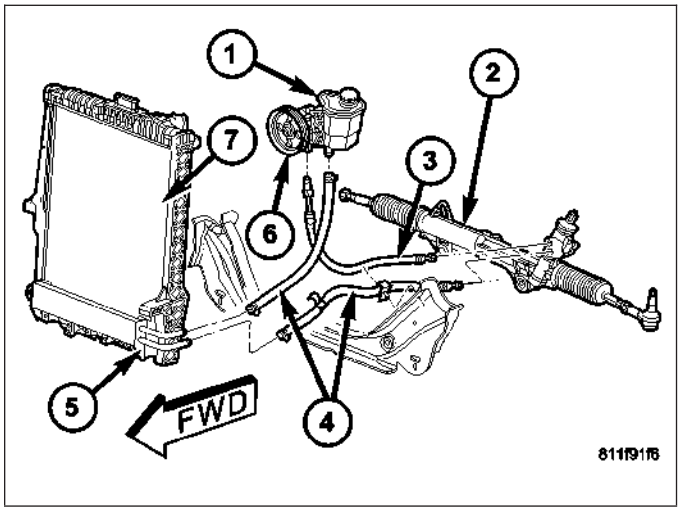
PUMP

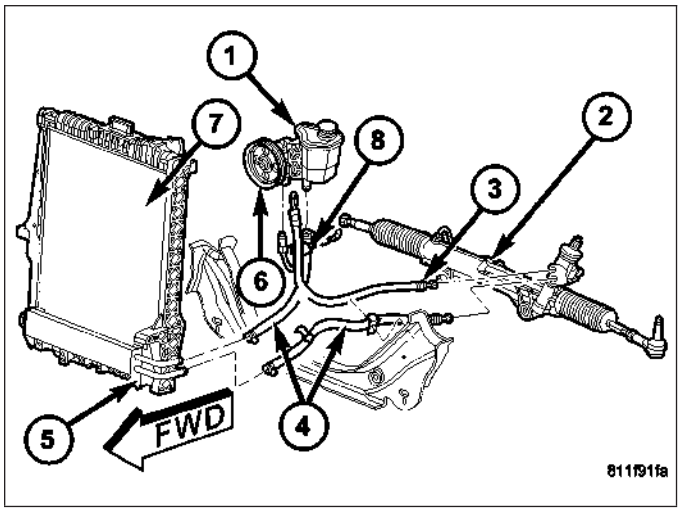
DESCRIPTION

The pump (1) is connected to the steering gear (2) via the pressure hose (3) and the return hoses (4). The pump shaft has a pressed-on pulley (6) that is belt driven by the crankshaft pulley.



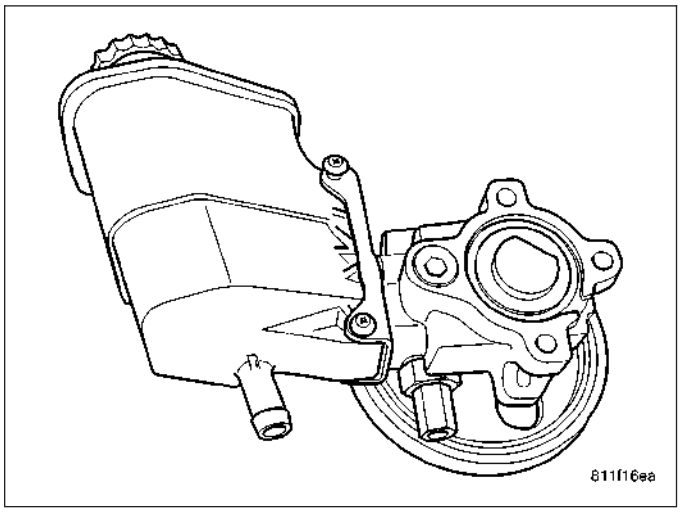
The power steering oil cooler (5) is mounted to the front lower part of the radiator (7).

NOTE: Power steering pumps are not interchangeable with pumps installed on other vehicles.



OPERATION

Hydraulic pressure is provided for the power steering gear by the belt driven power steering pump. The power steering pumps are constant flow rate and displacement, vane-type pumps.



DIAGNOSIS AND TESTING

PUMP LEAKAGE

The pump is serviced as an assembly and should not be disassembled. Plastic pump reservoirs can be replace and the reservoir O-ring.

Check for leaks in the following areas:

- Pump shaft seal behind the pulley
- Pump to reservoir O-ring
- Reservoir cap
- Pressure and return lines
- Flow control valve fitting

STANDARD PROCEDURE

POWER STEERING PUMP - INITIAL OPERATION

WARNING: THE FLUID LEVEL SHOULD BE CHECKED WITH ENGINE OFF TO PREVENT INJURY FROM MOVING COMPONENTS.

CAUTION: MOPAR® ATF+4 is to be used in the power steering system. No other power steering or automatic transmission fluid is to be used in the system. Damage may result to the power steering pump and system if any other fluid is used, and do not overfill.

Wipe filler cap clean, then check the fluid level. The dipstick should indicate **COLD** when the fluid is at normal temperature.

1. Turn steering wheel all the way to the left
2. Fill the pump fluid reservoir to the proper level and let the fluid settle for at least two (2) minutes.
3. Raise the front wheels off the ground.
4. Slowly turn the steering wheel lock-to-lock 20 times with the engine off while checking the fluid level.

NOTE: Vehicles with long return lines or oil coolers turn wheel 40 times.

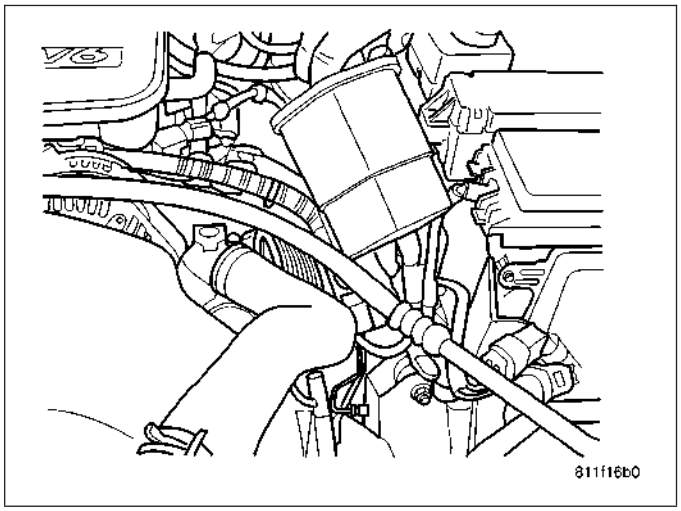
5. Start the engine. With the engine idling maintain the fluid level.
6. Lower the front wheels and let the engine idle for two minutes.
7. Turn the steering wheel in both direction and verify power assist and quiet operation of the pump.

If the fluid is extremely foamy or milky looking, allow the vehicle to stand a few minutes and repeat the procedure.

CAUTION: Do not run a vehicle with foamy fluid for an extended period. This may cause pump damage.

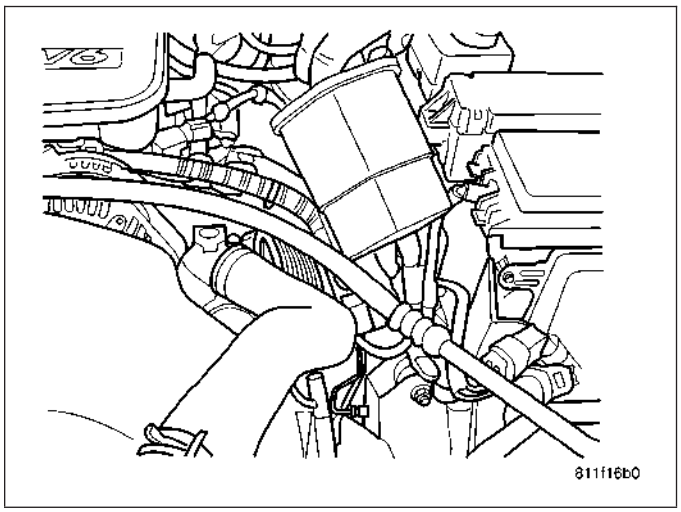
REMOVAL

1. Drain and siphon the power steering fluid from the pump.
2. Remove the serpentine drive belt, (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
3. Remove the reservoir return hose at the reservoir.
4. Remove the pressure hose from the pump.
5. Remove 3 pump mounting bolts through pulley access holes.
6. Remove the pump from the engine.



INSTALLATION

1. Align the pump with the mounting holes on the engine.
2. Install 3 pump mounting bolts through the pulley access holes. Tighten the bolts to 28 N·m (21 ft. lbs.).
3. Install the pressure hose to the pump. Tighten the pressure line to 31 N·m (23 ft. lbs.).
4. Install reservoir return hose to the reservoir.
5. Install the serpentine drive belt, (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).
6. Fill the power steering pump, (Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE).



SPECIFICATIONS

TORQUE CHART

TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Power Steering Pump Pump Mounting Bolts	28	21	—
Power Steering Pump Pressure Line	31	23	—
Power Steering Pressure line to Gear	38	28	—
Power Steering Return line to Gear	65	48	—

FLUID

DESCRIPTION

The recommended fluid for the power steering system is Mopar® ATF +4.

Mopar® ATF+4, when new is red in color. The ATF+4 is dyed red so it can be identified from other fluids used in the vehicle such as engine oil or antifreeze. The red color is not permanent and is not an indicator of fluid condition, As the vehicle is driven, the ATF+4 will begin to look darker in color and may eventually become brown. **THIS IS NORMAL.** ATF+4 also has a unique odor that may change with age. Consequently, odor and color cannot be used to indicate the fluid condition or the need for a fluid change.

STANDARD PROCEDURE

POWER STEERING FLUID LEVEL CHECKING

WARNING: FLUID LEVEL SHOULD BE CHECKED WITH THE ENGINE OFF TO PREVENT PERSONAL INJURY FROM MOVING PARTS.

CAUTION: MOPAR® ATF+4 is to be used in the power steering system. No other power steering or automatic transmission fluid is to be used in the system. Damage may result to the power steering pump and system if any other fluid is used, and do not overfill.

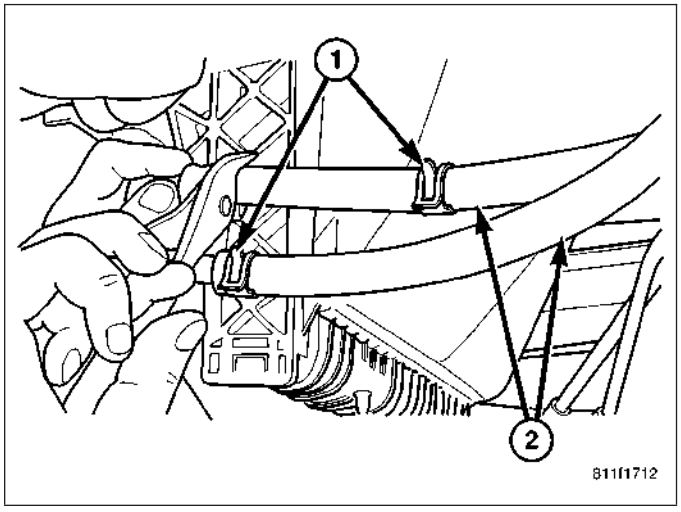
The power steering fluid level can be viewed on the dipstick attached to the filler cap. There are two ranges listed on the dipstick, COLD and HOT. Before opening power steering system, wipe the reservoir filler cap free of dirt and debris. Remove the cap and check the fluid level on its dipstick. When the fluid is at normal ambient temperature, approximately 21°C to 27°C (70°F to 80°F), the fluid level should read between the minimum and maximum area of the cold range. When the fluid is hot, fluid level is allowed to read up to the highest end of the HOT range. Only add fluid when the vehicle is cold.

Use only Mopar® ATF+4 Do not overfill the power steering system.

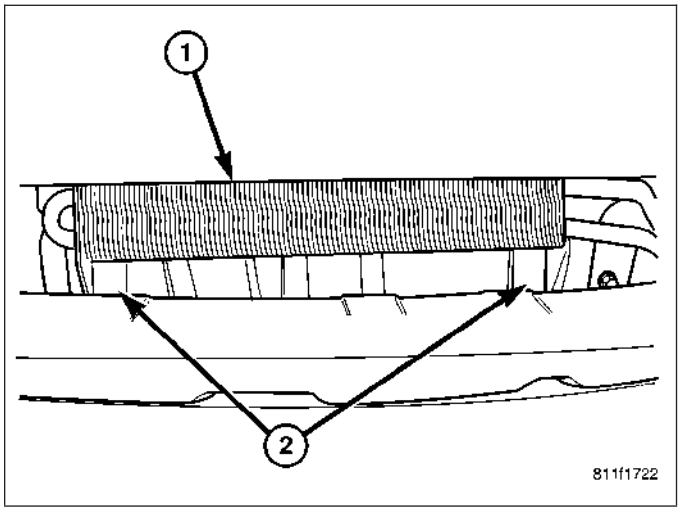
FLUID COOLER

REMOVAL

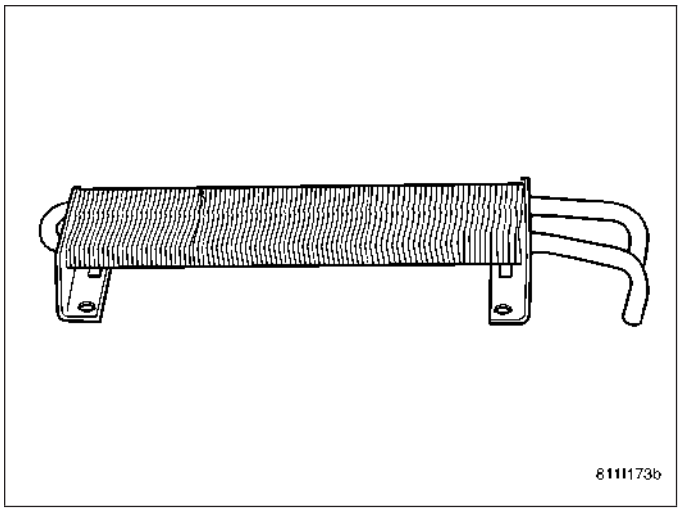
1. Siphon the power steering system.
2. Raise and support the vehicle.
3. Disconnect the hose clamps (1).
4. Disconnect the hoses (2) at the cooler.



5. Remove the cooler mounting bolts (2).

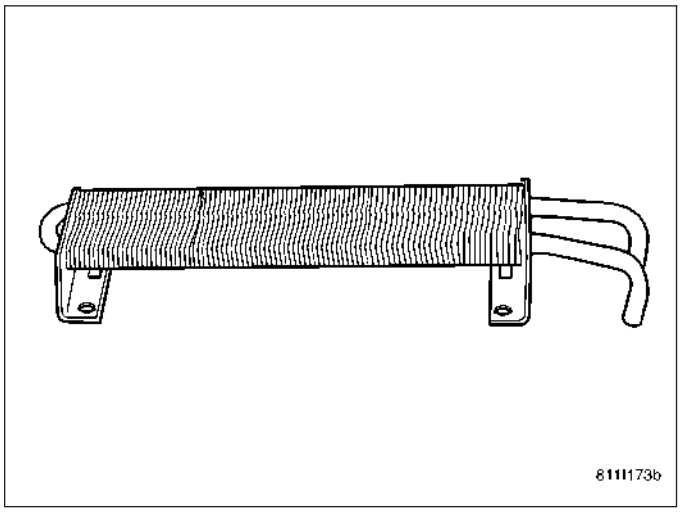


6. Remove the cooler.

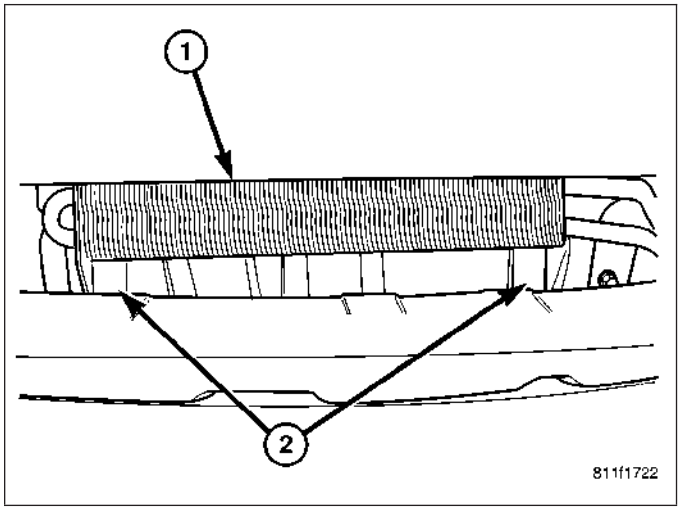


INSTALLATION

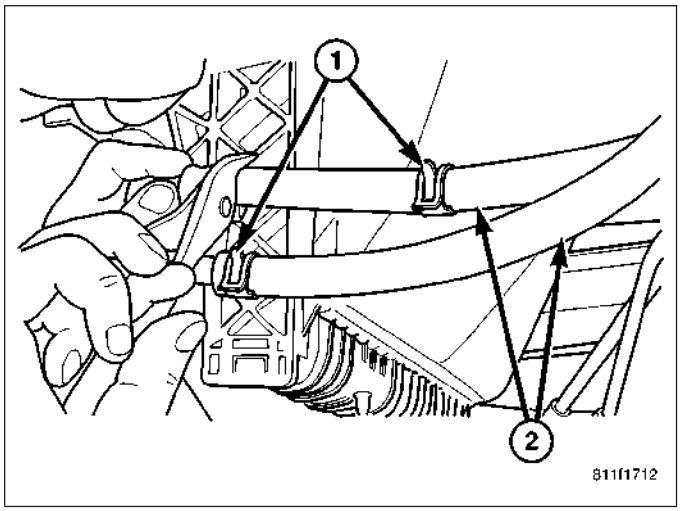
1. Install the cooler to the vehicle.



2. Install the cooler mounting nut and bolt (2).



3. Reconnect the hoses (2) at the cooler.
4. Reconnect the hose clamps (1).
5. Remove the support and lower the vehicle.
6. Refill the power steering system, (Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE).

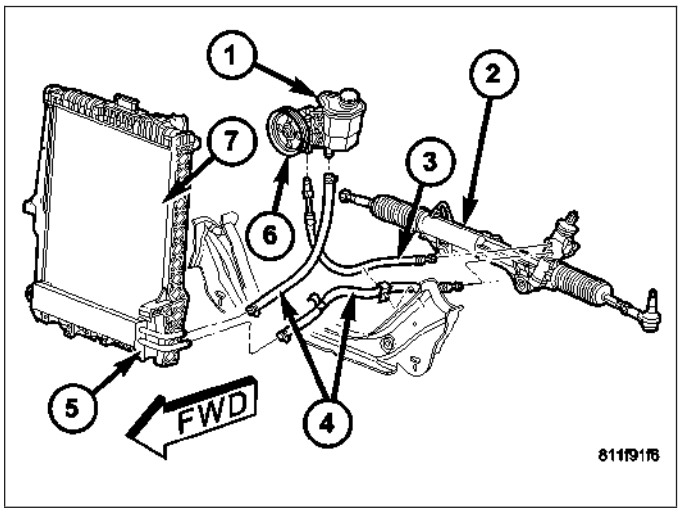


HOSES

REMOVAL

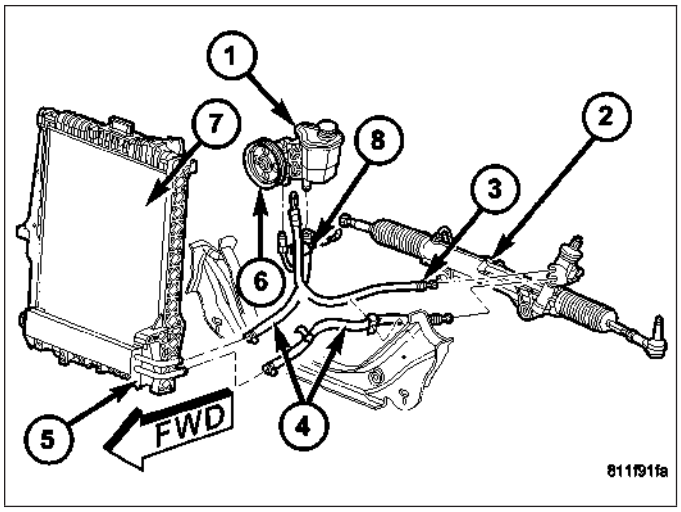
RETURN HOSE

1. Siphon the power steering system.
2. Raise and support the vehicle.
3. Disconnect the return hose (4) at the gear (2).
4. Disconnect the return hose (4) at the cooler (5).
5. Disconnect the return hose from the crossmember.
6. Remove the return hose from the vehicle.



PRESSURE HOSE

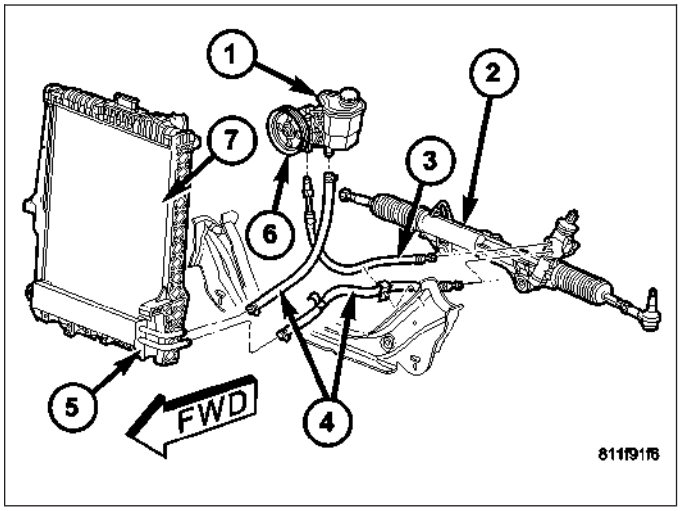
1. Siphon the power steering system.
2. Raise and support the vehicle.
3. Remove the return hose (4) at the gear (2) to gain access to the pressure hose (3).
4. Remove the pressure hose (3) at the gear (2).
5. Disconnect the pressure hose from the retainer at the crossmember.
6. Remove the pressure hose (3) at the pump (1).
7. Remove the pressure hose from the vehicle.



INSTALLATION

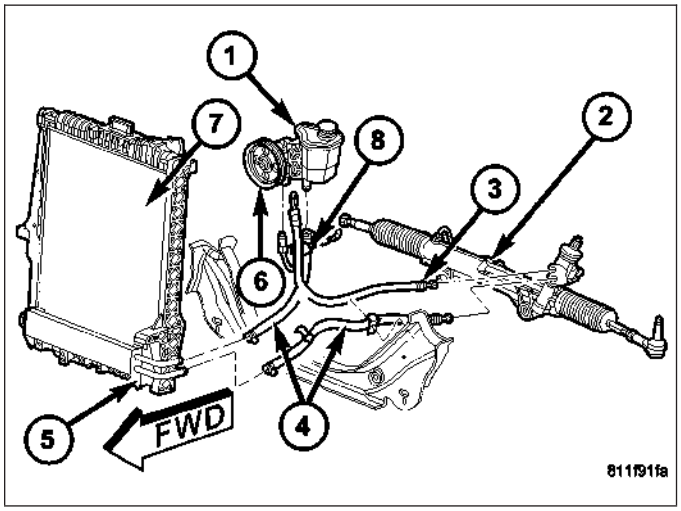
RETURN HOSE

1. Install the return hose to the vehicle.
2. Reconnect the return hose (4) at the cooler (5).
3. Reconnect the return hose (4) at the gear (2). Tighten the hose to 65 N·m (48 ft. lbs.).
4. Route the return hose to the crossmember and secure.
5. Remove the support and lower the vehicle.
6. Refill the power steering system, (Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE).



PRESSURE HOSE

1. Install the pressure hose (3) to the vehicle.
2. Reconnect the pressure hose (3) at the pump (1). Tighten the hose to 34 N·m (25 ft. lbs.).
3. Reconnect the return hose (4) to the gear (2). Tighten the hose to 65 N·m (48 ft. lbs.).
4. Reconnect the pressure hose (3) at the gear (2). Tighten the hose to 38 N·m (28 ft. lbs.).
5. Connect the pressure hose (3) to the crossmember retainer.
6. Remove the support and lower the vehicle.
7. Refill the power steering system, (Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE).

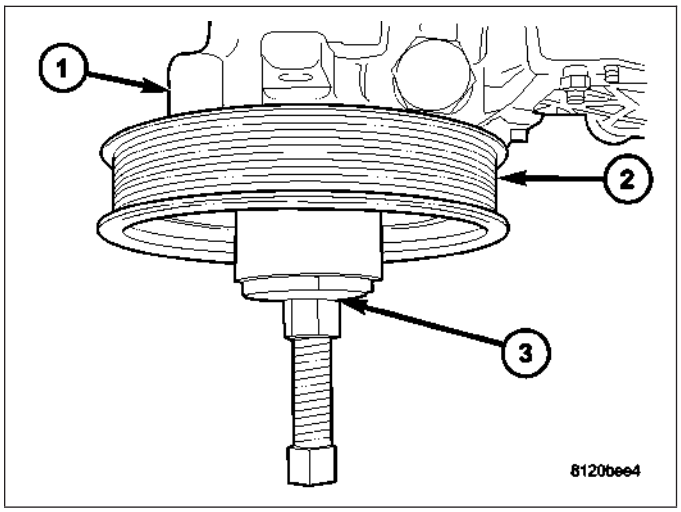


PULLEY

REMOVAL

CAUTION: Do not reuse the old power steering pump pulley it is not intended for reuse. A new pulley must be installed if removed.

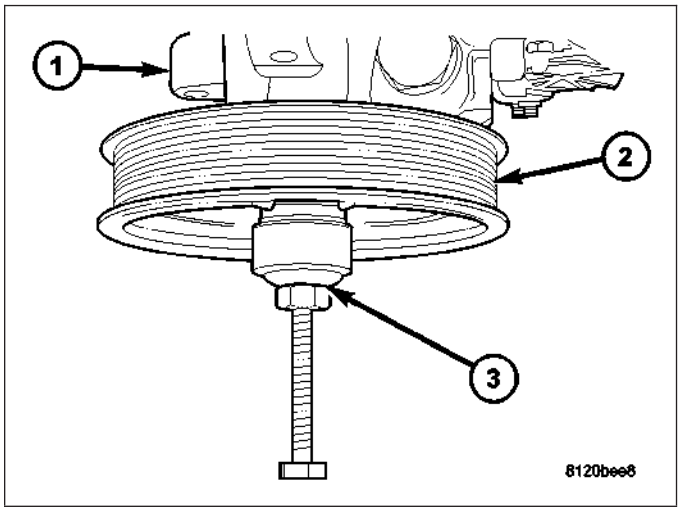
1. Remove the power steering pump assembly, (Refer to 19 - STEERING/PUMP - REMOVAL).
2. Remove the pulley (2) from the pump (1) using (OTC® 7185) power steering pulley removal tool (3) or equivalent.



INSTALLATION

CAUTION: Do not reuse the old power steering pump pulley it is not intended for reuse. A new pulley must be installed if removed.

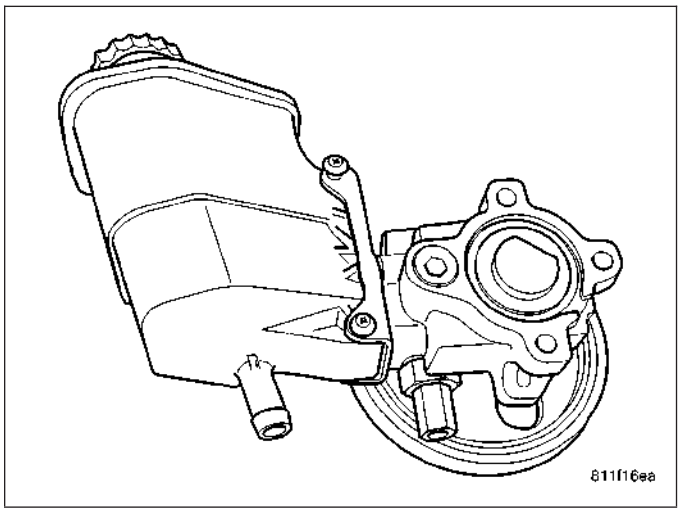
1. Replace the pulley if it's bent, cracked, or loose.
2. Install the pulley (2) on the pump (1) using (OTC® 7771) power steering pulley installation tool (3) or equivalent making sure it is flush with the end of the shaft. Ensure the tool and pulley remain aligned with the pump shaft.
3. Install the power steering pump assembly, (Refer to 19 - STEERING/PUMP - INSTALLATION).
4. Run engine until warm (5 min.) and note any belt chirp. If chirp exists, move pulley outward approximately 0.5 mm (0.020 in.). If noise increases, press on 1.0 mm (0.040 in.). **Be careful that pulley does not contact mounting bolts.**



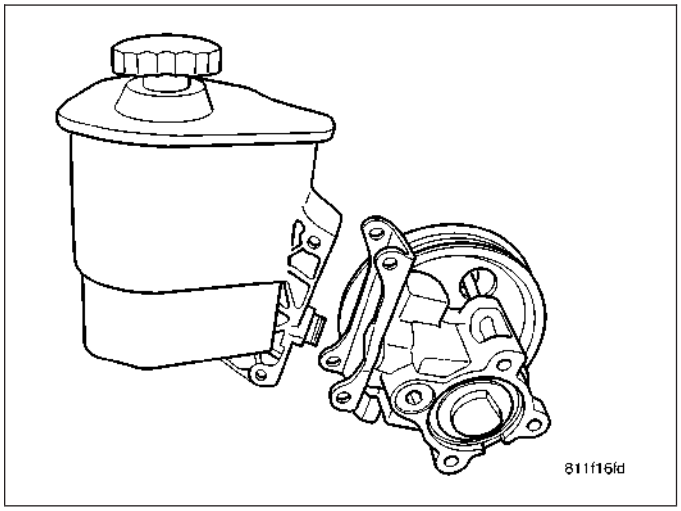
RESERVOIR

REMOVAL

1. Remove the power steering pump (Refer to 19 - STEERING/PUMP - REMOVAL).
2. With the pump on the bench drain the rest of the fluid out into a container.

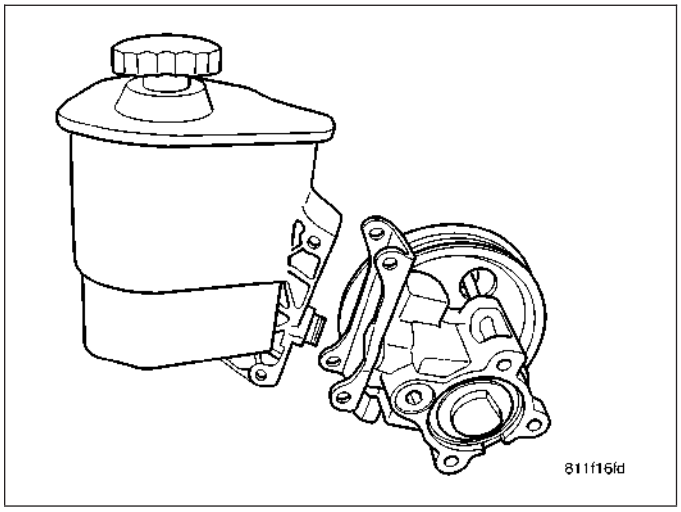


3. Remove the two bolts and separate the reservoir from the pump body.



INSTALLATION

1. Install a new o-ring on the port of the reservoir.
2. Install the reservoir on the pump body.
3. Install the two bolts securing the reservoir to the body and tighten.
4. Install the power steering pump (Refer to 19 - STEERING/PUMP - INSTALLATION).



TRANSMISSION AND TRANSFER CASE

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AUTOMATIC TRANSMISSION 42RLE - ELECTRICAL DIAGNOSTICS

DIAGNOSIS AND TESTING

P0122-TPS/APP CIRCUIT LOW

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on and engine running.
- **Set Condition:**
  This DTC will set if the monitored TPS voltage drops below .078 volts for the period of 0.48 seconds.

Possible Causes
RELATED TPS ENGINE DTCS PRESENT
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - STANDARD PROCEDURE)

Theory of Operation

The powertrain controller receives the throttle position signal from the Throttle Position Sensor (TPS). The controller provides the TPS with a 5 volt pull up and a sensor ground. The signal is checked for being out of range as well as for intermittent operation (excessive signal changes). The engine controller transmits the throttle value onto the Bus. Most engine controllers will calculate the throttle value if the throttle signal is lost. If an error is detected by the transmission controller and the throttle value is available on the Bus, the Bus value will be used, normal operation will continue, and a TPS code will be set. If an error is detected and the throttle value is not available on the Bus, normal operation will be discontinued, a TPS DTC will be set, and the MIL will be turned on after 5 minutes of calculated operation.

Diagnostic Test

1. DETERMINING IF RELATED ENGINE TPS DTCS ARE PRESENT

With the scan tool, check Engine DTCs, including pending DTCs and one trip failures.

Are there any Engine TPS DTCs present?

Yes >> Refer to the Driveability category and perform the appropriate diagnostic procedure.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK TO SEE IF DTC IS CURRENT

With the scan tool, record the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.
With the scan tool, erase Transmission DTCs.

NOTE: To erase EATX EVENT DATA information, a BATTERY DISCONNECT must be performed. Performing a BATTERY DISCONNECT will reset all learned Transmission values to controller defaults which may lead to erratic shift schedules.
Drive the vehicle and try to duplicate the conditions in which the DTC was reported by the EATX DTC EVENT DATA.
With the scan tool, read Transmission DTCs.

Does this DTC reset?

Yes >> Go To 3

No >> Go To 4

P0122-TPS/APP CIRCUIT LOW (CONTINUED)

3. POWERTRAIN CONTROL MODULE

NOTE: Due to the integration of the Powertrain and Transmission Control Modules, bus communication between the modules is internal.

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

Verify the flash level of the controller and update the controller if available.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

If there are no possible causes remaining, view repair.

Repair

Replace the Powertrain Control Module per the Service Information. With the scan tool PERFORM QUICK LEARN, then program Pinion Factor in the Front Control Module.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

4. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

Pay particular attention to the TPS signal and sensor ground circuits.

With the scan tool, check the EATX EVENT DATA to help identify the conditions in which the DTC was set.

Were there any problems found?

Yes >> Repair as necessary.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0123-TPS/APP CIRCUIT HIGH

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously with the ignition on and engine running.
- **Set Condition:**
  This DTC will set if the monitored TPS voltage rises above 4.94 volts for the period of 0.48 seconds.

Possible Causes
RELATED TPS ENGINE DTCS PRESENT
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - STANDARD PROCEDURE)

Theory of Operation

The powertrain controller receives the throttle position signal from the Throttle Position Sensor (TPS). The controller provides the TPS with a 5 volt pull up and a sensor ground. The signal is checked for being out of range as well as for intermittent operation (excessive signal changes). The engine controller transmits the throttle value onto the Bus. Most engine controllers will calculate the throttle value if the throttle signal is lost. If an error is detected by the transmission controller and the throttle value is available on the Bus, the Bus value will be used, normal operation will continue, and a TPS code will be set. If an error is detected and the throttle value is not available on the Bus, normal operation will be discontinued, a TPS DTC will be set, and the MIL will be turned on after 5 minutes of calculated operation.

Diagnostic Test

1. DETERMINING IF RELATED ENGINE TPS DTCS ARE PRESENT

With the scan tool, check Engine DTCs, including pending DTCs and one trip failures.

Are there any Engine TPS DTCs present?

Yes >> Refer to the Driveability category and perform the appropriate diagnostic procedure.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK TO SEE IF DTC IS CURRENT

With the scan tool, record the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.
With the scan tool, erase Transmission DTCs.

NOTE: To erase EATX EVENT DATA information, a BATTERY DISCONNECT must be performed. Performing a BATTERY DISCONNECT will reset all learned Transmission values to controller defaults which may lead to erratic shift schedules.
Drive the vehicle and try to duplicate the conditions in which the DTC was reported by the EATX DTC EVENT DATA.
With the scan tool, read Transmission DTCs.

Does this DTC reset?

Yes >> Go To 3

No >> Go To 4

P0123-TPS/APP CIRCUIT HIGH (CONTINUED)

3. POWERTRAIN CONTROL MODULE

NOTE: Due to the integration of the Powertrain and Transmission Control Modules, communication between the modules is internal.

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

If there are no possible causes remaining, view repair.

Repair

Replace the Powertrain Control Module per the Service Information. With the scan tool PERFORM QUICK LEARN, then program Pinion Factor in the Front Control Module.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

4. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

Pay particular attention to the TPS signal and sensor ground circuits.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Were there any problems found?

Yes >> Repair as necessary.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0124-TPS/APP INTERMITTENT

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on and engine running.
- **Set Condition:**
  This DTC will set if the monitored TPS throttle angle between the angles of 6° and 120° and the degree change is greater than 5° within a period of less than 7.0 ms.

Possible Causes
RELATED TPS ENGINE DTCS PRESENT
THROTTLE POSITION SENSOR
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - STANDARD PROCEDURE)

Theory of Operation

The powertrain controller receives the throttle position signal from the Throttle Position Sensor (TPS). The controller provides the TPS with a 5 volt pull up and a sensor ground. The signal is checked for being out of range as well as for intermittent operation (excessive signal changes). The engine controller transmits the throttle value onto the Bus. Most engine controllers will calculate the throttle value if the throttle signal is lost. If an error is detected by the transmission controller and the throttle value is available on the Bus, the Bus value will be used, normal operation will continue, and a TPS code will be set. If an error is detected and the throttle value is not available on the Bus, normal operation will be discontinued, a TPS DTC will be set, and the MIL will be turned on after 5 minutes of calculated operation.

Diagnostic Test

1. DETERMINING IF RELATED ENGINE TPS DTCS ARE PRESENT

With the scan tool, check Engine DTCs, including pending DTCs and one trip failures.

Are there any Engine TPS DTCs present?

Yes >> Refer to the Driveability category and perform the appropriate diagnostic procedure.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK TO SEE IF DTC IS CURRENT

With the scan tool, record the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.
With the scan tool, erase Transmission DTCs.

NOTE: To erase EATX EVENT DATA information, a BATTERY DISCONNECT must be performed. Performing a BATTERY DISCONNECT will reset all learned Transmission values to controller defaults which may lead to erratic shift schedules.

Drive the vehicle and try to duplicate the conditions in which the DTC was reported by the EATX EVENT DATA.
With the scan tool, read Transmission DTCs.

Does this DTC reset?

Yes >> Go To 3

No >> Go To 5

P0124-TPS/APP INTERMITTENT (CONTINUED)

3. CHECK THROTTLE POSITION SENSOR OPERATION

Ignition On, Engine Not Running.

With the scan tool, under Transmission Sensors, monitor the TPS voltage in the following step.

Slowly open and close the throttle while checking for erratic voltage changes.

Did the TPS voltage change smooth and consistent?

Yes >> Go To 4

No >> Replace the Throttle Position Sensor per the Service Information.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

4. POWERTRAIN CONTROL MODULE

NOTE: Due to the integration of the Powertrain and Transmission Control Modules, communication between the modules is internal.

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

Check for any Service Bulletins for any possible causes that may apply.

If there are no possible causes remaining, view repair.

Repair

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN, then program the Pinion Factor in the Front Control Module.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

5. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

Pay particular attention to the TPS signal and sensor ground circuits.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Were there any problems found?

Yes >> Repair as necessary.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0218-HIGH TEMPERATURE OPERATION ACTIVATED

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Whenever the engine is running.
- **Set Condition:**
  Immediately when a Overheat shift schedule is activated when the Transmission Oil Temperature reaches 155° C or 240° F.

Possible Causes
ENGINE COOLING SYSTEM OPERATION
TRANSMISSION OIL COOLER PLUGGED
HIGH TEMPERATURE OPERATIONS ACTIVATED

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).

Theory of Operation

If the transmission oil temperature rises above 115 C (240 F), the overheat shift schedule is activated refer to Transmission Operation as a function of Transmission Oil Temperature and the code is set. The DTC is an informational code only and is being set to aid the technician in determining root cause of a customer driveability issue. The code is also intended to alert the technician to determine if a cooling system malfunction has occurred or if an additional transmission air to oil cooler should be added to the vehicle if the customer regularly drives in a manner that overheats the transmission. Extended operation above 115 C (240 F) will reduce the durability of the transmission and should be avoided. Correcting the cooling system malfunction or installing an additional transmission oil cooler will improve transmission durability especially for customers who operate in city/construction stop and go traffic, tow trailers regularly, drive aggressively in low gear or drive regularly in mountainous areas.

Diagnostic Test

1. CHECK ENGINE COOLING SYSTEM

Perform Engine Cooling System diagnostics per the Service Information.

Is the Engine Cooling System functioning properly?

Yes >> Go To 2

No >> Repair the cause of the engine overheating. Refer to the Service Information for the related diagnostic or repair procedures.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

2. TRANSMISSION OIL COOLER RESTRICTED

Check the Transmission Oil Cooler Flow in accordance with the Service Information.

Is the transmission oil cooler restricted or plugged?

Yes >> Go To 3

No >> Repair or replace the Transmission Oil Cooler per the Service Information. Repair the cause of the plugged Transmission Oil Cooler as necessary.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

P0218-HIGH TEMPERATURE OPERATION ACTIVATED (CONTINUED)

3. HIGH TEMPERATURE OPERATION

This DTC is an informational DTC designed to aid the Technician in diagnosing shift quality complaints.

This DTC indicates that the transmission has been operating in the ″Overheat″ shift schedule which may generate a customer complaint.

The customer driving patterns may indicate the need for an additional transmission oil cooler.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

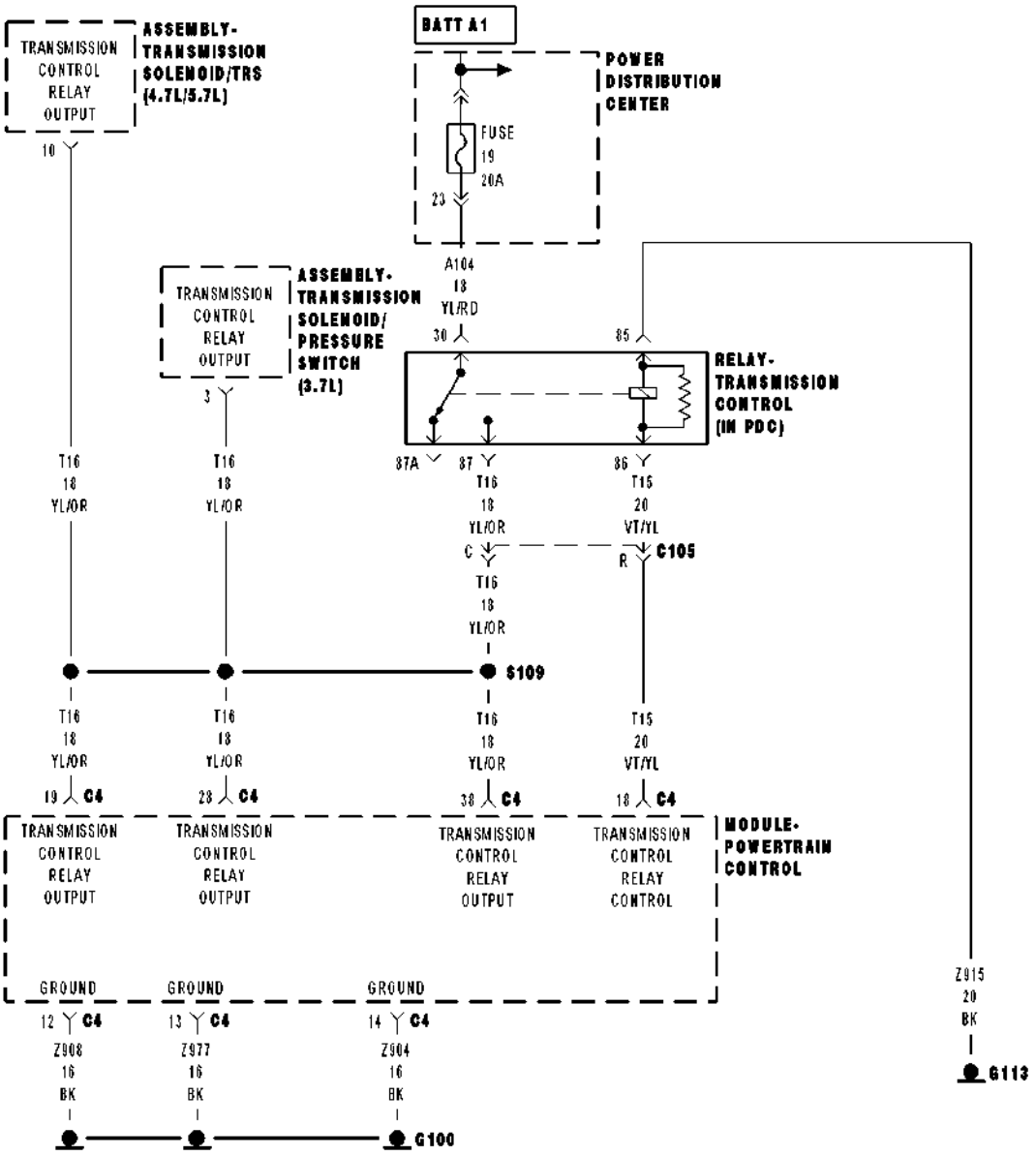
View repair options.

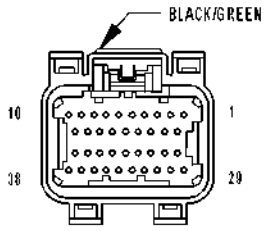
Repair

Repair the cause of transmission overheating per the Service Information.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

P0562-BATTERY VOLTAGE LOW





MODULE-POWERTRAIN CONTROL C4

814AE91E

42RLE MINI PWR GND CKTS

P0562-BATTERY VOLTAGE LOW (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the engine running and the PCM has closed the Transmission Control Relay.
- **Set Condition:**
  If the battery voltage of the Transmission Control Relay Output Sense circuit(s) to the PCM is less than 10.0 volts for the period of 15 seconds. Note: P0562 generally indicates a gradually falling battery voltage or a resistive connection(s) to the PCM. The DTC will also set if the battery voltage sensed at the PCM is less than 6.5v for 200ms or where Transmission Control Relay Output circuits is less than 7.2v for 200ms.

Possible Causes
RELATED CHARGING SYSTEM DTC'S
(Z908) OR (Z977) GROUND CIRCUIT OPEN OR HIGH RESISTANCE
(A104) FUSED B+ CIRCUIT OPEN OR HIGH RESISTANCE
(T16) TRANSMISSION CONTROL RELAY OUTPUT TO TCM OPEN OR HIGH RESISTANCE
TRANSMISSION CONTROL RELAY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).

Theory of Operation

Transmission damage may occur if there is insufficient supply voltage to properly control the solenoids. To prevent this possibility, the battery voltage is monitored and the system is placed in logical limp-in if the battery voltage drops below the limit.

Diagnostic Test

1. RELATED CHARGING SYSTEM DTC'S

With the scan tool, read the Engine DTC's.

Are there any Charging System related DTCs present?

Yes >> Refer to the Charging System category and repair any Charging System DTCs before proceeding. After repairing the Charging System DTCs, perform the Transmission Verification test to verify the transmission and or controller was not damaged.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CONDITION FOR DTC P0562 PRESENT

NOTE: Generator, battery, and charging system must be fully functional before performing this test.
With the scan tool, read DTCs.

Is the status for this DTC Active or the STARTS SINCE SET counter set at 0?

Yes >> Go To 3

No >> Go To 8

P0562-BATTERY VOLTAGE LOW (CONTINUED)

3. CHECKING THE (Z908) and (Z977) GROUND CIRCUITS

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

NOTE: Check connectors - Clean/repair as necessary.

CAUTION: DO NOT PROBE THE PCM HARNESS CONNECTORS. PROBING THE PCM HARNESS CONNECTORS WILL DAMAGE THE PCM TERMINALS RESULTING IN POOR TERMINAL TO PIN CONNECTION. INSTALL MILLER TOOL #8815 TO PERFORM DIAGNOSIS.

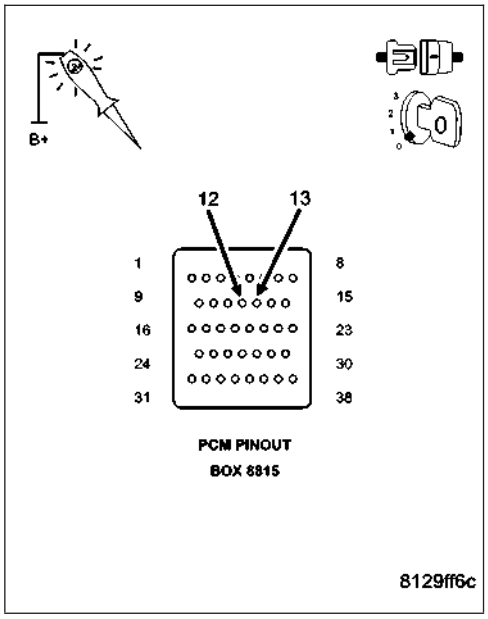
Using a 12-volt test light connected to 12-volts, check the (Z908) and (Z977) Ground circuits in the appropriate terminal of MILLER TOOL #8815.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly for all the Ground circuits?

Yes >> Go To 4

No >> Repair the (Z908) and/or (Z977) Ground circuit for an open circuit or high resistance.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.



4. CHECKING (A104) FUSED B+ CIRCUIT

Turn the ignition off to the lock position.

Remove the Transmission Control Relay.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

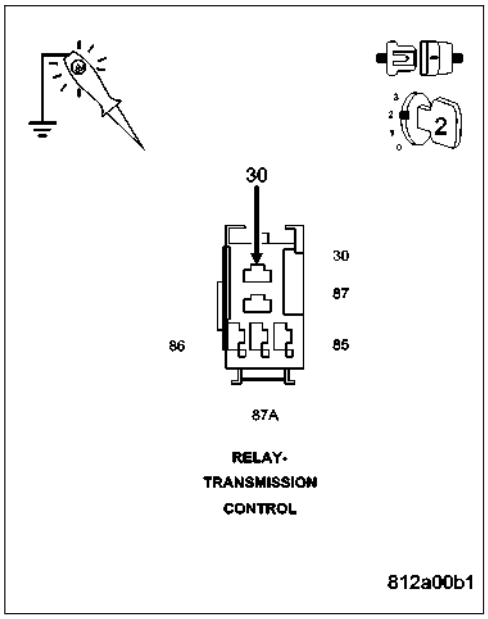
Using a 12-volt test light connected to ground, check the (A104) Fused B+ circuit in the Transmission Control Relay connector.

NOTE: The Test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Go To 5

No >> Repair the (A104) Fused B+ circuit for an open or high resistance.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.



P0562-BATTERY VOLTAGE LOW (CONTINUED)

5. CHECKING THE (T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Remove the Transmission Control Relay.

NOTE: Check connectors - Clean/repair as necessary.

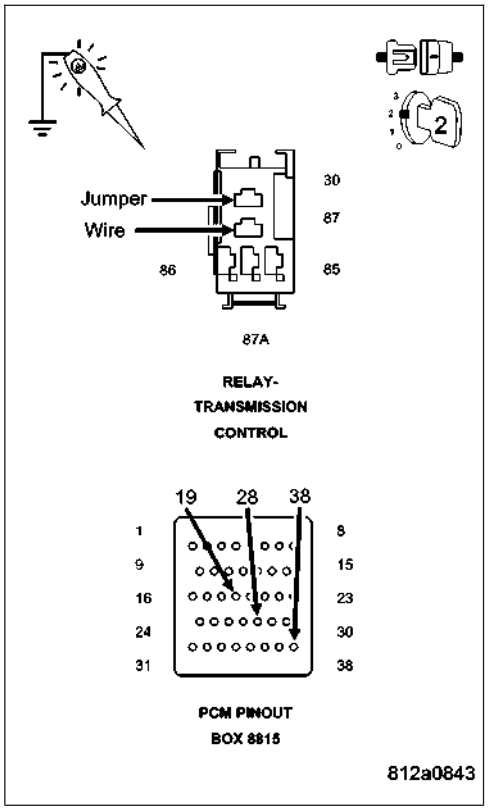
CAUTION: DO NOT PROBE THE PCM HARNESS CONNECTORS. PROBING THE PCM HARNESS CONNECTORS WILL DAMAGE THE PCM TERMINALS RESULTING IN POOR TERMINAL TO PIN CONNECTION. INSTALL MILLER TOOL #8815 TO PERFORM DIAGNOSIS.

Connect a jumper wire between (A104) Fused B+ circuit and the (T16) Transmission Control Relay Output circuit.

Ignition on, engine not running.

Using a 12-volt test light connected to ground, check all (T16) Transmission Control Relay Output circuits in the appropriate terminal of MILLER TOOL #8815.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.



Does the test light illuminate brightly?

Yes >> Go To 6

No >> Repair the (T16) Transmission Control Relay Output circuit(s) for an open or high resistance.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

6. TRANSMISSION CONTROL RELAY

Turn the ignition off to the lock position.

Install a substitute Relay in place of the Transmission Control Relay.

Start the engine.

Using a voltmeter, measure the battery voltage.

With the scan tool, monitor the Transmission Switched Battery Voltage.

Compare the scan tool Transmission Switched Battery voltage to the actual battery voltage.

Is the scan tool voltage within 2.0 volts of the battery voltage?

Yes >> Replace the Transmission Control Relay.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 7

P0562-BATTERY VOLTAGE LOW (CONTINUED)

7. POWERTRAIN CONTROL MODULE

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

Check for any Service Bulletins and S.T.A.R. ON-LINE for any possible causes that may apply.

If there are no possible causes remaining, view repair.

Repair

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN then program Pinion Factor in the Front Control Module.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

8. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set the DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for shorts and open circuits.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Were there any problems found?

Yes >> Repair as necessary.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0602-CONTROL MODULE PROGRAMMING ERROR/NOT PROGRAMMED

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Check for generic software is made at power-up.
- **Set Condition:**
  If generic software is found , the MIL will light immediately. This DTC is designed to signal the technician that the controller still has generic software installed.

Possible Causes
PCM - PROGRAMMING ERROR

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).

Theory of Operation

The controller is programmed during manufacturing with generic software to facilitate testing. This software does not have the proper calibrations to control a transmission in a vehicle. The check for generic software is made at power-up. If generic software is found , the MIL will light immediately and the MIL will stay on even if the fault is cleared, until the proper software is installed. Note: Transmission will be placed in limp-in mode.

Diagnostic Test

1. CONTROL MODULE PROGRAMMING ERROR

NOTE: Controller is programmed with generic software and will not allow the correct vehicle Powertrain management.

Record the controller part number.

Update the controller with the correct software in accordance with the Service Information.

Verify that the controller updated successfully.

Test Complete

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

P0604-INTERNAL CONTROL MODULE RAM

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  One time after the ignition key is turned to the run position.
- **Set Condition:**
  The read value does not match the written value in any RAM location.

Possible Causes
PCM - INTERNAL ERROR

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING.

Theory of Operation

After the controller is reset, the microprocessor checks the integrity of each RAM location by writing to it and reading back from it. The read value should be the same as the written value. MIL on after 10 seconds of vehicle operation and transmission will be placed in limp-in.

Diagnostic Test

1. PCM - INTERNAL ERROR

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

If there are no possible causes remaining, view repair.

Repair

Replace the Powertrain Control Module. With the scan tool perform QUICK LEARN, then program Pinion Factor in the Front Control Module.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

P0605-INTERNAL CONTROL MODULE ROM

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  One time after the ignition key is turned to the run position.
- **Set Condition:**
  If the ROM checksum does not match a known constant.

Possible Causes
PCM - INTERNAL ERROR

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).

Theory of Operation

After the controller is reset, the microprocessor checks the integrity of the program memory (ROM). A checksum is calculated by adding all used bytes in the program memory. The sum should be the same as a known constant stored in memory. MIL on after 10 seconds of vehicle operation and transmission will be placed in limp-in.

Diagnostic Test

1. PCM - INTERNAL ERROR

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

If there are no possible causes remaining, view repair.

Repair

Replace the Powertrain Control Module. With the scan tool perform QUICK LEARN, then program Pinion Factor in the Front Control Module.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

P0613-INTERNAL TRANSMISSION PROCESSOR

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  After the ignition key is turned to the run position and 60 seconds thereafter.
- **Set Condition:**
  Either of the following conditions occur 3 times in less than 590 milliseconds: The watchdog line remains high after the watchdog test or the transmission relay coil is energized and remains on after the watchdog delay expires.

Possible Causes
PCM - INTERNAL ERROR

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).

Theory of Operation

The internal watchdog is a separate hardware circuit which continuously monitors the microprocessor. To make sure the transmission is operating properly, the watchdog must receive a signal from the microprocessor within a specific time window. MIL on after 10 seconds of vehicle operation and transmission will be placed in limp-in.

Diagnostic Test

1. PCM - INTERNAL ERROR

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

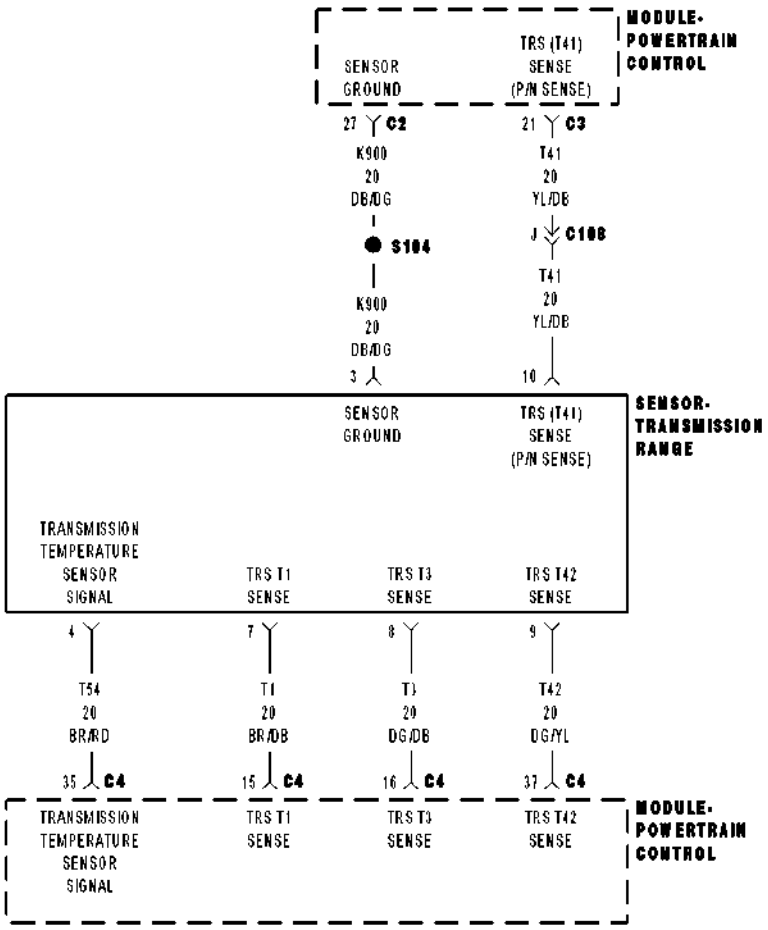
If there are no possible causes remaining, view repair.

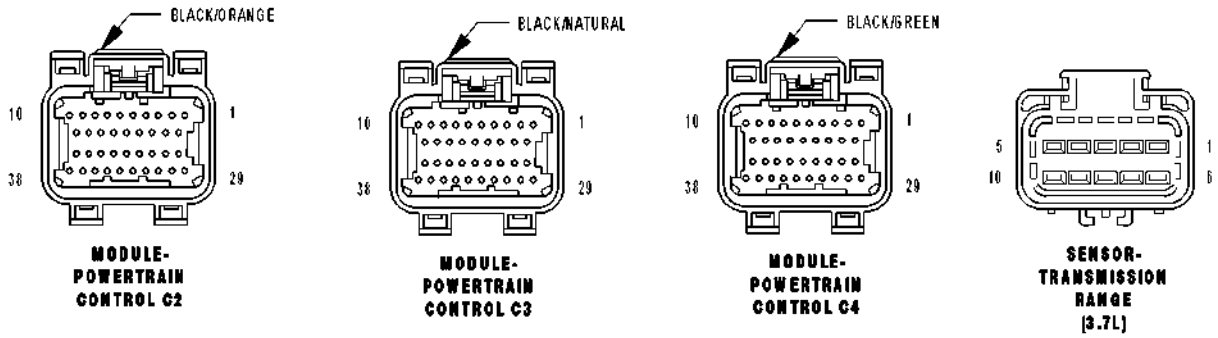
Repair

Replace the Powertrain Control Module. With the scan tool perform QUICK LEARN, then program Pinion Factor in the Front Control Module.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

P0706-TRANSMISSION RANGE SENSOR RATIONALITY





42RLE MINI TRS CKTS

P0706-TRANSMISSION RANGE SENSOR RATIONALITY (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition in the run position.
- **Set Condition:**
  The DTC will set if an invalid PRNDL code which lasts for more than 100 milliseconds and within 1 second of power-up or the PRNDL code error does not correct itself before a change in input occurs.

Possible Causes
SHIFTER OUT OF ADJUSTMENT
TRS (T1) SENSE CIRCUIT OPEN
TRS (T3) SENSE CIRCUIT OPEN
TRS (T41) SENSE CIRCUIT OPEN
TRS (T42) SENSE CIRCUIT OPEN
TRS (T1) SENSE CIRCUIT SHORT TO GROUND
TRS (T3) SENSE CIRCUIT SHORT TO GROUND
TRS (T41) SENSE CIRCUIT SHORT TO GROUND
TRS (T42) SENSE CIRCUIT SHORT TO GROUND
TRS (T1) SENSE CIRCUIT SHORT TO VOLTAGE
TRS (T3) SENSE CIRCUIT SHORT TO VOLTAGE
TRS (T41) SENSE CIRCUIT SHORT TO VOLTAGE
TRS (T42) SENSE CIRCUIT SHORT TO VOLTAGE
TRANSMISSION RANGE SENSOR
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).

Theory of Operation

The C1 through C4 (T1, T3, T41, and T42) sense circuits communicate the shift lever position to the PCM. Each circuit is terminated at the transmission with a switch. Each switch can be either open or closed, depending on the shift lever position. The PCM can decode this information and determine the shift lever position. Each shift lever position has a certain combination of switches, which will be open and closed, this is called a PRNDL code. There are 4 switches, therefore: there are many possible combinations of open and closed switches (codes). However, there are only 9 valid codes (8 for AutoStick), one for each gear position and three recognized between gear codes. The remainder of the codes should never occur, these are called invalid codes. The following chart shows the normal switch states for each shift lever position.

TRS SWITCH STATES

SLP	T42	T41	T3	T1
P	CL	CL	CL	OP
R	CL	OP	OP	OP
N	CL	CL	OP	CL
OD	OP	OP	OP	CL
3	OP	OP	CL	OP
L	CL	OP	CL	CL

P0706-TRANSMISSION RANGE SENSOR RATIONALITY (CONTINUED)

Diagnostic Test

1. CHECK IF THE DTC P0706 IS CURRENT

With the scan tool, erase Transmission DTCs.

Cycle the ignition off, then start the vehicle.

Firmly apply the brakes and shift into Overdrive.

NOTE: Vehicle must remain in Overdrive for at least three seconds.

With the brakes firmly applied, shift slowly through all gears (PRNDL) as least three times, pausing momentarily in each gear.

NOTE: If all the PRNDL lights box individually then the error was cleared.

Shift into park and turn the ignition off to the lock position.

Ignition on, engine not running.

With the scan tool, read Transmission DTCs.

Does the DTC P0706 reset, or do all the PRNDL indicators remain boxed in park or neutral?

Yes >> Go To 2

No >> Go To 20

---

2. CHECK SHIFTER OPERATION

With the scan tool, perform the Shift Lever Position Test.

Select the test outcome from the following:

Test passes
Go To 20

Test fails with error code
Go To 3

Test fails without error code
Go To 18

---

3. PCM AND WIRING

Turn the ignition off to the lock position.

Remove the Starter Relay.

CAUTION: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

Ignition on, engine not running.

With the scan tool, perform the Shift Lever Position Test.

When the scan tool instructs you to put the Gear Selector in a particular position, you must do so using the Transmission Simulator.

The LED for the gear position in question must be illuminated on the Transmission Simulator, prior to pressing the ENTER key on the scan tool.

NOTE: After completion of this procedure, make sure to disconnect the Transmission Simulator, Miller tool #8333 and Electronic Transmission adaptor cable kit, Miller tool #8333-1A and reconnect all connectors.

Did the Shift Lever Position Test pass?

Yes >> Replace the Transmission Range Sensor per the Service Information.
Go To 19

No >> Go To 4

P0706-TRANSMISSION RANGE SENSOR RATIONALITY (CONTINUED)

4. MONITOR TRS SENSE CIRCUITS

Reconnect all disconnected connectors. Turn the ignition on, engine not running.

With the scan tool, monitor the TRS Sense circuits - C1 through C4.

Move the shift lever through all gear positions, pausing momentarily in each gear position. Watch for one of the circuits to not change state.

Select the circuit that did not change state.

TRS (T1) sense (C4)
Go To 5

TRS (T3) sense (C3)
Go To 8

TRS (T41) sense (C1)
Go To 11

TRS (T42) sense (C2)
Go To 14

---

5. TRS (T1) SENSE CIRCUIT OPEN

Turn the ignition off to the lock position.

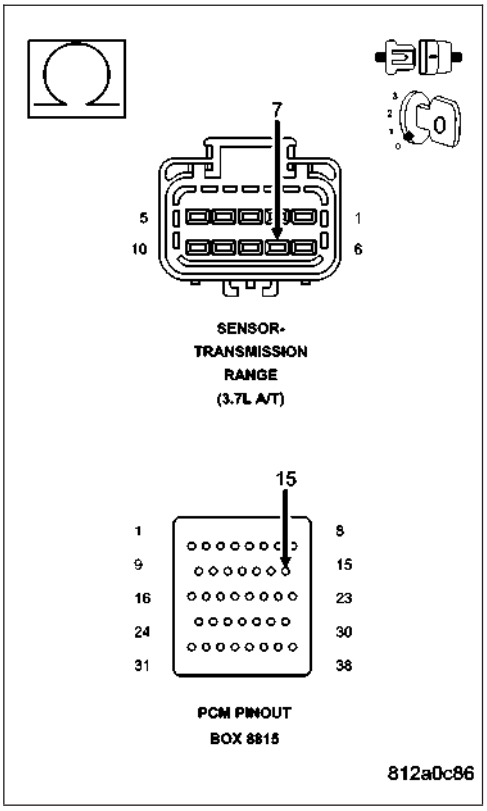
Disconnect the TRS harness connector.

Disconnect the PCM C4 harness connector.

NOTE: Check connectors - Clean/repair as necessary.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Tool #8815 to perform diagnosis.

Measure the resistance of the TRS (T1) Sense circuit from the appropriate terminal of special tool #8815 to the TRS harness connector.



Is the resistance above 5.0 ohms?

Yes >> Repair the TRS (T1) Sense circuit for an open.
Go To 19

No >> Go To 6

P0706-TRANSMISSION RANGE SENSOR RATIONALITY (CONTINUED)

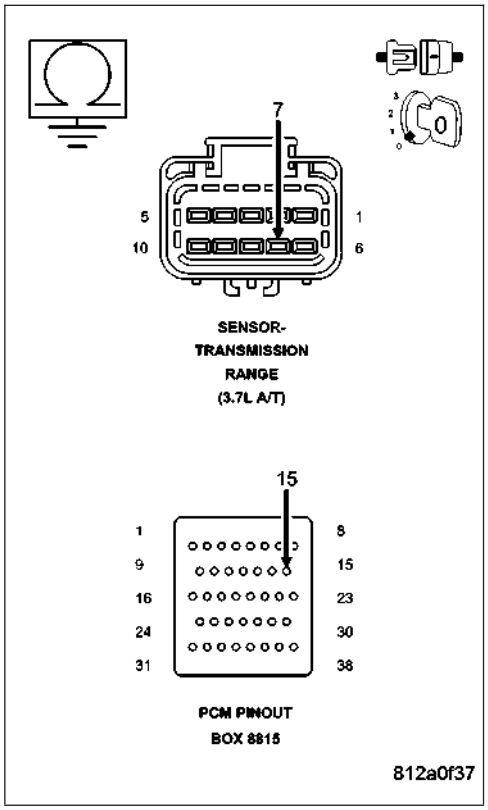
6. TRS (T1) SENSE CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the TRS (T1) Sense circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the TRS (T1) Sense circuit for a short to ground. Go To 19

No >> Go To 7



7. TRS (T1) SENSE CIRCUIT SHORT TO VOLTAGE

Remove the Transmission Control Relay from the PDC.

NOTE: Check connectors - Clean/repair as necessary.

Connect a jumper wire between the (A104) Fused B+ circuit and the (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

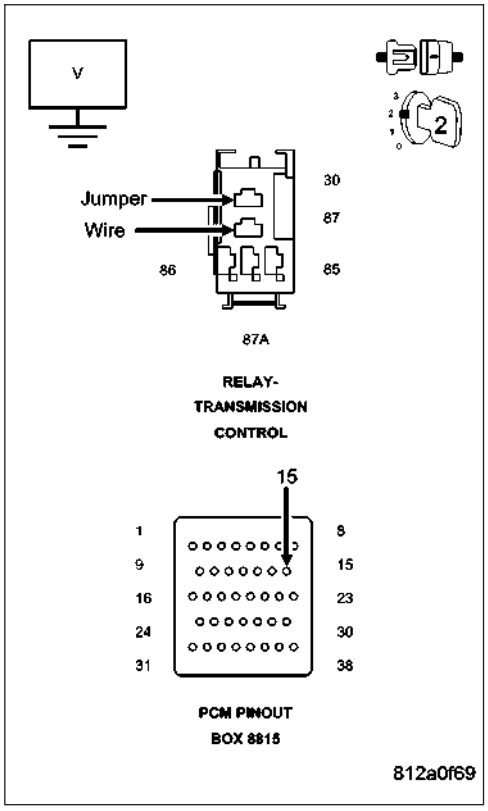
Ignition on, engine not running.

Measure the voltage of the TRS (T1) Sense circuit at the appropriate terminal of special tool #8815.

Is the voltage above 0.5 volt?

Yes >> Repair the TRS (T1) Sense circuit for a short to voltage. Go To 19

No >> Go To 17



P0706-TRANSMISSION RANGE SENSOR RATIONALITY (CONTINUED)

8. TRS (T3) SENSE CIRCUIT OPEN

Turn the ignition off to the lock position.

Disconnect the TRS harness connector.

Disconnect the PCM C4 harness connector.

NOTE: Check connectors - Clean/repair as necessary.

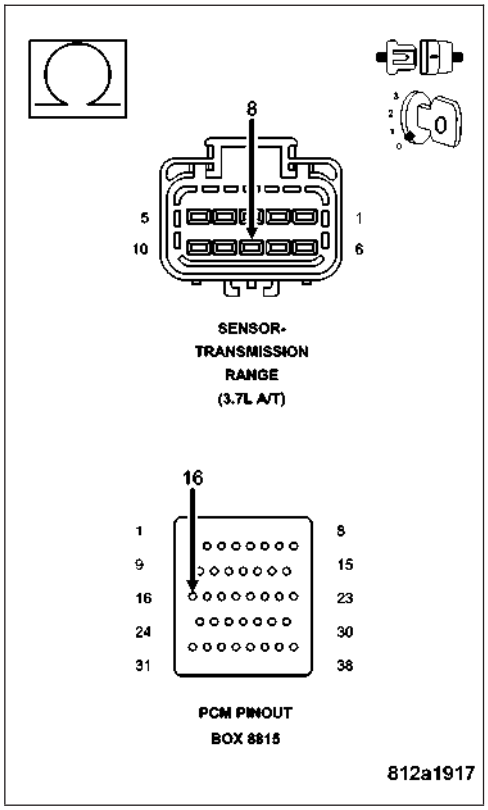
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Tool #8815 to perform diagnosis.

Measure the resistance of the TRS (T3) Sense circuit from the appropriate terminal of special tool #8815 to the TRS harness connector.

Is the resistance above 5.0 ohms?

Yes >> Repair the TRS (T3) Sense circuit for an open.
Go To 19

No >> Go To 9



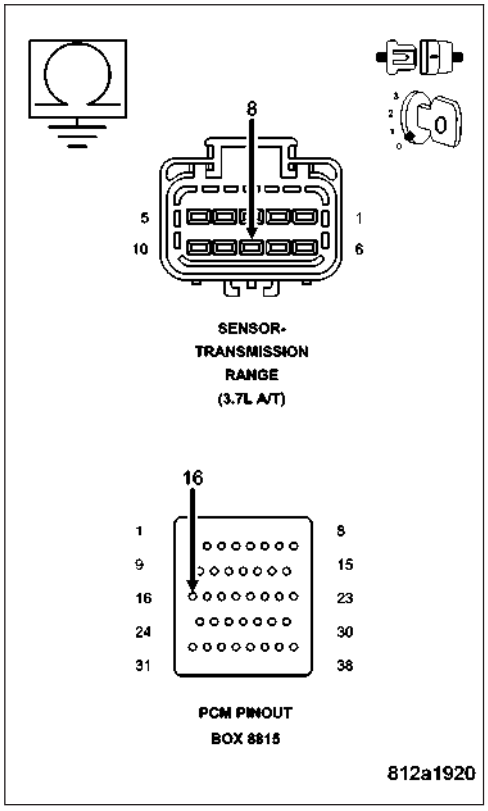
9. TRS (T3) SENSE CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the TRS (T3) Sense circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the TRS (T3) Sense circuit for a short to ground.
Go To 19

No >> Go To 10



P0706-TRANSMISSION RANGE SENSOR RATIONALITY (CONTINUED)

10. TRS (T3) SENSE CIRCUIT SHORT TO VOLTAGE

Remove the Transmission Control Relay.

NOTE: Check connectors - Clean/repair as necessary.

Connect a jumper wire between the (A104) Fused B+ circuit and the (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

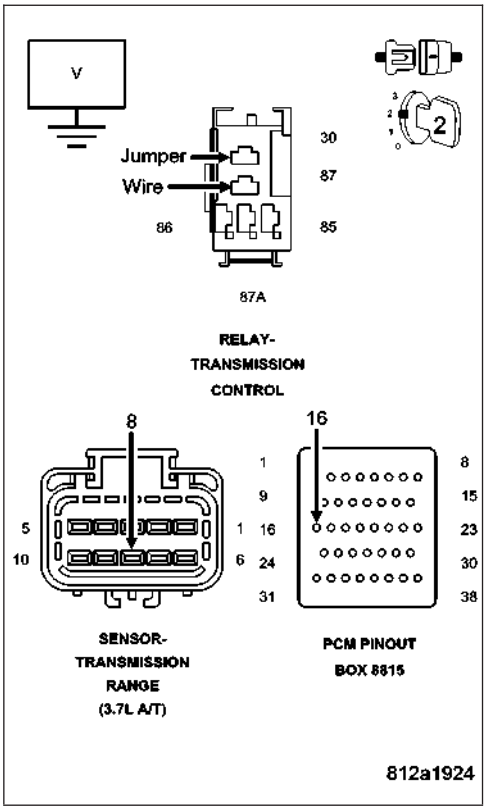
Ignition on, engine not running.

Measure the voltage of the TRS (T3) Sense circuit.

Is the voltage above 0.5 volt?

Yes >> Repair the TRS (T3) Sense circuit for a short to voltage. Go To 19

No >> Go To 17



11. TRS (T41) SENSE CIRCUIT OPEN

Turn the ignition off to the lock position.

Disconnect the TRS harness connector.

Disconnect the PCM C3 harness connector.

NOTE: Check connectors - Clean/repair as necessary.

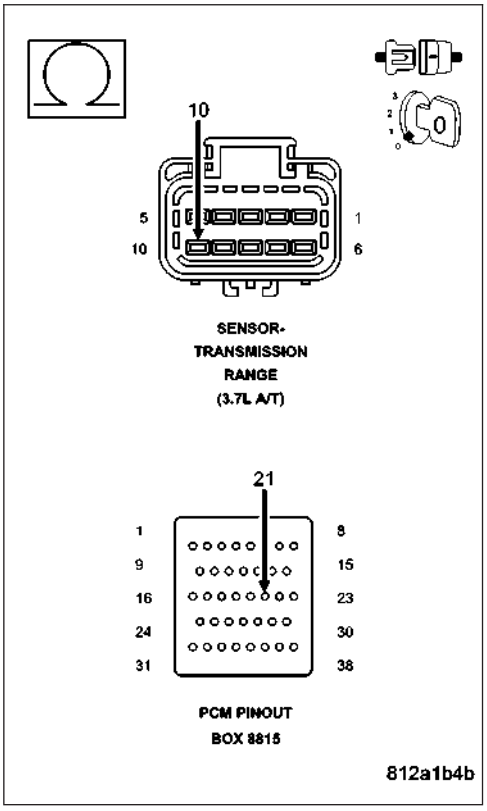
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Tool #8815 to perform diagnosis.

Measure the resistance of the TRS (T41) Sense circuit from the appropriate terminal of special tool #8815 to the TRS harness connector.

Is the resistance above 5.0 ohms?

Yes >> Repair the TRS (T41) Sense circuit for an open. Go To 19

No >> Go To 12



P0706-TRANSMISSION RANGE SENSOR RATIONALITY (CONTINUED)

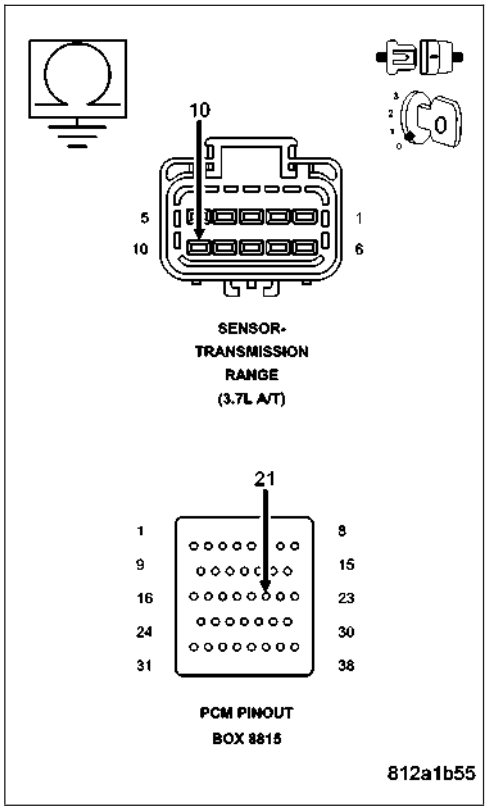
12. TRS (T41) SENSE CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the TRS (T41) Sense circuit

Is the resistance below 5.0 ohms?

Yes >> Repair the TRS (T41) Sense circuit for a short to ground. Go To 19

No >> Go To 13



13. TRS (T41) SENSE CIRCUIT SHORT TO VOLTAGE

Remove the Transmission Control Relay.

NOTE: Check connectors - Clean/repair as necessary.

Connect a jumper wire between the (A104) Fused B+ circuit and the (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

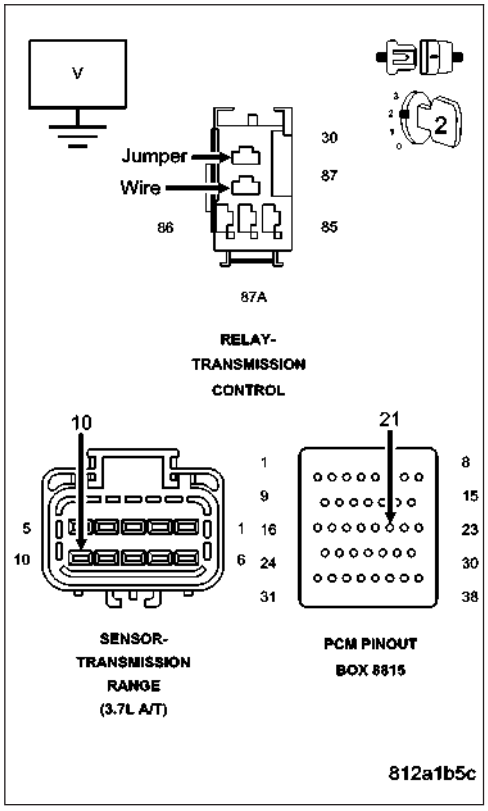
Ignition on, engine not running.

Measure the voltage of the TRS (T41) Sense circuit.

Is the voltage above 0.5 volt?

Yes >> Repair the TRS (T1) Sense circuit for a short to voltage. Go To 19

No >> Go To 17



P0706-TRANSMISSION RANGE SENSOR RATIONALITY (CONTINUED)

14. TRS (T42) SENSE CIRCUIT OPEN

Turn the ignition off to the lock position.

Disconnect the TRS harness connector.

Disconnect the PCM C4 harness connector.

NOTE: Check connectors - Clean/repair as necessary.

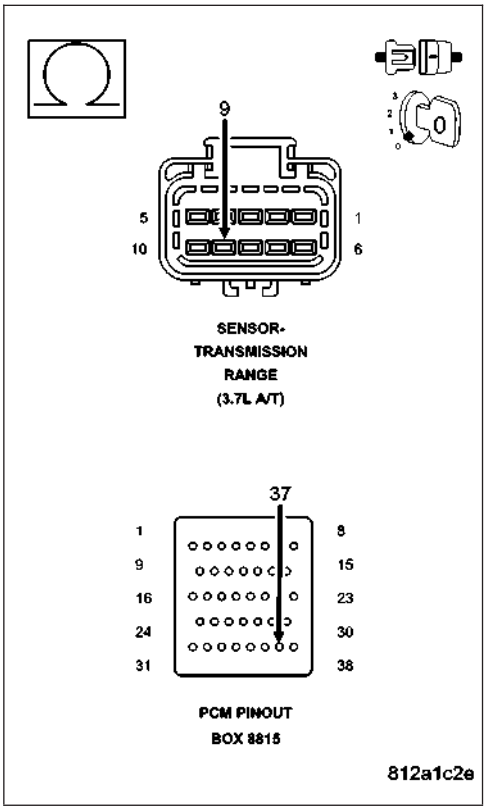
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Tool #8815 to perform diagnosis.

Measure the resistance of the TRS (T42) Sense circuit from the appropriate terminal of special tool #8815 to the TRS harness connector.

Is the resistance above 5.0 ohms?

Yes >> Repair the TRS (T42) Sense circuit for an open. Go To 19

No >> Go To 15



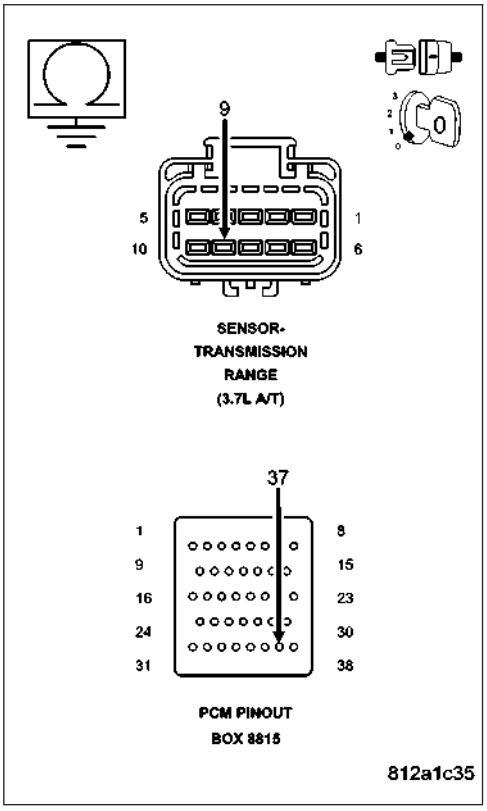
15. TRS (T42) SENSE CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the TRS (T42) Sense circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the TRS (T42) Sense circuit for a short to ground. Go To 19

No >> Go To 16



P0706-TRANSMISSION RANGE SENSOR RATIONALITY (CONTINUED)

16. TRS (T42) SENSE CIRCUIT SHORT TO VOLTAGE

Remove the Transmission Control Relay.

NOTE: Check connectors - Clean/repair as necessary.
Connect a jumper wire between the (A104) Fused B+ circuit and the (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

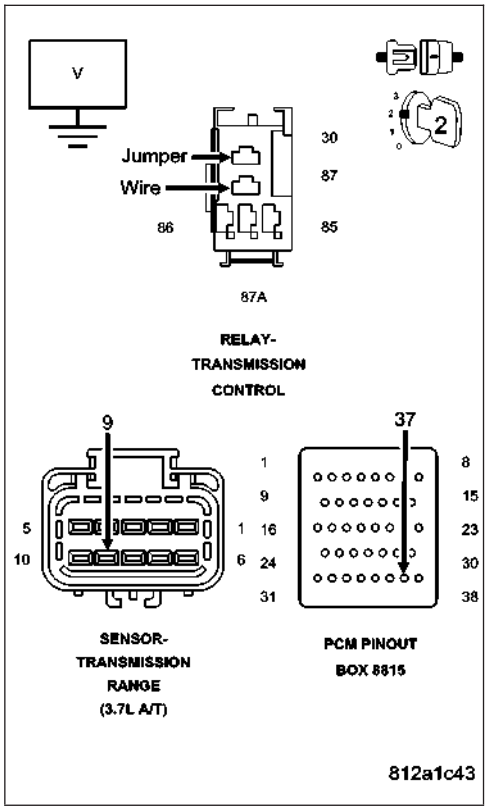
Ignition on, engine not running.

Measure the voltage of the TRS (T42) Sense circuit.

Is the voltage above 0.5 volt?

Yes >> Repair the TRS (T42) Sense circuit for a short to voltage.
Go To 19

No >> Go To 17



17. POWERTRAIN CONTROL MODULE

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

If there are no possible causes remaining, view repair.

Repair

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN.

Go To 19

18. CHECK AND ADJUST SHIFTER

If there are no possible causes remaining, view repair.

Repair

Adjust the Shift Linkage and/or cable per the Service Information.

Go To 19

P0706-TRANSMISSION RANGE SENSOR RATIONALITY (CONTINUED)

19. PRNDL FAULT CLEARING PROCEDURE

With the scan tool, erase Transmission DTCs.

Cycle the ignition off, then start the vehicle.

Firmly apply the brakes and shift into Overdrive.

NOTE: NOTE: Vehicle must remain in Overdrive for at least 3.0 seconds.
With the brakes firmly applied, shift slowly through all gears (PRNDL) as least three times, pausing momentarily in each gear.

NOTE: NOTE: If all the PRNDL lights box individually then the error was cleared.
Shift into park and turn the ignition off to the lock position.

Ignition on, engine not running.

With the DRBIII®, read Transmission DTCs.

Does the DTC P0706 reset, or do all the PRNDL indicators remain boxed in park or neutral?

Yes >> Return to the symptom list and perform diagnostics for P0706 CHECK SHIFTER SIGNAL.
Go To 1

No >> Test Complete.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

20. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set the DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for shorted and open circuits.

Check the Shift Linkage and cable for proper operation per the Service Information.

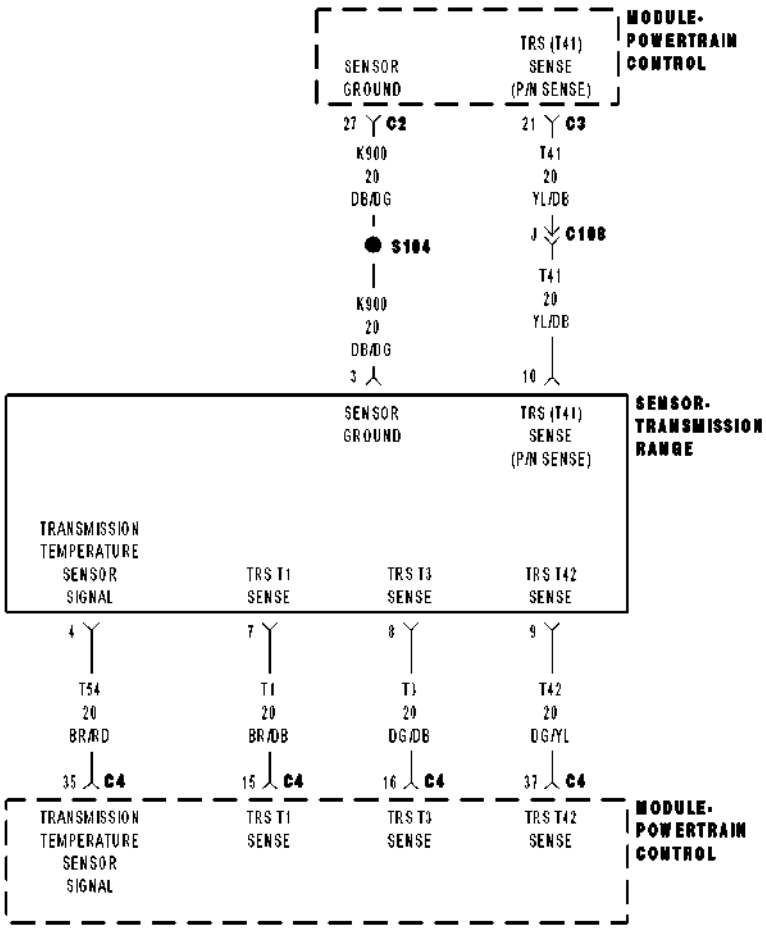
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

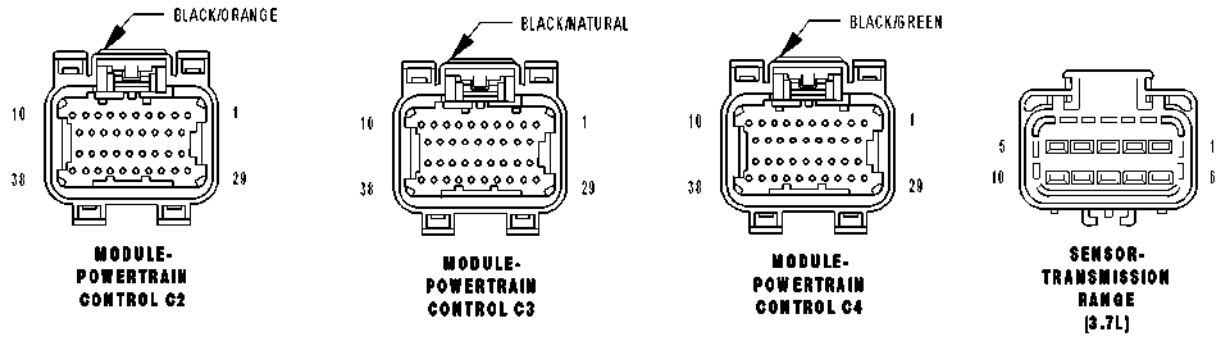
Were there any problems found?

Yes >> Repair as necessary.
Go To 19

No >> Test Complete.

P0711-TRANSMISSION TEMPERATURE SENSOR PERFORMANCE





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42RLE MINI TRS CKTS

P0711-TRANSMISSION TEMPERATURE SENSOR PERFORMANCE (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on and engine running.
- **Set Condition:**
  DTC will set when the transmission temperature does not reach a normal operating temperature within a given time frame. Time is variable due to ambient temperature. Approximate DTC set time is 10 to 35 minutes. The following are starting temperature to warm up times to set this DTC: starting temp -40° C (-40° F) warm up time 35 minutes, starting temp -28° C (-20° F) 25 min, starting temp -6.6° C (20° F) 20 minutes, starting temp 15.5 ° C (60° F) 10 minutes. When the fault is set, calculated temperature is substituted for measured temperature, however the fault code is stored only after three consecutive occurrences of the fault.

Possible Causes
RELATED TRANSMISSION TEMPERATURE DTC'S PRESENT
TRANSMISSION TEMPERATURE SENSOR
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).

Theory of Operation

The temperature sensor is used to sense the temperature of the transmission fluid. Transmission fluid temperature can affect shift quality, torque converter operation and when or if some diagnostics are run. A failed temperature sensor could affect the OBD diagnostics. If a problem occurs in the transmission temperature sensor circuit, transmission temperature will be based on a calculated value.

Diagnostic Test

1. DETERMINE IF RELATED TRANSMISSION TEMPERATURE DTCS ARE PRESENT

With the scan tool, check Transmission DTCs.

Are there any other Transmission Temperature Sensor related DTCs present?

Yes >> Refer to the Transmission category and perform the appropriate diagnostic procedure. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK TO SEE IF DTC IS ACTIVE

With the scan tool, view DTCs.

Is the status Active for this DTC or is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 3

No >> Go To 6

P0711-TRANSMISSION TEMPERATURE SENSOR PERFORMANCE (CONTINUED)

3. PCM AND WIRING

Turn the ignition off to the lock position.

Remove the Starter Relay.

CAUTION: Removal of the Starter Relay is to prevent a Transmission NO RESPONSE condition and to disable the starter.

Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the Transmission Simulator, turn the Input/Output switch to OFF.

With the scan tool, monitor the TRANS TEMP VOLTS while turning the Thermistor Voltage switch to all three positions on the Transmission Simulator.

Compare the scan tool readings with the numbers listed on the Transmission Simulator.

Do the readings on the Transmission Simulator match the scan tool readings ± 0.2 volts?

Yes >> Go To 4

No >> Go To 5

---

4. TRANSMISSION TEMPERATURE SENSOR

If there are no possible causes remaining, view repair.

Repair

Replace Transmission Solenoid/TRS Assembly per the Service Information.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

5. POWERTRAIN CONTROL MODULE

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

If there are no possible causes remaining, view repair.

Repair

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

6. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

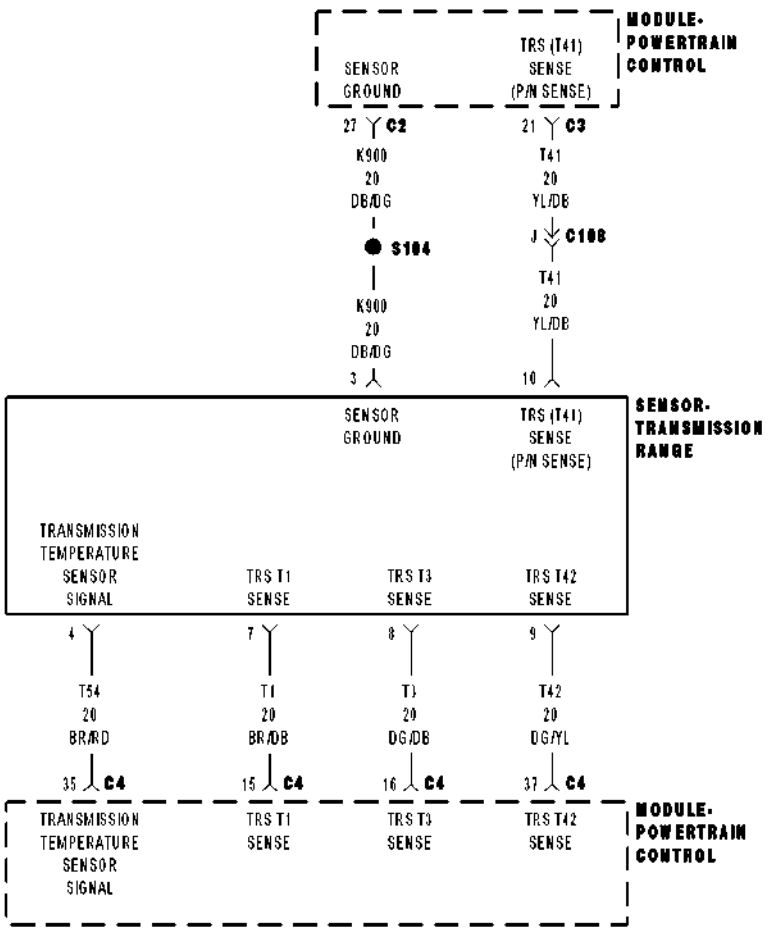
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

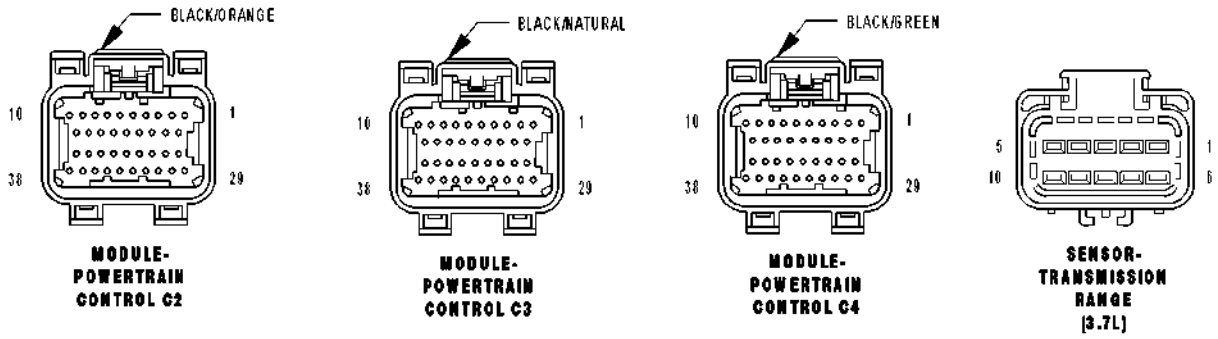
Were there any problems found?

Yes >> Repair as necessary.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0712-TRANSMISSION TEMPERATURE SENSOR LOW





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P0712-TRANSMISSION TEMPERATURE SENSOR LOW (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on and engine running.
- **Set Condition:**
  The DTC will set when the monitored Temperature Sensor voltage drops below 0.078 volts for the period of 1.45 seconds. When the fault is set, calculated temperature is substituted for measured temperature, however the fault code is stored only after three consecutive occurrences of the fault.

Possible Causes
RELATED DTCS PRESENT
(T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT SHORT TO GROUND
TRANSMISSION TEMPERATURE SENSOR
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).

Theory of Operation

The temperature sensor is used to sense the temperature of the transmission fluid. Transmission fluid temperature can affect shift quality, torque converter operation and when or if some diagnostics are run. A failed temperature sensor could affect the OBD diagnostics. If a problem occurs in the transmission temperature sensor circuit, transmission temperature will be based on a calculated value.

Diagnostic Test

1. DETERMINE IF RELATED DTCS ARE PRESENT

With the scan tool, check Transmission DTCs.

Are there any Speed Sensor DTCs present?

Yes >> Refer to the Transmission category and perform the appropriate diagnostic procedure. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK TO SEE IF DTC IS ACTIVE

With the scan tool, view DTCs.

Is the status Active for this DTC or is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 3

No >> Go To 7

P0712-TRANSMISSION TEMPERATURE SENSOR LOW (CONTINUED)

3. PCM AND WIRING

Turn the ignition off to the lock position.

Remove the Starter Relay.

CAUTION: Removal of the Starter Relay is to prevent a Transmission NO RESPONSE condition and to disable the starter.

Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the Transmission Simulator, turn the Input/Output switch to OFF.

With the scan tool, monitor the TRANS TEMP VOLTS while turning the Thermistor Voltage switch to all three positions on the Transmission Simulator.

Compare the scan tool readings with the numbers listed on the Transmission Simulator.

Do the readings on the Transmission Simulator match the scan tool readings ± 0.2 volts?

Yes >> Go To 4

No >> Go To 5

---

4. TRANSMISSION TEMPERATURE SENSOR

If there are no possible causes remaining, view repair.

Repair

Replace Transmission Solenoid/TRS Assembly per the Service Information.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

5. (T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT SHORT TO GROUND

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the TRS harness connector.

NOTE: Check connectors - Clean/repair as necessary.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Tool #8815 to perform diagnosis.

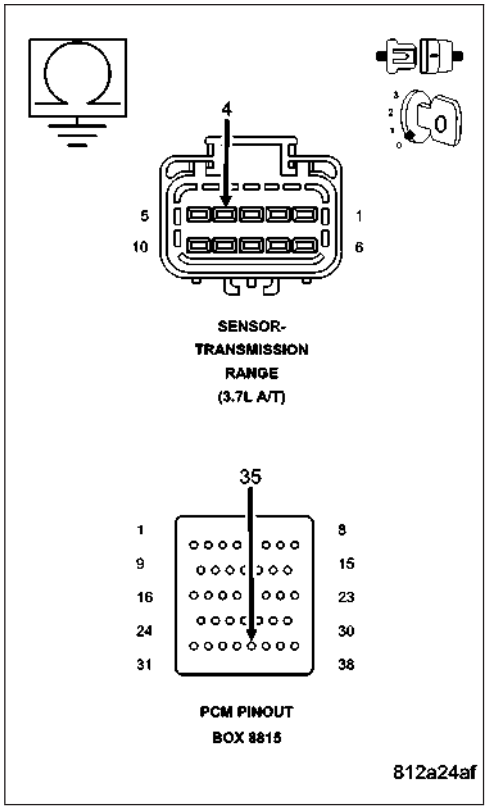
Measure the resistance between ground and the (T54) Transmission Temperature Sensor Signal circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (T54) Transmission Temperature Sensor Signal circuit for a short to ground.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 6



P0712-TRANSMISSION TEMPERATURE SENSOR LOW (CONTINUED)

6. POWERTRAIN CONTROL MODULE

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

If there are no possible causes remaining, view repair.

Repair

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

7. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

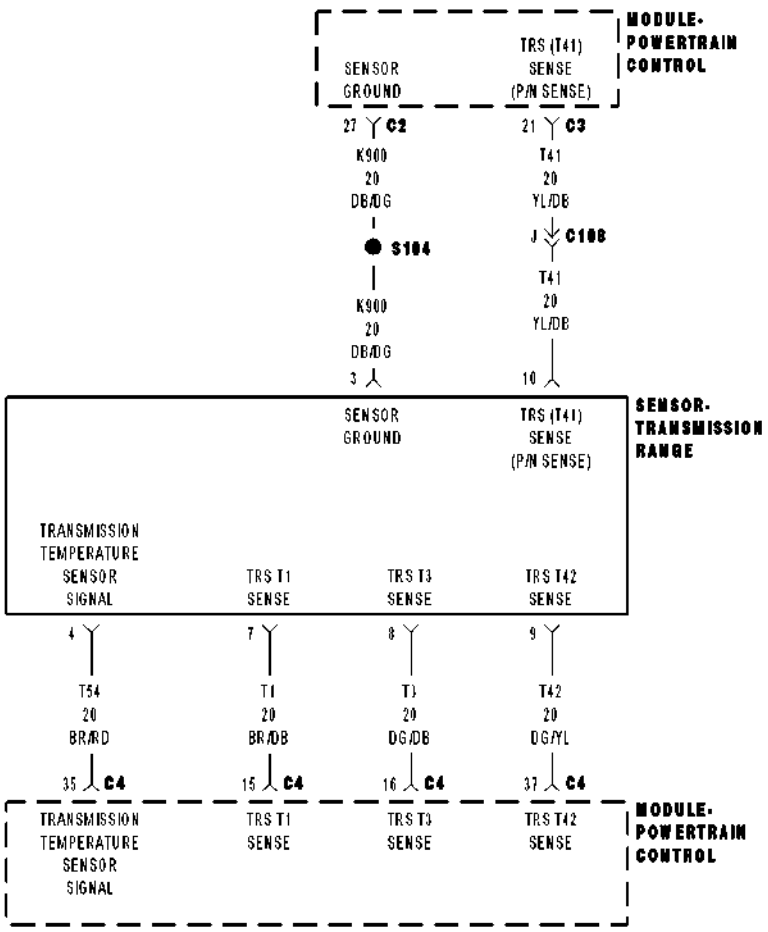
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

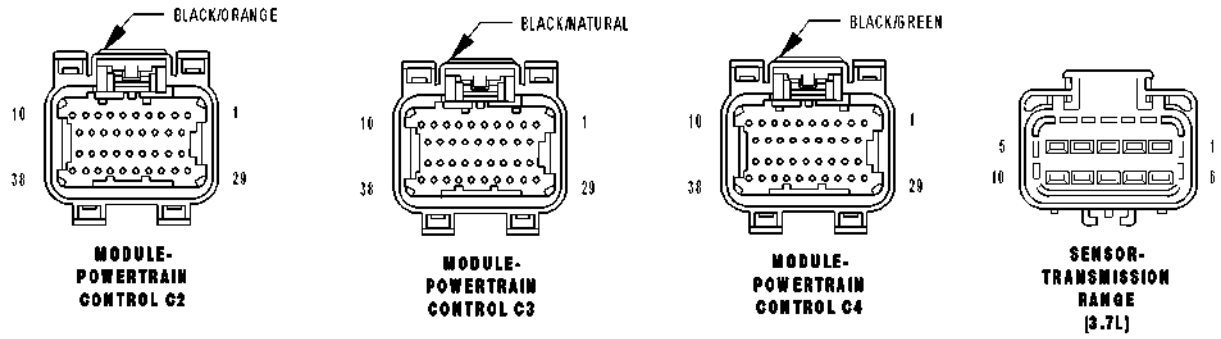
Were there any problems found?

Yes >> Repair as necessary.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0713-TRANSMISSION TEMPERATURE SENSOR HIGH





P0713-TRANSMISSION TEMPERATURE SENSOR HIGH (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on and engine running.
- **Set Condition:**
  The DTC will set when the monitored Temperature Sensor voltage rises above 4.94 volts for the period of 1.45 seconds. When the fault is set, calculated temperature is substituted for measured temperature, however the fault code is stored only after three consecutive occurrences of the fault.

Possible Causes
(K900) SENSOR GROUND OPEN
(T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT OPEN
(T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE
TRANSMISSION TEMPERATURE SENSOR
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).

Theory of Operation

The temperature sensor is used to sense the temperature of the transmission fluid. Transmission fluid temperature can affect shift quality, torque converter operation and when or if some diagnostics are run. A failed temperature sensor could affect the OBD diagnostics. If a problem occurs in the transmission temperature sensor circuit, transmission temperature will be based on a calculated value.

1. CHECK TO SEE IF DTC IS CURRENT

With the scan tool, view DTCs.

Is the status Active for this DTC or is STARTS SINCE SET counter 2 or less?

Yes >> Go To 2

No >> Go To 8

P0713-TRANSMISSION TEMPERATURE SENSOR HIGH (CONTINUED)

2. PCM AND WIRING

Turn the ignition off to the lock position.

Remove the Starter Relay.

CAUTION: Removal of the Starter Relay is to prevent a Transmission NO RESPONSE condition and to disable the starter.

Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the Transmission Simulator, turn the Input/Output switch to OFF.

With the scan tool, monitor the TRANS TEMP VOLTS while turning the Thermistor Voltage switch to all three positions on the Transmission Simulator.

Compare the scan tool readings with the numbers listed on the Transmission Simulator.

Do the readings on the Transmission Simulator match the scan tool readings ± 0.2 volts?

Yes >> Go To 3

No >> Go To 4

---

3. TRANSMISSION TEMPERATURE SENSOR

If there are no possible causes remaining, view repair.

Repair

Replace Transmission Solenoid/TRS Assembly per the Service Information.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

4. (T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT OPEN

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the TRS harness connector

NOTE: Check connectors - Clean/repair as necessary.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Tool #8815 to perform diagnosis.

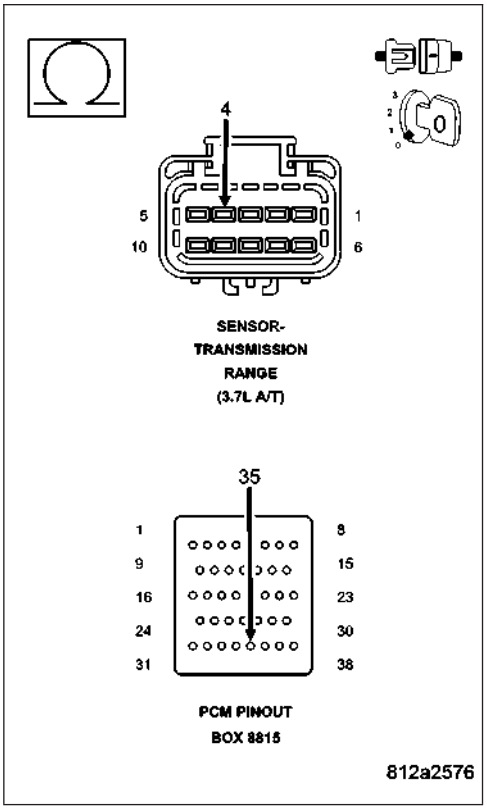
Measure the resistance of the Transmission Temperature Sensor Signal circuit from the appropriate terminal of special tool #8815 to the TRS harness connector.

Is the resistance above 5.0 ohms?

Yes >> Repair the Transmission Temperature Sensor Signal circuit for an open.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5



P0713-TRANSMISSION TEMPERATURE SENSOR HIGH (CONTINUED)

5. (K900) SENSOR GROUND CIRCUIT OPEN

Disconnect the PCM C2 harness connector

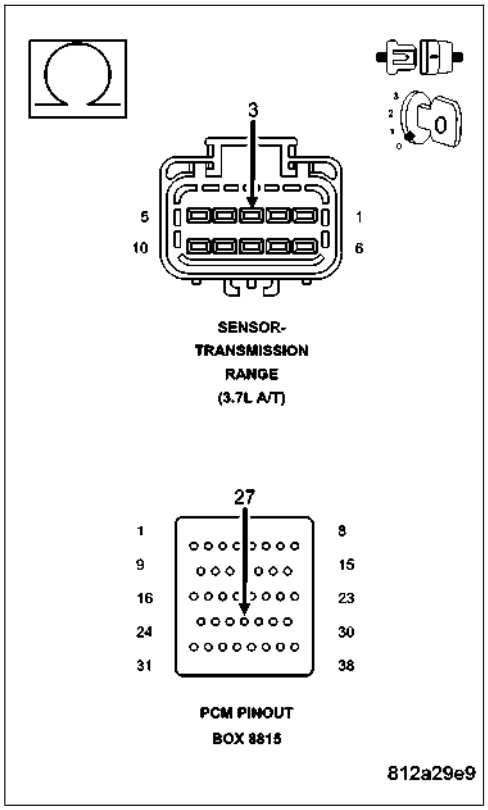
NOTE: Check connectors - Clean/repair as necessary.

Measure the resistance of the (K900) Sensor Ground circuit from the appropriate terminal of special tool #8815 to the TRS harness connector.

Is the resistance above 5.0 ohms?

Yes >> Repair the (K900) Sensor Ground circuit for an open.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 6



6. (T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE

Remove the Transmission Control Relay.

NOTE: Check connectors - Clean/repair as necessary.

Connect a jumper wire between the (A104) Fused B+ circuit and the (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

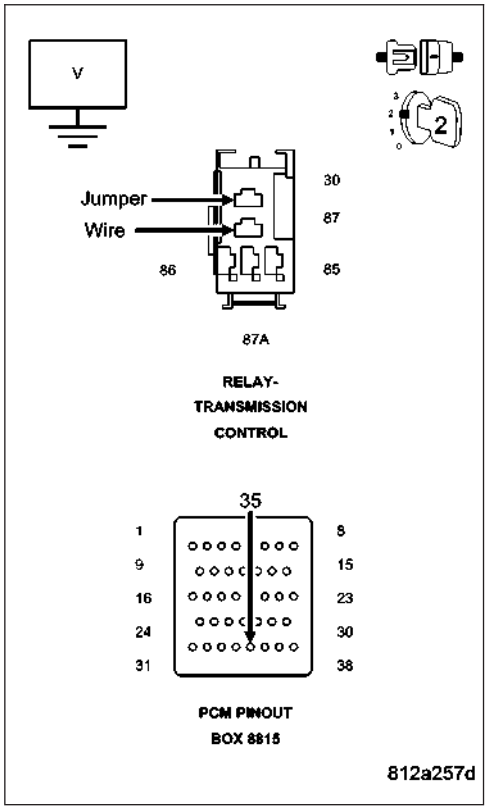
Ignition on, engine not running.

Measure the voltage of the (T54) Transmission Temperature Sensor Signal circuit in the appropriate terminal of special tool #8815.

Is the voltage above 0.5 volts?

Yes >> Repair the (T54) Transmission Temperature Sensor Signal circuit for a short to voltage.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 7



P0713-TRANSMISSION TEMPERATURE SENSOR HIGH (CONTINUED)

7. POWERTRAIN CONTROL MODULE

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

If there are no possible causes remaining, view repair.

Repair

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

8. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

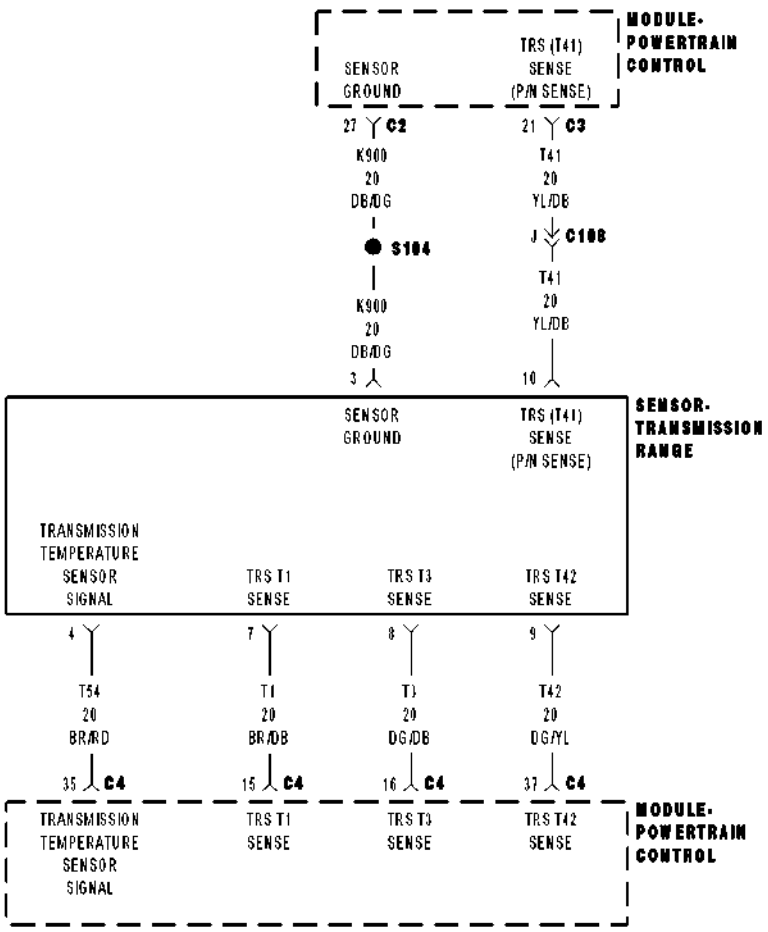
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

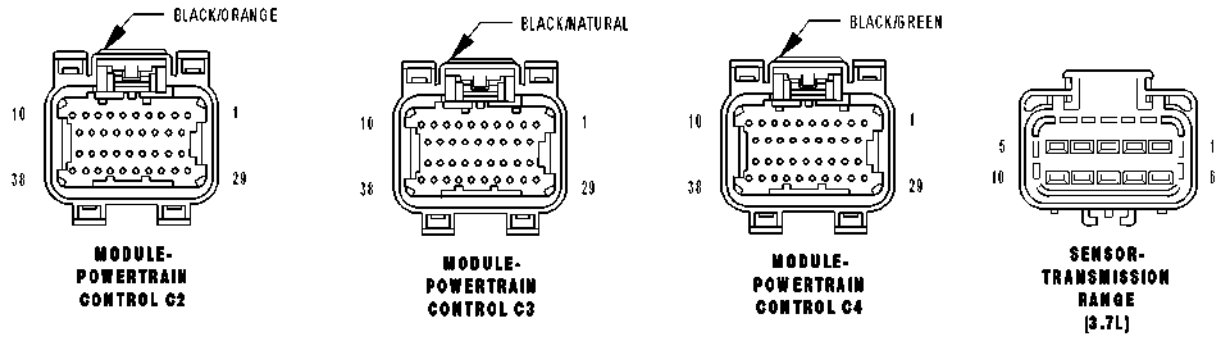
Were there any problems found?

Yes >> Repair as necessary.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0714-TRANSMISSION TEMPERATURE SENSOR INTERMITTENT





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P0714-TRANSMISSION TEMPERATURE SENSOR INTERMITTENT (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on and engine running.
- **Set Condition:**
  The DTC will set when the monitored Temperature Sensor voltage fluctuates or changes abruptly within a predetermined period of time.

Possible Causes
TRANSMISSION TEMPERATURE SENSOR
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).

Theory of Operation

The temperature sensor is used to sense the temperature of the transmission fluid. Transmission fluid temperature can affect shift quality, torque converter operation and when or if some diagnostics are run. A failed temperature sensor could affect the OBD diagnostics. If a problem occurs in the transmission temperature sensor circuit, transmission temperature will be based on a calculated value.

1. CHECK TO SEE IF DTC IS CURRENT

With the scan tool, view DTCs.

Is the status Active for this DTC or is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 2

No >> Go To 5

---

2. PCM AND WIRING

Turn the ignition off to the lock position.

Remove the Starter Relay.

CAUTION: CAUTION: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

NOTE: Note: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the Transmission Simulator, turn the Input/Output switch to OFF.

With the scan tool , monitor the TRANS TEMP VOLTS while turning the Thermistor Voltage switch to all three positions on the Transmission Simulator.

Compare the scan tool readings with the numbers listed on the Transmission Simulator.

Do the readings on the Transmission Simulator match a non-fluctuating scan tool reading ± 0.2 volts?

Yes >> Go To 3

No >> Go To 4

P0714-TRANSMISSION TEMPERATURE SENSOR INTERMITTENT (CONTINUED)

3. TRANSMISSION TEMPERATURE SENSOR

If there are no possible causes remaining, view repair.

Repair

Replace Transmission Solenoid/TRS Assembly per the Service Information.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

4. POWERTRAIN CONTROL MODULE

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

If there are no possible causes remaining, view repair.

Repair

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

5. INTERMITTENT WIRING AND CONNECTORS

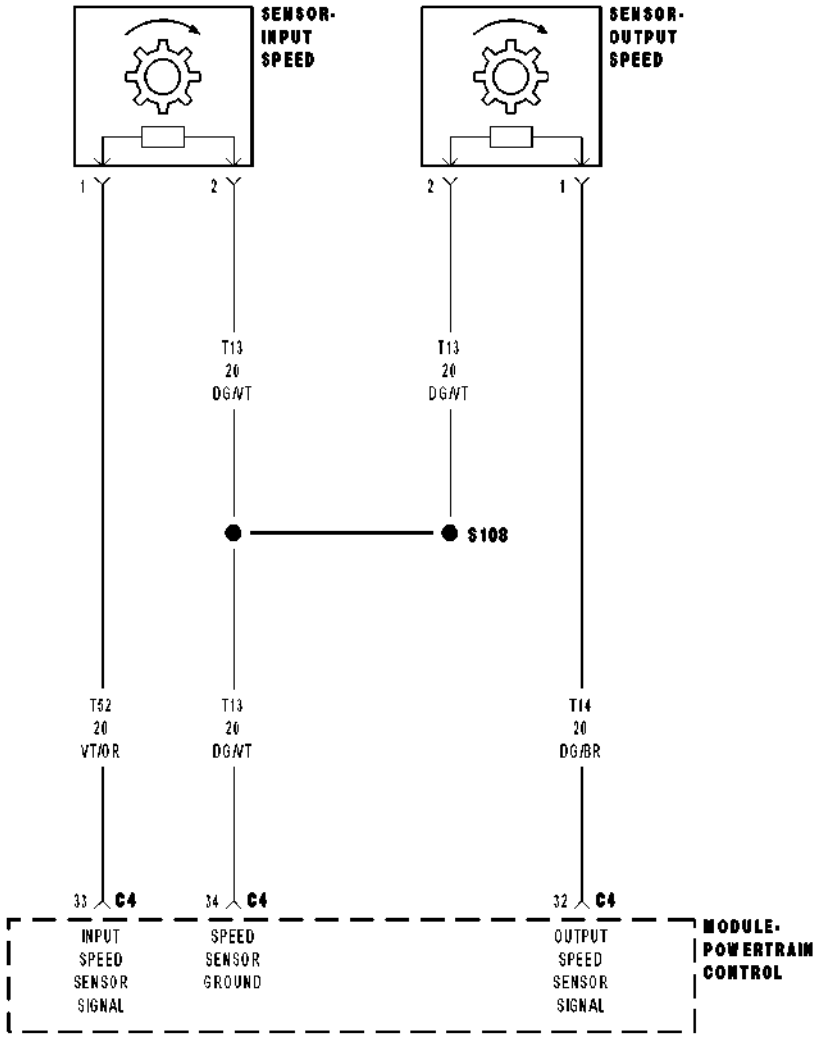
The conditions necessary to set this DTC are not present at this time.
Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.
Wiggle the wires while checking for shorted and open circuits.
With the scan tool , check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

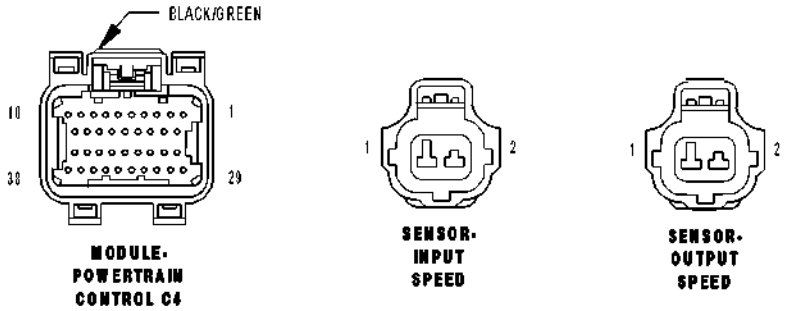
Were there any problems found?

Yes >> Repair as necessary.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0715-INPUT SPEED SENSOR 1 CIRCUIT





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P0715-INPUT SPEED SENSOR 1 CIRCUIT (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  The transmission gear ratio is monitored continuously while the transmission is in gear.
- **Set Condition:**
  If there is an excessive change in the Input RPM in any valid gear (R, 1st, 2nd, 3rd, or 4th).

Possible Causes
(T52) INPUT SPEED SENSOR SIGNAL CIRCUIT OPEN
(T13) SPEED SENSOR GROUND CIRCUIT OPEN
(T52) INPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO GROUND
(T52) INPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE
(T13) SPEED SENSOR GROUND CIRCUIT SHORT TO VOLTAGE
INPUT SPEED SENSOR
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).

Theory of Operation

The transmission system uses two speed sensors, one to measure input RPM and one to measure output RPM. These inputs are essential for proper transmission operation. Therefore, the integrity of this data is verified through system checks.

Diagnostic Test

1. CHECK TO SEE IF DTC P0715 IS CURRENT

Start the engine.

Place the shifter in park.

With the scan tool , read the Input Speed Sensor RPM.

Is the Input Speed Sensor reading below 400 RPM?

Yes >> Go To 2

No >> Go To 10

P0715-INPUT SPEED SENSOR 1 CIRCUIT (CONTINUED)

2. PCM AND WIRING

Turn the ignition off to the lock position.

Remove the Starter Relay.

CAUTION: Removal of the Starter Relay is to prevent a Transmission NO RESPONSE condition and to disable the starter.

Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

Ignition on, engine not running.

With the Transmission Simulator, set the ″Input/Output Speed″ switch to ″ON″ and the rotary switch to the ″3000/1250″ position.

With the scan tool, read the Input and Output RPM.

Does the Input speed read 3000 RPM and the Output speed read 1250 RPM ± 50 RPM?

Yes >> Go To 3

No >> Go To 4

---

3. INPUT SPEED SENSOR

If there are no possible causes remaining, view repair.

Repair

Replace the Input Speed Sensor per the Service Information.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

4. (T52) INPUT SPEED SENSOR SIGNAL CIRCUIT OPEN

Turn the ignition off to the lock position.

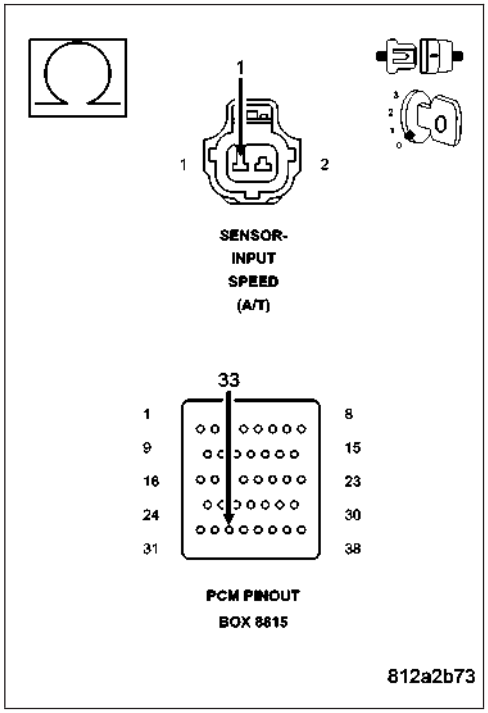
Disconnect the PCM C4 harness connector.

Disconnect the Input Speed Sensor harness connector.

NOTE: Check connectors - Clean/repair as necessary.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (T52) Input Speed Sensor Signal circuit from the appropriate terminal of special tool #8815 to the Input Speed Sensor connector.



Is the resistance above 5.0 ohms?

Yes >> Repair the (T52) Input Speed Sensor Signal circuit for an open.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5

P0715-INPUT SPEED SENSOR 1 CIRCUIT (CONTINUED)

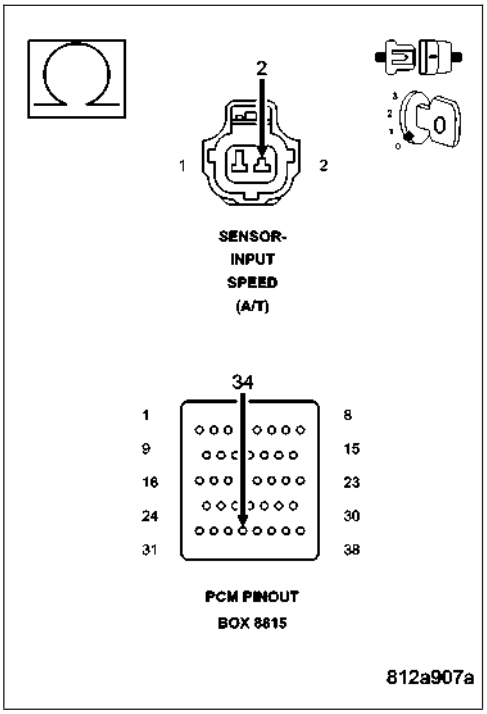
5. (T13) SPEED SENSOR GROUND CIRCUIT OPEN

Measure the resistance of the (T13) Speed Sensor Ground circuit from the from the appropriate terminal of special tool #8815 to the Input Speed Sensor harness connector.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T13) Speed Sensor Ground circuit for an open.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 6



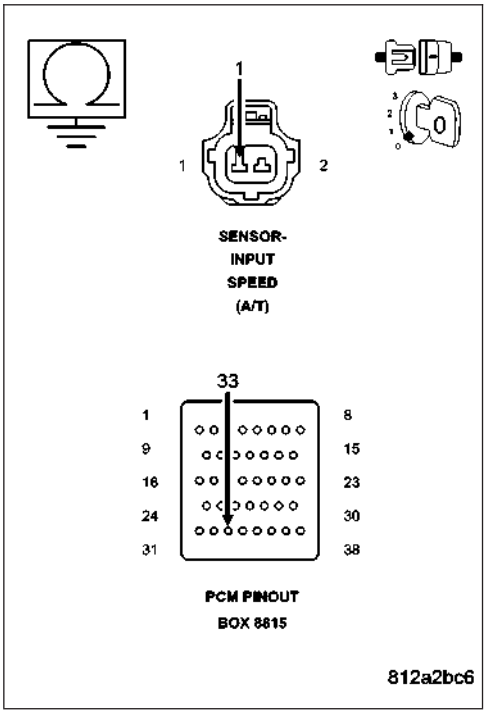
6. (T52) INPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T52) Input Speed Sensor Signal circuit.

Is the resistance Below 5.0 ohms?

Yes >> Repair the (T52) Input Speed Sensor Signal circuit for a short to ground.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 7



P0715-INPUT SPEED SENSOR 1 CIRCUIT (CONTINUED)

7. (T52) INPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE

Disconnect the Output Speed Sensor harness connector.

Remove the Transmission Control Relay.

NOTE: Check connectors - Clean/repair as necessary.

Connect a jumper wire between the (A104) Fused B+ circuit and (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

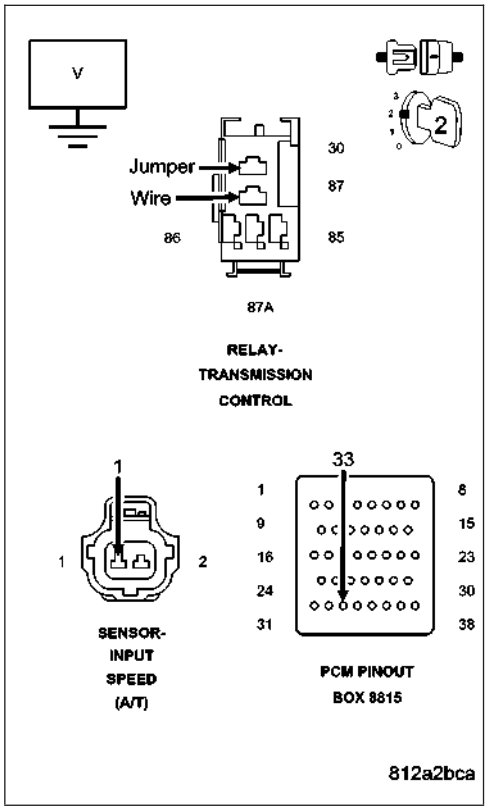
Ignition on, engine not running.

Measure the voltage of the (T52) Input Speed Sensor Signal circuit.

Is the voltage above 0.5 volt?

Yes >> Repair the (T52) Input Speed Sensor Signal circuit for a short to voltage.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 8



8. (T13) SPEED SENSOR GROUND CIRCUIT SHORT TO VOLTAGE

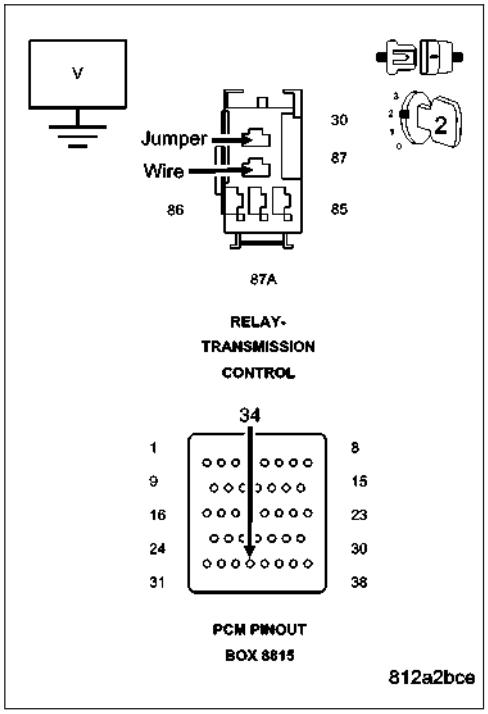
NOTE: The jumper wire must still be connected.

Measure the voltage of the (T13) Speed Sensor Ground circuit.

Is the voltage above 0.5 volts?

Yes >> Repair the (T13) Speed Sensor Ground circuit for a short to voltage.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 9



P0715-INPUT SPEED SENSOR 1 CIRCUIT (CONTINUED)

9. POWERTRAIN CONTROL MODULE

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

If there are no possible causes remaining, view repair.

Repair

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

10. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set the DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for shorted and open circuits.

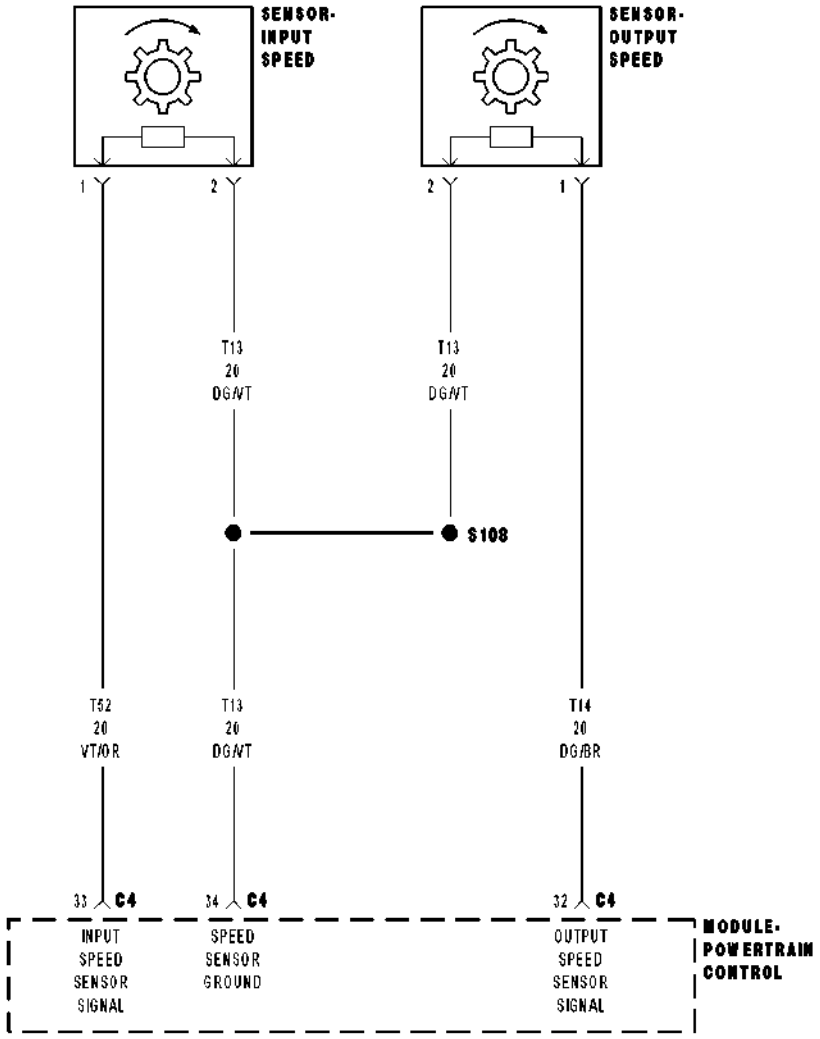
With the scan tool , check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

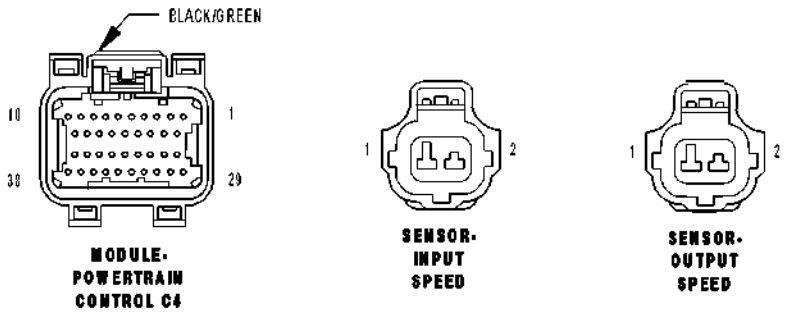
Were there any problems found?

Yes >> Repair as necessary.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0720-OUTPUT SPEED SENSOR CIRCUIT





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P0720-OUTPUT SPEED SENSOR CIRCUIT (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  The transmission gear ratio is monitored continuously while the transmission is in gear.
- **Set Condition:**
  If there is an excessive change in the Output RPM in any gear.

Possible Causes
(T14) OUTPUT SPEED SENSOR SIGNAL CIRCUIT OPEN
(T13) SPEED SENSOR GROUND CIRCUIT OPEN
(T14) OUTPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO GROUND
(T14) OUTPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE
(T13) SPEED SENSOR GROUND CIRCUIT SHORT TO VOLTAGE
OUTPUT SPEED SENSOR
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).

Theory of Operation

The transmission system uses two speed sensors, one to measure input RPM and one to measure output RPM. These inputs are essential for proper transmission operation. Therefore, the integrity of this data is verified through system checks.

Diagnostic Test

1. CHECK TO SEE IF DTC P0720 IS CURRENT

Start the engine in park.

Raise the drive wheels off of the ground.

WARNING: Properly support the vehicle.
Firmly apply the brakes and place the transmission selector in drive.

WARNING: Be sure to keep hands and feet clear of rotating wheels.
Release the brakes and allow the drive wheels to spin freely.

NOTE: The drive wheels must be turning at this point.
With the scan tool, read the Output RPM

Is the Output RPM below 100?

Yes >> Go To 2

No >> Go To 10

P0720-OUTPUT SPEED SENSOR CIRCUIT (CONTINUED)

2. PCM AND WIRING

Turn the ignition off to the lock position.

Remove the Starter Relay.

CAUTION: Removal of the Starter Relay is to prevent a Transmission NO RESPONSE condition and to disable the starter.

Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

Ignition on, engine not running.

With the Transmission Simulator, set the ″Input/Output Speed″ switch to ″ON″ and the rotary switch to the ″3000/1250″ position.

With the scan tool , read the Input and Output RPM.

Does the Input RPM read 3000 and the Output RPM read 1250 (within 50 RPM)?

Yes >> Go To 3

No >> Go To 4

---

3. OUTPUT SPEED SENSOR

If there are no possible causes remaining, view repair.

Repair

Replace the Output Speed Sensor per the Service Information.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

4. (T14) OUTPUT SPEED SENSOR SIGNAL CIRCUIT OPEN

Turn the ignition off to the lock position.

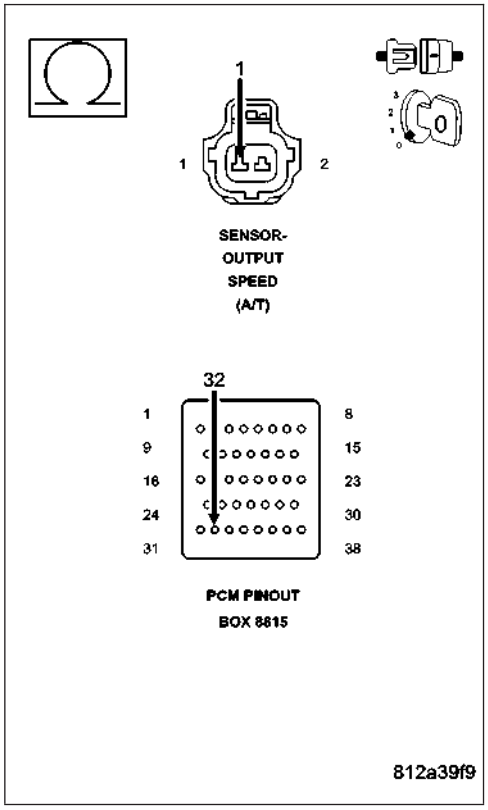
Disconnect the PCM C4 harness connector.

Disconnect the Output Speed Sensor harness connector.

NOTE: Check connectors - Clean/repair as necessary.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (T14) Output Speed Sensor Signal circuit from appropriate terminal of special tool #8815 to the Output Speed Sensor harness connector.



Is the resistance above 5.0 ohms?

Yes >> Repair the (T14) Output Speed Sensor Signal circuit for an open.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5

P0720-OUTPUT SPEED SENSOR CIRCUIT (CONTINUED)

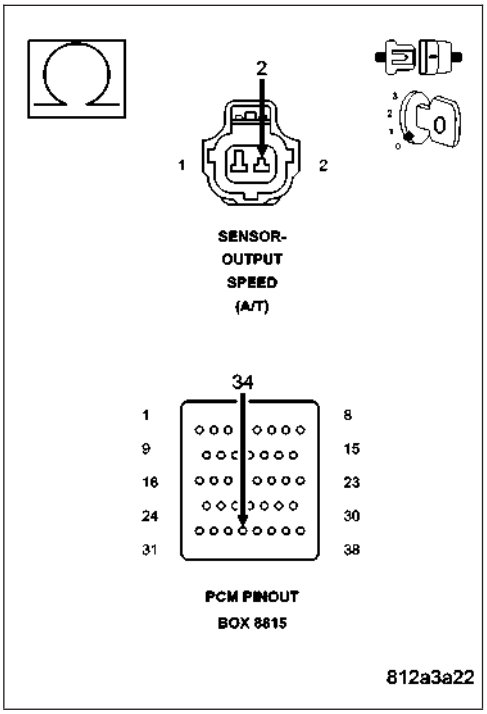
5. (T13) SPEED SENSOR GROUND CIRCUIT OPEN

Measure the resistance of the Speed Sensor Ground circuit from the appropriate terminal of special tool #8815 to the Output Speed Sensor harness connector.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T13) Speed Sensor Ground circuit for an open.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 6



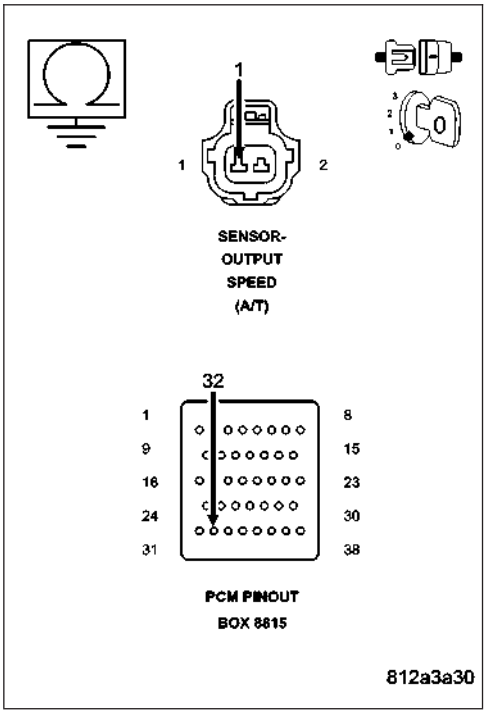
6. (T14) OUTPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T14) Output Speed Sensor Signal circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (T14) Output Speed Sensor Signal circuit for a short to ground.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 7



P0720-OUTPUT SPEED SENSOR CIRCUIT (CONTINUED)

7. (T14) OUTPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE

Remove the Transmission Control Relay.

NOTE: Check connectors - Clean/repair as necessary.
Connect a jumper wire between the (A104) Fused B+ circuit and (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

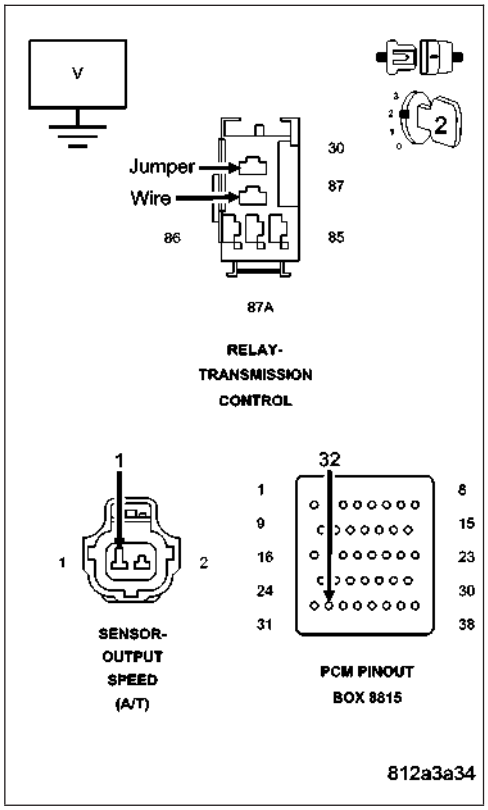
Ignition on, engine not running.

Measure the voltage of the (T14) Output Speed Sensor Signal circuit.

Is the voltage above 0.5 volt?

Yes >> Repair the (T14) Output Speed Sensor Signal circuit for a short to voltage.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 8



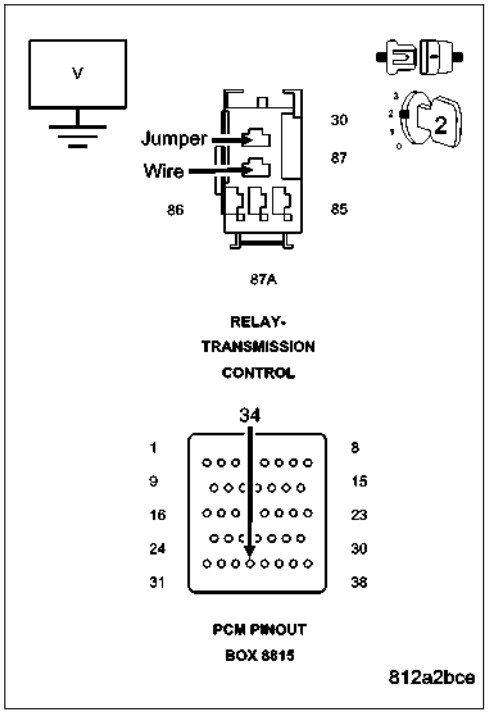
8. (T13) SPEED SENSOR GROUND CIRCUIT SHORT TO VOLTAGE

NOTE: The jumper wire must still be connected.
Measure the voltage of the (T13) Speed Sensor Ground circuit.

Is the voltage above 0.5 volts?

Yes >> Repair the (T13) Speed Sensor Ground circuit for a short to voltage.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 9



P0720-OUTPUT SPEED SENSOR CIRCUIT (CONTINUED)

9. POWERTRAIN CONTROL MODULE

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

If there are no possible causes remaining, view repair.

Repair

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

10. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set the DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for shorted and open circuits.

With the scan tool , check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Were there any problems found?

Yes >> Repair as necessary.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0725-ENGINE SPEED SENSOR CIRCUIT

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Whenever the engine is running.
- **Set Condition:**
  The Engine RPM is less than 390 or greater than 8000 for more than 2 seconds while the engine is running.

Possible Causes
ENGINE DTCS PRESENT
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).

Theory of Operation

The PCM uses a dual port RAM internal to the controller to send the engine speed signal to the Transmission Control System. The calculated engine RPM is compared to a minimum and maximum value. If the PCM interprets this signal to be out of range when the engine is running the code is set. The MIL illuminates after 10 seconds of vehicle operation and the transmission system defaults to Limp-in mode.

Diagnostic Test

1. CONDITION FOR DTC P0725 IS PRESENT

Start the engine.

NOTE: This DTC is not a Transmission Input Speed Sensor DTC.
With the scan tool, view DTCs.

Is the status Active for this DTC or is the STARTS SINCE SET counter set at 0?

Yes >> Go To 2

No >> Go To 4

---

2. ENGINE DTCS PRESENT

With the scan tool, read Engine DTCs.

Are there any Engine DTC's present?

Yes >> Refer to Section 9 – Engine Electrical Diagnostics and perform the appropriate diagnostic procedure. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 3

P0725-ENGINE SPEED SENSOR CIRCUIT (CONTINUED)

3. POWERTRAIN CONTROL MODULE

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

If there are no possible causes remaining, view repair.

Repair

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN, then program the Pinion Factor in the Front Control Module.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

4. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set the DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for shorted and open circuits.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Were there any problems found?

Yes >> Repair as necessary.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0731-GEAR RATIO ERROR IN 1ST

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  The Transmission gear ratio is monitored continuously while the transmission is in gear.
- **Set Condition:**
  If the ratio of the Input RPM to the Output RPM does not match the current gear ratio when compared to the known gear ratio.

Possible Causes
RELATED TRANSMISSION DTCS PRESENT
INTERMITTENT GEAR RATIO ERRORS
INTERNAL TRANSMISSION

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).

Theory of Operation

The transmission system uses two speed sensors, one to measure input RPM and one to measure output RPM. These inputs are essential for proper transmission operation. Therefore, the integrity of this data is verified through data checks. When in gear, if the gear ratio does not compare to a known gear ratio, the corresponding gear ratio error trouble code is set. The transmission will go into Limp-in mode after four gear ratio error events occur in a given driving cycle.

Diagnostic Test

1. DETERMINING IF RELATED TRANSMISSION DTCS ARE PRESENT

With the scan tool, read Transmission DTCs.

If any of these DTCs are present, perform their respective tests first.

Are there any Loss of Prime, Line Pressure Sensor and/or Speed Sensor DTCs present?

Yes >> Refer to appropriate diagnostic procedure in the Transmission category. If any of these DTC's are present, they will cause a gear ratio error. Perform the test for Loss of Prime first if it is present.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK TO SEE IF P0731 IS CURRENT

With the scan tool, perform the 1st gear clutch test. Follow the instructions on the scan tool.

Increase the throttle angle or TPS Degree to 30° for no more than a few seconds.

CAUTION: Do not overheat the transmission.

Did the Clutch Test pass, Input Speed remain at zero?

Yes >> Go To 3

No >> Go To 4

P0731-GEAR RATIO ERROR IN 1ST (CONTINUED)

3. CHECK FOR INTERMITTENT OPERATION

The conditions to set this DTC are not current at this time.

Check the gearshift linkage adjustment.

Gear ratio DTCs can be set by problems in the Input and Output Speed Sensor circuits. If the vehicle passes the Clutch Test and still sets Gear Ratio DTC, check the Speed Sensors for proper operation.

Remove the Starter Relay.

CAUTION: removal of the Starter Relay is to prevent a Transmission NO RESPONSE condition and to disable the starter.

Check the wiring and connectors for the Speed Sensors for a good connection, then perform a wiggle test using the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

This DTC can also be set under extreme temperature conditions. This is usually caused by an internal problem. Verify if the problem is only experienced under extreme hot or cold conditions.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Were there any problems found?

Yes >> Repair as necessary.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

---

4. INTERNAL TRANSMISSION

If there are no possible causes remaining, view repair.

Repair

Repair internal Transmission per the Service Information. Check all of the components related to the UD and LR clutches. Inspect the Oil Pump and repair or replace per the Service Information.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

P0732-GEAR RATIO ERROR IN 2ND

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  The Transmission gear ratio is monitored continuously while the transmission is in gear.
- **Set Condition:**
  If the ratio of the Input RPM to the Output RPM does not match the current gear ratio when compared to the known gear ratio.

Possible Causes
RELATED TRANSMISSION DTCS PRESENT
TRANSMISSION SOLENOID/PRESSURE SWITCH ASSEMBLY
INTERMITTENT GEAR RATIO ERRORS
INTERNAL TRANSMISSION

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).

Theory of Operation

The transmission system uses two speed sensors, one to measure input RPM and one to measure output RPM. These inputs are essential for proper transmission operation. Therefore, the integrity of this data is verified through data checks. When in gear, if the gear ratio does not compare to a known gear ratio, the corresponding gear ratio error trouble code is set. The transmission will go into Limp-in mode after four gear ratio error events occur in a given driving cycle.

Diagnostic Test

1. DETERMINING IF RELATED TRANSMISSION DTCS ARE PRESENT

With the scan tool, read Transmission DTCs.

If any of these DTCs are present, perform their respective tests first.

Are there any Loss of Prime, Line Pressure Sensor and/or Speed Sensor DTCs present?

Yes >> Refer to appropriate diagnostic procedure in the Transmission category. If any of these DTCs are present, they will cause a gear ratio error. Perform the test for Loss of Prime first if it is present.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK TO SEE IF P0732 IS CURRENT

With the scan tool, perform the 2nd gear clutch test. Follow the instructions on the scan tool.

Increase the throttle angle or TPS Degree to 30° for no more than a few seconds.

CAUTION: Do not overheat the transmission.

Did the Clutch Test pass, Input Speed remain at zero?

Yes >> Go To 3

No >> Go To 4

P0732-GEAR RATIO ERROR IN 2ND (CONTINUED)

3. CHECK FOR INTERMITTENT OPERATION

The conditions to set this DTC are not current at this time.

Check the gearshift linkage adjustment.

Gear ratio DTCs can be set by problems in the Input and Output Speed Sensor circuits. If the vehicle passes the Clutch Test and still sets Gear Ratio DTC, check the Speed Sensors for proper operation.

Remove the Starter Relay.

CAUTION: removal of the Starter Relay is to prevent a Transmission NO RESPONSE condition and to disable the starter.

Check the wiring and connectors to the Speed Sensors for a good connection, then perform a wiggle test using the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

This DTC can also be set under extreme temperature conditions. This is usually caused by an internal problem. Verify if the problem is only experienced under extreme hot or cold conditions.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Were there any problems found?

Yes >> Repair as necessary.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

---

4. CHECK FOR RELATED PRESSURE SWITCH DTC'S

With the scan tool, read Transmission DTC's.

Are the DTC's P0845 and/or P0846 present also?

Yes >> Replace the Transmission Solenoid/Pressure Switch Assembly per the Service Information.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5

---

5. INTERNAL TRANSMISSION

If there are no possible causes remaining, view repair.

Repair

Repair internal Transmission per the Service Information. Check all of the components related to the UD and 2/4 clutches. Inspect the Oil Pump and repair or replace per the Service Information.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

P0733-GEAR RATIO ERROR IN 3RD

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  The Transmission gear ratio is monitored continuously while the transmission is in gear.
- **Set Condition:**
  If the ratio of the Input RPM to the Output RPM does not match the current gear ratio when compared to the known gear ratio.

Possible Causes
RELATED TRANSMISSION DTCS PRESENT
INTERMITTENT GEAR RATIO ERRORS
TRANSMISSION SOLENOID/PRESSURE SWITCH ASSEMBLY
INTERNAL TRANSMISSION

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).

Theory of Operation

The transmission system uses two speed sensors, one to measure input RPM and one to measure output RPM. These inputs are essential for proper transmission operation. Therefore, the integrity of this data is verified through data checks. When in gear, if the gear ratio does not compare to a known gear ratio, the corresponding gear ratio error trouble code is set. The transmission will go into Limp-in mode after four gear ratio error events occur in a given driving cycle.

Diagnostic Test

1. DETERMINING IF RELATED TRANSMISSION DTCS ARE PRESENT

With the scan tool, read Transmission DTCs.

If any of these DTCs are present, perform their respective tests first.

Are there any Loss of Prime, Line Pressure Sensor and/or Speed Sensor DTCs present?

Yes >> Refer to appropriate diagnostic procedure in the Transmission category. If any of these DTCs are present, they will cause a gear ratio error. Perform the test for Loss of Prime first if it is present.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK TO SEE IF P0733 IS CURRENT

With the scan tool, perform the 3rd gear clutch test. Follow the instructions on the scan tool.

Increase the throttle angle or TPS Degree to 30° for no more than a few seconds.

CAUTION: Do not overheat the transmission.

Did the Clutch Test pass, Input Speed remain at zero?

Yes >> Go To 3

No >> Go To 4

P0733-GEAR RATIO ERROR IN 3RD (CONTINUED)

3. CHECK FOR INTERMITTENT OPERATION

The conditions to set this DTC are not current at this time.

Check the gearshift linkage adjustment.

Gear ratio DTCs can be set by problems in the Input and Output Speed Sensor circuits. If the vehicle passes the Clutch Test and still sets Gear Ratio DTC, check the Speed Sensors for proper operation.

Remove the Starter Relay.

CAUTION: removal of the Starter Relay is to prevent a Transmission NO RESPONSE condition and to disable the starter.

Check the wiring and connectors for the Speed Sensors for a good connection, then perform a wiggle test using the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

This DTC can also be set under extreme temperature conditions, this is usually caused by an internal problem. Verify if the problem is only experienced under extreme hot or cold conditions.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Were there any problems found?

Yes >> Repair as necessary.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

---

4. CHECK FOR RELATED PRESSURE SWITCH DTCS

With the scan tool, read Transmission DTCs.

Are the DTCs P0870 and/or P0871 present also?

Yes >> Replace the Transmission Solenoid/Pressure Switch Assembly per the Service Information.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5

---

5. INTERNAL TRANSMISSION

If there are no possible causes remaining, view repair.

Repair

Repair internal Transmission per the Service Information. Check all of the components related to the UD and O/D clutches. Inspect the Oil Pump and repair or replace per the Service Information.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

P0734-GEAR RATIO ERROR IN 4TH

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  The Transmission gear ratio is monitored continuously while the transmission is in gear.
- **Set Condition:**
  If the ratio of the Input RPM to the Output RPM does not match the current gear ratio when compared to the known gear ratio.

Possible Causes
RELATED TRANSMISSION DTCS PRESENT
INTERMITTENT GEAR RATIO ERRORS
TRANSMISSION SOLENOID/PRESSURE SWITCH ASSEMBLY
INTERNAL TRANSMISSION

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).

Theory of Operation

The transmission system uses two speed sensors, one to measure input RPM and one to measure output RPM. These inputs are essential for proper transmission operation. Therefore, the integrity of this data is verified through data checks. When in gear, if the gear ratio does not compare to a known gear ratio, the corresponding gear ratio error trouble code is set. The transmission will go into Limp-in mode after four gear ratio error events occur in a given driving cycle.

Diagnostic Test

1. DETERMINING IF RELATED TRANSMISSION DTCS ARE PRESENT

With the scan tool, read Transmission DTCs.

If any of these DTCs are present, perform their respective tests first.

Are there any Loss of Prime, Line Pressure Sensor and/or Speed Sensor DTCs present?

Yes >> Refer to appropriate diagnostic procedure in the Transmission category. If any of these DTCs are present, they will cause a gear ratio error. Perform the test for Loss of Prime first if it is present.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK TO SEE IF P0733 IS CURRENT

With the scan tool, perform the 4th gear clutch test. Follow the instructions on the scan tool.

Increase the throttle angle or TPS Degree to 30° for no more than a few seconds.

CAUTION: Do not overheat the transmission.

Did the Clutch Test pass, Input Speed remain at zero?

Yes >> Go To 3

No >> Go To 4

P0734-GEAR RATIO ERROR IN 4TH (CONTINUED)

3. CHECK FOR INTERMITTENT OPERATION

The conditions to set this DTC are not current at this time.

Check the gearshift linkage adjustment.

Gear ratio DTC's can be set by problems in the Input and Output Speed Sensor circuits. If the vehicle passes the Clutch Test and still sets a Gear Ratio DTC, check the Speed Sensors for proper operation.

Remove the Starter Relay.

CAUTION: Removal of the Starter Relay is to prevent a Transmission NO RESPONSE condition and to disable the starter.

Check the wiring and connectors for the Speed Sensors for a good connection, then perform a wiggle test using the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

This DTC can also be set under extreme temperature conditions, this is usually caused by an internal problem. Verify if the problem is only experienced under extreme hot or cold conditions.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Were there any problems found?

Yes >> Repair as necessary.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

---

4. CHECK FOR RELATED PRESSURE SWITCH DTC'S

With the scan tool, read Transmission DTC's.

Are the DTC's P0870 and/or P0871 present also?

Yes >> Replace the Transmission Solenoid/Pressure Switch Assembly per the Service Information.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5

---

5. INTERNAL TRANSMISSION

If there are no possible causes remaining, view repair.

Repair

Repair internal Transmission per the Service Information. Check all of the components related to the O/D and 2/4 clutches. Inspect the Oil Pump and repair or replace per the Service Information.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

P0736-GEAR RATIO ERROR IN REVERSE

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  The Transmission gear ratio is monitored continuously while the transmission is in gear.
- **Set Condition:**
  If the ratio of the Input RPM to the Output RPM does not match the current gear ratio when compared to the known gear ratio.

Possible Causes
RELATED TRANSMISSION DTCS PRESENT
INTERMITTENT GEAR RATIO ERRORS
INTERNAL TRANSMISSION

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).

Theory of Operation

The transmission system uses two speed sensors, one to measure input RPM and one to measure output RPM. These inputs are essential for proper transmission operation. Therefore, the integrity of this data is verified through data checks. When in gear, if the gear ratio does not compare to a known gear ratio, the corresponding gear ratio error trouble code is set. The transmission will go into Limp-in mode after four gear ratio error events occur in a given driving cycle.

Diagnostic Test

1. DETERMINING IF RELATED TRANSMISSION DTCS ARE PRESENT

With the scan tool, read Transmission DTCs.

If any of these DTCs are present, perform their respective tests first.

Are there any Loss of Prime, Line Pressure Sensor and/or Speed Sensor DTCs present?

Yes >> Refer to appropriate diagnostic procedure in the Transmission category. If any of these DTCs are present, they will cause a gear ratio error. Perform the test for Loss of Prime first if it is present.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK TO SEE IF P0731 IS CURRENT

With the scan tool, perform the Reverse gear clutch test. Follow the instructions on the scan tool.

Increase the throttle angle or TPS Degree to 30° for no more than a few seconds.

CAUTION: Do not overheat the transmission.

Did the Clutch Test pass, Input Speed remain at zero?

Yes >> Go To 3

No >> Go To 4

P0736-GEAR RATIO ERROR IN REVERSE (CONTINUED)

3. CHECK FOR INTERMITTENT OPERATION

The conditions to set this DTC are not current at this time.

Check the gearshift linkage adjustment.

Gear ratio DTCs can be set by problems in the Input and Output Speed Sensor circuits. If the vehicle passes the Clutch Test and still sets Gear Ratio DTC, check the Speed Sensors for proper operation.

Remove the Starter Relay.

CAUTION: Removal of the Starter Relay is to prevent a Transmission NO RESPONSE condition and to disable the starter.

Check the wiring and connectors for the Speed Sensors for a good connection, then perform a wiggle test using the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

This DTC can also be set under extreme temperature conditions, this is usually caused by an internal problem. Verify if the problem is only experienced under extreme hot or cold conditions.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Were there any problems found?

Yes >> Repair as necessary.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

---

4. INTERNAL TRANSMISSION

If there are no possible causes remaining, view repair.

Repair

Repair internal Transmission per the Service Information. Check all of the components related to the Reverse and LR clutches. Inspect the Oil Pump and repair or replace per the Service Information.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

P0740-TCC OUT OF RANGE

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  The Torque Converter Clutch (TCC) is in FEMCC or PEMCC, Transmission temperature is hot, Engine temperature is greater than 38° C or 100° F, Transmission Input Speed greater than engine speed, TPS less than 30°, and brake not applied.
- **Set Condition:**
  The TCC is modulated by controlling the duty cycle of the L/R Solenoid until the difference between the Engine RPM and the Transmission Input Speed RPM or duty cycle is within a desired range. The DTC is set after the period of 10 seconds and 3 occurrences of either: FEMCC - with slip greater than 100 RPM or PEMCC - duty cycle greater than 85%.

Possible Causes
RELATED L/R SOLENOID OR PRESSURE SWITCH DTCS PRESENT
INTERNAL TRANSMISSION

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).

Theory of Operation

When in 2nd, 3rd, or 4th gear, the torque converter clutch (TCC) can be locked or partially locked when certain conditions are met. The TCC piston is electronically modulated by increasing the duty cycle of the LR/TCC solenoid until the torque converter slip difference (difference between engine and turbine speed) is within 60 RPM. Then the LR/TCC solenoid is fully energized (FEMCC / 100% duty cycle). Torque converter slip is monitored in FEMCC to ensure adequate clutch capacity. The transmission will attempt normal EMCC operation (not in Limp-in) even after the MIL is illuminated. MIL will illuminate after 5 minutes of accumulated slip in FEMCC.

Diagnostic Test

1. RELATED L/R SOLENOID OR PRESSURE SWITCH DTCS ARE PRESENT

With the scan tool, read Transmission DTCs

Are the DTCs P0750 and/or P0841 present also?

Yes >> Refer to the Transmission category and perform the appropriate diagnostic procedure.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

P0740-TCC OUT OF RANGE (CONTINUED)

2. CHECK TO SEE IF DTC P0740 IS CURRENT

Ignition on, engine not running.

With the scan tool, record and erase DTCs.

Drive the vehicle until it is fully warmed up to at least 110 degrees (F).

Perform the following step 3 times.

Drive the vehicle at 50 MPH and allow 4th gear to engage for at least 10 seconds. Close the throttle, then tip back in until the throttle angle is between 25 and 29 degrees. Note that if you go over 30 degrees, you must back off of the throttle and retry.

Did the TCC engage during any of the attempts?

Yes >> Go To 4

No >> Go To 3

---

3. INTERNAL TRANSMISSION

If there are no possible causes remaining, view repair.

Repair

Perform the Hydraulic Pressure test per the Service Information and repair the internal transmission components and Torque convertor as necessary.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

4. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set the DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for shorted and open circuits.

This DTC can also be set under extreme temperature conditions. This is usually caused by an internal problem. Verify if the problem is only experienced under extreme hot or cold conditions.

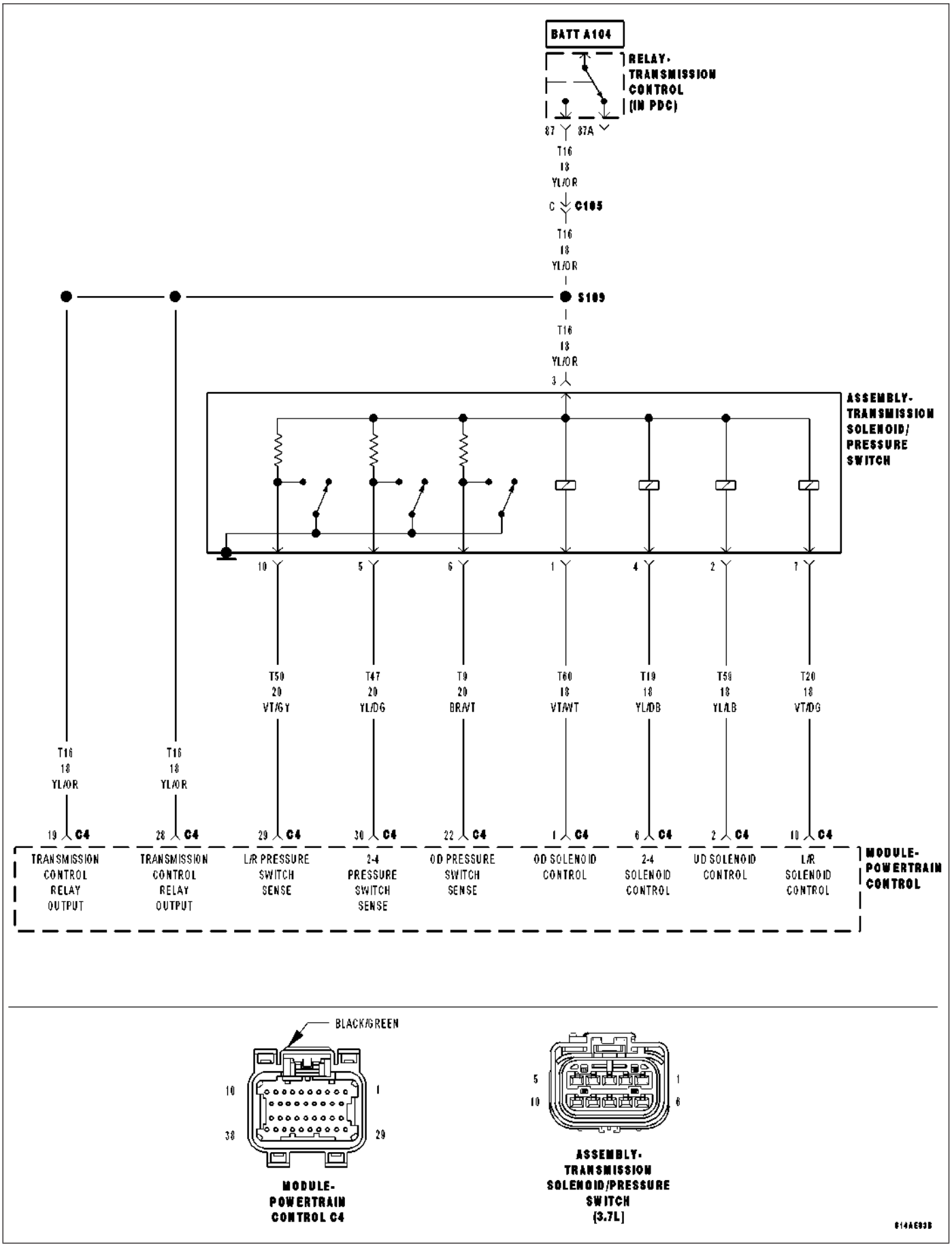
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Were there any problems found?

Yes >> Repair as necessary.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0750-LR SOLENOID CIRCUIT



P0750-LR SOLENOID CIRCUIT (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Initially at ignition on, then every 10 seconds thereafter. The solenoids will also be tested immediately after a gear ratio error or pressure switch error is detected.
- **Set Condition:**
  Three consecutive solenoid continuity test failures, or one failure if test is run in response to a gear ratio or pressure switch error.

Possible Causes
RELATED TRANSMISSION RELAY DTCS PRESENT
(T20) LR SOLENOID CONTROL CIRCUIT OPEN
(T20) LR SOLENOID CONTROL CIRCUIT SHORT TO GROUND
(T20) LR SOLENOID CONTROL CIRCUIT SHORT TO VOLTAGE
TRANSMISSION SOLENOID/PRESSURE SWITCH ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).

Theory of Operation

Four solenoids are used to control the friction elements (clutches). The continuity of the solenoids circuits are periodically tested. Each solenoid is turned on or off depending on its current state. An inductive spike should be detected by the PCM during this test. If no spike is detected, the circuit is tested again to verify the failure. In addition to the periodic testing, the solenoid circuits are tested if a gear ratio or pressure switch error occurs. In this case, one failure will result in the appropriate DTC being set. The MIL will illuminate and the transmission goes into neutral, if the DTC is set above 35 Km/h (22 MPH), Limp-in mode when vehicle speed is below 35 Km/h (22 MPH).

Diagnostic Test

1. DETERMINING IF RELATED RELAY DTCS ARE PRESENT

With the scan tool, read Transmission DTCs

Are there any Transmission Control Relay DTCs present also?

Yes >> Refer to the Transmission category and perform the appropriate diagnostic procedure. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK TO SEE IF P0750 IS CURRENT

With the scan tool, view DTCs.

Is the status Active for this DTC or is the STARTS SINCE SET counter for P0750 set at 0?

Yes >> Go To 3

No >> Go To 9

P0750-LR SOLENOID CIRCUIT (CONTINUED)

3. PCM AND WIRING

Turn the ignition off to the lock position.

Remove the Starter Relay.

CAUTION: Removal of the Starter Relay is to prevent a Transmission NO RESPONSE condition and to disable the starter.

Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

Ignition on, engine not running.

With the scan tool, actuate the L/R Solenoid.

Monitor the L/R Solenoid LED on the Transmission Simulator.

Did the L/R Solenoid LED on the Transmission Simulator blink on and off during actuation?

Yes >> Go To 7

No >> Go To 4

---

4. (T20) LR SOLENOID CONTROL CIRCUIT OPEN

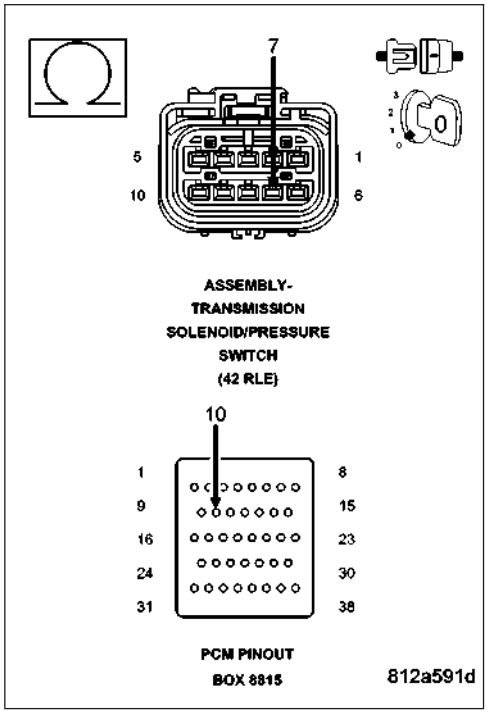
Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (T20) LR Solenoid Control circuit from the appropriate terminal of special tool #8815 to the Solenoid/Pressure Switch Assembly harness connector.



Is the resistance above 5.0 ohms?

Yes >> Repair the (T20) LR Solenoid Control circuit for an open. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5

P0750-LR SOLENOID CIRCUIT (CONTINUED)

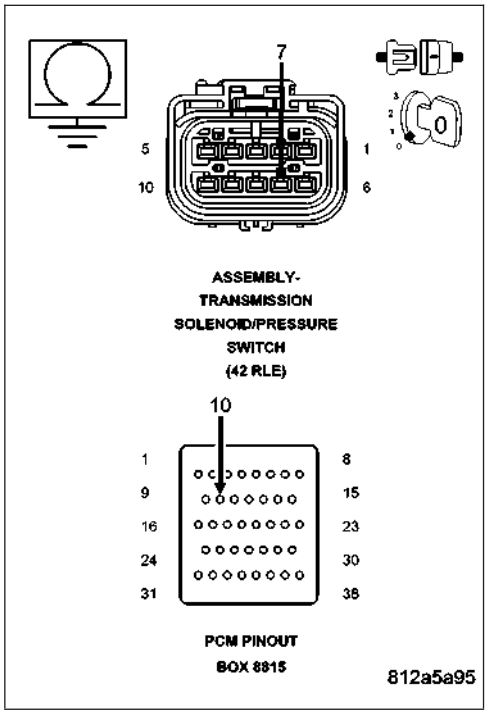
5. (T20) LR SOLENOID CONTROL CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T20) LR Solenoid Control circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (T20) LR Solenoid Control circuit for a short to ground.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 6



6. (T20) LR SOLENOID CONTROL CIRCUIT SHORT TO VOLTAGE

Remove the Transmission Control Relay.

NOTE: Check connectors - Clean/repair as necessary.
Connect a jumper wire between the (A104) Fused B+ circuit and the (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

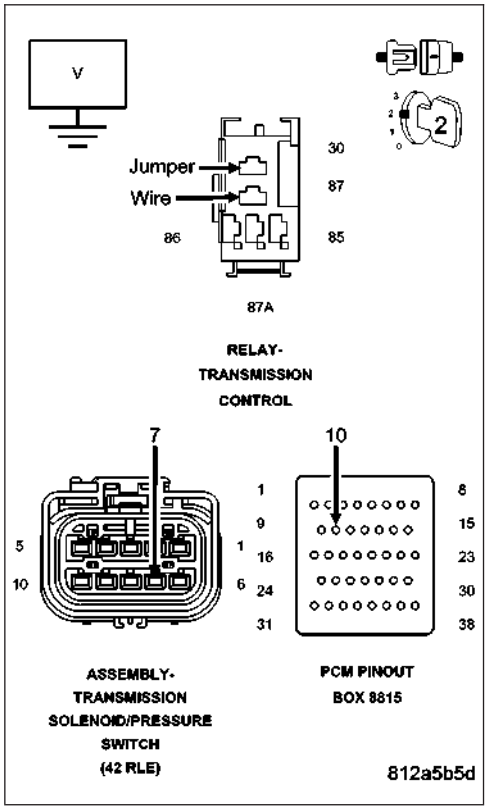
Ignition on, engine not running.

Measure the voltage of the (T20) LR Solenoid Control circuit.

Is the voltage above 0.5 volts?

Yes >> Repair the (T20) LR Solenoid Control circuit for a short to voltage.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 8



P0750-LR SOLENOID CIRCUIT (CONTINUED)

7. LR SOLENOID/PRESSURE SWITCH ASSEMBLY

If there are no possible causes remaining, view repair.

Repair

Replace the Transmission Solenoid/Pressure Switch Assembly per the Service Information.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

8. POWERTRAIN CONTROL MODULE

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

If there are no possible causes remaining, view repair.

Repair

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

9. INTERMITTENT WIRING AND CONNECTORS

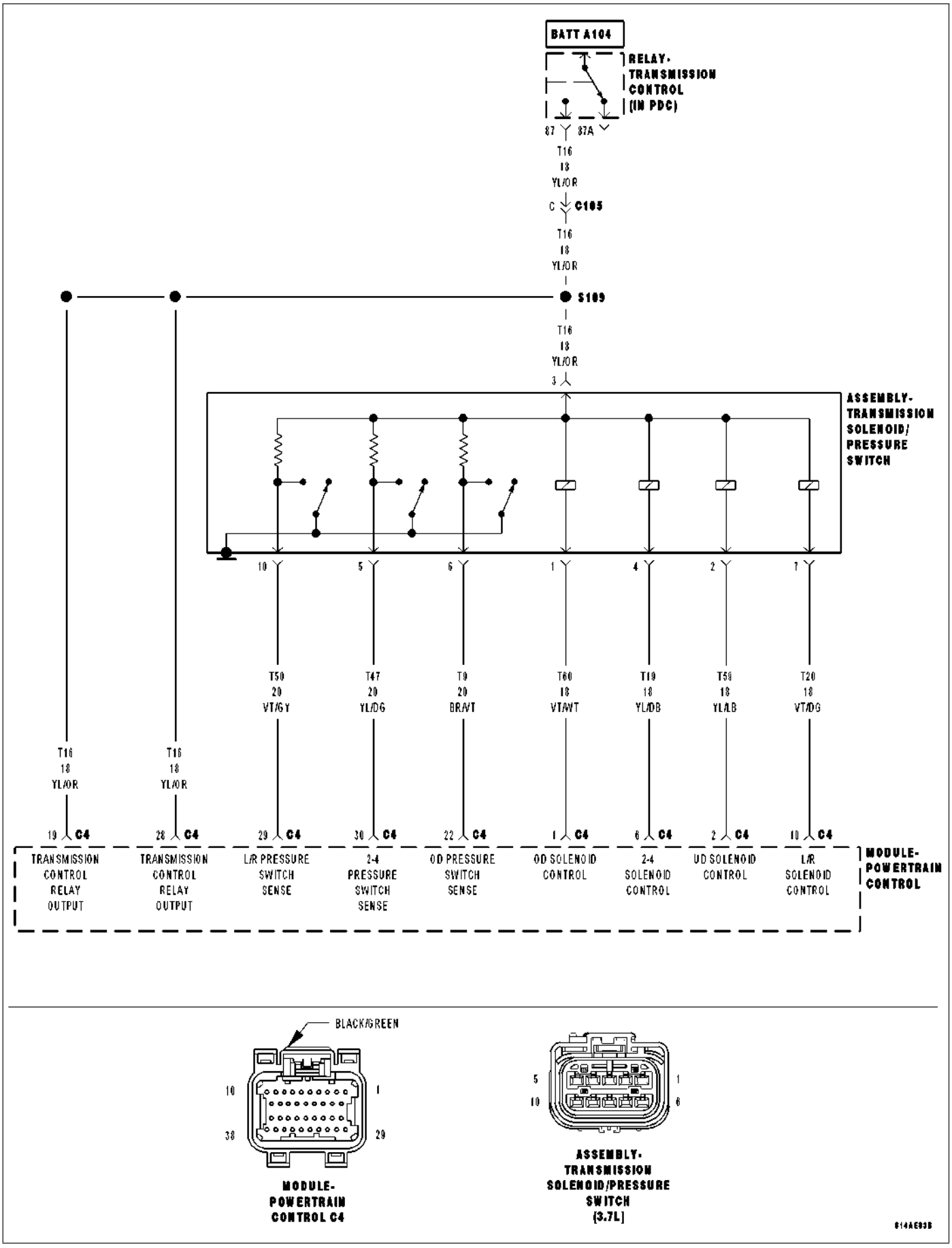
The conditions necessary to set the DTC are not present at this time.
Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.
Wiggle the wires while checking for shorted and open circuits.
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Were there any problems found?

Yes >> Repair as necessary.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0755-2/4 SOLENOID CIRCUIT



P0755-2/4 SOLENOID CIRCUIT (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Initially at ignition on, then every 10 seconds thereafter. The solenoids will also be tested immediately after a gear ratio error or pressure switch error is detected.
- **Set Condition:**
  Three consecutive solenoid continuity test failures, or one failure if test is run in response to a gear ratio or pressure switch error.

Possible Causes
RELATED TRANSMISSION RELAY DTCS PRESENT
(T19) 2/4 SOLENOID CONTROL CIRCUIT OPEN
(T19) 2/4 SOLENOID CONTROL CIRCUIT SHORT TO GROUND
(T19) 2/4 SOLENOID CONTROL CIRCUIT SHORT TO VOLTAGE
TRANSMISSION SOLENOID/PRESSURE SWITCH ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).

Theory of Operation

Four solenoids are used to control the friction elements (clutches). The continuity of the solenoids circuits are periodically tested. Each solenoid is turned on or off depending on its current state. An inductive spike should be detected by the PCM during this test. If no spike is detected, the circuit is tested again to verify the failure. In addition to the periodic testing, the solenoid circuits are tested if a gear ratio or pressure switch error occurs. In this case, one failure will result in the appropriate DTC being set. The MIL will illuminate and the transmission goes into neutral, if the DTC is set above 35 Km/h (22 MPH), Limp-in mode when vehicle speed is below 35 Km/h (22 MPH).

Diagnostic Test

1. DETERMINING IF RELATED TRANSMISSION RELAY DTCS ARE PRESENT

With the scan tool, read Transmission DTCs

Are there any Transmission Control Relay DTCs present also?

Yes >> Refer to the Transmission category and perform the appropriate diagnostic procedure. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK TO SEE IF P0755 IS CURRENT

With the scan tool, view DTCs.

Is the status Active for this DTC or is the STARTS SINCE SET counter set to 0?

Yes >> Go To 3

No >> Go To 9

P0755-2/4 SOLENOID CIRCUIT (CONTINUED)

3. PCM AND WIRING

Turn the ignition off to the lock position.

Remove the Starter Relay.

CAUTION: Removal of the Starter Relay is to prevent a Transmission NO RESPONSE condition and to disable the starter.

Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

Ignition on, engine not running.

With the scan tool, actuate the 2/4 Solenoid.

Monitor the 2/4 Solenoid LED on the Transmission Simulator.

Did the 2/4 Solenoid LED on the Transmission Simulator blink on and off during actuation?

Yes >> Go To 7

No >> Go To 4

---

4. (T19) 2/4 SOLENOID CONTROL CIRCUIT OPEN

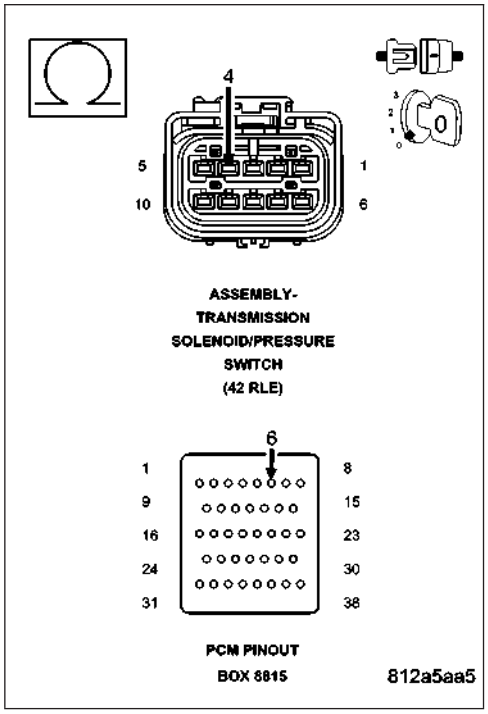
Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (T19) 2/4 Solenoid Control circuit from the appropriate terminal of special tool #8815 to the Solenoid/Pressure Switch Assembly harness connector.



Is the resistance above 5.0 ohms?

Yes >> Repair the (T19) 2/4 Solenoid Control circuit for an open. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5

P0755-2/4 SOLENOID CIRCUIT (CONTINUED)

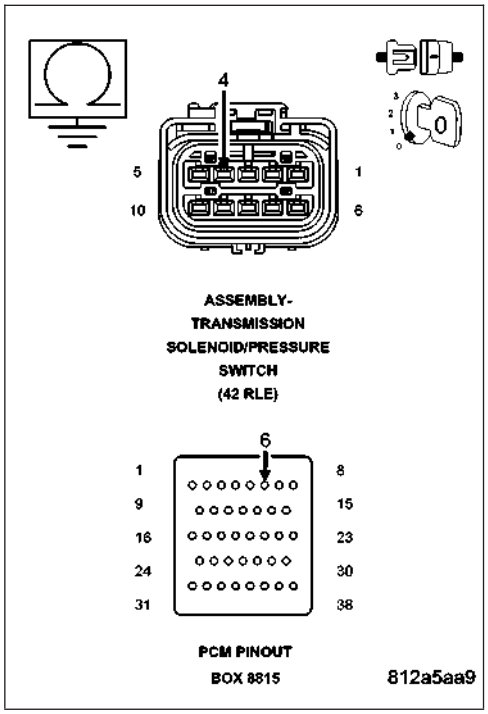
5. (T19) 2/4 SOLENOID CONTROL CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T19) 2/4 Solenoid Control circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (T19) 2/4 Solenoid Control circuit for a short to ground.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 6



6. (T19) 2/4 SOLENOID CONTROL CIRCUIT SHORT TO VOLTAGE

Remove the Transmission Control Relay.

NOTE: Check connectors - Clean/repair as necessary.
Connect a jumper wire between the (A104) Fused B+ circuit and the (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

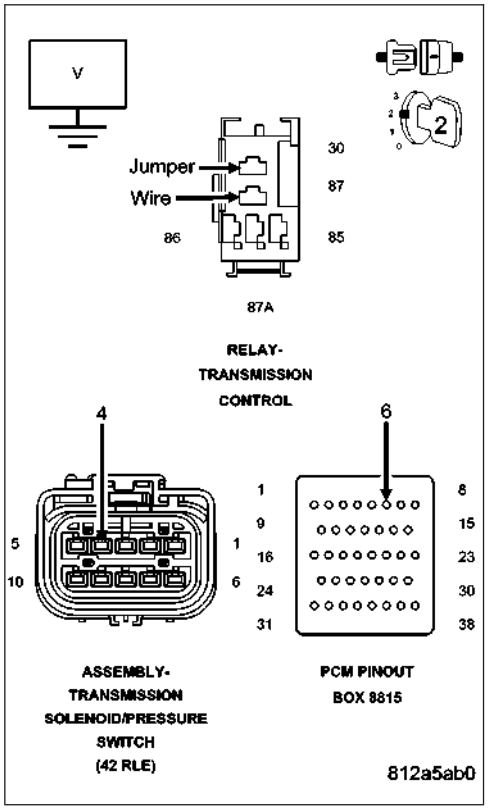
Ignition on, engine not running.

Measure the voltage of the (T19) 2/4 Solenoid Control circuit.

Is the voltage above 0.5 volts?

Yes >> Repair the (T19) 2/4 Solenoid Control circuit for a short to voltage.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 8



P0755-2/4 SOLENOID CIRCUIT (CONTINUED)

7. 2/4 SOLENOID/PRESSURE SWITCH ASSEMBLY

If there are no possible causes remaining, view repair.

Repair

Replace the Transmission Solenoid/Pressure Switch Assembly per the Service Information.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

8. POWERTRAIN CONTROL MODULE

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

If there are no possible causes remaining, view repair.

Repair

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

9. INTERMITTENT WIRING AND CONNECTORS

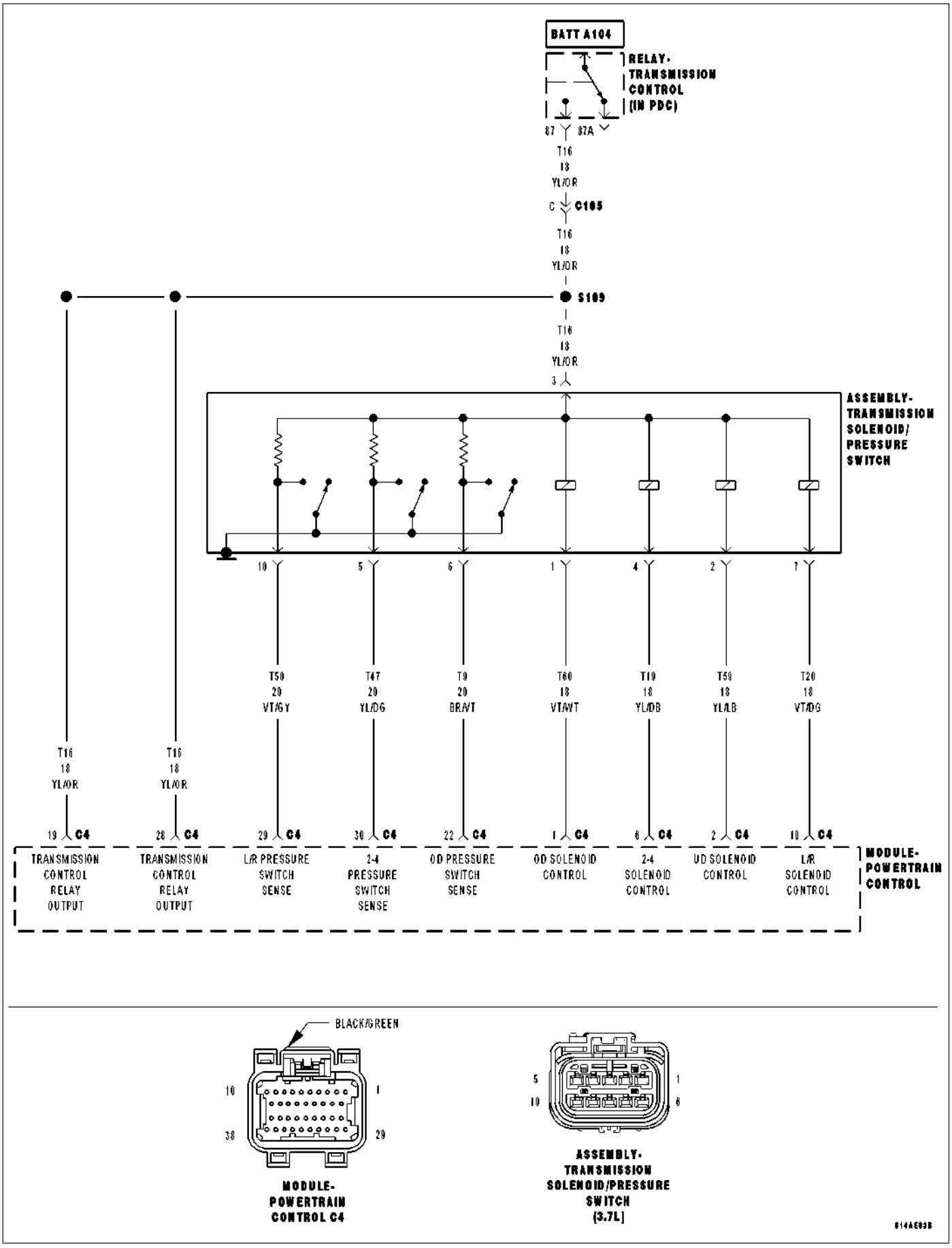
The conditions necessary to set the DTC are not present at this time.
Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.
Wiggle the wires while checking for shorted and open circuits.
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Were there any problems found?

Yes >> Repair as necessary.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0760-OD SOLENOID CIRCUIT



P0760-OD SOLENOID CIRCUIT (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Initially at ignition on, then every 10 seconds thereafter. The solenoids will also be tested immediately after a gear ratio error or pressure switch error is detected.
- **Set Condition:**
  Three consecutive solenoid continuity test failures, or one failure if test is run in response to a gear ratio or pressure switch error.

Possible Causes
RELATED TRANSMISSION RELAY DTC'S PRESENT
(T60) OD SOLENOID CONTROL CIRCUIT OPEN
(T60) OD SOLENOID CONTROL CIRCUIT SHORT TO GROUND
(T60) OD SOLENOID CONTROL CIRCUIT SHORT TO VOLTAGE
TRANSMISSION SOLENOID/PRESSURE SWITCH ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).

Theory of Operation

Four solenoids are used to control the friction elements (clutches). The continuity of the solenoid circuits is periodically tested. Each solenoid is turned on or off depending on its current state. An inductive spike should be detected by the PCM during this test. If no spike is detected, the circuit is tested again to verify the failure. In addition to the periodic testing, the solenoid circuits are tested if a gear ratio or pressure switch error occurs. In this case, one failure will result in the appropriate DTC being set. The MIL will illuminate and the transmission goes into neutral, if the DTC is set above 35 Km/h (22 MPH), Limp-in mode when vehicle speed is below 35 Km/h (22 MPH).

Diagnostic Test

1. DETERMINING IF RELATED RELAY DTCS ARE PRESENT

With the scan tool, read Transmission DTCs

Are there any Transmission Control Relay DTCs present also?

Yes >> Refer to the Transmission category and perform the appropriate diagnostic procedure. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK TO SEE IF P0760 IS CURRENT

With the scan tool, view DTCs.

Is the status Active for this DTC or is the STARTS SINCE SET counter set to 0?

Yes >> Go To 3

No >> Go To 9

P0760-OD SOLENOID CIRCUIT (CONTINUED)

3. PCM AND WIRING

Turn the ignition off to the lock position.

Remove the Starter Relay.

CAUTION: Removal of the Starter Relay is to prevent a Transmission NO RESPONSE condition and to disable the starter.

Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

Ignition on, engine not running.

With the scan tool, actuate the OD Solenoid.

Monitor the OD Solenoid LED on the Transmission Simulator.

Did the OD Solenoid LED on the Transmission Simulator blink on and off during actuation?

Yes >> Go To 7

No >> Go To 4

---

4. (T60) OD SOLENOID CONTROL CIRCUIT OPEN

Turn the ignition off to the lock position.

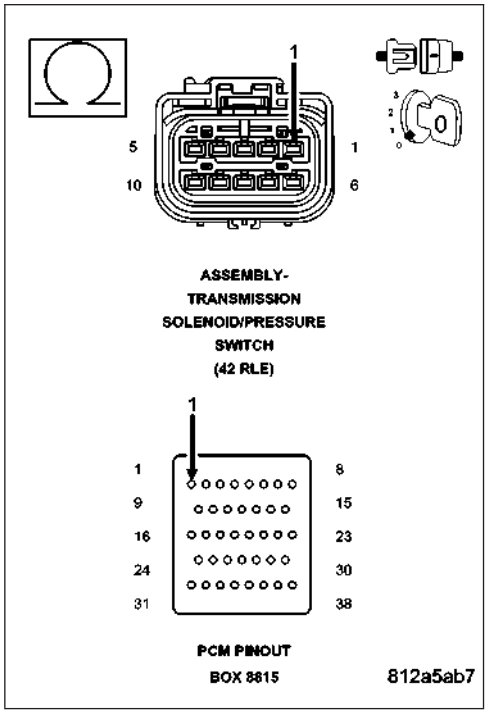
Disconnect the PCM C4 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

NOTE: Check connectors - Clean/repair as necessary.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (T60) OD Solenoid Control circuit from the appropriate terminal of special tool #8815 to the Solenoid/Pressure Switch Assembly harness connector.



Is the resistance above 5.0 ohms?

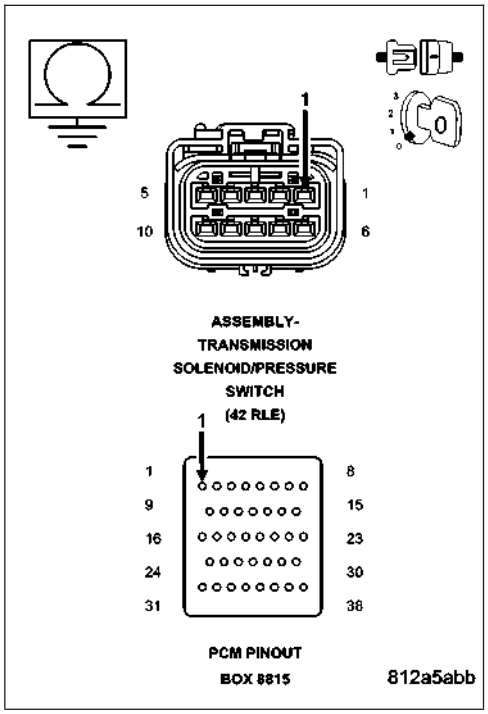
Yes >> Repair the (T60) OD Solenoid Control circuit for an open. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5

P0760-OD SOLENOID CIRCUIT (CONTINUED)

5. (T60) OD SOLENOID CONTROL CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T60) OD Solenoid Control circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (T60) OD Solenoid Control circuit for a short to ground.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 6

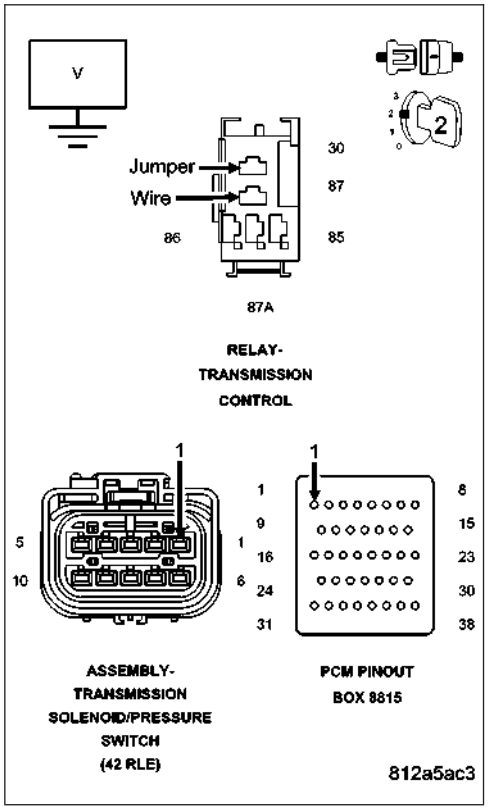
6. (T60) OD SOLENOID CONTROL CIRCUIT SHORT TO VOLTAGE

Remove the Transmission Control Relay.

NOTE: Check connectors - Clean/repair as necessary.
Connect a jumper wire between the (A104) Fused B+ circuit and the (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

Ignition on, engine not running.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.
Measure the voltage of the (T60) OD Solenoid Control circuit.



Is the voltage above 0.5 volts?

Yes >> Repair the (T60) OD Solenoid Control circuit for a short to voltage.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 8

P0760-OD SOLENOID CIRCUIT (CONTINUED)

7. OD SOLENOID/PRESSURE SWITCH ASSEMBLY

If there are no possible causes remaining, view repair.

Repair

Replace the Transmission Solenoid/Pressure Switch Assembly per the Service Information.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

8. POWERTRAIN CONTROL MODULE

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

If there are no possible causes remaining, view repair.

Repair

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

9. INTERMITTENT WIRING AND CONNECTORS

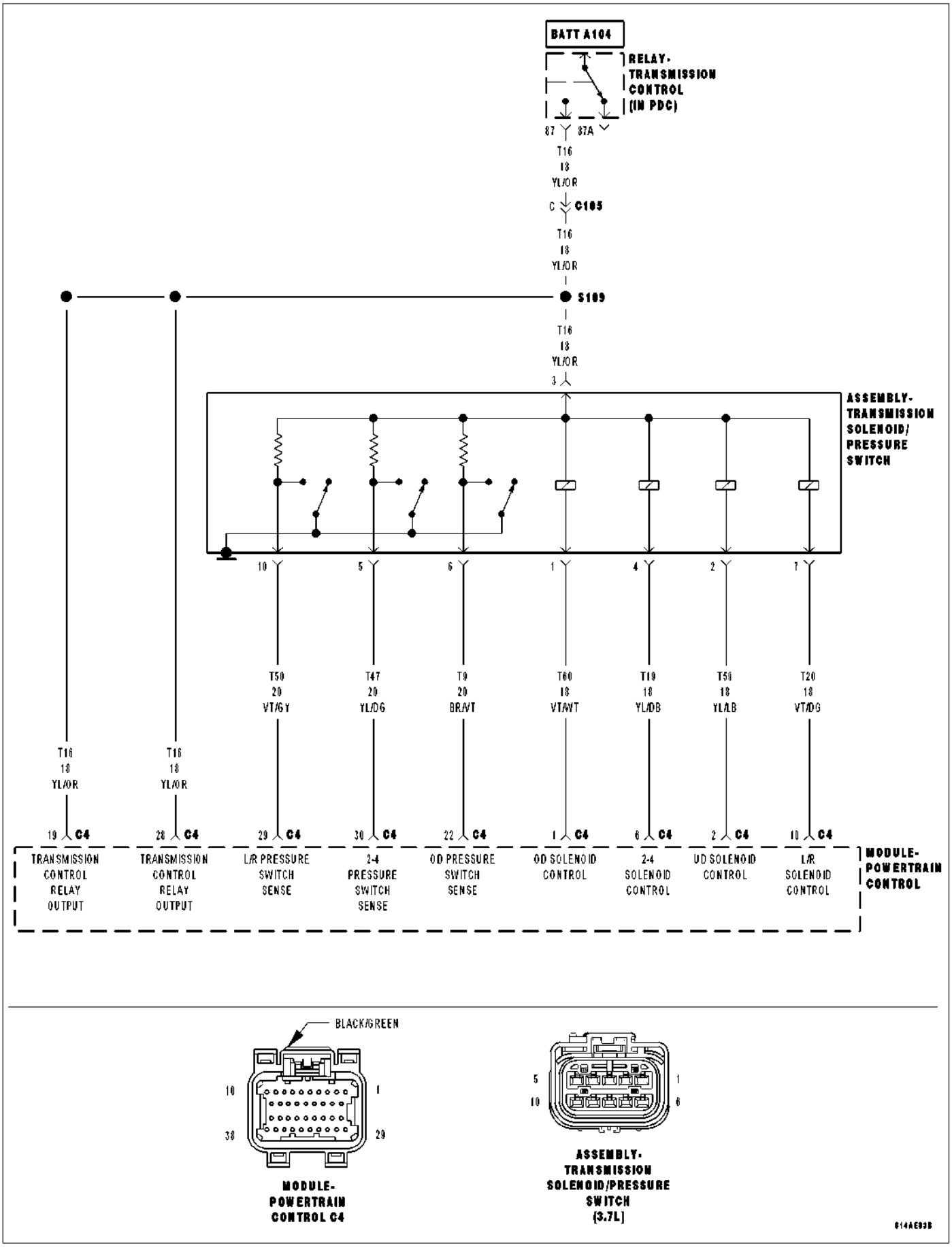
The conditions necessary to set the DTC are not present at this time.
Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.
Wiggle the wires while checking for shorted and open circuits.
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Were there any problems found?

Yes >> Repair as necessary.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0765-UD SOLENOID CIRCUIT



P0765-UD SOLENOID CIRCUIT (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Initially at ignition on, then every 10 seconds thereafter. The solenoids will also be tested immediately after a gear ratio error or pressure switch error is detected.
- **Set Condition:**
  Three consecutive solenoid continuity test failures, or one failure if test is run in response to a gear ratio or pressure switch error.

Possible Causes
RELATED TRANSMISSION RELAY DTCS PRESENT
(T59) UD SOLENOID CONTROL CIRCUIT OPEN
(T59) UD SOLENOID CONTROL CIRCUIT SHORT TO GROUND
(T59) UD SOLENOID CONTROL CIRCUIT SHORT TO VOLTAGE
TRANSMISSION SOLENOID/PRESSURE SWITCH ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).

Theory of Operation

Four solenoids are used to control the friction elements (clutches). The continuity of the solenoid circuits is periodically tested. Each solenoid is turned on or off depending on its current state. An inductive spike should be detected by the PCM during this test. If no spike is detected, the circuit is tested again to verify the failure. In addition to the periodic testing, the solenoid circuits are tested if a gear ratio or pressure switch error occurs. In this case, one failure will result in the appropriate DTC being set. The MIL will illuminate and the transmission goes into neutral, if the DTC is set above 35 Km/h (22 MPH), Limp-in mode when vehicle speed is below 35 Km/h (22 MPH).

Diagnostic Test

1. DETERMINING IF RELATED RELAY DTCS ARE PRESENT

With the scan tool, read Transmission DTCs

Are there any Transmission Control Relay DTCs present also?

Yes >> Refer to the Transmission category and perform the appropriate diagnostic procedure. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK TO SEE IF P0765 IS CURRENT

With the scan tool, view DTCs.

Is the status Active for this DTC or is the STARTS SINCE SET counter set to 0?

Yes >> Go To 3

No >> Go To 9

P0765-UD SOLENOID CIRCUIT (CONTINUED)

3. PCM AND WIRING

Turn the ignition off to the lock position.

Remove the Starter Relay.

CAUTION: Removal of the Starter Relay is to prevent a Transmission NO RESPONSE condition and to disable the starter.

Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

Ignition on, engine not running.

With the scan tool, actuate the UD Solenoid.

Monitor the UD Solenoid LED on the Transmission Simulator.

Did the UD Solenoid LED on the Transmission Simulator blink on and off during actuation?

Yes >> Go To 7

No >> Go To 4

---

4. (T59) UD SOLENOID CONTROL CIRCUIT OPEN

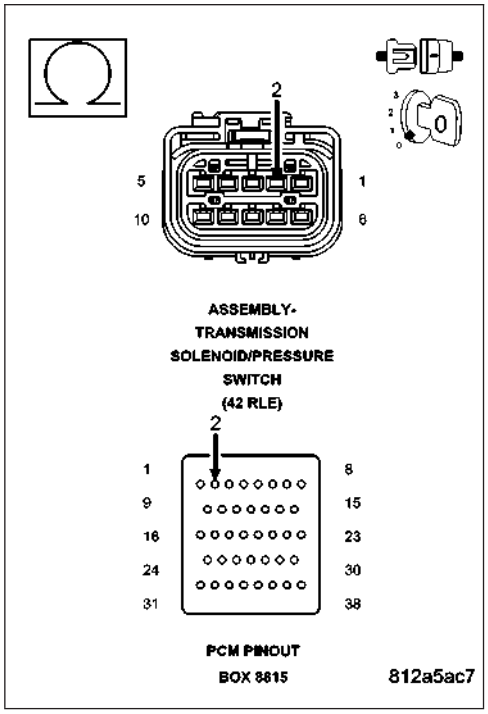
Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (T59) UD Solenoid Control circuit from the appropriate terminal of special tool #8815 to the Solenoid/Pressure Switch Assembly harness connector.



Is the resistance above 5.0 ohms?

Yes >> Repair the (T59) UD Solenoid Control circuit for an open. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5

P0765-UD SOLENOID CIRCUIT (CONTINUED)

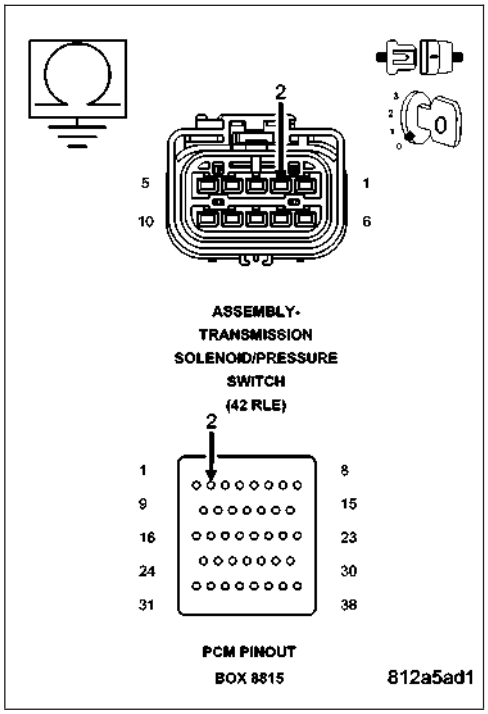
5. (T59) UD SOLENOID CONTROL CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T59) UD Solenoid Control circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (T59) UD Solenoid Control circuit for a short to ground.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 6



6. (T59) UD SOLENOID CONTROL CIRCUIT SHORT TO VOLTAGE

Remove the Transmission Control Relay.

NOTE: Check connectors - Clean/repair as necessary.
Connect a jumper wire between the (A104) Fused B+ circuit and the (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

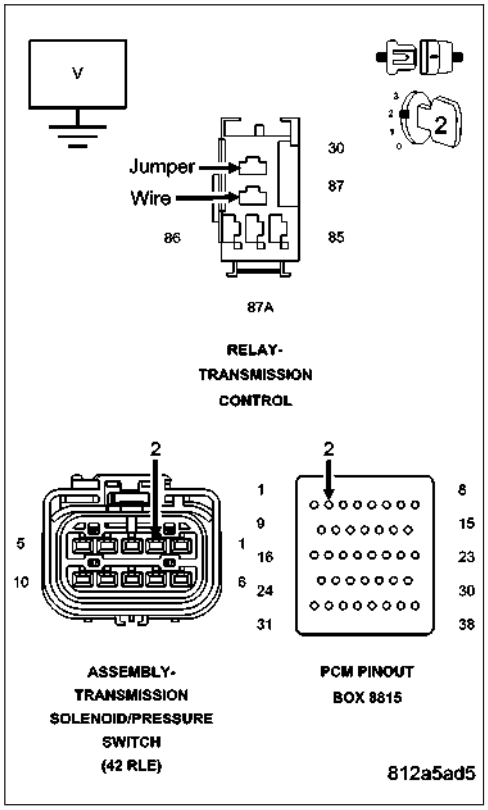
Ignition on, engine not running.

Measure the voltage of the (T59) UD Solenoid Control circuit.

Is the voltage above 0.5 volts?

Yes >> Repair the (T59) UD Solenoid Control circuit for a short to voltage.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 8



P0765-UD SOLENOID CIRCUIT (CONTINUED)

7. UD SOLENOID/PRESSURE SWITCH ASSEMBLY

If there are no possible causes remaining, view repair.

Repair

Replace the Transmission Solenoid/Pressure Switch Assembly per the Service Information.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

8. POWERTRAIN CONTROL MODULE

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

If there are no possible causes remaining, view repair.

Repair

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

9. INTERMITTENT WIRING AND CONNECTORS

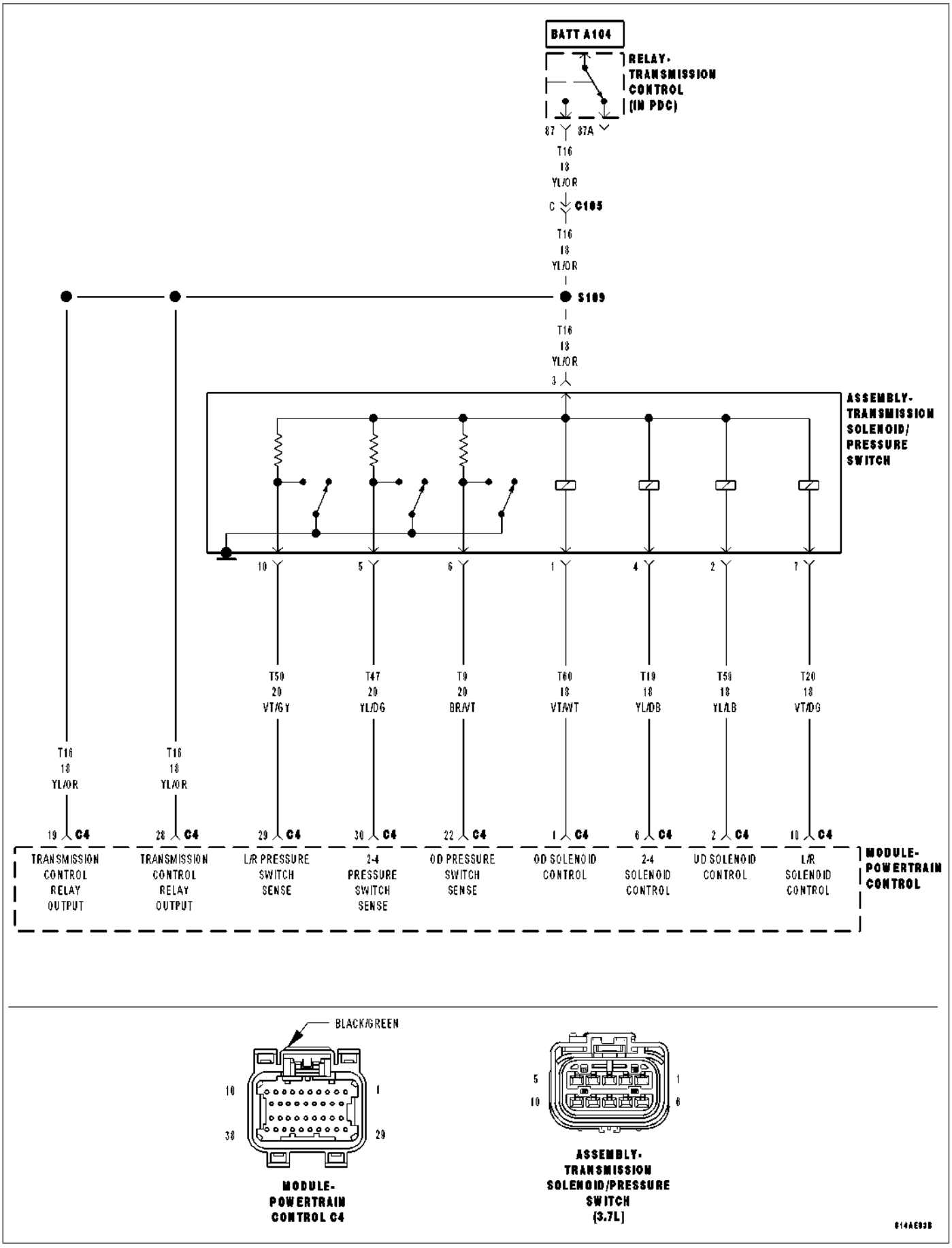
The conditions necessary to set the DTC are not present at this time.
Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.
Wiggle the wires while checking for shorted and open circuits.
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Were there any problems found?

Yes >> Repair as necessary.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0841-LR PRESSURE SWITCH RATIONALITY



P0841-LR PRESSURE SWITCH RATIONALITY (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Whenever the engine is running.
- **Set Condition:**
  The DTC is set if one of the pressure switches are open or closed at the wrong time in a given gear. If the problem is identified for 3 successive key starts, the transmission will go into Limp-in mode and the MIL will turn on after 10 seconds of vehicle operation.

Possible Causes
RELATED TRANSMISSION RELAY DTCS PRESENT
LOSS OF PRIME DTC PRESENT
(T50) L/R PRESSURE SWITCH SENSE CIRCUIT OPEN
(T50) L/R PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND
(T50) L/R PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
TRANSMISSION SOLENOID/PRESSURE SWITCH ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).

Theory of Operation

The Transmission system uses three pressure switches to monitor the fluid pressure in the LR, 2/4, and OD elements. The pressure switches are continuously monitored for the correct states in each gear. If a set condition is identified, 1st gear and torque converter lock-up (EMCC) will be inhibited. The vehicle will launch in 2nd gear and shift normally through the gears without allowing EMCC. If during the same key start, the set condition is no longer valid, the transmission will return to normal operation (1st and EMCC available). Limp-in will not occur unless DTC P0841 is accompanied by a code P0706 and the MIL will illuminate after 5 minutes of substituted operation.

PRESSURE SWITCH STATES

GEAR	L/R	2/4	OD
R	OP	OP	OP
P/N	CL	OP	OP
1st	CL	OP	OP
2nd	OP	CL	OP
D	OP	OP	CL
OD	OP	CL	CL

OP = OPEN

CL = CLOSED

P0841-LR PRESSURE SWITCH RATIONALITY (CONTINUED)

Diagnostic Test

1. DETERMINING IF RELATED TRANSMISSION RELAY DTCS ARE PRESENT

With the scan tool, read Transmission DTCs

Are there any Transmission Control Relay DTCs present also?

Yes >> Refer to the Transmission category and perform the appropriate diagnostic procedure. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK FOR LOSS OF PRIME DTC

With the scan tool, check for other Transmission DTCs.

Is the DTC P0944 present also?

Yes >> Refer to the Transmission category and perform the appropriate diagnostic procedure. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 3

---

3. CHECK TO SEE IF P0841 IS CURRENT

With the scan tool, view DTCs.

Is the status active for this DTC or is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 4

No >> Go To 10

---

4. PCM AND WIRING

Turn the ignition off to the lock position.

Remove the Starter Relay.

CAUTION: Removal of the Starter Relay is to prevent a Transmission NO RESPONSE condition and to disable the starter.

Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the Transmission Simulator, turn the Pressure Switch selector to L/R.

With the scan tool , monitor the L/R Pressure Switch state while pressing the Pressure Switch Test button on the Transmission Simulator.

Did the L/R Pressure Switch state change?

Yes >> Go To 8

No >> Go To 5

P0841-LR PRESSURE SWITCH RATIONALITY (CONTINUED)

5. (T50) L/R PRESSURE SWITCH SENSE CIRCUIT OPEN

Turn the ignition off to the lock position.

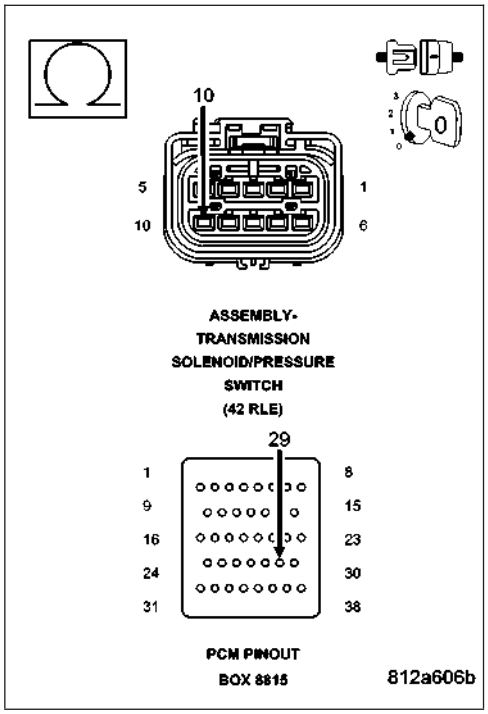
Disconnect the PCM C4 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

NOTE: Check connectors - Clean/repair as necessary.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (T50) L/R Pressure Switch Sense circuit from the appropriate terminal of special tool #8815 to the Transmission Solenoid/Pressure Switch Assembly harness connector.



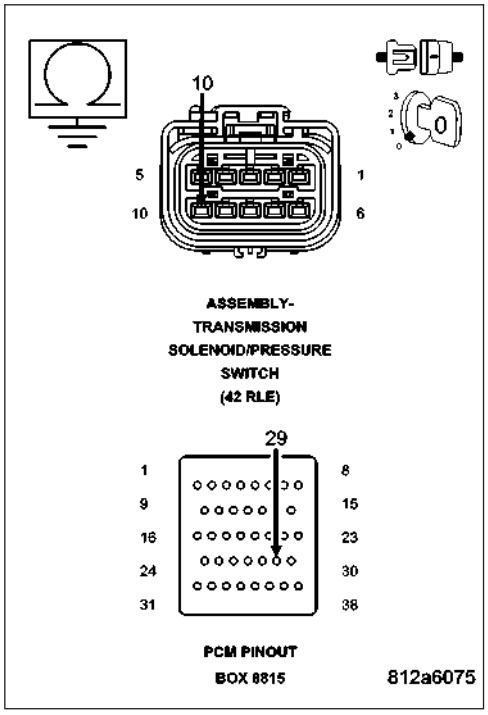
Is the resistance above 5.0 ohms?

Yes >> Repair the (T50) L/R Pressure Switch Sense circuit for an open.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 6

6. (T50) L/R PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T50) L/R Pressure Switch Sense circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (T50) L/R Pressure Switch Sense circuit for a short to ground.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 7

P0841-LR PRESSURE SWITCH RATIONALITY (CONTINUED)

7. (T50) L/R PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE

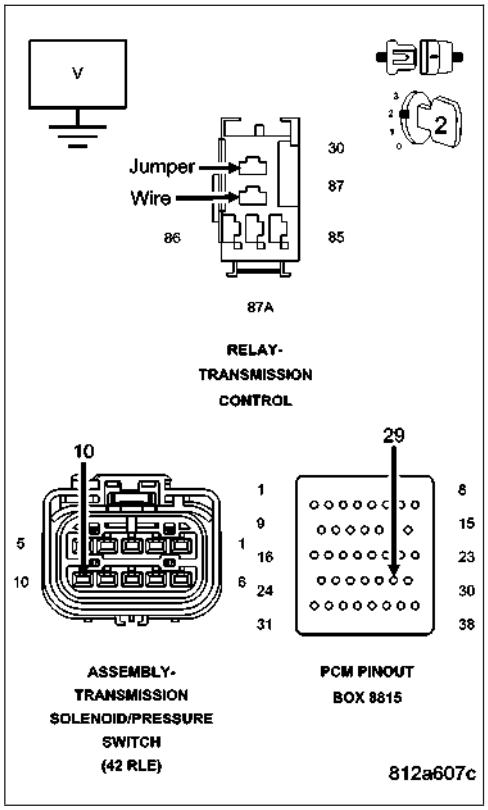
Remove the Transmission Control Relay.

NOTE: Check connectors - Clean/repair as necessary.
Connect a jumper wire between the (A104)Fused B+ circuit and (T16) Transmission Control Relay Output circuit.
Ignition on, engine not running.
Measure the voltage of the (T50) L/R Pressure Switch Sense circuit.

Is the voltage above 0.5 volts?

Yes >> Repair the (T50) L/R Pressure Switch Sense circuit for a short to voltage.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 9



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8. L/R PRESSURE SWITCH

If there are no possible causes remaining, view repair.

Repair

Replace the Transmission Solenoid/Pressure Switch Assembly per the Service Information.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

9. POWERTRAIN CONTROL MODULE

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

If there are no possible causes remaining, view repair.

Repair

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

P0841-LR PRESSURE SWITCH RATIONALITY (CONTINUED)

10. INTERMITTENT WIRING AND CONNECTORS

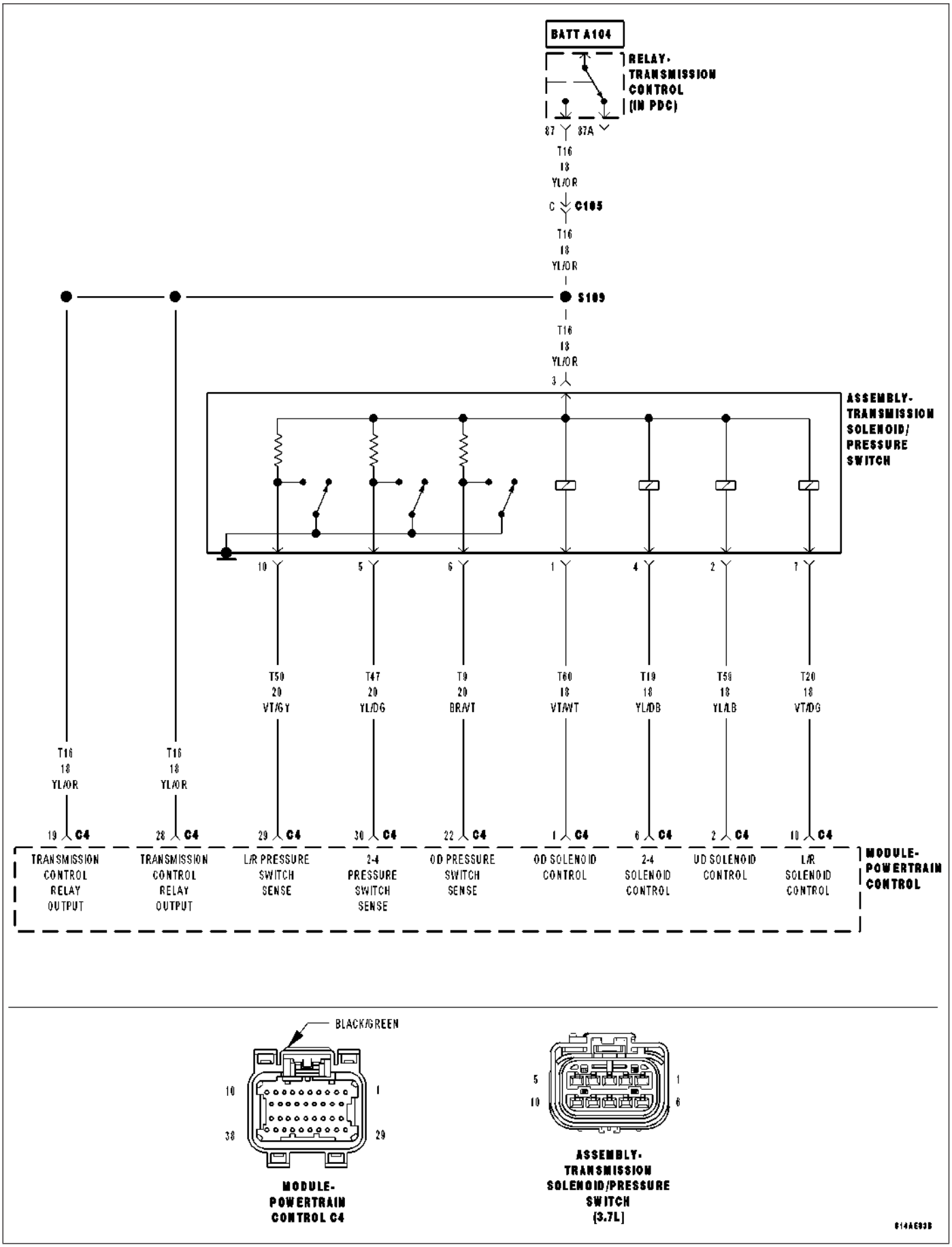
The conditions necessary to set the DTC are not present at this time.
Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.
Wiggle the wires while checking for shorted and open circuits.
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Were there any problems found?

Yes >> Repair as necessary.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0845-2/4 HYDRAULIC PRESSURE TEST



P0845-2/4 HYDRAULIC PRESSURE TEST (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  In any forward gear with engine speed above 1000 RPM, shortly after a shift and every minute thereafter.
- **Set Condition:**
  After a shift into a forward gear, with engine speed greater than 1000 RPM, the PCM momentarily turns on element pressure to the clutch circuits that don't have pressure to verify that the correct pressure switch closes. If the pressure switch does not close 2 times the DTC sets

Possible Causes
LOSS OF PRIME P0944 PRESENT
(T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
(T47) 2/4 PRESSURE SWITCH SENSE CIRCUIT OPEN
(T47) 2/4 PRESSURE SWITCH CIRCUIT SHORT TO GROUND
(T47) 2/4 PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
TRANSMISSION SOLENOID/PRESSURE SWITCH ASSEMBLY
INTERNAL TRANSMISSION
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).

Theory of Operation

Pressure switches are normally off or open (no pressure applied) and read high (+12 volts). When an element is applied, the corresponding pressure switch closes to ground (0 volts) or turns on. The controller tests the OD and 24 pressure switches when they are off (when the corresponding friction element is not applied) by briefly applying the OD and 24 elements which will cause the corresponding pressure switch to close. The test verifies that the switches are operational and that the switch will close when the corresponding element is applied. If a switch fails to respond, it is re-tested. The MIL illuminates and the transmission system defaults to Limp-in mode.

Diagnostic Test

1. CHECKING FOR LOSS OF PRIME DTC

With the scan tool, check for other Transmission DTCs.

Is the DTC P0944 present also?

Yes >> Refer to the Transmission category and perform the appropriate diagnostic procedure.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

P0845-2/4 HYDRAULIC PRESSURE TEST (CONTINUED)

2. CHECK FOR RELATED TRANSMISSION DTCS

With the scan tool, read Transmission DTCs.

Are any of the DTCs P0732, P0734 and/or P0846 present also?

Yes >> Replace the Transmission Solenoid/Pressure Switch Assembly per the Service Information. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 3

---

3. CHECK TO SEE IF DTC P0845 IS CURRENT

With the scan tool, view DTCs.

Is the status Active for this DTC or is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 4

No >> Go To 11

---

4. PCM AND WIRING

Turn the ignition off to the lock position.

Remove the Starter Relay.

CAUTION: Removal of the Starter Relay is to prevent a Transmission NO RESPONSE condition and to disable the starter.

Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the Transmission Simulator, turn the Pressure Switch selector switch to 2/4.

With the scan tool, monitor the UD Pressure Switch state while pressing the Pressure Switch Test button on the Transmission Simulator.

Wiggle the wires leading to the PCM while pressing and holding the Pressure Switch Test button.

Did the 2/4 Pressure Switch state change to closed and remain closed while wiggling the wires?

Yes >> Go To 5

No >> Go To 6

---

5. INTERNAL TRANSMISSION

If there are no possible causes remaining, view repair.

Repair

Disassemble and inspect the Valve Body per the Service Information and repair or replace as necessary. If no problems are found in the Valve Body, replace the Transmission Solenoid/Pressure Switch Assembly.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

P0845-2/4 HYDRAULIC PRESSURE TEST (CONTINUED)

6. (T47) 2/4 PRESSURE SWITCH SENSE CIRCUIT OPEN

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

NOTE: Check connectors - Clean/repair as necessary.

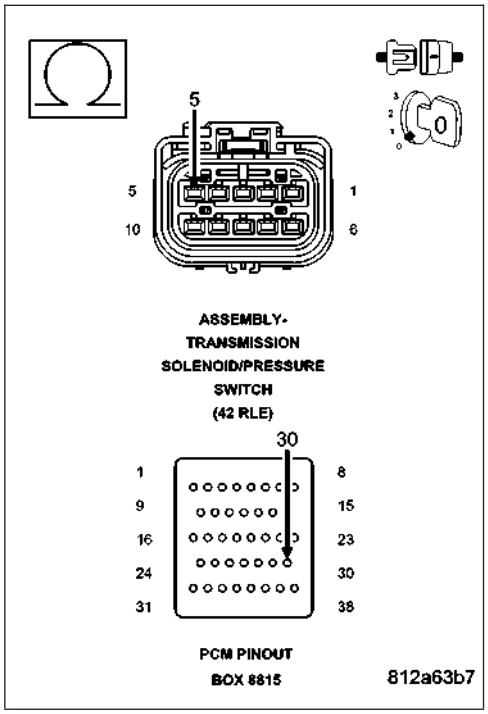
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (T47) 2/4 Pressure Switch Sense circuit from the appropriate terminal of special tool #8815 to the Transmission Solenoid/Pressure Switch Assembly harness connector.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T47) 2/4 Pressure Switch Sense circuit for an open.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 7



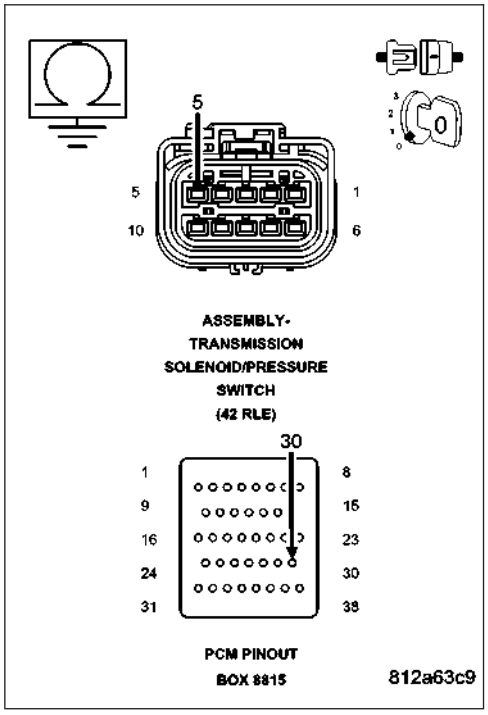
7. (T47) 2/4 PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T47) 2/4 Pressure Switch Sense circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (T47) 2/4 Pressure Switch Sense circuit for a short to ground.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 8



P0845-2/4 HYDRAULIC PRESSURE TEST (CONTINUED)

8. (T47) 2/4 PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE

Remove the Transmission Control Relay.

NOTE: Check connectors - Clean/repair as necessary.

Connect a jumper wire between the (A104) Fused B+ circuit and the (T16) Transmission Control Relay Output circuit.

Ignition on, engine not running.

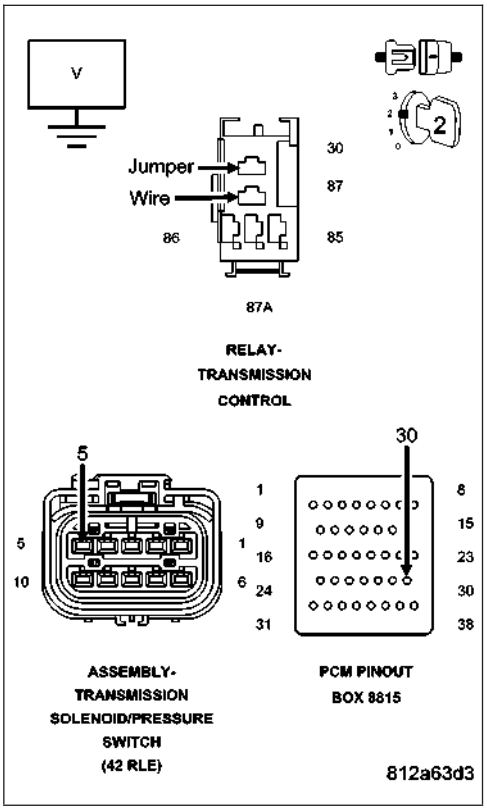
Measure the voltage of the (T47) 2/4 Pressure Switch Sense circuit.

Is the voltage above 0.5 volts?

Yes >> Repair the (T47) 2/4 Pressure Switch Sense circuit for a short to voltage.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 9



9. TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN

NOTE: The jumper wire must still be in place.

Using a 12-volt test light connected to ground, check (T16) Transmission Control Relay Output circuit in the Transmission Solenoid/Pressure Switch Assembly harness connector.

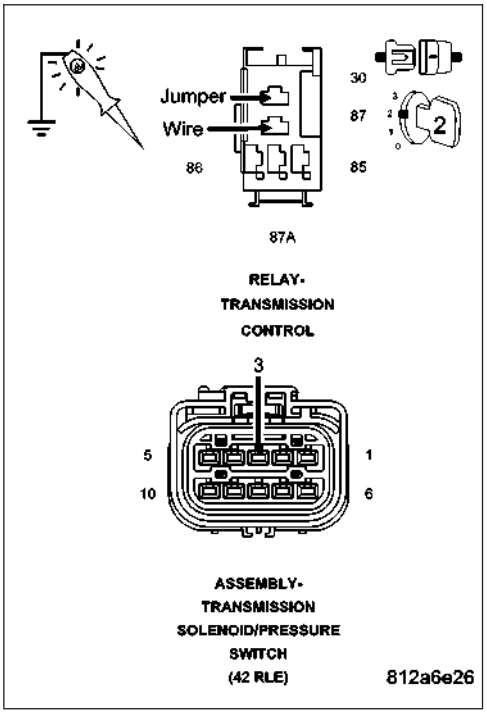
NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Go To 10

No >> Repair the Transmission Control Relay Output circuit for an open or high resistance. If the fuse is open make sure to check for a short to ground.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.



P0845-2/4 HYDRAULIC PRESSURE TEST (CONTINUED)

10. POWERTRAIN CONTROL MODULE

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

If there are no possible causes remaining, view repair.

Repair

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

11. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set the DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

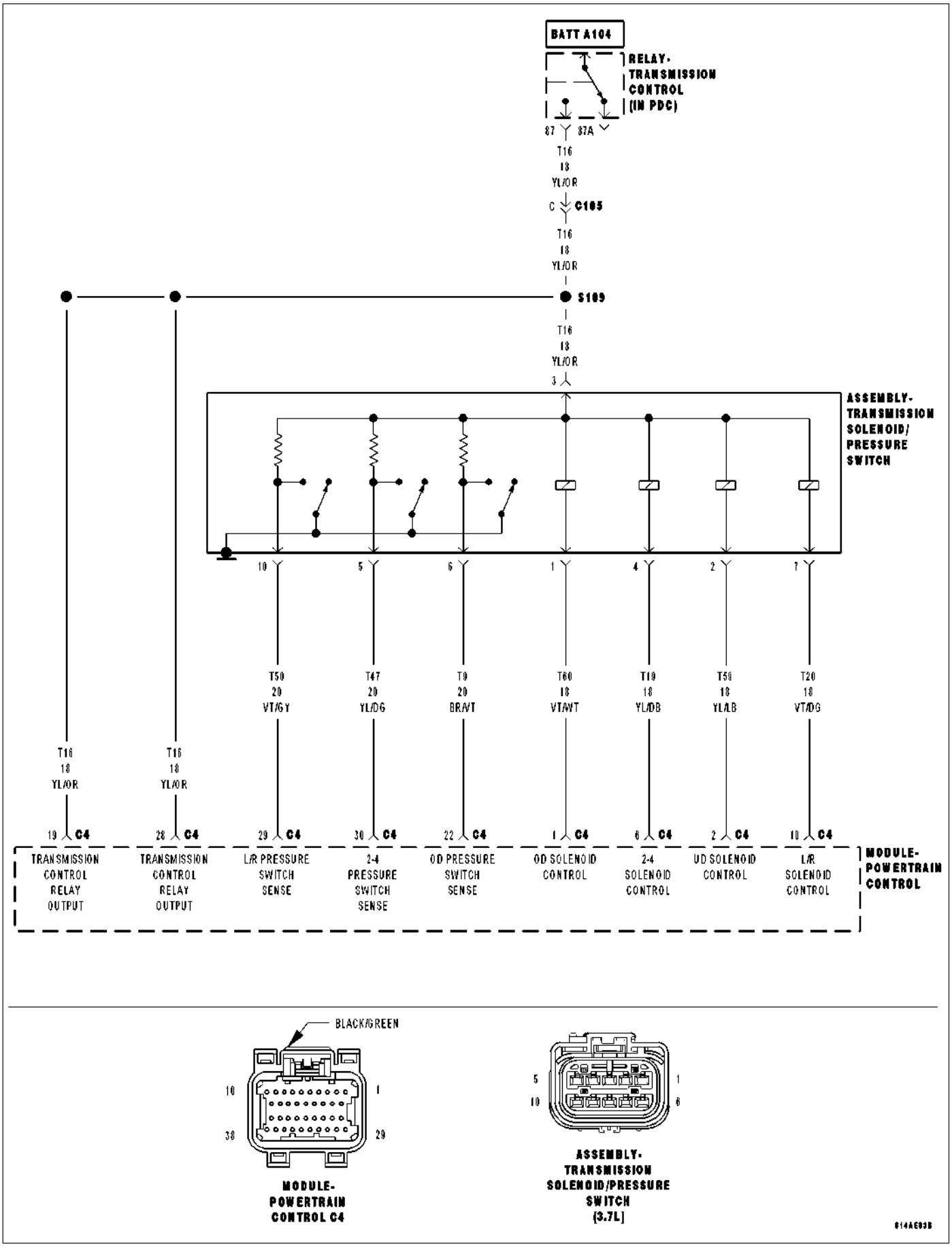
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Were there any problems found?

Yes >> Repair as necessary.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0846-2/4 PRESSURE SWITCH RATIONALITY



P0846-2/4 PRESSURE SWITCH RATIONALITY (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Whenever the engine is running.
- **Set Condition:**
  The DTC is set if one of the pressure switches are open or closed at the wrong time in a given gear. If the problem is identified for 3 successive key starts, the transmission will go into Limp-in mode and the MIL will turn on after 10 seconds of vehicle operation.

Possible Causes
RELATED TRANSMISSION RELAY DTCS PRESENT
LOSS OF PRIME DTC PRESENT
(T47) 2/4 PRESSURE SWITCH SENSE CIRCUIT OPEN
(T47) 2/4 PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND
(T47) 2/4 PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
TRANSMISSION SOLENOID/PRESSURE SWITCH ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).

Theory of Operation

The Transmission system uses three pressure switches to monitor the fluid pressure in the LR, 2/4, and OD elements. The pressure switches are continuously monitored for the correct states in each gear. The 2/4 pressure switch monitors the fluid pressure to the 2/4 clutch to confirm proper operation of the 2/4 solenoid. If the 2/4 pressure switch is identified as closed in P or N, the code will immediately be set and normal operation will be allowed for that given key start. If the problem is identified for 3 successive ignition cycles, the transmission will go into Limp-in mode.

PRESSURE SWITCH STATES

GEAR	L/R	2/4	OD
R	OP	OP	OP
P/N	CL	OP	OP
1st	CL	OP	OP
2nd	OP	CL	OP
D	OP	OP	CL
OD	OP	CL	CL

OP = OPEN

CL = CLOSED

P0846-2/4 PRESSURE SWITCH RATIONALITY (CONTINUED)

Diagnostic Test

1. DETERMINING IF RELATED TRANSMISSION RELAY DTCS ARE PRESENT

With the scan tool, read Transmission DTCs

Are there any Transmission Control Relay DTCs present also?

Yes >> Refer to the Transmission category and perform the appropriate symptom.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK FOR LOSS OF PRIME DTC

With the scan tool, check for other Transmission DTCs.

Is the DTC P0944 present also?

Yes >> Refer to the Transmission category and perform the appropriate diagnostic procedure.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 3

---

3. CHECK TO SEE IF P0846 IS CURRENT

With the scan tool, view DTCs.

Is the status Active for this DTC or is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 4

No >> Go To 10

---

4. PCM AND WIRING

Turn the ignition off to the lock position.

Remove the Starter Relay.

CAUTION: Removal of the Starter Relay is to prevent a Transmission NO RESPONSE condition and to disable the starter.

Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the Transmission Simulator, turn the Pressure Switch selector to 2/4.

With the scan tool , monitor the 2/4 Pressure Switch state while pressing the Pressure Switch Test button on the Transmission Simulator.

Did the 2/4 Pressure Switch state change?

Yes >> Go To 8

No >> Go To 5

P0846-2/4 PRESSURE SWITCH RATIONALITY (CONTINUED)

5. (T47) 2/4 PRESSURE SWITCH SENSE CIRCUIT OPEN

Turn the ignition off to the lock position.

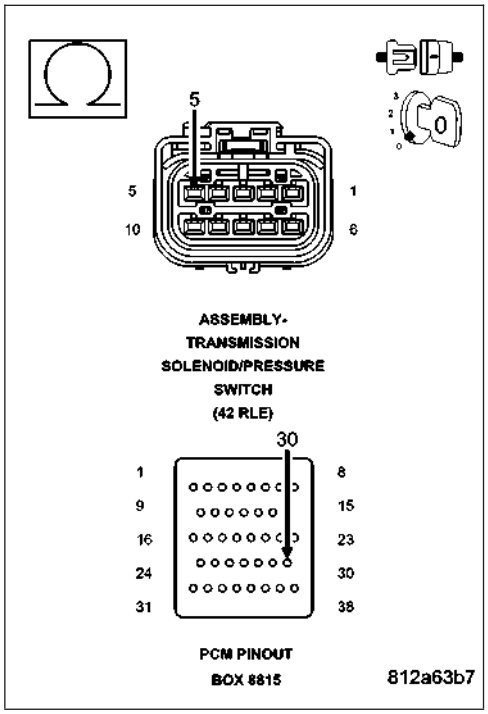
Disconnect the PCM C4 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

NOTE: Check connectors - Clean/repair as necessary.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (T47) 2/4 Pressure Switch Sense circuit from the appropriate terminal of special tool #8815 to the Transmission Solenoid/Pressure Switch Assembly harness connector.



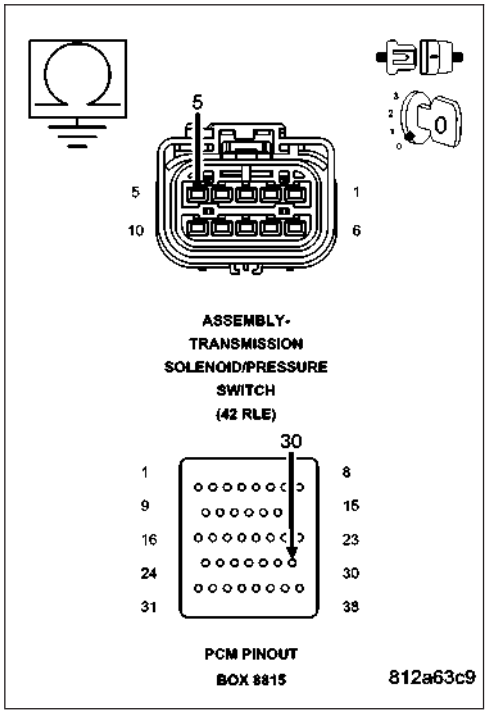
Is the resistance above 5.0 ohms?

Yes >> Repair the (T47) 2/4 Pressure Switch Sense circuit for an open.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 6

6. (T47) 2/4 PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T47) 2/4 Pressure Switch Sense circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (T47) 2/4 Pressure Switch Sense circuit for a short to ground.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 7

P0846-2/4 PRESSURE SWITCH RATIONALITY (CONTINUED)

7. (T47) 2/4 PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE

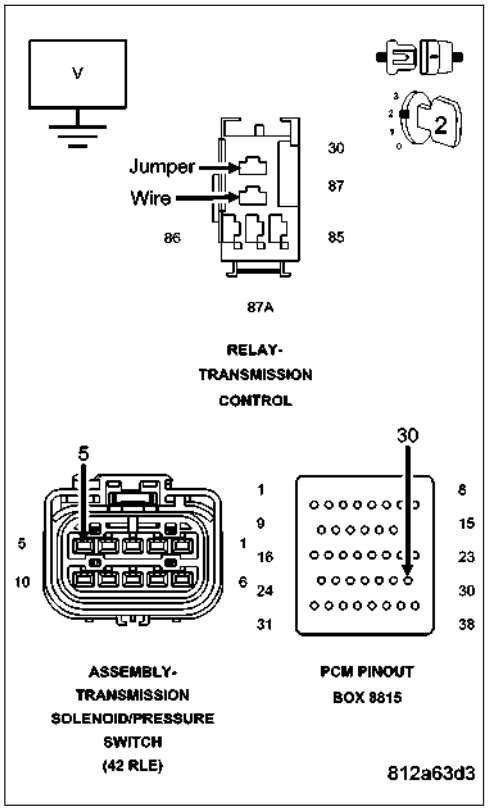
Remove the Transmission Control Relay.

NOTE: Check connectors - Clean/repair as necessary.
Connect a jumper wire between the (A104) Fused B+ circuit and (T16) Transmission Control Relay Output circuit.
Ignition on, engine not running.
Measure the voltage of the (T47) 2/4 Pressure Switch Sense circuit.

Is the voltage above 0.5 volts?

Yes >> Repair the (T47) 2/4 Pressure Switch Sense circuit for a short to voltage.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 9



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8. 2/4 PRESSURE SWITCH

If there are no possible causes remaining, view repair.

Repair

Replace the Transmission Solenoid/Pressure Switch Assembly per the Service Information.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

9. POWERTRAIN CONTROL MODULE

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

If there are no possible causes remaining, view repair.

Repair

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

P0846-2/4 PRESSURE SWITCH RATIONALITY (CONTINUED)

10. INTERMITTENT WIRING AND CONNECTORS

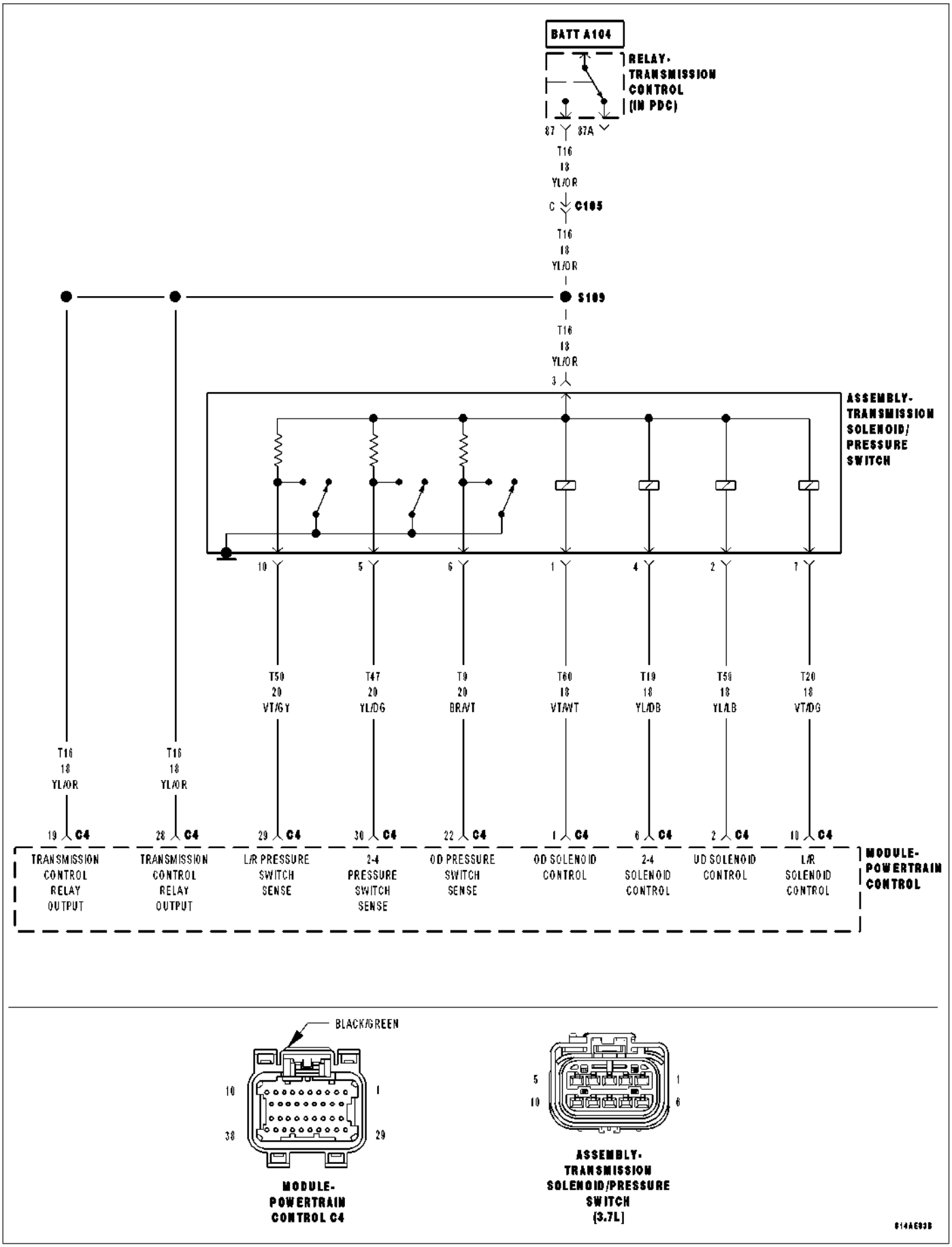
The conditions necessary to set the DTC are not present at this time.
Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.
Wiggle the wires while checking for shorted and open circuits.
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Were there any problems found?

Yes >> Repair as necessary.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0870-OD HYDRAULIC PRESSURE TEST



42RLE MINI SOL PRS CKTS

P0870-OD HYDRAULIC PRESSURE TEST (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  In any forward gear with engine speed above 1000 RPM, shortly after a shift and every minute thereafter.
- **Set Condition:**
  After a shift into a forward gear, with engine speed greater than 1000 RPM, the PCM momentarily turns on element pressure to the clutch circuits that don't have pressure to identify the correct pressure switch closes. If the pressure switch does not close 2 times the DTC sets.

Possible Causes
LOSS OF PRIME P0944 PRESENT
(T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
(T9) OD PRESSURE SWITCH SENSE CIRCUIT OPEN
(T9) OD PRESSURE SWITCH CIRCUIT SHORT TO GROUND
(T9) OD PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
TRANSMISSION SOLENOID/PRESSURE SWITCH ASSEMBLY
INTERNAL TRANSMISSION
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).

Theory of Operation

Pressure switches are normally off or open (no pressure applied) and read high (+12 volts). When an element is applied, the corresponding pressure switch closes to ground (0 volts) or turns on. The controller tests the OD and 2/4 pressure switches when they are off (when the corresponding friction element is not applied) by briefly applying the OD and 2/4 elements which will cause the corresponding pressure switch to close. The test verifies that the switches are operational and that the switch will close when the corresponding element is applied. If a switch fails to respond, it is re-tested. The MIL illuminates and the transmission system defaults to Limp-in mode.

Diagnostic Test

1. CHECKING FOR LOSS OF PRIME DTC

With the scan tool, check for other Transmission DTCs.

Is the DTC P0944 present also?

Yes >> Refer to the Transmission category and perform the appropriate diagnostic procedure.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

P0870-OD HYDRAULIC PRESSURE TEST (CONTINUED)

2. CHECK FOR RELATED TRANSMISSION DTCS

With the scan tool, read Transmission DTCs.

Are any of the DTCs P0732, P0734 and/or P0846 present also?

Yes >> Replace the Transmission Solenoid/Pressure Switch Assembly per the Service Information. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 3

---

3. CHECK TO SEE IF DTC P0870 IS CURRENT

With the scan tool, view DTCs.

Is the status Active for this DTC or is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 4

No >> Go To 11

---

4. PCM AND WIRING

Turn the ignition off to the lock position.

Remove the Starter Relay.

CAUTION: Removal of the Starter Relay is to prevent a Transmission NO RESPONSE condition and to disable the starter.

Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the Transmission Simulator, turn the Pressure Switch selector switch to OD.

With the scan tool, monitor the UD Pressure Switch state while pressing the Pressure Switch Test button on the Transmission Simulator.

Wiggle the wires leading to the PCM while pressing and holding the Pressure Switch Test button.

Did the OD Pressure Switch state change to closed and remain closed while wiggling the wires?

Yes >> Go To 5

No >> Go To 6

---

5. INTERNAL TRANSMISSION

If there are no possible causes remaining, view repair.

Repair

Disassemble and inspect the Valve Body per the Service Information and repair or replace as necessary. If no problems are found in the Valve Body, replace the Transmission Solenoid/Pressure Switch Assembly.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

P0870-OD HYDRAULIC PRESSURE TEST (CONTINUED)

6. (T9) OD PRESSURE SWITCH SENSE CIRCUIT OPEN

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

NOTE: Check connectors - Clean/repair as necessary.

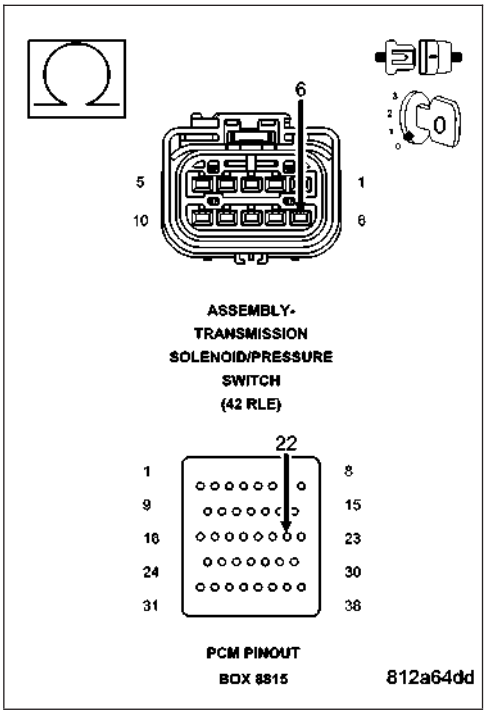
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (T9) OD Pressure Switch Sense circuit from the appropriate terminal of special tool #8815 to the Transmission Solenoid/Pressure Switch Assembly harness connector.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T9) OD Pressure Switch Sense circuit for an open.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 7



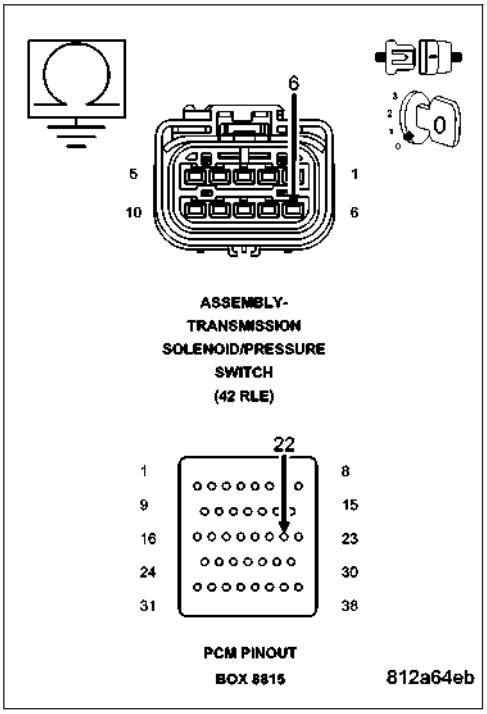
7. (T9) OD PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T9) OD Pressure Switch Sense circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (T9) OD Pressure Switch Sense circuit for a short to ground.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 8



P0870-OD HYDRAULIC PRESSURE TEST (CONTINUED)

8. (T9) OD PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE

Remove the Transmission Control Relay.

NOTE: Check connectors - Clean/repair as necessary.

Connect a jumper wire between the (A104) Fused B+ circuit and the (T16) Transmission Control Relay Output circuit.

Ignition on, engine not running.

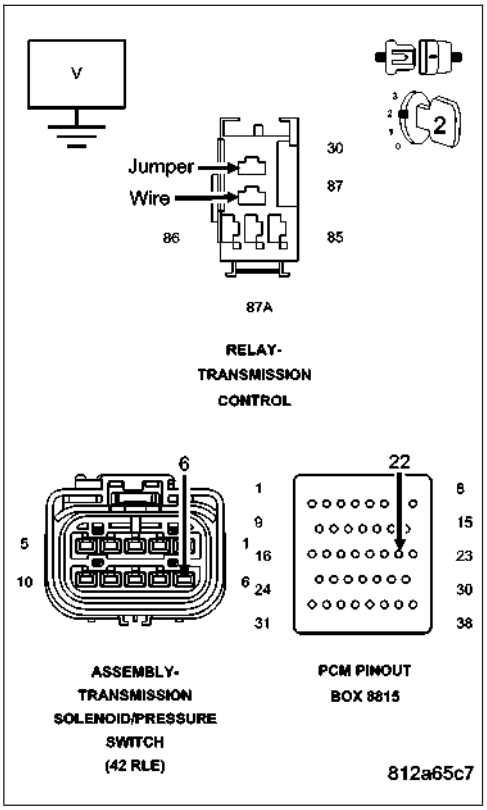
Measure the voltage of the (T9) OD Pressure Switch Sense circuit.

Is the voltage above 0.5 volts?

Yes >> Repair the (T9) OD Pressure Switch Sense circuit for a short to voltage.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 9



9. (T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN

NOTE: The jumper wire must still be in place.

Using a 12-volt test light connected to ground, check (T16) Transmission Control Relay Output circuit in the Transmission Solenoid/Pressure Switch Assembly harness connector.

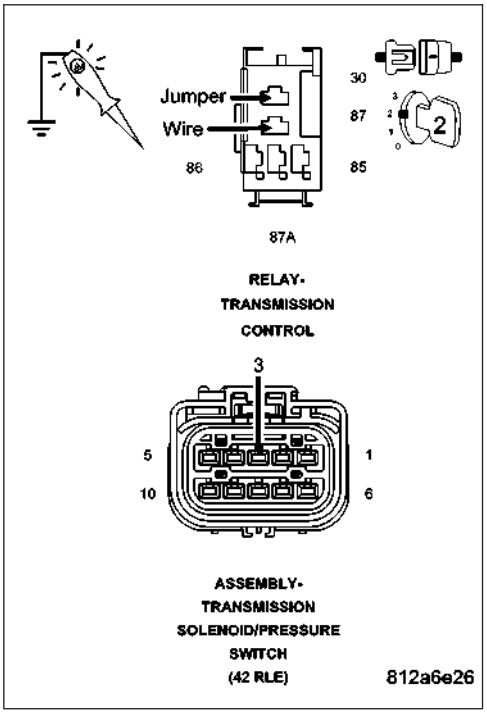
NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Go To 10

No >> Repair the (T16) Transmission Control Relay Output circuit for an open. If the fuse is open make sure to check for a short to ground.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.



P0870-OD HYDRAULIC PRESSURE TEST (CONTINUED)

10. POWERTRAIN CONTROL MODULE

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

If there are no possible causes remaining, view repair.

Repair

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

11. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set the DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

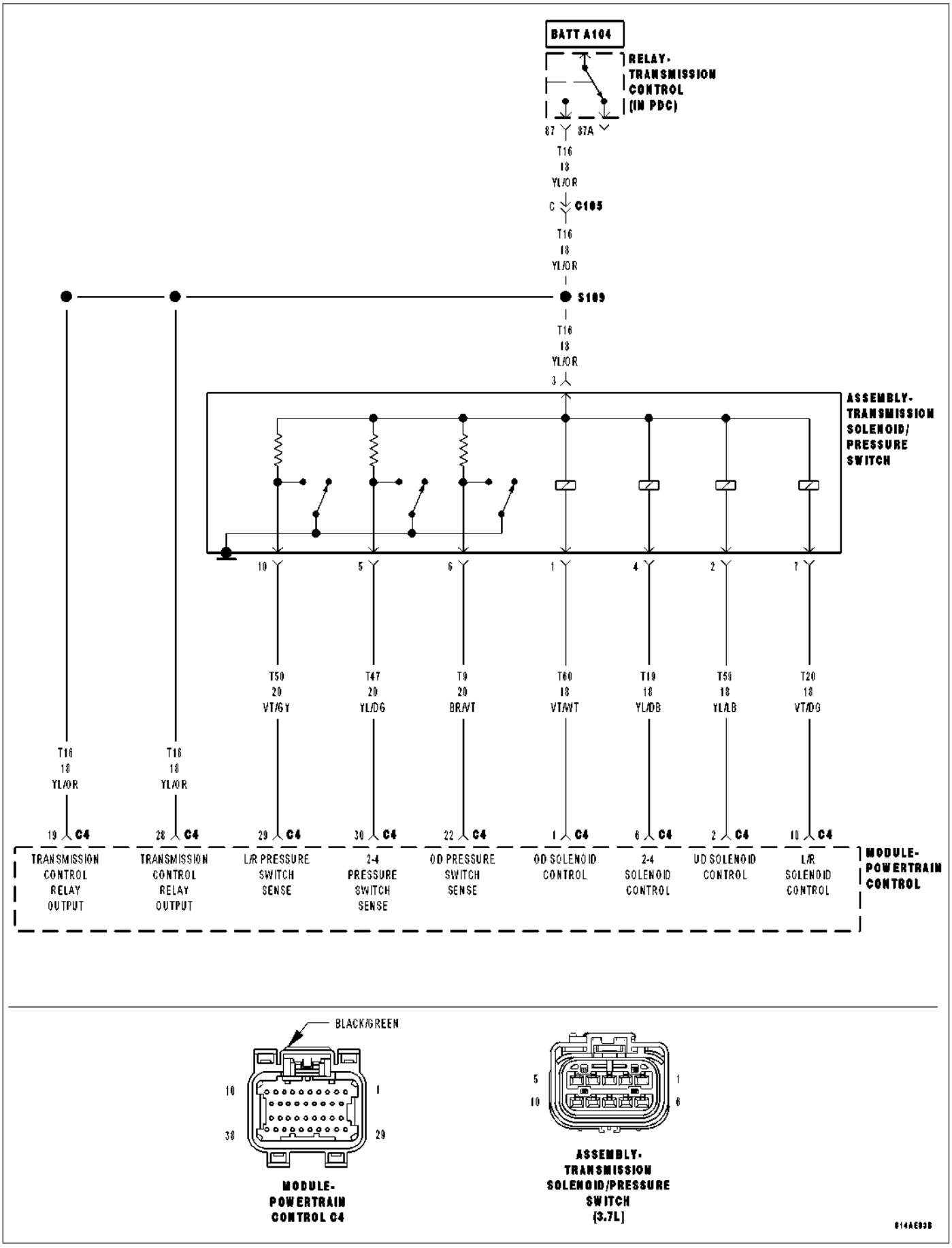
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Were there any problems found?

Yes >> Repair as necessary.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0871-OD PRESSURE SWITCH RATIONALITY



P0871-OD PRESSURE SWITCH RATIONALITY (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Whenever the engine is running.
- **Set Condition:**
  The DTC is set if one of the pressure switches are open or closed at the wrong time in a given gear. If the problem is identified for 3 successive key starts, the transmission will go into Limp-in mode and the MIL will turn on after 10 seconds of vehicle operation.

Possible Causes
RELATED TRANSMISSION RELAY DTCS PRESENT
LOSS OF PRIME DTC PRESENT
(T9) OD PRESSURE SWITCH SENSE CIRCUIT OPEN
(T9) OD PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND
(T9) OD PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
TRANSMISSION SOLENOID/PRESSURE SWITCH ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).

Theory of Operation

The Transmission system uses three pressure switches to monitor the fluid pressure in the LR, 2/4, and OD elements. The pressure switches are continuously monitored for the correct states in each gear. Normal operation will be experienced if no other codes are present. Transmission Control System will ignore the code. Limp-in condition will only occur if DTC P0871 is present with a DTC P0706.

PRESSURE SWITCH STATES

GEAR	L/R	2/4	OD
R	OP	OP	OP
P/N	CL	OP	OP
1st	CL	OP	OP
2nd	OP	CL	OP
D	OP	OP	CL
OD	OP	CL	CL

OP = OPEN

CL = CLOSED

P0871-OD PRESSURE SWITCH RATIONALITY (CONTINUED)

Diagnostic Test

1. DETERMINING IF RELATED TRANSMISSION RELAY DTCS ARE PRESENT

With the scan tool, read Transmission DTCs

Are there any Transmission Control Relay DTCs present also?

Yes >> Refer to the Transmission category and perform the appropriate diagnostic procedure. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK FOR LOSS OF PRIME DTC

With the scan tool, check for other Transmission DTCs.

Is the DTC P0944 present also?

Yes >> Refer to the Transmission category and perform the appropriate diagnostic procedure. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 3

---

3. CHECK TO SEE IF P0841 IS CURRENT

With the scan tool, view DTCs.

Is the status Active for this DTC or is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 4

No >> Go To 10

---

4. PCM AND WIRING

Turn the ignition off to the lock position.

Remove the Starter Relay.

CAUTION: Removal of the Starter Relay is to prevent a Transmission NO RESPONSE condition and to disable the starter.

Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the Transmission Simulator, turn the Pressure Switch selector to OD.

With the scan tool , monitor the OD Pressure Switch state while pressing the Pressure Switch Test button on the Transmission Simulator.

Did the OD Pressure Switch state change?

Yes >> Go To 8

No >> Go To 5

P0871-OD PRESSURE SWITCH RATIONALITY (CONTINUED)

5. (T9) OD PRESSURE SWITCH SENSE CIRCUIT OPEN

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

NOTE: Check connectors - Clean/repair as necessary.

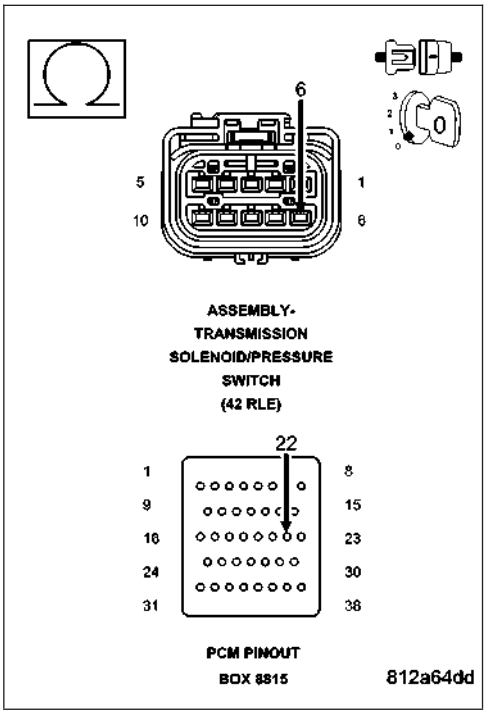
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (T9) OD Pressure Switch Sense circuit from the appropriate terminal of special tool #8815 to the Transmission Solenoid/Pressure Switch Assembly harness connector.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T9) OD Pressure Switch Sense circuit for an open.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 6



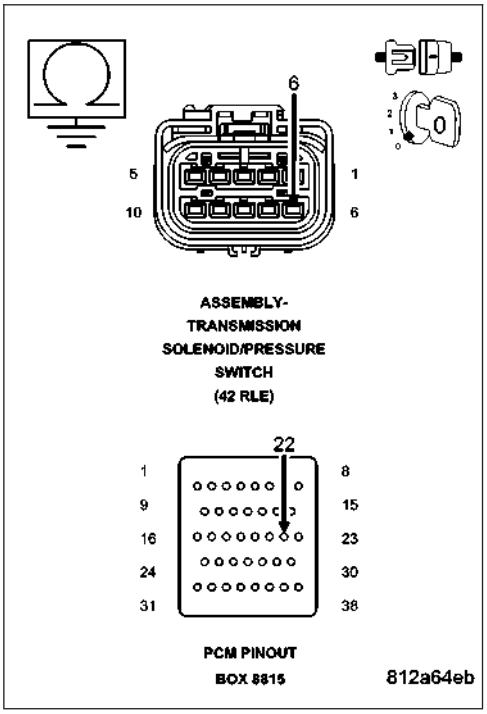
6. (T9) OD PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T9) OD Pressure Switch Sense circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (T9) OD Pressure Switch Sense circuit for a short to ground.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 7



P0871-OD PRESSURE SWITCH RATIONALITY (CONTINUED)

7. (T9) OD PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE

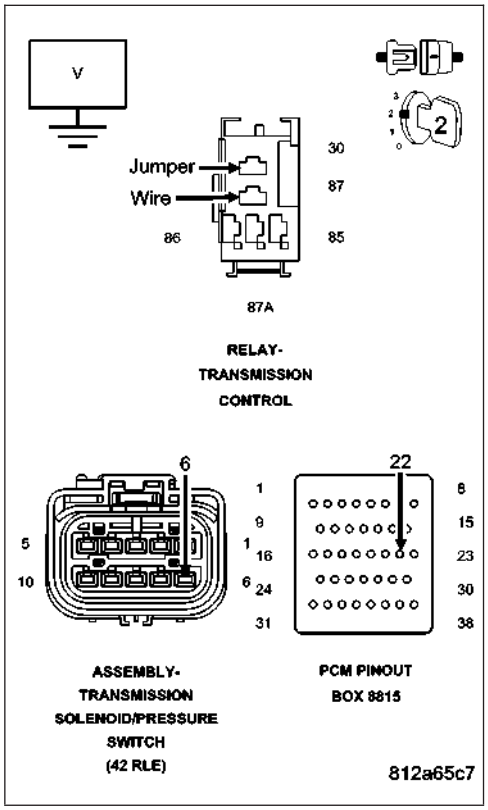
Remove the Transmission Control Relay.

NOTE: Check connectors - Clean/repair as necessary.
Connect a jumper wire between the (A104) Fused B+ circuit and (T16) Transmission Control Relay Output circuit.
Ignition on, engine not running.
Measure the voltage of the (T9) OD Pressure Switch Sense circuit.

Is the voltage above 0.5 volts?

Yes >> Repair the (T9) OD Pressure Switch Sense circuit for a short to voltage.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 9



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8. OD PRESSURE SWITCH

If there are no possible causes remaining, view repair.

Repair

Replace the Transmission Solenoid/Pressure Switch Assembly per the Service Information.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

9. POWERTRAIN CONTROL MODULE

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

If there are no possible causes remaining, view repair.

Repair

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

P0871-OD PRESSURE SWITCH RATIONALITY (CONTINUED)

10. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set the DTC are not present at this time.
Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.
Wiggle the wires while checking for shorted and open circuits.
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Were there any problems found?

Yes >> Repair as necessary.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0884-POWER UP AT SPEED

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  One time after each controller reset. Note: the Transmission Control Module is integrated with Powertrain Control Module. The Transmission Control Module has separate powers and grounds specifically to its portion of the PCM.
- **Set Condition:**
  This DTC will set if the PCM powers up and senses the vehicle in a valid forward gear (no PRNDL DTCs) with a output speed above 800 RPM, approximately 32Km/h or 20 MPH.

Possible Causes
INTERMITTENT POWER AND GROUND CIRCUITS

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).

Theory of Operation

If a vehicle loses power to the PCM, the vehicle will go to the 2nd gear mode since there is no power available to control the transmission solenoids. However if power is restored, the PCM will power-up and normal operation will be restored. This DTC identifies that power to the PCM was restored when the gear selector was in a ″Drive″ position while the vehicle was moving at speeds above 32 Km/h (20 MPH). If a customer shifts to Neutral and cycles the ignition key and quickly shifts to ″Drive″ while moving before the PCM comes out of its START ROUTINE, the DTC can be set. Therefore it is critical that this DTC diagnosis repair procedure should only be used if the vehicle is experiencing intermittent 2nd gear operation and subsequently a return to normal operation during normal driving. The transmission will not be placed in Limp-in. This is an informational DTC to be used when attempting to diagnose an intermittent 2nd gear operation and subsequent return to normal transmission operation.

Diagnostic Test

1. CHECK THE POWER AND GROUND CIRCUITS

This DTC is set when the PCM is initialized while the vehicle is moving in a valid forward gear. This is usually caused by a momentary loss of power to the Transmission portion of the PCM.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

NOTE: Due to the integration of the Powertrain and Transmission Control Modules, the transmission part of the PCM has its own specific power and ground circuits.

Check all of the Fused B+, Fused Ignition Switch Output, and Ground circuits related to the PCM for an intermittent open or short to ground.

Perform a wiggle test on all wiring and connectors pertaining to the PCM while looking for shorted or open circuits.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

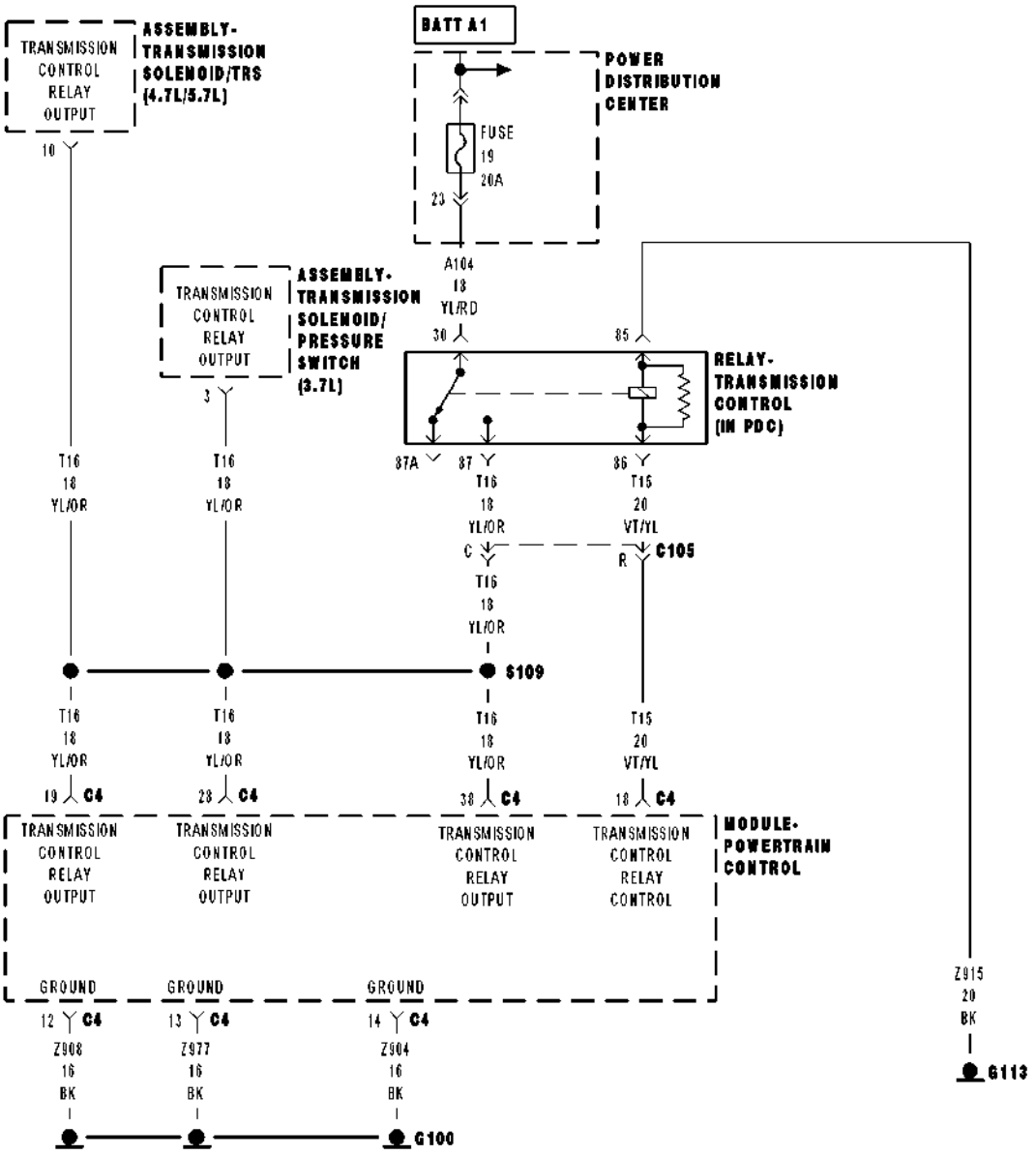
If there are no possible causes remaining, view repair.

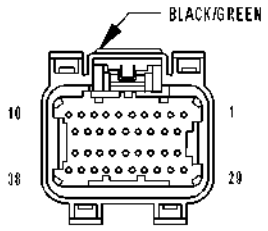
Repair

Repair as necessary.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

P0888-TRANSMISSION RELAY ALWAYS OFF





MODULE-POWERTRAIN CONTROL C4

814AE91E

P0888-TRANSMISSION RELAY ALWAYS OFF (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  This DTC is set when the Transmission Control Relay output circuit voltage at the Powertrain Control Module is less than 3 volts when the PCM is energizing the relay. Note: Due to the integration of the Powertrain and Transmission Control Modules, the transmission part of the PCM has its own specific power and ground circuits.

Possible Causes
(A104) FUSED B+ CIRCUIT OPEN
(T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
(T15) TRANSMISSION CONTROL RELAY CONTROL CIRCUIT OPEN
(Z915) TRANSMISSION CONTROL RELAY GROUND CIRCUIT OPEN
(T15) TRANSMISSION CONTROL RELAY CONTROL CIRCUIT SHORT TO GROUND
(T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT SHORT TO GROUND
TRANSMISSION CONTROL RELAY
TRANSMISSION SOLENOID/PRESSURE SWITCH ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).

Theory of Operation

The transmission control relay is used to supply power to the solenoid pack when the transmission is in normal operating mode. When the relay is off, no power is supplied to the solenoid pack and the transmission is in Limp-in mode. The relay output is fed back to the PCM. It is referred to as the Trans Relay Output circuit or switched battery. After a controller reset (ignition key turned to the run position or after cranking engine), the controller energizes the relay. Prior to this, the PCM verifies that the contacts are open by checking for no voltage at the transmission control relay outputs (switched battery) terminals. After the relay is energized, the PCM monitors the terminals to verify that the voltage is greater than 3 volts. The MIL illuminates and the transmission will be placed in Limp-in.

Diagnostic Test

1. CHECK TO SEE IF DTC P0888 IS CURRENT

With the scan tool, view DTCs.

Is the status Active for this DTC or is the STARTS SINCE SET counter equal to 0?

Yes >> Go To 2

No >> Go To 12

P0888-TRANSMISSION RELAY ALWAYS OFF (CONTINUED)

2. CHECK THE (A104) FUSED B+ CIRCUIT

Turn the ignition off to the lock position.

Remove the Transmission Control Relay.

NOTE: Check connectors - Clean/repair as necessary.

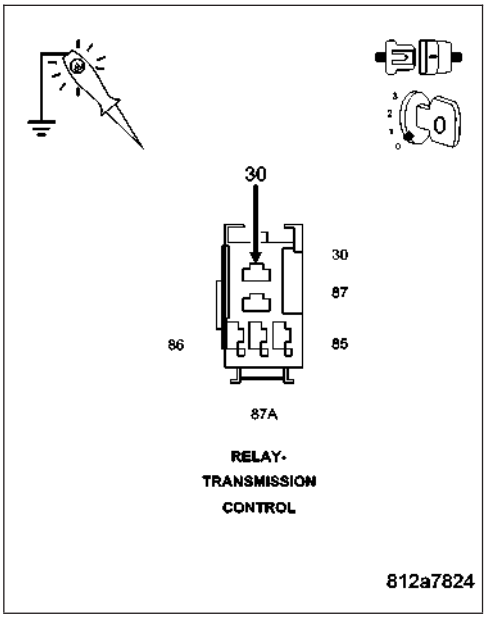
Using a 12-volt test light connected to ground, check the (A104) Fused B+ circuit in the Transmission Control Relay connector.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Go To 3

No >> Go To 9



3. (T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN

Connect a jumper wire between the (A104) Fused B+ circuit and the (T16) Transmission Control Relay Output circuits at the Transmission Control Relay connector.

Ignition on, engine not running.

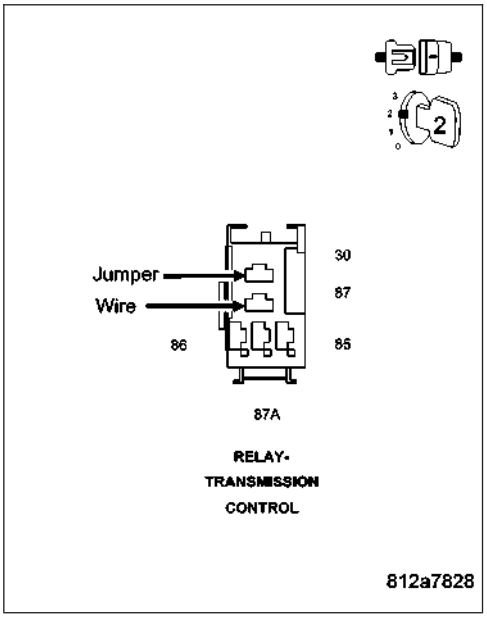
With the scan tool, read the Transmission Switched Battery voltage.

Is the Switched Battery voltage equal to battery voltage?

Yes >> Go To 4

No >> Repair the (T16) Transmission Control Relay Output circuits for an open or high resistance. Note: There are multiple Transmission Control Relay Output circuits.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.



P0888-TRANSMISSION RELAY ALWAYS OFF (CONTINUED)

4. TRANSMISSION CONTROL RELAY

Turn the ignition off to the lock position.
Install a substitute Relay in place of the Transmission Control Relay.
Ignition on, engine not running.
With the scan tool, read the Transmission Switched Battery voltage.

Is the Switched Battery voltage equal to battery voltage?

Yes >> Replace the Transmission Control Relay.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5

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5. (Z915) TRANSMISSION CONTROL RELAY GROUND CIRCUIT OPEN

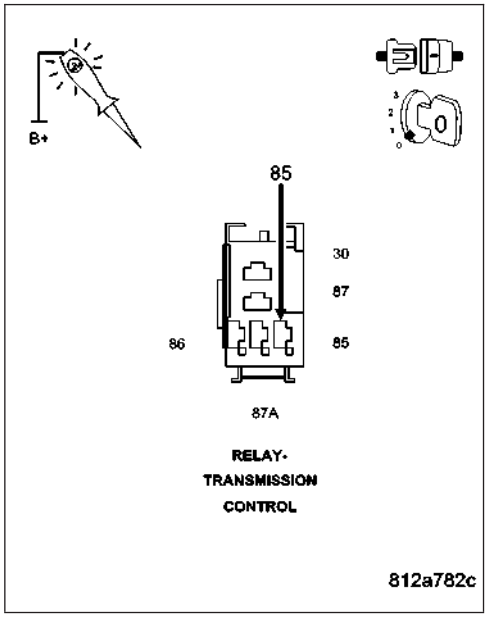
Using a 12-volt test light connected to 12-volts, check the (Z915) Transmission Control Relay Ground circuit.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Go To 6

No >> Repair the (Z915) Transmission Control Relay Ground circuit for an open.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.



P0888-TRANSMISSION RELAY ALWAYS OFF (CONTINUED)

6. (T15) TRANSMISSION CONTROL RELAY CONTROL CIRCUIT OPEN

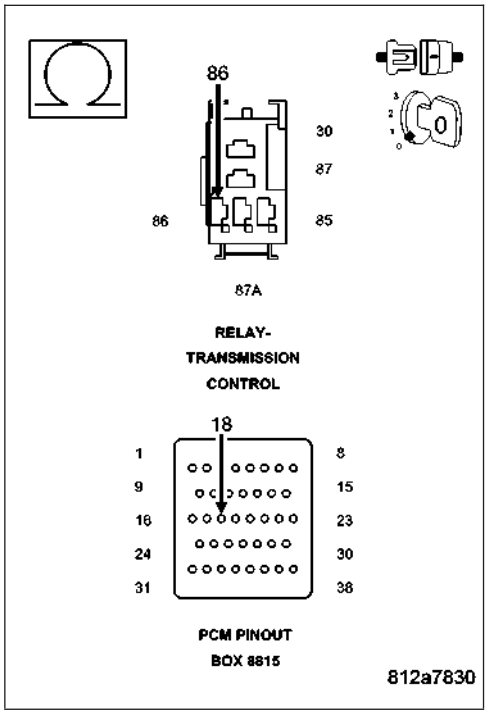
Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

NOTE: Check connectors - Clean/repair as necessary.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (T15) Transmission Control Relay Control circuit between the Transmission Control Relay connector and the appropriate terminal of special tool #8815.



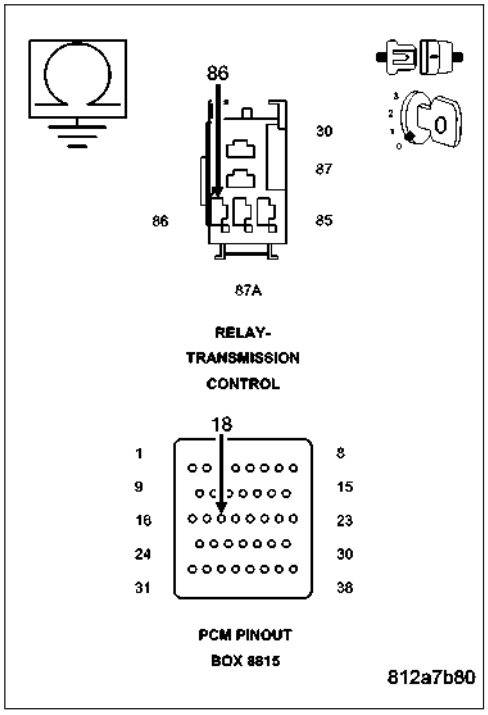
Is the resistance above 5.0 ohms?

Yes >> Repair the (T15) Transmission Control Relay Control circuit for an open.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 7

7. (T15) TRANSMISSION CONTROL RELAY CONTROL CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T15) Transmission Control Relay Control circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (T15) Transmission Control Relay Control circuit for a short to ground.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 8

P0888-TRANSMISSION RELAY ALWAYS OFF (CONTINUED)

8. POWERTRAIN CONTROL MODULE

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

If there are no possible causes remaining, view repair.

Repair

Replace the Powertrain Control Module per the Service Information. With the scan tool PERFORM QUICK LEARN.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

9. OPEN FUSE

Turn the ignition off to the lock position.

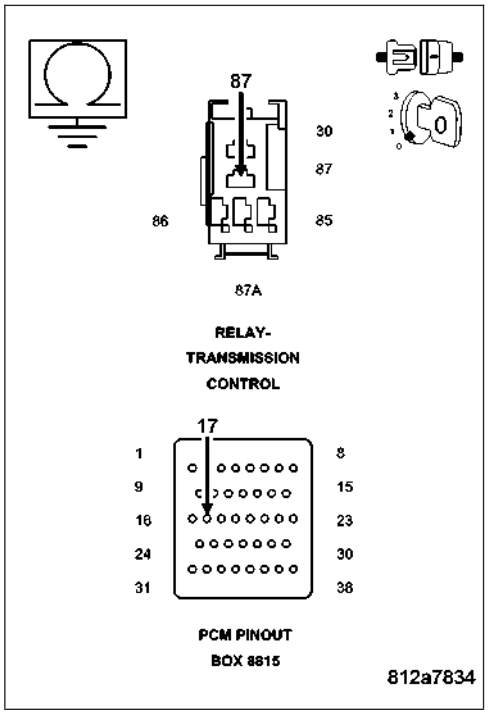
Remove the Transmission Control Relay.

Disconnect the PCM C4 harness connectors.

NOTE: Check connectors - Clean/repair as necessary.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance between ground and the (T16) Transmission Control Relay Output circuit.



Is the resistance below 5.0 ohms?

Yes >> Go To 10

No >> Repair the Fused B+ circuit for an open.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

P0888-TRANSMISSION RELAY ALWAYS OFF (CONTINUED)

10. (T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT SHORT TO GROUND

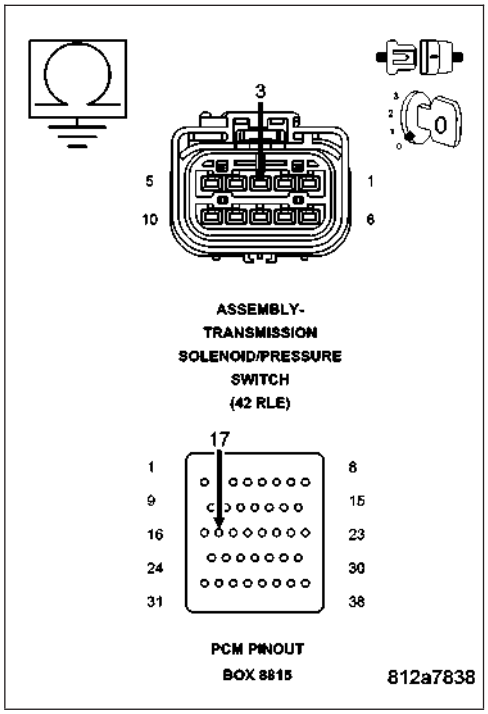
Disconnect the Transmission Solenoid/Pressure Switch harness connector.

NOTE: Check connectors - Clean/repair as necessary.
Measure the resistance between ground and the (T16) Transmission Control Relay Output circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (T16) Transmission Control Relay Output circuit for a short to ground.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 11



11. TRANSMISSION SOLENOID/PRESSURE SWITCH ASSEMBLY

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

If there are no possible causes remaining, view repair.

Repair

Replace the Transmission Solenoid/Pressure Switch Assembly per the Service Information.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

12. INTERMITTENT WIRING AND CONNECTORS

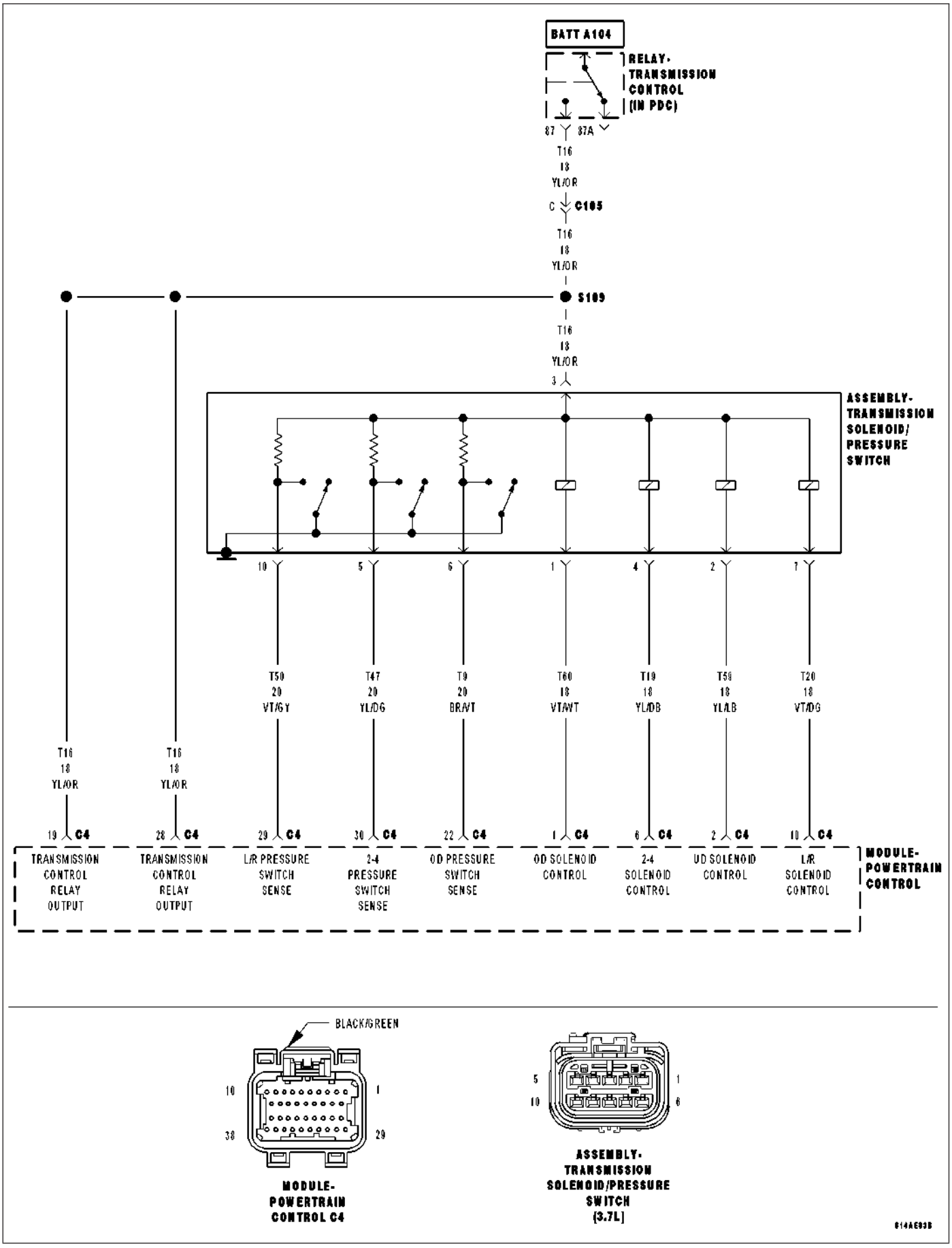
The conditions necessary to set the DTC are not present at this time.
Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.
Wiggle the wiring and connectors while checking for shorted and open circuits.
With the scan tool, check the EATX EVENT DATA to help identify the conditions in which the DTC was set.

Were there any problems found?

Yes >> Repair as necessary.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0890-SWITCHED BATTERY



P0890-SWITCHED BATTERY (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  One time after a reset (ignition key turned to the RUN position or after cranking engine).
- **Set Condition:**
  A fault is set if voltage greater than 4.5 volts is detected for 7 msec on any of the pressure switch circuits before the relay is energized. The transmission is placed in Limp-In. The MIL is on after 10 seconds. of vehicle operation.

Possible Causes
(T47) 2/4 PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
(T50) L/R PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
(T9) OD PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).

Theory of Operation

The transmission relay is used to supply power to the solenoid pack when in normal operating mode and to turn off power to produce transmission ″limp-in″ mode. The relay output (which supplies power to the solenoid pack) is fed back to the controller. It is referred to as SWITCHED BATTERY. After a controller reset (ignition key turned to the RUN position or after cranking engine), the controller verifies that the relay contacts are open by checking for no voltage on Switched battery line (transmission control relay output) before the relay is energized. After switched battery is verified for no voltage, the voltage of each of the solenoid pack pressure switches is also checked. Since the solenoid pack is not powered up, there should be no voltage on any of the pressure switches.

Diagnostic Test

1. CHECK TO SEE IF DTC P0890 IS PRESENT

With the scan tool, view DTCs.

Is the status Active for this DTC or is the STARTS SINCE SET counter set at 0?

Yes >> Go To 2

No >> Go To 6

P0890-SWITCHED BATTERY (CONTINUED)

2. (T9) OD PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Remove the Transmission Control Relay.

NOTE: Check connectors - Clean/repair as necessary.

Connect a jumper wire between the (A104) Fused B+ circuit and (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

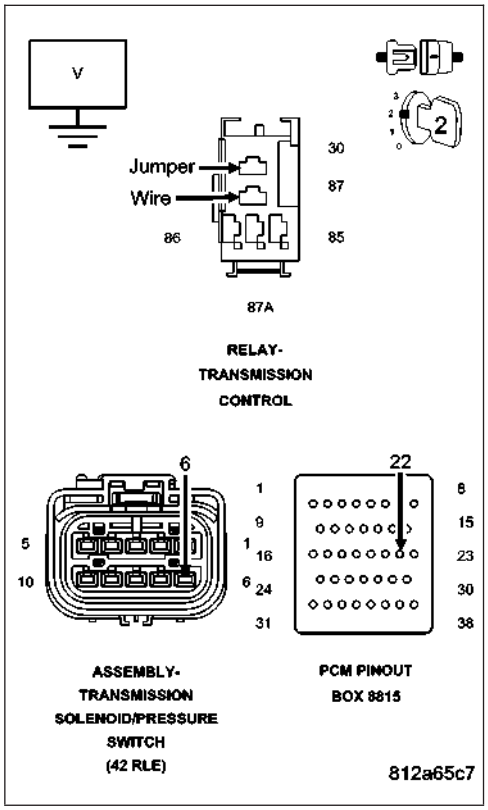
Ignition on, engine not running.

Measure the voltage of the (T9) OD Pressure Switch Sense circuit.

Is the voltage above 0.5 volt?

Yes >> Repair the (T9) OD Pressure Switch Sense circuit for a short to voltage.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 3



3. (T47) 2/4 PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE

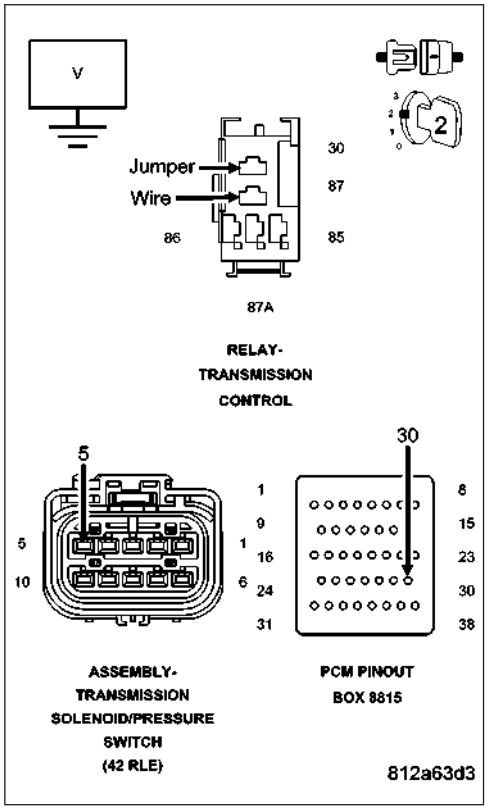
NOTE: The jumper wire must still be in place.

Measure the voltage of the (T47) 2/4 Pressure Switch Sense circuit.

Is the voltage above 0.5 volt?

Yes >> Repair the (T47) 2/4 Pressure Switch Sense circuit for a short to voltage.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 4



P0890-SWITCHED BATTERY (CONTINUED)

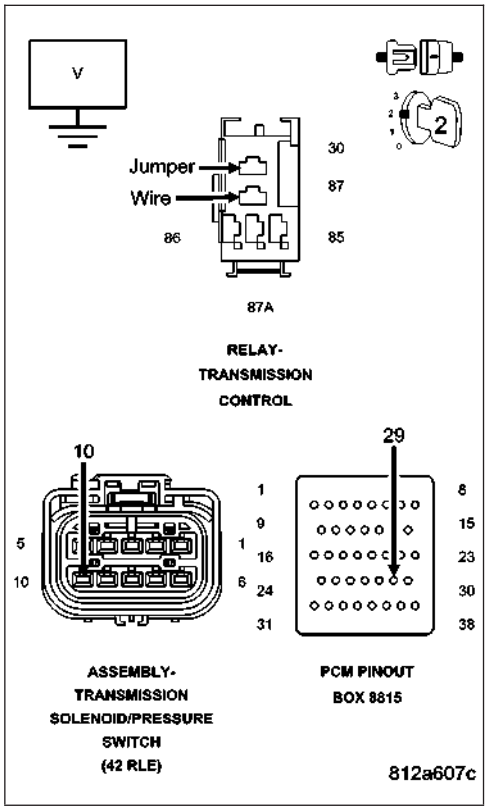
4. (T50) L/R PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE

NOTE: The jumper wire must still be in place.
Measure the voltage of the (T50) L/R Pressure Switch Sense circuit.

Is the voltage above 0.5 volts?

Yes >> Repair the (T50) L/R Pressure Switch Sense circuit for a short to voltage.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5



5. POWERTRAIN CONTROL MODULE

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

If there are no possible causes remaining, view repair.

Repair

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

6. INTERMITTENT WIRING AND CONNECTORS

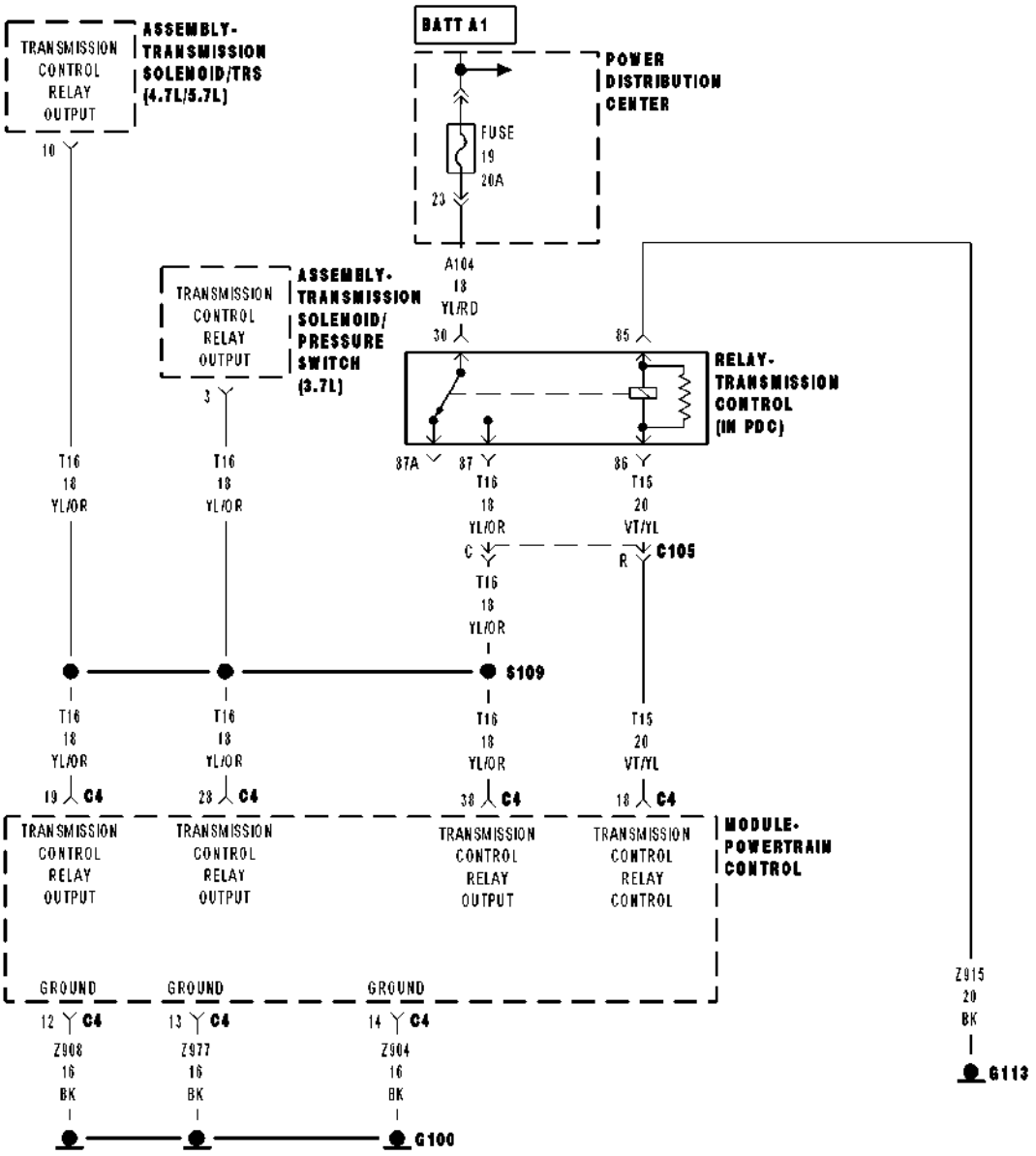
The conditions necessary to set the DTC are not present at this time.
Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.
Wiggle the wiring and connectors while checking for shorted and open circuits.
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

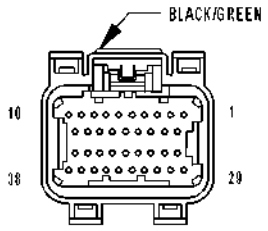
Were there any problems found?

Yes >> Repair as necessary.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0891-TRANSMISSION RELAY ALWAYS ON





MODULE-POWERTRAIN CONTROL C4

P0891-TRANSMISSION RELAY ALWAYS ON (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  After a reset (ignition key turned to the RUN position) and after a power down.
- **Set Condition:**
  Relay output (Switched Battery) is higher than 3 volts when relay is not energized by the controller. Fault Set Time: Less than 100 msec

Possible Causes
TRANSMISSION CONTROL RELAY STUCK CLOSED
(T15) TRANSMISSION CONTROL RELAY CONTROL CIRCUIT SHORT TO VOLTAGE
(T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUITS SHORT TO VOLTAGE
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).

Theory of Operation

The transmission relay is used to supply power to the solenoid pack when in normal operating mode and to turn off power to produce transmission ″limp-in″ mode. The relay output (which supplies power to the solenoid pack) is fed back to the controller This is referred to as SWITCHED BATTERY. After a controller reset (ignition key turned to the RUN position or after cranking engine), the controller verifies that the relay contacts are open by checking for no voltage on Switched battery line (relay output) before the relay is energized. Transmission locked in Limp-In. MIL on after 10 seconds of vehicle operation.

Diagnostic Test

1. CHECK TO SEE IF DTC P0891 IS CURRENT

With the scan tool, view DTCs.

Is the status Active for this DTC or is the STARTS SINCE SET counter equal to 0?

Yes >> Go To 2

No >> Go To 6

---

2. TRANSMISSION CONTROL RELAY CONTACTS STUCK CLOSED

Turn the ignition off to the lock position.

Remove the Transmission Control Relay.

NOTE: Check connectors - Clean/repair as necessary.

Measure the resistance between the Fused B+ circuit and the Transmission Control Relay Output Circuit at the terminals of the Transmission Control Relay.

Is the resistance above 5.0 ohms?

Yes >> Go To 3

No >> Replace the Transmission Control Relay.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

P0891-TRANSMISSION RELAY ALWAYS ON (CONTINUED)

3. (T16) TRANSMISSION RELAY OUTPUT CIRCUIT SHORT TO VOLTAGE

Ignition on, engine not running.

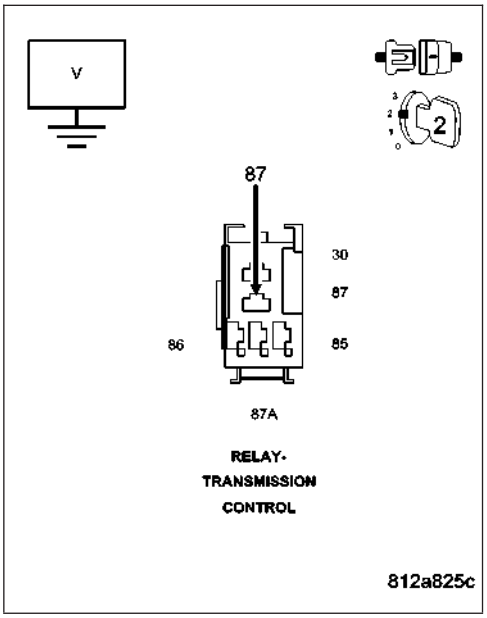
Measure the voltage at the (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

Is the voltage above 0.5 volts?

Yes >> Repair the (T16) Transmission Control Relay Output circuit for a short to voltage.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 4



4. (T15) TRANSMISSION CONTROL RELAY CONTROL CIRCUIT SHORT TO VOLTAGE

NOTE: The Transmission Controller will power up the Transmission Control Relay Control circuit for approximately 3.0 seconds after initial ignition on. Wait at least 3.0 seconds after turning the ignition to the on position before performing the following voltage check.

NOTE: P0888 Relay Always Off may set. Disregard this DTC.

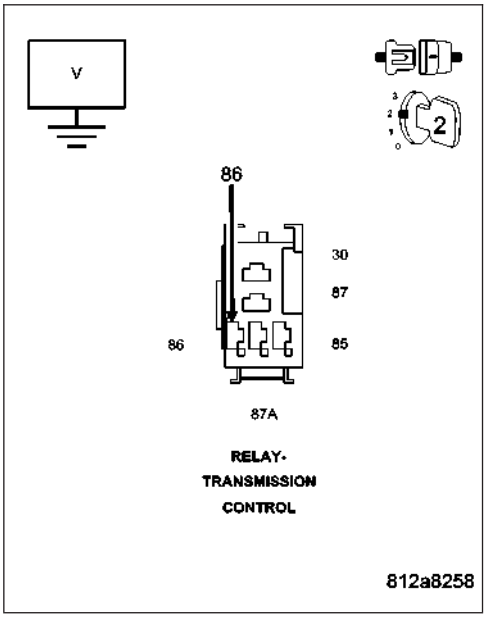
Measure the voltage at the (T15) Transmission Control Relay Control circuit after a 3.0 second wait period.

Is the voltage above 0.5 volts?

Yes >> Repair the (T15) Transmission Control Relay Control circuit for a short to voltage.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5



P0891-TRANSMISSION RELAY ALWAYS ON (CONTINUED)

5. POWERTRAIN CONTROL MODULE

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

If there are no possible causes remaining, view repair.

Repair

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

6. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set the DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for shorted and open circuits.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Were there any problems found?

Yes >> Repair as necessary.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0897-TRANSMISSION FLUID DETERIORATED

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Each transition from full EMCC to partial EMCC for A/C bump prevention.
- **Set Condition:**
  DTC set if 20 occurrences of a turbine acceleration sum. Fault Set Time: 20 transitions from full EMCC to partial EMCC. Transmission will not use partial EMCC. Established for A/C bump prevention.

Possible Causes
WORN OUT/ BURNT TRANSAXLE FLUID

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).

Theory of Operation

To prevent a bump due to A/C clutch engagement, a temporary torque converter partial EMCC condition is established prior to A/C clutch engagement. A message is received over the bus indicating that A/C clutch engagement is imminent. Partial EMCC is then established and a reply message, ″OK to engage A/C clutch″ is sent via the bus. Partial EMCC will be held for 450 ms before returning to full EMCC. During the transition from full to partial EMCC, a turbine acceleration sum is calculated, if this value exceeds a threshold value for several transitions, degraded transmission fluid is indicated.

Diagnostic Test

1. WORN OUT/ BURNT TRANSMISSION FLUID

Turn the ignition off to the lock position.

Flush the Transmission Oil Cooler and lines, replace the Transmission Oil Filter, refill with new Transmission Fluid, start the engine, and adjust the fluid per the Service Information.

NOTE: The Transmission Cooler must be flushed before proceeding.
Allow the engine to idle for 10 minutes, in Park.

Turn the ignition off to the lock position.

Again, flush the Transmission Oil Cooler and lines, replace the Transmission Oil Filter, refill with new Transmission Fluid, start the engine, and adjust the fluid per the Service Information.

With the scan tool, perform a Battery Disconnect.

NOTE: The Battery Disconnect must be done to re-enable EMCC during an A/C Clutch engagement.

NOTE: The vehicle may exhibit intermittent shudder during the first few hundred miles. The new Transmission Fluid will gradually penetrate the Torque Convertor Clutch friction material and the shudder should disappear.
Erase the DTC and return the vehicle to the customer.

Did the DTC reset and/or does the vehicle still shudder after a few thousand miles?

Yes >> Replace the Torque Converter per the Service Information.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0944-LOSS OF HYDRAULIC PUMP PRIME

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram**Refer to Section 8W**.

- **When Monitored:**
  Every 350 msec
- **Set Condition:**
  If the transmission begins to slip in any forward gear, and the pressure switch or switches that should be closed for a given gear are open, a loss of prime test begins. All available elements (in 1st gear LR, 2/4 and OD, in 2nd, 3rd, and 4th gear 2/4 and OD) are turned on by the PCM to see if pump prime exists. The code is set if none of the pressure switches respond. The PCM will continue to run the loss of prime test until pump pressure returns. The vehicle will not move or the transmission will slip. Normal operation will continue if pump prime returns.

Possible Causes
LOW TRANSMISSION FLUID LEVEL
SHIFT LEVER POSITION
PLUGGED TRANSMISSION FILTER
TRANSMISSION OIL PUMP

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).

Theory of Operation

The Loss of Prime Test is used to prevent transmission defaults and erroneous fault codes during temporary loss of pump prime that may occur with low transmission fluid under severe braking conditions, start-up, etc. and to point towards more subtle problems such as a plugged or ruptured oil filter. The Loss of Prime fault is set by a loss of hydraulic pressure in the transmission system. This condition, if sustained, will result in the vehicle being unable to move.

Diagnostic Test

1. CHECK TO SEE IF DTC P0944 IS CURRENT

Place the gear selector in park.

Start the engine.

NOTE: The Transmission Temperature must be at least 43° C (110° F) before performing the following steps. The Transmission must be at operating temperature prior to checking pressure. Cold transmission fluid will result in higher pressure readings.

Place the Transmission in Reverse.

With the scan tool, observe the Transmission Pressure Switch states.

Are any of the Pressure Switches closed?

Yes >> Go To 2

No >> Go To 4

P0944-LOSS OF HYDRAULIC PUMP PRIME (CONTINUED)

2. INTERMITTENT OPERATION

The conditions necessary to set this DTC are not present at this time.
Test drive the vehicle. Allow the Transmission to shift through all gears and ranges.

Was a delayed engagement and/or a no drive condition present during the test drive?

Yes >> Go To 4

No >> Go To 3

---

3. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.
Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.
Wiggle the wiring while checking for shorted and open circuits.
With the scan tool, check the EATX EVENT DATA to help identify the conditions in which the DTC was set.

Were there any problems found?

Yes >> Repair as necessary.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

---

4. SHIFT LEVER POSITION TEST

With the scan tool, perform a Shift Lever Position test. Follow the instructions on the screen.

Did the Shift Lever Position Test pass?

Yes >> Go To 5

No >> Perform the diagnostic procedure for P0706–CHECK SHIFTER SIGNAL.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

5. CHECK FOR PLUGGED TRANSMISSION FILTER

Remove the Transmission Pan and inspect the Transmission Fluid and Transmission Filter per the Service Information.

Does the Transmission Oil Pan contain excessive debris and/or is the Oil Filter plugged?

Yes >> Repair the cause of the plugged Transmission Filter. Refer to the Service Information for the proper repair procedure.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 6

---

6. TRANSMISSION OIL PUMP

If there are no possible causes remaining, view repair.

Repair

Replace the Transmission Oil Pump per the Service Information.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

P0992-2/4/OD HYDRAULIC PRESSURE TEST

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  In any forward gear with engine speed above 1000 RPM, shortly after a shift and every minute thereafter.
- **Set Condition:**
  After a shift into a forward gear, with engine speed greater than 1000 RPM, the PCM momentarily turns on element pressure to the clutch circuits that do not have pressure to identify that the correct pressure switch closes. If the pressure switch does not close 2 times the DTC sets.

Possible Causes
CONDITION P0992 PRESENT

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).

Theory of Operation

Pressure switches are normally off or open (no pressure applied) and read high (+12 volts). When an element is applied, the corresponding pressure switch closes to ground (0 volts) or turns on. The controller tests the OD and 2/4 pressure switches when they are off (when the corresponding friction element is not applied) by briefly applying the OD and 2/4 elements which will cause the corresponding pressure switch to close. The test verifies that the switches are operational and that the switch will close when the corresponding element is applied. If a switch fails to respond, it is re-tested. The MIL illuminates and the transmission system defaults to Limp-in mode.

1. CHECK TO SEE IF DTC P0992 IS CURRENT

NOTE: The vehicle must be driven to set this DTC. The transmission must at operating temperature with the Engine RPM above 1000 RPM.

This DTC is an indication of both the 2/4 and the O/D Hydraulic Pressure Switch DTCs present.

Perform the diagnostic procedures for both P0845 and P0870.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

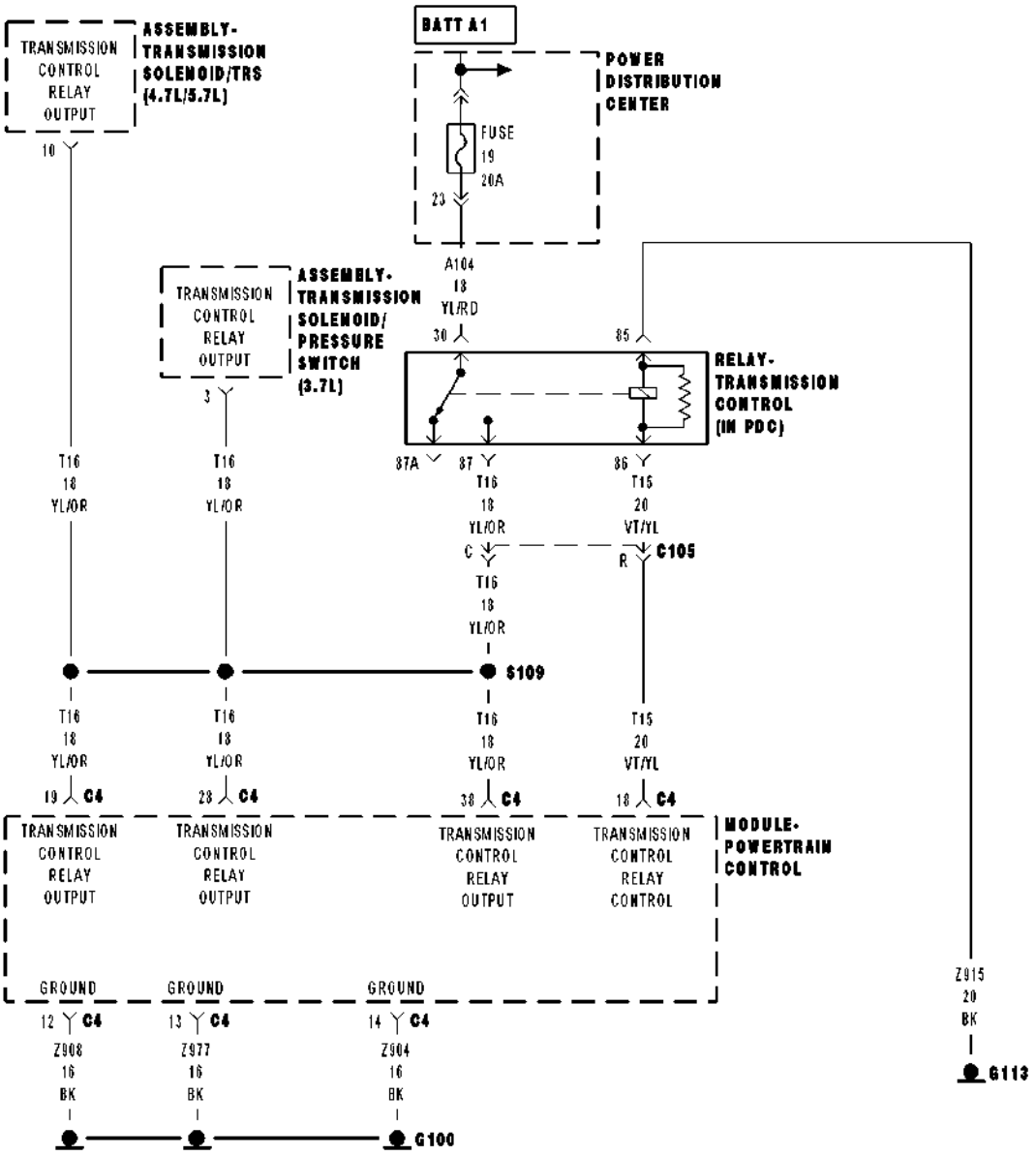
If there are no possible causes remaining, view repair.

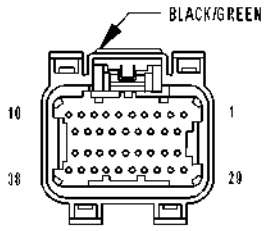
Repair

Refer to the Transmission category and perform the diagnostic procedures for P0845 and P0870.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

P1684-BATTERY WAS DISCONNECTED





MODULE-POWERTRAIN CONTROL C4

814AE91E

P1684-BATTERY WAS DISCONNECTED (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  After a reset (ignition key turned to the RUN position).
- **Set Condition:**
  The checksum of the battery backed RAM does not match the stored checksum. Set Time: Less than 7 msec.

Possible Causes
BATTERY WAS DISCONNECTED
PCM WAS REPLACED OR DISCONNECTED
QUICK LEARN WAS PERFORMED
(A919) FUSED B+ CIRCUIT TO PCM OPEN
(Z908 and Z977) GROUND CIRCUIT OPEN

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).

Theory of Operation

Note: This is not a fault code. It exists to provide reference information only. A battery backed RAM is used to maintain some learned values. When the battery is disconnected, this memory is lost. When the battery is reconnected, the loss of learned values will be detected by the controller. The code will be set and the learned values will be initialized to known constants and the learning process will continue. Setting the code has no effect except for re-initialization of learned values.

Diagnostic Test

1. BATTERY WAS DISCONNECTED

Has the battery been disconnected, lost it's charge, or been replaced recently?

Yes >> Disconnecting or replacing the battery will set this DTC. Erase the DTC.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. WAS QUICK LEARN PERFORMED

Has a Quick Learn procedure been performed?

Yes >> Performing Quick Learn will set this DTC. Erase the DTC.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 3

---

3. PCM REPLACED OR DISCONNECTED

Has the PCM been replaced or disconnected?

Yes >> Replacing or disconnecting the PCM will set this DTC. Erase the DTC.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 4

P1684-BATTERY WAS DISCONNECTED (CONTINUED)

4. (A919) FUSED B+ CIRCUIT

Turn the ignition off to the lock position.

Disconnect the PCM C1 harness connector.

NOTE: Check connectors - Clean/repair as necessary.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

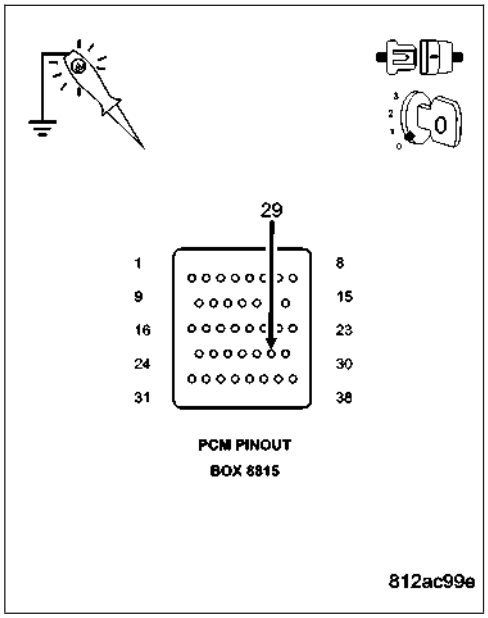
Using a 12-volt test light connected to ground, check the (A919) Fused B+ circuit.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Go To 5

No >> Repair the Fused B+ circuit for an open. If the fuse is open make sure to check for a short to ground.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.



5. (Z908) AND (Z977) GROUND CIRCUITS

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

NOTE: Check connectors - Clean/repair as necessary.

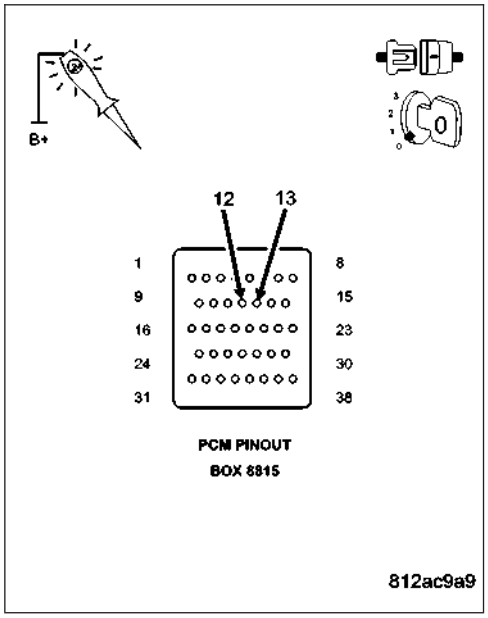
Using a 12-volt test light connected to 12-volts, check the (Z908) and (Z977) Ground circuits in the appropriate terminal of special tool #8815.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly for all of the ground circuits?

Yes >> Go To 6

No >> Repair the Ground circuits for an open.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.



P1684-BATTERY WAS DISCONNECTED (CONTINUED)

6. INTERMITTENT WIRING AND CONNECTORS

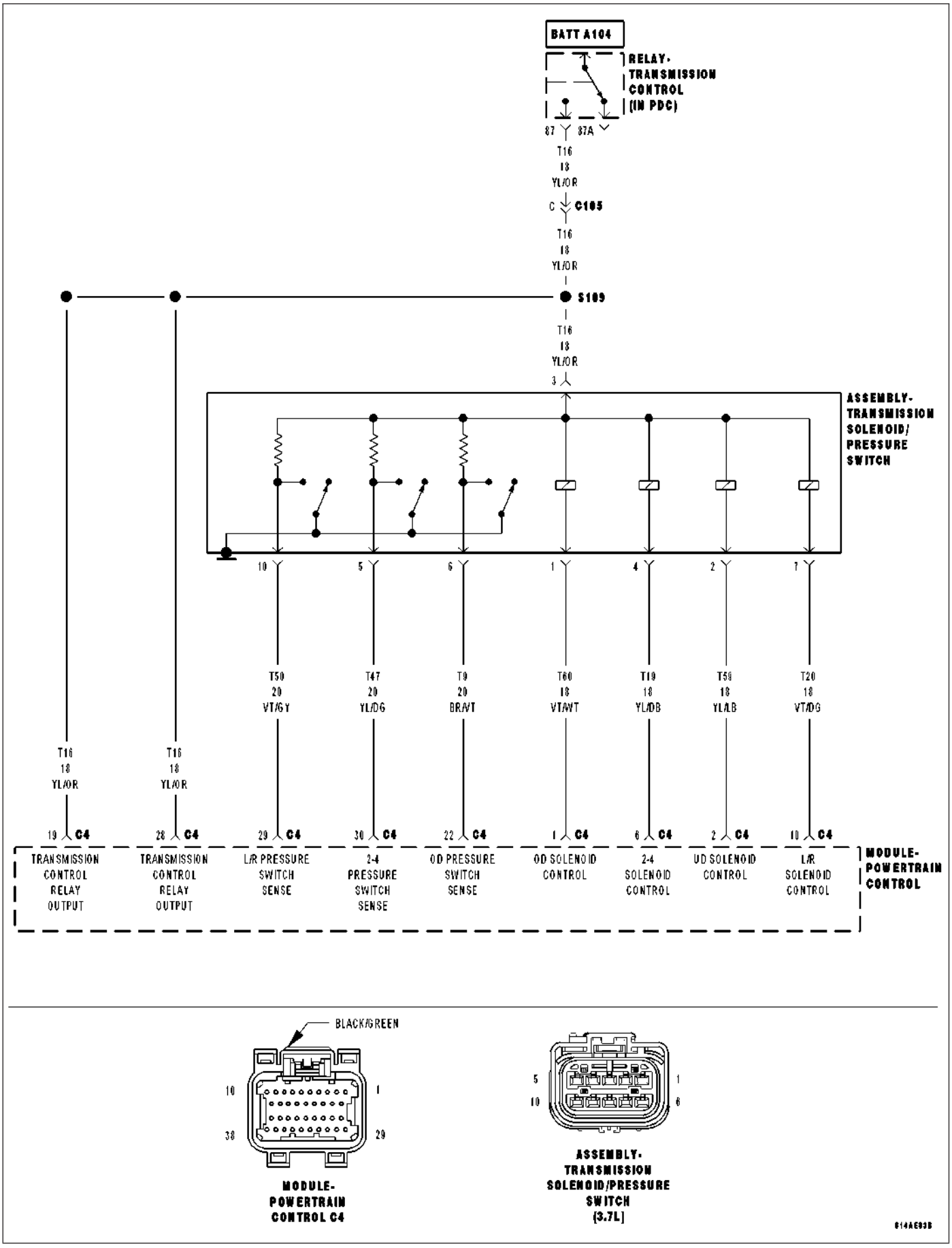
The conditions necessary to set the DTC are not present at this time.
Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.
Wiggle the wires while checking for shorted and open circuits.
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Were there any problems found?

Yes >> Repair as necessary.
Perform 42RLETRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P1775-SOLENOID SWITCH VALVE LATCHED IN TCC POSITION



P1775-SOLENOID SWITCH VALVE LATCHED IN TCC POSITION (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Prior to a shift into 1st gear.
- **Set Condition:**
  Transmission temperature must be hot. DTC is set after six unsuccessful attempts to shift into 1st gear.

Possible Causes
RELATED DTC P0841 PRESENT
(T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
(T50) L/R PRESSURE SWITCH SENSE CIRCUIT OPEN
(T50) L/R PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND
(T50) L/R PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
INTERNAL TRANSMISSION
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).

Theory of Operation

The Solenoid Switch Valve, an internal, hydraulically operated valve, controls the direction of the transmission fluid when the LR solenoid is energized. When the solenoid switch valve is in the downshifted position and the LR solenoid is energized, fluid is directed to the LR element for 1st gear. When the solenoid switch valve is In the upshifted position (2nd, 3rd, and 4th gear) and the LR solenoid is energized, fluid is directed into the Lockup Switch Valve which controls the Torque Converter Clutch. When shifting into 1st gear, a special sequence is followed to insure solenoid switch valve movement into the downshifted position. The LR pressure switch is monitored to confirm switch valve movement. If the solenoid switch valve movement is not confirmed (i.e. no LR pressure when the LR solenoid is energized), 2nd gear is substituted for 1st. No 1st gear (2nd gear is substituted). The transmission Torque converter FEMCC operation is inhibited. MIL on after 5 min. of substituted operation.

Diagnostic Test

1. DETERMINING IF RELATED DTCS ARE PRESENT

With the scan tool, check for other Transmission DTCs

Is the DTC P0841 present also?

Yes >> Refer to the Transmission category and perform the appropriate diagnostic procedure.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK TO SEE IF DTC P1775 IS CURRENT

With the scan tool, view DTCs.

Is the status Active for this DTC or is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 3

No >> Go To 10

P1775-SOLENOID SWITCH VALVE LATCHED IN TCC POSITION (CONTINUED)

3. PCM AND WIRING

Turn the ignition off to the lock position.

Remove the Starter Relay.

CAUTION: Removal of the Starter Relay is to prevent a Transmission NO RESPONSE condition and to disable the starter.

Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

Ignition on, engine not running.

With the Transmission Simulator, turn the Pressure Switch selector switch to L/R.

With the scan tool, monitor the L/R Pressure Switch State while pressing the Pressure Switch Test button.

Did the Pressure Switch state change from open to closed when the test button was pressed?

Yes >> Go To 4

No >> Go To 5

---

4. INTERNAL TRANSMISSION

If there are no possible causes remaining, view repair.

Repair

Repair internal transmission as necessary per the Service Information. Inspect the Solenoid Switch Valve per the Service Information and repair or replace as necessary. If no problems are found, replace the Transmission Solenoid/Pressure Switch Assembly.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

P1775-SOLENOID SWITCH VALVE LATCHED IN TCC POSITION (CONTINUED)

5. (T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN

Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Disconnect the PCM C4 harness connector.

Remove the Transmission Control Relay.

Remove the Starter Relay.

NOTE: Check connectors - Clean/repair as necessary.

Connect a jumper wire between the (A104) Fused B+ circuit and the (T16) Transmission Control Relay Output circuit at the Transmission Control Relay connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

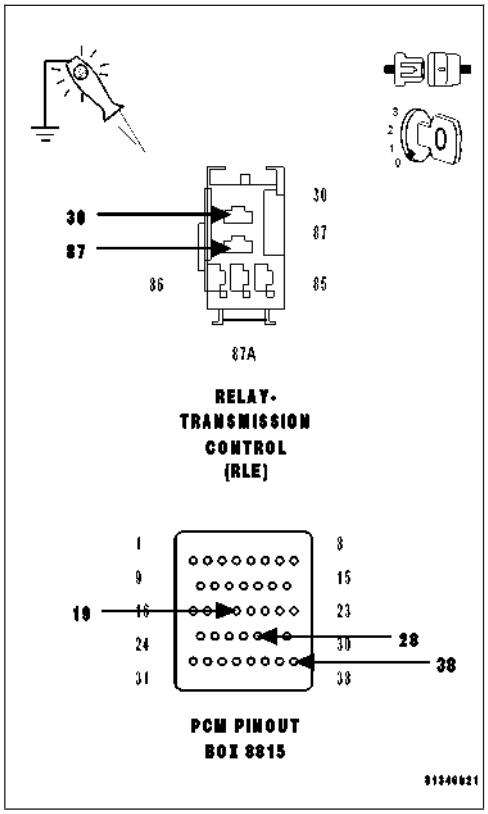
Using a 12-volt test light connected to ground, check all (T16) Transmission Control Relay Output circuits in the appropriate terminals of special tool #8815.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly on all Transmission Control Relay Output circuits?

Yes >> Repair the (T16) Transmission Control Relay Output circuit for an open.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 6



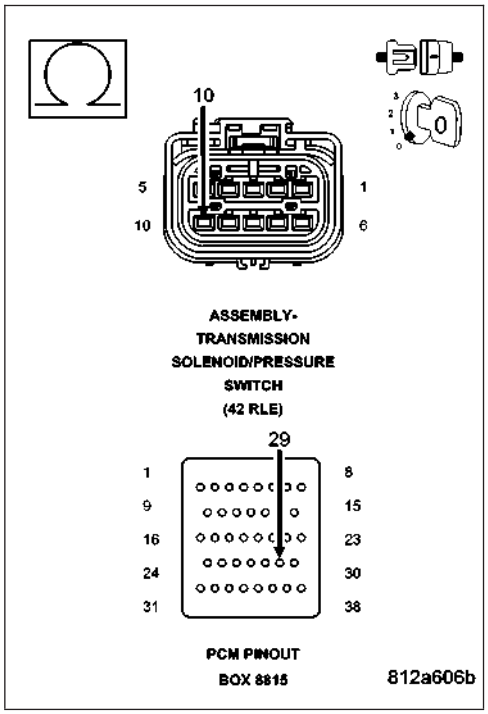
6. (T50) L/R PRESSURE SWITCH SENSE CIRCUIT OPEN

Measure the resistance of the (T50) L/R Pressure Switch Sense circuit from the appropriate terminal of special tool #8815 to the Transmission Solenoid/Pressure Switch Assembly harness connector.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T50) L/R Pressure Switch Sense circuit for an open.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 7



P1775-SOLENOID SWITCH VALVE LATCHED IN TCC POSITION (CONTINUED)

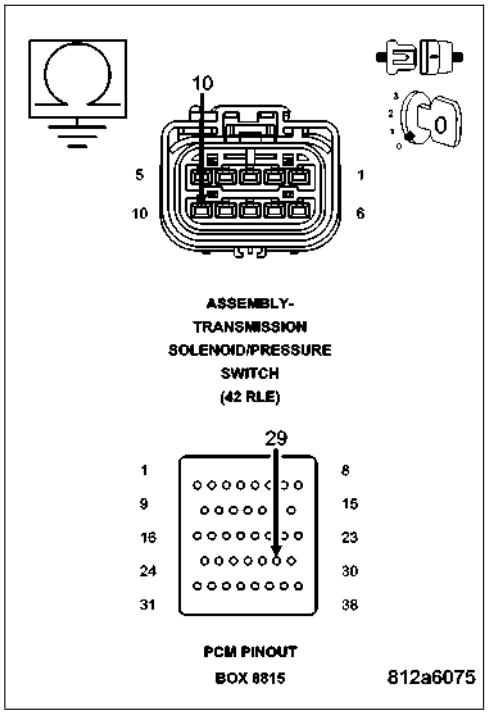
7. (T50) L/R PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T50) L/R Pressure Switch Sense circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (T50) L/R Pressure Switch Sense circuit for a short to ground.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 8



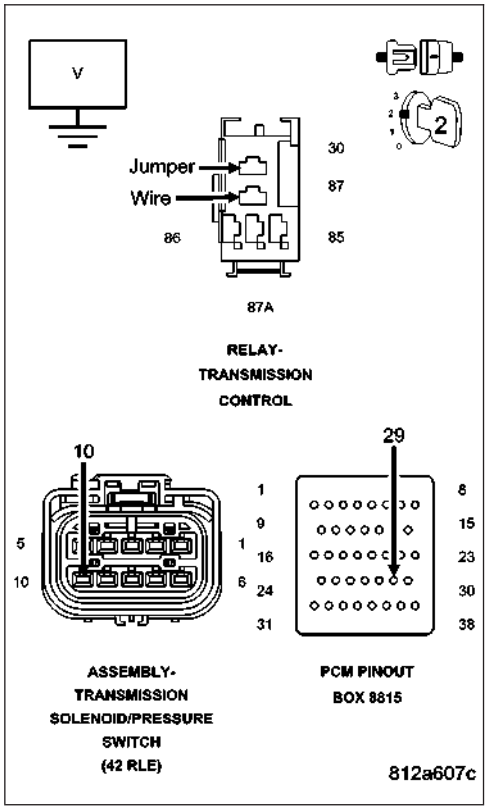
8. (T50) L/R PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE

NOTE: The jumper wire must still be in place.
Ignition on, engine not running.
Measure the voltage of the (T50) L/R Pressure Switch Sense circuit.

Is the voltage above 0.5 volts?

Yes >> Repair the (T50) L/R Pressure Switch Sense circuit for a short to voltage.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 9



P1775-SOLENOID SWITCH VALVE LATCHED IN TCC POSITION (CONTINUED)

9. POWERTRAIN CONTROL MODULE

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

If there are no possible causes remaining, view repair.

Repair

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

10. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Test drive and verify if the transmission is launching in 2nd gear and/or no TCC engagement.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

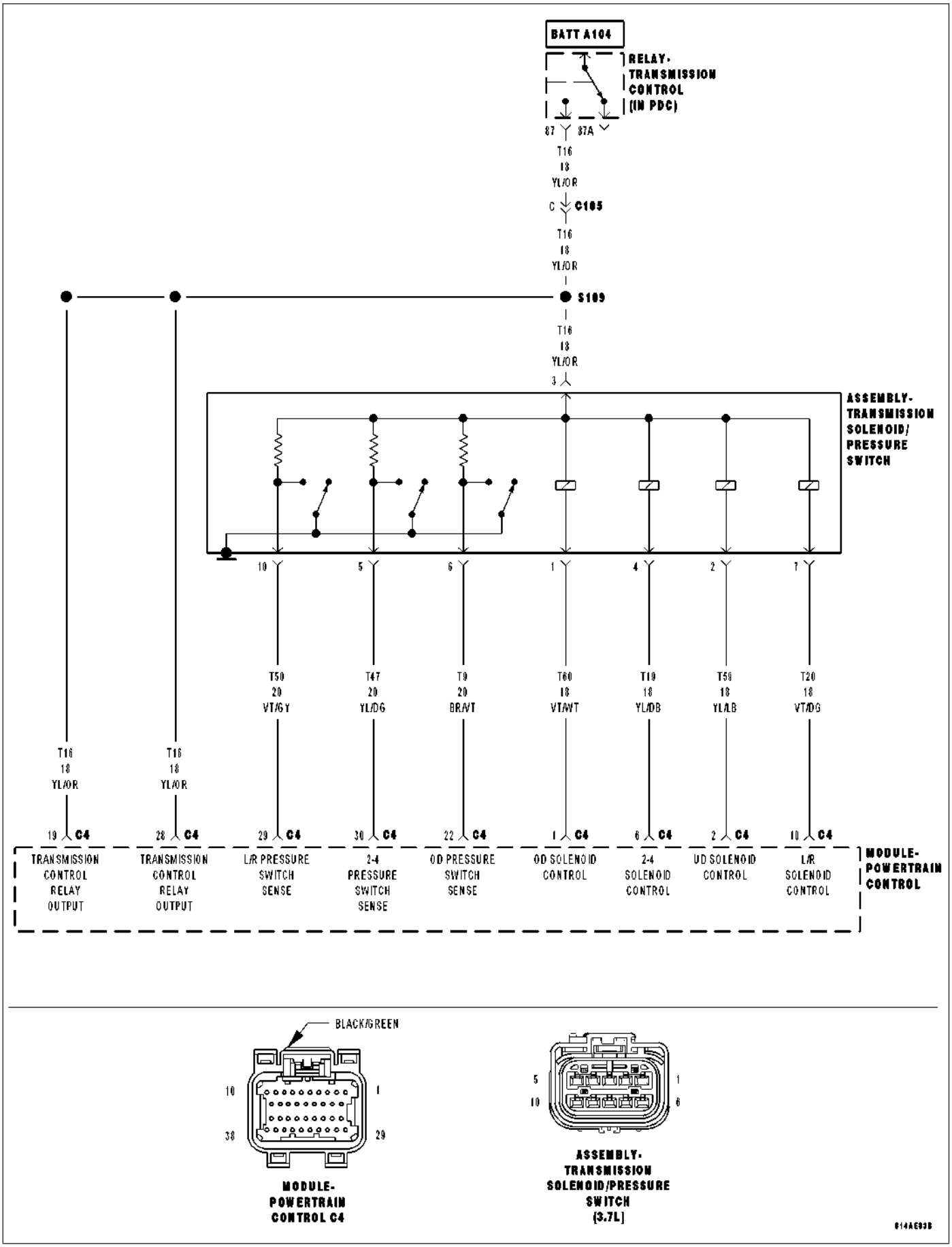
Are there 2nd gear launches and/or no TCC engagement?

Yes >> Disassemble and inspect the Valve Body per the Service Information and repair or replace as necessary. If no problems are found in the Valve Body, replace the Transmission Solenoid Pressure Switch Assembly.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P1776-SOLENOID SWITCH VALVE LATCHED IN LR POSITION



P1776-SOLENOID SWITCH VALVE LATCHED IN LR POSITION (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Every 7 ms when doing PEMCC or FEMCC.
- **Set Condition:**
  Must be in partial or full EMCC. The DTC is set if LR pressure is detected high for the fourth time.

Possible Causes
RELATED DTC P0841 PRESENT
(T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
(T50) L/R PRESSURE SWITCH SENSE CIRCUIT OPEN
(T50) L/R PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND
(T50) L/R PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
INTERNAL TRANSMISSION
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).

Theory of Operation

The Solenoid Switch Valve, an internal, hydraulically operated valve, controls the direction of the transmission fluid when the LR solenoid is energized. When the solenoid switch valve is in the downshifted position and the LR solenoid is energized, fluid is directed to the LR element for 1st gear. When the solenoid switch valve is in the up-shifted position (2nd, 3rd, and 4th gear) and the LR solenoid is energized, fluid is directed into the Lockup Switch Valve which controls the Torque Converter Clutch. When doing PEMCC or FEMCC, the LR pressure switch should indicate no pressure if the solenoid switch valve is in the TCC position. If the LR pressure switch indicates pressure while in partial or full EMCC, the EMCC operation is aborted and momentarily inhibited to avoid accidental application of the LR clutch. EMCC is attempted again when there is no LR pressure. The fourth detection of LR pressure while in PEMCC or FEMCC will result in setting the DTC. Torque converter EMCC operation inhibited. MIL on after 5 min. of substituted operation.

Diagnostic Test

1. DETERMINING IF RELATED DTCS ARE PRESENT

With the scan tool, check for other Transmission DTCs

Is the DTC P0841 present also?

Yes >> Refer to the Transmission category and perform the appropriate diagnostic procedure.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK TO SEE IF DTC P1776 IS CURRENT

With the scan tool, view DTCs.

Is the status Active for this DTC or is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 3

No >> Go To 10

P1776-SOLENOID SWITCH VALVE LATCHED IN LR POSITION (CONTINUED)

3. PCM AND WIRING

Turn the ignition off to the lock position.

Remove the Starter Relay.

CAUTION: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

Ignition on, engine not running.

With the Transmission Simulator, turn the Pressure Switch selector switch to L/R.

With the scan tool, monitor the L/R Pressure Switch State while pressing the Pressure Switch Test button.

Did the Pressure Switch state change from open to closed when the test button was pressed?

Yes >> Go To 4

No >> Go To 5

---

4. INTERNAL TRANSMISSION

If there are no possible causes remaining, view repair.

Repair

Repair internal transmission as necessary per the Service Information. Inspect the Solenoid Switch Valve per the Service Information and repair or replace as necessary. If no problems are found, replace the Transmission Solenoid/Pressure Switch Assembly.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

5. (T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN

Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Disconnect the PCM C4 harness connector.

Remove the Starter Relay.

Remove the Transmission Control Relay.

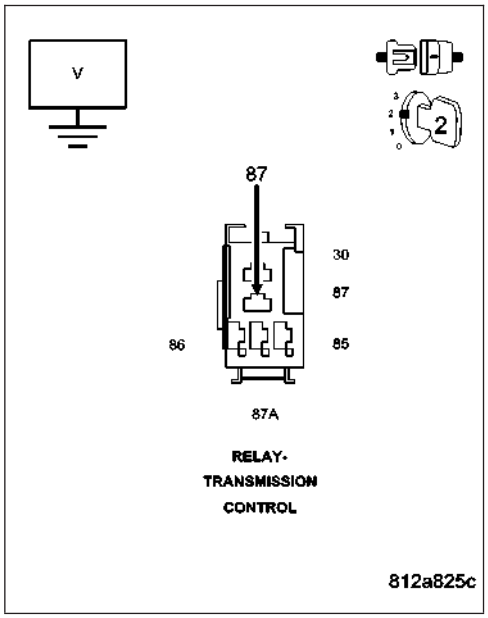
NOTE: Check connectors - Clean/repair as necessary.

Connect a jumper wire between the (A104) Fused B+ circuit and the (T16) Transmission Control Relay Output circuit at the Transmission Control Relay connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Using a 12-volt test light connected to ground, check all (T16) Transmission Control Relay Output circuits in the appropriate terminals of special tool #8815.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.



Does the test light illuminate brightly on all Transmission Control Relay Output circuits?

Yes >> Repair the (T16) Transmission Control Relay Output circuit(s) for an open.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 6

P1776-SOLENOID SWITCH VALVE LATCHED IN LR POSITION (CONTINUED)

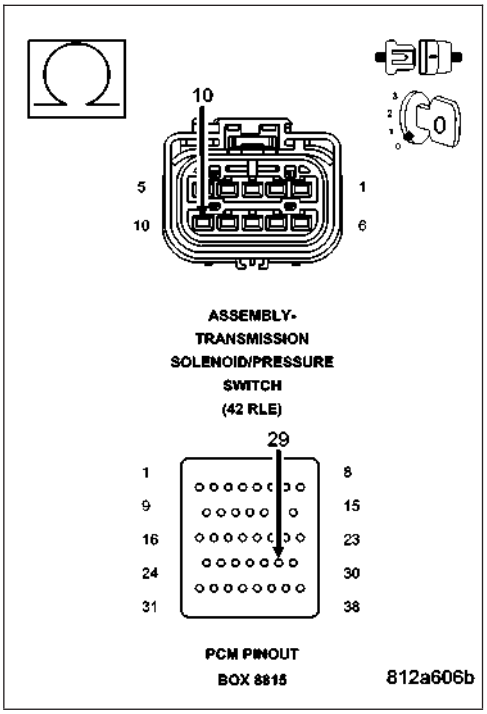
6. (T50) L/R PRESSURE SWITCH SENSE CIRCUIT OPEN

Measure the resistance of the (T50) L/R Pressure Switch Sense circuit from the appropriate terminal of special tool #8815 to the Transmission Solenoid/Pressure Switch Assembly harness connector.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T50) L/R Pressure Switch Sense circuit for an open.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 7



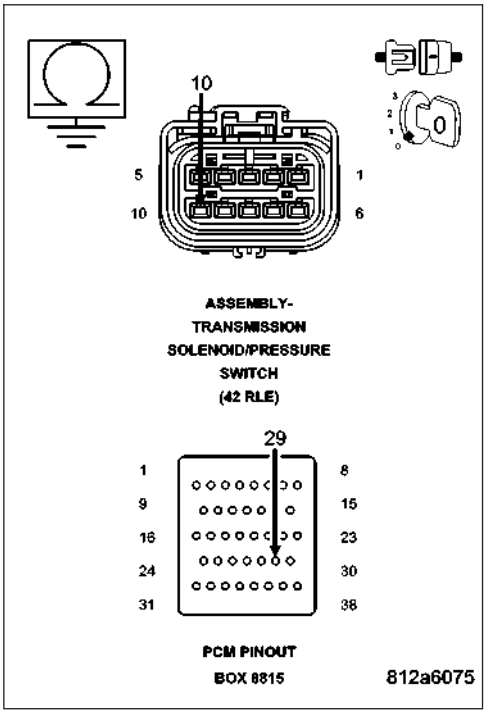
7. (T50) L/R PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T50) L/R Pressure Switch Sense circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (T50) L/R Pressure Switch Sense circuit for a short to ground.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 8



P1776-SOLENOID SWITCH VALVE LATCHED IN LR POSITION (CONTINUED)

8. (T50) L/R PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE

Ignition on, engine not running.

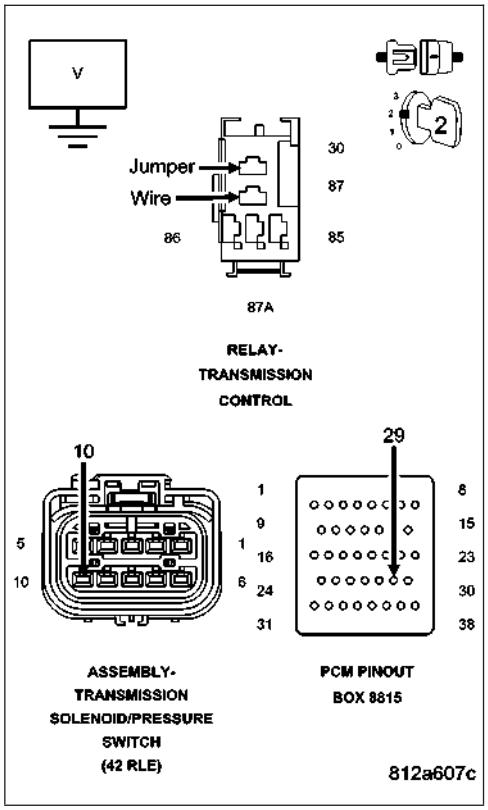
Measure the voltage of the (T50) L/R Pressure Switch Sense circuit.

Is the voltage above 0.5 volts?

Yes >> Repair the (T50) L/R Pressure Switch Sense circuit for a short to voltage.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 9



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9. POWERTRAIN CONTROL MODULE

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

If there are no possible causes remaining, view repair.

Repair

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

10. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Test drive and verify if the transmission is launching in 2nd gear and/or no TCC engagement.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Are there 2nd gear launches and/or no TCC engagement?

Yes >> Disassemble and inspect the Valve Body per the Service Information and repair or replace as necessary. If no problems are found in the Valve Body, replace the Transmission Solenoid Pressure Switch Assembly.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P1790-FAULT IMMEDIATELY AFTER SHIFT

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  After a Gear Ratio Error code is stored.
- **Set Condition:**
  After a Gear Ratio Error DTC has already been set. The DTC is set if the fault happened within 1.3 seconds of a shift. The DTC set time will vary from 1.214 seconds to 15 seconds.

Possible Causes
FAULT AFTER SHIFT

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).

Theory of Operation

This DTC is not stored alone. It is stored if a Gear Ratio DTC is detected immediately after shift. The existence of DTC P1790 indicates a mechanical or hydraulic (not electrical) related problems. It should be noted, however, that all mechanical problems don't necessarily result in DTC P1790. When this DTC exists, diagnosing the system should be based on the associated DTC and only mechanical causes should be considered.

Diagnostic Test

1. FAULT AFTER SHIFT

This DTC is set along with a Gear Ratio DTC. Perform the appropriate test for the Gear Ratio DTC stored.

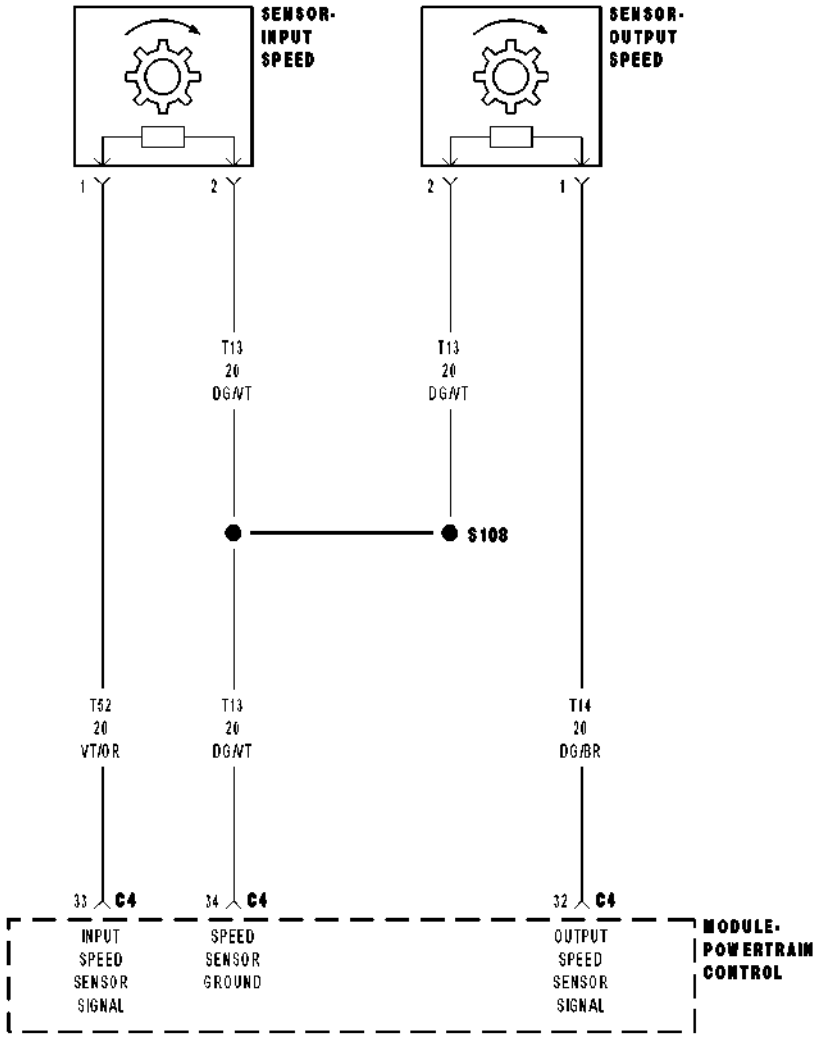
NOTE: Check Pending DTCs or 1 trip failures if there are no Active or Stored Gear Ratio DTCs.

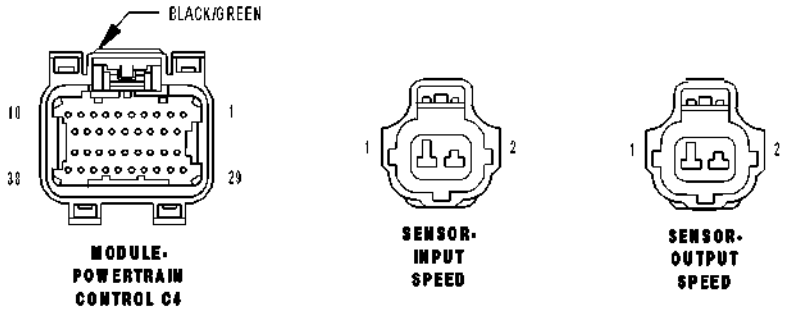
If there are no possible causes remaining, view repair.

Repair

Refer to the Transmission category and perform the appropriate diagnostic procedure.
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

P1794-SPEED SENSOR GROUND ERROR





814XE032

P1794-SPEED SENSOR GROUND ERROR (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Every 7ms after a controller reset with transmission in neutral.
- **Set Condition:**
  After a PCM reset in neutral and Input and Output sensor ratio equals 2.50 to 1.0 ± 50.0 RPM.

Possible Causes
SPEED SENSOR GROUND CIRCUIT OPEN
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).

Theory of Operation

The input and output speed sensors use a common ground circuit. The loss of this common ground results in the input signal being sensed for both. After a reset in neutral, and after observing a specific ratio, the Speed Check Fault Counter will increment. Because the speed sensors and the thermistor share the same ground circuit, this DTC may indicate a loss of the common speed sensor ground. In some cases this fault will cause a Gear Ratio Error DTC to be set.

Diagnostic Test

1. PCM AND WIRING

Turn the ignition off to the lock position.

Remove the Starter Relay.

CAUTION: Removal of the Starter Relay is to prevent a Transmission NO RESPONSE condition and to disable the starter.

Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

Ignition on, engine not running.

With the Transmission Simulator, set the ″Input/Output Speed″ switch to ″ON″ and the rotary switch to the ″3000/1250″ position.

With the scan tool, monitor the Input and Output Speed Sensor readings.

Does the Input Speed read 3000 RPM and the Output Speed read 1250 RPM, ± 50 RPM?

Yes >> Go To 2

No >> Go To 4

P1794-SPEED SENSOR GROUND ERROR (CONTINUED)

2. (T13) SPEED SENSOR GROUND CIRCUIT OPEN

Turn the ignition off to the lock position.

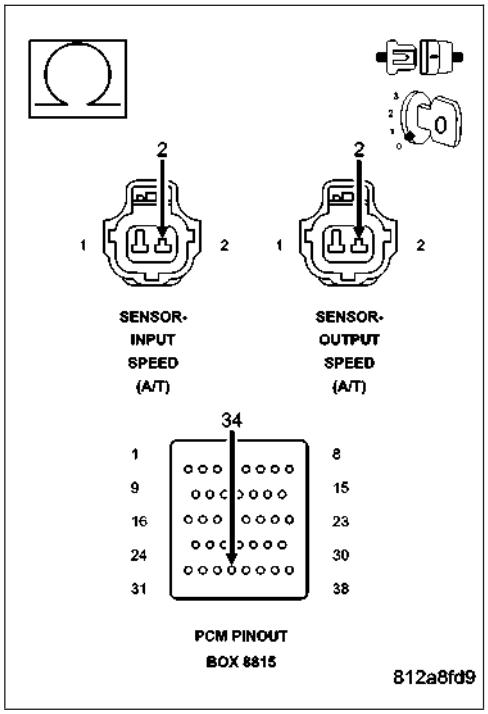
Disconnect the PCM C4 harness connector.

Disconnect the Input and Output Speed Sensor harness connectors.

NOTE: Check connectors - Clean/repair as necessary.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of both of the (T13) Speed Sensor Ground circuits from the appropriate terminal of special tool #8815 to the Input and Output Speed Sensor harness connectors.



Is the resistance above 5.0 ohms on either circuit?

Yes >> Repair the (T13) Speed Sensor Ground circuit for an open.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 3

---

3. POWERTRAIN CONTROL MODULE

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

If there are no possible causes remaining, view repair.

Repair

Replace and program the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

4. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set the DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Were there any problems found?

Yes >> Repair as necessary.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P1797-MANUAL SHIFT OVERHEAT

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with engine running.
- **Set Condition:**
  If the Engine Temperature exceeds 123° C (255° F) or the Transmission Temperature exceeds 135° C (275° F) while in AutoStick® mode. Note: Aggressive driving or driving in low for extended periods of time will set this DTC.

Possible Causes
MANUAL SHIFT OVERHEAT

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).

Theory of Operation

The major cause of heat build up in the transmission is torque converter slip. With the transmission in the AutoStick® mode, the torque converter can slip during aggressive driving or heavy loading conditions such as trailer towing or driving up steep grades. In the non autostick mode, internal controller logic prevents the transmission from overheating by managing the shift and EMCC schedule. In the autostick mode, when the transmission or engine temperature approaches an overheat condition, the manual shift overheat DTC sets and the autostick mode is temporarily suspended until the temperature returns to normal.

Diagnostic Test

1. MANUAL SHIFT OVERHEAT

This is an informational DTC only.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Check the engine and transmission cooling system for proper operation.

Check the Radiator Cooling Fan operation.

Check the Transmission Cooling operation.

Check the Transmission Fluid Level per the Service Information to verify that it is not overfilled.

NOTE: Aggressive driving or driving in low for extended periods of time will set this DTC.

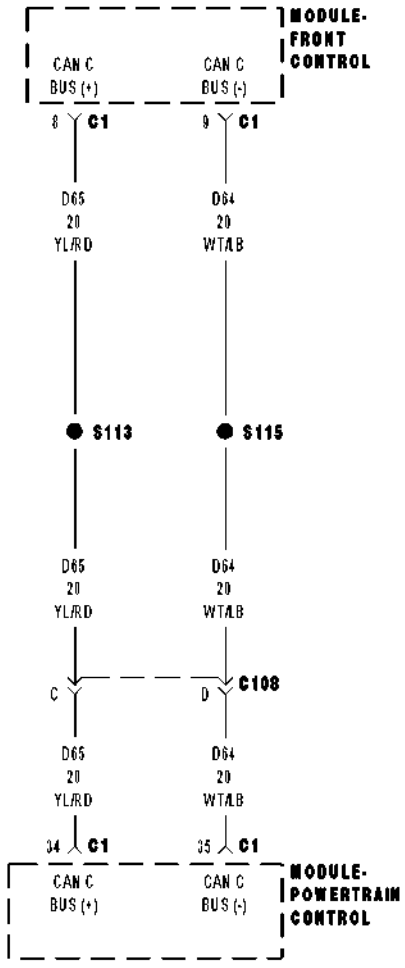
If there are no possible causes remaining, view repair.

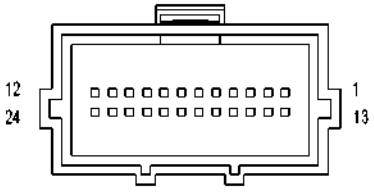
Repair

If the Transmission Fluid is low, repair any Transmission Fluid leak as necessary and adjust the Transmission Fluid Level per the Service Information. Refer to Service Information for the related symptoms and repair as necessary.

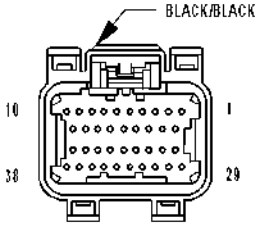
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

U0100 LOST COMMUNICATION WITH ECM/PCM





MODULE-
FRONT
CONTROL C1



MODULE-
POWERTRAIN
CONTROL C1

D14AE044

U0100 LOST COMMUNICATION WITH ECM/PCM (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

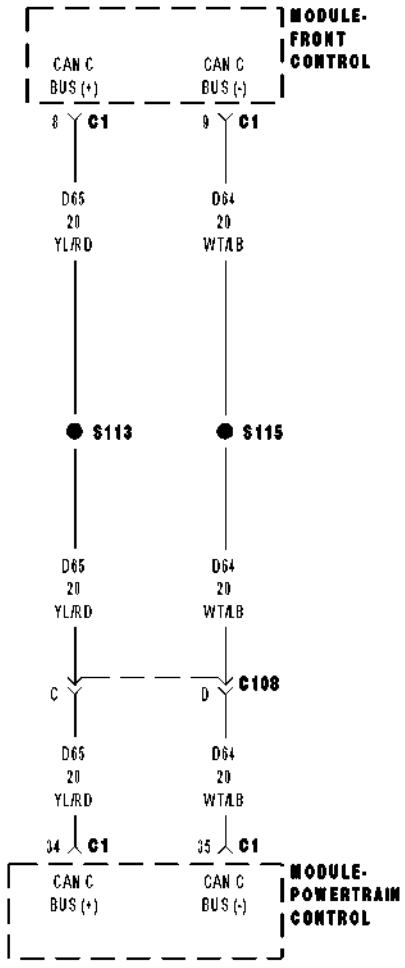
- **When Monitored:**
  Every 7 msec with:
  1) Engine speed greater than 500 RPM.
  2) Battery voltage between 10 and 16 volts.
- **Set Condition:**
  CAN C bus messages are not received for 10 seconds.

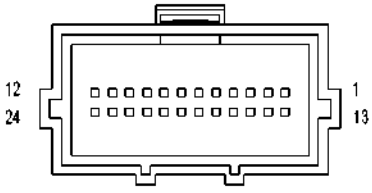
Theory of Operation

The NGC controller communicates over the CAN C bus. The transmission controller continuously monitors bus activity. The CAN C bus is also used to communicate transmission MIL status to the Engine Controller. If the Engine Controller is unable to communicate with the Transmission Controller, a DTC will set and the Engine Controller will illuminate the MIL.

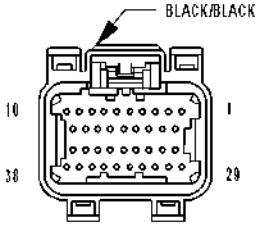
Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

U0002 CAN C BUS OFF PERFORMANCE





MODULE-
FRONT
CONTROL C1



MODULE-
POWERTRAIN
CONTROL C1

D14AE044

U0002 CAN C BUS OFF PERFORMANCE (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

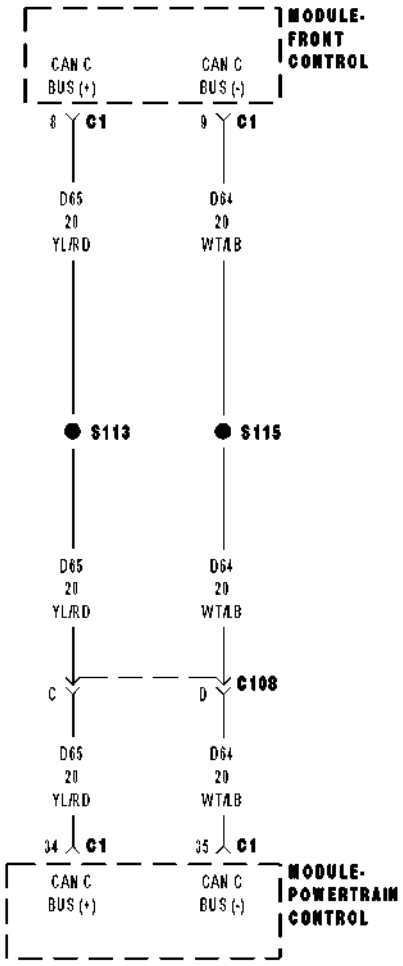
- **When Monitored:**
  Every 7 msec with:
  1) Engine speed greater than 500 RPM.
  2) Battery voltage between 10 and 16 volts.
- **Set Condition:**
  CAN C bus messages are not received for 10 seconds.

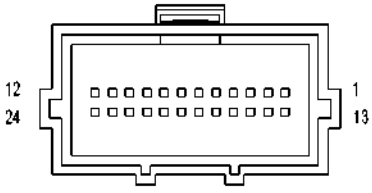
Theory of Operation

The NGC controller communicates over the CAN C bus. The transmission controller continuously monitors bus activity. The CAN C bus is also used to communicate transmission MIL status to the Engine Controller. If the Engine Controller is unable to communicate with the Transmission Controller, a DTC will set and the Engine Controller will illuminate the MIL.

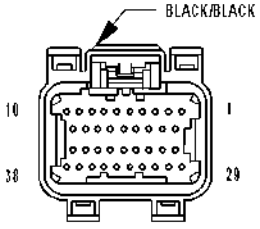
Diagnose the U0002 CAN C BUS OFF PERFORMANCE as the U0001 CAN C BUS CIRCUIT test in 8-ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

U0121 LOST COMMUNICATION WITH ABS





MODULE-
FRONT
CONTROL C1



MODULE-
POWERTRAIN
CONTROL C1

D14AE044

U0121 LOST COMMUNICATION WITH ABS (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

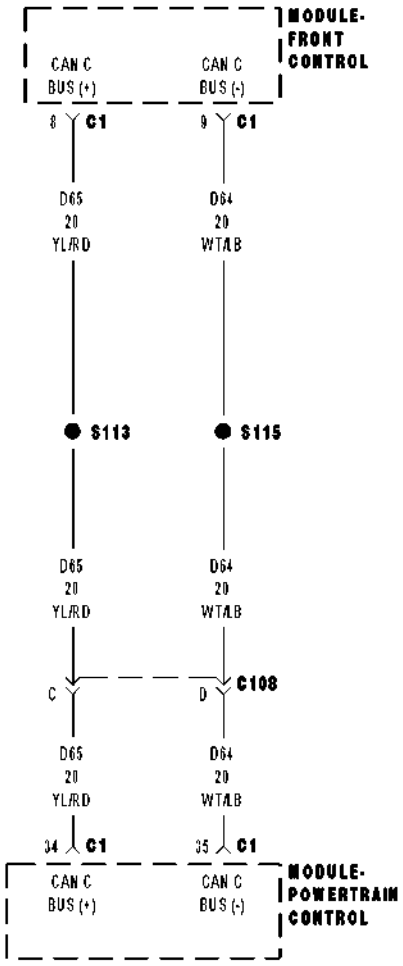
- **When Monitored:**
  Every 7 msec with:
  1) Engine speed greater than 500 RPM.
  2) Battery voltage between 10 and 16 volts.
- **Set Condition:**
  CAN C bus messages are not received for 10 seconds.

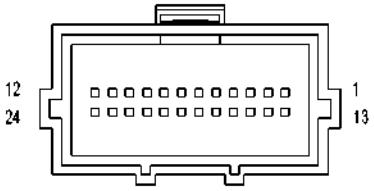
Theory of Operation

The NGC controller communicates over the CAN C bus. The transmission controller continuously monitors bus activity. The CAN C bus is also used to communicate transmission MIL status to the Engine Controller. If the Engine Controller is unable to communicate with the Transmission Controller, a DTC will set and the Engine Controller will illuminate the MIL.

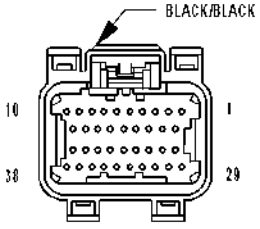
Refer to 8-ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

U0141 LOST COMMUNICATION WITH FCM





MODULE-
FRONT
CONTROL C1



MODULE-
POWERTRAIN
CONTROL C1

D14AE044

U0141 LOST COMMUNICATION WITH FCM (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Every 7 msec with:
  1) Engine speed greater than 500 RPM.
  2) Battery voltage between 10 and 16 volts.
- **Set Condition:**
  CAN C bus messages are not received for 10 seconds.

Theory of Operation

The NGC controller communicates over the CAN C bus. The transmission controller continuously monitors bus activity. The CAN C bus is also used to communicate transmission MIL status to the Engine Controller. If the Engine Controller is unable to communicate with the Transmission Controller, a DTC will set and the Engine Controller will illuminate the MIL.

Refer to 8-ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

STANDARD PROCEDURE

42RLE TRANSMISSION VERIFICATION TEST - VER 1

1.

1. After completion of the Transmission Verification Test, a Powertrain Verification Test must be performed. Refer to the Powertrain Category.

2. Connect the scan tool to the Data Link Connector (DLC).

3. Reconnect any disconnected components.

4. With the scan tool, erase all Transmission DTCs, also erase the PCM DTCs.

5. Perform *PRNDL FAULT CLEARING PROCEDURE after completion of repairs for P0706 CHECK SHIFTER SIGNAL.

6. With the scan tool, display Transmission Temperature. Start and run the engine until the Transmission Temperature is above 43° C (110° F).

7. Check the transmission fluid and adjust if necessary. Refer to the Service Information for the Fluid Fill procedure.

8. If the Powertrain Control Module or Torque Converter has been replaced, or if the Transmission has been repaired or replaced, perform a Quick Learn Procedure and reset the Pinion Factor with the scan tool.

9. Road test the vehicle. With the scan tool, monitor the engine RPM. Make 15 to 20 1-2, 2-3, 3-4 upshifts. Perform these shifts from a standing start to 45 M.p.h. with a constant throttle opening of 20 to 25 degrees.

10. Below 25 MPH, make 5 to 8 wide open throttle kickdowns to 1st gear. Allow at least 5 seconds each in 2nd and 3rd gear between each kickdown.

11. For a specific DTC, drive the vehicle according to the DTC When Monitored and Set Conditions in order to verify that the DTC is repaired.

12. If equipped with AutoStick®, upshift and downshift several times using the AutoStick® feature during the road test.

13. Where applicable, use the EATX OBDII task manager to run Good Trip time in each gear. This will confirm the repair.

14. Check for Diagnostic Trouble Codes (DTCs) after the road test. If a DTC sets during the road test , return to the Symptom list and perform the appropriate diagnostic procedure.

15. Erase the Engine DTC P0700 to turn the MIL off after making transmission repairs.

Were there any DTCs set during the road test?

Yes >> Refer to the Symptom List and perform the appropriate diagnostic procedure.

No >> Repair is complete.

PRE-DIAGNOSTIC CHECK OUT

For a complete wiring diagram **Refer to Section 8W**.

Diagnostic Test

1. PRE-DIAGNOSTIC CHECK OUT

1. Check the transmission fluid level. If the fluid level is low, locate and repair any leaks and fill the transmission to the proper level. Refer to the appropriate Service Information for procedures. Many transmission symptoms can be caused by a low fluid level.

2. Check the battery. To avoid false diagnosis, testing should only be performed with the battery fully charged.

3. With the scan tool, read Engine (PCM) DTCs. If DTCs are present, refer to the Driveability Category and perform to the appropriate diagnostic procedure(s) before proceeding.

4. With the scan tool, read Transmission (TCM) DTCs. Record all Stored, Active, and Pending DTC information. Diagnose any Pending DTC as a matured DTC.

5. With the scan tool, read EATX DTC EVENT DATA. Use this data to identify the conditions in which the DTC was set.

6. Performing a Battery Disconnect will clear all EATX DTC EVENT DATA and reset all learned Transmission values to the default values, which may temporarily result in erratic shift schedules.

7. With the scan tool, perform the Shift Lever Position Test. If the test does not pass, refer to the diagnostic procedure for P0706 Check Shifter Signal.

8. For Gear Ratio Error DTCs, use the scan tool to view CVI Monitor data. Read and record the Clutch Volume Index information.

9. Use the wiring diagram as a guide. Inspect the wiring and connectors related to this circuit. Repair as necessary.

10. Refer to the When Monitored and Set Conditions for this DTC. DTCs can set at ignition on, at start up, after driving under specific conditions and after diagnostic monitors have been run.

11. Refer to applicable Technical Service Bulletins (TSBs) for controller software update information. Some conditions can be corrected by upgrading the Engine (PCM) or Transmission (TCM) controller software.

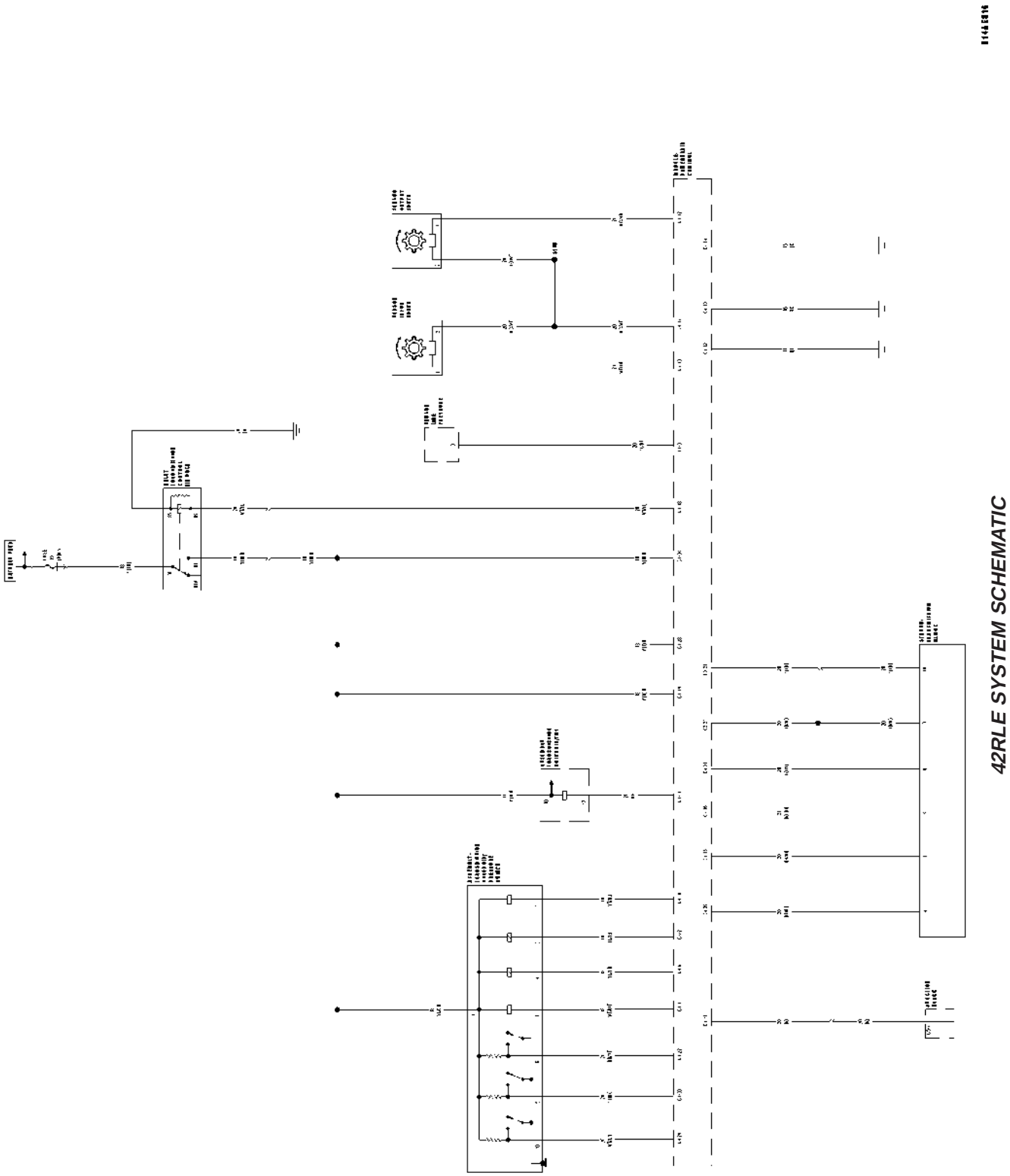
12. Refer to any Service Information Tune Ups or Technical Service Bulletins that apply to this symptom.

Were there any repairs made that fixed the vehicle?

Yes >> Testing complete.
Perform 42RLE VERIFICATION TEST - VER 1 (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - STANDARD PROCEDURE)

No >> Refer to the Transmission category and perform the appropriate diagnostic procedure(s).

SCHEMATICS AND DIAGRAMS



42RLE SYSTEM SCHEMATIC

AUTOMATIC TRANSMISSION 42RLE - SERVICE INFORMATION

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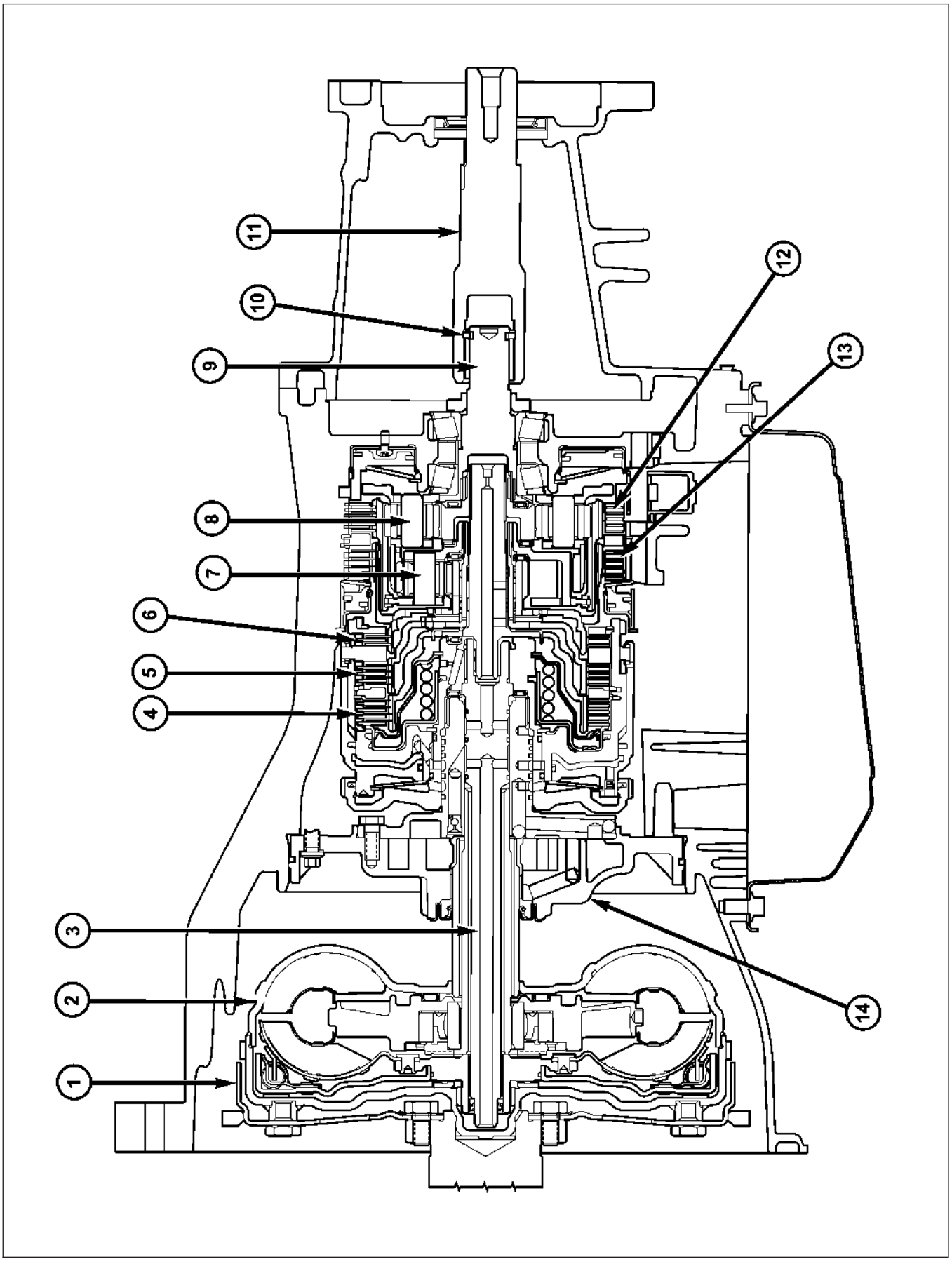
AUTOMATIC TRANSMISSION 42RLE - SERVICE INFORMATION

DESCRIPTION



BOF80141

42RLE Automatic Transmission

1 - DRIVEPLATE
2 - TORQUE CONVERTER
3 - INPUT SHAFT
4 - UNDERDRIVE CLUTCH
5 - OVERDRIVE CLUTCH
6 - REVERSE CLUTCH
7 - FRONT PLANET CARRIER
8 - REAR PLANET CARRIER
9 - OUTPUT SHAFT
10 - SNAP RING
11 - STUB SHAFT
12 - LOW/REVERSE CLUTCH
13 - 2/4 CLUTCH
14 - OIL PUMP

The 42RLE is a four-speed transmission that is a conventional hydraulic/mechanical assembly controlled with adaptive electronic controls and monitors. The hydraulic system of the transmission consists of the transmission fluid, fluid passages, hydraulic valves, and various line pressure control components. An input clutch assembly which houses the underdrive, overdrive, and reverse clutches is used. It also utilizes separate holding clutches: 2nd/4th gear and Low/Reverse. The primary mechanical components of the transmission consist of the following:

- Three multiple disc input clutches
- Two multiple disc holding clutches
- Four hydraulic accumulators
- Two planetary gear sets
- Hydraulic oil pump
- Valve body
- Solenoid/Pressure switch assembly

Control of the transmission is accomplished by fully adaptive electronics. Optimum shift scheduling is accomplished through continuous real-time sensor feedback information provided to the Transmission Control Module (TCM) portion of the Powertrain Control Module (PCM).

The TCM is the heart of the electronic control system and relies on information from various direct and indirect inputs (sensors, switches, etc.) to determine driver demand and vehicle operating conditions. With this information, the TCM can calculate and perform timely and quality shifts through various output or control devices (solenoid pack, transmission control relay, etc.).

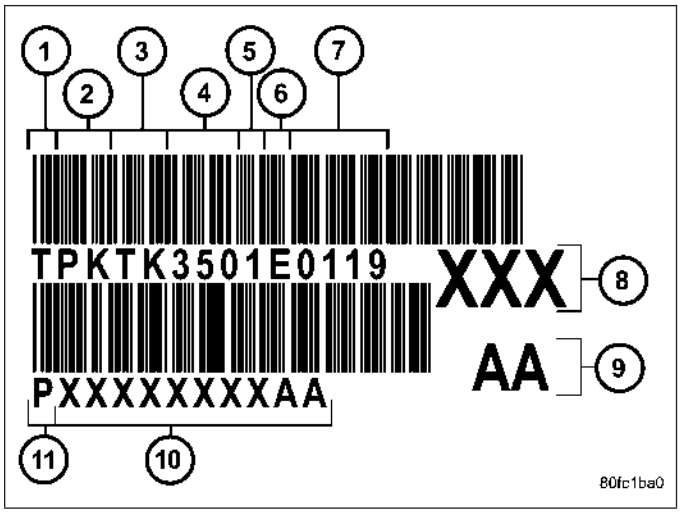
The TCM also performs certain self-diagnostic functions and provides comprehensive information (sensor data, DTC's, etc.) which is helpful in proper diagnosis and repair. This information can be viewed with the scan tool.

TRANSMISSION IDENTIFICATION

The 42RLE transmission can be identified by a bar-code label that is affixed to the upper left area of the bellhousing.

The label contains a series of digits that can be translated into useful information such as transmission part number (10), date of manufacture (4, 5), manufacturing origin (2), assembly line identifier (6), build sequence number (7), etc..

If the tag is not legible or is missing, the "PK" number, which is stamped into the left rear flange of the transmission case, can be referred to for identification. The entire part number, build code, and sequence number are stamped into the flange.

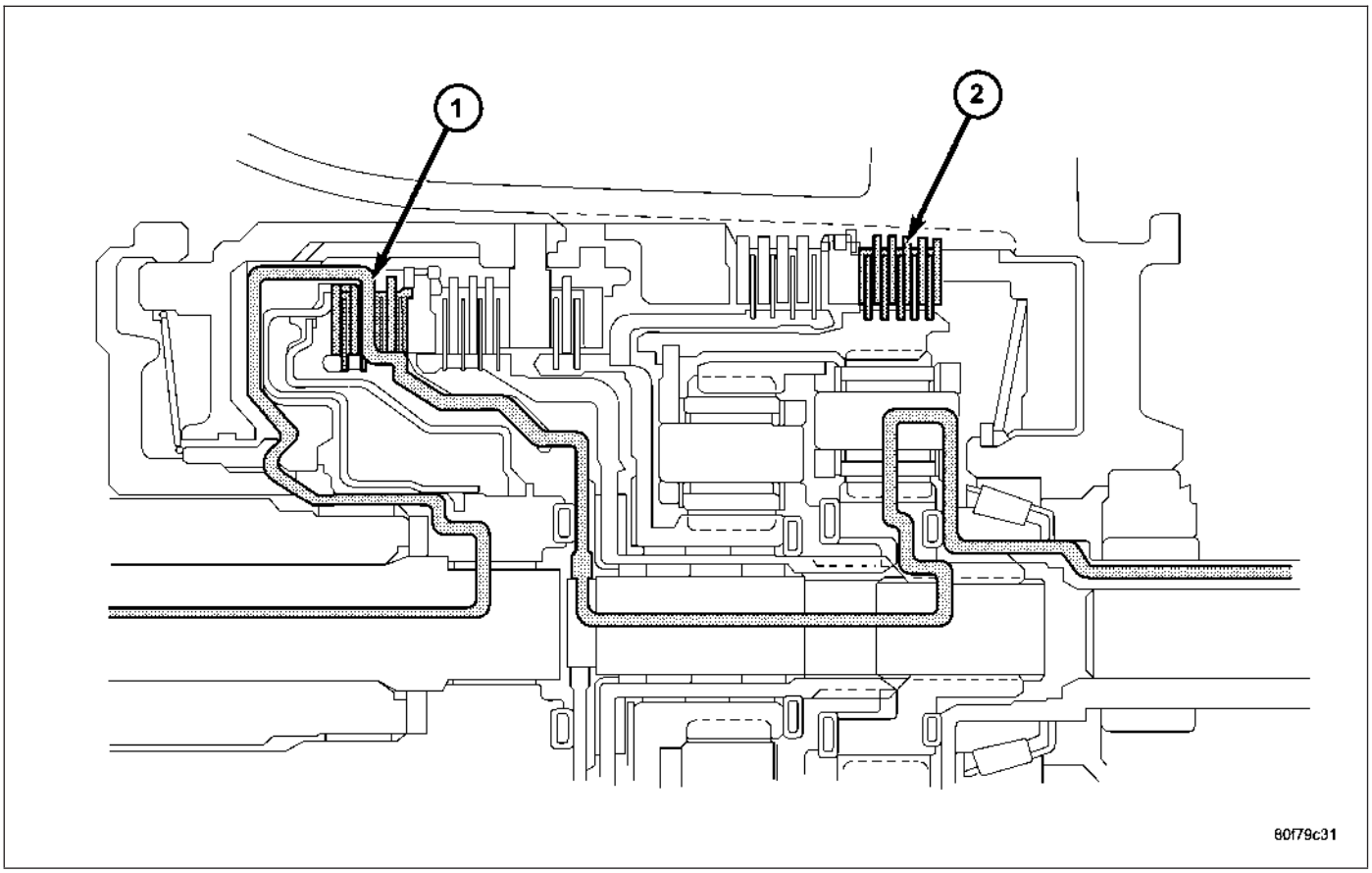


OPERATION

The 42RLE transmission ratios are:

First	2.84 : 1
Second	1.57 : 1
Third	1.00 : 1
Overdrive	0.69 : 1
Reverse	2.21 : 1

FIRST GEAR POWERFLOW

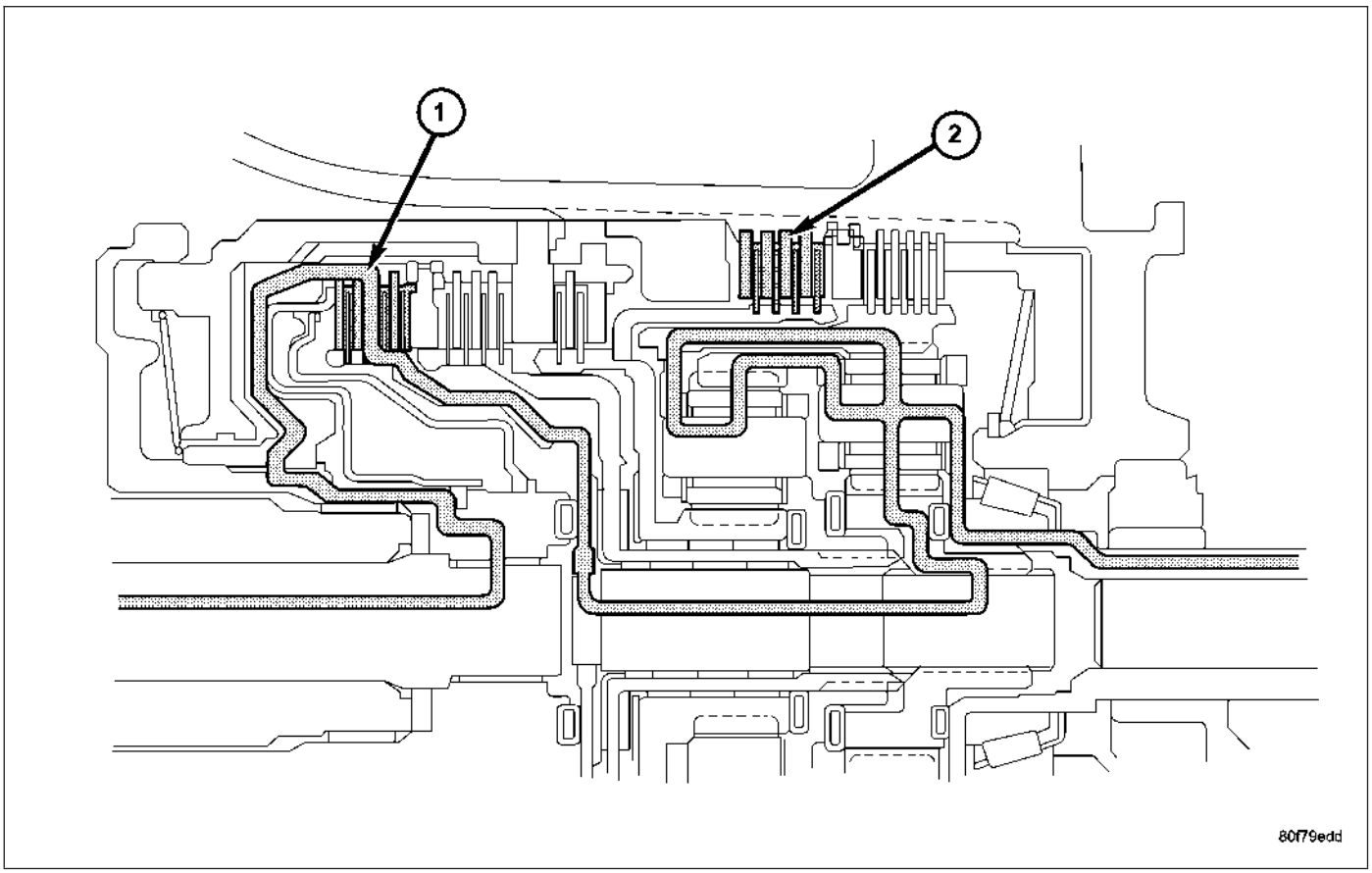


First Gear Powerflow

1 - UNDERDRIVE CLUTCH APPLIED (Turns Rear Sun)
2 - LOW-REVERSE CLUTCH APPLIED (Holds Rear Annulus/Front Carrier)

In first gear range, torque input is through the underdrive clutch (1) to the underdrive hub assembly. The underdrive hub is splined to the rear sun gear. When the underdrive clutch is applied, it rotates the underdrive hub and rear sun gear. The L/R clutch (2) is applied to hold the front carrier/rear annulus assembly. The rear sun gear drives the rear planetary pinion gears. The rear planetary pinion gears are forced to walk around the inside of the stationary rear annulus gear. The pinions are pinned to the rear carrier and cause the rear carrier assembly to rotate as they walk around the annulus gear. This provides the torque output for first gear. The other planetary gearset components are freewheeling. The first gear ratio is 2.84:1.

SECOND GEAR POWERFLOW

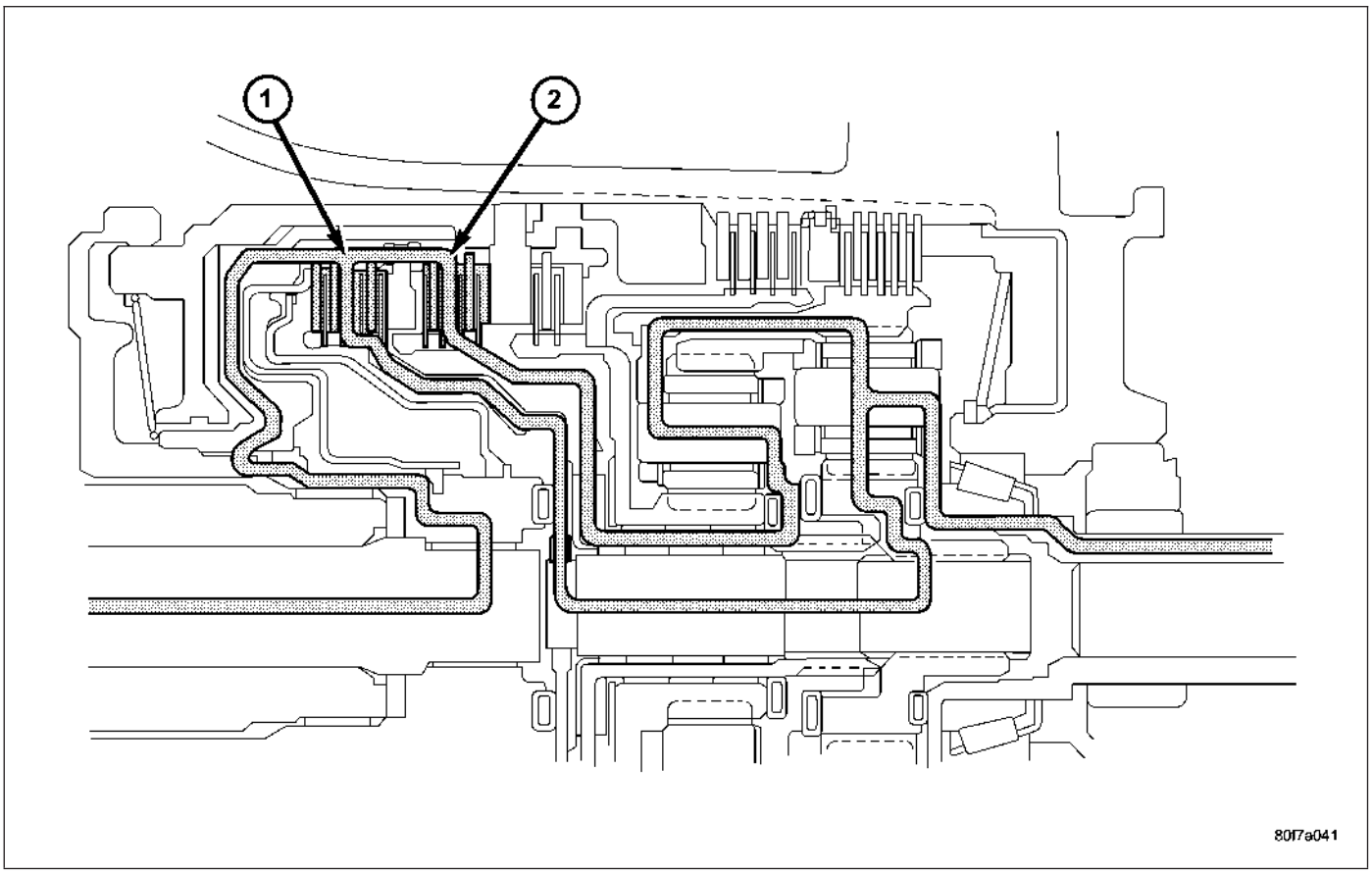


Second Gear Powerflow

1 - UNDERDRIVE CLUTCH APPLIED (Turns Rear Sun)
2 - 2-4 CLUTCH APPLIED (Holds Front Sun)

Second gear is achieved by having both planetary gear sets contribute to torque multiplication. As in first gear, torque input is through the underdrive clutch (1) to the rear sun gear. The 2/4 clutch (2) is applied to hold the front sun gear stationary. The rotating rear sun gear turns the rear planetary pinions. The rear pinions rotate the rear annulus/front carrier assembly. The pinions of the front carrier walk around the stationary front sun gear. This transmits torque to the front annulus/rear carrier assembly, which provides output torque and a gear ratio of 1.57:1.

THIRD GEAR POWERFLOW

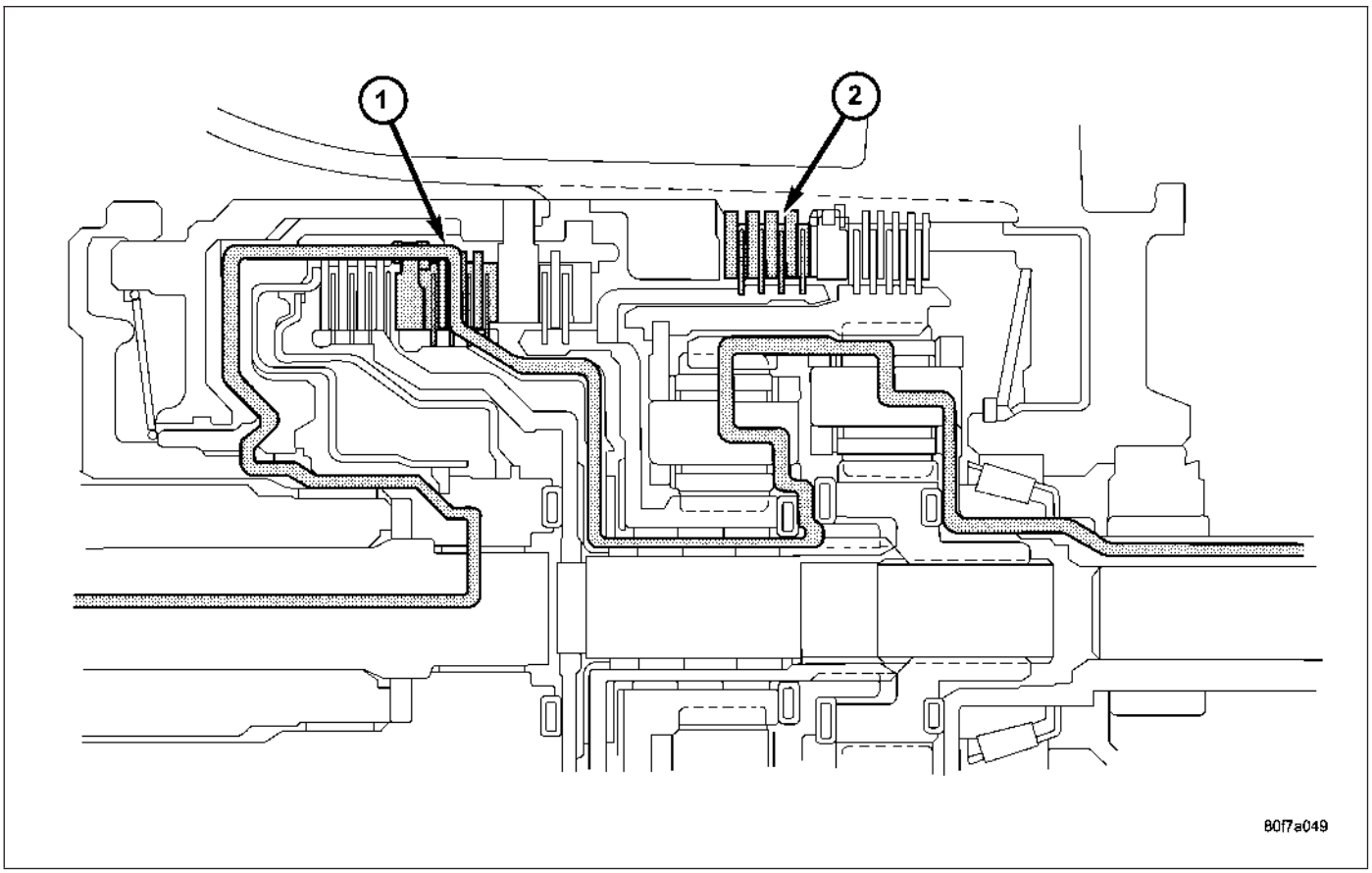


Third Gear Powerflow

1 - UNDERDRIVE CLUTCH APPLIED (Turns Rear Sun)
2 - OVERDRIVE CLUTCH APPLIED (Turns Front Carrier/Rear Annulus)

In third gear, two input clutches are applied to provide torque input: the underdrive clutch (1) and overdrive clutch (2). The underdrive clutch rotates the rear sun gear, while the overdrive clutch rotates the front carrier/rear annulus assembly. The result is two components (rear sun gear and rear annulus gear) rotating at the same speed and in the same direction. This effectively locks the entire planetary gearset together and is rotated as one unit. The gear ratio in third is 1:1.

FOURTH GEAR POWERFLOW

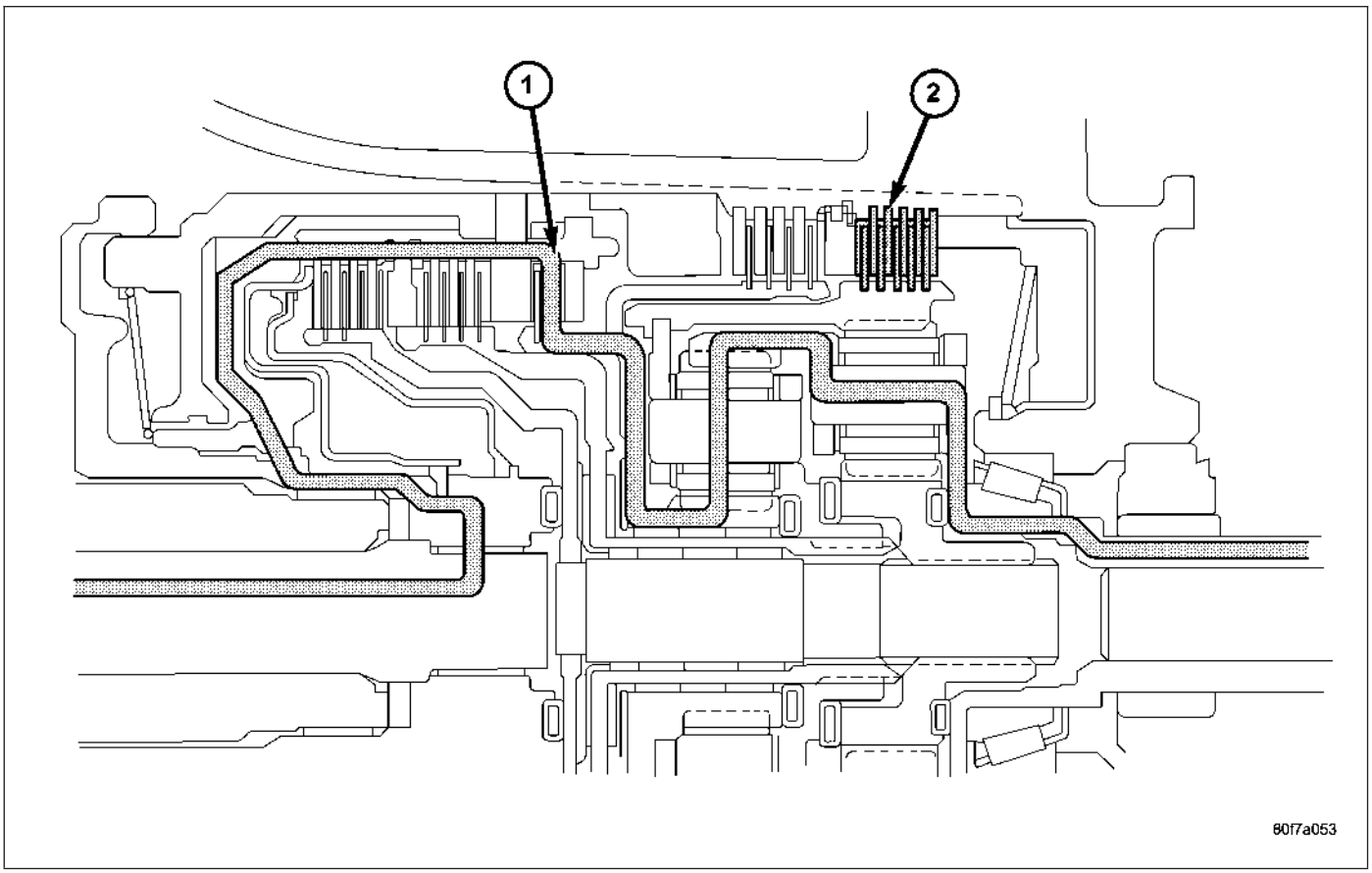


Fourth Gear Powerflow

1 - OVERDRIVE CLUTCH APPLIED (Turns Rear Sun)
2 - 2-4 CLUTCH APPLIED (Holds Front Sun)

In fourth gear input torque is through the overdrive clutch (1) which drives the front carrier. The 2/4 clutch (2) is applied to hold the front sun gear. As the overdrive clutch rotates the front carrier, it causes the pinions of the front carrier to walk around the stationary front sun gear. This causes the front carrier pinions to turn the front annulus/ rear carrier assembly which provides output torque. In fourth gear, transmission output speed is more than engine input speed. This situation is called overdrive and the gear ratio is 0.69:1.

REVERSE GEAR POWERFLOW



Reverse Gear Powerflow

1 - LOW-REVERSE CLUTCH APPLIED (Holds Rear Annulus Front Carrier)
2 - REVERSE CLUTCH APPLIED (Turns Front Sun)

In reverse, input power is through the reverse clutch (1). When applied, the reverse clutch drives the front sun gear through the overdrive hub and shaft. The L/R clutch (2) is applied to hold the front carrier/rear annulus assembly stationary. The front carrier is being held by the L/R clutch so the pinions are forced to rotate the front annulus/rear carrier assembly in the reverse direction. Output torque is provided, in reverse, with a gear ratio of 2.21:1.

DIAGNOSIS AND TESTING

AUTOMATIC TRANSMISSION

CAUTION: Before attempting any repair on the 42RLE Four Speed Automatic Transmission, always check for proper shift cable adjustment. Also check for diagnostic trouble codes with the scan tool and the 42RLE Transmission Diagnostic information.

42RLE automatic transmission malfunctions may be caused by these general conditions:

- Poor engine performance
- Improper adjustments
- Hydraulic malfunctions
- Mechanical malfunctions
- Electronic malfunctions

When diagnosing a problem always begin with recording the complaint. The complaint should be defined as specific as possible. Include the following checks:

- Temperature at occurrence (cold, hot, both)
- Dynamic conditions (acceleration, deceleration, upshift, cornering)
- Elements in use when condition occurs (what gear is transmission in during condition)
- Road and weather conditions
- Any other useful diagnostic information.

After noting all conditions, check the easily accessible variables:

- Fluid level and condition
- Shift cable adjustment
- Diagnostic trouble code inspection

Then perform a road test to determine if the problem has been corrected or that more diagnosis is necessary. If the problem exists after the preliminary tests and corrections are completed, hydraulic pressure checks should be performed.

ROAD TEST

Prior to performing a road test, verify that the fluid level, fluid condition, and linkage adjustment have been approved.

During the road test, the transmission should be operated in each position to check for slipping and any variation in shifting.

If the vehicle operates properly at highway speeds, but has poor acceleration, the converter stator overrunning clutch may be slipping. If acceleration is normal, but high throttle opening is needed to maintain highway speeds, the converter stator clutch may have seized. Both of these stator defects require replacement of the torque converter and thorough transmission cleaning.

Slipping clutches can be isolated by comparing the “Elements in Use” chart with clutch operation encountered on a road test. This chart identifies which clutches are applied at each position of the selector lever.

A slipping clutch may also set a DTC and can be determined by operating the transmission in all selector positions.

ELEMENTS IN USE AT EACH POSITION OF SELECTOR LEVER

Shift Lever Position	INPUT CLUTCHES			HOLDING CLUTCHES	
	Underdrive	Overdrive	Reverse	2/4	Low/Reverse
P - PARK					X
R - REVERSE			X		X
N - NEUTRAL					X
OD - OVERDRIVE					
First	X				X
Second	X			X	
Direct	X	X			
Overdrive		X		X	
D - DRIVE*					
First	X				X
Second	X			X	
Direct	X	X			
L - LOW*					
First	X				X
Second	X			X	
Direct	X	X			
* Vehicle upshift and downshift speeds are increased when in these selector positions.					

The process of elimination can be used to detect any unit which slips and to confirm proper operation of good units. Road test analysis can diagnose slipping units, but the cause of the malfunction cannot be determined. Practically any condition can be caused by leaking hydraulic circuits or sticking valves.

HYDRAULIC PRESSURE TESTS

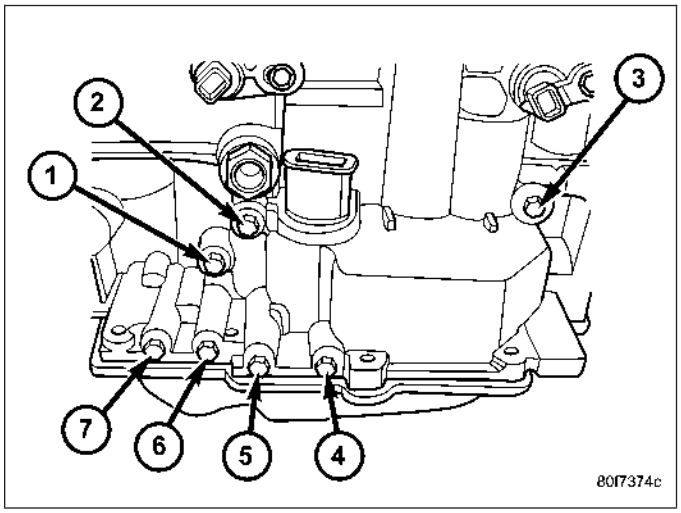
Pressure testing is a very important step in the diagnostic procedure. These tests usually reveal the cause of most transmission problems.

Before performing pressure tests, be certain that fluid level and condition, and shift cable adjustments have been checked and approved. Fluid must be at operating temperature (150 to 200 degrees F.).

Install an engine tachometer, raise vehicle on hoist which allows the wheels to turn, and position tachometer so it can be read.

Using special adapters L-4559, attach 300 psi gauge(s) C-3293SP to the port(s) required for test being conducted.

Test port locations are shown in the Pressure Taps graphic.



Pressure Taps

1 - TORQUE CONVERTER CLUTCH OFF
2 - REVERSE
3 - LOW/REVERSE
4 - 2/4
5 - UNDERDRIVE
6 - TORQUE CONVERTER CLUTCH ON
7 - OVERDRIVE

TEST ONE - SELECTOR IN MANUAL 1 (1st Gear)

NOTE: This test checks pump output, pressure regulation and condition of the low/reverse clutch hydraulic circuit and shift schedule.

1. Attach pressure gauge to the low/reverse clutch tap.
2. Move selector lever to the MANUAL 1 position.
3. Allow vehicle wheels to turn and increase throttle opening to achieve an indicated vehicle speed to 20 mph.
4. Low/reverse clutch pressure should read 115 to 145 psi.

TEST TWO - SELECTOR IN MANUAL 2 (Second Gear)

NOTE: This test checks the underdrive clutch hydraulic circuit as well as the shift schedule.

1. Attach gauge to the underdrive clutch tap.
2. Move selector lever to the MANUAL 2 position.
3. Allow vehicle wheels to turn and increase throttle opening to achieve an indicated vehicle speed of 30 mph.
4. In second gear the underdrive clutch pressure should read 110 to 145 psi.

TEST TWO A - SELECTOR IN DRIVE (OD ON - Fourth Gear)

NOTE: This test checks the underdrive clutch hydraulic circuit as well as the shift schedule.

1. Attach gauge to the underdrive clutch tap.
2. Move selector lever to the DRIVE position. Verfy that the OD switch is ON.

3. Allow wheels to rotate freely and increase throttle opening to achieve an indicated speed of 40 mph.
4. Underdrive clutch pressure should read below 5 psi. If not, than either the solenoid assembly or controller is at fault.

TEST THREE - SELECTOR IN DRIVE (OD OFF - Third and Second Gear)

NOTE: This test checks the overdrive clutch hydraulic circuit as well as the shift schedule.

1. Attach gauge to the overdrive clutch tap.
2. Move selector lever to the DRIVE position.
3. Allow vehicle wheels to turn and increase throttle opening to achieve an indicated vehicle speed of 20 mph.
4. Overdrive clutch pressure should read 74 to 95 psi.
5. Move selector lever to the DRIVE position and increase indicated vehicle speed to 30 mph.
6. The vehicle should be in second gear and overdrive clutch pressure should be less than 5 psi.

TEST FOUR - SELECTOR IN DRIVE (OD ON - Fourth Gear)

NOTE: This test checks the 2/4 clutch hydraulic circuit.

1. Attach gauge to the 2/4 clutch tap.
2. Move selector lever to the DRIVE position.
3. Allow vehicle front wheels to turn and increase throttle opening to achieve an indicated vehicle speed of 30 mph. Vehicle should be in fourth gear.
4. The 2/4 clutch pressure should read 75 to 95 psi.

TEST FIVE-SELECTOR IN DRIVE (OD ON - Fourth Gear, CC on)

NOTE: These tests check the torque converter clutch hydraulic circuit.

1. Attach gauge to the torque converter clutch off pressure tap.
2. Move selector lever to the DRIVE position.
3. Allow vehicle wheels to turn and increase throttle opening to achieve an indicated vehicle speed of 50 mph. Vehicle should be in 4th gear, CC on.

CAUTION: Both wheels must turn at the same speed.

4. Torque converter clutch off pressure should be less than 5 psi.
5. Now attach the gauge to the torque converter clutch on pressure tap.
6. Move selector to the OD position.
7. Allow vehicle wheels to turn and increase throttle opening to achieve an indicated vehicle speed of 50 mph.
8. Verify the torque converter clutch is applied mode using the RPM display of the scan tool.
9. Torque converter clutch on pressure should be 60-90 psi.

TEST SIX-SELECTOR IN REVERSE

NOTE: This test checks the reverse clutch hydraulic circuit.

1. Attach gauge to the reverse and low/reverse clutch tap.
2. Move selector lever to the REVERSE position.
3. Read reverse clutch pressure with output stationary (foot on brake) and throttle opened to achieve 1500 rpm.
4. Reverse and low/reverse clutch pressure should read 165 to 235 psi.

TEST RESULT INDICATIONS

1. If proper line pressure is found in any one test, the pump and pressure regulator are working properly.
2. Low pressure in all positions indicates a defective pump, a clogged filter, or a stuck pressure regulator valve.

3. Clutch circuit leaks are indicated if pressures do not fall within the specified pressure range.
4. If the overdrive clutch pressure is greater than 5 psi in Step 6 of Test Three, a worn reaction shaft seal ring or a defective solenoid assembly is indicated.
5. If the underdrive clutch pressure is greater than 5 psi in Step 4 of Test Two-A, a defective solenoid/pressure switch assembly or controller is the cause.

ALL PRESSURE SPECIFICATIONS ARE PSI (on hoist, with wheels free to turn)

Gear Selector Position	Actual Gear	PRESSURE TAPS						
		Under-drive Clutch	Over-drive Clutch	Reverse Clutch	Torque Converter Clutch Off	Torque Converter Clutch On	2/4 Clutch	Low/ Reverse Clutch
PARK - 0 mph *	PARK	0-2	0-5	0-2	60-110	45-100	0-2	115-145
REVERSE - 0 mph *	REVERSE	0-2	0-7	165-235	50-100	35-85	0-2	165-235
NEUTRAL - 0 mph *	NEUTRAL	0-2	0-5	0-2	60-110	45-100	0-2	115-145
Low - 20 mph #	FIRST	110-145	0-5	0-2	60-110	45-100	0-2	115-145
Third - 30 mph #	SECOND	110-145	0-5	0-2	60-110	45-100	115-145	0-2
Third - 45 mph #	DIRECT	75-95	75-95	0-2	60-90	45-80	0-2	0-2
OD - 30 mph #	OVERDRIVE	0-2	75-95	0-2	60-90	45-80	75-95	0-2
OD - 50 mph #	OVERDRIVE WITH TCC	0-2	75-95	0-2	0-5	60-95	75-95	0-2
*** Engine Speed at 1500 rpm**								
# CAUTION: Both wheels must be turning at same speed.								

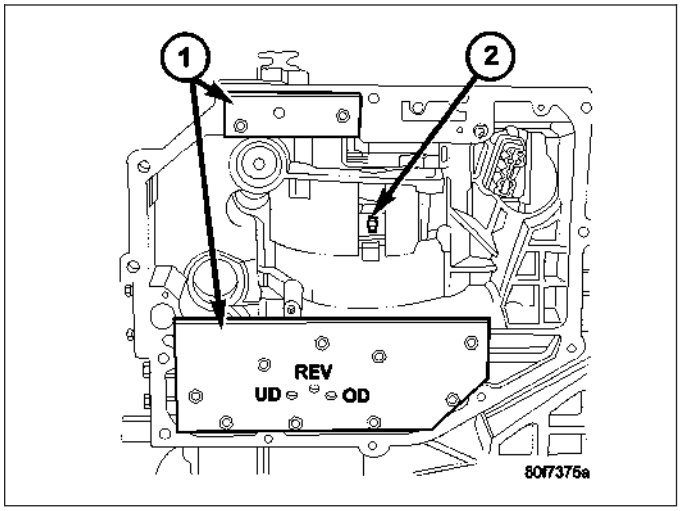
CLUTCH AIR PRESSURE TESTS

Inoperative clutches can be located by substituting air pressure for fluid pressure. The clutches may be tested by applying air pressure to their respective passages after the valve body has been removed. Use Special Tool 6599-1 (1) and 6599-2 (1) to perform test.

To make air pressure tests, proceed as follows:

NOTE: The compressed air supply must be free of all dirt and moisture. Use a pressure of 30 psi.

1. Remove oil pan and valve body. (Refer to 21 - TRANSMISSION/AUTOMATIC - 42RLE/VALVE BODY - REMOVAL)
2. Apply air pressure to the holes in the special tool (1), one at a time.
3. Listen for the clutch to apply. It will give a slight thud sound. If a large amount of air is heard escaping, the transmission must be removed from vehicle, disassembled and all seals inspected.



Air Pressure Test Plate

1 - AIR PRESSURE TEST PLATES
2 - 2/4 CLUTCH RETAINER HOLE

2/4 CLUTCH

Apply air pressure to the feed hole located on the 2/4 clutch retainer (2). Look in the area where the 2/4 piston contacts the first separator plate and watch carefully for the 2/4 piston to move rearward. The piston should return to its original position after the air pressure is removed.

OVERDRIVE CLUTCH

Apply air pressure to the overdrive clutch apply passage and watch for the push/pull piston to move forward. The piston should return to its starting position when the air pressure is removed.

REVERSE CLUTCH

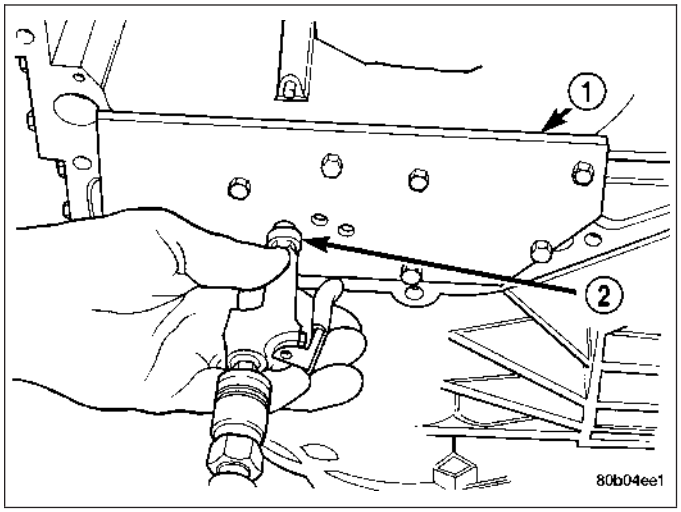
Apply air pressure to the reverse clutch apply passage and watch for the push/pull piston to move rearward. The piston should return to its starting position when the air pressure is removed.

LOW/REVERSE CLUTCH

Apply air pressure to the low/reverse clutch feed hole passage. Look in the area where the low/reverse piston contacts the first separator plate. Watch carefully for the piston to move forward. The piston should return to its original position after the air pressure is removed.

UNDERDRIVE CLUTCH

Because this clutch piston cannot be seen, its operation is checked by function. Use an air nozzle (2) to apply air pressure is to the low/reverse or the 2/4 clutch opening in Test Plate 6599-1 (2). This locks the output shaft. Use a piece of rubber hose wrapped around the input shaft and a pair of clamp-on pliers to turn the input shaft. Next apply air pressure to the underdrive clutch. The input shaft should not rotate with hand torque. Release the air pressure and confirm that the input shaft will rotate.



FLUID LEAKAGE

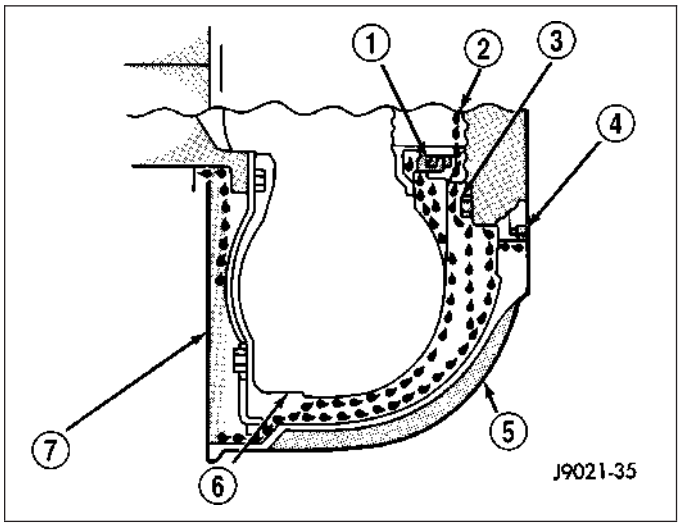
FLUID LEAKAGE - TORQUE CONVERTER HOUSING AREA

When diagnosing converter housing (5) fluid leaks, three actions must be taken before repair:

1. Verify proper transmission fluid level.
2. Verify that the leak originates from the converter housing area and is transmission fluid.
3. Determine the true source of the leak.

Fluid leakage at or around the torque converter area may originate from an engine oil leak (7). The area should be examined closely. Factory fill fluid is red and, therefore, can be distinguished from engine oil.

Some suspected converter housing fluid leaks may not be leaks at all. They may only be the result of residual fluid in the converter housing, or excess fluid spilled during factory fill, or fill after repair. Converter housing leaks have several potential sources. Through careful observation, a leak source can be identified before removing the transmission for repair.

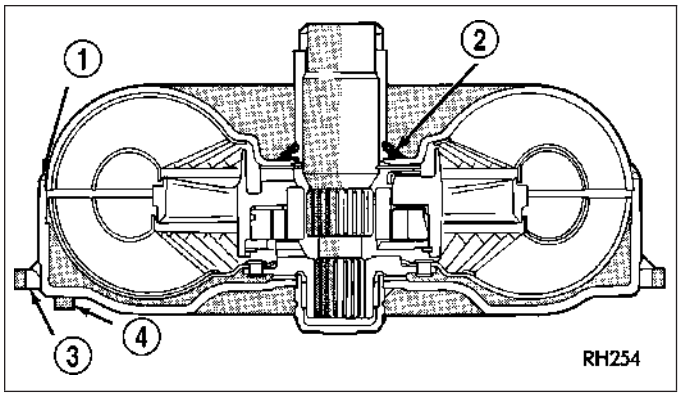


Pump seal (1) leaks tend to move along the drive hub and onto the rear of the converter. Pump o-ring or pump body leaks follow the same path as a seal leak. Pump attaching bolt (3) leaks are generally deposited on the inside of the converter housing (5) and not on the converter itself. Pump seal (1) or gasket (4) leaks usually travel down the inside of the converter housing.

TORQUE CONVERTER LEAKAGE

Possible sources of torque converter leakage are:

- Torque converter weld leaks at the outside diameter weld (1).
- Torque converter hub weld (2).



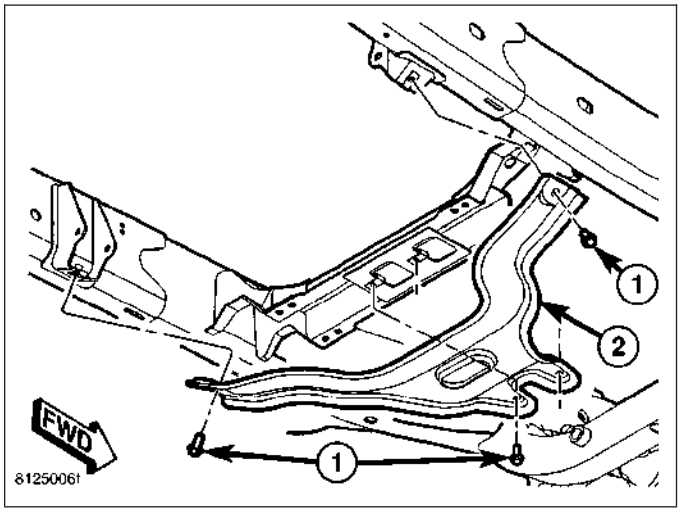
STANDARD PROCEDURE - ALUMINUM THREAD REPAIR

Damaged or worn threads in the aluminum transmission case and valve body can be repaired by the use of Heli-Coils®, or equivalent. This repair consists of drilling out the worn-out damaged threads. Then tap the hole with a special Heli-Coil® tap, or equivalent, and installing a Heli-Coil® insert, or equivalent, into the hole. This brings the hole back to its original thread size.

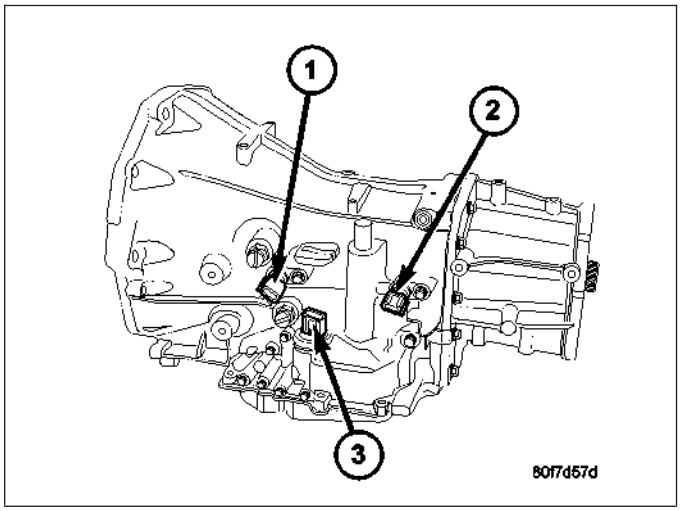
Heli-Coil®, or equivalent, tools, and inserts are readily available from most automotive parts suppliers.

REMOVAL

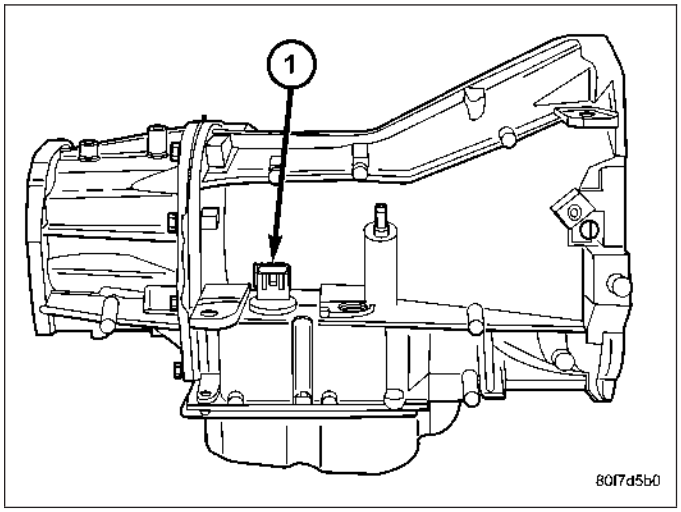
1. Disconnect the negative battery cable.
2. Raise and support the vehicle
3. Remove any necessary skid plates. (Refer to 13 - FRAMES & BUMPERS/FRAME/TRANSFER CASE SKID PLATE - REMOVAL)



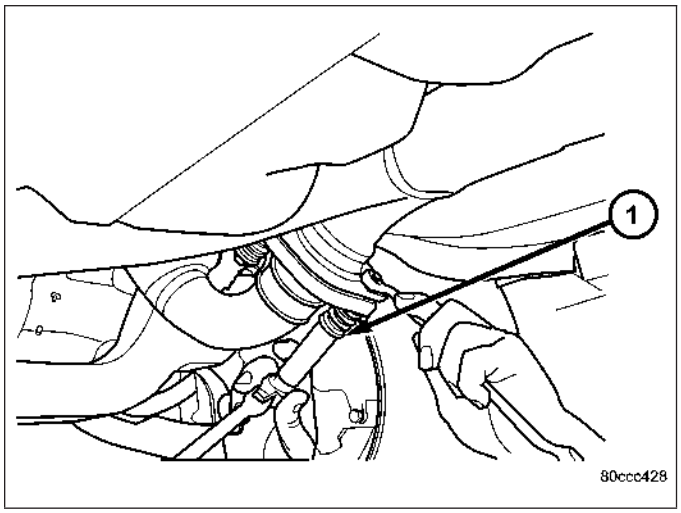
4. Mark propeller shaft and axle companion flanges for assembly alignment.
5. Remove the rear propeller shaft. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - REMOVAL)
6. Remove the front propeller shaft, if necessary. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - REMOVAL)
7. Disconnect wires from the input (1) and output (2) speed sensors.
8. Disconnect wires from the transmission range sensor (3).



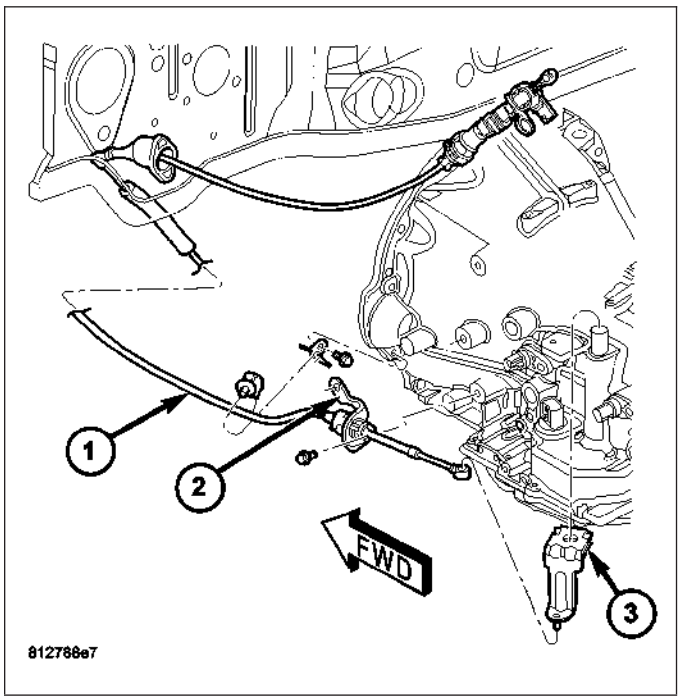
9. Disconnect wires from the solenoid/pressure switch assembly.



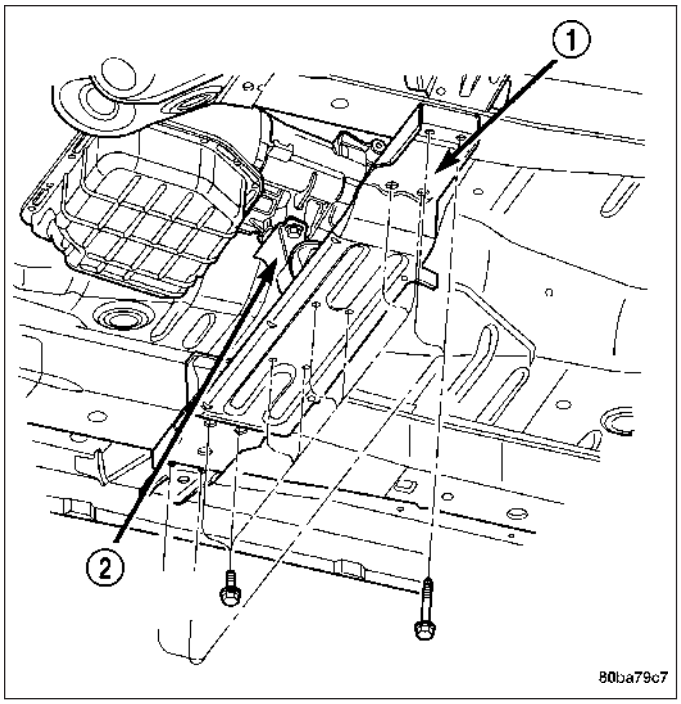
10. Remove the bolts holding the exhaust crossover pipe to the pre-catalytic converter pipe flanges (1).
11. Remove the bolts holding the exhaust crossover pipe to the catalytic converter flange.



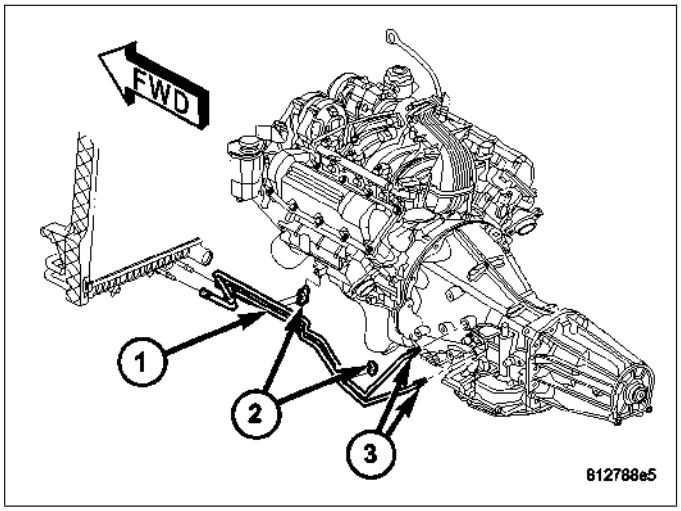
12. Disconnect gearshift cable (1) from transmission manual valve lever (3).
13. Disengage the shift cable (1) from the cable support bracket (2).



14. Remove the starter motor.
15. Remove the engine to transmission collar.
16. Rotate crankshaft in clockwise direction until converter bolts are accessible. Then remove bolts one at a time. Rotate crankshaft with socket wrench on dampener bolt.
17. Disconnect the transmission vent hose from the transmission.
18. Remove transfer case. (Refer to 21 - TRANSMISSION/TRANSFER CASE - REMOVAL)
19. Support rear of engine with safety stand or jack.
20. Raise transmission slightly with service jack to relieve load on crossmember and supports.
21. Remove bolts securing rear support and cushion to transmission and crossmember.
22. Remove bolts attaching crossmember to frame and remove crossmember.



23. Disconnect transmission fluid cooler lines (1) at transmission fittings (3) and clips (2).
24. Remove all remaining converter housing bolts.
25. Carefully work transmission and torque converter assembly rearward off engine block dowels.
26. Hold torque converter in place during transmission removal.
27. Lower transmission and remove assembly from under the vehicle.
28. To remove torque converter, carefully slide torque converter out of the transmission.



DISASSEMBLY

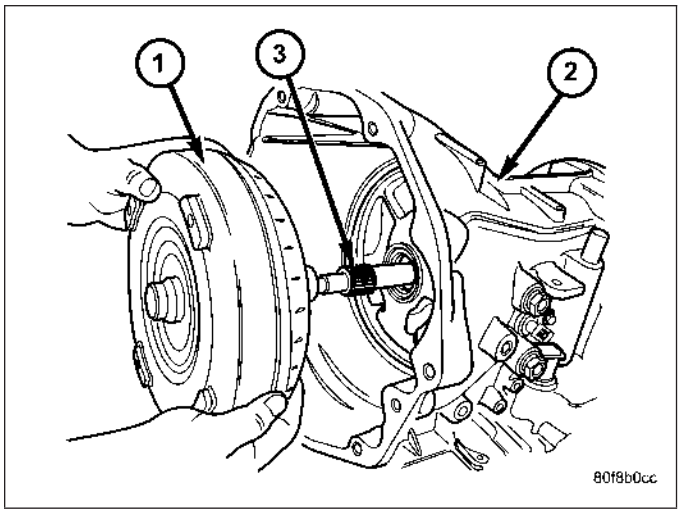
NOTE: If the transmission is being reconditioned (clutch/seal replacement) or replaced, it is necessary to perform the Quick Learn Procedure using the scan tool (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE).

NOTE: Tag all clutch pack assemblies, as they are removed, for reassembly identification.

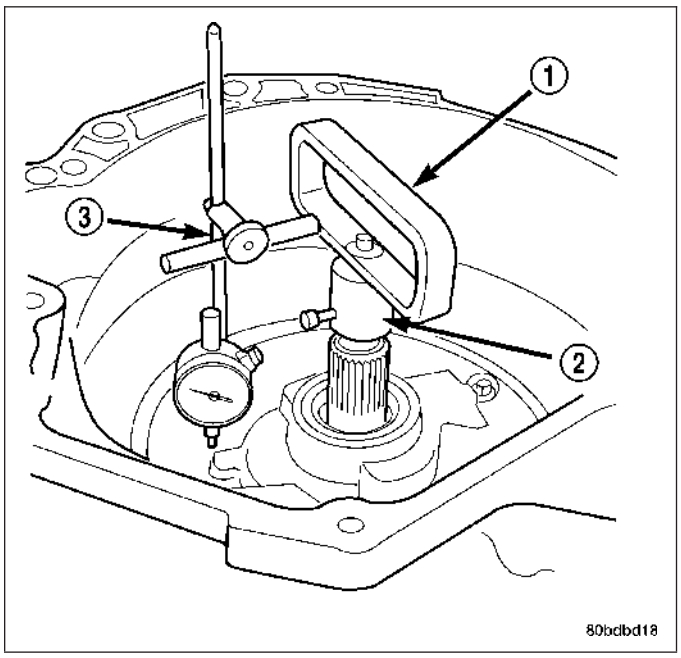
CAUTION: Do not intermix clutch discs or plates as the unit might then fail.

Before disassembling transmission, move the shift lever clockwise as far as it will go and then remove the shift lever.

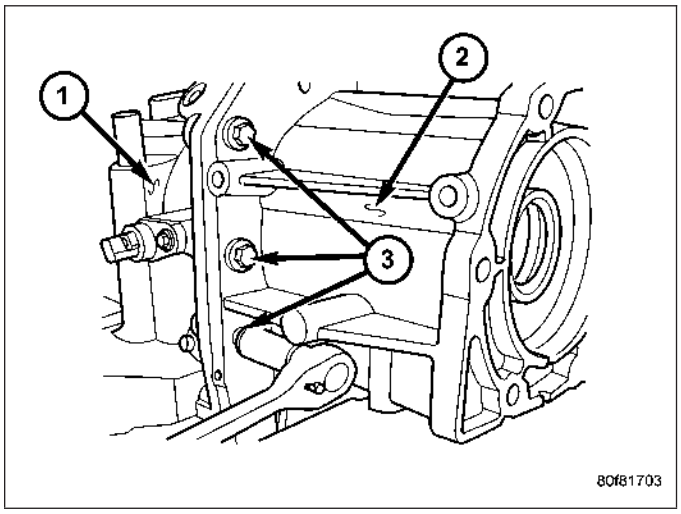
1. Remove the torque converter (1) from the transmission input shaft (3).



2. Measure input shaft end play using Tool 8266 (1, 2). Set up Tool 8266 and a dial indicator as shown.
3. Move input shaft in and out to obtain end play reading. End play specifications are 0.13 to 0.64 mm (0.005 to 0.025 inch). Record indicator reading for reference when reassembling the transmission. If endplay exceeds the specified range, the #4 thrust plate needs to be inspected and changed if necessary.

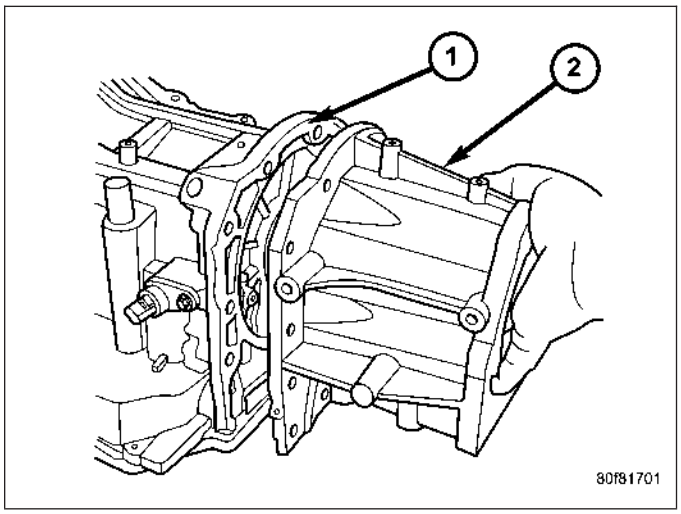


NOTE: The four bolts (3) along the bottom of the adapter or extension housing (2) have a sealing patch applied from the factory. Note the locations of these bolts and separate these bolts for reuse.

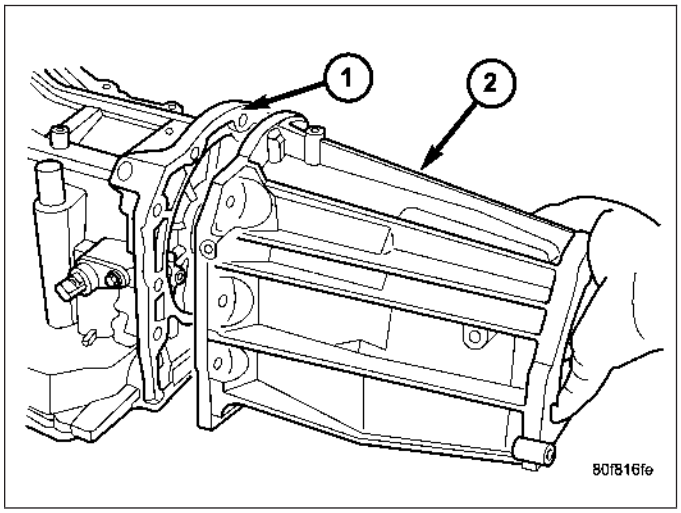


4. Remove the bolts that hold the adapter or extension housing (2) onto the transmission case.

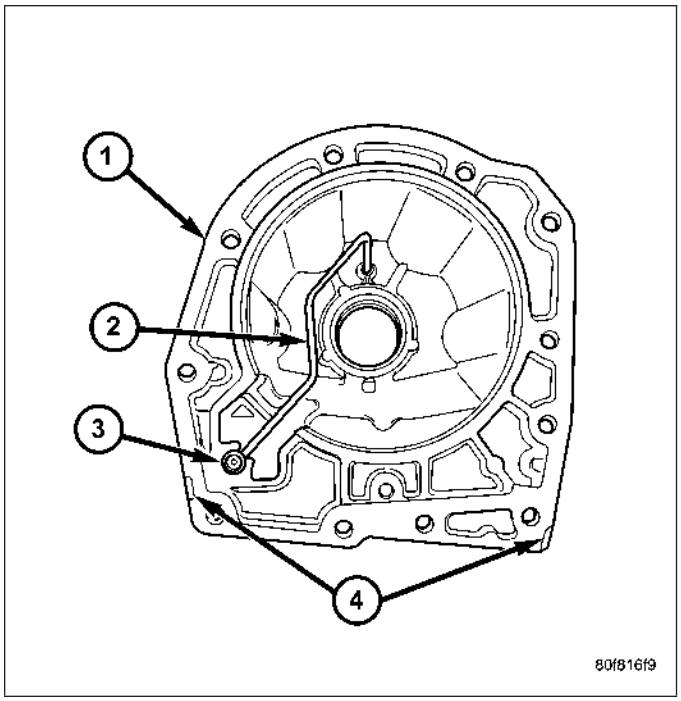
5. Remove the adapter (2) housing, 4X4 vehicles only, from the transmission case. There are two pry slots located near the bottom corners of the housing for separating the housing from the transmission case.



6. Remove the extension (2) housing, 4X2 vehicles only, from the transmission case. There are two pry slots located near the bottom corners of the housing for separating the housing from the transmission case.

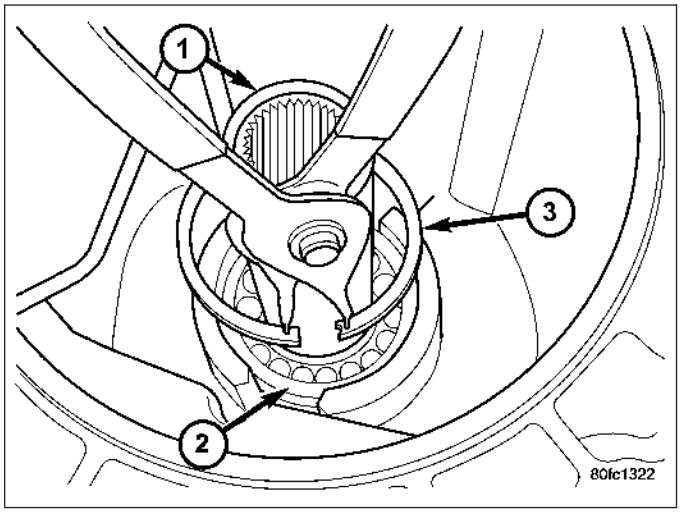


7. Inspect the lube tube grommet (3) for damage. If the grommet lip is damaged, it will need to be replaced.

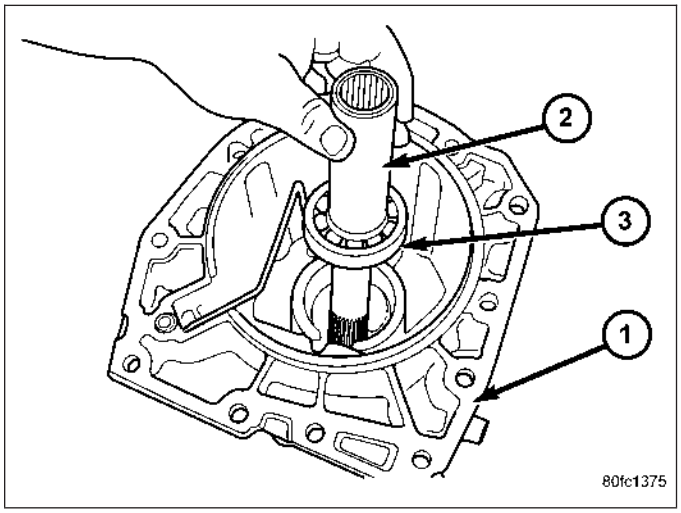


8. On 4X2 transmissions, perform the following, if necessary:

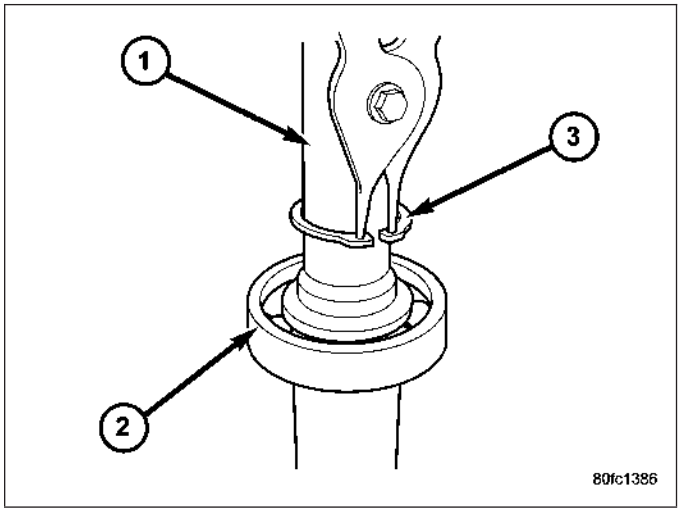
   a. Remove the extension shaft bearing snap ring (3) from the extension housing.



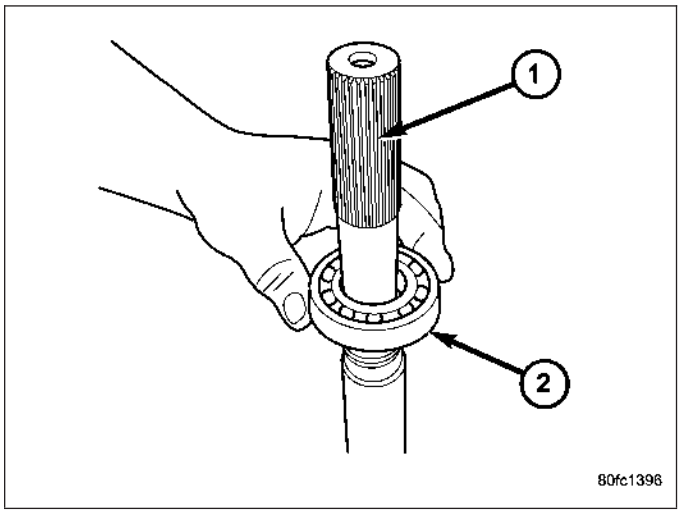
   b. Remove the extension shaft and bearing assembly (2) from the extension housing (1).



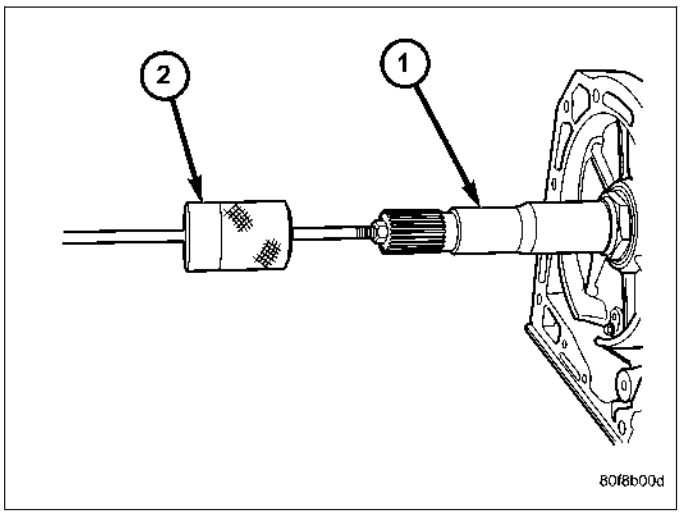
c. Remove the extension shaft bearing retaining ring (3) from the extension shaft (1).



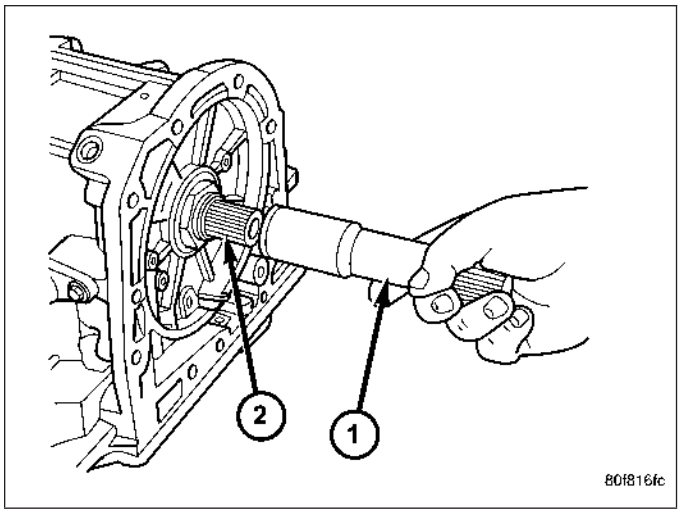
d. Remove the extension shaft bearing (2) from the extension shaft (1).



9. Using a Slide Hammer C-3752 (2), remove the 4X4 stub shaft (1).

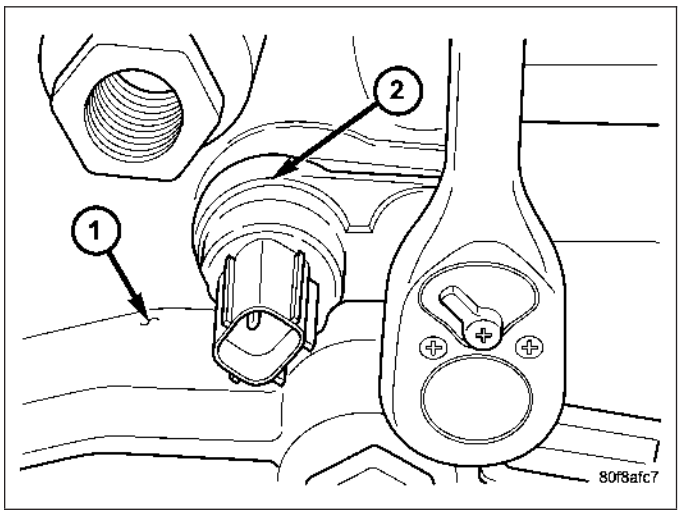


10. Remove the 4X4 stub shaft (1) from the transmission output shaft. Inspect the cir-clip on the shaft for damage and replace the clip if necessary.



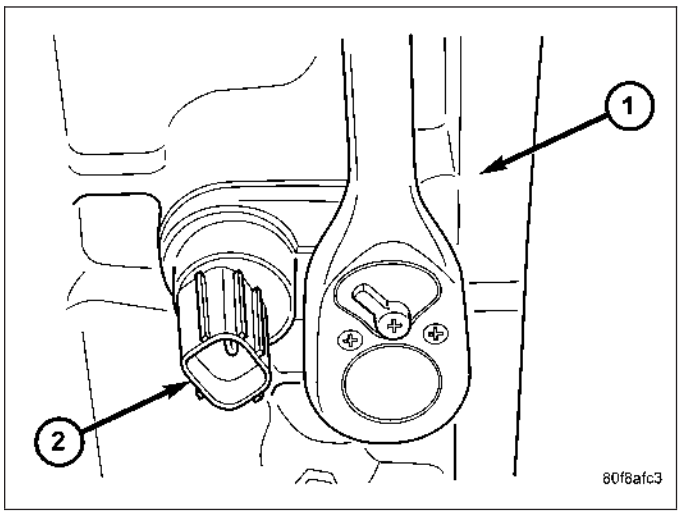
NOTE: The speed sensor bolts have a sealing patch applied from the factory. Separate these bolts for reuse.

11. Remove the input speed sensor bolt.

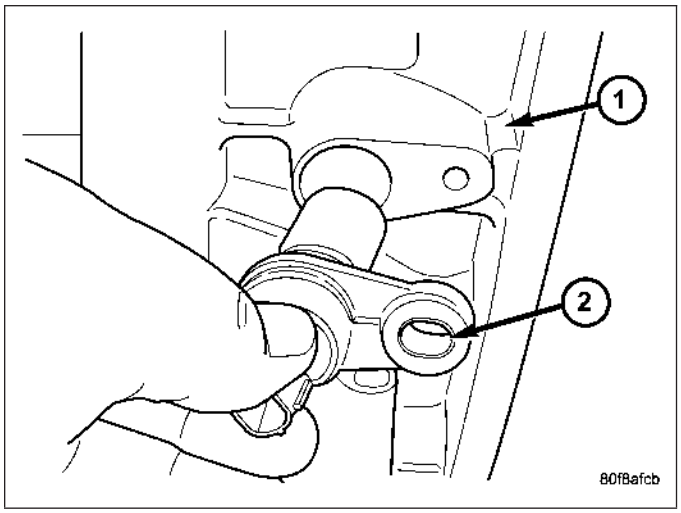


NOTE: The speed sensor bolts have a sealing patch applied from the factory. Separate these bolts for reuse.

12. Remove the output speed sensor bolt.

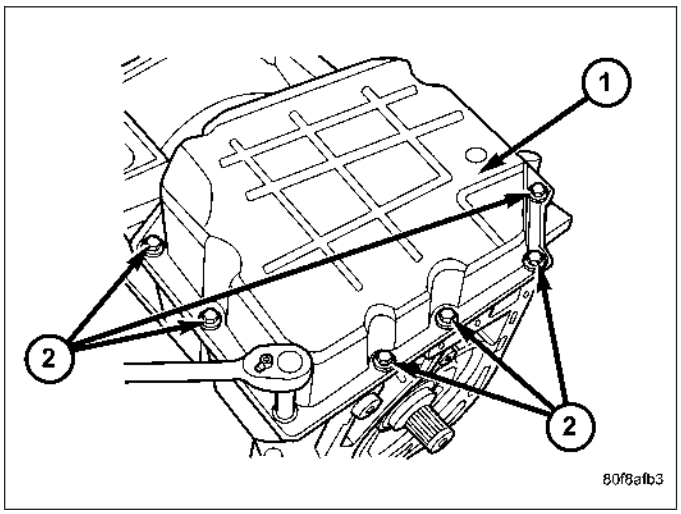


13. Remove the input and output (2) speed sensors. Identify the speed sensors for re-installation since they are not interchangeable.

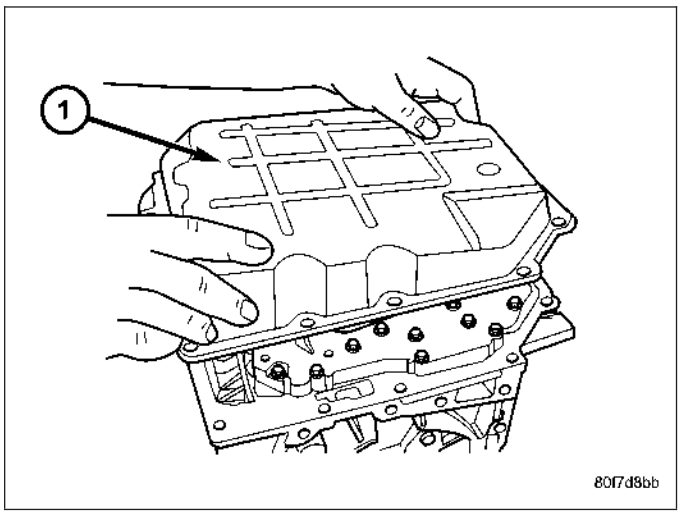


NOTE: One of the oil pan bolts has a sealing patch applied from the factory. Separate this bolt for reuse.

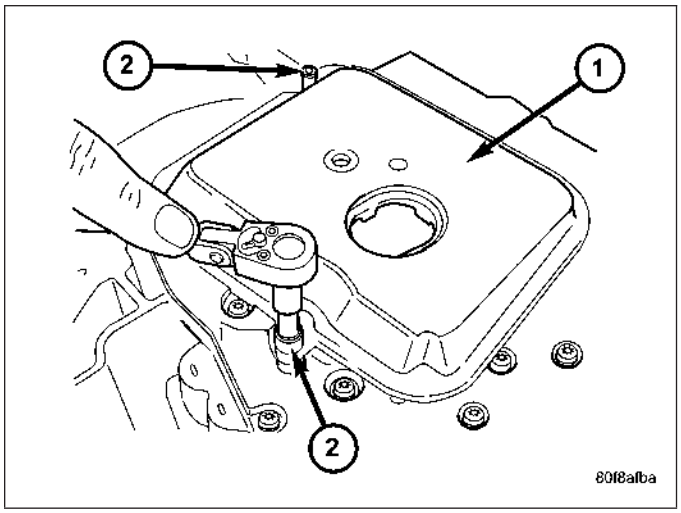
14. Remove the transmission oil pan bolts (2).



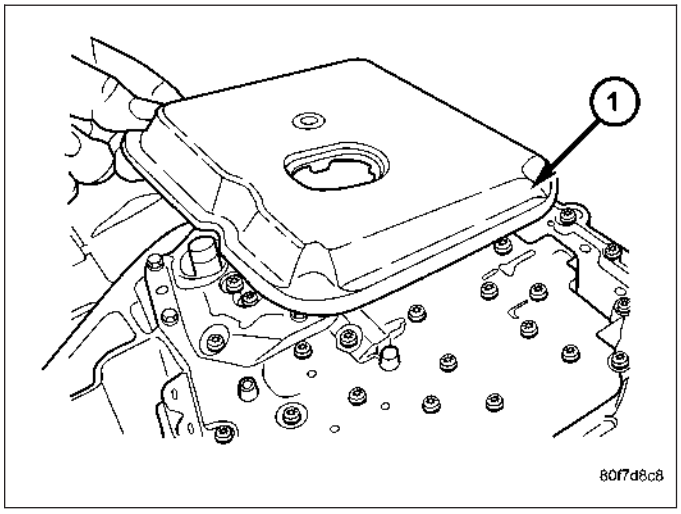
15. Remove the transmission oil pan (1).



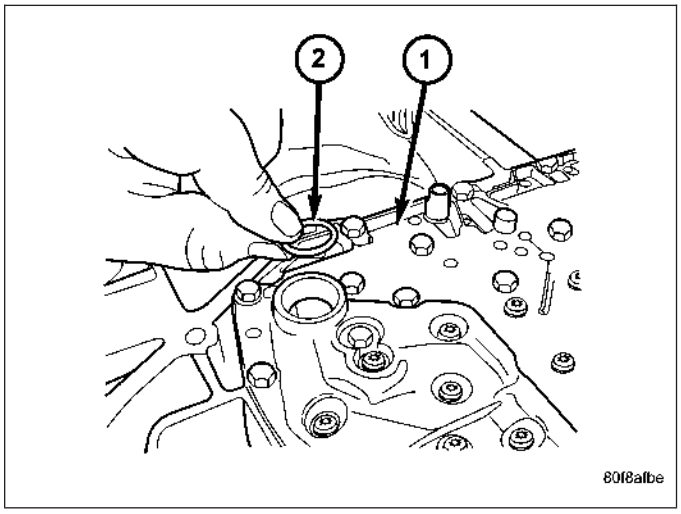
16. Remove the transmission oil filter screws (2).



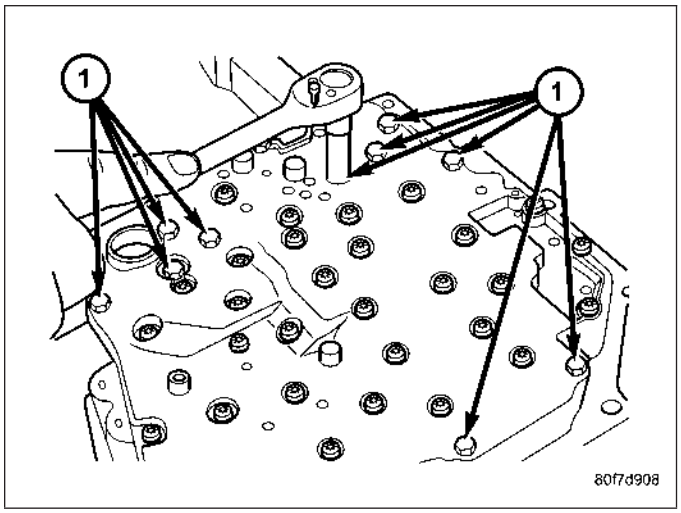
17. Remove transmission oil filter (1).



18. Remove the oil filter o-ring (2) from the valve body.

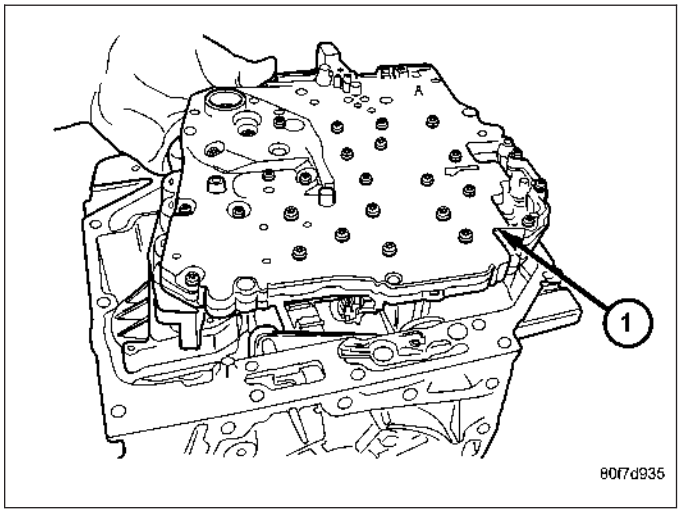


19. Remove valve body-to-case bolts (1).

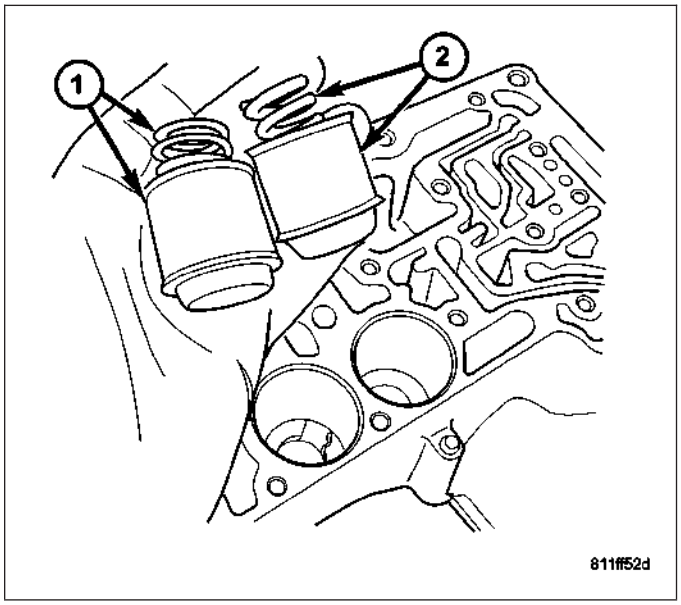


CAUTION: Do not handle the valve body by the manual shaft. Damage could result.

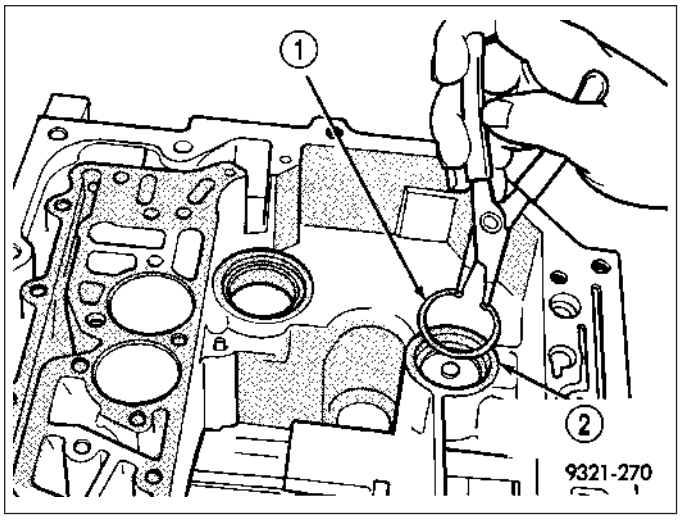
20. Remove valve body (1) from transmission.



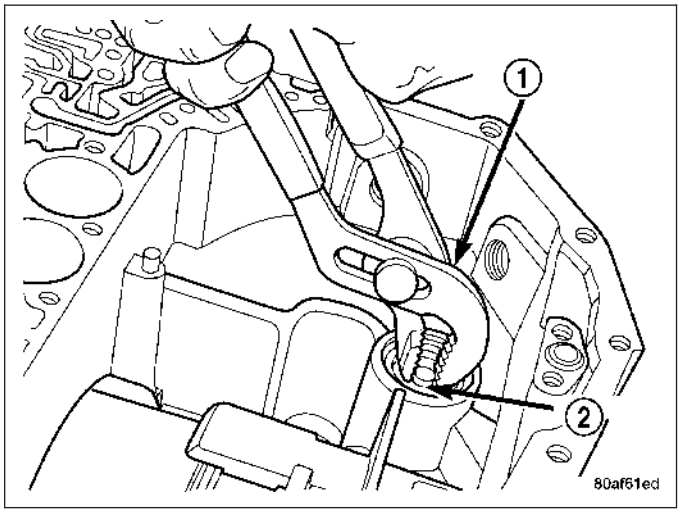
21. Remove underdrive and overdrive accumulators (1, 2).



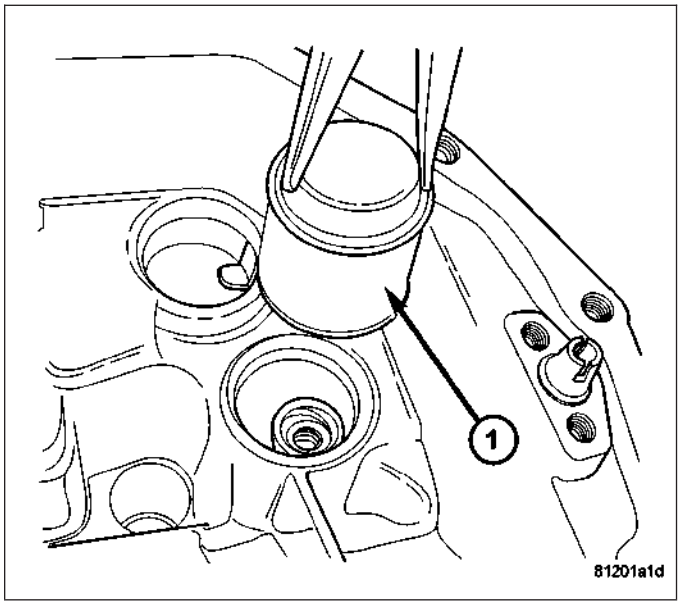
22. Remove the low/reverse accumulator snap ring (1).



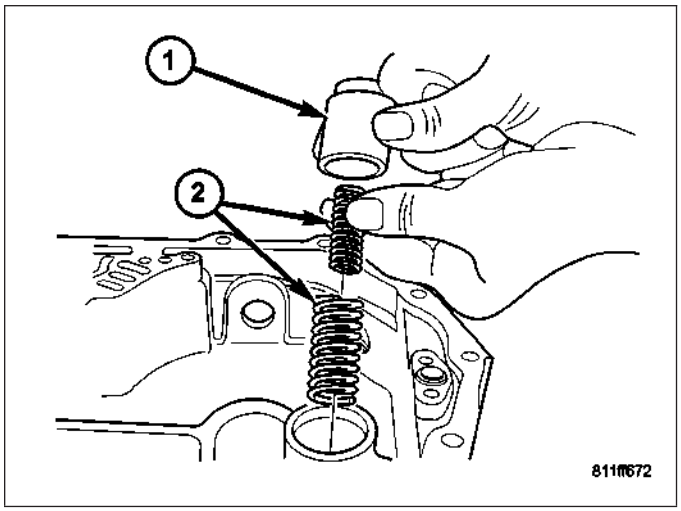
23. Remove the low/reverse accumulator plug (2).



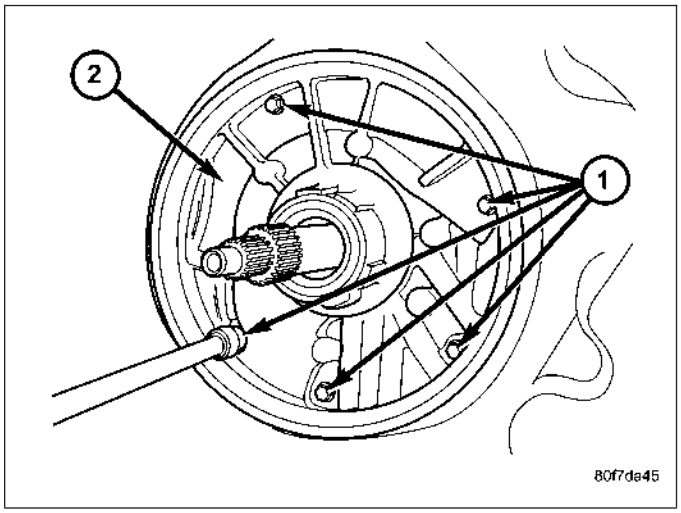
24. Remove low/reverse accumulator piston (1) using suitable pliers.



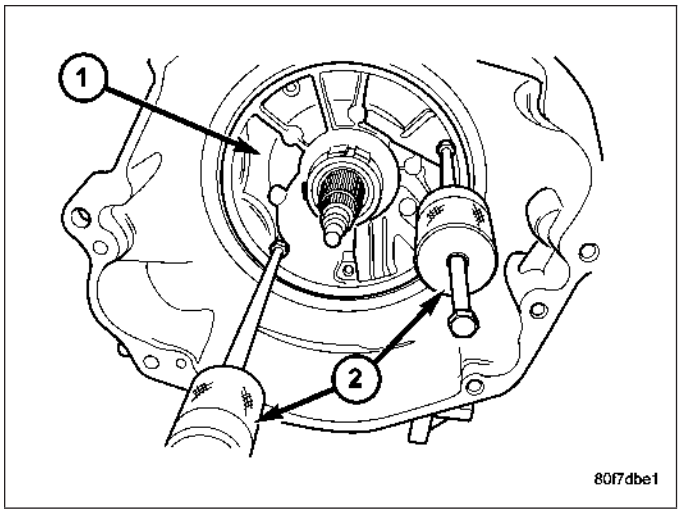
25. Remove piston (1) and springs (2).



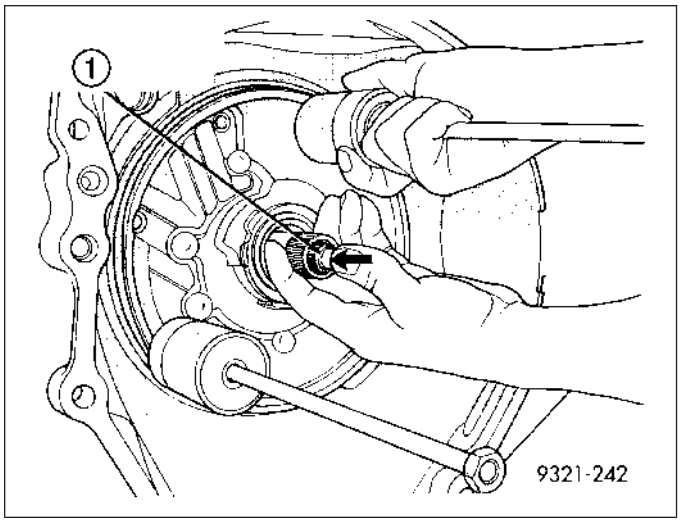
26. Remove and discard the oil pump-to-case bolts (1). The oil pump bolts are not to be reused.



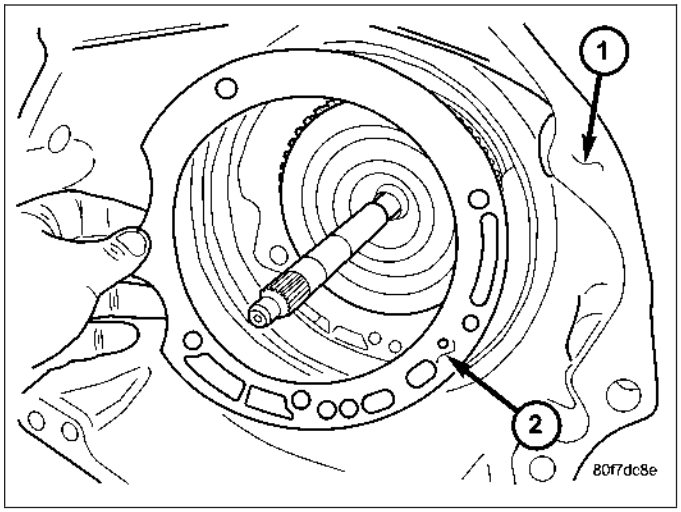
27. Remove oil pump using C-3752 Pullers (2).



28. Remove oil pump while pushing in on input shaft (1).

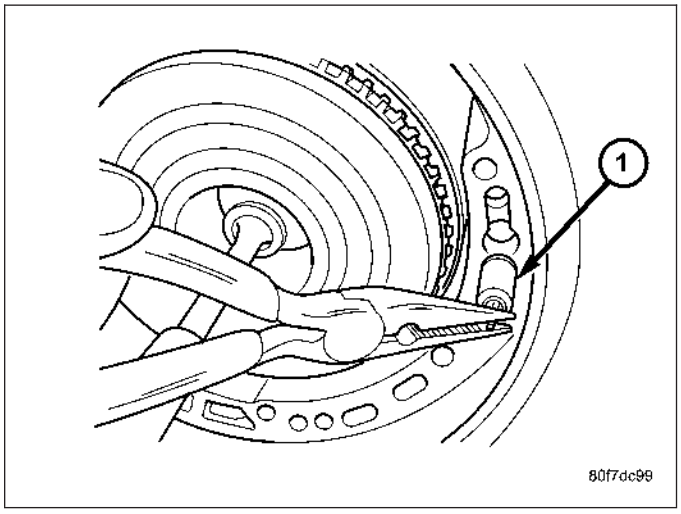


29. Remove oil pump gasket (2).

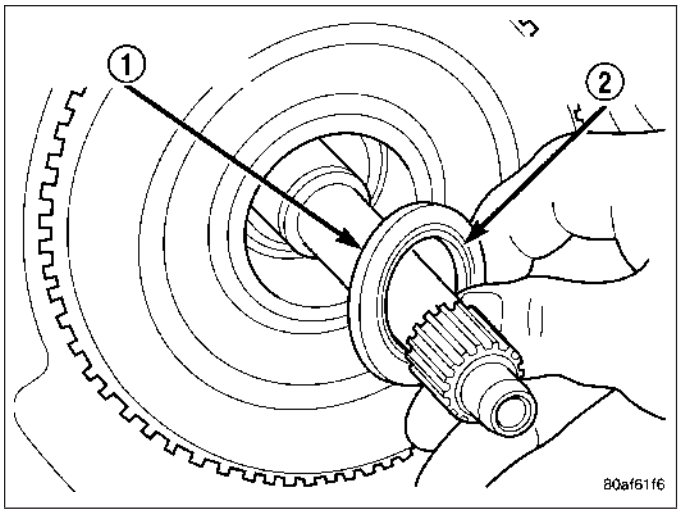


CAUTION: By-pass valve must be replaced if transmission failure occurs.

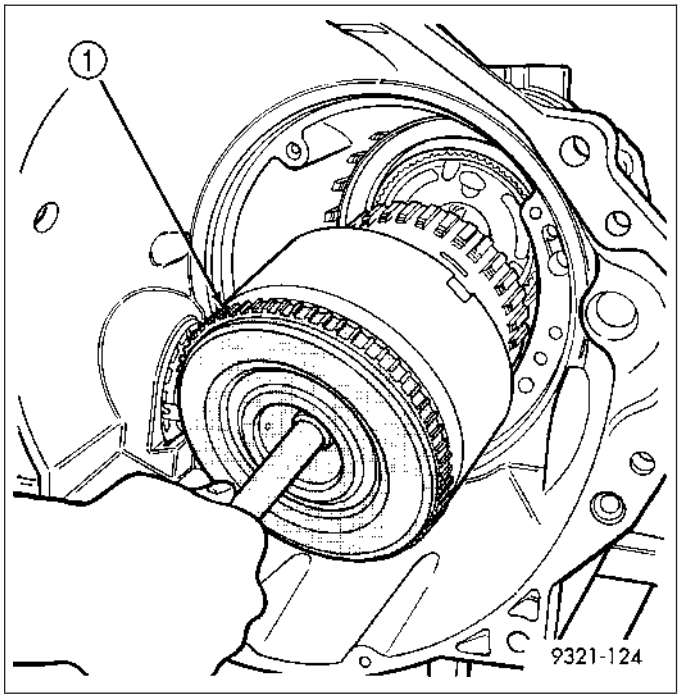
30. Remove the cooler by-pass valve (1).



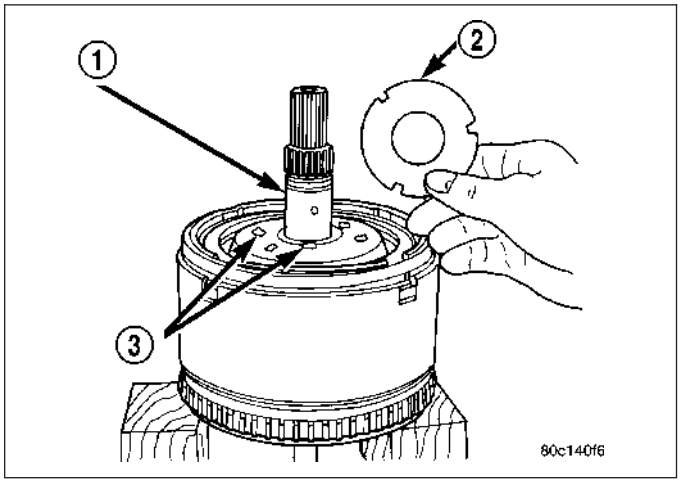
31. Remove the #1 caged needle bearing (1).



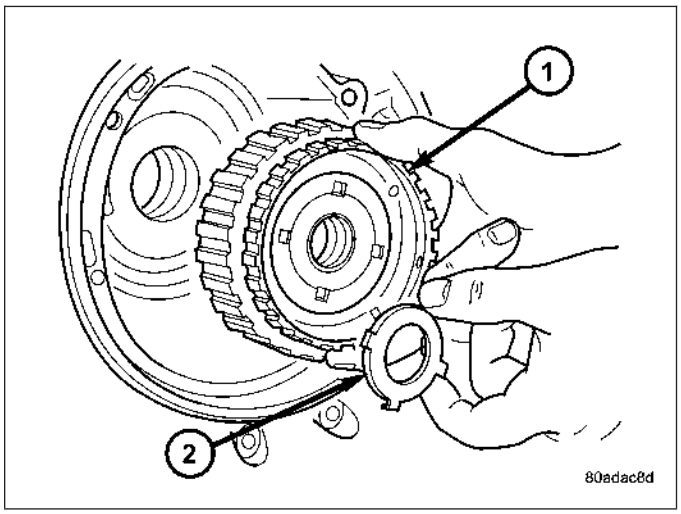
32. Remove the input clutch assembly (1).



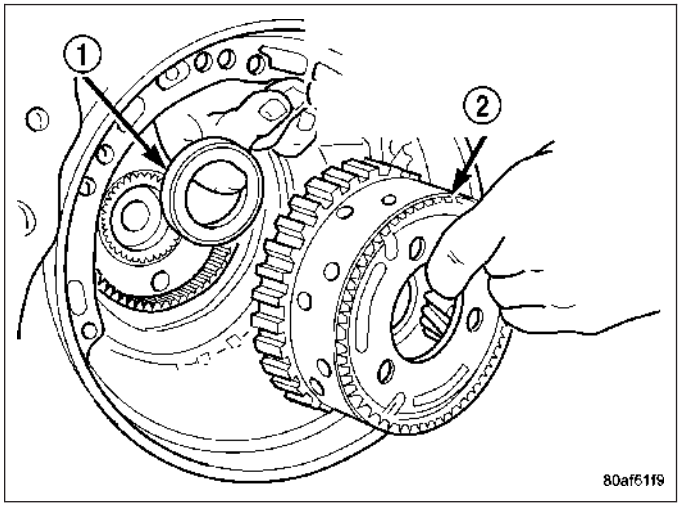
33. Remove the #4 thrust plate (2).



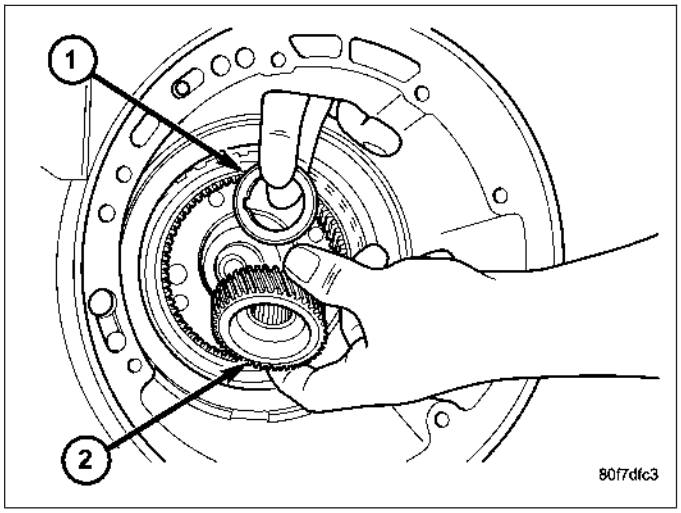
34. Remove the front sun gear assembly (1) and #4 thrust washer (if still in place).



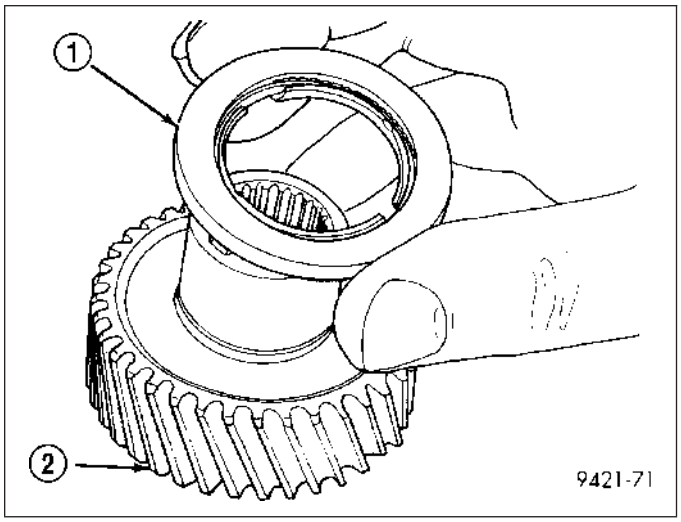
35. Remove the front carrier/rear annulus (2) and #6 needle bearing (1).



36. Remove the rear sun gear (2) and #7 needle bearing (1).

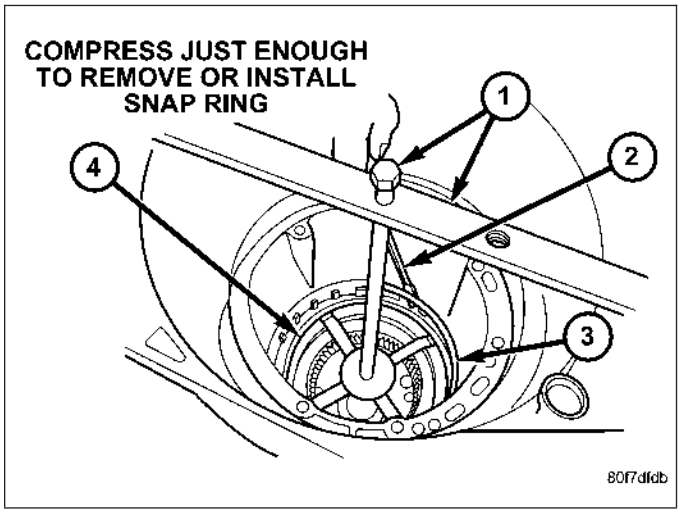


NOTE: The number seven needle bearing (1) has three antireversal tabs and is common with the number five and number two position. The orientation should allow the bearing to seat flat against the rear sun gear. A small amount of petrolatum can be used to hold the bearing to the rear sun gear.



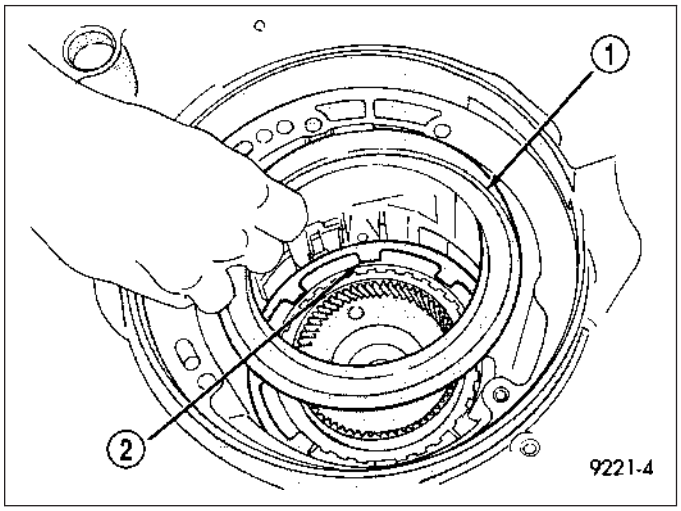
NOTE: Verify that Tool 5058A (1) is centered properly over the 2/4 clutch retainer (4) before compressing. If necessary, fasten the 5058A bar to the bellhousing flange with any combination of locking pliers and bolts to center the tool properly.

37. Install and load Tool 5058A to remove the 2/4 clutch retainer snap ring (3).

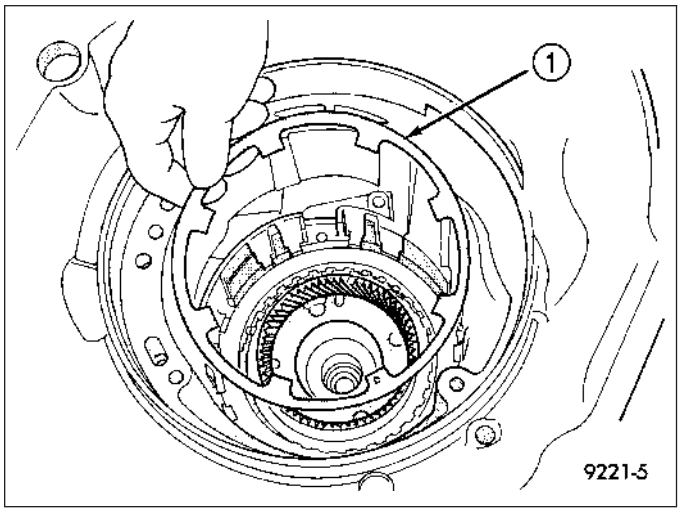


NOTE: The 2/4 Clutch Piston has bonded seals which are not individually serviceable. Seal replacement requires replacement of the piston assembly.

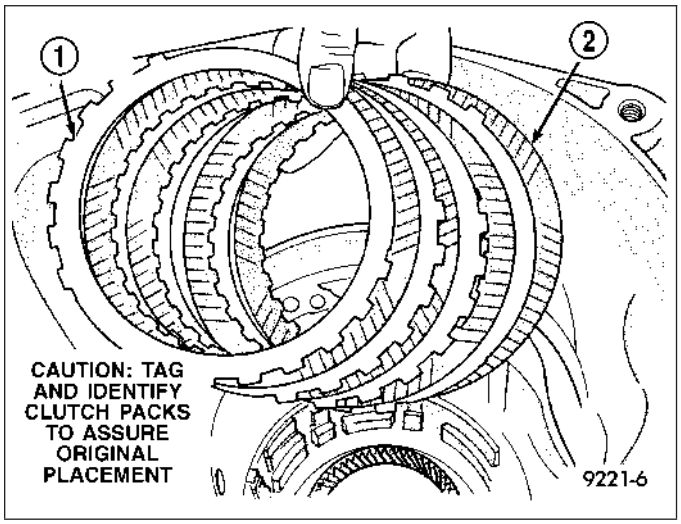
38. Remove the 2/4 clutch retainer (1).



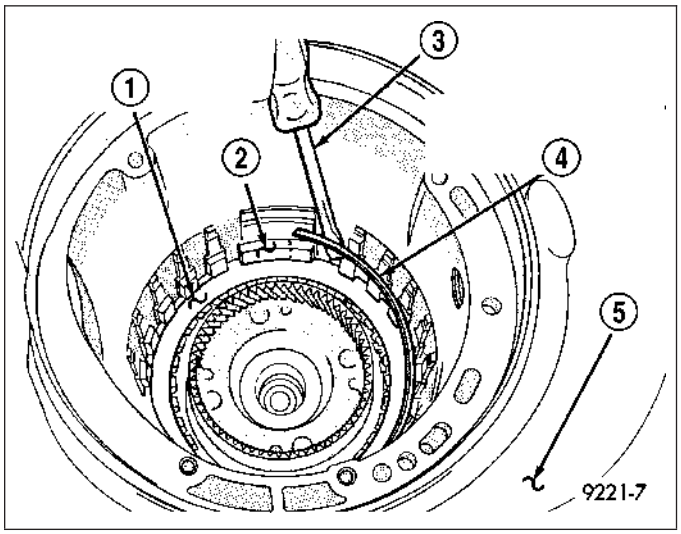
39. Remove the 2/4 clutch return spring (1).



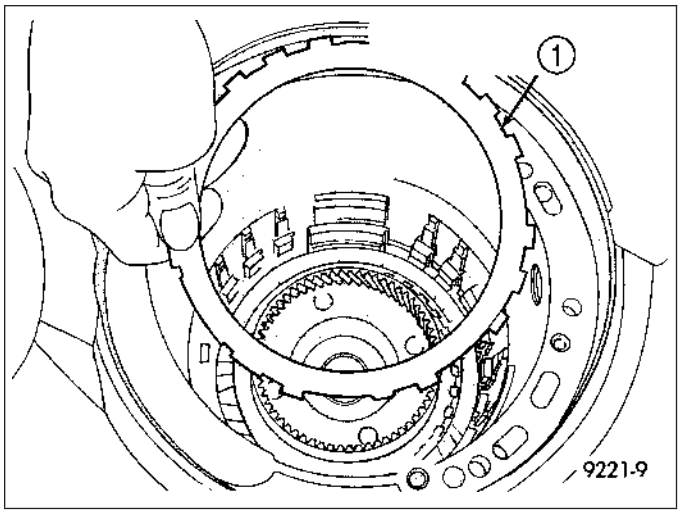
40. Remove the 2/4 clutch pack (1, 2).



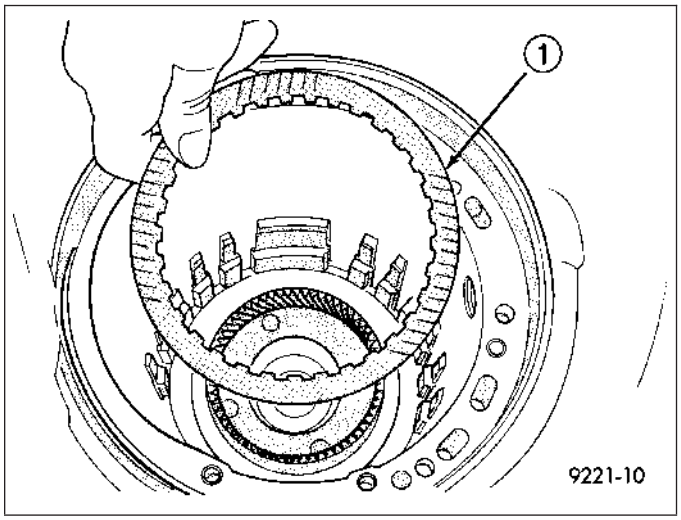
41. Remove the tapered snap ring (4).



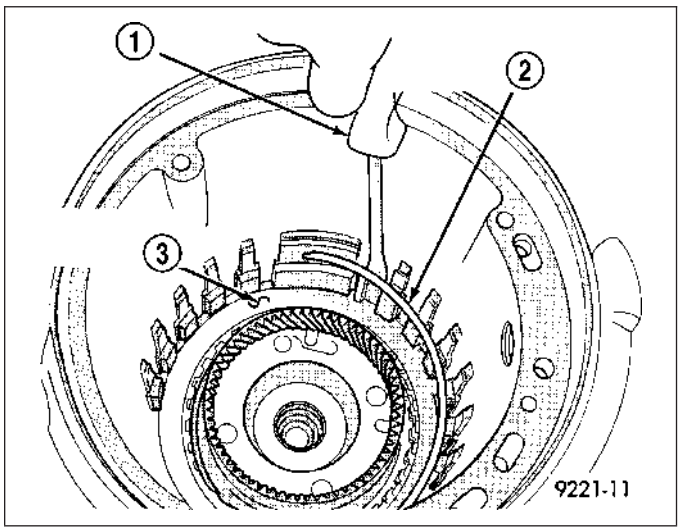
42. Remove the low/reverse reaction plate (1).



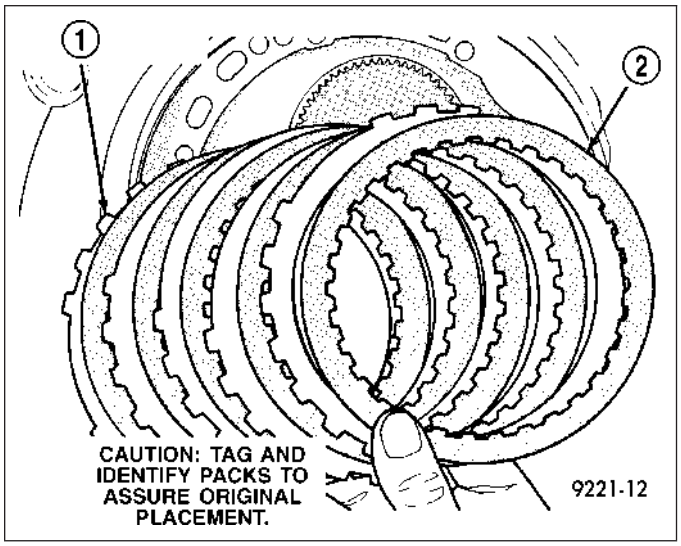
43. Remove one (1) low/reverse clutch disc to facilitate snap ring removal.



44. Remove the low/reverse reaction plate snap ring (2).

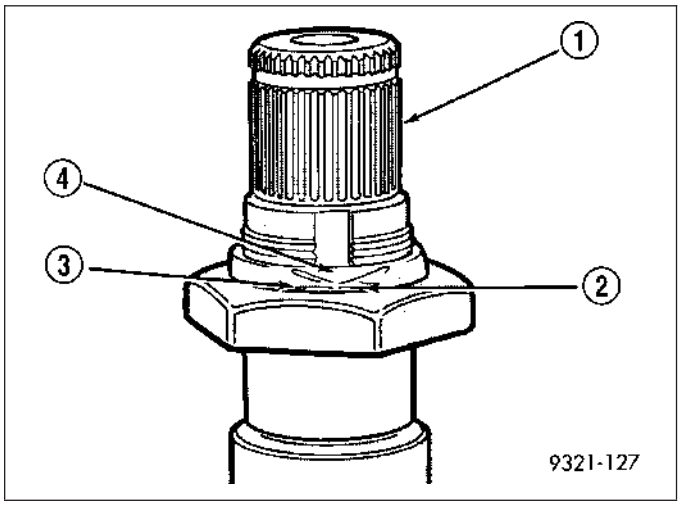


45. Remove the low/reverse clutch pack (1, 2).

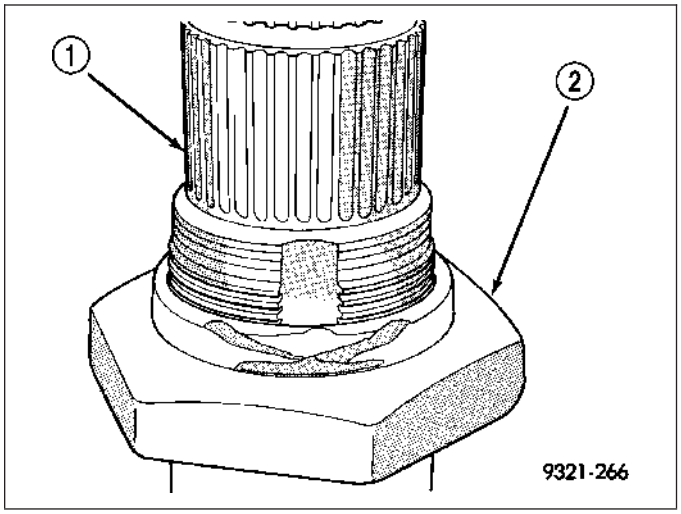


CAUTION: Failure to grind and open stakes (4) of the output shaft nut will result in thread damage to the shaft during nut removal.

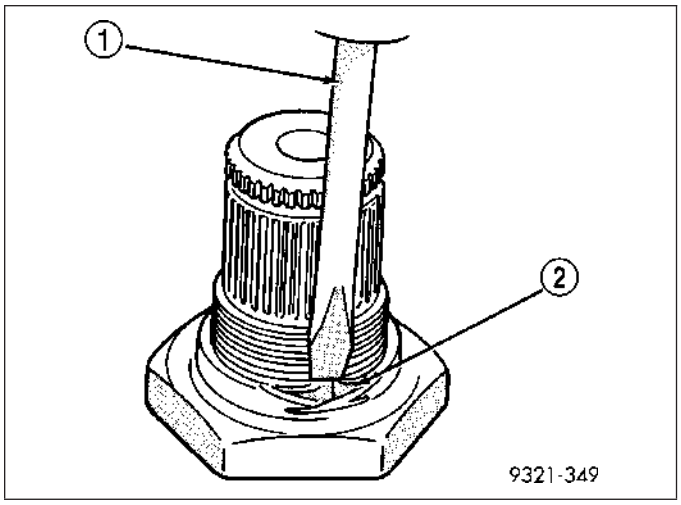
WARNING: WEAR SAFETY GOGGLES WHILE GRINDING STAKE NUTS.



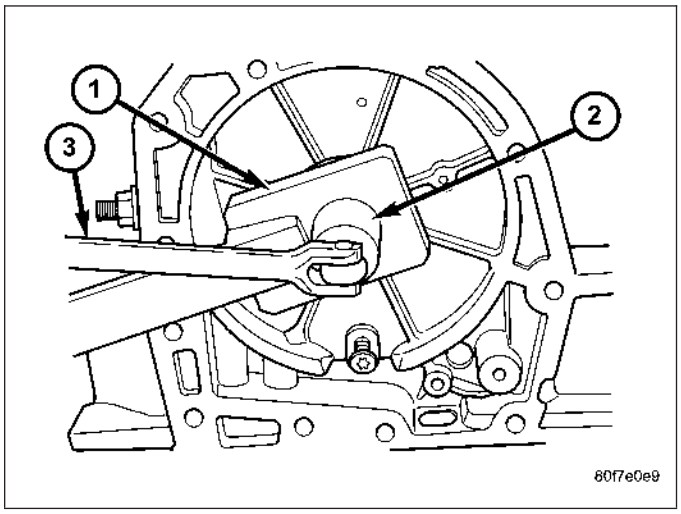
46. Using a die grinder or equivalent, grind the stakes in the shoulder of the shaft nut (2) as shown. Do not grind all the way through the nut and into the shaft. There are two stakes on each nut.



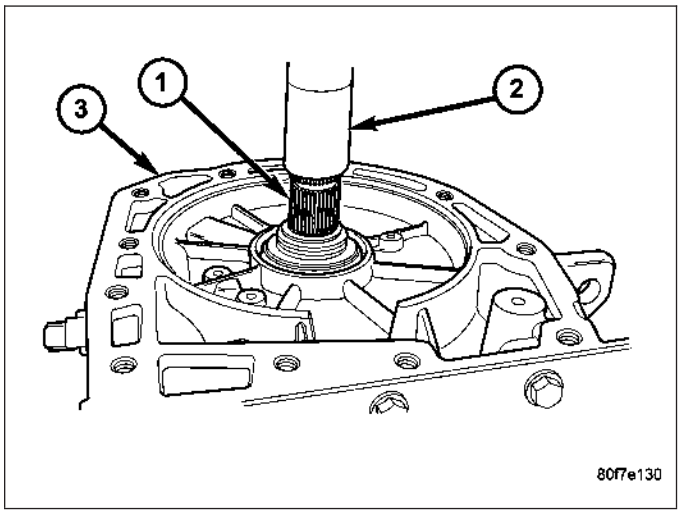
47. Using a small chisel (1), carefully open the stakes on nut (2).



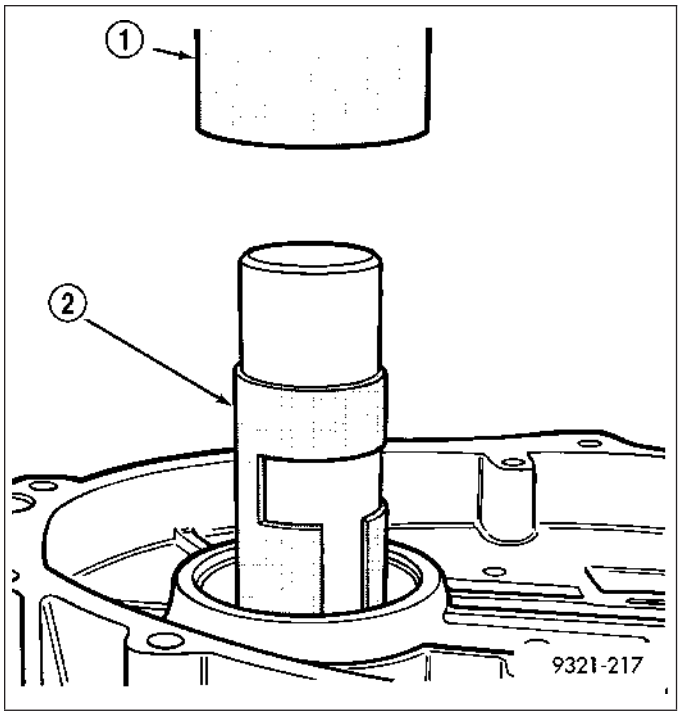
48. Use special tool 6497 (1) and 6498A (2) to remove the output shaft nut.



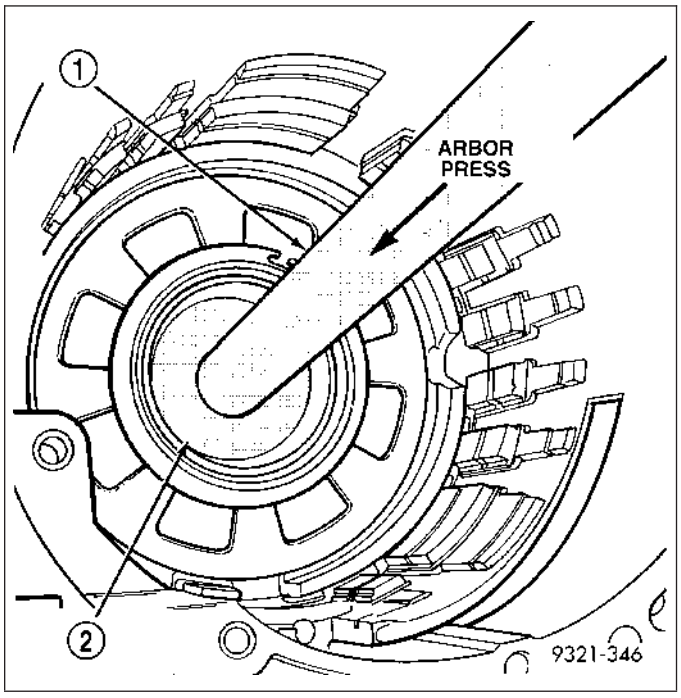
49. Remove the output shaft (1) from case (3) using a shop press (2).



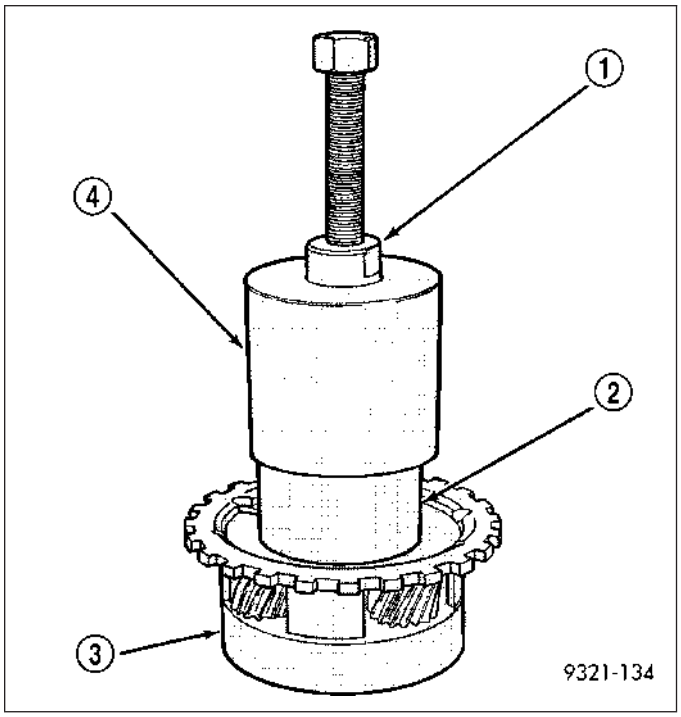
50. Use special tool 6596 (2) with a shop press (1) to remove the front output shaft bearing cup.



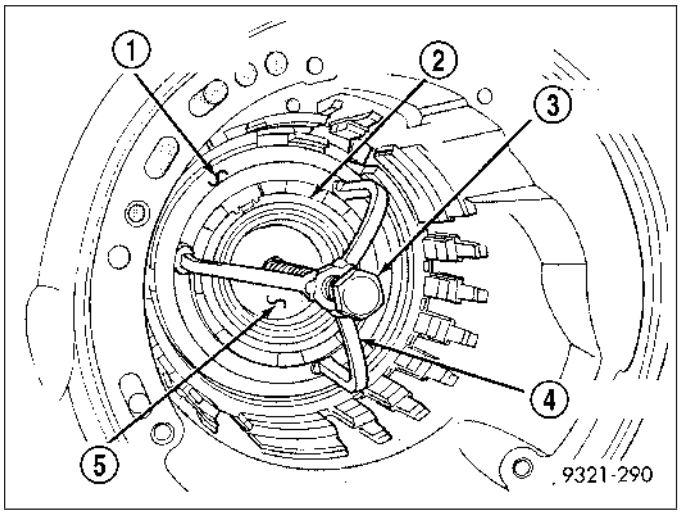
51. Use special tool 6597 (2) and handle C-4171 (1) and C-4171-2 to press the rear output shaft bearing cup rearward.



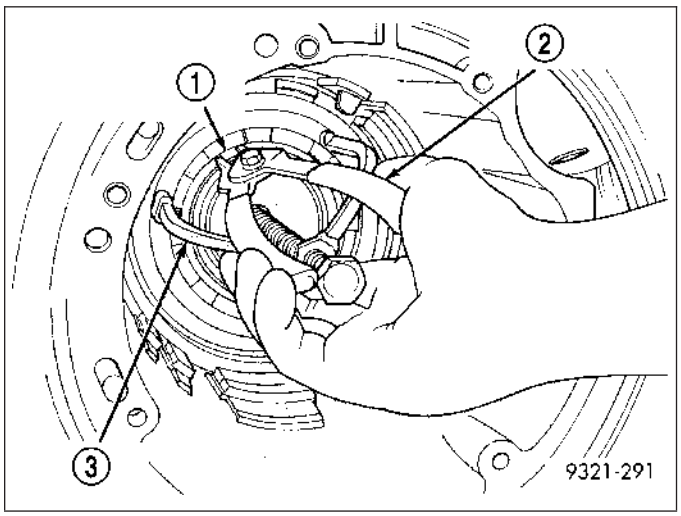
52. Remove the rear carrier front bearing cone (3).



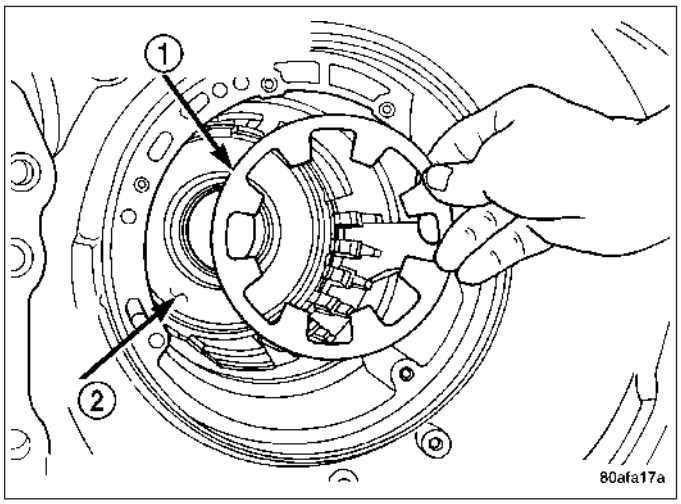
53. Install and load compressor 5059A (4) as shown.



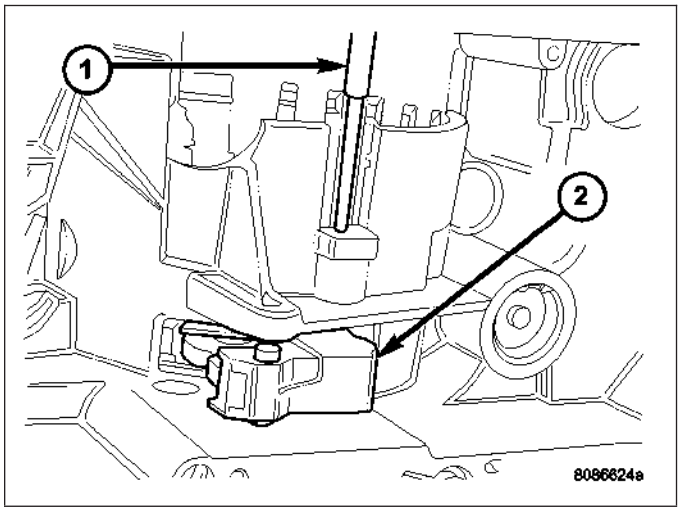
54. Remove the low/reverse belleville spring snap ring (1).



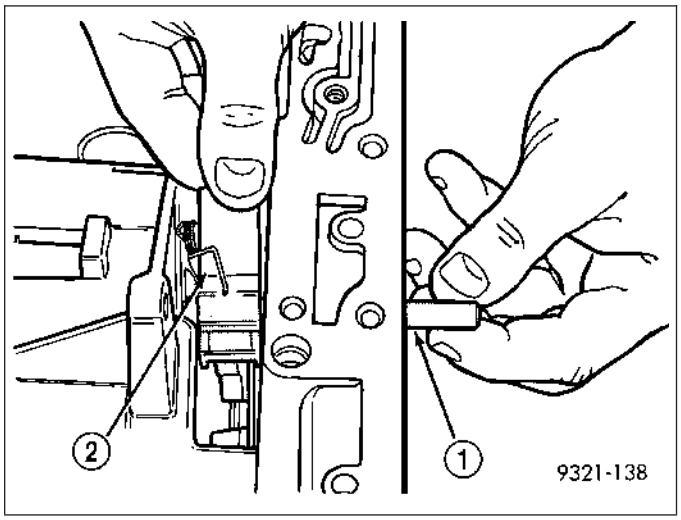
55. Remove the low/reverse piston belleville spring (1).



56. Remove the park sprag pivot retaining screw.
57. Drive out the anchor shaft using suitable punch (1).

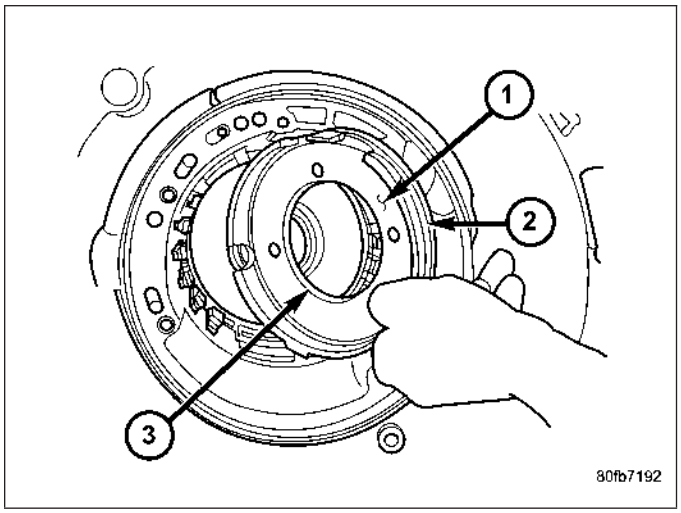


58. Remove the guide bracket pivot pin (1). Inspect all components for wear and replace if necessary.

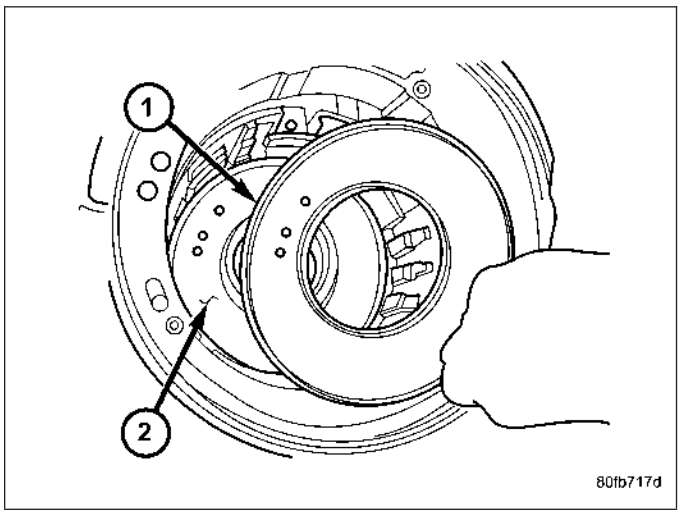


NOTE: The Low/Reverse Clutch Piston has bonded seals which are not individually serviceable. Seal replacement requires replacement of the piston assembly.

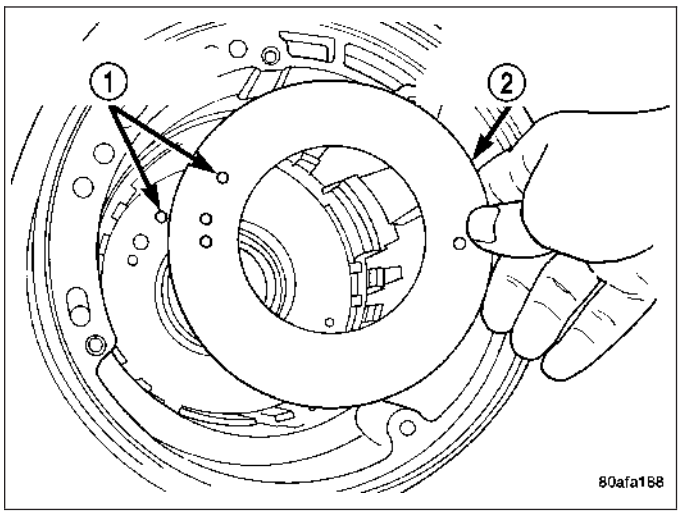
59. Remove the low/reverse clutch piston (1).
60. Remove the low/reverse piston retainer screws.



61. Remove low/reverse piston retainer (1).



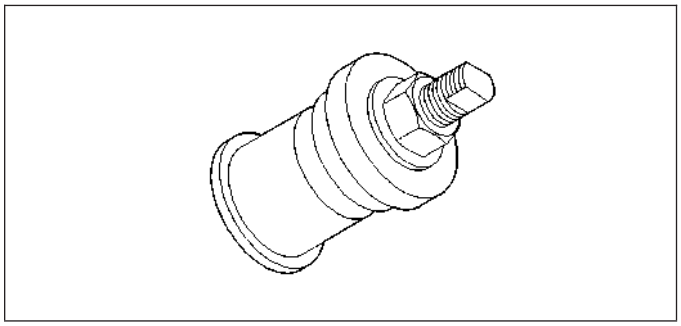
62. Remove the low/reverse piston retainer gasket (2).



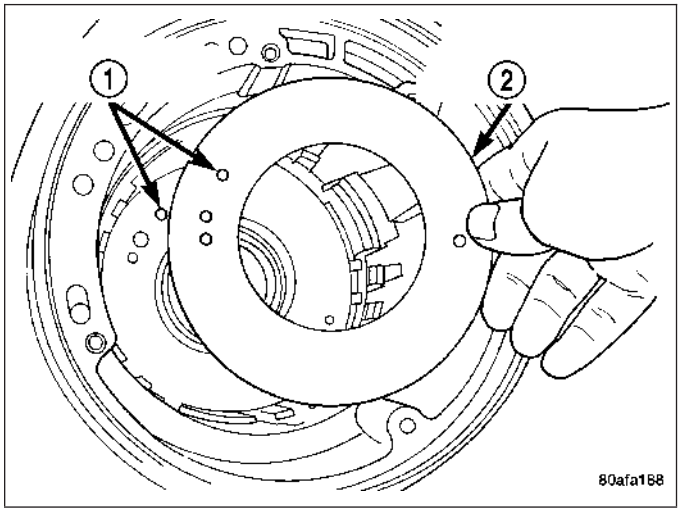
ASSEMBLY

NOTE: If the transmission assembly is being reconditioned (clutch/seal replacement) or replaced, it is necessary to perform the Quick Learn Procedure using the scan tool (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE).

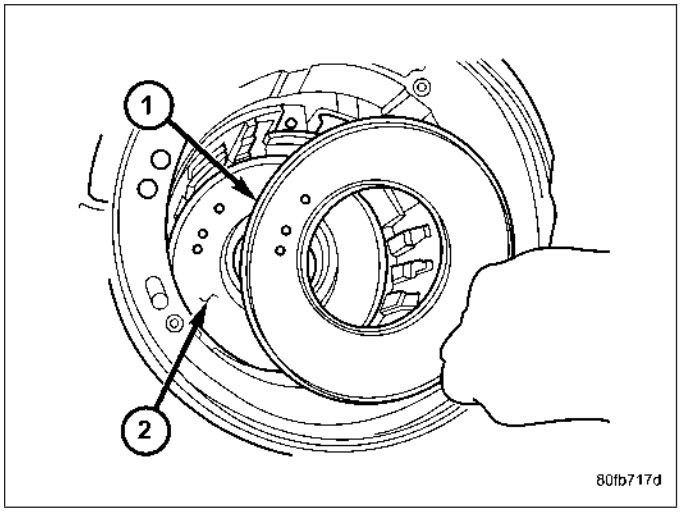
1. Install the output bearing cups using Special Tool - 5050A.



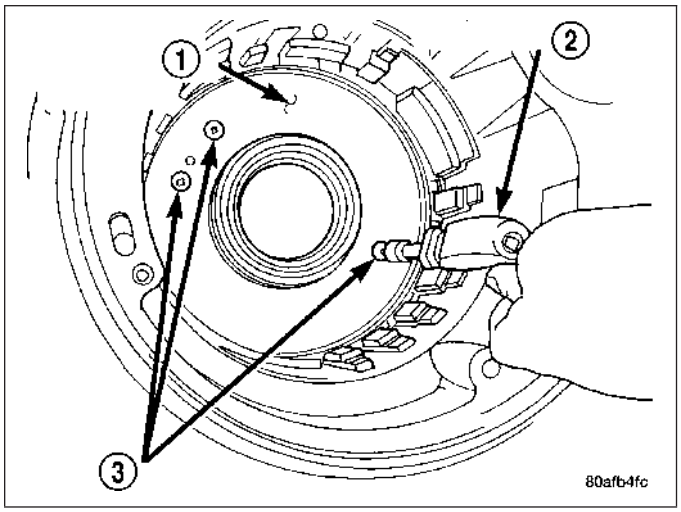
2. Install low/reverse piston retainer gasket (2).



3. Install low/reverse piston retainer (1).

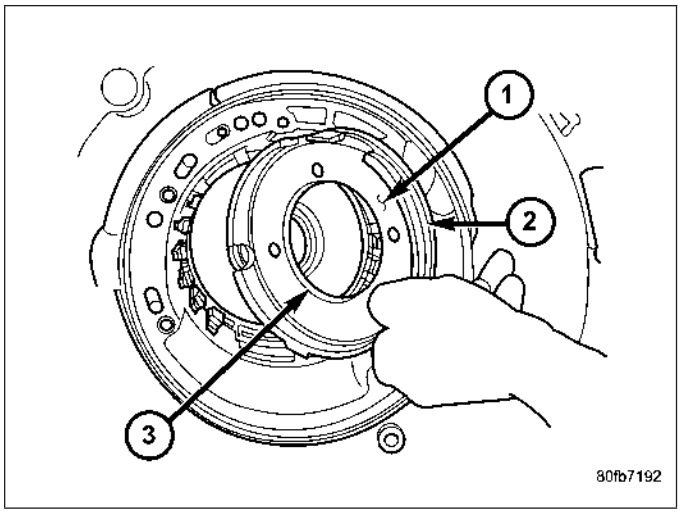


4. Install low/reverse piston retainer-to-case screws (3) and torque to 5 N·m (45 in. lbs.).

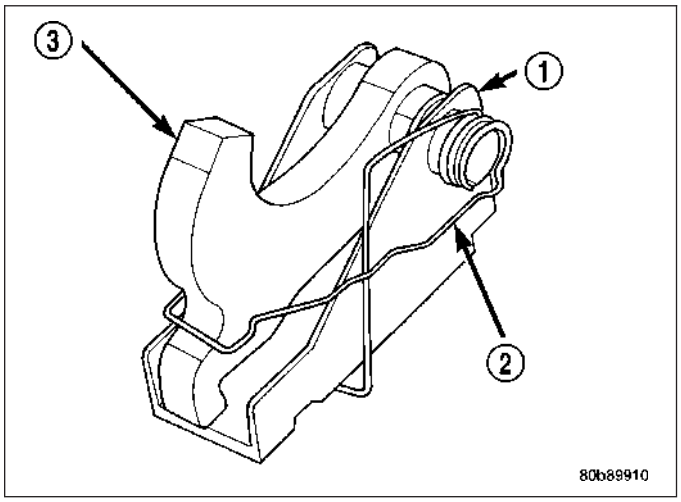


NOTE: The Low/Reverse Clutch Piston has bonded seals which are not individually serviceable. Seal replacement requires replacement of the piston assembly.

5. Install low/reverse clutch piston (1).

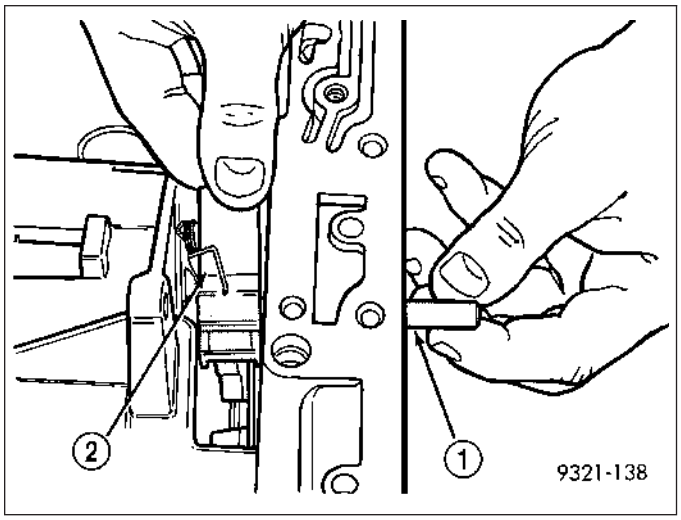


6. Assemble guide bracket (1) assembly as shown in , if necessary.

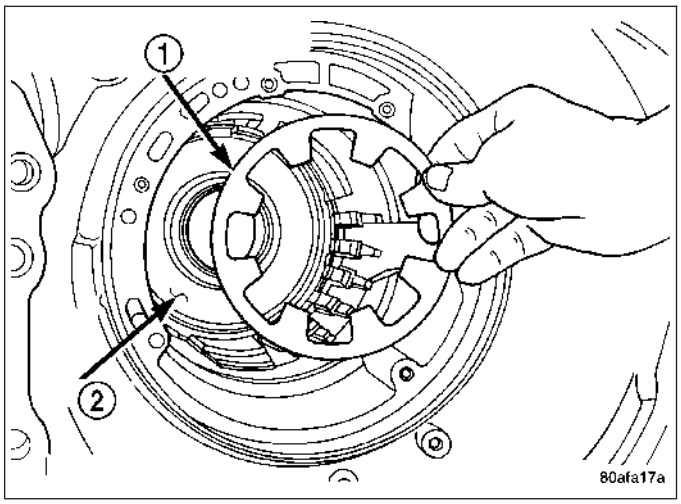


CAUTION: When installing, be sure guide bracket and split sleeve touch the rear of the transmission case.

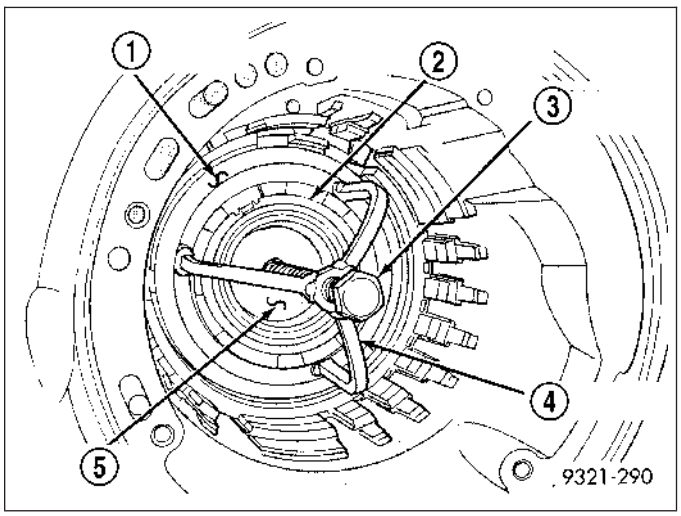
7. Install guide bracket pivot pin (1).
8. Install park sprag pivot retaining screw and torque to 4.5 N·m (40 in. lbs.).



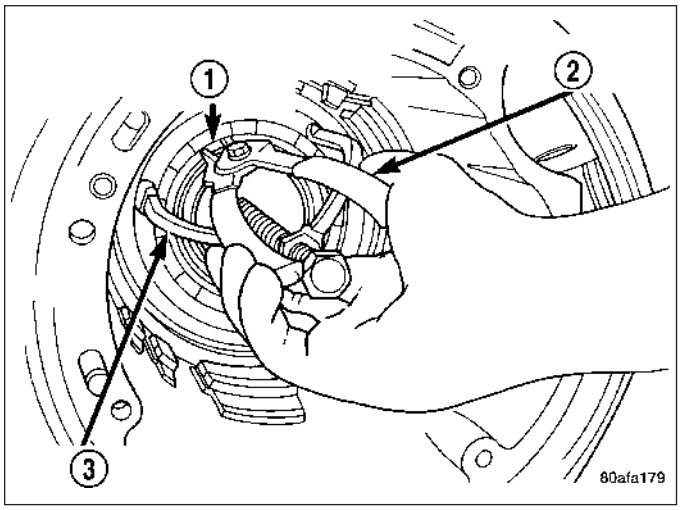
9. Install low/reverse piston belleville spring (1) into position.



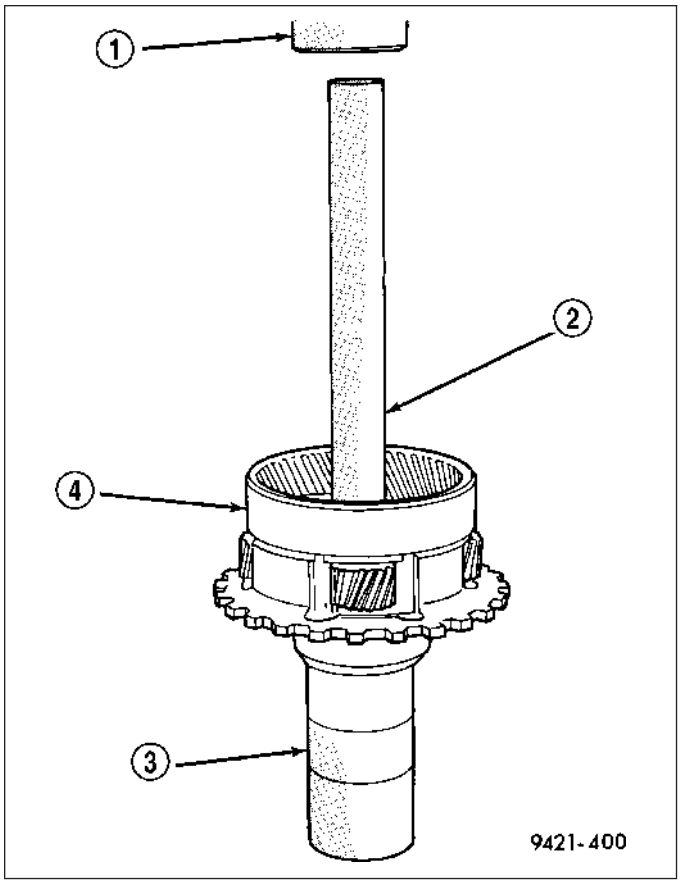
10. Install and load low/reverse spring compressor tool (3, 4, 5) as shown in to facilitate snap ring (2) installation.



11. Install snap ring (1) and remove compressor tool.



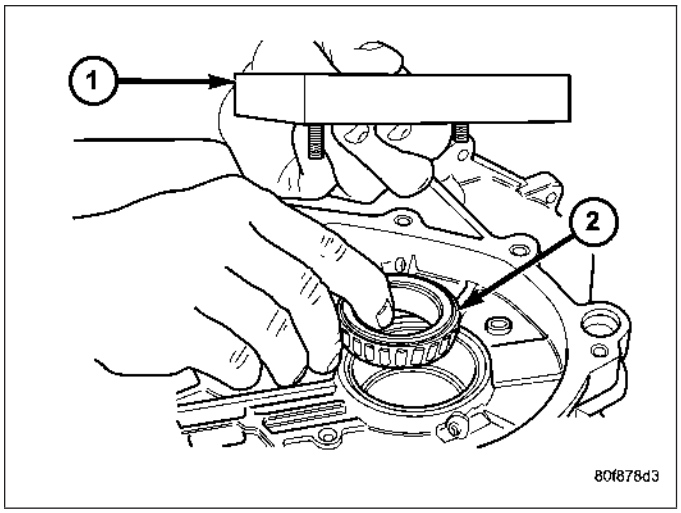
12. Install rear carrier (4) front bearing cone.



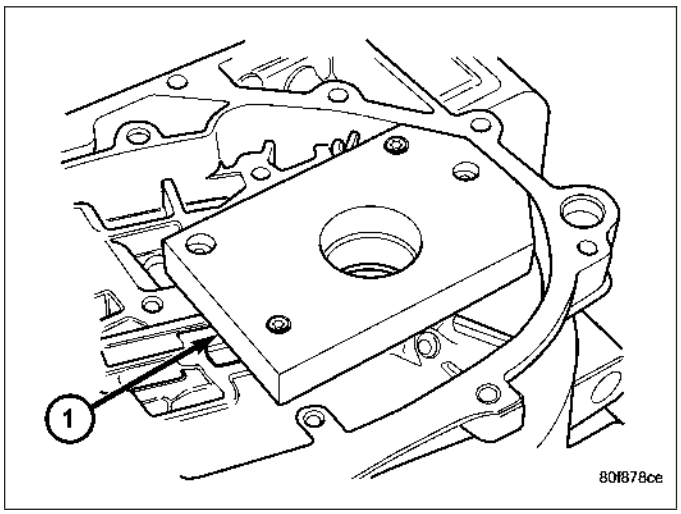
Check output bearing preload. **Output bearing preload must be checked and/or adjusted if any of the following items have been replaced:**

- Output shaft (rear carrier assembly)
- Output shaft bearings
- Transmission case

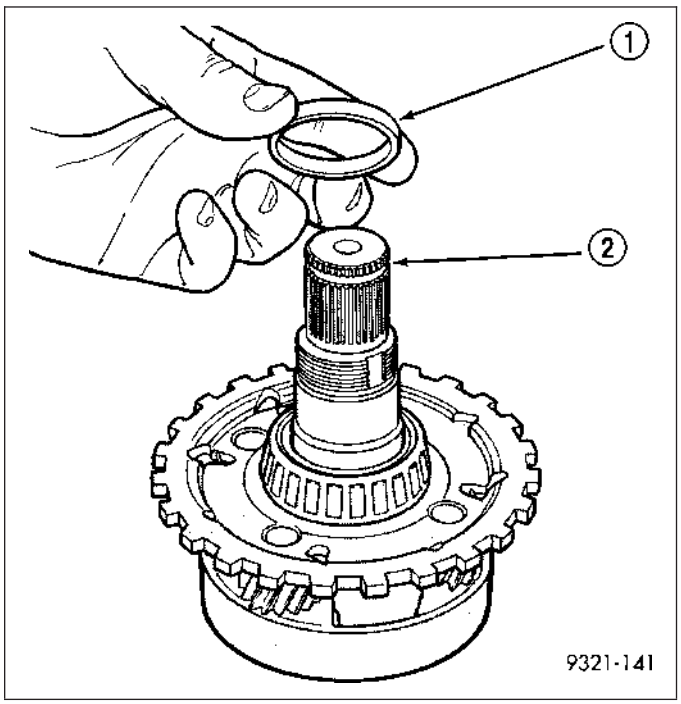
13. **PRELOAD CHECK/SHIM SELECTION:** Install rear output shaft bearing cone and special tool 6618A (1).



14. Install special tool 6618A (1). Lightly tighten retaining screws. Screws should be below the plate surface, but do not snug screws.
15. Turn case over on arbor press so that the plate is resting on the press base. **CAUTION: The output shaft will extend through the hole of tool 6618A. Ensure your press table has clearance for the output shaft.**

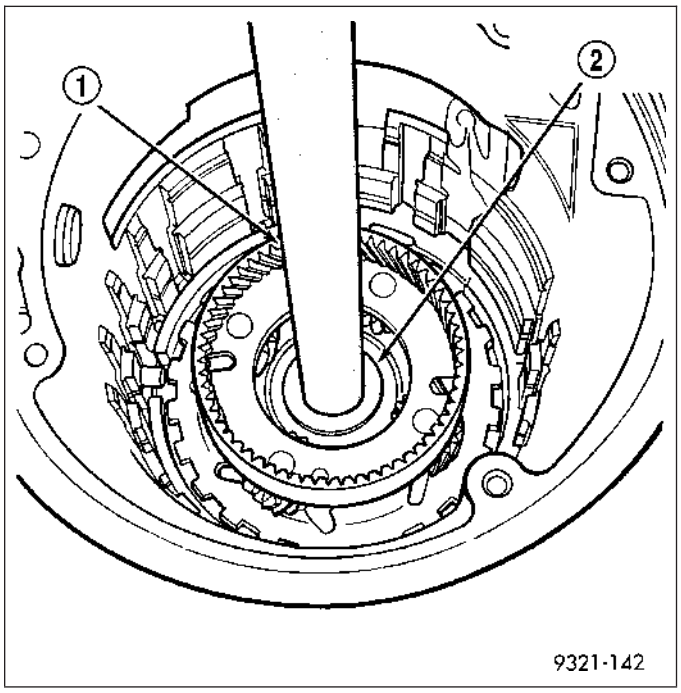


16. Install shim (1) on output shaft (2). Apply small amount of petrolatum onto the shim to hold it in place. Use the original shim as a starting point. If original shim is not available, use the thickest



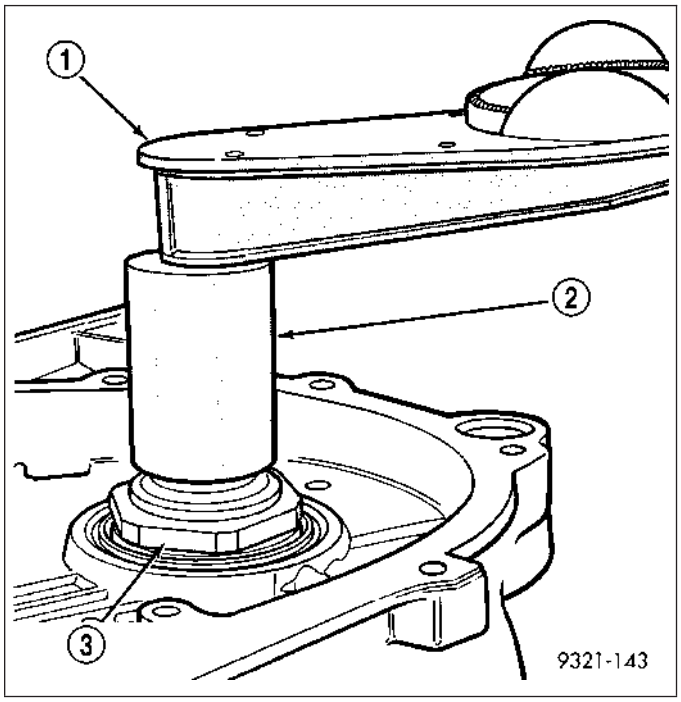
shim available.

17. Install output shaft/rear carrier into rear bearing. The shaft must be pressed into position. Use special tool MD-998911 (Disc) (2) and C- 4171 and C4171-2 (Handle) (1) to press shaft into rear bearing.



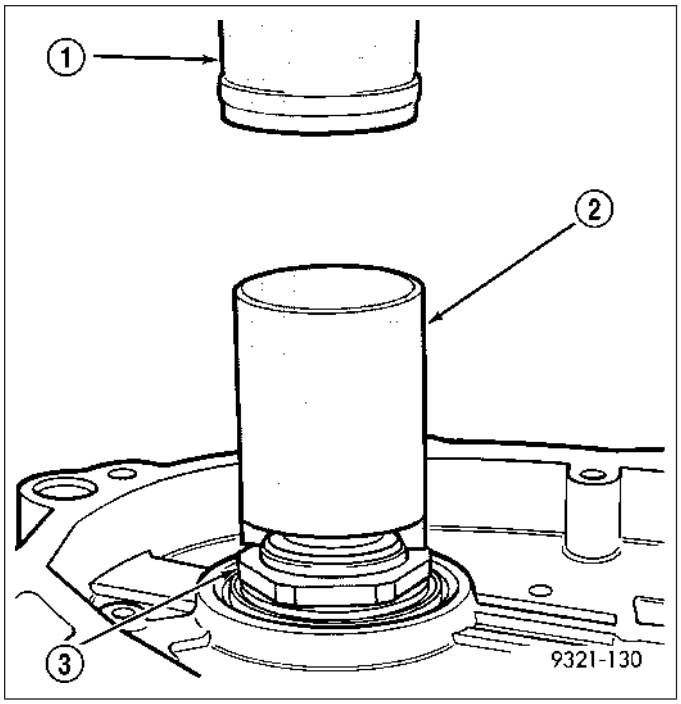
CAUTION: Do not re-use old output shaft nut because the removed stake weakens the nut flange. Using special tools 6497 and 6498-A, install new output shaft nut. Tighten new output shaft nut to 271 N·m (200 ft. lbs.).

18. Check the turning torque (1) of the output shaft. The shaft should have 1 to 8 in. lbs. of turning torque. If the turning torque is **higher than** 8 in. lbs., install a thicker shim. If turning torque is **less than** 1 in. lb., install a thinner shim. Make sure there is no end play.

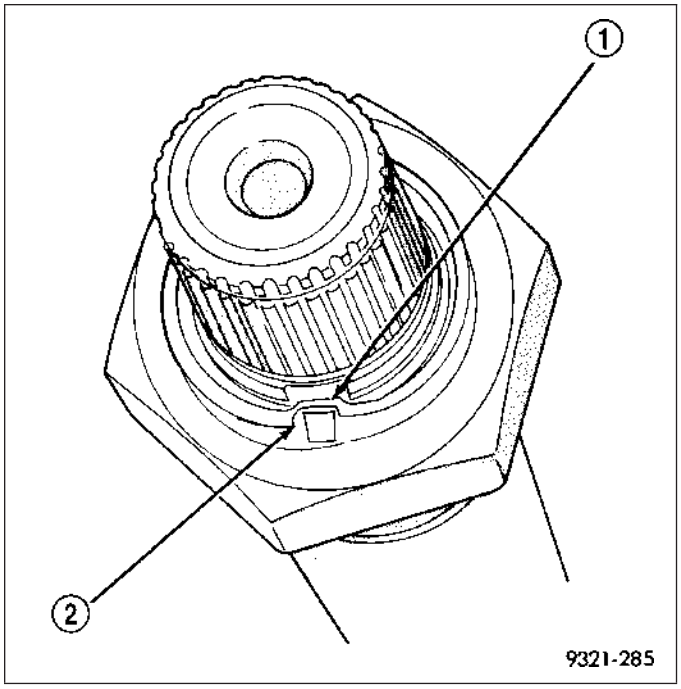


CAUTION: Failure to stake nut could allow the nut to back-off during use.

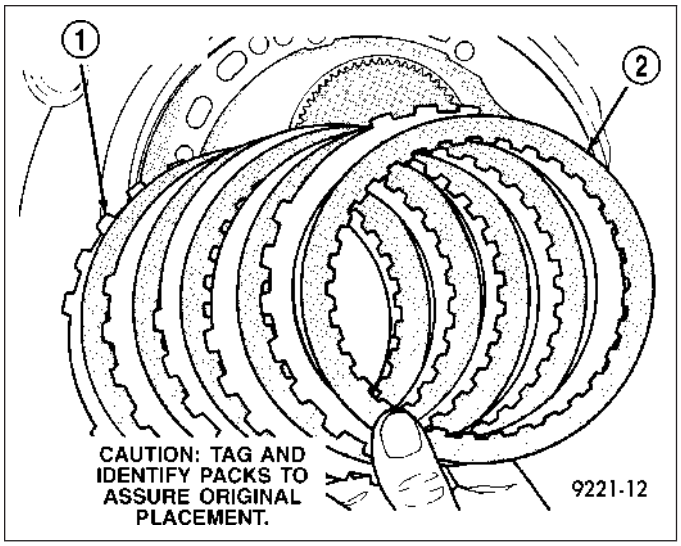
19. The new nut (3) must be staked after the correct turning torque is obtained. Use special tool 6639 (2) to stake output shaft nut.



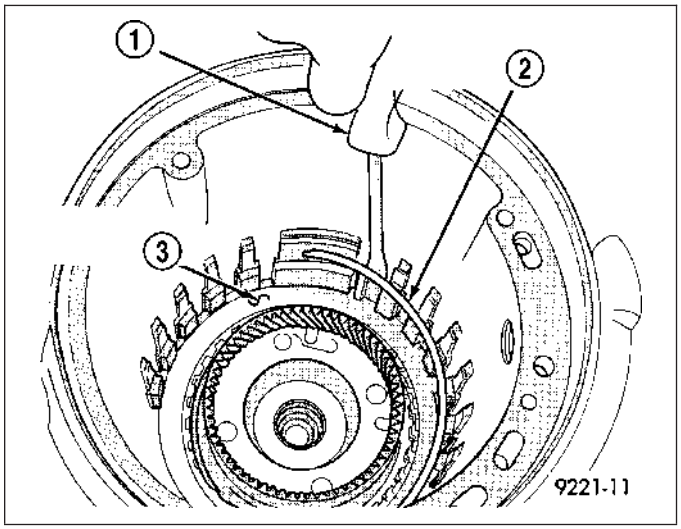
20. Verify that the nut has been properly staked to the output shaft.



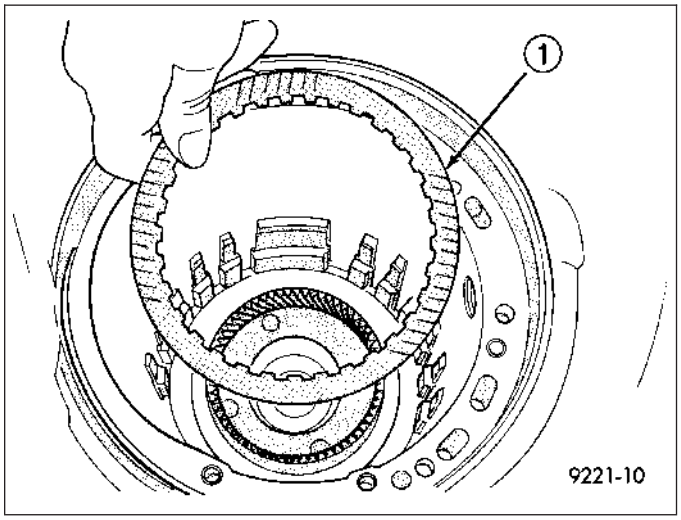
21. Install low/reverse clutch pack (1, 2). Leave uppermost disc out to facilitate snap ring installation.



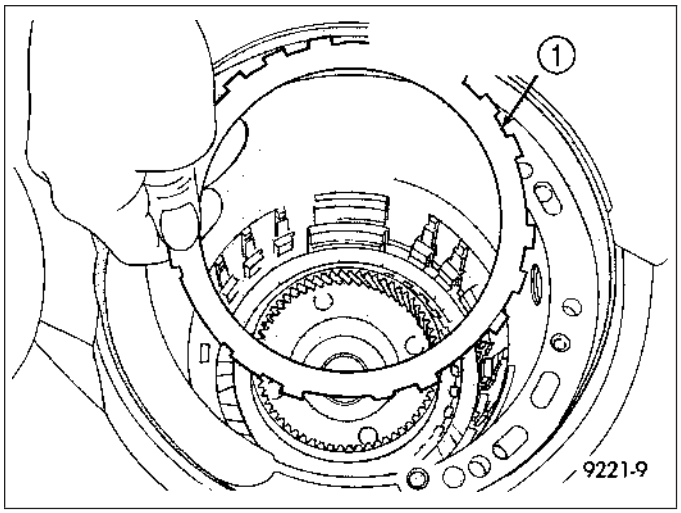
22. Install low/reverse reaction plate snap ring (2).



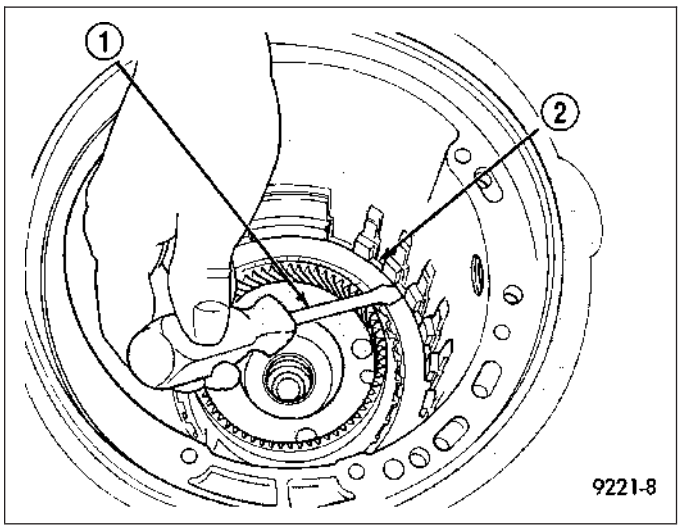
23. Install one low/reverse clutch disc (1).



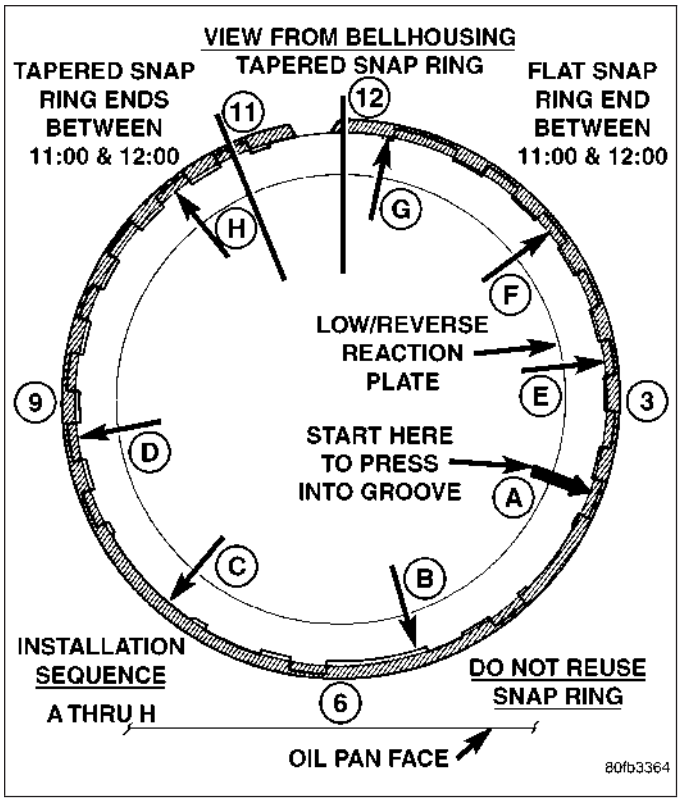
24. Install low/reverse reaction plate (1) with flat side up.



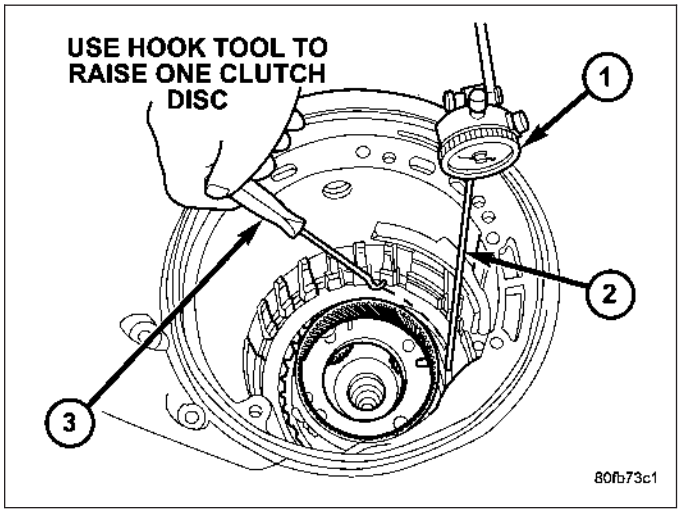
25. Install a new tapered snap ring (2) (tapered side out).



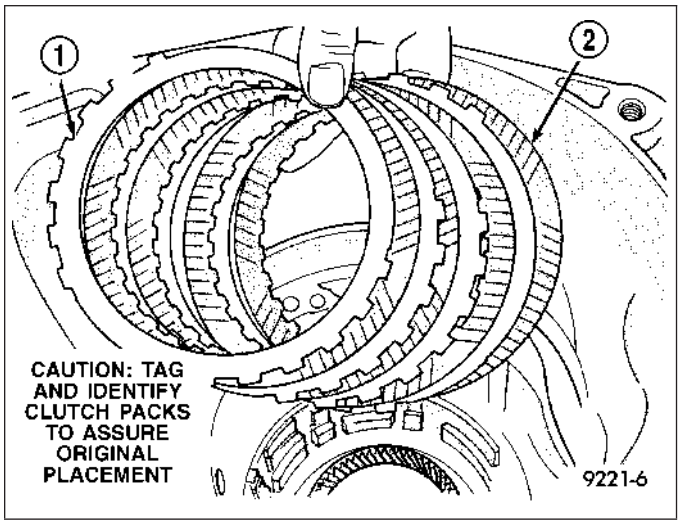
26. Make sure that the snap ring ends are oriented as shown.



27. Measure low/reverse clutch pack. Set up dial indicator (1) as shown. Press down clutch pack with finger and zero dial indicator. Record measurement in four (4) places and take average reading. **Low/Reverse clutch pack clearance is 0.84 to 1.60 mm (0.033 to 0.063 inch).**
28. Select the proper low/reverse reaction plate to achieve specifications.

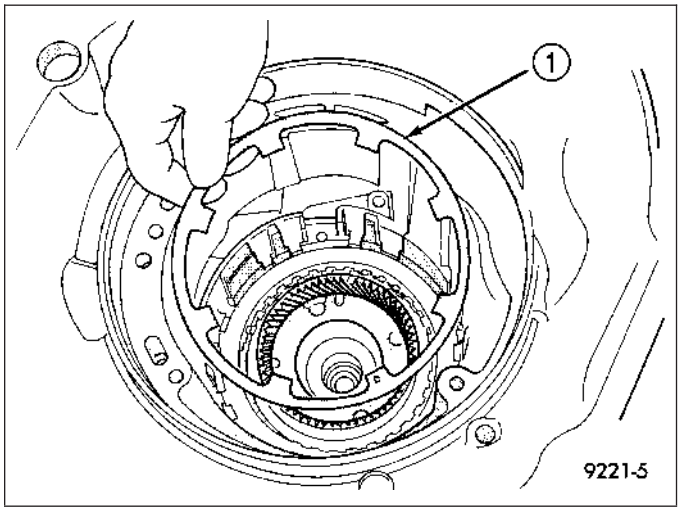


29. Install 2/4 clutch pack (1, 2).

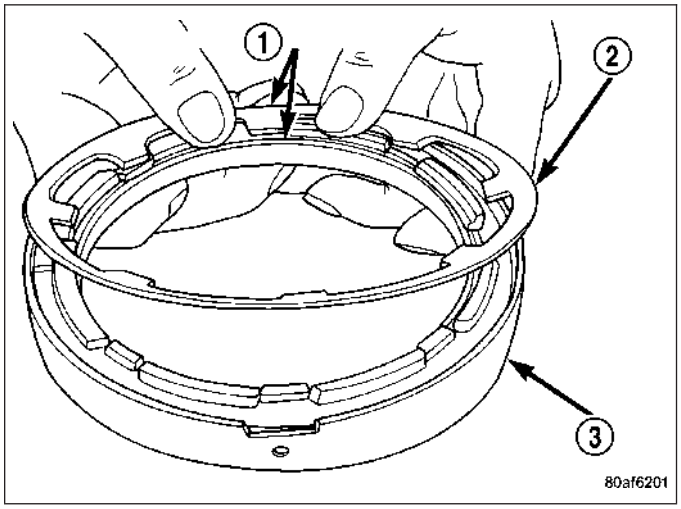


NOTE: The 2/4 Clutch Piston has bonded seals which are not individually serviceable. Seal replacement requires replacement of the piston assembly.

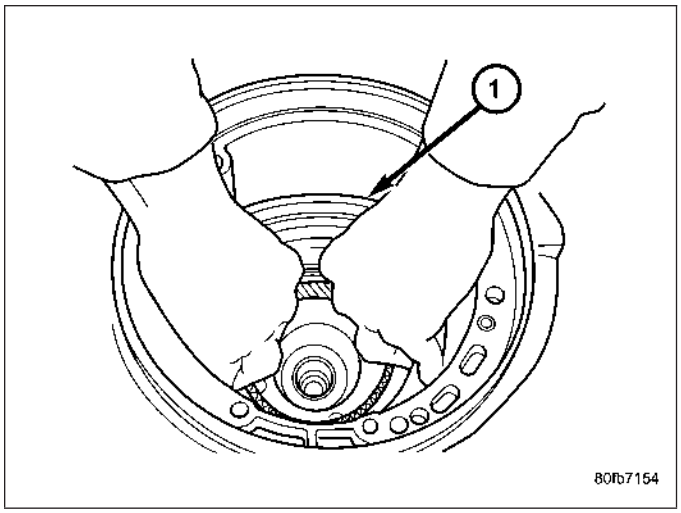
30. Install 2/4 clutch belleville spring (1).



31. Verify the proper orientation of the return spring (2) to the 2/4 retainer (3).

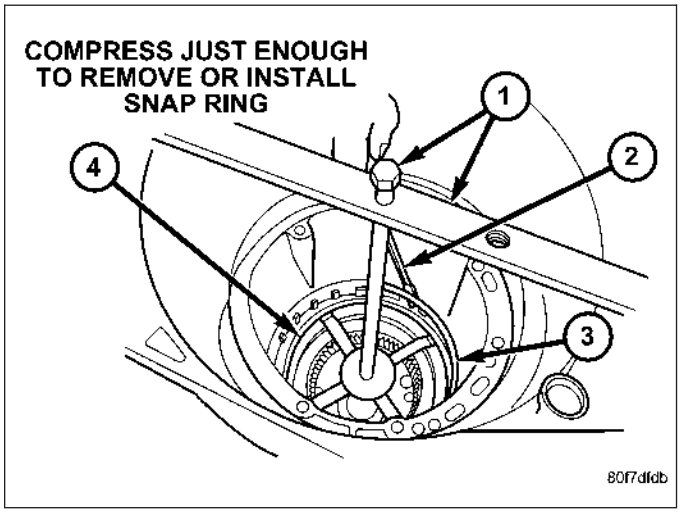


32. Install 2/4 clutch retainer (1).

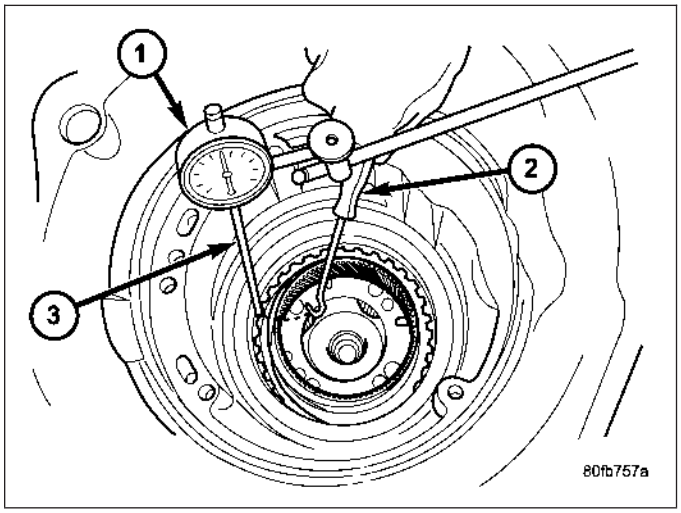


NOTE: Verify that Tool 5058A (1) is centered properly over the 2/4 clutch retainer (4) before compressing. If necessary, fasten the 5058A bar to the bellhousing flange with any combination of locking pliers and bolts to center the tool properly.

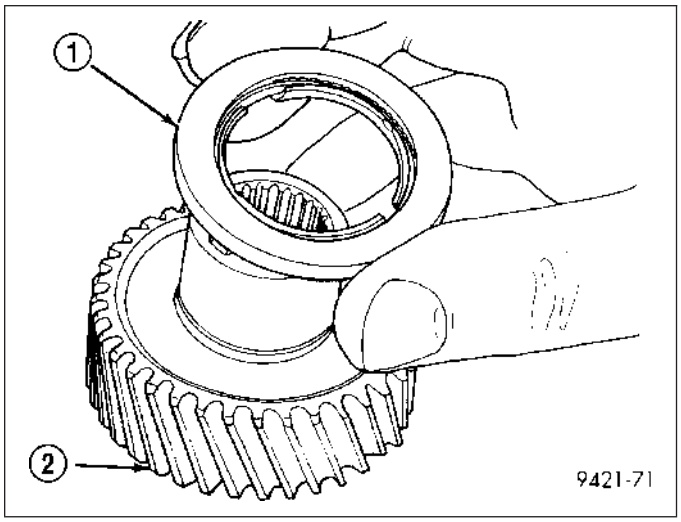
33. Set up Tool 5058 (1) as shown. Compress 2/4 clutch just enough to facilitate snap ring installation.



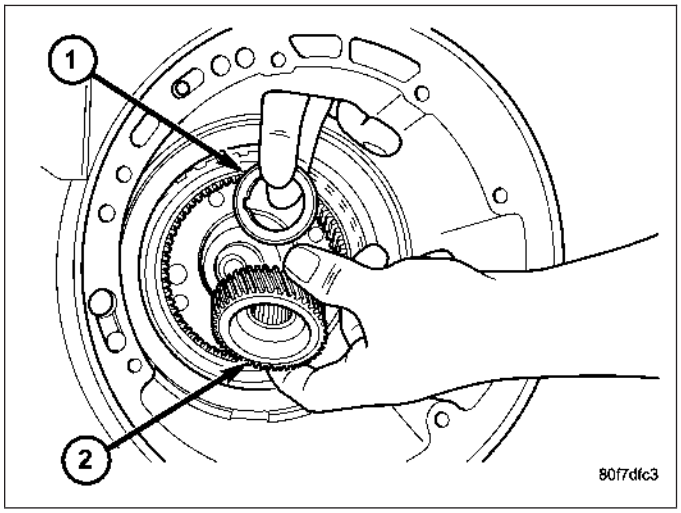
34. **Measure 2/4 clutch clearance:** Set up dial indicator (1) as shown. Press down clutch pack with finger and zero dial indicator. Record measurement in four (4) places and take average reading. **The 2/4 clutch pack clearance is 0.76 to 2.64 mm (0.030 to 0.104 inch).** If not within specifications, the clutch is not assembled properly or is excessively worn. **There is no adjustment for the 2/4 clutch clearance.**



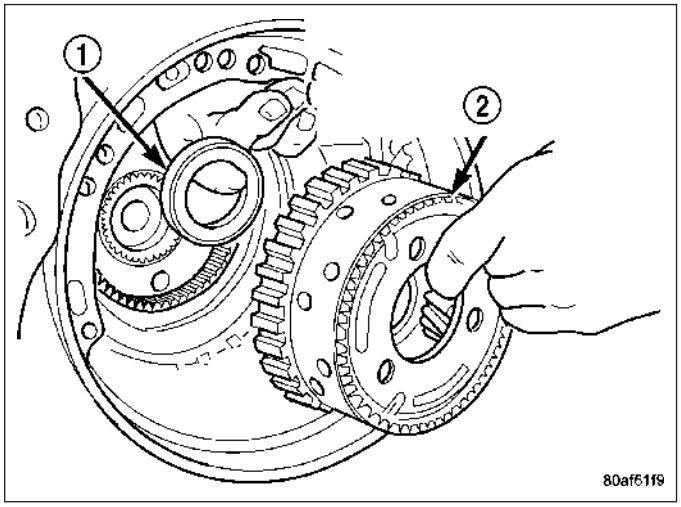
35. Install the #7 needle bearing (1) to the rear sun gear (2). **The number 7 needle bearing has three antireversal tabs and is common with the number 5 and number 2 position. The orientation should allow the bearing to seat flat against the rear sun gear. A small amount of petrolatum can be used to hold the bearing to the rear sun gear.**



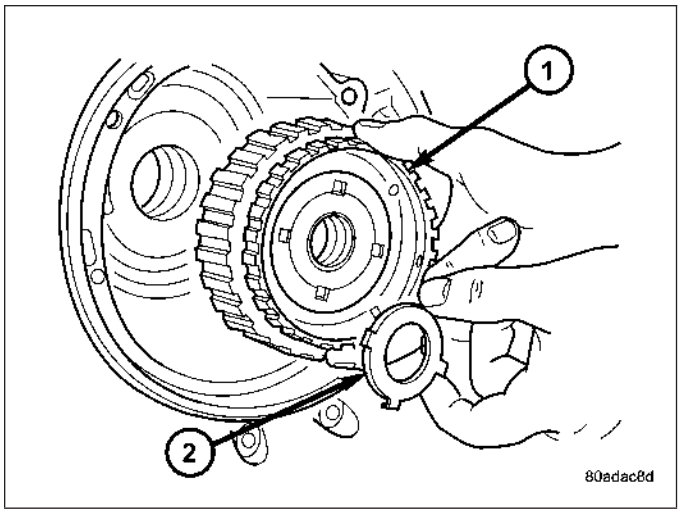
36. Install rear sun gear (2) and #7 needle bearing (1).



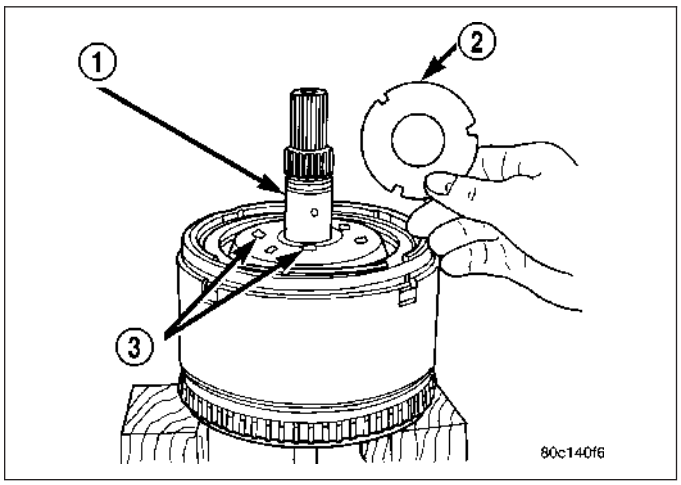
37. Install front carrier/rear annulus assembly (2) and #6 needle bearing (1).



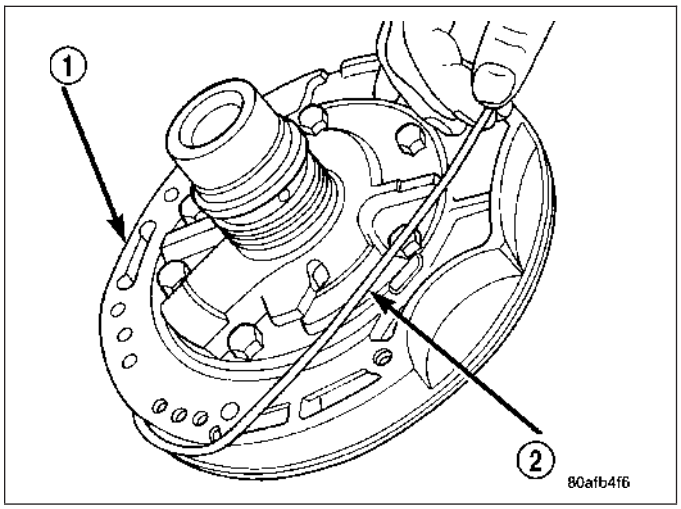
38. Install front sun gear assembly (1) and #4 thrust washer (2).



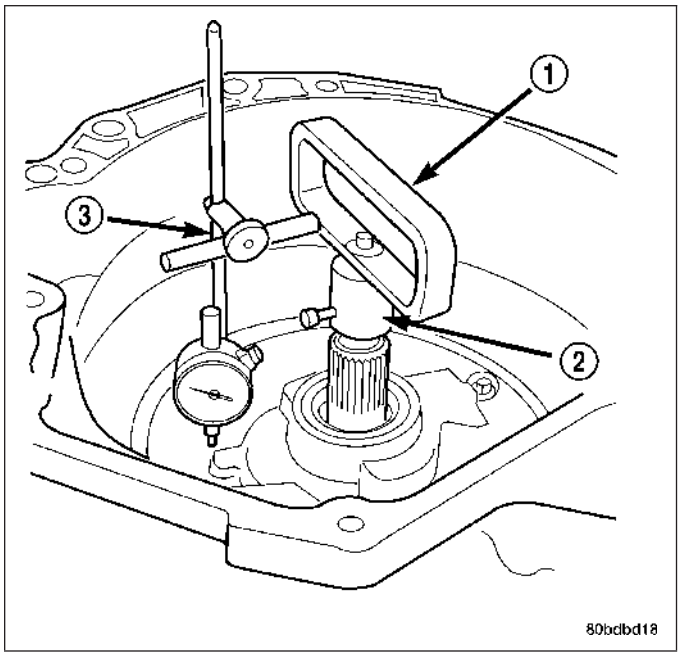
39. Determine proper #4 thrust plate thickness. Select the thinnest available #4 thrust plate.
40. Install #4 thrust plate (2) using petrolatum to hold into position.
41. Install input clutch assembly. Ensure the input clutch assembly is completely seated by viewing position through input speed sensor hole. **If the speed sensor tone wheel is not centered in the opening, the input clutches assembly is not seated properly.**



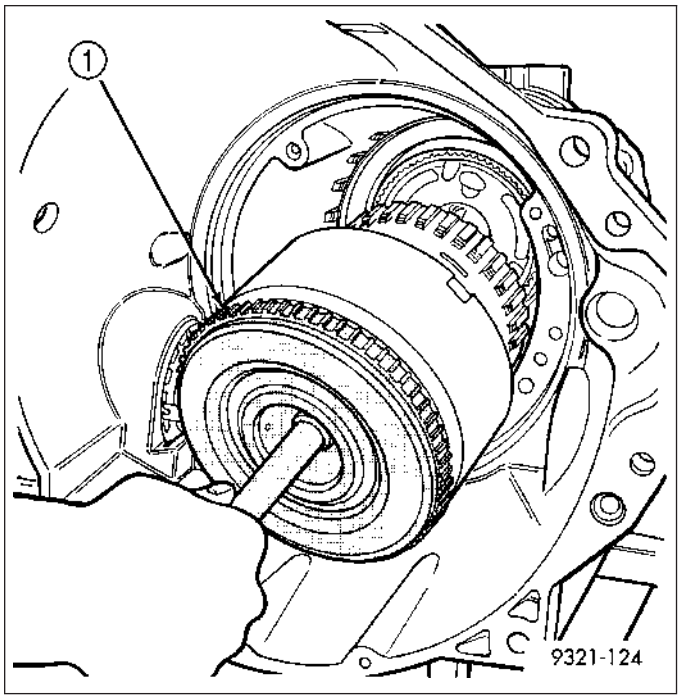
42. Remove the oil pump o-ring (2) and install oil pump and gasket to transmission. **Use screw-in dowels or phillips-head screwdrivers to align pump to case. Be sure to reinstall O-ring on oil pump after selecting the proper No. 4 thrust plate.**



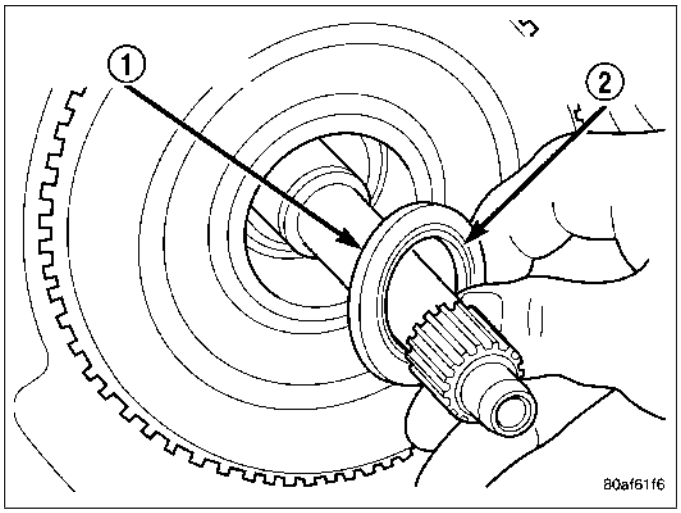
43. Measure the input shaft end play with the transmission in the vertical position. This will ensure that the measurement will be accurate.
44. Set up and measure endplay using End Play Set 8266 (1, 2) and Dial Indicator Set C3339 (3) as shown.
45. Measure input shaft end play. **Input shaft end play must be 0.127 to 0.635 mm (0.005 to 0.025 inch).** For example, if end play reading is 0.055 inch, select No. 4 Thrust Plate which is 0.071 to 0.074 thick. This should provide an input shaft end play reading of 0.020 inch, which is within specifications.



46. Remove oil pump, gasket, and input clutch assembly to gain access to and install proper #4 thrust plate.
47. Install input clutch assembly (1) with proper thrust plate.

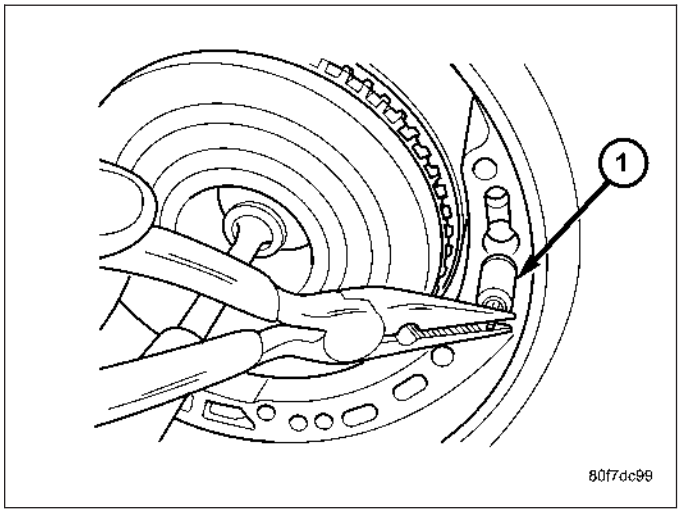


48. Install #1 caged needle bearing (1).



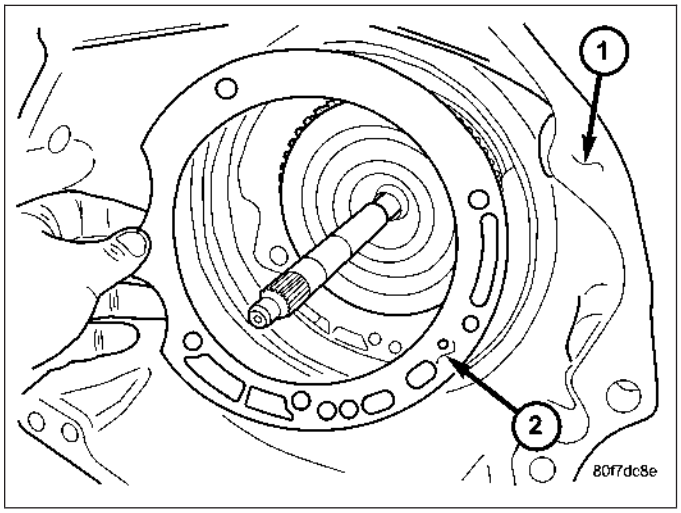
CAUTION: By-pass valve MUST be replaced if transmission failure occurs.

49. Replace cooler by-pass valve (1) if transmission failure has occurred.

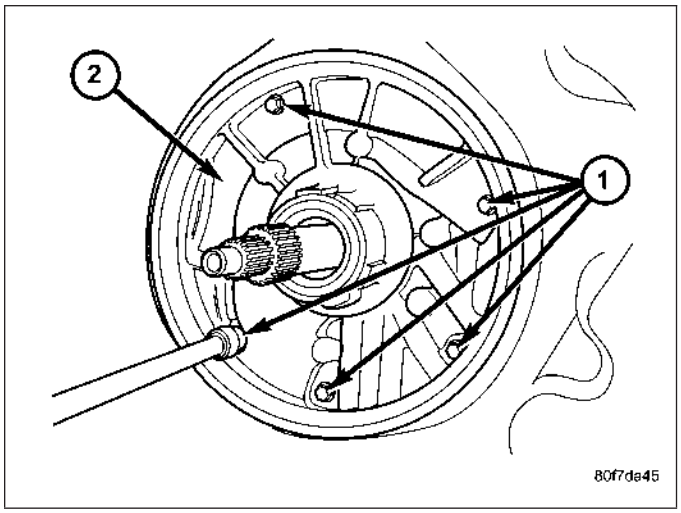


NOTE: To align oil pump, gasket, and case during installation, use threaded dowels or phillips screwdrivers.

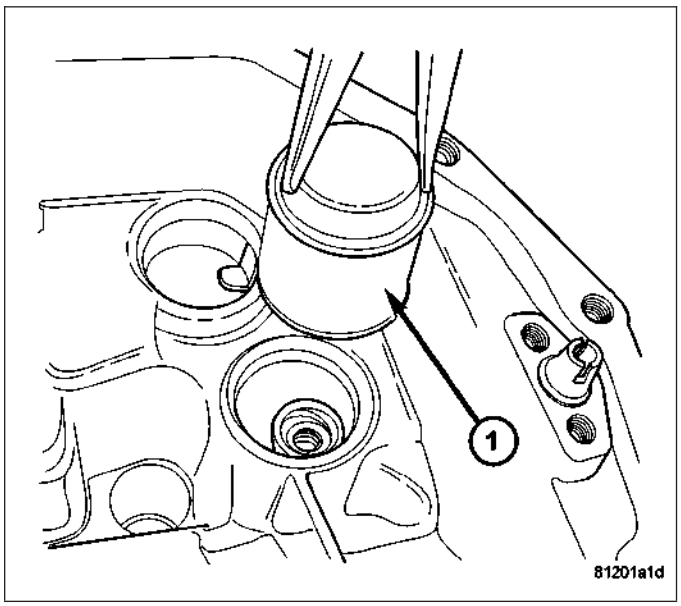
50. Install oil pump gasket (2).



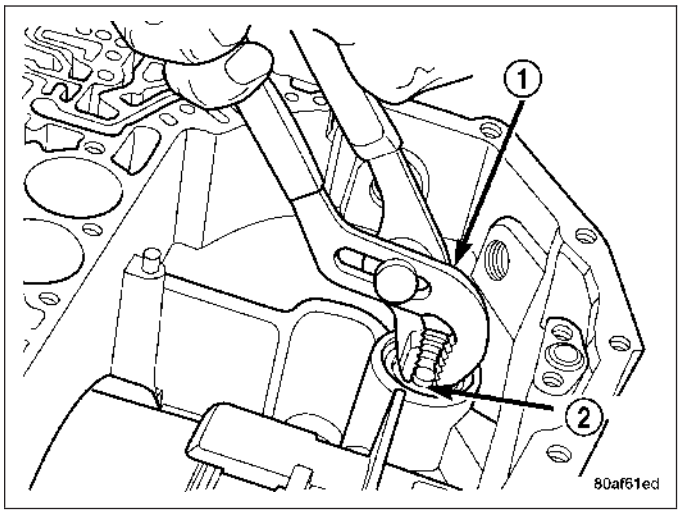
51. Install oil pump (2) and torque oil pump-to-case bolts (1) to 30 N·m (265 in. lbs.). Do not reuse original oil pump bolts.



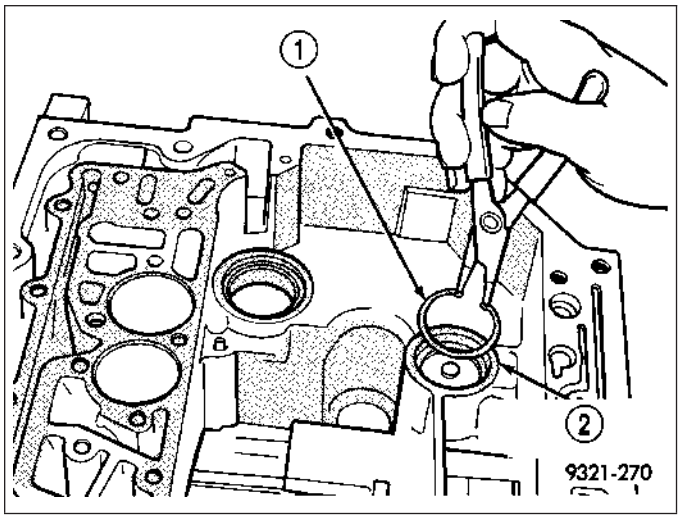
52. Install low/reverse accumulator (1) as shown.



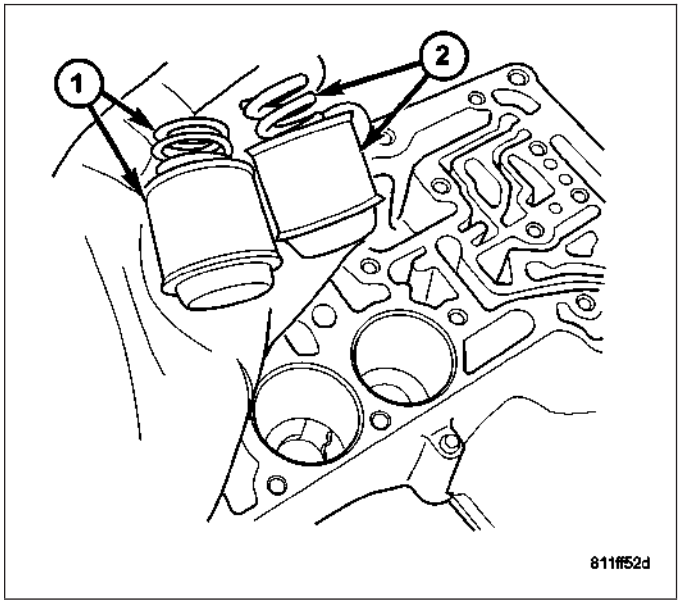
53. Install low/reverse accumulator plug (2).



54. Install low/reverse accumulator snap ring (1).

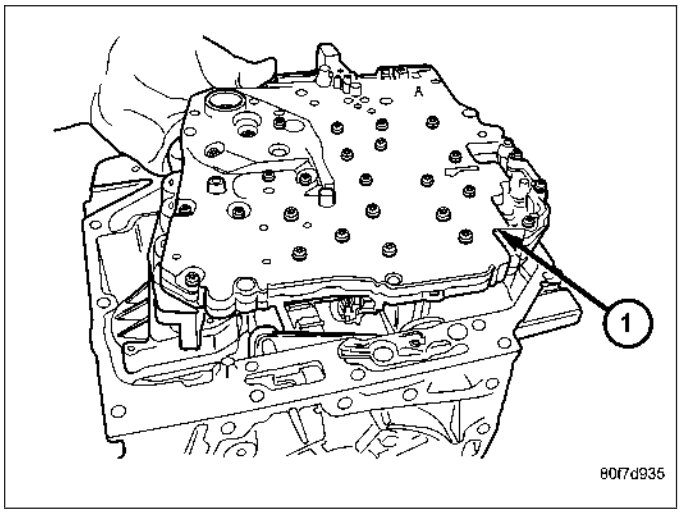


55. Install underdrive (2) and overdrive (1) accumulators and springs.

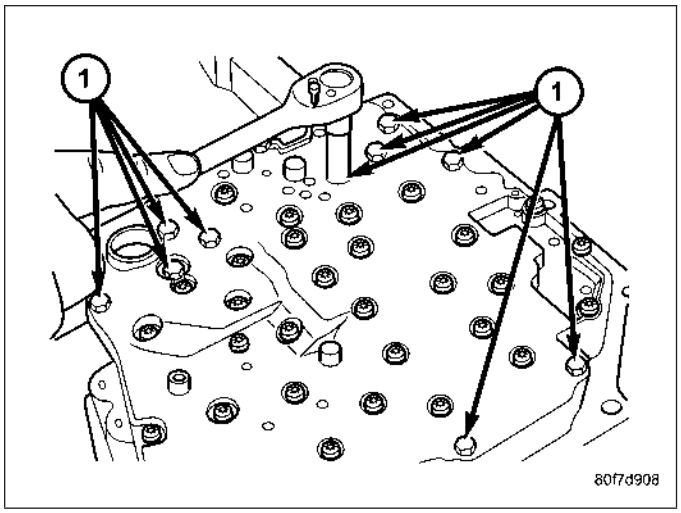


CAUTION: Do not handle the valve body by the manual shaft. Damage could result.

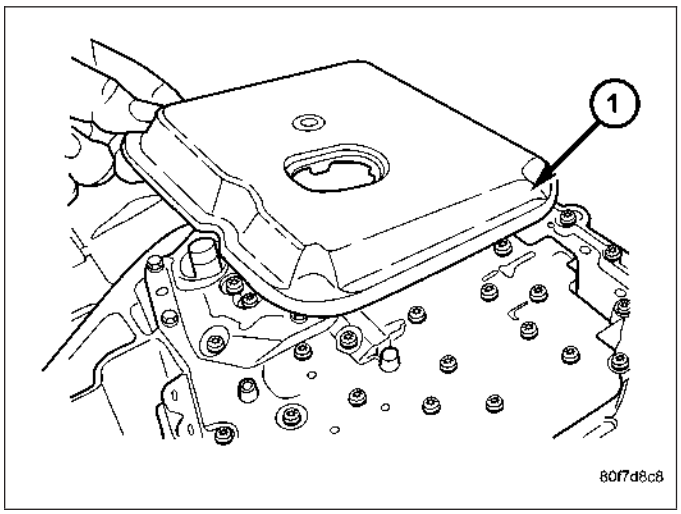
56. Install valve body (1) into place as shown.



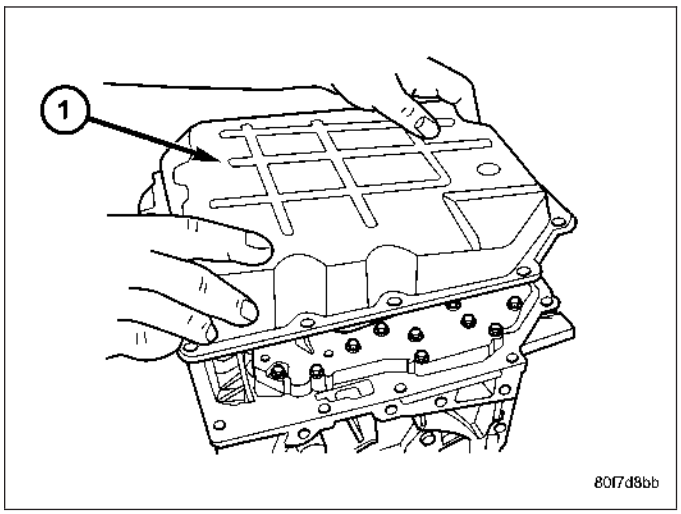
57. Install seven (7) valve body-to-case bolts (1) and torque to 12 N·m (105 in. lbs.).



58. Install transmission oil filter (1). Tighten the bolts to 5 N·m (45 in. lbs.).

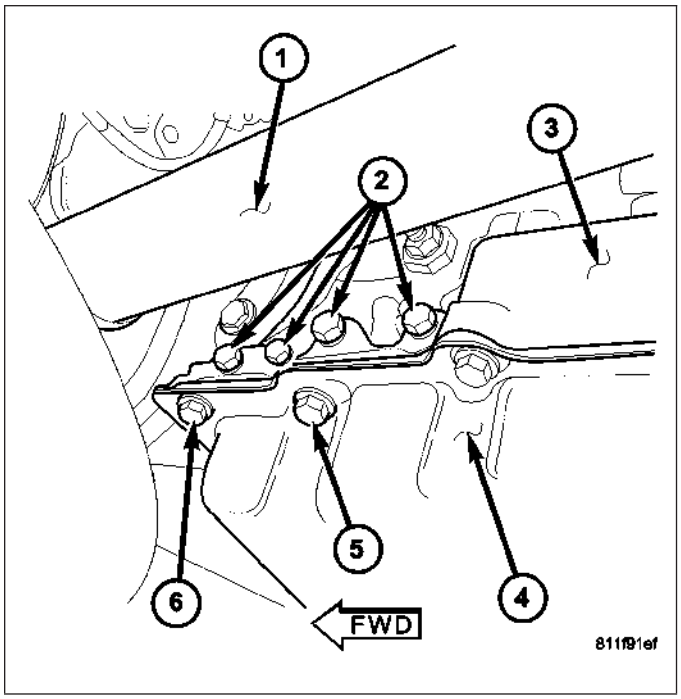


59. Install transmission oil pan (1) with a bead of Mopar® ATF RTV.



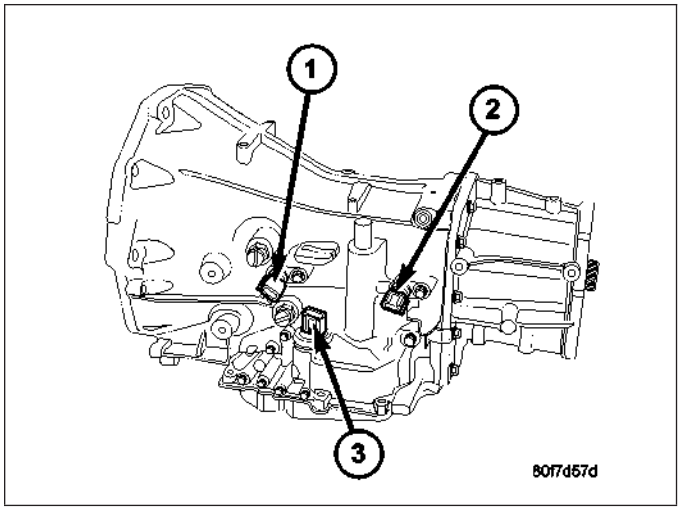
NOTE: Before installing the oil pan bolt in the bolt hole located between the torque converter clutch on and U/D clutch pressure tap circuits , it will be necessary to replentish the sealing patch on the bolt using Mopar® Lock & Seal Adhesive.

60. Install and torque the oil pan-to-case bolts to 20 N·m (14.5 ft. lbs.).

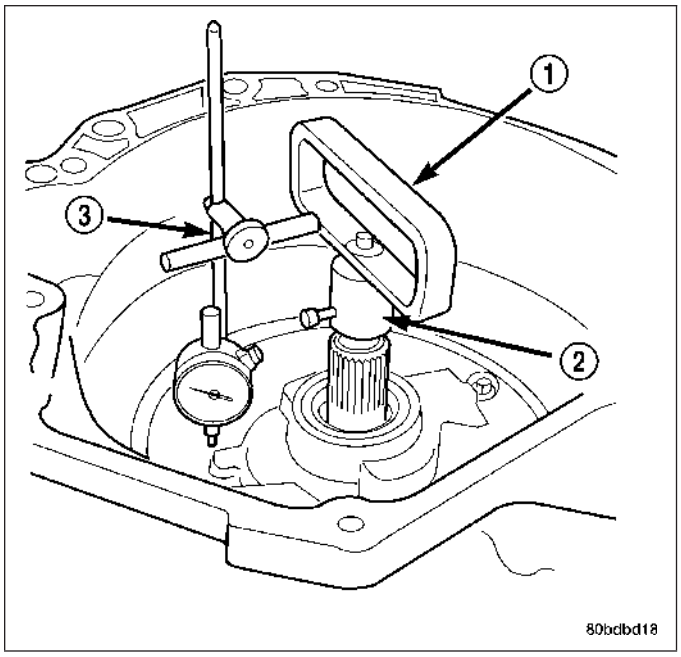


NOTE: Before installing either speed sensor bolt, it will be necessary to replentish the sealing patch on the bolt using Mopar® Lock & Seal Adhesive.

61. Install both speed sensors (1, 2) into the transmission case. Torque the speed sensor bolts to 9 N·m (80 in. lbs.).

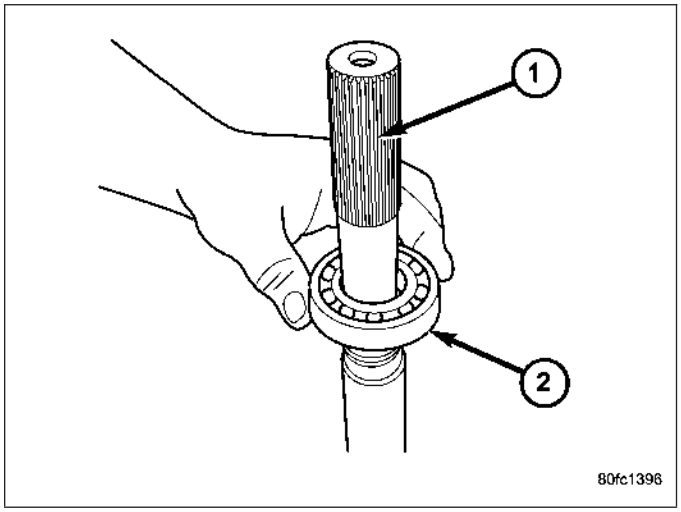


62. As a final check of the transmission, measure the input shaft end play. This will indicate when a #4 thrust plate change is required. The #4 thrust plate is located behind the overdrive clutch hub. Attach a dial indicator to transmission bell housing with its plunger seated against end of input shaft. Move input shaft in and out to obtain end play reading. **Input shaft end play must be 0.127 to 0.635 mm (0.005 to 0.025 inch).** If not within specifications, make the necessary thrust plate adjustment.

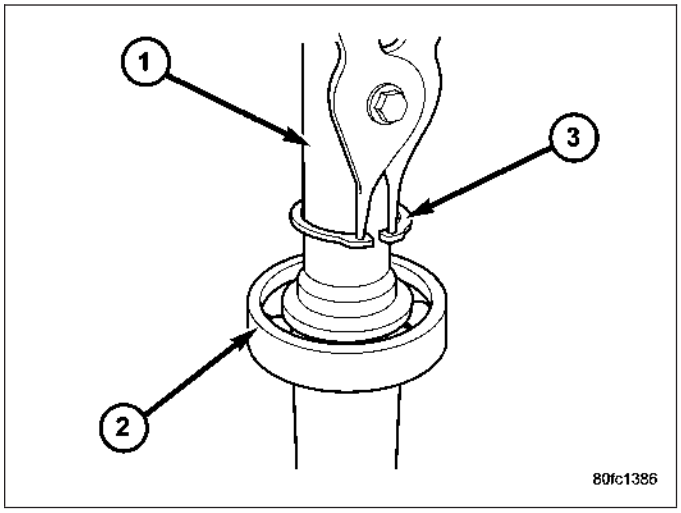


63. On 4X2 transmissions, perform the following, if necessary:

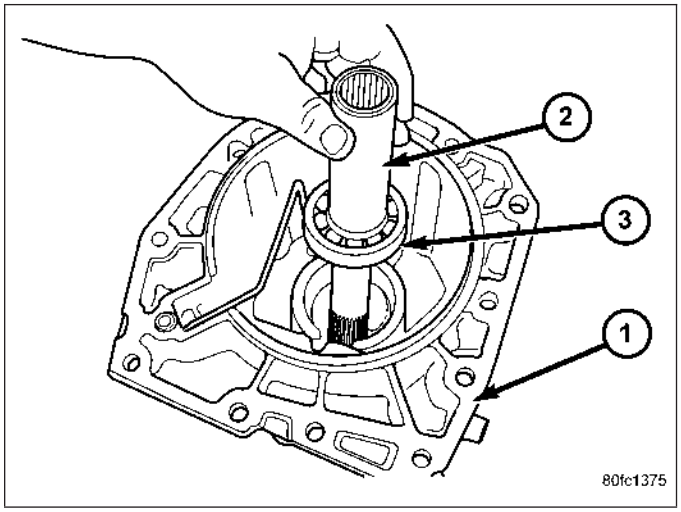
a. Install the extension shaft bearing (2) onto the extension shaft.



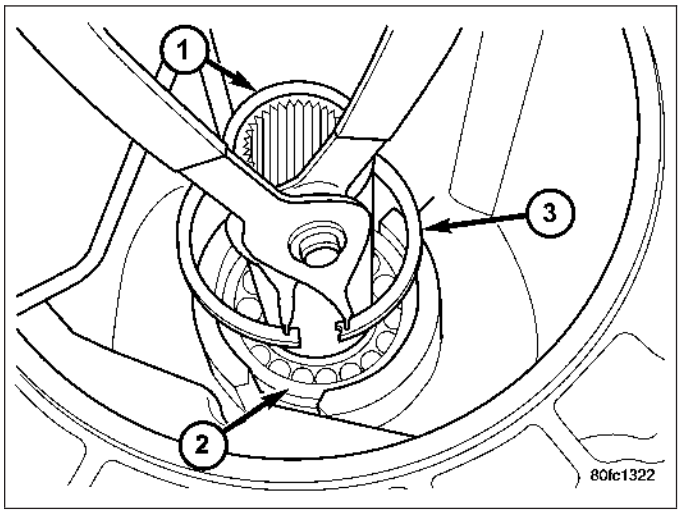
b. Install the extension shaft bearing retaining ring (3) onto the extension shaft (1).



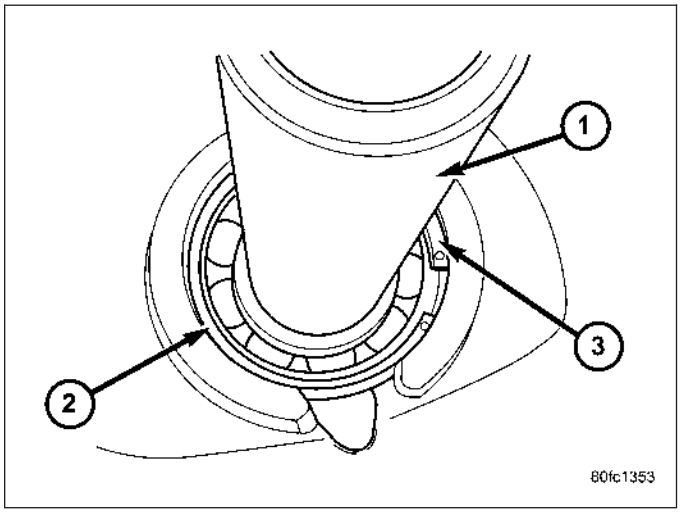
c. Install the extension shaft (2) and bearing assembly (3) into the extension housing (1).



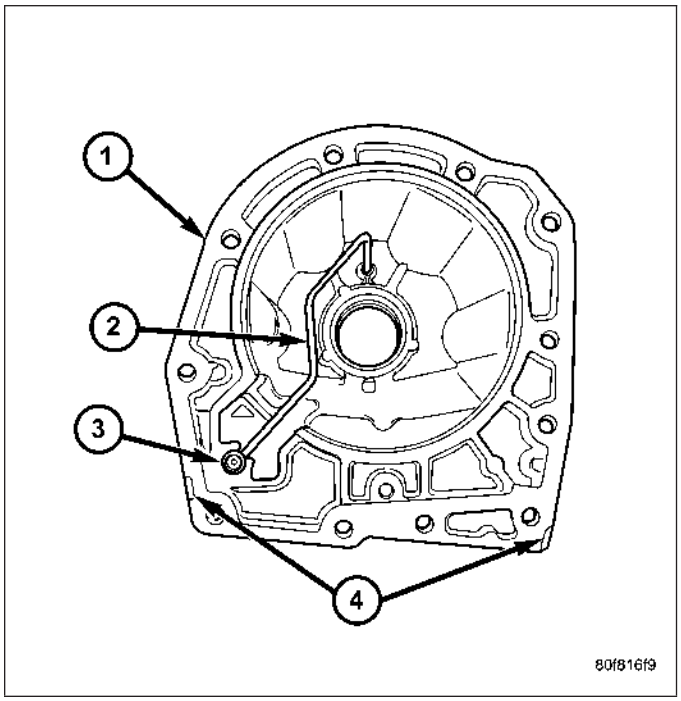
d. Install the extension shaft bearing snap ring (3) into the extension housing.



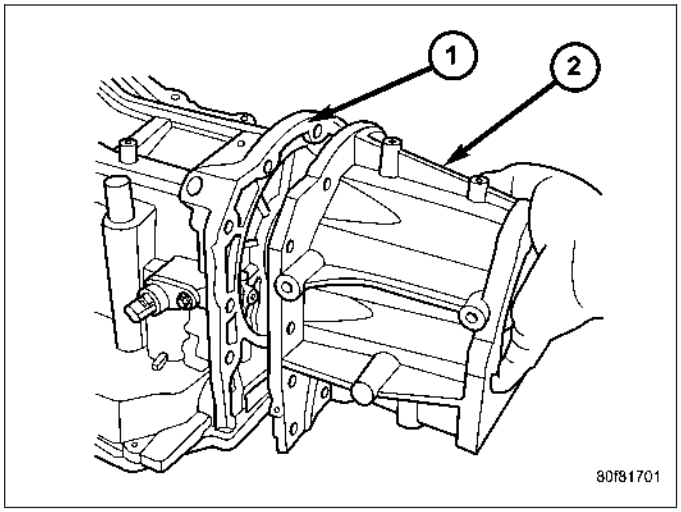
e. Verify that the extension shaft snap ring (3) is fully engaged in the snap ring groove.



64. Inspect the lube tube grommet (2) for damage. If the grommet lip is damaged, it will need to be replaced.

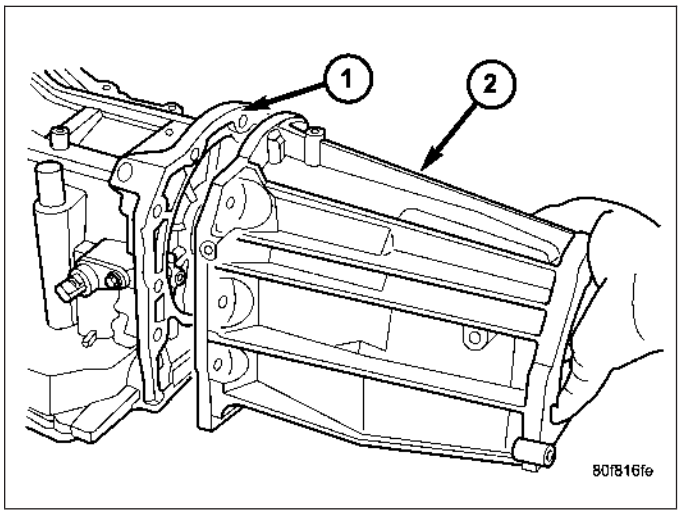


65. Install the 4X4 stub shaft onto the transmission output shaft.
66. Place a bead of Mopar® ATF RTV on the rear surface of the transmission case for the adapter/extension housing.

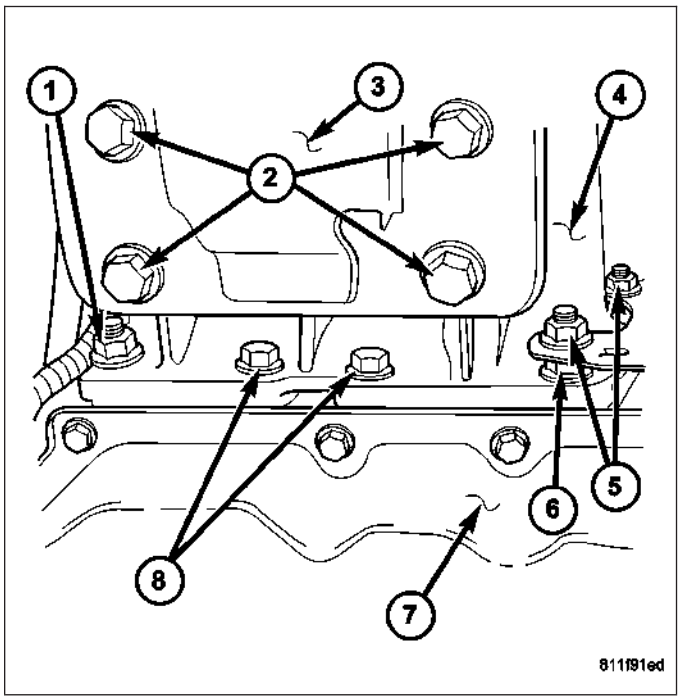


67. Install the adapter housing (2) onto the transmission case, 4X4 vehicles only.

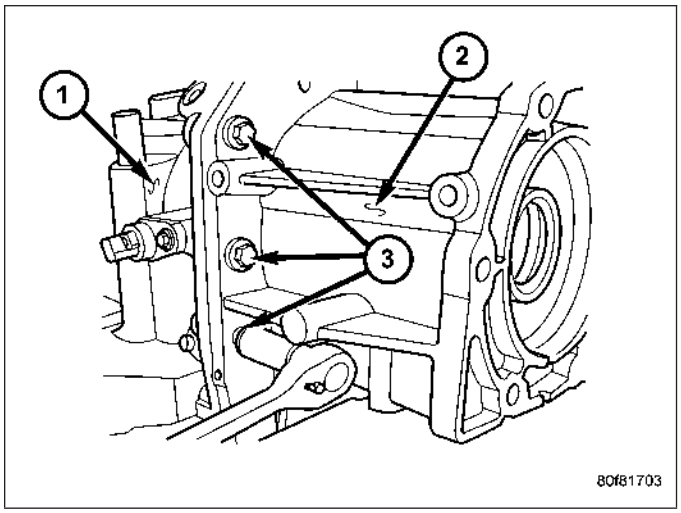
68. Install the extension housing (2) onto the transmission case, 4X2 vehicles only.



NOTE: Before installing the lowermost four adapter/extension housing bolts , it will be necessary to replentish the sealing patch on the bolts using Mopar® Lock & Seal Adhesive.



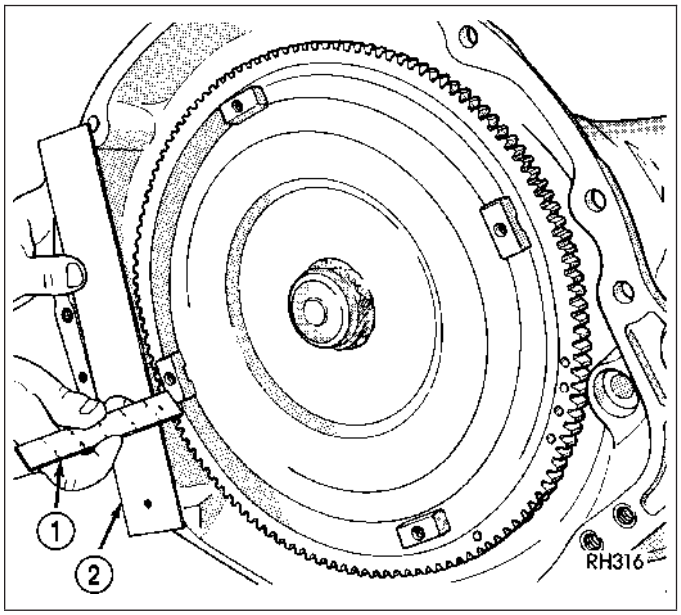
69. Install the bolts that hold the adapter or extension housing onto the transmission case. Be sure to install any stud bolts to their original locations. Tighten the bolts to 54 N·m (40 ft.lbs.).



INSTALLATION

NOTE: Check torque converter hub and hub drive flats for sharp edges burrs, scratches, or nicks. Polish the hub and flats with 320/400 grit paper and crocus cloth if necessary. The hub must be smooth to avoid damaging pump seal at installation.

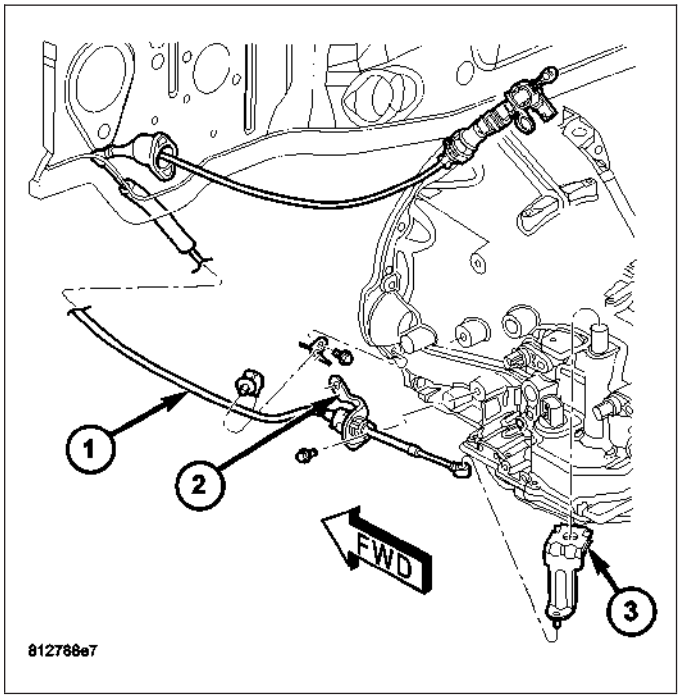
1. If a replacement transmission is being installed, transfer any components necessary, such as the manual shift lever and shift cable bracket, from the original transmission onto the replacement transmission.
2. Lubricate oil pump seal lip with transmission fluid.
3. Align converter and oil pump.
4. Carefully insert converter in oil pump. Then rotate converter back and forth until fully seated in pump gears.
5. Check converter seating with steel scale (1) and straightedge (2). Surface of converter lugs should be at least 13mm (1/2 in.) to rear of straightedge when converter is fully seated.
6. Temporarily secure converter with C-clamp.



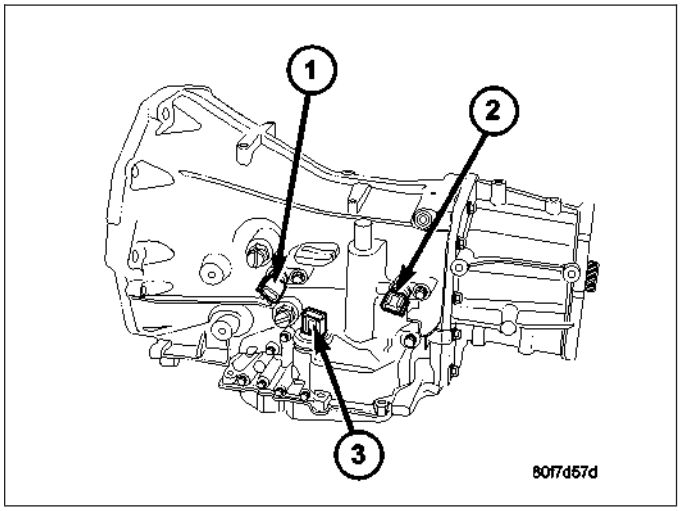
7. Position transmission on jack and secure it with chains.
8. Check condition of converter driveplate. Replace the plate if cracked, distorted or damaged. **Also be sure transmission dowel pins are seated in engine block and protrude far enough to hold transmission in alignment.**
9. Apply a light coating of Mopar® High Temp Grease to the torque converter hub pocket in the rear pocket of the engine's crankshaft.
10. Raise transmission and align the torque converter with the drive plate and transmission converter housing with the engine block.
11. Move transmission forward. Then raise, lower or tilt transmission to align the converter housing with engine block dowels.

12. Carefully work transmission forward and over engine block dowels until converter hub is seated in crankshaft. Verify that no wires, or the transmission vent hose, have become trapped between the engine block and the transmission.
13. Install two bolts to attach the transmission to the engine.
14. Install remaining torque converter housing to engine bolts. Tighten to 68 N·m (50 ft.lbs.).
15. Install transfer case, if equipped. Tighten transfer case nuts to 35 N·m (26 ft.lbs.).
16. Install rear transmission crossmember. Tighten crossmember to frame bolts to 68 N·m (50 ft.lbs.).
17. Install rear support to transmission. Tighten bolts to 47 N·m (35 ft.lbs.).
18. Lower transmission onto crossmember and install bolts attaching transmission mount to crossmember. Tighten clevis bracket to crossmember bolts to 47 N·m (35 ft.lbs.). Tighten the clevis bracket to rear support bolt to 68 N·m (50 ft.lbs.).

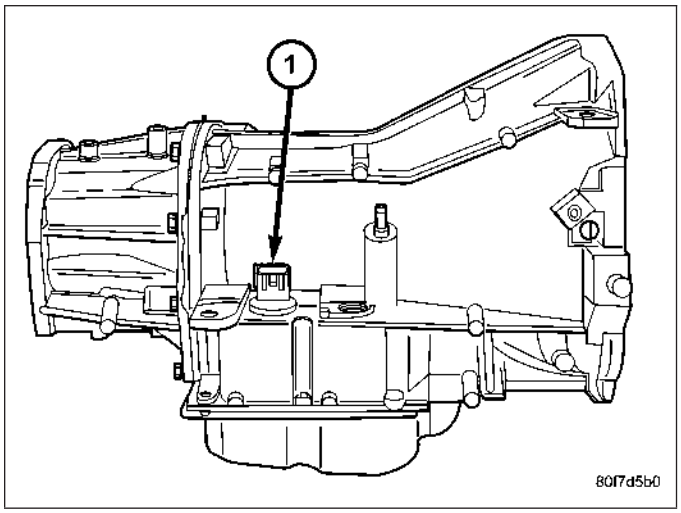
19. Connect gearshift cable (1) to support bracket (2) and transmission manual lever (3).



20. Connect input (1) and output (2) speed sensor wires and the transmission range sensor (3).

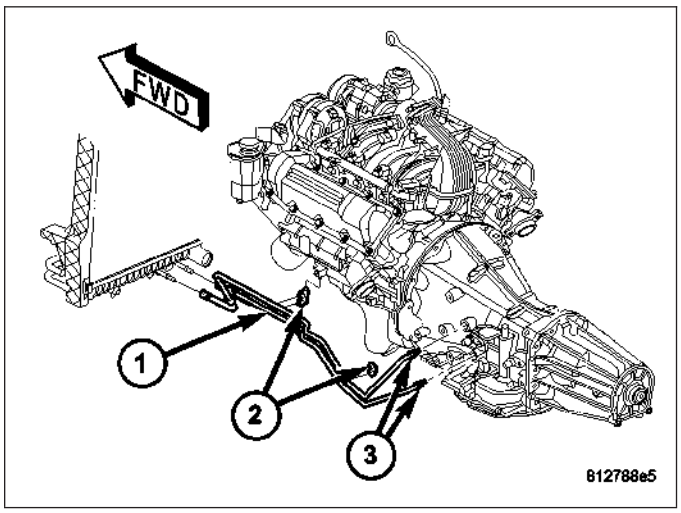


21. Connect wires to the solenoid/pressure switch assembly (1).

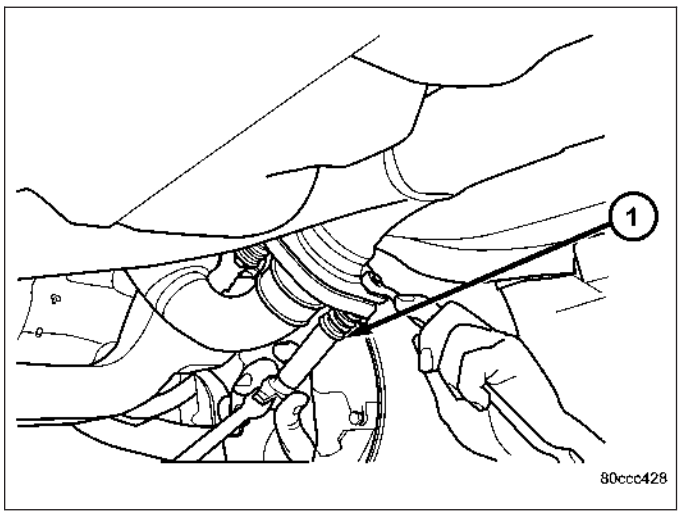


CAUTION: It is essential that correct length bolts be used to attach the converter to the driveplate. Bolts that are too long will damage the clutch surface inside the converter.

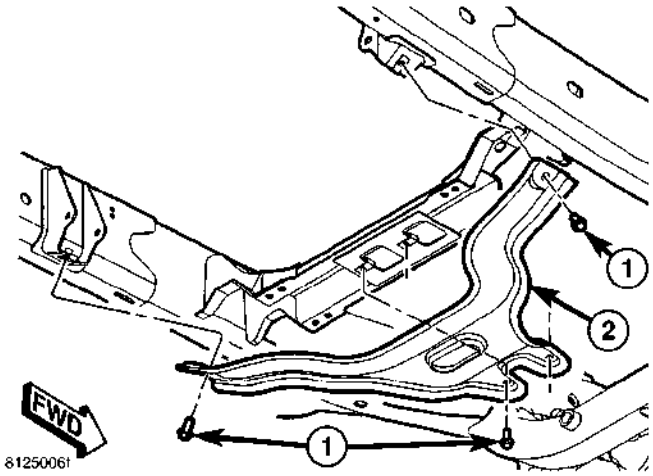
22. Install torque converter-to-driveplate bolts. Tighten bolts to 88 N·m (65 in. lbs.).
23. Install starter motor and cooler line bracket.
24. Connect cooler lines (1) to transmission.
25. Install transmission fill tube.



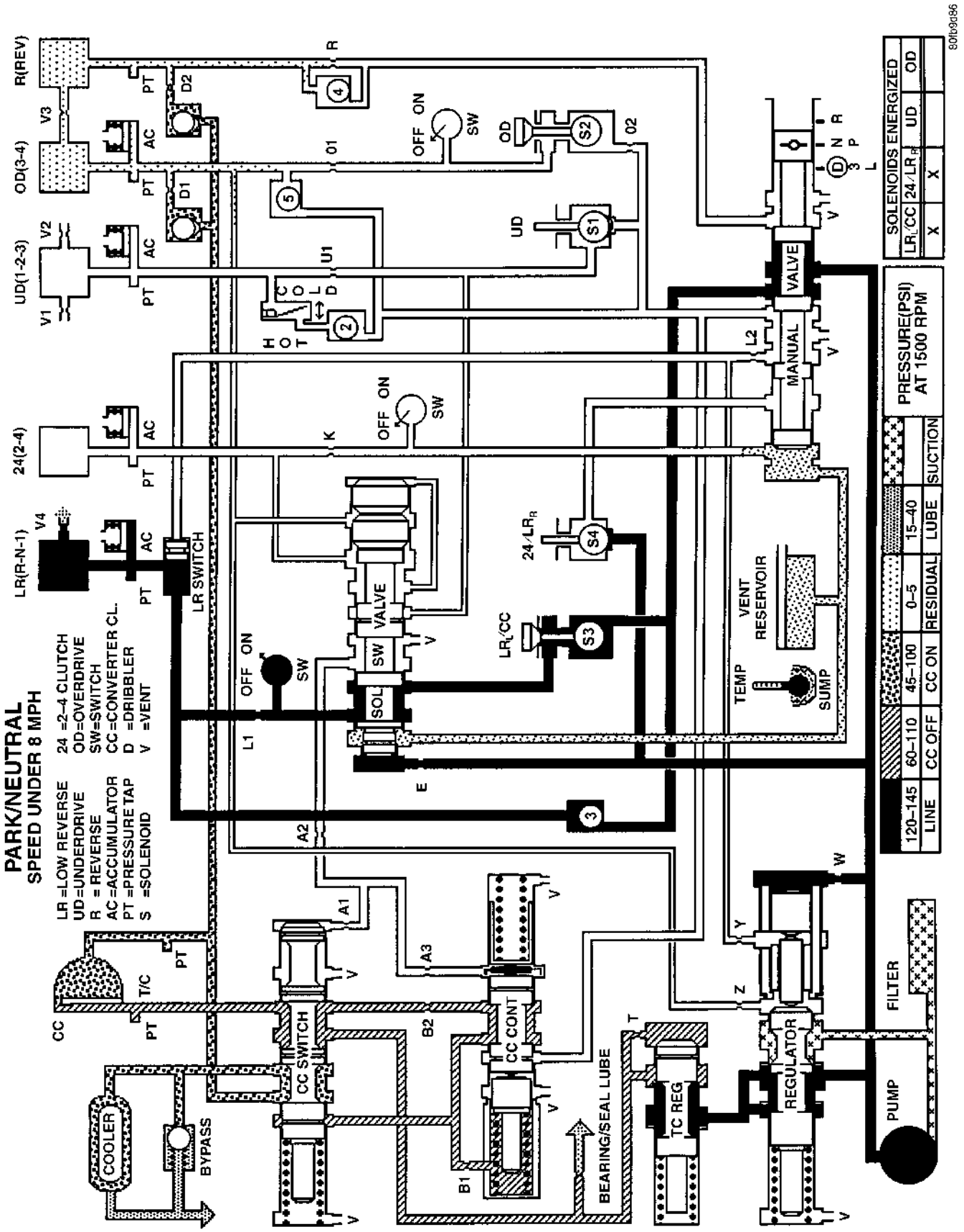
26. Install exhaust components (1).

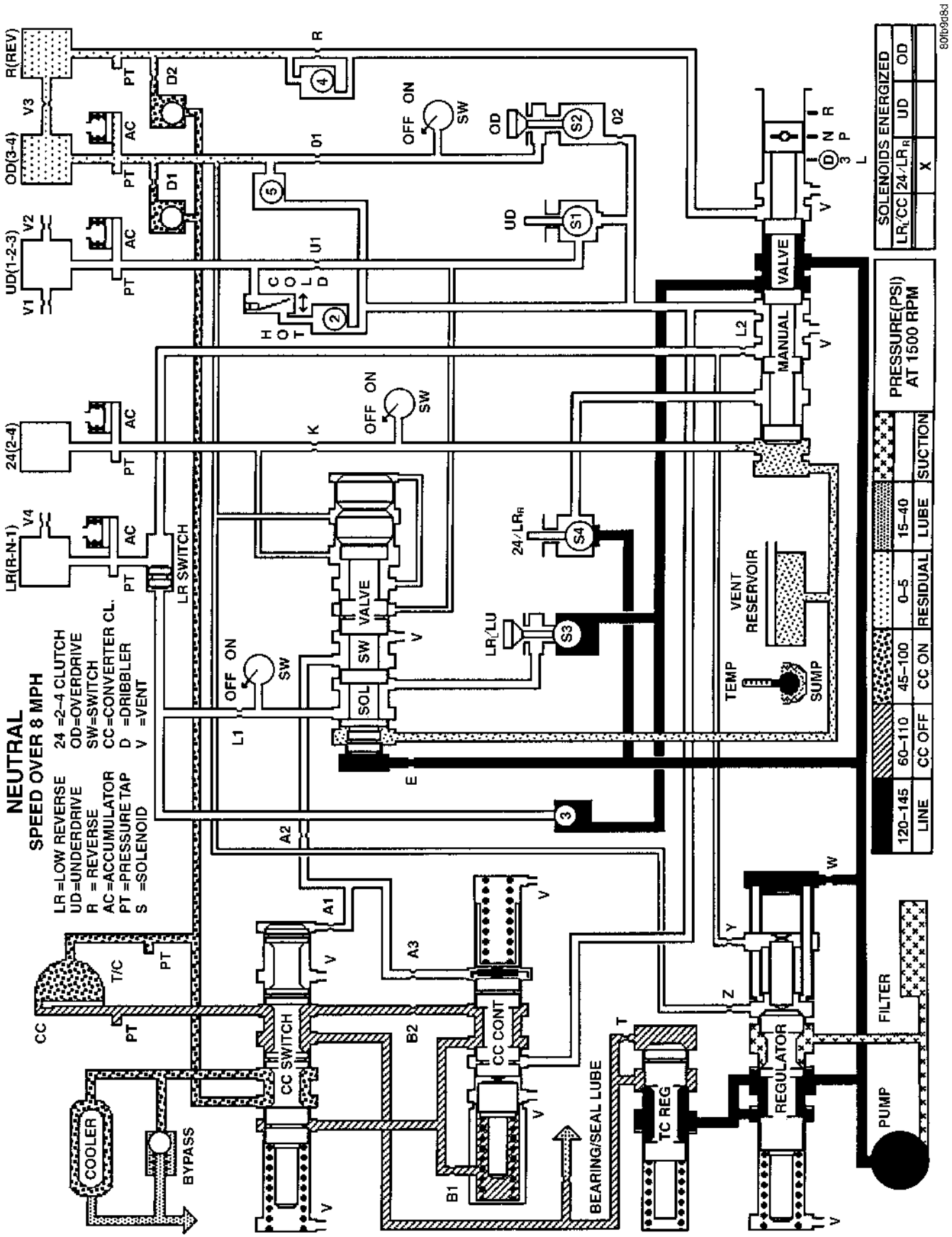


27. Align and connect propeller shaft(s).
28. Adjust gearshift cable if necessary.
29. Install any skid plates removed previously. (Refer to 13 - FRAMES & BUMPERS/FRAME/TRANSFER CASE SKID PLATE - INSTALLATION)
30. Lower vehicle.
31. Fill transmission with Mopar® ATF +4, Automatic Transmission Fluid.

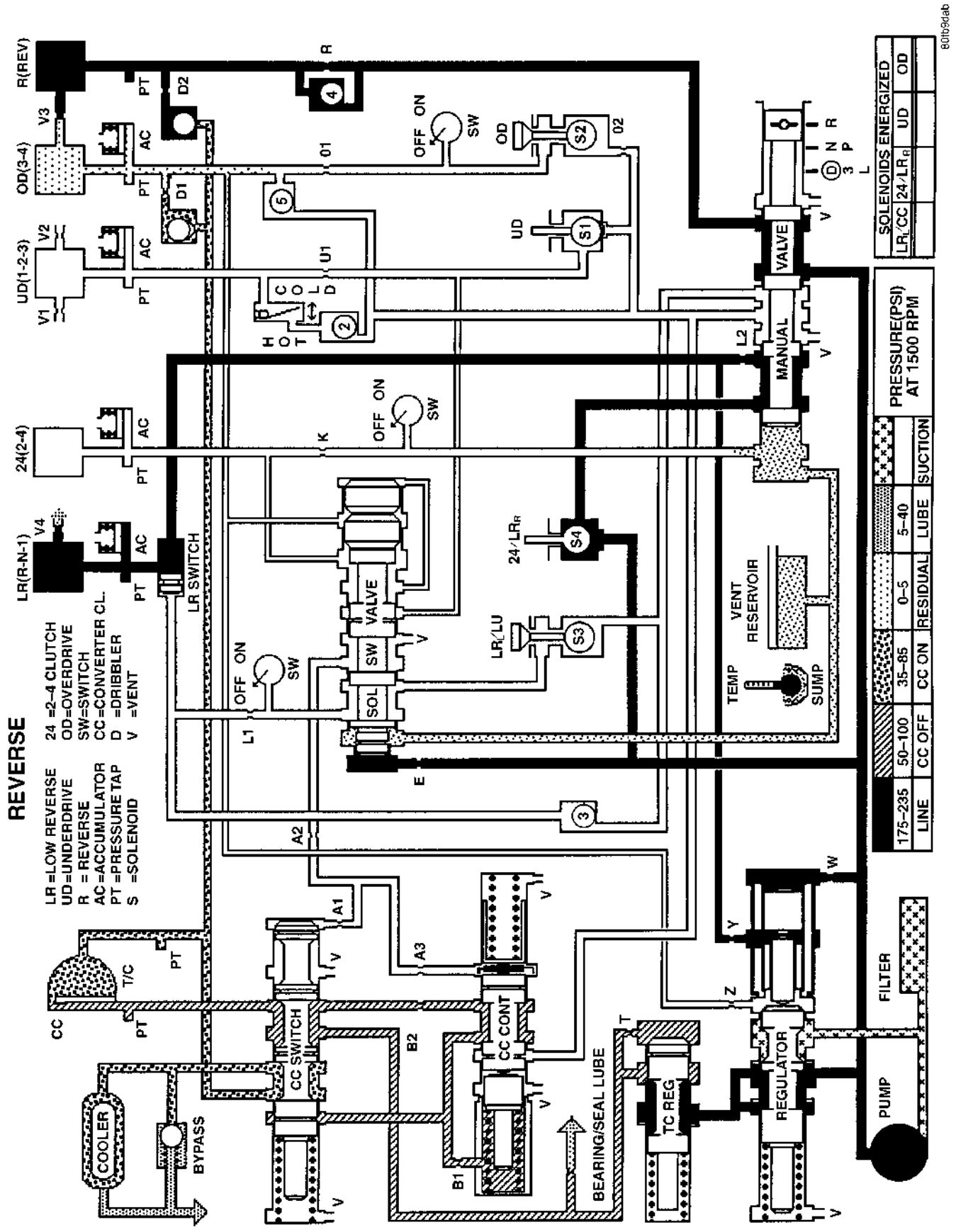


SCHEMATICS AND DIAGRAMS - 42RLE TRANSMISSION

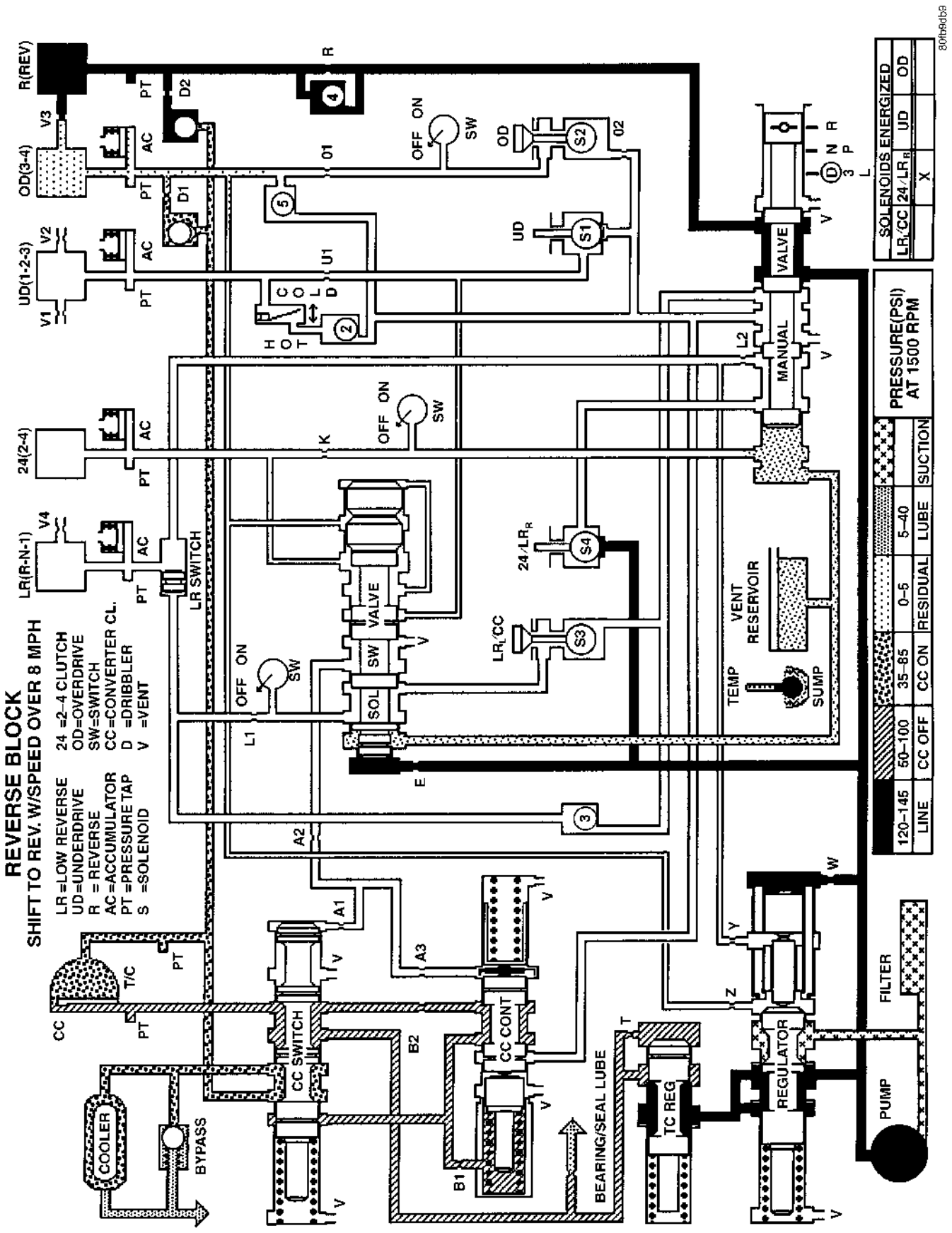




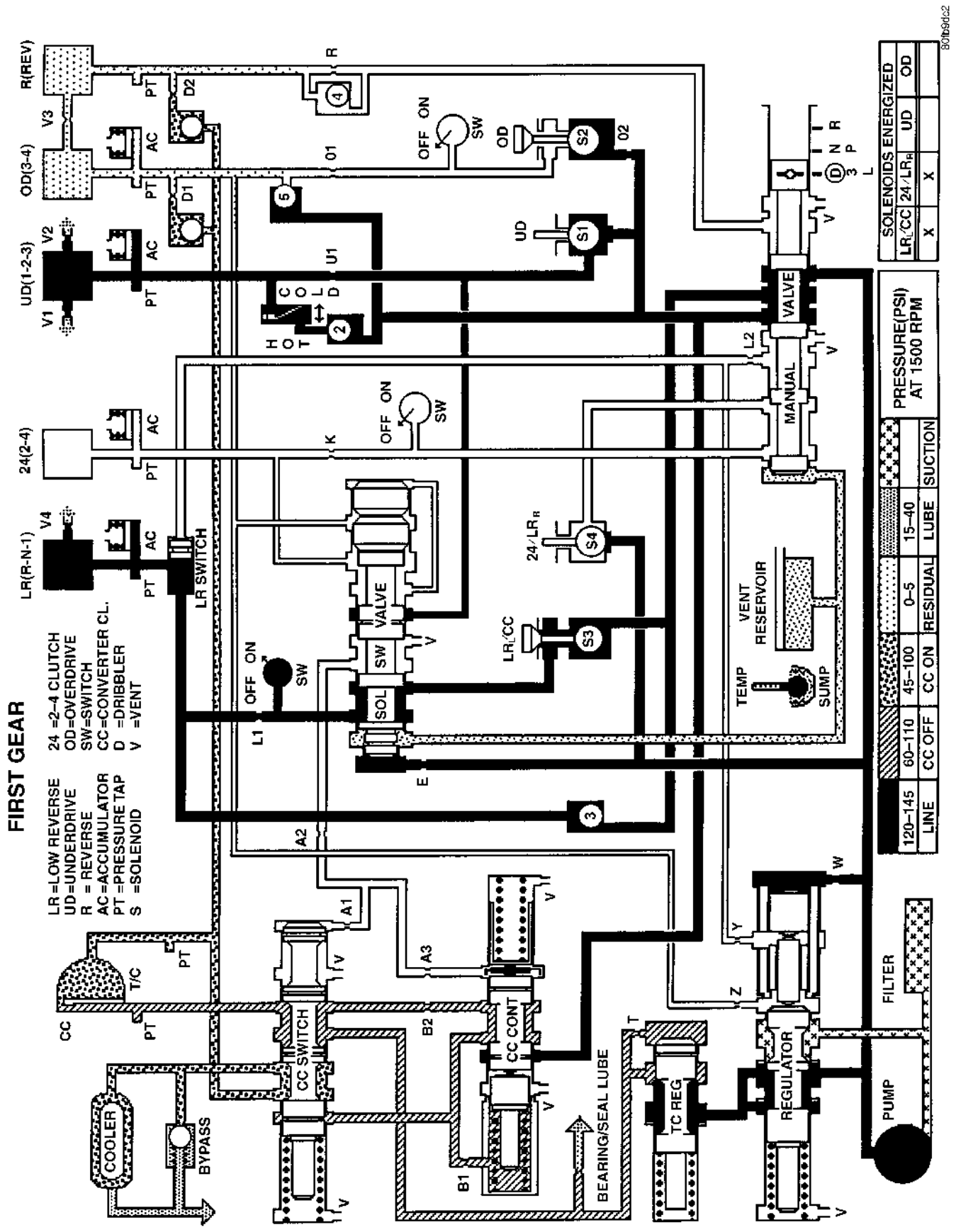
Neutral (Speed Over 8 mph)

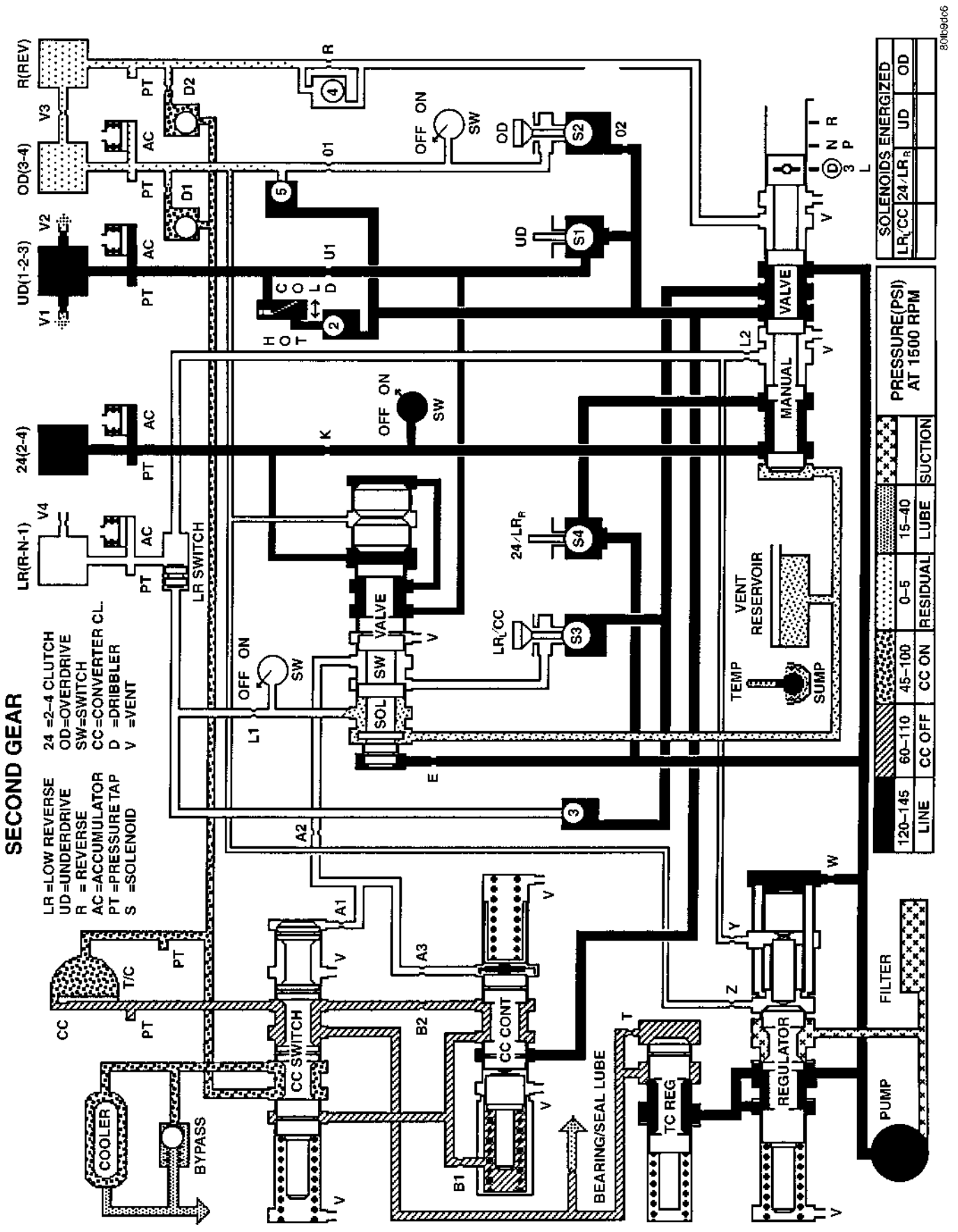

REVERSE
LR =LOW REVERSE
UD=UNDERDRIVE
R = REVERSE
AC=ACCUMULATOR
PT =PRESSURE TAP
S =SOLENOID
24 =2-4 CLUTCH
OD=OVERDRIVE
SW=SWITCH
CC=CONVERTER CL.
D =DRIBBLER
V =VENT
R(REV)
OD(3-4)
UD(1-2-3)
24(2-4)
LR(R-N-1)
V1
V2
V3
V4
AC
PT
D1
D2
LR SWITCH
OFF ON
SW
SOL
VALVE
MANUAL
VALVE
OD
UD
24/LR
LR/LU
S1
S2
S3
S4
HOT
COLD
TEMP
VENT
RESERVOIR
SUMP
PRESSURE(PSI)
AT 1500 RPM
SOLENOIDS ENERGIZED
LR/CC
24/LR
UD
OD
LINE
CC OFF
CC ON
RESIDUAL
LUBE
SUCTION
175–235
50–100
35–85
0–5
5–40
FILTER
PUMP
REGULATOR
TC REG
BEARING/SEAL LUBE
CC CONT
CC SWITCH
COOLER
BYPASS
T/C
CC
A1
A2
A3
B1
B2
E
K
L1
L2
U1
01
02
R
N
P
L
D
3
2
1
T
V
W
Y
Z
80ffb9dab

Reverse

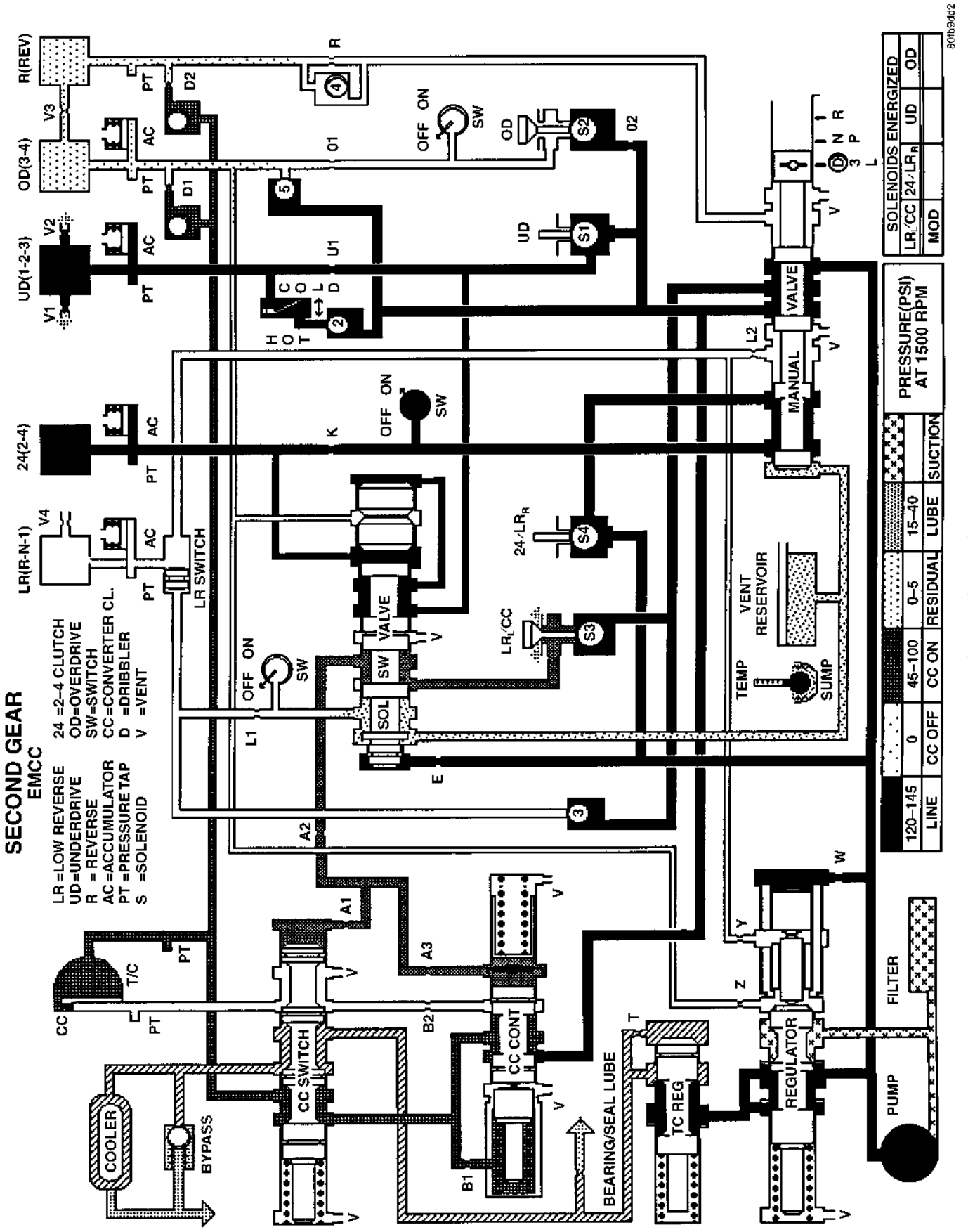


Reverse Block (Shift to Reverse w/Speed Over 8 mph)

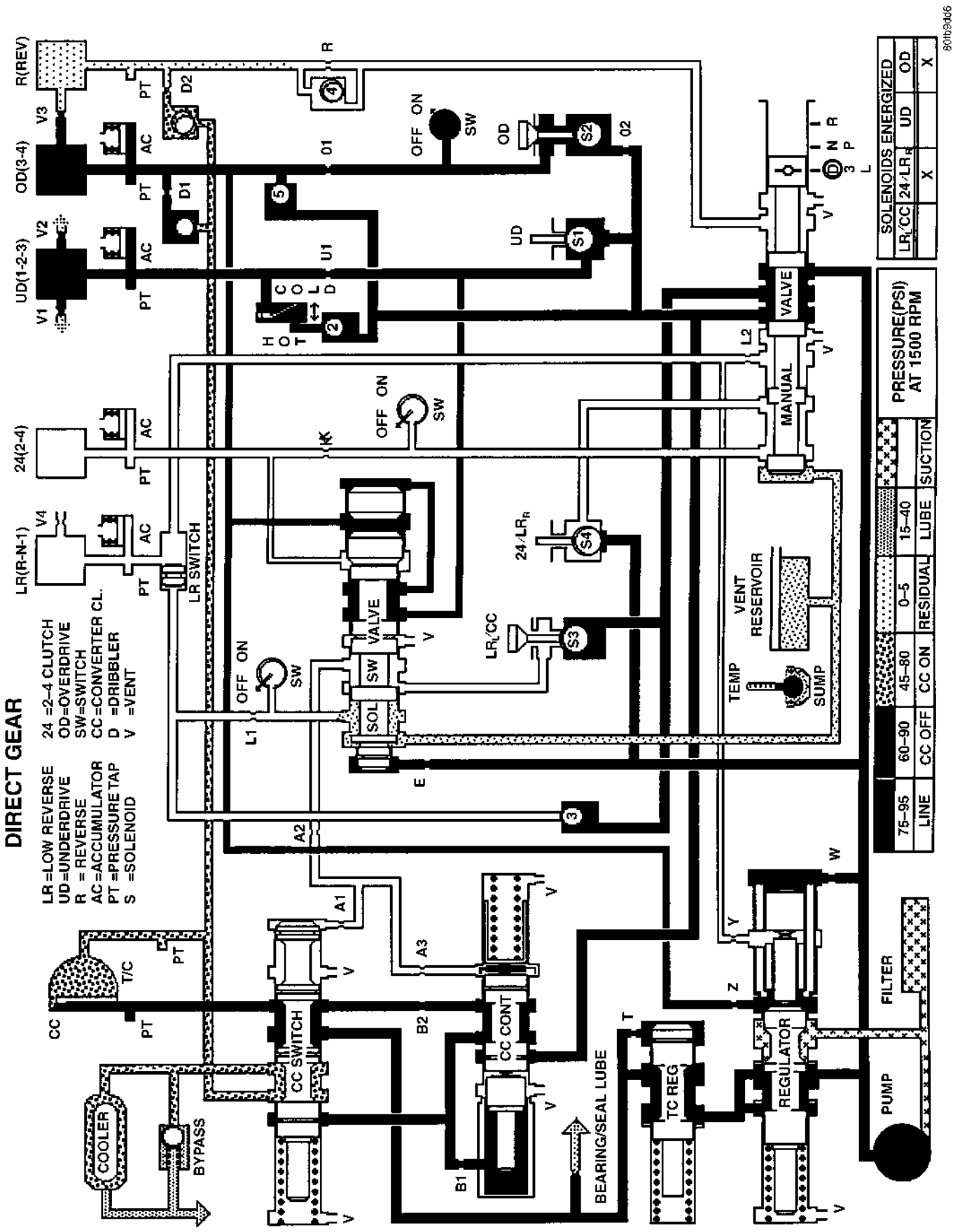

FIRST GEAR
LR=LOW REVERSE
UD=UNDERDRIVE
R = REVERSE
AC=ACCUMULATOR
PT =PRESSURE TAP
S =SOLENOID
24 =2-4 CLUTCH
OD=OVERDRIVE
SW=SWITCH
CC=CONVERTER CL.
D =DRIBBLER
V =VENT
R(REV)
OD(3-4)
UD(1-2-3)
24(2-4)
LR(R-N-1)
LR SWITCH
VALVE
MANUAL
VENT
RESERVOIR
TEMP
SUMP
PUMP
FILTER
REGULATOR
TC REG
CC CONT
CC SWITCH
COOLER
BYPASS
BEARING/SEAL LUBE
SOLENOIDS ENERGIZED
PRESSURE(PSI) AT 1500 RPM
LINE
CC OFF
CC ON
RESIDUAL
LUBE
SUCTION
First Gear

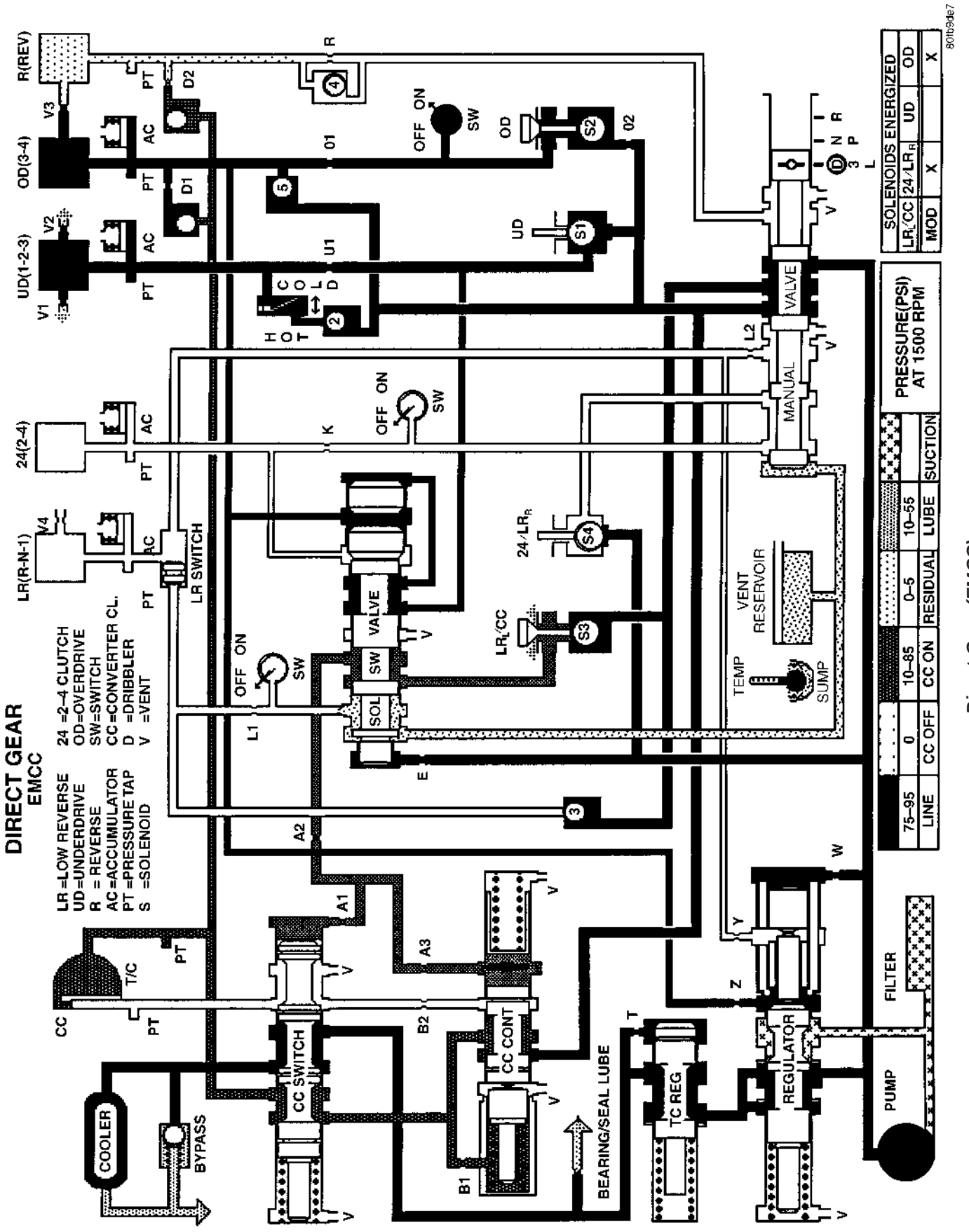

SECOND GEAR
LR =LOW REVERSE
UD=UNDERDRIVE
R = REVERSE
AC=ACCUMULATOR
PT =PRESSURE TAP
S =SOLENOID
24 =2-4 CLUTCH
OD=OVERDRIVE
SW=SWITCH
CC=CONVERTER CL.
D =DRIBBLER
V =VENT
R(REV)
OD(3-4)
UD(1-2-3)
24(2-4)
LR(R-N-1)
V1
V2
V3
V4
AC
PT
D1
D2
U1
U2
O1
O2
HOT
COLD
OFF ON
SW
VALVE
MANUAL
SOL
LR SWITCH
CC SWITCH
CC CONT
REGULATOR
TC REG
COOLER
BYPASS
FILTER
PUMP
VENT
RESERVOIR
TEMP
SUMP
BEARING/SEAL LUBE
SOLENOIDS ENERGIZED
LR/CC
24/LR
UD
OD
PRESSURE(PSI)
AT 1500 RPM
LINE
CC OFF
CC ON
RESIDUAL
LUBE
SUCTION
120–145
60–110
45–100
0–5
15–40

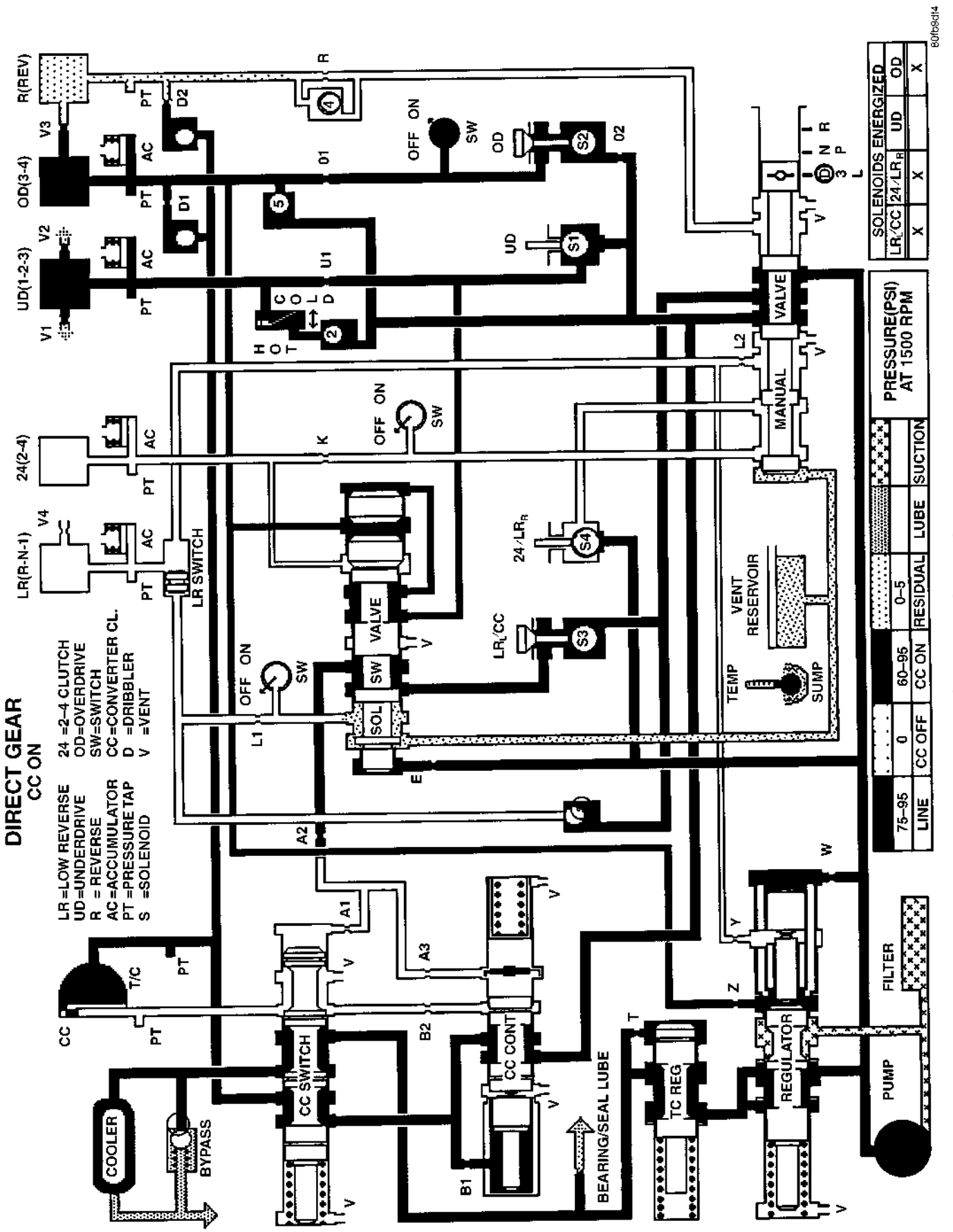
Second Gear



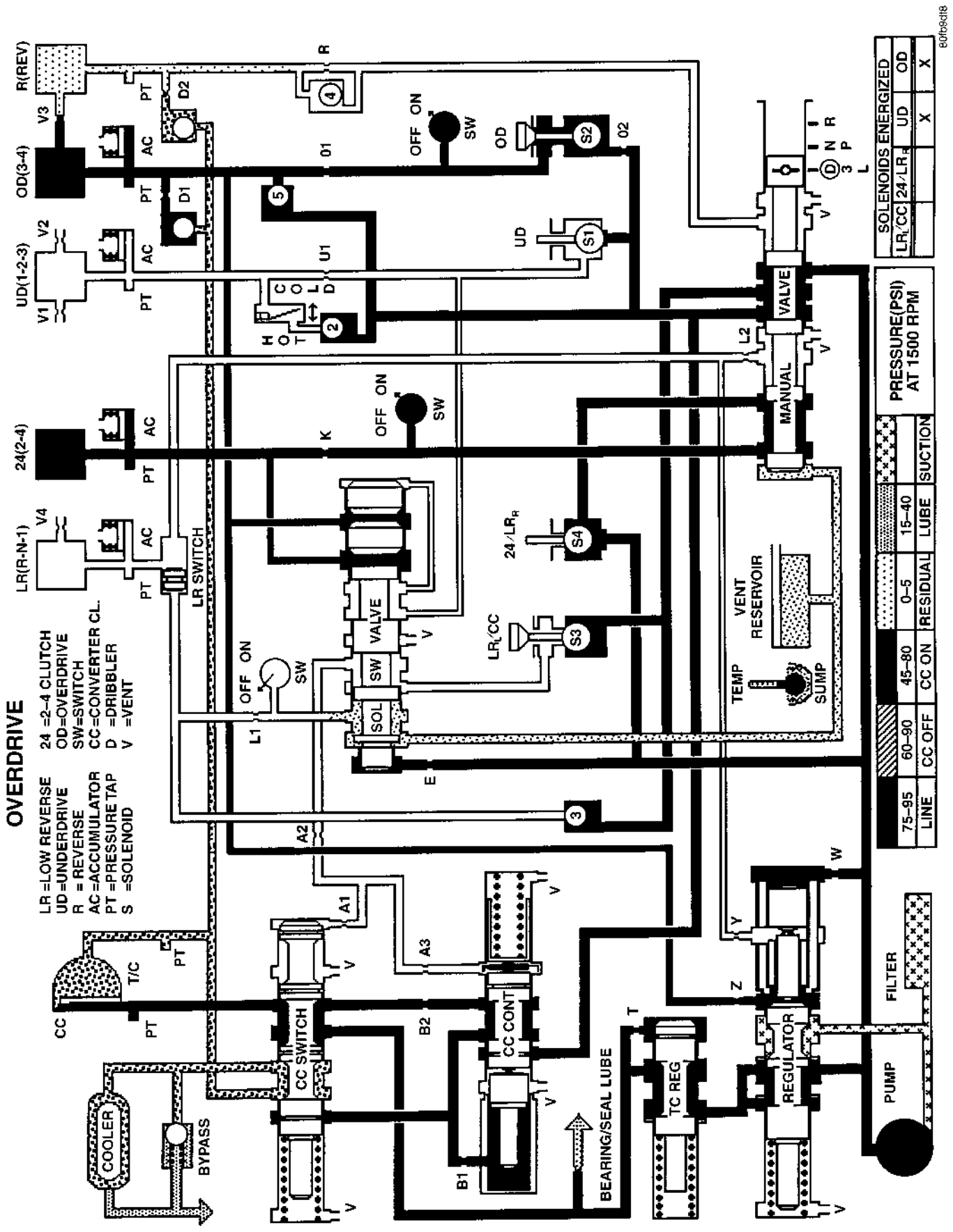
Second Gear (EMCC)

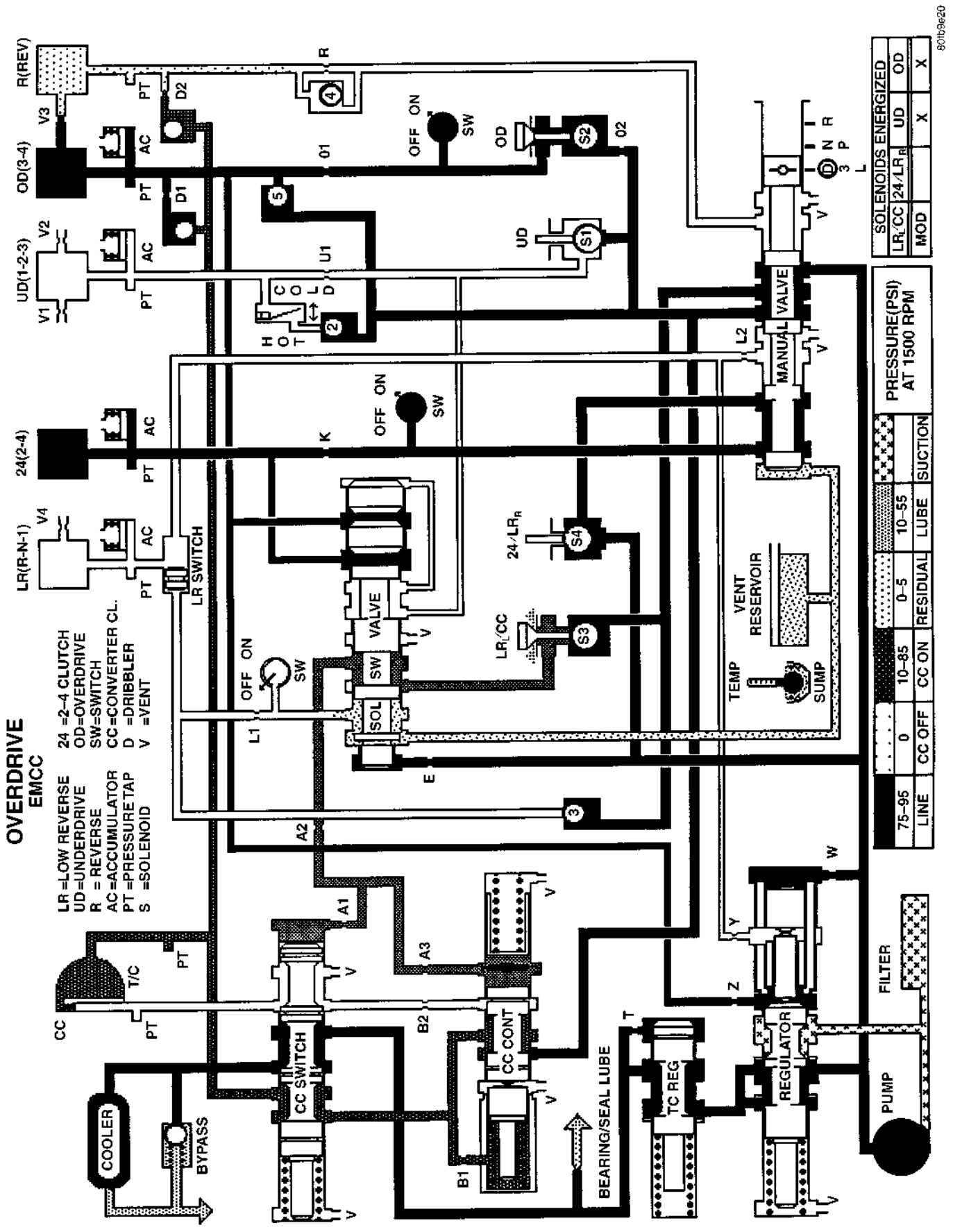

DIRECT GEAR
LR=LOW REVERSE
UD=UNDERDRIVE
R = REVERSE
AC=ACCUMULATOR
PT =PRESSURE TAP
S =SOLENOID
24 =2–4 CLUTCH
OD=OVERDRIVE
SW=SWITCH
CC=CONVERTER CL.
D =DRIBBLER
V =VENT
R(REV)
OD(3-4)
UD(1-2-3)
24(2-4)
LR(R-N-1)
LR SWITCH
OFF ON SW
CC
T/C
PT
COOLER
BYPASS
CC SWITCH
CC CONT
TC REG
REGULATOR
FILTER
PUMP
BEARING/SEAL LUBE
SOL
VALVE
MANUAL
VENT
RESERVOIR
SUMP
TEMP
SOLENOIDS ENERGIZED
LR/CC
24/LR
UD
OD
PRESSURE(PSI) AT 1500 RPM
LINE
CC OFF
CC ON
RESIDUAL
LUBE
SUCTION
75–95
60–90
45–80
0–5
15–40
Direct Gear
80fb9dd6

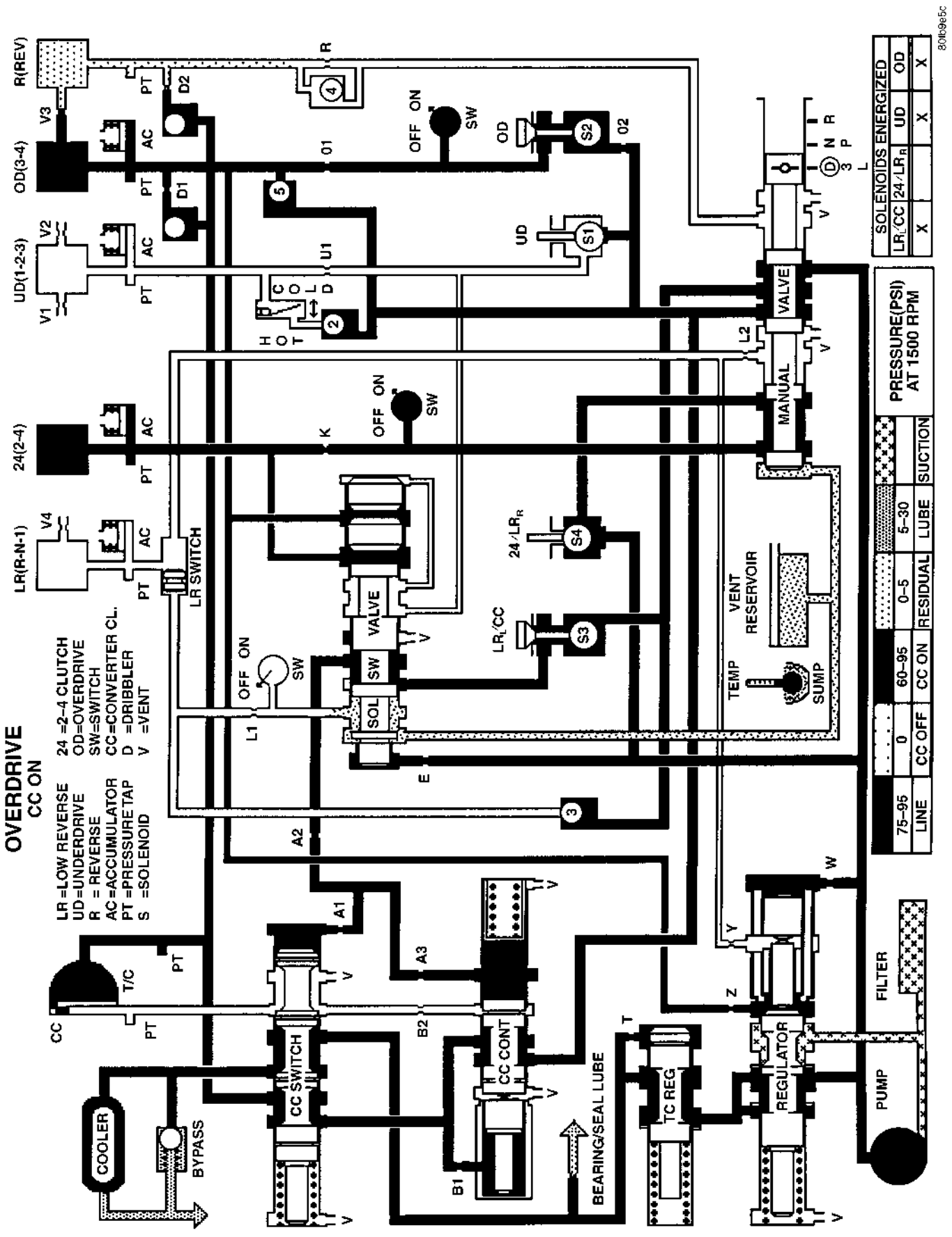

DIRECT GEAR
EMCC
LR =LOW REVERSE
UD=UNDERDRIVE
R = REVERSE
AC=ACCUMULATOR
PT =PRESSURE TAP
S =SOLENOID
24 =2–4 CLUTCH
OD=OVERDRIVE
SW=SWITCH
CC=CONVERTER CL.
D =DRIBBLER
V =VENT
R(REV)
OD(3-4)
UD(1-2-3)
LR(R-N-1)
24(2-4)
V1
V2
V3
V4
AC
PT
D1
D2
LR SWITCH
OFF ON SW
VALVE
SOL
SW
MANUAL
VENT
RESERVOIR
TEMP
SUMP
COOLER
BYPASS
T/C
CC SWITCH
CC CONT
TC REG
REGULATOR
PUMP
FILTER
BEARING/SEAL LUBE
SOLENOIDS ENERGIZED
LR/CC
24/LR
UD
OD
MOD
PRESSURE(PSI)
AT 1500 RPM
LINE
CC OFF
CC ON
RESIDUAL
LUBE
SUCTION
75–95
0
10–85
0–5
10–55
Direct Gear (EMCC)



Direct Gear (CC On)


OVERDRIVE
LR =LOW REVERSE
UD=UNDERDRIVE
R = REVERSE
AC=ACCUMULATOR
PT =PRESSURE TAP
S =SOLENOID
24 =2-4 CLUTCH
OD=OVERDRIVE
SW=SWITCH
CC=CONVERTER CL.
D =DRIBBLER
V =VENT
R(REV)
OD(3-4)
UD(1-2-3)
24(2-4)
LR(R-N-1)
LR SWITCH
OFF ON SW
VALVE
SOL
CC SWITCH
CC CONT
T/C
COOLER
BYPASS
BEARING/SEAL LUBE
TC REG
REGULATOR
PUMP
FILTER
MANUAL VALVE
VENT RESERVOIR
TEMP
SUMP
SOLENOIDS ENERGIZED
PRESSURE(PSI) AT 1500 RPM
LINE
SUCTION
80fc9d18
Overdrive


OVERDRIVE
EMCC
LR =LOW REVERSE
UD=UNDERDRIVE
R = REVERSE
AC=ACCUMULATOR
PT =PRESSURETAP
S =SOLENOID
24 =2–4 CLUTCH
OD=OVERDRIVE
SW=SWITCH
CC=CONVERTER CL.
D =DRIBBLER
V =VENT
R(REV)
OD(3-4)
UD(1-2-3)
24(2-4)
LR(R-N-1)
V1
V2
V3
V4
AC
PT
D1
D2
LR SWITCH
OFF ON
SW
VALVE
SOL
L1
E
K
U1
01
02
HOT
COLD
OD
UD
S1
S2
S3
S4
24/LR
LR/CC
MANUAL VALVE
L2
VENT RESERVOIR
TEMP
SUMP
T/C
CC
A1
A2
A3
B1
B2
CC SWITCH
CC CONT
COOLER
BYPASS
BEARING/SEAL LUBE
TC REG
REGULATOR
FILTER
PUMP
T
W
Y
Z
SOLENOIDS ENERGIZED
LR/CC
24/LR
UD
OD
MOD
X
PRESSURE(PSI) AT 1500 RPM
LINE
75–95
CC OFF
0
CC ON
10–85
RESIDUAL
0–5
LUBE
10–55
SUCTION
Overdrive (EMCC)
80fb9e20



Overdrive (CC On)

SPECIFICATIONS

42RLE AUTOMATIC TRANSMISSION

GENERAL SPECIFICATIONS

Transmission Type	Four-Speed Automatic, Electronically Controlled, Fully Adaptive, Electronically Modulated Torque Converter
Lubrication Method	Pump (internal - external gear-type)
Cooling Method	Water Heat Exchanger and/or Air-to-Oil Heat Exchanger

GEAR RATIOS

1st Gear	2.84:1
2nd Gear	1.57:1
3rd Gear (Direct)	1.00:1
4th Gear (Overdrive)	0.69:1
Reverse Gear	2.21:1

BEARING PRELOAD (Drag Torque)

Description	Metric	Standard
Output Shaft	0.22-0.903 N·m	1-8 in. lbs.

CLUTCH PACK

Description	Metric	Standard
Low/Reverse Clutch (Select Reaction Plate)	0.84-1.60 mm	0.033-0.063 in.
Two/Four Clutch (No Select)	0.76-2.64 mm	0.030-0.104 in.
Reverse Clutch (Select Snap Ring)	0.89-1.37 mm	0.035-0.054 in.
Overdrive Clutch (No Select)	1.07-3.25 mm	0.042-0.128 in.
Underdrive Clutch (Select Reaction Plate)	0.94-1.50 mm	0.037-0.059 in.

INPUT SHAFT

Description	Metric	Standard
End Play	0.127-0.635 mm	0.005-0.025 in.

OIL PUMP CLEARANCES

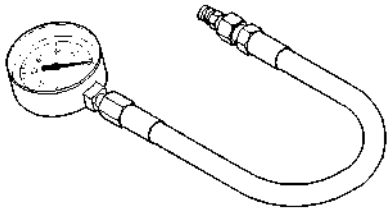
DESCRIPTION	METRIC	STANDARD
Outer Gear-to-Crescent	0.060-0.298 mm	0.0023-0.0117 in.
Inner Gear-to-Crescent	0.093-0.385 mm	0.0036-0.0151 in.
Outer Gear-to-Pocket	0.089-0.202 mm	0.0035-0.0079 in.
Outer Gear Side Clearance	0.020-0.046 mm	0.0008-0.0018 in.
Inner Gear Side Clearance	0.020-0.046 mm	0.0008-0.0018 in.

TORQUE SPECIFICATIONS

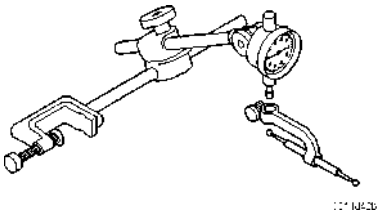
Description	N·m	Ft. Lbs.	In. Lbs.
Bolt, Torque Converter Housing to Engine	68	50	-
Bolt, Converter-to-Driveplate	88	65	-
Bolt, Fluid Filter-to-Valve Body	5	-	45
Bolt, L/R Clutch Retainer-to-Case	5	-	45
Bolt, Adapter/Extension Housing	54	40	-
Bolt, Manual Valve Lever-to-Manual Valve	5	-	45
Bolt, Oil Pan-to-Case	20	14.5	-
Bolt, Oil Pump-to-Case	30	-	265
Bolt, Park Sprag Retainer	4.5	-	40
Bolt, Reaction Shaft Support Halves	28	-	250
Bolt, Solenoid/Pressure Switch Assy-to-Valve Body	5.5	-	50
Bolt, Valve Body-to-Case	12	-	105
Bolt, Valve Body-to-Transfer Plate	5	-	45
Fitting, Cooler Line	47.5	35	-
Nut, Output Shaft	271	200	-
Plug, Pressure Tap	5	-	45
Bolt, Input Speed-to-Case Sensor	9	-	80
Bolt, Output Speed-to-Case Sensor	9	-	80

SPECIAL TOOLS

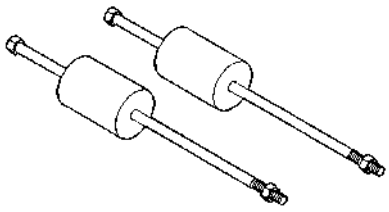
42RLE AUTOMATIC TRANSMISSION



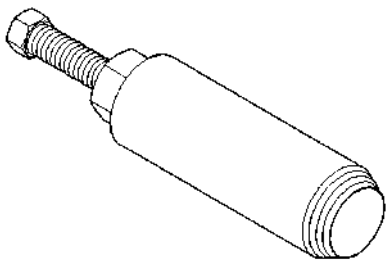
Pressure Gauge (High) C-3293SP



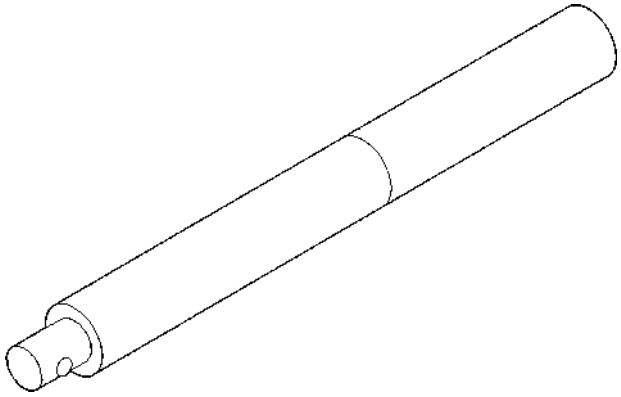
Dial Indicator C-3339



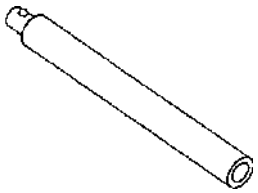
Hammer, Slide - C-3752



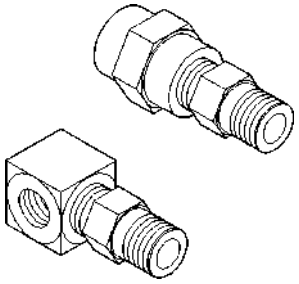
Puller, Seal - C-3981B



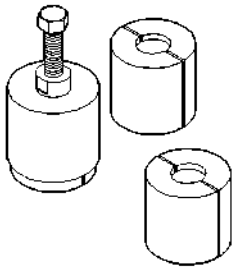
Universal Handle C-4171



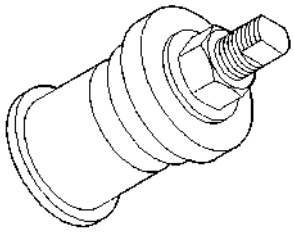
Extension, Handle - C-4171-2



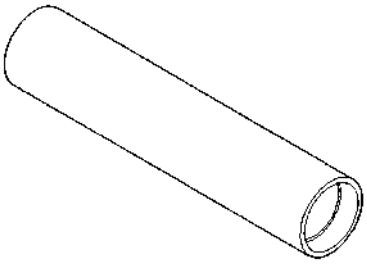
Adapter Set - L-4559



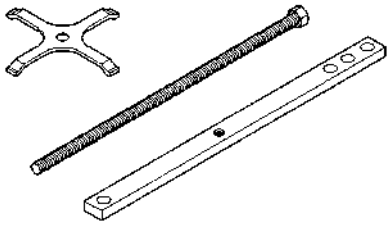
Puller Set 5048



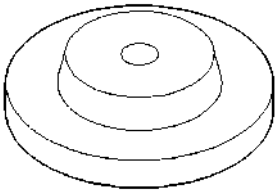
Installer - 5050A



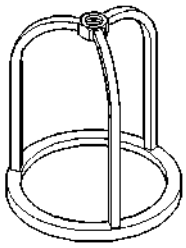
Installer - 6052



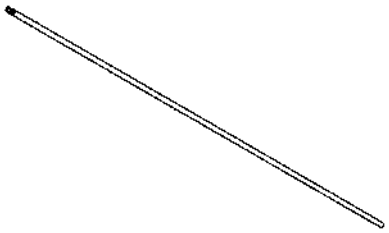
Compressor - 5058A



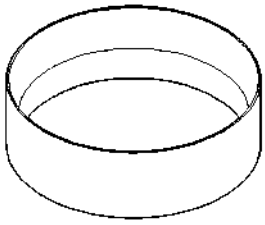
Disk - 6057



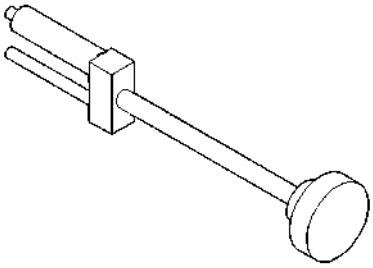
Compressor - 5059-A



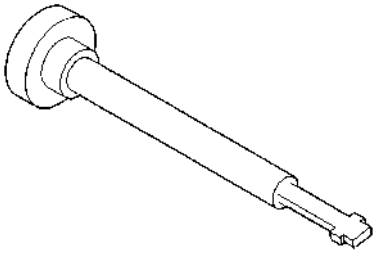
Tip - 6268



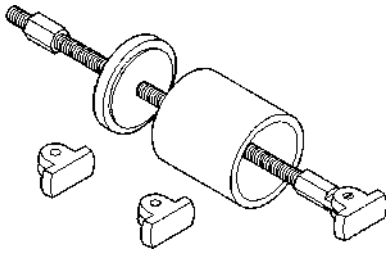
Installer - 5067



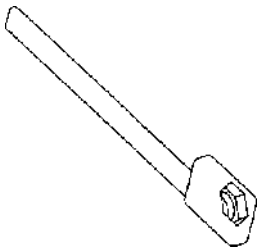
Remover/Installer - 6301



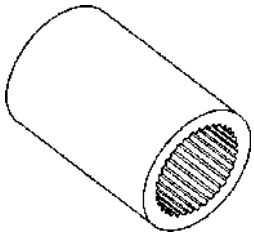
Remover/Installer - 6302



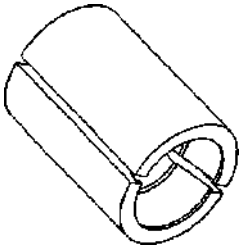
Remover - 6310



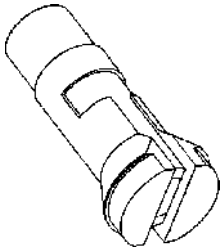
Wrench - 6497



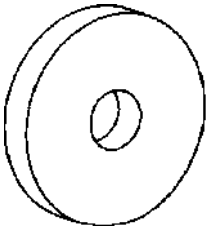
Wrench - 6498-A



Puller Jaws - 6545



Remover - 6596



Remover - 6597

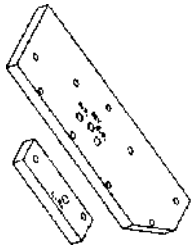
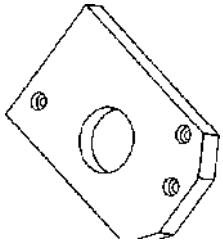
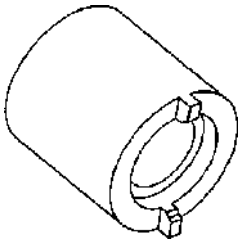


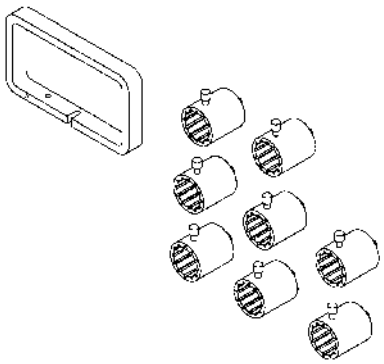
Plate Set - 6599



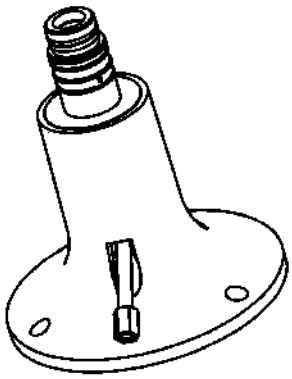
Plate, Support - 6618A



Tool, Staking - 6639



End Play Set - 8266

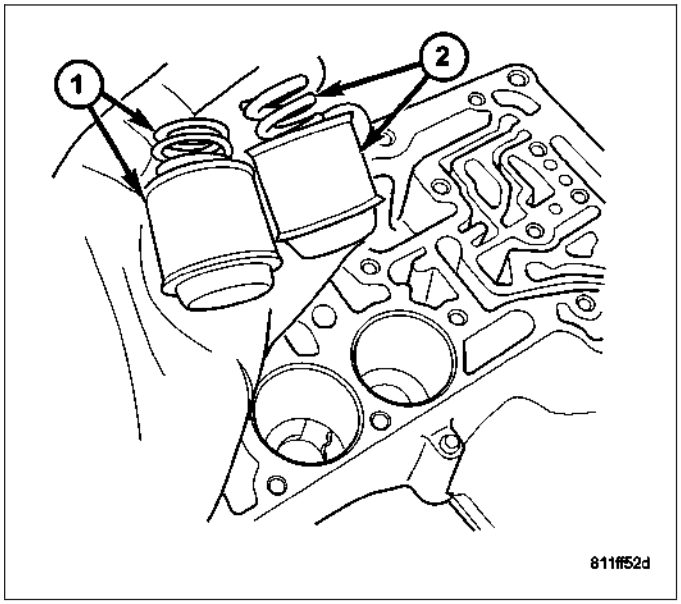


Fixture, Pressure - 8391

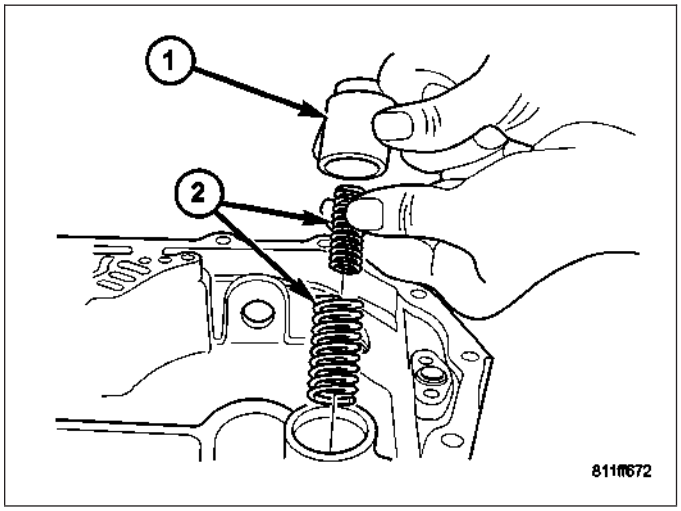
ACCUMULATOR

DESCRIPTION

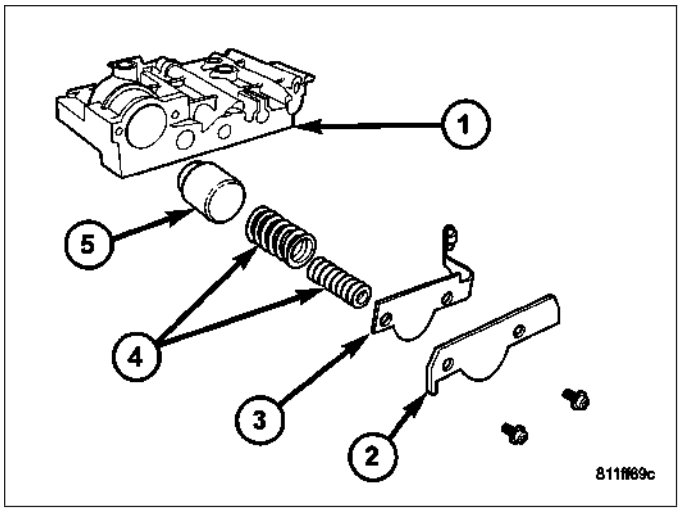
The 42RLE underdrive, overdrive, low/reverse, and 2/4 clutch hydraulic circuits each contain an accumulator. An accumulator typically consists of a piston, return spring(s), and a cover or plug. The overdrive (1) and underdrive (2) accumulators are located within the transmission case, and are retained by the valve body.



The low reverse (1) accumulator is also located within the transmission case, but the assembly is retained by a cover and a snap-ring.



The 2/4 accumulator (5) is located in the valve body. It is retained by a cover and retaining screws.



OPERATION

The function of an accumulator is to cushion the application of a frictional clutch element. When pressurized fluid is applied to a clutch circuit, the application force is dampened by fluid collecting in the respective accumulator chamber against the piston and springs. The intended result is a smooth, firm clutch application.

SEAL-ADAPTER HOUSING

REMOVAL

1. Remove the transfer case (Refer to 21 - TRANSMISSION/TRANSFER CASE - REMOVAL).
2. Using a screw mounted in a slide hammer, remove the adapter housing seal.

INSTALLATION

1. Install a new adapter housing seal with Tool Handle C-4171 and Installer C-3860-A.
2. Install the transfer case (Refer to 21 - TRANSMISSION/TRANSFER CASE - INSTALLATION).

BEARINGS

ADJUSTMENTS

BEARING ADJUSTMENT PROCEDURES

Take extreme care when removing and installing bearing cups and cones. **Use only an arbor press for installation,** as a hammer may not properly align the bearing cup or cone. Burrs or nicks on the bearing seat will give a false end play reading, while gauging for proper shims. Improperly seated bearing cup and cones are subject to low-mileage failure.

Bearing cups and cones should be replaced if they show signs of pitting or heat distress.

If distress is seen on either the cup or bearing rollers, both cup and cone must be replaced.

NOTE: Bearing drag torque specifications must be maintained to avoid premature bearing failures.

Used (original) bearing may lose up to 50 percent of the original drag torque after break-in.

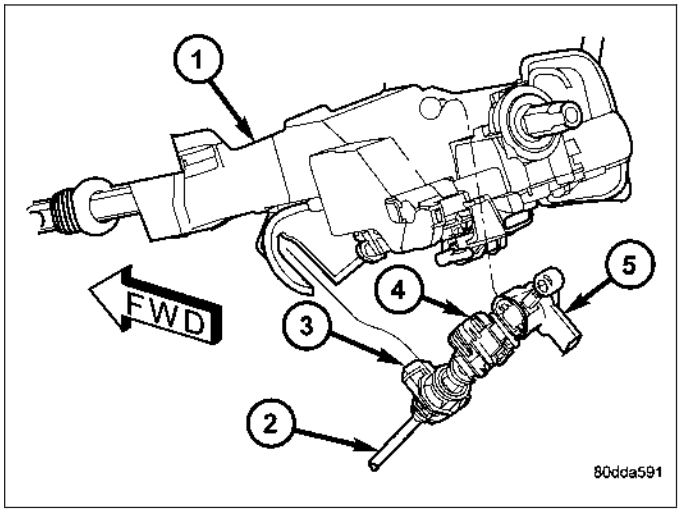
NOTE: All bearing adjustments must be made with no other component interference or gear inter-mesh.

Oil all bearings before checking turning torque.

MECHANISM-BRAKE TRANSMISSION SHIFT INTERLOCK

DESCRIPTION

The Brake Transmission Shifter Interlock (BTSI), is a solenoid operated system. It consists of a solenoid permanently mounted on the gearshift cable.



OPERATION

The system locks the shifter into the PARK position. The interlock system is engaged whenever the ignition switch is in the LOCK or ACCESSORY position. An additional electrically activated feature will prevent shifting out of the PARK position unless the brake pedal is depressed approximately one-half an inch. A magnetic holding device in line with the park lock cable is energized when the ignition is in the RUN position. When the key is in the RUN position and the brake pedal is depressed, the shifter is unlocked and will move into any position. The interlock system also prevents the ignition switch from being turned to the LOCK or ACCESSORY position, unless the shifter is fully locked into the PARK position.

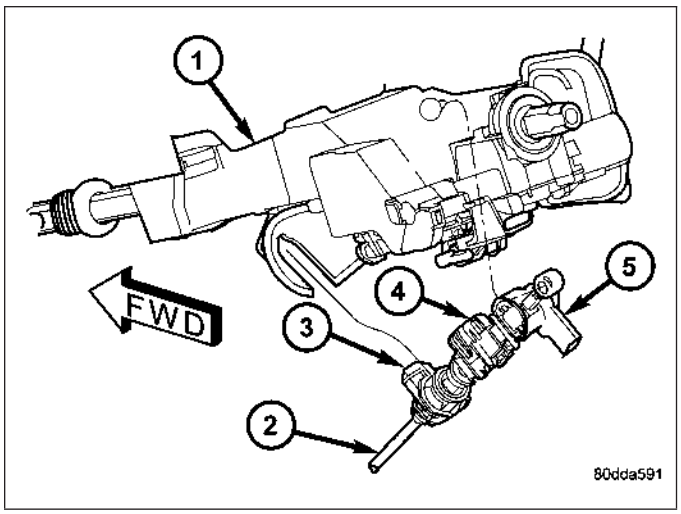
DIAGNOSIS AND TESTING - BRAKE TRANSMISSION SHIFT INTERLOCK

1. Verify that the key can only be removed in the PARK position.
2. When the shift lever is in PARK And the shift handle pushbutton is in the “OUT” position, the ignition key cylinder should rotate freely from OFF to LOCK. When the shifter is in any other gear or neutral position, the ignition key cylinder should not rotate to the LOCK position.
3. Shifting out of PARK should not be possible when the ignition key cylinder is in the OFF position.
4. Shifting out of PARK should not be possible while applying normal pushbutton force and ignition key cylinder is in the RUN or START positions unless the foot brake pedal is depressed approximately 1/2 inch (12mm).
5. Shifting out of PARK should not be possible when the ignition key cylinder is in the ACCESSORY or LOCK positions.
6. Shifting between any gears, NEUTRAL or into PARK may be done without depressing foot brake pedal with ignition switch in RUN or START positions.

ADJUSTMENTS - BRAKE TRANSMISSION SHIFT INTERLOCK

Correct cable adjustment is important to proper interlock operation. The gearshift cable must be correctly adjusted in order to shift out of PARK.

ADJUSTMENT PROCEDURE



1. Remove the steering column trim as necessary for access to the brake transmission shift interlock.
2. Shift the transmission into the PARK position.
3. Pull upward on both the BTSI lock tab (4) and the gearshift cable lock tab (3).
4. Verify that the shift lever is in the PARK position.
5. Verify positive engagement of the transmission park lock by attempting to rotate the propeller shaft. The shaft will not rotate when the park lock is engaged.
6. Turn ignition switch to LOCK position. **Be sure ignition key cylinder is in the LOCK position. Cable will not adjust correctly in any other position.**
7. Ensure that the cable is free to self-adjust by pushing cable rearward and releasing.
8. Push the gearshift cable lock tab (3) down until it snaps in place.
9. Locate the BTSI alignment hole in the bottom of the BTSI mechanism between the BTSI lock tab and the BTSI connector.
10. Move the BTSI assembly up or down on the gearshift cable until an appropriate size drill bit can be inserted into the alignment hole and through the assembly.
11. Push the BTSI lock tab (4) down until it snaps into place and remove the drill bit.
12. Install any steering column trim previously removed.

BTSI FUNCTION CHECK

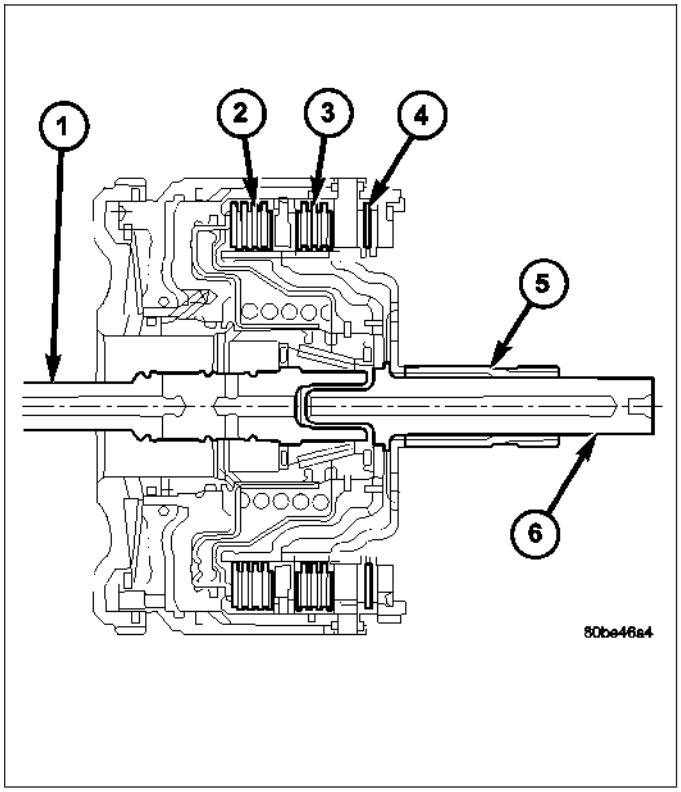
1. Verify removal of ignition key allowed in PARK position only.
2. When the shift lever is in PARK, the ignition key cylinder should rotate freely from off to lock. When the shifter is in any other position, the ignition key should not rotate from off to lock.
3. Shifting out of PARK should be possible when the ignition key cylinder is in the off position.
4. Shifting out of PARK should not be possible while applying normal force, and ignition key cylinder is in the run or start positions, unless the foot brake pedal is depressed approximately 1/2 inch (12mm).
5. Shifting out of PARK should not be possible when the ignition key cylinder is in the accessory or lock position.
6. Shifting between any gear and NEUTRAL, or PARK, may be done without depressing foot brake with ignition switch in run or start positions.
7. Engine starts must be possible with shifter lever in PARK or NEUTRAL positions only. Engine starts must not be possible in any position other than PARK or NEUTRAL.
8. With shifter lever in the:
   - PARK position - Apply upward force on the shift arm and remove pressure. Engine starts must be possible.
   - PARK position - Apply downward force on the shift arm and remove pressure. Engine starts must be possible.
   - NEUTRAL position - Normal position. Engine starts must be possible.
   - NEUTRAL position - Engine running and brakes applied, apply upward force on the shift arm. Transmission shall not be able to shift from neutral to reverse.

CLUTCHES-DRIVING

DESCRIPTION

Three hydraulically applied input clutches are used to drive planetary components. The underdrive (2), overdrive (3), and reverse (4) clutches are considered input/driving clutches and are contained within the input clutch assembly. The input clutch assembly also contains:

- Input shaft
- Input hub
- Clutch retainer
- Underdrive piston
- Overdrive/reverse piston
- Overdrive hub
- Underdrive hub



OPERATION

The three input clutches are responsible for driving different components of the planetary geartrain.

NOTE: (Refer to 21 - TRANSMISSION/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING) for a collective view of which clutch elements are applied at each position of the selector lever.

UNDERDRIVE CLUTCH

The underdrive clutch is hydraulically applied in first, second, and third (direct) gears by pressurized fluid against the underdrive piston. When the underdrive clutch is applied, the underdrive hub drives the rear sun gear.

OVERDRIVE CLUTCH

The overdrive clutch is hydraulically applied in third (direct) and overdrive gears by pressurized fluid against the overdrive/reverse piston. When the overdrive clutch is applied, the overdrive hub drives the front planet carrier.

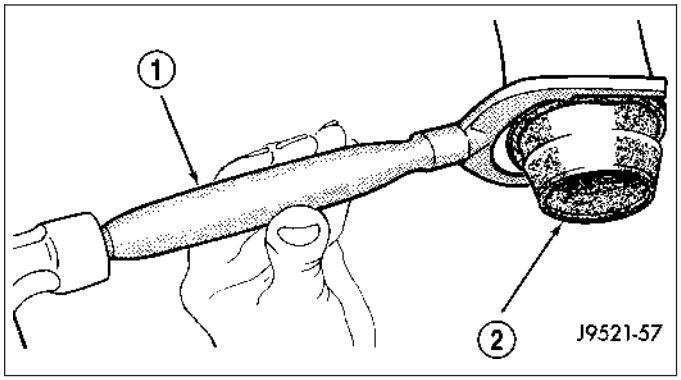
REVERSE CLUTCH

The reverse clutch is hydraulically applied in reverse gear only by pressurized fluid against the overdrive/reverse piston. When the reverse clutch is applied, the front sun gear assembly is driven.

SEAL-EXTENSION HOUSING

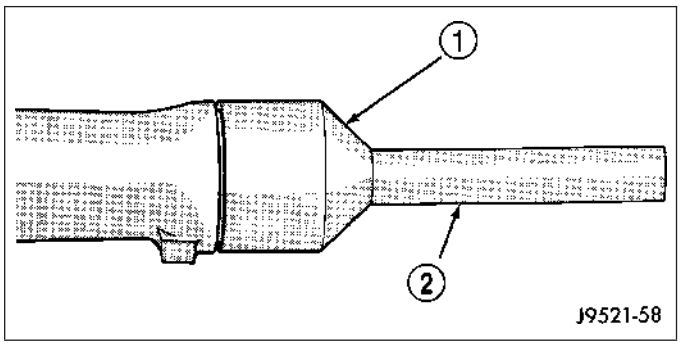
REMOVAL

1. Raise vehicle.
2. Mark propeller shaft and axle yoke, or companion flange, for alignment reference.
3. Disconnect and remove propeller shaft.
4. Remove old seal with Seal Remover C-3985-B (1) from overdrive extension housing.



INSTALLATION

1. Place seal in position on overdrive housing.
2. Drive seal into overdrive housing with Seal Installer C-3995-A (1).
3. Carefully guide propeller shaft slip yoke into housing and onto output shaft splines. Align marks made at removal and connect propeller shaft to rear axle pinion yoke.



FLUID AND FILTER

DIAGNOSIS AND TESTING

CAUSES OF BURNT FLUID

Burnt, discolored fluid is a result of overheating which has two primary causes.

1. A result of restricted fluid flow through the main and/or auxiliary cooler. This condition is usually the result of a faulty or improperly installed drainback valve, a damaged oil cooler, or severe restrictions in the coolers and lines caused by debris or kinked lines.
2. Heavy duty operation with a vehicle not properly equipped for this type of operation. Trailer towing or similar high load operation will overheat the transmission fluid if the vehicle is improperly equipped. Such vehicles should have an auxiliary transmission fluid cooler, a heavy duty cooling system, and the engine/axle ratio combination needed to handle heavy loads.

EFFECTS OF INCORRECT FLUID LEVEL

A low fluid level allows the pump to take in air along with the fluid. Air in the fluid will cause fluid pressures to be low and develop slower than normal. If the transmission is overfilled, the gears churn the fluid into foam. This aerates the fluid and causing the same conditions occurring with a low level. In either case, air bubbles cause fluid overheating, oxidation, and varnish buildup which interferes with valve and clutch operation. Foaming also causes fluid expansion which can result in fluid overflow from the transmission vent or fill tube. Fluid overflow can easily be mistaken for a leak if inspection is not careful.

FLUID CONTAMINATION

Transmission fluid contamination is generally a result of:

- adding incorrect fluid
- failure to clean dipstick and fill tube when checking level
- engine coolant entering the fluid
- internal failure that generates debris
- overheat that generates sludge (fluid breakdown)
- failure to replace contaminated converter after repair

The use of non-recommended fluids can result in transmission failure. The usual results are erratic shifts, slippage, abnormal wear and eventual failure due to fluid breakdown and sludge formation. Avoid this condition by using recommended fluids only.

The dipstick cap and fill tube should be wiped clean before checking fluid level. Dirt, grease and other foreign material on the cap and tube could fall into the tube if not removed beforehand. Take the time to wipe the cap and tube clean before withdrawing the dipstick.

Engine coolant in the transmission fluid is generally caused by a cooler malfunction. The only remedy is to replace the radiator as the cooler in the radiator is not a serviceable part. If coolant has circulated through the transmission, an overhaul is necessary.

The torque converter should be replaced whenever a failure generates sludge and debris. This is necessary because normal converter flushing procedures will not remove all contaminants.

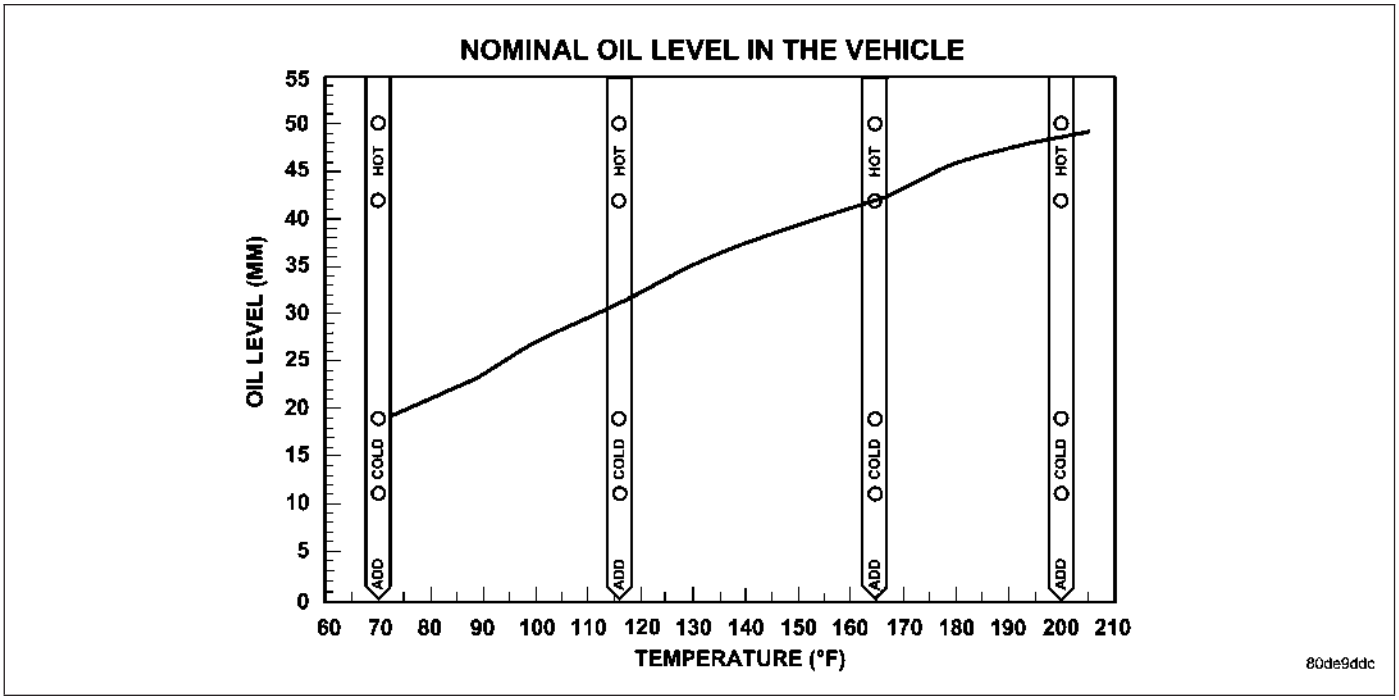
STANDARD PROCEDURE

FLUID LEVEL CHECK

The transmission sump has a dipstick to check oil similar to most automatic transmissions. It is located on the left side of the engine. Be sure to wipe all dirt from dipstick handle before removing.

The torque converter fills in both the PARK and NEUTRAL positions. Place the selector lever in PARK to be sure that the fluid level check is accurate. **The engine should be running at idle speed for at least one minute, with the vehicle on level ground.** At normal operating temperature (approximately 82 C. or 180 F.), the fluid level is correct if it is in the HOT region (cross-hatched area) on the oil level indicator. The fluid level should be in COLD region at 70° F fluid temperature. Adjust fluid level as necessary. Use only Mopar® ATF+4, Automatic Transmission Fluid.

FLUID LEVEL CHECK USING SCAN TOOL



42RLE Fluid Temperature Chart

NOTE: Engine and Transmission should be at normal operating temperature before performing this procedure.

1. Start engine and apply parking brake.
2. Connect scan tool and select transmission.
3. Select sensors.
4. Read the transmission temperature value.
5. Compare the fluid temperature value with the chart.
6. Adjust transmission fluid level shown on the dipstick according to the 42RLE Fluid Temperature Chart. Use only Mopar® ATF+4, Automatic Transmission Fluid.
7. Check transmission for leaks.

FLUID/FILTER SERVICE

NOTE: Only fluids of the type labeled Mopar® ATF+4, Automatic Transmission Fluid, should be used in the transmission sump. A filter change should be made at the time of the transmission oil change. The magnet (on the inside of the oil pan) should also be cleaned with a clean, dry cloth.

NOTE: If the transmission is disassembled for any reason, the fluid and filter should be changed.

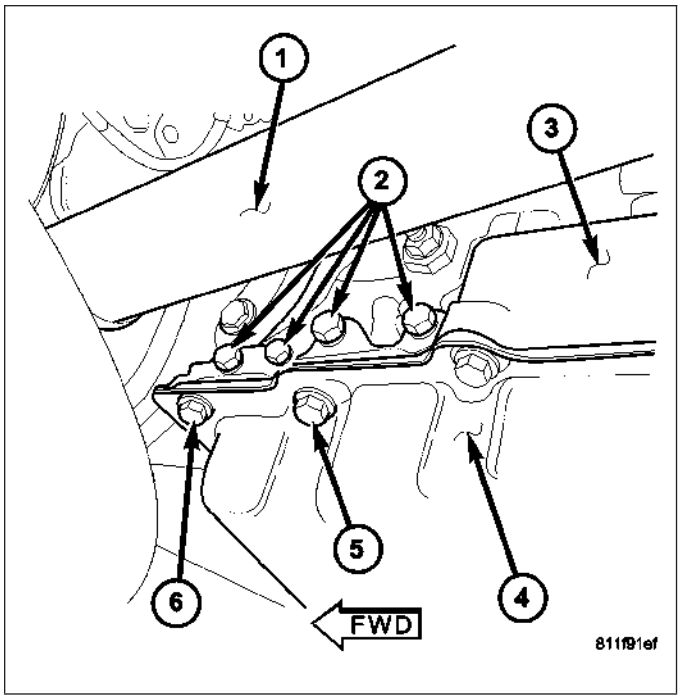
1. Raise vehicle on a hoist. Place a drain container with a large opening, under transmission oil pan.

NOTE: One of the oil pan bolts (5) has a sealing patch applied from the factory. Separate this bolt for reuse.

2. Loosen pan bolts and tap the pan at one corner to break it loose allowing fluid to drain, then remove the oil pan.
3. Install a new filter and o-ring on bottom of the valve body and tighten retaining screws to 5 N·m (40 in. lbs.).

NOTE: Before installing the oil pan bolt (5) in the bolt hole located between the torque converter clutch on and U/D clutch pressure tap circuits, it will be necessary to replentish the sealing patch on the bolt using Mopar® Lock & Seal Adhesive.

4. Clean the oil pan and magnet. Reinstall pan using new Mopar® Silicone Adhesive sealant. Tighten oil pan bolts to 19 N·m (165 in. lbs.).
5. Pour four quarts of Mopar® ATF+4, Automatic Transmission Fluid, through the dipstick opening.



6. Start engine and allow to idle for at least one minute. Then, with parking and service brakes applied, move selector lever momentarily to each position, ending in the park or neutral position.
7. Check the transmission fluid level and add an appropriate amount to bring the transmission fluid level to 3mm (1/8 in.) below the lowest mark on the dipstick.
8. Recheck the fluid level after the transmission has reached normal operating temperature (180°F.).
9. To prevent dirt from entering transmission, make certain that dipstick is fully seated into the dipstick opening.

TRANSMISSION FILL

To avoid overfilling transmission after a fluid change or overhaul, perform the following procedure:

1. Remove dipstick and insert clean funnel in transmission fill tube.
2. Add following initial quantity of Mopar® ATF +4, Automatic Transmission Fluid, to transmission:
   a. If only fluid and filter were changed, add **3 pints (1-1/2 quarts)** of ATF +4 to transmission.
   b. If transmission was completely overhauled, or torque converter was replaced or drained, add **12 pints (6 quarts)** of ATF +4 to transmission.
3. Apply parking brakes.
4. Start and run engine at normal curb idle speed.
5. Apply service brakes, shift transmission through all gear ranges then back to NEUTRAL, set parking brake, and leave engine running at curb idle speed.
6. Remove funnel, insert dipstick and check fluid level. If level is low, **add fluid to bring level to MIN mark on dipstick.** Check to see if the oil level is equal on both sides of the dipstick. If one side is noticably higher than the other, the dipstick has picked up some oil from the dipstick tube. Allow the oil to drain down the dipstick tube and re-check.
7. Drive vehicle until transmission fluid is at normal operating temperature.
8. With the engine running at curb idle speed, the gear selector in NEUTRAL, and the parking brake applied, check the transmission fluid level.

CAUTION: Do not overfill transmission, fluid foaming and shifting problems can result.

9. Add fluid to bring level up to MAX arrow mark.

When fluid level is correct, shut engine off, release park brake, remove funnel, and install dipstick in fill tube.

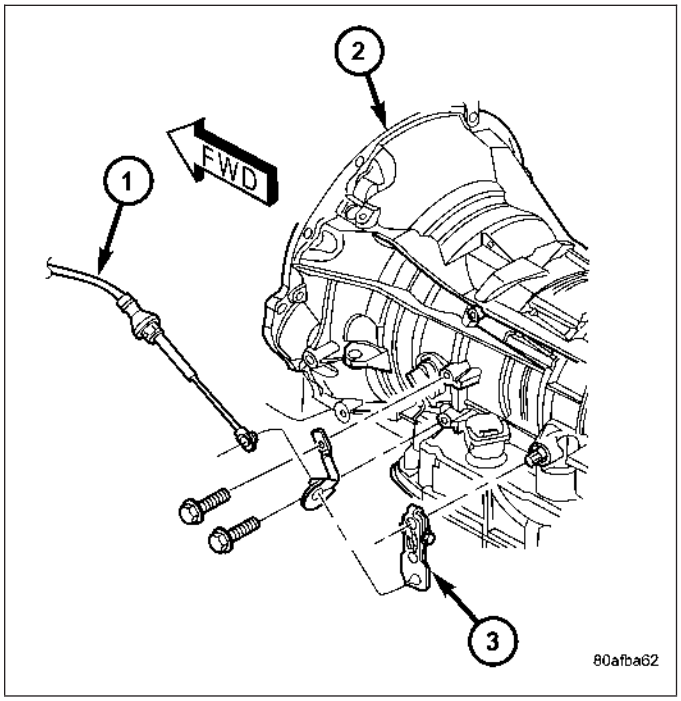
CABLE-GEARSHIFT

DIAGNOSIS AND TESTING - GEARSHIFT CABLE

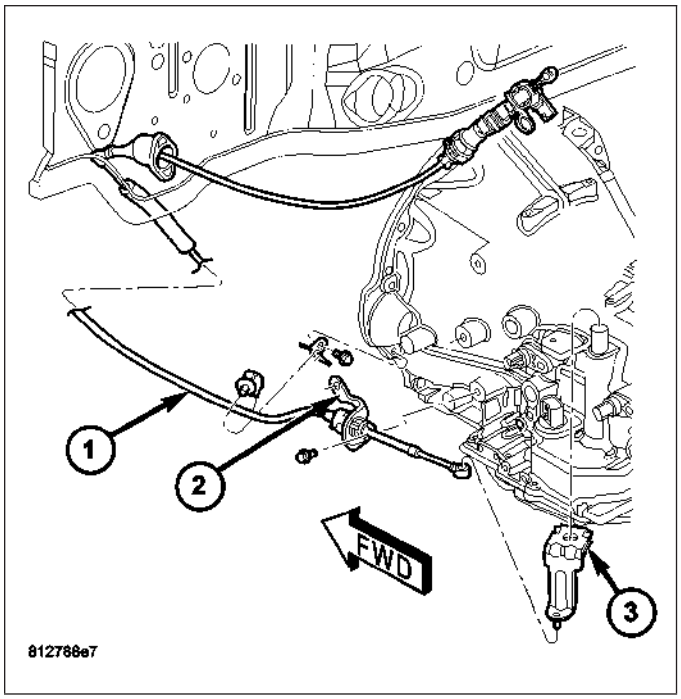
1. Engine starts must be possible with shift lever in PARK or NEUTRAL positions only. Engine starts must not be possible in any other gear position.
2. With the shift lever in the:
   a. PARK position - Apply upward force on the shift arm and remove pressure. Engine starts must be possible.
   b. PARK position - Apply downward force on the shift arm and remove pressure. Engine starts must be possible.
   c. NEUTRAL position - Normal position. Engine starts must be possible.
   d. NEUTRAL position - Engine running and brakes applied, apply upward force on the shift arm. Transmission shall not be able to shift from neutral to reverse.

REMOVAL

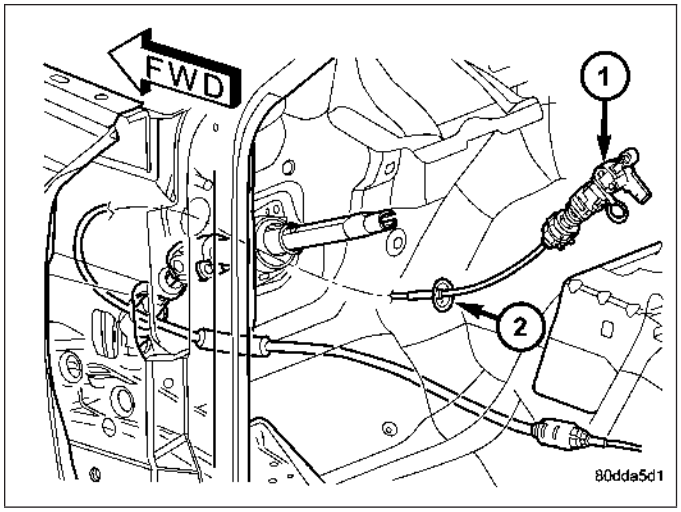
1. Shift transmission into PARK.
2. Raise vehicle.
3. Disengage cable (1) eyelet at transmission manual shift lever (3) and pull cable adjuster out of mounting bracket, RFE transmission equipped vehicles.



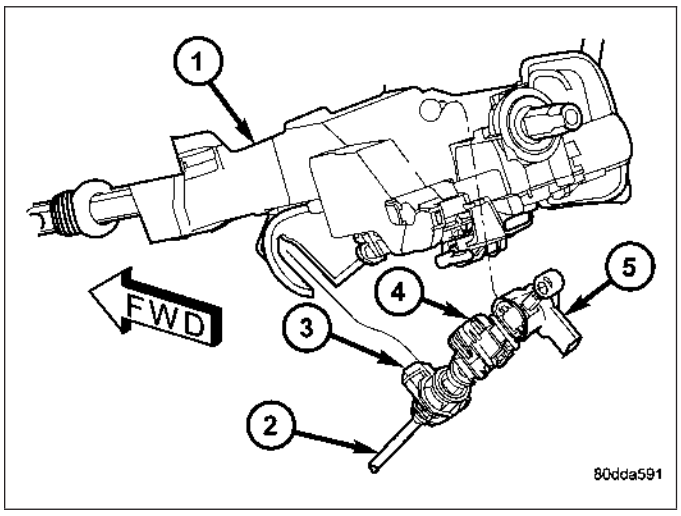
4. Disengage cable (1) eyelet at transmission manual shift lever (3) and pull cable adjuster out of mounting bracket (2), RLE transmission equipped vehicles.



5. Lower the vehicle.
6. Remove the dash panel insulation pad as necessary to access the gearshift cable grommet (2).
7. Remove grommet (2) from the dash panel.

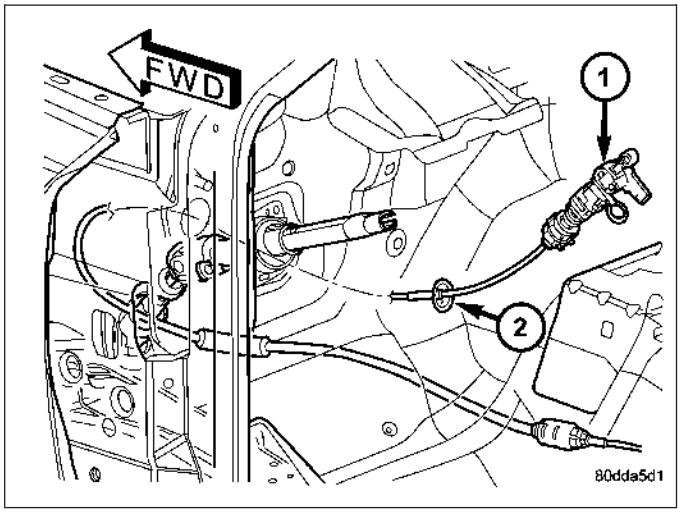


8. Remove any steering column (1) trim necessary to access the gearshift cable (2) and BTSI mechanism.
9. Disconnect the BTSI wiring connector (5).
10. Disconnect cable at lower column bracket and shift lever pin and pull the cable through the dash panel opening into the vehicle.
11. Remove gearshift cable (2) from vehicle.

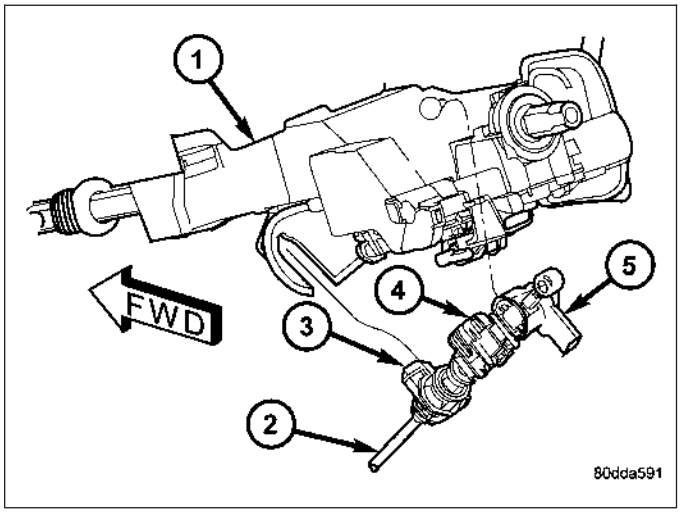


INSTALLATION

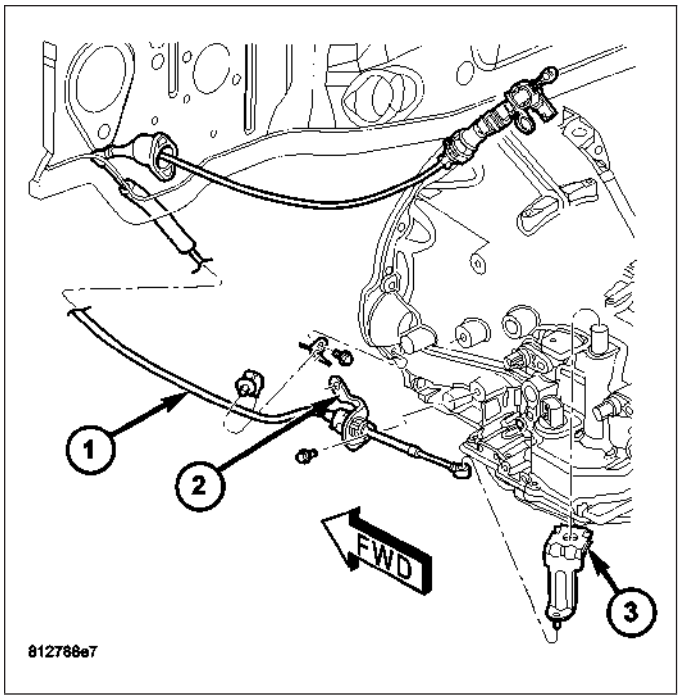
1. Route the transmission end of the gearshift cable (1) through the opening in the dash panel.
2. Seat the cable grommet (2) into the dash panel opening.



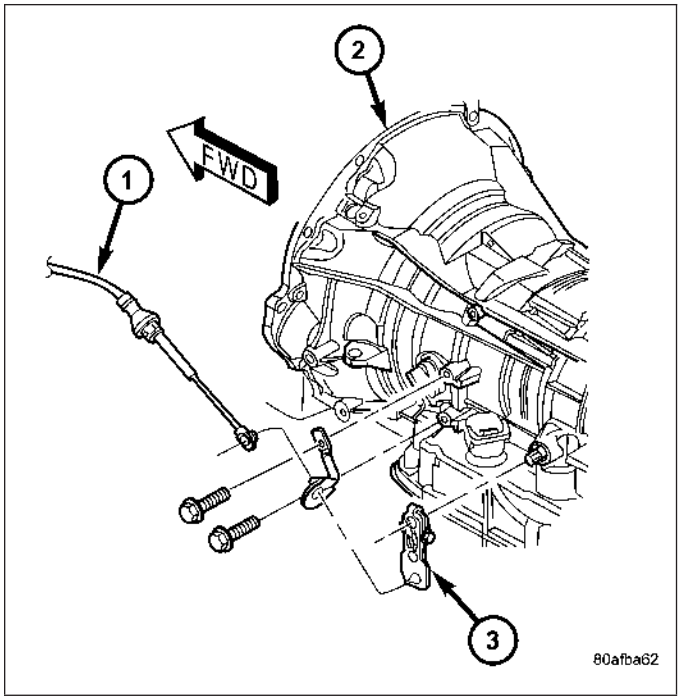
3. Snap the cable into the steering column (1) bracket so the retaining ears are engaged and snap the cable eyelet onto the shift lever ball stud.
4. Raise the vehicle.
5. Place the transmission manual shift lever in the “PARK” detent (rearmost) position and rotate prop shaft to ensure transmission is in PARK.



6. Route the gearshift cable (1) through the transmission mounting bracket (2) and secure the cable by snapping the cable retaining ears into the transmission bracket and snapping the cable eyelet on the manual shift lever (3) ball stud, RLE transmission equipped vehicles.



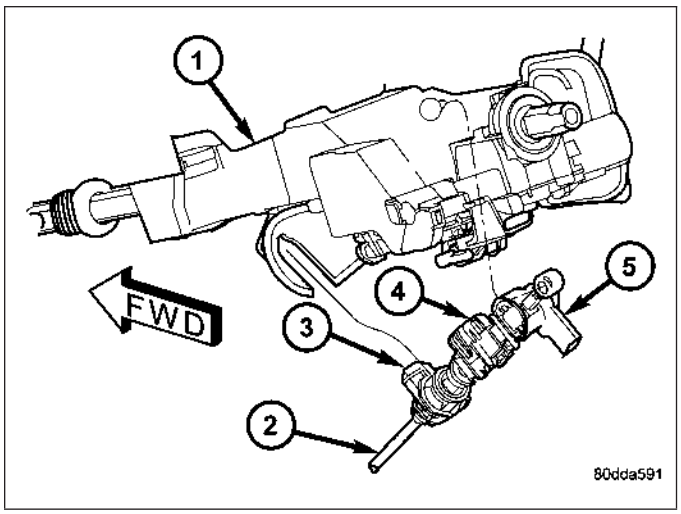
7. Route the gearshift cable (1) through the transmission mounting bracket and secure the cable by snapping the cable retaining ears into the transmission bracket and snapping the cable eyelet on the manual shift lever (3) ball stud, RFE transmission equipped vehicles.
8. Lower vehicle.
9. Lock the shift cable adjustment by pressing the cable adjuster lock tab (3) downward until it snaps into place.
10. Check for proper operation of the transmission range sensor.
11. Adjust the gearshift cable (Refer to 21 - TRANSMISSION/AUTOMATIC/GEAR SHIFT CABLE - ADJUSTMENTS) and BTSI mechanism (Refer to 21 - TRANSMISSION/AUTOMATIC/BRAKE TRANSMISSION SHIFT INTERLOCK SYSTEM - ADJUSTMENTS) as necessary.



ADJUSTMENTS - GEARSHIFT CABLE

Check adjustment by starting the engine in PARK and NEUTRAL. Adjustment is CORRECT if the engine starts only in these positions. Adjustment is INCORRECT if the engine starts in one but not both positions. If the engine starts in any position other than PARK or NEUTRAL, or if the engine will not start at all, the transmission range sensor may be faulty.

Gearshift Adjustment Procedure

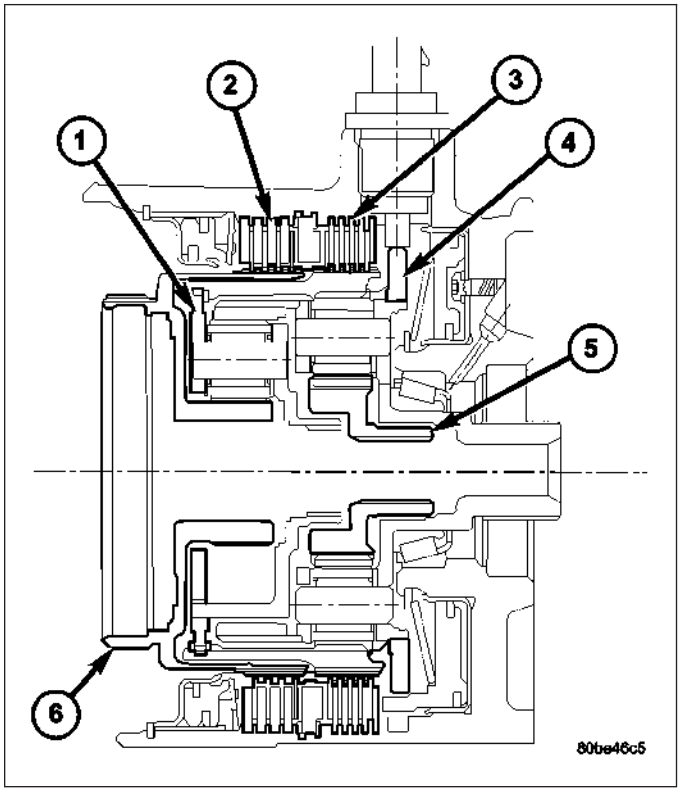


1. Shift transmission into PARK.
2. Release cable adjuster lock tab (3) (underneath the steering column) to unlock cable.
3. Raise vehicle.
4. Disengage the cable eyelet from the transmission manual shift lever.
5. Verify transmission shift lever is in PARK detent by moving lever fully rearward. Last rearward detent is PARK position.
6. Verify positive engagement of transmission park lock by attempting to rotate propeller shaft. Shaft will not rotate when park lock is engaged.
7. Snap the cable eyelet onto the transmission manual shift lever.
8. Lower vehicle.
9. Lock shift cable by pressing cable adjuster lock tab (3) downward until it snaps into place.
10. Check engine starting. Engine should start only in PARK and NEUTRAL.

CLUTCHES-HOLDING

DESCRIPTION

Two hydraulically applied multi-disc clutches are used to hold planetary geartrain components stationary while the input clutches drive others. The 2/4 (2) and Low/Reverse (3) clutches are considered holding clutches and are contained at the rear of the transmission case.



OPERATION

NOTE: (Refer to 21 - TRANSMISSION/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING) for a collective view of which clutch elements are applied at each position of the selector lever.

2/4 CLUTCH

The 2/4 clutch is hydraulically applied in second and fourth gears by pressurized fluid against the 2/4 clutch piston. When the 2/4 clutch is applied, the front sun gear assembly is held or grounded to the transmission case.

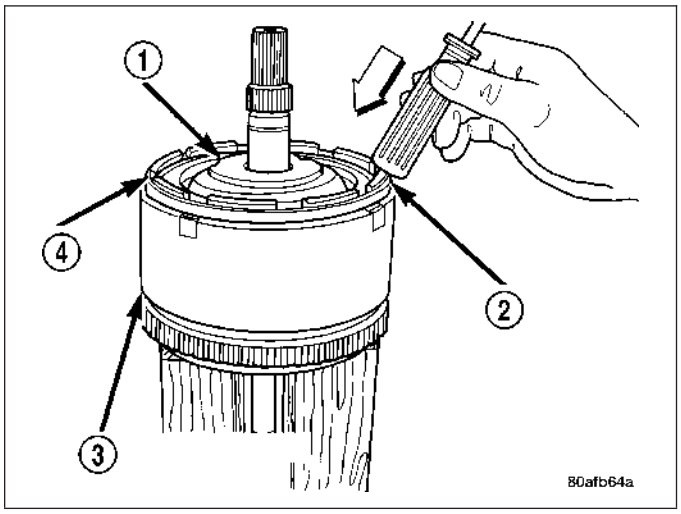
LOW/REVERSE CLUTCH

The Low/Reverse clutch is hydraulically applied in park, reverse, neutral, and first gears by pressurized fluid against the Low/Reverse clutch piston. When the Low/Reverse clutch is applied, the front planet carrier/rear annulus assembly is held or grounded to the transmission case.

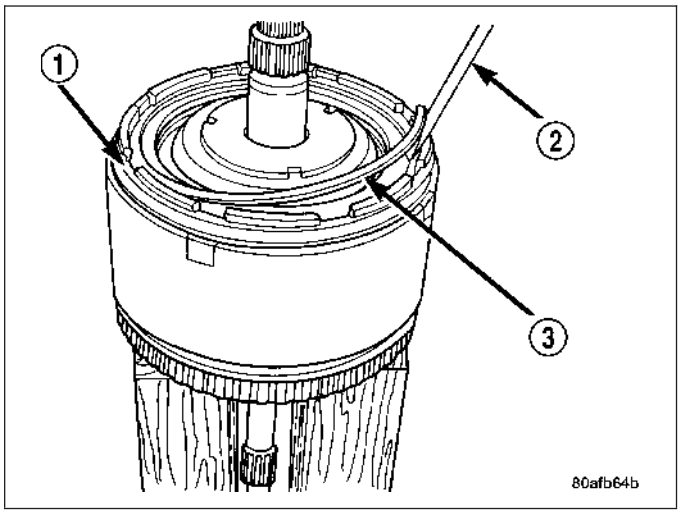
ASSEMBLY-INPUT CLUTCH

DISASSEMBLY

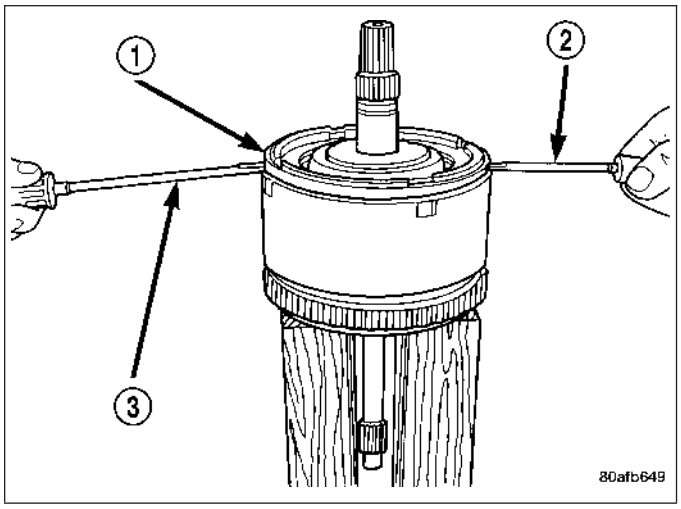
1. Mount input clutch assembly to Input Clutch Pressure Fixture (Tool 8391).
2. Tap down (2) reverse clutch reaction plate (4) to release pressure from snap ring.



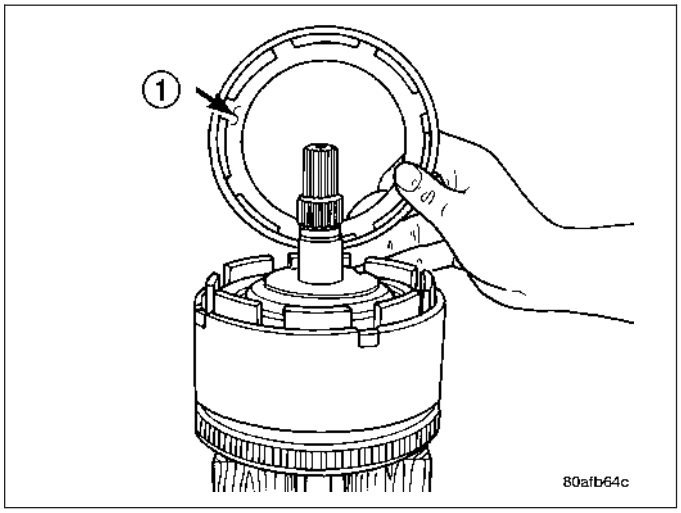
3. Remove reverse clutch snap ring (3).



4. Pry up reverse clutch reaction plate (1).

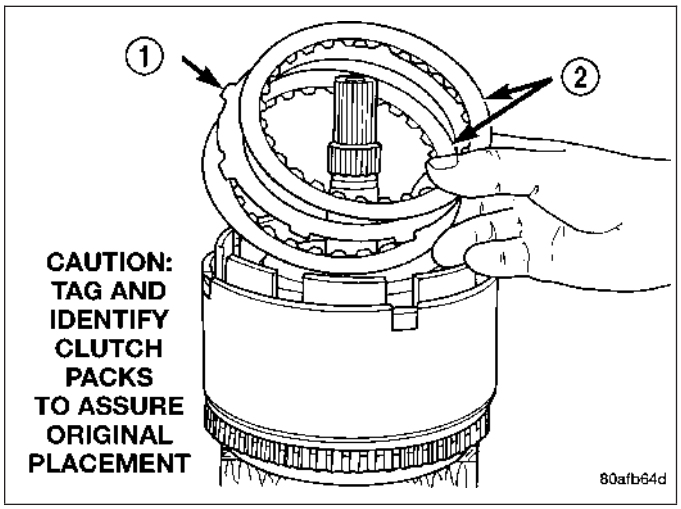


5. Remove reverse clutch reaction plate (1).

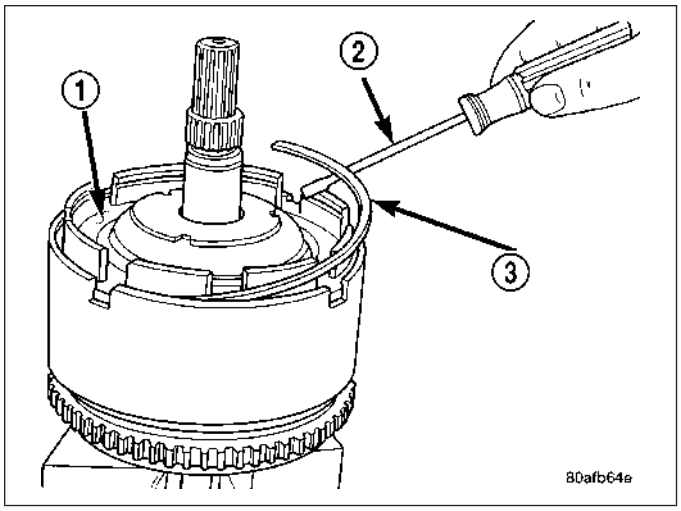


NOTE: Tag reverse clutch pack for reassembly identification.

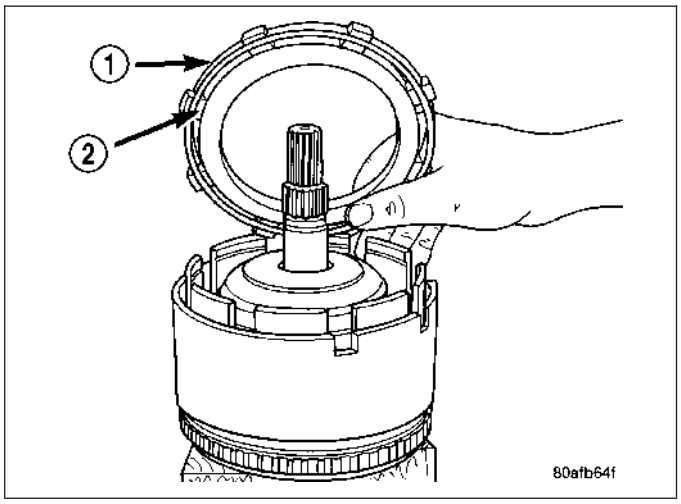
6. Remove the reverse clutch pack (two fibers/one steel) (1, 2).



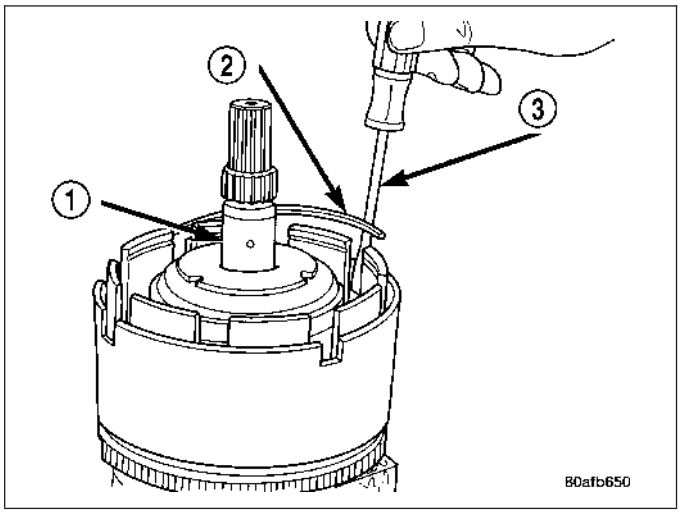
7. Remove the OD/Reverse reaction plate (1) snap ring (3).



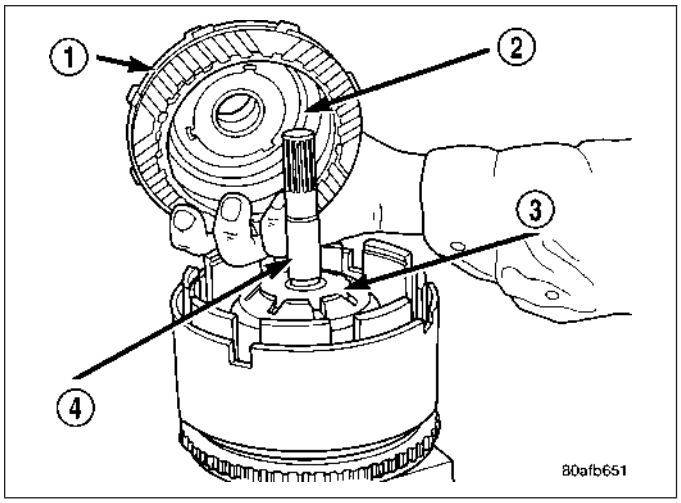
8. Remove OD/Reverse pressure plate (1).



9. Remove OD/Reverse reaction plate wave snap ring (2).

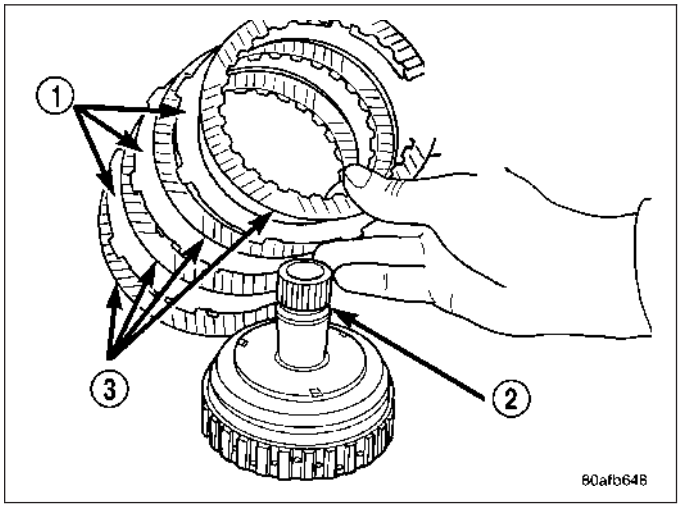


10. Remove OD shaft/hub and OD clutch pack (1).

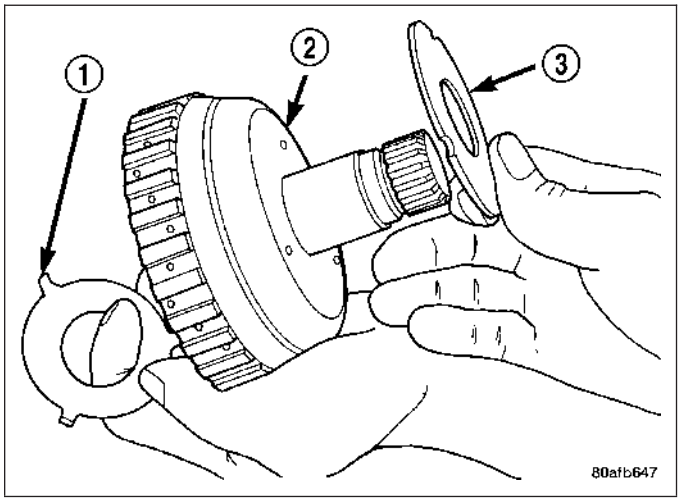


NOTE: Tag overdrive clutch pack for reassembly identification.

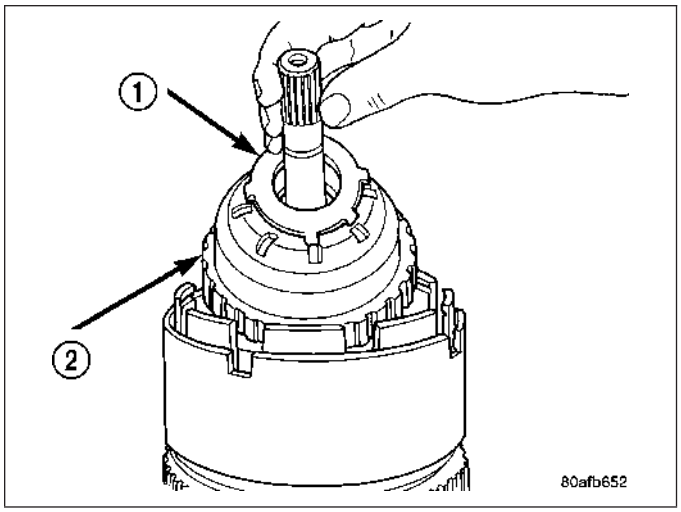
11. Remove the overdrive clutch (1, 3) from the overdrive hub/shaft (2).



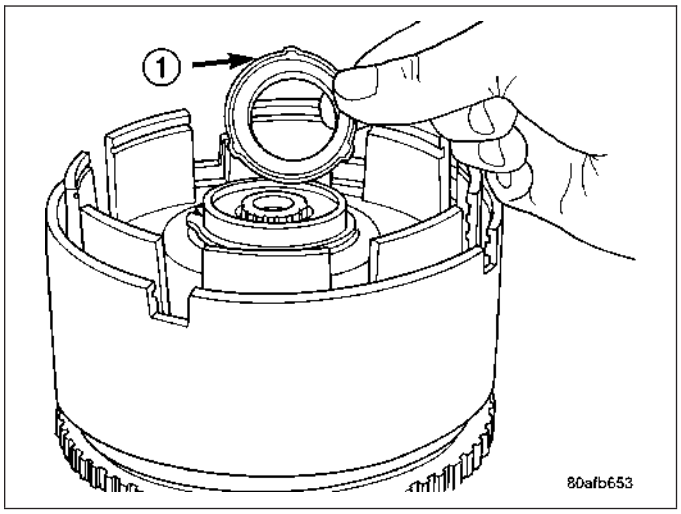
12. Remove and inspect number 3 and 4 thrust plates (1, 3).



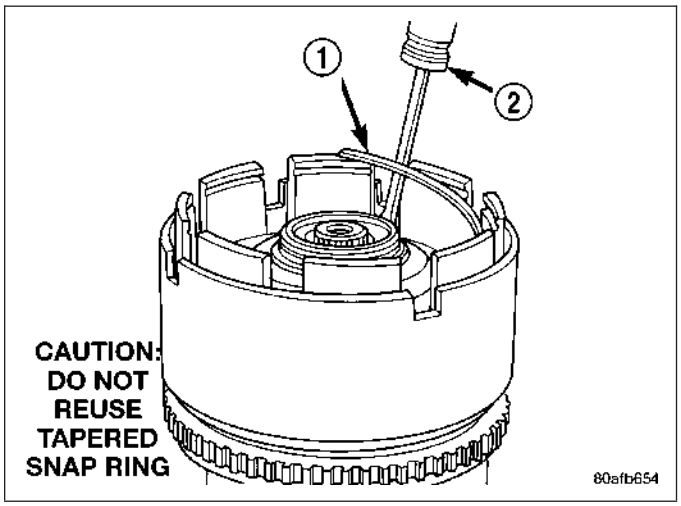
13. Remove the underdrive shaft assembly (2).



14. Remove the number 2 needle bearing (1).

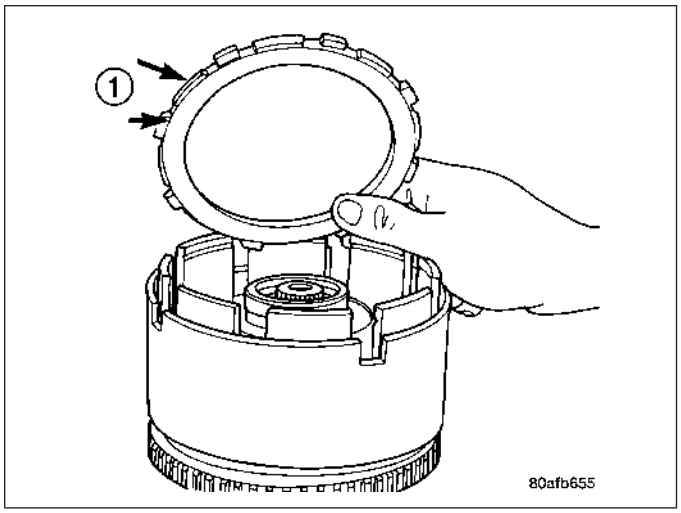


15. Remove the OD/UD reaction plate tapered snap ring (1).

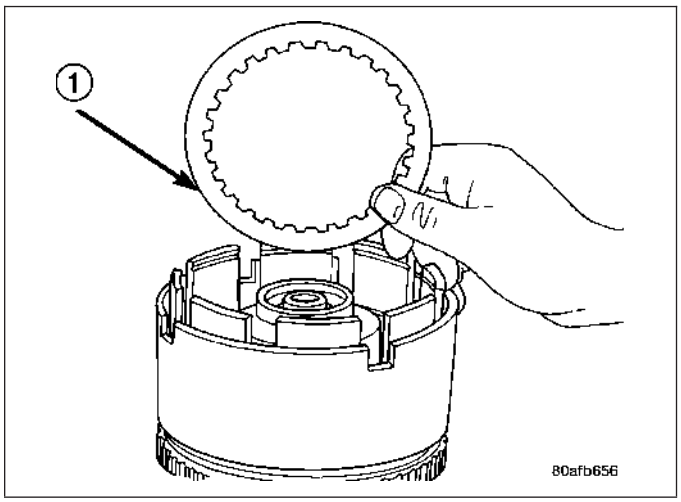


NOTE: The OD/UD clutch reaction plate has a step on both sides. The OD/UD clutches reaction plate goes tapered step side up.

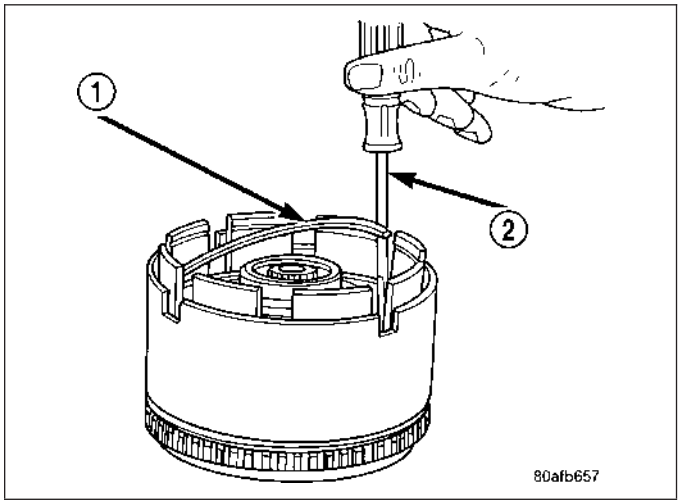
16. Remove the OD/UD reaction plate (1).



17. Remove the first UD clutch disc (1).

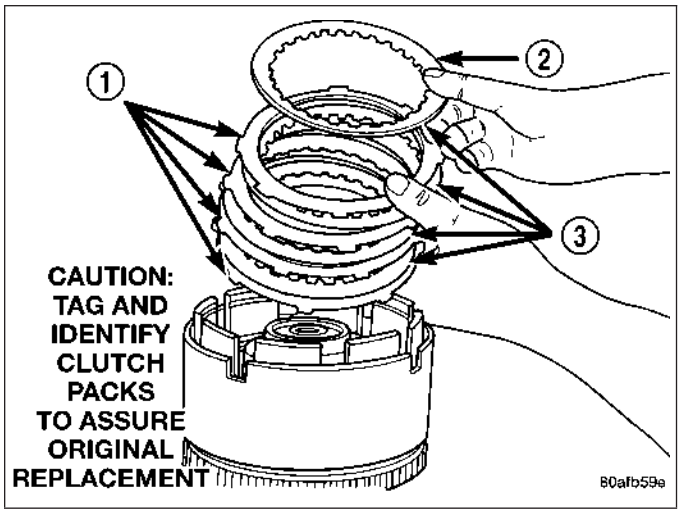


18. Remove the UD clutch flat snap ring (1).



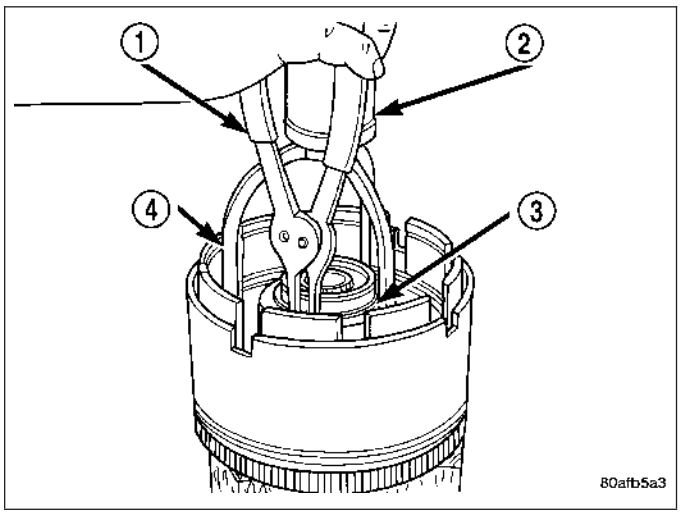
NOTE: Tag underdrive clutch pack for reassembly identification.

19. Remove the UD clutch pack (1, 3).

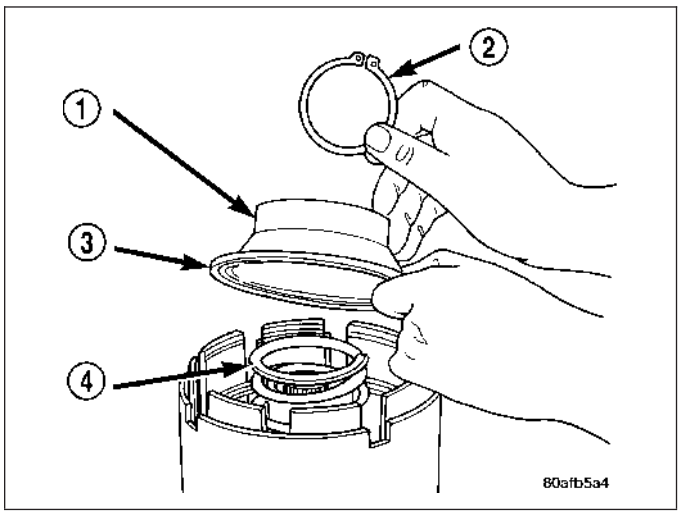


CAUTION: Compress return spring just enough to remove or install snap ring.

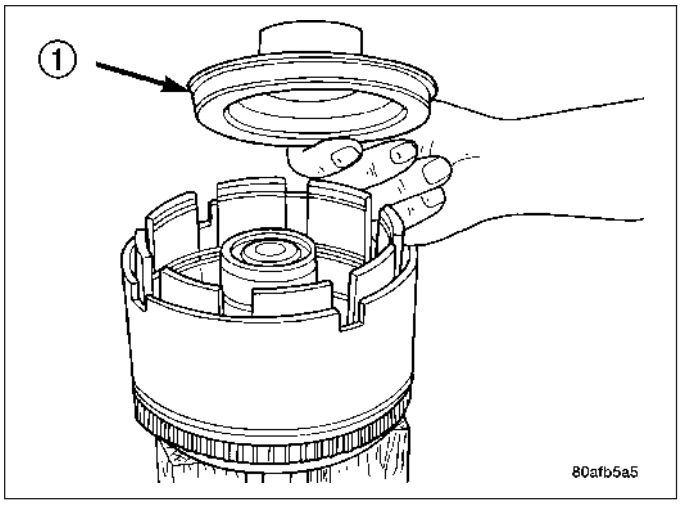
20. Using Tool 5059A (4) and an arbor press (2), compress UD clutch piston enough to remove snap ring (3).



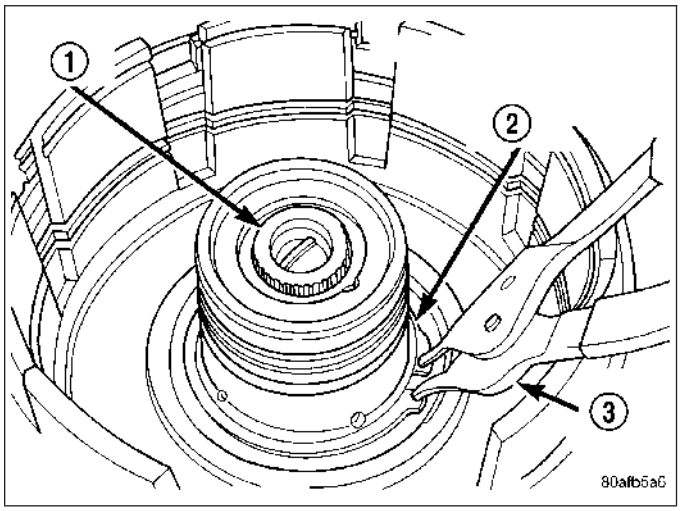
21. Remove the underdrive spring retainer snap ring (2), spring retainer (1), and spring (4).



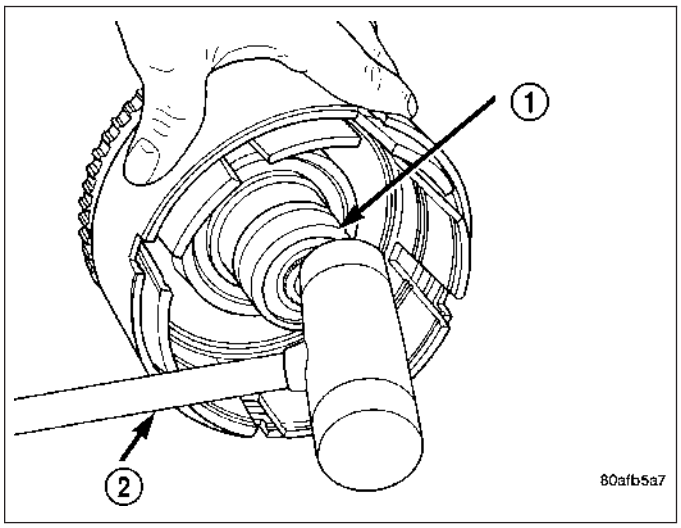
22. Remove the UD clutch piston (1).



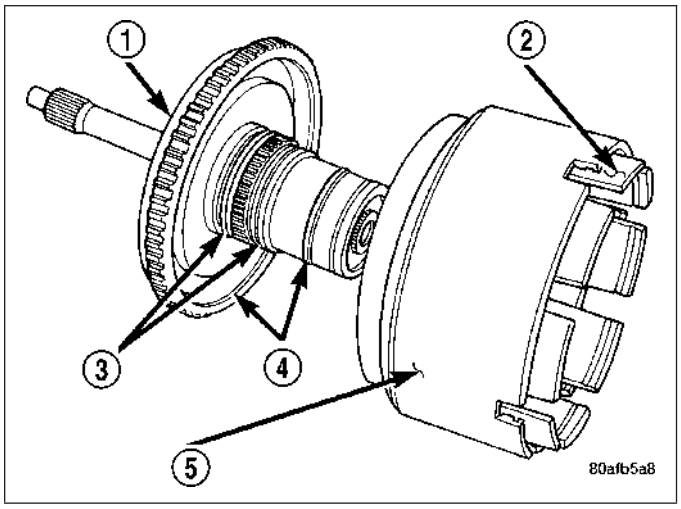
23. Remove the input hub tapered snap ring (2).



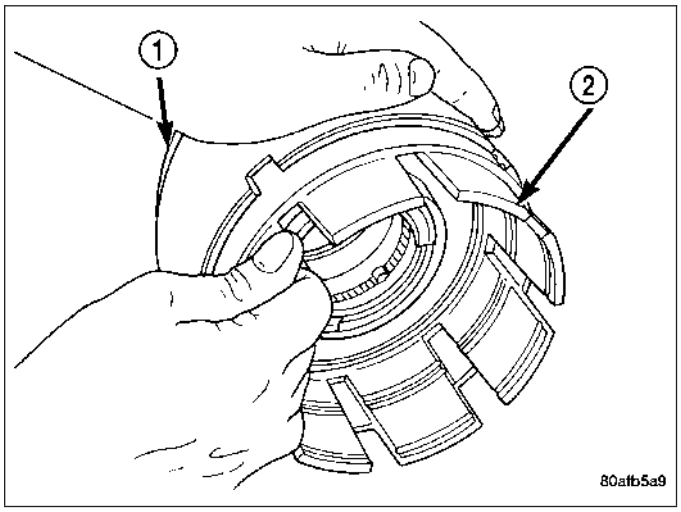
24. Tap on input hub (1) with soft faced hammer (2) and separate input hub from OD/Reverse piston and clutch retainer.



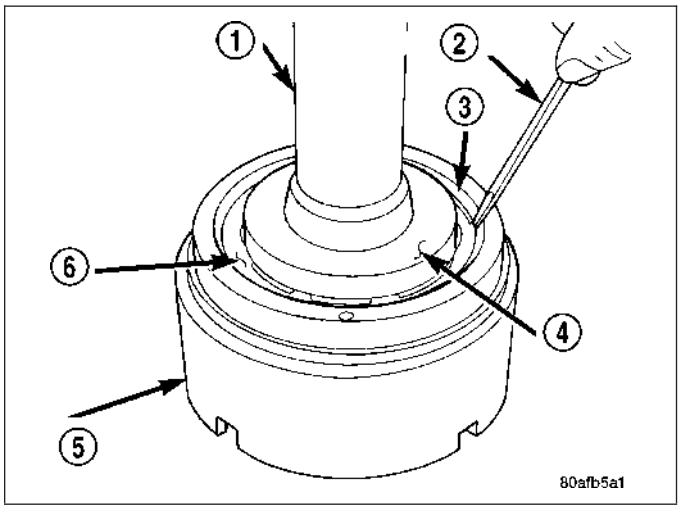
25. Separate the input hub from OD/Reverse piston (5) and clutch retainer (2).



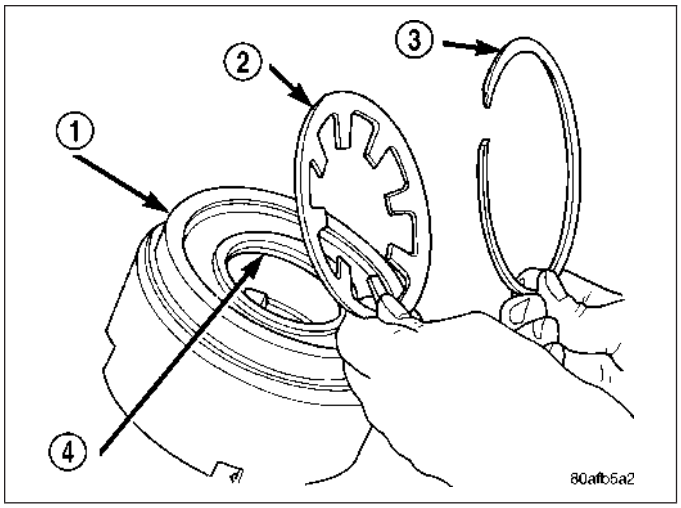
26. Separate clutch retainer (2) from OD/Reverse piston (1).



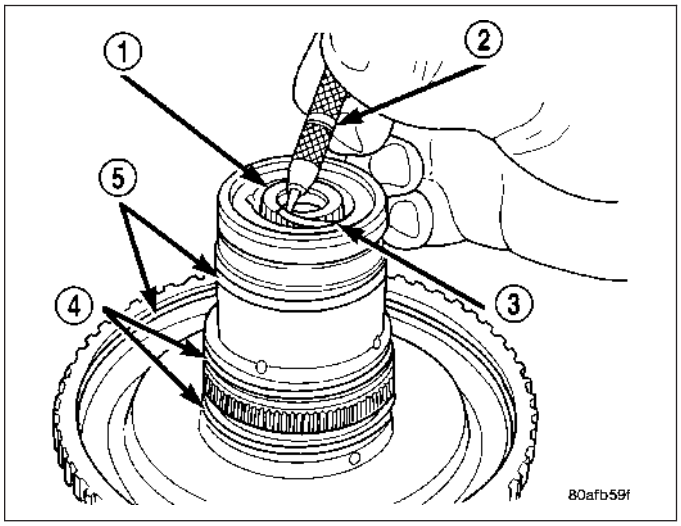
27. Using Tool 6057 (4) and an arbor press(1), compress OD/Reverse piston (5) return spring just enough to remove snap ring (3).



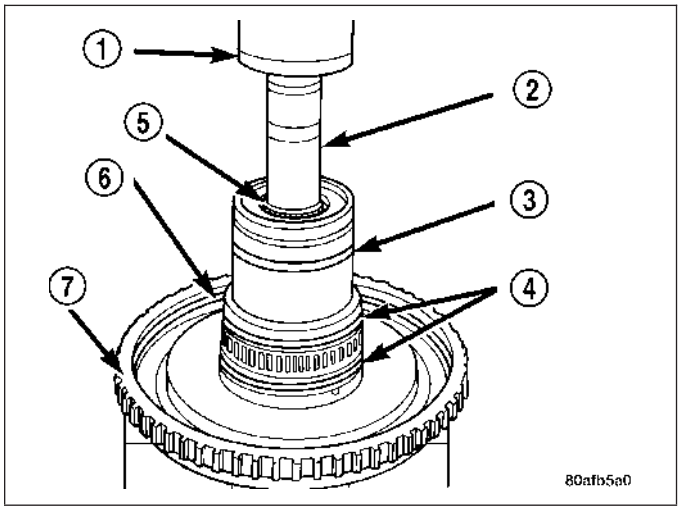
28. Remove the OD/Reverse piston (5) return spring and snap ring (3).



29. Remove input shaft (1) to input clutch hub snap ring (3).



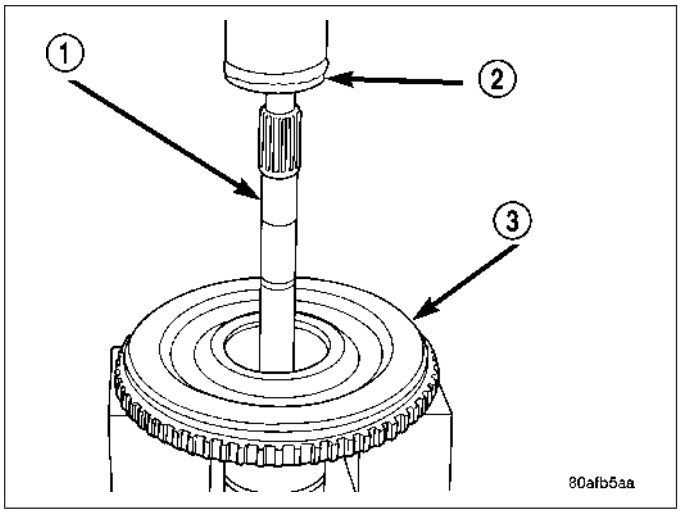
30. Using a suitably sized socket (2) and an arbor press (1), remove input shaft (5) from input shaft hub.



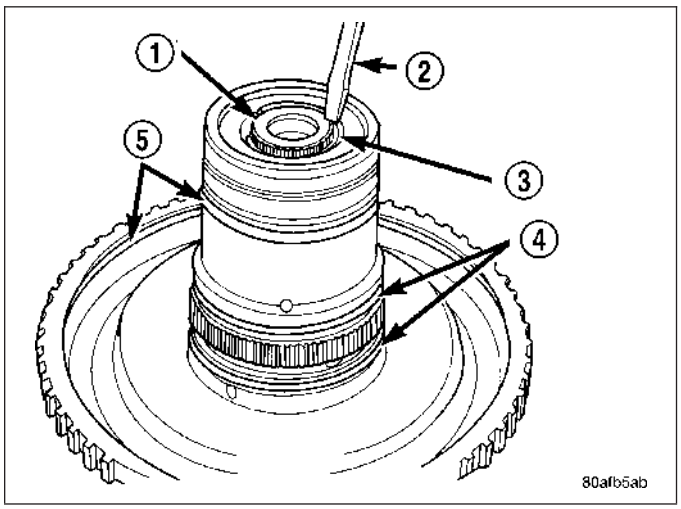
ASSEMBLY

Use petrolatum on all seals to ease assembly of components.

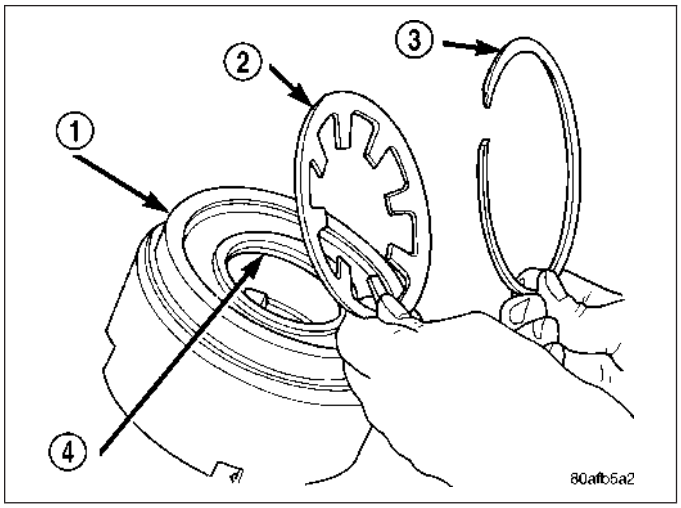
1. Using an arbor press(2), install input shaft (1) to input shaft hub (2).



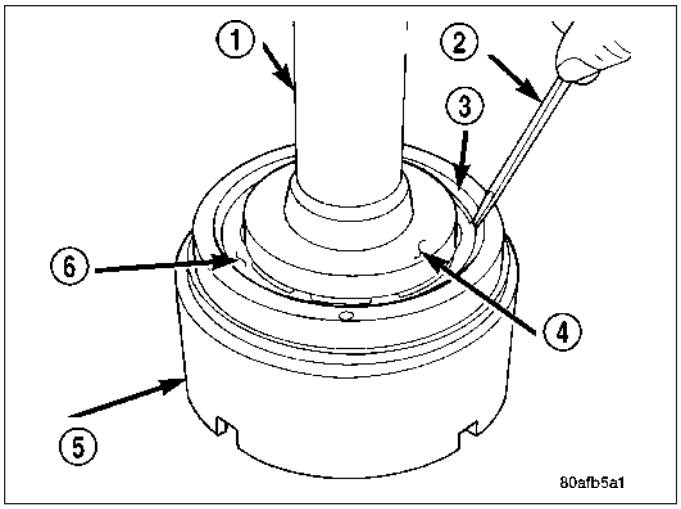
2. Install input shaft snap ring (3).



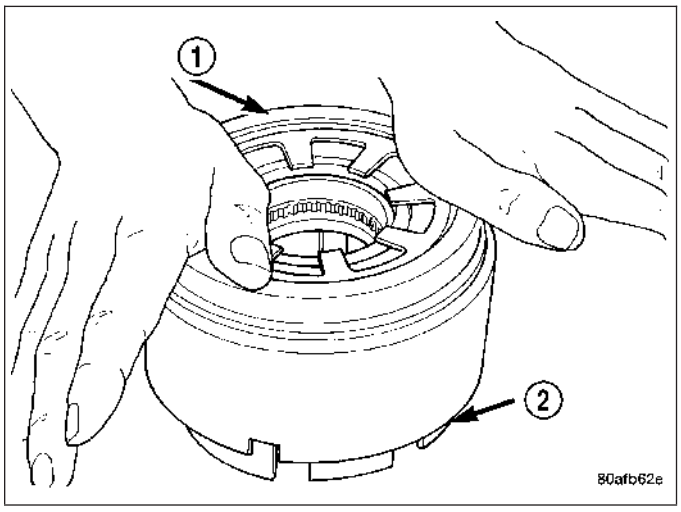
3. Position the OD/Reverse piston return spring (2) and snap ring (3) onto the OD/Reverse piston (1).



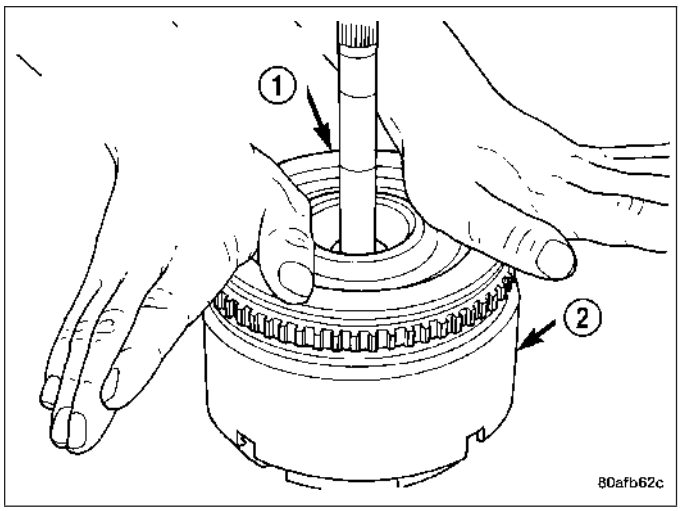
4. Using an arbor press (1) and Tool 6057 (4), install the OD/Reverse piston return spring (6) and snap ring (3).



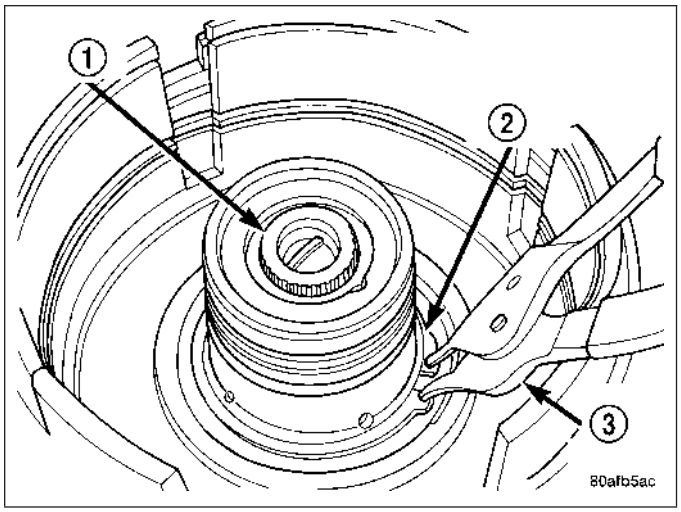
5. Install the OD/Reverse piston (1) assembly to the input clutch retainer (2).



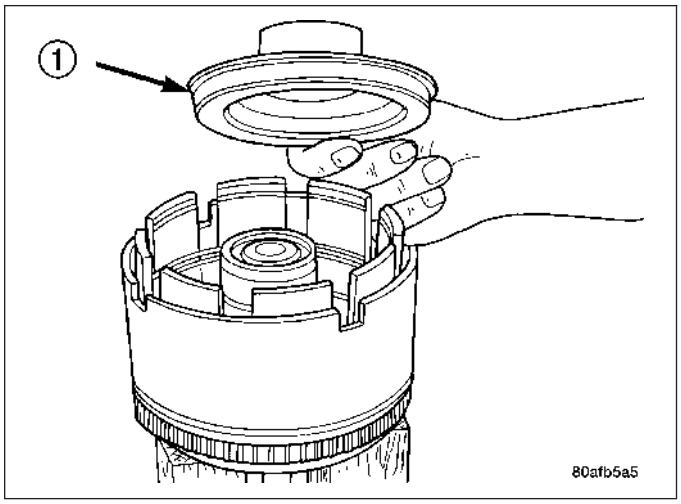
6. Install the input hub/shaft assembly (1) to the OD/Reverse piston/clutch retainer assembly (2).



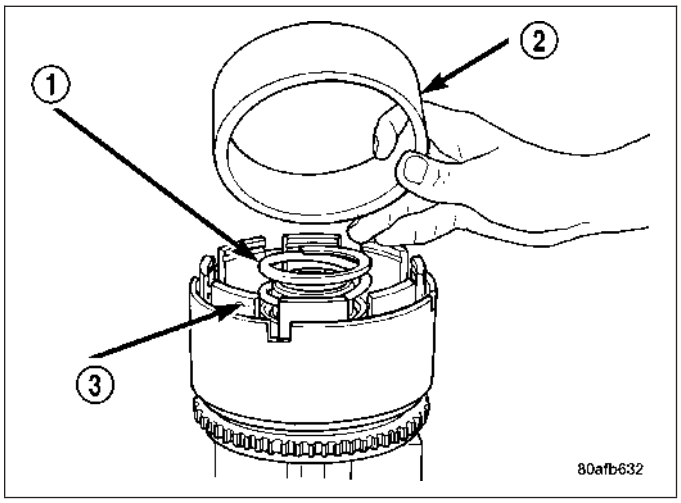
7. Install input hub tapered snap ring (2). **Make sure snap ring is fully seated.**



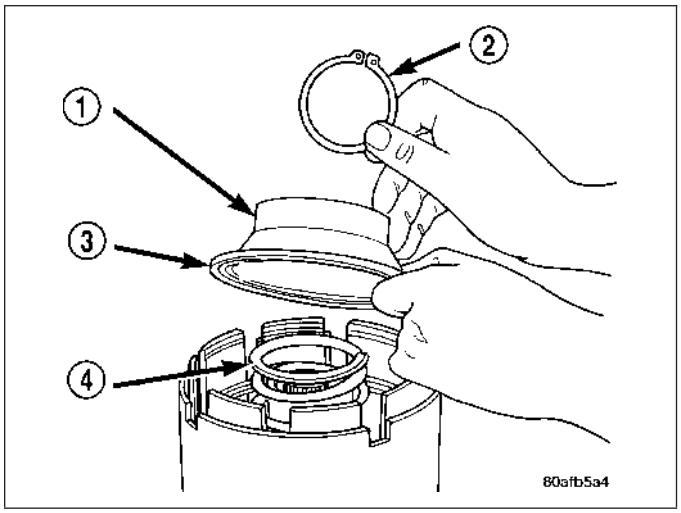
8. Install the UD clutch piston (1).



9. Install UD piston return spring (1)and Tool 5067 (2).

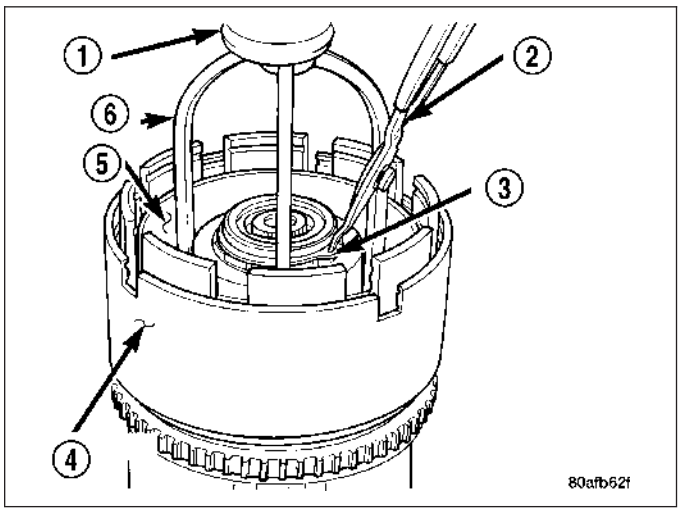


10. Position the UD spring retainer (1) and snap ring (2) on the piston return spring (4).

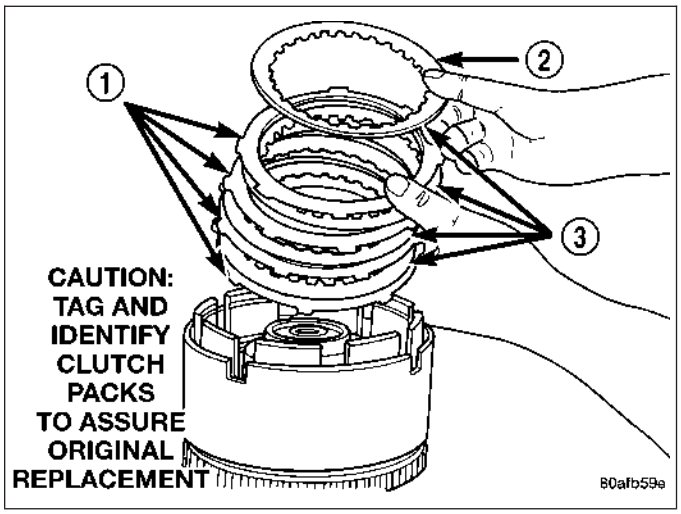


CAUTION: Compress return spring just enough to install snap ring.

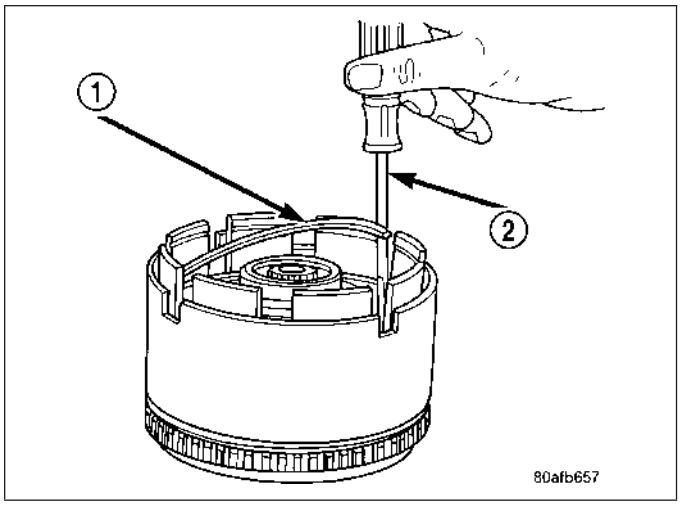
11. Using Tool 5059A (6) and an arbor press (1), install the UD spring retainer and snap ring (3).



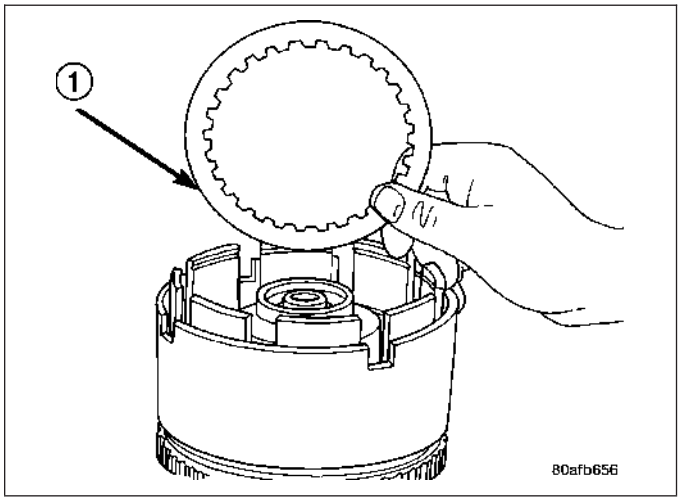
12. Install the UD clutch pack (four fibers/four steels) (1, 3). Leave the top disc (2) out until after the snap ring is installed.



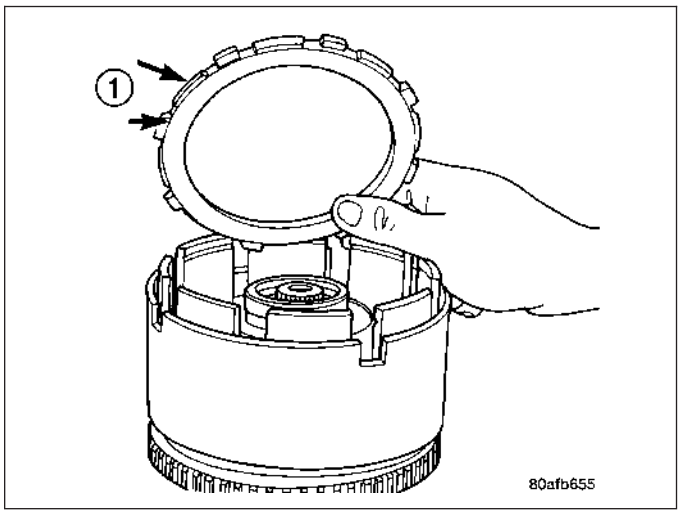
13. Install the UD clutch flat snap ring (1).



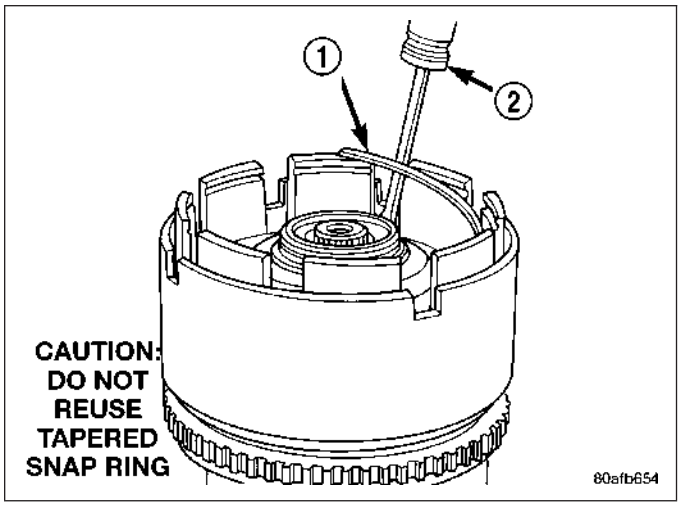
14. Install the last UD clutch disc (1).



15. Install the OD/UD clutch reaction plate (1). The OD/UD clutches reaction plate has a step on both sides. Install the OD/UD clutches reaction plate tapered step side up.

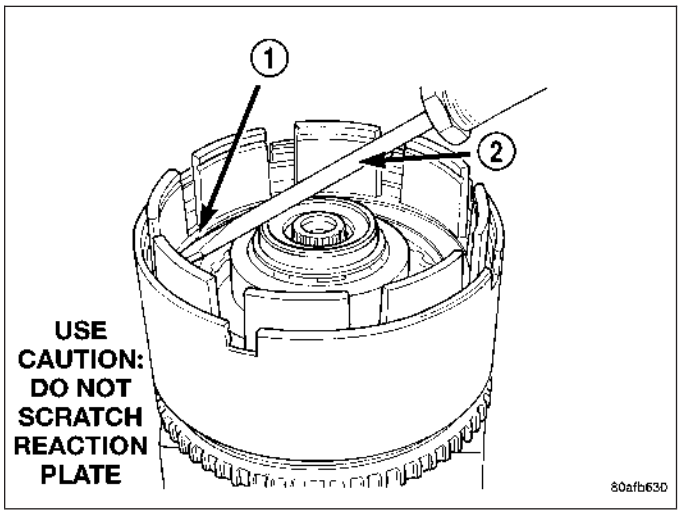


NOTE: Snap ring ends must be located within one finger of the input clutch hub. Be sure that snap ring is fully seated, by pushing with screwdriver, into snap ring groove all the way around.

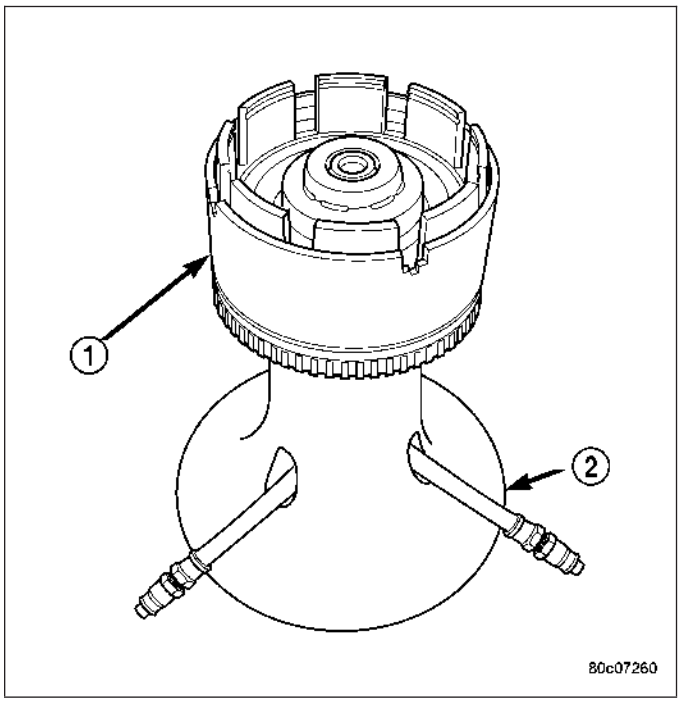


16. Install the UD/OD tapered snap ring (1).

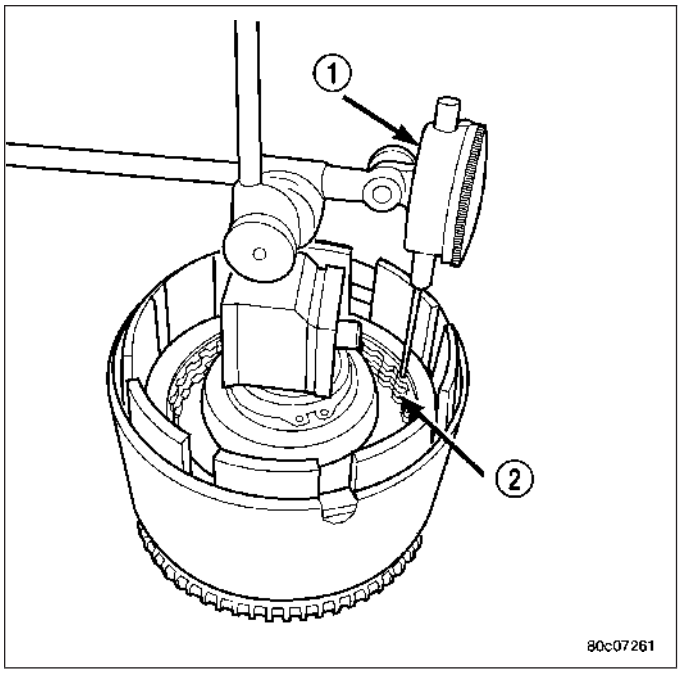
17. Seat tapered snap ring (1) to ensure proper installation.



18. Install input clutch assembly (1) to the Input Clutch Pressure Fixture 8391 (2).



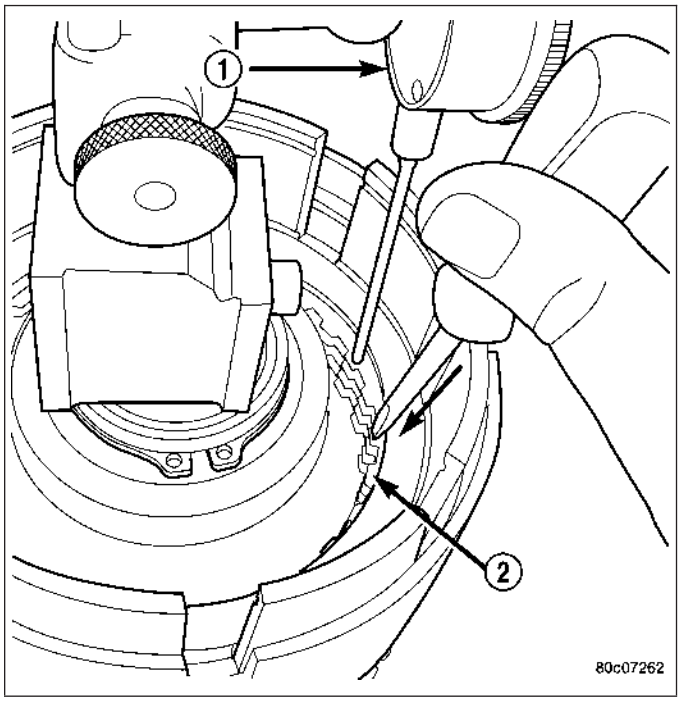
19. Set up dial indicator (1) on the UD clutch pack (2).



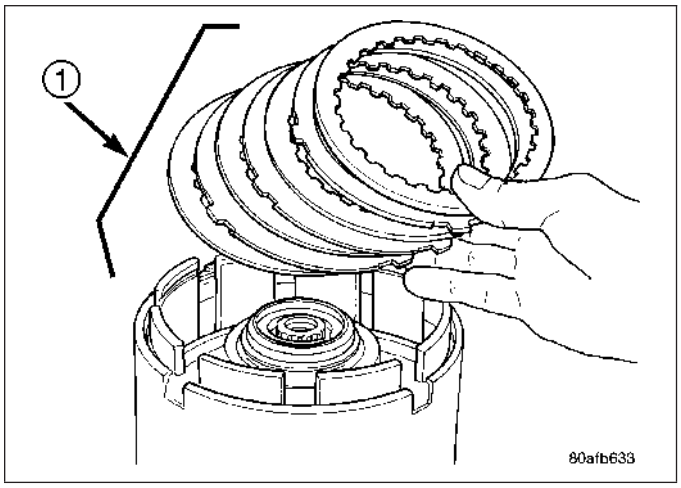
20. Using moderate pressure, press down and hold (near indicator) the UD clutch pack (2) with screwdriver or suitable tool and zero dial indicator (1). When releasing pressure on clutch pack, indicator reading should advance 0.005-0.010 inches.

CAUTION: Do not apply more than 30 psi (206 kPa) to the underdrive clutch pack.

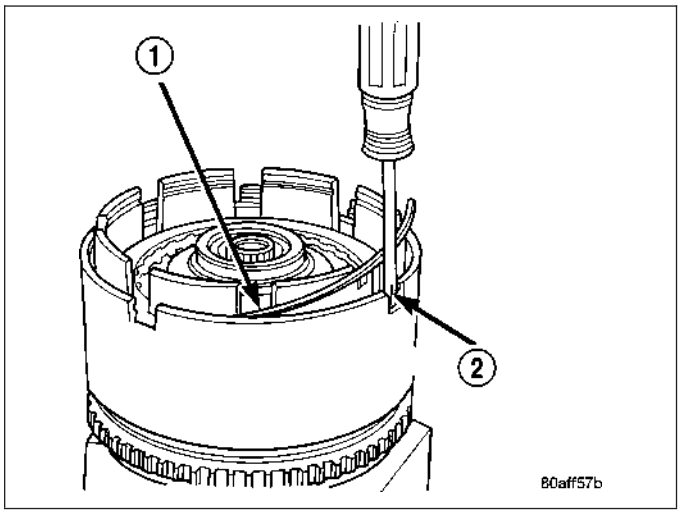
21. Apply 30 psi (206 kPa) to the underdrive hose on Tool 8391 and measure UD clutch clearance. Measure and record UD clutch pack measurement in four (4) places, 90° apart.
22. Take average of four measurements and compare with UD clutch pack clearance specification. **Underdrive clutch pack clearance must be 0.94-1.50 mm (0.037-0.059 in.).**
23. If necessary, select the proper reaction plate to achieve specifications.



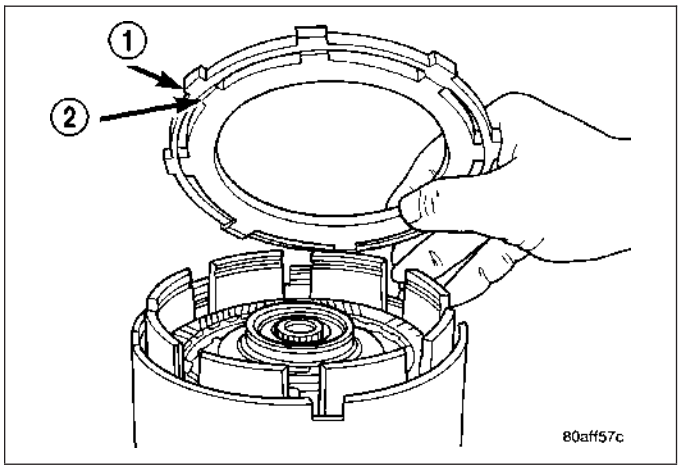
24. Install the OD clutch pack (four fibers/three steels) (1).



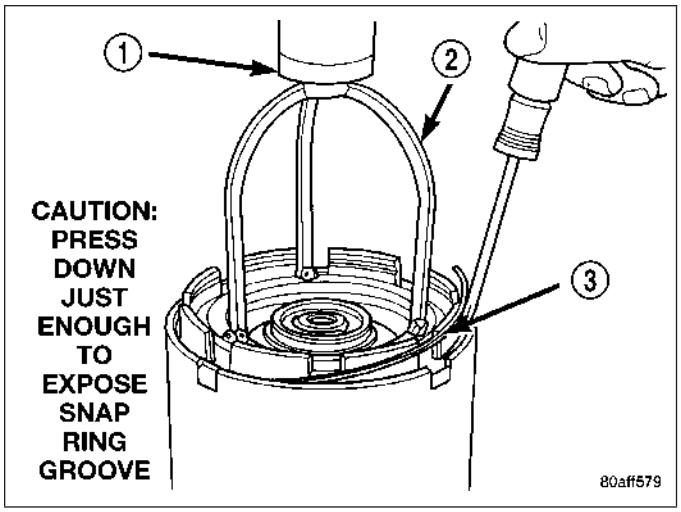
25. Install OD reaction plate waved snap ring (1).



26. Install the OD/Reverse reaction plate (1) with large step down (towards OD clutch pack).

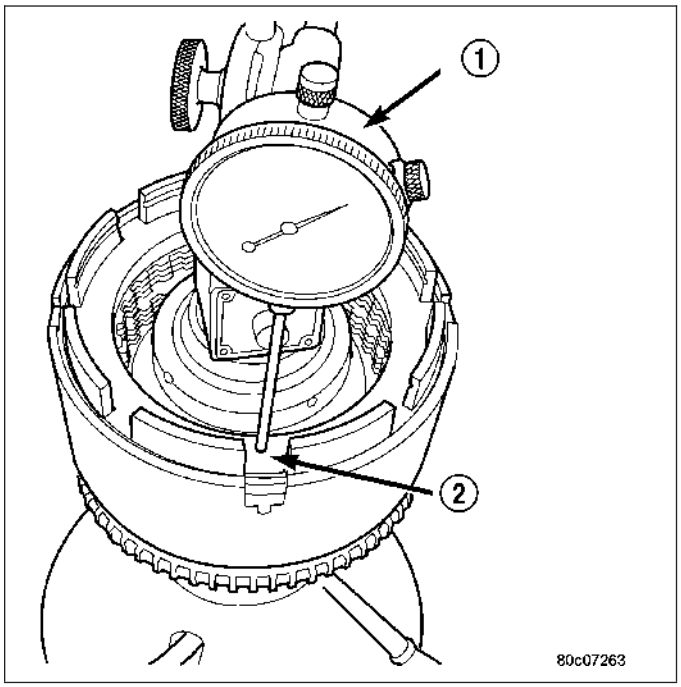


27. Install OD reaction plate flat snap ring (3).

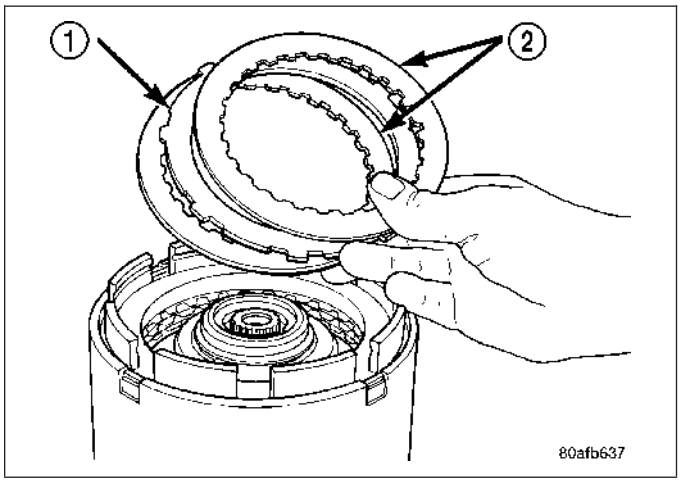


28. Measure OD clutch pack clearance. Set up dial indicator (1) on top of the OD/Reverse reaction plate (2).
29. Zero dial indicator and apply 30 psi (206 kPa) air pressure to the overdrive clutch hose on Tool 8391. Measure and record OD clutch pack measurement in four (4) places, 90° apart.
30. Take average of four measurements and compare with OD clutch pack clearance specification. **The overdrive (OD) clutch pack clearance is 1.07-3.25 mm (0.042-0.128 in.).**

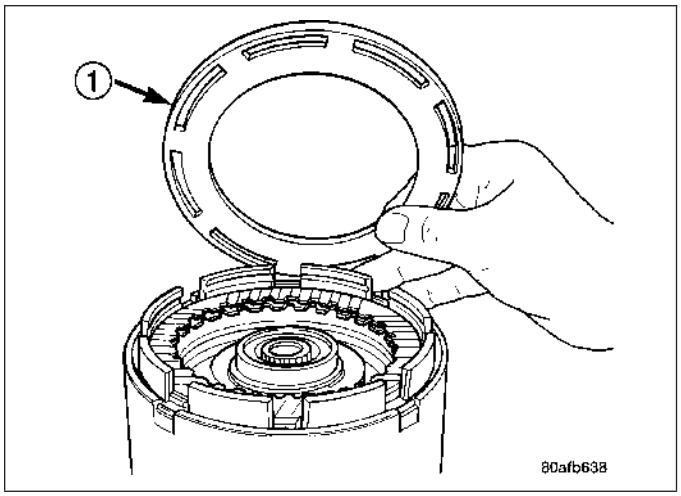
If not within specifications, the clutch is not assembled properly. There is no adjustment for the OD clutch clearance.



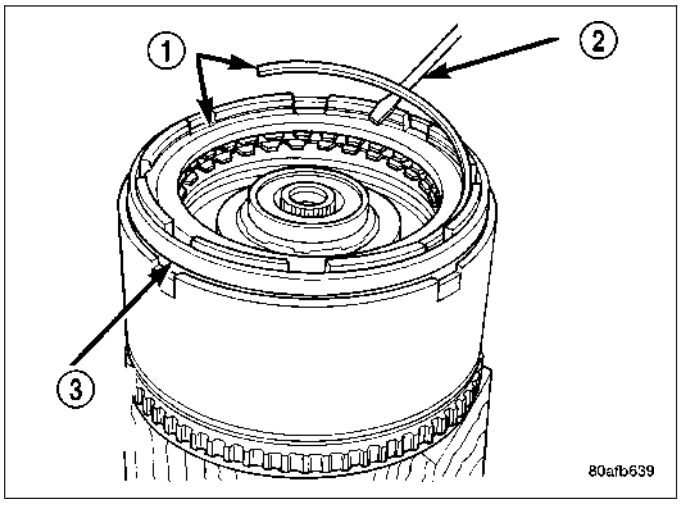
31. Install reverse clutch pack (two fibers/one steel) (1, 2).



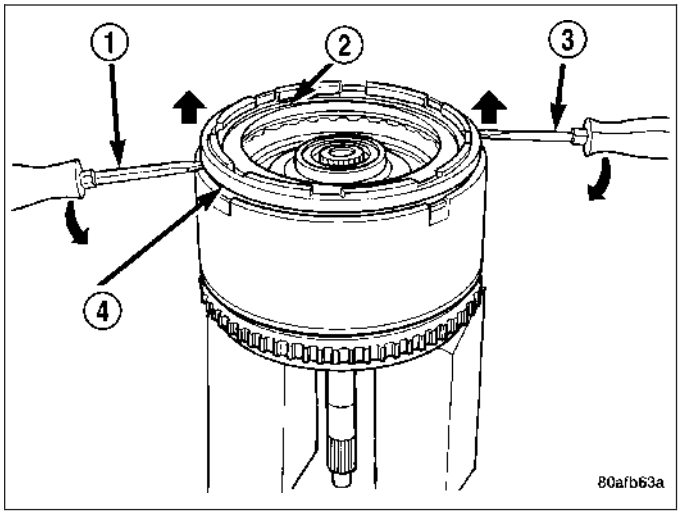
32. Install reverse clutch reaction plate (1) with the flat side down towards reverse clutch.



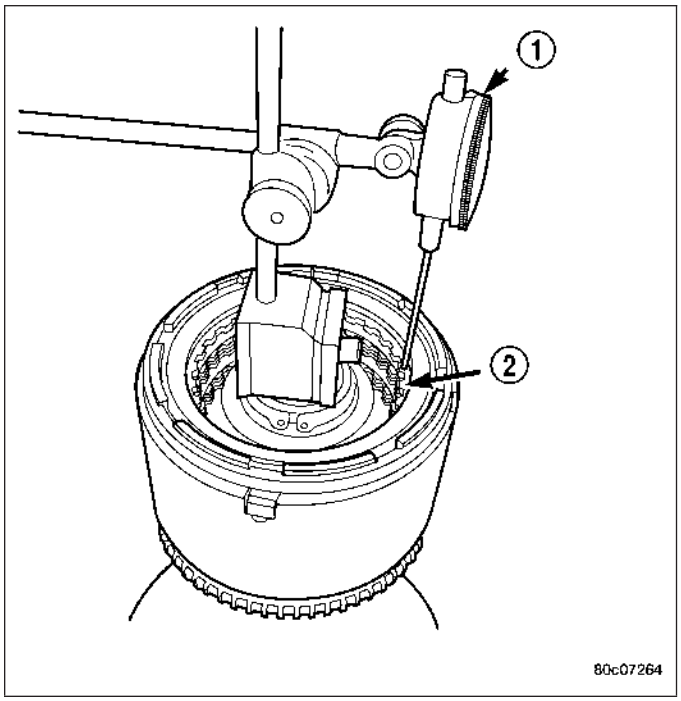
33. Tap reaction plate (3) down to allow installation of the reverse clutch snap ring (1). Install reverse clutch snap ring (1).



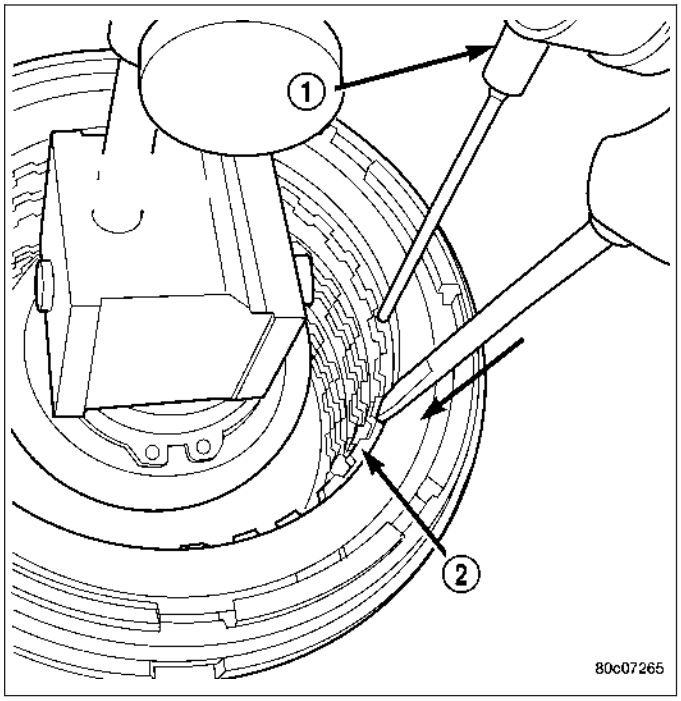
34. Pry up reverse reaction plate (4) to seat against snap ring (2).



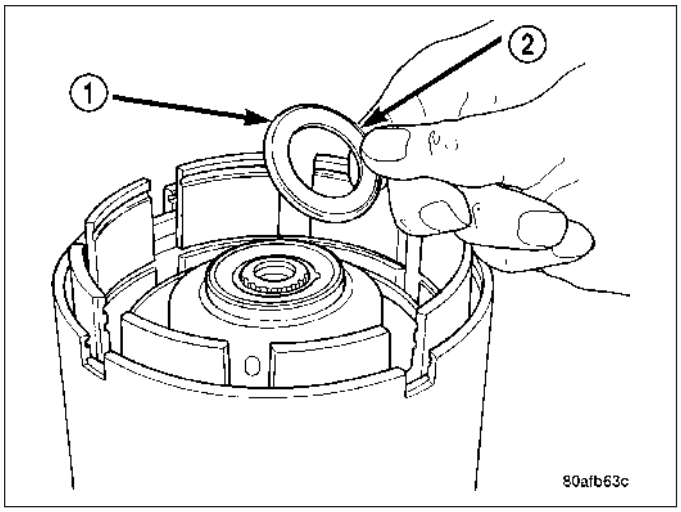
35. Set up a dial indicator (1) on the reverse clutch pack (2).



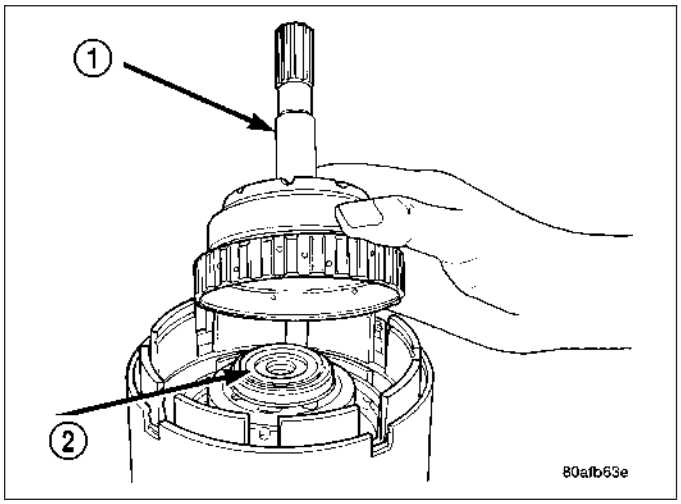
36. Using moderate pressure, press down and hold (near indicator) reverse clutch disc (2) with screwdriver or suitable tool and zero dial indicator (1). When releasing pressure, indicator should advance 0.005-0.010 inches as clutch pack relaxes.
37. Apply 30 psi (206 kPa) air pressure to the reverse clutch hose on Tool 8391. Measure and record reverse clutch pack measurement in four (4) places, 90° apart.
38. Take average of four measurements and compare with reverse clutch pack clearance specification. **The reverse clutch pack clearance is 0.89-1.37 mm (0.035-0.054 in.).** Select the proper reverse clutch snap ring to achieve specifications.
39. To complete the assembly, reverse clutch and overdrive clutch must be removed.



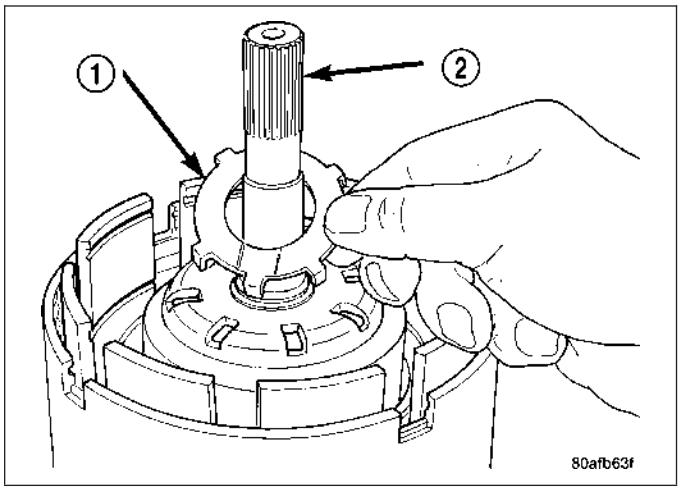
40. Install the number 2 needle bearing (1).



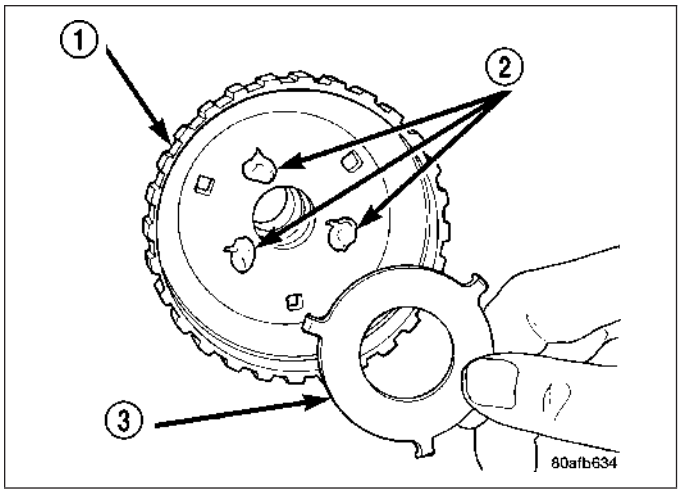
41. Install the underdrive shaft assembly (1).



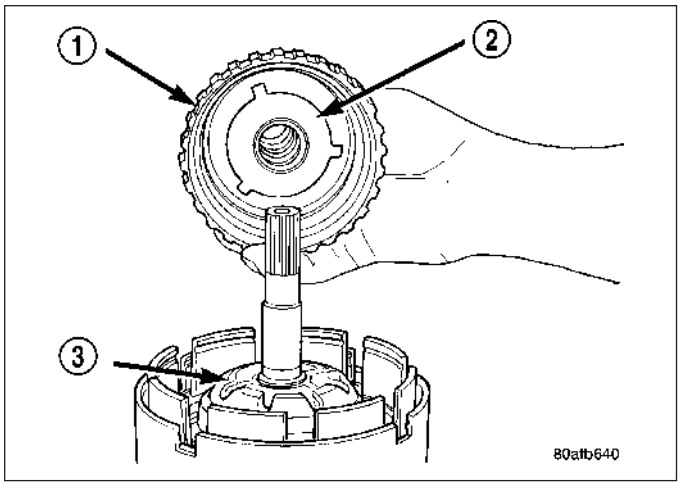
42. Install the number 3 thrust washer (1) to the underdrive shaft assembly (2). Be sure five tabs are seated properly.



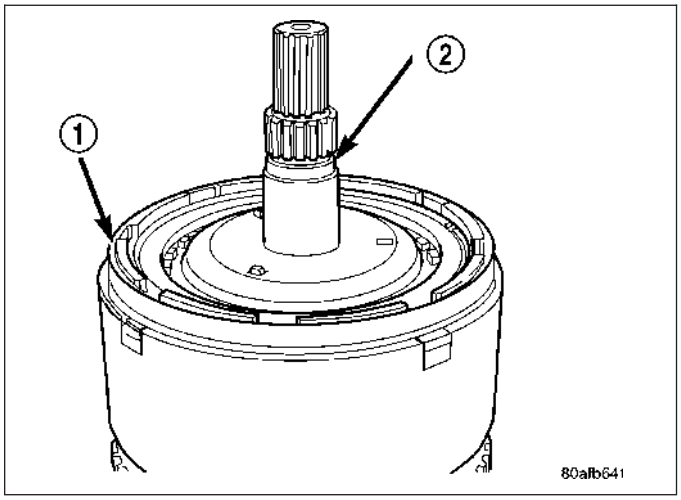
43. Install the number 3 thrust plate (3) to the bottom of the overdrive shaft assembly (1). Retain with petrolatum or transmission assembly gel (2).



44. Install the overdrive shaft assembly (1).



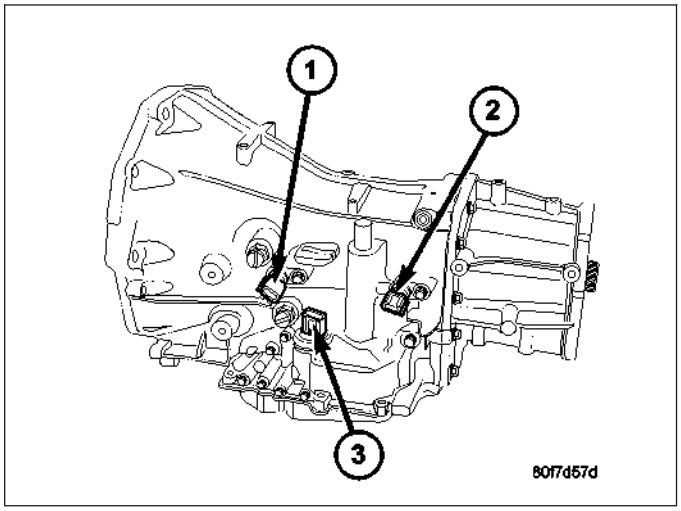
45. Reinstall overdrive and reverse clutch. **Rechecking these clutch clearances is not necessary.**



SENSOR-INPUT SPEED

DESCRIPTION

The Input (1) and Output (2) Speed Sensors are two-wire magnetic pickup devices that generate AC signals as rotation occurs. They are mounted in the left side of the transmission case and are considered primary inputs to the Transmission Control Module (TCM).



OPERATION

The Input Speed Sensor provides information on how fast the input shaft is rotating. As the teeth of the input clutch hub pass by the sensor coil, an AC voltage is generated and sent to the TCM. The TCM interprets this information as input shaft rpm.

The Output Speed Sensor generates an AC signal in a similar fashion, though its coil is excited by rotation of the rear planetary carrier lugs. The TCM interprets this information as output shaft rpm.

The TCM compares the input and output speed signals to determine the following:

- Transmission gear ratio
- Speed ratio error detection
- CVI calculation

The TCM also compares the input speed signal and the engine speed signal to determine the following:

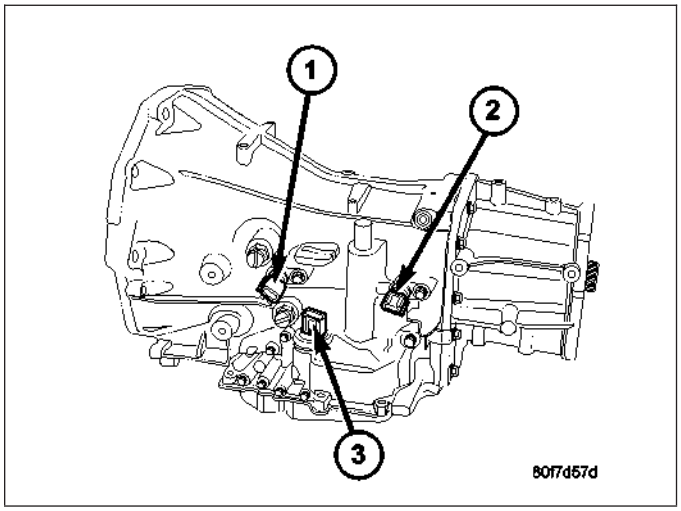
- Torque converter clutch slippage
- Torque converter element speed ratio

REMOVAL

1. Raise vehicle.
2. Place a suitable fluid catch pan under the transmission.
3. Remove the wiring connector from the input speed sensor.

NOTE: The speed sensor bolt has a sealing patch applied from the factory. Be sure to reuse the same bolt.

4. Remove the bolt holding the input speed sensor to the transmission case.
5. Remove the input speed sensor from the transmission case.

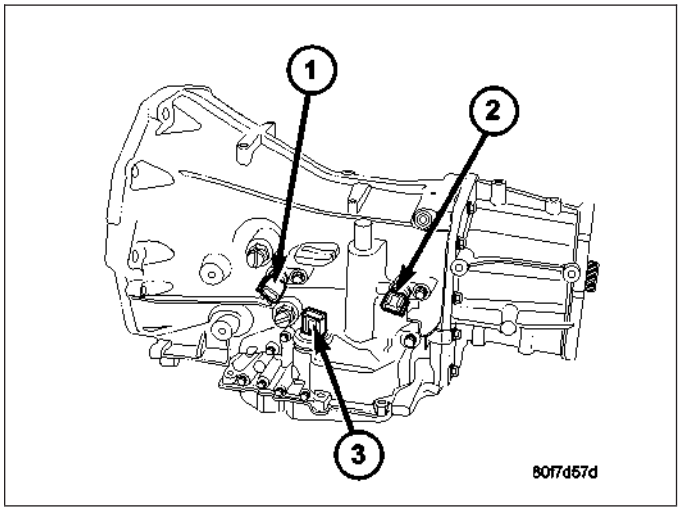


INSTALLATION

1. Install the input speed sensor (1) into the transmission case.

NOTE: Before installing the speed sensor bolt, it will be necessary to replentish the sealing patch on the bolt using Mopar® Lock & Seal Adhesive.

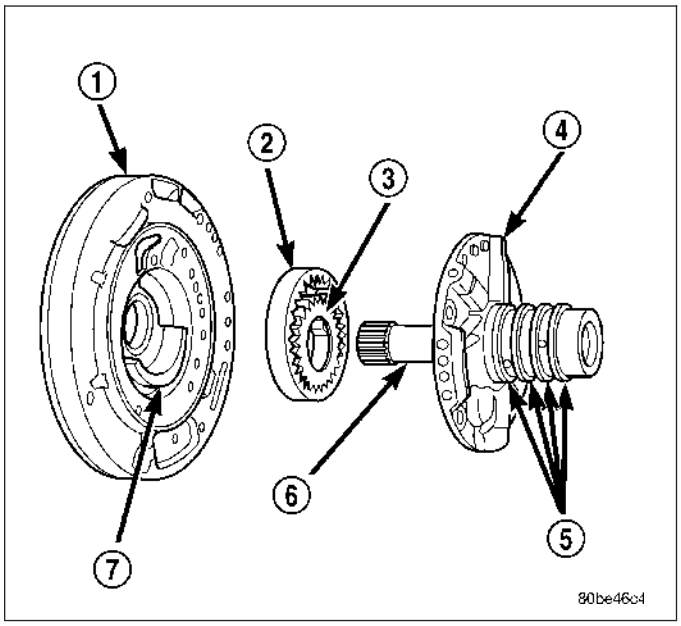
2. Install the bolt to hold the input speed sensor into the transmission case. Tighten the bolt to 9 N·m (80 in.lbs.).
3. Install the wiring connector onto the input speed sensor
4. Verify the transmission fluid level. Add fluid as necessary.
5. Lower vehicle.



PUMP-OIL

DESCRIPTION

The oil pump is located in the pump housing inside the bell housing of the transmission case. The oil pump assembly consists of an inner (3) and outer (2) gear, a housing (1), and a cover that also serves as the reaction shaft support (6).

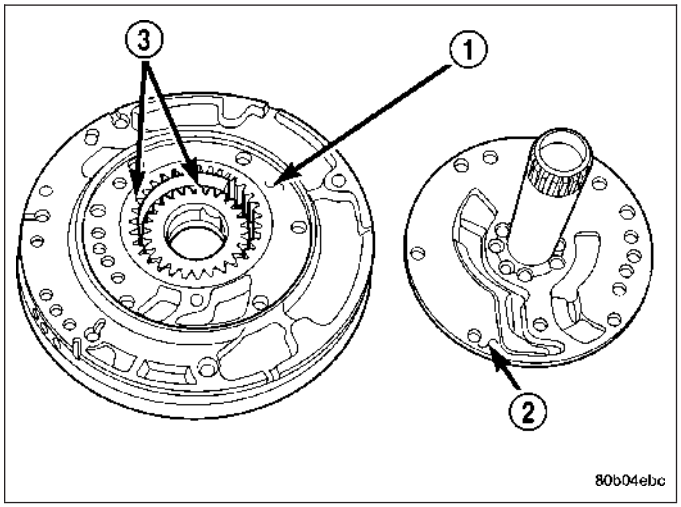


OPERATION

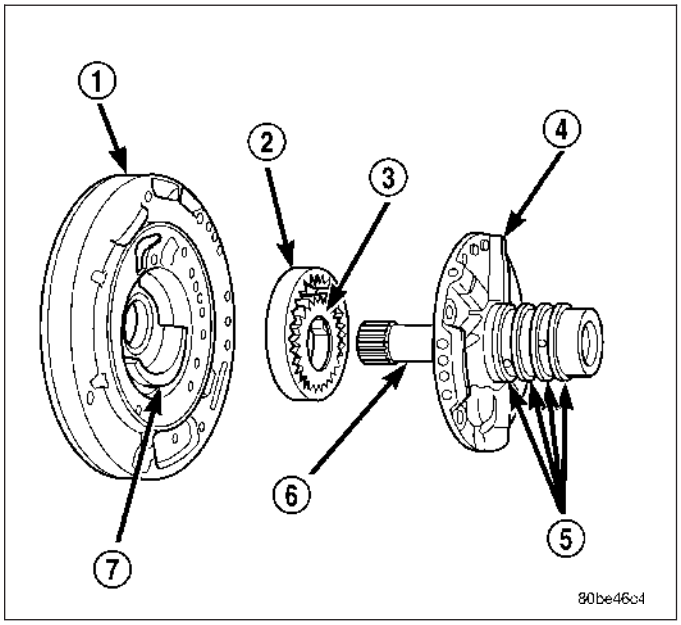
As the torque converter rotates, the converter hub rotates the inner and outer gears. As the gears rotate, the clearance between the gear teeth increases in the crescent area, and creates a suction at the inlet side of the pump. This suction draws fluid through the pump inlet from the oil pan. As the clearance between the gear teeth in the crescent area decreases, it forces pressurized fluid into the pump outlet and to the valve body.

DISASSEMBLY

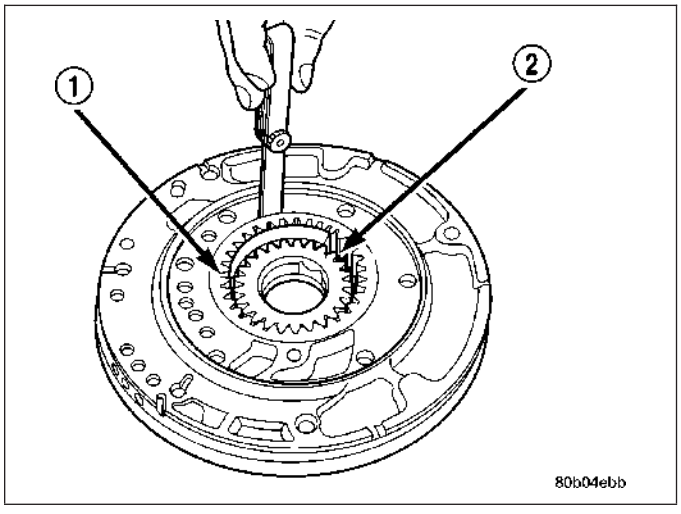
1. Remove the reaction shaft support bolts.
2. Remove the reaction shaft support(2) from the pump housing (1).



3. Remove the pump gears (2, 3) and check for wear and damage on pump housing (1) and gears (2, 3).



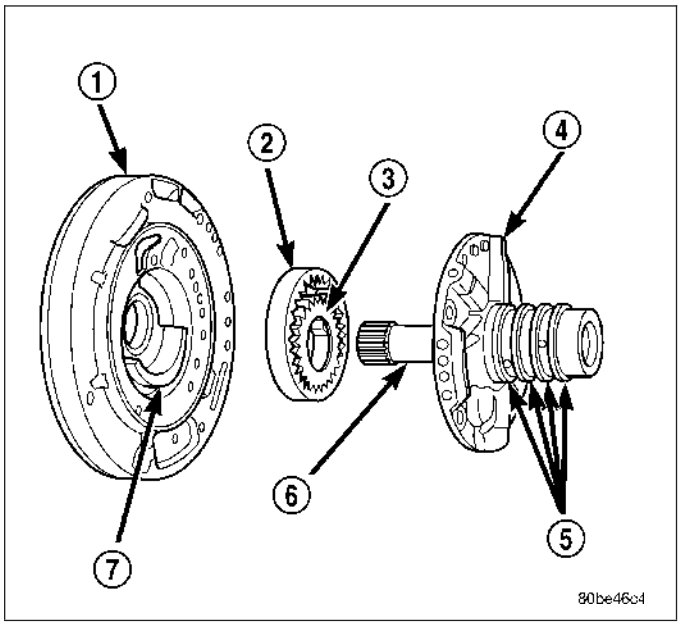
4. Re-install the gears and check clearances.
5. Measure the clearance between the outer gear (1) and the pump pocket (2). Clearance should be 0.089-0.202 mm (0.0035-0.0079 in.).
6. Measure clearance between outer gear and crescent. Clearance should be 0.060-0.298 mm (0.0023-0.0117 in.).
7. Measure clearance between inner gear and crescent. Clearance should be 0.093-0.385 mm (0.0036-0.0151 in.).
8. Position an appropriate piece of Plastigage across both pump gears.
9. Align the Plastigage to a flat area on the reaction shaft support housing.



10. Install the reaction shaft to the pump housing. Tighten the bolts to 27 N·m (20 ft. lbs.).
11. Remove bolts and carefully separate the housings. Measure the Plastigage following the instructions supplied.
12. Clearance between outer gear side and the reaction shaft support should be 0.020-0.046 mm (0.0008-0.0018 in.). Clearance between inner gear side and the reaction shaft support should be 0.020-0.046 mm (0.0008-0.0018 in.).

ASSEMBLY

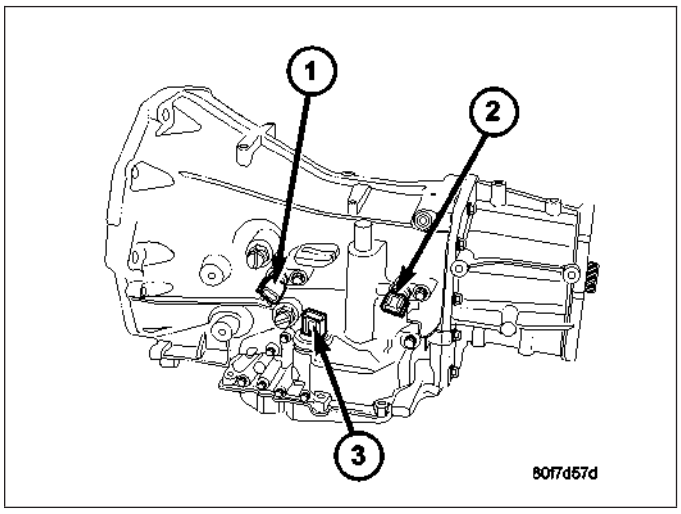
1. Assemble oil pump as shown
2. Install and torque reaction shaft support-to-oil pump housing bolts to 28 N·m (20 ft. lbs.) torque.



SENSOR-OUTPUT SPEED

DESCRIPTION

The Input (1) and Output (2) Speed Sensors are two-wire magnetic pickup devices that generate AC signals as rotation occurs. They are mounted in the left side of the transmission case and are considered primary inputs to the Transmission Control Module (TCM).



OPERATION

The Input Speed Sensor provides information on how fast the input shaft is rotating. As the teeth of the input clutch hub pass by the sensor coil, an AC voltage is generated and sent to the TCM. The TCM interprets this information as input shaft rpm.

The Output Speed Sensor generates an AC signal in a similar fashion, though its coil is excited by rotation of the rear planetary carrier lugs. The TCM interprets this information as output shaft rpm.

The TCM compares the input and output speed signals to determine the following:

- Transmission gear ratio
- Speed ratio error detection
- CVI calculation

The TCM also compares the input speed signal and the engine speed signal to determine the following:

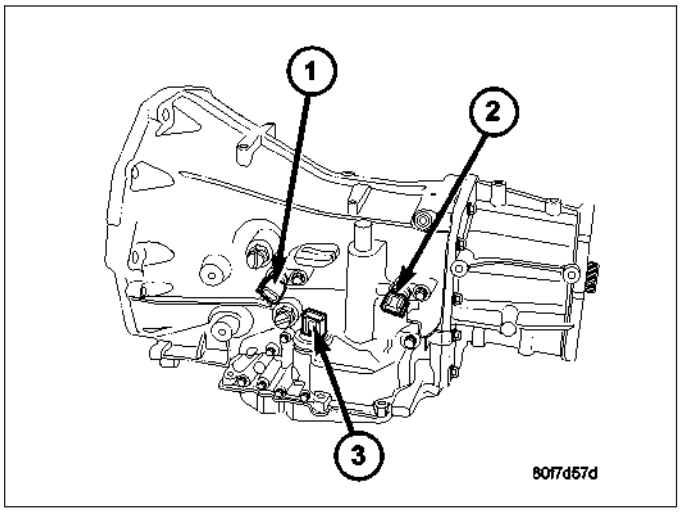
- Torque converter clutch slippage
- Torque converter element speed ratio

REMOVAL

1. Raise vehicle.
2. Place a suitable fluid catch pan under the transmission.
3. Remove the wiring connector from the output speed sensor (2).

NOTE: The speed sensor bolt has a sealing patch applied from the factory. Be sure to reuse the same bolt.

4. Remove the bolt holding the output speed sensor to the transmission case.
5. Remove the output speed sensor (2) from the transmission case.

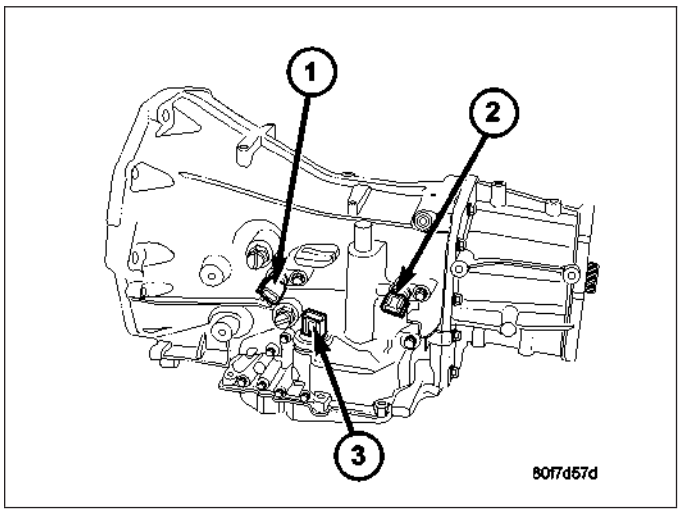


INSTALLATION

1. Install the output speed sensor (2) into the transmission case.

NOTE: Before installing the speed sensor bolt, it will be necessary to replentish the sealing patch on the bolt using Mopar® Lock & Seal Adhesive.

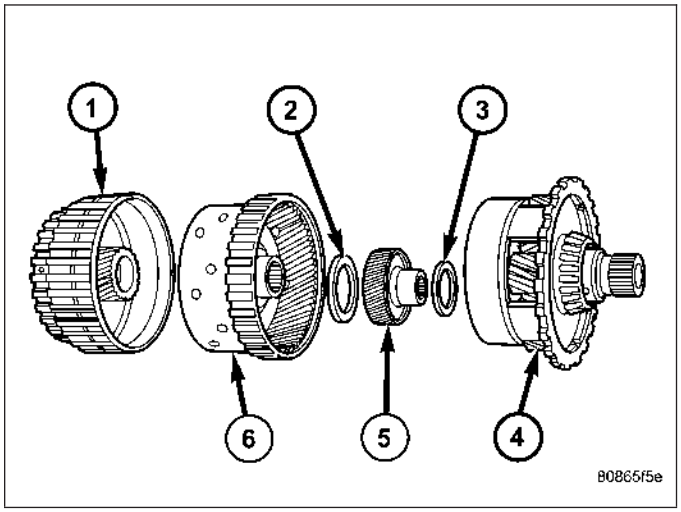
2. Install the bolt to hold the output speed sensor into the transmission case. Tighten the bolt to 9 N·m (80 in.lbs.).
3. Install the wiring connector onto the output speed sensor
4. Verify the transmission fluid level. Add fluid as necessary.
5. Lower vehicle.



GEARTRAIN-PLANETARY

DESCRIPTION

The planetary geartrain is located between the input clutch assembly and the rear of the transmission case. The planetary geartrain consists of two sun gears, two planetary carriers, two annulus (ring) gears, and one output shaft.



OPERATION

The planetary geartrain utilizes two planetary gear sets that connect the transmission input shaft to the output shaft. Input and holding clutches drive or lock different planetary members to change output ratio or direction.

SEAL-OIL PUMP

REMOVAL

1. Remove the transmission from the vehicle (Refer to 21 - TRANSMISSION/AUTOMATIC - 42RLE - REMOVAL).
2. Remove the torque converter from the transmission bellhousing.
3. Use special tool C-3981B to remove oil pump seal.

INSTALLATION

1. Clean and inspect oil pump seal seat. Then install seal using special tool C-4193-A.
2. Clean and inspect torque converter hub. If nicks, scratches or hub wear are found, torque converter replacement will be required.

CAUTION: If the torque converter is being replaced, apply a light coating of grease to the crankshaft pilot hole. Also inspect the engine drive plate for cracks. If any cracks are found replace the drive plate. Do not attempt to repair a cracked drive plate. Always use new torque converter to drive plate bolts.

3. Apply a light film of transmission oil to the torque converter hub and oil seal lips. Then install torque converter into transmission. Be sure that the hub lugs mesh with the front pump lugs when installing.
4. Reinstall the transmission into the vehicle. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - INSTALLATION)

MECHANISM-SHIFT

DESCRIPTION

The gear shift mechanism provides six shift positions which are:

- Park (P)
- Reverse (R)
- Neutral (N)

- Drive (D)
- Manual second (2)
- Manual low (1)

OPERATION

MANUAL LOW (1) range provides FIRST gear only. Overrun braking is also provided in this range. MANUAL SECOND (2) range provides FIRST and SECOND gear only.

DRIVE range provides FIRST, SECOND, THIRD and OVERDRIVE FOURTH gear ranges. The shift into OVERDRIVE FOURTH gear range occurs only after the transmission has completed the shift into D THIRD gear range. No further movement of the shift mechanism is required to complete the 3-4 shift.

The FOURTH gear upshift occurs automatically when the overdrive selector switch is in the ON position. An upshift to FOURTH gear may not occur or may be delayed in some of the possible shift schedules. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - OPERATION)

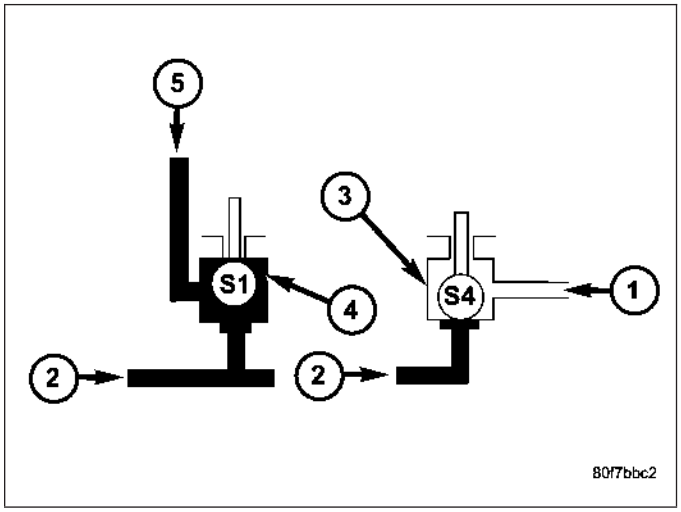
SOLENOID

DESCRIPTION

The typical electrical solenoid used in automotive applications is a linear actuator. It is a device that produces motion in a straight line. This straight line motion can be either forward or backward in direction, and short or long distance.

A solenoid is an electromechanical device that uses a magnetic force to perform work. It consists of a coil of wire, wrapped around a magnetic core made from steel or iron, and a spring loaded, movable plunger, which performs the work, or straight line motion.

The solenoids used in transmission applications are attached to valves which can be classified as **normally open** or **normally closed.** The **normally open** solenoid valve is defined as a valve which allows hydraulic flow when no current or voltage is applied to the solenoid. The **normally closed** solenoid valve is defined as a valve which does not allow hydraulic flow when no current or voltage is applied to the solenoid. These valves perform hydraulic control functions for the transmission and must therefore be durable and tolerant of dirt particles. For these reasons, the valves have hardened steel poppets and ball valves. The solenoids operate the valves directly, which means that the solenoids must have very high outputs to close the valves against the sizable flow areas and line pressures found in current transmissions. Fast response time is also necessary to ensure accurate control of the transmission.



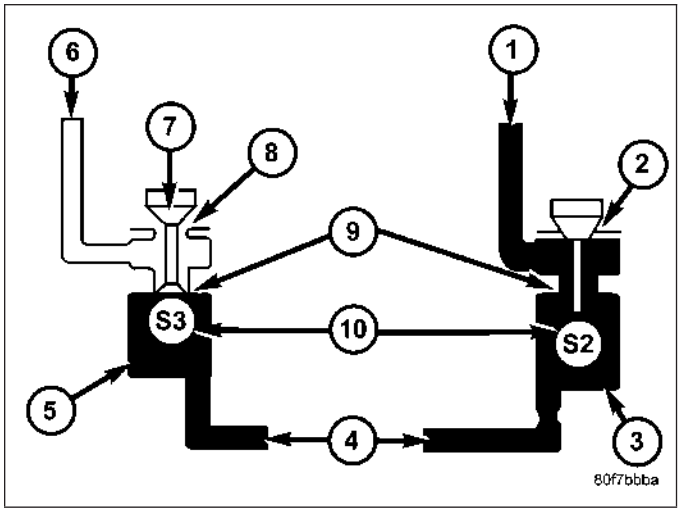
1 - MANUAL VALVE
2 - LINE PRESSURE
3 - 2/4 - LOW REVERSE SOLENOID ENERGIZED
4 - UNDERDRIVE SOLENOID DE-ENERGIZED
5 - UNDERDRIVE CLUTCH

The strength of the magnetic field is the primary force that determines the speed of operation in a particular solenoid design. A stronger magnetic field will cause the plunger to move at a greater speed than a weaker one. There are basically two ways to increase the force of the magnetic field:

1. Increase the amount of current applied to the coil or
2. Increase the number of turns of wire in the coil.

The most common practice is to increase the number of turns by using thin wire that can completely fill the available space within the solenoid housing. The strength of the spring and the length of the plunger also contribute to the response speed possible by a particular solenoid design.

A solenoid can also be described by the method by which it is controlled. Some of the possibilities include variable force, pulse-width modulated, constant ON, or duty cycle. The variable force and pulse-width modulated versions utilize similar methods to control the current flow through the solenoid to position the solenoid plunger at a desired position somewhere between full ON and full OFF. The constant ON and duty cycled versions control the voltage across the solenoid to allow either full flow or no flow through the solenoid's valve.



1 - OVERDRIVE CLUTCH
2 - NO VENT
3 - OVERDRIVE SOLENOID ENERGIZED
4 - MANUAL VALVE
5 - LOW REVERSE/CONVERTER CLUTCH SOLENOID DE-ENERGIZED
6 - SOLENOID SWITCH VALVE
7 - TAPER
8 - VENT TO SUMP
9 - ORIFICE
10 - CHECK BALL

OPERATION

When an electrical current is applied to the solenoid coil, a magnetic field is created which produces an attraction to the plunger, causing the plunger to move and work against the spring pressure and the load applied by the fluid the valve is controlling. The plunger is normally directly attached to the valve which it is to operate. When the current is removed from the coil, the attraction is removed and the plunger will return to its original position due to spring pressure.

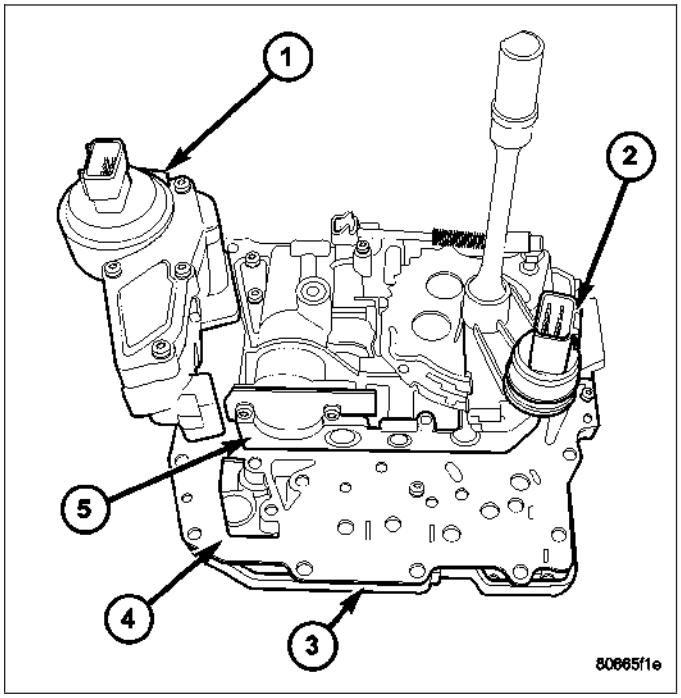
The plunger is made of a conductive material and accomplishes this movement by providing a path for the magnetic field to flow. By keeping the air gap between the plunger and the coil to the minimum necessary to allow free movement of the plunger, the magnetic field is maximized.

ASSEMBLY-TRANSMISSION SOLENOID/PRESSURE SWITCH

DESCRIPTION

The Solenoid/Pressure Switch Assembly (1) is inside the transmission and mounted to the valve body assembly. The assembly consists of four solenoids that control hydraulic pressure to the L/R, 2/4, OD, and UD friction elements (transmission clutches), and the torque converter clutch. The reverse clutch is controlled by line pressure from the manual valve in the valve body. The solenoids are contained within the Solenoid/Pressure Switch Assembly, and can only be serviced by replacing the assembly.

The solenoid assembly also contains pressure switches that monitor and send hydraulic circuit information to the TCM. Likewise, the pressure switches can only be service by replacing the assembly.



OPERATION

SOLENOIDS

The solenoids receive electrical power from the Transmission Control Relay through a single wire. The TCM energizes or operates the solenoids individually by grounding the return wire of the solenoid needed. When a solenoid is energized, the solenoid valve shifts, and a fluid passage is opened or closed (vented or applied), depending on its default operating state. The result is an apply or release of a frictional element.

The 2/4 and UD solenoids are normally applied, which allows fluid to pass through in their relaxed or “off” state. By design, this allows transmission limp-in (P,R,N,2) in the event of an electrical failure.

The continuity of the solenoids and circuits are periodically tested. Each solenoid is turned on or off depending on its current state. An inductive spike should be detected by the TCM during this test. If no spike is detected, the circuit is tested again to verify the failure. In addition to the periodic testing, the solenoid circuits are tested if a speed ratio or pressure switch error occurs.

PRESSURE SWITCHES

The TCM relies on three pressure switches to monitor fluid pressure in the L/R, 2/4, and OD hydraulic circuits. The primary purpose of these switches is to help the TCM detect when clutch circuit hydraulic failures occur. The range for the pressure switch closing and opening points is 11-23 psi. Typically the switch opening point will be approximately one psi lower than the closing point. For example, a switch may close at 18 psi and open at 17 psi. The switches are continuously monitored by the TCM for the correct states (open or closed) in each gear as shown in the following chart:

PRESSURE SWITCH STATES

GEAR	L/R	2/4	OD
R	OP	OP	OP
P/N	CL	OP	OP
1st	CL	OP	OP
2nd	OP	CL	OP
D	OP	OP	CL
OD	OP	CL	CL

OP = OPEN

CL = CLOSED

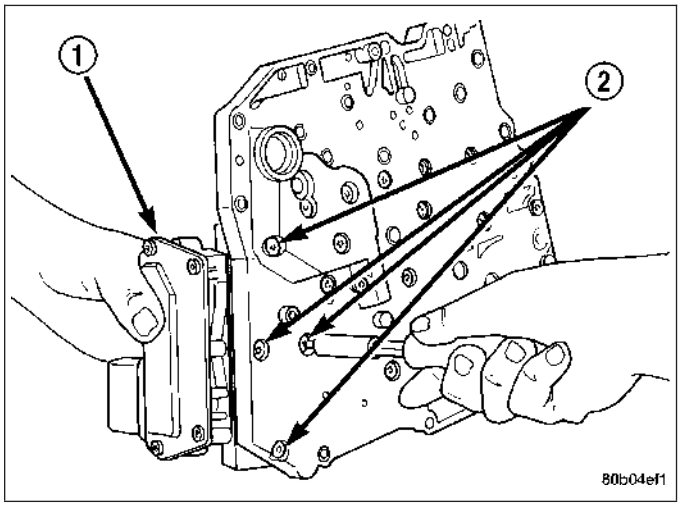
A Diagnostic Trouble Code (DTC) will set if the TCM senses any switch open or closed at the wrong time in a given gear.

The TCM also tests the 2/4 and OD pressure switches when they are normally off (OD and 2/4 are tested in 1st gear, OD in 2nd gear, and 2/4 in 3rd gear). The test simply verifies that they are operational, by looking for a closed state when the corresponding element is applied. Immediately after a shift into 1st, 2nd, or 3rd gear with the engine speed above 1000 rpm, the TCM momentarily turns on element pressure to the 2/4 and/or OD clutch circuits to identify that the appropriate switch has closed. If it doesn't close, it is tested again. If the switch fails to close the second time, the appropriate Diagnostic Trouble Code (DTC) will set.

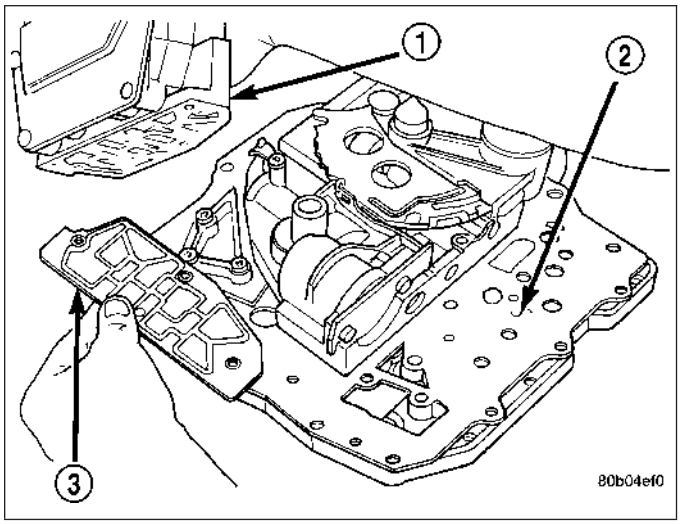
REMOVAL

NOTE: If the Solenoid/Pressure Switch Assembly is being replaced, the Quick Learn Procedure must be performed. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE)

1. Raise vehicle on hoist.
2. Remove valve body assembly from transmission. (Refer to 21 - TRANSMISSION/AUTOMATIC - 42RLE/VALVE BODY - REMOVAL)
3. Remove Solenoid/Pressure Switch Assembly retaining screws (2) from solenoid.



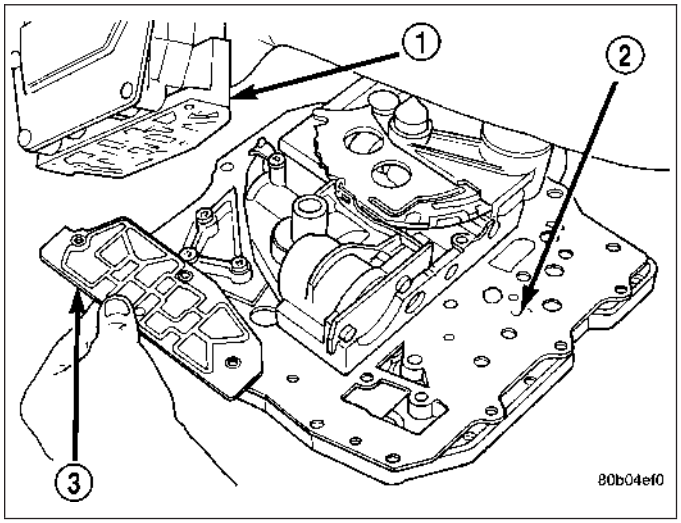
4. Remove Solenoid/Pressure Switch Assembly (1) and screen from valve body (2).



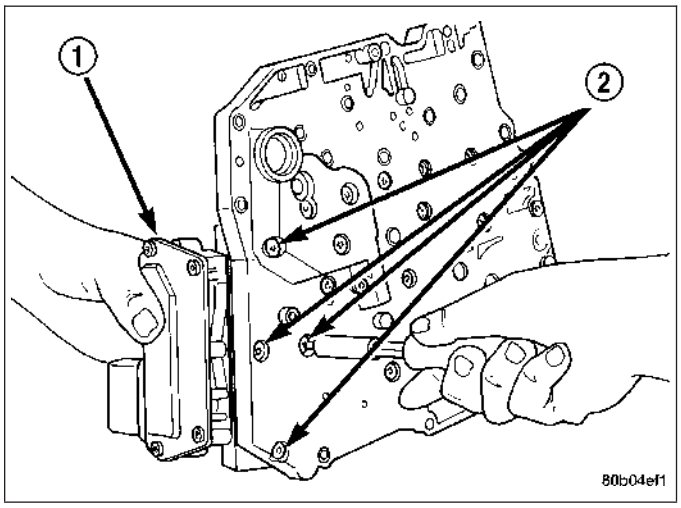
INSTALLATION

NOTE: If the Solenoid/Pressure Switch assembly is being replaced, the Quick Learn Procedure must be performed. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE)

1. Install Solenoid/Pressure Switch Assembly (1) and screen (3) to the separator and transfer plates.



2. Install and tighten retaining screws (2) to 5.5 N·m (50 in. lbs.) torque.
3. Install valve body. (Refer to 21 - TRANSMISSION/ AUTOMATIC - 42RLE/VALVE BODY - INSTALLATION)



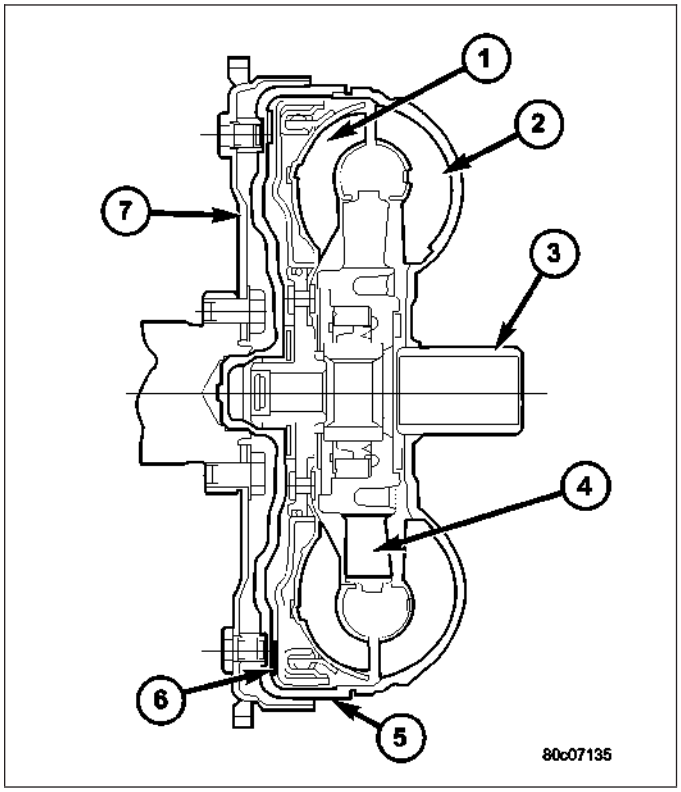
CONVERTER-TORQUE

DESCRIPTION

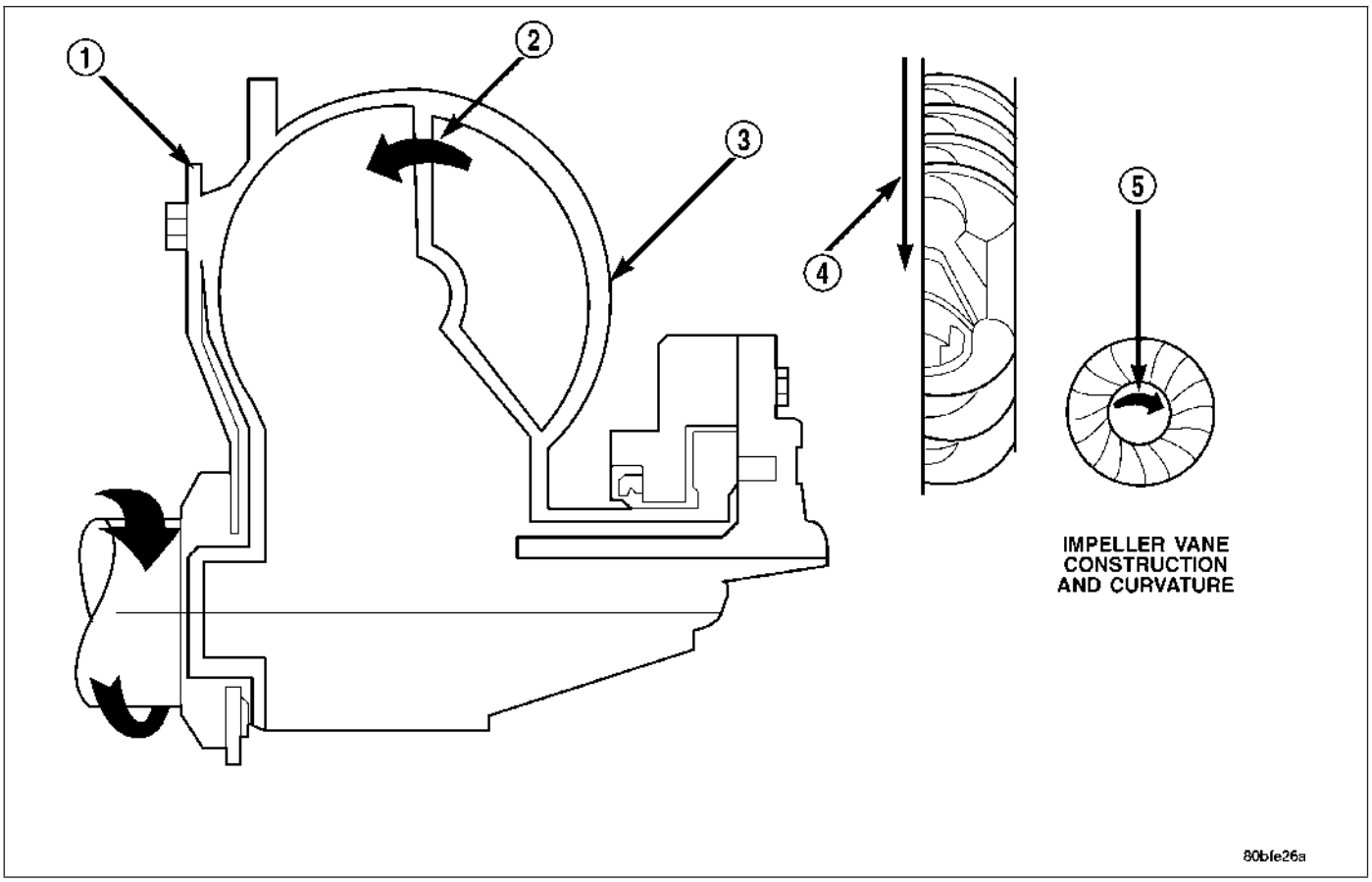
The torque converter is a hydraulic device that couples the engine crankshaft to the transmission. The torque converter consists of an outer shell with an internal turbine, a stator, an overrunning clutch, an impeller and an electronically applied converter clutch. The converter clutch provides reduced engine speed and greater fuel economy when engaged. Clutch engagement also provides reduced transmission fluid temperatures. The torque converter hub drives the transmission oil (fluid) pump.

The torque converter is a sealed, welded unit that is not repairable and is serviced as an assembly.

CAUTION: The torque converter must be replaced if a transmission failure resulted in large amounts of metal or fiber contamination in the fluid.



IMPELLER

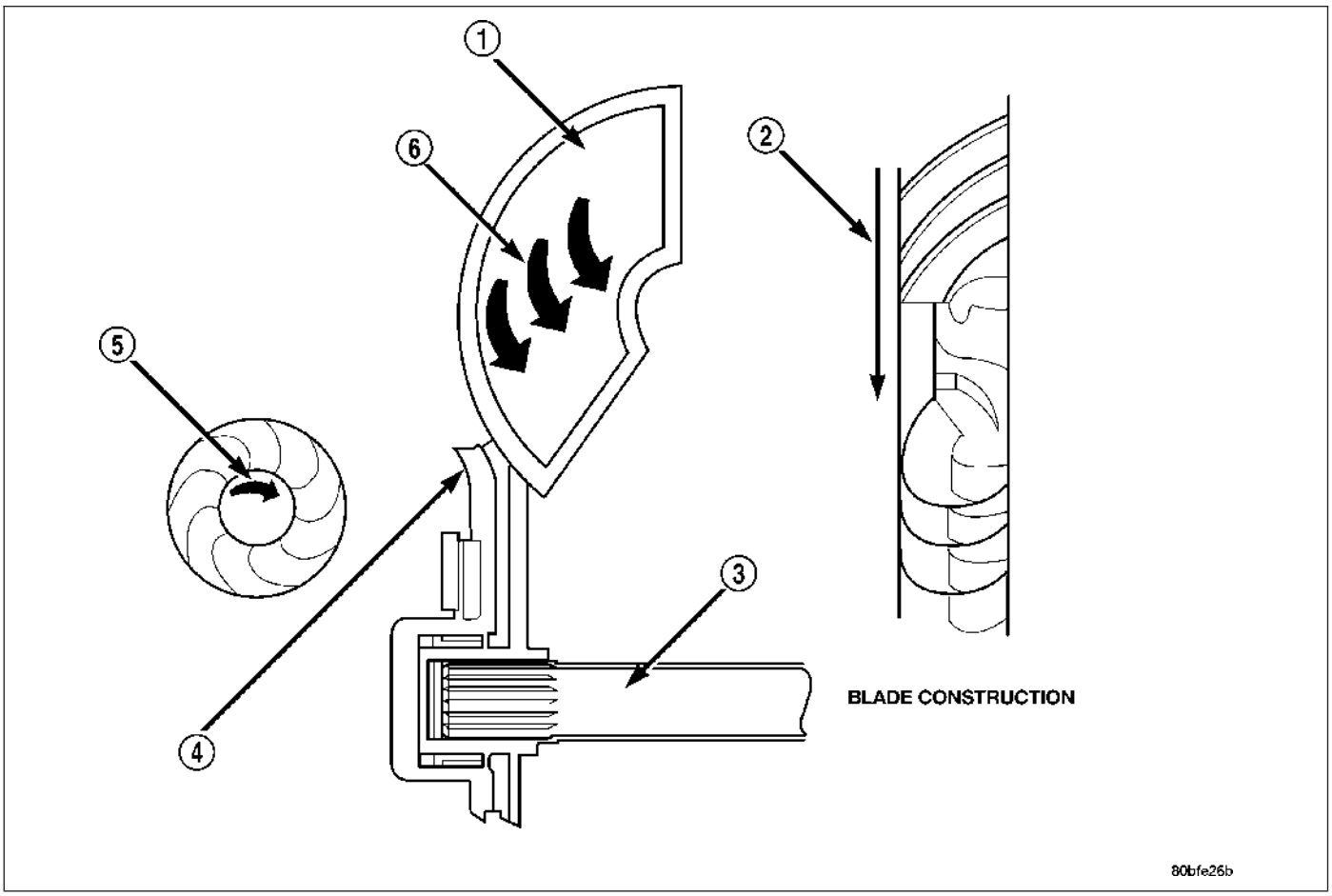


Impeller

1 - ENGINE FLEXPLATE
2 - OIL FLOW FROM IMPELLER SECTION INTO TURBINE SECTION
3 - IMPELLER VANES AND COVER ARE INTEGRAL
4 - ENGINE ROTATION
5 - ENGINE ROTATION

The impeller is an integral part of the converter housing. The impeller consists of curved blades placed radially along the inside of the housing on the transmission side of the converter. As the converter housing is rotated by the engine, so is the impeller, because they are one and the same and are the driving members of the system.

TURBINE



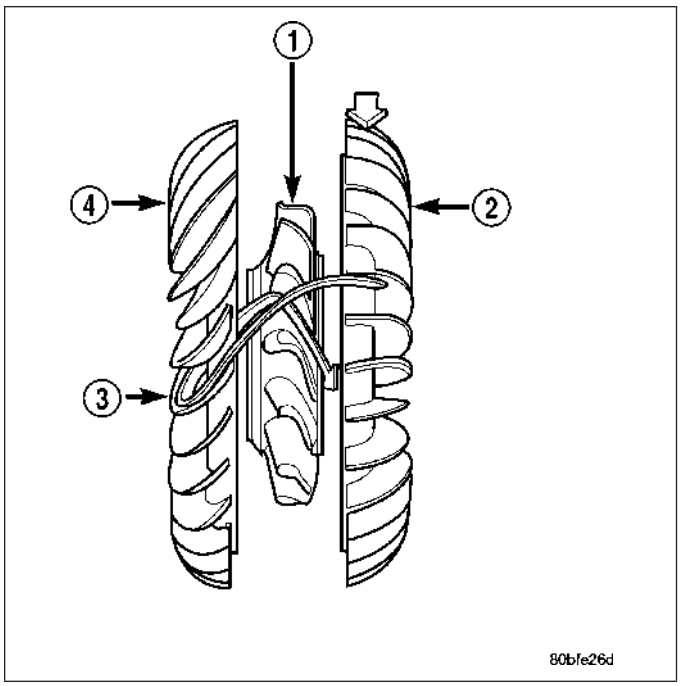
Turbine

1 - TURBINE VANE
2 - ENGINE ROTATION
3 - INPUT SHAFT
4 - PORTION OF TORQUE CONVERTER COVER
5 - ENGINE ROTATION
6 - OIL FLOW WITHIN TURBINE SECTION

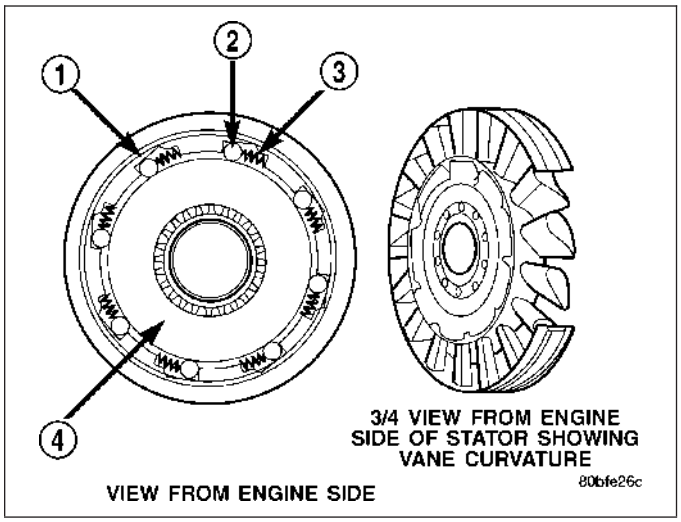
The turbine is the output, or driven, member of the converter. The turbine is mounted within the housing opposite the impeller, but is not attached to the housing. The input shaft is inserted through the center of the impeller and splined into the turbine. The design of the turbine is similar to the impeller, except the blades of the turbine are curved in the opposite direction.

STATOR

The stator assembly is mounted on a stationary shaft which is an integral part of the oil pump. The stator (1) is located between the impeller (2) and the turbine (4) within the torque converter case.

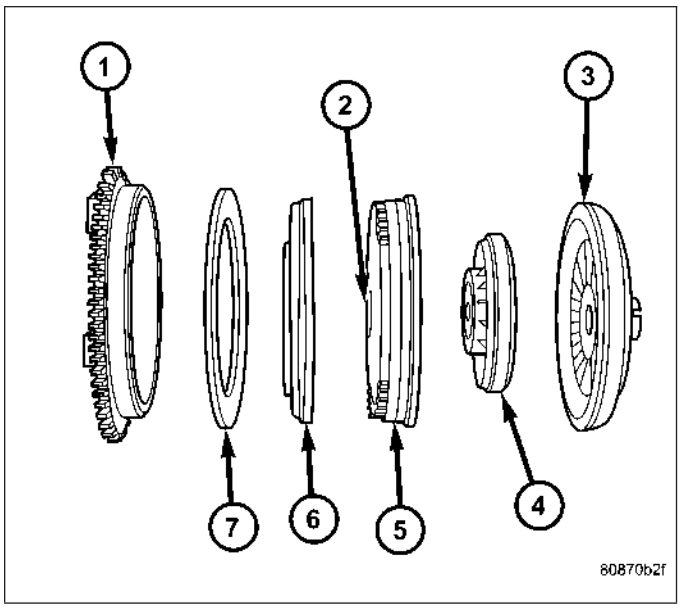


The stator contains an over-running clutch (1-4), which allows the stator to rotate only in a clockwise direction. When the stator is locked against the over-running clutch, the torque multiplication feature of the torque converter is operational.



TORQUE CONVERTER CLUTCH (TCC)

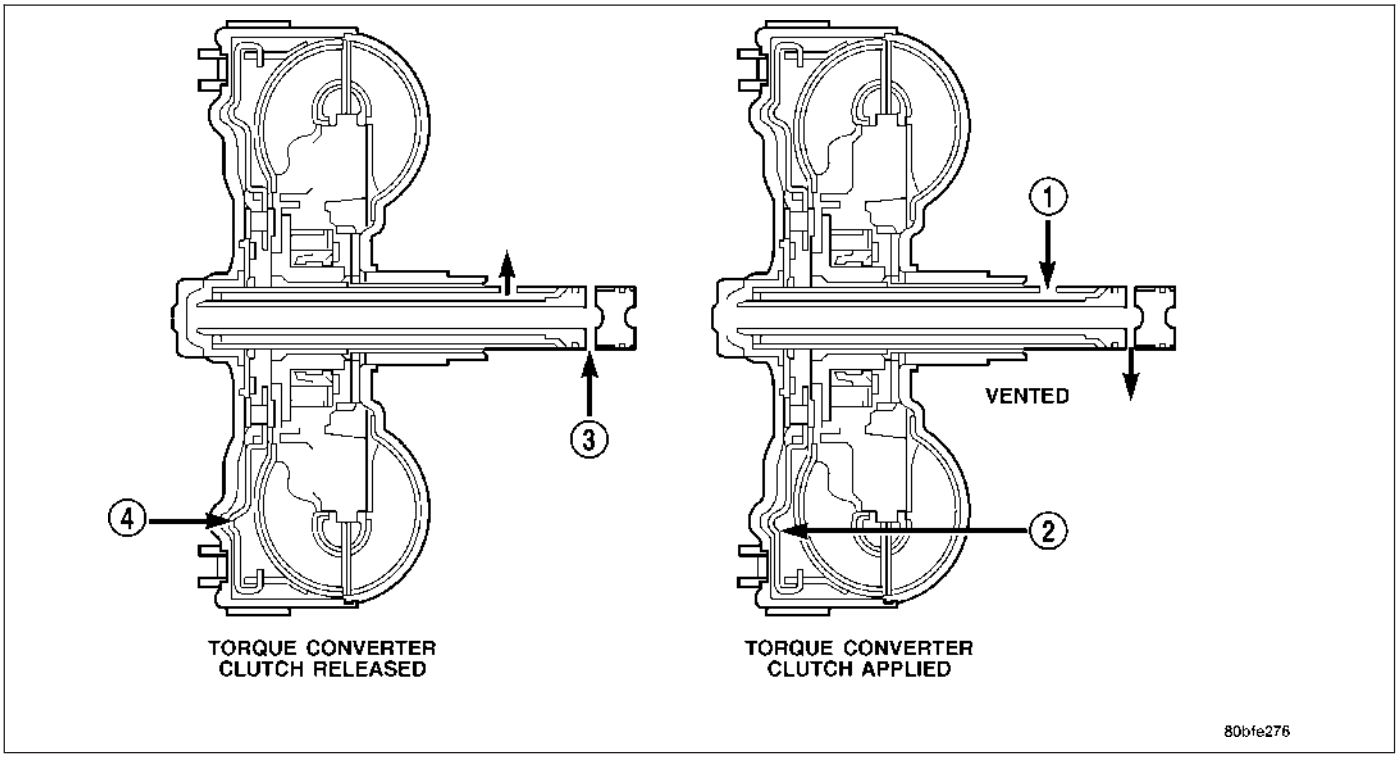
The TCC was installed to improve the efficiency of the torque converter that is lost to the slippage of the fluid coupling. Although the fluid coupling provides smooth, shock-free power transfer, it is natural for all fluid couplings to slip. If the impeller (3) and turbine (5) were mechanically locked together, a zero slippage condition could be obtained. A hydraulic piston (6) with friction material (7) was added to the turbine assembly (5) to provide this mechanical lock-up.



In order to reduce heat build-up in the transmission and buffer the powertrain against torsional vibrations, the TCM can duty cycle the L/R-CC Solenoid to achieve a smooth application of the torque converter clutch. This function, referred to as Electronically Modulated Converter Clutch (EMCC) can occur at various times depending on the following variables:

- Shift lever position
- Current gear range
- Transmission fluid temperature
- Engine coolant temperature
- Input speed
- Throttle angle
- Engine speed

OPERATION



Torque Converter Fluid Operation - Typical

1 - APPLY PRESSURE
2 - THE PISTON MOVES SLIGHTLY FORWARD
3 - RELEASE PRESSURE
4 - THE PISTON MOVES SLIGHTLY REARWARD

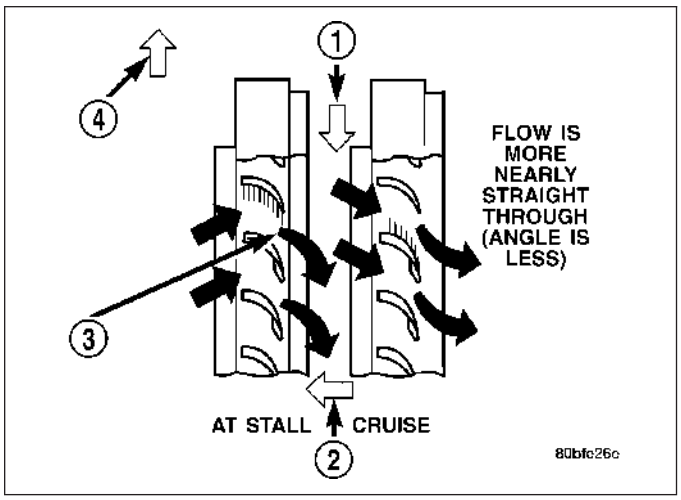
The converter impeller (driving member), which is integral to the converter housing and bolted to the engine drive plate, rotates at engine speed. The converter turbine (driven member), which reacts from fluid pressure generated by the impeller, rotates and turns the transmission input shaft.

TURBINE

As the fluid that was put into motion by the impeller blades strikes the blades of the turbine, some of the energy and rotational force is transferred into the turbine and the input shaft. This causes both of them (turbine and input shaft) to rotate in a clockwise direction following the impeller. As the fluid is leaving the trailing edges of the turbine's blades it continues in a "hindering" direction back toward the impeller. If the fluid is not redirected before it strikes the impeller, it will strike the impeller in such a direction that it would tend to slow it down.

STATOR

Torque multiplication is achieved by locking the stator's over-running clutch to its shaft. Under stall conditions (the turbine is stationary), the oil leaving the turbine blades strikes the face of the stator blades and tries to rotate them in a counterclockwise direction. When this happens the over-running clutch of the stator locks and holds the stator from rotating. With the stator locked, the oil strikes the stator blades and is redirected into a "helping" direction before it enters the impeller. This circulation of oil from impeller to turbine, turbine to stator, and stator to impeller, can produce a maximum torque multiplication of about 2.4:1. As the turbine begins to match the speed of the impeller, the fluid that was hitting the stator in such as way as to cause it to lock-up is no longer doing so. In this condition of operation, the stator begins to free wheel and the converter acts as a fluid coupling.



1 - DIRECTION STATOR WILL FREE WHEEL DUE TO OIL PUSHING ON BACKSIDE OF VANES
2 - FRONT OF ENGINE
3 - INCREASED ANGLE AS OIL STRIKES VANES
4 - DIRECTION STATOR IS LOCKED UP DUE TO OIL PUSHING AGAINST STATOR VANES

TORQUE CONVERTER CLUTCH (TCC)

In a standard torque converter, the impeller and turbine are rotating at about the same speed and the stator is freewheeling, providing no torque multiplication. By applying the turbine's piston and friction material to the front cover, a total converter engagement can be obtained. The result of this engagement is a direct 1:1 mechanical link between the engine and the transmission.

The clutch can be engaged in second, third, and fourth gear ranges depending on overdrive control switch position. If the overdrive control switch is in the normal ON position, the clutch will engage after the shift to fourth gear. If the control switch is in the OFF position, the clutch will engage after the shift to third gear.

The TCM controls the torque converter by way of internal logic software. The programming of the software provides the TCM with control over the L/R-CC Solenoid. There are four output logic states that can be applied as follows:

- No EMCC
- Partial EMCC
- Full EMCC
- Gradual-to-no EMCC

NO EMCC

Under No EMCC conditions, the L/R Solenoid is OFF. There are several conditions that can result in NO EMCC operations. No EMCC can be initiated due to a fault in the transmission or because the TCM does not see the need for EMCC under current driving conditions.

PARTIAL EMCC

Partial EMCC operation modulates the L/R Solenoid (duty cycle) to obtain partial torque converter clutch application. Partial EMCC operation is maintained until Full EMCC is called for and actuated. During Partial EMCC some slip does occur. Partial EMCC will usually occur at low speeds, low load and light throttle situations.

FULL EMCC

During Full EMCC operation, the TCM increases the L/R Solenoid duty cycle to full ON after Partial EMCC control brings the engine speed within the desired slip range of transmission input speed relative to engine rpm.

GRADUAL-TO-NO EMCC

This operation is to soften the change from Full or Partial EMCC to No EMCC. This is done at mid-throttle by decreasing the L/R Solenoid duty cycle.

REMOVAL

1. Remove transmission and torque converter from vehicle. (Refer to 21 - TRANSMISSION/AUTOMATIC - 545RFE/42RLE - REMOVAL)
2. Place a suitable drain pan under the converter housing end of the transmission.

CAUTION: Verify that transmission is secure on the lifting device or work surface, the center of gravity of the transmission will shift when the torque converter is removed creating an unstable condition. The torque converter is a heavy unit. Use caution when separating the torque converter from the transmission.

3. Pull the torque converter forward until the center hub clears the oil pump seal.
4. Separate the torque converter from the transmission.

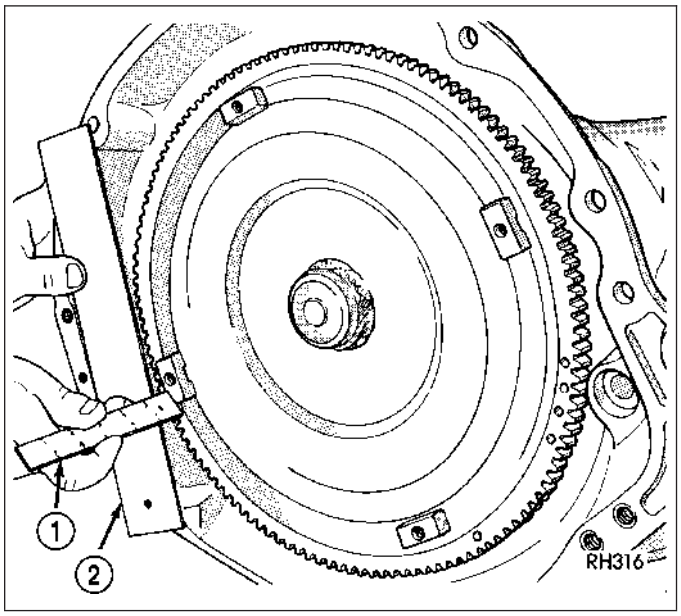
INSTALLATION

NOTE: Check converter hub and drive notches for sharp edges, burrs, scratches, or nicks. Polish the hub and notches with 320/400 grit paper or crocus cloth if necessary. The hub must be smooth to avoid damaging the pump seal at installation.

1. Lubricate oil pump seal lip with transmission fluid.
2. Place torque converter in position on transmission.

CAUTION: Do not damage oil pump seal or bushing while inserting torque converter into the front of the transmission.

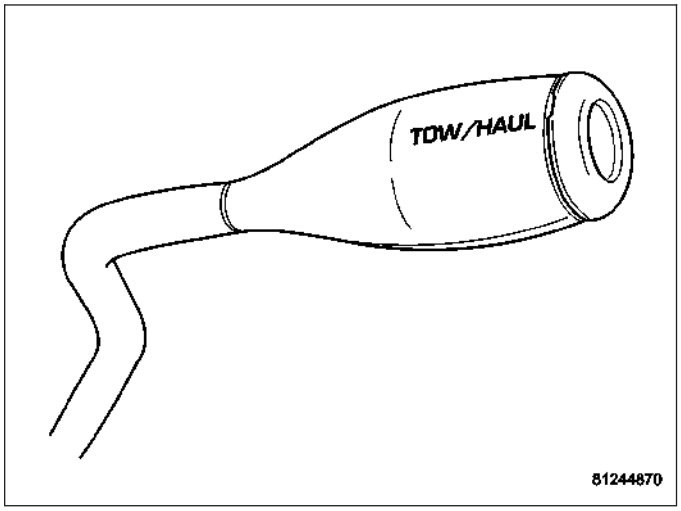
3. Align torque converter to oil pump seal opening.
4. Insert torque converter hub into oil pump.
5. While pushing torque converter inward, rotate converter until converter is fully seated in the oil pump gears.
6. Check converter seating with a scale (1) and straightedge (2). Surface of converter lugs should be 1/2 in. to rear of straightedge when converter is fully seated.
7. If necessary, temporarily secure converter with C-clamp attached to the converter housing.
8. Install the transmission in the vehicle.
9. Fill the transmission with the recommended fluid.



SWITCH-TOW/HAUL OVERDRIVE

DESCRIPTION

The tow/haul overdrive OFF (control) switch is located in the shift lever arm. The switch is a momentary contact device that signals the PCM to toggle current status of the overdrive function.

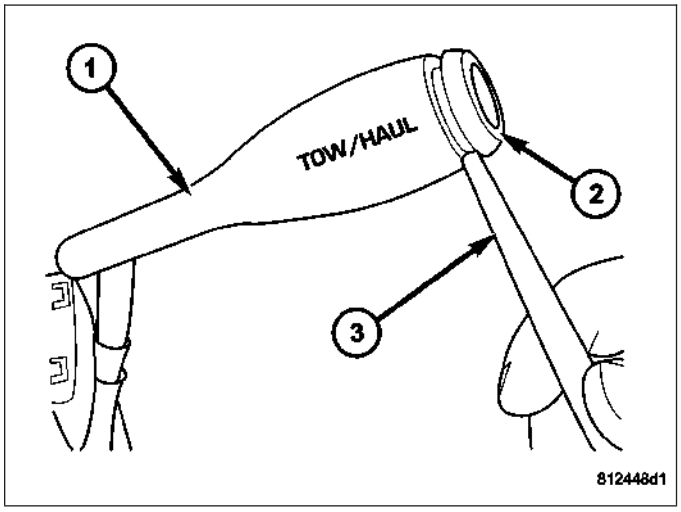


OPERATION

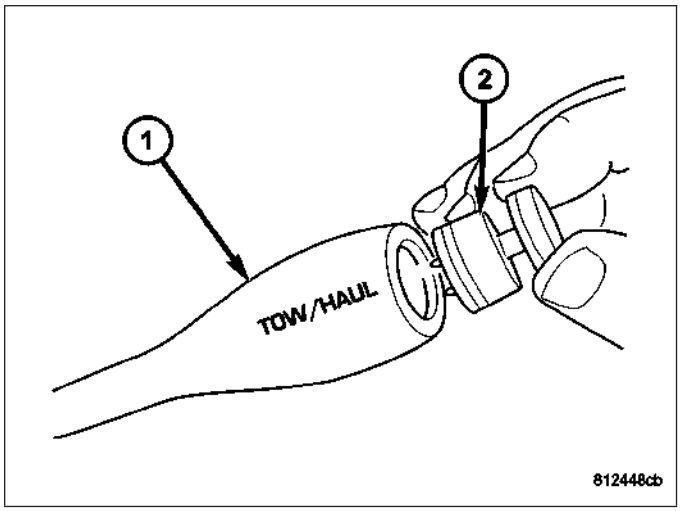
At key-on, overdrive operation is allowed. Pressing the switch once causes the tow/haul overdrive OFF mode to be entered and the Tow/Haul lamp to be illuminated. Pressing the switch a second time causes normal overdrive operation to be restored and the tow/haul lamp to be turned off. The tow/haul overdrive OFF mode defaults to ON after the ignition switch is cycled OFF and ON. The normal position for the control switch is the ON position. The switch must be in this position to energize the solenoid and allow a 3-4 upshift. The control switch indicator light illuminates only when the tow/haul overdrive switch is turned to the OFF position, or when illuminated by the transmission control module.

REMOVAL

1. Using a plastic trim tool, remove the tow/haul overdrive off switch retainer (2) from the shift lever (1).



2. Pull the switch (2) outwards to release it from the connector in the lever (1)



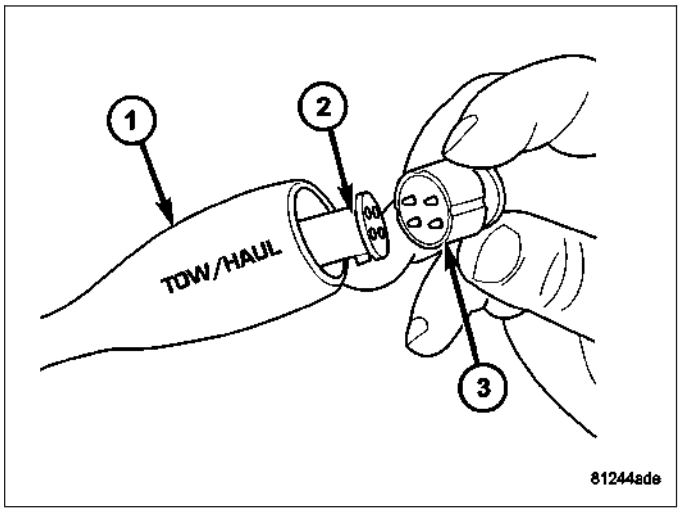
INSTALLATION

NOTE: There is enough slack in the wire to pull out the connector from the lever.

1. Pull the connector (2) out of the lever (1) just enough to grasp it.

CAUTION: Be careful not to bend the pins on the tow/haul overdrive off switch. Use care when installing the switch, as it is not indexed, and can be accidentally installed incorrectly.

2. Install the tow/haul overdrive off switch (3) into the connector (2)
3. Push the tow/haul overdrive off switch (3) and wiring into the shift lever (1).
4. Install the tow/haul overdrive off switch retainer onto the shift lever.



RELAY-TRANSMISSION CONTROL

DESCRIPTION

The relay is supplied fused B+ voltage, energized by the TCM, and is used to supply power to the solenoid pack when the transmission is in normal operating mode.

OPERATION

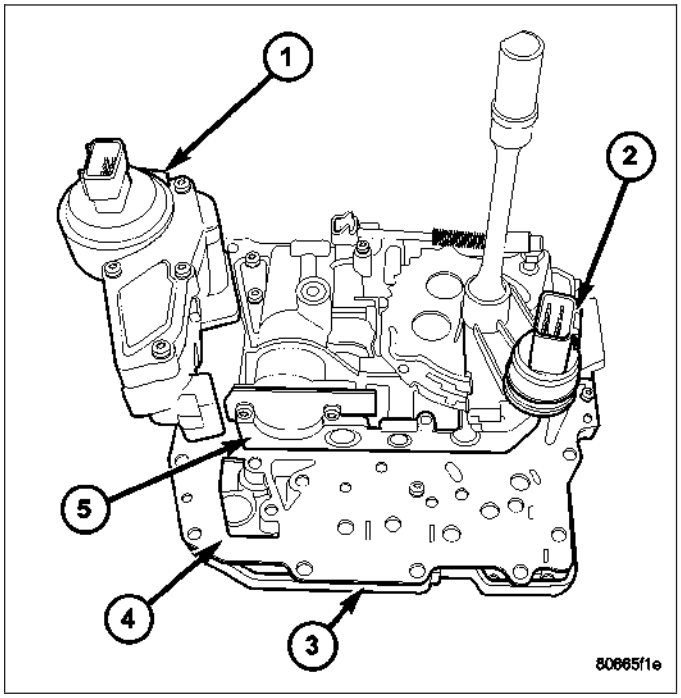
When the relay is “off”, no power is supplied to the solenoid pack and the transmission is in “limp-in” mode. After a controller reset, the TCM energizes the relay. Prior to this, the TCM verifies that the contacts are open by checking for no voltage at the switched battery terminals. After this is verified, the voltage at the solenoid pack pressure switches is checked. After the relay is energized, the TCM monitors the terminals to verify that the voltage is greater than 3 volts.

SENSOR-TRANSMISSION RANGE

DESCRIPTION

The Transmission Range Sensor (TRS) (2) is mounted to the top of the valve body inside the transmission and can only be serviced by removing the valve body assembly. The electrical connector extends through the transmission case.

The Transmission Range Sensor (TRS) has four switch contacts that monitor shift lever position and send the information to the PCM.



OPERATION

The Transmission Range Sensor (TRS) communicates shift lever position (SLP) to the TCM as a combination of open and closed switches. Each shift lever position has an assigned combination of switch states (open/closed) that the TCM receives from four sense circuits. The TCM interprets this information and determines the appropriate transmission gear position and shift schedule.

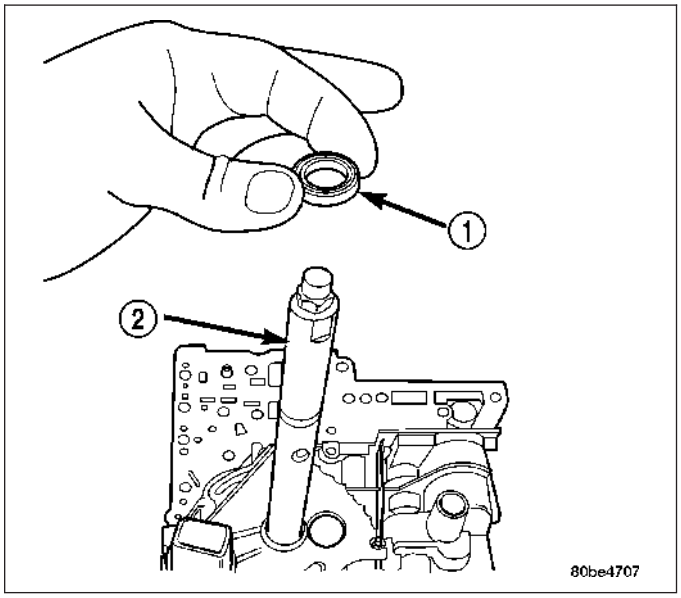
Since there are four switches, there are 16 possible combinations of open and closed switches (codes). Seven of these codes are related to gear position and three are recognized as “between gear” codes. This results in six codes which should never occur. These are called “invalid” codes. An invalid code will result in a DTC, and the TCM will then determine the shift lever position based on pressure switch data. This allows reasonably normal transmission operation with a TRS failure.

TRS SWITCH STATES

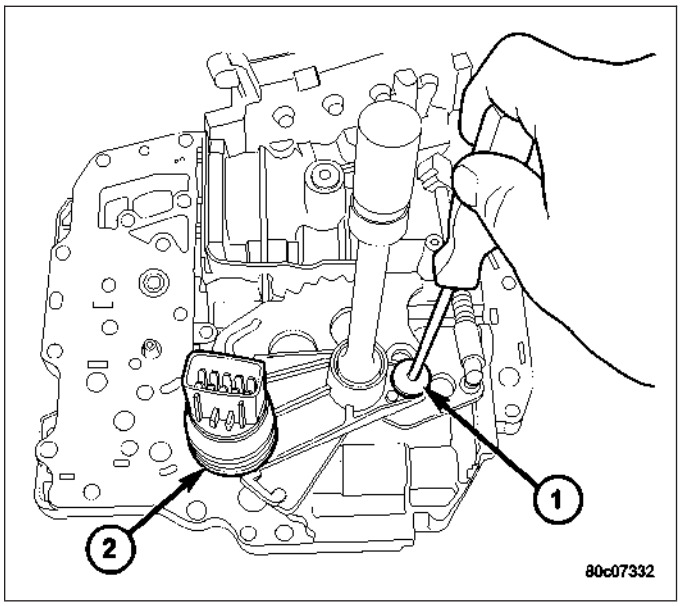
SLP	T42	T41	T3	T1
P	CL	CL	CL	OP
R	CL	OP	OP	OP
N	CL	CL	OP	CL
D	OP	OP	OP	CL
2	OP	OP	CL	OP
1	CL	OP	CL	CL

REMOVAL

1. Remove valve body assembly from vehicle. (Refer to 21 - TRANSMISSION/AUTOMATIC - 42RLE/ VALVE BODY - REMOVAL)
2. Remove the manual shaft seal (1).

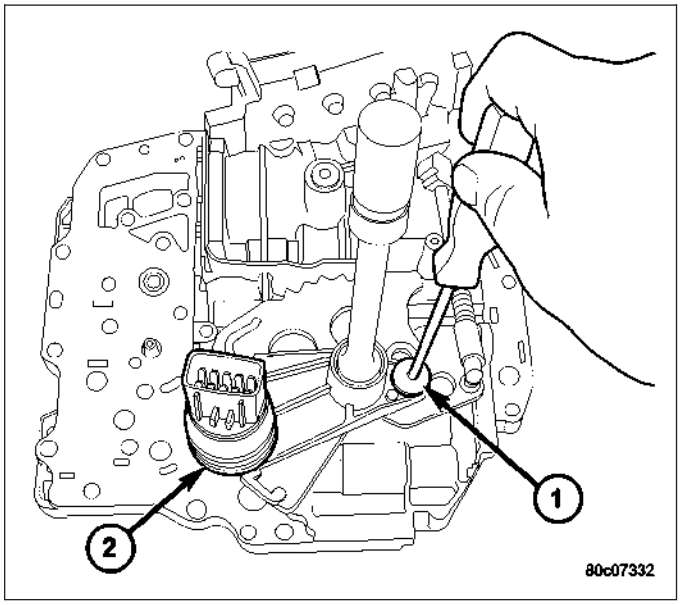


3. Remove manual shaft/TRS retaining screw (1).
4. Slide TRS off of manual valve shaft.

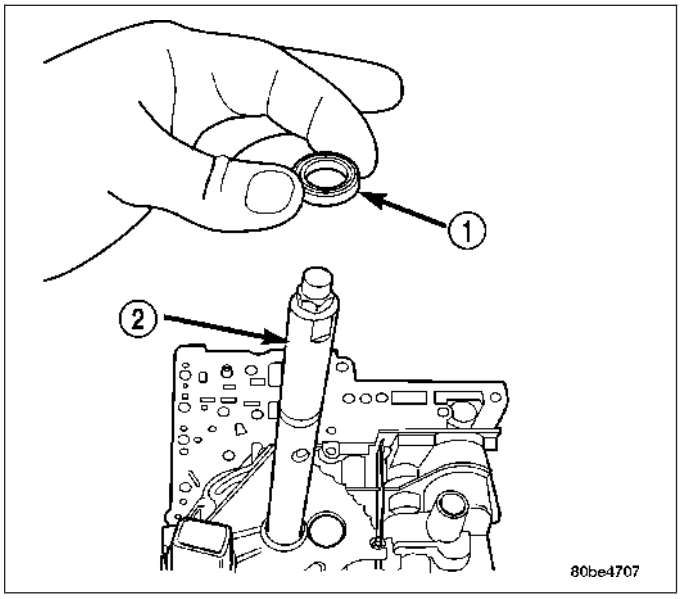


INSTALLATION

1. Install the TRS (2) to the manual shaft. Make sure TRS locating pin rests in manual valve bore slot.
2. Install the TRS/manual shaft retaining screw (1) and torque to 5 N·m (45 in. lbs.) torque.



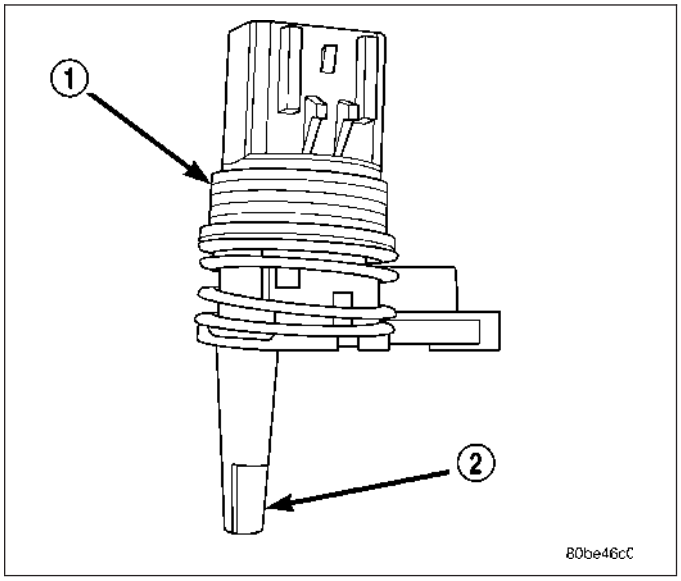
3. Install the manual shaft seal (1).
4. Install valve body to the transmission. (Refer to 21 - TRANSMISSION//AUTOMATIC - 42RLE/VALVE BODY - INSTALLATION)



SENSOR-TRANSMISSION TEMPERATURE

DESCRIPTION

The transmission temperature sensor (2) is located in the transmission range sensor (1) and communicates transmission sump temperature to the TCM.



OPERATION

The transmission range sensor (TRS) has an integrated thermistor that the TCM uses to monitor the transmission's sump temperature. Since fluid temperature can affect transmission shift quality and convertor lock up, the TCM requires this information to determine which shift schedule to operate in. The TCM also monitors this temperature data so it can energize the vehicle cooling fan(s) when a transmission "overheat" condition exists. If the thermistor circuit fails, the TCM will revert to calculated oil temperature usage.

CALCULATED TEMPERATURE

A failure in the temperature sensor or circuit will result in calculated temperature being substituted for actual temperature. Calculated temperature is a predicted fluid temperature which is calculated from a combination of inputs:

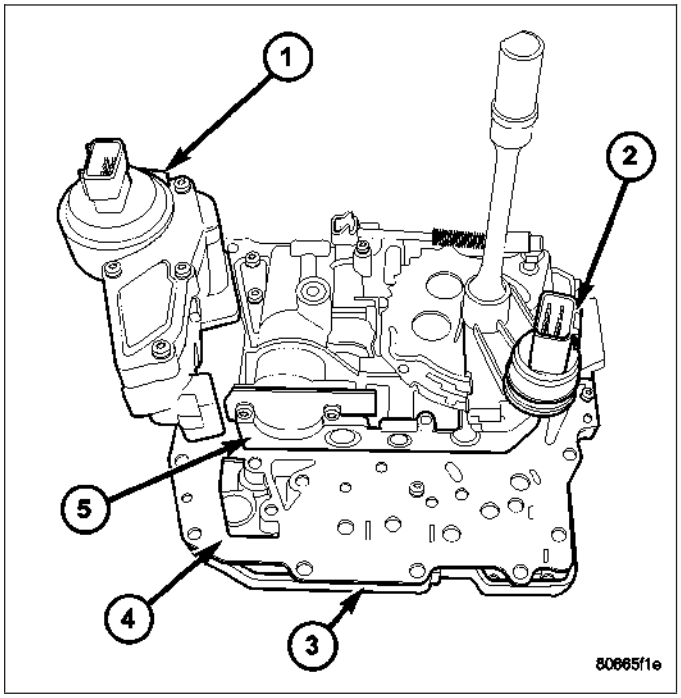
- Battery (ambient) temperature
- Engine coolant temperature
- In-gear run time since start-up

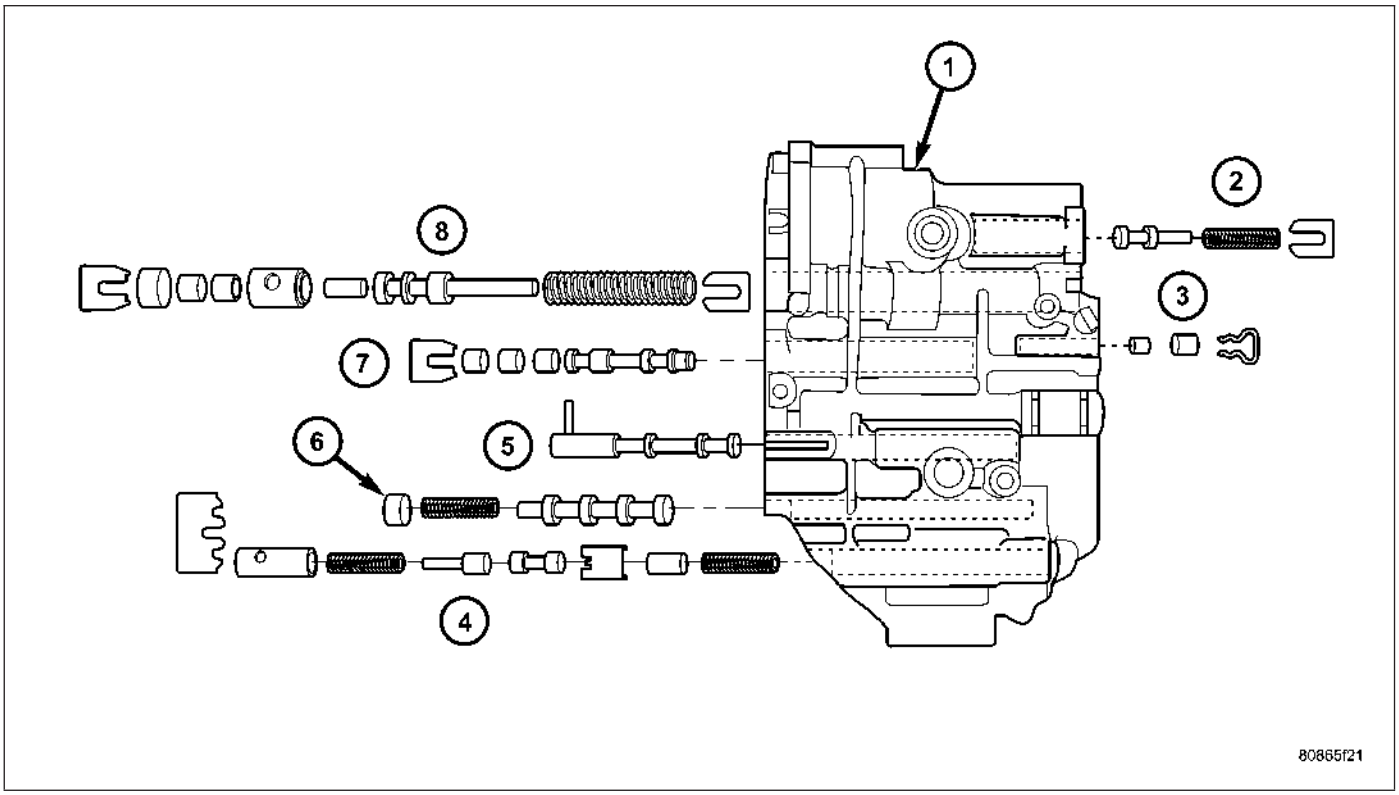
BODY-VALVE

DESCRIPTION

The valve body assembly consists of a cast aluminum valve body (5),separator plate (4), and transfer plate (3). The valve body contains valves and check balls that control fluid delivery to the torque converter clutch, solenoid/pressure switch assembly, and frictional clutches.

Also mounted to the valve body assembly are the solenoid/pressure switch assembly and the transmission range sensor (2).





Valve Body - Exploded

1 - VALVE BODY
2 - T/C REGULATOR VALVE
3 - L/R SWITCH VALVE
4 - CONVERTER CLUTCH CONTROL VALVE
5 - MANUAL VALVE
6 - CONVERTER CLUTCH SWITCH VALVE
7 - SOLENOID SWITCH VALVE
8 - REGULATOR VALVE

The valves contained within the valve body (1) include the following :

- Regulator valve(2)
- Solenoid switch valve(7)
- Manual valve(5)
- Converter clutch switch valve(6)
- Converter clutch control valve(4)
- Torque converter regulator valve(2)
- Low/Reverse switch valve(3)

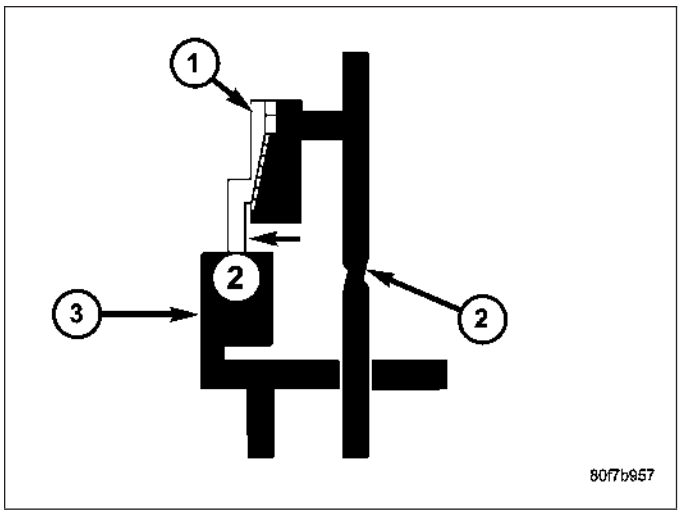
In addition, the valve body also contains the thermal valve, #2, 3, 4 & 5 check balls and the 2/4 accumulator assembly.

OPERATION

NOTE: (Refer to 21 - TRANSMISSION/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS) for a visual aid in determining valve location, operation and design.

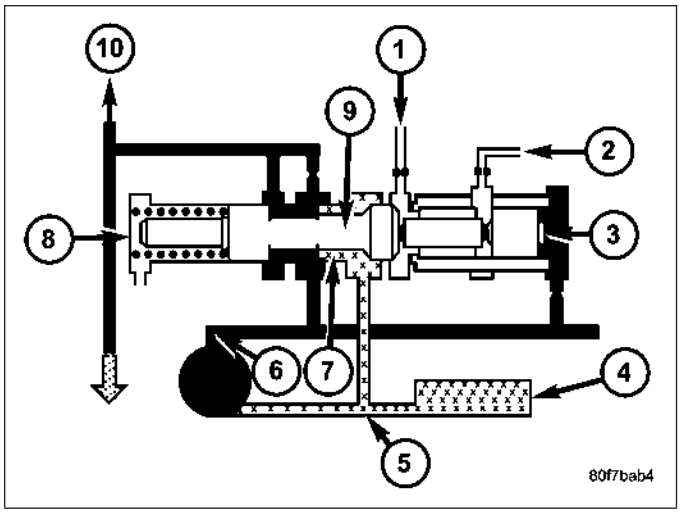
THERMAL VALVE

The thermal valve (1) is a bi-metallic shudder valve that helps control the venting rate of oil pressure in the underdrive clutch passage during release of the clutch. When the oil temperature is approximately 20 degrees Fahrenheit or less, the valve is fully open to assist in venting oil past the U1 orifice (2). At temperatures above 20 degrees, the valve starts to close and becomes fully closed at approximately 140 degrees. The thermal valve is located in the transfer plate of the valve body.



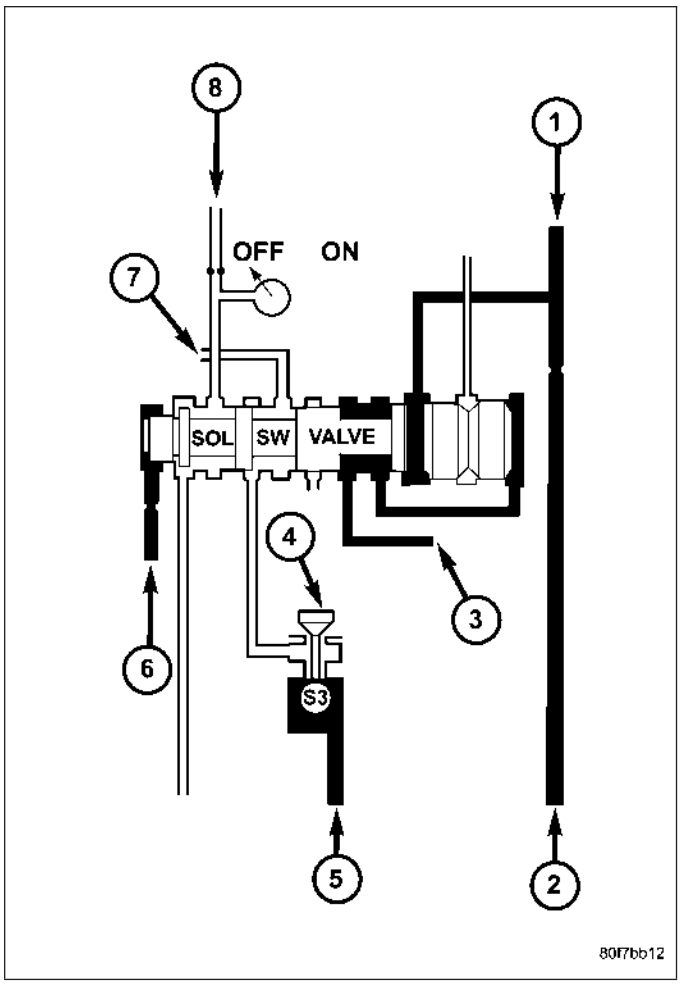
REGULATOR VALVE

The regulator valve (9) controls hydraulic pressure in the transmission. It receives unregulated pressure from the pump (6), which works against spring tension (8) to maintain oil at specific pressures. A system of sleeves and ports allows the regulator valve to work at one of three predetermined pressure levels. Regulated oil pressure is also referred to as “line pressure.”



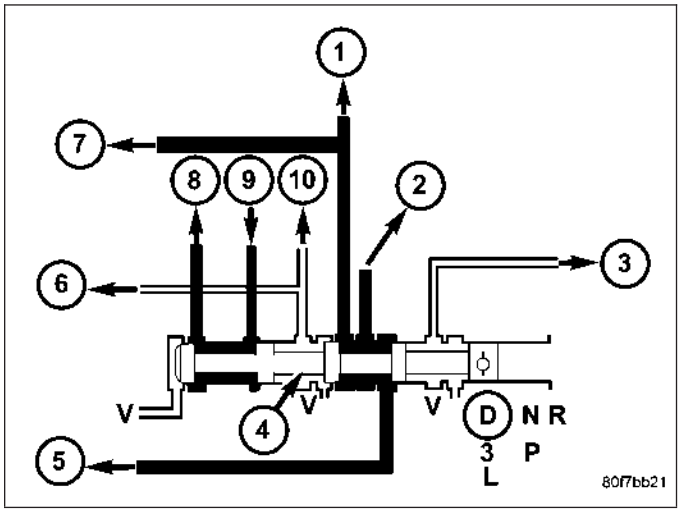
SOLENOID SWITCH VALVE

The solenoid switch valve controls line pressure from the LR/CC solenoid (4). In one position, it allows the low/reverse clutch to be pressurized. In the other, it directs line pressure to the converter control and converter clutch valves (7).



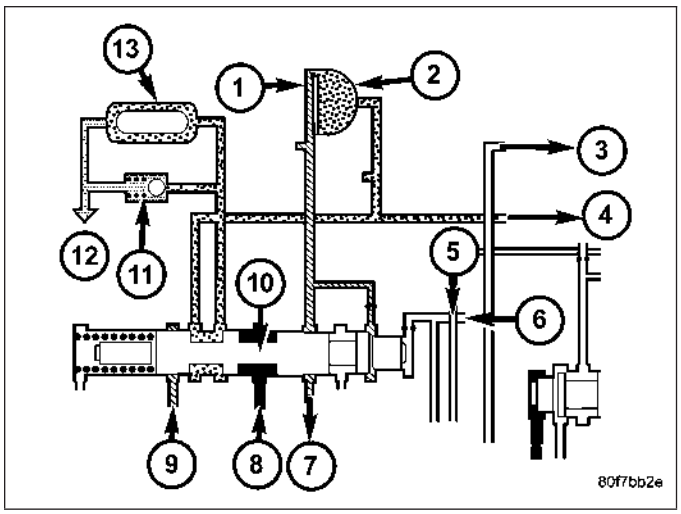
MANUAL VALVE

The manual valve (4) is operated by the mechanical shift linkage. Its primary responsibility is to send line pressure to the appropriate hydraulic circuits and solenoids. The valve has three operating ranges or positions.



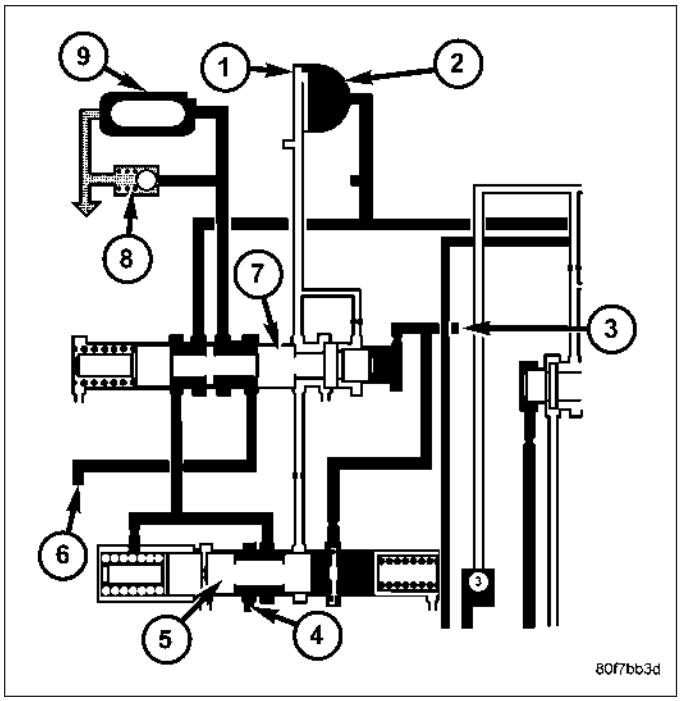
CONVERTER CLUTCH SWITCH VALVE

The main responsibility of the converter clutch switch valve (10) is to control hydraulic pressure applied to the front (off) side of the converter clutch piston. Line pressure from the regulator valve (5) is fed to the torque converter regulator valve (8). The pressure is then directed to the converter clutch switch valve (10) and to the front side of the converter clutch piston. This pressure pushes the piston back and disengages the converter clutch.



CONVERTER CLUTCH CONTROL VALVE

The converter clutch control valve (5) controls the back (on) side of the torque converter clutch (1). When the controller energizes or modulates the LR/CC solenoid to apply the converter clutch piston, both the converter clutch control valve (5) and the converter control valve move, allowing pressure to be applied to the back side of the clutch.



T/C REGULATOR VALVE

The torque converter regulator valve slightly regulates the flow of fluid to the torque converter.

LOW/REVERSE SWITCH VALVE

The low/reverse clutch is applied from different sources, depending on whether low (1st) gear or reverse is selected. The low/reverse switch valve alternates positions depending on from which direction fluid pressure is applied. By design, when the valve is shifted by fluid pressure from one channel, the opposing channel is blocked. The switch valve alienates the possibility of a sticking ball check, thus providing consistent application of the low/reverse clutch under these operating conditions.

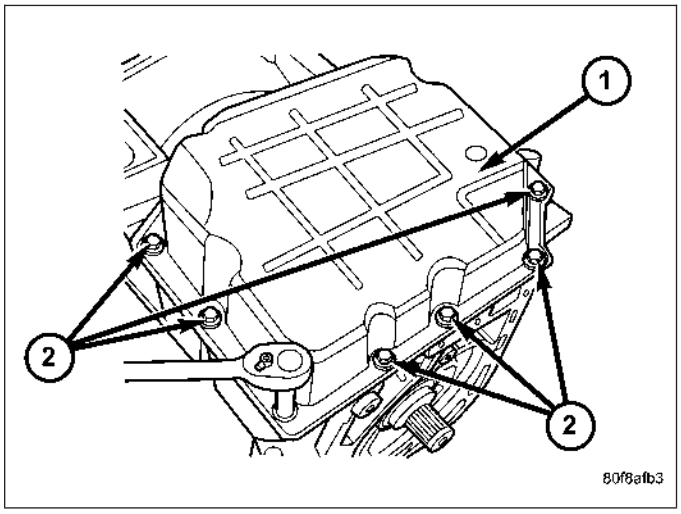
REMOVAL

NOTE: If valve body is being reconditioned or replaced, it is necessary to perform the Quick Learn Procedure. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE)

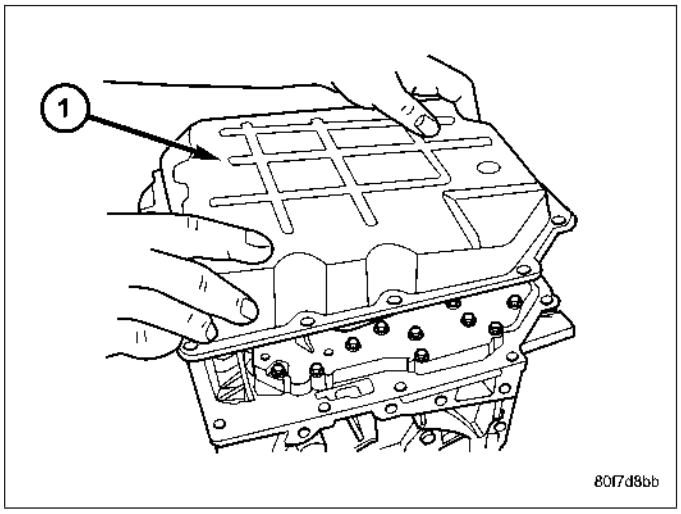
1. Disconnect the TRS and solenoid wiring connectors.
2. Disconnect the shift cable from the shift lever (at the transmission).
3. Move the manual shift lever clockwise as far as it will go. This should be one position past the L position. Then remove the manual shift lever.

NOTE: One of the oil pan bolts has a sealing patch applied from the factory. Separate this bolts for reuse.

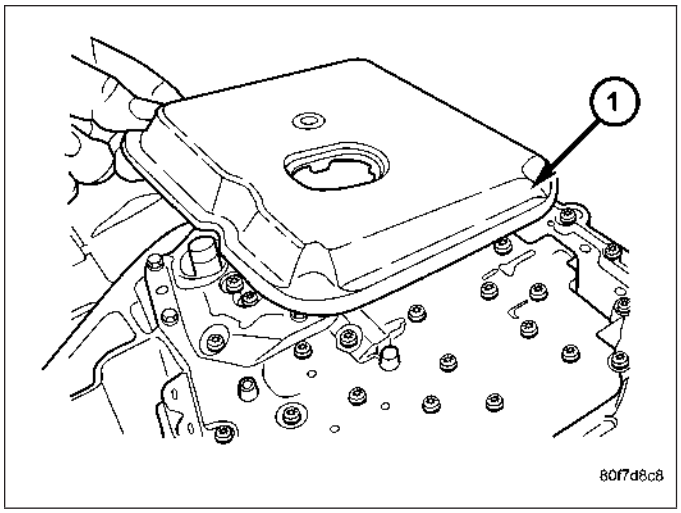
4. Remove transmission pan bolts (2).



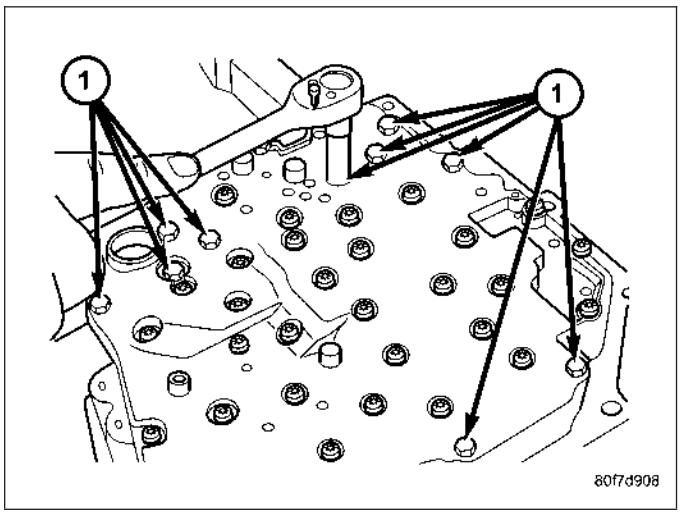
5. Remove transmission oil pan (1).



6. Remove oil filter (1) from valve body. It is held in place by two screws.

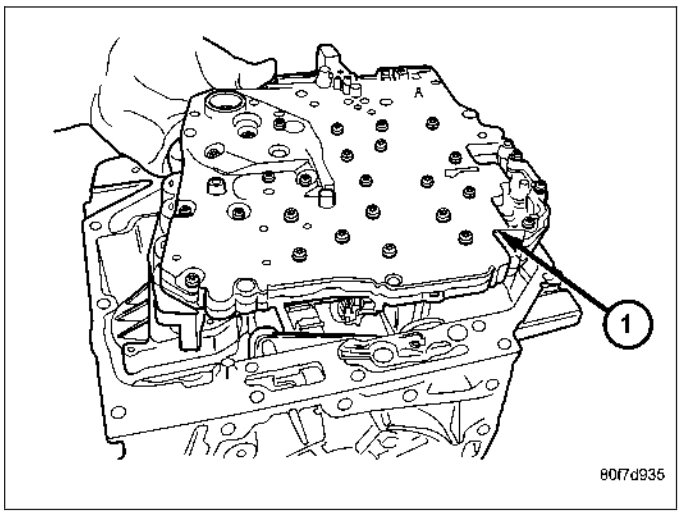


7. Remove valve body bolts-to-case (1).



CAUTION: The overdrive and underdrive accumulators and springs may fall out when removing the valve body.

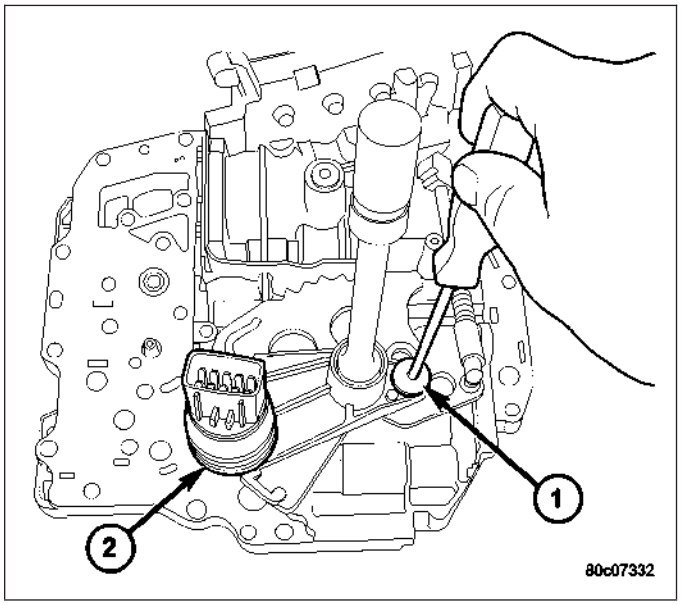
8. Carefully remove valve body assembly (1) from the transmission.



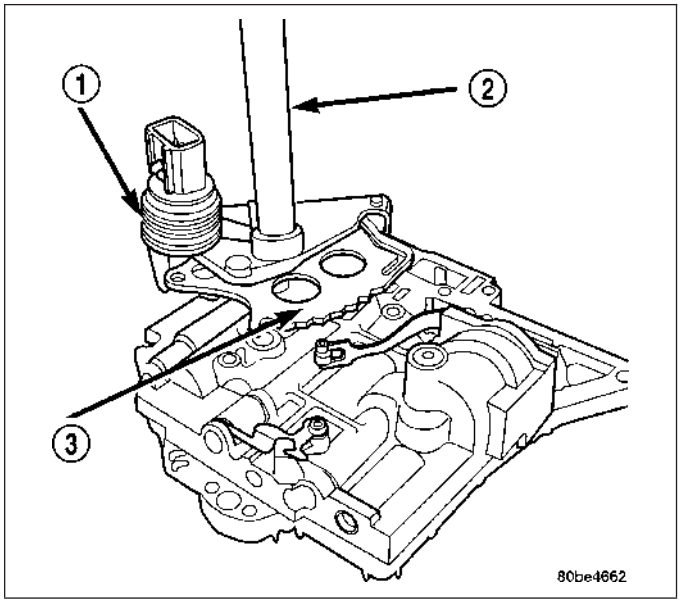
DISASSEMBLY

NOTE: If the valve body is being reconditioned or replaced, it is necessary to perform the Quick Learn Procedure using the scan tool (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE)

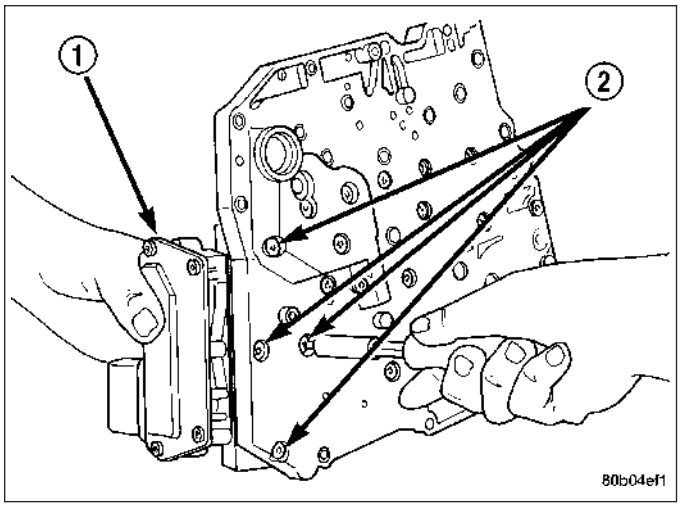
1. Remove manual shaft seal.
2. Remove manual shaft screw (1).



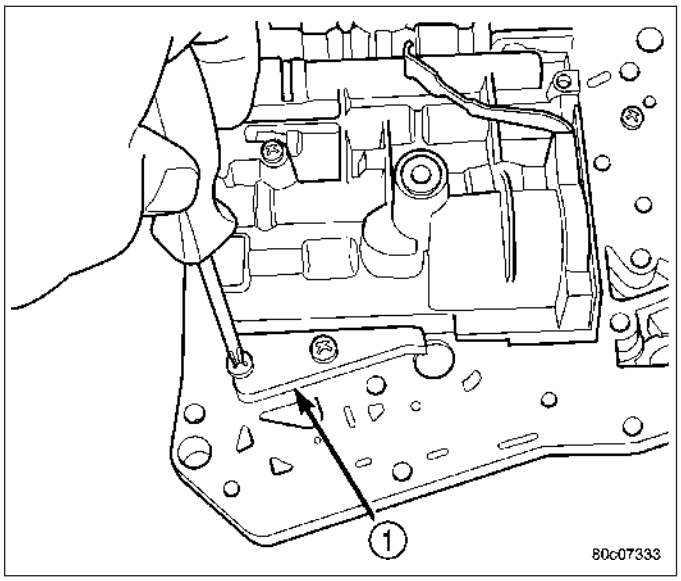
3. Remove Transmission Range Sensor (TRS) (1) and manual shaft (2).



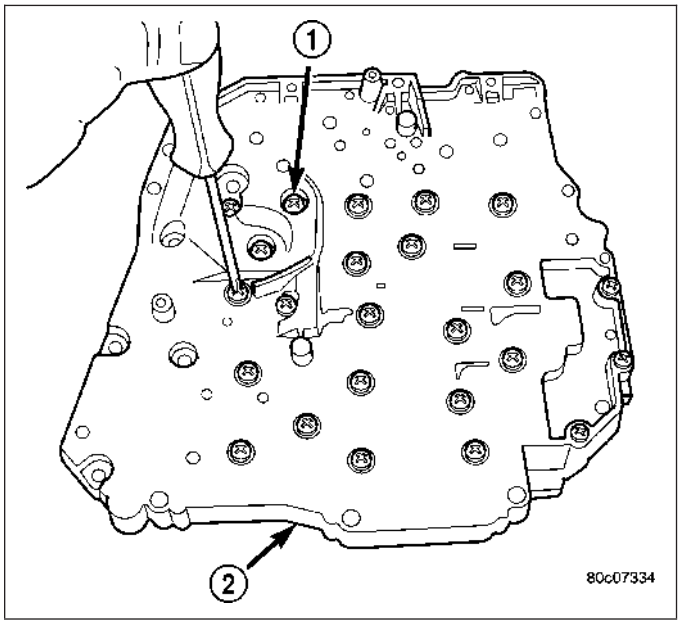
4. Remove Solenoid/Pressure Switch Assembly (1) from valve body.



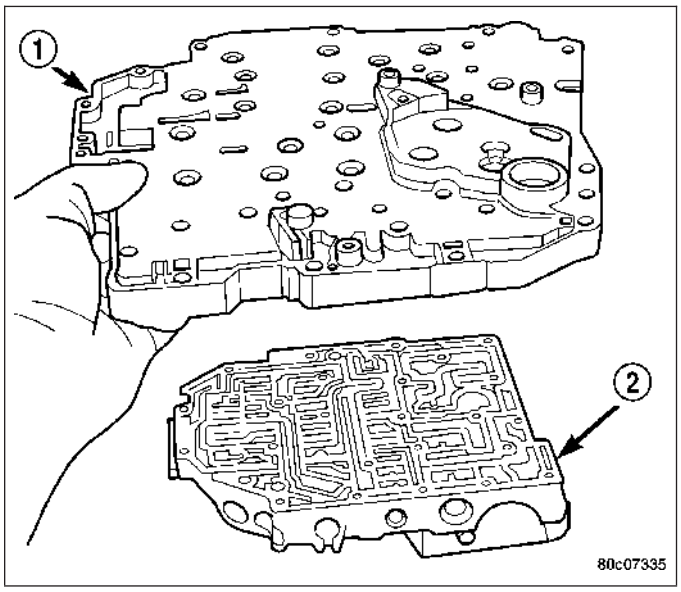
5. Remove valve body stiffener plate (1).



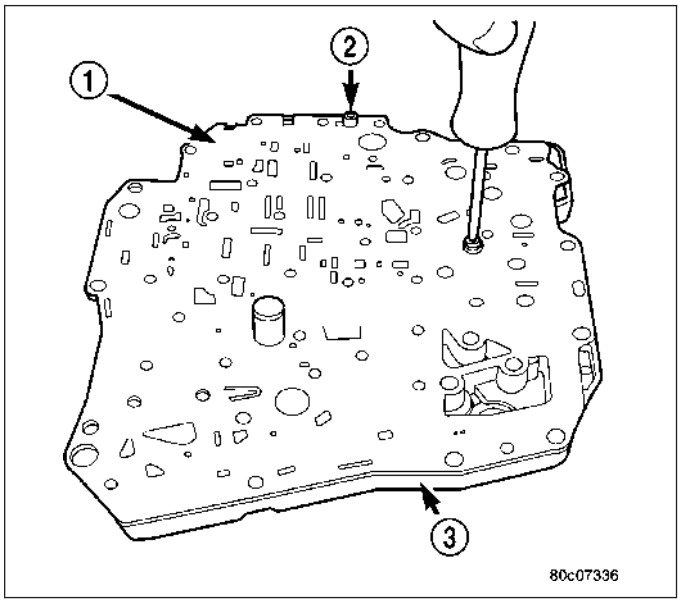
6. Invert valve body assembly and remove transfer plate-to-valve body screws (1).



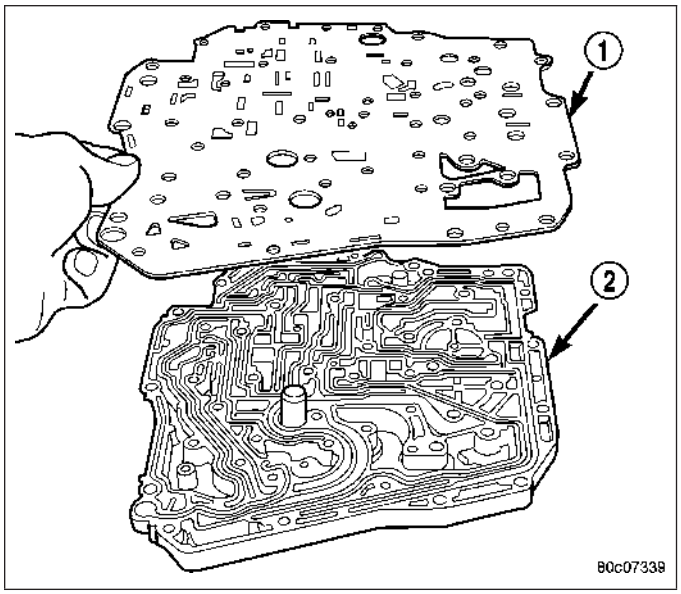
7. Remove transfer/separator plate (1) from valve body (2)



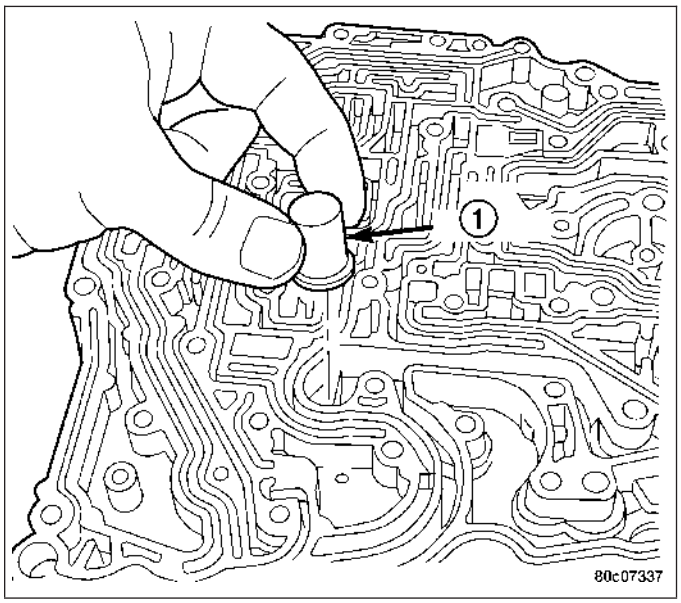
8. Remove separator plate-to-transfer plate screws (2).



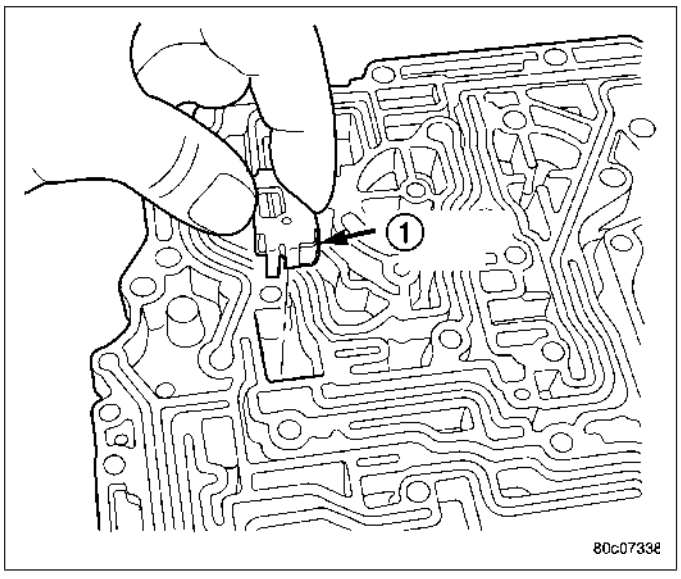
9. Remove separator plate (1) from transfer plate (2).

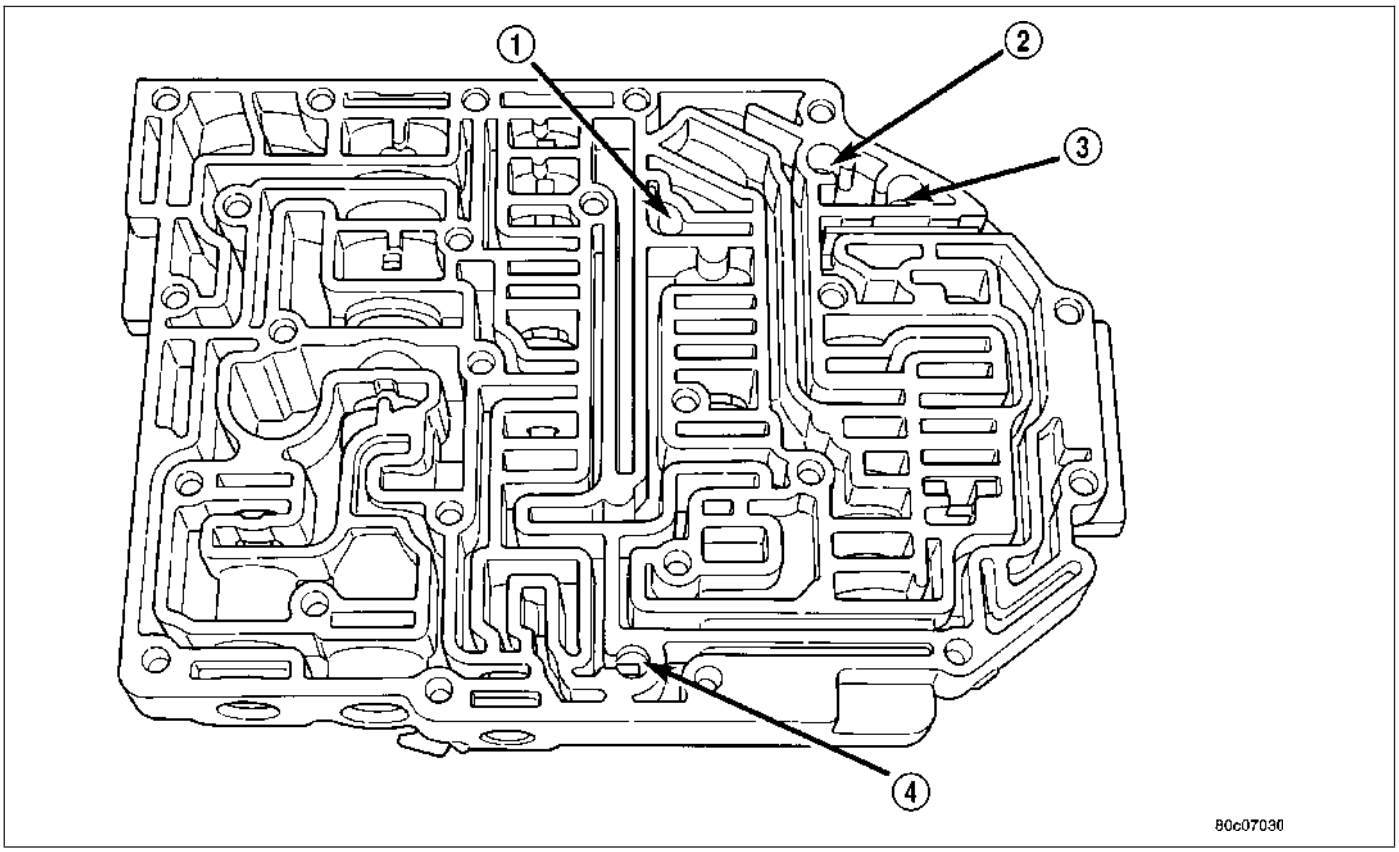


10. Remove the oil screen (1) from the transfer plate.



11. Remove thermal valve (1) from transfer plate.



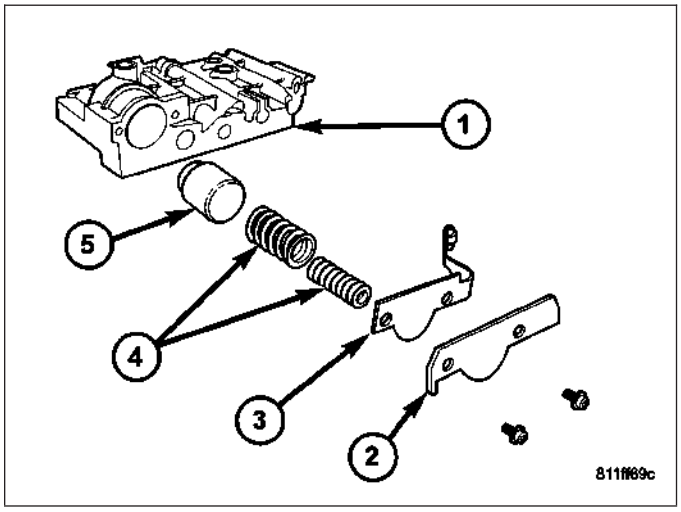


Ball Check Location

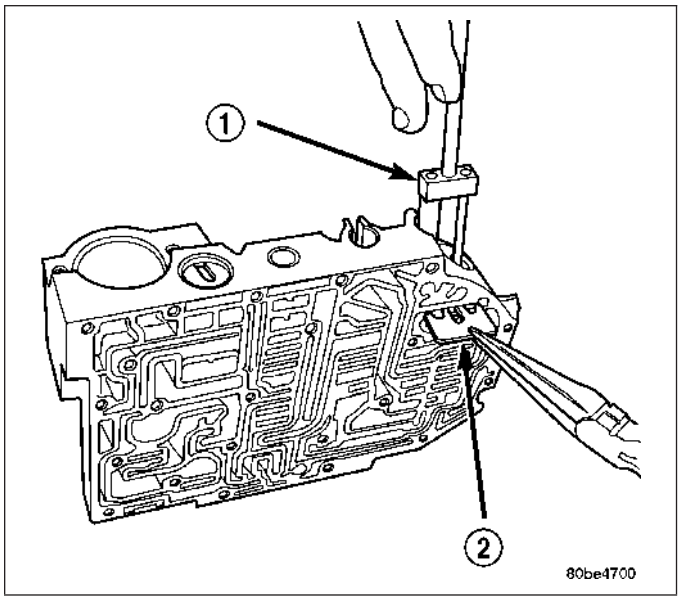
1 - (#4) BALL CHECK LOCATION
2 - (#2) BALL CHECK LOCATION
3 - (#5) BALL CHECK LOCATION
4 - (#3) BALL CHECK LOCATION

12. Remove valve body check balls (1-4). Note their location for assembly ease.

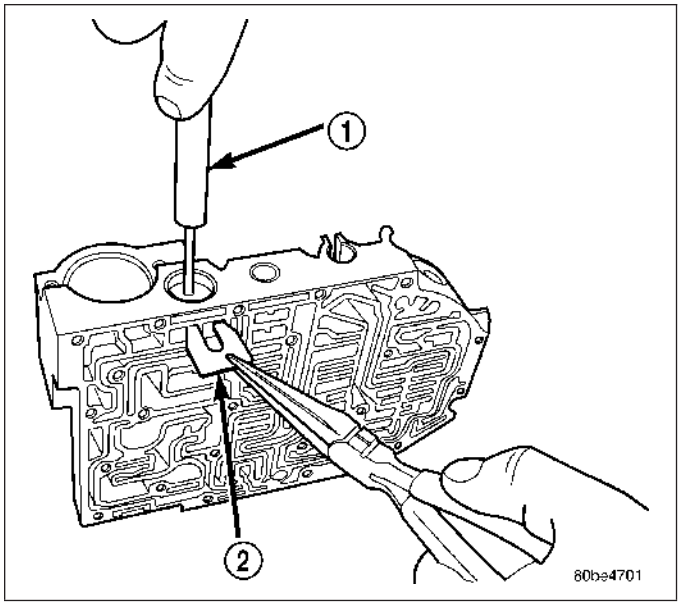
13. Remove 2/4 accumulator assembly (1-5).



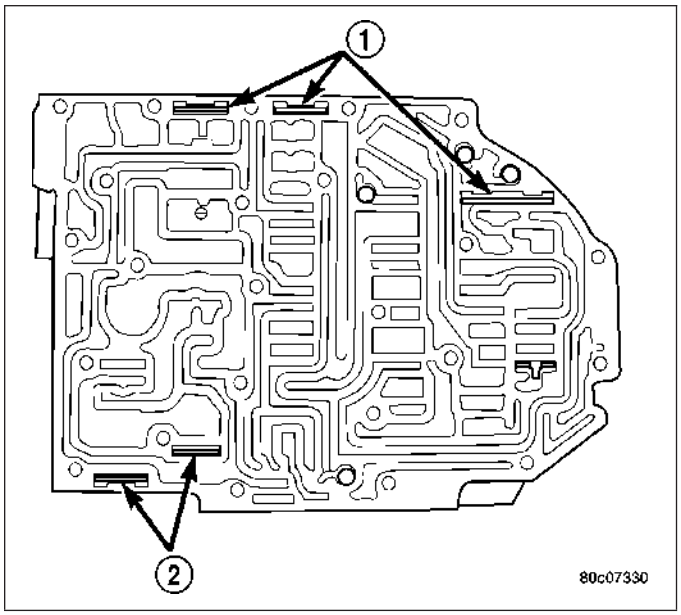
14. Remove dual retainer plate (2) from valve body. Use special tool 6301 (1) to remove plate (2).

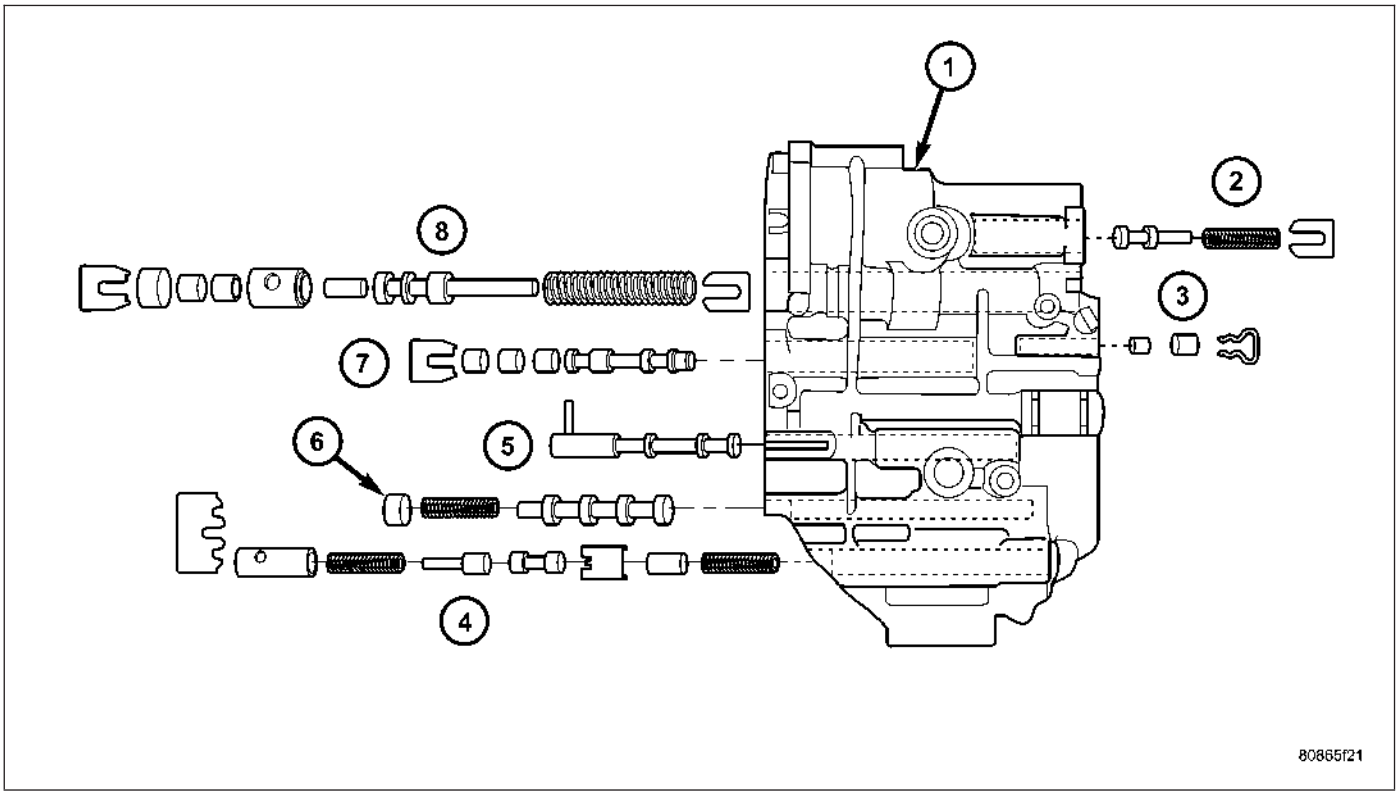


15. Remove regulator valve spring retainer (2).



16. Remove remaining retainers (1, 2).





Valve Body Assembly

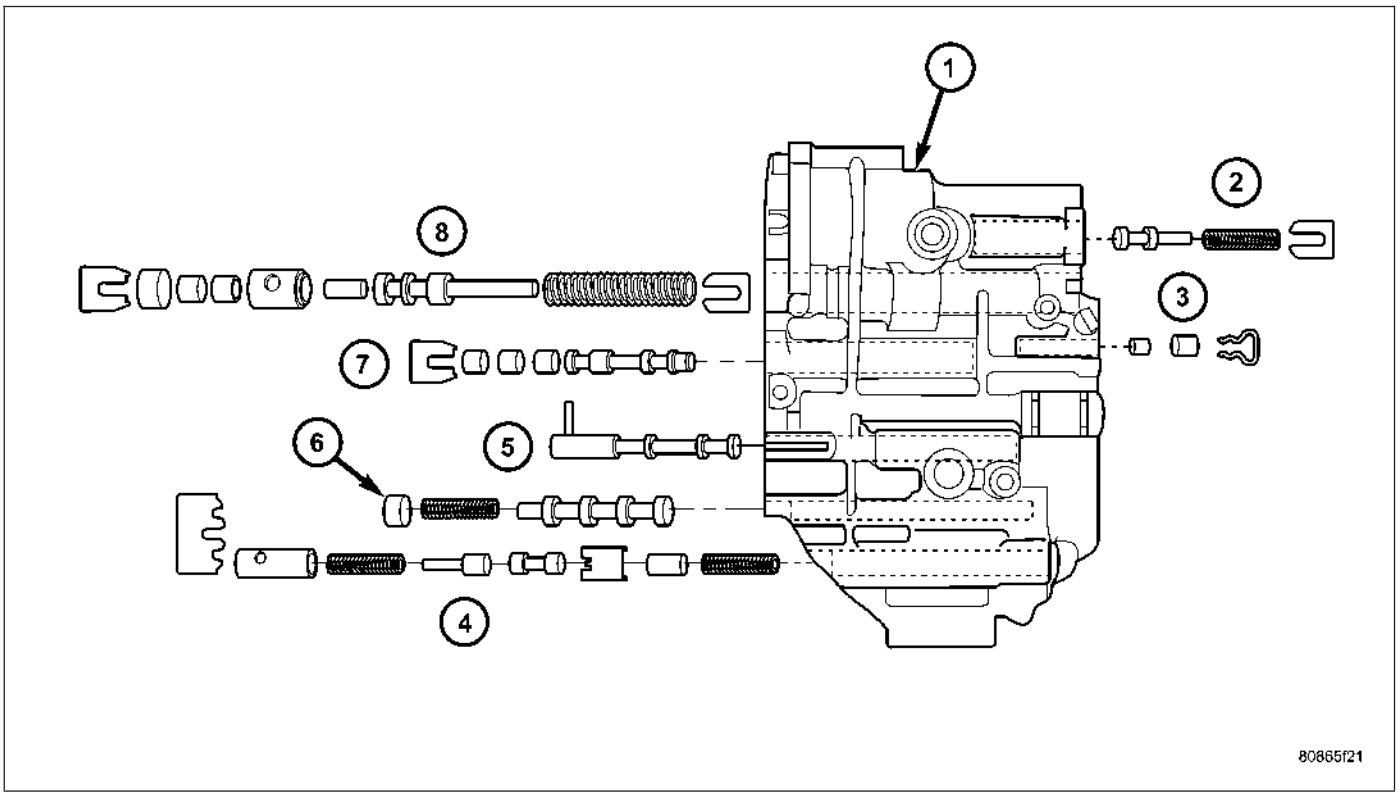
1 - VALVE BODY
2 - T/C REGULATOR VALVE
3 - L/R SWITCH VALVE
4 - CONVERTER CLUTCH CONTROL VALVE
5 - MANUAL VALVE
6 - CONVERTER CLUTCH SWITCH VALVE
7 - SOLENOID SWITCH VALVE
8 - REGULATOR VALVE

17. Remove all valves and springs.
18. Cleanliness through entire disassembly and assembly of the valve body cannot be overemphasized. When disassembling, each part should be washed in a suitable solvent, then dried by compressed air. **Do not wipe**

parts with shop towels. All mating surfaces in the valve body are accurately machined; therefore, careful handling of all parts must be exercised to avoid nicks or burrs.

ASSEMBLY

NOTE: If the valve body assembly is being reconditioned or replaced, it is necessary to perform the Quick Learn Procedure using the scan tool. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE)

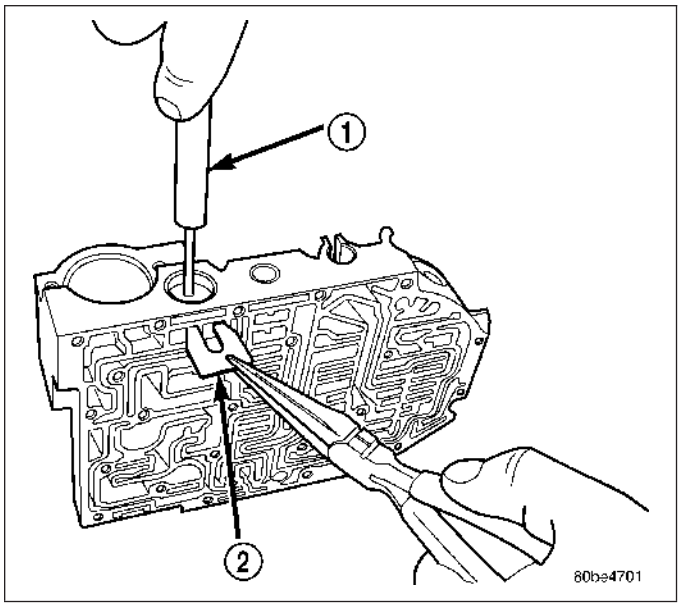


Valve Body Assembly

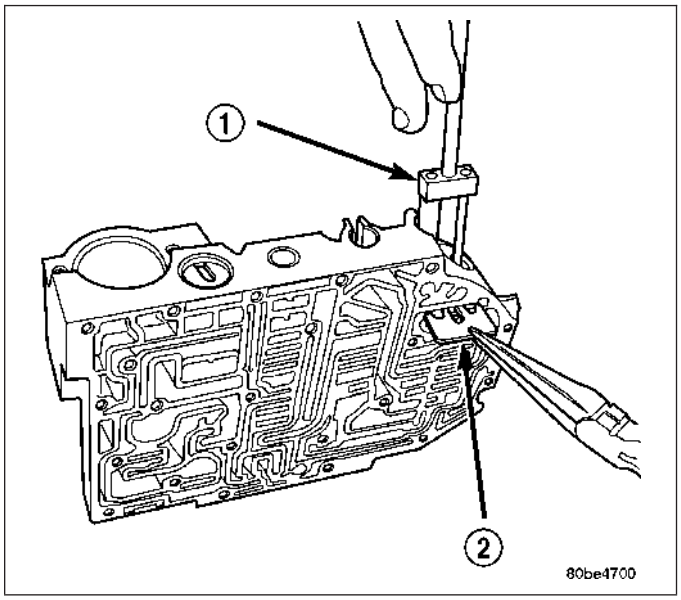
1 - VALVE BODY
2 - T/C REGULATOR VALVE
3 - L/R SWITCH VALVE
4 - CONVERTER CLUTCH CONTROL VALVE
5 - MANUAL VALVE
6 - CONVERTER CLUTCH SWITCH VALVE
7 - SOLENOID SWITCH VALVE
8 - REGULATOR VALVE

1. Install all valves and springs as shown.

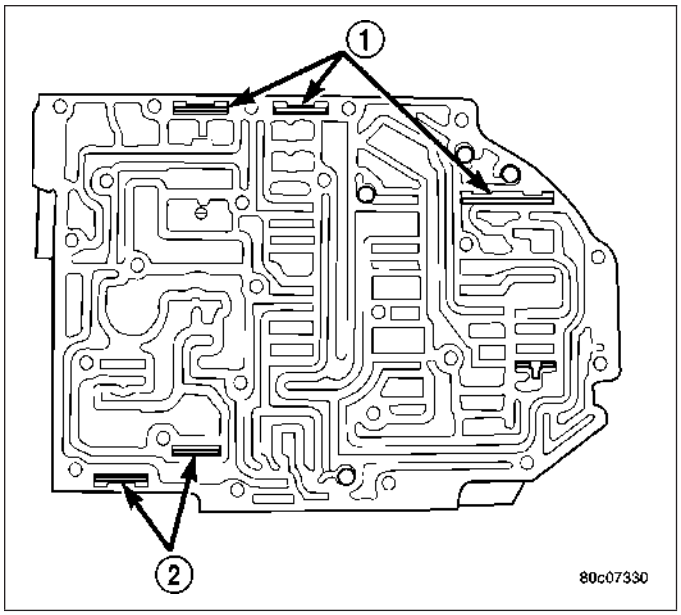
2. Install regulator valve spring retainer (2).



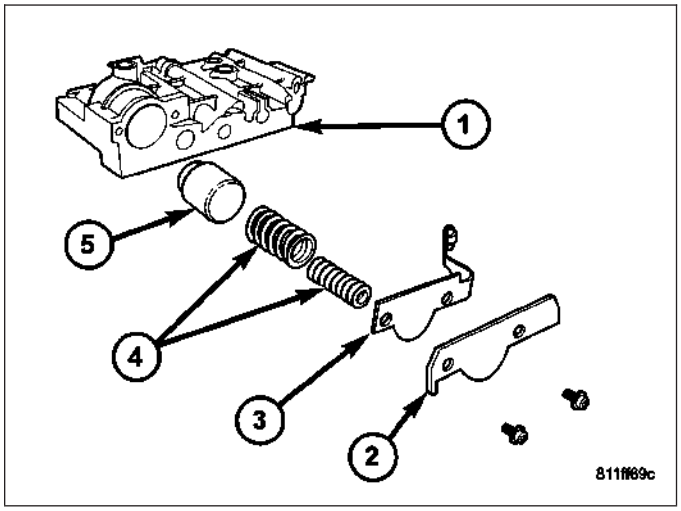
3. Install dual retainer plate (2) using Tool 6301 (1).

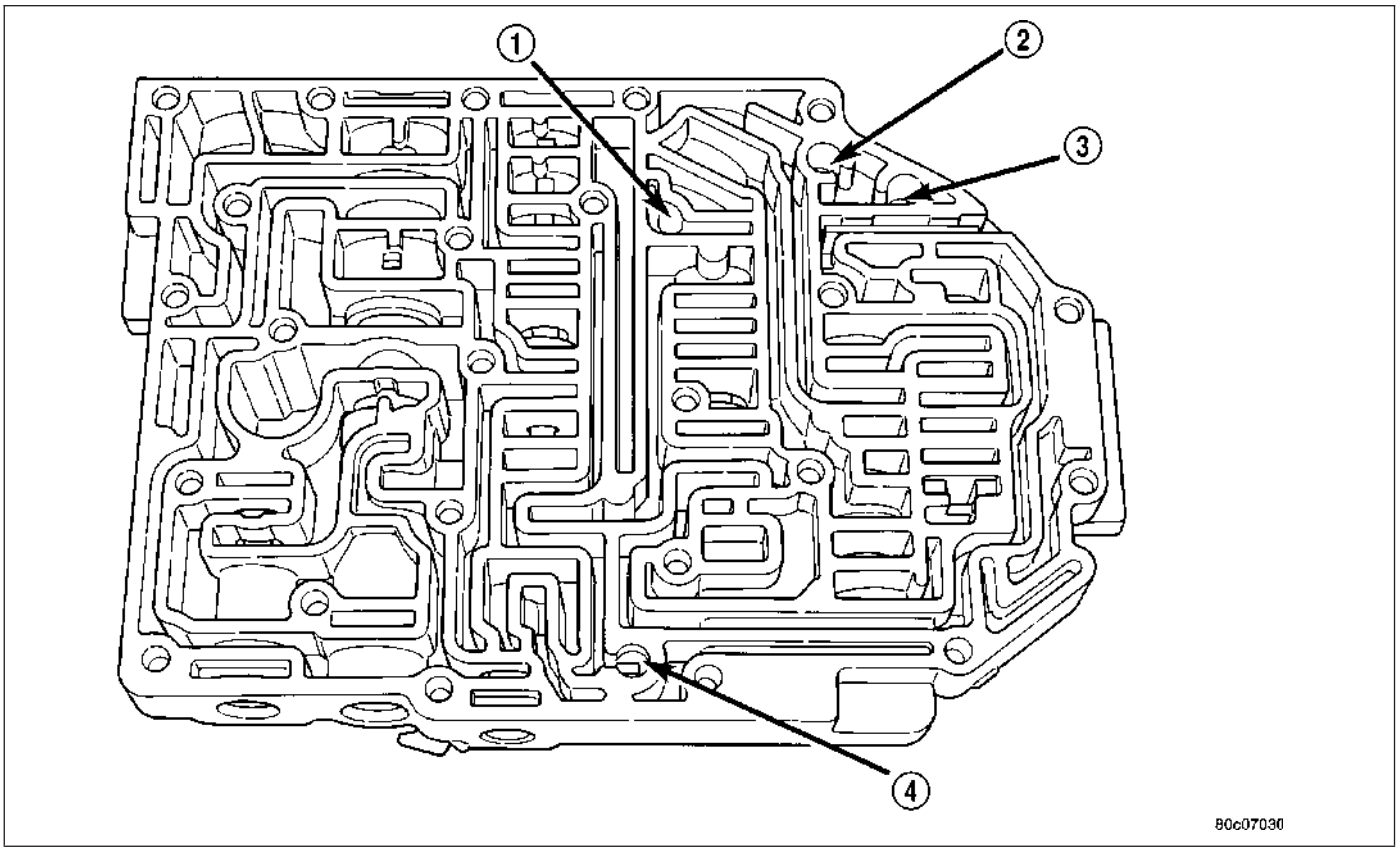


4. Verify that all retainers (1, 2) are installed as shown. Retainers should be flush or below valve body surface.



5. Install 2/4 Accumulator components (1-5) as shown. Torque 2/4 Accumulator retainer plate to 5 N·m (45 in. lbs.).



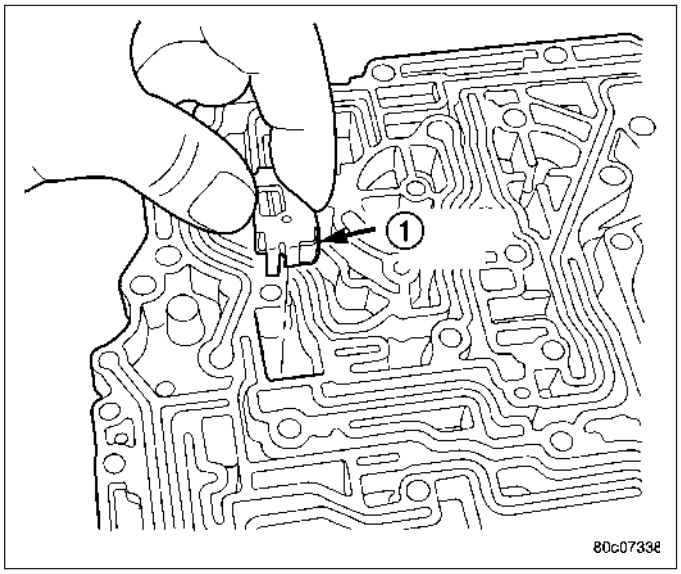


Ball Check Location

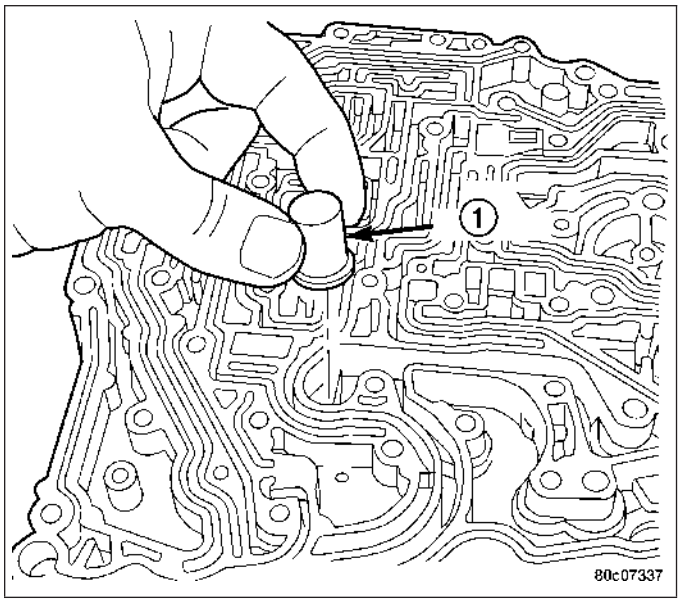
1 - (#4) BALL CHECK LOCATION
2 - (#2) BALL CHECK LOCATION
3 - (#5) BALL CHECK LOCATION
4 - (#3) BALL CHECK LOCATION

6. Install check balls into position as shown. If necessary, secure them with petrolatum or transmission assembly gel for assembly ease.

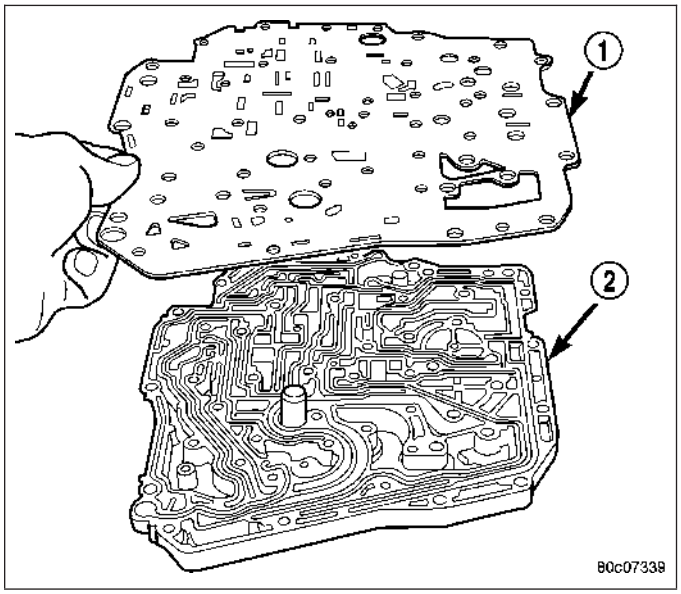
7. Install thermal valve (1) to the transfer plate.



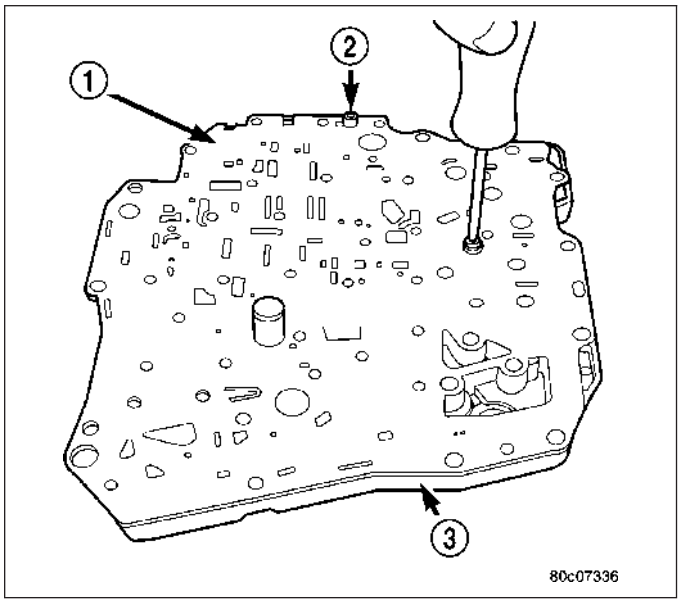
8. Install the oil screen (1) to the transfer plate.



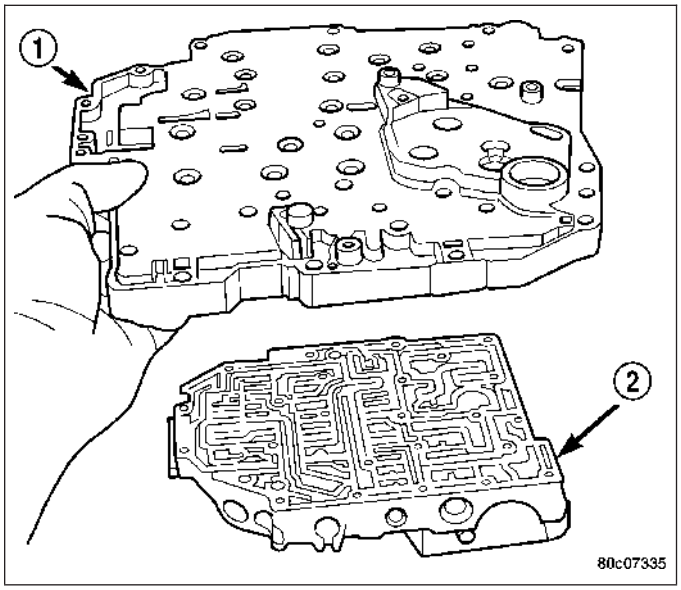
9. Install separator plate (1) to transfer plate (2).



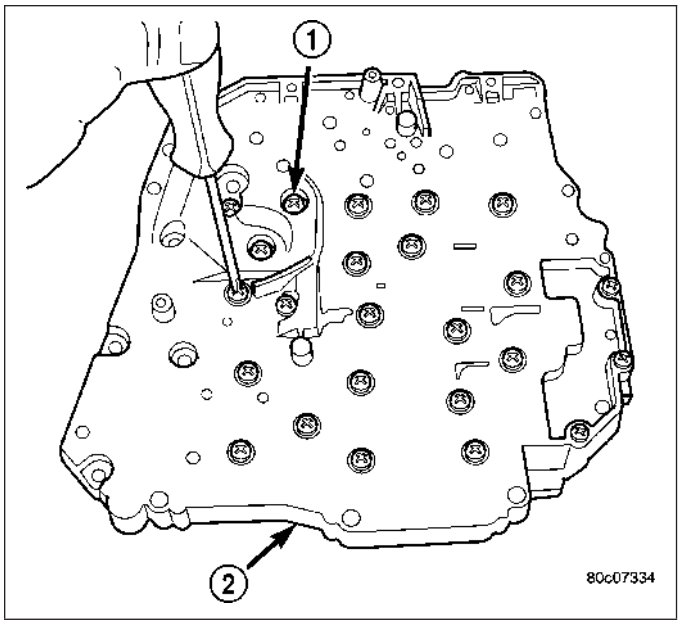
10. Install the two separator plate-to-transfer plate screws (2).



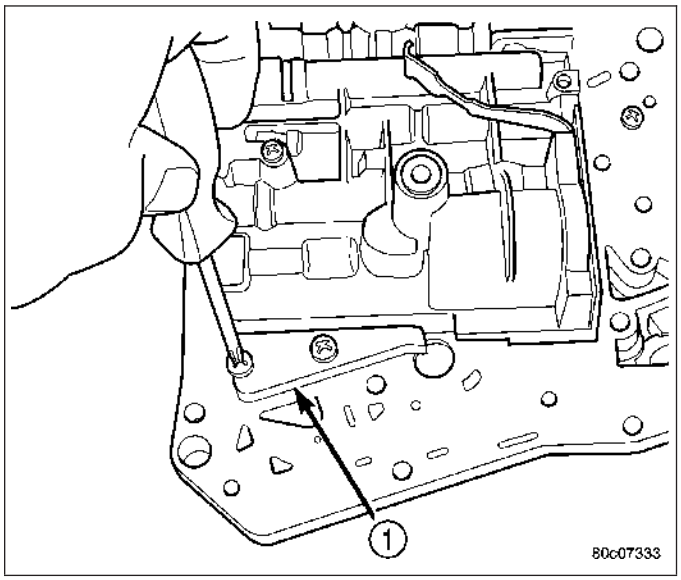
11. Install the transfer plate (1) to the valve body (2).



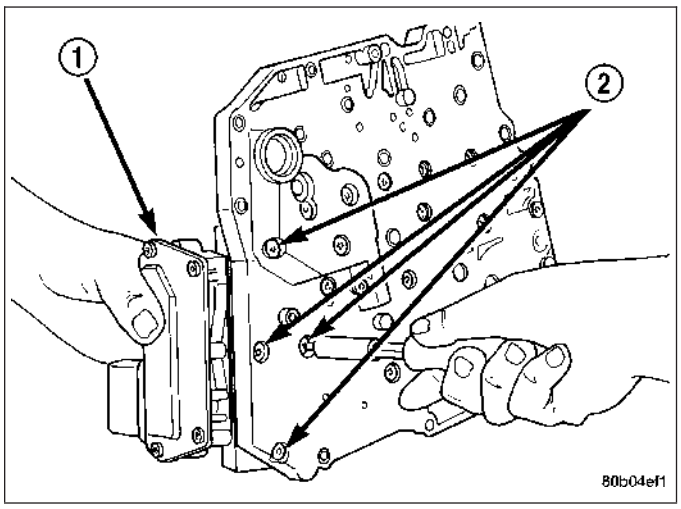
12. Install the transfer plate-to-valve body screws (1) and torque to 5 N·m (45 in. lbs.).



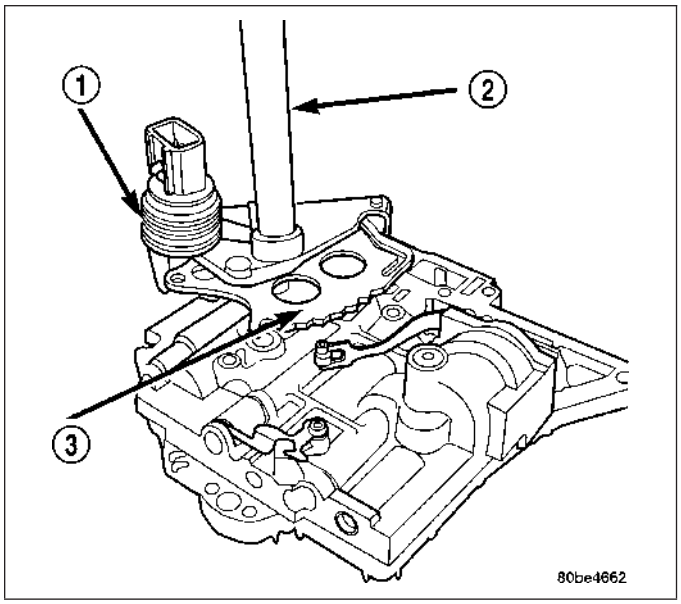
13. Install the stiffener plate (1).



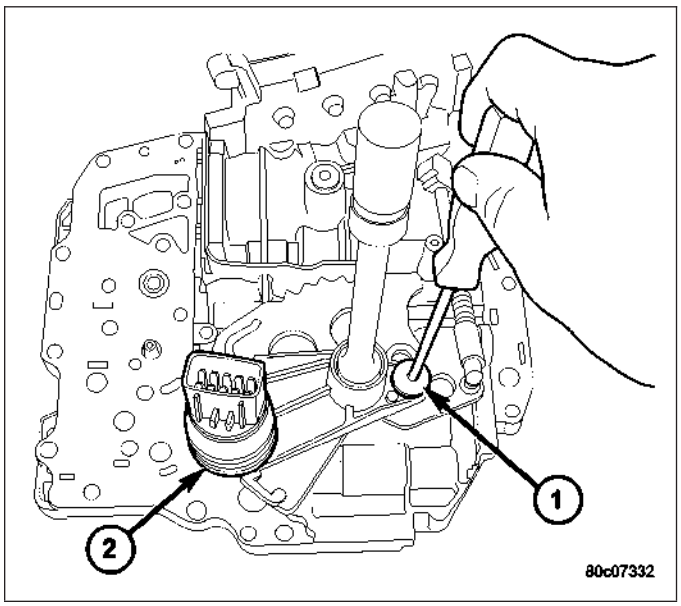
14. Install the solenoid/pressure switch assembly (1) and screws to the transfer plate and torque to 5.5 N·m (50 in. lbs.).



15. Install the manual shaft/rooster comb (3) and transmission range sensor (1) to the valve body.

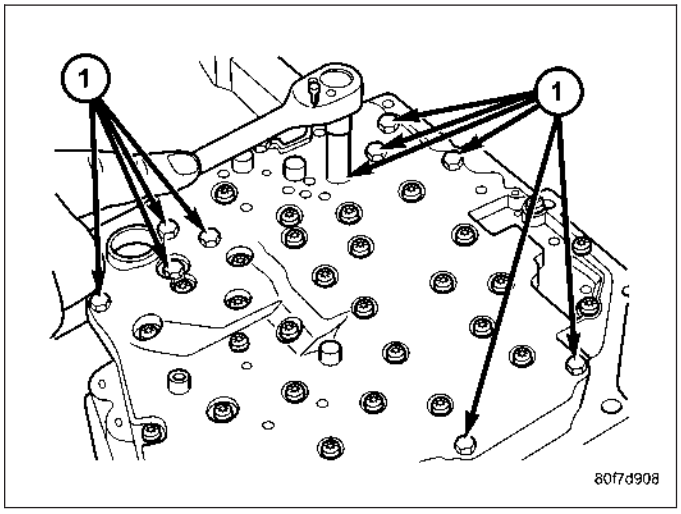


16. Install the TRS/manual shaft retaining screw (1) and torque to 5 N·m (45 in. lbs.).
17. Install manual shaft seal.

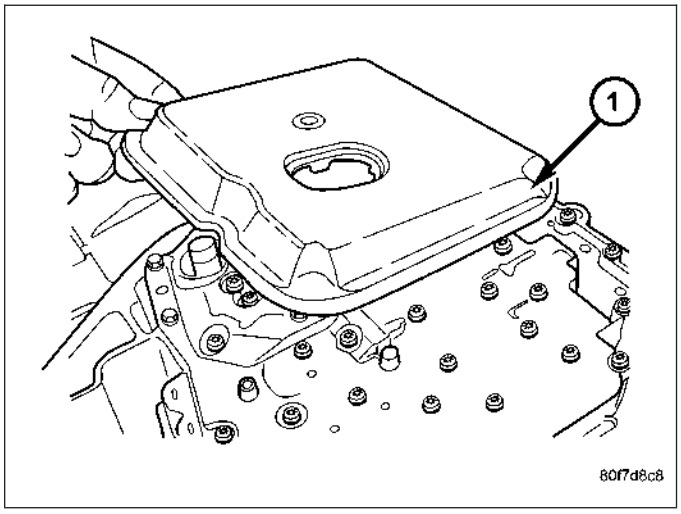


INSTALLATION

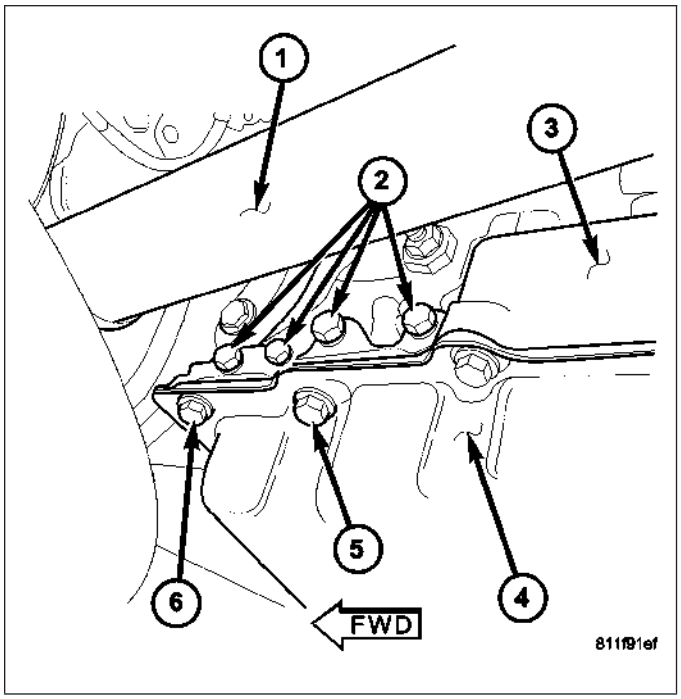
1. Install valve body into position and start bolts (1). Torque valve body to transmission case bolts (1) to 12 N·m (105 in. lbs.) torque.



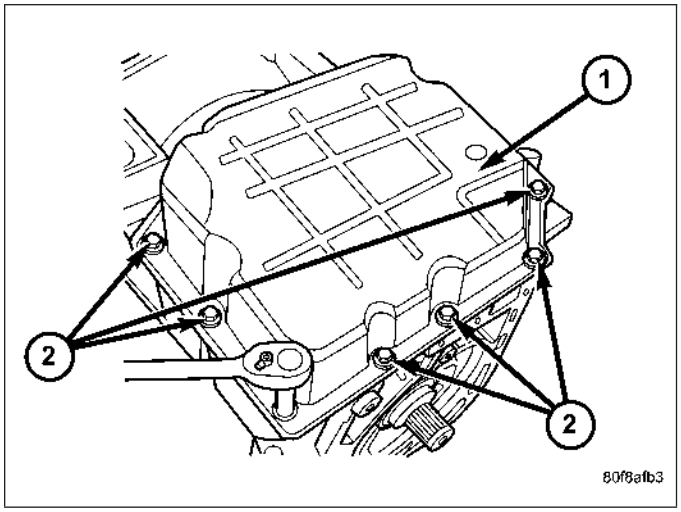
2. Install transmission oil filter (1).



NOTE: Before installing the oil pan bolt in the bolt hole (5) located between the torque converter clutch on and U/D clutch pressure tap circuits , it will be necessary to replentish the sealing patch on the bolt using Mopar® Lock & Seal Adhesive.



3. Make sure oil pan (1) and case rail are clean and dry. Install an 1/8” bead of RTV to the transmission oil pan and install to case. Tighten bolts (2) to 20 N·m (14.5 ft. lbs.).
4. Lower vehicle and connect the TRS connector.
5. Connect solenoid/pressure switch assembly connector.
6. Lower vehicle.
7. Fill transmission with ATF+4, Automatic Transmission Fluid. Verify proper fluid level. (Refer to 21 - TRANSMISSION/AUTOMATIC - 42RLE/FLUID - STANDARD PROCEDURE)



NOTE: If the valve body has been reconditioned or replaced, it is necessary to perform the Quick Learn Procedure. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE)

AUTOMATIC TRANSMISSION 545RFE - ELECTRICAL DIAGNOSTICS

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AUTOMATIC TRANSMISSION 545RFE - ELECTRICAL DIAGNOSTICS

DIAGNOSIS AND TESTING

45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1

For the Transmission circuit diagram (Refer to)(Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1

1. 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1

1. After completion of the Transmission Verification Test, the Powertrain Verification Test must be performed.

2. Connect the scan tool to the Data Link Connector (DLC).

3. Reconnect any disconnected components.

4. If the PCM has been replaced or reflashed, or the transmission has been repaired or replaced, it is necessary to perform the scan tool Quick Learn Procedure.

5. With the scan tool, erase all Transmission and Engine DTC's.

6. With the scan tool, display Transmission Temperature. Start and run the engine until the Transmission Temperature is HOT.

7. Check the Transmission fluid level and adjust if necessary. Refer to the Service Information for the Fluid Fill procedure. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE/FLUID - STANDARD PROCEDURE)

8. Road test the vehicle.

9. Perform the following shifts from a standing start with a constant throttle opening of 20 to 25 degrees to the speeds of 97 Km/h or 60 MPH; make fifteen to twenty 1 to 2, 2 to 3, 3 to 4 upshifts and for 545RFE, 4 to 5.

10. Perform the following shifts with speeds below 40 Km/h or 25 MPH; make five to eight wide open throttle kickdowns to 1st gear. Allow at least 5 seconds each in 2nd and 3rd gear between each kickdown.

11. Check for DTC's during the road test.

12. Use the EATX OBDII task manager to run Good Trip time in each gear, this will confirm the repair and to ensure that the DTC has not re-matured.

13. With the scan tool, perform a BATTERY DISCONNECT, this will clear the EATX DTC EVENT DATA

Were there any Diagnostic Trouble Codes (DTCs) set during the road test?

Yes >> Refer to the Symptom List for the appropriate diagnostic tests.

No >> Repair is complete.

PRE-DIAGNOSTIC CHECK OUT

For a complete wiring diagram **Refer to Section 8W**.

Diagnostic Test

1. PRE-DIAGNOSTIC CHECK OUT

Check the transmission fluid level. If the fluid level is low, locate and repair any leaks and fill the transmission to the proper level. Refer to the appropriate Service Information for procedures. Many transmission symptoms can be caused by a low fluid level.

Check the battery. To avoid false diagnosis, testing should only be performed with the battery fully charged.

With the scan tool, read Engine (PCM) DTCs. If DTCs are present, refer to the Driveability Category and perform to the appropriate diagnostic procedure(s) before proceeding.

With the scan tool, read Transmission (TCM) DTCs. Record all Stored, Active, and Pending DTC information. Diagnose any Pending DTC as a matured DTC.

With the scan tool, read EATX DTC EVENT DATA. Use this data to identify the conditions in which the DTC was set.

Performing a Battery Disconnect will clear all EATX DTC EVENT DATA and reset all learned Transmission values to the default values, which may temporarily result in erratic shift schedules.

With the scan tool, perform the Shift Lever Position Test. If the test does not pass, refer to the diagnostic procedure for P0706 Check Shifter Signal.

For Gear Ratio Error DTCs, use the scan tool to view CVI Monitor data. Read and record the Clutch Volume Index information.

Use the wiring diagram as a guide. Inspect the wiring and connectors related to this circuit. Repair as necessary.

Refer to the When Monitored and Set Conditions for this DTC. DTCs can set at ignition on, at start up, after driving under specific conditions and after diagnostic monitors have been run.

Refer to applicable Technical Service Bulletins (TSBs) for controller software update information. Some conditions can be corrected by upgrading the Engine (PCM) or Transmission (TCM) controller software.

Refer to any Service Information Tune Ups or Technical Service Bulletins that apply to this symptom.

Were there any repairs made that fixed the vehicle?

Yes >> Testing complete.

No >> Refer to the Transmission category and perform the appropriate diagnostic procedure(s).

P0122-TPS/APP CIRCUITLOW

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - DIAGNOSIS AND TESTING).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on and engine running.
- **Set Condition:**
  This DTC will set if the monitored TPS voltage drops below .078 volts for the period of 0.48 seconds.

Possible Causes
RELATED ENGINE TPS/APPS DTC'S PRESENT
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

Due to the integration of the Powertrain and Transmission Control Modules the New Generation Control Module III will be referred to as the Powertrain Control Module (PCM). The 3–wire TPS (4.7L V-8 Engine) provides the PCM with an input signal voltage that represents the throttle blade position of the throttle body. The Throttle Position Sensor (TPS) is connected to the throttle blade shaft. As the position of the throttle blade changes, the output voltage of the TPS changes.

The PCM supplies approximately 5.0 volts to the TPS. The TPS output voltage (input signal to the PCM) represents the throttle blade position. The PCM receives an input signal voltage from the TPS. This will vary in an approximate range from 0.26 volts at minimum throttle opening (idle), to 4.49 volts at maximum opening (wide open throttle).

The Accelerator Pedal Position Sensor (APPS) is currently used only with the 5.7L V-8 engine. The APPS is a linear potentiometer. It provides the PCM with a voltage signal proportional to the angle, or position of the accelerator pedal. The APPS signal along with inputs from other sensors is used by the PCM to calculate the throttle plate position.

A mechanical cable is used between the accelerator pedal and the APPS assembly. Although a cable is used between the accelerator pedal and the APPS assembly, a mechanical cable is not used between the accelerator pedal and the throttle body. The throttle plate position is electronically controlled by the PCM.

Diagnostic Test

1. DETERMINING IF RELATED ENGINE TPS/APPS DTC'S ARE PRESENT

With the scan tool, check Engine DTC's.

Are there any Engine TPS/APPS DTCs present?

Yes >> Refer to the Drivability Category and perform the appropriate Symptom.

No >> Go To 2

P0122-TPS/APP CIRCUITLOW (CONTINUED)

2. CHECK TO SEE IF DTC IS CURRENT

With the scan tool, record the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

With the scan tool, erase Transmission DTCs.

NOTE: To erase EATX DTC DTC EVENT DATA information, a BATTERY DISCONNECT must be performed. Performing a BATTERY DISCONNECT may reset learned Transmission values to controller defaults which may lead to erratic shift schedules.

Drive the vehicle and try to duplicate the conditions in which the DTC was reported by the EATX DTC EVENT DATA.

With the scan tool, read Transmission DTCs.

Did the DTC P0122 TPS/APPS LOW, reset?

Yes >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 3

---

3. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set the DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for shorted and open circuits.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Were there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0123- TPS/APP CIRCUIT HIGH

For the Transmission circuit diagram (Refer to) (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on and engine running.
- **Set Condition:**
  This DTC will set if the monitored TPS voltage rises above 4.94 volts for the period of 0.48 seconds.

Possible Causes
RELATED ENGINE TPS/APPS DTC'S PRESENT
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

Due to the integration of the Powertrain and Transmission Control Modules the New Generation Control Module III will be referred as the Powertrain Control Module (PCM). The 4.7L V-8 Throttle Positioning Sensor (TPS) provides the PCM with an input signal voltage that represents the throttle blade position of the throttle body. The TPS is connected to the throttle blade shaft. As the position of the throttle blade changes, the output voltage of the TPS changes.

The 5.7L V-8 Accelerator Pedal Position Sensor (APPS) is a linear potentiometer that provides the PCM with a voltage signal proportional to the angle, or position of the accelerator pedal. The APPS signal along with inputs from other sensors is used by the PCM to calculate the throttle plate position which is electronically controlled.

Diagnostic Test

1. DETERMINING IF RELATED ENGINE TPS/APPS DTC'S ARE PRESENT

With the scan tool, check Engine DTC's, this includes all one trip failures.

Are there any Engine TPS/APPS DTCs present?

Yes >> Refer to the Drivability category and perform the appropriate symptom.

No >> Go To 2

P0123- TPS/APP CIRCUIT HIGH (CONTINUED)

2. CHECK IF THE DTC IS CURRENT

With the scan tool, record the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

With the scan tool, erase Transmission DTCs.

NOTE: To erase EATX DTC EVENT DATA information, a BATTERY DISCONNECT must be performed. Performing a BATTERY DISCONNECT may reset all learned Transmission values to controller defaults that could lead to an inconsistent shift schedule.

Drive the vehicle and try to duplicate the conditions in which the DTC was reported by the EATX DTC EVENT DATA.

With the scan tool, read Transmission DTCs.

Did the DTC P0123 TPS/APPS HIGH, reset?

Yes >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 3

---

3. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set the DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for shorted and open circuits.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Were there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0124-TPS/APP INTERMITTENT

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete Transmission wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously with the ignition on and engine running.
- **Set Condition:**
  This DTC will set if the monitored TPS throttle angle between the angles of 6° and 120° and the degree change is greater than 5° within a period of less than 7.0 ms

Possible Causes
RELATED TPS ENGINE DTC'S PRESENT
THROTTLE POSITION SENSOR
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

Due to the integration of the Powertrain and Transmission Control Modules the New Generation Control Module III will be referred as the Powertrain Control Module (PCM). The 4.7L V-8 Throttle Positioning Sensor (TPS) provides the PCM with an input signal voltage that represents the throttle blade position of the throttle body. The TPS is connected to the throttle blade shaft. As the position of the throttle blade changes, the output voltage of the TPS changes.

The 5.7L V-8 Accelerator Pedal Position Sensor (APPS) is a linear potentiometer that provides the PCM with a voltage signal proportional to the angle, or position of the accelerator pedal. The APPS signal along with inputs from other sensors is used by the PCM to calculate the throttle plate position which is electronically controlled.

Diagnostic Test

1. DETERMINING IF RELATED ENGINE TPS DTC'S ARE PRESENT

With the scan tool, check Engine DTC's including all one trip failures.

Are there any Engine TPS/APPS DTCs present?

Yes >> Refer to the Powertrain category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK TO SEE IF DTC IS CURRENT

With the scan tool, record the DTC EVENT DATA to help identify the conditions in which the DTC was set.

With the scan tool, erase Transmission DTCs.

NOTE: To erase EATX EVENT DATA information, a BATTERY DISCONNECT must be performed. Performing a BATTERY DISCONNECT may reset all learned transmission values to controller default. This may lead to erratic shift schedules.

Drive the vehicle and try to duplicate the conditions in which the DTC was reported by the DTC EVENT DATA.

With the scan tool, read Transmission DTCs.

Did the DTC P0124 TPS/APPS INTERMITTENT, reset?

Yes >> Go To 3

No >> Go To 4

P0124-TPS/APP INTERMITTENT (CONTINUED)

3. CHECK THROTTLE POSITION SENSOR OPERATION

Ignition On, Engine Not Running.

With the scan tool, under Transmission Sensors, monitor the TPS voltage in the following step.

Slowly open and close the throttle while checking for erratic voltage changes.

Was the TPS voltage change smooth and consistent?

Yes >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the Throttle Position Sensor per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

4. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set the DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for shorted and open circuits.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Were there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0218-HIGH TEMPERATURE OPERATION ACTIVATED

For the Transmission circuit diagram. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Whenever the engine is running.
- **Set Condition:**
  Immediately after a Overheat shift schedule is activated when the Transmission temperature exceeds 127° C or 260° F.

Possible Causes
HIGH TEMPERATURE OPERATION ACTIVATED
TORQUE CONVERTER CLUTCH SLIPPING / NOT ACTIVATING
EXCESSIVE TIME IDLING IN GEAR

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

Theory of Operation

The DTC is intended as an informational DTC to aid the technician in determining the root cause of a customer dirveability issue. The DTC is also intended to alert the technicain to determine if a cooling system malfunction has occurred or if an additional transmission air to oil cooler is needed to support the customers driving behavior.

Diagnostic Test

1. HIGH TEMPERATURE OPERATION

This DTC is an informational DTC designed to aid the Technician in diagnosing shift quality complaints.

This DTC indicates that the transmission has been operating in the ″Overheat″ shift schedule which may generate a customer complaint.

The customer driving patterns may indicate the need for an additional transmission oil cooler.

Verify proper Engine cooling system operation which would affect proper transmission operation.

Verify proper torque converter clutch operation.

With the scan tool, check the DTC EVENT DATA to help identify the conditions in which the DTC was set.

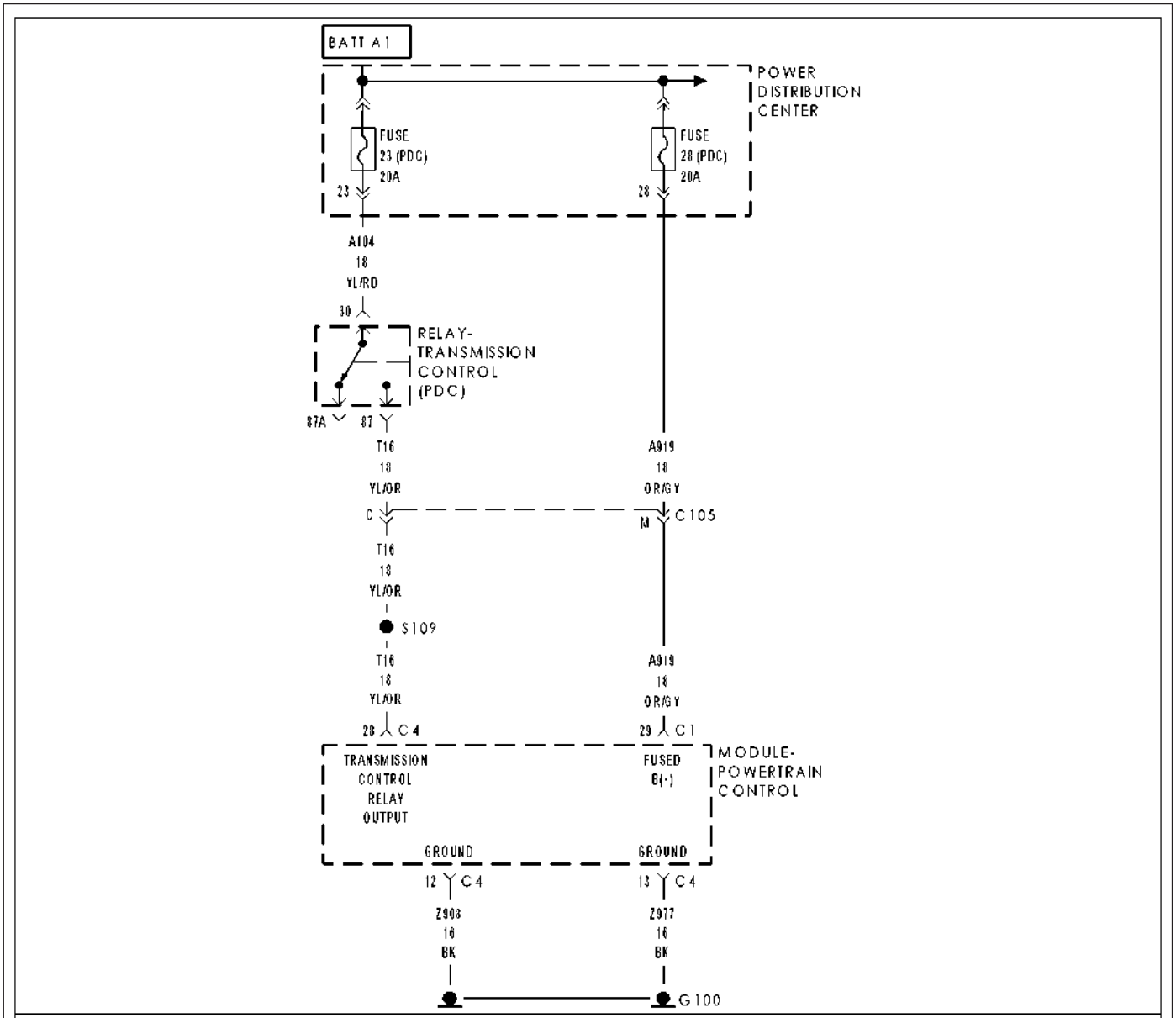
If there are no possible causes remaining, view repair.

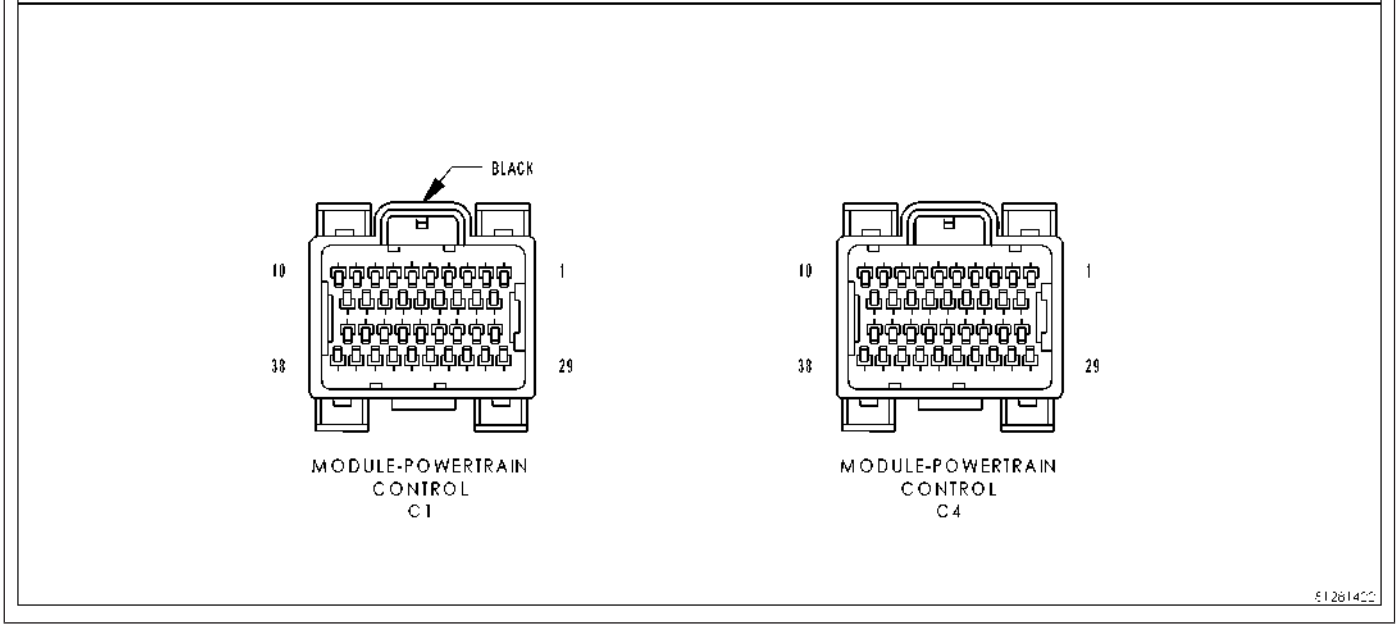
Repair

Repair the cause of transmission overheating. Refer to the Service Information for the proper repair procedure. Make sure to check for any Service Bulletins pertaining to this problem.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0562-BATTERY VOLTAGE LOW





P0562-BATTERY VOLTAGE LOW (CONTINUED)

For the Transmission circuit diagram. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the engine running and the PCM has closed the Transmission Control Relay.
- **Set Condition:**
  If the battery voltage of the Transmission Control Relay Output Sense circuit(s) to the PCM is less than 10.0 volts for the period of 15 seconds. Note: P0562 generally indicates a gradually falling battery voltage or a resistive connection(s) to the PCM. The DTC will also set if the battery voltage sensed at the PCM is less than 6.5-volts for 200ms or where Transmission Control Relay Output circuits are less than 7.2-volts for 200ms.

Possible Causes
RELATED CHARGING SYSTEM DTC'S
(Z908, Z977) GROUND CIRCUIT OPEN OR HIGH RESISTANCE
(A104) FUSED B+ CIRCUIT TO PCM OPEN OR HIGH RESISTANCE
(T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE
TRANSMISSION CONTROL RELAY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

Friction element distress could result from an insufficient supply voltage to properly control the solenoids. To prevent this possibility, the battery voltage is monitored and the system is placed in logical limp-in if the battery voltage drops below the limit.

Diagnostic Test

1. RELATED CHARGING SYSTEM DTC'S

With the scan tool, read the Engine DTC's.

Are there any related Charging System DTC's also present?

Yes >> Refer to the Charging System category and repair any Engine Charging System DTC's, before testing DTC P0562. NOTE: After repairing the Engine Charging System DTC's, perform the Transmission Verification test to verify the transmission was not damaged.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

P0562-BATTERY VOLTAGE LOW (CONTINUED)

2. CONDITION P0562 PRESENT

NOTE: Generator, battery, and charging system must be fully functional before performing this test.
With the scan tool, read Transmission DTC's.

With the scan tool, Check the STARTS SINCE SET counter for P0562.

NOTE: This counter only applies to the last DTC set.

Is the STARTS SINCE SET counter set at 0?

Yes >> Go To 3

No >> Go To 7

---

3. CHECKING (Z908, Z977) GROUND CIRCUITS

Turn the ignition off to the lock position.

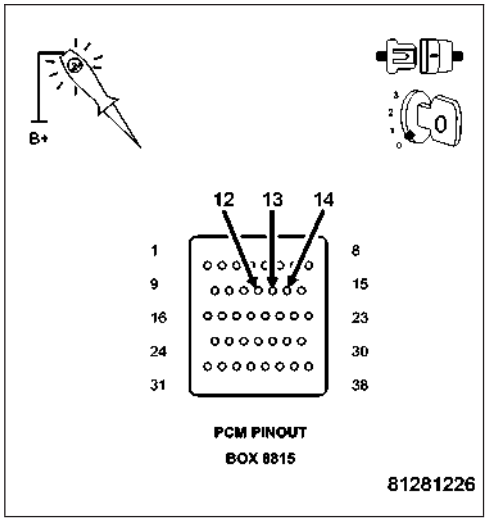
Disconnect the PCM C4 harness connector and connect Miller tool #8815.

NOTE: Check connectors - Clean/repair as necessary.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Using a 12-volt test light connected to 12-volts, check the PCM (Z908, Z977) Ground circuits at the appropriate terminals of Miller tool #8815.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.



Does the test light illuminate brightly for the PCM (Z908, Z977) Ground circuits?

Yes >> Go To 4

No >> Repair the (Z908, Z977) Ground circuit(s) for an open or high resistance.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

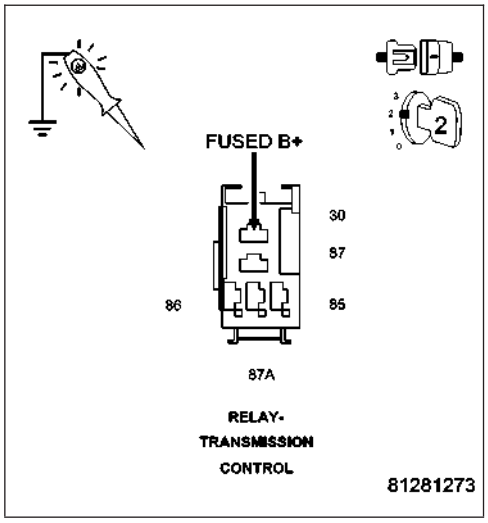
---

4. CHECKING (A104) FUSED B+ CIRCUIT

Remove the Transmission Control Relay.

Ignition on, engine not running.

Using a 12-volt test light connected to ground, check the (A104) Fused B+ circuit at the Transmission Control Relay connector.



Does the test light illuminate brightly?

Yes >> Go To 5

No >> Repair the (A104) Fused B+ circuit for an open or high resistance.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0562-BATTERY VOLTAGE LOW (CONTINUED)

5. CHECKING THE (T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT

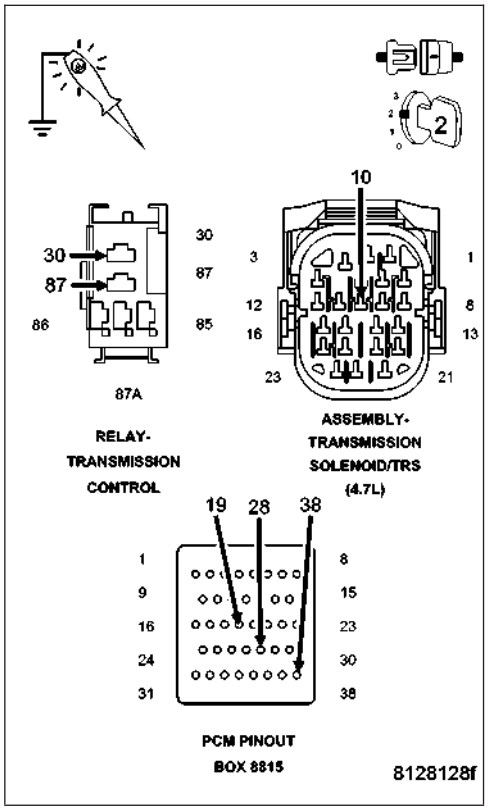
Turn the ignition off to the lock position.

NOTE: Check connectors - Clean/repair as necessary.

Connect a jumper wire between (A104) Fused B+ circuit and the (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

Ignition on, engine not running.

Using a 12-volt test light connected to ground, check all (T16) Transmission Control Relay Output circuits at the appropriate terminals of Miller tool #8815.



Does the test light illuminate brightly?

Yes >> Go To 6

No >> Repair the (T16) Transmission Control Relay Output circuit for an open or high resistance.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

6. TRANSMISSION CONTROL RELAY

Turn the ignition off to the lock position.

Reconnect all previously disconnected connectors.

Install a substitute Relay in place of the Transmission Control Relay.

Start the engine.

Using a voltmeter, measure the vehicles battery voltage.

With the scan tool, monitor the Transmission Switched Battery Voltage.

Compare the scan tool Transmission Switched Battery voltage to the actual battery voltage reading on the voltmeter.

Is the scan tool voltage within 1.0 volt of the battery voltage?

Yes >> Replace the Transmission Control Relay.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0562-BATTERY VOLTAGE LOW (CONTINUED)

7. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.
Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.
Wiggle the wires while checking for shorted and open circuits.
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Where there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0602-CONTROL MODULE PROGRAMMING ERROR/NOT PROGRAMMED

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Check for generic software is made at power-up
- **Set Condition:**
  If genic software is found , the MIL will light immediately. This DTC is designed to signal the technician that the controller still has generic software installed.

Possible Causes
PCM - PROGRAMMING ERROR

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING)

Theory of Operation

The controller is programmed during manufacturing with generic software to facilitate testing. This software does not have the proper calibrations to control a transmission in a vehicle. The check for generic software is made at power-up. If generic software is found , the MIL will light immediately and the MIL will stay on even if the fault is cleared, until the proper software is installed. Note: Transmission will be placed in limp-in mode.

Diagnostic Test

1. CONTROL MODULE PROGRAMMING ERROR

NOTE: Controller is programmed with generic software and will not allow the correct vehicle Powertrain management.

With the scan tool.

Record the vehicles controller part number.

Select Use Controller Part Number under the Flash Tab.

Flash the controller with the correct software.

Verify the controller flashed successfully.

Test Complete

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. Perform Quick Learn Procedure per the Service Information.

P0604-INTERNAL CONTROL MODULE RAM

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  One time after the controller is reset (ignition turned to the RUN position).
- **Set Condition:**
  Whenever the Powertrain Control Module (PCM) detects an internal controller problem.

Possible Causes
POWER OR GROUND CIRCUIT
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

After the controller is reset (ignition turned to the RUN position), the microprocessor checks the integrity of each RAM location by writing to it and reading back from it. The read value should be same as value written.

Diagnostic Test

1. CHECK WIRING AND CONNECTORS FOR INTERMITTENT OPERATION

Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits.

NOTE: Due to the integration of the Powertrain and Transmission Control Modules, the transmission part of the PCM has it's own specific power and ground circuits.
Wiggle the wires while checking for shorted and open circuits.

Check for any Service Bulletins that may apply.

Were there any problems found?

Yes >> Repair the power and/or ground circuits to the PCM and Transmission Control Relay as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0605-INTERNAL CONTROL MODULE ROM

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  One time after the controller is reset (ignition turned to the RUN position).
- **Set Condition:**
  Whenever the Powertrain Control Module (PCM) detects an internal controller problem.

Possible Causes
POWER OR GROUND CIRCUIT
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

After the controller is reset (ignition turned to the RUN position) the microprocessor checks the integrity of the program memory (ROM). A checksum is calculated by adding all used bytes in the program memory. The sum should be the same as a known constant stored in the program memory.

Diagnostic Test

1. CHECK WIRING AND CONNECTORS FOR INTERMITTENT OPERATION

Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits.

NOTE: Due to the integration of the Powertrain and Transmission Control Modules, the transmission part of the PCM has it's own specific power and ground circuits.
Wiggle the wires while checking for shorted and open circuits.

Check for any Service Bulletins that may apply.

Were there any problems found?

Yes >> Repair the power and/or ground circuits as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0613-INTERNAL TCM

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  1) One time after the controller is reset (ignition turned to the RUN position) and every 60 seconds thereafter. The Delay Test is executed after a reset only.
  2) 2 seconds after an invalid test.
- **Set Condition:**
  If either of the following conditions occur 3 times:
  1) The watchdog fault line remains high after the period has elapsed for the too early - too late watchdog test.
  2) The Transmission Control Relay remains on after the watchdog delay expired.

Possible Causes
POWER OR GROUND CIRCUIT
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The internal Watchdog (WD) is a separate hardware circuit that continuously monitors the microprocessor. To insure the proper operation of the EATX controller the watchdog must receive a signal from the microprocessor within a specific time window (14ms ± 1ms) to prevent a system shutdown after a short delay (570ms). The microprocessor periodically tests the WD's ability to provide this shutdown function using a three phase test;

1) Send the signal too late > 15ms

2) Send the signal too early < 13ms

3) Delay test < 590ms

If the watchdog input signal arrives too early or too late, the Watchdog Fault line will go low and the watchdog delay will start to time out. The delay will be reset by the correct timing of watchdog signal sent during subsequent operations.

The Delay Test checks the delay time out. The Delay Monitor line is pulled low, which forces the delay to start timing out. At the end of the delay time the Transmission Relay will be turned off. The delay test, upon detection of the relay turning off, will immediately turn the relay back on before shutdown can occur.

Diagnostic Test

1. CHECK THE WIRING AND CONNECTORS

Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits.

NOTE: Due to the integration of the Powertrain and Transmission Control Modules, the transmission part of the PCM has it's own specific power and ground circuits.
Wiggle the wires while checking for shorted and open circuits.

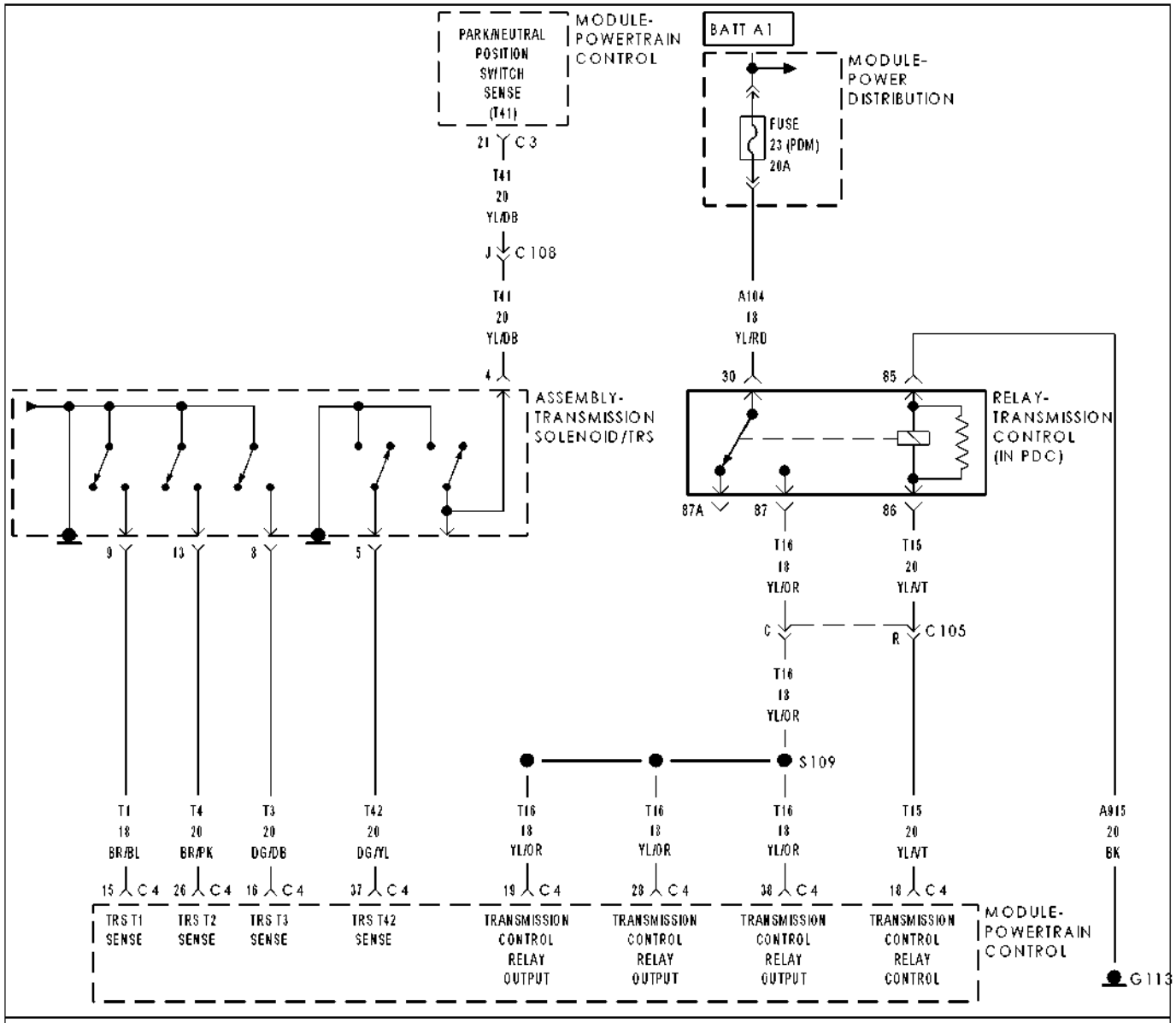
Check for any Service Bulletins that may apply.

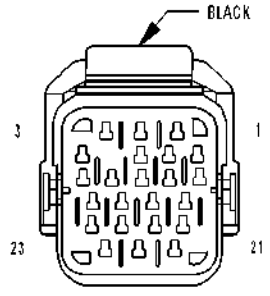
Were there any problems found?

Yes >> Repair the power and/or ground circuits as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

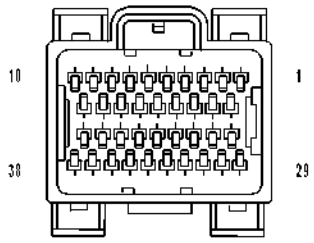
No >> Replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0706-TRANSMISSION RANGE SENSOR RATIONALITY

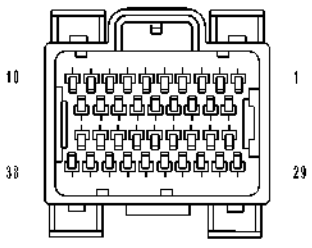




ASSEMBLY-TRANSMISSION SOLENOID/TRS (4.7L/5.7L)



MODULE-POWERTRAIN CONTROL C3



MODULE-POWERTRAIN CONTROL C4

8' 27E-400

P0706-TRANSMISSION RANGE SENSOR RATIONALITY (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on.
- **Set Condition:**
  The DTC will set if the controller detects an invalid PRNDL code which lasts for more than 0.042 seconds.

Possible Causes
SHIFTER OUT OF ADJUSTMENT
TRS SENSE CIRCUIT OPEN
TRS SENSE CIRCUIT SHORT TO GROUND
TRS SENSE CIRCUIT SHORT TO VOLTAGE
METAL DEBRIS IN OIL PAN
TRANSMISSION RANGE SENSOR
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The T1, T2, T3, T41, or T42 (C1 - C5) Sense circuits communicate the shift lever position to the Transmission Control System. Each circuit is terminated at the transmission by a switch (TRS). Each switch can be either open or closed, depending on the shift lever position. The PCM can decode this information and determine the shift lever position.

Each shift lever position has it own unique combination of closed and open switches. This is called a PRNDL code. There are 5 switches, therefore: there are many possible combinations of open and closed switches (codes). There are 12 valid codes: two for neutral, one for each other gear position (5), and five temporary (transition zone) codes. The remainder of the codes should never occur, these are called invalid codes.

Diagnostic Test

1. CHECK TO SEE IF P0706 DTC IS CURRENT

With the scan tool, perform the Shift Lever Position Test.

Select the test outcome from the following:

Test passes:
Go To 6

Test fails with Error Code:
Go To 2

Test fails without Error Code:
Perform the Gearshift Adjustment Procedure per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0706-TRANSMISSION RANGE SENSOR RATIONALITY (CONTINUED)

2. ASSEMBLY-TRANSMISSION SOLENOID/TRS

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

NOTE: Check connectors - Clean/repair as necessary.

Install Transmission Simulator, Miller tool #8333.

Ignition on, engine not running.

With the scan tool, perform the Shift Lever Position Test.

When the scan tool instructs you to put the Gear Selector in a particular position, you must do so using the selector switch on the Transmission Simulator.

The LED for the gear position in question must be illuminated on the Transmission Simulator prior to pressing ″ENTER″ on the scan tool.

NOTE: When the scan tool requests the O/D off button be depressed, you must use the O/D OFF button in the vehicle or you will fail the Shift Lever Position Test with an error code 11 or OD-TOW/HALL STUCK OPEN.

NOTE: If the Shift Lever Position test fails, make sure to note the identification of the TRS Sense circuit for future reference.

Did the Shift Lever Position test pass?

Yes >> Remove the Oil Pan and Main Valve Body Assembly per the Service Information. Check for metal debris on top of the Solenoid/TRS Assembly and the manual valve code plate. If debris is present, determine the cause of the debris and repair the transmission as necessary. If no problems are found, replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 3

---

3. TRS SENSE CIRCUIT OPEN

Turn the ignition off to the lock position.

Disconnect the Transmission Simulator, Miller tool #8333.

Disconnect the PCM harness connectors and install Miller tool #8815.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Measure the resistance of the identified (T1, T2, T3, T41, or T42) TRS Sense circuit, from the Transmission Solenoid/TRS Assembly harness connector to the appropriate terminal of Miller tool #8815.

Is the resistance above 5.0 ohms?

Yes >> Repair the identified (T1, T2, T3, T41, or T42) TRS Sense circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 4

P0706-TRANSMISSION RANGE SENSOR RATIONALITY (CONTINUED)

4. TRS SENSE CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the identified (T1, T2, T3, T41, or T42) TRS Sense circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the identified (T1, T2, T3, T41, or T42) TRS Sense circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5

---

5. TRS SENSE CIRCUIT SHORT TO OTHER CIRCUITS

Measure the resistance between the identified (T1, T2, T3, T41, or T42) TRS Sense circuit and all other circuits in the Transmission Solenoid/TRS Assembly harness connector.

Is the resistance below 100k ohms between the identified (T1, T2, T3, T41, or T42) TRS Sense circuit and any other circuit(s) in the Transmission Solenoid/TRS Assembly harness connector?

Yes >> Repair the identified (T1, T2, T3, T41, or T42) TRS Sense circuit for a short to other circuit(s).
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

6. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set the DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for shorted and open circuits.

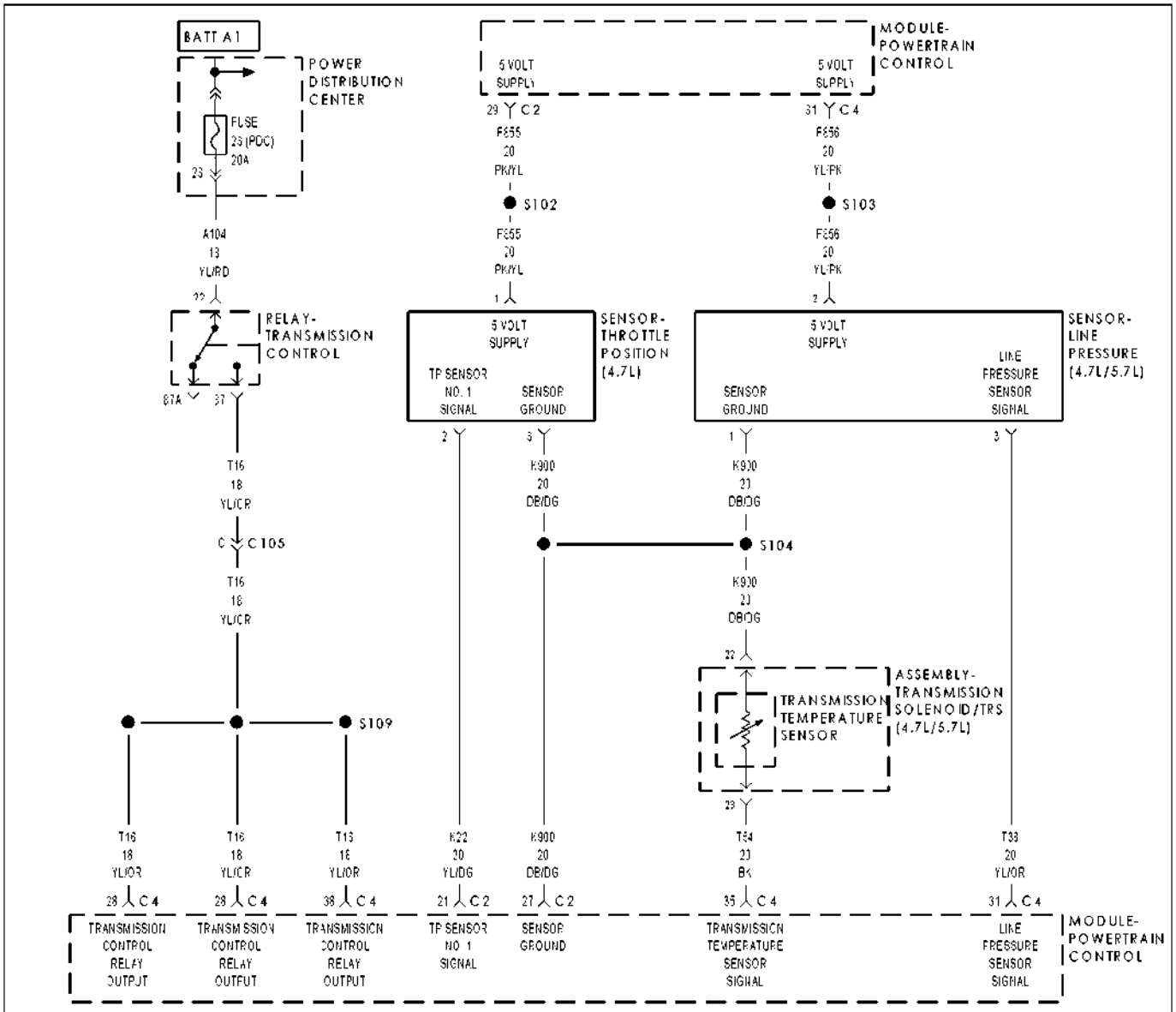
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

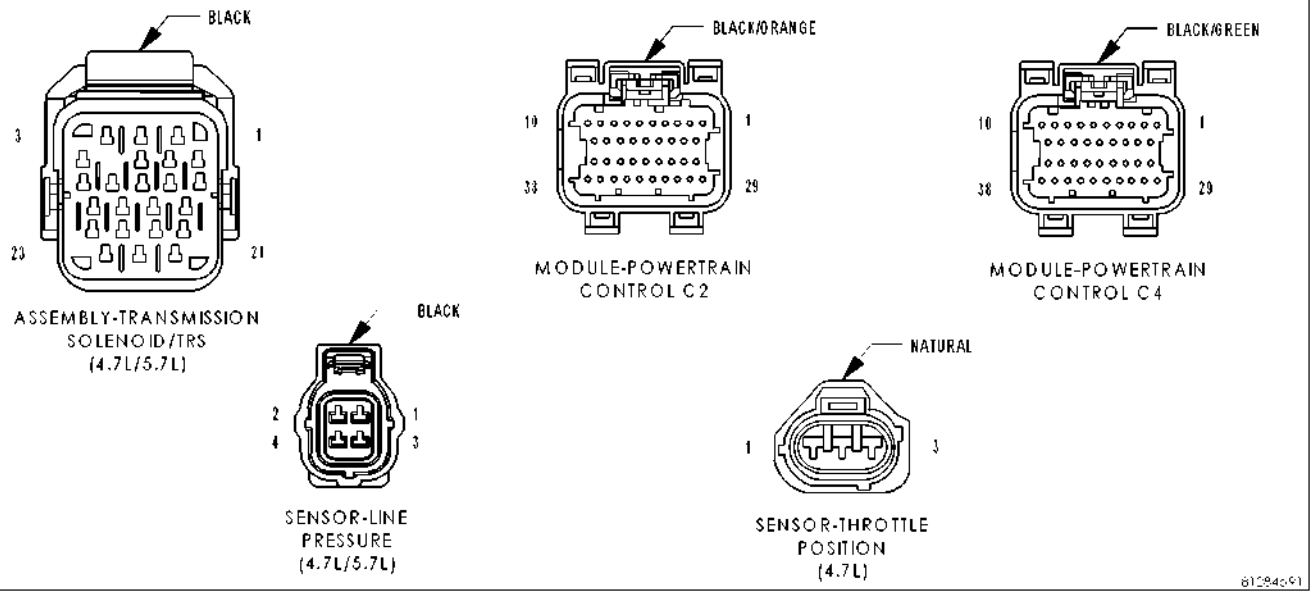
Were there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0711-TRANSMISSION TEMPERATURE SENSOR PERFORMANCE





P0711-TRANSMISSION TEMPERATURE SENSOR PERFORMANCE (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS) .

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on and engine running.
- **Set Condition:**
  This DTC will set when the desired transmission temperature does not reach a normal operating temperature within a given time frame. Time is variable due to ambient temperature. Approximate times are starting temperature to warm up time: (-40° F / -40° C - 35 min) (-20° F / -28° C - 25 min) (20° F / -6.6° C - 20 min) (60° F / 15.5 ° C - 10 min)

Possible Causes
RELATED DTC'S PRESENT
TRANSMISSION TEMPERATURE SENSOR
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Transmission Temperature Sensor is a variable resistor that changes with temperature, or otherwise known as a thermister. The temperature of the transmission fluid can affect a variety of electronically controlled transmission operations such as shift quality, torque converter lock-up, and when and/or if certain OBDII or system self-diagnostic test are performed. The Powertrain Control Module (PCM) substitutes a calculated transmission temperature value if a fault is detected in the Transmission Temperature Sensor circuit.

Diagnostic Test

1. DETERMINE IF RELATED DTC'S ARE PRESENT

With the scan tool, check Transmission DTC's.

Are there any other related Transmission Temperature Sensor DTCs present?

Yes >> Refer to the Transmission category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK TO SEE IF DTC IS CURRENT

With the scan tool, Check the STARTS SINCE SET counter for P0711.

NOTE: This counter only applies to the last DTC set.

Is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 3

No >> Go To 4

P0711-TRANSMISSION TEMPERATURE SENSOR PERFORMANCE (CONTINUED)

3. TRANSMISSION TEMPERATURE SENSOR

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the Transmission Simulator, turn the Input/Output switch to OFF.

With the scan tool, monitor the TRANS TEMP VOLTS while turning the Thermistor Voltage switch to all three positions on the Transmission Simulator.

Compare the scan tool readings to the voltage readings listed on the Transmission Simulator.

Do the readings on the scan tool match the Transmission Simulator readings ± 0.2 volts?

Yes >> Replace Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

4. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

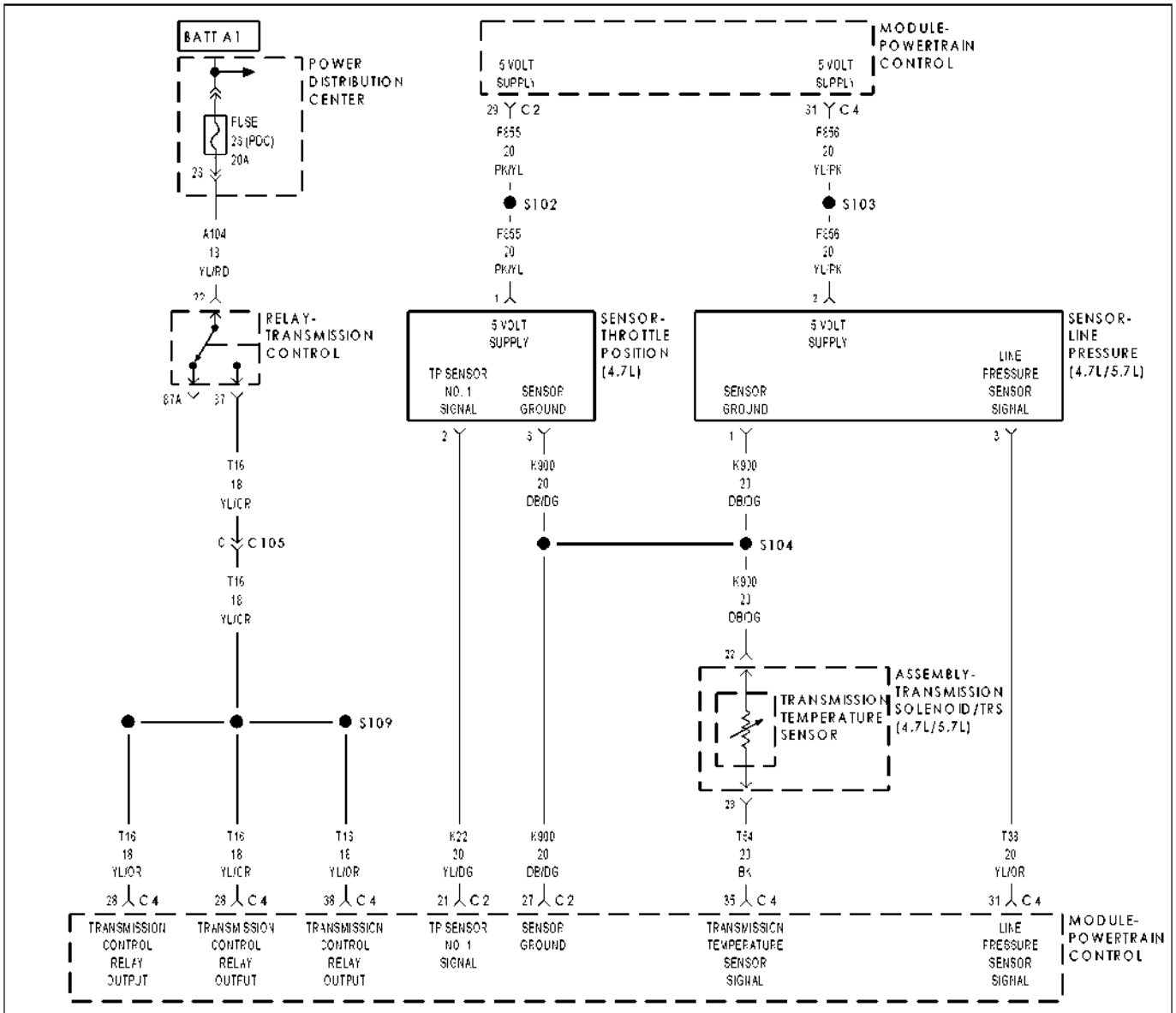
With the scan tool, check the DTC EVENT DATA to help identify the conditions in which the DTC was set.

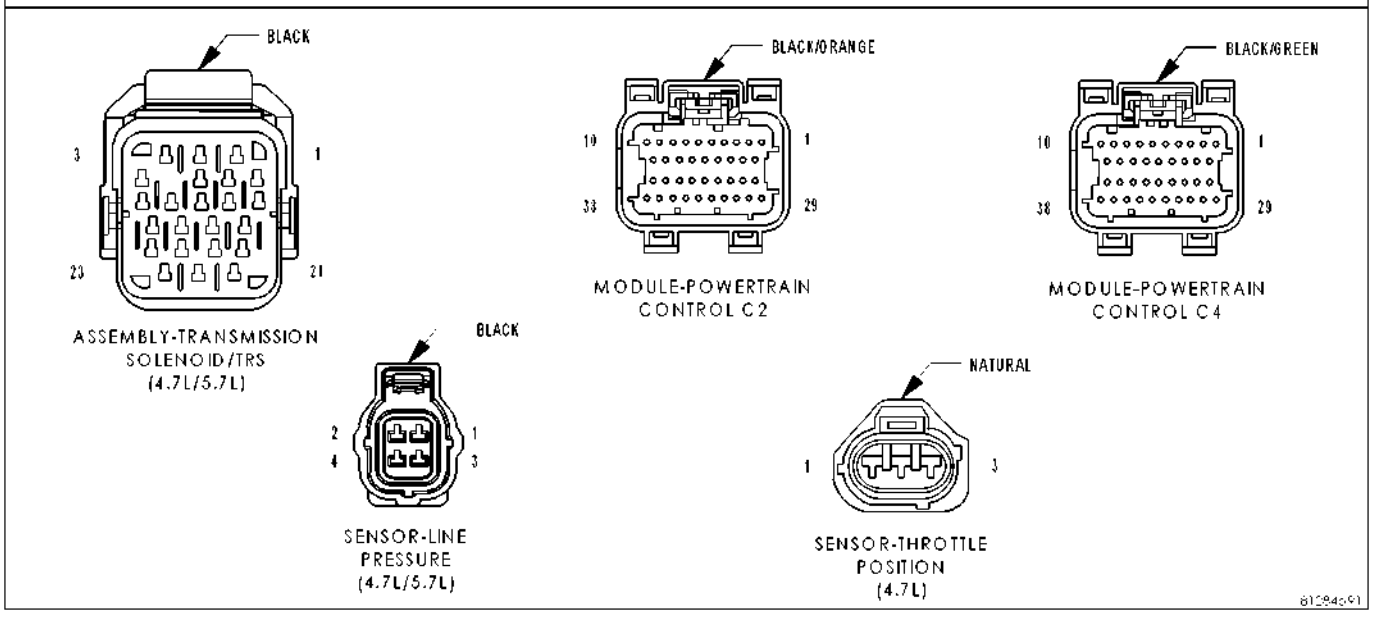
Were there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0712-TRANSMISSION TEMPERATURE SENSOR LOW





P0712-TRANSMISSION TEMPERATURE SENSOR LOW (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on and engine running.
- **Set Condition:**
  The DTC will set when the monitored Temperature Sensor voltage drops below 0.078 volts for the period of 0.45 seconds.

Possible Causes
RELATED DTC'S PRESENT
(T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT SHORT TO GROUND
TRANSMISSION TEMPERATURE SENSOR
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Transmission Temperature Sensor is a variable resistor that changes with temperature, or otherwise known as a thermister. The temperature of the transmission fluid can affect a variety of electronically controlled transmission operations such as shift quality, torque converter lock-up, and when and/or if certain OBDII or system self-diagnostic test are performed. The Powertrain Control Module (PCM) substitutes a calculated transmission temperature value if a fault is detected in the Transmission Temperature Sensor circuit.

Diagnostic Test

1. DETERMINE IF RELATED DTC'S ARE PRESENT

With the scan tool, check Transmission DTC's.

Are there any line pressure sensor or throttle position sensor DTCs present?

Yes >> Refer to the Transmission category and perform the appropriate symptom.

No >> Go To 2

---

2. CHECK TO SEE IF DTC IS CURRENT

With the scan tool, Check the STARTS SINCE SET counter for P0712.

NOTE: This counter only applies to the last DTC set.

Is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 3

No >> Go To 5

P0712-TRANSMISSION TEMPERATURE SENSOR LOW (CONTINUED)

3. TRANSMISSION TEMPERATURE SENSOR

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the Transmission Simulator, turn the Input/Output switch to OFF.

With the scan tool, monitor the TRANS TEMP VOLTS while turning the Thermistor Voltage switch to all three positions on the Transmission Simulator.

Compare the scan tool readings with the numbers listed on the Transmission Simulator.

Do the readings on the Transmission Simulator match the scan tool readings ± 0.2 volts?

Yes >> Replace Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 4

---

4. (T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT SHORT TO GROUND

Turn the ignition off to the lock position.

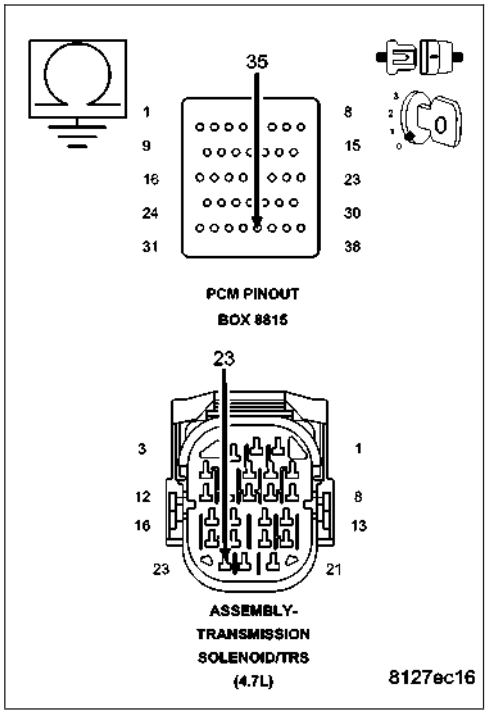
Disconnect the Transmission Simulator, Miller tool #8333.

Disconnect the PCM C4 harness connector and connect Miller tool #8815.

NOTE: Check connectors - Clean/repair as necessary.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Measure the resistance between ground and the (T54) Transmission Temperature Sensor Signal circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (T54) Transmission Temperature Sensor Signal circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0712-TRANSMISSION TEMPERATURE SENSOR LOW (CONTINUED)

5. INTERMITTENT WIRING AND CONNECTORS

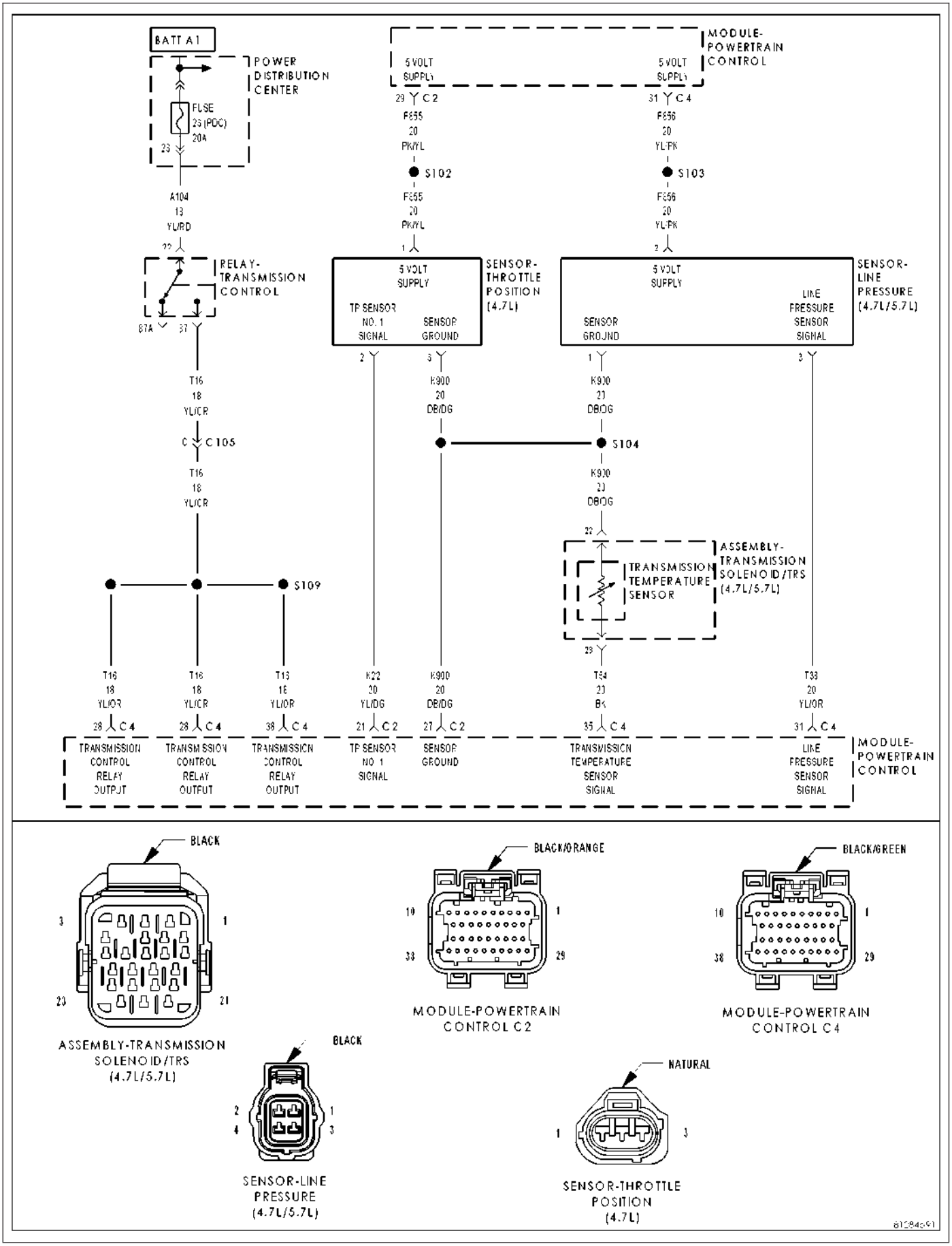
The conditions necessary to set this DTC are not present at this time.
Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.
Wiggle the wires while checking for shorted and open circuits.
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Were there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0713-TRANSMISSION TEMPERATURE SENSOR HIGH



P0713-TRANSMISSION TEMPERATURE SENSOR HIGH (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on and engine running.
- **Set Condition:**
  The DTC will set when the monitored Temperature Sensor voltage rises above 4.94 volts for the period of 0.45 seconds.

Possible Causes
RELATED DTC'S PRESENT
(T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT SHORT TO OTHER CIRCUITS
TRANSMISSION TEMPERATURE SENSOR
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Transmission Temperature Sensor is a variable resistor that changes with temperature, or otherwise known as a thermister. The temperature of the transmission fluid can affect a variety of electronically controlled transmission operations such as shift quality, torque converter lock-up, and when and/or if certain OBDII or system self-diagnostic test are performed. The Powertrain Control Module (PCM) substitutes a calculated transmission temperature value if a fault is detected in the Transmission Temperature Sensor circuit.

Diagnostic Test

1. DETERMINE IF RELATED DTC'S ARE PRESENT

With the scan tool, check Transmission DTC's.

Are there any line pressure sensor or throttle position sensor DTCs present?

Yes >> Refer to the Transmission category and perform the appropriate symptom.

No >> Go To 2

---

2. CHECK TO SEE IF DTC IS CURRENT

With the scan tool, check the STARTS SINCE SET counter for P0713.

NOTE: This counter only applies to the last DTC set.

Is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 3

No >> Go To 5

P0713-TRANSMISSION TEMPERATURE SENSOR HIGH (CONTINUED)

3. TRANSMISSION TEMPERATURE SENSOR

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333.

NOTE: Note: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the Transmission Simulator, turn the Input/Output switch to OFF.

With the scan tool, monitor the TRANS TEMP VOLTS while turning the Thermistor Voltage switch to all three positions on the Transmission Simulator.

Compare the scan tool readings with the numbers listed on the Transmission Simulator.

Do the readings on the Transmission Simulator match the scan tool readings ± 0.2 volts?

Yes >> Replace Transmission Solenoid/TRS assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 4

---

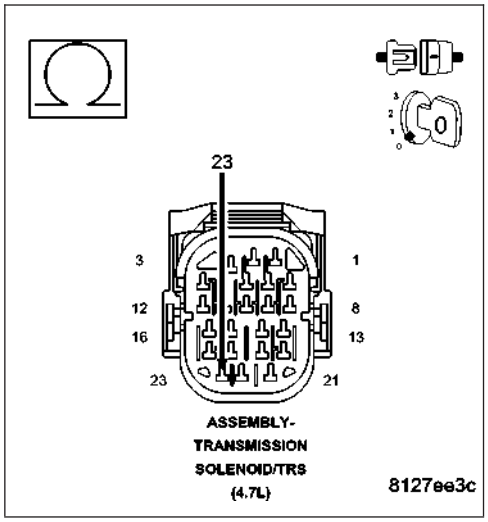
4. (T54) TRANSMISSION SENSOR SIGNAL CIRCUIT SHORT TO OTHER CIRCUITS

Turn the ignition off to the lock position.

Disconnect the Transmission Simulator, Miller tool #8333.

Disconnect the PCM harness connectors.

Measure the resistance between the (T54) Transmission Temperature Sensor Signal circuit and all other circuits in the Transmission Solenoid/TRS Assembly harness connector.



Is the resistance below 5.0 ohms between the (T54) Transmission Temperature Sensor Signal circuit and any other circuit(s) in the Transmission Solenoid/TRS Assembly harness connector?

Yes >> Repair the Transmission Temperature Sensor Signal circuit for a short to other circuit(s).
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0713-TRANSMISSION TEMPERATURE SENSOR HIGH (CONTINUED)

5. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

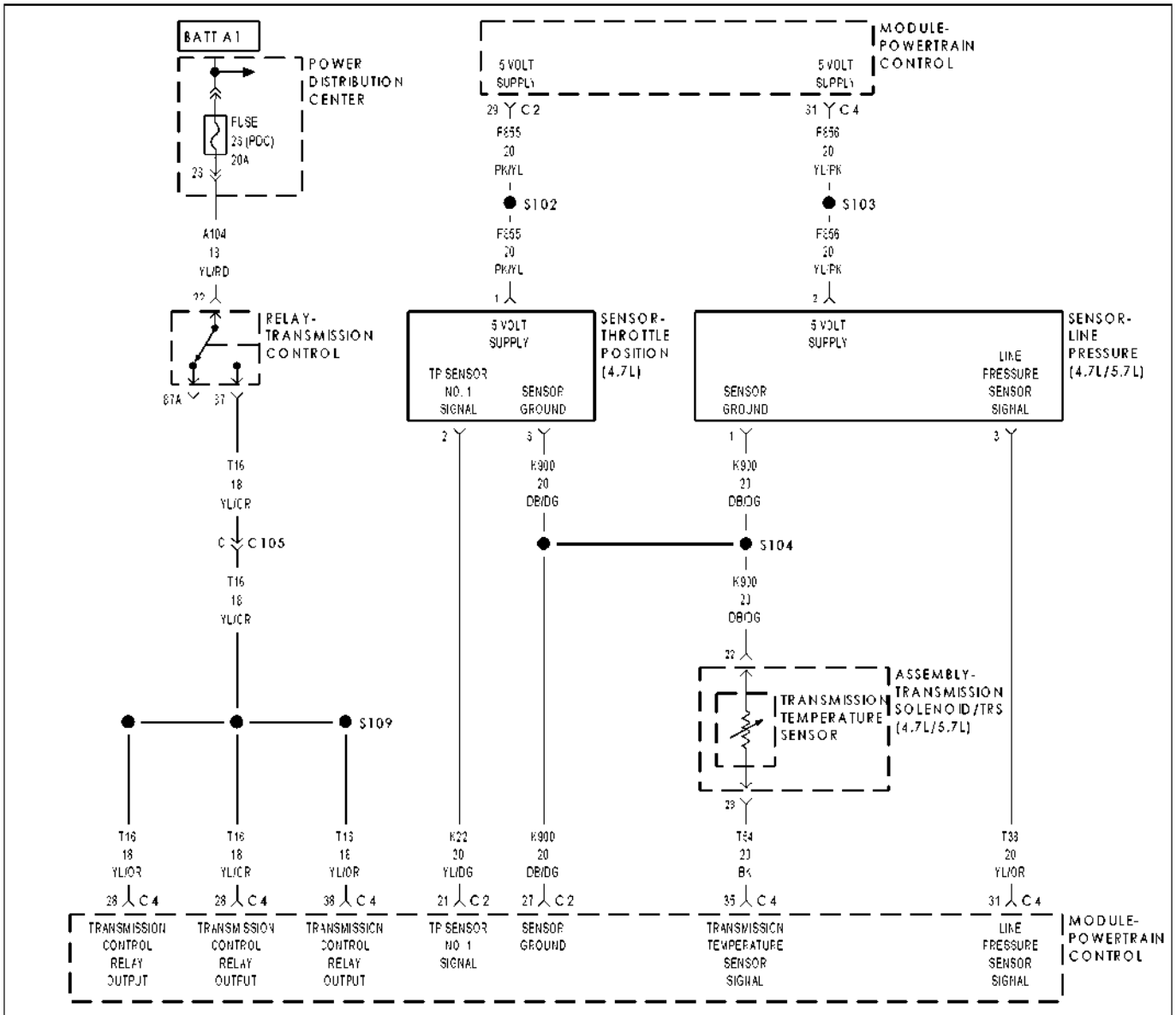
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

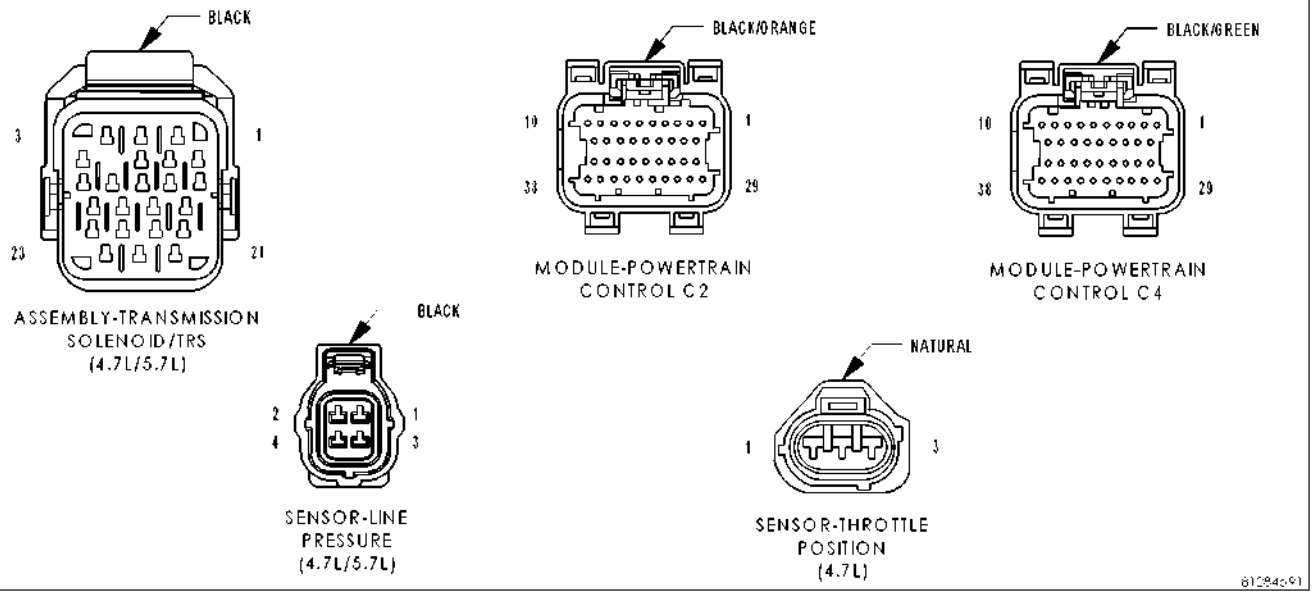
Were there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0714-TRANSMISSION TEMPERATURE SENSOR INTERMITTENT





P0714-TRANSMISSION TEMPERATURE SENSOR INTERMITTENT (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS) .

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on and engine running.
- **Set Condition:**
  The DTC will set when the monitored Temperature Sensor voltage fluctuates or changes abruptly within a predetermined period of time.

Possible Causes
RELATED DTC'S PRESENT
TRANSMISSION TEMPERATURE SENSOR
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Transmission Temperature Sensor is a variable resistor that changes with temperature, or otherwise known as a thermister. The temperature of the transmission fluid can affect a variety of electronically controlled transmission operations such as shift quality, torque converter lock-up, and when and/or if certain OBDII or system self-diagnostic test are performed. The Powertrain Control Module (PCM) substitutes a calculated transmission temperature value if a fault is detected in the Transmission Temperature Sensor circuit.

Diagnostic Test

1. DETERMINE IF RELATED DTC'S ARE PRESENT

With the scan tool, check Transmission DTC's.

Are there any line pressure sensor or throttle position sensor DTCs present?

Yes >> Refer to the Transmission category and perform the appropriate symptom.

No >> Go To 2

---

2. CHECK TO SEE IF DTC IS CURRENT

With the scan tool, Check the STARTS SINCE SET counter for P0714.

NOTE: This counter only applies to the last DTC set.

Is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 3

No >> Go To 4

P0714-TRANSMISSION TEMPERATURE SENSOR INTERMITTENT (CONTINUED)

3. TRANSMISSION TEMPERATURE SENSOR

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the Transmission Simulator, turn the Input/Output switch to OFF.

With the scan tool, monitor the TRANS TEMP VOLTS while turning the Thermistor Voltage switch to all three positions on the Transmission Simulator.

Compare the scan tool readings with the numbers listed on the Transmission Simulator.

Do the readings on the Transmission Simulator match a non-fluctuating scan tool reading ± 0.2 volts?

Yes >> Replace Transmission Solenoid/TRS assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

4. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

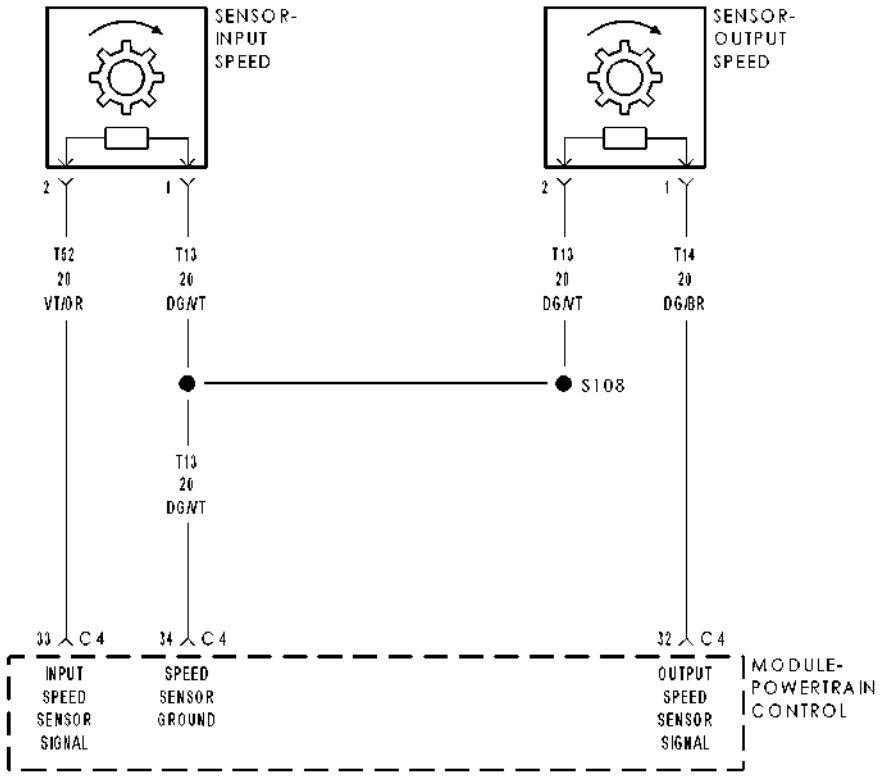
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

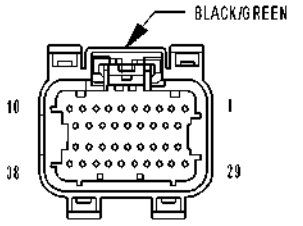
Were there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

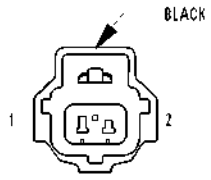
No >> Test Complete.

P0715-INPUT SPEED SENSOR 1 CIRCUIT

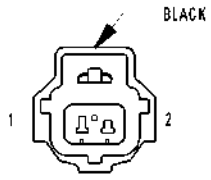




MODULE-POWERTRAIN CONTROL C4



SENSOR-INPUT SPEED



SENSOR-OUTPUT SPEED

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P0715-INPUT SPEED SENSOR 1 CIRCUIT (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS) .

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  The transmission gear ratio is monitored continuously while the transmission is in gear.
- **Set Condition:**
  If there is an excessive change in input RPM in any gear. This DTC can take up to five minutes of problem identification before illuminating the MIL.

Possible Causes
(T52) INPUT SPEED SENSOR SIGNAL CIRCUIT OPEN
(T13) SPEED SENSOR GROUND CIRCUIT OPEN
(T52) INPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO GROUND
(T13) SPEED SENSOR GROUND CIRCUIT SHORT TO GROUND
(T52) INPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE
(T13) SPEED SENSOR GROUND CIRCUIT SHORT TO VOLTAGE
INPUT SPEED SENSOR
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The transmission system uses two speed sensors, one to measure input RPM and one to measure output RPM. These inputs are essential for proper transmission operation. Therefore, the integrity of this data is verified through the following checks:

1) When in gear, if the gear ratio does not compare to a known gear ratio, the corresponding in-gear trouble code is set (DTCs P0731–36).

2) An excessive change in input or output speeds indicating signal intermittent which may result in the DTCs P0715 and/or P0720 to set.

3) If the common speed sensor ground circuit is lost, both sensor inputs will read the signal from the input speed sensor at idle in neutral. Since the input speed sensor reads 60 teeth from the input clutch hub and the output speed sensor reads 30 teeth from the park gear, the result is an apparent speed ratio of 1:2 and may cause the DTC P1794 to set when at a stop.

Diagnostic Test

1. CHECK TO SEE IF DTC P0715 IS CURRENT

Start the engine in park.

With the scan tool, monitor the Input Speed Sensor RPM.

Is the Input Speed Sensor RPM below 400 RPM?

Yes >> Go To 2

No >> Go To 9

P0715-INPUT SPEED SENSOR 1 CIRCUIT (CONTINUED)

2. INPUT SPEED SENSOR

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the Transmission Simulator, set the selector switch to 3000/1000 and the Input/Output switch to ON.

With the scan tool, monitor the Input and Output Speed Sensor RPM.

Does the Input speed read 3000 RPM and the Output speed read 1000 RPM ± 50 RPM?

Yes >> Replace the Input Speed Sensor per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 3

---

3. (T52) INPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector and connect Miller tool #8815.

NOTE: Make sure to leave the Speed Sensor, Transmission Solenoid/TRS Assembly, and Line Pressure Sensor harness connectors disconnected.

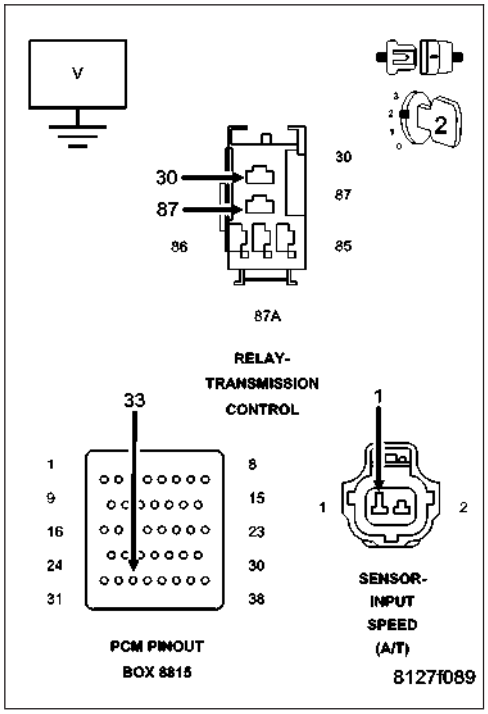
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Remove the Transmission Control Relay.

Place a jumper wire between the (A104) Fused B+ circuit and the (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

Ignition on, engine not running.

Measure the voltage of the (T52) Input Speed Sensor Signal circuit.



Is the voltage above 0.5 volts?

Yes >> Repair the (T52) Input Speed Sensor Signal circuit for a short to voltage.
Perform (NGC) 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 4

P0715-INPUT SPEED SENSOR 1 CIRCUIT (CONTINUED)

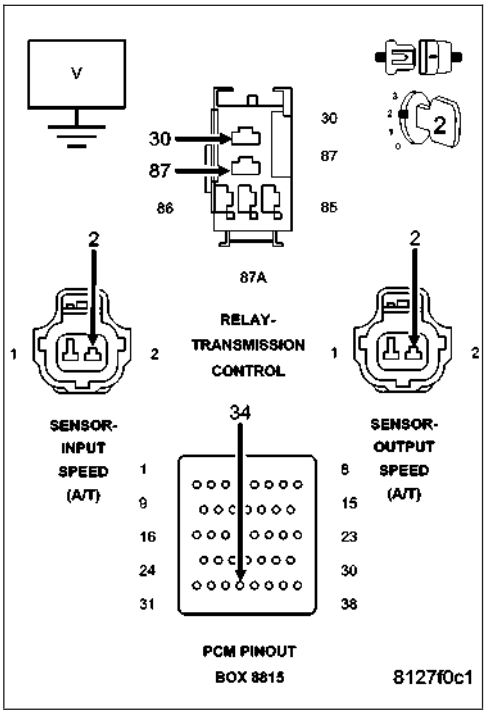
4. (T13) SPEED SENSOR GROUND CIRCUIT SHORT TO VOLTAGE

Measure the voltage of the (T13) Speed Sensor Ground circuit.

Is the voltage above 0.5 volts?

Yes >> Repair the (T13) Speed Sensor Ground circuit for a short to voltage.
Perform (NGC) 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5



5. (T52) INPUT SPEED SENSOR SIGNAL CIRCUIT OPEN

Turn the ignition off to the lock position.

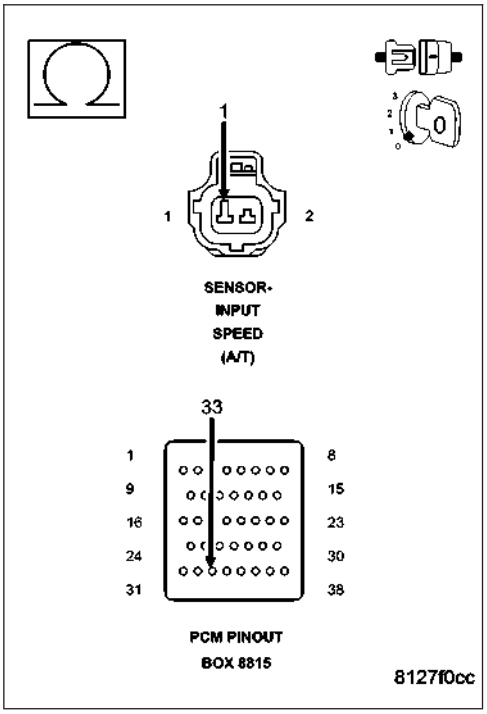
Disconnect the jumper wire between the (A104) Fused B+ circuit and the (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

Measure the resistance of the (T52) Input Speed Sensor Signal circuit between the Input Speed Sensor harness connector and the appropriate terminal of Miller tool #8815.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T52) Input Speed Sensor Signal circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 6



P0715-INPUT SPEED SENSOR 1 CIRCUIT (CONTINUED)

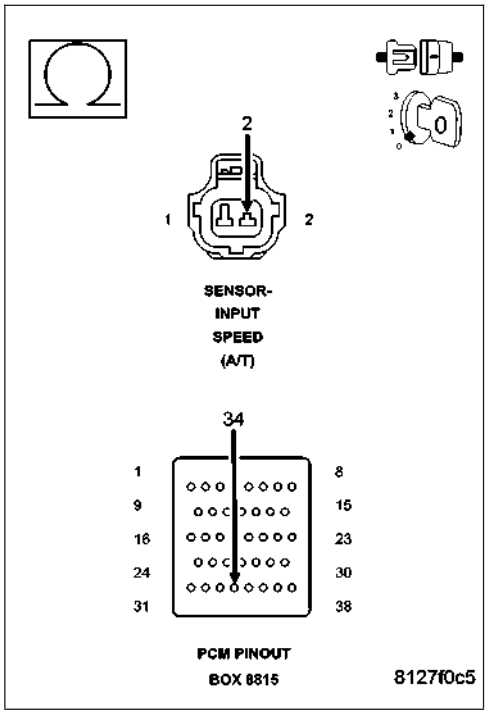
6. (T13) SPEED SENSOR GROUND CIRCUIT OPEN

Measure the resistance of the (T13) Speed Sensor Ground circuit between the Input Speed Sensor harness connector and the appropriate terminal of Miller tool #8815.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T13) Speed Sensor Ground circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 7



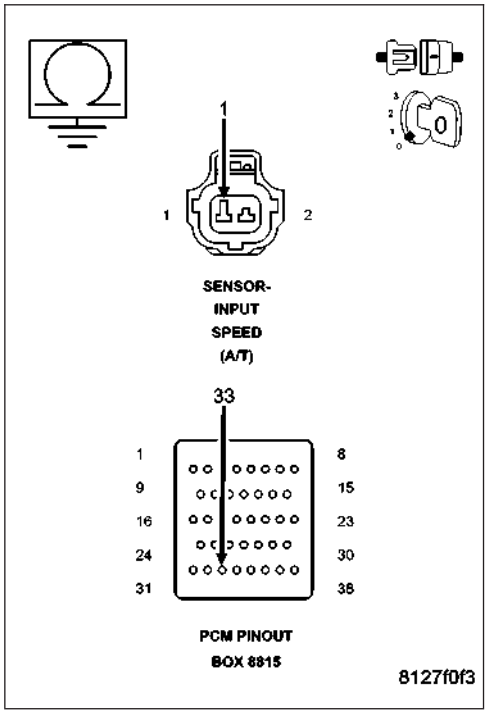
7. (T52) INPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the Input Speed Sensor Signal circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (T52) Input Speed Sensor Signal circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

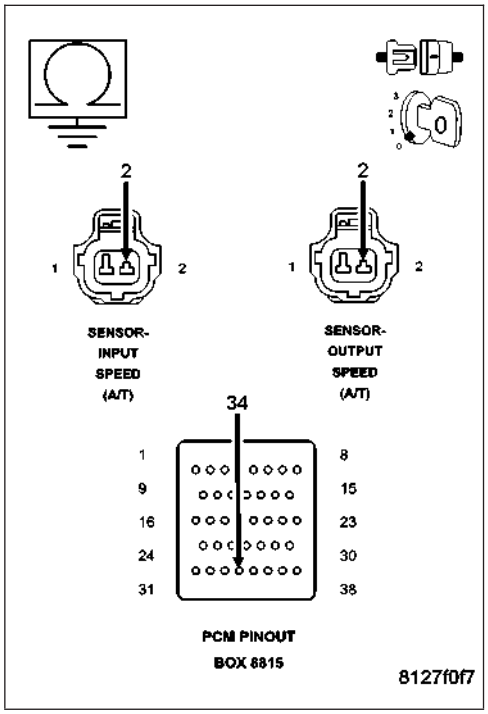
No >> Go To 8



P0715-INPUT SPEED SENSOR 1 CIRCUIT (CONTINUED)

8. (T13) SPEED SENSOR GROUND CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T13) Speed Sensor Ground circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (T13) Speed Sensor Ground circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

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9. INTERMITTENT WIRING AND CONNECTORS

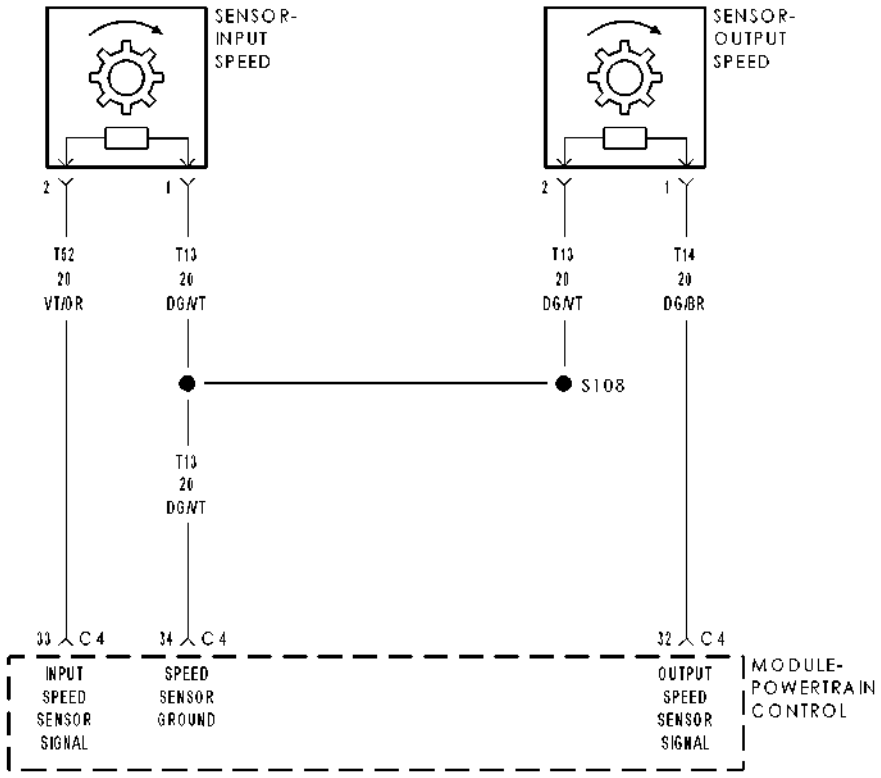
The conditions necessary to set this DTC are not present at this time.
Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.
Wiggle the wires while checking for shorted and open circuits.
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

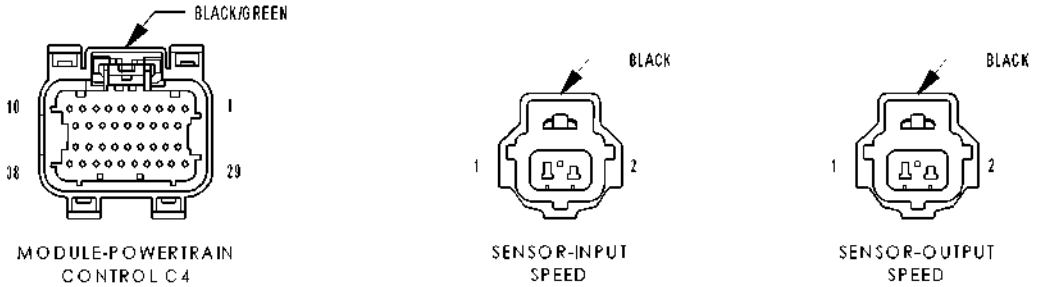
Were there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0720-OUTPUT SPEED SENSOR CIRCUIT





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P0720-OUTPUT SPEED SENSOR CIRCUIT (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  The transmission gear ratio is monitored continuously while the transmission is in gear.
- **Set Condition:**
  If there is an excessive change in output RPM in any gear. This DTC can take up to five minutes of problem identification before illuminating the MIL.

Possible Causes
OUTPUT SPEED SENSOR SIGNAL CIRCUIT OPEN
SPEED SENSOR GROUND CIRCUIT OPEN
OUTPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO GROUND
SPEED SENSOR GROUND CIRCUIT SHORT TO GROUND
OUTPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE
SPEED SENSOR GROUND CIRCUIT SHORT TO VOLTAGE
OUTPUT SPEED SENSOR
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The transmission system uses two speed sensors, one to measure input RPM and one to measure output RPM. These inputs are essential for proper transmission operation. Therefore, the integrity of this data is verified through the following checks:

1) When in gear, if the gear ratio does not compare to a known gear ratio, the corresponding in-gear trouble code is set (codes P0731 through P0736).

2) An excessive change in input or output speeds indicating signal intermittent will result in codes P0715 and/or P0720 being set.

3) If the common speed sensor ground circuit is lost, both sensor inputs will read the signal from the input speed sensor at idle in neutral. Since the input speed sensor has 60 teeth and the output speed sensor has 30 teeth, this results in a an apparent speed ratio of 1:2 and may cause the DTC P1794 to set.

P0720-OUTPUT SPEED SENSOR CIRCUIT (CONTINUED)

Diagnostic Test

1. CHECK TO SEE IF DTC P0720 IS CURRENT

Turn the ignition off to the lock position.

CAUTION: Properly support the vehicle and raise all drive wheels off the ground.

Release the parking brake.

Start the engine in park.

Place the transmission gear selector in drive, release foot from brake.

WARNING: BE SURE TO KEEP HANDS AND FEET CLEAR OF ROTATING WHEELS.

With the scan tool, monitor the Output Speed Sensor RPM.

Is the Output Speed Sensor RPM below 100 RPM?

Yes >> Go To 2

No >> Go To 9

---

2. OUTPUT SPEED SENSOR

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the Transmission Simulator, set the selector switch to 3000/1000 and the Input/Output switch to ON.

With the scan tool, monitor the Input and Output Speed Sensor RPM

Does the Input Speed read 3000 RPM and the Output Speed read 1000 RPM, ± 50 RPM?

Yes >> Replace the Output Speed Sensor per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 3

P0720-OUTPUT SPEED SENSOR CIRCUIT (CONTINUED)

3. OUTPUT SPEED SENSOR SIGNAL CIRCUIT OPEN

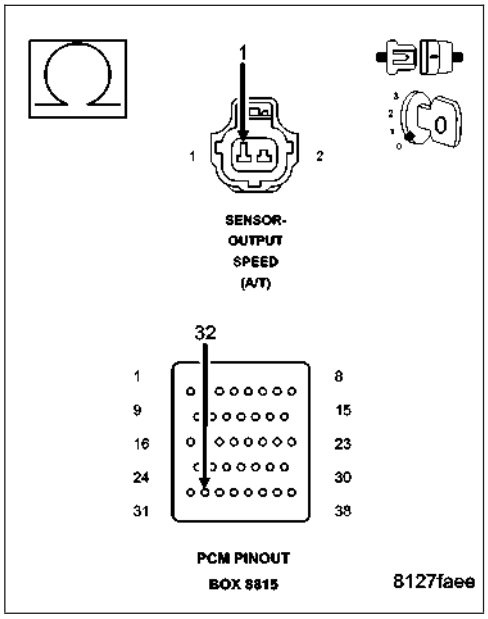
Turn the ignition off to the lock position.

Disconnect the Transmission Simulator, Miller tool #8333.

Disconnect the PCM harness connectors and connect Miller special tool #8815.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller special tool #8815 to perform diagnosis..

Measure the resistance of the Output Speed Sensor Signal circuit from the Output Speed Sensor harness connector to the appropriate terminal of special tool #8815.



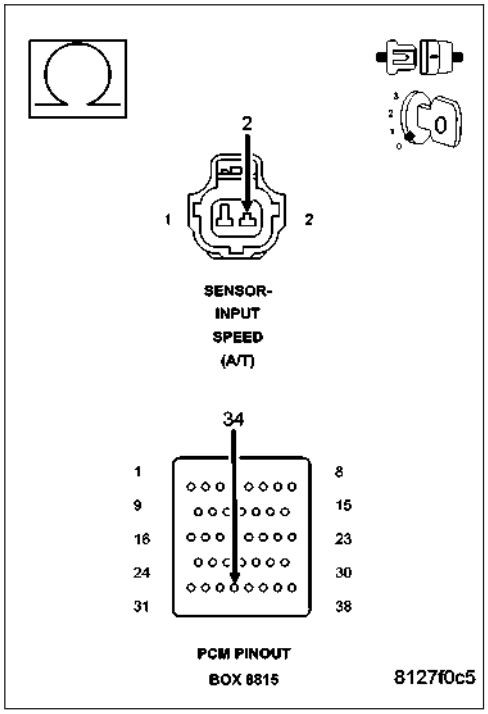
Is the resistance above 5.0 ohms?

Yes >> Repair the Output Speed Sensor Signal circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 4

4. SPEED SENSOR GROUND CIRCUIT OPEN

Measure the resistance of the Speed Sensor Ground circuit from the Output Speed Sensor harness connector to the appropriate terminal in the special tool #8815.



Is the resistance above 5.0 ohms?

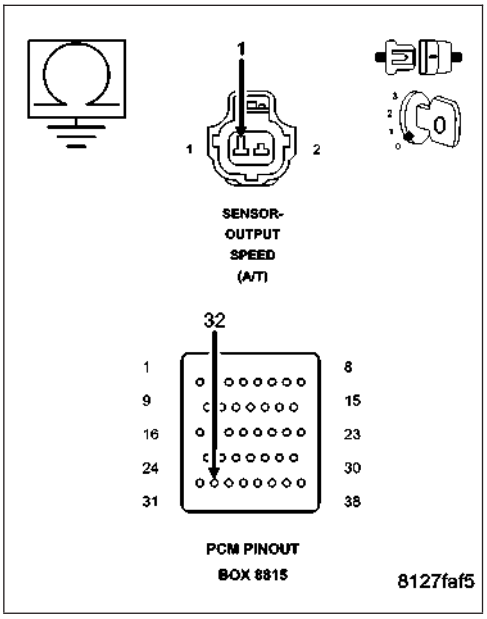
Yes >> Repair the Speed Sensor Ground circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5

P0720-OUTPUT SPEED SENSOR CIRCUIT (CONTINUED)

5. OUTPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the Output Speed Sensor Signal circuit.



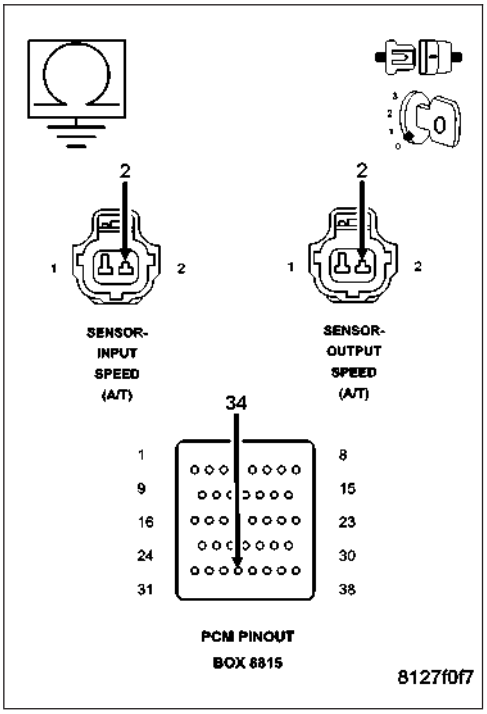
Is the resistance below 5.0 ohms?

Yes >> Repair the Output Speed Sensor Signal circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 6

6. SPEED SENSOR GROUND CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the Speed Sensor Ground circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the Speed Sensor Ground circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 7

P0720-OUTPUT SPEED SENSOR CIRCUIT (CONTINUED)

7. OUTPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE

Remove the Transmission Control Relay.

Place a jumper wire between the Fused B+ circuit and the Transmission Relay Output circuit in the Transmission Control Relay connector.

Ignition on, engine not running.

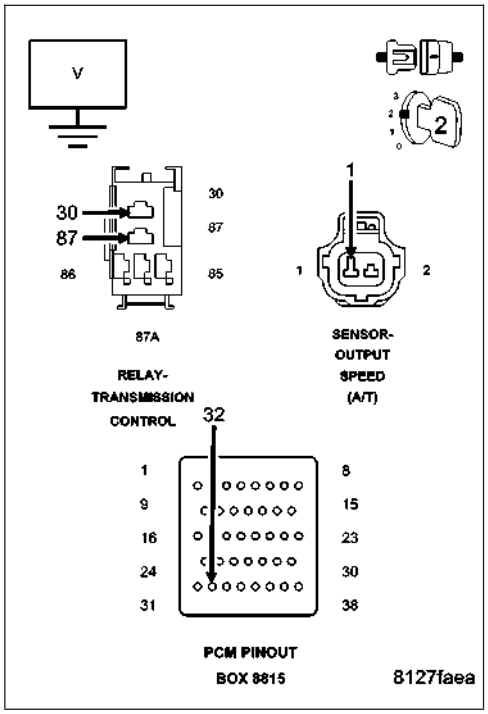
Measure the voltage of the Output Speed Sensor Signal circuit.

Is the voltage above 0.5 volts?

Yes >> Repair the Output Speed Sensor Signal circuit for a short to voltage.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 8



8. SPEED SENSOR GROUND CIRCUIT SHORT TO VOLTAGE

Measure the voltage of the Speed Sensor Ground circuit.

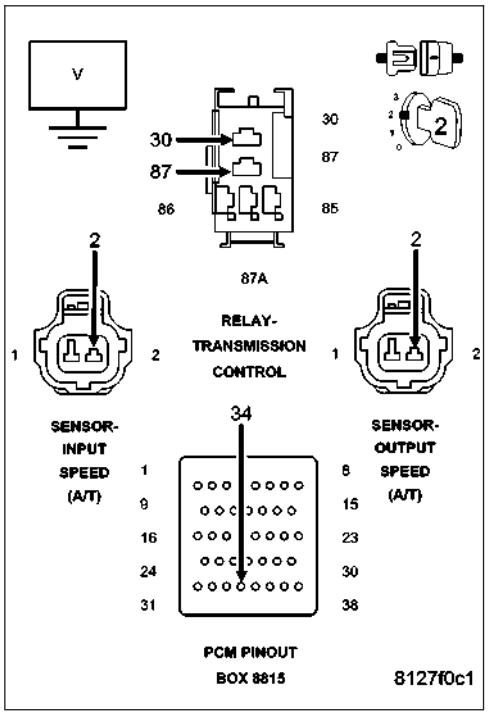
Is the voltage above 0.5 volts?

Yes >> Repair the Speed Sensor Ground circuit for a short to voltage.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.



P0720-OUTPUT SPEED SENSOR CIRCUIT (CONTINUED)

9. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.
Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.
Wiggle the wires while checking for shorted and open circuits.
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Were there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0725-ENGINE SPEED SENSOR CIRCUIT

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously every 7 msec with the ignition on and engine running.
- **Set Condition:**
  This DTC will set when the calculated engine speed is less than 390 RPM with the engine running, or greater than 8000 RPM, for the period of 2.0 seconds. The PCM will place the Transmission in Limp-in when this DTC is set. **Note: This is not a Transmission Input Speed Sensor DTC.**

Possible Causes
RELATED ENGINE DTC'S PRESENT
CRANK POSITION SENSOR OR WIRING
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Transmission Control System calculates the engine RPM by directly reading the engine crank position sensor. It compares the calculated value to the engine speed sensor signal transmitted from the Engine Control System over the controllers internal bus. The calculated engine RPM is also compared to a minimum and a maximum value. **Note: Due to the integration of the Powertrain Control Module (PCM) and Transmission Control Module (TCM), bus communication between the modules is internal and unserviceable.**

Diagnostic Test

1. RELATED ENGINE DTCS PRESENT

NOTE: This is not a Transmission Input Speed Sensor DTC.
Ignition on, engine not running.
With the scan tool, read all Engine DTC's. This includes any active or stored or one trip DTCs.

Are there any engine RPM related DTCs present?

Yes >> Refer to the Powertrain category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

P0725-ENGINE SPEED SENSOR CIRCUIT (CONTINUED)

2. VERIFY IF THE DTC IS CURRENT

Ignition on, engine not running.

With a scan tool, read and record all EATX DTC EVENT DATA.

With the scan tool, erase all active and stored transmission DTCs. (Note: it may be necessary to perform a battery disconnect with the scan tool to clear EATX DTC EVENT DATA.)

Using the EATX DTC EVENT DATA, duplicate the conditions in which the original DTC set.

With the scan tool, read transmission and engine DTCs.

NOTE: Refer to all engine DTCs first in the following question.

Pick the answer below that best describes your findings, (this includes one trip failures).

Transmission DTC P0725 set

Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Also check the Crank Position sensor and wiring. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

Engine DTC set

Refer to the Driveability category and perform the appropriate symptom.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No DTC set at all

Go To 3

---

3. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Were there any problems found?

Yes >> Repair as necessary.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0731-GEAR RATIO ERROR IN 1ST

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously with the ignition on, engine running, with the transmission in gear.
- **Set Condition:**
  If the ratio of the Input RPM to the Output RPM does not match the current gear ratio. This DTC can take up to five minutes of problem identification before illuminating the MIL

Possible Causes
CUT UD PISTON SEAL
LOW FLUID LEVEL
CRACKED OR MISINSTALLED PRIMARY OIL FILTER OR SEAL
STUCK OR STICKING MAIN REGULATOR VALVE
FAILED OVERRUNNING CLUTCH
CUT UD ACCUMULATOR SEAL RING
BROKEN UD ACCUMULATOR PISTON
BROKEN REACTION SHAFT SUPPORT SEAL RING
LOW LINE PRESSURE
BROKEN / MISSING MAIN VALVE BODY BLEED ORIFICE
BROKEN / MISSING DRIBBLER ORIFICE ASSEMBLY IN REACTION SHAFT SUPPORT
POOR MACHINING ON PUMP VALVE BODY FACE
INPUT SPEED SENSOR AND RELATED WIRING
TRANSMISSION SOLENOID/TRS ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The transmission system uses two speed sensors, one to measure input RPM and one to measure output RPM. These inputs are essential for proper transmission operation. Therefore, the integrity of this data is verified through the following checks:

1) Once in a particular gear, if the gear ratio varies from the correct gear ratio, the corresponding in-gear trouble code is set (DTCs P0731–36).

2) An excessive change in input or output speeds indicating signal intermittent may result in the DTCs P0715 and/or P0720 being set.

3) If the common speed sensor ground circuit is lost, both sensor inputs will read the pulses from the input speed sensor when at a stop in neutral. Since the input speed sensor reads 60 teeth from the input clutch hub and the output speed sensor reads 30 teeth from the park gear, the result is an apparent speed ratio of 1:2 and may cause the DTC P1794 to set.

P0731-GEAR RATIO ERROR IN 1ST (CONTINUED)

Diagnostic Test

1. DETERMINING IF RELATED DTC'S ARE PRESENT

With the scan tool, check for other transmission DTC's

If any of these DTC's are present, perform their respective tests first.

Are there any Transmission; solenoid, line pressure, speed sensor, and/or loss of prime DTC's present?

Yes >> Refer to the Transmission category and perform the appropriate symptom. If any of these DTCs are present, they may cause a Speed Ratio Error. Perform the test for P0944 first if it is present.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK TO SEE IF DTC P0731 IS CURRENT

With the scan tool, perform the 1st Gear Clutch Test. Follow the instructions on the scan tool.

Increase the throttle angle or TPS Degree to 30° for no more than a few seconds.

CAUTION: Do not overheat the transmission.

Did the Clutch Test pass, Input Speed remain at zero?

Yes >> Go To 3

No >> Go To 4

---

3. CHECK FOR INTERMITTENT OPERATION

The conditions to set this DTC are not currently present.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

- If the DTC Event Data shows fault P0731 was set in Park, Reverse, or Neutral, replace the Powertrain Control Module.

- If the DTC Event Data shows fault P0731 set with input RPM = zero, check the input speed sensor and related wiring.

- If the DTC Event Data shows fault P0731 set with line pressure significantly below desired line pressure, check for the cause of low line pressure (i.e., oil level, misinstalled or damaged primary filter or filter seal, sticking main regulator valve in pump, etc.).

- If the DTC Event Data shows fault P0731 set with the UD pressure switch open (but line pressure matches Desired Line Pressure), air check the UD hydraulic clutch circuit for leakage per the Service Information. If the UD hydraulic clutch circuit is OK, replace the solenoid/TRS assembly.

Check the gearshift linkage adjustment.

Intermittent Gear Ratio DTCs can be set by problems in the Input and Output Speed Sensor circuits and/or Speed Sensor Ground circuit.

Remove the Starter Relay.

NOTE: Failure to remove the Starter Relay can cause a Transmission - No Response condition.

Install Transmission Simulator, Miller tool #8333.

Wiggle wiring and connectors while checking for intermittent operation with the Transmission Simulator.

Gear ratio DTC's can also be set under extreme temperature conditions.

Verify if the problem is only experienced under extreme hot or cold conditions.

Were there any problems found.

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0731-GEAR RATIO ERROR IN 1ST (CONTINUED)

4. INTERNAL TRANSMISSION

Repair internal transmission as necessary. Refer to the Service Information.

If there were any line pressure DTC's present along with this DTC, make sure to inspect the: Primary oil filter and seal, Transmission Oil Pump, and the Main regulator valve per the Service Information.

If DTC's P0876 and/or P0875 were present in addition to the P0731, replace the Transmission Solenoid/TRS Assembly in addition to necessary internal repairs.

Pay particular attention to the following list of possible causes when repairing the transmission condition.

- Cut UD piston seal
- Failed overrunning clutch
- Cut UD accumulator seal ring
- Broken UD accumulator piston
- Broken reaction shaft support seal ring
- Low line pressure
- Broken/missing main valve body bleed orifice
- Broken/missing dribbler orifice assembly in reaction shaft support
- Poor machining on pump valve body face
- Transmission Solenoid/TRS Assembly

View repair.

Repair

Repair internal transmission per the Service Information.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0732-GEAR RATIO ERROR IN 2ND

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously with the ignition on, engine running, with the transmission in gear.
- **Set Condition:**
  If the ratio of the Input RPM to the Output RPM does not match the current gear ratio. This DTC can take up to five minutes of problem identification before illuminating the MIL

Possible Causes
RELATED DTC'S PRESENT
INPUT SPEED SENSOR OR WIRING
LOW FLUID LEVEL
CRACKED OR MISINSTALLED PRIMARY OIL FILTER OR SEAL
WORN SOLENOID SWITCH VALVE OR PLUGS
STUCK OR STICKING MAIN REGULATOR VALVE
BURNED UD OR 2C CLUTCH
CUT 2C OR UD PISTON SEAL
BROKEN 2C PISTON CASTING
BROKEN OR MISSING 2C BLEED ORIFICE
BROKEN OR MISSING UD BLEED ORIFICE
CUT 2C OR UD ACCUMULATOR PISTON SEAL
CRACKED 2C OR UD ACCUMULATOR PISTON
CUT OR MISSING #5 OR #7 CHECK BALL
TRANSMISSION SOLENOID/TRS ASSEMBLY
BROKEN WELD - REACTION CARRIER TO REVERSE SUN GEAR
MISSING TEETH ON INPUT CLUTCH HUB TONE WHEEL

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The transmission system uses two speed sensors, one to measure input RPM and one to measure output RPM. These inputs are essential for proper transmission operation. Therefore, the integrity of this data is verified through the following checks:

1) Once in a particular gear, if the gear ratio varies from the correct gear ratio, the corresponding in-gear trouble code is set (DTCs P0731–36).

2) An excessive change in input or output speeds indicating signal intermittent may result in the DTCs P0715 and/or P0720 being set.

3) If the common speed sensor ground circuit is lost, both sensor inputs will read the pulses from the input speed sensor when at a stop in neutral. Since the input speed sensor reads 60 teeth from the input clutch hub and the output speed sensor reads 30 teeth from the park gear, the result is an apparent speed ratio of 1:2 and may cause the DTC P1794 to set.

P0732-GEAR RATIO ERROR IN 2ND (CONTINUED)

Diagnostic Test

1. DETERMINING IF RELATED DTC'S ARE PRESENT

With the scan tool, check for other transmission DTC's

Are there any Transmission; solenoid, line pressure, speed sensor, and/or loss of prime DTC's present?

Yes >> Refer to appropriate symptom in the Transmission category. Perform the test for P0944–LOSS OF PRIME first if it is present.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK IF DTC IS CURRENT

With the scan tool, read and record the EATX DTC EVENT DATA.

NOTE: Make sure to record all EATX DTC EVENT DATA stored in the scan tool for future reference in this test procedure.

Does the EATX DTC EVENT DATA display information for the DTC P0732?

Yes >> Go To 4

No >> Go To 3

---

3. CHECK EATX DTC EVENT DATA

In the EATX DTC EVENT DATA, identify the DTC that was recorded earlier.

Does the EATX DTC EVENT DATA display information for the DTC P1790, with target gear = 2nd, or with both 2C and UD clutches applying?

Yes >> Go To 4

No >> Go To 7

---

4. CHECK RPM IN EATX DTC EVENT DATA

Refer to the EATX DTC EVENT DATA recorded earlier.

Does the Input RPM read zero?

Yes >> Check the input speed sensor and wiring. Refer to test P0715 and diagnose as if the DTC is current.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5

---

5. CHECK LINE PRESSURE READING

Refer to the EATX DTC EVENT DATA recorded earlier.

Is the line pressure reading more than 10 psi below the desired line pressure?

Yes >> Go To 6

No >> Go To 7

P0732-GEAR RATIO ERROR IN 2ND (CONTINUED)

6. CHECK TRANSMISSION OIL FILTER

Turn the ignition off to the lock position.

Remove and inspect the Transmission Oil Pan for excessive debris per the Service Information.

Remove and inspect the Primary Oil Filter per the Service Information.

NOTE: Make sure the Primary Transmission Oil Filter and seal are properly installed and are not cracked or split.

Does the Oil Pan contain excessive debris and/or is the Primary Oil Filter cracked, plugged or misinstalled?

Yes >> Repair the plugged, cracked, or split Primary Transmission Oil Filter and/or seal. If excessive clutch debris is present, check the clutches for damage. Refer to the Service Information for the proper hydraulic clutch repair procedure.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Remove the Transmission Oil Pump per the Service Information. Check the main Regulator Valve for sticking in its bore, scoring, and/or damage and clean and repair as necessary. If no problem is found, replace the Transmission Solenoid/TRS Assembly.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

7. CHECK TO SEE IF DTC P0732 IS CURRENT

With the scan tool, perform the 2nd Gear Clutch Test. Follow the instructions on the scan tool.

Increase the throttle angle, TPS Degree, to 30° for no more than a few seconds.

CAUTION: Do not overheat the transmission.

NOTE: If the 2C clutch is faulty, the overrunning clutch will hold and the slip test will pass. The 2nd gear clutch test will not detect a faulty 2C clutch. However, it will detect a faulty UD clutch.

Did the clutch test pass, did the Input Speed remain at zero?

Yes >> Go To 8

No >> Go To 10

---

8. CHECK FOR INTERMITTENT OPERATION

Check the Shifter adjustment per the Service Information.

Intermittent gear ratio DTCs can be set by problems in the Input and Output Speed Sensor circuits and/or Speed Sensor Ground circuit.

Check the Speed Sensor wiring and connectors for good connection, then perform a wiggle test using the Transmission Simulator, Miller tool #8333.

Were there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 9

P0732-GEAR RATIO ERROR IN 2ND (CONTINUED)

9. CHECK FOR SLIPPAGE

With the scan tool, erase Transmission DTCs.

Road test the vehicle.

Is there an obvious slippage noticed in 2nd gear, or runaway on the 1–2 shift?

Yes >> Go To 12

No >> Go To 15

---

10. UD HYDRAULIC CLUTCH CIRCUIT

Remove Transmission Oil Pan and check for excessive debris.

Remove the Valve Body and air check the UD hydraulic clutch circuit (in the case) per the Service Information.

NOTE: The UD clutch passage contains a small bleed orifice, a small amount of air leakage is normal.

Were there any problems found, excessive debris and/or excessive air leakage in the UD clutch hydraulic circuit?

Yes >> Repair as necessary. Check the UD clutch piston seals, reaction shaft support seal rings and the dribbler assembly, and the flatness of the pump valve body and pump housing faces. Check main regulator valve for sticking in the bore.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 11

---

11. UD ACCUMULATOR PISTON

Check the UD bleed orifice, accumulator piston, and accumulator piston seal in the main valve body.

Were there any problems found?

Yes >> Repair as necessary. Refer to the Service Information for proper repair procedures.

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

12. EXCESSIVE DEBRIS

Remove the Transmission Oil Pan and check for excessive debris.

If grey sludge is present, check for a improperly assembled 2C clutch with the thick reaction plate not against the case.

Remove the valve body and air check the 2C hydraulic clutch circuit (in the 2C/4C clutch retainer) per the Service Information.

NOTE: The 2C clutch passage contains a small bleed orifice, a small amount of air leakage is normal.

Were there any problems found, excessive debris, improperly assembled 2C clutch and/or excessive air leakage in the 2C hydraulic clutch circuit?

Yes >> Repair as necessary. Refer to the Service Information for proper repair procedures. Note: Check the 2C piston seals and bleed orifice.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 13

P0732-GEAR RATIO ERROR IN 2ND (CONTINUED)

13. 2C ACCUMULATOR

Check the 2C Accumulator piston for cracks or a cut seal.

Check for a cut or missing #7 or #5 check balls.

Check the Solenoid Switch Valve and its plugs for sticking in its bore or excessive wear.

Were there any problems found

Yes >> Repair as necessary. Refer to the Service Information for proper repair procedures.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 14

---

14. CHECK FOR BROKEN REVERSE SUN GEAR WELD

Working through the windows in the bottom of the case, check for a broken Reverse Sun gear weld to the reaction carrier as follows:

(1) Hold the Transmission Output Shaft by holding the Transmission Manual Lever in the park position.

(2) Rotate the Input Annulus gear and drive shell, (the drum that encloses the two rearmost carriers).

(3) Check to see if the reaction carrier (the frontmost carrier, whose outer shell is splined to the 2C clutch) is rotating faster than the drive shell is being turned.

Is the reaction carrier turning faster than the drive shell?

Yes >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the reaction carrier per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

15. CHECK IF DTC RESET

Did the DTC P0732 reset during the road test?

Yes >> Go To 16

No >> Go To 17

P0732-GEAR RATIO ERROR IN 2ND (CONTINUED)

16. LIST OF POSSIBLE CAUSES

If any other DTC's set during the road test, refer to the appropriate symptom in the Transmission category.

If no other DTC's set during the road test, below is a list of possible causes, but not strictly limited to those:

— Check for excessive debris in the Transmission Oil pan, plugged, cracked, or misinstalled Primary Transmission Oil Filter and/or seal.

— Check for cut and/or missing #7 and #5 check balls in the main valve body.

— Check the 2C and UD accumulator pistons and seals, UD bleed orifice, and the Solenoid Switch Valve and Plugs in the main valve body.

— Check the UD clutch piston seals, reaction shaft support seal rings and dribbler assembly.

— Check the 2C clutch piston seals, and bleed orifice.

— Check the main regulator valve for sticking in its bore and the flatness of the pump valve body and pump housing faces.

— Check for a improperly assembled 2C clutch with the thick reaction plate not against the case.

View repair

Repair

Repair as necessary. Refer to the Service Information for proper repair procedures.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

17. INTERMITTENT DTC

The conditions to set this DTC are not currently present.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

- If the DTC Event Data shows fault P0732 was set in Park, Reverse, or Neutral, replace the Powertrain Control Module.

- If the DTC Event Data shows fault P0732 set with input RPM = zero, check the input speed sensor and related wiring.

- If the DTC Event Data shows fault P0732 set with line pressure significantly below desired line pressure, check for the cause of low line pressure (i.e., oil level, misinstalled or damaged primary filter or filter seal, sticking main regulator valve in pump, etc.).

- If the DTC Event Data shows fault P0732 set with the UD or 2C pressure switch open (but line pressure matches Desired Line Pressure), air check the UD and 2C hydraulic clutch circuits for leakage per the Service Information. If the UD and 2C hydraulic clutch circuits are OK, replace the Transmission Solenoid/TRS assembly.

Check the gearshift linkage adjustment.

Intermittent Gear Ratio DTCs can be set by problems in the Input and Output Speed Sensor circuits and/or Speed Sensor Ground circuit.

Remove the Starter Relay.

NOTE: Failure to remove the Starter Relay can cause a Transmission - No Response condition.

Install Transmission Simulator, Miller tool #8333.

Wiggle wiring and connectors while checking for intermittent operation with the Transmission Simulator.

Gear ratio DTC's can also be set under extreme temperature conditions.

Verify if the problem is only experienced under extreme hot or cold conditions.

Were there any problems found.

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0733-GEAR RATIO ERROR IN 3RD

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously with the ignition on, engine running, with the transmission in gear.
- **Set Condition:**
  If the ratio of the Input RPM to the Output RPM does not match the current gear ratio. This DTC can take up to five minutes of problem identification before illuminating the MIL

Possible Causes
RELATED DTC'S PRESENT
INPUT SPEED SENSOR OR WIRING
LOW FLUID LEVEL
CRACKED OR MISINSTALLED PRIMARY OIL FILTER OR SEAL
BENT OR BROKEN ACCUMULATOR COVER ON MAIN VALVE BODY
WORN SOLENOID SWITCH VALVE OR PLUGS
STUCK OR STICKING MAIN REGULATOR VALVE
BURNED UD OR OD CLUTCH
CUT OD OR UD PISTON SEAL
BROKEN OR MISSING UD OR OD BLEED ORIFICE IN MAIN VALVE BODY
BROKEN OR MISSING BLEED ORIFICE IN UD OR OD CLUTCH PISTON
CUT OD OR UD ACCUMULATOR PISTON SEAL
CRACKED OD OR UD ACCUMULATOR PISTON
CUT OR MISSING #6 CHECK BALL
TRANSMISSION SOLENOID/TRS ASSEMBLY
BROKEN WELD - REVERSE CARRIER HUB TO CARRIER
BROKEN REACTION SHAFT SUPPORT SEAL RING
POOR MACHINING ON PUMP VALVE BODY FACE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The transmission system uses two speed sensors, one to measure input RPM and one to measure output RPM. These inputs are essential for proper transmission operation. Therefore, the integrity of this data is verified through the following checks:

1) Once in a particular gear, if the gear ratio varies from the correct gear ratio, the corresponding in-gear trouble code is set (DTCs P0731–36).

2) An excessive change in input or output speeds indicating signal intermittent may result in the DTCs P0715 and/or P0720 being set.

3) If the common speed sensor ground circuit is lost, both sensor inputs will read the pulses from the input speed sensor when at a stop in neutral. Since the input speed sensor reads 60 teeth from the input clutch hub and the output speed sensor reads 30 teeth from the park gear, the result is an apparent speed ratio of 1:2 and may cause the DTC P1794 to set.

P0733-GEAR RATIO ERROR IN 3RD (CONTINUED)

Diagnostic Test

1. DETERMINING IF RELATED DTC'S ARE PRESENT

With the scan tool, check for other transmission DTC's

Are there any Transmission; solenoid, line pressure, speed sensor, and/or loss of prime DTC's present?

Yes >> Refer to appropriate symptom in the Transmission category. Perform the test for P0944–LOSS OF PRIME first if it is present.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK EATX DTC EVENT DATA

With the scan tool, read and record the EATX DTC EVENT DATA.

NOTE: Make sure to record all EATX DTC EVENT DATA stored in the scan tool for future reference in this test procedure.

Does the EATX DTC EVENT DATA display information for the DTC P0733?

Yes >> Go To 4

No >> Go To 3

---

3. TARGET GEAR IN EATX DTC EVENT DATA

In the EATX DTC EVENT DATA, identify the DTC that was recorded earlier.

Does the EATX DTC EVENT DATA display information for the DTC P1790, with target gear = 3rd, or with both OD and UD clutches applying?

Yes >> Go To 4

No >> Go To 7

---

4. CHECK RPM IN EATX DTC EVENT DATA

Refer to the EATX DTC EVENT DATA recorded earlier.

Does the Input RPM read zero?

Yes >> Check the input speed sensor and wiring. Refer to test P0715 and diagnose as if the DTC is current.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5

---

5. CHECK LINE PRESSURE READING

Refer to the EATX DTC EVENT DATA recorded earlier.

Is the line pressure reading more than 10 psi below the desired line pressure?

Yes >> Go To 6

No >> Go To 7

P0733-GEAR RATIO ERROR IN 3RD (CONTINUED)

6. CHECK TRANSMISSION OIL FILTER

Turn the ignition off to the lock position.

Remove and inspect the Transmission Oil Pan for excessive debris per the Service Information.

Remove and inspect the Primary Oil Filter per the Service Information.

NOTE: Make sure the Primary Transmission Oil Filter and seal are properly installed and are not cracked or split.

Does the Oil Pan contain excessive debris and/or is the Primary Oil Filter cracked, plugged or misinstalled?

Yes >> Repair the plugged, cracked, or split Primary Transmission Oil Filter and/or seal. If excessive clutch debris is present, check the clutches for damage. Refer to the Service Information for the proper hydraulic clutch repair procedure.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Remove the Transmission Oil Pump per the Service Information. Check the main Regulator Valve for sticking in its bore, scoring, and/or damage and clean and repair as necessary. If no problem is found, replace the Transmission Solenoid/TRS Assembly.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

7. CHECK TO SEE IF DTC P0733 IS CURRENT

With the scan tool, perform the 3rd Gear Clutch Test. Follow the instructions on the scan tool.

Increase the throttle angle, TPS Degree, to 30° for no more than a few seconds.

CAUTION: Do not overheat the transmission.

NOTE: If the OD clutch is faulty, the overrunning clutch will hold and the slip test will pass. The 3rd gear clutch test will not detect a faulty OD clutch. However, it will detect a faulty UD clutch.

Did the clutch test pass, did the Input Speed remain at zero?

Yes >> Go To 8

No >> Go To 10

---

8. CHECK FOR INTERMITTENT OPERATION

Check the Shifter adjustment per the Service Information.

Intermittent gear ratio DTCs can be set by problems in the Input and Output Speed Sensor circuits and/or Speed Sensor Ground circuit.

Check the Speed Sensor wiring and connectors for good connection, then perform a wiggle test using the Transmission Simulator, Miller tool #8333.

Were there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 9

P0733-GEAR RATIO ERROR IN 3RD (CONTINUED)

9. CHECK FOR SLIPPAGE

With the scan tool, erase Transmission DTCs.

Road test the vehicle. Check operation in 3rd gear, 4th gear, and Reverse.

Is there an obvious slippage noticed in 3rd gear, or runaway on the 2–3 shift?

Yes >> Go To 12

No >> Go To 16

---

10. UD HYDRAULIC CLUTCH CIRCUIT

Remove Transmission Oil Pan and check for excessive debris.

Remove the Valve Body and air check the UD hydraulic clutch circuit (in the case) per the Service Information.

NOTE: The UD clutch passage contains a small bleed orifice, a small amount of air leakage is normal.

Were there any problems found, excessive debris and/or excessive air leakage in the UD hydraulic clutch circuit?

Yes >> Repair as necessary. Check the UD clutch piston seals, reaction shaft support seal rings and dribbler assemblies, and the flatness of the pump valve body and pump housing faces. Check main regulator valve for sticking in the bore.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 11

---

11. UD ACCUMULATOR PISTON

Check the UD bleed orifice, accumulator piston, and accumulator piston seal in the main valve body.

Were there any problems found?

Yes >> Repair as necessary. Refer to the Service Information for proper repair procedures.

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

12. EXCESSIVE DEBRIS

Remove the Transmission Oil Pan and check for excessive debris.

Remove the valve body and check if the accumulator cover is intact.

Air check the OD hydraulic clutch circuit (in the case) per the Service Information.

NOTE: The OD clutch passage contains a small bleed orifice which connects to the Reverse clutch hydraulic circuit, a small amount of air leakage into the Reverse clutch passage is normal.

Were there any problems found, excessive debris, and/or excessive air leakage in the OD hydraulic clutch circuit?

Yes >> Repair as necessary. Refer to the Service Information for proper repair procedures. Note: Check the bleed orifice in the OD/Reverse clutch piston.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 13

P0733-GEAR RATIO ERROR IN 3RD (CONTINUED)

13. OD ACCUMULATOR

Check the OD Accumulator piston for cracks or a cut seal.
Check for a cut or missing #6 check ball.
Check the Solenoid Switch Valve and its plugs for sticking in its bore or excessive wear.

Were there any problems found?

Yes >> Repair as necessary. Refer to the Service Information for proper repair procedures.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 14

---

14. CHECK FOR NO REVERSE

During the road test on a previous test, did the vehicle have no reverse and no 3rd gear, but 1st and 2nd gears were OK?

Yes >> Go To 15

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

15. CHECK FOR BROKEN REVERSE CARRIER WELD

Remove the Transmission per the Service Information and inspect the weld on the reverse carrier hub.

Were there any problems found?

Yes >> Repair as necessary.

No >> Disassemble and inspect the input clutch assembly. Check the OD and Reverse clutch seals, discs, and bleed orifice (in the OD/Reverse clutch piston). Check the OD hub and shaft. Repair as necessary. Refer to the Service Information for proper repair procedures.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

16. CHECK IF DTC RESET

Did the DTC P0733 reset during the road test?

Yes >> Go To 17

No >> Go To 18

P0733-GEAR RATIO ERROR IN 3RD (CONTINUED)

17. LIST OF POSSIBLE CAUSES

If any other DTC's set during the road test, refer to the appropriate symptom in the Transmission category.

If no other DTC's set during the road test, below is a list of possible causes, but not strictly limited to those.

Check for:

— Excessive debris in the Transmission Oil pan, plugged, cracked, or misinstalled Primary Transmission Oil Filter and/or seal.

— Cut or missing #6 check ball in the main valve body.

— OD and UD accumulator pistons and seals and bleed orifices, and the Solenoid Switch Valve and Plugs in the main valve body.

— OD and UD clutch piston seals, reaction shaft support seal rings and dribbler assemblies, and the flatness of the pump valve body and pump housing faces.

— Main regulator valve for sticking in its bore.

View repair

Repair

Repair as necessary. Refer to the Service Information for proper repair procedures.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

18. CHECK FOR INTERMITTENT OPERATION

The conditions to set this DTC are not currently present.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

— If the DTC Event Data shows fault P0733 was set in the Park, Reverse, or Neutral, replace the Powertrain Control Module.

— If the DTC Event Data shows fault P0733 set with input RPM = zero, check the input speed sensor and related wiring.

— If the DTC Event Data shows fault P0733 set with line pressure significantly below desired line pressure, check for the cause of low line pressure (i.e., oil level, misinstalled or damaged primary filter or filter seal, sticking main regulator valve in pump, etc.).

— If the DTC Event Data shows fault P0733 set with the OD or UD pressure switch open (but line pressure matches Desired Line Pressure), air check the OD and UD hydraulic clutch circuits for leakage per the Service Information. If the OD and UD hydraulic clutch circuits are OK, replace the Transmission Solenoid/TRS assembly.

Check the gearshift linkage adjustment.

Intermittent Gear Ratio DTCs can be set by problems in the Input and Output Speed Sensor circuits and/or Speed Sensor Ground circuit.

Remove the Starter Relay.

NOTE: Failure to remove the Starter Relay can cause a Transmission - No Response condition.

Install the Transmission Simulator, Miller tool #8333.

Wiggle wiring and connectors while checking for intermittent operation with the Transmission Simulator.

Gear ratio DTC's can also be set under extreme temperature conditions.

Verify if the problem is only experienced under extreme hot or cold conditions.

Were there any problems found.

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0734-GEAR RATIO ERROR IN 4TH

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously with the ignition on, engine running, with the transmission in gear.
- **Set Condition:**
  If the ratio of the Input RPM to the Output RPM does not match the current gear ratio. This DTC can take up to five minutes of problem identification before illuminating the MIL.

Possible Causes
LOW FLUID LEVEL
INPUT SPEED SENSOR OR WIRING
VALVE BODY ACCUMULATOR COVER FAILED
CUT OD OR 4C ACCUMULATOR SEAL
CRACKED OD OR 4C ACCUMULATOR PISTON
BROKEN OR MISSING OD BLEED ORIFICE IN MAIN VALVE BODY
CUT 4C TOWER SEAL
TRANSMISSION SOLENOID/TRS ASSEMBLY
CUT OR MISSING #5 OR #6 CHECK BALL
WORN SOLENOID SWITCH VALVE OR PLUGS
CUT OD OR 4C PISTON SEAL
STUCK MAIN REGULATOR VALVE
BURNED OD OR 4C CLUTCH
BROKEN OR MISSING 4C BLEED ORIFICE IN 2C/4C RETAINER
BROKEN REACTION SHAFT SUPPORT SEAL RING
POOR MACHINING ON PUMP VALVE BODY FACE
LOOSE / MISSING DRIBBLER ORIFICE ASSEMBLY IN REACTION SHAFT SUPPORT
CRACKED / LOOSE / MISSING OD/REVERSE PISTON BLEED ORIFICE
BROKEN REVERSE CARRIER HUB WELD
BROKEN REVERSE SUN GEAR WELD TO REACTION CARRIER

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

P0734-GEAR RATIO ERROR IN 4TH (CONTINUED)

Theory of Operation

The transmission system uses two speed sensors, one to measure input RPM and one to measure output RPM. These inputs are essential for proper transmission operation. Therefore, the integrity of this data is verified through the following checks:

1) Once in a particular gear, if the gear ratio varies from the correct gear ratio, the corresponding in-gear trouble code is set (DTCs P0731–36).

2) An excessive change in input or output speeds indicating signal intermittent may result in the DTCs P0715 and/or P0720 being set.

3) If the common speed sensor ground circuit is lost, both sensor inputs will read the pulses from the input speed sensor when at a stop in neutral. Since the input speed sensor reads 60 teeth from the input clutch hub and the output speed sensor reads 30 teeth from the park gear, the result is an apparent speed ratio of 1:2 and may cause the DTC P1794 to set.

1. DETERMINING IF RELATED DTC'S ARE PRESENT

With the scan tool, check for other transmission DTC's

If any of these DTC's are present, perform their respective tests first.

Are there any Transmission; solenoid, line pressure, speed sensor, and/or loss of prime DTC's present?

Yes >> Refer to the Transmission category and perform the appropriate symptom. If any of these DTCs are present, they may cause a Speed Ratio Error. Perform the test for P0944 first if it is present.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK DTC EVENT DATA

With the scan tool, read and record the DTC EVENT DATA.

NOTE: Make sure to record all DTC EVENT DATA stored in the scan tool for future reference in this test procedure.

Does the DTC EVENT DATA display information for the DTC P0734?

Yes >> Go To 4

No >> Go To 3

---

3. CHECK FOR OTHER DTC

In the DTC EVENT DATA recorded earlier, does the DTC EVENT DATA show the DTC P1790, with Target Gear = 4th, or with both the 4C and OD clutches applying?

Yes >> Go To 4

No >> Go To 6

---

4. CHECK INPUT RPM

In the DTC EVENT DATA recorded earlier, does the Input RPM read zero?

Yes >> Refer to the Transmission category and perform the diagnostic procedure for P0715 (Input Speed Sensor Error). Diagnose the DTC as if it is set and current.

No >> Go To 5

P0734-GEAR RATIO ERROR IN 4TH (CONTINUED)

5. CHECK LINE PRESSURE READING

In the DTC EVENT DATA recorded earlier, is the line pressure reading more than 10 PSI below the desired line pressure reading?

Yes >> Remove the Transmission Oil pan and check the Transmission Oil filter for improper installation or plugged, if Primary oil filter is OK, check the main regulator valve in pump. If excessive debris is in the oil pan, check clutches and repair as necessary. Refer to the Service Information for proper repair procedures.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 6

---

6. CHECK TRANSMISSION FOR SLIPPAGE

Erase DTCs and road test the vehicle.

Check the transmission operation in reverse and all forward gears.

During the road test, was there any obvious slippage noted in 4th gear or a runaway during the 3–4 shift?

Yes >> Go To 8

No >> Go To 7

---

7. CHECK IF DTC RESET

With the scan tool, check for Transmission DTCs after the road test.

Did the DTC P0734 reset?

Yes >> Go To 8

No >> Test Complete.

---

8. CHECK INTERNAL TRANSMISSION

— Remove the Transmission Oil Pan and Valve Body per the Service Information and check for the following:
— Excessive debris in the oil pan.
— Remove the Valve Body and check if the accumulator cover is intact and the 4C tower seal is not cut or split.
— OD and 4C accumulator pistons for cracks and/or cut seals.
— Solenoid Switch Valve and its plugs for stickiness or wear.
— Cut or missing #5 and/or #6 check ball.
— OD bleed orifice on top of the Valve Body
— Air check the OD and 4C hydraulic clutch circuits for excessive leakage. Refer to the Service information.

NOTE: Both the OD and 4C hydraulic clutch circuits contain a small bleed orifice. A small amount of air leakage is considered normal. The OD hydraulic clutch circuit bleed orifice connects to the Reverse input clutch hydraulic cavity. A small amount of air leakage into the Reverse hydraulic clutch circuit is considered normal.

Were there any problems found?

Yes >> Repair as necessary. Refer to the Service Information for proper repair procedures.

No >> Go To 9

P0734-GEAR RATIO ERROR IN 4TH (CONTINUED)

9. TRANSMISSION SOLENOID/TRS ASSEMBLY

Was there no reverse gear during the road test?

Yes >> Go To 10

No >> Replace the Solenoid/TRS Assembly per the Service Information.

---

10. CHECK ROAD TEST RESULTS

During the road test, was there no 2nd gear and no 4th gear, but 3rd gear (limp-in) was OK?

Yes >> Go To 11

No >> Go To 12

---

11. CHECK FOR BROKEN REVERSE SUN GEAR WELD

Working through the windows in the bottom of the case, check for a broken Reverse Sun gear weld to the reaction carrier as follows:

(1) Hold the Transmission Output Shaft by holding the Transmission Manual Lever in the park position.

(2) Rotate the Input Annulus gear and drive shell, (the drum that encloses the two rearmost carriers).

(3) Check to see if the reaction carrier (the frontmost carrier, whose outer shell is splined to the 2C clutch) is rotating faster than the drive shell is being turned.

Is the reaction carrier turning faster than the drive shell?

Yes >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the reaction carrier per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

12. CHECK FOR NO REVERSE

Remove the Transmission per the Service Information and inspect the weld on the reverse carrier hub.

Were there any problems found?

Yes >> Repair as necessary. Refer to the Service Information for proper repair procedures.

No >> Disassemble and inspect the input clutch assembly. Check the OD and Reverse clutch seals, discs, and bleed orifice (in the OD/Reverse clutch piston). Check the OD hub and shaft. Repair as necessary. Refer to the Service Information for proper repair procedures.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0735-GEAR RATIO ERROR IN 5TH

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously with the ignition on, engine running, with the transmission in gear.
- **Set Condition:**
  If the ratio of the Input RPM to the Output RPM does not match the current gear ratio. This DTC can take up to five minutes of problem identification before illuminating the MIL.

Possible Causes
LOW FLUID LEVEL
INPUT SPEED SENSOR OR WIRING
VALVE BODY ACCUMULATOR COVER FAILED
CUT OD OR 2C ACCUMULATOR SEAL
CRACKED OD OR 2C ACCUMULATOR PISTON
BROKEN OR MISSING OD BLEED ORIFICE IN MAIN VALVE BODY
CUT 2C TOWER SEAL
TRANSMISSION SOLENOID/TRS ASSEMBLY
CUT OR MISSING #5, #6, OR #7 CHECK BALL
WORN SOLENOID SWITCH VALVE OR PLUGS
CUT OD OR 2C PISTON SEAL
STUCK MAIN REGULATOR VALVE
BURNED OD OR 2C CLUTCH
BROKEN OR MISSING 2C BLEED ORIFICE IN 2C/4C RETAINER
BROKEN REACTION SHAFT SUPPORT SEAL RING
POOR MACHINING ON PUMP VALVE BODY FACE
LOOSE / MISSING DRIBBLER ORIFICE ASSEMBLY IN REACTION SHAFT SUPPORT
CRACKED / LOOSE / MISSING OD/REVERSE PISTON BLEED ORIFICE
BROKEN REVERSE CARRIER HUB WELD
BROKEN REVERSE SUN GEAR WELD TO REACTION CARRIER

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

P0735-GEAR RATIO ERROR IN 5TH (CONTINUED)

Theory of Operation

The transmission system uses two speed sensors, one to measure input RPM and one to measure output RPM. These inputs are essential for proper transmission operation. Therefore, the integrity of this data is verified through the following checks:

1) Once in a particular gear, if the gear ratio varies from the correct gear ratio, the corresponding in-gear trouble code is set (DTCs P0731–36).

2) An excessive change in input or output speeds indicating signal intermittent may result in the DTCs P0715 and/or P0720 being set.

3) If the common speed sensor ground circuit is lost, both sensor inputs will read the pulses from the input speed sensor when at a stop in neutral. Since the input speed sensor reads 60 teeth from the input clutch hub and the output speed sensor reads 30 teeth from the park gear, the result is an apparent speed ratio of 1:2 and may cause the DTC P1794 to set.

1. DETERMINING IF RELATED DTC'S ARE PRESENT

With the scan tool, check for other transmission DTC's

If any of these DTC's are present, perform their respective tests first.

Are there any Transmission; solenoid, line pressure, speed sensor, and/or loss of prime DTC's present?

Yes >> Refer to the Transmission category and perform the appropriate symptom. If any of these DTCs are present, they may cause a Speed Ratio Error. Perform the test for P0944 first if it is present.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK EATX DTC EVENT DATA

With the scan tool, read and record the EATX DTC EVENT DATA.

NOTE: Make sure to record all EATX DTC EVENT DATA stored in the scan tool for future reference in this test procedure.

Does the EATX DTC EVENT DATA display information for the DTC P0735?

Yes >> Go To 4

No >> Go To 3

---

3. CHECK TARTET GEAR

In the EATX DTC EVENT DATA recorded earlier, does the DTC EVENT DATA show the DTC P1790, with Target gear = 5th, or with both the 2C and OD clutches applying?

Yes >> Go To 4

No >> Go To 6

---

4. CHECK INPUT RPM

In the EATX DTC EVENT DATA recorded earlier, does the Input RPM read zero?

Yes >> Refer to the Transmission category and perform the diagnostic procedure for P0715 (Input Speed Sensor Error). Diagnose the DTC as if it is set and current.

No >> Go To 5

P0735-GEAR RATIO ERROR IN 5TH (CONTINUED)

5. CHECK LINE PRESSURE READING

In the EATX DTC EVENT DATA recorded earlier, is the line pressure reading more than 10 PSI below the desired line pressure reading?

Yes >> Remove the Transmission Oil pan and check the Transmission Oil filter for improper installation or plugged, if Primary oil filter is OK, check the main regulator valve in pump. If excessive debris is in the oil pan, check clutches and repair as necessary. Refer to the Service Information for proper repair procedures.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 6

---

6. CHECK TRANSMISSION FOR SLIPPAGE

Erase DTCs and road test the vehicle.

Check the transmission operation in reverse and all forward gears.

During the road test, was there any obvious slippage noted in 5th gear or a runaway during the 4–5 shift?

Yes >> Go To 8

No >> Go To 7

---

7. CHECK IF DTC RESET

With the scan tool, check for Transmission DTCs after the road test.

Did the DTC P0735 reset?

Yes >> Go To 8

No >> Test Complete.

---

8. CHECK INTERNAL TRANSMISSION

Remove the Transmission Oil Pan and Valve Body, per the Service Information, and check for the following:

— Excessive clutch and or metal debris in the oil pan.

— If the accumulator cover is intact and the 2C tower seal is not cut or split.

— OD and 2C accumulator pistons for cracks or cut seals.

— Solenoid Switch Valve and its plugs for stickiness or wear.

— Cut or missing #5, #6, or #7 check ball.

— OD bleed orifice on top of the valve body.

— Air check the OD and 2C hydraulic clutch circuits for excessive leakage. Refer to the Service information.

NOTE: Both the OD and 2C hydraulic clutch circuits contain a small bleed orifice. A small amount of air leakage is considered normal. The OD hydraulic clutch circuit bleed orifice connects to the Reverse input clutch hydraulic cavity. A small amount of air leakage into the Reverse hydraulic clutch circuit is considered normal.

Were there any problems found?

Yes >> Repair as necessary. Refer to the Service Information for proper repair procedures.

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.

P0736-GEAR RATIO ERROR IN REVERSE

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously with the ignition on, engine running, with the transmission in gear.
- **Set Condition:**
  If the ratio of the Input RPM to the Output RPM does not match the current gear ratio. This DTC can take up to five minutes of problem identification before illuminating the MIL

Possible Causes
LOW FLUID LEVEL
CUT LR TOWER SEAL ON MAIN VALVE BODY
CUT LR CLUTCH PISTON SEALS
BROKEN OR MISSING LR CLUTCH BLEED ORIFICE (IN LR CLUTCH RETAINER)
CUT LR ACCUMULATOR PISTON SEAL IN MAIN VALVE BODY
CRACKED LR ACCUMULATOR PISTON IN MAIN VALVE BODY
CUT OD/REV PISTON SEALS
BROKEN OR MISSING OD/REV BLEED ORIFICE (IN OD/REV CLUTCH PISTON)
BROKEN REVERSE CARRIER HUB WELD
BROKEN REVERSE SUN GEAR WELD TO THE REACTION CARRIER

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The transmission system uses two speed sensors, one to measure input RPM and one to measure output RPM. These inputs are essential for proper transmission operation. Therefore, the integrity of this data is verified through the following checks:

1) Once in a particular gear, if the gear ratio varies from the correct gear ratio, the corresponding in-gear trouble code is set (DTCs P0731–36).

2) An excessive change in input or output speeds indicating signal intermittent may result in the DTCs P0715 and/or P0720 being set.

3) If the common speed sensor ground circuit is lost, both sensor inputs will read the pulses from the input speed sensor when at a stop in neutral. Since the input speed sensor reads 60 teeth from the input clutch hub and the output speed sensor reads 30 teeth from the park gear, the result is an apparent speed ratio of 1:2 and may cause the DTC P1794 to set.

Diagnostic Test

1. DETERMINING IF RELATED DTC'S ARE PRESENT

With the scan tool, check for other transmission DTC's

Are there any Transmission; solenoid, line pressure, speed sensor, and/or loss of prime DTC's present?

Yes >> Refer to appropriate symptom in the Transmission category. Perform the test for P0944–LOSS OF PRIME first if it is present.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

P0736-GEAR RATIO ERROR IN REVERSE (CONTINUED)

2. CHECK TO SEE IF DTC IS CURRENT

With the scan tool, perform the Reverse Gear Clutch test. Follow the instructions on the scan tool.

Increase the throttle angle, TPS degree, to 30°, for no more than a few seconds.

CAUTION: Do not overheat the transmission.

NOTE: Make sure to record all EATX DTC EVENT DATA stored in the scan tool for future reference in this test procedure.

Did the clutch test pass, input speed remain at zero?

Yes >> Go To 3

No >> Go To 4

---

3. CHECK DTC EVENT DATA

The conditions necessary to set this DTC are not currently present.

With the scan tool, check the DTC EVENT DATA to help identify the conditions in which the DTC was set.

Does the DTC EVENT DATA show an input speed reading of zero?

Yes >> Go To 8

No >> Go To 4

---

4. POSSIBLE INTERNAL TRANSMISSION CAUSES

Remove the Transmission Oil Pan and Valve Body and check the following per the Service Information:

Clutch or metal debris in the pan

LR clutch tower seal on the main valve body or cuts and the LR accumulator piston and seals.

Air check the Reverse and LR Hydraulic Clutch circuits (in the case) for excessive air leakage.

NOTE: Both Hydraulic Clutch circuits contain a small bleed orifice , a small amount of air leakage is normal. The Reverse hydraulic clutch circuit bleed orifice connects to the OD hydraulic clutch cavity. A small amount of air leakage into the OD hydraulic clutch circuit is considered normal.

Were there any problems found?

Yes >> Repair as necessary. If clutch debris is present, remove the transmission and inspect the Reverse and LR clutches, and inspect the Transmission Oil Pump and Main Regulator Valve for damage or sticking in its bore.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5

---

5. CLUTCH TEST FAILURE

Did the clutch test fail in reverse?

Yes >> Go To 6

No >> Test complete.

P0736-GEAR RATIO ERROR IN REVERSE (CONTINUED)

6. CHECK FOR BROKEN REVERSE SUN GEAR WELD

Working through the windows in the bottom of the case, check for a broken Reverse Sun gear weld to the reaction carrier as follows:

(1) Hold the Transmission Output Shaft by holding the Transmission Manual Lever in the park position.

(2) Rotate the Input Annulus gear and drive shell, (the drum that encloses the two rearmost carriers).

(3) Check to see if the reaction carrier (the frontmost carrier, whose outer shell is splined to the 2C clutch) is rotating faster than the drive shell is being turned.

Is the reaction carrier turning faster than the drive shell?

Yes >> Go To 7

No >> Replace the reaction carrier per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

7. CHECK REVERSE CARRIER HUB

Remove the Transmission per the Service Information and inspect the weld on the reverse carrier hub.

Were there any problems found?

Yes >> Repair as necessary. Refer to the Service Information for proper repair procedures.

No >> Disassemble and inspect the input clutch assembly. Check the Reverse clutch reaction plate snap ring. Check the OD and Reverse clutch seals, discs, and bleed orifice (in the OD/Reverse clutch piston). Check the Reverse hub and shaft. Repair as necessary. Refer to the Service Information for proper repair procedures.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

8. CHECK FOR INTERMITTENT OPERATION

Intermittent gear ratio DTCs can be set by problems in the Input and Output Speed Sensor circuits and/or Speed Sensor Ground circuit.

Remove the Starter Relay

NOTE: Failure to remove the Starter Relay can cause a Transmission - No Response condition.
Check the Speed Sensor wiring and connectors for good connection, then perform a wiggle test using the Transmission Simulator, Miller tool #8333.

Were there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test complete.

P0740–TCC OUT OF RANGE

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS) .

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  During Electronically Modulated Converter Clutch (EMCC) Operation.
- **Set Condition:**
  Transmission must be in EMCC, with input speed greater than 1750 RPM. TCC-L/R Solenoid achieves the maximum duty cycle and can not pull engine speed within 60 RPM of input speed. Also when the transmission is in FEMCC and the engine slips TCC less than 100 RPM for 10 seconds. This DTC can take up to five minutes of problem identification before illuminating the MIL.

Possible Causes
RELATED DTC P0750 PRESENT
L/R SOLENOID
TORQUE CONVERTER AND/OR INTERNAL TRANSMISSION

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

When in 2nd, 2nd Prime, 3rd, or 4th gear, the torque converter clutch (TCC) can be engaged when certain conditions are met. The TCC piston is electronically modulated by increasing the duty cycle of the LR Solenoid until the torque converter slip difference (difference between engine and transmission input speed) is within 60 RPM. Then the LR solenoid is fully energized (FEMCC / 100% duty cycle). Torque converter slip is monitored in FEMCC to ensure adequate clutch capacity.

Diagnostic Test

1. DETERMINING IF RELATED DTC P0750 IS PRESENT

With the scan tool, read transmission DTC's

Is the DTC P0750 present also?

Yes >> Refer to the Transmission category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

P0740–TCC OUT OF RANGE (CONTINUED)

2. CHECK TO SEE IF DTC P0740 IS CURRENT

With the scan tool, Read and RECORD ALL Transmission DTC's. After recording DTC's, erase DTC's.

Drive the vehicle until the transmission temperature is at least 43° C or 110° F and the engine temperature at least 49° C or 120° F.

Perform the following steps 3 times.

Drive the vehicle to the speed of at least 88 km/h or 55 MPH.

Allow 4th gear to engage for at least 10 seconds.

Close the throttle.

Tip back into the throttle until the TPS angle is between 25 and 29 degrees.

NOTE: If the throttle angle goes over 30 degrees, you must close the throttle and try again.

Did the TCC engage during any of the attempts, Engine speed approximately equal to input speed?

Yes >> Go To 3

No >> Go To 4

---

3. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorts and open circuits.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Were there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

---

4. LR SOLENOID

With the scan tool, check for other transmission DTC's.

Are the DTCs P1775 and P0841 present also?

Yes >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5

P0740–TCC OUT OF RANGE (CONTINUED)

5. TORQUE CONVERTER AND/OR INTERNAL TRANSMISSION

Repair internal transmission as necessary.

Check for the following possible causes. Refer to the Service information for the proper repair procedures.

Inspect the Transmission Oil Pump.

If no problems are found, replace the Transmission Solenoid/TRS Assembly.

Check the Torque Converter Switch Valve and the Torque Converter Clutch Control Valve for sticking in the bore.

Check the Teflon seal rings on the input shaft.

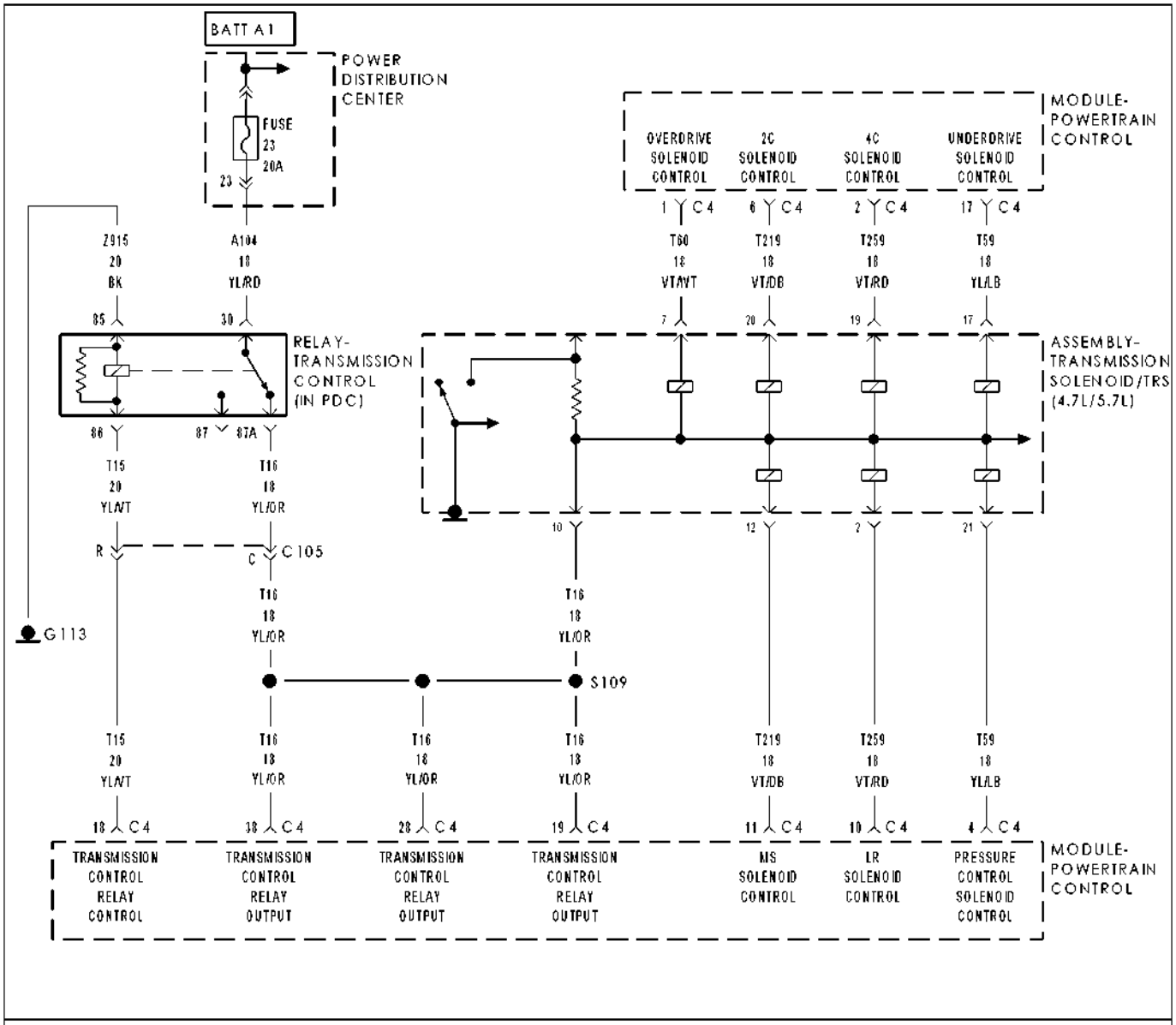
View repair.

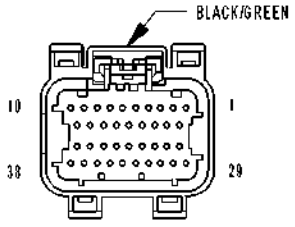
Repair

In all cases, replace the Torque Converter. Make sure to check all other possible causes in addition to the Torque Converter.

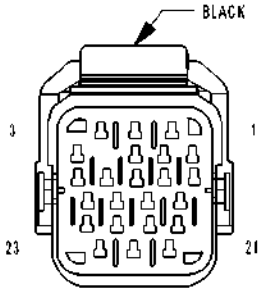
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0750-LR SOLENOID CIRCUIT





MODULE-POWERTRAIN CONTROL C4



ASSEMBLY-TRANSMISSION SOLENOID/TRS (4.7L/5.7L)

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P0750-LR SOLENOID CIRCUIT (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Initially at power-up, then every 10 seconds thereafter. The solenoid circuits will also be tested immediately after a gear ratio or pressure switch error is detected.
- **Set Condition:**
  After three consecutive solenoid continuity test failures, or one failure if test is run in response to a gear ratio or pressure switch error. **Note: This DTC is strictly an electrical fault and does not apply to any internal transmission failures.**

Possible Causes
RELATED RELAY DTC'S PRESENT
(T20) LR SOLENOID CONTROL CIRCUIT SHORT TO OTHER CIRCUITS
(T20) LR SOLENOID CONTROL CIRCUIT OPEN
(T20) LR SOLENOID CONTROL CIRCUIT SHORT TO GROUND
TRANSMISSION SOLENOID/TRS ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Transmission Control System uses six electronically controlled solenoids that allow hydraulic fluid to be applied to various friction elements (clutches), which enables the gear requested. The continuity of each solenoid circuit is periodically tested. Each inactive solenoid is turned on for a few milliseconds, then off. Each active solenoid is turned off for a few milliseconds, then on. This pulsing of voltage to the solenoid causes an inductive spike which can be sensed by the Transmission Control System. If an inductive spike is not sensed by the Transmission Control System during the continuity check, it is tested again. If the test fails three consecutive times, the appropriate Diagnostic Trouble Code (DTC) is set. If the solenoid test is run in response to a gear ratio or pressure switch error, one failure will result in setting the appropriate DTC. **Note: This DTC is strictly an electrical fault and does not apply to any internal transmission failures.**

Diagnostic Test

1. RELATED TRANSMISSION RELAY DTC'S PRESENT

With the scan tool, check for other transmission DTC's.

Are there any Transmission Control Relay DTC's present?

Yes >> Refer to the Transmission category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

P0750-LR SOLENOID CIRCUIT (CONTINUED)

2. CHECK TO SEE IF P0750 IS PRESENT

Ignition on, engine not running.

With the scan tool, erase all Transmission DTC's.

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the scan tool, actuate the LR Solenoid.

Monitor the LR Solenoid LED on the Transmission Simulator.

Did the LR Solenoid LED on the Transmission Simulator blink on and off?

Yes >> Go To 3

No >> Go To 4

---

3. TRANSMISSION SOLENOID/TRS ASSEMBLY

With the scan tool, continue to actuate the LR Solenoid for the period of 2 minutes with the Transmission Simulator still connected.

After 2 minutes of actuation, with the scan tool, stop the actuation and check for transmission DTCs.

Did the DTC P0750 reset during the actuation test?

Yes >> Go To 4

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

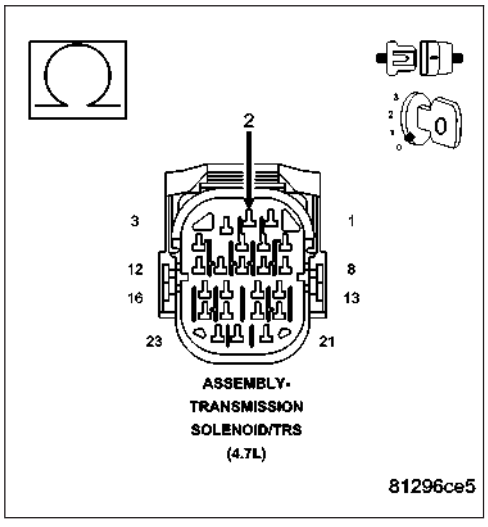
4. (T20) LR SOLENOID CONTROL CIRCUIT SHORT TO OTHER CIRCUITS

Turn the ignition off to the lock position.

Disconnect the Transmission Simulator, Miller tool #8333.

Disconnect the PCM harness connectors.

Measure the resistance between the (T20) LR Solenoid Control circuit and all other circuits in the Transmission Solenoid/TRS Assembly harness connector.



Is the resistance below 5.0 ohms between the (T20) LR Solenoid Control circuit and any other circuit(s) in the Transmission Solenoid/TRS Assembly harness connector?

Yes >> Repair the (T20) LR Solenoid Control circuit for a short to other circuit(s).
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5

P0750-LR SOLENOID CIRCUIT (CONTINUED)

5. (T20) LR SOLENOID CONTROL CIRCUIT OPEN

Connect Miller tool #8815 to the PCM C4 harness connector.

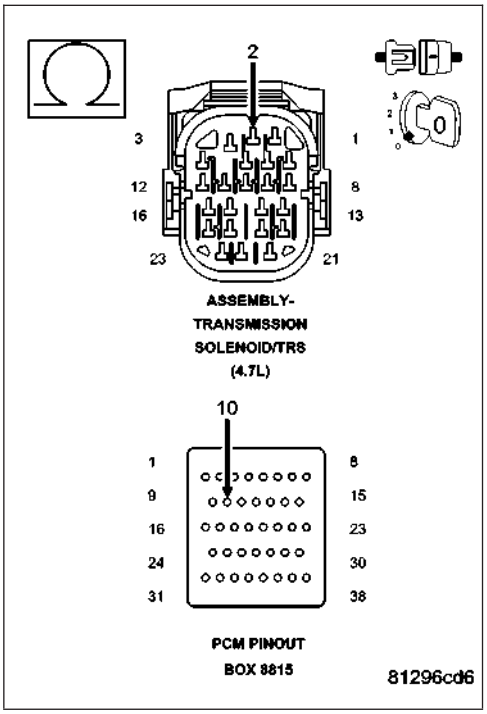
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Measure the resistance of the (T20) LR Solenoid Control circuit from the Transmission Solenoid/TRS Assembly harness connector to the appropriate terminal of Miller tool #8815.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T20) LR Solenoid Control circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 6



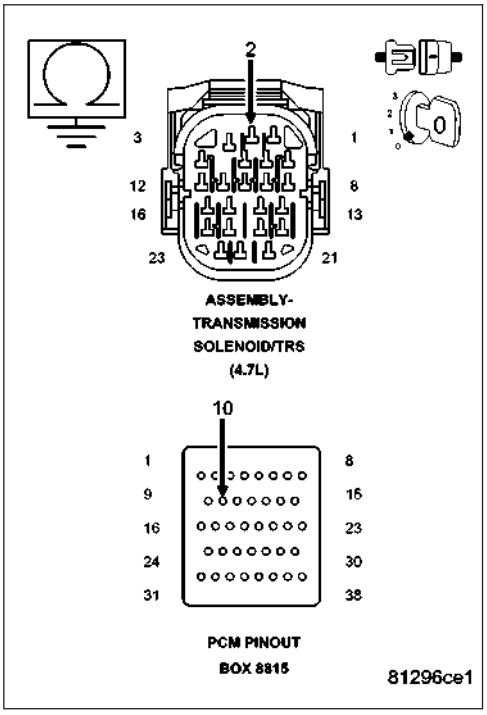
6. (T20) LR SOLENOID CONTROL CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T20) LR Solenoid Control circuit.

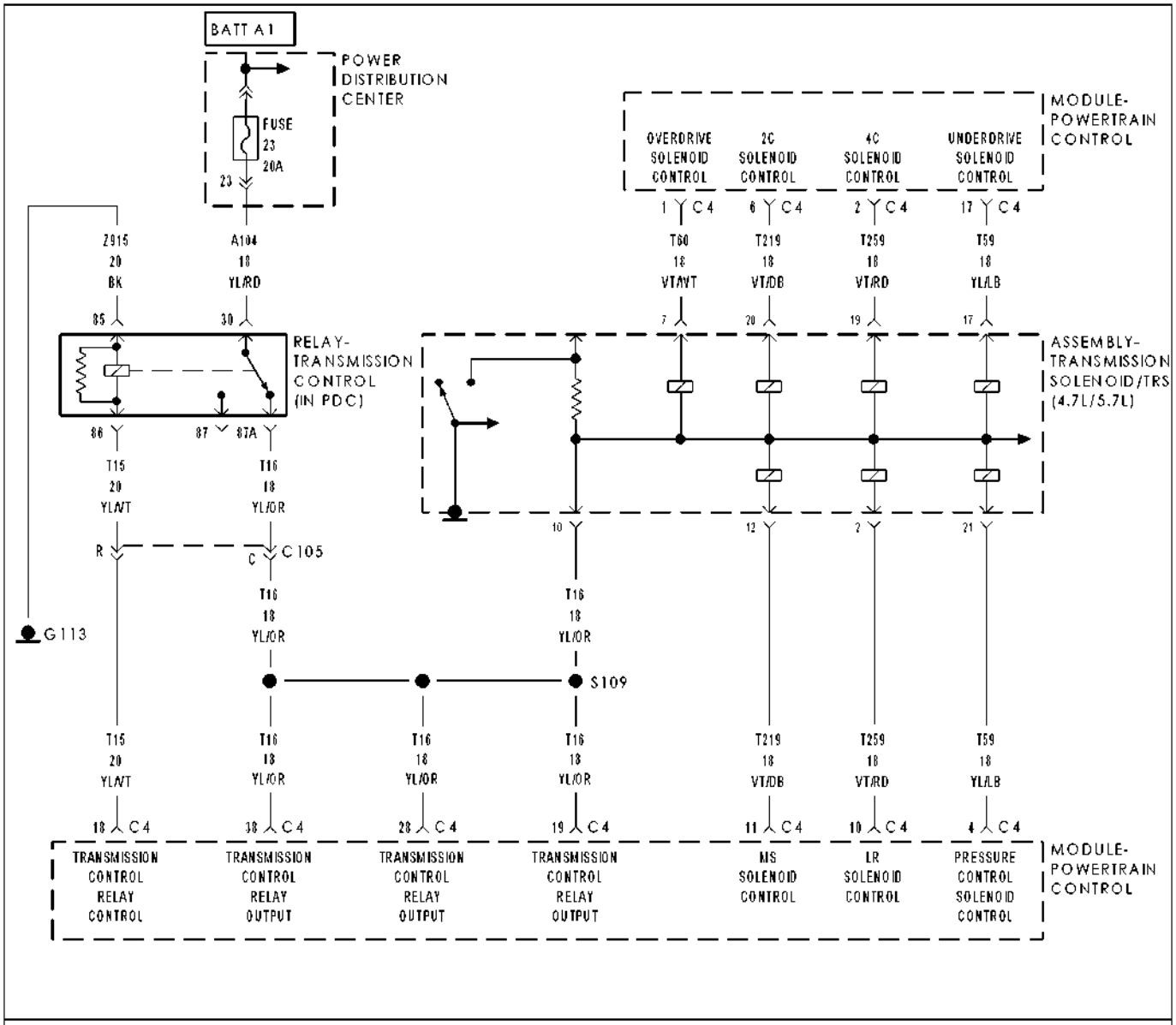
Is the resistance below 5.0 ohms?

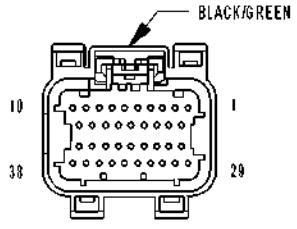
Yes >> Repair the (T20) LR Solenoid Control circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

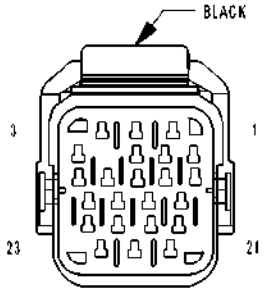


P0755-2C SOLENOID CIRCUIT





MODULE-POWERTRAIN CONTROL C4



ASSEMBLY-TRANSMISSION SOLENOID/TRS (4.7L/5.7L)

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P0755-2C SOLENOID CIRCUIT (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Initially at power-up, then every 10 seconds thereafter. The solenoid circuits will also be tested immediately after a gear ratio or pressure switch error is detected.
- **Set Condition:**
  After three consecutive solenoid continuity test failures, or one failure if test is run in response to a gear ratio or pressure switch error. **Note: This DTC is strictly an electrical fault and does not apply to any internal transmission failures.**

Possible Causes
RELATED RELAY DTC'S PRESENT
(T219) 2C SOLENOID CONTROL CIRCUIT SHORT TO OTHER CIRCUITS
(T219) 2C SOLENOID CONTROL CIRCUIT OPEN
(T219) 2C SOLENOID CONTROL CIRCUIT SHORT TO GROUND
TRANSMISSION SOLENOID/TRS ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Transmission Control System uses six electronically controlled solenoids that allow hydraulic fluid to be applied to various friction elements (clutches), which enables the gear requested. The continuity of each solenoid circuit is periodically tested. Each inactive solenoid is turned on for a few milliseconds, then off. Each active solenoid is turned off for a few milliseconds, then on. This pulsing of voltage to the solenoid causes an inductive spike which can be sensed by the Transmission Control System. If an inductive spike is not sensed by the Transmission Control System during the continuity check, it is tested again. If the test fails three consecutive times, the appropriate Diagnostic Trouble Code (DTC) is set. If the solenoid test is run in response to a gear ratio or pressure switch error, one failure will result in setting the appropriate DTC. **Note: This DTC is strictly an electrical fault and does not apply to any internal transmission failures.**

Diagnostic Test

1. RELATED TRANSMISSION RELAY DTC'S PRESENT

With the scan tool, check for other transmission DTC's.

Are there any Transmission Control Relay DTC's present?

Yes >> Refer to the Transmission category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

P0755-2C SOLENOID CIRCUIT (CONTINUED)

2. CHECK TO SEE IF P0755 IS PRESENT

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the scan tool, actuate the 2C Solenoid.

Did the 2C Solenoid LED blink on and off on the Transmission Simulator?

Yes >> Go To 3

No >> Go To 4

---

3. TRANSMISSION SOLENOID/TRS ASSEMBLY

With the scan tool, continue to actuate the 2C Solenoid for the period of 2 minutes with the Transmission Simulator still connected.

After 2 minutes of actuation, with the scan tool, stop the actuation and check for transmission DTCs.

Did the DTC P0755 reset during the actuation test?

Yes >> Go To 4

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

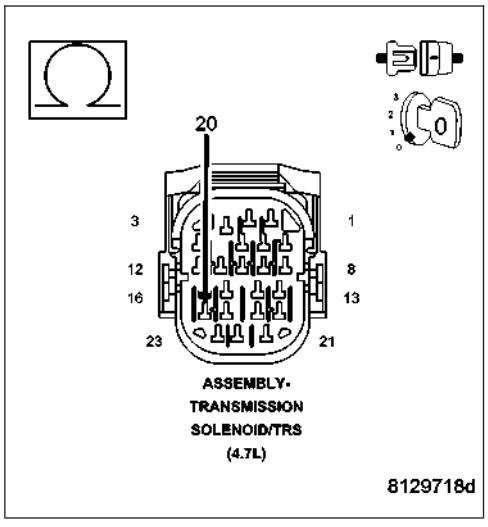
4. (T219) 2C SOLENOID CONTROL CIRCUIT SHORT TO OTHER CIRCUITS

Turn the ignition off to the lock position.

Disconnect the Transmission Simulator, Miller tool #8333.

Disconnect the PCM harness connectors.

Measure the resistance between the (T219) 2C Solenoid Control circuit and all other circuits in the Transmission Solenoid/TRS Assembly harness connector.



Is the resistance below 5.0 ohms between the (T219) 2C Solenoid Control circuit and any other circuit(s) in the Transmission Solenoid/TRS Assembly harness connector?

Yes >> Repair the (T219) 2C Solenoid Control circuit for a short to other circuit(s).
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5

P0755-2C SOLENOID CIRCUIT (CONTINUED)

5. (T219) 2C SOLENOID CONTROL CIRCUIT OPEN

Connect Miller tool #8815 to the PCM C4 harness connector.

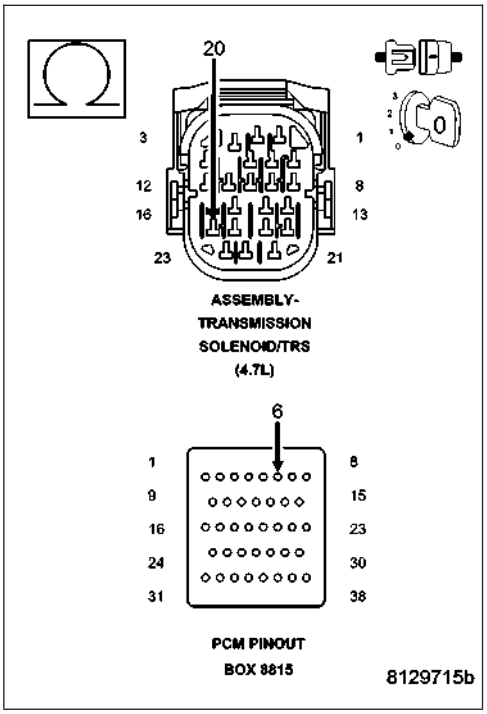
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Measure the resistance of the (T219) 2C Solenoid Control circuit from the Transmission Solenoid/TRS Assembly harness connector to the appropriate terminal of Miller tool #8815.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T219) 2C Solenoid Control circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 6



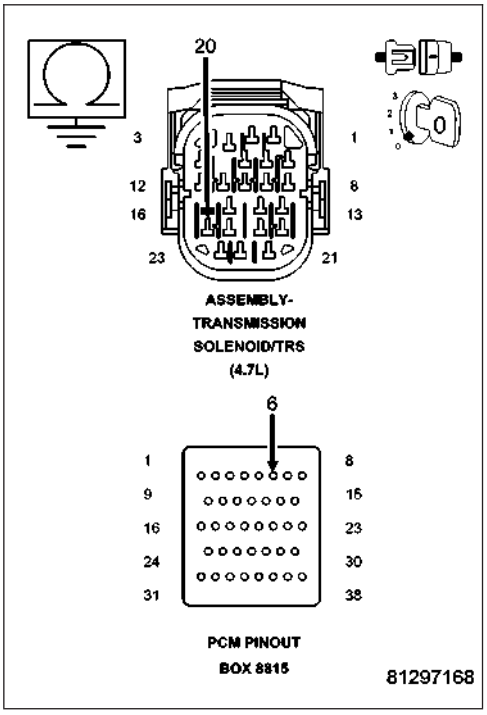
6. (T219) 2C SOLENOID CONTROL CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T219) 2C Solenoid Control circuit.

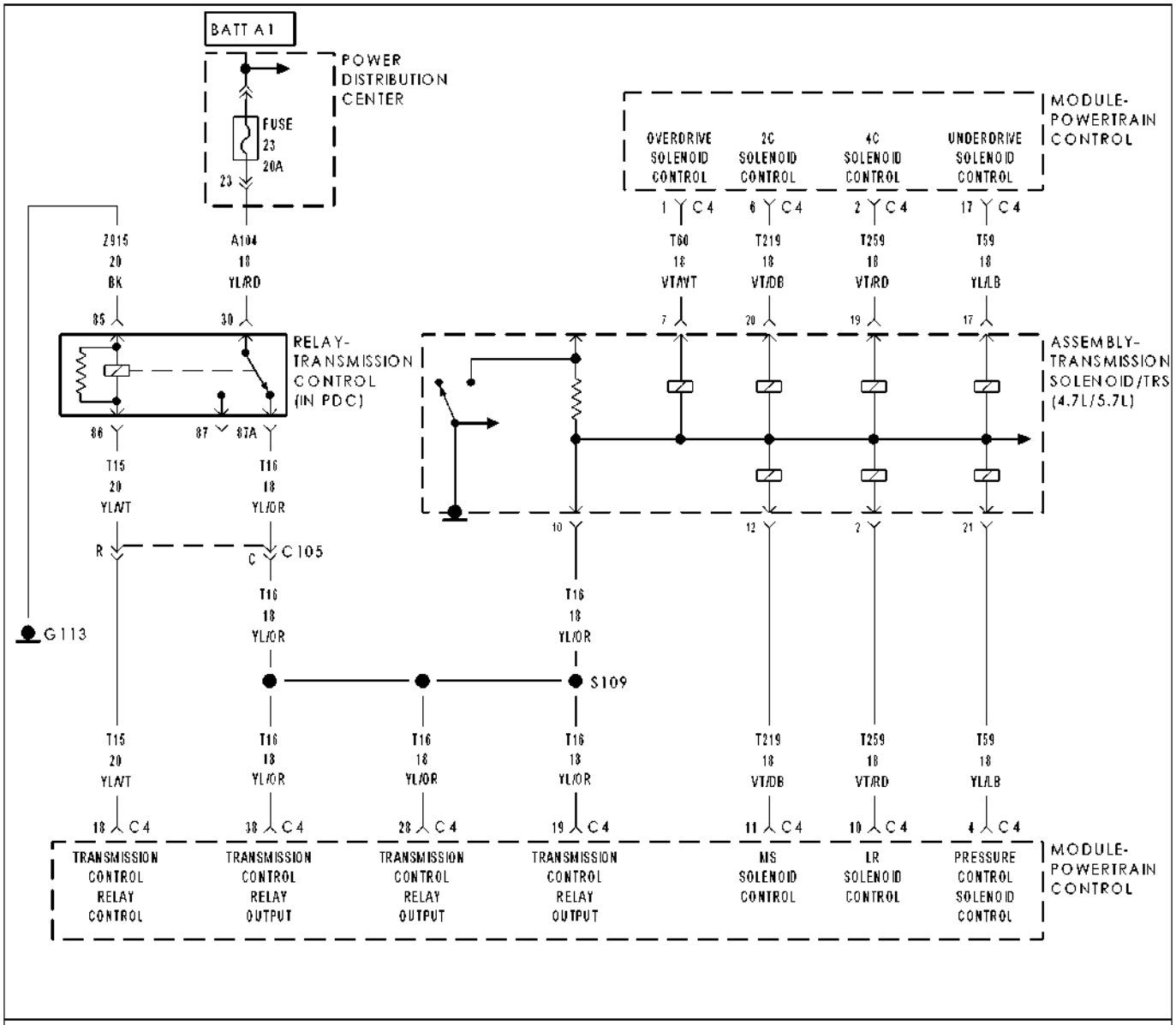
Is the resistance below 5.0 ohms?

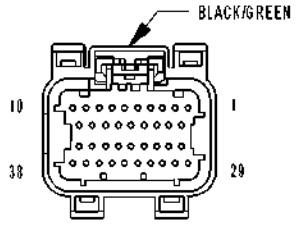
Yes >> Repair the (T219) 2C Solenoid Control circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

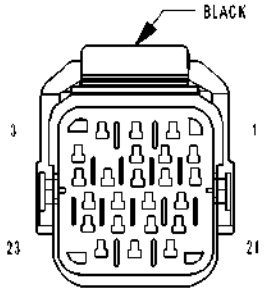


P0760-OD SOLENOID CIRCUIT





MODULE-POWERTRAIN CONTROL C4



ASSEMBLY-TRANSMISSION SOLENOID/TRS (4.7L/5.7L)

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P0760-OD SOLENOID CIRCUIT (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS) .

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Initially at power-up, then every 10 seconds thereafter. The solenoid circuits will also be tested immediately after a gear ratio or pressure switch error is detected.
- **Set Condition:**
  After three consecutive solenoid continuity test failures, or one failure if test is run in response to a gear ratio or pressure switch error. **Note: This DTC is strictly an electrical fault and does not apply to any internal transmission failures.**

Possible Causes
RELATED RELAY DTC'S PRESENT
(T60) OD SOLENOID CONTROL CIRCUIT SHORT TO OTHER CIRCUITS
(T60) OD SOLENOID CONTROL CIRCUIT OPEN
(T60) OD SOLENOID CONTROL CIRCUIT SHORT TO GROUND
TRANSMISSION SOLENOID/TRS ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Transmission Control System uses six electronically controlled solenoids that allow hydraulic fluid to be applied to various friction elements (clutches), which enables the gear requested. The continuity of each solenoid circuit is periodically tested. Each inactive solenoid is turned on for a few milliseconds, then off. Each active solenoid is turned off for a few milliseconds, then on. This pulsing of voltage to the solenoid causes an inductive spike which can be sensed by the Transmission Control System. If an inductive spike is not sensed by the Transmission Control System during the continuity check, it is tested again. If the test fails three consecutive times, the appropriate Diagnostic Trouble Code (DTC) is set. If the solenoid test is run in response to a gear ratio or pressure switch error, one failure will result in setting the appropriate DTC. **Note: This DTC is strictly an electrical fault and does not apply to any internal transmission failures.**

Diagnostic Test

1. RELATED TRANSMISSION RELAY DTC'S PRESENT

With the scan tool, check for other transmission DTC's.

Are there any Transmission Control Relay DTC's present?

Yes >> Refer to the Transmission category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

P0760-OD SOLENOID CIRCUIT (CONTINUED)

2. CHECK TO SEE IF P0760 IS PRESENT

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the scan tool, actuate the OD Solenoid.

Monitor the OD Solenoid LED on the Transmission Simulator.

Did the OD Solenoid LED on the Transmission Simulator blink on and off?

Yes >> Go To 3

No >> Go To 4

---

3. TRANSMISSION SOLENOID/TRS ASSEMBLY

With the scan tool, continue to actuate the OD Solenoid for the period of 2 minutes with the Transmission Simulator still connected.

After 2 minutes of actuation, with the scan tool, stop the actuation and check for transmission DTCs.

Did the DTC P0760 reset during the actuation test?

Yes >> Go To 4

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

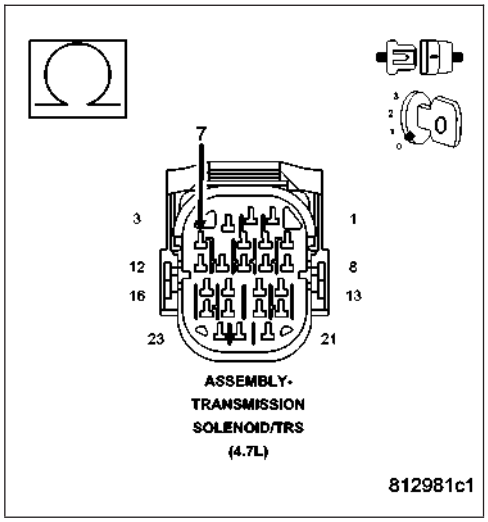
4. (T60) OD SOLENOID CONTROL CIRCUIT SHORT TO OTHER CIRCUITS

Turn the ignition off to the lock position.

Disconnect the Transmission Simulator, Miller tool #8333.

Disconnect the PCM harness connectors.

Measure the resistance between the (T60) OD Solenoid Control circuit and all other circuits in the Transmission Solenoid/TRS Assembly harness connector.



Is the resistance below 5.0 ohms between the (T60) OD Solenoid Control circuit and any other circuit(s) in the Transmission Solenoid/TRS Assembly harness connector?

Yes >> Repair the (T60) OD Solenoid Control circuit for a short to other circuit(s).
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5

P0760-OD SOLENOID CIRCUIT (CONTINUED)

5. (T60) OD SOLENOID CONTROL CIRCUIT OPEN

Connect Miller tool #8815 to the PCM C4 harness connector.

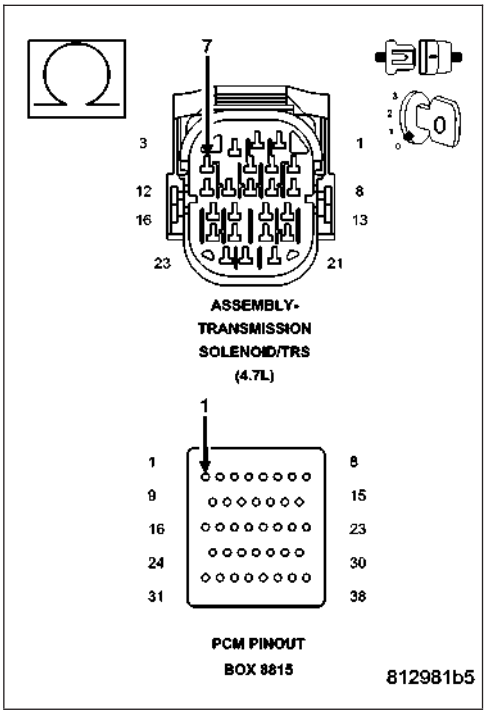
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller special tool #8815 to perform diagnosis.

Measure the resistance of the (T60) OD Solenoid Control circuit from the Transmission Solenoid/TRS Assembly harness connector to the appropriate terminal of Miller tool #8815.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T60) OD Solenoid Control circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 6



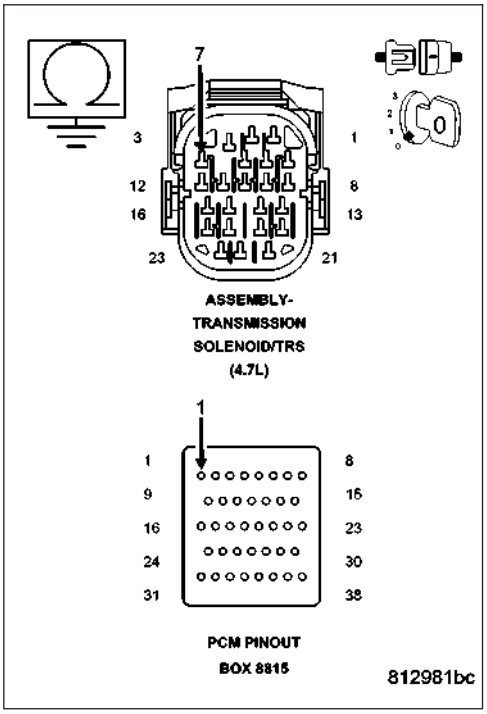
6. (T60) OD SOLENOID CONTROL CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T60) OD Solenoid Control circuit.

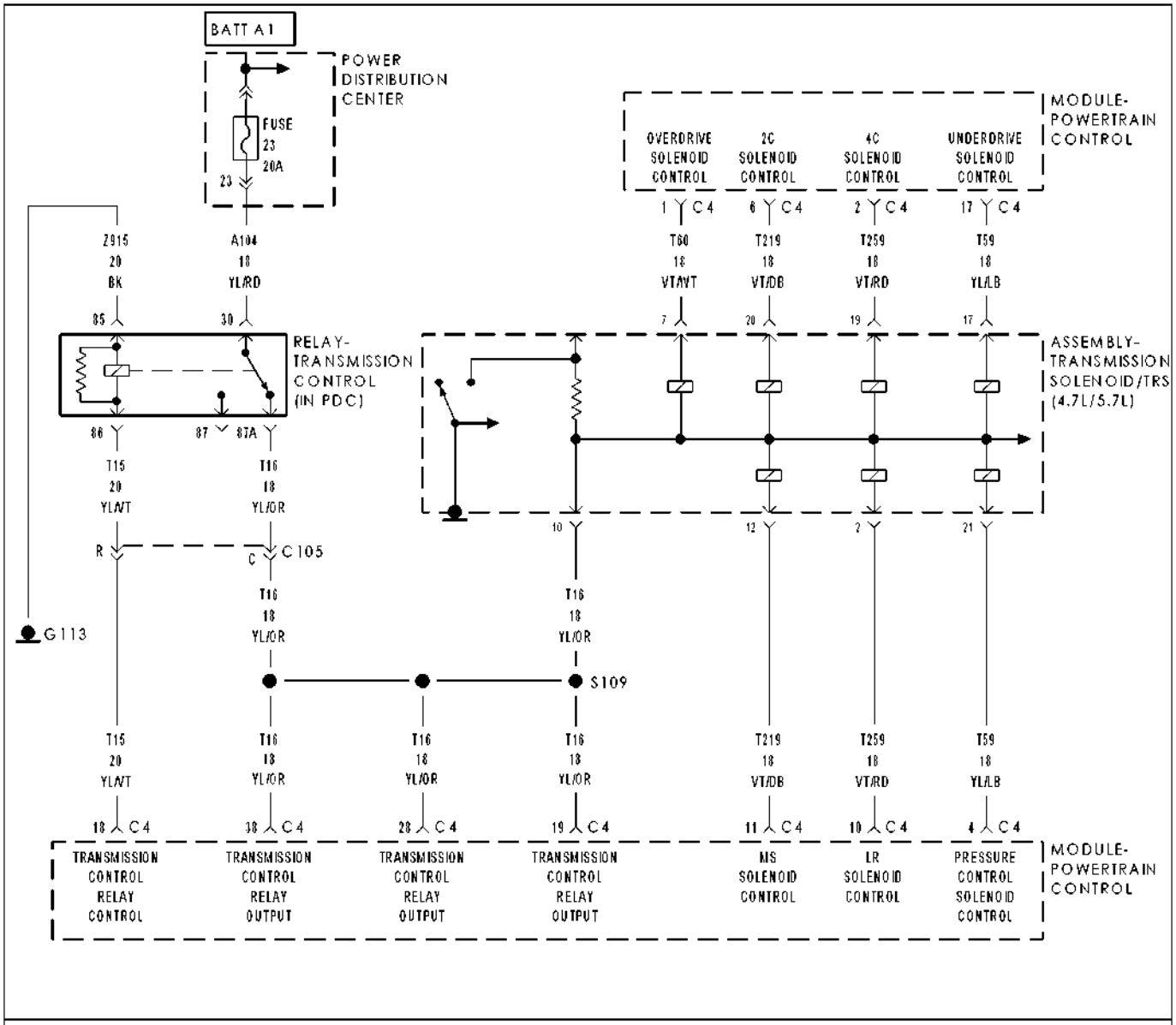
Is the resistance below 5.0 ohms?

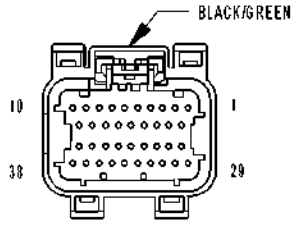
Yes >> Repair the (T60) OD Solenoid Control circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

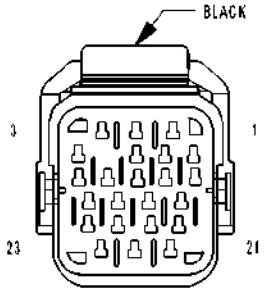


P0765-UD SOLENOID CIRCUIT





MODULE-POWERTRAIN CONTROL C4



ASSEMBLY-TRANSMISSION SOLENOID/TRS (4.7L/5.7L)

81239beb

P0765-UD SOLENOID CIRCUIT (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Initially at power-up, then every 10 seconds thereafter. The solenoid circuits will also be tested immediately after a gear ratio or pressure switch error is detected.
- **Set Condition:**
  After three consecutive solenoid continuity test failures, or one failure if test is run in response to a gear ratio or pressure switch error. **Note: This DTC is strictly an electrical fault and does not apply to any internal transmission failures.**

Possible Causes
RELATED RELAY DTC'S PRESENT
(T59) UD SOLENOID CONTROL CIRCUIT SHORT TO OTHER CIRCUITS
(T59) UD SOLENOID CONTROL CIRCUIT OPEN
(T59) UD SOLENOID CONTROL CIRCUIT SHORT TO GROUND
TRANSMISSION SOLENOID/TRS ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Transmission Control System uses six electronically controlled solenoids that allow hydraulic fluid to be applied to various friction elements (clutches), which enables the gear requested. The continuity of each solenoid circuit is periodically tested. Each inactive solenoid is turned on for a few milliseconds, then off. Each active solenoid is turned off for a few milliseconds, then on. This pulsing of voltage to the solenoid causes an inductive spike which can be sensed by the Transmission Control System. If an inductive spike is not sensed by the Transmission Control System during the continuity check, it is tested again. If the test fails three consecutive times, the appropriate Diagnostic Trouble Code (DTC) is set. If the solenoid test is run in response to a gear ratio or pressure switch error, one failure will result in setting the appropriate DTC. **Note: This DTC is strictly an electrical fault and does not apply to any internal transmission failures.**

Diagnostic Test

1. RELATED TRANSMISSION RELAY DTC'S PRESENT

With the scan tool, check for other transmission DTC's.

Are there any Transmission Control Relay DTC's present?

Yes >> Refer to the Transmission category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

P0765-UD SOLENOID CIRCUIT (CONTINUED)

2. CHECK TO SEE IF P0765 IS PRESENT

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the scan tool, actuate the UD Solenoid.

Monitor the UD Solenoid LED on the Transmission Simulator.

Did the UD Solenoid LED on the Transmission Simulator blink on and off?

Yes >> Go To 3

No >> Go To 4

---

3. TRANSMISSION SOLENOID/TRS ASSEMBLY

With the scan tool, continue to actuate the UD Solenoid for the period of 2 minutes with the Transmission Simulator still connected.

After 2 minutes of actuation, with the scan tool, stop the actuation and check for transmission DTCs.

Did the DTC P0765 reset during the actuation test?

Yes >> Go To 4

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

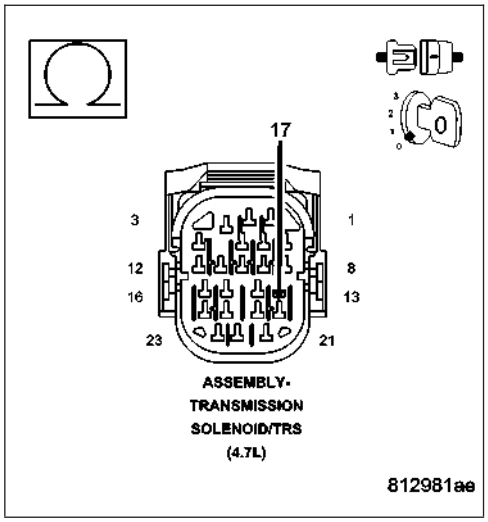
4. (T59) UD SOLENOID CONTROL CIRCUIT SHORT TO OTHER CIRCUITS

Turn the ignition off to the lock position.

Disconnect the Transmission Simulator, Miller tool #8333.

Disconnect the PCM harness connectors.

Measure the resistance between the (T59) UD Solenoid Control circuit and all other circuits in the Transmission Solenoid/TRS Assembly harness connector.



Is the resistance below 5.0 ohms between the (T59) UD Solenoid Control circuit and any other circuit(s) in the Transmission Solenoid/TRS Assembly harness connector?

Yes >> Repair the (T59) UD Solenoid Control circuit for a short to other circuit(s).
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5

P0765-UD SOLENOID CIRCUIT (CONTINUED)

5. (T59) UD SOLENOID CONTROL CIRCUIT OPEN

Connect Miller tool #8815 to the PCM C4 harness connector.

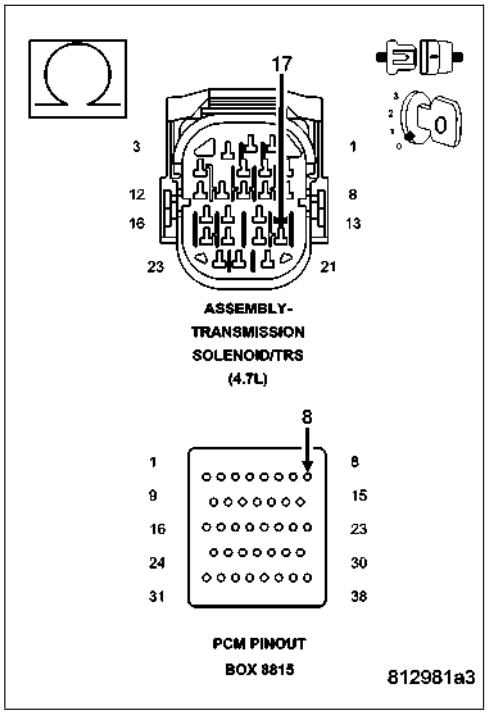
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Measure the resistance of the (T59) UD Solenoid Control circuit from the Transmission Solenoid/TRS Assembly harness connector to the appropriate terminal of Miller tool #8815.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T59) UD Solenoid Control circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 6



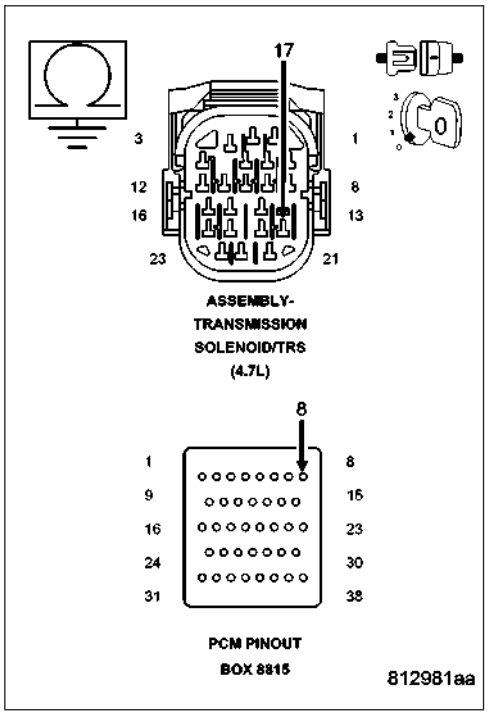
6. (T59) UD SOLENOID CONTROL CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T59) UD Solenoid Control circuit.

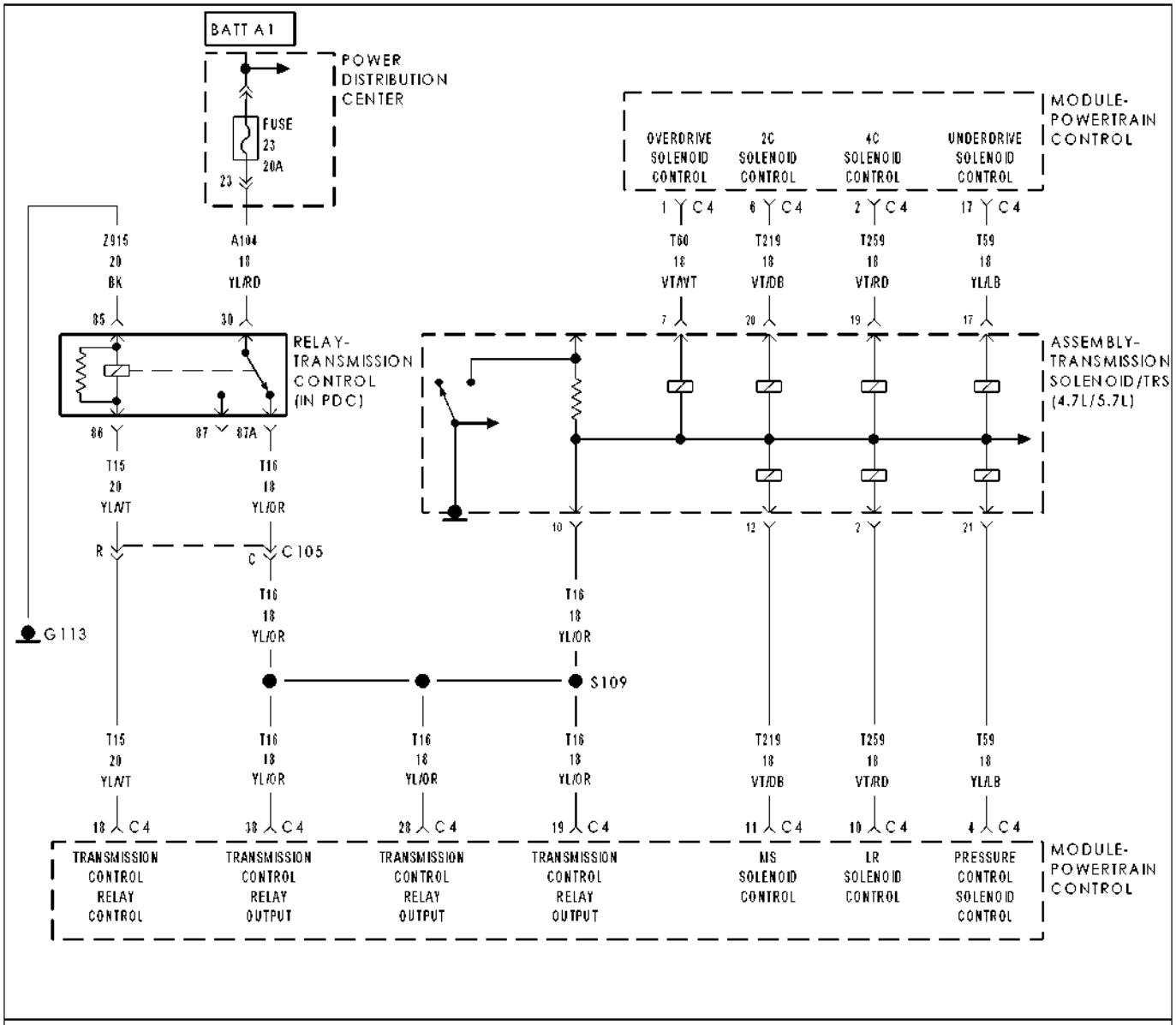
Is the resistance below 5.0 ohms?

Yes >> Repair the (T59) UD Solenoid Control circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.



P0770-4C SOLENOID CIRCUIT



P0770-4C SOLENOID CIRCUIT (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Initially at power-up, then every 10 seconds thereafter. The solenoid circuits will also be tested immediately after a gear ratio or pressure switch error is detected.
- **Set Condition:**
  After three consecutive solenoid continuity test failures, or one failure if test is run in response to a gear ratio or pressure switch error. **Note: This DTC is strictly an electrical fault and does not apply to any internal transmission failures.**

Possible Causes
RELATED RELAY DTC'S PRESENT
(T259) 4C SOLENOID CONTROL CIRCUIT SHORT TO OTHER CIRCUITS
(T259) 4C SOLENOID CONTROL CIRCUIT OPEN
(T259) 4C SOLENOID CONTROL CIRCUIT SHORT TO GROUND
TRANSMISSION SOLENOID/TRS ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Transmission Control System uses six electronically controlled solenoids that allow hydraulic fluid to be applied to various friction elements (clutches), which enables the gear requested. The continuity of each solenoid circuit is periodically tested. Each inactive solenoid is turned on for a few milliseconds, then off. Each active solenoid is turned off for a few milliseconds, then on. This pulsing of voltage to the solenoid causes an inductive spike which can be sensed by the Transmission Control System. If an inductive spike is not sensed by the Transmission Control System during the continuity check, it is tested again. If the test fails three consecutive times, the appropriate Diagnostic Trouble Code (DTC) is set. If the solenoid test is run in response to a gear ratio or pressure switch error, one failure will result in setting the appropriate DTC. **Note: This DTC is strictly an electrical fault and does not apply to any internal transmission failures.**

Diagnostic Test

1. RELATED TRANSMISSION RELAY DTC'S PRESENT

With the scan tool, check for other transmission DTC's.

Are there any Transmission Control Relay DTC's present?

Yes >> Refer to the Transmission category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

P0770-4C SOLENOID CIRCUIT (CONTINUED)

2. CHECK TO SEE IF P0770 IS PRESENT

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the scan tool, actuate the 4C Solenoid.

Monitor the 4C Solenoid LED on the Transmission Simulator.

Did the 4C Solenoid LED on the Transmission Simulator blink on and off?

Yes >> Go To 3

No >> Go To 4

---

3. TRANSMISSION SOLENOID/TRS ASSEMBLY

With the scan tool, continue to actuate the 4C Solenoid for the period of 2 minutes with the Transmission Simulator still connected.

After 2 minutes of actuation, with the scan tool, stop the actuation and check for transmission DTCs.

Did the DTC P0770 reset during the actuation test?

Yes >> Go To 4

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

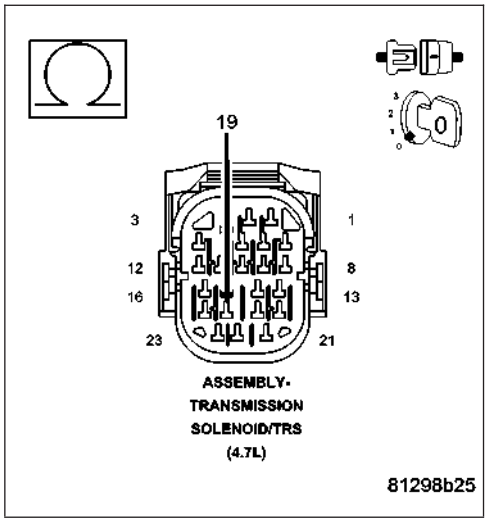
4. (T259) 4C SOLENOID CONTROL CIRCUIT SHORT TO OTHER CIRCUITS

Turn the ignition off to the lock position.

Disconnect the Transmission Simulator, Miller tool #8333.

Disconnect the PCM harness connectors.

Measure the resistance between the (T259) 4C Solenoid Control circuit and all other circuits in the Transmission Solenoid/TRS Assembly harness connector.



Is the resistance below 5.0 ohms between the (T259) 4C Solenoid Control circuit and any other circuit(s) in the Transmission Solenoid/TRS Assembly harness connector?

Yes >> Repair the (T259) 4C Solenoid Control circuit for a short to other circuit(s).
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5

P0770-4C SOLENOID CIRCUIT (CONTINUED)

5. (T259) 4C SOLENOID CONTROL CIRCUIT OPEN

Connect Miller tool #8815 to the PCM C4 harness connector.

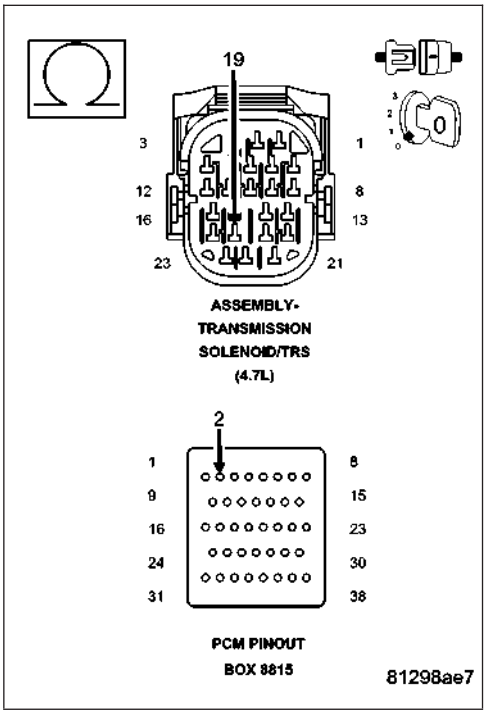
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller special tool #8815 to perform diagnosis.

Measure the resistance of the (T259) 4C Solenoid Control circuit from the Transmission Solenoid/TRS Assembly harness connector to the appropriate terminal of Miller tool #8815.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T259) 4C Solenoid Control circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 6



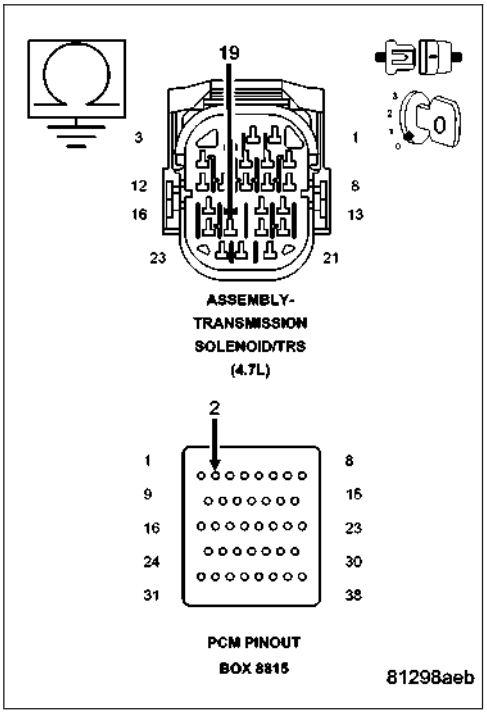
6. (T259) 4C SOLENOID CONTROL CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T259) 4C Solenoid Control circuit.

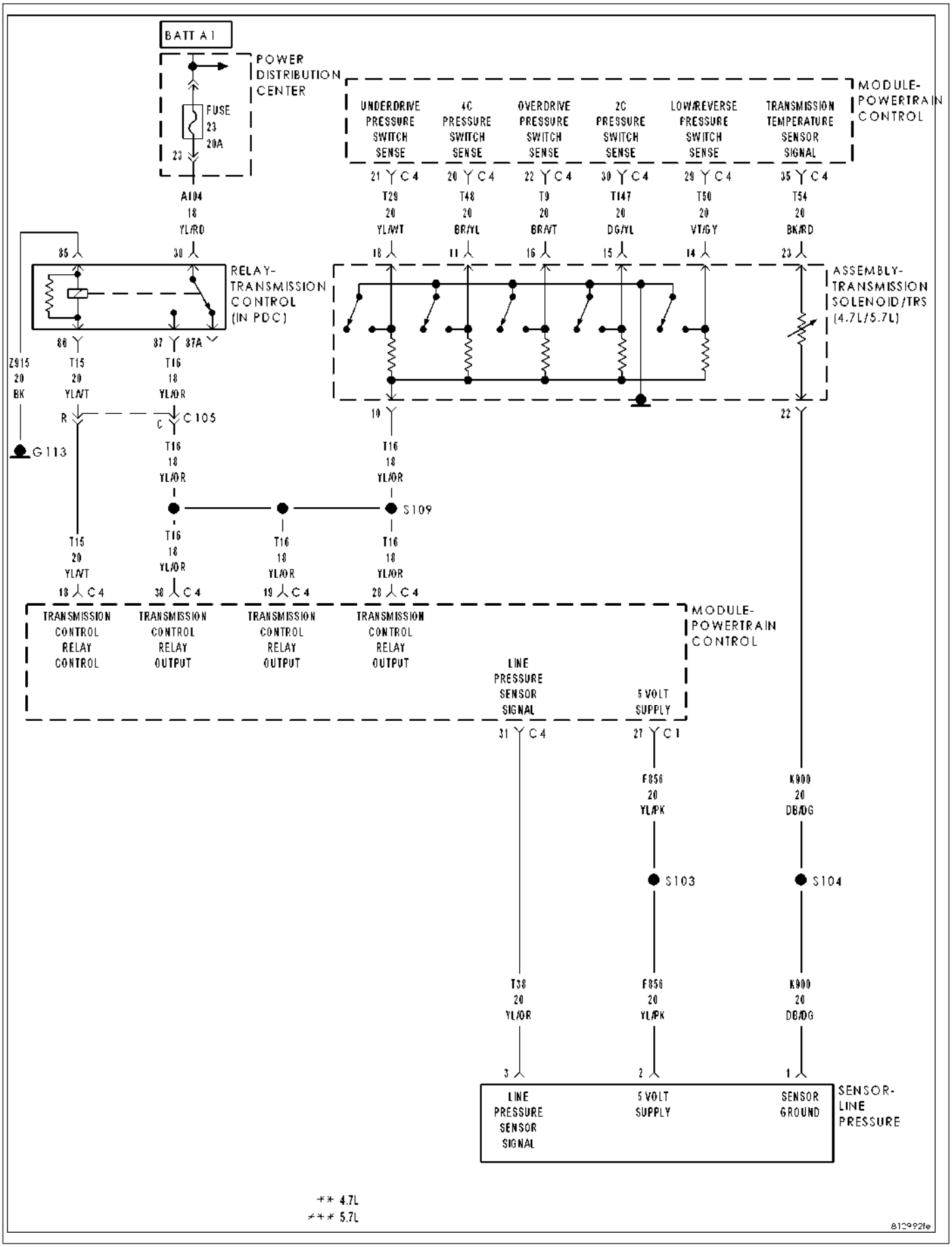
Is the resistance below 5.0 ohms?

Yes >> Repair the (T259) 4C Solenoid Control circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.



P0841-LR PRESSURE SWITCH RATIONALITY



P0841-LR PRESSURE SWITCH RATIONALITY (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously with the ignition on and engine running.
- **Set Condition:**
  The DTC will set if the LR Pressure Switch reads open or closed at the wrong time in a given gear.

Possible Causes
LOSS OF PRIME AND/OR TRANSMISSION CONTROL RELAY DTC PRESENT
LOW FLUID LEVEL
LOW LINE PRESSURE
REVERSE CARRIER SNAP RING DISLODGED
CRACKED OR MISINSTALLED PRIMARY OIL FILTER OR FILTER SEAL
STICKING MAIN REGULATOR VALVE IN PUMP VALVE BODY
NO. 1 CHECK BALL CUT OR DAMAGED
WIRING AND CONNECTORS
(T50) LR PRESSURE SWITCH SENSE CIRCUIT OPEN
(T50) LR PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND
(T50) LR PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
TRANSMISSION SOLENOID/TRS ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Transmission system uses five pressure switches to monitor the fluid pressure in the LR, 2C, 4C, UD, and OD clutch circuits. The pressure switches are continuously monitored for the correct states in each gear as shown.

GEAR	L/R	2C	4C	UD	OD
REVERSE	OPEN	OPEN	OPEN	OPEN	OPEN
P/N	CLOSED**	OPEN	OPEN	OPEN	OPEN
1ST	CLOSED*	OPEN	OPEN	CLOSED	OPEN
2ND	OPEN	CLOSED	OPEN	CLOSED	OPEN
2ND PRIME	OPEN	OPEN	CLOSED	CLOSED	OPEN
3RD	OPEN	OPEN	OPEN	CLOSED	CLOSED
4TH	OPEN	OPEN	CLOSED	OPEN	CLOSED
5TH	OPEN	CLOSED	OPEN	OPEN	CLOSED

*L/R is closed if output speed is below 100 rpm in Drive and Manual 2. L/R is closed in Manual 1.

**May be open when rolling in Neutral or at low oil temperatures.

P0841-LR PRESSURE SWITCH RATIONALITY (CONTINUED)

Diagnostic Test

1. OTHER RELATED DTC'S PRESENT

Ignition on, engine not running.

With the scan tool, check for other transmission DTC's.

Are there any Loss of Prime and/or Transmission Control Relay related DTC's present?

Yes >> Refer to the Transmission category and perform the appropriate symptom. If the DTC P0944 is present, perform its respective test first.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CONDITION P0841 PRESENT

With the scan tool, check the EATX DTC EVENT DATA for P0841.

NOTE: Make sure to record all EATX DTC EVENT DATA stored in the scan tool for future reference in this test procedure.

Does the EATX DTC EVENT DATA show the DTC P0841?

Yes >> Go To 3

No >> Refer to the Symptom Catagory and perform diagnostics for the DTC reported in the EATX DTC EVENT DATA.

---

3. DTC SET IN REVERSE

Does the EATX DTC EVENT DATA show the DTC P0841 set while in Reverse?

Yes >> Go To 10

No >> Go To 4

---

4. LR PRESSURE SWITCH CLOSED

Does the EATX DTC EVENT DATA show the LR Pressure Switch reading CLOSED when the DTC P0841 was set?

Yes >> Go To 5

No >> Go To 14

P0841-LR PRESSURE SWITCH RATIONALITY (CONTINUED)

5. PCM AND WIRING

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

Turn the Pressure Switch selector to LR on the Transmission Simulator.

With the scan tool, monitor the LR Pressure Switch state while pressing the Pressure Switch Test button on the Transmission Simulator.

Did the LR Pressure Switch state change from open to closed while pressing the Pressure Switch Test button on the Transmission Simulator?

Yes >> Go To 6

No >> Go To 10

---

6. POOR WIRING AND CONNECTIONS

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 7

---

7. DTC SET IN FIRST GEAR

With the EATX DTC EVENT DATA recorded earlier, check what gear the transmission was in when the DTC P0841 was set.

Does the EATX DTC EVENT DATA show the Present Gear as first gear when the DTC P0841 was set ?

Yes >> Go To 8

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

8. NO. 1 CHECK BALL CUT OR DAMAGED

Turn the ignition off to the lock position.

Remove the Transmission Valve Body per the Service Information.

Check the No. 1 Check Ball for any possible cuts or damage.

Is the No. 1 Check Ball cut or damaged?

Yes >> Replace the No. 1 Check Ball and check for clutch debris in the transmission oil pan. If there is excessive debris, perform internal repairs to the LR Clutch assembly. Refer to the Service Information for proper repair procedures.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 9

P0841-LR PRESSURE SWITCH RATIONALITY (CONTINUED)

9. REVERSE CARRIER SNAP RING DISLODGED OR TRANSMISSION SOLENOID/TRS ASSEMBLY

Looking through the windows in the bottom of the case, check whether the snap ring at the front of the Reverse (center) Carrier has dislodged.

NOTE: It may be necessary to pry the Input Annulus Gear Shell rearward to check this snap ring.

Is the Reverse Carrier Snap Ring dislodged?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

10. (T50) LR PRESSURE SWITCH SENSE CIRCUIT OPEN

Turn the ignition off to the lock position.

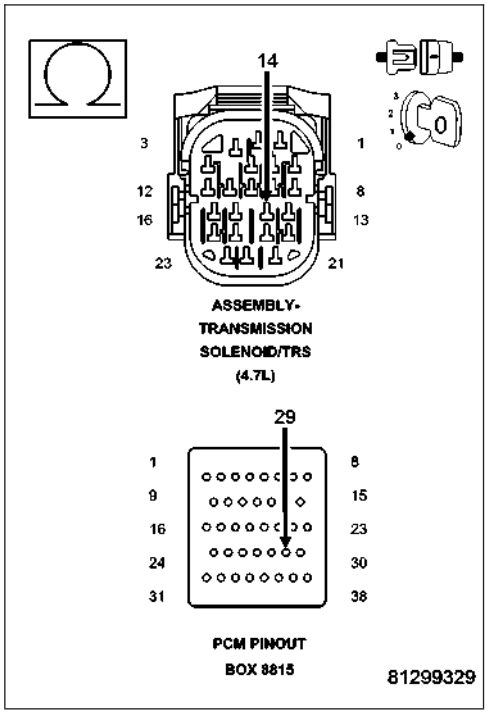
Disconnect the Transmission Simulator, Miller tool #8333 if connected in a previous step or disconnect the Transmission Solenoid /TRS Assembly harness connector.

Disconnect the PCM C4 harness connector and connect Miller tool #8815.

NOTE: Check connectors - Clean/repair as necessary.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Measure the resistance of the (T50) LR Pressure Switch Sense circuit from the Solenoid/TRS Assembly harness connector to the appropriate terminal of the Miller tool #8815.



Is the resistance above 5.0 ohms?

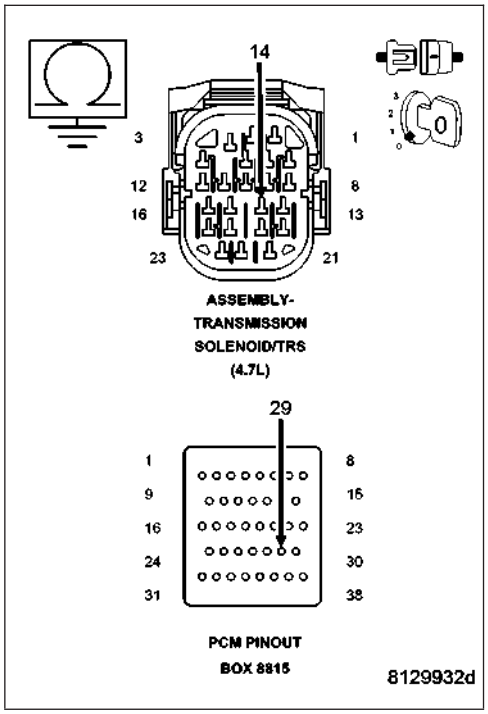
Yes >> Repair the (T50) LR Pressure Switch Sense circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 11

P0841-LR PRESSURE SWITCH RATIONALITY (CONTINUED)

11. (T50) LR PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T50) LR Pressure Switch Sense circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (T50) LR Pressure Switch Sense circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 12

---

12. PCM POWERS AND GROUNDS

Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 13

---

13. ROAD TEST THE VEHICLE

With the scan tool, clear the DTC and road test the vehicle.

Try to duplicate the conditions in which the DTC originally set using the EATX DTC EVENT DATA recorded earlier.

Did the DTC P0841 reset?

Yes >> Replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 17

P0841-LR PRESSURE SWITCH RATIONALITY (CONTINUED)

14. LOW LINE PRESSURE

In the EATX DTC EVENT DATA recorded earlier, compare the Line Pressure and the Desired Line Pressure.

Is the Line Pressure less than 40 psi, and significantly below the Desired Line Pressure?

Yes >> Repair as necessary to correct low line pressure. Check for low fluid level. Check the Primary Oil Filter seal for a split, crack, or improperly installed. Refer to the Service Information for the proper installation procedure. If the fluid level and Primary Oil Filter are OK, check the Main Regulator Valve in the Oil Pump per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 15

---

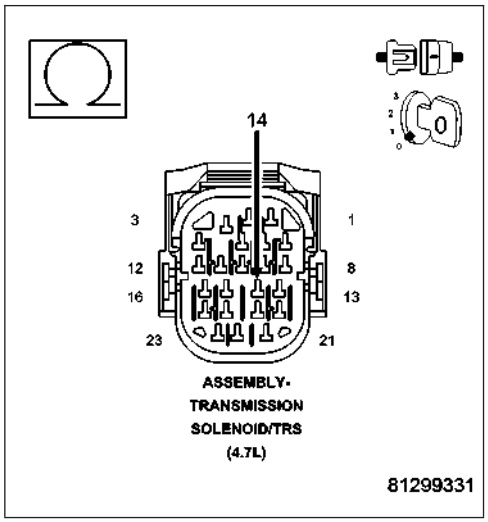
15. (T50) LR PRESSURE SWITCH SENSE CIRCUIT SHORT TO OTHER CIRCUITS

Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid/TRS Assembly harness connector.

Disconnect all PCM harness connectors.

Measure the resistance between the (T50) LR Pressure Switch Sense circuit and all other circuits in the Transmission Solenoid/TRS Assembly harness connector.



Is the resistance below 5.0 ohms between the (T50) LR Pressure Switch Sense circuit and all other circuit(s) in the Transmission Solenoid/TRS Assembly harness connector?

Yes >> Repair the (T50) LR Pressure Switch Sense circuit for a short to other circuit(s).
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 16

---

16. ROAD TEST THE VEHICLE

With the scan tool, clear the DTC and road test the vehicle.

Try to duplicate the conditions in which the DTC originally set using the EATX DTC EVENT DATA recorded earlier.

Did the DTC P0841 reset?

Yes >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 17

P0841-LR PRESSURE SWITCH RATIONALITY (CONTINUED)

17. INTERMITTENT WIRING AND CONNECTORS

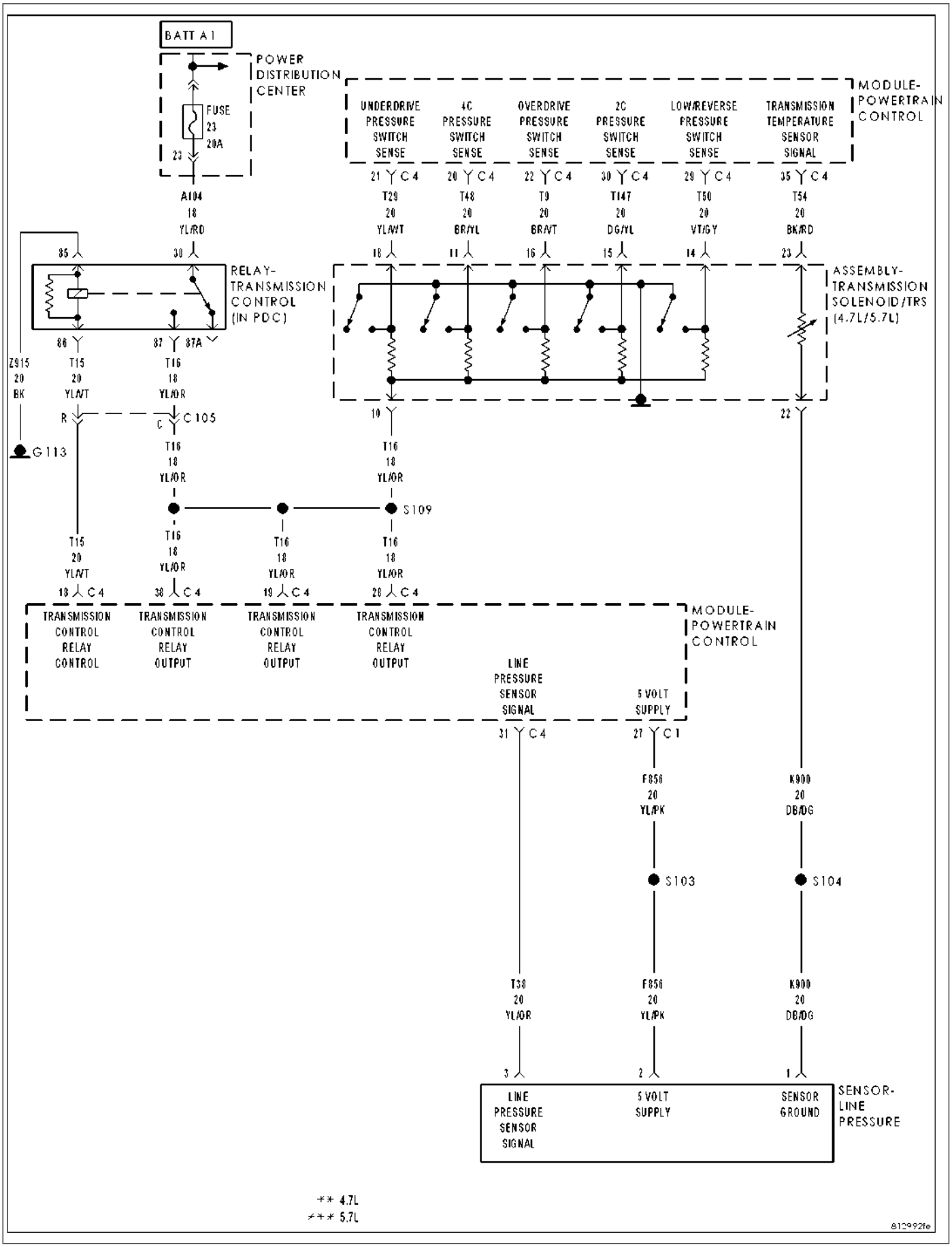
The conditions necessary to set this DTC are not present at this time.
Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.
Wiggle the wires while checking for shorted and open circuits.
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Were there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0845-2C HYDRAULIC PRESSURE TEST



P0845-2C HYDRAULIC PRESSURE TEST (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  In any forward gear with engine speed above 1000 RPM shortly after a shift and every minute thereafter.
- **Set Condition:**
  After a shift into a forward gear, with engine speed above 1000 RPM, the PCM momentarily turns on element pressure to the Clutch circuits that don't have pressure to identify the correct Pressure Switch closes. If the Pressure Switch does not close 2 times, the DTC sets.

Possible Causes
LINE PRESSURE SENSOR
TRANSMISSION FLUID CONTAMINATION
RELATED DTC'S PRESENT
TRANSMISSION SOLENOID/TRS ASSEMBLY
EXCESSIVE DEBRIS IN OIL PAN
POOR LINE PRESSURE SENSOR CONNECTION
(T147) 2C PRESSURE SWITCH SENSE CIRCUIT OPEN
TRANSMISSION CONTROL RELAY DTCS PRESENT
(T147) 2C PRESSURE SWITCH SENSE CIRCUIT OPEN
(F856) 5-VOLT SUPPLY CIRCUIT OPEN
(T147) 2C PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND
(F856) 5-VOLT SUPPLY CIRCUIT SHORT TO GROUND
(T147) 2C PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
TRANSMISSION SOLENOID/TRS ASSEMBLY
INTERNAL TRANSMISSION
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Transmission Control System tests the pressure switches when they are off. The test verifies that the switches are operational (They will close with pressure applied). The Transmission Control System verifies that the switch closes when the corresponding element is applied. If a switch fails to close, it is re-tested. If it fails the second test, the DTC will set, the MIL will illuminate and the transmission system will default to the orderly Shutdown routine.

Diagnostic Test

1. DETERMINING IF RELATED DTC'S ARE PRESENT

With the scan tool, check for other transmission DTC's

Is there any Loss of Prime, Transmission Control Relay, and/or Line Pressure Sensor DTCs present?

Yes >> Refer to the Transmission category and perform the appropriate symptom. If the DTC, P0944-LOSS OF PRIME is present, perform its respective test first.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

P0845-2C HYDRAULIC PRESSURE TEST (CONTINUED)

2. DTC P0755 PRESENT

With the scan tool, check Transmission DTCs.

Is the DTC P0755 also present?

Yes >> Refer to the symptom list and perform diagnostics for P0755–2C SOLENOID CIRCUIT.

No >> Go To 3

---

3. DTCS P0732, P0735 AND/OR P0846 PRESENT

With the scan tool, check for other transmission DTC's

Are the DTCs P0732, P0735, and/or P0846 present also?

Yes >> Go To 12

No >> Go To 4

---

4. CHECK TO SEE IF DTC P0845 IS CURRENT

With the scan tool, Check the STARTS SINCE SET counter for P0845.

NOTE: This counter only applies to the last DTC set.

Is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 5

No >> Go To 17

---

5. LINE PRESSURE STAYS THE SAME

Start the engine.

Warm the transmission to 82° C or 180° F.

Firmly apply the brakes.

With the scan tool, monitor the Line Pressure during the following step.

Move the shift lever to each gear position, pausing momentarily in each position and record the line pressure reading. Allow the pressure to stabilize for at least 5 seconds in each range.

Did the line pressure remain at a steady value between 585 and 655 kPa or 85 and 95 PSI in each position?

Yes >> Go To 6

No >> Go To 10

---

6. CHECK LINE PRESSURE SENSOR CONNECTION

Ignition on, engine not running.

With the scan tool, monitor the Line Pressure while firmly pushing the Transmission Line Pressure Sensor connector inwards towards the Transmission.

Did the Line Pressure reading on the scan tool change to about 207 kPa or 30 PSI when the connector was pushed inward?

Yes >> Disconnect and properly reconnect the Line Pressure Sensor connector. Inspect terminals and repair as necessary.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 7

P0845-2C HYDRAULIC PRESSURE TEST (CONTINUED)

7. LINE PRESSURE SENSOR OPERATION

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

With the Transmission Simulator select the ″OFF″ position on the ″Input/Output Speed″ switch.

Ignition on, engine not running.

With the scan tool, monitor the Line Pressure while turning the Pressure Switch selector to each of the 3 line pressure positions on the Transmission Simulator.

NOTE: All three scan tool Line Pressure readings should be steady and ±14 kPa or 2.0 PSI of the reading specified on the Transmission Simulator.

Did the scan tool Line Pressure readings match the specified readings on the Transmission Simulator and remain steady in all three positions?

Yes >> Replace the Line Pressure Sensor per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 8

---

8. (F856) 5-VOLT SUPPLY CIRCUIT OPEN

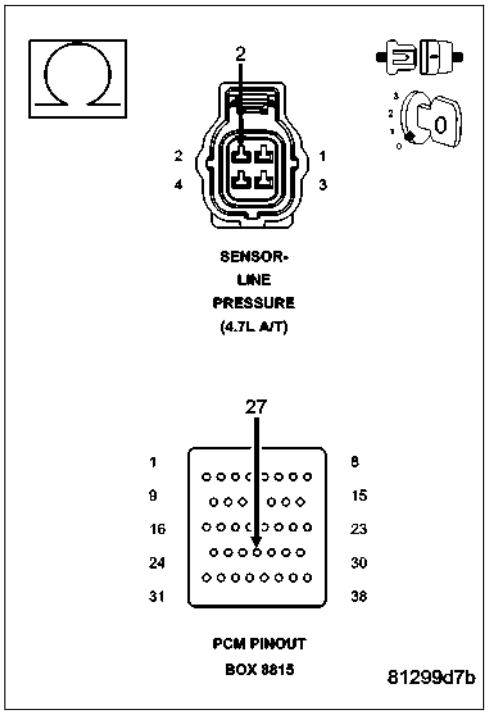
Turn the ignition off to the lock position.

Disconnect Transmission Simulator.

Disconnect the PCM C1 harness connector and connect Miller tool #8815.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Measure the resistance of the (F856) 5-volt Supply circuit from the Line Pressure Sensor harness connector to the appropriate terminal of Miller tool #8815.



Is the resistance above 5.0 ohms?

Yes >> Repair the (F856) 5-volt Supply circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 9

P0845-2C HYDRAULIC PRESSURE TEST (CONTINUED)

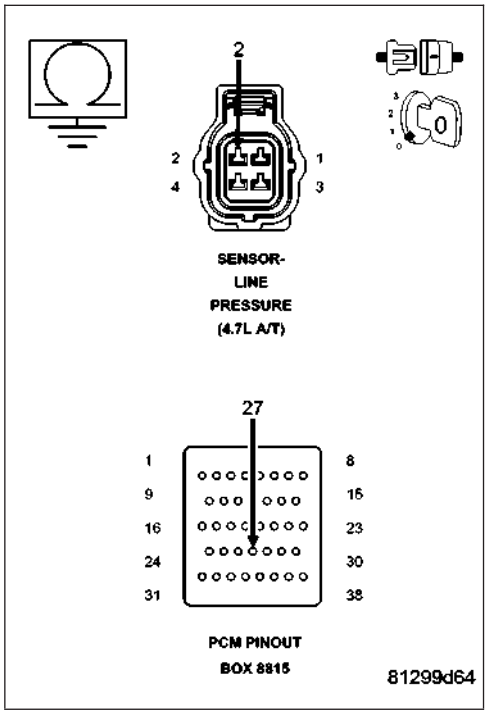
9. (F856) 5-VOLT SUPPLY CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (F856) 5-volt Supply circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (F856) 5-volt Supply circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.



10. COMPARE SCAN TOOL TO PRESSURE GAUGE

Turn the ignition off to the lock position.

Connect the Line Pressure Adapter, Miller tool #8259 and 0-300 psi Test Gauge, Miller tool #C-3293-SP. Refer to the Service Information for proper installation procedure.

CAUTION: Apply parking brake.

Start the engine.

In the following steps, compare the scan tool Line Pressure to the Pressure Gauge readings in each gear.

CAUTION: Do not overheat transmission.

With the gear selector in park, raise the RPM to 1500, and compare line pressure readings.

Firmly apply the brakes, move the gear selector into reverse, raise the RPM to 1500, and compare the line pressure readings.

Firmly apply the brakes, move the gear selector into drive, raise the RPM to 1500, and compare the line pressure readings.

Does the scan tool Line Pressure readings match the Pressure Gauge readings ± 10 psi?

Yes >> Go To 11

No >> Replace the Line Pressure Sensor per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0845-2C HYDRAULIC PRESSURE TEST (CONTINUED)

11. WIRING AND CONNECTORS

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Failure to remove the Starter Relay can cause a Transmission - No Response condition.

Remove the Line Pressure Adapter, Miller tool #8259 and 0-300 psi Test Gauge, Miller tool #C-3293-SP.

Install the Transmission Simulator, Miller tool #8333.

On the Transmission Simulator, turn the Pressure Switch selector switch to 2C.

Ignition on, engine not running.

With the scan tool, monitor the 2C Pressure Switch state while pressing and holding the Pressure Switch test button and wiggling the wire harness and connectors that pertain to the 2C Pressure Switch.

Did the 2C Pressure Switch state change to closed and remain closed while wiggling the wires?

Yes >> Go To 12

No >> Go To 14

---

12. CHECK FOR EXCESSIVE DEBRIS

Turn the ignition off to the lock position.

Remove the Transmission Simulator, Miller tool #8333.

Remove and inspect the Transmission Oil Pan per the Service Information.

Does the Transmission Oil Pan contain excessive debris or contamination?

Yes >> Repair the cause of the excessive debris in the Transmission Oil Pan. Refer to the Service Information for the proper procedures.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 13

---

13. CHECK 2C HYDRAULIC CLUTCH CIRCUIT

Remove the Valve Body and air check the 2C clutch hydraulic circuit, in the 2C/4C clutch retainer, for leakage per the Service Information.

NOTE: The 2C hydraulic clutch circuit contains a small bleed orifice, a small amount of air leakage is normal.

Was there excessive air leakage noticed during the air check?

Yes >> Repair as necessary. Check the 2C clutch piston, piston seals and bleed orifice assembly.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Disassemble and inspect the Valve Body and repair as necessary. Inspect the 2C Accumulator piston and seals. Check for an extra check ball downstream from the #7 check ball pocket and repair as necessary. If no problems are found in the Valve Body, replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0845-2C HYDRAULIC PRESSURE TEST (CONTINUED)

14. (T147) 2C PRESSURE SWITCH SENSE CIRCUIT OPEN

Turn the ignition off to the lock position.

Remove the Transmission Simulator, Miller tool #8333.

Disconnect the PCM C4 harness connector and connect Miller tool #8815.

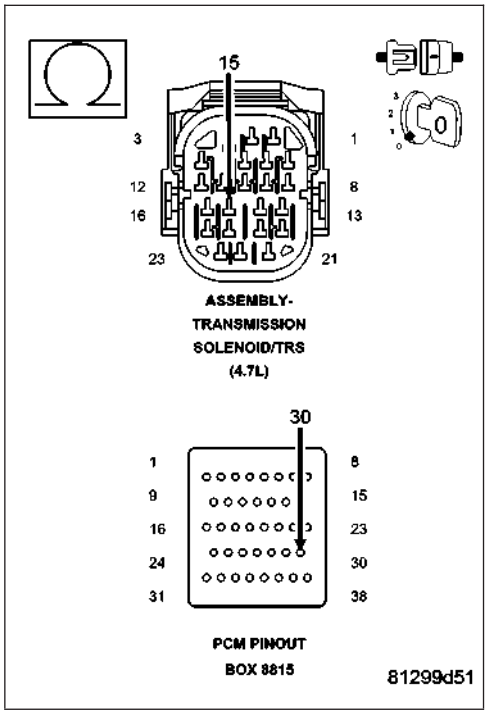
Measure the resistance of the (T147) 2C Pressure Switch Sense circuit from the Transmission Solenoid/TRS Assembly harness connector to the appropriate terminal of Miller tool #8815.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T147) 2C Pressure Switch Sense circuit for an open.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 15



15. (T147) 2C PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND

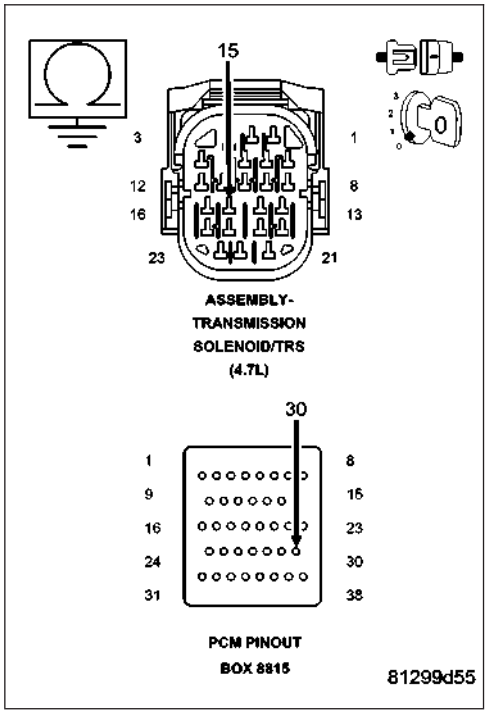
Measure the resistance between ground and the (T147) 2C Pressure Switch Sense circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (T147) 2C Pressure Switch Sense circuit for a short to ground.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 16



P0845-2C HYDRAULIC PRESSURE TEST (CONTINUED)

16. (T147) 2C PRESSURE SWITCH SENSE CIRCUIT SHORT TO OTHER CIRCUITS

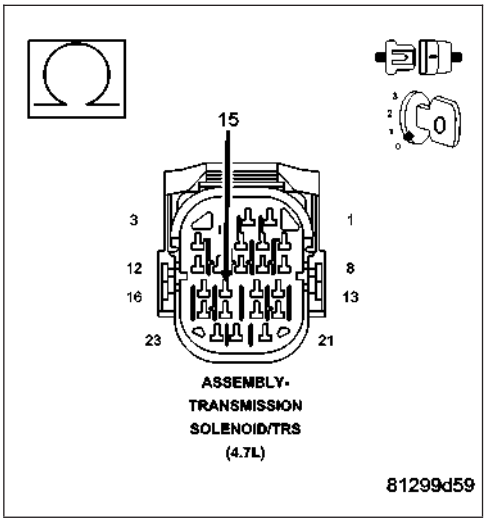
Disconnect all PCM harness connectors.

Disconnect the Transmission Solenoid/TRS Assembly harness connector.

NOTE: Make sure the Transmission Solenoid/TRS Assembly harness connector is disconnected.

NOTE: Check connectors - Clean/repair as necessary.

Measure the resistance between the (T147) 2C Pressure Switch Sense circuit and all other circuits in the Transmission Solenoid/TRS Assembly harness connector.



Is the resistance below 5.0 ohms between the (T147) 2C Pressure Switch Sense circuit and any other circuit(s) in the Transmission Solenoid/TRS Assembly harness connector?

Yes >> Repair the (T147) 2C Pressure Switch Sense circuit for a short to other circuit(s).
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

17. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

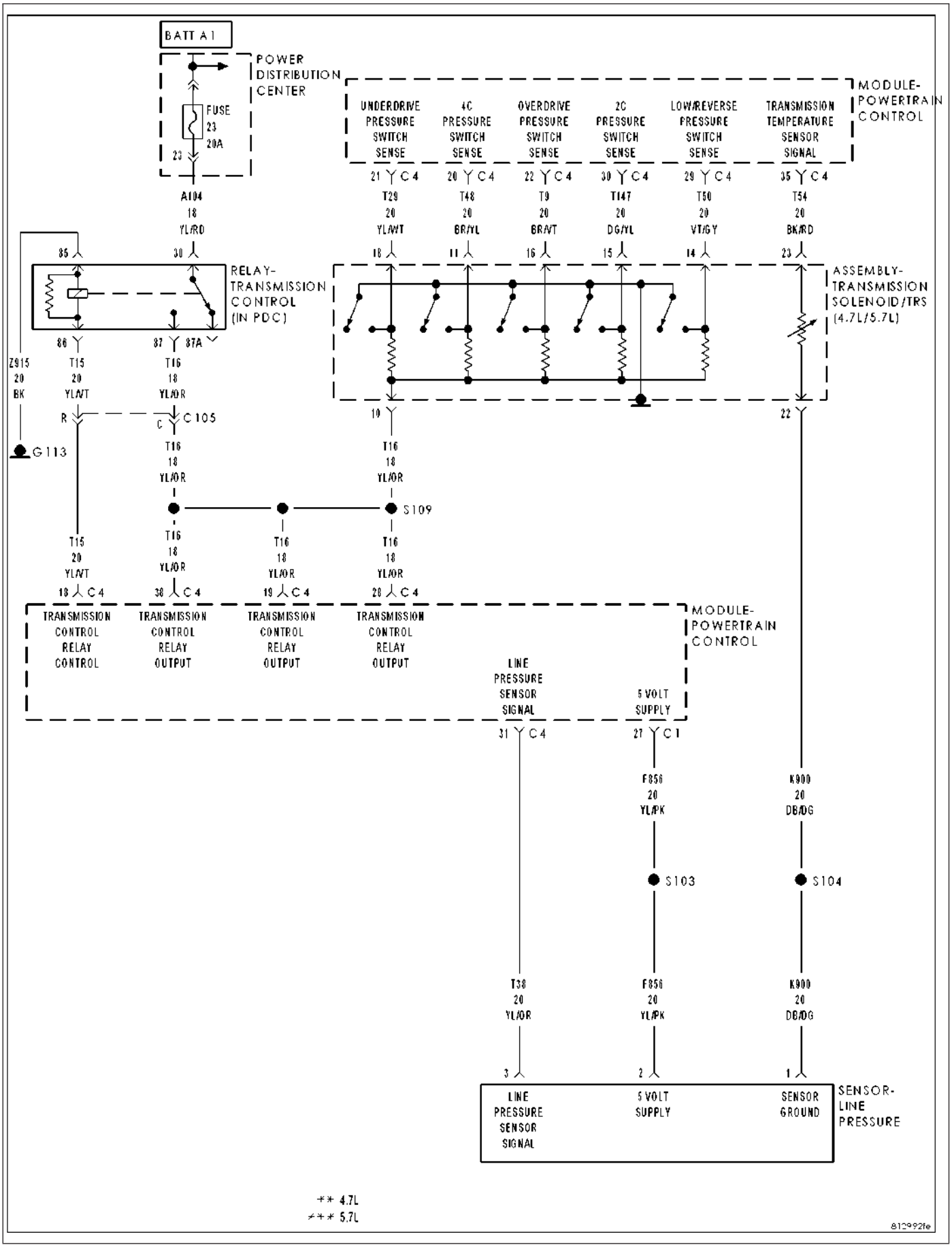
If the EATX DTC EVENT DATA shows the DTC P0845 set while the Line Pressure was significantly below the Desired Line Pressure reading, check for causes of low line pressure (low fluid level, broken or mis-installed primary oil filter or filter seal, sticking Main Regulator Valve in the Pump Valve Body etc.). If the data shows the DTC set while the Line Pressure reading was significantly higher than the Desired Line Pressure, check the Line Pressure Sensor and related wiring.

Where there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0846-2C PRESSURE SWITCH RATIONALITY



P0846-2C PRESSURE SWITCH RATIONALITY (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously with the ignition on, engine running, with the transmission in gear.
- **Set Condition:**
  The DTC is set if the 2C Pressure Switch reads open or closed at the wrong time in a given gear.

Possible Causes
RELATED RELAY DTC'S PRESENT
(T147) 2C PRESSURE SWITCH SENSE CIRCUIT OPEN
(T147) 2C PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND
(T147) 2C PRESSURE SWITCH SENSE CIRCUIT SHORT TO OTHER CIRCUITS
EXCESSIVE FLUID LEAKAGE IN 2C CLUTCH CIRCUIT
NO. 5 AND/OR NO. 7 CHECK BALL CUT OR DAMAGED
EXTRA CHECK BALL DOWNSTREAM OF THE NO. 7 CHECK BALL SOCKET
LOW LINE PRESSURE
TRANSMISSION SOLENOID/TRS ASSEMBLY
POWERTRAIN CONTROL MODULE
WIRING AND CONNECTORS

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Transmission system uses five pressure switches to monitor the fluid pressure in the LR, 2C, 4C, UD, and OD clutch circuits. The pressure switches are continuously monitored for the correct states in each gear as shown.

GEAR	L/R	2C	4C	UD	OD
REVERSE	OPEN	OPEN	OPEN	OPEN	OPEN
P/N	CLOSED**	OPEN	OPEN	OPEN	OPEN
1ST	CLOSED*	OPEN	OPEN	CLOSED	OPEN
2ND	OPEN	CLOSED	OPEN	CLOSED	OPEN
2ND PRIME	OPEN	OPEN	CLOSED	CLOSED	OPEN
3RD	OPEN	OPEN	OPEN	CLOSED	CLOSED
4TH	OPEN	OPEN	CLOSED	OPEN	CLOSED
5TH	OPEN	CLOSED	OPEN	OPEN	CLOSED

*L/R is closed if output speed is below 100 rpm in Drive and Manual 2. L/R is closed in Manual 1.

**May be open when rolling in Neutral or at low oil temperatures.

P0846-2C PRESSURE SWITCH RATIONALITY (CONTINUED)

Diagnostic Test

1. DETERMINING IF RELATED RELAY DTC'S ARE PRESENT

With the scan tool, check for other transmission DTC's.

Are there any Transmission Control Relay related DTC's present?

Yes >> Refer to the Transmission category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. EATX DTC DATA SHOW CURRENT DTC

With the scan tool, check the EATX DTC EVENT DATA.

Does the EATX DTC EVENT DATA show data for DTC P0846?

Yes >> Go To 3

No >> Refer to the Transmission category and perform the appropriate symptom shown in the EATX DTC EVENT DATA.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

3. MULTIPLE DTCS PRESENT

With the scan tool, check for other transmission DTC's.

Are there two or more related pressure switch rationality DTCs present in addition to P0846?

Yes >> Go To 4

No >> Go To 7

---

4. RELATED DTC PRESENT

With the scan tool, check the EATX DTC EVENT DATA for P0846.

NOTE: Make sure to record all EATX DTC EVENT DATA stored in the scan tool for future reference in this test procedure.

Do all the pressure switches read CLOSED in the EATX DTC EVENT DATA for P0846?

Yes >> Refer to Transmission category and perform diagnostics for P0888.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5

---

5. EATX DTC EVENT DATA READ OPEN

In the EATX DTC EVENT DATA recorded earlier, read the state of all pressure switches.

Do all the pressure switches read OPEN?

Yes >> Go To 6

No >> Go To 7

P0846-2C PRESSURE SWITCH RATIONALITY (CONTINUED)

6. LOW LINE PRESSURE

In the EATX DTC EVENT DATA recorded earlier, compare the Line Pressure and the Desired Line Pressure.

Is the Line Pressure less than 40 psi, and significantly below the Desired Line Pressure?

Yes >> Repair as necessary to correct low line pressure. Check fluid level and adjust as necessary. If fluid level is OK, check the Primary Oil Filter seal for a split, crack, or improperly installed. If the filter and seal are OK, check the Main Regulator Valve in the Oil Pump. Refer to the Service Information for the above procedures.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

7. EATX DTC EVENT DATA READ PARK REVERSE OR NEUTRAL

With the scan tool, check the EATX DTC EVENT DATA for P0846.

NOTE: Make sure to record all EATX DTC EVENT DATA stored in the scan tool for future reference in this test procedure.

Does the EATX DTC EVENT DATA show the DTC P0846 set in Park, Neutral, or Reverse?

Yes >> Go To 12

No >> Go To 8

---

8. EATX DTC EVENT DATA READ CLOSED

With the scan tool, check the EATX DTC EVENT DATA for P0846.

NOTE: Make sure to record all EATX DTC EVENT DATA stored in the scan tool for future reference in this test procedure.

Does the EATX DTC EVENT DATA show the 2C Pressure Switch reading CLOSED?

Yes >> Go To 10

No >> Go To 9

---

9. PRIMARY OIL FILTER SEAL

In the EATX DTC EVENT DATA recorded earlier, compare the Line Pressure and the Desired Line Pressure.

Is the Line Pressure less than 40 psi, and significantly below the Desired Line Pressure?

Yes >> Repair as necessary to correct low line pressure. Check fluid level and adjust as necessary. If fluid level is OK, check the Primary Oil Filter seal for a split, crack, or improperly installed. If the filter and seal are OK, check the Main Regulator Valve in the Oil Pump. Refer to the Service Information for the above procedures.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 15

P0846-2C PRESSURE SWITCH RATIONALITY (CONTINUED)

10. PCM AND WIRING

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the Transmission Simulator, turn the Pressure Switch selector switch to the 2C position.

With the scan tool, monitor the 2C Pressure Switch while pressing the Pressure Switch test button on the Transmission Simulator.

Did the state of the 2C Pressure Switch change while pressing the Pressure Switch Test button?

Yes >> Go To 11

No >> Go To 12

---

11. TRANSMISSION SOLENOID/TRS ASSEMBLY

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

Where there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

12. (T147) 2C PRESSURE SWITCH SENSE CIRCUIT OPEN

Turn the ignition off to the lock position.

Disconnect the Transmission Simulator, Miller tool #8333.

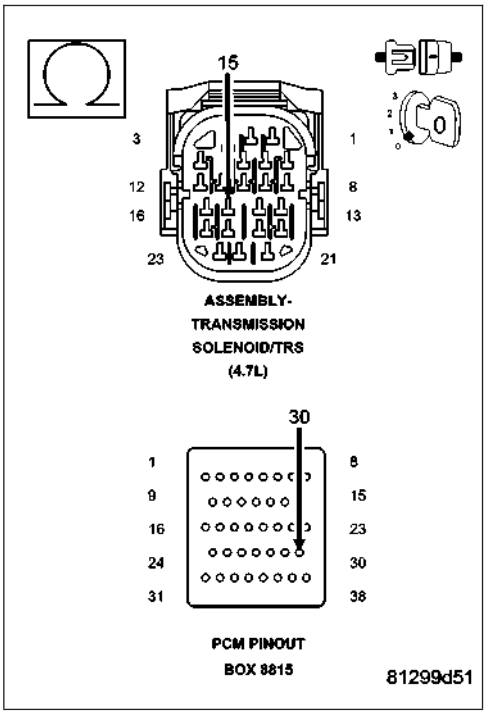
Disconnect the PCM C4 harness connector.

NOTE: Check connectors - Clean/repair as necessary.

Connect Miller tool #8815 to the PCM C4 harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Measure the resistance of the (T147) 2C Pressure Switch Sense circuit from the appropriate terminal of Miller tool #8815 to the Transmission Solenoid/TRS Assembly harness connector.



Is the resistance above 5.0 ohms?

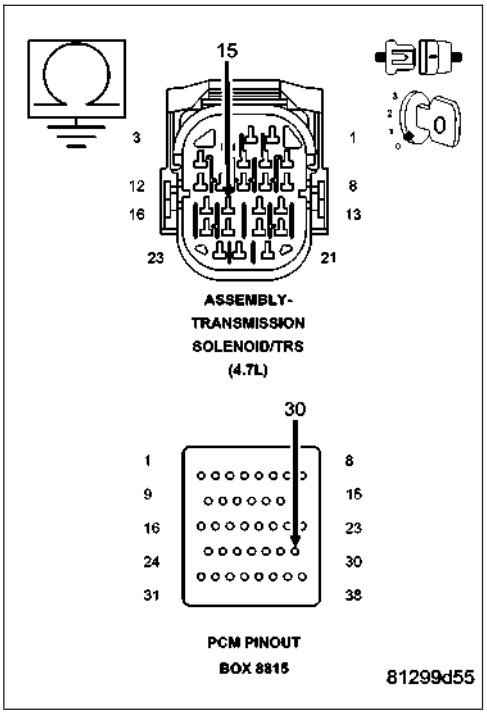
Yes >> Repair the (T147) 2C Pressure Switch Sense circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 13

P0846-2C PRESSURE SWITCH RATIONALITY (CONTINUED)

13. (T147) 2C PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T147) 2C Pressure Switch Sense circuit.



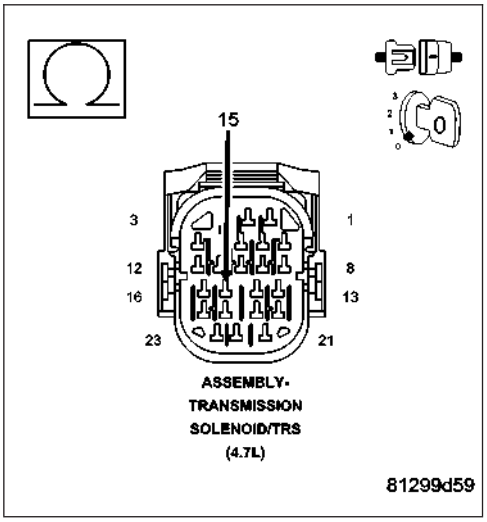
Is the resistance below 5.0 ohms?

Yes >> Repair the (T147) 2C Pressure Switch Sense circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 14

14. (T147) 2C PRESSURE SWITCH SENSE CIRCUIT SHORT TO ANOTHER CIRCUIT

Measure the resistance between the (T147) 2C Pressure Switch Sense circuit and all the other circuits in the Transmission Solenoid/ TRS Assembly harness connector.



Is the resistance below 5.0 ohms?

Yes >> Repair the (T147) 2C Pressure Switch Sense circuit for a short to another circuit(s).
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the Powertrain Control Module per the Service Information. With the scan tool, perform the QUICK LEARN procedure.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0846-2C PRESSURE SWITCH RATIONALITY (CONTINUED)

15. #5 AND/OR #7 CHECK BALL CUT OR DAMAGED

Turn the Ignition off to the lock position.

Remove the Valve Body Assembly per the Service Information.

Inspect the #5 and #7 check balls for any cuts or damage.

Inspect the 2C accumulator piston and seals and also the 2C tower seal on top of the valve body. Refer to the Service Information.

Where there any problems found?

Yes >> Repair as necessary. Check for excessive clutch debris in the transmission oil pan. If excessive clutch debris is present, repair 2C clutch as necessary. Refer to the Service Information for proper repair procedures.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 16

---

16. EXCESSIVE FLUID LEAKAGE WITH 2C CLUTCH CIRCUIT

Air check the 2C Clutch hydraulic circuit. Refer to the Service Information.

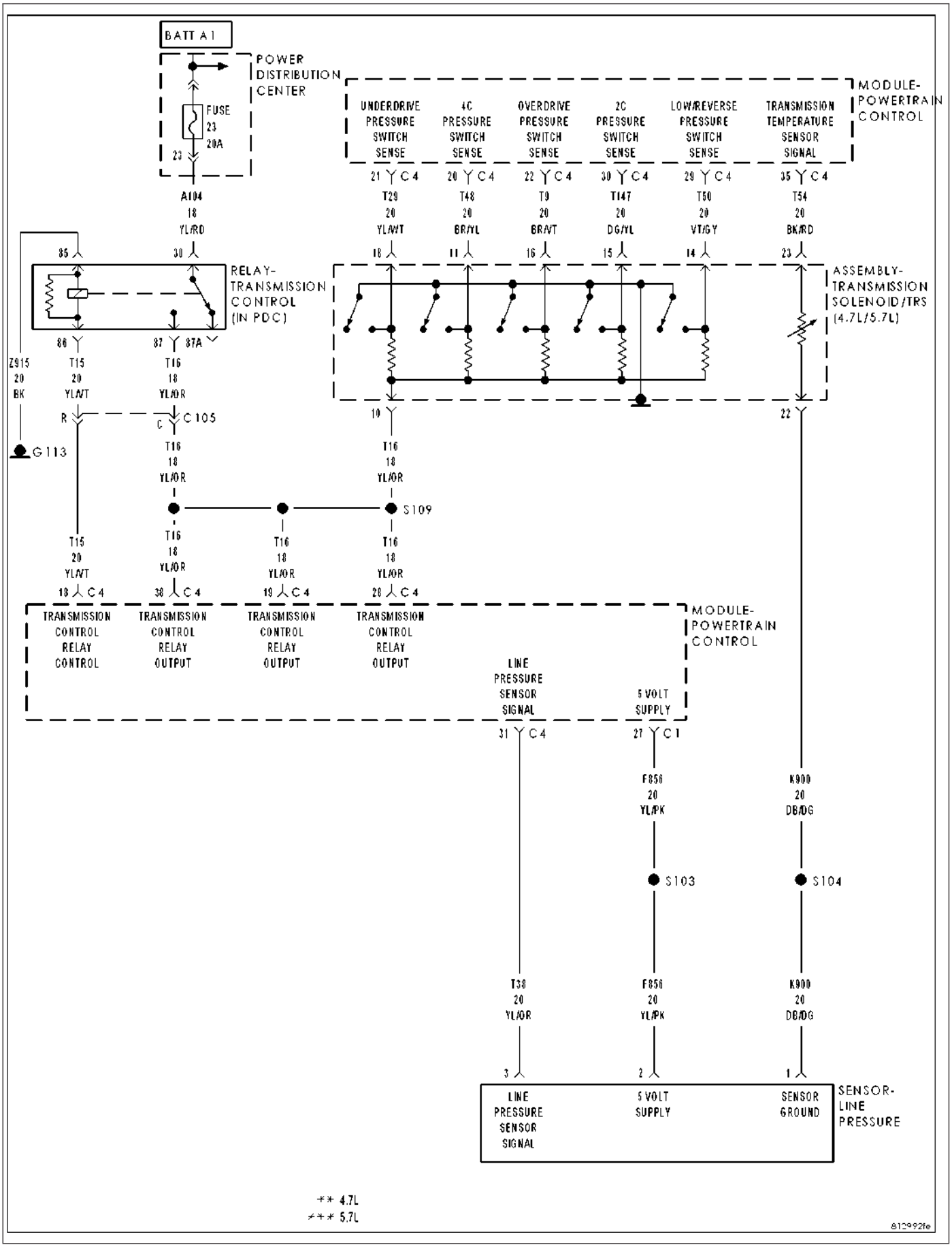
NOTE: This hydraulic clutch circuit contains a small bleed orifice. Small leakage is considered normal.

Was there excessive air leakage in the 2C Clutch hydraulic circuit?

Yes >> Repair as necessary. Refer to the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0868-LINE PRESSURE LOW



P0868-LINE PRESSURE LOW (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously while driving in a forward gear.
- **Set Condition:**
  The PCM continuously monitors Actual Line Pressure and compares it to Desired Line Pressure. If the Actual Line Pressure is more than 10 PSI below Desired Line Pressure, this DTC will set.

Possible Causes
CHECK FOR RELATED DTC'S
LOW FLUID LEVEL
(F856) 5-VOLT SUPPLY CIRCUIT OPEN
POOR LINE PRESSURE SENSOR CONNECTION
(F856) 5-VOLT SUPPLY CIRCUIT SHORT TO GROUND
(F856) 5-VOLT SUPPLY CIRCUIT SHORT TO VOLTAGE
(T140) PRESSURE CONTROL SOLENOID CONTROL CIRCUIT SHORT TO ANOTHER CIRCUIT
INTERNAL TRANSMISSION
LINE PRESSURE SENSOR
CRACKED, PLUGGED, OR MISINSTALLED PRIMARY OIL FILTER
STUCK OR STICKING MAIN REGULATOR VALVE
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

Line pressure is measured by the Line Pressure Sensor (LPS) and regulation is achieved by changing the duty cycle of the Pressure Control Solenoid (PCS) controlled by the Transmission Control System. (5% duty cycle = solenoid off = max line pressure, 62% duty cycle = solenoid on = min line pressure). The Transmission Control System calculates the desired line pressure based on inputs from both the engine and transmission.

The Transmission Control System calculates torque input to the transmission and uses it as the primary input to the desired line pressure calculation. This is called Torque Based Line Pressure. In addition, the line pressure is set to a preset level 827 or 931 kPa (120 or 135 PSI) during shifts and in Park and Neutral to ensure consistent shift quality. The desired line pressure is continuously being compared to the actual line pressure. If the actual line pressure is consistently lower than the target while driving, the line pressure low DTC P0868 will set.

Diagnostic Test

1. CHECK FOR RELATED DTC'S

With the scan tool, check for other transmission DTC's

Is the DTC P0932 present also?

Yes >> Refer to the Transmission category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

P0868-LINE PRESSURE LOW (CONTINUED)

2. CONDITION P0868 PRESENT

With the scan tool, check the STARTS SINCE SET counter for P0868.

NOTE: This counter only applies to the last DTC set.

Is the START SINCE SET COUNTER 2 or less?

Yes >> Go To 3

No >> Go To 11

---

3. CHECK LINE PRESSURE SENSOR CONNECTION

Ignition on, **engine not running.**

With the scan tool, monitor the Line Pressure, firmly push the Line Pressure Sensor harness connector towards the Transmission.

Did the Line Pressure change to about 207 kPa or 30 PSI when the connector was pushed?

Yes >> Disconnect and properly reconnect the Line Pressure Sensor connector. Inspect terminals and repair as necessary.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 4

---

4. PCM AND WIRING

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333.

With the Transmission Simulator select the ″OFF″ position on the ″Input/Output Speed″ switch.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the scan tool, monitor the Line Pressure during the following steps.

Using the Transmission Simulator, set the rotary knob to each of the 3 line pressure positions.

NOTE: All three scan tool Line Pressure readings should be steady and ±14 kPa or 2.0 PSI of the reading specified on the Transmission Simulator.

Did the Line Pressure read within ±14 kPa or 2.0 PSI in all three positions?

Yes >> Go To 5

No >> Go To 7

P0868-LINE PRESSURE LOW (CONTINUED)

5. LINE PRESSURE SENSOR

Turn the ignition off to the lock position.

Disconnect the Transmission Simulator, Miller tool #8333 and reconnect all previously disconnected connectors.

Install the Line Pressure Adaptor, Miller tool #8259, and the Pressure Gauge, Miller tool #C-3293, 0 to 2000 kPa or 0 to 300 PSI.

Start the engine in park.

Monitor the line pressure readings of both the scan tool and the pressure gauge and compare the two readings.

Is the line pressure gauge reading within 34 kPa or 5 PSI of the scan tool reading?

Yes >> Go To 6

No >> Replace the Line Pressure Sensor per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

6. PLUGGED TRANSMISSION OIL FILTER

Turn the ignition off to the lock position.

Remove and inspect the Transmission Oil Pan for excessive debris per the Service Information.

Remove and inspect the Primary Oil Filter per the Service Information.

NOTE: Make sure the Primary Transmission Oil Filter and/or O-ring is not cracked or split.

Does the Oil Pan contain excessive debris and/or is the Primary Oil Filter cracked or plugged?

Yes >> Repair the plugged, cracked, or split Primary Transmission Oil Filter and/or O-ring. If the Primary Transmission Oil Filter is plugged refer to the Service Information for the proper Hydraulic repair procedure.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Repair internal transmission and inspect the Transmission Oil Pump per the Service Information and replace if necessary. If no problem is found, replace the Solenoid/TRS Assembly.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

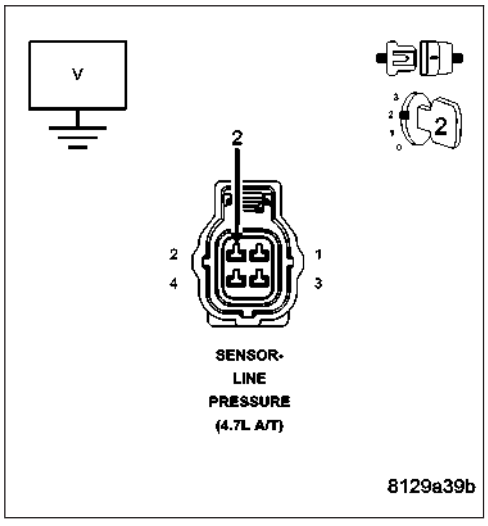
7. (F856) 5-VOLT SUPPLY CIRCUIT SHORT TO VOLTAGE

Disconnect the Transmission Simulator, Miller tool #8333.

Reconnect all previously disconnected connectors except the Line Pressure Sensor harness connector.

Ignition on, engine not running.

Measure the voltage of the (F856) 5-volt Supply circuit in the Line Pressure Sensor harness connector.



Is the voltage above 5.5 volts?

Yes >> Repair the (F856) 5-volt Supply circuit for a short to voltage.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 8

P0868-LINE PRESSURE LOW (CONTINUED)

8. (F856) 5-VOLT SUPPLY CIRCUIT OPEN

Turn the ignition off to the lock position.

Disconnect the PCM C1 harness connector and connect Miller tool #8815.

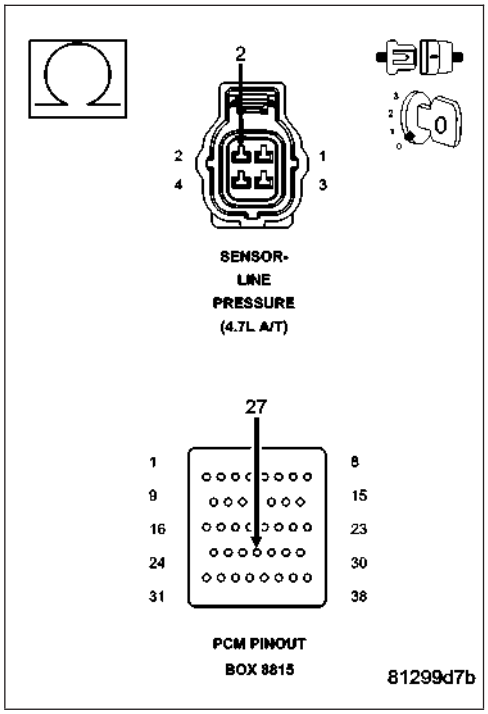
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Measure the resistance of the (F856) 5-volt Supply circuit from the Line Pressure Sensor harness connector to the appropriate terminal of Miller tool #8815.

Is the resistance above 5.0 ohms?

Yes >> Repair the (F856) 5-volt Supply circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 9



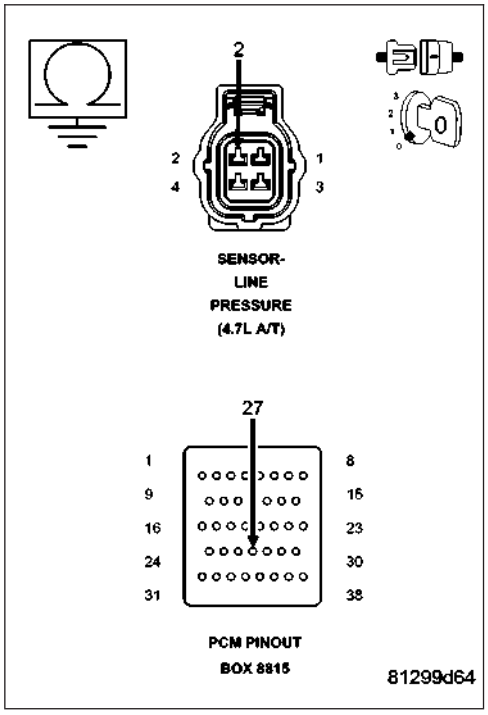
9. (F856) 5-VOLT SUPPLY CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (F856) 5-volt Supply circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (F856) 5-volt Supply circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 10



P0868-LINE PRESSURE LOW (CONTINUED)

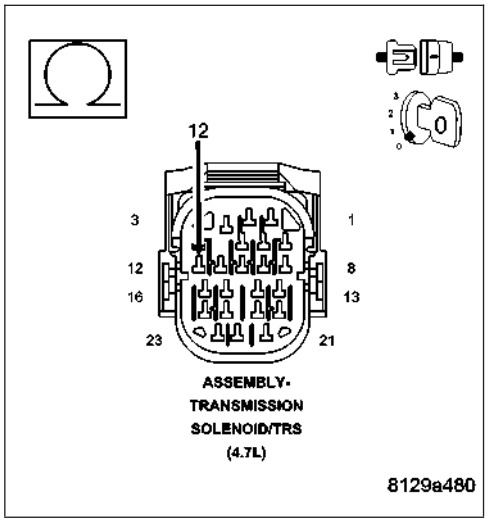
10. (T140) PRESSURE CONTROL SOLENOID CONTROL CIRCUIT SHORT TO ANOTHER CIRCUIT

Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid/TRS Assembly harness connector.

Disconnect all PCM harness connectors.

Measure the resistance between the (T140) Pressure Control Solenoid Control circuit and all other circuits in the Transmission Solenoid/TRS Assembly harness connector.



Is the resistance below 5.0 ohms between the (T140) Pressure Control Solenoid Control circuit and any other circuit(s) in the Transmission Solenoid/TRS Assembly harness connector?

Yes >> Repair the (T140) Pressure Control Solenoid Control circuit for a short to another circuit(s).
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

11. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

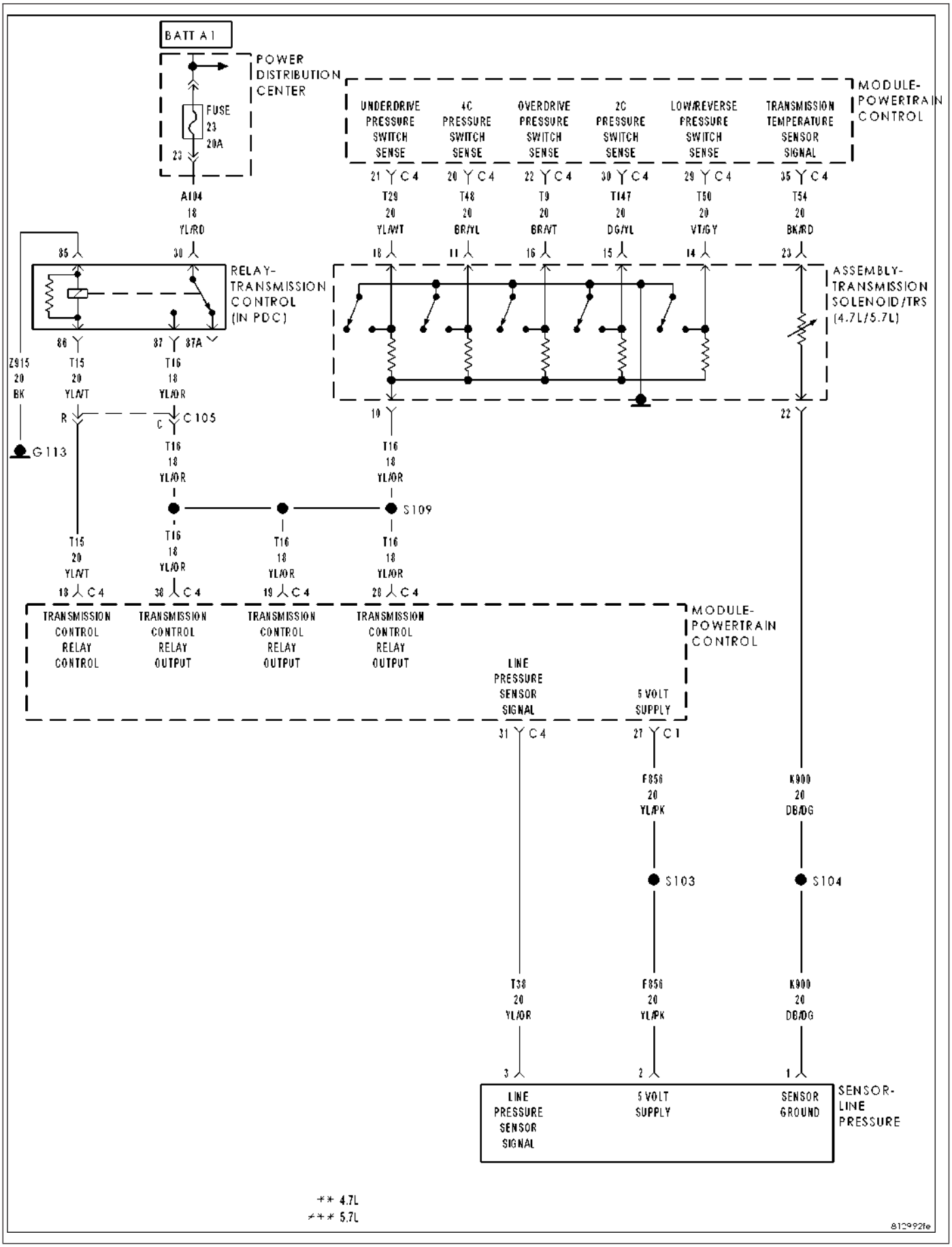
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Where there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0869-LINE PRESSURE HIGH



P0869-LINE PRESSURE HIGH (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously while driving in a forward gear.
- **Set Condition:**
  The PCM continuously monitors Actual Line Pressure. If the Actual Line Pressure reading is greater than the highest Desired Line Pressure ever used in the current gear, while the Pressure Control Solenoid duty cycle is at or near its maximum value (which should result in minimum line pressure), the DTC will set.

Possible Causes
(F856) 5-VOLT SUPPLY CIRCUIT OPEN
LINE PRESSURE SENSOR CONNECTION
(T140) PRESSURE CONTROL SOLENOID CONTROL CIRCUIT OPEN
(F856) 5-VOLT SUPPLY CIRCUIT SHORT TO GROUND
(T140) PRESSURE CONTROL SOLENOID CONTROL CIRCUIT SHORT TO GROUND
ITRANSMISSION CONTROL RELAY OUTPUT CIRCUIT
LINE PRESSURE SENSOR
STUCK OR STICKING MAIN REGULATOR VALVE
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

Line pressure is measured by the Line Pressure Sensor (LPS) and regulation is achieved by changing the duty cycle of the Pressure Control Solenoid (PCS) controlled by the Transmission Control System. (5% duty cycle = solenoid off = max line pressure, 62% duty cycle = solenoid on = min line pressure). The Transmission Control System calculates the desired line pressure based on inputs from both the engine and transmission.

The Transmission Control System calculates torque input to the transmission and uses it as the primary input to the desired line pressure calculation. This is called Torque Based Line Pressure. In addition, the line pressure is set to a preset level 827 or 931 kPa (120 or 135 PSI) during shifts and in Park and Neutral to ensure consistent shift quality. The desired line pressure is continuously being compared to the actual line pressure. If the actual line pressure is consistently higher than the highest desired line pressure ever used in the current gear, the line pressure high DTC P0869 will set.

Diagnostic Test

1. CHECK FOR RELATED DTC'S

With the scan tool, check for other Transmission DTC's

Is the DTC P0932 or P0888 present also?

Yes >> Refer to the Transmission category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

P0869-LINE PRESSURE HIGH (CONTINUED)

2. CONDITION P0869 PRESENT

With the scan tool, check the STARTS SINCE SET counter for P0869.

Is the STARTS SINCE SET COUNTER 2 or less?

Yes >> Go To 3

No >> Go To 10

---

3. CHECK LINE PRESSURE SENSOR CONNECTION

Ignition on, engine not running.

With the scan tool, monitor the Transmission Line Pressure.

Firmly push the Line Pressure Sensor harness connector inward towards the Transmission.

Did the Line Pressure change to about 207 kPa or 30 PSI when the sensor connector was pushed?

Yes >> Disconnect and properly reconnect the Line Pressure Sensor connector. Inspect terminals and repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 4

---

4. PCM AND WIRING

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333.

With the Transmission Simulator select the ″OFF″ position on the ″Input/Output Speed″ switch.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the scan tool, monitor the Line Pressure during the following step.

Using the Transmission Simulator, set the rotary switch to each of the 3 line pressure positions.

NOTE: All three scan tool Line Pressure readings should be steady and ±14 kPa or 2.0 PSI of the reading specified on the Transmission Simulator.

Did the Line Pressure read within ±14 kPA or 2.0 PSI in all three positions?

Yes >> Go To 5

No >> Go To 6

P0869-LINE PRESSURE HIGH (CONTINUED)

5. CHECK LINE PRESSURE SENSOR CALIBRATION

Turn the ignition off to the lock position.

Disconnect the Transmission Simulator, Miller tool #8333 and reconnect all previously disconnected connectors.

Install the Line Pressure Adaptor, Miller tool #8259, and Pressure Gauge, Miller tool #C-3293, 0 to 2000 kPa or 0 to 300 PSI.

Start the engine in park.

Monitor the Line Pressure readings on the scan tool and the pressure gauge.

Compare the Line Pressure readings between the scan tool and the pressure gauge.

Is the pressure gauge reading within 34 kPa or 5 PSI of the scan tool reading?

Yes >> Repair the internal transmission and inspect the Transmission Oil Pump per the Service Information and replace if necessary. If no problem is found, replace the Transmission Solenoid/TRS Assembly, possible cause is a stuck Pressure Control Solenoid.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the Line Pressure Sensor per the Service information.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

6. (T140) PRESSURE CONTROL SOLENOID CONTROL CIRCUIT OPEN

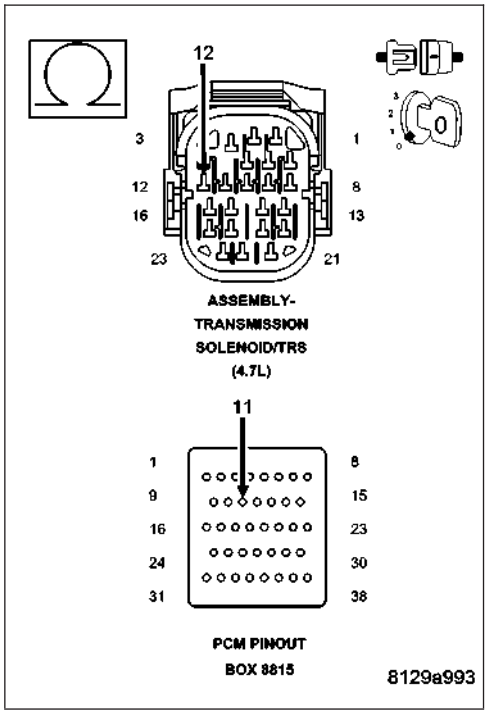
Turn the ignition off to the lock position.

Disconnect the Transmission Simulator, Miller tool #8333.

Disconnect the Powertrain Control Module C4 harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Measure the resistance of the (T140) Pressure Control Solenoid Control circuit from the appropriate terminal of Miller tool #8815 to the Solenoid/TRS harness connector.



Is the resistance above 5.0 ohms?

Yes >> Repair the (T140) Pressure Control Solenoid Control circuit for an open.

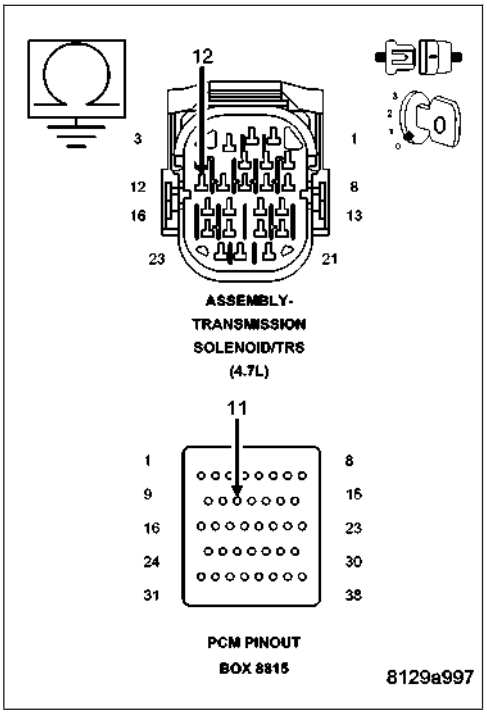
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 7

P0869-LINE PRESSURE HIGH (CONTINUED)

7. (T140) PRESSURE CONTROL SOLENOID CONTROL CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T140) Pressure Control Solenoid Control circuit.



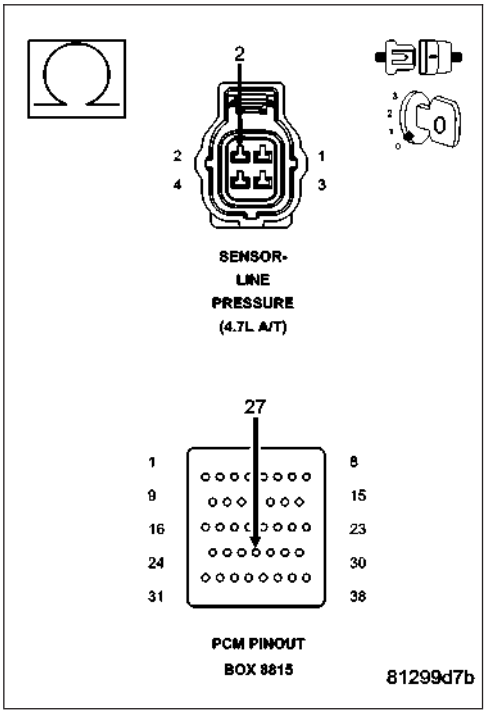
Is the resistance below 5.0 ohms?

Yes >> Repair the (T140) Pressure Control Solenoid Control circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 8

8. (F856) 5-VOLT SUPPLY CIRCUIT OPEN

Measure the resistance of the (F856) 5-volt Supply circuit between the Line Pressure Sensor harness connector to the appropriate terminal of Miller tool #8815.



Is the resistance above 5.0 ohms?

Yes >> Repair the (F856) 5-volt Supply circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 9

P0869-LINE PRESSURE HIGH (CONTINUED)

9. (F856) 5-VOLT SUPPLY CIRCUIT SHORT TO GROUND

Disconnect the PCM C1 harness connector.

Disconnect the Line Pressure Sensor harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Measure the resistance between ground and the (F856) 5-volt Supply circuit.

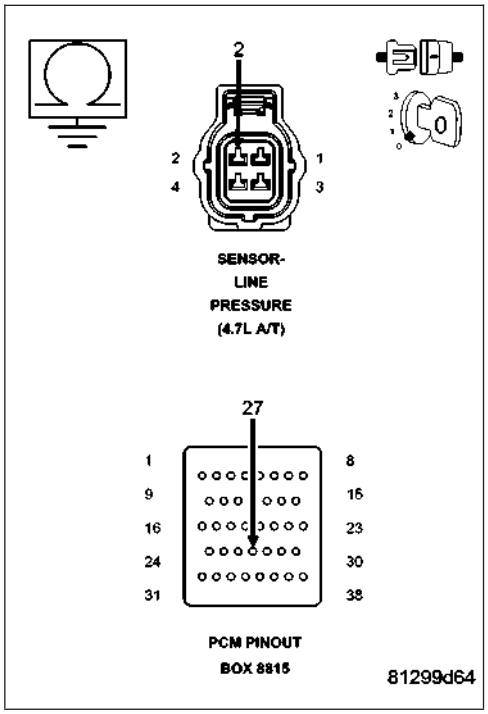
Is the resistance below 5.0 ohms?

Yes >> Repair the (F856) 5-volt Supply circuit for a short to ground.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the Powertrain Control Module per the Service Information. With the scan tool perform the QUICK LEARN procedure.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.



10. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

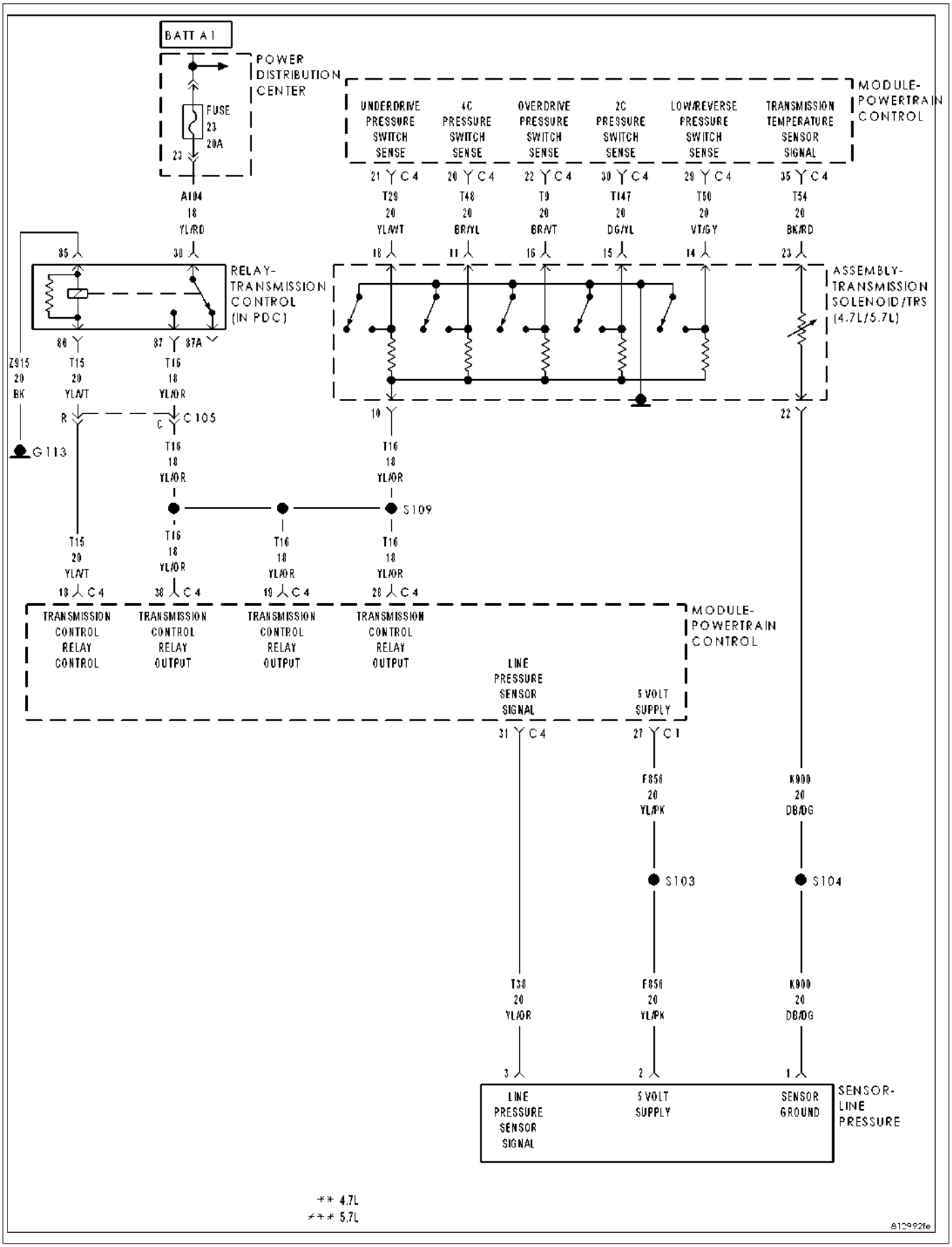
Where there any problems found?

Yes >> Repair as necessary.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0870-OD HYDRAULIC PRESSURE TEST



P0870-OD HYDRAULIC PRESSURE TEST (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  In any forward gear with engine speed above 1000 RPM shortly after a shift and every minute thereafter.
- **Set Condition:**
  After a shift into a forward gear, with engine speed above 1000 RPM, the PCM momentarily turns on element pressure to the Clutch circuits that don't have pressure to identify the correct Pressure Switch closes. If the Pressure Switch does not close 2 times, the DTC sets.

Possible Causes
LINE PRESSURE SENSOR
TRANSMISSION FLUID CONTAMINATION
RELATED DTC'S PRESENT
TRANSMISSION SOLENOID/TRS ASSEMBLY
EXCESSIVE DEBRIS IN OIL PAN
POOR LINE PRESSURE SENSOR CONNECTION
(T9) OD PRESSURE SWITCH SENSE CIRCUIT OPEN
TRANSMISSION CONTROL RELAY DTCS PRESENT
(T9) OD PRESSURE SWITCH SENSE CIRCUIT OPEN
(F856) 5-VOLT SUPPLY CIRCUIT OPEN
TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
(T9) OD PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND
(F856) 5-VOLT SUPPLY CIRCUIT SHORT TO GROUND
(T9) OD PRESSURE SWITCH SENSE CIRCUIT SHORT TO OTHER CIRCUITS
TRANSMISSION SOLENOID/TRS ASSEMBLY
INTERNAL TRANSMISSION
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Transmission Control System tests the pressure switches when they are off. The test verifies that the switches are operational (They will close with pressure applied). The Transmission Control System verifies that the switch closes when the corresponding element is applied. If a switch fails to close, it is re-tested. If it fails the second test, the DTC will set, the MIL will illuminate and the transmission system will default to the orderly Shutdown routine.

P0870-OD HYDRAULIC PRESSURE TEST (CONTINUED)

Diagnostic Test

1. DETERMINING IF RELATED DTC'S ARE PRESENT

With the scan tool, check for other transmission DTC's

Is there any Loss of Prime, Transmission Control Relay, and/or Line Pressure Sensor DTCs present?

Yes >> Refer to the Transmission category and perform the appropriate symptom. If the DTC, P0944-LOSS OF PRIME is present, perform its respective test first.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. DTC P0760 PRESENT

With the scan tool, check Transmission DTCs.

Is the DTC P0760 also present?

Yes >> Refer to the symptom list and perform diagnostics for P0760–OD SOLENOID CIRCUIT.

No >> Go To 3

---

3. OTHER DTCS PRESENT

With the scan tool, check for other transmission DTC's

Are any of the DTCs, P0733, P0734 ,P0735 and/or P0871 present also?

Yes >> Go To 12

No >> Go To 4

---

4. CHECK TO SEE IF DTC P0870 IS CURRENT

With the scan tool, check the STARTS SINCE SET counter for P0870.

Is the STARTS SINCE SET COUNTER 2 or less?

Yes >> Go To 5

No >> Go To 17

---

5. LINE PRESSURE STAYS THE SAME

Start the engine.

Warm the transmission to 82° C or 180° F.

Firmly apply the brakes.

With the scan tool, monitor the Line Pressure during the following step.

Move the shift lever to each gear position, pausing momentarily in each position and record the line pressure reading. Allow the pressure to stabilize for at least 5 seconds in each range.

Did the line pressure remain at a steady value between 585 and 655 kPa or 85 and 95 PSI in each position?

Yes >> Go To 6

No >> Go To 10

P0870-OD HYDRAULIC PRESSURE TEST (CONTINUED)

6. CHECK LINE PRESSURE SENSOR CONNECTION

Ignition on, engine not running.

With the scan tool, monitor the Line Pressure while firmly pushing the Transmission Line Pressure Sensor connector inwards towards the Transmission.

Did the Line Pressure reading on the scan tool change to about 207 kPa or 30 PSI when the connector was pushed inward?

Yes >> Disconnect and properly reconnect the Line Pressure Sensor connector. Inspect terminals and repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 7

---

7. LINE PRESSURE SENSOR OPERATION

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

With the Transmission Simulator select the ″OFF″ position on the ″Input/Output Speed″ switch.

Ignition on, engine not running.

With the scan tool, monitor the Line Pressure while turning the Pressure Switch selector to each of the 3 line pressure positions on the Transmission Simulator.

NOTE: All three scan tool Line Pressure readings should be steady and ±14 kPa or 2.0 PSI of the reading specified on the Transmission Simulator.

Did the scan tool Line Pressure readings match the specified readings on the Transmission Simulator and remain steady in all three positions?

Yes >> Replace the Line Pressure Sensor per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 8

P0870-OD HYDRAULIC PRESSURE TEST (CONTINUED)

8. (F856) 5-VOLT SUPPLY CIRCUIT OPEN

Turn the ignition off to the lock position.

Disconnect Transmission Simulator.

Disconnect the PCM C4 harness connector and connect Miller tool #8815.

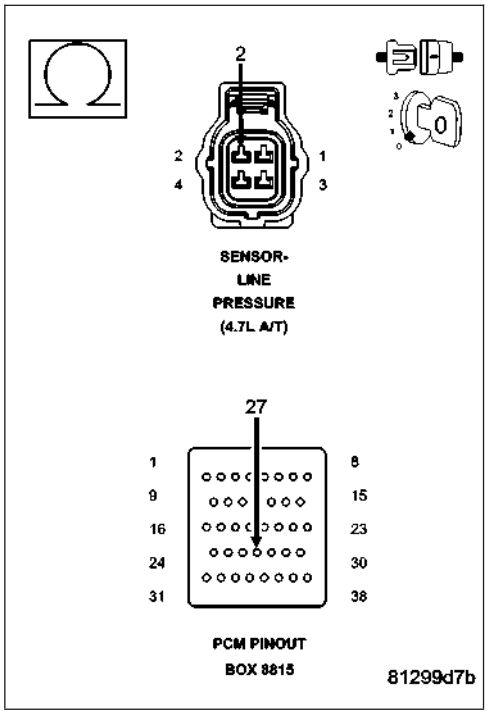
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Measure the resistance of the (F856) 5-volt Supply circuit from the Line Pressure Sensor harness connector to the appropriate terminal of Miller tool #8815.

Is the resistance above 5.0 ohms?

Yes >> Repair the (F856) 5-volt Supply circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 9



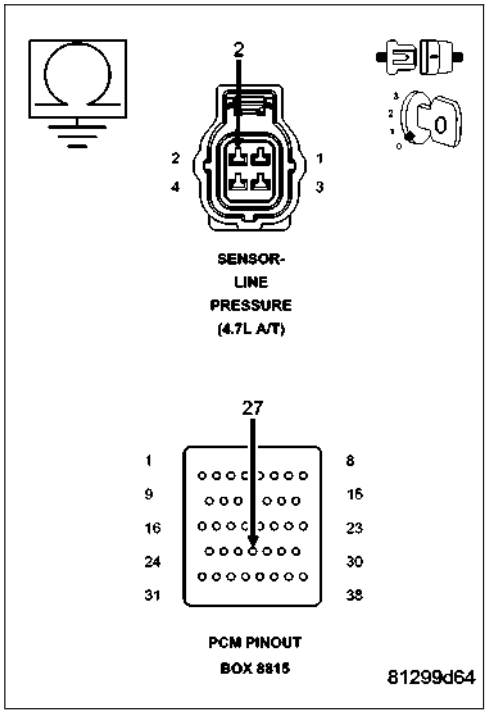
9. (F856) 5-VOLT SUPPLY CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (F856) 5-volt Supply circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (F856) 5-volt Supply circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.



P0870-OD HYDRAULIC PRESSURE TEST (CONTINUED)

10. COMPARE SCAN TOOL TO PRESSURE GAUGE

Turn the ignition off to the lock position.

Connect the Line Pressure Adapter, Miller tool #8259 and 0-300 psi Test Gauge, Miller tool #C-3293-SP. Refer to the Service Information for proper installation procedure.

CAUTION: Apply parking brake.

Start the engine.

In the following steps, compare the scan tool Line Pressure to the Pressure Gauge readings in each gear.

CAUTION: Do not overheat transmission.

With the gear selector in park, raise the RPM to 1500, and compare line pressure readings.

Firmly apply the brakes, move the gear selector into reverse, raise the RPM to 1500, and compare the line pressure readings.

Firmly apply the brakes, move the gear selector into drive, raise the RPM to 1500, and compare the line pressure readings.

Does the scan tool Line Pressure readings match the Pressure Gauge readings ± 10 psi?

Yes >> Go To 11

No >> Replace the Line Pressure Sensor per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

11. WIRING AND CONNECTORS

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Failure to remove the Starter Relay can cause a Transmission - No Response condition.

Remove the Line Pressure Adapter, Miller tool #8259 and 0-300 psi Test Gauge, Miller tool #C-3293-SP.

Install the Transmission Simulator, Miller tool #8333.

On the Transmission Simulator, turn the Pressure Switch selector switch to OD.

Ignition on, engine not running.

With the scan tool, monitor the OD Pressure Switch state while pressing and holding the Pressure Switch test button and wiggling the wire harness and connectors that pertain to the OD Pressure Switch.

Did the OD Pressure Switch state change to closed and remain closed while wiggling the wires?

Yes >> Go To 12

No >> Go To 14

---

12. CHECK FOR EXCESSIVE DEBRIS

Turn the ignition off to the lock position.

Remove the Transmission Simulator, Miller tool #8333.

Remove and inspect the Transmission Oil Pan per the Service Information.

Does the Transmission Oil Pan contain excessive debris or contamination?

Yes >> Repair the cause of the excessive debris in the Transmission Oil Pan. Refer to the Service Information for the proper procedures.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 13

P0870-OD HYDRAULIC PRESSURE TEST (CONTINUED)

13. CHECK OD HYDRAULIC CLUTCH CIRCUIT

Remove the Valve Body and air check the OD hydraulic clutch circuit (in the case) for leakage per the Service Information.

NOTE: The OD hydraulic clutch circuit contains a small bleed orifice which connects to the Reverse hydraulic clutch circuit. A small amount of air leakage is normal.

Was there excessive air leakage noticed during the air check?

Yes >> Repair as necessary. Check the OD/Rev clutch piston seals, bleed orifice assembly, reaction shaft support seal rings, and machining of the main mating faces on the pump housing, pump valve boday, and reaction shaft support..

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Disassemble and inspect the Valve Body and repair as necessary. Inspect the OD Accumulator piston and seals. Check for an extra check ball downstream from the #6 check ball pocket and repair as necessary. If no problems are found in the Valve Body, replace the Transmission Solenoid/TRS Assembly per the Service Information.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

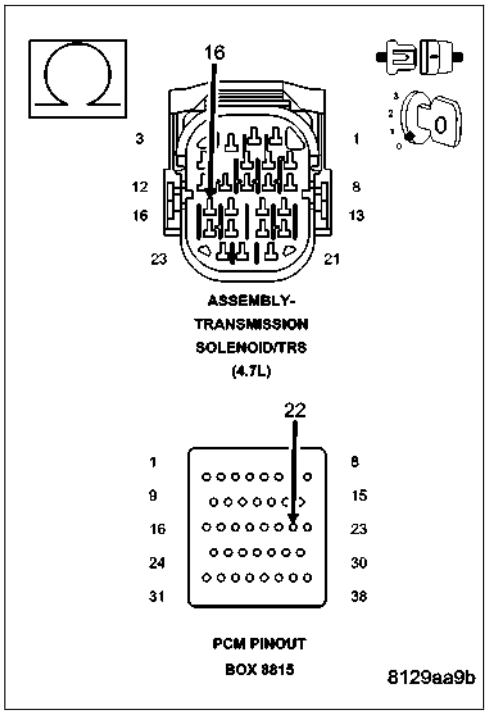
14. (T9) OD PRESSURE SWITCH SENSE CIRCUIT OPEN

Turn the ignition off to the lock position.

Remove the Transmission Simulator, Miller tool #8333.

Disconnect the PCM C4 harness connector and connect Miller tool #8815.

Measure the resistance of the (T9) OD Pressure Switch Sense circuit from the Transmission Solenoid/TRS Assembly harness connector to the appropriate terminal of Miller tool #8815.



Is the resistance above 5.0 ohms?

Yes >> Repair the (T9) OD Pressure Switch Sense circuit for an open.

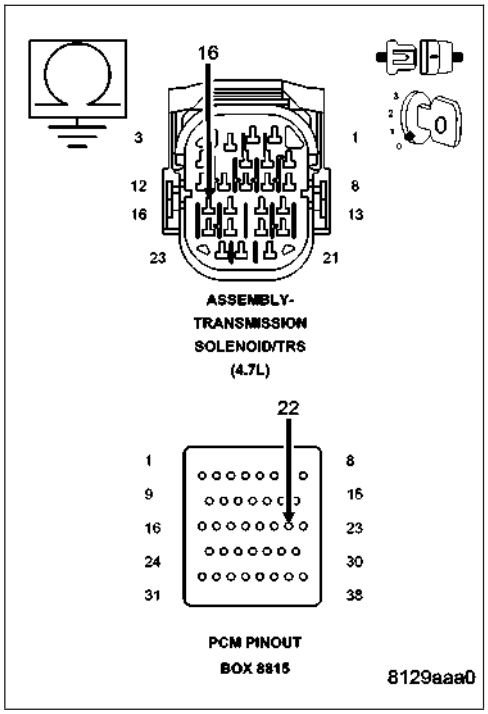
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 15

P0870-OD HYDRAULIC PRESSURE TEST (CONTINUED)

15. OD PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T9) OD Pressure Switch Sense circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (T9) OD Pressure Switch Sense circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 16

16. OD PRESSURE SWITCH SENSE CIRCUIT SHORT TO OTHER CIRCUITS

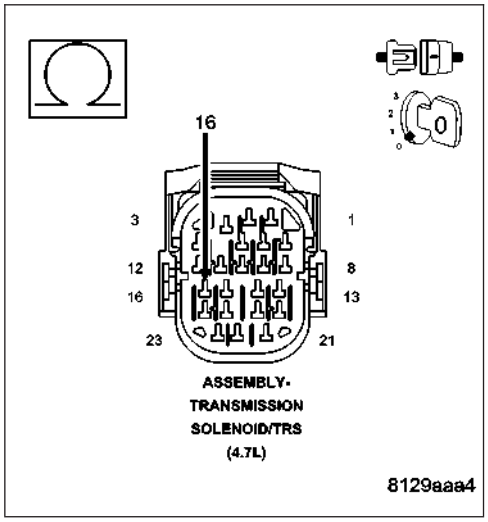
Disconnect all PCM harness connectors.

Disconnect the Transmission Solenoid/TRS Assembly harness connector.

NOTE: Make sure the Transmission Solenoid/TRS Assembly harness connector is disconnected.

NOTE: Check connectors - Clean/repair as necessary.

Measure the resistance between the (T9) OD Pressure Switch Sense circuit and all other circuits in the Transmission Solenoid/TRS Assembly harness connector.



Is the resistance below 5.0 ohms between the (T9) OD Pressure Switch Sense circuit and any other circuit(s) in the Transmission Solenoid/TRS Assembly harness connector?

Yes >> Repair the (T9) OD Pressure Switch Sense circuit for a short to other circuit(s).
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0870-OD HYDRAULIC PRESSURE TEST (CONTINUED)

17. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

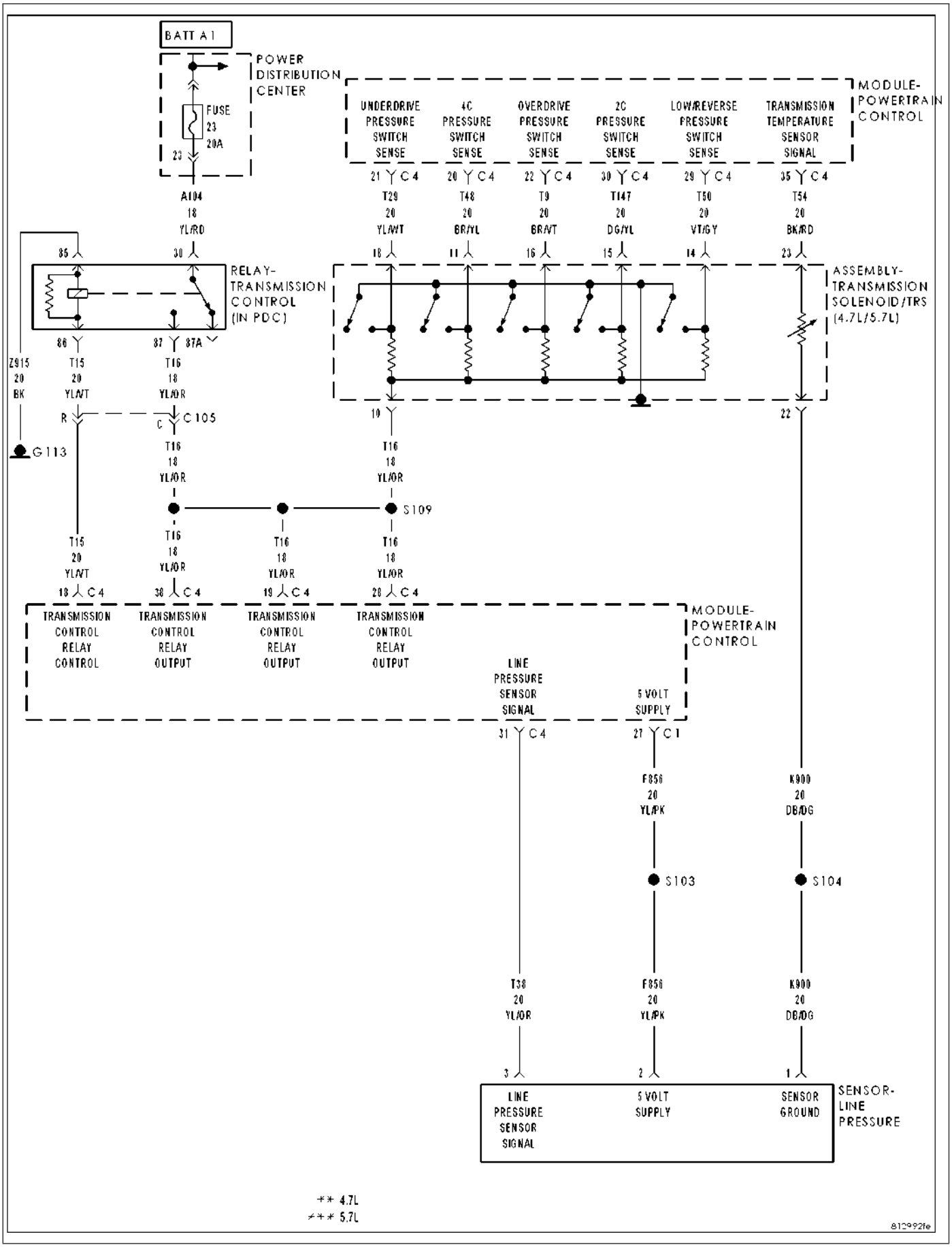
If the EATX DTC EVENT DATA shows the DTC P0870 set while the Line Pressure was significantly below the Desired Line Pressure reading, check for causes of low line pressure (low fluid level, broken or mis-installed primary oil filter or filter seal, sticking Main Regulator Valve in the Pump Valve Body etc.). If the data shows the DTC set while the Line Pressure reading was significantly higher than the Desired Line Pressure, check the Line Pressure Sensor and related wiring.

Where there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0871-OD PRESSURE SWITCH RATIONALITY



P0871-OD PRESSURE SWITCH RATIONALITY (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously with the ignition on and engine running.
- **Set Condition:**
  The appropriate DTC is set if one of the pressure switches are open or closed at the wrong time in a given gear.

Possible Causes
RELATED RELAY DTC'S PRESENT
LINE PRESSURE DTCS PRESENT
NO. 4 OR 6 CHECK BALL CUT OR DAMAGED
(T9) OD PRESSURE SWITCH SENSE CIRCUIT OPEN
(T9) OD PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND
(T9) OD PRESSURE SWITCH SENSE CIRCUIT SHORT TO OTHER CIRCUITS
LOW LINE PRESSURE
WIRING AND CONNECTORS
CUT OD/REV PISTON SEAL
BROKEN OR MISSING DO/REV PISTON BLEED ORIFICE
BROKEN REACTION SHAFT SUPPORT SEAL RING
POOR MACHINING ON PUMP VALVE BODY FACE
BROKEN OR MISSING DRIBBLER ORIFICE ASSEMBLY IN REACTION SHAFT SUPPORT
TRANSMISSION SOLENOID/TRS ASSEMBLY
CUT OD ACCUMULATOR PISTON SEAL
CRACKED OD ACCUMULATOR PISTON
BROKEN OR MISSING OD BLEED ORIFICE IN MAIN VALVE BODY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

P0871-OD PRESSURE SWITCH RATIONALITY (CONTINUED)

Theory of Operation

The Transmission system uses five pressure switches to monitor the fluid pressure in the LR, 2C, 4C, UD, and OD clutch circuits. The pressure switches are continuously monitored for the correct states in each gear as shown.

GEAR	L/R	2C	4C	UD	OD
REVERSE	OPEN	OPEN	OPEN	OPEN	OPEN
P/N	CLOSED**	OPEN	OPEN	OPEN	OPEN
1ST	CLOSED*	OPEN	OPEN	CLOSED	OPEN
2ND	OPEN	CLOSED	OPEN	CLOSED	OPEN
2ND PRIME	OPEN	OPEN	CLOSED	CLOSED	OPEN
3RD	OPEN	OPEN	OPEN	CLOSED	CLOSED
4TH	OPEN	OPEN	CLOSED	OPEN	CLOSED
5TH	OPEN	CLOSED	OPEN	OPEN	CLOSED

*L/R is closed if output speed is below 100 rpm in Drive and Manual 2. L/R is closed in Manual 1.

**May be open when rolling in Neutral or at low oil temperatures.

Diagnostic Test

1. DETERMINING IF RELATED RELAY DTC'S ARE PRESENT

With the scan tool, check for other transmission DTC's.

Are there any Transmission Control Relay related DTC's present?

Yes >> Refer to the Transmission category and perform the appropriate symptom. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. LINE PRESSURE DTCS PRESENT

With the scan tool, read Transmission DTCs.

Are there any Line Pressure DTCs present?

Yes >> Refer to the Transmission category and perform the appropriate symptom. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 3

---

3. CHECK FOR OTHER PRESSURE SWITCH DTCS

With the scan tool, check Transmission DTCs.

Are there two or more other pressure switch rationality DTCs present in addition to P0871?

Yes >> Go To 5

No >> Go To 4

P0871-OD PRESSURE SWITCH RATIONALITY (CONTINUED)

4. CHECK IF DTC IS CURRENT

With the scan tool, check and record the EATX DTC EVENT DATA.

NOTE: Make sure to record all EATX DTC EVENT DATA stored in the scan tool for future reference in this test procedure.

Does the EATX DTC EVENT DATA show data for P0871

Yes >> Go To 8

No >> Refer to the Transmission Category and perform the appropriate symptom.

---

5. RELATED DTC PRESENT

With the scan tool, check and record the EATX DTC EVENT DATA.

NOTE: Make sure to record all EATX DTC EVENT DATA stored in the scan tool for future reference in this test procedure.

Do all the pressure switches read CLOSED in the EATX DTC EVENT DATA?

Yes >> Refer to the Transmission category and perform diagnostics for P0888. Follow instructions as if the DTC is current.

No >> Go To 6

---

6. CHECK IF PRESSURE SWITCHES READ OPEN

In the EATX DTC EVENT DATA recorded earlier, read the state of all pressure switches.

Do all the pressure switches read open?

Yes >> Go To 7

No >> Go To 8

---

7. CHECK FOR LOW LINE PRESSURE

In the EATX DTC EVENT DATA recorded earlier, compare the Line Pressure to the Desired Line Pressure.

Is the Line Pressure less than 40 PSI, and significantly below the Desired Line Pressure?

Yes >> Repair as necessary to correct low line pressure. Check fluid level and adjust as necessary. If fluid level is OK, check the Primary Oil Filter weal for a spit, crack , or improperly installed. If the filer and seal are OK, check the Main Regulator Valve in the Oil Pump. Refer to the Service Information for the above procedures.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0871-OD PRESSURE SWITCH RATIONALITY (CONTINUED)

8. CHECK IF IN PARK, NEUTRAL, OR REVERSE

Ignition on, engine not running.

With the scan tool, read and record the EATX DTC EVENT DATA for P0871.

NOTE: Make sure to record all EATX DTC EVENT DATA stored in the scan tool for future reference in this test procedure.

Does the EATX DTC EVENT DATA show the OD Pressure Switch DTC set while in Park, Neutral, or Reverse?

Yes >> Go To 18

No >> Go To 9

---

9. OD PRESSURE SWITCH OPEN

Refer to the EATX DTC EVENT DATA recorded earlier for P0871.

Did the OD Pressure Switch read OPEN?

Yes >> Go To 10

No >> Go To 15

---

10. LOW LINE PRESSURE

Refer to the EATX DTC EVENT DATA recorded earlier and compare the Line Pressure and the Desired Line Pressure.

Is the Line Pressure less than 40 psi, and significantly below the Desired Line Pressure?

Yes >> Repair as necessary to correct low line pressure. Check the fluid level. Check the Primary Oil Filter seal for a split, crack, or improperly installed. Refer to the Service Information for the proper installation procedure. If the fluid level and filter are OK, check the Main Regulator Valve in the Oil Pump.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 11

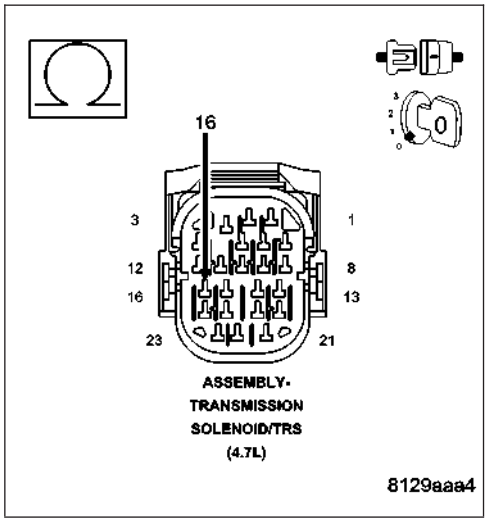
---

11. (T9) OD PRESSURE SWITCH SENSE CIRCUIT SHORT TO OTHER CIRCUITS

Turn the ignition off to the lock position.

Disconnect all PCM harness connectors.

Disconnect the Transmission Solenoid/TRS Assembly harness connector.



NOTE: Check connectors - Clean/repair as necessary.

Measure the resistance between the (T9) OD Pressure Switch Sense circuit and all other circuits in the Transmission Solenoid/TRS Assembly harness connector.

Is the resistance below 5.0 ohms between the (T9) OD Pressure Switch Sense circuit and any other circuit(s) in the Transmission Solenoid/TRS Assembly harness connector?

Yes >> Repair the (T9) OD Pressure Switch Sense circuit for a short to other circuit(s).

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 12

P0871-OD PRESSURE SWITCH RATIONALITY (CONTINUED)

12. CHECK TO SEE IF DTC RESETS

Reconnect all previously disconnected connectors.

With the scan too, erase transmission DTCs.

Test drive the vehicle, use the EATX DTC EVENT DATA recored earlier to help duplicate the conditions when the DTC originality set.

Does the DTC P0871 reset?

Yes >> Go To 13

No >> Go To 22

---

13. POWERTRAIN CONTROL MODULE

Remove the Transmission Control Relay.

Operate the vehicle in Drive.

Is the transmission slipping while in Drive?

Yes >> Go To 14

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

14. INTERNAL TRANSMISSION

Perform an Air Check Transmission Clutch Operation procedure per the Service Information.

NOTE: The OD/Rev piston contains a small bleed orifice, a small amount of leakage between the OD and Reverse hydraulic clutch circuits is considered normal.

Is there excessive air leakage in any clutch circuit?

Yes >> Check the OD/Rev piston seals and bleed orifice, reaction shaft support seal rings, dribbler orifice assemblies in the reaction shaft support and for poor machine on the pump valve body faces. Refer to the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Repair the Valve Body. Check the OD Accumulator piston and seals, OD bleed orifice, and No.6 check ball cuts or damage. If no problems are found in the Valve Body, replace the Transmission Solenoid/ TRS Assembly. Refer to the Service Information for proper repair procedures.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0871-OD PRESSURE SWITCH RATIONALITY (CONTINUED)

15. PCM AND WIRING

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the Transmission Simulator, turn the Pressure Switch selector switch to OD.

With the scan tool, monitor the OD Pressure Switch state while pressing the Pressure Switch Test button on the Transmission Simulator.

Did the state of the OD Pressure Switch change from OPEN to CLOSED while pressing the Test button?

Yes >> Go To 16

No >> Go To 18

---

16. NO. 4 AND/OR NO. 6 CHECK BALL CUT OR DAMAGED

With the scan tool, erase previously stored DTC's and test drive the vehicle, use the EATX DTC EVENT DATA to help duplicate the conditions when the DTC originality set. Note any DTCs that may set.

Remove the Transmission Valve Body per the Service Information.

Check the No. 4 and No. 6 Check Balls for cuts or damage.

Is the No. 4 and/or No. 6 Check Ball cut or damaged?

Yes >> Replace the No. 4 and/or No. 6 Check Ball and check for clutch debris in the transmission oil pan. If there is excessive debris, perform internal repairs to the OD Clutch Assembly. Refer to the Service Information for proper repair procedures.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 17

---

17. TRANSMISSION SOLENOID/TRS ASSEMBLY

Did the DTC P0871 reset during the test drive in the previous step?

Yes >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 22

P0871-OD PRESSURE SWITCH RATIONALITY (CONTINUED)

18. (T9) OD PRESSURE SWITCH SENSE CIRCUIT OPEN

Turn the ignition off to the lock position.

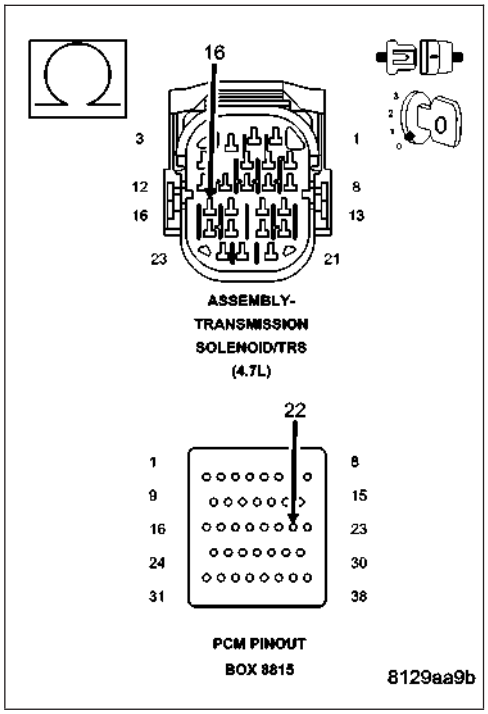
Disconnect the PCM C4 harness connector and connect Miller tool #8815.

Disconnect the Transmission Solenoid /TRS Assembly harness connector

NOTE: Check connectors - Clean/repair as necessary.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Measure the resistance of the (T9) OD Pressure Switch Sense circuit from the appropriate terminal of Miller tool #8815 to the Solenoid/TRS Assembly harness connector.



Is the resistance above 5.0 ohms?

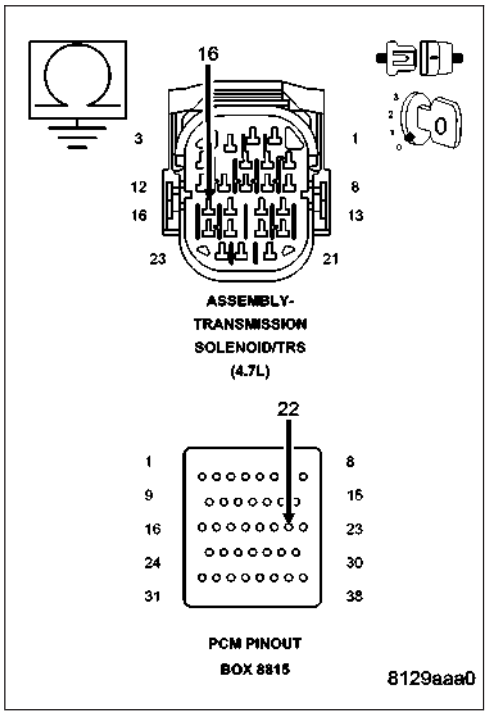
Yes >> Repair the (T9) OD Pressure Switch Sense circuit for an open.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 19

19. (T9) OD PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T9) OD Pressure Switch Sense circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (T9) OD Pressure Switch Sense circuit for a short to ground.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 20

P0871-OD PRESSURE SWITCH RATIONALITY (CONTINUED)

20. WIRING AND CONNECTORS

Using the schematics as a guide, inspect the wiring and connectors. Pay particular attention to all power and ground circuits.

Were there any problems found

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 21

---

21. POWERTRAIN CONTROL MODULE

Reconnect all previously disconnected connectors.

Make sure all EATX DTC EVENT DATA is recorded.

With the scan tool, erase previously stored DTC's and test drive the vehicle, use the EATX DTC EVENT DATA to help duplicate the conditions when the DTC originality set.

Does the DTC P0871 reset?

Yes >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 22

---

22. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

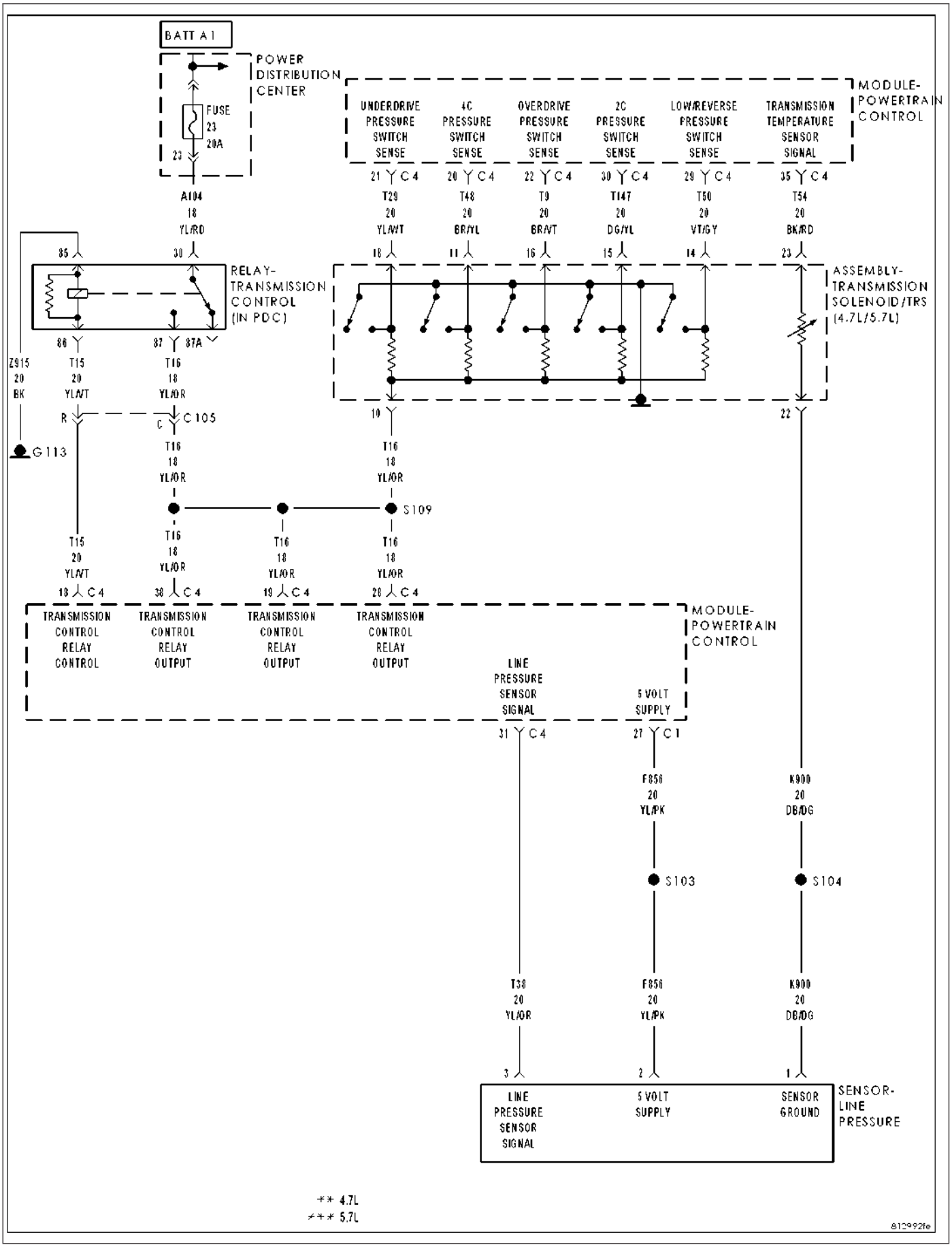
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Where there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0875-UD HYDRAULIC PRESSURE TEST



P0875-UD HYDRAULIC PRESSURE TEST (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  In any forward gear with engine speed above 1000 RPM shortly after a shift and every minute thereafter.
- **Set Condition:**
  After a shift into a forward gear, with engine speed above 1000 RPM, the PCM momentarily turns on element pressure to the Clutch circuits that don't have pressure to identify the correct Pressure Switch closes. If the Pressure Switch does not close 2 times, the DTC sets.

Possible Causes
LINE PRESSURE SENSOR
TRANSMISSION FLUID CONTAMINATION
RELATED DTC'S PRESENT
TRANSMISSION SOLENOID/TRS ASSEMBLY
EXCESSIVE DEBRIS IN OIL PAN
POOR LINE PRESSURE SENSOR CONNECTION
(T29) UD PRESSURE SWITCH SENSE CIRCUIT OPEN
TRANSMISSION CONTROL RELAY DTCS PRESENT
(T29) UD PRESSURE SWITCH SENSE CIRCUIT OPEN
(F856) 5-VOLT SUPPLY CIRCUIT OPEN
(T29) UD PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND
(F856) 5-VOLT SUPPLY CIRCUIT SHORT TO GROUND
(T29) UD PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
TRANSMISSION SOLENOID/TRS ASSEMBLY
INTERNAL TRANSMISSION
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Transmission Control System tests the pressure switches when they are off. The test verifies that the switches are operational (They will close with pressure applied). The Transmission Control System verifies that the switch closes when the corresponding element is applied. If a switch fails to close, it is re-tested. If it fails the second test, the DTC will set, the MIL will illuminate and the transmission system will default to the orderly Shutdown routine.

Diagnostic Test

1. DETERMINING IF RELATED DTC'S ARE PRESENT

With the scan tool, check for other transmission DTC's

Is there any Loss of Prime, Transmission Control Relay, and/or Line Pressure Sensor DTCs present?

Yes >> Refer to the Transmission category and perform the appropriate symptom. If the DTC, P0944-LOSS OF PRIME is present, perform its respective test first.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

P0875-UD HYDRAULIC PRESSURE TEST (CONTINUED)

2. DTC P0765 PRESENT

With the scan tool, check Transmission DTCs.

Is the DTC P0765 also present?

Yes >> Refer to the symptom list and perform diagnostics for P0765–UD SOLENOID CIRCUIT.

No >> Go To 3

---

3. OTHER DTCS PRESENT

With the scan tool, check for other transmission DTC's

Are any of the DTCs, P0731, P0732, P0733, P0876, and/or P1736 present also?

Yes >> Go To 12

No >> Go To 4

---

4. CHECK TO SEE IF DTC P0875 IS CURRENT

With the scan tool, check the STARTS SINCE SET counter for P0875.

Is the STARTS SINCE SET COUNTER 2 or less?

Yes >> Go To 5

No >> Go To 17

---

5. LINE PRESSURE STAYS THE SAME

Start the engine.

Warm the transmission to 82° C or 180° F.

Firmly apply the brakes.

With the scan tool, monitor the Line Pressure during the following step.

Move the shift lever to each gear position, pausing momentarily in each position and record the line pressure reading. Allow the pressure to stabilize for at least 5 seconds in each range.

Did the line pressure remain at a steady value between 585 and 655 kPa or 85 and 95 PSI in each position?

Yes >> Go To 6

No >> Go To 10

---

6. CHECK LINE PRESSURE SENSOR CONNECTION

Ignition on, engine not running.

With the scan tool, monitor the Line Pressure while firmly pushing the Transmission Line Pressure Sensor connector inwards towards the Transmission.

Did the Line Pressure reading on the scan tool change to about 207 kPa or 30 PSI when the connector was pushed inward?

Yes >> Disconnect and properly reconnect the Line Pressure Sensor connector. Inspect terminals and repair as necessary.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 7

P0875-UD HYDRAULIC PRESSURE TEST (CONTINUED)

7. LINE PRESSURE SENSOR OPERATION

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

With the Transmission Simulator select the ″OFF″ position on the ″Input/Output Speed″ switch.

Ignition on, engine not running.

With the scan tool, monitor the Line Pressure while turning the Pressure Switch selector to each of the 3 line pressure positions on the Transmission Simulator.

NOTE: All three scan tool Line Pressure readings should be steady and ±14 kPa or 2.0 PSI of the reading specified on the Transmission Simulator.

Did the scan tool Line Pressure readings match the specified readings on the Transmission Simulator and remain steady in all three positions?

Yes >> Replace the Line Pressure Sensor per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 8

---

8. (F856) 5-VOLT SUPPLY CIRCUIT OPEN

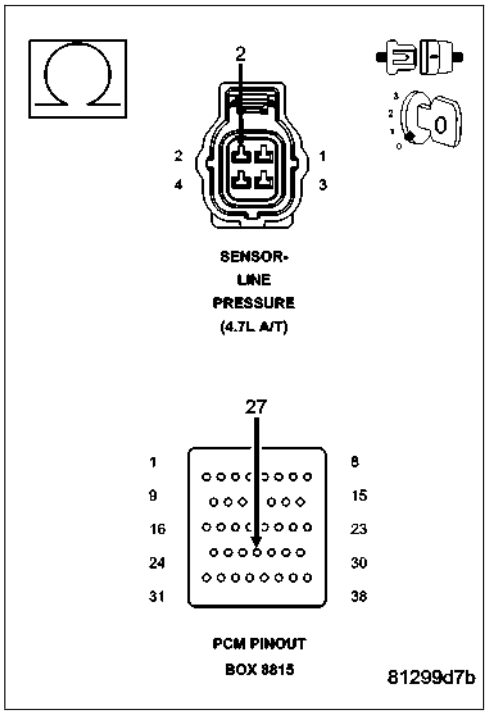
Turn the ignition off to the lock position.

Disconnect Transmission Simulator.

Disconnect the PCM C1 harness connector and connect Miller tool #8815.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Measure the resistance of the (F856) 5-volt Supply circuit from the Line Pressure Sensor harness connector to the appropriate terminal of Miller tool #8815.



Is the resistance above 5.0 ohms?

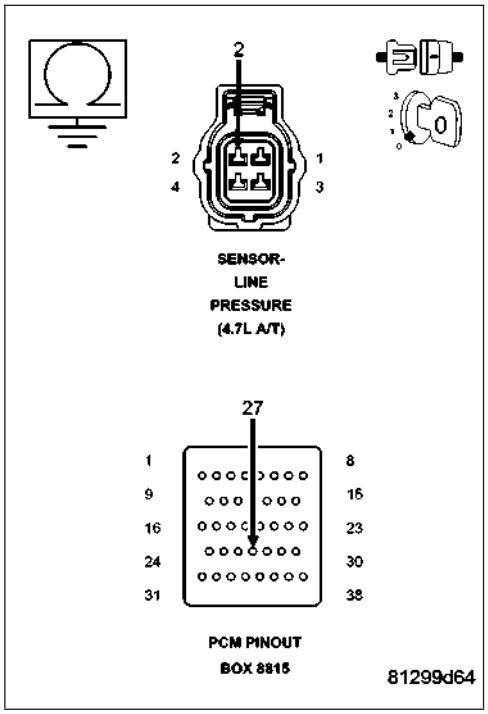
Yes >> Repair the (F856) 5-volt Supply circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 9

P0875-UD HYDRAULIC PRESSURE TEST (CONTINUED)

9. (F856) 5-VOLT SUPPLY CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (F856) 5-volt Supply circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (F856) 5-volt Supply circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

10. COMPARE SCAN TOOL TO PRESSURE GAUGE

Turn the ignition off to the lock position.

Connect the Line Pressure Adapter, Miller tool #8259 and 0-300 psi Test Gauge, Miller tool #C-3293-SP. Refer to the Service Information for proper installation procedure.

CAUTION: Apply parking brake.

Start the engine.

In the following steps, compare the scan tool Line Pressure to the Pressure Gauge readings in each gear.

CAUTION: Do not overheat transmission.

With the gear selector in park, raise the RPM to 1500, and compare line pressure readings.

Firmly apply the brakes, move the gear selector into reverse, raise the RPM to 1500, and compare the line pressure readings.

Firmly apply the brakes, move the gear selector into drive, raise the RPM to 1500, and compare the line pressure readings.

Does the scan tool Line Pressure readings match the Pressure Gauge readings ± 10 psi?

Yes >> Go To 11

No >> Replace the Line Pressure Sensor per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0875-UD HYDRAULIC PRESSURE TEST (CONTINUED)

11. WIRING AND CONNECTORS

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Failure to remove the Starter Relay can cause a Transmission - No Response condition.

Remove the Line Pressure Adapter, Miller tool #8259 and 0-300 psi Test Gauge, Miller tool #C-3293-SP.

Install the Transmission Simulator, Miller tool #8333.

On the Transmission Simulator, turn the Pressure Switch selector switch to UD.

Ignition on, engine not running.

With the scan tool, monitor the UD Pressure Switch state while pressing and holding the Pressure Switch test button and wiggling the wire harness and connectors that pertain to the UD Pressure Switch.

Did the UD Pressure Switch state change to closed and remain closed while wiggling the wires?

Yes >> Go To 12

No >> Go To 14

---

12. CHECK FOR EXCESSIVE DEBRIS

Turn the ignition off to the lock position.

Remove the Transmission Simulator, Miller tool #8333.

Remove and inspect the Transmission Oil Pan per the Service Information.

Does the Transmission Oil Pan contain excessive debris or contamination?

Yes >> Repair the cause of the excessive debris in the Transmission Oil Pan. Refer to the Service Information for the proper procedures.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 13

---

13. CHECK UD HYDRAULIC CLUTCH CIRCUIT

Remove the Valve Body and air check the UD hydraulic clutch circuit (in the case) for leakage per the Service Information.

NOTE: The UD hydraulic clutch circuit contains a small bleed orifice. A small amount of air leakage is normal.

Was there excessive air leakage noticed during the air check?

Yes >> Repair as necessary. Check the UD clutch piston, piston seals and bleed orifice, reaction shaft support seal rings, and machining of the main mating faces of the pump housing, pump valve body, and reaction shaft support.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Disassemble and inspect the Valve Body and repair as necessary. Inspect the UD Accumulator piston and seals. If no problems are found in the Valve Body, replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0875-UD HYDRAULIC PRESSURE TEST (CONTINUED)

14. (T29) UD PRESSURE SWITCH SENSE CIRCUIT OPEN

Turn the ignition off to the lock position.

Remove the Transmission Simulator, Miller tool #8333.

Disconnect the PCM C4 harness connector and connect Miller tool #8815.

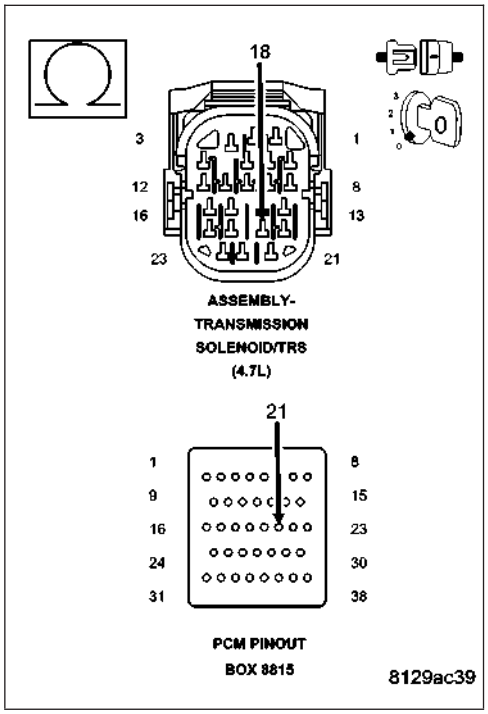
Measure the resistance of the (T29) UD Pressure Switch Sense circuit from the Transmission Solenoid/TRS Assembly harness connector to the appropriate terminal of Miller tool #8815.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T29) UD Pressure Switch Sense circuit for an open.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 15



15. (T29) UD PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND

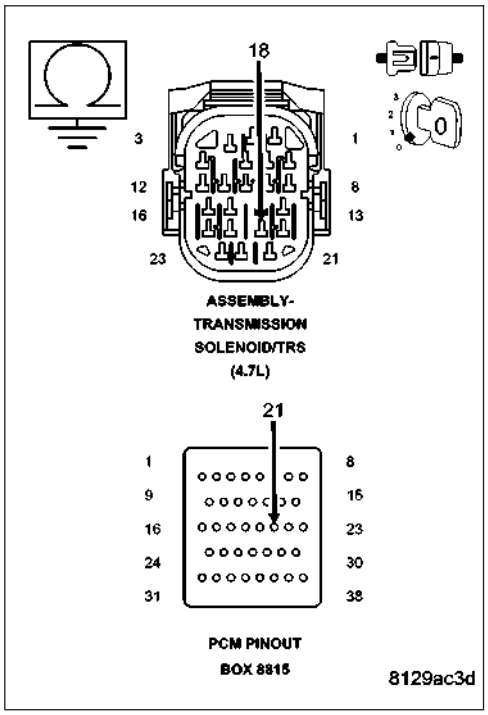
Measure the resistance between ground and the (T29) UD Pressure Switch Sense circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (T29) UD Pressure Switch Sense circuit for a short to ground.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 16



P0875-UD HYDRAULIC PRESSURE TEST (CONTINUED)

16. (T29) UD PRESSURE SWITCH SENSE CIRCUIT SHORT TO OTHER CIRCUITS

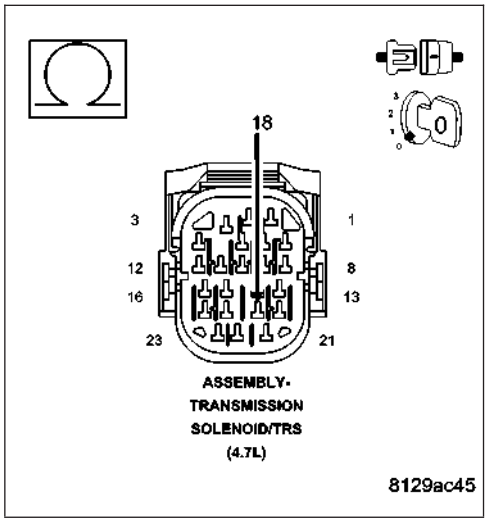
Disconnect all PCM harness connectors.

Disconnect the Transmission Solenoid/TRS Assembly harness connector.

NOTE: Make sure the Transmission Solenoid/TRS Assembly harness connector is disconnected.

NOTE: Check connectors - Clean/repair as necessary.

Measure the resistance between the (T29) UD Pressure Switch Sense circuit and all other circuits in the Transmission Solenoid/TRS Assembly harness connector.



Is the resistance below 5.0 ohms between the (T29) UD Pressure Switch Sense circuit and any other circuit(s) in the Transmission Solenoid/TRS Assembly harness connector?

Yes >> Repair the (T29) UD Pressure Switch Sense circuit for a short to other circuit(s).
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

17. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

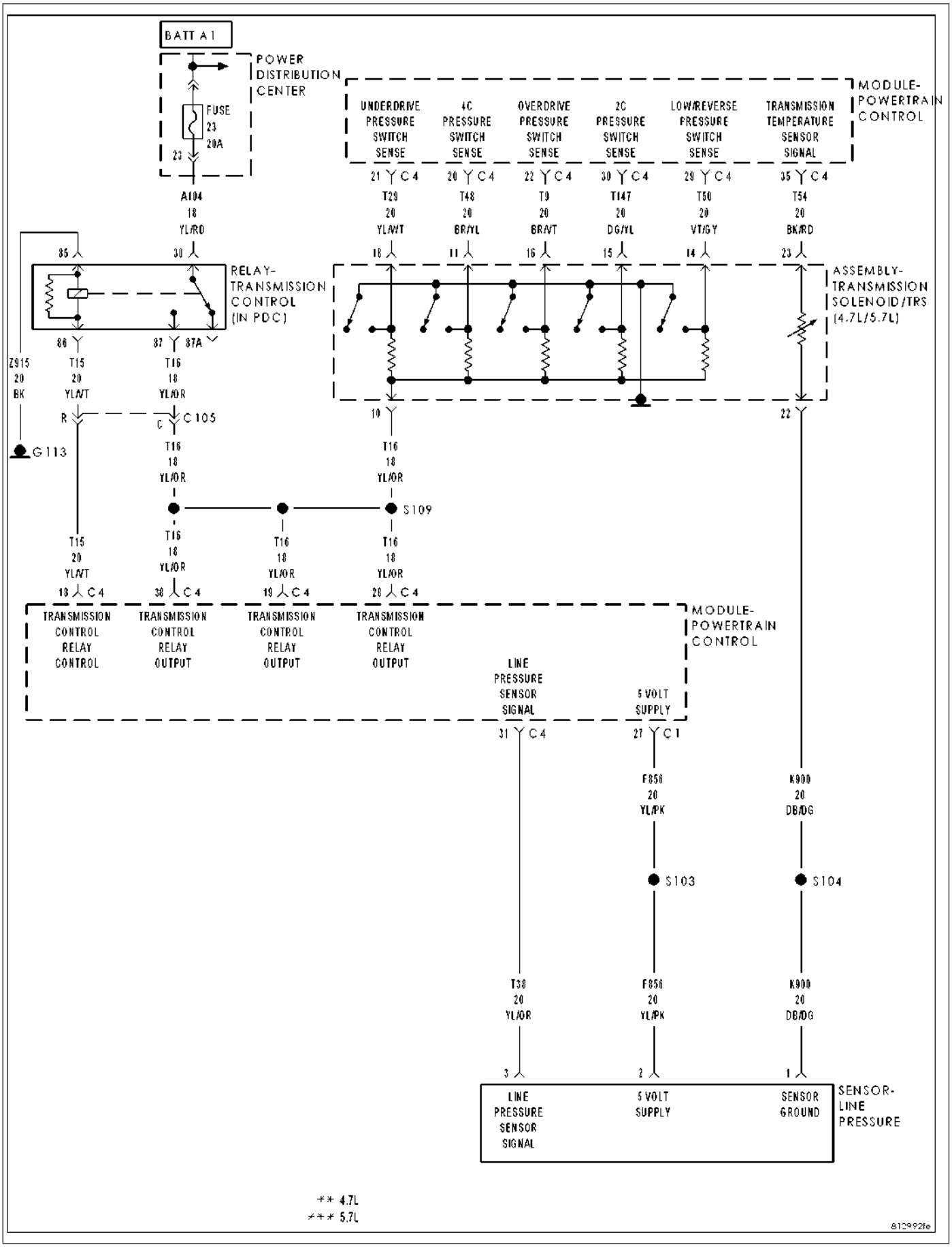
If the EATX DTC EVENT DATA shows the DTC P0875 set while the Line Pressure was significantly below the Desired Line Pressure reading, check for causes of low line pressure (low fluid level, broken or mis-installed primary oil filter or filter seal, sticking Main Regulator Valve in the Pump Valve Body etc.). If the data shows the DTC set while the Line Pressure reading was significantly higher than the Desired Line Pressure, check the Line Pressure Sensor and related wiring.

Where there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0876-UD PRESSURE SWITCH RATIONALITY



P0876-UD PRESSURE SWITCH RATIONALITY (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously with the ignition on and engine running.
- **Set Condition:**
  This DTC is set if the UD pressure switch is in the wrong state for the current gear. For example, this code would be set if the UD pressure switch remained off while the transmission was in second gear.

Possible Causes
RELATED RELAY DTC'S PRESENT
LOW FLUID LEVEL
NO. 2 CHECK BALL CUT OR DAMAGED
LOW LINE PRESSURE
CRACKED OR MISINSTALLED SUMP FILTER OR SEAL
STICKING MAIN REGULATOR VALVE IN PUMP VALVE BODY
(T29) UD PRESSURE SWITCH SENSE CIRCUIT OPEN
(T29) UD PRESSURE SWITCH CIRCUIT SHORT TO GROUND
(T29) UD PRESSURE SWITCH SENSE CIRCUIT SHORT TO ANOTHER CIRCUITS
TRANSMISSION SOLENOID/TRS ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Transmission system uses five pressure switches to monitor the fluid pressure in the LR, 2C, 4C, UD, and OD clutch circuits. The pressure switches are continuously monitored for the correct states in each gear as shown.

GEAR	L/R	2C	4C	UD	OD
REVERSE	OPEN	OPEN	OPEN	OPEN	OPEN
P/N	CLOSED**	OPEN	OPEN	OPEN	OPEN
1ST	CLOSED*	OPEN	OPEN	CLOSED	OPEN
2ND	OPEN	CLOSED	OPEN	CLOSED	OPEN
2ND PRIME	OPEN	OPEN	CLOSED	CLOSED	OPEN
3RD	OPEN	OPEN	OPEN	CLOSED	CLOSED
4TH	OPEN	OPEN	CLOSED	OPEN	CLOSED
5TH	OPEN	CLOSED	OPEN	OPEN	CLOSED

*L/R is closed if output speed is below 100 rpm in Drive and Manual 2. L/R is closed in Manual 1.

**May be open when rolling in Neutral or at low oil temperatures.

P0876-UD PRESSURE SWITCH RATIONALITY (CONTINUED)

Diagnostic Test

1. CHECK IF RELATED DTC'S ARE PRESENT

With the scan tool, check for other transmission DTC's.

Are there any Transmission Control Relay, Line Pressure, and/or Loss of Prime DTC's present?

Yes >> Refer to the Transmission category and perform the appropriate symptom. If a Loss of Prime DTC is present, perform its respective test first.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK FOR PRESSURE SWITCH DTCS

Are there two or more other pressure switch rationality DTC's present in addition to P0876?

Yes >> Go To 3

No >> Go To 4

---

3. CHECK IF ALL PRESSURE SWITCHES READ CLOSED

With the scan tool, read and record all EATX DTC EVENT DATA.

NOTE: Make sure to record all EATX DTC EVENT DATA stored in the scan tool for future reference in this test procedure.

Does the EATX DTC EVENT DATA show all pressure switches reading CLOSED?

Yes >> Refer to the symptom category and perform diagnostics for P0888. Diagnose the symptom as if the DTC is current.

No >> Go To 4

---

4. CHECK FOR OTHER DTCS

With the scan tool, check for other transmission DTC's.

Is the DTC P2704 present also?

Yes >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5

---

5. CHECK EATX DTC EVENT DATA

With the scan tool, read and record the DTC EVENT DATA.

NOTE: Make sure to record all EATX DTC EVENT DATA stored in the scan tool for future reference in this test procedure.

Does the DTC EVENT DATA display information for the DTC P0876?

Yes >> Go To 6

No >> Refer to the symptom list and perform diagnostics for the DTC listed in the EATX DTC EVENT DATA.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0876-UD PRESSURE SWITCH RATIONALITY (CONTINUED)

6. CHECK IF DTC EVENT DATA WAS SET IN PARK, NEUTRAL OR REVERSE

Refer to the DTC EVENT DATA recorded earlier.

Did the DTC P0876 set in Park, Neutral, or Reverse?

Yes >> Go To 10

No >> Go To 7

---

7. CHECK FOR UD PRESSURE SWITCH STATUS

Refer to the DTC EVENT DATA recorded earlier.

Did the DTC P0876 set with the UD Pressure Switch closed?

Yes >> Go To 10

No >> Go To 8

---

8. CHECK LINE PRESSURE

In the EATX DTC EVENT DATA recorded earlier, compare the Line Pressure and the Desired Line Pressure.

Is the Line Pressure less than 40 PSI, and significantly below the Desired Line Pressure?

Yes >> Repair as necessary to correct low line pressure. Check fluid level and adjust as necessary. If fluid level is OK, check the Primary Oil Filter seal for a split, crack, or improperly installed. If the filter and seal are OK, check the Main Regulator Valve in the Oil Pump. Refer to the Service Information for the above procedures.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 9

---

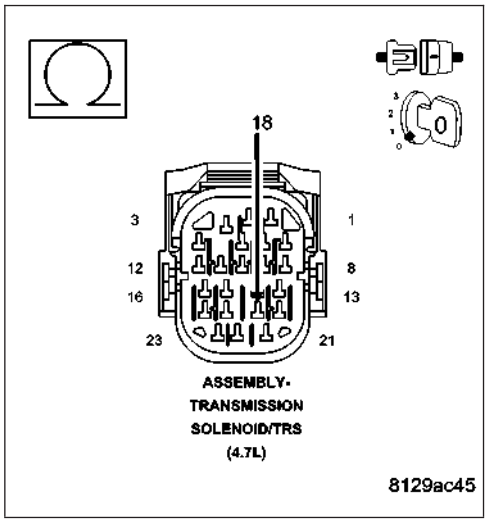
9. (T29) UD PRESSURE SWITCH SENSE CIRCUIT SHORT TO OTHER CIRCUITS

Turn the ignition off to the lock position.

Disconnect all PCM harness connectors.

Disconnect the Transmission Solenoid/TRS Assembly harness connector.

Measure the resistance between the (T29) UD Pressure Switch Sense circuit and all other circuits in the Transmission Solenoid/TRS Assembly harness connector.



Is the resistance below 5.0 ohms between the (T29) UD Pressure Switch Sense circuit and any other circuit(s) in the Transmission Solenoid/TRS Assembly harness connector?

Yes >> Repair the (T29) UD Pressure Switch Sense circuit for a short to other circuit(s).

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0876-UD PRESSURE SWITCH RATIONALITY (CONTINUED)

10. PCM AND WIRING

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the Transmission Simulator, turn the Pressure Switch selector switch to the UD position.

With the scan tool, monitor the UD Pressure Switch state while pressing the Pressure Switch Test button on the Transmission Simulator.

Did the state of the UD Pressure Switch change while pressing the Pressure Switch Test button?

Yes >> Go To 14

No >> Go To 11

---

11. (T29) UD PRESSURE SWITCH SENSE CIRCUIT OPEN

Turn the ignition off to the lock position.

Disconnect the Transmission Simulator, Miller tool #8333.

Disconnect the PCM C4 harness connector and connect Miller tool #8815.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

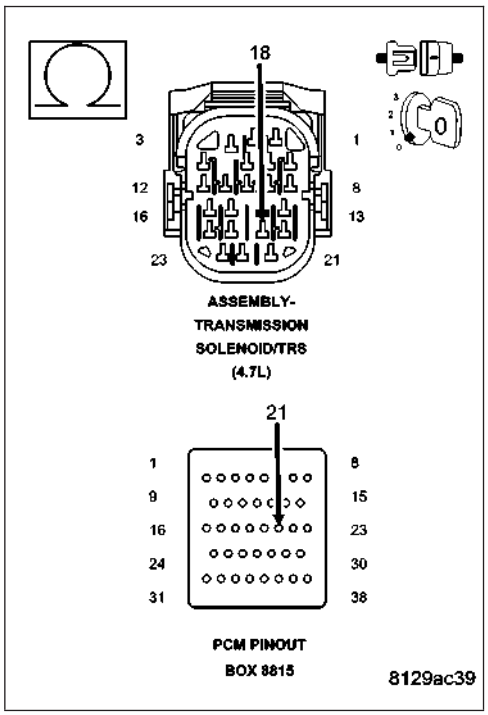
Measure the resistance of the (T29) UD Pressure Switch Sense circuit from the Transmission Solenoid/TRS Assembly harness connector and the appropriate terminal of the special tool #8815.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T29) UD Pressure Switch Sense circuit for an open.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

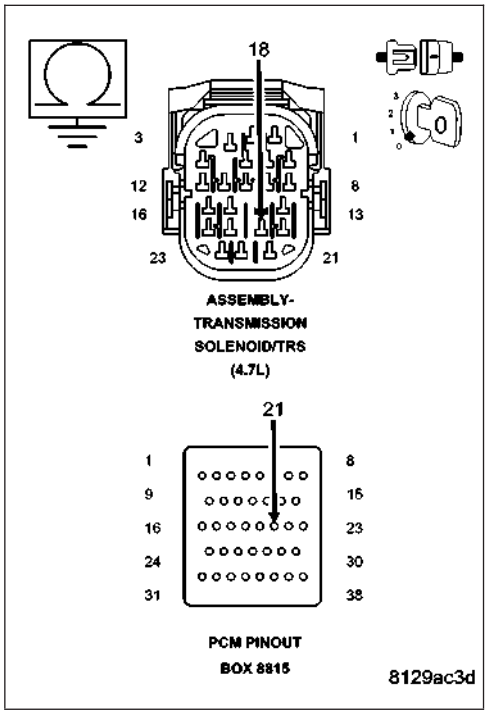
No >> Go To 12



P0876-UD PRESSURE SWITCH RATIONALITY (CONTINUED)

12. (T29) UD PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T29) UD Pressure Switch Sense circuit.



Is the resistance below 5.0 ohms?

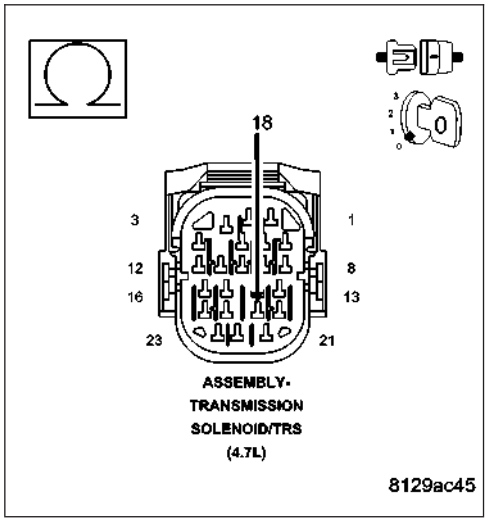
Yes >> Repair the (T29) UD Pressure Switch Sense circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 13

13. (T29) UD PRESSURE SWITCH SENSE CIRCUIT SHORT TO ANOTHER CIRCUIT

Disconnect all PCM harness connectors.

NOTE: Make sure the Transmission Solenoid/TRS Assembly harness connector is disconnected.
Measure the resistance between the (T29) UD Pressure Switch Sense circuit and all other circuits in the Transmission Solenoid/TRS Assembly harness connector.



Is the resistance below 5.0 ohms between the (T29) UD Pressure Switch Sense circuit and any other circuit(s) in the Transmission Solenoid/TRS Assembly harness connector?

Yes >> Repair the (T29) UD Pressure Switch Sense circuit for a short to another circuit(s).
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0876-UD PRESSURE SWITCH RATIONALITY (CONTINUED)

14. WIGGLE TEST WITH SIMULATOR

Perform the steps in the previous test while wiggling the wiring harness and connectors pertaining to the UD Pressure Switch.

Did the state of the UD Pressure Switch change while pressing the Pressure Switch Test button?

Yes >> Repair the wiring harness and/or connectors as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 15

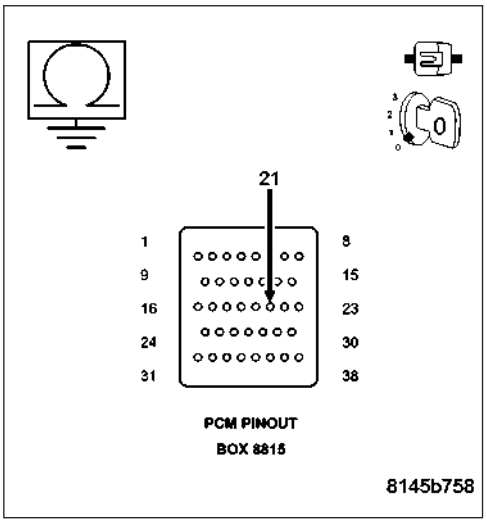
---

15. CHECK FOR TRANSMISSION SOLENOID/TRS ASSEMBLY FOR A SHORT TO GROUND

Disconnect the Transmission Simulator and reconnect the Transmission Solenoid/TRS Assembly harness connector.

Disconnect the PCM C4 harness connector and connect Miller tool #8815.

Measure the resistance between ground and the (T29) UD Pressure Switch Sense circuit in the appropriate terminal of Miller tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 16

---

16. CHECK IF DTC RESETS

Reconnect all previously disconnected connectors.

With the scan tool, erase all transmission DTCs.

Test drive the vehicle. Using the EATX DTC EVENT DATA recorded earlier, try to duplicate the conditions in which the DTC originally set.

Does the DTC P0876 reset?

Yes >> Go To 17

No >> Go To 18

P0876-UD PRESSURE SWITCH RATIONALITY (CONTINUED)

17. CHECK FOR CUT NO. 2 CHECK BALL

Remove the Valve Body per the Service Information.

Check the No. 2 check ball for cuts or damage.

Is the No. 2 check ball cut or damaged?

Yes >> Replace the No. 2 check ball. Check for excessive clutch debris in the oil pan. If excessive debris is present, check the UD Clutch and repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information. Check for excessive clutch debris in the oil pan. If excessive debris is present, check the UD Clutch and repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

18. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

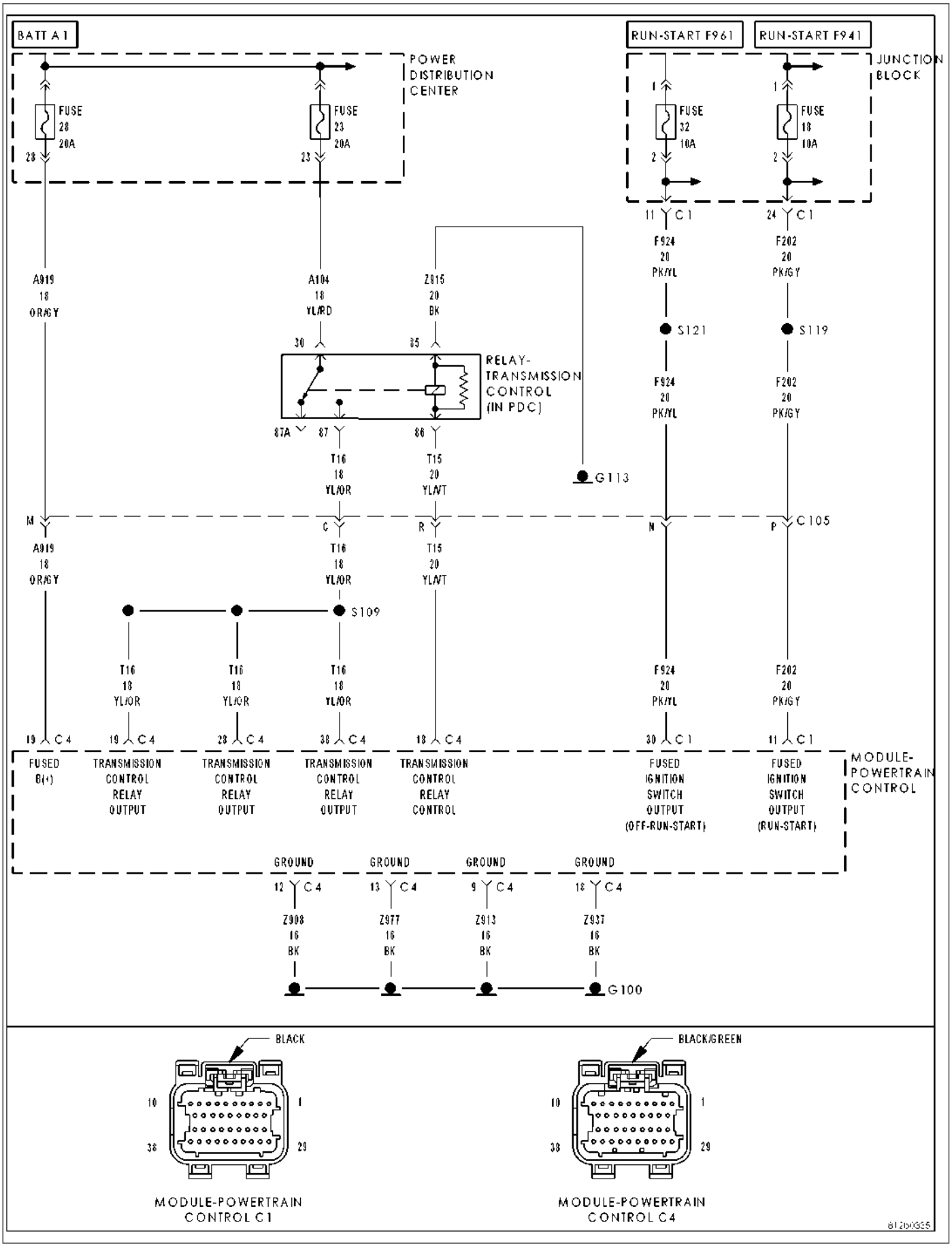
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Were there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0884-POWER UP AT SPEED



P0884-POWER UP AT SPEED (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When Powertrain Control Module initially powers up. Due to the integration of the Powertrain and Transmission Control Modules, the transmission part of the PCM has its own specific power and ground circuits.
- **Set Condition:**
  This DTC will set if the PCM powers up and senses the vehicle in a valid forward gear, with no PRNDL DTCs, and an output speed above 800 RPM, approximately 32 Kmh or 20 MPH.

Possible Causes
POWER UP AT SPEED

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

If a vehicle loses power to the Transmission Control System, the solenoids (LR, 2C, OD, UD, 4C) will go to their respective power off state. Some solenoids are normally vented and some are normally applied in their power off state. The transmission is designed to be in 3rd gear with all of the solenoids in this state. However, if power is restored, the Transmission Control System will power-up and normal operation will be restored.

This code identifies that power to the Transmission Control System was restored when the gear selector was in a ″Drive″ position while the vehicle was moving at speeds above 32 Kmh (20 MPH). **This DTC does not indicate a problem with the transmission or Transmission Control System,** instead, it suggests intermittent problems in the fused ignition switch output, fused B(+), or ground circuits to the TCM. Alternately, if a person performs a rolling restart maneuver, the DTC can be set. Therefore it is critical that this DTC be investigated if the vehicle is experiencing intermittent 3rd gear operation and a subsequent return to normal operation.

Diagnostic Test

1. CHECK FOR INTERMITTENT POWER AND GROUND CIRCUITS

This DTC is set when the Transmission portion of the Powertrain Control Module is initialized while the vehicle is moving down the road in a valid forward gear.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

NOTE: Due to the integration of the Powertrain and Transmission Control Modules, the transmission part of the PCM has its own specific power and ground circuits.

Check all of the Fused B(+), Fused Ignition Switch Output, and ground circuits to the PCM for an intermittent open or short to ground.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

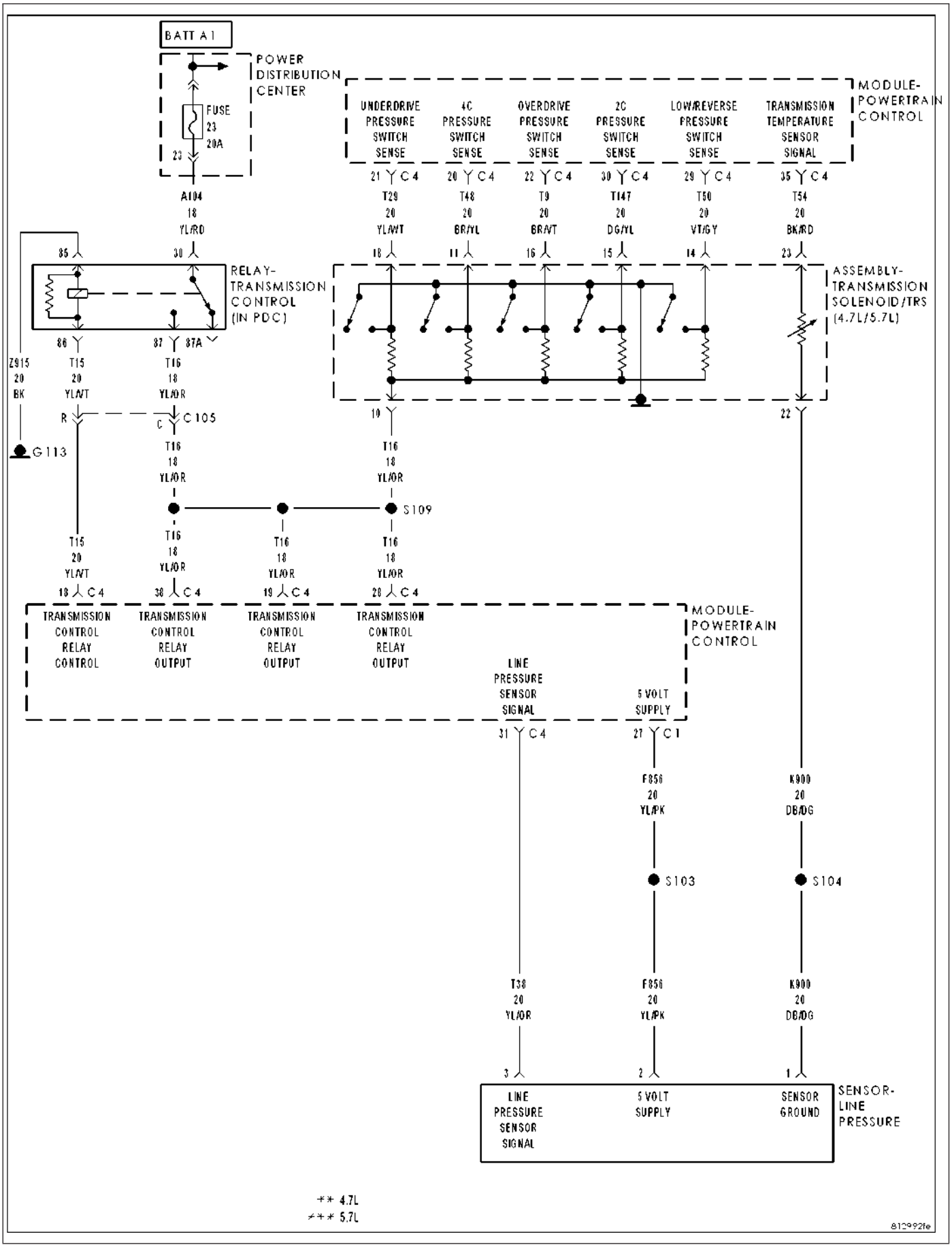
If there are no possible causes remaining, view repair.

Repair

Check all power and ground circuits to the PCM and repair as necessary.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0888-TRANSMISSION RELAY ALWAYS OFF



P0888-TRANSMISSION RELAY ALWAYS OFF (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  When the ignition is turned from ″OFF″ position to ″RUN″ position and/or the ignition is turned from ″START″ position to ″RUN″ position.
- **Set Condition:**
  This DTC is set when less than 3.0 volts are present at the transmission control relay output circuits at the Powertrain Control Module when the PCM is energizing the relay.

Possible Causes
(A104) FUSED B+ CIRCUIT OPEN
(T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
(T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT SHORT TO GROUND
(T15) TRANSMISSION CONTROL RELAY CONTROL CIRCUIT OPEN
(T15) TRANSMISSION CONTROL RELAY CONTROL CIRCUIT SHORT TO GROUND
(Z915) TRANSMISSION CONTROL RELAY GROUND CIRCUIT OPEN
TRANSMISSION CONTROL RELAY STUCK OPEN
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The transmission control relay is used to supply power to the solenoids and pressure switches when the transmission is in normal operating mode. The relay output is fed back to the TCM through pins 16, 17, and 36. It is referred to as ″Transmission Control Relay Output″. This circuit does not supply power to the TCM, it is only a sense circuit. When the relay is off, no power is supplied to the solenoids and pressure switches, and the transmission is in ″limp-in″ or ″default″ mode. **Note: Inadequate Transmission Control Relay Output voltage can also cause DTCs P0846, P0869, P0871, P0876 or P0988 to set. This does not indicate an internal transmission or solenoid/TRS problem. Repairing the P0888 fault should also eliminate the related DTCs.**

Diagnostic Test

1. CHECK TO SEE IF DTC P0888 IS CURRENT

With the scan tool, Check the STARTS SINCE SET counter for P0888.

NOTE: This counter only applies to the last DTC set.

Is the STARTS SINCE SET counter equal to 0?

Yes >> Go To 2

No >> Go To 9

P0888-TRANSMISSION RELAY ALWAYS OFF (CONTINUED)

2. (A104) FUSED B+ CIRCUIT OPEN

Turn the ignition off to the lock position.

Remove the Transmission Control Relay.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

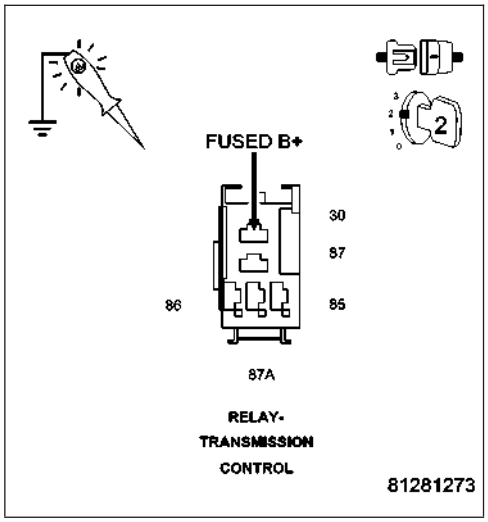
Using a 12-volt test light connected to ground, check the (A104) Fused B+ circuit in the Transmission Control Relay connector.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Go To 3

No >> Repair the (A104) Fused B+ circuit for an open. If the fuse is open make sure to check for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.



3. (Z915) TRANSMISSION CONTROL RELAY GROUND CIRCUIT OPEN

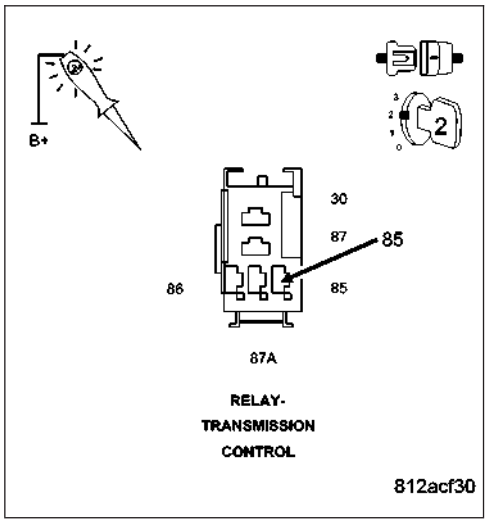
Turn the ignition off to the lock position.

Using a 12-volt test light connected to 12-volts, check the (Z915) Transmission Control Relay Ground circuit in the Transmission Control Relay connector.

Does the test light illuminate brightly?

Yes >> Repair the (Z915) Transmission Control Relay Ground circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 4



4. TRANSMISSION CONTROL RELAY

Install a substitute relay in place of the Transmission Control Relay.

Start the vehicle.

With the scan tool, check transmission DTCs.

Did the DTC P0888 reset?

Yes >> Replace the Transmission Control Relay.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5

P0888-TRANSMISSION RELAY ALWAYS OFF (CONTINUED)

5. (T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector and connect Miller tool #8815.

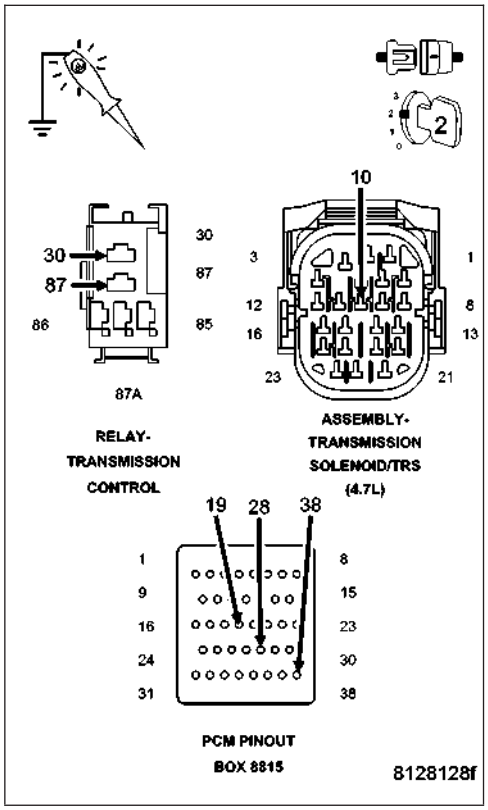
Disconnect the Transmission Solenoid/TRS Assembly harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Connect a jumper wire between the (A104) Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector.

Ignition on, engine not running.

Using a 12-volt test light connected to ground, check all four (T16) Transmission Control Relay Output circuits in the PCM C4 harness connector and Transmission Solenoid/TRS Assembly harness connector.



Does the test light illuminate brightly on all four (T16) Transmission Control Relay Output circuits?

Yes >> Go To 6

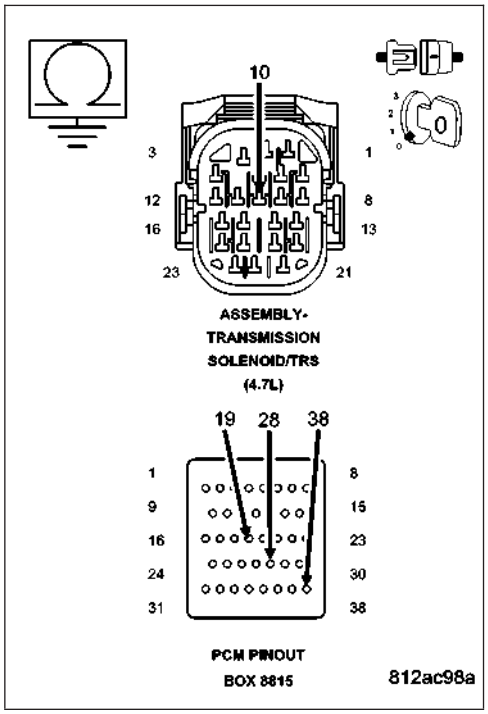
No >> Repair the (T16) Transmission Control Relay Output circuit(s) for an open or high resistance.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

6. (T16) TRANSMISSION RELAY OUTPUT CIRCUIT SHORT TO GROUND

Turn the ignition off to the lock position.

Measure the resistance between ground and the (T16) Transmission Control Relay Output circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (T16) Transmission Control Relay Output circuit for a short to ground.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 7

P0888-TRANSMISSION RELAY ALWAYS OFF (CONTINUED)

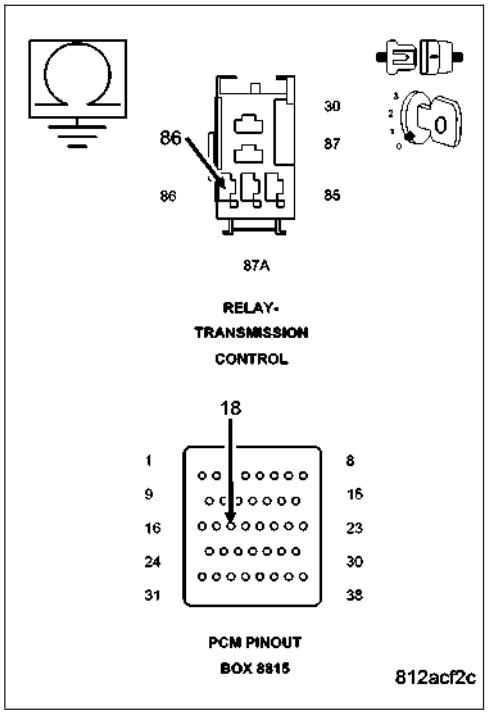
7. (T15) TRANSMISSION CONTROL RELAY CONTROL CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T15) Transmission Control Relay Control circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (T15) Transmission Control Relay Control circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 8



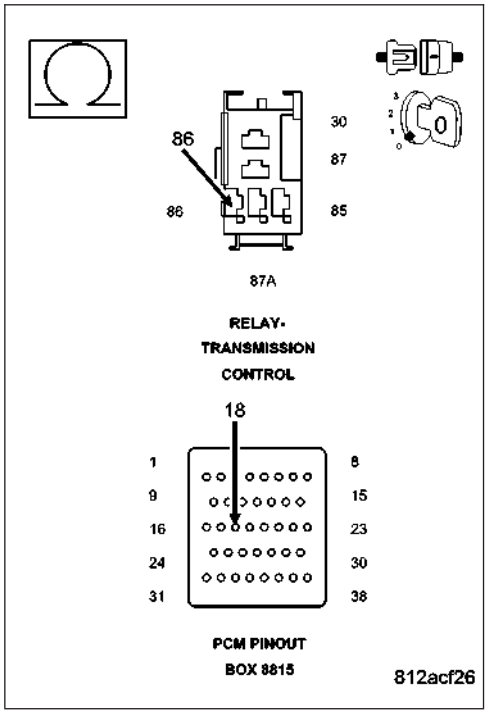
8. (T15) TRANSMISSION CONTROL RELAY CONTROL CIRCUIT OPEN

Measure the resistance of the (T15) Transmission Control Relay Control circuit between the Transmission Control Relay connector and the appropriate terminal of Miller tool #8815.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T15) Transmission Control Relay Control circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.



P0888-TRANSMISSION RELAY ALWAYS OFF (CONTINUED)

9. INTERMITTENT WIRING AND CONNECTORS

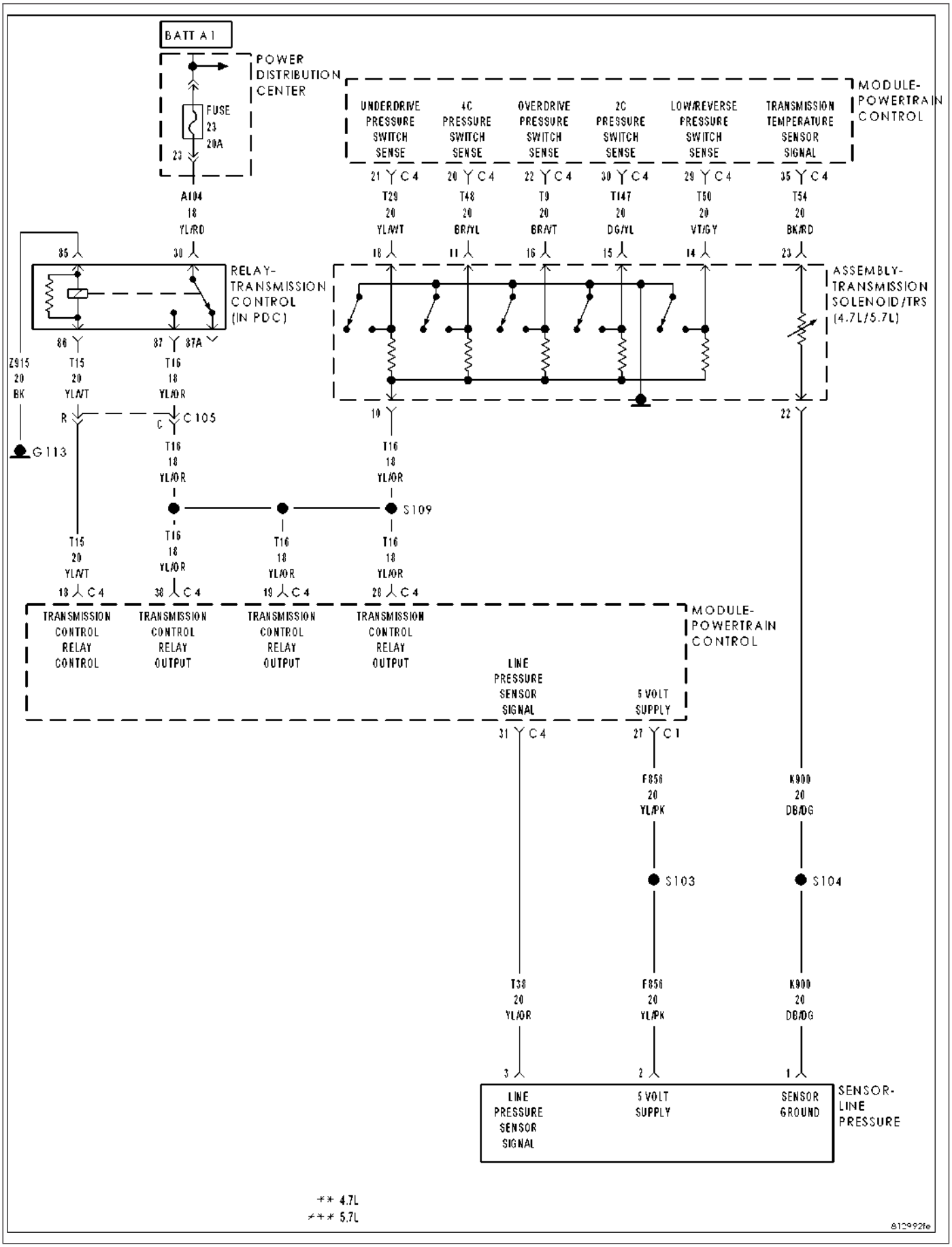
The conditions necessary to set this DTC are not present at this time.
Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.
Wiggle the wires while checking for shorted and open circuits.
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Where there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0890-SWITCHED BATTERY



P0890-SWITCHED BATTERY (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the ignition is turned from ″OFF″ position to ″RUN″ position and/or the ignition is turned from ″START″ position to ″RUN″ position.
- **Set Condition:**
  This DTC is set if the Powertrain Control Module senses voltage on any of the pressure switch inputs prior to the Transmission Control Relay being energized.

Possible Causes
PRESSURE SWITCH SENSE CIRCUITS SHORT TO VOLTAGE
TRANSMISSION SOLENOID/TRS ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Transmission control relay is used to supply power to the solenoids and pressure switches (Transmission Solenid/TRS Assembly) when the transmission is in normal operating mode. When the relay is off, no power is supplied and the transmission is in ″limp-in″ mode. The relay output is fed back to the PCM through pins C4–19, C4–28 and C4–38 and are referred to as ″Transmission Control Relay Output″.

Immediately after a controller reset (ignition key turned to the ″run″ position or after cranking engine), the TCM verifies that the relay contacts are open by checking for no voltage at the transmission control relay output terminals. After this is verified, the voltage at the pressure switches are checked. There should be no voltage on the pressure switches at this time. The PCM will then activate the relay.

Diagnostic Test

1. CHECK TO SEE IF DTC P0890 IS PRESENT

With the scan tool, Check the STARTS SINCE SET counter for P0890.

NOTE: This counter only applies to the last DTC set.

Is the ″Starts Since Set″ counter set at 0?

Yes >> Go To 2

No >> Go To 4

P0890-SWITCHED BATTERY (CONTINUED)

2. PRESSURE SWITCH SENSE CIRCUITS SHORT TO VOLTAGE

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector and connect Miller tool #8815.

Disconnect the Transmission Solenoid/TRS Assembly harness connector.

Remove the Transmission Control Relay.

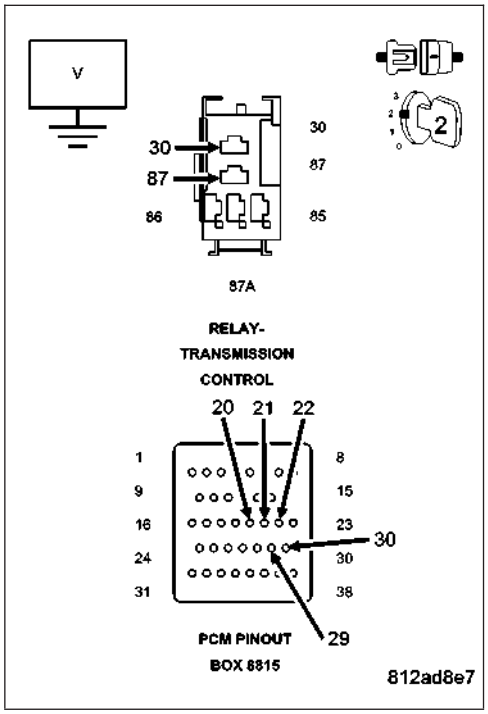
NOTE: Note: Check connectors - Clean/repair as necessary.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector.

Ignition on, engine not running.

Measure the voltage of the (T147) 2C, (T48) 4C, (T50) LR, (T9) OD, and (T29) UD Pressure Switch Sense circuits in Miller tool #8815.



Is the voltage above 0.5 volt on any of the measured circuits?

Yes >> Repair the (T147) 2C, (T48) 4C, (T50) LR, (T9) OD, and/or (T29) UD Pressure Switch Sense circuit(s) for a short to voltage.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 3

3. TRANSMISSION SOLENOID/TRS ASSEMBLY

Turn the ignition off.

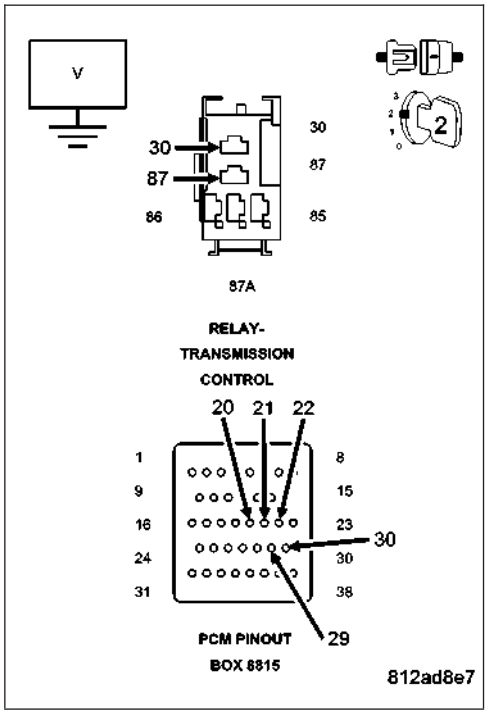
Remove the jumper wire.

NOTE: Do not reinstall the Transmission Relay.

Reconnect the Transmission Solenoid/TRS Assembly harness connector.

Ignition on, engine not running.

Measure the voltage of the (T147) 2C, (T48) 4C, (T50) LR, (T9) OD, and (T29) UD Pressure Switch Sense circuits in Miller tool #8815.



Is the voltage above 0.5 volts on any of the sense circuits?

Yes >> Replace the Transmission Solenoid/TRS Assembly.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0890-SWITCHED BATTERY (CONTINUED)

4. INTERMITTENT WIRING AND CONNECTORS

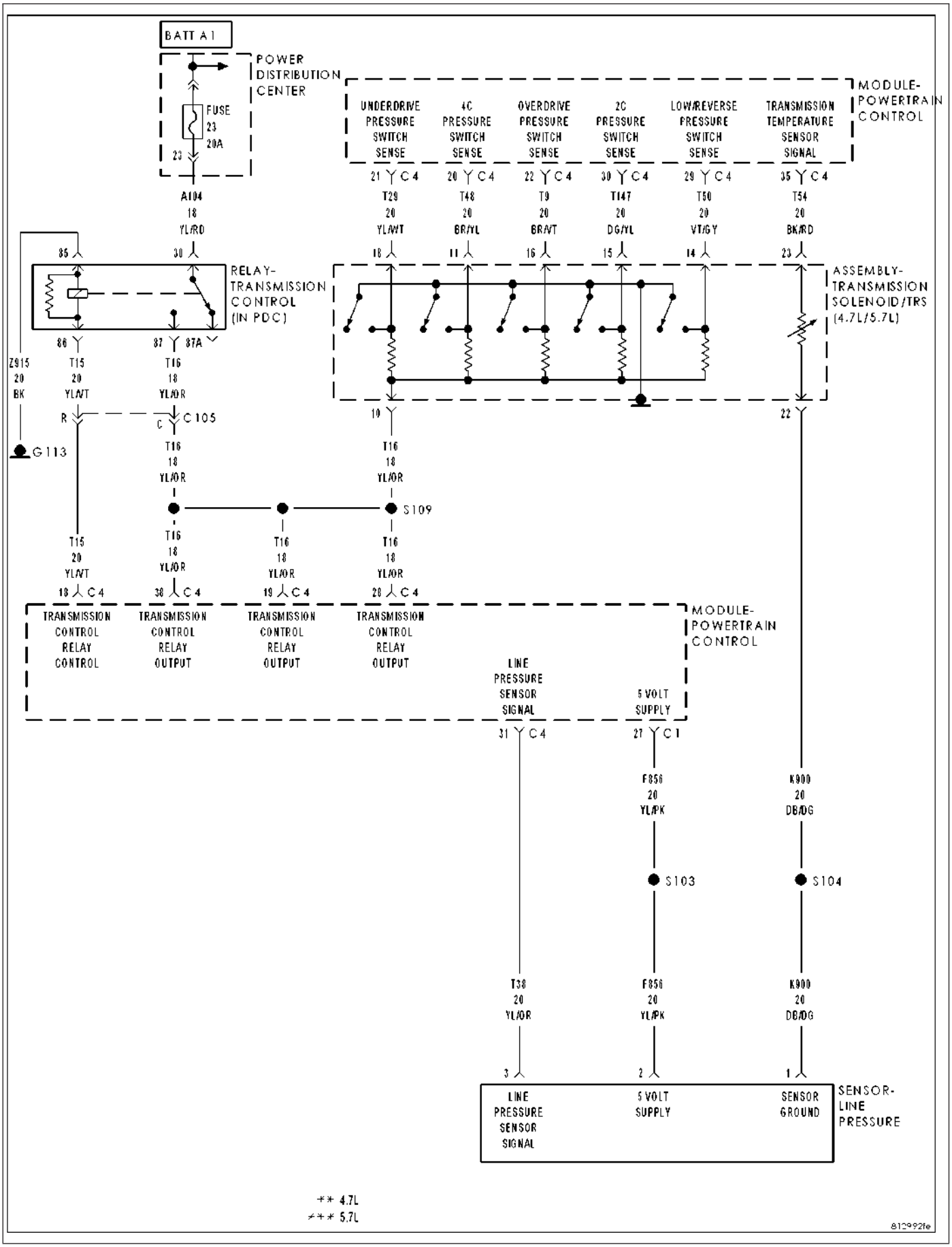
The conditions necessary to set this DTC are not present at this time.
Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.
Wiggle the wires while checking for shorted and open circuits.
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Where there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0891-TRANSMISSION RELAY ALWAYS ON



P0891-TRANSMISSION RELAY ALWAYS ON (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the ignition is turned from ″OFF″ position to ″RUN″ position and/or the ignition is turned from ″START″ position to ″RUN″ position.
- **Set Condition:**
  This DTC is set if the Powertrain Control Module senses greater than 3.0 volts on the Transmission Control Relay Output circuits prior to a request from the PCM to energize the Transmission Control Relay.

Possible Causes
(T15) TRANSMISSION CONTROL RELAY CONTROL CIRCUIT SHORT TO VOLTAGE
(T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT SHORT VOLTAGE
TRANSMISSION CONTROL RELAY
TRANSMISSION SOLENOID/TRS ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Transmission Control Relay is used to supply power (Transmission Control Relay Output) to the Transmission Solenoid/TRS Assembly when in normal operating mode and to pins C4–19, C4–28 and C4–38 of the PCM. The purpose of the Transmission Control Relay is to allow the PCM to turn off the power to the Transmission Solenoid/TRS Assembly in event that the transmission should need to be placed into “limp-in” mode due to a DTC.

After a PCM reset, (ignition switch turned to the run position, or after cranking engine) the PCM verifies that the Transmission Control Relay contacts are open by checking for voltage on the Transmission Control Relay Output circuit before the Transmission Control Relay is energized. If voltage is detected, the DTC will set.

Diagnostic Test

1. CHECK TO SEE IF DTC P0891 IS CURRENT

With the scan tool, check the STARTS SINCE SET counter.

NOTE: This counter only applies to the last DTC set.

Is the STARTS SINCE SET counter set to 0?

Yes >> Go To 2

No >> Go To 6

P0891-TRANSMISSION RELAY ALWAYS ON (CONTINUED)

2. TRANSMISSION CONTROL RELAY

Turn the ignition off to the lock position.

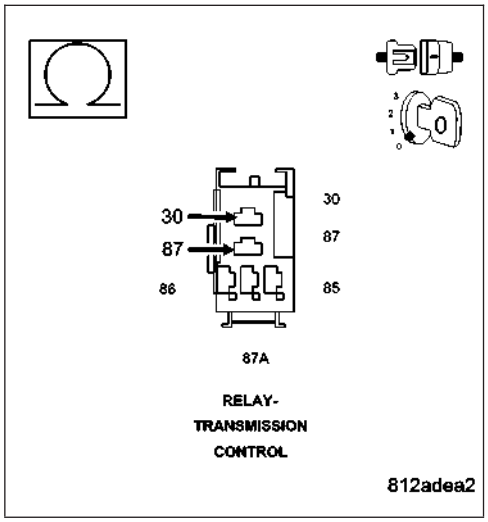
Disconnect the Transmission Control Relay.

NOTE: Note: Check connectors - Clean/repair as necessary.
Measure the resistance between the (A104) Fused B+ circuit and the (T16) Transmission Control Relay Output Circuit of the Transmission Control Relay.

Is the resistance above 5.0 ohms?

Yes >> Go To 3

No >> Replace the Transmission Control Relay.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.



3. (T16) TRANSMISSION RELAY OUTPUT CIRCUIT SHORT TO VOLTAGE

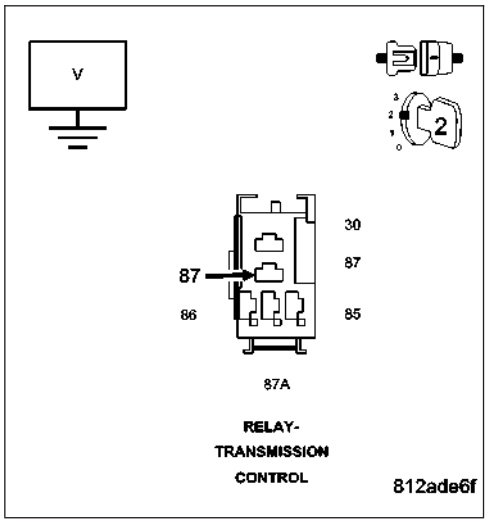
Ignition on, engine not running.

Measure the voltage at the (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

Is the voltage above 0.5 volts?

Yes >> Go To 4

No >> Go To 5



P0891-TRANSMISSION RELAY ALWAYS ON (CONTINUED)

4. TRANSMISSION SOLENOID/TRS ASSEMBLY

Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid/TRS Assembly harness connector.

NOTE: NOTE: Check connectors - Clean/repair as necessary.

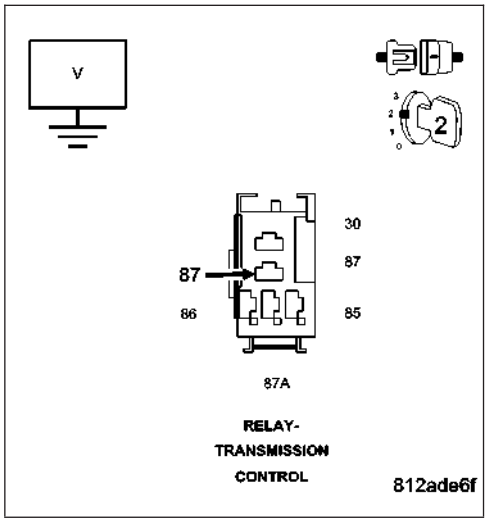
Ignition on, engine not running.

Measure the voltage at the (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

Is the voltage above 0.5 volts?

Yes >> Repair the (T16) Transmission Control Relay Output circuit for a short to voltage.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.



5. (T15)TRANSMISSION CONTROL RELAY CONTROL CIRCUIT SHORT TO VOLTAGE

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector and connect Miller tool #8815.

Disconnect the Transmission Solenoid/TRS Assembly harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Connect a jumper wire between the (A104) Fused B+ circuit and the (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

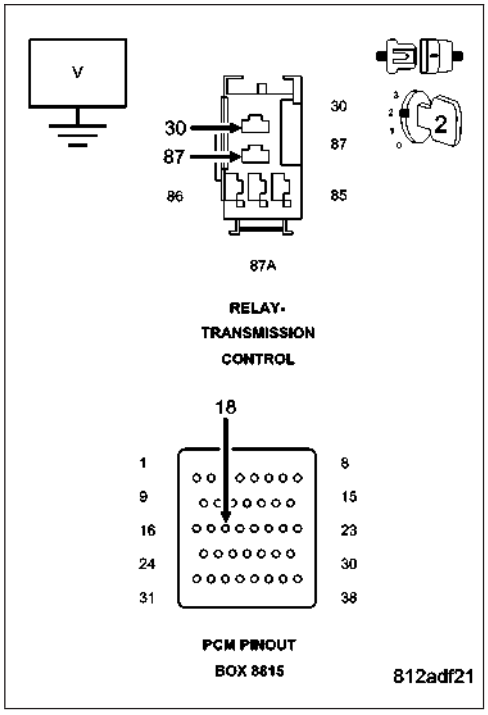
Ignition on, engine not running.

Measure the voltage of the (T15) Transmission Control Relay Control circuit.

Is the voltage above 0.5 volts?

Yes >> Repair the (T15) Transmission Control Relay Control circuit for a short to voltage.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.



P0891-TRANSMISSION RELAY ALWAYS ON (CONTINUED)

6. INTERMITTENT WIRING AND CONNECTORS

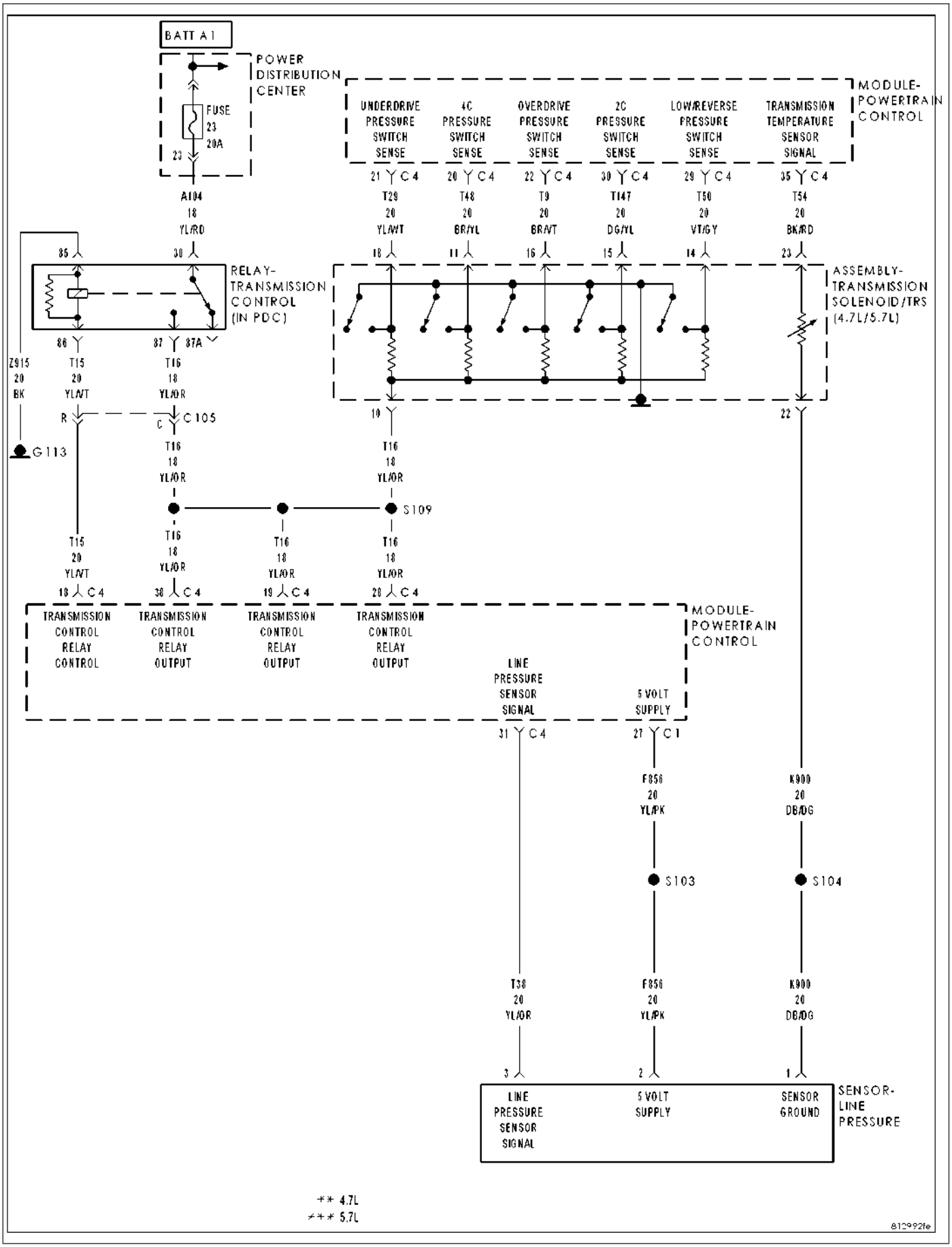
The conditions necessary to set this DTC are not present at this time.
Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.
Wiggle the wires while checking for shorted and open circuits.
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Where there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0932-LINE PRESSURE SENSOR CIRCUIT



P0932-LINE PRESSURE SENSOR CIRCUIT (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously with the ignition on, engine running, with the transmission in gear.
- **Set Condition:**
  The PCM continuously monitors Actual Line Pressure and compares it to Desired Line Pressure. If the Actual Line Pressure reading is more than 172.4 kPa (25 psi) higher than the Desired Line Pressure, but is less than the highest Line Pressure ever used in the current gear, the DTC sets.

Possible Causes
RELATED DTC'S PRESENT
LINE PRESSURE CONNECTOR AND WIRING
INTERNAL TRANSMISSION
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

Line pressure is electronically controlled by the Transmission Control System and is measured by the Line Pressure Sensor (LPS). The desired line pressure is continuously being compared to the actual line pressure and is regulated by electronically changing the duty cycle of the Pressure Control Solenoid (PCS). (5% duty cycle = solenoid off = max line pressure, 62% duty cycle = solenoid on = min line pressure).

The Transmission Control System calculates the desired line pressure based on inputs from the transmission and engine. A calculated torque input to the transmission is used as the primary input of the desired line pressure calculation and is called Torque Based Line Pressure. In addition, the line pressure is set to a preset level 827 to 931 kPa (120 to 135 PSI) during shifts and in Park and Neutral to ensure consistent shift quality.

Diagnostic Test

1. DETERMINING IF RELATED DTC'S ARE PRESENT

With the scan tool, check for other transmission DTC's.

Are there any other line pressure related DTC's present?

Yes >> Refer to the Transmission category and perform the appropriate symptom. Perform the test for P0934 and/or P0935 first if present.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

P0932-LINE PRESSURE SENSOR CIRCUIT (CONTINUED)

2. CONDITION P0932 PRESENT

CAUTION: Apply Parking Brake
Start the engine.

CAUTION: Firmly apply the brakes.
With the scan tool, monitor the Line Pressure, Desired Line Pressure and the TPS degrees.

While firmly applying the brakes, place the shifter in reverse, then slowly press the accelerator pedal to a TPS degree of 15°.

Compare the Line Pressure reading to the Desired Line Pressure reading on the scan tool.

Does the Line Pressure stay within ± 34 kPa or 5 PSI of the Desired Line Pressure?

No >> Go To 3

Yes >> Go To 5

---

3. CHECK LINE PRESSURE CONNECTOR AND WIRING

Ignition on, engine not running.

With the scan tool, monitor the Line Pressure Sensor voltage while wiggling the wiring harness and connectors pertaining to the Line Pressure Sensor and the Transmission Solenoid/TRS Assembly.

Did the voltage remain steady while wiggling the wiring harness and connectors?

Yes >> Go To 4

No >> Disconnect and properly reconnect the Line Pressure Sensor connector. Inspect terminals and repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

4. PCM AND WIRING

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333.

With the Transmission Simulator select the ″OFF″ position on the ″Input/Output Speed″ switch.

Ignition on, engine not running.

With the scan tool, monitor the Line Pressure during the following step.

With the Transmission Simulator, turn the selector switch to each of the 3 Line Pressure positions.

NOTE: All three scan tool Line Pressure readings should be steady and ±14 kPa or 2.0 PSI of the reading specified on the Transmission Simulator.

Does the Line Pressure on the scan tool fluctuate up and down more than 69 kPa or 10 PSI at any of the 3 line pressure positions on the Transmission Simulator?

Yes >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Repair internal transmission and inspect the oil pump per the Service information and replace if necessary. If no problems are found, replace the Transmission Solenoid/TRS Assembly — possible cause is the Pressure Control Solenoid is stuck.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0932-LINE PRESSURE SENSOR CIRCUIT (CONTINUED)

5. INTERMITTENT WIRING AND CONNECTORS

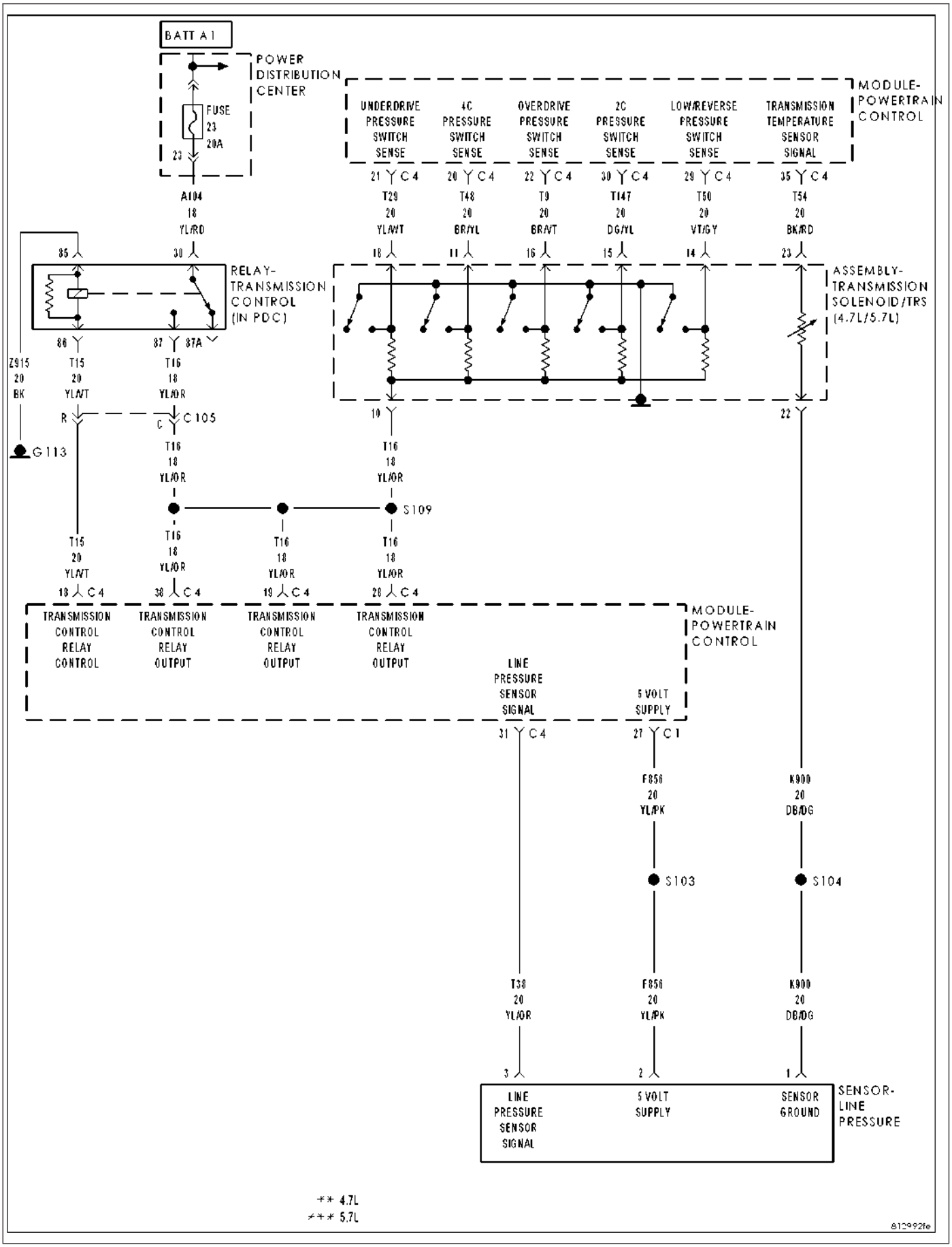
The conditions necessary to set this DTC are not present at this time.
Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.
Wiggle the wires while checking for shorted and open circuits.
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Where there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0934-LINE PRESSURE SENSOR CIRCUIT LOW



P0934-LINE PRESSURE SENSOR CIRCUIT LOW (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on and engine running.
- **Set Condition:**
  This DTC will set when the monitored Line Pressure Sensor voltage is less than or equal to 0.35 volts for 0.18 seconds.

Possible Causes
(F856) 5-VOLT SUPPLY CIRCUIT OPEN
(F856) 5-VOLT SUPPLY CIRCUIT SHORT TO GROUND
(T38) LINE PRESSURE SENSOR SIGNAL CIRCUIT SHORT TO GROUND
LINE PRESSURE SENSOR
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

Line pressure is electronically controlled by the Transmission Control System and is measured by the Line Pressure Sensor (LPS). The desired line pressure is continuously being compared to the actual line pressure and is regulated by electronically changing the duty cycle of the Pressure Control Solenoid (PCS). (5% duty cycle = solenoid off = max line pressure, 62% duty cycle = solenoid on = min line pressure).

The Transmission Control System calculates the desired line pressure based on inputs from the transmission and engine. A calculated torque input to the transmission is used as the primary input of the desired line pressure calculation and is called Torque Based Line Pressure. In addition, the line pressure is set to a preset level 827 to 931 kPa (120 to 135 PSI) during shifts and in Park and Neutral to ensure consistent shift quality.

The monitored Line Pressure Sensor voltage should always be between 0.35 and 4.75 volts. Any monitored voltages outside these parameters indicate an Line Pressure Sensor or wiring problem and will cause either DTC P0934 or P0935 to set.

Diagnostic Test

1. CHECK TO SEE IF DTC IS CURRENT

With the scan tool, check the STARTS SINCE SET counter for P0934.

NOTE: This counter only applies to the last DTC set.

Is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 2

No >> Go To 6

P0934-LINE PRESSURE SENSOR CIRCUIT LOW (CONTINUED)

2. PCM AND WIRING

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333.

Ignition on, engine not running.

With the scan tool, under Transmission Sensors, monitor the Line Pressure.

Using the Transmission Simulator, set the rotary switch to each of the 3 line pressure positions.

NOTE: The readings should be within ±14 kPa or 2.0 PSI on the scan tool to the pressure readings specified on Transmission Simulator.

Does the Line Pressure on the scan tool match the line pressures on the Transmission Simulator?

Yes >> Replace the Line Pressure Sensor per the Service Information.
Perform (NGC) 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 3

---

3. (T38) LINE PRESSURE SENSOR SIGNAL CIRCUIT SHORT TO GROUND

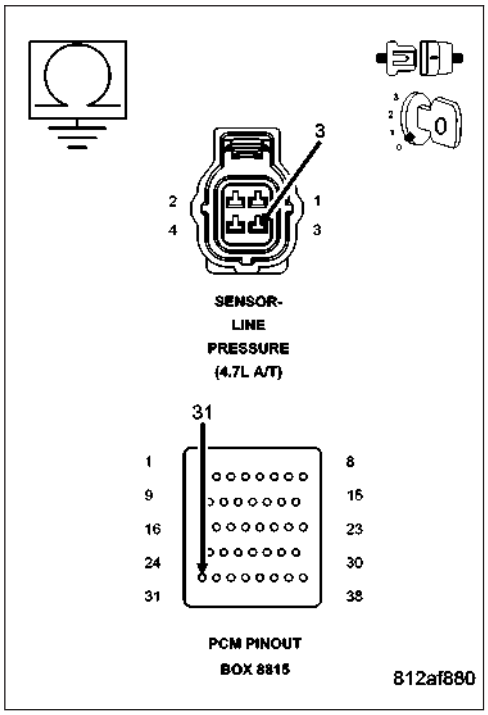
Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector and connect Miller tool #8815.

Disconnect the Transmission Simulator, Miller tool #8333.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Measure the resistance between ground and the (T38) Line Pressure Sensor Signal circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (T38) Line Pressure Sensor Signal circuit for a short to ground.
Perform (NGC) 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 4

P0934-LINE PRESSURE SENSOR CIRCUIT LOW (CONTINUED)

4. (F856) 5-VOLT SUPPLY CIRCUIT OPEN

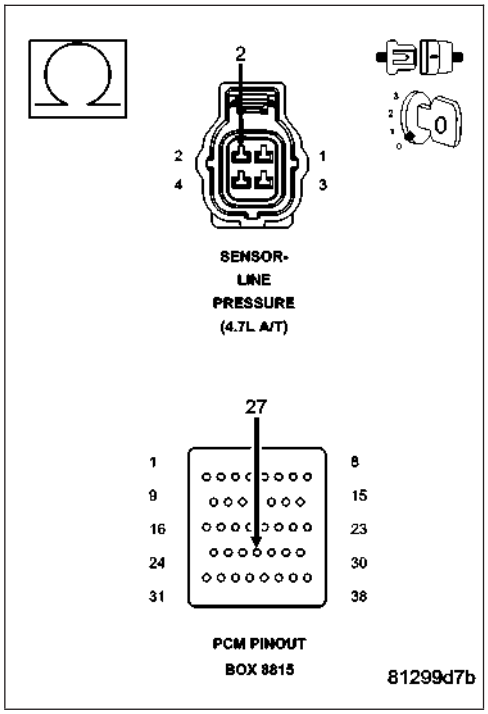
Disconnect the PCM C1 harness connector and connect Miller tool #8815.

Measure the resistance of the (F856) 5-volt Supply circuit between Line Pressure sensor harness connector and the appropriate terminal of Miller tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Repair the (F856) 5-volt Supply circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5



5. (F856) 5-VOLT SUPPLY CIRCUIT SHORT TO GROUND

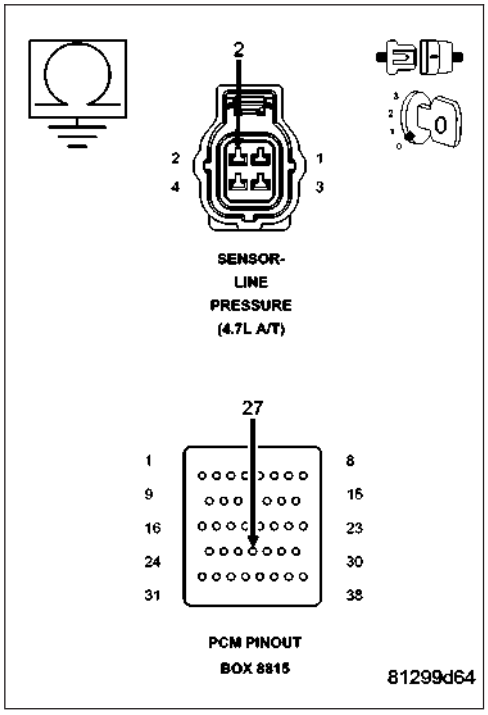
Disconnect the PCM C1 harness connector and connect Miller tool #8815.

Measure the resistance between ground and the (F856) 5-volt Supply circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (F856) 5-volt Supply circuit for a short to ground.
Perform (NGC) 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.



P0934-LINE PRESSURE SENSOR CIRCUIT LOW (CONTINUED)

6. INTERMITTENT WIRING AND CONNECTORS

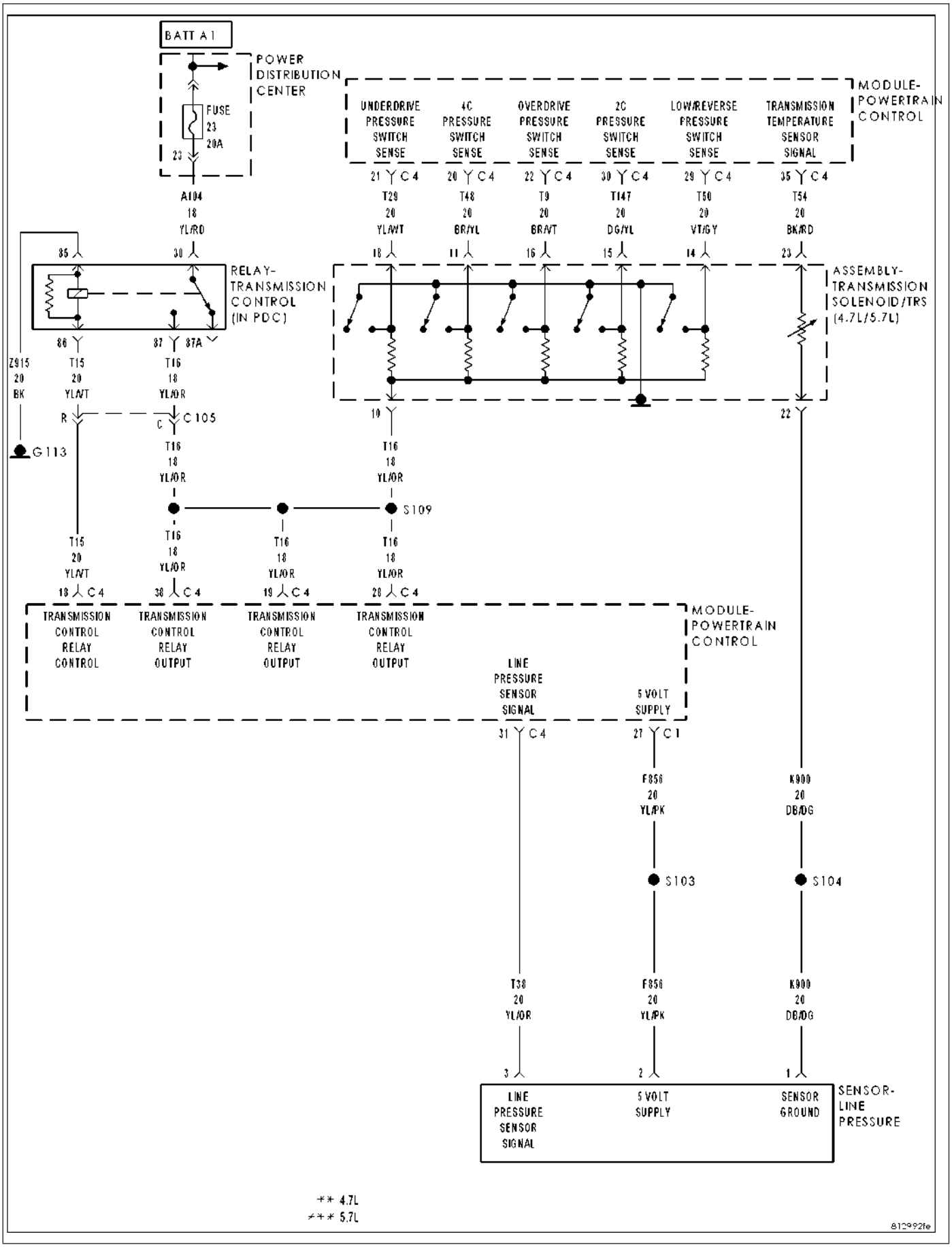
The conditions necessary to set this DTC are not present at this time.
Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.
Wiggle the wires while checking for shorted and open circuits.
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Where there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0935-LINE PRESSURE SENSOR CIRCUIT HIGH



P0935-LINE PRESSURE SENSOR CIRCUIT HIGH (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously with ignition on and engine running.
- **Set Condition:**This DTC will set if the monitored Line Pressure Sensor voltage is greater than or equal to 4.75 volts for the period of 0.18 seconds

Possible Causes
(T38) LINE PRESSURE SENSOR SIGNAL CIRCUIT OPEN
(K900) SENSOR GROUND CIRCUIT OPEN
(T38) LINE PRESSURE SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE
LINE PRESSURE SENSOR
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

Line pressure is electronically controlled by the Transmission Control System and is measured by the Line Pressure Sensor (LPS). The desired line pressure is continuously being compared to the actual line pressure and is regulated by electronically changing the duty cycle of the Pressure Control Solenoid (PCS). (5% duty cycle = solenoid off = max line pressure, 62% duty cycle = solenoid on = min line pressure).

The Transmission Control System calculates the desired line pressure based on inputs from the transmission and engine. A calculated torque input to the transmission is used as the primary input of the desired line pressure calculation and is called Torque Based Line Pressure. In addition, the line pressure is set to a preset level 827 to 931 kPa (120 to 135 PSI) during shifts and in Park and Neutral to ensure consistent shift quality.

The monitored Line Pressure Sensor voltage should always be between 0.35 and 4.75 volts. Any monitored voltages outside these parameters indicate an Line Pressure Sensor or wiring problem and will cause either DTC P0934 or P0935 to set.

Diagnostic Test

1. CHECK TO SEE IF DTC IS CURRENT

With the scan tool, Check the STARTS SINCE SET counter for P0935.

NOTE: This counter only applies to the last DTC set.

Is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 2

No >> Go To 6

P0935-LINE PRESSURE SENSOR CIRCUIT HIGH (CONTINUED)

2. PCM AND WIRING

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the scan tool, monitor the Line Pressure.

Using the Transmission Simulator, set the rotary switch to each of the 3 line pressure positions.

NOTE: The readings should be within ±14 kPa or 2.0 PSI on the scan tool of the pressure reading specified on Transmission Simulator.

Does the 3 line pressures on the scan tool match the Line pressure readings on the Transmission Simulator?

Yes >> Replace the Line Pressure Sensor per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 3

---

3. (K900) SENSOR GROUND CIRCUIT OPEN

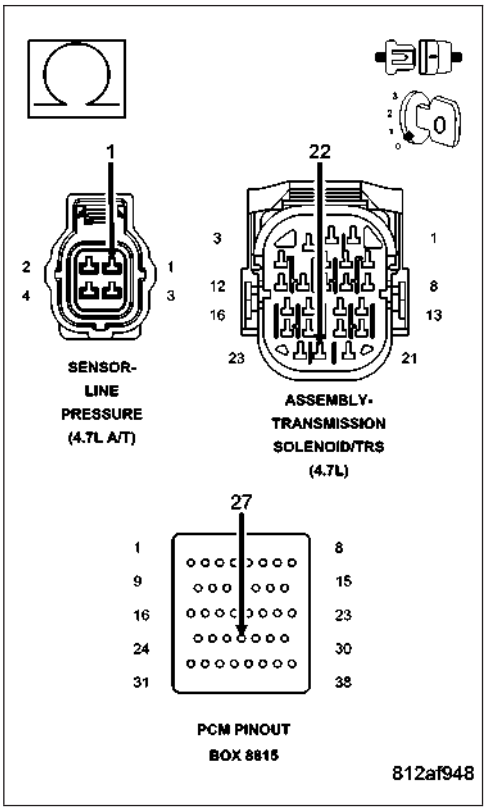
Turn the ignition off to the lock position.

Disconnect the Transmission Simulator, Miller tool #8333.

Disconnect the PCM C2 harness connector and connect Miller tool #8815.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Measure the resistance of the (K900) Sensor Ground circuit from the Line Pressure Sensor harness connector to the appropriate terminal of Miller tool #8815.



Is the resistance above 5.0 ohms?

Yes >> Repair the (K900) Sensor Ground circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 4

P0935-LINE PRESSURE SENSOR CIRCUIT HIGH (CONTINUED)

4. (T38) LINE PRESSURE SENSOR SIGNAL CIRCUIT OPEN

Disconnect the PCM C4 harness connector and connect Miller tool #8815.

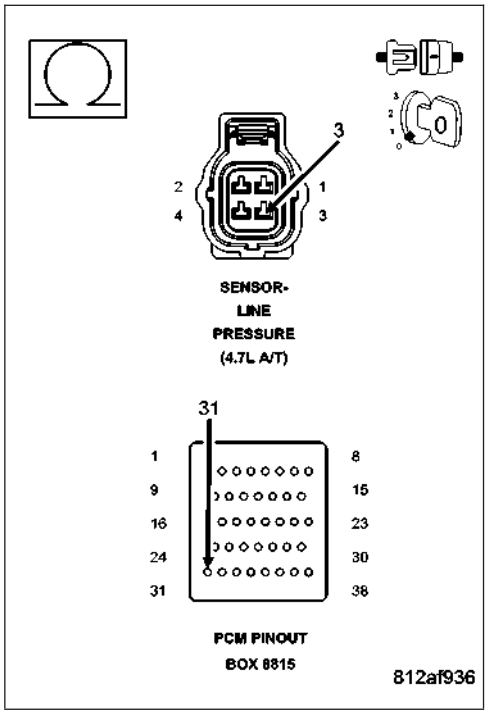
Measure the resistance of the (T38) Line Pressure Sensor Signal circuit from the Line Pressure Sensor harness connector to the appropriate terminal of Miller tool #8815.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T38) Line Pressure Sensor Signal circuit for an open.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5



5. (T38) LINE PRESSURE SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE

Remove the Transmission Control Relay.

Connect a jumper wire between the (A104) Fused B+ circuit and the (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

Ignition on, engine not running.

Measure the voltage of the (T38) Line Pressure Sensor Signal circuit.

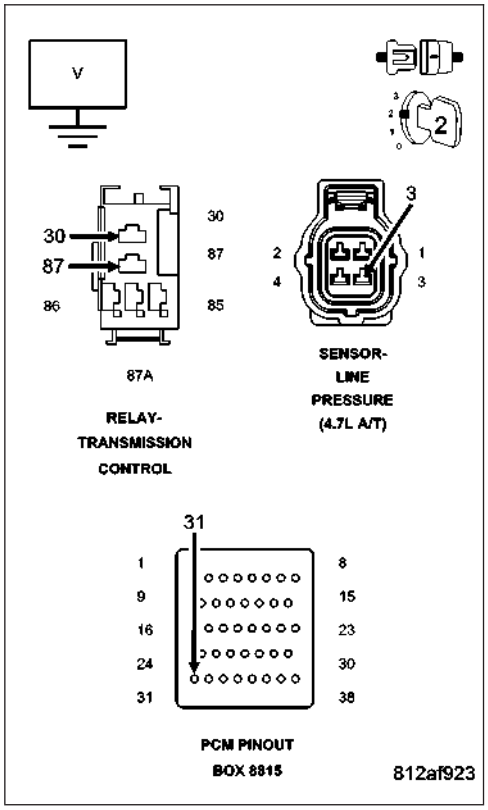
Is the voltage above 5.5 volts?

Yes >> Repair the (T38) Line Pressure Sensor Signal circuit for a short to voltage.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.



P0935-LINE PRESSURE SENSOR CIRCUIT HIGH (CONTINUED)

6. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.
Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.
Wiggle the wires while checking for shorted and open circuits.
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Where there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0944-LOSS OF HYDRAULIC PUMP PRIME

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  If the transmission is slipping in any forward gear and all the pressure switches are not indicating pressure, a loss of prime test is run.
- **Set Condition:**
  If the transmission begins to slip in a forward gear and all the pressure switch(s) that should be closed are open a loss of prime test begins. Available elements are turned on by the PCM to see if pump prime exists. The DTC sets if no pressure switch(s) respond.

Possible Causes
SHIFT LEVER OUT OF ADJUSTMENT
INPROPER FLUID LEVEL
CRACKED OR IMPROPERLY INSTALLED PRIMARY OIL FILTER OR SEAL
LOOSE COOLER RETURN FILTER
STUCK OR STICKING MAIN REGULATOR VALVE
TRANSMISSION OIL PUMP

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Loss of prime test is used to prevent transmission defaults and erroneous fault codes during temporary loss of pump prime that may occur with low transmission fluid under severe braking conditions, start-up, etc. and to point towards more subtle problems such as a plugged or cracked oil filter.

The Loss of Prime DTC is set by a loss of hydraulic pressure in the transmission system. This condition, if sustained, will result in the vehicle being unable to move.

Diagnostic Test

1. SHIFT LEVER POSITION TEST

Using the scan tool, perform a Shift Lever Position test. Follow the instructions on the scan tool.

Did the Shift Lever Position Test pass?

Yes >> Go To 2

No >> Refer to the Transmission category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0944-LOSS OF HYDRAULIC PUMP PRIME (CONTINUED)

2. CHECK TO SEE IF DTC P0944 IS CURRENT

Place the gear selector in Park.

Start the engine.

The transmission must be at operating temperature prior to checking pressure. A cold transmission will give higher readings.

Run the engine at 1500 RPM.

With the scan tool, monitor the Transmission Line Pressure.

Does the Line Pressure match the Desired Line Pressure within ± 5 psi?

No >> Go To 6

Yes >> Go To 3

---

3. CHECK LINE PRESSURE IN DRIVE AND REVERSE

Firmly apply the brake and repeat the previous test in both Drive and the Reverse gear positions.

With the scan tool, monitor the Transmission Line Pressure.

Does the Line Pressure match the Desired Line Pressure within ± 5 psi in all gear ranges?

Yes >> Go To 4

No >> Go To 5

---

4. REVIEW CUSTOMER COMMENTS

The conditions necessary to set this DTC are not present at this time.

Verify with the customer if a delayed engagement and/or an intermittent ″No Drive″ condition has occurred.

If the customers answer is ″No″ erase the DTC and return the vehicle to the customer.

Make sure to check for any TSBs or controller flash updates that my apply.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Has the customer experienced any delayed engagement and/or ″No Drive″ conditions?

Yes >> Repair internal transmission as necessary. Replace the Transmission Oil Pump if inspection reveals no signs of internal seal leakage. Refer to the Service Information for the proper repair procedure.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

---

5. DTC VERIFICATION

Read and record the DTC and the EATX DTC EVENT DATA information.

Test drive the vehicle and attempt to operate the vehicle within the parameters in which the DTC set.

With the scan tool, read DTCs.

Did any following DTCs set, P0868, P0944, P0841, P0846, P0871, P0876, or P0988?

Yes >> Go To 6

No >> Test Complete.

P0944-LOSS OF HYDRAULIC PUMP PRIME (CONTINUED)

6. CHECK TRANSMISSION OIL FILTER

Remove and inspect the Transmission Oil Pan per the Service Information.

Remove and inspect the Primary Oil Filter per the Service Information.

Inspect the oil filter seal for damage and proper installation.

Does the Oil Pan contain excessive debris and/or is the Oil Filter plugged or seal damaged?

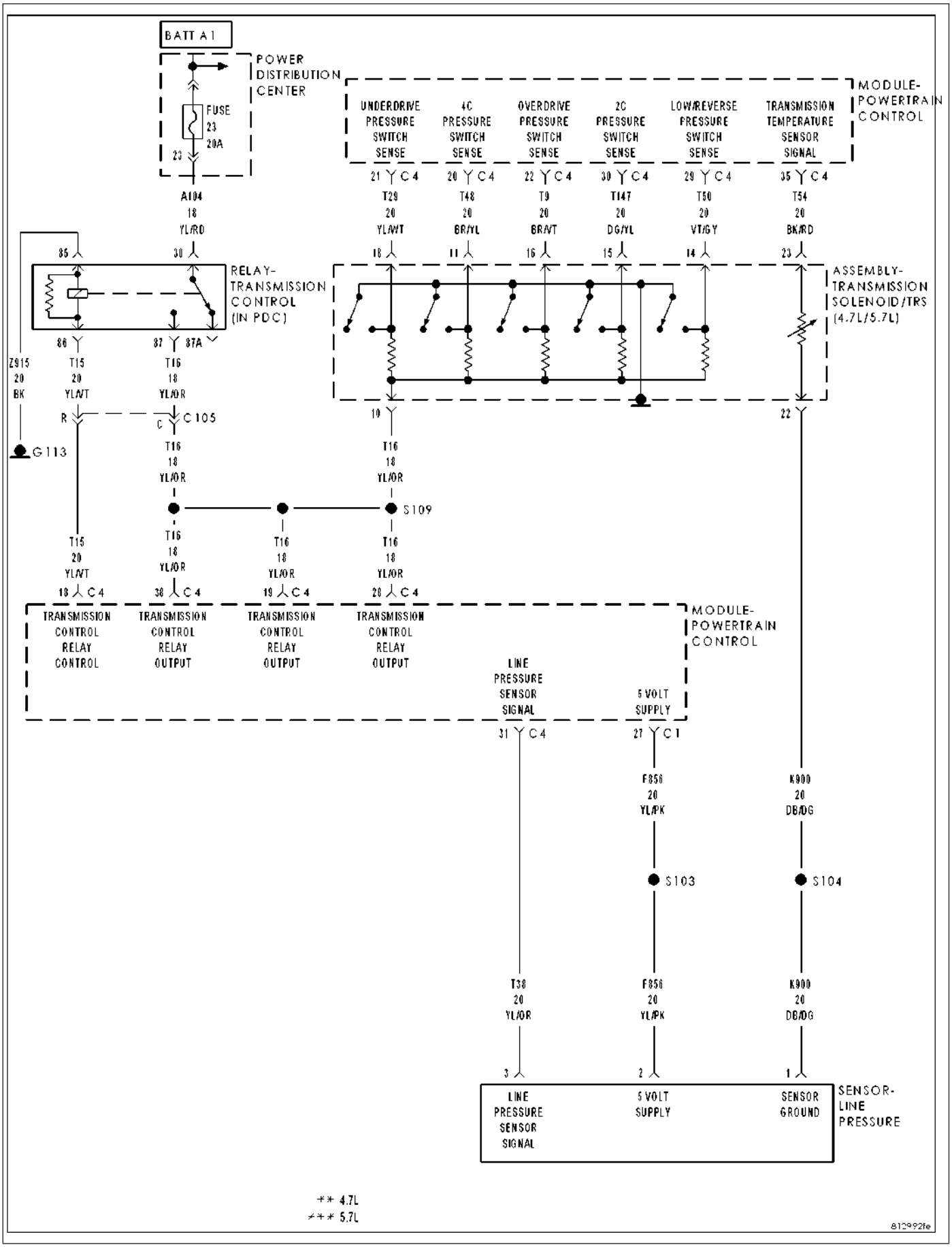
Yes >> Repair the cause of the plugged transmission oil filter or excessive debris. Check the Transmission Oil Filter seal for improper installation onto filter neck instead of into the pump bore, not fully seated against pump housing, filter neck not engaged into pump. Repair as necessary.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Repair the Transmission Oil Pump as necessary. Check for a stuck main regulator valve and clean if necessary. Refer to the Service Information for the proper repair procedure.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0987-4C HYDRAULIC PRESSURE TEST



P0987-4C HYDRAULIC PRESSURE TEST (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  In any forward gear with engine speed above 1000 RPM shortly after a shift and every minute thereafter.
- **Set Condition:**
  After a shift into a forward gear, with engine speed above 1000 RPM, the PCM momentarily turns on element pressure to the Clutch circuits that don't have pressure to identify the correct Pressure Switch closes. If the Pressure Switch does not close 2 times, the DTC sets.

Possible Causes
LINE PRESSURE SENSOR
TRANSMISSION FLUID CONTAMINATION
RELATED DTC'S PRESENT
TRANSMISSION SOLENOID/TRS ASSEMBLY
EXCESSIVE DEBRIS IN OIL PAN
POOR LINE PRESSURE SENSOR CONNECTION
TRANSMISSION CONTROL RELAY DTCS PRESENT
(T48) 4C PRESSURE SWITCH SENSE CIRCUIT OPEN
(F856) 5-VOLT SUPPLY CIRCUIT OPEN
(T48) 4C PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND
(F856) 5-VOLT SUPPLY CIRCUIT SHORT TO GROUND
(T48) 4C PRESSURE SWITCH SENSE CIRCUIT SHORT TO OTHERS
TRANSMISSION SOLENOID/TRS ASSEMBLY
INTERNAL TRANSMISSION
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Transmission Control System tests the pressure switches when they are off. The test verifies that the switches are operational (They will close with pressure applied). The Transmission Control System verifies that the switch closes when the corresponding element is applied. If a switch fails to close, it is re-tested. If it fails the second test, the DTC will set, the MIL will illuminate and the transmission system will default to the orderly Shutdown routine.

Diagnostic Test

1. DETERMINING IF RELATED DTC'S ARE PRESENT

With the scan tool, check for other transmission DTC's

Is there any Loss of Prime, Transmission Control Relay, and/or Line Pressure Sensor DTCs present?

Yes >> Refer to the Transmission category and perform the appropriate symptom. If the DTC P0944 is present, perform its respective test first.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

P0987-4C HYDRAULIC PRESSURE TEST (CONTINUED)

2. DTC P0770 PRESENT

With the scan tool, check Transmission DTCs.

Is the DTC P0770 also present?

Yes >> Refer to the symptom list and perform diagnostics for P0770.

No >> Go To 3

---

3. OTHER DTCS PRESENT

With the scan tool, check for other transmission DTC's

Are the DTCs P0988 and/or P1736 present also?

Yes >> Go To 12

No >> Go To 4

---

4. CHECK TO SEE IF DTC P0987 IS CURRENT

With the scan tool, check if the DTC P0987-4C HYDRAULIC PRESSURE TEST FAILURE is active or stored.

Is the DTC P0987-4C HYDRAULIC PRESSURE TEST FAILURE active?

Yes >> Go To 5

No >> Go To 17

---

5. LINE PRESSURE STAYS THE SAME

Start the engine.

Warm the transmission to 82° C or 180° F.

Firmly apply the brakes.

With the scan tool, monitor the Line Pressure during the following step.

Move the shift lever to each gear position, pausing momentarily in each position and record the line pressure reading. Allow the pressure to stabilize for at least 5 seconds in each range.

Did the line pressure remain at a steady value between 585 and 655 kPa or 85 and 95 PSI in each position?

Yes >> Go To 6

No >> Go To 10

---

6. CHECK LINE PRESSURE SENSOR CONNECTION

Ignition on, engine not running.

With the scan tool, monitor the Line Pressure while firmly pushing the Transmission Line Pressure Sensor connector inwards towards the Transmission.

Did the Line Pressure reading on the scan tool change to about 207 kPa or 30 PSI when the connector was pushed inward?

Yes >> Disconnect and properly reconnect the Line Pressure Sensor connector. Inspect terminals and repair as necessary.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 7

P0987-4C HYDRAULIC PRESSURE TEST (CONTINUED)

7. LINE PRESSURE SENSOR OPERATION

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

With the Transmission Simulator select the ″OFF″ position on the ″Input/Output Speed″ switch.

Ignition on, engine not running.

With the scan tool, monitor the Line Pressure while turning the Pressure Switch selector to each of the 3 line pressure positions on the Transmission Simulator.

NOTE: All three scan tool Line Pressure readings should be steady and ±14 kPa or 2.0 PSI of the reading specified on the Transmission Simulator.

Did the scan tool Line Pressure readings match the specified readings on the Transmission Simulator and remain steady in all three positions?

Yes >> Replace the Line Pressure Sensor per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 8

---

8. (F856) 5-VOLT SUPPLY CIRCUIT OPEN

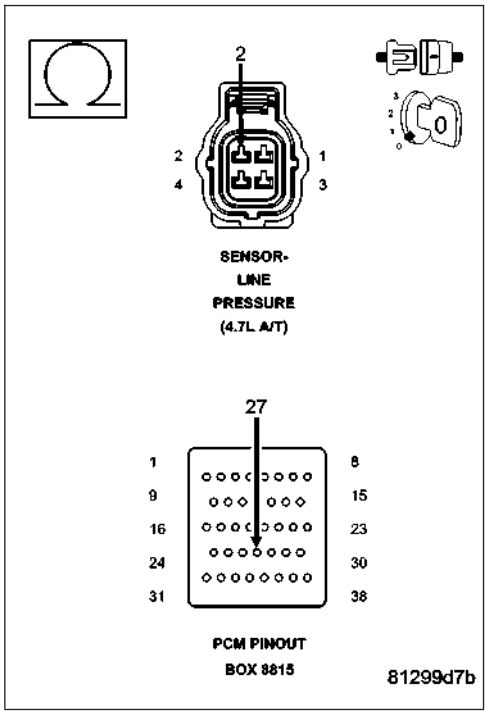
Turn the ignition off to the lock position.

Disconnect Transmission Simulator.

Disconnect the PCM C1 harness connector and connect Miller tool #8815.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Measure the resistance of the (F856) 5-volt Supply circuit from the Line Pressure Sensor harness connector to the appropriate terminal of Miller tool #8815.



Is the resistance above 5.0 ohms?

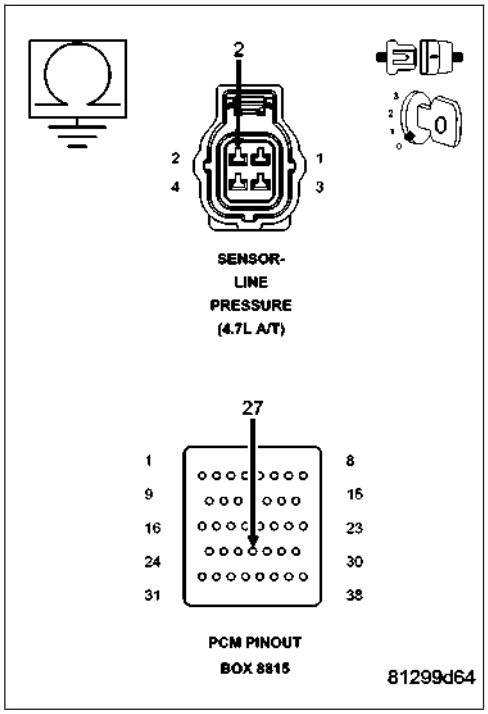
Yes >> Repair the (F856) 5-volt Supply circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 9

P0987-4C HYDRAULIC PRESSURE TEST (CONTINUED)

9. (F856) 5-VOLT SUPPLY CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (F856) 5-volt Supply circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (F856) 5-volt Supply circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

10. COMPARE SCAN TOOL TO PRESSURE GAUGE

Turn the ignition off to the lock position.

Connect the Line Pressure Adapter, Miller tool #8259 and 0-300 psi Test Gauge, Miller tool #C-3293-SP. Refer to the Service Information for proper installation procedure.

CAUTION: Apply parking brake.

Start the engine.

In the following steps, compare the scan tool Line Pressure to the Pressure Gauge readings in each gear.

CAUTION: Do not overheat transmission.

With the gear selector in park, raise the RPM to 1500, and compare line pressure readings.

Firmly apply the brakes, move the gear selector into reverse, raise the RPM to 1500, and compare the line pressure readings.

Firmly apply the brakes, move the gear selector into drive, raise the RPM to 1500, and compare the line pressure readings.

Does the scan tool Line Pressure readings match the Pressure Gauge readings ± 10 psi?

Yes >> Go To 11

No >> Replace the Line Pressure Sensor per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0987-4C HYDRAULIC PRESSURE TEST (CONTINUED)

11. WIRING AND CONNECTORS

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Failure to remove the Starter Relay can cause a Transmission - No Response condition.

Remove the Line Pressure Adapter, Miller tool #8259 and 0-300 psi Test Gauge, Miller tool #C-3293-SP.

Install the Transmission Simulator, Miller tool #8333.

On the Transmission Simulator, turn the Pressure Switch selector switch to 4C.

Ignition on, engine not running.

With the scan tool, monitor the 4C Pressure Switch state while pressing and holding the Pressure Switch test button and wiggling the wire harness and connectors that pertain to the 4C Pressure Switch.

Did the 4C Pressure Switch state change to closed and remain closed while wiggling the wires?

Yes >> Go To 12

No >> Go To 14

---

12. CHECK FOR EXCESSIVE DEBRIS

Turn the ignition off to the lock position.

Remove the Transmission Simulator, Miller tool #8333.

Remove and inspect the Transmission Oil Pan per the Service Information.

Does the Transmission Oil Pan contain excessive debris or contamination?

Yes >> Repair the cause of the excessive debris in the Transmission Oil Pan. Refer to the Service Information for the proper procedures.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 13

---

13. CHECK 4C HYDRAULIC CLUTCH CIRCUIT

Remove the Valve Body and air check the 4C hydraulic clutch circuit (in the case) for leakage per the Service Information.

NOTE: The 4C hydraulic clutch circuit contains a small bleed orifice. A small amount of air leakage is normal.

Was there excessive air leakage noticed during the air check?

Yes >> Repair as necessary. Check the 4C clutch piston, piston seals and bleed orifice assembly.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Disassemble and inspect the Valve Body and repair as necessary. Inspect the 4C Accumulator piston and seals. If no problems are found in the Valve Body, replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0987-4C HYDRAULIC PRESSURE TEST (CONTINUED)

14. (T48) 4C PRESSURE SWITCH SENSE CIRCUIT OPEN

Turn the ignition off to the lock position.

Remove the Transmission Simulator, Miller tool #8333 and connect Miller tool #8815.

Disconnect the PCM C4 harness connector.

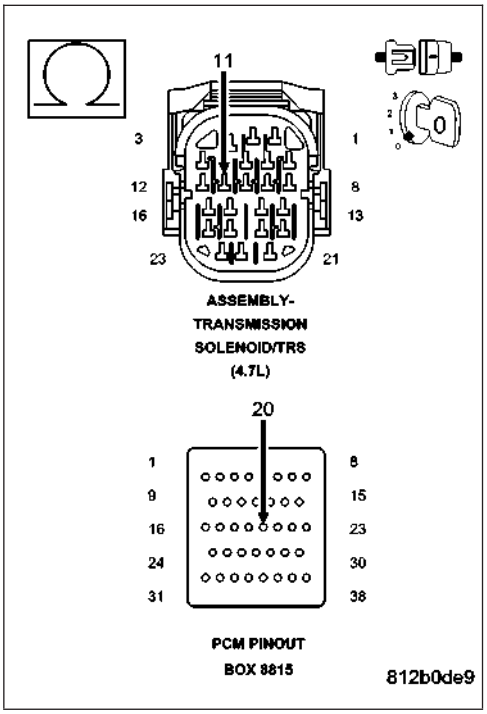
Measure the resistance of the (T48) 4C Pressure Switch Sense circuit from the Transmission Solenoid/TRS Assembly harness connector to the appropriate terminal of Miller tool #8815.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T48) 4C Pressure Switch Sense circuit for an open.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 15



15. (T48) 4C PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND

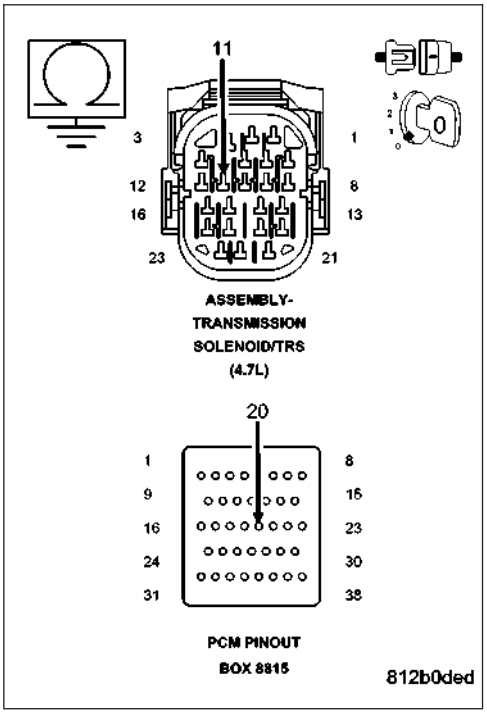
Measure the resistance between ground and the (T48) 4C Pressure Switch Sense circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (T48) 4C Pressure Switch Sense circuit for a short to ground.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 16



P0987-4C HYDRAULIC PRESSURE TEST (CONTINUED)

16. (T48) 4C PRESSURE SWITCH SENSE CIRCUIT SHORT TO OTHER CIRCUITS

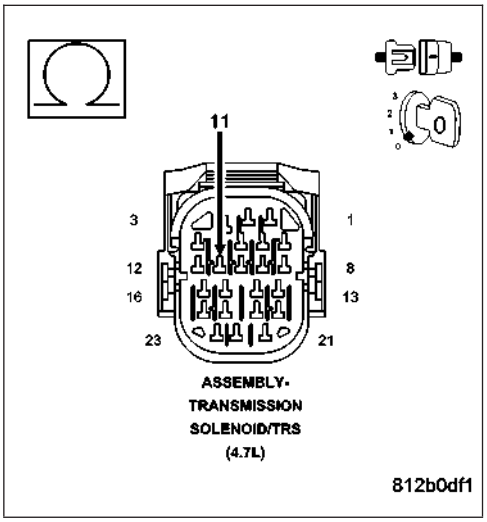
Disconnect all PCM harness connectors.

Disconnect the Transmission Solenoid/TRS Assembly harness connector.

NOTE: Make sure the Transmission Solenoid/TRS Assembly harness connector is disconnected.

NOTE: Check connectors - Clean/repair as necessary.

Measure the resistance between the (T48) 4C Pressure Switch Sense circuit and all other circuits in the Transmission Solenoid/TRS Assembly harness connector.



Is the resistance below 5.0 ohms between the (T48) 4C Pressure Switch Sense circuit and any other circuit(s) in the Transmission Solenoid/TRS Assembly harness connector?

Yes >> Repair the (T48) 4C Pressure Switch Sense circuit for a short to other circuit(s).
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

17. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

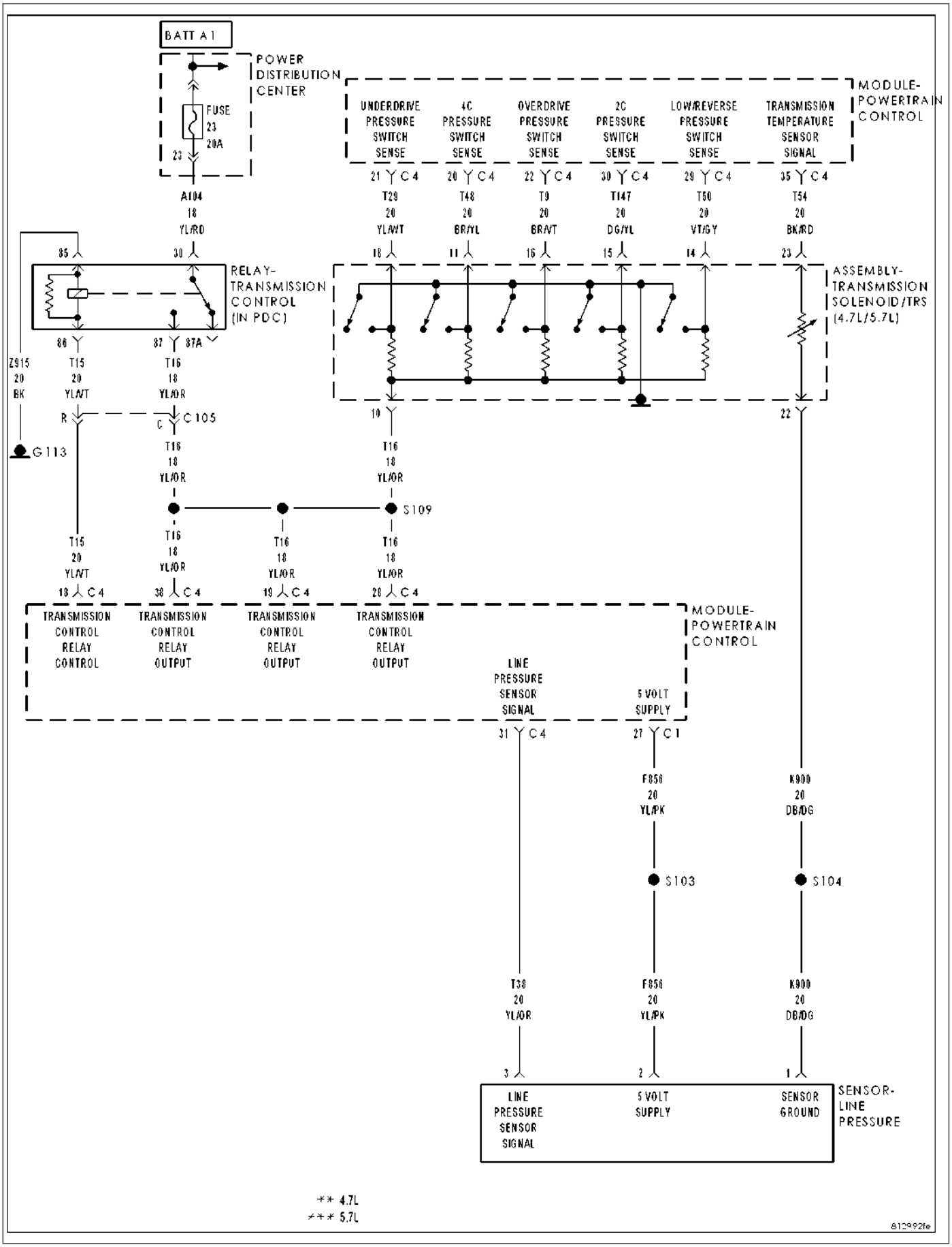
If the EATX DTC EVENT DATA shows the DTC P0987 set while the Line Pressure was significantly below the Desired Line Pressure reading, check for causes of low line pressure (low fluid level, broken or mis-installed primary oil filter or filter seal, sticking Main Regulator Valve in the Pump Valve Body etc.). If the data shows the DTC set while the Line Pressure reading was significantly higher than the Desired Line Pressure, check the Line Pressure Sensor and related wiring.

Where there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0988-4C PRESSURE SWITCH RATIONALITY



P0988-4C PRESSURE SWITCH RATIONALITY (CONTINUED)

For the Transmission circuit diagram (Refer to)(Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously with the ignition on, engine running, with the transmission in gear.
- **Set Condition:**
  The DTC is set if the 4C Pressure Switch reads open or closed at the wrong time in a given gear.

Possible Causes
RELATED RELAY DTC'S PRESENT
DTC P0871 ALSO PRESENT
LOSS OF 12-VOLT FEED
(T48) 4C PRESSURE SWITCH SENSE CIRCUIT OPEN
(T48) 4C PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND
EXCESSIVE FLUID LEAKAGE WITH 2C CLUTCH CIRCUIT
#5 AND/OR #7 CHECK BALL CUT OR DAMAGED
LOW LINE PRESSURE
TRANSMISSION SOLENOID/TRS ASSEMBLY
POWERTRAIN CONTROL MODULE
WIRING AND CONNECTORS

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Transmission system uses five pressure switches to monitor the fluid pressure in the LR, 2C, 4C, UD, and OD clutch circuits. The pressure switches are continuously monitored for the correct states in each gear as shown.

GEAR	L/R	2C	4C	UD	OD
REVERSE	OPEN	OPEN	OPEN	OPEN	OPEN
P/N	CLOSED	OPEN	OPEN	OPEN	OPEN
1ST	CLOSED*	OPEN	OPEN	CLOSED	OPEN
2ND	OPEN	CLOSED	OPEN	CLOSED	OPEN
2ND PRIME	OPEN	OPEN	CLOSED	CLOSED	OPEN
DRIVE	OPEN	OPEN	OPEN	CLOSED	CLOSED
4TH	OPEN	OPEN	CLOSED	OPEN	CLOSED
5TH	OPEN	CLOSED	OPEN	OPEN	CLOSED

*L/R is closed if output speed is below 100 rpm in Drive and Manual 2. L/R is open in Manual 1.

P0988-4C PRESSURE SWITCH RATIONALITY (CONTINUED)

Diagnostic Test

1. DETERMINING IF RELATED RELAY DTC'S ARE PRESENT

With the scan tool, check for other transmission DTC's.

Are there any Transmission Control Relay related DTC's present?

Yes >> Refer to the Transmission category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. EATX DTC DATA SHOW CURRENT DTC

With the scan tool, check the EATX DTC EVENT DATA.

Does the EATX DTC EVENT DATA show data for DTC P0988?

Yes >> Go To 3

No >> Refer to the Transmission category and perform the appropriate symptom shown in the EATX DTC EVENT DATA.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

3. MULTIPLE DTCS PRESENT

With the scan tool, check for other transmission DTC's.

Are there two or more related Pressure Switch Sense DTCs present in addition to P0988?

Yes >> Go To 4

No >> Go To 7

---

4. RELATED DTC PRESENT

With the scan tool, check the EATX DTC EVENT DATA for P0988.

NOTE: Make sure to record all EATX DTC EVENT DATA stored in the scan tool for future reference in this test procedure.

Do all the pressure switches read CLOSED in the EATX DTC EVENT DATA for P0988?

Yes >> Refer to Transmission category and perform diagnostics for the DTC P0888.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5

---

5. EATX DTC EVENT DATA READ OPEN

In the EATX DTC EVENT DATA recorded earlier, read the state of all pressure switches.

Do all the pressure switches read OPEN?

Yes >> Go To 6

No >> Go To 7

P0988-4C PRESSURE SWITCH RATIONALITY (CONTINUED)

6. LOW LINE PRESSURE

In the EATX DTC EVENT DATA recorded earlier, compare the Line Pressure and the Desired Line Pressure.

Is the Line Pressure less than 40 psi, and significantly below the Desired Line Pressure?

Yes >> Repair as necessary to correct low line pressure. Check fluid level and adjust as necessary. If fluid level is OK, check the Primary Oil Filter seal for a split, crack, or improperly installed. If the filter and seal are OK, check the Main Regulator Valve in the Oil Pump. Refer to the Service Information for the above procedures.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

7. DTC P0871 ALSO PRESENT

With the scan tool, check Transmission DTCs.

Is the DTC P0871 also present?

Yes >> Refer to the Transmission category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 8

---

8. EATX DTC EVENT DATA READ PARK REVERSE OR NEUTRAL

With the scan tool, check the EATX DTC EVENT DATA for P0988.

NOTE: Make sure to record all EATX DTC EVENT DATA stored in the scan tool for future reference in this test procedure.

Does the EATX DTC EVENT DATA show the DTC set in Park, Neutral, or Reverse for P0988?

Yes >> Go To 13

No >> Go To 9

---

9. EATX DTC EVENT DATA READ CLOSED

With the scan tool, check the EATX DTC EVENT DATA for P0988.

NOTE: Make sure to record all EATX DTC EVENT DATA stored in the scan tool for future reference in this test procedure.

Does the EATX DTC EVENT DATA show the 4C Pressure Switch reading CLOSED?

Yes >> Go To 11

No >> Go To 10

P0988-4C PRESSURE SWITCH RATIONALITY (CONTINUED)

10. PRIMARY OIL FILTER SEAL

In the EATX DTC EVENT DATA recorded earlier, compare the Line Pressure and the Desired Line Pressure.

Is the Line Pressure less than 40 psi, and significantly below the Desired Line Pressure?

Yes >> Repair as necessary to correct low line pressure. Check fluid level and adjust as necessary. If fluid level is OK, check the Primary Oil Filter seal for a split, crack, or improperly installed. If the filter and seal are OK, check the Main Regulator Valve in the Oil Pump. Refer to the Service Information for the above procedures.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 15

---

11. PCM AND WIRING

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the Transmission Simulator, turn the Pressure Switch selector switch to the 4C position.

With the scan tool, monitor the 4C Pressure Switch while pressing the Pressure Switch test button on the Transmission Simulator.

Did the state of the 4C Pressure Switch change while pressing the Pressure Switch Test button?

Yes >> Go To 12

No >> Go To 13

---

12. TRANSMISSION SOLENOID/TRS ASSEMBLY

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

Where there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0988-4C PRESSURE SWITCH RATIONALITY (CONTINUED)

13. (T48) 4C PRESSURE SWITCH SENSE CIRCUIT OPEN

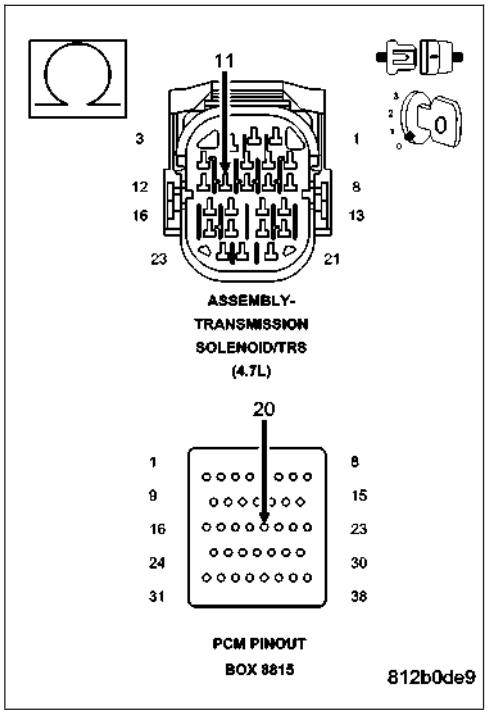
Turn the ignition off to the lock position.

Disconnect the Transmission Simulator, Miller tool #8333.

Disconnect the PCM C4 harness connector.

NOTE: Check connectors - Clean/repair as necessary.
Connect Miller tool #8815 to the PCM C4 harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.
Measure the resistance of the (T48) 4C Pressure Switch Sense circuit from the appropriate terminal of Miller tool #8815 to the Transmission Solenoid/TRS Assembly harness connector.



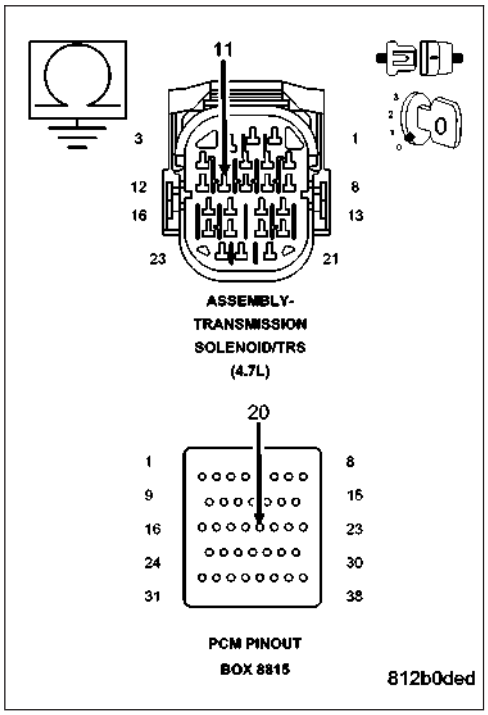
Is the resistance above 5.0 ohms?

Yes >> Repair the (T48) 4C Pressure Switch Sense circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 14

14. (T48) 4C PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T48) 4C Pressure Switch Sense circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (T48) 4C Pressure Switch Sense circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the Powertrain Control Module per the Service Information. With the scan tool, perform the QUICK LEARN procedure.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0988-4C PRESSURE SWITCH RATIONALITY (CONTINUED)

15. #5 AND/OR #7 CHECK BALL CUT OR DAMAGED

Turn the Ignition off to the lock position.

Remove the Valve Body Assembly per the Service Information.

Inspect the #5 and #7 check balls for any cuts or damage.

Inspect the 4C accumulator piston and seals and also the 4C tower seal on top of the valve body. Refer to the Service Information.

Where there any problems found?

Yes >> Repair as necessary. Check for excessive clutch debris in the transmission oil pan. If excessive clutch debris is present, repair 4C clutch as necessary. Refer to the Service Information for proper repair procedures.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 16

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16. EXCESSIVE FLUID LEAKAGE WITH 4C CLUTCH CIRCUIT

Air check the 4C Clutch hydraulic circuit. Refer to the Service Information.

NOTE: This hydraulic clutch circuit contains a small bleed orifice. Small leakage is considered normal.

Was there excessive air leakage in the 4C Clutch hydraulic circuit?

Yes >> Repair as necessary. Refer to the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P1684-BATTERY WAS DISCONNECTED

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Whenever the ignition is in the Run/Start position.
- **Set Condition:**
  This DTC will set whenever Powertrain Control Module is disconnected from Fused B+ or ground. It will also be set during the DRBIII® Battery Disconnect and/or Quick Learn procedure.

Possible Causes
BATTERY WAS DISCONNECTED
SCAN TOOL BATTERY DISCONNECT PERFORMED
PCM WAS REPLACED OR DISCONNECTED
QUICK LEARN WAS PERFORMED

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The PCM uses a battery backed RAM (Random Access Memory) is used to maintain some learned values. When the battery B(+) is disconnected, the memory is lost. When the B(+) is restored, this memory loss is detected by the Transmission Control System. The DTC is set and the learned values are initialized to known constants or previously learned values from EEPROM (Electronic Erasable Programmable Read Only Memory). This results in the reinitialization of some parameters.

Diagnostic Test

1. POSSIBLE CAUSES

This DTC is an informational DTC only.

This DTC is set due to a momentary loss of power and/or the ground circuits to the PCM.

Below are a list of possible causes associated with this DTC.

Battery was disconnected.

The BATTERY DISCONNECT feature on the scan tool was performed.

The QUICK LEARN feature on the scan tool was performed.

PCM was replaced or disconnected.

Were any of the above possible causes performed?

Yes >> This is the cause of the DTC. Erase the DTC and return vehicle to customer. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

P1684-BATTERY WAS DISCONNECTED (CONTINUED)

2. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

NOTE: Check all power and ground circuits to the PCM for a intermittent or high resistance condition.
Wiggle the wires while checking for shorted and open circuits.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Where there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P1715-RESTRICTED MANUAL VALVE IN T3 RANGE

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Whenever the PRNDL code indicates Temp3.
- **Set Condition:**
  This DTC sets when conditions for the DTC P1776 are satisfied or 3 unsuccessful attempts to engage 1st gear while the shifter is in the temp3 zone. This indicates a restricted port at the manual valve because the shifter is not fully engaged in the drive position.

Possible Causes
RELATED TRANSMISSION DTC'S PRESENT
CUSTOMER DRIVING HABITS
MISADJUSTED SHIFTER

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. DETERMINING IF RELATED DTC'S ARE PRESENT

With the scan tool, check for other transmission DTC's

Are any of the following DTC's P0731, P0732, P0733, P0734, P1736 or P0715 present?

Yes >> Refer to the Transmission category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK SHIFTER ADJUSTMENT

Check Shifter adjustment per the Service Information.

Is the shifter properly adjusted?

Yes >> Go To 3

No >> Adjust the Shifter Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P1715-RESTRICTED MANUAL VALVE IN T3 RANGE (CONTINUED)

3. CHECK CUSTOMER DRIVING HABIT

This DTC can be set if the customer rests their hand on the shift lever while they are driving. The transmission can be put in the T3 position if just enough forward pressure is exerted on the shift lever.

When this occurs, the feed port to the clutch is restricted, the transmission will declare neutral, and this DTC will be set. The customer should be informed not to rest their hand on the shifter while driving.

This DTC can also be set by simply bumping the shift lever toward neutral while accelerating.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

If there are no possible causes remaining, view repair.

Repair

This DTC can be set by putting too much forward pressure on the shift lever while it is in the OD position. Make sure the customer is informed.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P1736-GEAR RATIO ERROR IN 2ND PRIME

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on, engine running, with the transmission in gear.
- **Set Condition:**
  If the ratio of the Input RPM to the Output RPM does not match the current gear ratio. This DTC can take up to five minutes of problem identification before illuminating the MIL

Possible Causes
RELATED DTC'S PRESENT
INPUT SPEED SENSOR OR WIRING
LOW FLUID LEVEL
CRACKEC OR MISINSTALLED PRIMARY OIL FILTER OR SEAL
WORN SOLENOID SWITCH VALVE OR PLUGS
STUCK OR STICKING MAIN REGULATOR VALVE
BURNED UD OR 4C CLUTCH
CUT 4C OR UD PISTON SEAL
BROKEN 4C PISTON CASTING
BROKEN OR MISSING 4C BLEED ORIFICE
BROKEN OR MISSING UD BLEED ORIFICE
CUT 4C OR UD ACCUMULATOR PISTON SEAL
CRACKED 4C OR UD ACCUMULATOR PISTON
EXTRA CHECK BALL IN PASSAGE DOWNSTREAM OF #7 CHECK BALL POCKET
TRANSMISSION SOLENOID/TRS ASSEMBLY
BROKEN WELD - REACTION CARRIER TO REVERSE SUN GEAR
MISSING TEETH ON INPUT CLUTCH HUB TONE WHEEL

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The transmission system uses two speed sensors, one to measure input RPM and one to measure output RPM. These inputs are essential for proper transmission operation. Therefore, the integrity of this data is verified through the following checks:

1) When in gear, if the gear ratio does not compare to a known gear ratio, the corresponding in-gear trouble code is set (DTCs P0731–36).

2) An excessive change in input or output speeds indicating signal intermittent which may result in the DTCs P0715 and/or P0720 to set.

3) If the common speed sensor ground circuit is lost, both sensor inputs will read the signal from the input speed sensor at idle in neutral. Since the input speed sensor reads 60 teeth from the input clutch hub and the output speed sensor reads 30 teeth from the park gear, the result is an apparent speed ratio of 1:2 and may cause the DTC P1794 to set when at a stop.

P1736-GEAR RATIO ERROR IN 2ND PRIME (CONTINUED)

Diagnostic Test

1. DETERMINING IF RELATED DTC'S ARE PRESENT

With the scan tool, check for other transmission DTC's

Are any Transmission: solenoid, line pressure, speed sensor, or loss of prime DTC's present?

Yes >> Refer to appropriate symptom in the Transmission category. Perform the test for P0944–LOSS OF PRIME first if it is present.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK EATX DTC EVENT DATA

With the scan tool, read and record the EATX DTC EVENT DATA.

NOTE: Make sure to record all EATX DTC EVENT DATA stored in the scan tool for future reference in this test procedure.

Does the EATX DTC EVENT DATA display information for the DTC P1736?

Yes >> Go To 3

No >> Go To 6

---

3. CHECK RPM IN EATX DTC EVENT DATA

Refer to the EATX DTC EVENT DATA recorded earlier.

Does the Input RPM read zero?

Yes >> Check the input speed sensor and wiring. Refer to test P0715 and diagnose as if the DTC is current. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 4

---

4. CHECK LINE PRESSURE READING

Refer to the EATX DTC EVENT DATA recorded earlier.

Is the line pressure reading more than 10 psi below the desired line pressure?

Yes >> Go To 5

No >> Go To 6

P1736-GEAR RATIO ERROR IN 2ND PRIME (CONTINUED)

5. PLUGGED TRANSMISSION OIL FILTER

Turn the ignition off to the lock position.

Remove and inspect the Transmission Oil Pan for excessive debris per the Service Information.

Remove and inspect the Primary Oil Filter per the Service Information.

NOTE: Make sure the Primary Transmission Oil Filter and/or seal is not cracked or split.

Does the Oil Pan contain excessive debris and/or is the Primary Oil Filter cracked or plugged?

Yes >> Repair the plugged, cracked, or split Primary Transmission Oil Filter and/or seal. If the Primary Transmission Oil Filter is plugged, refer to the Service Information for the proper hydraulic clutch repair procedure.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Remove the Transmission Oil Pump per the Service Information. Check the main Regulator Valve for sticking in its bore, scoring, and/or damage and clean and repair as necessary. If no problem is found, replace the Transmission Solenoid/TRS Assembly.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

6. CHECK TO SEE IF DTC P1736 IS CURRENT

With the scan tool, perform the 2nd Prime Gear Clutch Test. Follow the instructions on the scan tool.

Increase the throttle angle, TPS Degree, to 30° for no more than a few seconds.

CAUTION: Do not overheat the transmission.

NOTE: If the 4C clutch is faulty, the overrunning clutch will hold and the slip test will pass. The 2nd prime gear clutch test will not detect a faulty 4C clutch. However, it will detect a faulty UD clutch.

Did the clutch test pass, did the Input Speed remain at zero?

Yes >> Go To 7

No >> Go To 9

---

7. CHECK FOR INTERMITTENT OPERATION

Check the Shifter adjustment per the Service Information.

Intermittent gear ratio DTCs can be set by problems in the Input and Output Speed Sensor circuits and/or Speed Sensor Ground circuit.

Check the Speed Sensor wiring and connectors for good connection, then perform a wiggle test using the Transmission Simulator, Miller tool #8333.

Were there any problems found?

Yes >> Repair as necessary.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 8

---

8. CHECK FOR SLIPPAGE

With the scan tool, erase Transmission DTCs.

Road test the vehicle.

Durning the road test, operate in 4th gear, and perform kickdown shifts from 4th to 2nd (prime) gears.

Is there an obvious slippage noticed in 4th or 2nd prime gears, or runaway on the 4-2 shift?

Yes >> Go To 11

No >> Go To 14

P1736-GEAR RATIO ERROR IN 2ND PRIME (CONTINUED)

9. UD CLUTCH HYDRAULIC CIRCUIT

Remove Transmission Oil Pan and check for excessive debris.

Remove the Valve Body and air check the UD clutch hydraulic circuit (in the case) per the Service Information.

NOTE: The UD clutch passage contains a small bleed orifice, a small amount of air leakage is normal.

Were there any problems found, excessive debris and/or excessive air leakage in the UD clutch hydraulic circuit?

Yes >> Repair as necessary. Check the UD clutch piston seals and the dribbler assembly, reaction shaft support seal rings, and the flatness of the pump valve body and pump housing faces. Check main regulator valve for sticking in the bore.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 10

---

10. UD ACCUMULATOR PISTON

Check the UD bleed orifice, accumulator piston, and accumulator piston seal in the main valve body.

Were there any problems found?

Yes >> Repair as necessary. Refer to the Service Information for proper repair procedures.

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

11. EXCESSIVE DEBRIS

Remove the Transmission Oil Pan and check for excessive debris.

Remove the valve body and air check the 4C clutch hydraulic circuit per the Service Information.

NOTE: The 4C clutch passage contains a small bleed orifice, a small amount of air leakage is normal.

Were there any problems found, excessive debris, improperly assembled 4C clutch and/or excessive air leakage in the 4C clutch hydraulic circuit?

Yes >> Repair as necessary. Refer to the Service Information for proper repair procedures. Note: Check the 4C piston seals and bleed orifice.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 12

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12. 4C ACCUMULATOR

Check the 4C Accumulator piston for cracks or a cut seal.

Check for a cut or missing #7 or #5 check balls.

Check the Solenoid Switch Valve and its plugs for sticking in its bore or excessive wear.

Were there any problems found

Yes >> Repair as necessary. Refer to the Service Information for proper repair procedures.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 13

P1736-GEAR RATIO ERROR IN 2ND PRIME (CONTINUED)

13. CHECK FOR BROKEN REVERSE SUN GEAR WELD

Working through the windows in the bottom of the case, check for a broken Reverse Sun gear weld to the reaction carrier as follows:

(1) Hold the Transmission Output Shaft by holding the Transmission Manual Lever in the park position.

(2) Rotate the Input Annulus gear and drive shell, (the drum that encloses the two rearmost carriers).

(3) Check to see if the reaction carrier (the frontmost carrier, whose outer shell is splined to the 4C clutch) is rotating faster than the drive shell is being turned.

Is the reaction carrier turning faster than the drive shell?

Yes >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the reaction carrier per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

14. CHECK IF DTC RESET

Did the DTC P1736 reset during the road test?

Yes >> Go To 15

No >> Go To 16

---

15. LIST OF POSSIBLE CAUSES

If any other DTC's set during the road test, refer to the appropriate symptom in the Transmission category.

If no other DTC's set during the road test, below is a list of possible causes, but not strictly limited to those:

Check for excessive debris in the Transmission Oil pan, plugged, cracked, or split Primary Transmission Oil Filter and/or O-ring.

Check for cuts or missing #7 and #5 check balls in the main valve body.

Check the 4C and UD accumulator pistons and seals, UD bleed orifice, and the Solenoid Switch Valve and Plugs in the main valve body.

Check the UD clutch piston seals, reaction shaft support seal rings, and the flatness of the pump valve body and pump housing faces.

Check the 4C clutch piston seals, and bleed orifice.

Check the UD clutch piston seals, reaction shaft support seal rings, and dribbler assemblies, and the flatness of the pump valve body and pump housing faces.

View repair

Repair

Repair as necessary. Refer to the Service Information for proper repair procedures.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P1736-GEAR RATIO ERROR IN 2ND PRIME (CONTINUED)

16. INTERMITTENT DTC

The conditions necessary to set this DTC are not present at this time.

Use the EATX DTC EVENT DATA to help identify the conditions and/or possible causes that may have caused the DTC to set.

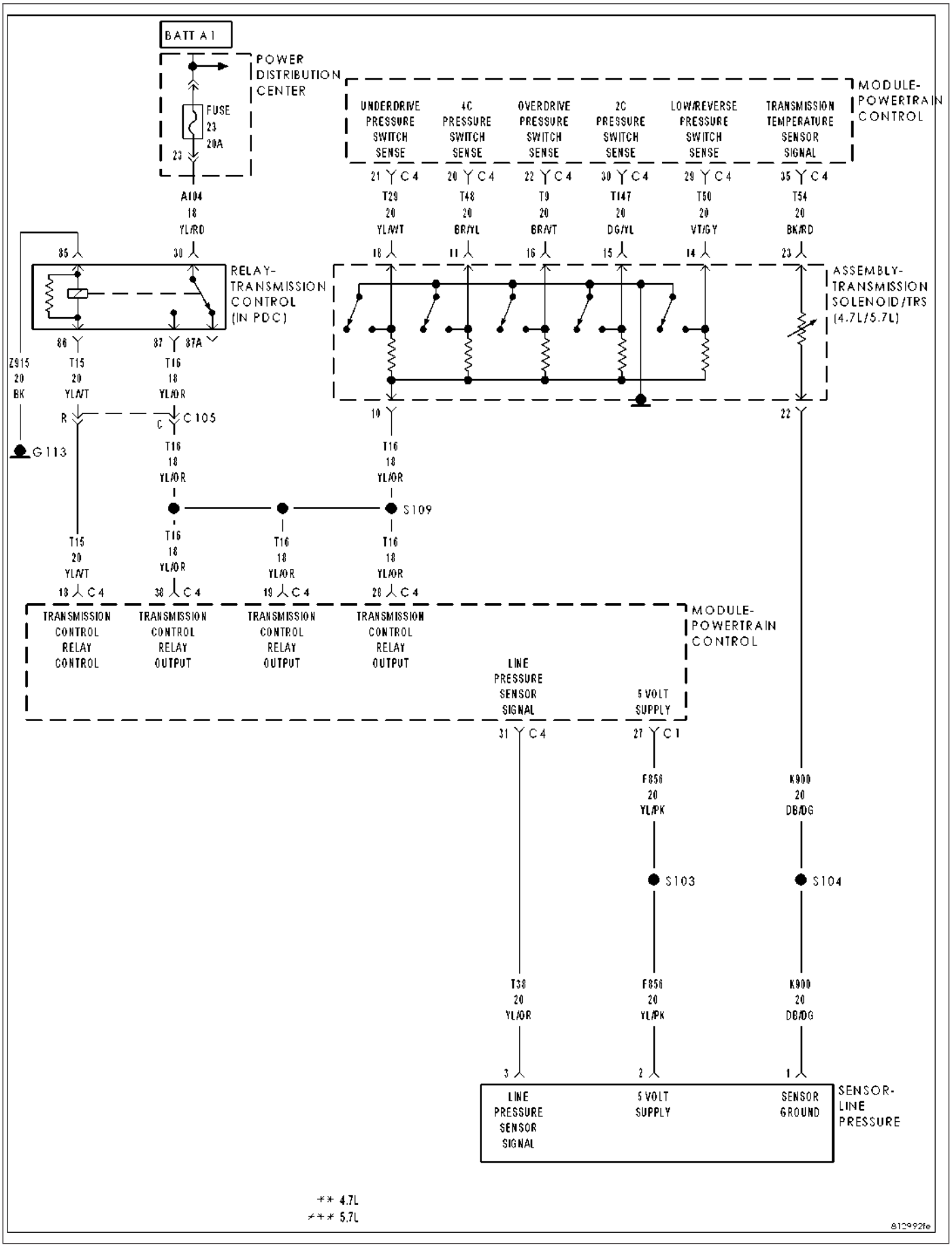
Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

Where there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P1775-SOLENOID SWITCH VALVE LATCHED IN TCC POSITION



P1775-SOLENOID SWITCH VALVE LATCHED IN TCC POSITION (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  During an attempted shift into 1st gear.
- **Set Condition:**
  This DTC is set if three unsuccessful attempts are made to shift the Solenoid Switch Valve (SSV) into the downshifted position in one given ignition start. This DTC can take up to five minutes to mature before illuminating the MIL.

Possible Causes
RELATED DTC P0841 PRESENT
SOLENOID SWITCH VALVE STICKING
LR PRESSURE SWITCH SENSE CIRCUIT SHORT TO OTHER CIRCUITS
TRANSMISSION SOLENOID/TRS ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Solenoid Switch Valve (SSV) controls the direction of the transmission fluid when the L/R Solenoid is energized. The SSV will be in the downshifted position in 1st gear, thus directing the fluid to the L/R clutch circuit. In 2nd through 5th gears, it will be in the upshifted position and directing the fluid into the torque converter clutch (TCC).

When shifting into 1st gear, a special hydraulic sequence is performed to ensure SSV movement into the downshifted position. The L/R Pressure Switch is monitored to confirm SSV movement. If movement is not confirmed (the L/R pressure switch does not close), EMCC is inhibited until SSV operation is confirmed.

Diagnostic Test

1. DETERMINING IF RELATED DTC'S ARE PRESENT

With the scan tool, check for other transmission DTC's

Is the DTC P0841 present also?

Yes >> Refer to the Transmission category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK TO SEE IF DTC P1775 IS CURRENT

Perform a visual inspection of all connectors, wiring, and cooler connections before proceeding. Repair as necessary.

With the scan tool, Check the STARTS SINCE SET counter.

NOTE: This counter only applies to the last DTC set.

Is the STARTS SINCE SET counter for P1775 at 2 or less?

Yes >> Go To 3

No >> Go To 6

P1775-SOLENOID SWITCH VALVE LATCHED IN TCC POSITION (CONTINUED)

3. PCM AND WIRING

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the Transmission Simulator, turn the Pressure Switch selector switch to LR.

With the scan tool, monitor the LR Pressure Switch state while pressing the Pressure Switch Test button on the Transmission Simulator.

Did the state of the L/R Pressure Switch change while pressing the Pressure Switch Test button?

Yes >> Go To 4

No >> Go To 5

---

4. SOLENOID SWITCH VALVE STICKING

Turn the ignition off to the lock position.

Remove the Transmission Oil Pan per the Service Information.

Remove the Transmission Valve body per the Service Information.

Inspect the Solenoid Switch Valve and Plugs for sticking.

Is the Solenoid Switch Valve or Plugs sticking?

Yes >> Clean and inspect per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P1775-SOLENOID SWITCH VALVE LATCHED IN TCC POSITION (CONTINUED)

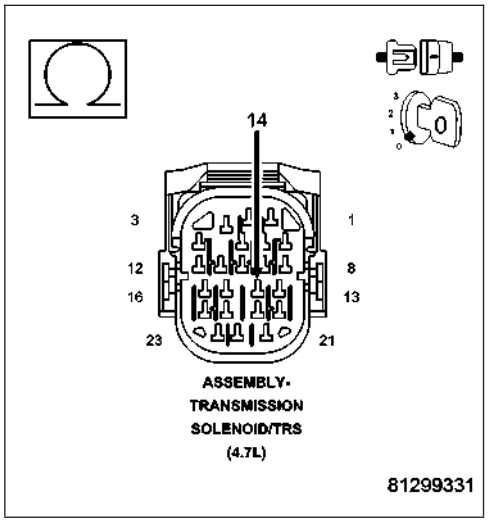
5. LR PRESSURE SWITCH SENSE CIRCUIT SHORT TO OTHER CIRCUITS

Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid/TRS Assembly harness connector.

Disconnect all PCM harness connectors.

Measure the resistance between the (T50) LR Pressure Switch Sense circuit and all other circuits in the Transmission Solenoid/TRS Assembly harness connector.



Is the resistance below 5.0 ohms between the (T50) LR Pressure Switch Sense circuit and all other circuit(s) in the Transmission Solenoid/TRS Assembly harness connector?

Yes >> Repair the (T50) LR Pressure Switch Sense circuit for a short to other circuit(s).
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

6. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

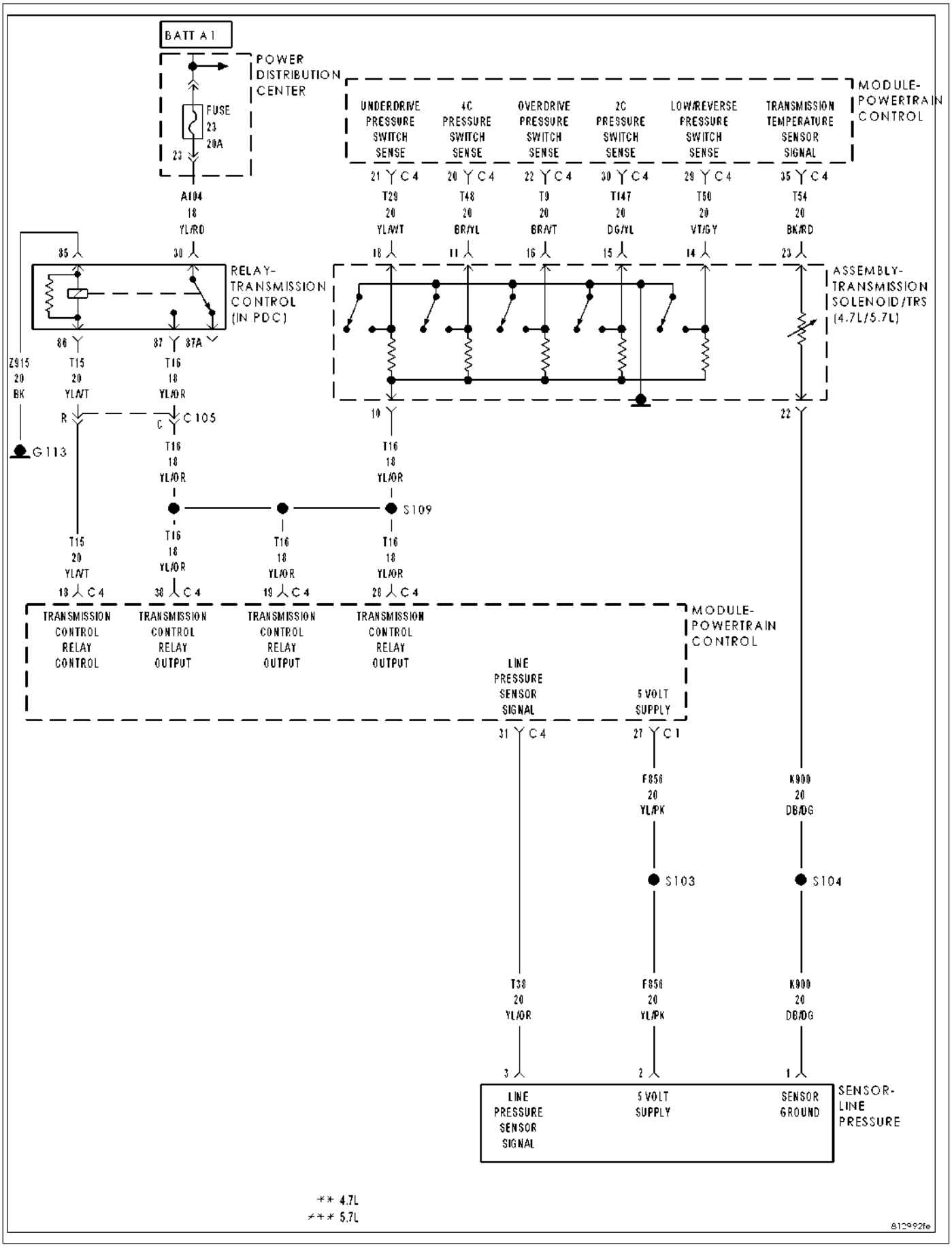
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Where there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P1776-SOLENOID SWITCH VALVE LATCHED IN LR POSITION



P1776-SOLENOID SWITCH VALVE LATCHED IN LR POSITION (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously when performing partial or full EMCC - PEMCC or FEMCC.
- **Set Condition:**
  If the transmission senses the L/R pressure switch closing while performing PEMCC or FEMCC. This DTC will set after two unsuccessful attempts to perform PEMCC or FEMCC. This DTC can take up to five minutes of problem identification before illuminating the MIL.

Possible Causes
RELATED DTC P0841 PRESENT
LR PRESSURE SWITCH SENSE CIRCUIT OPEN
LR PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND
SOLENOID SWITCH VALVE
POWERTRAIN CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Solenoid Switch Valve (SSV) controls the direction of the transmission fluid when the L/R Solenoid is energized. The SSV will be in the downshifted position in 1st gear, thus directing the fluid to the L/R clutch circuit. In 2nd through 5th gears, it will be in the upshifted position and directing the fluid into the torque converter clutch (TCC).

When in 2nd, 2nd Prime, 3rd, 4th, or 5th gear, the Torque Converter Clutch (TCC) can be engaged when certain conditions are met. The TCC piston is electronically modulated by increasing the duty cycle of the L/R solenoid until the torque converter slip difference (difference between engine and transmission input speed) is within 60 RPM. Then the L/R solenoid is fully energized (FEMCC / 100% duty cycle). Torque converter slip is monitored in FEMCC to ensure adequate clutch capacity.

Diagnostic Test

1. DETERMINING IF RELATED DTC'S ARE PRESENT

With the scan tool, check for other transmission DTC's

Is the DTC P0841 present also?

Yes >> Refer to the Transmission category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

P1776-SOLENOID SWITCH VALVE LATCHED IN LR POSITION (CONTINUED)

2. CHECK TO SEE IF DTC P1776 IS CURRENT

With the scan tool, Check the STARTS SINCE SET counter.

NOTE: NOTE: This counter only applies to the last DTC set.

Is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 3

No >> Go To 7

---

3. PCM AND WIRING

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the Transmission Simulator, turn the Pressure Switch selector switch to the LR position.

With the scan tool, monitor the LR Pressure Switch state while pressing the Pressure Switch Test button on the Transmission Simulator.

Did the state of the LR Pressure Switch change while pressing the Pressure Switch Test button?

Yes >> Go To 4

No >> Go To 5

---

4. SOLENOID SWITCH VALVE

Remove the Valve Body per the Service Information.

Inspect the Solenoid Switch Valve and plugs for sticking in the bore and/or wear.

Were there any problems found?

Yes >> Clean and repair as necessary per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 7

P1776-SOLENOID SWITCH VALVE LATCHED IN LR POSITION (CONTINUED)

5. LR PRESSURE SWITCH SENSE CIRCUIT OPEN

Turn the ignition off to the lock position.

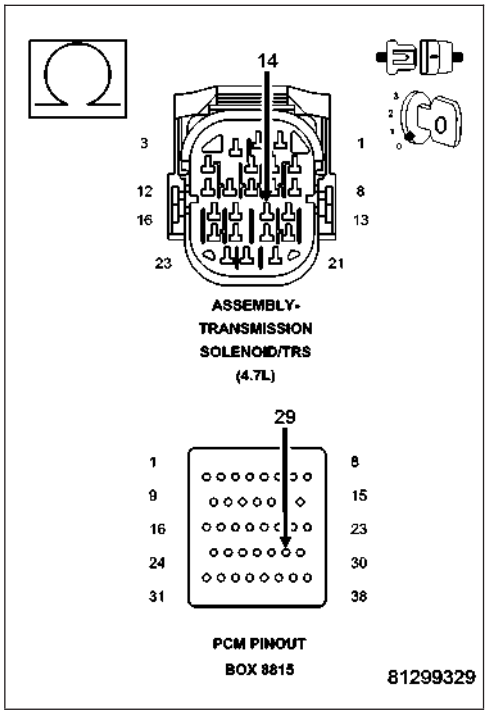
Disconnect the Transmission Simulator, Miller tool #8333.

Disconnect the PCM C4 harness connector and connect Miller tool #8815.

NOTE: Note: Check connectors - Clean/repair as necessary.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Measure the resistance of the (T50) LR Pressure Switch Sense circuit between the appropriate terminal of Miller tool #8815 to the Solenoid/ TRS Assembly harness connector.



Is the resistance above 5.0 ohms?

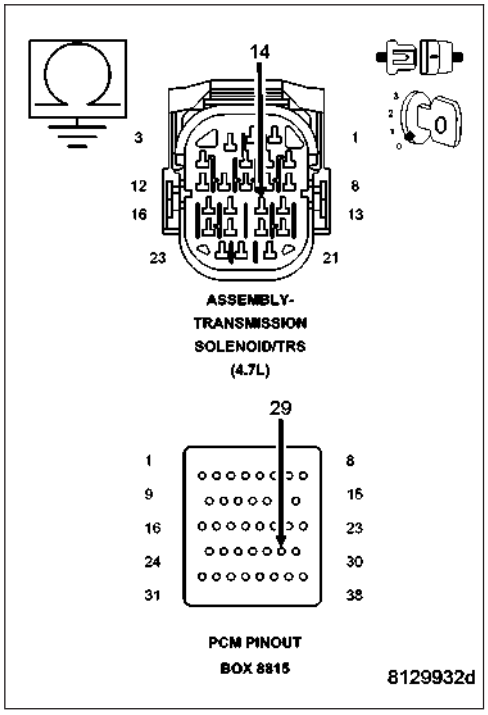
Yes >> Repair the (T50) LR Pressure Switch Sense circuit for an open.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 6

6. (T50) LR PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T50) LR Pressure Switch Sense circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (T50) LR Pressure Switch Sense circuit for a short to ground.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P1776-SOLENOID SWITCH VALVE LATCHED IN LR POSITION (CONTINUED)

7. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

This DTC can also be set by the Solenoid Switch Valve intermittently sticking in it's bore under extreme temperature conditions, or by a worn Solenoid Switch Valve or plugs.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Where there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P1790-FAULT IMMEDIATELY AFTER SHIFT

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  After a speed ratio error is stored.
- **Set Condition:**
  This DTC is set if the associated speed ratio DTC is stored within 1.3 seconds after a shift.

Possible Causes
FAULT AFTER SHIFT

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

This DTC will only be stored along with a gear ratio DTC. If this DTC is set, it indicates a probable hydraulic (line pressure) or mechanical problem exists. Diagnosing the transmission should be based on the associated speed ratio DTC and mechanical causes should be considered first.

INTENDED GEAR	CLUTCHES APPLYING	RECOMENDED DTC
REVERSE	UD** - MS	P0738
1ST	UD - LR*	P0731
2ND	UD - 2C	P0732
2ND PRIME	UD - 4C	P1736
3RD	UD - OD/MS	P0733
4TH	OD/MS - 2C	P0734
5TH	OD/MS - 2C	P0735

* L/R is used only up to 150 output RPM in 1st gear. ** UD will show as applied in Reverse but the UD clutch is actually released. OD/MS is OD and/or MS.

Diagnostic Test

1. INTENDED GEAR TO APPLIED CLUTCH

With the scan tool, check the EATX DTC EVENT DATA to determine in which gear the slippage occurred and the clutches that were applied.

With the EATX DTC EVENT DATA, use the information provided above to determine the proper symptom for diagnosis.

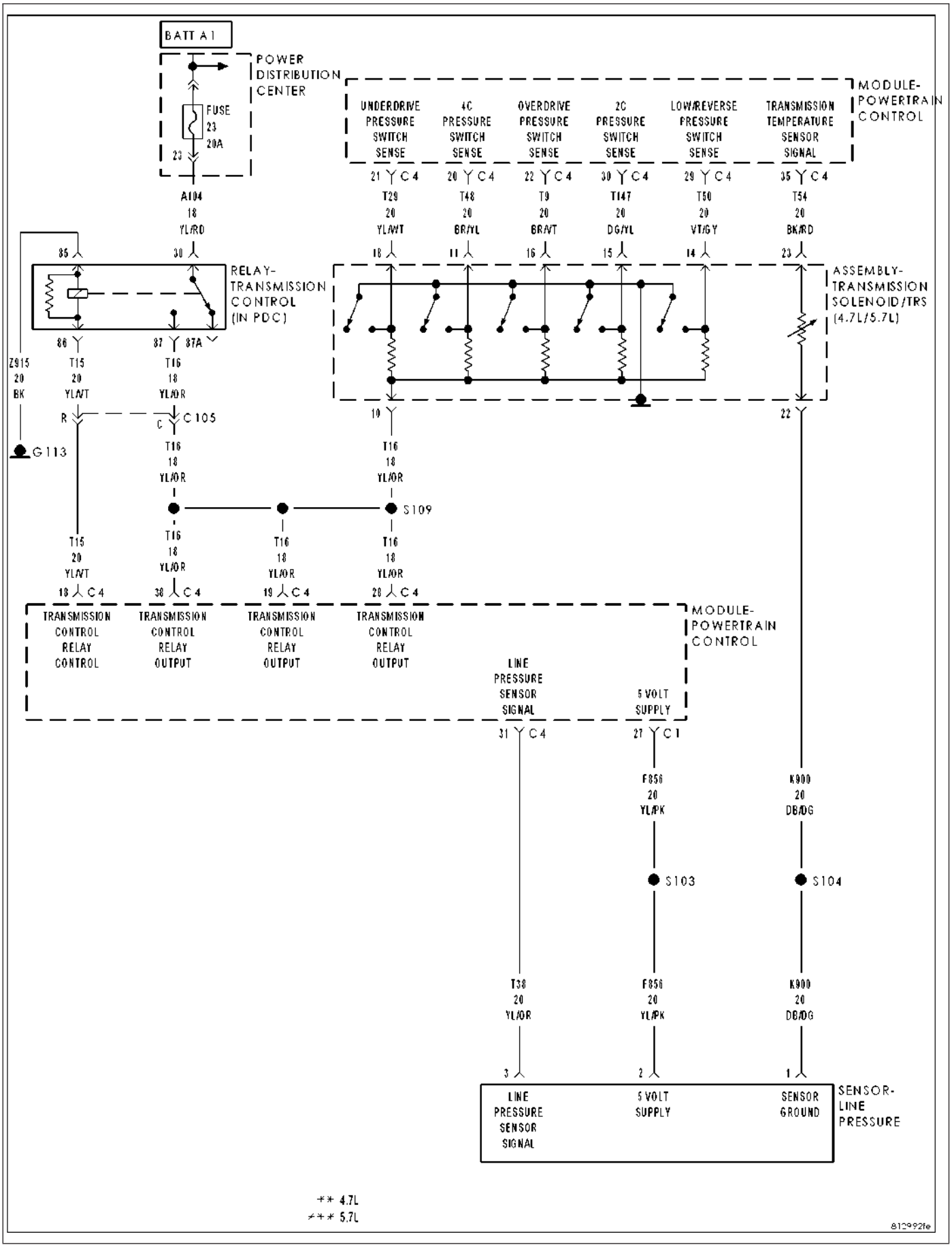
View repair

Repair

Refer to the Transmission category and perform the appropriate symptom identified from the EATX DTC EVENT DATA, intended gear, and applied clutches.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P1794-SPEED SENSOR GROUND ERROR



P1794-SPEED SENSOR GROUND ERROR (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  The gear ratio is monitored continuously while the Transmission is in gear.
- **Set Condition:**
  After a controller reset in neutral and a ratio of input to output, of 1 to 2. This DTC can take up to five minutes of problem identification before illuminating the MIL.

Possible Causes
(T13) SPEED SENSOR GROUND CIRCUIT OPEN
(T13) SPEED SENSOR GROUND CIRCUIT SHORT TO GROUND
(T13) SPEED SENSOR GROUND CIRCUIT SHORT TO VOLTAGE
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The transmission system uses two speed sensors, one to measure input RPM and one to measure output RPM. These inputs are essential for proper transmission operation. Therefore, the integrity of this data is verified through the following checks:

1) When in gear, if the gear ratio does not compare to a known gear ratio, the corresponding in-gear trouble code is set (DTCs P0731–36).

2) An excessive change in input or output speeds indicating signal intermittent which may result in the DTCs P0715 and/or P0720 to set.

3) If the common speed sensor ground circuit is lost, both sensor inputs will read the signal from the input speed sensor at idle in neutral. Since the input speed sensor reads 60 teeth from the input clutch hub and the output speed sensor reads 30 teeth from the park gear, the result is an apparent speed ratio of 1:2 and may cause the DTC P1794 to set when at a stop.

Diagnostic Test

1. CHECK TO SEE IF DTC P1794 IS CURRENT

Engine Running, Shift lever in park.

With the scan tool, read the Transmission Output and Input Speed Sensor states.

Is the Output Speed Sensor reading twice the Input Speed Sensor reading?

Yes >> Go To 2

No >> Go To 6

P1794-SPEED SENSOR GROUND ERROR (CONTINUED)

2. PCM AND WIRING

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool 8333.

NOTE: Check connectors - Clean/repair as necessary.

With the Transmission Simulator, set the Input/Output Speed selector switch to the ″3000/1000″ position. Turn the Input/Output Speed switch to ″ON″.

Ignition on, engine not running.

With the scan tool, monitor the Input and Output Speed Sensor state.

Does the Input speed read 3000 RPM and the Output speed read 1000 RPM, within 50 RPM?

Yes >> Go To 6

No >> Go To 3

---

3. (T13) SPEED SENSOR GROUND CIRCUIT OPEN

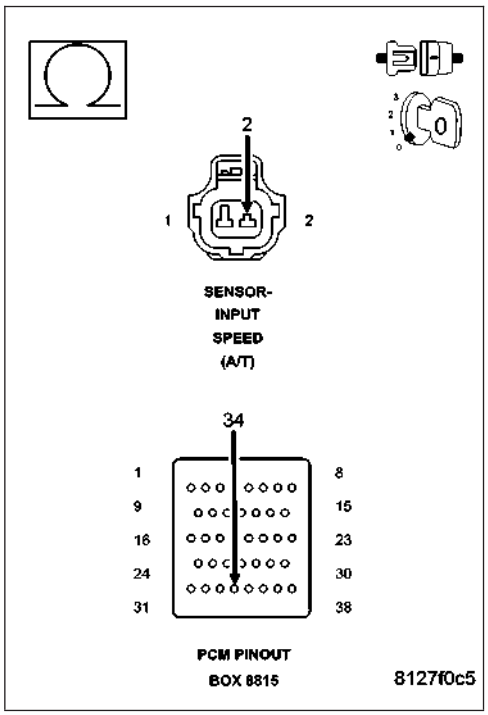
Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector and connect Miller tool #8815.

Disconnect the Transmission Simulator, Miller tool #8333.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Measure the resistance of the (T13) Speed Sensor Ground circuit from the appropriate terminal of Miller tool #8815 to the Transmission Solenoid/TRS Assembly and both Input and Output Speed Sensor harness connectors.



Is the resistance above 5.0 ohms on any of the above measurements?

Yes >> Repair the (T13) Speed Sensor Ground circuit for an open.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 4

P1794-SPEED SENSOR GROUND ERROR (CONTINUED)

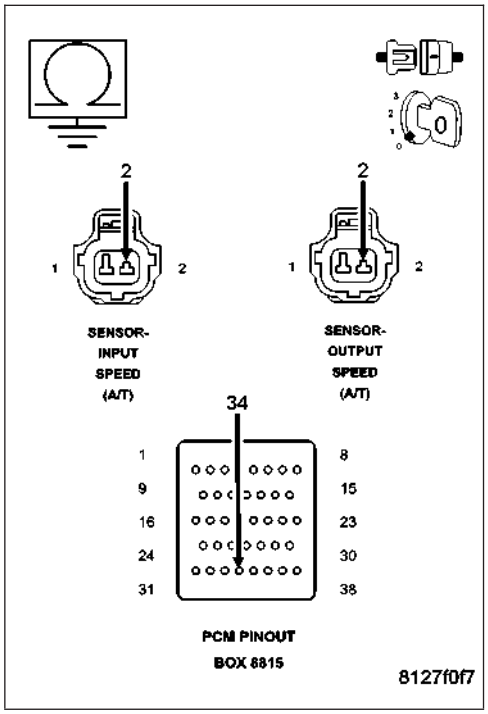
4. (T13) SPEED SENSOR GROUND CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T13) Speed Sensor Ground circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (T13) Speed Sensor Ground circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5



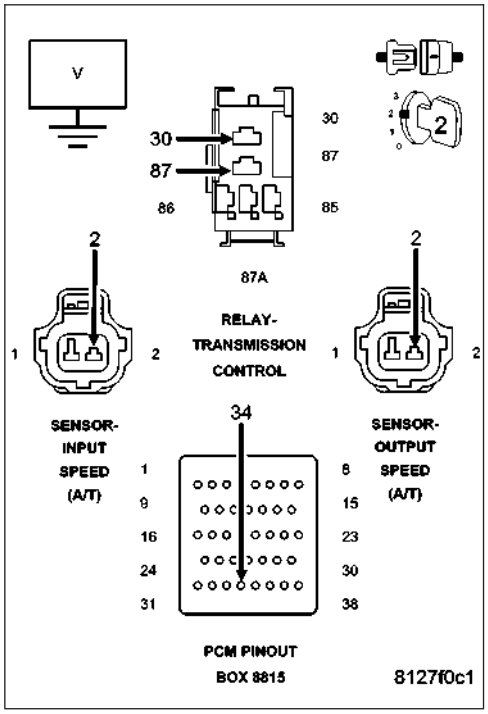
5. (T13) SPEED SENSOR GROUND CIRCUIT SHORT TO VOLTAGE

Ignition on, engine not running.
Measure the voltage of the (T13) Speed Sensor Ground circuit.

Is the voltage above 0.5 volt?

Yes >> Repair the (T13) Speed Sensor Ground circuit for a short to voltage.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.



P1794-SPEED SENSOR GROUND ERROR (CONTINUED)

6. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.
Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.
Wiggle the wires while checking for shorted and open circuits.
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Where there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P2700-INADEQUATE ELEMENT VOLUME LR

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Whenever the engine is running. The LR clutch volume index (CVI) is updated during a 3-1 or 2-1 manual downshift with throttle angle below 5 degrees. Transmission temperature must be at least 43° C (110° F).
- **Set Condition:**
  When the LR clutch volume index (CVI) falls below 16.

Possible Causes
HYDRAULIC LEAK IN THE VALVE BODY
BROKEN L/R CLUTCH PISTON RETURN SPRING OR SPRING RETAINERS
BROKEN L/R ACCUMULATOR SPRING(S)
TRANSMISSION SOLENOID/TRS ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The volumes of the transmission fluid needed to apply the friction elements are continuously monitored and learned for adaptive controls. As the clutch friction material wears, the volume of fluid needed to apply the clutch increases. Certain transmission mechanical problems can cause near-zero learned volumes resulting in setting a DTC. The DTC will usually set with other DTC's, which indicates an internal transmission problem.

Diagnostic Test

1. OTHER DTCS PRESENT

With the scan tool, check for other transmission DTCs.

Are there any Pressure Switch Sense circuit DTCs present also?

Yes >> Refer to the Transmission category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK LR CLUTCH VOLUME INDEX

With the scan tool, erase DTCs.

Start the engine and warm the transmission.

NOTE: The TRANS TEMP DEG must be at least 43° C or 110° F before performing the following steps.
Drive the vehicle and perform at least ten 3-1 manual downshifts at closed throttle from speeds of about 32 Kmh or 20 MPH.

With the scan tool, read the LR CL VOL INDEX.

Is the LR CL VOL INDEX below 20?

Yes >> Go To 3

No >> Go To 5

P2700-INADEQUATE ELEMENT VOLUME LR (CONTINUED)

3. L/R CLUTCH CIRCUIT LEAKS IN THE VALVE BODY

Turn the ignition off to the lock position.
Remove the transmission oil pan per the Service Information.
Remove the valve body per the service information.
Check condition of the L/R accumulator springs.
Look for possible leak paths into the L/R clutch hydraulics circuit within the valve body.

Were any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 4

---

4. AIR CHECK L/R CLUTCH CIRCUITS

Perform an air check on the L/R Clutch circuit per the Service Information.
Watch and listen for L/R Clutch piston movement.

Does the L/R piston stroke and return properly?

Yes >> Replace the Transmission/TRS Solenoid Assembly per the service information. With the scan tool, perform Quick Learn.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Repair internal transmission as necessary. Pay attention to the components related to the L/R clutch. A broken or weak L/R clutch return spring, Accumulator Spring, and/or dislocated snap ring could cause this problem.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

5. VERIFY PCM OPERATION

NOTE: The TRANS TEMP DEG must be at least 43° C or 110° F before performing the following steps.
Perform eight learnable starts. A learnable start is defined as follows: Start engine. From a standstill, accelerate lightly to 80 Kmh or 50 MPH, then brake lightly to a stop. Turn off engine.
With the scan tool, record the CL VOL INDEX (CVI) for all clutches
With the scan tool, perform a BATTERY DISCONNECT.
With the scan tool, read the CVI's and compare them to the readings recorded before the BATTERY DISCONNECT.

Are any of the CVI's less than 5 or different than before the BATTERY DISCONNECT?

Yes >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P2701-INADEQUATE ELEMENT VOLUME 2C

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Whenever the engine is running. The 2C clutch volume index (CVI) is updated during a 3-2 kickdown with throttle angle between 10 and 54 degrees. Transmission temperature must be at least 43° C (110° F).
- **Set Condition:**
  When the 2C CVI falls below 5.

Possible Causes
HYDRAULIC LEAK IN THE VALVE BODY
BROKEN 2C CLUTCH PISTON RETURN SPRING / DISLODGED SNAP RING
BROKEN ACCUMULATOR SPRING(S)
TRANSMISSION SOLENOID/TRS ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The volumes of the transmission fluid needed to apply the friction elements are continuously monitored and learned for adaptive controls. As the clutch friction material wears, the volume of fluid needed to apply the clutch increases. Certain transmission mechanical problems can cause near-zero learned volumes resulting in setting a DTC. The DTC will usually set with other DTC's, which indicates an internal transmission problem.

Diagnostic Test

1. OTHER DTCS PRESENT

With the scan tool, check for other transmission DTCs.

Are there any Pressure Switch Sense circuit DTCs present also?

Yes >> Refer to the Transmission category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK 2C CLUTCH VOLUME INDEX

With the scan tool, erase Transmission DTCs.

Drive the vehicle at about 80 Kmh or 50 MPH, then depress the OD off button. This will put the vehicle into third gear.

NOTE: The TRANS TEMP DEG must be at least 43° C or 110° F before performing the following steps.
Perform at least ten 3-2 kickdowns by depressing the throttle between 10 and 54 TPS DEGREES at speeds of about 80 Kmh or 50 MPH.

With the scan tool, read the 2C CL VOL INDEX.

Is the 2C CL VOL INDEX below 10?

Yes >> Go To 3

No >> Go To 5

P2701-INADEQUATE ELEMENT VOLUME 2C (CONTINUED)

3. 2C CLUTCH CIRCUIT LEAKS IN THE VALVE BODY

Turn the ignition off to the lock position.

Remove the transmission oil pan per the Service Information.

Remove the valve body per the service information.

Check condition of the 2C accumulator springs.

Look for possible leak paths into the 2C clutch hydraulics circuit within the valve body.

Were any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 4

---

4. AIR CHECK 2C CLUTCH CIRCUIT

Turn the ignition off to the lock position.

Perform an air check on the 2C Clutch circuit per the Service Information.

Watch and listen for 2C Clutch piston movement.

Dose the piston stroke and return properly?

Yes >> Replace the Transmission/TRS Solenoid Assembly per the service information. With the scan tool, perform Quick Learn.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Repair internal transmission as necessary. Pay attention to the components related to the 2C clutch. A broken or dislodged 2C return spring, snap ring or broken 2C Accumulator Spring could cause this problem.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

5. VERIFY PCM OPERATION

NOTE: NOTE: The TRANS TEMP DEG must be at least 43° C or 110° F before performing the following steps.

Perform eight learnable starts. A learnable start is defined as follows: Start engine. From a standstill, accelerate lightly to 80 Kmh or 50 MPH, then brake lightly to a stop. Turn off engine.

With the scan tool, record the CL VOL INDEX (CVI) for all clutches

With the scan tool, perform a BATTERY DISCONNECT.

With the scan tool, read the CVI's and compare them to the readings recorded before the BATTERY DISCONNECT.

Are any of the CVI's less than 5 or different than before the BATTERY DISCONNECT?

Yes >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P2702-INADEQUATE ELEMENT VOLUME OD

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Whenever the engine is running. The OD clutch volume index (CVI) is updated during a 2-3 upshift with throttle angle between 10 and 54 degrees. Transmission temperature must be at least 43° C (110° F).
- **Set Condition:**
  When the OD CVI falls below 5.

Possible Causes
HYDRAULIC LEAK IN THE VALVE BODY
BROKEN OD ACCUMULATOR SPRING
BROKEN OD/REV PISTON BELLEVILLE SPRING OR DISLODGED SNAP RING
INTERNAL LEAKAGE IN PUMP ASSEMBLY
TRANSMISSION SOLENOID/TRS ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The volumes of the transmission fluid needed to apply the friction elements are continuously monitored and learned for adaptive controls. As the clutch friction material wears, the volume of fluid needed to apply the clutch increases. Certain transmission mechanical problems can cause near-zero learned volumes resulting in setting a DTC. The DTC will usually set with other DTC's, which indicates an internal transmission problem.

Diagnostic Test

1. OTHER DTCS PRESENT

With the scan tool, check for other transmission DTCs.

Are there any Pressure Switch Sense circuit DTCs present also?

Yes >> Refer to the Transmission category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK THE OD CLUTCH VOLUME INDEX

With the scan tool, erase DTCs.

NOTE: The TRANS TEMP DEG must be at least 43° C or 110° F before performing the following steps.
Drive the vehicle and perform at least ten 2-3 upshifts with the TPS degree between 10 and 54.
With the scan tool, read the OD CL VOL INDEX.

Is the OD CL VOL INDEX below 10?

Yes >> Go To 3

No >> Go To 5

P2702-INADEQUATE ELEMENT VOLUME OD (CONTINUED)

3. OD CLUTCH CIRCUIT LEAKS IN THE VALVE BODY

Turn the ignition off to the lock position.

Remove the transmission oil pan per the Service Information.

Remove the valve body per the service information.

Check condition of the OD accumulator spring.

Look for possible leak paths into the OD clutch hydraulics circuit within the valve body.

Were any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 4

---

4. AIR CHECK OD CLUTCH CIRCUIT

Perform an air check on the OD Clutch circuit per the Service Information.

Watch and listen for OD Clutch piston movement.

Air check all other pump passages and watch for air leakage into the OD clutch passage.

NOTE: There is a bleed orifice between the OD and Reverse Clutch passages, so a small amount of air leakage from Reverse to OD is normal.

Were any problems found?

Yes >> Repair internal transmission. Pay attention to the OD Clutch. Broken or weak return spring or a dislocated snap ring could cause this problem. If no problems were found in the OD clutch, or if leakage into the OD passage was noted, replace Pump Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the Transmission/TRS Solenoid Assembly per the service information. With the scan tool, perform Quick Learn.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

5. VERIFY PCM OPERATION

NOTE: The TRANS TEMP DEG must be at least 43° C or 110° F before performing the following steps.

Perform eight learnable starts. A learnable start is defined as follows: Start engine. From a standstill, accelerate lightly to 80 Kmh or 50 MPH, then brake lightly to a stop. Turn off engine.

With the scan tool, record the CL VOL INDEX (CVI) for all clutches.

With the scan tool, perform a BATTERY DISCONNECT.

With the scan tool, read the CVI's and compare them to the readings recorded before the BATTERY DISCONNECT.

Are any of the CVI's less than 5 or different than before the BATTERY DISCONNECT?

Yes >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P2703-INADEQUATE ELEMENT VOLUME UD

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Whenever the engine is running. The UD clutch volume index (CVI) is updated during a 4-3 kickdown with throttle angle between 10 and 54 degrees. Transmission temperature must be at least 43° C (110° F).
- **Set Condition:**
  When the UD CVI falls below 11.

Possible Causes
BROKEN UD ACCUMULATOR SPRING(S)
BROKEN UD CLUTCH PISTON SPRING OR DISLODGED SNAP RING
INTERNAL LEAKAGE IN PUMP OR VALVE BODY ASSEMBLIES
TRANSMISSION SOLENOID/TRS ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The volumes of the transmission fluid needed to apply the friction elements are continuously monitored and learned for adaptive controls. As the clutch friction material wears, the volume of fluid needed to apply the clutch increases. Certain transmission mechanical problems can cause near-zero learned volumes resulting in setting a DTC. The DTC will usually set with other DTC's, which indicates an internal transmission problem.

Diagnostic Test

1. OTHER DTCS PRESENT

With the scan tool, check for other transmission DTCs.

Are there any Pressure Switch Sense circuit DTCs present also?

Yes >> Refer to the Transmission category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK UD CLUTCH VOLUME INDEX

With the scan tool, erase Transmission DTCs.

NOTE: The TRANS TEMP DEG must be at least 43° C or 110° F before performing the following steps.
Drive the vehicle and perform at least ten 4-3 kickdowns by depressing the throttle between 30 and 54 TPS degrees at speeds about 80 Kmh or 50 MPH.

With the scan tool, read the UD clutch volume index (CVI).

Is the UD CVI below 10?

Yes >> Go To 3

No >> Go To 5

P2703-INADEQUATE ELEMENT VOLUME UD (CONTINUED)

3. UD CLUTCH CIRCUIT LEAKS IN THE VALVE BODY

Turn the ignition off to the lock position.

Remove the transmission oil pan and valve body per the Service Information.

Check the condition of the UD accumulator springs.

Look for possible leak paths into the UD clutch hydraulics circuit within the valve body.

Were there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 4

---

4. AIR CHECK UD CLUTCH CIRCUIT

Perform an air check on the UD Clutch circuit per the Service Information.

Watch and listen for UD Clutch piston movement.

Air check all other pump passages for air leakage into the UD Clutch circuit.

Were any problems found?

Yes >> Repair internal transmission. Pay attention to components related to the UD clutch. Broken or weak return spring or a dislocated snap ring. If no trouble is found in UD clutch component or UD clutch leakage was noted in passage, replace the Pump Assembly.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the Transmission/TRS Solenoid Assembly per the service information. With the scan tool, perform Quick Learn.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

5. VERIFY PCM OPERATION

NOTE: The TRANS TEMP DEG must be at least 43° C or 110° F before performing the following steps.

Perform eight learnable starts. A learnable start is defined as follows: Start engine. From a standstill, accelerate lightly to 80 Kmh or 50 MPH, then brake lightly to a stop. Turn off engine.

With the scan tool, record the clutch volume index (CVI) for all clutches.

With the scan tool, perform a BATTERY DISCONNECT.

With the scan tool, read the CVI's and compare them to the readings recorded before the BATTERY DISCONNECT.

Are any of the CVI's less than 5 or different than before the BATTERY DISCONNECT?

Yes >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P2704-INADEQUATE ELEMENT VOLUME 4C

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Whenever the engine is running. The 4C clutch volume index (CVI) is updated during a 3-4 upshift with throttle angle between 10 and 54 degrees. Transmission temperature must be at least 43° C (110° F).
- **Set Condition:**
  When the 4C CVI falls below 5.

Possible Causes
BROKEN 4C RETURN SPRING OR DISLODGED SNAP RING
BROKEN 4C ACCUMULATOR SPRING(S)
HYDRAULIC LEAK IN THE VALVE BODY
TRANSMISSION SOLENOID/TRS ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The volumes of the transmission fluid needed to apply the friction elements are continuously monitored and learned for adaptive controls. As the clutch friction material wears, the volume of fluid needed to apply the clutch increases. Certain transmission mechanical problems can cause near-zero learned volumes resulting in setting a DTC. The DTC will usually set with other DTC's, which indicates an internal transmission problem.

Diagnostic Test

1. CHECK THE 4C CLUTCH VOLUME

With the scan tool, record the 4C clutch volume index (CVI) and erase DTC's.

Perform at least 10, 3-4 upshifts with the throttle between 10 and 54 degrees. The Transmission temperature must be at least 43° C or 110° F.

With the scan tool, read the 4C CVI.

Is the current 4C CVI below 10?

Yes >> Go To 2

No >> Go To 5

---

2. DTC P0876 PRESENT

With the scan tool, read DTCs.

NOTE: The DTC P0876 must also be set with P2704 in order for this test to be valid.

Is the DTC P0876 also present?

Yes >> Replace the Transmission Solenoid/TRS Assembly per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 3

P2704-INADEQUATE ELEMENT VOLUME 4C (CONTINUED)

3. 4C CLUTCH CIRCUIT LEAKS IN THE VALVE BODY

Turn the ignition off to the lock position.

Remove the transmission oil pan per the Service Information.

Remove the valve body per the Service Information.

Check condition of the 4C accumulator springs.

Look for possible leak paths into the 4C clutch hydraulics circuit within the valve body.

Were any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 4

---

4. AIR CHECK 4C CLUTCH CIRCUIT

Perform an air check on the 4C Clutch circuit per the Service Information.

Listen for proper 4C Clutch piston movement.

Were any problems found?

Yes >> Repair Internal transmission as necessary. Pay attention to the mechanical components related to the 4th clutch. A broken or weak return spring or a dislocated snap ring could cause this problem.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the Transmission Solenoid/TRS Assembly per the service information. With the scan tool, perform Quick Learn.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

5. VERIFY PCM OPERATION

Perform eight learnable starts. A learnable start is defined as follows: Start engine. From a standstill, accelerate lightly to 50 MPH, then brake lightly to a stop. Turn off engine.

With the scan tool, record Transmission CL VOL INDEX (CVI) for all clutches.

With the scan tool, perform a BATTERY DISCONNECT.

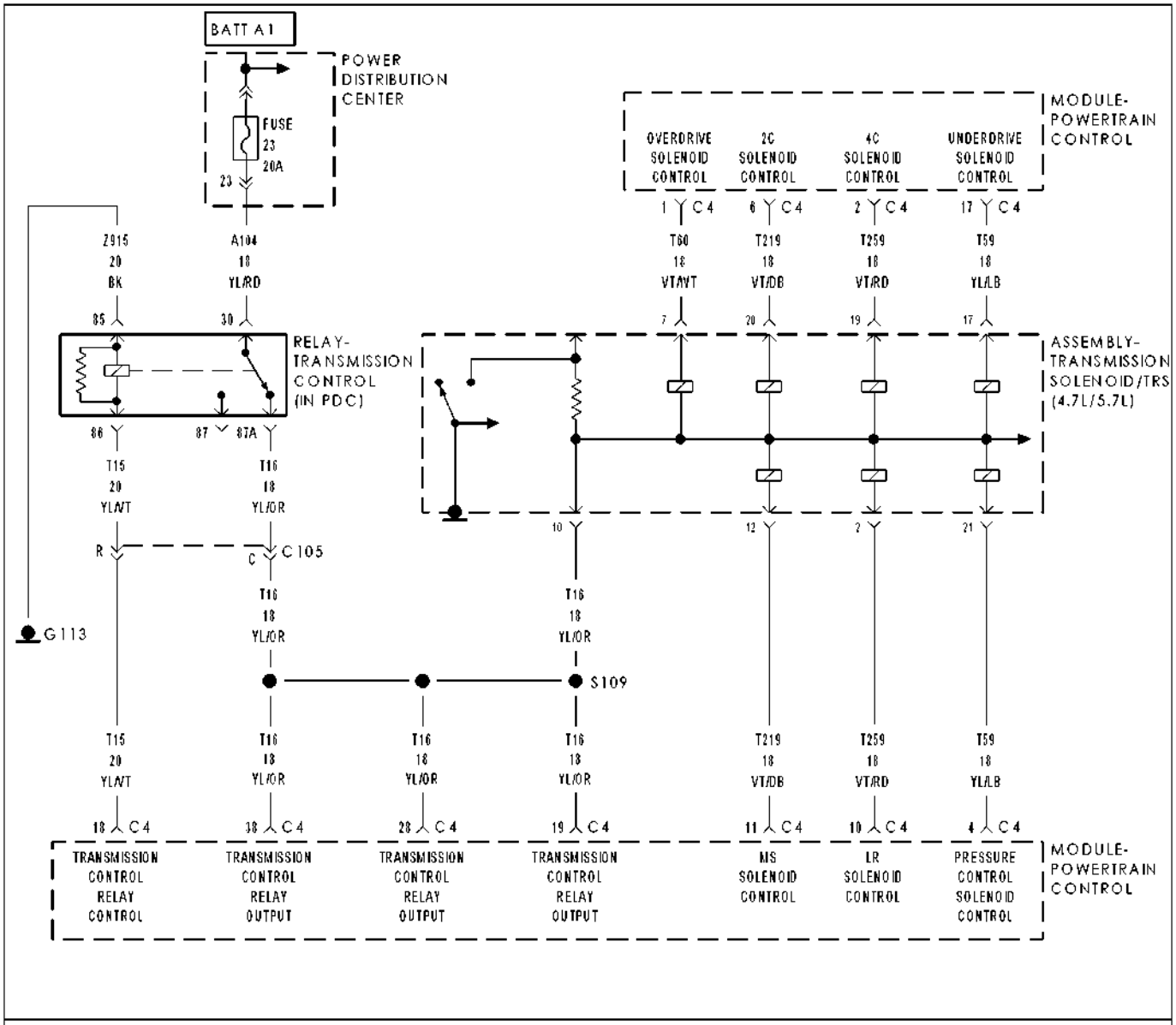
With the scan tool, read the CVI's and compare them to the reading recorded before the BATTERY DISCONNECT.

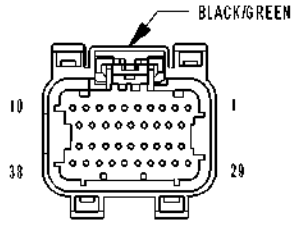
Are any of the CVI's less than 5 or are they different than before the battery disconnect?

Yes >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

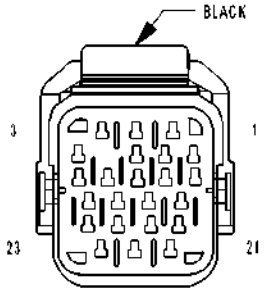
No >> Test Complete.

P2706-MS SOLENOID CIRCUIT





MODULE-POWERTRAIN CONTROL C4



ASSEMBLY-TRANSMISSION SOLENOID/TRS (4.7L/5.7L)

81239be0

P2706-MS SOLENOID CIRCUIT (CONTINUED)

For the Transmission circuit diagram (Refer to)(Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Initially at power-up, then every 10 seconds thereafter. The solenoid circuits will also be tested immediately after a gear ratio or pressure switch error is detected.
- **Set Condition:**
  After three consecutive solenoid continuity test failures, or one failure if test is run in response to a gear ratio or pressure switch error. **Note: This DTC is strictly an electrical fault and does not apply to any internal transmission failures.**

Possible Causes
RELATED RELAY DTC'S PRESENT
(T118) MS SOLENOID CONTROL CIRCUIT SHORT TO OTHER CIRCUITS
(T118) MS SOLENOID CONTROL CIRCUIT OPEN
(T118) MS SOLENOID CONTROL CIRCUIT SHORT TO GROUND
TRANSMISSION SOLENOID/TRS ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Transmission Control System uses six electronically controlled solenoids that allow hydraulic fluid to be applied to various friction elements (clutches), which enables the gear requested. The continuity of each solenoid circuit is periodically tested. Each inactive solenoid is turned on for a few milliseconds, then off. Each active solenoid is turned off for a few milliseconds, then on. This pulsing of voltage to the solenoid causes an inductive spike which can be sensed by the Transmission Control System. If an inductive spike is not sensed by the Transmission Control System during the continuity check, it is tested again. If the test fails three consecutive times, the appropriate Diagnostic Trouble Code (DTC) is set. If the solenoid test is run in response to a gear ratio or pressure switch error, one failure will result in setting the appropriate DTC. **Note: This DTC is strictly an electrical fault and does not apply to any internal transmission failures.**

Diagnostic Test

1. RELATED TRANSMISSION RELAY DTC'S PRESENT

With the scan tool, check for other transmission DTC's.

Are there any Transmission Control Relay DTC's present?

Yes >> Refer to the Transmission category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

P2706-MS SOLENOID CIRCUIT (CONTINUED)

2. CHECK THE TRANSMISSION SOLENOID/TRS ASSEMBLY

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the scan tool, actuate the MS Solenoid.

Monitor the MS Solenoid LED on the Transmission Simulator.

Did the MS Solenoid LED on the Transmission Simulator blink on and off?

Yes >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 3

---

3. TRANSMISSION SOLENOID/TRS ASSEMBLY

With the scan tool, continue to actuate the MS Solenoid for the period of 2 minutes with the Transmission Simulator still connected.

After 2 minutes of actuation, with the scan tool, stop the actuation and check for transmission DTCs.

Did the DTC P2706 reset during the actuation test?

Yes >> Go To 4

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

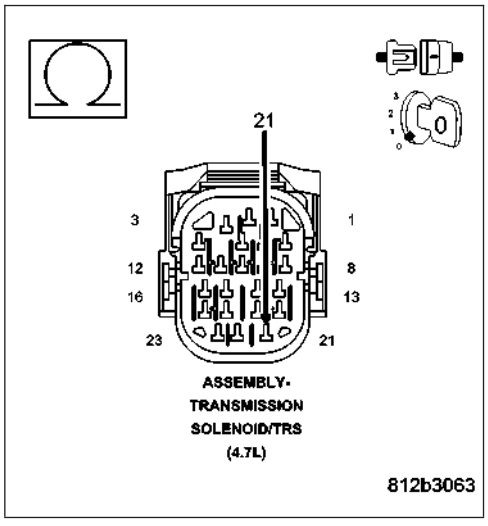
4. (T118) MS SOLENOID CONTROL CIRCUIT SHORT TO OTHER CIRCUITS

Turn the ignition off to the lock position.

Disconnect the Transmission Simulator, Miller tool #8333.

Disconnect the PCM harness connectors.

Measure the resistance between the (T118) MS Solenoid Control circuit and all other circuits in the Transmission Solenoid/TRS Assembly harness connector.



Is the resistance below 5.0 ohms between the (T118) MS Solenoid Control circuit and any other circuit(s) in the Transmission Solenoid/TRS Assembly harness connector?

Yes >> Repair the (T118) MS Solenoid Control circuit for a short to other circuit(s).
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5

P2706-MS SOLENOID CIRCUIT (CONTINUED)

5. (T118) MS SOLENOID CONTROL CIRCUIT OPEN

Connect Miller tool #8815 to the PCM C4 harness connector.

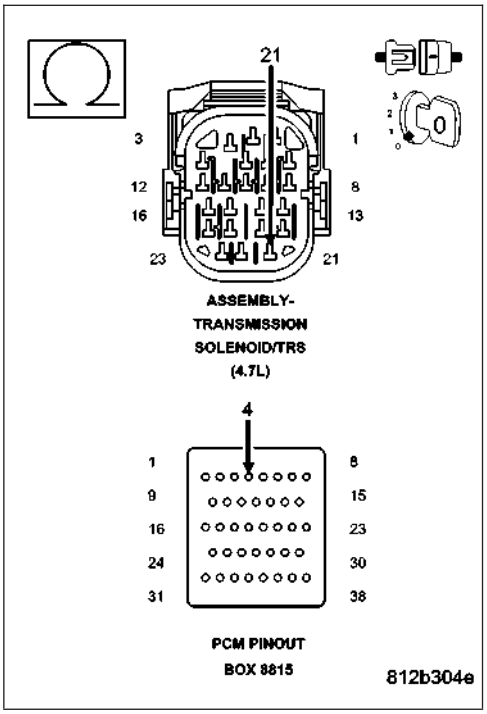
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller special tool #8815 to perform diagnosis.

Measure the resistance of the (T118) MS Solenoid Control circuit from the Transmission Solenoid/TRS Assembly harness connector to the appropriate terminal of Miller tool #8815.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T118) MS Solenoid Control circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 6



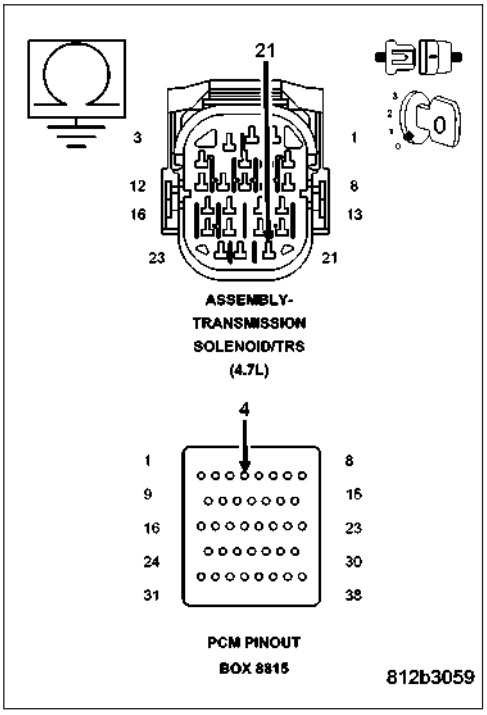
6. (T118) MS SOLENOID CONTROL CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T118) MS Solenoid Control circuit.

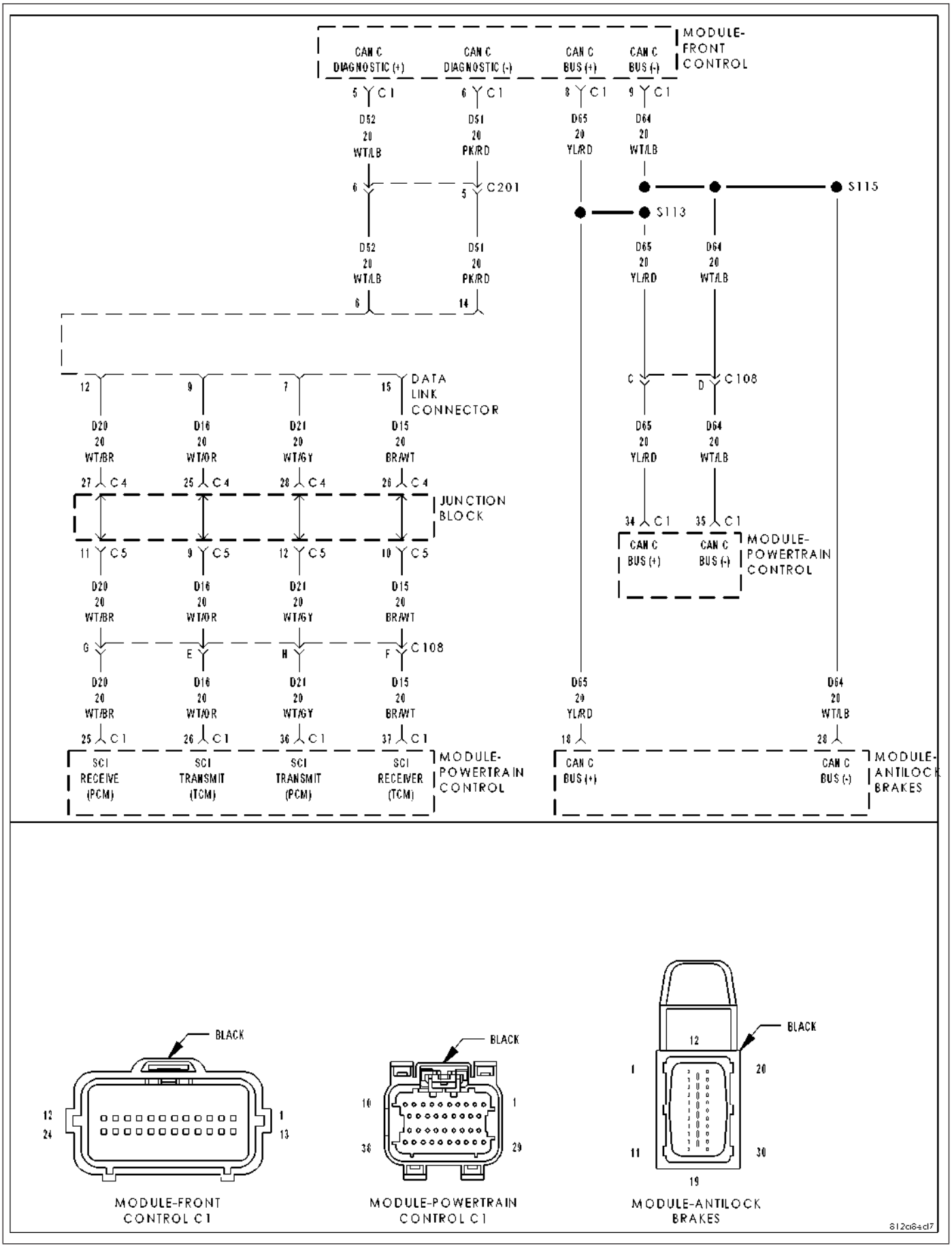
Is the resistance below 5.0 ohms?

Yes >> Repair the (T118) MS Solenoid Control circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.



U0002 CAN C BUS OFF PERFORMANCE



U0002 CAN C BUS OFF PERFORMANCE (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

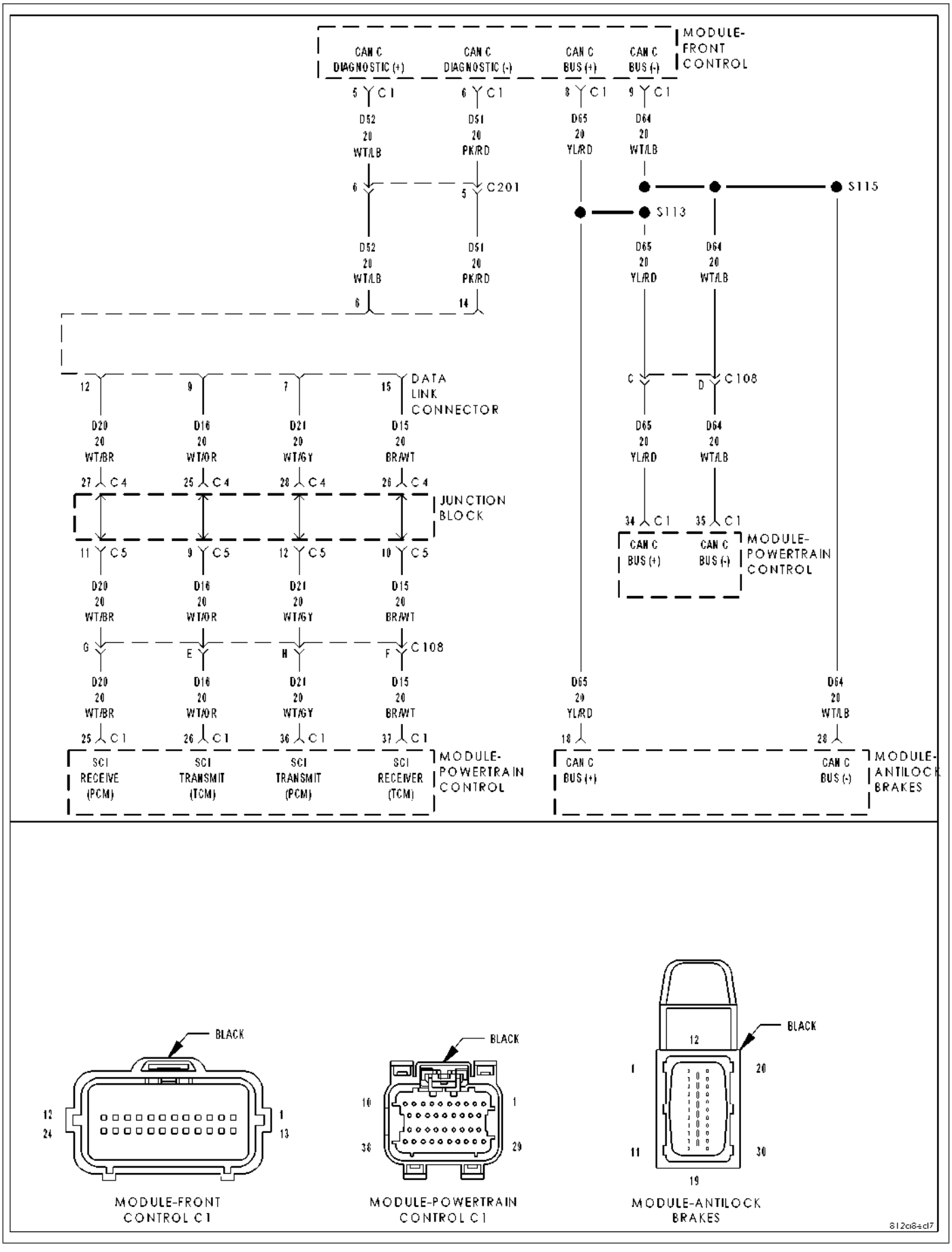
- **When Monitored:**
  Every 7 msec. Conditions: 1) Engine speed greater than 500 RPM. 2) Battery voltage greater than 10v but less than 16v.
- **Set Condition:**
  CAN C bus messages not received for 10 seconds.

Theory of Operation

Some NGC controllers communicate with other controllers over the CAN C bus. The transmission controller continuously monitors the bus activity and receives the messages it needs. The CAN C bus is also used to communicate transmission MIL status to the Engine Controller, therefor if the Engine Controller is unable to communicate with the Transmission Controller, the Engine Controller will light the MIL.

Diagnose the U0002 CAN C BUS OFF PERFORMANCE as the U0001 CAN C BUS CIRCUIT test in 8-ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

U0100–NO COMMUNICATION WITH THE ECM/PCM



U0100–NO COMMUNICATION WITH THE ECM/PCM (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

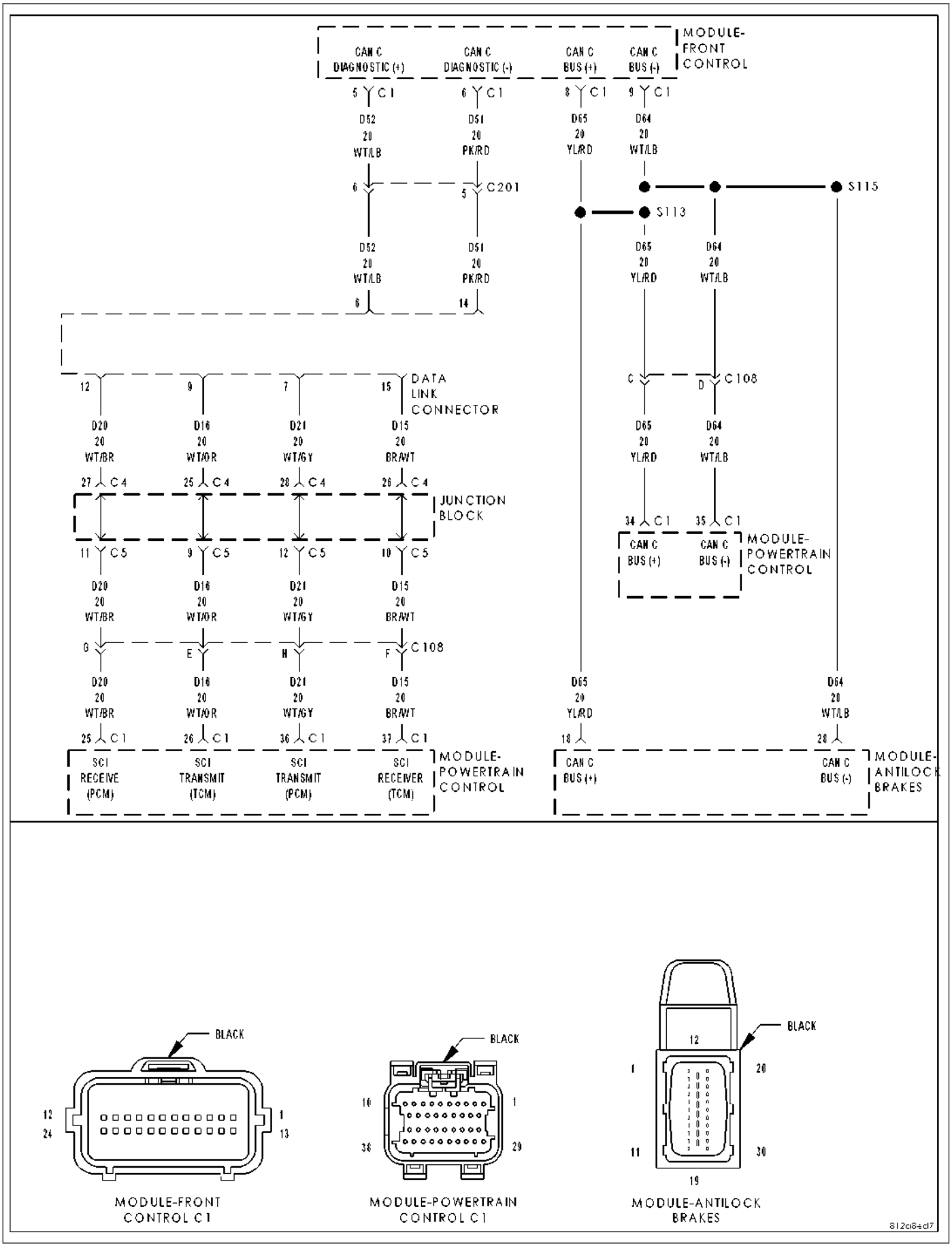
- **When Monitored:**
  Every 7 msec. with the ignition on.
- **Set Condition:**
  ECM/PCM CAN bus message not received by the Transmission Control System for the period of 10 seconds.

Theory of Operation

Communication over the CAN bus is continuously monitored between the Engine Control System and the Transmission Control System. Due to the integration of both systems into one module, (Powertrain Control Module) the bus communication between the systems is internally transmitted over the duel port ram.

Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

U0121–LOST COMMUNICATION WITH ABS



U0121–LOST COMMUNICATION WITH ABS (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

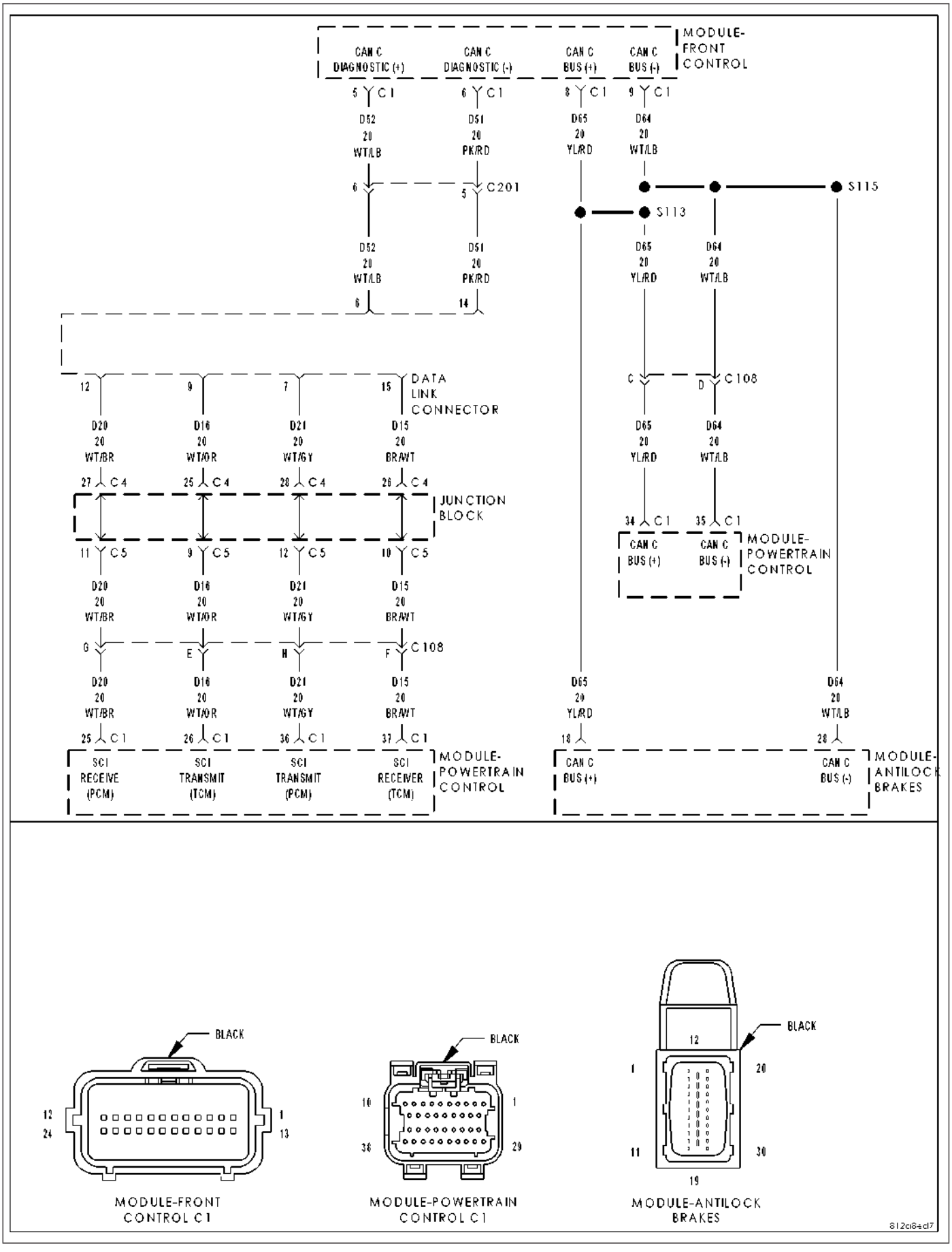
- **When Monitored:**
  Every 7 msec. Conditions: 1) Engine speed greater than 500 RPM. 2) Battery voltage greater than 10v but less than 16v.
- **Set Condition:**
  CAN C bus messages not received for 10 seconds.

Theory of Operation

Some NGC controllers communicate with other controllers over the CAN C bus. The transmission controller continuously monitors the bus activity and receives the messages it needs. The CAN C bus is also used to communicate transmission MIL status to the Engine Controller, therefor if the Engine Controller is unable to communicate with the Transmission Controller, the Engine Controller will light the MIL.

Refer to 8-ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

U0141 LOST COMMUNICATION WITH FCM



U0141 LOST COMMUNICATION WITH FCM (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

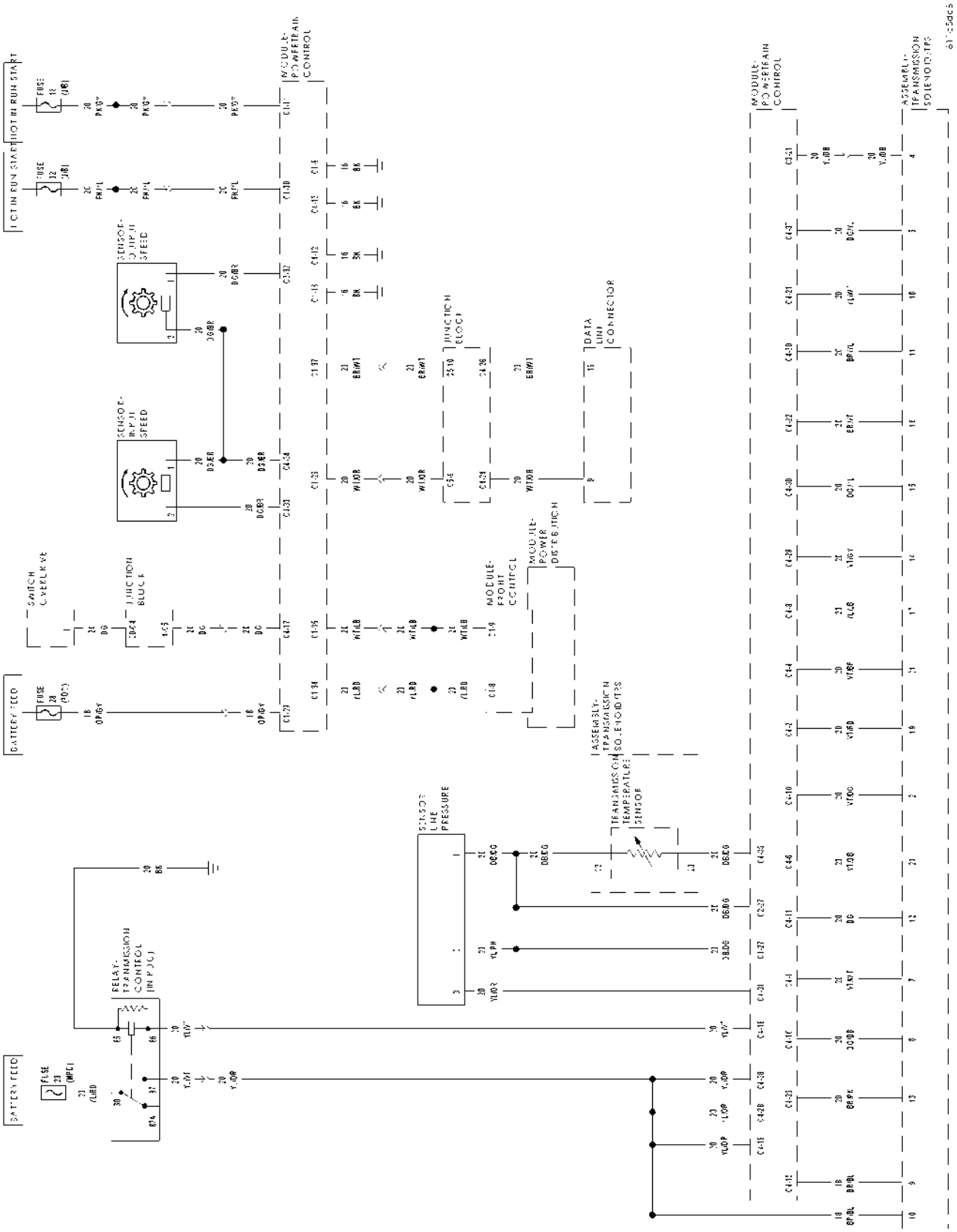
- **When Monitored:**
  Every 7 msec. Conditions: 1) Engine speed greater than 500 RPM. 2) Battery voltage greater than 10v but less than 16v.
- **Set Condition:**
  CAN C bus messages not received for 10 seconds.

Theory of Operation

Some NGC controllers communicate with other controllers over the CAN C bus. The transmission controller continuously monitors the bus activity and receives the messages it needs. The CAN C bus is also used to communicate transmission MIL status to the Engine Controller, therefor if the Engine Controller is unable to communicate with the Transmission Controller, the Engine Controller will light the MIL.

Refer to 8-ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

SCHEMATICS AND DIAGRAMS



RFE TRANSMISSION CIRCUIT DIAGRAM

AUTOMATIC TRANSMISSION 545RFE - SERVICE INFORMATION

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AUTOMATIC TRANSMISSION 545RFE - SERVICE INFORMATION

DESCRIPTION

The 545RFE automatic transmission is a sophisticated, multi-range, electronically controlled transmission which combines optimized gear ratios for responsive performance, state of the art efficiency features and low NVH. Other features include driver adaptive shifting and three planetary gear sets to provide wide ratio capability with precise ratio steps for optimum driveability. The three planetary gear sets also make available a unique alternate second gear ratio. The primary 2nd gear ratio fits between 1st and 3rd gears for normal through-gear accelerations. The alternate second gear ratio (2prime) allows smoother 4-2 kickdowns at high speeds to provide 2nd gear passing performance over a wider highway cruising range. An additional overdrive ratio (0.67:1) is also provided for greater fuel economy and less NVH at highway speeds.

The hydraulic portion of the transmission consists of the transmission fluid, fluid passages, hydraulic valves, and various line pressure control components.

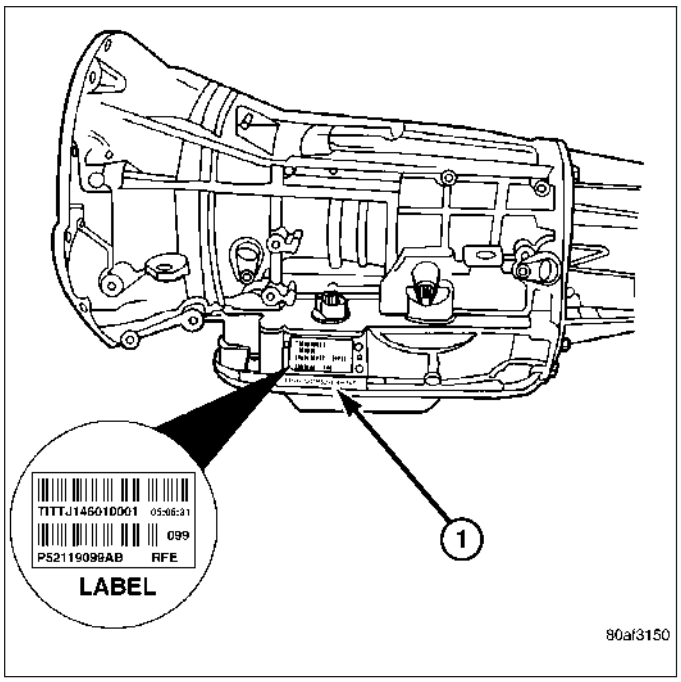
The primary mechanical components of the transmission consist of the following:

- Three multiple disc input clutches
- Three multiple disc holding clutches
- Five hydraulic accumulators
- Three planetary gear sets
- Dual Stage Hydraulic oil pump
- Valve body
- Solenoid pack

The Transmission Control Module (TCM) is the “heart” or “brain” of the electronic control system and relies on information from various direct and indirect inputs (sensors, switches, etc.) to determine driver demand and vehicle operating conditions. Depending on the vehicle configuration, the TCM may be a standalone module or it it may be housed along with the Powertrain Control Module (PCM) in a single module. With this information, the TCM can calculate and perform timely and quality shifts through various output or control devices (solenoid pack, transmission control relay, etc.).

TRANSMISSION IDENTIFICATION

Transmission identification numbers (1) are stamped on the left side of the case just above the oil pan sealing surface. Refer to this information when ordering replacement parts. A label is attached to the transmission case above the stamped numbers. The label gives additional information which may also be necessary for identification purposes.



GEAR RATIOS

The 545RFE gear ratios are:

1st	3.00:1
2nd	1.67:1
2nd Prime	1.50:1
3rd	1.00:1
4th	0.75:1
5th	0.67:1
Reverse	3.00:1

OPERATION

The 545RFE offers full electronic control of all automatic up and downshifts, and features real-time adaptive closed-loop shift and pressure control. Electronic shift and torque converter clutch controls help protect the transmission from damage due to high temperatures, which can occur under severe operating conditions. By altering shift schedules, line pressure, and converter clutch control, these controls reduce heat generation and increase transmission cooling.

To help reduce efficiency-robbing parasitic losses, the transmissions includes a dual-stage transmission fluid pump with electronic output pressure control. Under most driving conditions, pump output capacity greatly exceeds that which is needed to keep the clutches applied. The 45RFE/545RFE pump-pressure control system monitors input torque and adjusts the pump pressure accordingly. The primary stage of the pump works continuously; the second stage is bypassed when demand is low. The control system also monitors input and output speed and, if incipient clutch slip is observed, the pressure control solenoid duty cycle is varied, increasing pressure in proportion to demand.

A high-travel torque converter damper assembly allows earlier torque converter clutch engagement to reduce slippage. Needle-type thrust bearings reduce internal friction. The 45RFE/545RFE is packaged in a one-piece die-cast aluminum case. To reduce NVH, the case has high lateral, vertical and torsional stiffness. It is also designed to maximize the benefit of the structural dust cover that connects the bottom of the bell housing to the engine bedplate, enhancing overall power train stiffness. Dual filters protect the pump and other components. A cooler return filter is added to the customary main sump filter. Independent lubrication and cooler circuits assure ample pressure for normal transmission operation even if the cooler is obstructed or the fluid cannot flow due to extremely low temperatures.

The hydraulic control system design (without electronic assist) provides the transmission with PARK, REVERSE, NEUTRAL, SECOND, and THIRD gears, based solely on driver shift lever selection. This design allows the vehicle to be driven (in "limp-in" mode) in the event of a electronic control system failure, or a situation that the Transmission Control Module (TCM) recognizes as potentially damaging to the transmission.

The TCM also performs certain self-diagnostic functions and provides comprehensive information (sensor data, DTC's, etc.) which is helpful in proper diagnosis and repair. This information can be viewed with the scan tool.

DIAGNOSIS AND TESTING

AUTOMATIC TRANSMISSION

CAUTION: Before attempting any repair on a RFE automatic transmission, check for Diagnostic Trouble Codes with the scan tool.

Transmission malfunctions may be caused by these general conditions:

- Poor engine performance
- Improper adjustments
- Hydraulic malfunctions
- Mechanical malfunctions
- Electronic malfunctions

Diagnosis of these problems should always begin by checking the easily accessible variables: fluid level and condition, gearshift cable adjustment. Then perform a road test to determine if the problem has been corrected or if more diagnosis is necessary. If the problem persists after the preliminary tests and corrections are completed, hydraulic pressure checks should be performed.

PRELIMINARY

Two basic procedures are required. One procedure for vehicles that are drivable and an alternate procedure for disabled vehicles (will not back up or move forward).

VEHICLE IS DRIVABLE

1. Check for transmission fault codes using scan tool.
2. Check fluid level and condition.
3. Adjust gearshift cable if complaint was based on delayed, erratic, or harsh shifts.
4. Road test and note how transmission upshifts, downshifts, and engages.
5. Perform hydraulic pressure test if shift problems were noted during road test.
6. Perform air-pressure test to check clutch operation.

VEHICLE IS DISABLED

1. Check fluid level and condition.
2. Check for broken or disconnected gearshift cable.
3. Check for cracked, leaking cooler lines, or loose or missing pressure-port plugs.
4. Raise and support vehicle on safety stands, start engine, shift transmission into gear, and note following:
   a. If propeller shaft turns but wheels do not, problem is with differential or axle shafts.
   b. If propeller shaft does not turn and transmission is noisy, stop engine. Remove oil pan, and check for debris. If pan is clear, remove transmission and check for damaged driveplate, converter, oil pump, or input shaft.
   c. If propeller shaft does not turn and transmission is not noisy, perform hydraulic-pressure test to determine if problem is hydraulic or mechanical.

ROAD TESTING

Before road testing, be sure the fluid level and control cable adjustments have been checked and adjusted if necessary. Verify that all diagnostic trouble codes have been resolved.

Observe engine performance during the road test. A poorly tuned engine will not allow accurate analysis of transmission operation.

Operate the transmission in all gear ranges. Check for shift variations and engine flare which indicates slippage. Note if shifts are harsh, spongy, delayed, early, or if part throttle downshifts are sensitive.

Slippage indicated by engine flare, usually means clutch, overrunning clutch, or line presure problems.

A slipping clutch can often be determined by comparing which internal units are applied in the various gear ranges. The Clutch Application chart provides a basis for analyzing road test results.

545RFE CLUTCH APPLICATION CHART

SLP	UD	OD	R	2C	4C	L/R	OVERRUNNING
P–PARK						ON	
R–REVERSE			ON			ON	
N-NEUTRAL						ON	
D–FIRST	ON					ON*	ON
D–SECOND	ON			ON			
D–SECOND PRIME	ON				ON		
D–THIRD	ON	ON					
D–FOURTH		ON			ON		
D–FIFTH		ON		ON			
D–LIMP-IN	ON	ON					
2–FIRST	ON					ON*	ON
2–SECOND	ON			ON			
2–LIMP-IN	ON			ON			
1–LOW	ON					ON	ON

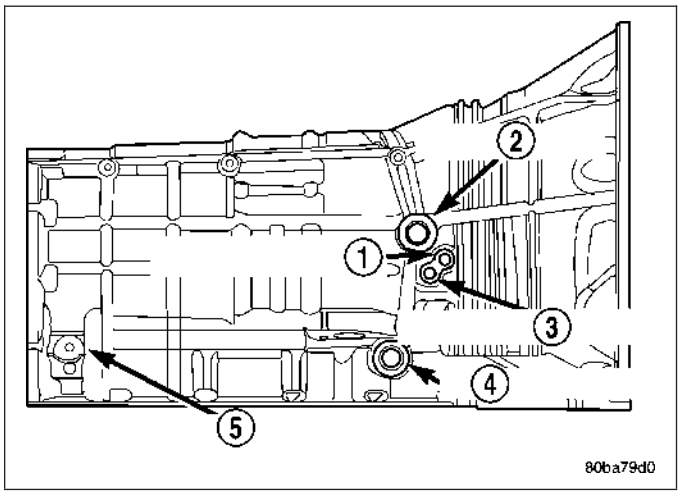
*L/R clutch is on only with the output shaft speed below 150 rpm.

HYDRAULIC PRESSURE TEST

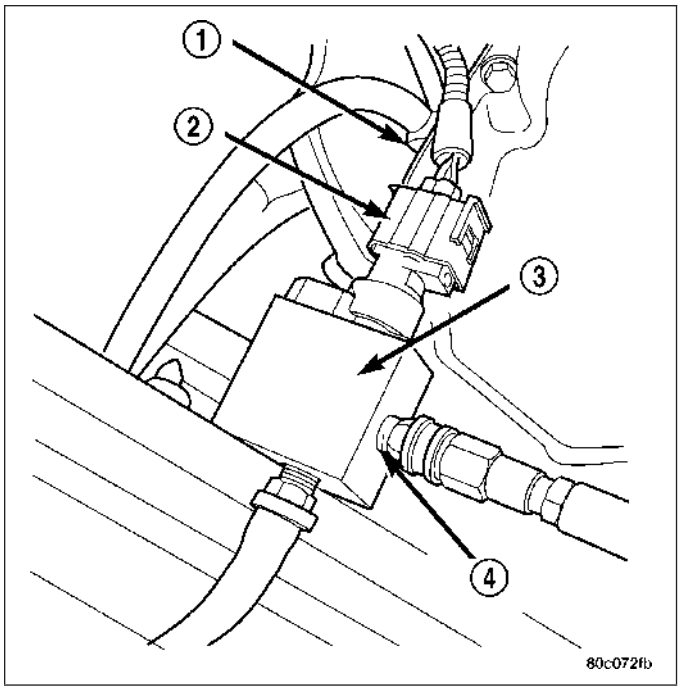
An accurate tachometer and pressure test gauges are required. Test Gauge C-3293-SP has a 300 psi range and is used at all locations where pressures exceed 100 psi.

Pressure Test Port Locations

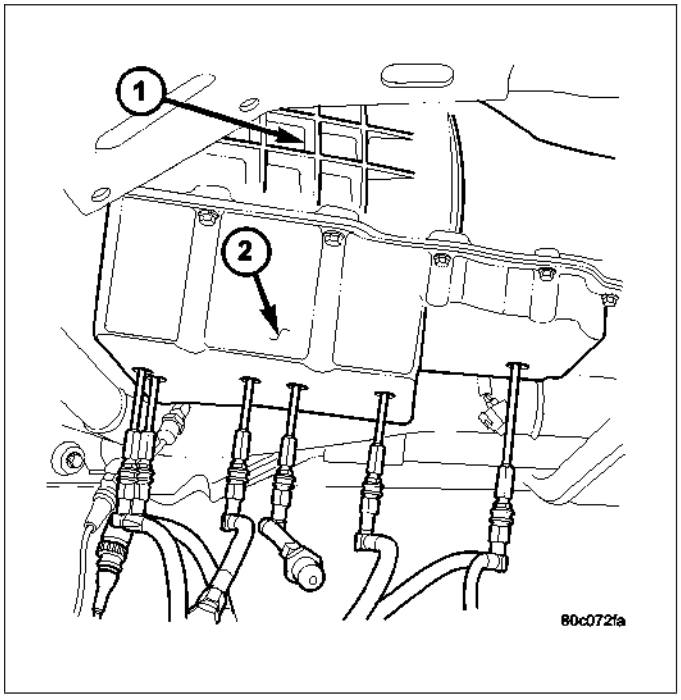
Only two pressure ports are supplied on the transmission case. The torque converter clutch apply (3) and release (1) ports are located on the right side of the transmission case.



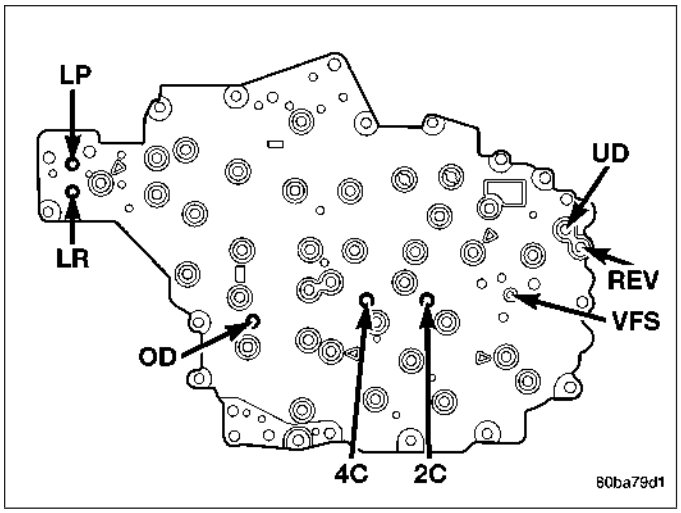
To determine the line pressure, there are two available methods. The scan tool can be used to read line pressure from the line pressure sensor. The second method is to install Line Pressure Adapter 8259 (3) into the transmission case and then install the pressure gauge and the original sensor (2) into the adapter. This will allow a comparison of the scan tool readings and the gauge reading to determine the accuracy of the line pressure sensor. The scan tool line pressure reading should match the gauge reading within ±10 psi.



In order to access any other pressure tap locations, the transmission oil pan must be removed, the pressure port plugs removed and Valve Body Pressure Tap Adapter 8258-A (2) installed. The extensions supplied with Adapter 8258-A will allow the installation of pressure gauges to the valve body.



Refer to the Pressure Tap Locations graphic for correct pressure tap location identification.



TEST PROCEDURE

All pressure readings should be taken with the transmission fluid level full, transmission oil at the normal operating temperature, and the engine at 1500 rpm. Check the transmission for proper operation in each gear position that is in question or if a specific element is in question, check the pressure readings in at least two gear positions that employ that element. Refer to the Hydraulic Schematics at the rear of this section to determine the correct pressures for each element in a given gear position.

NOTE: The RFE utilizes closed loop control of pump line pressure. The pressure readings may therefore vary greatly but should always follow line pressure.

Some common pressures that can be measured to evaluate pump and clutch performance are the upshift/downshift pressures and the garage shift pressures. The upshift/downshift pressure for all shifts is 120 psi. The garage shift pressure when performing a N-R shift is 220 psi. The garage shift pressure for the R-N shift is 120 psi and 135 psi for N-1 shifts.

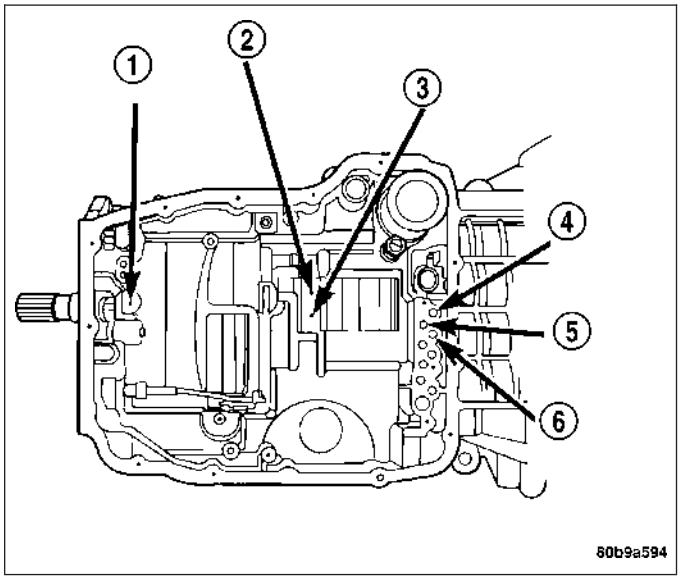
AIR CHECKING TRANSMISSION CLUTCH OPERATION

Air-pressure testing can be used to check transmission clutch operation. The test can be conducted with the transmission either in the vehicle or on the work bench, as a final check.

Air-pressure testing requires that the oil pan and valve body be removed from the transmission. The clutch apply passages are shown in the Air Pressure Test Passages graphic.

NOTE: The air supply which is used must be free of moisture and dirt. Use a pressure of 30 psi to test clutch operation.

Apply air pressure at each port. If the clutch is functioning, a soft thump will be heard as the clutch is applied. The clutch application can also be felt by touching the appropriate element while applying air pressure. As the air pressure is released, the clutch should also release.



Air Pressure Test Passages

1 - LOW REVERSE CLUTCH
2 - 4TH CLUTCH
3 - 2ND CLUTCH
4 - OVERDRIVE CLUTCH
5 - UNDERDRIVE CLUTCH
6 - REVERSE CLUTCH

CONVERTER HOUSING FLUID LEAK

When diagnosing converter housing fluid leaks, two items must be established before repair.

1. Verify that a leak condition actually exists.
2. Determined the true source of the leak.

Some suspected converter housing fluid leaks may not be leaks at all. They may only be the result of residual fluid in the converter housing, or excess fluid spilled during factory fill or fill after repair. Converter housing leaks have several potential sources. Through careful observation, a leak source can be identified before removing the transmission for repair. Torque converter seal leaks tend to move along the drive hub and onto the rear of the converter. Pump cover seal leaks tend to run down the cover and the inside surface of the bellhousing.

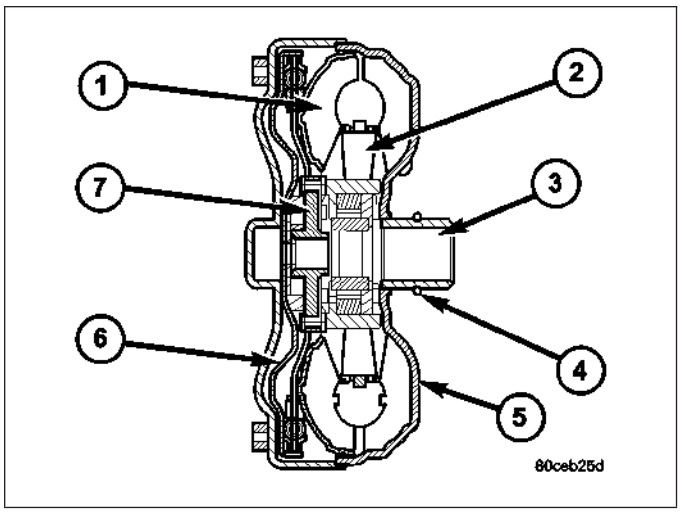
Some leaks, or suspected leaks, may be particularly difficult to locate. If necessary, a Mopar® approved dye should be used to locate and confirm a leak.

TORQUE CONVERTER LEAK POINTS

Possible sources of converter leaks are:

1. Leaks at the weld joint around the outside diameter weld.
2. Leaks at the converter hub weld.

In most cases, a torque converter which is wet from transmission fluid indicates a leak at one of these areas.



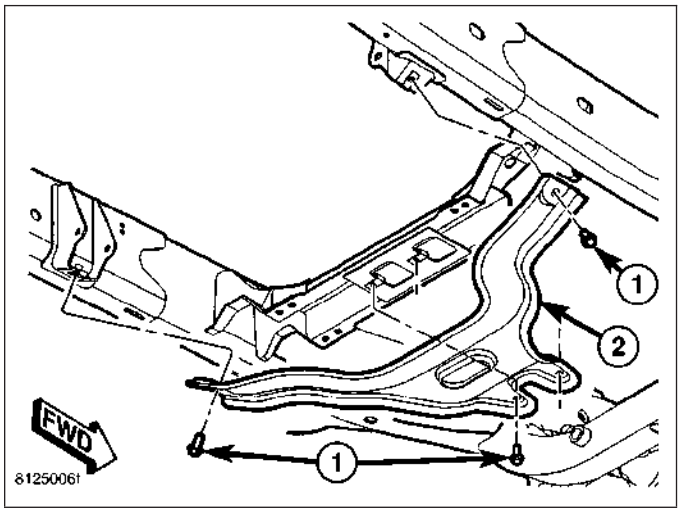
STANDARD PROCEDURE - ALUMINUM THREAD REPAIR

Damaged or worn threads in the aluminum transmission case and valve body can be repaired by the use of Heli-Coils™, or equivalent. This repair consists of drilling out the worn-out damaged threads. Then tap the hole with a special Heli-Coil™ tap, or equivalent, and installing a Heli-Coil™ insert, or equivalent, into the hole. This brings the hole back to its original thread size.

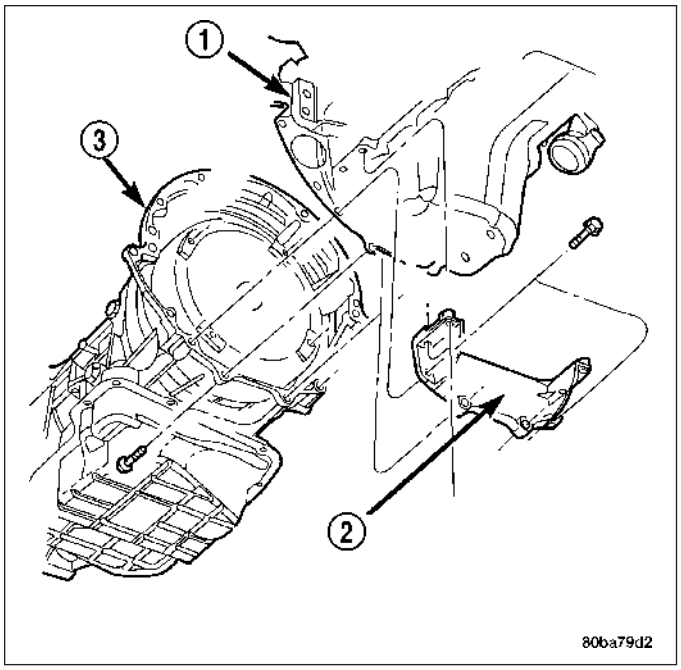
Heli-Coil™, or equivalent, tools and inserts are readily available from most automotive parts suppliers.

REMOVAL

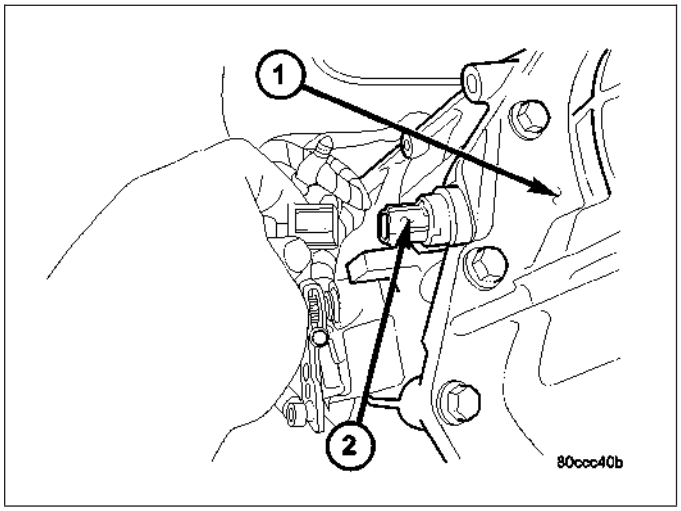
1. Disconnect the negative battery cable.
2. Raise and support the vehicle
3. Remove any necessary skid plates. (Refer to 13 - FRAMES & BUMPERS/FRAME/TRANSFER CASE SKID PLATE - REMOVAL)
4. Mark propeller shaft and axle companion flanges for assembly alignment.
5. Remove the rear propeller shaft. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT - REAR/PROPELLER SHAFT - REMOVAL)
6. Remove the front propeller shaft, if necessary. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT - FRONT/PROPELLER SHAFT - REMOVAL)



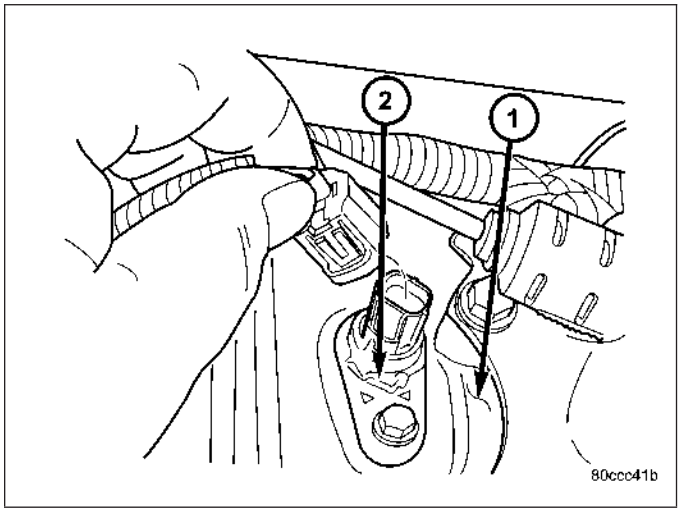
7. Remove the engine to transmission collar (2).
8. Remove the exhaust support bracket from the rear of the transmission.
9. Disconnect and lower or remove any necessary exhaust components.
10. Remove the starter motor.
11. Rotate crankshaft in clockwise direction until converter bolts are accessible. Then remove bolts one at a time. Rotate crankshaft with socket wrench on dampener bolt.



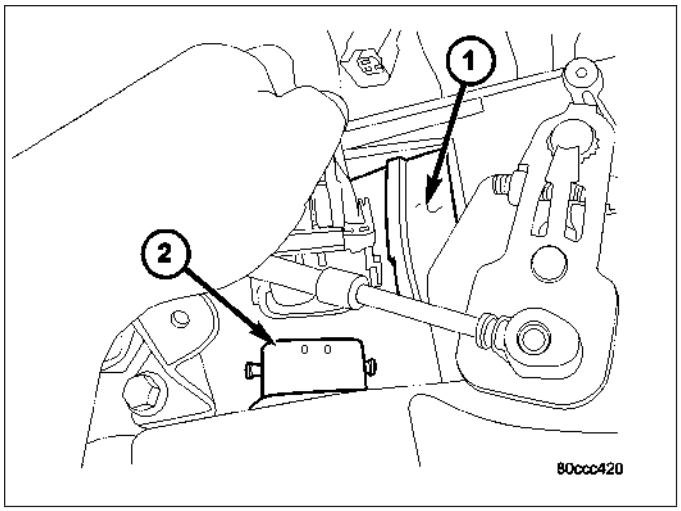
12. Disengage the output speed sensor (2) connector from the output speed sensor.



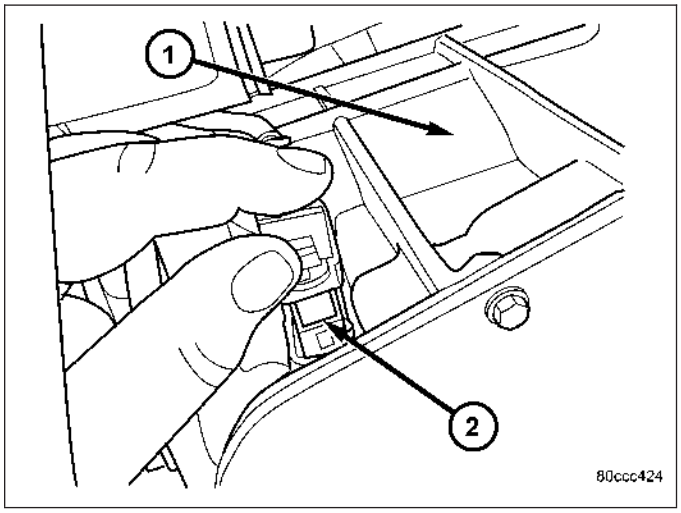
13. Disengage the input speed sensor (2) connector from the input speed sensor.



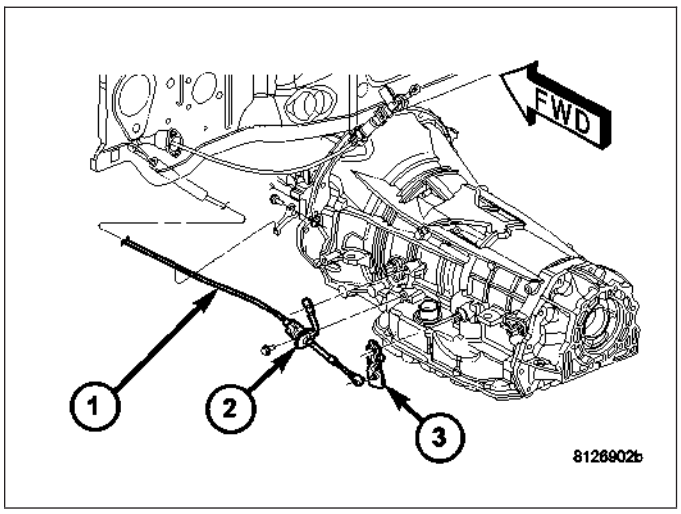
14. Disengage the transmission solenoid/TRS assembly (2) connector from the transmission solenoid/TRS assembly.



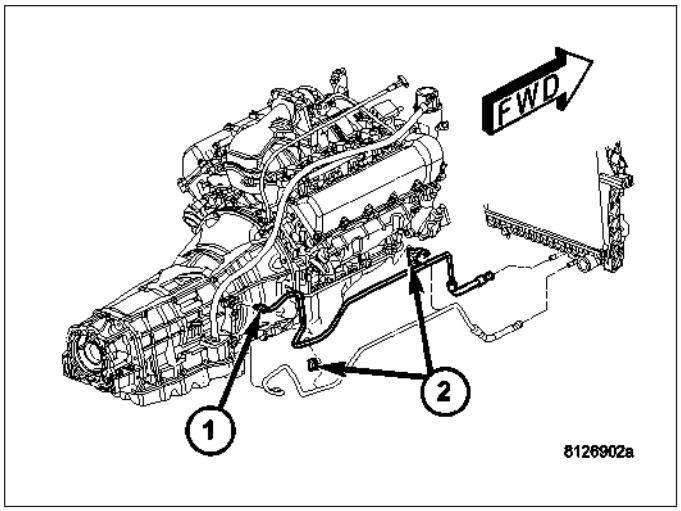
15. Disengage the line pressure sensor (2) connector from the line pressure sensor.



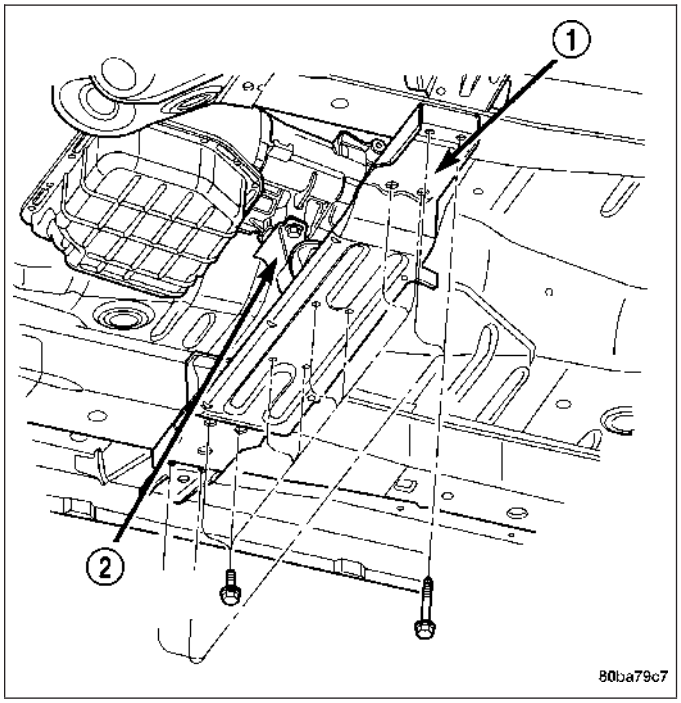
16. Disconnect gearshift cable (1) from transmission manual valve lever (3).
17. Remove the gearshift cable (1) from the shift cable support bracket (2).



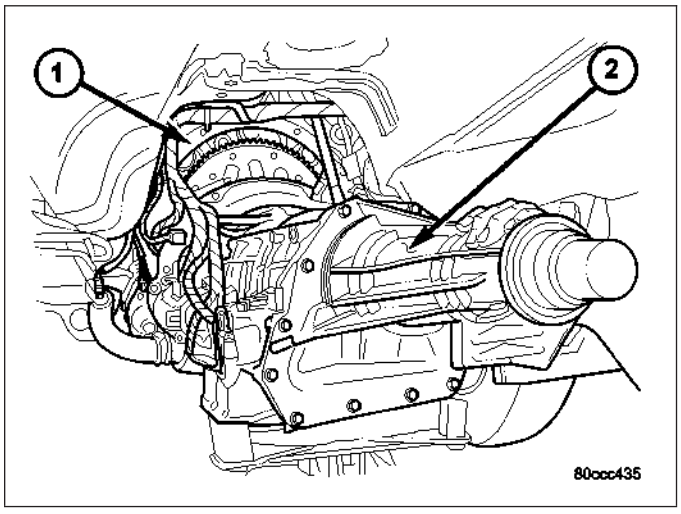
18. Disconnect transmission fluid cooler lines at transmission fittings (1) and clips (2).



19. Support rear of engine with safety stand or jack.
20. Raise transmission slightly with service jack to relieve load on crossmember (1) and supports (2).
21. Remove bolts securing rear support and cushion to transmission and crossmember.
22. Remove bolts attaching crossmember to frame and remove crossmember.

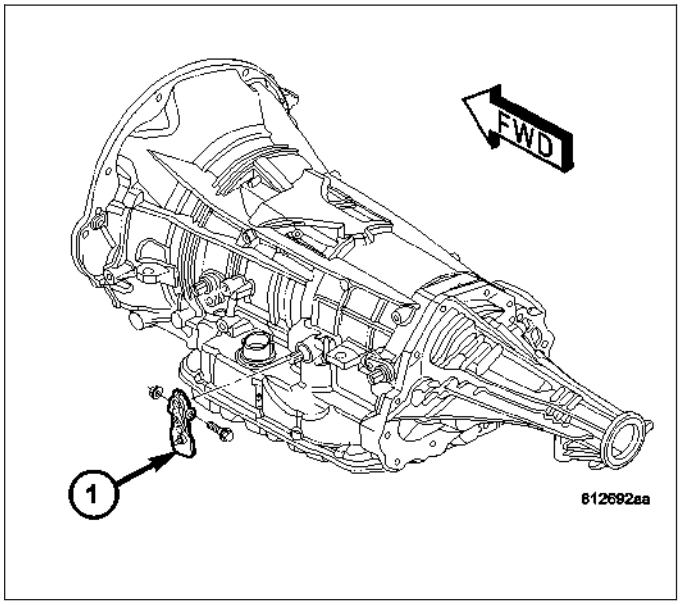


23. Remove transfer case.
24. Remove all remaining converter housing bolts.
25. Carefully work transmission and torque converter assembly (2) rearward off engine (1) block dowels.
26. Hold torque converter in place during transmission removal.
27. Lower transmission and remove assembly from under the vehicle.
28. To remove torque converter, carefully slide torque converter out of the transmission.

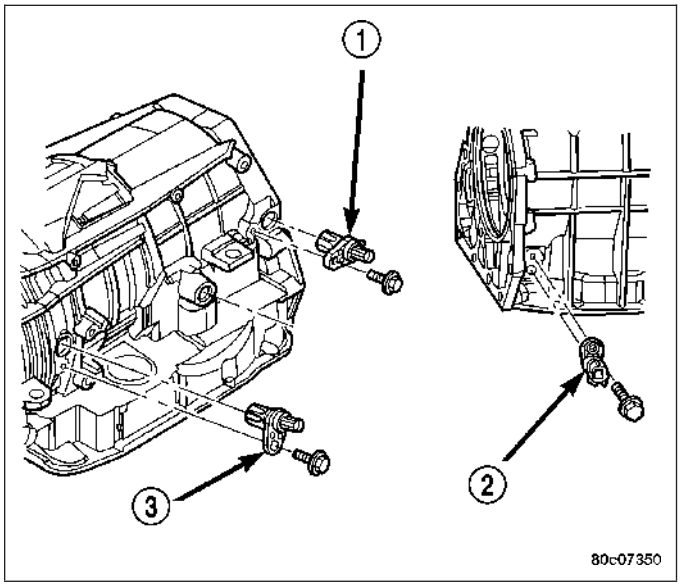


DISASSEMBLY

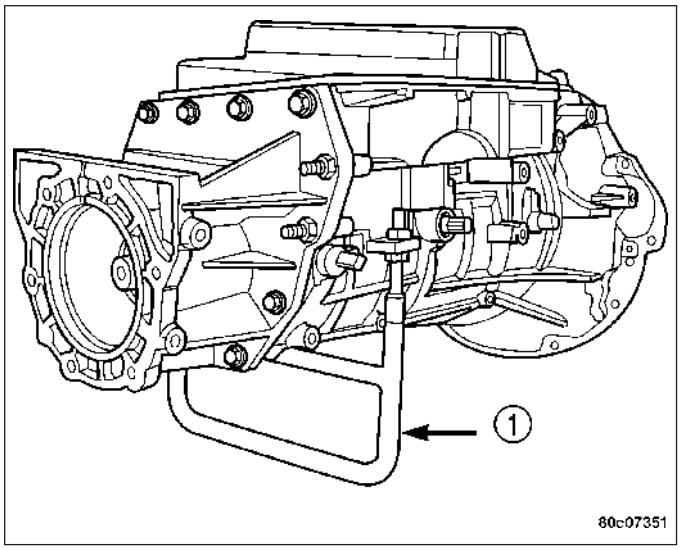
1. Drain fluid from transmission.
2. Clean exterior of transmission with suitable solvent or pressure washer.
3. Remove the torque converter from the transmission.
4. Remove the manual shift lever (1) from the transmission.



5. Remove the input (3), output (1), and line pressure sensors (2) from the transmission case.
6. Inspect the ends of the sensors for debris, which may indicate the nature of the transmission failure.

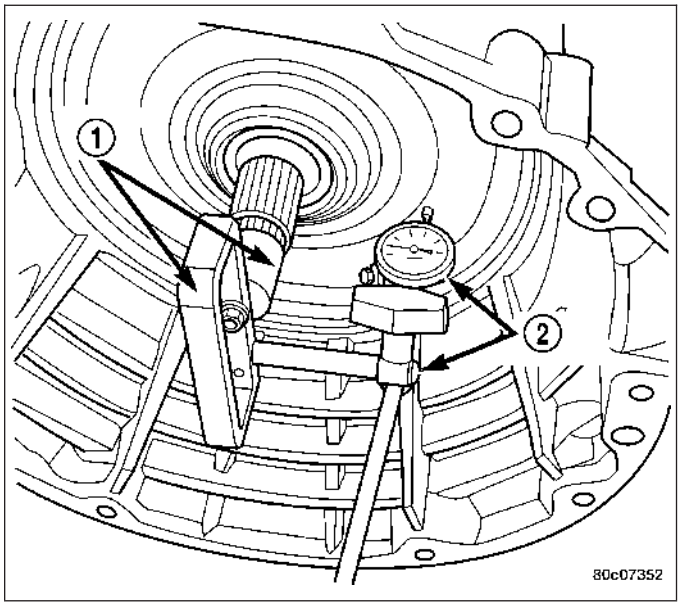


7. Install Support Stand 8257 (1) onto the transmission case.

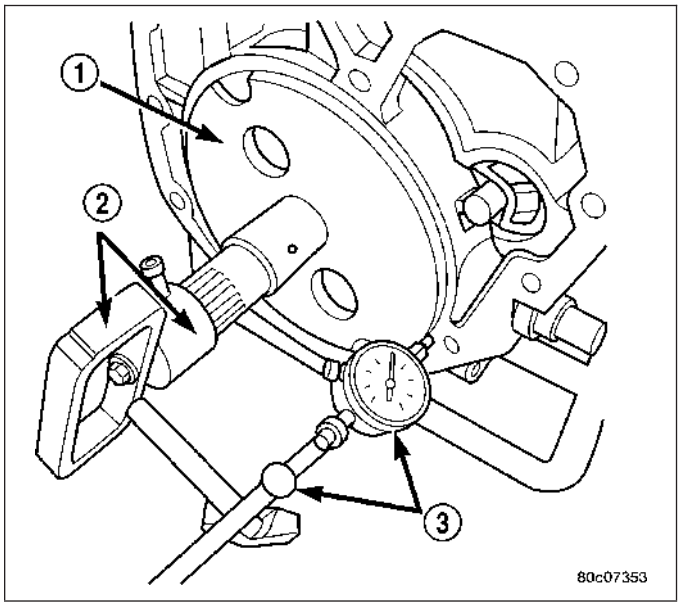


8. Using Adapter 8266-1 from End-Play Tool Set 8266 (1) and Dial Indicator C-3339 (2), measure and record the input shaft end-play.

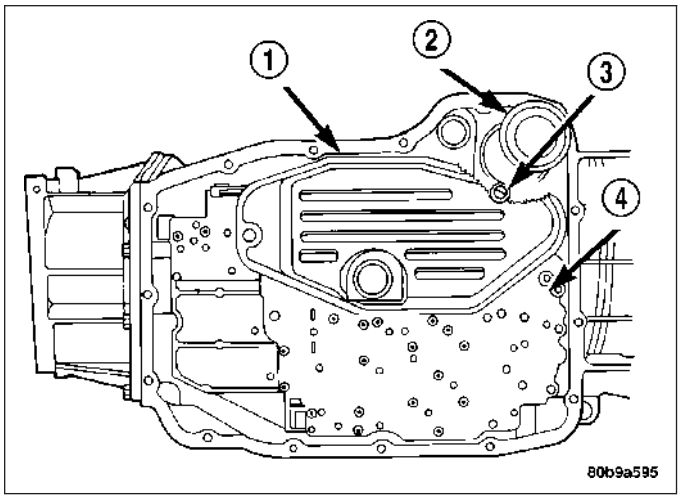
NOTE: When measuring the input shaft end-play, two ″stops″ will be felt. When the input shaft is pushed inward and the dial indicator zeroed, the first ″stop″ felt when the input shaft is pulled outward is the movement of the input shaft in the input clutch housing hub. This value should not be included in the end-play measured value and therefore must be recorded and subtracted from the dial indicator reading.



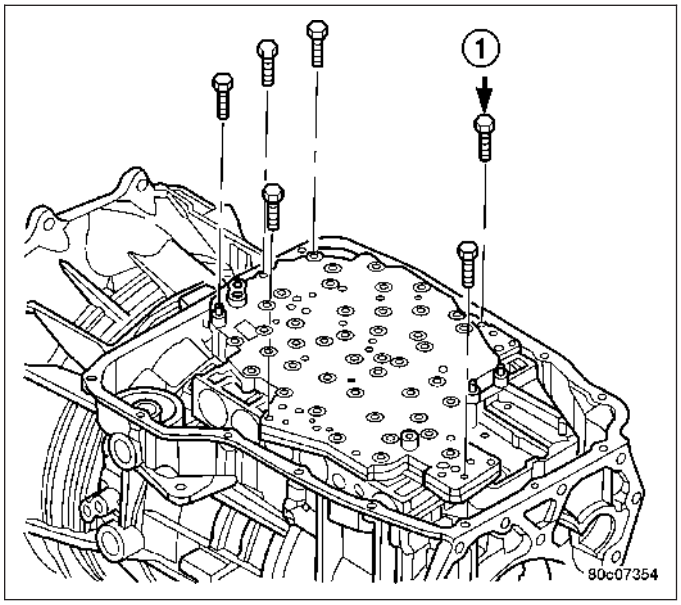
9. Remove the bolts holding the transmission extension/adapter housing to the transmission case.
10. Remove the extension/adapter housing from the transmission case.
11. Using Alignment Plate 8261 (1), Adapter 8266-17 from End-Play Tool Set 8266 (2) and Dial Indicator C-3339 (3), measure and record the output shaft end-play.



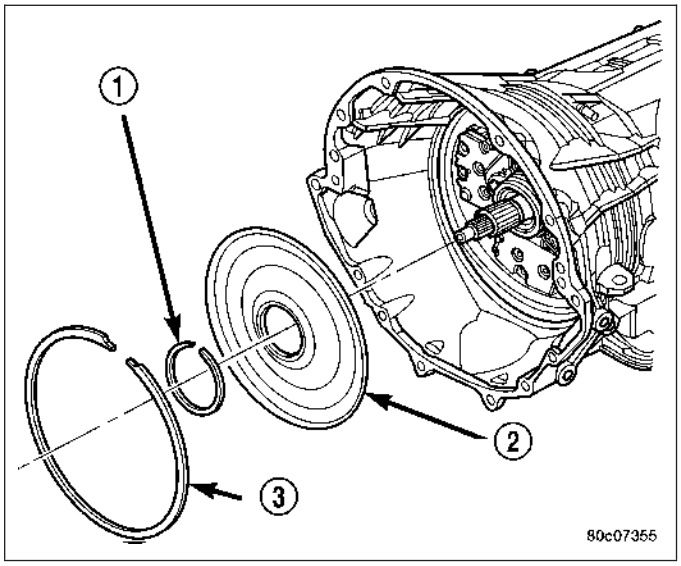
12. Remove the bolts holding the transmission oil pan to the transmission case.
13. Remove the transmission oil pan from the transmission case.
14. Remove the primary oil filter (1) and the oil cooler return filter (2).
15. Remove the cooler return filter bypass valve (3).



16. Remove the bolts (1) holding the valve body to the transmission case.
17. Remove the valve body from the transmission case.

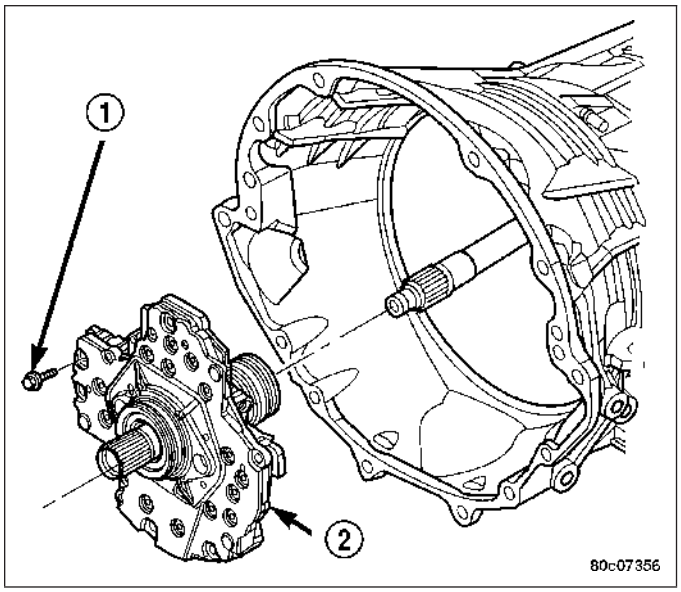


18. Remove the outer snap-ring (3) securing the transmission front cover (2) into the transmission case.
19. Remove the inner snap-ring (1) securing the transmission front cover to the oil pump.
20. Reaching through a case opening in the valve body area with a long blunted tool, remove the transmission front cover from the transmission case.

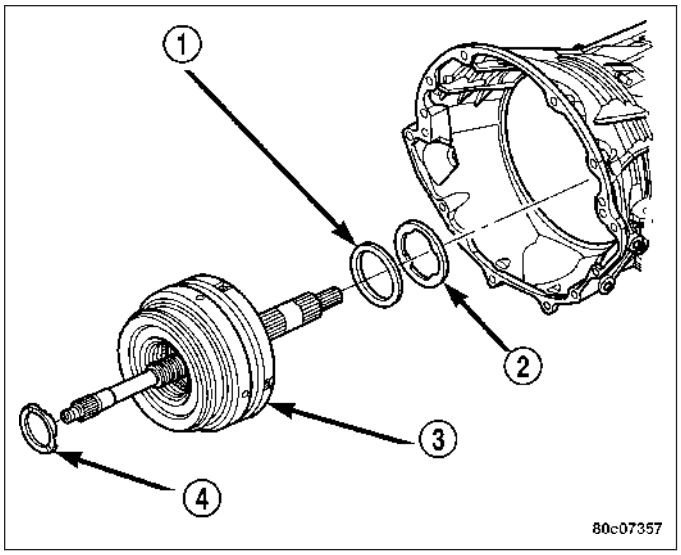


21. Remove the bolts (1) holding the oil pump into the transmission case.
22. Remove the oil pump (2). Hold inward on the input shaft to prevent pulling the input clutch assembly with the oil pump.

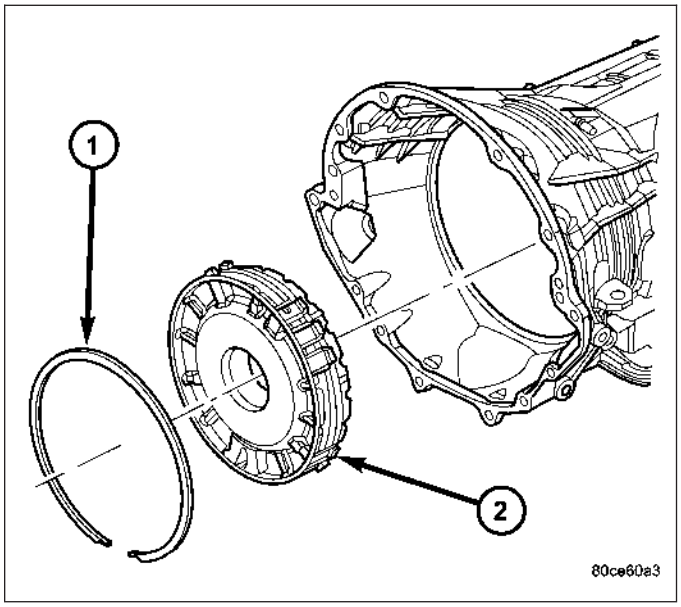
CAUTION: If the input shaft is not held during oil pump removal, the input clutch assembly will attempt to move forward with the oil pump and the numbers 2, 3, or 4 bearings inside the input clutch assembly may become dislodged.



23. Remove the number 1 thrust bearing (4) from the input clutch assembly.
24. Remove the input clutch assembly (3) from the transmission case.
25. Remove the number 5 thrust bearing (1) and selective thrust plate (2) from the input clutch assembly (3) , or the 4C clutch retainer/bulkhead.

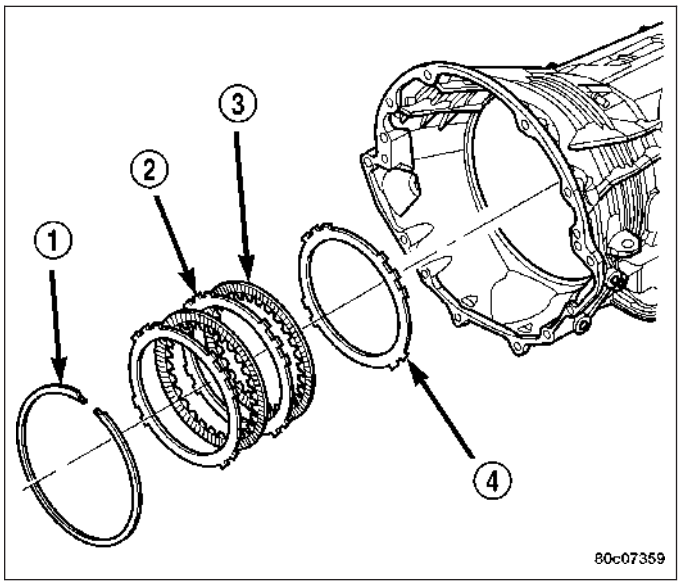


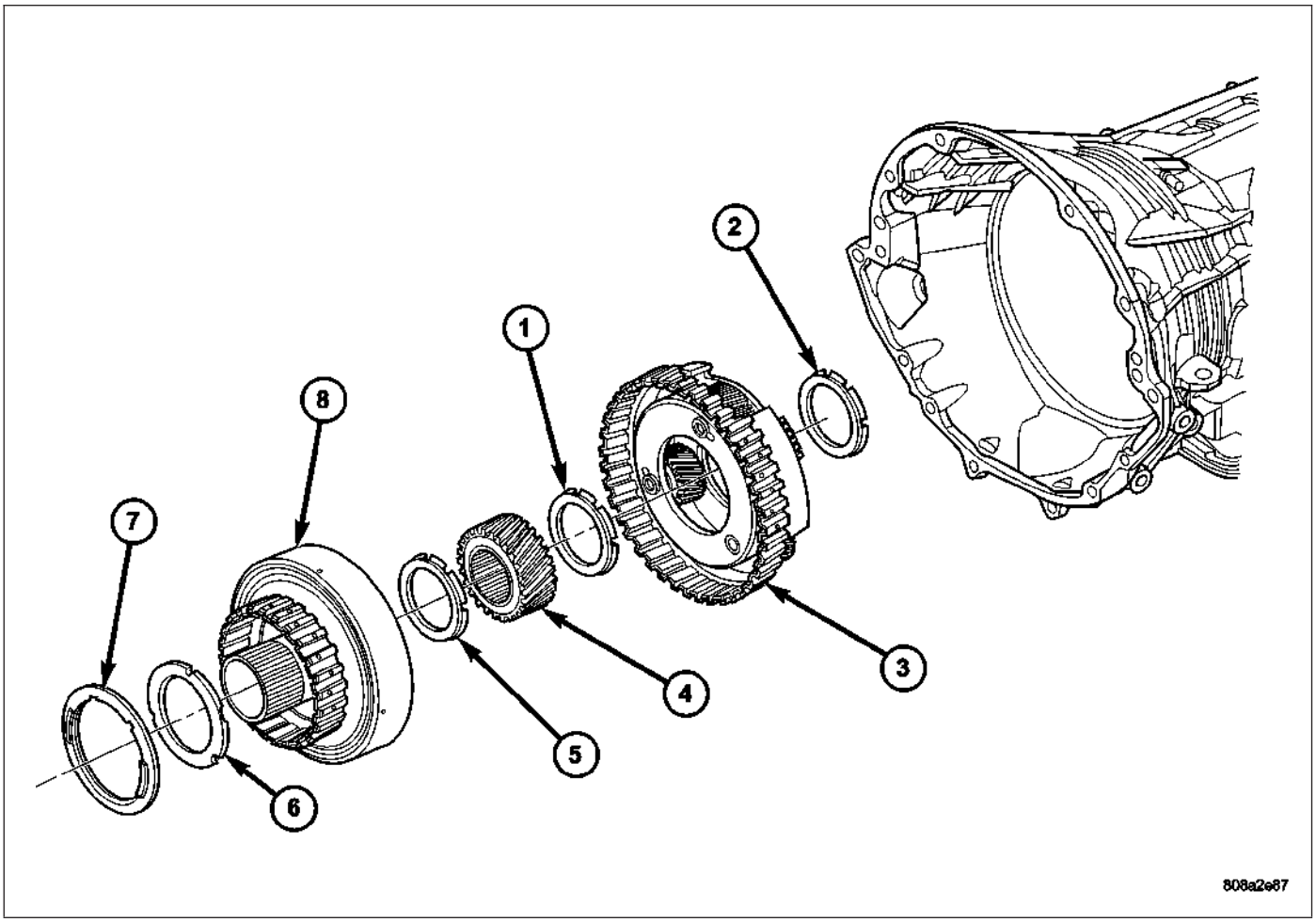
26. Remove the 4C clutch retainer/bulkhead tapered snap-ring (1) from the transmission case.



27. Remove the 4C clutch retainer/bulkhead (2) from the transmission case.

28. Remove the front 2C clutch pack snap-ring (1) from the transmission case.
29. Remove the 2C clutch pack (2, 3, 4) from the transmission case.



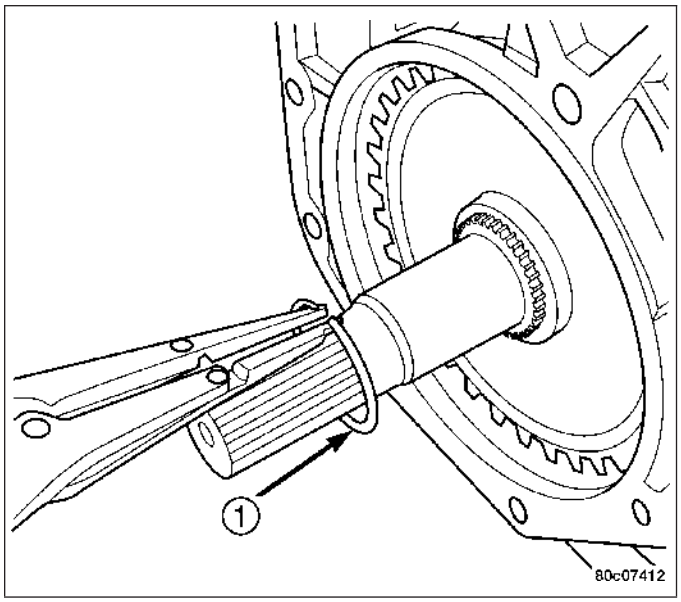


Remove Reaction Annulus and Carrier

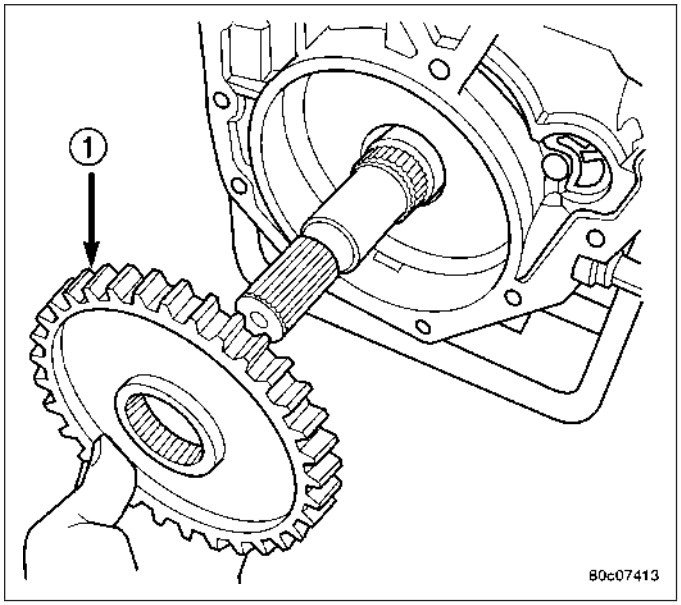
1 - THRUST BEARING NUMBER 8
2 - THRUST BEARING NUMBER 9
3 - REACTION PLANETARY CARRIER
4 - REACTION SUN GEAR
5 - THRUST BEARING NUMBER 7
6 - THRUST PLATE (SELECT)
7 - THRUST BEARING NUMBER 6
8 - REACTION ANNULUS

30. Remove the rear selective plate (6) and number 6 thrust bearing (7) from the reaction annulus (8).
31. Remove the reaction annulus (8) from the reaction planetary carrier (3).
32. Remove the number 7 thrust bearing (5).
33. Remove the reaction sun gear (4).
34. Remove the number 8 thrust bearing (1) from the reaction planetary carrier (3).
35. Remove the reaction planetary carrier (3). Note that this planetary gear set has three pinion gears.
36. Remove the number 9 thrust bearing (2) from the reverse planetary gear set.

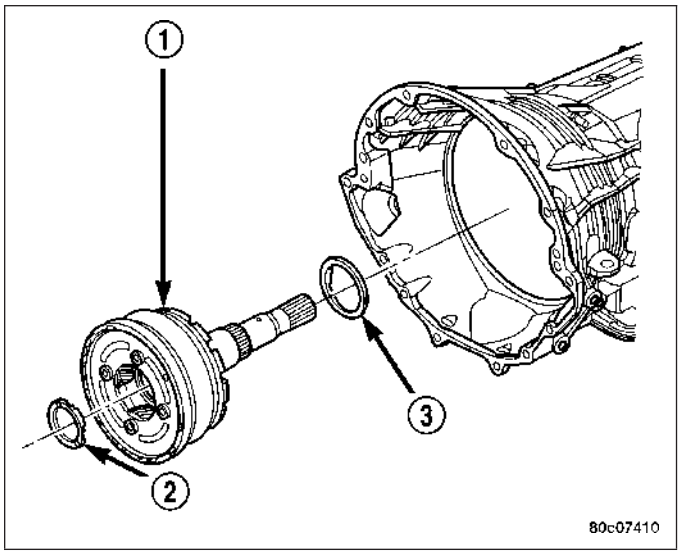
37. Remove the snap-ring (1) holding the park sprag gear onto the output shaft.



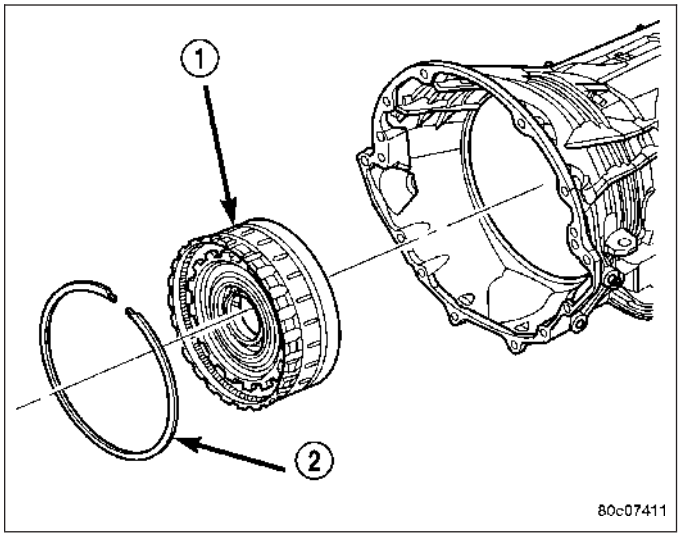
38. Remove the park sprag gear (1) from the output shaft.



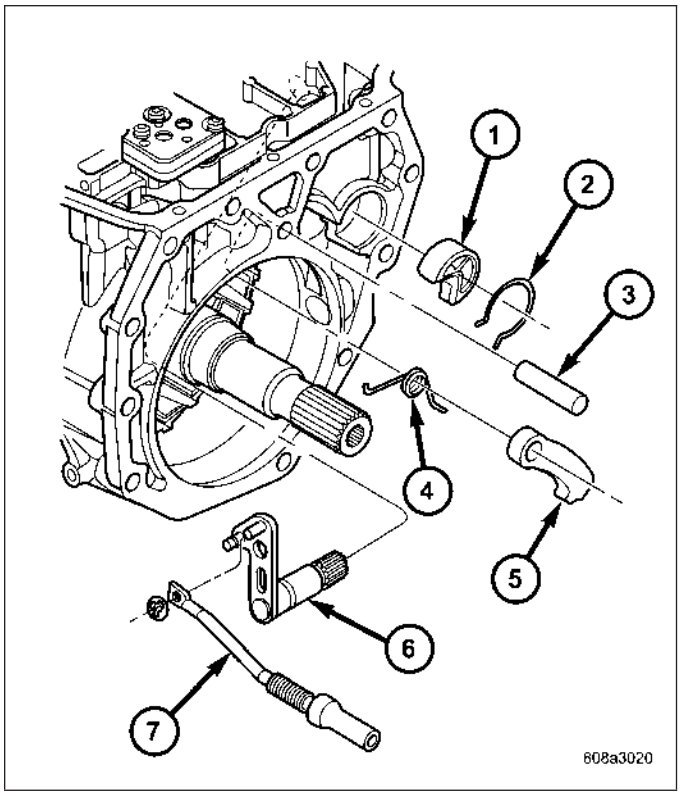
39. Remove the input/reverse planetary assembly (1).
40. Remove the number 12 thrust bearing (3) from the input/reverse planetary assembly (1).



41. Remove the snap-ring (2) holding the low/reverse clutch retainer (1) into the transmission case.
42. Remove the low/reverse clutch retainer (1) from the transmission case.



43. Remove the park rod (7) and e-clip.
44. Remove the park rod guide snap-ring (2).
45. Remove the park rod guide (1).
46. Remove the park pawl pivot shaft (3), park pawl (5), and spring (4).
47. Remove the manual selector shaft (6).
48. Remove the manual selector shaft seal.
49. Remove the dipstick tube seal.



CLEANING

The use of crocus cloth is permissible where necessary, providing it is used carefully. When used on shafts, or valves, use extreme care to avoid rounding off sharp edges. Sharp edges are vital as they prevent foreign matter from getting between the valve and valve bore.

Do not reuse oil seals, gaskets, seal rings, or O-rings during overhaul. Replace these parts as a matter of course. Also do not reuse snap rings or E-clips that are bent or distorted. Replace these parts as well.

Lubricate transmission parts with Mopar® ATF +4, Automatic Transmission Fluid, during overhaul and assembly. Use petroleum jelly, Mopar® Door Ease, or Ru-Glyde to prelubricate seals, O-rings, and thrust washers. Petroleum jelly can also be used to hold parts in place during reassembly.

Clean the case in a solvent tank. Flush the case bores and fluid passages thoroughly with solvent. Dry the case and all fluid passages with compressed air. Be sure all solvent is removed from the case and that all fluid passages are clear.

NOTE: Do not use shop towels or rags to dry the case (or any other transmission component) unless they are made from lint-free materials. Lint will stick to case surfaces and transmission components and circulate throughout the transmission after assembly. A sufficient quantity of lint can block fluid passages and interfere with valve body operation.

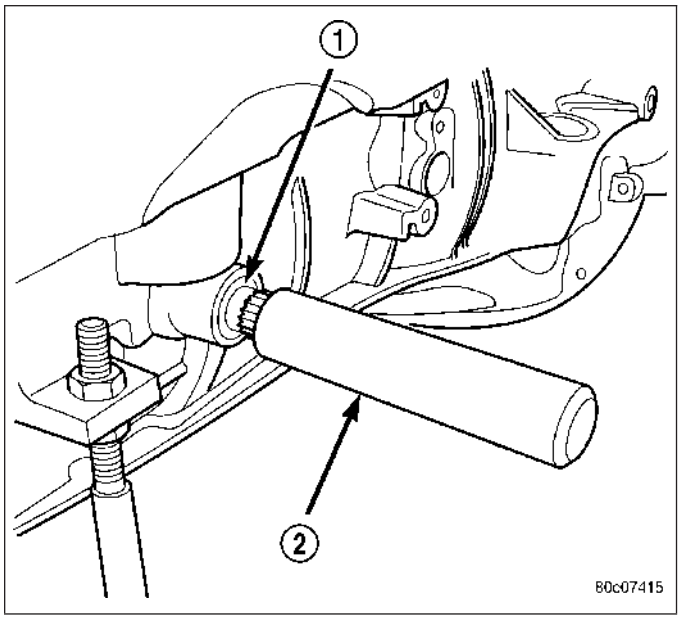
INSPECTION

Inspect the case for cracks, porous spots, worn bores, or damaged threads. Damaged threads can be repaired with Helicoil® thread inserts. However, the case will have to be replaced if it exhibits any type of damage or wear.

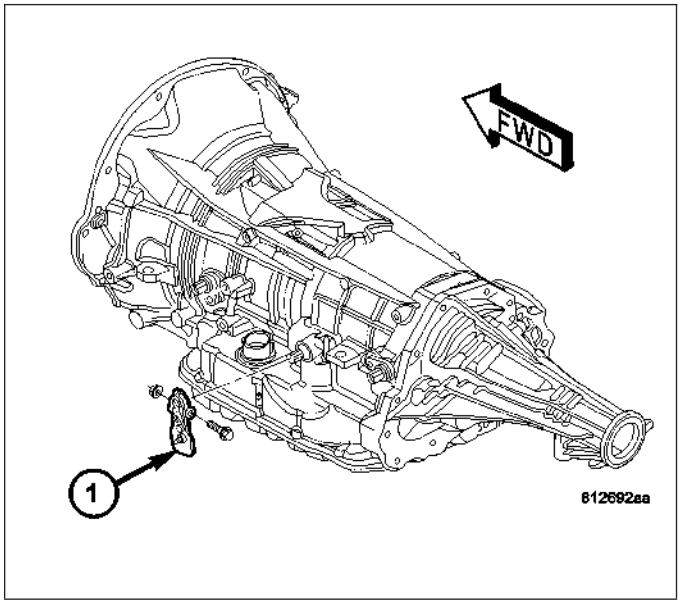
ASSEMBLY

NOTE: Clean and inspect all components. Replace any components which show evidence of excessive wear or scoring.

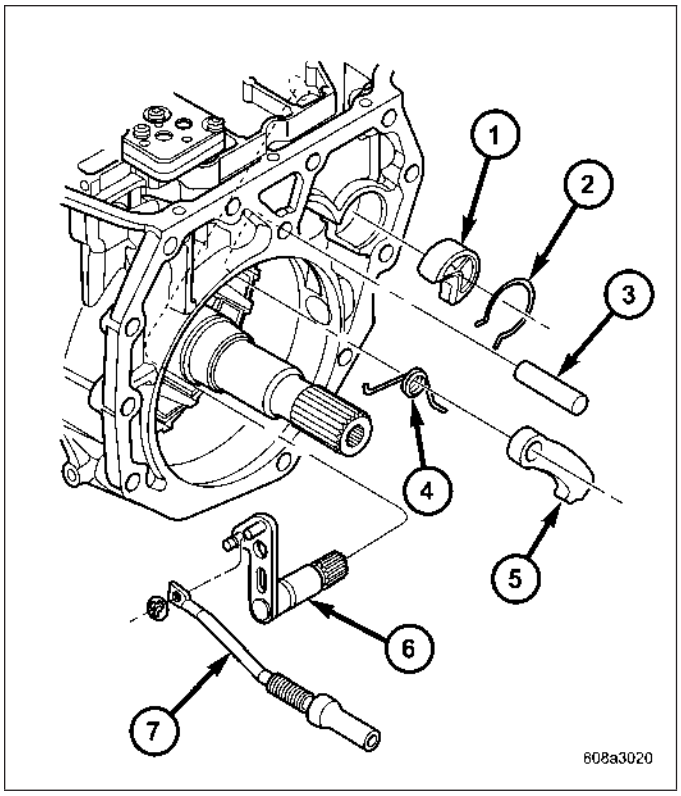
1. Install the cooler filter bypass valve. Torque the bypass valve to specification. The valve uses a tapered pipe thread and excessive torque can damage the transmission case. Tighten the cooler filter bypass valve to 4.5 N·m (40 in.lbs.).
2. Install a new selector shaft seal (1) using Seal Installer 8253 (2).



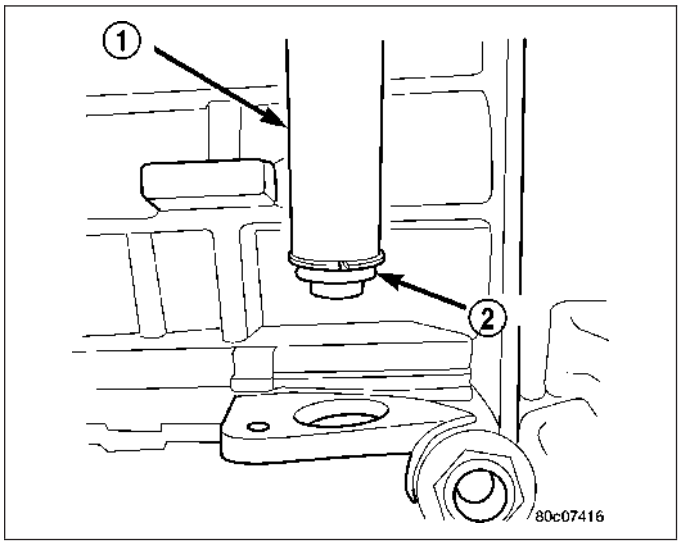
3. Install the manual selector shaft and retaining screw. Tighten the manual selector shaft retaining screw to 28 N·m (250 in.lbs.).
4. Install the manual shift lever (1) onto the manual selector shaft. Torque the retaining cross-bolt to 16 N·m (140 in.lbs.).



5. Install the park pawl (5), spring (4), and shaft (3).
6. Install the park rod (7) and e-clip.
7. Install the park rod guide (1) and snap-ring (2).

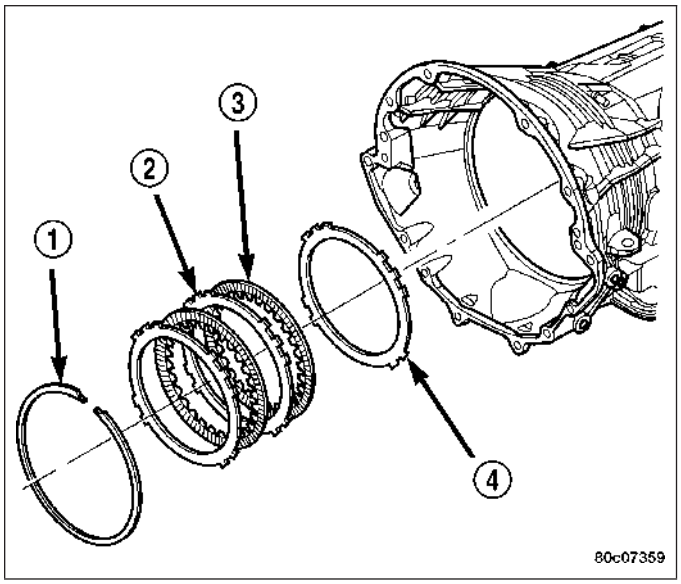


8. Install a new dipstick tube seal (2) using Seal Installer 8254 (1).

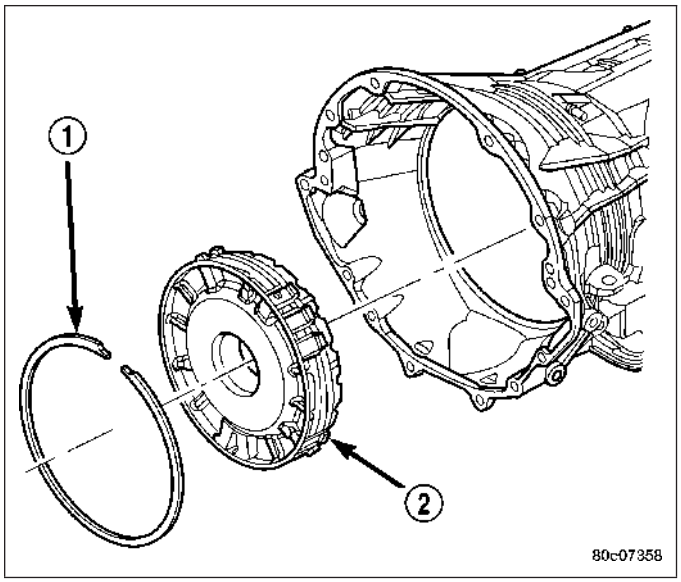


NOTE: Before final assembly of transmission centerline, the 2C/4C clutch components should be installed into position and measured as follows:

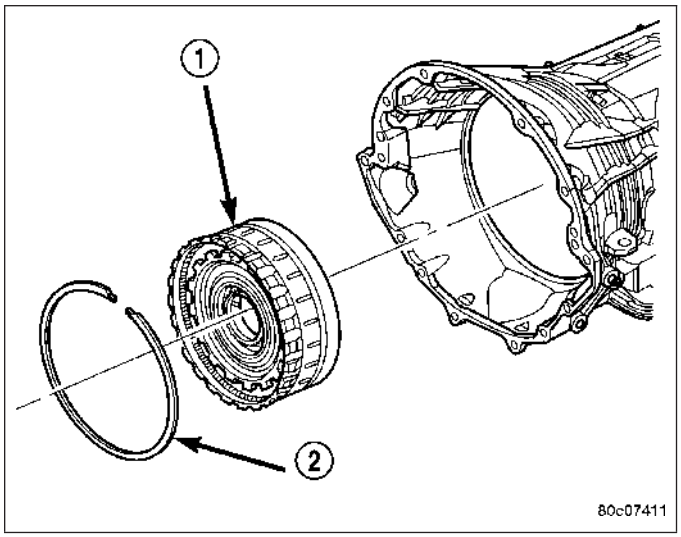
9. Install the 2C reaction plate (4) into the transmission case.
10. Install the 2C clutch pack (2, 3) into the transmission case.
11. Install the flat 2C clutch snap-ring (1) into the transmission case.



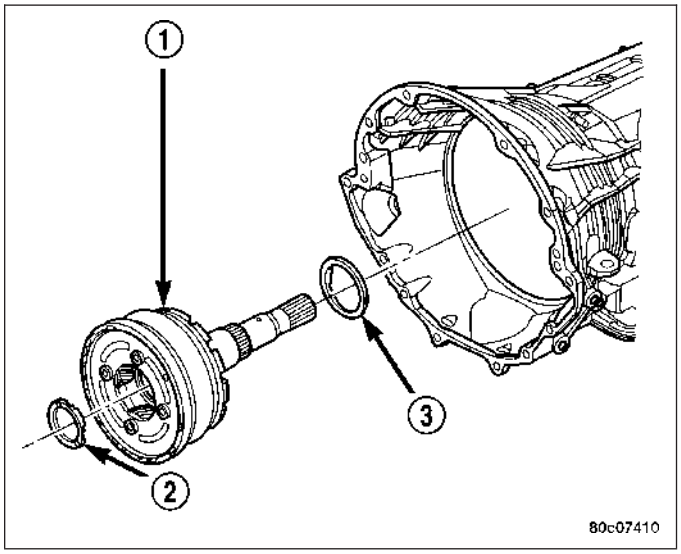
12. Install the 4C retainer/bulkhead (2) into the transmission case. Make sure that the oil feed holes are pointing toward the valve body area.
13. Install the 4C retainer/bulkhead tapered snap-ring (1) into the transmission case. Make sure that the open ends of the snap-ring are located in the case opening toward the valve body area.
14. Using a feeler gauge through the opening in the rear of the transmission case, measure the 2C clutch pack clearance between the 2C reaction plate and the transmission case at four different points. The average of these measurements is the 2C clutch pack clearance. The correct clutch clearance is 0.455-1.335 mm (0.018-0.053 in.). The reaction plate is not selective. If the clutch pack clearance is not within specification, the reaction plate, all the friction discs, and steels must be replaced.
15. Remove the 4C retainer/bulkhead and all of the 2C clutch components from the transmission case.



16. Install the low/reverse clutch assembly (1). Make sure that the oil feed hole points toward the valve body area and that the bleed orifice is aligned with the notch in the rear of the transmission case.
17. Install the snap-ring (2) to hold the low/reverse clutch retainer into the transmission case. The snap-ring is tapered and must be installed with the tapered side forward. Once installed, verify that the snap-ring is fully seated in the snap-ring groove.
18. Air check the low/reverse clutch and verify correct overrunning clutch operation.

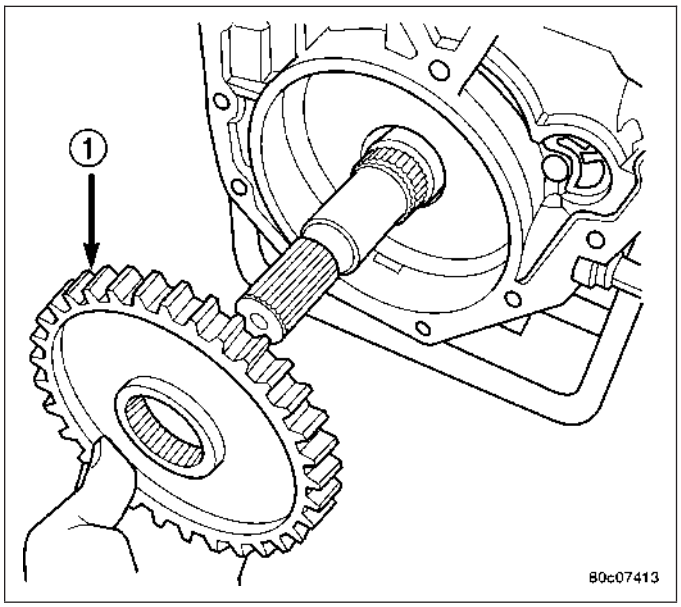


19. Install the number 12 thrust bearing (3) over the output shaft and against the rear planetary gear set. The flat side of the bearing goes toward the planetary gearset and the raised tabs on the inner race should face the rear of the transmission.

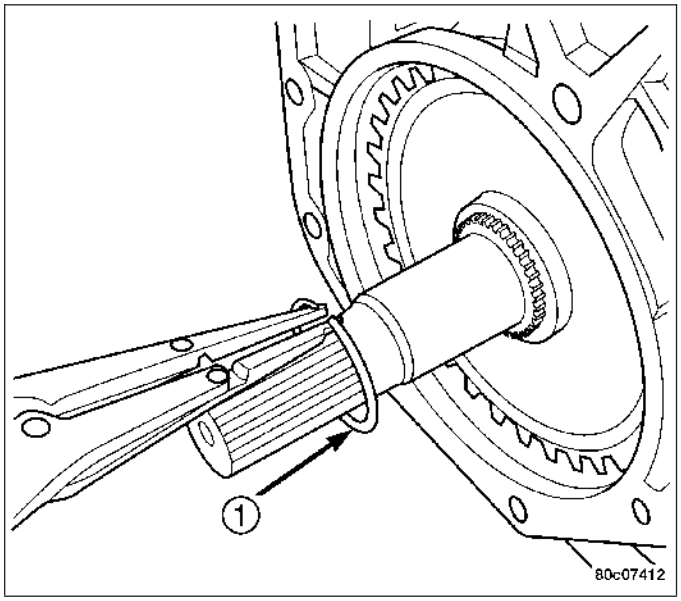


20. Install the reverse/input planetary assembly (1) through the low/reverse clutch assembly.

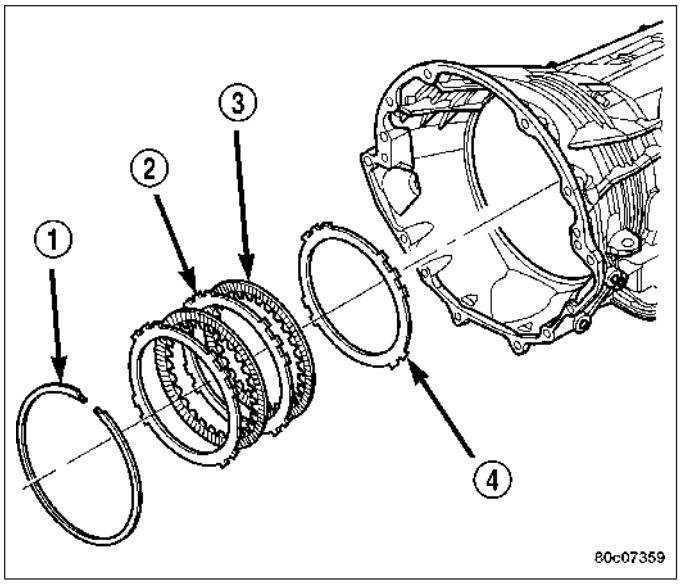
21. Install the park sprag gear (1) onto the output shaft.

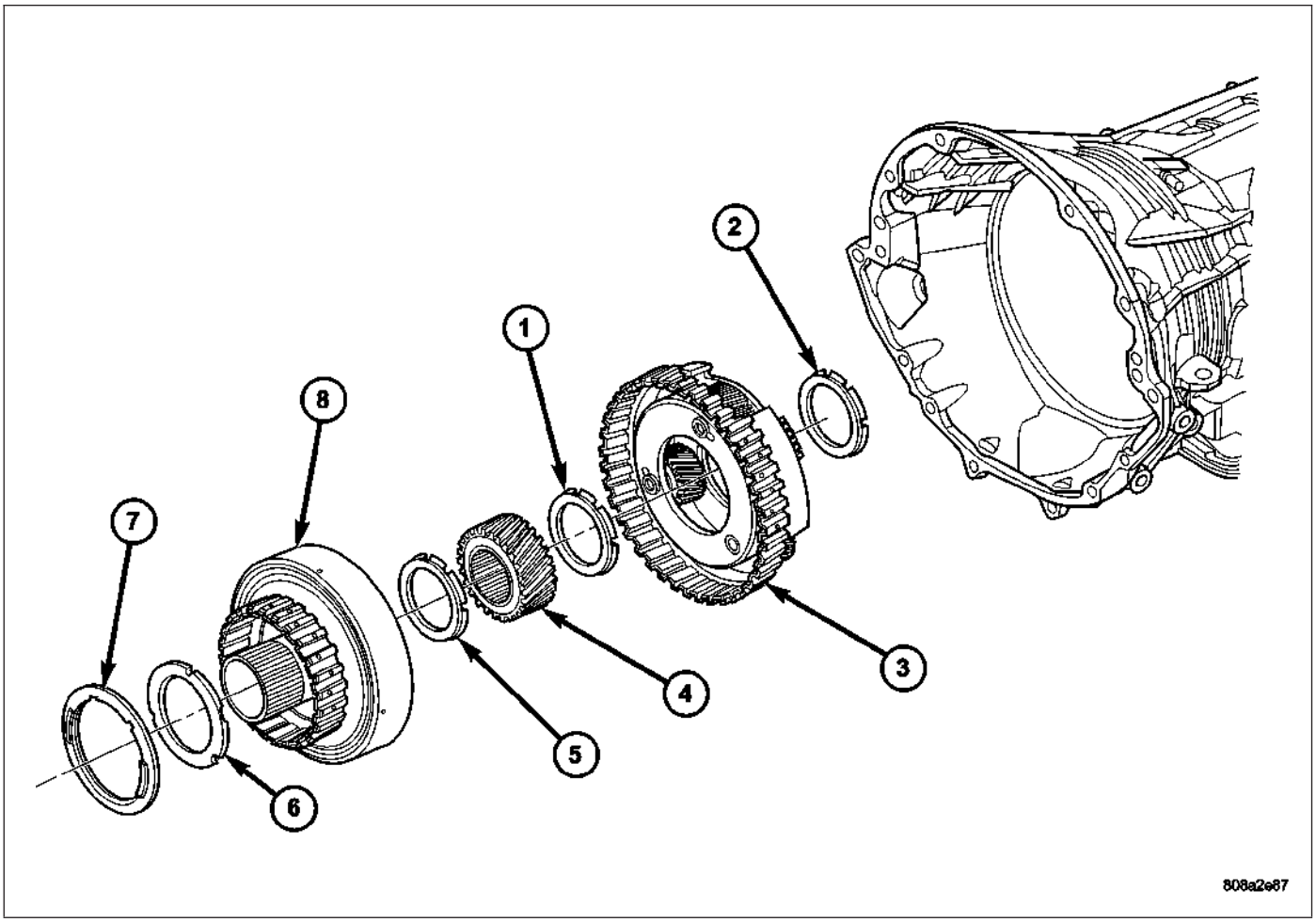


22. Install the snap-ring (1) to hold the park sprag onto the output shaft.



23. Install the 2C reaction plate (4) into the transmission case.
24. Install the 2C clutch pack (2, 3, 4) into the transmission case.

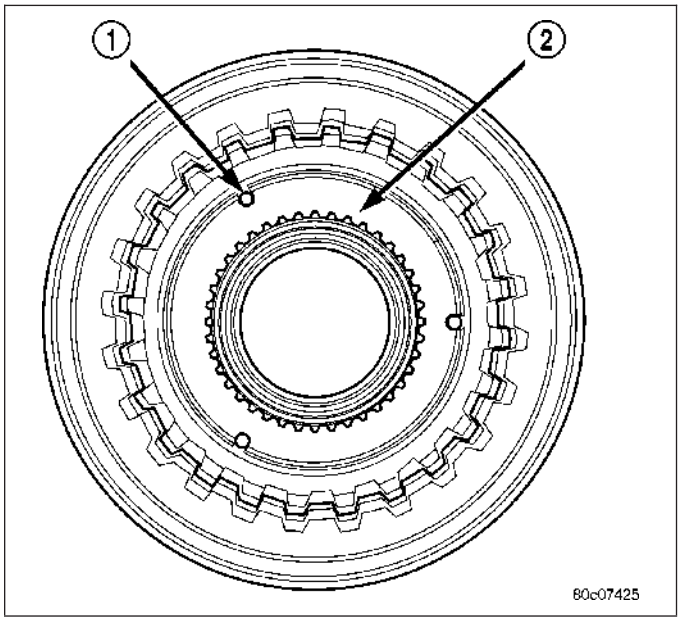




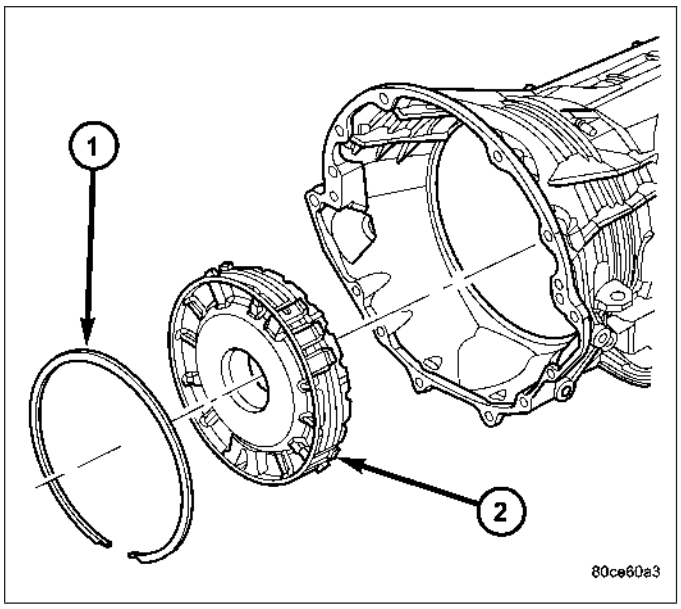
Install Reaction Annulus and Carrier

1 - THRUST BEARING NUMBER 8
2 - THRUST BEARING NUMBER 9
3 - REACTION PLANETARY CARRIER
4 - REACTION SUN GEAR
5 - THRUST BEARING NUMBER 7
6 - THRUST PLATE (SELECT)
7 - THRUST BEARING NUMBER 6
8 - REACTION ANNULUS

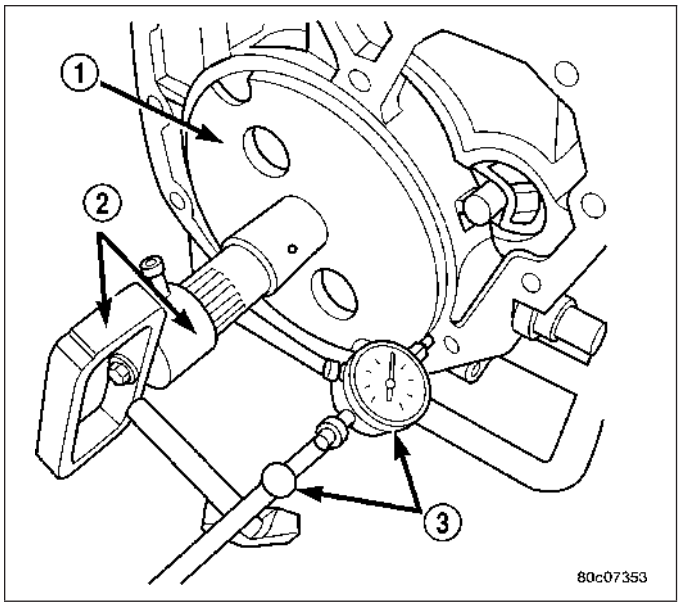
25. Install the number 8 thrust bearing (1) inside the reaction carrier with the outer race against the reaction planetary carrier (3).
26. Install the reaction planetary gear set and the number 9 thrust bearing (2), with the inner race against the reaction planetary carrier (3), into the transmission case.
27. Install the flat 2C clutch snap-ring into the transmission case.
28. Install the reaction sun gear (4) into the reaction planetary gear set. **Make sure** the small shoulder is facing the front of the transmission.
29. Install the number 7 thrust bearing (5) onto the reaction sun gear (4) with the inner race against the sun gear.
30. Install the output shaft selective thrust plate (2) onto the reaction annulus with the oil grooves facing the annulus gear and the lugs (1) and notches aligned as shown.
31. Install the number 6 thrust bearing (7) against the output shaft selective thrust plate (6) with the flat side against the thrust plate and the raised tabs on the inner race facing the front of the transmission.
32. Install the reaction annulus (8) into the reaction planetary gear set.



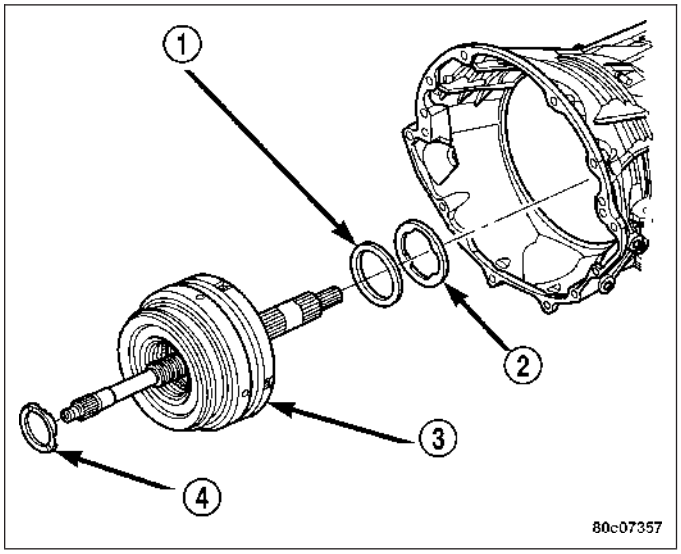
33. Install the 4C retainer/bulkhead (2) into the transmission case. Make sure that the oil feed holes are pointing toward the valve body area. Rotate the reaction annulus during the installation of the 4C retainer/bulkhead to ease installation.
34. Install the 4C retainer/bulkhead tapered snap-ring (1) into the transmission case with the taper toward the front of the case. Make sure that the open ends of the snap-ring are located in the case opening toward the valve body area.
35. Air check the 2C and 4C clutch operation.



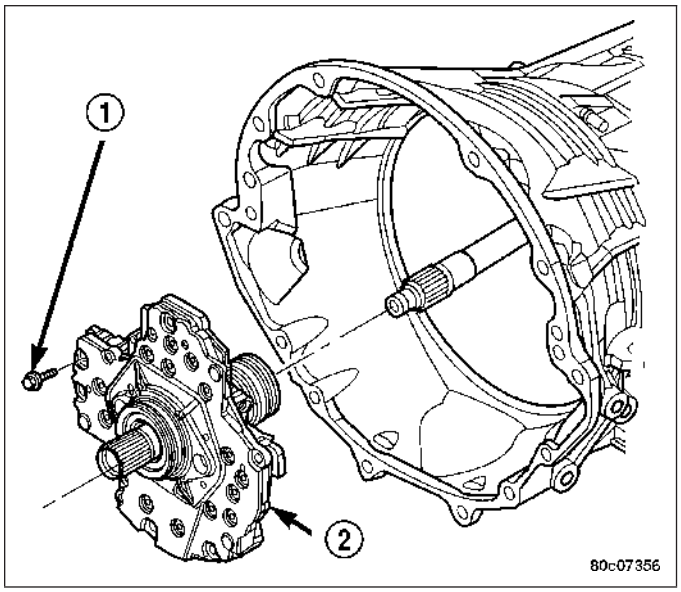
36. Using Alignment Plate 8261 (1), Adapter 8266-17 from End-Play Tool Set 8266 (2) and Dial Indicator C-3339 (3), measure and record the output shaft end-play. The correct output shaft end-play is 0.22-0.55 mm (0.009-0.021 in.). Adjust as necessary. Install the chosen output shaft selective thrust plate and re-measure end-play to verify selection.
37. Apply a bead of RTV silicone and install the extension/adapter housing onto the transmission case.
38. Install and torque the bolts to hold the extension/adapter housing onto the transmission case. The correct torque is 54 N·m (40 ft.lbs.).



39. Install the number 5 thrust bearing (1) and selective thrust plate (2) onto the 4C retainer/bulkhead. Be sure that the outer race of the bearing is against the thrust plate.
40. Install the input clutch assembly (3) into the transmission case. Make sure that the input clutch assembly is fully installed by performing a visual inspection through the input speed sensor hole. If the tone wheel teeth on the input clutch assembly are centered in the hole, the assembly is fully installed.
41. Install the number 1 thrust bearing (4) with the outer race up in the pocket of the input clutch assembly.

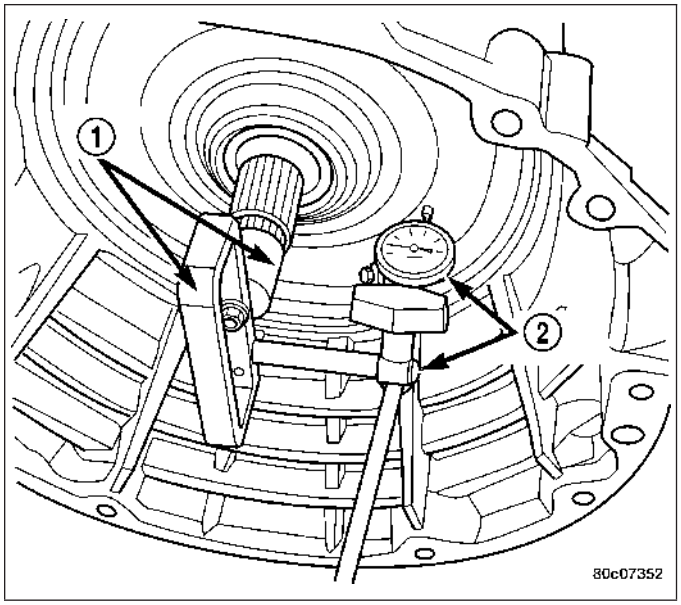


42. Install the oil pump (2) into the transmission case.
43. Install the bolts (1) to hold the oil pump into the transmission case. Tighten the oil pump bolts to 28 N·m (250 in.lbs.).

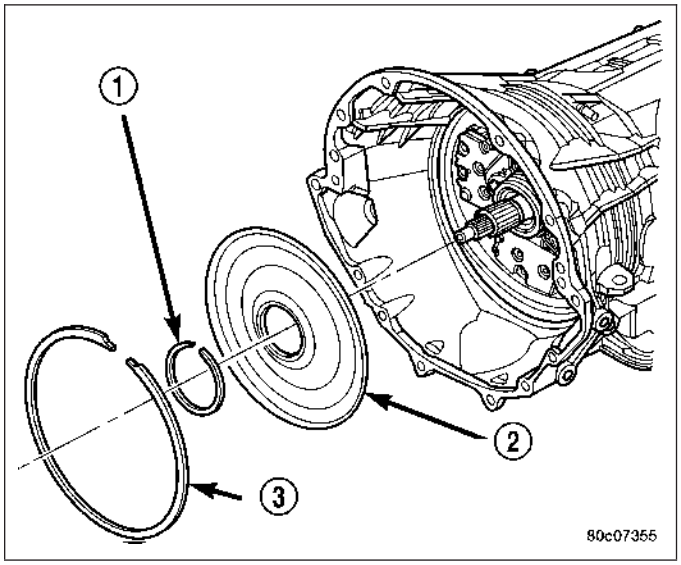


44. Using Adapter 8266-1 from End-Play Tool Set 8266 (1) and Dial Indicator C-3339 (2), measure and record the input shaft end-play. The correct end-play is 0.46-0.89 mm (0.018-0.035 in.). Adjust as necessary. Install the chosen thrust plate on the number 5 thrust bearing and re-measure end-play to verify selection.

NOTE: When measuring the input shaft end-play, two ″stops″ will be felt. When the input shaft is pushed inward and the dial indicator zeroed, the first ″stop″ felt when the input shaft is pulled outward is the movement of the input shaft in the input clutch housing hub. This value should not be included in the end-play measured value and therefore must be recorded and subtracted from the dial indicator reading.

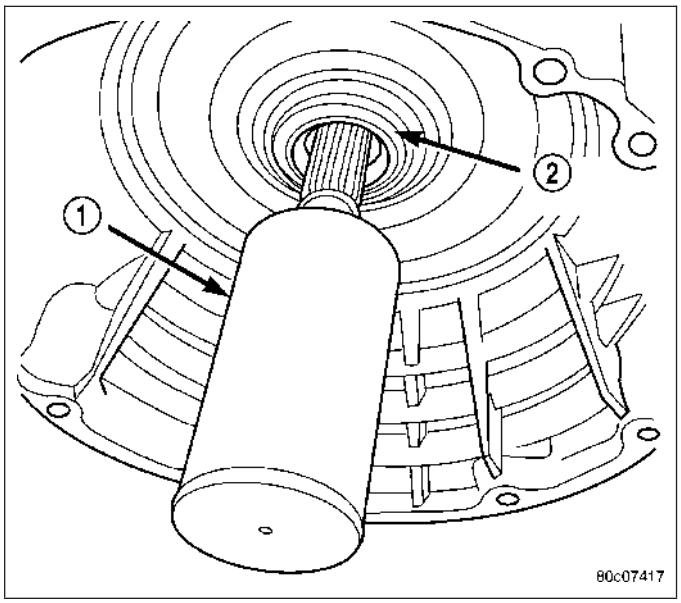


45. Install the transmission front cover (2) into the transmission case.
46. Install the outer snap-ring (3) to hold the transmission front cover (2) into the transmission case.

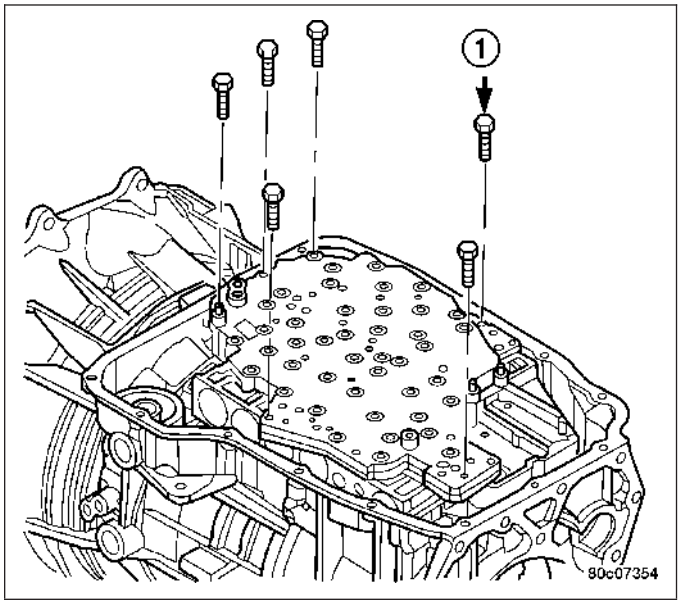


47. Partially install the inner transmission front cover snap-ring (1) onto the oil pump.

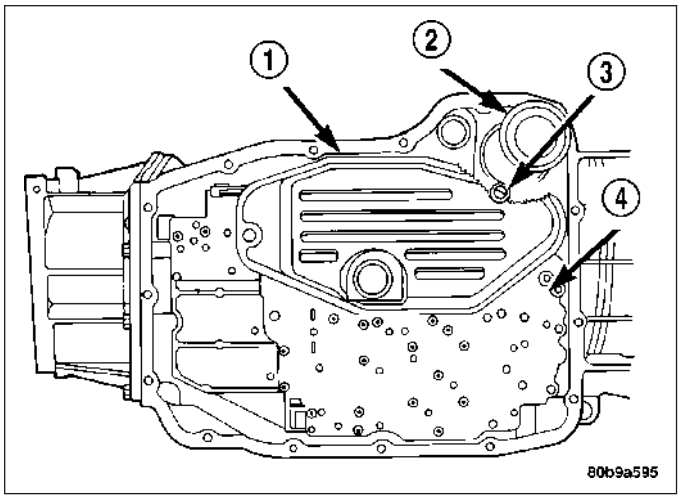
48. Using Installer 8255 (1), install the inner transmission front cover snap-ring (2) the remainder of the way onto the oil pump.



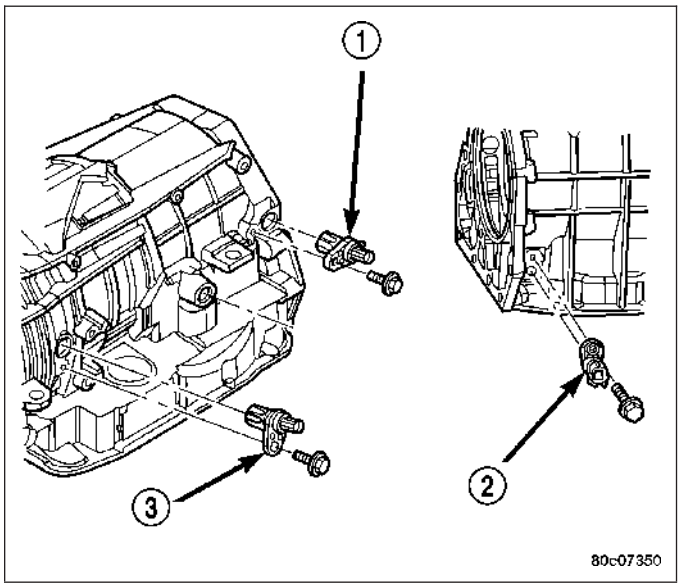
49. Install the valve body. Verify that the pin on the manual lever has properly engaged the TRS selector plate. Tighten the valve body to transmission case bolts (1) to 12 N·m (105 in.lbs.).



CAUTION: The primary oil filter seal MUST be fully installed flush against the oil pump body. DO NOT install the seal onto the filter neck and attempt to install the filter and seal as an assembly. Damage to the transmission will result.



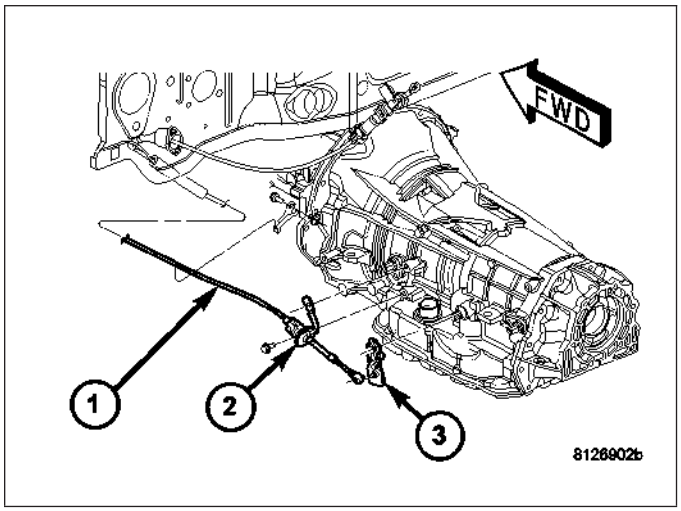
50. Install a new primary oil filter seal in the oil pump inlet bore. Seat the seal in the bore with the butt end of a hammer, or other suitable tool.
51. Install the primary oil filter (1) and the oil cooler return filter (2). Tighten the screw to hold the primary oil filter to the valve body to 4.5 N·m (40 in.lbs.). Using Oil Filter Wrench 8321, tighten the cooler return oil filter to the transmission case to 14 N·m (125 in.lbs.).
52. Apply RTV silicone to the oil pan and install the transmission oil pan. Tighten the bolts to 12 N·m (105 in.lbs.).
53. Install the input (3), output (1), and line pressure sensors (2). Tighten the bolts to 12 N·m (105 in.lbs.).



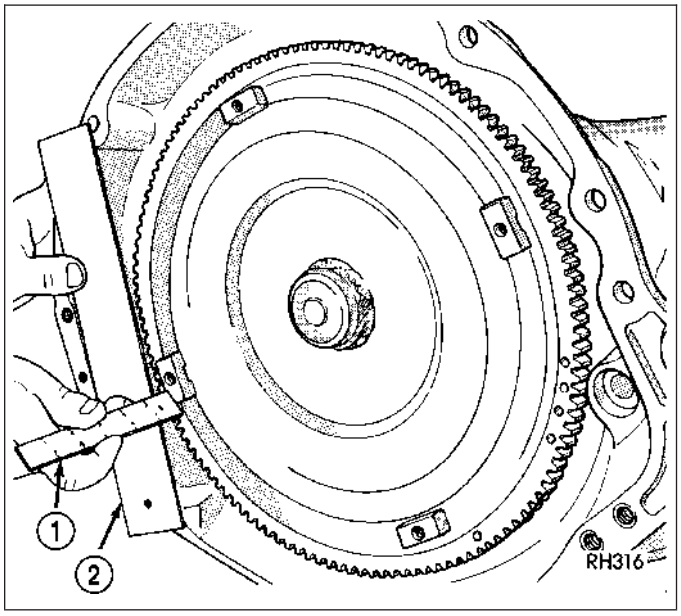
INSTALLATION

NOTE: Check torque converter hub and hub drive flats for sharp edges burrs, scratches, or nicks. Polish the hub and flats with 320/400 grit paper and crocus cloth if necessary. Verify that the converter hub o-ring is properly installed and is free of any debris. The hub must be smooth to avoid damaging pump seal at installation.

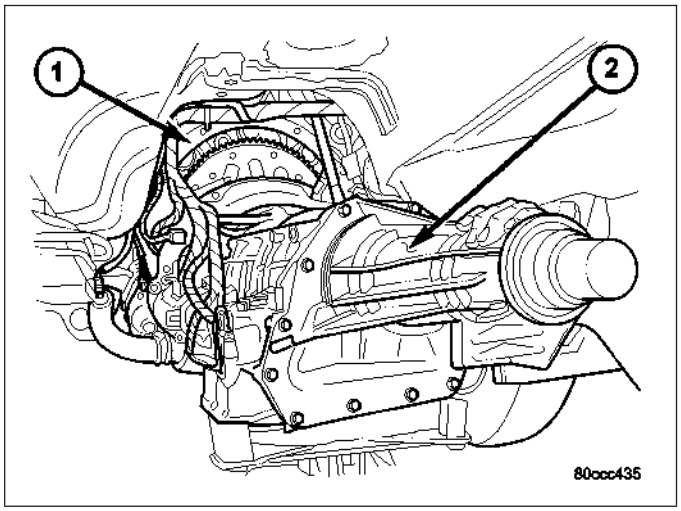
1. If a replacement transmission is being installed, transfer any components necessary, such as the manual shift lever (3) and shift cable bracket (2), from the original transmission onto the replacement transmission.



2. Lubricate oil pump seal lip with transmission fluid.
3. Align converter and oil pump.
4. Carefully insert converter in oil pump. Then rotate converter back and forth until fully seated in pump gears.
5. Check converter seating with steel scale and straightedge. Surface of converter lugs should be at least 13mm (1/2 in.) (1) to rear of straightedge (2) when converter is fully seated.
6. Temporarily secure converter with C-clamp.

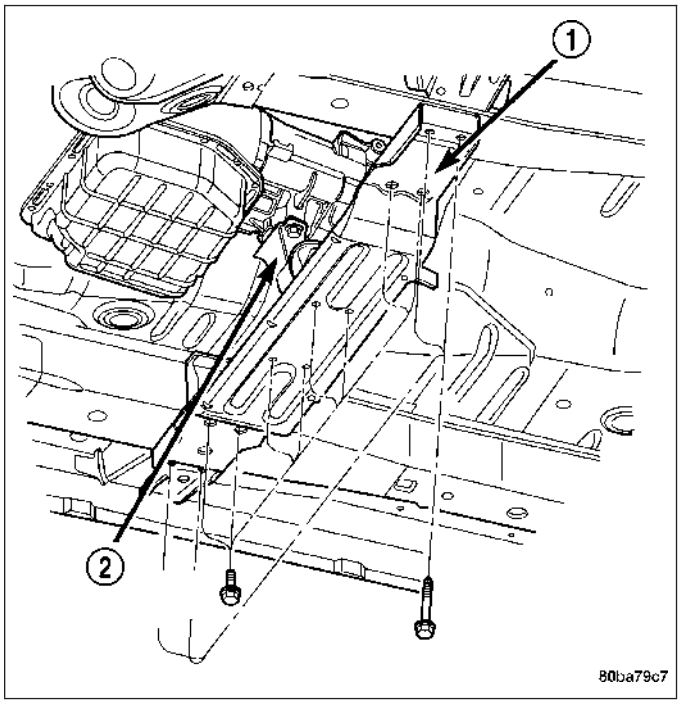


7. Position transmission on jack and secure it with chains.
8. Check condition of converter driveplate. Replace the plate if cracked, distorted or damaged. **Also be sure transmission dowel pins are seated in engine block and protrude far enough to hold transmission in alignment.**
9. Apply a light coating of Mopar® High Temp Grease to the torque converter hub pocket in the rear pocket of the engine's crankshaft.
10. Raise transmission and align the torque converter with the drive plate and transmission converter housing with the engine block.
11. Move transmission forward. Then raise, lower or tilt transmission to align the converter housing with engine block dowels.

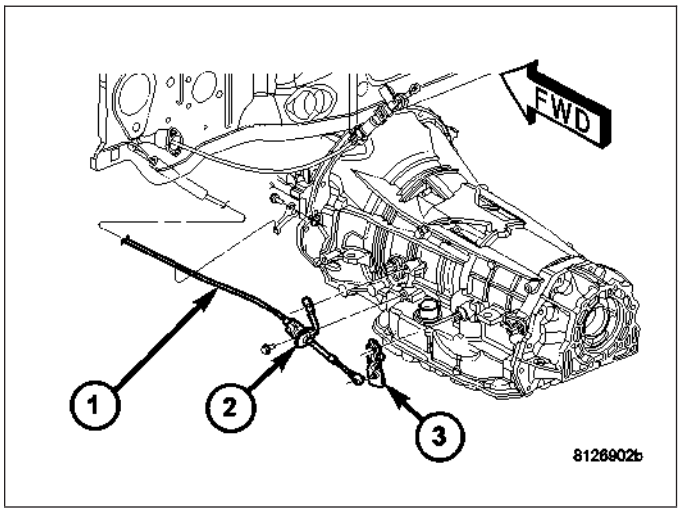


12. Carefully work transmission forward and over engine block dowels until converter hub is seated in crankshaft. Verify that no wires, or the transmission vent hose, have become trapped between the engine block and the transmission.
13. Install two bolts to attach the transmission to the engine.
14. Install remaining torque converter housing to engine bolts. Tighten to 68 N·m (50 ft.lbs.).
15. Install transfer case, if equipped. Tighten transfer case nuts to 35 N·m (26 ft.lbs.).

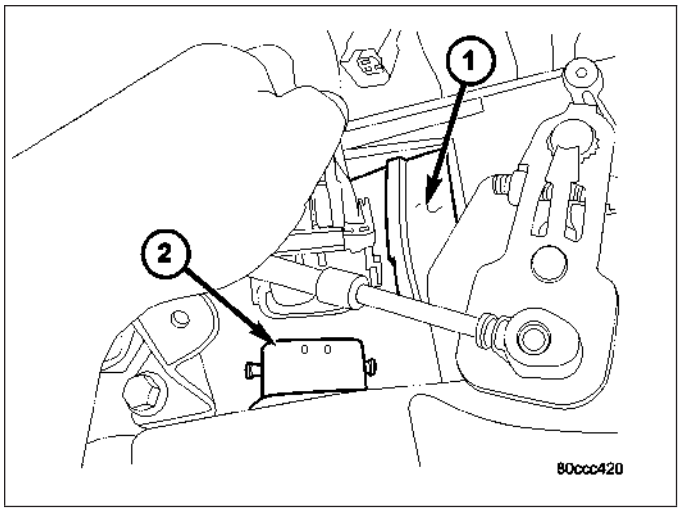
16. Install rear transmission crossmember (1). Tighten crossmember to frame bolts to 68 N·m (50 ft.lbs.).
17. Install rear support to transmission (2). Tighten bolts to 47 N·m (35 ft.lbs.).
18. Lower transmission onto crossmember and install bolts attaching transmission mount to crossmember. Tighten clevis bracket to crossmember bolts to 47 N·m (35 ft.lbs.). Tighten the clevis bracket to rear support bolt to 68 N·m (50 ft.lbs.).
19. Remove engine support fixture.



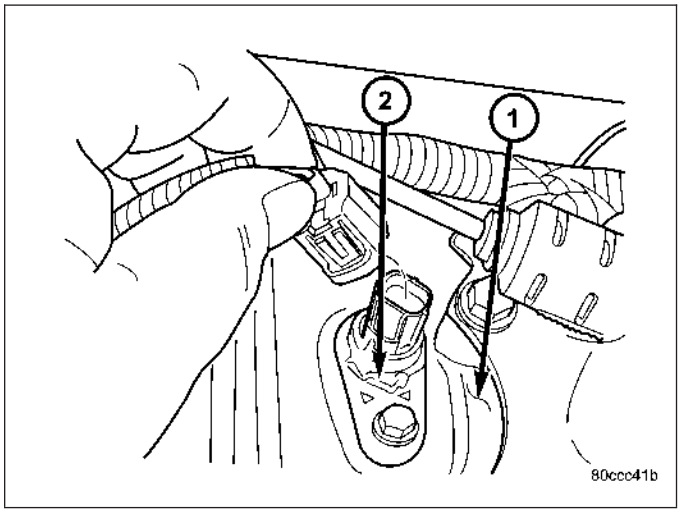
20. Connect gearshift cable (1) to transmission.



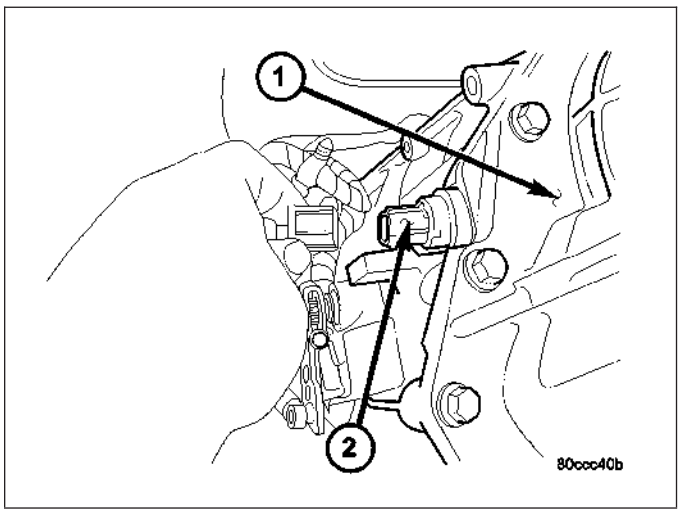
21. Connect the wiring harness connector to the solenoid and pressure switch assembly (2) connector. Be sure transmission harnesses are properly routed.



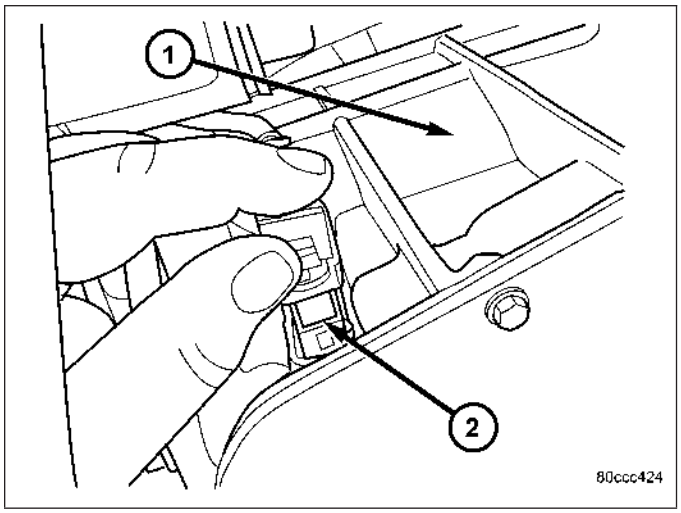
22. Connect the wiring harness connector to the input speed sensor (2).



23. Connect the wiring harness connector to the output speed sensor (2).

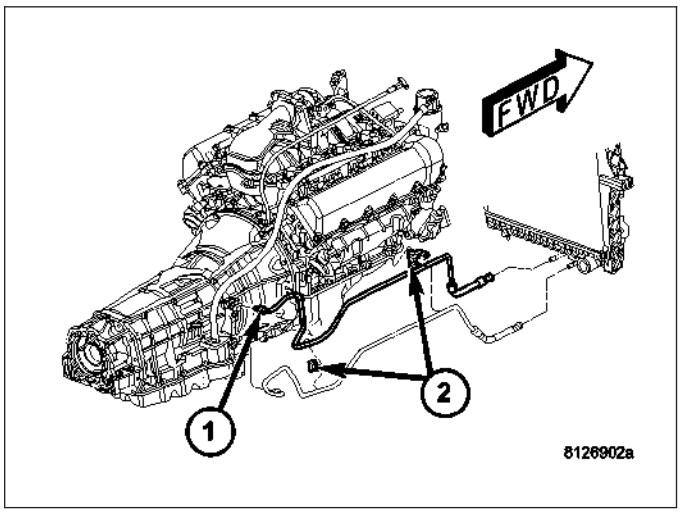


24. Connect the wiring harness connector to the line pressure sensor (2).

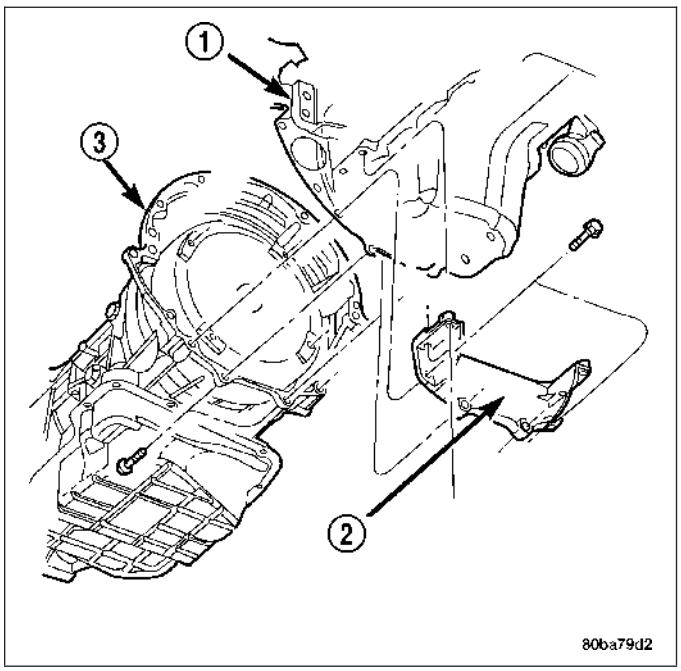


CAUTION: It is essential that correct length bolts be used to attach the converter to the driveplate. Bolts that are too long will damage the clutch surface inside the converter.

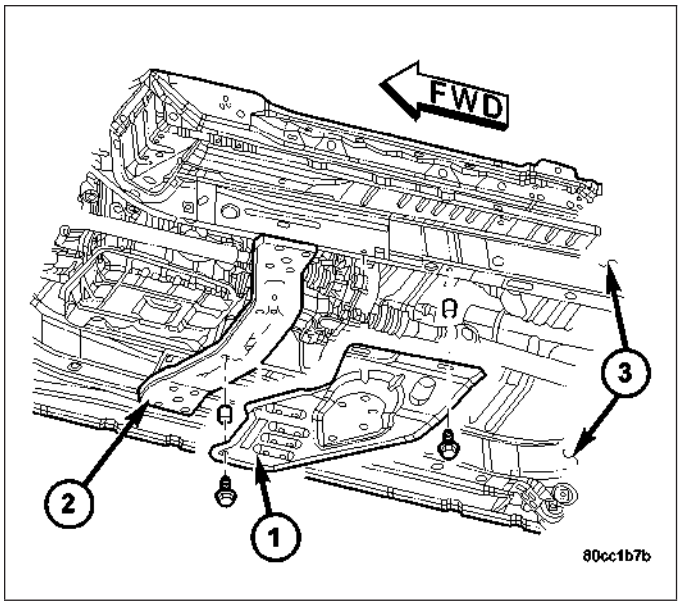
25. Install torque converter-to-driveplate bolts. Tighten bolts to 31 N·m (270 in. lbs.).
26. Install starter motor and cooler line bracket.
27. Connect cooler lines to transmission.



28. Install transmission fill tube.
29. Install exhaust components.
30. Install the structural dust cover (2) onto the transmission and the engine. (Refer to 9 - ENGINE/ ENGINE BLOCK/STRUCTURAL COVER - INSTALLATION)

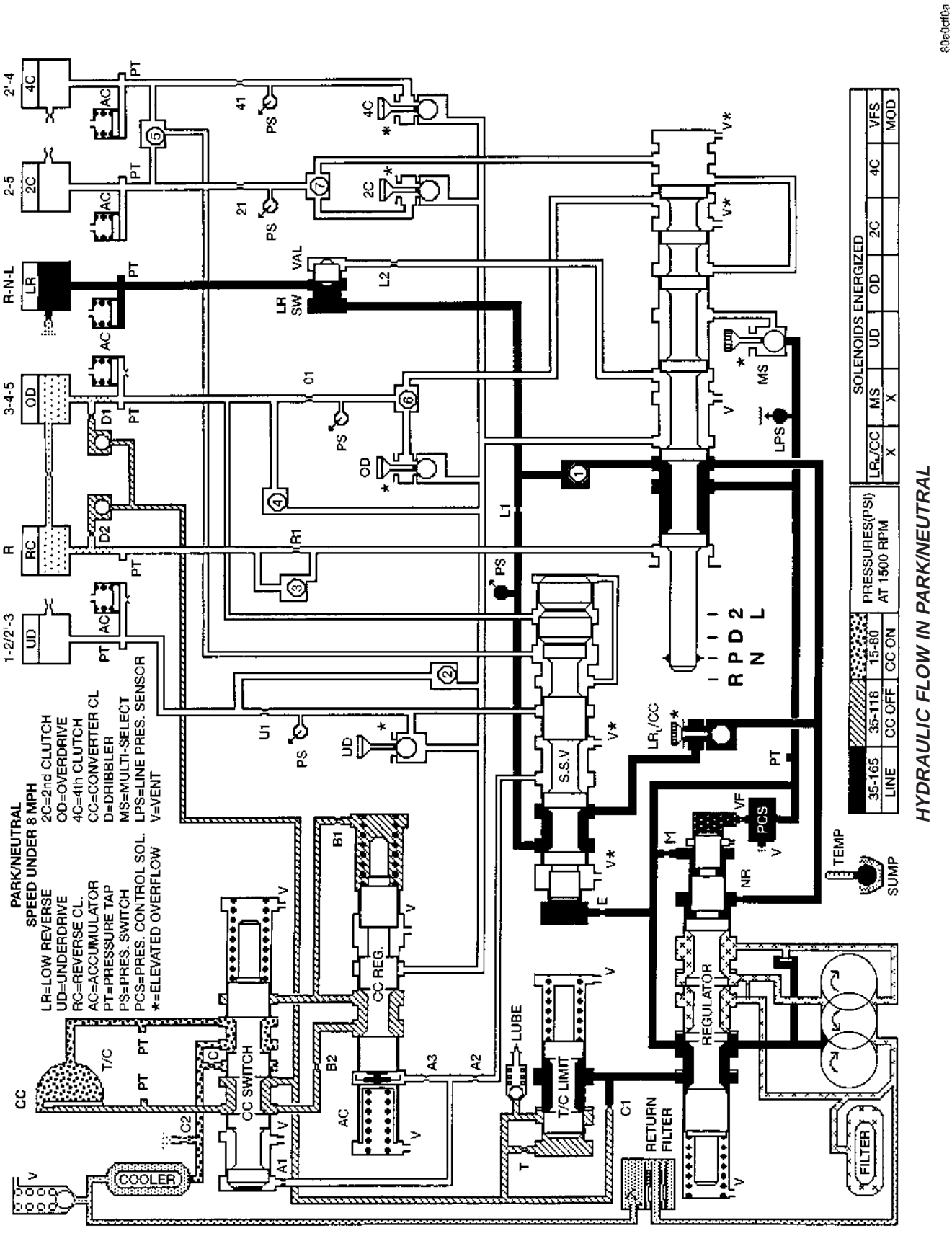


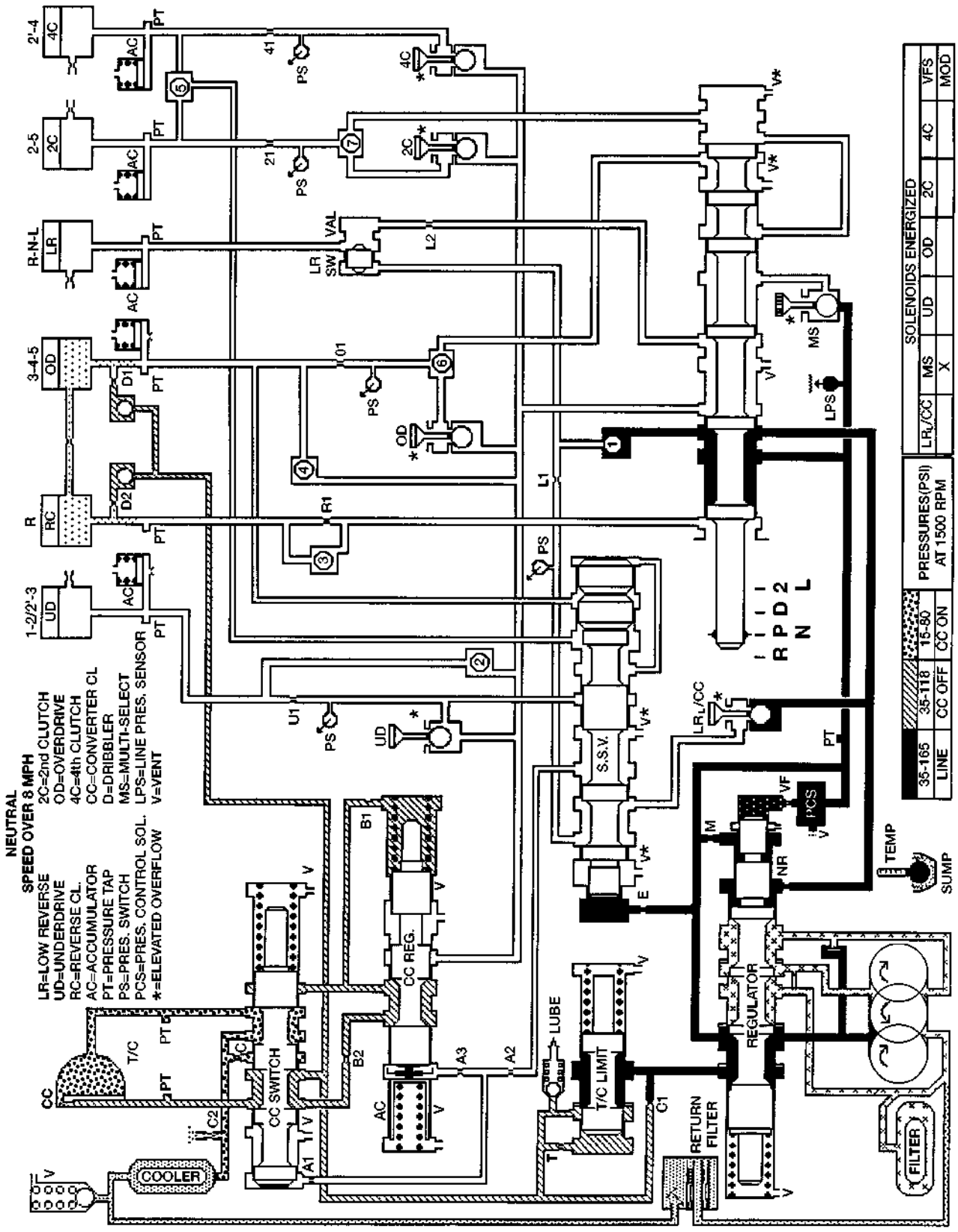
31. Align and install the front propeller shaft, if necessary. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT - FRONT/PROPELLER SHAFT - INSTALLATION)
32. Align and install the rear propeller shaft. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT - REAR/PROPELLER SHAFT - INSTALLATION)
33. Adjust gearshift cable if necessary.
34. Install any skid plates (1) removed previously. (Refer to 13 - FRAMES & BUMPERS/FRAME/TRANSFER CASE SKID PLATE - INSTALLATION)
35. Lower vehicle.
36. Fill transmission with Mopar® ATF +4, Automatic Transmission Fluid.



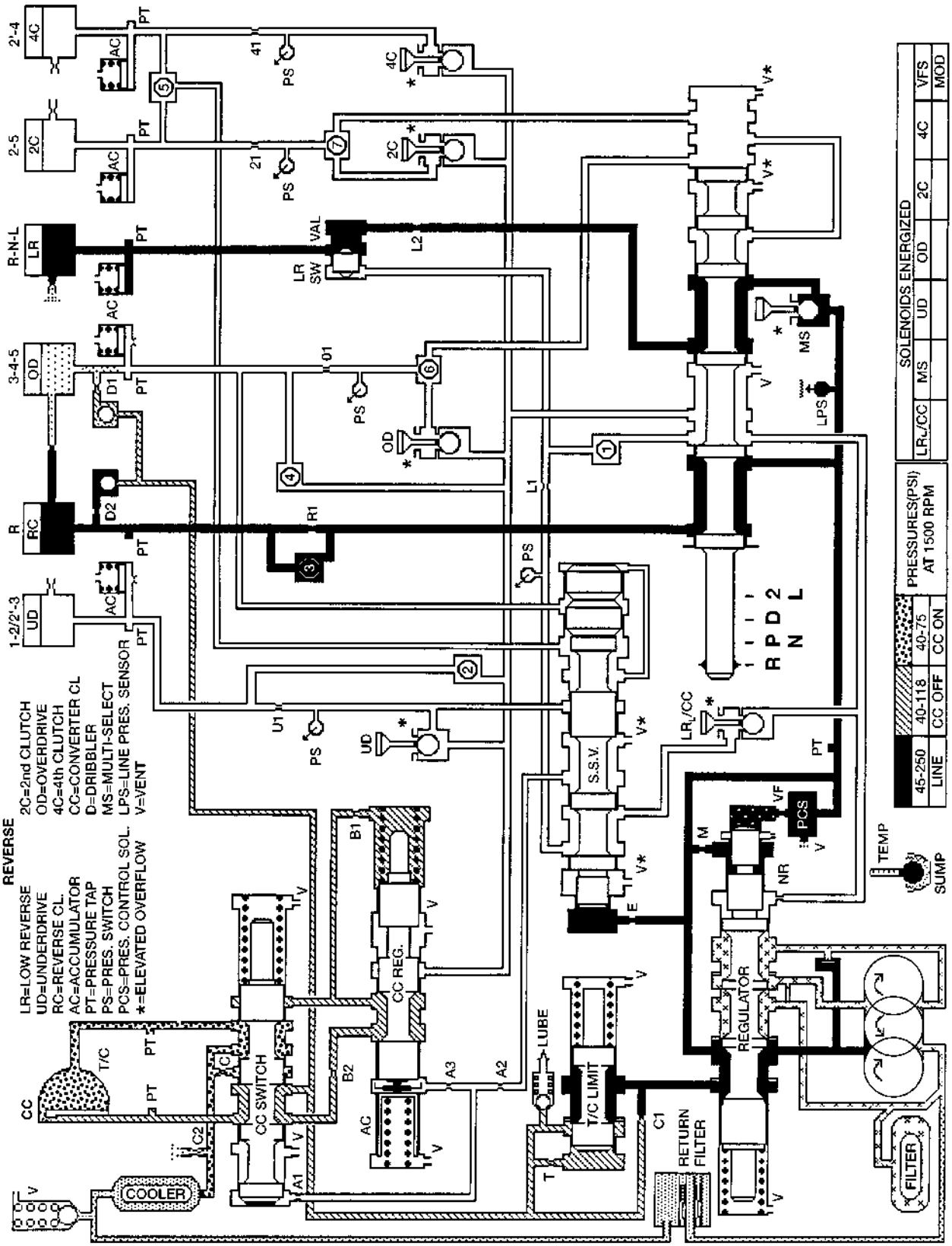
SCHEMATICS AND DIAGRAMS

HYDRAULIC SCHEMATICS

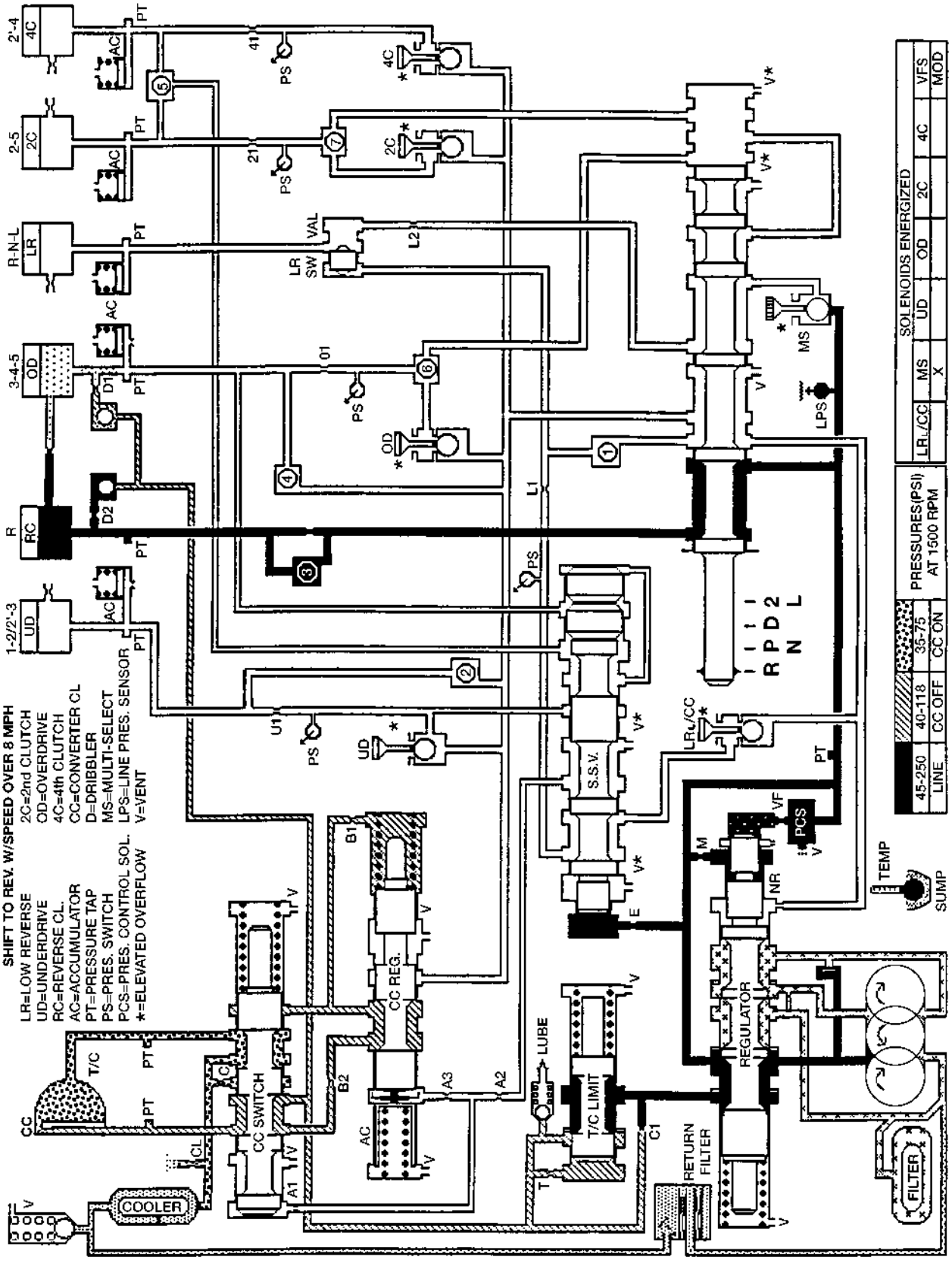




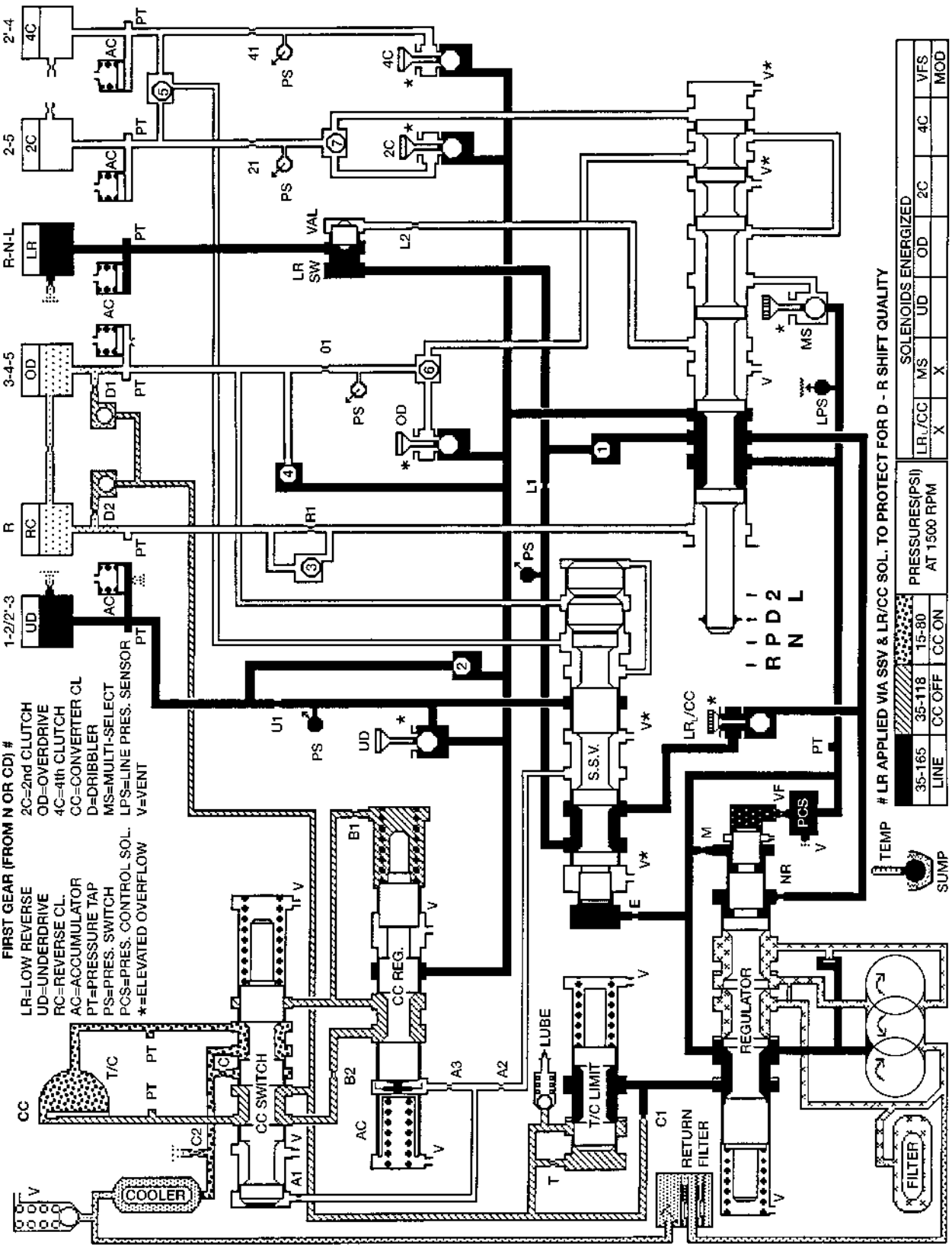
HYDRAULIC FLOW IN NEUTRAL OVER 8MPH



HYDRAULIC FLOW IN REVERSE

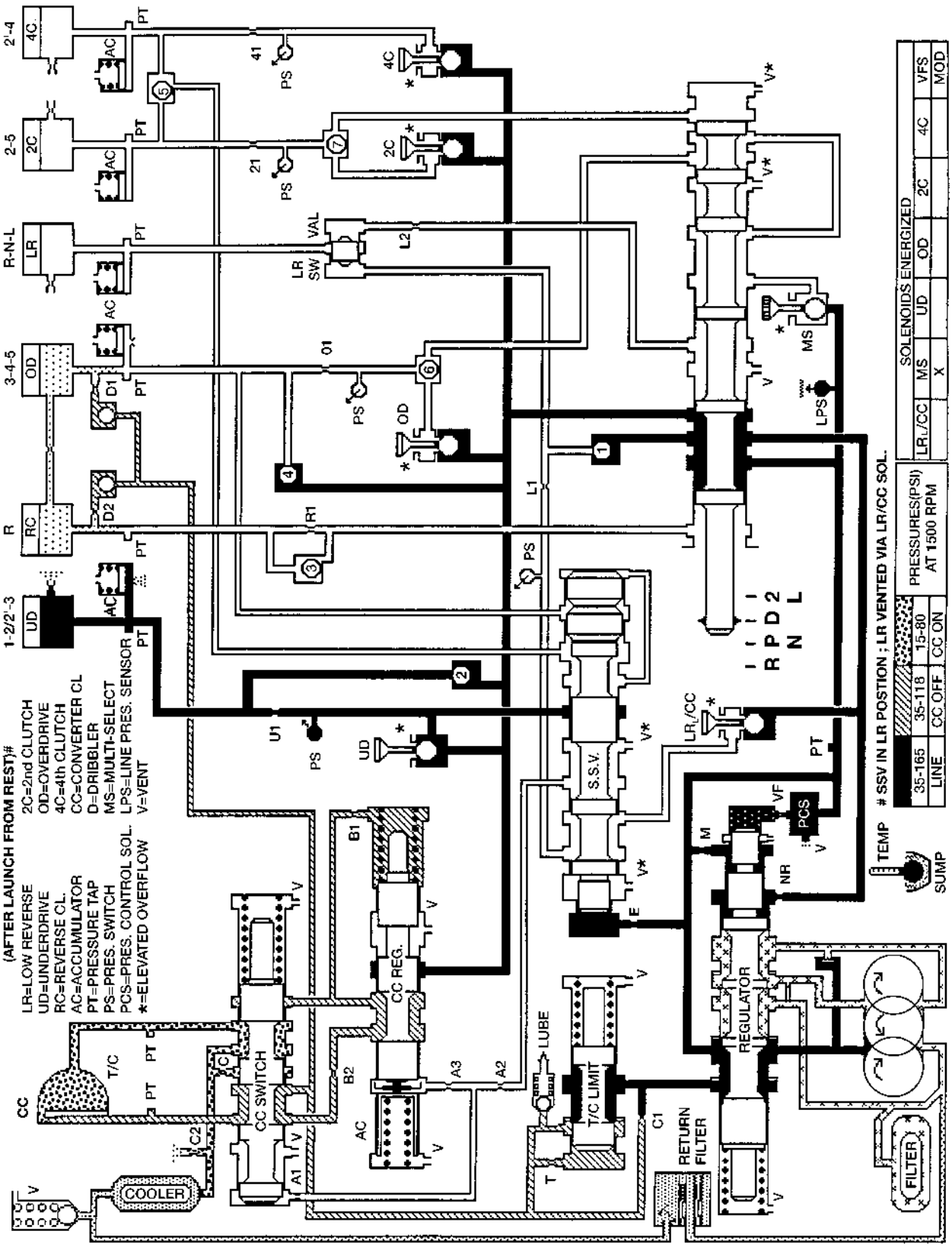


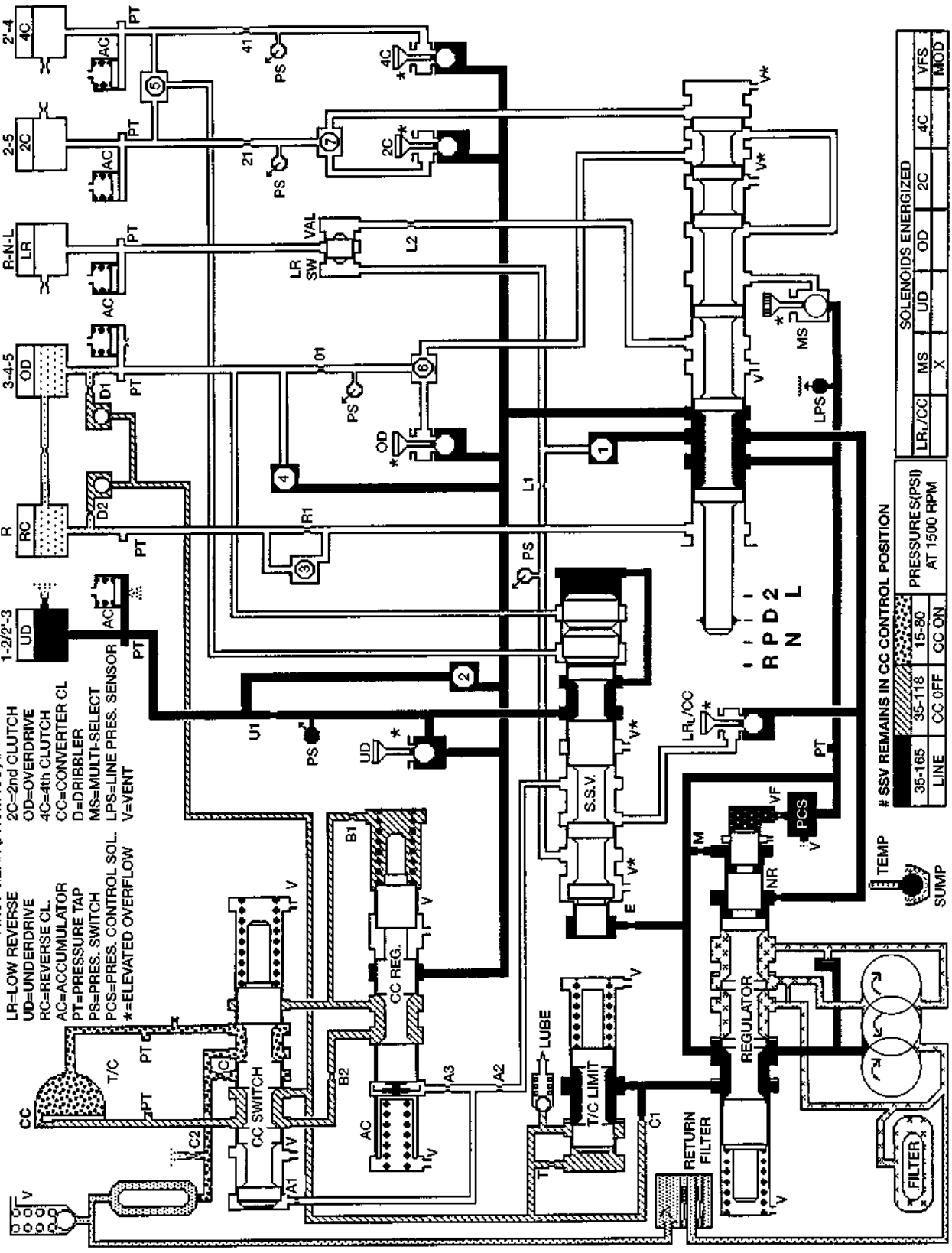
HYDRAULIC FLOW IN REVERSE BLOCK



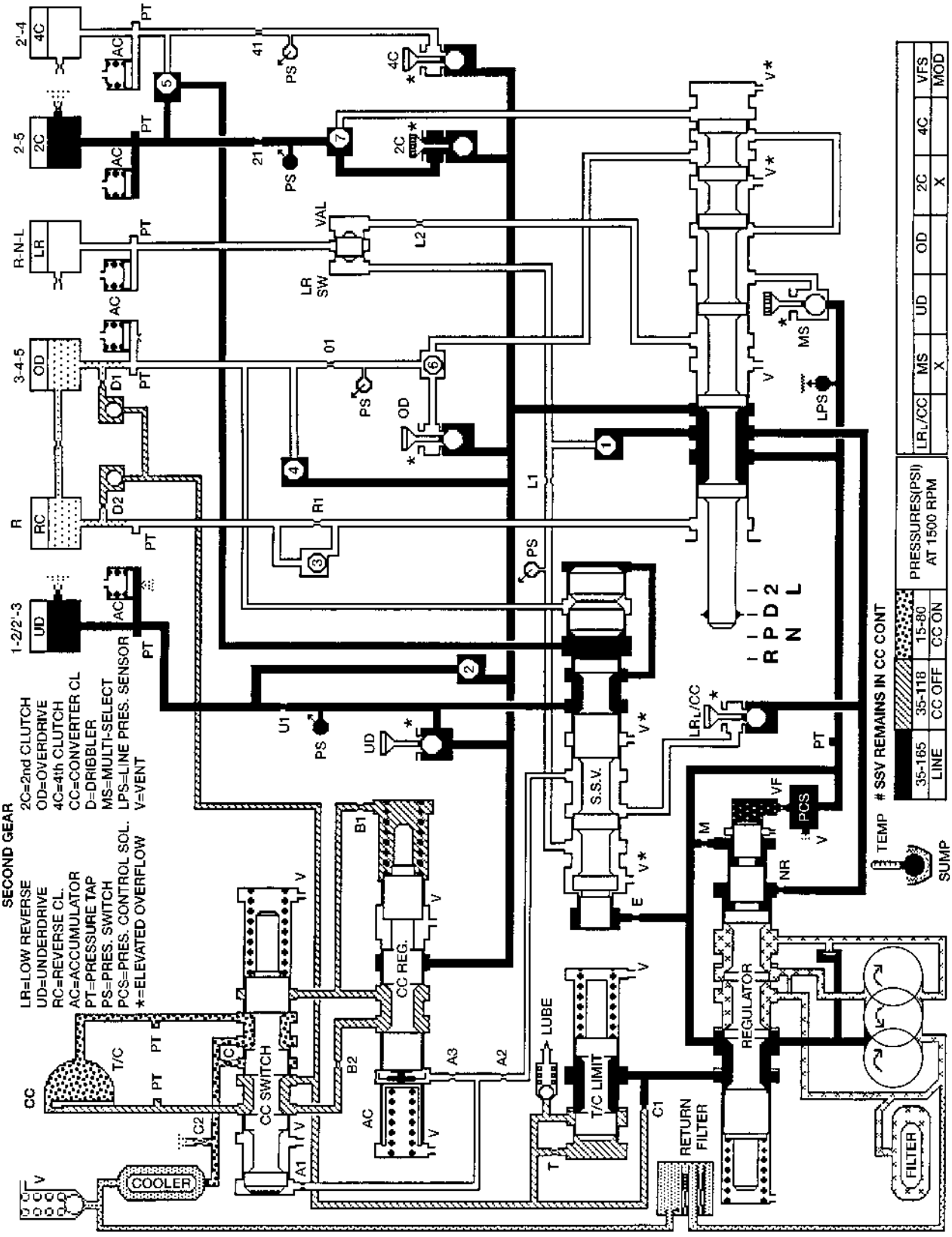
30a0dfee

HYDRAULIC FLOW IN FIRST GEAR (FROM N OR OD)

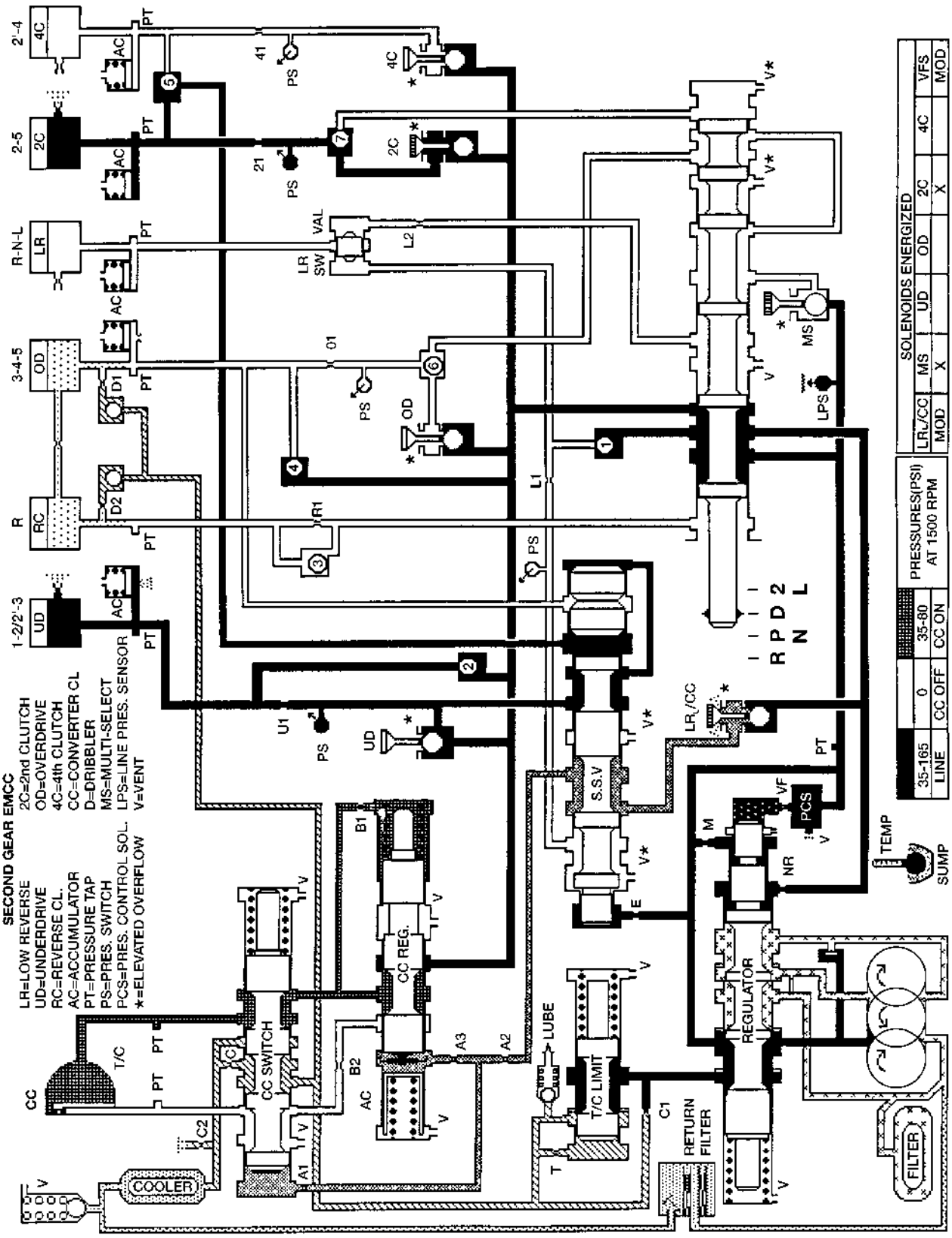

80a0e087
FIRST GEAR
(AFTER LAUNCH FROM REST)#
LR=LOW REVERSE
UD=UNDERDRIVE
RC=REVERSE CL.
AC=ACCUMULATOR
PT=PRESSURE TAP
PS=PRES. SWITCH
PCS=PRES. CONTROL SOL.
*=ELEVATED OVERFLOW
2C=2nd CLUTCH
OD=OVERDRIVE
4C=4th CLUTCH
CC=CONVERTER CL
D=DRIBBLER
MS=MULTI-SELECT
LPS=LINE PRES. SENSOR
V=VENT
# SSV IN LR POSTION ; LR VENTED VIA LR/CC SOL.
PRESSURES(PSI) AT 1500 RPM
LINE 35-165
CC ON 15-80
CC OFF 35-118
SOLENOIDS ENERGIZED
LR/CC MS UD OD 2C 4C VFS
X MOD
1-2/2'-3
R
3-4-5
R-N-L
2-5
2'-4
R P D 2
N L
COOLER
FILTER
SUMP
TEMP
PCS
VF
NR
S.S.V.
LR/CC
LPS
MS
T/C
CC
CC SWITCH
CC REG.
AC
LUBE
T/C LIMIT
REGULATOR
RETURN FILTER
VAL
LR SW
PS
OD
UD
HYDRAULIC FLOW IN FIRST GEAR (AFTER LAUNCH FROM REST)



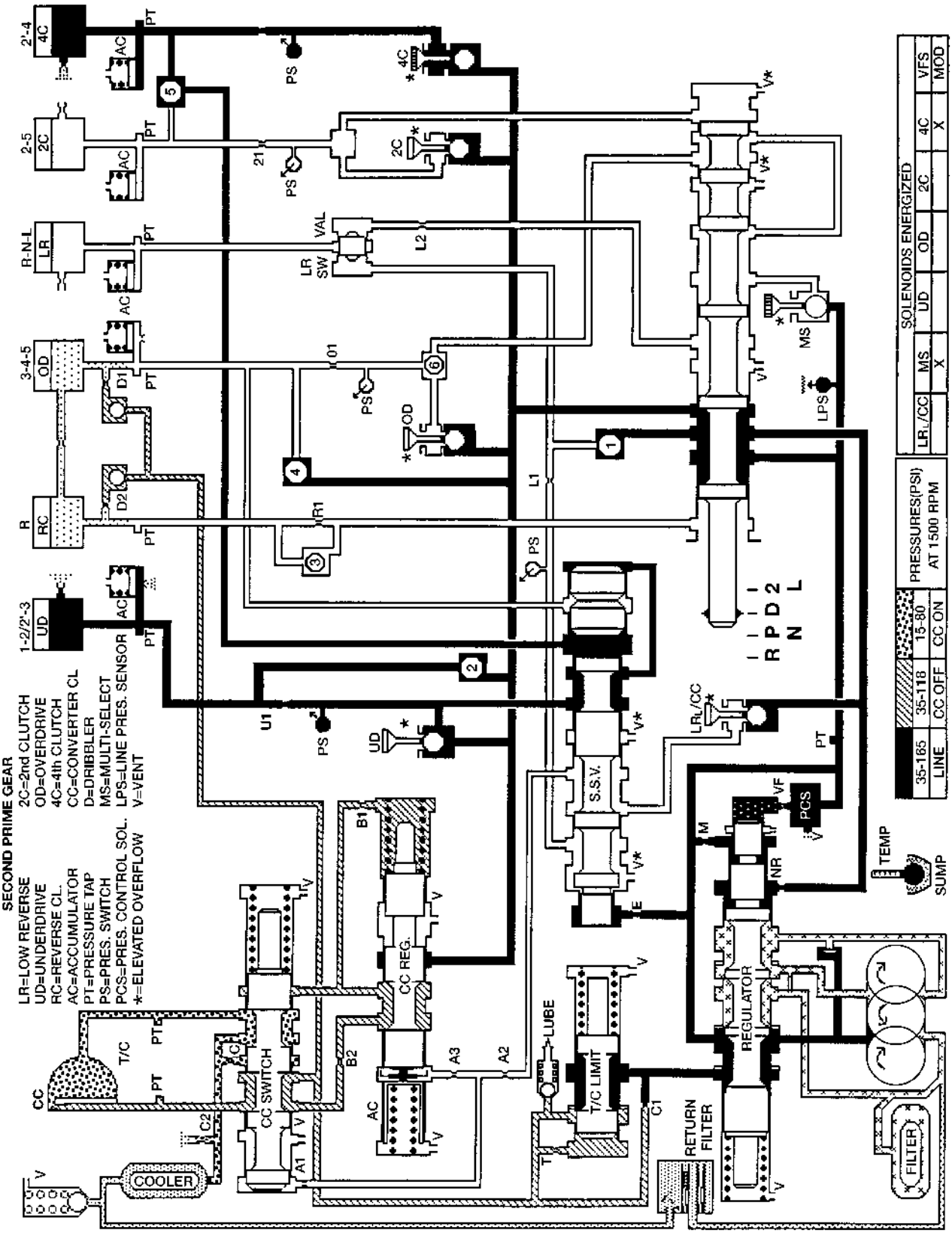
HYDRAULIC FLOW IN FIRST GEAR (FROM K/D)



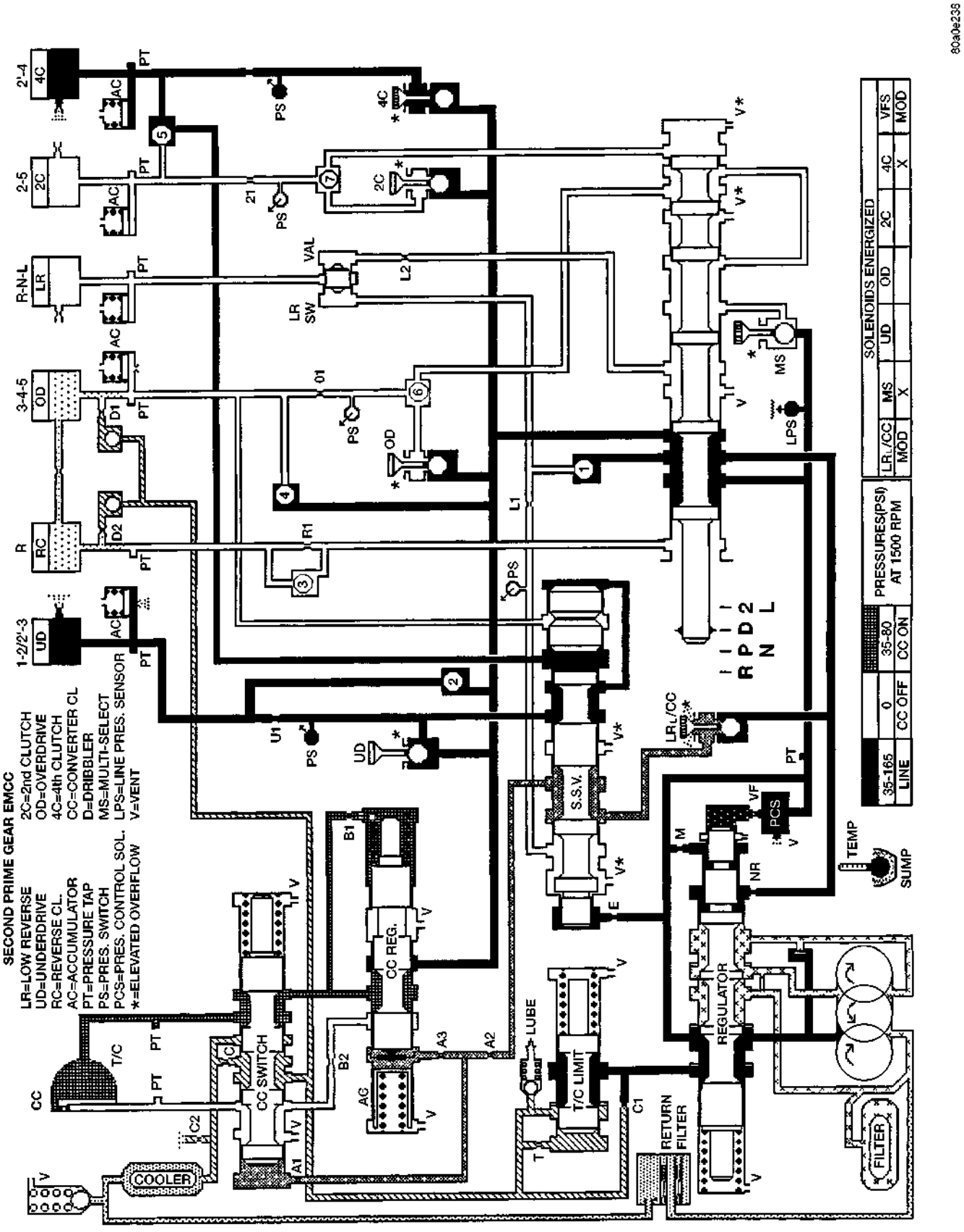
HYDRAULIC FLOW IN SECOND GEAR



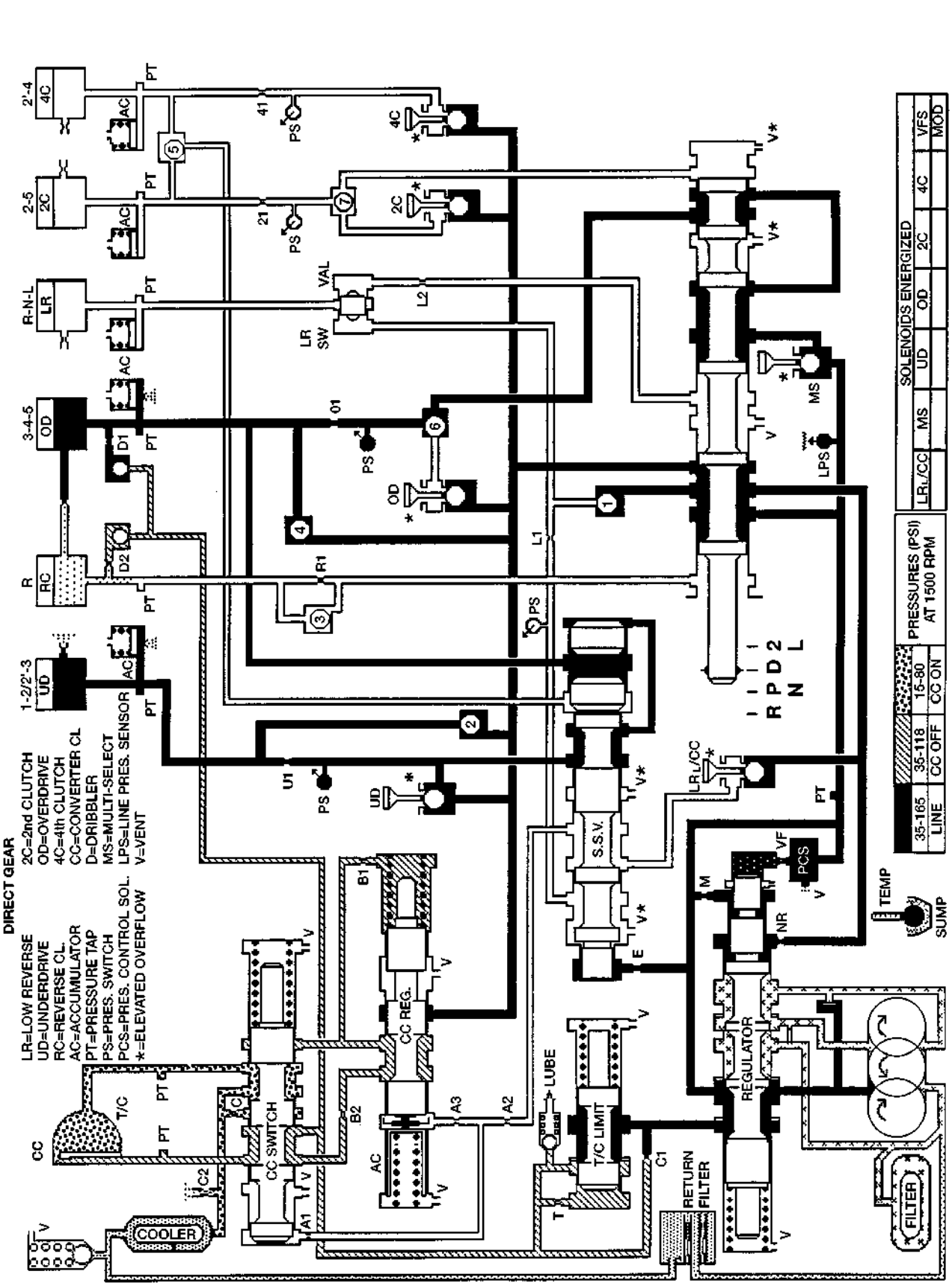
HYDRAULIC FLOW IN SECOND GEAR EMCC



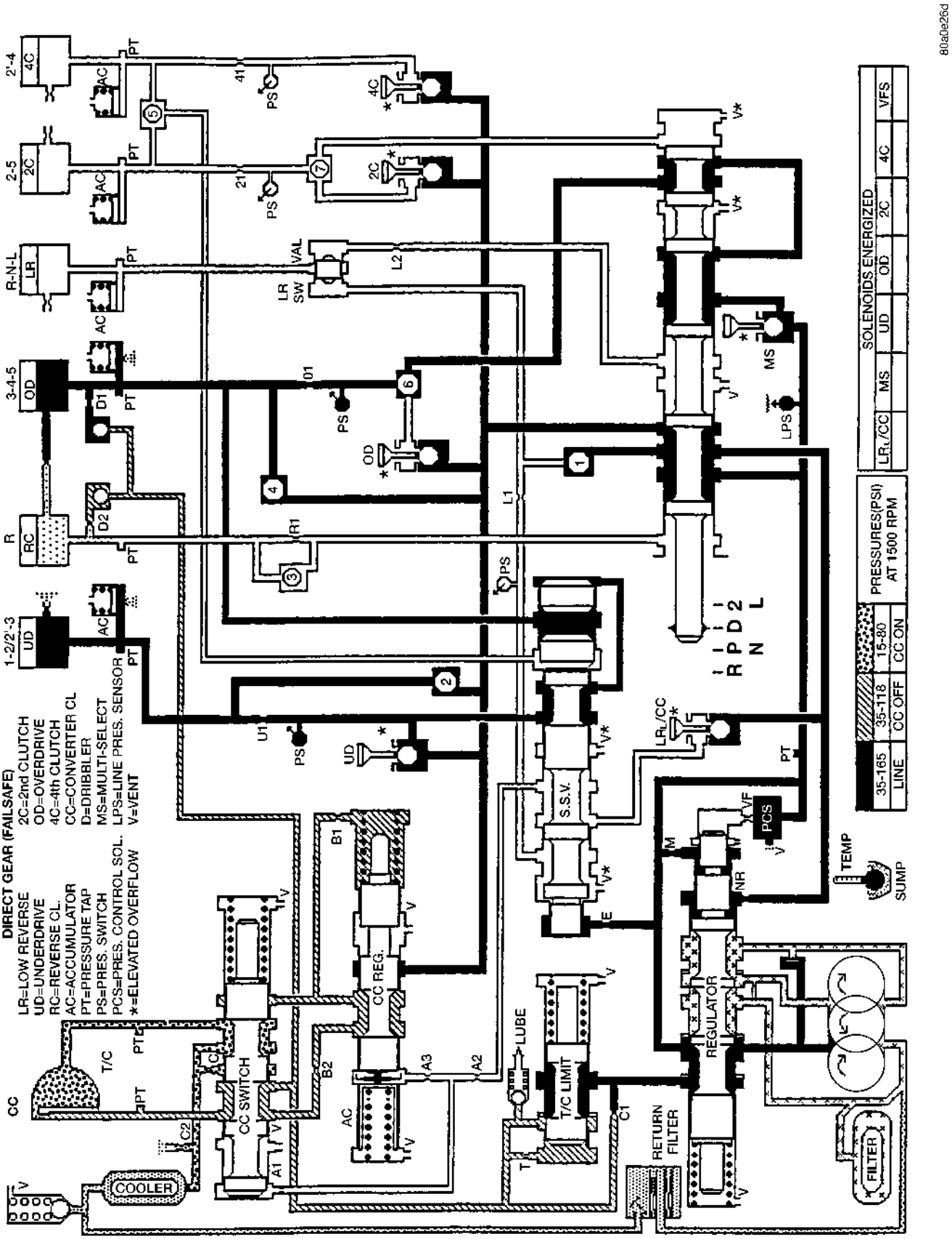
HYDRAULIC FLOW IN SECOND PRIME GEAR



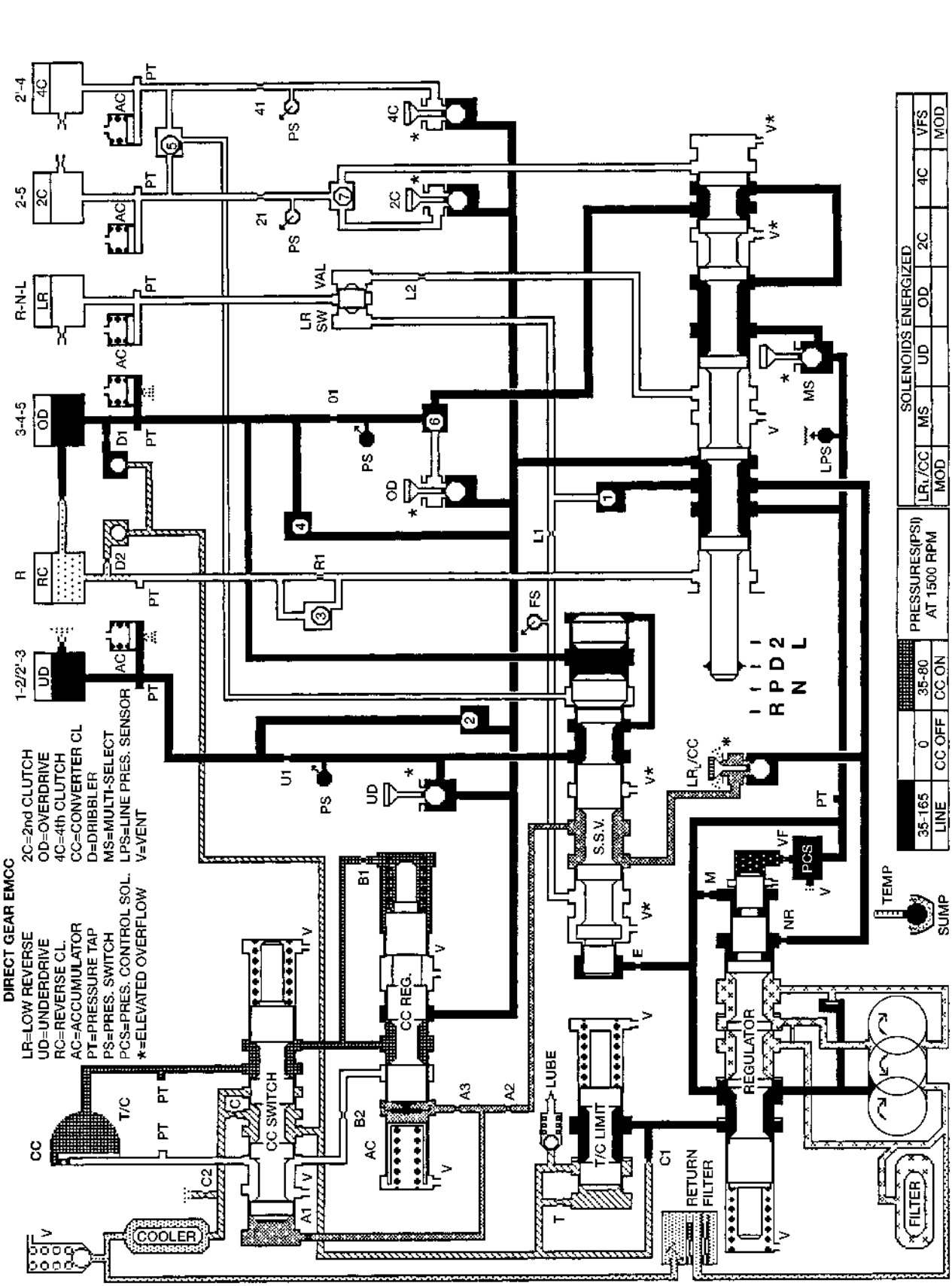
HYDRAULIC FLOW IN SECOND PRIME GEAR EMCC

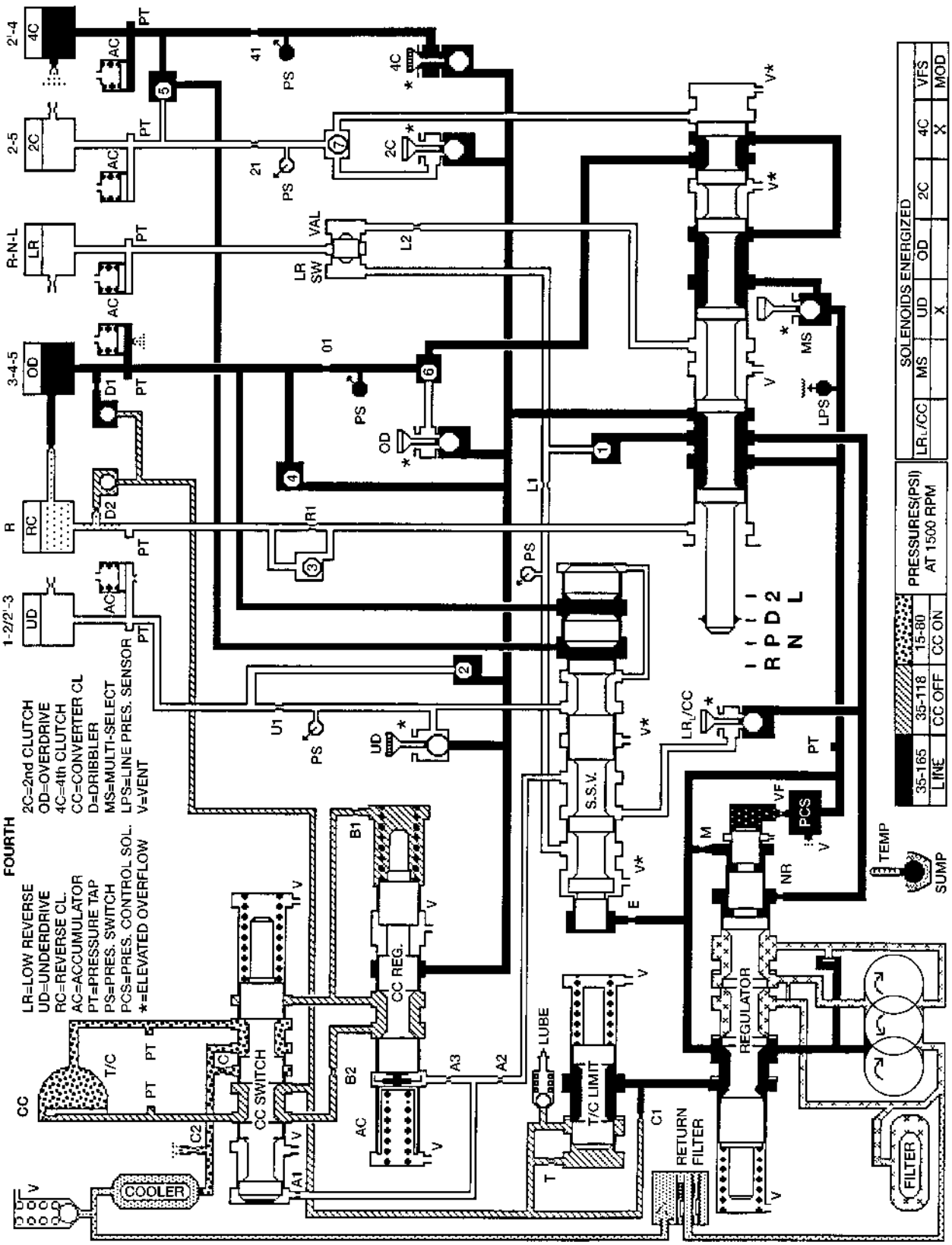


HYDRAULIC FLOW IN DIRECT GEAR

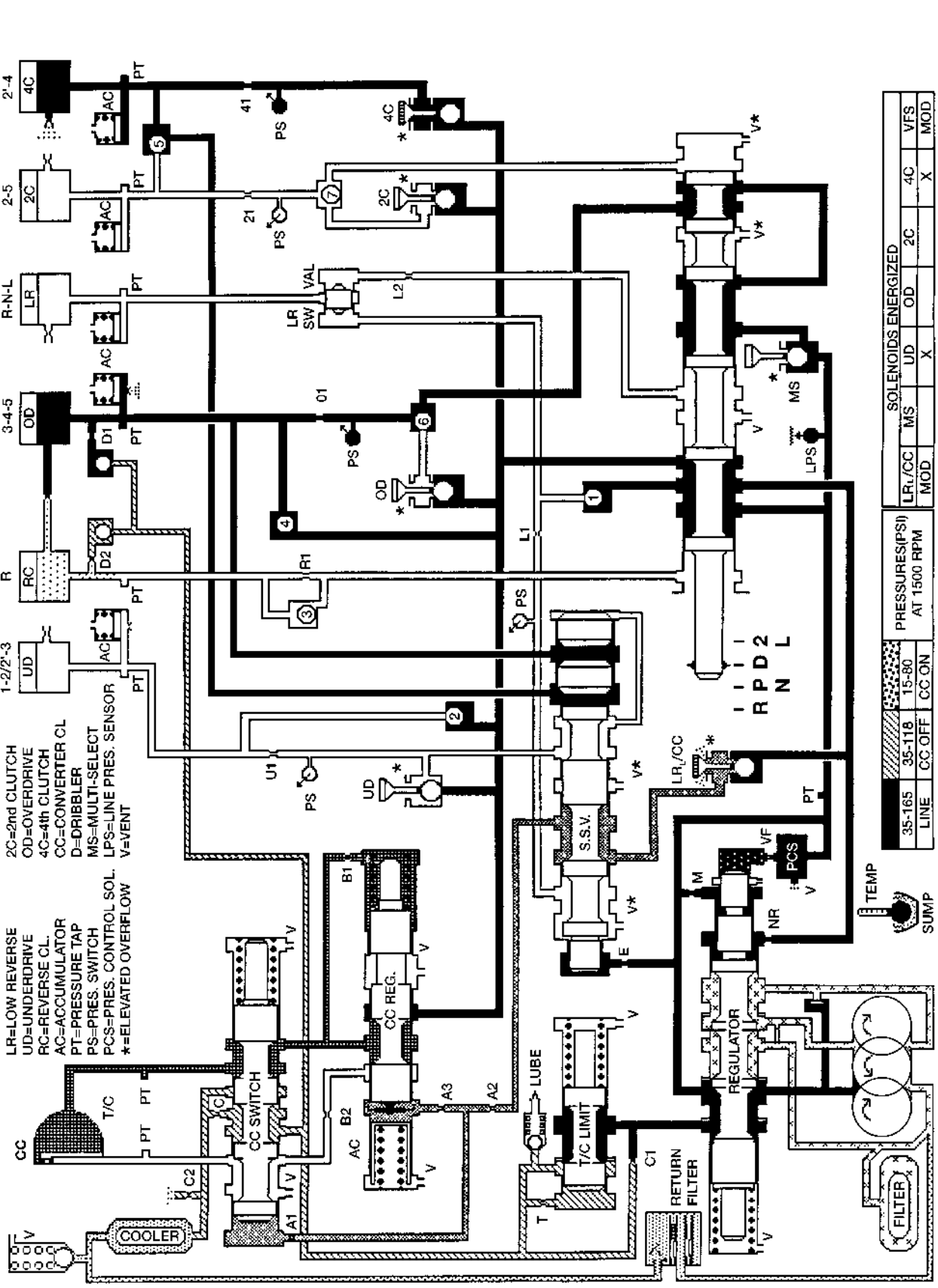


HYDRAULIC FLOW IN DIRECT GEAR (FAILSAFE)

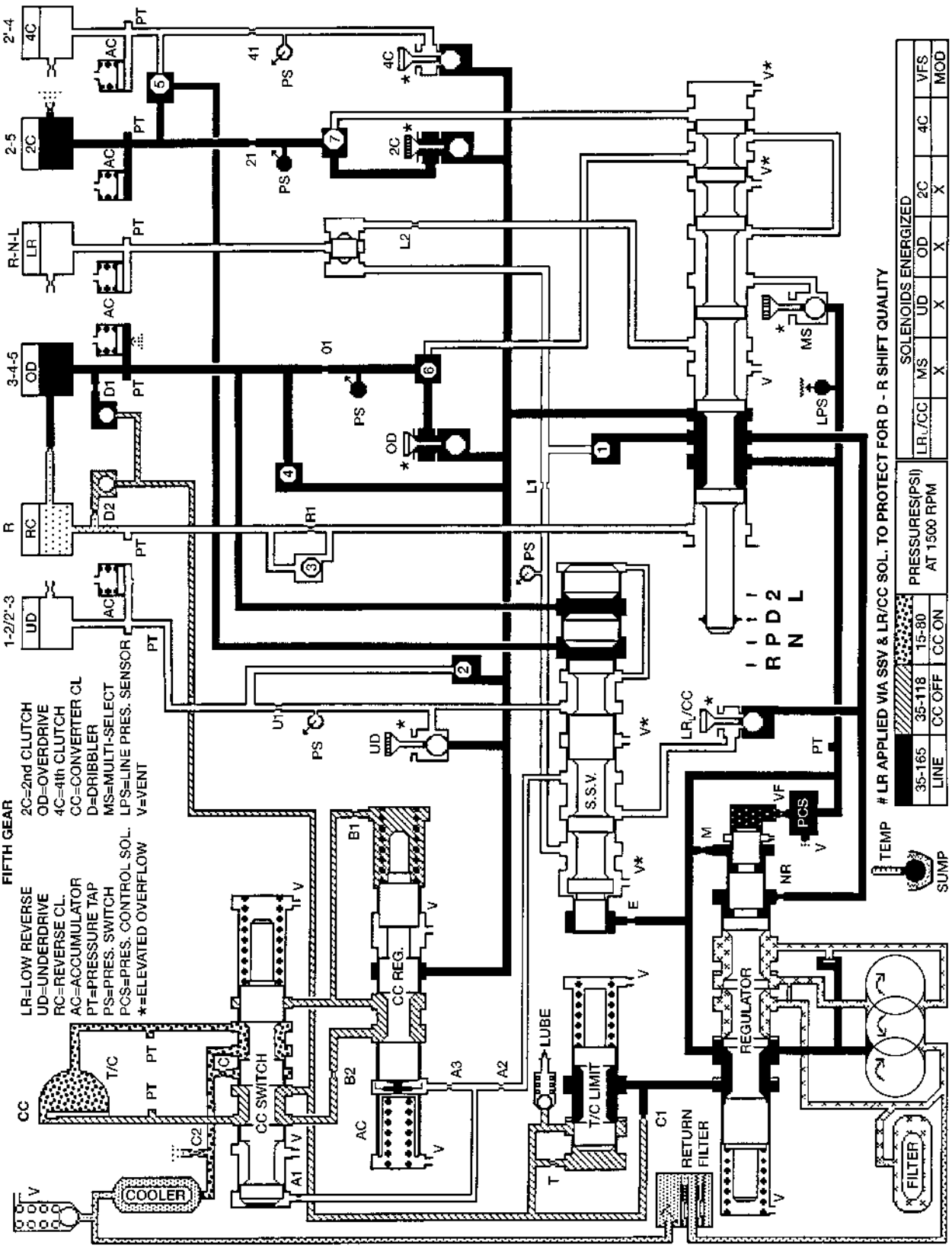

80a0e328
DIRECT GEAR EMCC
LR=LOW REVERSE
UD=UNDERDRIVE
RC=REVERSE CL.
AC=ACCUMULATOR
PT=PRESSURE TAP
PS=PRES. SWITCH
PCS=PRES. CONTROL SOL.
*=ELEVATED OVERFLOW
2C=2nd CLUTCH
OD=OVERDRIVE
4C=4th CLUTCH
CC=CONVERTER CL
D=DRIBBLER
MS=MULTI-SELECT
LPS=LINE PRES. SENSOR
V=VENT
PRESSURES(PSI) AT 1500 RPM
LINE
35-165
CC OFF
0
CC ON
35-80
SOLENOIDS ENERGIZED
LR/CC
MOD
MS
UD
OD
2C
4C
VFS
MOD
R N D 2 1 1 1
HYDRAULIC FLOW IN DIRECT GEAR EMCC

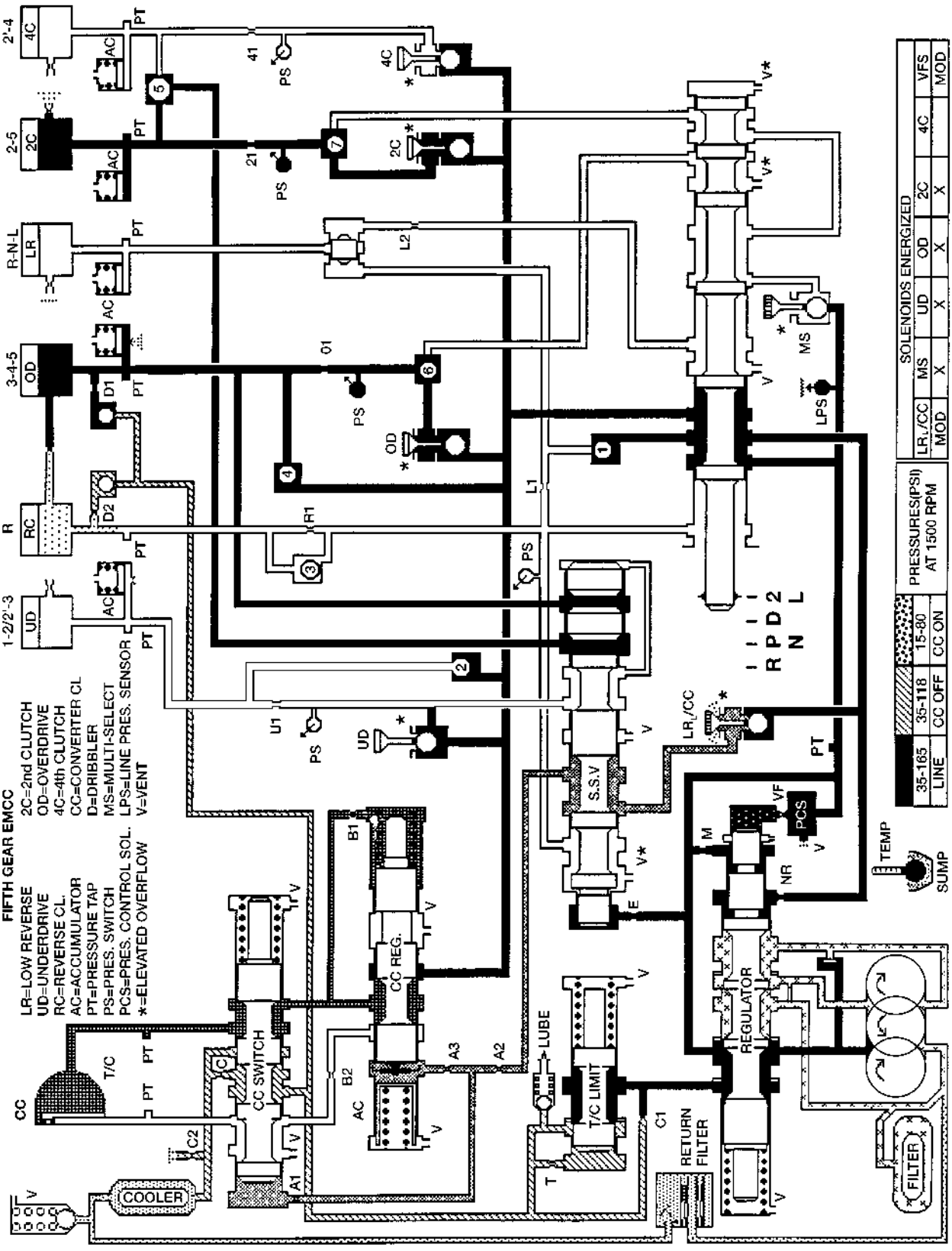


HYDRAULIC FLOW IN FOURTH

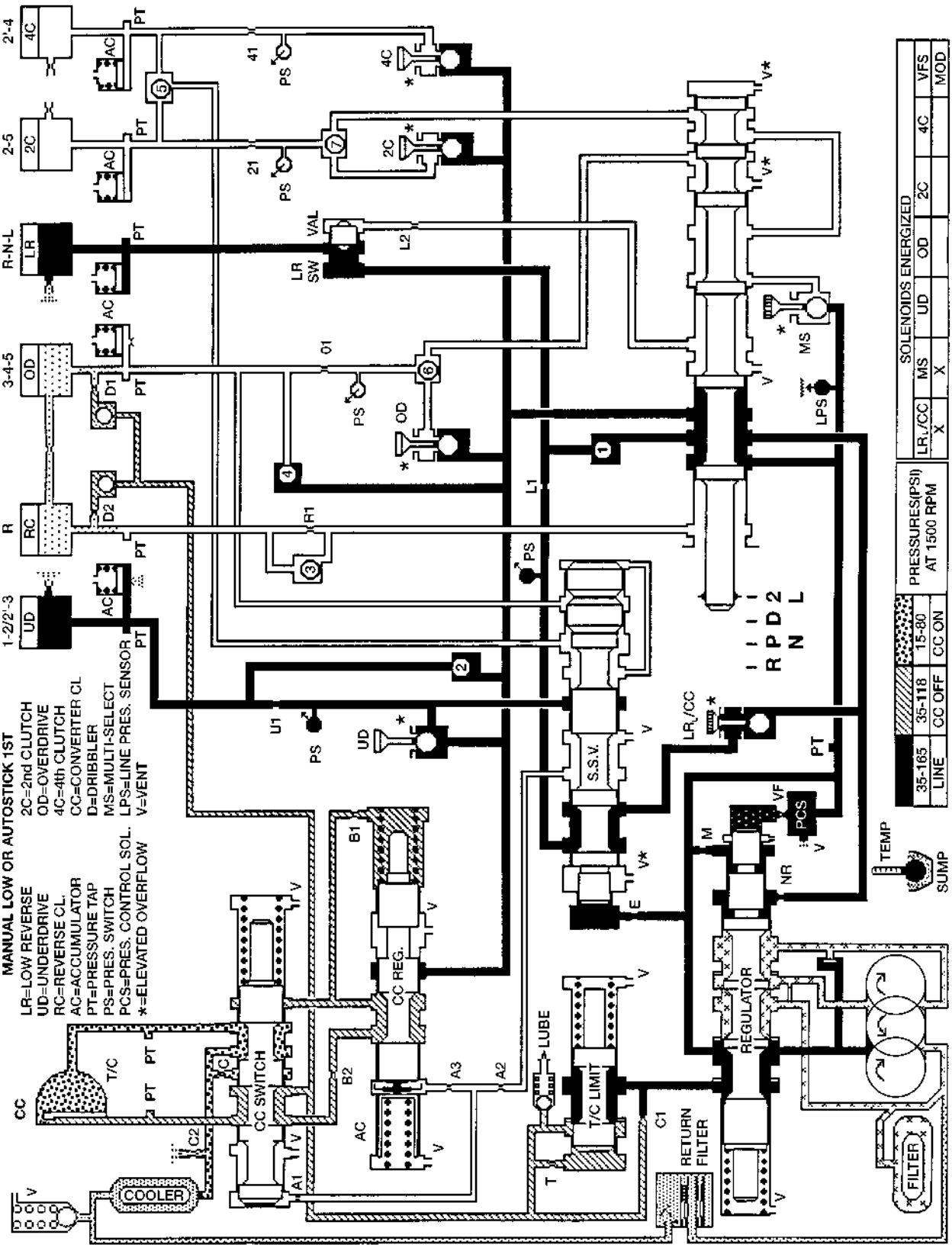


HYDRAULIC FLOW IN FOURTH EMCC

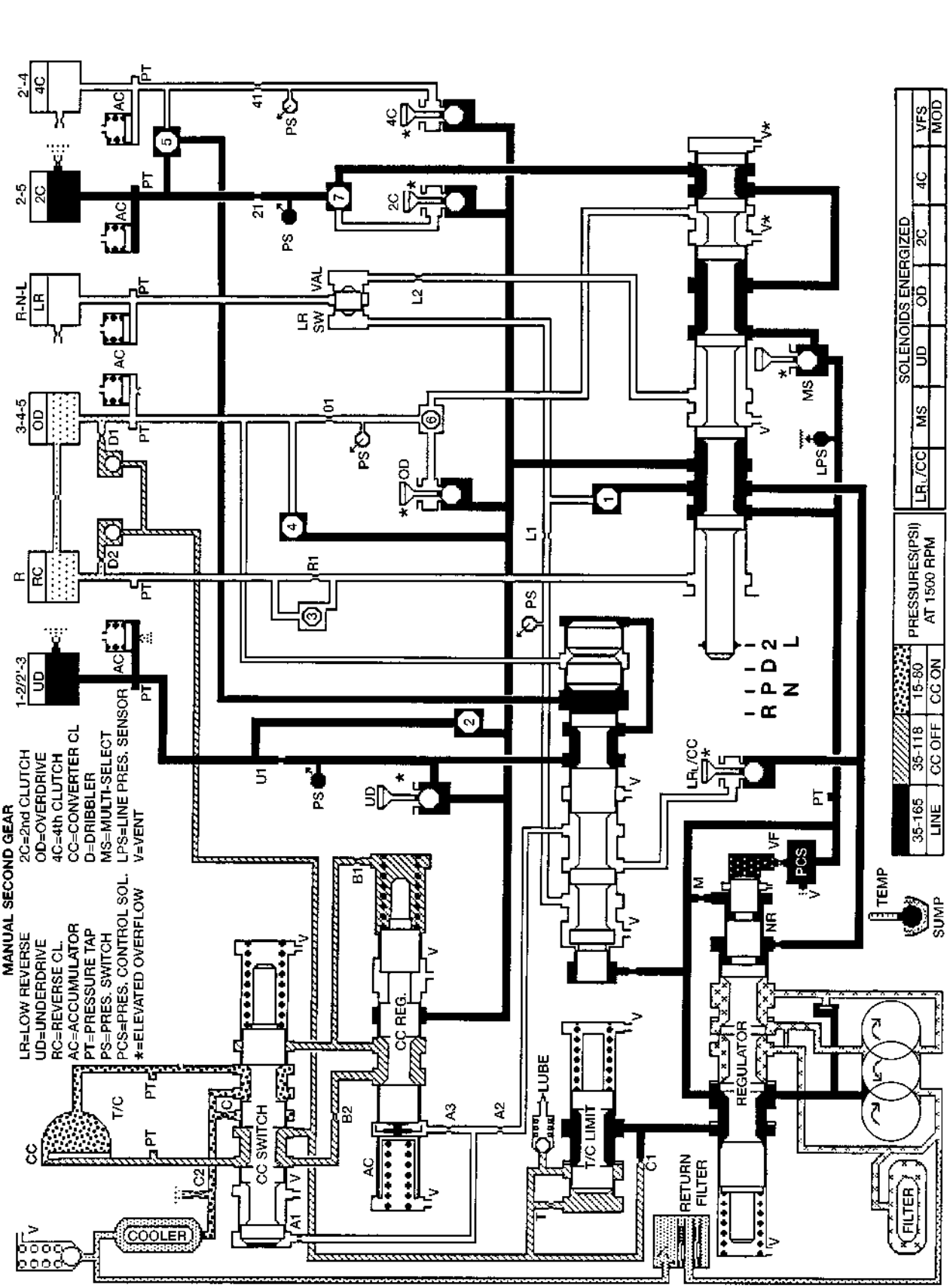

80a0e564
FIFTH GEAR
LR=LOW REVERSE
UD=UNDERDRIVE
RC=REVERSE CL.
AC=ACCUMULATOR
PT=PRESSURE TAP
PS=PRES. SWITCH
PCS=PRES. CONTROL SOL.
*=ELEVATED OVERFLOW
2C=2nd CLUTCH
OD=OVERDRIVE
4C=4th CLUTCH
CC=CONVERTER CL
D=DRIBBLER
MS=MULTI-SELECT
LPS=LINE PRES. SENSOR
V=VENT
# LR APPLIED VIA SSV & LR/CC SOL. TO PROTECT FOR D - R SHIFT QUALITY
PRESSURES(PSI) AT 1500 RPM
LINE 35-165
LR 35-118
LR/CC 15-80
SOLENOIDS ENERGIZED
LR/CC
MS
UD
OD
2C
4C
VFS
MOD
R
N
L
P
D
2
1
2-4
2-5
R-N-L
3-4-5
1-2/2'-3
CC
T/C
C
C1
C2
A1
A2
A3
B1
B2
AC
CC SWITCH
CC REG.
S.S.V.
T/C LIMIT
LUBE
REGULATOR
RETURN FILTER
FILTER
COOLER
SUMP
TEMP
PCS
VF
NR
LPS
MS
PS
V
M
E
T
L1
L2
R1
U1
01
21
41
HYDRAULIC FLOW IN FIFTH



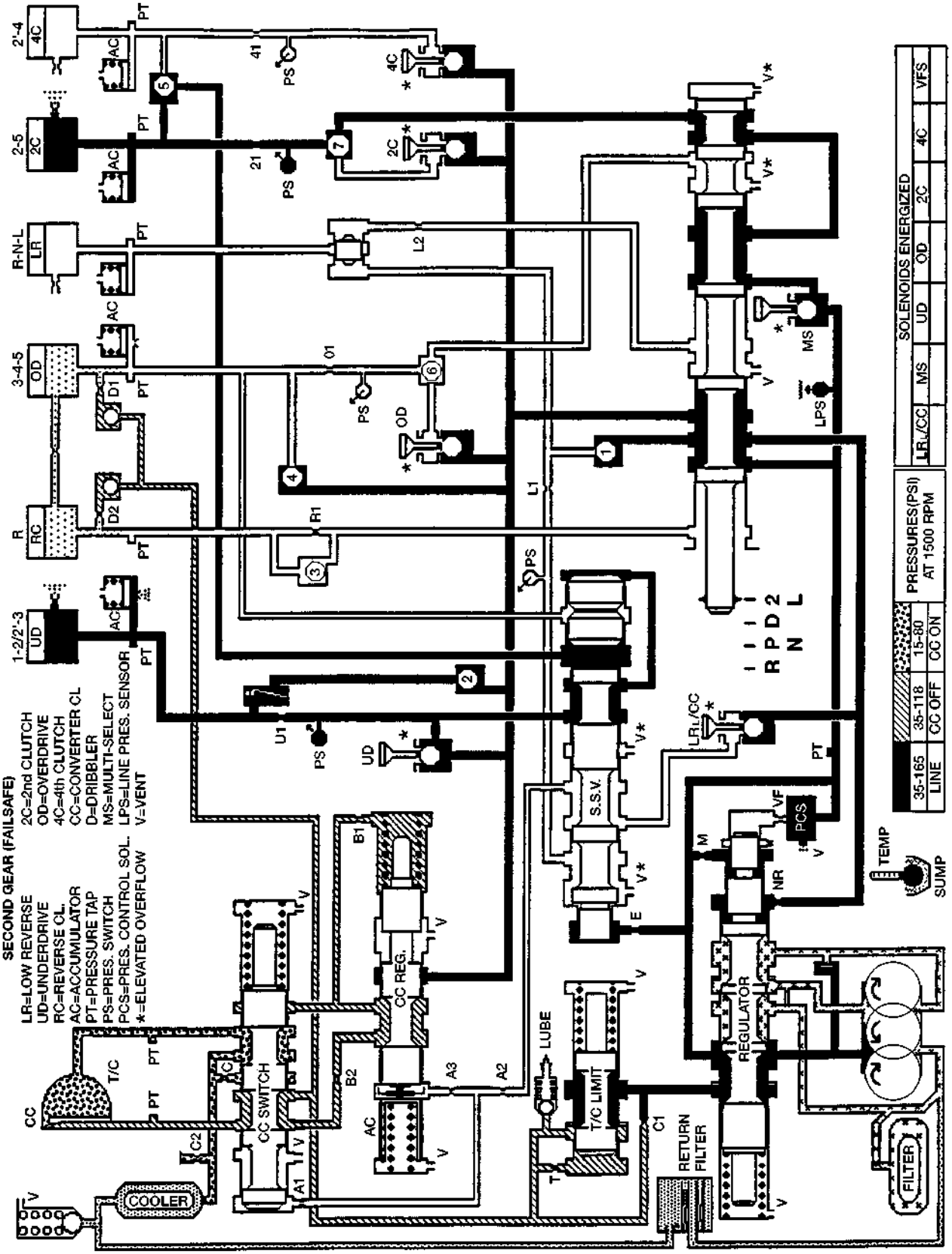
HYDRAULIC FLOW IN FIFTH EMCC



HYDRAULIC FLOW IN MANUAL LOW OR AUTOSTICK 1ST



HYDRAULIC FLOW IN MANUAL SECOND



HYDRAULIC FLOW IN MANUAL SECOND (FAILSAFE)

SPECIFICATIONS

TRANSMISSION

GENERAL

Component	Metric	Inch
Output Shaft End Play	0.22-0.55 mm	0.009-0.021 in.
Input Shaft End Play	0.46-0.89 mm	0.018-0.035 in.
2C Clutch Pack Clearance	0.455-1.335 mm	0.018-0.053 in.
4C Clutch Pack Clearance	0.770-1.390 mm	0.030-0.055 in.
L/R Clutch Pack Clearance	1.00-1.74 mm	0.039-0.069 in.
OD Clutch Pack Clearance	1.103-1.856 mm	0.043-0.073 in.
UD Clutch Pack Clearance	0.84-1.54 mm	0.033-0.061 in.
Reverse Clutch Pack Clearance	0.81-1.24 mm	0.032-0.049 in.
Recommended fluid	Mopar® ATF +4	

GEAR RATIOS

1ST	3.00:1
2ND	1.67:1
2ND Prime	1.50:1
3RD	1.0:1
4TH	0.75:1
5TH	0.67:1
REVERSE	3.00:1

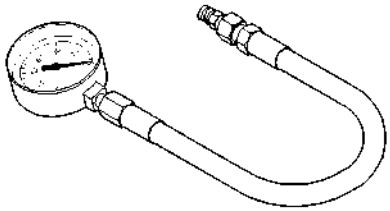
TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Fitting, cooler line at trans	17.5	-	155
Bolt, torque convertor	31	23	-
Bolt/nut, crossmember	68	50	-
Bolt, driveplate to crankshaft	75	55	-
Bolt, oil pan	11.8	-	105
Screw, primary fluid filter	4.5	-	40
Bolt, oil pump	28.2	-	250
Bolt, oil pump body to cover	4.5	-	40
Screw, plate to oil pump body	4.5	-	40
Bolt, valve body to case	11.8	-	105
Plug, pressure test port	5.1	-	45
Bolt, reaction shaft support	11.8	-	105
Screw, valve body to transfer plate	5.6	-	50

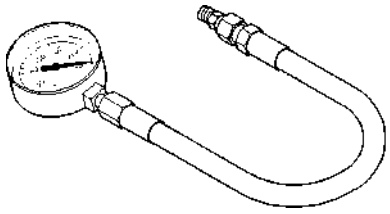
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Screw, solenoid module to transfer plate	5.7	-	50
Screw, accumulator cover	7	-	60
Screw, detent spring	4.5	-	40
Bolt, input speed sensor	11.8	-	105
Bolt, output speed sensor	11.8	-	105
Bolt, line pressure sensor	11.8	-	105
Bolt, extension housing	54	40	-
Valve, cooler return filter bypass	4.5	-	40
Screw, manual valve cam retaining	4.5	-	40
Bolt, manual lever	28.2	-	250

SPECIAL TOOLS

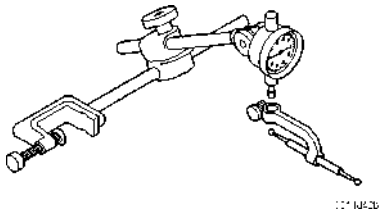
AUTOMATIC TRANSMISSION - RFE



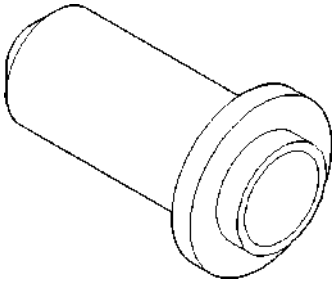
Gauge, Oil Pressure - C-3292



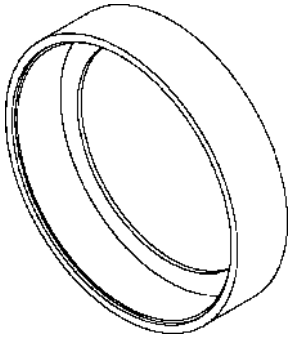
Gauge, Oil Pressure - C-3293SP



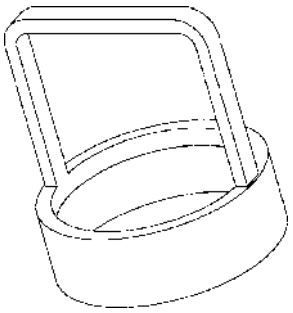
Dial Indicator - C-3339



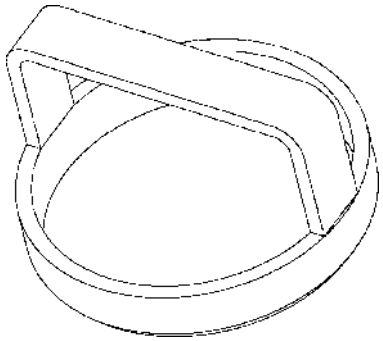
Installer, Seal - C-3860-A



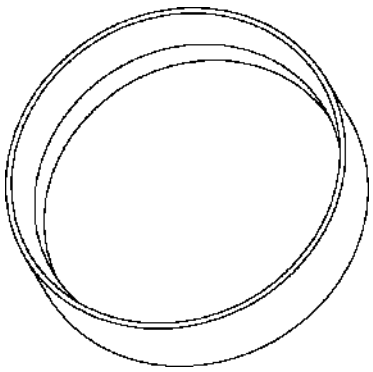
Compressor, Spring - 8249



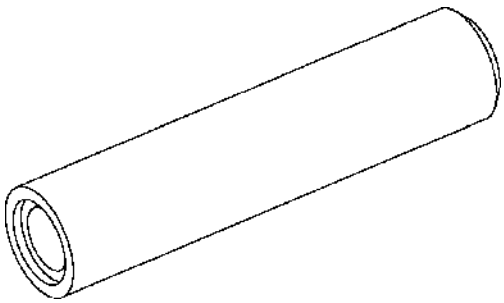
Compressor, Spring - 8250



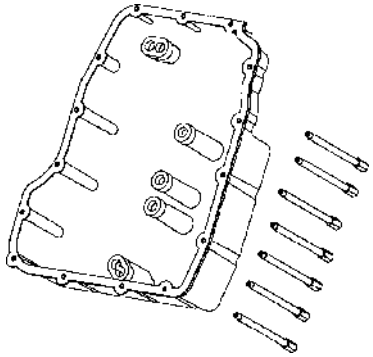
Compressor, Spring - 8251



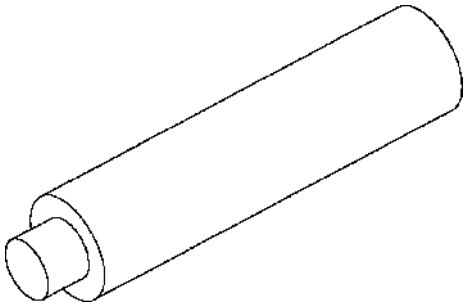
Installer, Piston - 8252



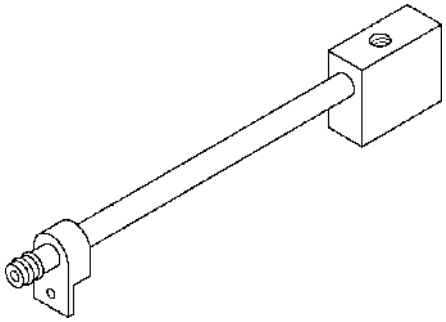
Installer, Seal - 8253



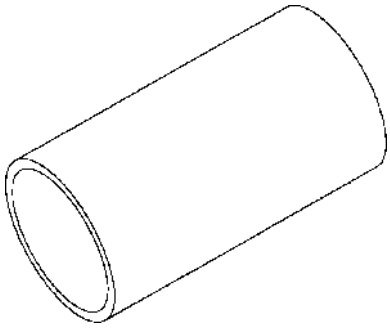
Adapter, Pressure Tap - 8258-A



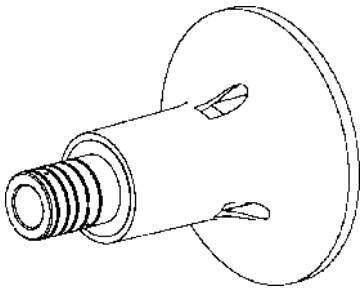
Installer, Seal - 8254



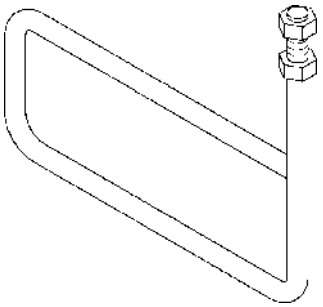
Adapter, Line Pressure - 8259



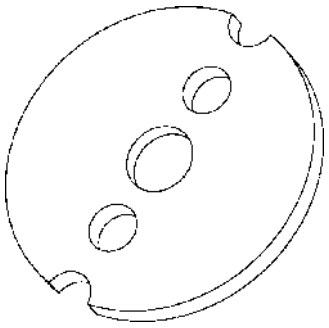
Installer, Snap-ring - 8255



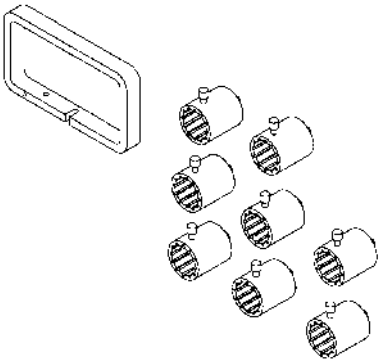
Fixture, Input Clutch Pressure - 8260



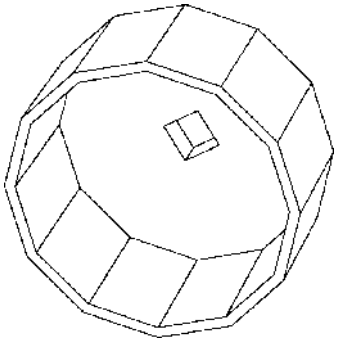
Stand, Support - 8257



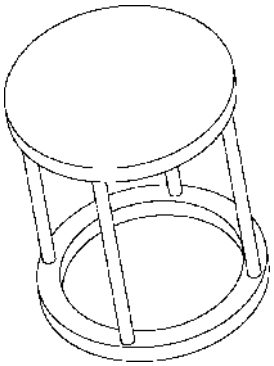
Plate, Alignment - 8261



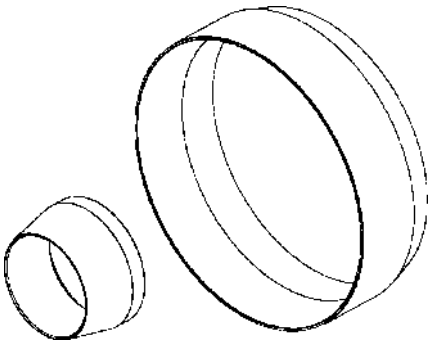
End Play Set - 8266



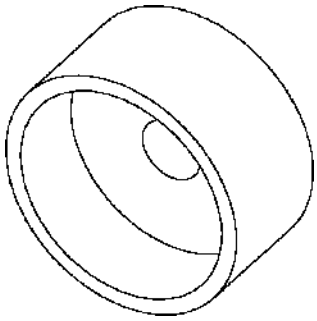
Wrench, Filter - 8321



Compressor, Spring - 8285



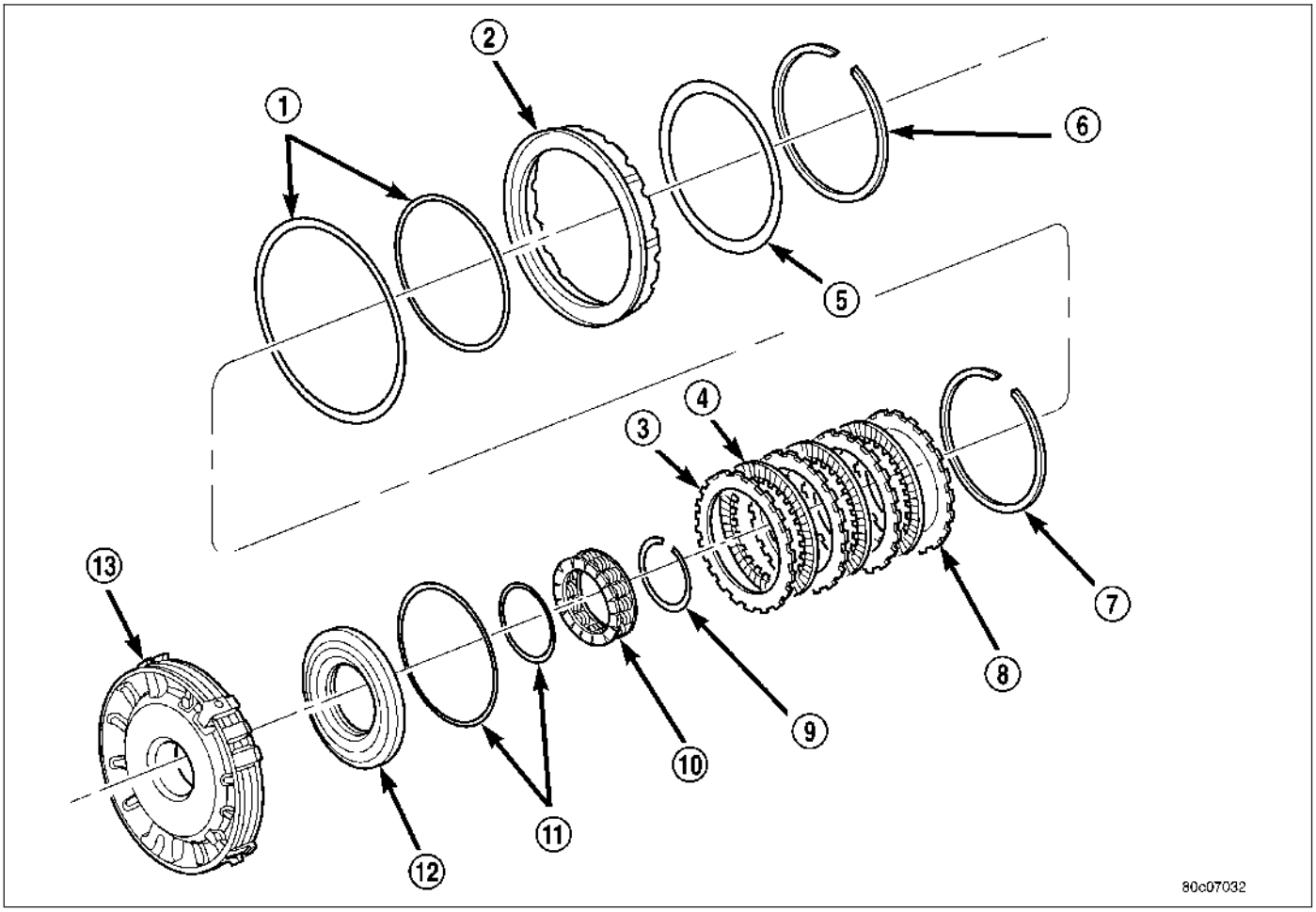
Installer, Piston - 8504



Installer, Bearing - 8320

RETAINER/BULKHEAD-4C

DISASSEMBLY

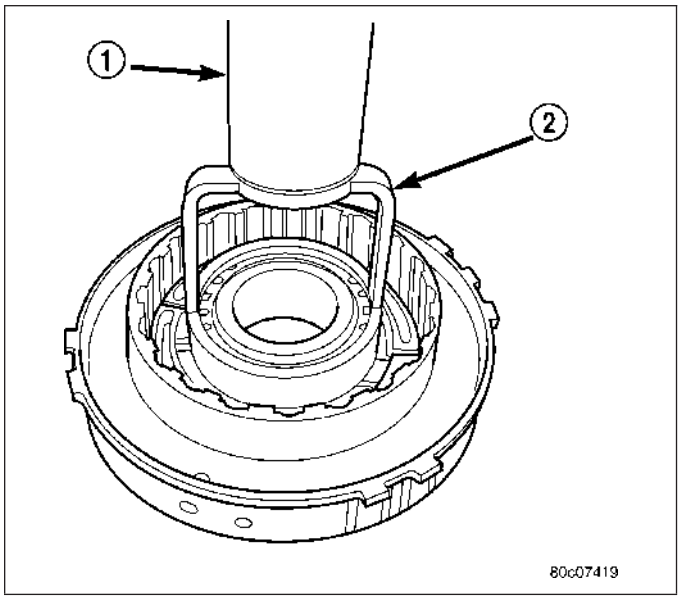


4C Retainer/Bulkhead Components

1 - SEAL
2 - 2C PISTON
3 - PLATE
4 - DISC
5 - 2C BELLEVILLE SPRING
6 - SNAP-RING
7 - SNAP-RING (SELECT)
8 - REACTION PLATE
9 - SNAP-RING
10 - RETURN SPRING
11 - SEAL
12 - 4C PISTON
13 - 4C RETAINER/BULKHEAD

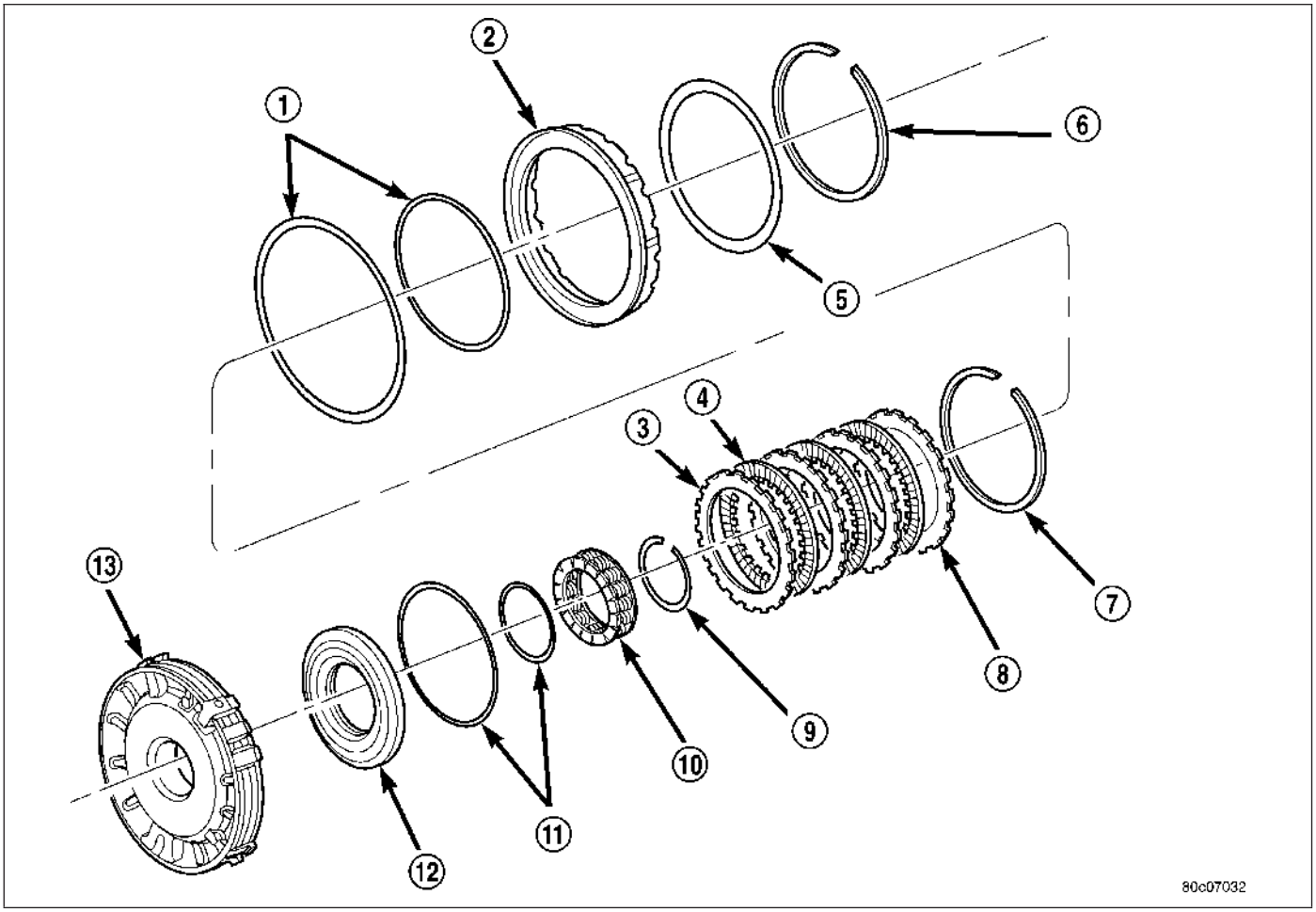
1. Remove the 2C piston Belleville spring snap-ring (6) from the 4C retainer /bulkhead (13).
2. Remove the 2C piston Belleville spring (5) from the retainer/bulkhead (13).
3. Remove the 2C piston (2) from the retainer/bulkhead (13). Use 20 psi of air pressure to remove the piston if necessary.
4. Remove the 4C clutch snap-ring (7) from the retainer/bulkhead (13).
5. Remove the 4C clutch pack (3, 4, 8) from the retainer/bulkhead (13).

6. Using Spring Compressor 8250 (2) and a suitable shop press (1), compress the 4C piston return spring (10) and remove the snap-ring (9).
7. Remove the 4C piston return spring (10) and piston (12) from the retainer/bulkhead (13). Use 20 psi of air pressure to remove the piston if necessary.



ASSEMBLY

NOTE: Clean and inspect all components. Replace any components which show evidence of excessive wear or scoring.

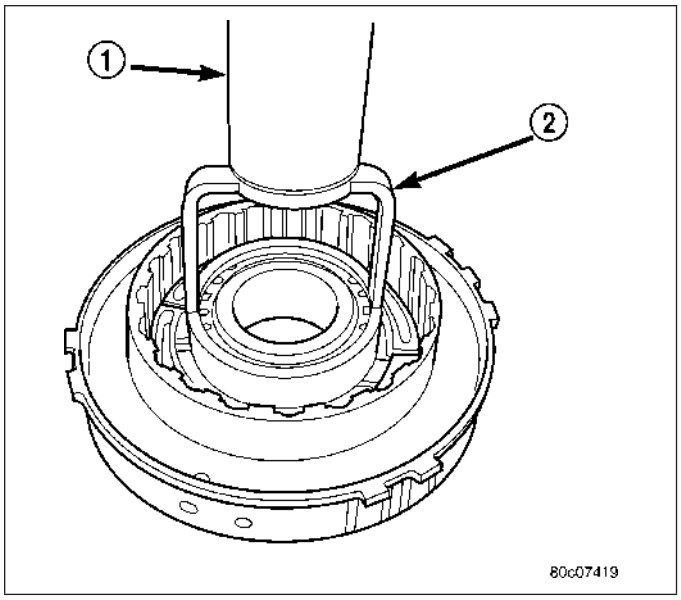


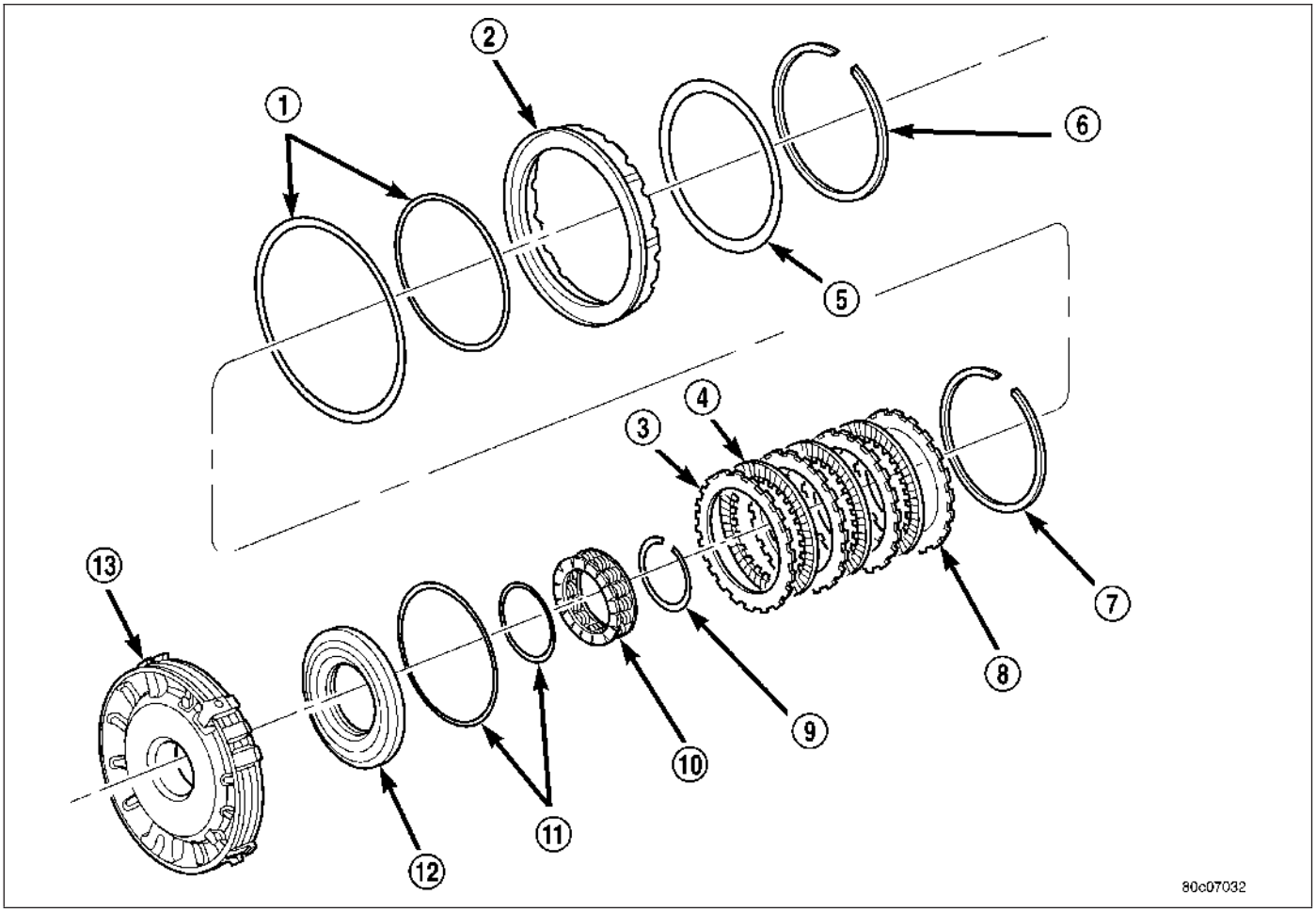
4C Retainer/Bulkhead Components

1 - SEAL
2 - 2C PISTON
3 - PLATE
4 - DISC
5 - 2C BELLEVILLE SPRING
6 - SNAP-RING
7 - SNAP-RING (SELECT)
8 - REACTION PLATE
9 - SNAP-RING
10 - RETURN SPRING
11 - SEAL
12 - 4C PISTON
13 - 4C RETAINER/BULKHEAD

1. Install new seals (1, 11) on the 2C and 4C pistons or in the piston retainers.
2. Lubricate all seals with Mopar® ATF +4 prior to installation.
3. Install the 4C piston (12) into the 4C retainer/bulkhead (13).
4. Position the 4C piston return spring (10) onto the 4C piston (12).

5. Using Spring Compressor 8250 (2) and a suitable shop press (1), compress the 4C piston return spring and install the snap-ring.





4C Retainer/Bulkhead Components

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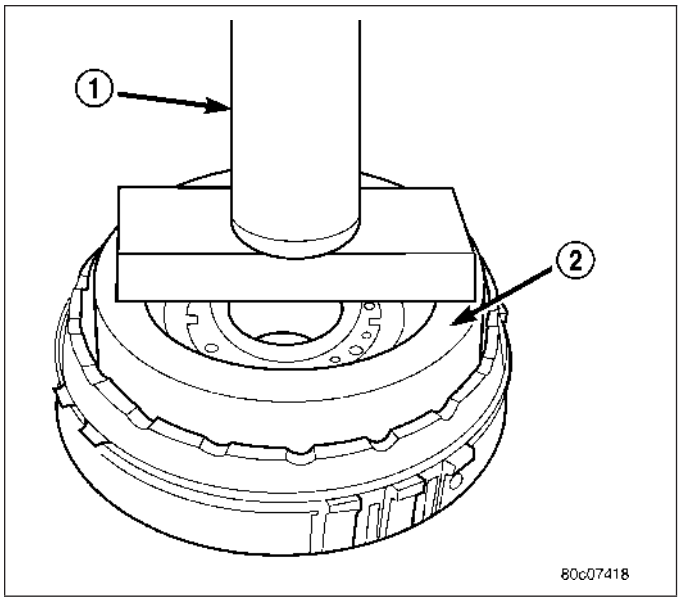
8 - REACTION PLATE
9 - SNAP-RING
10 - RETURN SPRING
11 - SEAL
12 - 4C PISTON
13 - 4C RETAINER/BULKHEAD

6. Assemble and install the 4C clutch pack (3, 4) into the retainer/bulkhead (13) with the steel separator plate against the piston.
7. Install the 4C reaction plate (8) and snap-ring (7) into the retainer/bulkhead (13). The 4C reaction plate is non-directional.
8. Measure the 4C clutch clearance. The correct clutch clearance is 0.77-1.39 mm (0.030-0.055 in.). The snap-ring (7) is selectable. Install the chosen snap-ring and re-measure to verify the selection.
9. Install the 2C piston (2) into the retainer/bulkhead (13).
10. Position the 2C Belleville spring (5) onto the 2C piston (2).
11. Position the 2C Belleville spring snap-ring (6) onto the 2C Belleville spring (5).

12. Using Spring Compressor 8249 (2) and a suitable shop press (1), compress the Belleville spring (5) until the snap-ring (6) is engaged with the snap-ring groove in the retainer/bulkhead.



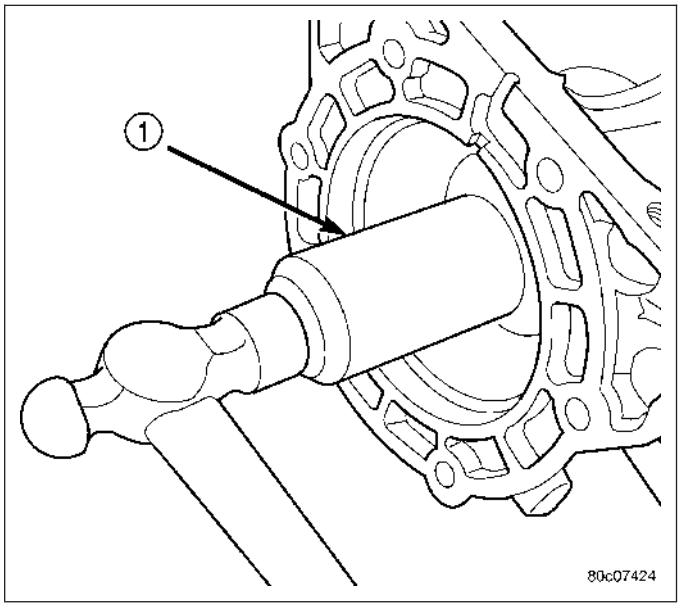
SEAL-ADAPTER HOUSING

REMOVAL

1. Remove the transfer case from the transmission.
2. Using a screw mounted on a slide hammer, remove the adapter housing seal.

INSTALLATION

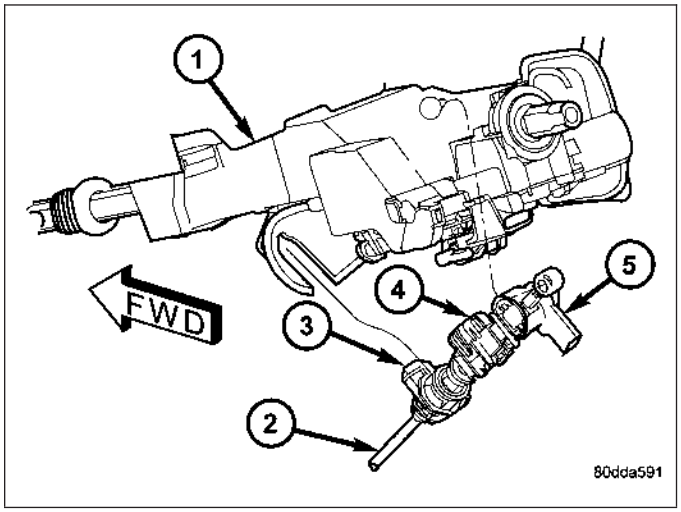
1. Clean the adapter seal bore in the adapter housing of any residue or particles remaining from the original seal.
2. Install new oil seal in the adapter housing using Seal Installer C-3860-A (1) . A properly installed seal is flush to the face of the seal bore.
3. Install the transfer case onto the transmission.



SYSTEM-BRAKE TRANSMISSION SHIFT INTERLOCK

DESCRIPTION

The Brake Transmission Shifter Interlock (BTSI), is a solenoid operated system. It consists of a solenoid permanently mounted on the gearshift cable.



OPERATION

The system locks the shifter into the PARK position. The interlock system is engaged whenever the ignition switch is in the LOCK or ACCESSORY position. An additional electrically activated feature will prevent shifting out of the PARK position unless the brake pedal is depressed approximately one-half an inch. A magnetic holding device in line with the park lock cable is energized when the ignition is in the RUN position. When the key is in the RUN position and the brake pedal is depressed, the shifter is unlocked and will move into any position. The interlock system also prevents the ignition switch from being turned to the LOCK or ACCESSORY position, unless the shifter is fully locked into the PARK position.

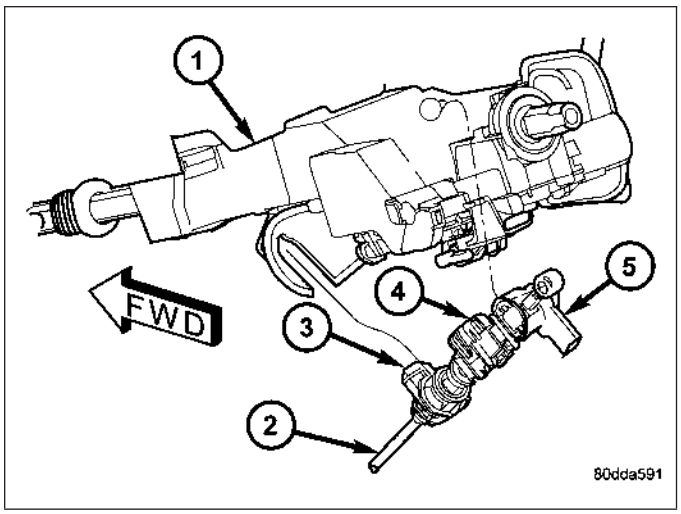
DIAGNOSIS AND TESTING - BRAKE TRANSMISSION SHIFT INTERLOCK

1. Verify that the key can only be removed in the PARK position.
2. When the shift lever is in PARK And the shift handle pushbutton is in the “OUT” position, the ignition key cylinder should rotate freely from OFF to LOCK. When the shifter is in any other gear or neutral position, the ignition key cylinder should not rotate to the LOCK position.
3. Shifting out of PARK should not be possible when the ignition key cylinder is in the OFF position.
4. Shifting out of PARK should not be possible while applying normal pushbutton force and ignition key cylinder is in the RUN or START positions unless the foot brake pedal is depressed approximately 1/2 inch (12mm).
5. Shifting out of PARK should not be possible when the ignition key cylinder is in the ACCESSORY or LOCK positions.
6. Shifting between any gears, NEUTRAL or into PARK may be done without depressing foot brake pedal with ignition switch in RUN or START positions.

ADJUSTMENTS - BRAKE TRANSMISSION SHIFT INTERLOCK

Correct cable adjustment is important to proper interlock operation. The gearshift cable must be correctly adjusted in order to shift out of PARK.

ADJUSTMENT PROCEDURE



1. Remove the steering column trim as necessary for access to the brake transmission shift interlock.
2. Shift the transmission into the PARK position.
3. Pull upward on both the BTSI lock tab (4) and the gearshift cable lock tab (3).
4. Verify that the shift lever is in the PARK position.
5. Verify positive engagement of the transmission park lock by attempting to rotate the propeller shaft. The shaft will not rotate when the park lock is engaged.
6. Turn ignition switch to LOCK position. **Be sure ignition key cylinder is in the LOCK position. Cable will not adjust correctly in any other position.**
7. Ensure that the cable is free to self-adjust by pushing cable rearward and releasing.
8. Push the gearshift cable lock tab (3) down until it snaps in place.
9. Locate the BTSI alignment hole in the bottom of the BTSI mechanism between the BTSI lock tab and the BTSI connector.
10. Move the BTSI assembly up or down on the gearshift cable until an appropriate size drill bit can be inserted into the alignment hole and through the assembly.
11. Push the BTSI lock tab (4) down until it snaps into place and remove the drill bit.
12. Install any steering column trim previously removed.

BTSI FUNCTION CHECK

1. Verify removal of ignition key allowed in PARK position only.
2. When the shift lever is in PARK, the ignition key cylinder should rotate freely from off to lock. When the shifter is in any other position, the ignition key should not rotate from off to lock.
3. Shifting out of PARK should be possible when the ignition key cylinder is in the off position.
4. Shifting out of PARK should not be possible while applying normal force, and ignition key cylinder is in the run or start positions, unless the foot brake pedal is depressed approximately 1/2 inch (12mm).
5. Shifting out of PARK should not be possible when the ignition key cylinder is in the accessory or lock position.
6. Shifting between any gear and NEUTRAL, or PARK, may be done without depressing foot brake with ignition switch in run or start positions.
7. Engine starts must be possible with shifter lever in PARK or NEUTRAL positions only. Engine starts must not be possible in any position other than PARK or NEUTRAL.
8. With shifter lever in the:
   - PARK position - Apply upward force on the shift arm and remove pressure. Engine starts must be possible.
   - PARK position - Apply downward force on the shift arm and remove pressure. Engine starts must be possible.
   - NEUTRAL position - Normal position. Engine starts must be possible.
   - NEUTRAL position - Engine running and brakes applied, apply upward force on the shift arm. Transmission shall not be able to shift from neutral to reverse.

FLUID AND FILTER

DIAGNOSIS AND TESTING

EFFECTS OF INCORRECT FLUID LEVEL

A low fluid level allows the pump to take in air along with the fluid. Air in the fluid will cause fluid pressures to be low and develop slower than normal. If the transmission is overfilled, the gears churn the fluid into foam. This aerates the fluid and causing the same conditions occurring with a low level. In either case, air bubbles cause fluid overheating, oxidation, and varnish buildup which interferes with valve and clutch operation. Foaming also causes fluid expansion which can result in fluid overflow from the transmission vent or fill tube. Fluid overflow can easily be mistaken for a leak if inspection is not careful.

CAUSES OF BURNT FLUID

Burnt, discolored fluid is a result of overheating which has three primary causes.

1. Internal clutch slippage, usually caused by low line pressure, inadequate clutch apply pressure, or clutch seal failure.
2. A result of restricted fluid flow through the main and/or auxiliary cooler. This condition is usually the result of a faulty or improperly installed drainback valve, a damaged oil cooler, or severe restrictions in the coolers and lines caused by debris or kinked lines.
3. Heavy duty operation with a vehicle not properly equipped for this type of operation. Trailer towing or similar high load operation will overheat the transmission fluid if the vehicle is improperly equipped. Such vehicles should have an auxiliary transmission fluid cooler, a heavy duty cooling system, and the engine/axle ratio combination needed to handle heavy loads.

FLUID CONTAMINATION

Transmission fluid contamination is generally a result of:

- adding incorrect fluid
- failure to clean dipstick and fill tube when checking level
- engine coolant entering the fluid
- internal failure that generates debris
- overheat that generates sludge (fluid breakdown)
- failure to replace contaminated converter after repair

The use of non-recommended fluids can result in transmission failure. The usual results are erratic shifts, slippage, abnormal wear and eventual failure due to fluid breakdown and sludge formation. Avoid this condition by using recommended fluids only.

The dipstick cap and fill tube should be wiped clean before checking fluid level. Dirt, grease and other foreign material on the cap and tube could fall into the tube if not removed beforehand. Take the time to wipe the cap and tube clean before withdrawing the dipstick.

Engine coolant in the transmission fluid is generally caused by a cooler malfunction. The only remedy is to replace the radiator as the cooler in the radiator is not a serviceable part. If coolant has circulated through the transmission, an overhaul is necessary.

The torque converter should be replaced whenever a failure generates sludge and debris. This is necessary because normal converter flushing procedures will not remove all contaminants.

STANDARD PROCEDURE

FLUID LEVEL CHECK

Low fluid level can cause a variety of conditions because it allows the pump to take in air along with the fluid. As in any hydraulic system, air bubbles make the fluid spongy, therefore, pressures will be low and build up slowly.

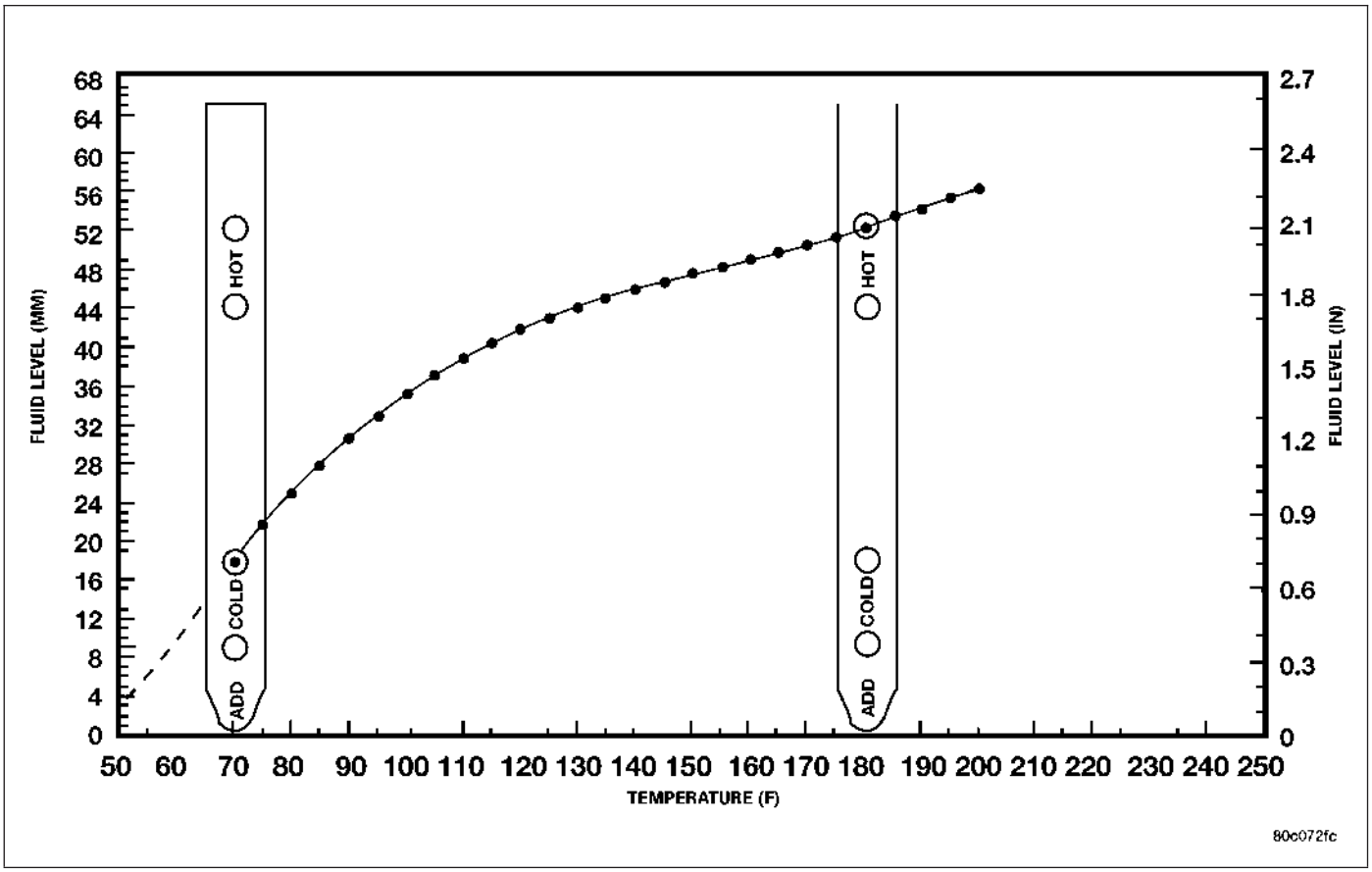
Improper filling can also raise the fluid level too high. When the transmssion has too much fluid, the geartrain churns up foam and cause the same conditions which occur with a low fluid level.

In either case, air bubbles can cause overheating and/or fluid oxidation, and varnishing. This can interfere with normal valve, clutch, and accumulator operation. Foaming can also result in fluid escaping from the transmission vent where it may be mistaken for a leak.

After the fluid has been checked, seat the dipstick fully to seal out water and dirt.

The transmission has a dipstick to check oil level. It is located on the right side of the engine. Be sure to wipe all dirt from dipstick handle before removing.

The torque converter fills in both the P (PARK) and N (NEUTRAL) positions. Place the selector lever in P (PARK) to be sure that the fluid level check is accurate. **The engine should be running at idle speed for at least one minute, with the vehicle on level ground.** At normal operating temperature (approximately 82 C. or 180 F.), the fluid level is correct if it is in the HOT region (cross-hatched area) on the oil level indicator. The fluid level will be approximately at the upper COLD hole of the dipstick at 70° F fluid temperature.



Transmission Fluid Temperature Chart

NOTE: Engine and Transmission should be at normal operating temperature before performing this procedure.

1. Start engine and apply parking brake.
2. Shift the transmission into DRIVE for approximately 2 seconds.
3. Shift the transmission into REVERSE for approximately 2 seconds.
4. Shift the transmission into PARK.
5. Hook up scan tool and select transmission.
6. Select sensors.
7. Read the transmission temperature value.
8. Compare the fluid temperature value with the chart.
9. Adjust transmission fluid level shown on the dipstick according to the Transmission Fluid Temperature Chart.

NOTE: After adding any fluid to the transmission, wait a minimum of 2 minutes for the oil to fully drain from the fill tube into the transmission before rechecking the fluid level.

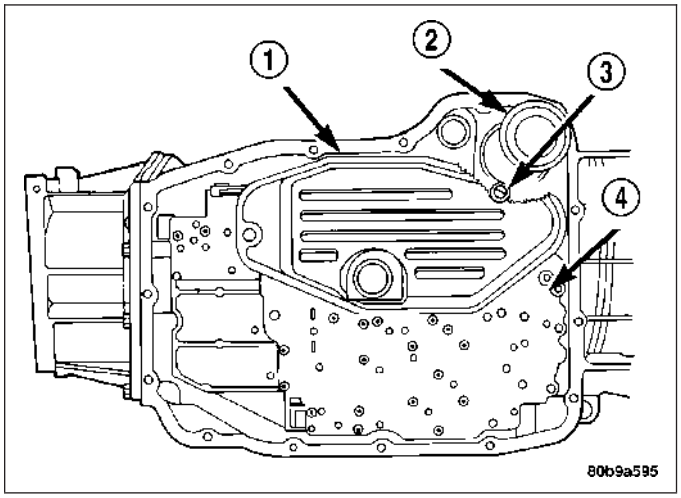
10. Check transmission for leaks.

FLUID AND FILTER REPLACEMENT

For proper service intervals (Refer to LUBRICATION & MAINTENANCE/MAINTENANCE SCHEDULES - DESCRIPTION).

REMOVAL

1. Hoist and support vehicle on safety stands.
2. Place a large diameter shallow drain pan beneath the transmission pan.
3. Remove bolts holding front and sides of pan to transmission.
4. Loosen bolts holding rear of pan to transmission.
5. Slowly separate front of pan away from transmission allowing the fluid to drain into drain pan.
6. Hold up pan and remove remaining bolts holding pan to transmission.
7. While holding pan level, lower pan away from transmission.
8. Pour remaining fluid in pan into drain pan.
9. Remove the screw holding the primary oil filter (1) to valve body.
10. Separate filter from valve body and oil pump and pour fluid in filter into drain pan.
11. Inspect the oil filter seal in the bottom of the oil pump. If the seal is not installed completely in the oil pump, or is otherwise damaged, then remove and discard the oil filter seal from the bottom of the oil pump. If the seal is installed correctly and is in good condition, it can be reused.
12. If replacing the cooler return filter (2), use Oil Filter Wrench 8321 to remove the filter from the transmission.
13. Dispose of used trans fluid and filter(s) properly.



INSPECTION

Inspect bottom of pan and magnet for excessive amounts of metal. A light coating of clutch material on the bottom of the pan does not indicate a problem unless accompanied by a slipping condition or shift lag. If fluid and pan are contaminated with excessive amounts of debris, refer to the diagnosis section of this group.

CLEANING

1. Using a suitable solvent, clean pan and magnet.
2. Using a suitable gasket scraper, clean original sealing material from surface of transmission case and the transmission pan.

INSTALLATION

CAUTION: The primary oil filter seal MUST be fully installed flush against the oil pump body. DO NOT install the seal onto the filter neck and attempt to install the filter and seal as an assembly. Damage to the transmission will result.

1. If necessary, install a new primary oil filter seal in the oil pump inlet bore. Seat the seal in the bore with a suitable tool (appropriately sized drift or socket, the butt end of a hammer, or other suitable tool).

2. Place replacement filter in position on valve body and into the oil pump.
3. Install screw to hold the primary oil filter (1) to valve body. Tighten screw to 4.5 N·m (40 in. lbs.) torque.
4. Install new cooler return filter (2) onto the transmission, if necessary. Torque the filter to 14.12 N·m (125 in.lbs.).
5. Place bead of Mopar® RTV sealant onto the transmission case sealing surface.
6. Place pan in position on transmission.
7. Install bolts to hold pan to transmission. Tighten bolts to 11.8 N·m (105 in. lbs.) torque.
8. Lower vehicle and fill transmission with Mopar® ATF +4.

TRANSMISSION FILL

To avoid overfilling transmission after a fluid change or overhaul, perform the following procedure:

1. Remove dipstick and insert clean funnel in transmission fill tube.
2. Add following initial quantity of Mopar® ATF +4 to transmission:
   a. If only fluid and filter were changed, add **10 pints (5 quarts)** of ATF +4 to transmission.
   b. If transmission was completely overhauled and the torque converter was replaced or drained, add **24 pints (12 quarts)** of ATF +4 to transmission.
3. Check the transmission fluid (Refer to 21 - TRANSMISSION/AUTOMATIC - RFE/FLUID - STANDARD PROCEDURE) and adjust as required.

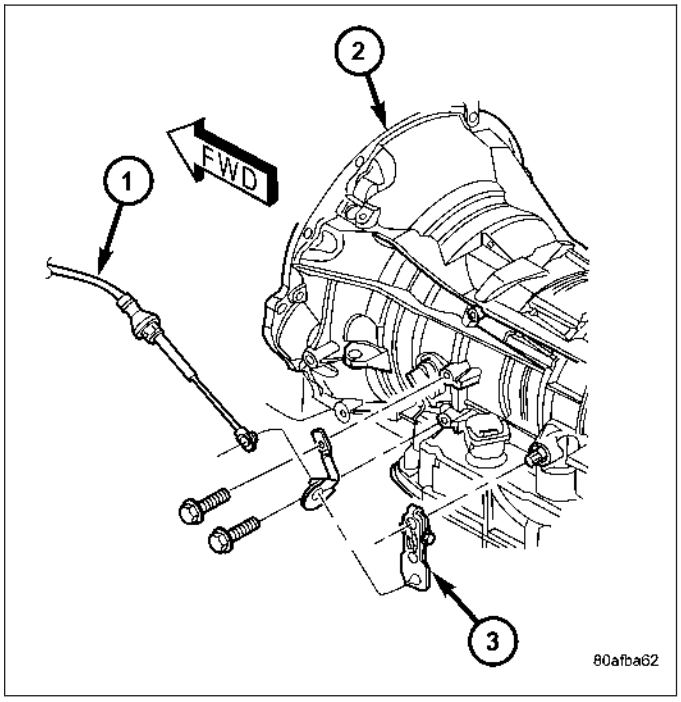
CABLE-GEARSHIFT

DIAGNOSIS AND TESTING - GEARSHIFT CABLE

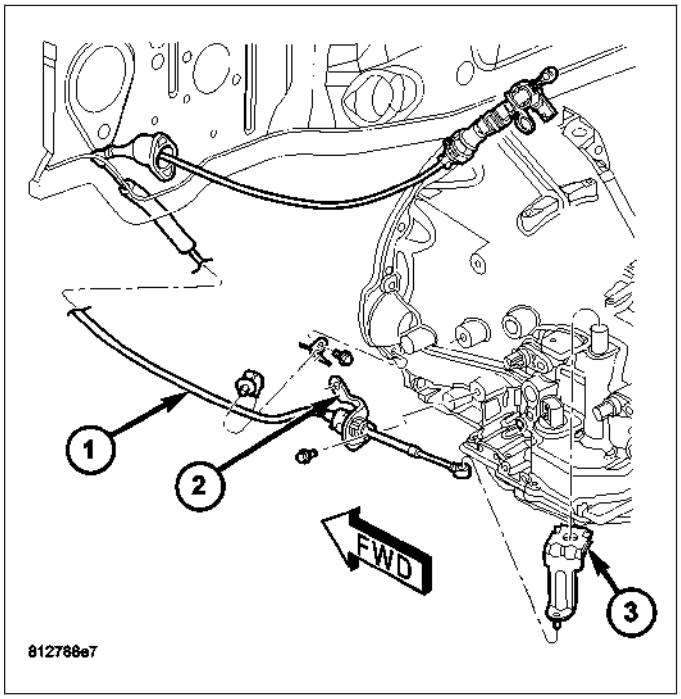
1. Engine starts must be possible with shift lever in PARK or NEUTRAL positions only. Engine starts must not be possible in any other gear position.
2. With the shift lever in the:
   a. PARK position - Apply upward force on the shift arm and remove pressure. Engine starts must be possible.
   b. PARK position - Apply downward force on the shift arm and remove pressure. Engine starts must be possible.
   c. NEUTRAL position - Normal position. Engine starts must be possible.
   d. NEUTRAL position - Engine running and brakes applied, apply upward force on the shift arm. Transmission shall not be able to shift from neutral to reverse.

REMOVAL

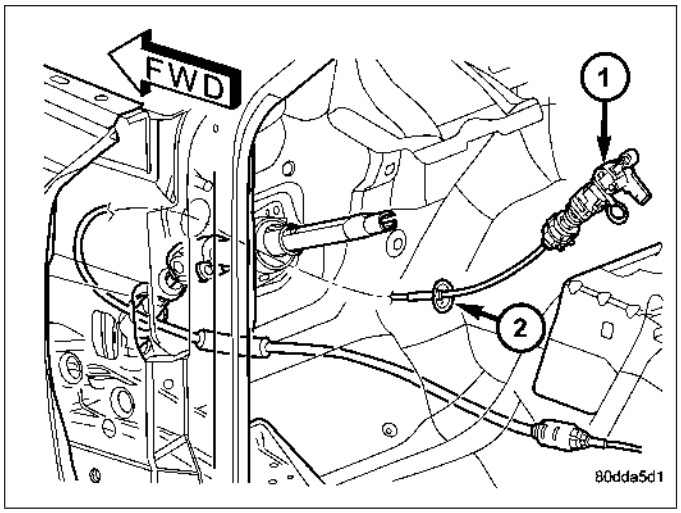
1. Shift transmission into PARK.
2. Raise vehicle.
3. Disengage cable (1) eyelet at transmission manual shift lever (3) and pull cable adjuster out of mounting bracket, RFE transmission equipped vehicles.



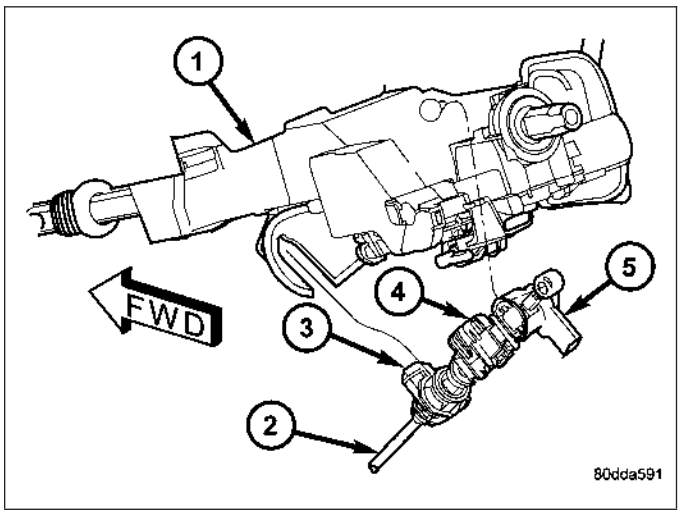
4. Disengage cable (1) eyelet at transmission manual shift lever (3) and pull cable adjuster out of mounting bracket (2), RLE transmission equipped vehicles.



5. Lower the vehicle.
6. Remove the dash panel insulation pad as necessary to access the gearshift cable grommet (2).
7. Remove grommet (2) from the dash panel.

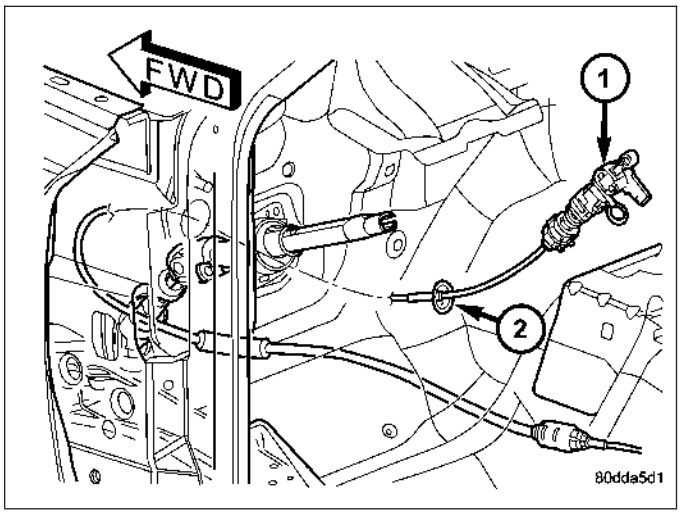


8. Remove any steering column (1) trim necessary to access the gearshift cable (2) and BTSI mechanism.
9. Disconnect the BTSI wiring connector (5).
10. Disconnect cable at lower column bracket and shift lever pin and pull the cable through the dash panel opening into the vehicle.
11. Remove gearshift cable (2) from vehicle.

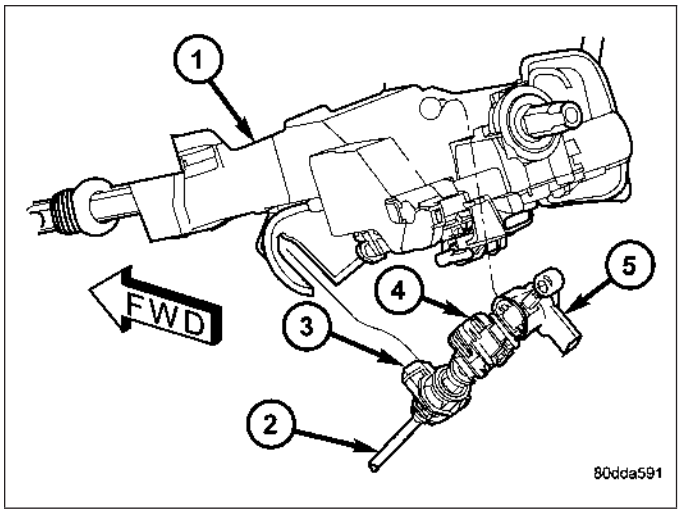


INSTALLATION

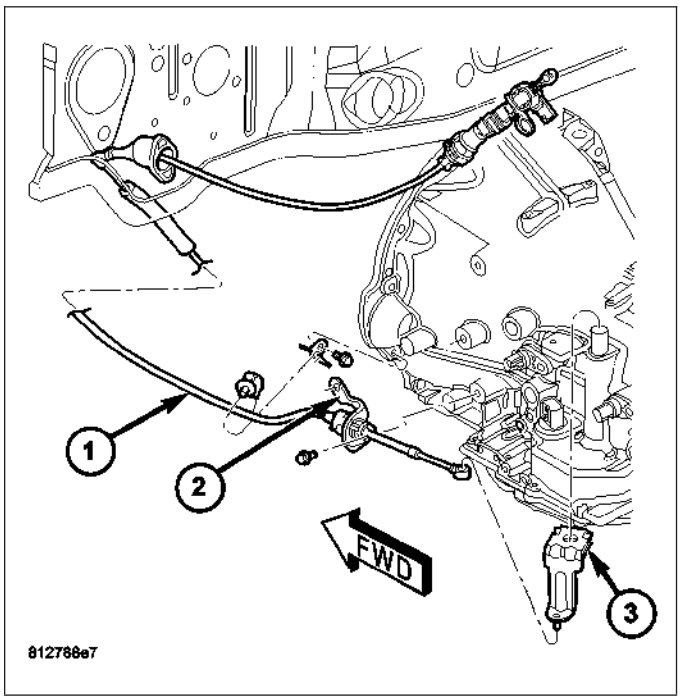
1. Route the transmission end of the gearshift cable (1) through the opening in the dash panel.
2. Seat the cable grommet (2) into the dash panel opening.



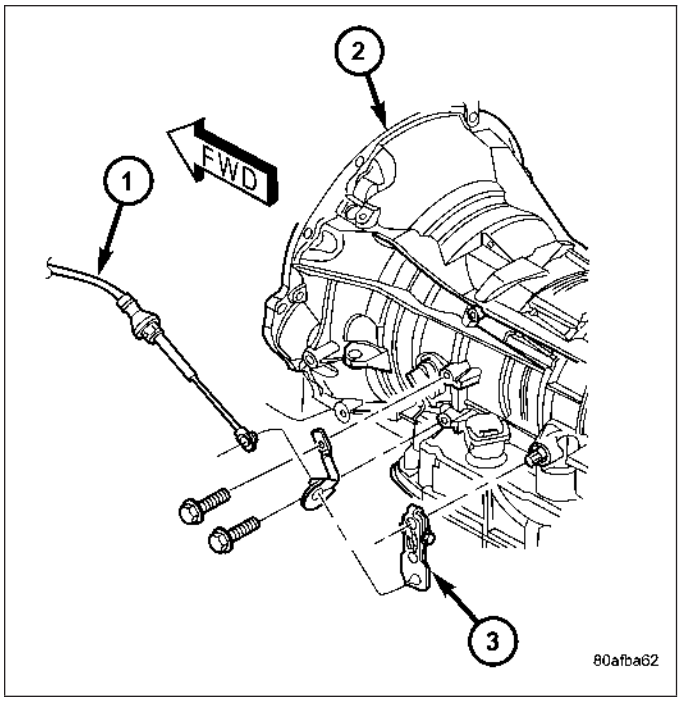
3. Snap the cable into the steering column (1) bracket so the retaining ears are engaged and snap the cable eyelet onto the shift lever ball stud.
4. Raise the vehicle.
5. Place the transmission manual shift lever in the “PARK” detent (rearmost) position and rotate prop shaft to ensure transmission is in PARK.



6. Route the gearshift cable (1) through the transmission mounting bracket (2) and secure the cable by snapping the cable retaining ears into the transmission bracket and snapping the cable eyelet on the manual shift lever (3) ball stud, RLE transmission equipped vehicles.



7. Route the gearshift cable (1) through the transmission mounting bracket and secure the cable by snapping the cable retaining ears into the transmission bracket and snapping the cable eyelet on the manual shift lever (3) ball stud, RFE transmission equipped vehicles.
8. Lower vehicle.
9. Lock the shift cable adjustment by pressing the cable adjuster lock tab (3) downward until it snaps into place.
10. Check for proper operation of the transmission range sensor.
11. Adjust the gearshift cable (Refer to 21 - TRANSMISSION/AUTOMATIC/GEAR SHIFT CABLE - ADJUSTMENTS) and BTSI mechanism (Refer to 21 - TRANSMISSION/AUTOMATIC/BRAKE TRANSMISSION SHIFT INTERLOCK SYSTEM - ADJUSTMENTS) as necessary.

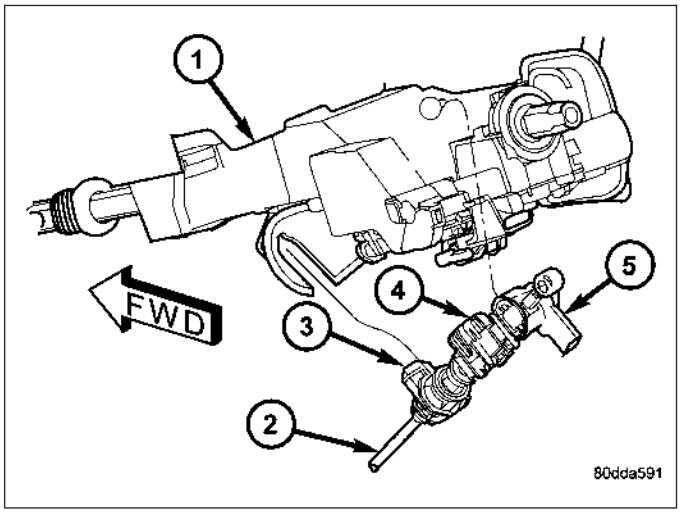


ADJUSTMENTS - GEARSHIFT CABLE

Check adjustment by starting the engine in PARK and NEUTRAL. Adjustment is CORRECT if the engine starts only in these positions. Adjustment is INCORRECT if the engine starts in one but not both positions. If the engine starts in any position other than PARK or NEUTRAL, or if the engine will not start at all, the transmission range sensor may be faulty.

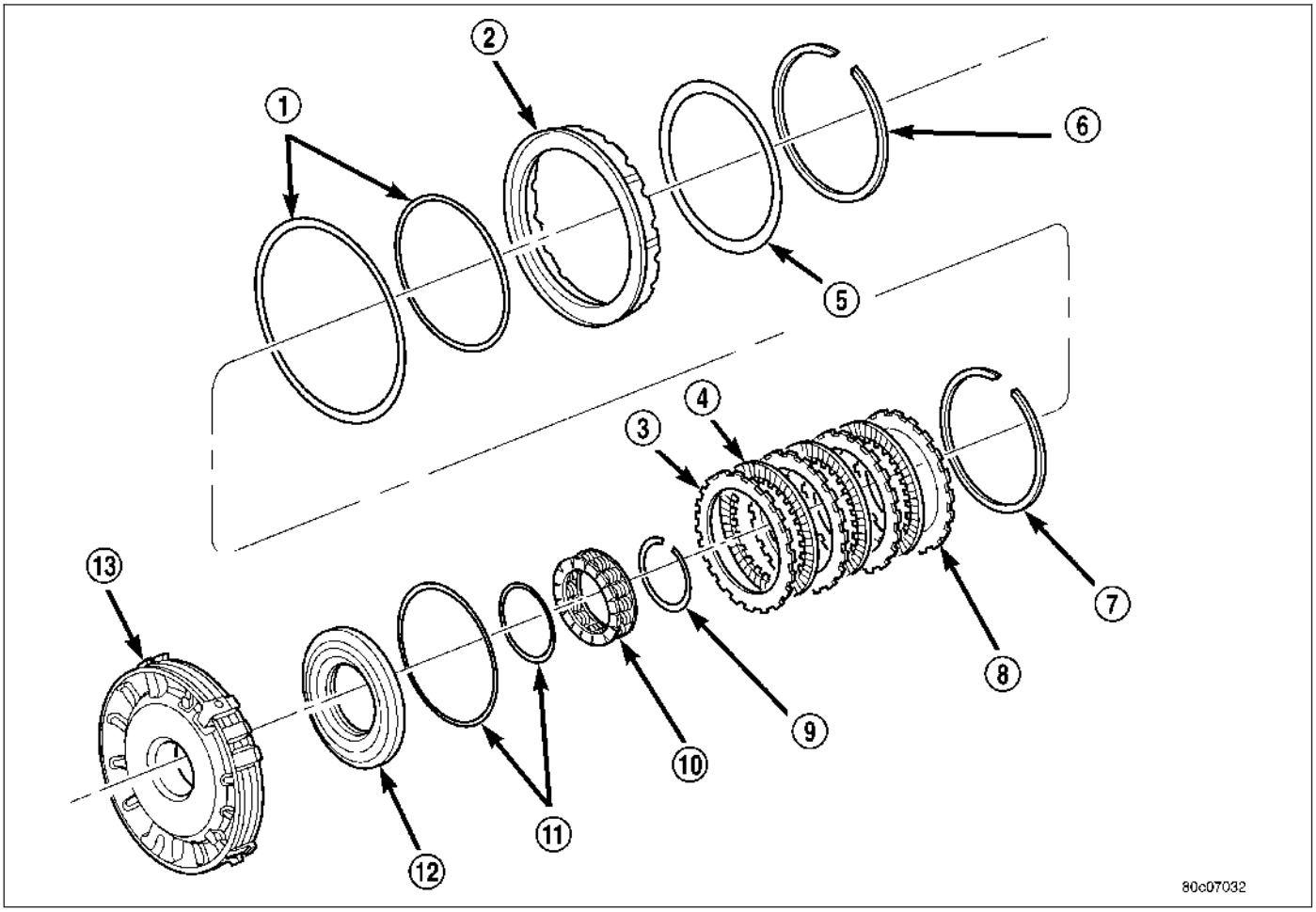
Gearshift Adjustment Procedure

1. Shift transmission into PARK.
2. Release cable adjuster lock tab (3) (underneath the steering column) to unlock cable.
3. Raise vehicle.
4. Disengage the cable eyelet from the transmission manual shift lever.
5. Verify transmission shift lever is in PARK detent by moving lever fully rearward. Last rearward detent is PARK position.
6. Verify positive engagement of transmission park lock by attempting to rotate propeller shaft. Shaft will not rotate when park lock is engaged.
7. Snap the cable eyelet onto the transmission manual shift lever.
8. Lower vehicle.
9. Lock shift cable by pressing cable adjuster lock tab (3) downward until it snaps into place.
10. Check engine starting. Engine should start only in PARK and NEUTRAL.



CLUTCHES-HOLDING

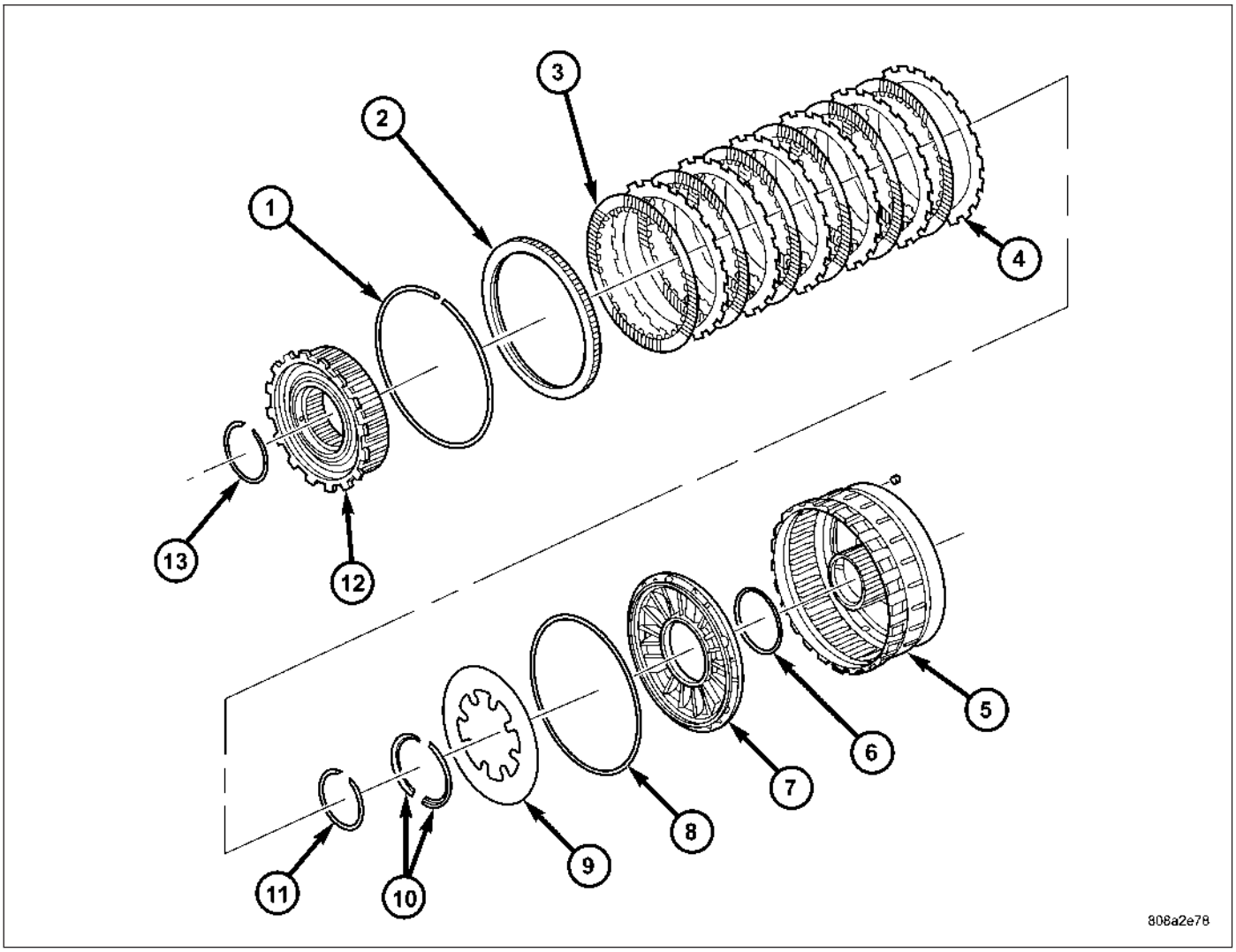
DESCRIPTION



2C and 4C Clutches

1 - SEAL
2 - 2C PISTON
3 - PLATE
4 - DISC
5 - 2C BELLEVILLE SPRING
6 - SNAP-RING
7 - SNAP-RING (SELECT)
8 - REACTION PLATE
9 - SNAP-RING
10 - RETURN SPRING
11 - SEAL
12 - 4C PISTON
13 - 4C RETAINER/BULKHEAD

Three hydraulically applied multi-disc clutches are used to hold some planetary geartrain components stationary while the input clutches drive others. The 2C, 4C, and Low/Reverse clutches are considered holding clutches. The 2C and 4C clutches are located in the 4C retainer/bulkhead (13).



Low/Reverse Clutch

1 - SNAP-RING (SELECT)
2 - REACTION PLATE
3 - DISC
4 - PLATE
5 - L/R CLUTCH RETAINER
6 - SEAL
7 - PISTON
8 - SEAL
9 - BELLEVILLE SPRING
10 - RETAINER
11 - SNAP-RING
12 - OVERRUNNING CLUTCH
13 - SNAP-RING

The Low/Reverse clutch is located at the rear of the transmission case.

OPERATION

2C CLUTCH

The 2C clutch is hydraulically applied in second and fifth gear by pressurized fluid against the 2C piston. When the 2C clutch is applied, the reverse sun gear assembly is held or grounded to the transmission case by holding the reaction planetary carrier.

4C CLUTCH

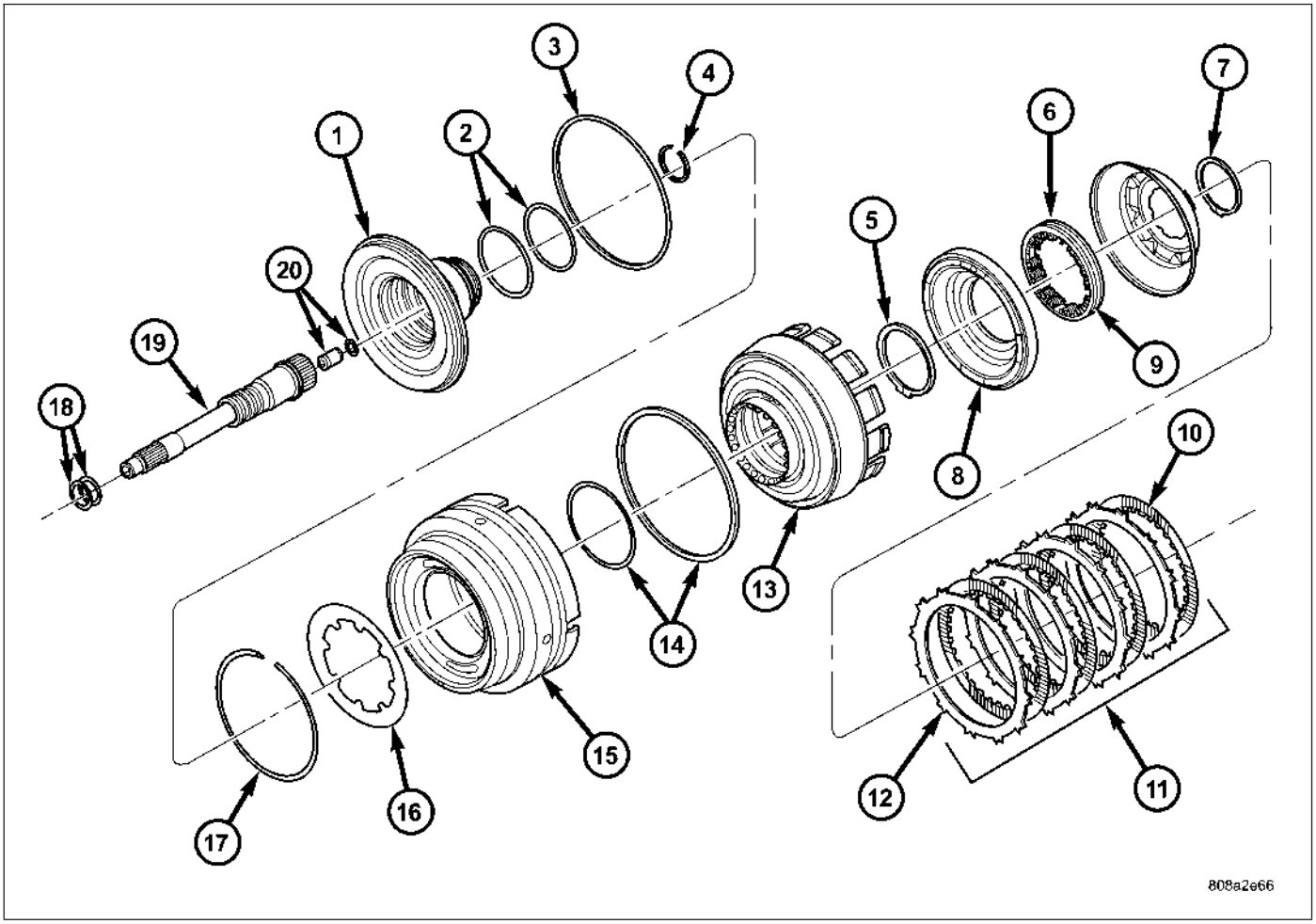
The 4C clutch is hydraulically applied in second prime and fourth gear by pressurized fluid against the 4C clutch piston. When the 4C clutch is applied, the reaction annulus gear is held or grounded to the transmission case.

LOW/REVERSE CLUTCH

The Low/Reverse clutch is hydraulically applied in park, reverse, neutral, and first gear, only at low speeds, by pressurized fluid against the Low/Reverse clutch piston. When the Low/Reverse clutch is applied, the input annulus assembly is held or grounded to the transmission case.

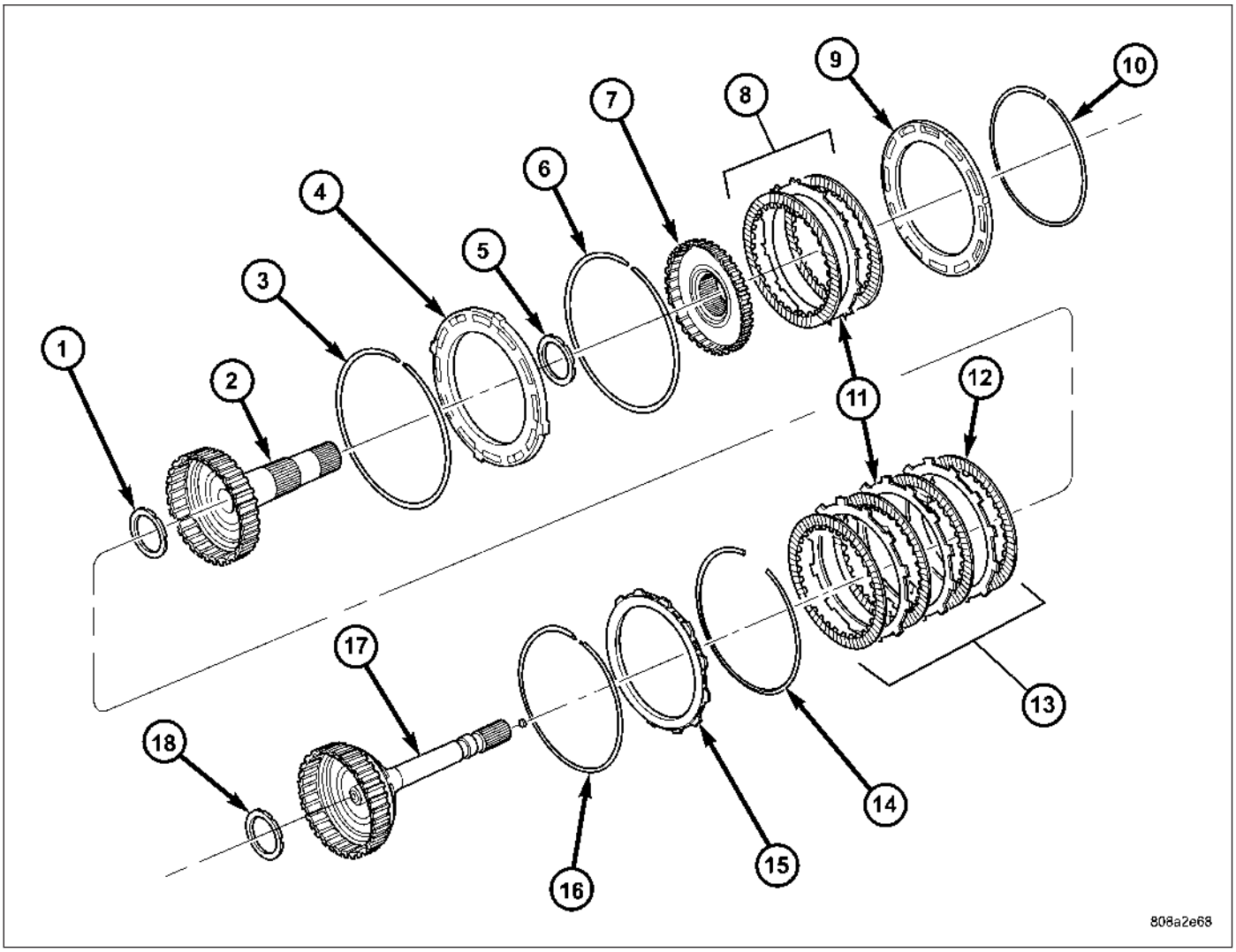
ASSEMBLY-INPUT CLUTCH

DESCRIPTION



Input Clutch Assembly - Part 1

1 - INPUT CLUTCH HUB
2 - O-RING SEALS
3 - SEAL
4 - SNAP-RING
5 - SNAP-RING
6 - UD BALANCE PISTON
7 - SNAP-RING
8 - UD PISTON
9 - SPRING
10 - DISC
11 - UD CLUTCH
12 - PLATE
13 - CLUTCH RETAINER
14 - SEAL
15 - OD/REV PISTON
16 - BELLEVILLE SPRING
17 - SNAP-RING
18 - SEAL RINGS
19 - INPUT SHAFT
20 - LUBRICATION CHECK VALVE AND SNAP-RING



Input Clutch Assembly - Part 2

1 - THRUST BEARING NUMBER 3
2 - OD HUB/SHAFT
3 - SNAP-RING (WAVE)
4 - REV/OD REACTION PLATE
5 - THRUST BEARING NUMBER 4
6 - SNAP-RING (FLAT)
7 - REVERSE HUB/SHAFT
8 - REVERSE CLUTCH
9 - REVERSE REACTION PLATE
10 - SNAP-RING (SELECT)
11 - PLATE
12 - DISC
13 - OD CLUTCH
14 - SNAP-RING (TAPERED)
15 - UD/OD REACTION PLATE
16 - SNAP-RING (FLAT)
17 - UD HUB/SHAFT
18 - THRUST BEARING NUMBER 2

Three hydraulically applied input clutches are used to drive planetary components. The underdrive, overdrive, and reverse clutches are considered input clutches and are contained within the input clutch assembly.

The input clutch assembly also contains:

- Input shaft
- Input hub
- Clutch retainer
- Underdrive piston
- Overdrive/reverse piston
- Overdrive hub
- Underdrive hub

OPERATION

The three input clutches are responsible for driving different components of the planetary geartrain.

UNDERDRIVE CLUTCH

The underdrive clutch is hydraulically applied in first, second, second prime, and third (direct) gears by pressurized fluid against the underdrive piston. When the underdrive clutch is applied, the underdrive hub drives the input sun gear.

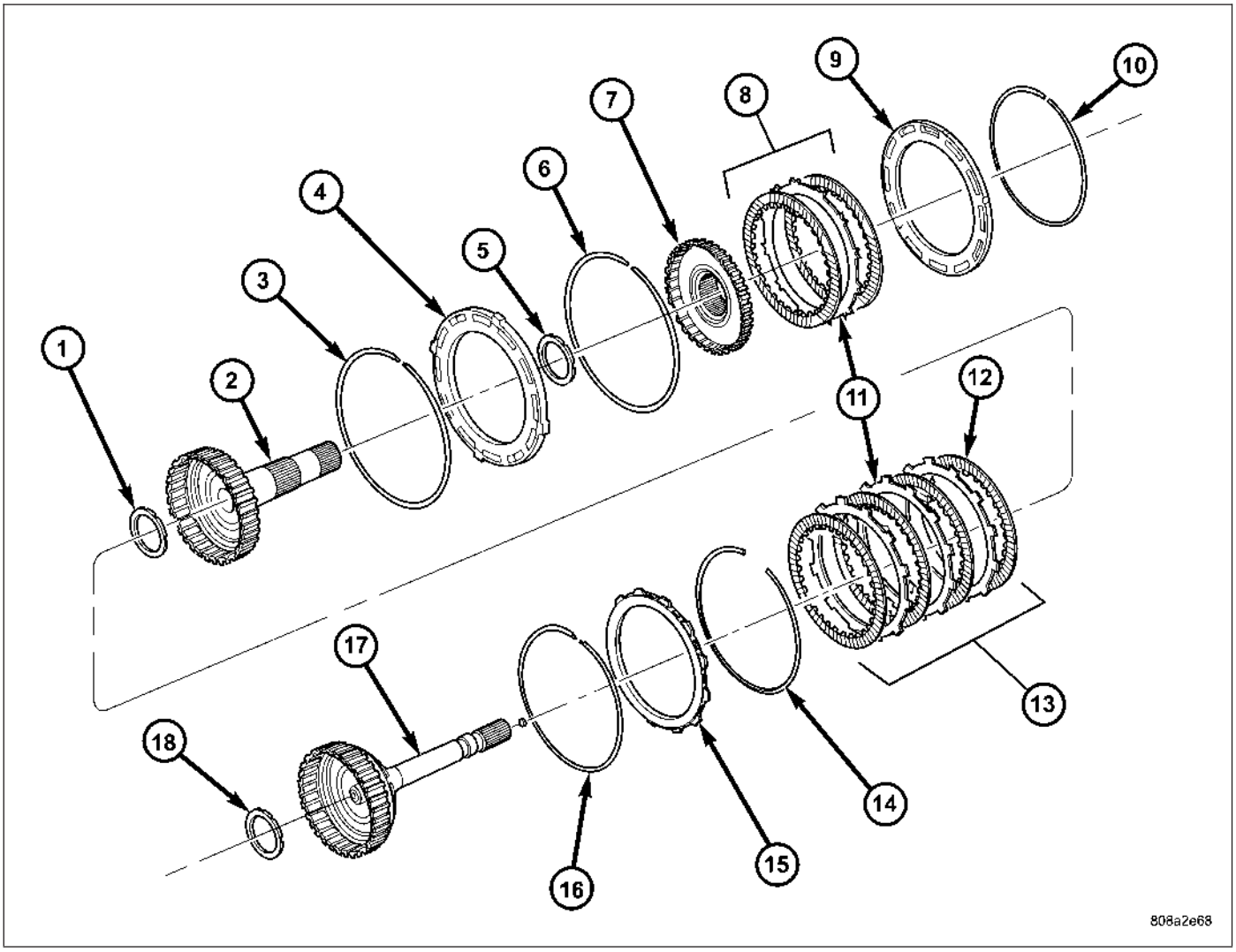
OVERDRIVE CLUTCH

The overdrive clutch is hydraulically applied in third (direct), fourth, and fifth gears by pressurized fluid against the overdrive/reverse piston. When the overdrive clutch is applied, the overdrive hub drives the reverse carrier/input annulus assembly.

REVERSE CLUTCH

The reverse clutch is hydraulically applied in reverse gear by pressurized fluid against the overdrive/reverse piston. When the reverse clutch is applied, the reaction annulus gear is driven.

DISASSEMBLY



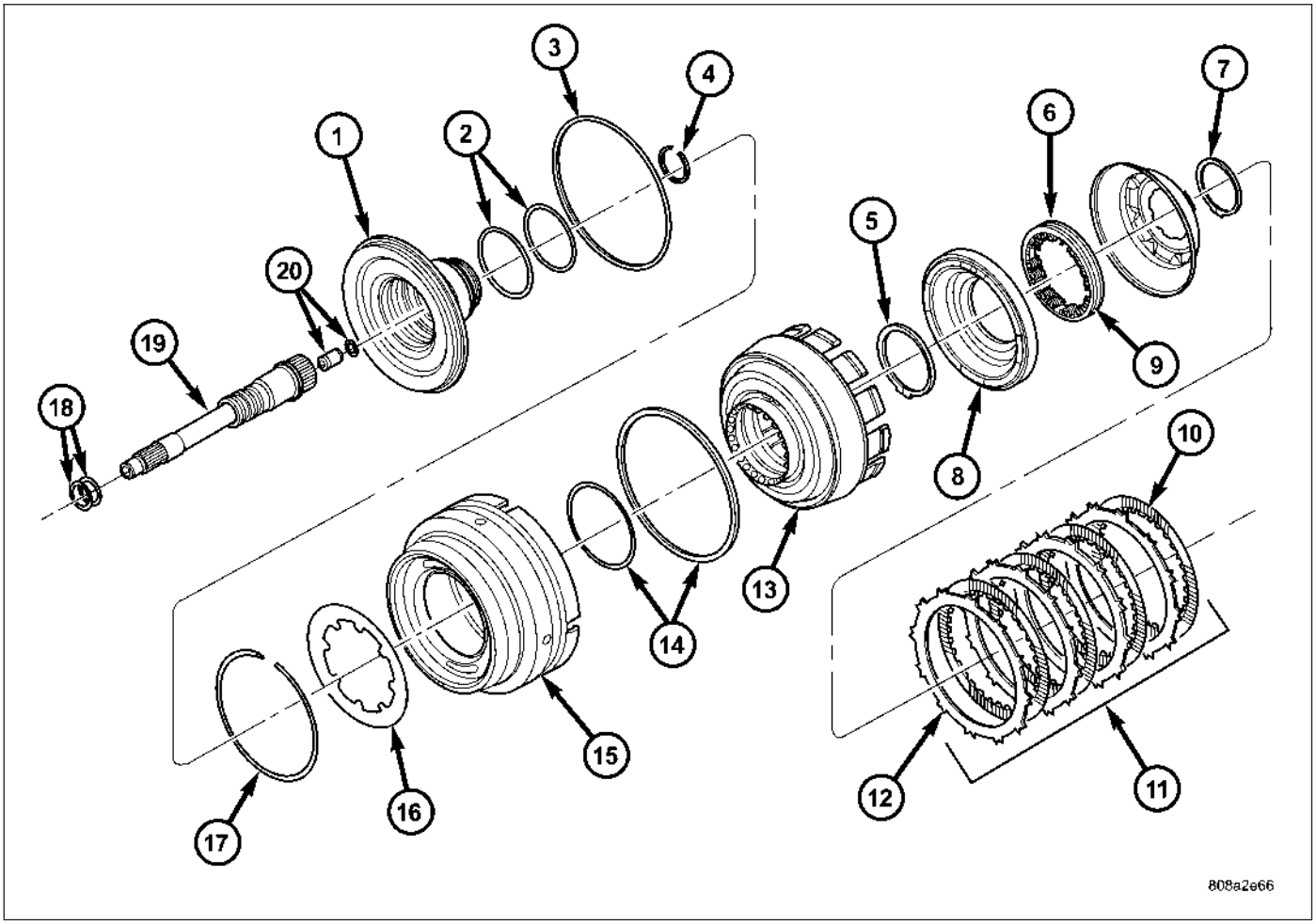
Input Clutch Assembly - Part 2

1 - THRUST BEARING NUMBER 3
2 - OD HUB/SHAFT
3 - SNAP-RING (WAVE)
4 - REV/OD REACTION PLATE
5 - THRUST BEARING NUMBER 4
6 - SNAP-RING (FLAT)
7 - REVERSE HUB/SHAFT
8 - REVERSE CLUTCH
9 - REVERSE REACTION PLATE
10 - SNAP-RING (SELECT)
11 - PLATE
12 - DISC
13 - OD CLUTCH
14 - SNAP-RING (TAPERED)
15 - UD/OD REACTION PLATE
16 - SNAP-RING (FLAT)
17 - UD HUB/SHAFT
18 - THRUST BEARING NUMBER 2

1. Remove the reverse reaction plate selective snap-ring (10) from the input clutch retainer (13).
2. Remove the reverse reaction plate (9) from the input clutch retainer (13).
3. Remove the reverse hub (7) and reverse clutch pack (8) from the input clutch retainer (13).
4. Remove the number 4 thrust bearing (5) from the overdrive hub (2).
5. Remove the overdrive hub (2) from the input clutch retainer (13).
6. Remove the number 3 thrust bearing (1) from the underdrive hub (17).
7. Remove the OD/reverse reaction plate snap-ring (6) from the input clutch retainer (13).
8. Remove the underdrive hub (17), overdrive clutch (13), and overdrive reaction plate (15) from the input clutch retainer (13).

NOTE: The overdrive friction discs and steel discs are thicker than the matching components in the underdrive and reverse clutches.

9. Remove the number 2 thrust bearing (18) from the input clutch hub (1).
10. Remove the overdrive clutch wave snap-ring (3) from the input clutch retainer (13).
11. Remove the UD/OD reaction plate tapered snap-ring (14) from the input clutch retainer (13).
12. Remove the UD/OD reaction plate (15) from the input clutch retainer (13).
13. Remove the UD/OD reaction plate flat snap-ring (16) from the input clutch retainer (13).

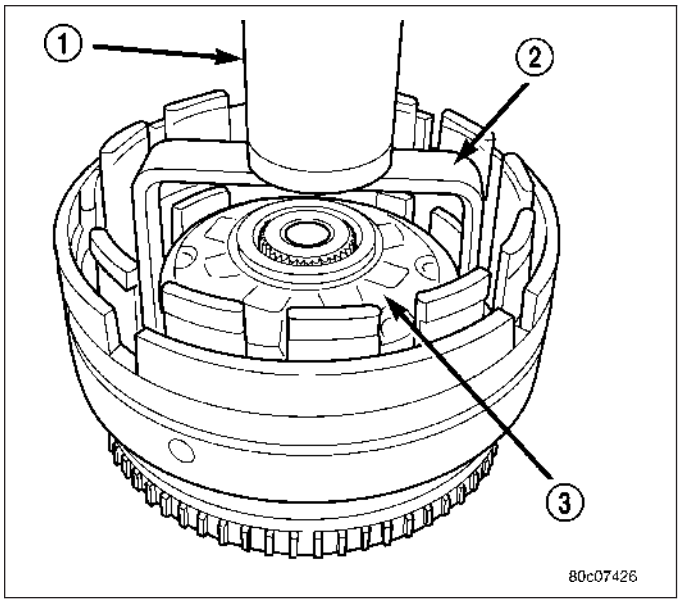


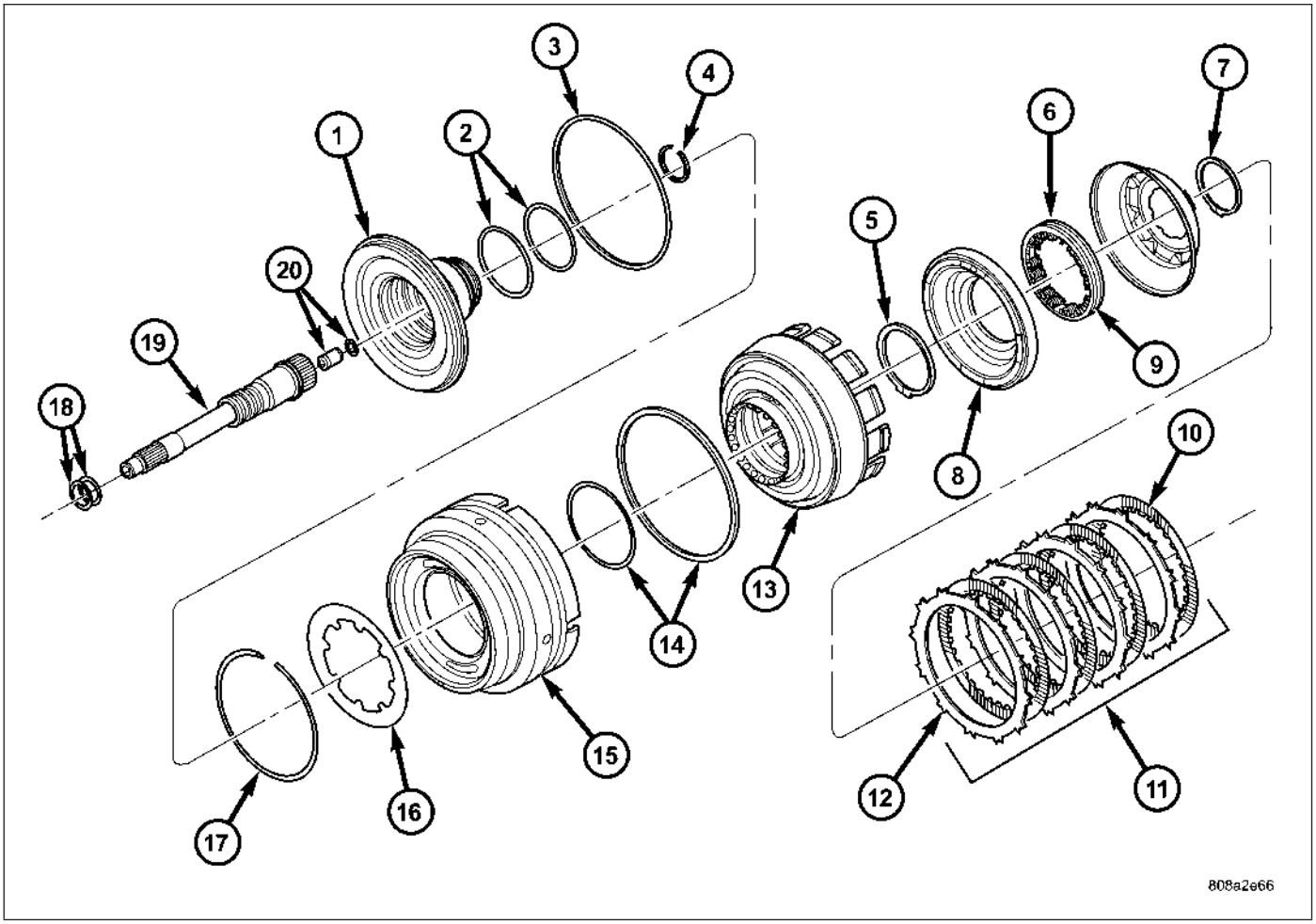
Input Clutch Assembly - Part 1

1 - INPUT CLUTCH HUB
2 - O-RING SEALS
3 - SEAL
4 - SNAP-RING
5 - SNAP-RING
6 - UD BALANCE PISTON
7 - SNAP-RING
8 - UD PISTON
9 - SPRING
10 - DISC
11 - UD CLUTCH
12 - PLATE
13 - CLUTCH RETAINER
14 - SEAL
15 - OD/REV PISTON
16 - BELLEVILLE SPRING
17 - SNAP-RING
18 - SEAL RINGS
19 - INPUT SHAFT
20 - LUBRICATION CHECK VALVE AND SNAP-RING

14. Remove the underdrive clutch pack (11) from the input clutch retainer (13).

15. Using Spring Compressor 8251 (2) , compress the UD/OD balance piston (3) and remove the snap-ring from the input clutch hub (1).





Input Clutch Assembly - Part 1

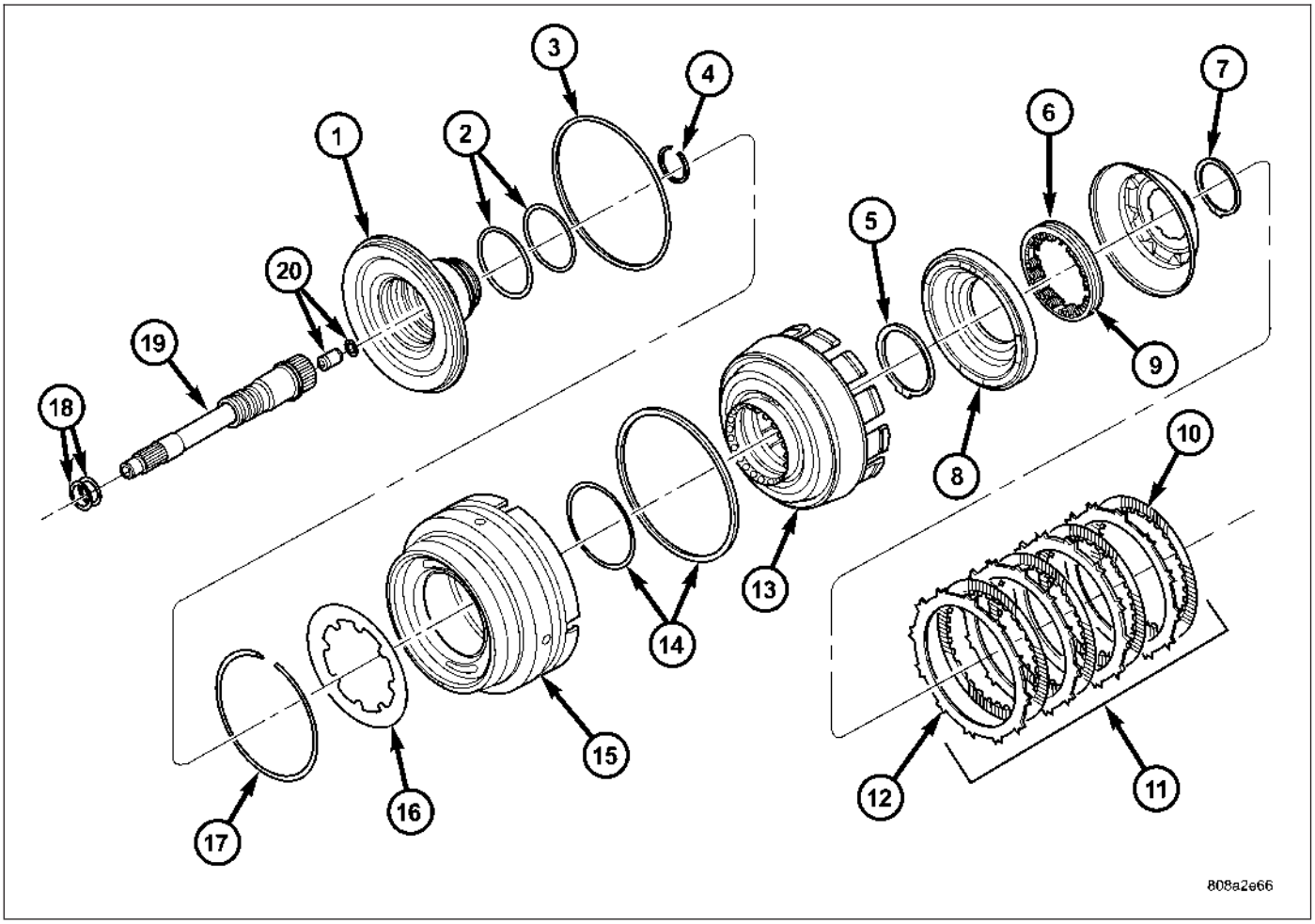
1 - INPUT CLUTCH HUB	11 - UD CLUTCH
2 - O-RING SEALS	12 - PLATE
3 - SEAL	13 - CLUTCH RETAINER
4 - SNAP-RING	14 - SEAL
5 - SNAP-RING	15 - OD/REV PISTON
6 - UD BALANCE PISTON	16 - BELLEVILLE SPRING
7 - SNAP-RING	17 - SNAP-RING
8 - UD PISTON	18 - SEAL RINGS
9 - SPRING	19 - INPUT SHAFT
10 - DISC	20 - LUBRICATION CHECK VALVE AND SNAP-RING

16. Remove the UD/OD balance piston (6) and piston return spring (9) from the input clutch retainer (13).
17. Remove the underdrive piston (8) from the input clutch retainer (13).

NOTE: Both the UD/OD balance piston and the underdrive piston have seals molded onto them. If the seal is damaged, do not attempt to install a new seal onto the piston. The piston/seal must be replaced as an assembly.

18. Remove the input clutch retainer tapered snap-ring (5).
19. Separate input clutch retainer (13) from input clutch hub (1).
20. Separate OD/reverse piston (15) from input clutch hub retainer (13).
21. Remove all seals and o-rings from the input shaft and input hub. The o-rings on the input hub are color coded. Be sure to make note of which o-ring belongs in which location.

ASSEMBLY



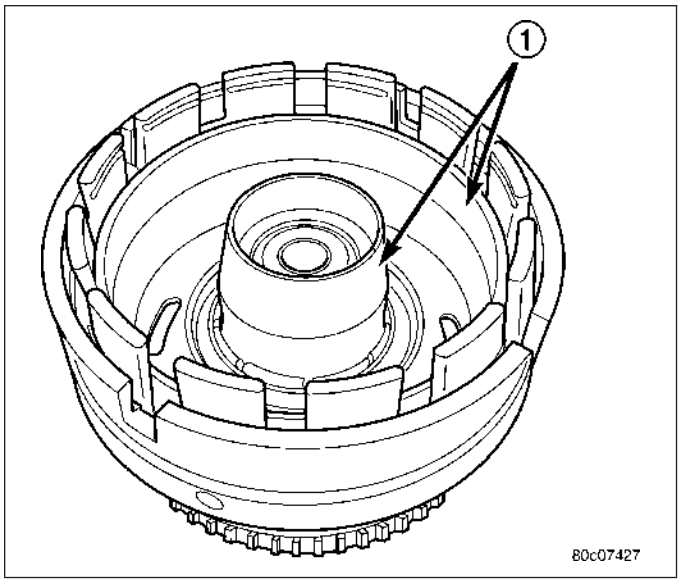
Input Clutch Assembly - Part 1

1 - INPUT CLUTCH HUB
2 - O-RING SEALS
3 - SEAL
4 - SNAP-RING
5 - SNAP-RING
6 - UD BALANCE PISTON
7 - SNAP-RING
8 - UD PISTON
9 - SPRING
10 - DISC
11 - UD CLUTCH
12 - PLATE
13 - CLUTCH RETAINER
14 - SEAL
15 - OD/REV PISTON
16 - BELLEVILLE SPRING
17 - SNAP-RING
18 - SEAL RINGS
19 - INPUT SHAFT
20 - LUBRICATION CHECK VALVE AND SNAP-RING

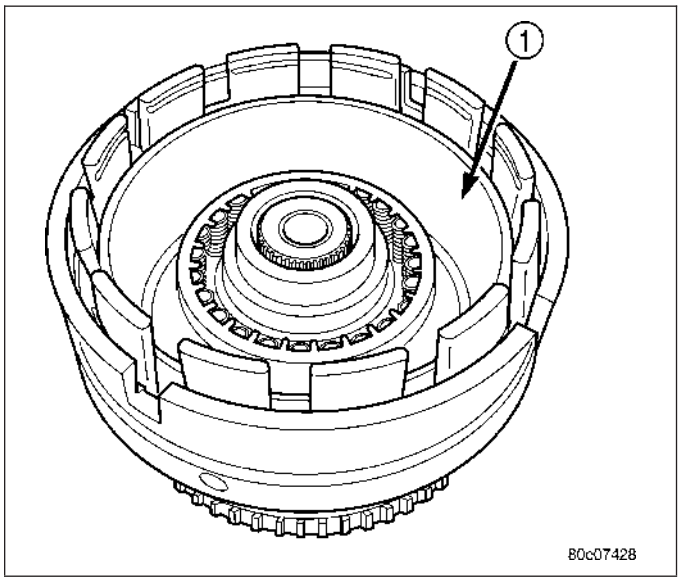
NOTE: Install all new seals and o-rings onto the input shaft and input hub. The o-rings on the input hub are color coded. Be sure to install the correct o-ring in the correct location.

1. Check the transmission lubrication check valve (20) located in the input shaft using shop air. The valve should only allow air flow in one direction. If the valve allows no air flow, or air flow in both directions, the valve will need to be replaced.
2. Lubricate all seals with Mopar® ATF +4, Automatic Transmission Fluid, prior to installation.
3. Assemble the OD/reverse piston (15) onto the input clutch hub (1).
4. Assemble the input clutch retainer (13) onto the input clutch hub (1).
5. Install the input clutch retainer tapered snap-ring (5) with tapered side up onto the input clutch hub (1).

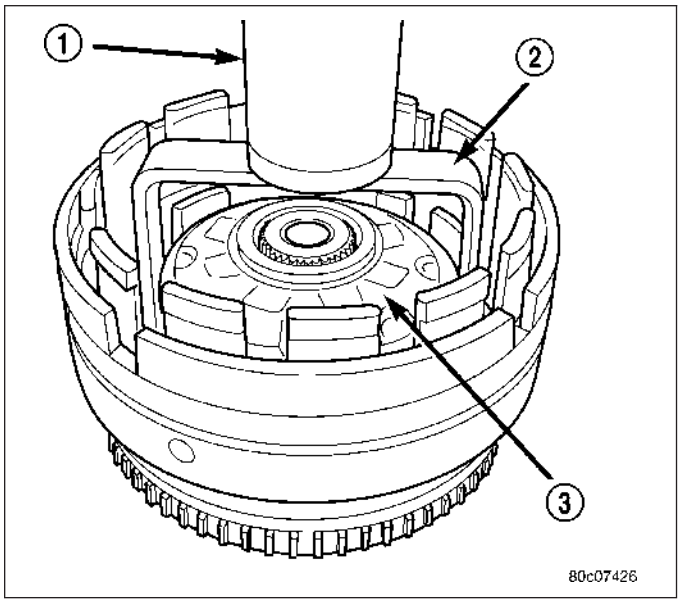
6. Install Piston Guides 8504 (1) into the input clutch retainer (13) and onto the input clutch hub (1) to guide the inner and outer underdrive piston (8) seals into position.
7. Install the underdrive piston (8) into the input clutch retainer (13) and over the input clutch hub (1).

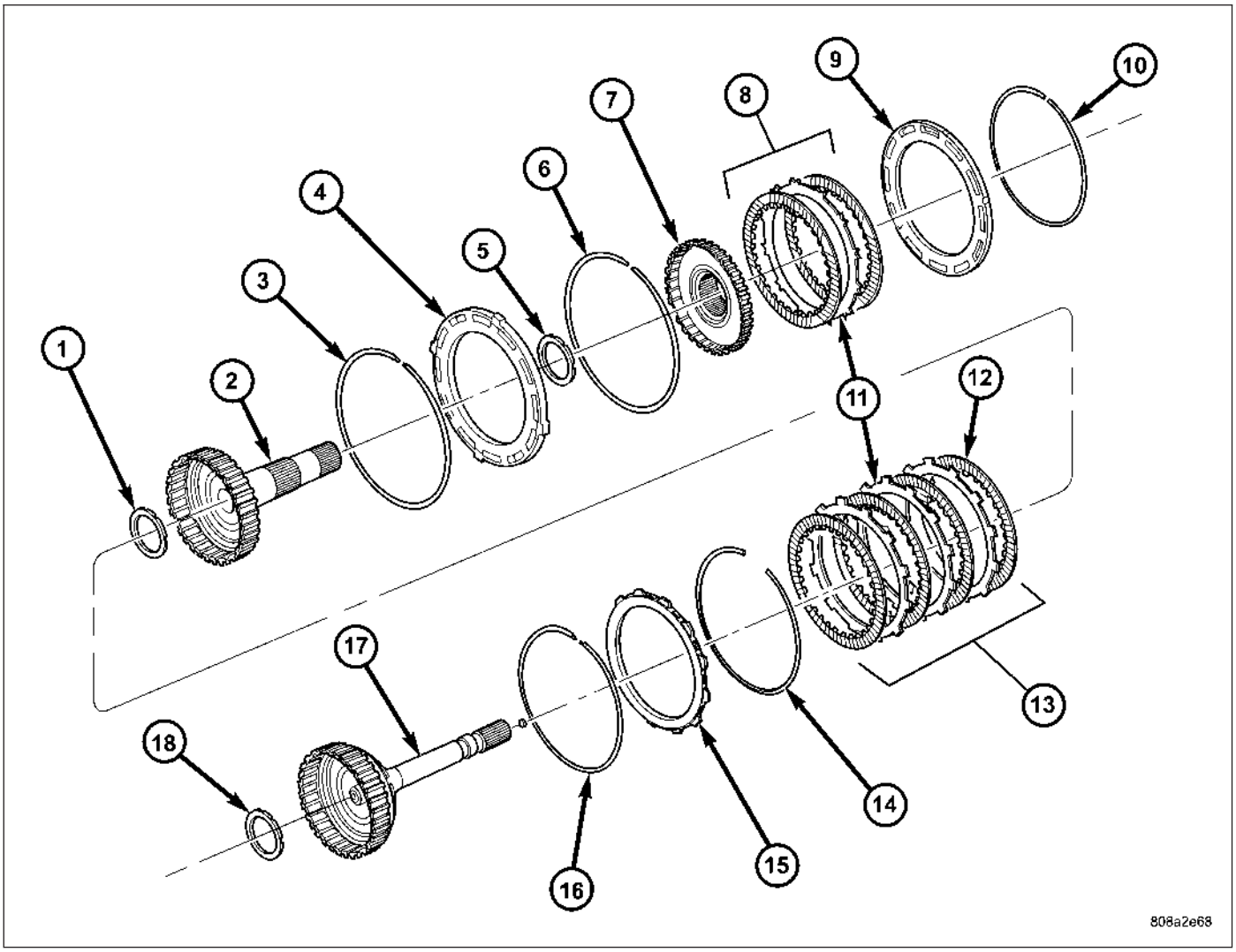


8. Install the UD/OD balance piston return spring pack (9) into the input clutch retainer (13).
9. Install Piston Guide 8252 (1) into the input clutch retainer (13) to guide the UD/OD balance piston (6) seal into position inside the underdrive piston (8).



10. Install the UD/OD balance piston (3) into the input clutch retainer and the underdrive piston.
11. Using Spring Compressor 8251 (2), compress the UD/OD return spring pack and secure the piston in place with the snap-ring.
12. Install the underdrive clutch pack (11) into the input clutch retainer.



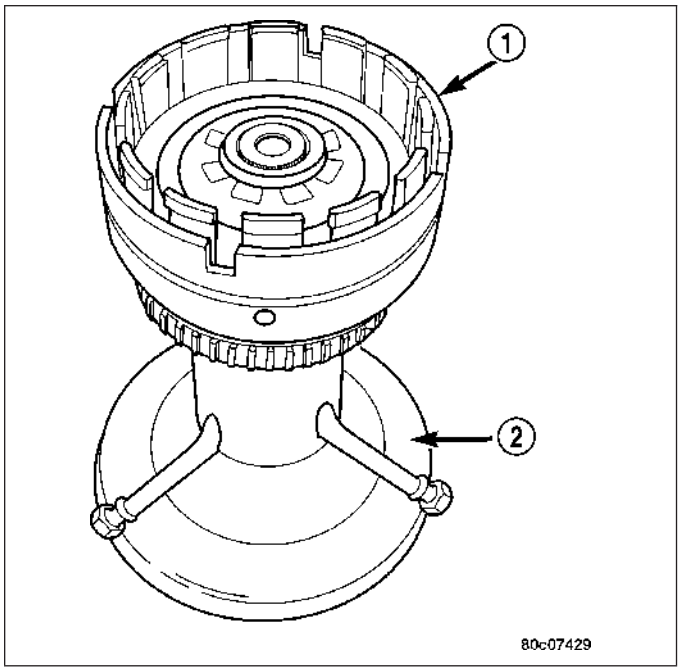


Input Clutch Assembly - Part 2

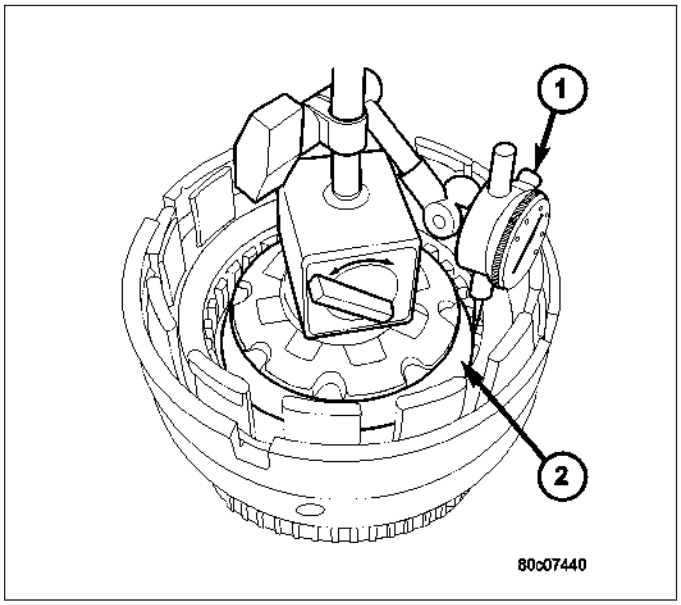
1 - THRUST BEARING NUMBER 3
2 - OD HUB/SHAFT
3 - SNAP-RING (WAVE)
4 - REV/OD REACTION PLATE
5 - THRUST BEARING NUMBER 4
6 - SNAP-RING (FLAT)
7 - REVERSE HUB/SHAFT
8 - REVERSE CLUTCH
9 - REVERSE REACTION PLATE
10 - SNAP-RING (SELECT)
11 - PLATE
12 - DISC
13 - OD CLUTCH
14 - SNAP-RING (TAPERED)
15 - UD/OD REACTION PLATE
16 - SNAP-RING (FLAT)
17 - UD HUB/SHAFT
18 - THRUST BEARING NUMBER 2

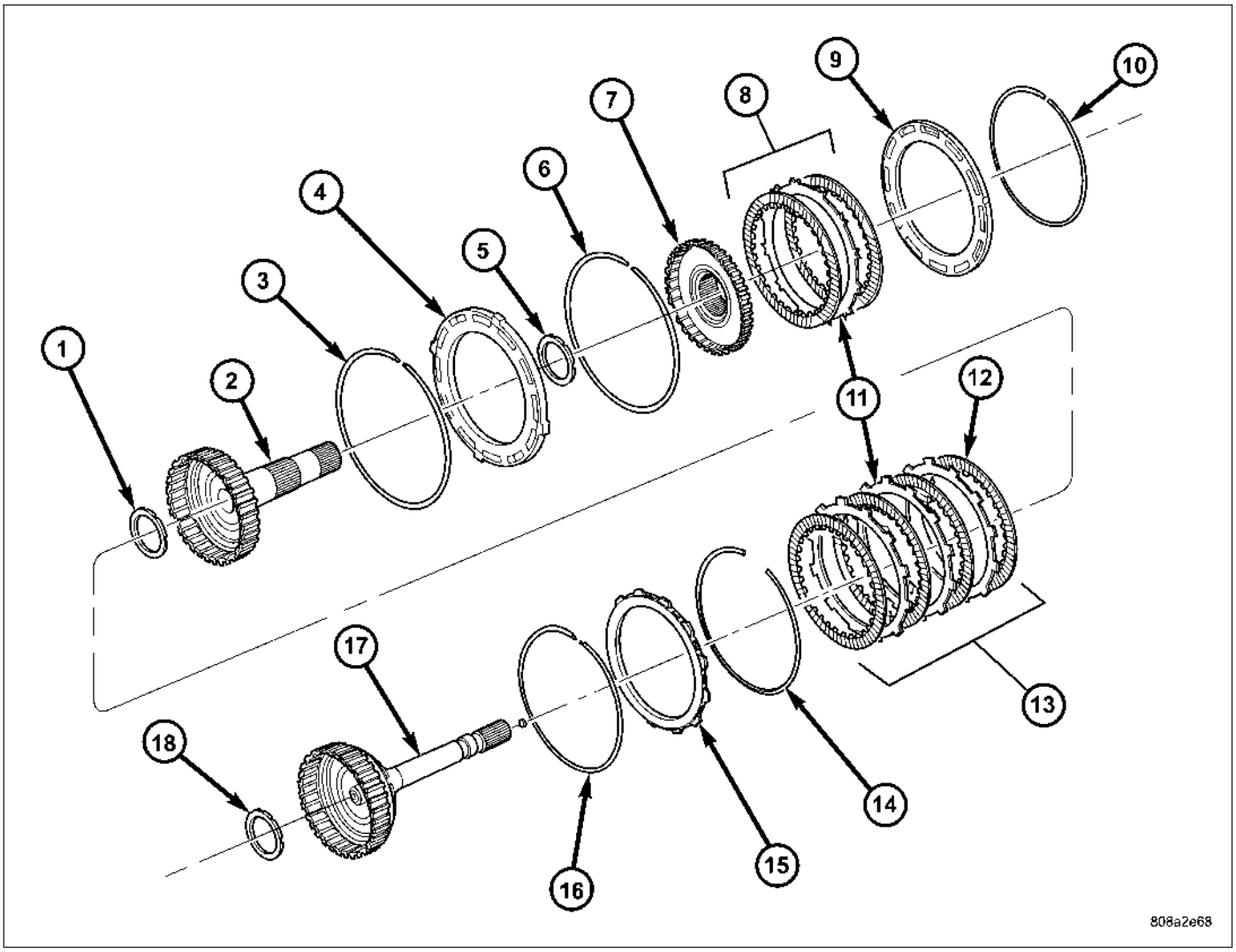
13. Install the UD/OD reaction plate lower flat snap-ring (16). The correct snap-ring can be identified by the two tabbed ears.
14. Install the UD/OD reaction plate (15) into the input clutch retainer. The reaction plate is to be installed with the big step down.
15. Install the UD/OD reaction plate upper tapered snap-ring (14) with tapered side up.

16. Install the input clutch assembly into Input Clutch Pressure Fixture 8260 (2).



17. Mount a dial indicator to the assembly, push down on the clutch discs and zero the indicator against the underdrive clutch discs. Apply 20 psi of air pressure to the underdrive clutch and record the dial indicator reading. Measure and record UD clutch pack measurement in four (4) places, 90° apart. Take average of four measurements and compare with UD clutch pack clearance specification. The correct clutch clearance is 0.84-1.54 mm (0.033-0.061 in.). The reaction plate is not selective. If the clutch clearance is not within specification, replace the reaction plate along with all the friction and steel discs.



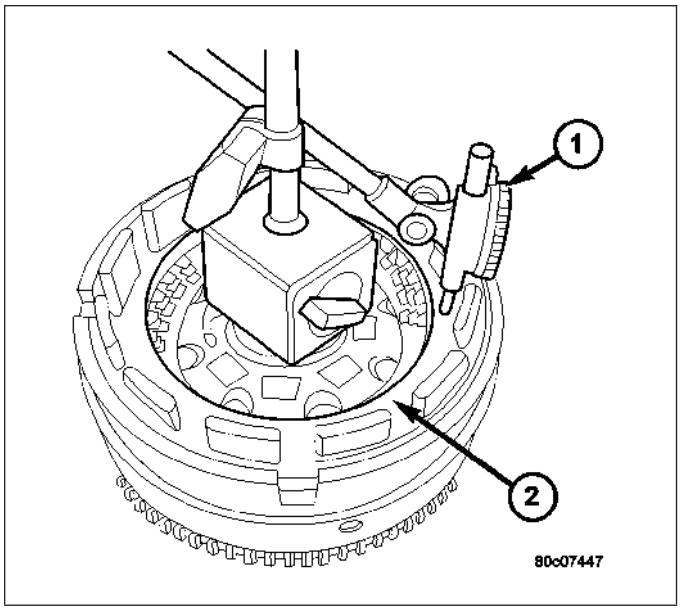


Input Clutch Assembly - Part 2

1 - THRUST BEARING NUMBER 3
2 - OD HUB/SHAFT
3 - SNAP-RING (WAVE)
4 - REV/OD REACTION PLATE
5 - THRUST BEARING NUMBER 4
6 - SNAP-RING (FLAT)
7 - REVERSE HUB/SHAFT
8 - REVERSE CLUTCH
9 - REVERSE REACTION PLATE
10 - SNAP-RING (SELECT)
11 - PLATE
12 - DISC
13 - OD CLUTCH
14 - SNAP-RING (TAPERED)
15 - UD/OD REACTION PLATE
16 - SNAP-RING (FLAT)
17 - UD HUB/SHAFT
18 - THRUST BEARING NUMBER 2

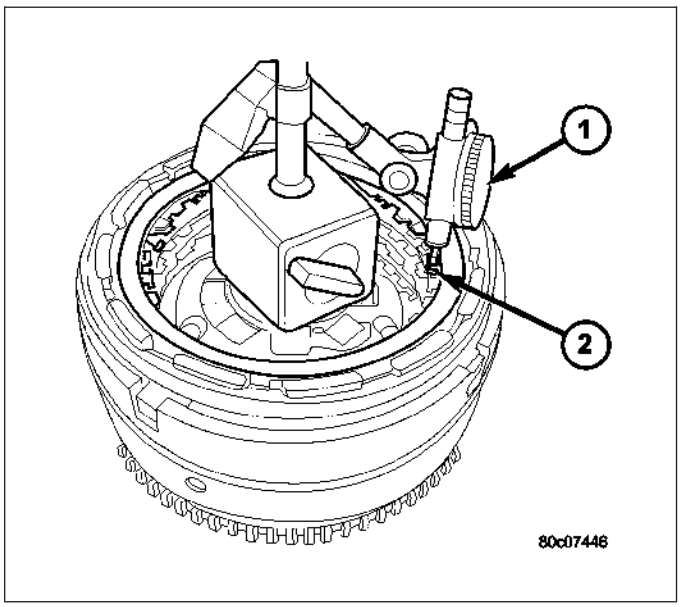
18. Install the overdrive clutch pack (13) into the input clutch retainer. The overdrive steel separator plates can be identified by the lack of the half-moon cuts in the locating tabs.
19. Install the overdrive clutch wavy snap-ring (3) with the two tabbed ears into the input clutch retainer.
20. Install the OD/reverse reaction plate (4) into the input clutch retainer. The reaction plate is non-directional.
21. Install the OD/reverse reaction plate flat snap-ring (6) into the input clutch retainer.

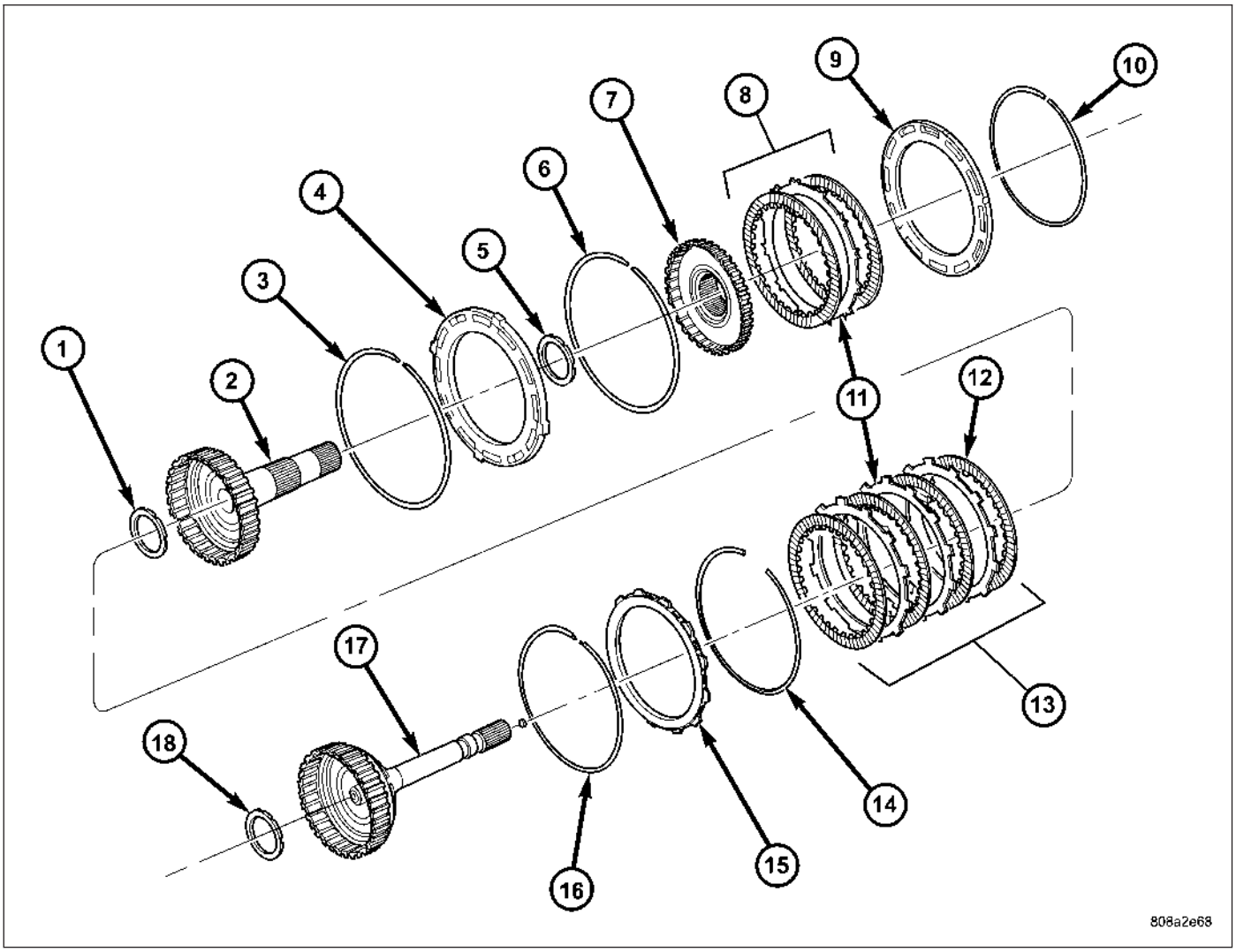
22. Mount a dial indicator to the assembly and zero the indicator against the OD/reverse reaction plate (2). Apply 20 psi of air pressure to the overdrive clutch and record the dial indicator reading. Measure and record OD clutch pack measurement in four (4) places, 90° apart. Take average of four measurements and compare with OD clutch pack clearance specification.Verify that the clutch clearance is 1.103-1.856 mm (0.043-0.073 in.). The reaction plate is not selective. If the clutch clearance is not within specification, replace the reaction plate along with all the friction and steel discs.



23. Install the reverse clutch pack (8) into the input clutch retainer.
24. Install the reverse reaction plate(9) into the input clutch retainer.
25. Install the reverse reaction plate selective snap-ring (10) into the input clutch retainer.

26. Mount a dial indicator to the assembly, push down on the clutch discs, pull up on the reaction plate to ensure the plate is properly seated and zero the indicator against the reverse clutch discs (2). Apply 20 psi of air pressure to the reverse clutch and record the dial indicator reading. Measure and record Reverse clutch pack measurement in four (4) places, 90° apart. Take average of four measurements and compare with Reverse clutch pack clearance specification. The correct clutch clearance is 0.58-1.47 mm (0.023-0.058 in.). Adjust as necessary. Install the chosen snap-ring and re-measure to verify selection.





Input Clutch Assembly - Part 2

1 - THRUST BEARING NUMBER 3
2 - OD HUB/SHAFT
3 - SNAP-RING (WAVE)
4 - REV/OD REACTION PLATE
5 - THRUST BEARING NUMBER 4
6 - SNAP-RING (FLAT)
7 - REVERSE HUB/SHAFT
8 - REVERSE CLUTCH
9 - REVERSE REACTION PLATE
10 - SNAP-RING (SELECT)
11 - PLATE
12 - DISC
13 - OD CLUTCH
14 - SNAP-RING (TAPERED)
15 - UD/OD REACTION PLATE
16 - SNAP-RING (FLAT)
17 - UD HUB/SHAFT
18 - THRUST BEARING NUMBER 2

27. Remove the reverse clutch pack (8) from the input clutch retainer.
28. Install the number 2 thrust bearing (18) onto the underdrive hub (17) with outer race against the hub with petroleum jelly.
29. Install the underdrive hub (17) into the input clutch retainer.
30. Install the number 3 thrust bearing (1) into the overdrive hub (2) with the outer race against the hub with petroleum jelly.
31. Install the overdrive hub (2) into the input clutch retainer.
32. Install the number 4 thrust bearing (5) into the reverse hub with outer race against the hub with petroleum jelly.
33. Install the reverse hub (7) into the input clutch retainer.
34. Install the complete reverse clutch pack (8).
35. Install the reverse reaction plate (9) and snap-ring (10).
36. Push up on reaction plate to allow reverse clutch to move freely.

SENSOR-INPUT SPEED

DESCRIPTION

The Input and Output Speed Sensors are two-wire magnetic pickup devices that generate AC signals as rotation occurs. They are mounted in the left side of the transmission case and are considered primary inputs to the Transmission Control Module (TCM).

OPERATION

The Input Speed Sensor provides information on how fast the input shaft is rotating. As the teeth of the input clutch hub pass by the sensor coil, an AC voltage is generated and sent to the TCM. The TCM interprets this information as input shaft rpm.

The Output Speed Sensor generates an AC signal in a similar fashion, though its coil is excited by rotation of the rear planetary carrier lugs. The TCM interprets this information as output shaft rpm.

The TCM compares the input and output speed signals to determine the following:

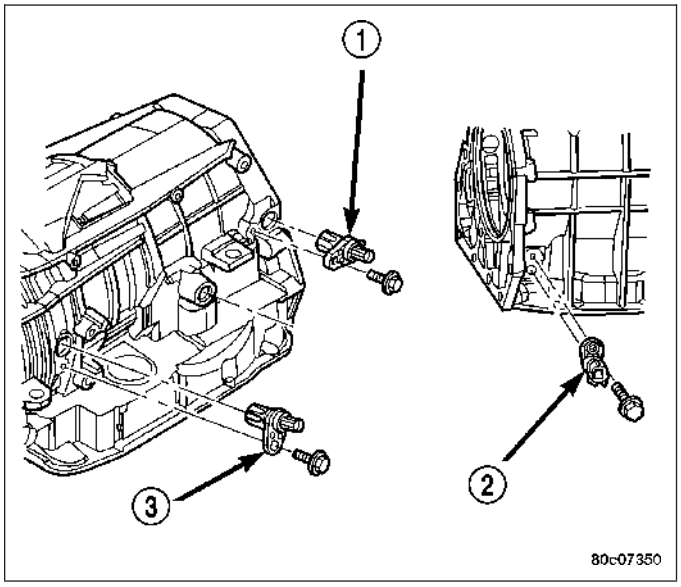
- Transmission gear ratio
- Speed ratio error detection
- CVI calculation

The TCM also compares the input speed signal and the engine speed signal to determine the following:

- Torque converter clutch slippage
- Torque converter element speed ratio

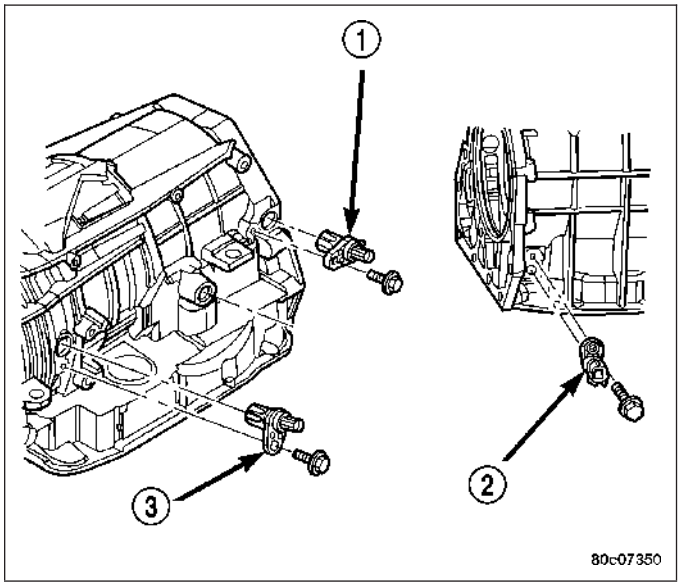
REMOVAL

1. Raise vehicle.
2. Place a suitable fluid catch pan under the transmission.
3. Remove the wiring connector from the input speed sensor (3).
4. Remove the bolt holding the input speed sensor to the transmission case.
5. Remove the input speed sensor (3) from the transmission case.



INSTALLATION

1. Install the input speed sensor (3) into the transmission case.
2. Install the bolt to hold the input speed sensor (3) into the transmission case. Tighten the bolt to 11.9 N·m (105 in.lbs.).
3. Install the wiring connector onto the input speed sensor.
4. Verify the transmission fluid level. Add fluid as necessary.
5. Lower vehicle.



SENSOR-LINE PRESSURE

DESCRIPTION

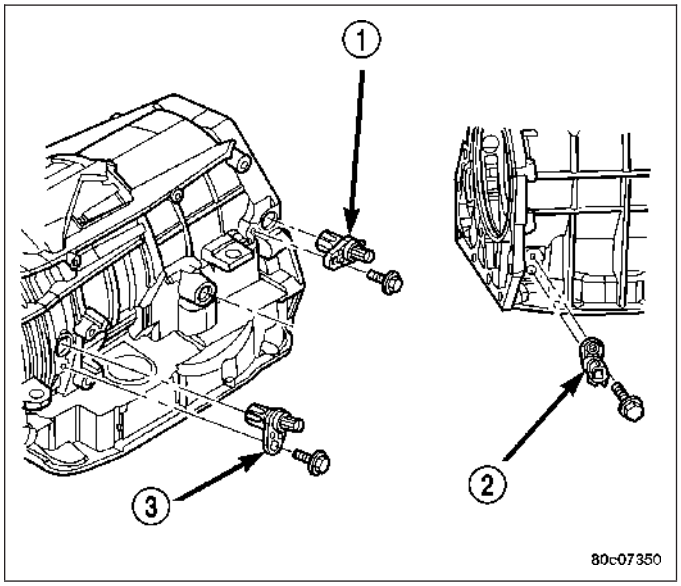
The TCM utilizes a closed-loop system to control transmission line pressure. The system contains a variable force style solenoid, the Pressure Control Solenoid, mounted on the side of the solenoid and pressure switch assembly. The solenoid is duty cycle controlled by the TCM to vent the unnecessary line pressure supplied by the oil pump back to the sump. The system also contains a variable pressure style sensor, the Line Pressure Sensor, which is a direct input to the TCM. The line pressure solenoid monitors the transmission line pressure and completes the feedback loop to the TCM. The TCM uses this information to adjust its control of the pressure control solenoid to achieve the desired line pressure.

OPERATION

The TCM calculates the desired line pressure based upon inputs from the transmission and engine. The TCM calculates the torque input to the transmission and uses that information as the primary input to the calculation. The line pressure is set to a predetermined value during shifts and when the transmission is in the PARK and NEUTRAL positions. This is done to ensure consistent shift quality. During all other operation, the actual line pressure is compared to the desired line pressure and adjustments are made to the pressure control solenoid duty cycle.

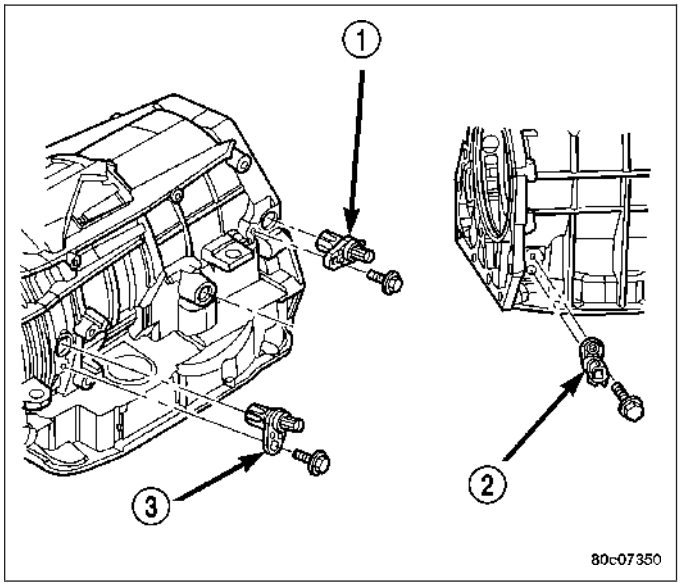
REMOVAL

1. Raise vehicle.
2. Place a suitable fluid catch pan under the transmission.
3. Remove the wiring connector from the line pressure sensor (2).
4. Remove the bolt holding the line pressure sensor (2) to the transmission case.
5. Remove the line pressure sensor (2) from the transmission case.



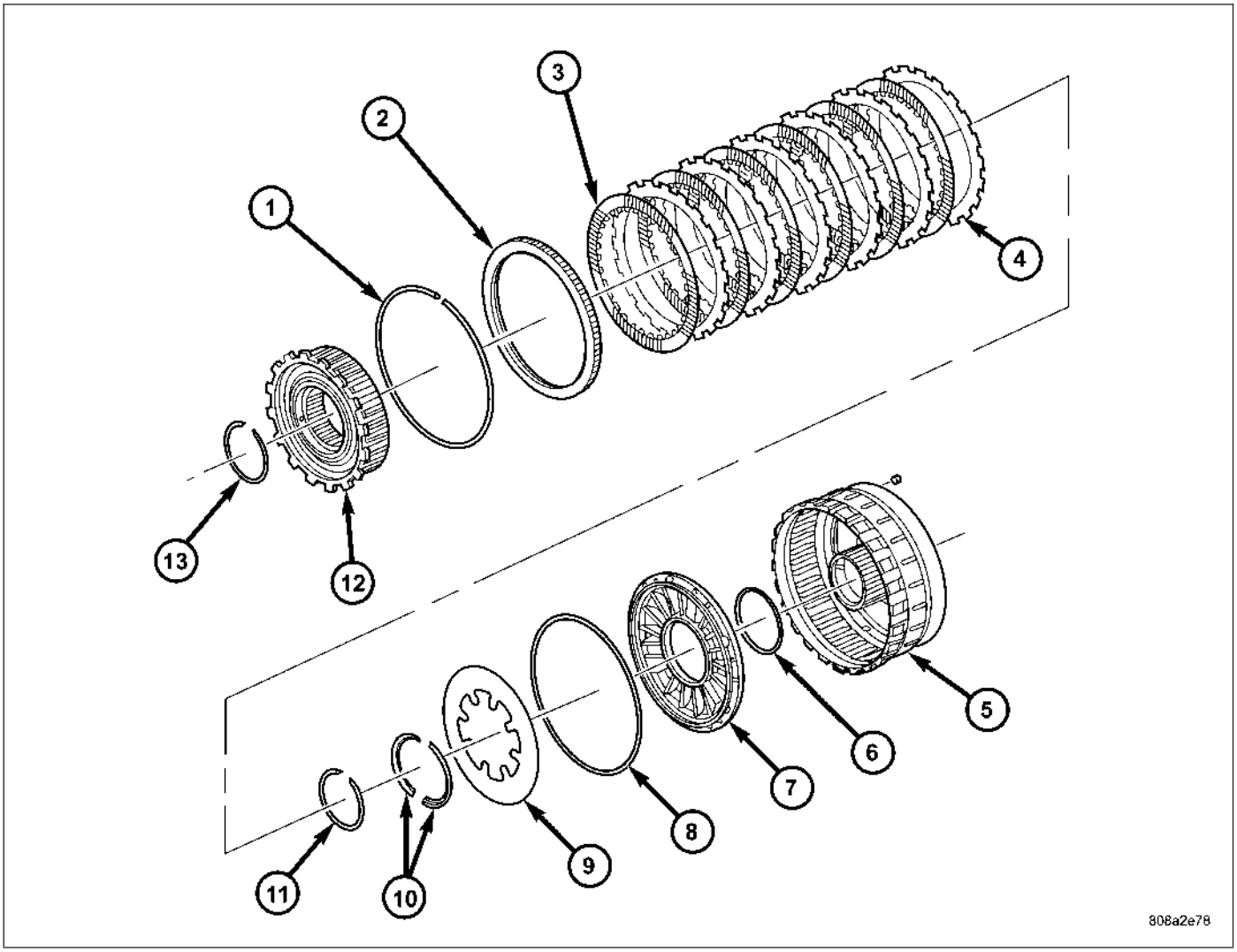
INSTALLATION

1. Install the line pressure sensor (2) into the transmission case.
2. Install the bolt to hold the line pressure sensor (2) into the transmission case. Tighten the bolt to 11.9 N·m (105 in.lbs.).
3. Install the wiring connector onto the line pressure sensor (2).
4. Verify the transmission fluid level. Add fluid as necessary.
5. Lower vehicle.



CLUTCH-LOW/REVERSE

DISASSEMBLY

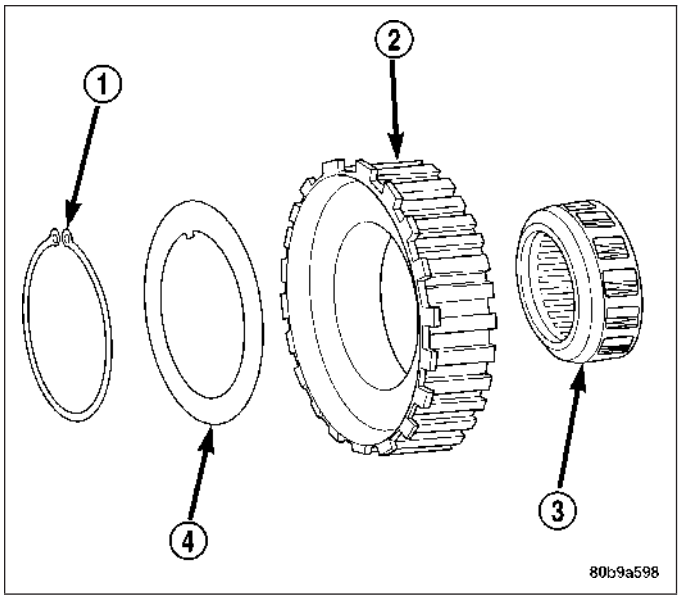


Low/Reverse Clutch Assembly

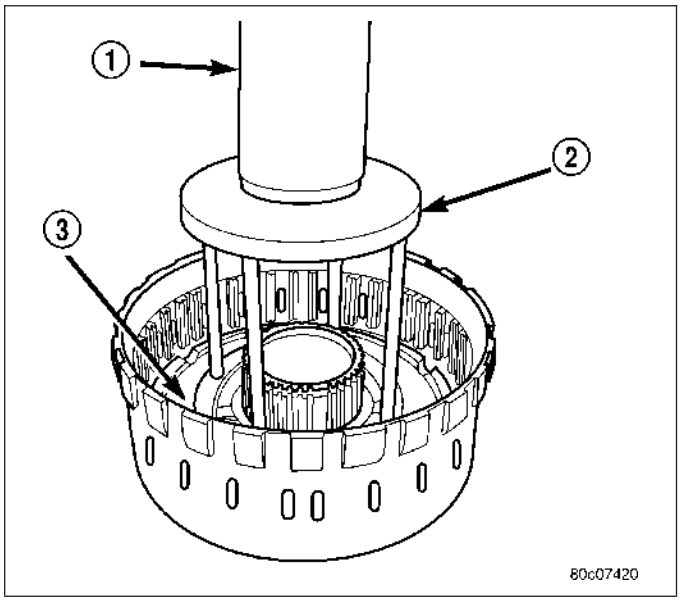
1 - SNAP-RING (SELECT)
2 - REACTION PLATE
3 - DISC
4 - PLATE
5 - L/R CLUTCH RETAINER
6 - SEAL
7 - PISTON
8 - SEAL
9 - BELLEVILLE SPRING
10 - RETAINER
11 - SNAP-RING
12 - OVERRUNNING CLUTCH
13 - SNAP-RING

1. Remove the inner overrunning clutch snap-ring (13) from the low/reverse clutch retainer (5).
2. Remove the outer low/reverse reaction plate flat snap-ring (1.
3. Remove the low/reverse clutch (3, 4) and the overrunning clutch (12) from the low/reverse clutch retainer (5) as an assembly.
4. Separate the low/reverse clutch (3, 4) from the overrunning clutch (12).

5. Remove the overrunning clutch snap-ring (1).
6. Remove the spacer (4) from the overrunning clutch (3).
7. Separate the inner and outer races (2) of the overrunning clutch (3).
8. Remove the overrunning clutch lower snap-ring.



9. Using Spring Compressor 8285 (2) and a suitable shop press (1), compress the low/reverse piston Belleville spring (3) and remove the split retaining ring holding the Belleville spring into the low/reverse clutch retainer.
10. Remove the low/reverse clutch Belleville spring (3) and piston from the low/reverse clutch retainer. Use 20 psi of air pressure to remove the piston if necessary.



CLEANING

Clean the overrunning clutch assembly, clutch cam, and low-reverse clutch retainer. Dry them with compressed air after cleaning.

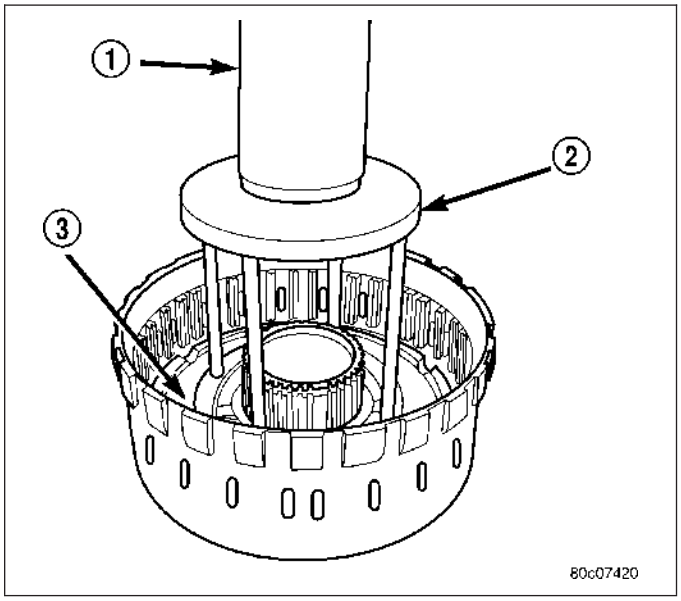
INSPECTION

Inspect condition of each clutch part after cleaning. Replace the overrunning clutch roller and spring assembly if any rollers or springs are worn or damaged, or if the roller cage is distorted, or damaged. Replace the cam if worn, cracked or damaged.

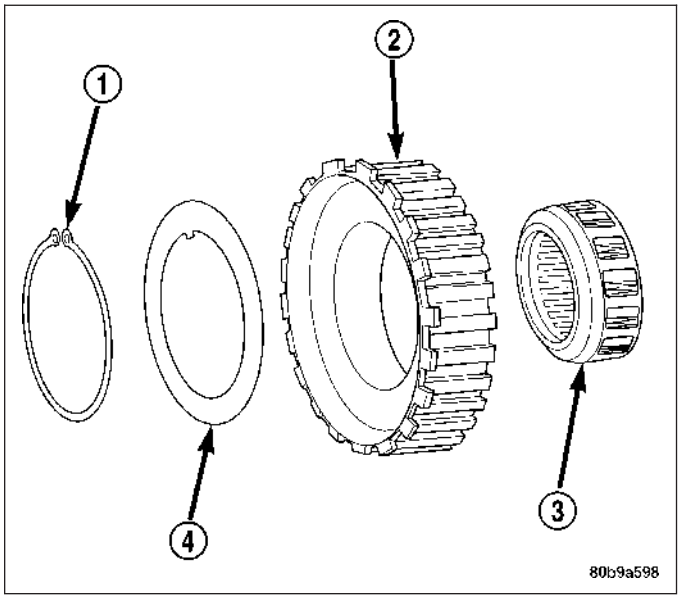
Replace the low-reverse clutch retainer if the clutch race, roller surface or inside diameter is scored, worn or damaged.

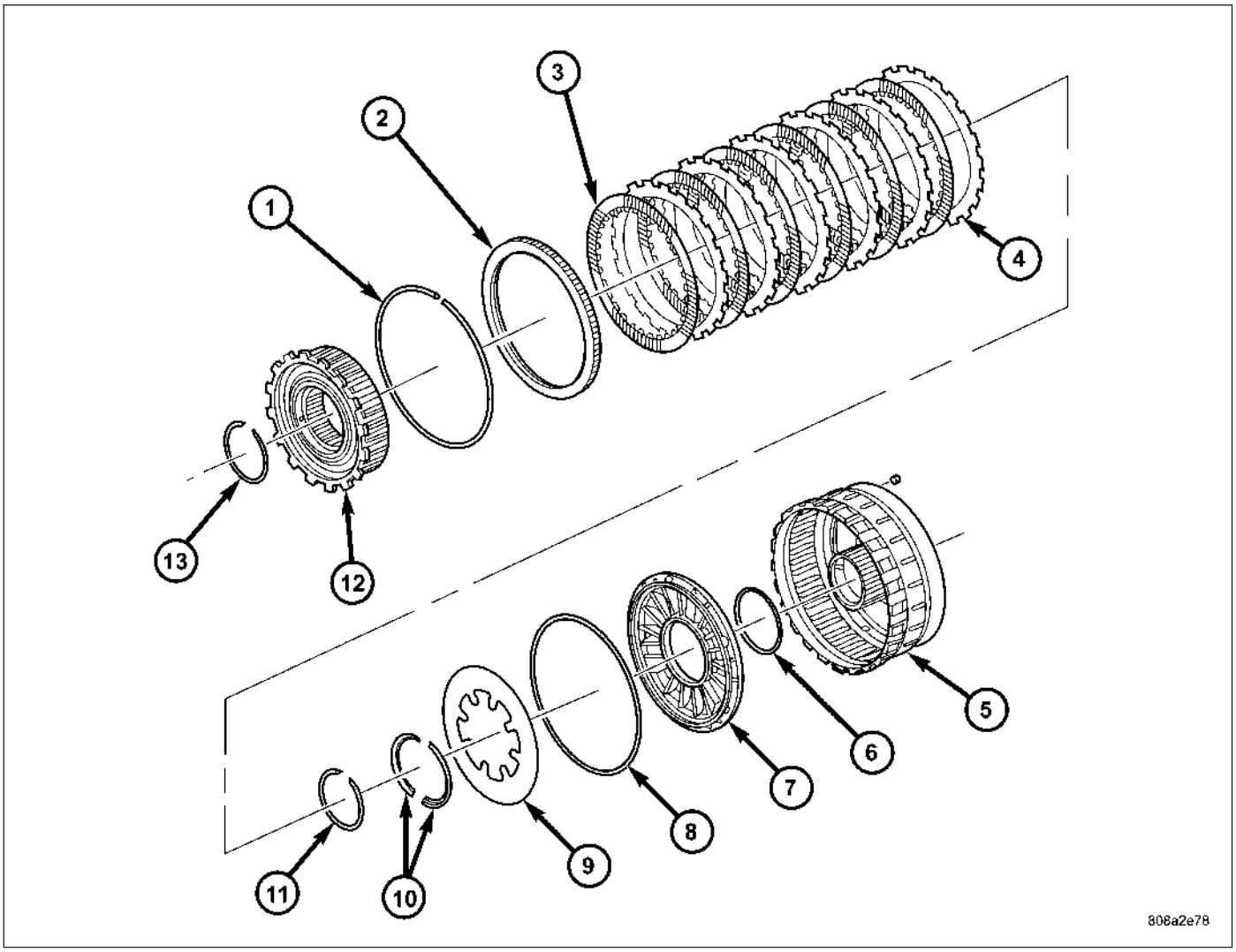
ASSEMBLY

1. Check the bleed orifice to ensure that it is not plugged or restricted.
2. Install a new seal on the low/reverse piston. Lubricate the seal with Mopar® ATF +4, Automatic Transmission Fluid, prior to installation.
3. Install the low/reverse piston into the low/reverse clutch retainer.
4. Position the low/reverse piston Belleville spring (3) on the low/reverse piston.
5. Using Spring Compressor 8285 (2) and a suitable shop press (1), compress the low/reverse piston Belleville spring (3) and install the split retaining ring to hold the Belleville spring into the low/reverse clutch retainer.



6. Install the lower overrunning clutch snap-ring.
7. Assemble the inner and outer races (2) of the overrunning clutch (3).
8. Position the overrunning clutch spacer (4) on the overrunning clutch (3).
9. Install the upper overrunning clutch snap-ring (1).





Low/Reverse Clutch Assembly

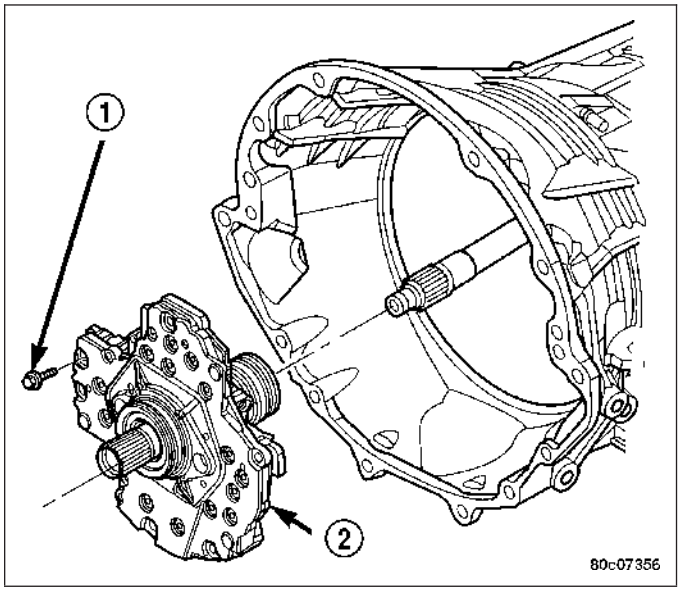
1 - SNAP-RING (SELECT)
2 - REACTION PLATE
3 - DISC
4 - PLATE
5 - L/R CLUTCH RETAINER
6 - SEAL
7 - PISTON
8 - SEAL
9 - BELLEVILLE SPRING
10 - RETAINER
11 - SNAP-RING
12 - OVERRUNNING CLUTCH
13 - SNAP-RING

10. Assemble and install the low/reverse clutch pack (3, 4) into the low/reverse clutch retainer (5).
11. Install the low/reverse reaction plate (2) into the low/reverse clutch retainer (5). The reaction plate is directional and must be installed with the flat side down.
12. Install the low/reverse clutch pack snap-ring (1). The snap-ring is selectable and should be chosen to give the correct clutch pack clearance.
13. Measure the low/reverse clutch pack clearance and adjust as necessary. The correct clutch clearance is 1.00-1.74 mm (0.039-0.075 in.).
14. Install the overrunning clutch (12) into the low/reverse clutch retainer (5) making sure that the index splines are aligned with the retainer.
15. Install the overrunning clutch inner snap-ring (13).

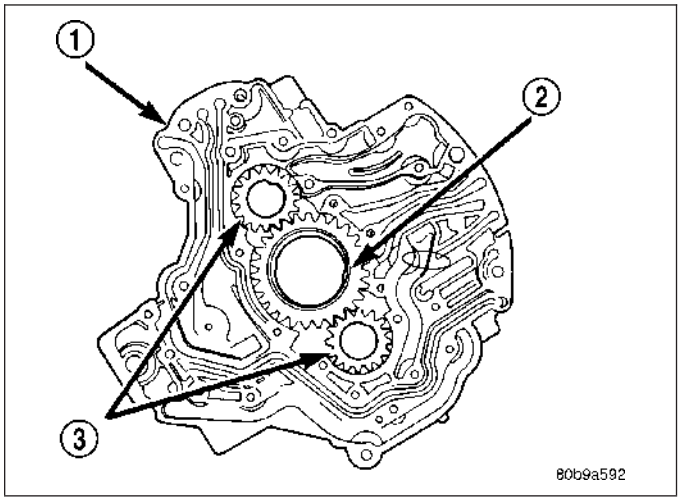
PUMP-OIL

DESCRIPTION

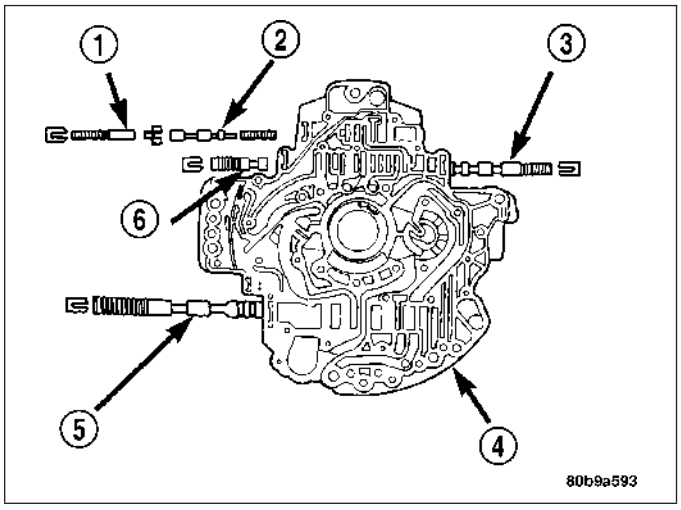
The oil pump (2) is located at the front of the transmission inside the bell housing and behind the transmission front cover.

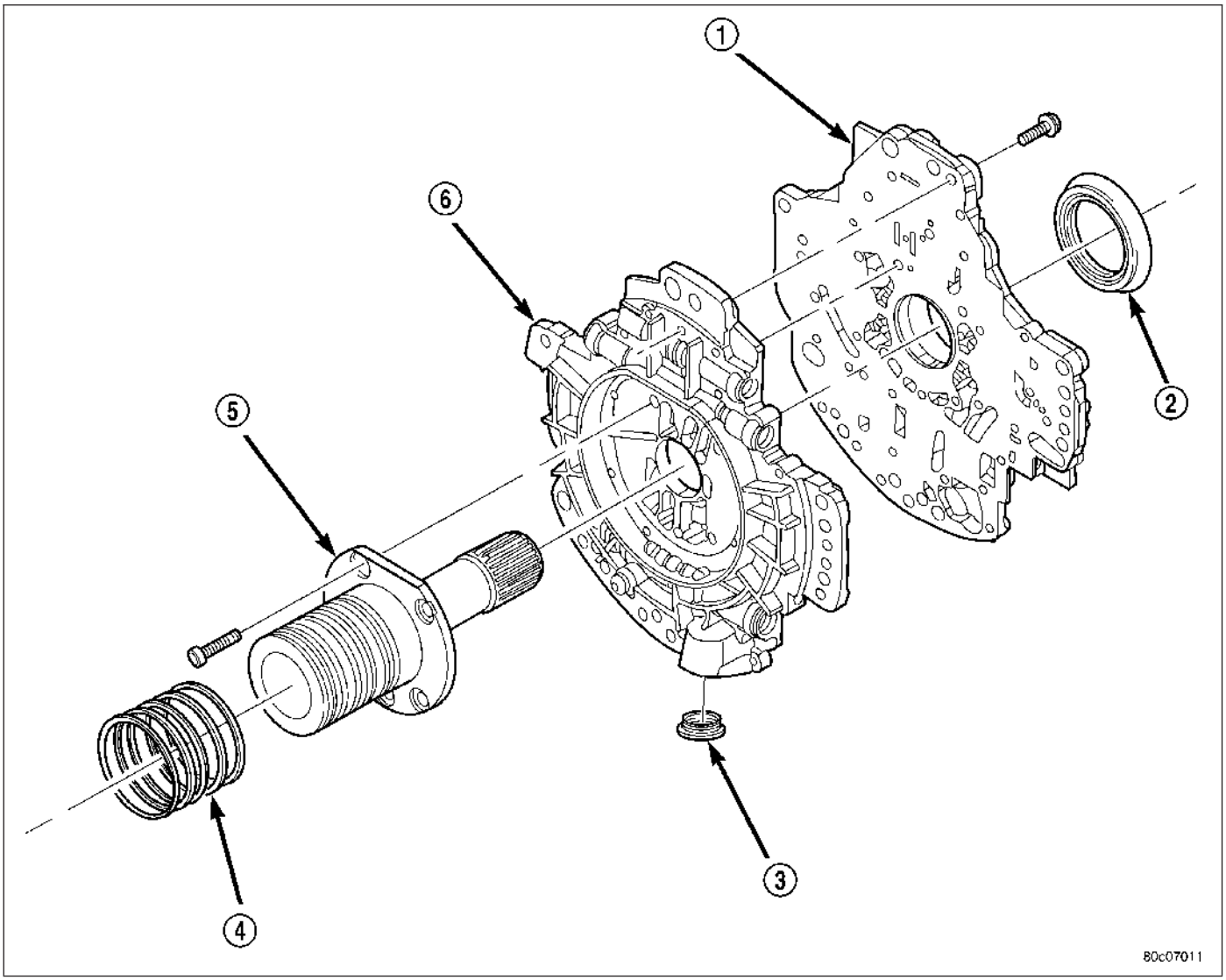


The oil pump consists of two independent pumps.



The oil pump also contains a number of valves. The converter clutch switch (3) and control valves (2), pressure regulator valve (5), and converter pressure limit valve (6) are all located in the oil pump valve body.





Oil Pump Reaction Shaft

1 - PUMP HOUSING	4 - SEAL RING (5)
2 - SEAL	5 - REACTION SHAFT SUPPORT
3 - OIL FILTER SEAL	6 - PUMP VALVE BODY

A front seal (2), and a bolt on reaction shaft (5) complete the oil pump assembly.

OPERATION

As the torque converter rotates, the converter hub rotates the oil pump drive gear. As the drive gear rotates both driven gears, a vacuum is created when the gear teeth come out of mesh. This suction draws fluid through the pump inlet from the oil pan. As the gear teeth come back into mesh, pressurized fluid is forced into the pump outlet and to the oil pump valves.

At low speeds, both sides of the pump supply fluid to the transmission. As the speed of the torque converter increases, the flow from both sides increases until the flow from the primary side alone is sufficient to meet system demands. At this point, the check valve located between the two pumps closes. The secondary side is shut down and the primary side supplies all the fluid to the transmission.

CONVERTER CLUTCH SWITCH VALVE

The converter clutch switch valve is used to control the hydraulic pressure supplied to the front (OFF) side of the torque converter clutch.

CONVERTER CLUTCH REGULATOR VALVE

The converter clutch regulator valve is used to control the hydraulic pressure supplied to the back (ON) side of the torque converter clutch.

TORQUE CONVERTER LIMIT VALVE

The torque converter limit valve serves to limit the available line pressure to the torque converter clutch.

STANDARD PROCEDURE - OIL PUMP VOLUME CHECK

Measuring the oil pump output volume will determine if sufficient oil flow to the transmission oil cooler exists, and whether or not an internal transmission failure is present.

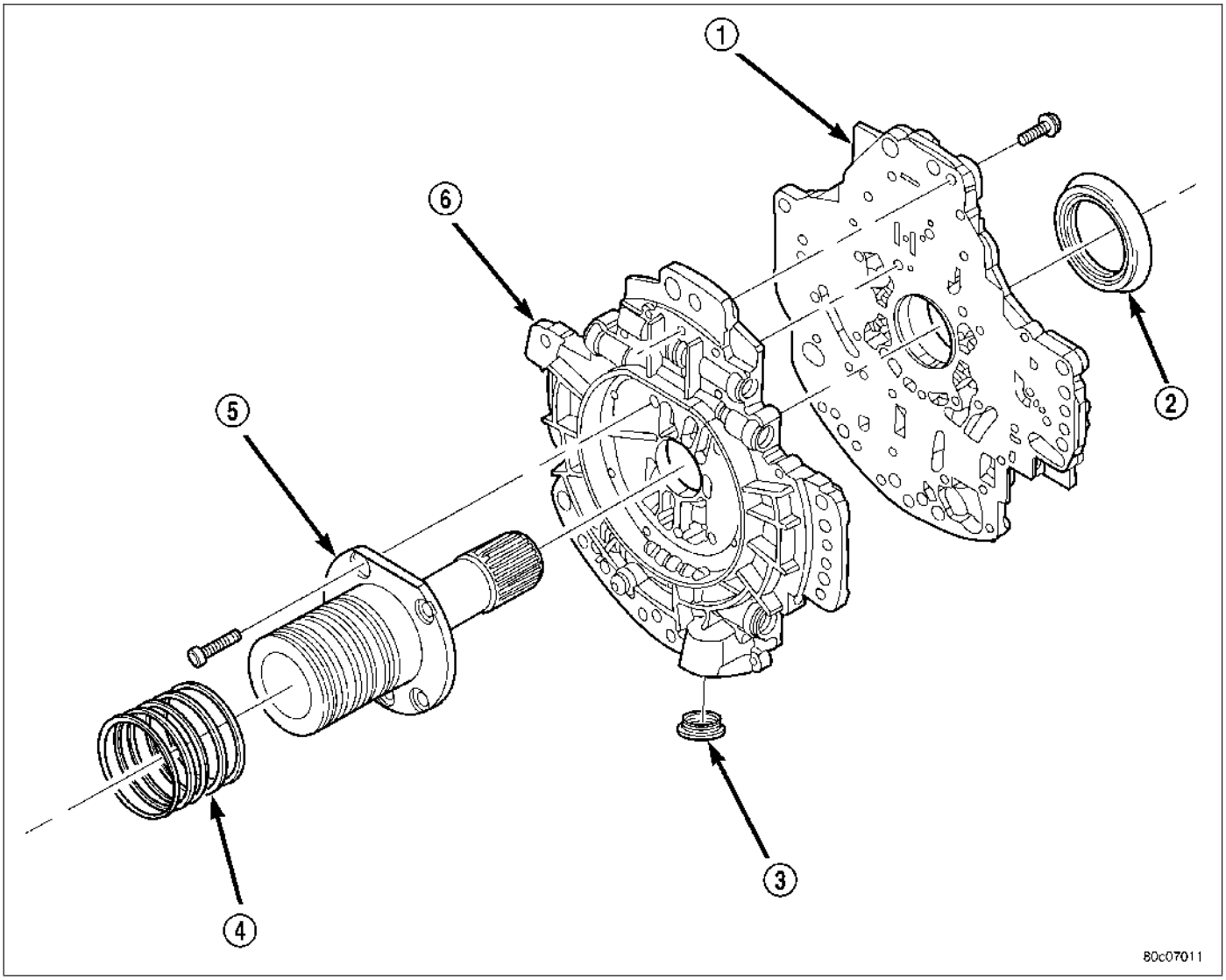
Verify that the transmission fluid is at the proper level. Refer to the Fluid Level Check procedure in this section. If necessary, fill the transmission to the proper level with Mopar® ATF +4, Automatic Transmission Fluid.

1. Disconnect the **To cooler** line at the cooler inlet and place a collecting container under the disconnected line.

CAUTION: With the fluid set at the proper level, fluid collection should not exceed (1) quart or internal damage to the transmission may occur.

2. Run the engine **at 1800 rpm**, with the shift selector in neutral. Verify that the transmission fluid temperature is below 104.5° C (220° F) for this test.
3. If one quart of transmission fluid is collected in the container in 30 seconds or less, oil pump flow volume is within acceptable limits. If fluid flow is intermittent, or it takes more than 30 seconds to collect one quart of fluid, refer to the Hydraulic Pressure tests in this section for further diagnosis.
4. Re-connect the **To cooler** line to the transmission cooler inlet.
5. Refill the transmission to proper level.

DISASSEMBLY

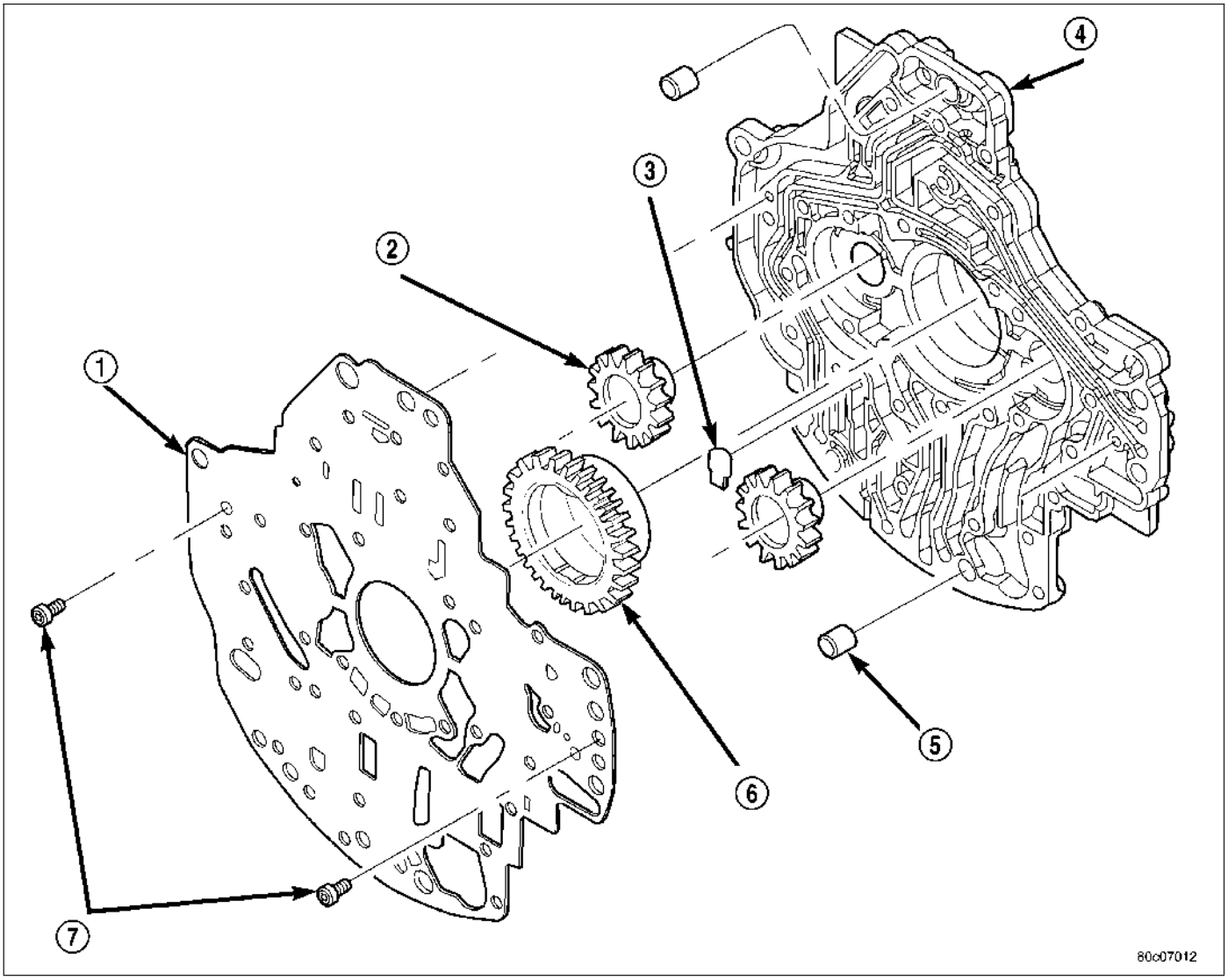


Oil Pump Assembly

1 - PUMP HOUSING
2 - SEAL
3 - OIL FILTER SEAL
4 - SEAL RING (5)
5 - REACTION SHAFT SUPPORT
6 - PUMP VALVE BODY

1. Remove the bolts holding the reaction shaft support (5) to the oil pump.
2. Remove the reaction shaft support (5) from the oil pump.
3. Remove all bolts holding the oil pump halves together.
4. Using suitable prying tools, separate the oil pump sections by inserting the tools in the supplied areas and prying the halves apart.

NOTE: The oil pump halves are aligned to each other through the use of two dowels. Be sure to pry upward evenly to prevent damage to the oil pump components.

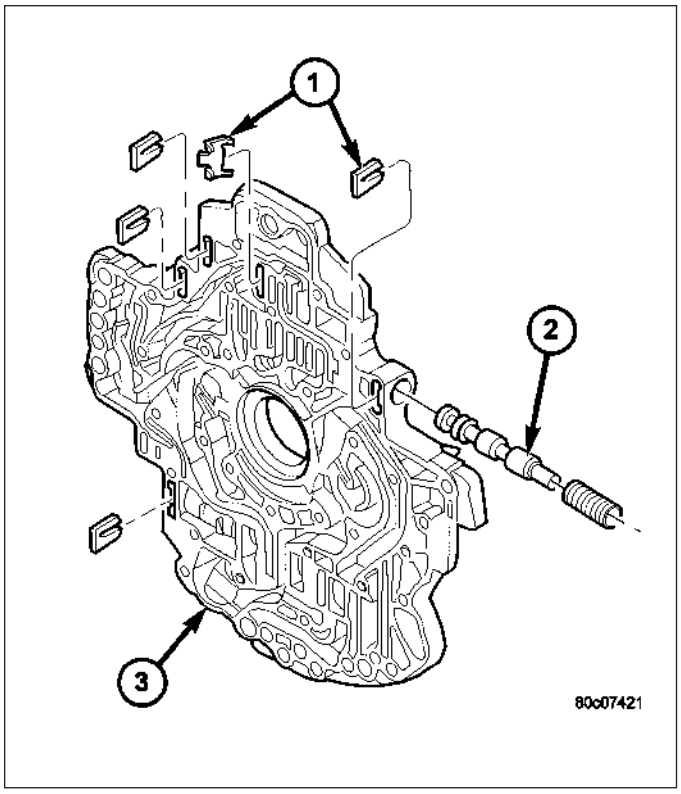


Oil Pump Housing and Gears

1 - SEPARATOR PLATE
2 - DRIVEN GEAR (2)
3 - CHECK VALVE
4 - PUMP HOUSING
5 - DOWEL (2)
6 - DRIVE GEAR
7 - SCREW

5. Remove the screws (7) holding the separator plate (1) onto the oil pump housing (4).
6. Remove the separator plate (1) from the oil pump housing (4).
7. Mark all gears for location. The gears are select fit and if the oil pump is to be reused, the gears must be returned to their original locations.
8. Remove the oil pump gears (2, 6) from the oil pump housing (4).

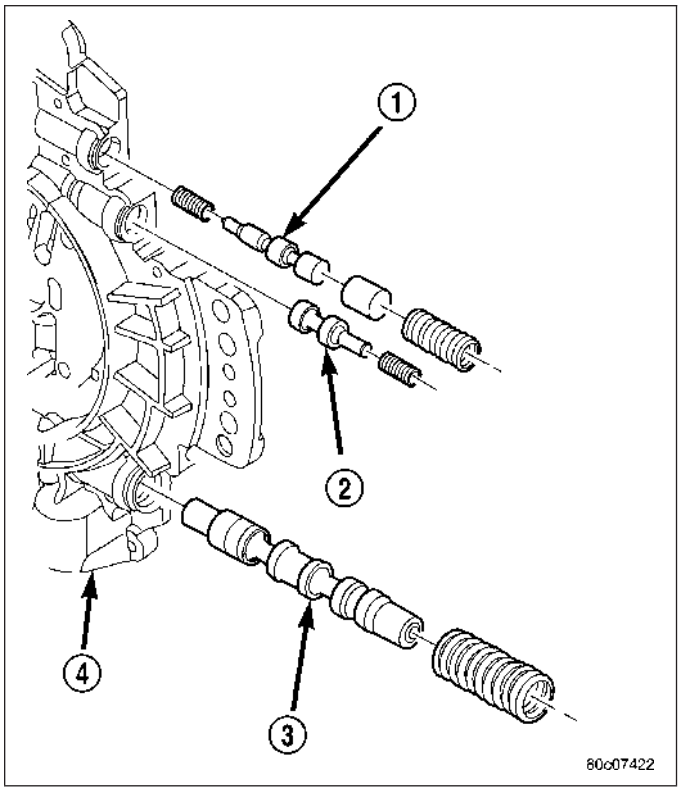
9. Remove the oil pump valve retainers (1) and associated valve (2) and spring one at a time. Mark the combination of components as a group and tag them as to the location from which they were removed.



T/C Switch Valve

1 - RETAINER
2 - T/C SWITCH VALVE
3 - OIL PUMP VALVE BODY

10. Remove the T/C regulator valve (1), T/C limit valve (2), and regulator valve (3).



Oil Pump Valve Body

1 - T/C REGULATOR VALVE
2 - T/C LIMIT VALVE
3 - REGULATOR VALVE
4 - OIL PUMP VALVE BODY

CLEANING

Clean pump and support components with solvent and dry them with compressed air.

INSPECTION

Check condition of the seal rings and thrust washer on the reaction shaft support. The seal rings do not need to be replaced unless cracked, broken, or severely worn.

Inspect the pump and support components. Replace the pump or support if the seal ring grooves or machined surfaces are worn, scored, pitted, or damaged. Replace the pump gears if pitted, worn chipped, or damaged.

Inspect the pump reaction shaft support bushings. Replace either bushing only if heavily worn, scored or damaged. It is not necessary to replace the bushings unless they are actually damaged.

Inspect the valves and plugs for scratches, burrs, nicks, or scores. Minor surface scratches on steel valves and plugs can be removed with crocus cloth but **do not round off the edges of the valve or plug lands.** Maintaining sharpness of these edges is vitally important. The edges prevent foreign matter from lodging between the valves and plugs and the bore.

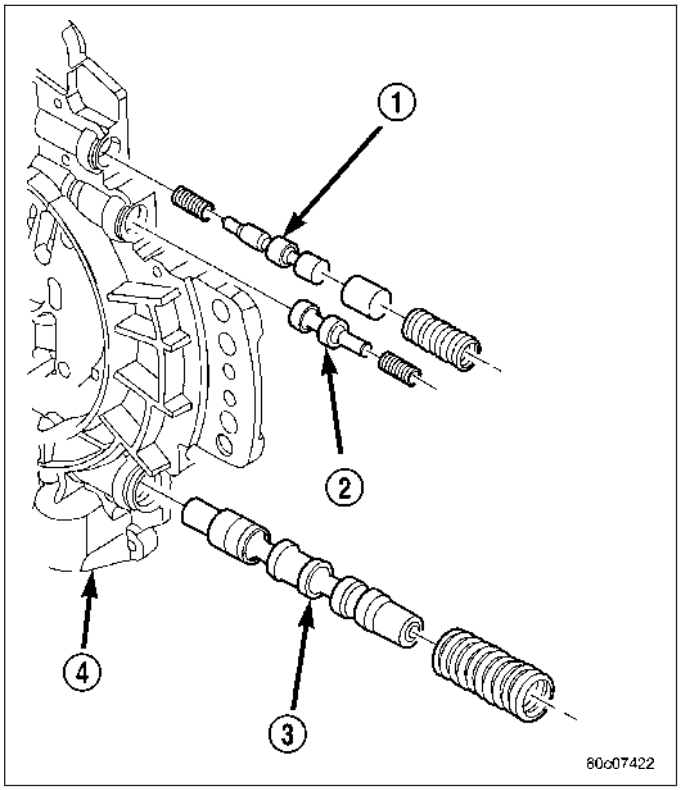
Inspect all the valve and plug bores in the oil pump cover. Use a penlight to view the bore interiors. Replace the oil pump if any bores are distorted or scored. Inspect all of the valve springs. The springs must be free of distortion, warpage or broken coils.

Trial fit each valve and plug in its bore to check freedom of operation. When clean and dry, the valves and plugs should drop freely into the bores.

ASSEMBLY

NOTE: Clean and inspect all components. Make sure that all passages are thoroughly cleaned and are free from dirt or debris. Make sure that all valves move freely in their proper bore. Make sure that all gear pockets and bushings are free from excessive wear and scoring. Replace the oil pump if any excessive wear or scoring is found.

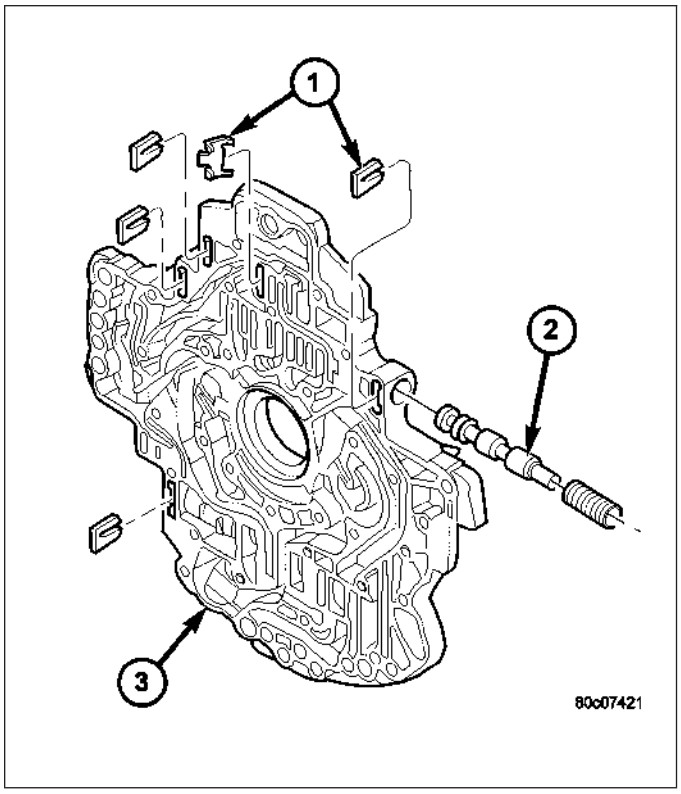
1. Install the T/C regulator valve (1), T/C limit valve (2), and regulator valve (3).



Oil Pump Valve Body

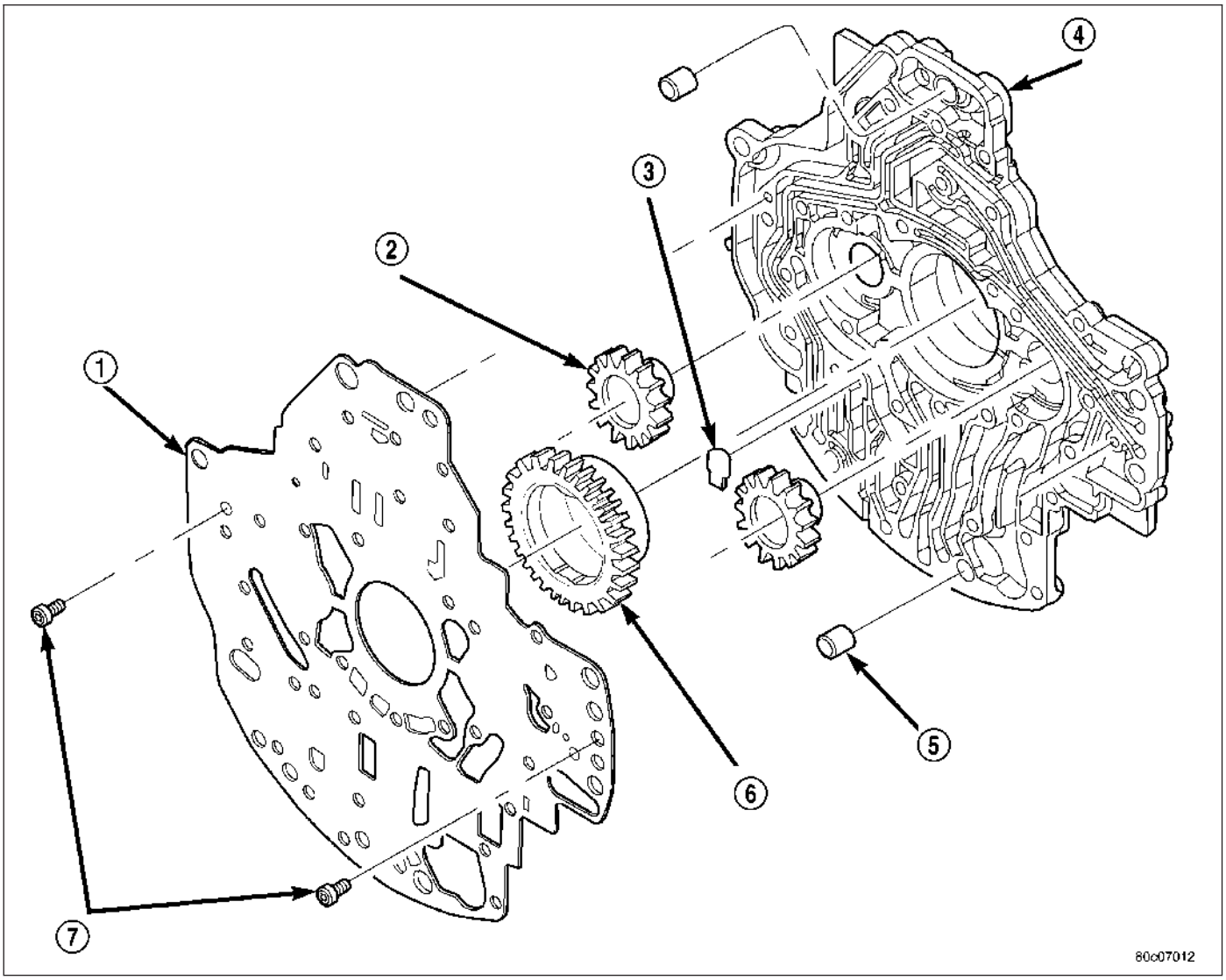
1 - T/C REGULATOR VALVE
2 - T/C LIMIT VALVE
3 - REGULATOR VALVE
4 - OIL PUMP VALVE BODY

2. Lubricate the oil pump valves with Mopar® ATF +4 and install the valve (2), spring, and retainer (1) into the appropriate oil pump valve body (3) bore.



T/C Switch Valve

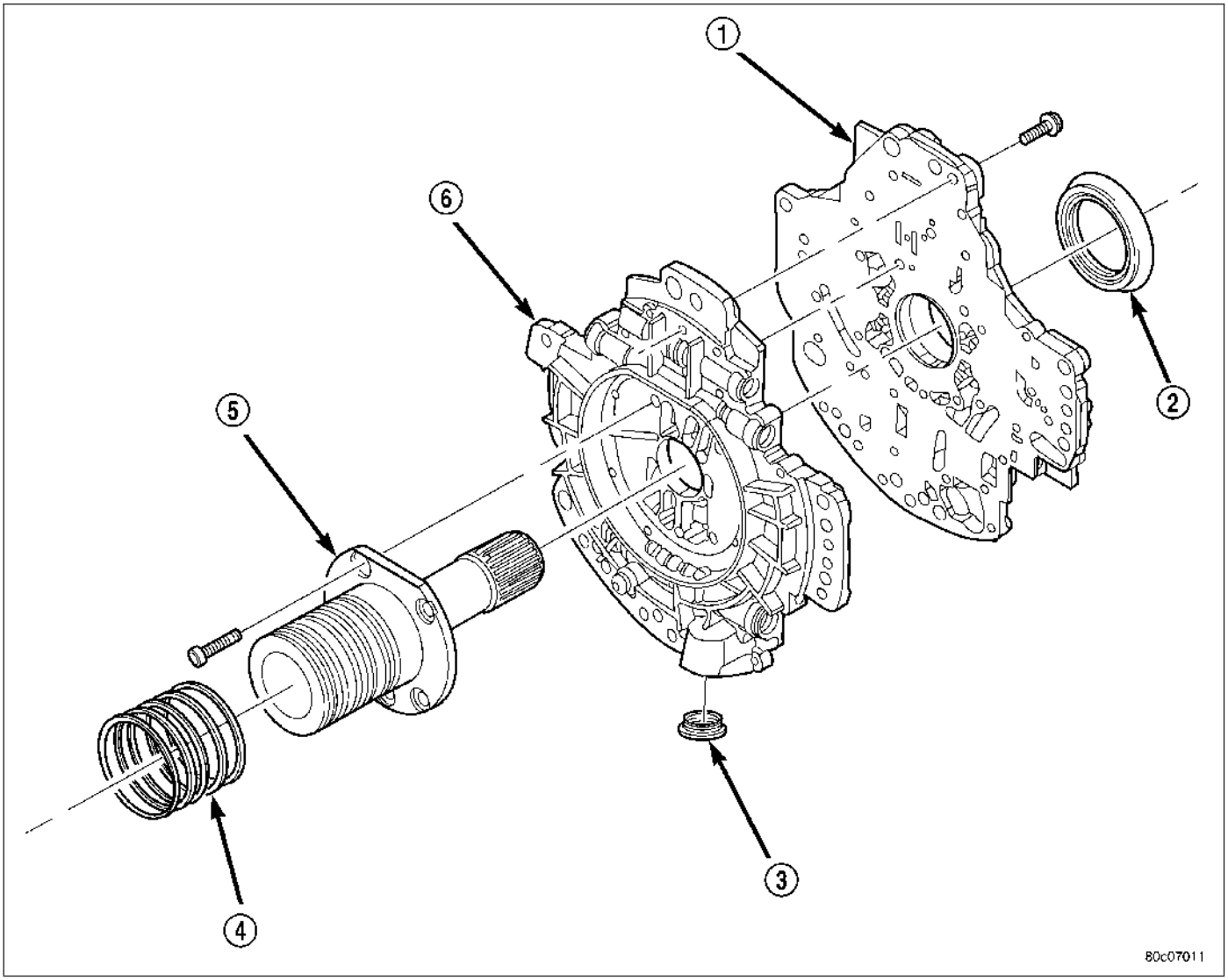
1 - RETAINER
2 - T/C SWITCH VALVE
3 - OIL PUMP VALVE BODY



Oil Pump Housing and Gears

1 - SEPARATOR PLATE
2 - DRIVEN GEAR (2)
3 - CHECK VALVE
4 - PUMP HOUSING
5 - DOWEL (2)
6 - DRIVE GEAR
7 - SCREW

3. Coat the gears (2, 6) with Mopar® ATF +4 and install into their original locations.
4. Place the separator plate (1) onto the oil pump housing (4).
5. Install the screws(7) to hold the separator plate (1) onto the oil pump housing (4). Tighten the screws to 4.5 N·m (40 in.lbs.).



Oil Pump Assembly

1 - PUMP HOUSING	4 - SEAL RING (5)
2 - SEAL	5 - REACTION SHAFT SUPPORT
3 - OIL FILTER SEAL	6 - PUMP VALVE BODY

6. Position the oil pump valve body (6) onto the locating dowels.
7. Seat the two oil pump halves together and install all bolts finger tight.
8. Torque all bolts down slowly starting in the center and working outward. The correct torque is 4.5 N·m (40 in.lbs.).
9. Verify that the oil pump gears rotate freely and smoothly.
10. Position the reaction shaft support (5) onto the oil pump valve body (6).
11. Install and torque the bolts to hold the reaction shaft support (5) to the oil pump valve body (6). The correct torque is 12 N·m (105 in.lbs.).

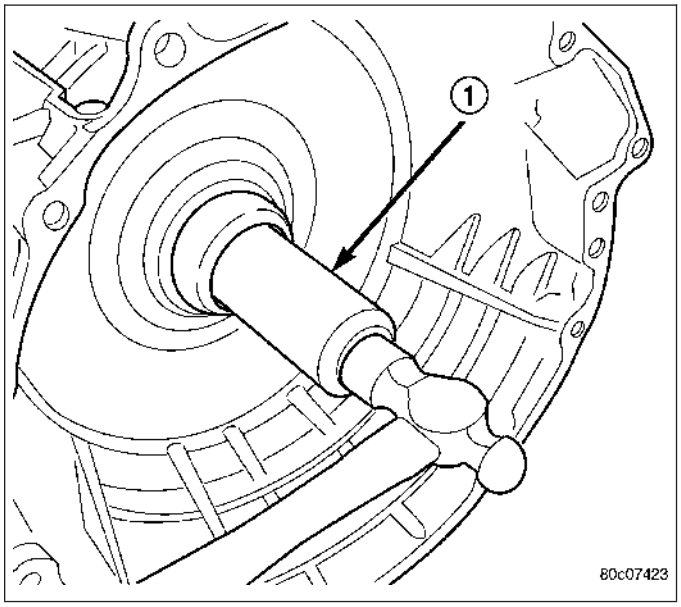
SEAL-OIL PUMP FRONT

REMOVAL

1. Remove transmission from the vehicle.
2. Remove the torque converter from the transmission.
3. Using a screw mounted in a slide hammer, remove the oil pump front seal.

INSTALLATION

1. Clean seal bore of the oil pump of any residue or particles from the original seal.
2. Install new oil seal in the oil pump housing using Seal Installer C-3860-A (1).



SENSOR-OUTPUT SPEED

DESCRIPTION

The Input and Output Speed Sensors are two-wire magnetic pickup devices that generate AC signals as rotation occurs. They are mounted in the left side of the transmission case and are considered primary inputs to the Transmission Control Module (TCM).

OPERATION

The Input Speed Sensor provides information on how fast the input shaft is rotating. As the teeth of the input clutch hub pass by the sensor coil, an AC voltage is generated and sent to the TCM. The TCM interprets this information as input shaft rpm.

The Output Speed Sensor generates an AC signal in a similar fashion, though its coil is excited by rotation of the rear planetary carrier lugs. The TCM interprets this information as output shaft rpm.

The TCM compares the input and output speed signals to determine the following:

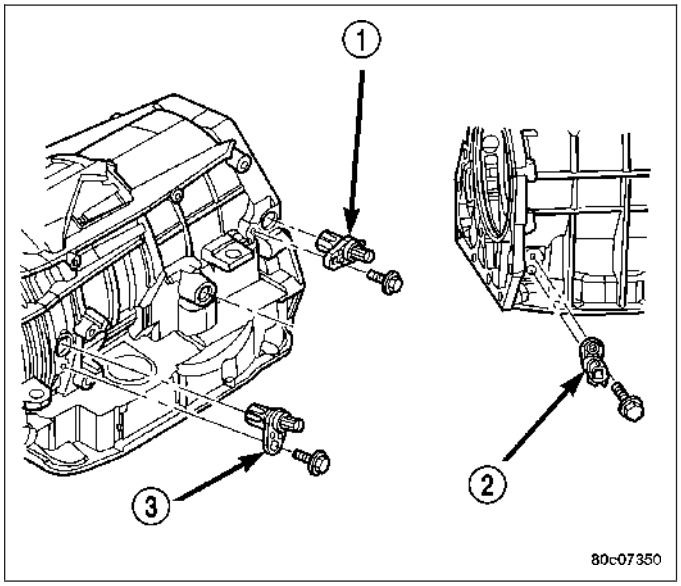
- Transmission gear ratio
- Speed ratio error detection
- CVI calculation

The TCM also compares the input speed signal and the engine speed signal to determine the following:

- Torque converter clutch slippage
- Torque converter element speed ratio

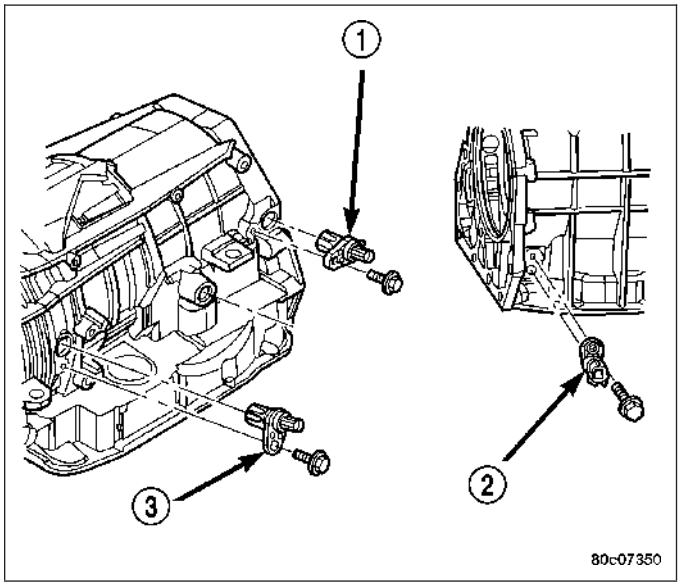
REMOVAL

1. Raise vehicle.
2. Place a suitable fluid catch pan under the transmission.
3. Remove the wiring connector from the output speed sensor (1).
4. Remove the bolt holding the output speed sensor (1) to the transmission case.
5. Remove the output speed sensor (1) from the transmission case.



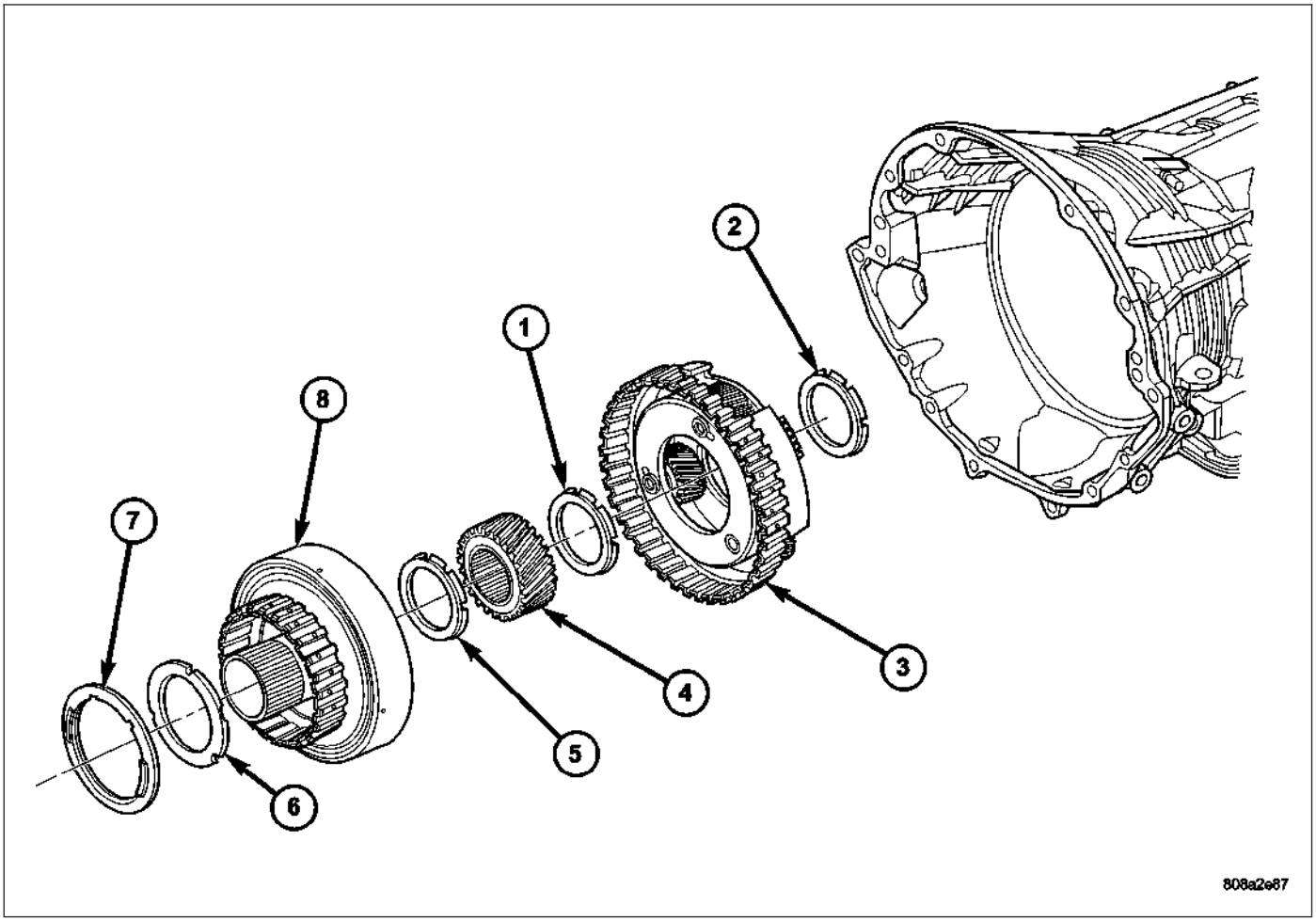
INSTALLATION

1. Install the output speed sensor (1) into the transmission case.
2. Install the bolt to hold the output speed sensor (1) into the transmission case. Tighten the bolt to 11.9 N·m (105 in.lbs.).
3. Install the wiring connector onto the output speed sensor (1).
4. Verify the transmission fluid level. Add fluid as necessary.
5. Lower vehicle.



GEARTRAIN-PLANETARY

DESCRIPTION

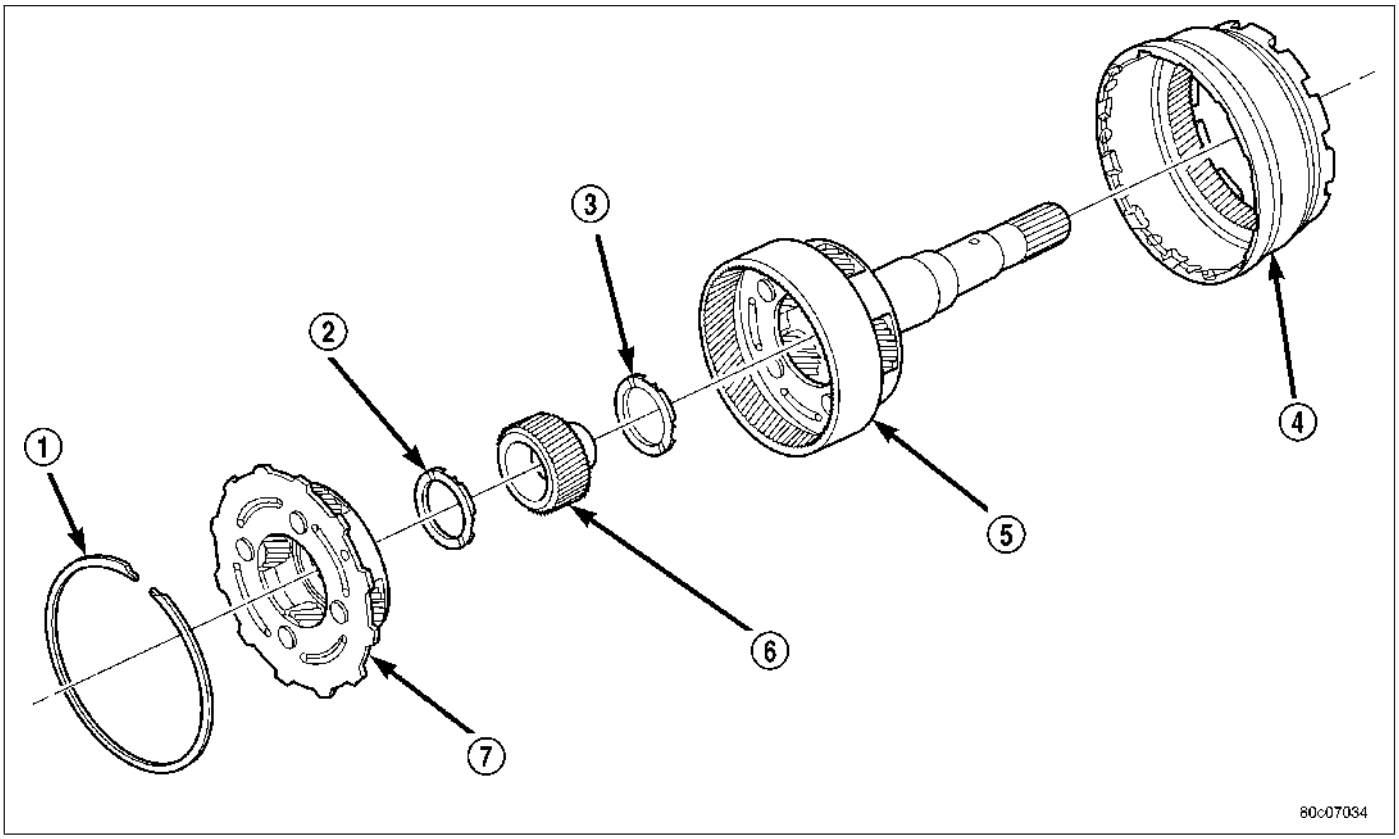


Reaction Planetary Geartrain

1 - THRUST BEARING NUMBER 8
2 - THRUST BEARING NUMBER 9
3 - REACTION PLANETARY CARRIER
4 - REACTION SUN GEAR
5 - THRUST BEARING NUMBER 7
6 - THRUST PLATE (SELECT)
7 - THRUST BEARING NUMBER 6
8 - REACTION ANNULUS

The planetary geartrain is located behind the 4C retainer/bulkhead, toward the rear of the transmission. The planetary geartrain consists of three primary assemblies:

- Reaction (3, 4, 8).



Reverse/Input Planetary Geartrain

1 - SNAP-RING
2 - THRUST BEARING NUMBER 10
3 - THRUST BEARING NUMBER 11
4 - INPUT ANNULUS
5 - INPUT PLANETARY CARRIER
6 - INPUT SUN GEAR
7 - REVERSE PLANETARY CARRIER

- Reverse (7).
- Input (4, 5, 6).

OPERATION

REACTION PLANETARY GEARTRAIN

The reaction planetary carrier and reverse sun gear of the reaction planetary geartrain are a single component which is held by the 2C clutch when required. The reaction annulus gear is a stand alone component that can be driven by the reverse clutch or held by the 4C clutch. The reaction sun gear is driven by the overdrive clutch.

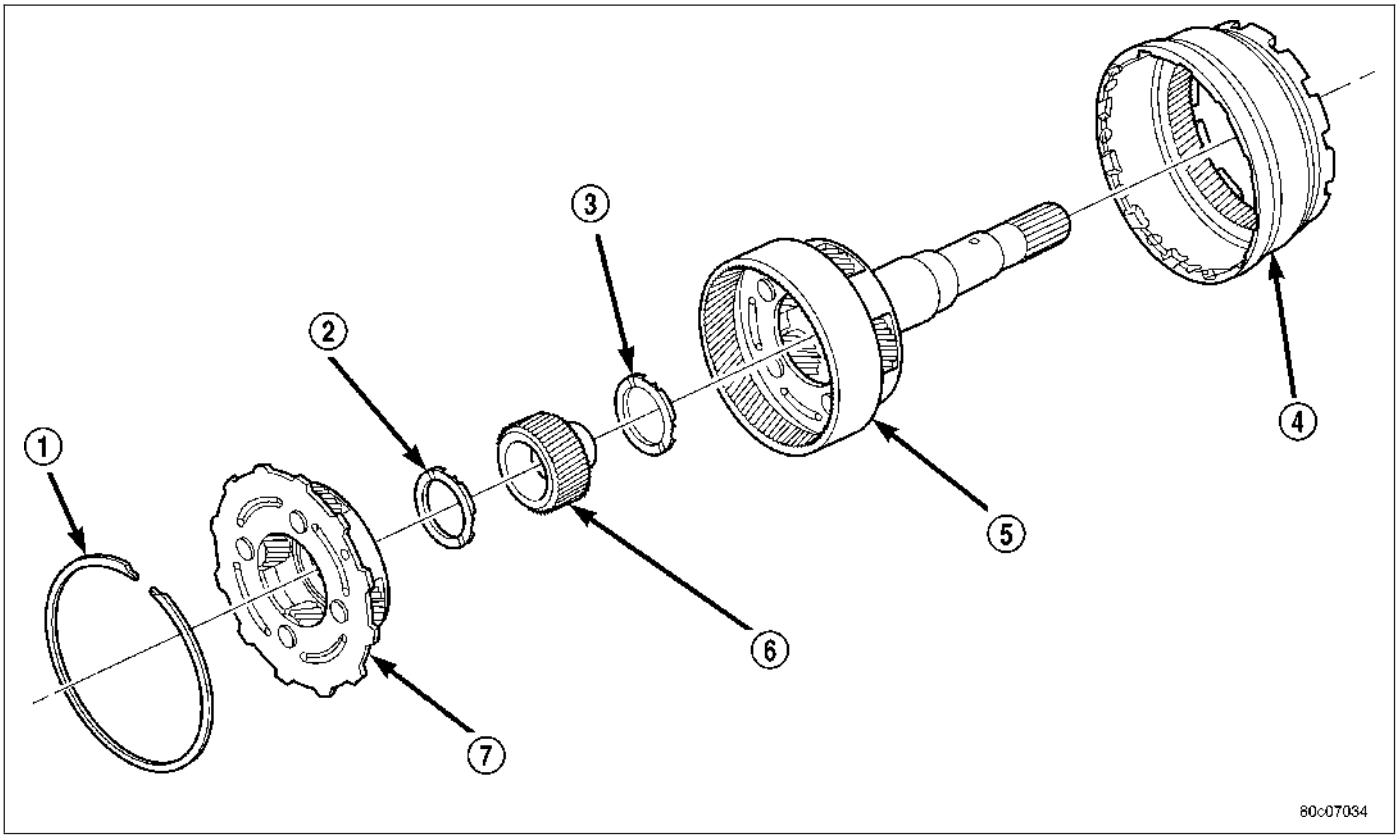
REVERSE PLANETARY GEARTRAIN

The reverse planetary geartrain is the middle of the three planetary sets. The reverse planetary carrier can be driven by the overdrive clutch as required. The reverse planetary carrier is also splined to the input annulus gear, which can be held by the low/reverse clutch. The reverse planetary annulus, input planetary carrier, and output shaft are all one piece.

INPUT PLANETARY GEARTRAIN

The input sun gear of the input planetary geartrain is driven by the underdrive clutch.

DISASSEMBLY



Reverse/Input Planetary Carrier Assembly

1 - SNAP-RING
2 - THRUST BEARING NUMBER 10
3 - THRUST BEARING NUMBER 11
4 - INPUT ANNULUS
5 - INPUT PLANETARY CARRIER
6 - INPUT SUN GEAR
7 - REVERSE PLANETARY CARRIER

1. Remove the snap-ring (1) holding the input annulus (4) into the input carrier (5).
2. Remove the input annulus (4) from the input carrier (5).
3. Remove the number 9 thrust bearing from the reverse planetary carrier. Note that this planetary carrier has four pinion gears.
4. Remove the reverse planetary gear carrier (7).
5. Remove the number 10 thrust bearing (2) from the input sun gear (6).
6. Remove the input sun gear (6) from the input carrier (5).
7. Remove the number 11 thrust bearing (3) from the input carrier (5).

CLEANING

Clean the planetary components in solvent and dry them with compressed air.

INSPECTION

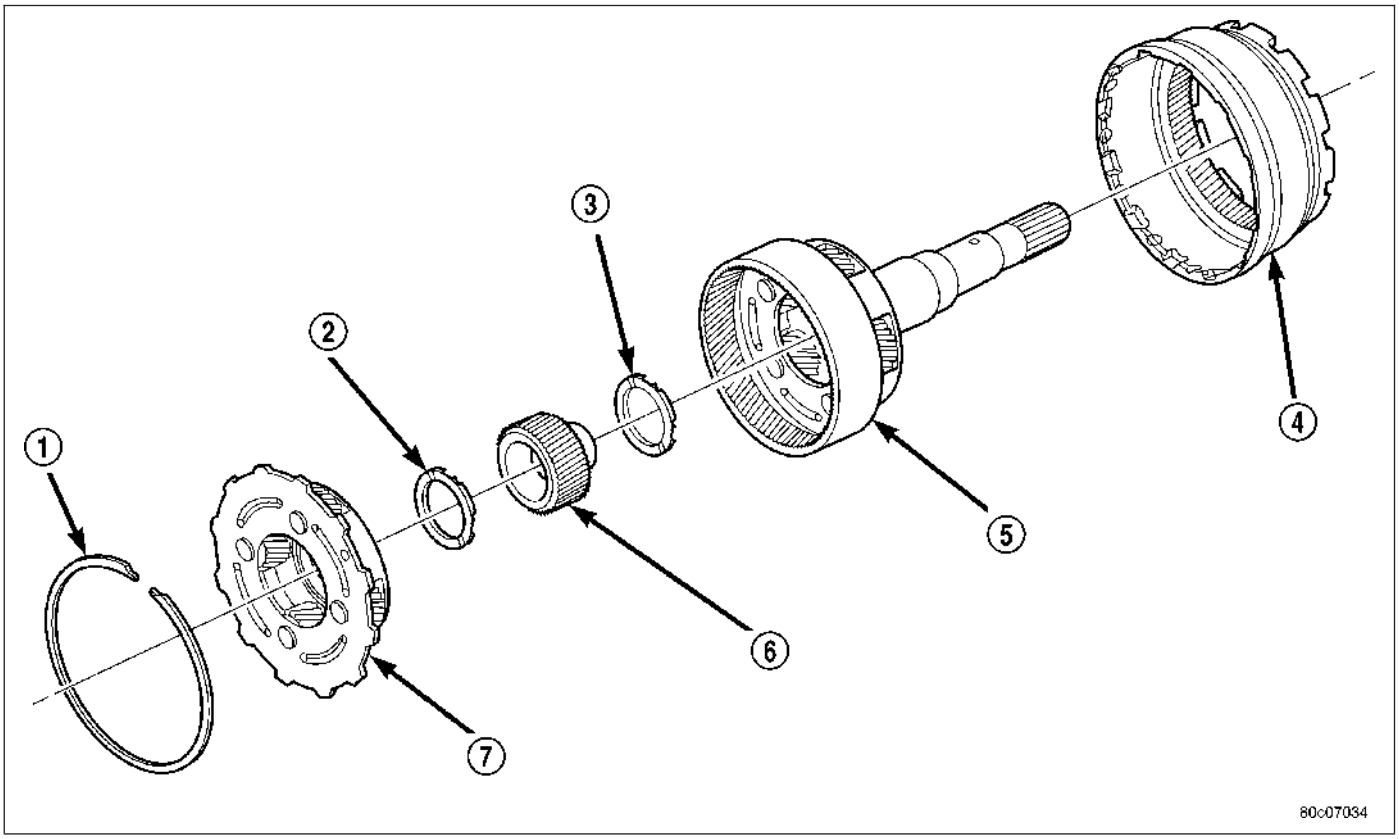
Check sun gear and driving shell condition. Replace the gear if damaged or if the bushings are scored or worn. The bushings are not serviceable. Replace the driving shell if worn, cracked or damaged.

Replace planetary gear sets if gears, pinion pins, or carrier are damaged in any way. Replace the annulus gears and supports if either component is worn or damaged.

Replace the output shaft if the machined surfaces are scored, pitted, or damaged in any way. Also replace the shaft if the splines are damaged, or exhibits cracks at any location.

ASSEMBLY

NOTE: Clean and inspect all components. Replace any components which show evidence of excessive wear or scoring.



Reverse/Input Planetary Carrier Assembly

1 - SNAP-RING
2 - THRUST BEARING NUMBER 10
3 - THRUST BEARING NUMBER 11
4 - INPUT ANNULUS
5 - INPUT PLANETARY CARRIER
6 - INPUT SUN GEAR
7 - REVERSE PLANETARY CARRIER

1. Install the number 11 thrust bearing (3) into the input planetary carrier (5) so that the inner race will be toward the front of the transmission.
2. Install the input sun gear (6) into the input carrier (5).
3. Install the number 10 thrust bearing (2) onto the rear of the reverse planetary carrier (7) with the inner race toward the carrier.
4. Install the number 9 thrust bearing onto the front of the reverse planetary carrier (7) with the outer race toward the carrier and the inner race facing upward.
5. Install the reverse planetary gear carrier (7) into the input carrier (5).
6. Install the input annulus gear (4) into the input carrier (5).
7. Install the snap-ring (1) to hold the input annulus gear (4) into the input carrier (5).

MECHANISM-SHIFT

DESCRIPTION

The gear shift mechanism provides six shift positions which are:

- Park (P)
- Reverse (R)

- Neutral (N)
- Drive (D)
- Manual second (2)
- Manual low (1)

OPERATION

MANUAL LOW (1) range provides FIRST gear only. Overrun braking is also provided in this range. MANUAL SECOND (2) range provides FIRST and SECOND gear only.

DRIVE range provides FIRST, SECOND, THIRD and OVERDRIVE FOURTH and FIFTH gear ranges. The shift into OVERDRIVE FOURTH and FIFTH gear range occurs only after the transmission has completed the shift into D THIRD gear range. No further movement of the shift mechanism is required to complete the 3-4 or 4-5 shifts.

The FOURTH and FIFTH gear upshifts occurs automatically when the overdrive selector switch is in the ON position. An upshift to FOURTH and FIFTH gears may not occur or may be delayed in some of the possible shift schedules. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - OPERATION)

SWITCH VALVE-SOLENOID

DESCRIPTION

The Solenoid Switch Valve (SSV) is located in the valve body and controls the direction of the transmission fluid when the L/R-TCC solenoid is energized.

OPERATION

The Solenoid Switch Valve controls line pressure from the LR-TCC solenoid. In 1st gear, the SSV will be in the downshifted position, thus directing fluid to the L/R clutch circuit. In 2nd, 3rd, 4th, and 5th gears, the solenoid switch valve will be in the upshifted position and directs the fluid into the torque converter clutch (TCC) circuit.

When shifting into 1st gear, a special hydraulic sequence is performed to ensure SSV movement into the downshifted position. The L/R pressure switch is monitored to confirm SSV movement. If the movement is not confirmed (the L/R pressure switch does not close), 2nd gear is substituted for 1st. A DTC will be set after three unsuccessful attempts are made to get into 1st gear in one given key start.

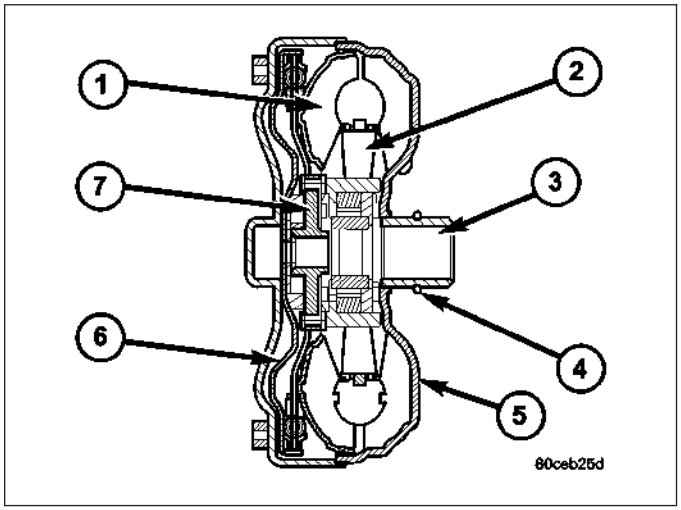
CONVERTER-TORQUE

DESCRIPTION

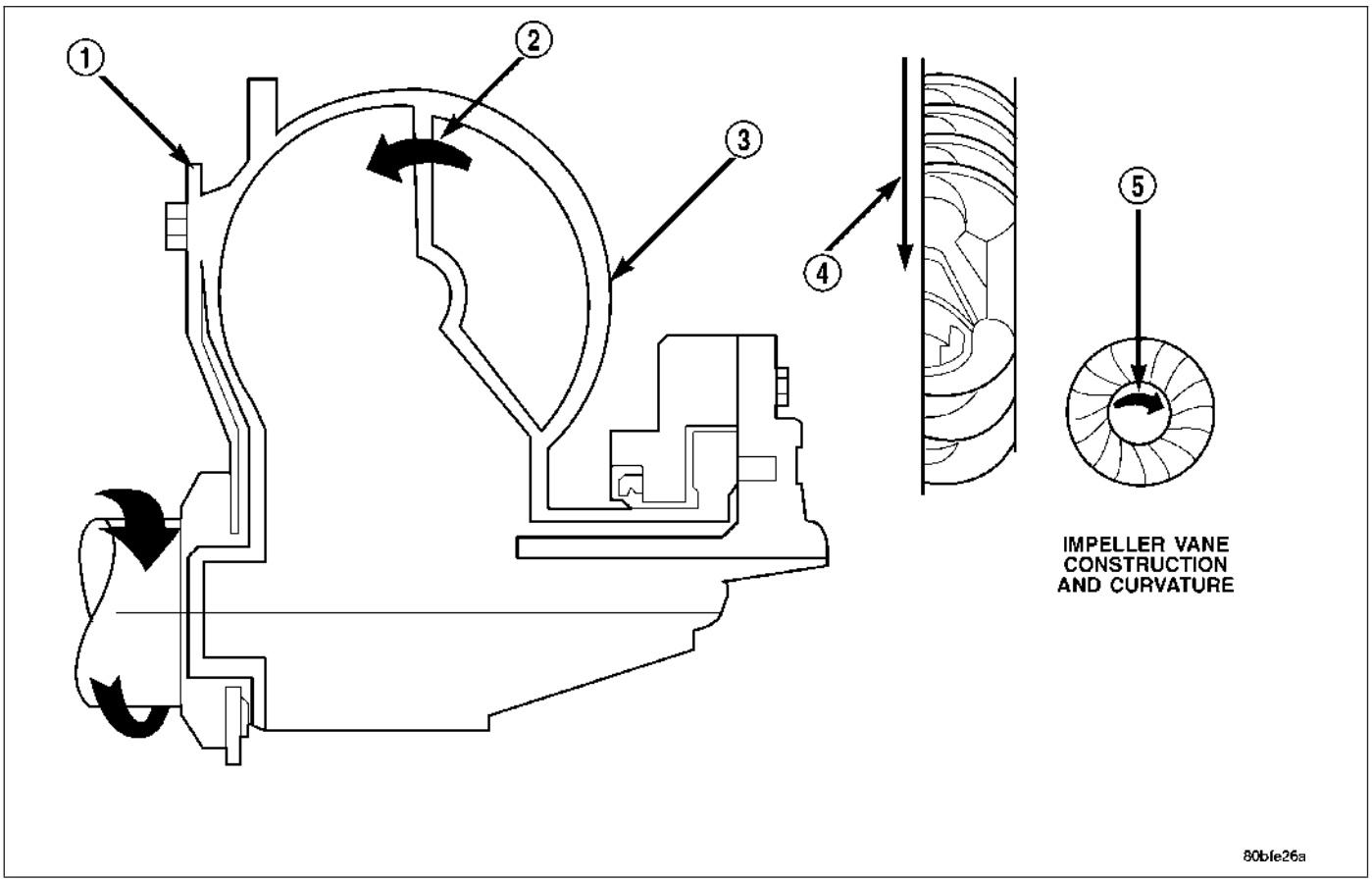
The torque converter is a hydraulic device that couples the engine crankshaft to the transmission. The torque converter consists of an outer shell with an internal turbine (1), a stator (2), an overrunning clutch, an impeller (5), and an electronically applied converter clutch (6). The converter clutch provides reduced engine speed and greater fuel economy when engaged. Clutch engagement also provides reduced transmission fluid temperatures. The torque converter hub (3) drives the transmission oil (fluid) pump and contains an o-ring seal (4) to better control oil flow.

The torque converter is a sealed, welded unit that is not repairable and is serviced as an assembly.

CAUTION: The torque converter must be replaced if a transmission failure resulted in large amounts of metal or fiber contamination in the fluid.



IMPELLER

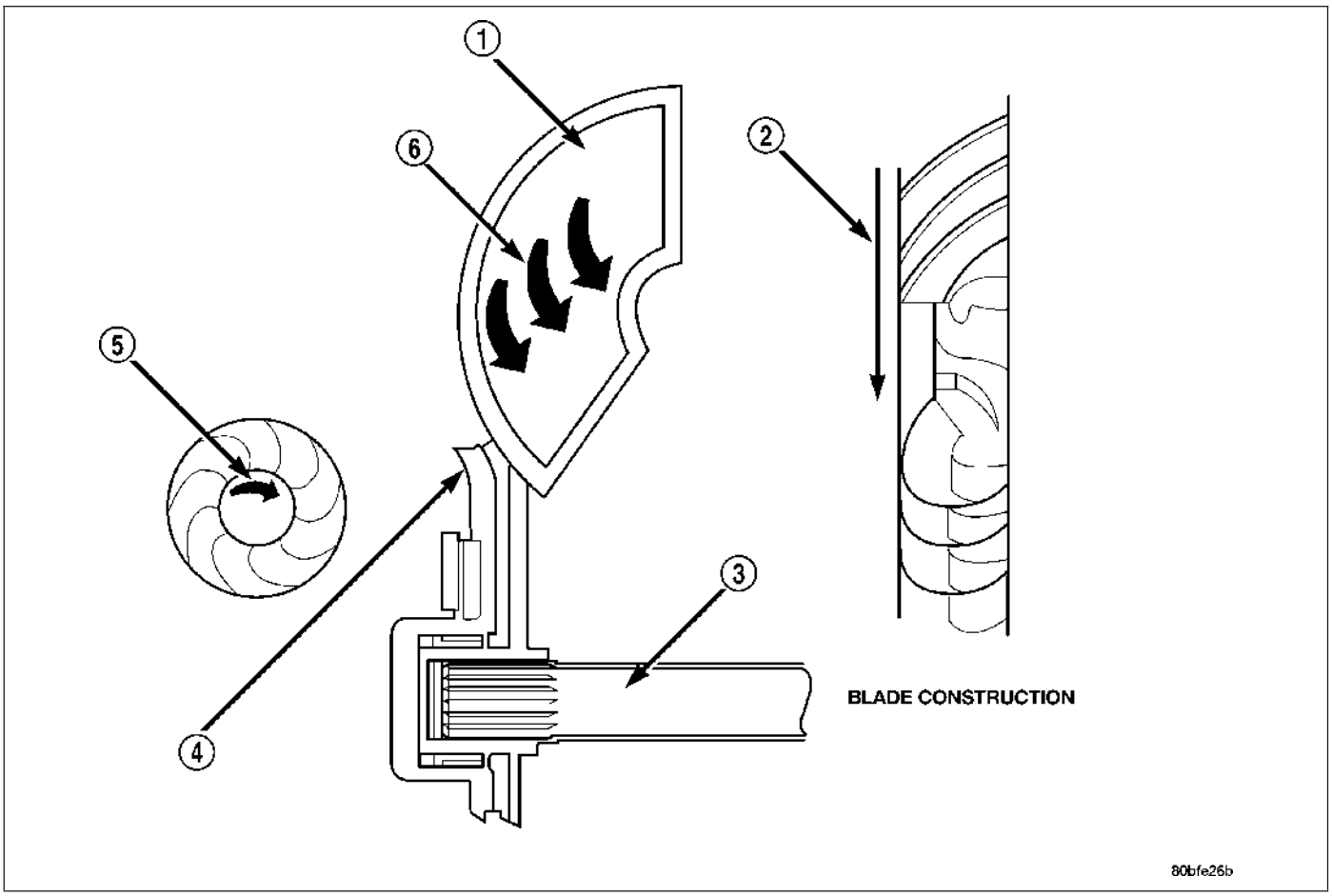


Impeller

1 - ENGINE FLEXPLATE
2 - OIL FLOW FROM IMPELLER SECTION INTO TURBINE SECTION
3 - IMPELLER VANES AND COVER ARE INTEGRAL
4 - ENGINE ROTATION
5 - ENGINE ROTATION

The impeller is an integral part of the converter housing. The impeller consists of curved blades placed radially along the inside of the housing on the transmission side of the converter. As the converter housing is rotated by the engine, so is the impeller, because they are one and the same and are the driving members of the system.

TURBINE



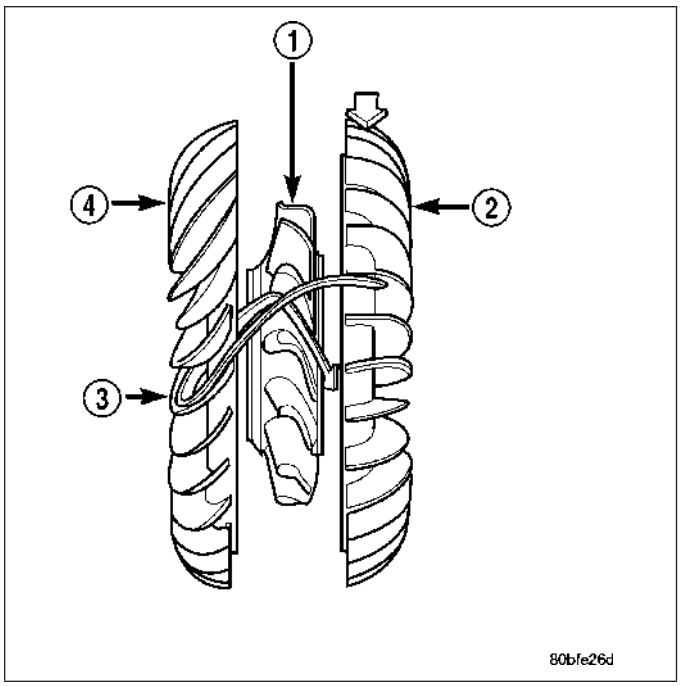
Turbine

1 - TURBINE VANE
2 - ENGINE ROTATION
3 - INPUT SHAFT
4 - PORTION OF TORQUE CONVERTER COVER
5 - ENGINE ROTATION
6 - OIL FLOW WITHIN TURBINE SECTION

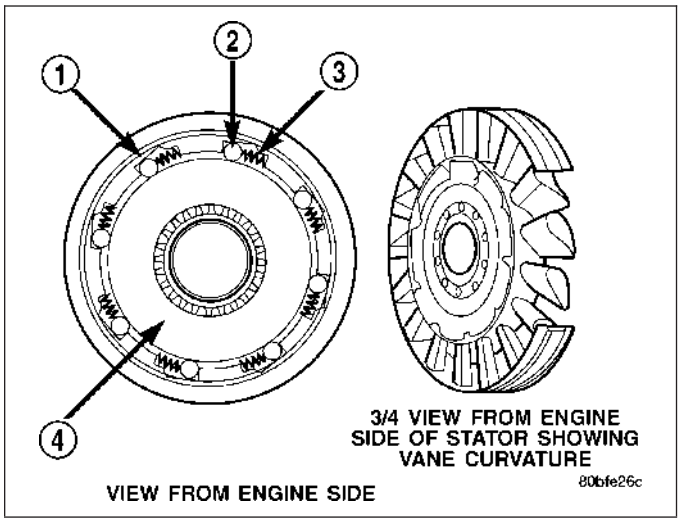
The turbine is the output, or driven, member of the converter. The turbine is mounted within the housing opposite the impeller, but is not attached to the housing. The input shaft is inserted through the center of the impeller and splined into the turbine. The design of the turbine is similar to the impeller, except the blades of the turbine are curved in the opposite direction.

STATOR

The stator assembly is mounted on a stationary shaft which is an integral part of the oil pump. The stator (1) is located between the impeller (2) and the turbine (4) within the torque converter case.

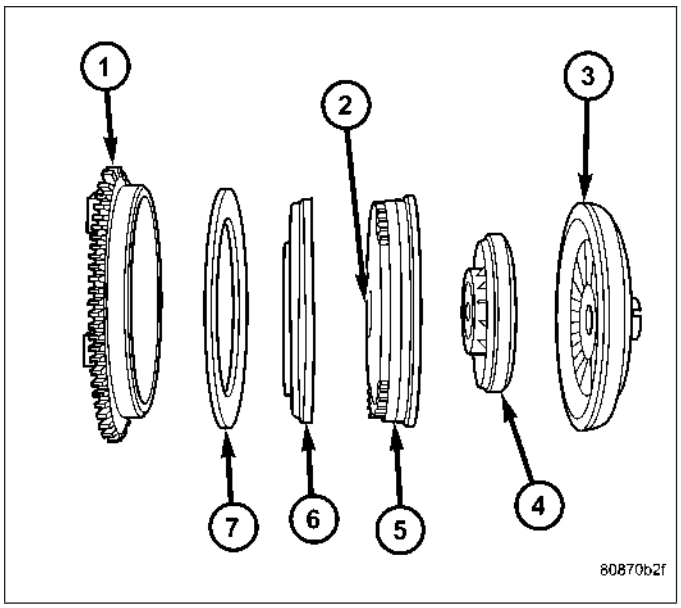


The stator contains an over-running clutch (1-4), which allows the stator to rotate only in a clockwise direction. When the stator is locked against the over-running clutch, the torque multiplication feature of the torque converter is operational.



TORQUE CONVERTER CLUTCH (TCC)

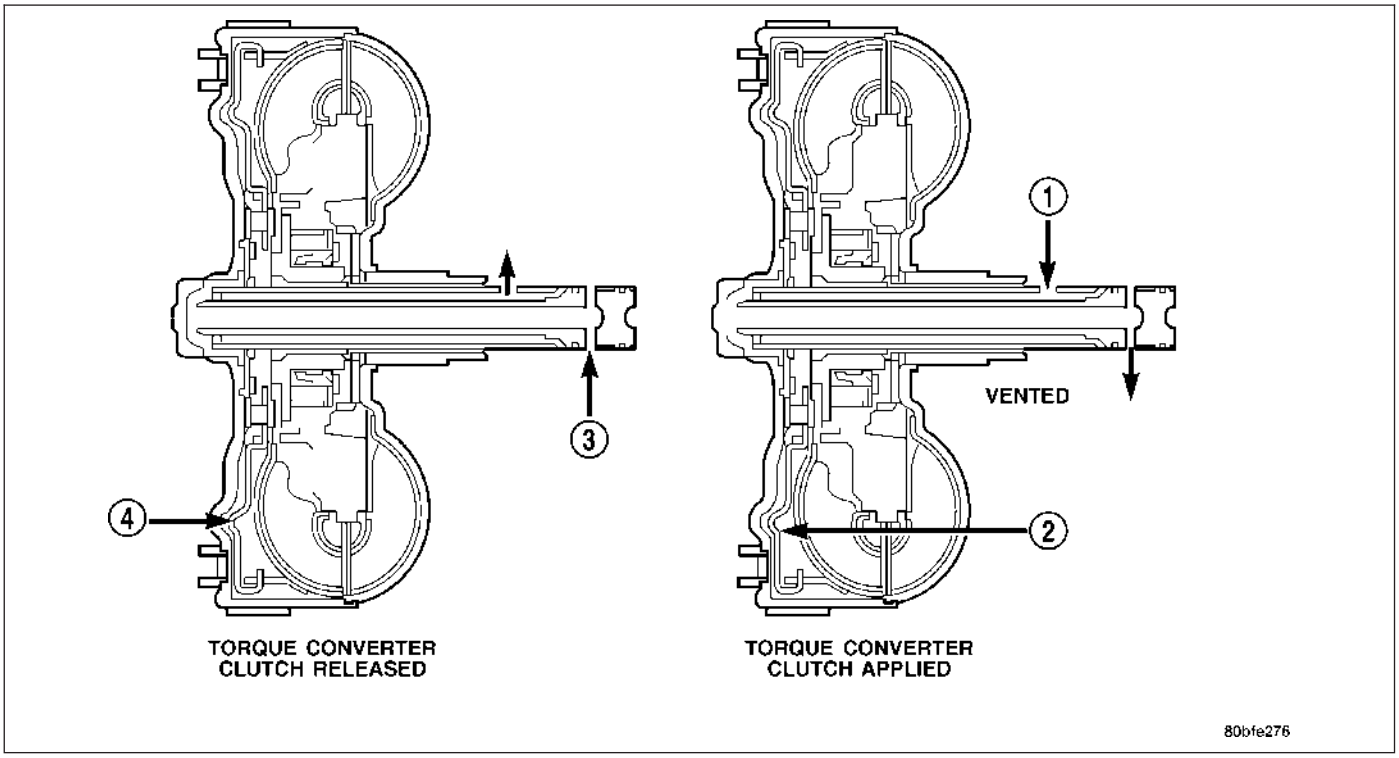
The TCC was installed to improve the efficiency of the torque converter that is lost to the slippage of the fluid coupling. Although the fluid coupling provides smooth, shock-free power transfer, it is natural for all fluid couplings to slip. If the impeller (3) and turbine (5) were mechanically locked together, a zero slippage condition could be obtained. A hydraulic piston (6) with friction material (7) was added to the turbine assembly (5) to provide this mechanical lock-up.



In order to reduce heat build-up in the transmission and buffer the powertrain against torsional vibrations, the TCM can duty cycle the L/R-CC Solenoid to achieve a smooth application of the torque converter clutch. This function, referred to as Electronically Modulated Converter Clutch (EMCC) can occur at various times depending on the following variables:

- Shift lever position
- Current gear range
- Transmission fluid temperature
- Engine coolant temperature
- Input speed
- Throttle angle
- Engine speed

OPERATION



Torque Converter Fluid Operation - Typical

1 - APPLY PRESSURE
2 - THE PISTON MOVES SLIGHTLY FORWARD
3 - RELEASE PRESSURE
4 - THE PISTON MOVES SLIGHTLY REARWARD

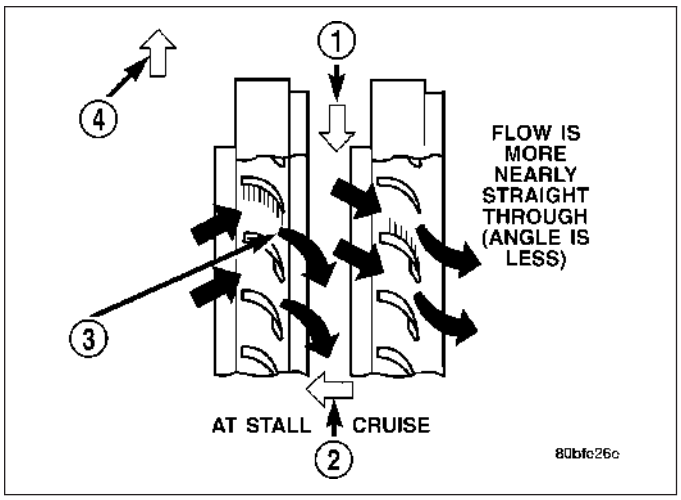
The converter impeller (driving member), which is integral to the converter housing and bolted to the engine drive plate, rotates at engine speed. The converter turbine (driven member), which reacts from fluid pressure generated by the impeller, rotates and turns the transmission input shaft.

TURBINE

As the fluid that was put into motion by the impeller blades strikes the blades of the turbine, some of the energy and rotational force is transferred into the turbine and the input shaft. This causes both of them (turbine and input shaft) to rotate in a clockwise direction following the impeller. As the fluid is leaving the trailing edges of the turbine's blades it continues in a "hindering" direction back toward the impeller. If the fluid is not redirected before it strikes the impeller, it will strike the impeller in such a direction that it would tend to slow it down.

STATOR

Torque multiplication is achieved by locking the stator's over-running clutch to its shaft. Under stall conditions (the turbine is stationary), the oil leaving the turbine blades strikes the face of the stator blades and tries to rotate them in a counterclockwise direction. When this happens the over-running clutch of the stator locks and holds the stator from rotating. With the stator locked, the oil strikes the stator blades and is redirected into a "helping" direction before it enters the impeller. This circulation of oil from impeller to turbine, turbine to stator, and stator to impeller, can produce a maximum torque multiplication of about 2.4:1. As the turbine begins to match the speed of the impeller, the fluid that was hitting the stator in such as way as to cause it to lock-up is no longer doing so. In this condition of operation, the stator begins to free wheel and the converter acts as a fluid coupling.



1 - DIRECTION STATOR WILL FREE WHEEL DUE TO OIL PUSHING ON BACKSIDE OF VANES
2 - FRONT OF ENGINE
3 - INCREASED ANGLE AS OIL STRIKES VANES
4 - DIRECTION STATOR IS LOCKED UP DUE TO OIL PUSHING AGAINST STATOR VANES

TORQUE CONVERTER CLUTCH (TCC)

In a standard torque converter, the impeller and turbine are rotating at about the same speed and the stator is freewheeling, providing no torque multiplication. By applying the turbine's piston and friction material to the front cover, a total converter engagement can be obtained. The result of this engagement is a direct 1:1 mechanical link between the engine and the transmission.

The clutch can be engaged in second, third, and fourth gear ranges depending on overdrive control switch position. If the overdrive control switch is in the normal ON position, the clutch will engage after the shift to fourth gear. If the control switch is in the OFF position, the clutch will engage after the shift to third gear.

The TCM controls the torque converter by way of internal logic software. The programming of the software provides the TCM with control over the L/R-CC Solenoid. There are four output logic states that can be applied as follows:

- No EMCC
- Partial EMCC
- Full EMCC
- Gradual-to-no EMCC

NO EMCC

Under No EMCC conditions, the L/R Solenoid is OFF. There are several conditions that can result in NO EMCC operations. No EMCC can be initiated due to a fault in the transmission or because the TCM does not see the need for EMCC under current driving conditions.

PARTIAL EMCC

Partial EMCC operation modulates the L/R Solenoid (duty cycle) to obtain partial torque converter clutch application. Partial EMCC operation is maintained until Full EMCC is called for and actuated. During Partial EMCC some slip does occur. Partial EMCC will usually occur at low speeds, low load and light throttle situations.

FULL EMCC

During Full EMCC operation, the TCM increases the L/R Solenoid duty cycle to full ON after Partial EMCC control brings the engine speed within the desired slip range of transmission input speed relative to engine rpm.

GRADUAL-TO-NO EMCC

This operation is to soften the change from Full or Partial EMCC to No EMCC. This is done at mid-throttle by decreasing the L/R Solenoid duty cycle.

REMOVAL

1. Remove transmission and torque converter from vehicle. (Refer to 21 - TRANSMISSION/AUTOMATIC - 545RFE/ 42RLE - REMOVAL)
2. Place a suitable drain pan under the converter housing end of the transmission.

CAUTION: Verify that transmission is secure on the lifting device or work surface, the center of gravity of the transmission will shift when the torque converter is removed creating an unstable condition. The torque converter is a heavy unit. Use caution when separating the torque converter from the transmission.

3. Pull the torque converter forward until the center hub clears the oil pump seal.
4. Separate the torque converter from the transmission.

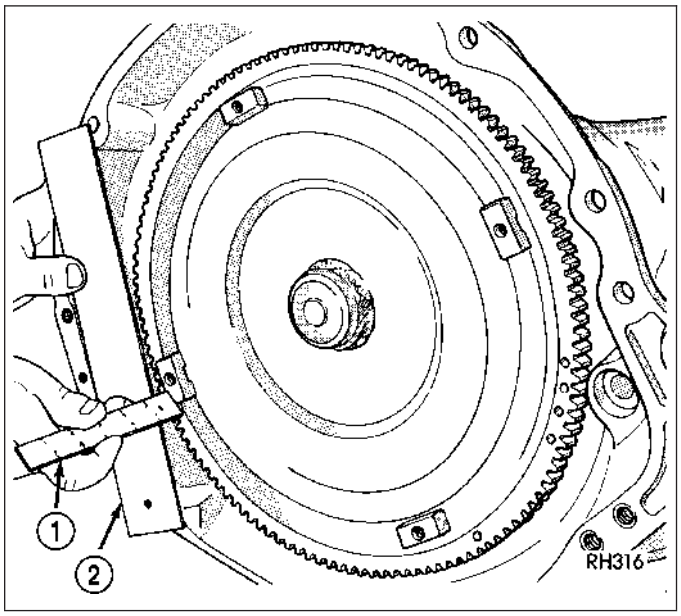
INSTALLATION

NOTE: Check converter hub and drive flats for sharp edges, burrs, scratches, or nicks. Polish the hub and flats with 320/400 grit paper or crocus cloth if necessary. Verify that the converter hub o-ring is properly installed and is free from debris. The hub must be smooth to avoid damaging the pump seal at installation.

1. Lubricate oil pump seal lip with transmission fluid.
2. Place torque converter in position on transmission.

CAUTION: Do not damage oil pump seal or converter hub o-ring while inserting torque converter into the front of the transmission.

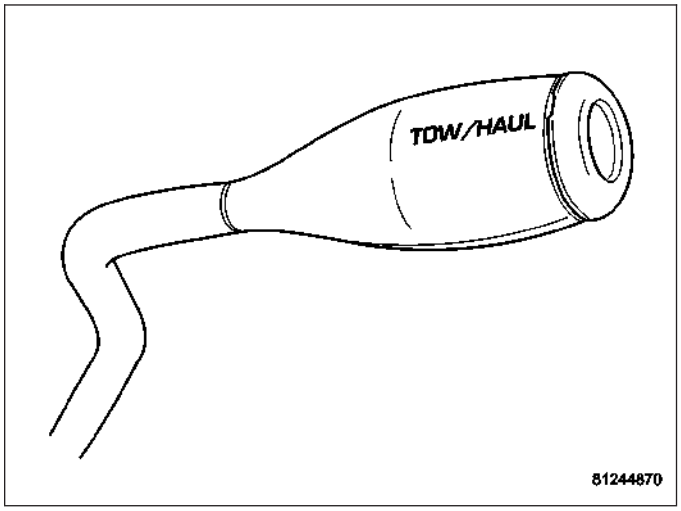
3. Align torque converter to oil pump seal opening.
4. Insert torque converter hub into oil pump.
5. While pushing torque converter inward, rotate converter until converter is fully seated in the oil pump gears.
6. Check converter seating with a scale (1) and straightedge (2). Surface of converter lugs should be at least 13 mm (1/2 in.) to rear of straightedge when converter is fully seated.
7. If necessary, temporarily secure converter with C-clamp attached to the converter housing.
8. Install the transmission in the vehicle.
9. Fill the transmission with the recommended fluid.



SWITCH-TOW/HAUL OVERDRIVE

DESCRIPTION

The tow/haul overdrive OFF (control) switch is located in the shift lever arm. The switch is a momentary contact device that signals the PCM to toggle current status of the overdrive function.

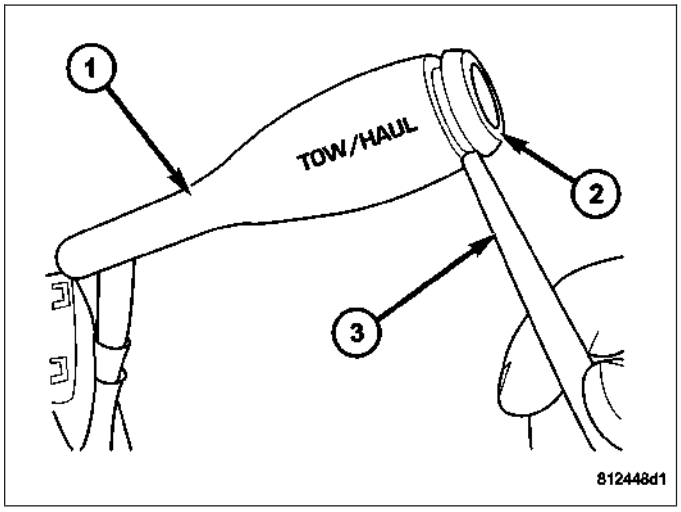


OPERATION

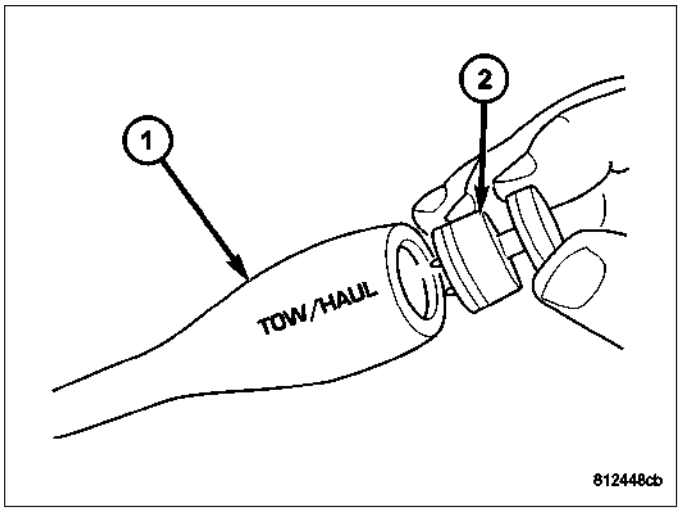
At key-on, overdrive operation is allowed. Pressing the switch once causes the tow/haul overdrive OFF mode to be entered and the Tow/Haul lamp to be illuminated. Pressing the switch a second time causes normal overdrive operation to be restored and the tow/haul lamp to be turned off. The tow/haul overdrive OFF mode defaults to ON after the ignition switch is cycled OFF and ON. The normal position for the control switch is the ON position. The switch must be in this position to energize the solenoid and allow a 3-4 upshift. The control switch indicator light illuminates only when the tow/haul overdrive switch is turned to the OFF position, or when illuminated by the transmission control module.

REMOVAL

1. Using a plastic trim tool, remove the tow/haul overdrive off switch retainer (2) from the shift lever (1).



2. Pull the switch (2) outwards to release it from the connector in the lever (1)



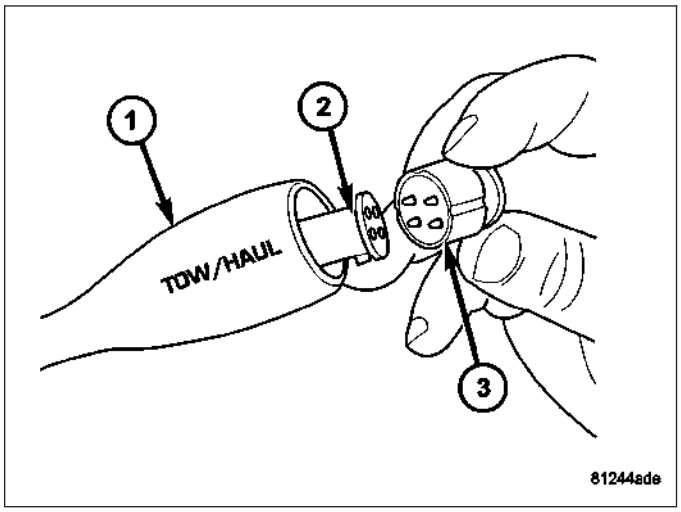
INSTALLATION

NOTE: There is enough slack in the wire to pull out the connector from the lever.

1. Pull the connector (2) out of the lever (1) just enough to grasp it.

CAUTION: Be careful not to bend the pins on the tow/haul overdrive off switch. Use care when installing the switch, as it is not indexed, and can be accidentally installed incorrectly.

2. Install the tow/haul overdrive off switch (3) into the connector (2)
3. Push the tow/haul overdrive off switch (3) and wiring into the shift lever (1).
4. Install the tow/haul overdrive off switch retainer onto the shift lever.



RELAY-TRANSMISSION CONTROL

DESCRIPTION

The relay is supplied fused B+ voltage, energized by the TCM, and is used to supply power to the solenoid pack when the transmission is in normal operating mode.

OPERATION

When the relay is “off”, no power is supplied to the solenoid pack and the transmission is in “limp-in” mode. After a controller reset, the TCM energizes the relay. Prior to this, the TCM verifies that the contacts are open by checking for no voltage at the switched battery terminals. After this is verified, the voltage at the solenoid pack pressure switches is checked. After the relay is energized, the TCM monitors the terminals to verify that the voltage is greater than 3 volts.

SENSOR-TRANSMISSION RANGE

DESCRIPTION

The Transmission Range Sensor (TRS) is part of the solenoid module, which is mounted to the top of the valve body inside the transmission.

The Transmission Range Sensor (TRS) has five switch contact pins that:

- Determine shift lever position
- Supply ground to the Starter Relay in Park and Neutral only.
- Supply +12 V to the backup lamps in Reverse only.

The TRS also has an integrated temperature sensor (thermistor) that communicates transmission temperature to the TCM and PCM.

OPERATION

The Transmission Range Sensor (TRS) communicates shift lever position to the TCM as a combination of open and closed switches. Each shift lever position has an assigned combination of switch states (open/closed) that the TCM receives from four sense circuits. The TCM interprets this information and determines the appropriate transmission gear position and shift schedule.

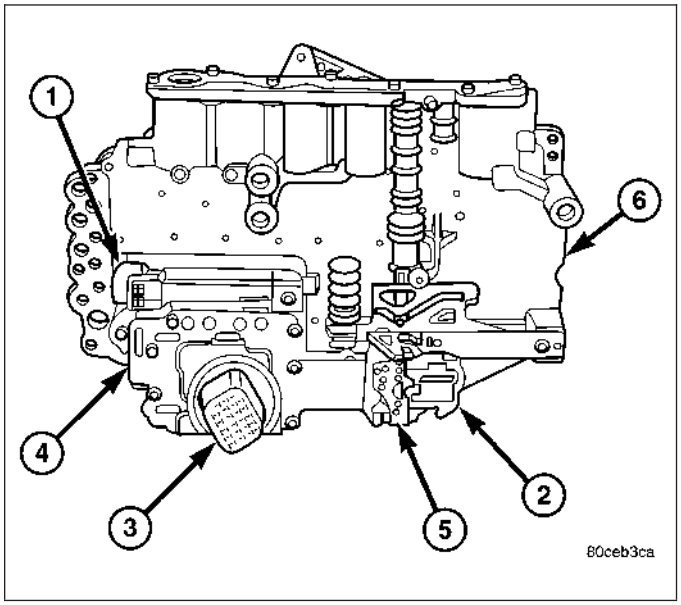
There are many possible combinations of open and closed switches (codes). Seven of these possible codes are related to gear position and five are recognized as “between gear” codes. This results in many codes which should **never occur**. These are called “invalid” codes. An invalid code will result in a DTC, and the TCM will then determine the shift lever position based on pressure switch data. This allows reasonably normal transmission operation with a TRS failure.

GEAR	C5	C4	C3	C2	C1
Park	CL	OP	OP	CL	CL
Temp 1	CL	OP	OP	CL	OP
Reverse	OP	OP	OP	CL	OP
Temp 2	OP	OP	CL	CL	OP
Neutral 1	OP	OP	CL	CL	CL
Neutral 2	OP	CL	CL	CL	CL
Temp 3	OP	CL	CL	CL	OP
Drive	OP	CL	CL	OP	OP
Temp 4	OP	CL	OP	OP	OP
Manual 2	CL	CL	OP	OP	OP
Temp 5	CL	OP	OP	OP	OP
Manual 1	CL	OP	CL	OP	OP

ASSEMBLY-TRANSMISSION SOLENOID/TRS

DESCRIPTION

The transmission solenoid/TRS assembly is internal to the transmission and mounted on the valve body assembly. The assembly consists of six solenoids that control hydraulic pressure to the six friction elements (transmission clutches), and the torque converter clutch. The pressure control solenoid is located on the side of the solenoid/TRS assembly. The solenoid/TRS assembly also contains five pressure switches that feed information to the TCM.



OPERATION

SOLENOIDS

Solenoids are used to control the L/R, 2C, 4C, OD, and UD friction elements. The reverse clutch is controlled by line pressure and the position of the manual valve in the valve body. All the solenoids are contained within the Solenoid and Pressure Switch Assembly. The solenoid and pressure switch assembly contains one additional solenoid, Multi-Select (MS), which serves primarily to provide 2nd and 3rd gear limp-in operation.

The solenoids receive electrical power from the Transmission Control Relay through a single wire. The TCM energizes or operates the solenoids individually by grounding the return wire of the solenoid as necessary. When a solenoid is energized, the solenoid valve shifts, and a fluid passage is opened or closed (vented or applied), depending on its default operating state. The result is an apply or release of a frictional element.

The MS and UD solenoids are normally applied to allow transmission limp-in in the event of an electrical failure.

The continuity of the solenoids and circuits are periodically tested. Each solenoid is turned on or off depending on its current state. An inductive spike should be detected by the TCM during this test. If no spike is detected, the circuit is tested again to verify the failure. In addition to the periodic testing, the solenoid circuits are tested if a speed ratio or pressure switch error occurs.

PRESSURE SWITCHES

The TCM relies on five pressure switches to monitor fluid pressure in the L/R, 2C, 4C, UD, and OD hydraulic circuits. The primary purpose of these switches is to help the TCM detect when clutch circuit hydraulic failures occur. The switches close at approximately 23 psi and open at approximately 11 psi, and simply indicate whether or not pressure exists. The switches are continuously monitored by the TCM for the correct states (open or closed) in each gear as shown in the following chart:

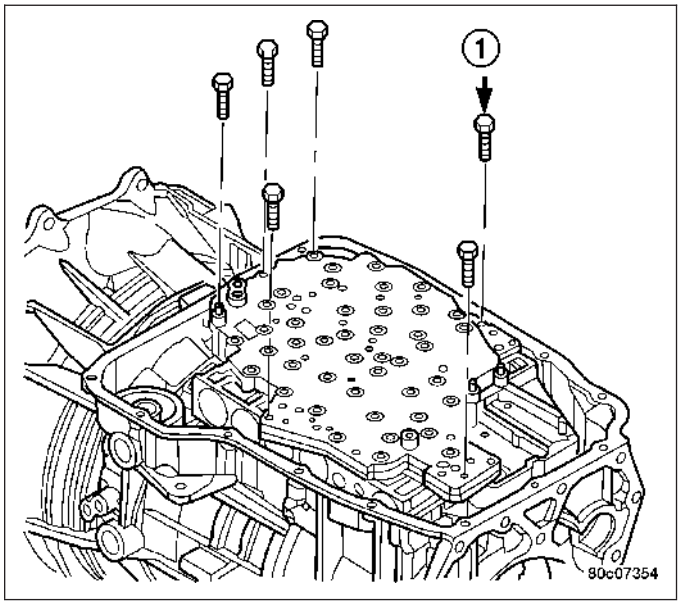
GEAR	L/R	2C	4C	UD	OD
R	OP	OP	OP	OP	OP
P/N	CL	OP	OP	OP	OP
1ST	CL*	OP	OP	CL	OP
2ND	OP	CL	OP	CL	OP
2ND PRIME	OP	OP	CL	CL	OP
D	OP	OP	OP	CL	CL
4TH	OP	OP	CL	OP	CL
5TH	OP	CL	OP	OP	CL

*L/R is closed if output speed is below 100 rpm in Drive and Manual 2. L/R is open in Manual 1.

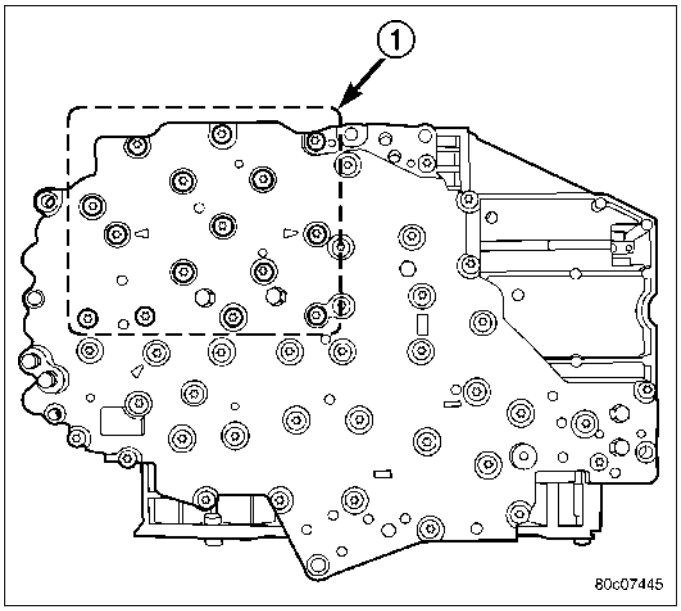
A Diagnostic Trouble Code (DTC) will set if the TCM senses any switch open or closed at the wrong time in a given gear.

REMOVAL

1. Remove the valve body from the transmission. (Refer to 21 - TRANSMISSION/AUTOMATIC - 45RFE/545RFE/VALVE BODY - REMOVAL)

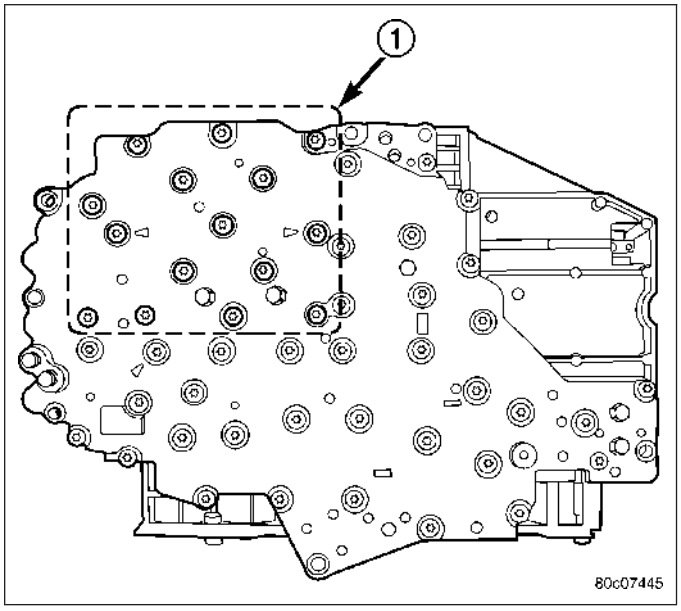


2. Remove the bolts (1) holding the transmission solenoid/TRS assembly onto the valve body.
3. Separate the transmission solenoid/TRS assembly from the valve body.



INSTALLATION

1. Place TRS selector plate in the PARK position.
2. Position the transmission solenoid/TRS assembly onto the valve body. Be sure that both alignment dowels are fully seated in the valve body and that the TRS switch contacts are properly positioned in the selector plate
3. Install the bolts (1) to hold the transmission solenoid/TRS assembly onto the valve body.
4. Tighten the solenoid assembly screws adjacent to the arrows cast into the bottom of the valve body first. Tighten the screws to 5.7 N·m (50 in.lbs.).
5. Tighten the remainder of the solenoid assembly screws to 5.7 N·m (50 in.lbs.).
6. Install the valve body into the transmission.



SENSOR-TRANSMISSION TEMPERATURE

DESCRIPTION

The transmission temperature sensor is a thermistor that is integral to the Transmission Range Sensor (TRS).

OPERATION

The transmission temperature sensor is used by the TCM to sense the temperature of the fluid in the sump. Since fluid temperature can affect transmission shift quality and convertor lock up, the TCM requires this information to determine which shift schedule to operate in.

Calculated Temperature

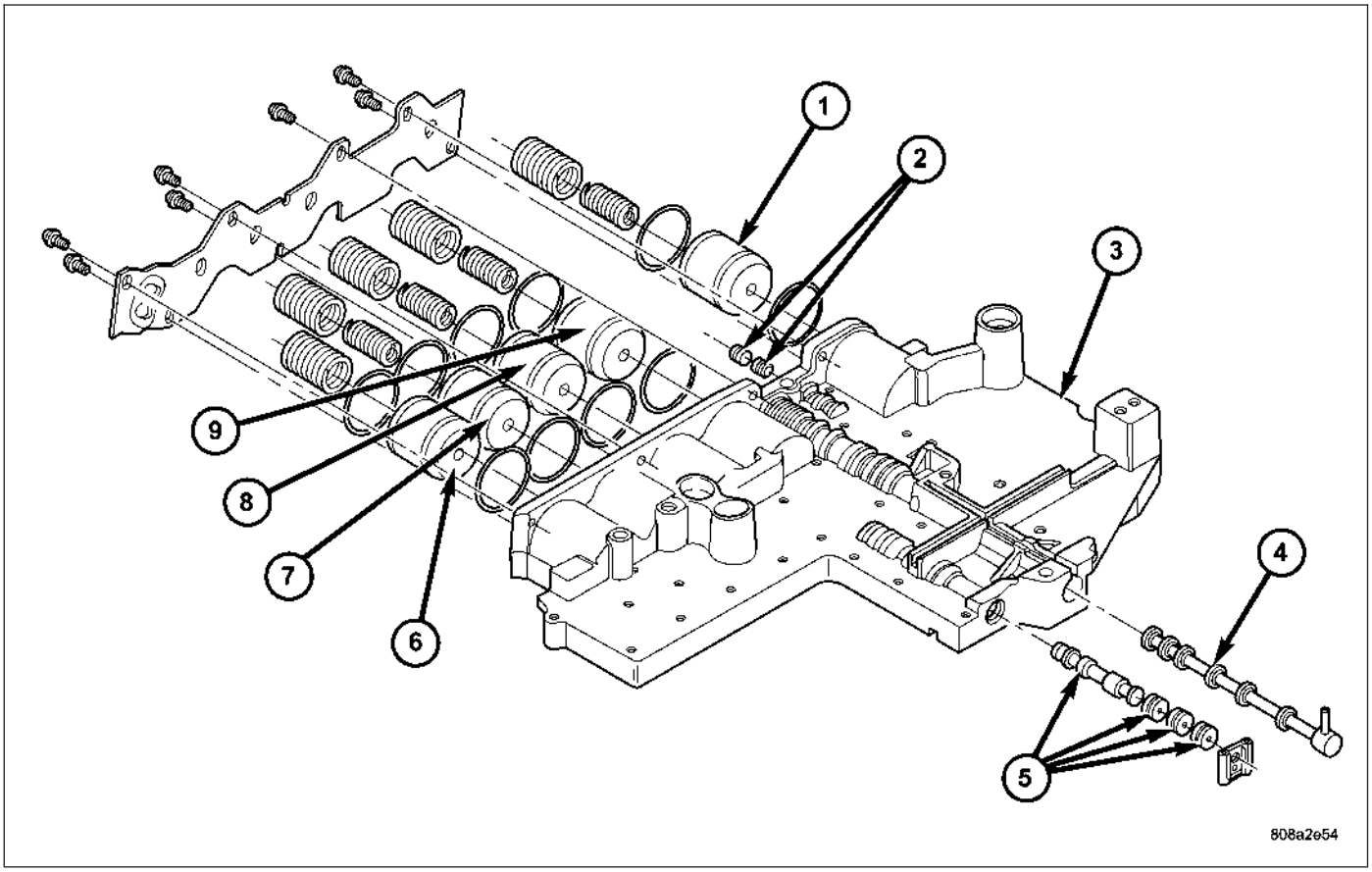
A failure in the temperature sensor or circuit will result in calculated temperature being substituted for actual temperature. Calculated temperature is a predicted fluid temperature which is calculated from a combination of inputs:

- Battery (ambient) temperature

- Engine coolant temperature
- In-gear run time since start-up

ASSEMBLY-VALVE BODY

DESCRIPTION



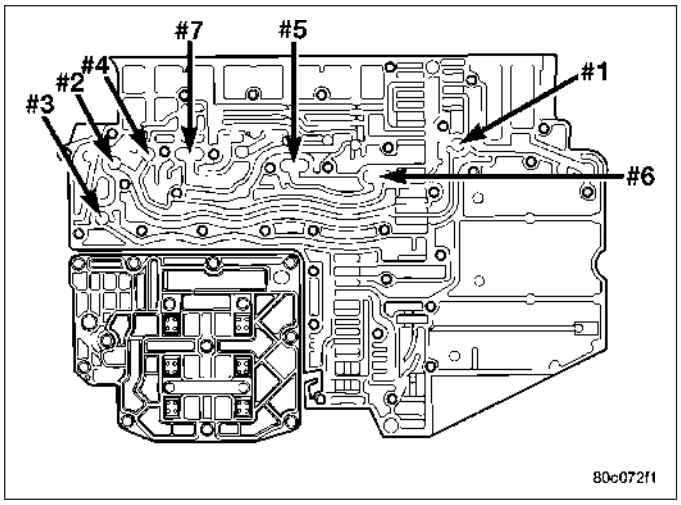
Valve Body Components

1 - LOW/REVERSE ACCUMULATOR
2 - LOW/REVERSE SWITCH VALVE
3 - UPPER VALVE BODY
4 - MANUAL VALVE
5 - SOLENOID SWITCH VALVE
6 - OVERDRIVE ACCUMULATOR
7 - UNDERDRIVE ACCUMULATOR
8 - 4C ACCUMULATOR
9 - 2C ACCUMULATOR

The valve body consists of a cast aluminum valve body, a separator plate, and a transfer plate. The valve body contains valves and check balls that control fluid delivery to the torque converter clutch, bands, and frictional clutches. The valve body contains the following components :

- Solenoid switch valve
- Manual valve
- Low/reverse switch valve
- 5 Accumulators

- 7 check balls



OPERATION

NOTE: Refer to the Hydraulic Schematics for a visual aid in determining valve location, operation and design.

SOLENOID SWITCH VALVE

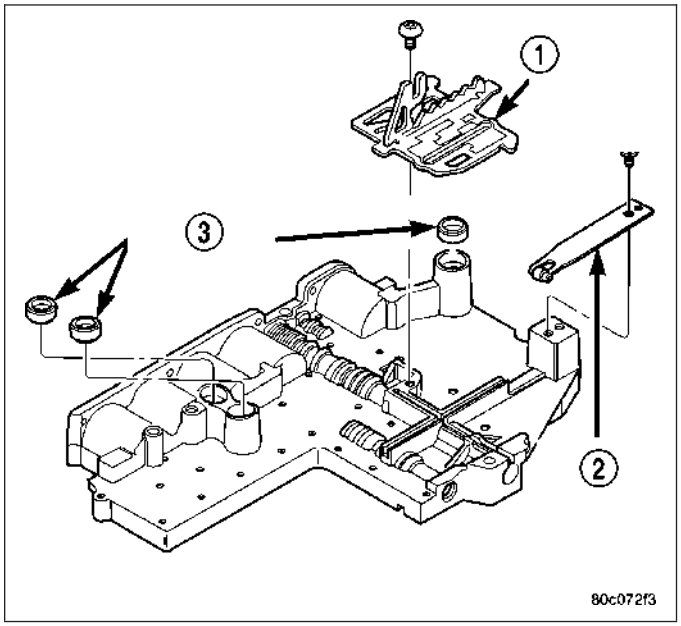
The Solenoid Switch Valve (SSV) controls the direction of the transmission fluid when the L/R-TCC solenoid is energized.

The Solenoid Switch Valve controls line pressure from the LR-TCC solenoid. In 1st gear, the SSV will be in the downshifted position, thus directing fluid to the L/R clutch circuit. In 2nd, 3rd, 4th, and fifth gears, the solenoid switch valve will be in the upshifted position and directs the fluid into the torque converter clutch (TCC) circuit.

When shifting into 1st gear, a special hydraulic sequence is performed to ensure SSV movement into the downshifted position. The L/R pressure switch is monitored to confirm SSV movement. If the movement is not confirmed (the L/R pressure switch does not close), 2nd gear is substituted for 1st. A DTC will be set after three unsuccessful attempts are made to get into 1st gear in one given key start.

MANUAL VALVE

The manual valve is a relay valve. The purpose of the manual valve is to direct fluid to the correct circuit needed for a specific gear or driving range. The manual valve, as the name implies, is manually operated by the driver with a lever located on the top of the valve body. The valve is connected mechanically by a cable to the gearshift mechanism. The valve is held in each of its positions by a roller detent spring (2) that engages the “roostercomb” of the TRS selector plate (1).



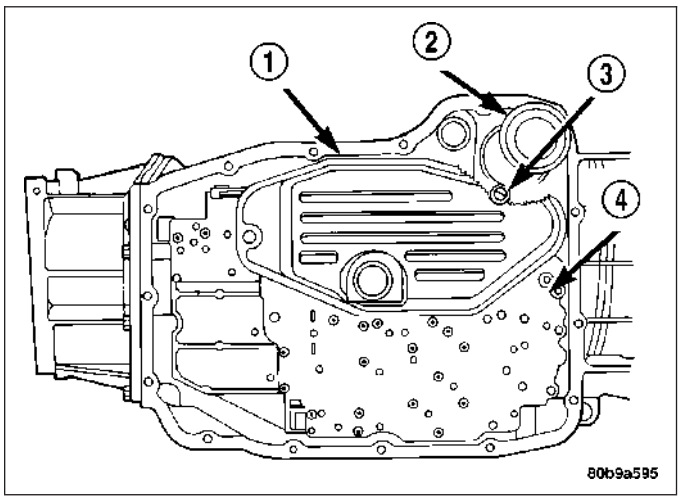
LOW/REVERSE SWITCH VALVE

The low/reverse switch valve allows the low/reverse clutch to be operated by either the LR/CC solenoid or the MS solenoid.

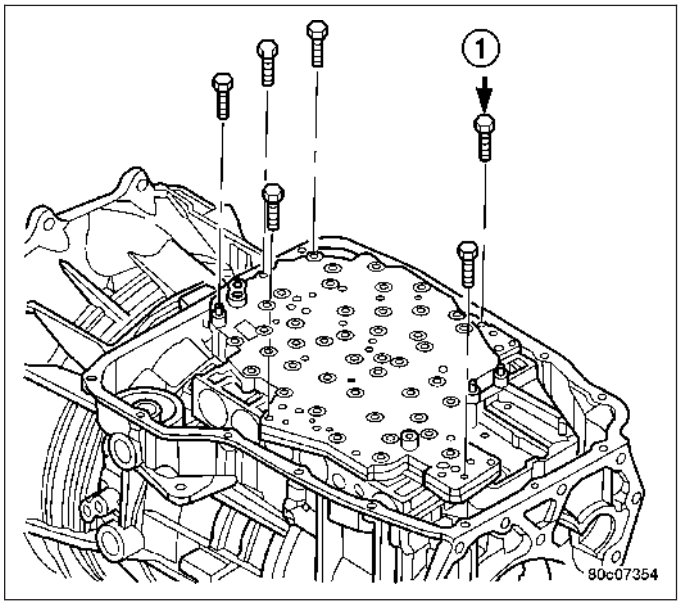
REMOVAL

NOTE: The valve body can be removed for service without having to remove the transmission assembly. The valve body can be disassembled for cleaning and inspection of the individual components. (Refer to 21 - TRANSMISSION/AUTOMATIC - 45RFE/VALVE BODY - DISASSEMBLY)

1. Shift transmission into PARK.
2. Raise vehicle.
3. Disconnect wires at the solenoid and pressure switch assembly connector.
4. Position drain pan under transmission oil pan.
5. Remove transmission oil pan.
6. Remove the primary oil filter (1) from valve body.

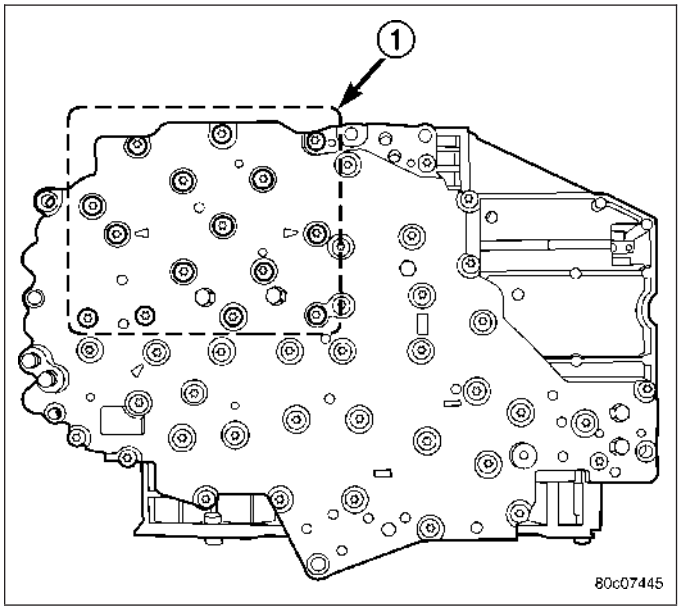


7. Remove bolts (1) attaching valve body to transmission case.
8. Lower the valve body and work the electrical connector out of transmission case.
9. Separate the valve body from the transmission.

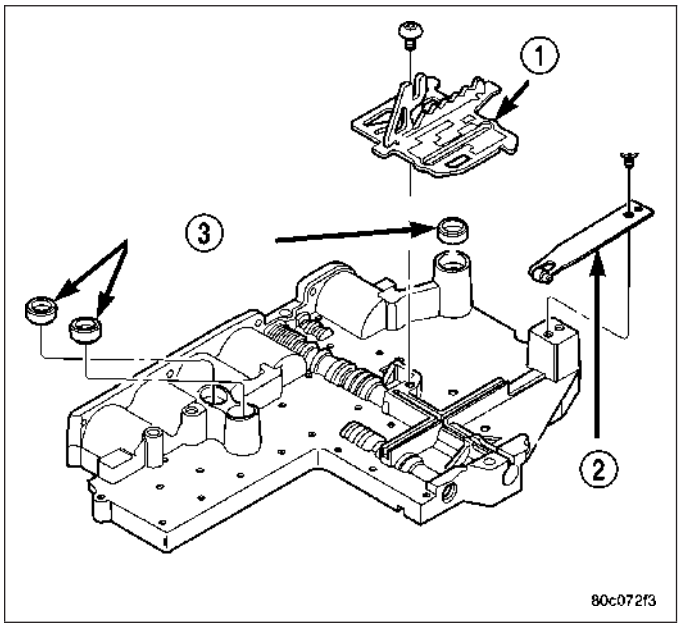


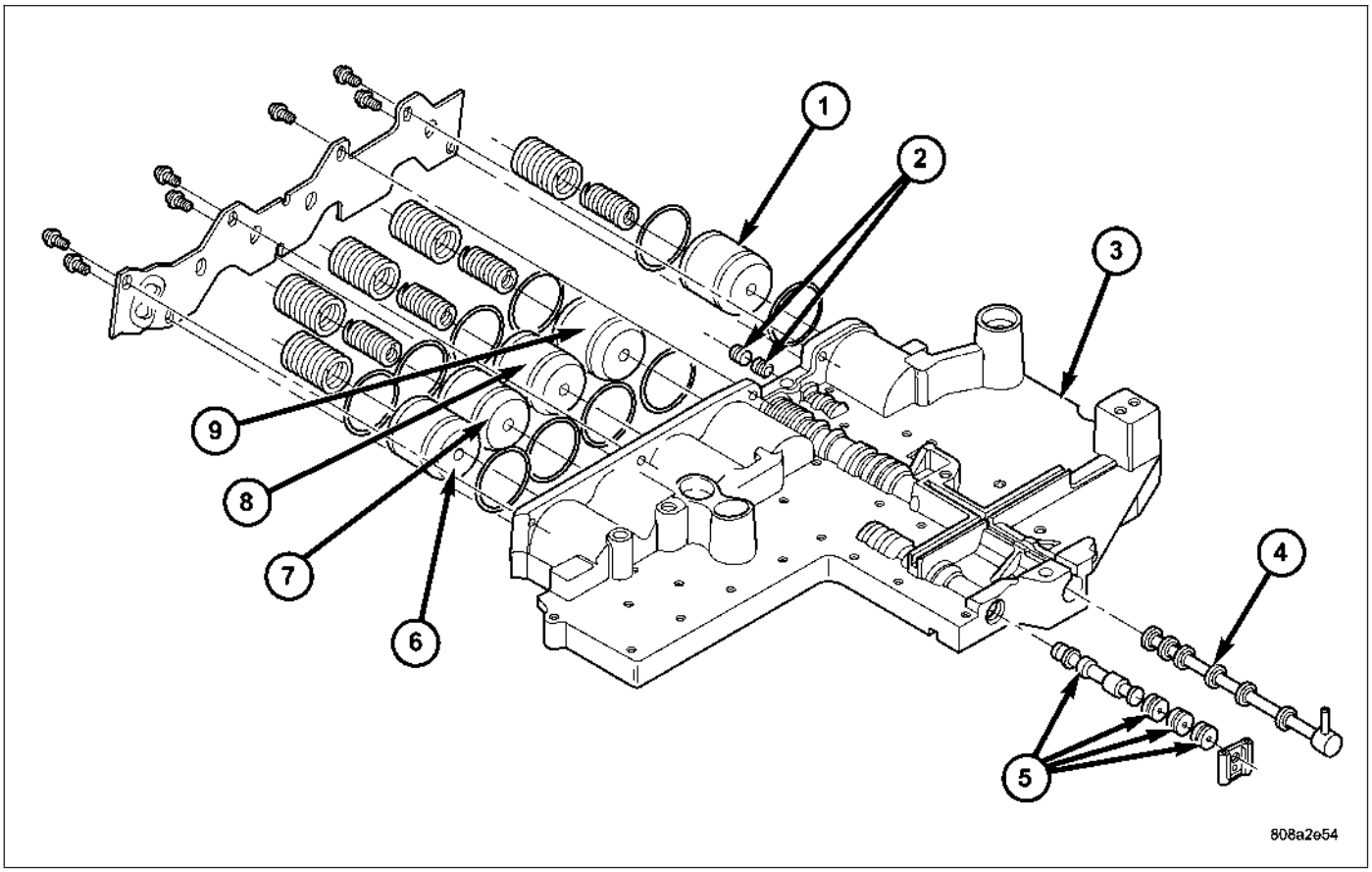
DISASSEMBLY

1. Remove the bolts (1) holding the solenoid and pressure switch assembly to the valve body. Do not remove the screws on the top of the solenoid and pressure switch assembly.
2. Separate the solenoid and pressure switch assembly from the valve body.



3. Remove the screw holding the detent spring (2) onto the valve body.
4. Remove the detent spring (2) from the valve body.
5. Remove the TRS selector plate (1) from the valve body and the manual valve.
6. Remove the clutch passage seals (3) from the valve body, if necessary.





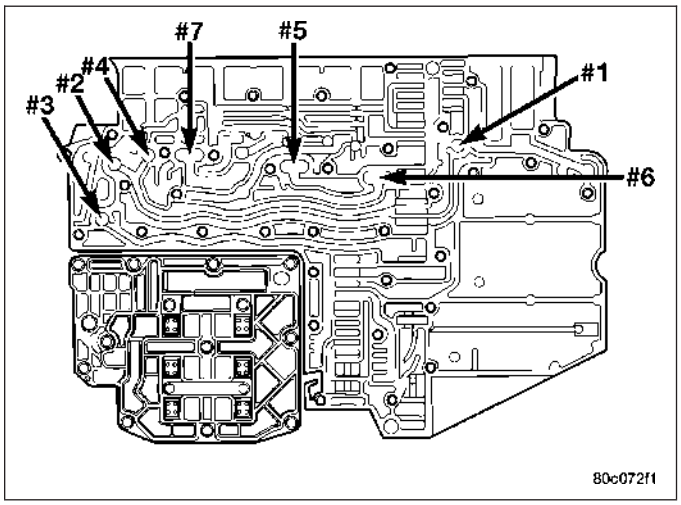
Valve Body Components

1 - LOW/REVERSE ACCUMULATOR
2 - LOW/REVERSE SWITCH VALVE
3 - UPPER VALVE BODY
4 - MANUAL VALVE
5 - SOLENOID SWITCH VALVE
6 - OVERDRIVE ACCUMULATOR
7 - UNDERDRIVE ACCUMULATOR
8 - 4C ACCUMULATOR
9 - 2C ACCUMULATOR

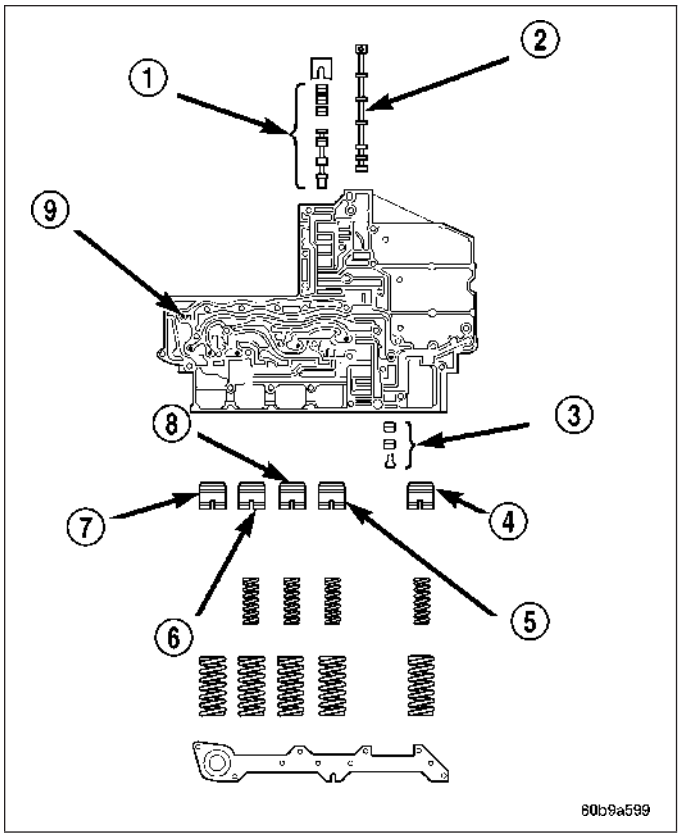
7. Remove the screws holding the accumulator cover onto the valve body.
8. Remove the accumulator springs and pistons (1, 6-9) from the valve body. Note which accumulator piston and spring belong in each location.
9. Place the valve body on the bench with the transfer plate upward.

NOTE: The valve body contains seven check balls. The transfer plate must be placed upward to prevent losing the check balls when the transfer plate is removed from the valve body.

10. Remove the screws holding the valve body to the valve body transfer plate.
11. Remove the transfer plate from the valve body. Note the location of all check balls.
12. Remove the check balls from the valve body.



13. Remove the retainers securing the solenoid switch valve (1), manual valve (2), and the low/reverse switch valve (3) from the valve body and remove the associated valve and spring. Tag each valve and spring combination with location information to aid in assembly.

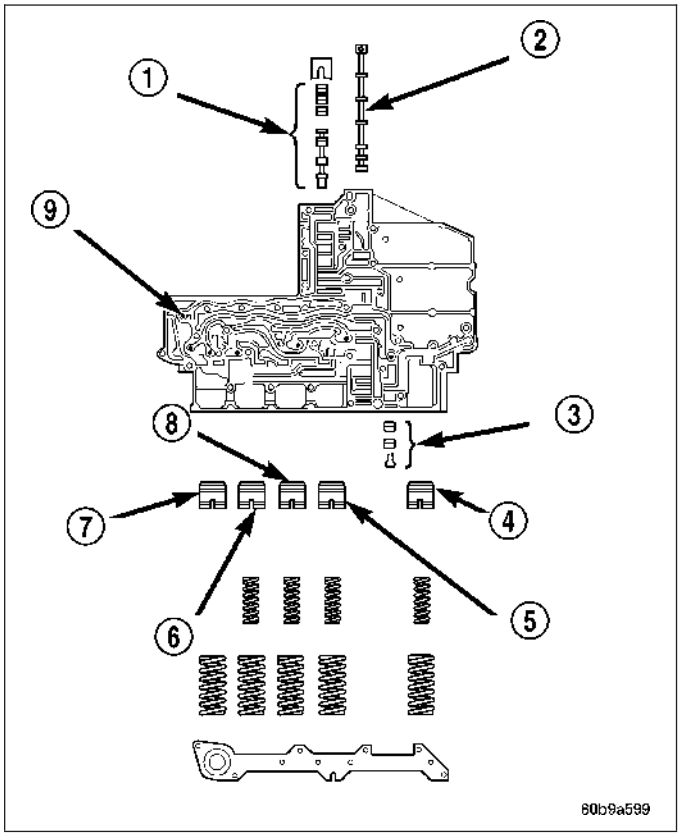


CLEANING

Clean the valve housings, valves, plugs, springs, and separator plates with a standard parts cleaning solution only. Do not use gasoline, kerosene, or any type of caustic solution.

Do not immerse any of the electrical components in cleaning solution. Clean the electrical components by wiping them off with dry shop towels only.

Dry all except the electrical parts with compressed air. Make sure all passages are clean and free from obstructions. **Do not use rags or shop towels to dry or wipe off valve body components. Lint from these materials can stick to valve body parts, interfere with valve operation, and clog filters and fluid passages.**



INSPECTION

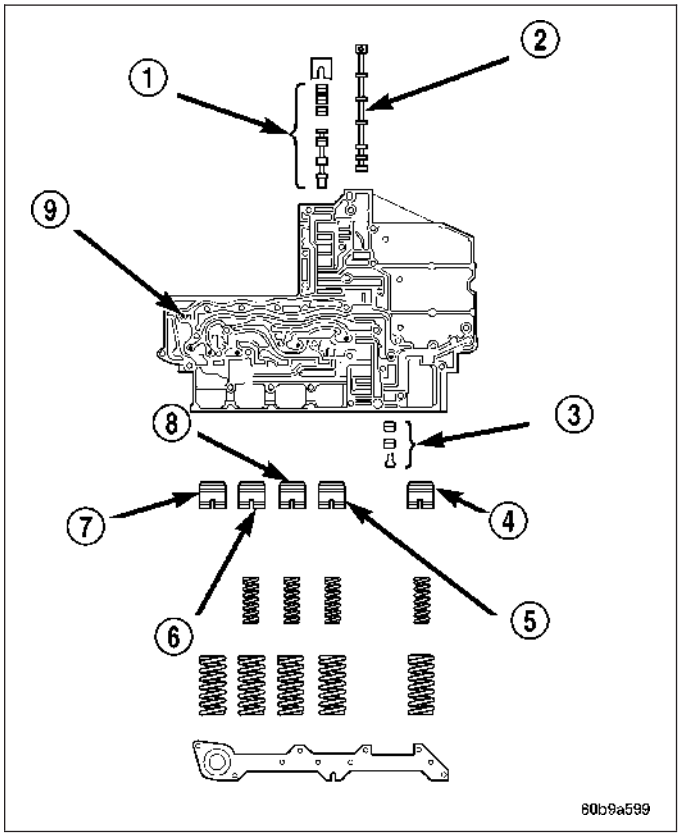
Inspect all of the valve body mating surfaces for scratches, nicks, burrs, or distortion. Use a straight-edge to check surface flatness. Minor scratches may be removed with crocus cloth using only very light pressure.

Minor distortion of a valve body mating surface may be corrected by smoothing the surface with a sheet of crocus cloth. Position the crocus cloth on a surface plate, sheet of plate glass or equally flat surface. If distortion is severe or any surfaces are heavily scored, the valve body will have to be replaced.

Inspect the valves and plugs for scratches, burrs, nicks, or scores. Minor surface scratches on steel valves and plugs can be removed with crocus cloth but **do not round off the edges of the valve or plug lands.** Maintaining sharpness of these edges is vitally important. The edges prevent foreign matter from lodging between the valves and plugs and the bore.

Inspect all the valve and plug bores in the valve body. Use a penlight to view the bore interiors. Replace the valve body if any bores are distorted or scored. Inspect all of the valve body springs. The springs must be free of distortion, warpage or broken coils.

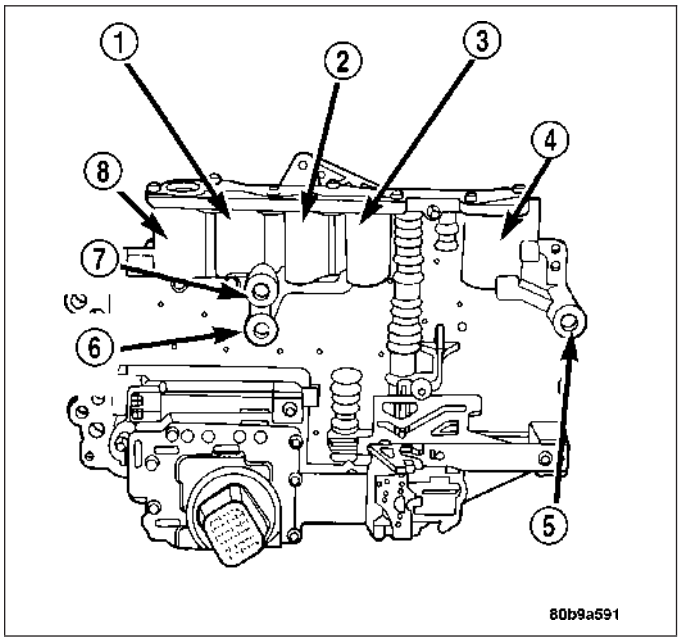
Trial fit each valve and plug in its bore to check freedom of operation. When clean and dry, the valves and plugs should drop freely into the bores.



Valve body bores do not change dimensionally with use. If the valve body functioned correctly when new, it will continue to operate properly after cleaning and inspection. It should not be necessary to replace a valve body assembly unless it is damaged in handling.

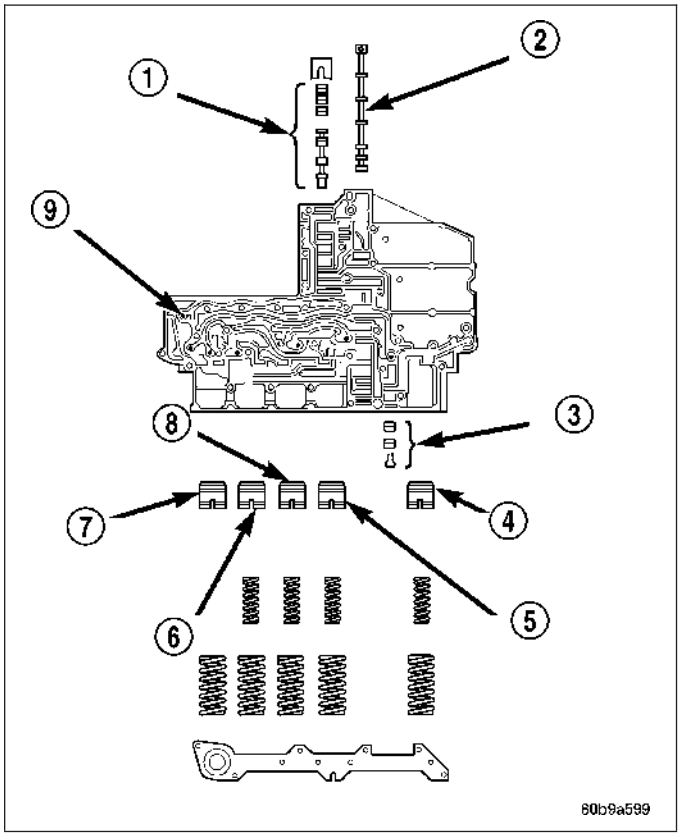
Inspect all the accumulator bores in the valve body. Use a penlight to view the bore interiors. Replace the valve body if any bores are distorted or scored. Inspect all of the accumulator springs. The springs must be free of distortion, warpage or broken coils.

Inspect all the fluid seals on the valve body. Replace any seals that are cracked, distorted, or damaged in any way. These seals pass fluid pressure directly to the clutches. Any pressure leak at these points, may cause transmission performance problems.

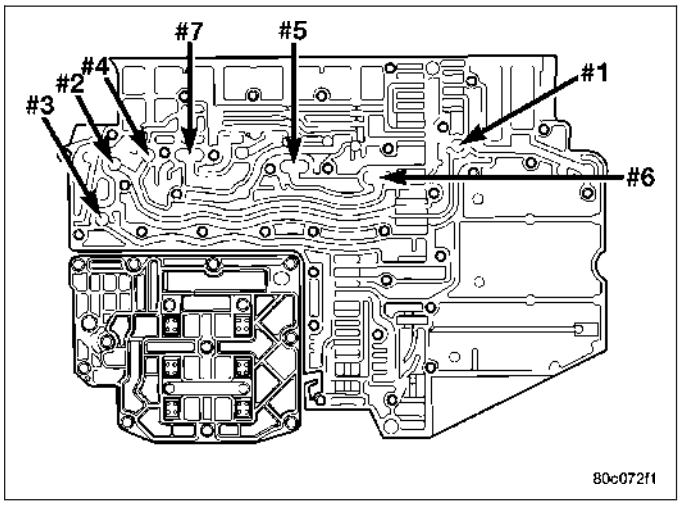


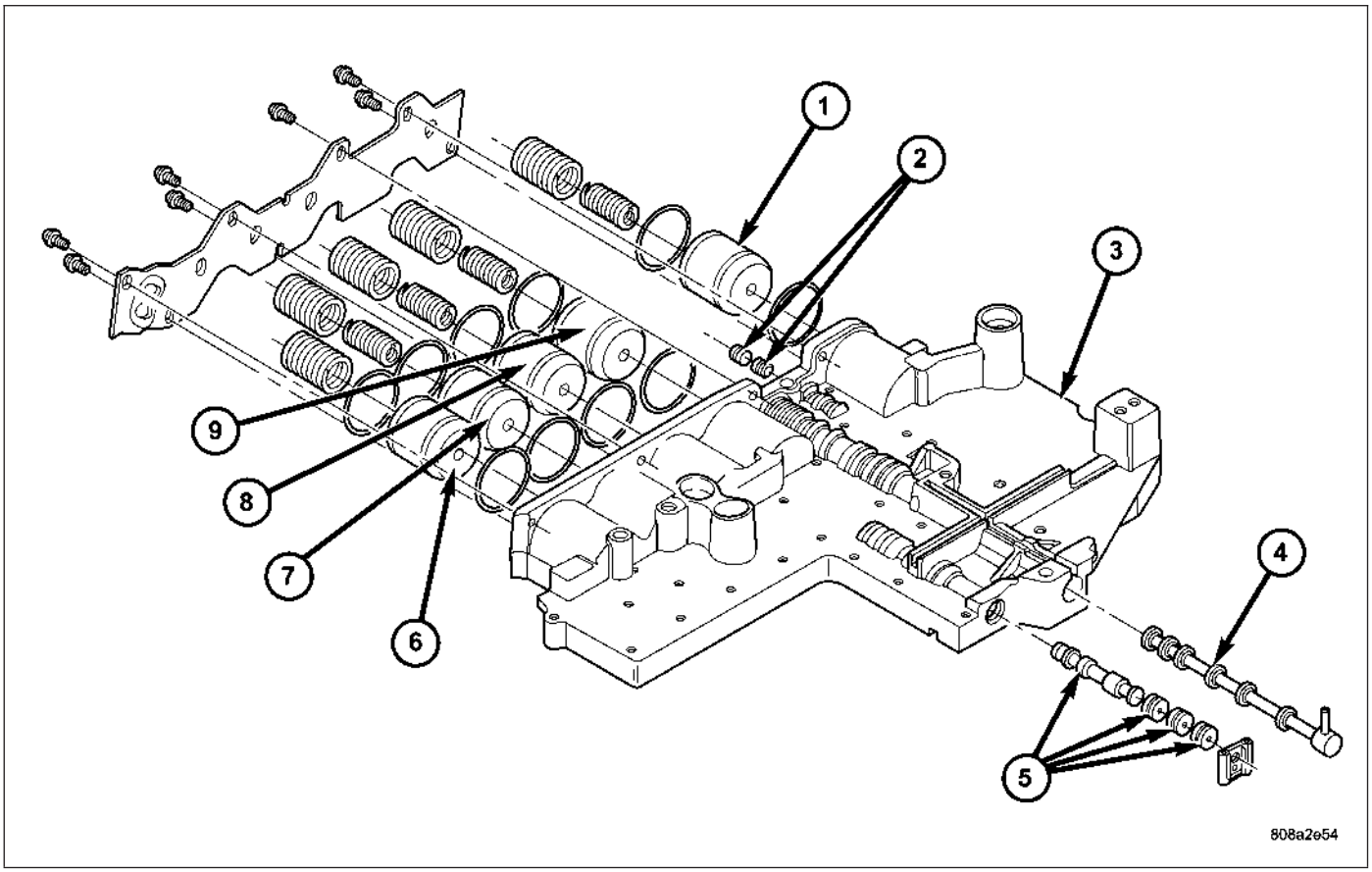
ASSEMBLY

1. Lubricate valves, springs, and the housing valve bores with clean transmission fluid.
2. Install solenoid switch valve (1), manual valve (2), and the low/reverse switch valve (3) into the valve body.
3. Install the retainers to hold each valve into the valve body.



4. Install the valve body check balls into their proper locations.
5. Position the transfer plate onto the valve body.
6. Install the screws to hold the transfer plate to the valve body. Tighten the screws to 5.6 N·m (50 in. lbs.).



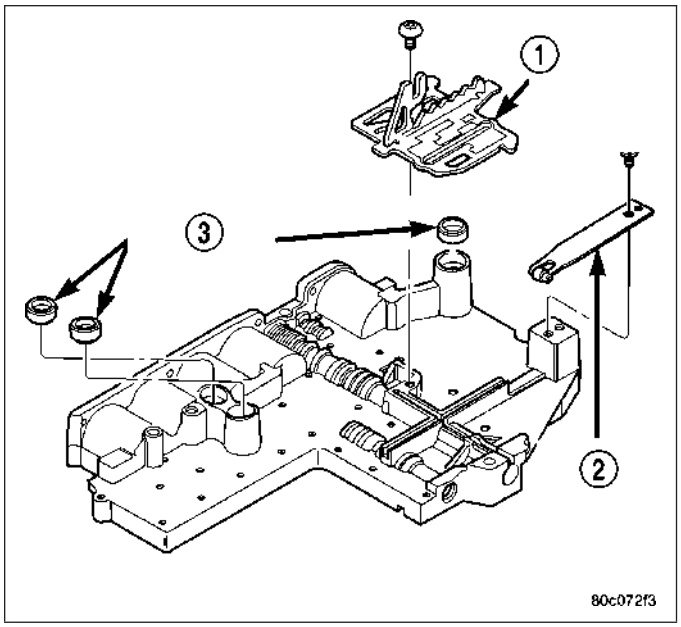


Valve Body Components

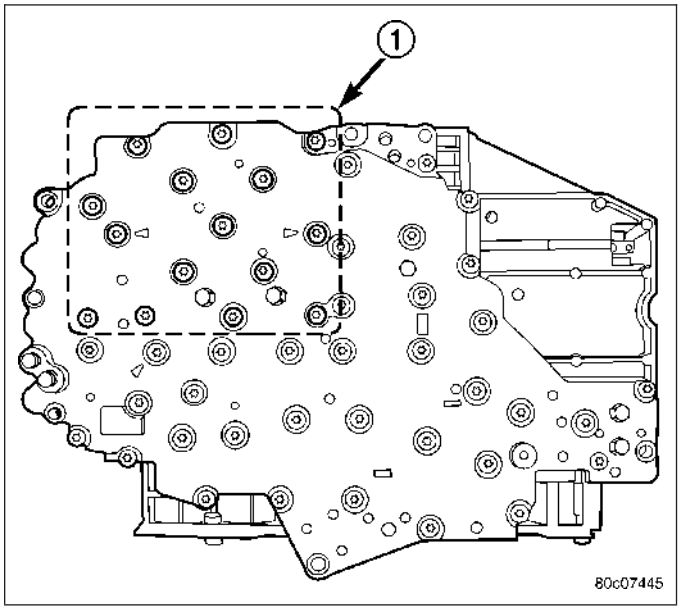
1 - LOW/REVERSE ACCUMULATOR
2 - LOW/REVERSE SWITCH VALVE
3 - UPPER VALVE BODY
4 - MANUAL VALVE
5 - SOLENOID SWITCH VALVE
6 - OVERDRIVE ACCUMULATOR
7 - UNDERDRIVE ACCUMULATOR
8 - 4C ACCUMULATOR
9 - 2C ACCUMULATOR

7. Install the accumulator pistons (1, 6-9) and springs into the valve body in the location from which they were removed. Note that all accumulators except the overdrive have two springs. The overdrive accumulator piston (6) has only one spring.
8. Position the accumulator cover onto the valve body.
9. Install the screws to hold the accumulator cover onto the valve body. Tighten the screws to 7 N·m (60 in. lbs.).

10. Install the TRS selector plate (1) onto the valve body and the manual valve.
11. Position the detent spring (2) onto the valve body.
12. Install the screw to hold the detent spring (2) onto the valve body. Tighten the screw to 4.5 N·m (40 in. lbs.).
13. Install new clutch passage seals (3) onto the valve body, if necessary.

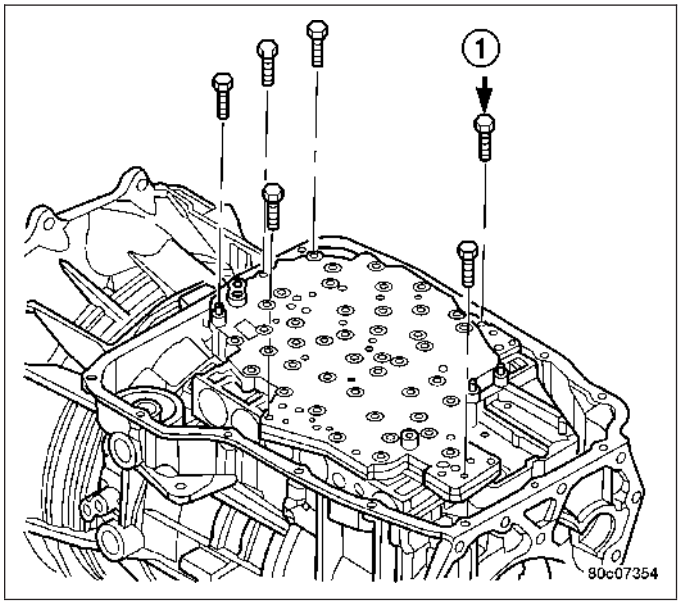


14. Install the solenoid and pressure switch assembly onto the valve body.
15. Install the bolts (1) to hold the solenoid and pressure switch assembly onto the valve body. Tighten the bolts to 5.7 N·m (50 in. lbs.). Tighten the bolts adjacent to the arrows cast into the bottom of the transfer plate first.



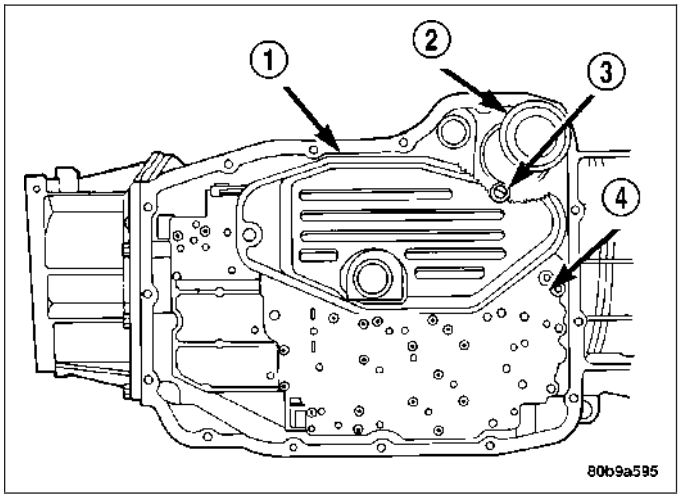
INSTALLATION

1. Check condition of seals on valve body and the solenoid and pressure switch assembly. Replace seals if cut or worn.
2. Place TRS selector plate in the PARK position.
3. Place the transmission in the PARK position.
4. Lubricate seal on the solenoid and pressure switch assembly connector with petroleum jelly.
5. Position valve body in transmission and align the manual lever on the valve body to the pin on the transmission manual shift lever.
6. Seat valve body in case and install one or two bolts to hold valve body in place.
7. Tighten valve body bolts alternately and evenly to 12 N·m (105 in. lbs.) torque.



CAUTION: The primary oil filter seal MUST be fully installed flush against the oil pump body. DO NOT install the seal onto the filter neck and attempt to install the filter and seal as an assembly. Damage to the transmission will result.

8. Install a new primary oil filter seal in the oil pump inlet bore. Seat the seal in the bore with the butt end of a hammer, or other suitable tool.
9. Place replacement filter (1) in position on valve body and into the oil pump.
10. Install screw to hold filter to valve body. Tighten screw to 4.5 N·m (40 in. lbs.) torque.
11. Connect the solenoid and pressure switch assembly connector.



12. Install oil pan. Tighten pan bolts to 12 N·m (105 in. lbs.) torque.
13. Lower vehicle and fill transmission with Mopar® ATF +4.
14. Check and adjust gearshift cable, if necessary.

TRANSFER CASE - ELECTRICAL DIAGNOSTICS

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TRANSFER CASE - ELECTRICAL DIAGNOSTICS

DIAGNOSIS AND TESTING

TRANSFER CASE VERIFICATION TEST VER 1

Diagnostic Test

1. TRANSFER CASE VERIFICATION TEST— VER 1

Disconnect all jumper wires and reconnect all previously disconnected components and connectors.

With the scan tool, select Clear Stored DTCs.

Make sure that all accessories are turned off and that the battery is fully charged.

Test drive the vehicle in each Transfer Case range and verify proper operation in each range.

NOTE: To select or deselect 2WD, AWD or 4HI mode, vehicle speed must be below 55 M.P.H. (88 KM/H) with all wheels at vehicle speed.

NOTE: Shifts will not take place with a wheel speed difference of greater than 13 M.P.H. between the front and rear wheels.

NOTE: To select or deselect 4LO (if equipped), vehicle speed must be below 3 M.P.H. (5 KM/H) with the ignition ON and the transmission in neutral (auto trans) or the clutch pedal pressed (man trans).

NOTE: To select or deselect Transfer Case Neutral, vehicle speed must be 0 M.P.H. with the ignition ON, engine OFF, the brake pedal applied, and the transmission in neutral (auto trans) or the clutch pedal pressed (man trans). Press the Neutral button (if equipped) on the Transfer Case Selector Switch until the Neutral Indicator is illuminated.

WARNING: Apply the parking brake. The vehicle may roll with the Transfer Case in neutral.

NOTE: To verify that the Transfer Case is in Neutral, shift the automatic transmission into reverse and release the brake pedal for three seconds or shift the manual transmission into gear and slowly release the clutch pedal. There should be no vehicle movement if the Transfer Case is in Neutral.

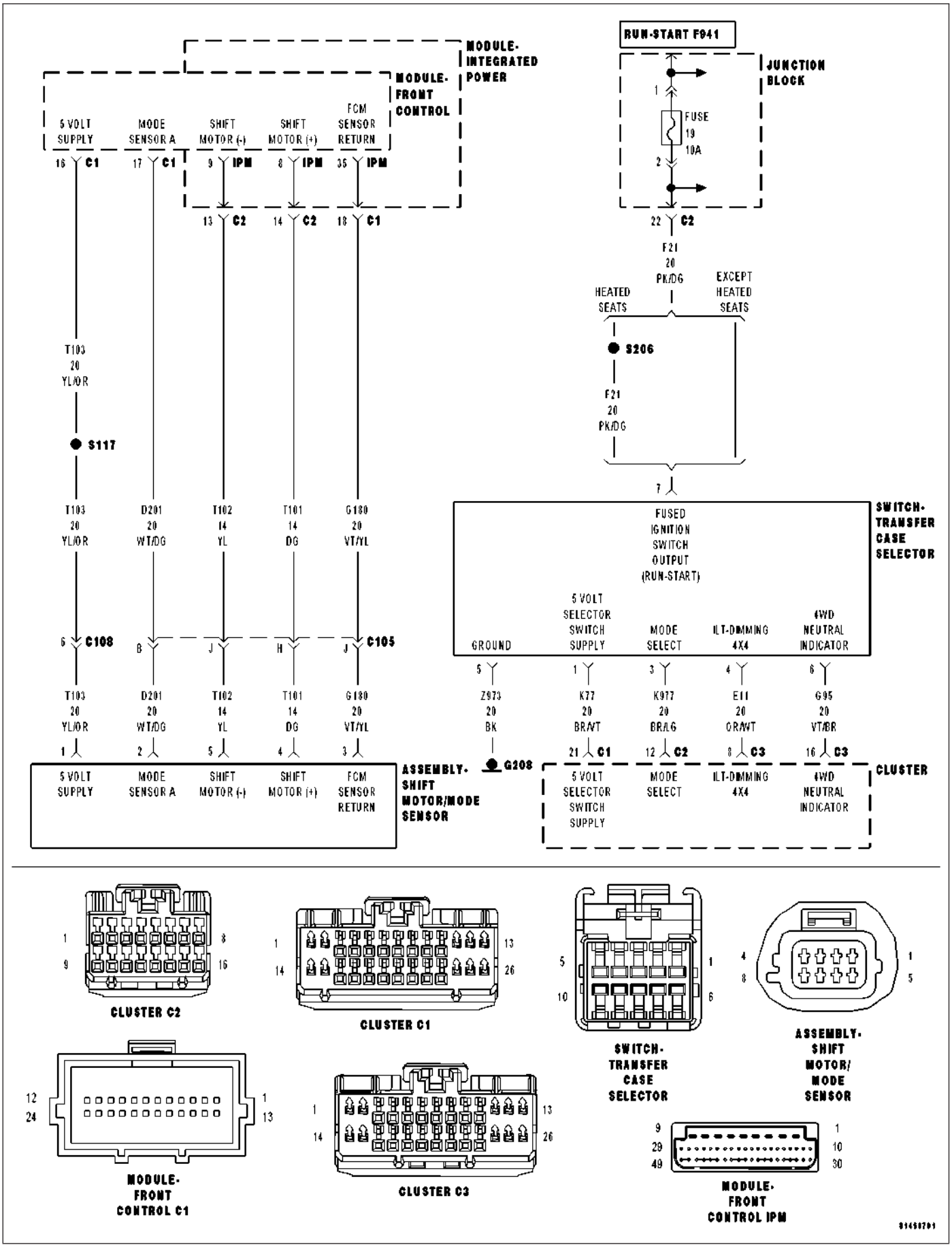
With the scan tool, select View DTCs in the Front Control Module (FCM) and in the Cluster (CCN).

Are there any DTCs present in the Front Control Module (FCM) or in the Cluster (CCN)?

Yes >> Return to the symptom list and perform the appropriate diagnostic test.

No >> Repair is complete.

C1401- TRANSFER CASE RANGE SELECT SWITCH CIRCUIT LOW



C1401- TRANSFER CASE RANGE SELECT SWITCH CIRCUIT LOW (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  Transfer Case Range Select Switch voltage less than 0.1568 volts for 5 seconds

Possible Causes
INTERMITTENT CONDITION
(K77) 5 VOLT SELECTOR SWITCH SUPPLY CIRCUIT OPEN
(K77) 5 VOLT SELECTOR SWITCH SUPPLY CIRCUIT SHORTED TO GROUND
(K977) MODE SELECT CIRCUIT OPEN
(K977) MODE SELECT CIRCUIT SHORT TO GROUND
TRANSFER CASE SELECTOR SWITCH
INSTRUMENT CLUSTER

Diagnostic Test

1. TCASE (DTCM) SWITCH VOLTAGE LESS THAN 0.2 VOLTS

Ignition on, engine not running.
With the scan tool under Data Display, read the TCASE (DTCM) Switch voltage.

Is the voltage less than 0.2 volts?

Yes >> Go To 2
No >> Go To 9

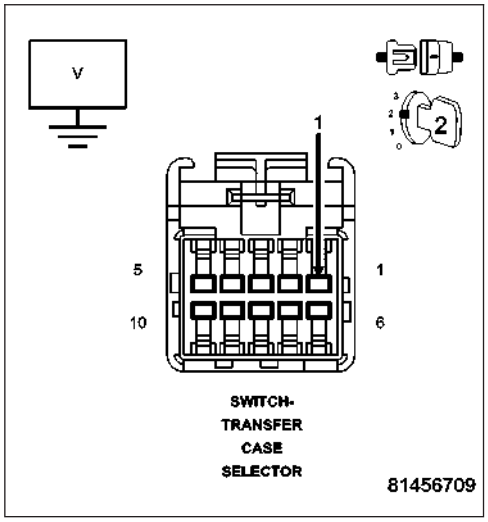
---

2. (K77) 5 VOLT SELECTOR SWITCH SUPPLY CIRCUIT VOLTAGE LESS THAN 0.2 VOLTS

Turn the ignition off.
Disconnect the Transfer Case Selector Switch connector.
Turn the ignition on.
Measure the voltage of the (K77) 5 Volt Selector Switch Supply circuit.

Is the voltage less than 0.2 volts?

Yes >> Go To 3
No >> Go To 5



C1401- TRANSFER CASE RANGE SELECT SWITCH CIRCUIT LOW (CONTINUED)

3. (K77) 5 VOLT SELECTOR SWITCH SUPPLY CIRCUIT OPEN

Turn the ignition off.

Disconnect the Instrument Cluster C1 connector.

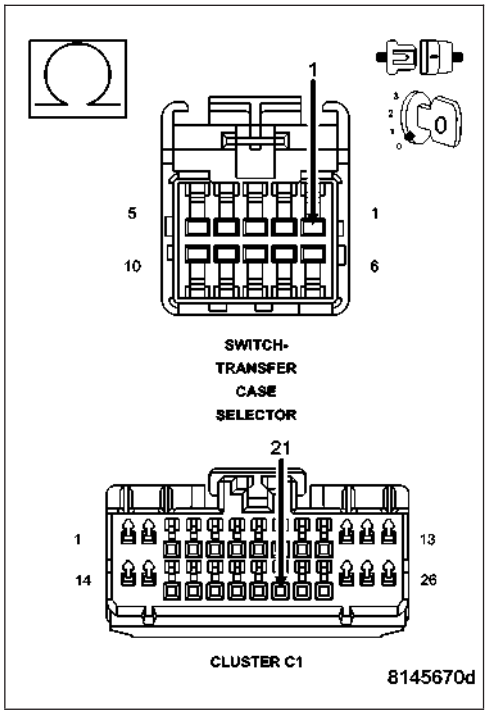
Measure the resistance of the (K77) 5 Volt Selector Switch Supply circuit.

Is the resistance greater than 5.0 ohms?

Yes >> Repair the (K77) 5 Volt Selector Switch Supply circuit for an open.

Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go To 4



4. (K77) 5 VOLT SELECTOR SWITCH SUPPLY CIRCUIT SHORTED TO GROUND

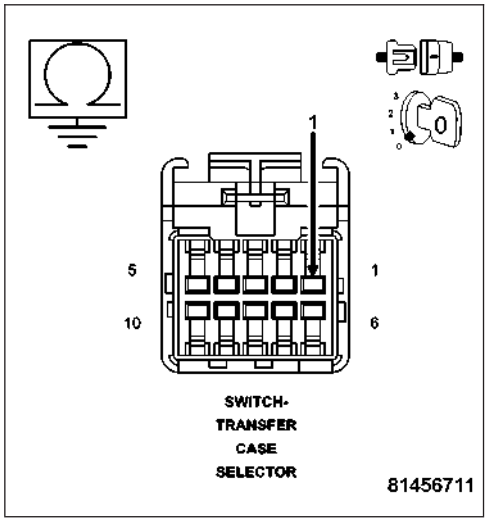
Measure the resistance between the (K77) 5 Volt Selector Switch Supply circuit and ground.

Is the resistance less than 5.0 ohms?

Yes >> Repair the (K77) 5 Volt Selector Switch Supply circuit for a short to ground.

Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go To 8



C1401- TRANSFER CASE RANGE SELECT SWITCH CIRCUIT LOW (CONTINUED)

5. TRANSFER CASE SELECTOR SWITCH

Turn the ignition off.

Connect a jumper wire between the 5 Volt Selector Switch Supply circuit and the Mode Select circuit in the Transfer Case Selector Switch connector.

Ignition on, engine not running.

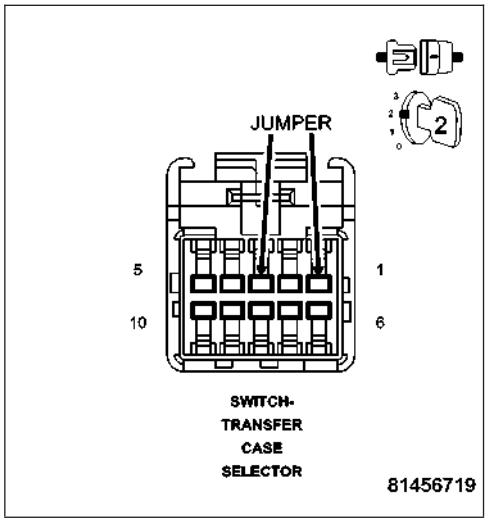
With the scan tool in Data Display, read the Range Switch voltage.

The switch voltage should be approximately 5 volts.

Does the voltage display as described?

Yes >> Replace the Transfer Case Selector Switch.
Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go To 6



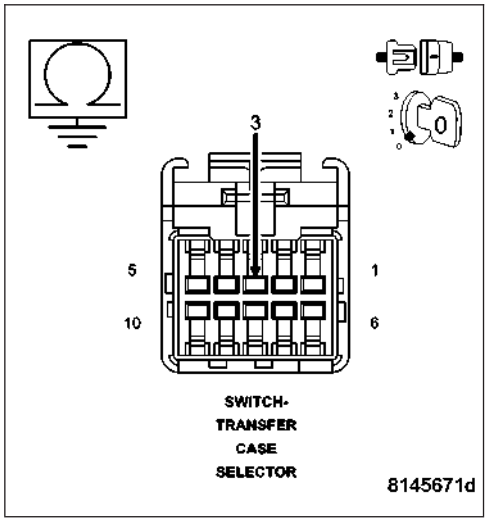
6. (K977) MODE SELECT CIRCUIT SHORT TO GROUND

Measure the resistance between the (K977) Mode Select circuit and ground.

Is the resistance less than 5.0 ohms?

Yes >> Repair the (K977) Mode Select circuit for a short to ground.
Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

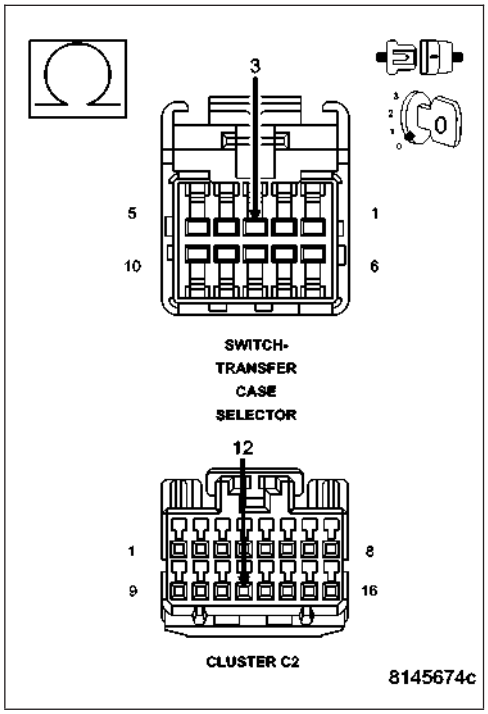
No >> Go To 7



C1401- TRANSFER CASE RANGE SELECT SWITCH CIRCUIT LOW (CONTINUED)

7. (K977) MODE SELECT CIRCUIT OPEN

Measure the resistance of the (K977) Mode Select circuit.



Is the resistance above 5.0 ohms?

Yes >> Repair the (K977) Mode Select circuit for an open.
Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go To 8

---

8. INSTRUMENT CLUSTER

View repair.

Repair

Replace the Instrument Cluster in accordance with the Service Information.

Perform the BODY VERIFICATION TEST-VER 1 (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) and TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

---

9. INTERMITTENT WIRING AND CONNECTORS

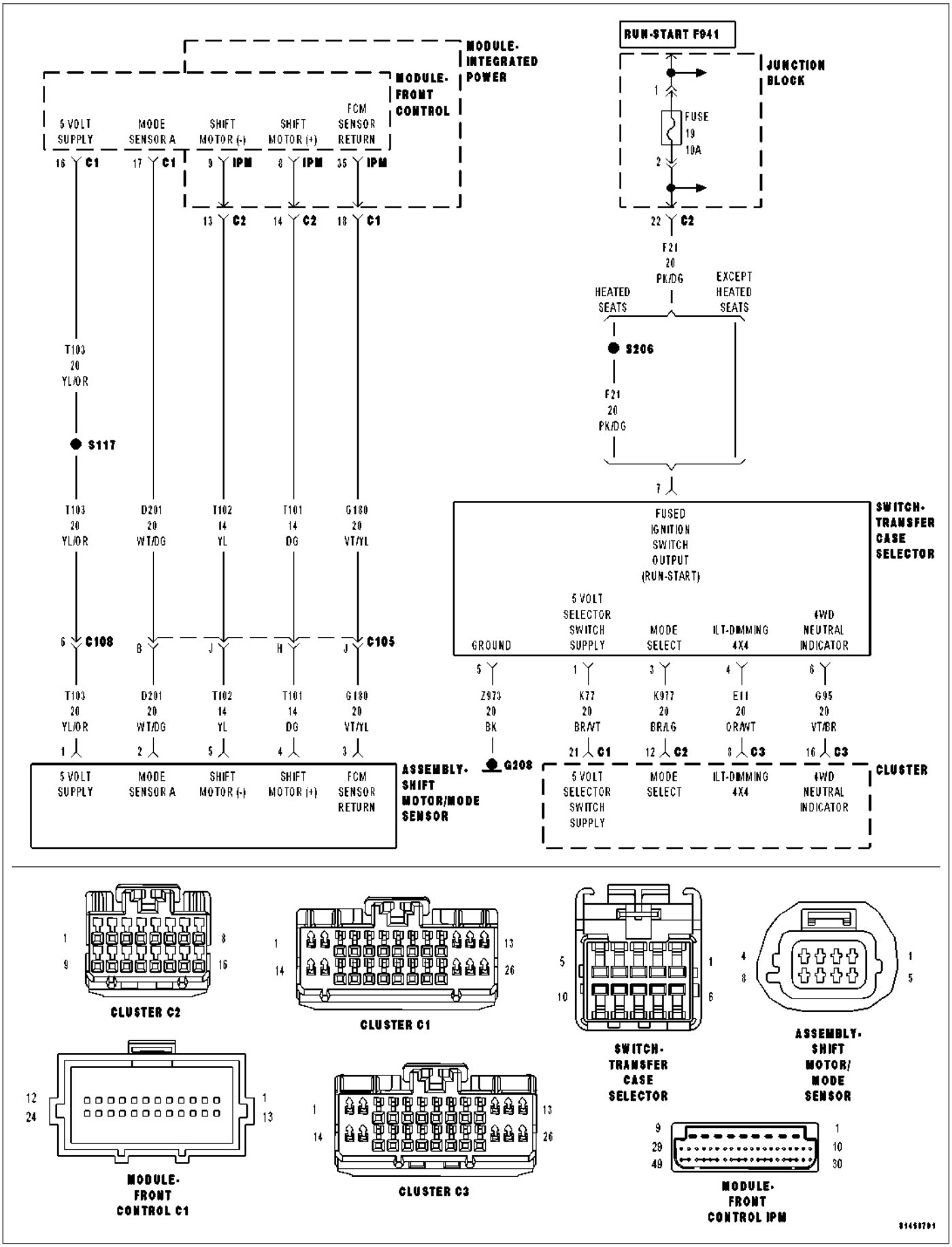
The conditions necessary to set this DTC are not present at this time.
Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
While monitoring the scan tool data relative to this circuit, wiggle test the wiring and connectors.
Look for the data to change or for the DTC to reset during the wiggle test.

Were any problems found?

Yes >> Repair as necessary.
Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Test complete.

C1402- TRANSFER CASE RANGE SELECT SWITCH CIRCUIT HIGH



C1402- TRANSFER CASE RANGE SELECT SWITCH CIRCUIT HIGH (CONTINUED)
For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  Transfer Case Range Select Switch voltage greater than 4.86 volts for 5 seconds

Possible Causes
INTERMITTENT CONDITION
(K77) 5 VOLT SELECTOR SWITCH SUPPLY CIRCUIT SHORTED TO VOLTAGE
(K977) MODE SELECT CIRCUIT SHORTED TO VOLTAGE
(K977) MODE SELECT CIRCUIT OPEN
(Z973) TRANSFER CASE SELECTOR SWITCH GROUND CIRCUIT OPEN
TRANSFER CASE SELECTOR SWITCH
INSTRUMENT CLUSTER

Diagnostic Test

1. TCASE (DTCM) SWITCH VOLTAGE ABOVE 4.8 VOLTS

Ignition on, engine not running.
With the scan tool under Data Display, read the TCASE (DTCM) Switch voltage.

Is the volage above 4.8 volts?

Yes >> Go To 2

No >> Go to 8

---

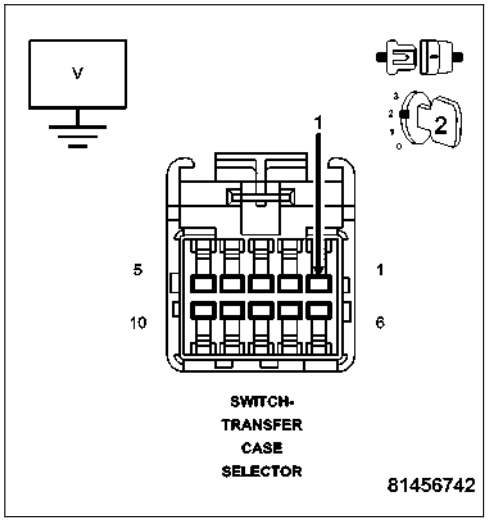
2. (K77) 5 VOLT SELECTOR SWITCH SUPPLY CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.
Disconnect the Transfer Case Selector Switch connector.
Turn the ignition on.
Measure the voltage of the (K77) 5 Volt Selector Switch Supply circuit.

Is the voltage above 5.5 volts?

Yes >> Repair the (K77) 5 Volt Selector Switch Supply circuit for a short to voltage.
Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go to 3



C1402- TRANSFER CASE RANGE SELECT SWITCH CIRCUIT HIGH (CONTINUED)

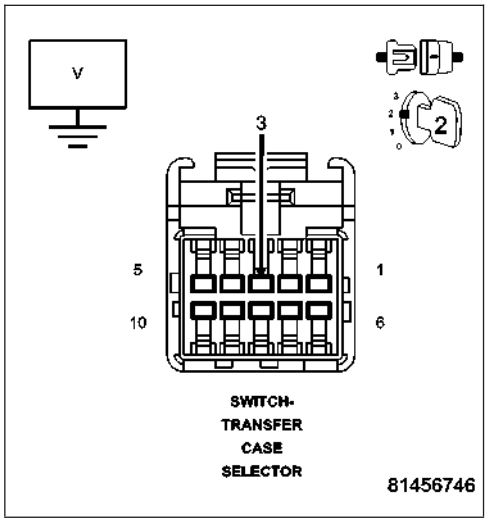
3. (K977) MODE SELECT CIRCUIT SHORTED TO VOLTAGE

Measure the voltage of the (K977) Mode Select circuit.

Is there any voltage present?

Yes >> Repair the (K977) Mode Select circuit for a short to voltage.
Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go to 4



4. TRANSFER CASE SELECTOR SWITCH

With the scan tool under Data Display, read the TCASE (DTCM) Switch voltage.

Is the voltage equal to 0 volts?

Yes >> Replace the Transfer Case Selector Switch.
Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go to 5

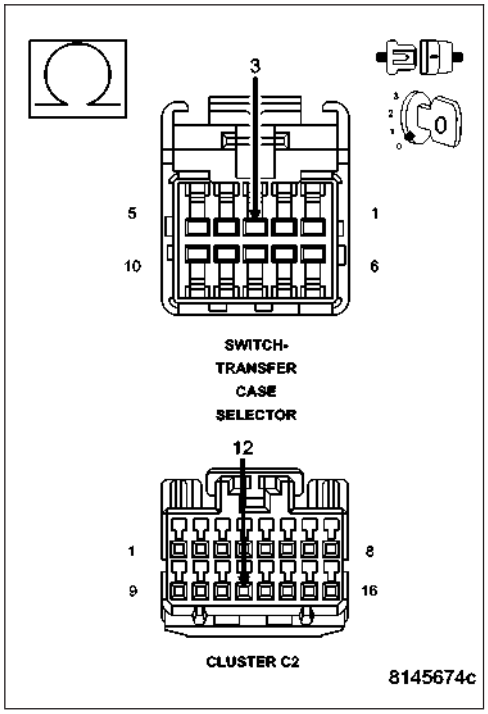
5. (K977) MODE SELECT CIRCUIT OPEN

Turn the ignition off.
Disconnect the Instrument Cluster C2 connector.
Measure the resistance of the (K977) Mode Select circuit.

Is the resistance above 5.0 ohms?

Yes >> Repair the (K977) Mode Select circuit for an open.
Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

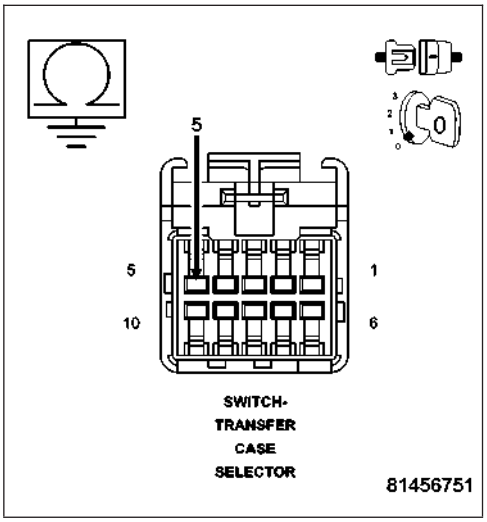
No >> Go To 6



C1402- TRANSFER CASE RANGE SELECT SWITCH CIRCUIT HIGH (CONTINUED)

6. TRANSFER CASE SELECTOR SWITCH (Z973) GROUND CIRCUIT OPEN

Measure the resistance of the Transfer Case Selector Switch (Z973) ground circuit.



Is the resistance above 5.0 ohms?

Yes >> Repair the Transfer Case Selector Switch (Z973) ground circuit for an open.
Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go To 7

---

7. INSTRUMENT CLUSTER

Repair

Replace the Instrument Cluster in accordance with the Service Information.

Perform the BODY VERIFICATION TEST-VER 1 and TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

---

8. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

While monitoring the scan tool data relative to this circuit, wiggle test the wiring and connectors.

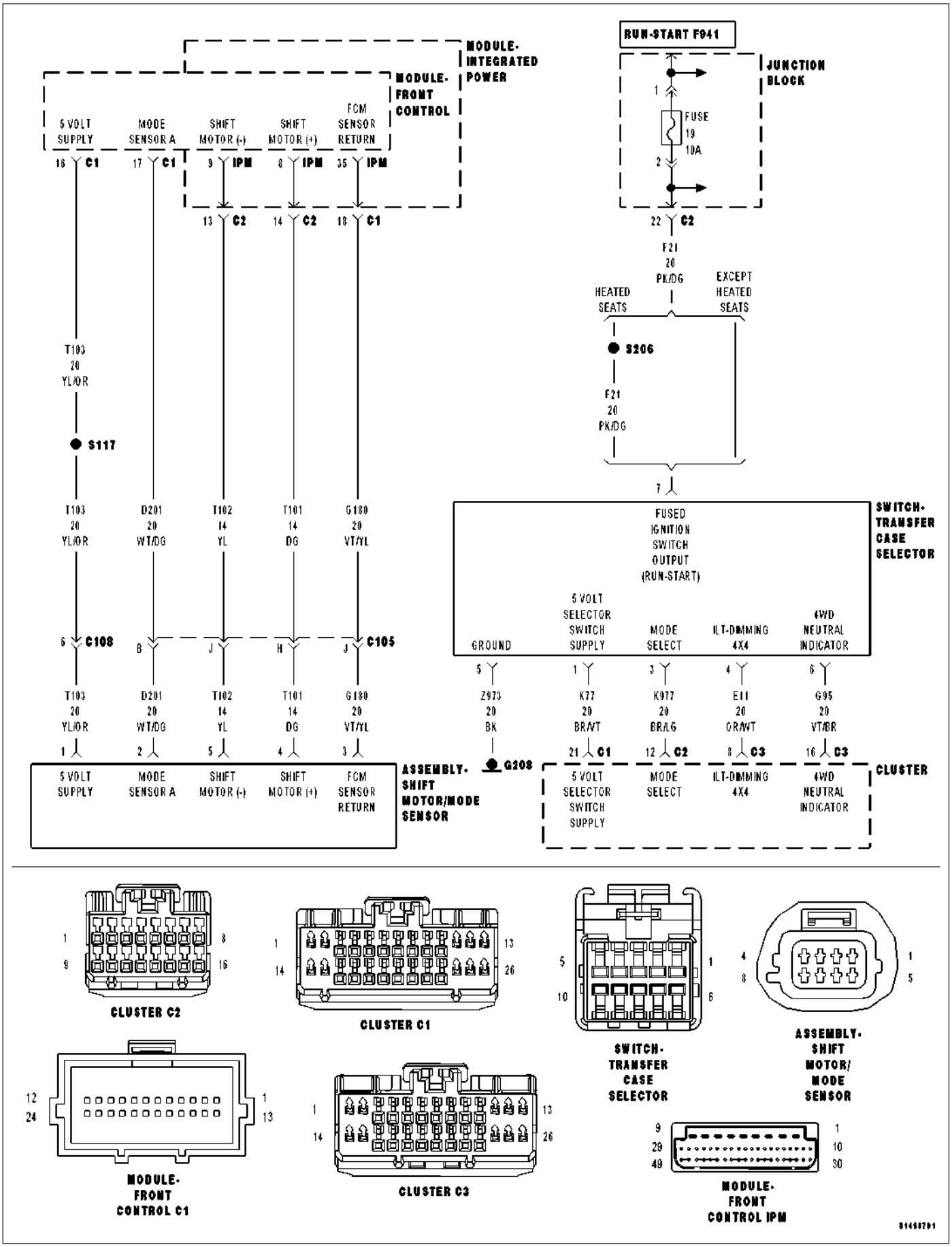
Look for the data to change or for the DTC to reset during the wiggle test.

Were any problems found?

Yes >> Repair as necessary.
Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Test complete.

C1404- TRANSFER CASE RANGE POSITION SENSOR CIRCUIT LOW



C1404- TRANSFER CASE RANGE POSITION SENSOR CIRCUIT LOW (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Ignition on. Battery voltage between 9 and 16 volts.
- **Set Condition:**
  FCM detects a short to ground on the Transfer Case Position Sensor signal circuit for 2 seconds.

Possible Causes
INTERMITTENT CONDITION
(T103) 5 VOLT SUPPLY CIRCUIT OPEN
(T103) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(D201) MODE SENSOR A CIRCUIT SHORTED TO GROUND
SHIFT MOTOR/MODE SENSOR ASSEMBLY
FRONT CONTROL MODULE

Diagnostic Test

1. T-CASE POSITION SENSOR VOLTAGE BELOW 0.2 VOLTS

Ignition on, engine not running.
With the scan tool under Data Display, read the T-Case Position Sensor voltage.

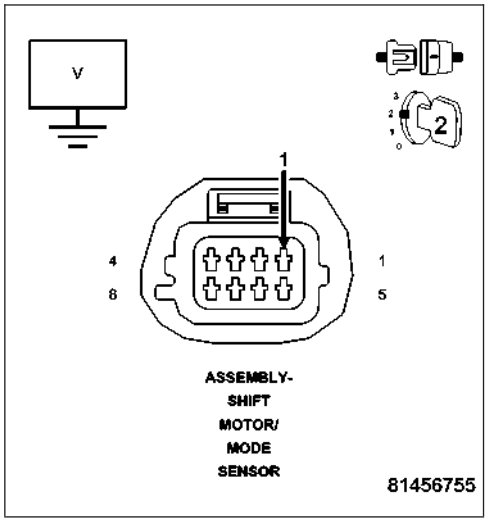
Is the voltage below 0.2 volts?

Yes >> Go to 2
No >> Go to 8

---

2. (T103) 5 VOLT SUPPLY CIRCUIT VOLTAGE BELOW 0.2 VOLTS

Turn the ignition off.
Disconnect the Shift Motor/Mode Sensor connector.
Turn the ignition on.
Measure the voltage of the (T103) 5 Volt Supply circuit.



Is the voltage below 0.2 volts?

Yes >> Go to 3
No >> Go to 5

C1404- TRANSFER CASE RANGE POSITION SENSOR CIRCUIT LOW (CONTINUED)

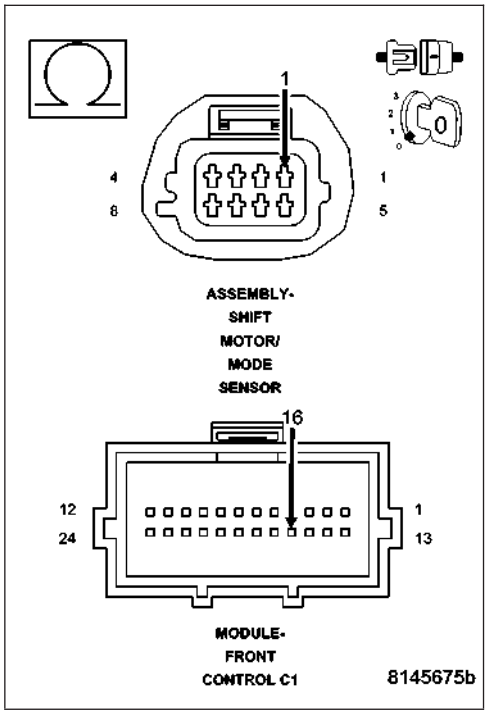
3. (T103) 5 VOLT SUPPLY CIRCUIT OPEN

Turn the ignition off.
Disconnect the Front Control Module C1 connector.
Measure the resistance of the (T103) 5 Volt Supply circuit.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T103) 5 Volt Supply circuit for an open.
Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go to 4



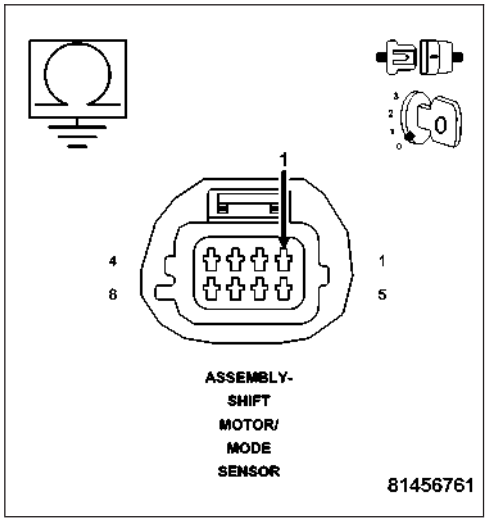
4. (T103) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (T103) 5 Volt Supply circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (T103) 5 Volt Supply circuit for a short to ground.
Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go to 7



C1404- TRANSFER CASE RANGE POSITION SENSOR CIRCUIT LOW (CONTINUED)

5. SHIFT MOTOR/MODE SENSOR ASSEMBLY

With the scan tool under Data Display, read the T-Case Position Sensor voltage.

Is the voltage above 4.5 volts?

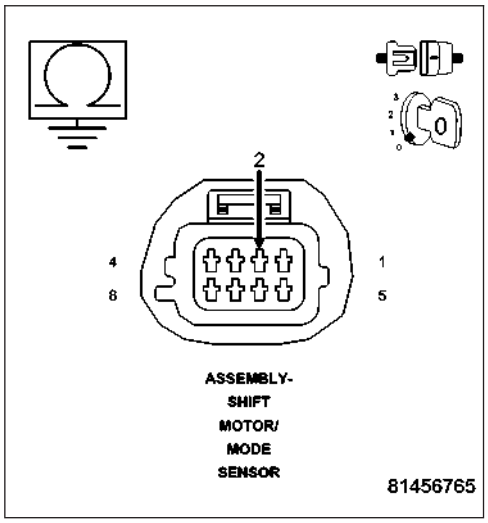
Yes >> Replace the Shift Motor/Mode Sensor Assembly.
Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go to 6

---

6. (D201) MODE SENSOR A CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (D201) Mode Sensor A circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (D201) Mode Sensor A circuit for a short to ground.
Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go to 7

---

7. FRONT CONTROL MODULE

View repair.

Repair

Replace the Front Control Module.
Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

---

8. INTERMITTENT WIRING AND CONNECTORS

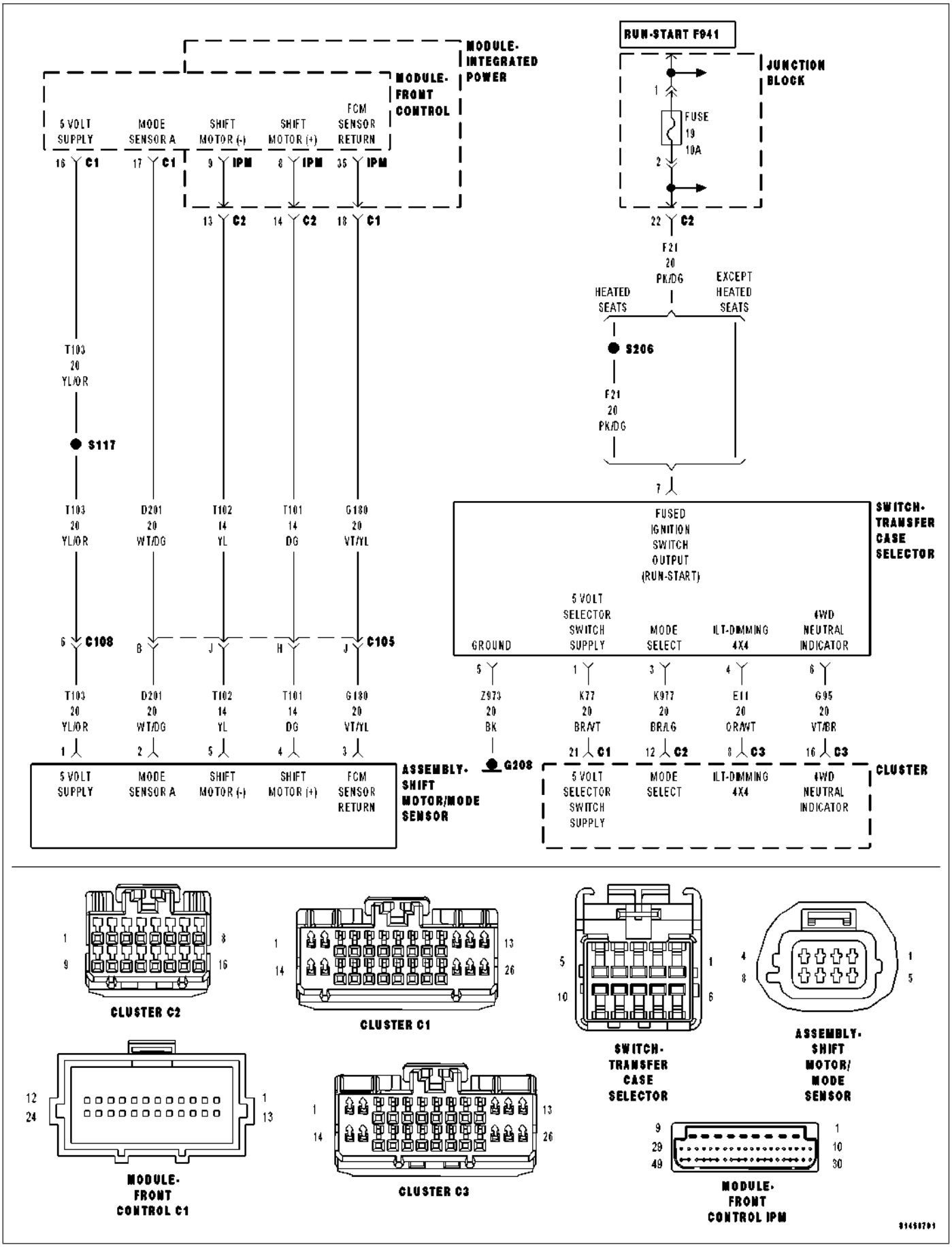
The conditions necessary to set this DTC are not present at this time.
Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
While monitoring the scan tool data relative to this circuit, wiggle test the wiring and connectors.
Look for the data to change or for the DTC to reset during the wiggle test.

Were any problems found?

Yes >> Repair as necessary.
Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Test complete.

C1405- TRANSFER CASE RANGE POSITION SENSOR CIRCUIT HIGH



C1405- TRANSFER CASE RANGE POSITION SENSOR CIRCUIT HIGH (CONTINUED)
For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Ignition on. Battery voltage between 9 and 16 volts
- **Set Condition:**
  FCM detects 5 volts on the Transfer Case Range Position Sensor signal circuit for 2 seconds

Possible Causes
INTERMITTENT CONDITION
(T103) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
(D201) MODE SENSOR A CIRCUIT SHORTED TO VOLTAGE
(D201) MODE SENSOR A CIRCUIT OPEN
(G180) FCM SENSOR RETURN CIRCUIT OPEN
SHIFT MOTOR/MODE SENSOR ASSEMBLY
FRONT CONTROL MODULE

Diagnostic Test

1. T-CASE POSITION SENSOR VOLTAGE ABOVE 4.8 VOLTS

Ignition on, engine not running.
With the scan tool under Data Display, read the T-Case Position Sensor voltage.

Is the voltage above 4.8 volts?

Yes >> Go To 2

No >> Go to 8

---

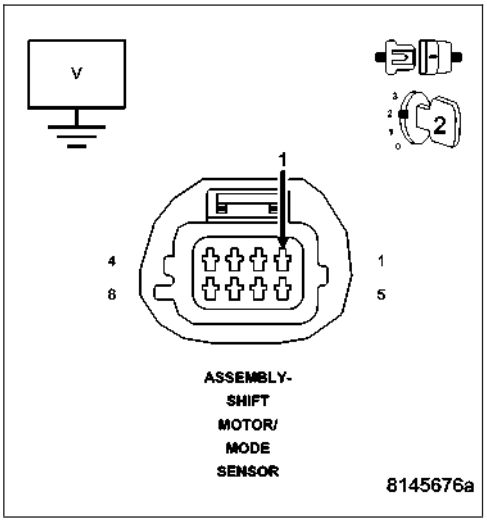
2. (T103) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.
Disconnect the Shift Motor/Mode Sensor connector.
Turn the ignition on.
Measure the voltage of the (T103) 5 Volt Supply circuit.

Is the voltage above 5.5 volts?

Yes >> Repair the (T103) 5 Volt Supply circuit for a short to voltage.
Perform the TRANSFER CASE VERIFICATION TESTVER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

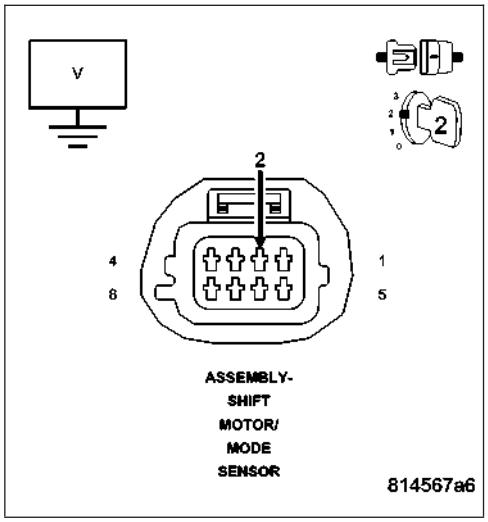
No >> Go to 3



C1405- TRANSFER CASE RANGE POSITION SENSOR CIRCUIT HIGH (CONTINUED)

3. (D201) MODE SENSOR A CIRCUIT SHORTED TO VOLTAGE

Measure the voltage of the (D201) Mode Sensor A circuit.



Is the voltage above 5.5 volts?

Yes >> Repair the (D201) Mode Sensor A circuit for a short to voltage.

Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go to 4

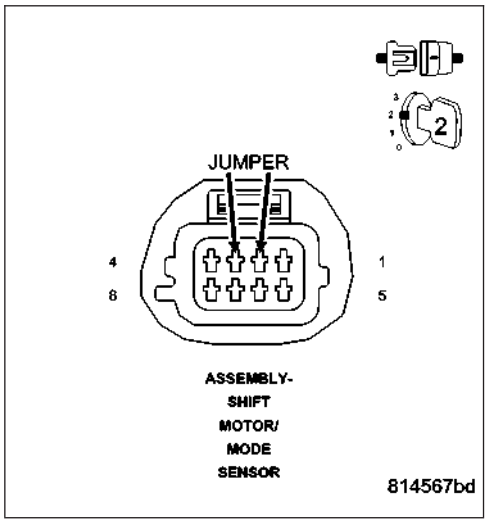
4. SHIFT MOTOR/MODE SENSOR ASSEMBLY

Turn the ignition off.

Connect a jumper wire between the (G180) FCM Sensor Return circuit and the (D201) Mode Sensor A circuit in the Shift Motor/Mode Sensor connector.

Turn the ignition on.

With the scan tool under Data Display, read the T-Case Position Sensor voltage.



NOTE: Remove the jumper wire before continuing.

Is the voltage below 0.2 volts?

Yes >> Replace the Shift Motor/Mode Sensor assembly.

Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go to 5

C1405- TRANSFER CASE RANGE POSITION SENSOR CIRCUIT HIGH (CONTINUED)

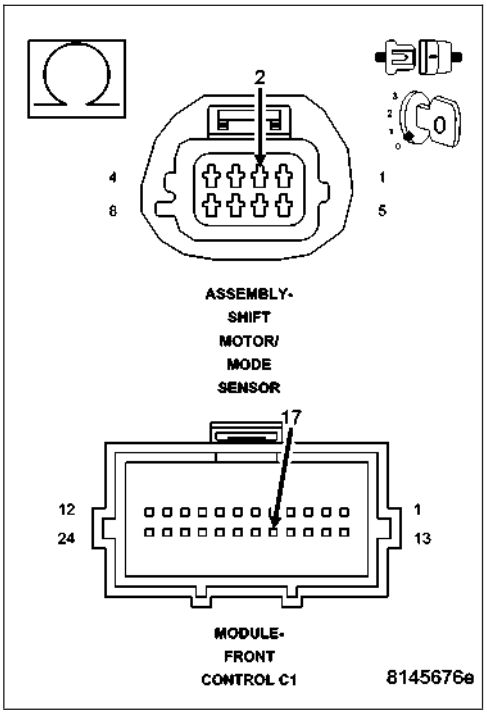
5. (D201) MODE SENSOR A CIRCUIT OPEN

Turn the ignition off.
Disconnect the Front Control Module C1 connector.
Measure the resistance of the (D201) Mode Sensor A circuit.

Is the resistance above 5.0 ohms?

Yes >> Repair the (D201) Mode Sensor A circuit for an open. Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go to 6

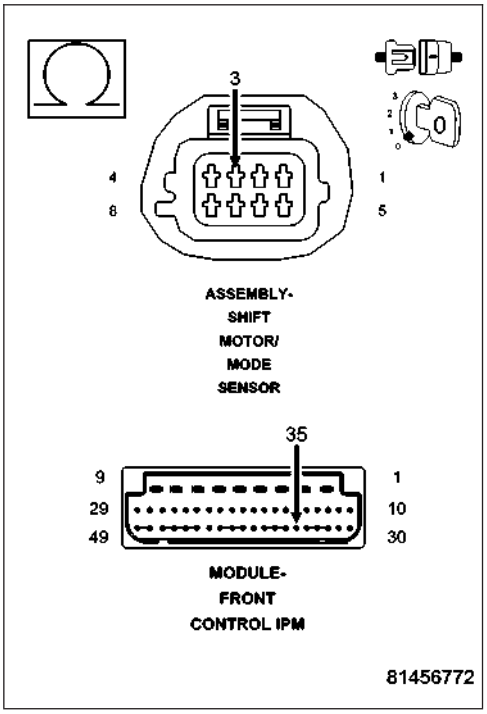


6. (G180) FCM SENSOR RETURN CIRCUIT OPEN

Measure the resistance of the (G180) FCM Sensor Return circuit.

Yes >> Repair the (G180) FCM Sensor Return circuit for an open. Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go to 7



C1405- TRANSFER CASE RANGE POSITION SENSOR CIRCUIT HIGH (CONTINUED)

7. FRONT CONTROL MODULE

View repair.

Repair

Replace the Front Control Module in accordance with the Service information.

Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

---

8. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

While monitoring the scan tool data relative to this circuit, wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

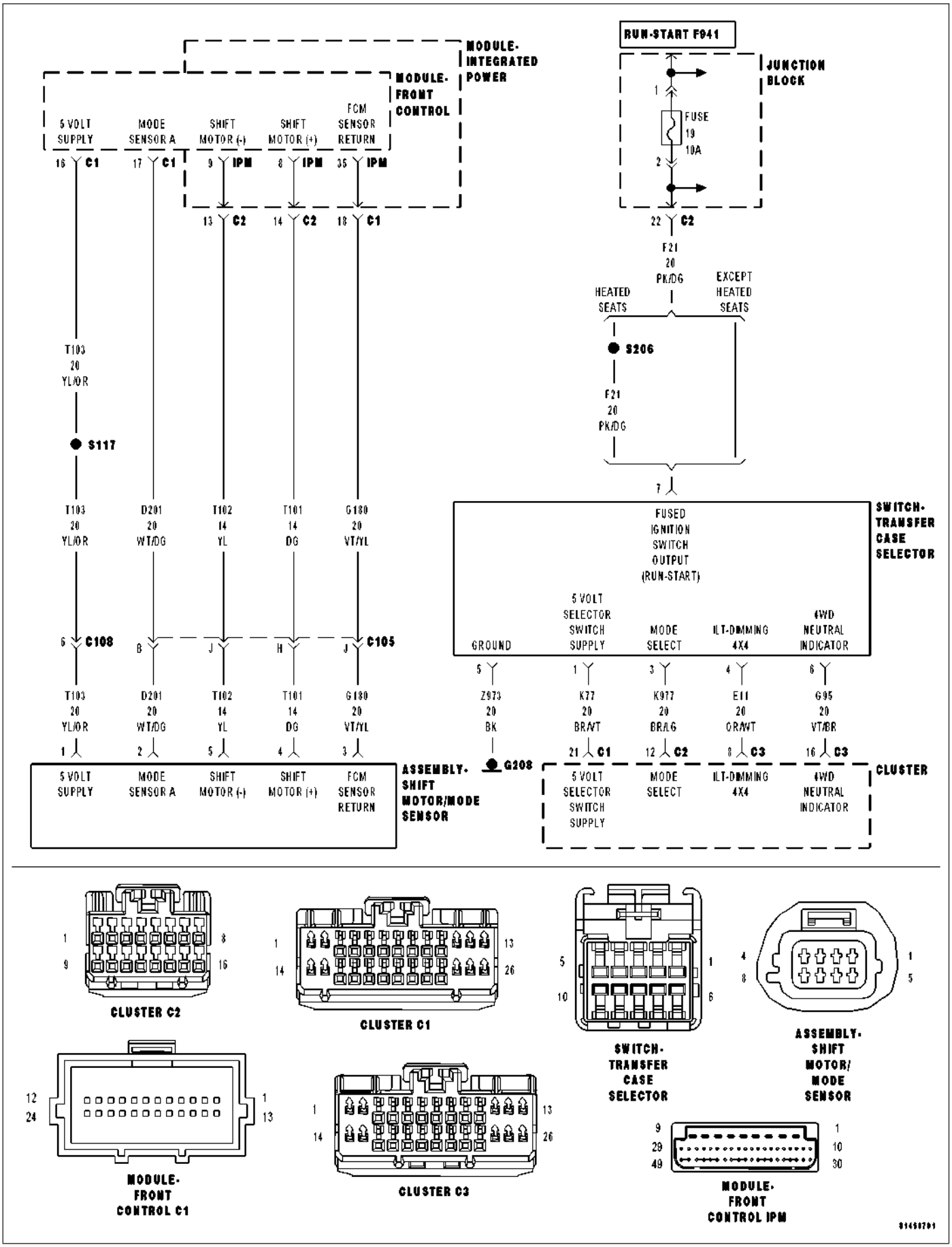
Were any problems found?

Yes >> Repair as necessary.

Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Test complete.

C140B- TRANSFER CASE MOTOR CONTROL CIRCUIT LOW



C140B- TRANSFER CASE MOTOR CONTROL CIRCUIT LOW (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Ignition on. Battery voltage between 9 and 16 volts.
- **Set Condition:**
  FCM detects low voltage on the Transfer Case Motor Control Circuit for 0.5 seconds.

Possible Causes
INTERMITTENT CONDITION
(T101) SHIFT MOTOR + (POS) CIRCUIT OPEN
(T102) SHIFT MOTOR — (NEG) CIRCUIT OPEN
(T101) SHIFT MOTOR + (POS) CIRCUIT SHORTED TO GROUND
(T102) SHIFT MOTOR — (NEG) CIRCUIT SHORTED TO GROUND
(T101) SHIFT MOTOR + (POS) CIRCUIT SHORTED TO (T102) SHIFT MOTOR — (NEG) CIRCUIT
SHIFT MOTOR/MODE SENSOR ASSEMBLY
FRONT CONTROL MODULE
POWER DISTRIBUTION MODULE

Diagnostic Test

1. SHIFT MOTOR DTC IS ACTIVE

Ignition on, engine not running.
With the scan tool, Clear DTCs.
Move the Shift control to each position, while monitoring the Data Display on the scan tool.

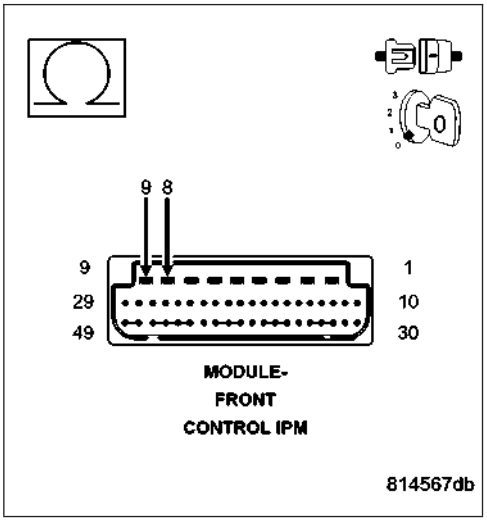
Does the DTC reset?

Yes >> Go to 2
No >> Go to 10

---

2. SHIFT MOTOR CIRCUIT RESISTANCE AT FCM CONNECTOR

Turn the ignition off.
Remove the Front Control Module (FCM) from the Power Distribution Module (PDM).
Measure the resistance between the Shift Motor (+) circuit and the Shift Motor (-) circuit in the FCM connector of the PDM.



Is the resistance between 40 and 100 ohms?

Yes >> Go to 9
No >> Go to 3

C140B- TRANSFER CASE MOTOR CONTROL CIRCUIT LOW (CONTINUED)

3. SHIFT MOTOR CIRCUIT RESISTANCE AT PDM CONNECTOR

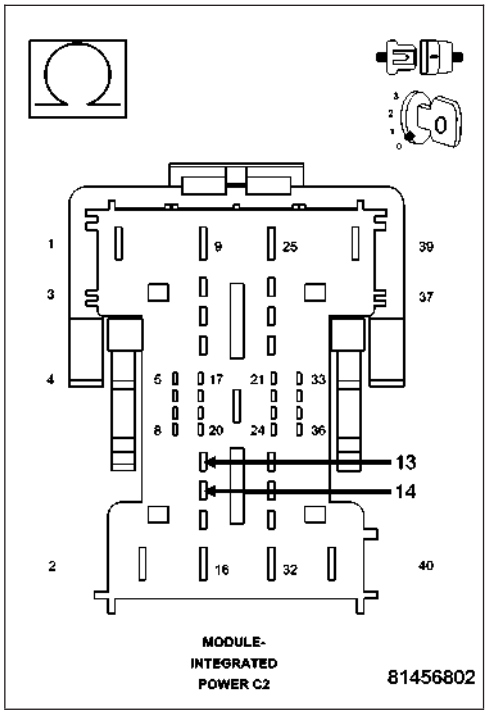
Disconnect the Power Distribution Module (PDM) C2 connector.

Measure the resistance between the Shift Motor (+) circuit and the Shift Motor (-) circuit at the PDM C2 connector.

Is the resistance between 40 and 100 ohms?

Yes >> Replace the Power Distribution Module (PDM).
Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go to 4



4. (T101) SHIFT MOTOR + (POS) CIRCUIT OPEN

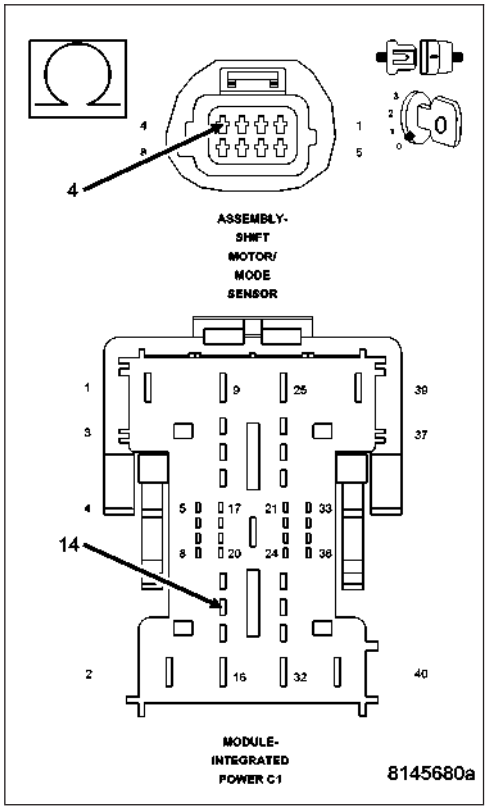
Disconnect the Shift Motor/Mode Sensor Assembly connector.

Measure the resistance of the (T101) Shift Motor + (pos) circuit from the Shift Motor/Mode Sensor Assembly connector to the Power Distribution Module C2 connector.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T101) Shift Motor + (pos) circuit for an open.
Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go to 5



C140B- TRANSFER CASE MOTOR CONTROL CIRCUIT LOW (CONTINUED)

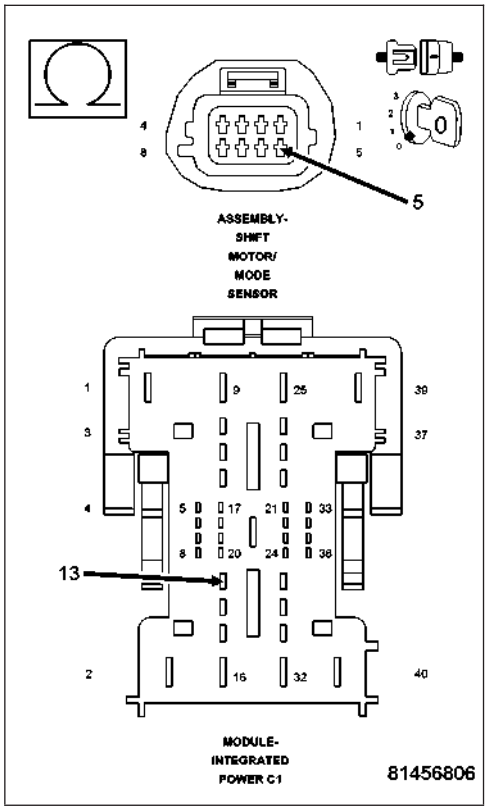
5. (T102) SHIFT MOTOR — (NEG) CIRCUIT OPEN

Measure the resistance of the (T102) Shift Motor — (neg) circuit from the Shift Motor/Mode Sensor Assembly connector to the Power Distribution Module C2 connector.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T102) Shift Motor — (neg) circuit for an open.
Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go to 6



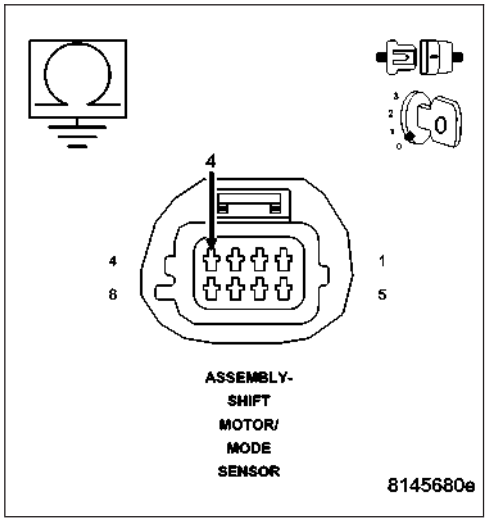
6. (T101) SHIFT MOTOR + (POS) CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (T101) Shift Motor + (pos) circuit at the Shift Motor/Mode Sensor Assembly connector.

Is the resistance below 5.0 ohms?

Yes >> Repair the (T101) Shift Motor + (pos) circuit for a short to ground.
Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

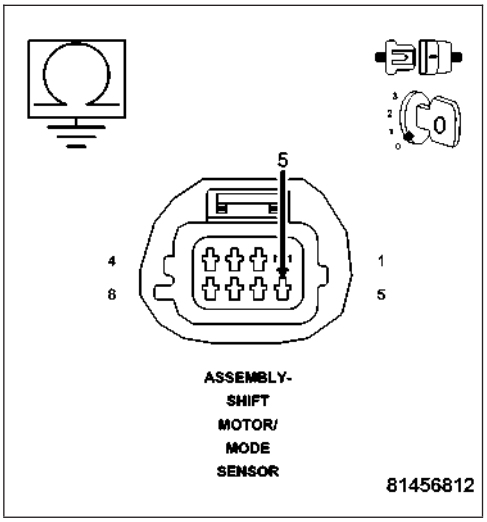
No >> Go to 7



C140B- TRANSFER CASE MOTOR CONTROL CIRCUIT LOW (CONTINUED)

7. (T102) SHIFT MOTOR — (NEG) CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (T102) Shift Motor — (neg) circuit at the Shift Motor/Mode Sensor Assembly connector.



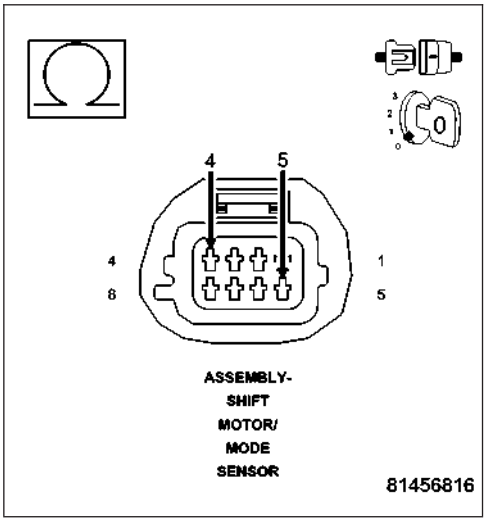
Is the resistance below 5.0 ohms?

Yes >> Repair the (T102) Shift Motor — (neg) circuit for a short to ground.
Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go to 8

8. (T101) SHIFT MOTOR + (POS) CIRCUIT SHORTED TO (T102) SHIFT MOTOR — (NEG) CIRCUIT

Measure the resistance between (T101) Shift Motor + (pos) circuit and the (T102) Shift Motor — (neg) circuit at the Shift Motor/Mode Sensor Assembly connector.



Is the resistance below 5.0 ohms?

Yes >> Repair the (T101) Shift Motor + (pos) circuit for a short to the (T102) Shift Motor — (neg) circuit.
Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Replace the Shift Motor/Mode Sensor assembly in accordance with the Service Information.
Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

9. FRONT CONTROL MODULE

Using the wiring diagram/schematic as a guide, inspect all wiring and connectors that pertain to this circuit.

Were any problems found?

Yes >> Repair as necessary.
Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Replace the Front Control Module in accordance with the Service Information.
Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

C140B- TRANSFER CASE MOTOR CONTROL CIRCUIT LOW (CONTINUED)

10. INTERMITTENT WIRING AND CONNECTORS

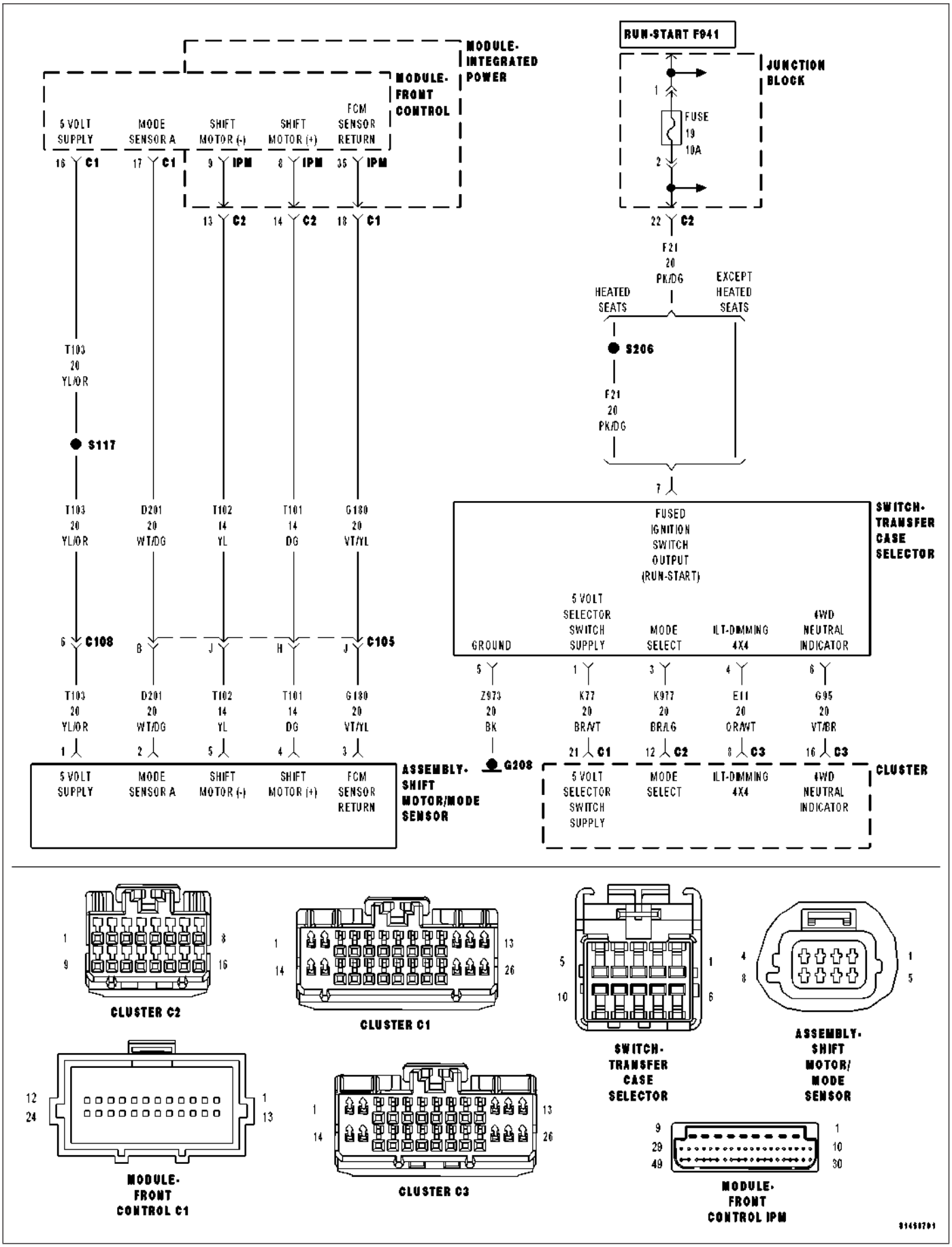
The conditions necessary to set this DTC are not present at this time.
Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
While monitoring the scan tool data relative to this circuit, wiggle test the wiring and connectors.
Look for the data to change or for the DTC to reset during the wiggle test.

Were any problems found?

Yes >> Repair as necessary.
Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Test complete.

C140C- TRANSFER CASE MOTOR CONTROL CIRCUIT HIGH



C140C- TRANSFER CASE MOTOR CONTROL CIRCUIT HIGH (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Ignition on. Battery voltage between 9 and 16 volts.
- **Set Condition:**
  FCM detects high voltage on the Transfer Case Motor Control Circuit for 2 seconds.

Possible Causes
INTERMITTENT CONDITION
(T101) SHIFT MOTOR + (POS) CIRCUIT SHORTED TO VOLTAGE
(T102) SHIFT MOTOR — (NEG) CIRCUIT SHORTED TO VOLTAGE
(T101) SHIFT MOTOR + (POS) CIRCUIT OPEN
(T102) SHIFT MOTOR — (NEG) CIRCUIT OPEN
(T101) SHIFT MOTOR + (POS) CIRCUIT SHORTED TO (T102) SHIFT MOTOR — (NEG) CIRCUIT
SHIFT MOTOR/MODE SENSOR ASSEMBLY
INTEGRATED POWER MODULE
FRONT CONTROL MODULE

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.
With the scan tool, Clear DTCs.
Move the Shift control to each position, while monitoring the Data Display on the scan tool.

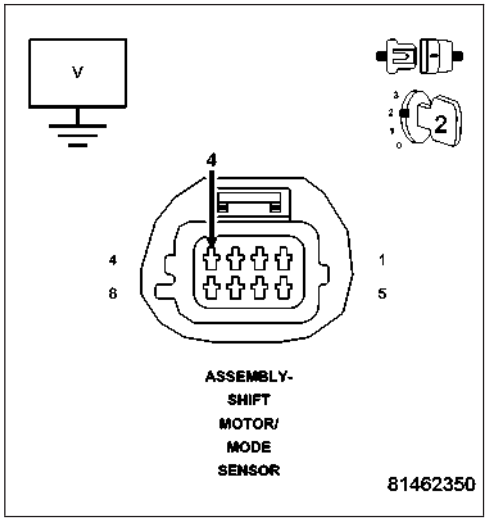
Does the DTC reset?

Yes >> Go to 2
No >> Go to 12

---

2. (T101) SHIFT MOTOR (+) CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.
Disconnect the Shift Motor/Mode Sensor Assembly connector.
Remove the Front Control Module (FCM) from the Integrated Power Module (IPM).
Turn the ignition on.
Measure the voltage of the (T101) Shift Motor (+) circuit at the Shift Motor/Mode Sensor Assembly connector.



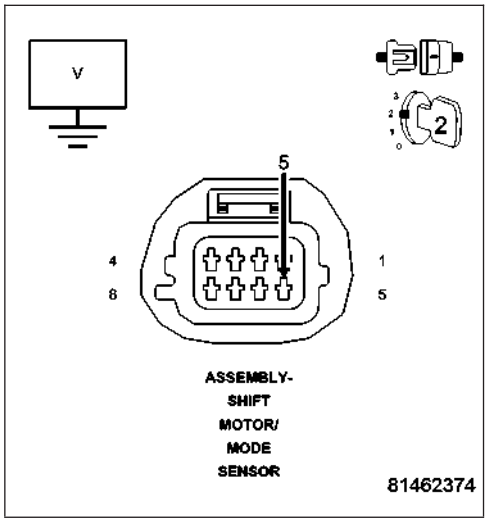
Is there any voltage present?

Yes >> Repair the (T101) Shift Motor (+) circuit for a short to voltage.
Perform the TRANSFER CASE VERIFICATION TEST-VER 1.
No >> Go to 3

C140C- TRANSFER CASE MOTOR CONTROL CIRCUIT HIGH (CONTINUED)

3. (T102) SHIFT MOTOR (-) CIRCUIT SHORTED TO VOLTAGE

Measure the voltage of the (T102) Shift Motor (-) circuit at the Shift Motor/Mode Sensor Assembly connector.



Is there any voltage present?

Yes >> Repair the (T102) Shift Motor (-) circuit for a short to voltage.
Perform the TRANSFER CASE VERIFICATION TEST-VER 1.

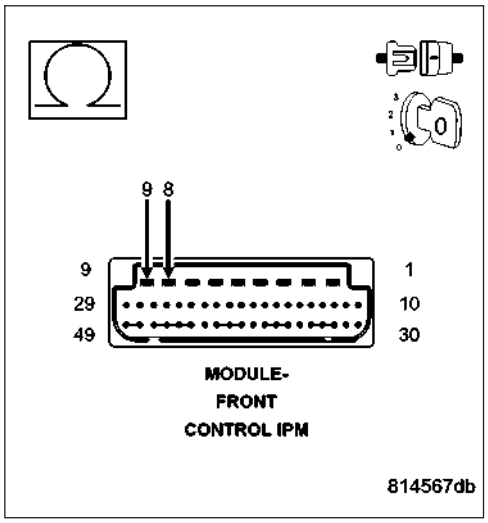
No >> Go to 4

4. SHIFT MOTOR CIRCUIT RESISTANCE AT FCM CONNECTOR

Turn the ignition off.

Connect the Shift Motor/Mode Sensor Assembly connector.

Measure the resistance between the Shift Motor (+) circuit and the Shift Motor (-) circuit in the FCM connector of the IPM.



Is the resistance between 40 and 100 ohms?

Yes >> Go to 11

No >> Go to 5

C140C- TRANSFER CASE MOTOR CONTROL CIRCUIT HIGH (CONTINUED)

5. SHIFT MOTOR CIRCUIT RESISTANCE AT IPM CONNECTOR

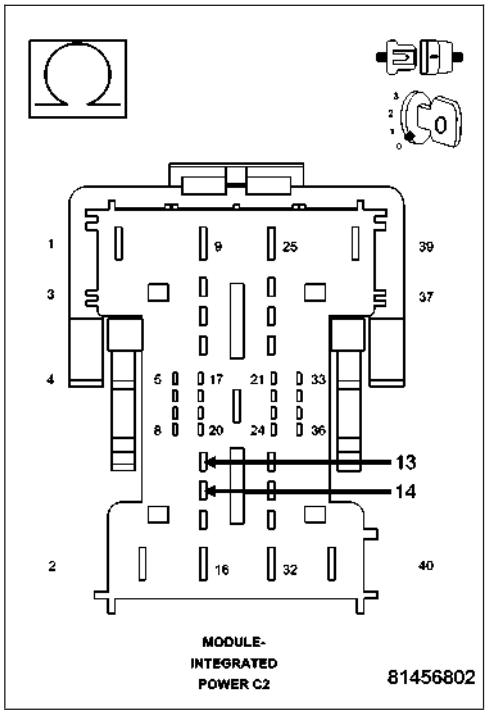
Disconnect the Integrated Power Module (IPM) C2 connector.

Measure the resistance between the Shift Motor (+) circuit and the Shift Motor (-) circuit at the IPM C2 connector.

Is the resistance between 40 and 100 ohms?

Yes >> Go to 10

No >> Go to 6



6. (T101) SHIFT MOTOR + (POS) CIRCUIT OPEN

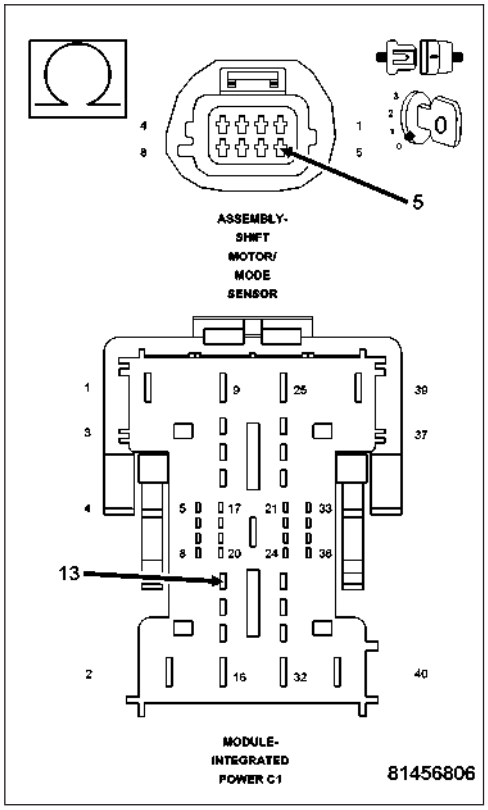
Disconnect the Shift Motor/Mode Sensor Assembly connector.

Measure the resistance of the (T101) Shift Motor + (pos) circuit from the Shift Motor/Mode Sensor Assembly connector to the Integrated Power Module C2 connector.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T101) Shift Motor + (pos) circuit for an open. Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go to 7



C140C- TRANSFER CASE MOTOR CONTROL CIRCUIT HIGH (CONTINUED)

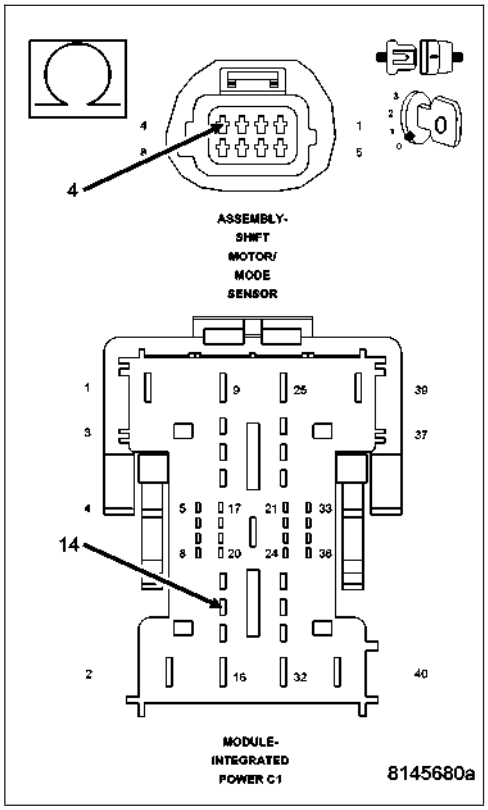
7. (T102) SHIFT MOTOR — (NEG) CIRCUIT OPEN

Measure the resistance of the (T102) Shift Motor — (neg) circuit from the Shift Motor/Mode Sensor Assembly connector to the Integrated Power Module C2 connector.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T102) Shift Motor — (neg) circuit for an open. Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go to 8



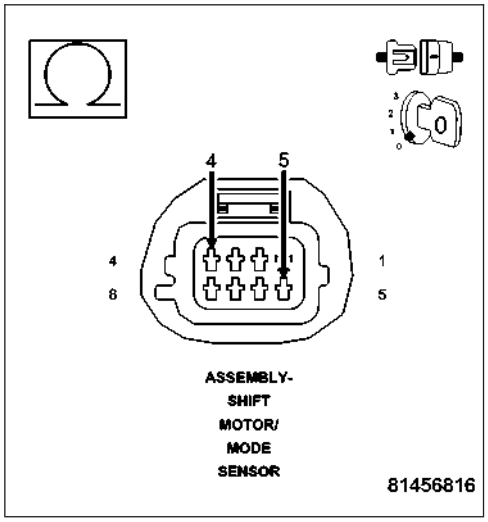
8. (T101) SHIFT MOTOR + (POS) CIRCUIT SHORTED TO (T102) SHIFT MOTOR — (NEG) CIRCUIT

Measure the resistance between (T101) Shift Motor + (pos) circuit and the (T102) Shift Motor — (neg) circuit at the Shift Motor/Mode Sensor Assembly connector.

Is the resistance below 5.0 ohms?

Yes >> Repair the (T101) Shift Motor + (pos) circuit for a short to the (T102) Shift Motor — (neg) circuit.
Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go to 9



C140C- TRANSFER CASE MOTOR CONTROL CIRCUIT HIGH (CONTINUED)

9. SHIFT MOTOR/MODE SENSOR ASSEMBLY

Using the wiring diagram/schematic as a guide, inspect all wiring and connectors that pertain to this circuit.

Were any problems found?

Yes >> Repair as necessary.
Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Replace the Shift Motor/Mode Sensor Assembly in accordance with the Service Information.
Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

---

10. INTEGRATED POWER MODULE

Using the wiring diagram/schematic as a guide, inspect all wiring and connectors that pertain to this circuit.

Were any problems found?

Yes >> Repair as necessary.
Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Replace the Integrated Power Module in accordance with the Service Information.
Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

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11. FRONT CONTROL MODULE

Using the wiring diagram/schematic as a guide, inspect all wiring and connectors that pertain to this circuit.

Were any problems found?

Yes >> Repair as necessary.
Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Replace the Front Control Module in accordance with the Service Information.
Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

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12. INTERMITTENT WIRING AND CONNECTORS

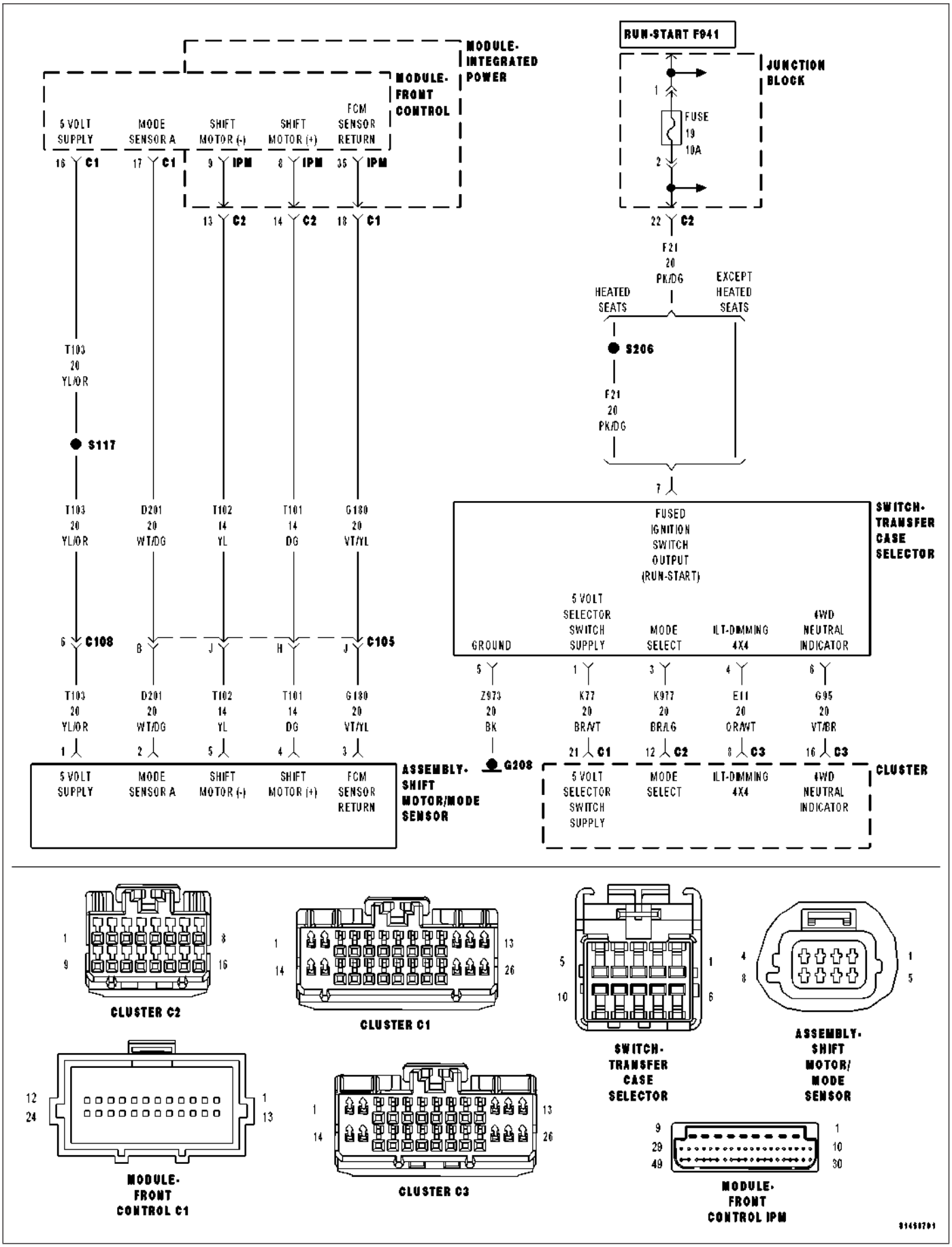
The conditions necessary to set this DTC are not present at this time.
Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
While monitoring the scan tool data relative to this circuit, wiggle test the wiring and connectors.
Look for the data to change or for the DTC to reset during the wiggle test.

Were any problems found?

Yes >> Repair as necessary.
Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Test complete.

C230A- NEUTRAL INDICATOR CONTROL CIRCUIT LOW



C230A- NEUTRAL INDICATOR CONTROL CIRCUIT LOW (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  CCM detects low voltage on the Neutral Indicator Control Circuit.

Possible Causes
INTERMITTENT CONDITION
(G95) 4WD NEUTRAL INDICATOR CIRCUIT OPEN
(G95) 4WD NEUTRAL INDICATOR CIRCUIT SHORTED TO GROUND
TRANSFER CASE SELECTOR SWIITCH
INSTRUMENT CLUSTER MODULE (CCN)

Diagnostic Test

1. NEUTRAL INDICATOR CONTROL CIRCUIT DTC IS ACTIVE

Ignition on.

With the scan tool, Clear DTCs.

Shift the Transfer Case into neutral for 30 seconds.

NOTE: To select or deselect Transfer Case Neutral, vehicle speed must be 0 MPH with the ignition ON, engine OFF, the brake pedal applied, and the transmission in neutral (auto trans) or the clutch pedal pressed (man trans). Press the Neutral button (if equipped) on the Transfer Case Selector Switch until the Neutral Indicator is illuminated.

WARNING: Apply the parking brake. The vehicle may roll with the Transfer Case in neutral.

NOTE: To verify that the Transfer Case is in Neutral, shift the automatic transmission into reverse and release the brake pedal for three seconds or shift the manual transmission into gear and slowly release the clutch pedal. There should be no vehicle movement if the Transfer Case is in Neutral.

With the scan tool, Read DTCs.

Does the Neutral Indicator DTC reset?

Yes >> Go to 2

No >> Go to 6

C230A- NEUTRAL INDICATOR CONTROL CIRCUIT LOW (CONTINUED)

2. (G95) 4WD NEUTRAL INDICATOR CIRCUIT SHORTED TO GROUND

Turn the ignition off.

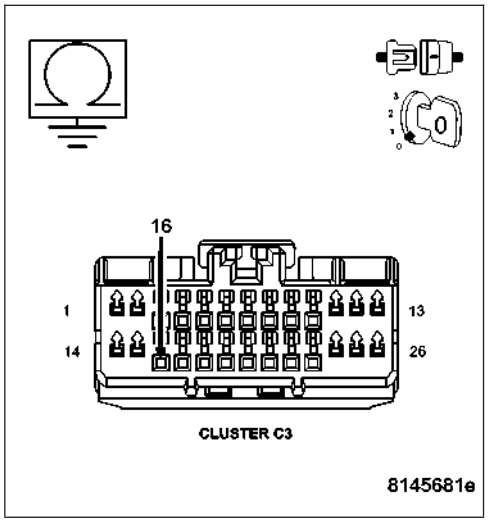
Disconnect the Instrument Cluster Module (CCN) C3 connector.

Measure the resistance between ground and the (G95) 4WD Neutral Indicator circuit.

Is the resistance below 5.0 ohms?

Yes >> Go to 3

No >> Go to 4



3. TRANSFER CASE SELECTOR SWITCH

Disconnect the Transfer Case Selector Switch connector.

Measure the resistance between ground and the (G95) 4WD Neutral Indicator circuit.

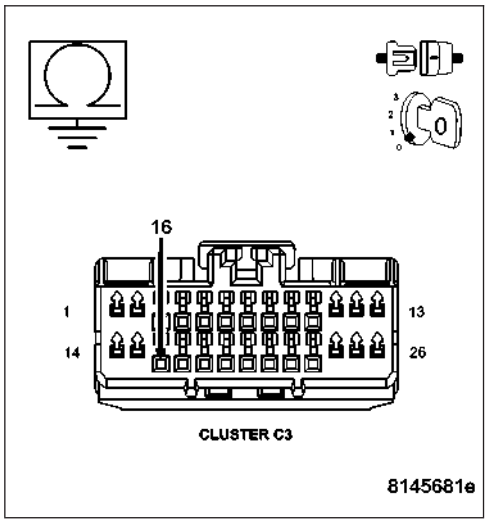
Is the resistance below 5.0 ohms?

Yes >> Repair the (G95) 4WD Neutral Indicator circuit for a short to ground.

Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Replace the Transfer Case Selector Switch.

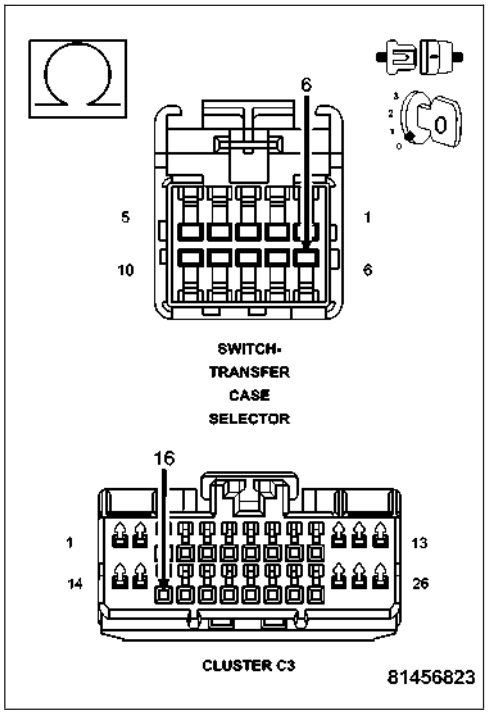
Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)



C230A- NEUTRAL INDICATOR CONTROL CIRCUIT LOW (CONTINUED)

4. (G95) 4WD NEUTRAL INDICATOR CIRCUIT OPEN

Disconnect the Transfer Case Selector Switch connector.
Measure the resistance of the (G95) 4WD Neutral Indicator circuit.



Is the resistance above 5.0 ohms?

Yes >> Repair the open (G95) 4WD Neutral Indicator circuit.
Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go to 5

---

5. INSTRUMENT CLUSTER MODULE

View repair.

Repair

Replace the Instrument Cluster Module in accordance with the Service information.
Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

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6. INTERMITTENT WIRING AND CONNECTORS

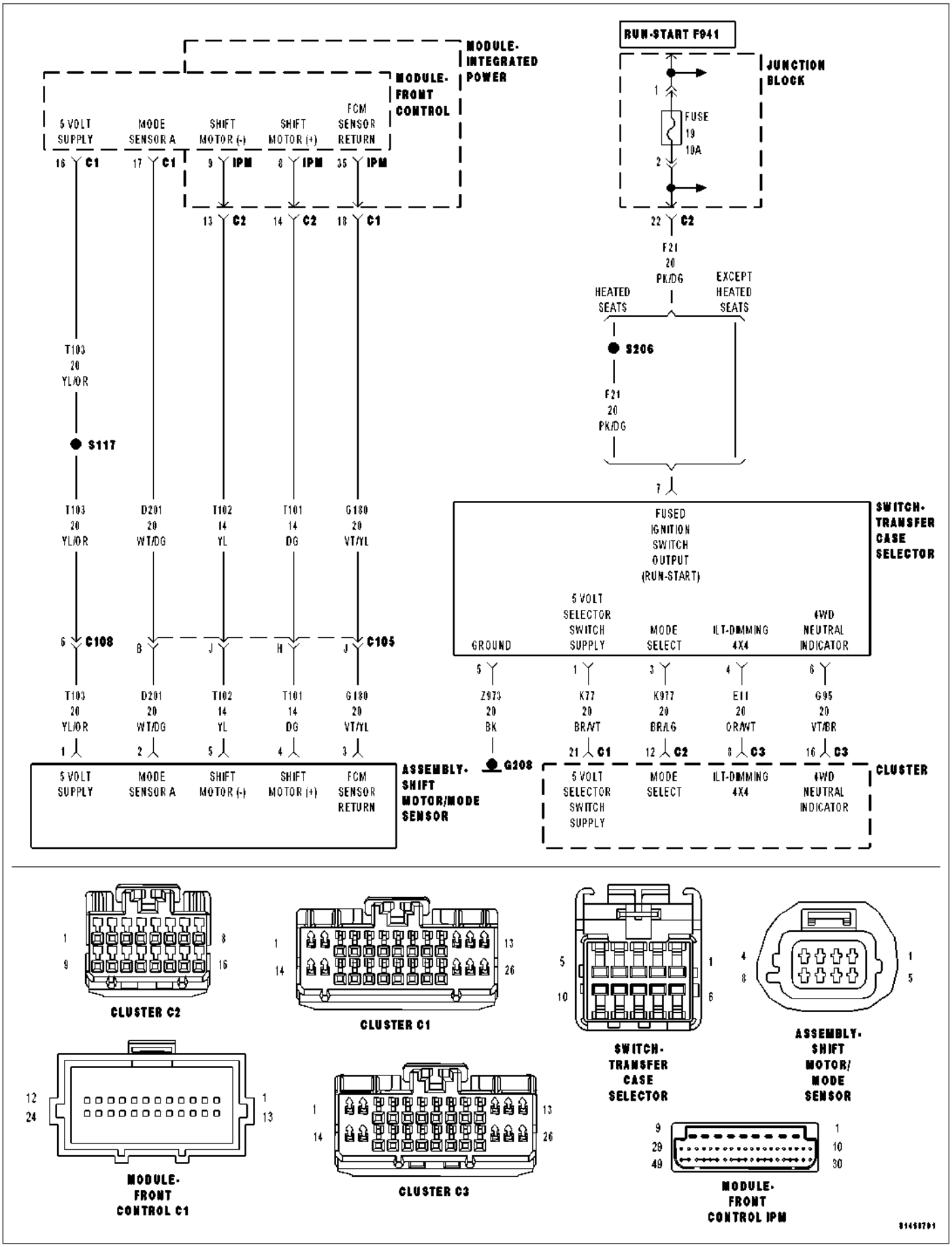
The conditions necessary to set this DTC are not present at this time.
Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
While monitoring the scan tool data relative to this circuit, wiggle test the wiring and connectors.
Look for the data to change or for the DTC to reset during the wiggle test.

Were any problems found?

Yes >> Repair as necessary.
Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Test complete.

C230B- NEUTRAL INDICATOR CONTROL CIRCUIT HIGH



C230B- NEUTRAL INDICATOR CONTROL CIRCUIT HIGH (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  CCM detects high voltage on the Neutral Indicator Control Circuit.

Possible Causes
INTERMITTENT CONDITION
(G95) 4WD NEUTRAL INDICATOR CIRCUIT OPEN
(G95) 4WD NEUTRAL INDICATOR CIRCUIT SHORTED TO VOLTAGE
TRANSFER CASE SELECTOR SWIITCH
INSTRUMENT CLUSTER MODULE (CCN)

Diagnostic Test

1. NEUTRAL INDICATOR CONTROL CIRCUIT DTC IS ACTIVE

Ignition on.

With the scan tool, Clear DTCs.

Shift the Transfer Case into neutral for 30 seconds.

NOTE: To select or deselect Transfer Case Neutral, vehicle speed must be 0 MPH with the ignition ON, engine OFF, the brake pedal applied, and the transmission in neutral (auto trans) or the clutch pedal pressed (man trans). Press the Neutral button (if equipped) on the Transfer Case Selector Switch until the Neutral Indicator is illuminated.

WARNING: Apply the parking brake. The vehicle may roll with the Transfer Case in neutral.

NOTE: To verify that the Transfer Case is in Neutral, shift the automatic transmission into reverse and release the brake pedal for three seconds or shift the manual transmission into gear and slowly release the clutch pedal. There should be no vehicle movement if the Transfer Case is in Neutral.

With the scan tool, Read DTCs.

Does the Neutral Indicator DTC reset?

Yes >> Go to 2

No >> Go to 6

C230B- NEUTRAL INDICATOR CONTROL CIRCUIT HIGH (CONTINUED)

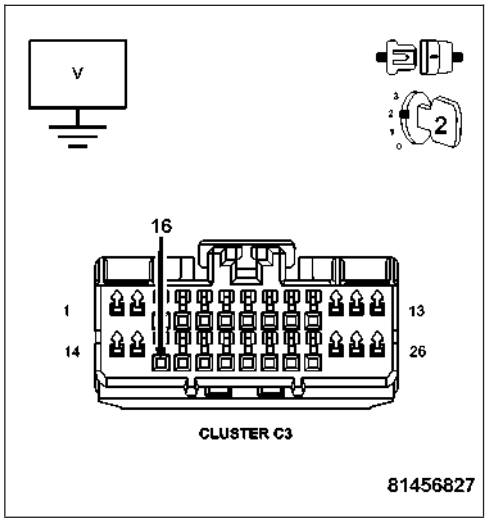
2. (G95) 4WD NEUTRAL INDICATOR CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.
Disconnect the Instrument Cluster Module (CCN) C3 connector.
Turn the ignition on.
Measure the voltage of the (G95) 4WD Neutral Indicator circuit.

Is there any voltage present?

Yes >> Go to 3

No >> Go to 4



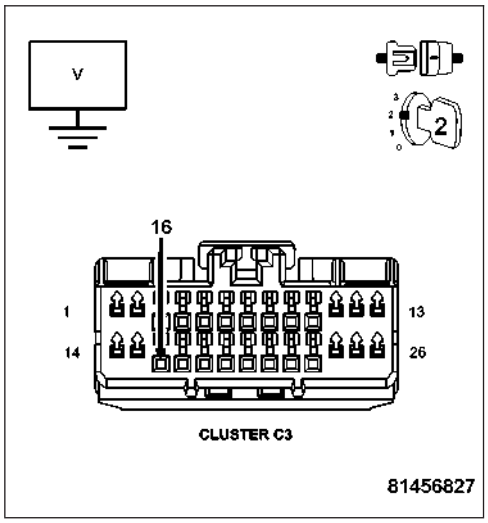
3. TRANSFER CASE SELECTOR SWITCH

Disconnect the Transfer Case Selector Switch connector.
Measure the voltage of the (G95) 4WD Neutral Indicator circuit.

Is there any voltage present?

Yes >> Repair the (G95) 4WD Neutral Indicator circuit for a short to voltage.
Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Replace the Transfer Case Selector Switch.
Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)



C230B- NEUTRAL INDICATOR CONTROL CIRCUIT HIGH (CONTINUED)

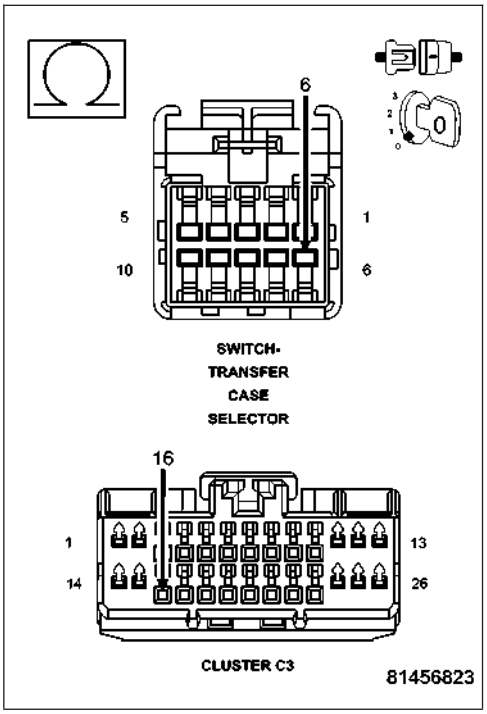
4. (G95) 4WD NEUTRAL INDICATOR CIRCUIT OPEN

Disconnect the Transfer Case Selector Switch connector.
Measure the resistance of the (G95) 4WD Neutral Indicator Control circuit.

Is the resistance above 5.0 ohms?

Yes >> Repair the open (G95) 4WD Neutral Indicator circuit.
Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go to 5



5. INSTRUMENT CLUSTER MODULE

View repair.

Repair

Replace the Instrument Cluster Module in accordance with the Service information.
Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

6. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.
Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
While monitoring the scan tool data relative to this circuit, wiggle test the wiring and connectors.
Look for the data to change or for the DTC to reset during the wiggle test.

Were any problems found?

Yes >> Repair as necessary.
Perform the TRANSFER CASE VERIFICATION TEST-VER 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Test complete.

TRANSFER CASE - NV144 - SERVICE INFORMATION

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TRANSFER CASE - NV144 - SERVICE INFORMATION

DESCRIPTION

The NV144 is an electronically controlled, single-speed, AWD transfer case.

The geartrain is mounted in two aluminum case halves attached with bolts.

OPERATING RANGES

Transfer case operating ranges are:

- AWD (All-wheel drive)
- 4HI (4-wheel drive)

The AWD range is for use on any road surface at any time.

The 4HI range is for off road use only. It is not for use on hard surface roads. The only exception being when the road surface is wet or slippery or covered by ice and snow.

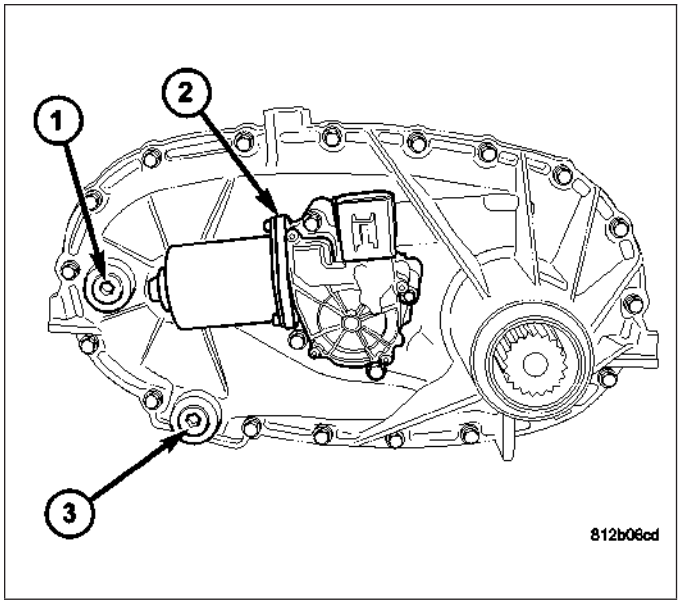
SHIFT MECHANISM

Operating ranges are selected with a dash mounted shift selector switch. The shift selector switch provides a input to the Front Control Module (FCM) to indicate the driver's desire to change operating ranges. The FCM uses this input, along with input from the transfer case mounted mode sensor and information from the vehicle's bus, to determine if a shift is permitted. If the FCM decides the shift is permitted, the FCM controls the shift motor, mounted to the exterior of the transfer case, to perform the shift.

IDENTIFICATION

A circular ID tag is attached to the rear case of each transfer case. The ID tag provides the transfer case model number, assembly number, and serial number.

The transfer case serial number also represents the date of build.



OPERATION

The input gear is splined to the transmission output shaft. The input gear drives the mainshaft through the differential assembly. The front output shaft is operated by a drive chain that connects the shaft to a drive sprocket on the mainshaft.

DIAGNOSIS AND TESTING

TRANSFER CASE - NV144

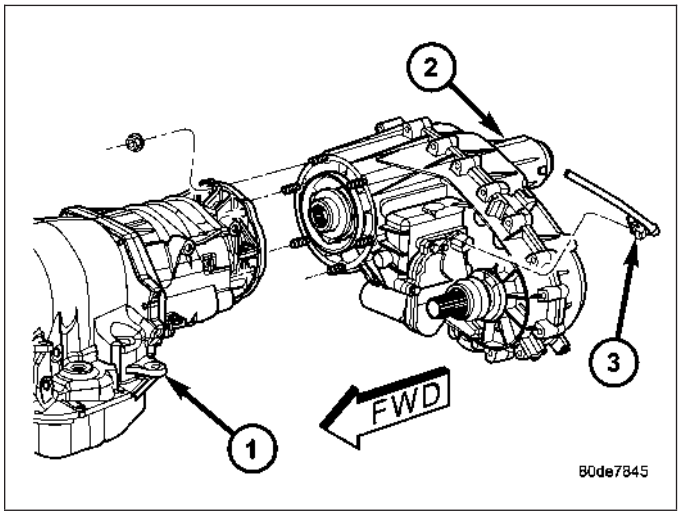
DIAGNOSIS CHART

Condition	Possible Cause	Correction
Transfer case difficult to shift or will not shift into desired mode.	1) Transfer case electronically controlled shift system malfunction.	1) Verify proper operation per the appropriate diagnostic manual.
	2) If vehicle was operated for an extended period in 4HI mode on dry surface, driveline torque load may cause difficulty.	2) Drive the vehicle in a straight line and momentarily release the accelerator. The transfer case can then be shifted to the desired mode.
	3) Insufficient or incorrect lubricant.	3) Drain and refill transfer case with the correct quantity of Mopar® ATF +4, Automatic Transmission Fluid.
	4) Internal transfer case components binding, worn, or damaged.	4) Repair or replace components as necessary.
Transfer case noisy in all drive modes.	1) Insufficient or incorrect lubricant.	1) Drain and refill transfer case with the correct quantity of Mopar® ATF +4, Automatic Transmission Fluid.
	2) Internal transfer case components binding, worn, or damaged.	2) Repair or replace components as necessary.

Condition	Possible Cause	Correction
Lubricant leaking from transfer case seals or vent.	1) Transfer case overfilled.	1) Drain lubricant to the correct level.
	2) Transfer case vent closed or restricted.	2) Clean or replace vent as necessary.
	3) Transfer case seals damaged or installed incorrectly.	3) Replace suspect seal.
Abnormal tire wear.	1) Extended operation in 4HI mode on dry surfaces,	1) Operate vehicle in AWD mode on dry surfaces.

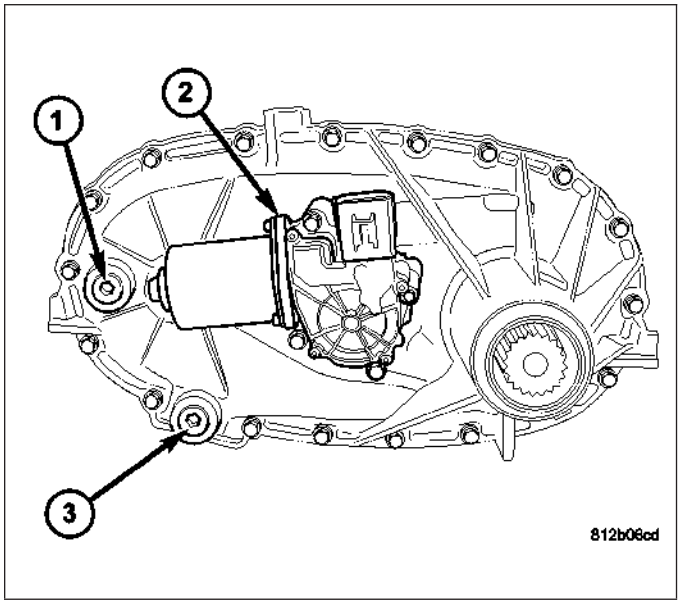
REMOVAL

1. Shift transfer case into AWD.
2. Raise vehicle.
3. Drain transfer case lubricant.
4. Mark front and rear propeller shafts for alignment reference.
5. Support transmission (1) with jack stand.
6. Remove the transfer case skid plate, if equipped.
7. Disconnect front and rear propeller shafts at transfer case.
8. Disconnect transfer case shift motor and mode sensor wire connectors (3).
9. Disconnect transfer case vent hose.
10. Support transfer case (2) with transmission jack.
11. Secure transfer case (2) to jack with chains.
12. Remove nuts attaching transfer case to transmission.
13. Pull transfer case and jack rearward to disengage transfer case.
14. Remove transfer case (2) from under vehicle.



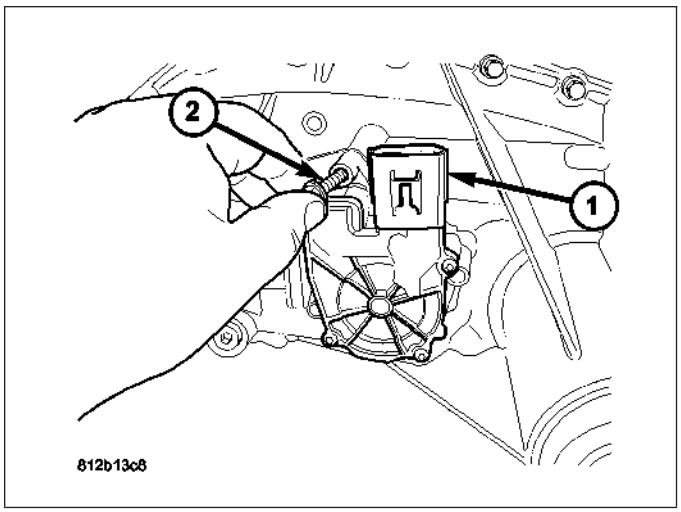
DISASSEMBLY

Position transfer case on shallow drain pan. Remove drain plug (3) and drain lubricant remaining in case.

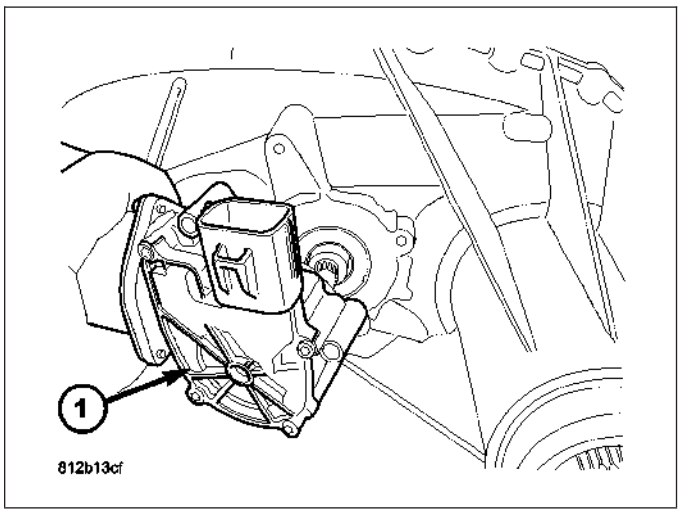


SHIFT MOTOR ASSEMBLY

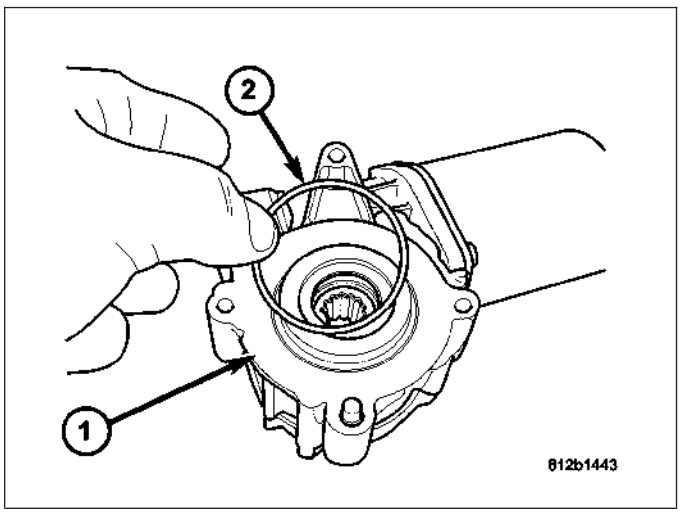
1. Remove the bolts (2) which hold the shift motor and mode sensor assembly (1) to the transfer case.



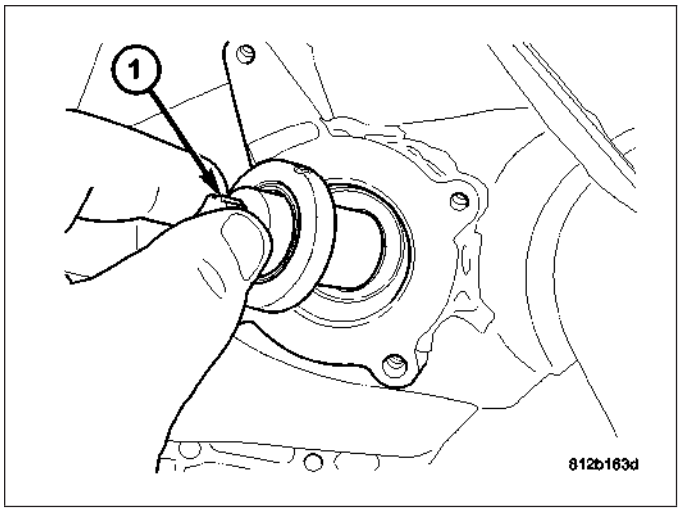
2. Remove the shift motor and mode sensor assembly (1) from the transfer case.



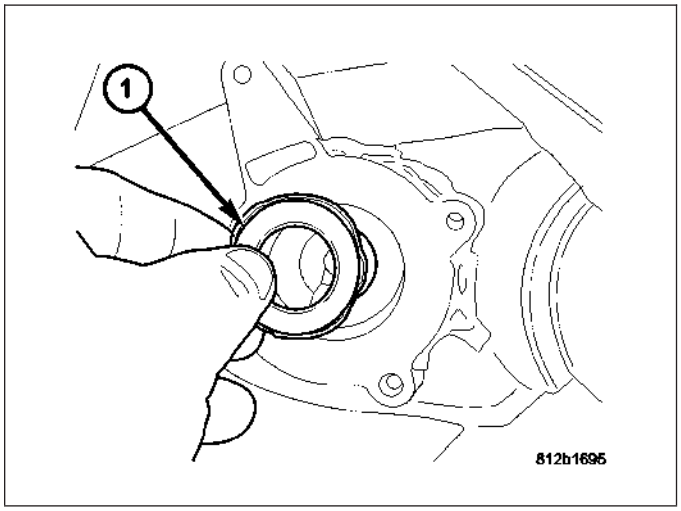
3. Remove and discard the shift motor o-ring (2) from the shift motor (1).



4. Remove the transfer case shift screw (1) and top bearing from the transfer case.

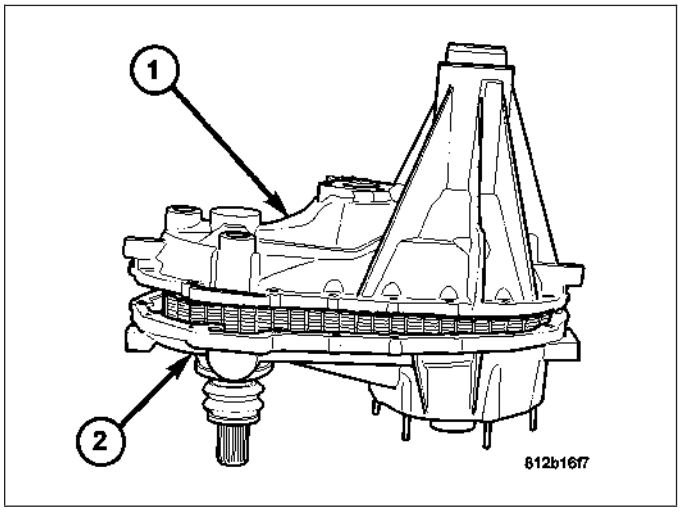


5. Remove the shift screw lower bearing (1) from the transfer case.



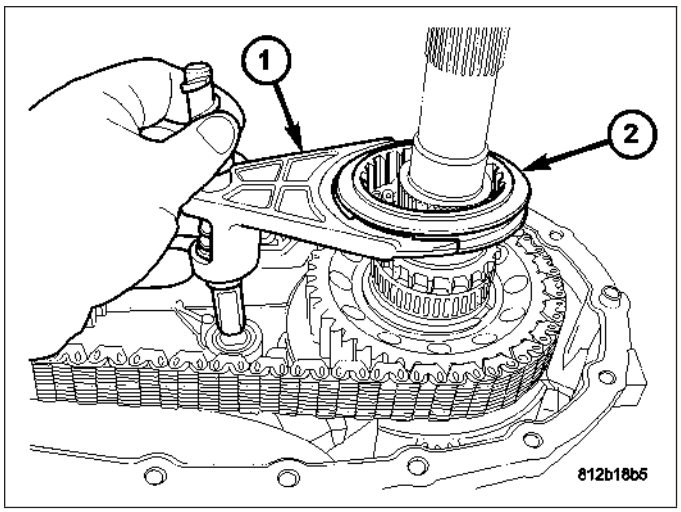
REAR CASE

1. Support transfer case so rear case is facing upward.
2. Remove bolts holding the front case (2) to the rear case (1).
3. Loosen rear case with flat blade screwdriver to break sealer bead.
4. Remove the rear case (1) from the front case (2).

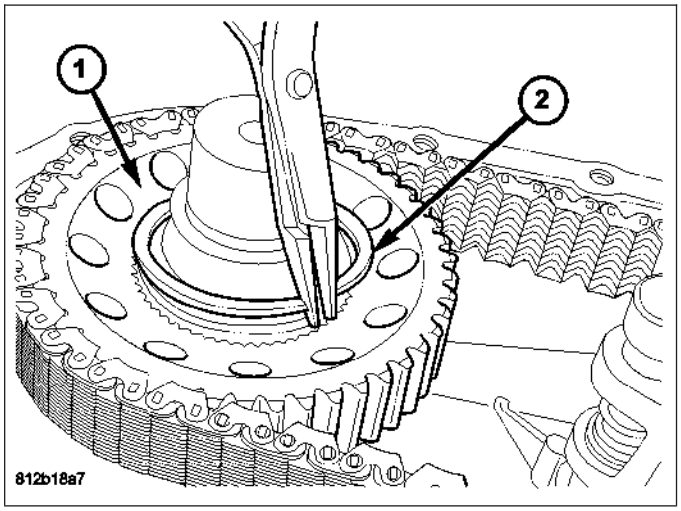


DRIVE CHAIN AND SPROCKETS

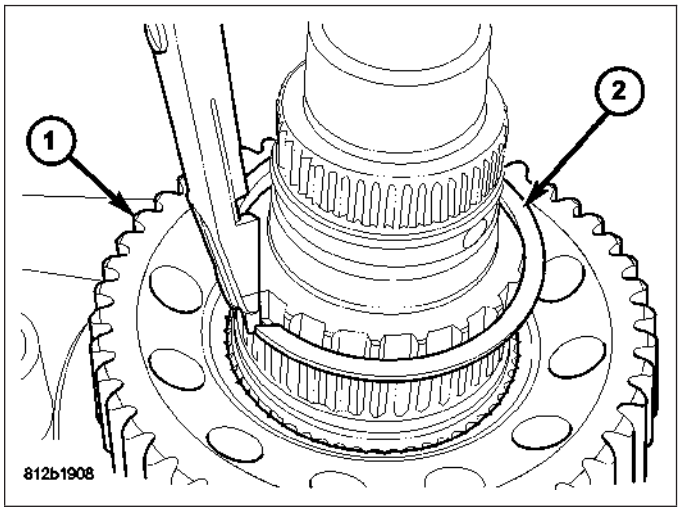
1. Remove the shift fork (1) and sleeve (2) as an assembly.



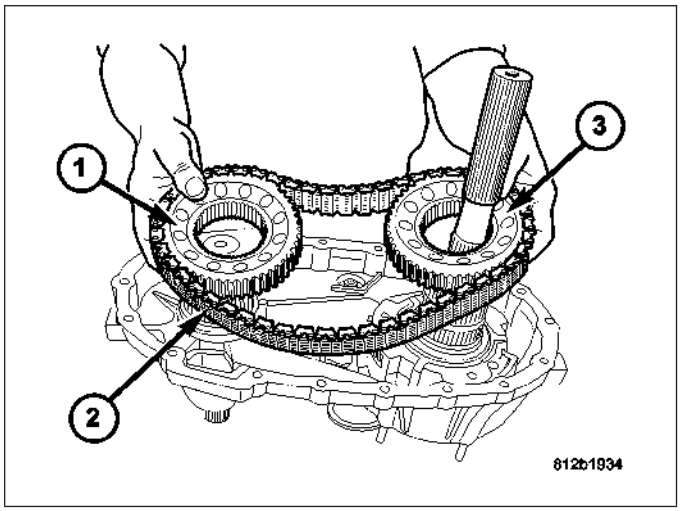
2. Remove the front output shaft drive sprocket (1) retaining ring (2).



3. Remove the mainshaft drive sprocket (1) retaining ring (2).

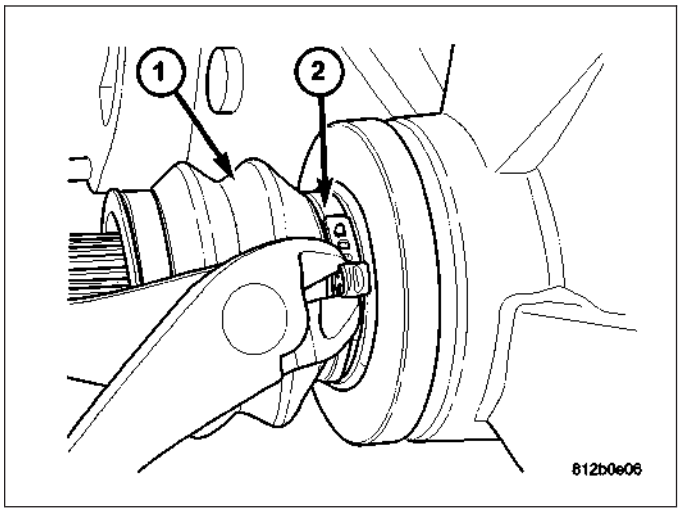


4. Remove the front output shaft drive sprocket (1), the mainshaft drive sprocket (3), and the drive chain (2) as one unit.

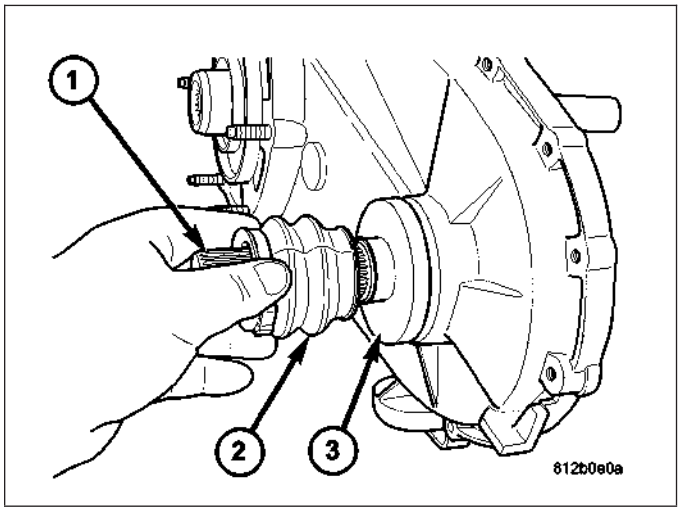


FRONT OUTPUT SHAFT

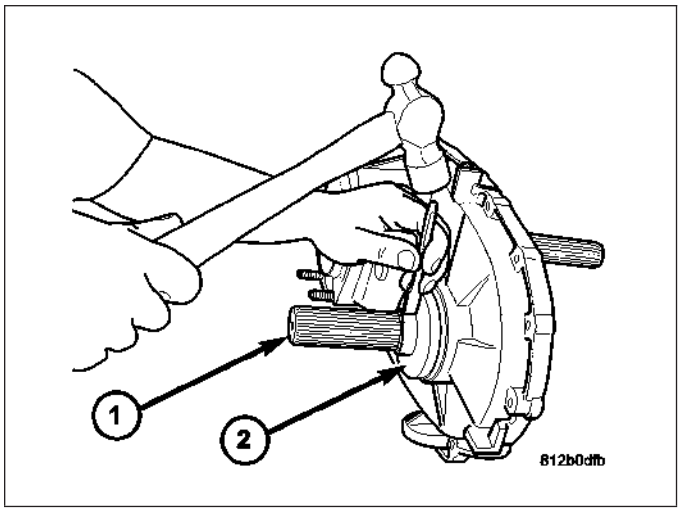
1. Remove the front propeller shaft seal boot (1) retaining clamp (2).



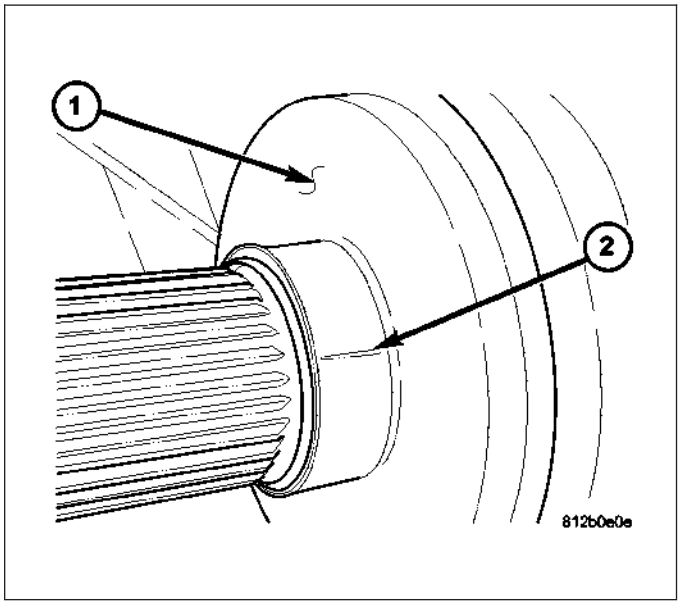
2. Remove the front propeller shaft seal boot (2) from the front output shaft seal slinger (3).



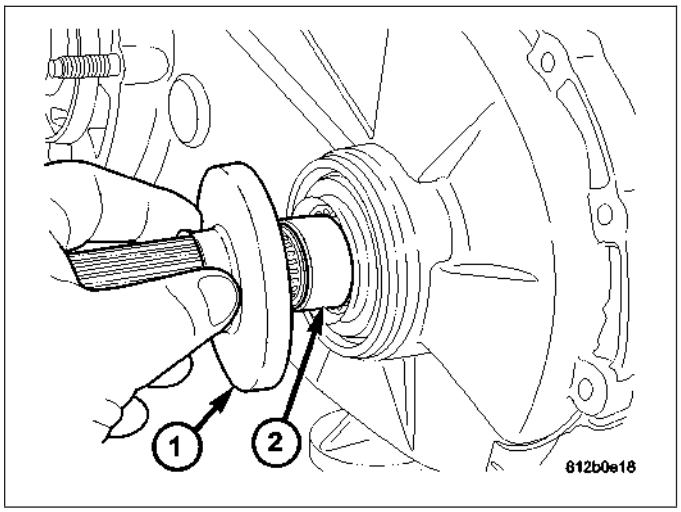
3. Using a suitable hammer and chisel, strike the seal slinger (2) with the chisel as shown in three, equally spaced locations.



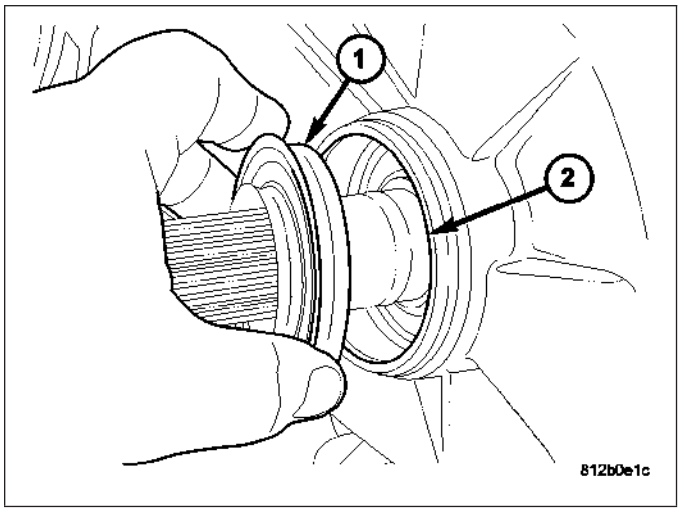
4. The indentations (2) should appear as shown here.



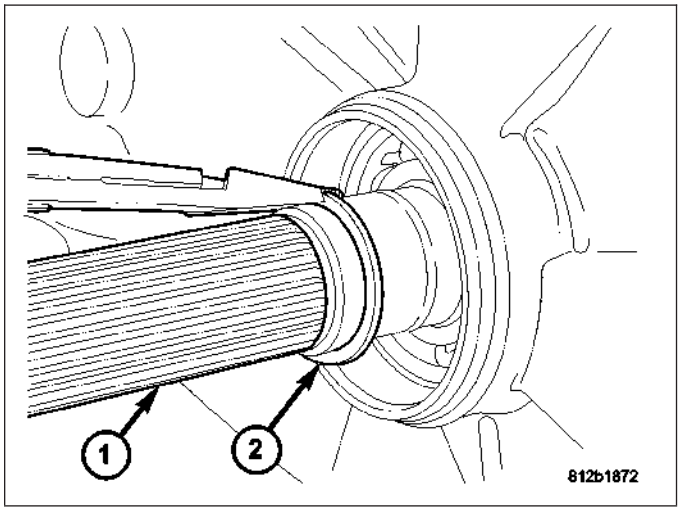
5. Remove the front output shaft seal slinger (1) from the output shaft (2).



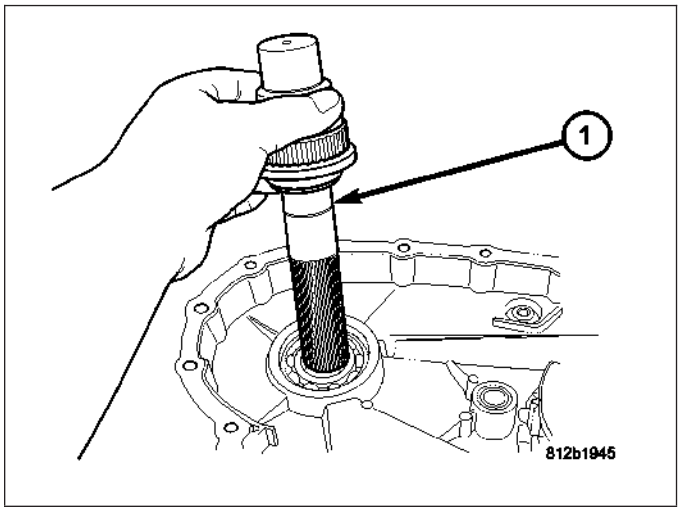
6. Remove the front output shaft seal (1) from the transfer case bore (2) using a suitable tool.



7. Remove the front output shaft retaining ring (2) from the output shaft (1).

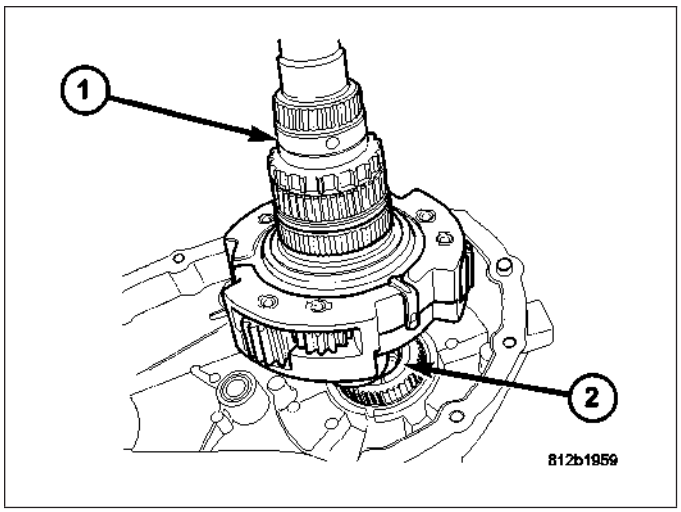


8. Remove the front output shaft (1) from the transfer case front case.

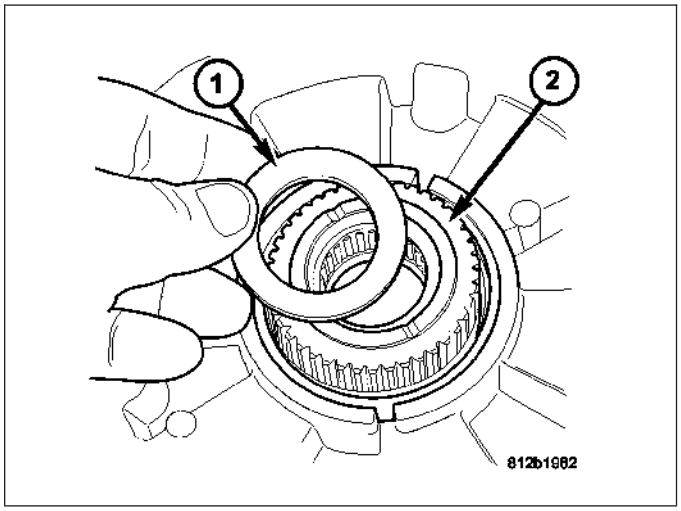


MAINSHAFT

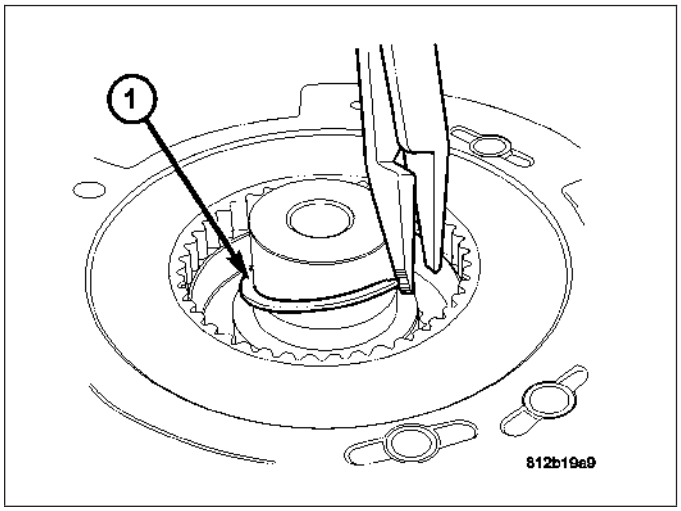
1. Remove the mainshaft assembly (1) from the input gear (2).



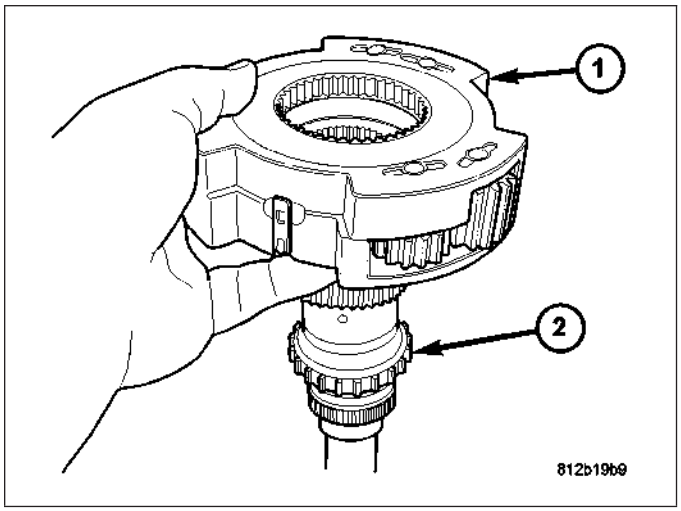
2. Remove the mainshaft thrust washer (1) from the input gear (2).



3. Remove the differential retaining ring (1) from the mainshaft.

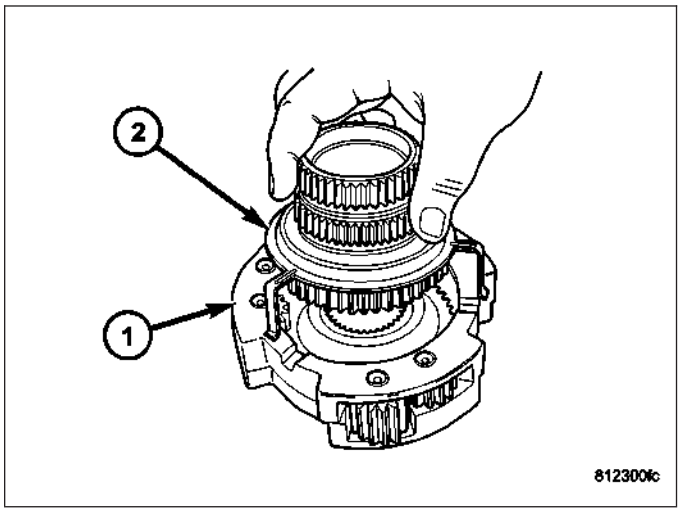


4. Remove the differential assembly (1) from the mainshaft (2).

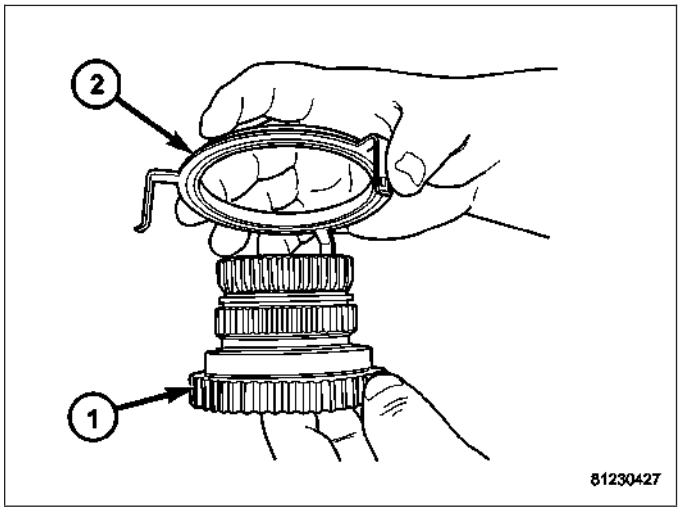


DIFFERENTIAL

1. Remove the mode hub and mode hub retainer (2) from the differential assembly (1).

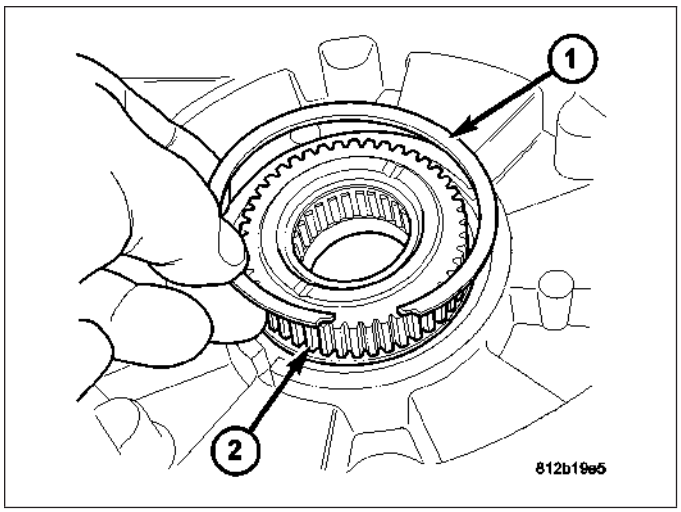


2. Remove the mode hub retainer (1) from the mode hub (2).

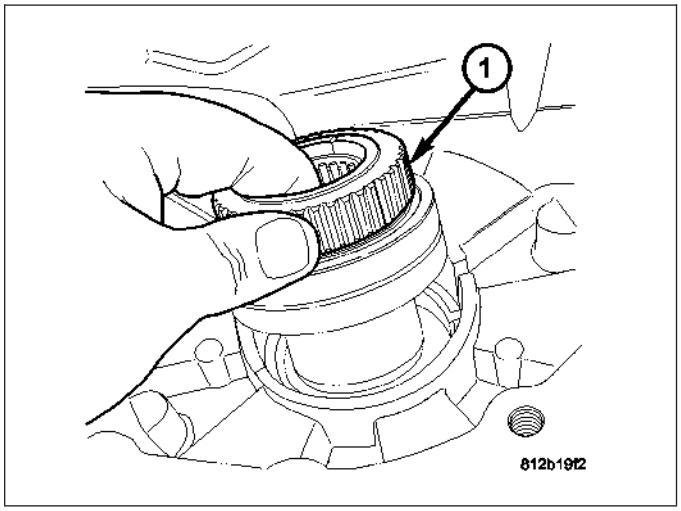


INPUT GEAR

1. Remove the input gear assembly (2) retaining ring (1) from the transfer case.



2. Remove the input gear assembly (1) from the transfer case front case.



CLEANING

Clean the transfer case parts with a standard parts cleaning solvent. Remove all traces of sealer from the cases and retainers with a scraper and 3M™ all purpose cleaner. Use compressed air to remove solvent residue from oil feed passages in the case halves, retainers, gears, and shafts.

INSPECTION

MAINSHAFT AND SPROCKET INSPECTION

Inspect the splines on the shaft and the teeth on the sprocket. Minor nicks and scratches can be smoothed with an oilstone. However, replace any part that is damaged.

Check the contact surfaces in the sprocket bore and on the mainshaft. Minor nicks and scratches can be smoothed with 320-400 grit emery cloth but do not try to salvage the shaft if nicks or wear is severe.

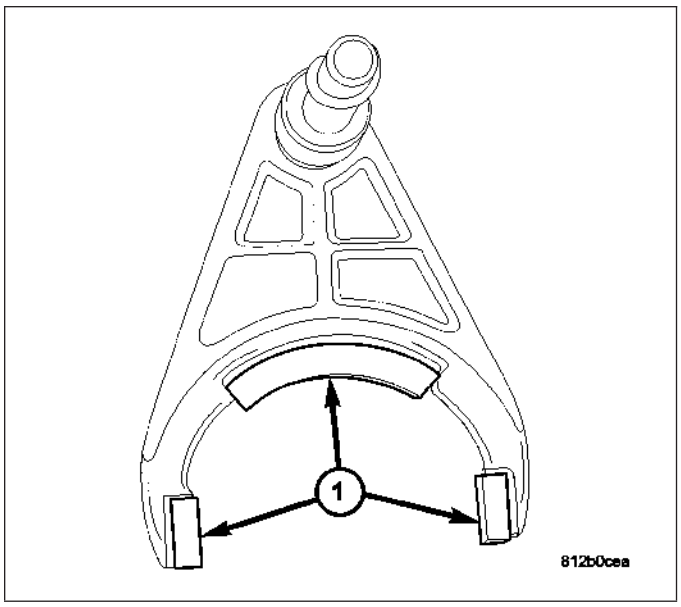
INPUT GEAR AND BEARING ASSEMBLY

Check the teeth on the input gear. Minor nicks can be dressed off with an oilstone but replace the gear if any teeth are broken, cracked, or chipped. Check the bearing for smooth operation. Replace the input gear and bearing assembly if the bearing exhibits any sign of damage or rough rotation.

SHIFT FORK AND SLEEVE

Check condition of the shift fork and mode fork shift rail. Minor nicks on the shift rail can be smoothed with 320-400 grit emery cloth.

Inspect the shift fork wear pads (1). The mode fork pads are serviceable and can be replaced if necessary.



FRONT OUTPUT SHAFT AND DRIVE CHAIN

Inspect the sprocket teeth and bearing surfaces. Minor nicks on the teeth can be smoothed with an oilstone. Use 320-400 grit emery to smooth minor scratches on the shaft bearing surfaces. Replace the shaft if the splines are damaged, bearing surfaces are scored, or if any sprocket teeth are cracked or broken.

Examine the drive chain and shaft bearings. Replace the chain and both sprockets if the chain is stretched, distorted, or if any of the links bind. Replace the bearings if rough, or noisy.

FRONT/REAR CASES

Inspect the cases for wear and damage. Replace the input shaft seal; do not reuse it.

Check case condition. If leaks were a problem, look for gouges and severe scoring of case sealing surfaces. Also make sure the front case mounting studs are in good condition.

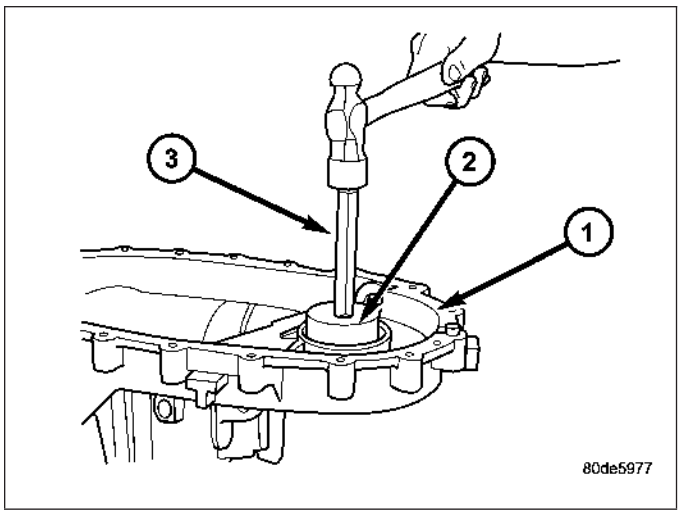
Check the front case mounting studs and vent tube. The tube can be secured with Loctite™ 271 or 680 if loose. The stud threads can be cleaned up with a die if necessary. Also check condition of the fill/drain plug threads in the rear case. The threads can be repaired with a thread chaser or tap if necessary. Or the threads can be repaired with Helicoil® stainless steel inserts if required.

ASSEMBLY

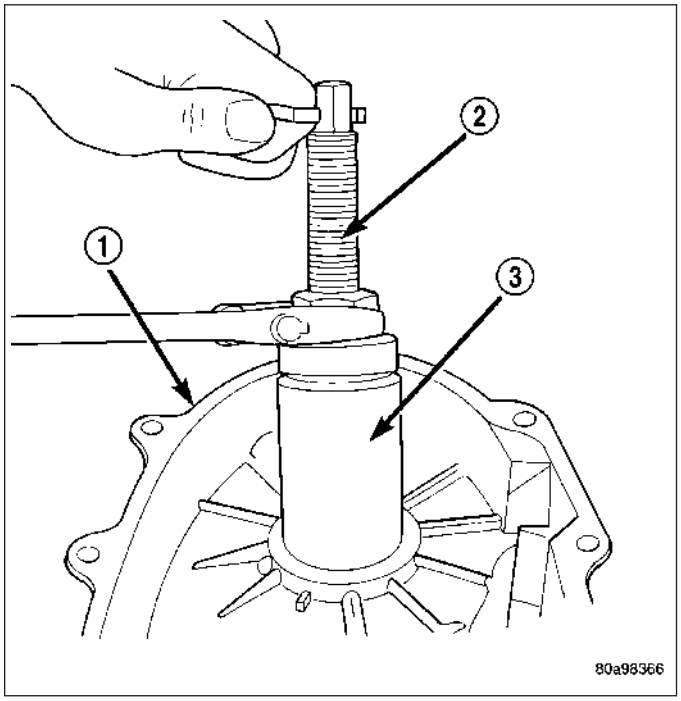
Lubricate transfer case components with Mopar® ATF +4, Automatic Transmission Fluid or petroleum jelly (where indicated) during assembly.

BEARINGS

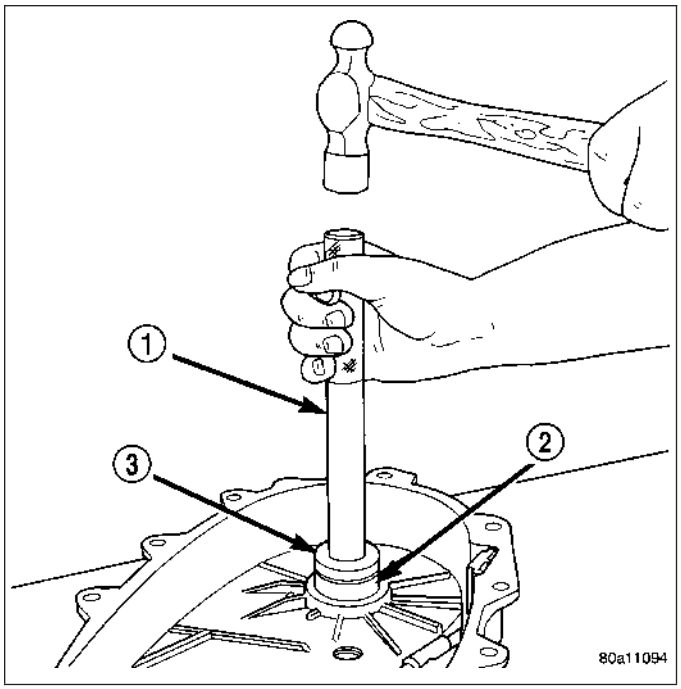
1. Remove the front output shaft bearing retaining ring from inside the front case (1) half.
2. Using Installer 6953 and Handle C-4171, remove front output shaft bearing.
3. Start the front output shaft bearing in case. Then seat bearing with Handle C-4171 (3) and Installer 6953 (2).
4. Install the front output shaft bearing retaining ring.



5. Remove the front output shaft rear bearing with the screw and jaws from Remover L-4454 (2) and Cup 8148 (3).

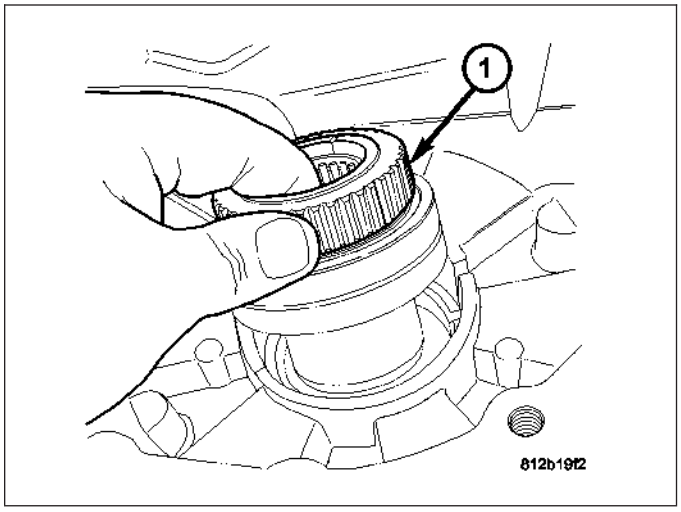


6. Install the new front output shaft rear bearing (2) with Tool Handle C-4171 (1) and Installer 5066 (3).

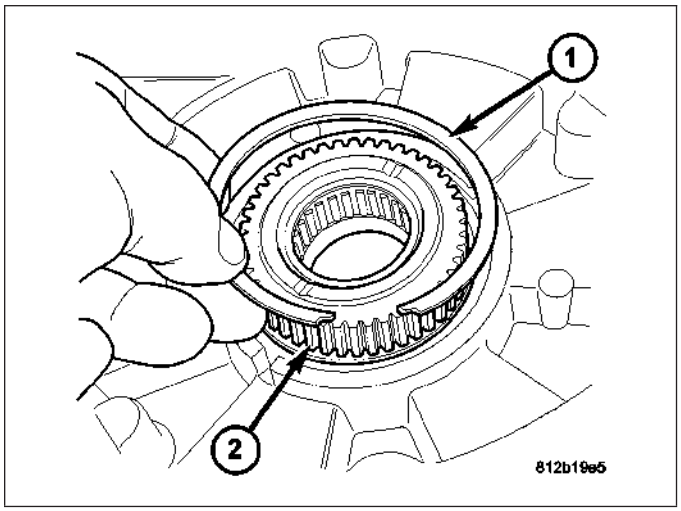


INPUT GEAR

1. Align and install the input gear and bearing assembly (1) into the front case. Be sure that the input gear bearing is fully seated in the front case.



2. Install snap-ring (2) to hold the input gear assembly (2) into the front case.
3. Install a new input shaft oil seal with Handle C-4171 and Installer 8841.

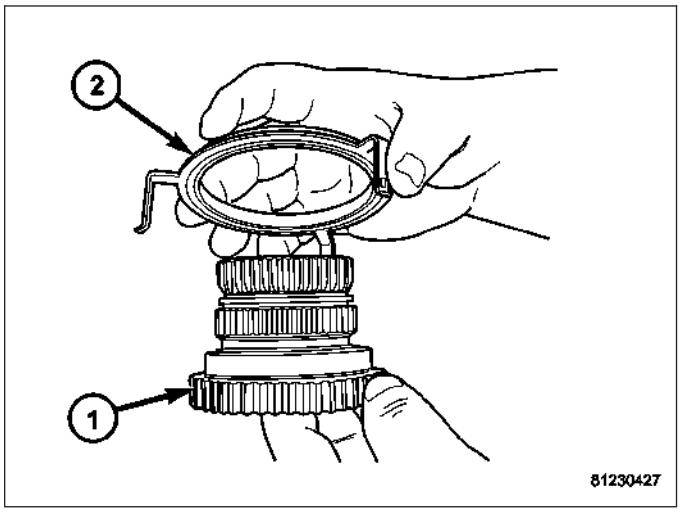


MAINSHAFT

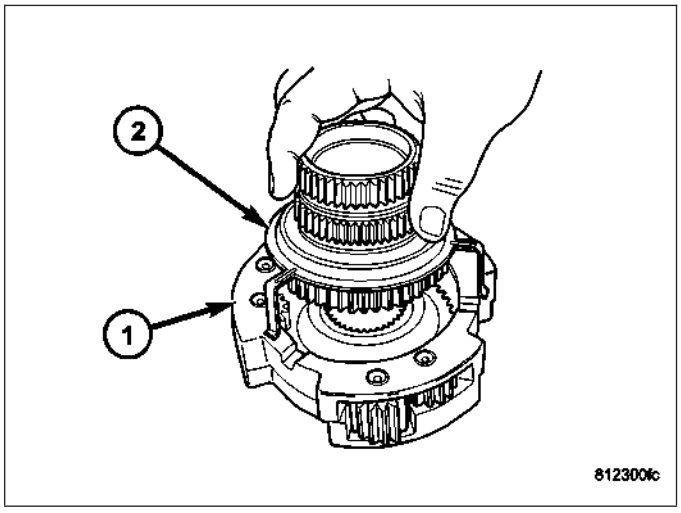
1. Lubricate the mainshaft splines with recommended transmission fluid.

NOTE: Replace the mode hub retainer if the legs were distorted during removal.

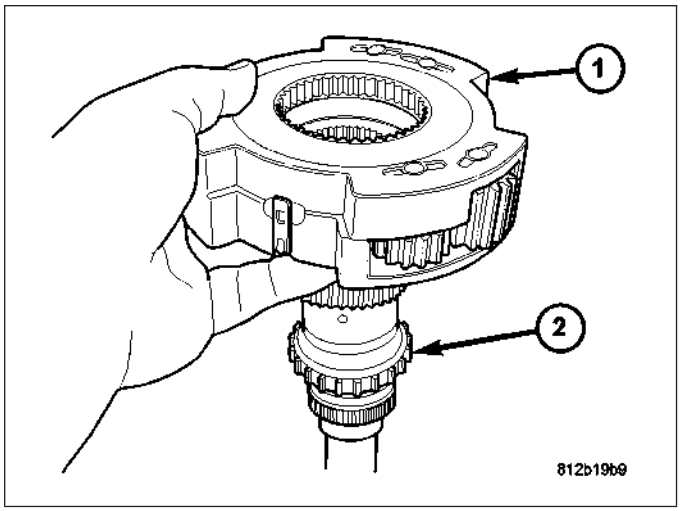
2. Install the mode hub retainer (1) onto the mode hub (2).



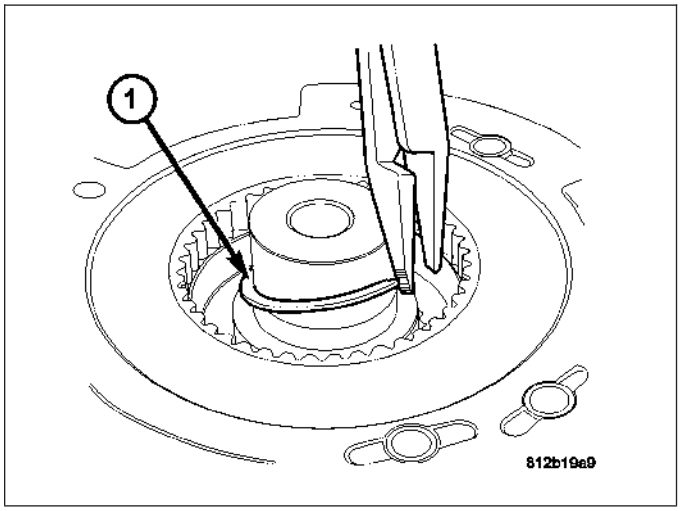
3. Install the mode hub and mode hub retainer (2) onto the differential assembly (1). Make sure the retainer is fully seated onto the differential.



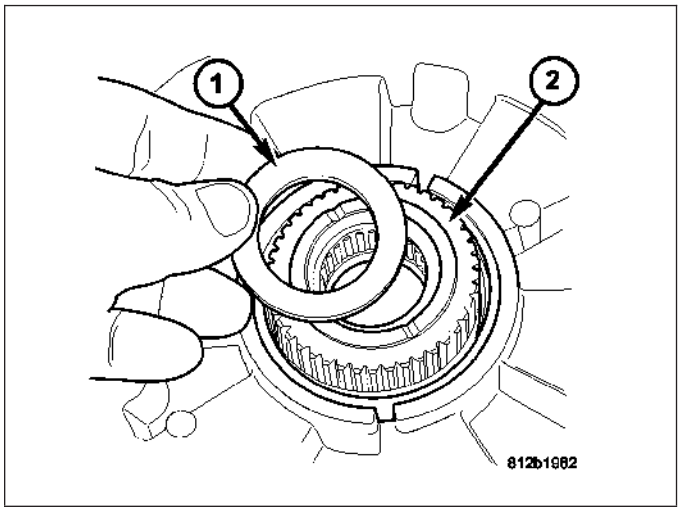
4. Install the differential assembly (1) onto the mainshaft (2).



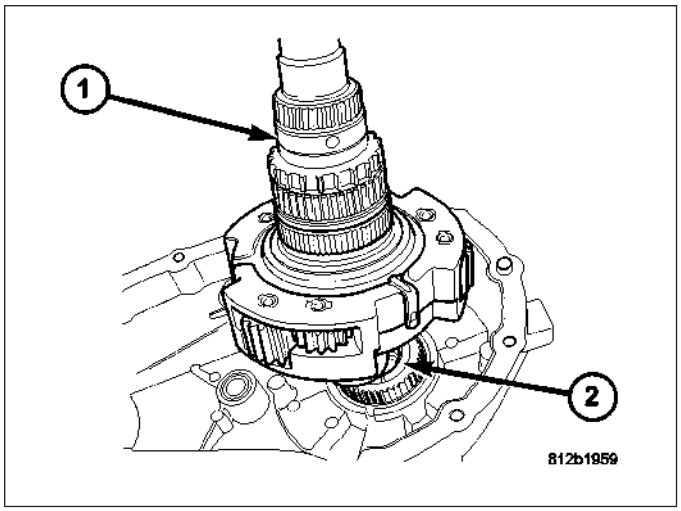
5. Install the differential snap-ring (1).



6. Install the mainshaft thrust washer (1) onto the input gear assembly (2).

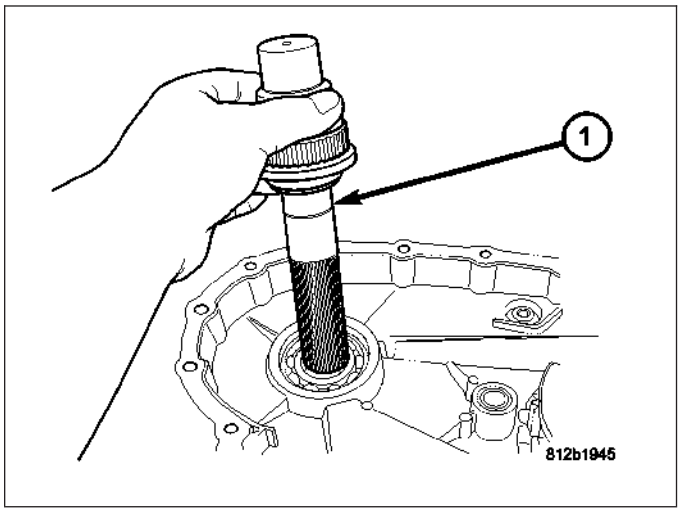


7. Install the mainshaft and differential assembly (1) into the input gear (2).

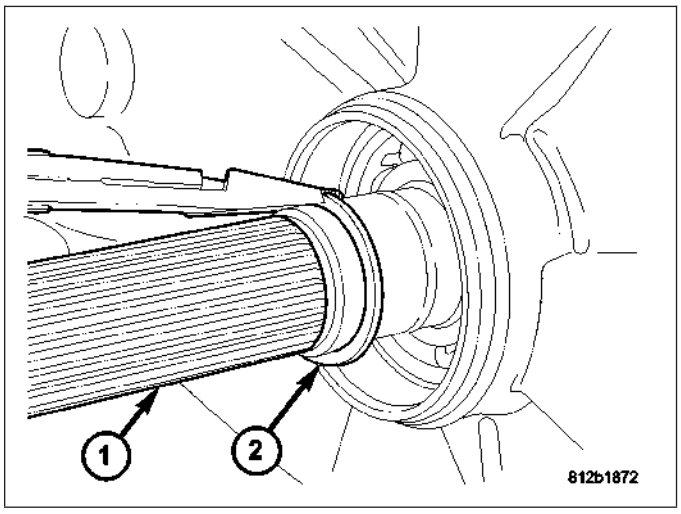


FRONT OUTPUT SHAFT

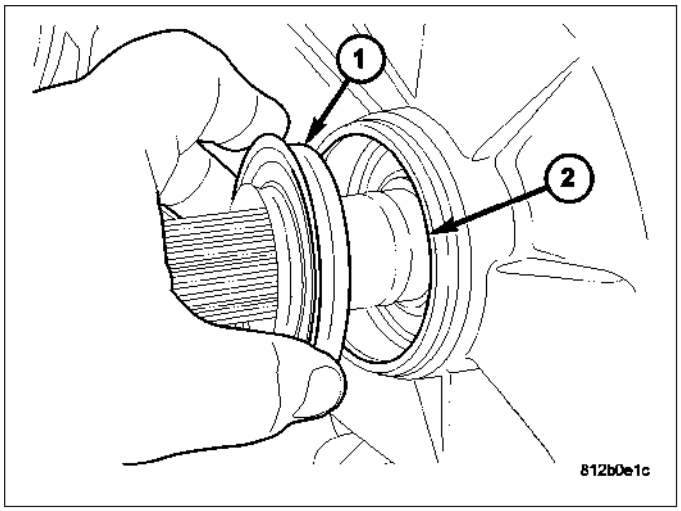
1. Install the front output shaft (1) into the transfer case front case.



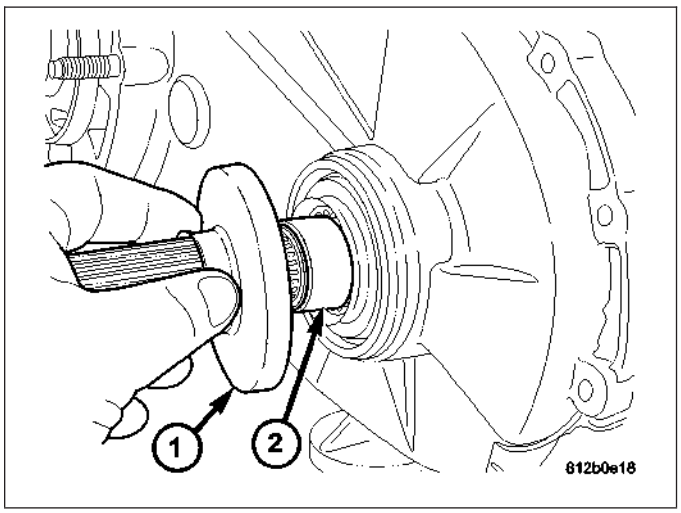
2. Install the front output shaft retaining ring (2) onto the output shaft (1).



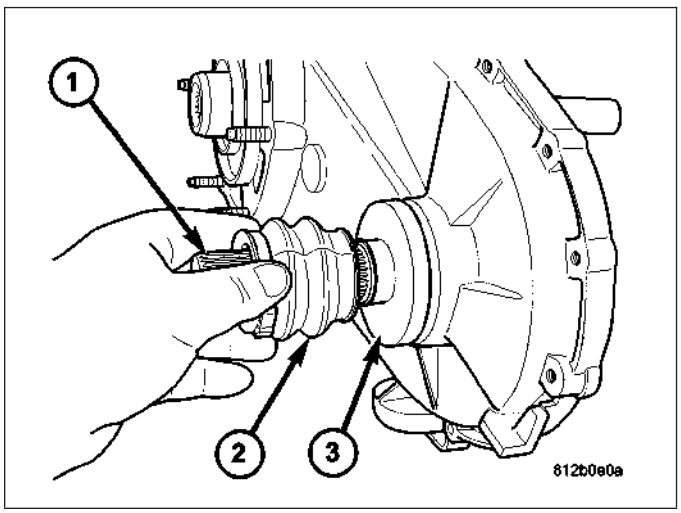
3. Install the new front output shaft seal (1) into position in the transfer case bore (2).
4. Install the new front output shaft seal (1) with Installer MB991168A.



5. Install the new front output shaft seal slinger (1) into position on the output shaft (2).
6. Install the front output shaft seal slinger with Installer 8840. Install the slinger onto the shaft until the tool contacts the rear of the output shaft.

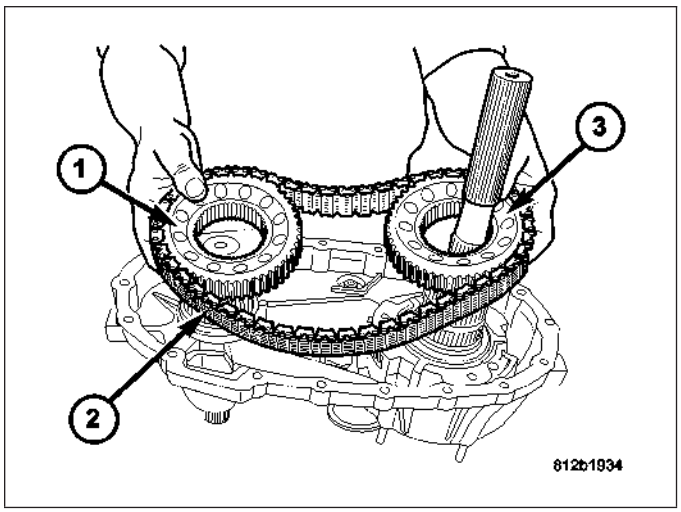


7. Install the seal boot (2) onto the seal slinger (3)
8. Install a new seal boot clamp onto the seal boot.
9. Install the seal boot and clamp onto the slinger hub and tighten the clamp with Crimp Tool C-4975-A.

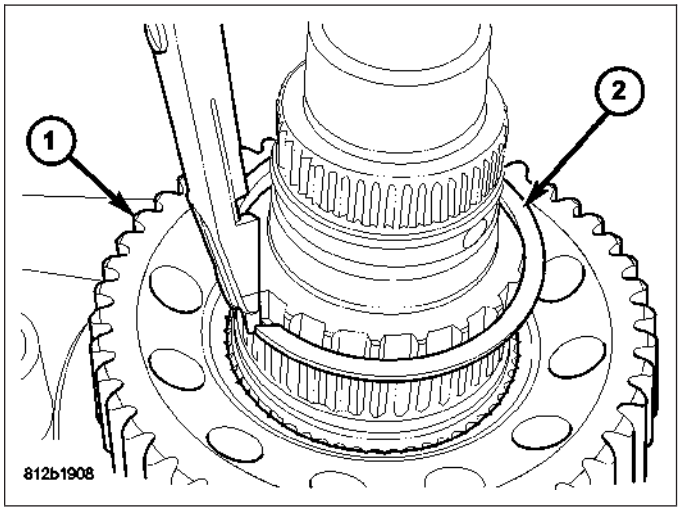


DRIVE CHAIN AND SPROCKETS

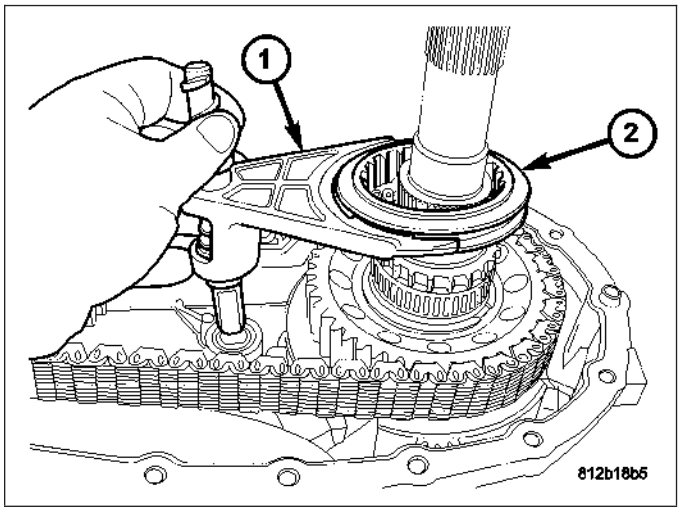
1. Install the front output shaft drive sprocket (1), the mainshaft drive sprocket (3), and the drive chain (2) as one unit.



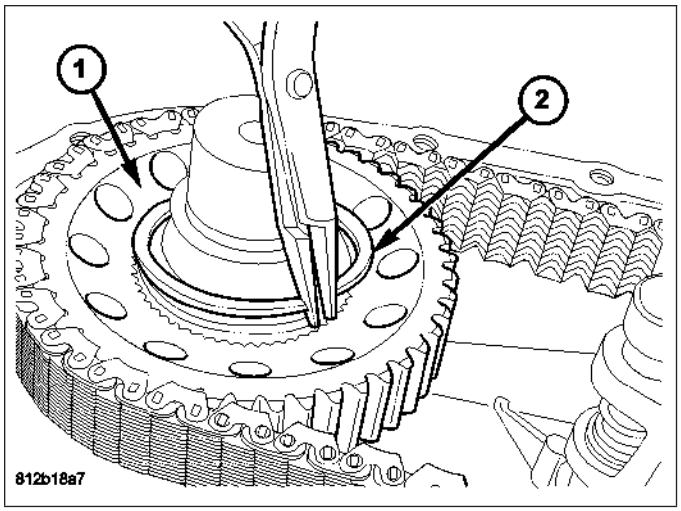
2. Install the mainshaft drive sprocket (1) retaining ring (2).



3. Install the shift fork (1) and sleeve (2) as an assembly.

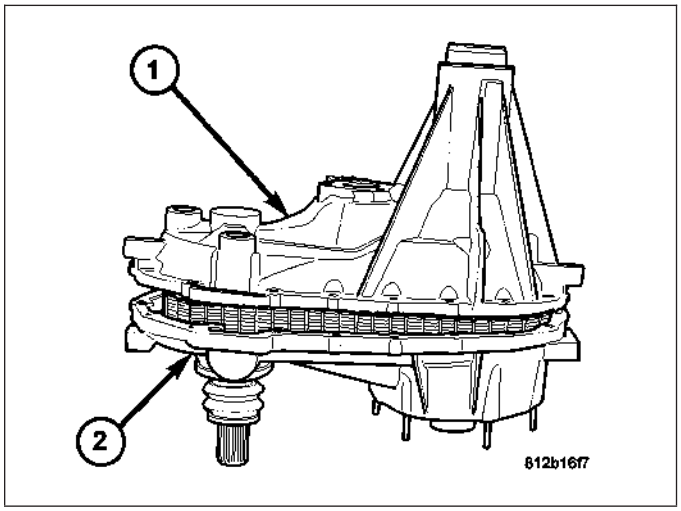


4. Install the front drive sprocket (1) retaining ring (2).



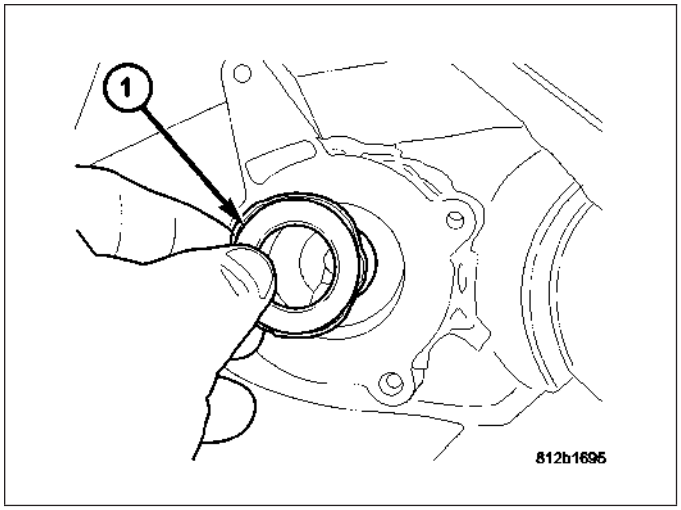
REAR CASE

1. Install the magnet in the front case pocket.
2. Support transfer case so that the rear case is facing upward.
3. Apply 3 mm (1/8 in.) wide bead of Mopar® Gasket Maker, or equivalent silicone adhesive sealer, to mounting flange of front case. Work sealer bead around bolt holes.
4. Install the rear case (1) onto the front case (2).
5. Install the bolts to hold the front case (2) to the rear case (1).
6. Tighten case bolts to 25-28 N·m (18-21 ft. lbs.) torque.

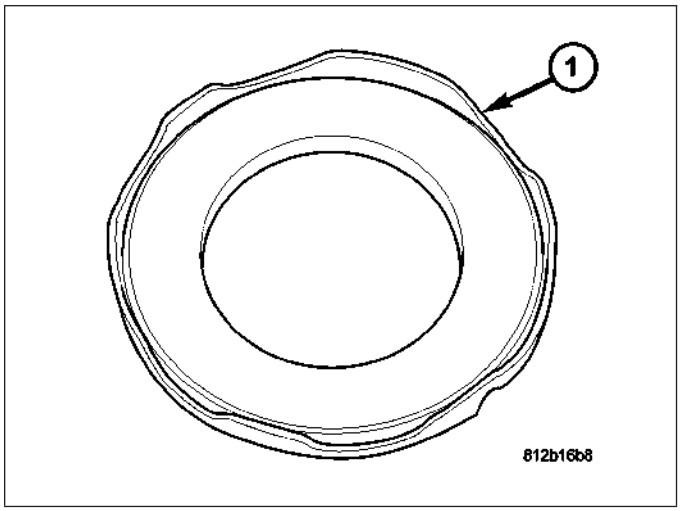


SHIFT MOTOR AND MODE SENSOR ASSEMBLY

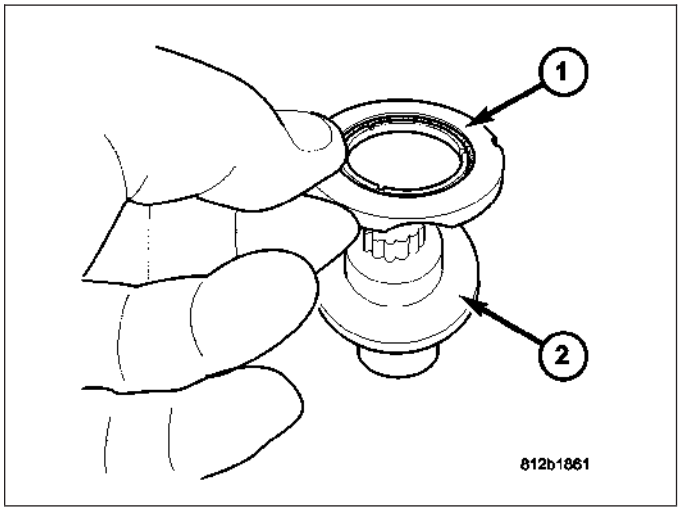
1. Install the shift screw lower bearing (1) into the transfer case.



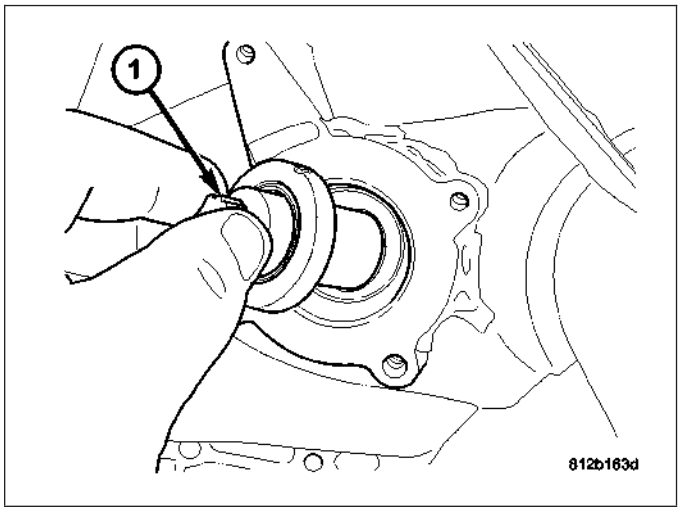
2. Make sure the bearing is installed with the tabs (1) up.



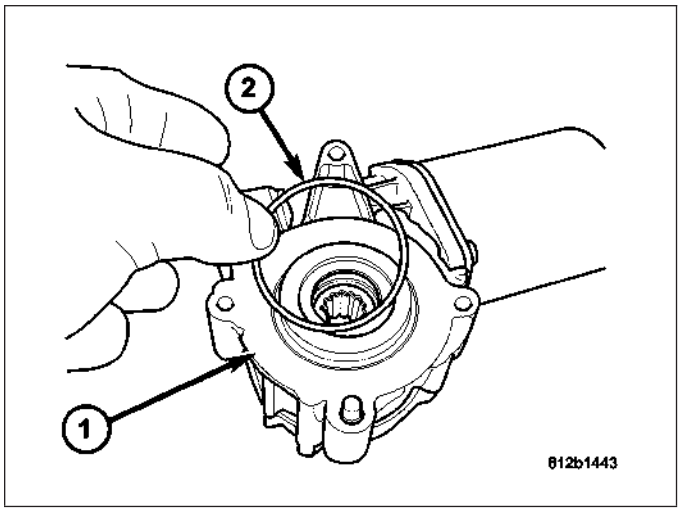
3. Install the shift screw top bearing (1) onto the shift screw (2). Make sure the bearing is installed with the tabs down.



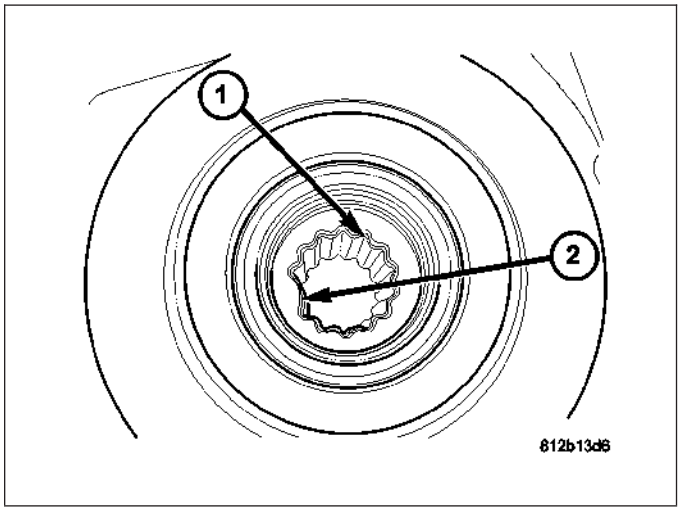
4. Install the transfer case shift screw (1) and top bearing from the transfer case. Make sure that the shift screw is fully seated in the case. The missing tooth in the shift screw spines should be aligned with the indicator groove in the case.



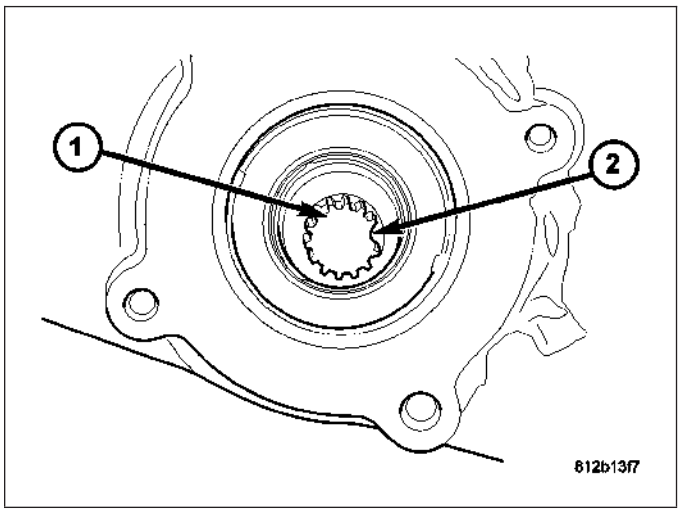
5. Verify that the shift motor o-ring (2) is clean and properly positioned inside the machined o-ring groove of the shift motor (1).
6. Add high temperature grease between the shift motor assembly and the transfer case mating surface for sealing purposes.



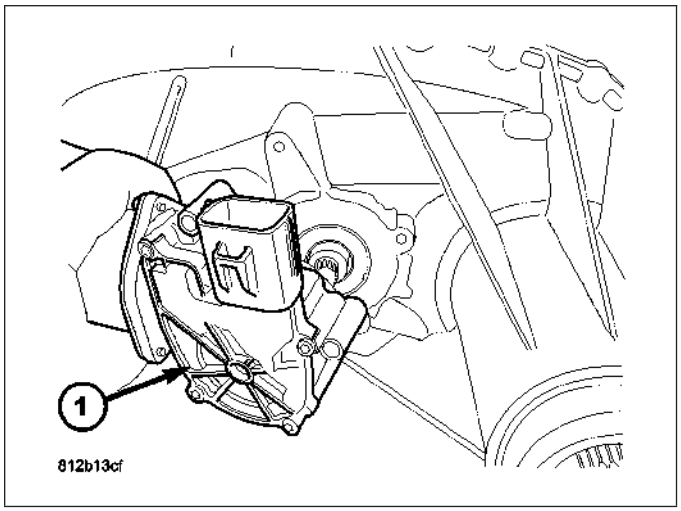
NOTE: Verify that the missing tooth (2) in the shift motor drive spline (1)...



NOTE: ...and the transfer case drive spline (1) missing tooth (2) are aligned. It may be necessary to manually shift the transfer case if the shift motor and transfer case shaft are not aligned.

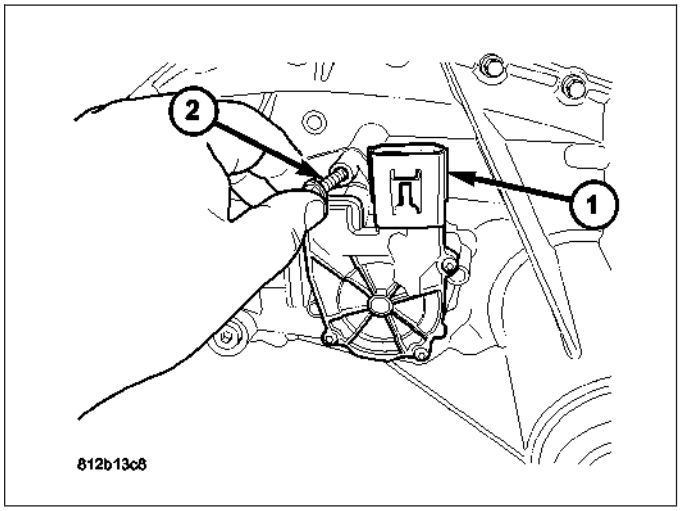


7. Position the shift motor and mode sensor assembly (1) onto the transfer case.



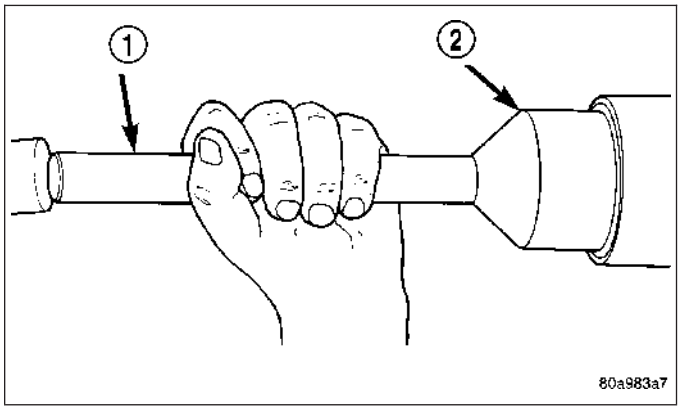
CAUTION: If the original shift motor and mode sensor assembly bolts are reused, be sure to use Mopar® Lock & Seal or Loctite™ 242 to replenish the lock patch material originally found on the bolts

8. Install the bolts (2) to hold the shift motor and mode sensor assembly (1) to the transfer case. Tighten the bolts to 9-14 N·m (7-10 ft.lbs.).



EXTENSION SEAL

1. Clean fluid residue from sealing surface and inspect for defects.
2. Using Installer D-163 (2) and Handle C-4171 (1), install the new seal into the rear case extension.



INSTALLATION

1. Mount transfer case on a transmission jack.
2. Secure transfer case to jack with chains.
3. Position transfer case under vehicle.
4. Align transfer case and transmission shafts and install transfer case onto the transmission.

5. Install and tighten transfer case attaching nuts to 27-34 N·m (20-25 ft. lbs.) torque.
6. Connect the vent hose.
7. Connect the shift motor and mode sensor assembly wiring connector. Secure wire harness to clips on transfer case.
8. Align and connect the propeller shafts. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/FRONT PROPELLER SHAFT - INSTALLATION) (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/REAR PROPELLER SHAFT - INSTALLATION)
9. Fill transfer case with correct fluid. (Refer to 21 - TRANSMISSION/TRANSFER CASE/FLUID - STANDARD PROCEDURE)
10. Install skid plate, if equipped.
11. Remove transmission jack and support stand.
12. Lower vehicle and verify transfer case shift operation.

SPECIFICATIONS

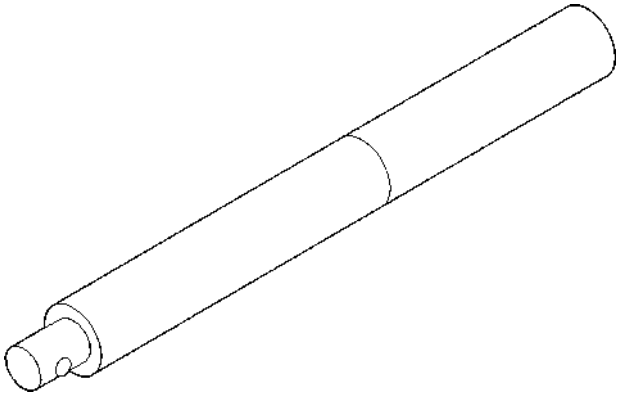
TRANSFER CASE - NV144

TORQUE SPECIFICATIONS

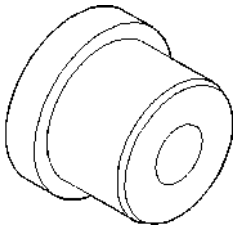
DESCRIPTION	N-m	Ft. Lbs.	In. Lbs.
Plug, Drain/Fill	20-34	15-25	-
Bolt, Case Half	25-28	18-21	-
Bolt, Shift Motor and Mode Sensor Assembly	9-14	7-10	-
Nut, Mounting	30-41	20-30	-

SPECIAL TOOLS

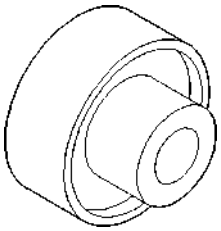
TRANSFER CASE - NV144



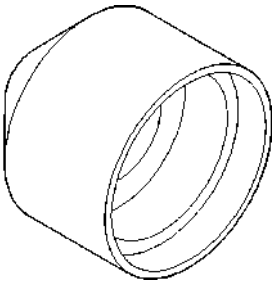
Handle, Universal - C-4171



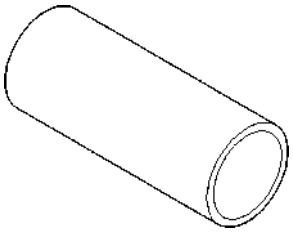
Installer, Bushing - 5066



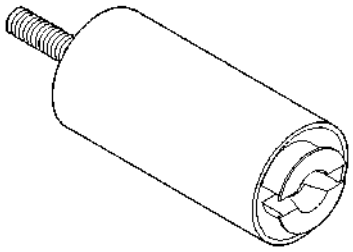
Installer, Bearing - 6953



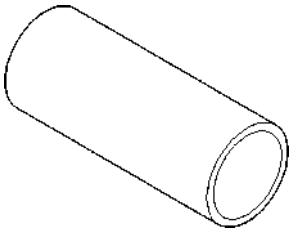
Installer, Seal - D-163



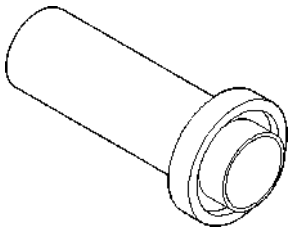
Cup - 8148



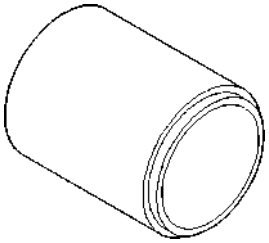
Remover - L-4454



Installer - 8840



Installer, Seal - MB991168A



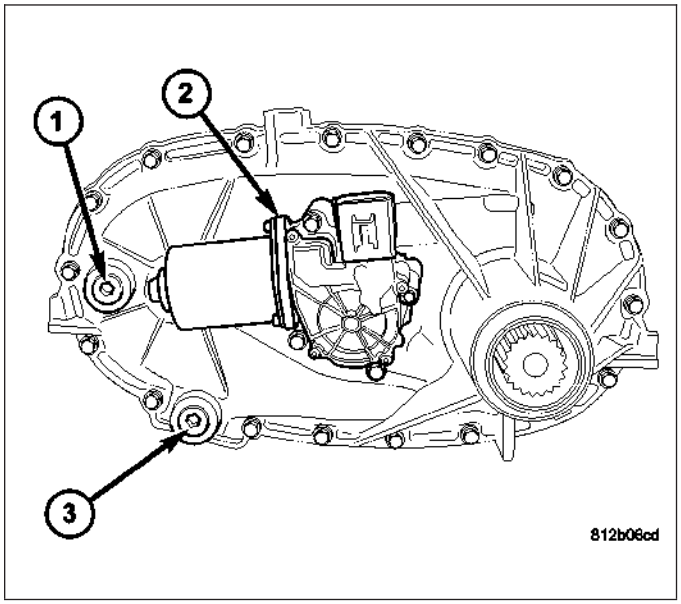
Installer, Seal - 8841

FLUID

STANDARD PROCEDURE - FLUID DRAIN AND REFILL

The fill and drain plugs (1, 3) are both in the rear case.

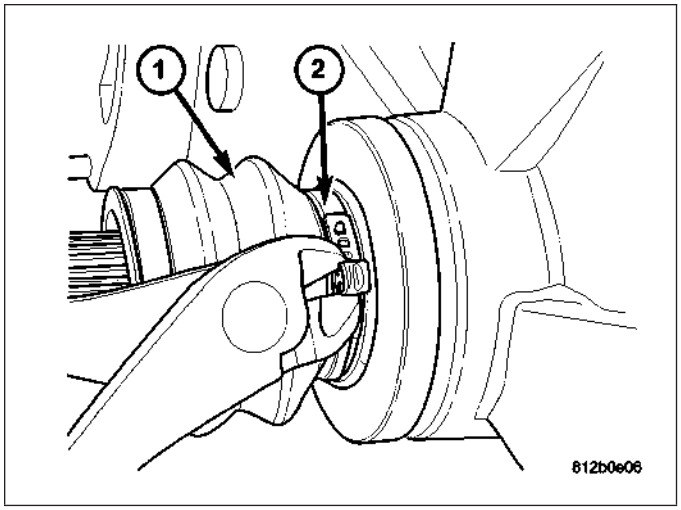
1. Raise vehicle.
2. Position drain pan under transfer case.
3. Remove drain (3) and fill plugs (1) and drain lubricant completely.
4. Install drain plug (3). Tighten plug to 20-34 N·m (15-25 ft.lbs.).
5. Remove drain pan.
6. Fill transfer case to bottom edge of fill plug opening with Mopar® ATF +4, Automatic Transmission fluid.
7. Install and tighten fill plug (1) to 20-34 N·m (15-25 ft.lbs.).
8. Lower vehicle.



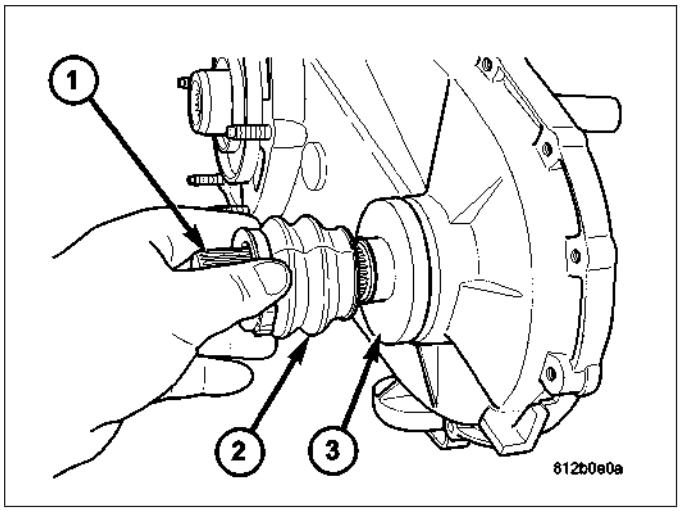
SEAL-FRONT OUTPUT SHAFT

REMOVAL

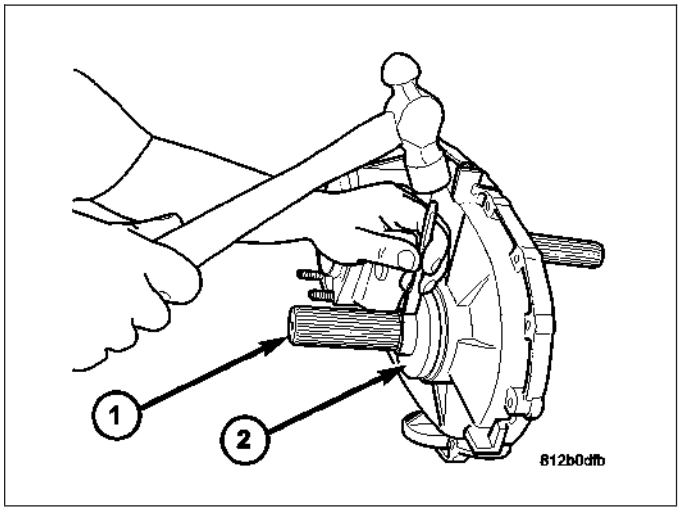
1. Remove the front propeller shaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - REMOVAL).
2. Remove the front propeller shaft seal boot (1) retaining clamp (2).



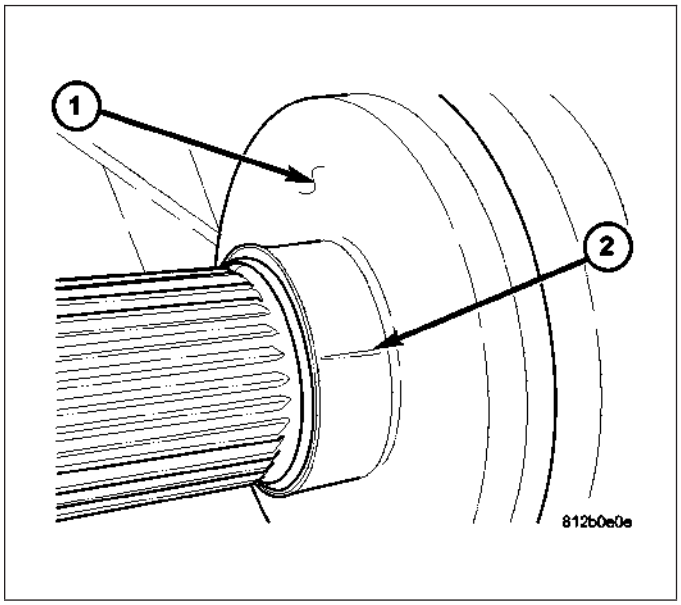
3. Remove the front propeller shaft seal boot (2) from the front output shaft seal slinger (3).



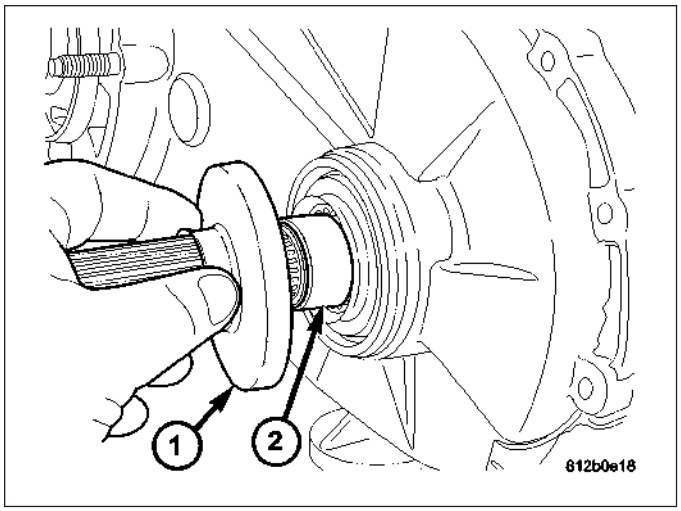
4. Using a suitable hammer and chisel, strike the seal slinger (2) with the chisel as shown in three, equally spaced locations.



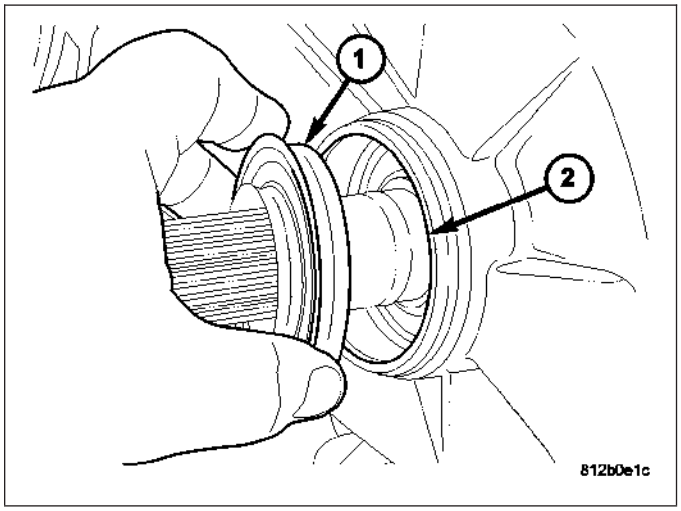
5. The indentations (2) should appear as shown here.



6. Remove the front output shaft seal slinger (1) from the output shaft (1).

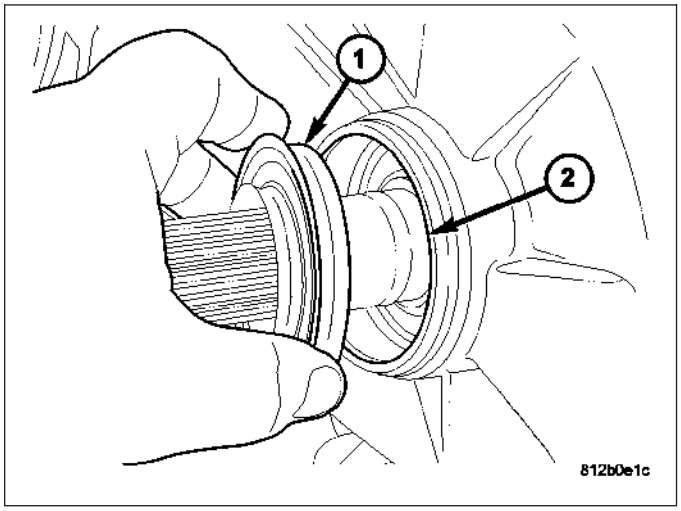


7. Remove the front output shaft seal (1) from the transfer case bore (2) using a suitable tool.

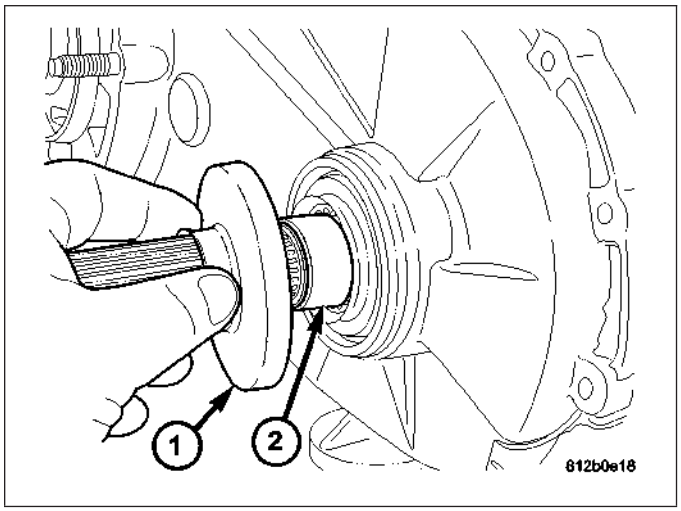


INSTALLATION

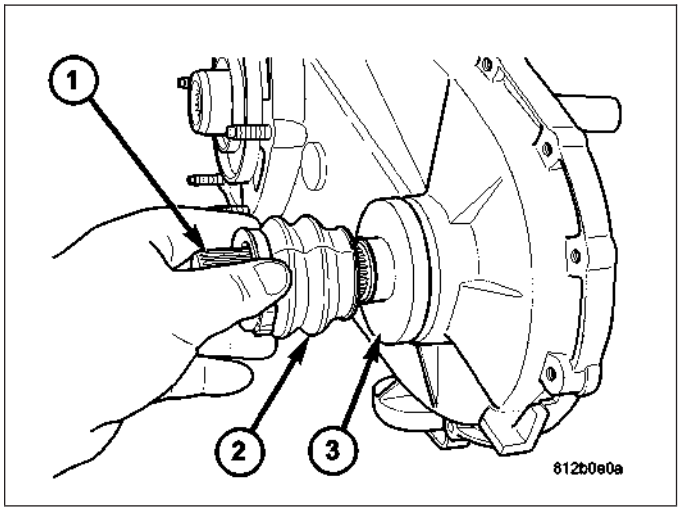
1. Install the new front output shaft seal (1) into position in the transfer case bore (2).
2. Install the new front output shaft seal (1) with Installer MB991168A.



3. Install the new front output shaft seal slinger (1) into position on the output shaft (2).
4. Install the front output shaft seal slinger with Installer 8840. Install the slinger onto the shaft until the tool contacts the rear of the output shaft.



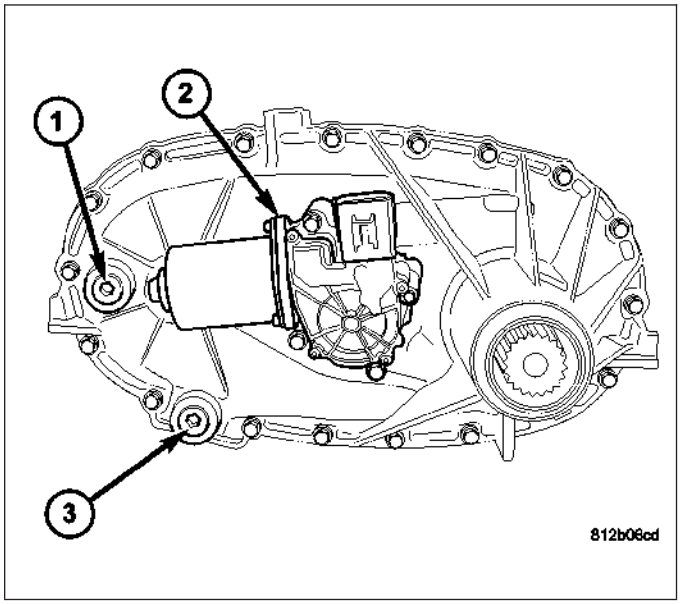
5. Install the seal boot (2) onto the seal slinger (3)
6. Install a new seal boot clamp onto the seal boot.
7. Install the seal boot and clamp onto the slinger hub and tighten the clamp with Crimp Tool C-4975-A.
8. Install the front propeller shaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - INSTALLATION).



SENSOR-MODE

DESCRIPTION

The transfer case mode sensor (2) provides the Front Control Module (FCM) feedback about the position of the transfer case. The sensor consists of a linear analog position sensor that converts the motor output shaft position into a DC signal. The sensor may rotate a full 360 degrees for both the NV144 and the NV244 GENII. The operating envelope or sector rotation is -5 to 180 degrees for the NV144 and -40 to 20 degrees for the NV244 GENII. The FCM must supply 5VDC (+/- 0.5v) to the sensor whenever the FCM is not in sleep mode and monitor the shift motor position. The sensor position is monitored when the ignition is in the RUN position and for 10 seconds after the ignition is shifted to the OFF position. The sensor is mechanically linked to the shaft of the cam which allows the transfer case to shift. The mode sensor will draw less than 20 mA of current during operation.



OPERATION

During normal vehicle operation, the Front Control Module (FCM) monitors the mode sensor outputs at least every 2 milliseconds when the shift motor is stationary or active.

Refer to SHAFT ANGLE vs. TRANSFER CASE POSITION for the relative angles of the transfer case shift sector versus the interpreted transfer case gear operating mode.

SHAFT ANGLE vs. TRANSFER CASE POSITION

Shaft Angle (Degrees)	Transfer Case Position
0	AWD
-20	4LOCK

NOTE: All the parameter voltages referred to in the following information are calibrated items in the controller software and are subject to change.

NOTE: For a further explanation of Phase 1 through 3 shifting, (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - OPERATION).

The following information describes the different mode sensor positions:

- 4LOCK TARGET REGION - The position shall be considered 4LOCK if the voltage is greater than or equal to encoder_4LOCK_min Volts and it is also less than or equal to encoder_4LOCK_max Volts.
- AWD TARGET REGION - The position shall be considered AWD if the voltage is greater than or equal to encoder_AWD_min Volts and it is also less than or equal to encoder_AWD_max Volts.
- AWD SHIFT LIMIT - During Phase 2 and Phase 3 shifting, shifts may become unidirectional when a voltage is greater than or equal to encoder_AWD_min Volts has been reached.

The mode sensor position will be considered invalid by the FCM if the voltage is greater than or equal to encoder_High_Range_Limit Volts or if it is less than or equal to encoder_Low_Range_Limit Volts.

If FCM looses the encoder signal in a NV144 transfer case during a shift, the FCM will respond with a shift back in the opposite direction of travel to first attempt to find the encoder signal. If the signal is not found, the FCM will drive motor in AWD direction for 1 second.

Refer to MODE SENSOR VOLTAGES - NV144 table for the mode sensor voltages.

MODE SENSOR VOLTAGES - NV144

Parameter Name	Voltage
encoder_4LOCK_Min	4.19
encoder_4LOCK_Max	4.35
encoder_AWD_Min	0.45
encoder_AWD_Max	0.55
encoder_High_Range_Limit	4.51
encoder_Low_Range _Limit	0.20

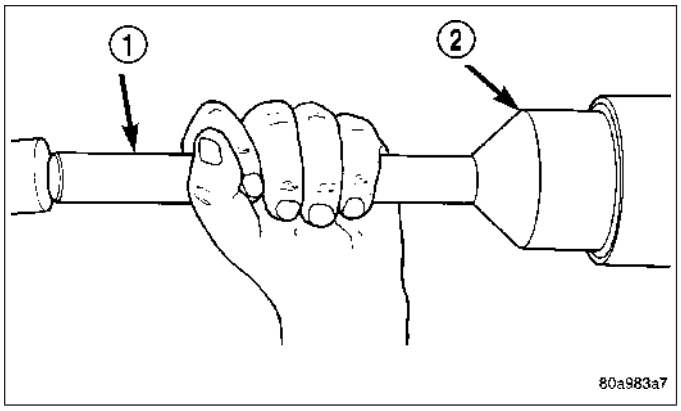
SEAL-REAR CASE EXTENSION

REMOVAL

1. Raise vehicle.
2. Remove rear propeller shaft. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - REMOVAL)
3. Using a suitable pry tool or slide-hammer mounted screw, remove the rear case extension seal.

INSTALLATION

1. Clean fluid residue from sealing surface and inspect for defects.
2. Using Installer D-163 (2) and Handle C-4171 (1), install the new seal into the rear case extension.
3. Install the rear propeller shaft. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/ PROPELLER SHAFT - INSTALLATION)
4. Verify proper fluid level.
5. Lower vehicle.



SWITCH-TRANSFER CASE SELECTOR

DESCRIPTION

The selector switch assembly is mounted in the right side of the vehicle's Instrument Panel (IP) and consists of a rotary knob connected to a resistive network for the mode shift selections.

OPERATION

As the position of the selector switch varies, the resistance between the Mode Sensor supply voltage pin and the Mode Sensor output will vary. Hardware, software, and calibrations within the Front Control Module (FCM) are provided that interpret the selector switch resistance as given in the table below: SELECTOR SWITCH INTERPRETATION

SELECTOR SWITCH INTERPRETATION

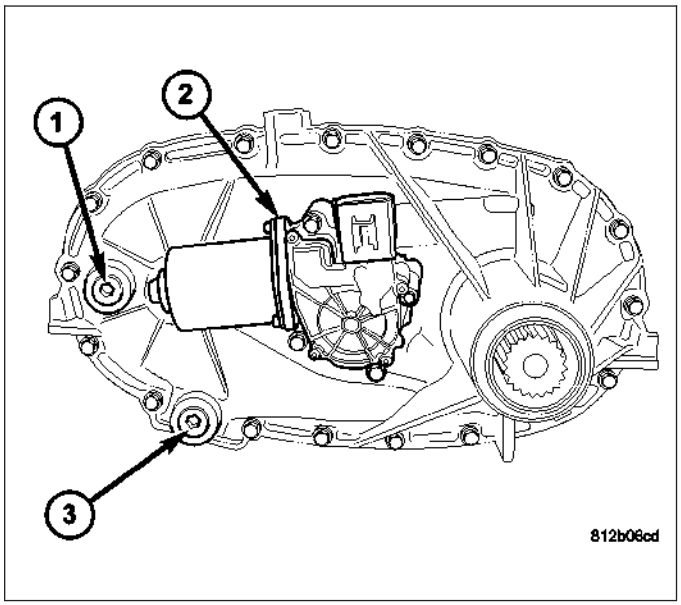
Required Interpretation	Resistance Range (ohms)
Shorted	<150
AWD (Default)	1159-1287
4LOCK	2259-2503
Open/Diagnostic	>19K

The internal structure and function of the selector switch is such that the connection is made to the Open/Diagnostic resistor before the connection to the individual position resistors is broken. Because of this characteristic, if the resistance between the Mode Sensor supply voltage pin and the Mode Sensor output pin is >19k ohms, the position resistor is open.

ASSEMBLY-SHIFT MOTOR/MODE SENSOR

DESCRIPTION

The shift motor (1) is an electromechanical device consisting of a DC permanent magnet motor, a motor brake, a gear train and an analog position sensor. The shift motors' overall function is to move and lock a gear that moves the mode fork found in the transfer case. This allows the transfer case to be shifted electrically to multiple operating positions (4LOCK and AWD). The operating current of the shift motor under stall conditions is 30 amps maximum at 72° F with 13.5 volts, at the motor leads.



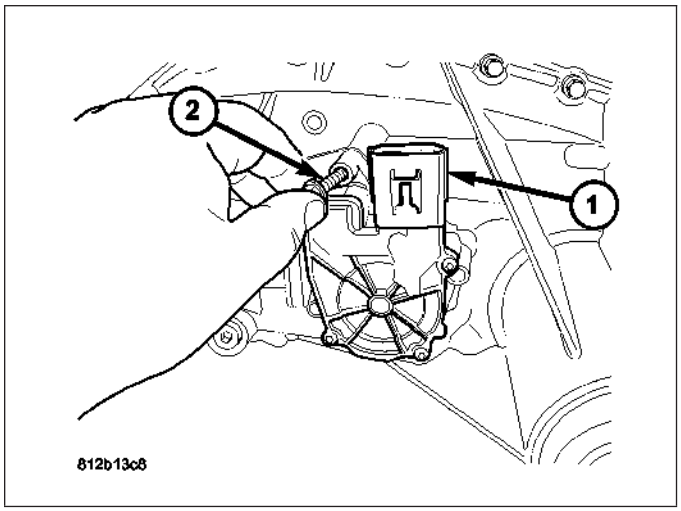
OPERATION

Shifting in the transfer case occurs when the shift motor brake is released and a Pulse Width Modulated (PWM) voltage is supplied to the shift motor by the Front Control Module (FCM). A linear analog position sensor located inside the shift motor, provides the FCM with the motors' angular, rotational position. With this information, the FCM continuously knows the motors' position, and therefore allows it to accurately control the motors' operation, including voltage polarity which is used to control motor direction.

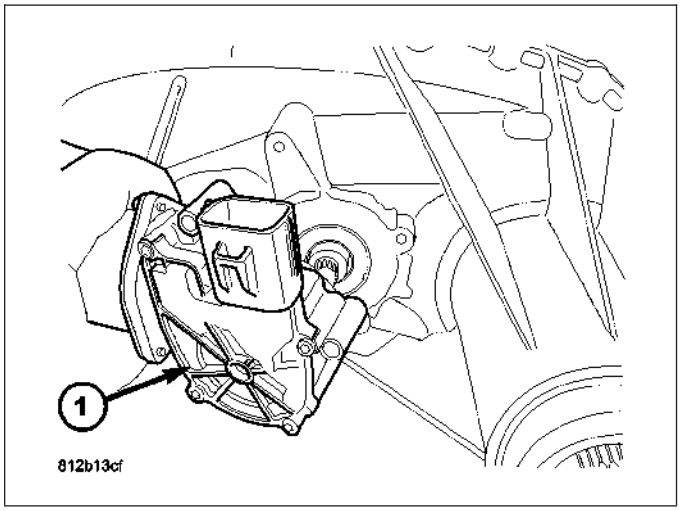
REMOVAL

NOTE: New shift motor assemblies are shipped in the AWD position. If a new shift motor assembly must be installed, it will be necessary to shift the transfer case to the AWD position prior to motor installation.

1. Raise the vehicle on a suitable hoist.
2. Disengage the wiring connector from the shift motor and mode sensor assembly.
3. Remove the bolts (2) holding the shift motor and mode sensor assembly (1) onto the transfer case.

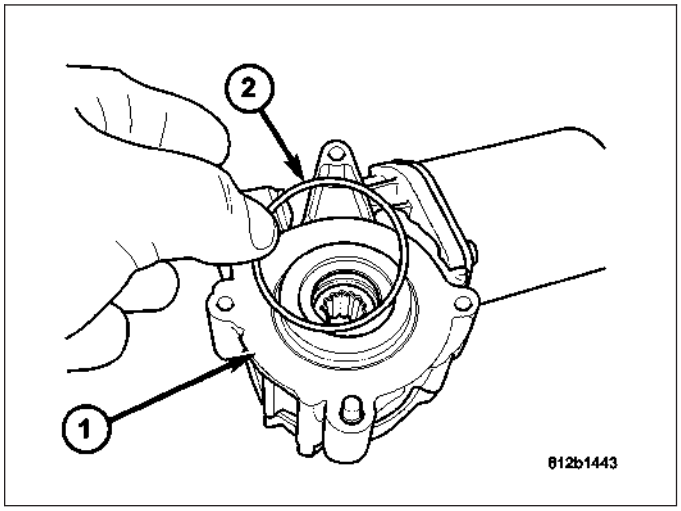


4. Separate the shift motor and mode sensor assembly (1) from the transfer case.

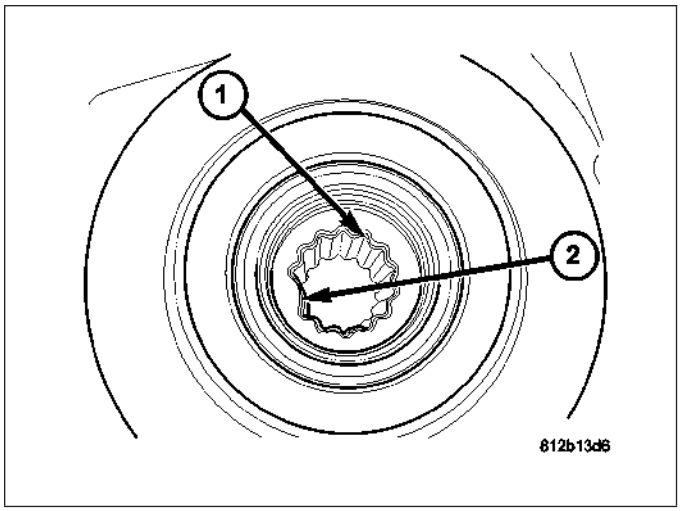


INSTALLATION

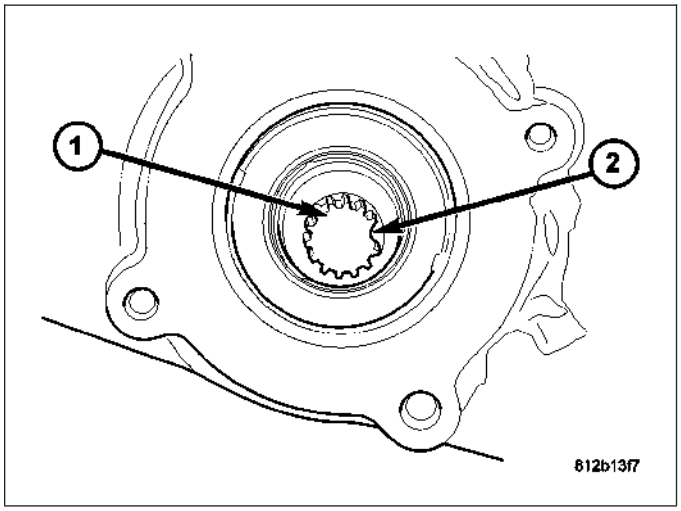
1. Verify that the shift motor o-ring is clean and properly positioned inside the machined o-ring groove of the shift motor.
2. Add high temperature grease between the shift motor assembly and the transfer case mating surface for sealing purposes.



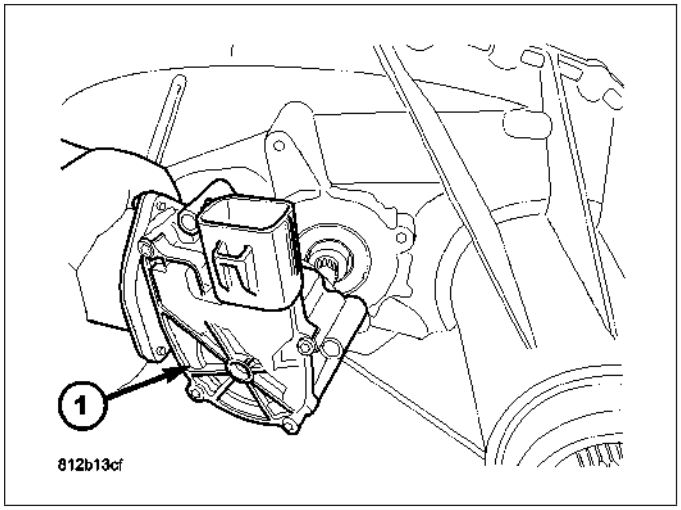
NOTE: Verify that the missing tooth (2) in the shift motor drive spline (1)...



NOTE: ...and the transfer case drive spline (1) missing tooth (2) are aligned. It may be necessary to manually shift the transfer case if the shift motor and transfer case shaft are not aligned.



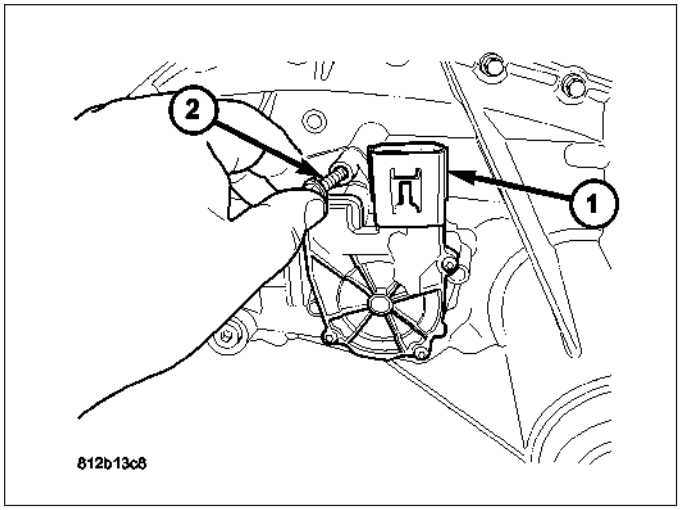
3. Position the shift motor and mode sensor assembly (1) onto the transfer case.



4. Install the bolts (2) to hold the assembly (1) onto the transfer case. Tighten the bolts to 9-14 N·m (7-10 ft.lbs.).

CAUTION: If the original shift motor and mode sensor assembly bolts are reused, be sure to use Mopar® Lock & Seal or Loctite™ 242 to replenish the lock patch material originally found on the bolts

5. Engage the wiring connector to the shift motor and mode sensor assembly.
6. Refill the transfer case as necessary.
7. Lower vehicle and verify transfer case operation.



TRANSFER CASE - NV244 GENII - SERVICE INFORMATION

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TRANSFER CASE - NV244 GENII - SERVICE INFORMATION

DESCRIPTION

The NV244 GENII is an electronically controlled full and part-time transfer case with no two wheel drive operation.

A differential in the transfer case is used to control torque transfer to the front and rear axles. A low range gear reduction system provides increased low speed torque capability for off road operation. The low range provides a 2.72:1 reduction ratio.

The geartrain is mounted in two aluminum case halves attached with bolts. The mainshaft front and rear bearings are mounted in aluminum retainer housings bolted to the case halves.

OPERATING RANGES

NV244 GENII operating ranges are:

- AWD(All-Wheel Drive)
- 4LOCK (Part-time)
- 4LO
- NEUTRAL

The AWD mode can be used at any time and on any road surface.

The 4LOCK (Part-time) and 4LO ranges are for off road use only. The only time these ranges can be used is when the road surface is covered with snow, ice, or other loose slippery material.

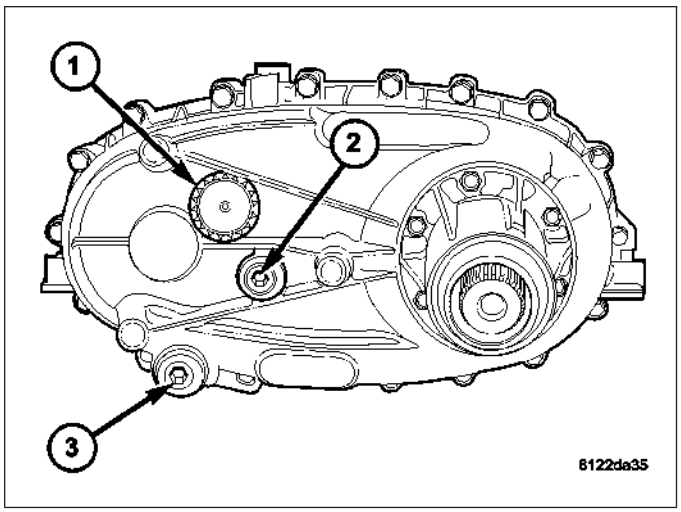
SHIFT MECHANISM

Operating ranges are selected with a dash mounted shift selector switch. The shift selector switch provides a input to the Transfer Case Control Module (TCCM) to indicate the driver's desire to change operating ranges. The TCCM uses this input, along with the input from the transfer case mounted mode sensor and information from the vehicle's bus, to determine if a shift is permitted. If the TCCM decides the shift is permitted, the TCCM controls the shift motor, mounted to the exterior of the transfer case, to perform the shift.

IDENTIFICATION

A circular ID (1) tag is attached to the rear case of each transfer case. The ID tag provides the transfer case model number, assembly number, serial number, and low range ratio.

The transfer case serial number also represents the date of build.



OPERATION

The input gear is splined to the transmission output shaft. The input gear drives the mainshaft through the planetary assembly and range sleeve. The front output shaft is operated by a drive chain that connects the shaft to a drive sprocket on the mainshaft. The drive sprocket is splined to a differential assembly. Depending on the position of the mode fork and sleeve, the front output shaft is driven directly by the mainshaft or through the differential. The mode fork operates the mode sleeve and hub. The sleeve and hub are not equipped with a synchronizer mechanism for shifting.

DIAGNOSIS AND TESTING

TRANSFER CASE - NV244

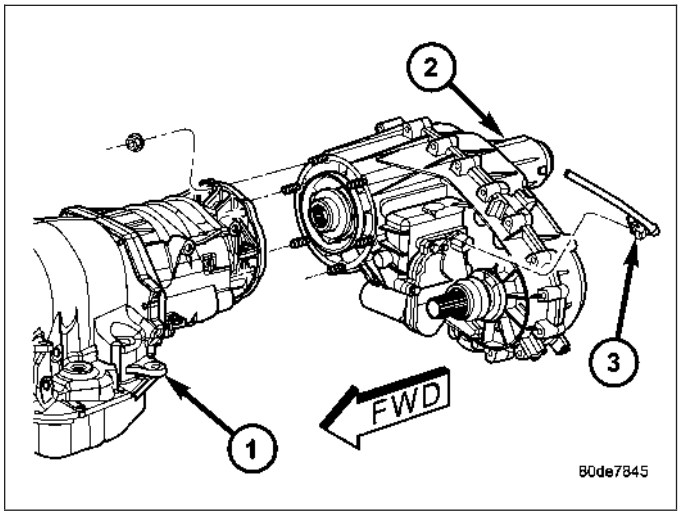
DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSE	CORRECTION
Transfer case difficult to shift or will not shift into desired range.	1) Transfer case electronically controlled shift system malfunction.	1) Verify proper operation per the appropriate diagnostic manual.
	2) Insufficient or incorrect lubricant.	2) Drain and refill transfer case with the correct quantity of Mopar® ATF +4, Automatic Transmission Fluid.
	3) Internal transfer case components binding, worn, or damaged.	3) Repair or replace components as necessary.
Transfer case noisy in all drive modes.	1) Insufficient or incorrect lubricant.	1) Drain and refill transfer case with the correct quantity of Mopar® ATF +4, Automatic Transmission Fluid.
	2) Internal transfer case components binding, worn, or damaged.	2) Repair or replace components as necessary.

CONDITION	POSSIBLE CAUSE	CORRECTION
Transfer case noisy while in, or jumps out of, 4LO.	1) Transfer case not completely engaged in 4LO position.	1) While rolling 2-3 MPH and the transmission in NEUTRAL, or the clutch depressed on vehicles equipped with a manual transmission, shift the transfer case to the AWD or 4LOCK position, and then back into the 4LO position.
	2) Range fork damaged, inserts worn, or fork is binding on the shift rail.	2) Repair or replace components as necessary.
	3) Low range gear worn or damaged.	3) Repair or replace components as necessary.
Lubricant leaking from transfer case seals or vent.	1) Transfer case overfilled.	1) Drain lubricant to the correct level.
	2) Transfer case vent closed or restricted.	2) Clean or replace vent as necessary.
	3) Transfer case seals damaged or installed incorrectly.	3) Replace suspect seal.
Transfer case will not shift through 4LOCK (Part-time) range.	1) Incomplete shift due to drivetrain torque load.	1) Drive in a straight line and momentarily release the accelerator pedal to complete the shift.
	2) Incorrect tire pressure.	2) Correct tire pressure as necessary.
	3) Excessive tire wear.	3) Correct tire condition as necessary.
	4) Excessive vehicle loading.	4) Correct as necessary.

REMOVAL

1. Shift transfer case into AWD.
2. Raise vehicle.
3. Drain transfer case lubricant.
4. Mark front and rear propeller shafts for alignment reference.
5. Support transmission (1) with jack stand.
6. Remove the transfer case skid plate, if equipped.
7. Disconnect front and rear propeller shafts at transfer case.
8. Disconnect transfer case shift motor and mode sensor wire connectors (3).
9. Disconnect transfer case vent hose.
10. Support transfer case (2) with transmission jack.
11. Secure transfer case (2) to jack with chains.
12. Remove nuts attaching transfer case to transmission.
13. Pull transfer case and jack rearward to disengage transfer case.
14. Remove transfer case (2) from under vehicle.

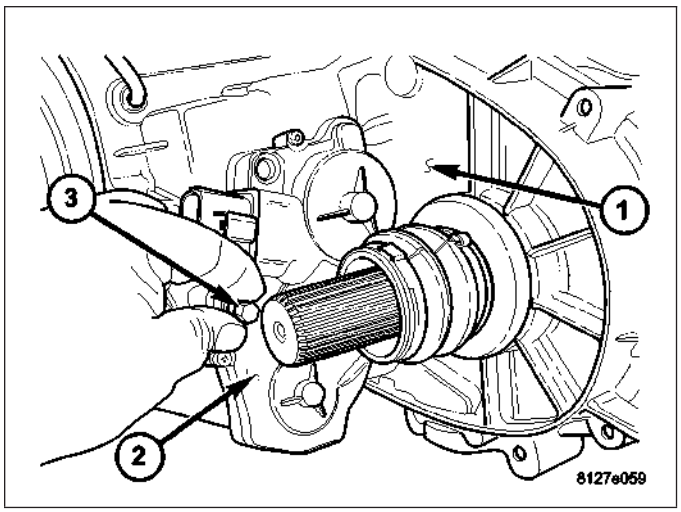


DISASSEMBLY

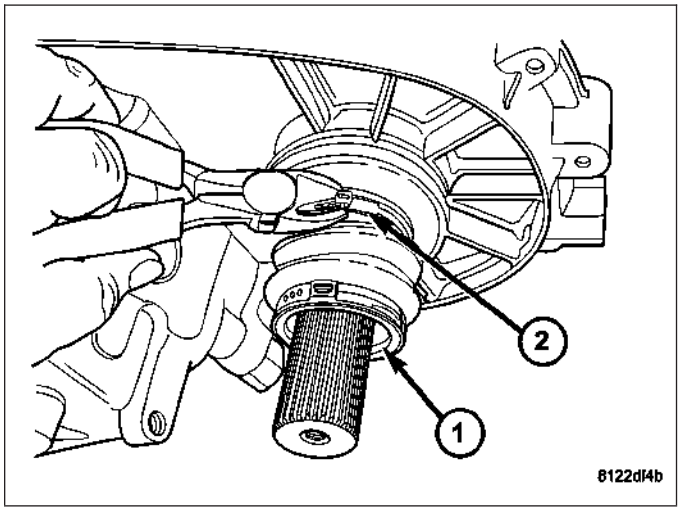
Position transfer case in a shallow drain pan. Remove drain plug and drain any remaining lubricant remaining in case.

SHIFT MOTOR ASSEMBLY AND FRONT OUTPUT SHAFT SEAL

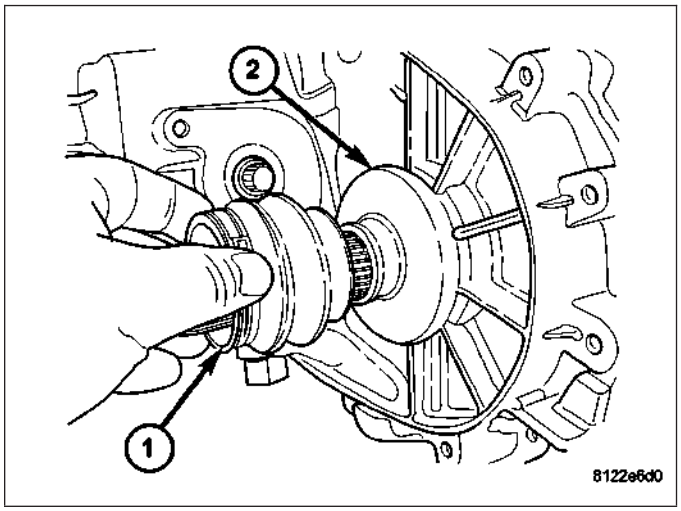
1. Remove the bolts (3) which hold the shift motor and mode sensor assembly (2) to the transfer case (1).
2. Remove the shift motor and mode sensor assembly (2) from the transfer case (1).



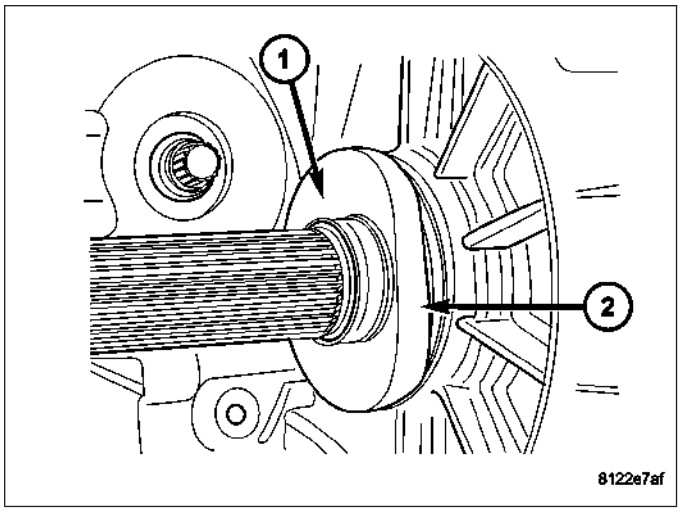
3. Remove the front propeller shaft seal boot retaining clamp (2).



4. Remove the front propeller shaft seal boot (1) from the output shaft seal slinger (2).

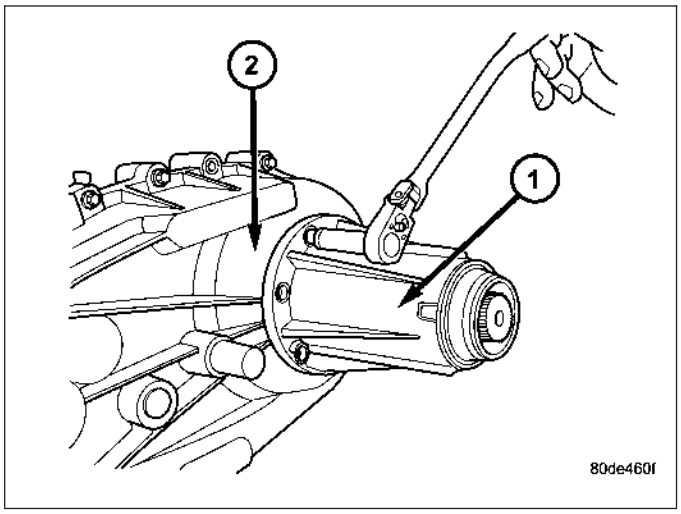


5. Remove the front output shaft seal slinger (1) by bending the slinger away (2) from the transfer case.
6. Using a suitable pry tool, remove the slinger from the output shaft using care not to damage the shaft.
7. Using a screw and a slide hammer, remove the front output shaft seal.

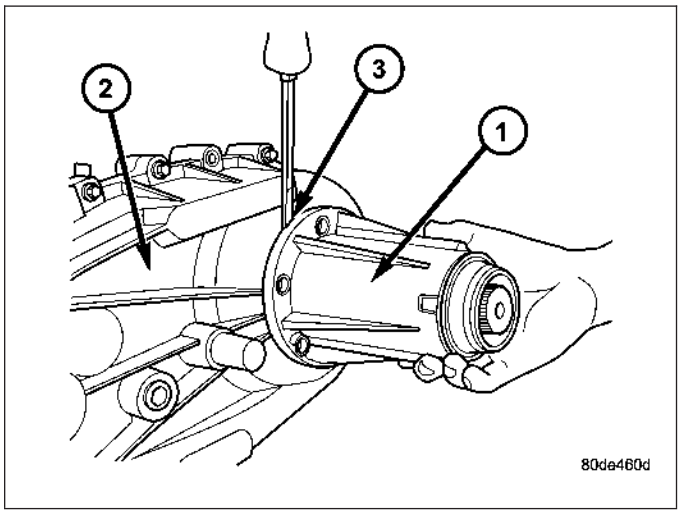


REAR EXTENSION

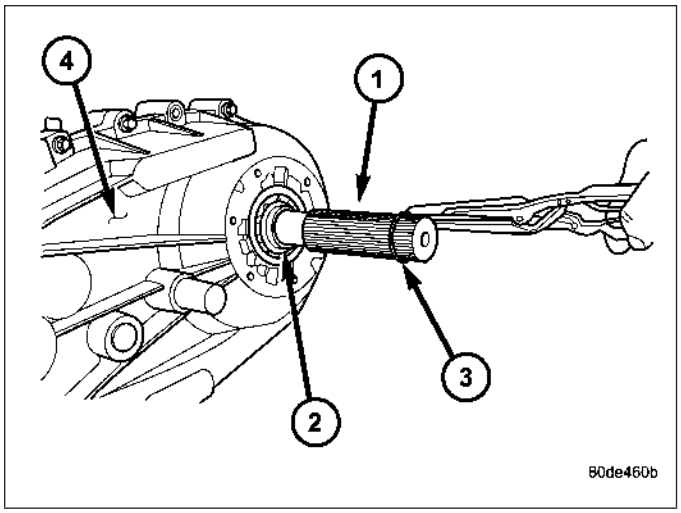
1. Remove the rear extension housing (1) bolts.



2. Remove the rear extension housing (1) from the transfer case (2). Tap extension once or twice with a plastic mallet to break sealer bead and loosen it using the supplied pry slots (3).

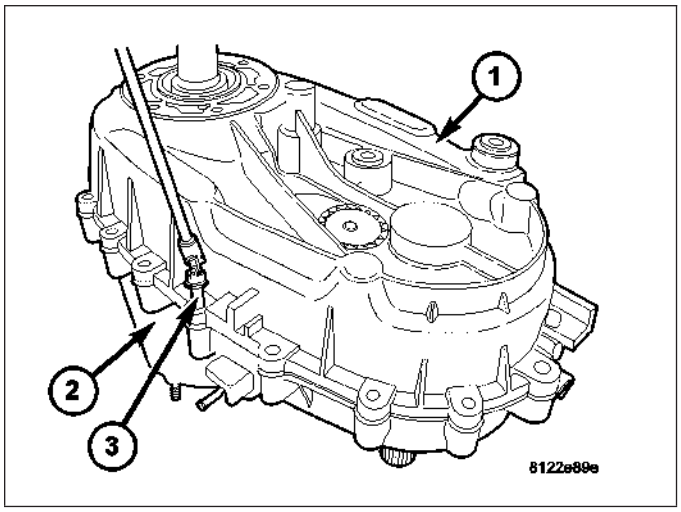


3. Remove the output bearing retaining ring (3) with heavy duty snap-ring pliers.

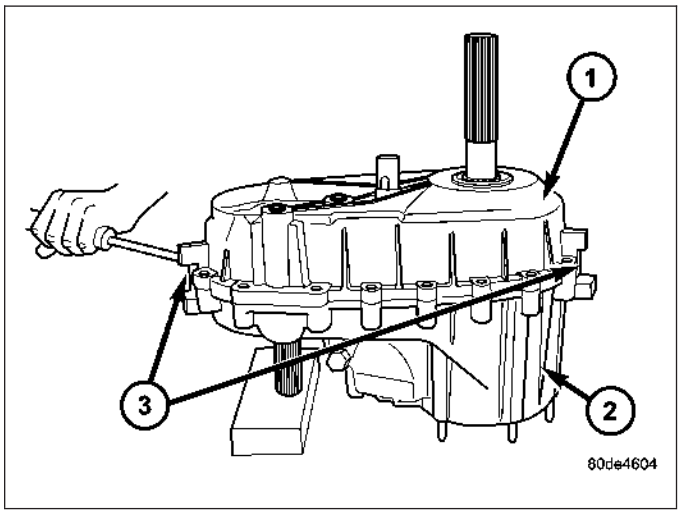


OIL PUMP AND REAR CASE

1. Remove the rear case-to-front case bolts (3).

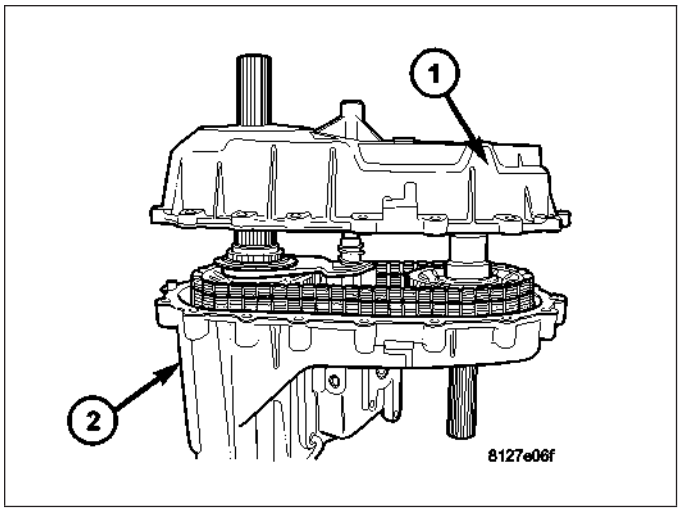


2. Loosen the rear case (1) with pry tool to break sealer bead. Insert tool in slot (3) at each end of case.
3. Unseat the rear case from alignment dowels.



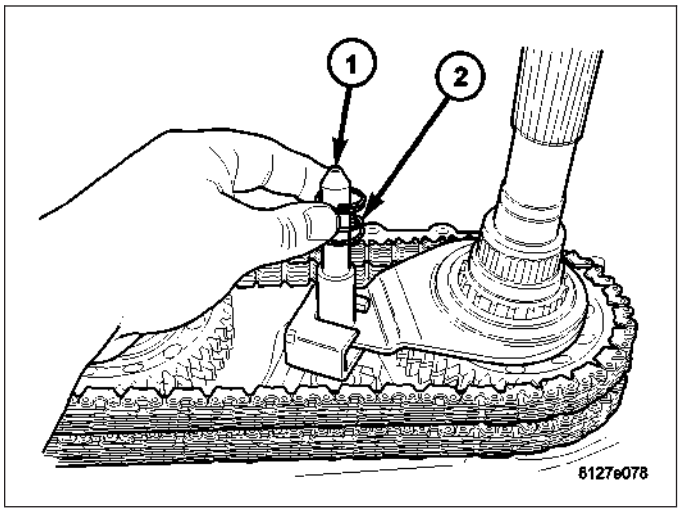
CAUTION: Do not remove the bolts holding the oil pump cover to the rear case half. The oil pump cover is aligned to the rear output shaft inner bearing race and will become mis-aligned if the bolts are loosened. If the transfer case failure has generated any debris which may have become trapped in the oil pump. the rear case and oil pump assembly MUST be replaced.

4. Remove the rear case (1) and oil pump assembly from front case (2).
5. Remove the oil pump pickup tube.

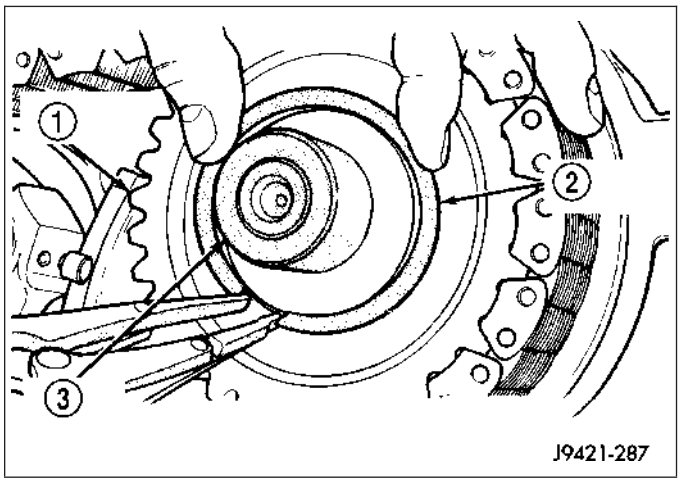


FRONT OUTPUT SHAFT AND DRIVE CHAIN

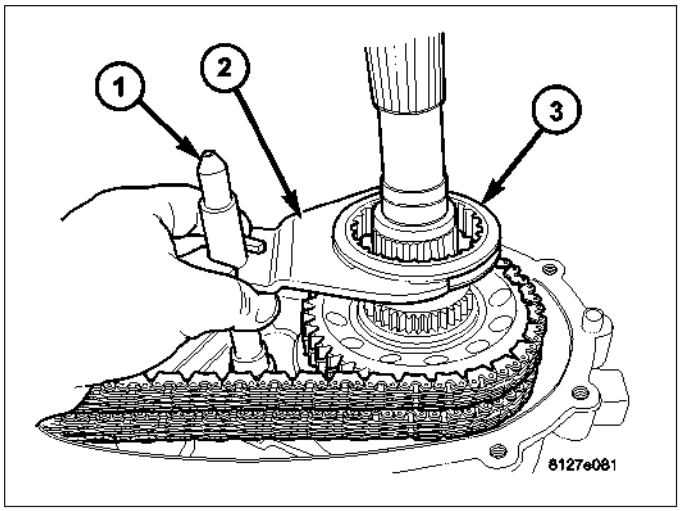
1. Remove the shift rail spring (2).



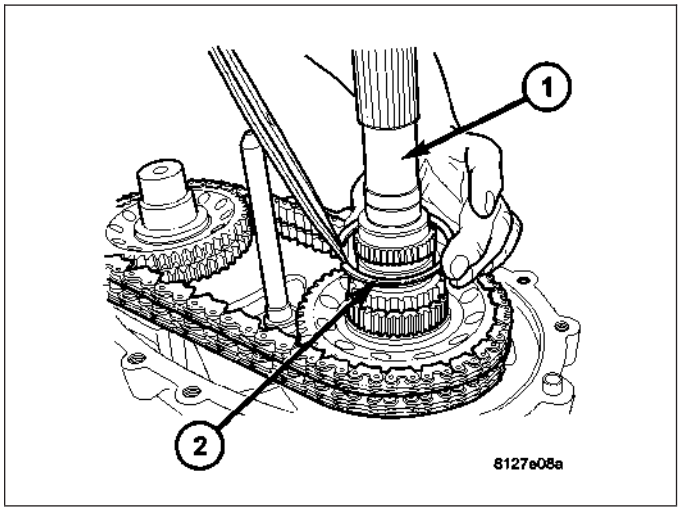
2. Remove the front sprocket retaining ring (2).



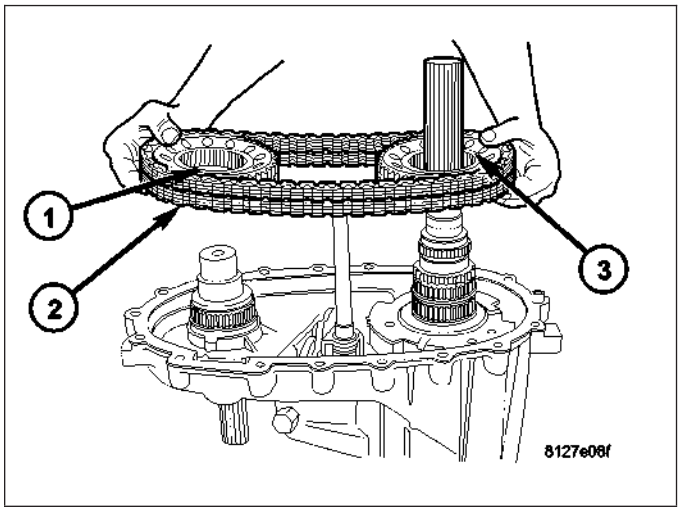
3. Remove the mode fork (2) and sleeve (3) from the shift rail (1) and mainshaft.



4. Remove the rear output shaft retaining ring (2) from the output shaft (1).

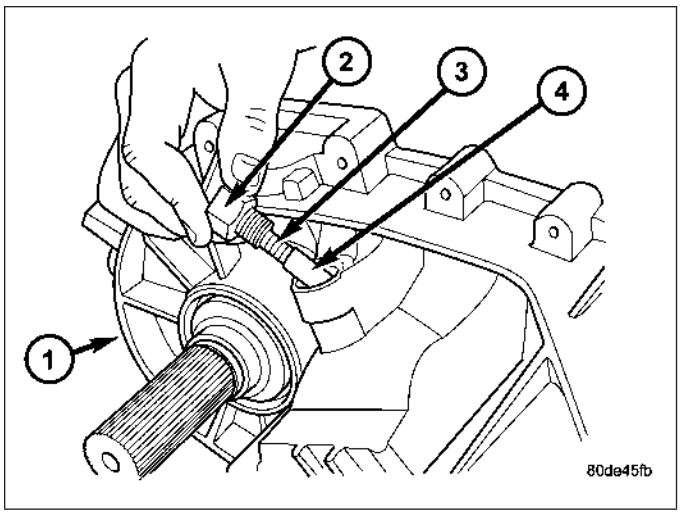


5. Pull front sprocket (1), rear sprocket (3), and chain (2) outward simultaneously.
6. Remove front sprocket (1), rear sprocket (3), and chain (2) as an assembly.

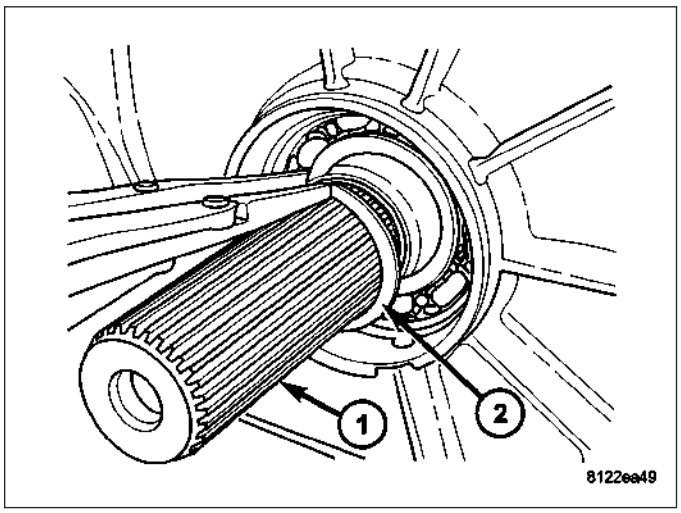


SHIFT FORKS AND MAINSHAFT

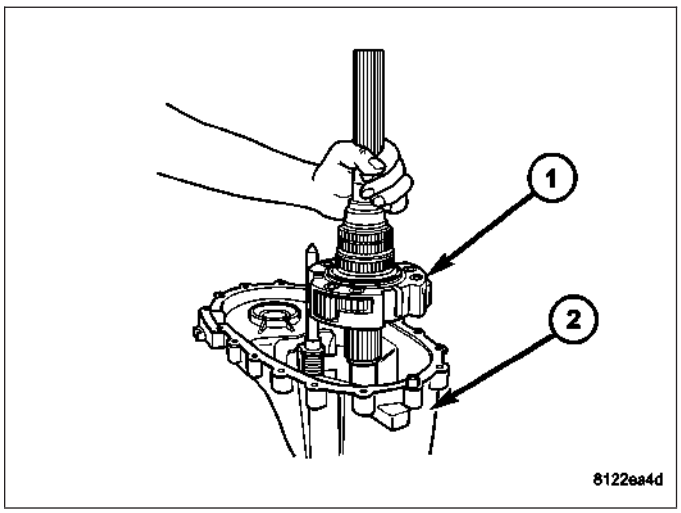
1. Loosen detent plug (2).
2. Remove the detent plug (2), spring(3), and plunger (4). Note that the plug has an O-ring seal. Remove and discard this seal.



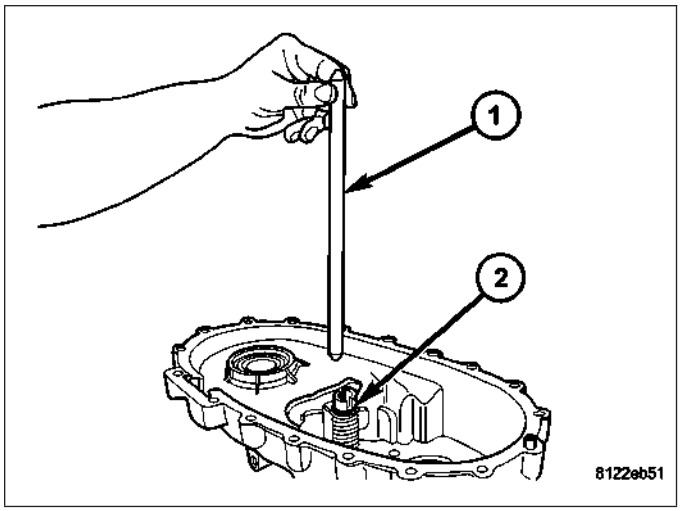
3. Remove the front output shaft snap-ring (2).
4. Remove front output shaft (1) from the front output shaft front bearing.



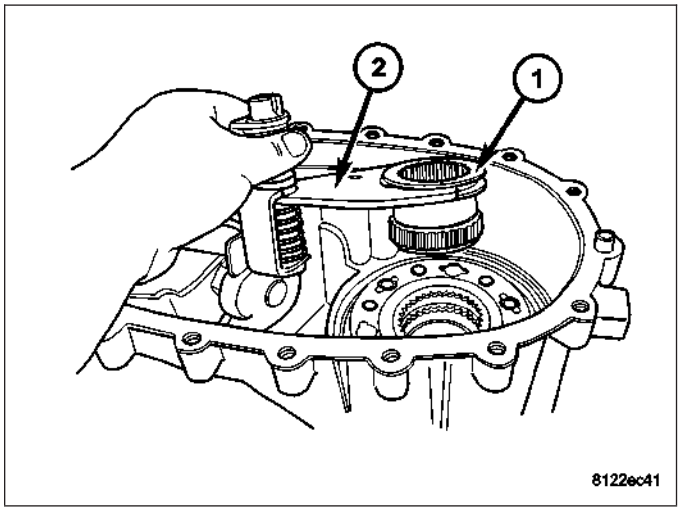
5. Remove the mainshaft and differential assembly (2) from the input gear and transfer case.



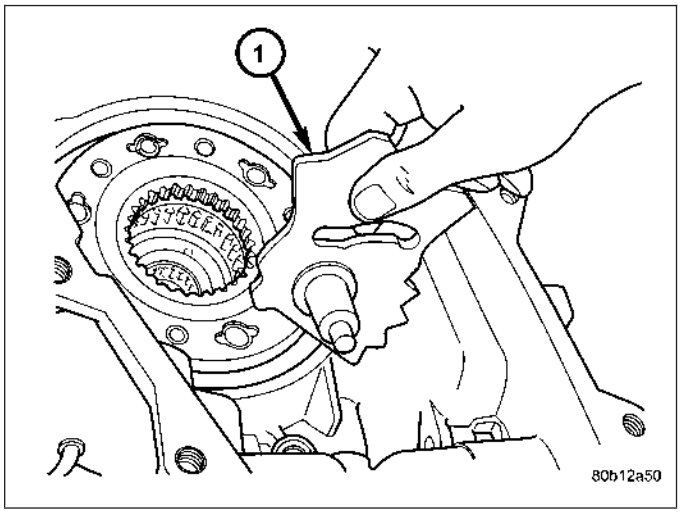
6. Remove the shift rail (1) from the range fork assembly (2) and the front case.



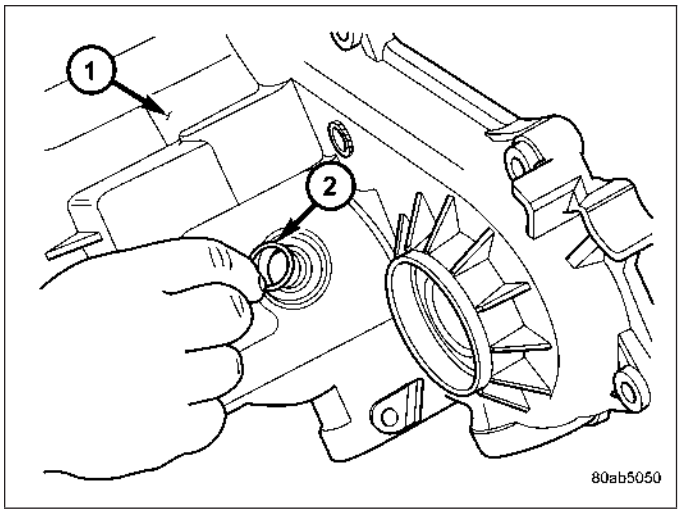
7. Remove range fork (2) and hub as an assembly. Note fork position for installation reference.



8. Remove shift sector (1).

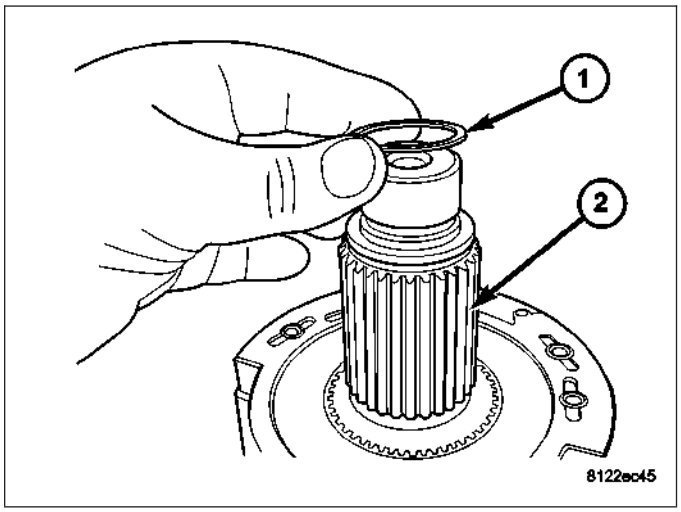


9. Remove the shift sector o-ring (2).

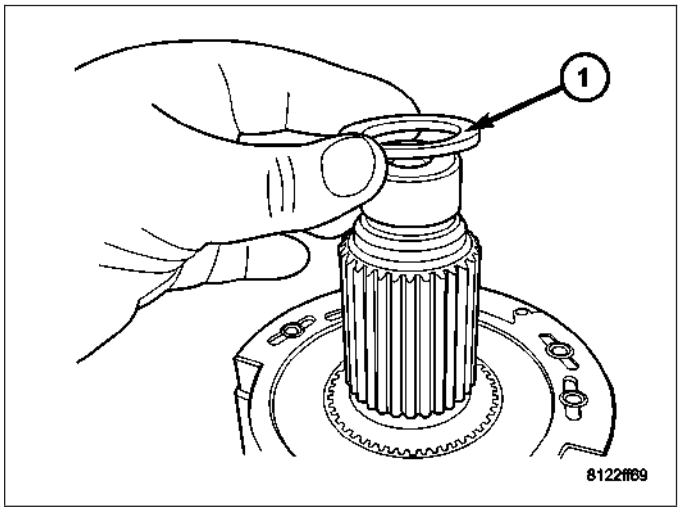


MAINSHAFT

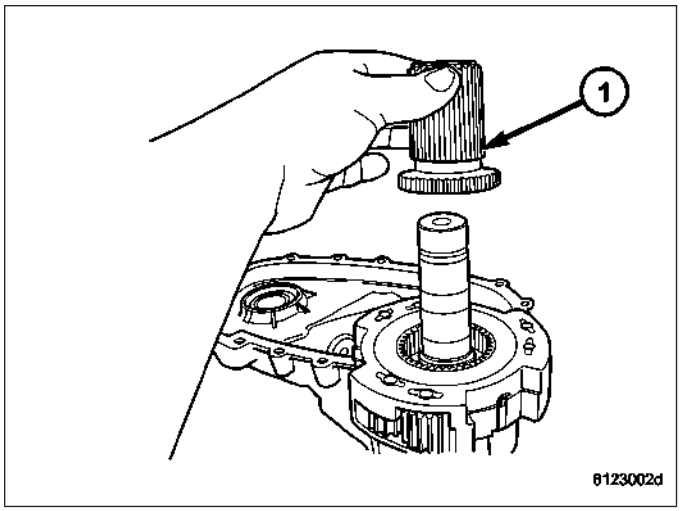
1. Remove intermediate clutch shaft snap-ring (1).



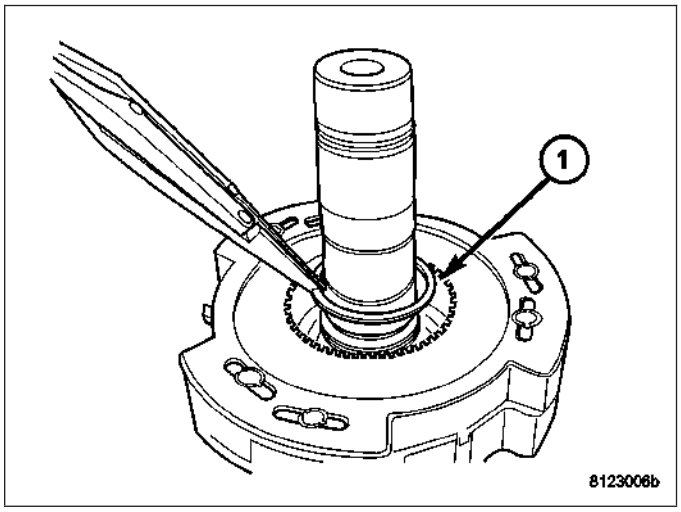
2. Remove the intermediate clutch shaft thrust ring (1).



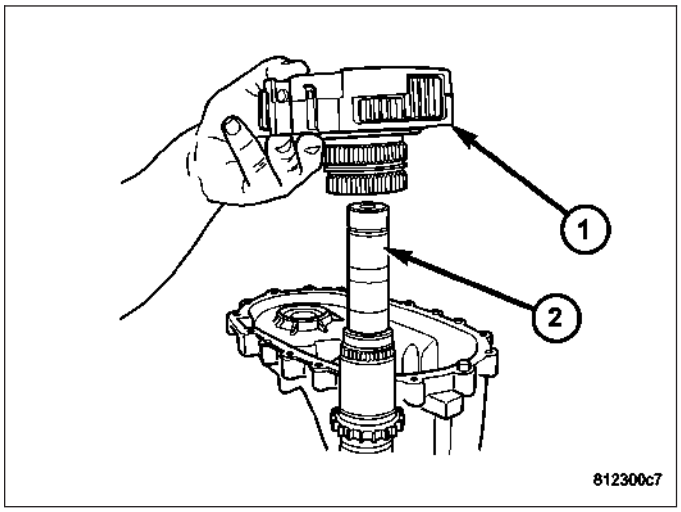
3. Remove the intermediate clutch shaft (1).



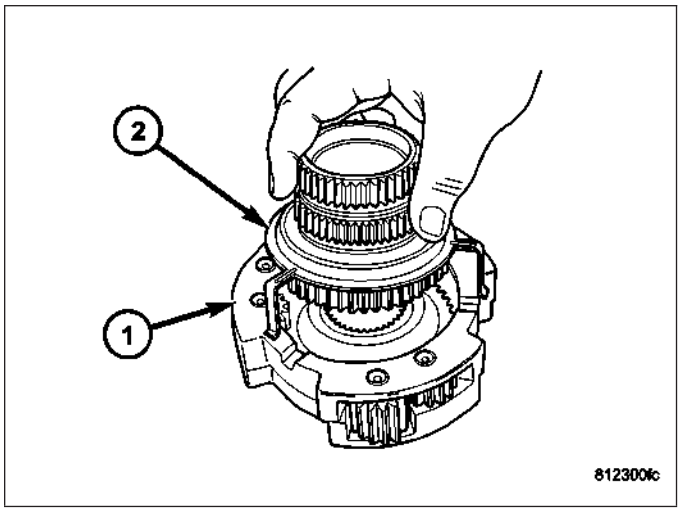
4. Remove the differential snap-ring (1).



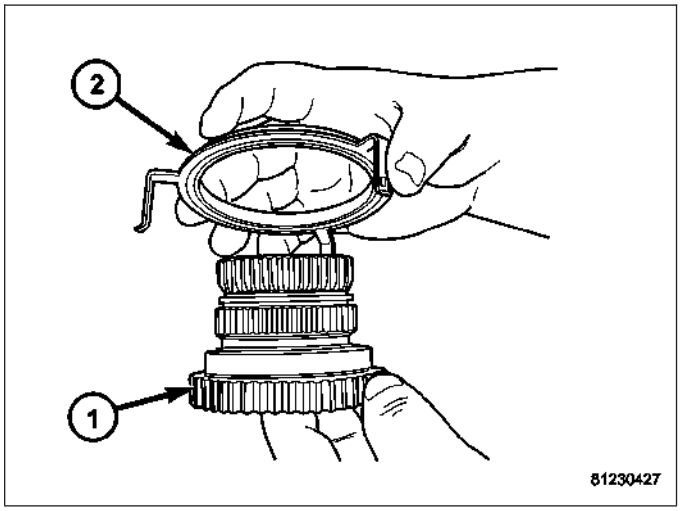
5. Remove the differential assembly (1) from the mainshaft (2).



6. Remove the mode hub and mode hub retainer (2) from the differential assembly (1).

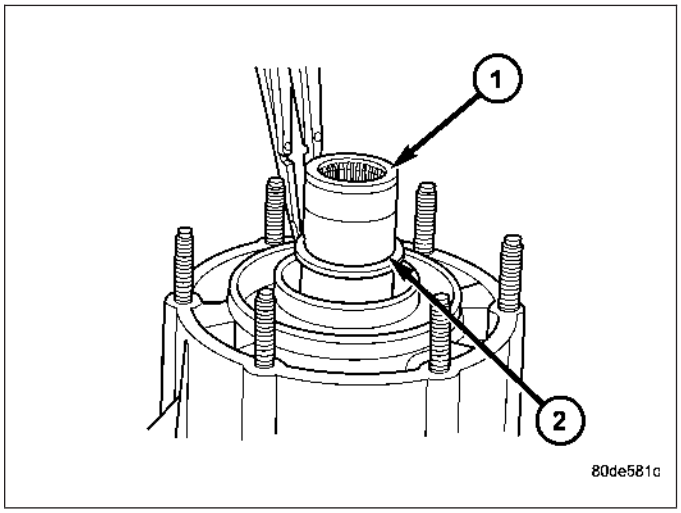


7. Remove the mode hub retainer (1) from the mode hub (2).

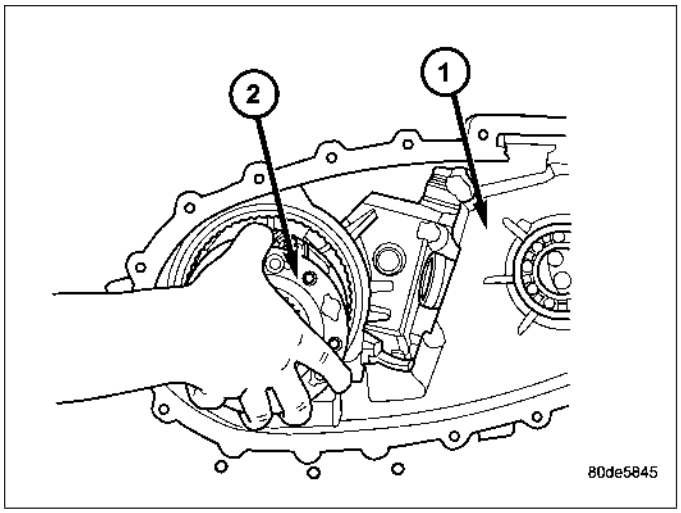


INPUT AND PLANETARY GEAR

1. Remove the input gear seal with suitable screw and slide hammer.
2. Remove the input gear retaining ring (2) with heavy duty snap-ring pliers.

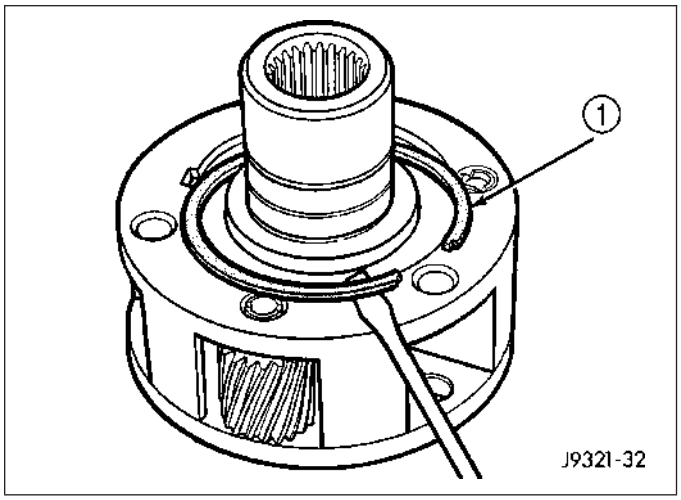


3. Place front case in horizontal position. Then remove input gear and low range gear as an assembly (2). Tap gear out of bearing with plastic mallet, if necessary.

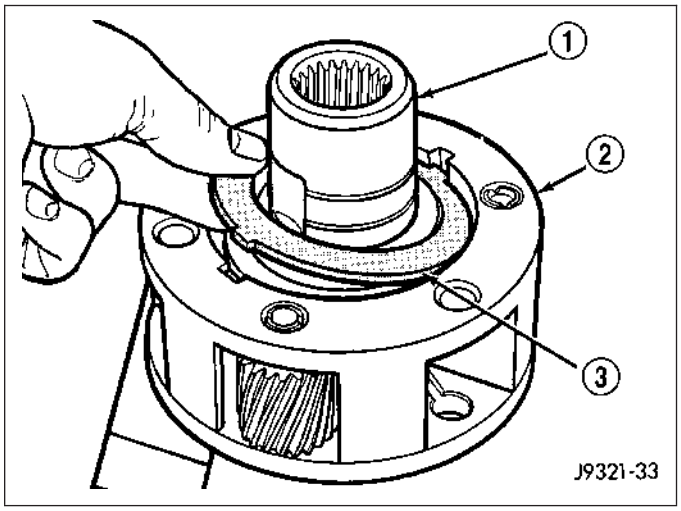


INPUT AND PLANETARY GEAR

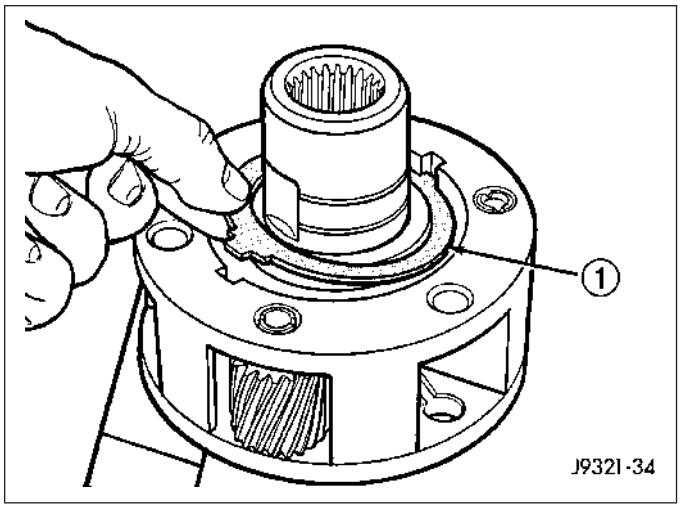
1. Remove the snap-ring (1) that retains input gear in low range gear.



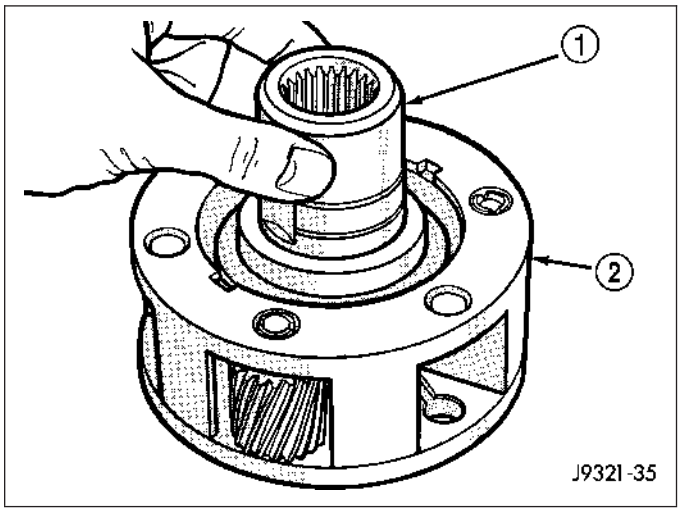
2. Remove the retainer (3).



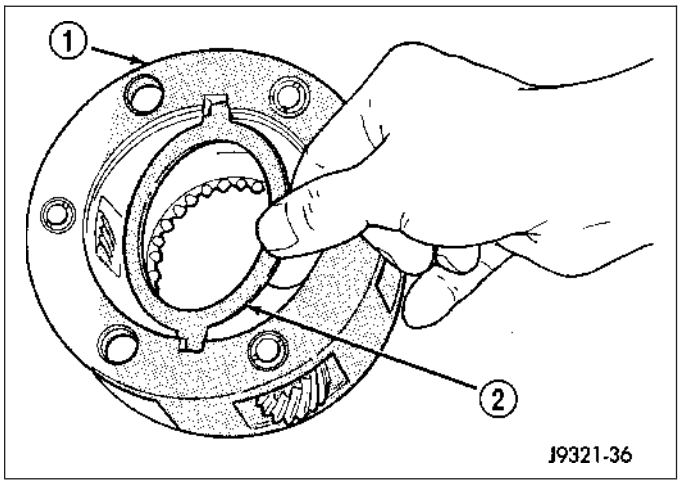
3. Remove the front tabbed thrust washer (1).



4. Remove the input gear (1).



5. Remove the rear tabbed thrust washer (2) from the low range gear (1).



CLEANING

Clean the transfer case parts with a standard parts cleaning solvent. Remove all traces of sealer from the cases and retainers with a scraper and 3M™ all purpose cleaner. Use compressed air to remove solvent residue from oil feed passages in the case halves, retainers, gears, and shafts.

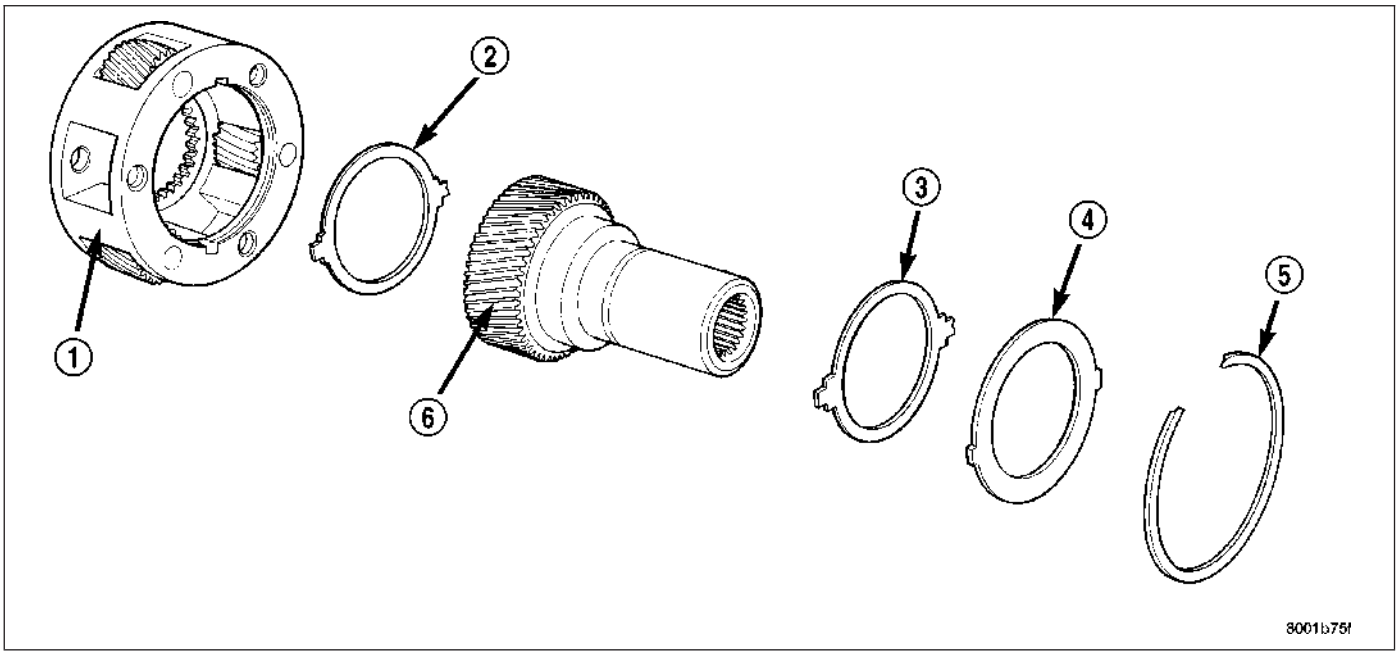
INSPECTION

MAINSHAFT/SPROCKET/HUB INSPECTION

Inspect the splines on the hub and shaft and the teeth on the sprocket. Minor nicks and scratches can be smoothed with an oilstone. However, replace any part that is damaged.

Check the contact surfaces in the sprocket bore and on the mainshaft. Minor nicks and scratches can be smoothed with 320-400 grit emery cloth but do not try to salvage the shaft if nicks or wear is severe.

INPUT GEAR AND PLANETARY CARRIER



Input Gear and Carrier Components

1 - PLANETARY CARRIER
2 - REAR THRUST WASHER
3 - FRONT THRUST WASHER
4 - CARRIER LOCK RING
5 - CARRIER LOCK RETAINING RING
6 - INPUT GEAR

Check the teeth on the gear. Minor nicks can be dressed off with an oilstone but replace the gear if any teeth are broken, cracked, or chipped. The bearing surface on the gear can be smoothed with 300-400 grit emery cloth if necessary.

Examine the carrier body and pinion gears for wear or damage. The carrier will have to be replaced as an assembly if the body, pinion pins, or pinion gears are damaged.

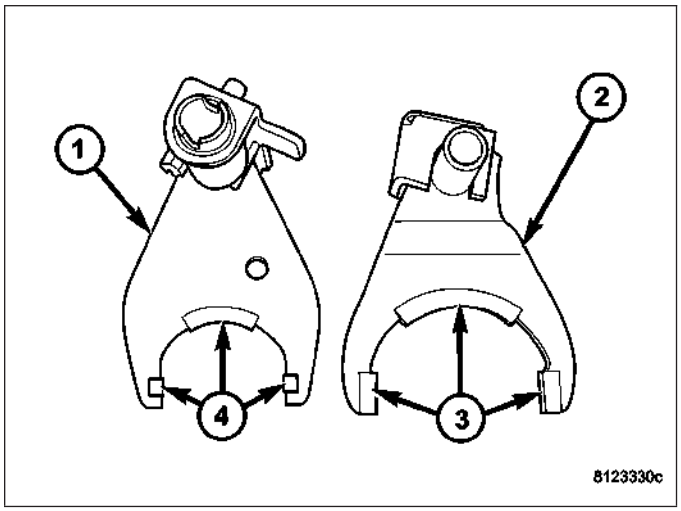
Check the lock ring and both thrust washers for wear or cracks. Replace them if necessary. Also replace the lock retaining ring if bent, distorted, or broken.

SHIFT FORKS/HUBS/SLEEVES

Check condition of the shift forks and mode fork shift rail. Minor nicks on the shift rail can be smoothed with 320-400 grit emery cloth.

Inspect the shift fork wear pads (3, 4). The mode (2) and range (1) fork pads are serviceable and can be replaced if necessary.

Check both of the sleeves for wear or damage, especially on the interior teeth. Replace the sleeves if wear or damage is evident.



REAR EXTENSION HOUSING

Inspect the extension housing seal and bushing. Replace both components if either show any sign of wear or damage.

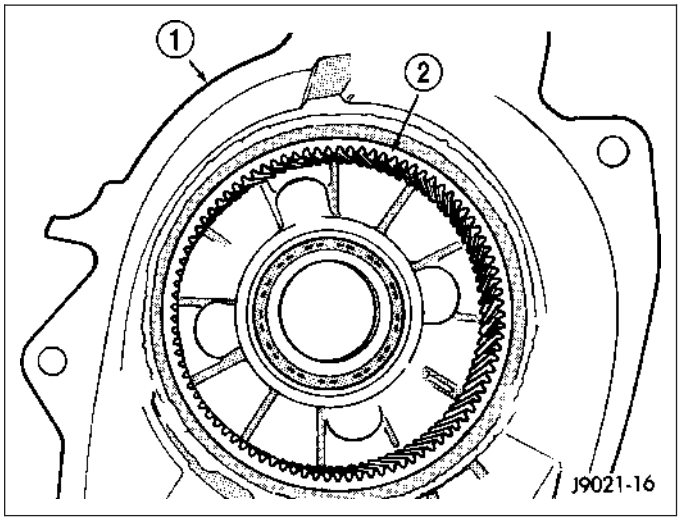
FRONT OUTPUT SHAFT AND DRIVE CHAIN

Inspect the shaft splines and bearing surfaces. Minor nicks on the splines can be smoothed with an oilstone. Use 320-400 grit emery to smooth minor scratches on the shaft bearing surfaces. Replace the shaft if the bearing surfaces are scored or if any of the splines are cracked or broken.

Examine the drive chain and shaft bearings. Replace the chain and both sprockets if the chain is stretched, distorted, or if any of the links bind. Replace the bearings if rough, or noisy.

LOW RANGE ANNULUS GEAR

Inspect annulus gear (2) condition carefully. The gear is only serviced as part of the front case (1). If the gear is damaged, it will be necessary to replace the gear and front case as an assembly. Do not attempt to remove the gear.



FRONT AND REAR CASES

Inspect the cases for wear and damage.

Check case condition. If leaks were a problem, look for gouges and severe scoring of case sealing surfaces. Also make sure the front case mounting studs are in good condition.

Check the front case mounting studs and vent tube. The tube can be secured with Loctite™ 271 or 680 if loose. The stud threads can be cleaned up with a die if necessary. Also check condition of the fill/drain plug threads in the

rear case. The threads can be repaired with a thread chaser or tap if necessary. Or the threads can be repaired with Helicoil® stainless steel inserts if required.

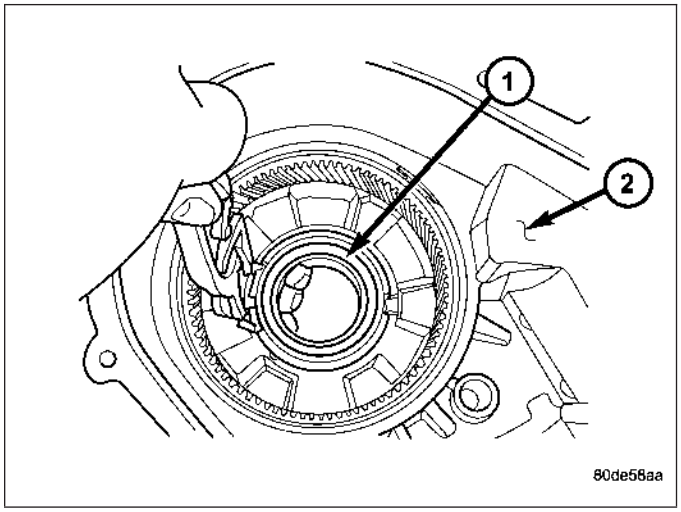
OIL PUMP/OIL PICKUP

Examine the oil pump pickup parts. Replace the pump if any part appears to be worn or damaged. Do not disassemble the pump as individual parts are not available. The pump is only available as a complete assembly. The pickup screen, hose, and tube are the only serviceable parts and are available separately.

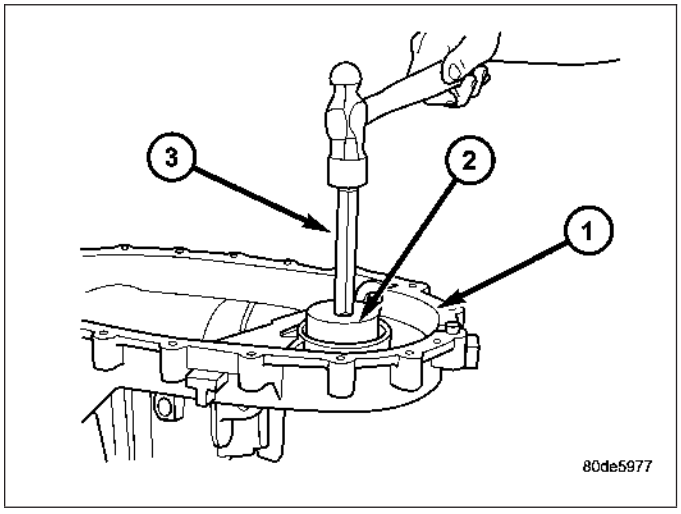
ASSEMBLY

BEARINGS AND SEALS

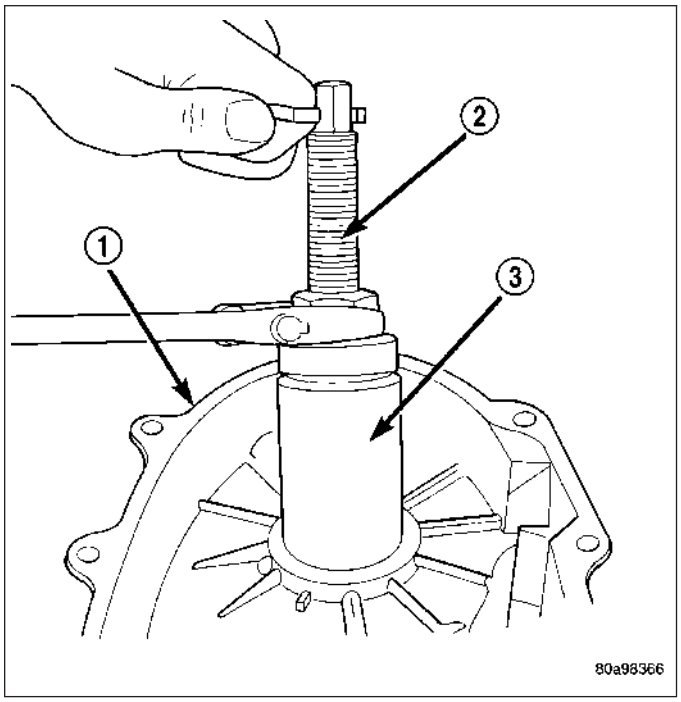
1. Remove the input shaft bearing (1) from the front case (2) with suitable snap-ring pliers.
2. Transfer the retaining ring to the new bearing if necessary and install the bearing into the front case.



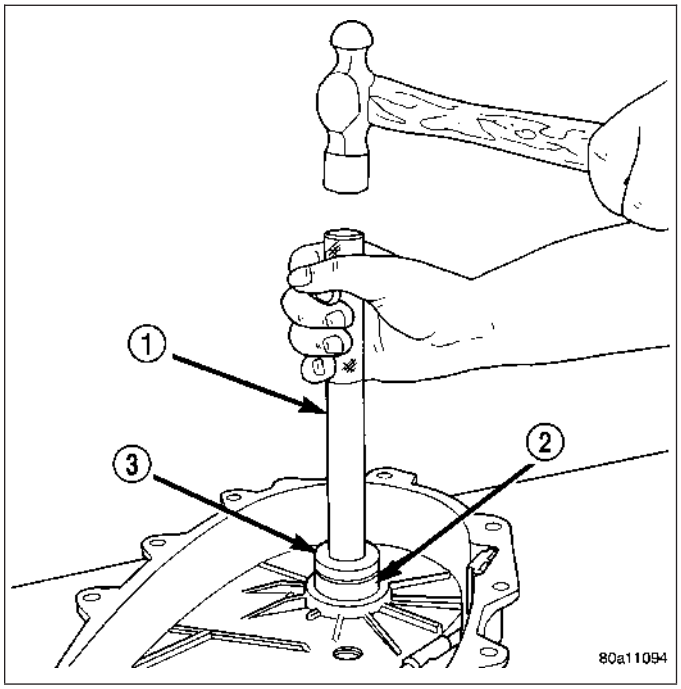
3. Remove the front output shaft bearing retaining ring from inside the front case (1) half.
4. Using Installer 6436 and Handle C-4171, remove front output shaft bearing.
5. Start the front output shaft bearing in case. Then seat bearing with Handle C-4171 (3) and Installer 6953 (2).
6. Install the front output shaft bearing retaining ring.



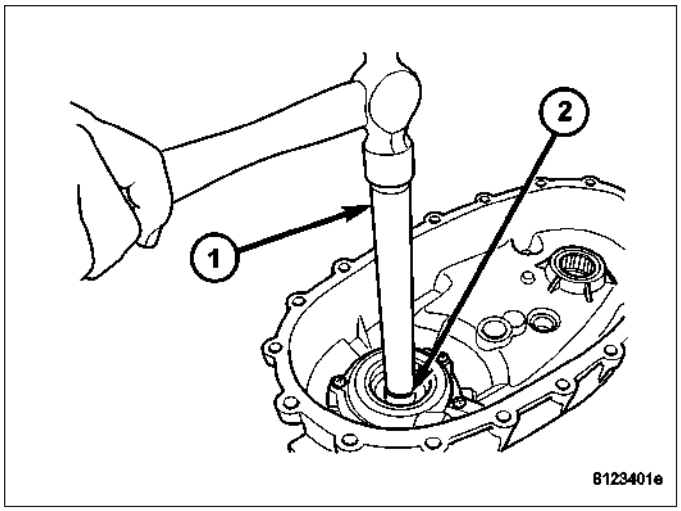
7. Remove the front output shaft rear bearing with the screw and jaws from Remover L-4454 (2) and Cup 8148 (3).



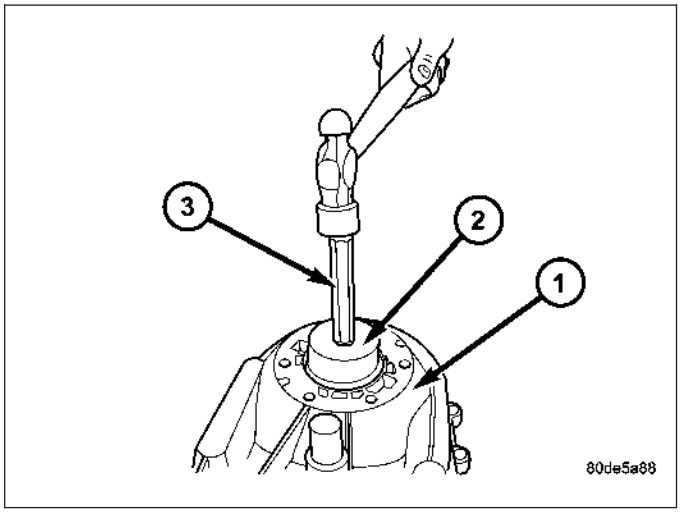
8. Install the new bearing with Tool Handle C-4171 (1) and Installer 5066 (2).



9. Remove the rear output shaft bearing from the rear case using Installer 5065 (2) and Handle C-4171 (1).

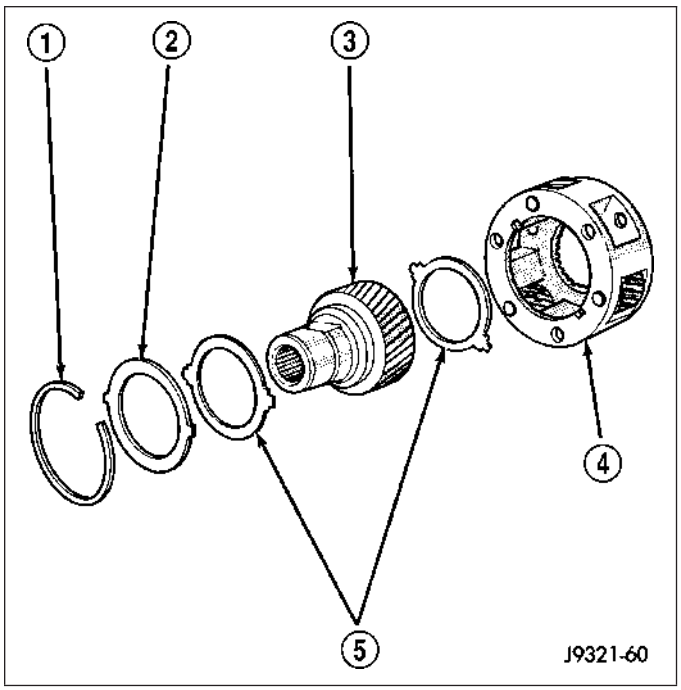


10. Install the rear output shaft bearing into the rear case (1) using Remover/Installer 6953 (2) and Handle C-4171 (3).

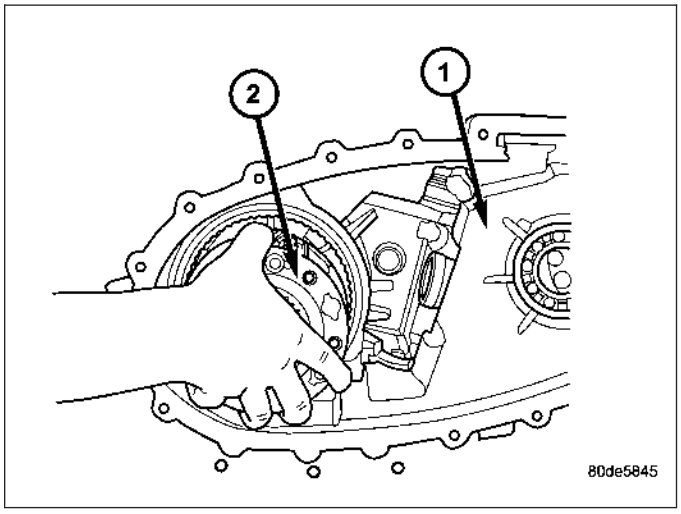


INPUT AND PLANETARY GEAR

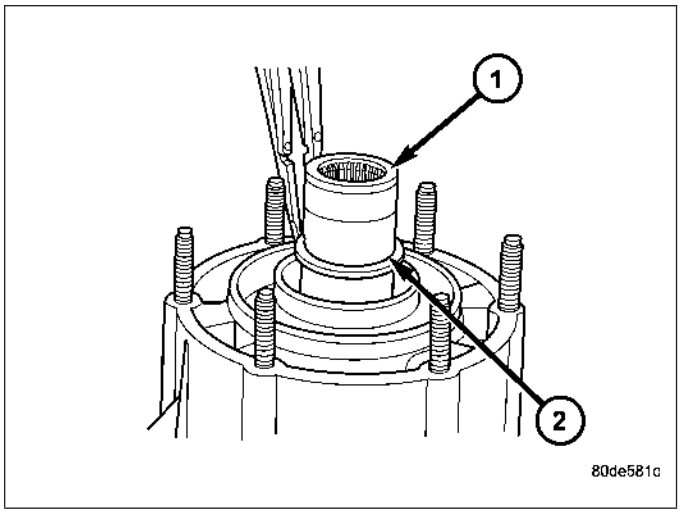
1. Lubricate the gears (3, 4) and thrust washers (5) with recommended transmission fluid.
2. Install the first thrust washer (5) in low range gear (4). Be sure washer tabs are properly aligned in gear notches.
3. Install the input gear (3) in low range gear (4). Be sure input gear is fully seated.
4. Install the remaining thrust washer (5) in low range gear (4) and on top of input gear (3). Be sure washer tabs are properly aligned in gear notches.
5. Install the retainer (2) on input gear (3) and install snap-ring (1).



6. Align and install the low range/input gear assembly (2) in front case (1). Be sure the low range gear pinions are engaged in the annulus gear and that the input gear shaft is fully seated in the front bearing.



7. Install the snap-ring (2) to hold input/low range gear (1) into the front bearing.
8. Install a new input gear seal using Installer 8841 and Handle C-4171.

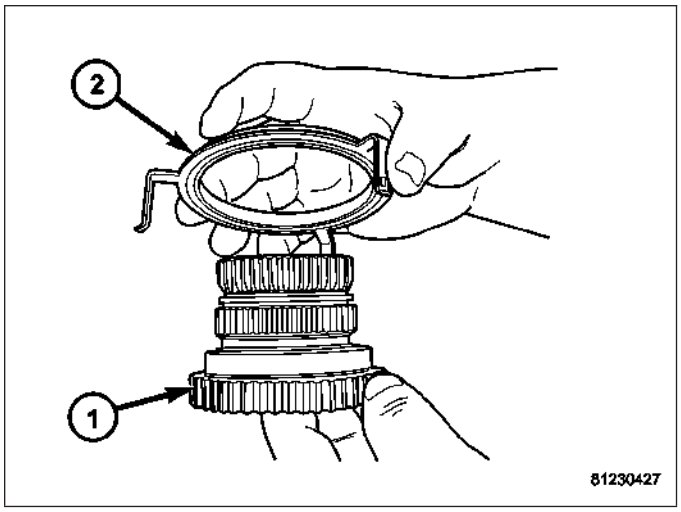


SHIFT FORKS AND MAINSHAFT

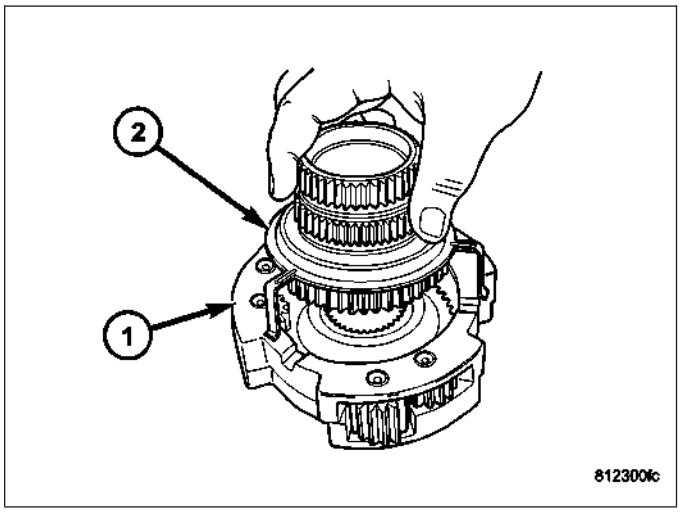
1. Lubricate the mainshaft splines with recommended transmission fluid.

NOTE: Replace the mode hub retainer if the legs were distorted during removal.

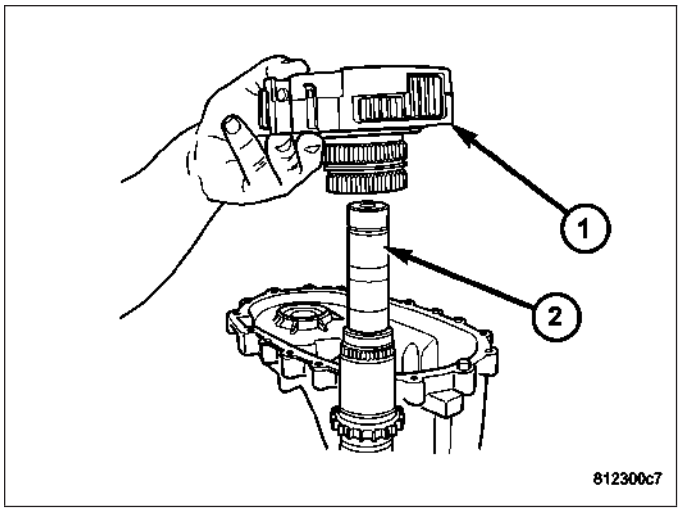
2. Install the mode hub retainer (1) onto the mode hub (2).



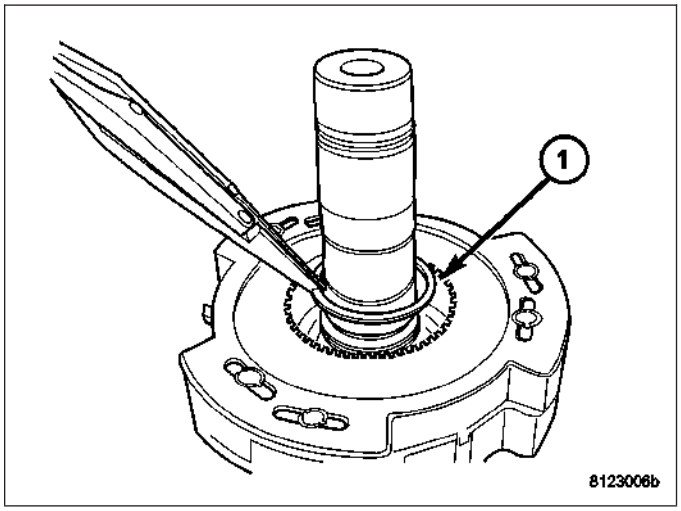
3. Install the mode hub and mode hub retainer (2) onto the differential assembly (1). Make sure the retainer is fully seated onto the differential.



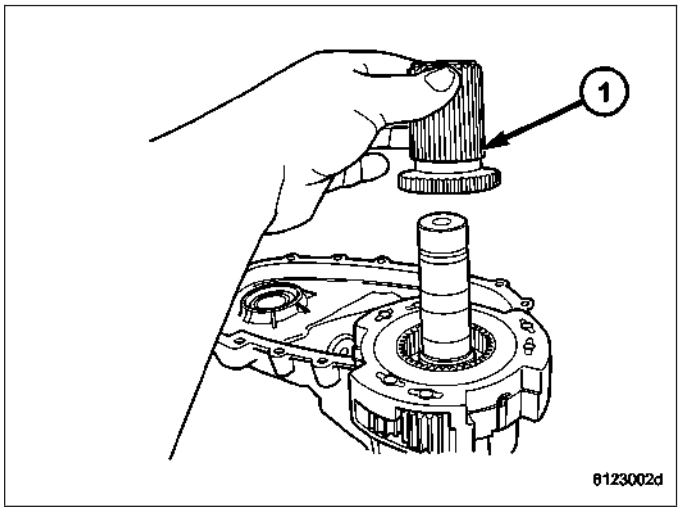
4. Install the differential assembly (1) onto the mainshaft.



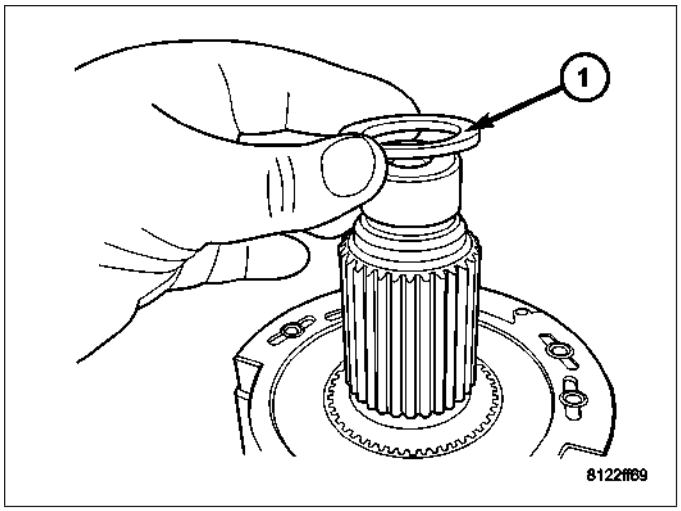
5. Install the differential snap-ring (1).



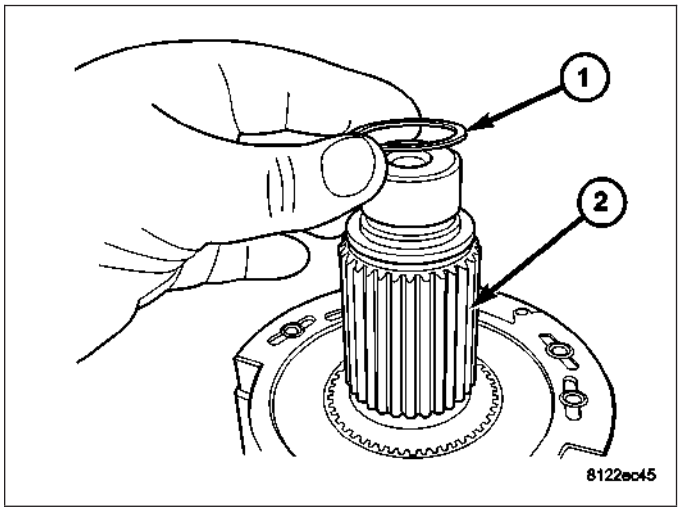
6. Install the intermediate clutch shaft (1).



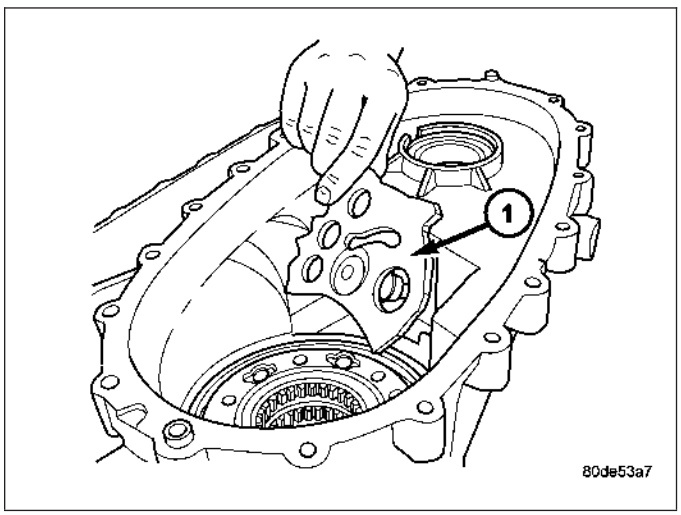
7. Install the clutch shaft thrust ring (1).



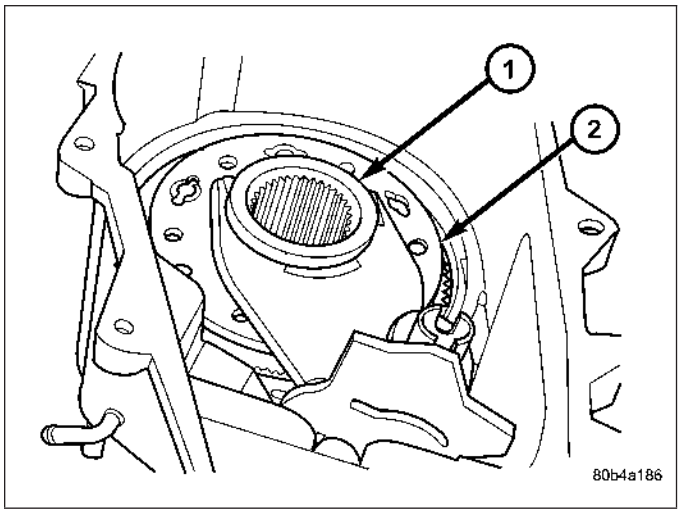
8. Install the clutch shaft snap-ring (1).



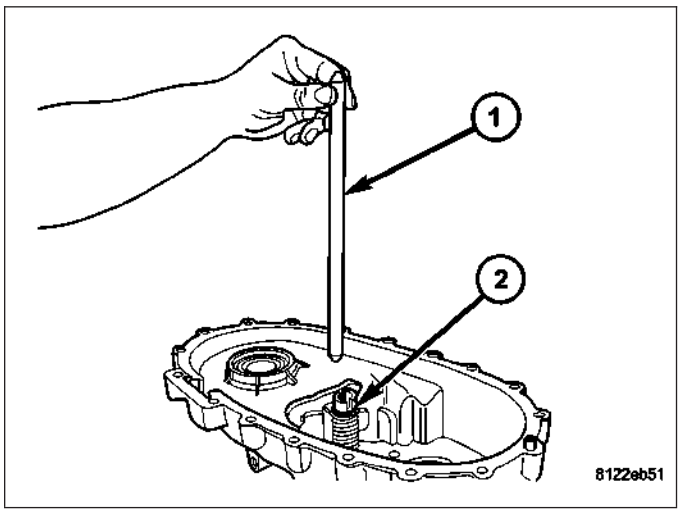
9. Lubricate the sector shaft (1) with transmission fluid and install shift sector in case. Position slot in sector so it will be aligned with shift fork pin when shift forks are installed.
10. Install the shift sector o-ring.



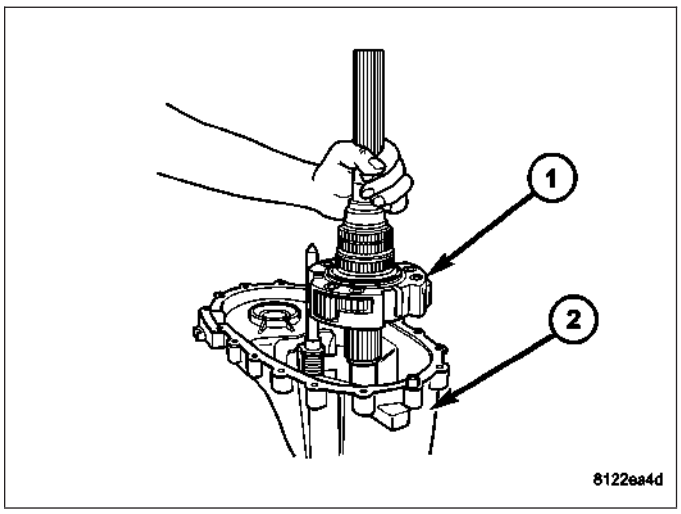
11. Assemble and install the range fork (2) and hub (1). Be sure the hub is properly seated in the low range gear and engaged to the input gear.
12. Align and insert the range fork pin in the shift sector slot.



13. Install the shift rail (1) into the range fork assembly (2) and the front case.

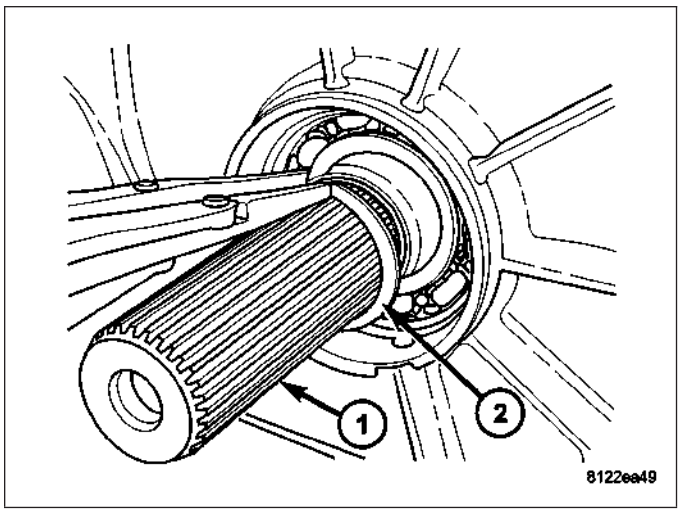


14. Install the mainshaft and differential assembly (2) into the input gear and transfer case front case (1).

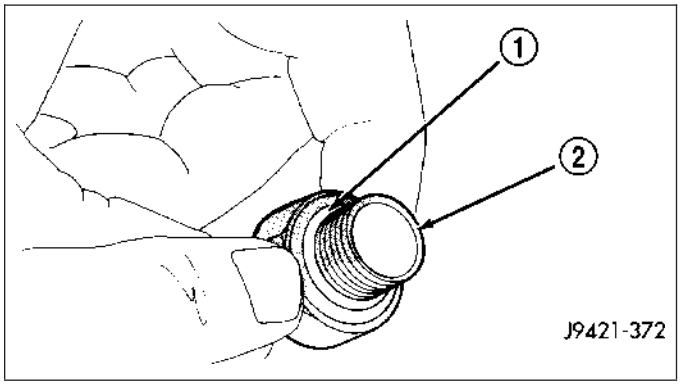


FRONT OUTPUT SHAFT AND DRIVE CHAIN

1. Install the front output shaft into the front output shaft bearing.
2. Install the front output shaft snap-ring (2) onto the output shaft (1).
3. Install the new front output shaft seal with Installer MB991168A.

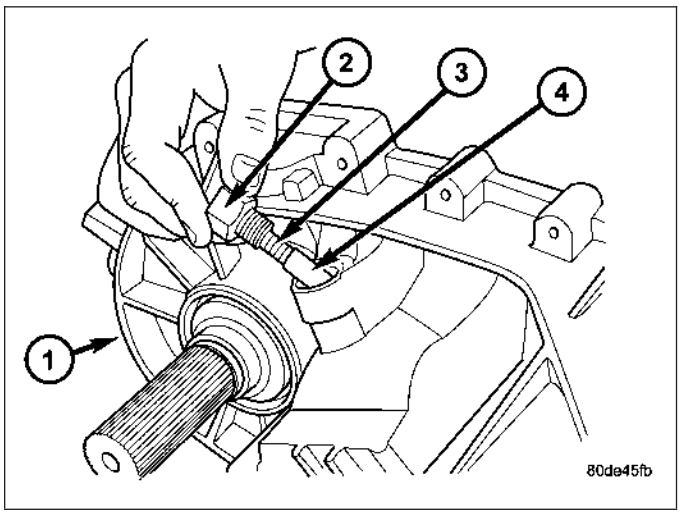


4. Install new o-ring (1) on detent plug (2).

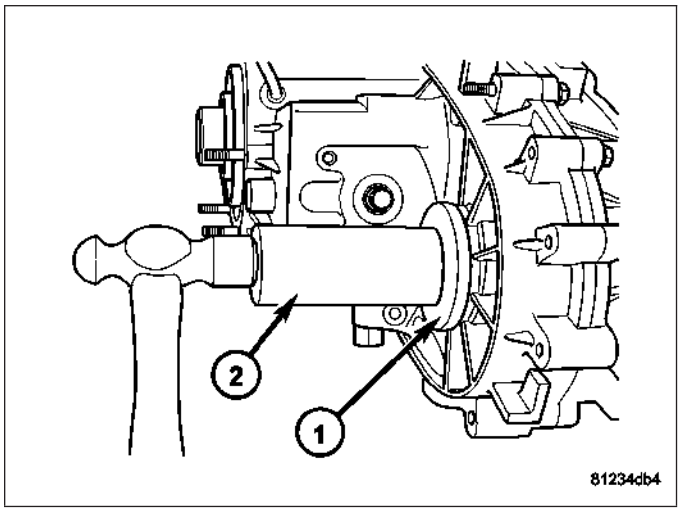


NOTE: Shift the transfer case to the same range/ mode position it was in when the shift motor was removed prior to installing the shift detent components.

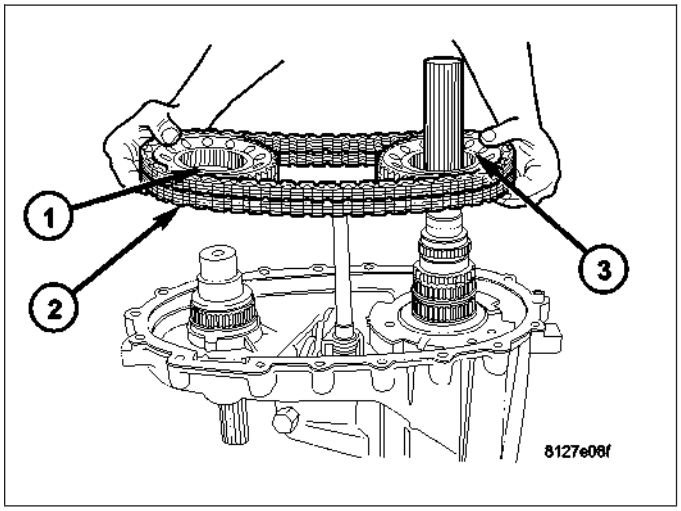
5. Install detent plunger (4), spring (3), and plug (2). Tighten the plug to 16-25 N·m (12-18 ft. lbs.).



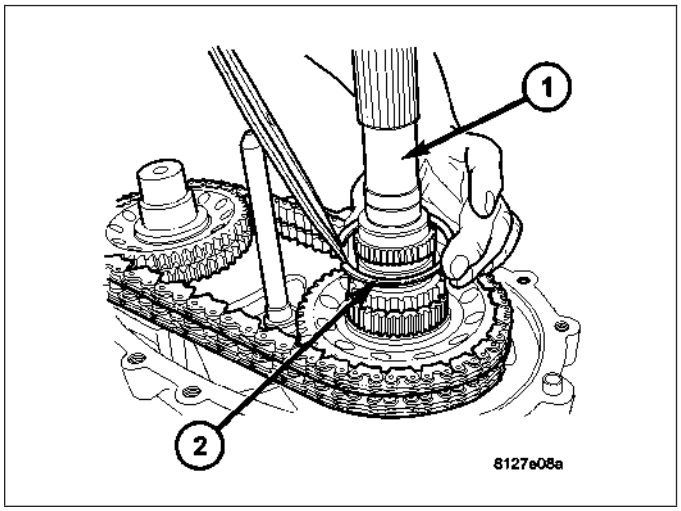
6. Install the new front output shaft seal slinger (1) with Installer 8840 (2). Install the slinger onto the shaft until the tool contacts the front of the output shaft.



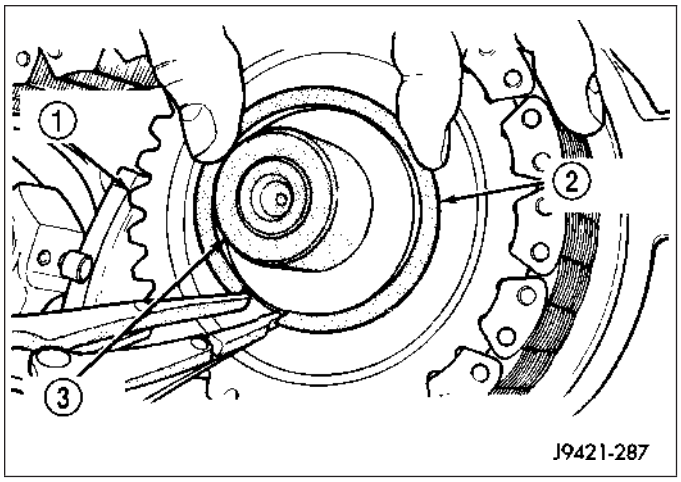
7. Install the front sprocket (1), rear sprocket (3), and chain (2) as an assembly.
8. Lower the front sprocket (1), rear sprocket (3), and chain (2) over the front and rear output shafts simultaneously until fully seated on both splines.



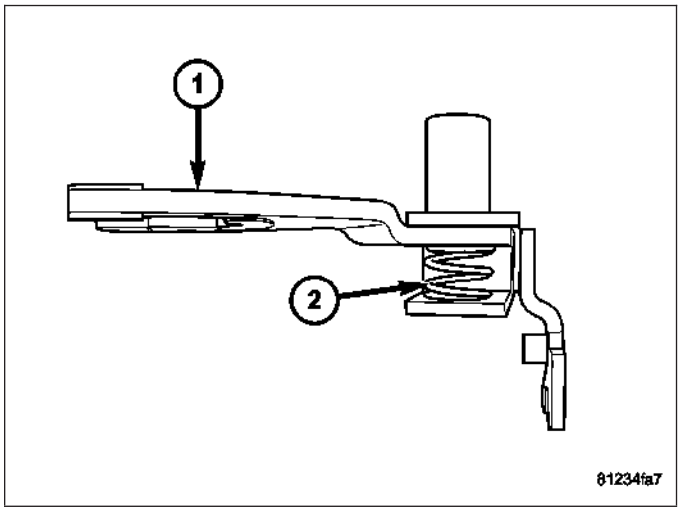
9. Install the rear output shaft retaining ring (2) onto the output shaft (1).



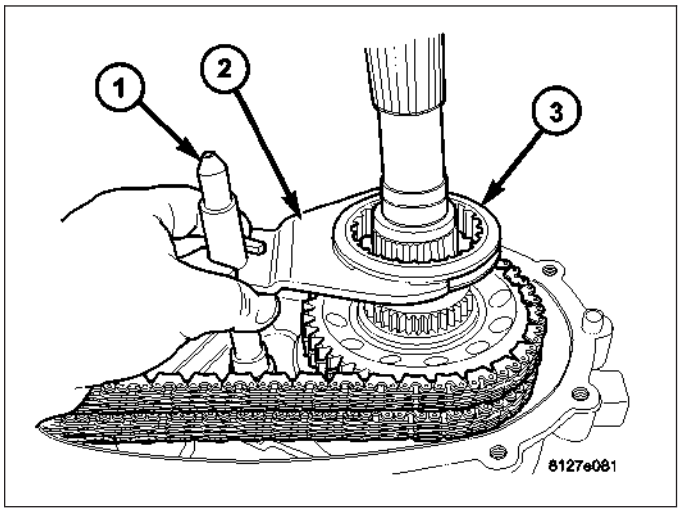
10. Install the front sprocket retaining ring (2).



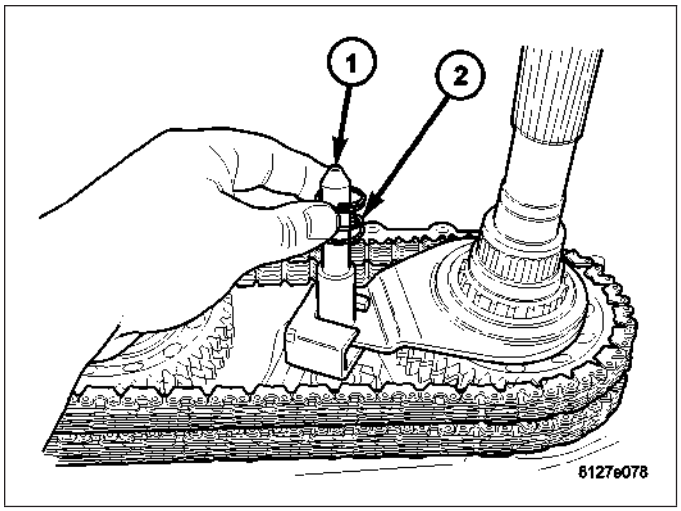
11. Inspect the mode fork assembly (1). Replace pads if necessary. Also check springs (2) and slider bracket. Replace worn or damaged components.



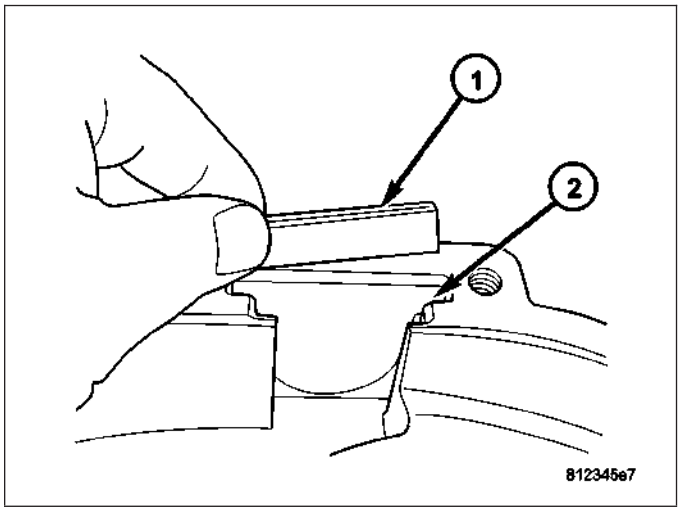
12. Install the mode fork (2) and sleeve (3) over the shift rail (1) and mainshaft.



13. Install the shift rail spring (2) onto the shift rail (1).



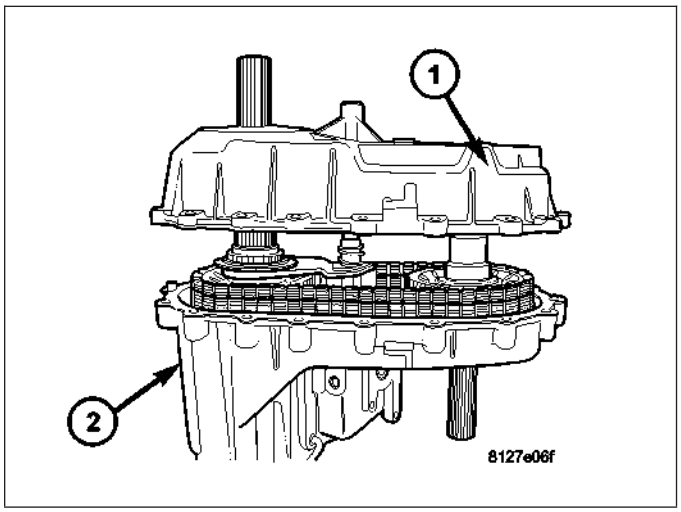
14. Insert the transfer case sump magnet (1) into the front case pocket (2).



OIL PUMP AND REAR CASE

Lubricate the oil pump components with transmission fluid before installation. Prime the oil pickup tube by pouring a little oil into the tube before installation.

CAUTION: Do not remove the bolts holding the oil pump cover to the rear case half. The oil pump cover is aligned to the rear output shaft inner bearing race and will become mis-aligned if the bolts are loosened. If the transfer case failure has generated any debris which may have become trapped in the oil pump. the rear case and oil pump assembly MUST be replaced.

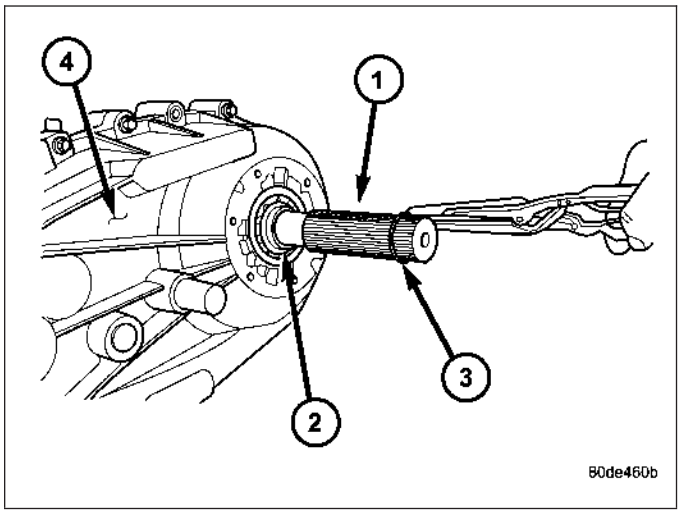


1. Install a new o-ring in pickup tube inlet of oil pump, if necessary.
2. Insert the oil pickup tube into the oil pump.
3. Apply bead of Mopar® Gasket Maker, or equivalent, to mating surface of front case (2). Keep sealer bead width to maximum of 3/16 inch. Do not use excessive amount of sealer as excess will be displaced into case interior.

NOTE: Lift upward and gently shake the rear output shaft while settling the rear case onto the front case dowels. This will allow the mainshaft splines to more easily engage the oil pump.

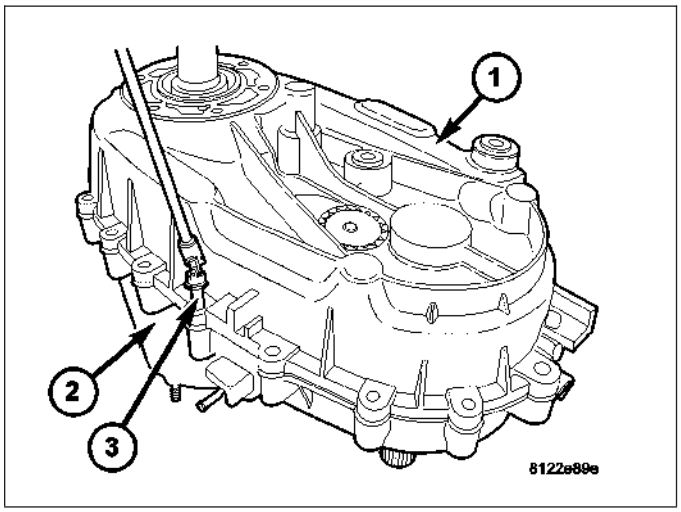
4. Align the oil pump with mainshaft and align shift rail with bore in rear case (1). Then install rear case (1) and oil pump assembly.

5. Install the rear output bearing snap-ring (3) to the rear output shaft (1).



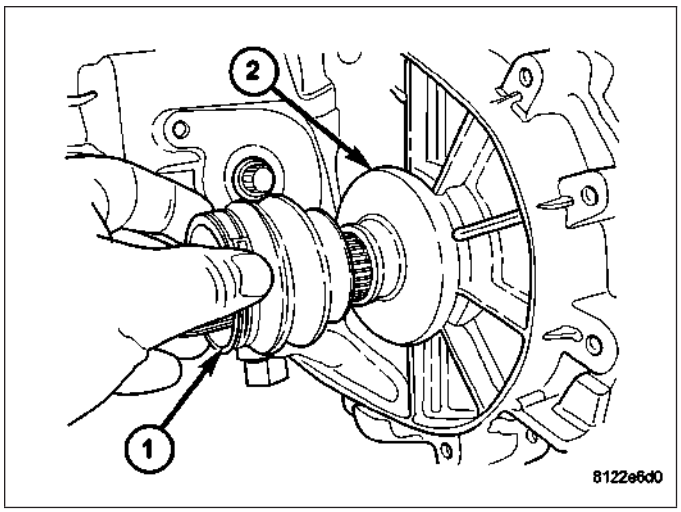
CAUTION: Verify that shift rail, and case alignment dowels are seated before installing any bolts. Case could be cracked if shaft rail or dowels are misaligned.

6. Install 4-5 rear case-to front case bolts (3) to hold rear case in position. Tighten bolts snug but not to specified torque at this time.
7. Apply Mopar® Lock 'n Seal Adhesive to remainder of rear case-to-front case bolt threads and install bolts. Tighten bolts to 25-28 N·m (18-21 ft. lbs.).

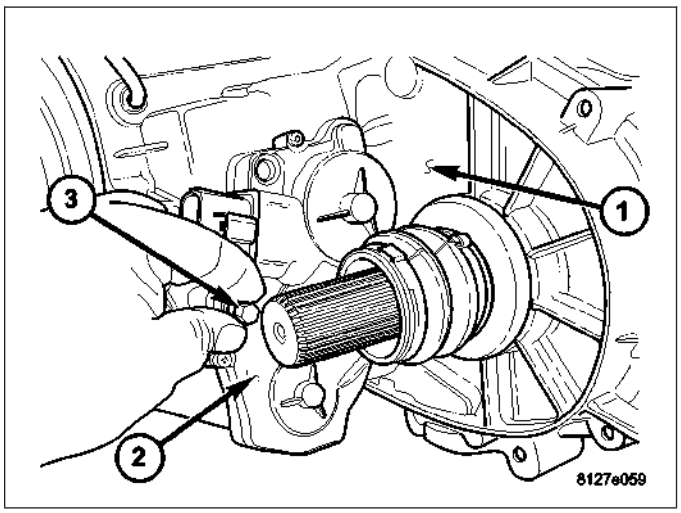


SEAL BOOT AND SHIFT MOTOR ASSEMBLY

1. Install a new seal boot clamp onto the seal boot (1).
2. Install the seal boot (1) and clamp onto the slinger (2) hub and tighten the clamp with Crimp Tool C-4975-A.

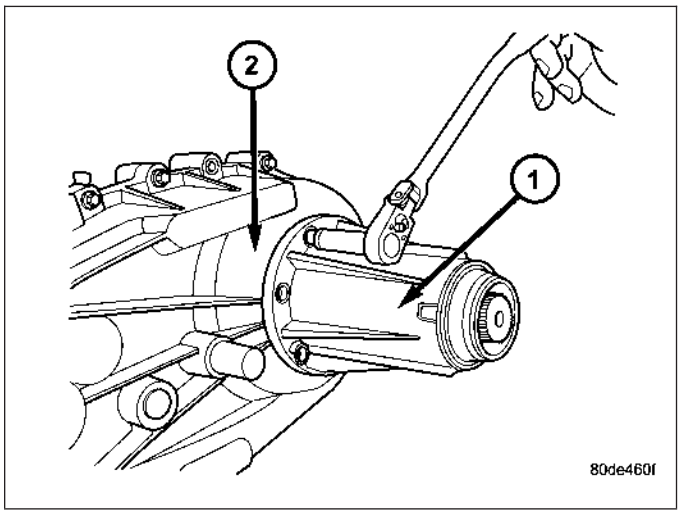


3. Position the shift motor and mode sensor assembly (2) onto the transfer case (1).
4. Install the bolts (3) to hold the shift motor and mode sensor assembly (2) to the transfer case(1). Tighten the bolts to 16-25 N·m (12-18 ft. lbs.).



REAR EXTENSION

1. Install new seal in rear extension housing seal with Installer D-163 and Handle C-4171. Verify that the weep hole in the rebber is oriented downward.
2. Apply bead of Mopar® Gasket Maker, or equivalent, to mating surface of rear extension housing. Keep sealer bead width to maximum of 3/16 inch. Do not use excessive amount of sealer as excess could be displaced into output bearing.
3. Align and install rear extension housing (1) onto the rear case (2).
4. Apply Mopar® Silicone Sealer to threads of rear extension housing bolts. Then install and tighten bolts to 16-24 N·m (12-18 ft. lbs.) torque.



INSTALLATION

1. Mount transfer case on a transmission jack.
2. Secure transfer case to jack with chains.
3. Position transfer case under vehicle.
4. Align transfer case and transmission shafts and install transfer case onto the transmission.
5. Install and tighten transfer case attaching nuts to 27-34 N·m (20-25 ft. lbs.) torque.
6. Connect the vent hose.
7. Connect the shift motor and mode sensor assembly wiring connector. Secure wire harness to clips on transfer case.
8. Align and connect the propeller shafts. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/FRONT PROPELLER SHAFT - INSTALLATION) (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/REAR PROPELLER SHAFT - INSTALLATION)
9. Fill transfer case with correct fluid. (Refer to 21 - TRANSMISSION/TRANSFER CASE/FLUID - STANDARD PROCEDURE)
10. Install skid plate, if equipped.
11. Remove transmission jack and support stand.
12. Lower vehicle and verify transfer case shift operation.

SPECIFICATIONS

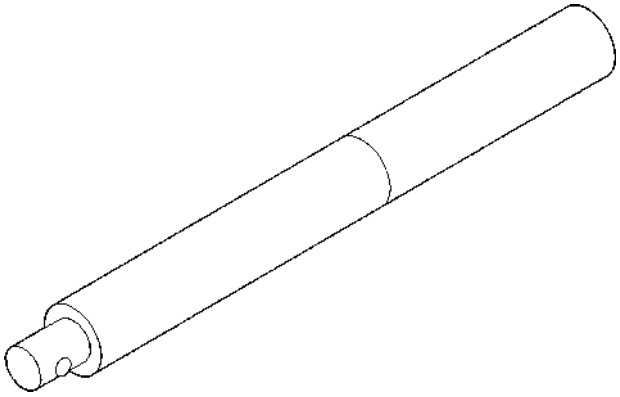
TRANSFER CASE - NV244 GENII

TORQUE SPECIFICATIONS

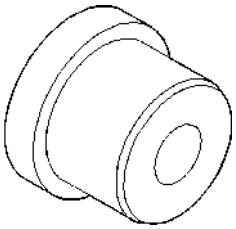
DESCRIPTION	N-m	Ft. Lbs.	In. Lbs.
Plug, Detent	16-24	12-18	-
Plug, Drain/Fill	20-34	15-25	-
Bolt, Extension Housing	16-24	12-18	-
Bolt, Case Half	25-28	18-21	-
Screw, Oil Pump	14-19	10-14	-
Nuts, Mounting	30-41	20-30	-
Bolts, Shift Motor and Mode Sensor Assembly	16-24	12-18	-

SPECIAL TOOLS

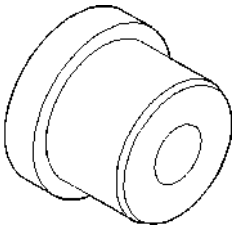
TRANSFER CASE - NV244 GENII



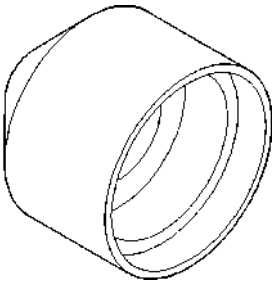
Handle, Universal - C-4171



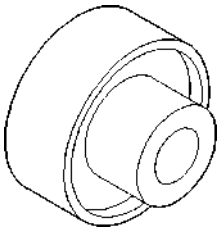
Installer, Bushing - 5065



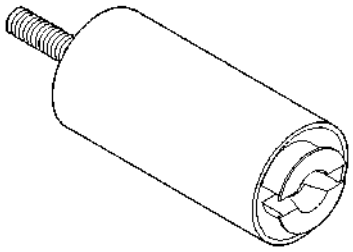
Installer, Bushing - 5066



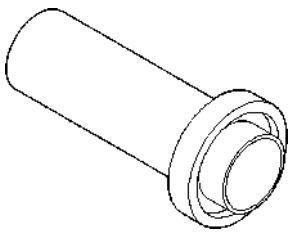
Installer, Seal - D-163



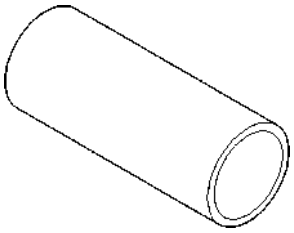
Installer, Bearing - 6953



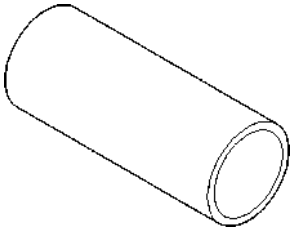
Remover - L-4454



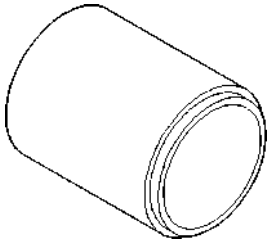
Installer, Seal - MB991168A



Cup - 8148



Installer - 8840



Installer, Seal - 8841

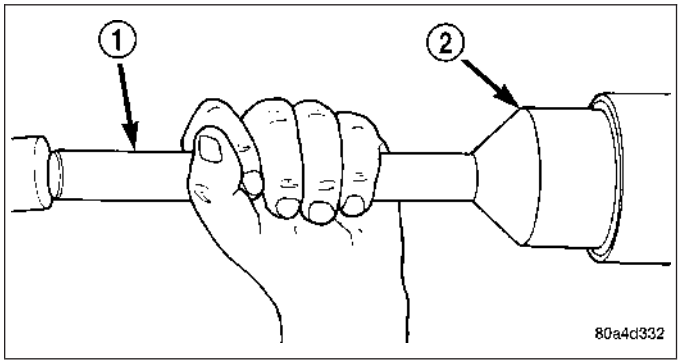
SEAL-EXTENSION HOUSING

REMOVAL

1. Raise and support vehicle.
2. Remove rear propeller shaft. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - REMOVAL)
3. Using a suitable pry tool or slide-hammer mounted screw, remove the extension housing seal.

INSTALLATION

1. Clean fluid residue from sealing surface and inspect for defects.
2. Using Installer D-163 (2) and Handle C-4171 (1), install seal in extension housing.
3. Install propeller shaft. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - INSTALLATION)
4. Verify proper transfer case fluid level.
5. Lower vehicle.

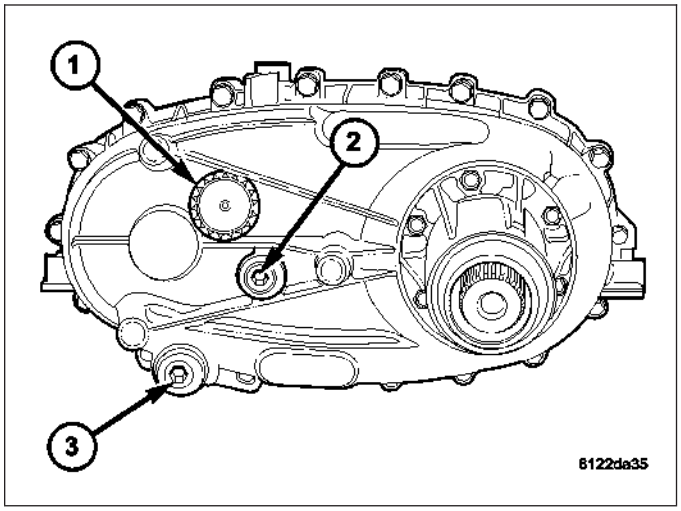


FLUID

STANDARD PROCEDURE - FLUID DRAIN AND REFILL

NOTE: The fill (2) and drain (3) plugs are both in the rear case.

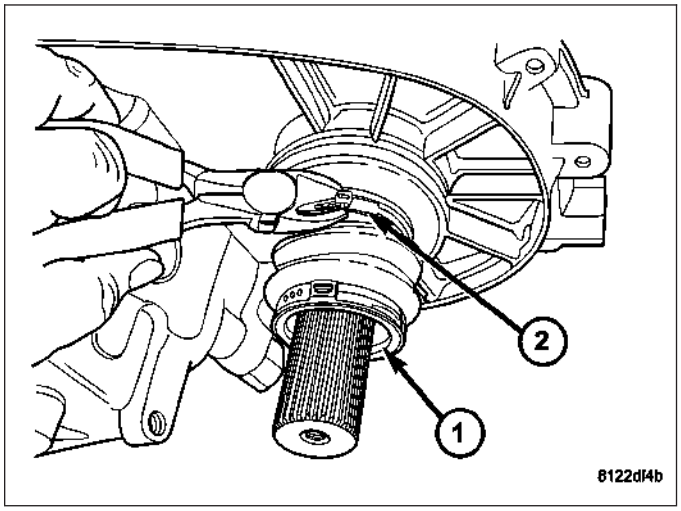
1. Raise vehicle.
2. Position drain pan under transfer case.
3. Remove drain (3) and fill (2) plugs and drain lubricant completely.
4. Install drain plug (3). Tighten plug to 20-34 N·m (15-25 ft. lbs.).
5. Remove drain pan.
6. Fill transfer case to bottom edge of fill plug opening with Mopar® ATF +4, Automatic Transmission fluid.
7. Install and tighten fill plug (2) to 20-34 N·m (15-25 ft. lbs.).
8. Lower vehicle.



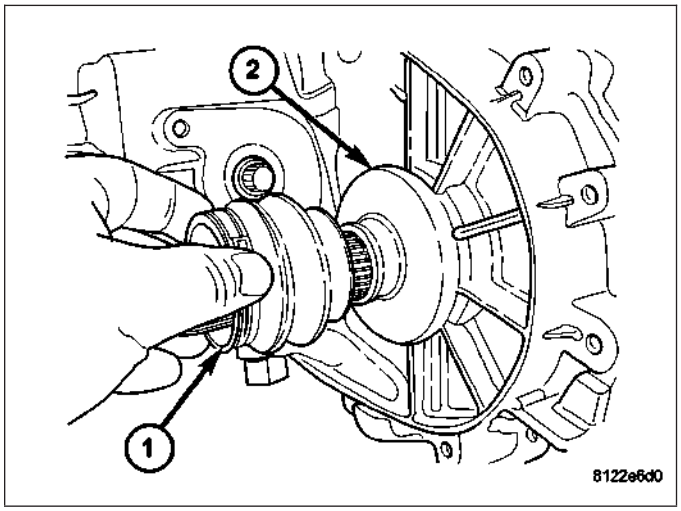
SEAL-FRONT OUTPUT SHAFT

REMOVAL

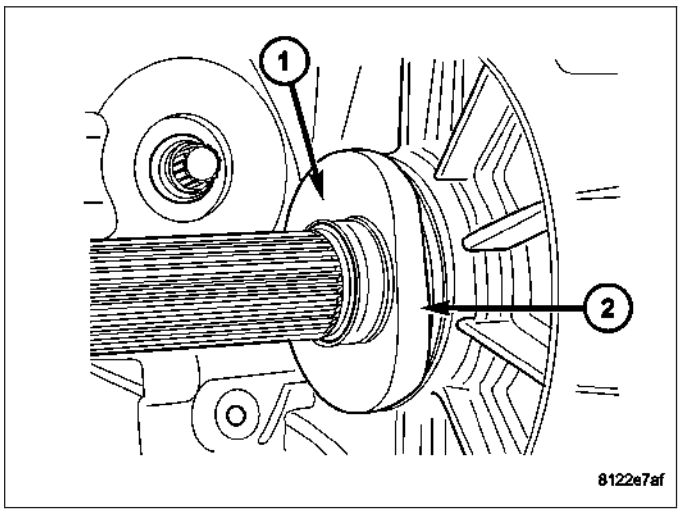
1. Remove the front propeller shaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - REMOVAL).
2. Remove the front propeller shaft seal boot retaining clamp (2).



3. Remove the front propeller shaft seal boot (1) from the front output shaft seal slinger.



4. Remove the front output shaft seal slinger (1) by bending the slinger away (2) from the transfer case.
5. Using a suitable pry tool, remove the slinger from the output shaft using care not to damage the shaft.
6. Using a screw and a slide hammer, remove the front output shaft seal.



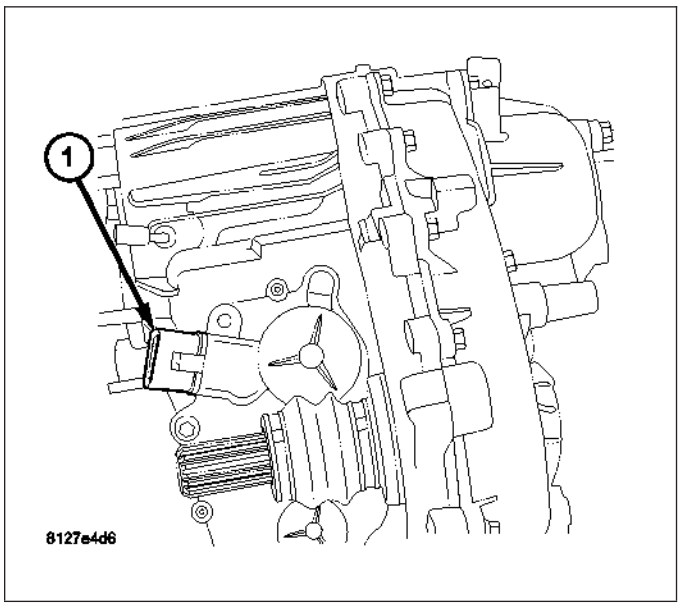
INSTALLATION

1. Install the new front output shaft seal with Installer MB991168A.
2. Install the front output shaft seal slinger with Installer 8840. Install the slinger onto the shaft until the tool contacts the rear of the output shaft.
3. Install a new seal boot clamp onto the seal boot.
4. Install the seal boot and clamp onto the slinger hub and tighten the clamp with Crimp Tool C-4975-A.
5. Install front propeller shaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - INSTALLATION).

SENSOR-MODE

DESCRIPTION

The transfer case mode sensor (1) provides the Front Control Module (FCM) feedback about the position of the transfer case. The sensor consists of a linear analog position sensor that converts the motor output shaft position into a DC signal. The sensor may rotate a full 360 degrees for both the NV144 and the NV244 GENII. The operating envelope or sector rotation is -5 to 180 degrees for the NV144 and -40 to 20 degrees for the NV244 GENII. The FCM must supply 5VDC (+/- 0.5v) to the sensor whenever the FCM is not in sleep mode and monitor the shift motor position. The sensor position is monitored when the ignition is in the RUN position and for 10 seconds after the ignition is shifted to the OFF position. The sensor is mechanically linked to the shaft of the cam which allows the transfer case to shift. The mode sensor will draw less than 20 mA of current during operation.



OPERATION

During normal vehicle operation, the Front Control Module (FCM) monitors the mode sensor outputs at least every 2 milliseconds when the shift motor is stationary or active.

Refer to SECTOR ANGLES vs. TRANSFER CASE POSITION for the relative angles of the transfer case shift sector versus the interpreted transfer case gear operating mode.

SECTOR ANGLES vs. TRANSFER CASE POSITION

Shaft Angle (Degrees)	Transfer Case Position
+20	4LO
0	N
-20	AWD
-40	4LOCK

NOTE: All the parameter voltages referred to in the following information are calibrated items in the controller software and are subject to change.

NOTE: For a further explanation of Phase 1 through 3 shifting, (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - OPERATION).

The following information describes the different mode sensor positions:

- 4LO TARGET REGION - The position shall be considered 4LO if the voltage is greater than or equal to encoder_4LO_min Volts and it is also less than or equal to encoder_4LO_max Volts.
- 4LO SHIFT LIMIT - During Phase 2 and Phase 3 shifting, shifts may become unidirectional when a voltage is less than or equal to encoder_4LO_min Volts has been reached.
- 4LOCK TARGET REGION - The position shall be considered 4LOCK if the voltage is greater than or equal to encoder_4LOCK_min Volts and it is also less than or equal to encoder_4LOCK_max Volts.
- NEUTRAL TARGET REGION - The position shall be considered NEUTRAL if the voltage is greater than or equal to encoder_Neutral_min Volts and it is also less than or equal to encoder_Neutral_max Volts.
- AWD TARGET REGION - The position shall be considered AWD if the voltage is greater than or equal to encoder_AWD_min Volts and it is also less than or equal to encoder_AWD_max Volts.
- AWD SHIFT LIMIT - During Phase 2 and Phase 3 shifting, shifts may become unidirectional when a voltage is greater than or equal to encoder_AWD_min Volts has been reached.

The mode sensor position will be considered invalid by the FCM if the voltage is greater than or equal to encoder-_High_Range_Limit Volts or if it is less than or equal to encoder_Low_Range_Limit Volts.

Refer to MODE SENSOR VOLTAGES - NV244 GENII table for the mode sensor voltages.

MODE SENSOR VOLTAGES - NV244 GENII

Parameter Name	Voltage
encoder_4LOCK_Min	4.26
encoder_4LOCK_Max	4.36
encoder_AWD_Min	3.36
encoder_AWD_Max	3.44
encoder_Neutral_Min	2.45
encoder_Neutral_Max	2.54
encoder_4LO _Min	1.48
encoder_4LO _Max	1.57
encoder_High_Range_Limit	4.51
encoder_Low_Range _Limit	0.50

SWITCH-TRANSFER CASE SELECTOR

DESCRIPTION

The selector switch assembly is mounted in the right side of the vehicle's Instrument Panel (IP) and consists of a rotary knob connected to a resistive network for the mode and range shift selections. Also located in this assembly is a recessed, normally open momentary switch for making shifts into and out of transfer case NEUTRAL. A pen, or similar instrument, is used to make a NEUTRAL shift selection, thus reducing the likelihood of an inadvertent shift request.

OPERATION

As the position of the selector switch varies, the resistance between the Mode Sensor supply voltage pin and the Mode Sensor output will vary. Hardware, software, and calibrations within the Front Control Module (FCM) are provided that interpret the selector switch resistance as given in the table below: SELECTOR SWITCH INTERPRETATION

SELECTOR SWITCH INTERPRETATION

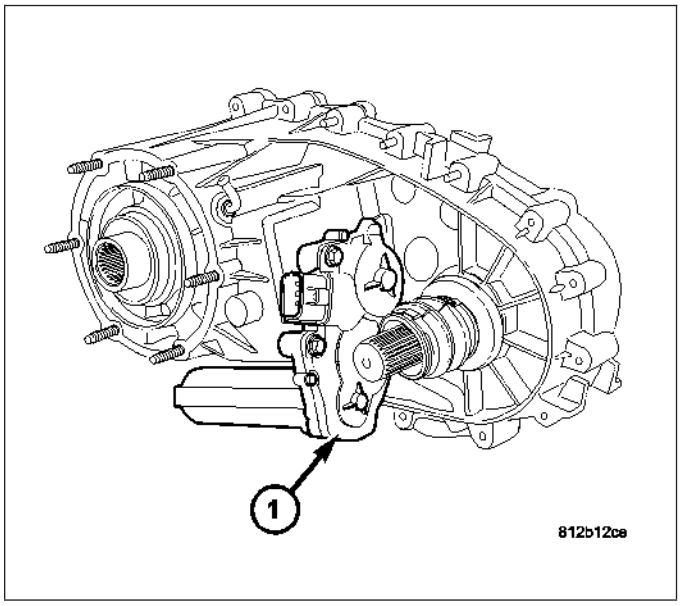
Required Interpretation	Resistance Range (ohms)
Shorted	<150
AWD+NEUTRAL	176-200
4LOCK+NEUTRAL	190-216
4LO+NEUTRAL	199-226
AWD (Default)	1159-1287
4LOCK	2259-2503
4LO	4820-5334
Open/Diagnostic	>19K

The internal structure and function of the selector switch is such that the connection is made to the Open/Diagnostic resistor before the connection to the individual position resistors is broken. Because of this characteristic, if the resistance between the Mode Sensor supply voltage pin and the Mode Sensor output pin is >19k ohms, the position resistor is open.

ASSEMBLY-SHIFT MOTOR/MODE SENSOR

DESCRIPTION

The shift motor (1) is an electromechanical device consisting of a DC permanent magnet motor, gear train, and an analog position sensor. The shift motors' overall function is to move and lock a gear that moves the mode and range forks found in the transfer case. This allows the transfer case to be shifted electrically to multiple operating positions (4LOCK, AWD, N (neutral), and 4LO). The operating current of the shift motor under stall conditions is 30 amps maximum at 72° F with 13.5 volts, at the motor leads.



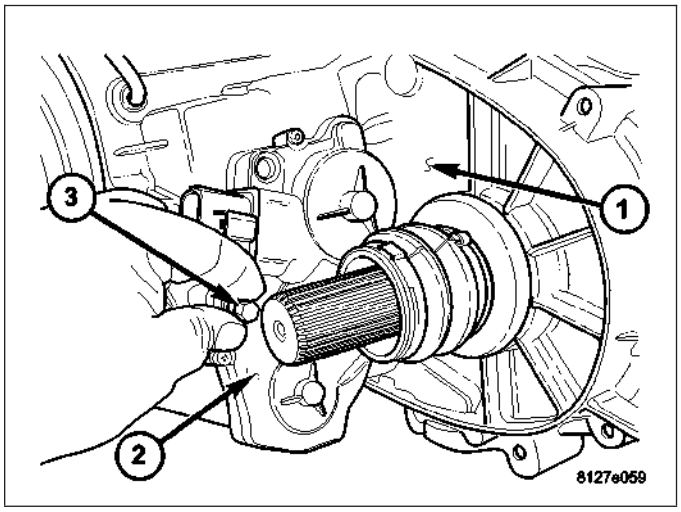
OPERATION

Shifting in the transfer case occurs when a Pulse Width Modulated (PWM) voltage is supplied to the shift motor by the Front Control Module (FCM). A linear analog position sensor located inside the shift motor, provides the FCM with the motors' angular, rotational position. With this information, the FCM continuously knows the motors' position, and therefore allows it to accurately control the motors' operation, including voltage polarity which is used to control motor direction.

REMOVAL

NOTE: New shift motor assemblies are shipped in the AWD position. If a new shift motor assembly must be installed, it will be necessary to shift the transfer case to the AWD position prior to motor installation.

1. Raise the vehicle on a suitable hoist.
2. Disengage the wiring connector from the shift motor and mode sensor assembly.
3. Remove the bolts (3) holding the shift motor and mode sensor assembly (2) onto the transfer case (1).
4. Separate the shift motor and mode sensor assembly (2) from the transfer case (1).

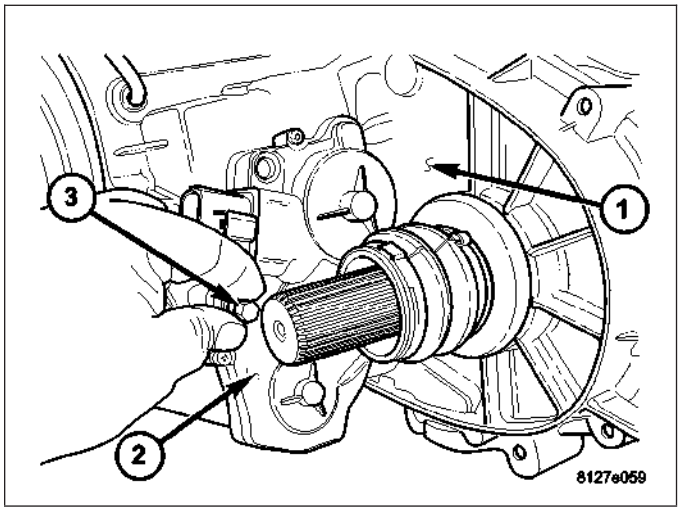


INSTALLATION

1. Verify that the shift motor o-ring is clean and properly positioned inside the machined o-ring groove of the shift motor.
2. Add high temperature grease between the actuator and the transfer case mating surface for sealing purposes.

NOTE: Verify that the shift motor position and sector shaft orientation are aligned. It may be necessary to manually shift the transfer case if the shift motor and sector shaft are not aligned.

3. Position the shift motor and mode sensor assembly (2) onto the transfer case (1).
4. Install the bolts (3) to hold the assembly (2) onto the transfer case (1). Tighten the bolts to 16-24 N·m (12-18 ft.lbs.).



CAUTION: If the original shift motor and mode sensor assembly bolts are reused, be sure to use Mopar® Lock & Seal or Loctite™ 242 to replenish the lock patch material originally found on the bolts

5. Engage the wiring connector to the shift motor and mode sensor assembly.
6. Refill the transfer case as necessary.
7. Lower vehicle and verify transfer case operation.

TIRES/WHEELS

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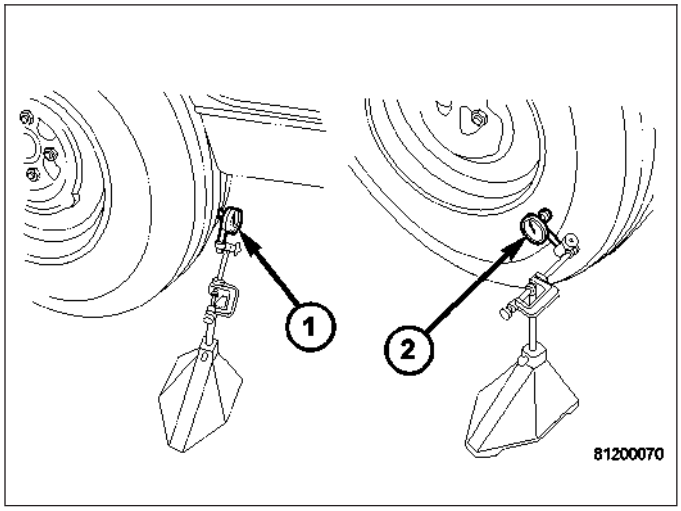
TIRES/WHEELS

DIAGNOSIS AND TESTING

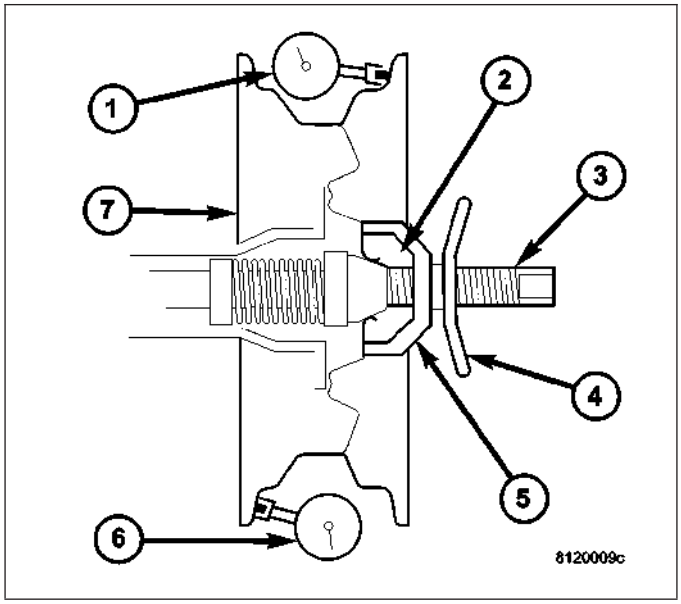
TIRE AND WHEEL RUNOUT

Radial runout is the difference between the high and low points on the tire or wheel.



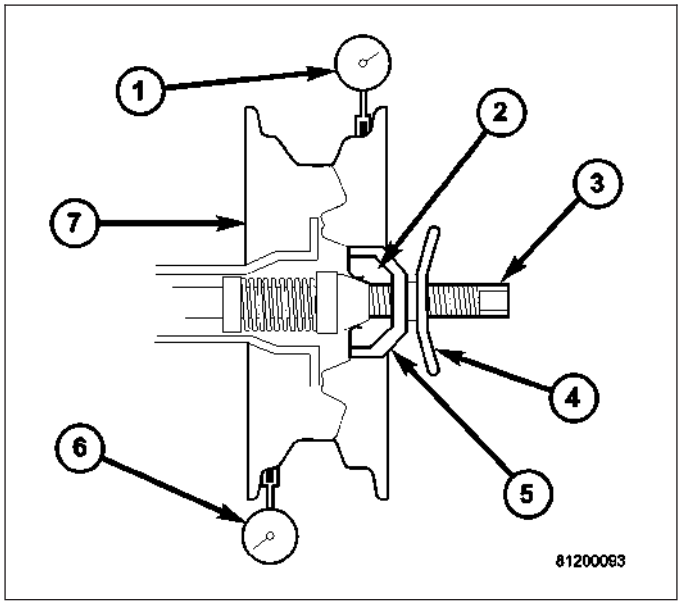
Lateral runout is the **wobble** of the tire or wheel.

Lateral runout of more than 2.0 mm (.080 inch) measured near the shoulder of the tire may cause the vehicle to shake.



Radial runout of more than 1.5 mm (.060 inch) measured at the center line of the tread may cause the vehicle to shake.

Sometimes radial runout can be reduced. Relocate the wheel and tire assembly on the mounting studs (See Method 1). If this does not reduce runout to an acceptable level, the tire can be rotated on the wheel. (See Method 2).



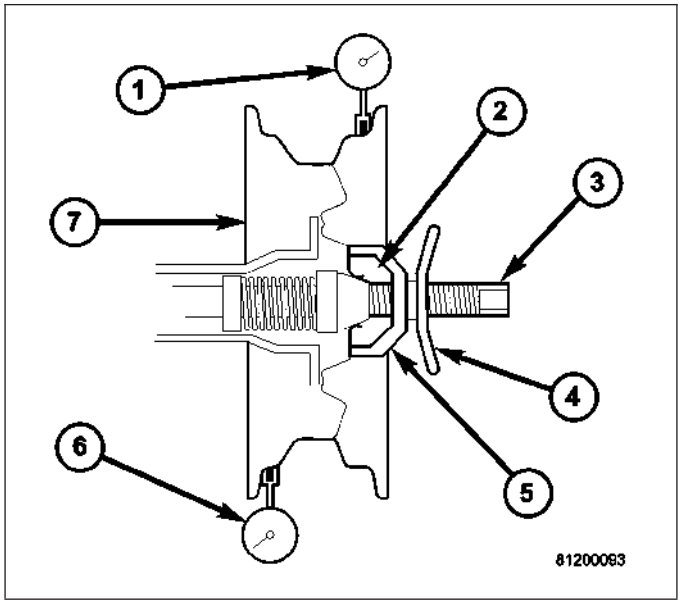
METHOD 1 (RELOCATE WHEEL ON HUB)

1. Drive vehicle a short distance to eliminate tire flat spotting from a parked position.
2. Check wheel bearings and adjust if adjustable or replace if necessary.
3. Check the wheel mounting surface.
4. Relocate wheel on the mounting, two studs over from the original position.
5. Tighten wheel nuts until all are properly torqued, to eliminate brake distortion.
6. Check radial runout. If still excessive, mark tire sidewall, wheel, and stud at point of maximum runout and proceed to Method 2.

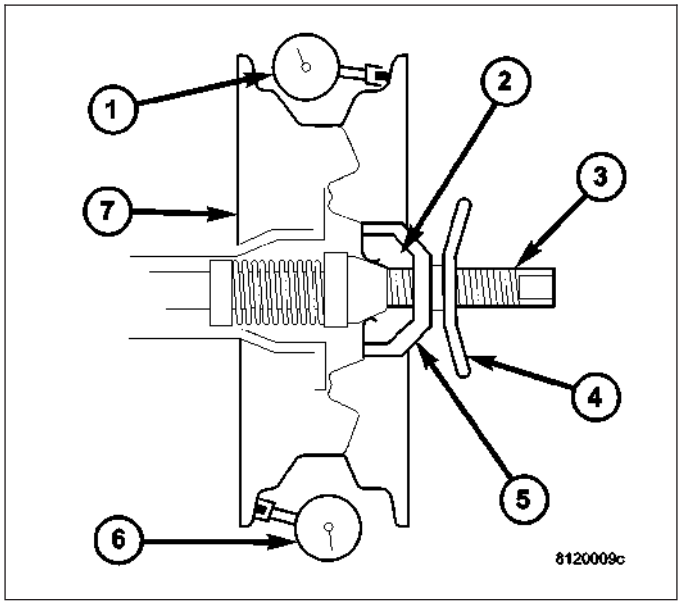
METHOD 2 (RELOCATE TIRE ON WHEEL)

Note: Rotating the tire on wheel is particularly effective when there is runout in both tire and wheel.

1. Remove tire from wheel and mount wheel on service dynamic balance machine.
2. Check the wheel radial runout.



3. Check the wheel lateral runout.
   - STEEL WHEELS: Radial runout 0.031 in., Lateral runout 0.031 in. (maximum)
   - ALUMINUM WHEELS: Radial runout 0.02 in., Lateral runout 0.025 in. (maximum)
4. If point of greatest wheel lateral runout is near original chalk mark, remount tire 180 degrees. Recheck runout.



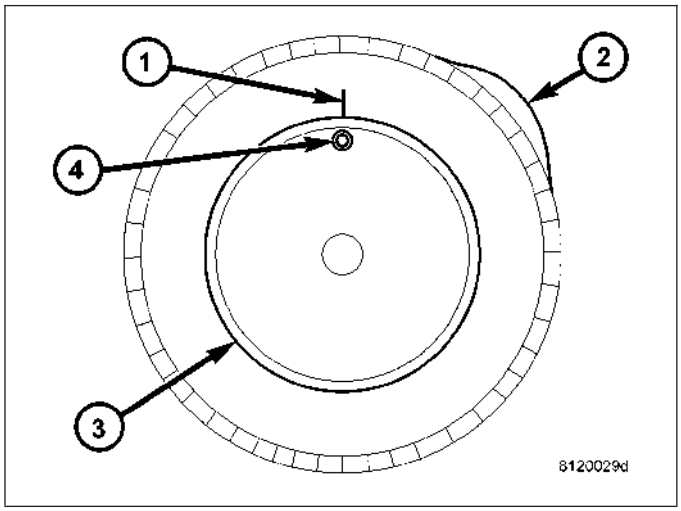
STANDARD PROCEDURE

MATCH MOUNTING

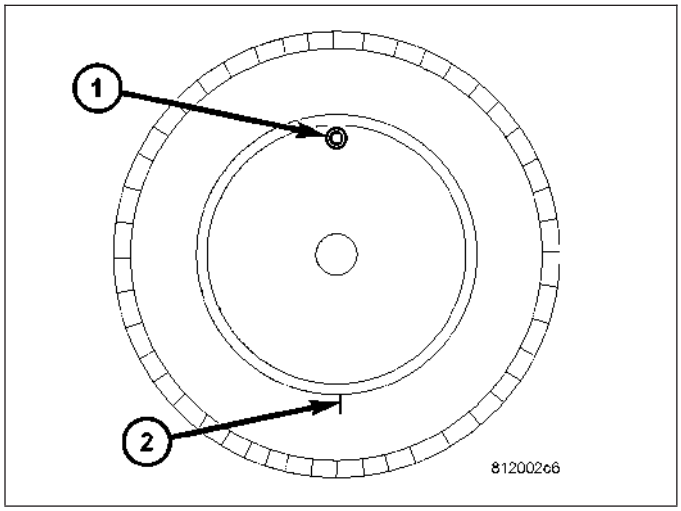
Wheels and tires are match mounted at the factory. This means that the high spot of the tire is matched to the low spot on the wheel rim. Each are marked with a bright colored temporary label on the outboard surface for alignment. The wheel is also marked permanently on the inside of the rim in the tire well. This permanent mark may be a paint dot or line, a permanent label or a stamped impression such as an X. An optional location mark is a small spherical indentation on the vertical face of the outboard flange on some non styled base steel wheels. The tire must be removed to locate the permanent mark on the inside of the wheel.

Before dismounting a tire from its wheel, a reference mark should be placed on the tire at the valve stem location. This reference will ensure that it is remounted in the original position on the wheel.

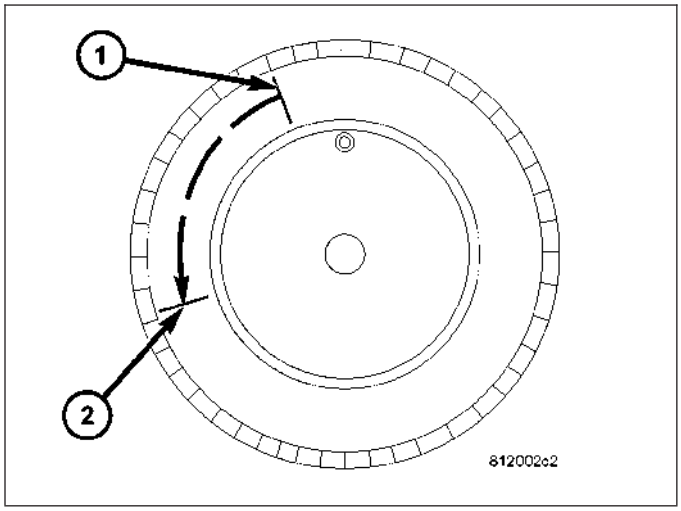
1. Remove the tire and wheel assembly from the vehicle and mount on a service dynamic balance machine.
2. Measure the total runout on the center of the tire tread rib (3) with a dial indicator. Record the indicator reading. Mark the tire to indicate the high spot (2). Place a mark on the tire at the valve stem (4) location (1).



3. Break down the tire and remount it 180 degrees on the rim (1)(2).
4. Measure the total indicator runout again. Mark the tire to indicate the high spot.



5. If runout is still excessive, the following procedures must be done.
   - If the high spot is within 101.6 mm (4.0 in.) of the first spot and is still excessive, replace the tire.
   - If the high spot is within 101.6 mm (4.0 in.) of the first spot on the wheel, the wheel may be out of specifications. Refer to Wheel and Tire Runout.
   - If the high spot is NOT within 101.6 mm (4.0 in.) of either high spot, draw an arrow on the tread from second high spot (1) to first (2). Break down the tire and remount it 90 degrees on rim in that direction. This procedure will normally reduce the runout to an acceptable amount, if not replace the rim.

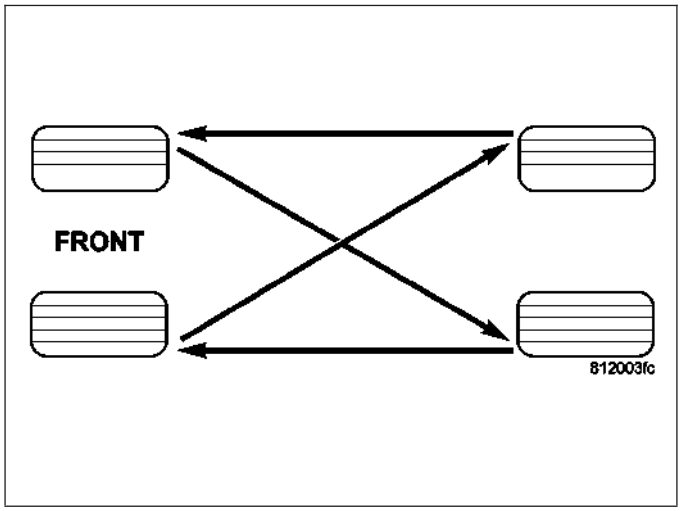


ROTATION

Tires on the front and rear operate at different loads and perform different steering, driving, and braking functions. For these reasons they wear at unequal rates and tend to develop irregular wear patterns. These effects can be reduced by rotating the tires at regular intervals. The benefits of tire rotation are:

- Increase tread life
- Maintain traction levels
- A smooth, quiet ride

The suggested method of tire rotation is shown in graphic. Other rotation methods can be used, but they will not provide all the tire longevity benefits.



TIRE AND WHEEL BALANCE

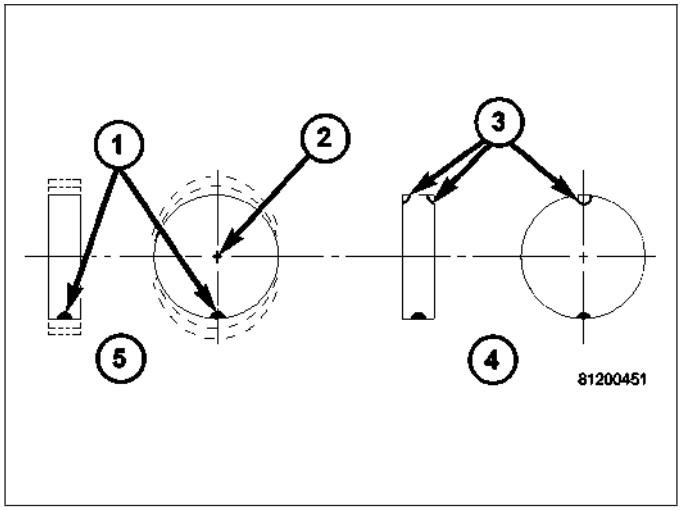
It is recommended that a two plane service dynamic balancer be used when a tire and wheel assembly require balancing. Refer to balancer operation instructions for proper cone mounting procedures. Typically use front cone mounting method for steel wheels. For aluminum wheel use back cone mounting method without cone spring.

Note: Static should be used only when a two plane balancer is not available.

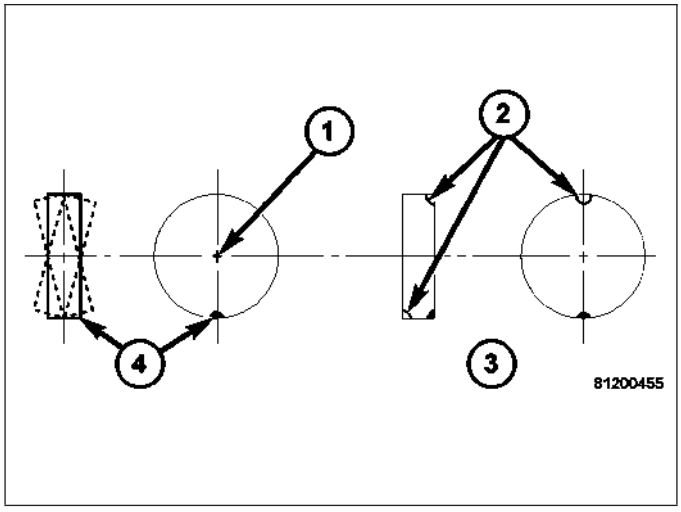
Note: Cast aluminum and forged aluminum wheels require coated balance weights and special alignment equipment.

Wheel balancing can be accomplished with either on or off vehicle equipment. When using on-vehicle balancing equipment, remove the opposite wheel/tire. Off-vehicle balancing is recommended.

For static balancing, find the location of the heavy spot (1) causing the imbalance (5). Counter balance wheel directly opposite the heavy spot. Determine weight required to counter balance the area of imbalance (4). Place half of this weight on the **inner** rim flange (3) and the other half on the **outer** rim flange (3).



For dynamic balancing (3), the balancing equipment is designed to locate the amount of weight to be applied to both the inner and outer rim flange (2).



TIRES

DESCRIPTION

TIRES

Tires are designed and engineered for each specific vehicle. They provide the best overall performance for normal operation. The ride and handling characteristics match the vehicle's requirements. With proper care they will give excellent reliability, traction, skid resistance, and tread life.

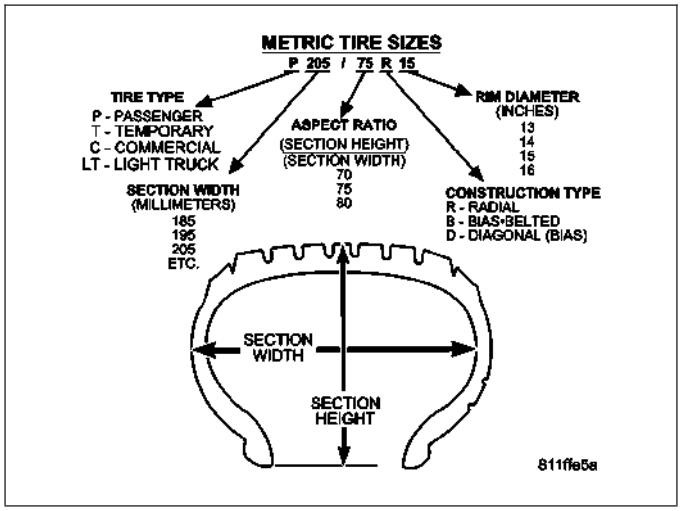
Driving habits have more effect on tire life than any other factor. Careful drivers will obtain in most cases, much greater mileage than severe use or careless drivers. A few of the driving habits which will shorten the life of any tire are:

- Rapid acceleration
- Severe brake applications
- High speed driving
- Excessive speeds on turns
- Striking curbs and other obstacles

Radial-ply tires are more prone to irregular tread wear. It is important to follow the tire rotation interval (Refer to 22 - TIRES/WHEELS - STANDARD PROCEDURE). This will help to achieve a greater tread life.

TIRE IDENTIFICATION

Tire type, size, aspect ratio and speed rating are encoded in the letters and numbers imprinted on the side wall of the tire. Refer to the chart to decipher the tire identification code.



Performance tires have a speed rating letter after the aspect ratio number. The speed rating is not always printed on the tire sidewall. These ratings are:

- **Q** up to 100 mph
- **S** up to 112 mph
- **T** up to 118 mph
- **U** up to 124 mph
- **H** up to 130 mph
- **V** up to 149 mph
- **Z** more than 149 mph (consult the tire manufacturer for the specific speed rating)

An All Season type tire will have either **M + S, M & S or M–S** (indicating mud and snow traction) imprinted on the side wall.

TIRE CHAINS

Tire snow chains may be used on **certain** models. Refer to the Owner's Manual for more information.

RADIAL-PLY TIRES

Radial-ply tires improve handling, tread life and ride quality, and decrease rolling resistance.

Radial-ply tires must always be used in sets of four. Under no circumstances should they be used on the front only. They may be mixed with temporary spare tires when necessary. A maximum speed of 50 MPH is recommended while a temporary spare is in use.

Radial-ply tires have the same load-carrying capacity as other types of tires of the same size. They also use the same recommended inflation pressures.

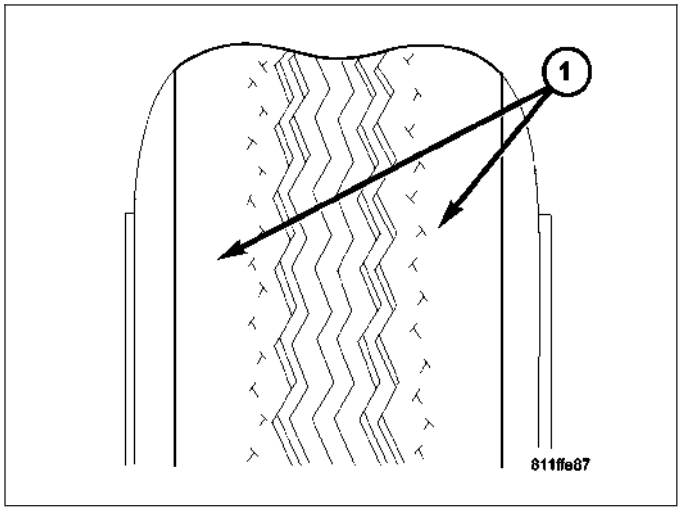
The use of oversized tires, either in the front or rear of the vehicle, can cause vehicle drive train failure. This could also cause inaccurate wheel speed signals when the vehicle is equipped with Anti-Lock Brakes.

The use of tires from different manufactures on the same vehicle is NOT recommended. The proper tire pressure should be maintained on all four tires.

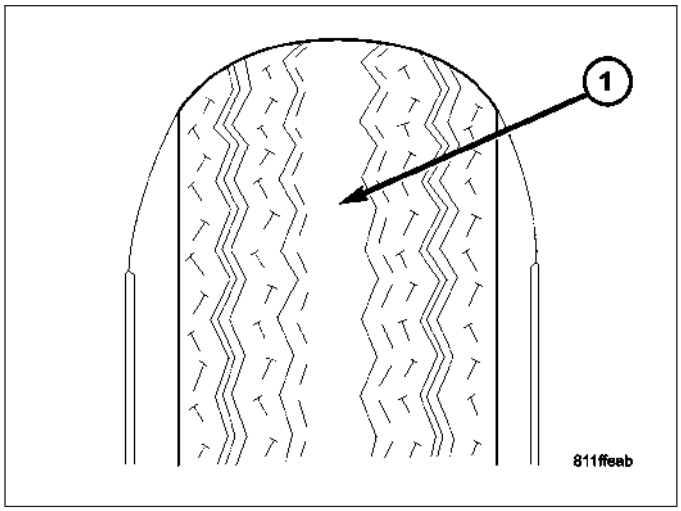
TIRE INFLATION PRESSURES

WARNING: OVER OR UNDER INFLATED TIRES CAN AFFECT VEHICLE HANDLING AND TREAD WEAR. THIS MAY CAUSE THE TIRE TO FAIL SUDDENLY, RESULTING IN LOSS OF VEHICLE CONTROL.

Under inflation will cause rapid shoulder wear (1), tire flexing, and possible tire failure.



Over inflation will cause rapid center wear (1) and loss of the tire's ability to cushion shocks.



Improper inflation can cause:

- Uneven wear patterns
- Reduced tread life
- Reduced fuel economy
- Unsatisfactory ride
- Vehicle drift

For proper tire pressure specification refer to the vehicles Owners Manual.

TIRE PRESSURE FOR HIGH SPEED

Refer to the Vehicles Owners Manual package.

SPARE / TEMPORARY TIRE

The temporary spare tire is designed for emergency use only. The original tire should be repaired or replaced at the first opportunity, then reinstalled. Do not exceed speeds of 50 M.P.H. when using the temporary spare tire. Refer to Owner's Manual for complete details.

FULL SIZE, SPARE WHEEL WITH MATCHING TIRE

The spare is a full usage wheel with a matching tire, It can be used within the (posted legal) speed limits or distance limitations as of the rest of the vehicles four tires. Refer to Owner's Manual for complete details.

REPLACEMENT TIRES

The original equipment tires provide a proper balance of many characteristics such as:

- Ride
- Noise
- Handling
- Durability
- Tread life
- Traction
- Rolling resistance
- Speed capability

It is recommended that tires equivalent to the original equipment tires be used when replacement is needed.

Failure to use equivalent replacement tires may adversely affect the safety and handling of the vehicle.

The use of oversize tires may cause interference with vehicle components. Under extremes of suspension and steering travel, interference with vehicle components may cause tire damage.

WARNING: FAILURE TO EQUIP THE VEHICLE WITH TIRES HAVING ADEQUATE SPEED CAPABILITY CAN RESULT IN SUDDEN TIRE FAILURE.

DIAGNOSIS AND TESTING

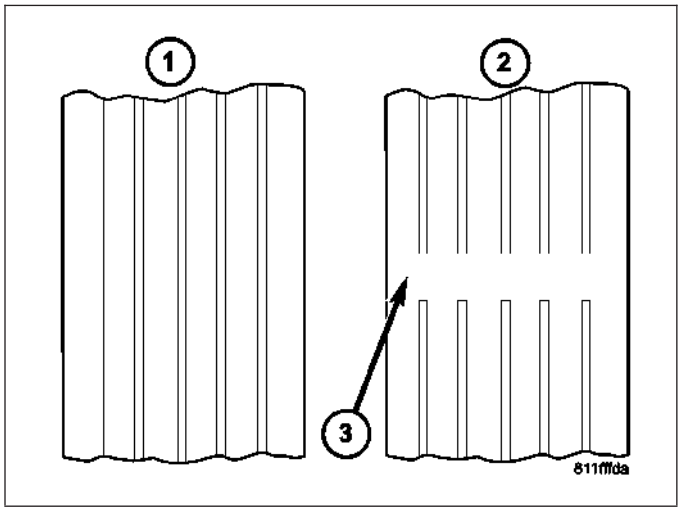
PRESSURE GAUGES

A quality air pressure gauge is recommended to check tire pressure. After checking the air pressure, replace valve cap finger tight.

TREAD WEAR INDICATORS

Tread wear indicators (3) are molded into the bottom of the tread grooves. When tread depth is 1.6 mm (1/16 in.), the tread wear indicators (3) will appear as a 13 mm (1/2 in.) band.

Tire replacement is necessary when indicators appear in two or more grooves or if localized balding occurs.



TIRE WEAR PATTERNS

CONDITION	RAPID WEAR AT SHOULDERS	RAPID WEAR AT CENTER	CRACKED TREADS	WEAR ON ONE SIDE	FEATHERED EDGE	BALD SPOTS	SCALLOPED WEAR
EFFECT	1. 2.						
CAUSE	UNDER-INFLATION OR LACK OF ROTATION	OVER-INFLATION OR LACK OF ROTATION	UNDER-INFLATION OR EXCESSIVE SPEED*	EXCESSIVE CAMBER	INCORRECT TOE	UNBALANCED WHEEL OR TIRE DEFECT*	LACK OF ROTATION OF TIRES OR WORN OR OUT-OF-ALIGNMENT SUSPENSION.
CORRECTION	ADJUST PRESSURE TO SPECIFICATIONS WHEN TIRES ARE COOL ROTATE TIRES			ADJUST CAMBER TO SPECIFICATIONS	ADJUST TOE-IN TO SPECIFICATIONS	DYNAMIC OR STATIC BALANCE WHEELS	ROTATE TIRES AND INSPECT SUSPENSION SEE GROUP 2

* HAVE TIRE INSPECTED FOR FUTURE USE.

812014d7

Under inflation will cause wear on the shoulders of tire. Over inflation will cause wear at the center of tire.

Excessive camber causes the tire to run at an angle to the road. One side of tread is then worn more than the other.

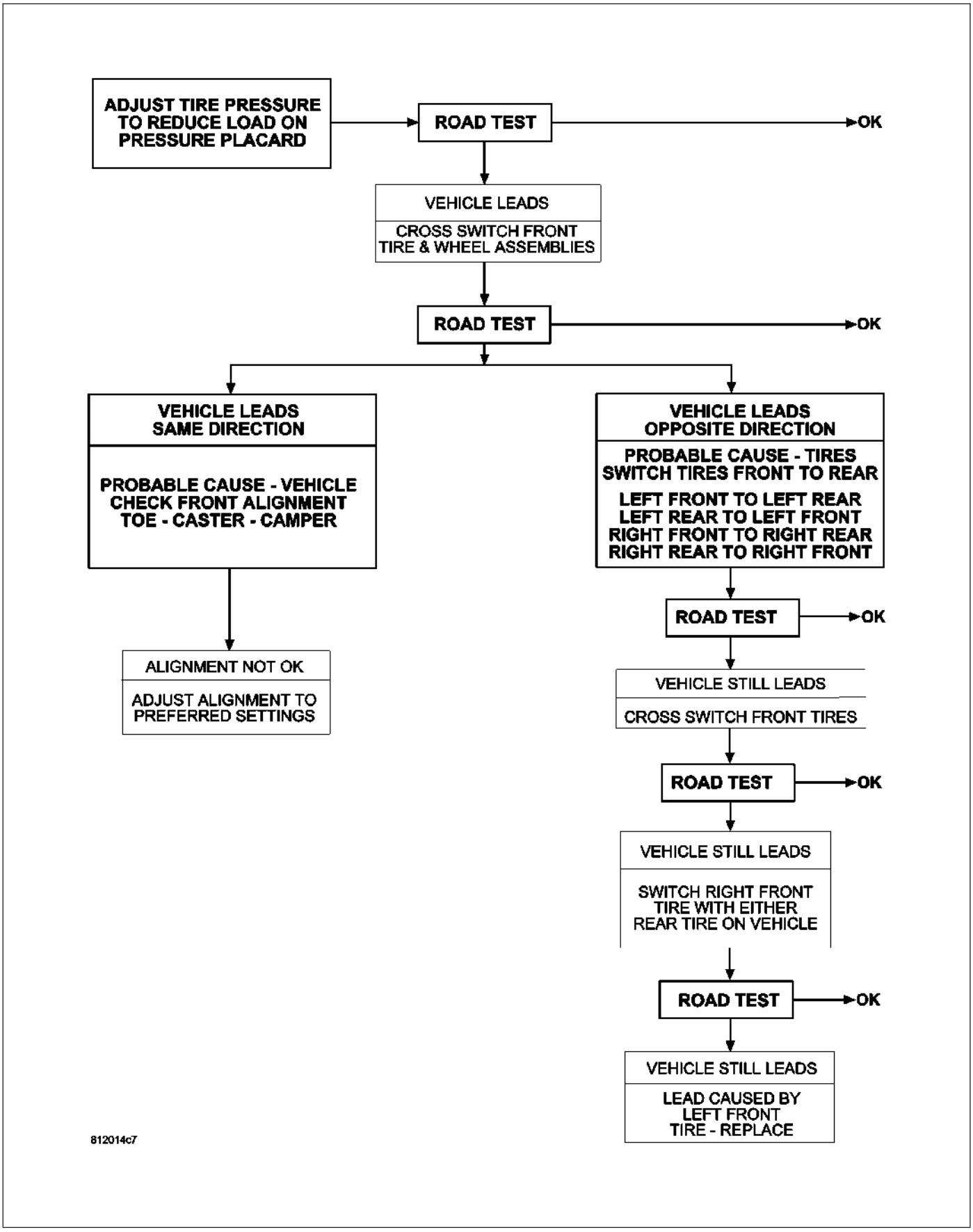
Excessive toe-in or toe-out causes wear on the tread edges and a feathered effect across the tread.

TIRE NOISE OR VIBRATION

Radial-ply tires are sensitive to force impulses caused by improper mounting, vibration, wheel defects, or possibly tire imbalance.

To find out if tires are causing the noise or vibration, drive the vehicle over a smooth road at varying speeds. Note the noise level during acceleration and deceleration. The engine, differential and exhaust noises will change as speed varies, while the tire noise will usually remain constant.

TIRE/VEHICLE LEAD



Use the following Vehicle Lead Diagnosis And Correction Chart to diagnose and correct a vehicle lead or drift problem.

STANDARD PROCEDURE

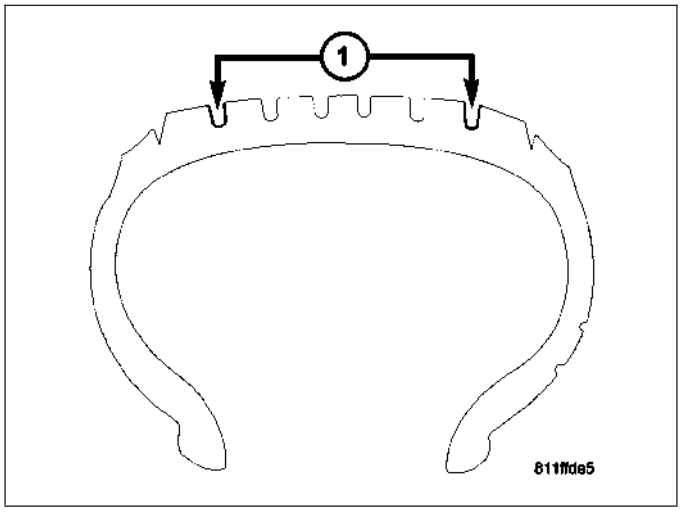
TIRE REPAIR AREA

For proper repairing, a radial tire must be removed from the wheel. Repairs should only be made if the defect, or puncture, is in the tread area (1). The tire should be replaced if the puncture is located in the sidewall.

Deflate tire completely before removing the tire from the wheel. Use lubrication such as a mild soap solution when dismounting or mounting tire. Use tools free of burrs or sharp edges which could damage the tire or wheel rim.

Before mounting tire on wheel, make sure all rust is removed from the rim bead and repaint if necessary.

Install wheel on vehicle, and tighten to proper torque specification.



CLEANING

TIRES

Remove the protective coating on the tires before delivery of a vehicle. This coating may cause deterioration of the tires.

To remove the protective coating, apply warm water and let it soak for a few minutes. Afterwards, scrub the coating away with a soft bristle brush. Steam cleaning may also be used to remove the coating.

Note: DO NOT use gasoline, mineral oil, oil-based solvent or a wire brush for cleaning.

SPECIFICATIONS

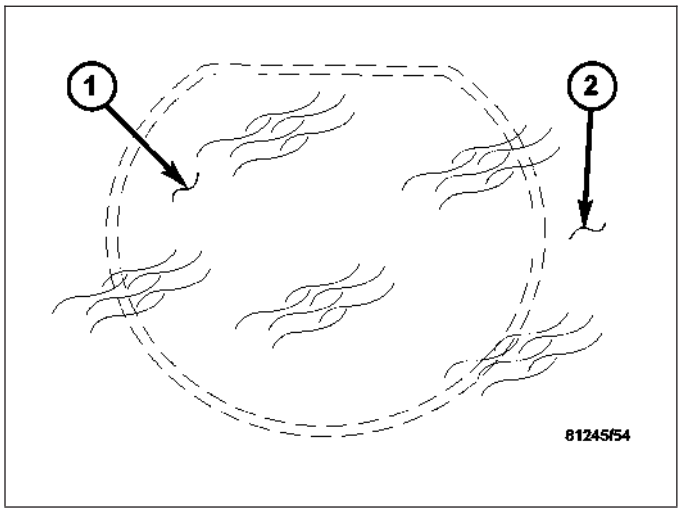
TIRE REVOLUTIONS PER MILE

DESCRIPTION	SPECIFICATION
TIRE SIZE	REVOLUTIONS PER MILE
P245/70R17	686
P265/65R17	684
P275/60R17 BUX	695

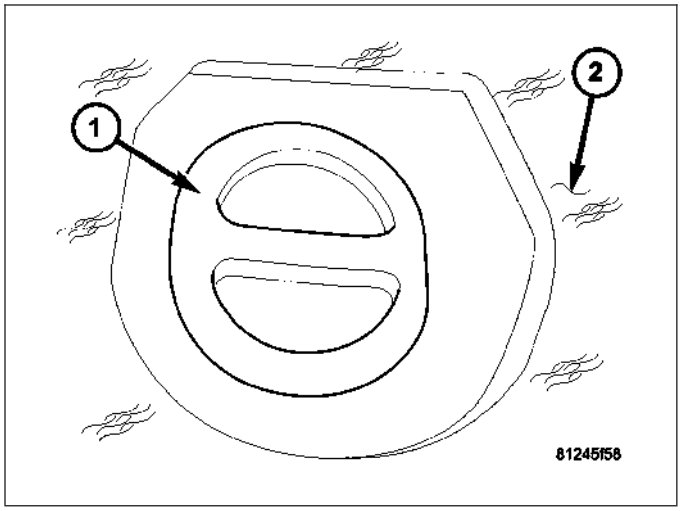
SPARE TIRE WINCH

REMOVAL

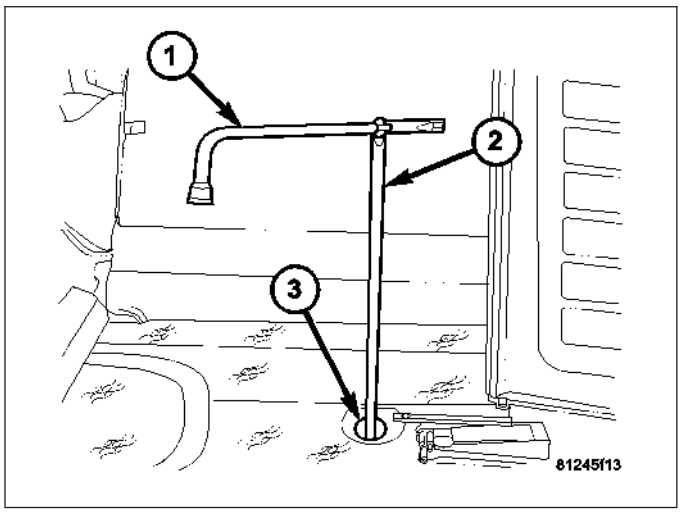
1. Pull up on the hole (1) cut in the carpet (2) to access the spare tire winch cover.



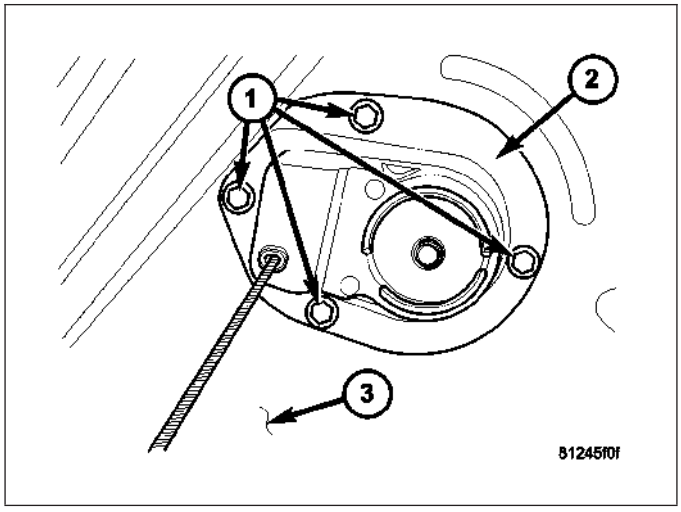
2. Remove the spare tire winch cover (1).



3. Install the jack handle (2) and lug wrench (1) to the spare tire winch (3) to loosen the spare tire to the ground.

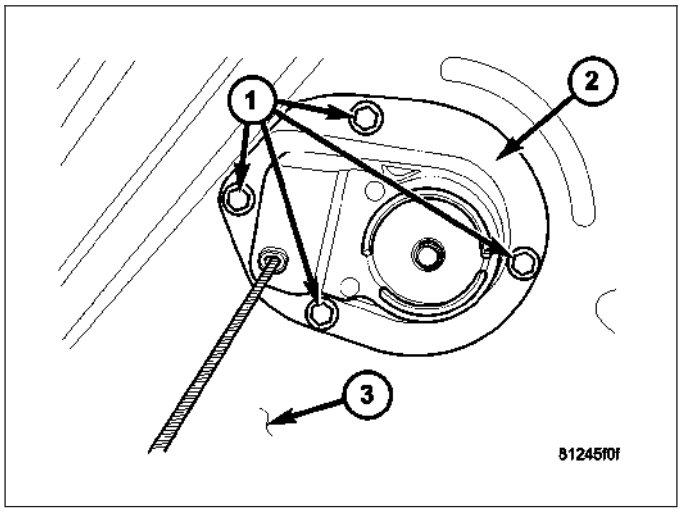


4. Remove spare tire.
5. Remove 4 bolts (1) attaching spare tire winch (2) to body (3).
6. Separate spare tire winch from vehicle.

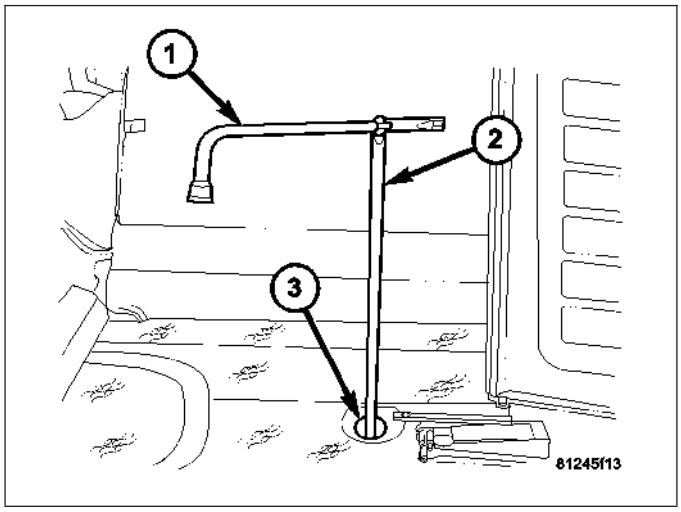


INSTALLATION

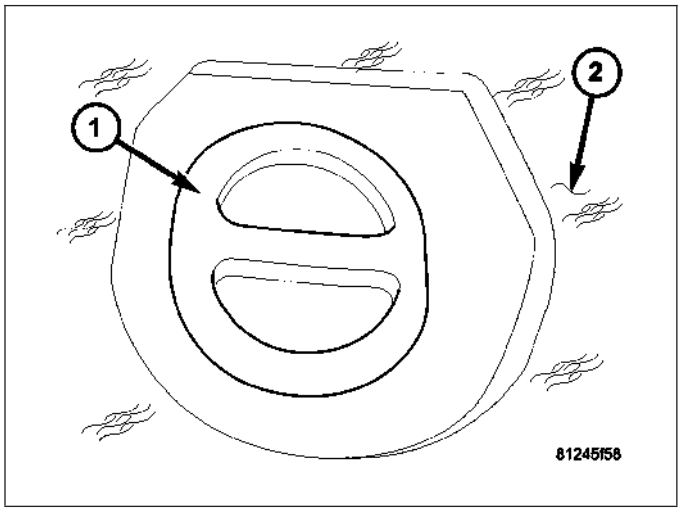
1. Position spare tire winch (2) on the vehicle.
2. Install and tighten 4 bolts (1) attaching the spare tire winch to body (3).
3. Install spare tire.



4. Tighten the spare tire up to the vehicle.
5. Remove the jack handle (2) and lug wrench (1).



6. Install the spare tire winch cover (1) and reseat the carpet access hole.



WHEELS

DESCRIPTION

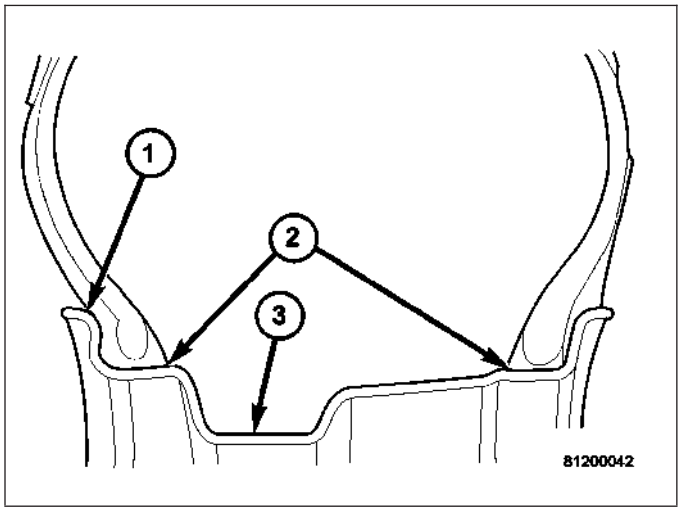
WHEEL DESIGN

The rim size is on the vehicle safety certification label located on the drivers door shut face. The size of the rim is determined by the drivetrain package. Original equipment wheels/rims are designed for operation up to the specified maximum vehicle capacity.

All models use stamped steel, cast aluminum or forged aluminum wheels. Every wheel has raised sections between the rim flanges (1) and rim drop well (3) called safety humps.

Initial inflation of the tire forces the bead over these raised sections. In case of rapid loss of air pressure, the raised sections help hold the tire on the wheel.

The wheel studs and nuts are designed for specific applications. All aluminum and some steel wheels have wheel stud nuts with an enlarged nose. This enlarged nose is necessary to ensure proper retention of the wheels. Do not use replacement studs or nuts with a different design or lesser quality.



DIAGNOSIS AND TESTING

WHEEL INSPECTION

Inspect wheels for:

- Excessive run out
- Dents or cracks
- Damaged wheel lug nut holes
- Air Leaks from any area or surface of the rim

Note: Do not attempt to repair a wheel by hammering, heating or welding.

If a wheel is damaged an original equipment replacement wheel should be used. When obtaining replacement wheels, they should be equivalent in load carrying capacity. The diameter, width, offset, pilot hole and bolt circle of the wheel should be the same as the original wheel.

WARNING: FAILURE TO USE EQUIVALENT REPLACEMENT WHEELS MAY ADVERSELY AFFECT THE SAFETY AND HANDLING OF THE VEHICLE. USED WHEELS ARE NOT RECOMMENDED. THE SERVICE HISTORY OF THE WHEEL MAY HAVE INCLUDED SEVERE TREATMENT OR VERY HIGH MILEAGE. THE RIM COULD FAIL WITHOUT WARNING.

STANDARD PROCEDURE

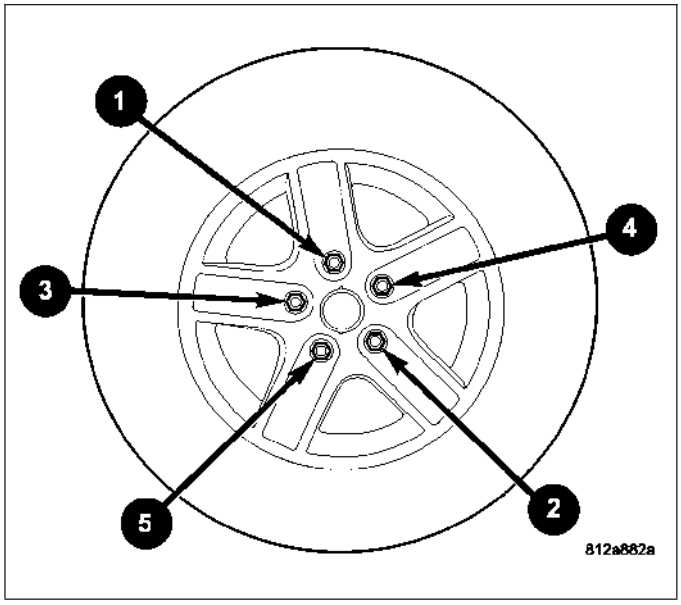
WHEEL INSTALLATION

The wheel studs and nuts are designed for specific applications. They must be replaced with equivalent parts. Do not use replacement parts of lesser quality or a substitute design. All aluminum and some steel wheels have wheel stud nuts which feature an enlarged nose. This enlarged nose is necessary to ensure proper retention of the aluminum wheels.

Note: Do not use chrome plated lug nuts with chrome plated wheels.

Before installing the wheel, be sure to remove any build up of corrosion on the wheel mounting surfaces. Ensure wheels are installed with good metal-to-metal contact. Improper installation could cause loosening of wheel nuts. This could affect the safety and handling of your vehicle.

To install the wheel, first position it properly on the mounting surface. All wheel nuts should then be tightened just snug. Gradually tighten them in sequence to the proper torque specification. **Never use oil or grease on studs or nuts.**



WHEEL REPLACEMENT

The wheel studs and nuts are designed for specific applications. They must be replaced with equivalent parts. Do not use replacement parts of lesser quality or a substitute design. All aluminum and some steel wheels have wheel stud nuts which feature an enlarged nose. This enlarged nose is necessary to ensure proper retention of the aluminum wheels.

Note: Do not use chrome plated lug nuts with chrome plated wheels.

Before installing the wheel, be sure to remove any build up of corrosion on the wheel mounting surfaces. Ensure wheels are installed with good metal-to-metal contact. Improper installation could cause loosening of wheel nuts. This could affect the safety and handling of your vehicle.

To install the wheel, first position it properly on the mounting surface. All wheel nuts should then be tightened just snug. Gradually tighten them in sequence to the proper torque specification. **Never use oil or grease on studs or nuts.**

Wheels must be replaced if they have:

- Excessive runout
- Bent or dented
- Leak air through welds
- Have damaged bolt holes

Wheel repairs employing hammering, heating, or welding are not allowed.

Original equipment wheels are available through your dealer. Replacement wheels from any other source should be equivalent in:

- Load carrying capacity
- Diameter
- Width
- Offset
- Mounting configuration

Failure to use equivalent replacement wheels may affect the safety and handling of your vehicle. Replacement with **used** wheels is not recommended. Their service history may have included severe treatment.

SPECIFICATIONS

CAUTION: DO NOT USE CHROME PLATED LUG NUTS WITH CHROME PLATED WHEELS.

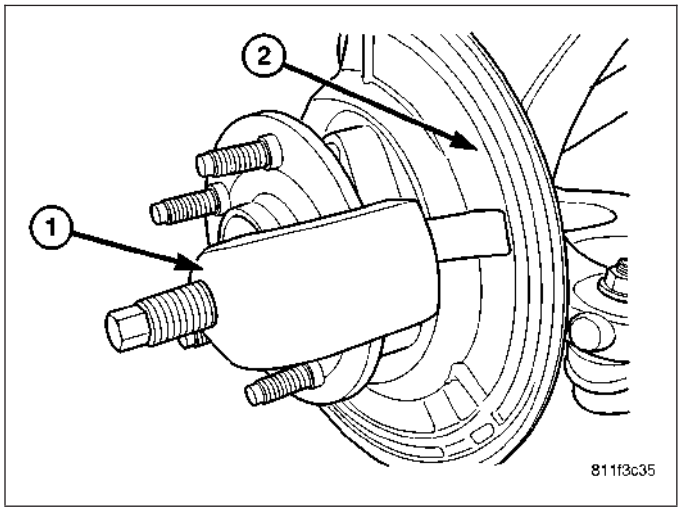
TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Wheel Lug Nut	183 ± 10	135 ± 10	—

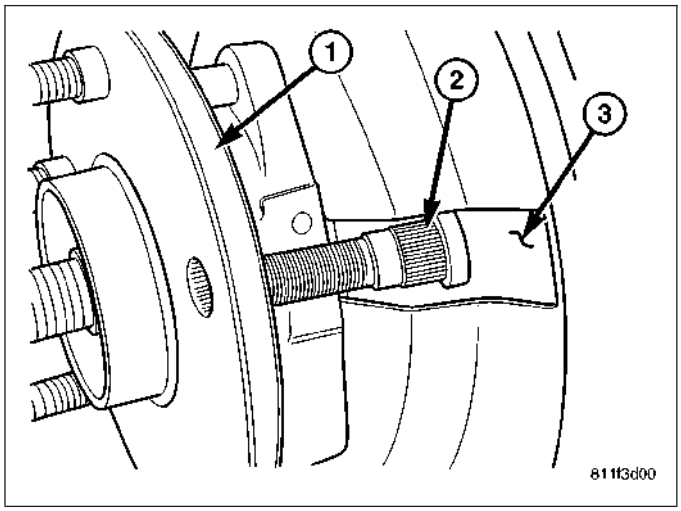
STUDS

REMOVAL

1. Raise and support the vehicle.
2. Remove the wheel and tire assembly.
3. Remove the brake caliper, caliper adapter and rotor, (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - REMOVAL).
4. Remove the wheel speed sensor from the hub.
5. Press the stud from the hub using special tool C-4150A (1).

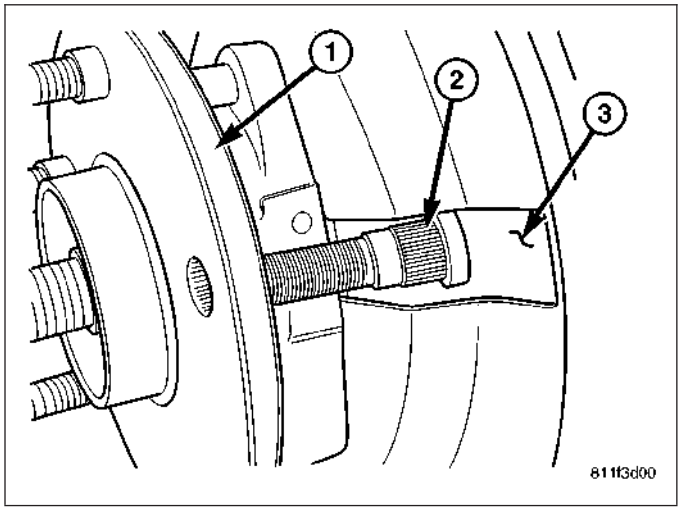


6. Remove the stud (2) from the hub (1) through the backing plate access hole (3).



INSTALLATION

1. Install the new stud (2) into the hub flange (1).
2. Install three proper sized washers onto the stud, then install lug nut with the flat side of the nut against the washers.
3. Tighten the lug nut until the stud is pulled into the hub flange. Verify that the stud is properly seated into the flange.
4. Remove the lug nut and washers.
5. Install the brake rotor, caliper adapter, and caliper, (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ ROTORS - INSTALLATION).



6. Install the wheel speed sensor.
7. Install the wheel and tire assembly, use new lug nut on the stud or studs that were replaced.
8. Remove the support and lower the vehicle.

BODY

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BODY

WARNING

SAFETY PRECAUTIONS AND WARNINGS

WARNING: Use an osha approved breathing filter when spraying paint or solvents in a confined area. Personal injury can result.

- **Avoid prolonged skin contact with petroleum or alcohol – based cleaning solvents. Personal injury can result.**
- **Do not stand under a hoisted vehicle that is not properly supported on safety stands. Personal injury can result.**

CAUTION: When holes must be drilled or punched in an inner body panel, verify depth of space to the outer body panel, electrical wiring, or other components. Damage to vehicle can result.

- **Do not weld exterior panels unless combustible material on the interior of vehicle is removed from the repair area. Fire or hazardous conditions, can result.**
- **Always have a fire extinguisher ready for use when welding.**
- **Disconnect the negative (-) cable clamp from the battery when servicing electrical components that are live when the ignition is OFF. Damage to electrical system can result.**
- **Do not use abrasive chemicals or compounds on painted surfaces. Damage to finish can result.**
- **Do not use harsh alkaline based cleaning solvents on painted or upholstered surfaces. Damage to finish or color can result.**
- **Do not hammer or pound on plastic trim panel when servicing interior trim. Plastic panels can break.**

DIAGNOSIS AND TESTING

WATER LEAKS

Water leaks can be caused by poor sealing, improper body component alignment, body seam porosity, missing plugs, or blocked drain holes. Centrifugal and gravitational force can cause water to drip from a location away from the actual leak point, making leak detection difficult. All body sealing points should be water tight in normal wet-driving conditions. Water flowing downward from the front of the vehicle should not enter the passenger or luggage

compartment. Moving sealing surfaces will not always seal water tight under all conditions. At times, side glass or door seals will allow water to enter the passenger compartment during high pressure washing or hard driving rain (severe) conditions. Overcompensating on door or glass adjustments to stop a water leak that occurs under severe conditions can cause premature seal wear and excessive closing or latching effort. After completing a repair, water test vehicle to verify leak has stopped before returning vehicle to use.

VISUAL INSPECTION BEFORE WATER LEAK TESTS

Verify that floor and body plugs are in place, body drains are clear, and body components are properly aligned and sealed. If component alignment or sealing is necessary, refer to the appropriate section of this group for proper procedures.

WATER LEAK TESTS

WARNING: Do not use electric shop lights or tools in water test area. Personal injury can result.

When the conditions causing a water leak have been determined, simulate the conditions as closely as possible.

- If a leak occurs with the vehicle parked in a steady light rain, flood the leak area with an open-ended garden hose.
- If a leak occurs while driving at highway speeds in a steady rain, test the leak area with a reasonable velocity stream or fan spray of water. Direct the spray in a direction comparable to actual conditions.
- If a leak occurs when the vehicle is parked on an incline, hoist the end or side of the vehicle to simulate this condition. This method can be used when the leak occurs when the vehicle accelerates, stops or turns. If the leak occurs on acceleration, hoist the front of the vehicle. If the leak occurs when braking, hoist the back of the vehicle. If the leak occurs on left turns, hoist the left side of the vehicle. If the leak occurs on right turns, hoist the right side of the vehicle. For hoisting recommendations (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).

WATER LEAK DETECTION

To detect a water leak point-of-entry, do a water test and watch for water tracks or droplets forming on the inside of the vehicle. If necessary, remove interior trim covers or panels to gain visual access to the leak area. If the hose cannot be positioned without being held, have someone help do the water test.

Some water leaks must be tested for a considerable length of time to become apparent. When a leak appears, find the highest point of the water track or drop. The highest point usually will show the point of entry. After leak point has been found, repair the leak and water test to verify that the leak has stopped.

Locating the entry point of water that is leaking into a cavity between panels can be difficult. The trapped water may splash or run from the cavity, often at a distance from the entry point. Most water leaks of this type become apparent after accelerating, stopping, turning, or when on an incline.

MIRROR INSPECTION METHOD

When a leak point area is visually obstructed, use a suitable mirror to gain visual access. A mirror can also be used to deflect light to a limited-access area to assist in locating a leak point.

BRIGHT LIGHT LEAK TEST METHOD

Some water leaks in the luggage compartment can be detected without water testing. Position the vehicle in a brightly lit area. From inside the darkened luggage compartment inspect around seals and body seams. If necessary, have a helper direct a drop light over the suspected leak areas around the luggage compartment. If light is visible through a normally sealed location, water could enter through the opening.

PRESSURIZED LEAK TEST METHOD

When a water leak into the passenger compartment cannot be detected by water testing, pressurize the passenger compartment and soap test exterior of the vehicle. To pressurize the passenger compartment, close all doors and windows, start engine, and set heater control to high blower in HEAT position. If engine can not be started, connect a charger to the battery to ensure adequate voltage to the blower. With interior pressurized, apply dish detergent solution to suspected leak area on the exterior of the vehicle. Apply detergent solution with spray device or soft bristle brush. If soap bubbles occur at a body seam, joint, seal or gasket, the leak entry point could be at that location.

WIND NOISE

Wind noise is the result of most air leaks. Air leaks can be caused by poor sealing, improper body component alignment, body seam porosity, or missing plugs in the engine compartment or door hinge pillar areas. All body sealing points should be airtight in normal driving conditions. Moving sealing surfaces will not always seal airtight under all conditions. At times, side glass or door seals will allow wind noise to be noticed in the passenger compartment during high cross winds. Over compensating on door or glass adjustments to stop wind noise that occurs under severe conditions can cause premature seal wear and excessive closing or latching effort. After a repair procedure has been performed, test vehicle to verify noise has stopped before returning vehicle to use.

VISUAL INSPECTION BEFORE TESTS

Verify that floor and body plugs are in place and body components are aligned and sealed. If component alignment or sealing is necessary, refer to the appropriate section of this group for proper procedures.

ROAD TESTING WIND NOISE

1. Drive the vehicle to verify the general location of the wind noise.
2. Apply 50 mm (2 in.) masking tape in 150 mm (6 in.) lengths along weatherstrips, weld seams or moldings. After each length is applied, drive the vehicle. If noise goes away after a piece of tape is applied, remove tape, locate, and repair defect.

POSSIBLE CAUSE OF WIND NOISE

- Moldings standing away from body surface can catch wind and whistle.
- Gaps in sealed areas behind overhanging body flanges can cause wind-rushing sounds.
- Misaligned movable components.
- Missing or improperly installed plugs in pillars.
- Weld burn through holes.

STANDARD PROCEDURE

BODY LUBRICATION

All mechanisms and linkages should be lubricated when necessary. This will maintain ease of operation and provide protection against rust and excessive wear. The weatherstrip seals should be lubricated to prolong their life as well as to improve door sealing.

All applicable exterior and interior vehicle operating mechanisms should be inspected and cleaned. Pivot/sliding contact areas on the mechanisms should then be lubricated.

1. When necessary, lubricate the operating mechanisms with the specified lubricants.
2. Apply silicone lubricant to a cloth and wipe it on door seals to avoid over-spray that can soil passenger's clothing.
3. Before applying lubricant, the component should be wiped clean. After lubrication, any excess lubricant should be removed.
4. The hood latch, latch release mechanism, latch striker, and safety latch should be lubricated periodically.
5. The door lock cylinders should be lubricated twice each year (preferably autumn and spring).
   - Spray a small amount of lock cylinder lubricant directly into the lock cylinder.
   - Apply a small amount to the key and insert it into the lock cylinder.
   - Rotate it to the locked position and then back to the unlocked position several times.
   - Remove the key. Wipe the lubricant from it with a clean cloth to avoid soiling of clothing.

HEAT STAKING

1. Remove trim panel.
2. Bend or move the trim panel components at the heat staked joints. Observe the heat staked locations and/or component seams for looseness.
3. Heat stake the components.

a. If the heat staked or component seam location is loose, hold the two components tightly together and using a soldering gun with a flat tip, melt the material securing the components together. Do not over heat the affected area, damage to the exterior of the trim panel may occur.

b. If the heat staked material is broken or missing, use a hot glue gun to apply new material to the area to be repaired. The panels that are being heat staked must be held together while the applying the glue. Once the new material is in place, it may be necessary to use a soldering gun to melt the newly applied material. Do not over heat the affected area, damage to the exterior of the trim panel may occur.

4. Allow the repaired area to cool and verify the repair.
5. Install trim panel.

PLASTIC BODY PANEL REPAIR

There are many different types of plastics used in today's automotive environment. We group plastics in three different categories: Rigid, Semi-Rigid, and Flexible. Any of these plastics may require the use of an adhesion promoter for repair. These types of plastic are used extensively on DaimlerChrysler Motors vehicles. Always follow repair material manufacturer's plastic identification and repair procedures.

Rigid Plastics:

Examples of rigid plastic use: Fascias, Hoods, Doors, and other Body Panels, which include SMC, ABS, and Polycarbonates.

Semi-Rigid Plastics:

Examples of semi-rigid plastic use: Interior Panels, Under Hood Panels, and other Body Trim Panels.

Flexible Plastics:

Examples of flexible plastic use: Fascias, Body Moldings, and upper and lower Fascia Covers.

Repair Procedure:

The repair procedure for all three categories of plastics is basically the same. The one difference is the material used for the repair. The materials must be specific for each substrate, rigid repair material for rigid plastic repair, semi-rigid repair material for semi-rigid plastic repair and flexible repair material for flexible plastic repair.

Adhesion Promoter/Surface Modifier:

Adhesion Promoters/Surface Modifiers are required for certain plastics. All three categories may have plastics that require the use of adhesion promoter/surface modifiers. Always follow repair material manufacturer's plastic identification and repair procedures.

SAFETY PRECAUTION AND WARNINGS

WARNING:

- **Eye protection should be used when servicing components. Personal injury can result.**
- **Use an OSHA approved breathing mask when mixing epoxy, grinding, and spraying paint or solvents in a confined area. Personal injury can result.**
- **Avoid prolonged skin contact with resin, petroleum, or alcohol based solvents. Personal injury can result.**
- **Do not venture under a hoisted vehicle that is not properly supported on safety stands. Personal injury can result.**

NOTE:

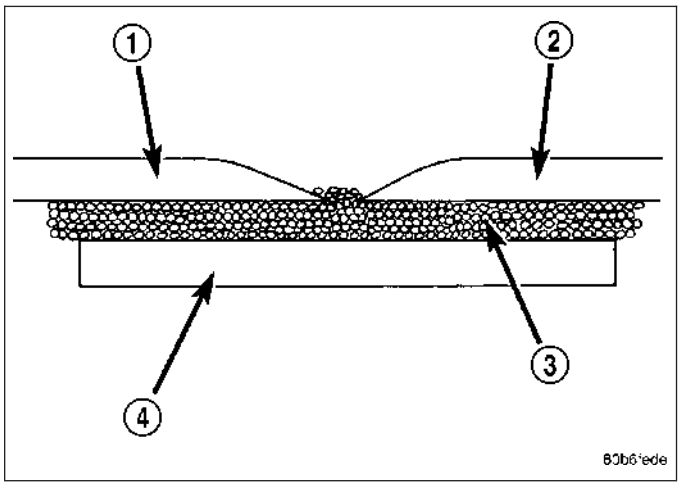
- **When holes must be drilled or cut in body panels, verify locations of internal body components and electrical wiring. Damage to vehicle can result.**
- **Do not use abrasive chemicals or compounds on undamaged painted surfaces around repair areas. Damage to finish can result.**

RIGID, SEMI-RIGID, AND FLEXIBLE PLASTIC PARTS TYPES

CODE	FAMILY NAME	COMMON TRADE NAME	TYPICAL APPLICATION
ASA	ACRYLONITRILE STYRENE ACRYLITE	LURAN S	CONSOLES, GRILLES
ABS	ACRYLONITRILE BUTADIENE STYRENE	TERLURAN	″A″ PILLARS, CONSOLES, GRILLES
ABS/PC	ABS/PC ALLOY	PULSE, PROLOY, BAYBLEND	DOORS, INSTRUMENT PANELS
ABS/PVC	ABS/PV ALLOY	PROLOY, PULSE, LUSTRAN, CYCLOVIN	DOOR PANELS, GRILLES, TRIM
BMC	BULK MOLDING COMPOUND	BMC	FENDER EXTENSIONS
EMA	EHTYLENE METHYL ACRYLATE/IONOMER	SURLYN, EMA, IONOMER	BUMPER GUARDS, PADS
METTON	METTON	METTON	GRILLES, KICK PANELS, RUNNING BOARDS
MPPO	MODIFIED POLYPHENYLENE OXIDE	MPPO	SPOILER ASSEMBLY
PA	POLYAMID	ZYTEL, VYDYNE, PA, MINLON	FENDERS, QUARTER PANELS
PET	THERMOPLASTIC POLYESTER	RYNITE	TRIM
PBT/PPO	PBT/PPO ALLOY	GERMAX	CLADDINGS
PBTP	POLYBUTYLENE THEREPTHALATE	PBT, PBTP, POCAN, VALOX	WHEEL COVERS, FENDERS, GRILLES
PBTP/EEBC	POLYBUTYLENE THEREPTHALATE/EEBC ALLOY	BEXLOY, ″M″, PBTP/EEBC	FASCIAS, ROCKER PANEL, MOLDINGS
PC	POLYCARBONATE	LEXAN, MERLON, CALIBRE, MAKROLON PC	TAIL LIGHT LENSES, IP TRIM, VALANCE PANELS
PC/ABS	PC/ABS ALLOY	GERMAX, BAY BLENDS, PULSE	DOORS, INSTRUMENT PANELS
PPO	POLYPHENYLENE OXIDE	AZDEL, HOSTALEN, MARLEX, PRFAX, NORYL, GTX, PPO	INTERIOR TRIM, DOOR PANELS, SPLASH SHIELDS, STEERING COLUMN SHROUD
PPO/PA	POLYPHENYLENE/ POLYAMID	PPO/PA, GTX 910	FENDERS, QUARTER PANELS
PR/FV	FIBERGLASS REINFORCED PLASTIC	FIBERGLASS, FV, PR/FV	BODY PANELS
PS	POLYSTYRENE	LUSTREX, STYRON, PS	DOOR PANELS, DASH PANELS
RTM	RESIN TRANSFER MOLDING COMPOUND	RTM	BODY PANELS
SMC	SHEET MOLDED COMPOUND	SMC	BODY PANELS
TMC	TRANSFER MOLDING COMPOUND	TMC	GRILLES

CODE	FAMILY NAME	COMMON TRADE NAME	TYPICAL APPLICATION
UP	UNSATURATED POLYESTER (THERMOSETTING)	SMC, BMC, TMC, ZMC, IMC, XSMC, UP	GRILLE OPENING PANEL, LIFTGATES, FLARESIDE FENDERS, FENDER EXTENSIONS
EEBC	ETHER/ESTER BLOCKED CO-POLYMER	EEBC	BUMPERS
EEBC/PBTP	EEBC/POLYBUTYLENE TEREPTHALATE	EEBC, PBTP, BEXLOY	BUMPER, ROCKER PANELS
EMPP	ETHYLENE MODIFIED POLYPROPYLENE	EMPP	BUMPER COVERS
EPDM	ETHYLENE/ PROPROPYLENE DIENE MONOMER	EPDM, NORDEL, VISTALON	BUMPERS
EPM	ETHYLENE/ PROPROPYLENE CO-POLYMER	EPM	FENDERS
MPU	FOAM POLYURETHANE	MPU	SPOILERS
PE	POLYETHYLENE	ALATHON, DYLAN, LUPOLEN, MARLEX	-
PP	POLYPROPYLENE (BLENDS)	NORYL, AZDEL, MARLOX, DYLON, PRAVEX	INNER FENDER, SPOILERS, KICK PANELS
PP/EPDM	PP/EPDM ALLOY	PP/EPDM	SPOILERS, GRILLES
PUR	POLYURETHANE	COLONELS, PUR, PU	FASCIAS, BUMPERS
PUR/PC	PUR/PC ALLOY	TEXIN	BUMPERS
PVC	POLYVINYL CHLORIDE	APEX, GEON, VINYLITE	BODY MOLDINGS, WIRE INSULATION, STEERING WHEELS
RIM	REACTION INJECTED MOLDED POLYURETHANE	RIM, BAYFLEX	FRONT FASCIAS, MODULAR WINDOWS
RRIM	REINFORCED REACTION INJECTED MOLDED	PUR, RRIM	FASCIAS, BODY PANELS, BODY TRIMS
TPE	THERMO POLYETHYLENE	TPE, HYTREL, BEXLOY-V	FASCIAS, BUMPERS, CLADDINGS
TPO	THERMOPOLYOLEFIN	POLYTROPE, RENFLEX, SANTOPRENE, VISAFLEX, ETA, APEX, TPO, SHIELDS, CLADDINGS	BUMPERS, END CAPS, TELCAR, RUBBER, STRIPS, SIGHT, INTERIOR B POST
TPP	THERMO-POLYPROPYLENE	TPP	BUMPERS
TPU	THERMOPOLYURETHANE, POLYESTER	TPU, HYTREL, TEXIN, ESTANE	BUMPERS, BODY SIDE, MOLDINGS, FENDERS, FASCIAS

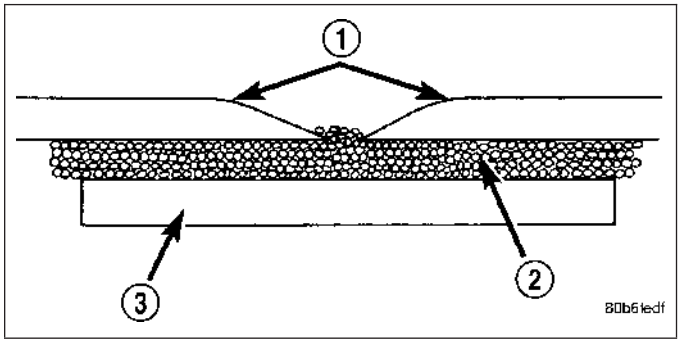
PANEL SECTIONING



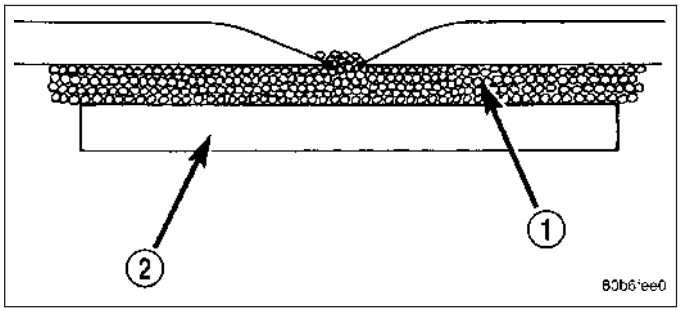
If it is required to section a large panel for a plastic repair, it will be necessary to reinforce the panel. To bond two plastic panels together, a reinforcement must overlap both panels. The panels must be “V’d” at a 20 degree angle. The area to be reinforced should be washed, then sanded. Be sure to wipe off any excess soap and water when finished. Lightly sand or abrade the plastic with an abrasive pad or sandpaper. Blow off any dust with compressed air or wipe with a clean dry rag.

When bonding plastic panels, Follow repair material manufacturers recommendations. Be sure that enough adhesive has been applied to allow squeeze out and to fill the full bond line. Once the pieces have been brought together, do not move them until the adhesive is cured. The assembly can be held together with clamps, rivets, etc. A faster cure can be obtained by heating with a heat lamp or heat gun. After the parts have been bonded and have had time to cure, rough sand the seam and apply the final adhesive filler to the area being repaired. Smooth the filler with a spreader, wooden tongue depressor, or squeegee. For fine texturing, a small amount of water can be applied to the filler surface while smoothing. The cured filler can be sanded as necessary and, as a final step, cleanup can be done with soapy water. Wipe the surface clean with a dry cloth allowing time for the panel to dry before moving on with the repair.

PANEL REINFORCEMENT

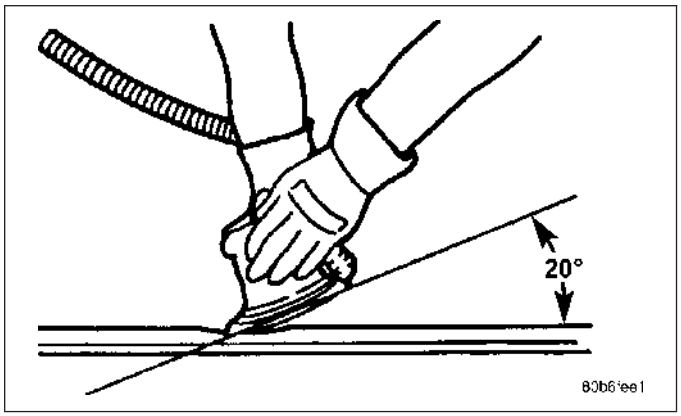


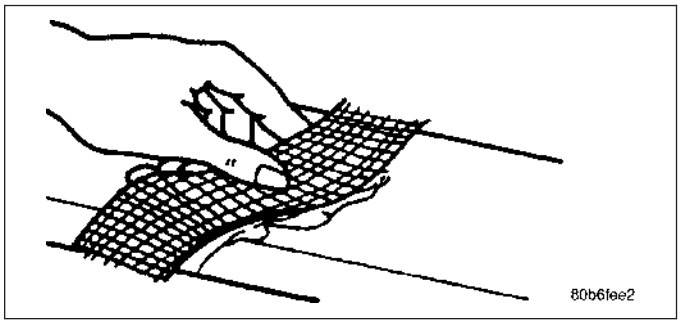
Structural repair procedures for rigid panels with large cracks and holes will require a reinforcement backing. Reinforcements can be made with several applications of glass cloth saturated with structural adhesive. Semi-rigid or flexible repair materials should be used for semi-rigid or flexible backing reinforcement and. Open meshed fiberglass dry wall tape can be used to form a reinforcement. The dry wall tape allows the resin to penetrate through and make a good bond between the panel and the adhesive. Structurally, the more dry wall tape used, the stronger the repair.



Another kind of repair that can be done to repair large cracks and holes is to use a scrap piece of similar plastic and bond with structural adhesive. The reinforcement should cover the entire break and should have a generous amount of overlap on either side of the cracked or broken area.

When repairing plastic, the damaged area is first “V’d” out, or beveled. Large bonding areas are desirable when repairing plastic because small repairs are less likely to hold permanently. Beveling the area around a crack at a 20 degree angle will increase the bonding surface for a repair. It is recommended that sharp edges be avoided because the joint may show through after the panel is refinished.



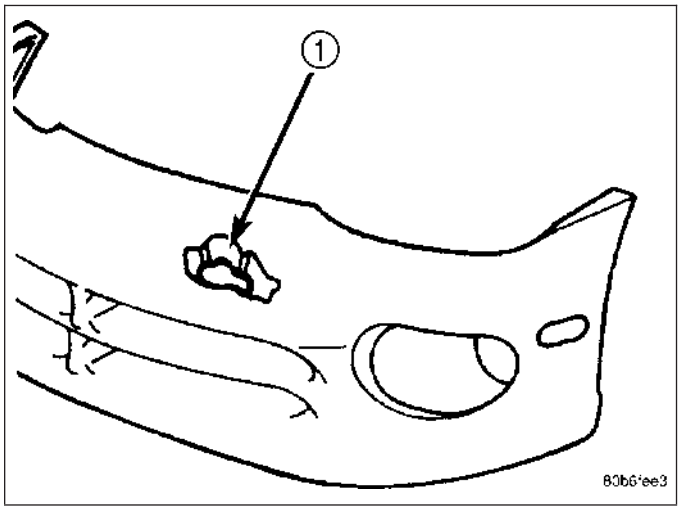


- Panel repair for both flexible and rigid panels are basically the same. The primary difference between flexible panel repair and rigid panel repair is in the adhesive materials used.
- The technician should first decide what needs to be done when working on any type of body panel. One should determine if it is possible to return the damage part to its original strength and appearance without exceeding the value of the replacement part.
- When plastic repairs are required, it is recommended that the part be left on the vehicle when every possible. That will save time, and the panel will remain stationary during the repair. Misalignment can cause stress in the repair areas and can result in future failure.

VISUAL INSPECTION

Composite materials can mask the severity of an accident. Adhesive bond lines, interior structure of the doors, and steel structures need to be inspected carefully to get a true damage assessment. Close inspection may require partial removal of interior trim or inner panels.

Identify the type of repair: Puncture or Crack - Damage that has penetrated completely through the panel. Damage is confined to one general area; a panel section is not required. However, a backer panel, open fiberglass tape, or matted material must be bonded from behind.

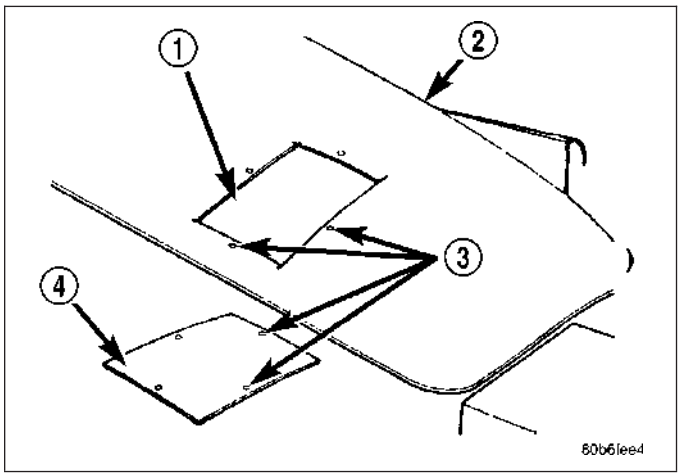


PANEL SURFACE PREPARATION

If a body panel has been punctured, cracked, or crushed, the damaged area must be removed from the panel to achieve a successful repair. All spider web cracks leading away from a damaged area must be stopped or removed. To stop a running crack in a panel, drill a 6 mm (0.250 in.) hole at the end of the crack farthest away from the damage. If spider web cracks can not be stopped, the panel would require replacement. The surfaces around the damaged area should be stripped of paint and freed from wax and oil. Scuff surfaces around repair area with 360 grit wet/dry sandpaper, or equivalent, to assure adhesion of repair materials.

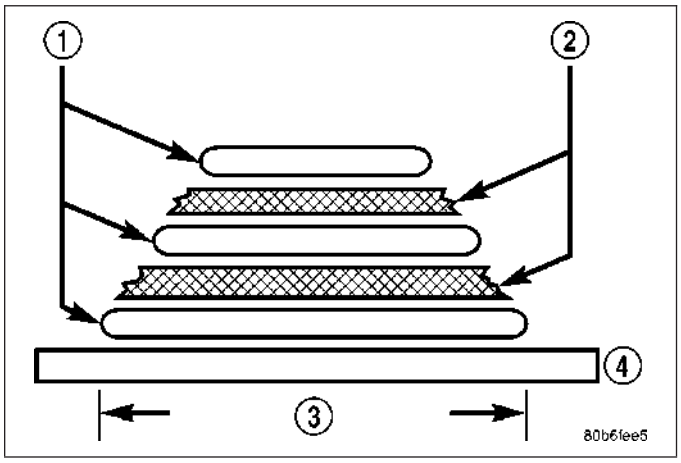
PATCHING PANELS

An panel that has extensive puncture type damage can be repaired by cutting out the damaged material. Use a suitable reciprocating saw or cut off wheel to remove the section of the panel that is damaged. The piece cut out can be used as a template to shape the new patch. It is not necessary to have access to the back of the panel to install a patch. Bevel edges of cutout at 20 degrees to expose a larger bonding area on the outer side. This will allow for an increased reinforcement areas.



PANEL PATCH FABRICATIONS

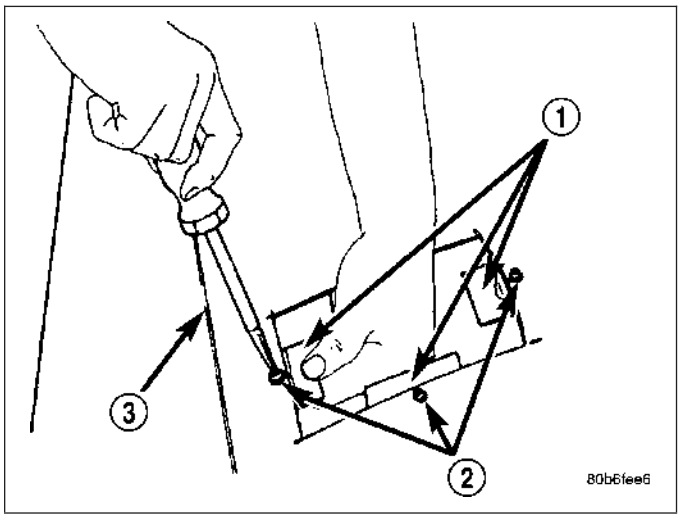
A patch can be fabricated from any rigid fiberglass panel that has comparable contour with the repair area. Lift gates and fenders can be used to supply patch material. If existing material is not available or compatible, a patch can be constructed with adhesive and reinforcement mesh (dry wall tape). Perform the following operation if required:



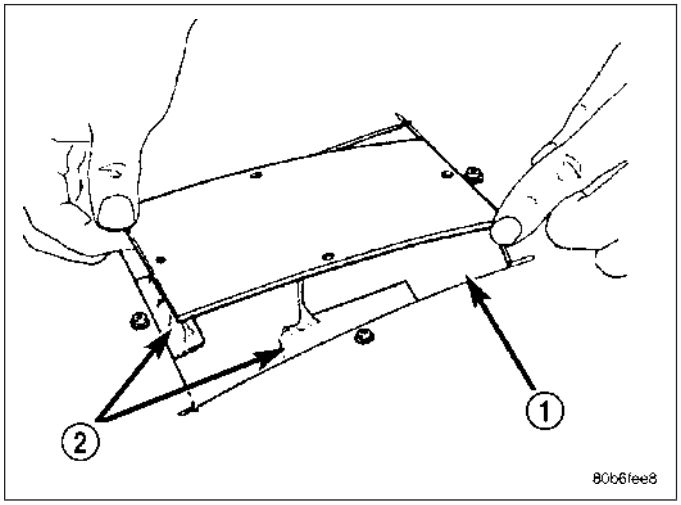
1. Cover waxed paper or plastic with adhesive backed nylon mesh (dry wall tape) larger than the patch required.
2. Tape waxed paper or plastic sheet with mesh to a surface that has a compatible contour to the repair area.
3. Apply a liberal coat of adhesive over the reinforcement mesh. If necessary apply a second or third coat of adhesive and mesh after first coat has cured. The thickness of the patch should be the same as the repair area.
4. After patch has cured, peel waxed paper or plastic from the back of the patch.
5. If desired, a thin film coat of adhesive can be applied to the back of the patch to cover mesh for added strength.

PANEL PATCH INSTALLATION

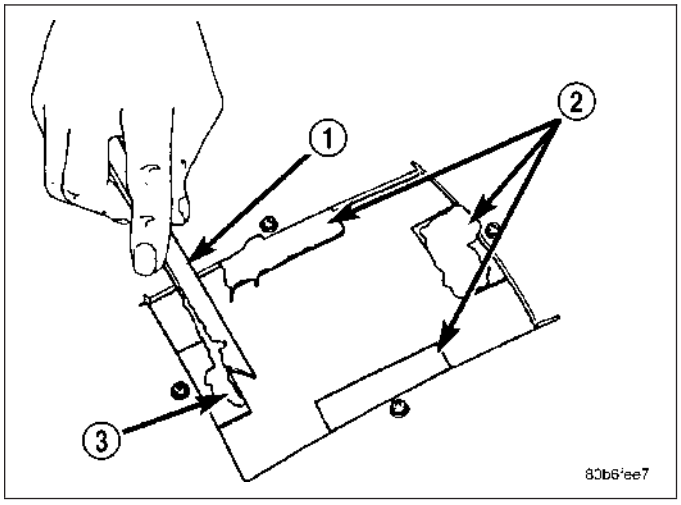
1. Make a paper or cardboard pattern the size and shape of the cutout hole in the panel.
2. Trim 3 mm (0.125 in.) from edges of pattern so patch will have a gap between connecting surfaces.
3. Using the pattern as a guide, cut the patch to size.
4. Cut scrap pieces of patch material into 50 mm (2 in.) squares to use as patch supports to sustain the patch in the cutout.
5. Drill 4 mm (0.160 in.) holes 13 mm (0.5 in.) in from edge of cutout hole.
6. Drill 4 mm (0.160 in.) holes 13 mm (0.5 in.) away from edge of patch across from holes drilled around cutout.
7. Drill 3 mm (0.125 in.) holes in the support squares 13 mm (0.5 in.) from the edge in the center of one side.



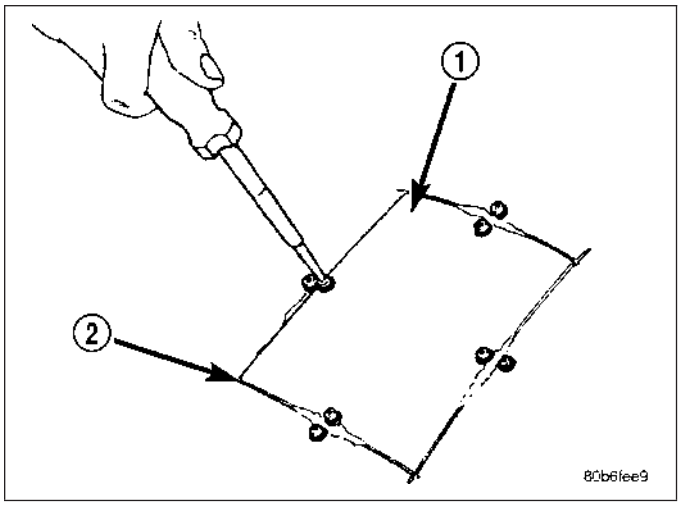
8. Scuff the backside of the body panel around the cutout hole with a scuff pad or sandpaper.
9. Mix enough adhesive to cover one side of all support squares.
10. Apply adhesive to cover one side of all support squares.
11. Using number 8 sheet metal screws, secure support squares to back side of body panel with adhesive sandwiched between the panel and squares.
12. Position patch in cutout against support squares and adjust patch until the gap is equal along all sides.
13. Drill 3 mm (0.125 in.) holes in the support squares through the pre-drilled holes in the patch.



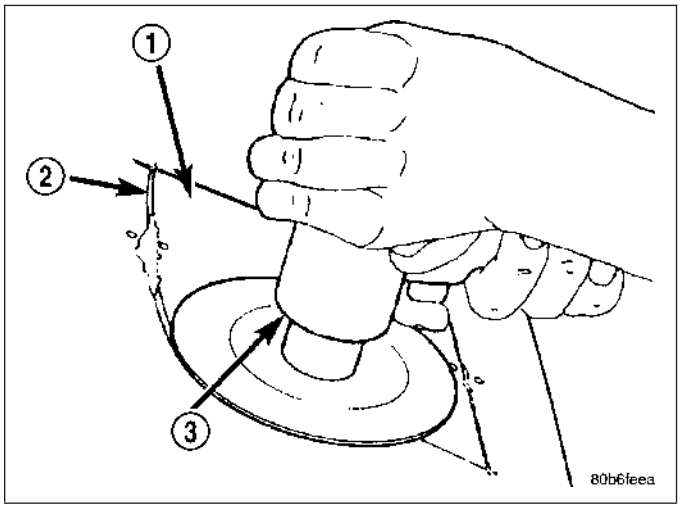
14. Apply a coat of adhesive to the exposed ends of the support squares.



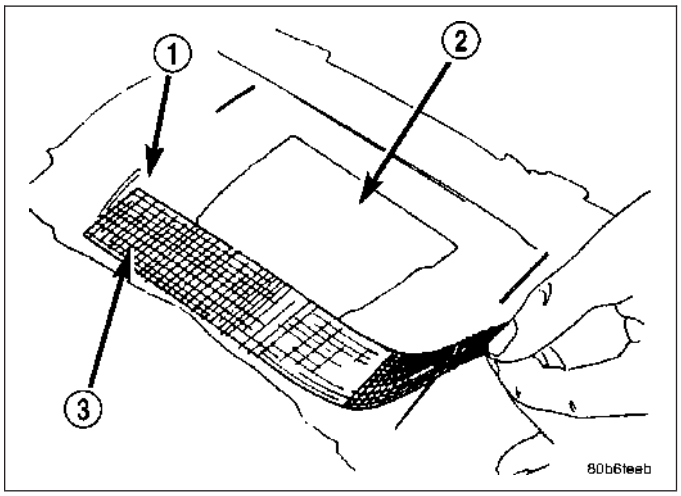
15. Install screws to hold the patch to support squares. Tighten screws until patch surface is flush with panel surface.
16. Allow adhesive to cure, and remove all screws.



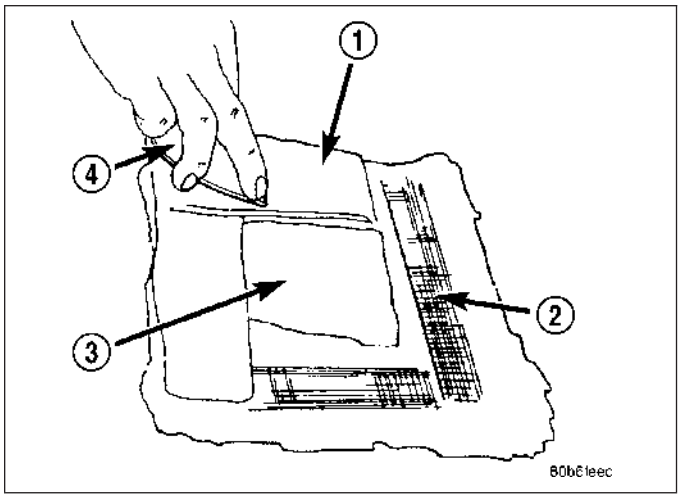
17. Using a 125 mm (5 in.) 24 grit disc grinder, grind a 50 mm (2 in.) to 75 mm (3 in.) wide and 2 mm (0.080 in.) deep path across the gaps around the patch. With compressed air, blow dust from around patch.



18. Apply adhesive backed nylon mesh (dry wall tape) over gaps around patch.
19. Mix enough adhesive to cover the entire patch area.



20. Apply adhesive over the mesh around patch, and smooth epoxy with a wide spreader to reduce finish grinding. Use two to three layers of mesh and adhesive to create a stronger repair.



PATCHED PANEL SURFACING

After patch panel is installed, the patch area can be finished using the same methods as finishing other types of body panels. If mesh material is exposed in the patched area, grind surface down, and apply a coat of high quality rigid plastic body filler. Prime, block sand, and paint as required.

BUZZ, SQUEAK & RATTLE

Buzz, Squeak & Rattles (BSR) may be caused by any one or more of the following and may be corrected as indicated:

- Loose fasteners should be tightened to specifications.
- Damaged or missing clips should be replaced.
- Damaged trim panels should be replaced.
- Incorrectly installed trim panels should be reinstalled properly.

Many BSR complaints such as loose trim, can be serviced using the Mopar® Parts BSR Noise Reduction Kit. This kit contains various tapes including foam, flock and anti-squeak used to eliminate noises caused by metal, plastic and vinyl components. Long life lubricants and greases can also be used on a variety of components. Refer to the Buzz, Squeak & Rattle Kit table for material contents and usage.

Buzz, Squeak & Rattle Kit

ITEM	FEATURES	APPLICATIONS	SERVICE TEMP
Itch And Squeak Tape	An abrasion resistant material thin enough to conform to most irregular surfaces. Stops most itches and squeaks.	Between metal and metal, metal and plastic, metal and vinyl, vinyl and plastic. Interior. Examples: Trim panels and bezels.	-40° to 225° Fahrenheit (-40° to 107° Celsius)
Black Nylon Flock	Nylon Flock with an aggressive acrylic adhesive. Provides for cushioning and compression fit, also isolates components. Water-resistant.	Between metal and metal, metal and plastic, vinyl and plastic. Examples: Pull cups, bezels, clips, ducts, top cover to glass, cowl panel.	-40° to 180° Fahrenheit (-40° to 82° Celsius)
High Density Urethane Foam	Tear resistant, highly resilient and durable.	Between metal and metal, metal and plastic. Water-resistant. Examples: I/P, heavy metal rattles, isolating brackets.	-40° to 180° Fahrenheit (-40° to 82° Celsius)

ITEM	FEATURES	APPLICATIONS	SERVICE TEMP
Open Cell Foam Tape	Soft foam conforms to irregular surfaces.	Wire harness and connector wrap. Examples: Seals, gasket, wiring, heat ducts.	-40° to 180° Fahrenheit (-40° to 82° Celsius)
Closed Cell Low Density Foam Tape	Soft, conformable. Water-resistant.	Wherever bulk is needed. Prevents closing flutters and rattles when applied to door watershield. Examples: Door, I/P.	-40° to 180° Fahrenheit (-40° to 82° Celsius)
NYE® Grease 880	Long life.	Suspensions. Examples: Strut busings, sway bars.	-40° to 390° Fahrenheit (-40° to 200° Celsius)
Krytox® Oil	Long life. Will not dry out or harm plastics or rubber.	When access is not possible, oil will migrate to condition. Vinyl, rubber, plastic, metal. Examples: Convertible top bushings, pull cups trim panel inserts.	-30° to 400° Fahrenheit (-34° to 205° Celsius)
Krytox® Grease	Long life. Will not dry out or harm plastics or rubber.	Vinyl, rubber, plastic, metal, glass. Examples: Weather-strips, backlite and windshield moldings.	-30° to 400° Fahrenheit (-34° to 205° Celsius)

SPECIFICATIONS - TORQUE

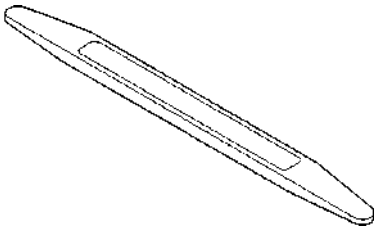
TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
2nd row seat assembly - front bolts	27	20	—
2nd row seat assembly - rear bolts	47	35	—
3rd row seat assembly bolts - front bolts	34	25	—
3rd row seat assembly bolts - rear bolts	47	35	—
Air cleaner to fender mounting bolts	10	—	85
A-pillar trim grab handle bolts	6	—	55
Body isolator bolts	81	60	—
B-pillar grab handle bolts	6	—	55
Fender bolts	8	—	75
Front door exterior handle nuts	5	—	45
Front door glass run fasteners	8	—	70
Front door glass to regulator nuts	9	—	80
Front door hinge fasteners	28	21	—
Front door latch adjustment screw	3	—	30
Front door latch screws	10	—	85
Front door latch striker bolts	28	21	—
Front door regulator bolts	9	—	80
Front end sheet metal mounting bolts	81	60	—

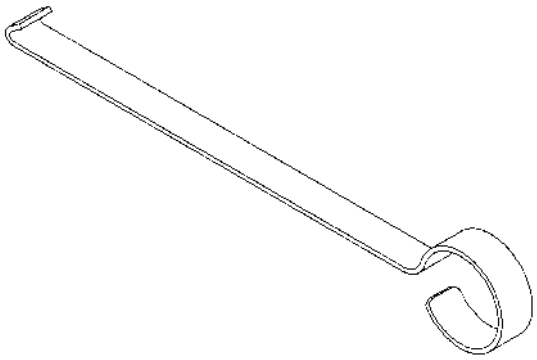
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Front seat back bolts	40	30	—
Front seat belt anchor bolt	39	29	—
Front seat belt buckle bolt	43	32	—
Front seat cushion pan bolts	10	—	90
Front seat manual length adjust to side member bolts/nuts	42	31	—
Front seat power length adjuster to height adjuster bolts/nuts	21	15	—
Front seat strain gauge to riser bolts	40	30	—
Front seat strain gauge to seat adjuster bolts	45	33	—
Front seat to floor - rear bolts	47	35	—
Front seat to floor - front bolts	27	20	—
Front shoulder belt anchor bolt	39	29	—
Grille bolts - upper	13	10	—
Ground wire to a-pillar bolts	14	10	—
Hood hinge to body bolts	20	15	—
Hood hinge to hood nuts	23	17	—
Hood latch bolts	11	8	—
Instrument panel center support bolts	11	—	95
Instrument panel fenceline bolts	8	—	70
Instrument panel side support bolts	27	20	—
Instrument panel to pedal support bracket bolts	14	10	—
Liftgate hinge fasteners	28	21	—
Liftgate latch screws	11	—	95
Liftgate latch striker bolts	28	21	—
Power distribution center to fender bolts	11	—	100
Radio amplifier bolts	6	—	50
Rear cargo tie down anchor bolt	12	9	—
Rear door exterior handle nuts	5	—	45
Rear door glass run fasteners	9	—	80
Rear door glass to regulator nuts	9	—	80
Rear door hinge fasteners	28	21	—
Rear door latch screws	10	—	85
Rear door latch striker bolts	28	21	—
Rear view mirrow set screw	1	—	9
Seat belt lower anchor bolt - third row	39	29	—
Seat belt turning loop screw - second row	39	29	—
Side view mirror nuts	7	—	60
Steering column coupler bolt	38	28	—
Steering column mounting nuts	28	21	—
Storage bin screws - rear	7	—	60
Sunroof glass panel attaching screws	3.5	—	31
Sunroof module assembly screws	6	—	53
Sunroof motor screws	4	—	40

SPECIAL TOOLS

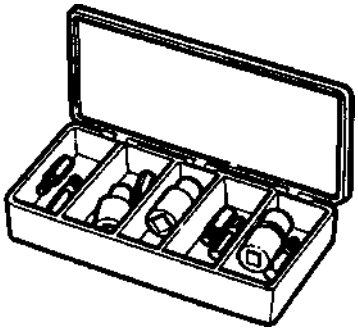
BODY



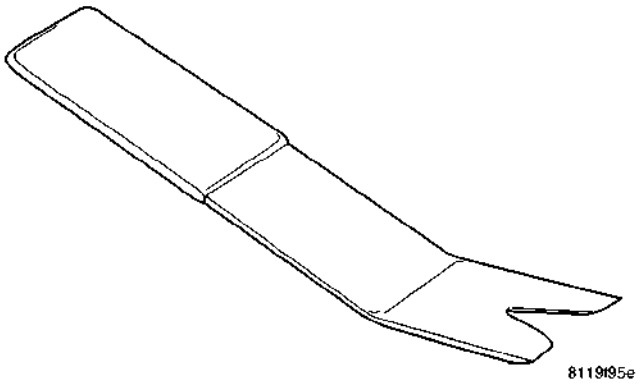
Trim Stick C-4755



Outer Belt Molding Remover - 9093



TORX BIT SET C-4794-B



REMOVER, MOLDINGS C-4829-A

HOOD

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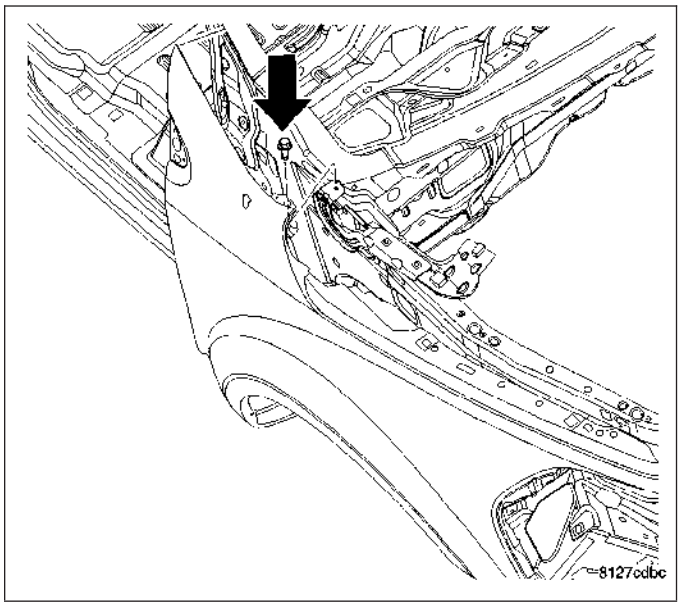
HINGE

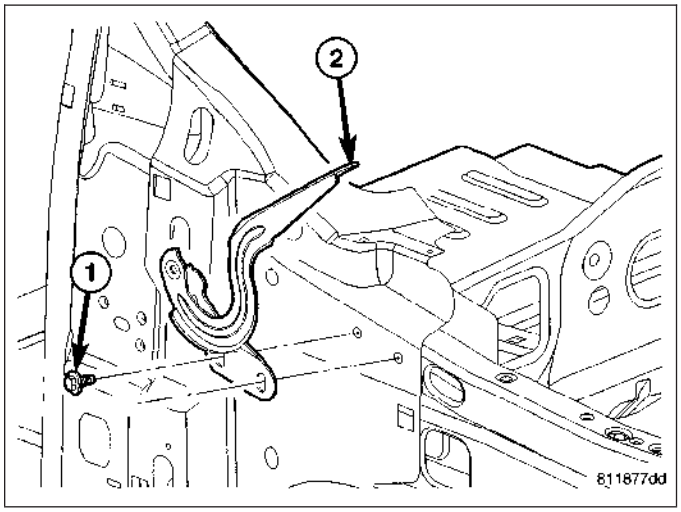
REMOVAL

NOTE: It is not necessary to remove the hood to replace one or both hinges. The hinges can be replaced one at a time.

1. Open hood and support the side that requires hinge replacement.
2. Remove the cowl grille. (Refer to 23 - BODY/EXTERIOR/COWL GRILLE AND SCREEN - REMOVAL)
3. Mark all bolt and hinge attachment locations using a grease pencil or equivalent, to provide reference marks for installation.
4. Remove the fender support bolt.

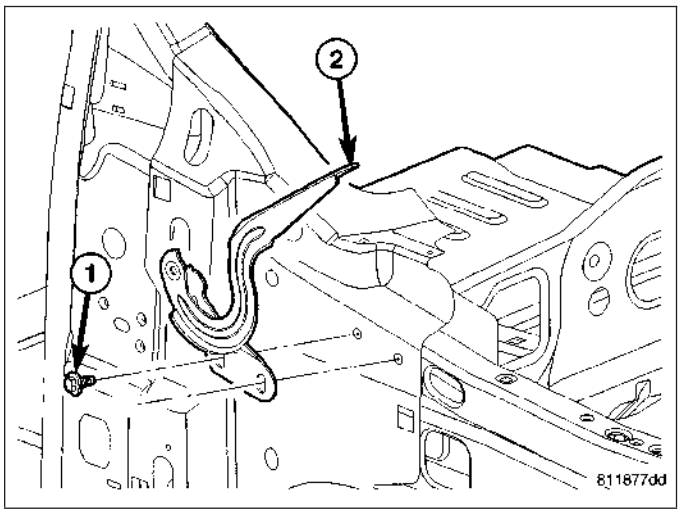


5. Remove the plastic rivets and remove the wheelhouse splash shield. (Refer to 23 - BODY/EXTERIOR/FRONT WHEELHOUSE SPLASH SHIELD - DESCRIPTION)
6. Remove the nuts attaching the hinge to the hood.
7. From inside the fender, remove the two hinge bolts (1).
8. Slide the hinge (2) forward and remove from the fender rail.

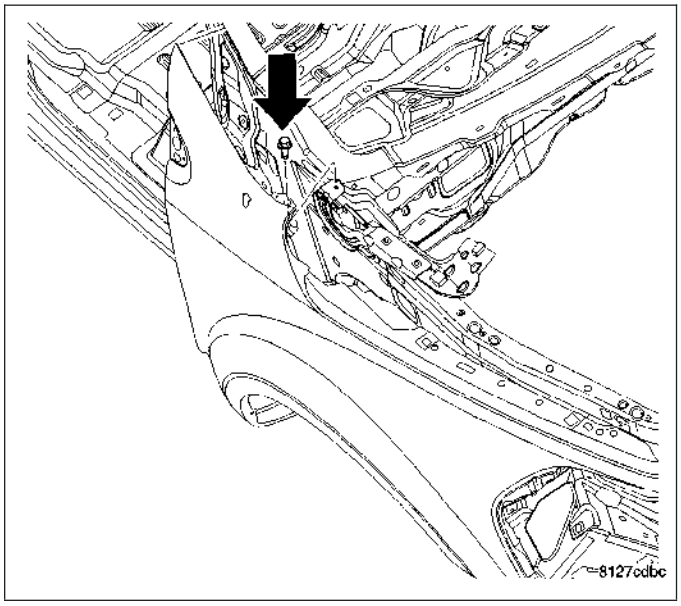


INSTALLATION

1. Install the hinge (2), slide back into position on the fender rail and align all marks.
2. From inside the fender, install the two hinge bolts (1).
3. Tighten the rear bolt to 20 N·m (15 ft. lbs.)
4. Tighten the front bolt to 20 N·m (15 ft. lbs.)



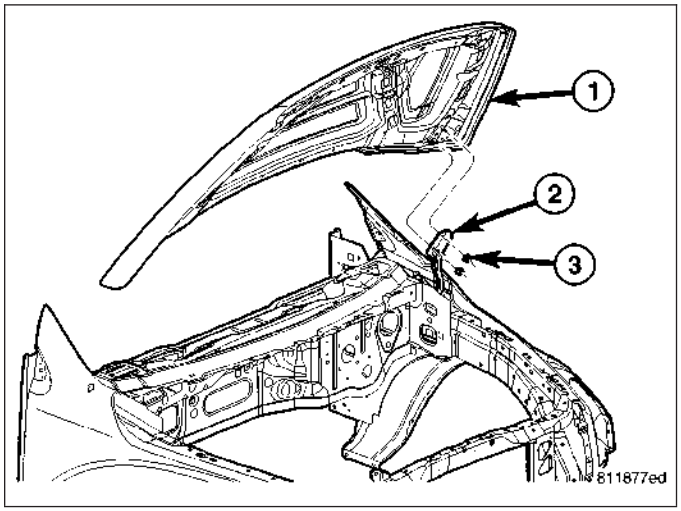
5. Install the nuts attaching the hinge to the hood and tighten the nuts to 23 N·m (17 ft. lbs.)
6. Install the fender support bolt and tighten to 8 N·m (75 in. lbs.).
7. Install the cowl grille. (Refer to 23 - BODY/EXTERIOR/COWL GRILLE AND SCREEN - INSTALLATION)
8. Install the wheelhouse splash shield and install the rivets. (Refer to 23 - BODY/EXTERIOR/FRONT WHEELHOUSE SPLASH SHIELD - DESCRIPTION)
9. Check hood fit and adjust if required. (Refer to 23 - BODY/BODY STRUCTURE/GAP AND FLUSH - SPECIFICATIONS)



HOOD

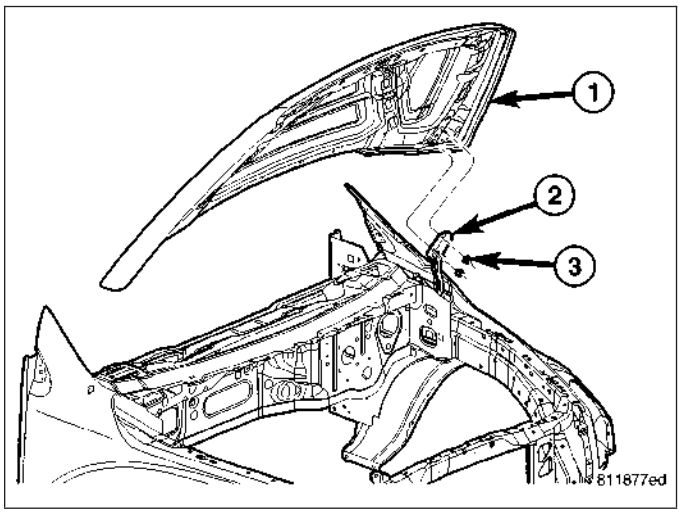
REMOVAL

1. Open hood and disconnect the washer hoses.
2. Mark all nut and hinge attachment locations using a grease pencil or equivalent, to provide reference marks for installation.
3. Remove the top nuts (3) attaching hood to hinge and loosen the bottom nuts (3) until they can be removed by hand.
4. Remove the bottom nuts (3) and separate the hood (1) from the vehicle.



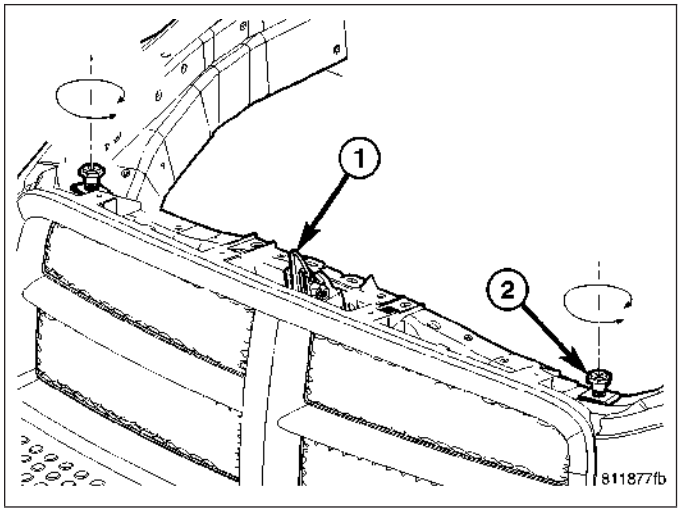
INSTALLATION

1. Position the hood (1) onto the hinges (2).
2. Align all marks and install the nuts.
3. Tighten the nuts too 23 N·m (17 ft. lbs.).
4. Connect the washer hoses.
5. Close hood and adjust as necessary. (Refer to 23 - BODY/HOOD/HOOD - ADJUSTMENTS)



ADJUSTMENTS

NOTE: For gap and flush specifications, (Refer to 23 - BODY/BODY STRUCTURE/GAP AND FLUSH - SPECIFICATIONS).

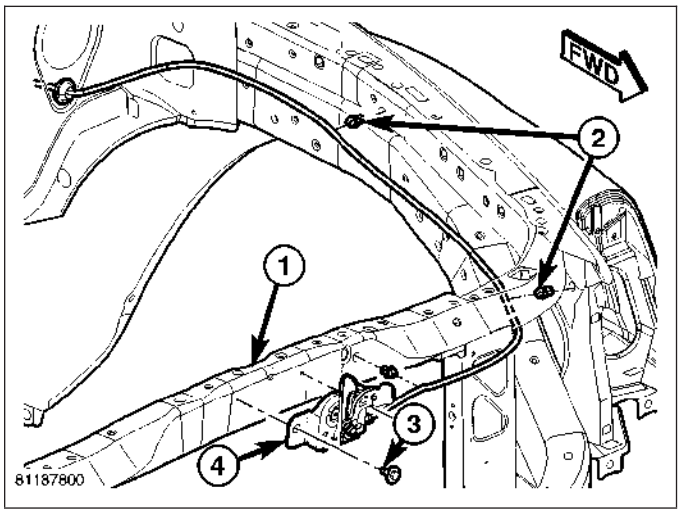


1. If hood is low in relation to cowl panel, loosen the hood to hinge nuts and insert shims between hinge and hood.
2. Adjust hood bumpers (2) in or out to adjust hood-to-fender height alignment.
3. Loosen the hood latch screws.
4. Close the hood and check the fore/aft position of the hood.
5. Loosen the hood to hinge nuts to adjust the fore/aft position.
6. Once the fore/aft position of the hood is correct, tighten the hood to hinge nuts to 23 N·m (17 ft. lbs.).
7. Lower the hood. Inspect clearance between the hood and the cowl cover.
8. Adjust the hood latch as necessary and tighten the bolts to 11 N·m (8 ft. lbs.).
9. Align the latch striker so that striker enters the latch squarely and without binding.

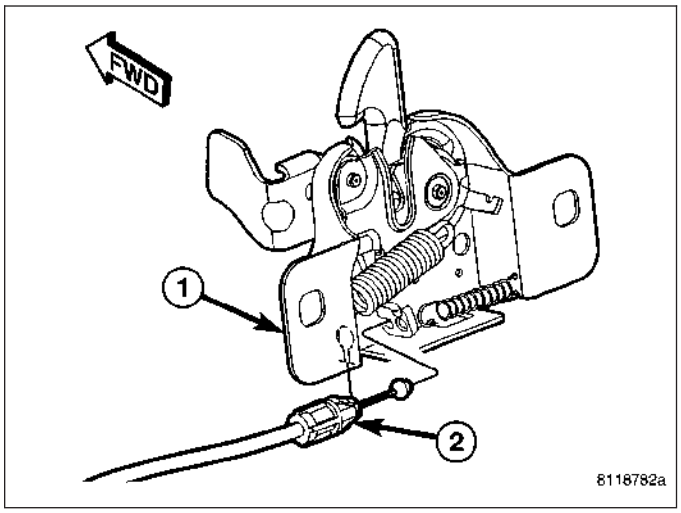
LATCH

REMOVAL

1. Remove the push pin fasteners and remove the upper radiator shroud.
2. Using a grease pencil or equivalent, mark latch position for installation alignment.
3. Remove bolts (3) attaching hood latch (4) to upper radiator crossmember (1).

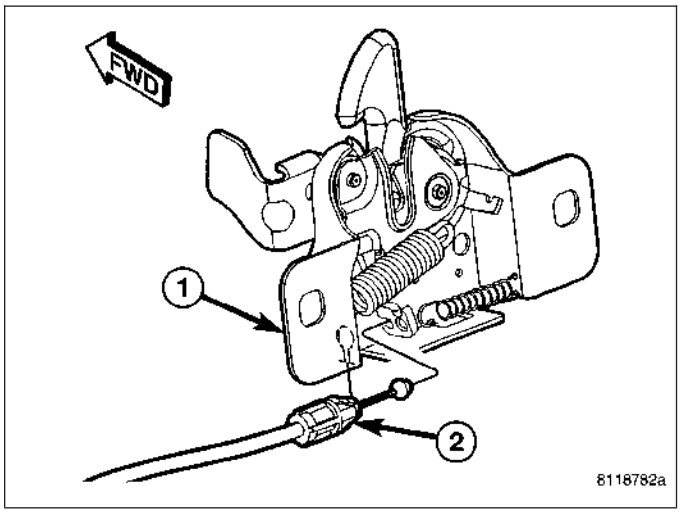


4. Separate hood latch (1) from crossmember and disconnect the release cable (2).

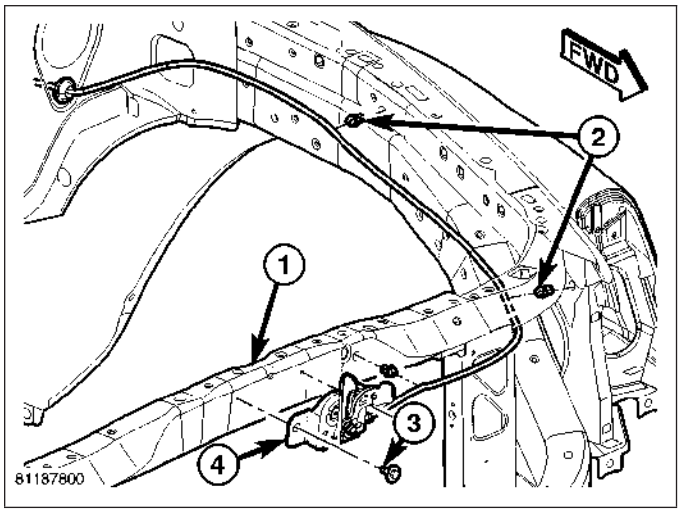


INSTALLATION

1. Connect release cable (2) to the hood latch (1).

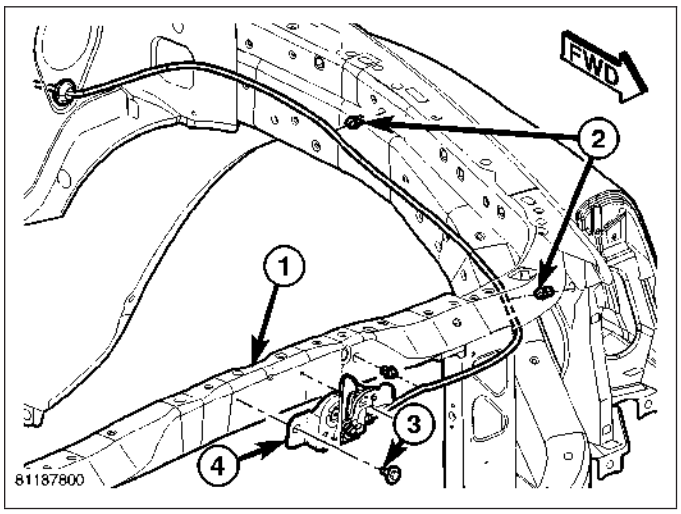


2. Install the latch (4) lining up the marks made previously and install the bolts (3).
3. Tighten the bolts to 11 N·m (8 ft. lbs.).
4. Close hood and adjust latch as necessary. (Refer to 23 - BODY/HOOD/LATCH - ADJUSTMENTS)



ADJUSTMENTS

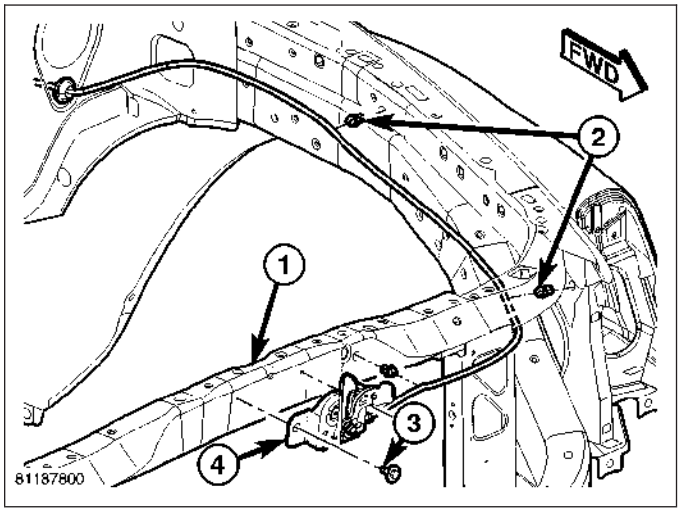
1. Check and adjust the hood if required. (Refer to 23 - BODY/HOOD/HOOD - ADJUSTMENTS)
2. Remove the push pin fasteners and remove the upper radiator shroud.
3. Loosen the hood latch bolts (3).
4. Move the latch to the correct location and lightly tighten the bolts.
5. Close the hood slowly and observe the latching operation.
6. If necessary, adjust the latch position and tighten the bolts to 11 N·m (8 ft. lbs.).



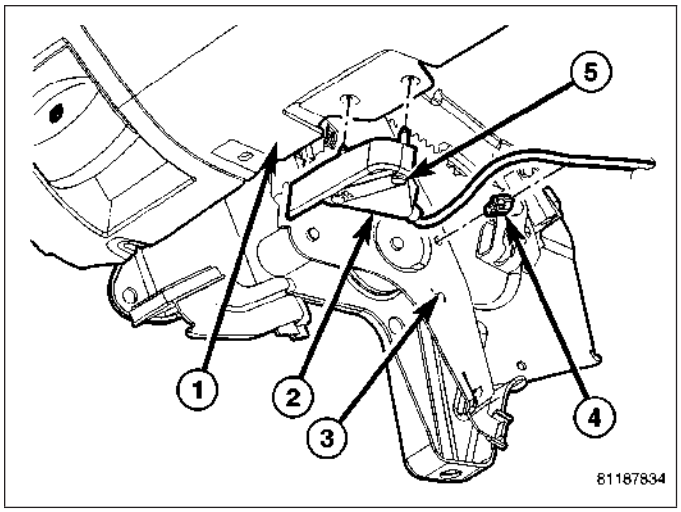
RELEASE-HOOD LATCH

REMOVAL

1. Remove the grille. (Refer to 23 - BODY/EXTERIOR/GRILLE - REMOVAL)
2. Remove hood latch (4). (Refer to 23 - BODY/HOOD/LATCH - REMOVAL)
3. Remove the left headlamp unit. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HEADLAMP UNIT - REMOVAL)
4. Remove the plastic rivets and remove the left front wheelhouse splash shield. (Refer to 23 - BODY/EXTERIOR/FRONT WHEELHOUSE SPLASH SHIELD - DESCRIPTION)
5. Detach the release cable and the retainer clips (2) in the engine compartment.



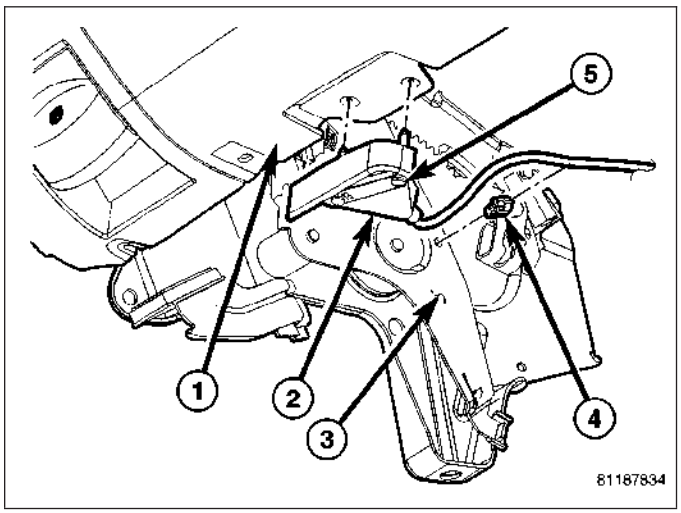
6. Separate the release cable grommet from the dash panel hole.
7. Detach the release cable and the retainer clips (4).
8. From the inside of the vehicle, remove the screws (5) attaching the hood release handle (2) to the bottom of the instrument panel (1).
9. Pull/route the hood release cable through the dash panel hole and remove it from the inside of the vehicle.



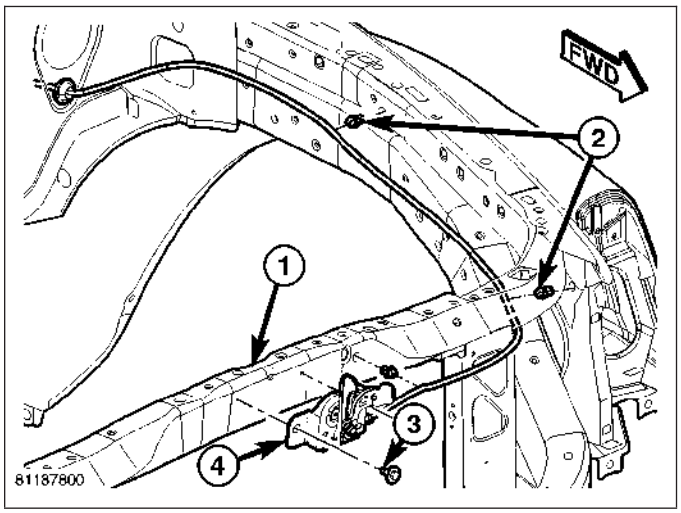
INSTALLATION

NOTE: If replacement hood latch is also being installed, ensure that it is thoroughly lubricated.

1. From inside the vehicle, pull/route the hood release cable through the dash panel hole and into the engine compartment.
2. Install the hood release handle (2) and install the screws (5).
3. Install the cable grommet in the dash panel hole.
4. Attach the retainer clip (4) to the release cable and install.



5. Attach the retainer clips (2) to the release cable and install them into the holes in the engine compartment.
6. Install hood latch. (Refer to 23 - BODY/HOOD/LATCH - INSTALLATION)



7. Install the wheelhouse splash shield and install the rivets. (Refer to 23 - BODY/EXTERIOR/FRONT WHEELHOUSE SPLASH SHIELD - DESCRIPTION)
8. Install the left headlamp unit. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HEADLAMP UNIT - INSTALLATION)
9. Install the grille. (Refer to 23 - BODY/EXTERIOR/GRILLE - INSTALLATION)

DOOR - FRONT

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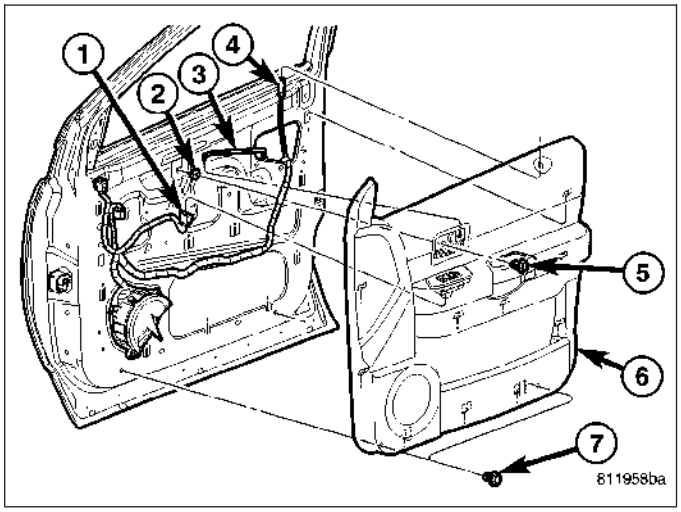
PANEL-TRIM

REMOVAL

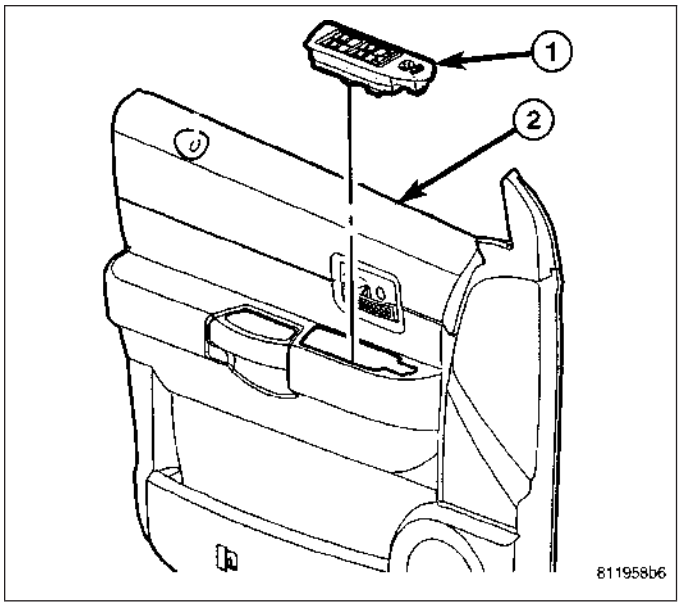
1. Remove the screws (5 & 7).

CAUTION: Trim panel is attached to the door using hooks molded into the panel. Do not pull the trim panel straight off or damage to the panel and/or power switch assembly may occur.

2. Lift the trim panel up off the lock rod (4) and attachment hooks and separate the panel from the door slightly.
3. Disconnect the electrical connectors (1).
4. Disconnect the inside handle actuator rod (3) and remove the trim panel (6).

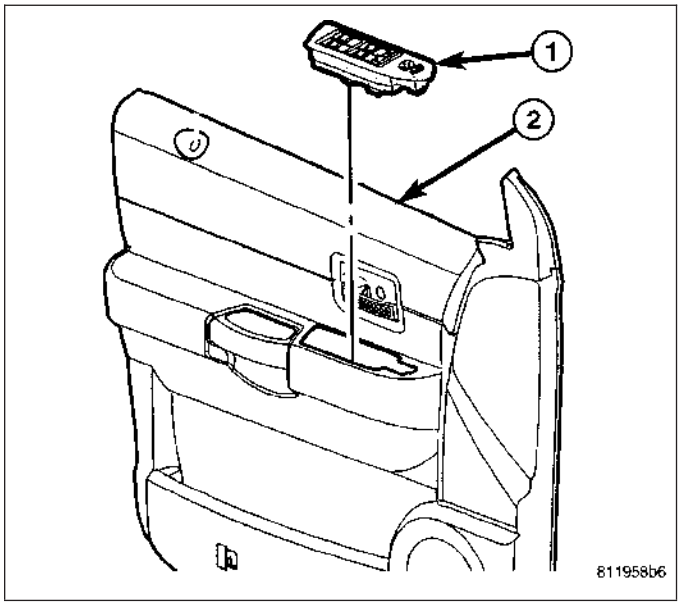


5. Remove the switch panel (1) if necessary.

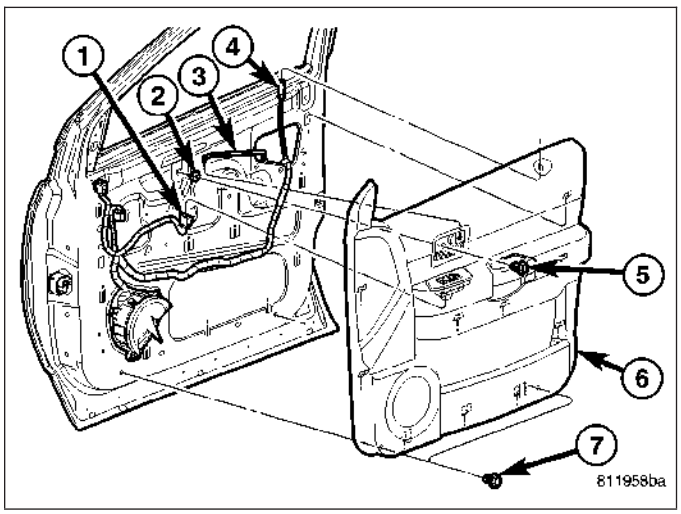


INSTALLATION

1. Install the switch assembly (1).



2. Position the trim panel (6) and connect the inside handle actuator rod (3).
3. Connect the electrical connectors (1).
4. Lift the trim panel up and onto the lock rod (4) and attachment hooks.
5. Install the screws (5 & 7).



WATERSHIELD

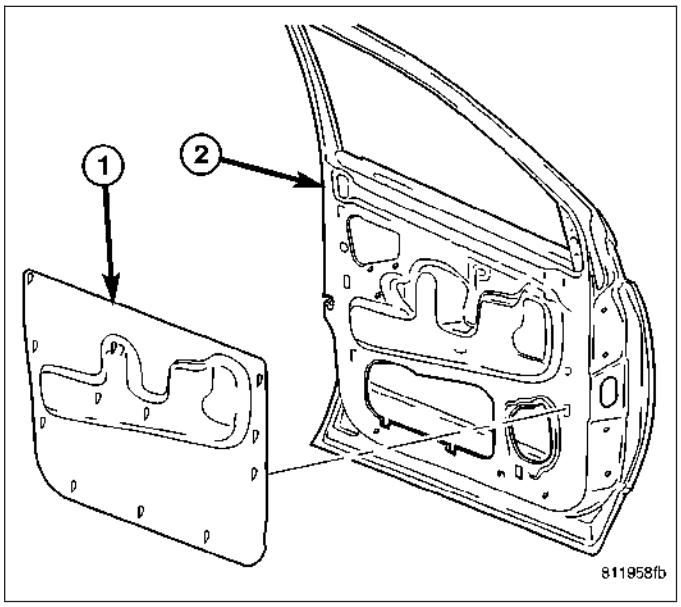
REMOVAL

CAUTION: Do not allow the watershield or adhesive to become contaminated with dirt or other foreign substances.

Do not damage the watershield during removal and installation.

If the watershield becomes contaminated or damaged, replace the watershield.

1. Remove the speaker. (Refer to 8 - ELECTRICAL/AUDIO/SPEAKER - REMOVAL)
2. Remove the door trim panel. (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - REMOVAL)
3. Separate the watershield (1) from the inner door panel (2) and off of the latch linkages.



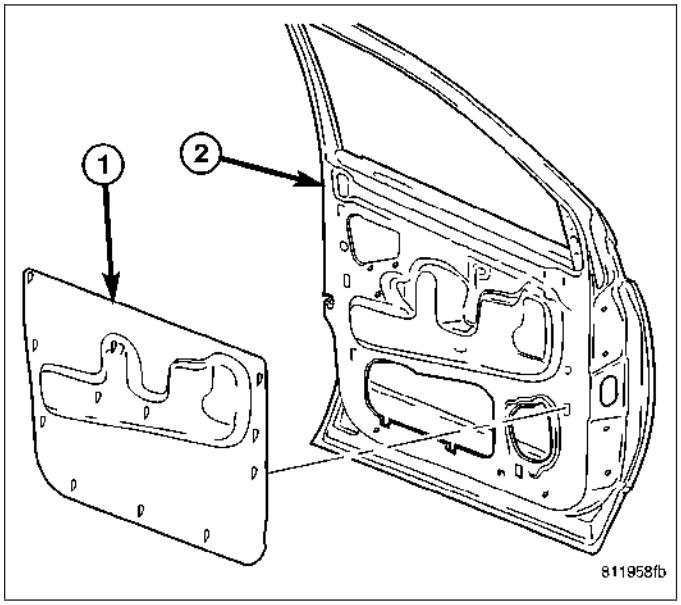
INSTALLATION

CAUTION: Do not allow the watershield or adhesive to become contaminated with dirt or other foreign substances.

Do not damage the watershield during removal and installation.

If the watershield becomes contaminated or damaged, replace the watershield.

1. Position the wire harness and actuator rods through the holes in the watershield.
2. Secure the watershield to the inner door panel.
3. Install the speaker. (Refer to 8 - ELECTRICAL/AUDIO/SPEAKER - INSTALLATION)
4. Install the trim panel. (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - INSTALLATION)



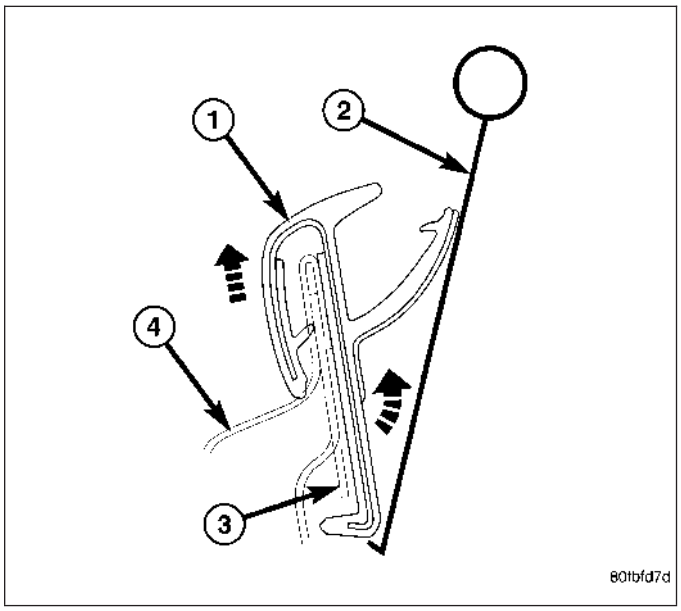
GLASS

REMOVAL

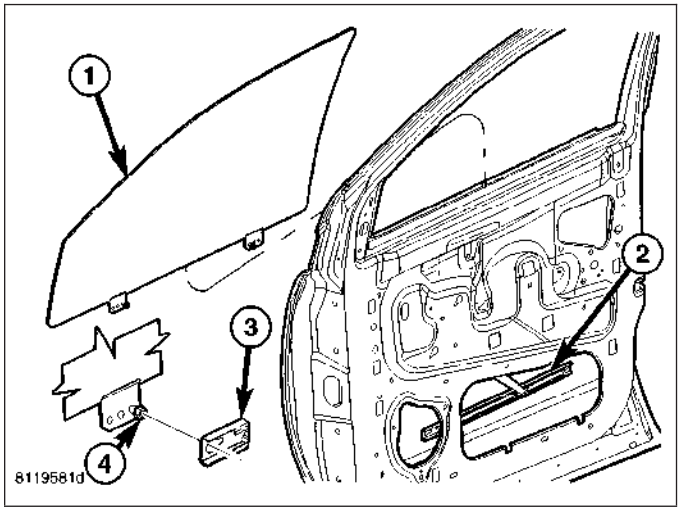
1. Remove the watershield. (Refer to 23 - BODY/ DOOR - FRONT/WATERSHIELD - REMOVAL)
2. Separate the inner belt molding from the mounting flange from the rear to the front.
3. Insert special tool #9093 (2) between the outer belt molding (1) and glass at the rear.
4. Push down on outer belt molding (1) and rotate upper part of tool (2) outward from vehicle then lift up on molding (1) to disengage from locking tabs (3) working from back to front.

NOTE: Typical outer belt molding design shown.

5. Slide molding out from under the side view mirror and remove.

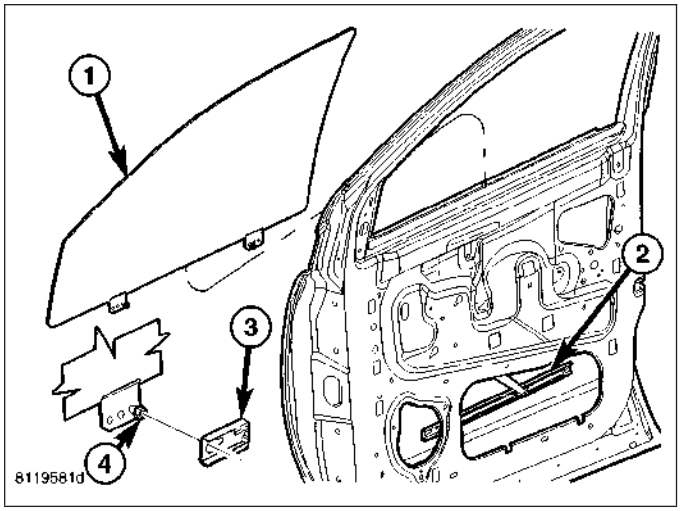


6. Temporarily install the window switch and position the glass (1) to gain access to the regulator nuts (4).
7. Remove the nuts (4) and remove the glass (1).



INSTALLATION

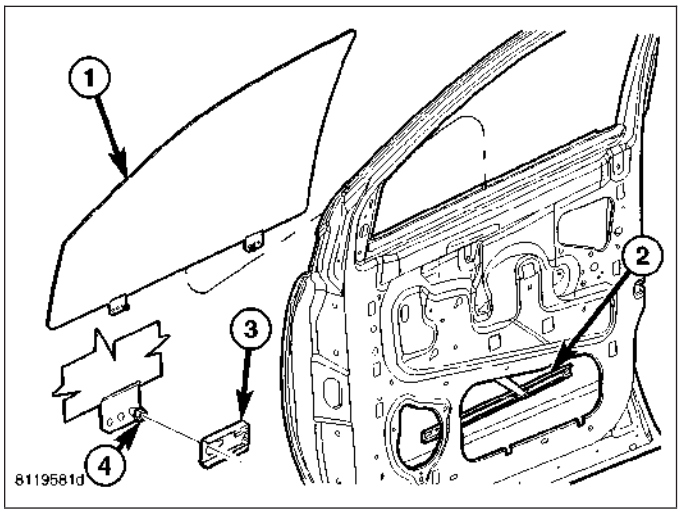
1. Position the glass into the door and install onto the regulator.
2. Install the nuts (4) and tighten to 9 N·m (80 in. lbs.).
3. Position the outer belt molding onto the door and position forward under the side view mirror. Seat the molding fully.
4. Position the inner belt molding onto the door and seat fully starting at the back of the door.
5. Install the watershield. (Refer to 23 - BODY/DOOR - FRONT/WATERSHIELD - INSTALLATION)



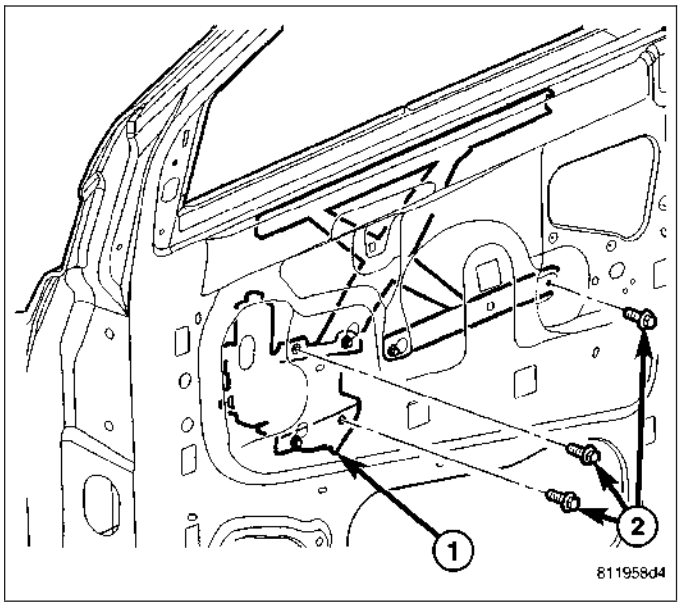
REGULATOR-WINDOW

REMOVAL

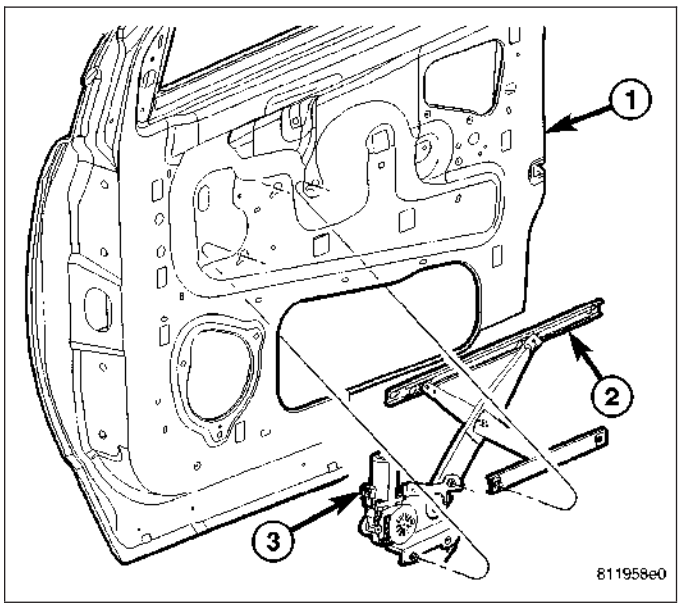
1. Remove the watershield. (Refer to 23 - BODY/ DOOR - FRONT/WATERSHIELD - REMOVAL)
2. Temporarily install the window switch and position the glass (1) to gain access to the regulator nuts (4).
3. Remove the nuts (4).
4. Secure the glass in the up position using a wood wedge or equivalent.



5. Remove the bolts (2) and loosen the remaining regulator bolts.

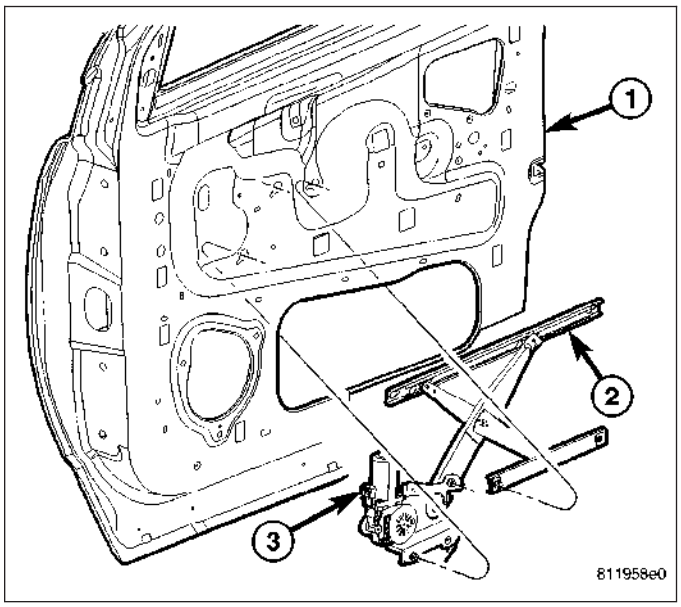


6. Separate the regulator (2) from the door panel (1) and disconnect the electrical connector (3).

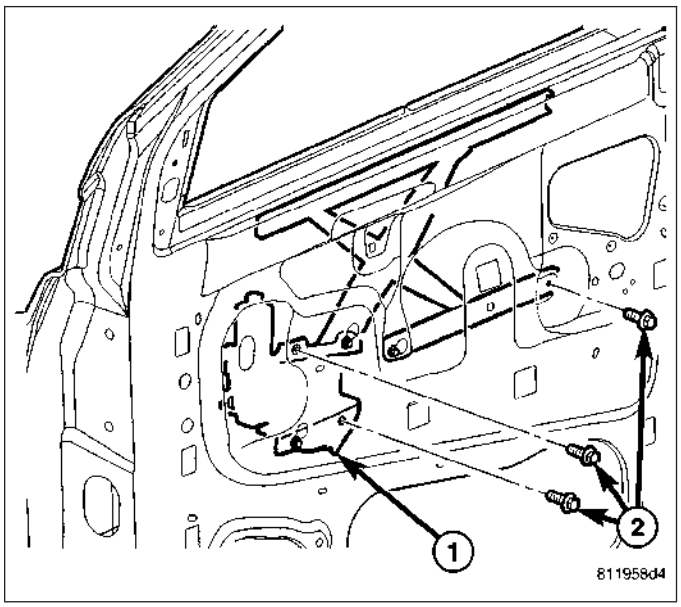


INSTALLATION

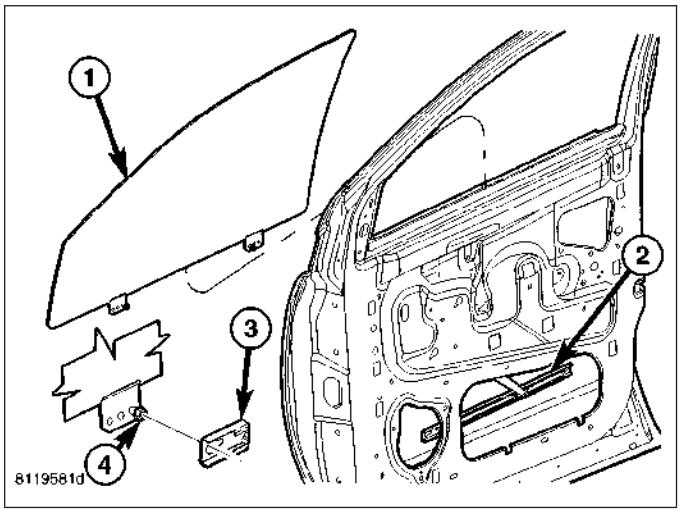
1. Position the regulator (2) into the door (1) and connect the electrical connector (3).



2. Position the regulator bolts into the keyhole slots and slide into place.
3. Install the remaining regulator bolts (2).
4. Tighten the bolts to 9 N·m (80 in. lbs.).



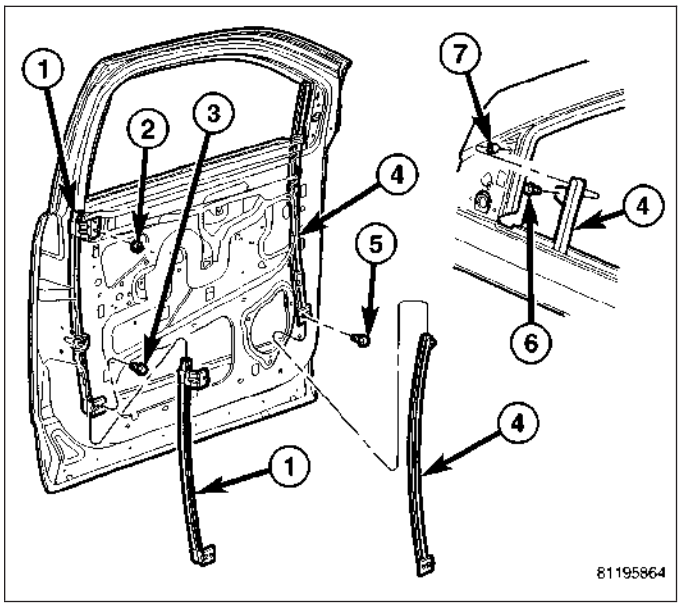
5. Position the glass (1) onto the door regulator (3).
6. Install the nuts (4) and tighten to 9 N·m (80 in. lbs.).
7. Install the watershield. (Refer to 23 - BODY/DOOR - FRONT/WATERSHIELD - INSTALLATION)



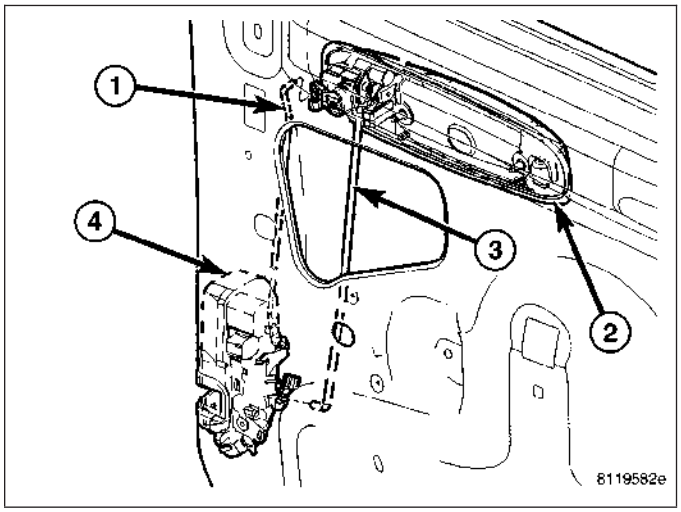
HANDLE-EXTERIOR

REMOVAL

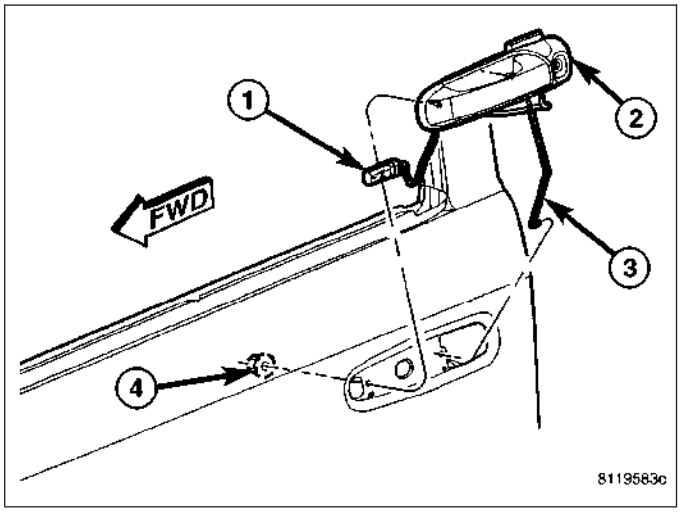
1. Remove the watershield. (Refer to 23 - BODY/ DOOR - FRONT/WATERSHIELD - REMOVAL)
2. Remove the bolt (3) and nut (2) and position aside the rear glass run channel (1).



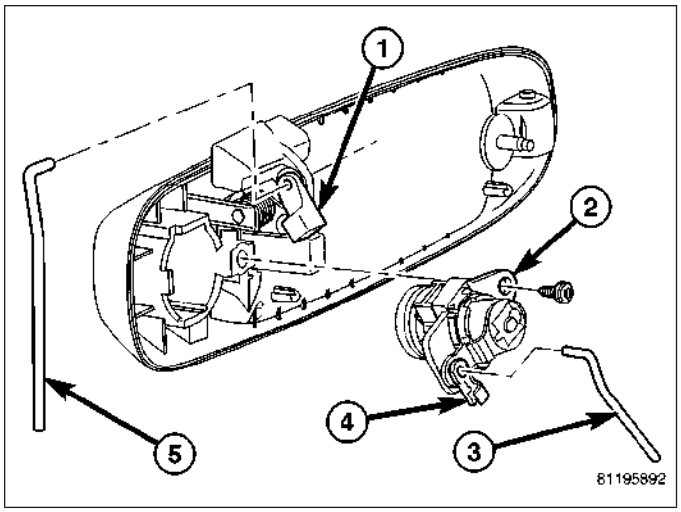
3. Disconnect the links (1 & 3) from the latch (4).



4. Remove the nut (4), the handle (2) and disconnect the electrical connector (1).

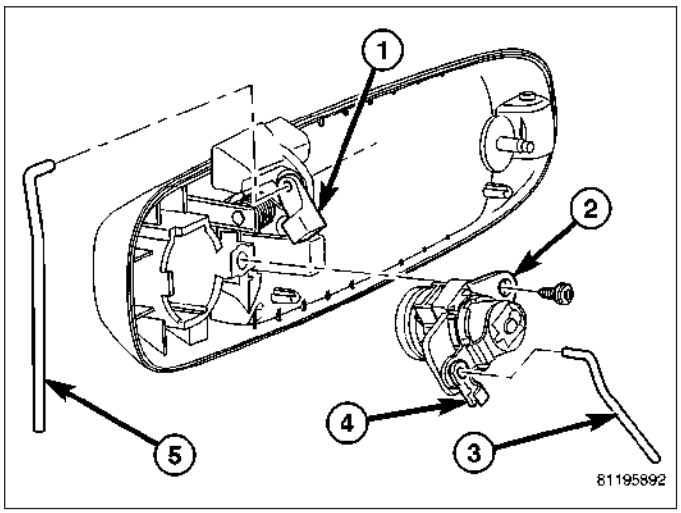


5. Separate the links (3 & 5) from the clips (1 & 4) and remove the lock cylinder (2).

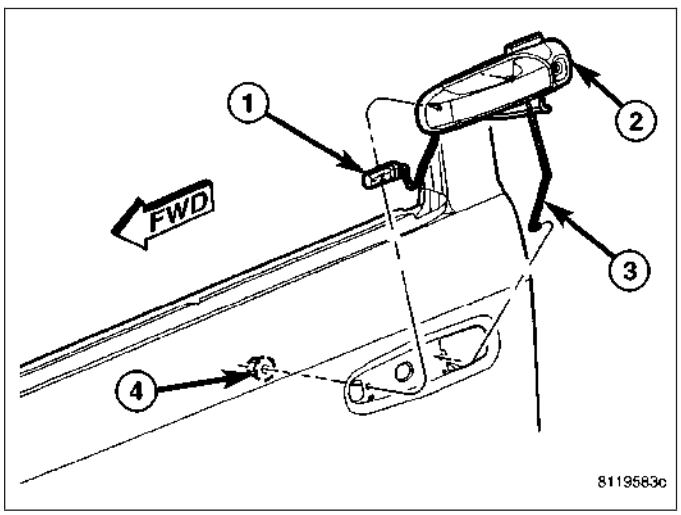


INSTALLATION

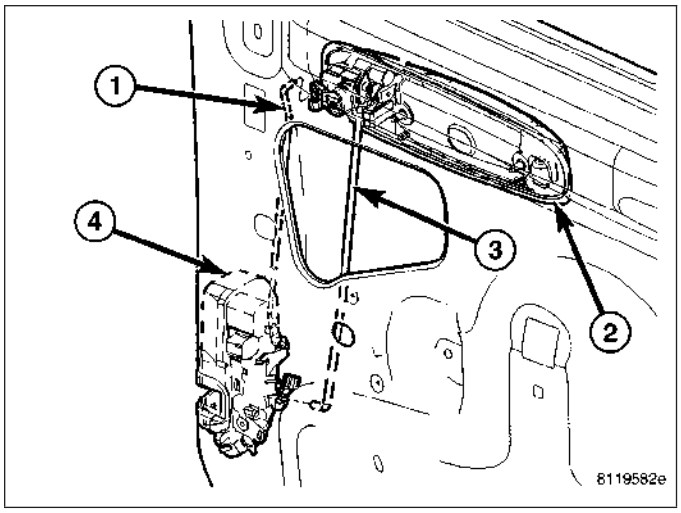
1. Install the links (3 & 5) into the clips (1 & 4) and install the lock cylinder (2) into the exterior handle.



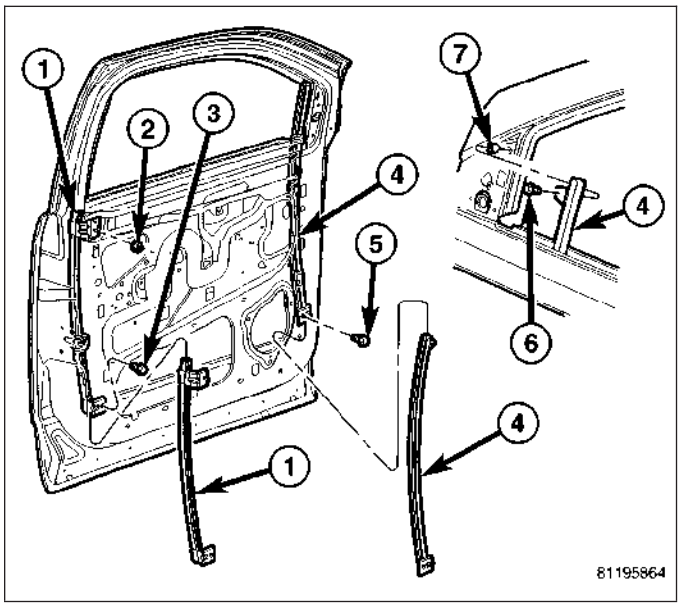
2. Connect the electrical connector (1), and position the handle (2) onto the door.
3. Install the nuts (4) and tighten to 5 N·m (45 in. lbs.).



4. Connect the links (1 & 3) to the latch (4).



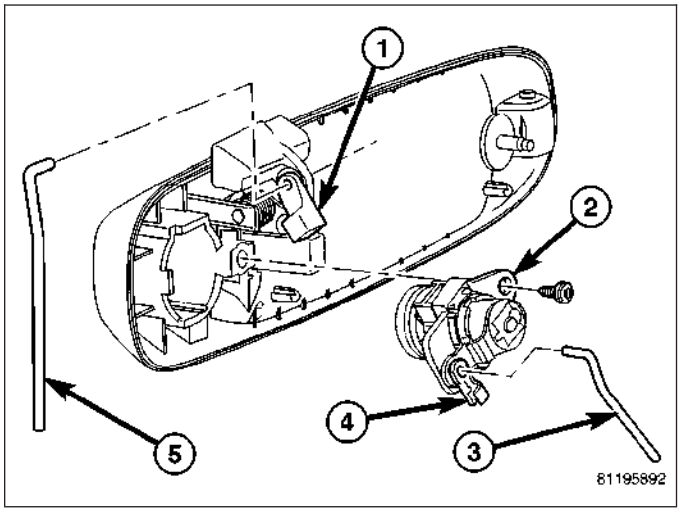
5. Position the rear glass run channel back and install the nut and bolt.
6. Tighten the fasteners to 8 N·m (70 in. lbs.).
7. Install the watershield. (Refer to 23 - BODY/DOOR - FRONT/WATERSHIELD - INSTALLATION) (Refer to 23 - BODY/DOOR - FRONT/WATERSHIELD - INSTALLATION)
8. Adjust the latch as needed. (Refer to 23 - BODY/DOOR - FRONT/LATCH - ADJUSTMENTS)



CYLINDER-LOCK

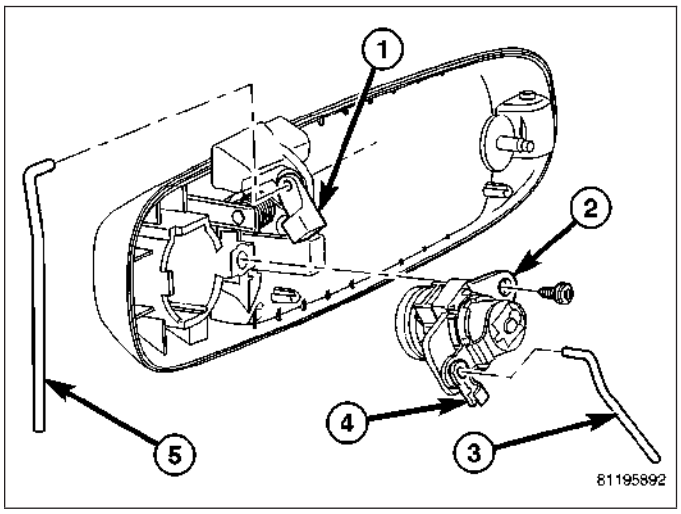
REMOVAL

1. Remove the exterior handle. (Refer to 23 - BODY/DOOR - FRONT/EXTERIOR HANDLE - REMOVAL)
2. Remove the screw and remove the lock cylinder (2).



INSTALLATION

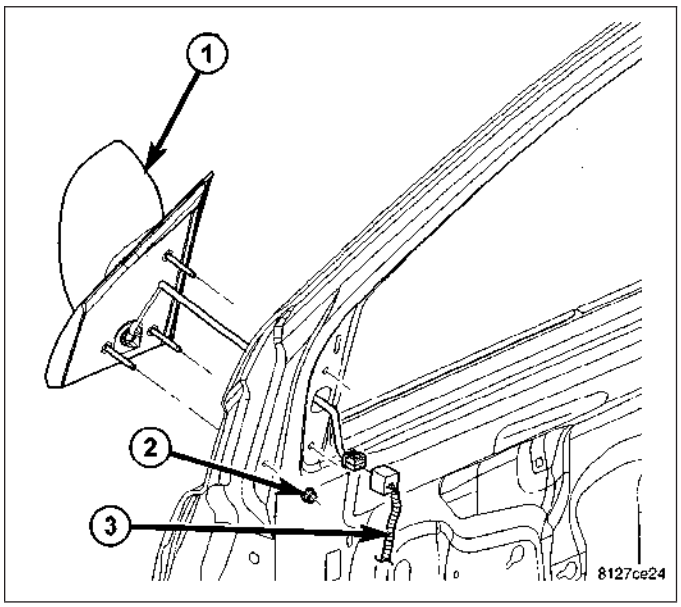
1. Install the lock cylinder (2) and install the screw.
2. Install the exterior handle. (Refer to 23 - BODY/ DOOR - FRONT/EXTERIOR HANDLE - INSTALLATION)



CHANNEL-GLASS

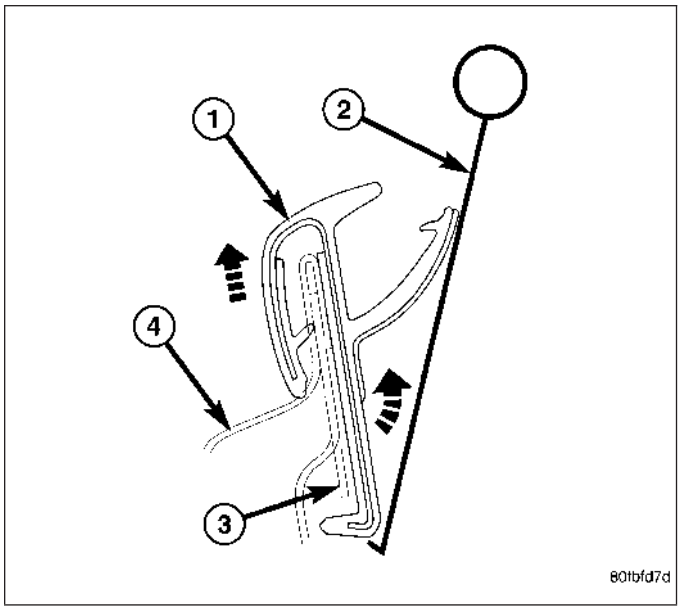
REMOVAL

1. Raise the glass to the full up position.
2. Remove the watershield. (Refer to 23 - BODY/ DOOR - FRONT/WATERSHIELD - REMOVAL)
3. Remove the nuts (2) and disconnect the electrical connector (3), if equipped.
4. Remove the side view mirror (1).

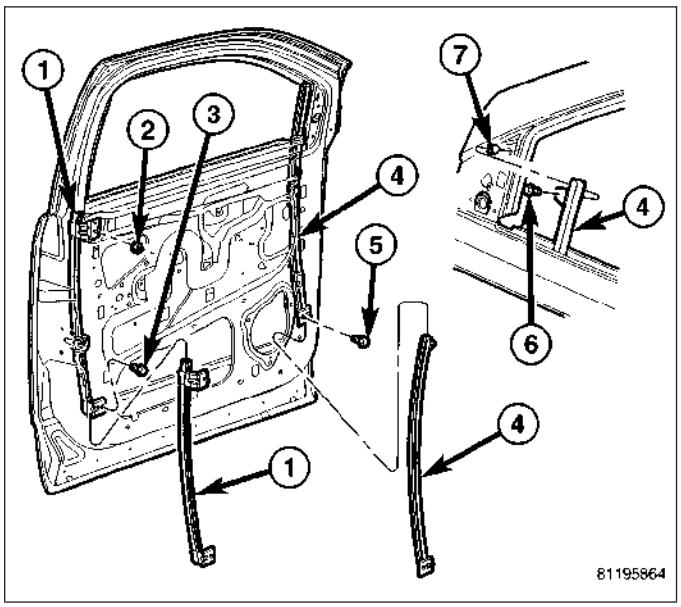


5. Separate the inner belt molding from the mounting flange from the rear to the front.
6. Insert special tool #9093 (2) between the outer belt molding (1) and glass at the rear.
7. Push down on outer belt molding (1) and rotate upper part of tool (2) outward from vehicle then lift up on molding (1) to disengage from locking tabs (3) working from back to front.

NOTE: Typical outer belt molding design shown.

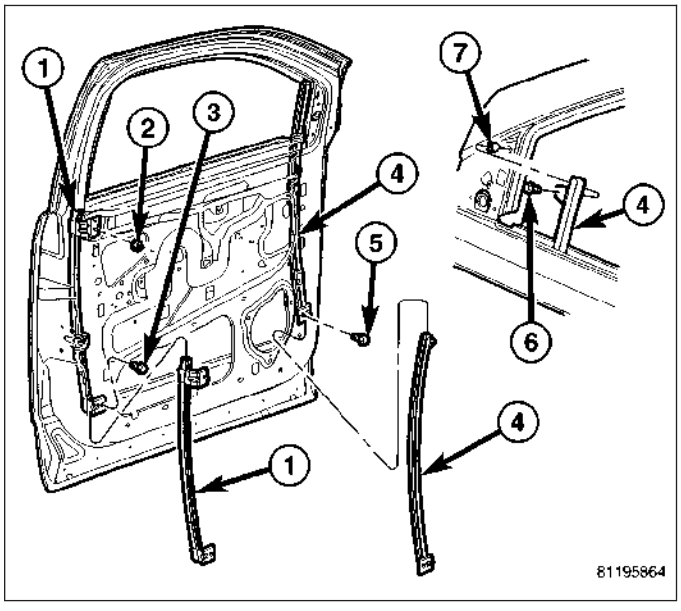


8. Remove the nut (2) and bolt (3) and remove the rear glass run channel (1).
9. Remove the bolts (6 & 5) and remove the front glass run channel (4).

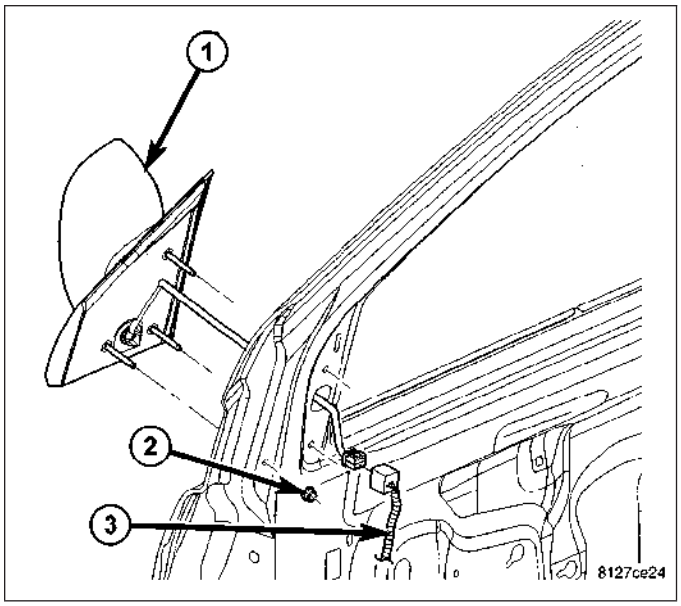


INSTALLATION

1. Install the front glass run channel (4) and install the bolts (6 & 5). Tighten the bolts to 8 N·m (70 in. lbs.).
2. Install the rear glass run channel and install the nut and bolt.
3. Tighten the fasteners to 8 N·m (70 in. lbs.).
4. Position the inner and outer belt molding onto the door and seat fully.



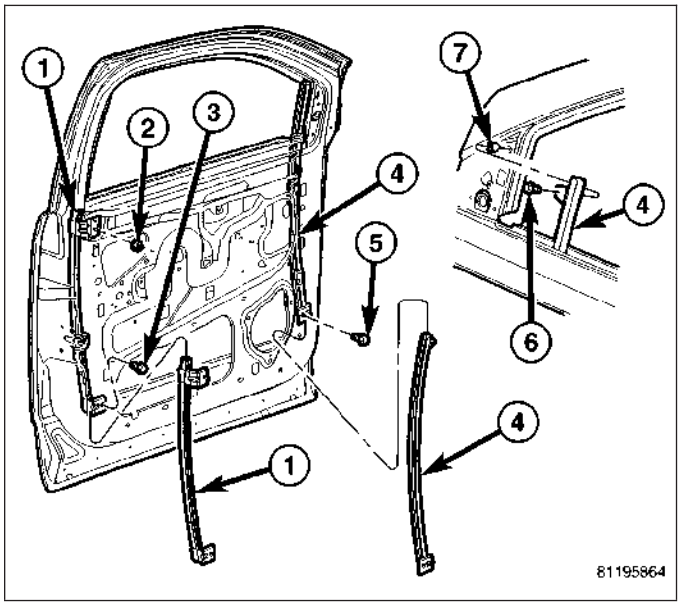
5. Install the side view mirror.
6. Install the nuts and connect the electrical connector.
7. Install the watershield. (Refer to 23 - BODY/DOOR - FRONT/WATERSHIELD - INSTALLATION)



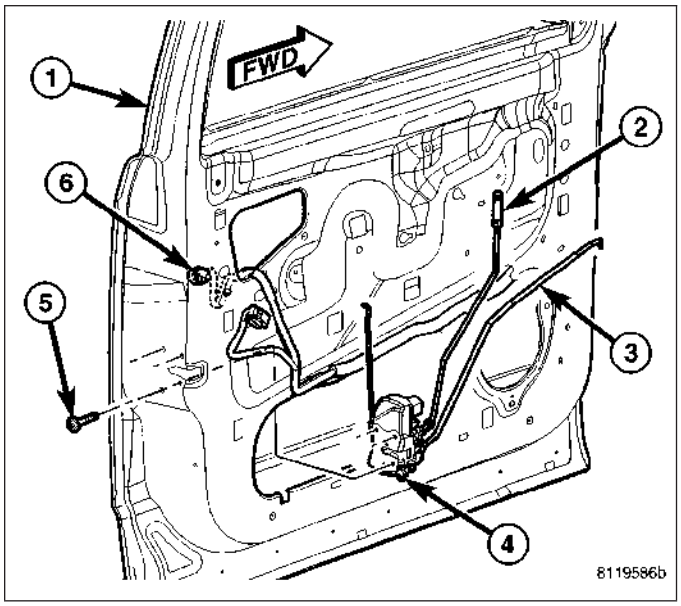
LATCH

REMOVAL

1. Remove the watershield. (Refer to 23 - BODY/DOOR - FRONT/WATERSHIELD - REMOVAL)
2. Remove the bolt (3) and nut (2) and position aside the rear glass run channel (1).

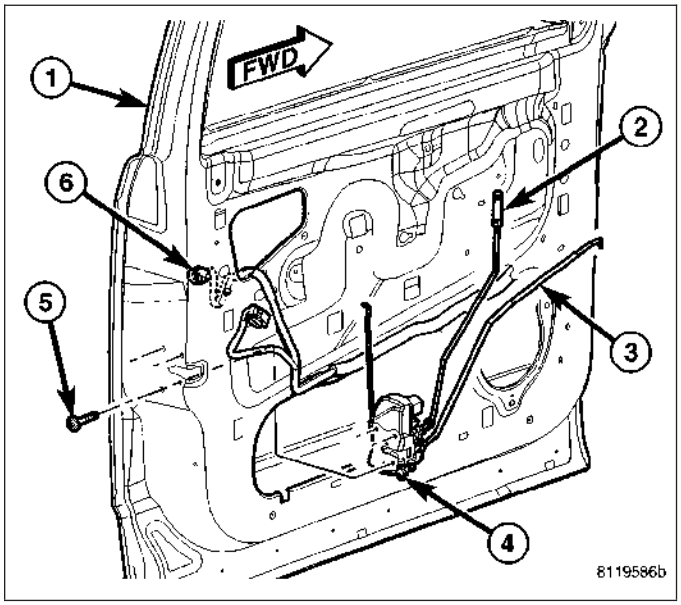


3. Remove the latch screws (5).
4. Disconnect the actuator rods (3).
5. Disconnect the electrical connectors (6) and remove the latch.

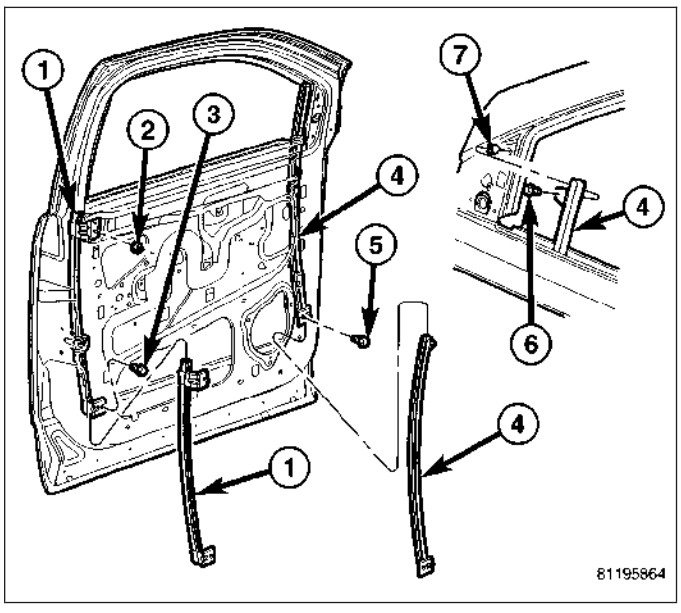


INSTALLATION

1. Install the latch into the door.
2. Connect the electrical connectors (6).
3. Connect the actuator rods (3).
4. Install the screws and tighten to 10 N·m (85 in. lbs.).
5. Adjust the latch as needed. (Refer to 23 - BODY/DOOR - FRONT/LATCH - ADJUSTMENTS)



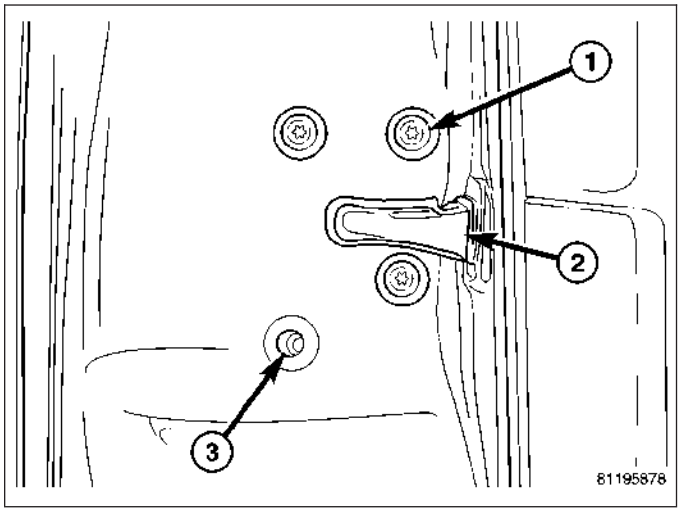
6. Position the rear glass run channel back and install the nut and bolt.
7. Tighten the fasteners to 8 N·m (70 in. lbs.).
8. Install the watershield. (Refer to 23 - BODY/DOOR - FRONT/WATERSHIELD - INSTALLATION) (Refer to 23 - BODY/DOOR - FRONT/WATERSHIELD - INSTALLATION)



ADJUSTMENTS

ADJUSTMENT

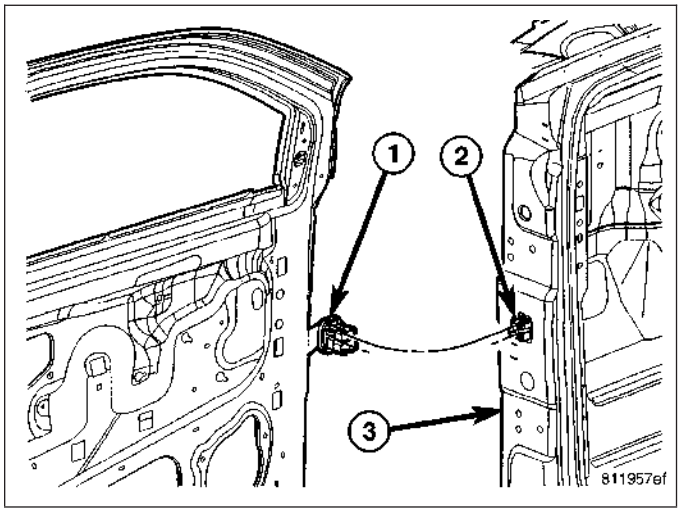
1. Locate access hole (3) and remove the trim plug covering it.
2. Insert a 5/32-inch hex-wrench through hole and into adjustment screw. Loosen screw.
3. Operate outside handle several times to release any restriction because of mis-alignment.
4. Tighten adjustment screw to 3 N·m (30 in. lbs.).
5. Test handle for proper operation.



DOOR

REMOVAL

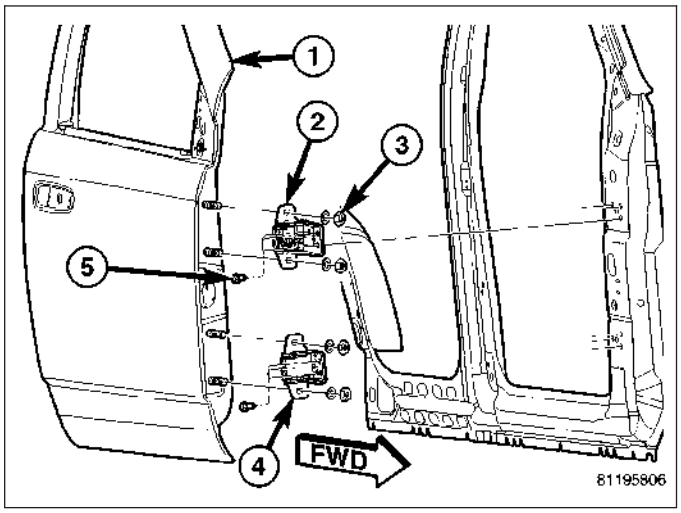
1. Disconnect the door wire harness electrical connector (1) at the a-pillar (2).



2. Using a grease pencil or equivalent, mark the outline of the door hinges on the door end to aid installation.
3. Support the door with a suitable lifting device.

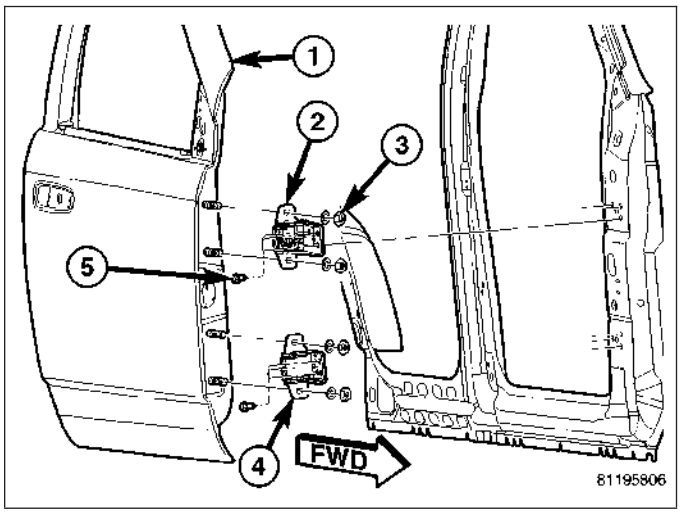
NOTE: The welded washers should not be separated from the hinge. If the washers are removed the door may have to be re-adjusted.

4. Remove the nuts (3) attaching the door hinges (2) to the door (1).

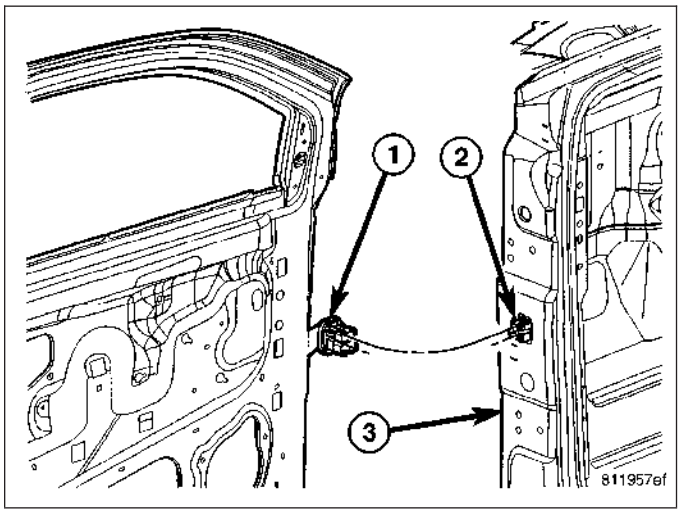


INSTALLATION

1. Support the door with a suitable lifting device and install the door (1) onto the hinges (2).
2. Install the washers, if they were removed previously, nuts and tighten to 28 N·m (21 ft. lbs.).



3. Connect the electrical connectors (1 & 2).
4. Adjust the door as necessary. (Refer to 23 - BODY/DOOR - FRONT/DOOR - ADJUSTMENTS)



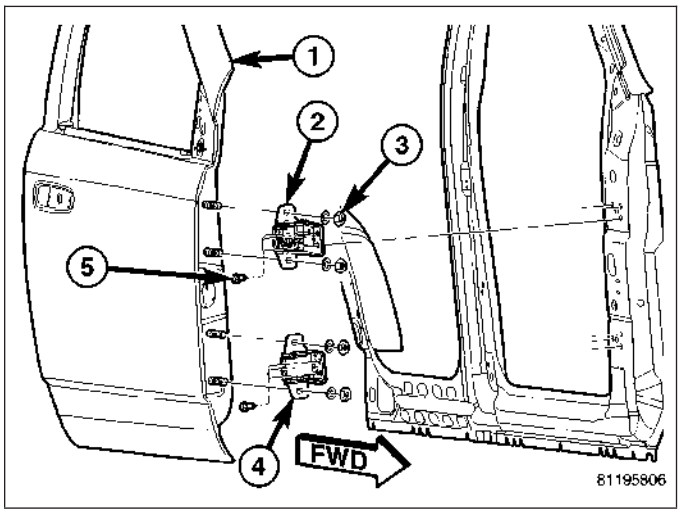
ADJUSTMENTS

NOTE: For vehicles with four doors, it is recommended that you adjust the rear door before adjusting the front door. (Refer to 23 - BODY/DOORS - REAR/DOOR - ADJUSTMENTS)

- **Door adjustment measurements should be taken from stationary or welded body panels like the roof, rocker or quarter panels.**
- **During adjustment procedures, it is recommended that all the hinge fasteners be loosened except for the upper most fasteners. Adjustments can be made using the upper bolts to hold the door with final torque of the fasteners occurring after correct door positioning is achieved.**
- **A suitable body sealant should be used when removing or moving the hinges.**

FORE/AFT

NOTE: Fore/aft (lateral) door adjustment is done by loosening the hinge to the hinge pillar fasteners one hinge at a time and moving the door to the correct position.



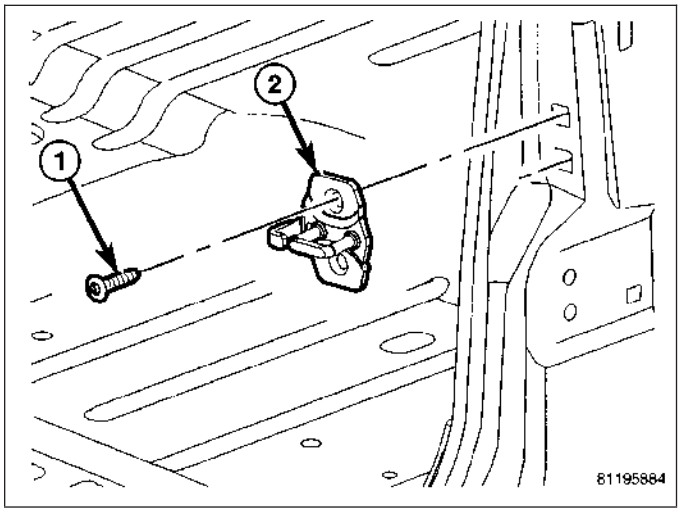
1. Support the door with a suitable lifting device.
2. Loosen the hinge (2) to hinge pillar fasteners (5). (Refer to 23 - BODY/DOOR - FRONT/HINGE - REMOVAL)
3. Adjust the door to the correct position. (Refer to 23 - BODY/BODY STRUCTURE/GAP AND FLUSH - SPECIFICATIONS)
4. Tighten the hinge pillar fasteners to 28 N·m (21 ft. lbs.).

UP/DOWN

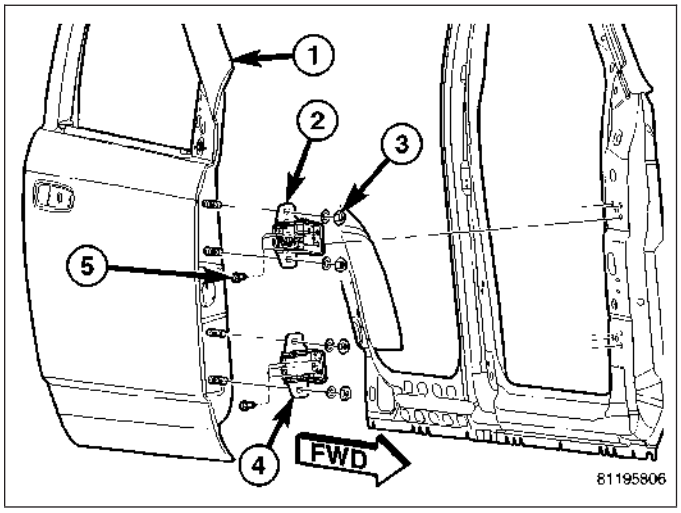
NOTE: Up/down door adjustment is done by loosening either the hinge to the hinge pillar fasteners or the hinge to door fasteners and moving the door to the correct position.

NOTE: When adjustment of the door requires the loosening of the door to hinge fasteners, it will be necessary to separate the welded washers with a chisel or other suitable tool.

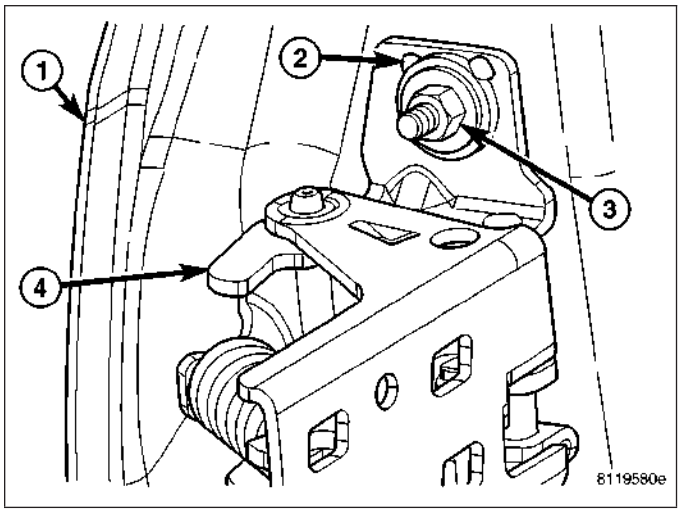
NOTE: When the up/down adjustments are done correctly, the top of the door is positioned over flush to the roof. (Refer to 23 - BODY/BODY STRUCTURE/GAP AND FLUSH - SPECIFICATIONS)



1. Support the door with a suitable lifting device.
2. Loosen the latch striker bolts (1). (Refer to 23 - BODY/DOOR - FRONT/LATCH STRIKER - REMOVAL)
3. Loosen the hinge to door fasteners (3) (Refer to 23 - BODY/DOOR - FRONT/DOOR - REMOVAL) or loosen the hinge to hinge pillar fasteners (5) (Refer to 23 - BODY/DOOR - FRONT/HINGE - REMOVAL).

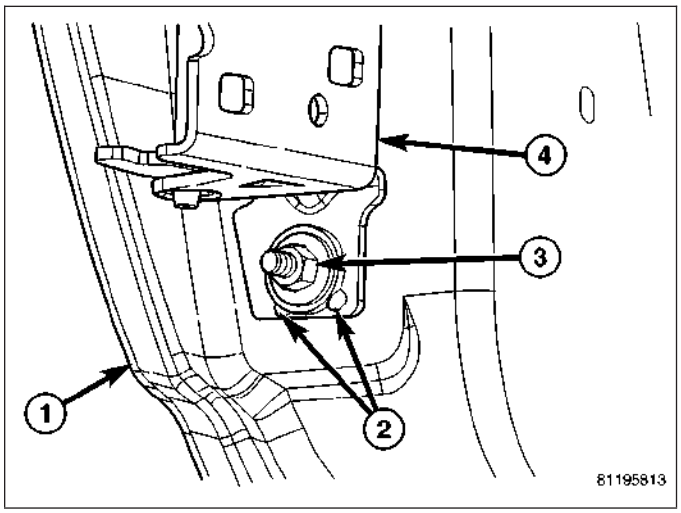


NOTE: When adjusting the door using the door to hinge adjustment, remove the upper hinge welds (2) and separate the washers from the hinge (4).

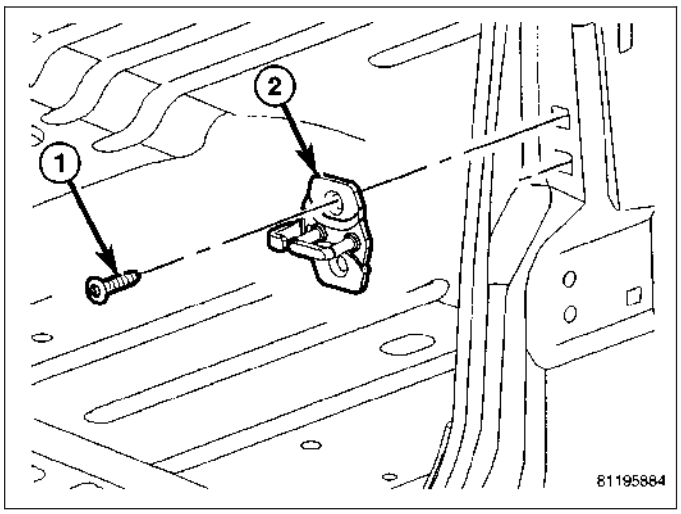


NOTE: When adjusting the door using the door to hinge adjustment, remove the lower hinge welds (2) and separate the washers from the hinge (4).

4. Adjust the door to the correct position. (Refer to 23 - BODY/BODY STRUCTURE/GAP AND FLUSH - SPECIFICATIONS)
5. Tighten the hinge pillar fasteners or the door to hinges fasteners to 28 N·m (21 ft. lbs.).



6. Tighten the latch striker bolts (1). (Refer to 23 - BODY/DOOR - FRONT/LATCH STRIKER - INSTALLATION)

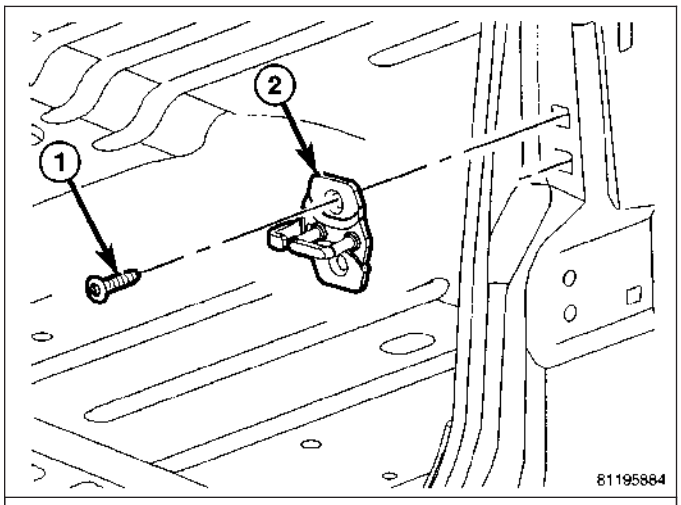


IN/OUT

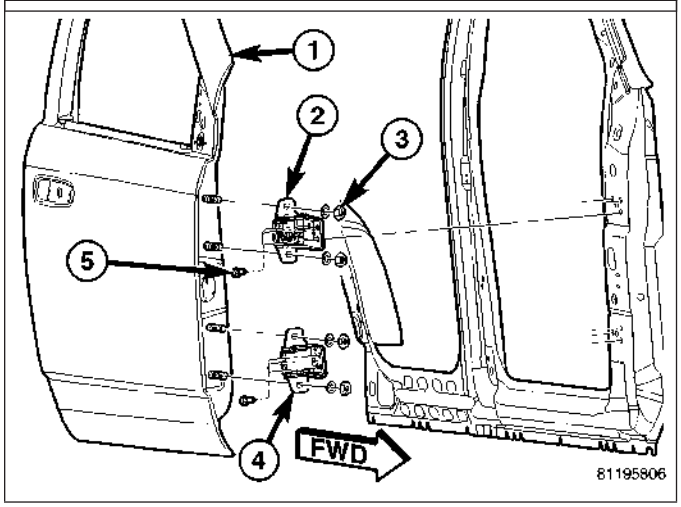
NOTE: In/out door adjustment is done by loosening the hinge to door fasteners one hinge at a time and moving the door to the correct position.

NOTE: When adjustment of the door requires the loosening of the door to hinge fasteners, it will be necessary to separate the welded washers with a chisel or other suitable tool.

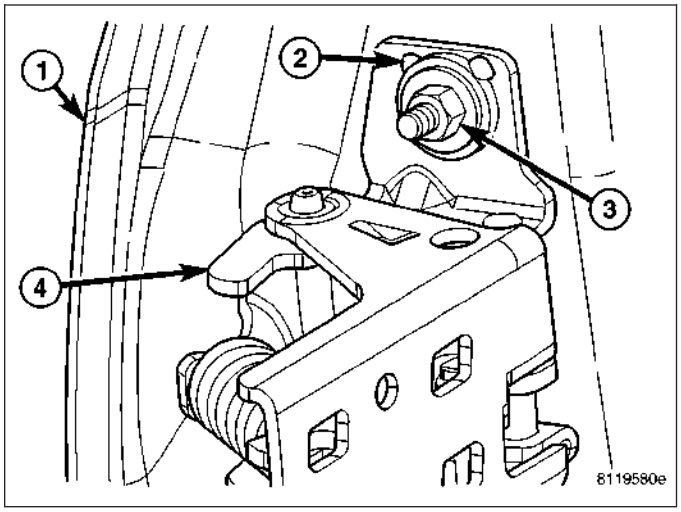
1. Support the door with a suitable lifting device.
2. Loosen the latch striker bolts (1). (Refer to 23 - BODY/DOOR - FRONT/LATCH STRIKER - REMOVAL)



3. Loosen the hinge to door fasteners (3). (Refer to 23 - BODY/DOOR - FRONT/DOOR - REMOVAL)

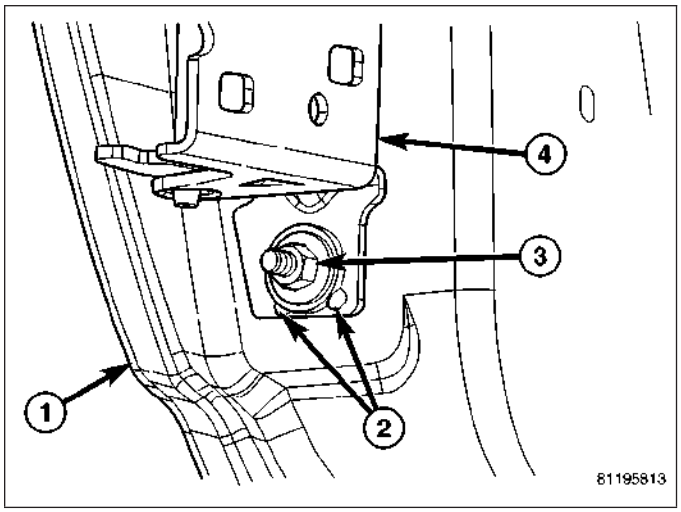


NOTE: When adjusting the door using the door to hinge adjustment, remove the upper hinge welds (2) and separate the washers from the hinge (4).

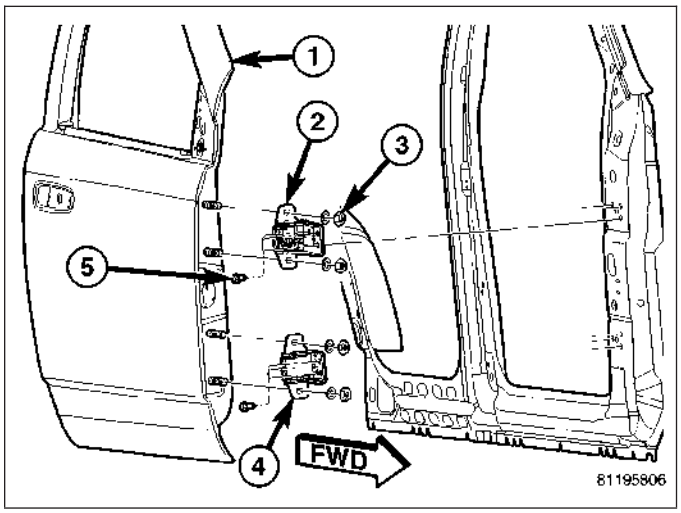


NOTE: When adjusting the door using the door to hinge adjustment, remove the lower hinge welds (2) and separate the washers from the hinge (4).

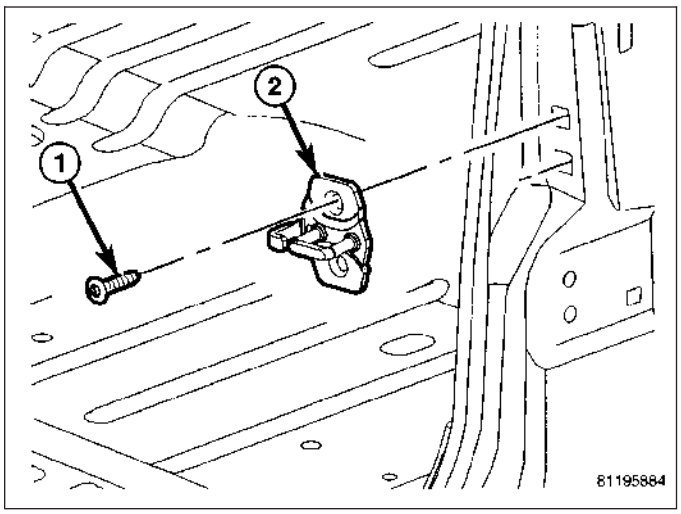
4. Adjust the door to the correct position. (Refer to 23 - BODY/BODY STRUCTURE/GAP AND FLUSH - SPECIFICATIONS)



5. Tighten the door to hinges fasteners (3) to 28 N·m (21 ft. lbs.).



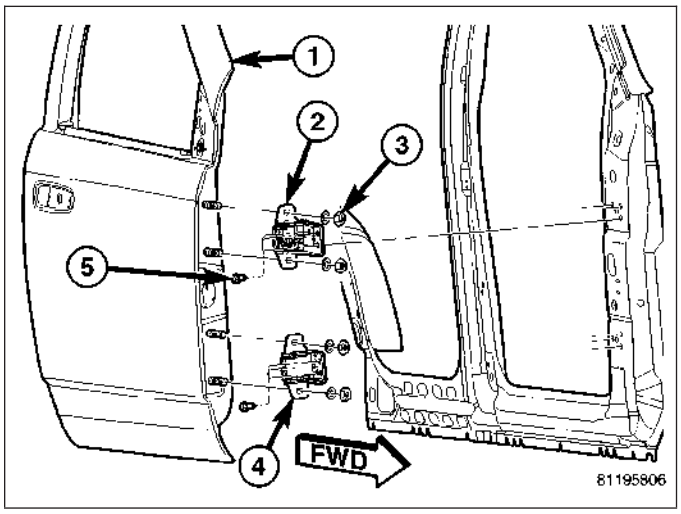
6. Tighten the latch striker bolts (1). (Refer to 23 - BODY/DOOR - FRONT/LATCH STRIKER - INSTALLATION)



HINGE

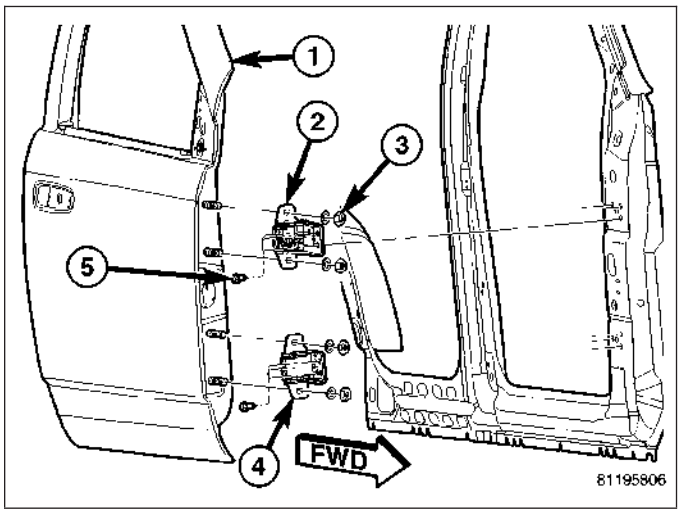
REMOVAL

1. Remove the door. (Refer to 23 - BODY/DOOR - FRONT/DOOR - REMOVAL)
2. Using a grease pencil or equivalent, mark the outline of the door hinges on a-pillar end to aid installation.
3. Remove the bolts (5) and remove the hinges (2 & 4).



INSTALLATION

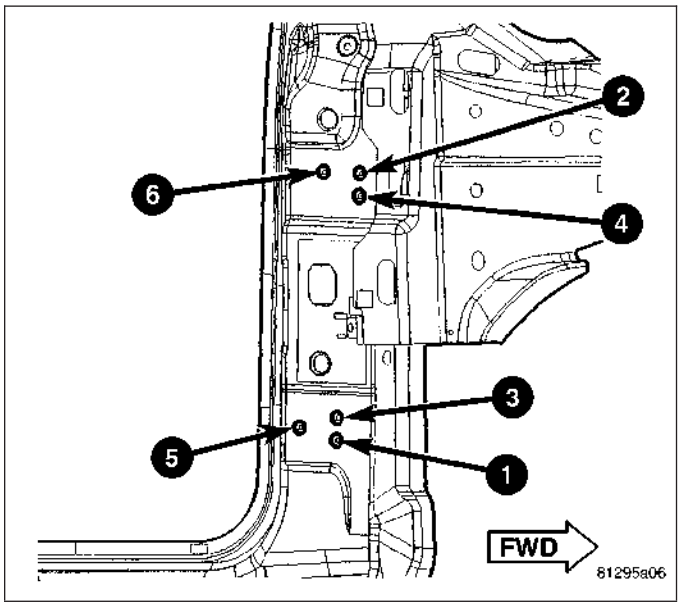
1. If necessary, paint replacement door hinge before installation.
2. Position door hinge (2 & 4) on hinge pillar using alignment marks and install the bolts (5).



3. Tighten the bolts to 28 N·m (21 ft. lbs.) using the sequence shown.

NOTE: Right hand door shown, left hand door opposite.

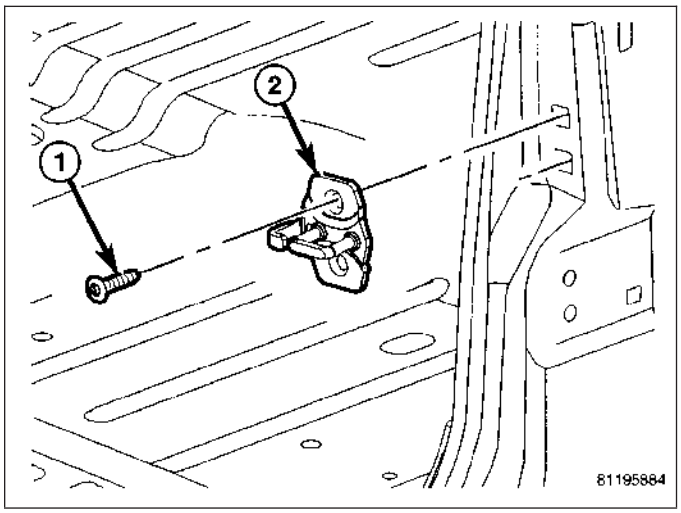
4. Install the door. (Refer to 23 - BODY/DOOR - FRONT/DOOR - INSTALLATION)



STRIKER

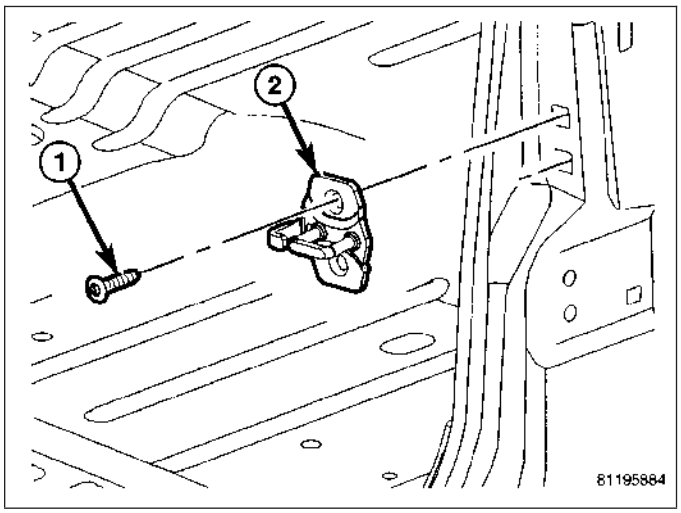
REMOVAL

1. Using a grease pencil or equivalent, mark the position of the striker (2).
2. Remove the bolts (1) and remove the striker.



INSTALLATION

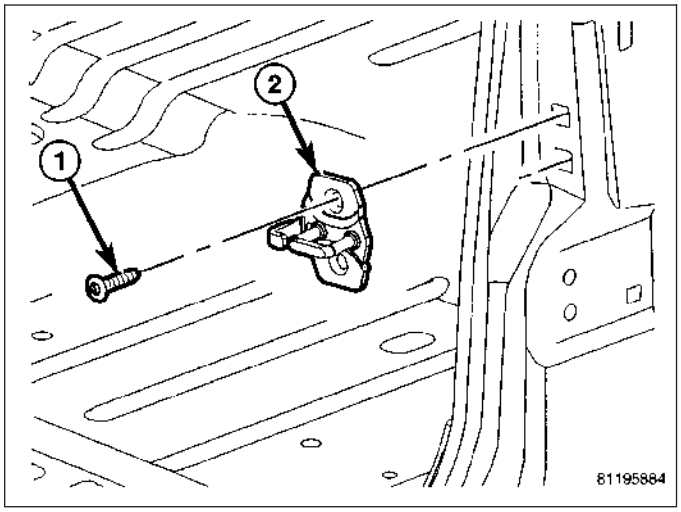
1. Install the striker and install the bolts.
2. Tighten the bolts to 28 N·m (21 ft. lbs.).
3. Adjust the striker if needed. (Refer to 23 - BODY/DOOR - FRONT/LATCH STRIKER - ADJUSTMENTS)



ADJUSTMENTS

ADJUSTMENT

1. Using a grease pencil or equivalent, mark the position of the striker (2) to aid in adjustment.
2. Loosen the striker bolts (1).
3. Change the striker position to adjust the rear gap and flush measurement. (Refer to 23 - BODY/ BODY STRUCTURE/GAP AND FLUSH - SPECIFICATIONS)
4. Tighten the bolts to 28 N·m (21 ft. lbs.).



DOORS - REAR

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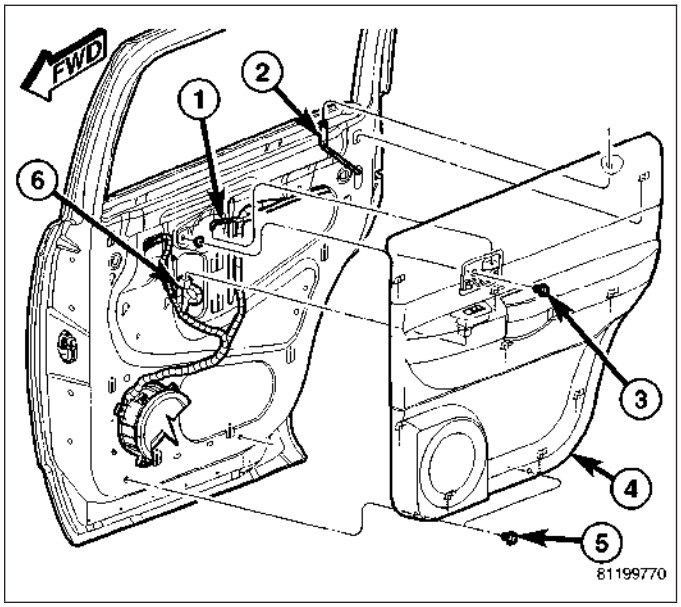
PANEL-TRIM

REMOVAL

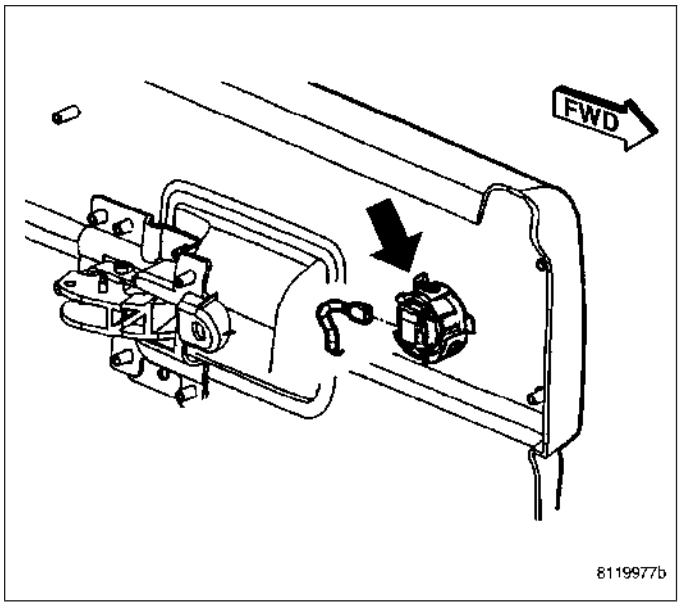
1. Remove the screws (3 & 5).

CAUTION: Trim panel is attached to the door using hooks molded into the panel. Do not pull the trim panel straight off or damage to the panel and/or power switch assembly may occur.

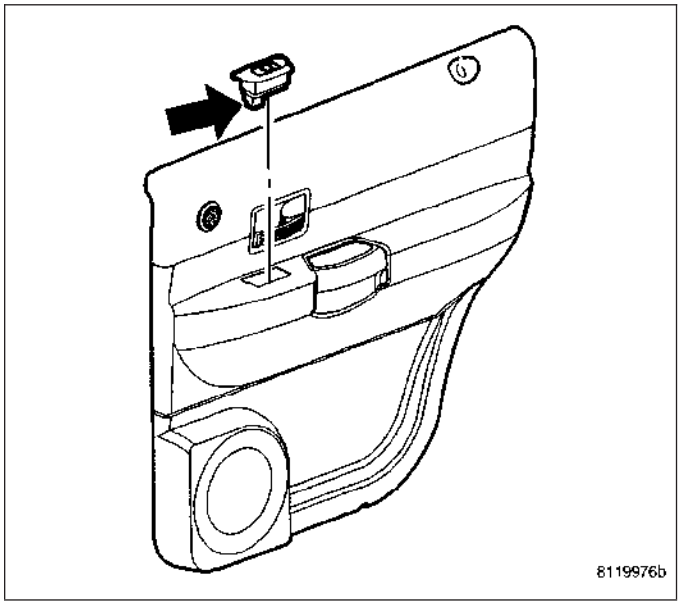
2. Lift the trim panel up off the lock rod (2) and attachment hooks and separate the panel from the door slightly.
3. Disconnect the electrical connectors (6).
4. Disconnect the inside handle actuator rod (1).



5. Disconnect the electrical connector and remove the tweeter.

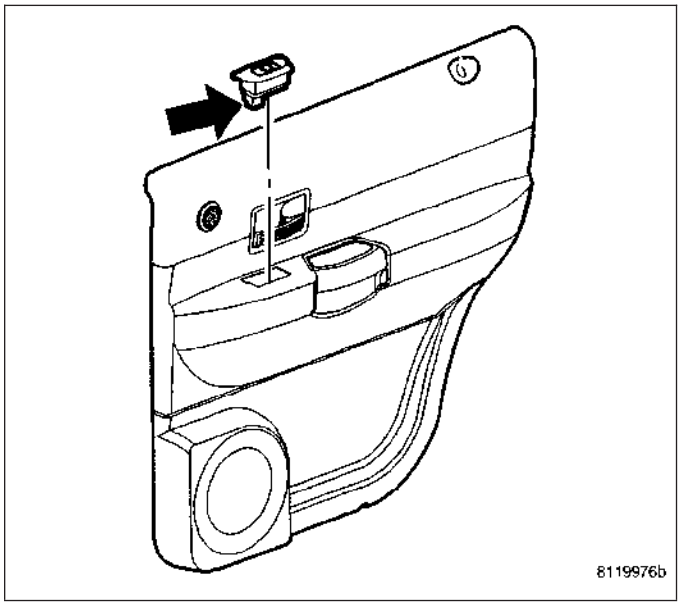


6. Remove the switch panel if necessary.

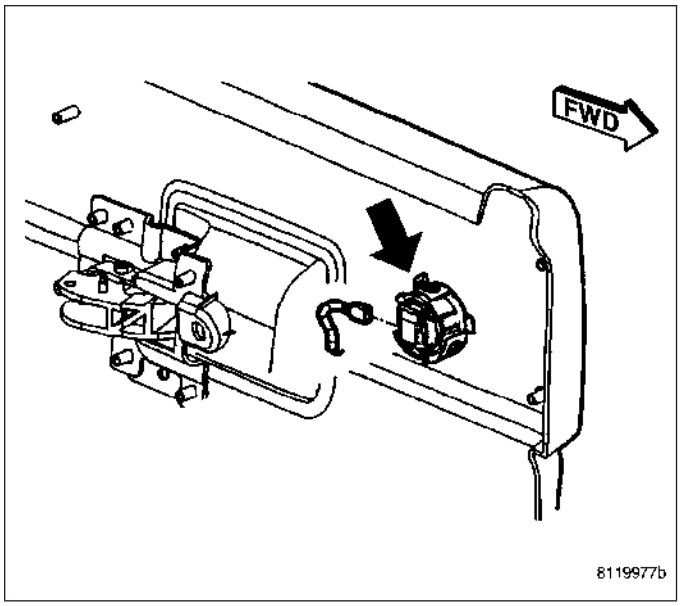


INSTALLATION

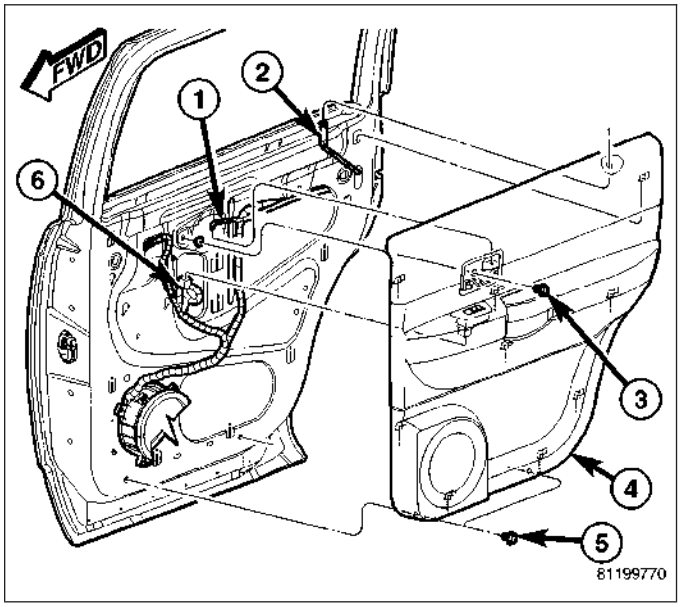
1. Install the switch assembly.



2. Install the tweeter and connect the electrical connector.



3. Position the trim panel (4) and connect the inside handle actuator rod (1).
4. Connect the electrical connectors (6).
5. Lift the trim panel up and onto the lock rod (2) and attachment hooks.
6. Install the screws (3 & 5).



WATERSHIELD

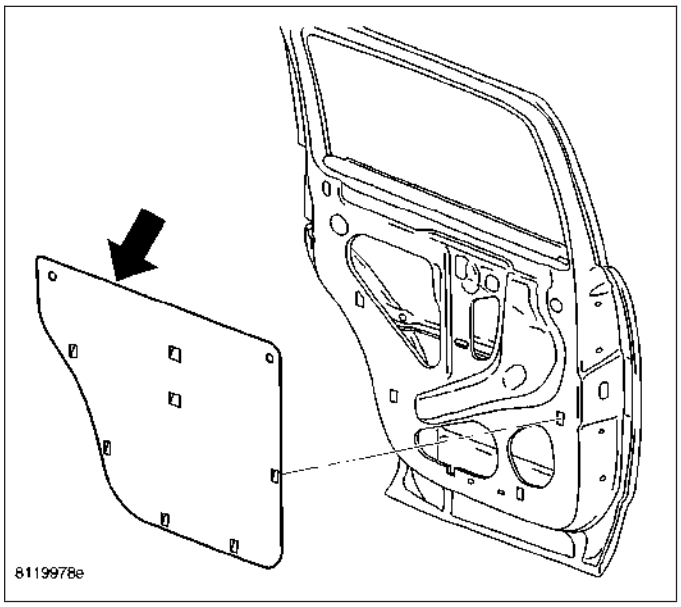
REMOVAL

CAUTION: Do not allow the watershield or adhesive to become contaminated with dirt or other foreign substances.

Do not damage the watershield during removal and installation.

If the watershield becomes contaminated or damaged, replace the watershield.

1. Remove the speaker. (Refer to 8 - ELECTRICAL/AUDIO/SPEAKER - REMOVAL)
2. Remove the door trim panel. (Refer to 23 - BODY/DOORS - REAR/TRIM PANEL - REMOVAL)
3. Separate the watershield from the inner door panel and off of the latch linkages.



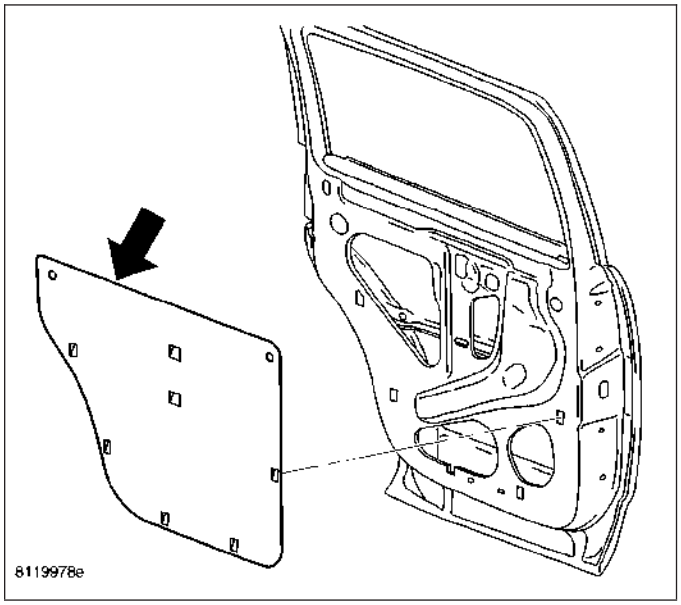
INSTALLATION

CAUTION: Do not allow the watershield or adhesive to become contaminated with dirt or other foreign substances.

Do not damage the watershield during removal and installation.

If the watershield becomes contaminated or damaged, replace the watershield.

1. Position the wire harness and actuator rods through the holes in the watershield.
2. Secure the watershield to the inner door panel.
3. Install the speaker. (Refer to 8 - ELECTRICAL/AUDIO/SPEAKER - INSTALLATION)
4. Install the trim panel. (Refer to 23 - BODY/DOORS - REAR/TRIM PANEL - INSTALLATION)



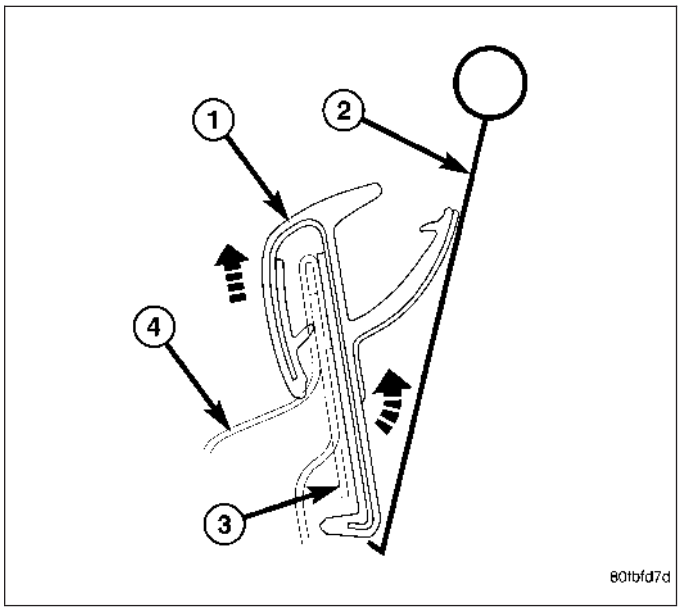
GLASS

REMOVAL

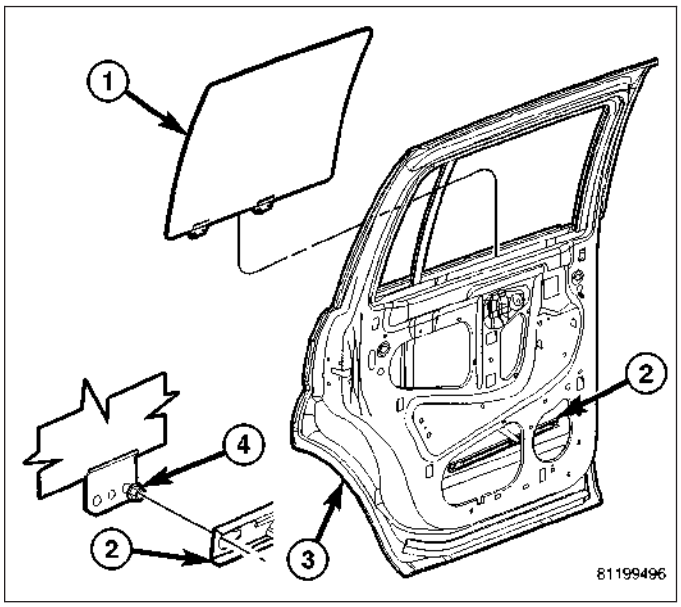
1. Remove the watershield. (Refer to 23 - BODY/ DOORS - REAR/WATERSHIELD - REMOVAL)
2. Separate the inner belt molding from the mounting flange from the rear to the front.
3. Insert special tool #9093 (2) between the outer belt molding (1) and glass at the rear.
4. Push down on outer belt molding (1) and rotate upper part of tool (2) outward from vehicle then lift up on molding (1) to disengage from locking tabs (3) working from back to front.

NOTE: Typical outer belt molding design shown.

5. Slide molding out from under the side view mirror and remove.



6. Temporarily install the window switch and position the glass (1) to gain access (2) to the regulator nuts (4).
7. Remove the nuts (4) and remove the glass (1).

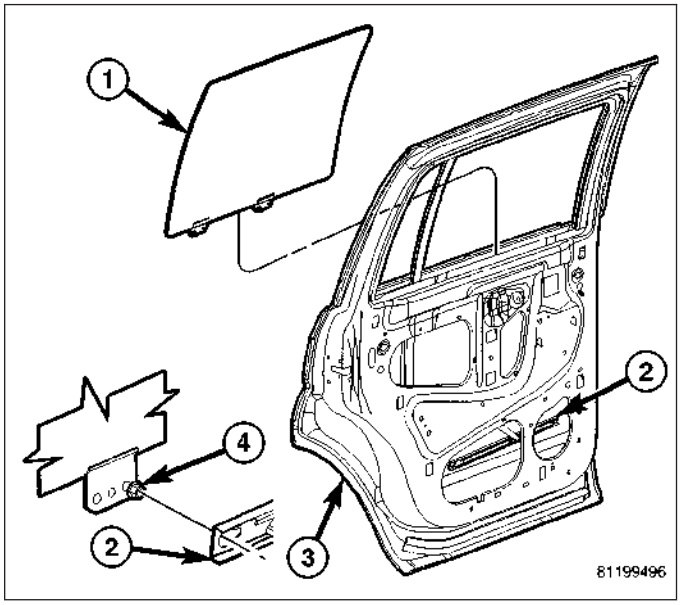


NOTE: When removing the quarter glass, remove rear glass run channel and weather strip and separate the glass from the strip. (Refer to 23 - BODY/DOORS - REAR/GLASS RUN CHANNEL - INSTALLATION)

INSTALLATION

NOTE: When installing the quarter glass, position the glass in the glass run weather strip and seat fully then install the rear glass run channel. (Refer to 23 - BODY/DOORS - REAR/GLASS RUN CHANNEL - INSTALLATION)

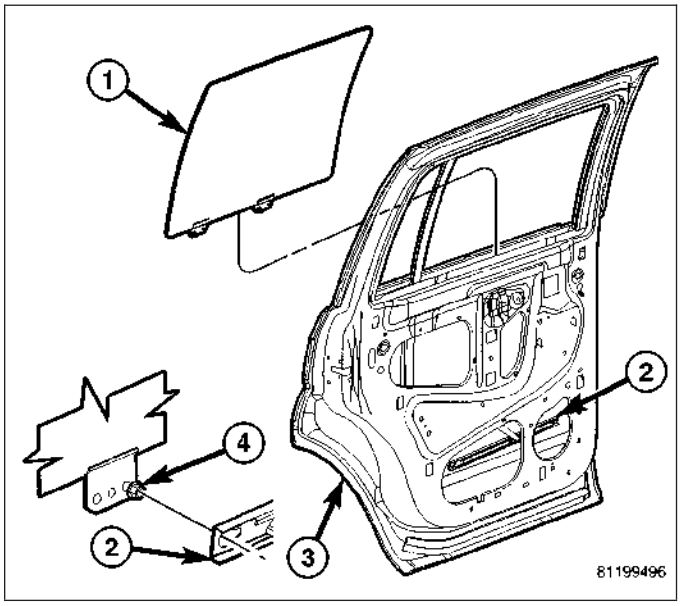
1. Position the glass into the door and install onto the regulator.
2. Install the nuts (4) and tighten to 9 N·m (80 in. lbs.).
3. Position the outer belt molding onto the door and seat the molding fully starting at the back of the door.
4. Position the inner belt molding onto the door and seat fully starting at the back of the door.
5. Install the watershield. (Refer to 23 - BODY/DOORS - REAR/WATERSHIELD - INSTALLATION)



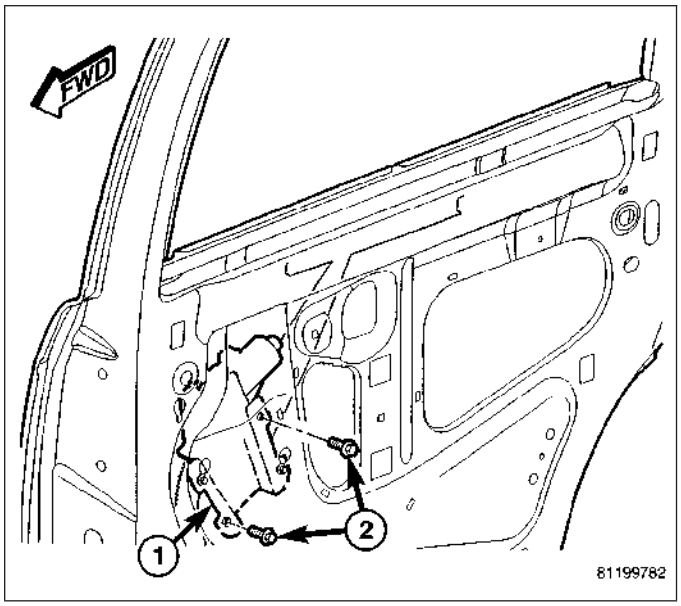
REGULATOR-WINDOW

REMOVAL

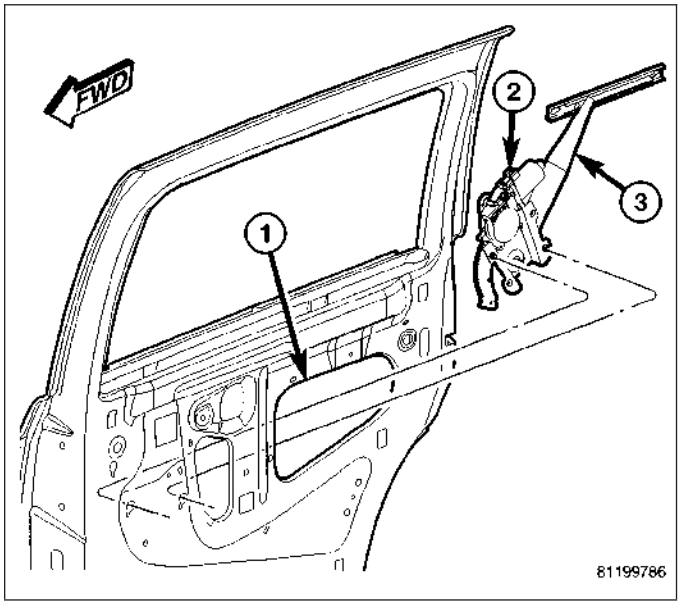
1. Remove the watershield. (Refer to 23 - BODY/DOORS - REAR/WATERSHIELD - REMOVAL)
2. Temporarily install the window switch and position the glass (1) to gain access to the regulator nuts (4).
3. Remove the nuts (4).
4. Secure the glass in the up position using a wood wedge or equivalent.



5. Remove the bolts (2) and loosen the remaining regulator bolts.

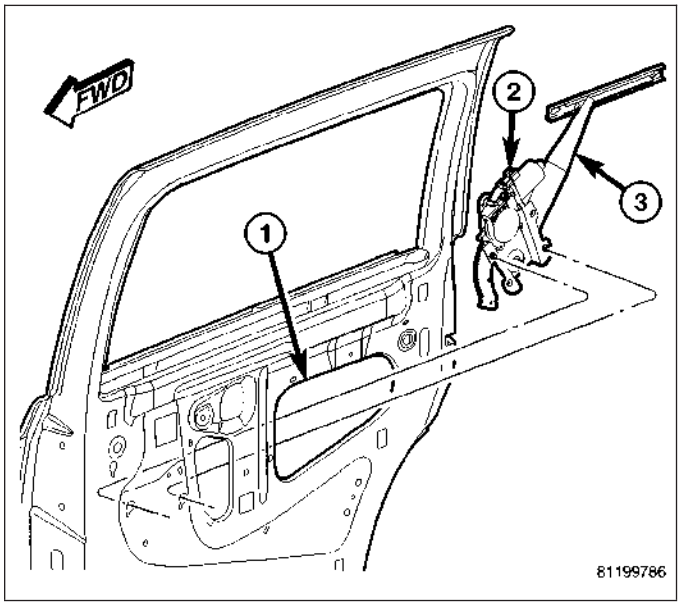


6. Separate the regulator (3) from the door panel (1) and disconnect the electrical connector (2).

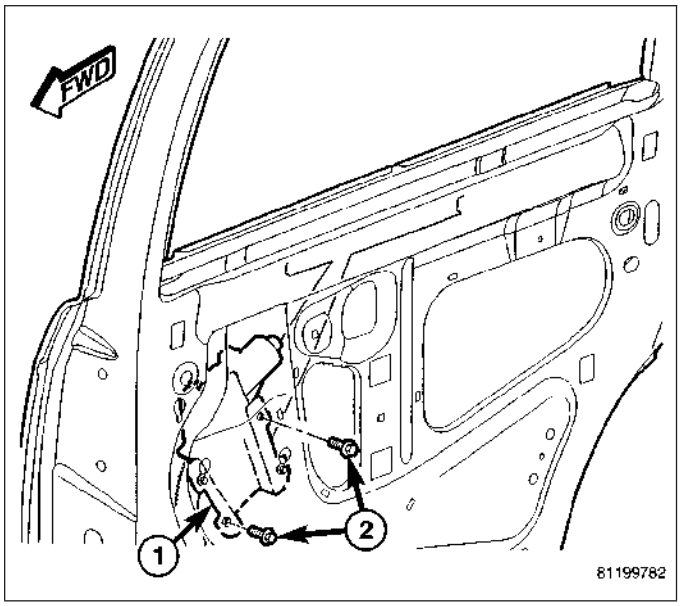


INSTALLATION

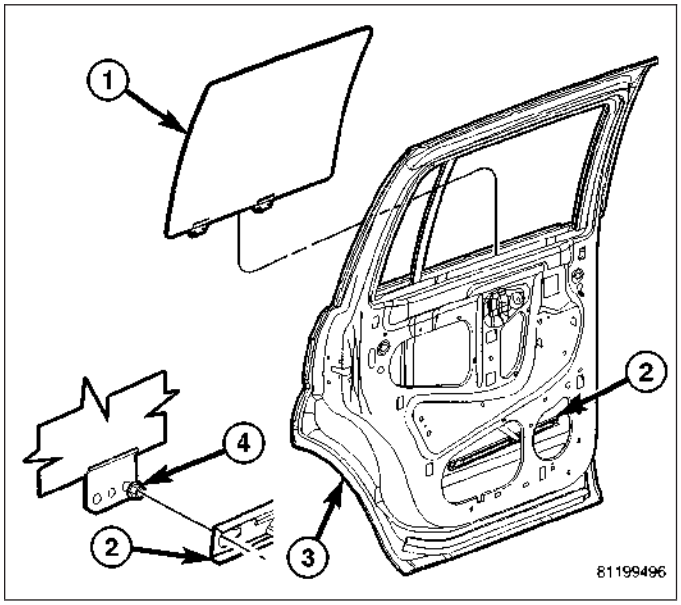
1. Position the regulator (3) into the door (1) and connect the electrical connector (2).



2. Position the regulator bolts into the keyhole slots and slide into place.
3. Install the remaining regulator bolts (2).
4. Tighten the bolts to 9 N·m (80 in. lbs.).



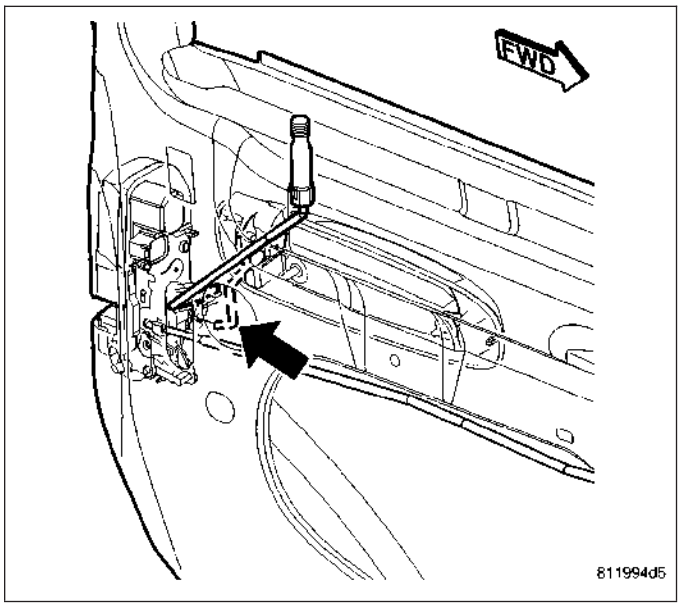
5. Position the glass (1) onto the door regulator (3).
6. Install the nuts (4) and tighten to 9 N·m (80 in. lbs.).
7. Install the watershield. (Refer to 23 - BODY/ DOORS - REAR/WATERSHIELD - INSTALLATION)



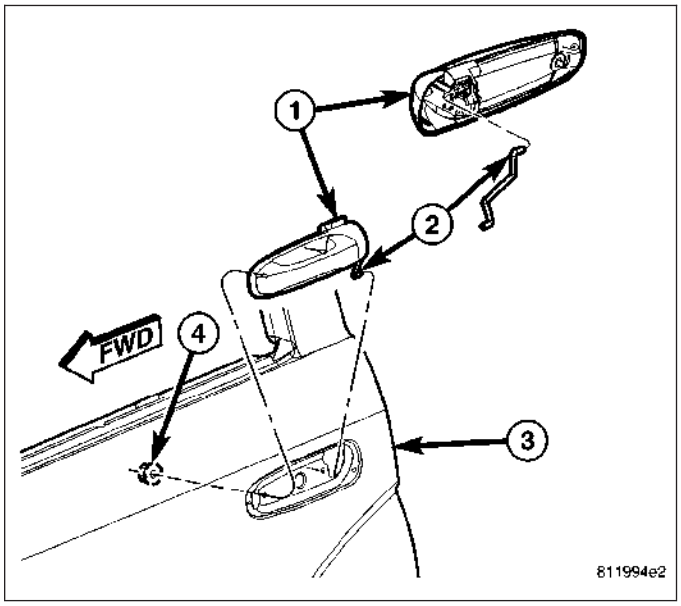
HANDLE-EXTERIOR

REMOVAL

1. Remove the watershield. (Refer to 23 - BODY/ DOORS - REAR/WATERSHIELD - REMOVAL)
2. Disconnect the link from the latch.

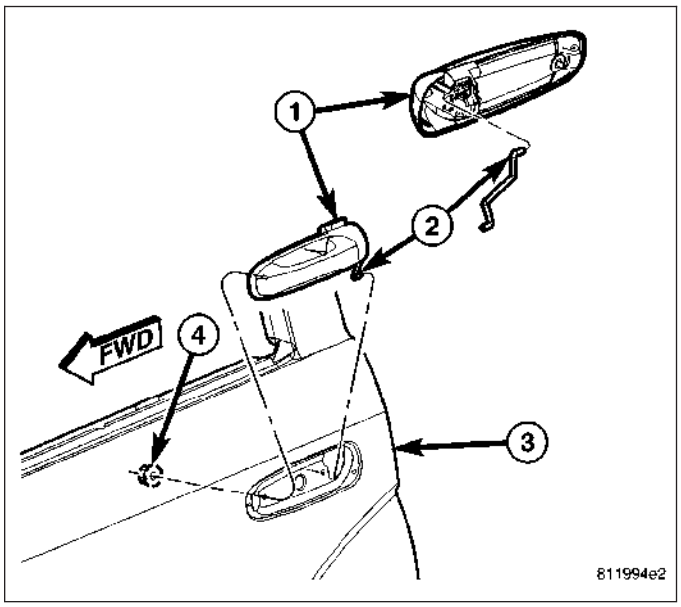


3. Remove the nut (4) and the handle (1).

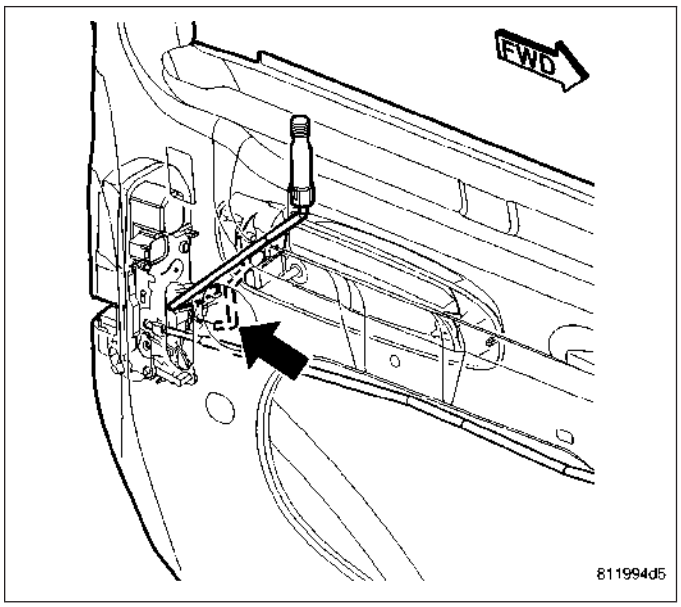


INSTALLATION

1. Position the handle (1) into the door and install the nuts (4).
2. Tighten the nuts to 5 N·m (45 in. lbs.).



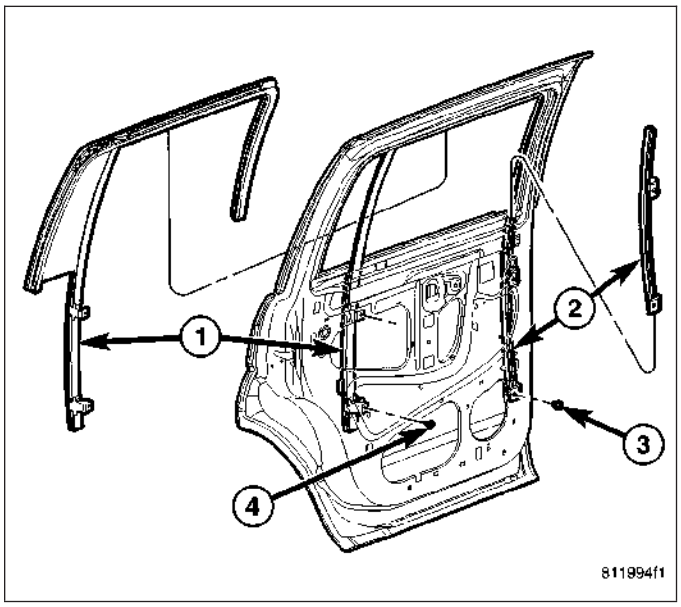
3. Connect the link.
4. Install the watershield. (Refer to 23 - BODY/ DOORS - REAR/WATERSHIELD - INSTALLATION)



CHANNEL-GLASS

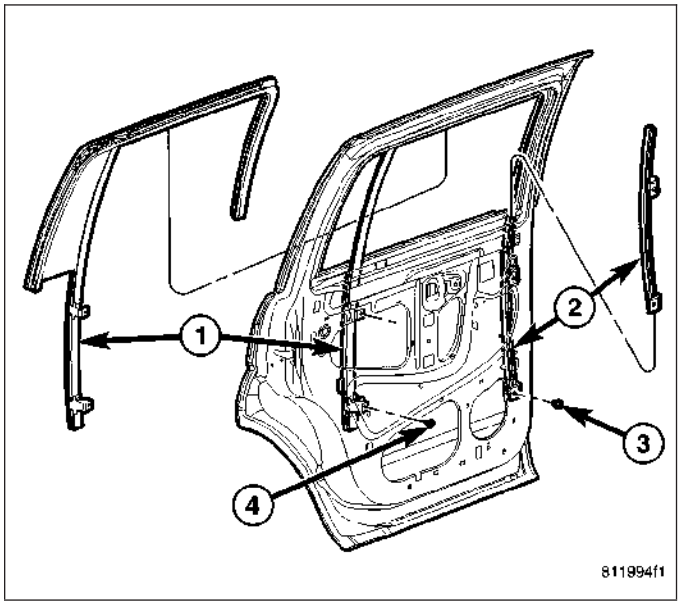
REMOVAL

1. Raise glass to the up position and remove the watershield. (Refer to 23 - BODY/DOORS - REAR/WATERSHIELD - REMOVAL)
2. Remove the inner belt molding.
3. Remove the bolt and nut (3) and remove the front channel.
4. Remove the door glass as necessary. (Refer to 23 - BODY/DOORS - REAR/DOOR GLASS - REMOVAL)
5. Remove the bolt (4) and remove the rear glass run channel and stationary glass (1).



INSTALLATION

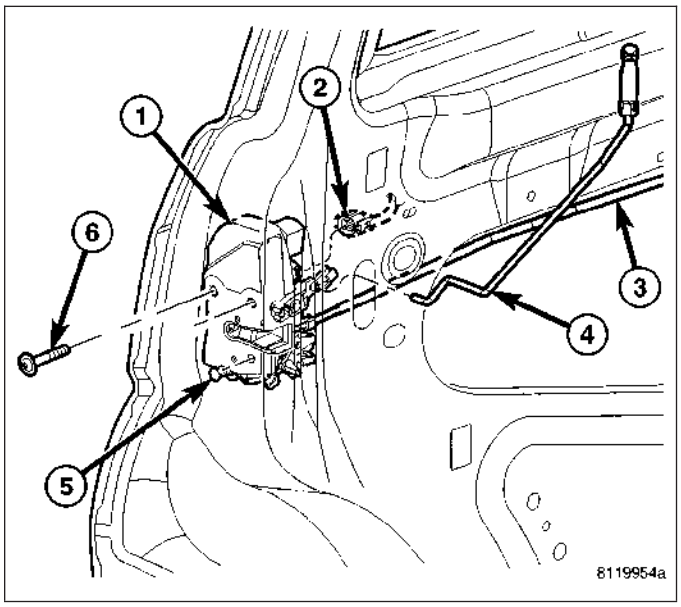
1. Install the rear glass run channel and stationary glass (1) into the door and seat fully along the door frame.
2. Install the bolt (4) and tighten to 9 N·m (80 in. lbs.).
3. Install the door glass as necessary except for the inner belt molding. (Refer to 23 - BODY/DOORS - REAR/DOOR GLASS - INSTALLATION)
4. Install the front glass run channel and install the bolt and nut (3).
5. Tighten the bolt and nut (3) to 9 N·m (80 in. lbs.).
6. Install the inner belt molding and install the watershield. (Refer to 23 - BODY/DOORS - REAR/WATERSHIELD - INSTALLATION)



LATCH

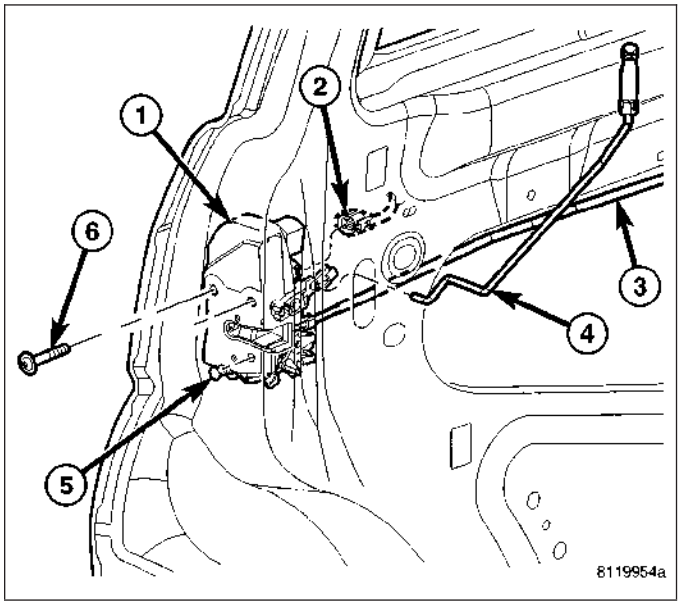
REMOVAL

1. Remove the watershield. (Refer to 23 - BODY/ DOORS - REAR/WATERSHIELD - REMOVAL)
2. Disconnect the latch actuator rods (3 & 4).
3. Remove the screws (5) and remove the latch (1).
4. Disconnect the electrical connector (2).



INSTALLATION

1. Position the latch (1) into the door and connect the electrical connector (2).
2. Install the latch and install the screws (5).
3. Tighten the screws to 10 N·m (85 in. lbs.).
4. Connect the actuator rods (3 & 4).
5. Install the watershield. (Refer to 23 - BODY/ DOORS - REAR/WATERSHIELD - INSTALLATION)



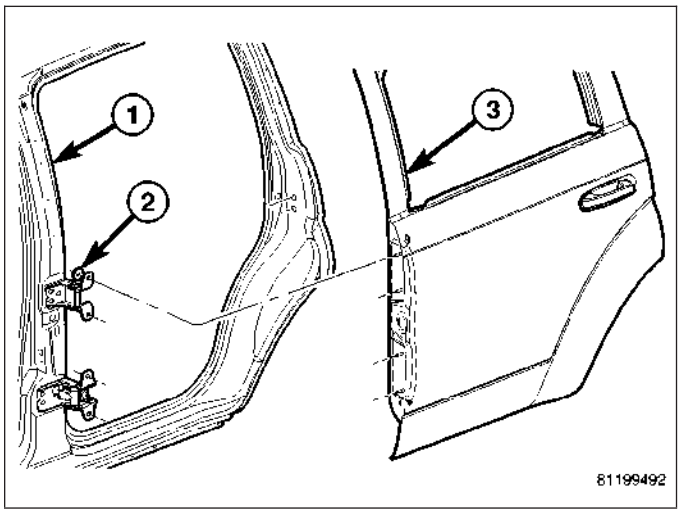
DOOR

REMOVAL

1. Disconnect the door wire harness electrical connector at the b-pillar.
2. Using a grease pencil or equivalent, mark the outline of the door hinges on the door end to aid installation.
3. Support the door with a suitable lifting device.

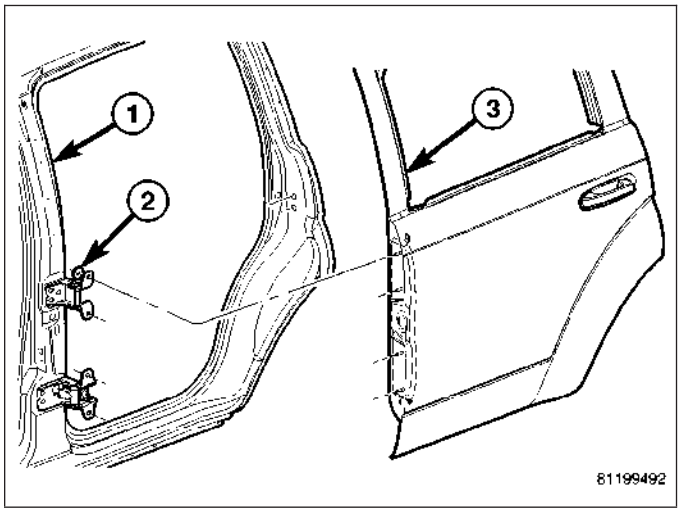
NOTE: The welded washers should not be separated from the hinge. If the washers are removed the door may have to be re-adjusted.

4. Remove the nuts attaching the door hinges (2) to the door (3).



INSTALLATION

1. Support the door with a suitable lifting device and install the door onto the hinges.
2. Install the nuts and washers, if there were removed previously, and tighten to 28 N·m (21 ft. lbs.).
3. Connect the electrical connector.
4. Adjust the door as necessary. (Refer to 23 - BODY/DOORS - REAR/DOOR - ADJUSTMENTS)



ADJUSTMENTS

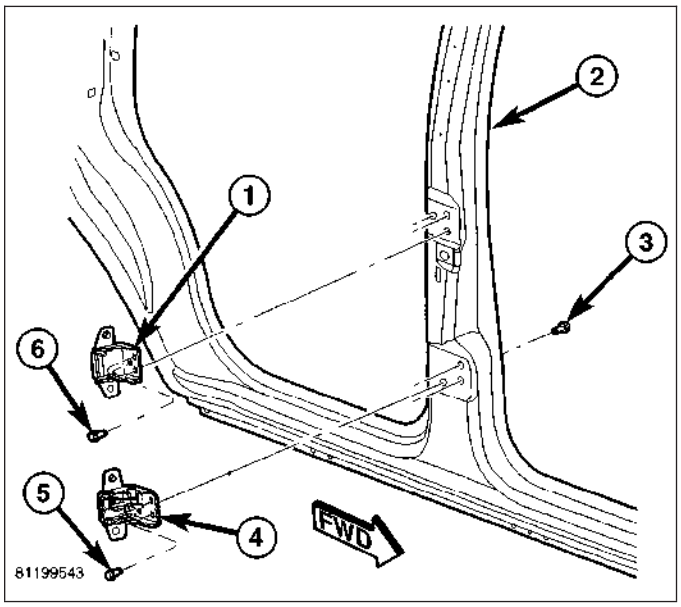
NOTE: For vehicles with four doors, it is recommended that you adjust the rear door before adjusting the front door. (Refer to 23 - BODY/DOORS - REAR/DOOR - ADJUSTMENTS)

- **Door adjustment measurements should be taken from stationary or welded body panels like the roof, rocker or quarter panels.**
- **During adjustment procedures, it is recommended that all the hinge fasteners be loosened except for the upper most fasteners. Adjustments can be made using the upper bolts to hold the door with final torque of the fasteners occurring after correct door positioning is achieved.**
- **A suitable body sealant should be used when removing or moving the hinges.**

FORE/AFT

NOTE: Fore/aft (lateral) door adjustment is done by loosening the hinge to the hinge pillar fasteners one hinge at a time and moving the door to the correct position.

1. Support the door with a suitable lifting device.
2. Loosen the hinge (1) to hinge pillar fasteners (3). (Refer to 23 - BODY/DOOR - FRONT/HINGE - REMOVAL)
3. Adjust the door to the correct position. (Refer to 23 - BODY/BODY STRUCTURE/GAP AND FLUSH - SPECIFICATIONS)
4. Tighten the hinge pillar fasteners to 28 N·m (21 ft. lbs.). (Refer to 23 - BODY/DOORS - REAR/HINGE - INSTALLATION)



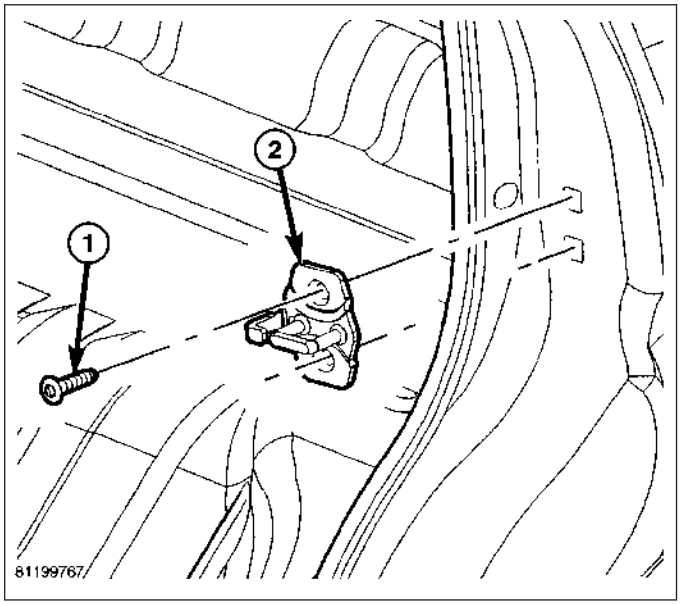
UP/DOWN

NOTE: Up/down door adjustment is done by loosening either the hinge to the hinge pillar fasteners or the hinge to door fasteners and moving the door to the correct position.

NOTE: When adjustment of the door requires the loosening of the door to hinge fasteners, it will be necessary to separate the welded washers with a chisel or other suitable tool.

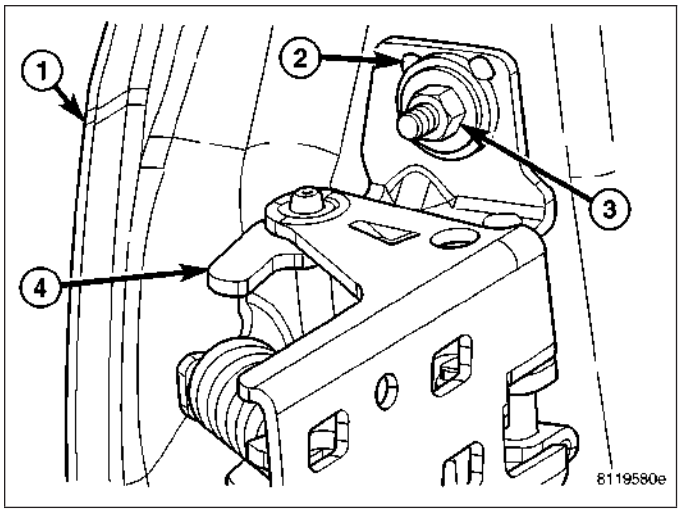
NOTE: When the up/down adjustments are done correctly, the top of the door is positioned over flush to the roof. (Refer to 23 - BODY/BODY STRUCTURE/GAP AND FLUSH - SPECIFICATIONS)

1. Support the door with a suitable lifting device.
2. Loosen the latch striker bolts (1). (Refer to 23 - BODY/DOOR - FRONT/LATCH STRIKER - REMOVAL)



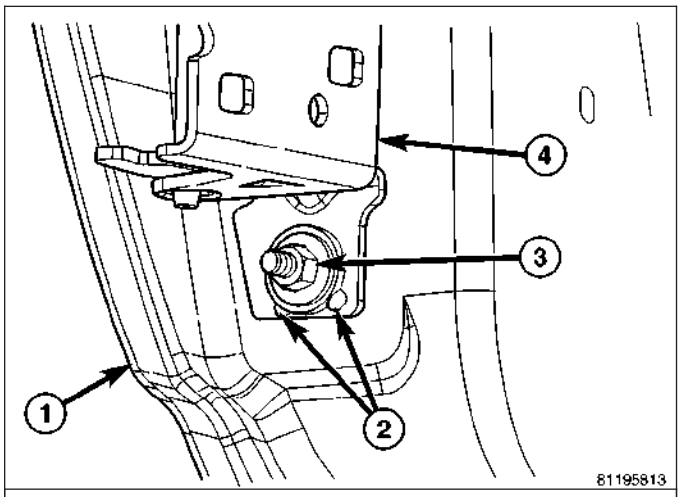
3. Loosen the hinge to door fasteners (3) (Refer to 23 - BODY/DOOR - FRONT/DOOR - REMOVAL) or loosen the hinge to hinge pillar fasteners (Refer to 23 - BODY/DOOR - FRONT/HINGE - REMOVAL).

NOTE: When adjusting the door using the door to hinge adjustment, remove the upper hinge welds (2) and separate the washers from the hinge (4).

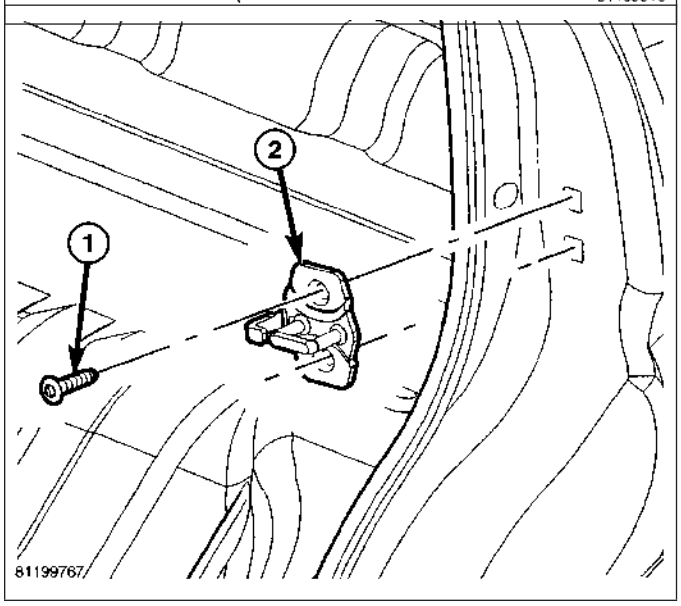


NOTE: When adjusting the door using the door to hinge adjustment, remove the lower hinge welds (2) and separate the washers from the hinge (4).

4. Adjust the door to the correct position. (Refer to 23 - BODY/BODY STRUCTURE/GAP AND FLUSH - SPECIFICATIONS)
5. Tighten the hinge pillar fasteners or the door to hinges fasteners to 28 N·m (21 ft. lbs.). (Refer to 23 - BODY/DOORS - REAR/HINGE - INSTALLATION)



6. Tighten the latch striker bolts (1). (Refer to 23 - BODY/DOOR - FRONT/LATCH STRIKER - INSTALLATION)

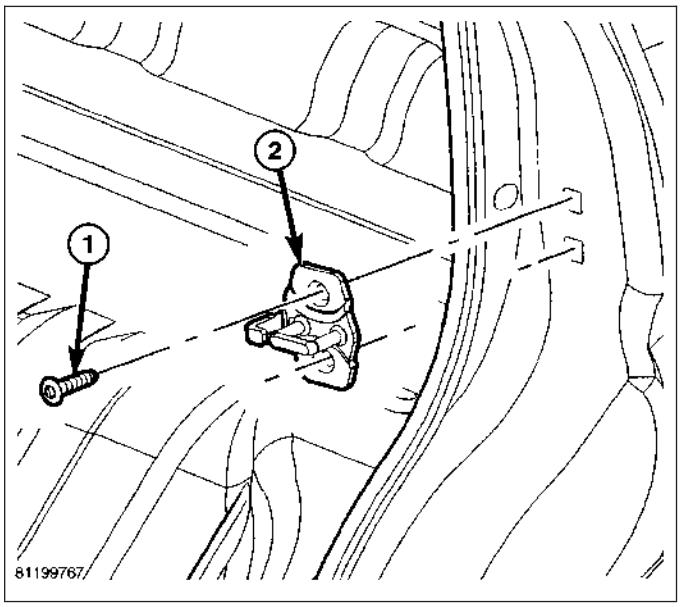


IN/OUT

NOTE: In/out door adjustment is done by loosening the hinge to door fasteners one hinge at a time and moving the door to the correct position.

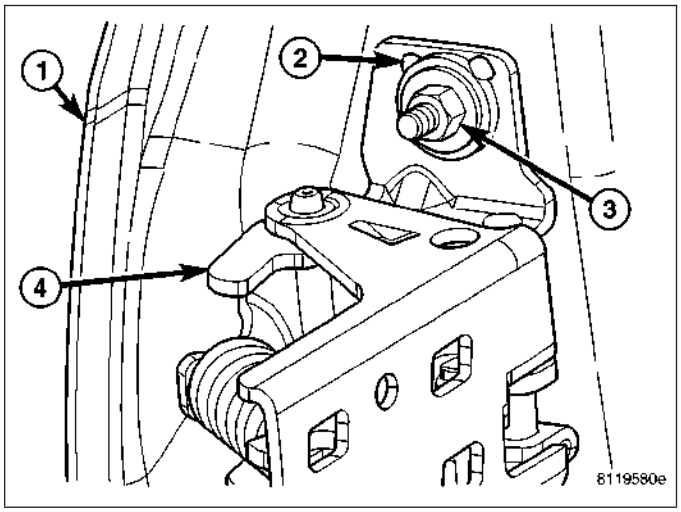
NOTE: When adjustment of the door requires the loosening of the door to hinge fasteners, it will be necessary to separate the welded washers with a chisel or other suitable tool.

1. Support the door with a suitable lifting device.
2. Loosen the latch striker bolts (1). (Refer to 23 - BODY/DOOR - FRONT/LATCH STRIKER - REMOVAL)



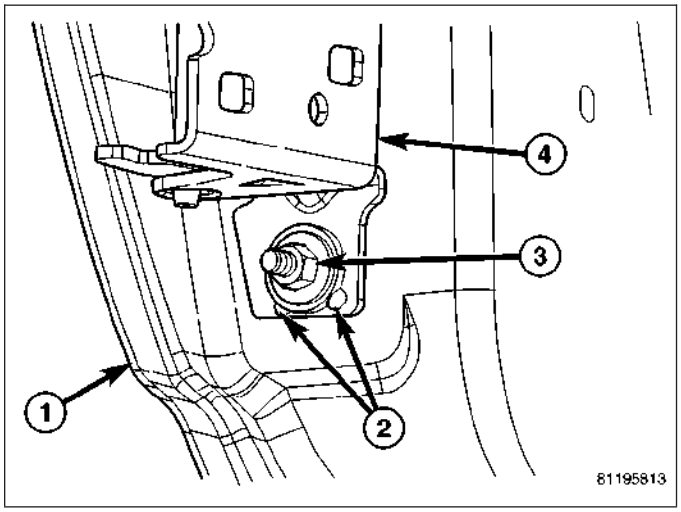
3. Loosen the hinge to door fasteners (3). (Refer to 23 - BODY/DOOR - FRONT/DOOR - REMOVAL)

NOTE: When adjusting the door using the door to hinge adjustment, remove the upper hinge welds (2) and separate the washers from the hinge (4).

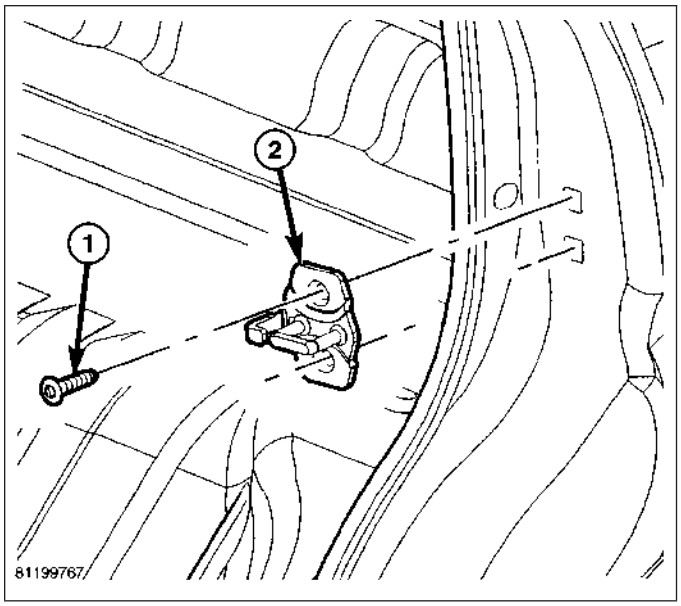


NOTE: When adjusting the door using the door to hinge adjustment, remove the lower hinge welds (2) and separate the washers from the hinge (4).

4. Adjust the door to the correct position. (Refer to 23 - BODY/BODY STRUCTURE/GAP AND FLUSH - SPECIFICATIONS)
5. Tighten the door to hinges fasteners (3) to 28 N·m (21 ft. lbs.). (Refer to 23 - BODY/DOORS - REAR/DOOR - INSTALLATION)



6. Tighten the latch striker bolts (1). (Refer to 23 - BODY/DOOR - FRONT/LATCH STRIKER - INSTALLATION)



HINGE

REMOVAL

NOTE: It is not necessary to remove the door to replace the hinges if they are replaced one at a time.

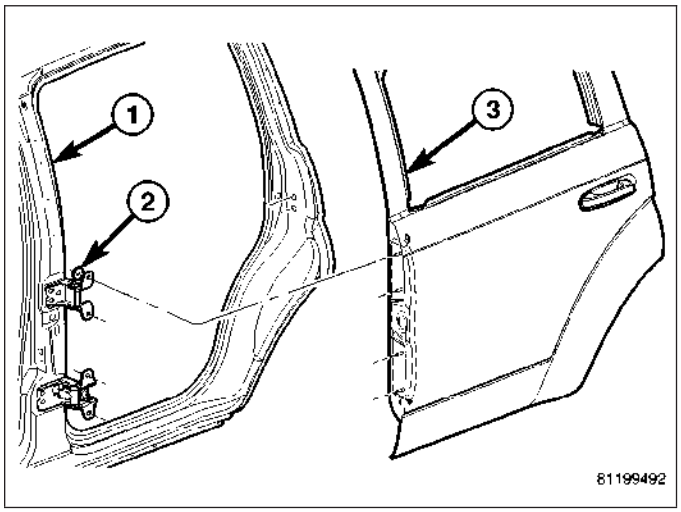
NOTE: The welded washers should not be separated from the hinge. If the washers are removed the door may have to be re-adjusted.

NOTE: A suitable body sealant should be used when removing or moving the hinges.

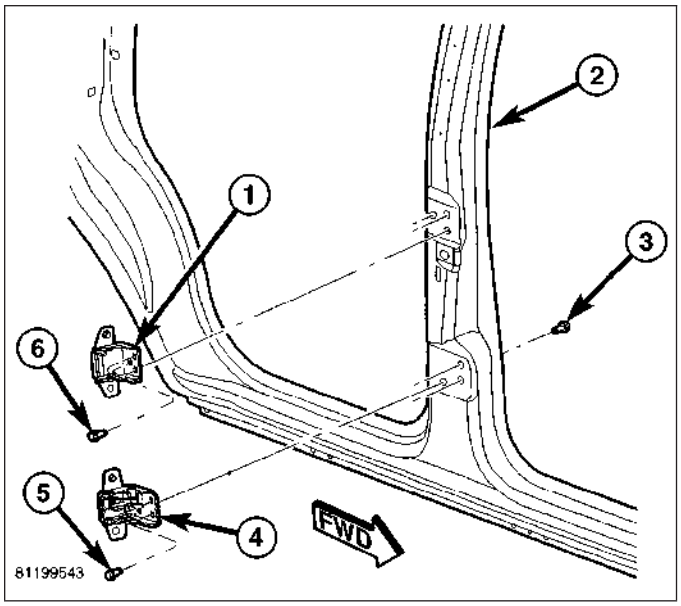
1. Open the front door.

UPPER HINGE

1. Using a grease pencil or equivalent, mark the position of the hinge on the door and b-pillar.
2. Remove the nuts (2) attaching the hinge to the door (3).

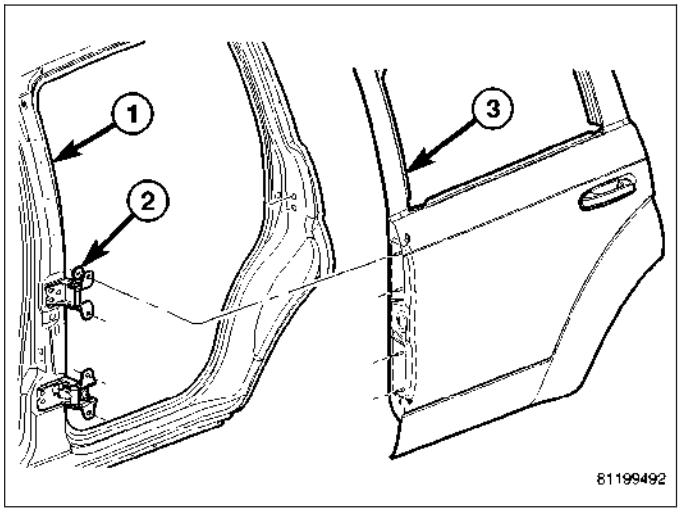


3. Remove the three bolts (6) attaching the hinge (1) to the b-pillar (2) and remove the hinge.

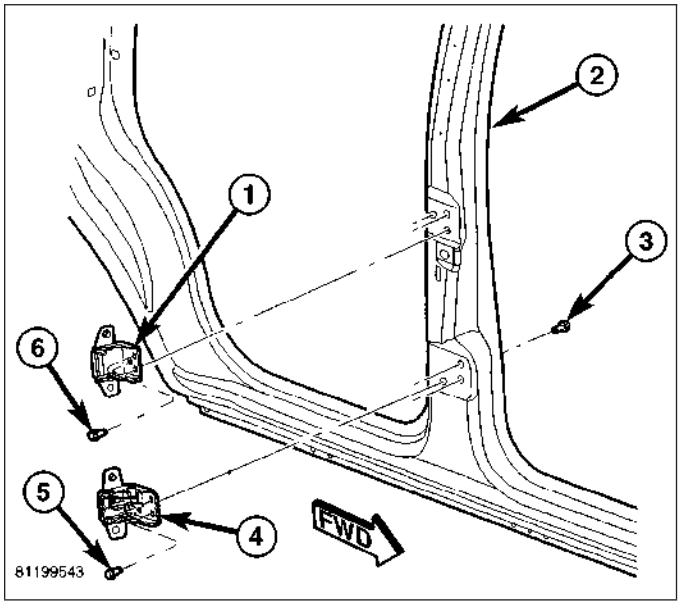


LOWER HINGE

1. Using a grease pencil or equivalent, mark the position of the hinge on the door and b-pillar.
2. Remove the lower b-pillar trim. (Refer to 23 - BODY/INTERIOR/B-PILLAR LOWER TRIM - REMOVAL)
3. Remove the nuts (2) attaching the hinge to the door (3).



4. Remove the two bolts (5) attaching the hinge (4) to the b-pillar (2).
5. From the inside of the vehicle remove the remaining bolt (3) attaching the hinge (4) to the b-pillar (2) and remove the hinge.

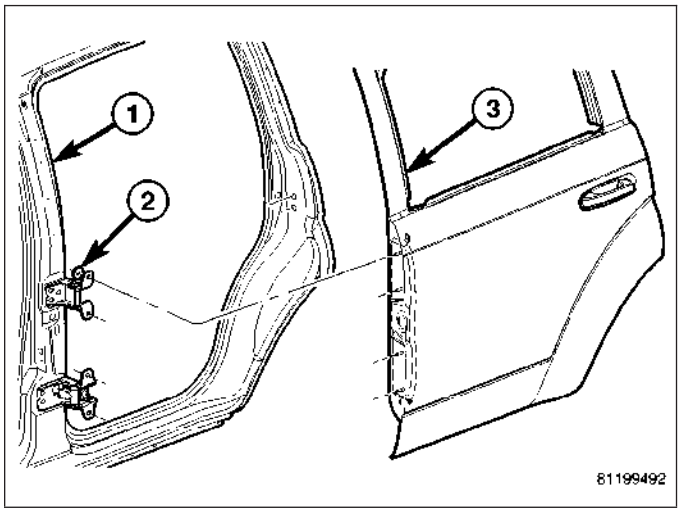


INSTALLATION

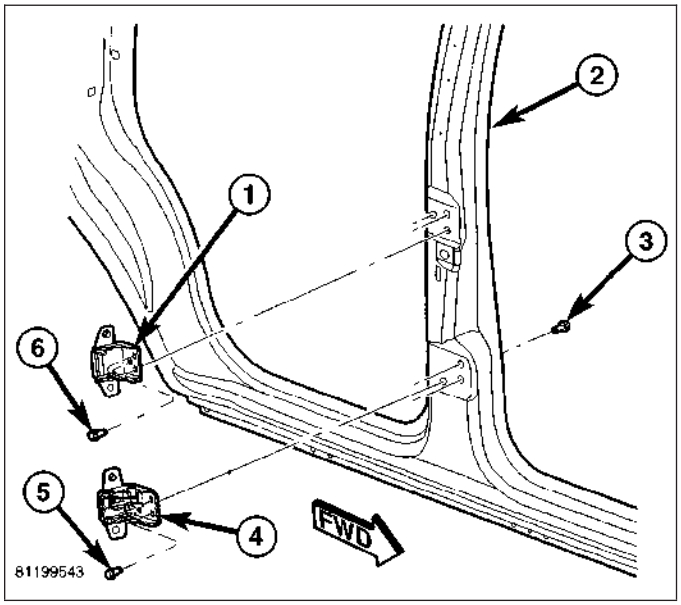
UPPER HINGE

NOTE: A suitable body sealant should be used when removing or moving the hinges.

1. Install the hinge to door washers, if there were removed previously, and nuts (2) and tighten to 28 N·m (21 ft. lbs.).



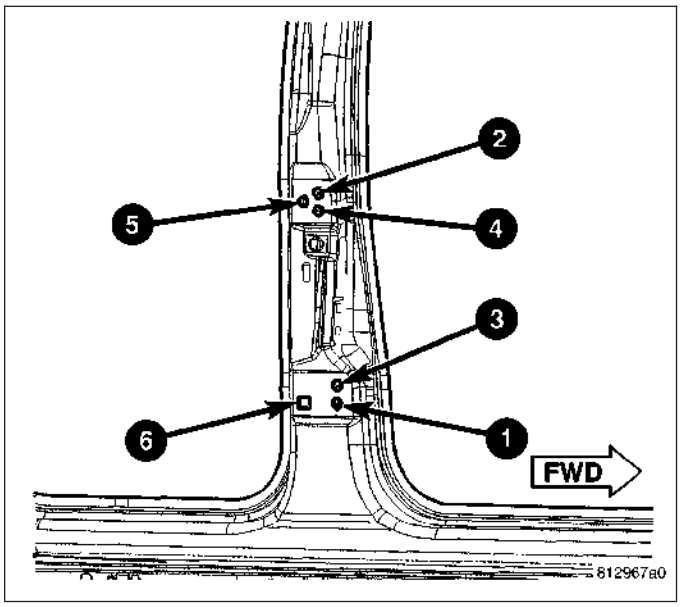
2. Install the three hinge to b-pillar bolts (6).



3. Tighten the bolts to 28 N·m (21 ft. lbs.) using the sequence shown.

NOTE: Right hand door shown, left hand door opposite.

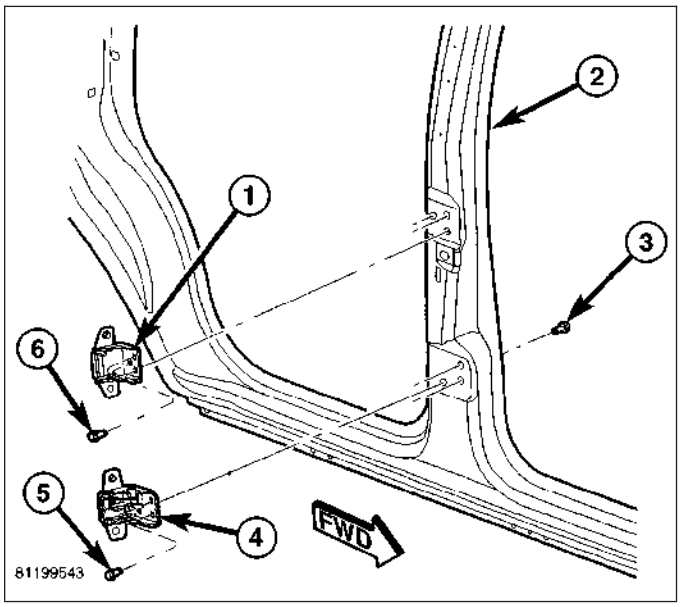
4. Adjust the door if needed. (Refer to 23 - BODY/ DOORS - REAR/DOOR - ADJUSTMENTS)



LOWER HINGE

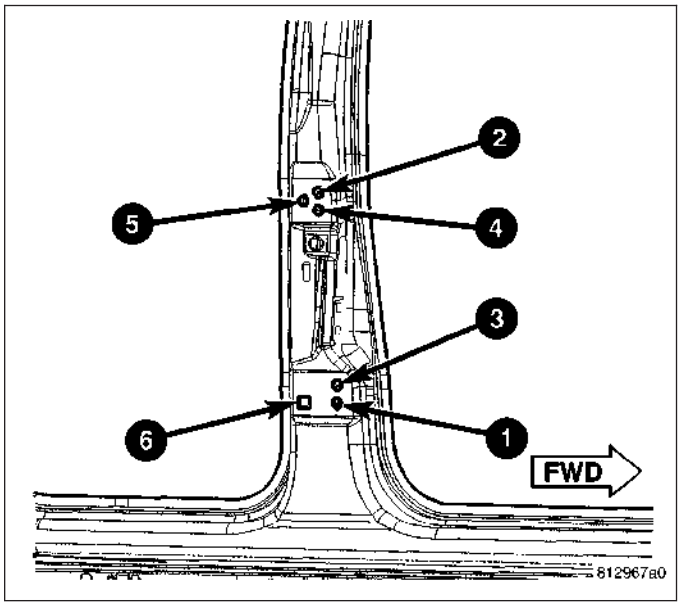
NOTE: A suitable body sealant should be used when removing or moving the hinges.

1. Install the hinge (4) and install the b-pillar bolts (5 & 3).

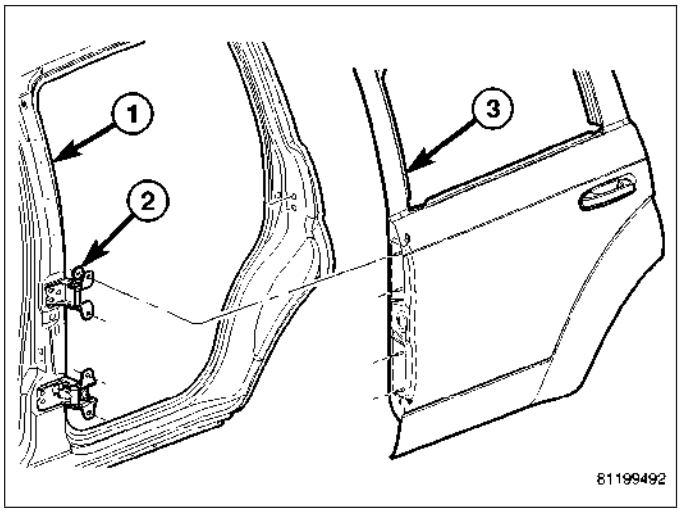


2. Tighten the bolts to 28 N·m (21 ft. lbs.) using the sequence shown.

NOTE: Right hand door shown, left hand door opposite.



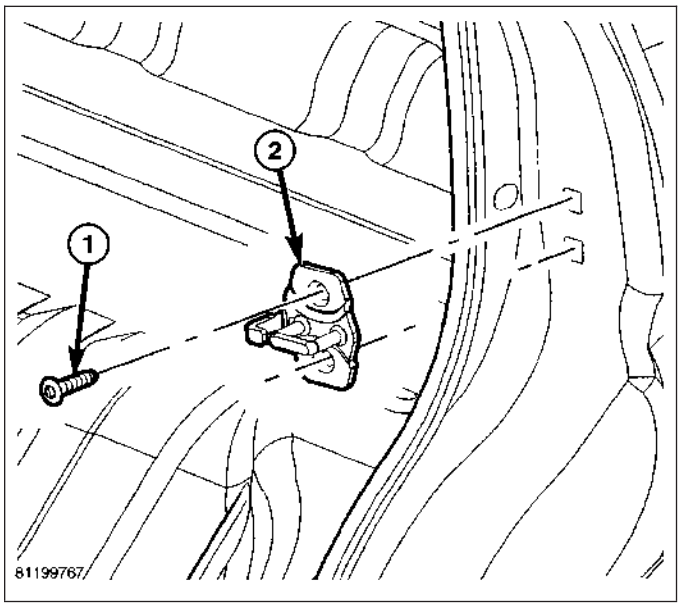
3. Install the hinge to door washers, if there were removed previously, and nuts (2) and tighten to 28 N·m (21 ft. lbs.).
4. Adjust the door if needed. (Refer to 23 - BODY/ DOORS - REAR/DOOR - ADJUSTMENTS)
5. Install the lower b-pillar trim. (Refer to 23 - BODY/ INTERIOR/B-PILLAR LOWER TRIM - INSTALLATION)



STRIKER

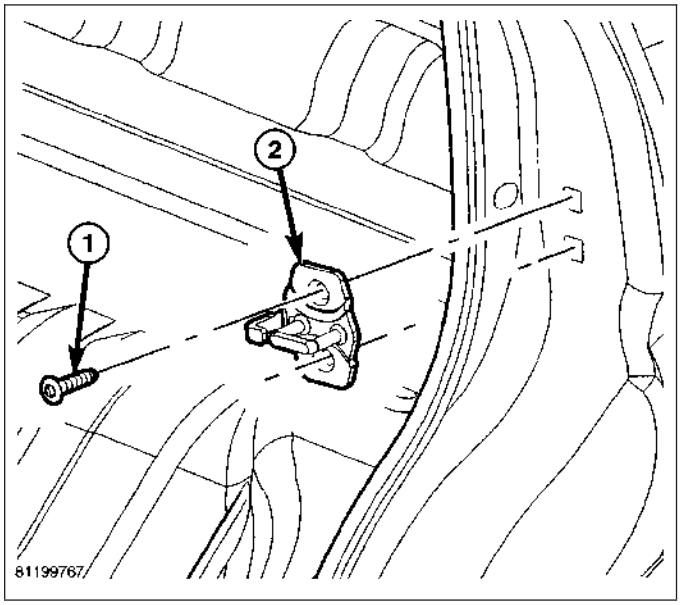
REMOVAL

1. Using a grease pencil or equivalent, mark the position of the striker (2).
2. Remove the bolts (1) and remove the striker.



INSTALLATION

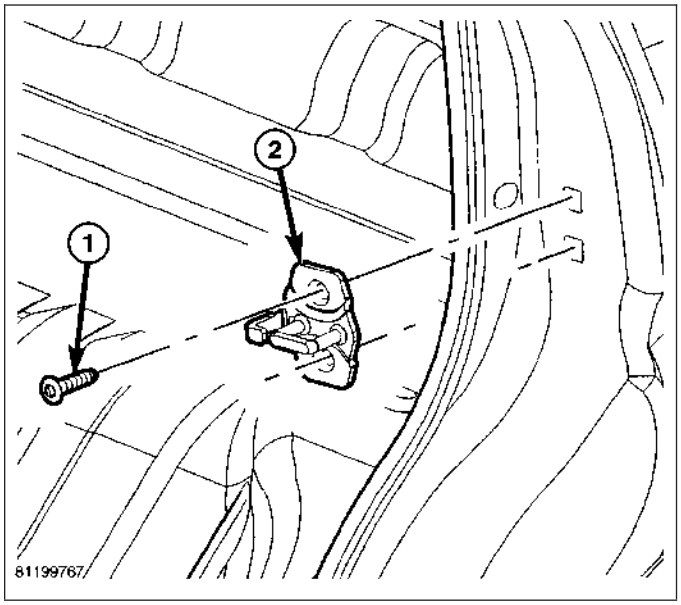
1. Install the striker and install the bolts.
2. Tighten the bolts to 28 N·m (21 ft. lbs.).
3. Adjust the striker if needed. (Refer to 23 - BODY/DOORS - REAR/LATCH STRIKER - ADJUSTMENTS)



ADJUSTMENTS

ADJUSTMENT

1. Using a grease pencil or equivalent, mark the position of the striker (2) to aid in adjustment.
2. Loosen the striker bolts (1).
3. Change the striker position to adjust the rear gap and flush measurement. (Refer to 23 - BODY/ BODY STRUCTURE/GAP AND FLUSH - SPECIFICATIONS)
4. Tighten the bolts to 28 N·m (21 ft. lbs.).



LIFTGATE

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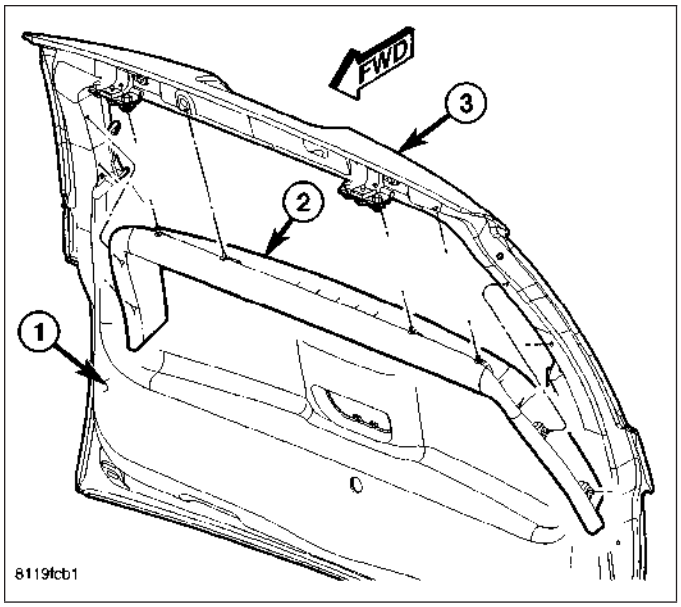
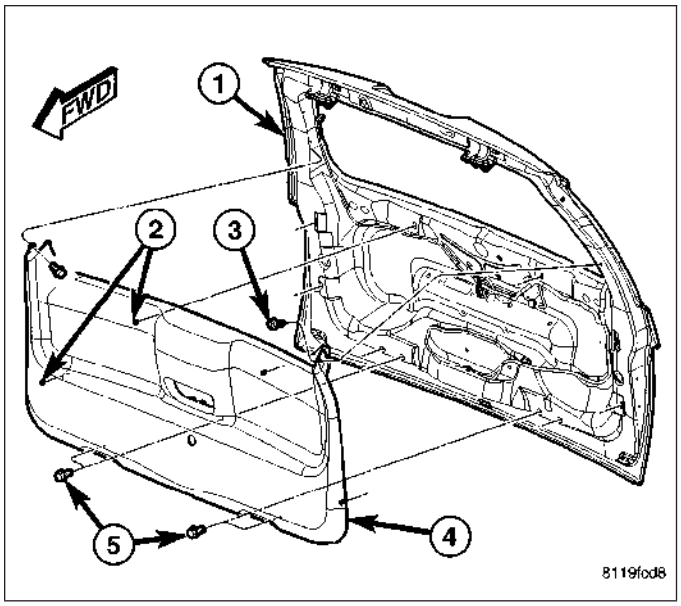
PANEL-TRIM

REMOVAL

1. Using a trim stick C-4829-A or equivalent, separate the pushpin fasteners and remove the upper trim panel (2).

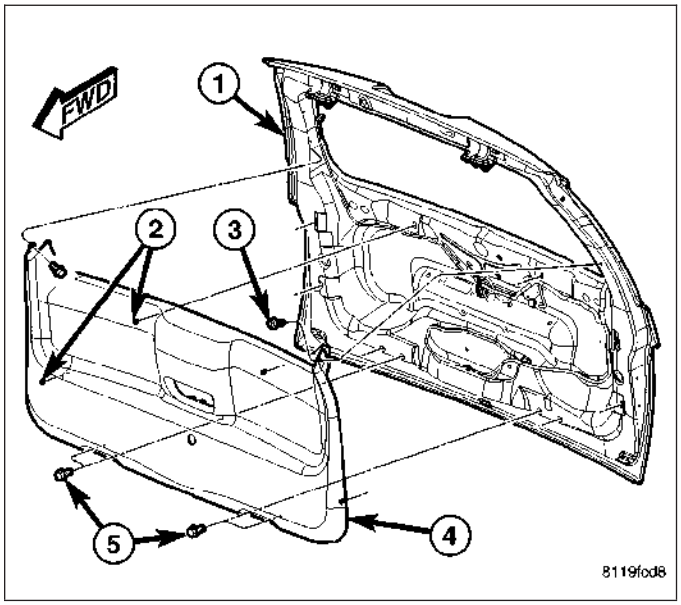


2. Remove the two upper screws (3) and the four lower screws (5).
3. Remove the lower trim panel (4) and disconnect the electrical connector.

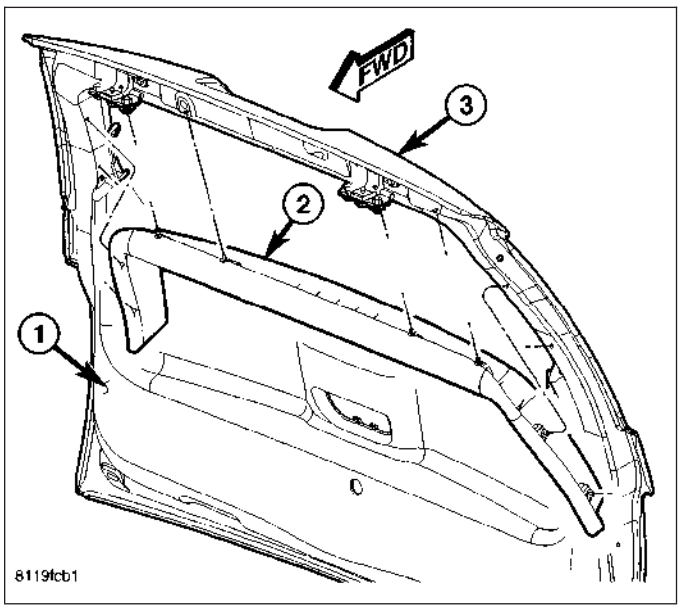


INSTALLATION

1. Connect the electrical connector and install the lower trim panel (4) onto the guide pins (2).
2. Install the four lower screws (5) and two upper screws (3).



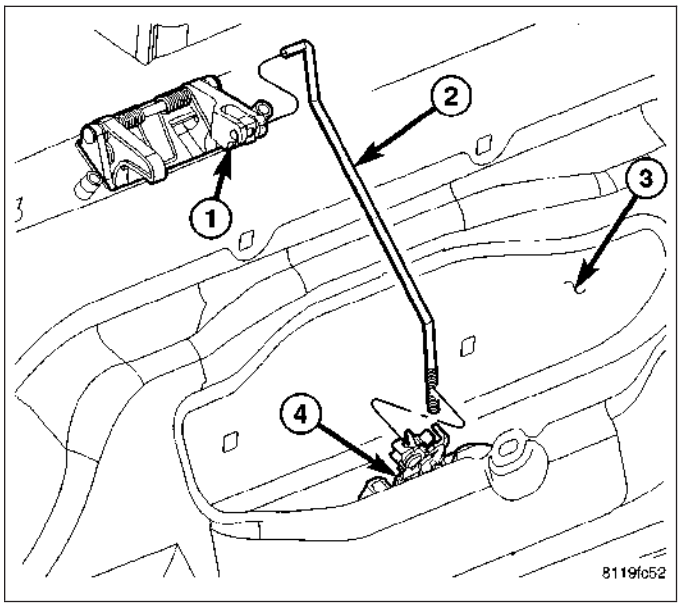
3. Position the upper trim (2) into place and seat the push pin fasteners fully.



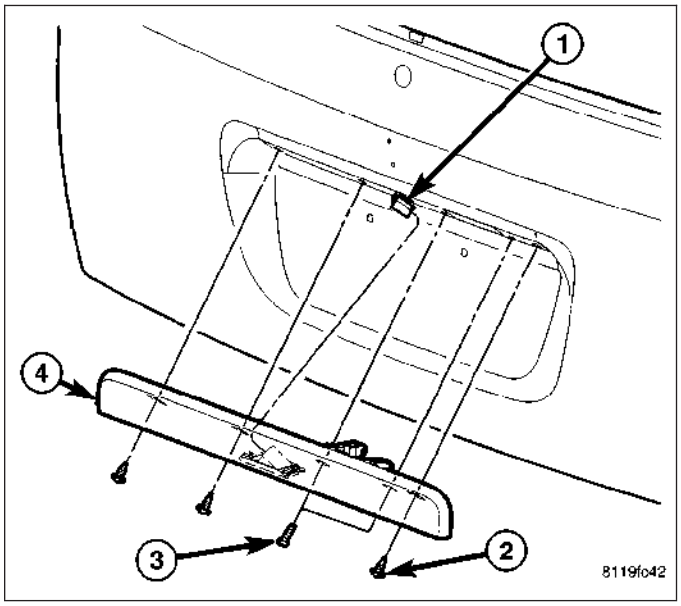
HANDLE

REMOVAL

1. Remove the trim panels. (Refer to 23 - BODY/LIFTGATE/TRIM PANEL - REMOVAL)
2. Disconnect the latch actuator rod (2).

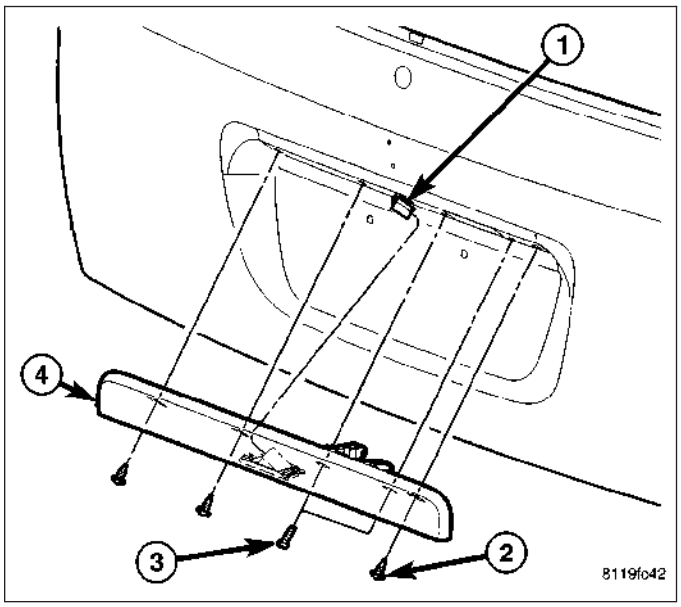


3. Remove the screws (2 & 3) and remove the handle.
4. Disconnect the electrical connector (1).

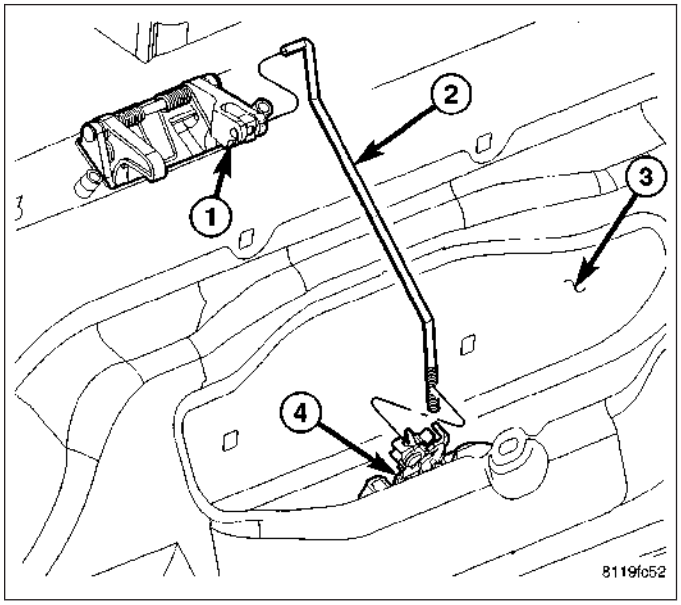


INSTALLATION

1. Connect the electrical connector (1) and install the handle (4).
2. Install the screws (2 & 3).



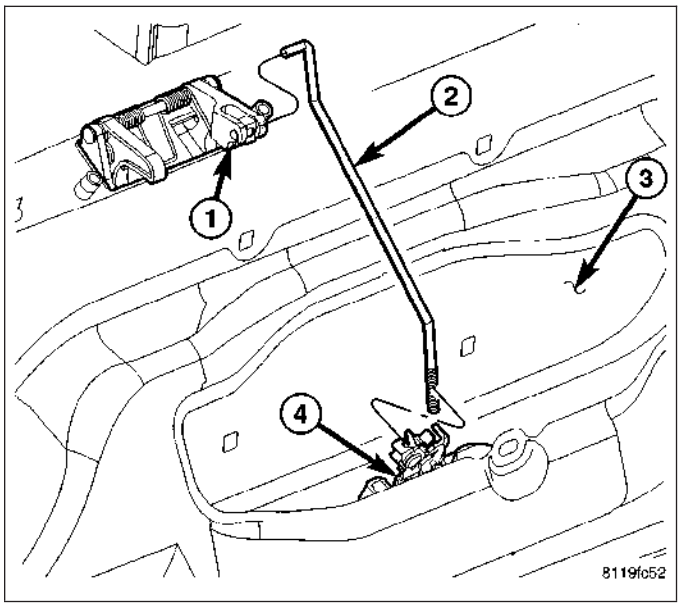
3. Connect the latch actuator rod (2) to the handle (1).
4. Install the trim panels. (Refer to 23 - BODY/DECK-LID/HATCH/LIFTGATE/TAILGATE/TRIM PANEL - INSTALLATION)



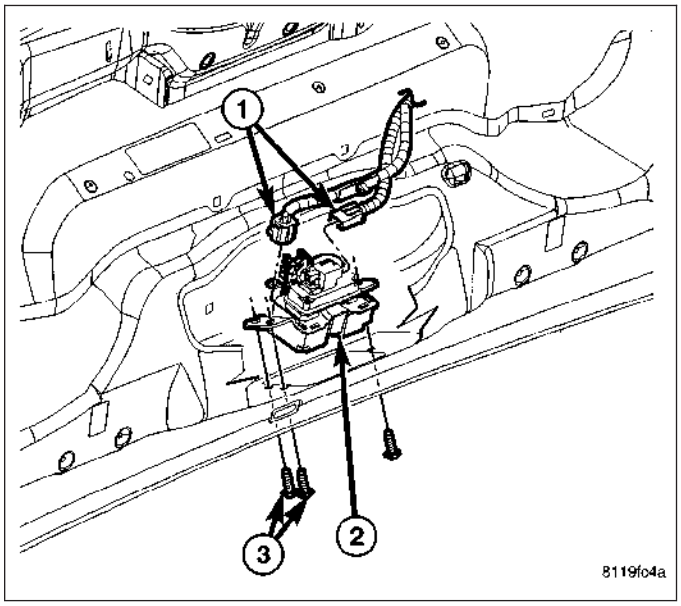
LATCH

REMOVAL

1. Remove liftgate trim panels. (Refer to 23 - BODY/ LIFTGATE/TRIM PANEL - REMOVAL)
2. Disconnect the exterior handle actuator rod (2).

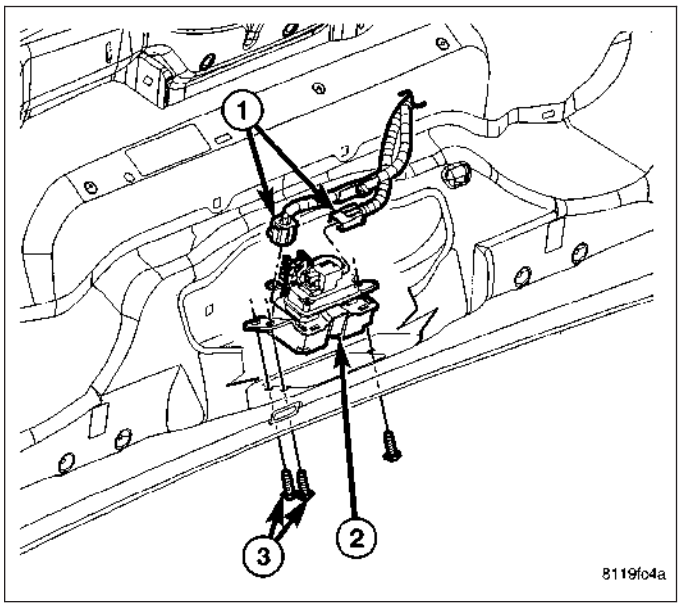


3. Disconnect the electrical connectors (1).
4. Remove the screws (3) and remove the latch (2).



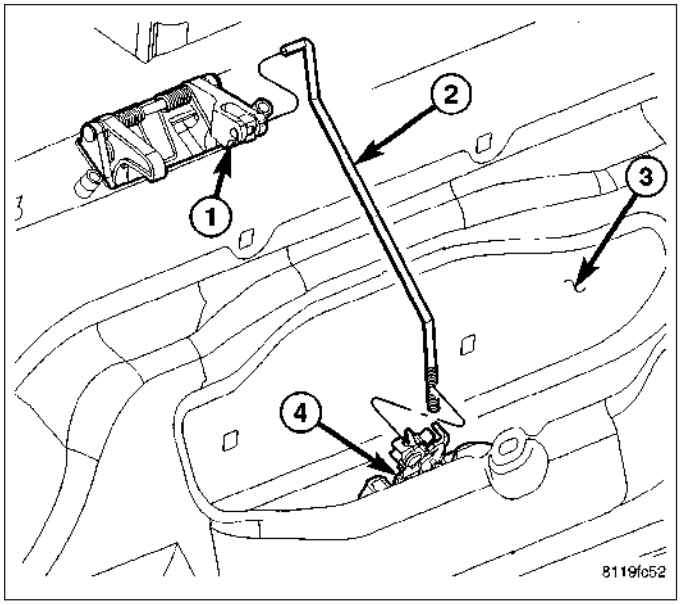
INSTALLATION

1. Position the latch (2) into the liftgate and install the screws (3).
2. Tighten the screws to 11 N·m (95 in. lbs.).
3. Connect the electrical connectors (1).



Connect the latch actuator rod (2) to the exterior handle (1) and the latch (4).

4. Install the trim panels. (Refer to 23 - BODY/LIFTGATE/TRIM PANEL - INSTALLATION)

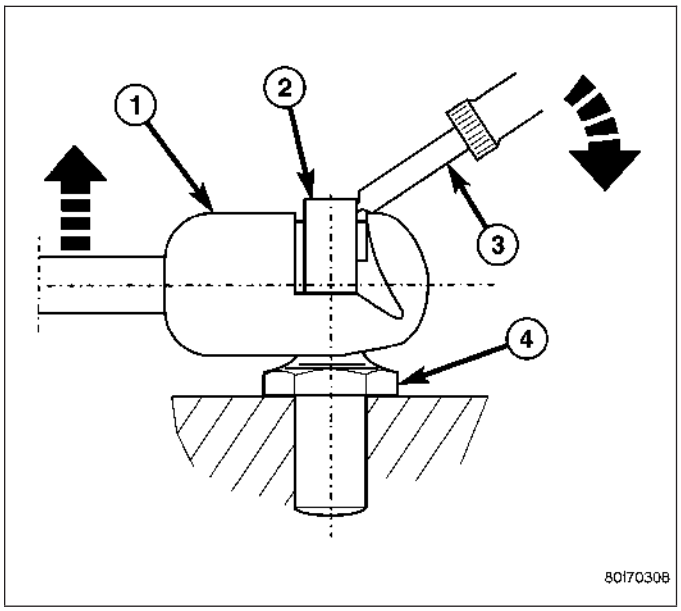


SUPPORT-STRUT

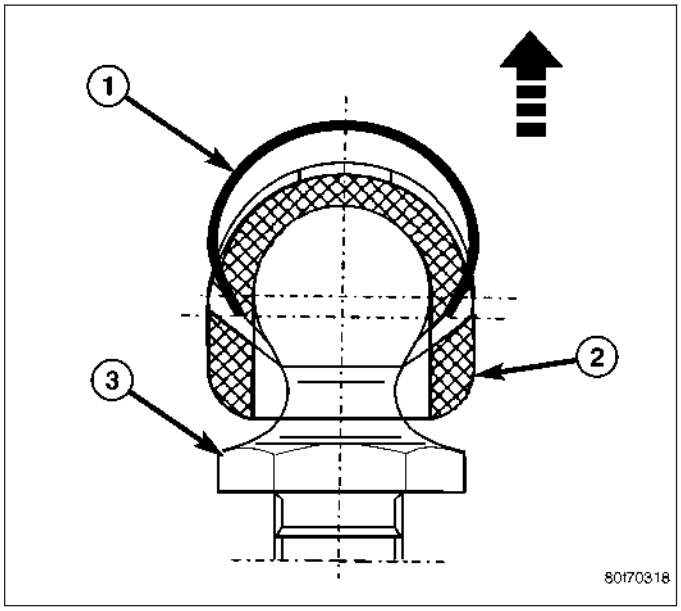
REMOVAL

WARNING: DO NOT REMOVE THE LIFTGATE SUPPORT RODS WITH THE LIFTGATE CLOSED. THE SUPPORT ROD PISTONS ARE OPERATED BY HIGH PRESSURE GAS AND COULD CAUSE PERSONAL INJURY AND/OR VEHICLE DAMAGE IF THEY ARE REMOVED WITH THE PISTONS COMPRESSED (LIFTGATE CLOSED). ONCE REMOVED, DO NOT ATTEMPT TO DISASSEMBLE OR REPAIR THE SUPPORT RODS.

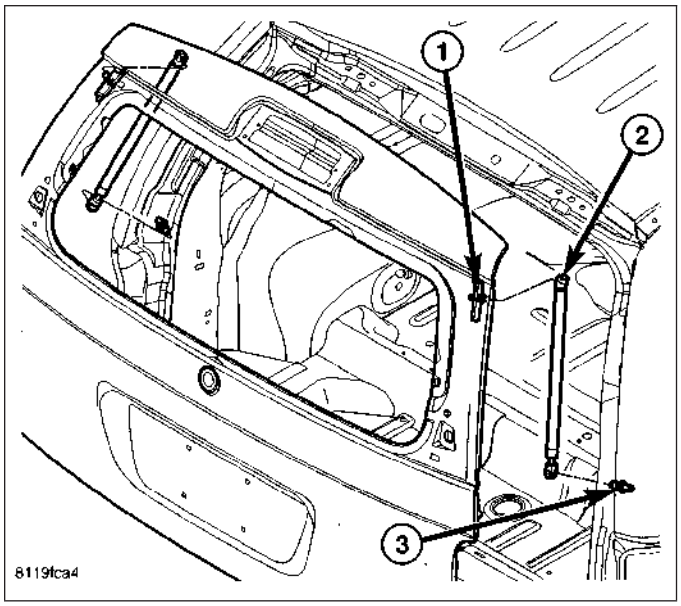
1. Open the liftgate and support.
2. Using a small flat bladed tool (3), or equivalent, release the retaining clips (2) while pulling the ball socket (1) away from the ball stud (4).



NOTE: Lift the clips (1) only enough to release the ball studs (3).



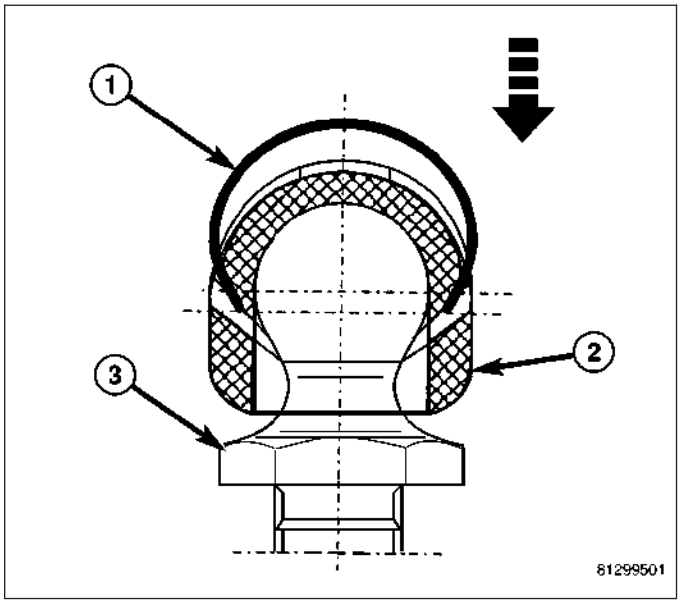
3. Remove the support cylinder (2) from the upper (1) and lower (3) ball studs.



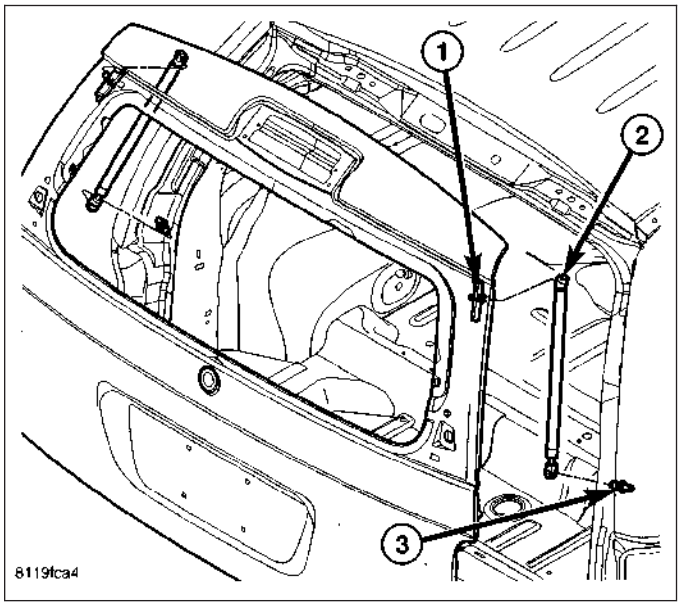
INSTALLATION

WARNING: DO NOT REMOVE THE LIFTGATE SUPPORT RODS WITH THE LIFTGATE CLOSED. THE SUPPORT ROD PISTONS ARE OPERATED BY HIGH PRESSURE GAS AND COULD CAUSE PERSONAL INJURY AND/OR VEHICLE DAMAGE IF THEY ARE REMOVED WITH THE PISTONS COMPRESSED (LIFTGATE CLOSED). ONCE REMOVED, DO NOT ATTEMPT TO DISASSEMBLE OR REPAIR THE SUPPORT RODS.

1. Make sure the retaining clips (1) are seated into the ball socket (2) fully.



2. Install the support cylinder (2) over the ball studs (1 & 3) with the thin end connected to the body and the retaining clips snapping into place.

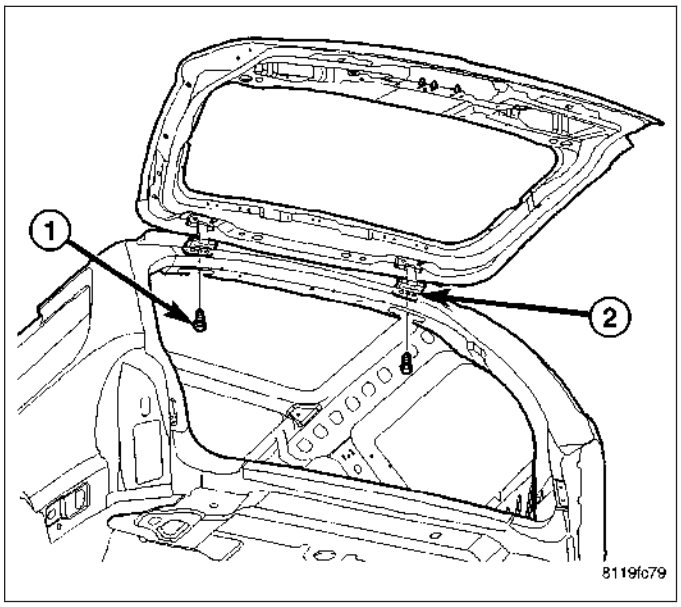


LIFTGATE

REMOVAL

WARNING: Do not disconnect the support rod cylinders with the liftgate closed. The support rod pistons are operated by high pressure gas. This pressure could cause damage and/or personal injury if they are removed while the pistons are compressed.

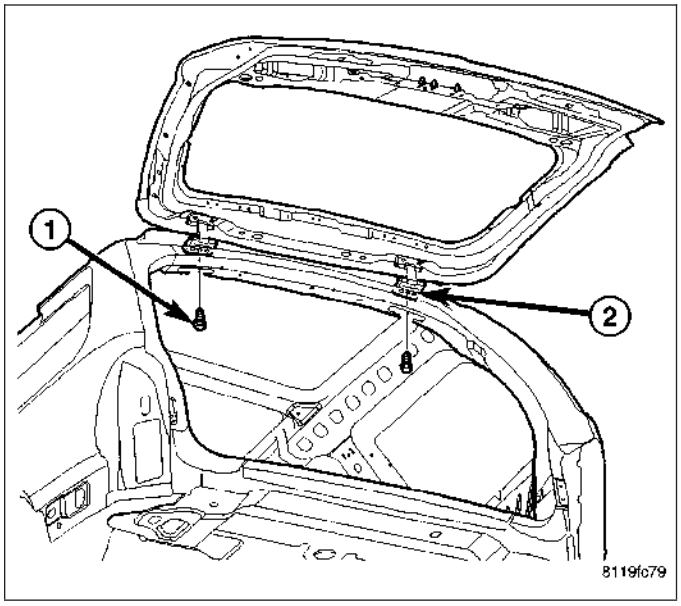
1. Open and support the liftgate.
2. Using a trim stick C-4755 or equivalent, remove the upper rear headliner trim.
3. Remove the support cylinders from the liftgate. (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/SUPPORT CYLINDER - REMOVAL)
4. Disconnect the wire harnesses and the washer hose.
5. Using a grease pencil or equivalent, mark the hinge location.
6. Remove the six liftgate to body bolts (1) and remove liftgate from vehicle.



INSTALLATION

NOTE: A suitable body sealant should be used when removing or moving the hinges.

1. Position the liftgate onto the vehicle and install the six body bolts (1).
2. Tighten the bolts to 28 N·m (21 ft. lbs.).
3. Check and adjust the liftgate if necessary. (Refer to 23 - BODY/LIFTGATE/LIFTGATE - ADJUSTMENTS)
4. Position the upper rear headliner trim and seat fully.

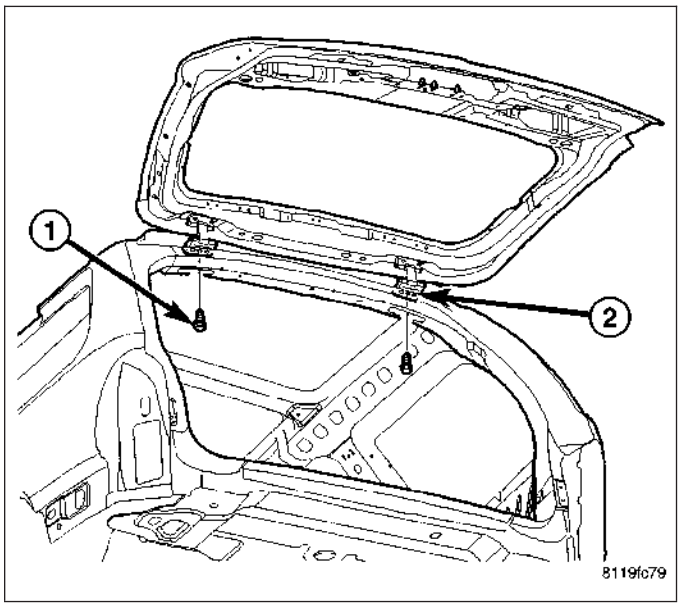


ADJUSTMENTS

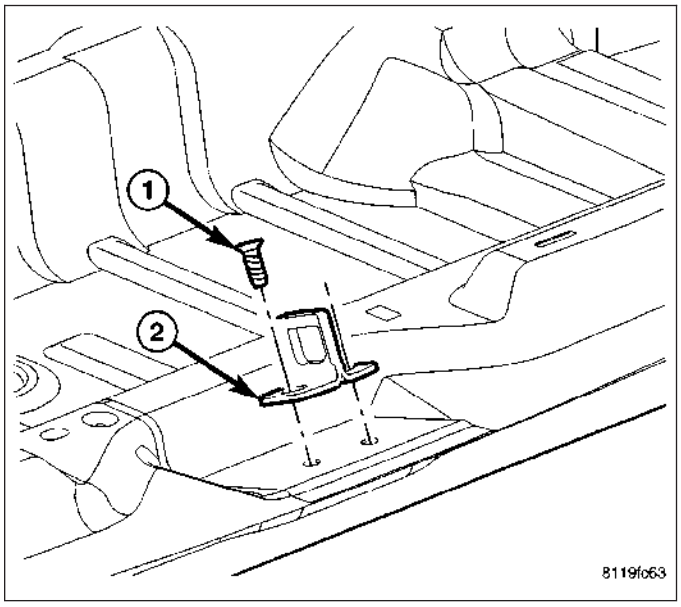
NOTE: The position of the liftgate can be adjusted upward or downward by the use of slots in the hinge. An inward or outward adjustment is achieved by use of slots in the body. If an inward or outward adjustment is needed, use a body sealer on the hinge to body mating surface.

In/out

1. Using a trim stick C-4755 or equivalent, remove the upper rear headliner trim.
2. For the upper lift gate adjustments, loosen the six hinge to header bolts (1) and adjust to specifications (Refer to 23 - BODY/BODY STRUCTURE/ GAP AND FLUSH - SPECIFICATIONS)
3. Tighten the hinge bolts to 28 N·m (21 ft. lbs.).

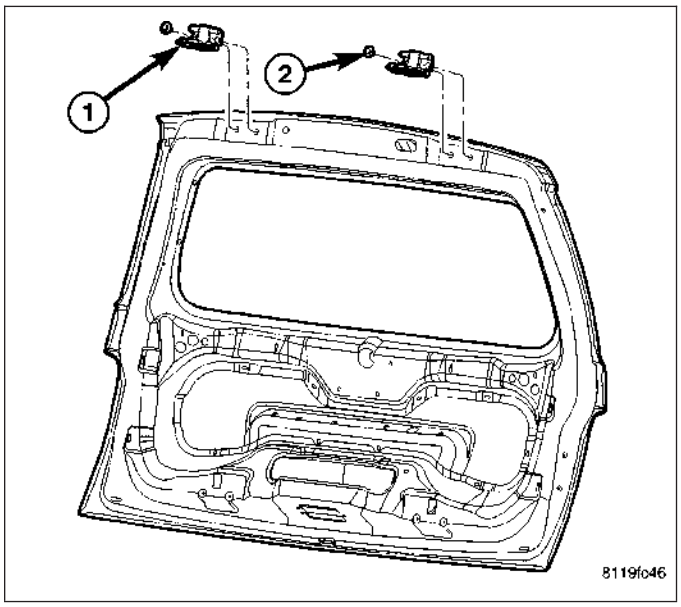


4. Open the load floor, remove the scuff plate screws and remove liftgate trim scuff plate.
5. For the lower lift gate adjustments, loosen the striker screws (1) and adjust to specifications (Refer to 23 - BODY/BODY STRUCTURE/GAP AND FLUSH - SPECIFICATIONS)
6. Tighten the striker screws to 28 N·m (21 ft. lbs.).
7. Install the liftgate trim scuff plate and install the screws.
8. Position the upper rear headliner trim and seat fully.

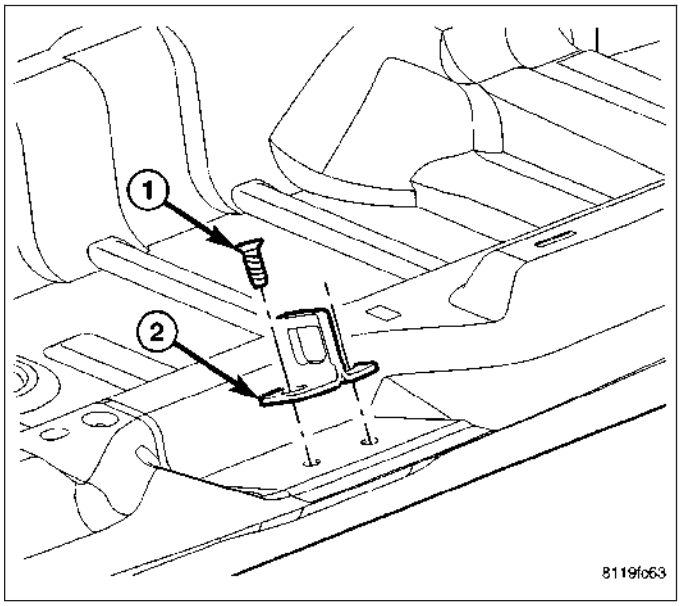


Up/Down and Left/Right

1. Loosen the hinge to liftgate bolts (2).



2. Open the load floor, remove the scuff plate screws and remove liftgate trim scuff plate.
3. Loosen the striker screws (1).
4. Adjust the liftgate up/down position and tighten the hinge bolts to 28 N·m (21 ft. lbs.). (Refer to 23 - BODY/BODY STRUCTURE/GAP AND FLUSH - SPECIFICATIONS)
5. Confirm the lower liftgate in/out position and tighten the striker screws to 28 N·m (21 ft. lbs.).
6. Install the liftgate trim scuff plate and install the screws.



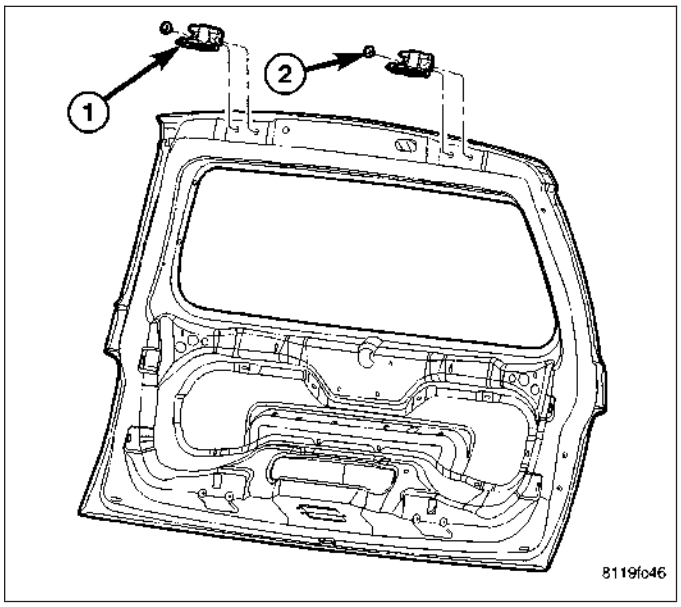
HINGE

REMOVAL

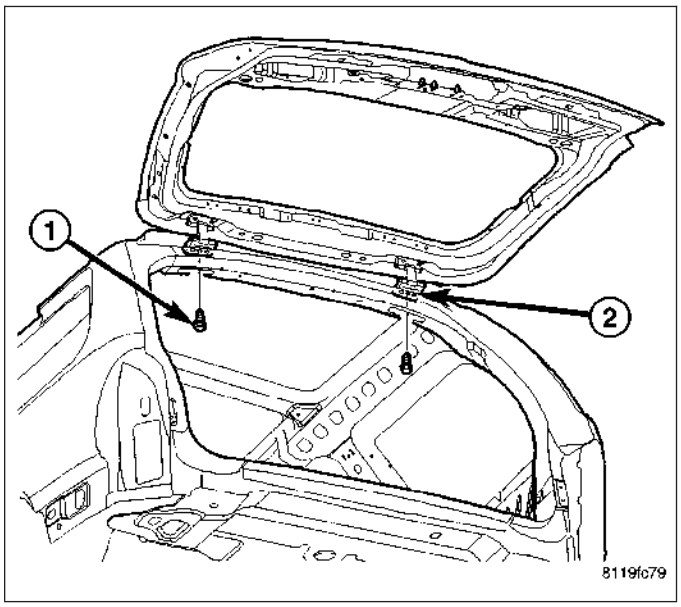
NOTE: It is not necessary to remove the liftgate to replace one or both hinges. The hinges can be replaced one at a time.

NOTE: A suitable body sealant should be used when removing or moving the hinges.

1. Support liftgate on a suitable lifting device.
2. Using a trim stick C-4755 or equivalent, remove the upper rear headliner trim.
3. Using a grease pencil or equivalent, mark the location of the hinge to aid installation.
4. Remove the liftgate bolts (2).



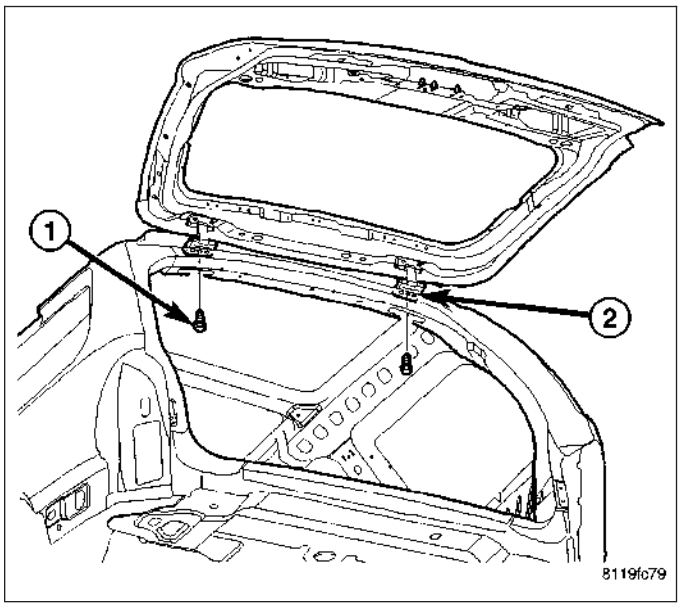
5. Remove the body bolts (1) and remove the hinge.



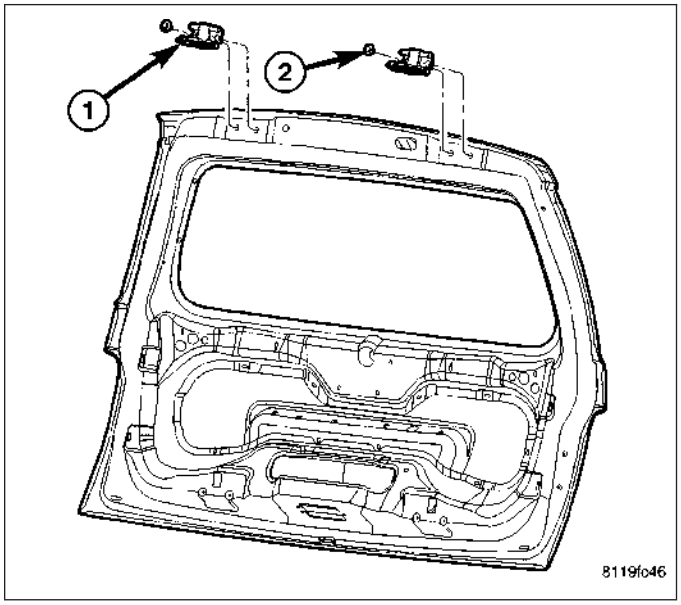
INSTALLATION

NOTE: A suitable body sealant should be used when removing or moving the hinges.

1. If necessary, paint replacement hinge before installation.
2. Install the hinge (2) and install the body bolts (1).
3. Tighten the bolts to 28 N·m (21 ft. lbs.).



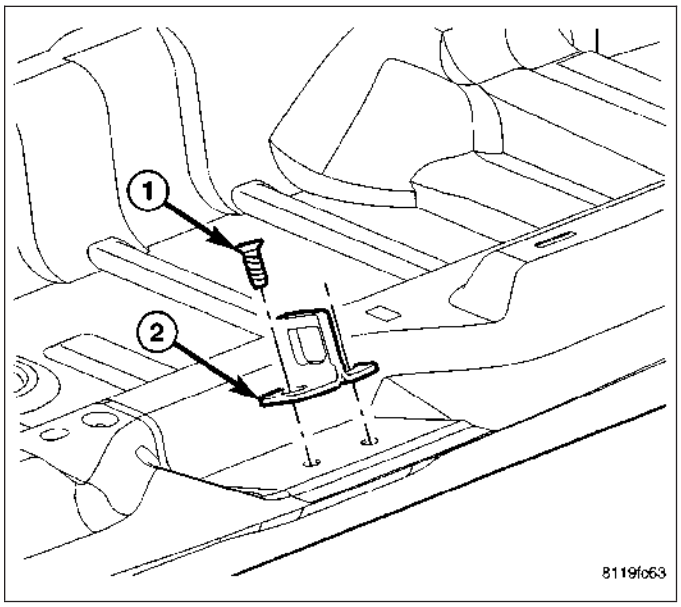
4. Install the liftgate bolts (2) and tighten to 28 N·m (21 ft. lbs.).
5. Adjust liftgate if necessary. (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/LIFTGATE - ADJUSTMENTS)
6. Position the upper rear headliner trim and seat fully.



STRIKER

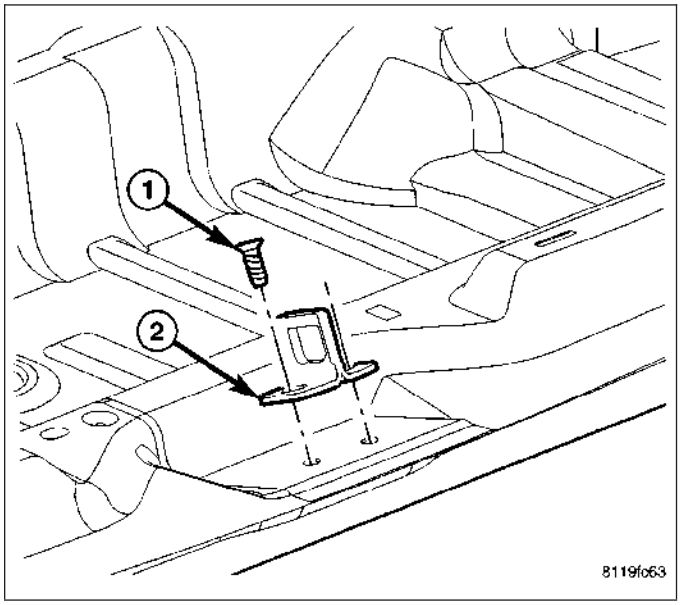
REMOVAL

1. Open the load floor, remove the scuff plate screws and remove liftgate trim scuff plate.
2. Remove screws attaching liftgate striker to floor pan (1) and remove the striker.



INSTALLATION

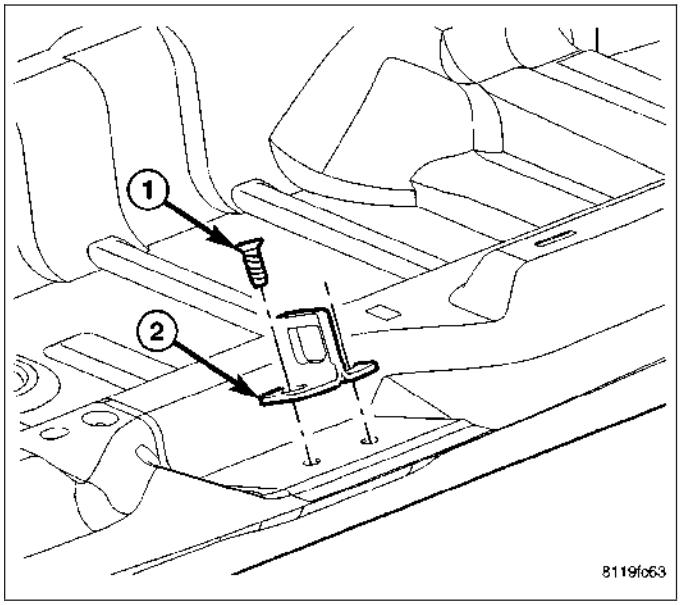
1. Install the striker (2) and install the bolts (1).
2. Tighten the bolts to 28 N·m (21 ft. lbs.).
3. Adjust the striker if needed. (Refer to 23 - BODY/ LIFTGATE/LATCH STRIKER - ADJUSTMENTS)
4. Install the liftgate trim scuff plate and install the screws.



ADJUSTMENTS

ADJUSTMENT

1. Using a grease pencil or equivalent, mark the position of the striker (2) to aid in adjustment.
2. Loosen the striker bolts (1).
3. Change the striker position to adjust the lower liftgate gap and flush measurement. (Refer to 23 - BODY/BODY STRUCTURE/GAP AND FLUSH - SPECIFICATIONS)
4. Tighten the bolts to 28 N·m (21 ft. lbs.).



EXTERIOR

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BODY SIDE MOLDINGS

REMOVAL

1. Apply a length of masking tape on the body, parallel to the top edge of the molding to use as a guide, if necessary.
2. Warm the effected adhesive type molding and body metal to approximately 38°C (100°F) using a suitable heat lamp or heat gun.
3. Pull stick-on molding from painted surface.

INSTALLATION

1. Clean body surface with MOPAR® Super Kleen solvent or equivalent. Wipe surface dry with lint free cloth.
2. Remove protective cover from tape on back of molding. Apply molding to body below the masking tape guide.
3. Remove masking tape guide and firmly press molding to body surface to assure adhesion.

STRIPES AND DECALS-BODY

REMOVAL

1. Warm the panel to approximately 38°C (100°F) using a suitable heat lamp or heat gun.
2. Peel decal from body panel using an even pressure pull.
3. Remove adhesive residue from body panel using a suitable adhesive removing solvent.

INSTALLATION

The painted surface of the body panel to be covered by a decal must be smooth and completely cured before decal can be applied. Ripples and feather edging will read through if surface is not properly prepared. Clean all residue from surface.

1. Peel paper backing away from decal exposing adhesive back of decal.
2. Apply soap solution liberally to adhesive back of decal.

3. Apply soap solution liberally to body panel surface.
4. Place decal into position on body panel. Smooth out wrinkles by pulling lightly on edges of decal until it lays flat on painted surface.
5. Push air pockets from under decal to the perimeter of the panel from the center of the decal out.
6. Squeegee soap solution and air bubbles from behind decal from the center of the panel out using a body putty applicator squeegee.
7. Small air or water bubbles under decal can be pierced with a pin and smoothed out.

PLATES-EXTERIOR NAME

REMOVAL

NOTE: Exterior nameplates are attached to body panels with adhesive tape.

1. Apply a length of masking tape on the body, parallel to the top edge of the nameplate to use as a guide, if necessary.
2. If temperature is below 21°C (70°F) warm emblem with a heat lamp or gun. Do not exceed 52°C (120°F) when heating emblem.
3. Insert a plastic trim stick or a hard wood wedge behind the emblem to separate the adhesive backing from the body.
4. Clean adhesive residue from body with MOPAR® Super Clean solvent or equivalent.

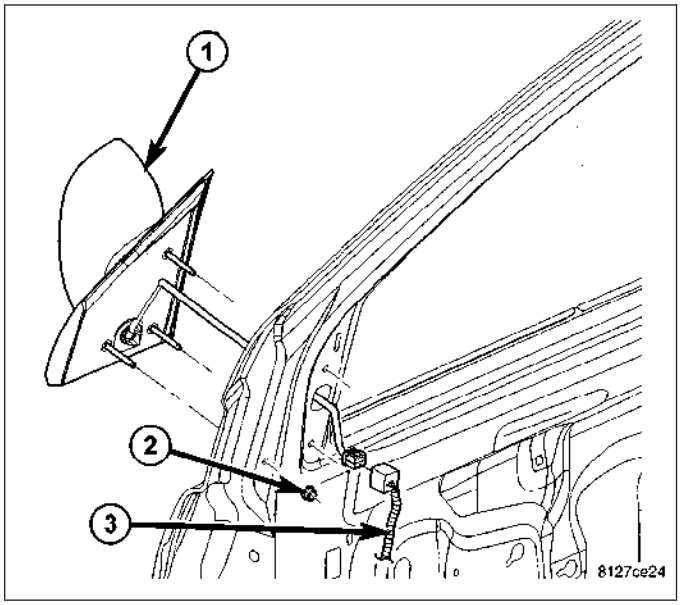
INSTALLATION

1. Remove carrier from adhesive tape on back of emblem.
2. Position emblem properly on body.
3. Press emblem firmly to body with palm of hand.
4. If temperature is below 21°C (70°F) warm emblem with a heat lamp or gun to assure adhesion. Do not exceed 52°C (120°F) when heating emblem.

MIRROR-OUTSIDE REARVIEW

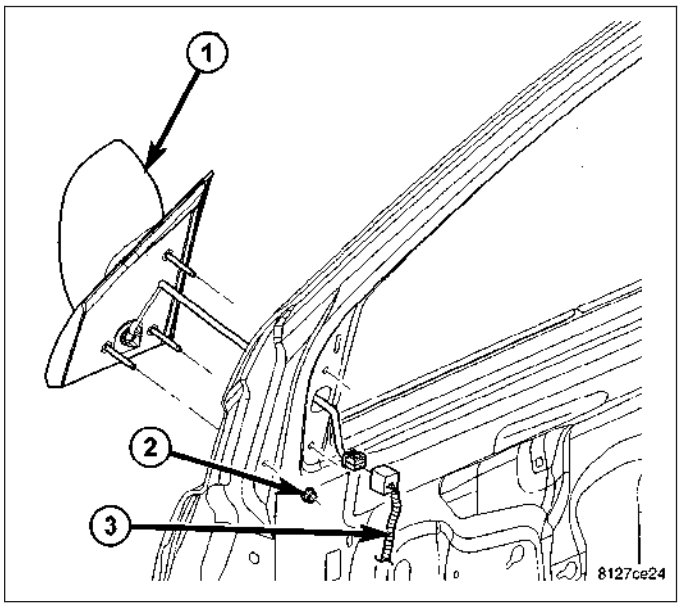
REMOVAL

1. Partially remove the door trim panel to gain access to the mirror fasteners. (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - REMOVAL)
2. Disconnect the electrical connector (3), if equipped.
3. Remove the nuts (2) and remove the mirror (1).



INSTALLATION

1. Install the mirror (1) and install the nuts (2).
2. Tighten the nuts to 7 N·m (60 in. lbs.).
3. Connect the electrical connector (3).
4. Install the door trim panel. (Refer to 23 - BODY/ DOOR - FRONT/TRIM PANEL - INSTALLATION)



GLASS-OUTSIDE REARVIEW MIRROR

REMOVAL

WARNING: ALWAYS WEAR EYE AND HAND PROTECTION WHEN SERVICING THE MIRROR ASSEMBLY. FAILURE TO OBSERVE THESE WARNINGS MAY RESULT IN PERSONAL INJURY FROM BROKEN GLASS.

1. Carefully pull/pry the broken glass holder from the mirror assembly.
2. Disconnect the heated mirror electrical connectors from the terminals on the mirror glass holder, if equipped.

INSTALLATION

CAUTION: It is important to make sure the motor is square to the glass holder (attaching fingers) prior to glass holder attachment, otherwise the glass holder could be installed incorrectly causing poor retention and possible repeat failure.

1. Position the new mirror glass holder to the mirror assembly.

NOTE: Position the mirror glass holder so that the moisture drain hole on the mirror glass holder assembly is facing downward.

2. Align the mirror glass holder's attaching fingers to the mirror motor housing.

NOTE: Ensure that the protective rubber cover of the mirror motor housing is positioned correctly around the bottom of the fingers area.

3. Using one hand, firmly press the mirror glass holder assembly into place while at the same time supporting the housing assembly from the backside with the other hand.

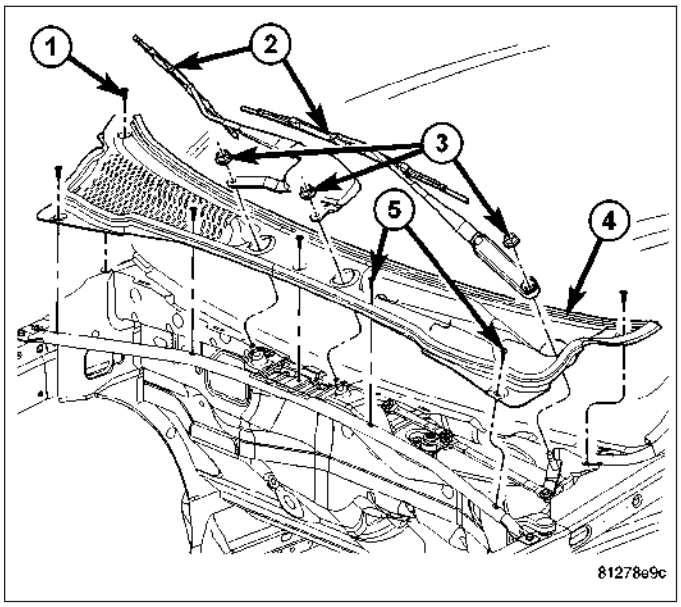
NOTE: Pressure must be applied equally over the center portion of the mirror to engage the mirror glass holder's attaching fingers to the corresponding fingers on the housing assembly. One or more clicks may be heard when finger engagement takes place.

4. Verify retention of the mirror glass holder assembly by gently pulling outward on the mirror glass holder.

PANEL-COWL TOP

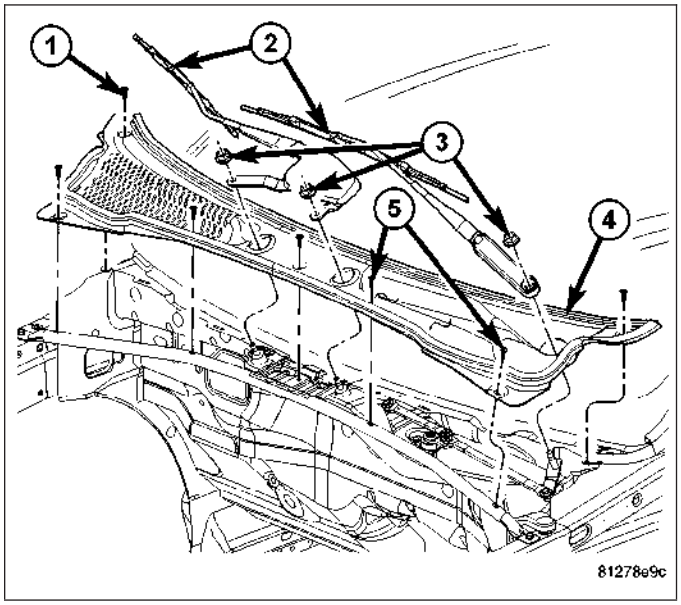
REMOVAL

1. Open the hood and remove the wiper arm nuts (3) and wiper arms (2). (Refer to 8 - ELECTRICAL/ WIPERS/WASHERS/WIPER ARMS - REMOVAL)
2. Remove the two rear screws (1) and the five front screws (5).
3. Remove the cowl grille (4).



INSTALLATION

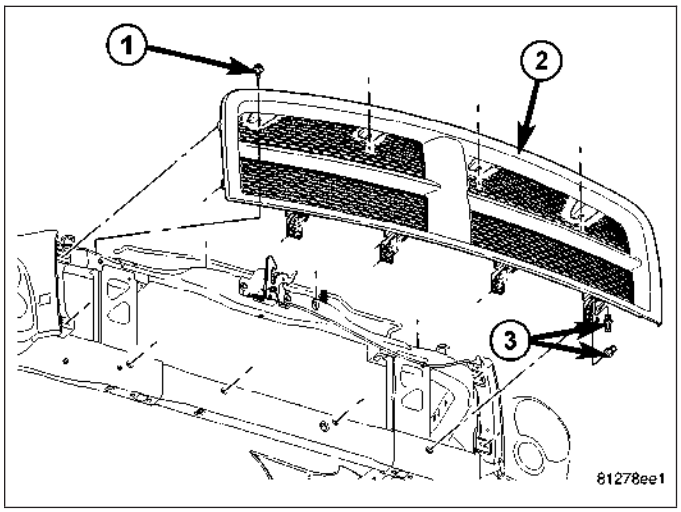
1. Install the grille (4) and install the front and rear screws (1 & 5).
2. Install the wiper arms (2) and install the nuts (3). (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/ WIPER ARMS - INSTALLATION)



GRILLE

REMOVAL

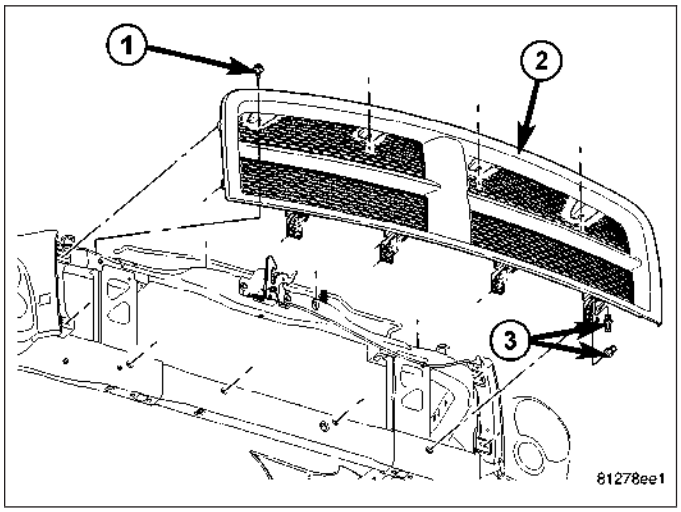
1. Remove the push pin fasteners and remove the upper radiator shroud.
2. Remove the upper bolts (1) and separate the four side clips.
3. From underneath, remove the push pins (3) and remove the grille.



INSTALLATION

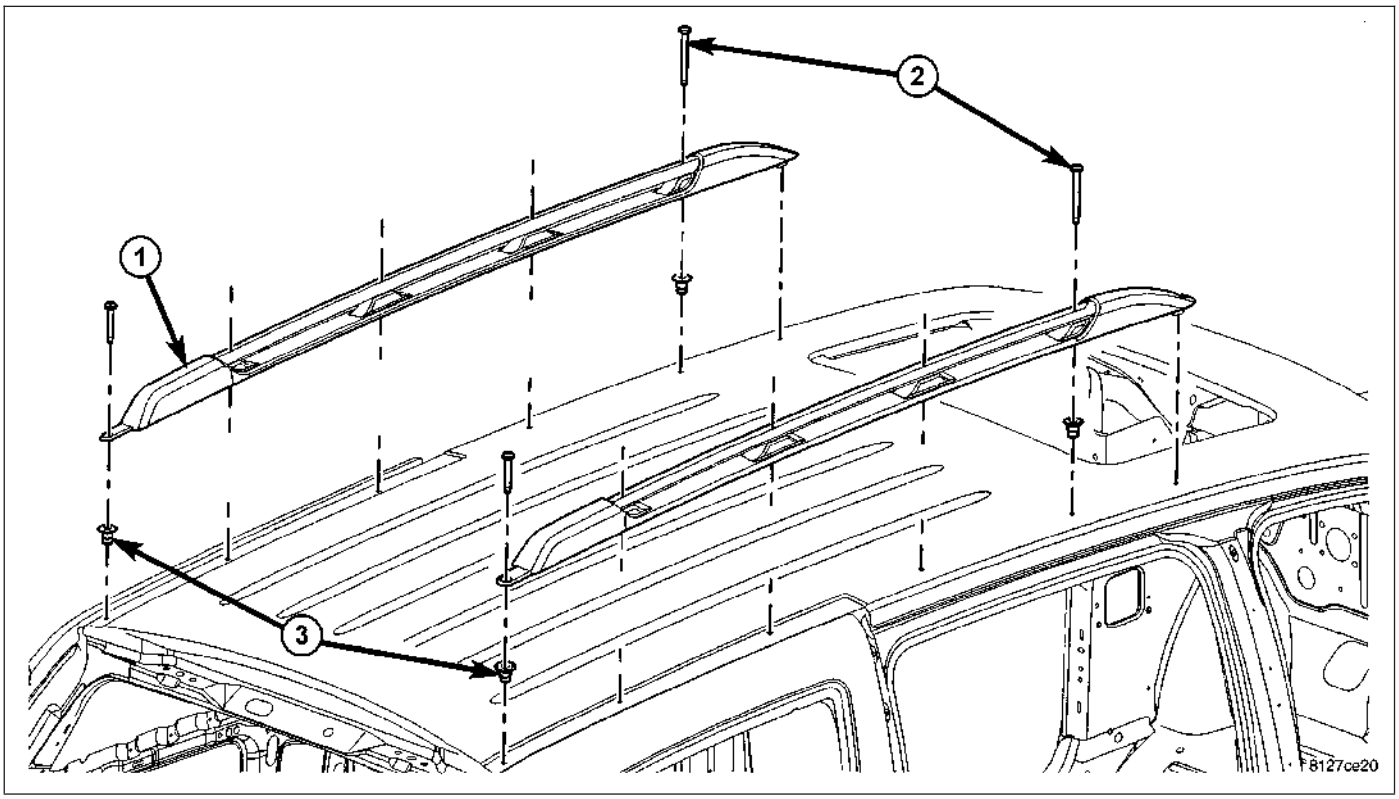
CAUTION: Do not use a hammer or mallet to install the upper radiator shroud push pins, due to potential damage to the grille.

1. Install the grille (2) and seat the side clips fully.
2. From underneath install the push pin fasteners (3).
3. Install the upper bolts (1) and tighten to 13 N·m (10 ft. lbs.).
4. Install the upper radiator shroud and install the push pin fasteners.



RACK-LUGGAGE

DESCRIPTION

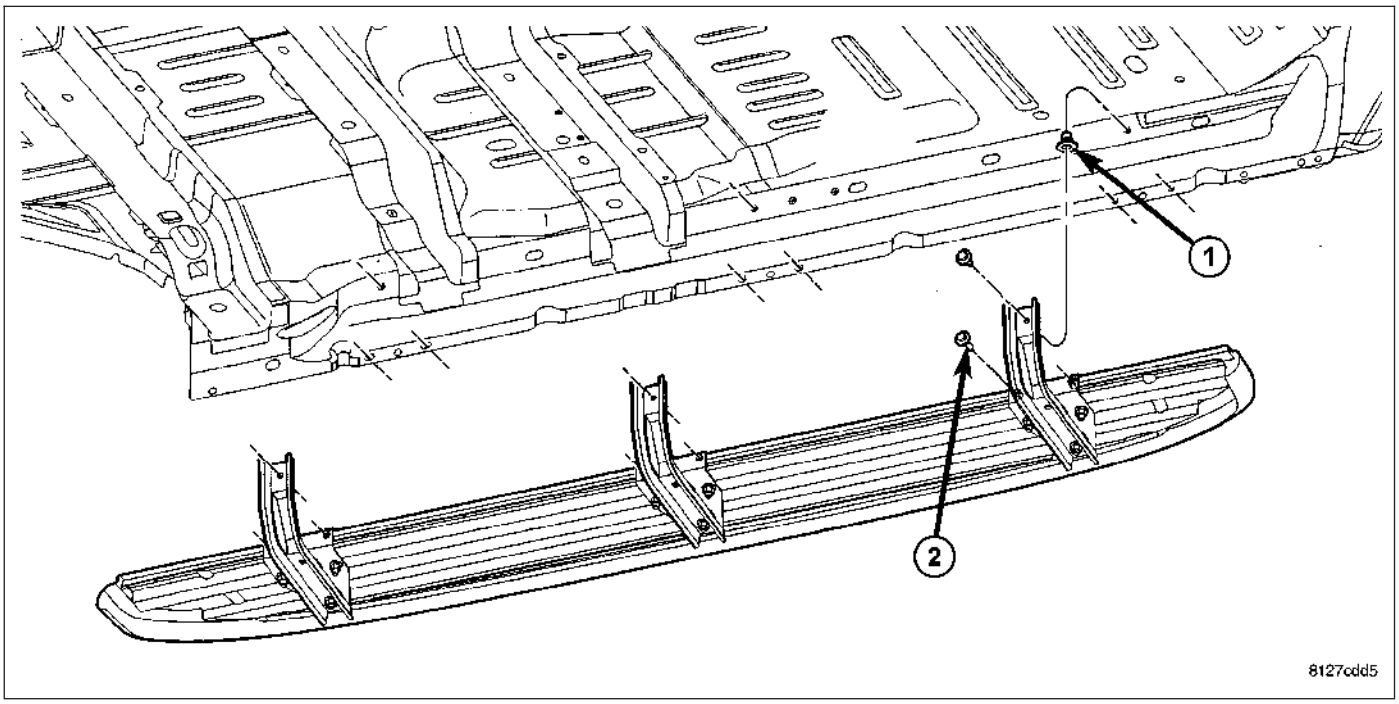


LUGGAGE RACK

1 - RAIL ASSEMBLY
2 - SCREWS (5 PER RAIL)
3 - RIV NUTS

BOARD-RUNNING

DESCRIPTION

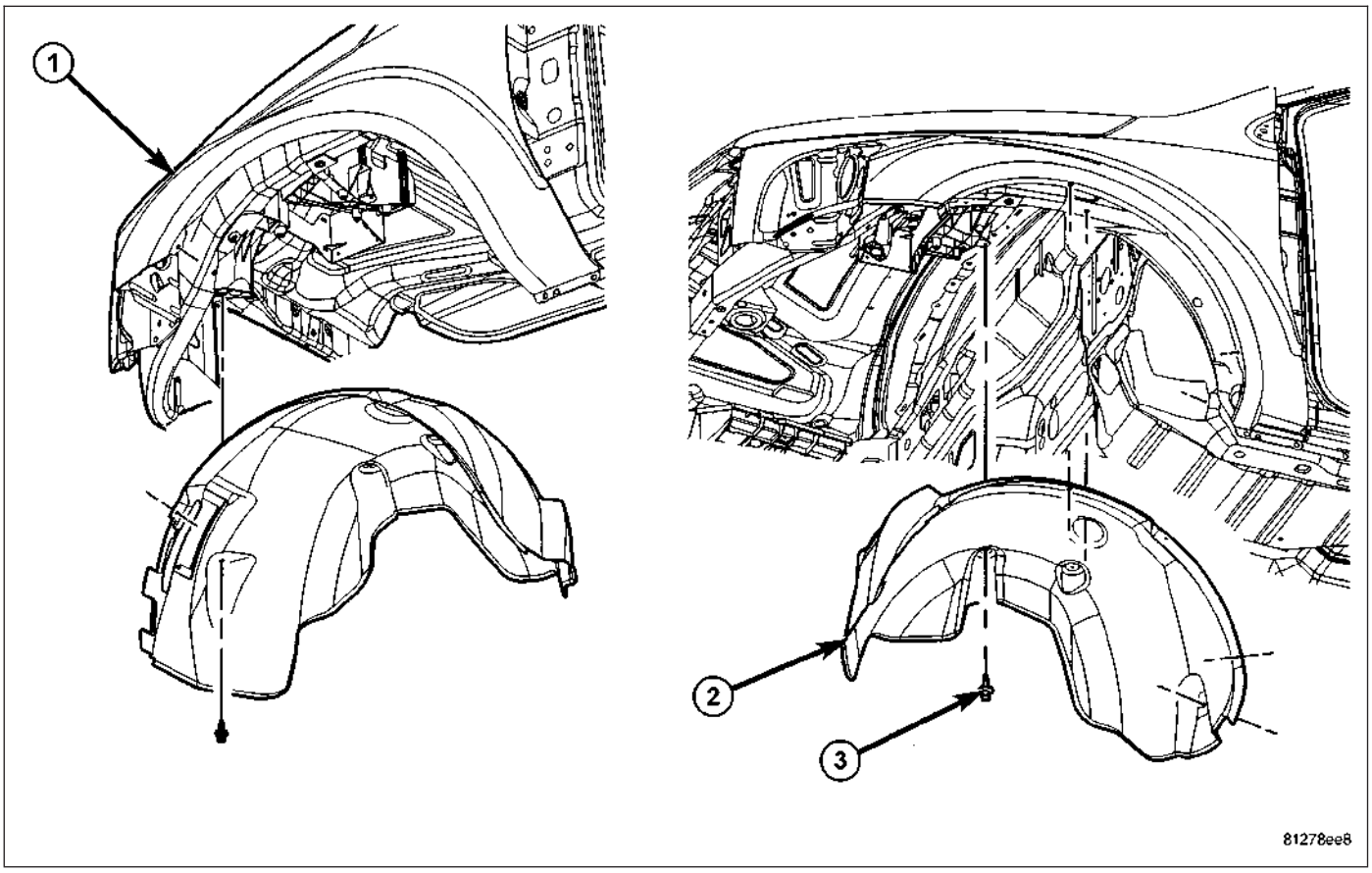


RUNNING BOARD

1 - RIV NUTS
2 - BOLTS 23 N·m (17 ft. lbs.)

LINER-FRONT FENDER

DESCRIPTION

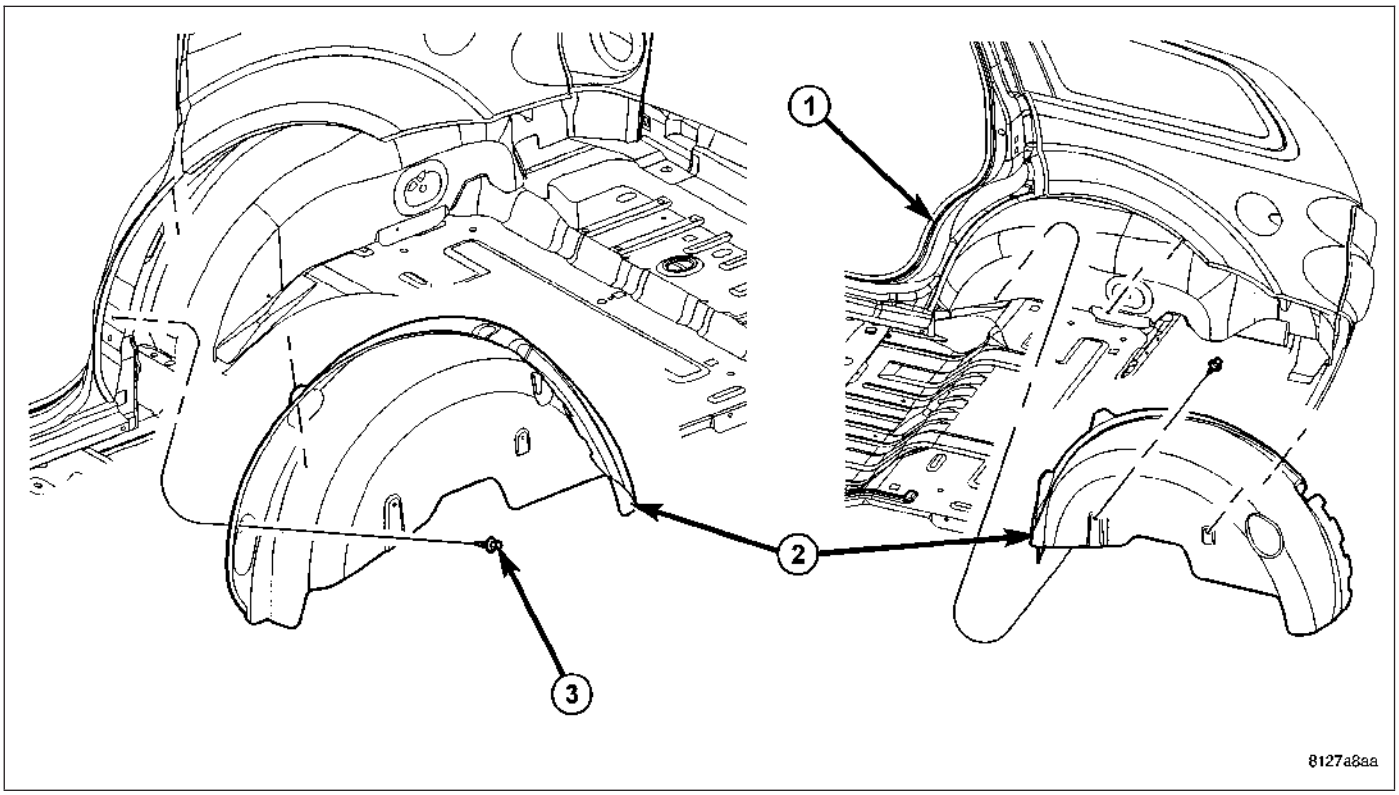


FRONT FENDER LINER

1 - FRONT FENDER
2 - LINER
3 - PLASTIC RIVETS (7 PER SIDE)

LINER-QUARTER PANEL

DESCRIPTION



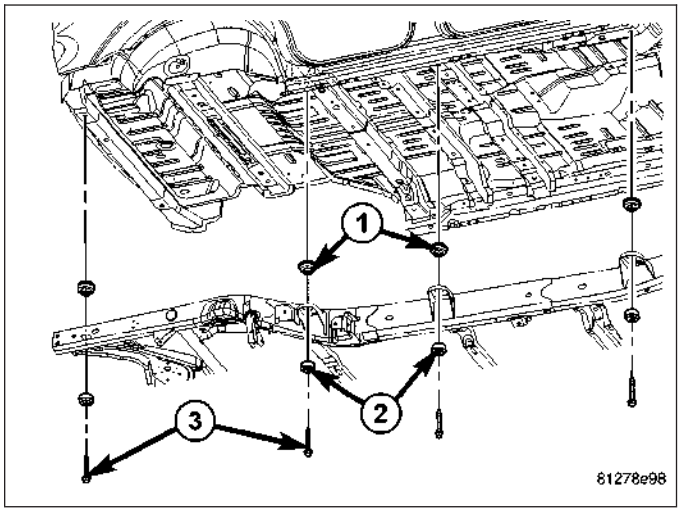
QUARTER PANEL LINER

1 - C-PILLAR
2 - QUARTER PANEL LINER
3 - PLASTIC RIVET (5 PER SIDE)

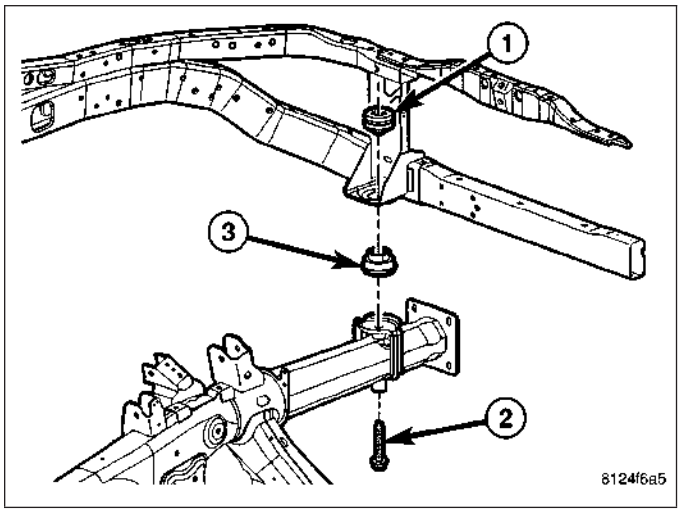
ISOLATORS-BODY

REMOVAL

1. Remove all cab to frame mounting bolts (3) and rebound cushions (2).

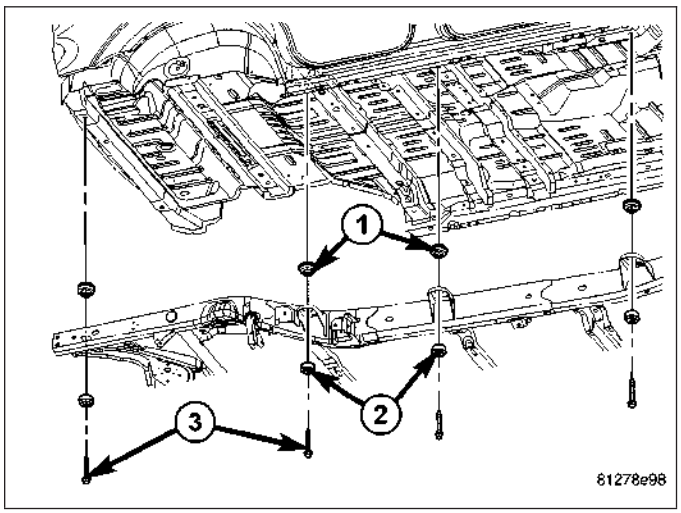


2. Remove the front end sheet metal mounting bolt (2).
3. Using a floor jack and block of wood under the cab sill, lift the body to gain access to the isolators.
4. Remove the cab isolators (1 above) and the front end sheet metal mounting isolator (3).
5. Install new isolators and repeat steps one through 4, for the opposite side.

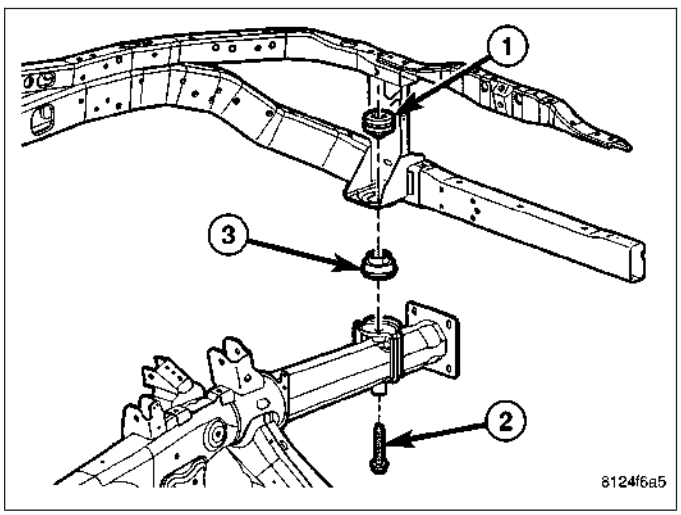


INSTALLATION

1. Install the isolators (1) rebound cushions (2), and bolts (3).



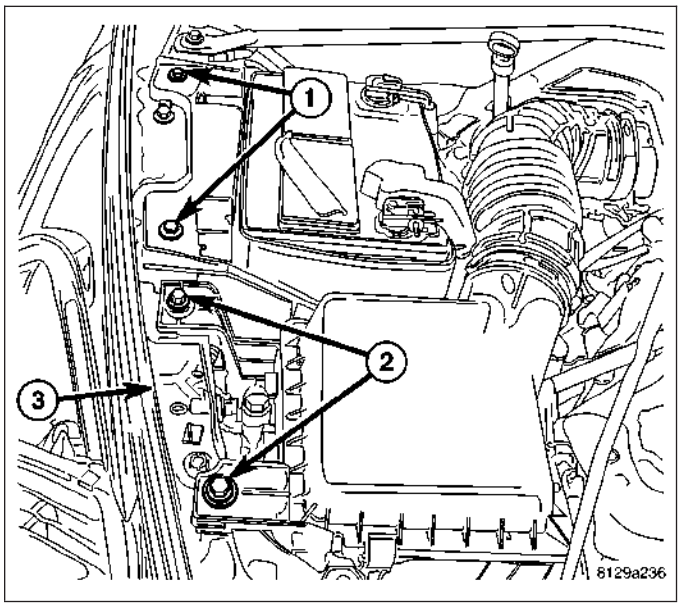
2. Install the front end sheet metal mounting isolators (1 & 3) and install the bolt (2).
3. Tighten the bolts to 81 N·m (60 ft. lbs.).



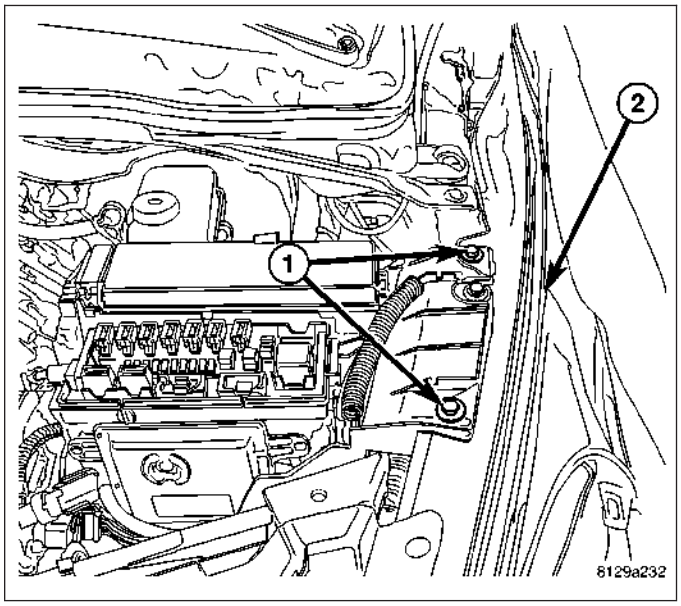
FENDER

REMOVAL

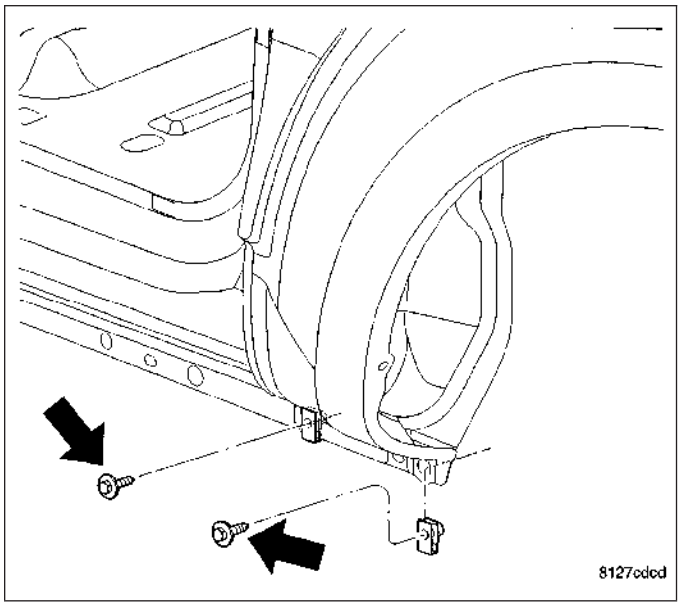
1. Remove the grille. (Refer to 23 - BODY/EXTERIOR/GRILLE - REMOVAL)
2. Remove the headlight assembly. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HEADLAMP UNIT - REMOVAL)
3. Remove the wheelhouse splash shield. (Refer to 23 - BODY/EXTERIOR/FRONT WHEELHOUSE SPLASH SHIELD - DESCRIPTION)
4. Remove the cowl grille. (Refer to 23 - BODY/EXTERIOR/COWL GRILLE AND SCREEN - REMOVAL)
5. When servicing the right side fender, remove the battery tray (1) and air cleaner bolts (2) from the front end sheet metal (3).



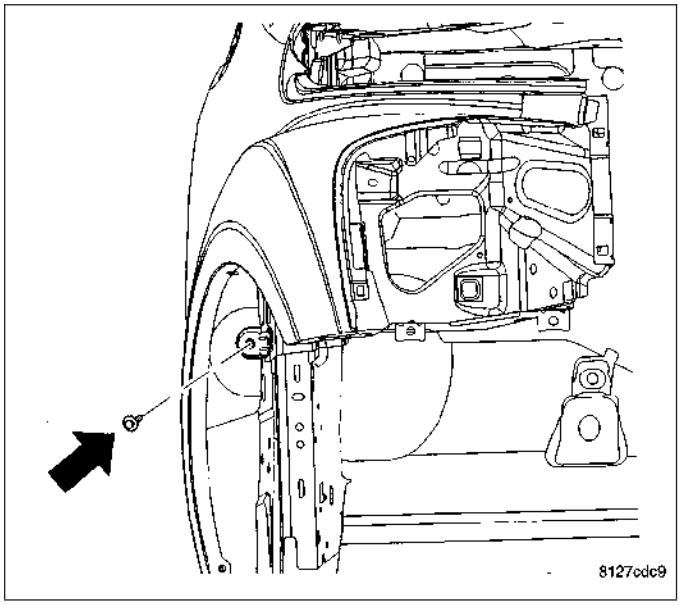
6. When servicing the left side fender, remove the power distribution center bolts (1) from the front end sheet metal (2).



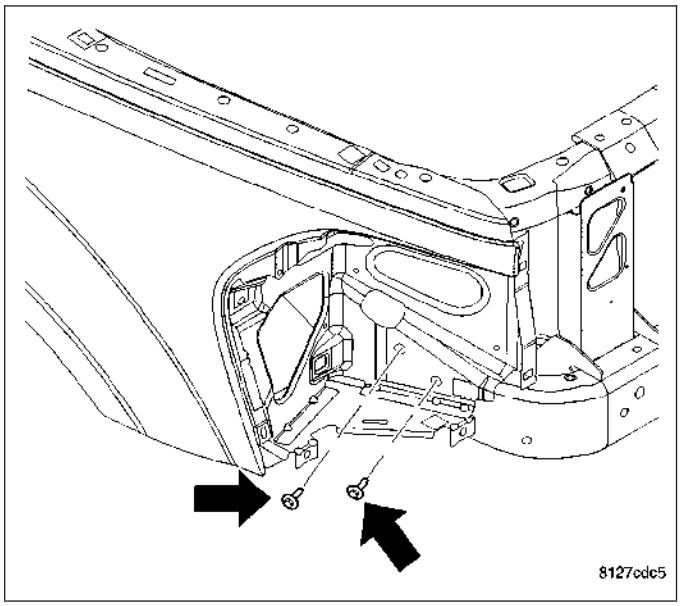
7. Remove the two bolts from the fender behind the wheel.



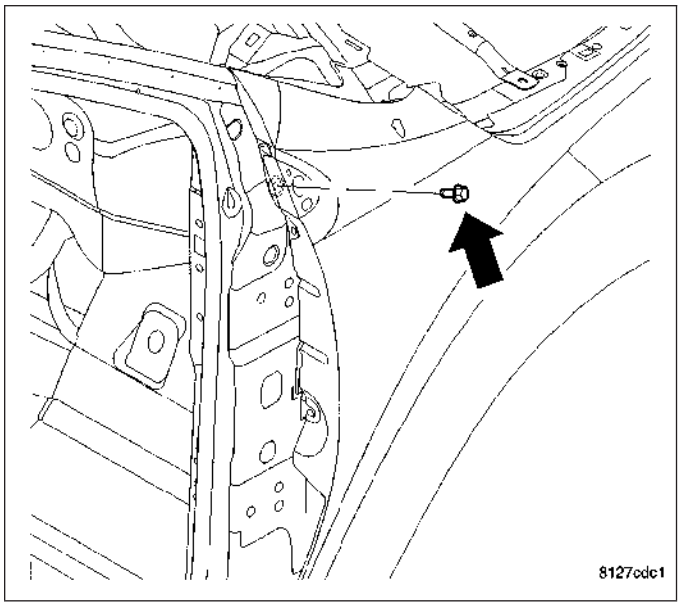
8. Remove the bolt from inside the wheel well.



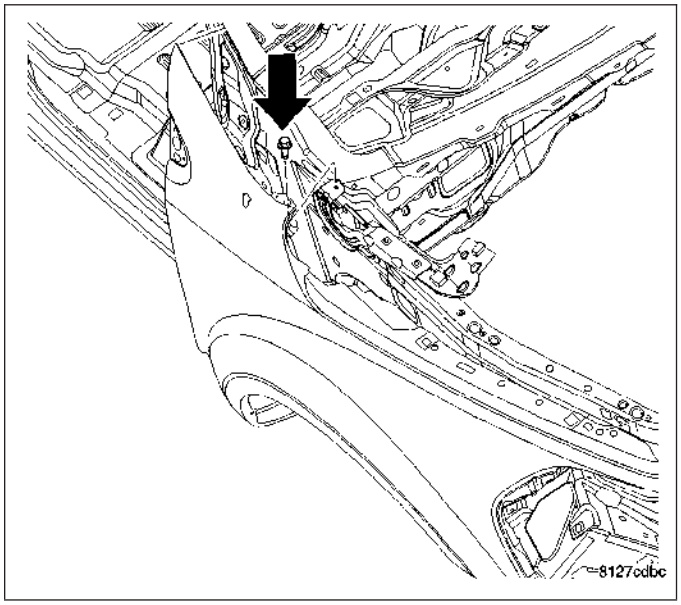
9. Remove the bolts from the headlamp opening.



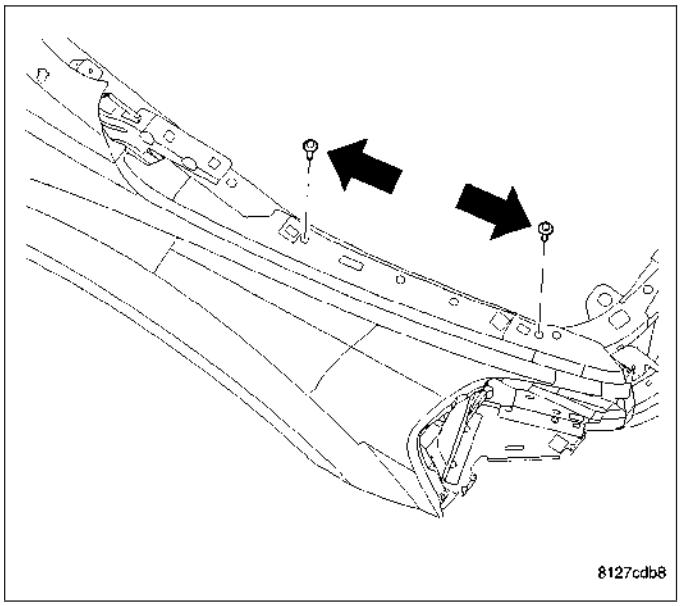
10. Using a trim stick C-4755 or equivalent, remove the trim and remove the bolt at the upper rear of the fender.



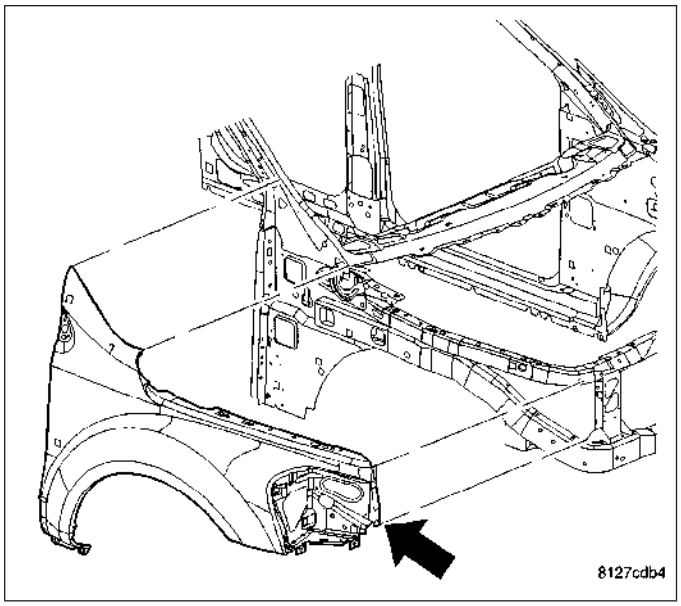
11. Remove the upper fender bolt support bolt to the hood hinge.



12. Remove the front end sheet metal mounting bolts.

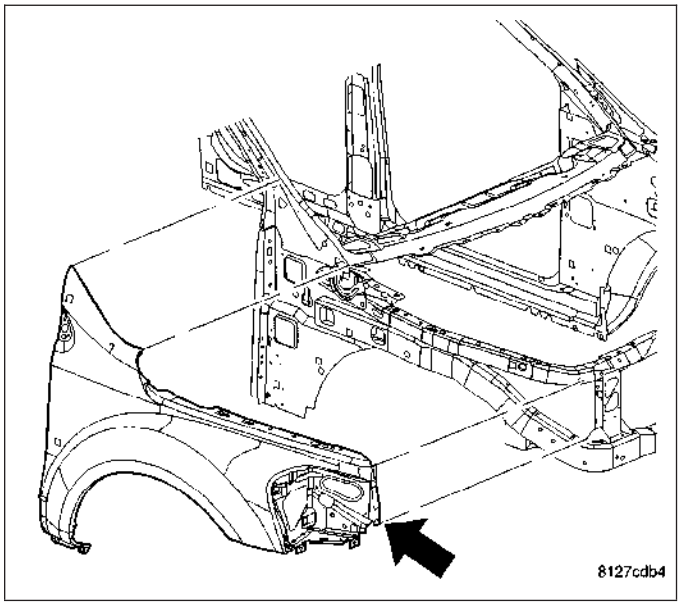


13. Slide the fender off the front end sheet metal mounting support.



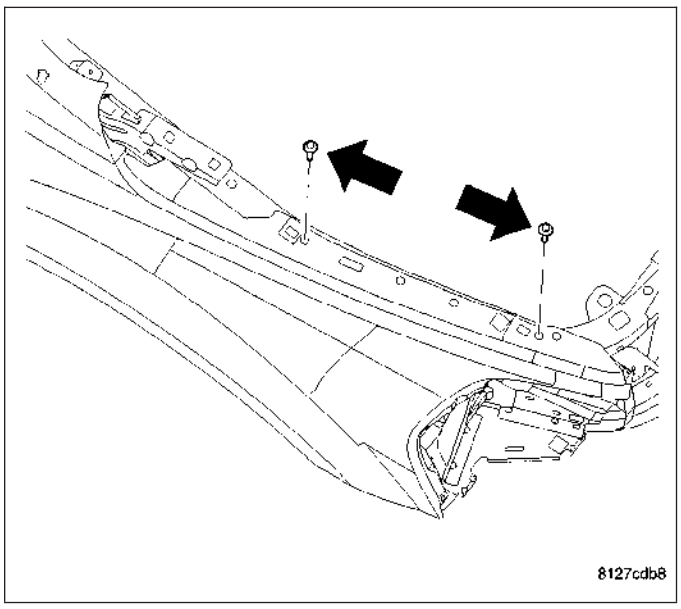
INSTALLATION

1. When installing the left side fender, position the fender onto the Front End Sheet Metal mounting hydroform and slide under the power distribution center.
2. When installing the right side fender, position the fender onto the FESM mounting hydroform and slide under the battery tray and air cleaner mounting brackets.

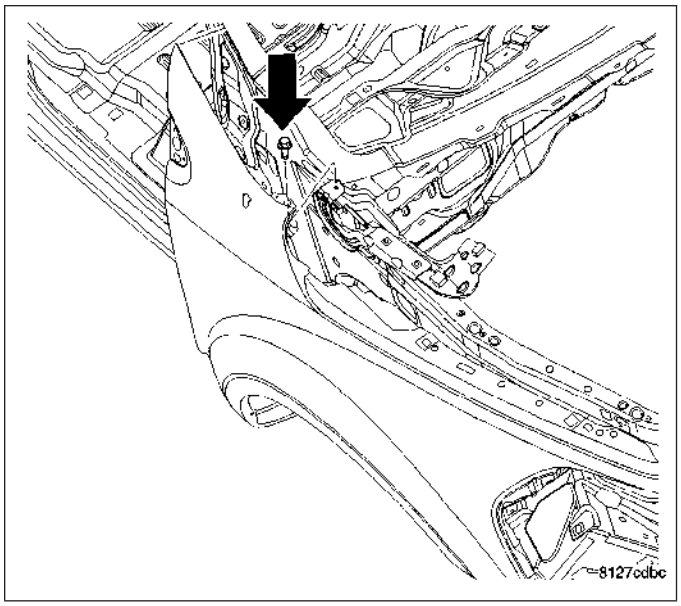


NOTE: Tighten the fender fasteners only after all fasteners are installed loosely and fender is adjusted for gap and flush, using the sequence provided at the end of the installation procedure.

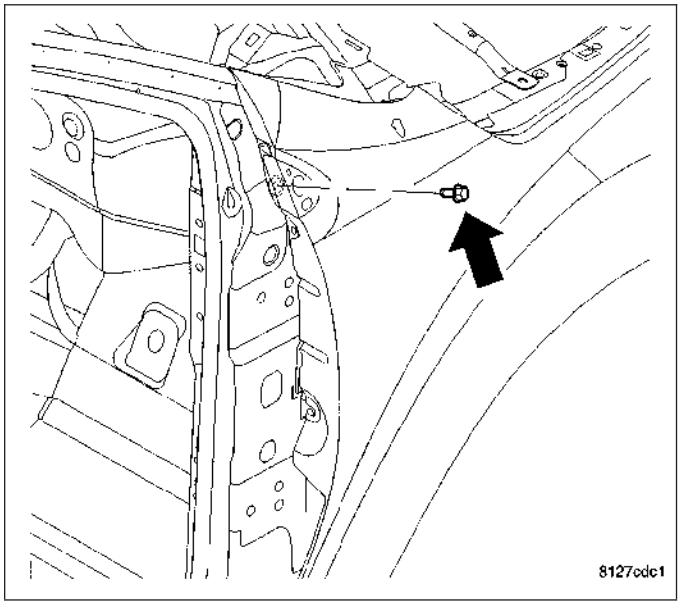
3. Loosely install the upper FESM mounting bolts.



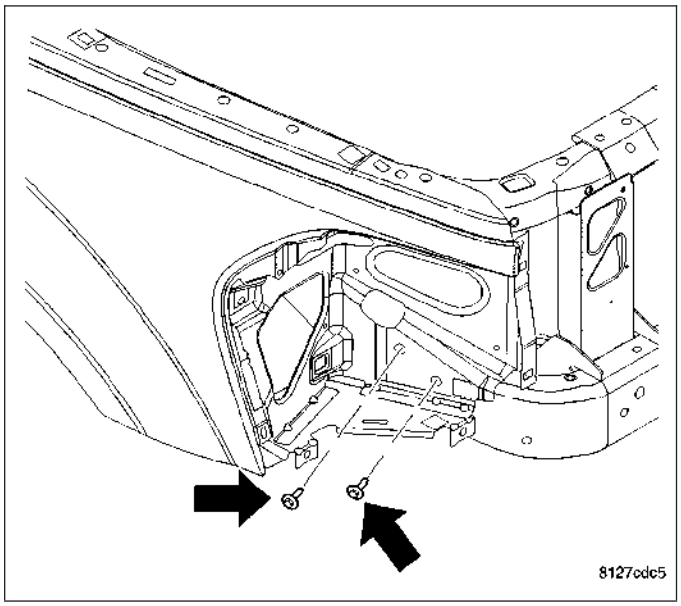
4. Loosely install the bolt attaching the rear upper fender to the hood hinge.



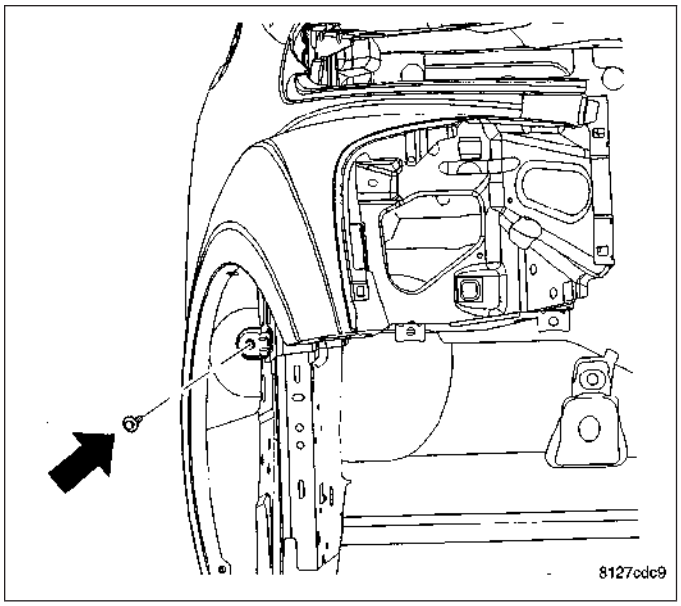
5. Loosely install the bolt attaching the rear upper fender to the a-pillar.



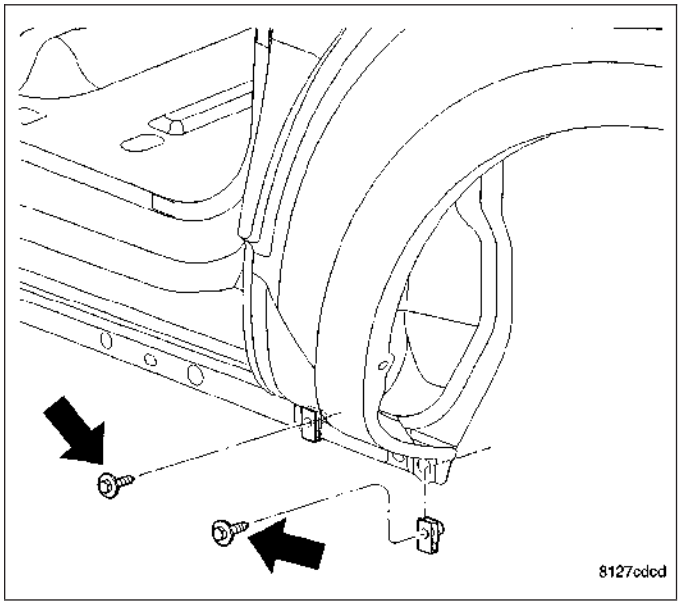
6. Loosely install the two bolts located in the headlamp opening.



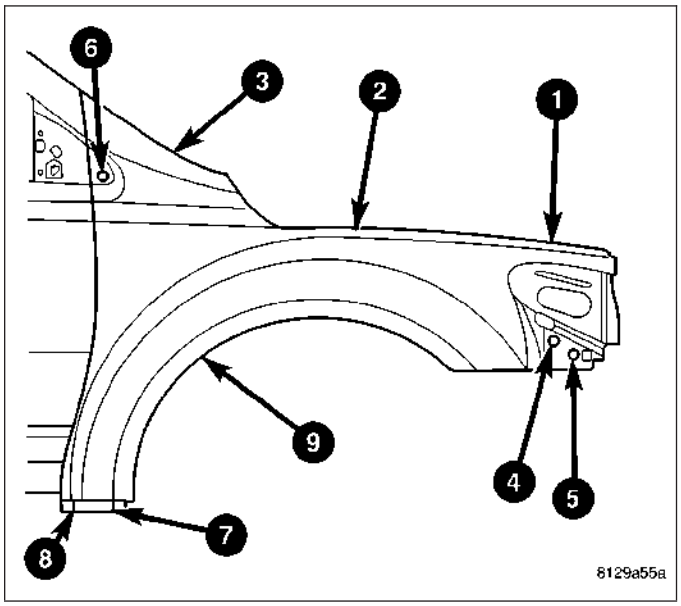
7. Loosely install the bolt located inside the wheel well.



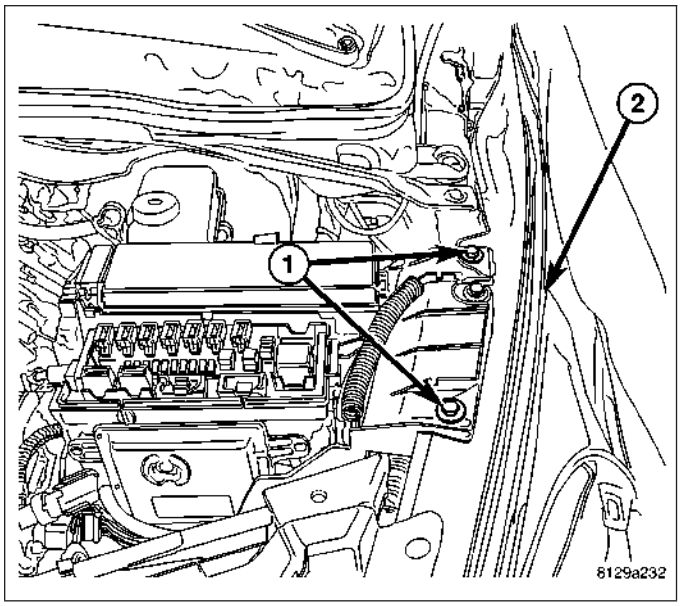
8. Loosely install the two lower bolts located at the a-pillar.



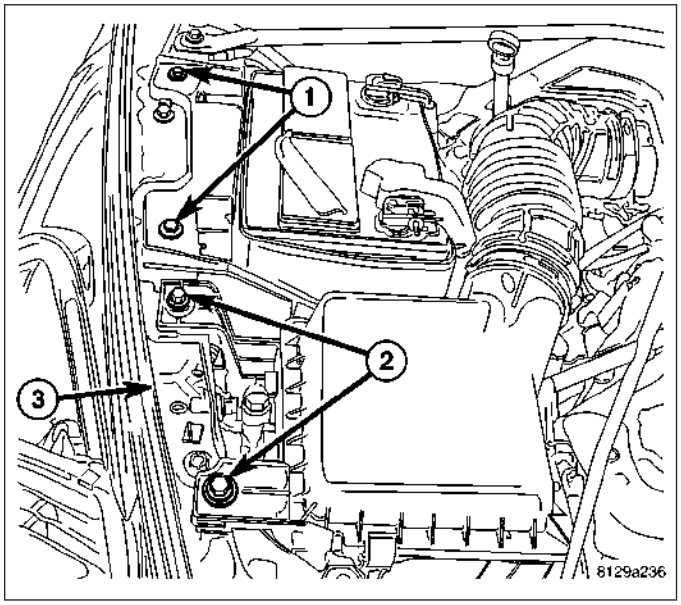
9. Check the fender positioning and adjust as required by adding shims. (Refer to 23 - BODY/ BODY STRUCTURE/GAP AND FLUSH - SPECIFICATIONS)
10. Tighten the fender bolts to 8 N·m (75 in. lbs.) using the sequence shown.



11. When installing the left side fender, install the power distribution center bolts (1) to the FESM (2) and tighten to 11 N·m (100 in. lbs.).



12. When installing the right side fender, install the battery tray bolts and tighten to 11 N·m (100 in. lbs.).
13. Install the air cleaner mounting bolts and tighten to 10 N·m (85 in. lbs.).
14. Install the cowl grille. (Refer to 23 - BODY/EXTERIOR/COWL GRILLE AND SCREEN - INSTALLATION)
15. Install the wheelhouse splash shield. (Refer to 23 - BODY/EXTERIOR/FRONT WHEELHOUSE SPLASH SHIELD - DESCRIPTION)
16. Install the headlight assembly. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HEADLAMP UNIT - INSTALLATION)
17. Install the grille. (Refer to 23 - BODY/EXTERIOR/GRILLE - INSTALLATION)



INSTRUMENT PANEL

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INSTRUMENT PANEL

WARNING

RESTRAINT SYSTEM

WARNING: To avoid personal injury or death, during and following any seat belt or child restraint anchor service, carefully inspect all seat belts, buckles, mounting hardware, retractors, tether straps, and anchors for proper installation, operation, or damage. Replace any belt that is cut, frayed, or torn. Straighten any belt that is twisted. Tighten any loose fasteners. Replace any belt that has a damaged or inoperative buckle or retractor. Replace any belt that has a bent or damaged latch plate or anchor plate. Replace any child restraint anchor or the unit to which the anchor is integral that has been bent or damaged. Never attempt to repair a seat belt or child restraint component. Always replace damaged or faulty seat belt and child restraint components with the correct, new and unused replacement parts listed in the daimlerchrysler mopar parts catalog.

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

WARNING: To avoid personal injury or death on vehicles equipped with airbags, before performing any welding operations disconnect and isolate the battery negative (ground) cable and disconnect all wire harness connectors from the airbag control module (acm). Failure to take the proper precautions could result in accidental airbag deployment and other possible damage to the supplemental restraint system circuits and components.

WARNING: To avoid personal injury or death, do not attempt to dismantle an airbag unit or tamper with its inflator. Do not puncture, incinerate, or bring into contact with electricity. Do not store at temperatures exceeding 93° c (200° f). An airbag inflator unit may contain sodium azide and potassium nitrate. These materials are poisonous and extremely flammable. Contact with acid, water, or heavy metals may produce harmful and irritating gases (sodium hydroxide is formed in the presence of moisture) or combustible compounds. An airbag inflator unit may also contain a gas canister pressurized to over 2500 psi.

WARNING: To avoid personal injury or death, when handling a seat belt tensioner retractor, proper care should be exercised to keep fingers out from under the retractor cover and away from the seat belt webbing where it exits from the retractor cover.

WARNING: To avoid personal injury or death, replace all restraint system components only with parts specified in the daimlerchrysler mopar parts catalog. Substitute parts may appear interchangeable, but internal differences may result in inferior occupant protection.

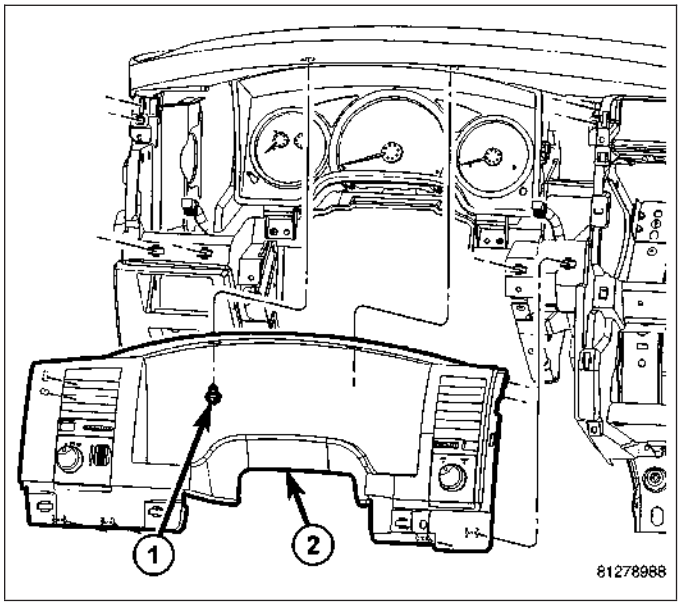
WARNING: To avoid personal injury or death, the fasteners, screws, and bolts originally used for the restraint system components must never be replaced with any substitutes. These fasteners have special coatings and are specifically designed for the restraint system. Any time a new fastener is needed, replace it with the correct fasteners provided in the service package or specified in the daimlerchrysler mopar parts catalog.

WARNING: To avoid personal injury or death, when a steering column has an airbag unit attached, never place the column on the floor or any other surface with the steering wheel or airbag unit face down.

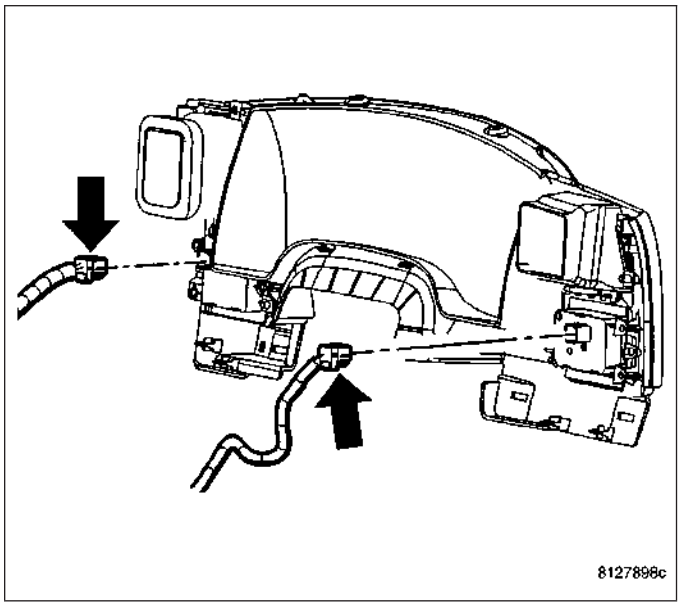
BEZEL-CLUSTER

REMOVAL

1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/INSTRUMENT PANEL - WARNING)
2. Remove the steering column opening cover. (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - REMOVAL)
3. Remove the screws (1) and using a trim stick C-4755 or equivalent, separate the cluster bezel from the instrument panel.

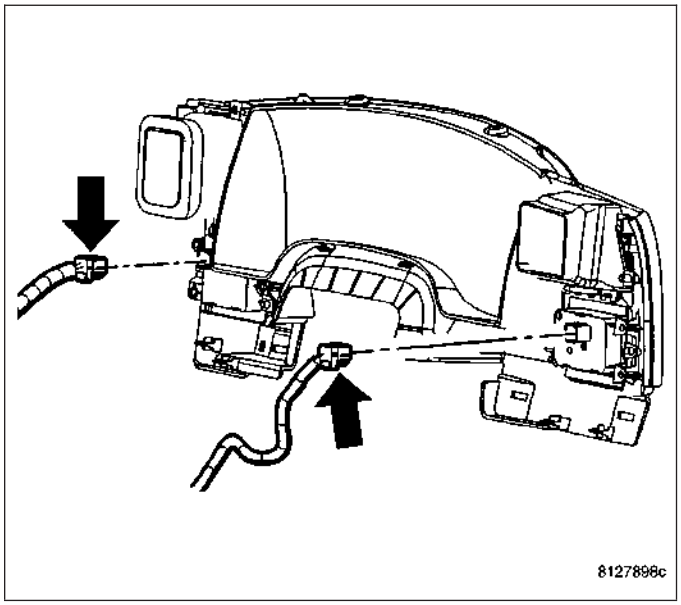


4. Disconnect the electrical connectors.

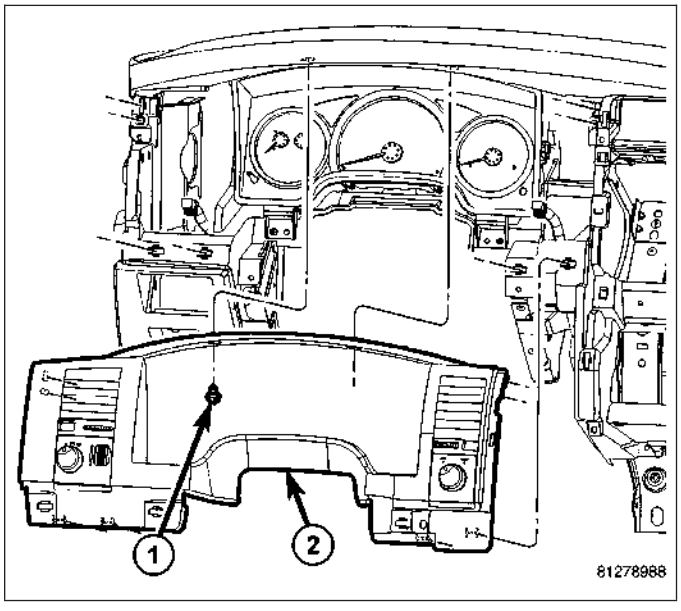


INSTALLATION

1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/INSTRUMENT PANEL - WARNING)
2. Connect the electrical connectors.

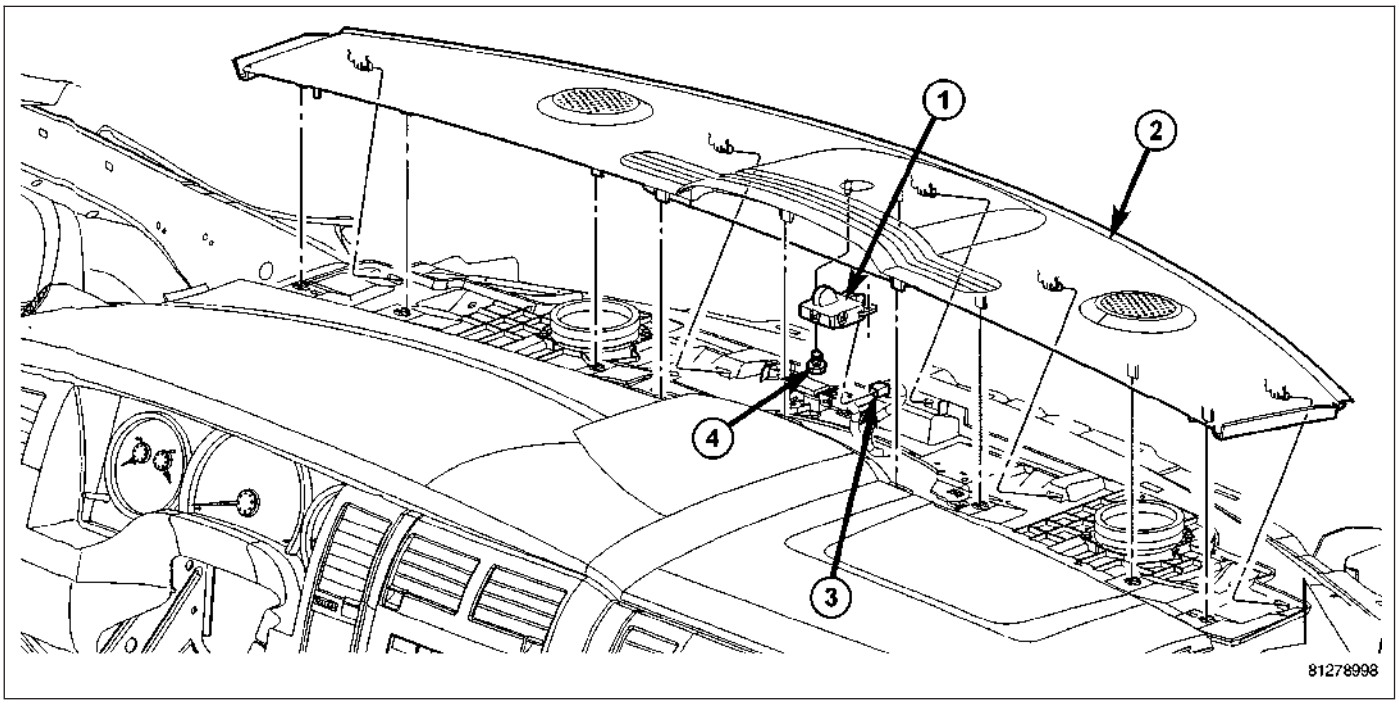


3. Position the bezel (2) onto the instrument panel and seat fully.
4. Install the screws (1).
5. Install the steering column opening cover. (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - INSTALLATION)



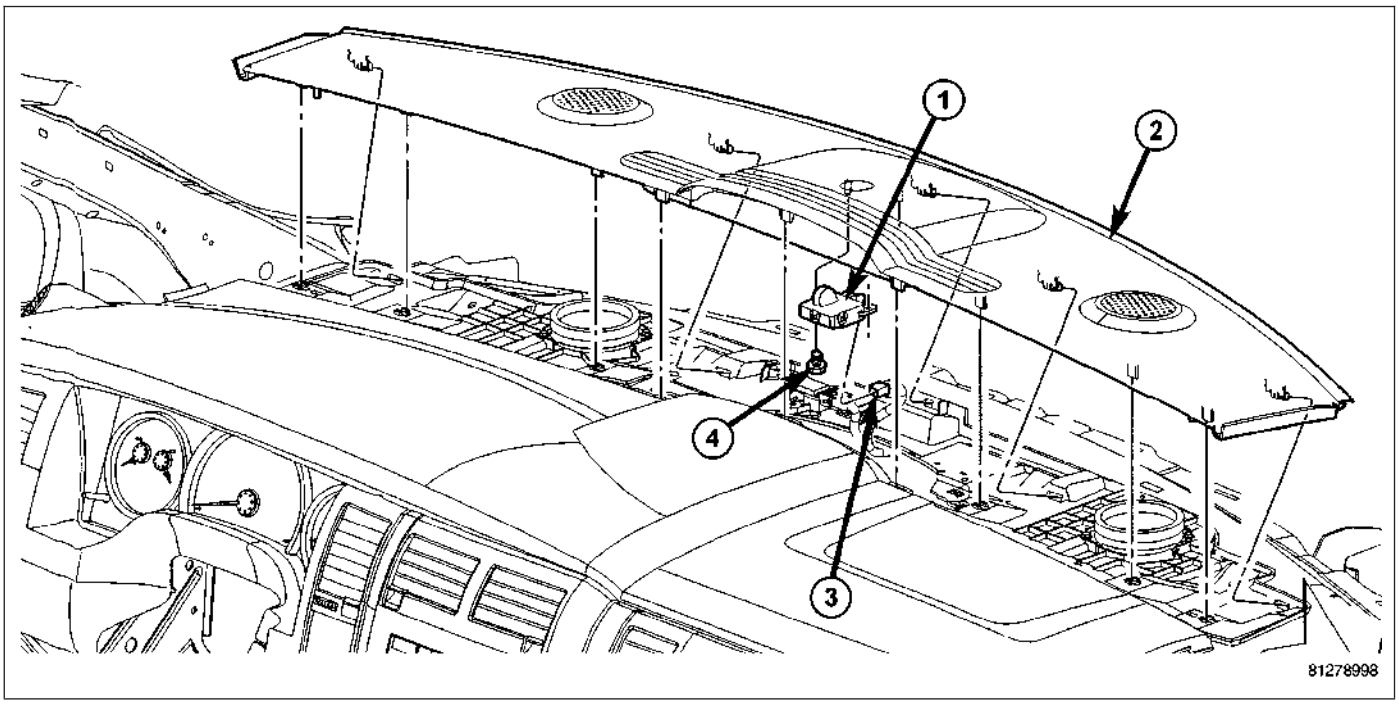
GRILLE-DEFROSTER

REMOVAL



1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/ INSTRUMENT PANEL - WARNING)
2. Using a trim stick C-4755 or equivalent, remove the drivers side a-pillar trim.
3. Open the trim covers in the passenger side a-pillar grab handle and remove the bolts.
4. Remove the right a-pillar trim panel.
5. Using a trim stick C-4755 or equivalent, remove the instrument panel defroster grille.
6. Disconnect the sensor electrical connector (2).
7. Remove the screw (4) and remove the sun sensor (1).

INSTALLATION



1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/ INSTRUMENT PANEL - WARNING)
2. Install the sun sensor (1) and install the screw (4).
3. Position the defroster grille (2) into place and connect the electrical connector (3).
4. Position the drivers side a-pillar trim into place and seat the retaining clips fully.
5. Position the passenger side a-pillar trim panel into place and seat fully.
6. Install the bolts and tighten to 6 N·m (55 in. lbs.).

ASSEMBLY-INSTRUMENT PANEL

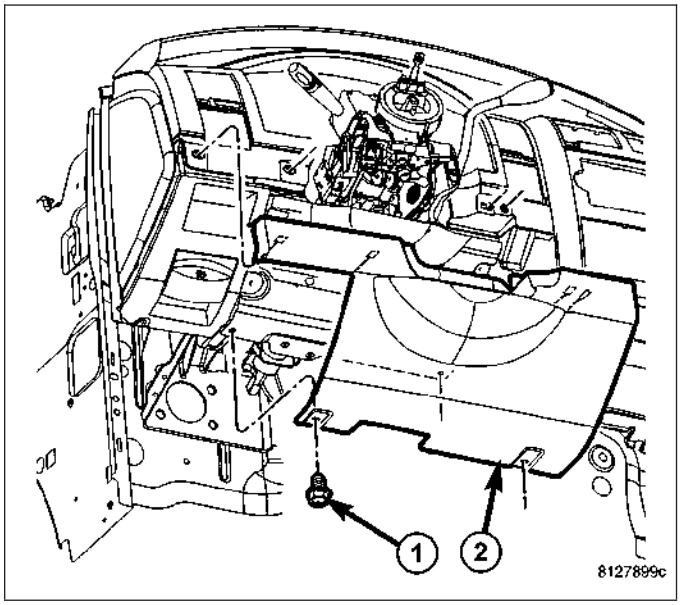
REMOVAL

WARNING: TO AVOID PERSONAL INJURY OR DEATH, ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, AIRBAG, OCCUPANT CLASSIFICATION SYSTEM, SEAT BELT TENSIONER, IMPACT SENSOR, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT.

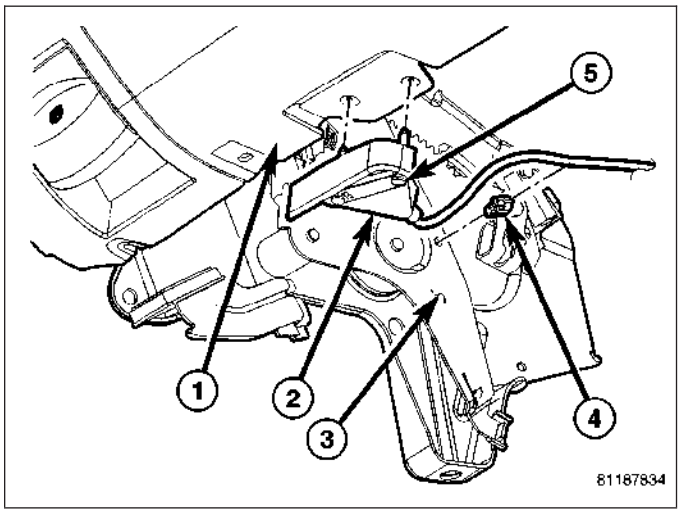
WARNING: TO AVOID PERSONAL INJURY OR DEATH, NEVER STRIKE OR DROP THE OCCUPANT RESTRAINT CONTROLLER, AS IT CAN DAMAGE THE IMPACT SENSOR OR AFFECT ITS CALIBRATION. THE OCCUPANT RESTRAINT CONTROLLER CONTAINS THE IMPACT SENSOR, WHICH ENABLES THE SYSTEM TO DEPLOY THE SUPPLEMENTAL RESTRAINTS. IF AN AIRBAG CONTROL MODULE IS ACCIDENTALLY DROPPED DURING SERVICE, THE MODULE MUST BE SCRAPPED AND REPLACED WITH A NEW UNIT. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN ACCIDENTAL, INCOMPLETE, OR IMPROPER SUPPLEMENTAL RESTRAINT DEPLOYMENT.

CAUTION: On vehicles equipped with the Occupant Classification System (OCS), never replace both the Occupant Restraint Controller (ORC) and the Occupant Classification Module (OCM) at the same time. If both require replacement, replace one. Then perform the supplemental restraint verification test before replacing the other. Both the ORC and the OCM store OCS calibration data, which they transfer to one another when one of them is replaced. If both are replaced at the same time, an irreversible fault will be set in both modules.

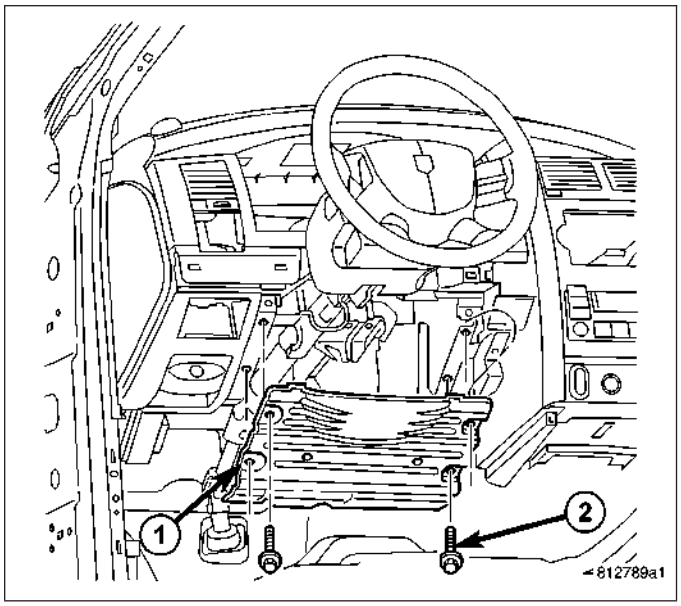
1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/INSTRUMENT PANEL - WARNING)
2. Disconnect and isolate battery negative cable.
3. Using a trim stick C-4755 or equivalent, remove the left door sill trim cover.
4. Remove the screw and remove the left cowl trim cover.
5. Remove the left instrument panel end cap.
6. Remove the two screws (1) and remove the steering column opening cover (2).



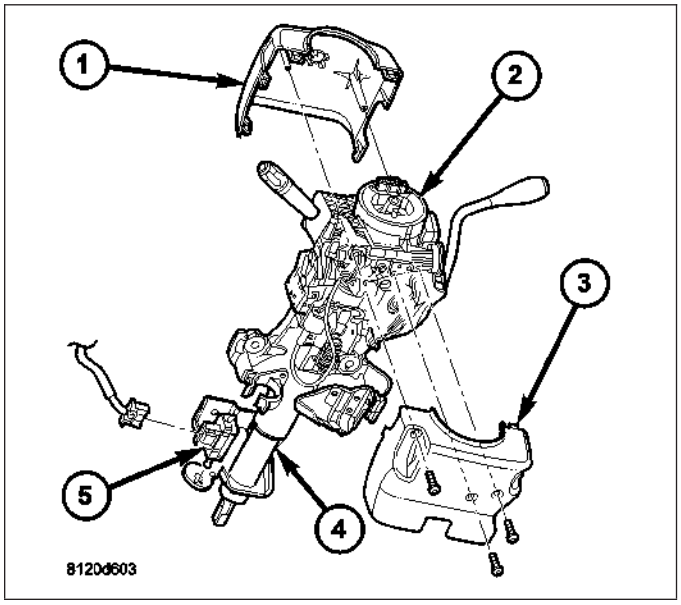
7. Remove the screws (5) and position aside the hood release handle (2).



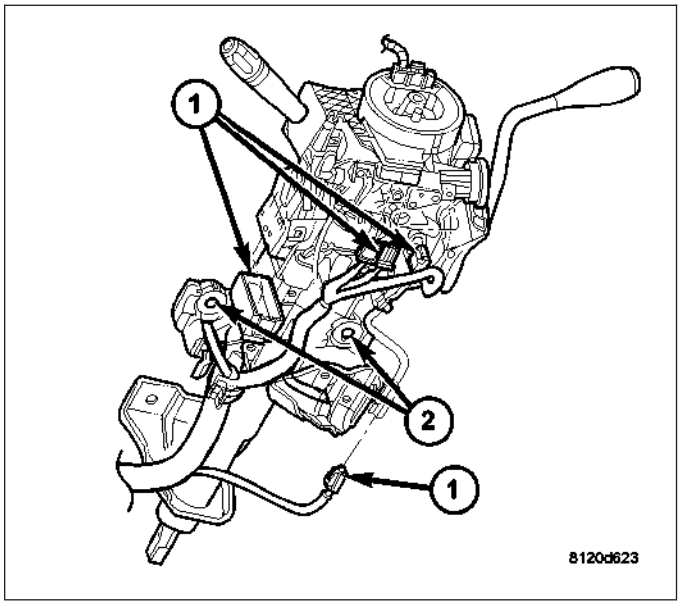
8. Remove the four screws (2) and remove the steering column opening reinforcement (1).



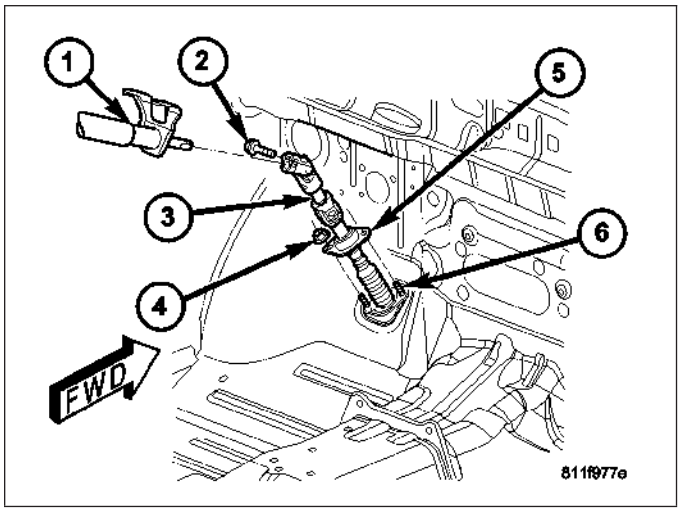
9. Remove the steering column tilt lever.
10. Remove the upper (1) and lower (3) column shrouds.



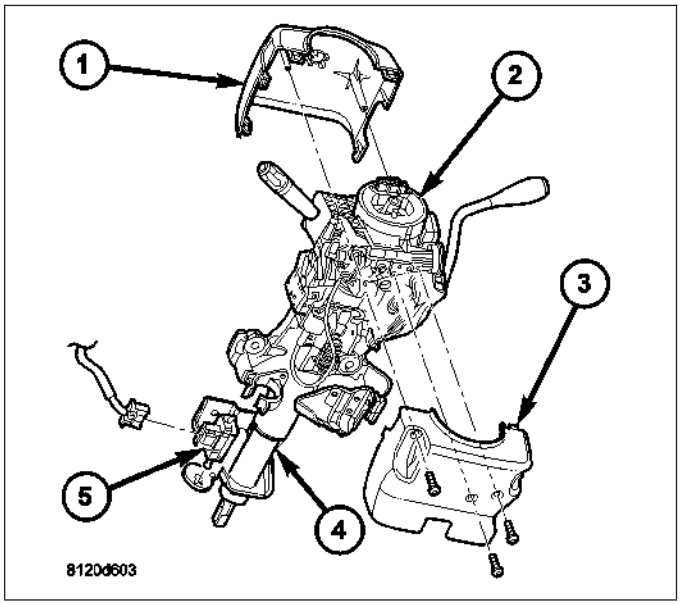
11. Disconnect the wiring harness connectors (1) to the column.
12. Remove the shift cable from the column shift lever actuator. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC/GEAR SHIFT CABLE - REMOVAL)
13. Release the shift cable from the column bracket and remove it from the bracket.
14. Remove the SKIM module in order to disconnect the electrical connector.



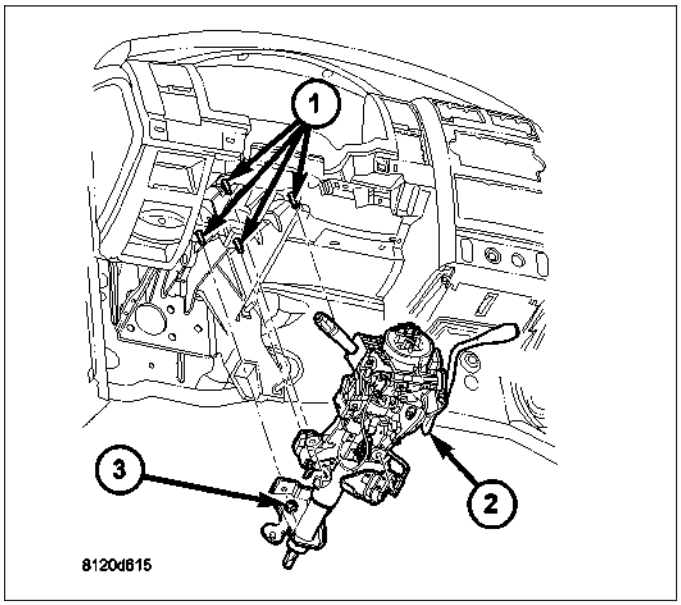
15. Remove the upper steering shaft coupler bolt (2) and slide the shaft (3) down.



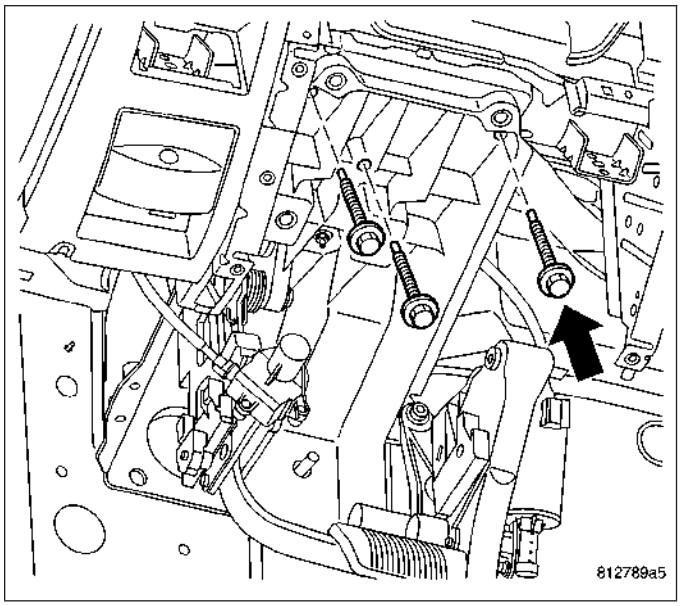
16. Remove the brake light switch (5) and discard (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/BRAKE LAMP SWITCH - REMOVAL).



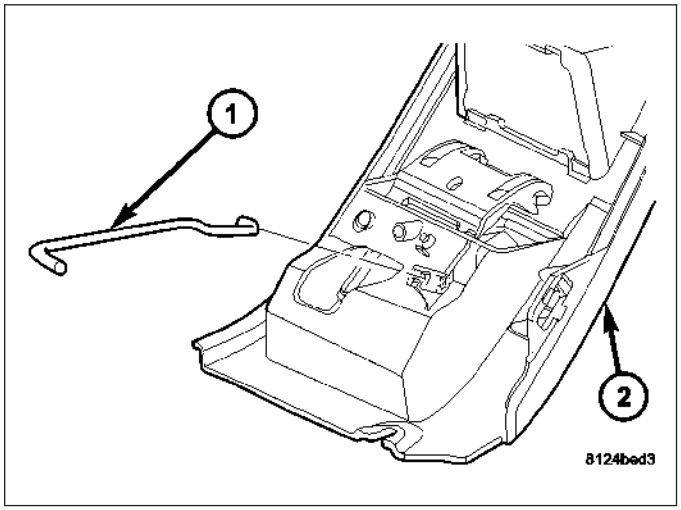
17. Remove the four steering column mounting nuts (3).
18. Lower the column from the mounting studs (1).
19. Remove the steering column assembly (2) from the vehicle.



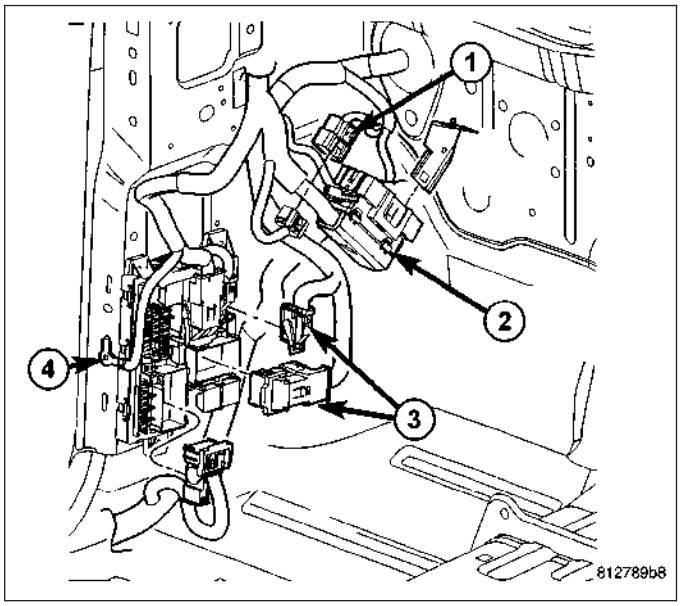
20. Remove the pedal support bracket bolts.



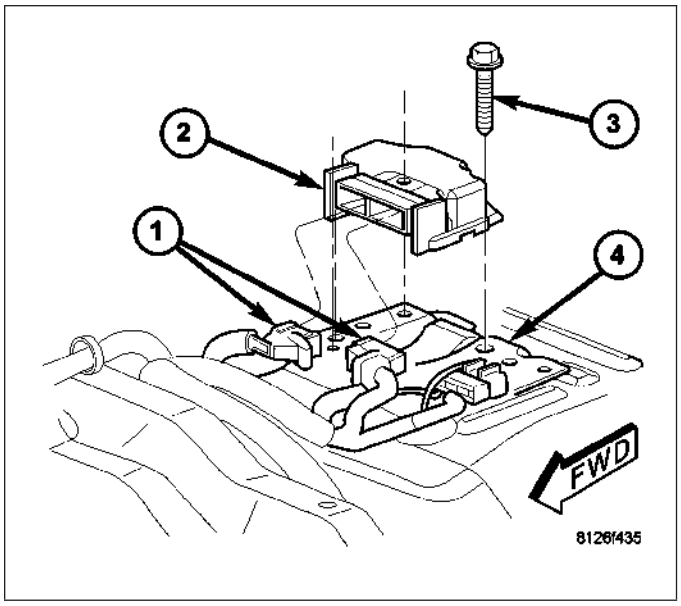
21. Disengage the release rod (1) from the arm on the pedal assembly.



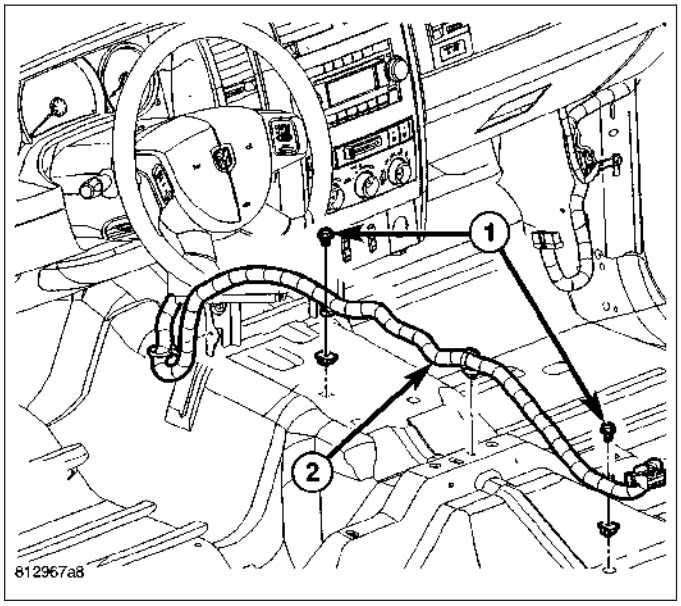
22. Disconnect the electrical connectors (1, 2 and 3) from the fuse block.
23. Remove the bolt and remove the ground wire (4).
24. Open the trim covers in the drivers side a-pillar grab handle and remove the bolts.
25. Remove the a-pillar trim panel.
26. Remove the floor console. (Refer to 23 - BODY/ INTERIOR/FLOOR CONSOLE - REMOVAL)



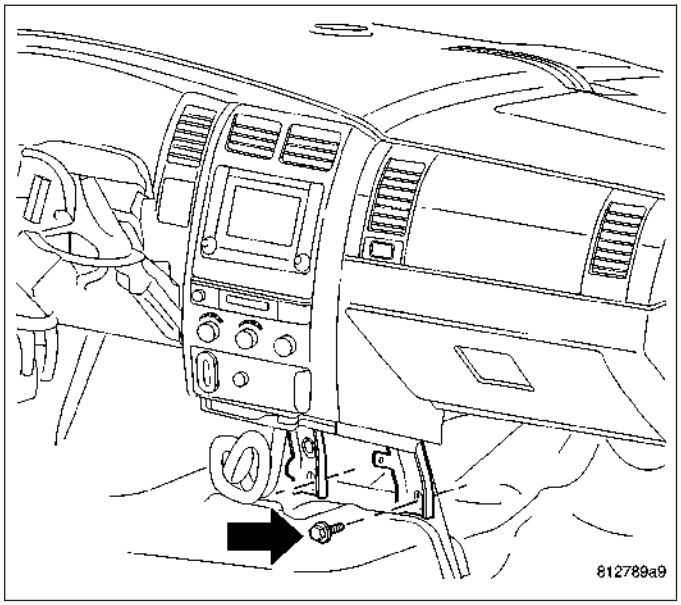
27. Disconnect the two body wire harness connectors (1) from the Occupant Restraint Controller (ORC) (2) connector receptacles located on the forward facing side of the module. To disconnect the wire harness connectors from the ORC, depress the release tab and lift the lever arm on each connector.



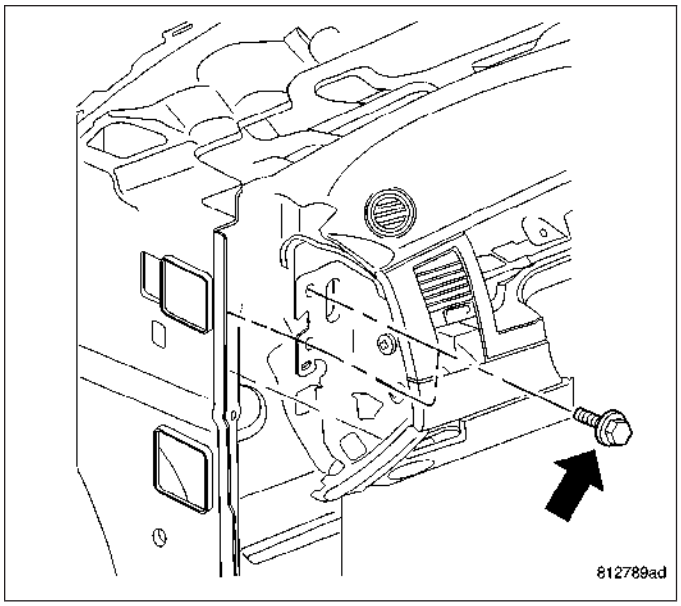
28. Position the carpet aside and remove the center harness screws (1). Pull instrument panel wiring harness (2) from under the carpet.



29. Remove the center support bolts.
30. Remove the drivers seat. (Refer to 23 - BODY/ SEATS/SEAT - REMOVAL)
31. Remove the drivers side floor duct.

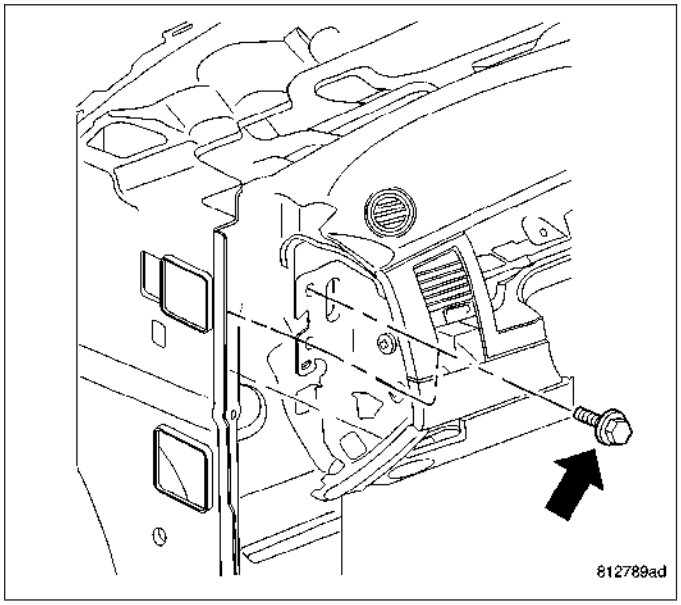


32. Remove the drivers side support bolts.

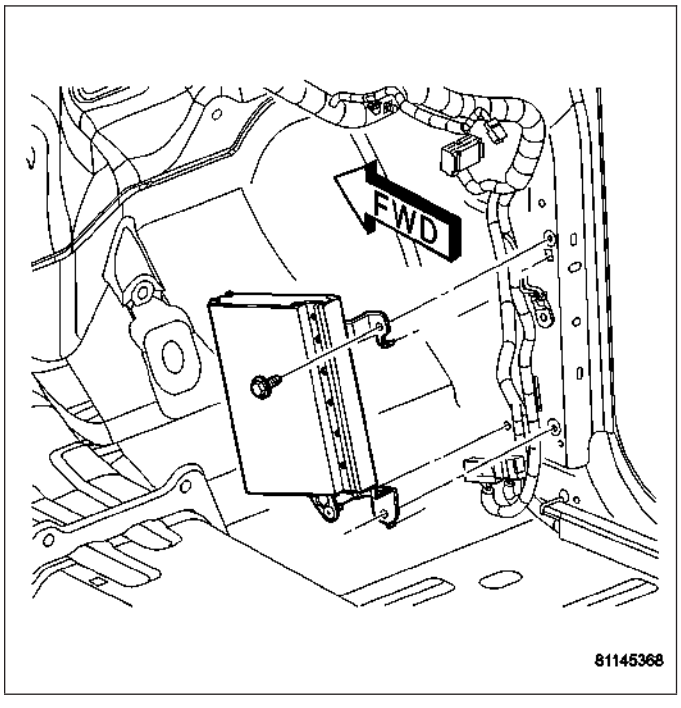


33. Remove the right instrument panel end cap.
34. Remove the passenger side support bolts.

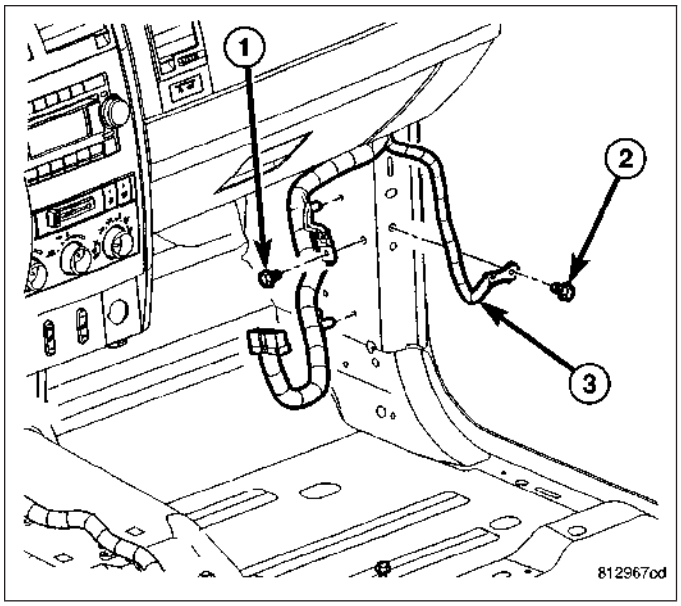
NOTE: Drivers side shown, passenger side similar.

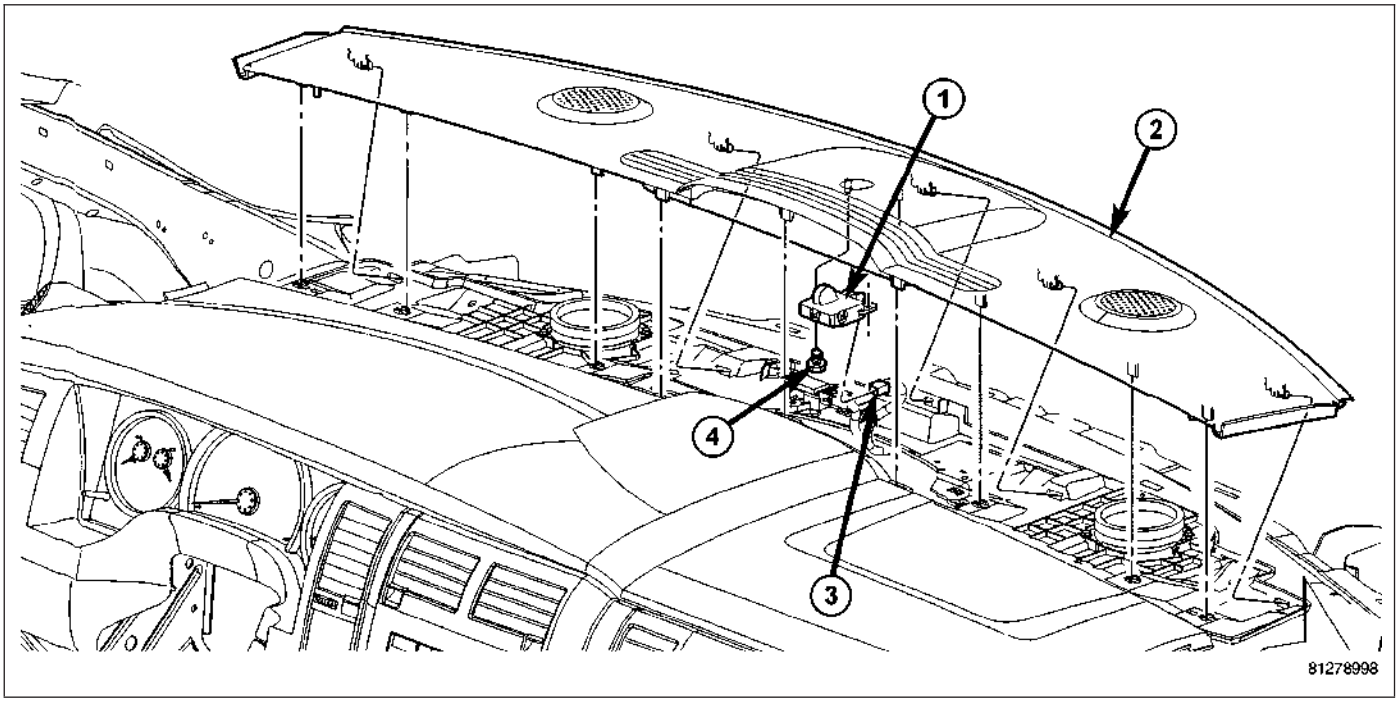


35. Using a trim stick C-4755 or equivalent, remove the right door sill trim cover.
36. Remove the screw and remove the right cowl trim cover.
37. Remove the bolts and remove the amplifier.
38. Disconnect the amplifier and antenna electrical connectors.

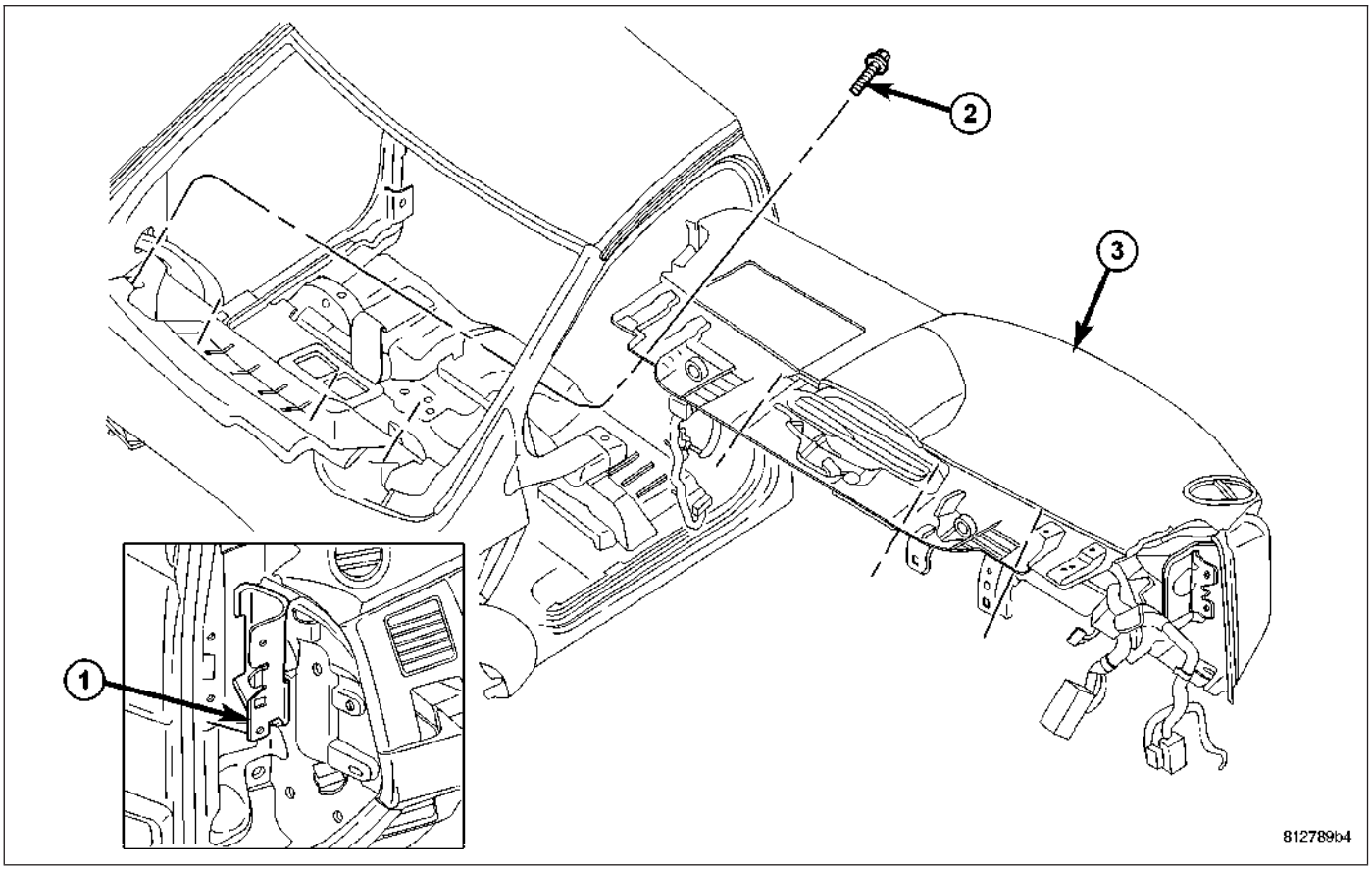


39. Remove the harness bolt (1) and the ground wire(3) bolt (2).
40. Remove the passenger side rear floor duct.





41. Open the trim covers in the passenger side a-pillar grab handle and remove the bolts.
42. Remove the a-pillar trim panel.
43. Using a trim stick C-4755 or equivalent, remove the instrument panel defroster grille.
44. Disconnect the sensor electrical connector (2).



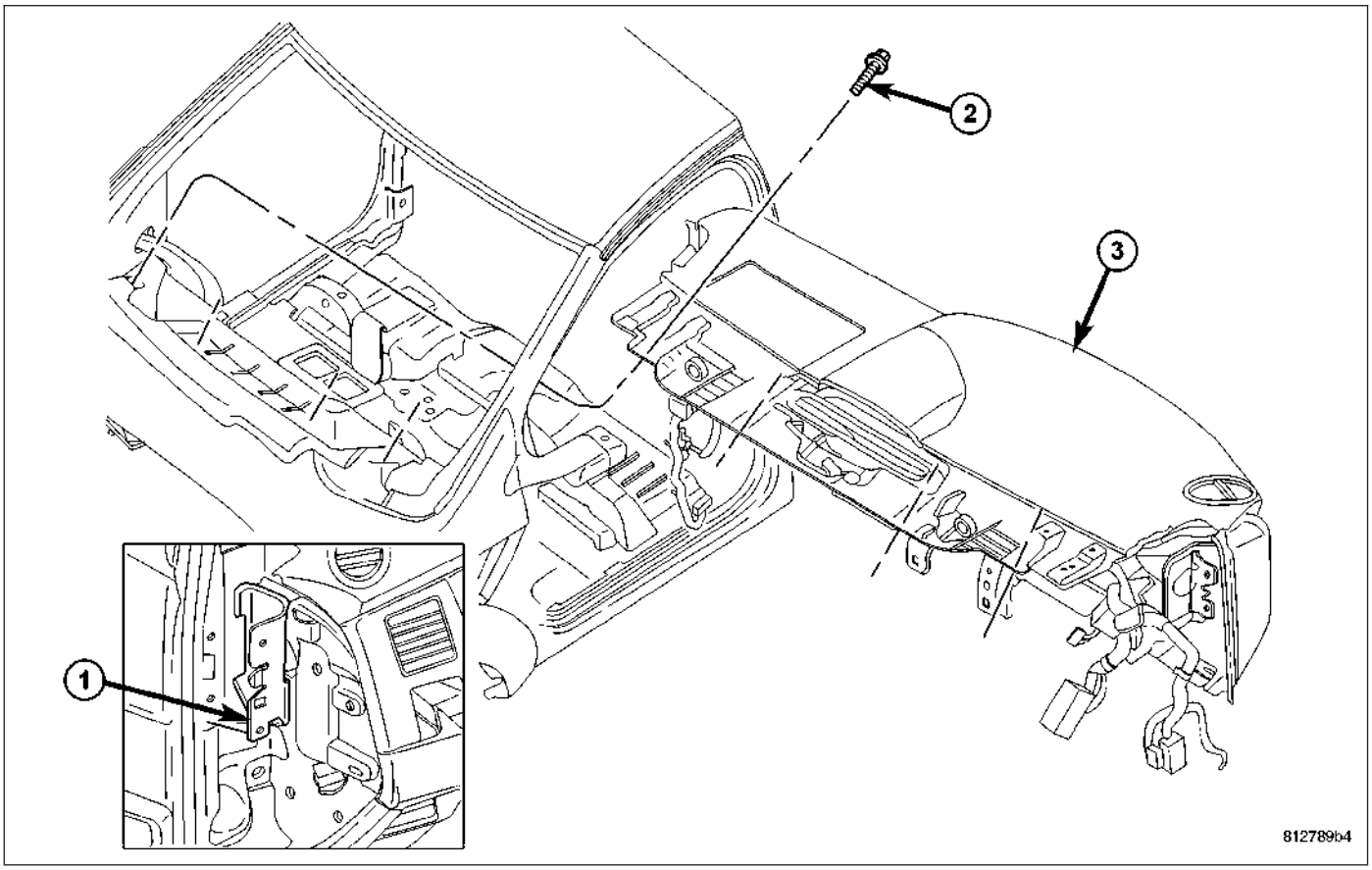
45. Remove the four fenceline bolts (2).
46. Lift the instrument panel assembly (3) off the side support pins (1) and remove assembly through the drivers door.

INSTALLATION

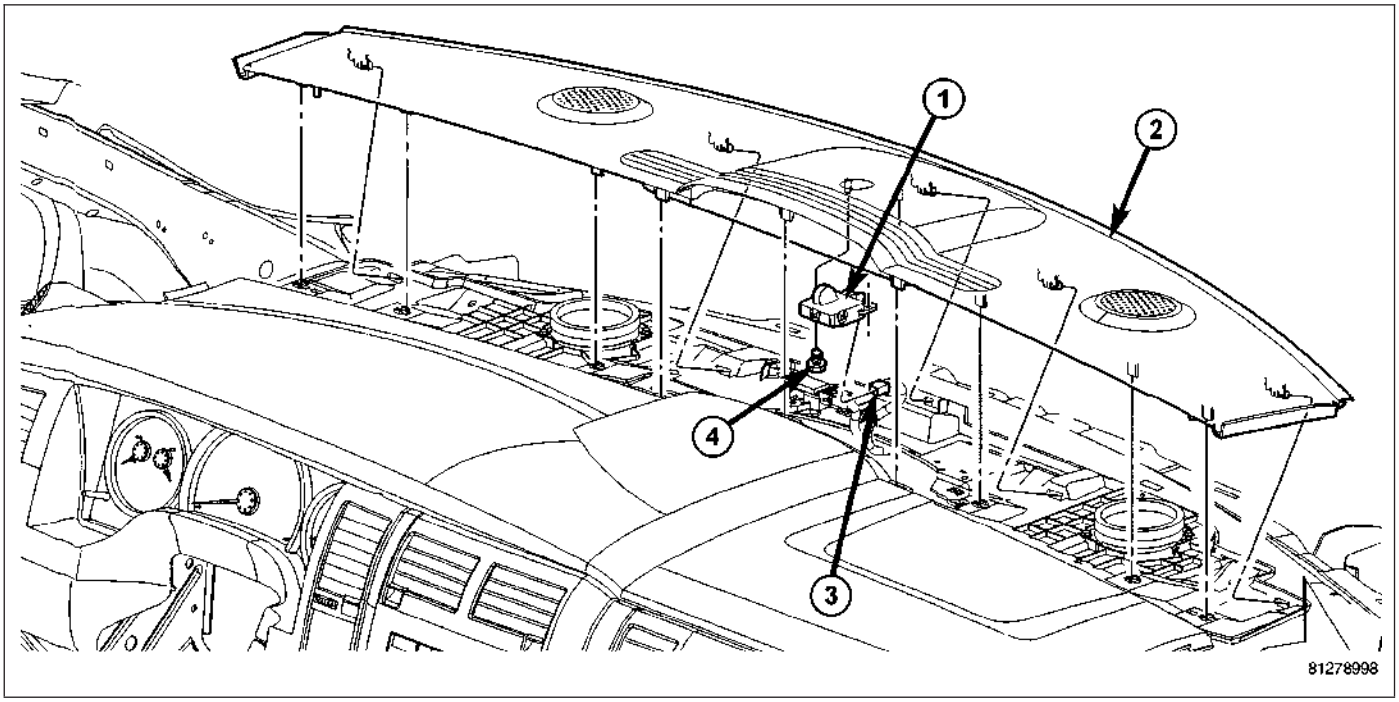
WARNING: TO AVOID PERSONAL INJURY OR DEATH, ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, AIRBAG, OCCUPANT CLASSIFICATION SYSTEM, SEAT BELT TENSIONER, IMPACT SENSOR, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT.

WARNING: TO AVOID PERSONAL INJURY OR DEATH, NEVER STRIKE OR DROP THE OCCUPANT RESTRAINT CONTROLLER, AS IT CAN DAMAGE THE IMPACT SENSOR OR AFFECT ITS CALIBRATION. THE OCCUPANT RESTRAINT CONTROLLER CONTAINS THE IMPACT SENSOR, WHICH ENABLES THE SYSTEM TO DEPLOY THE SUPPLEMENTAL RESTRAINTS. IF AN AIRBAG CONTROL MODULE IS ACCIDENTALLY DROPPED DURING SERVICE, THE MODULE MUST BE SCRAPPED AND REPLACED WITH A NEW UNIT. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN ACCIDENTAL, INCOMPLETE, OR IMPROPER SUPPLEMENTAL RESTRAINT DEPLOYMENT.

CAUTION: On vehicles equipped with the Occupant Classification System (OCS), never replace both the Occupant Restraint Controller (ORC) and the Occupant Classification Module (OCM) at the same time. If both require replacement, replace one. Then perform the supplemental restraint verification test before replacing the other. Both the ORC and the OCM store OCS calibration data, which they transfer to one another when one of them is replaced. If both are replaced at the same time, an irreversible fault will be set in both modules.

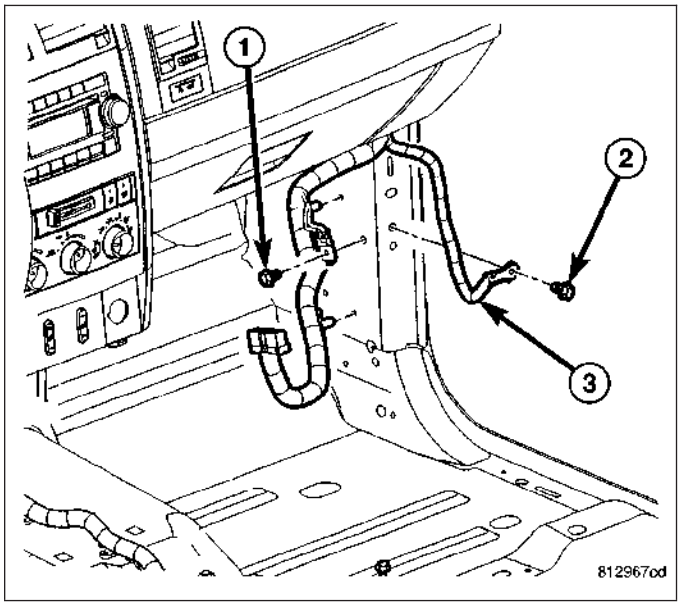


1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/ INSTRUMENT PANEL - WARNING)
2. Position the instrument panel assembly (3) into the vehicle through the drivers side door and install onto the side support pins (1).
3. Install the four fenceline bolts and tighten to 8 N·m (70 in. lbs.).

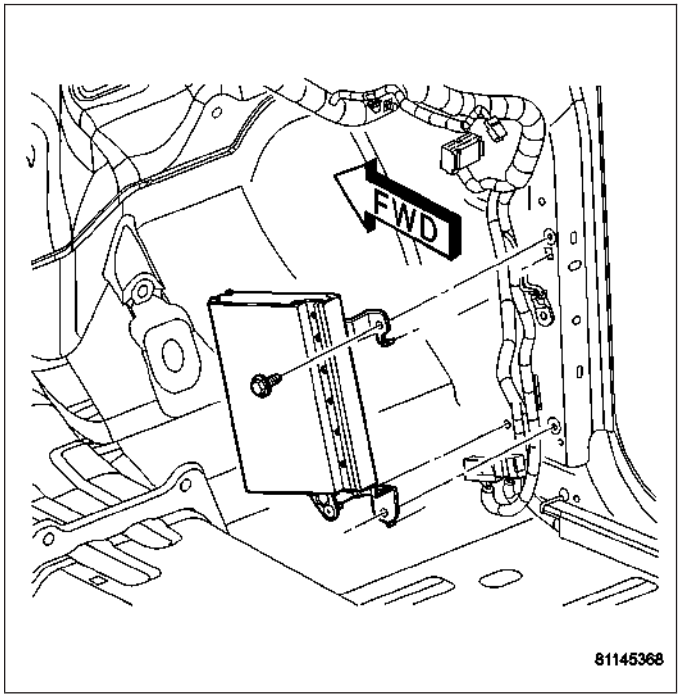


4. Connect the sensor electrical connector (2).

5. Install the instrument panel defroster grille and seat fully.
6. Position the passenger side a-pillar trim panel into place and seat fully.
7. Install the bolts and tighten to 6 N·m (55 in. lbs.).
8. Install the passenger side rear floor duct.
9. Install the screws for the ground wire (2) and passenger side wire harness (1).
10. Tighten the ground wire (2) and harness bolts (3) to 14 N·m (10 ft. lbs.).



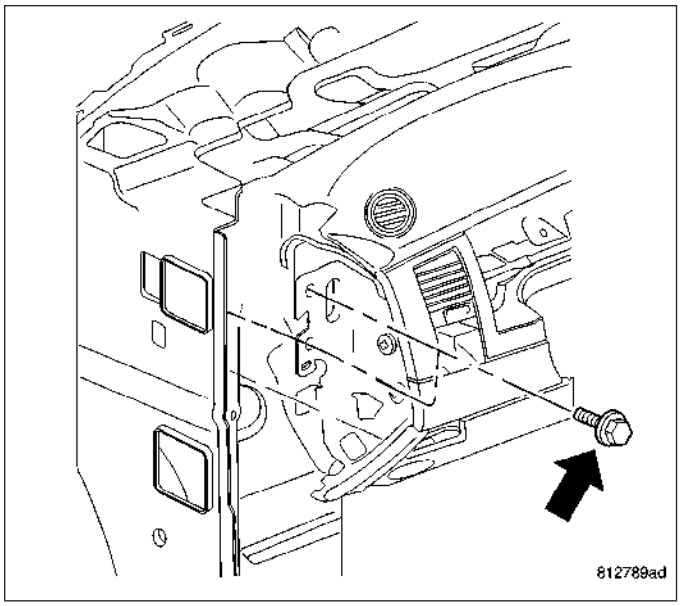
11. Connect the amplifier and antenna electrical connectors.
12. Install the amplifier and install the bolts.
13. Tighten the bolts to 6 N·m (50 in. lbs.).
14. Install the right cowl trim cover and install the screw.
15. Install the right door sill trim cover.



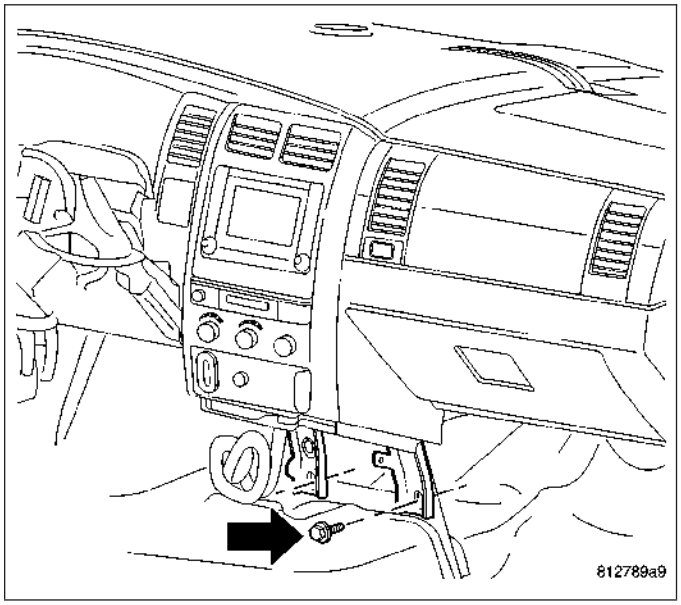
16. Install the passenger side support bolts and tighten to 27 N·m (20 ft. lbs.).
17. Install the right instrument panel end cap.

NOTE: Drivers side shown, passenger side similar.

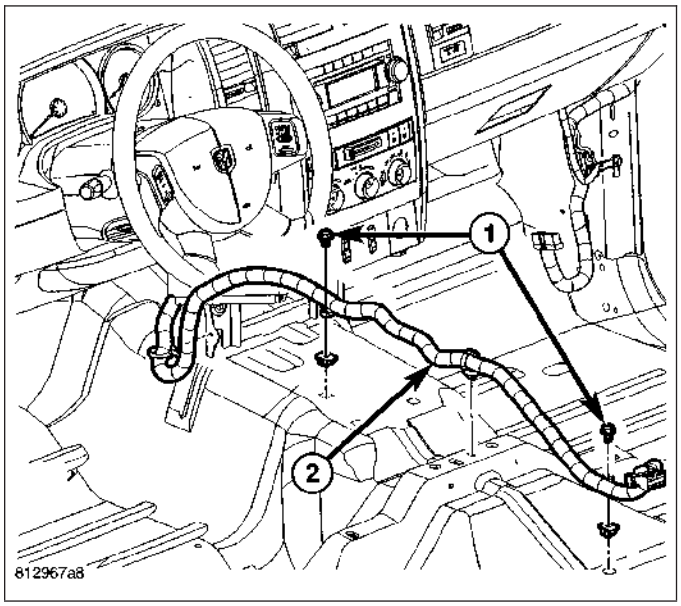
18. Install the drivers side support bolts and tighten to 27 N·m (20 ft. lbs.).



19. Install the drivers side floor duct.
20. Install the drivers seat. (Refer to 23 - BODY/ SEATS/SEAT - INSTALLATION)
21. Install the center support bolts and tighten to 11 N·m (95 in. lbs.).

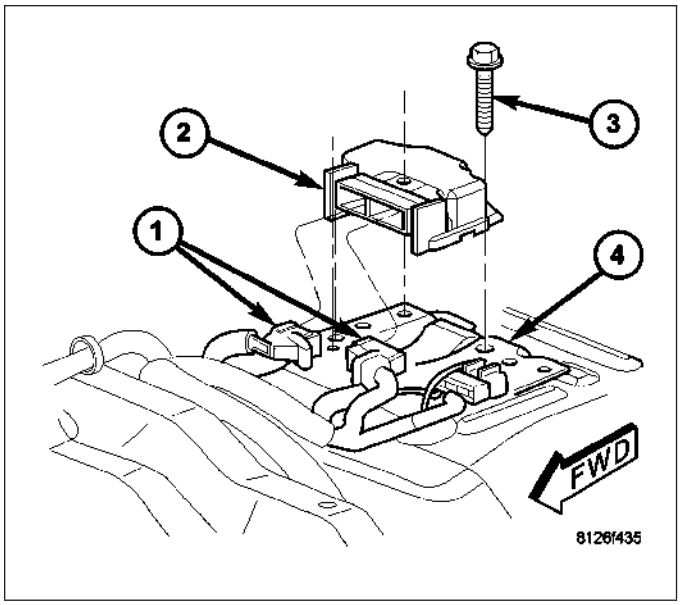


22. Position the center instrument panel wiring harness (2) under the carpet and install the bolts (1).

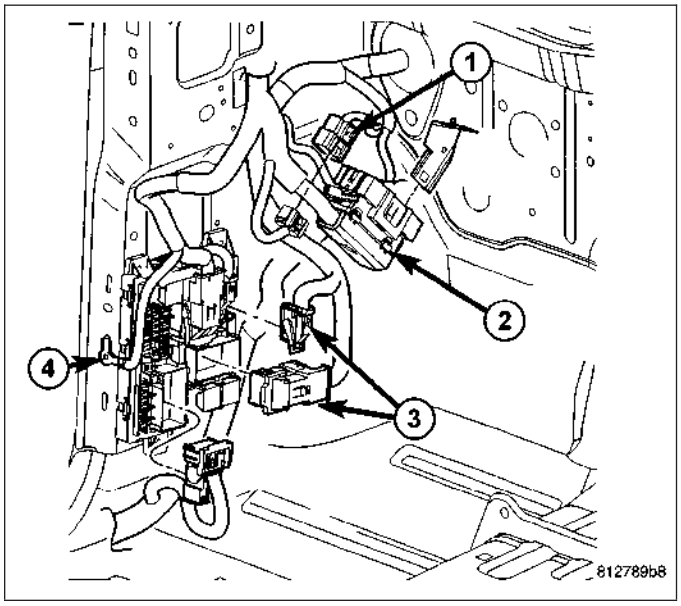


CAUTION: The lever arms of the wire harness connectors for the ORC MUST be in the unlatched position before they are inserted into their connector receptacles on the ORC or they may become damaged.

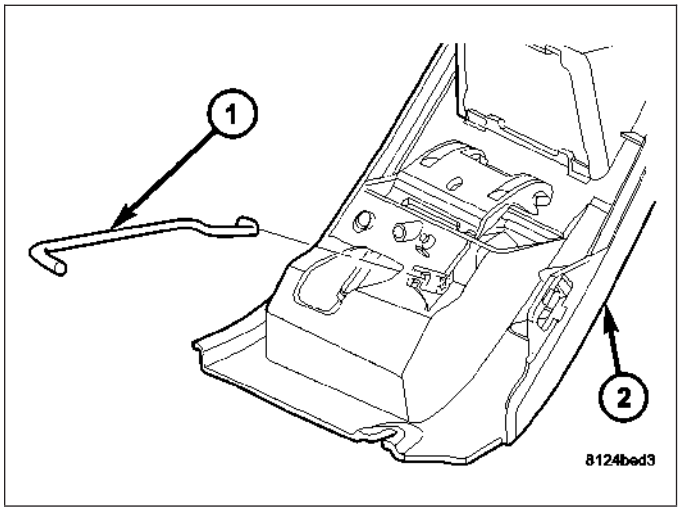
23. Reconnect the two body wire harness connectors (1) to the ORC connector receptacles located on the forward facing side of the module. Be certain that the latches on both connectors are each fully engaged.
24. Install the floor console. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION)



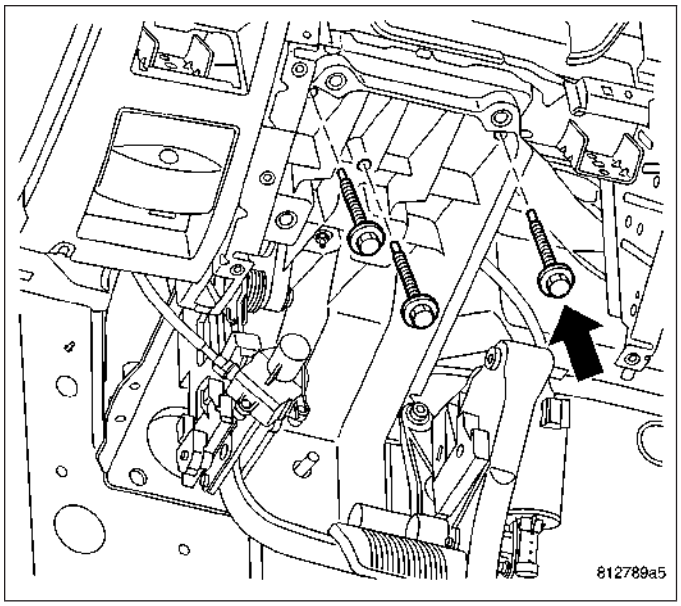
25. Position the drivers side a-pillar trim into place and seat the retaining clips fully.
26. Install the bolts and tighten to 6 N·m (55 in. lbs.).
27. Install the ground wire (4) and install the bolt.
28. Tighten the ground wire bolts to 14 N·m (10 ft. lbs.)
29. Connect the electrical connectors (1, 2 and 3) at the fuse block.



30. Connect the brake release rod (1) to the arm on the pedal assembly.

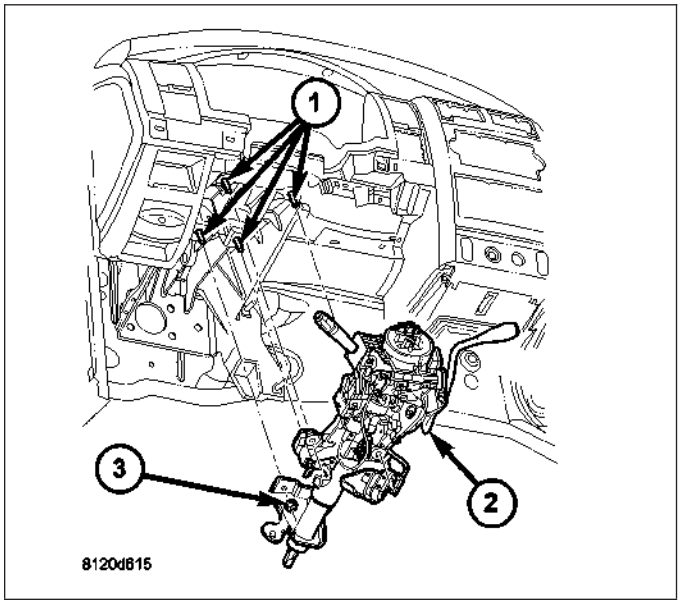


31. Install the pedal support bolts and tighten to 14 N·m (10 ft. lbs.).

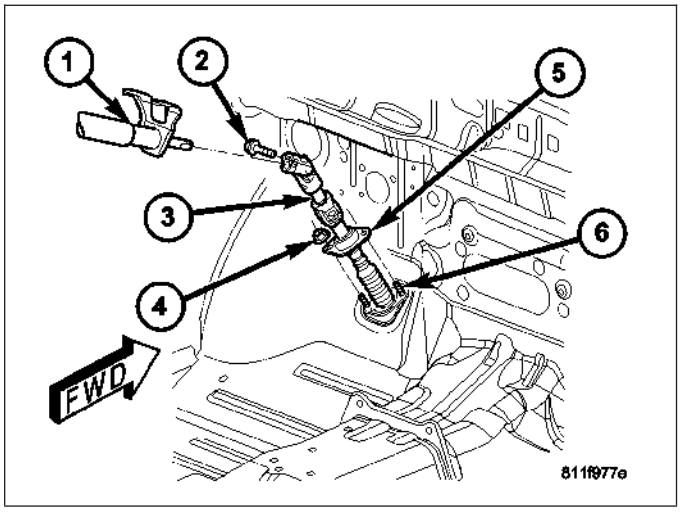


CAUTION: All fasteners must be torqued to specification to ensure proper operation of the steering column.

32. Position the steering column (2) on the dash panel support (1) and loosely install the mounting nuts (3).
33. Firmly slide the steering column (2) upward against the studs (1) in dash panel and hand tighten the nuts (3).



34. Install the steering shaft coupler (3) on the steering shaft (1) and loosely install a **new** bolt (2).

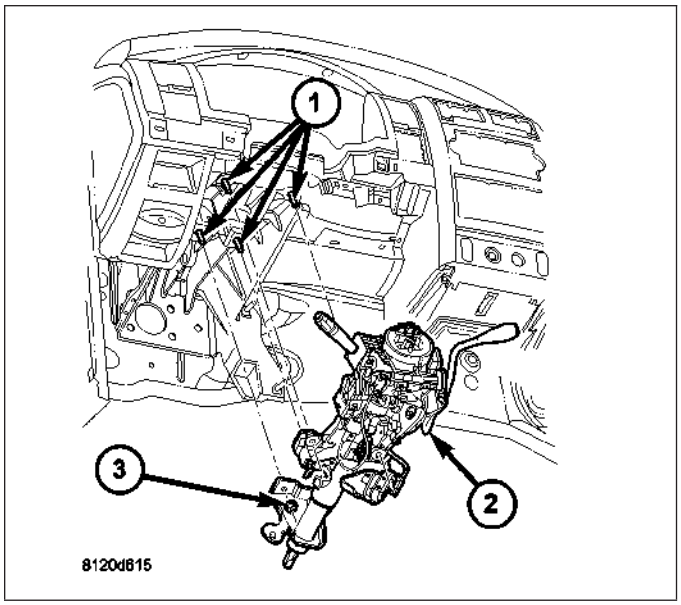


35. Center steering column (2) in dash opening and tighten mounting nuts (3) to 28 N·m (21 ft. lbs.).

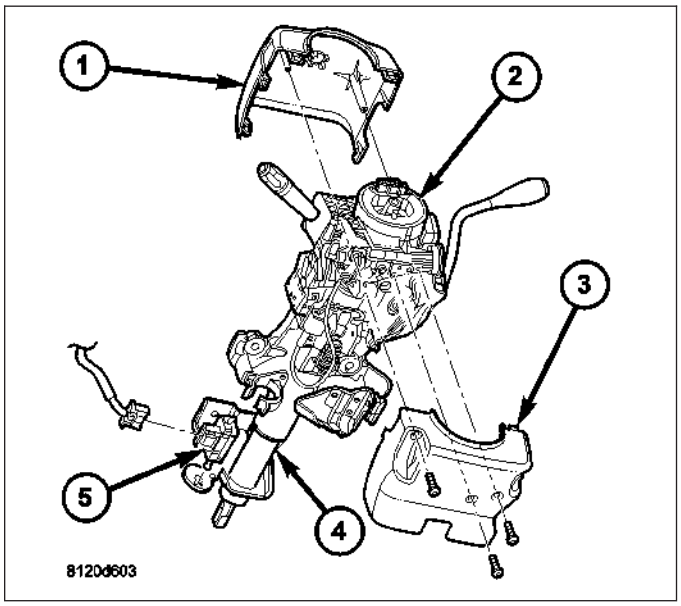
NOTE: Torque the upper left nut first then the lower right nut. Then torque the lower left nut then the upper right nut.

NOTE: A new bolt must be used for reinstallation.

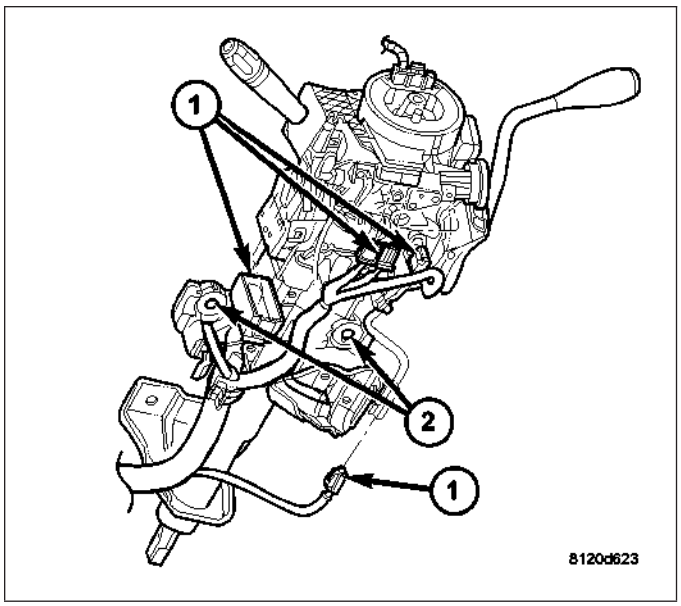
36. Tighten the coupler bolt to 38 N·m (28 ft. lbs.).



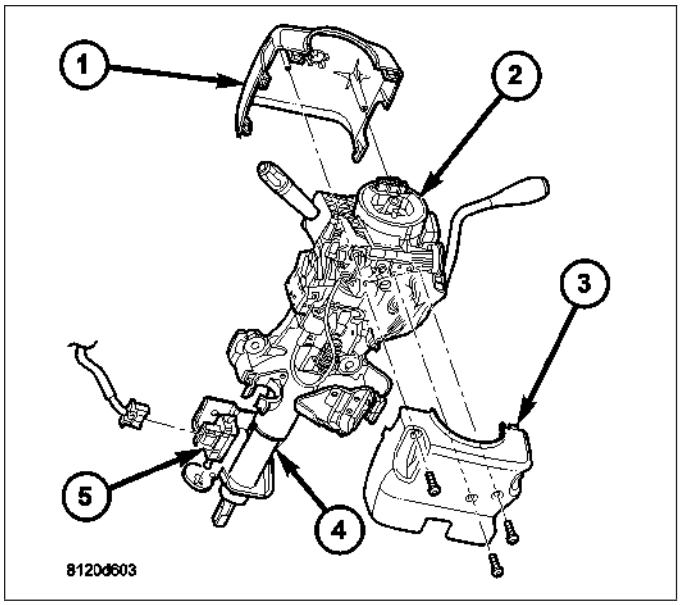
37. Install a new brake light switch (5) (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/ BRAKE LAMP SWITCH - REMOVAL).
38. Install the shifter cable. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC/GEAR SHIFT CABLE - INSTALLATION)



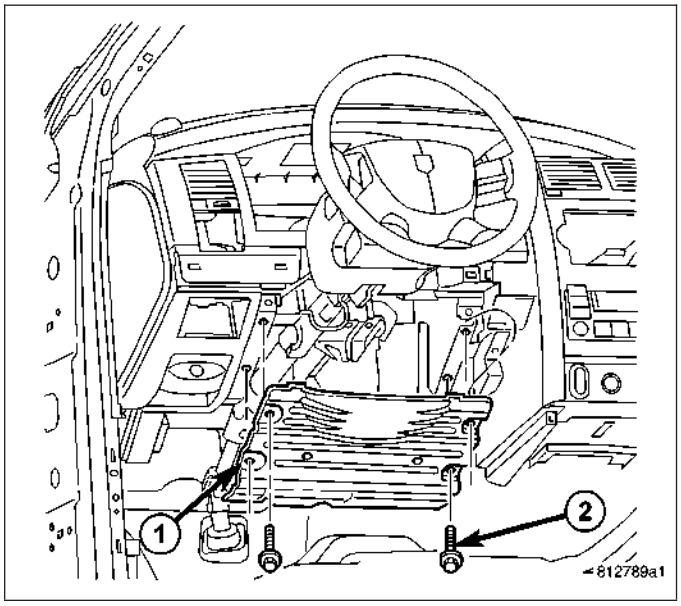
39. Connect the wiring harness (1) to the column (2).
40. Install the SKIM module.



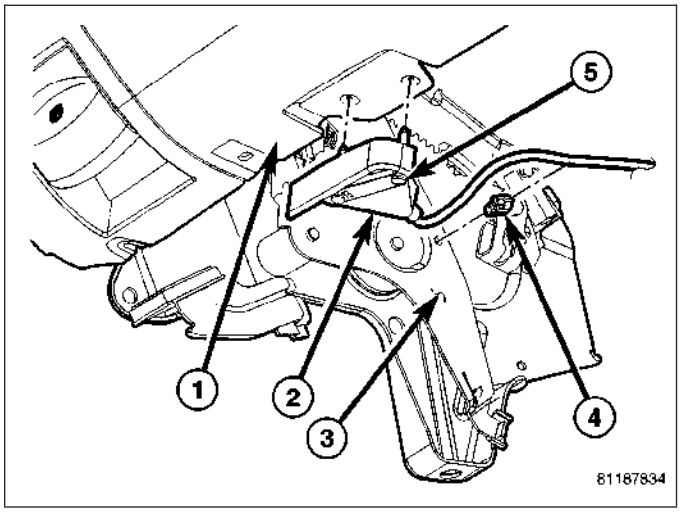
41. Install the upper (1) and lower (3) column shrouds and install the screws.
42. Install the column tilt lever.



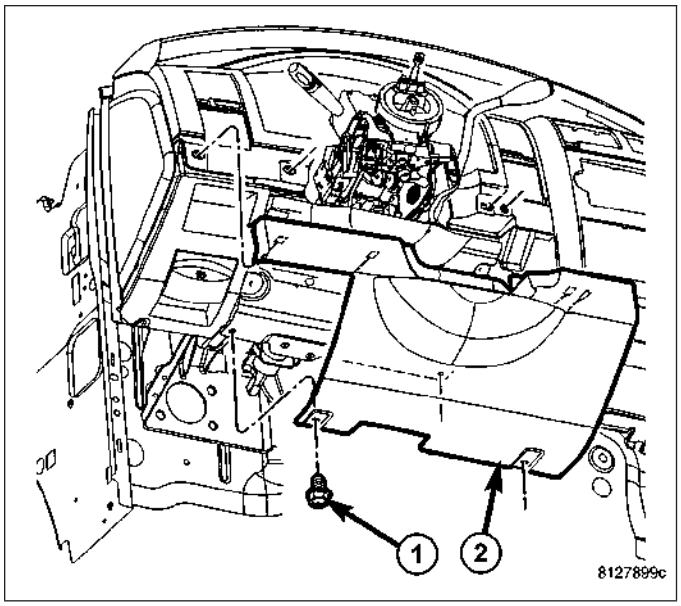
43. Install the steering column opening reinforcement (1) and install the four screws.



44. Install the hood release handle (2) and install the screws (5).



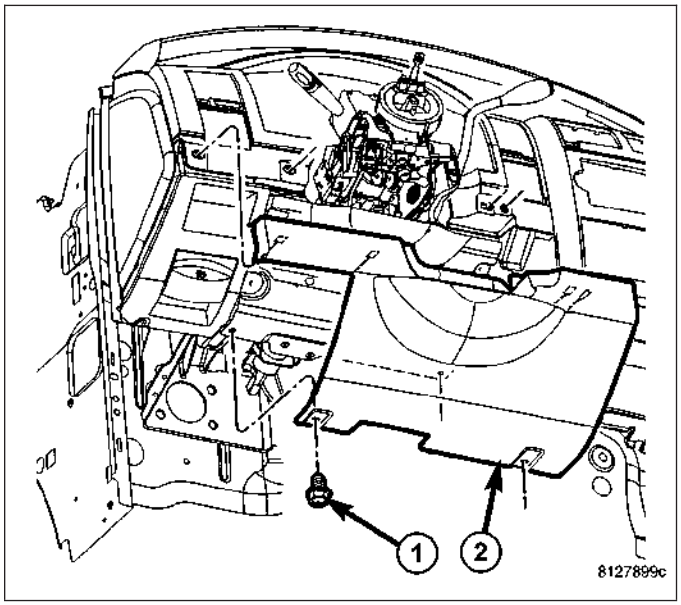
45. Install the steering column opening cover (2) and install the two screws (1).
46. Install the left instrument panel end cap.
47. Instal the left cowl trim cover and install the screw.
48. Install the left door sill trim cover and seat fully.
49. Do not reconnect the battery negative cable at this time. The supplemental restraint system verification test procedure should be performed following service of any supplemental restraint system component. (Refer to 8 - ELECTRICAL/ RESTRAINTS - STANDARD PROCEDURE - VERIFICATION TEST).



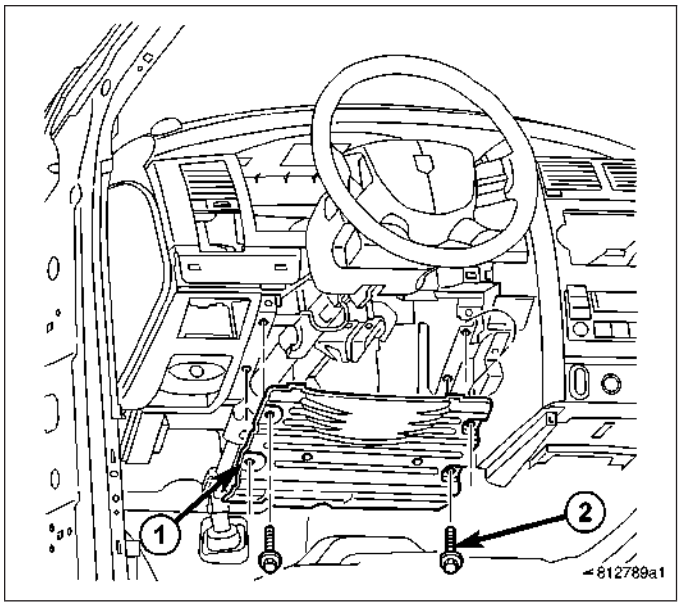
COVER-STEERING COLUMN OPENING

REMOVAL

1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/INSTRUMENT PANEL - WARNING)
2. Remove the two screws (1) and remove the opening cover (2).

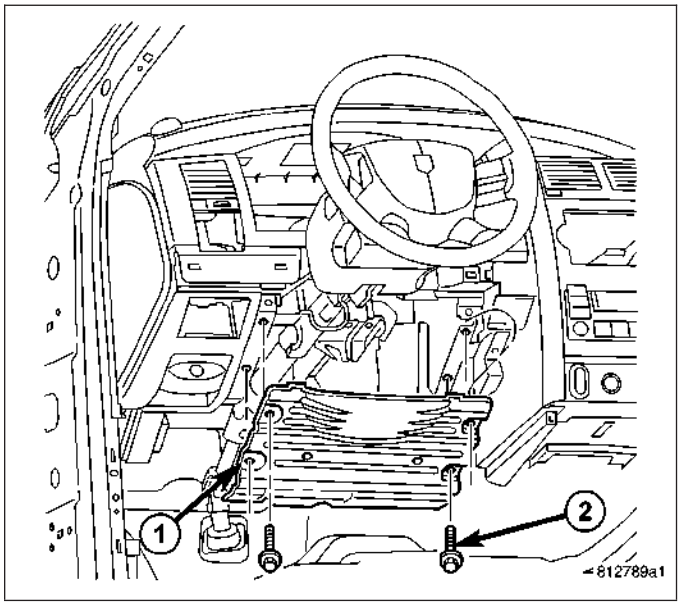


3. Remove the four screws (2) and remove the steering column opening reinforcement.

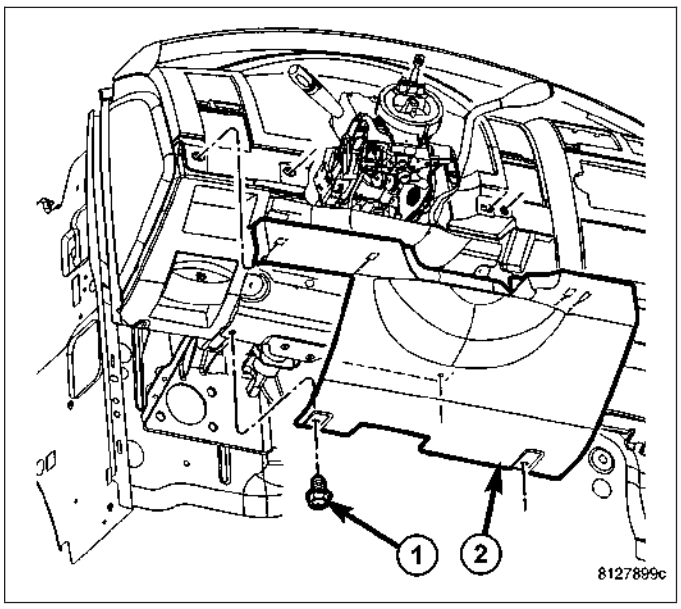


INSTALLATION

1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/INSTRUMENT PANEL - WARNING)
2. Install the opening reinforcement (1) and install the four screws (2).



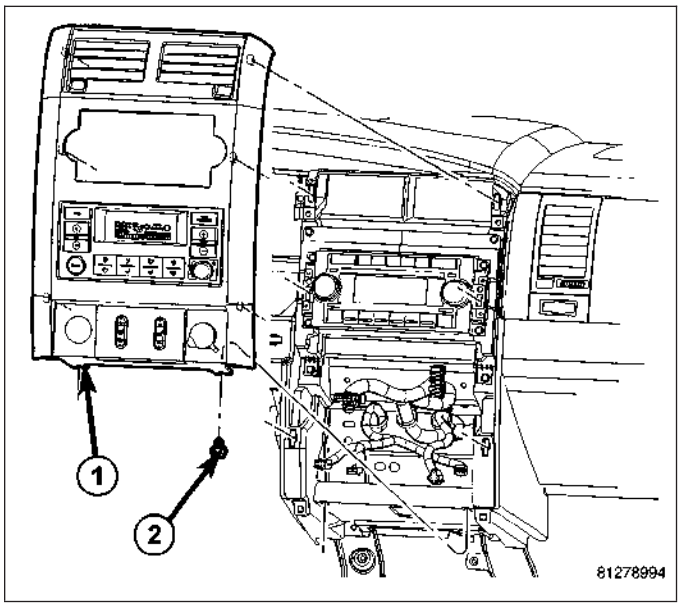
3. Install the opening cover (2) and seat fully.
4. Install the two screws (1).



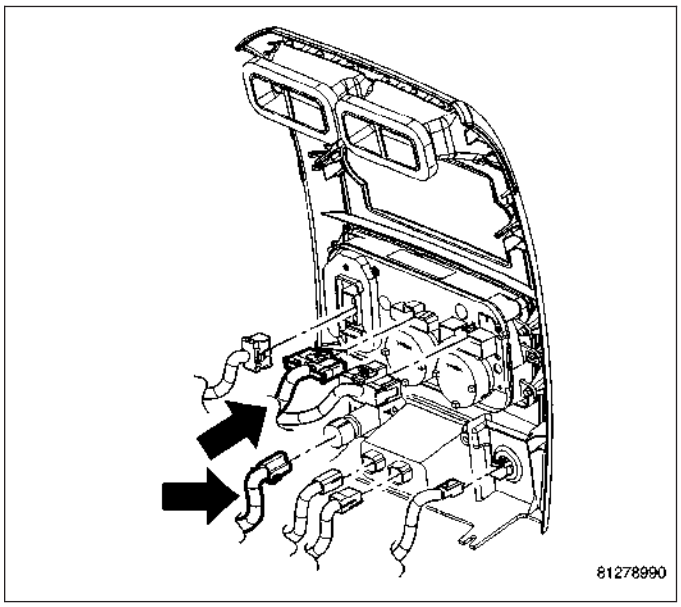
BEZEL-CENTER

REMOVAL

1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/INSTRUMENT PANEL - WARNING)
2. Remove the two screws (2) and remove the bezel (1).

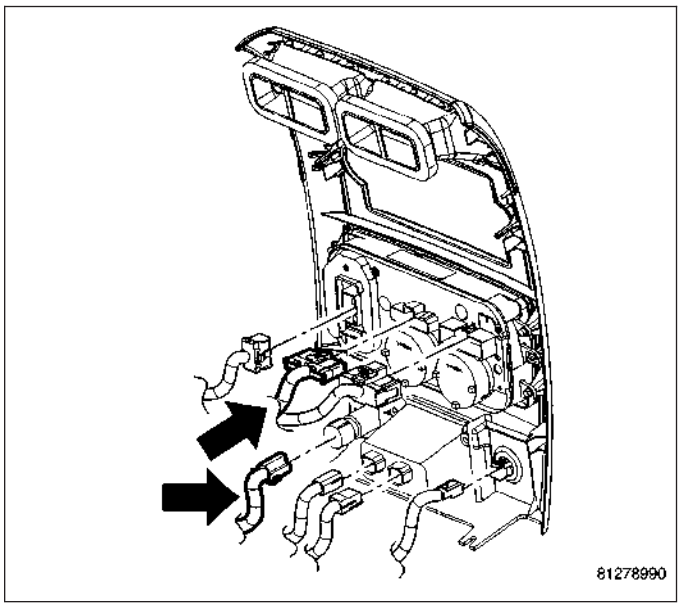


3. Disconnect the electrical connectors and remove the bezel.

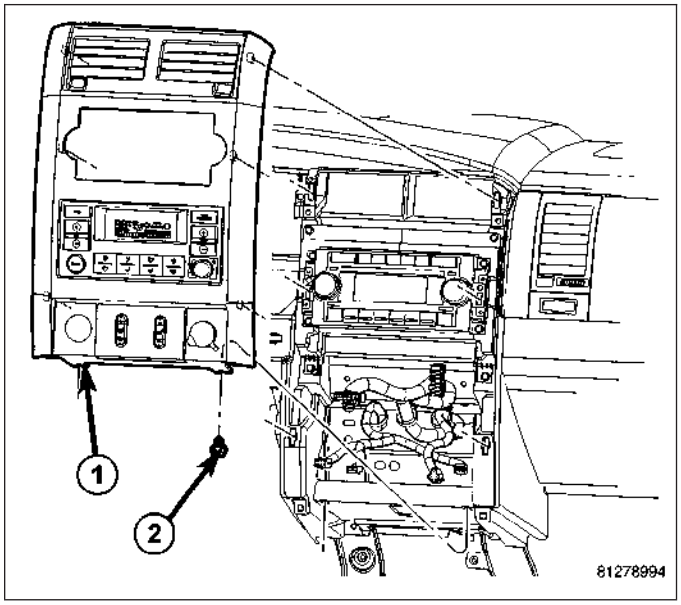


INSTALLATION

1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/INSTRUMENT PANEL - WARNING)
2. Connect the electrical connectors.



3. Install the center bezel (1) and install the two screws (2).



INTERIOR

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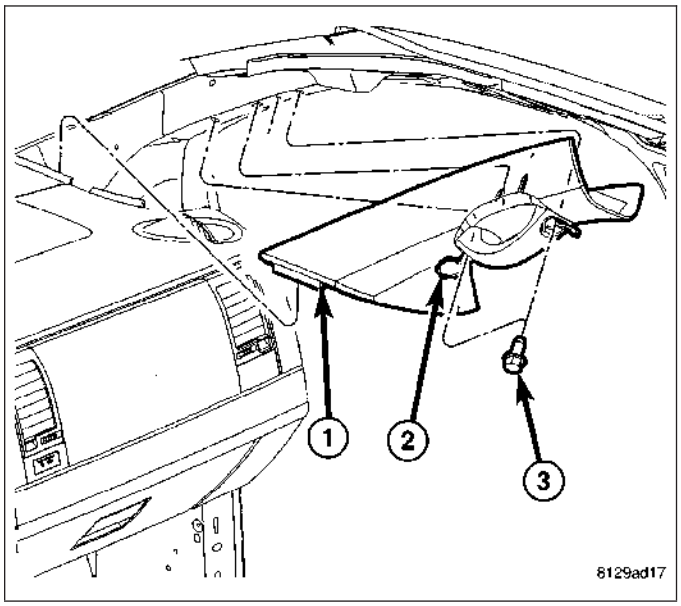
PANEL-A PILLAR TRIM

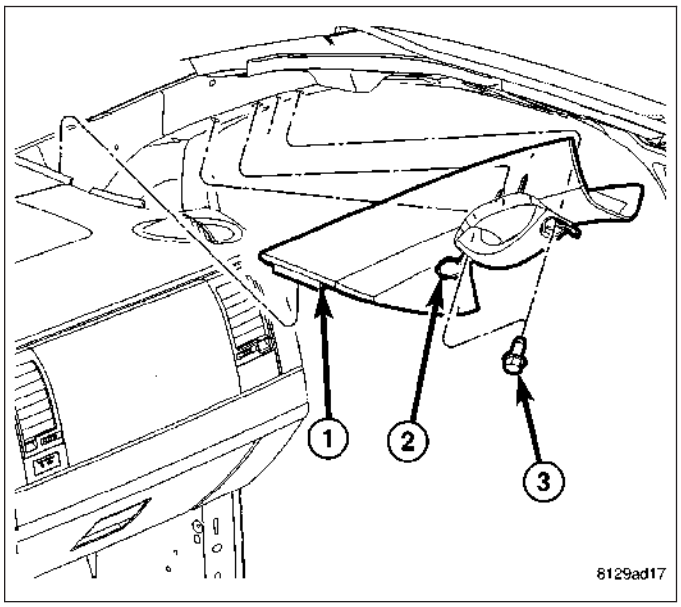
REMOVAL

1. Using a small flat bladed tool or equivalent open the trim plugs (2) in the a-pillar grab handle and remove the bolts (3).
2. Remove the a-pillar trim panel (1).



INSTALLATION

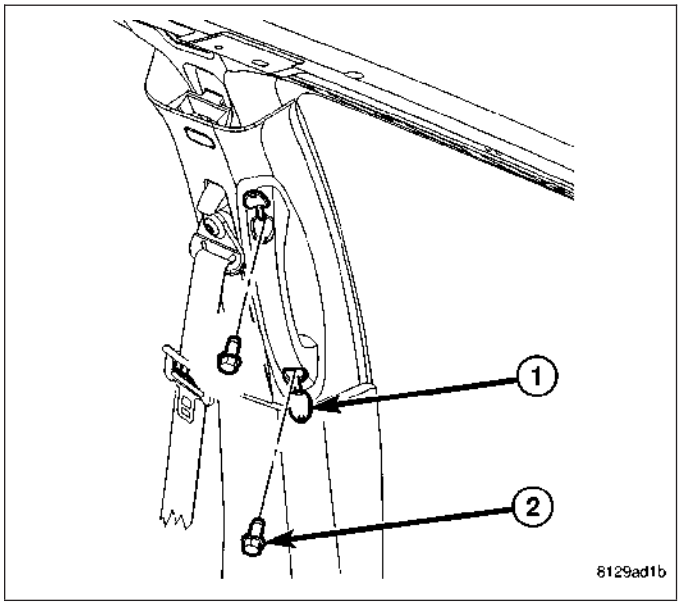
1. Position the a-pillar trim (1) into place and seat the retaining clips fully.
2. Install the bolts and tighten to 6 N·m (55 in. lbs.).



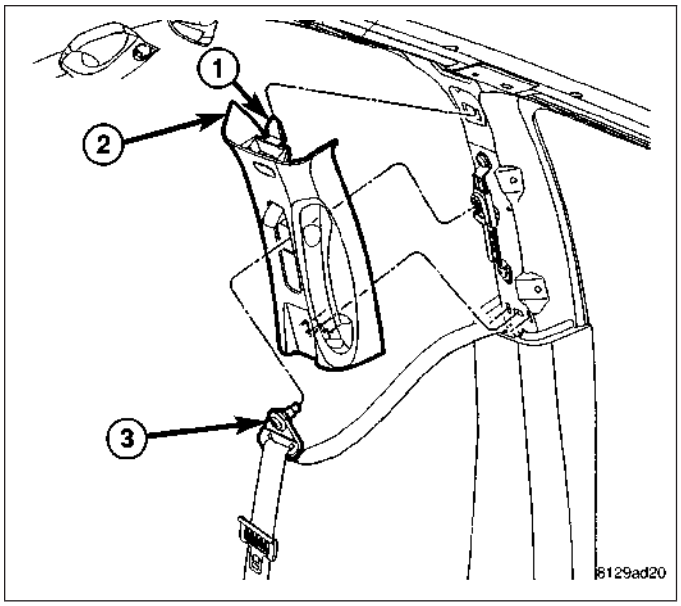
PANEL-B PILLAR TRIM

REMOVAL

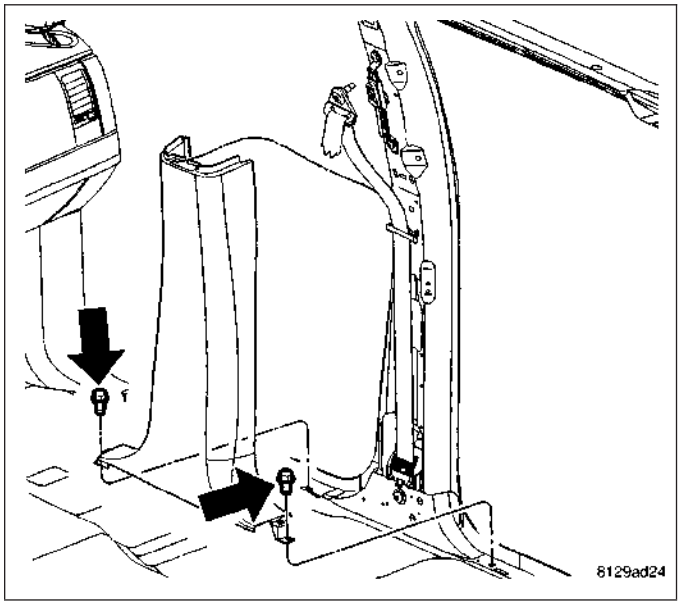
1. Using a small flat bladed tool or equivalent open the trim plugs (1) in the grab handle and remove the bolts (2).



2. Remove the shoulder belt anchor bolt (3) and separate the upper trim panel (2) at the bottom and off the hook (1) at the top.

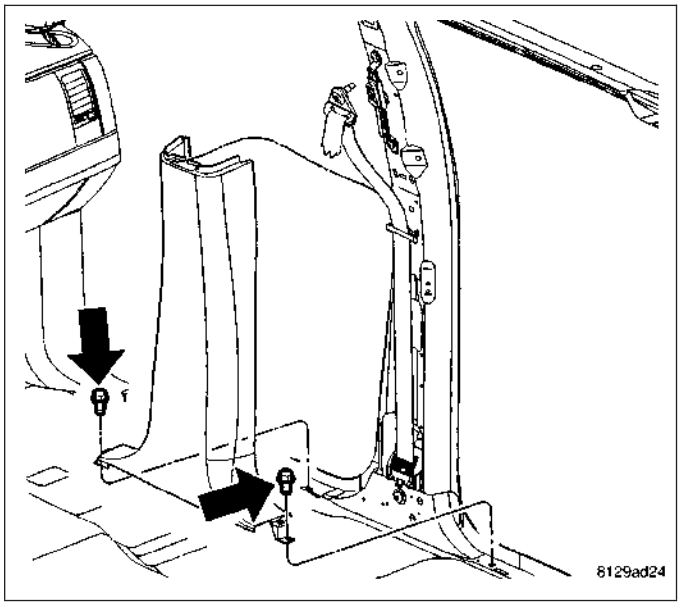


3. Using a trim stick C-4755 or equivalent, remove the door sill scuff plates. (Refer to 23 - BODY/INTERIOR/DOOR SILL SCUFF PLATE - DESCRIPTION)
4. Remove the bolts and remove the lower b-pillar trim.

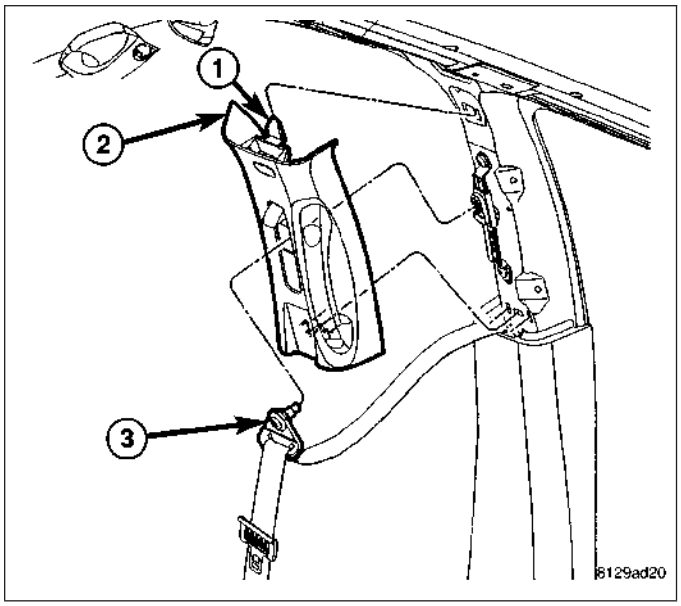


INSTALLATION

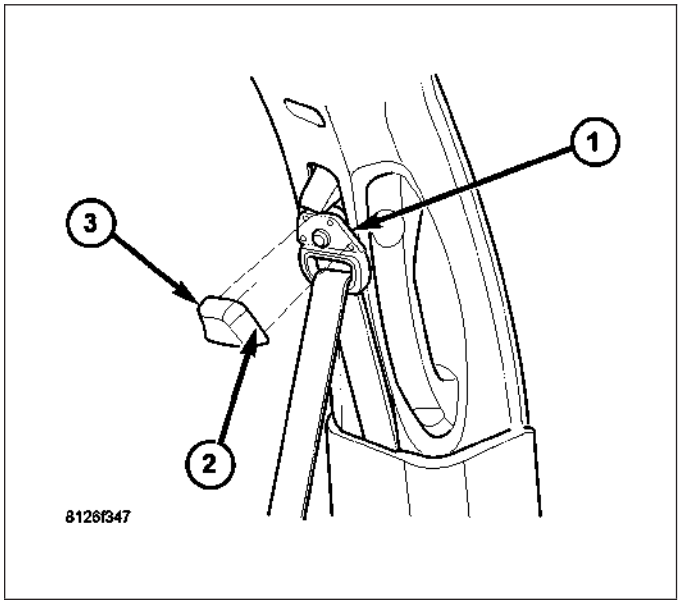
1. Position the shoulder belt through the upper slot in the trim.
2. Install the trim panel and install the bolts.
3. Position the door sill scuff plates and seat the clips fully. (Refer to 23 - BODY/INTERIOR/DOOR SILL SCUFF PLATE - DESCRIPTION)



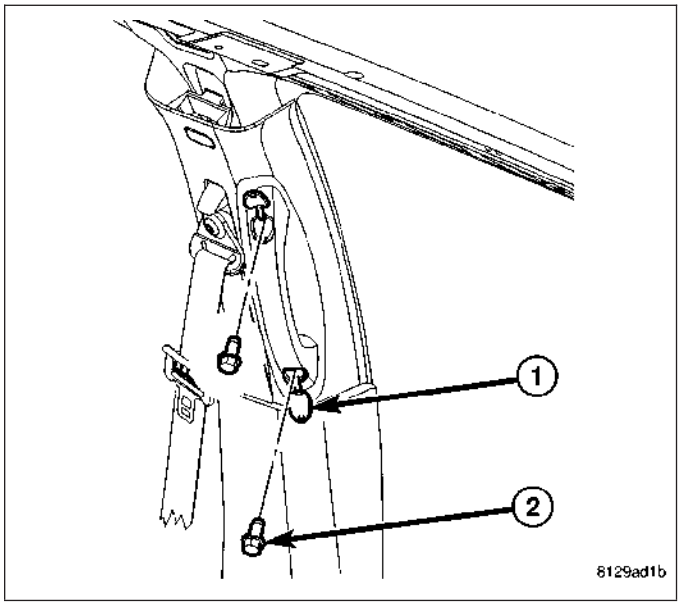
4. Position the upper trim panel tab (1) into the b-pillar and seat the lower side of the trim fully.
5. Install the shoulder belt anchor bolt (3) and tighten to 39 N·m (29 ft. lbs.).



6. Engage the tab (2) on the lower edge of the trim cover (3) in the slot below the screw in the turning loop (1). Then press the upper edge of the trim cover over the top of the turning loop until it snaps into place.



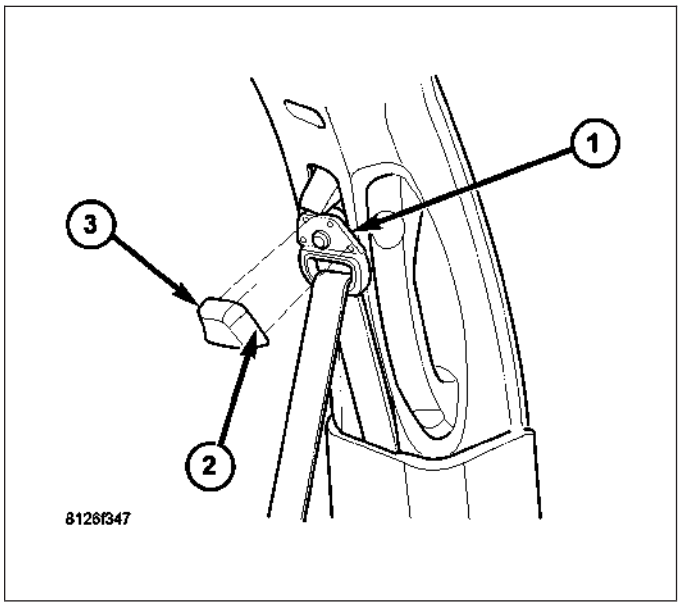
7. Install the grab handle bolts (2) and tighten to 6 N·m (55 in. lbs.).



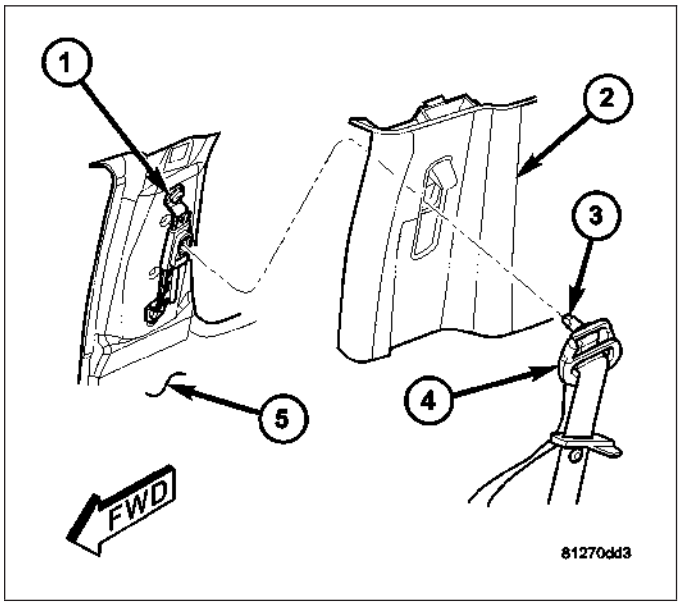
PANEL-C PILLAR TRIM

REMOVAL

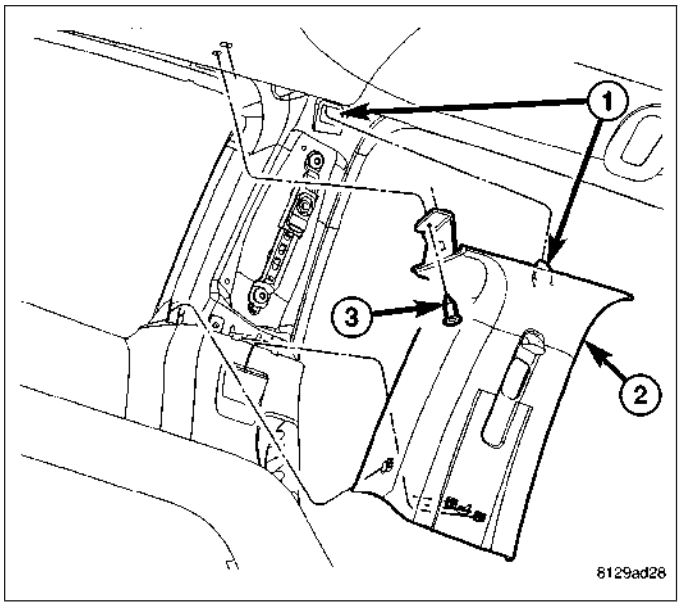
1. Remove the quarter glass trim panel. (Refer to 23 - BODY/INTERIOR/INTERIOR TRIM PANELS - QUARTER GLASS - REMOVAL)
2. Unsnap the upper edge of the trim cover (3) from the second row outboard seat belt turning loop (1) and disengage the tab (2) on the lower edge of the cover to access the turning loop screw.



3. Remove the screw (3) that secures the seat belt turning loop (4) to the height adjuster (1) on the upper C-pillar (5).

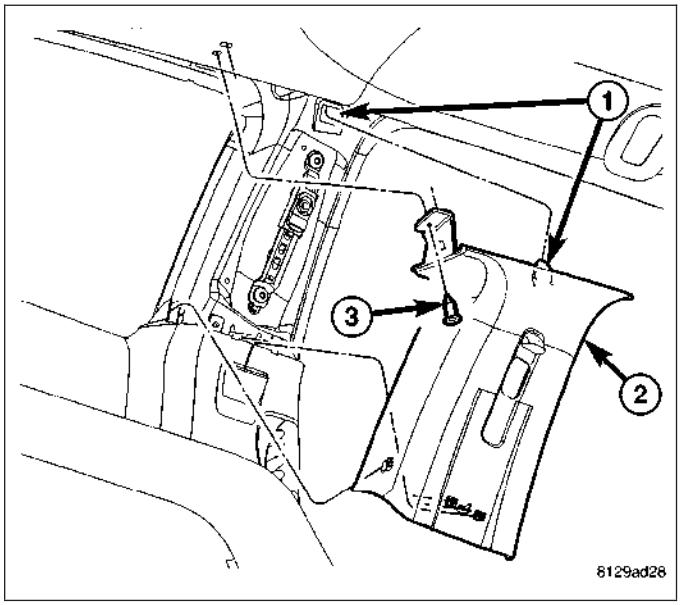


4. Remove the screw (3).
5. Using a trim stick C-4755 or equivalent, separate the bottom edge of the trim (2) from the pillar and remove off of the upper locating tab (1).

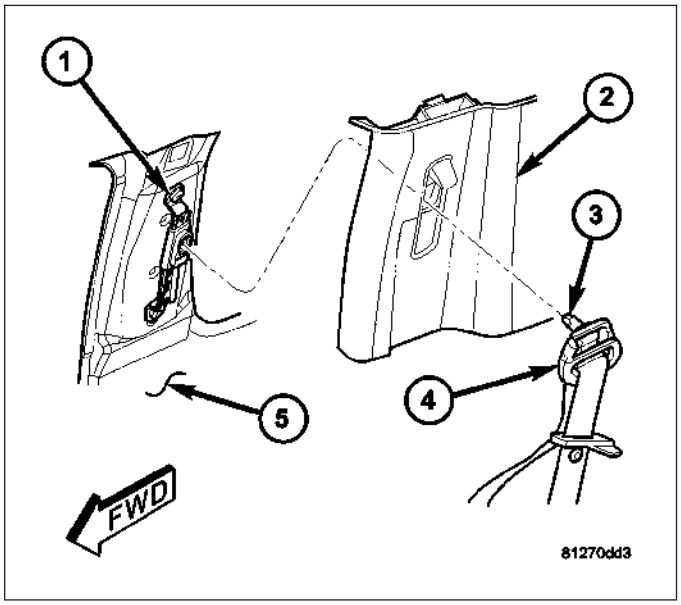


INSTALLATION

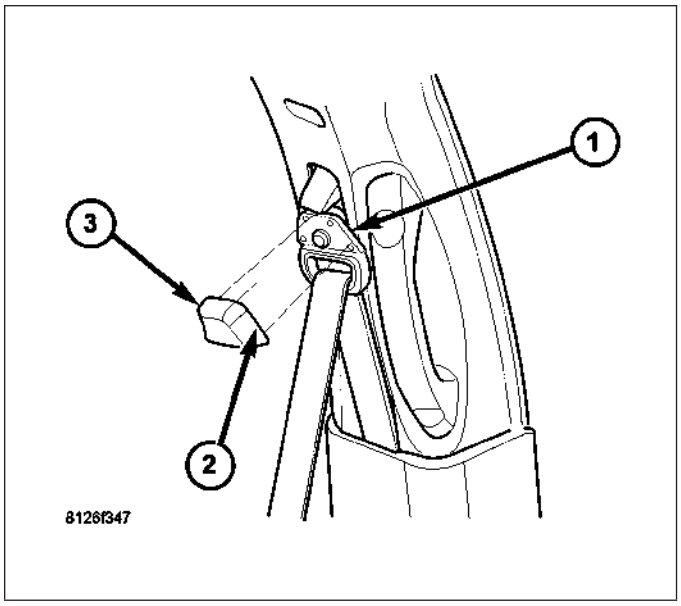
1. Position the upper trim panel tab (1) into the b-pillar and seat the lower side of the trim fully.
2. Install the screw (3).



3. Position the seat belt turning loop (4) to the height adjuster (1).
4. Install the screw (3) and tighten the to 39 N·m (29 ft. lbs.).



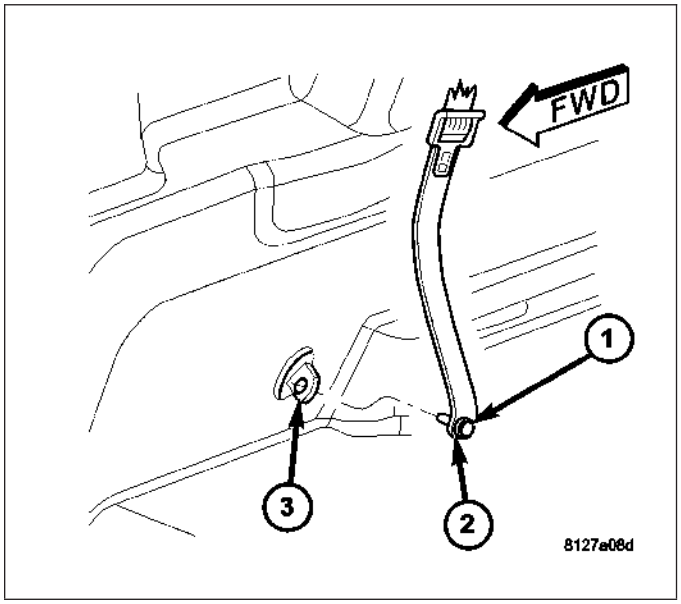
5. Engage the tab (2) on the lower edge of the trim cover (3) in the slot below the screw in the turning loop (1). Then press the upper edge of the trim cover over the top of the turning loop until it snaps into place.



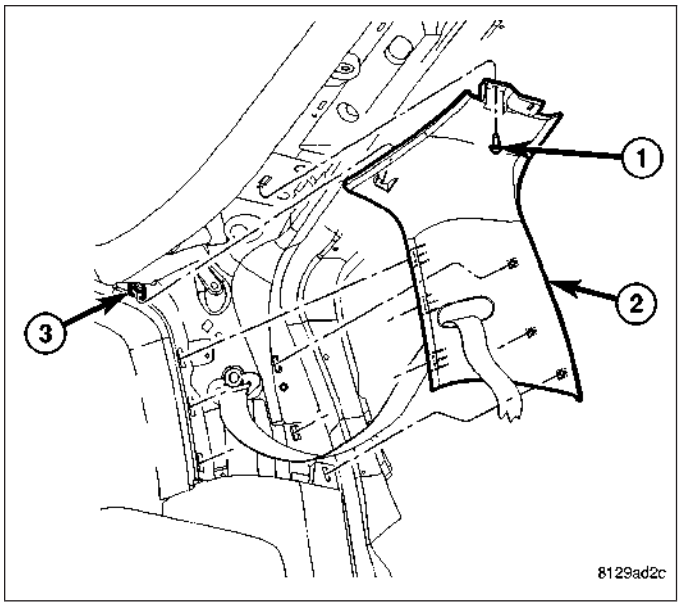
PANEL-D PILLAR TRIM

REMOVAL

1. Move the third row seat cushion to its storage position, but leave the third row seat back in its upright position for easiest access to the seat belt lower anchor (2) on the quarter inner panel (3).
2. Remove the screw (1) that secures the lower anchor to the tapping plate on the quarter inner panel.

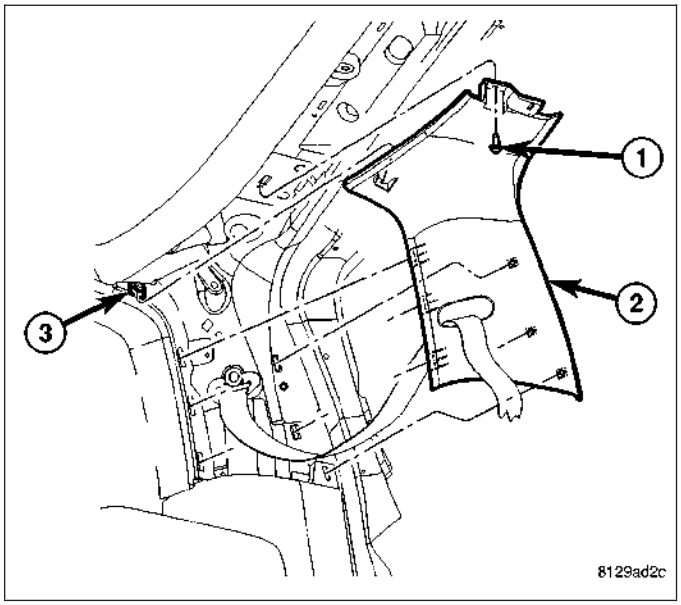


3. Using a trim stick C-4755 or equivalent, remove the upper rear headliner trim. (Refer to 23 - BODY/INTERIOR/REAR HEADER TRIM - DESCRIPTION)
4. Remove the screw (1).
5. Using a trim stick C-4755 or equivalent, separate the trim (2) and retaining clips and anchor (3).

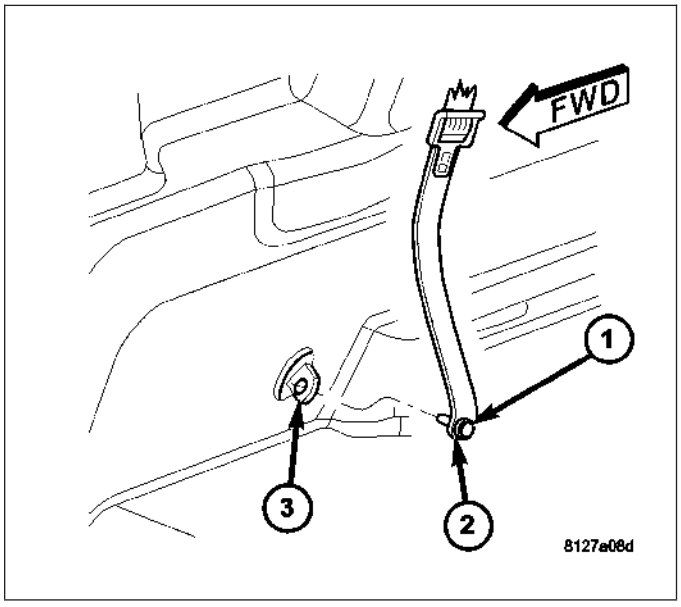


INSTALLATION

1. Position the shoulder belt through the slot in the trim.
2. Position the trim (2) in place on the b-pillar and anchor (3).
3. Seat the retaining clips fully and install the screw (1).
4. Position the rear header trim in place and seat the retaining clips fully.



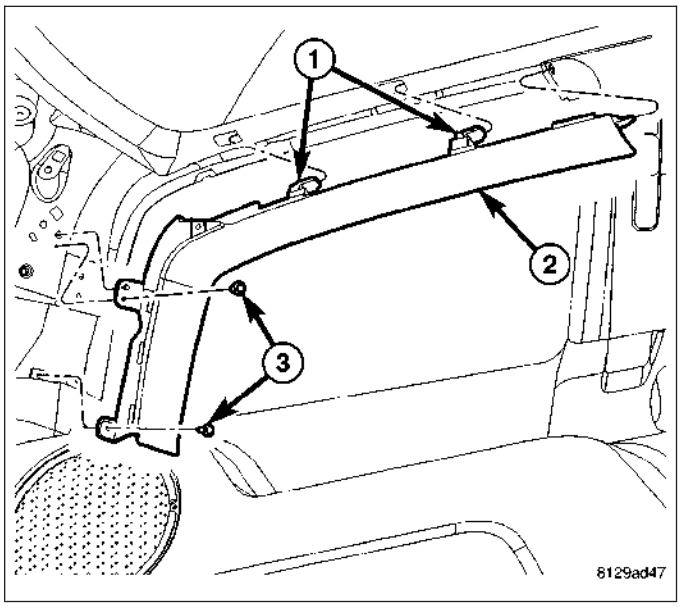
5. Position the seat belt lower anchor (2) to the tapping plate (3) on the quarter inner panel.
6. Install the screw (1) that secures the lower anchor to the tapping plate and tighten the to 39 N·m (29 ft. lbs.).



PANEL-QUARTER GLASS INTERIOR TRIM

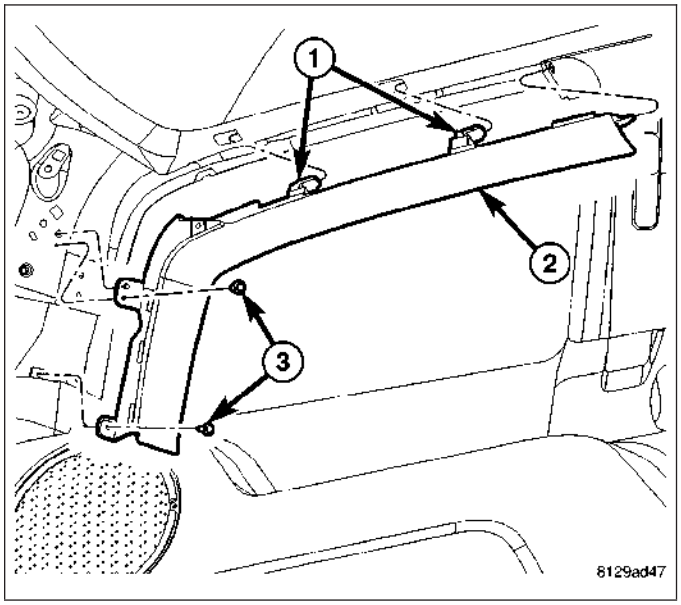
REMOVAL

1. Remove the d-pillar trim. (Refer to 23 - BODY/INTERIOR/D-PILLAR TRIM - REMOVAL)
2. Remove the screws (3).
3. Slide the trim panel (2) off the retaining tabs (1) and remove.



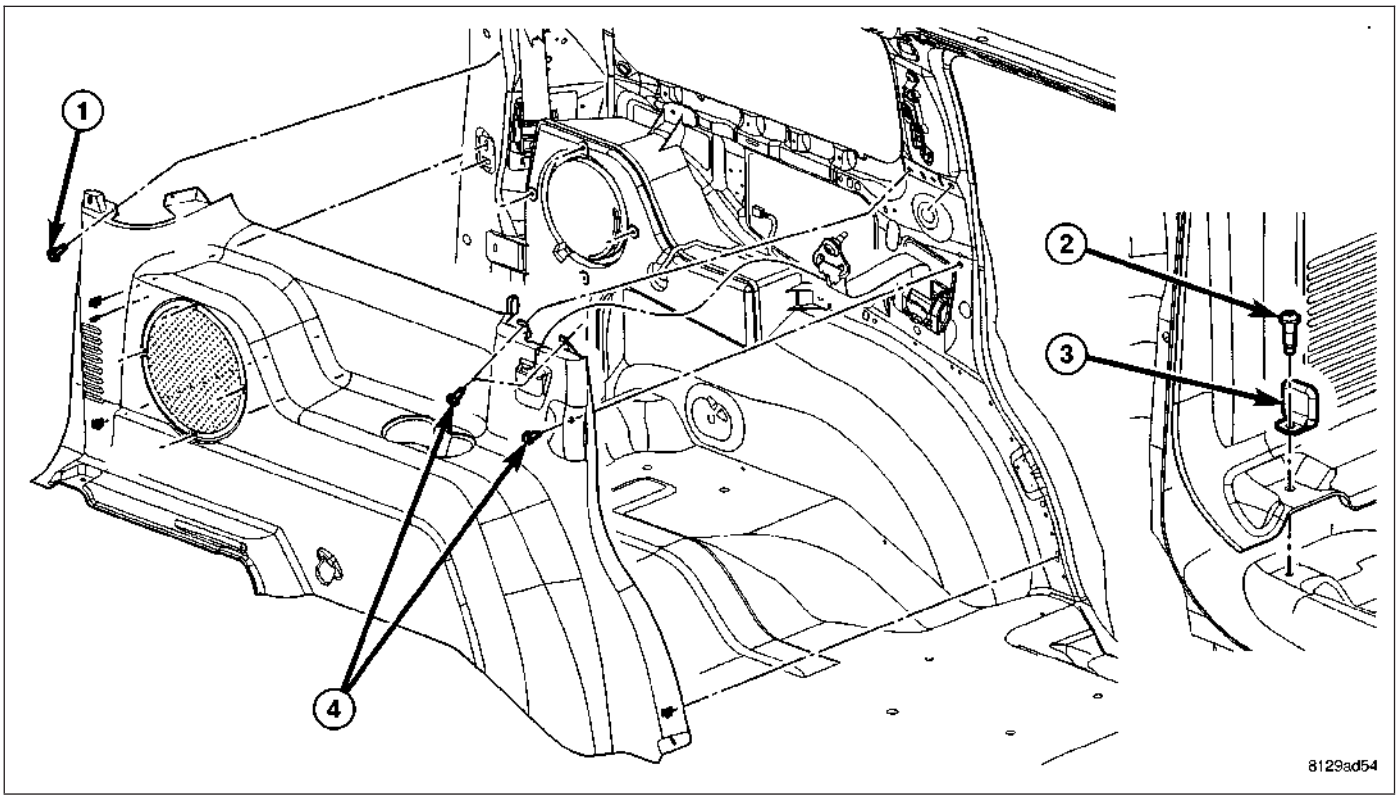
INSTALLATION

1. Position the trim panel (2) over the retaining tabs (1) and slide into place fully.
2. Install the screws (3).
3. Install the d-pillar trim. (Refer to 23 - BODY/INTERIOR/D-PILLAR TRIM - INSTALLATION)



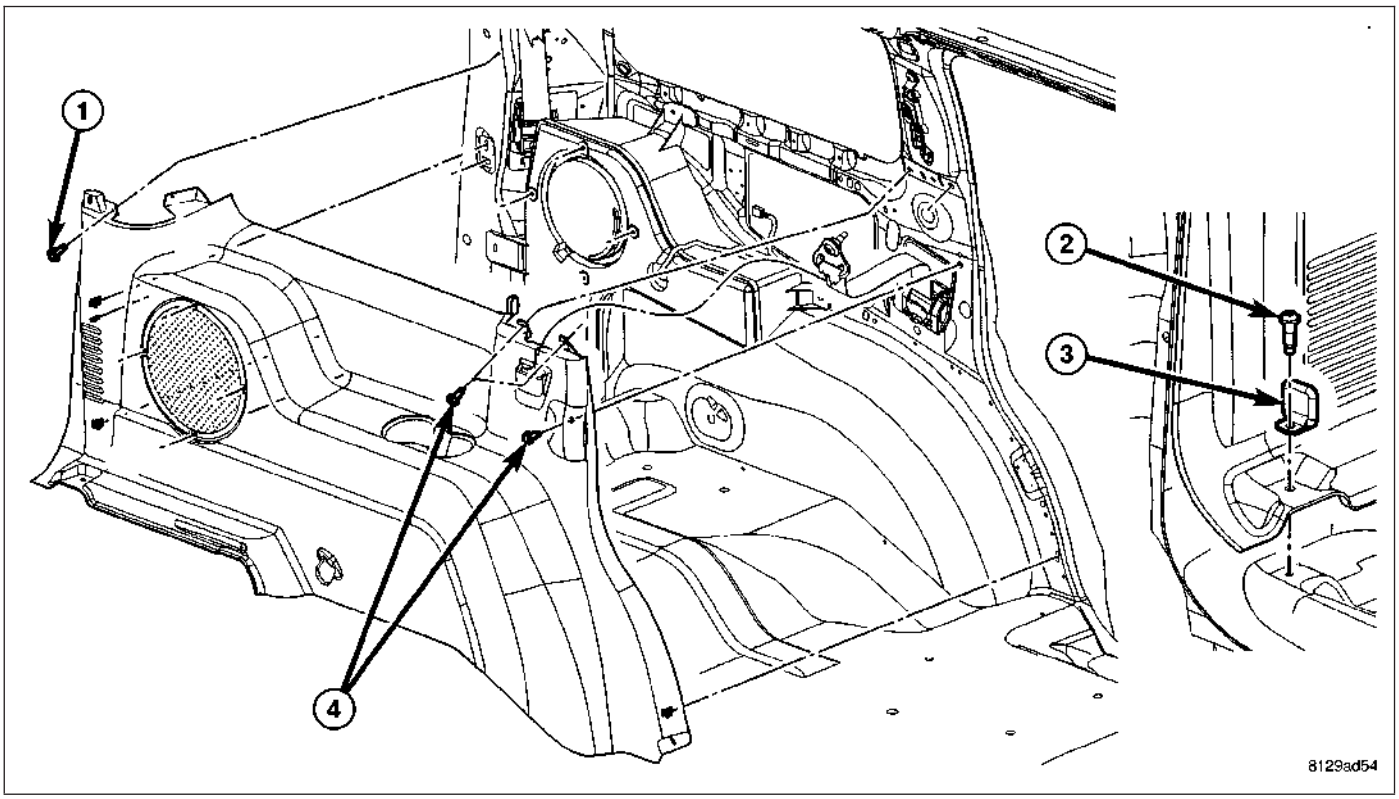
PANEL-QUARTER TRIM

REMOVAL



1. Remove the c-pillar trim. (Refer to 23 - BODY/INTERIOR/C-PILLAR TRIM - REMOVAL)
2. Remove the rear screw (1).
3. Remove the tie down anchor bolt (2) and tie down (3).
4. Remove the three front screws (4) and separate the trim panel.
5. Disconnect the power outlet electrical connector, if equipped.

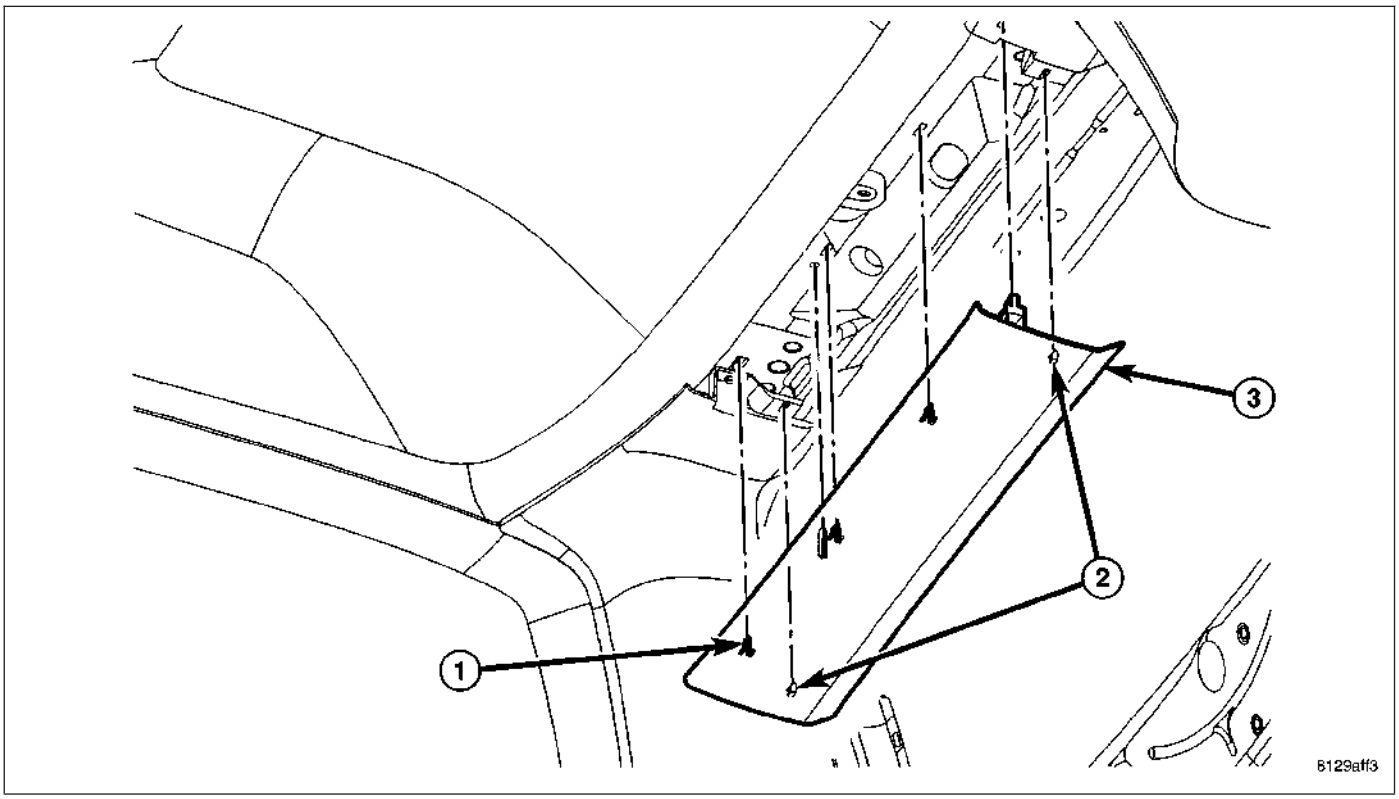
INSTALLATION



1. Connect the power outlet electrical connector, if equipped.
2. Position the trim panel onto the quarter panel and seat the retaining clips fully.
3. Install the three forward screws (4).
4. Install the rear screw (1).
5. Install the tie down (3) and tie down anchor bolt (2).
6. Tighten the bolt to 12 N·m (9 ft. lbs.)
7. Install the c-pillar trim. (Refer to 23 - BODY/INTERIOR/C-PILLAR TRIM - INSTALLATION)

PANEL-REAR HEADER TRIM

DESCRIPTION

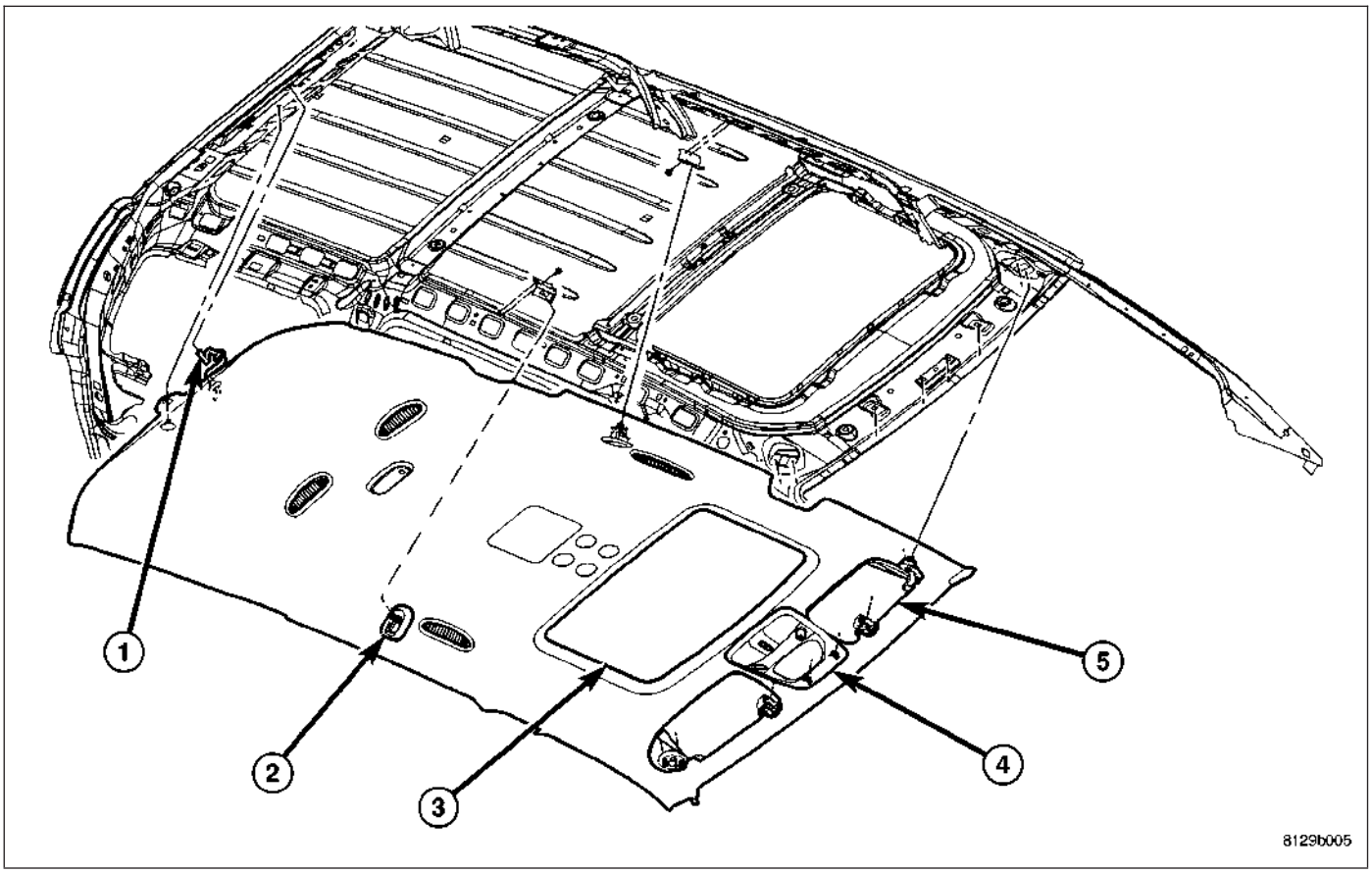


REAR HEADER TRIM

1 - RETAINING CLIPS
2 - ALIGNMENT PINS
3 - REAR HEADER TRIM

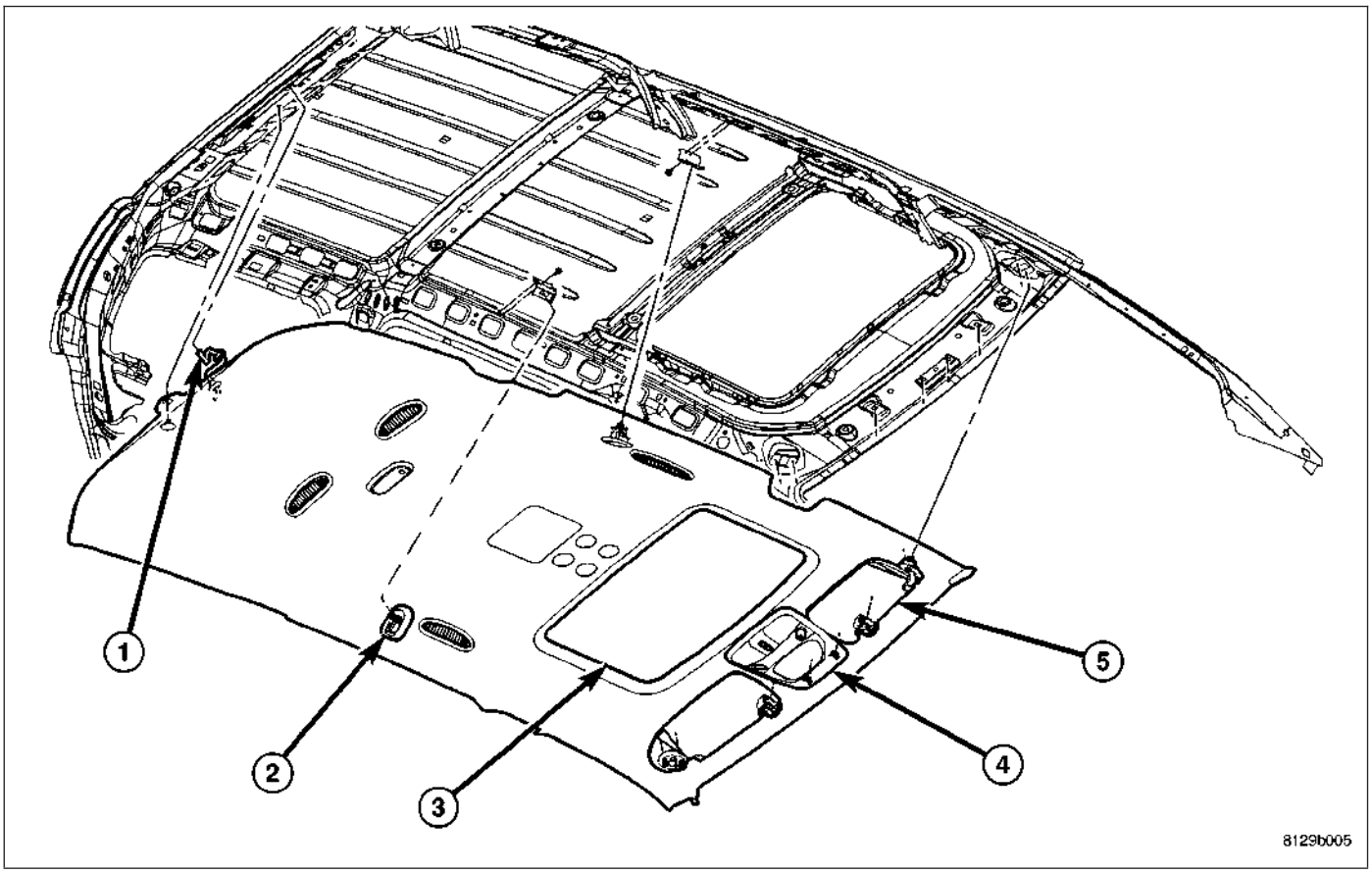
HEADLINER

REMOVAL



1. Disconnect and isolate battery negative cable.
2. Remove the sun visors (5) and disconnect the electrical connectors, if equipped.
3. Remove the a-pillar trim panels. (Refer to 23 - BODY/INTERIOR/A-PILLAR TRIM - REMOVAL)
4. Remove the overhead console (4). (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - REMOVAL)
5. Remove the left upper b-pillar trim. (Refer to 23 - BODY/INTERIOR/B-PILLAR TRIM - REMOVAL)
6. Remove the left c-pillar trim. (Refer to 23 - BODY/INTERIOR/C-PILLAR TRIM - REMOVAL)
7. Remove the screws and remove the coat hooks (2).
8. Remove the front seat headrests.
9. Fold both second row seats forward.
10. Place the third row seat into the storage position, if equipped.
11. Remove the dome lamps. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - INTERIOR/DOME LAMP - REMOVAL)
12. Remove the DVD player. (Refer to 8 - ELECTRICAL/AUDIO/DVD PLAYER - REMOVAL)
13. Remove the push pin fastener at the rear of the headliner.
14. Remove the sunroof opening trim lace (3). (Refer to 23 - BODY/SUNROOF/OPENING TRIM LACE - REMOVAL)
15. Drop the headliner down and disconnect the electrical connectors.
16. Disconnect the front and rear washer hoses and remove the headliner through the liftgate opening.

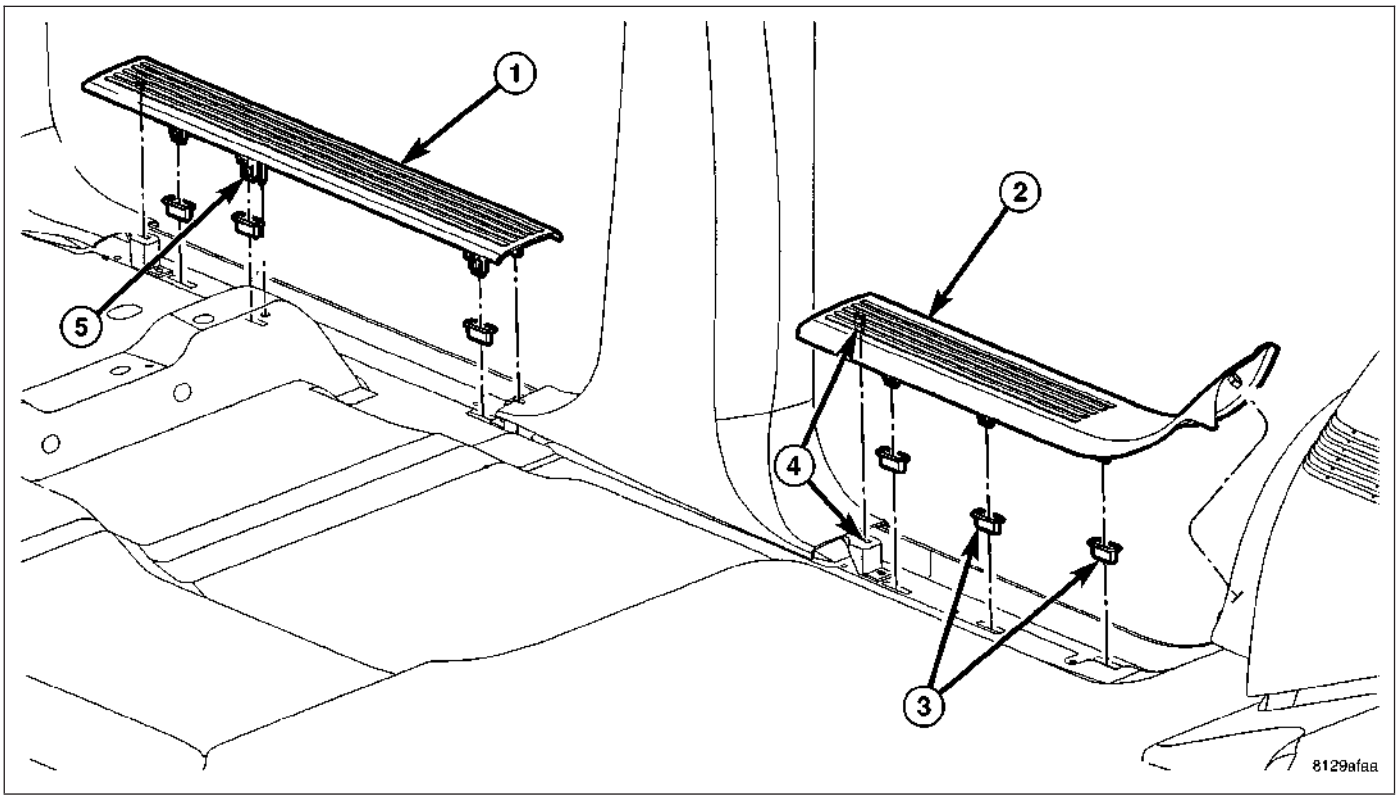
INSTALLATION



1. Place headliner into the vehicle through the liftgate opening and connect the front and rear washer hoses (1).
2. Connect the electrical connectors.
3. Install the sunroof opening trim lace (3), if equipped.
4. Install the push pin fastener at the rear of the headliner.
5. Install the DVD player. (Refer to 8 - ELECTRICAL/AUDIO/DVD PLAYER - INSTALLATION)
6. Install the dome lamps. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - INTERIOR/DOME LAMP - INSTALLATION)
7. Install the front seat headrests.
8. Install the screws and install the coat hooks (2).
9. Install the c-pillar trim. (Refer to 23 - BODY/INTERIOR/C-PILLAR TRIM - INSTALLATION)
10. Install the upper b-pillar trim. (Refer to 23 - BODY/INTERIOR/B-PILLAR TRIM - INSTALLATION)
11. Install the overhead console. (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - INSTALLATION)
12. Install the a-pillar trim panels. (Refer to 23 - BODY/INTERIOR/A-PILLAR TRIM - INSTALLATION)
13. Connect the electrical connectors and install the sun visors (5).
14. Connect battery negative cable.

PLATE-DOOR SCUFF

DESCRIPTION

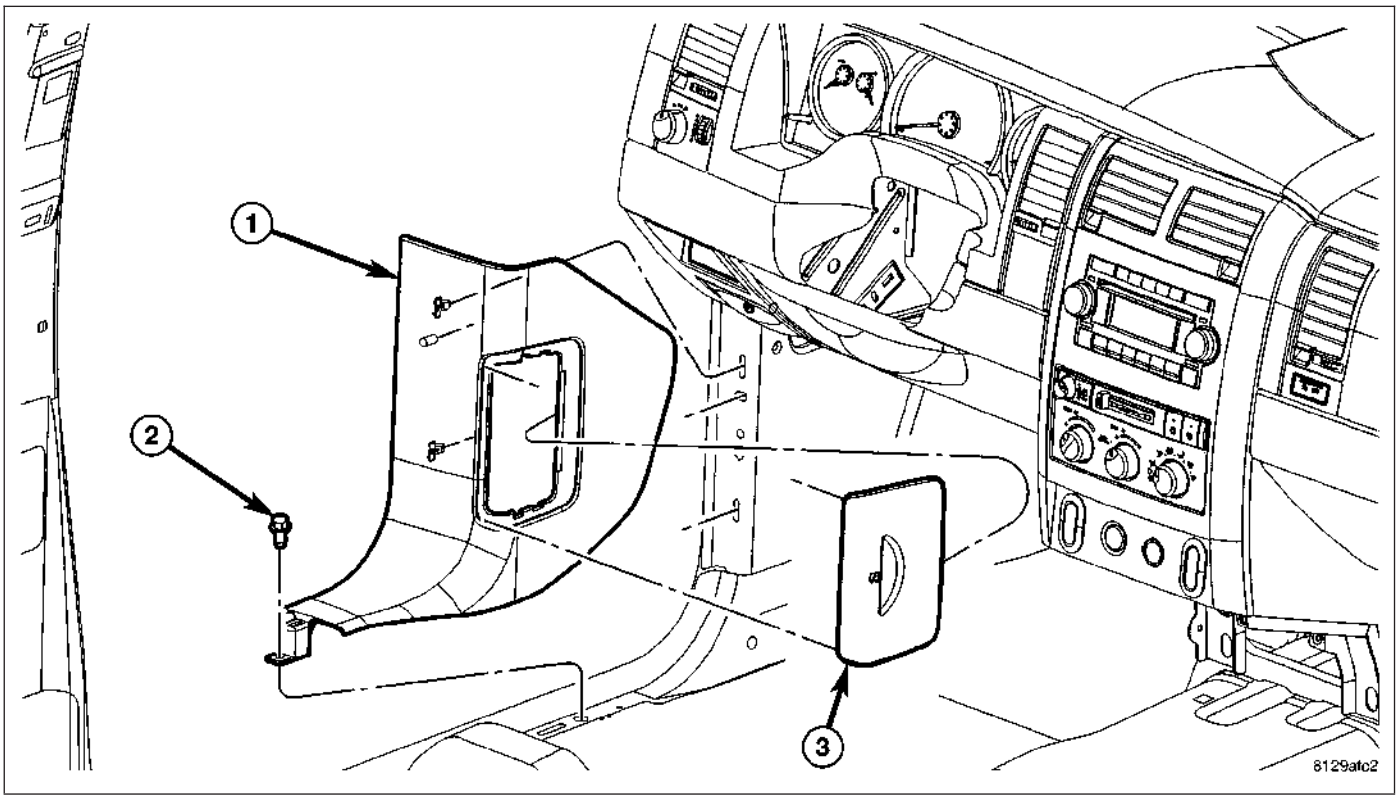


SCUFF PLATES

1 - FRONT DOOR SILL SCUFF PLATE
2 - REAR DOOR SILL SCUFF PLATE
3 - GROMMETS
4 - ALIGNMENT PINS
5 - RETAINING CLIPS

PANEL-COWL SIDE TRIM

DESCRIPTION

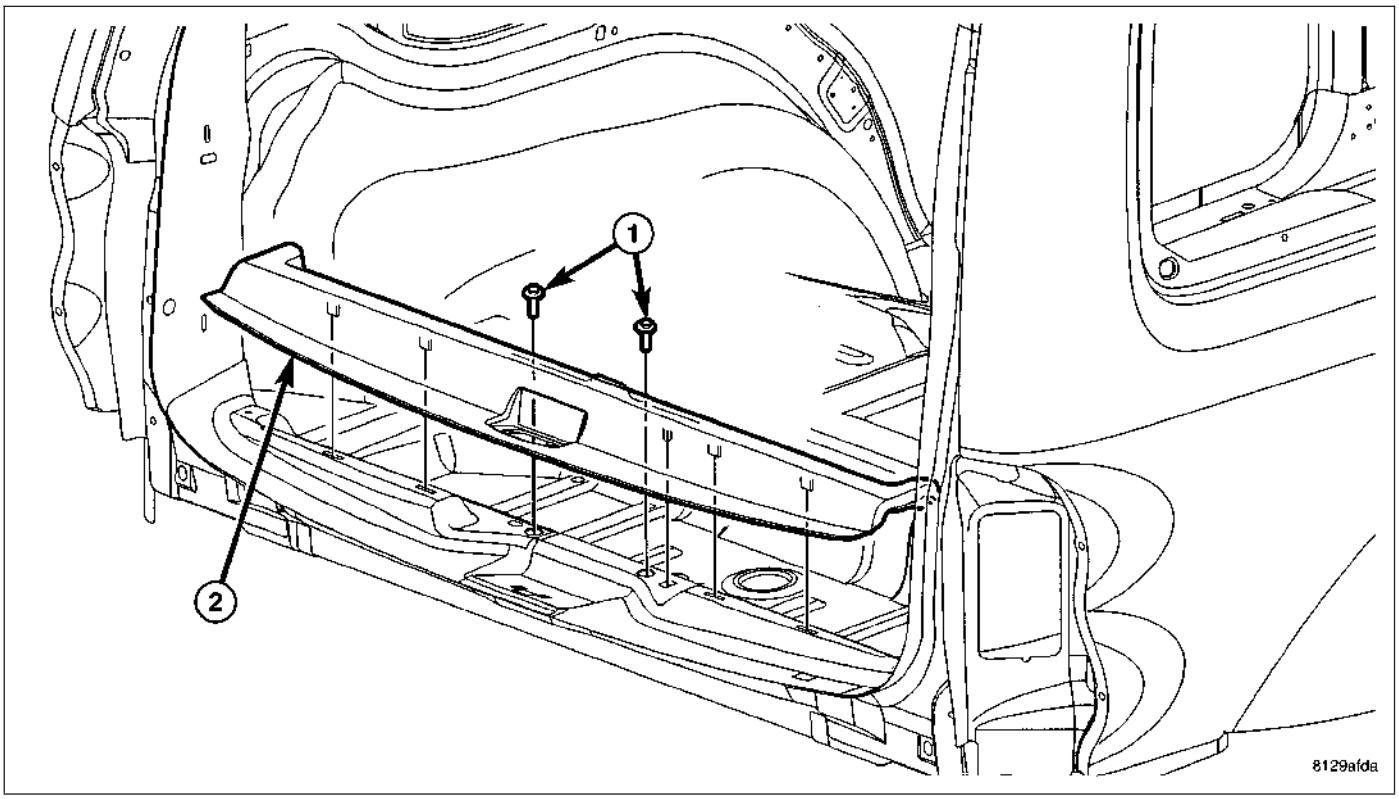


COWL TRIM PANEL

1 - COWL TRIM PANEL
2 - SCREW
3 - FUSE PANEL DOOR (LEFT SIDE)

PLATE-LIFTGATE SCUFF

DESCRIPTION



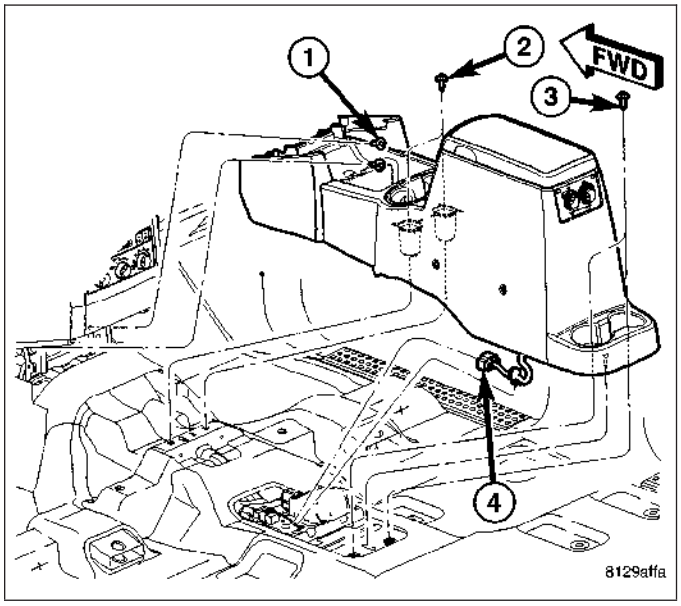
LIFTGATE SCUFF PLATE

1 - SCREWS (2)
2 - LIFTGATE SCUFF PLATE

CONSOLE-FLOOR

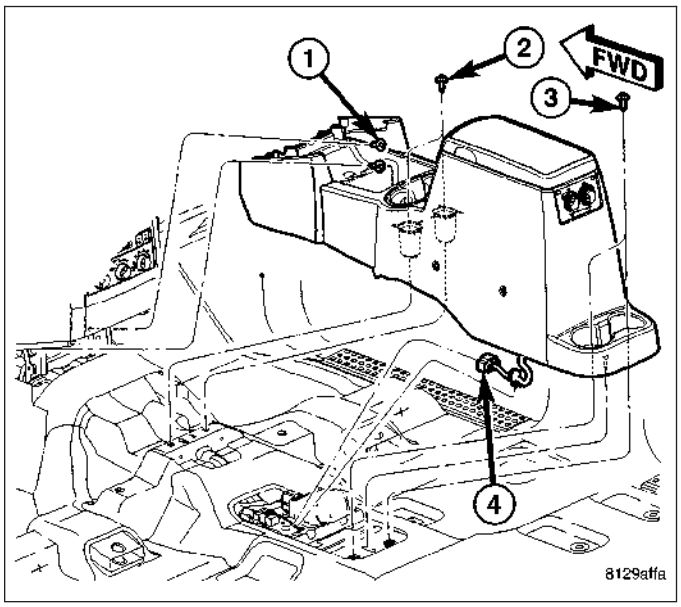
REMOVAL

1. Remove the rubber cup holder liners.
2. Remove the front (1), center (2) and rear screws (3).
3. Lift the floor console up and disconnect the electrical connector (4).
4. Slide the floor console back and remove.



INSTALLATION

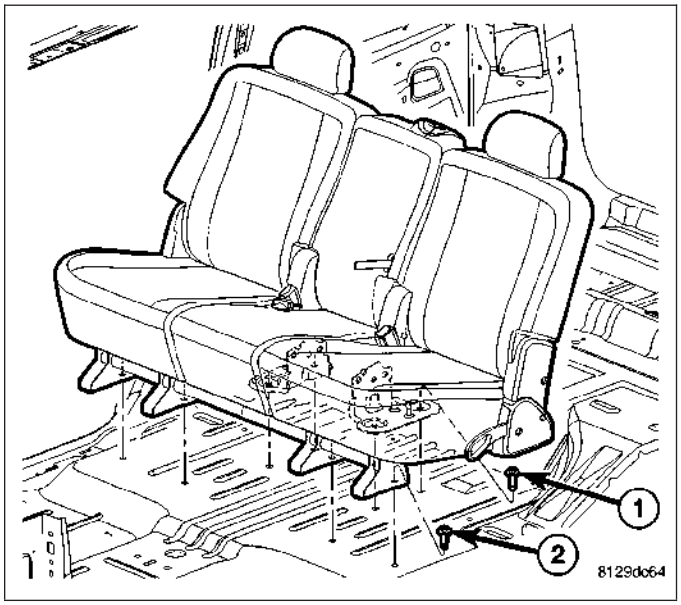
1. Position the floor console in the vehicle and connect the electrical connector (4).
2. Slide the console forward and engage the front with the instrument panel.
3. install the screws (3, 2 & 1).
4. Install the rubber cup holder liners.

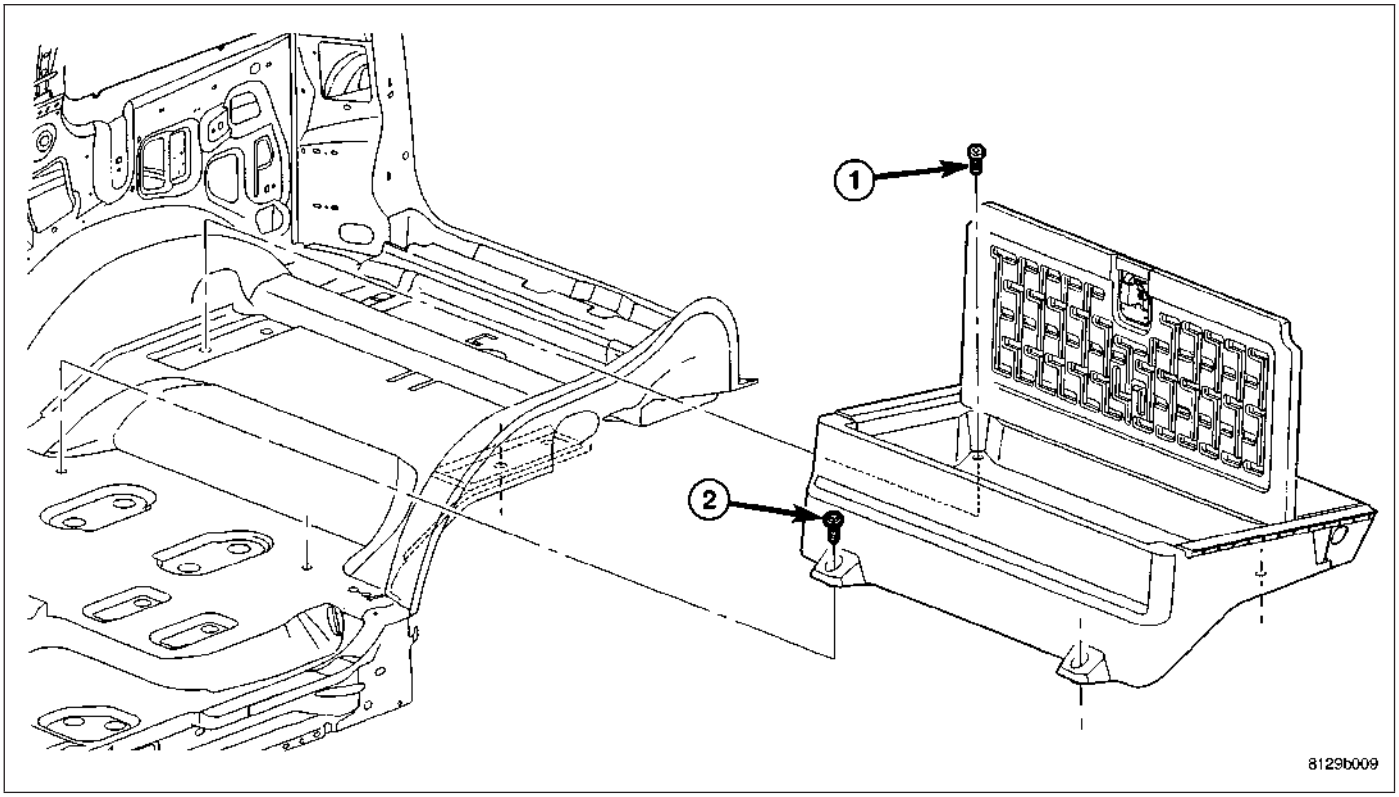


CARPET

REMOVAL

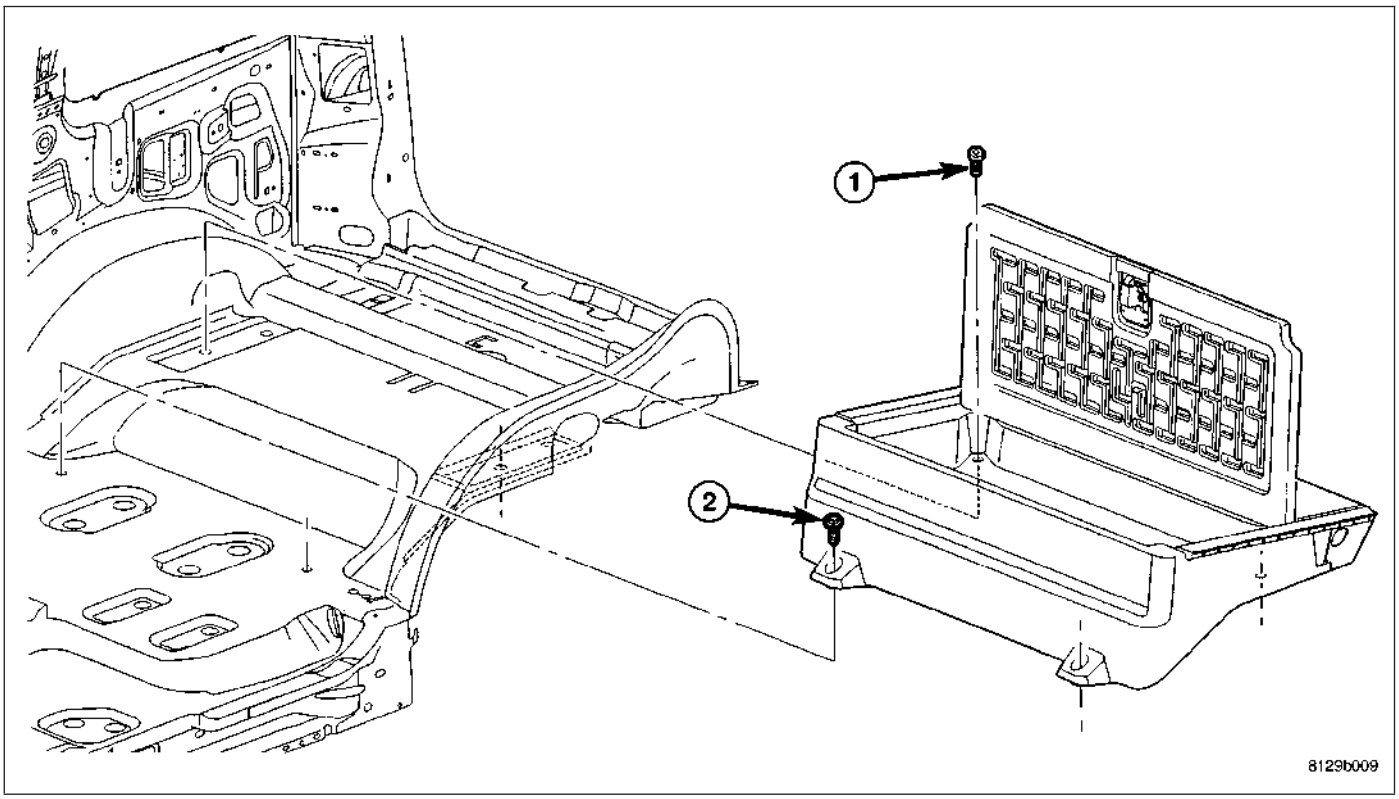
1. Remove the front seats. (Refer to 23 - BODY/SEATS/SEAT - FRONT - REMOVAL)
2. Remove the floor console. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL)
3. Using a trim stick C-4755 or equivalent, remove the door sill scuff plates. (Refer to 23 - BODY/INTERIOR/DOOR SILL SCUFF PLATE - DESCRIPTION)
4. Remove the cowl trim panels. (Refer to 23 - BODY/INTERIOR/COWL TRIM COVER - DESCRIPTION)
5. Fold the second row seats forward and remove the right and left side bolts (1 & 2).
6. Remove the second row seat assembly.



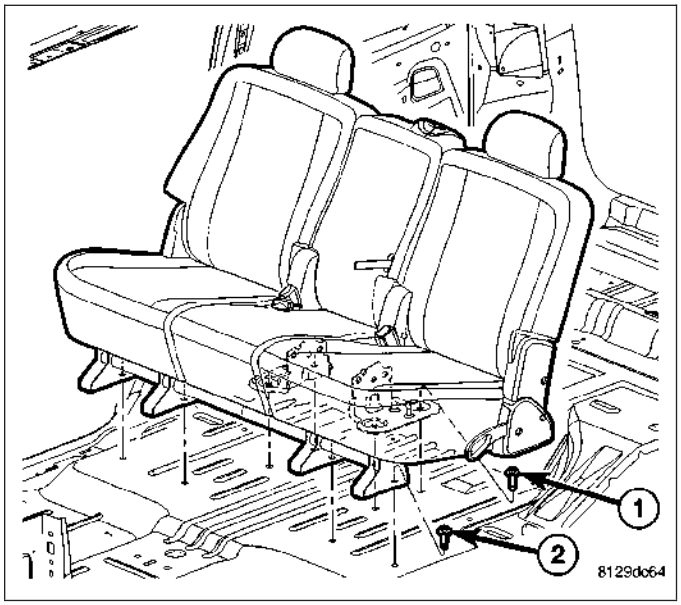


7. Remove the third row seat assembly, if equipped. (Refer to 23 - BODY/SEATS/SEAT - THIRD ROW - REMOVAL)
8. Remove the bolts (1 & 2) and remove storage bin, if equipped.
9. Remove the carpet from under the side trim panels.
10. Remove the carpet.

INSTALLATION



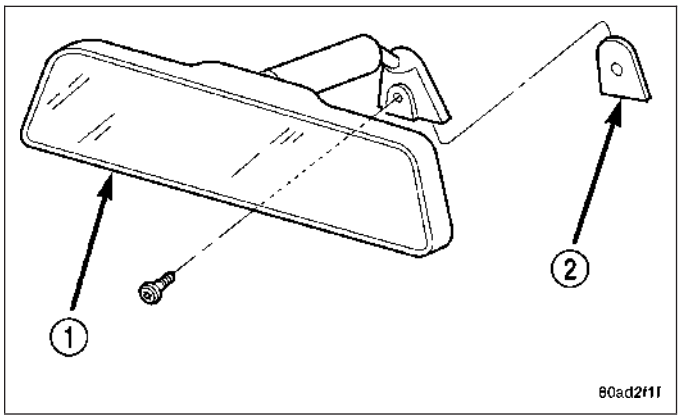
1. Position the carpet in vehicle and tuck up under the side trim panels.
2. Install the third row seat assembly, if equipped. (Refer to 23 - BODY/SEATS/SEAT - THIRD ROW - INSTALLATION)
3. Install the storage bin, if equipped, and screws and tighten the rear screws to 7 N·m (60 in. lbs.).
4. Install the second row seat assembly and install the bolts (1 & 2).
5. Tighten the front bolts (2) to 27 N·m (20 ft. lbs.).
6. Tighten the rear bolts (1) to 47 N·m (35 ft. lbs.).
7. Install the cowl trim panels. (Refer to 23 - BODY/INTERIOR/COWL TRIM COVER - DESCRIPTION)
8. Position the door sill scuff plates and seat the clips fully. (Refer to 23 - BODY/INTERIOR/DOOR SILL SCUFF PLATE - DESCRIPTION)
9. Install the floor console. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION)
10. Install the front seats. (Refer to 23 - BODY/SEATS/SEAT - FRONT - INSTALLATION)



MIRROR-INSIDE REARVIEW

REMOVAL

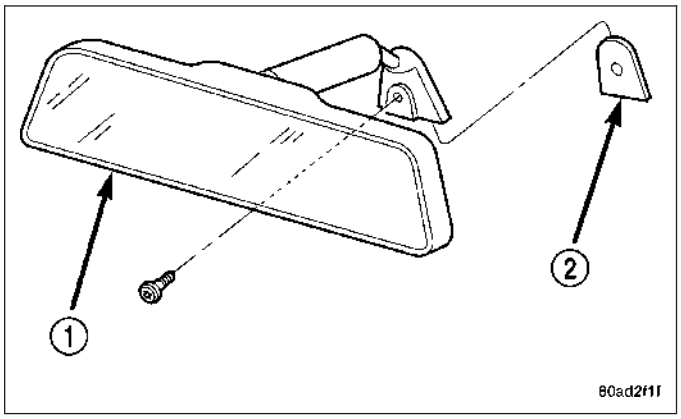
1. Loosen the mirror base set screw.
2. Slide the mirror base upward and off the bracket (2).



INSTALLATION

INSTALLATION - REARVIEW MIRROR

1. Position the mirror base at the bracket (2) and slide it downward onto the support bracket.
2. Tighten set screw to 1 N·m (9 in. lbs.).



INSTALLATION - REARVIEW MIRROR SUPPORT BRACKET

1. Mark the position for the mirror bracket on the outside of the windshield glass with a wax pencil.
2. Clean the bracket contact area on the glass. Use a mild powdered cleanser on a cloth saturated with isopropyl (rubbing) alcohol. Finally, clean the glass with a paper towel dampened with alcohol.
3. Sand the surface on the support bracket with fine grit-sandpaper. Wipe the bracket surface clean with a paper towel.
4. Apply accelerator to the surface on the bracket according to the following instructions:
   - Crush the vial to saturate the felt applicator.
   - Remove the paper sleeve.
   - Apply accelerator to the contact surface on the bracket.
   - Allow the accelerator to dry for five minutes.
   - Do not touch the bracket contact surface after the accelerator has been applied.
5. Apply adhesive accelerator to the bracket contact surface on the windshield glass. Allow the accelerator to dry for one minute. Do not touch the glass contact surface after the accelerator has been applied.
6. Install the bracket according to the following instructions:
   - Apply one drop of adhesive at the center of the bracket contact-surface on the windshield glass.
   - Apply an even coat of adhesive to the contact surface on the bracket.
   - Align the bracket with the marked position on the windshield glass.
   - Press and hold the bracket in place for at least one minute.

NOTE: Verify that the mirror support bracket is correctly aligned, because the adhesive will cure rapidly.

7. Allow the adhesive to cure for 8-10 minutes. Remove any excess adhesive with an alcohol-dampened cloth.
8. Allow the adhesive to cure for an additional 8-10 minutes before installing the mirror.

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PAINT

SPECIFICATIONS - PAINT CODES

EXTERIOR COLORS

EXTERIOR COLOR	DAIMLERCHRYSLER CODE
Deep Molten Red Pearlcoat	BR8
Flame Red Clearcoat	PR4
Light Khaki Metallic Clearcoat	AJC
Timberline Green Pearlcoat	AGW
Patriot Blue Pearlcoat	WB7
Atlantic Blue Pearlcoat	ZBJ
Graphite Metallic Clearcoat	ZDR
Bright Silver Metallic Clearcoat	WS2
Black Clearcoat	DX8
Bright White Clearcoat	GW7

INTERIOR COLORS

INTERIOR COLOR	DAIMLERCHRYSLER CODE
D M.Slate Gray	D5
Khaki	J3
Slate Gray/Light Greystone	BD1
Deep Gray	ZSP

BASECOAT/CLEARCOAT FINISH

DESCRIPTION

The original equipment paint finish is a multi step process that involves cleaning, applying electro de-position (E-coat), anti-chip primer, basecoat, and clearcoat steps.

CAUTION: Do not use abrasive chemicals, abrasive compounds or harsh alkaline based cleaning solvents on the painted surfaces of a vehicle. Failure to follow this caution can result in damage to vehicle finish.

On most vehicles a two-part paint application (basecoat/clearcoat) is used. Color paint that is applied to primer is called basecoat. A clear coat paint is then applied to protect the basecoat from ultraviolet light and to provide a durable high-gloss finish.

PAINT CODE

DESCRIPTION

Exterior vehicle body colors are identified on the Vehicle Certification Label (Refer to VEHICLE DATA/VEHICLE INFORMATION/VEHICLE CERTIFICATION LABEL - DESCRIPTION). The first digit of the paint code listed on the vehicle indicates the sequence of application, i.e.: P = primary coat, Q = secondary coat. The color names provided in the Paint and Trim Code Description chart are the color names used on most repair product containers. (Refer to 23 - BODY/PAINT - SPECIFICATIONS)

PAINT TOUCH-UP

DESCRIPTION

When a painted metal surface has been scratched or chipped, it should be touched-up as soon as possible to avoid corrosion. For best results, use MOPAR® Scratch Filler/Primer, Touch-Up Paints and Clear Top Coat.

WARNING: USE AN OSHA APPROVED RESPIRATOR AND SAFETY GLASSES WHEN SPRAYING PAINT OR SOLVENTS IN A CONFINED AREA. PERSONAL INJURY CAN RESULT.

STANDARD PROCEDURE

1. Scrape loose paint and corrosion from inside scratch or chip.
2. Clean affected area with MOPAR® Tar/Road Oil Remover or equivalent, and allow to dry.
3. Fill the inside of the scratch or chip with a coat of filler/primer. Do not overlap primer onto good surface finish. The applicator brush should be wet enough to puddle-fill the scratch or chip without running. Do not stroke brush applicator on body surface. Allow the filler/primer to dry hard.
4. Cover the filler/primer with color touch-up paint. Do not overlap touch-up color onto the original color coat around the scratch or chip. Butt the new color to the original color, if possible. Do not stroke applicator brush on body surface. Allow touch-up paint to dry hard.
5. On vehicles without clearcoat, the touch-up color can be lightly finesse sanded (1500 grit) and polished with rubbing compound.
6. On vehicles with clearcoat, apply clear top coat to touch-up paint with the same technique as described in Step 4. Allow clear top coat to dry hard. If desired, Step 5 can be performed on clear top coat.

WARNING: AVOID PROLONGED SKIN CONTACT WITH PETROLEUM OR ALCOHOL – BASED CLEANING SOLVENTS. PERSONAL INJURY CAN RESULT.AVOID PROLONGED SKIN CONTACT WITH PETROLEUM OR ALCOHOL – BASED CLEANING SOLVENTS. PERSONAL INJURY CAN RESULT.

FINESSE SANDING/BUFFING & POLISHING

DESCRIPTION

CAUTION: Do not remove more than 0.5 mils of clearcoat finish when sanding, hand buffing or polishing. Basecoat paint must retain clearcoat for durability.

CAUTION: If the finish has been finesse sanded in the past, it cannot be repeated. Failure to follow this caution can result in damage to vehicle finish.

NOTE: Finesse sanding should only be performed by a trained automotive paint technician.

Minor acid etching, orange peel, or smudging in a clearcoat or single-stage finish can be reduced with light finesse sanding, hand buffing and polishing. Use a Paint Thickness Gauge #PR-ETG-2X or equivalent to determine clearcoat or single-stage paint thickness before and after the repair.

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SEATS

WARNING

RESTRAINT SYSTEM

WARNING: During and following any seat belt or child restraint anchor service, carefully inspect all seat belts, buckles, mounting hardware, retractors, tether straps, and anchors for proper installation, operation, or damage. Replace any belt that is cut, frayed, or torn. Straighten any belt that is twisted. Tighten any loose fasteners. Replace any belt that has a damaged or inoperative buckle or retractor. Replace any belt that has a bent or damaged latch plate or anchor plate. Replace any child restraint anchor or the unit to which the anchor is integral that has been bent or damaged. Never attempt to repair a seat belt or child restraint component. Always replace damaged or faulty seat belt and child restraint components with the correct, new and unused replacement parts listed in the DaimlerChrysler Mopar parts catalog. Failure to follow these instructions may result in personal injury or death.

WARNING: On vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment. Failure to follow these instructions may result in personal injury or death.

WARNING: On vehicles equipped with airbags, before performing any welding operations disconnect and isolate the battery negative (ground) cable and disconnect all wire harness connectors from the airbag control module (acm). Failure to take the proper precautions could result in accidental airbag deployment and other possible damage to the supplemental restraint system circuits and components. Failure to follow these instructions may result in personal injury or death.

WARNING: Replace all restraint system components only with parts specified in the DaimlerChrysler Mopar parts catalog. Substitute parts may appear interchangeable, but internal differences may result in inferior occupant protection. Failure to follow these instructions may result in personal injury or death.

WARNING: The fasteners, screws, and bolts originally used for the restraint system components must never be replaced with any substitutes. These fasteners have special coatings and are specifically designed for the restraint system. Any time a new fastener is needed, replace it with the correct fasteners provided in the service package or specified in the DaimlerChrysler Mopar parts catalog. Failure to follow these instructions may result in personal injury or death.

WARNING: On vehicles equipped with the occupant classification system (ocs) do not hang any after market devices from the front passengers seat back. Do not install a front drivers seat back cover with map pocket onto the passenger seat. Failure to follow these instructions may result in personal injury or death.

WARNING: The Seat Weight Sensor is a sensitive, calibrated unit and must be handled carefully. Do not drop or handle roughly. If dropped or damaged, replace with another sensor. Failure to follow these instructions may result in personal injury or death.

WARNING: The front passenger seat must be handled carefully as well. When removing the seat, be careful when setting on floor not to drop. If dropped, the sensor may be inoperative. Failure to follow these instructions may result in personal injury or death.

WARNING: When the seat is on the floor, no one should sit in the front passenger seat. This uneven force may damage the sensing ability of the seat weight sensors. If sat on and damaged, the sensor may be inoperative. Failure to follow these instructions may result in personal injury or death.

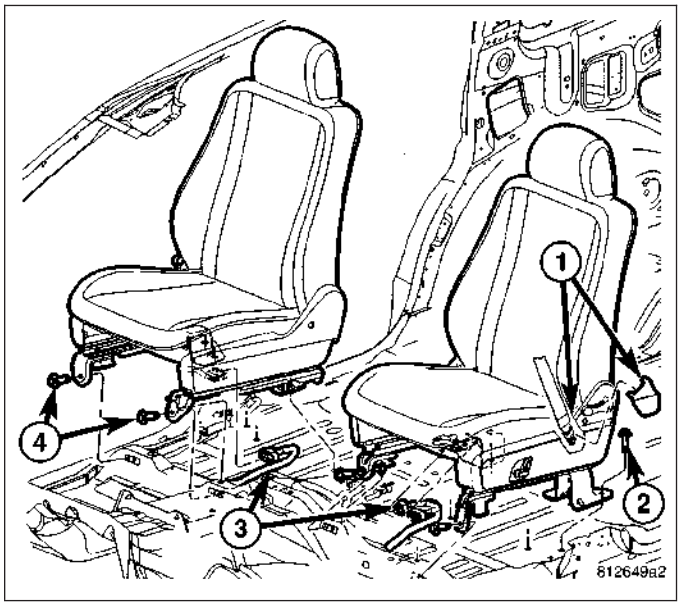
SEAT-FRONT

REMOVAL

1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/SEATS - WARNING)

WARNING: The Seat Weight Sensor is a sensitive, calibrated unit and must be handled carefully. Do not drop or handle roughly. If dropped or damaged, replace with another sensor. Failure to follow these instructions may result in personal injury or death.

WARNING: The front passenger seat must be handled carefully as well. When removing the seat, be careful when setting on floor not to drop. If dropped, the sensor may be inoperative. Failure to follow these instructions may result in personal injury or death.

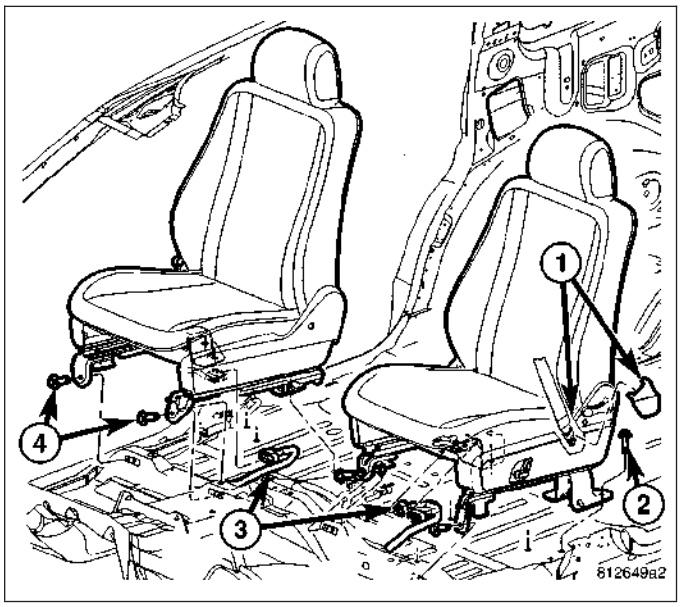


WARNING: When the seat is on the floor, no one should sit in the front passenger seat. This uneven force may damage the sensing ability of the seat weight sensors. If sat on and damaged, the sensor may be inoperative. Failure to follow these instructions may result in personal injury or death.

2. Move the seat forward to gain access to the rear bolts.
3. Disconnect and isolate battery negative cable.
4. Remove the cover and lower seat belt anchor (1).
5. Remove the two front (4) and three rear (2) bolts.
6. Disconnect the electrical connectors (3), if equipped, and remove the seat from the vehicle.

INSTALLATION

1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/SEATS - WARNING)



WARNING: The Seat Weight Sensor is a sensitive, calibrated unit and must be handled carefully. Do not drop or handle roughly. If dropped or damaged, replace with another sensor. Failure to follow these instructions may result in personal injury or death.

WARNING: The front passenger seat must be handled carefully as well. When removing the seat, be careful when setting on floor not to drop. If dropped, the sensor may be inoperative. Failure to follow these instructions may result in personal injury or death.

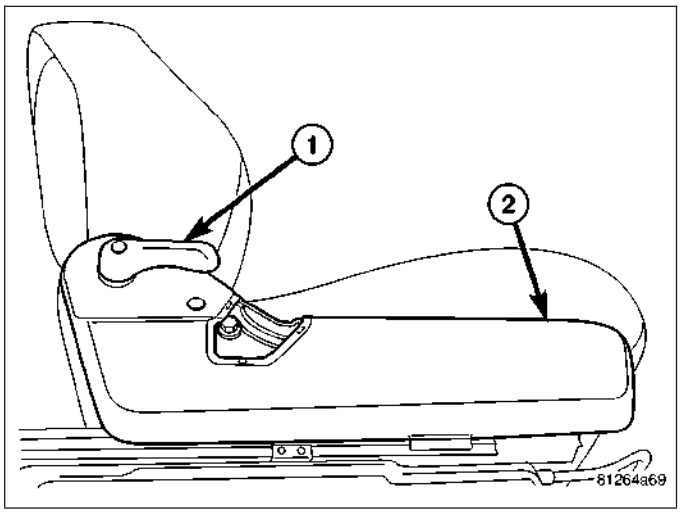
WARNING: When the seat is on the floor, no one should sit in the front passenger seat. This uneven force may damage the sensing ability of the seat weight sensors. If sat on and damaged, the sensor may be inoperative. Failure to follow these instructions may result in personal injury or death.

2. Position the seat into the vehicle and connect the electrical connectors (3), if equipped.
3. Install the two front bolts (4) and three rear bolts (2).
4. Tighten the front inner bolt to 27 N·m (20 ft. lbs.) then tighten the front outer bolt to 27 N·m (20 ft. lbs.).
5. Tighten the rear bolts to 47 N·m (35 ft. lbs.).
6. Install the lower seat belt anchor (1) and install the bolt.
7. Tighten the bolt to 39 N·m (29 ft. lbs.) and install the trim cover (1).
8. Do not reconnect the battery negative cable at this time. The supplemental restraint system verification test procedure should be performed following service of any supplemental restraint system component. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - VERIFICATION TEST).
9. Following successful completion of the supplemental restraint system verification test procedure, perform the Occupant Classification System Verification Test using a scan tool. (Refer to 8 - ELECTRICAL/RESTRAINTS - *OCS VERIFICATION TEST - VER 1)

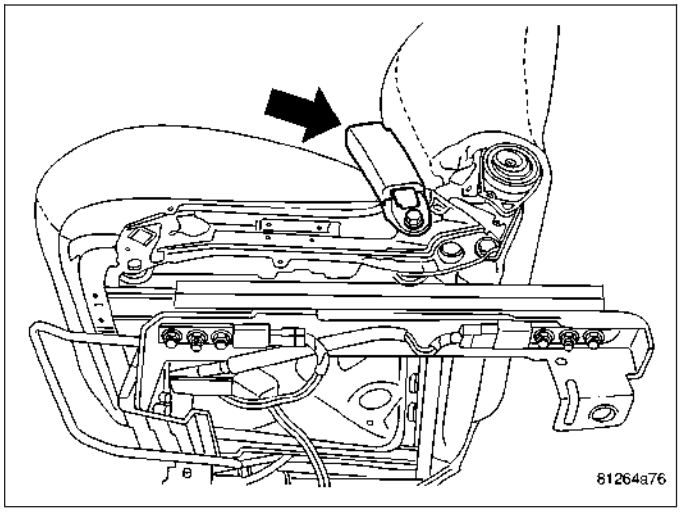
CUSHION/COVER-SEAT BACK - FRONT

REMOVAL

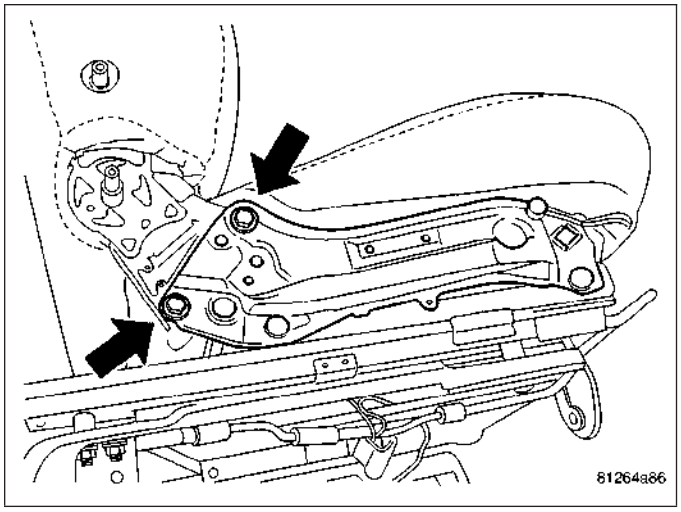
1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/SEATS - WARNING)
2. Remove the front seat. (Refer to 23 - BODY/SEATS/SEAT - FRONT - REMOVAL)
3. Remove the lumbar and recliner handles (1).
4. Remove the screws and remove the side shields (2).



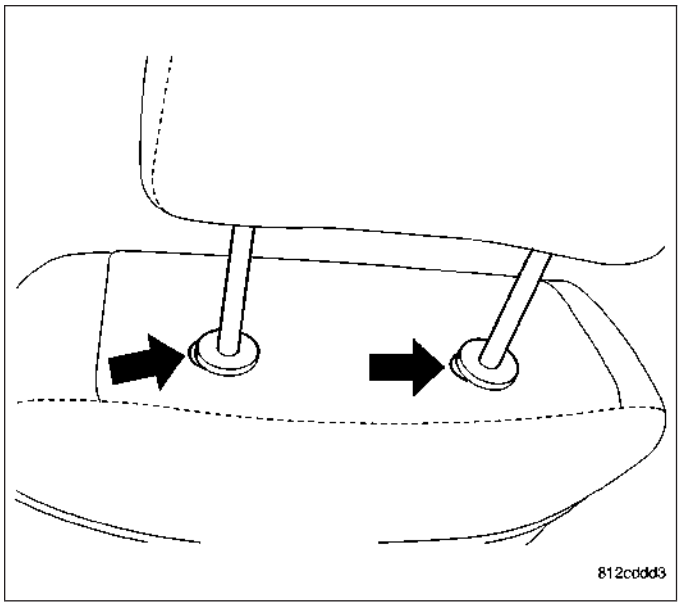
5. Remove the belt buckle.



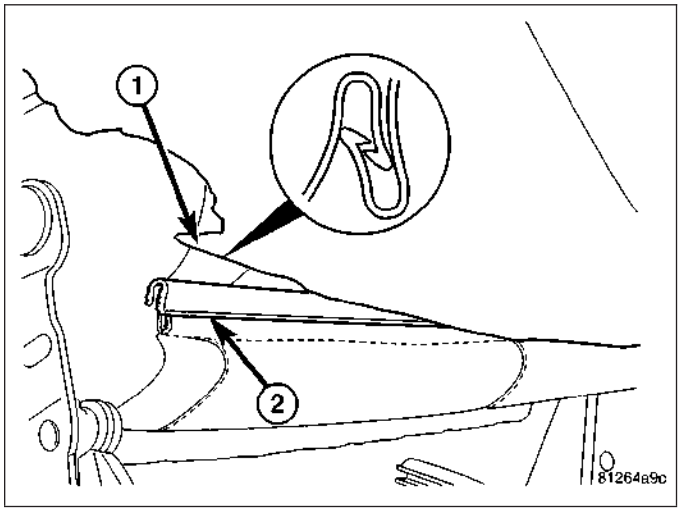
6. Remove the seat back bolts from both sides.



7. Push in the buttons on both headrest sleeves, pull the headrest up and remove.

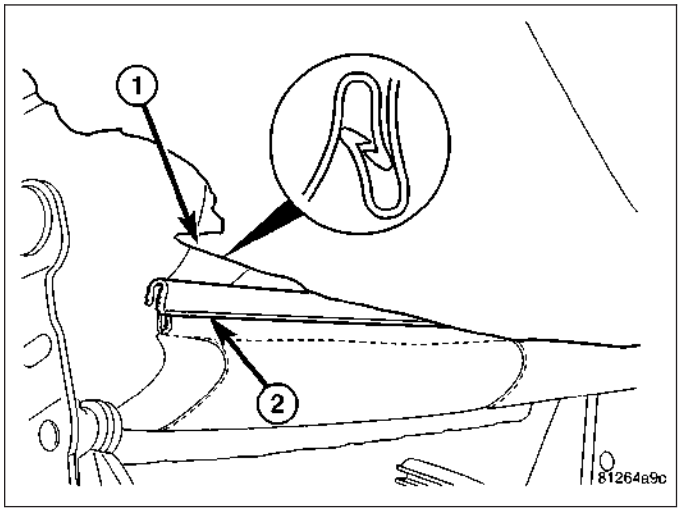


8. Separate the j-straps (1 & 2) and pull cover up over frame and remove cushion.
9. Pinch both headrest sleeve ribs from inside the seat back frame with pliers or equivalent.
10. Strike the bottom of the sleeve with a rubber mallet or equivalent, and remove the headrest sleeves.

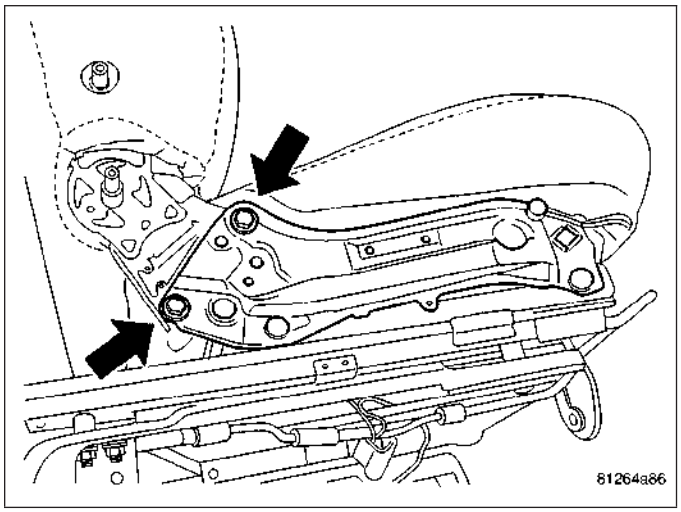


INSTALLATION

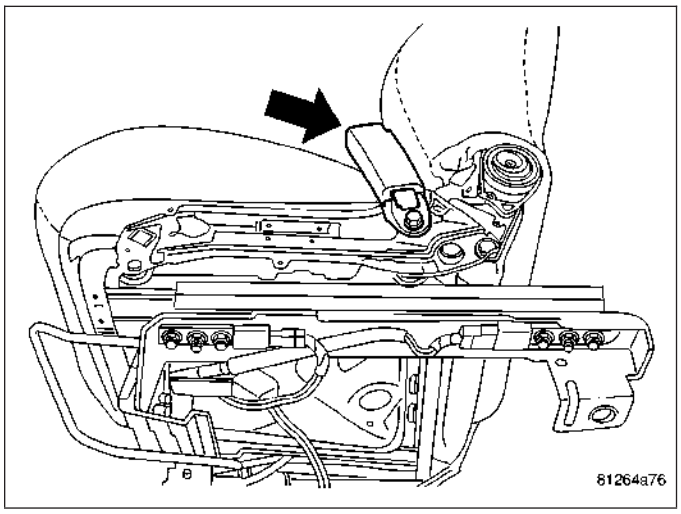
1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/SEATS - WARNING)
2. Position the seat back cover over the seat back frame and install the headrest sleeves.
3. Position the seat back cushion on the frame and position the cover over the cushion.
4. Connect the j-straps (1 & 2).



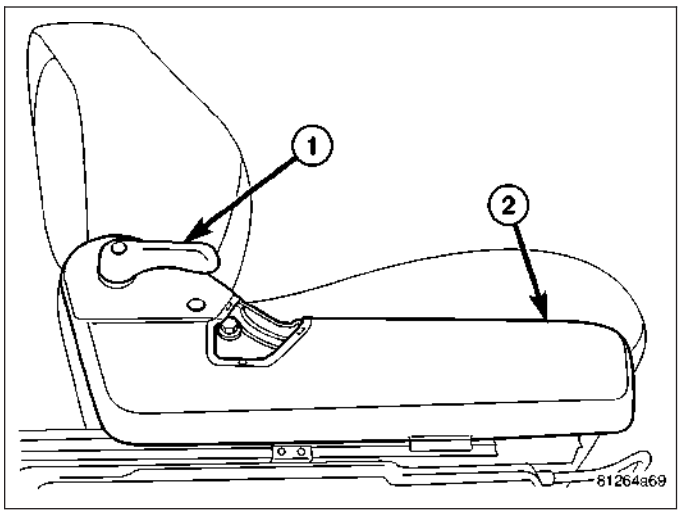
5. Install the seat back bolts and tighten to 40 N·m (30 ft. lbs.).



6. Position the front seat belt buckle lower anchor onto the stud near the rear of the inboard seat cushion frame. Be certain the anti-rotation tab on the anchor is engaged in the clearance hole of the frame.
7. Tighten the nut to 43 N·m (32 ft. lbs.)



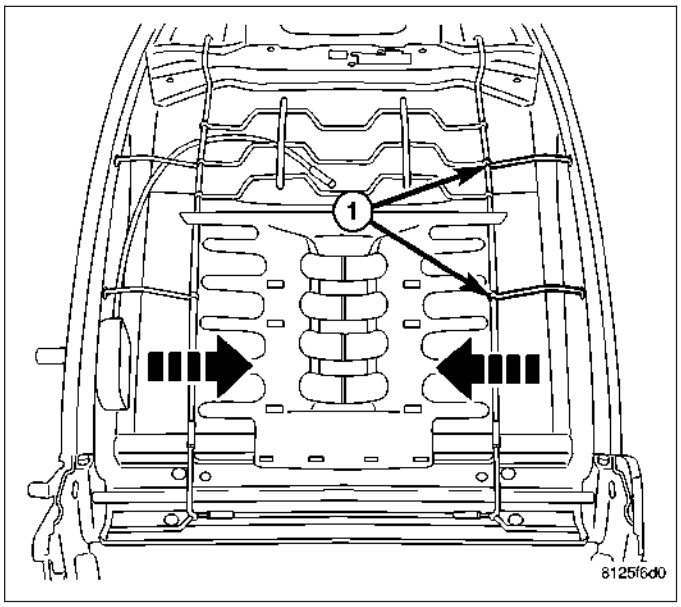
8. Install the side shields (2) and install the screws.
9. Install the lumbar and recliner handles (1 & 4).



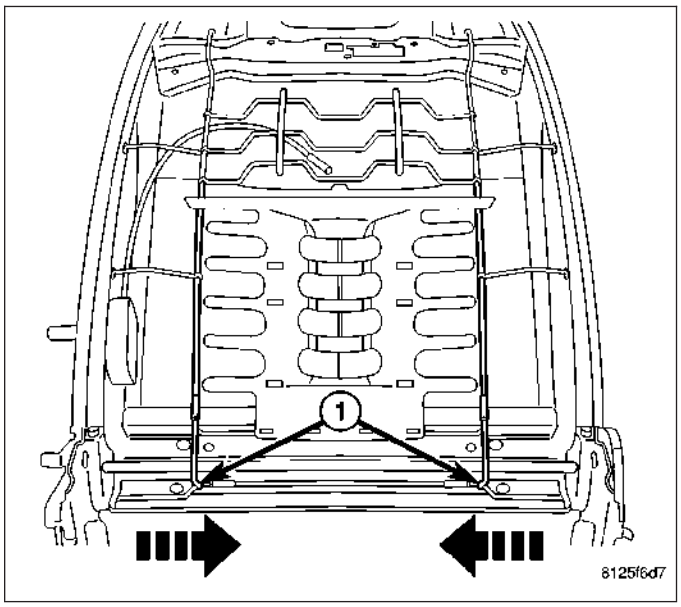
SUPPORT-LUMBAR

REMOVAL

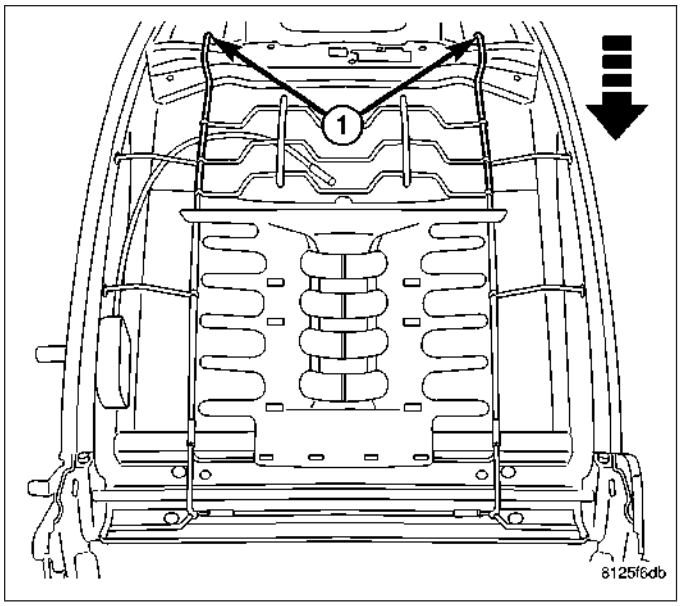
1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/SEATS - WARNING)
2. Remove the seat back cushion/cover. (Refer to 23 - BODY/SEATS/SEAT BACK CUSHION / COVER - FRONT - REMOVAL)
3. Release the lumbar mat side wires (1) by pulling out on the wire supports and then pulling them in.



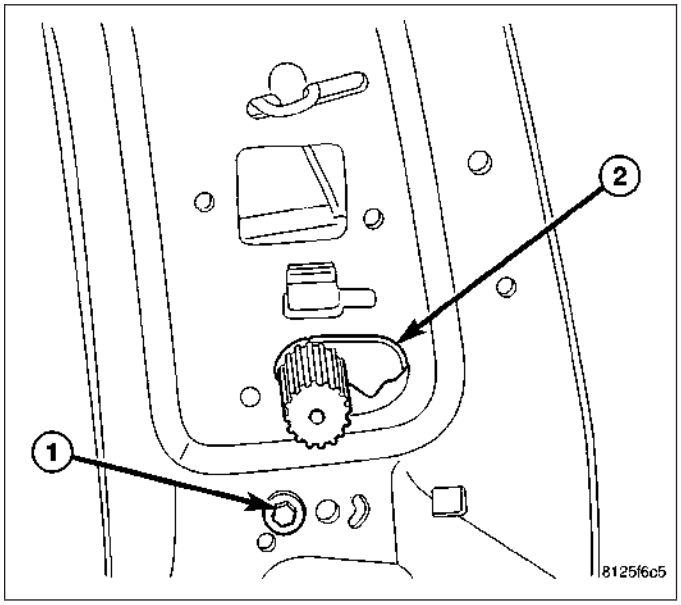
4. Squeeze the lower support wires (1) in and release the lower wires.



5. Pull the upper support wires (1) down and release the lumbar mat from the seat back frame.

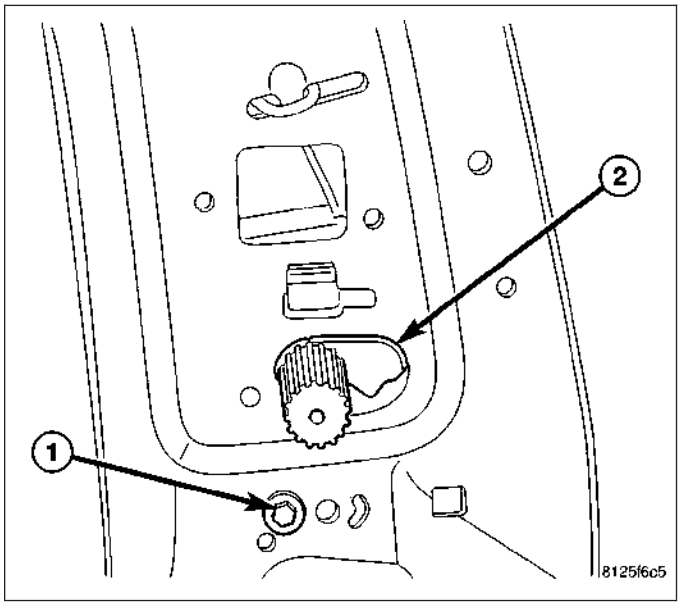


6. Remove the rivet (1) and remove the lumbar mechanism (2).

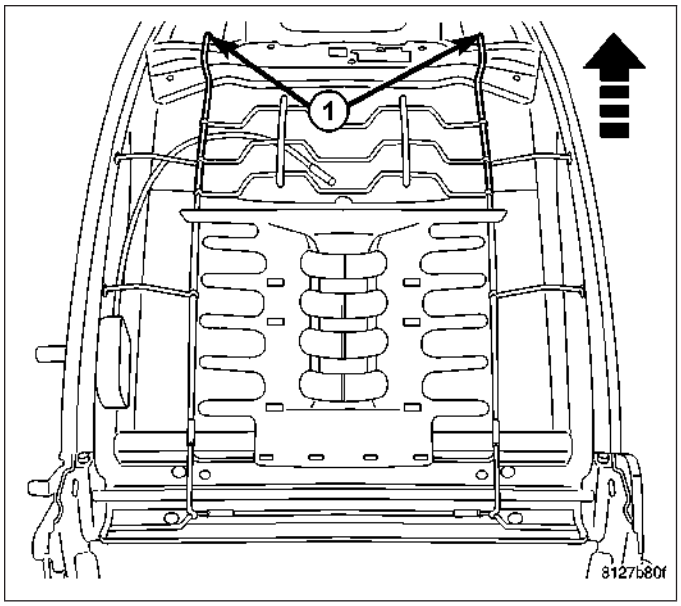


INSTALLATION

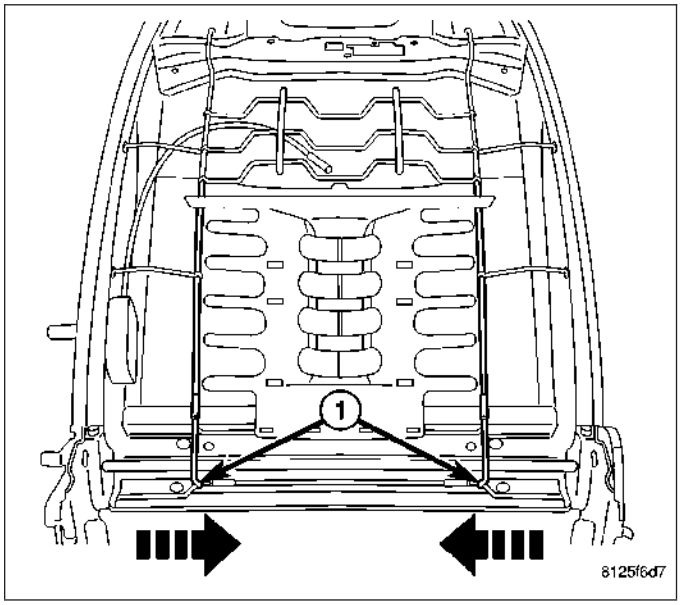
1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/SEATS - WARNING)
2. Install the lumbar mechanism (2) and install a new rivet (1).



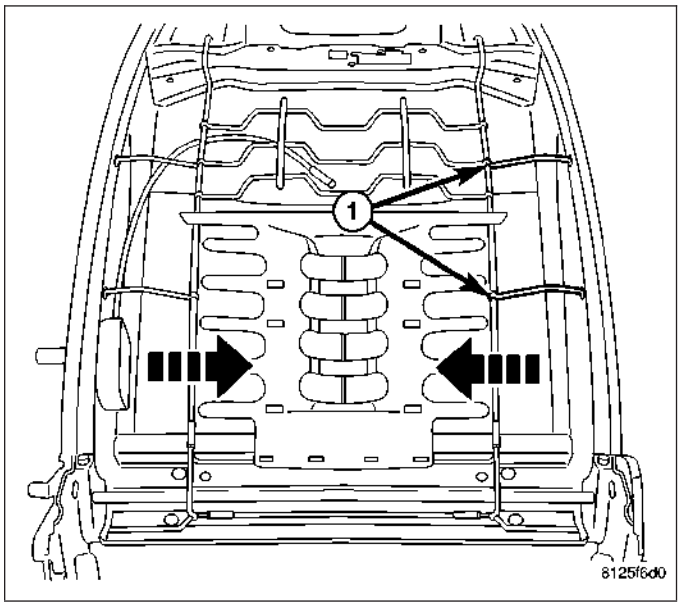
3. Place lumbar mat onto seat back frame and insert the upper support wires (1) into the frame.



4. Squeeze the lower support wires (1) together and insert into the lower frame.



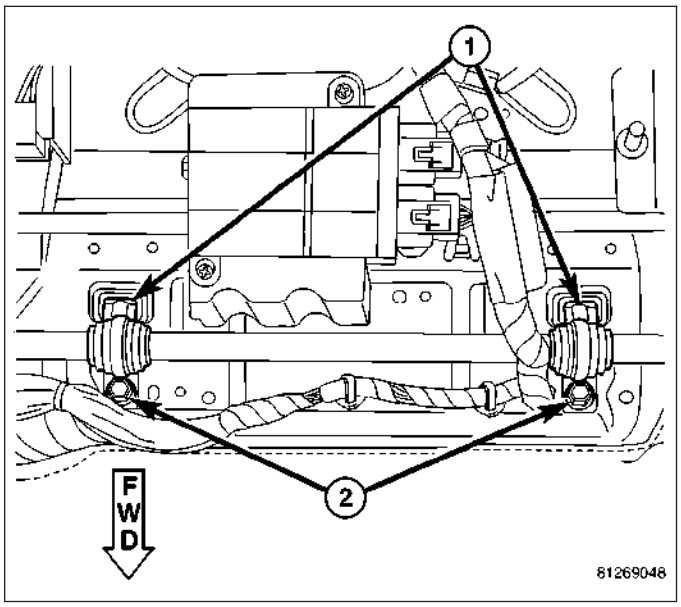
5. Squeeze the side support wires together and insert them into the sides of the seat back frame.
6. Install the seat back cushion/cover. (Refer to 23 - BODY/SEATS/SEAT BACK CUSHION / COVER - FRONT - INSTALLATION)



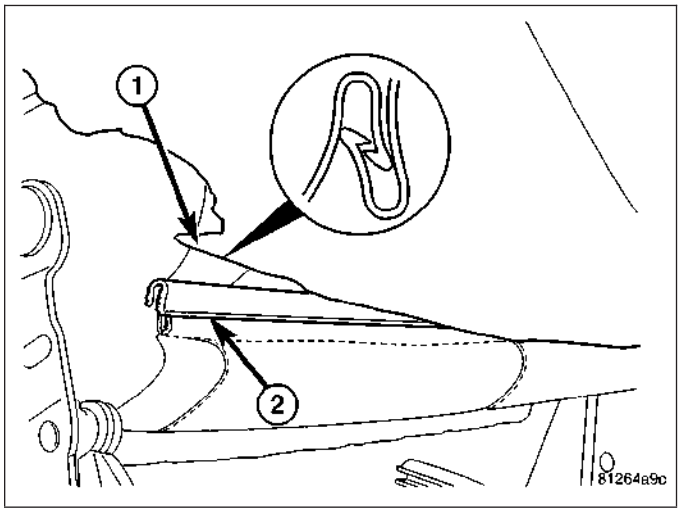
CUSHION/COVER-CUSHION - FRONT

REMOVAL

1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/SEATS - WARNING)
2. Move the seat to the forward position and disconnect and isolate the batter negative cable.
3. Remove the bolts (2) and the clamps (1) and remove the seat cushion.
4. Disconnect the electrical connector, if equipped.

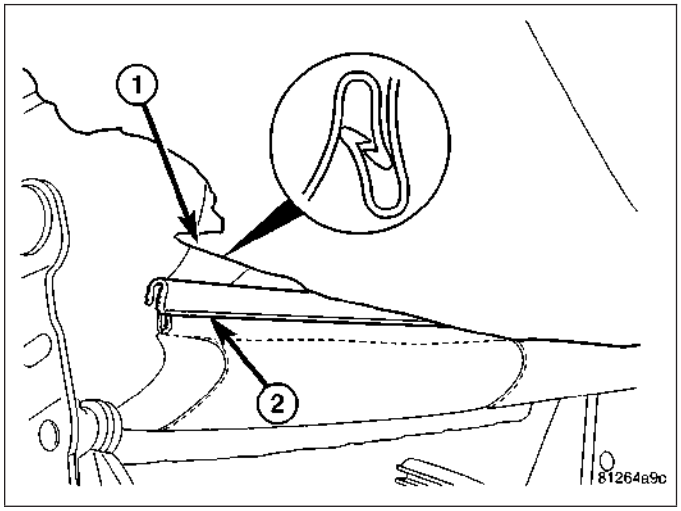


5. Separate the j-straps (1 & 2) and seat cushion cover and foam.

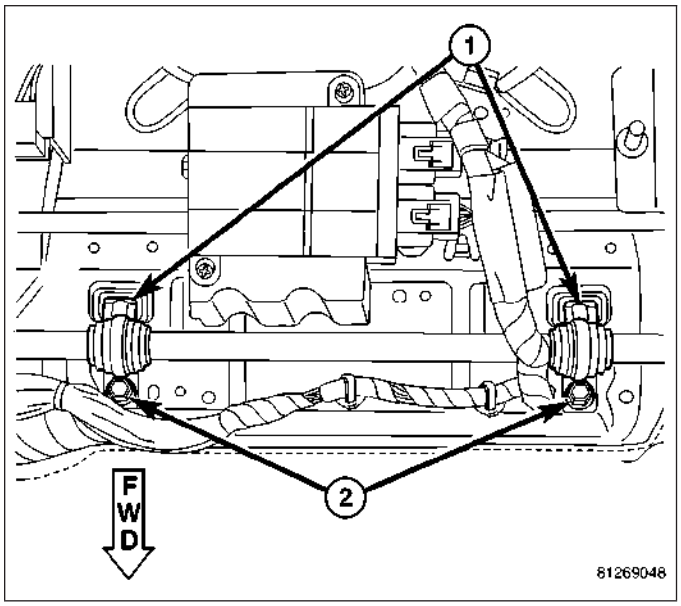


INSTALLATION

1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/SEATS - WARNING)
2. Position the cushion cover and foam over the seat pan and connect the j-straps (1 & 2).



3. Position the seat cushion assembly onto the seat frame and install the clamps (1).
4. Connect the wire harness to the seat cushion pan, if equipped.
5. Install the bolts (2) and tighten to 10 N·m (90 in. lbs.).
6. Connect battery negative cable.



ADJUSTERS-FRONT

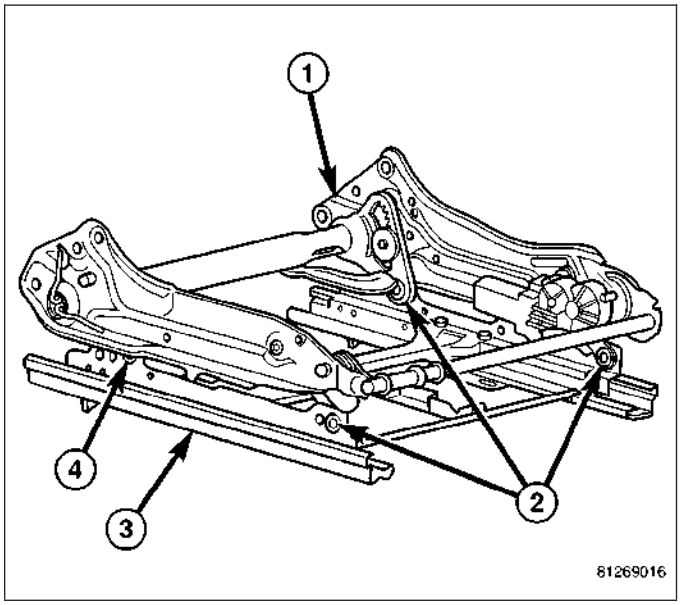
REMOVAL

1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/ SEATS - WARNING)
2. Remove the seat cushion as necessary. (Refer to 23 - BODY/SEATS/SEAT CUSHION / COVER - FRONT - REMOVAL)

Power

1. Remove the seat risers. (Refer to 23 - BODY/ SEATS/SEAT RISER - FRONT - REMOVAL)
2. Remove the bolts and nuts (2 & 4) and separate the height adjuster assembly from the length adjuster assembly (3).

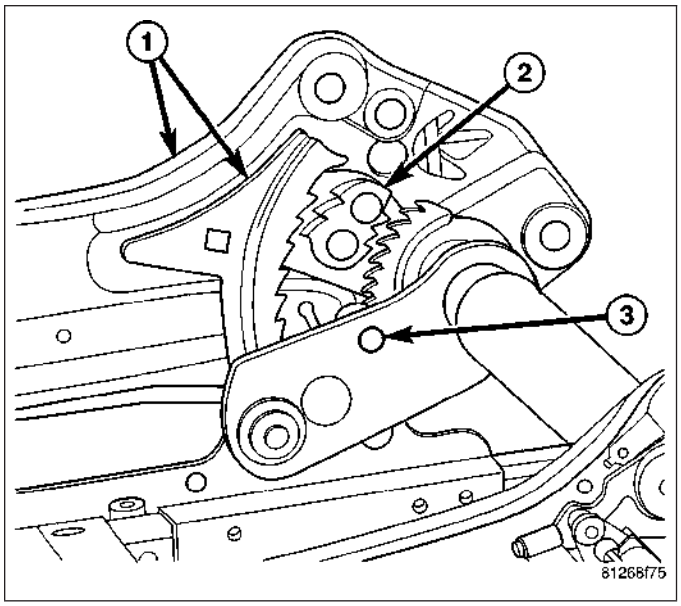
NOTE: Bolt (4) is a different size from the other three bolts (2). Note the location for proper installation.



WARNING: A SEAT STRUCTURE THAT HAS SEEN SIGNIFICANT LOAD MAY HAVE THE LOCKING MECHANISM ACTIVATED AND MAY EXHIBIT THE FOLLOWING SYMPTOMS:

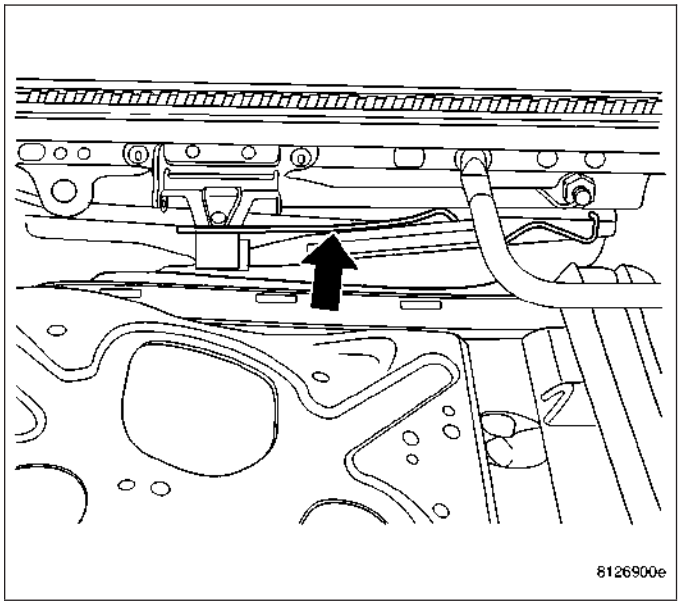
- **LOCKING PAWL (2) LOOSE**
- **LOCKING PAWL (2) ENGAGED INTO THE SEAT FRAME SIDEMEMBER (1)**
- **HEIGHT ADJUSTER ONLY WORKS ON OUTBOARD SIDE**
- **BROKEN OR MISSING SHEAR PIN (3)**

IF ANY ONE OR MORE OF THESE SYMPTOMS EXIST REPLACE THE HEIGHT ADJUSTER ASSEMBLY. DO NOT ATTEMPT ANY REPAIRS. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN PERSONAL INJURY OR DEATH.

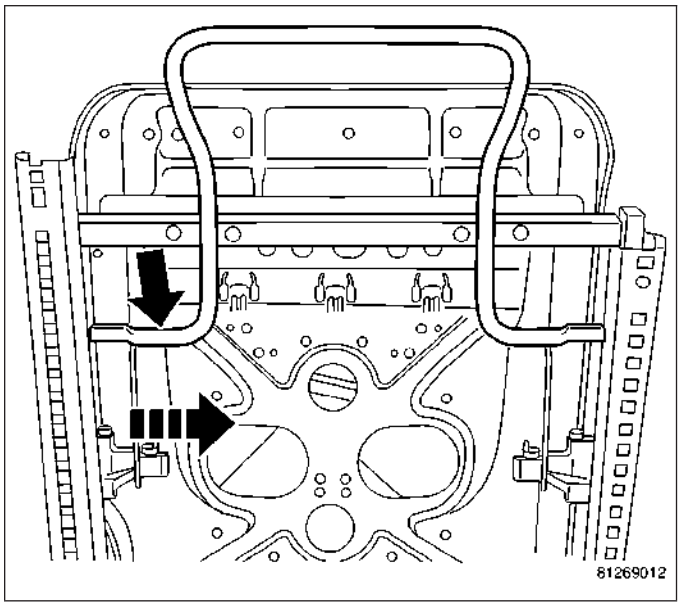


Manual

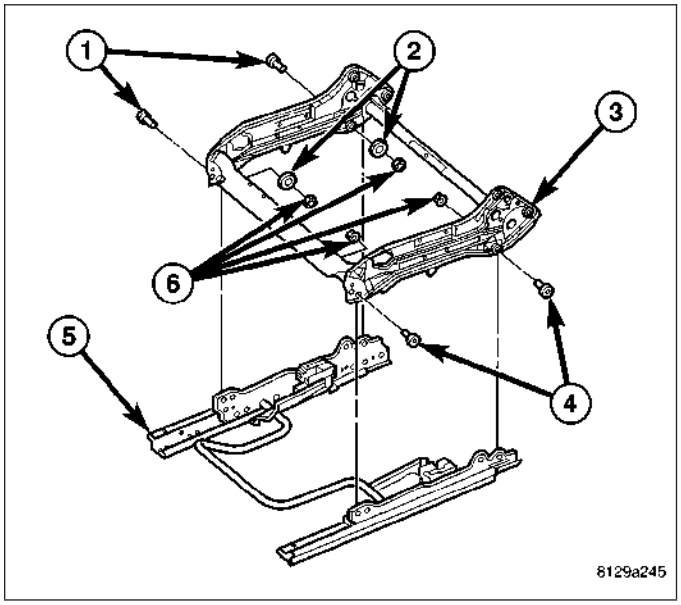
1. Remove the spring clip.



2. Squeeze the towel bar together and pull the towel bar out of the left and right seat tracks.



3. Remove the bolts (1 & 4), nuts (6) and spacers (2) and separate the side member assembly (3) from the length adjuster assembly (5).



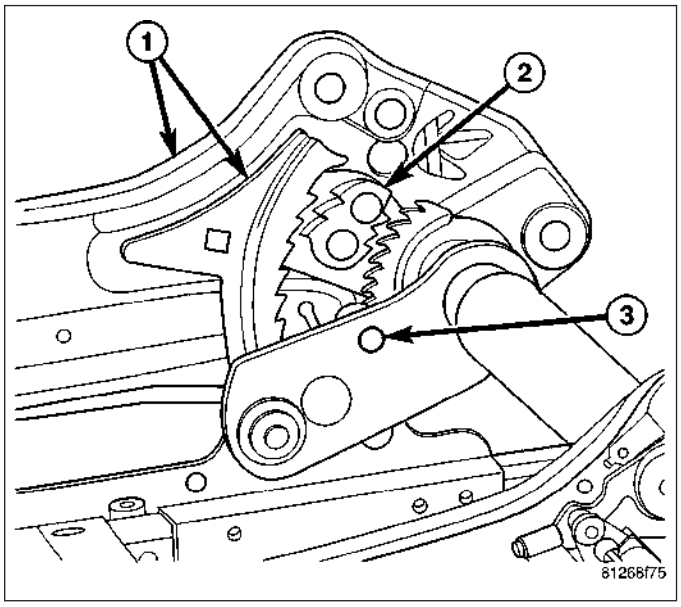
INSTALLATION

Power

1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/SEATS - WARNING)

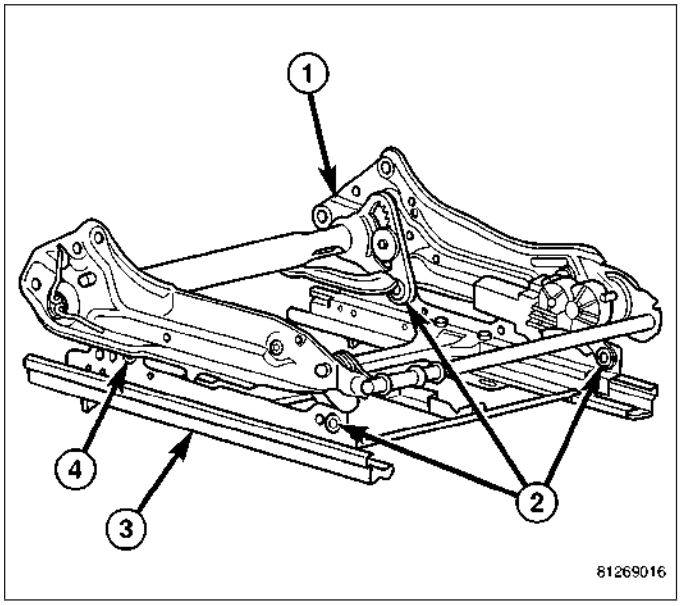
WARNING: A SEAT STRUCTURE THAT HAS SEEN SIGNIFICANT LOAD MAY HAVE THE LOCKING MECHANISM ACTIVATED AND MAY EXHIBIT THE FOLLOWING SYMPTOMS:
- **LOCKING PAWL (2) LOOSE**
- **LOCKING PAWL (2) ENGAGED INTO THE SEAT FRAME SIDEMEMBER (1)**
- **HEIGHT ADJUSTER ONLY WORKS ON OUTBOARD SIDE**
- **BROKEN OR MISSING SHEAR PIN (3)**

IF ANY ONE OR MORE OF THESE SYMPTOMS EXIST REPLACE THE HEIGHT ADJUSTER ASSEMBLY. DO NOT ATTEMPT ANY REPAIRS. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN PERSONAL INJURY OR DEATH.



2. Install the seat risers. (Refer to 23 - BODY/SEATS/SEAT RISER - INSTALLATION)
3. Position the height adjuster assembly (1) onto the length adjuster assembly (3) and install the nuts, bolts and spacers on the inboard side.

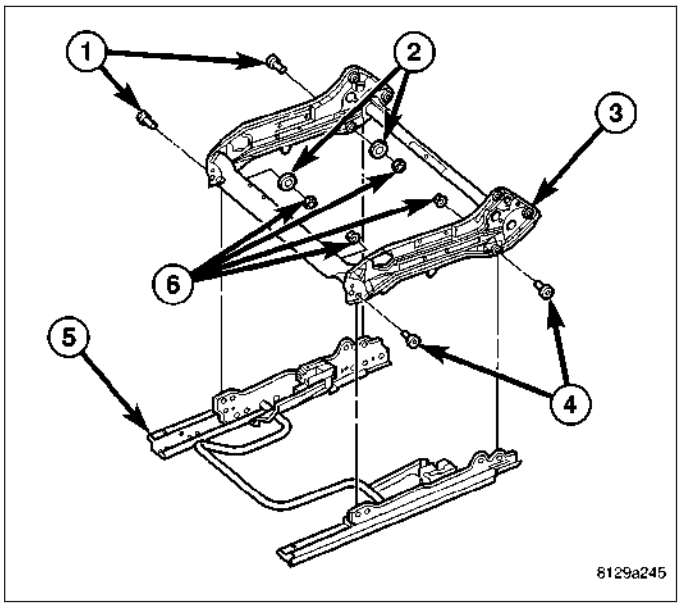
NOTE: Bolts (2) and (4) are different and need to be installed into the correct positions.



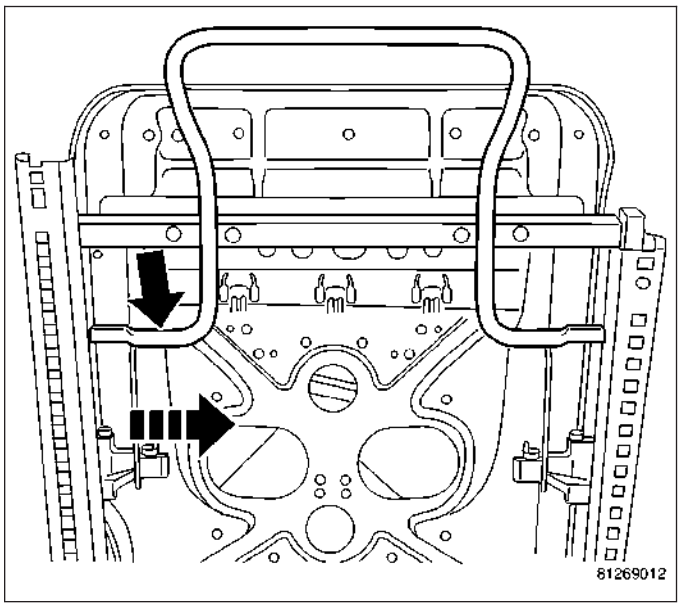
4. Tighten the bolts to 21 N·m (15 ft. lbs.).
5. Install the seat cushion and install the seat. (Refer to 23 - BODY/SEATS/SEAT CUSHION COVER - INSTALLATION)

Manual

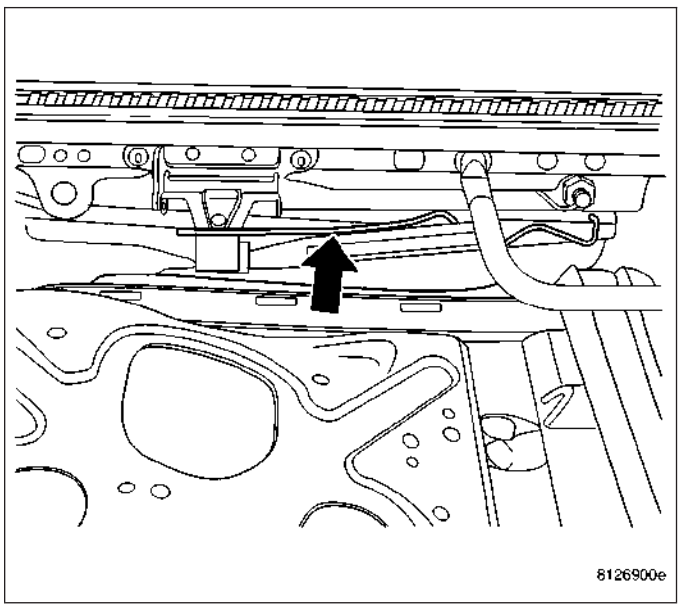
1. Install the seat risers. (Refer to 23 - BODY/SEATS/ SEAT RISER - INSTALLATION)
2. Position the side member assembly (3) onto the length adjuster assembly (5) and install the nuts (6), bolts (1 & 4) and spacers (2) on the inboard side.
3. Tighten the bolts to 42 N·m (31 ft. lbs.).



4. Squeeze the towel bar together and insert the ends into the bushings on both tracks.



5. Install the spring clip.
6. Install the seat cushion and install the seat. (Refer to 23 - BODY/SEATS/SEAT CUSHION COVER - INSTALLATION)



RISER-FRONT

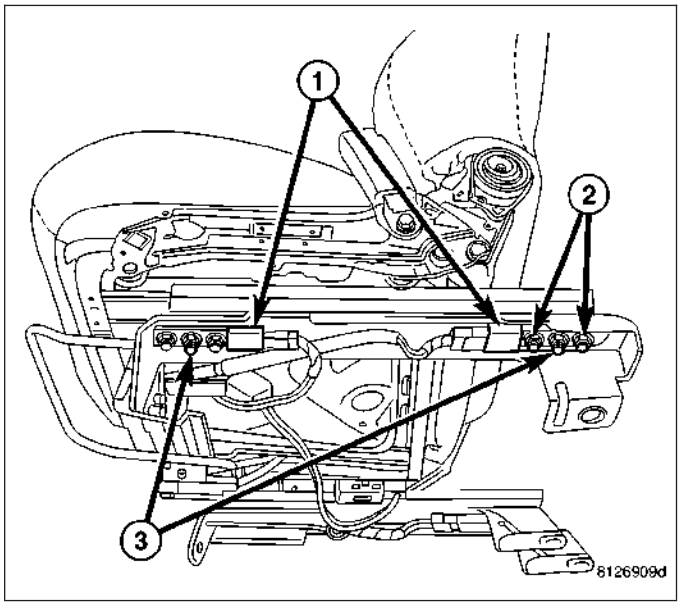
REMOVAL

Manual Length Adjuster

1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/SEATS - WARNING)
2. Remove the seat. (Refer to 23 - BODY/SEATS/SEAT - REMOVAL)
3. Move the seat to the forward position on the tracks and remove the seat adjuster bolts/nuts (3).
4. Move the seat to the reward position on the tracks and remove the front seat adjuster bolts/nuts (3).

NOTE: Passenger seat with strain gauges shown, drivers side seat similar.

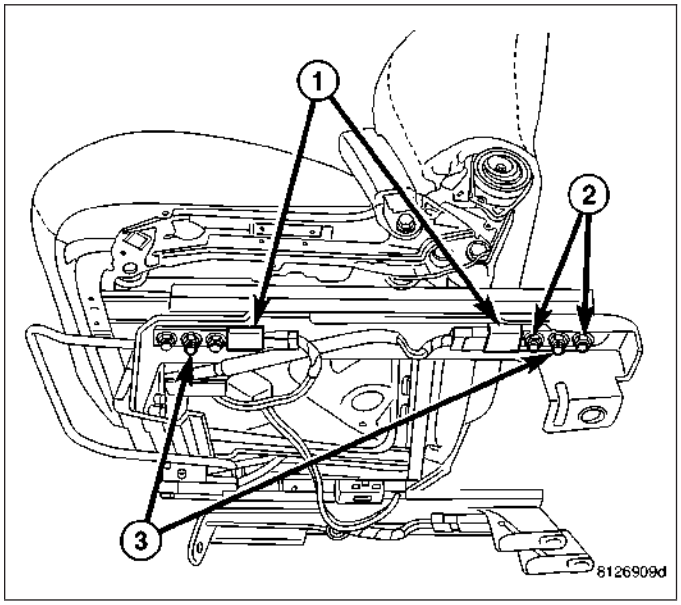
5. Disconnect strain gauge electrical connectors (1), if equipped.
6. If equipped, remove the strain gauge bolts (2) and remove the strain gauges as necessary.



Power Length Adjuster

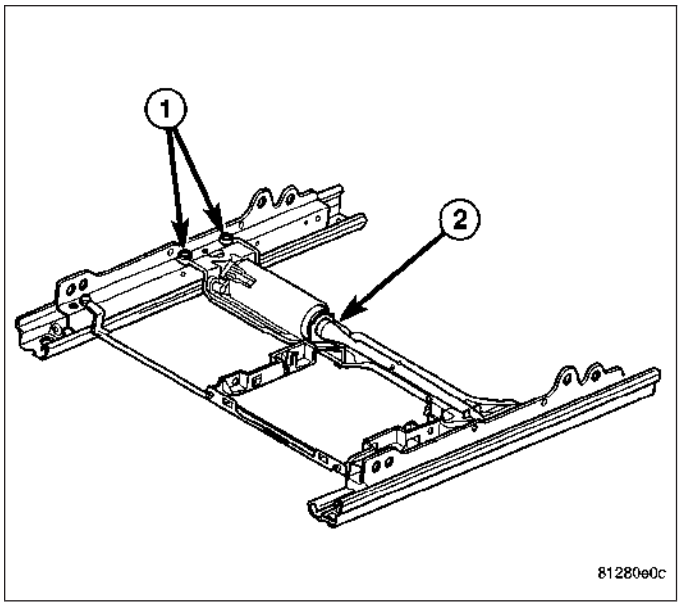
1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/SEATS - WARNING)
2. Unbolt the seat from the floor as necessary to gain access to the riser bolts. (Refer to 23 - BODY/SEATS/SEAT - REMOVAL)
3. Move the seat to the forward position on the tracks, tip the seat backwards in vehicle and remove the seat adjuster bolts/nuts (3).
4. Move the seat to the reward position on the tracks and remove the front seat adjuster bolts/nuts (3).

NOTE: Manual seat length adjuster shown, power similar.

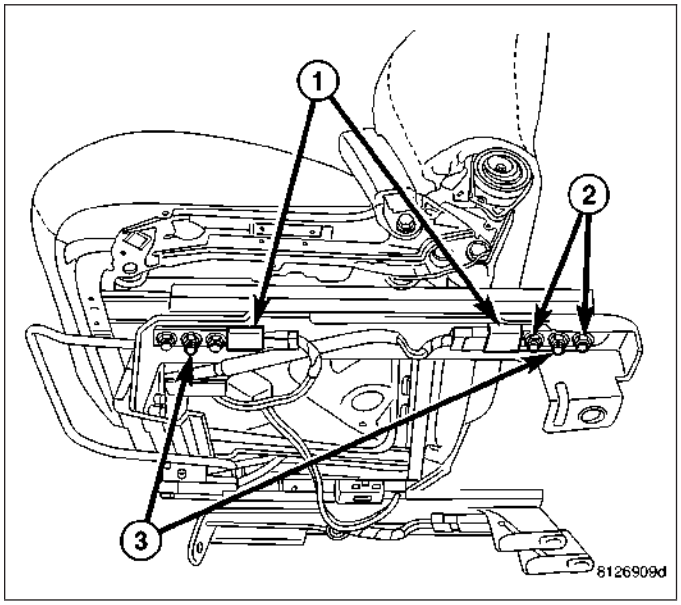


5. If the seat cannot be moved forward or backward, remove the seat cushion. (Refer to 23 - BODY/ SEATS/SEAT CUSHION COVER - REMOVAL)
6. Remove the four bolts (1) and remove the motor and cable assembly (2) from the length adjuster assembly.

CAUTION: When the motor and cable assembly are removed from the tracks discard the length adjuster assembly and replace with a new one.



7. Disconnect and isolate battery negative cable.
8. Remove the seat off of the risers and disconnect the electrical connectors.
9. Disconnect strain gauge electrical connectors (1), if equipped.
10. If equipped, remove the strain gauge bolts (2) and remove the strain gauges as necessary.

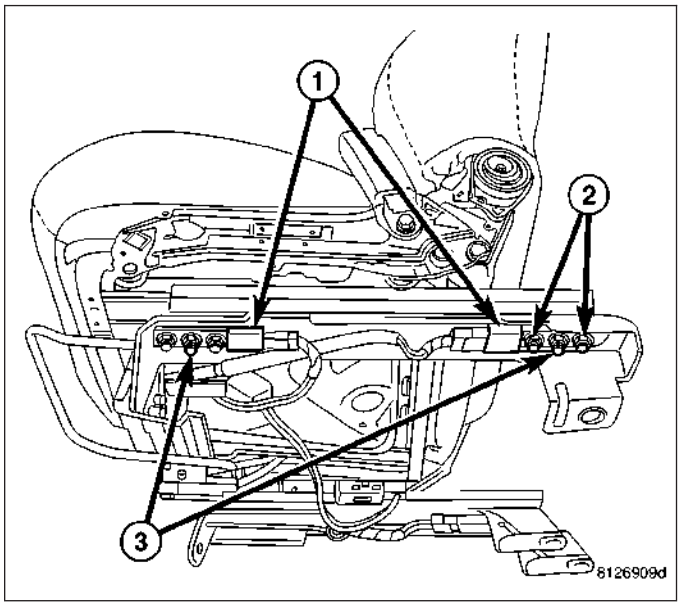


INSTALLATION

Manual Length Adjuster

1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/SEATS - WARNING)

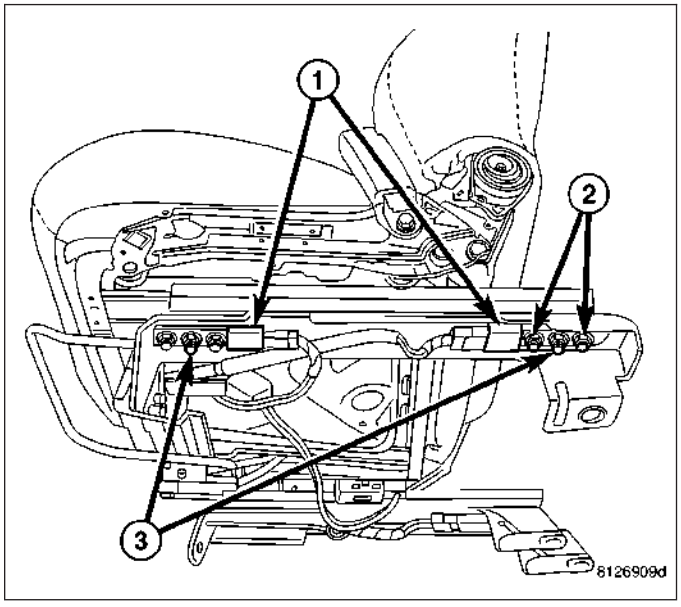
NOTE: Passenger seat with strain gauges shown, drivers side seat similar.



2. If equipped, install the strain gauges and install the bolts (2).
3. Tighten the bolts to 40 N·m (30 ft. lbs.).
4. If necessary, connect the electrical connections (1).
5. Move the seat to the forward position on the tracks and install the rear seat adjuster bolts/nuts (3).
6. Tighten the bolts to 45 N·m (33 ft. lbs.).
7. Move the seat to the reward position on the tracks and install the front seat adjuster bolts/nuts (3).
8. Tighten the bolts to 45 N·m (33 ft. lbs.).
9. Install the seat. (Refer to 23 - BODY/SEATS/SEAT - INSTALLATION)

Power Length Adjuster

1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/SEATS - WARNING)
2. If equipped, install the strain gauges and install the bolts (2).
3. Tighten the bolts to 40 N·m (30 ft. lbs.).
4. Position the seat into the vehicle onto the risers and connect the electrical connectors.
5. Move the seat to the forward position on the tracks and install the seat adjuster bolts/nuts (3).
6. Tighten the bolts attaching the adjuster to the risers/strain gauges to 45 N·m (33 ft. lbs.).
7. Move the seat to the reward position on the tracks and install the front seat adjuster bolts/nuts (3).
8. Tighten the bolts attaching the adjuster to the risers/strain gauges to 45 N·m (33 ft. lbs.).
9. If necessary, connect the strain gauge electrical connections (1).



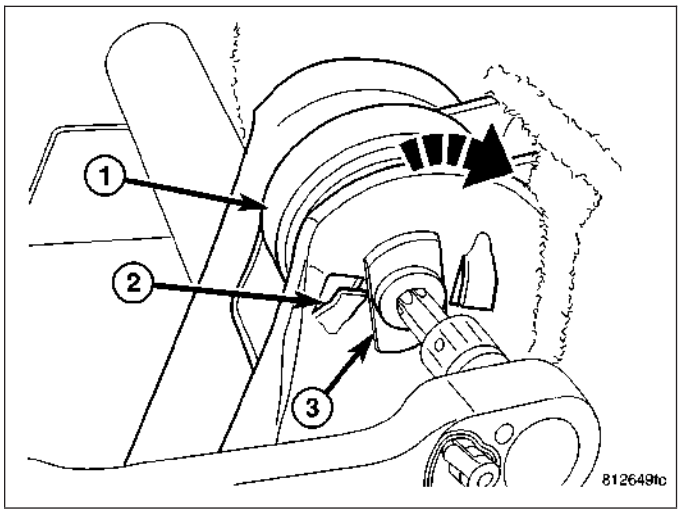
CAUTION: When the motor and cable assembly are removed from the tracks discard the length adjuster assembly and replace with a new one.

10. Bolt the seat to the floor. (Refer to 23 - BODY/SEATS/SEAT - INSTALLATION)

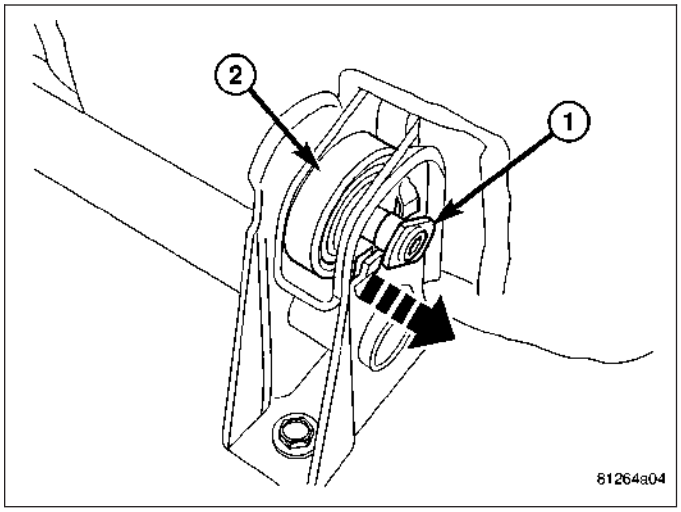
SEAT-SECOND ROW

REMOVAL

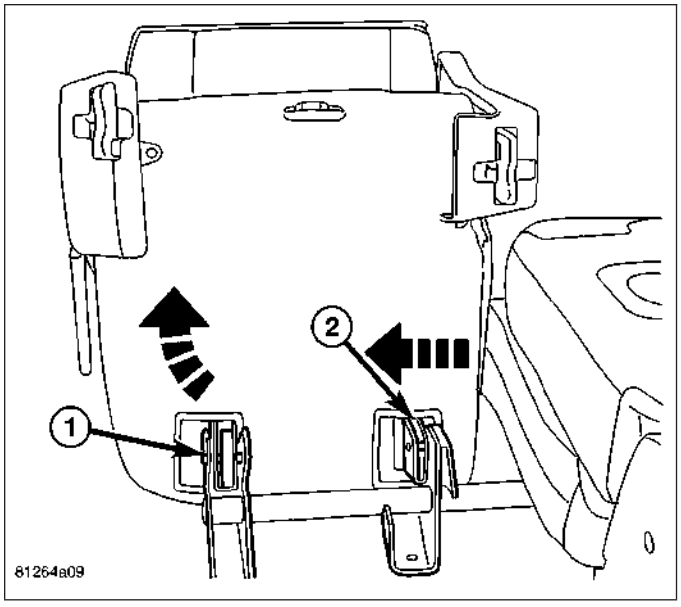
1. Position the front seat to the full forward position.
2. Release and fold seat forward.
3. Turn the hinge pin (3) clockwise and disengage from the retaining tabs (2).



4. With pin (1) released from the retaining tabs, tap pin out of the spring (2) and remove.

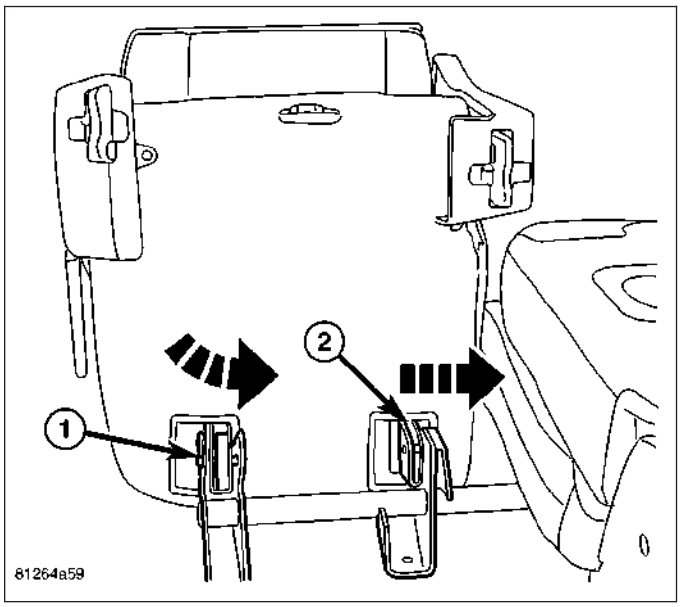


5. Twist the seat assembly up and out of the outboard hinge (1) and disengage from the inner hinge (2) and remove seat.

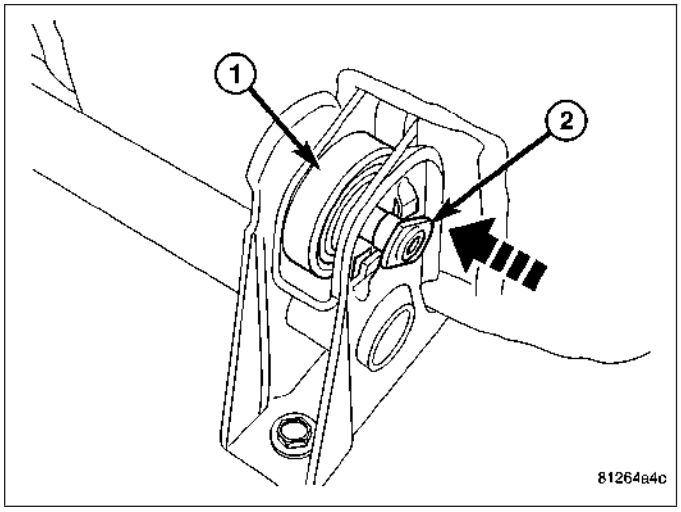


INSTALLATION

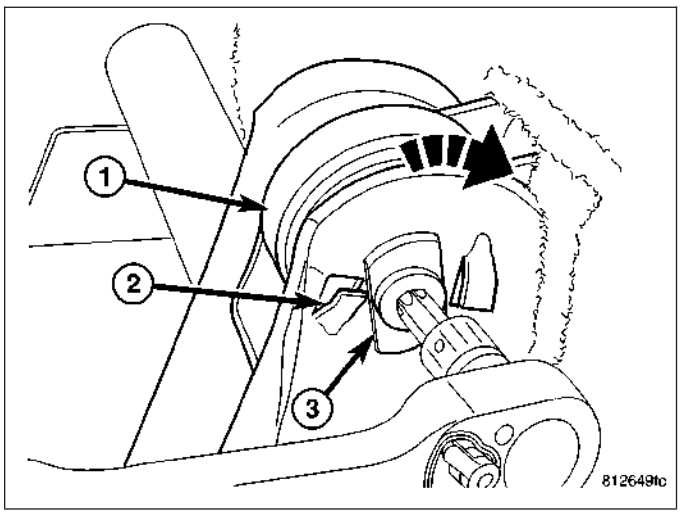
1. Position the seat into the vehicle and engage inboard hinge (2).
2. Rotate seat down and engage the outboard hinge (1).



3. Insert the hinge spring (1) and insert the pin (2).



4. Turn the hinge pin (3) and engage the pin into the retaining tabs (2).

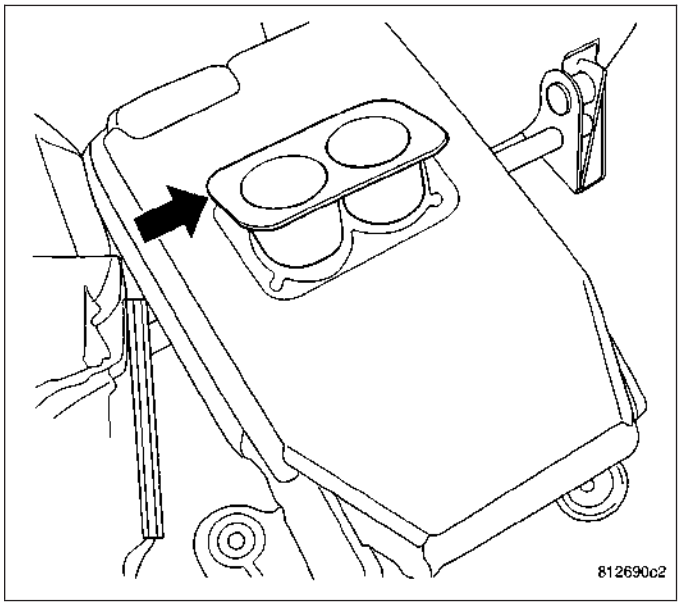


CUSHION/COVER-SEAT BACK - SECOND ROW

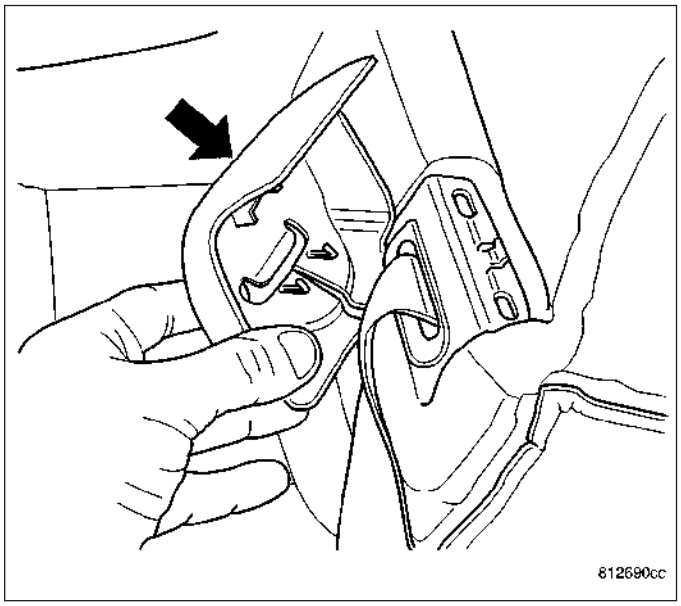
REMOVAL

Center

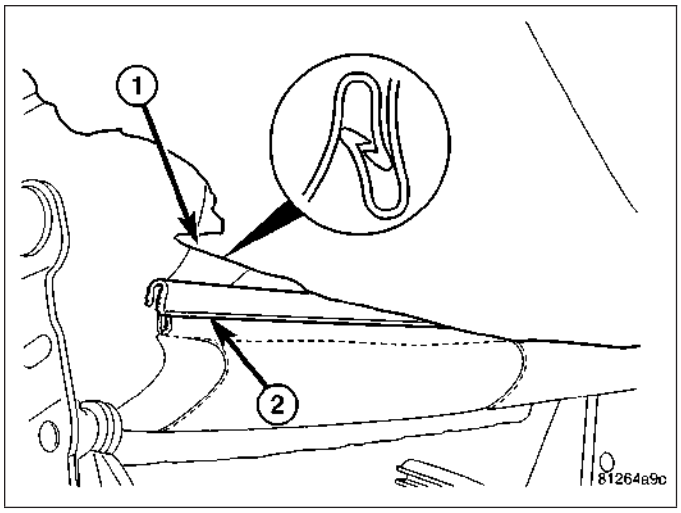
1. Using a trim stick C-4755 or equivalent, remove the cup holder.



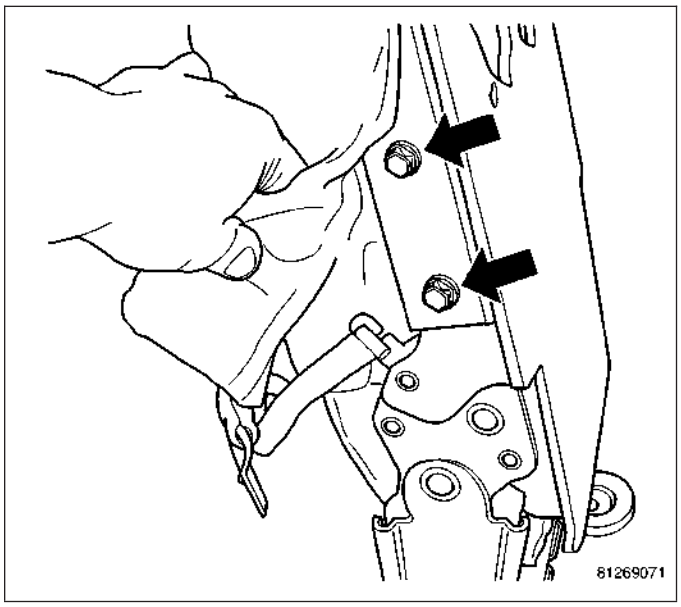
2. Using a trim stick C-4755 or equivalent, remove the seat belt bezel.



3. Remove the screws and remove the side shields.
4. Remove the bolt and remove the seat belt anchor.
5. Separate the j-straps (1 & 2) and pull cover up over frame.

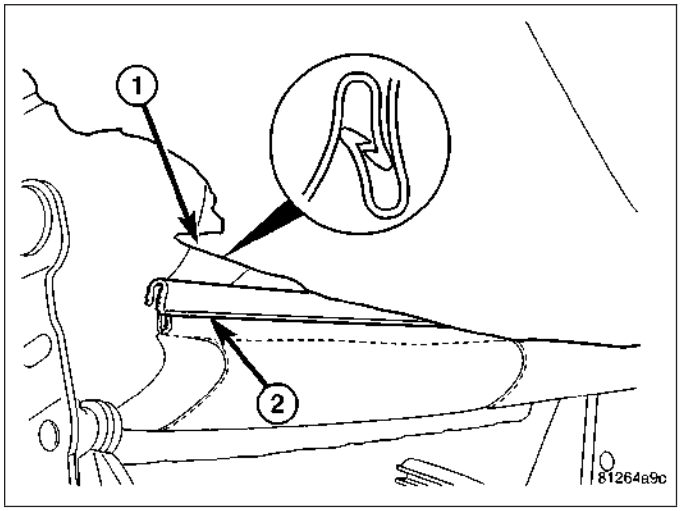


6. Remove the four seat back bolts and remove the seat back.
7. Remove the seat back cover and foam.

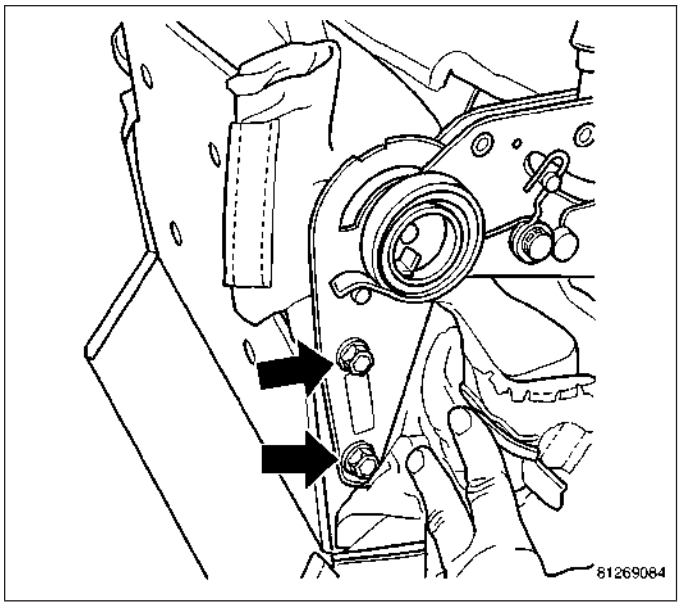


Outer

1. Fold the rear seat forward.
2. Remove the side shields.
3. Separate the j-straps (1 & 2) and pull cover up over frame.



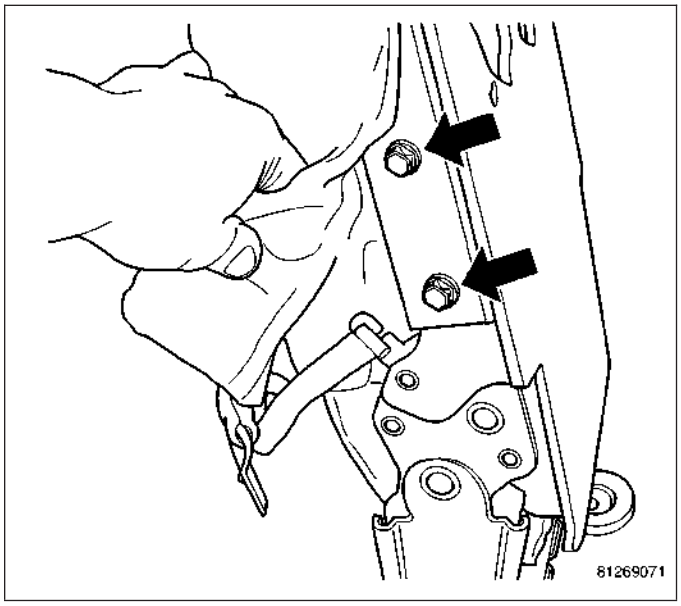
1. Remove the four bolts securing the seat back.
2. Remove the head rests and partially remove the seat back cover.
3. Remove the head rest sleeves and remove the cover and cushion.



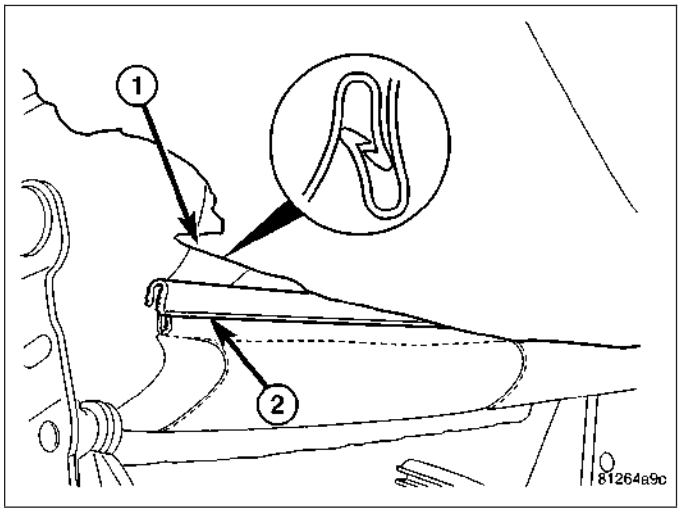
INSTALLATION

Center

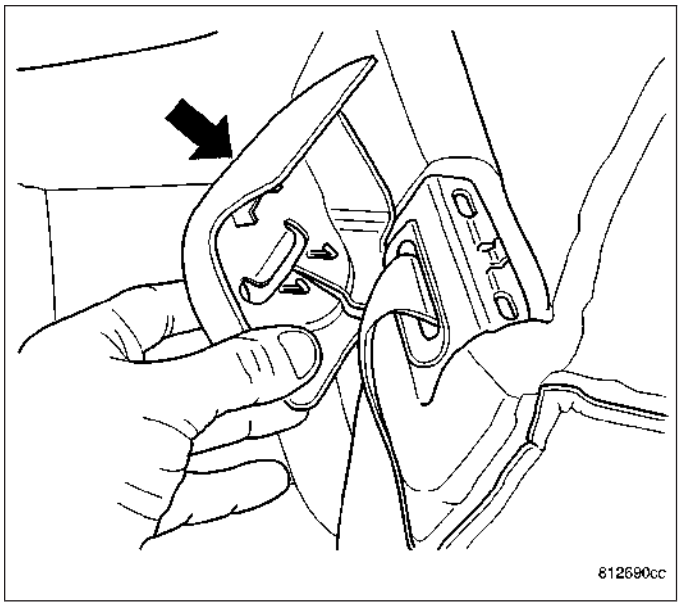
1. Position the seat back cover and foam over the seat back frame and install the seat back.
2. Install the bolts.



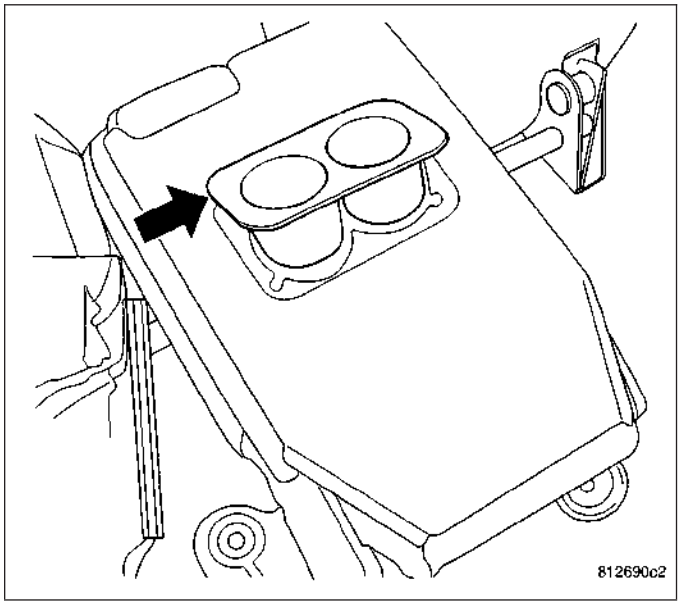
3. Connect the j-straps (1 & 2).
4. Install the seat belt anchor and tighten the bolt to 43 N·m (32 ft. lbs.).
5. Install the side shields.



6. Install the seat belt bezel.

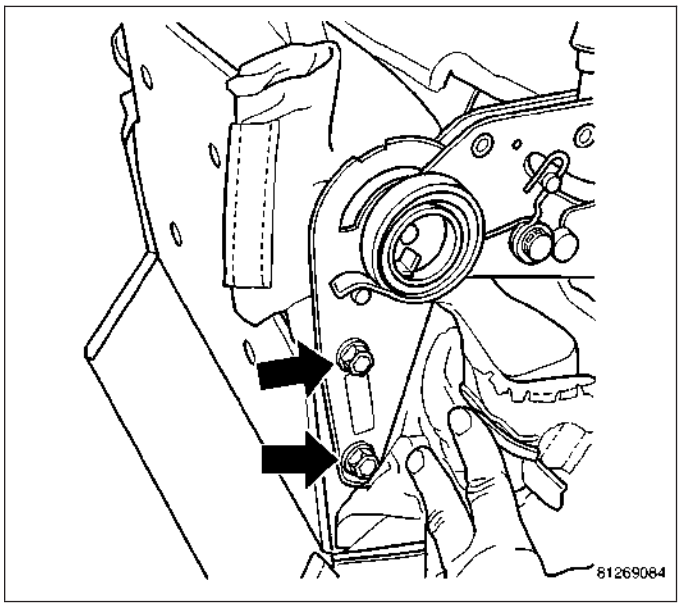


7. Install the cup holder.

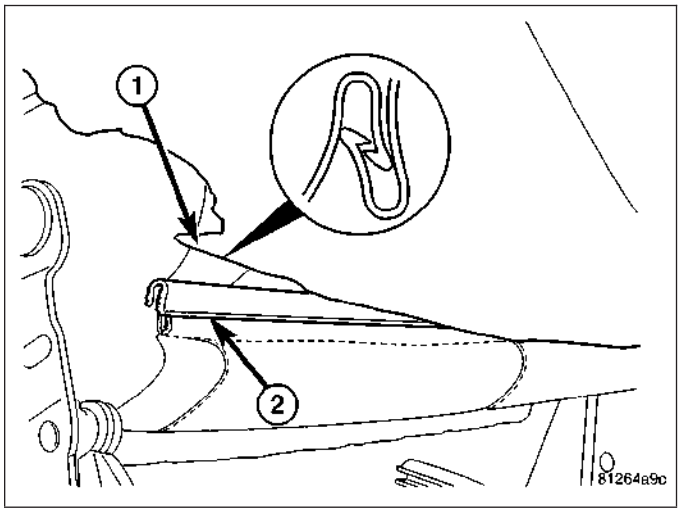


Outer

1. Position the seat back cover over the seat back frame and install the headrest sleeves.
2. Position the seat back cushion on the frame and position the cover over the cushion.
3. Install the seat back and install the bolts.



4. Connect the j-straps (1 & 2).
5. Install the side shields.

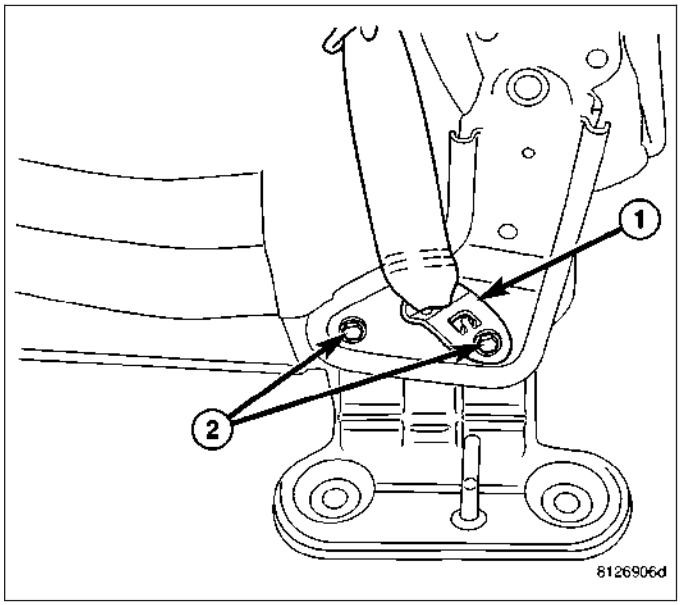


CUSHION/COVER-CUSHION - SECOND ROW

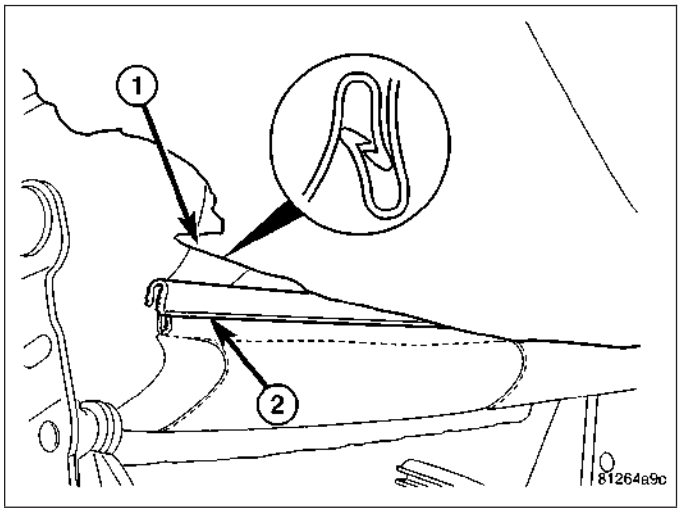
REMOVAL

Center

1. Fold both outer seats forward.
2. Remove the side shields.
3. Remove the four cushion bolts (2) and seat belt anchor (1) and remove the seat back assembly.

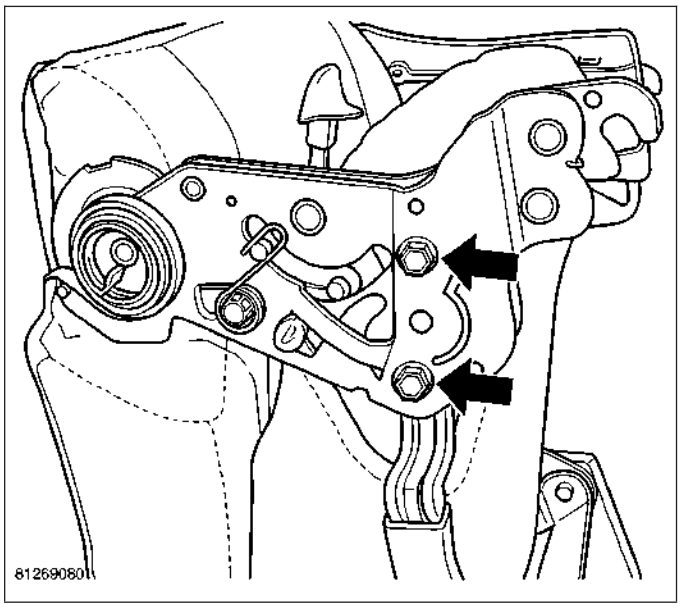


4. Separate the j-straps (1 & 2) and remove cover/ cushion from the frame.

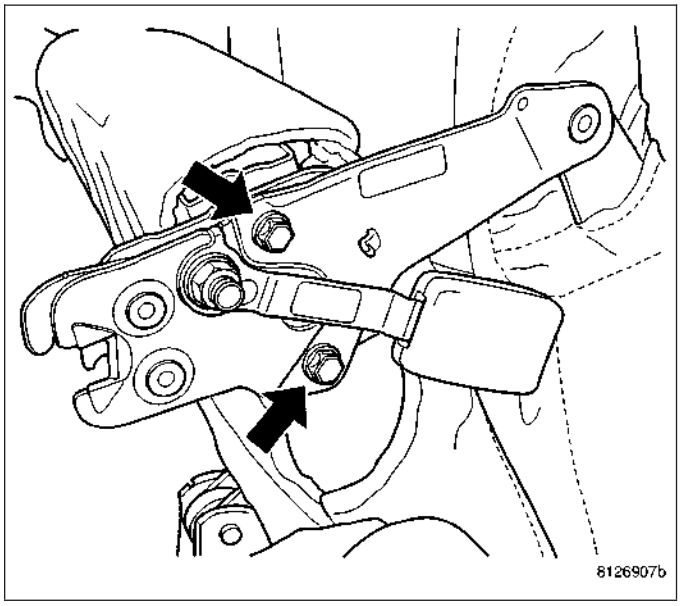


Outer

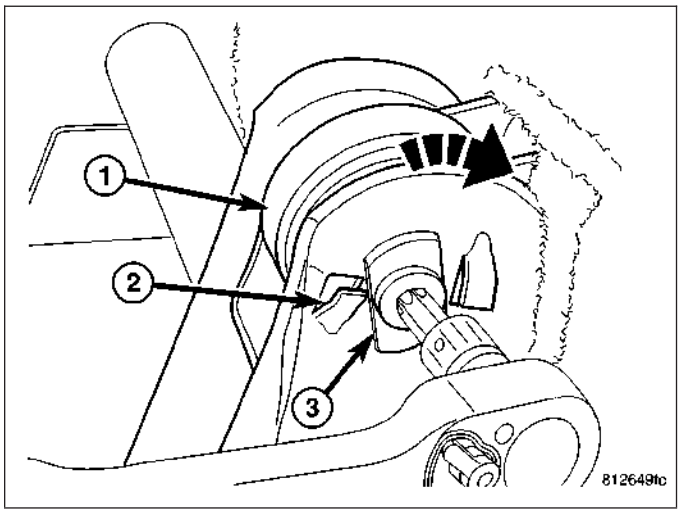
1. Remove the seat back. (Refer to 23 - BODY/ SEATS/SEAT BACK CUSHION / COVER - REMOVAL)
2. Remove the outboard hinge bolts and remove the connector tube and hinge from the seat.



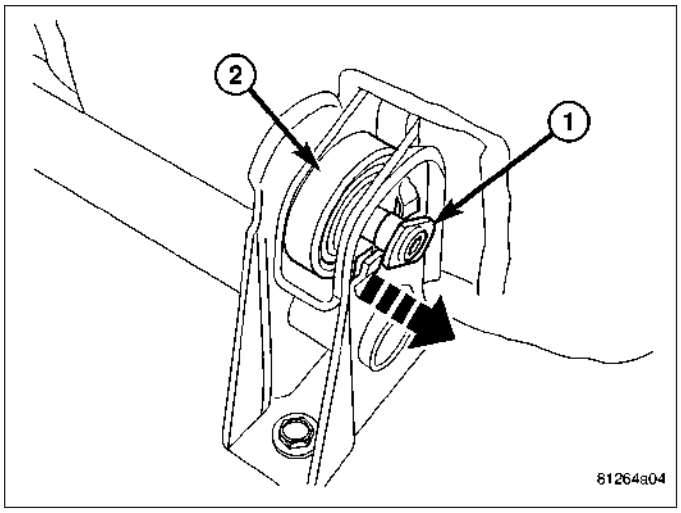
3. Remove the inboard hinges bolts and hinge.



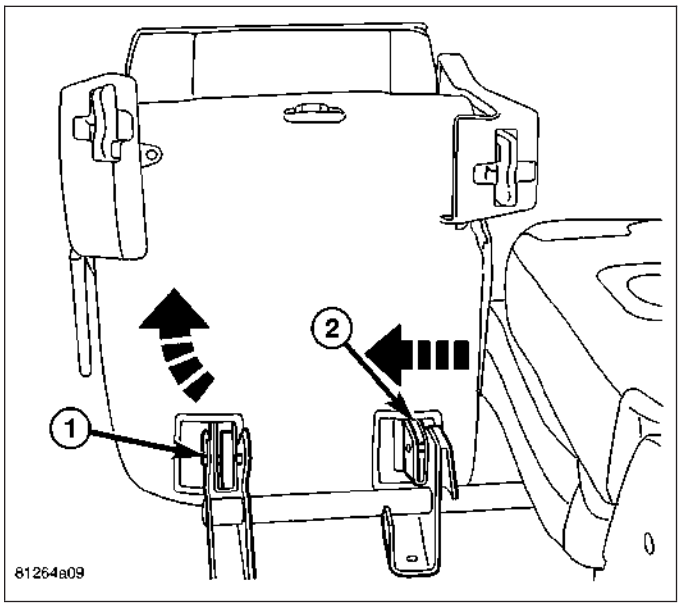
4. Turn the hinge pin (3) clockwise and disengage from the retaining tabs (2).



5. With pin (1) released from the retaining tabs, tap pin out of the spring (2) and remove.



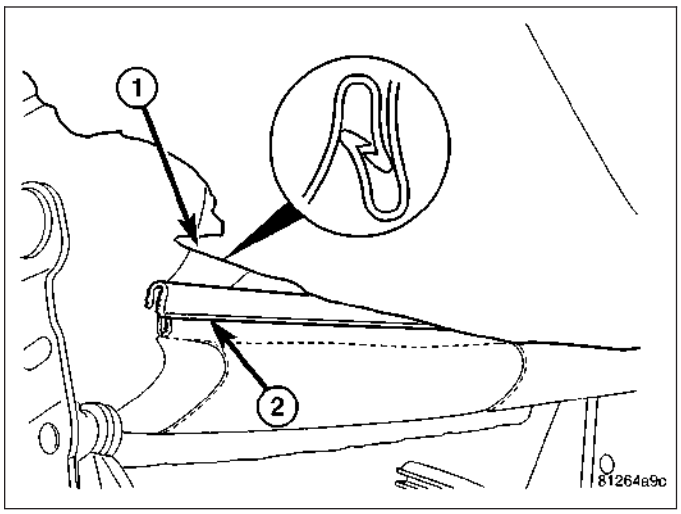
6. Twist the seat cushion assembly up and out of the outboard hinge (1) and disengage from the inner hinge (2) and remove seat.
7. Remove the seat cushion cover and foam from the seat frame.



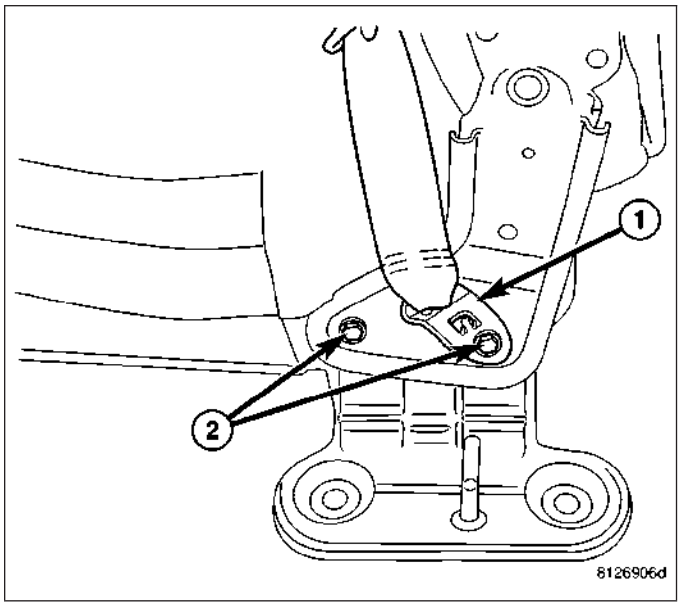
INSTALLATION

Center

1. Connect the j-straps (1 & 2).

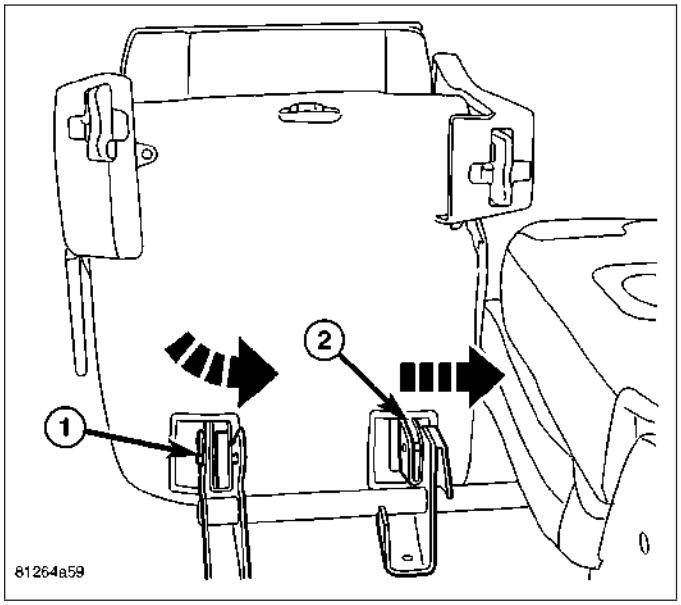


2. Install the seat belt anchor (1) and four cushion bolts (2).
3. Install the side shields.

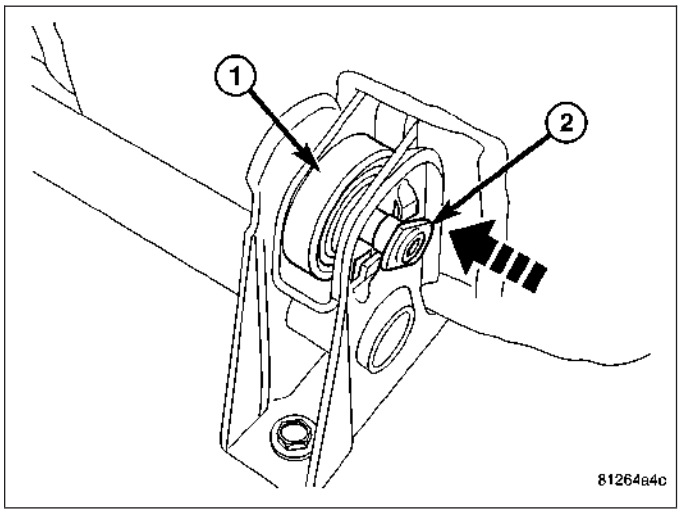


Outer

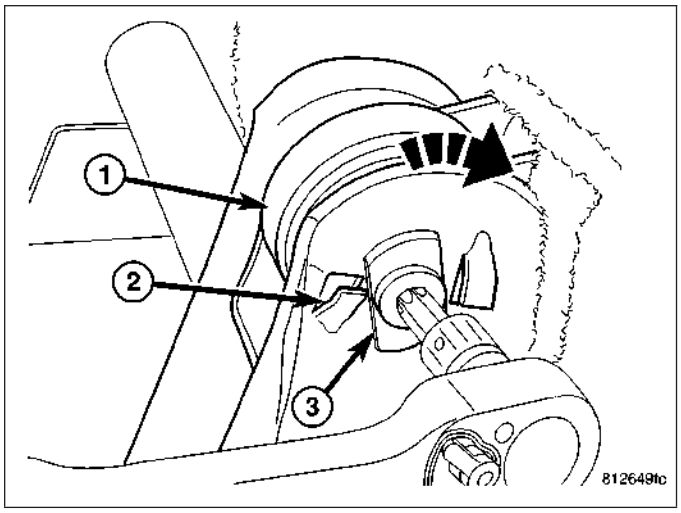
1. Install the seat cushion/cover over the seat frame.
2. Position the seat cushion assembly into the vehicle and engage inboard hinge (2).
3. Rotate seat down and engage the outboard hinge (1).



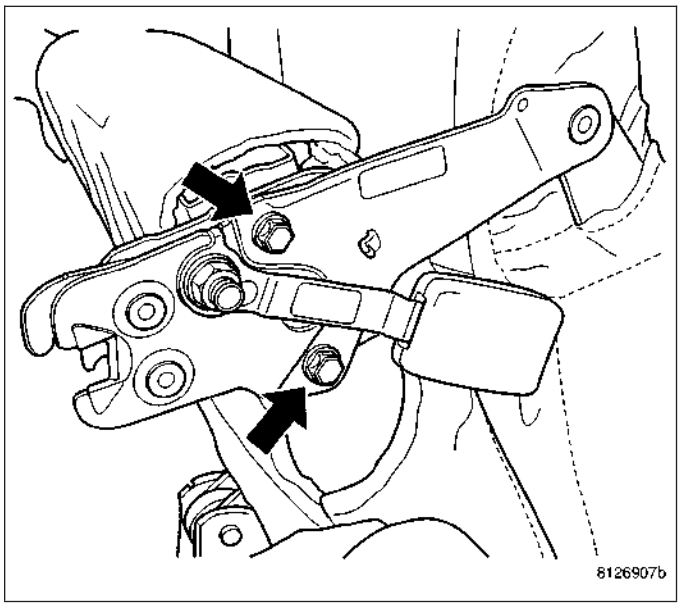
4. Insert the hinge spring (1) and insert the pin (2).



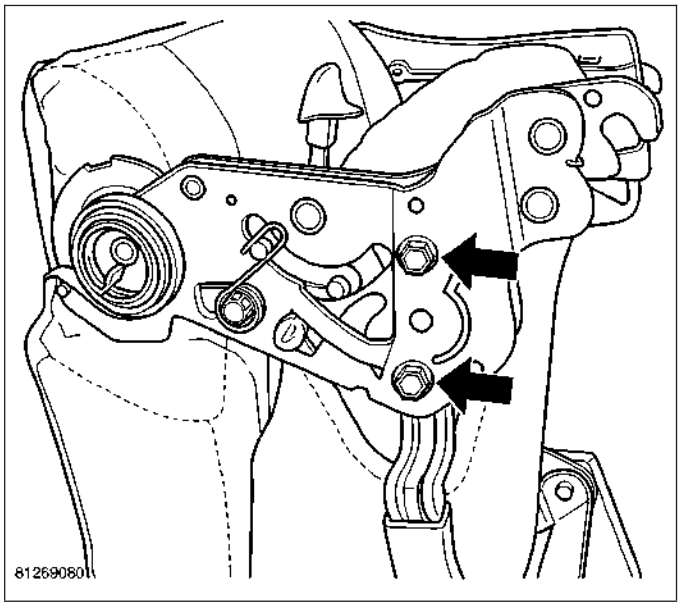
5. Turn the hinge pin (3) and engage the pin into the retaining tabs (2).



6. Install the inboard hinges and bolts.



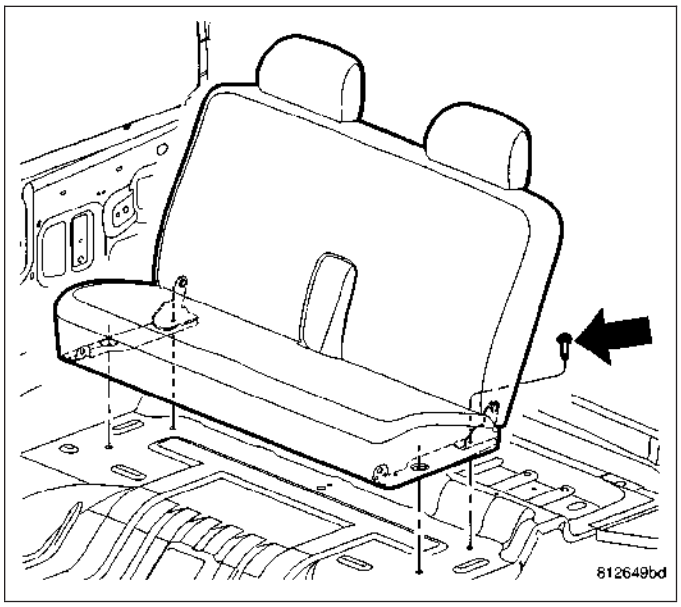
7. Install the connector tube/outboard hinge assembly into the seat cushion and install the bolts.
8. Install the seat back assembly. (Refer to 23 - BODY/SEATS/SEAT BACK CUSHION / COVER - INSTALLATION)



SEAT-THIRD ROW

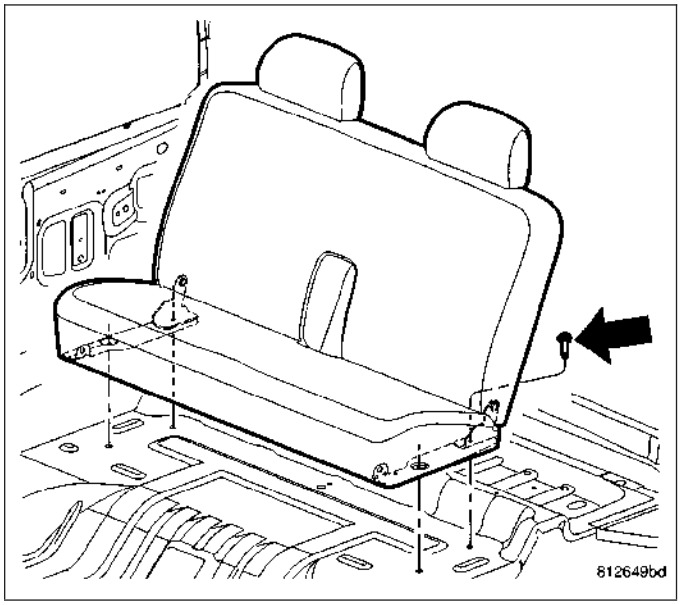
REMOVAL

1. Fold the third seat cushion forward and remove the bolts.
2. Remove the seat assembly from the vehicle.



INSTALLATION

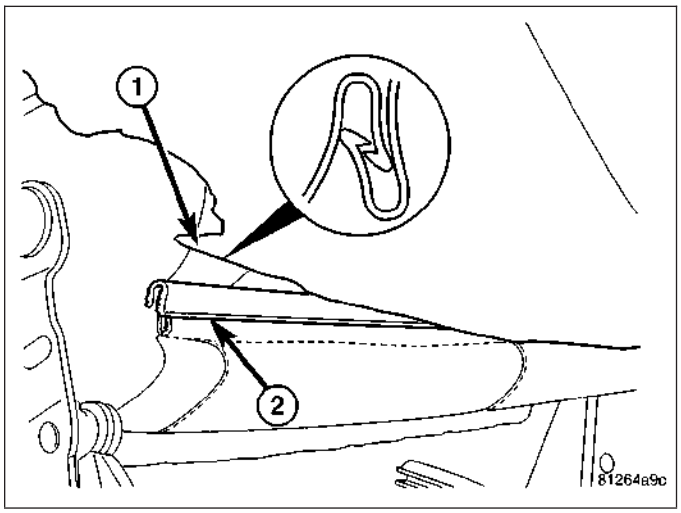
1. Install the seat and fold the seat cushion forward.
2. Install the front bolts and tighten to 40 N·m (25 ft. lbs.).
3. Install the rear bolts and tighten to 47 N·m (35 ft. lbs.).



CUSHION/COVER-SEAT BACK - THIRD ROW

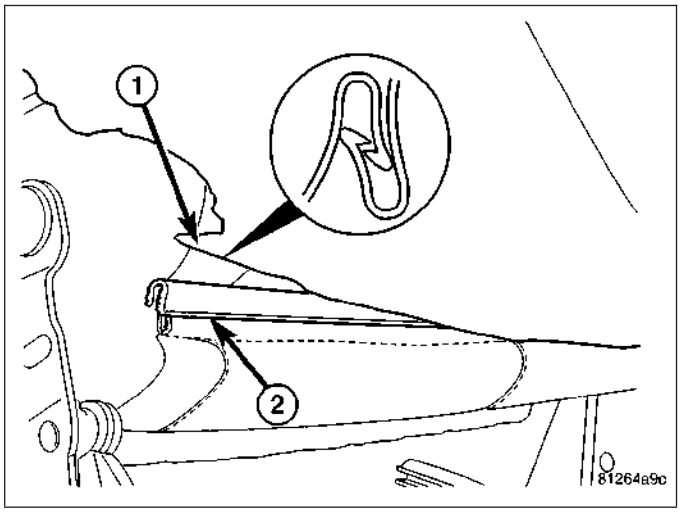
REMOVAL

1. Remove the seat. (Refer to 23 - BODY/SEATS/SEAT - REMOVAL)
2. Remove the headrests.
3. Separate the j-straps (1 & 2) and position the cover/cushion aside.
4. Remove the headrest sleeves and remove the cushion/cover.



INSTALLATION

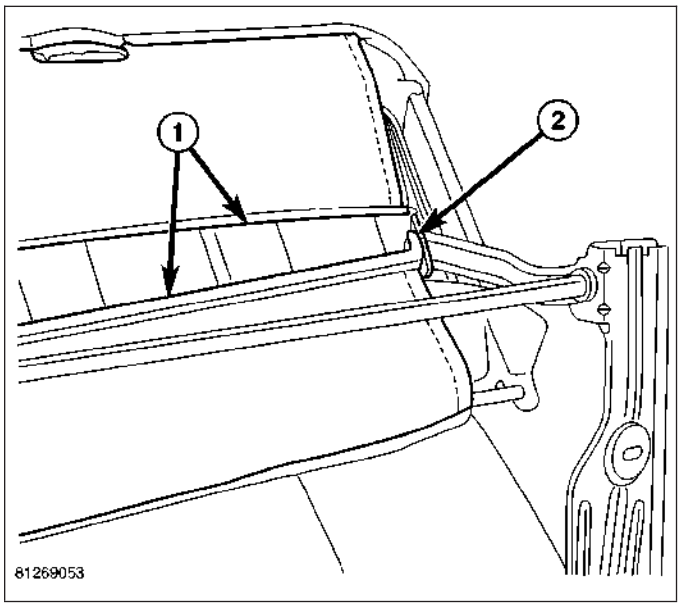
1. Position the seat back cushion/cover over the seat back frame and connect the j-straps (1 & 2).
2. Install the headrest sleeves.
3. Install the seat. (Refer to 23 - BODY/SEATS/SEAT - INSTALLATION)



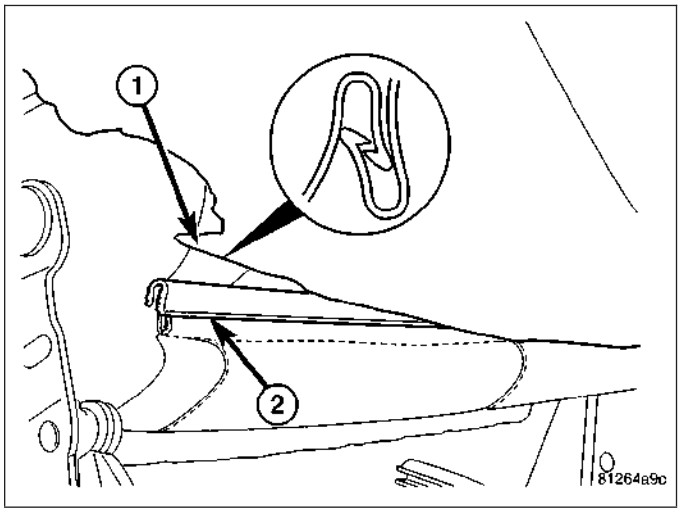
CUSHION/COVER-CUSHION - THIRD ROW

REMOVAL

1. Fold seat cushion forward to access the bolts.
2. Remove the bolts (2) and remove the cushion assembly from the vehicle.

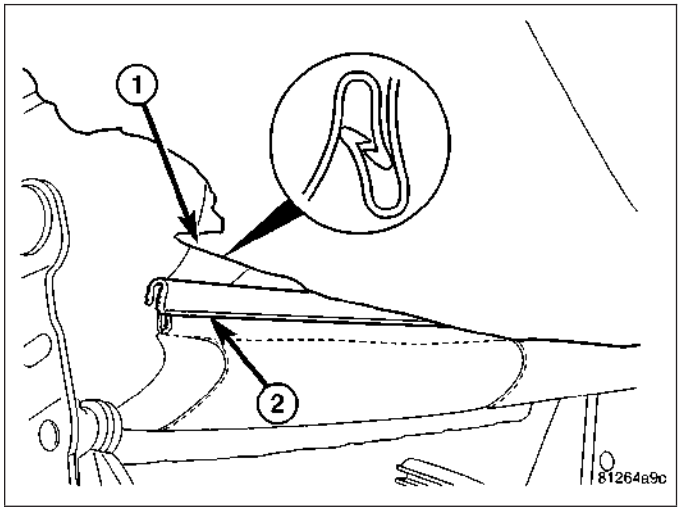


3. Separate the j-straps (1 & 2) and remove the cushion/cover from the frame.

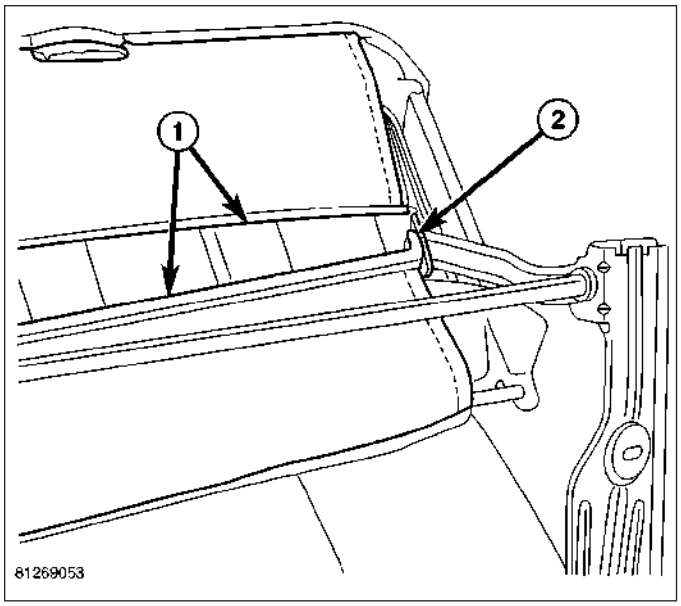


INSTALLATION

1. Position the cushion/cover over the frame and connect the j-straps (1 & 2).



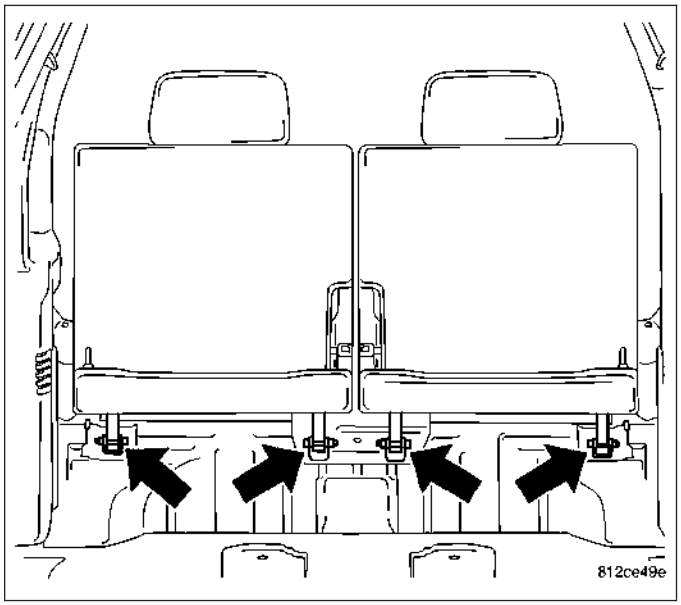
2. Install the cushion assembly onto the seat pivot assembly and install the bolts (2).



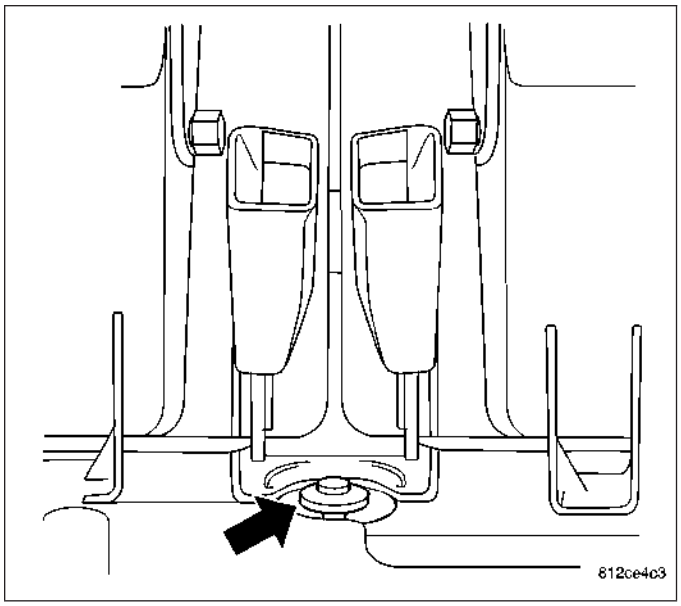
SEAT-THIRD ROW 50/50 SPLIT

REMOVAL

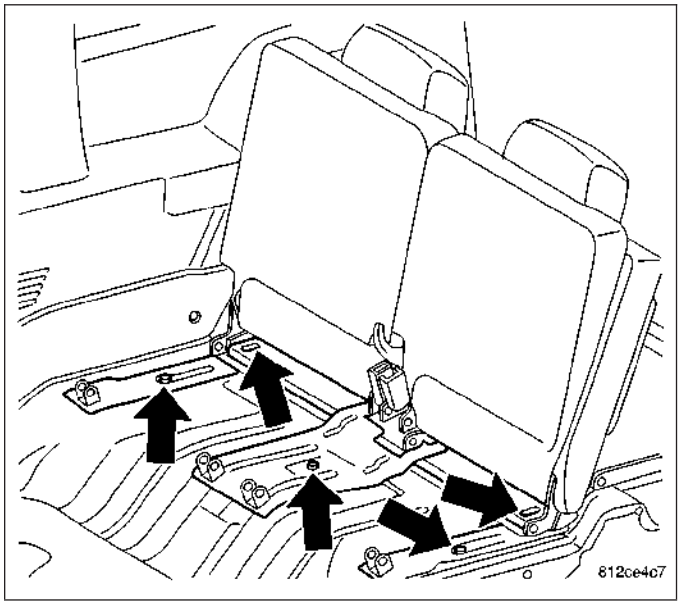
1. Remove the four bolts and nuts securing the front cushion pivots to the floor.



2. Remove the bolt between the center seat belt buckles.

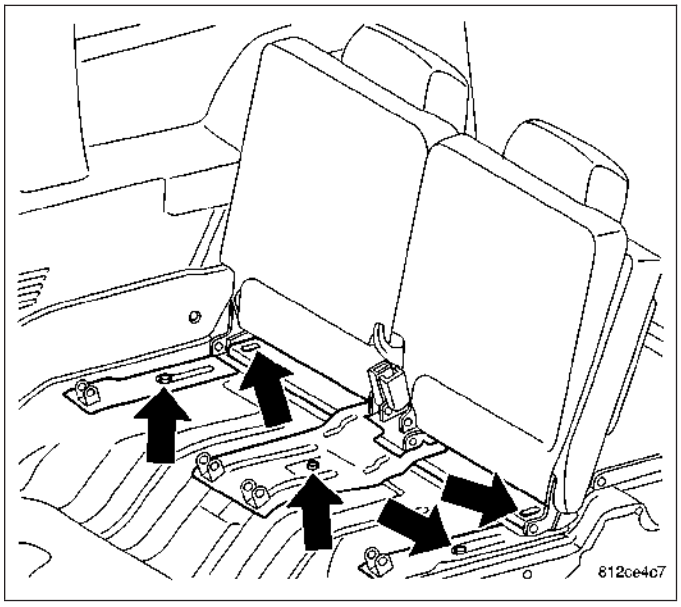


3. Remove the five assembly bolts and remove the seat assembly.

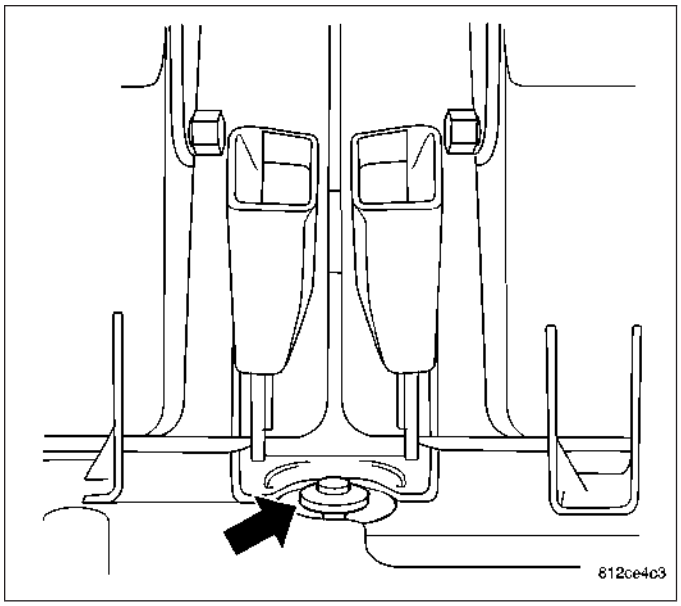


INSTALLATION

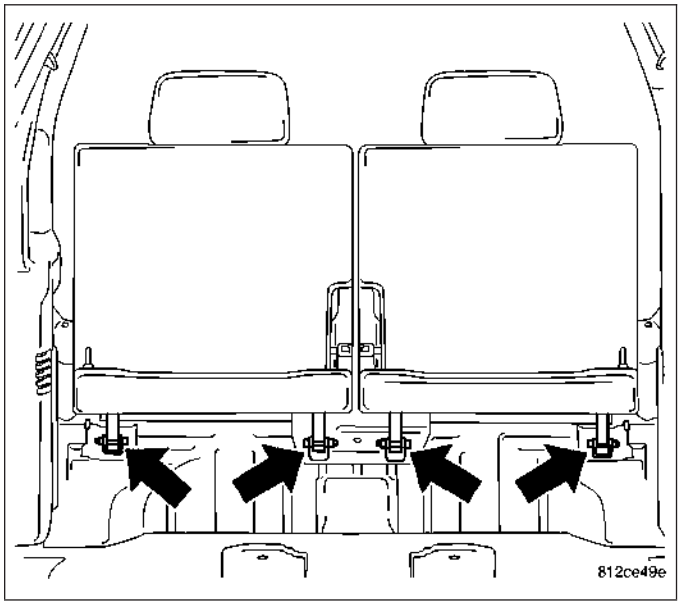
1. Install the seats and install the bolts.



2. Install the bolt between the belt buckles.
3. Tighten the three rear assembly bolts to 47 N·m (35 ft. lbs.).
4. Tighten the three front assembly bolts to 34 N·m (25 ft. lbs.).



5. Install the front seat cushion pivot bolts/nuts and tighten to 34 N·m (25 ft. lbs.).



STATIONARY GLASS

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STATIONARY GLASS

WARNING

WINDSHIELD SAFETY PRECAUTIONS

WARNING: Do not operate the vehicle within 24 hours of windshield installation. It takes at least 24 hours for urethane adhesive to cure. If it is not cured, the windshield may not perform properly in an accident.

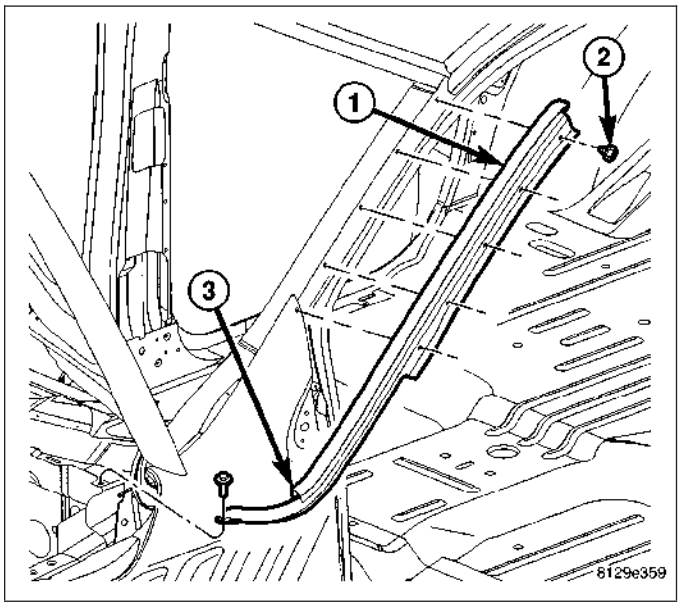
- **Urethane adhesives are applied as a system. Use glass cleaner, glass prep solvent, glass primer, pvc (vinyl) primer and pinch weld (fence) primer provided by the adhesive manufacturer. If not, structural integrity could be compromised.**
- **Daimlerchrysler does not recommend glass adhesive by brand. Technicians should review product labels and technical data sheets, and use only adhesives that their manufactures warrant will restore a vehicle to the requirements of fmvss 212. Technicians should also insure that primers and cleaners are compatible with the particular adhesive used.**
- **Be sure to refer to the urethane manufacturer's directions for curing time specifications, and do not use adhesive after its expiration date.**
- **Vapors that are emitted from the urethane adhesive or primer could cause personal injury. Use them in a well-ventilated area.**
- **Skin contact with urethane adhesive should be avoided. Personal injury may result.**
- **Always wear eye and hand protection when working with glass.**

CAUTION: Protect all painted and trimmed surfaces from coming in contact with urethane or primers. Be careful not to damage painted surfaces when removing moldings or cutting urethane around windshield.

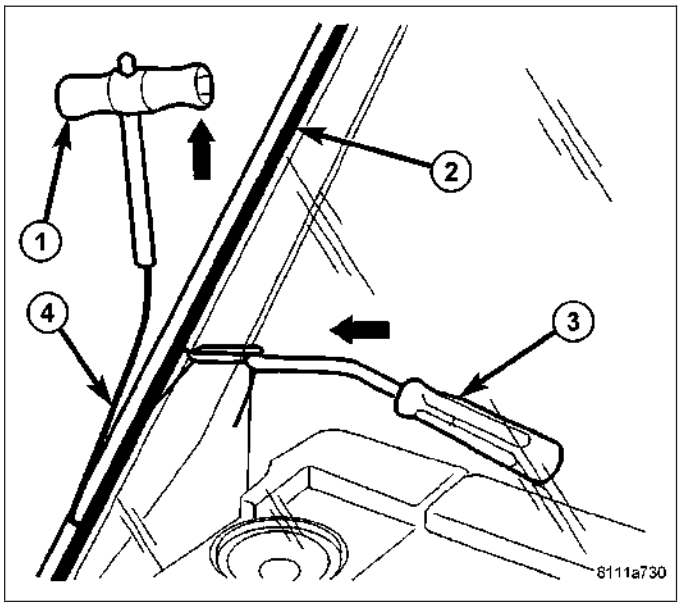
WINDSHIELD

REMOVAL

1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/STATIONARY GLASS - WARNING)
2. Remove the screws (2) attaching the side windshield molding (1) to the a-pillars and remove the molding.
3. Remove rear view mirror. (Refer to 23 - BODY/INTERIOR/REAR VIEW MIRROR - REMOVAL)
4. Remove the cowl grille. (Refer to 23 - BODY/EXTERIOR/COWL GRILLE AND SCREEN - REMOVAL)



5. Using a windshield cut-out wire separate the adhesive.
6. Carefully remove windshield.



1 - T-HANDLE
2 - WINDSHIELD ADHESIVE
3 - COUNTER SUPPORT
4 - CUTTING WIRE

INSTALLATION

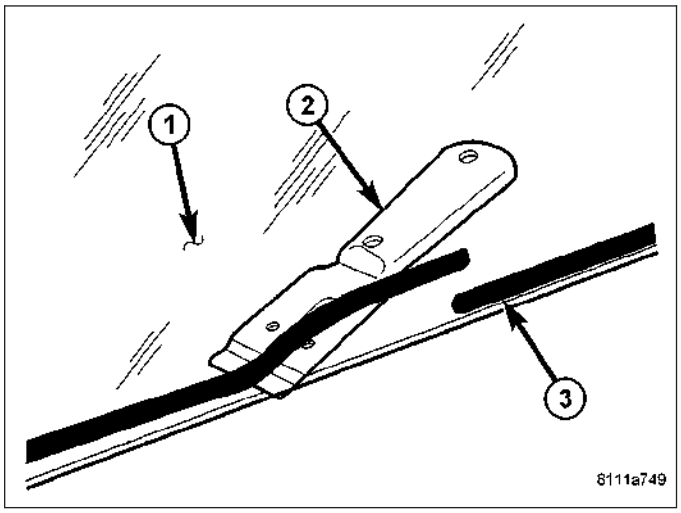
WARNING: ALLOW THE URETHANE AT LEAST 24 HOURS TO CURE BEFORE RETURNING THE VEHICLE TO USE.

CAUTION: Roll down the left and right front door glass and open the rear glass slider (if available) before installing windshield to avoid pressurizing the passenger compartment if a door is slammed before urethane is cured. Water leaks can result.

NOTE: The windshield fence should be cleaned of most of its old urethane bonding material. A small amount of old urethane, approximately 1-2 mm in height, should remain on the fence. Do not grind off or completely remove all old urethane from the fence, the paint finish and bonding strength will be adversely affected. Support spacers located on the cowl at the bottom of the windshield opening should be replaced with new parts. Replace any missing or damaged spacers around the perimeter of the windshield opening.

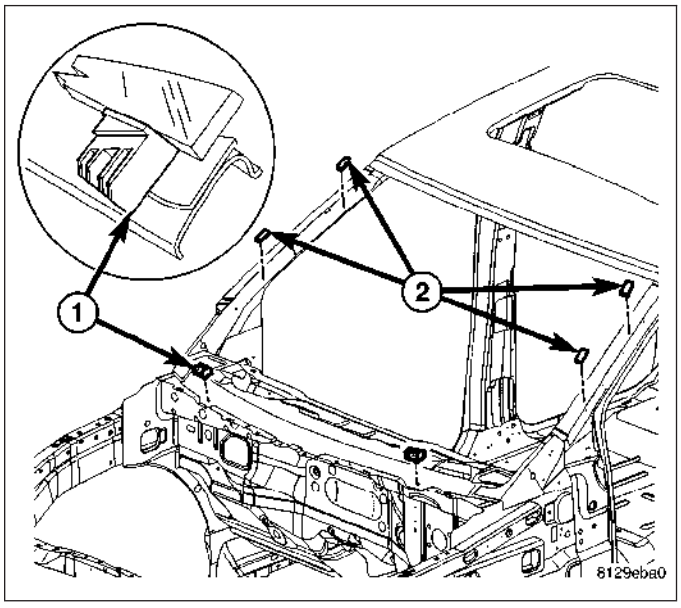
Windshield Preparation - Installing A Previously Installed Windshield

1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/STATIONARY GLASS - WARNING)
2. Level old bead of windshield adhesive (3) to a thickness of approximately 1 mm (0.04 in.) and remove loose adhesive.

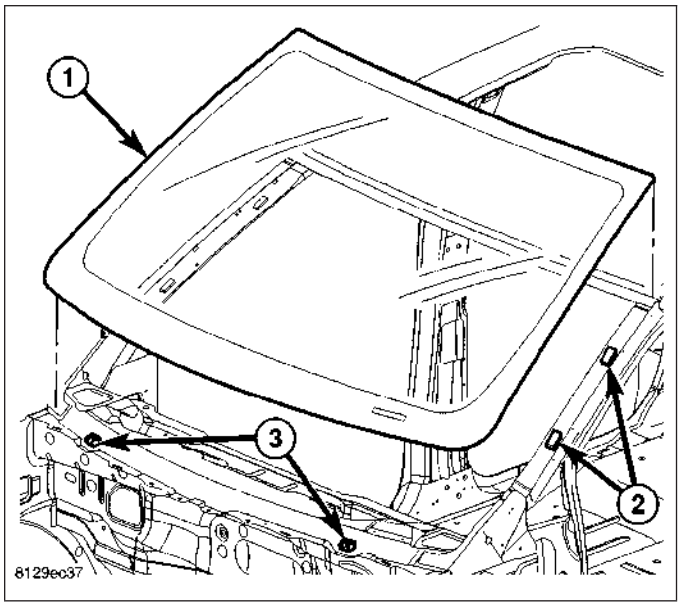


3. Apply four new spacers (2) to the a-pillars and place them evenly apart at the top and bottom.
4. Install the lower spacer assemblies (1) into the slotted holes and verify proper installation by pulling to make sure they are locked on.

NOTE: Lower spacers must be facing with the flat side upwards when installing into the slotted holes.



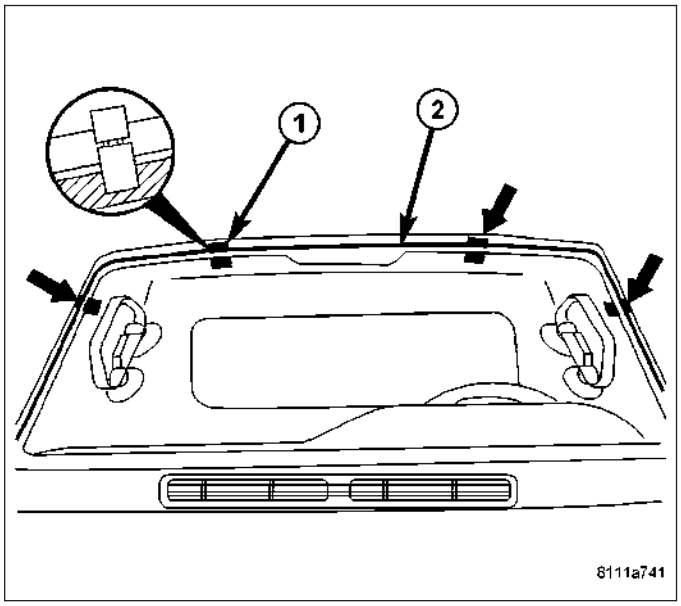
5. Position windshield (1) in center of windshield opening and resting on the side and lower spacers (2 & 3).
6. Adjust the lower spacers (3) as required, to obtain the specified roof gap tolerance by pushing on the side of the wedge and raising or lowering the glass as necessary. For roof gap specifications, refer to the table Roof Gap Tolerances .



Roof Gap Tolerances

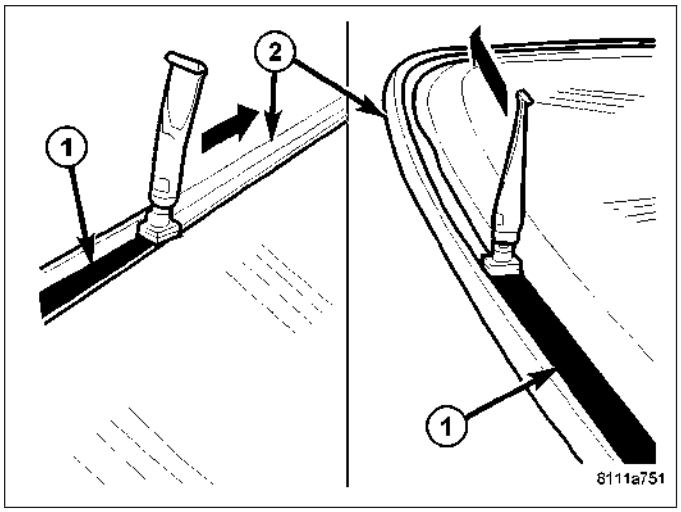
Roof Gap	Roof Flush
4.0 mm ± 1.5 mm Parallel within 2.0 mm	Underflush 2.0 mm ± 1.5 mm
(0.16 in ± 0.060 in) Parallel within (0.080 in)	(0.080 in ± 0.060 in)

7. Apply adhesive tape (1) to the locations shown to aid with final installation.
8. Verify windshield gap is parallel to with windshield.
9. Cut tape with a sharp knife and remove windshield.

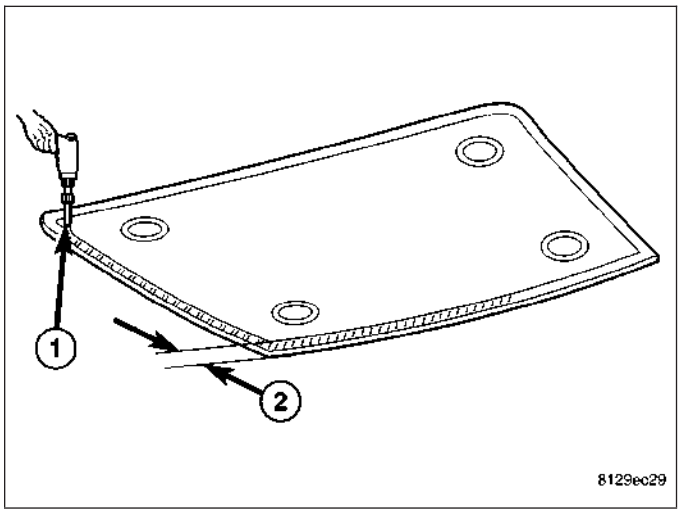


NOTE: Typical primer installation shown.

10. Clean and dry area of glass (2) to be re-glued with a suitable glass preparation solvent and rag.
11. Using a flash light, verify that glass primer is without damage.
12. Re-prime any damaged area. If old adhesive has been exposed for more than 12 hours, entire adhesive area needs to be re-primed.



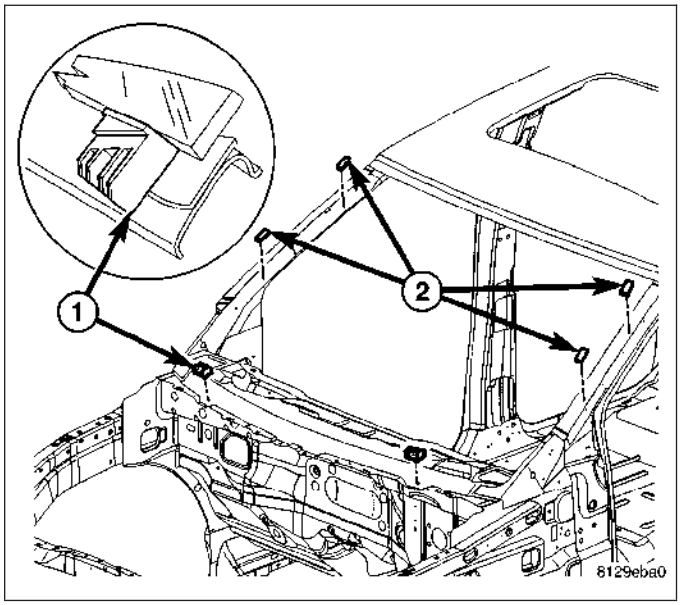
13. Apply primer (1) around the perimeter of the glass to a width of 15 mm (0.5 in.) (2).
14. Allow primer to air dry for at least 10 minutes.
15. Using a flash light, verify that glass primer is without damage.



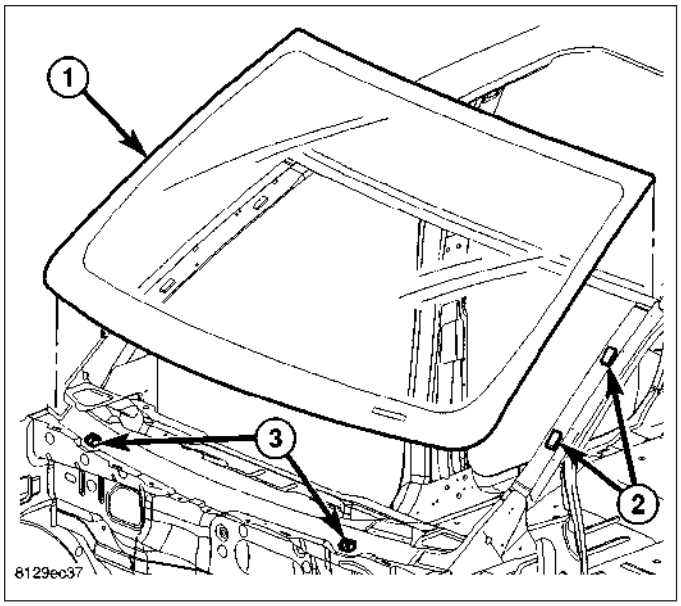
Windshield Preparation - Installing A New Windshield

1. Apply four new spacers (2) to the a-pillars and place them evenly apart at the top and bottom.
2. Install the lower spacer assemblies (1) into the slotted holes and verify proper installation by pulling to make sure they are locked on.

NOTE: Lower spacers must be facing with the flat side upwards when installing into the slotted holes.



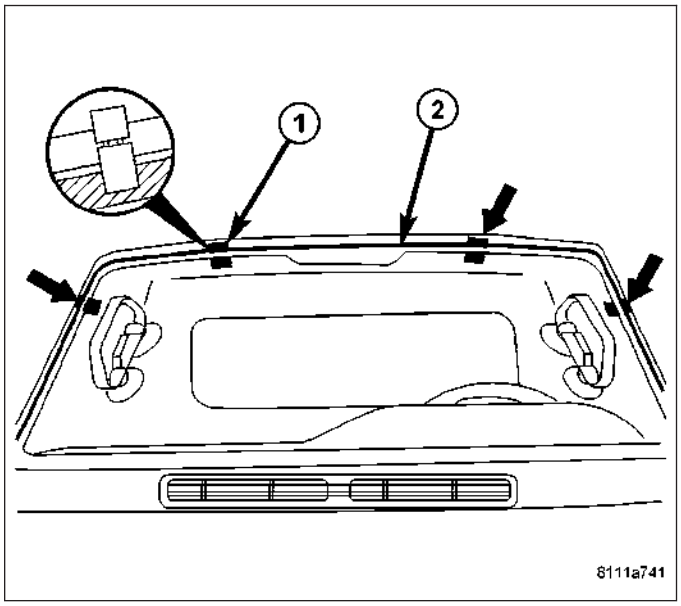
3. Position windshield (1) in center of windshield opening and resting on the side and lower spacers (2 & 3).
4. Adjust the lower spacers (3) as required, to obtain the specified roof gap tolerance by pushing on the side of the wedge and raising or lowering the glass as necessary. For roof gap specifications, refer to the table Roof Gap Tolerances .



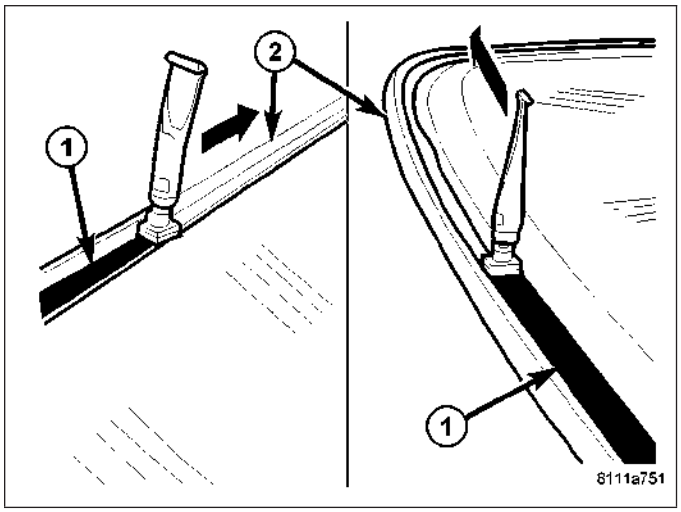
Roof Gap Tolerances

Roof Gap	Roof Flush
4.0 mm ± 1.5 mm Parallel within 2.0 mm	Underflush 2.0 mm ± 1.5 mm
(0.16 in ± 0.060 in) Parallel within (0.080 in)	(0.080 in ± 0.060 in)

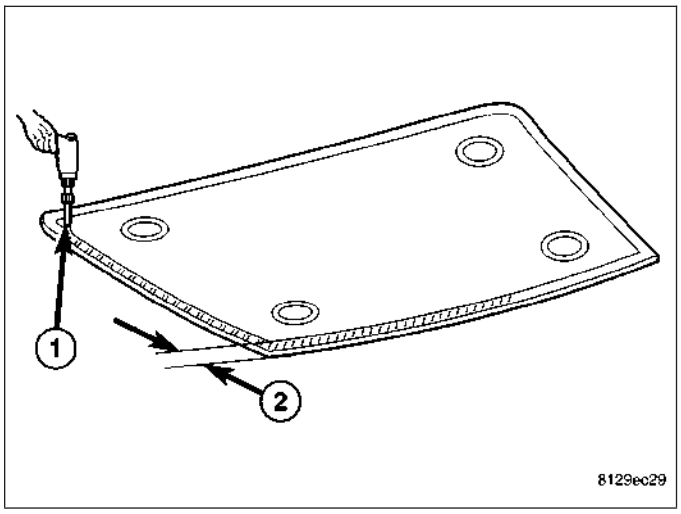
5. Clean and check windshield for damage.
6. Position windshield in center of windshield opening.
7. Apply adhesive tape to the locations shown to aid with final installation.
8. Verify windshield gap is parallel to with windshield.
9. Cut tape with a sharp knife and remove windshield.



10. Clean and dry area of glass to be glued with a suitable glass preparation solvent and rag.
11. Apply primer to gluing surface at windshield seal.

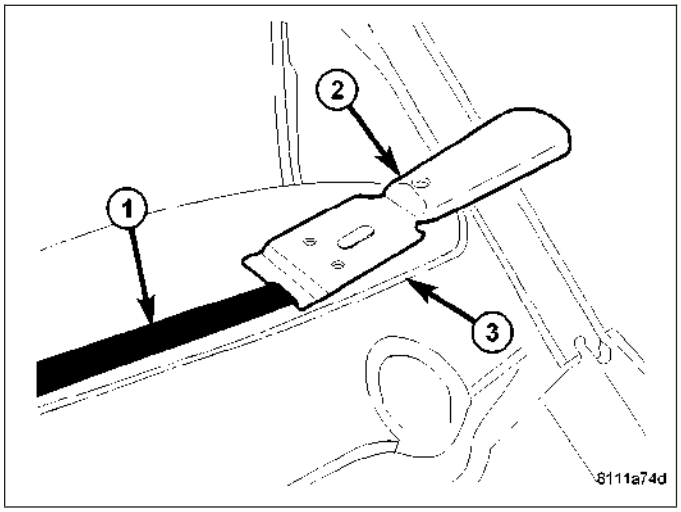


12. Apply primer (1) around the perimeter of the glass to a width of 15 mm (0.5 in.) (2).
13. Allow primer to air dry for at least 10 minutes.
14. Using a flash light, verify that glass primer is without damage.

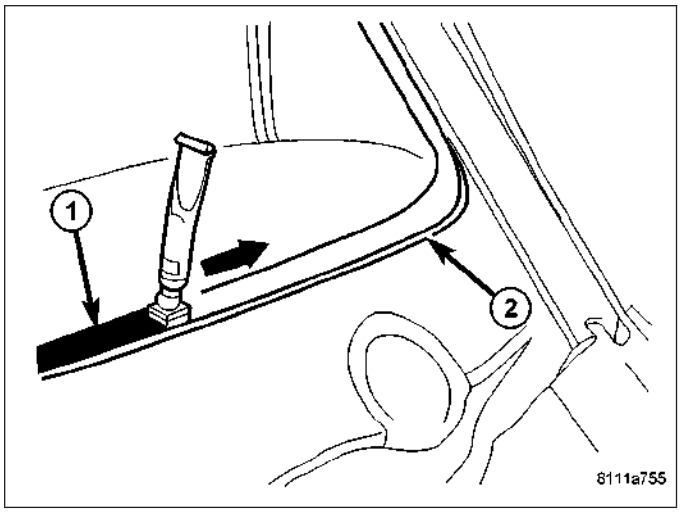


Windshield Opening Preparation

1. Clean and vacuum windshield opening.
2. Level old bead of windshield opening adhesive (1) to a thickness of approximately 1 mm (0.04 in.) and remove loose adhesive.



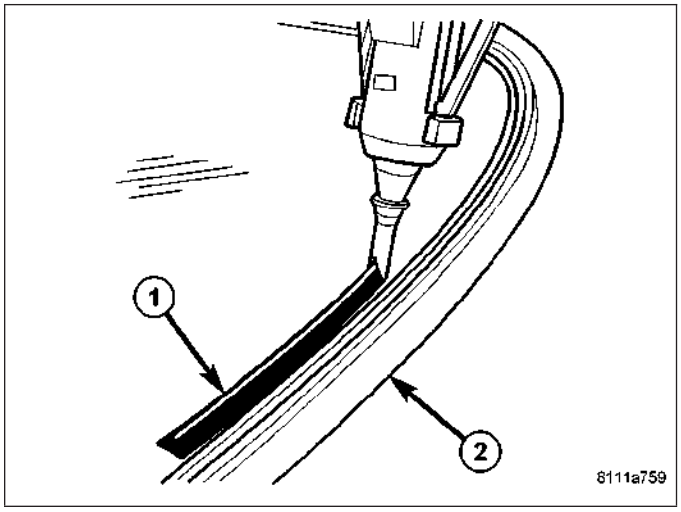
3. Clean and dry area of windshield opening to be re-glued with a suitable glass preparation solvent and rag.
4. Re-prime any damaged area. If old adhesive has been exposed for more than 12 hours, entire adhesive area needs to be re-primed.
5. Allow primer to air dry for at least 10 minutes.



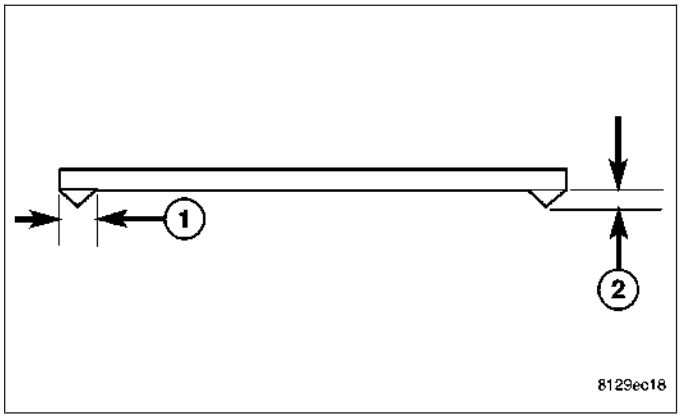
Windshield Installation

1. Apply bead of adhesive (1) with a triangular nozzle directly to the windshield seal starting at bottom in center of windshield.

CAUTION: Always apply bead of adhesive to the windshield. Always install the windshield within 5 minutes after applying adhesive.

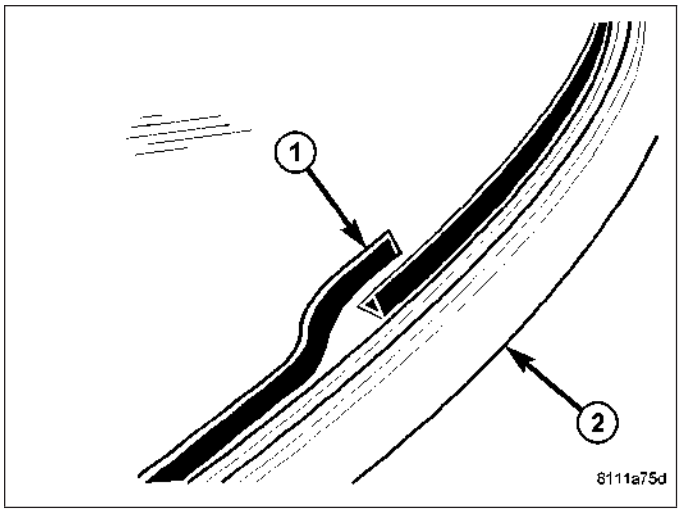


2. Bead dimensions should be approximately 9.5 - 12.0 mm wide (1) by 12.7 - 14.0 mm in height (2).



1 - ADHESIVE WIDTH 9.5 - 12.0 mm (0.375 - 0.470 in)
2 - ADHESIVE HEIGHT 12.7 - 14.0 mm (0.50 - 0.55 in)

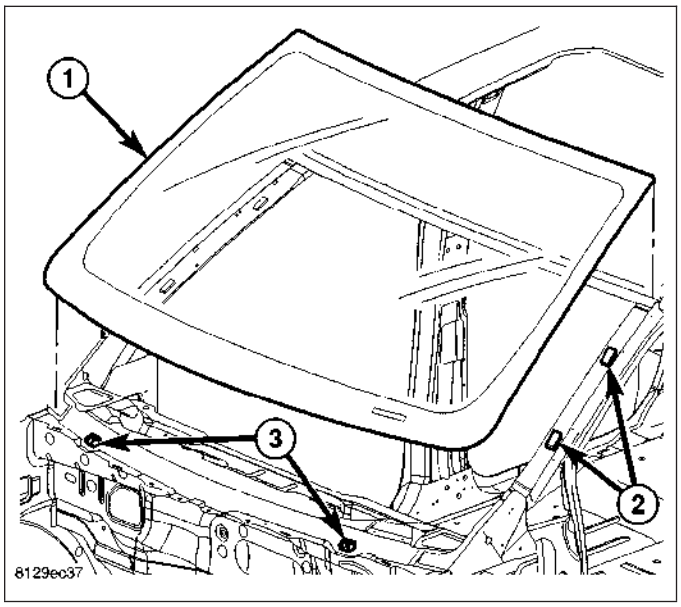
3. Allow end of adhesive bead to run out parallel to the start of the bead and smooth ends flush.



4. Lift windshield into place in the center of the windshield opening and use the tape as a guide to aid installation of the windshield into the center of the cutout.
5. Carefully lay down windshield and press on.

CAUTION: It is no longer possible to move the windshield after installation. The windshield should never be pressed into place by more than one person, because the windshield can break if pressed simultaneously on both sides.

CAUTION: Roll down the left and right front door glass and open the rear glass slider (if available) before installing windshield to avoid pressurizing the passenger compartment if a door is slammed before urethane is cured. Water leaks can result.



6. Install cowl grille. (Refer to 23 - BODY/EXTERIOR/COWL GRILLE AND SCREEN - INSTALLATION)
7. Install rear view mirror. (Refer to 23 - BODY/INTERIOR/REAR VIEW MIRROR - INSTALLATION)

GLASS-REAR DOOR

DESCRIPTION

The rear door quarter glass is seated within the rear glass run channel and glass run weatherstrip.

1. To remove the quarter glass, remove the rear glass run channel and remove the glass from the channel. (Refer to 23 - BODY/DOORS - REAR/GLASS RUN CHANNEL - REMOVAL)

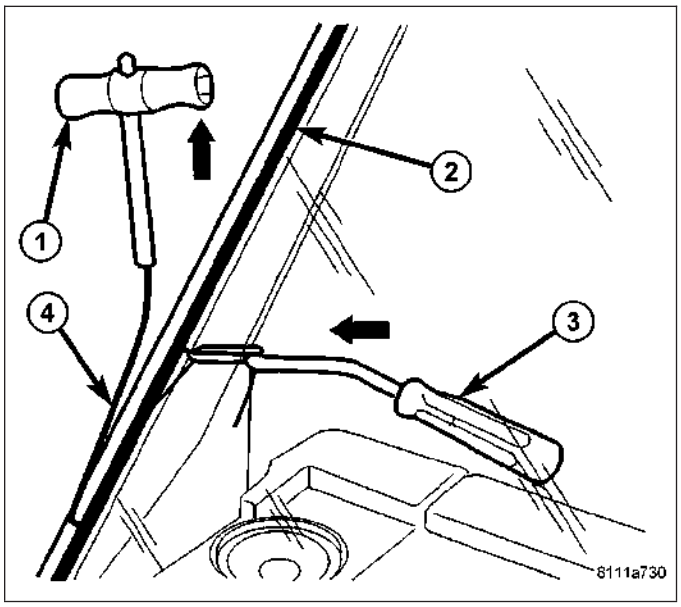
GLASS-QUARTER

REMOVAL

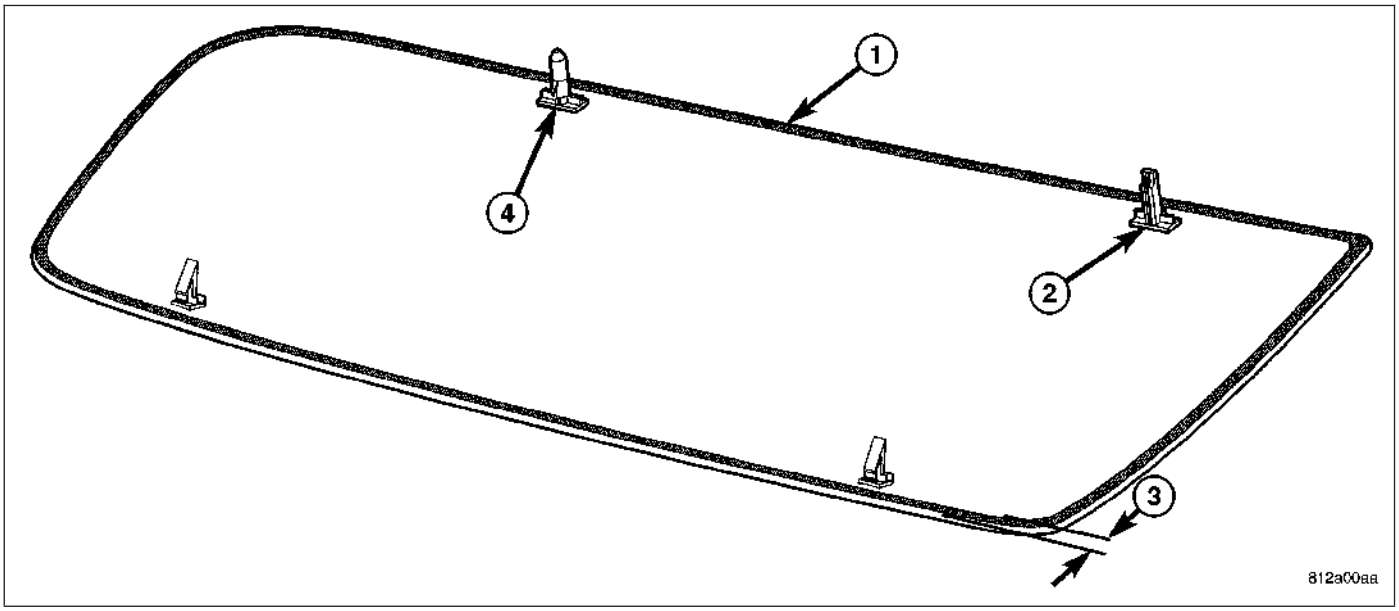
1. Before proceeding with the following repair procedure, review all warnings and cautions (Refer to 23 - BODY/STATIONARY GLASS - WARNING).
2. Remove quarter panel trim (Refer to 23 - BODY/INTERIOR/QUARTER PANEL TRIM - REMOVAL).

NOTE: Windshield removal shown, quarter glass similar.

3. Using a windshield cut-out wire (4) or other suitable tool, separate the adhesive (2).



1 - T-HANDLE
2 - WINDSHIELD ADHESIVE
3 - COUNTER SUPPORT
4 - CUTTING WIRE



4. Release the tabs (2) and the tabs on the alignment pin (4) and carefully remove the quarter glass.

INSTALLATION

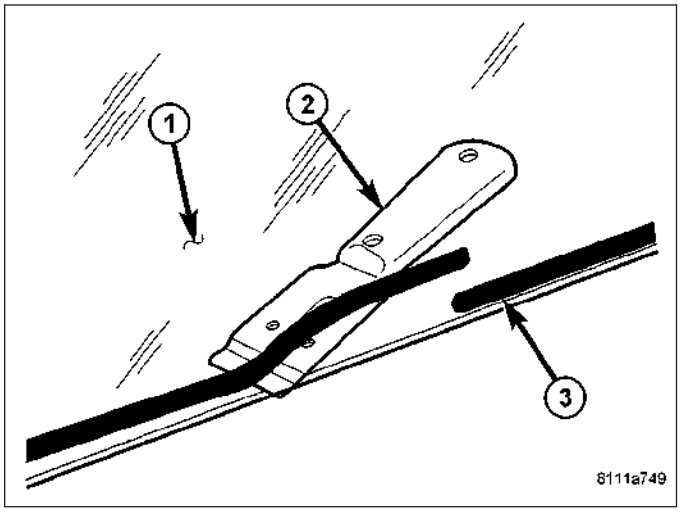
WARNING: ALLOW THE URETHANE AT LEAST 24 HOURS TO CURE BEFORE RETURNING THE VEHICLE TO USE.

CAUTION: Roll down the left and right front door glass and open the rear glass slider (if available) before installing quarter glass to avoid pressurizing the passenger compartment if a door is slammed before urethane is cured. Water leaks can result.

NOTE: The quarter glass fence should be cleaned of most of its old urethane bonding material. A small amount of old urethane, approximately 1-2 mm in height, should remain on the fence. Do not grind off or completely remove all old urethane from the fence, the paint finish and bonding strength will be adversely affected.

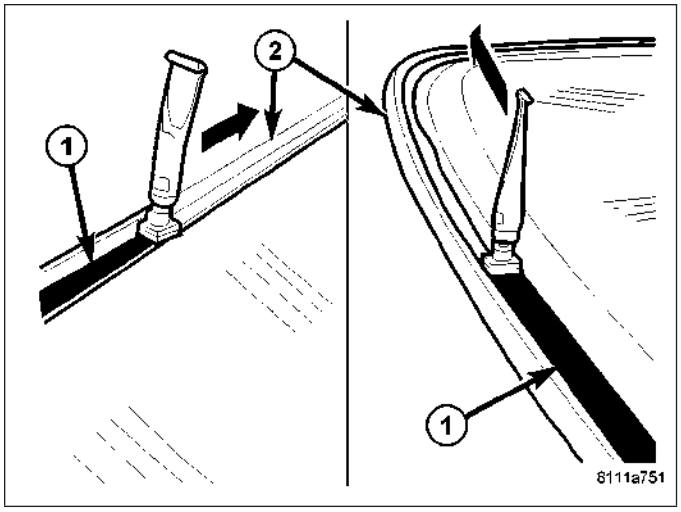
Glass Preparation - Installing A Previously Installed Quarter Glass

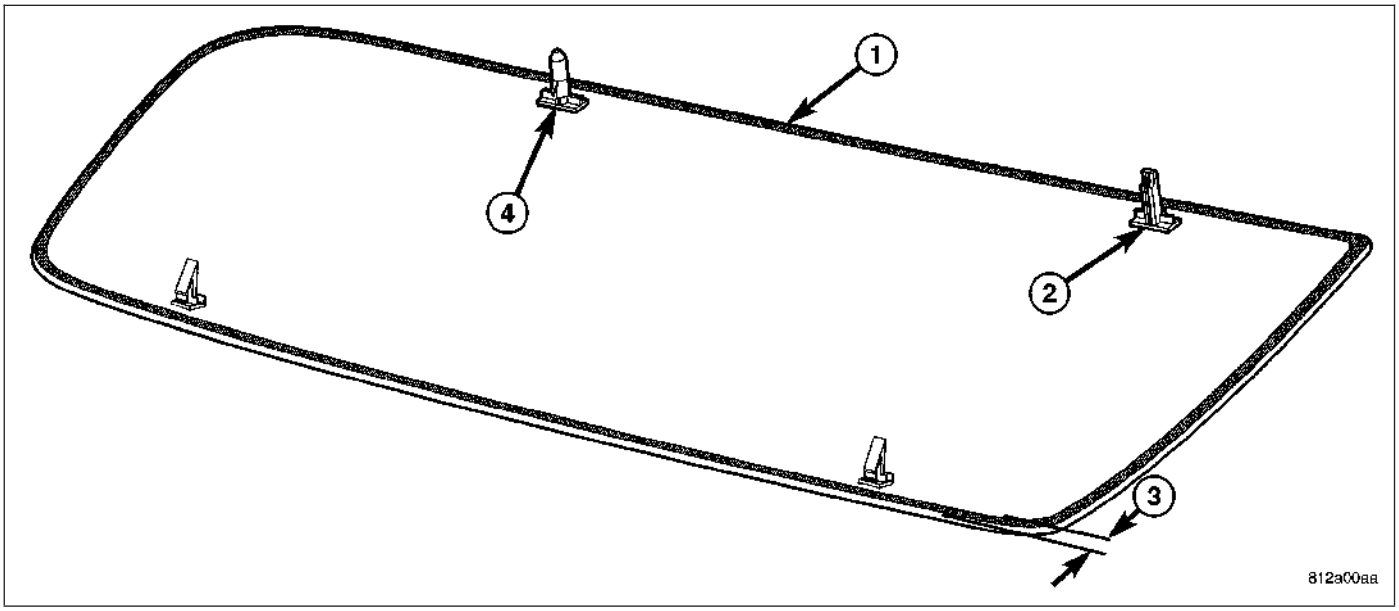
1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/STATIONARY GLASS - WARNING)
2. Level old bead of quarter glass adhesive (3) to a thickness of approximately 1 mm (0.04 in.) and remove loose adhesive.



NOTE: Typical primer installation shown.

3. Clean and dry area of glass (2) to be re-glued with a suitable glass preparation solvent and rag.
4. Using a flash light, verify that glass primer is without damage.
5. Re-prime any damaged area. If old adhesive has been exposed for more than 12 hours, entire adhesive area needs to be re-primed.



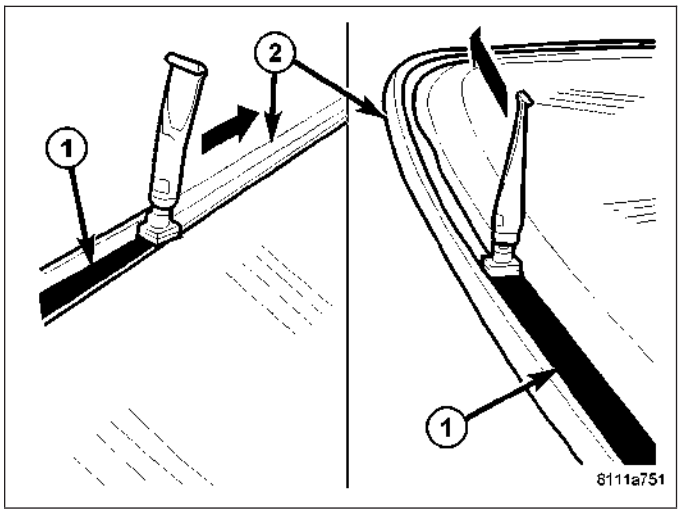


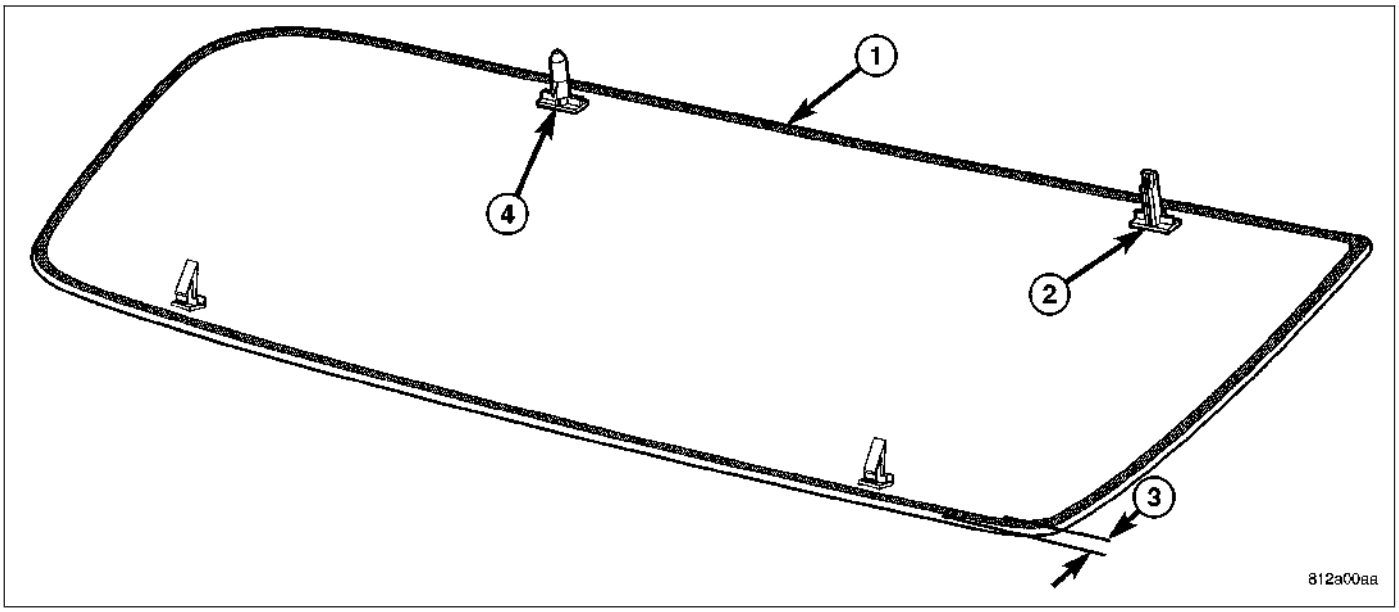
6. Apply primer (1) around the perimeter of the glass to a width of 15 mm (0.5 in.) (3).
7. Allow primer to air dry for at least 10 minutes.
8. Using a flash light, verify that glass primer is without damage.

Glass Preparation - Installing A New Quarter Glass

NOTE: Typical primer installation shown.

1. Clean and dry area of glass (2) to be re-glued with a suitable glass preparation solvent and rag.
2. Apply primer to gluing surface at quarter glass seal.



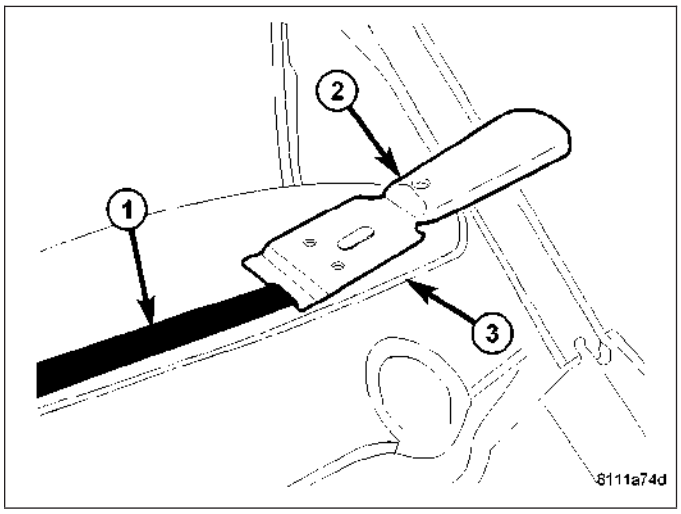


3. Apply primer (1) around the perimeter of the glass to a width of 15 mm (0.5 in.) (3).
4. Allow primer to air dry for at least 10 minutes.
5. Using a flash light, verify that glass primer is without damage.

Quarter Glass Opening Preparation

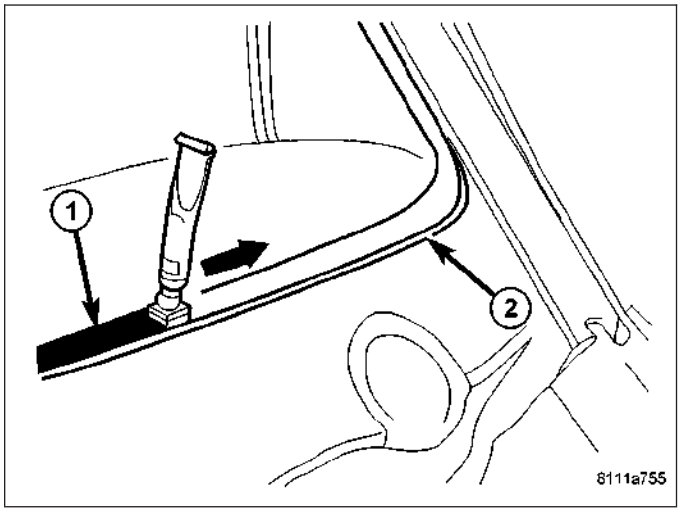
NOTE: Windshield opening shown, quarter glass opening similar.

1. Clean and vacuum quarter glass opening.
2. Level old bead of quarter glass opening adhesive (1) to a thickness of approximately 1 mm (0.04 in.) and remove loose adhesive.



NOTE: Windshield opening shown, quarter glass opening similar.

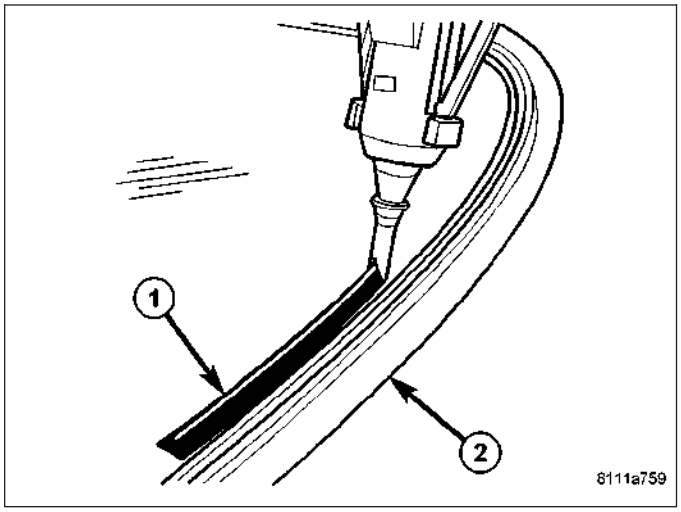
3. Clean and dry area of quarter glass opening to be re-glued with a suitable glass preparation solvent and rag.
4. Re-prime any damaged area. If old adhesive has been exposed for more than 12 hours, entire adhesive area needs to be re-primed.
5. Allow primer to air dry for at least 10 minutes.



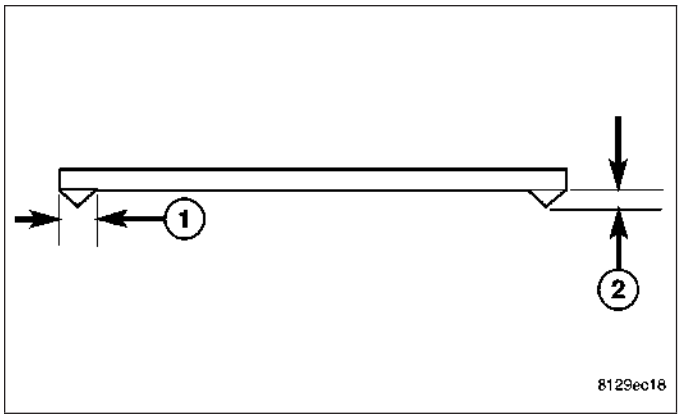
Quarter Glass Installation

1. Apply bead of adhesive (1) with a triangular nozzle directly to the quarter glass seal starting at bottom in center of the quarter glass.

CAUTION: Always apply bead of adhesive to the quarter glass. Always install the quarter glass within 5 minutes after applying adhesive.

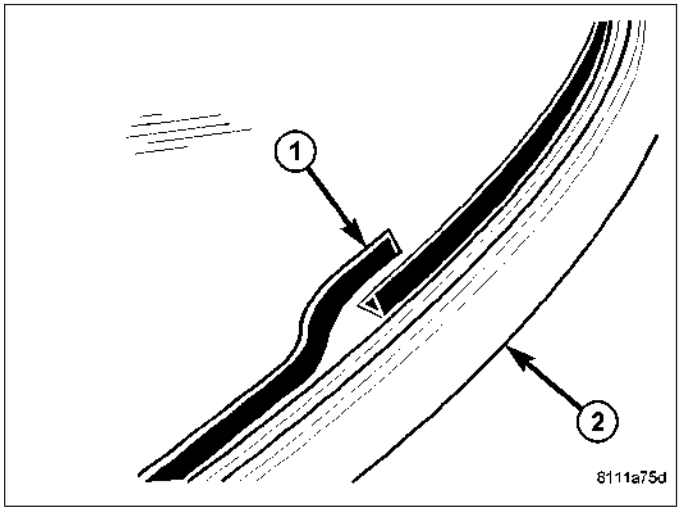


2. Bead dimensions should be approximately 9.5 mm wide (1) by 12.7 mm in height (2).



1 - ADHESIVE WIDTH 9.5 mm (0.375 in)
2 - ADHESIVE HEIGHT 12.7 mm (0.50 in)

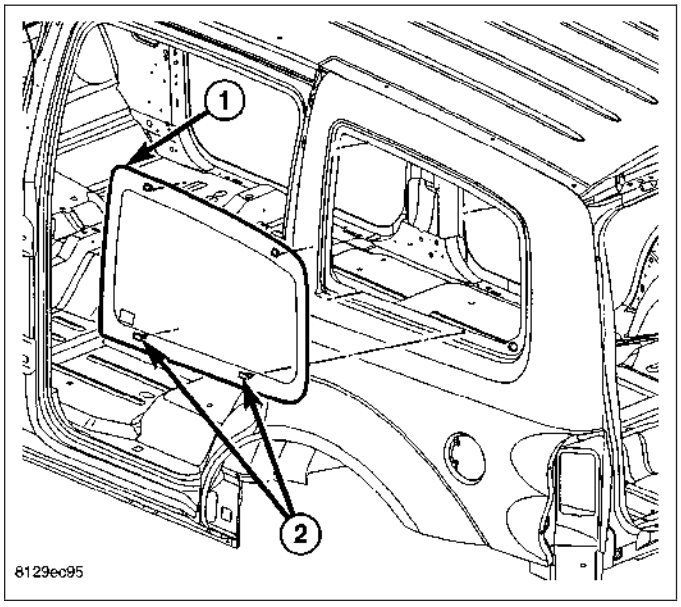
3. Allow end of adhesive bead (1) to run out parallel to the start of the bead and smooth ends flush.



4. Lift quarter glass into place in the center of the quarter glass opening and install over the alignment tabs and pin (2).
5. Carefully lay down the quarter glass and press on.

CAUTION: It is no longer possible to move the quarter glass after installation. The quarter glass should never be pressed into place by more than one person, because the quarter glass can break if pressed simultaneously on both sides.

CAUTION: Roll down the left and right front door glass and open the rear glass slider (if available) before installing quarter glass to avoid pressurizing the passenger compartment if a door is slammed before urethane is cured. Water leaks can result.



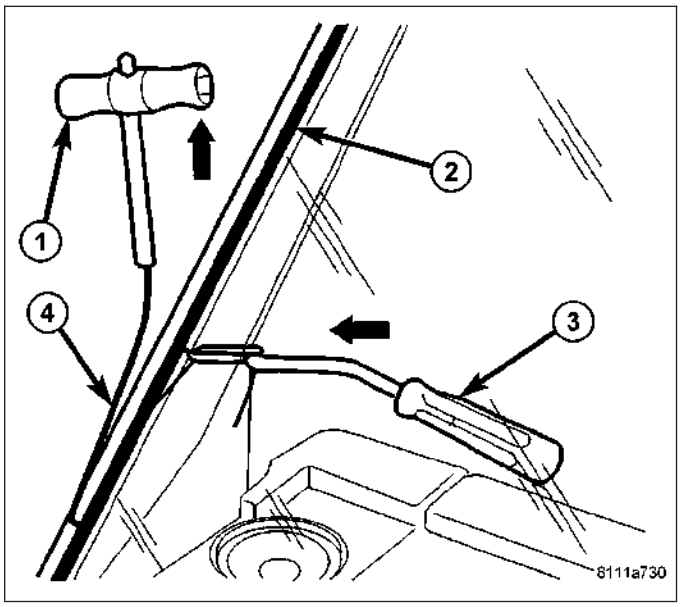
1. Install quarter panel trim. (Refer to 23 - BODY/INTERIOR/QUARTER PANEL TRIM - INSTALLATION)

GLASS-LIFTGATE

REMOVAL

NOTE: Windshield removal shown, backlite similar.

1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/STATIONARY GLASS - WARNING)
2. Remove liftgate trim panels. (Refer to 23 - BODY/LIFTGATE/TRIM PANEL - REMOVAL)
3. Remove the center stop light. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/CENTER HIGH MOUNTED STOP LAMP - REMOVAL)
4. Remove rear window wiper arm, if equipped. (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER ARMS - REMOVAL)
5. Disconnect the heated backlite electrical connectors, if equipped.
6. Using a windshield cut-out wire or other suitable tool, separate the adhesive.
7. Carefully remove backlite.



1 - T-HANDLE
2 - WINDSHIELD ADHESIVE
3 - COUNTER SUPPORT
4 - CUTTING WIRE

INSTALLATION

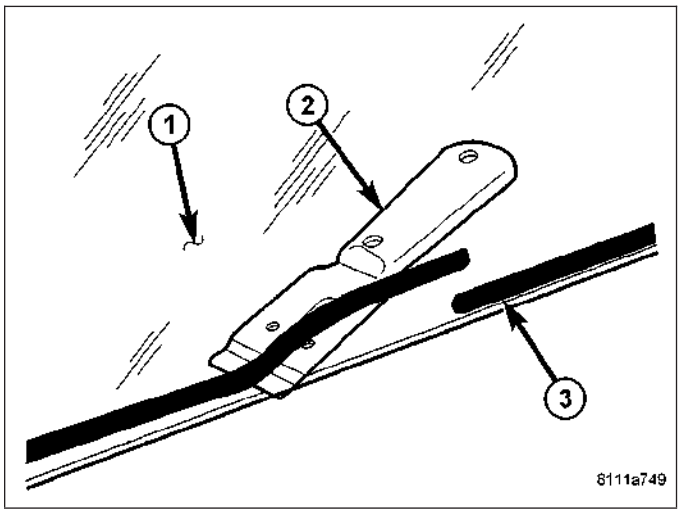
WARNING: ALLOW THE URETHANE AT LEAST 24 HOURS TO CURE BEFORE RETURNING THE VEHICLE TO USE.

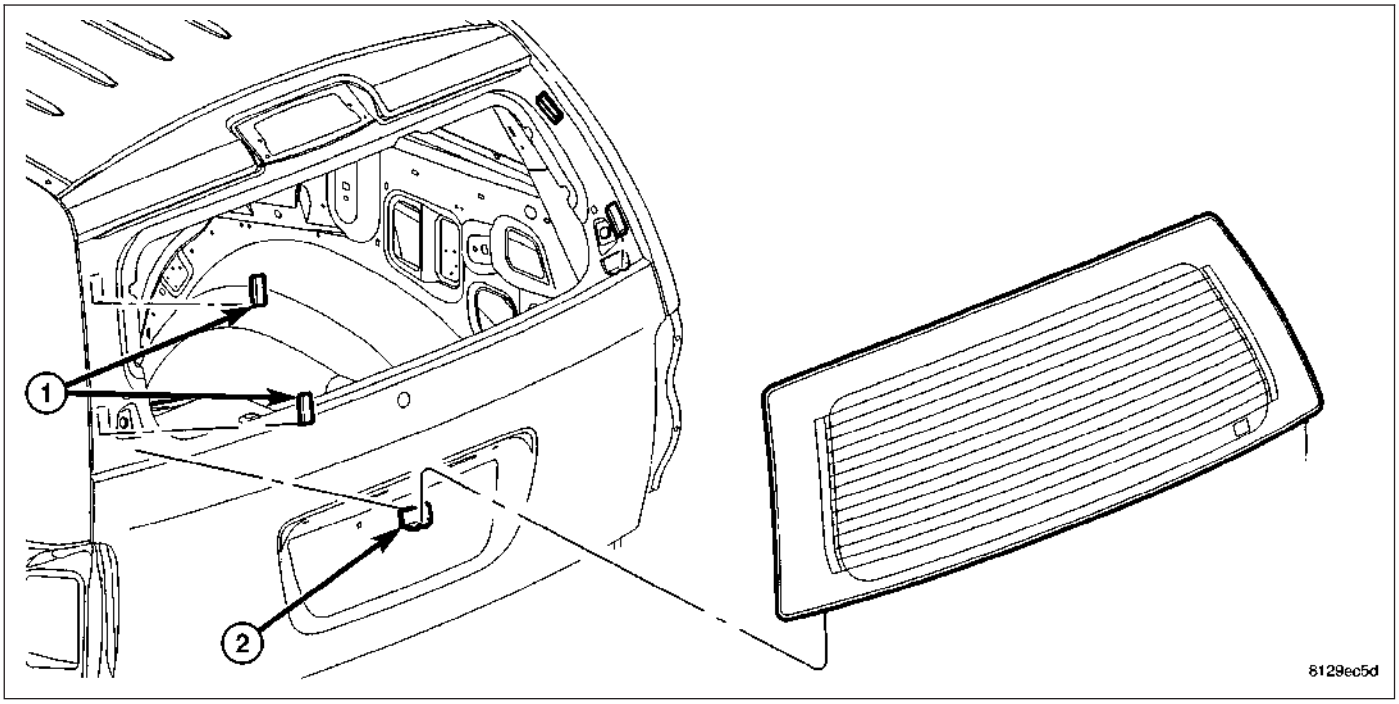
CAUTION: Roll down the left and right front door glass and open the rear glass slider (if available) before installing backlite to avoid pressurizing the passenger compartment if a door is slammed before urethane is cured. Water leaks can result.

NOTE: The backlite fence should be cleaned of most of its old urethane bonding material. A small amount of old urethane, approximately 1-2 mm in height, should remain on the fence. Do not grind off or completely remove all old urethane from the fence, the paint finish and bonding strength will be adversely affected. Support spacers should be replaced with new parts. Replace any missing or damaged spacers around the perimeter of the liftgate opening.

Glass Preparation - Installing A Previously Installed Backlite

1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/STATIONARY GLASS - WARNING)
2. Level old bead of backlite adhesive (3) to a thickness of approximately 1 mm (0.04 in.) and remove loose adhesive.





3. Apply four new spacers (1) to the liftgate frame and place them 55 mm in from the window opening; 70 mm from the upper edge and 150 mm from the lower edge.
4. Install the lower spacers (2) to the backlite approximately 36 cm (1.0 in) from each side of the glass.

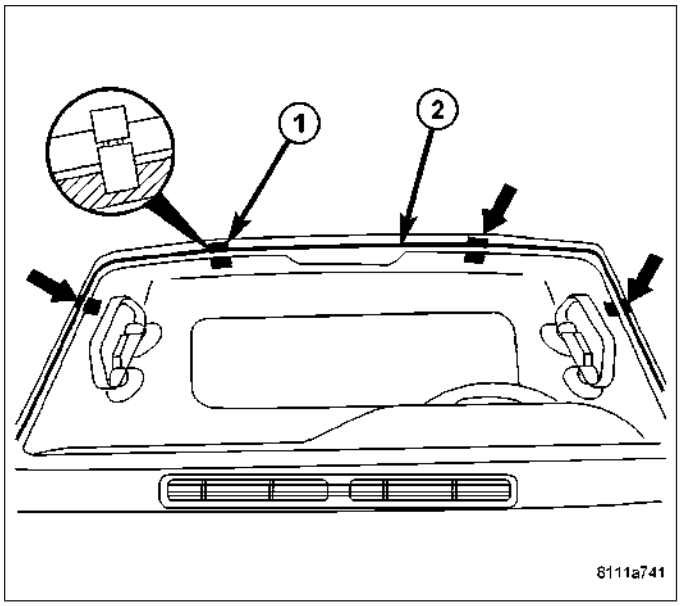
NOTE: Remove the lower spacers 2 hours after installation of the glass.

5. Position backlite in center of liftgate opening and resting on the side and lower spacers.

6. Apply adhesive tape strips (1) around the perimeter of the liftgate opening to aid in installation.

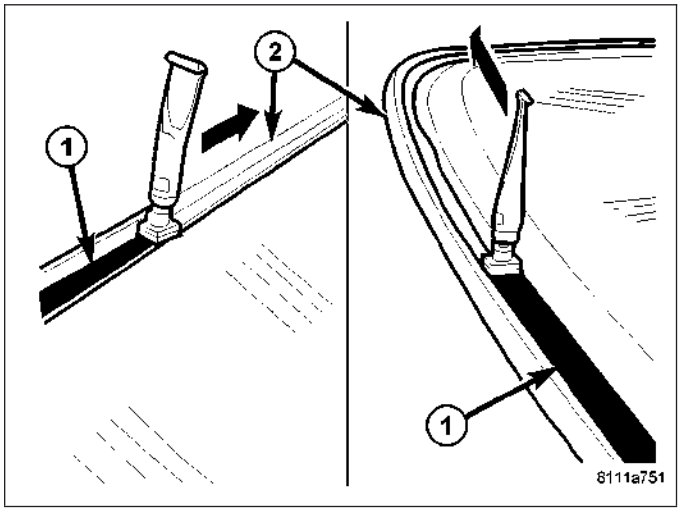
NOTE: Windshield installation shown, backlite similar.

7. Verify the backlite gap is parallel to with the liftgate opening.
8. Cut tape with a sharp knife and remove backlite.

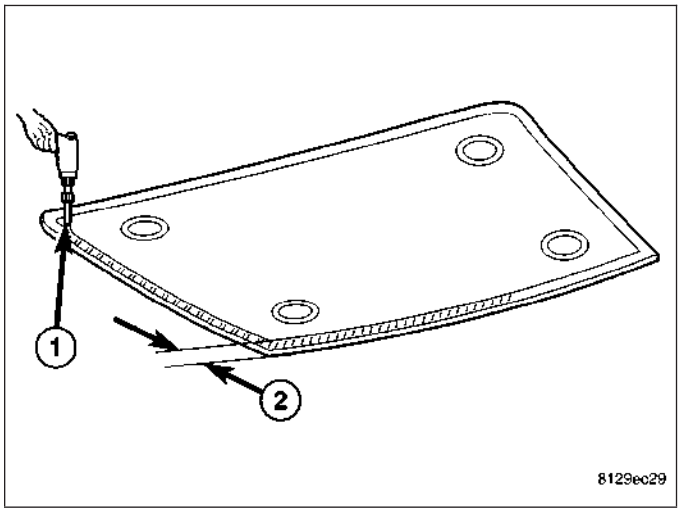


NOTE: Typical primer installation shown.

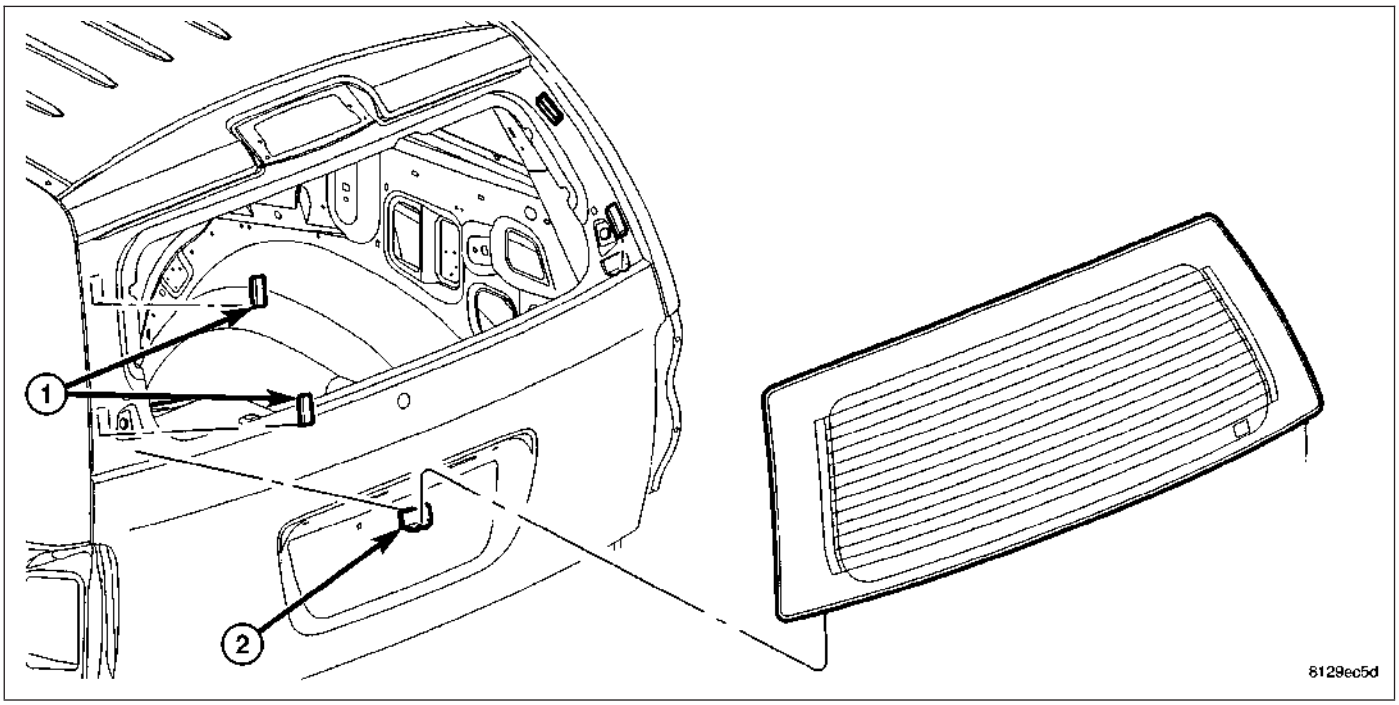
9. Clean and dry area of glass (2) to be re-glued with a suitable glass preparation solvent and rag.
10. Using a flash light, verify that glass primer is without damage.
11. Re-prime any damaged area. If old adhesive has been exposed for more than 12 hours, entire adhesive area needs to be re-primed.



12. Apply primer (1) around the perimeter of the glass to a width of 15 mm (0.5 in.) (2).
13. Allow primer to air dry for at least 10 minutes.
14. Using a flash light, verify that glass primer is without damage.



Glass Preparation - Installing A New Backlite



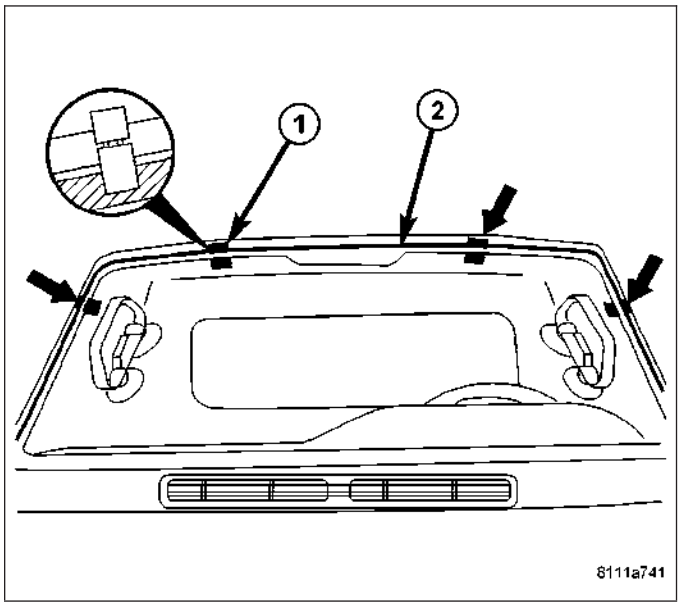
1. Apply four new spacers (1) to the liftgate frame and place them 55 mm in from the window opening; 70 mm from the upper edge and 150 mm from the lower edge.
2. Install the lower spacers (2) to the backlite approximately 36 cm (1.0 in) from each side of the glass.

NOTE: Remove the lower spacers 2 hours after installation of the glass.

3. Position backlite in center of liftgate opening and resting on the side and lower spacers.
4. Apply adhesive tape strips (1) around the perimeter of the liftgate opening to aid in installation.

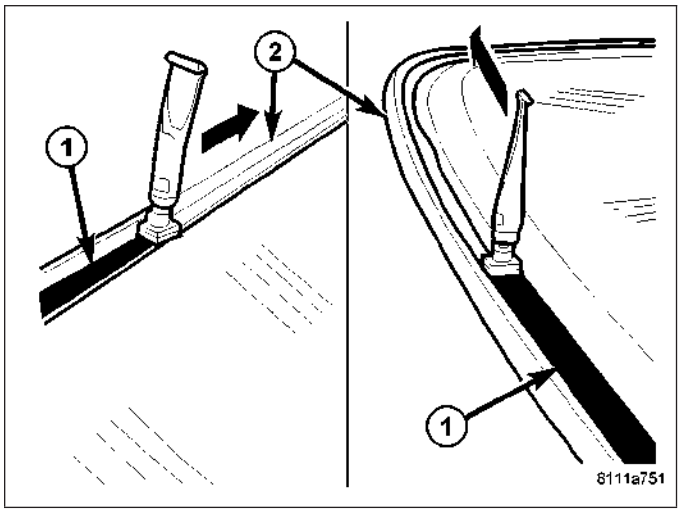
NOTE: Windshield installation shown, backlite similar.

5. Verify the backlite gap is parallel to with the liftgate opening.
6. Cut tape with a sharp knife and remove backlite.

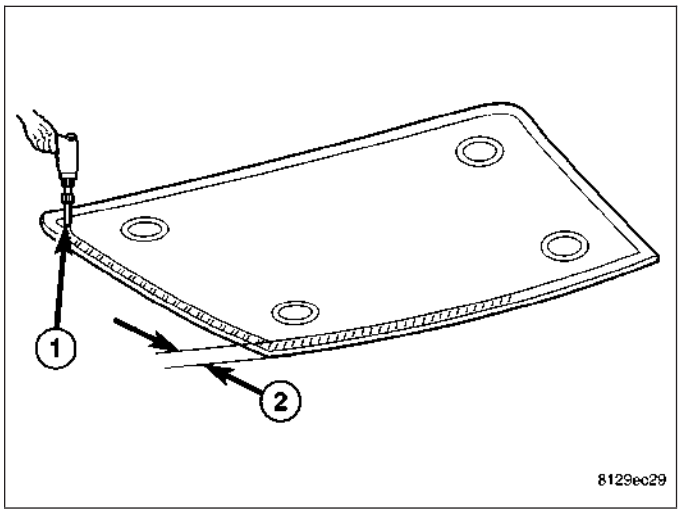


NOTE: Typical primer installation shown.

7. Clean and dry area of glass (2) to be re-glued with a suitable glass preparation solvent and rag.
8. Apply primer to gluing surface at backlite seal.



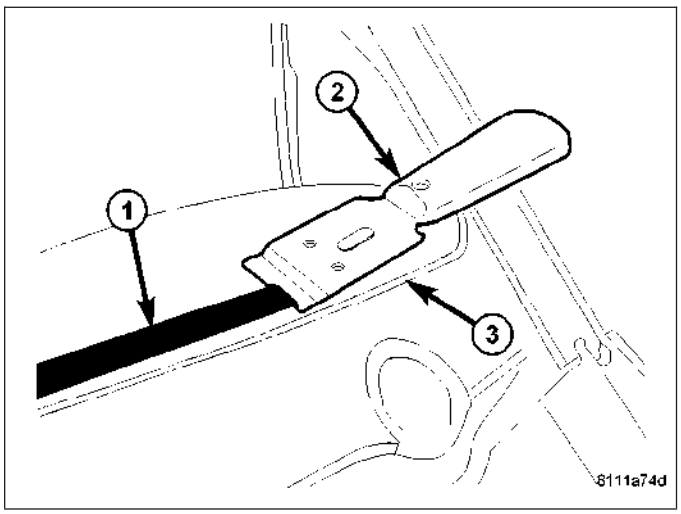
9. Apply primer (1) around the perimeter of the glass to a width of 15 mm (0.5 in.) (2).
10. Allow primer to air dry for at least 10 minutes.
11. Using a flash light, verify that glass primer is without damage.



Liftgate Opening Preparation

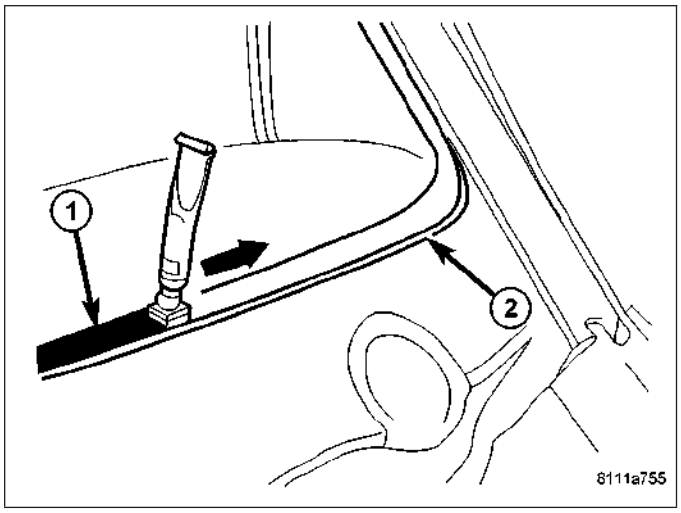
NOTE: Windshield opening shown, liftgate opening similar.

1. Clean and vacuum liftgate opening.
2. Level old bead of liftgate opening adhesive (1) to a thickness of approximately 1 mm (0.04 in.) and remove loose adhesive.



NOTE: Windshield opening shown, liftgate opening similar.

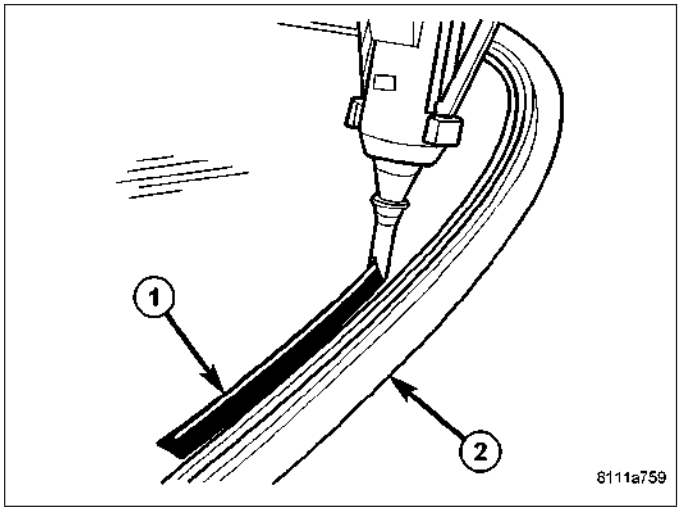
3. Clean and dry area of liftgate opening to be re-glued with a suitable glass preparation solvent and rag.
4. Re-prime any damaged area. If old adhesive has been exposed for more than 12 hours, entire adhesive area needs to be re-primed.
5. Allow primer to air dry for at least 10 minutes.



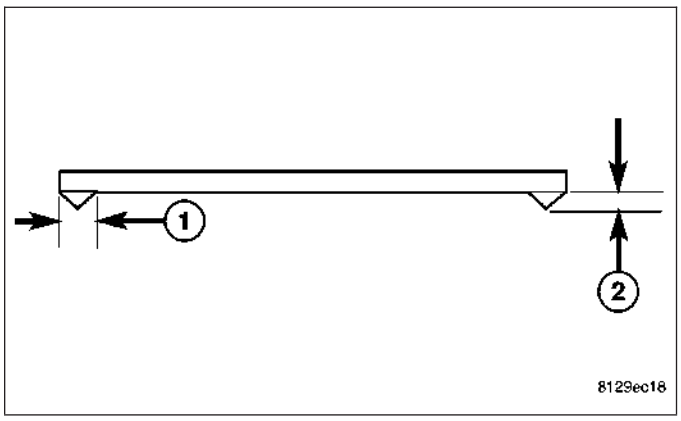
Backlite Installation

1. Apply bead of adhesive (1) with a triangular nozzle directly to the backlite seal starting at bottom in center of the backlite.

CAUTION: Always apply bead of adhesive to the backlite. Always install the backlite within 5 minutes after applying adhesive.

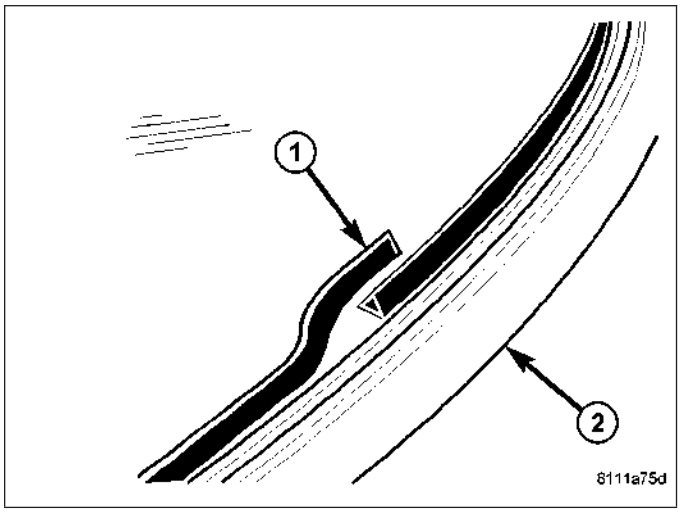


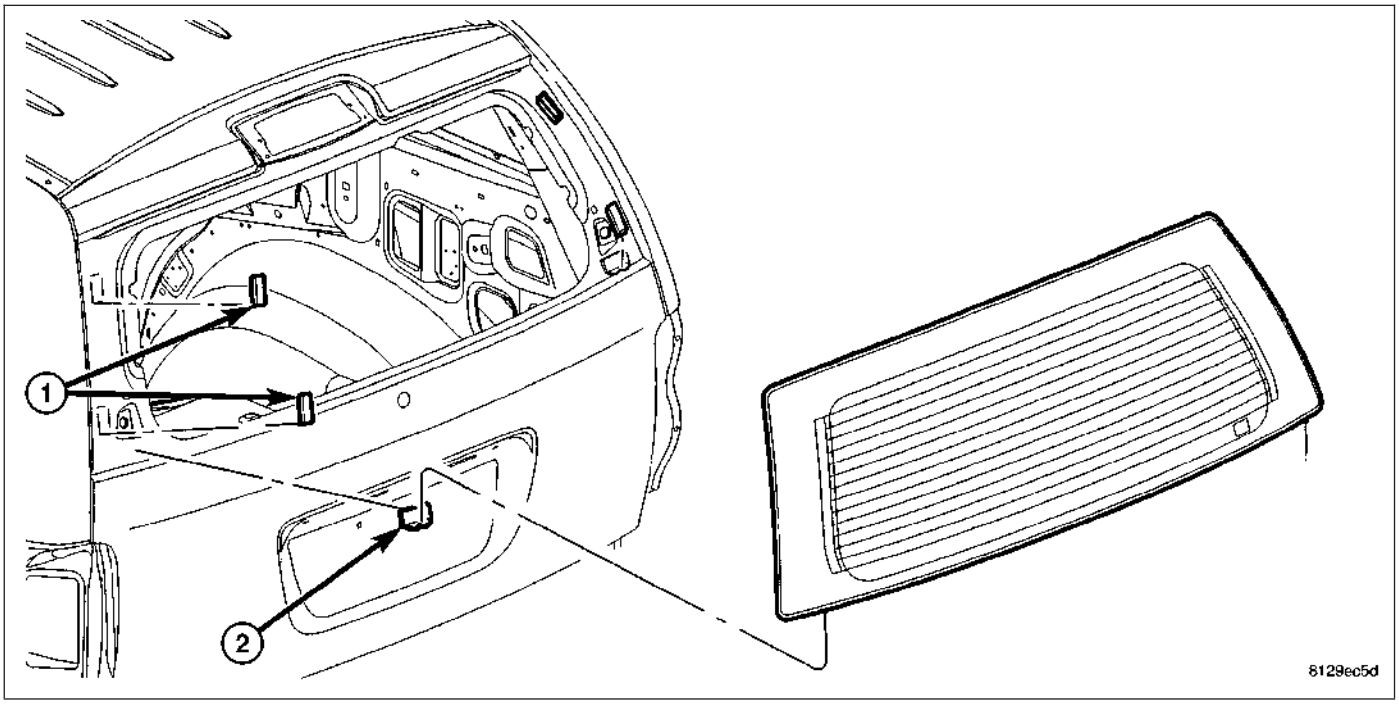
2. Bead dimensions should be approximately 9.5 mm wide (1) by 12.7 mm in height (2).



1 - ADHESIVE WIDTH 9.5 mm (0.375 in)
2 - ADHESIVE HEIGHT 12.7 mm (0.50 in)

3. Allow end of adhesive bead (1) to run out parallel to the start of the bead and smooth ends flush.





4. Lift backlite into place in the center of the liftgate opening and use the tape as a guide to aid installation of the backlite into the center of the cutout.
5. Carefully lay down the backlite and press on.

CAUTION: It is no longer possible to move the backlite after installation. The backlite should never be pressed into place by more than one person, because the backlite can break if pressed simultaneously on both sides.

CAUTION: Roll down the left and right front door glass and open the rear glass slider (if available) before installing backlite to avoid pressurizing the passenger compartment if a door is slammed before urethane is cured. Water leaks can result.

6. Install the rear wiper arm, if equipped. (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER ARMS - INSTALLATION)
7. Install the liftgate trim panels.
8. Install the center stop light. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/CENTER HIGH MOUNTED STOP LAMP UN - INSTALLATION)

SUNROOF

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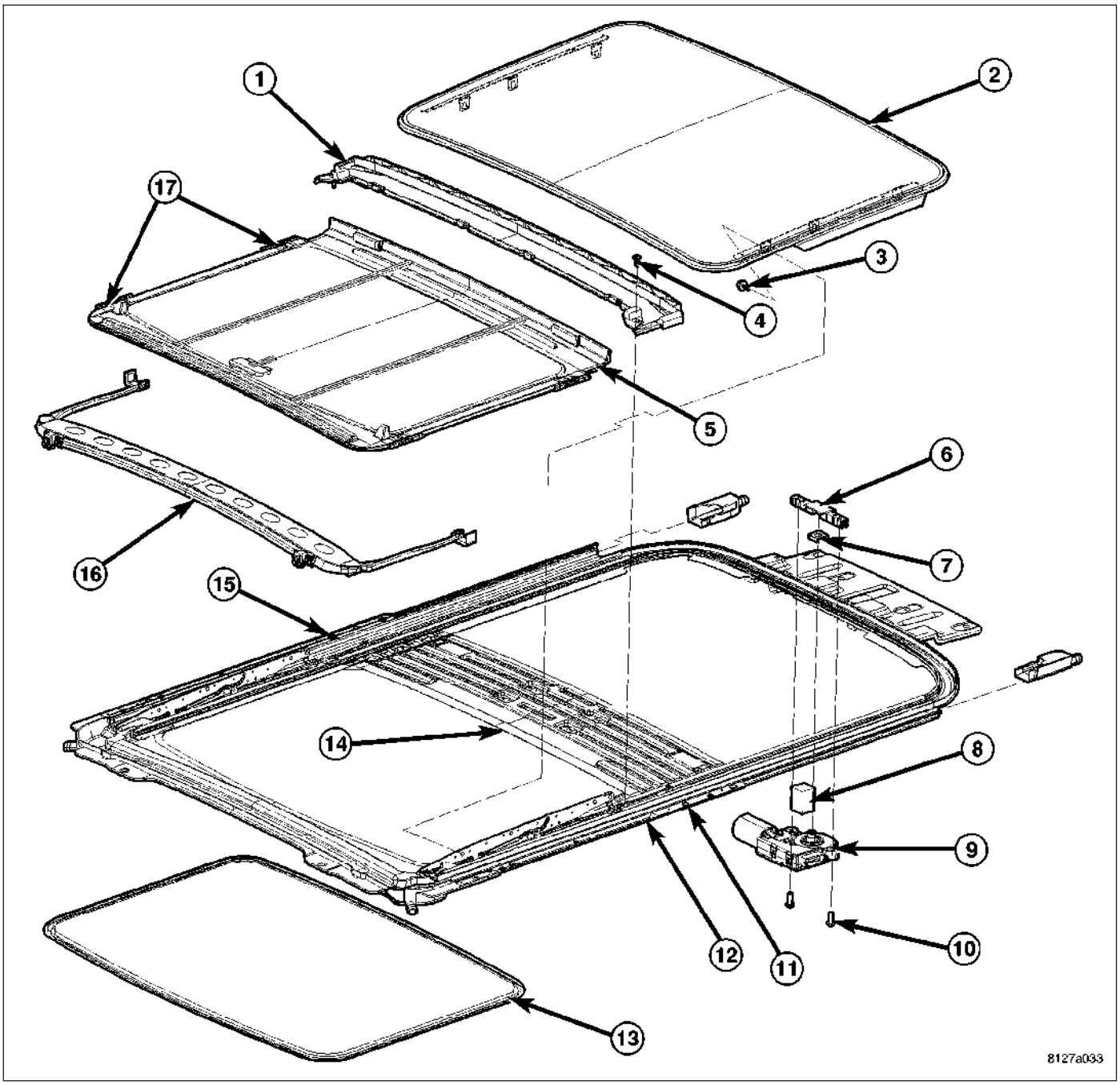
SUNROOF

DESCRIPTION



SUN ROOF ASSEMBLY

1 - WATER CHANNEL
2 - GLASS ASSEMBLY
3 - SCREWS (3 PER SIDE) 3.5 N·m (31 in. lbs.)
4 - SCREWS (2)
5 - SUN SHADE
6 - MOTOR COVER
7 - MOTOR CLIP
8 - INSULATOR
9 - MOTOR
10 - SCREWS (2) 4 N·m (40 in. lbs.)
11 - LEFT SIDE ALIGNMENT HOLE
12 - SUNROOF ASSEMBLY FRAME
13 - OPENING TRIM LACE
14 - TRIM LACE BUT JOINT NOTCH
15 - RIGHT SIDE ALIGNMENT SLOT
16 - WIND DEFLECTOR
17 - SPRING FEET CLIPS

WARNING: Keep fingers and other body parts out of sunroof opening at all times.

The sun roof features consists of:

- Sun roof glass
- Sun roof sun shade

The sunroof power sliding glass panel and sunshade can be positioned anywhere along its travel, rearward of glass panel front edge.

The sunroof is electrically operated from a switch located in the overhead console. To operate the sunroof the ignition switch must be in the Accessory or On/Run position. The open/close switch is a rocker style design that open or close the sunroof; the vent switch is a push-button design. The 'express-open' function of the motor is triggered by a single quick press-and-release of the 'open' button. This causes the glass panel to retract to the comfort-open position. The wind deflector will deploy as the glass panel retracts. Quickly pressing and releasing the 'open' button. a second time will cause the glass panel to retract fully under the roof. The operator can control the position of the glass panel by pressing and holding the open button until the glass panel has reached the desired position. Neither the close nor vent buttons have 'express' functionary. These buttons must be held until the glass panel has reached the desired position. The sunroof will also operate for up to fifteen minutes after the ignition key is turned off for customer comfort and convenience while parking.

DIAGNOSIS AND TESTING

SUNROOF

Refer to SUNROOF DIAGNOSIS CHART for possible causes. Before beginning sunroof diagnostics verify that all other power accessories are in proper operating condition. If not, a common electrical problem may exist. Refer to Wiring Diagrams, in this publication for circuit, splice and component descriptions. Check the condition of the circuit protection (20 amp circuit breaker in the Junction Block). Inspect all wiring connector pins for proper engagement and continuity. Check for battery voltage at the power sunroof controller, refer to Wiring Diagrams, for circuit information. If battery voltage of more than 10 volts is detected at the controller, proceed with the following tests (the controller will not operate at less than 10 volts).

Before beginning diagnosis for wind noise or water leaks, verify that the problem was not caused by releasing the control switch before the sunroof was fully closed. The sunroof module has a water-management system. If however, the sunroof glass is in a partial closed position, high pressure water may be forced beyond the water management system boundaries and onto the headlining.

Every time the sunroof module loses power it must be initialized. To initialize the motor, connect power to the sunroof and press the close-button until the glass panel has reached the full-close position. There will be a slight “kick” of the glass panel when initialization occurs if the glass panel starts in the full-close position. The “kick” is accompanied by a soft tick noise. This is the indication that the sunroof module is initialized

SUNROOF DIAGNOSIS CHART

SYMPTOM	POSSIBLE CAUSE
Sunroof motor inoperative.	Faulty control switch. Faulty circuit ground between sunroof module, control switch, and body harness. Faulty power circuit between sunroof module, control switch, and body harness. Faulty sunroof drive motor. Faulty sunroof module.
Audible whine when switch is depressed, sunroof does not operate.	Faulty sunroof drive motor. Binding cable.

SYMPTOM	POSSIBLE CAUSE
Audible clicking or ratcheting when switch is pressed, sunroof does not operate.	Broken or worn drive cable. Worn drive motor gear. Mechanisms not synchronized.
Sunroof vents and opens, but does not close.	Broken or disengaged trough guide Binding cable. Faulty circuit. Faulty control switch. Faulty sunroof module. Faulty drive motor.
Sunroof vents, but does not open.	Binding cable or mechanism. Faulty circuit. Faulty switch. Faulty sunroof module.
Sunroof does not vent	Binding cable or mechanism. Faulty circuit. Faulty control switch. Faulty sunroof module.
Sunroof water leak.	Drain tubes clogged or kinked or disconnected from the sunroof. Glass panel improperly adjusted. Faulty glass panel seal.
Gurgling sound from sunroof	Low spot in drain hose routing, allowing water to stand.
Wind noise from sunroof.	Glass panel compression to the roof opening not consistent. Wind deflector not deploying properly. Glass not installed or adjusted properly. Faulty glass panel seal.
Buzz, Squeak, Rattles from sunroof	Loose or broken attaching hardware. No lubrication in track. Worn or broken mechanism. Cables bunched or kinked
Sunshade will not function or does not operate smoothly	Sunshade feet are missing, broken or loose. Track obstructions or interference.
Glass movement not consistent or glass does not operate smoothly	Glass and Track timing. Glass and Track alignment Cables and Guide alignment

WATER DRAINAGE AND WIND NOISE DIAGNOSIS

The sliding glass panel is designed to seal the opening with a snug but not perfectly water tight fit between the roof and the seal. The fit can be checked by inserting a business card or equivalent, between the roof and the seal. The piece of paper should have some resistance when pulled around the opening with the glass panel in the closed position. This check can only be complete when both the glass seal and the roof are dry. The sunroof housing will drain off a minimum amount of water. Excessive wind noise could result if the gap clearances are exceeded. The sunroof glass panel may need to be adjusted. (Refer to 23 - BODY/SUNROOF/GLASS PANEL - ADJUSTMENTS)

Adequate drainage is provided by a drain trough in the sunroof housing which encircles the sliding glass panel and leads to drain hoses. If a wet headliner or other water leak complaints are encountered, before performing any adjustments, first ensure that the drainage system is not plugged or disconnected. Use a pint container to pour water into the sunroof housing drain trough. If water flow is restricted, use compressed air to blow out any material plugging the drain system. Retest system again.

To further check for a disconnected drain hose:

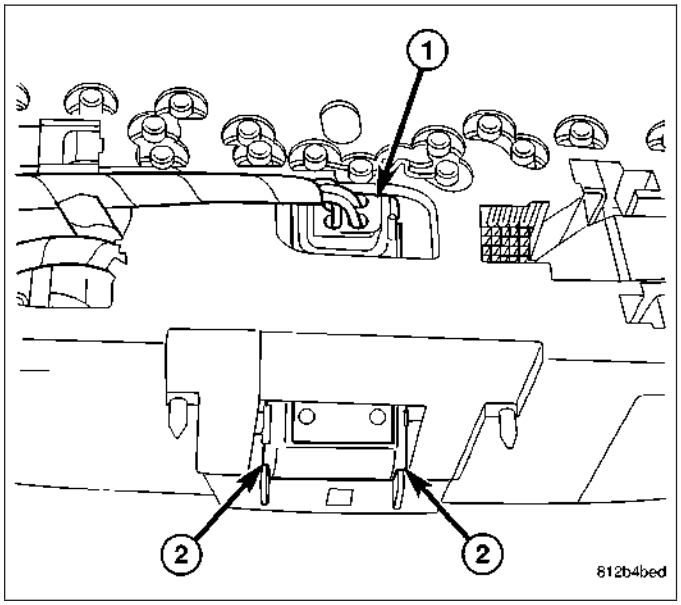
NOTE: Care must be taken not to fold or kink the headliner upon removal.

1. Lower headliner as necessary to gain access to sunroof housing drain tubes. (Refer to 23 - BODY/INTERIOR/HEADLINER - REMOVAL)
2. Repair as necessary.

SWITCH-SUNROOF

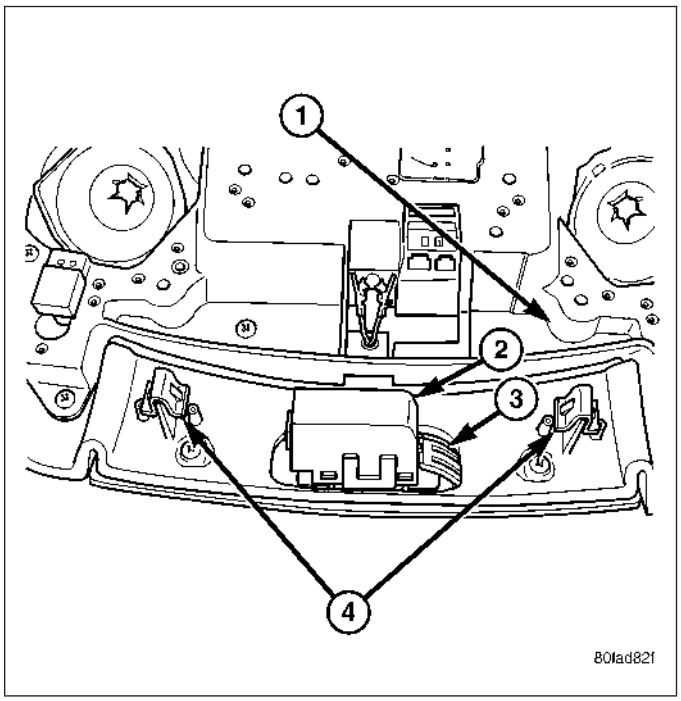
REMOVAL

1. Disconnect and isolate the negative battery cable.
2. Separate the overhead console from the headliner, by carefully pulling down on the front portion, toward the windshield, to release the retaining clips.
3. Release the sunroof switch retaining tab (2), disconnect the electrical connector (1) and remove the switch from the console.



INSTALLATION

1. Position the switch (2) against the overhead console (1) and push the switch to seat properly in retaining clip (3).
2. Install the overhead console and seat the retaining clips (4) fully.
3. Connect the negative battery cable.

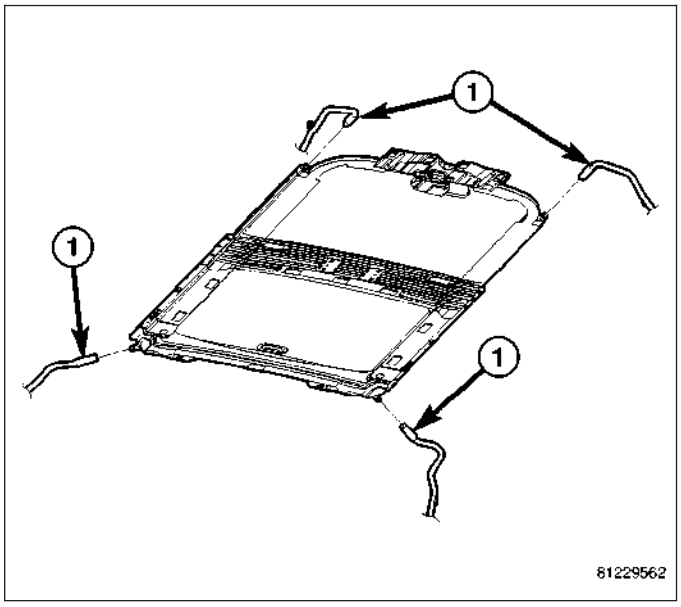


HOSE-DRAIN

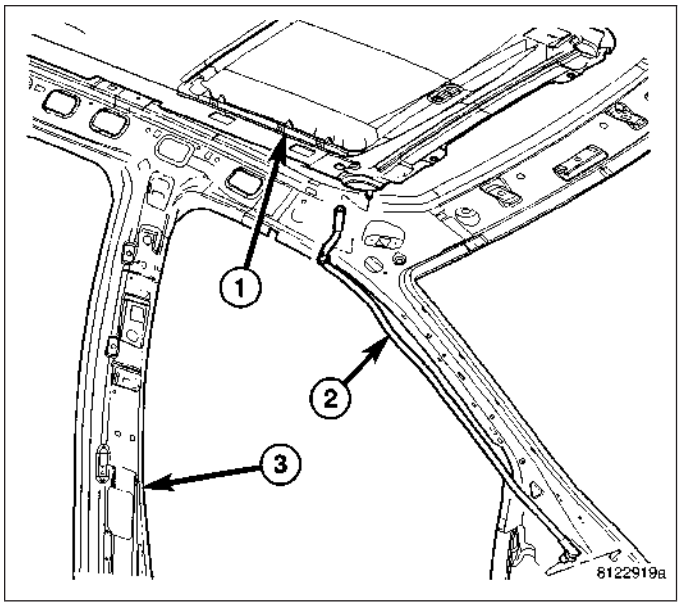
REMOVAL

FRONT HOSES

1. Move glass panel to the fully closed position.
2. Disconnect negative battery cable.
3. Remove headliner (Refer to 23 - BODY/INTERIOR/HEADLINER - REMOVAL).
4. Disconnect the drain hose from the sunroof housing (1).
5. Drain any liquid from hose connection.

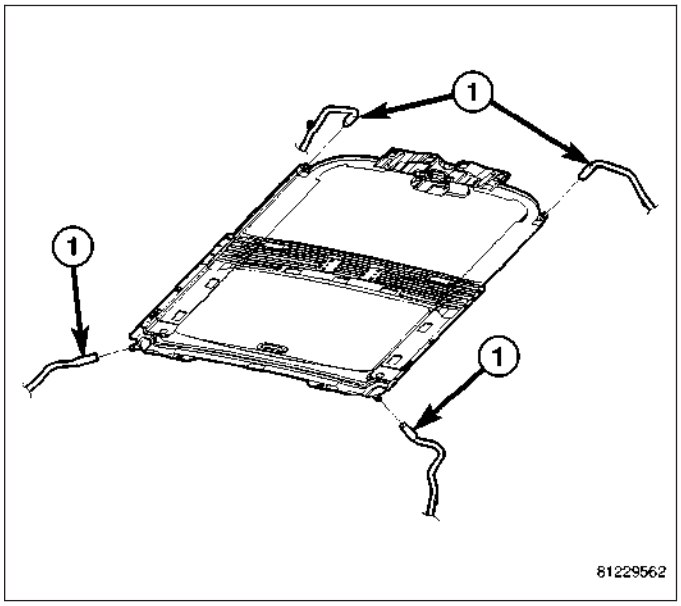


6. Remove tube (2), as necessary.

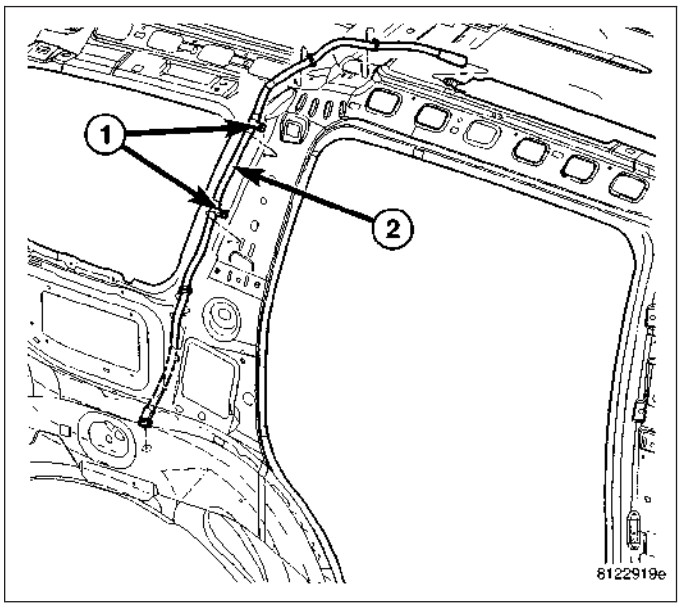


REAR HOUSING HOSE

1. Move glass panel to the fully closed position.
2. Disconnect negative battery cable.
3. Remove headliner (Refer to 23 - BODY/INTERIOR/ HEADLINER - REMOVAL).
4. Disconnect the drain hose from the sunroof housing (1).
5. Drain any liquid from hose connection, if necessary.



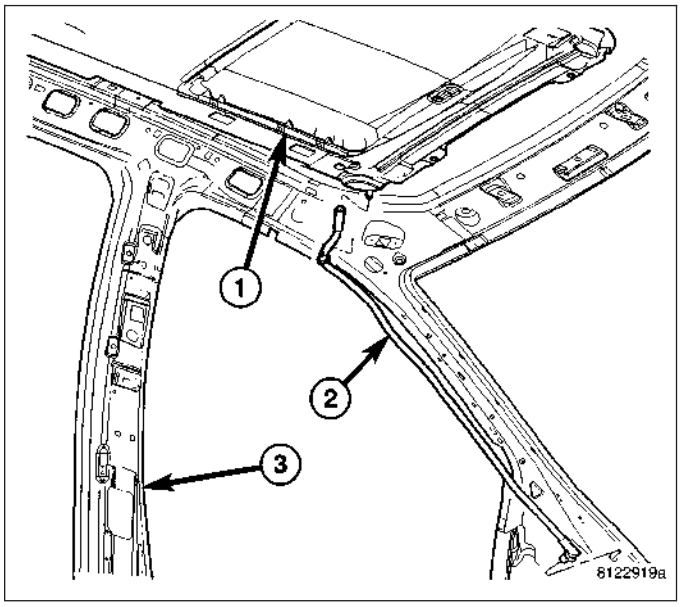
6. Release the push pin fasteners (1) and remove the tube (2).



INSTALLATION

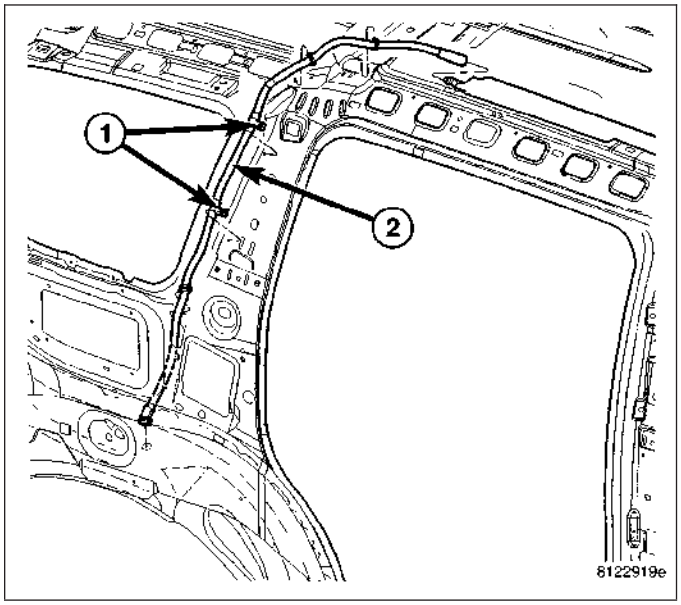
FRONT HOSES

1. Connect the new drain hose (2) to the sunroof housing (1) and test drainage.
2. Install headliner (Refer to 23 - BODY/INTERIOR/ HEADLINER - INSTALLATION).
3. Verify sunroof operation and alignment.

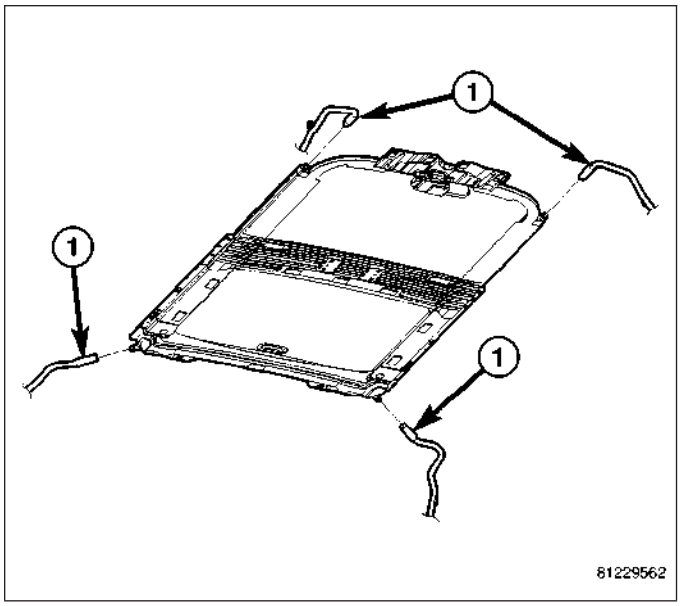


REAR HOUSING HOSE

1. Install the rear hose (2) and seat the push pin fasteners (1) fully.



2. Connect the new drain hose (1) to the sunroof housing and test drainage.
3. Install the quarter trim panels. (Refer to 23 - BODY/INTERIOR/QUARTER PANEL TRIM - INSTALLATION)
4. Install headliner (Refer to 23 - BODY/INTERIOR/ HEADLINER - INSTALLATION).
5. Connect the control switch wire connector and install control switch.
6. Verify sunroof operation and alignment.

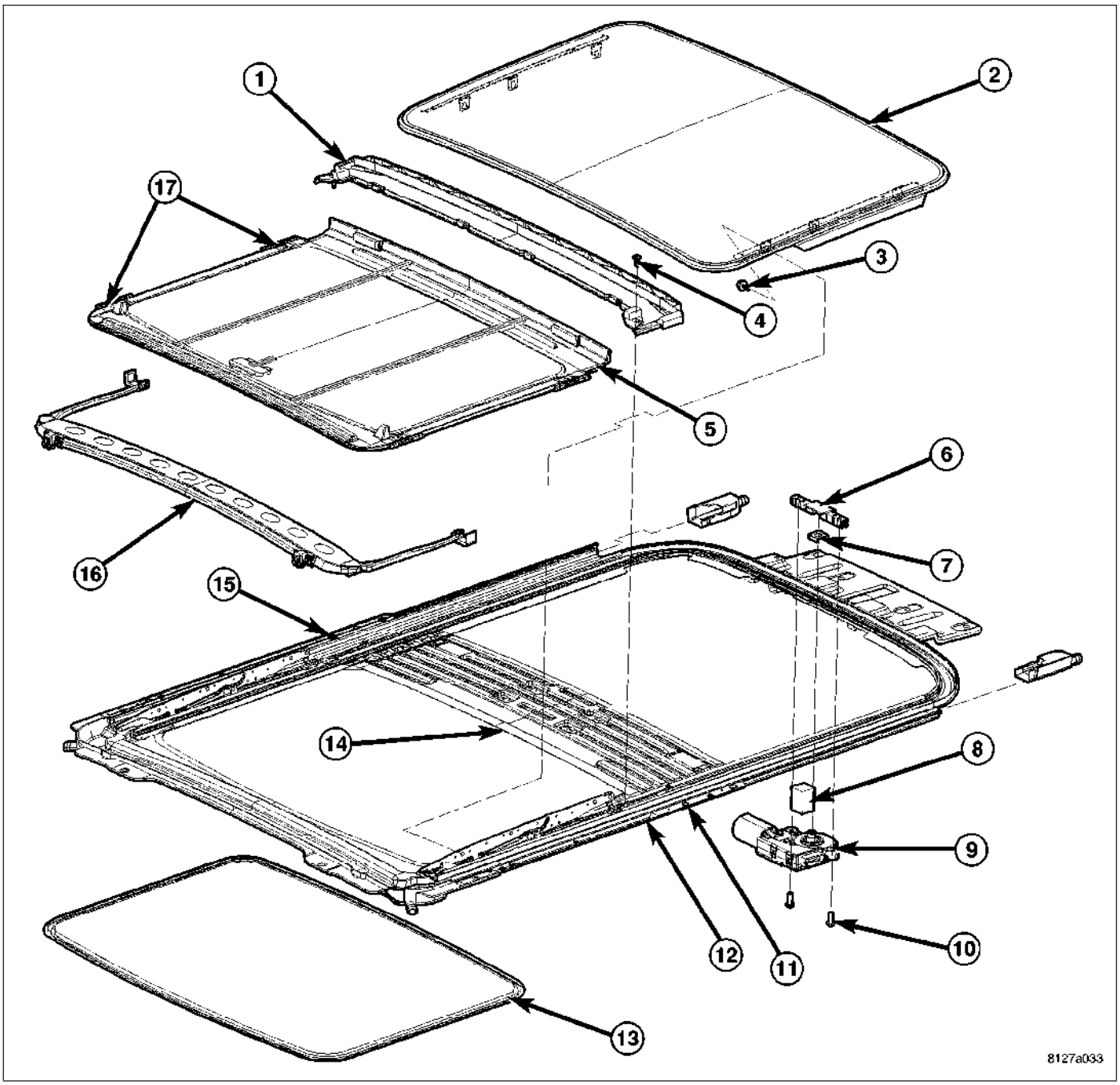


MOTOR

STANDARD PROCEDURE - INITIALIZATION

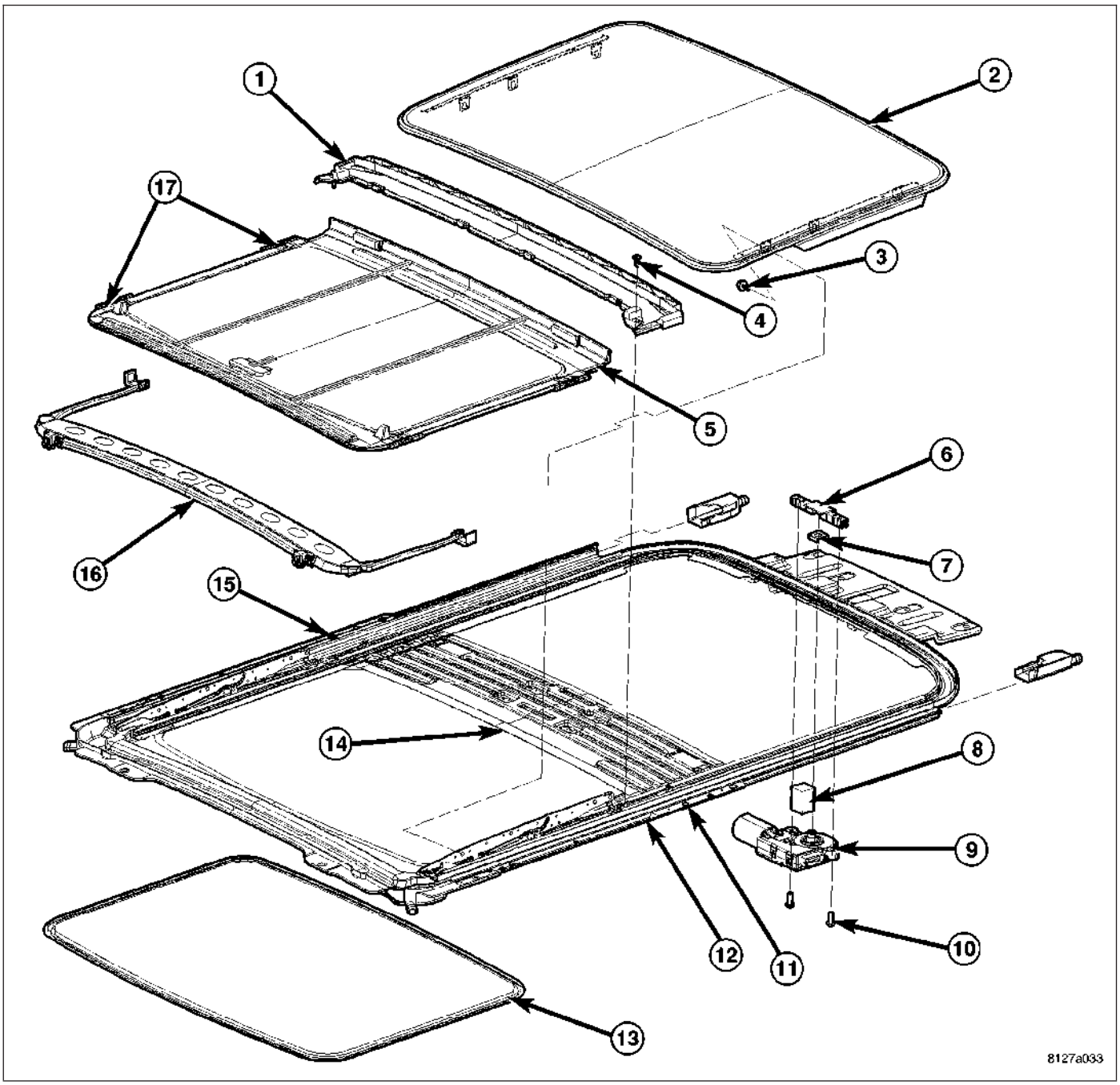
1. To initialize the motor, connect power to the sunroof.
2. Press the close-button until the glass panel has reached the full closed position.There will be a slight “kick” of the glass panel when initialization occurs if the glass panel starts in the full closed position.The “kick” is accompanied by a soft tick noise.

REMOVAL



1. Remove the sunroof (Refer to 23 - BODY/SUNROOF/MODULE ASSEMBLY - REMOVAL).
2. Remove the sunroof motor retaining screws (10) and remove motor (9).

INSTALLATION



CAUTION: THE SUNROOF MOTOR MUST BE TIMED WITH THE SUNROOF ASSEMBLY. FAILURE TO DO SO WILL RESULT IN IMPROPER SUNROOF OPERATION AND POSSIBLE LEAKAGE OR DAMAGE TO THE ASSEMBLY.

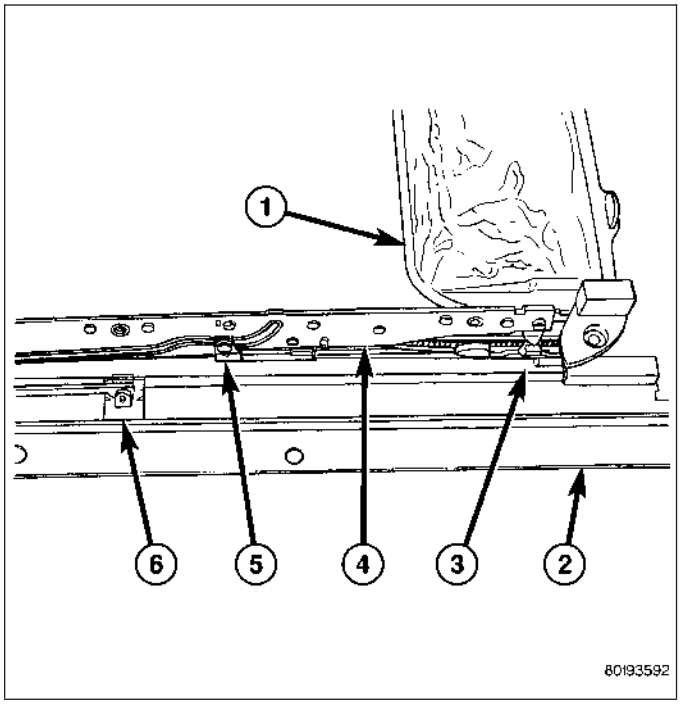
1. Assure proper sunroof motor timing before installation (Refer to 23 - BODY/SUNROOF/DRIVE MOTOR - ADJUSTMENTS).
2. Position the sunroof motor (9) to the sunroof assembly, install the retaining screws (10) and tighten to 4 N·m (40 in. lbs.).
3. Connect the timed sunroof assembly to a power source and initialize. (Refer to 23 - BODY/SUNROOF/DRIVE MOTOR - STANDARD PROCEDURE - INITIALIZATION)
4. Assure proper operation before installing the sunroof assembly into the vehicle.

ADJUSTMENTS

ADJUSTMENT

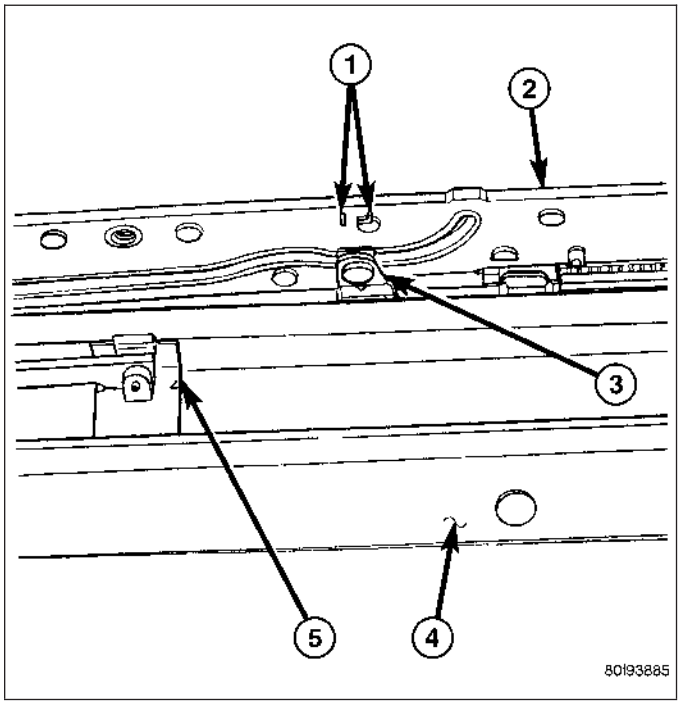
CAUTION: There is no adjustment available for a normally operating sunroof. This procedure is used to set sunroof motor to sunroof assembly timing before the motor is installed in the assembly.

1. Manually push the sunroof guide assembly (4) to the full forward position until it is locked into position. This is verified by attempting to push the guide assembly rearward.

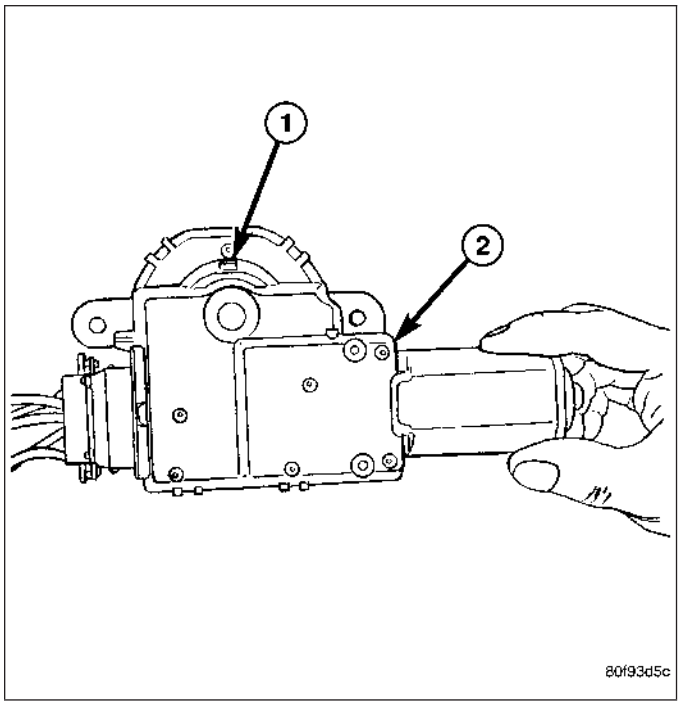


NOTE: The guide rail (2) will be raised above the U-frame assembly (4) when in the lock position.

2. Remove the sunroof glass (Refer to 23 - BODY/ SUNROOF/GLASS PANEL - REMOVAL).
3. Manually move the guide pivot (3) inside the guide cam slot until it is centered between the etched timing marks (1) on both rails on both the left hand and right hand side rails.

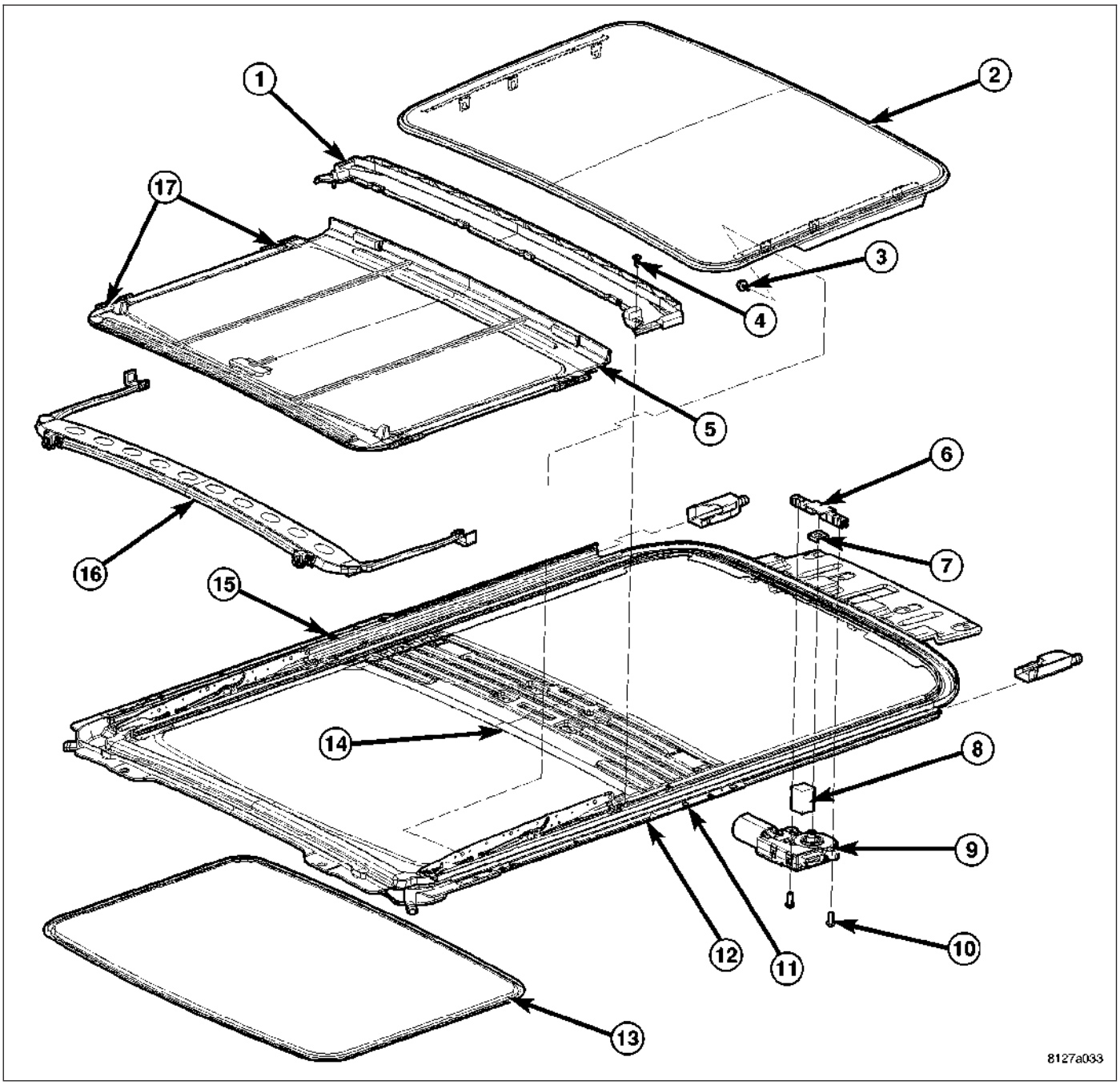


4. Verify that the white marking is visible in the new motor window (1). If the mark is not visible, connect a power source to the motor and cycle the 'close' button until the motor is in the closed position (indicated by the white mark in the window).
5. Install the sunroof motor and verify proper sunroof operation (Refer to 23 - BODY/SUNROOF/DRIVE MOTOR - INSTALLATION).
6. Install the sunroof glass, leaving the retaining bolts loose.
7. Install the sunroof assembly into the vehicle (Refer to 23 - BODY/SUNROOF/MODULE ASSEMBLY - INSTALLATION).
8. Flush the sunroof glass into the vehicle roof opening and check sunroof glass alignment (Refer to 23 - BODY/SUNROOF/GLASS PANEL - ADJUSTMENTS).



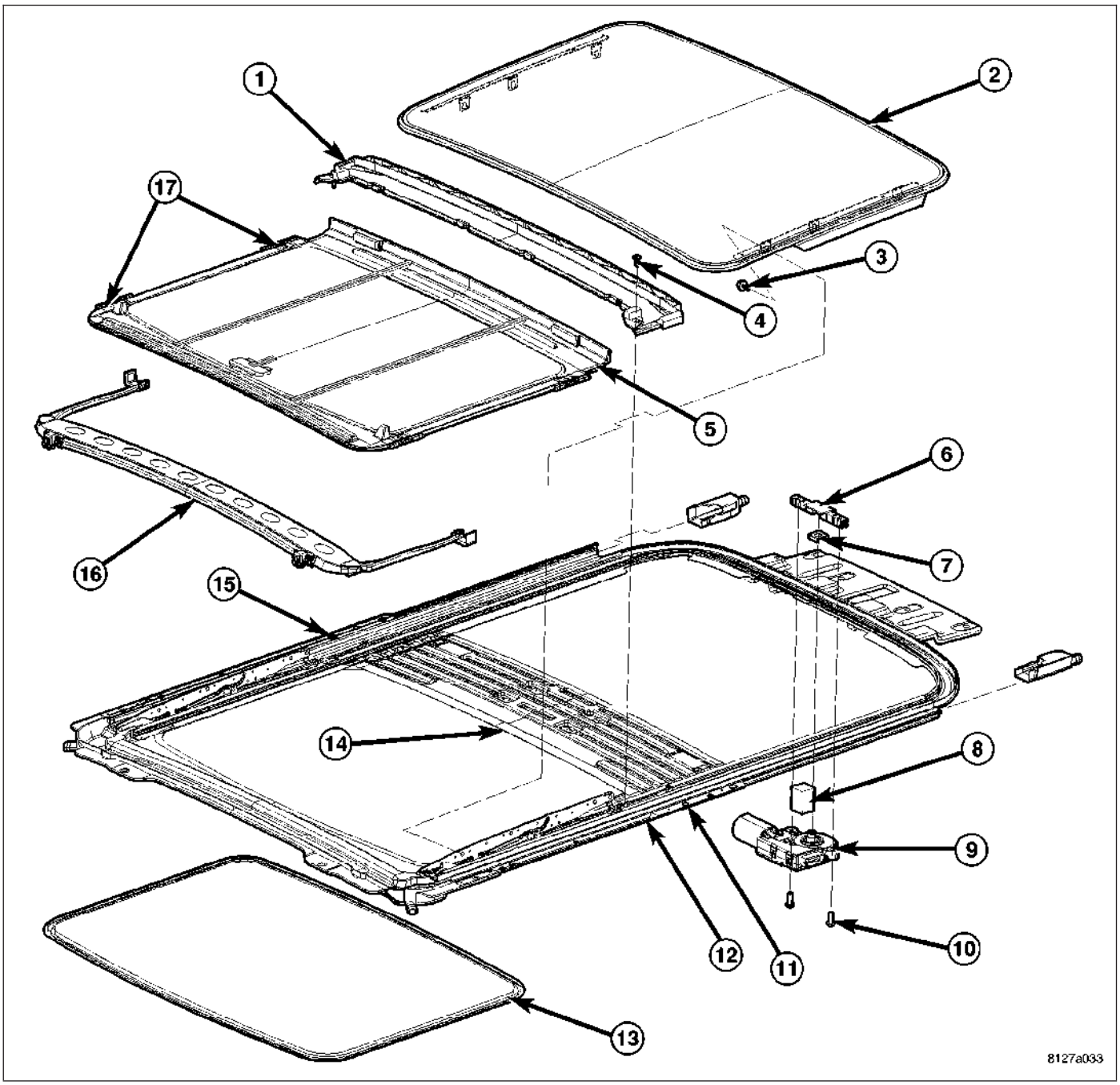
GLASS

REMOVAL



1. Move the glass panel (2) to the vent position.
2. Slide sunshade (5) rearward to the open position.
3. Remove the glass panel screws (3).
4. Lift off glass panel (2) and remove from vehicle.

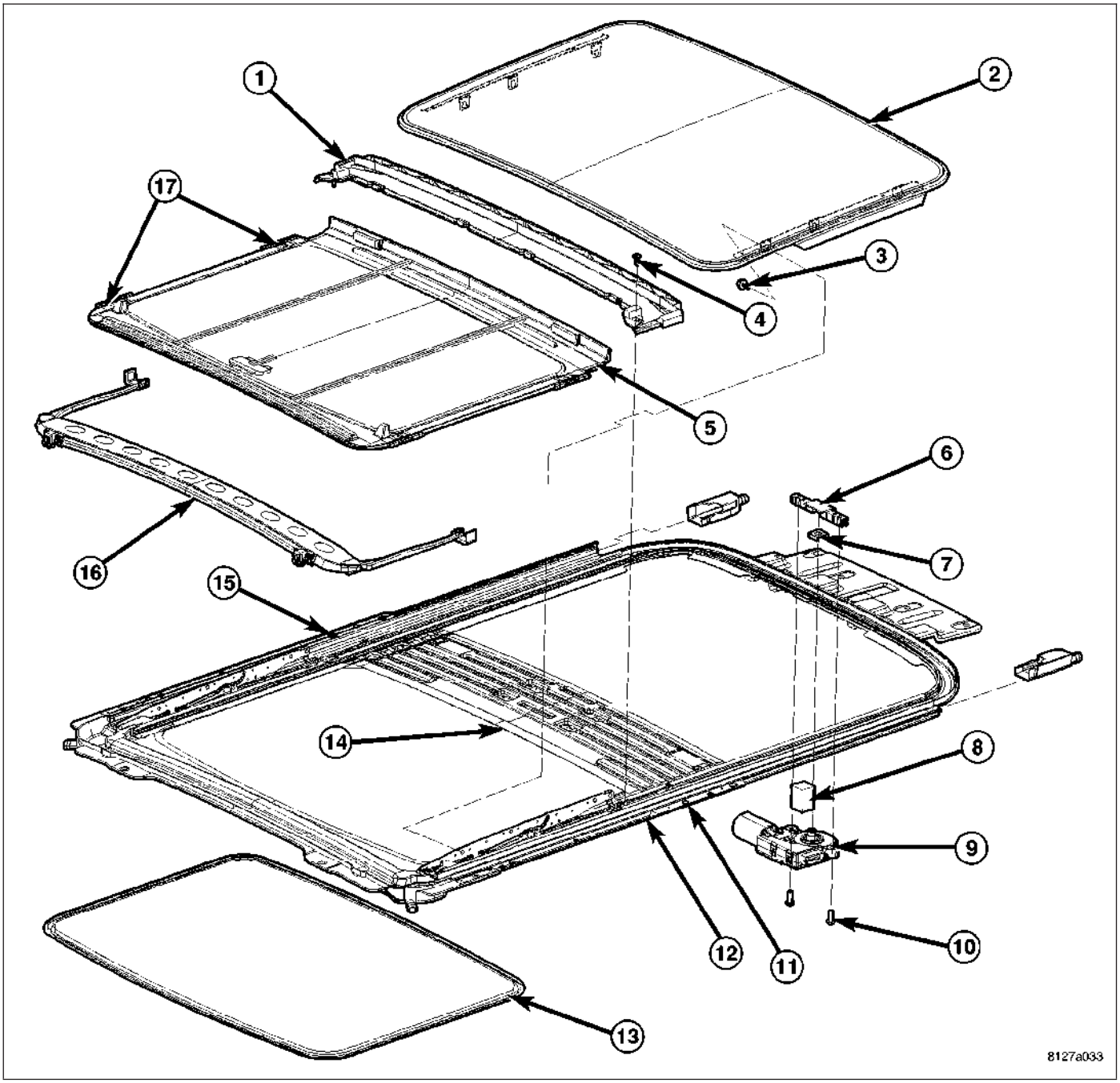
INSTALLATION



1. Position glass panel (2) on to mechanism lift arms.
2. Start the attaching screws (3).
3. Connect a 12v power supply and move the sunroof to the vent position then to the closed position.
4. Adjust sunroof glass (2) to fit flush with roof line (Refer to 23 - BODY/SUNROOF/GLASS PANEL - ADJUSTMENTS).
5. Tighten the screws (3).
6. Verify sunroof operation and alignment.

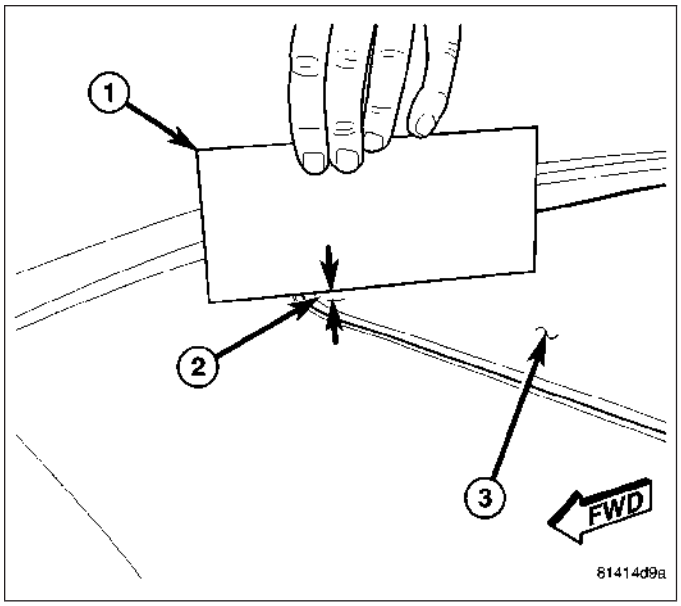
ADJUSTMENTS

SUNROOF GLASS PANEL ADJUSTMENT

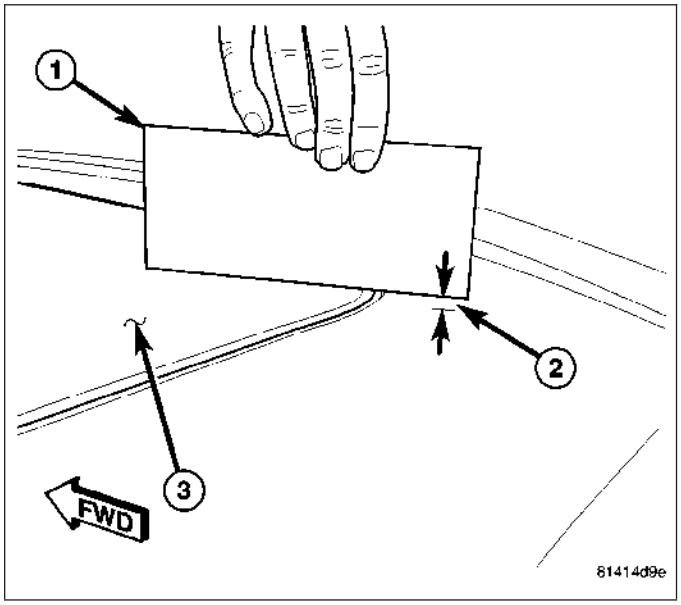


1. Move the sunshade (5) rearward to the open position.
2. Move the sunroof glass panel (2) to the fully closed position.
3. Loosen all glass attachment screws on both sides of the module such that the glass panel is adjustable in the vertical and fore-aft directions.
4. Cycle the sunroof open, closed, vent and closed again.

5. Standing outside the vehicle (one side at a time with one hand supporting the front corner of the glass panel) lift the front glass panel corner (3) until it is between flush and slightly under flush (0.00 to - 1.75 mm) with the front roof corner (2). User your free hand to snug up the glass bolt with sufficient force (finger tight) that the weight of the glass panel corner is supported. Repeat this process on the other side of the vehicle.



6. Move to the rear of the sunroof glass panel. Standing outside of the vehicle (one side at a time with one hand supporting the rear corner of the glass panel) lift the rear glass panel corner (3) until it is between flush and slightly over flush (0.00 to +1.75mm) with the rear roof corner (2). Use your free hand to snug up the glass bolt with sufficient force (finger tight) that the weight of the glass panel corner is supported. Repeat this process on the other side of the vehicle.
7. Check the flushness of the glass panel in the corners with a business card (1) (or other straight edged tool that won't scratch the glass or roof) held at a 45 degree angle to the vehicle's for/aft centerline. The preferred glass panel placement for blockage of wirer/air leaks is flush at all the corners. If this is not possible, adjust the glass panel's vertical placement within the tolerance ranges described above towards the flush position.

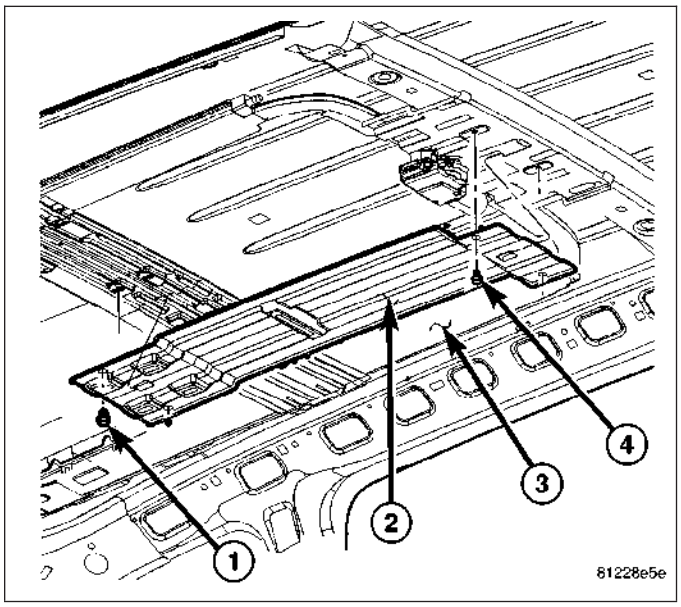


8. If the glass panel's vertical position needs to be adjusted, loosen the bolt at the corner and make the necessary adjustments. Tighten the bolt before moving onto the next corner.
9. Once the proper glass position has been achieved, tighten the six glass panel attaching screws to 3.5 N·m (31 in. lbs.).
10. Check for proper fit. If not OK, repeat glass panel adjustment.

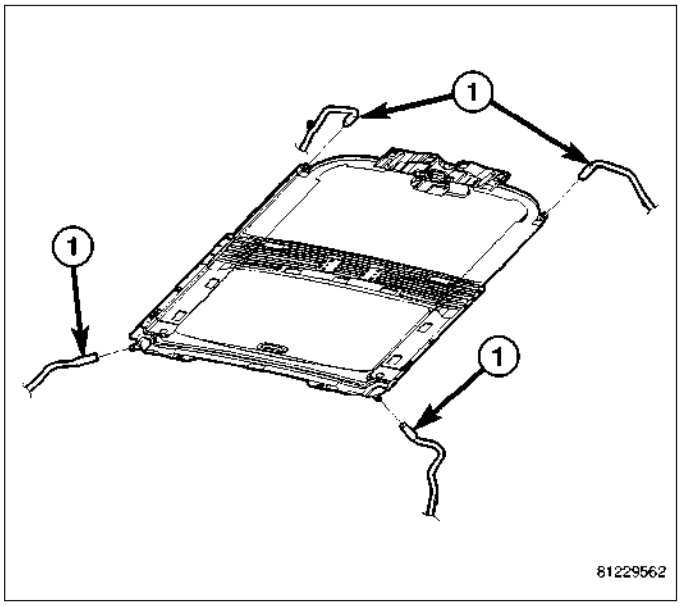
ASSEMBLY-MODULE

REMOVAL

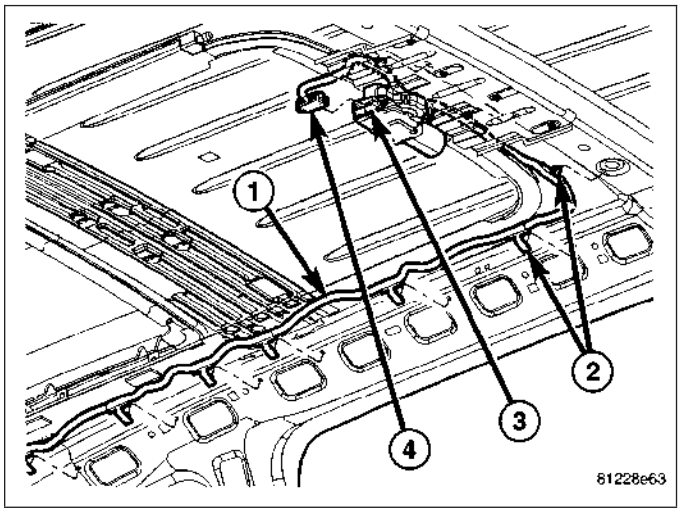
1. Move glass panel to the fully closed position.
2. Disconnect and isolate the battery negative cable.
3. Remove headliner (Refer to 23 - BODY/INTERIOR/ HEADLINER - REMOVAL).
4. Remove the bolts (1 & 4) and remove the video display support bracket, if equipped.

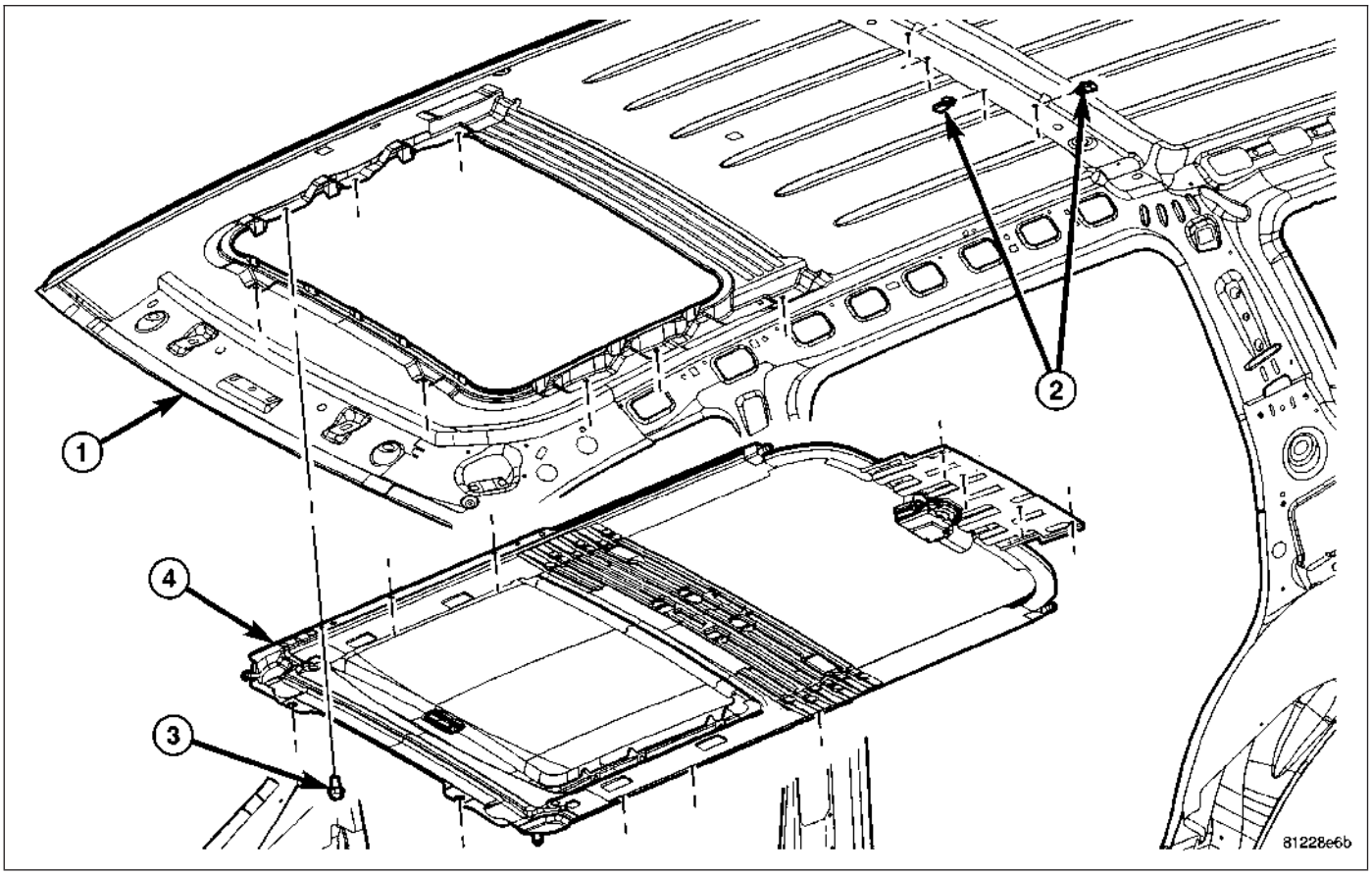


5. Disconnect the four drain tubes (1) from sunroof housing.



6. Disconnect the sunroof wire harness (1) electrical connector (3) and (4).

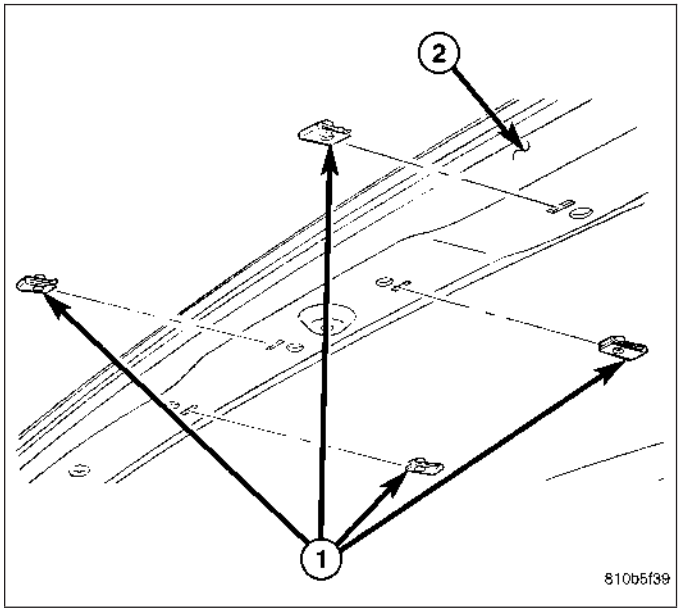


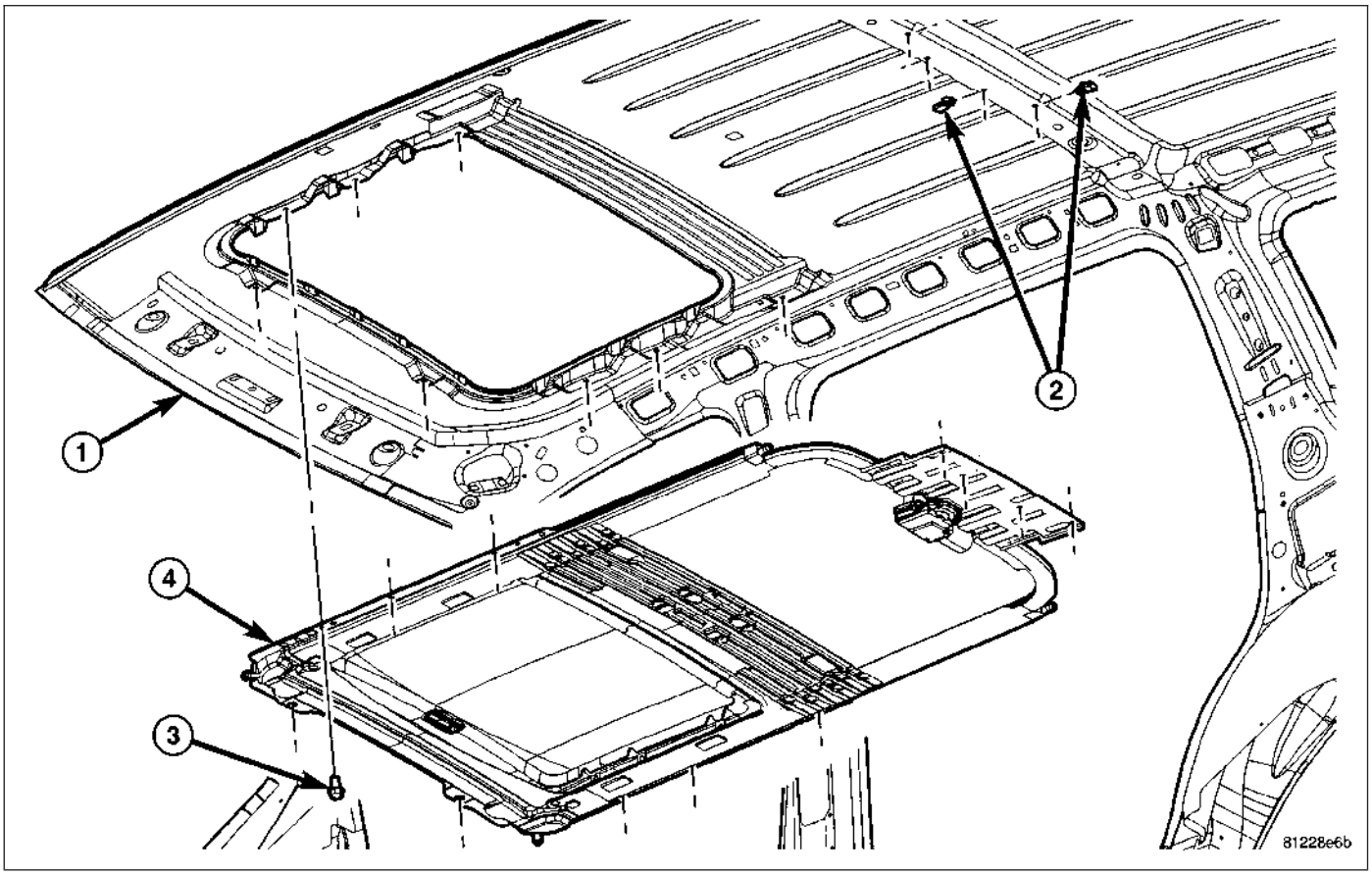


7. Loosen fasteners (3) attaching sunroof assembly.
8. With the aid of a helper, support the sunroof and remove the fasteners attaching sunroof assembly (4) to roof panel (1).
9. Remove the sunroof (4) from vehicle.

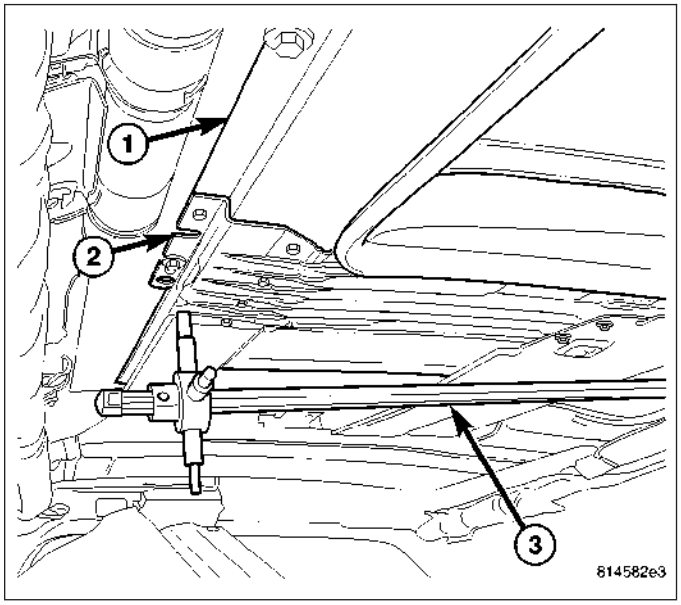
INSTALLATION

1. Verify that u-nuts (1) are in position in the roof bow #2 (2).
2. Verify that glass panel is loose and slightly retracted.

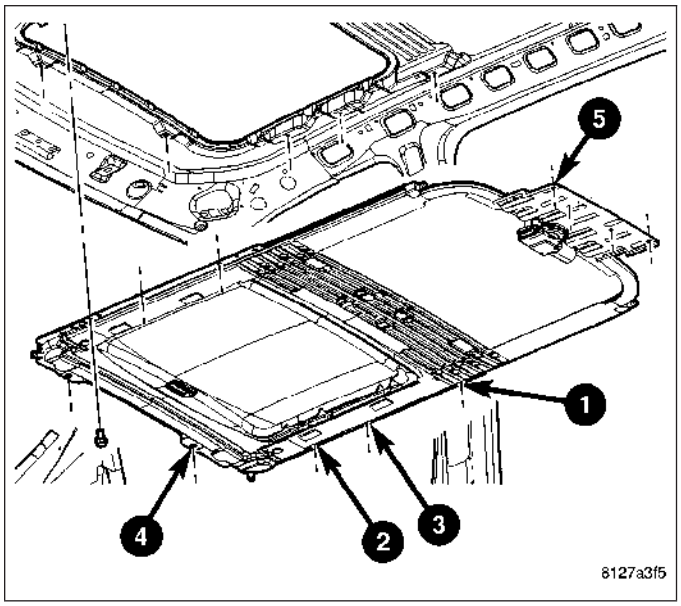




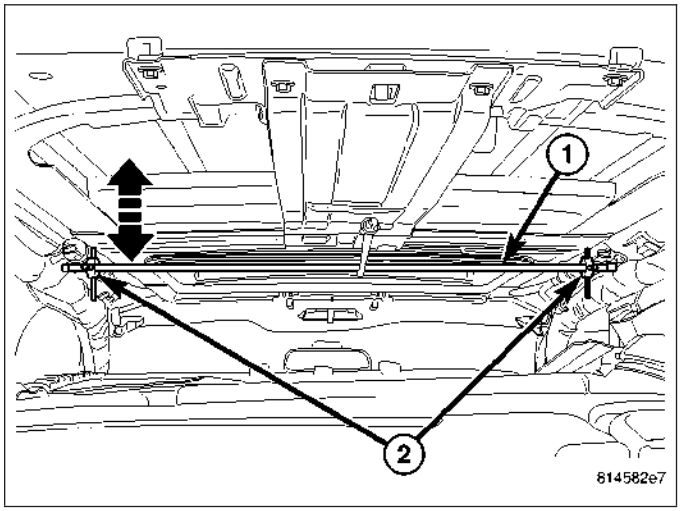
3. Raise sunroof module assembly (4) and guide it carefully into position.
4. While supporting the sunroof assembly, start the 12 attaching screws, three along each side rail, two along the front trough and four along the motor bracket.
5. Position special tool # 9582 pins (3) through the locating holes (2) and confirm the module assembly (1) is properly aligned.



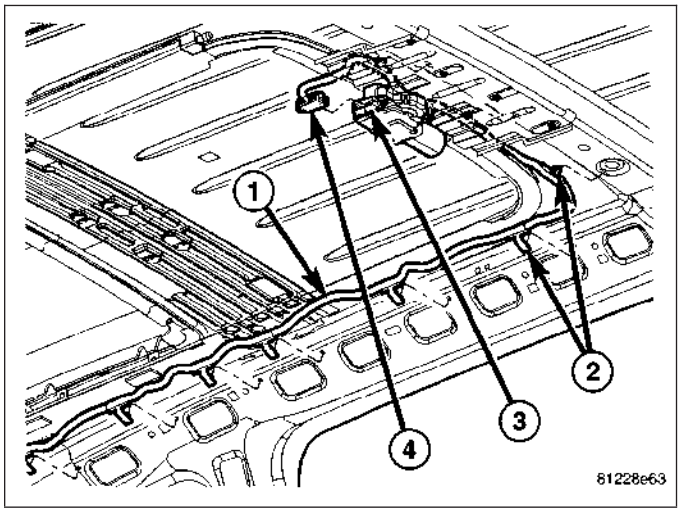
6. Tighten the attaching screws to 6 N·m (53 in. lbs.) using the sequence shown.



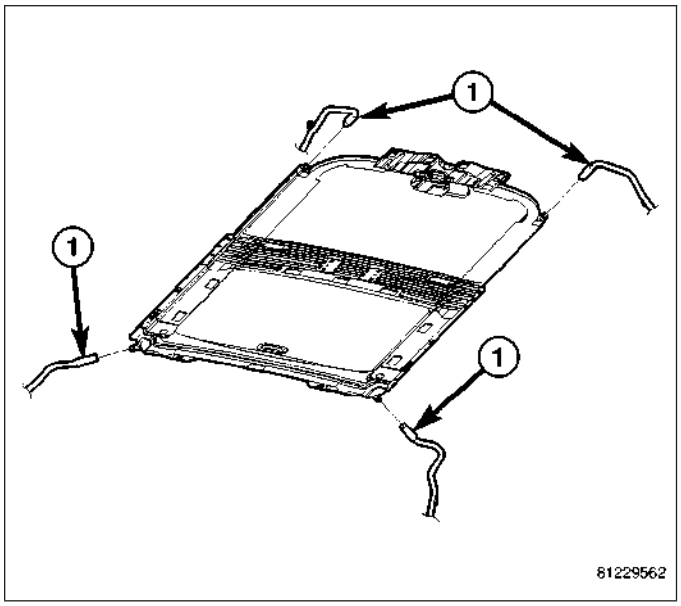
7. Remove the alignment tool (1) from the alignment holes (2).



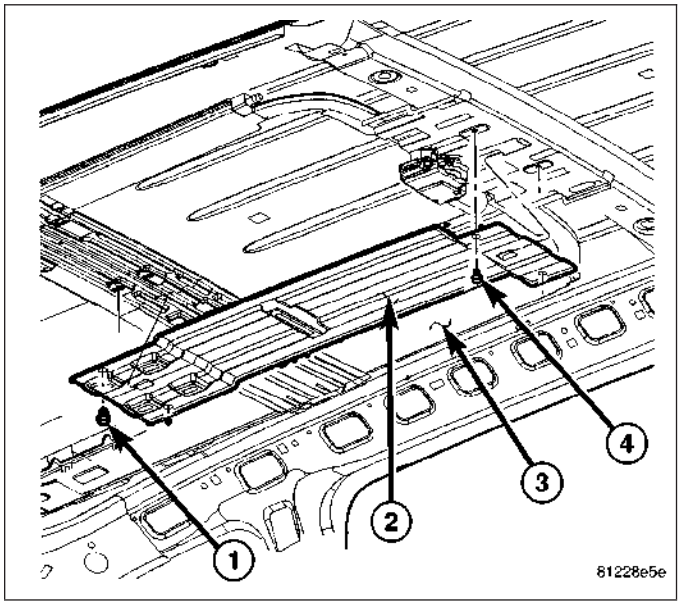
8. Connect the electrical connector (4).



9. Connect the drain tubes to the sunroof (1).



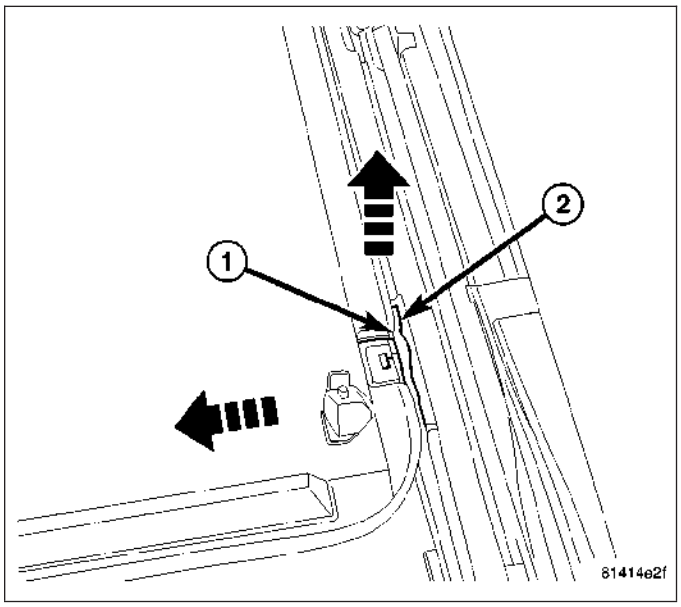
10. Position the video display support bracket (2), if equipped, and install the bolts (1 & 4). Tighten the bolts to 6 N·m (53 in. lbs.).
11. Connect battery negative cable.
12. Test sunroof operation, adjust if necessary. (Refer to 23 - BODY/SUNROOF/GLASS PANEL - ADJUSTMENTS)
13. Install headliner. (Refer to 23 - BODY/INTERIOR/ HEADLINER - INSTALLATION)



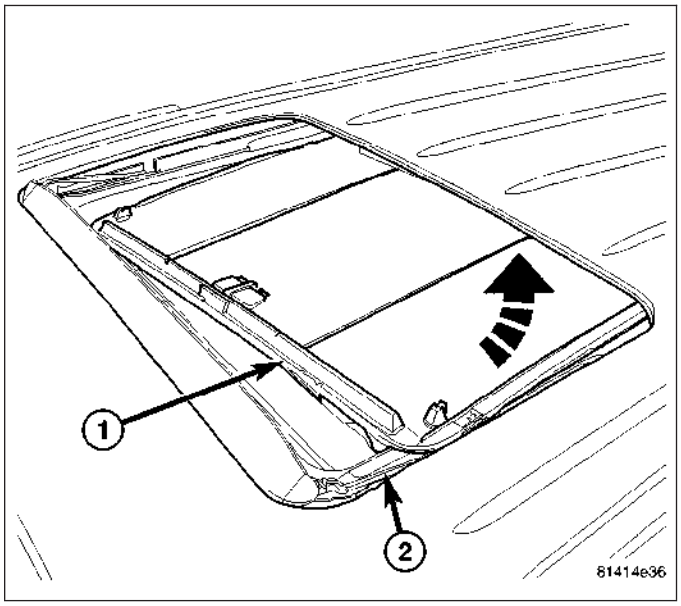
SUNSHADE

REMOVAL

1. Remove the water channel. (Refer to 23 - BODY/ SUNROOF/WATER CHANNEL - REMOVAL)
2. Cycle sunroof motor (9) to the open position.
3. Move sunshade (5) towards the closed position stopping three to four inches from the closed position.
4. Depress the spring feet clips (1) in the cross car direction on one side of the sunshade by applying a side-load to the shade while pulling up at the front centerline of the sunshade. This will cause one spring feet clip (1) to pop out of the track.

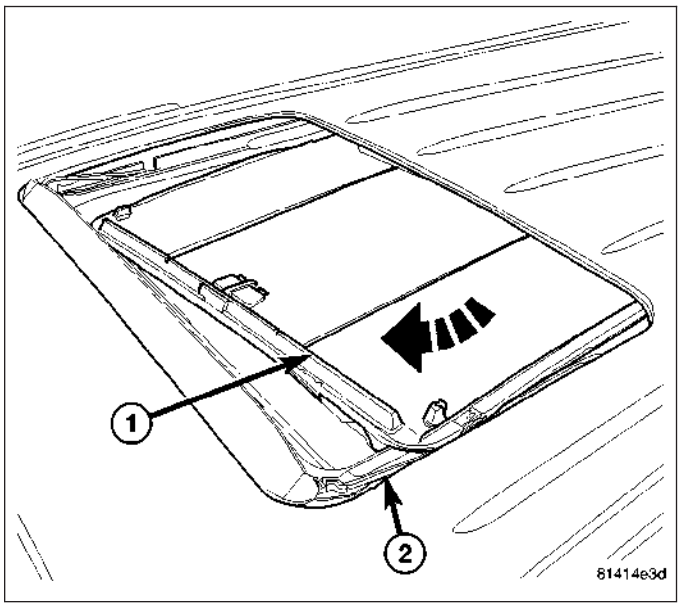


5. Remove the other front foot by rotating the shade (1) out and the foot resting on the top of the sunroof frame (2).
6. Pull the shade farther forward in the vehicle and repeat the previous step to remove the rear spring feet.
7. Remove the sunshade (2).

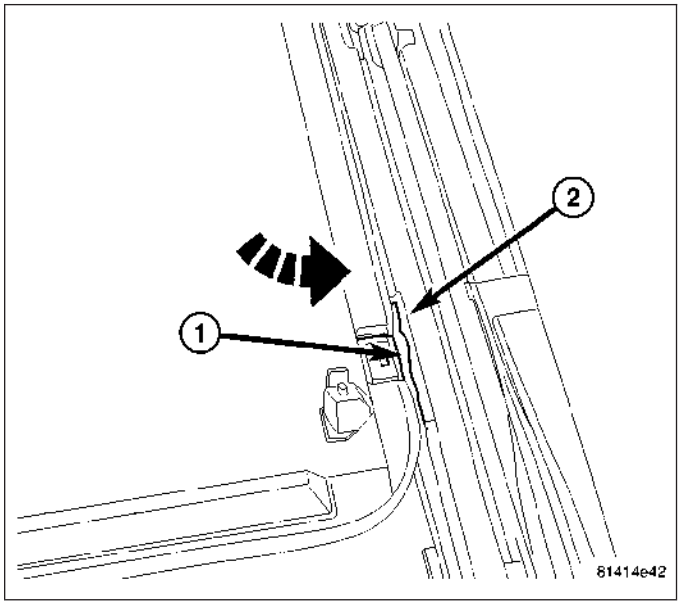


INSTALLATION

1. Place one side of the sunshade (1) spring feet clips into the top track U-frame (2).

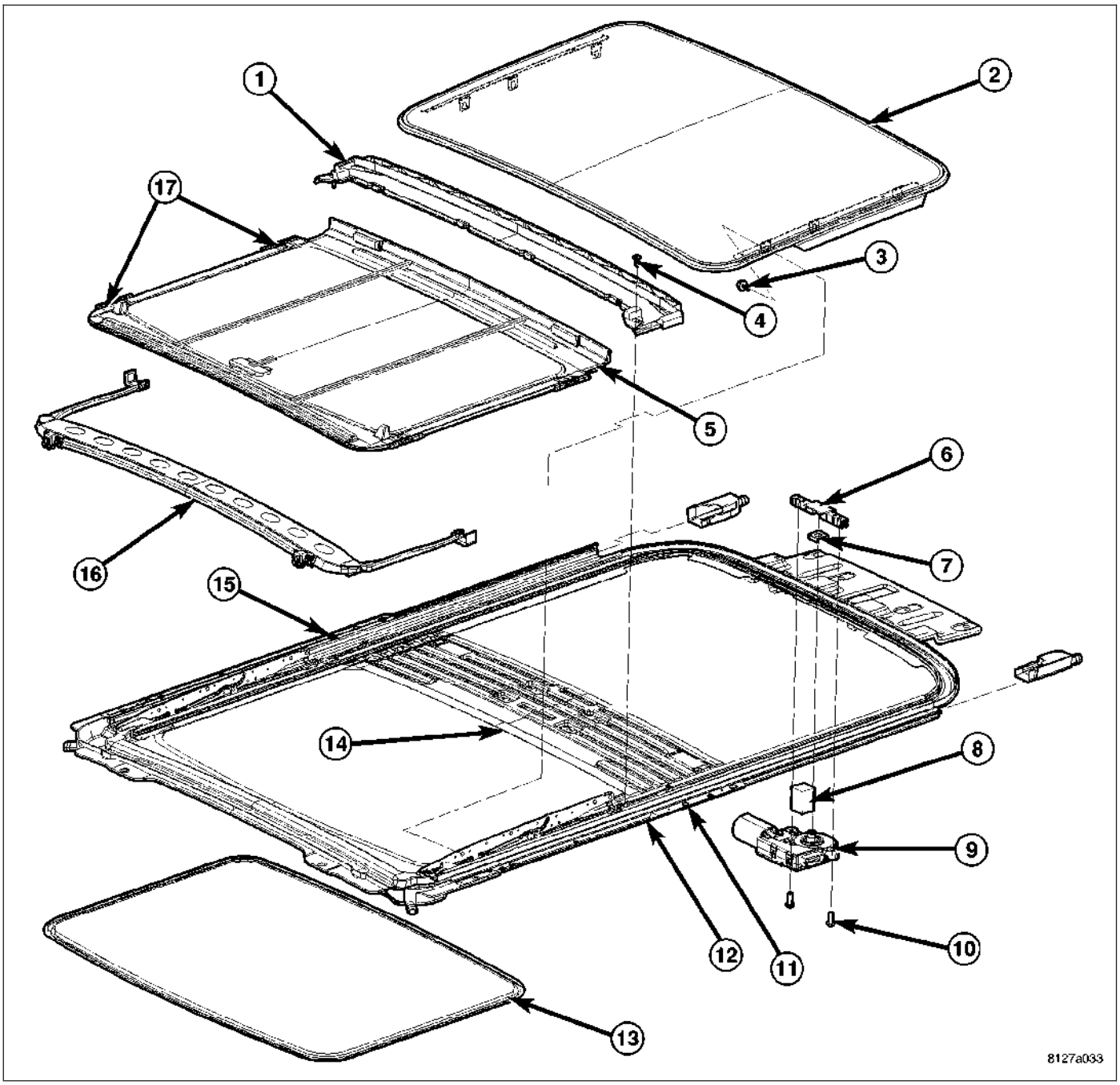


2. Depress the both releasing clips (1) on the other side to allow them to go into the top track of the U-frame (2).
3. Move sunshade to the open position.
4. Verify that the sunshade moves back and forth properly.
5. Cycle sunroof towards the closed position.
6. Position the sunshade so that the handle is in the center of the opening.
7. Install the water channel. (Refer to 23 - BODY/ SUNROOF/WATER CHANNEL - INSTALLATION)



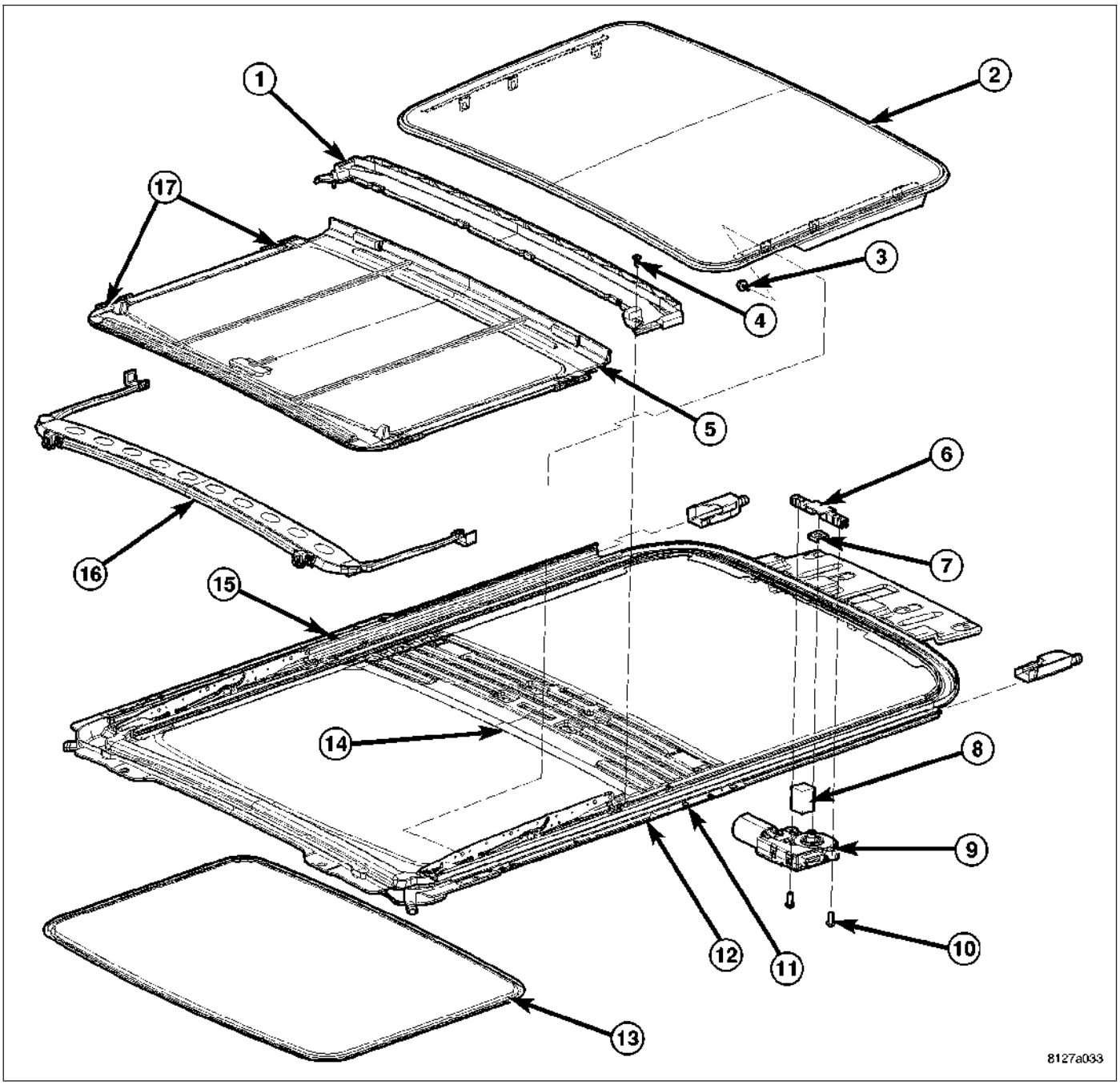
CHANNEL-DRAIN

REMOVAL



1. Remove glass panel (2). (Refer to 23 - BODY/SUNROOF/GLASS PANEL - REMOVAL)
2. Remove the retaining screws (4).
3. Carefully slide water channel (1) forward to release tabs from U-frame (12) and remove from vehicle.

INSTALLATION



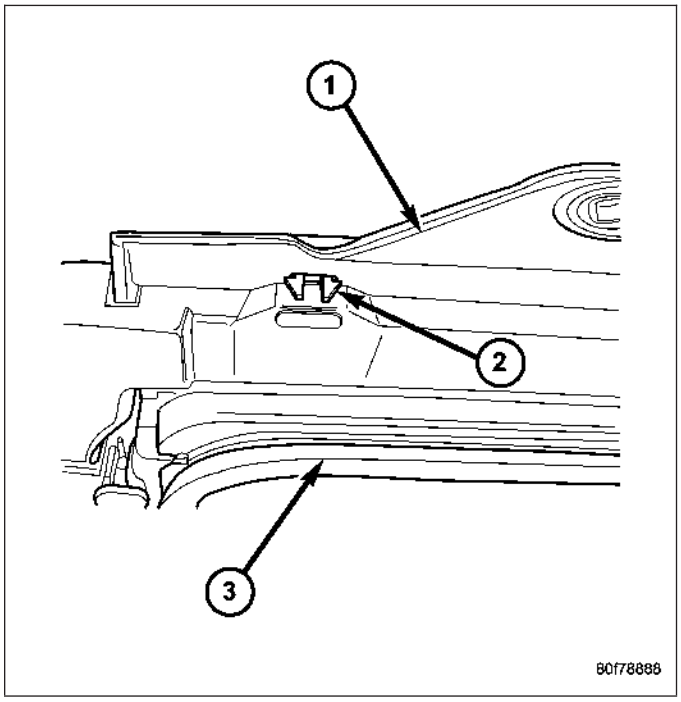
1. Carefully place water channel (1) onto U-frame (12) and slide it rearward to lock tabs.
2. Install the water channel attaching screws (4) drivers side first then passenger side.
3. Tighten the screws to 1.5 N·m (12 in. lbs.).
4. Position glass panel (1) on to mechanism lift arms.
5. Start the glass attaching screws (3), and hand tighten.
6. Adjust sunroof glass (Refer to 23 - BODY/SUNROOF/GLASS PANEL - ADJUSTMENTS).
7. Verify sunroof operation and alignment.

DEFLECTOR-WIND

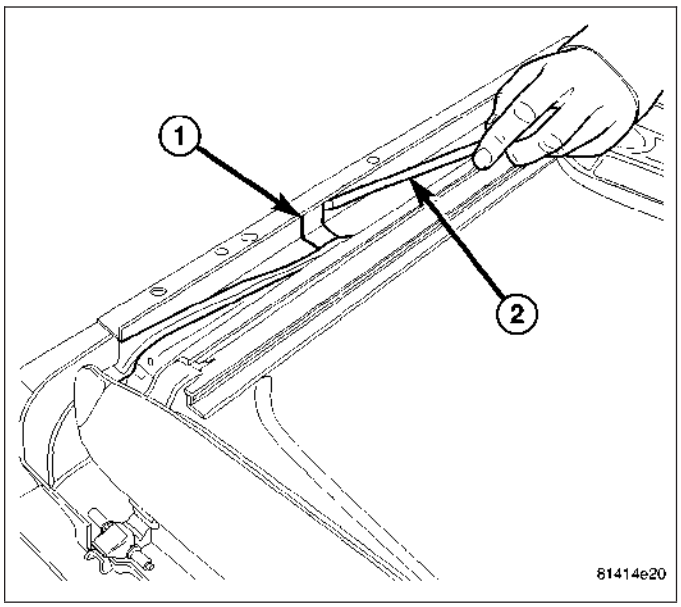
REMOVAL

Including front hinges:

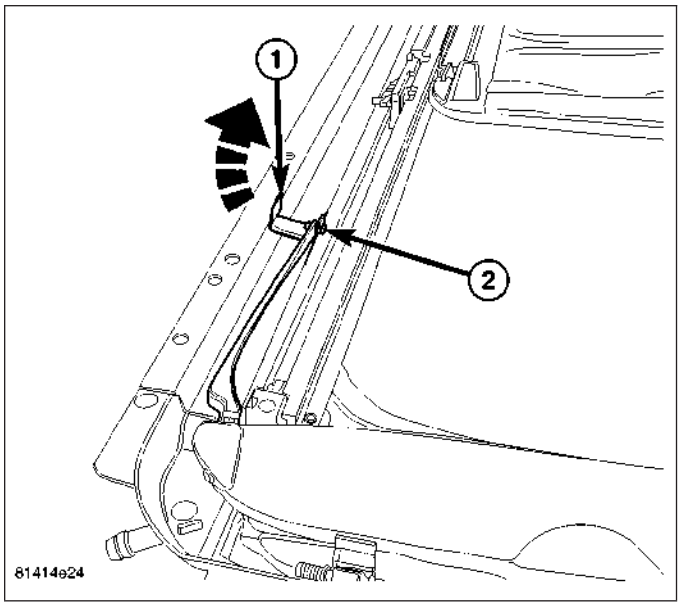
1. Fully open sunroof glass panel.
2. Remove sunroof assembly (1). (Refer to 23 - BODY/SUNROOF/MODULE ASSEMBLY - REMOVAL)
3. Depress the front deflector retaining tabs (2).



4. Using a small flat bladed tool (2) or equivalent, release the both hinges (1) from the u-frame track.*Right side hinge shown, left similiar.

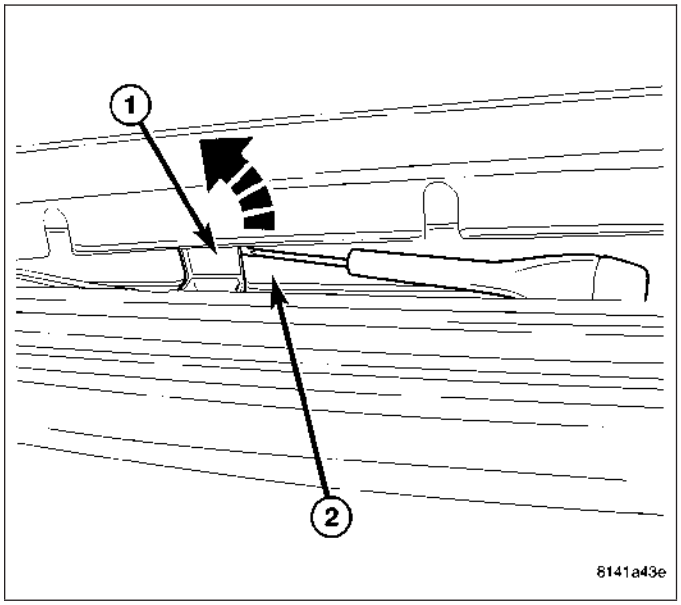


5. Rotate the hinge feet (1) up and out of the u-frame (2) and remove wind deflector.*Right side hinge shown, left similiar.

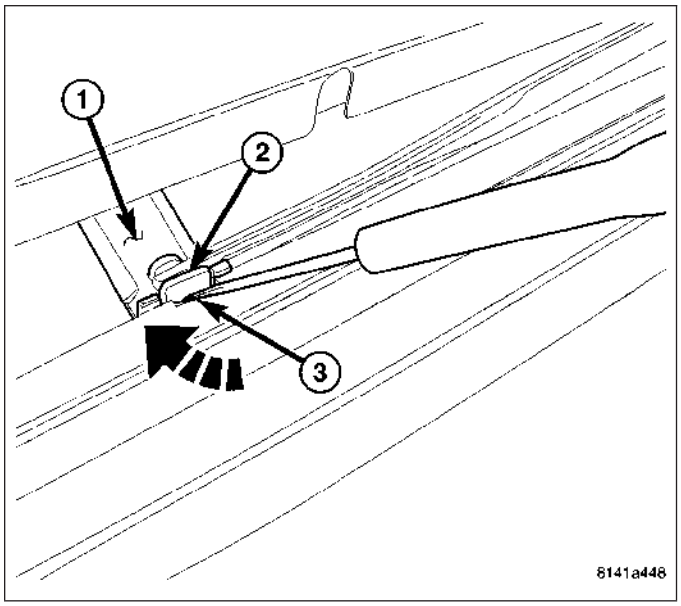


Without front hinges:

1. Using a small flat bladed tool (2) or equivalent, release the both hinges (1) from the u-frame track.*Right side hinge shown, left similiar.

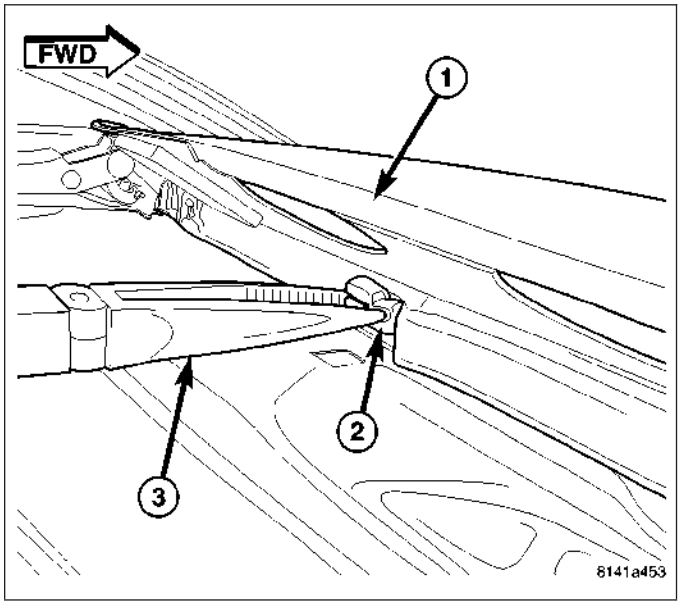


2. Using a small flat bladed tool or equivalent, release the inner locking tab (2) portion of the hinges from the u-frame tracks (3) and separate the hinges (1) from the track.

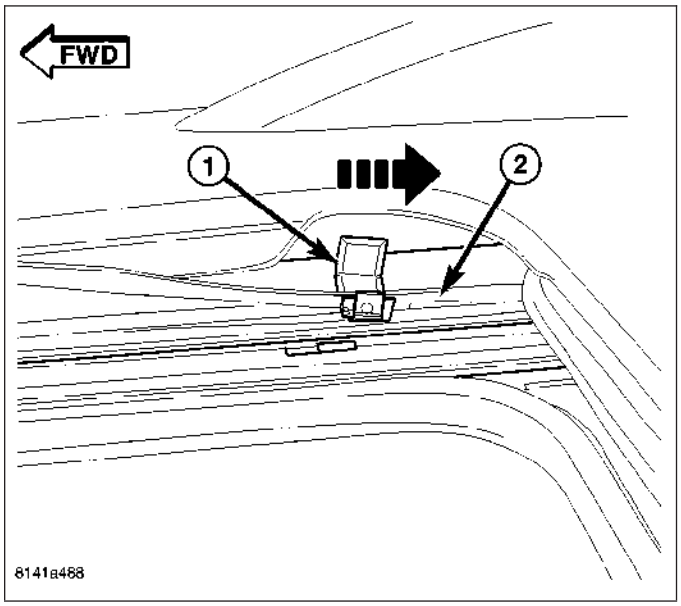


NOTE: Placing a small rolled up piece of paper or equivalent, between the hinge and the sunroof opening may aid installation of the wind deflector.

3. Using needle-nose pliers (3) squeeze the retaining tabs on the forward hinges (2) and separate the wind deflector (1) from the hinges.



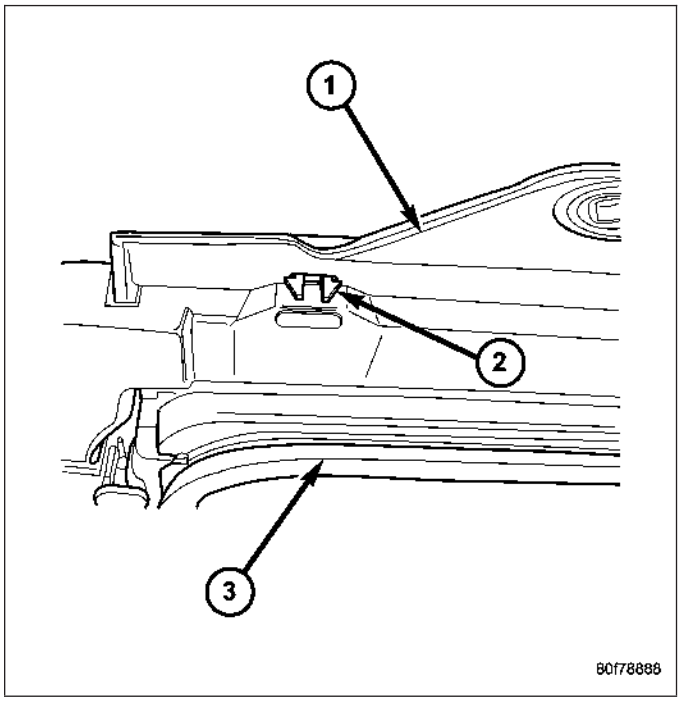
4. Slide the wind deflector assembly (1) rearward to the back of the roof opening (2) and remove.



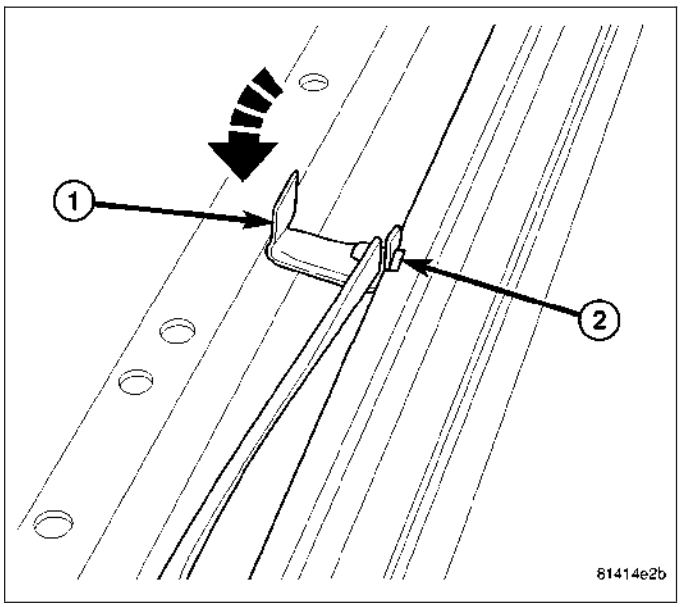
INSTALLATION

Including front hinges:

1. Position the spring arms down into the trough.
2. Place wind deflector arms in upward position engage the wind deflector blade into the u-frame.
3. Seat the retaining clips (2) fully.

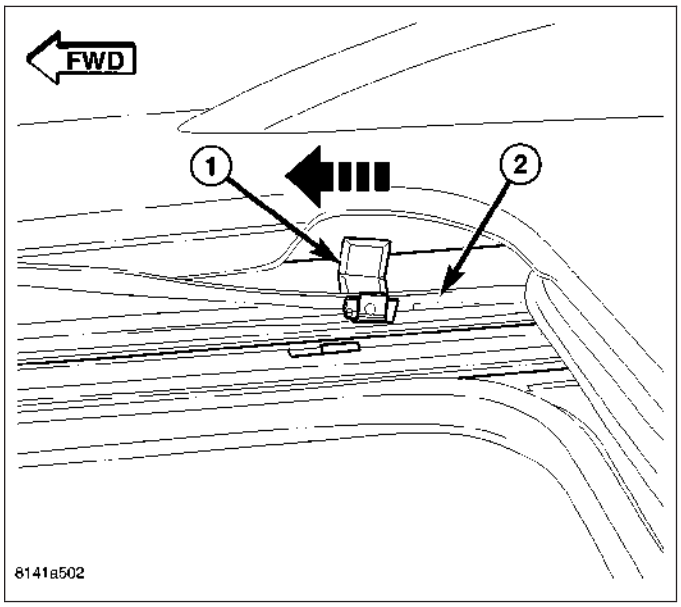


4. Position the wind deflector hinges (1) into the u-frame at the notch (2) and secure down into the channel fully.*Right side hinge shown, left side similar.
5. Verify wind deflector operation.
6. Install the sun roof assembly (Refer to 23 - BODY/ SUNROOF/MODULE ASSEMBLY - INSTALLATION).



Without front hinges:

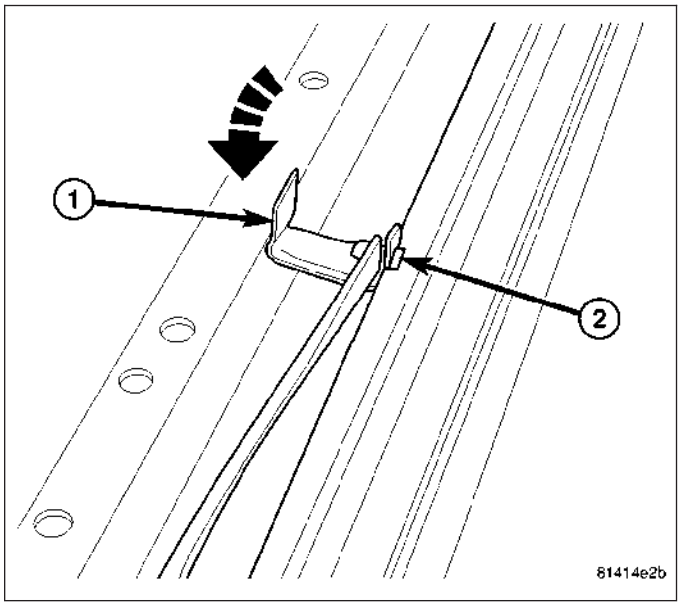
1. Position wind deflector assembly (1) into the roof opening (2) and slide forward to the mounting point in the u-frame.



2. Position the wind deflector hinges (1) into the u-frame at the notch (2) and secure down into the channel fully.*Right side hinge shown, left side similar.

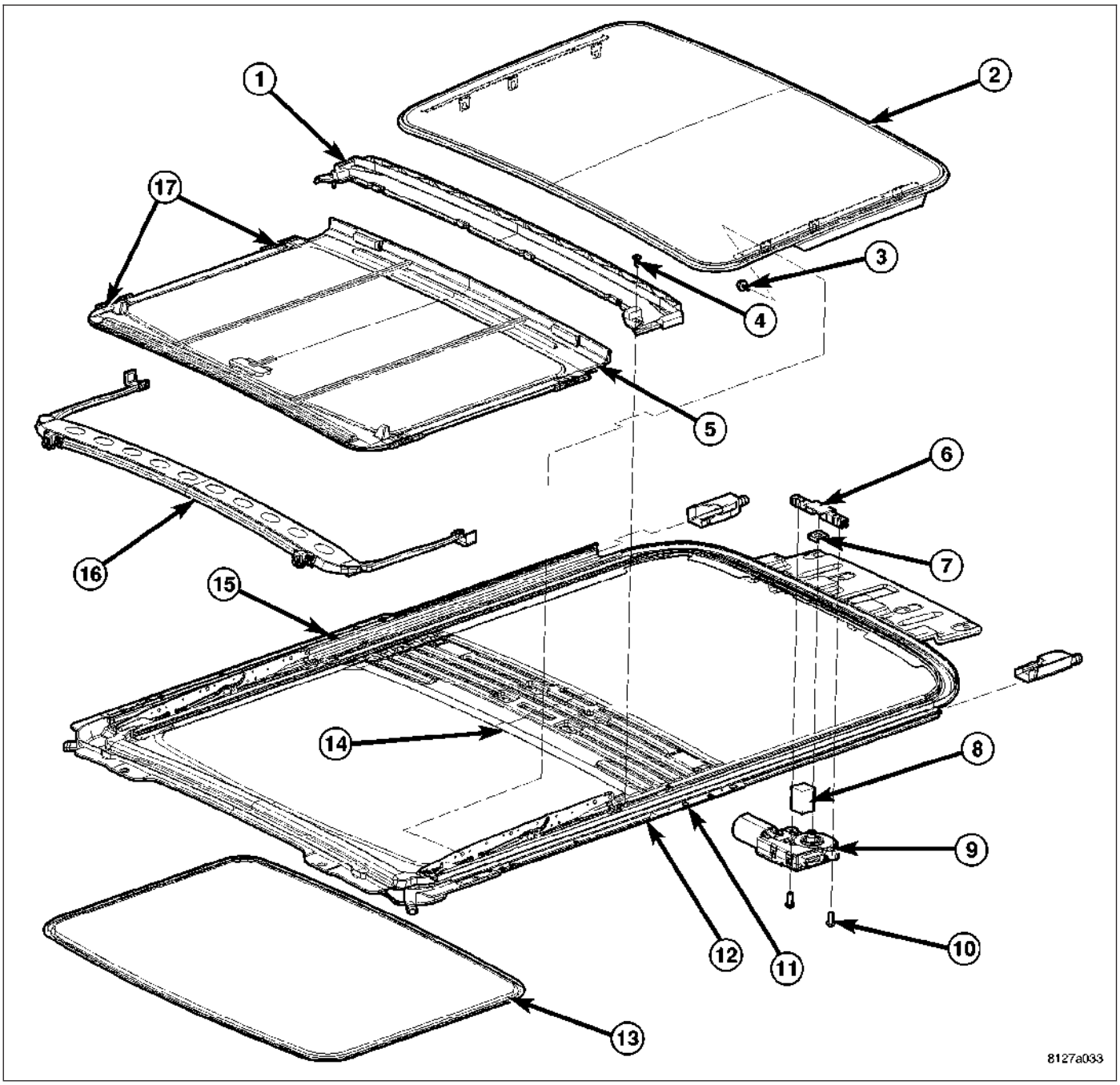
NOTE: Placing a small rolled up piece of paper or equivalent, between the hinge and the sunroof opening may aid installation of the wind deflector.

3. Position the front of the wind deflector over the front hinges and seat down onto the retaining clips fully.



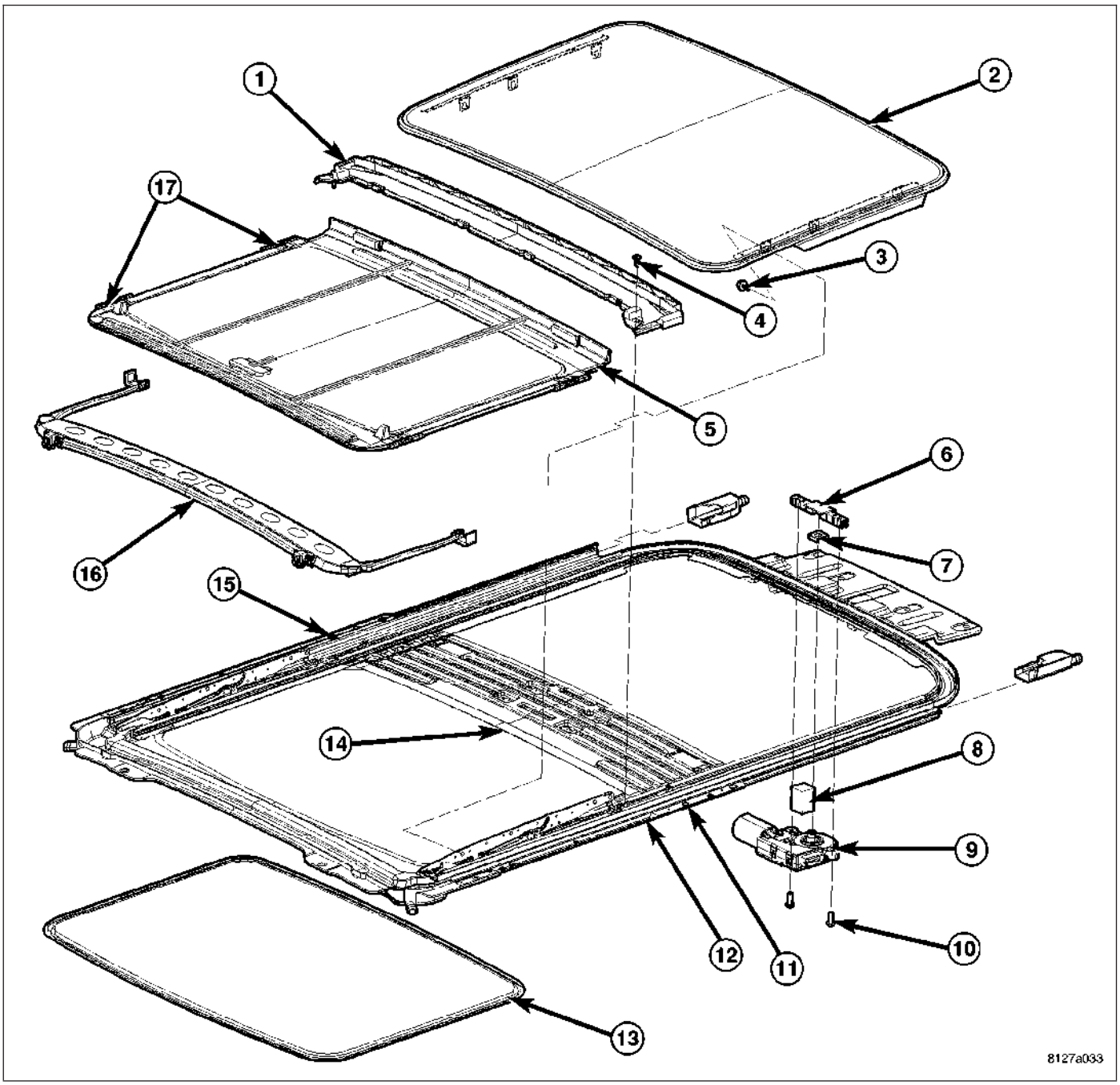
TRIM LACE

REMOVAL



1. Remove trim lace (13) by holding one end of the trim lace at the butt joint and pulling horizontally into the opening until lace is completely loose from the headliner/sunroof joint.

INSTALLATION



1. Place butt joint of trim lace into position starting at the rear of the opening at the butt joint notch (14) in the u-frame.
2. Push lace into position.
3. Ensure that the corner radii is fully engage.
4. Once the original trim lace is attached to sunroof module using a trim stick C-4755 or equivalent, begin tucking the headliner under the lip on the trim lace working all the way around the opening. When installing a new trim lace, begin tucking the headliner under the lip as the tear cord is removed working all the way around the opening.

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WEATHERSTRIP-FRONT DOOR GLASS RUN

REMOVAL

1. Remove glass. (Refer to 23 - BODY/DOOR - FRONT/DOOR GLASS - REMOVAL)
2. Pull the glass run weatherstrip and run channels from the window opening.
3. Pull the glass run weatherstrip from the run channels.

INSTALLATION

1. Install the glass run weatherstrip into the window opening and the run channels.
2. Install glass. (Refer to 23 - BODY/DOOR - FRONT/DOOR GLASS - INSTALLATION)

WEATHERSTRIP-FRONT DOOR BELT INNER

REMOVAL

1. Remove trim panel. (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - REMOVAL)
2. Peel seal from door pinch weld.

INSTALLATION

1. Slide seal into position on door.
2. Install the trim panel. (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - INSTALLATION)

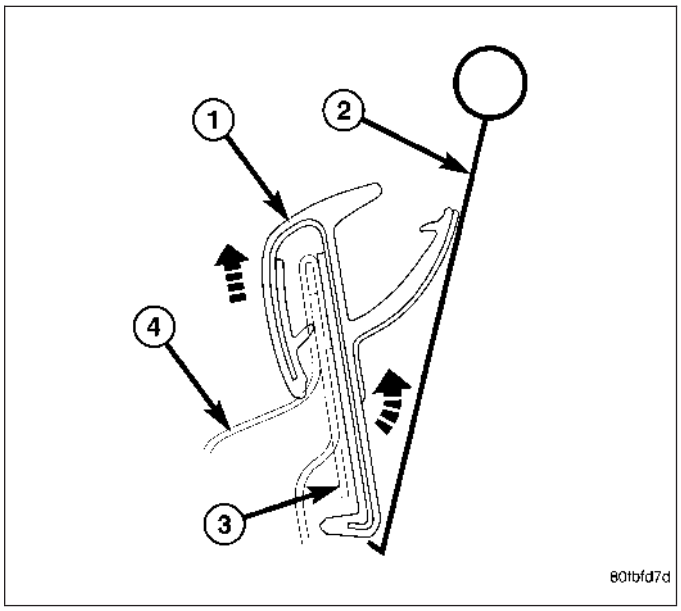
WEATHERSTRIP-FRONT DOOR BELT OUTER

REMOVAL

1. Insert special tool #9093 (2) between the outer belt molding (1) and glass at the rear.
2. Push down on outer belt molding (1) and rotate upper part of tool (2) outward from vehicle then lift up on molding (1) to disengage from locking tabs (3) working from back to front.

NOTE: Typical outer belt molding design shown.

3. Slide molding out from under the side view mirror and remove.



INSTALLATION

1. Position the outer belt molding onto the door and position forward under the side view mirror. Seat the molding fully.

WEATHERSTRIP-REAR DOOR GLASS RUN

REMOVAL

1. Remove the glass run channels. (Refer to 23 - BODY/DOORS - REAR/GLASS RUN CHANNEL - REMOVAL)
2. Separate the quarter glass from the weatherstrip.

INSTALLATION

1. Position the quarter glass into the weatherstrip and rear run channel.
2. Install the run channels. (Refer to 23 - BODY/DOORS - REAR/GLASS RUN CHANNEL - INSTALLATION)

WEATHERSTRIP-REAR DOOR BELT INNER

REMOVAL

1. Remove trim panel. (Refer to 23 - BODY/DOORS - REAR/TRIM PANEL - REMOVAL)
2. Pull weatherstrip from inner door panel.

INSTALLATION

1. Position weatherstrip on inner door panel.
2. Press into place.
3. Install trim panel. (Refer to 23 - BODY/DOORS - REAR/TRIM PANEL - INSTALLATION)

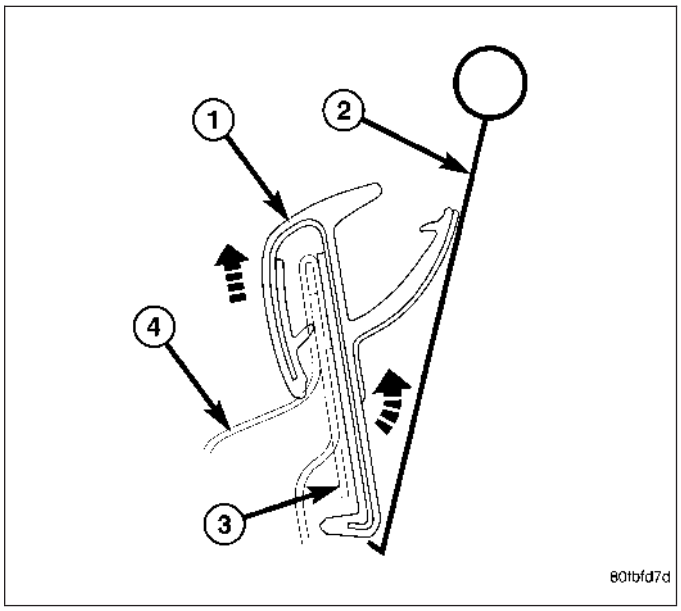
WEATHERSTRIP-REAR DOOR BELT OUTER

REMOVAL

1. Insert special tool #9093 (2) between the outer belt molding (1) and glass at the rear.
2. Push down on outer belt molding (1) and rotate upper part of tool (2) outward from vehicle then lift up on molding (1) to disengage from locking tabs (3) working from back to front.

NOTE: Typical outer belt molding design shown.

3. Slide molding out from under the side view mirror and remove.



INSTALLATION

1. Position the outer belt molding onto the door and seat the molding fully starting at the back of the door.

BODY STRUCTURE

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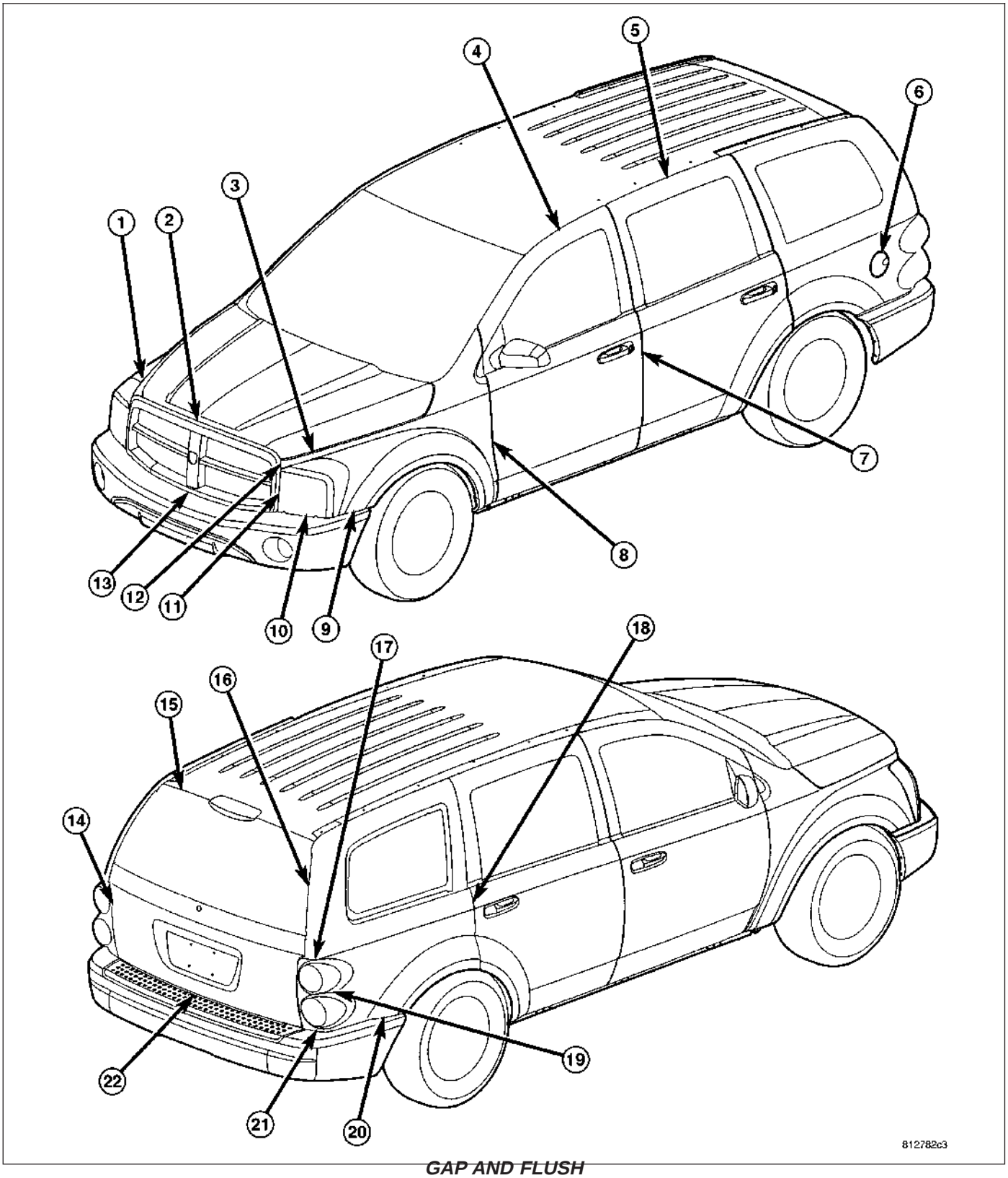
GAP AND FLUSH

SPECIFICATIONS

GAP AND FLUSH



GAP AND FLUSH

NOTE: ALL DIMENSIONS ARE IN MILLIMETERS.

GAP AND FLUSH MEASUREMENTS

DIMENSION	LOCATION	GAP	FLUSH
1	HEADLAMP TO FENDER	3.0 ± 2.5	HEADLAMP OVERFLUSH 0.9 ± 2.25
2	GRILLE TO HOOD	8.0 ± 2.75 PARALLEL WITHIN 4.0	—
3	HOOD TO FENDER	4.5 ± 1.25 PARALLEL WITHIN 2.0	0.0 ± 1.25 (REAR) OVERFLUSH 2.0 ± 1.25 (FRONT/MIDDLE)
4	FRONT DOOR TO ROOF	—	OVERFLUSH 0.25 ±1.25
5	REAR DOOR TO ROOF	—	0.0 ± 1.25
6	FUEL FILLER DOOR TO QUARTER PANEL	3.2 ± 1.25	0.0 ± 1.25
7	FRONT DOOR TO REAR DOOR	4.5 ± 1.25 PARALLEL WITHIN 1.0	0.0 ± 2.5
8	FRONT DOOR TO FENDER	4.5 ± 1.25 PARALLEL WITHIN 1.0	0.0 ± 1.25
9	FRONT FASCIA TO FENDER	12.8 ± 3.0 PARALLEL WITHIN 2.5	0.0 ± 2.5
10	HEADLAMP TO FASCIA	13.0 ± 3.0 PARALLEL WITHIN 2.5	—
11	HEADLAMP TO GRILLE	6.3 ± 3.0	—
12	GRILLE TO FENDER	6.4 ± 3.0	—
13	FRONT FASCIA TO GRILLE	13.0 ± 3.0 PARALLEL WITHIN 2.5	—
14	TAILLAMP TO LIFTGATE	4.5 ± 2.0	OVERFLUSH 1.4 ± 2.5
15	LIFTGATE TO ROOF	8.0 ± 1.5 PARALLEL WITHIN 1.0	0.0 ± 1.5
16	LIFTGATE TO APERTURE	4.5 ± 1.25 PARALLEL WITHIN 1.0	0.0 ± 1.25
17	TAILLAMP TO APERTURE – TOP	2.0 ± 1.5	0.0 ± 1.5
18	REAR DOOR TO QUARTER PANEL	4.5 ± 1.25 PARALLEL WITHIN 1.0	0.0 ± 1.25
19	TAILLAMP TO APERTURE – MIDDLE	1.5 ± 1.5	0.0 ± 1.5
20	REAR FASCIA TO APERTURE	13.5 ± 3.0 PARALLEL WITHIN 2.5	—

DIMENSION	LOCATION	GAP	FLUSH
21	REAR FASCIA TO TAILLAMP	13.5 ± 3.0 PARALLEL WITHIN 2.5	—
22	REAR FASCIA TO LIFTGATE	13.5 ± 3.0 PARALLEL WITHIN 2.5	—

OPENING DIMENSIONS

SPECIFICATIONS

OPENING DIMENSIONS

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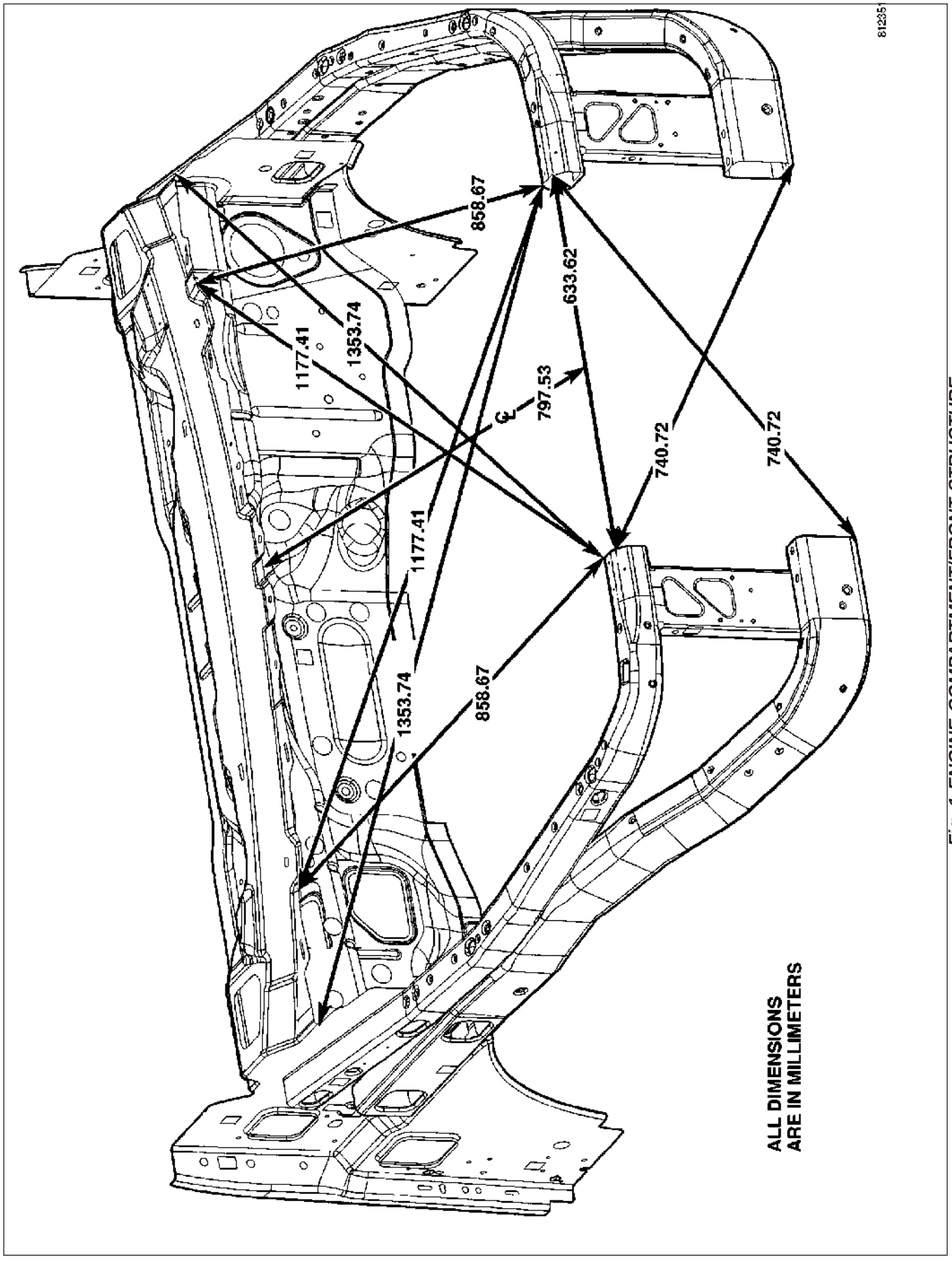

Fig. 1 ENGINE COMPARTMENT/FRONT STRUCTURE

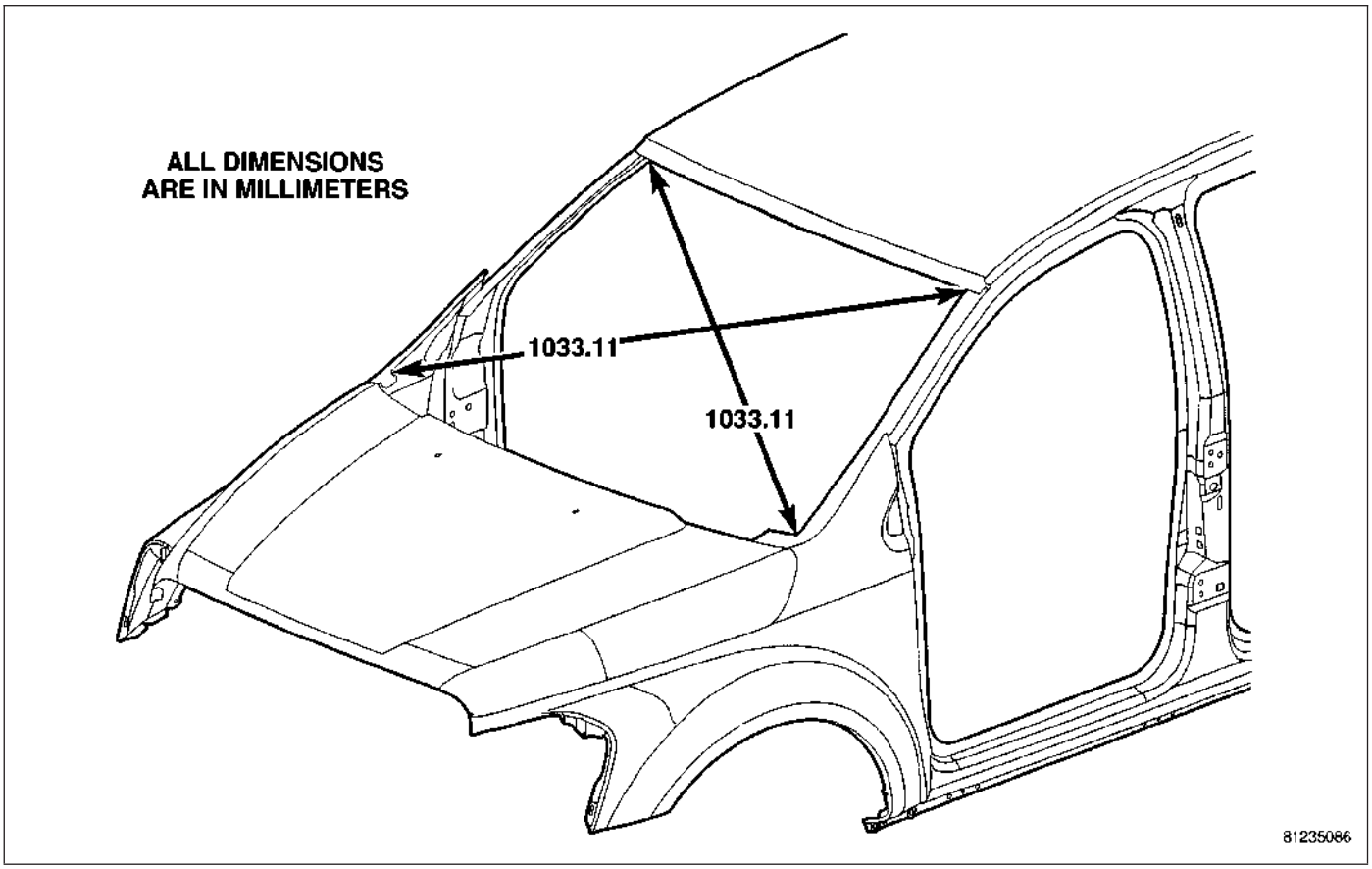

Fig. 2 WINDSHIELD OPENING

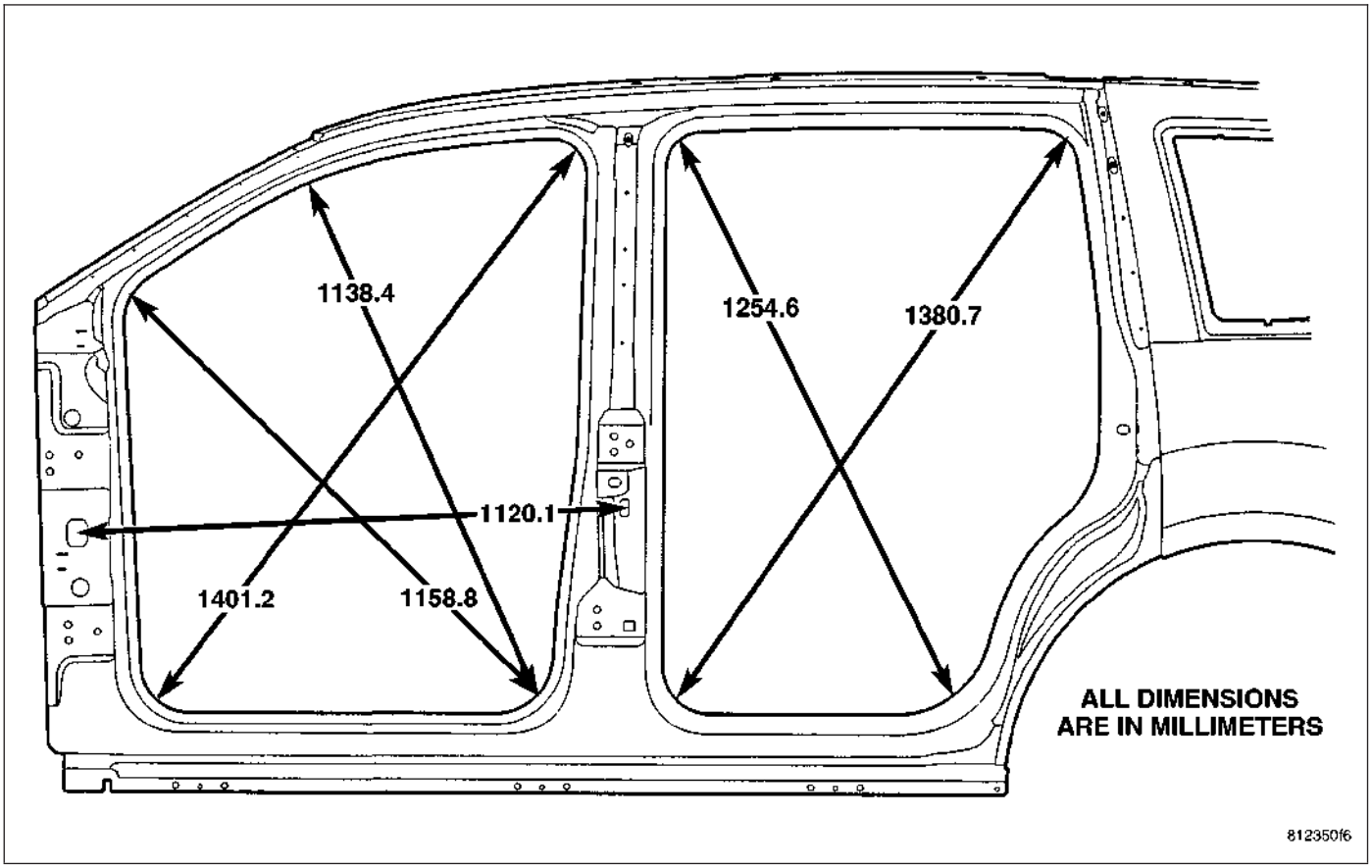

Fig. 3 DOOR OPENINGS

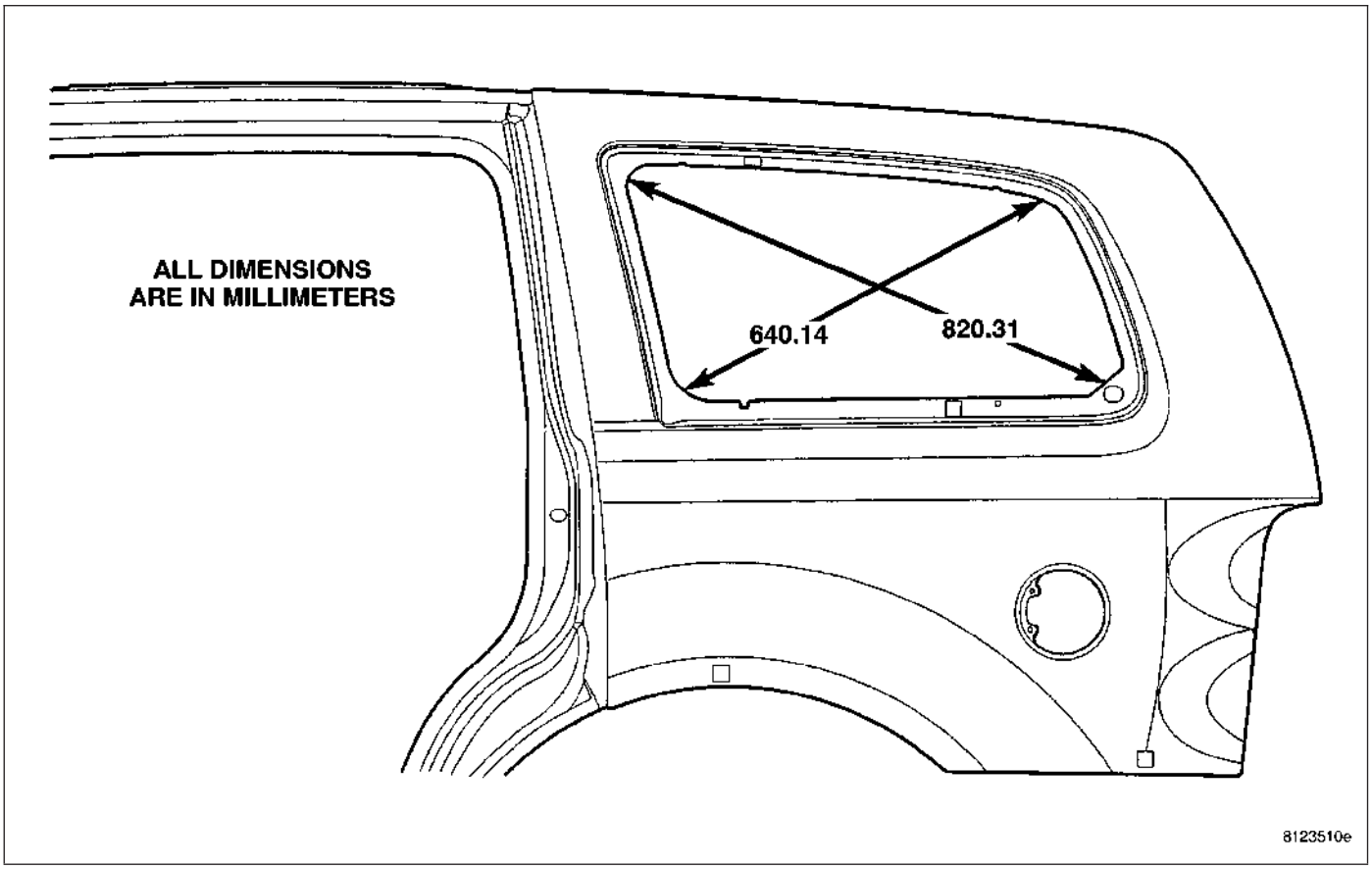

Fig. 4 QUARTER WINDOW OPENING

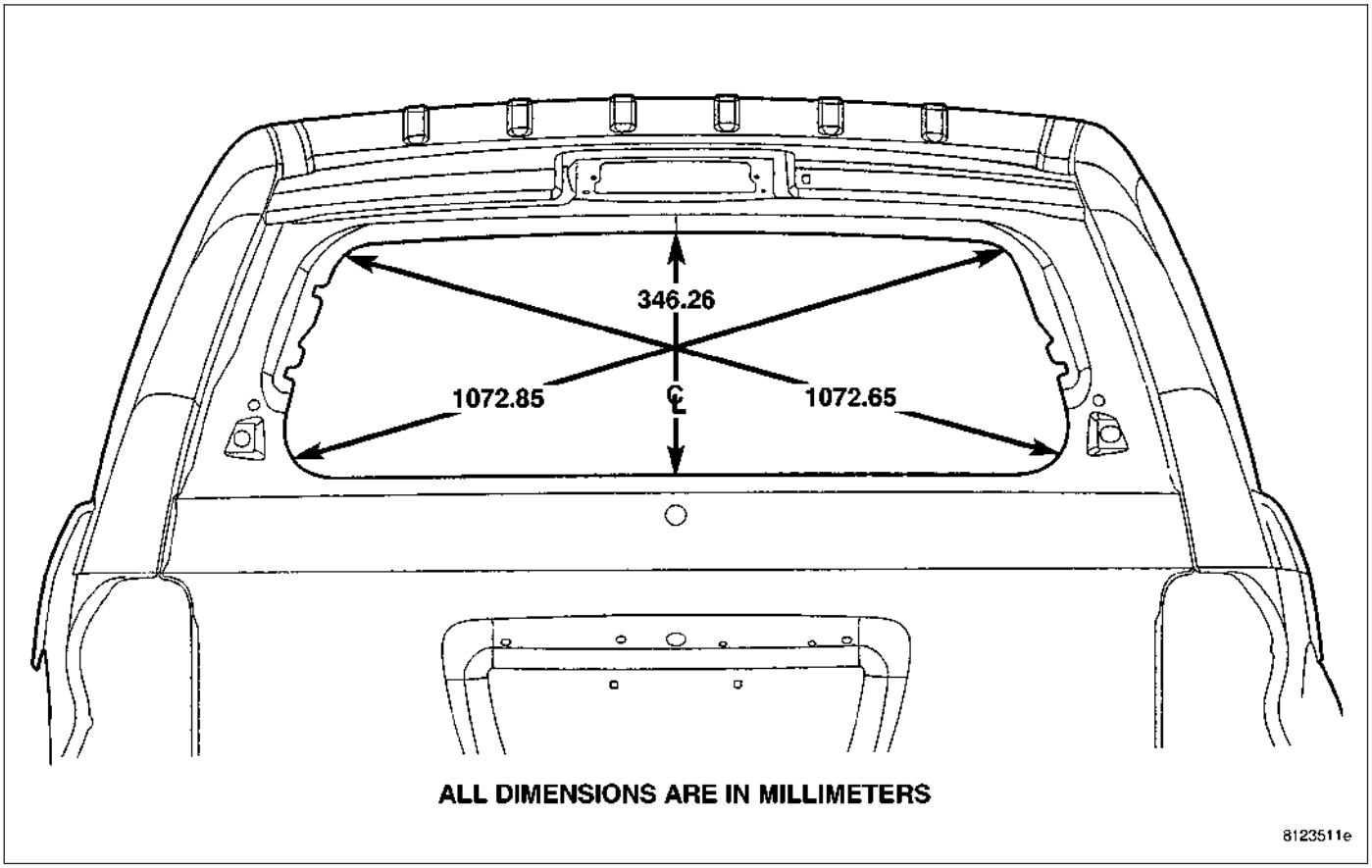

Fig. 5 BACKLITE OPENING

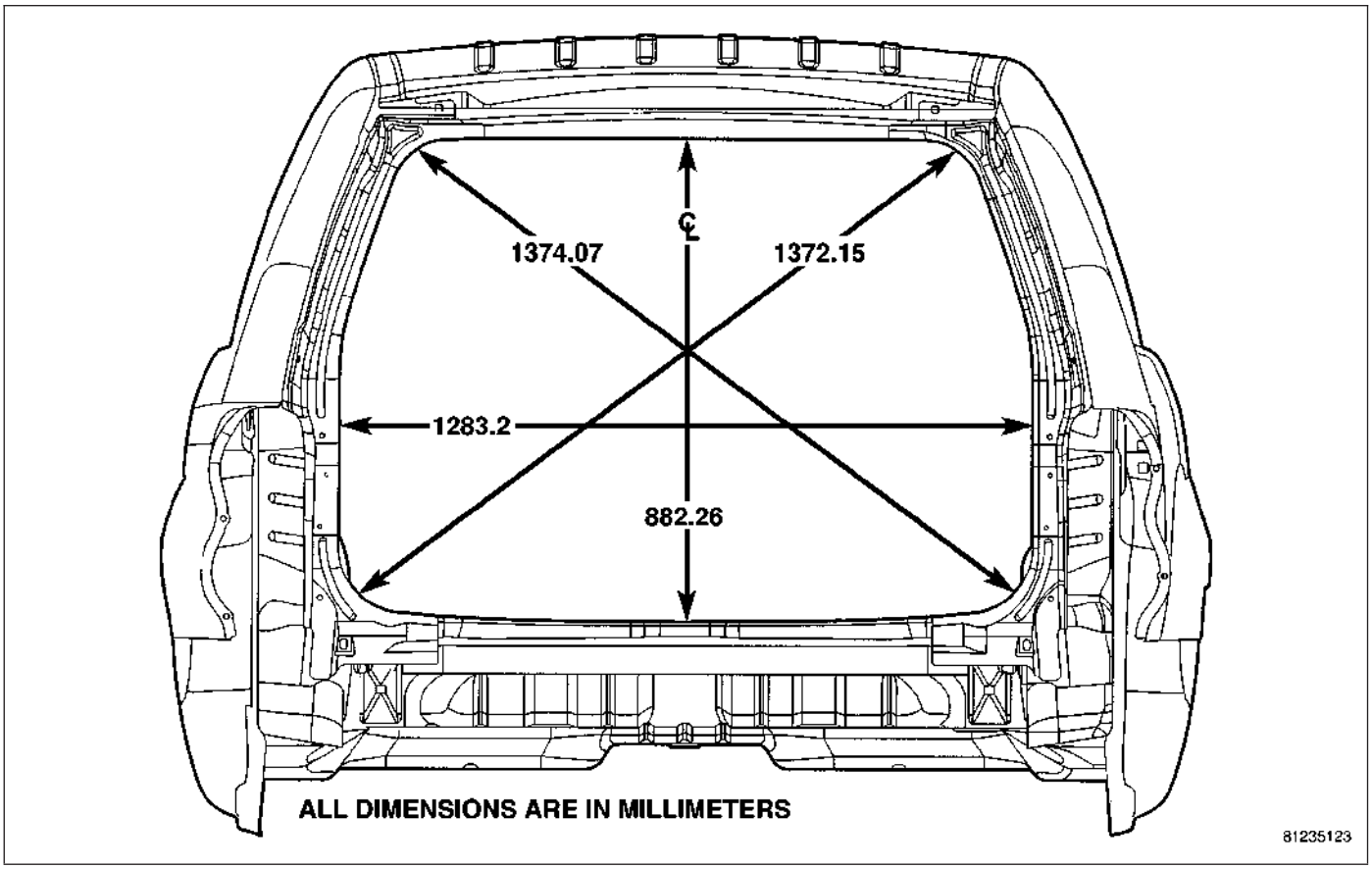

Fig. 6 LIFTGATE OPENING

SEALER LOCATIONS

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BODY SEALING LOCATIONS

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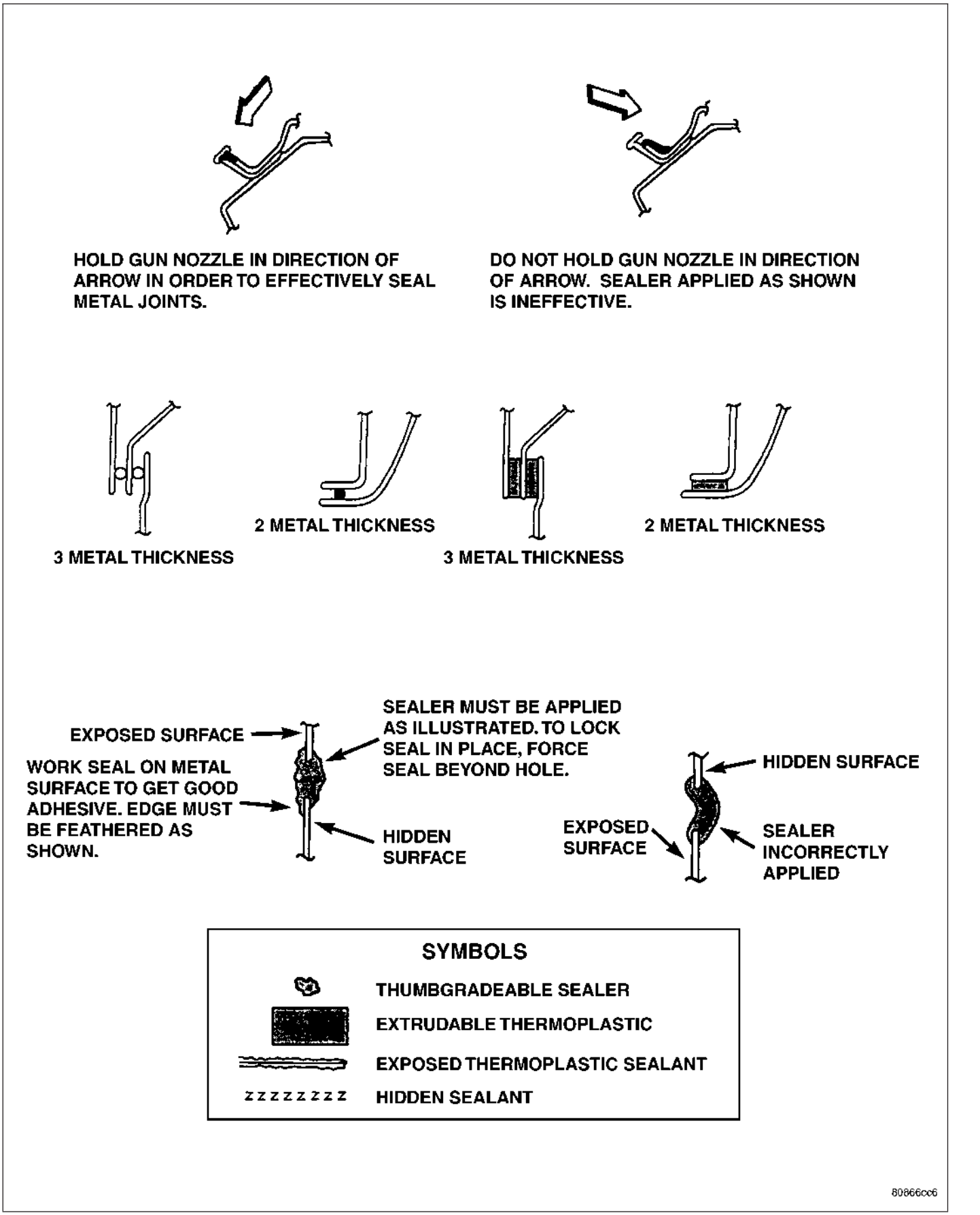


Fig. 7 APPLICATION METHODS

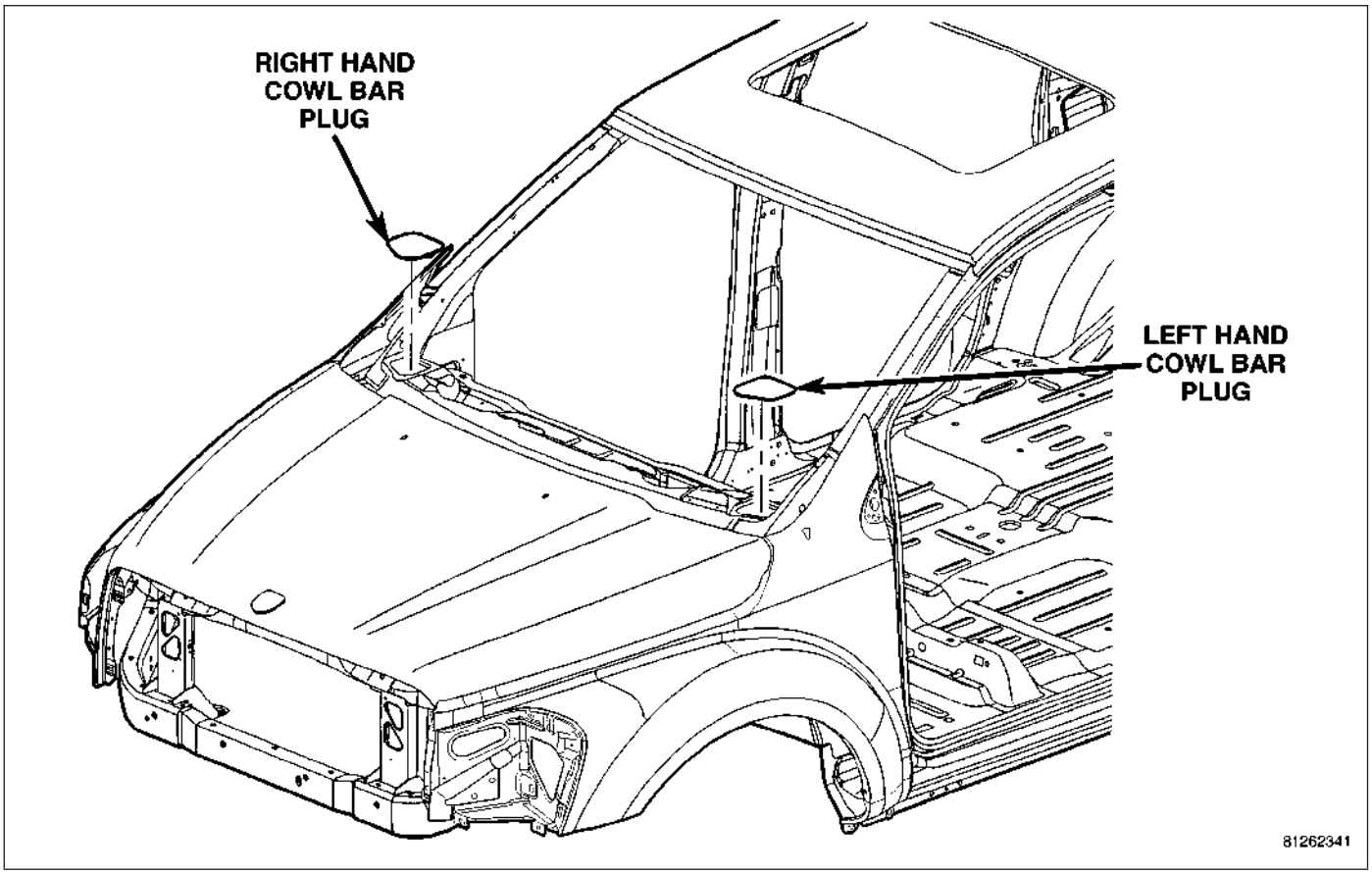


Fig. 8 COWL BAR PLUGS

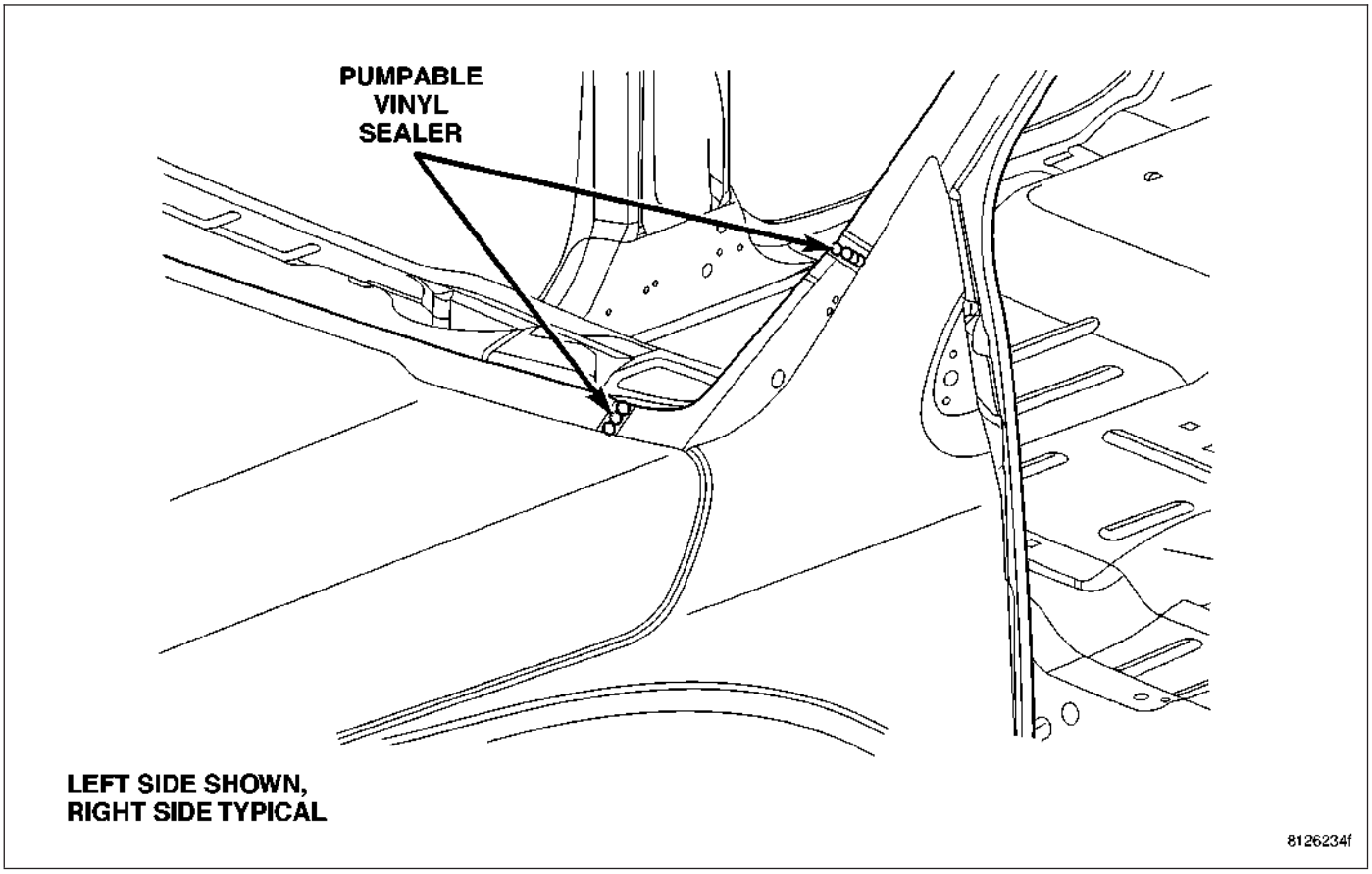


Fig. 9 A-PILLAR/COWL BAR

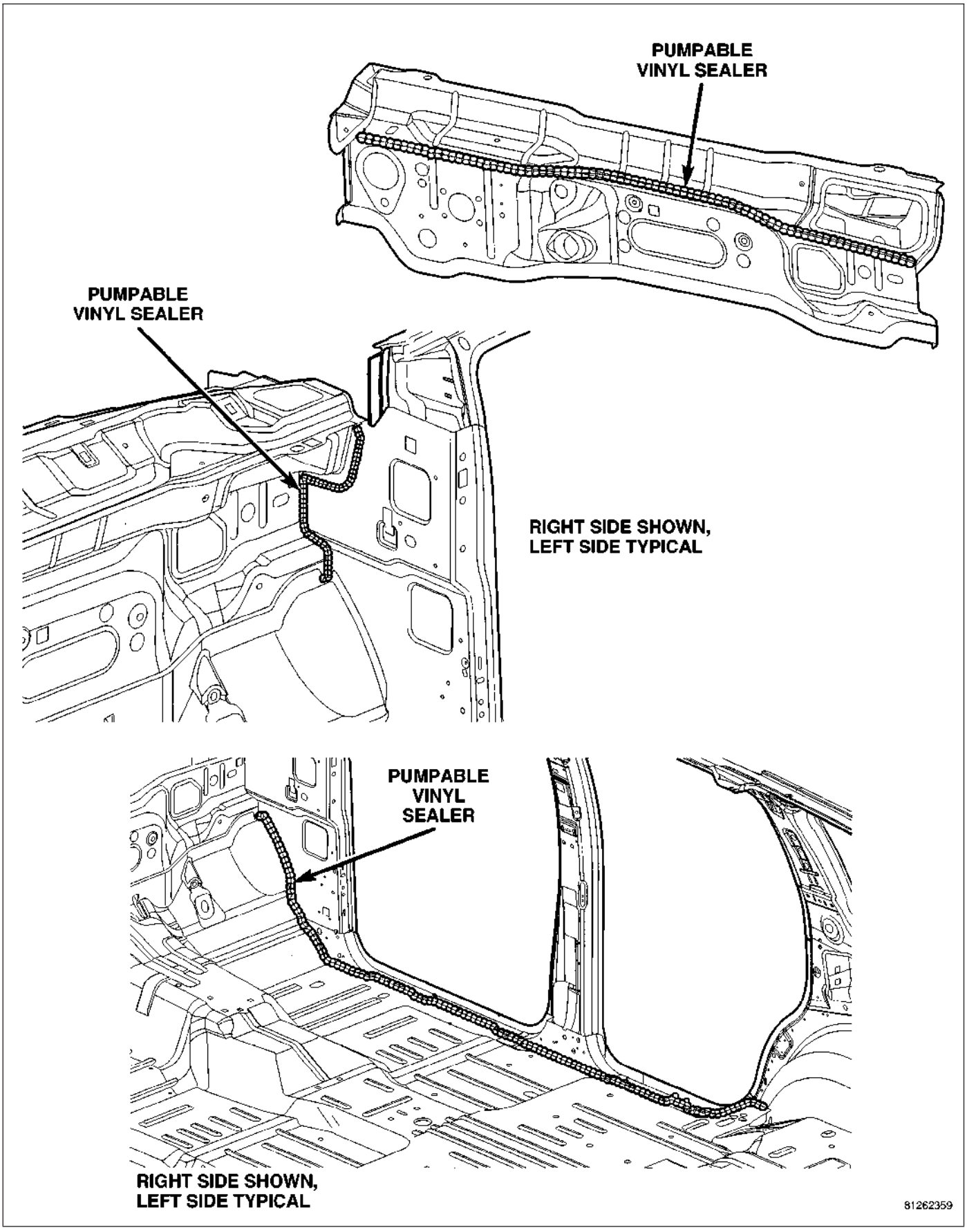


Fig. 10 LOWER PLENUM, DASH PANEL, COWL SIDE AND FLOOR PAN

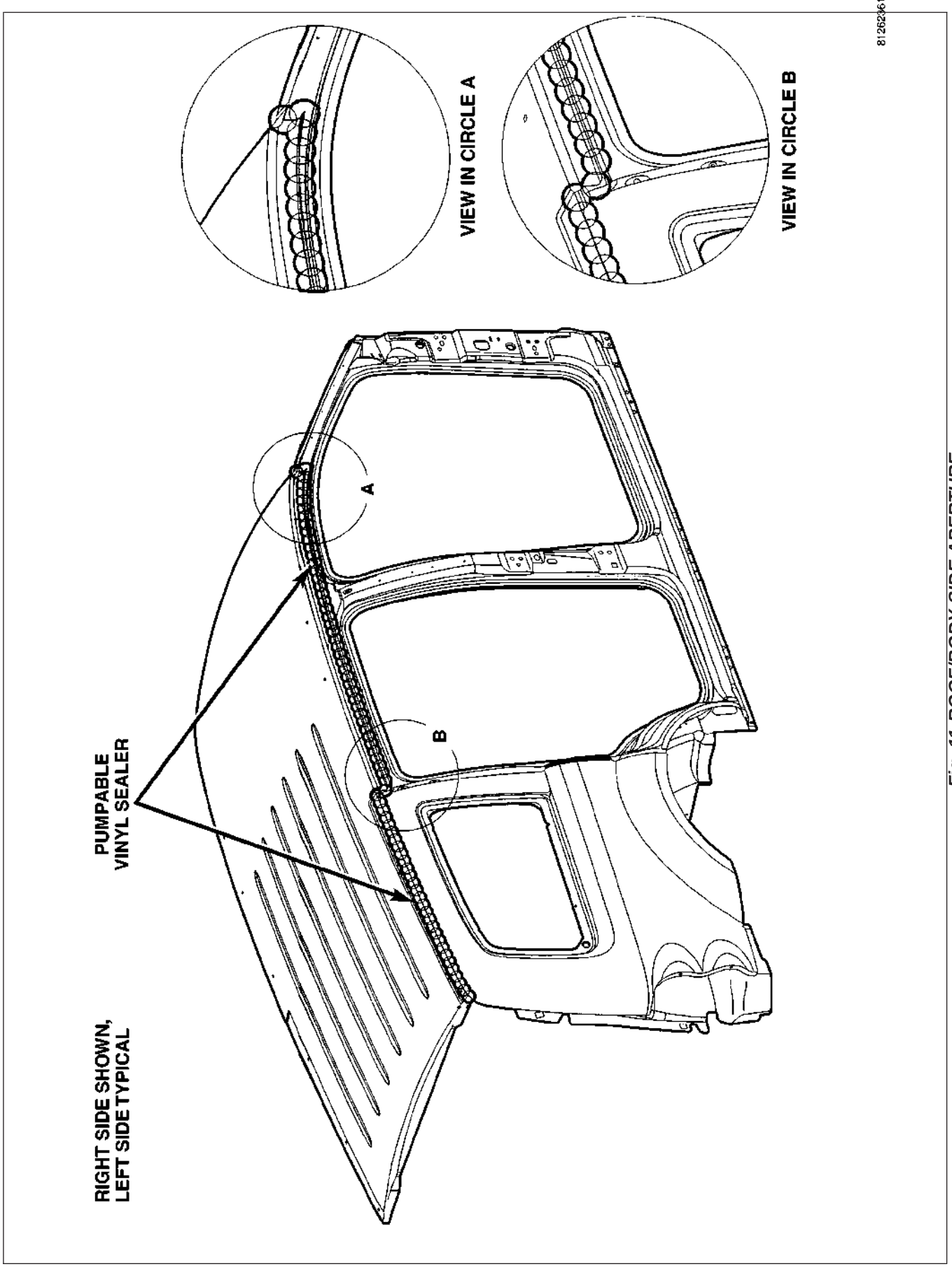


Fig. 11 ROOF/BODY SIDE APERTURE

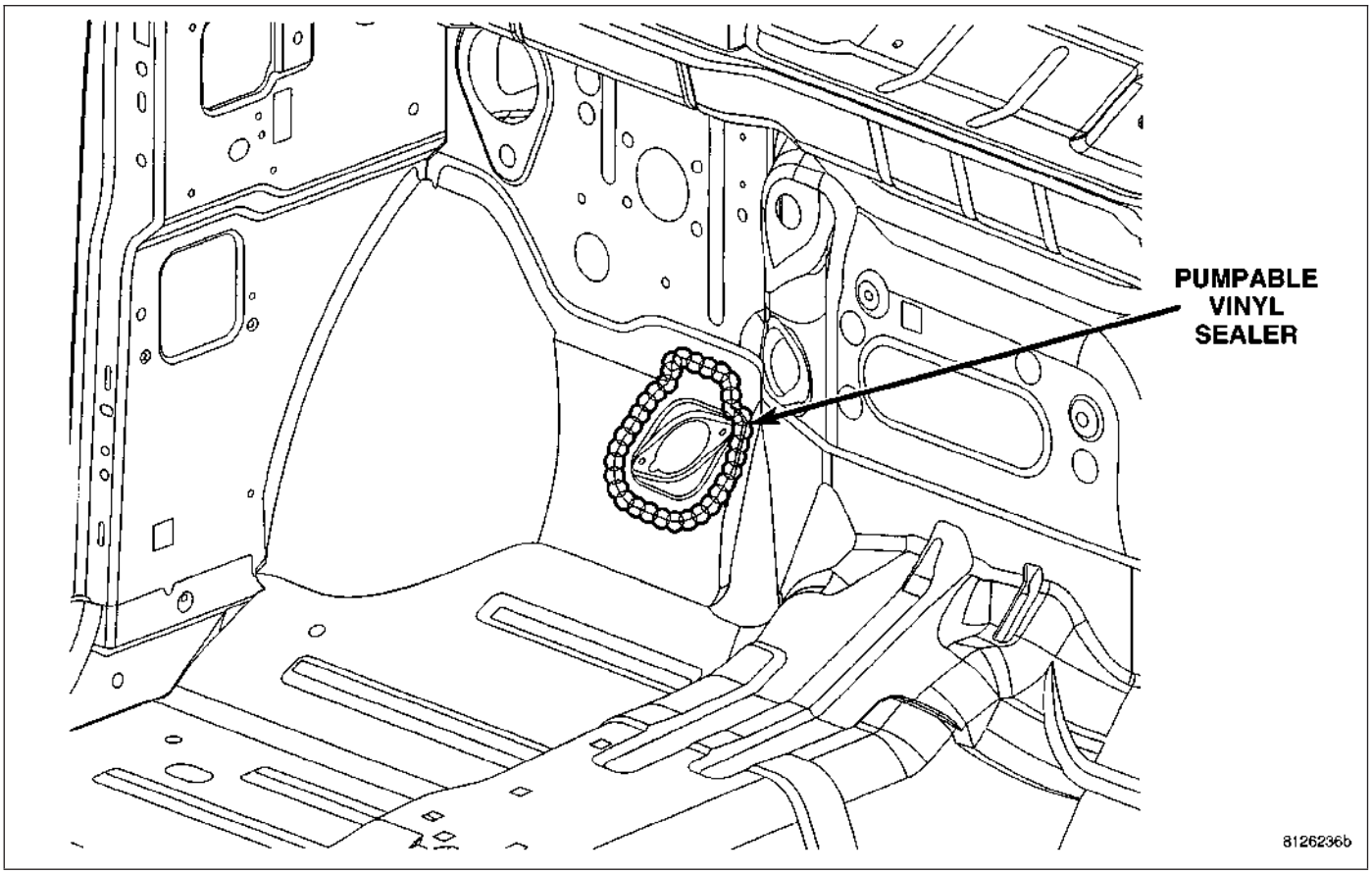


Fig. 12 STEERING COLUMN REINFORCEMENT

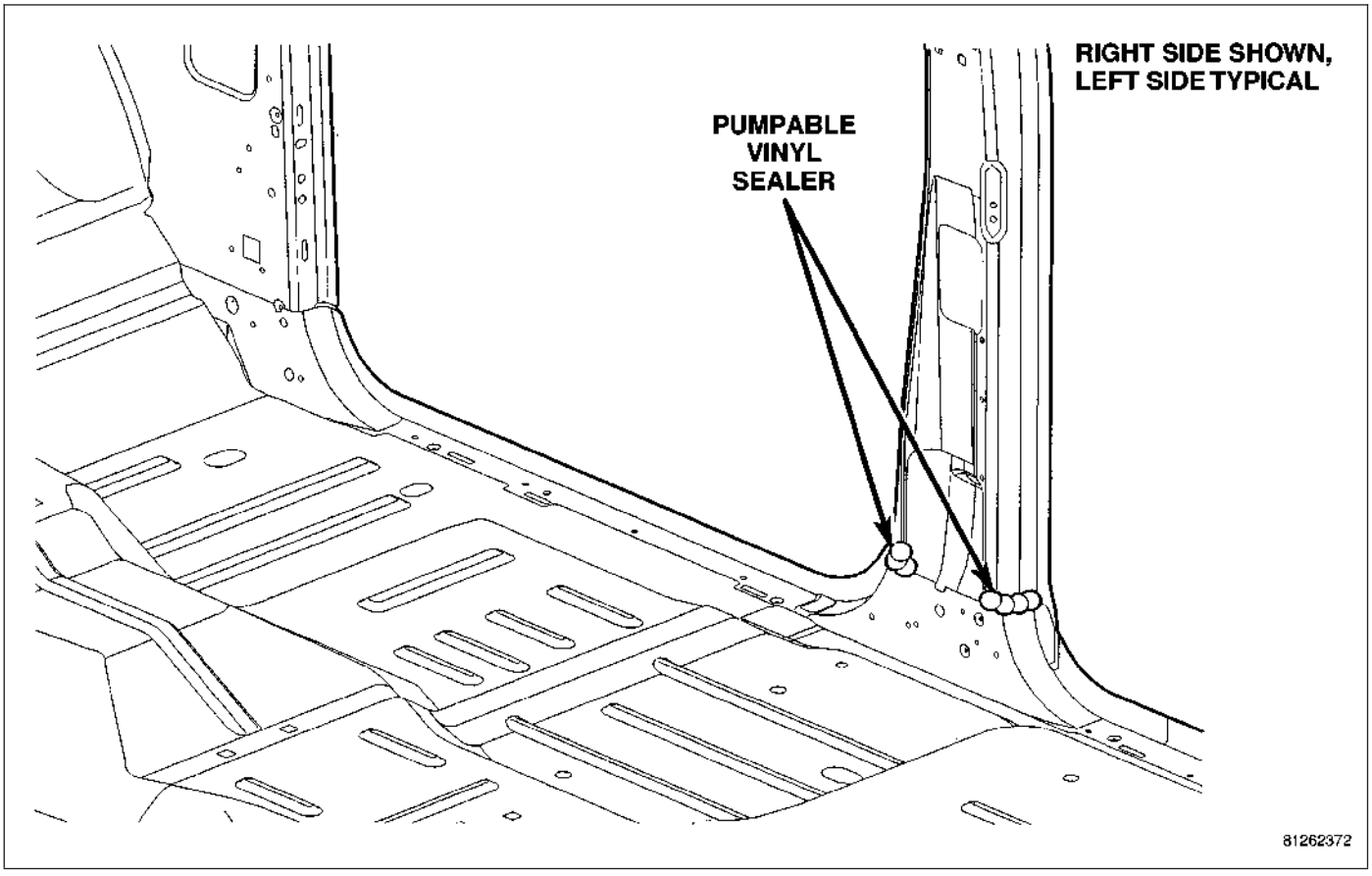


Fig. 13 B-PILLAR - INNER SILL

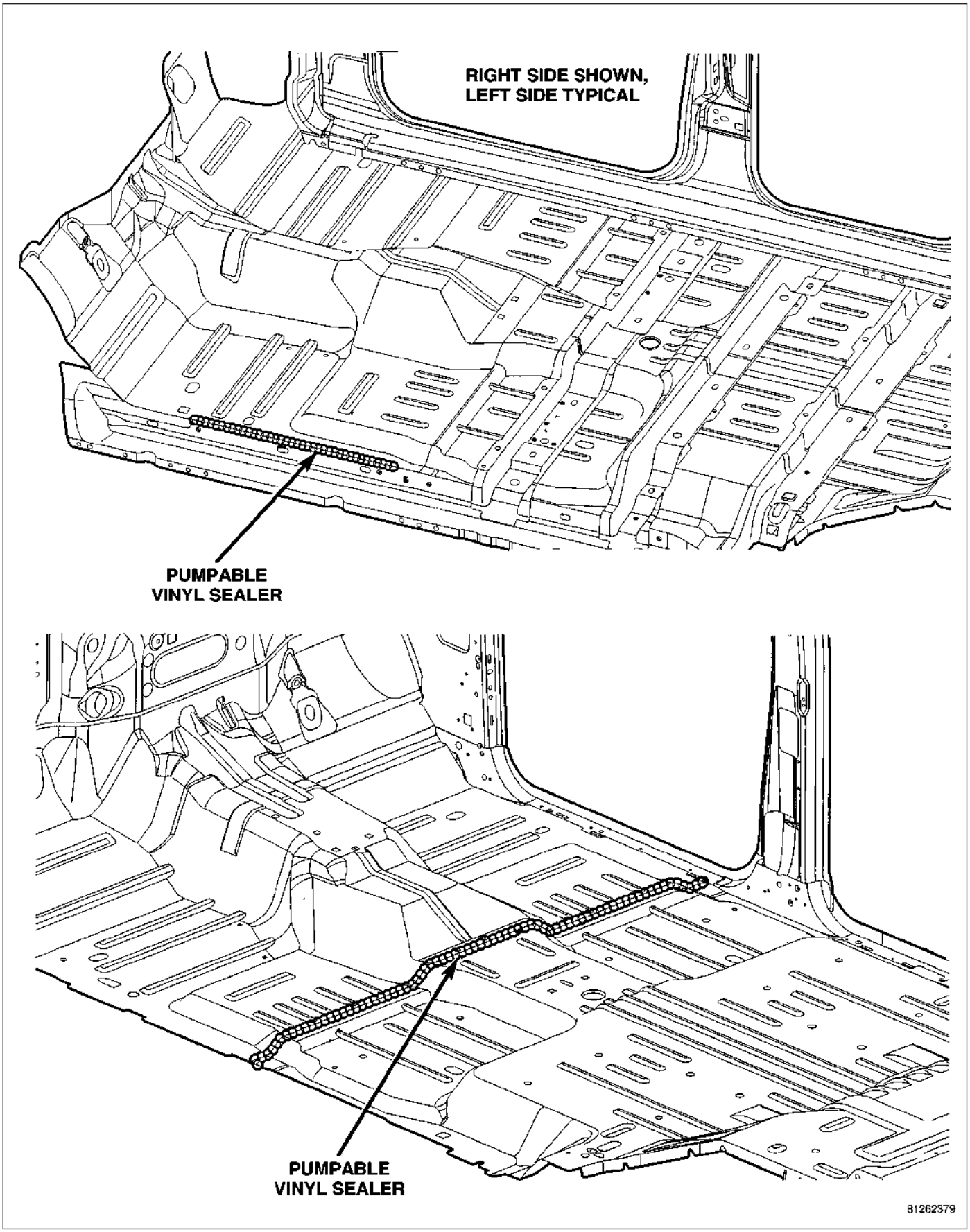


Fig. 14 FLOOR PAN

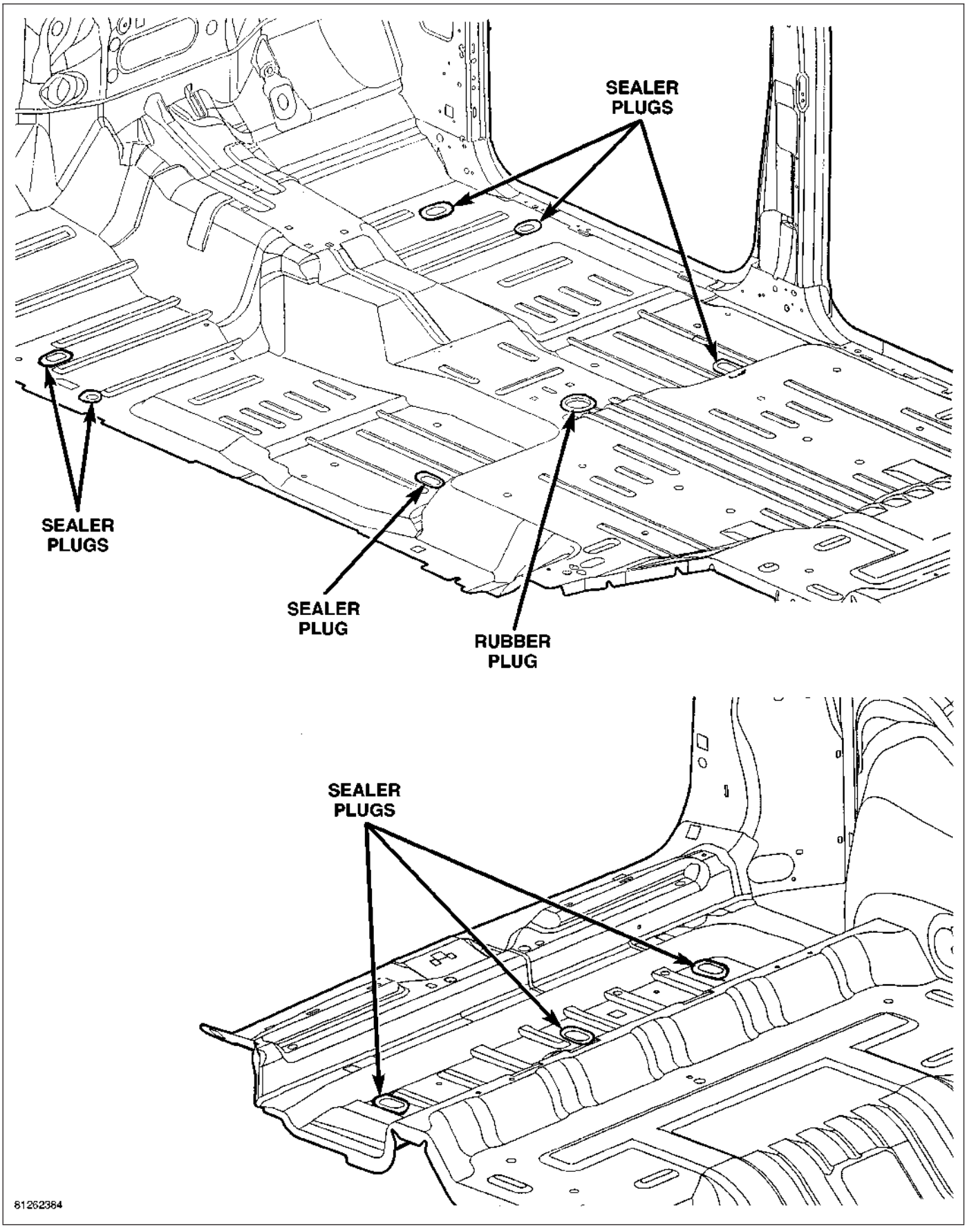


Fig. 15 FLOOR PAN - SEALER PLUGS

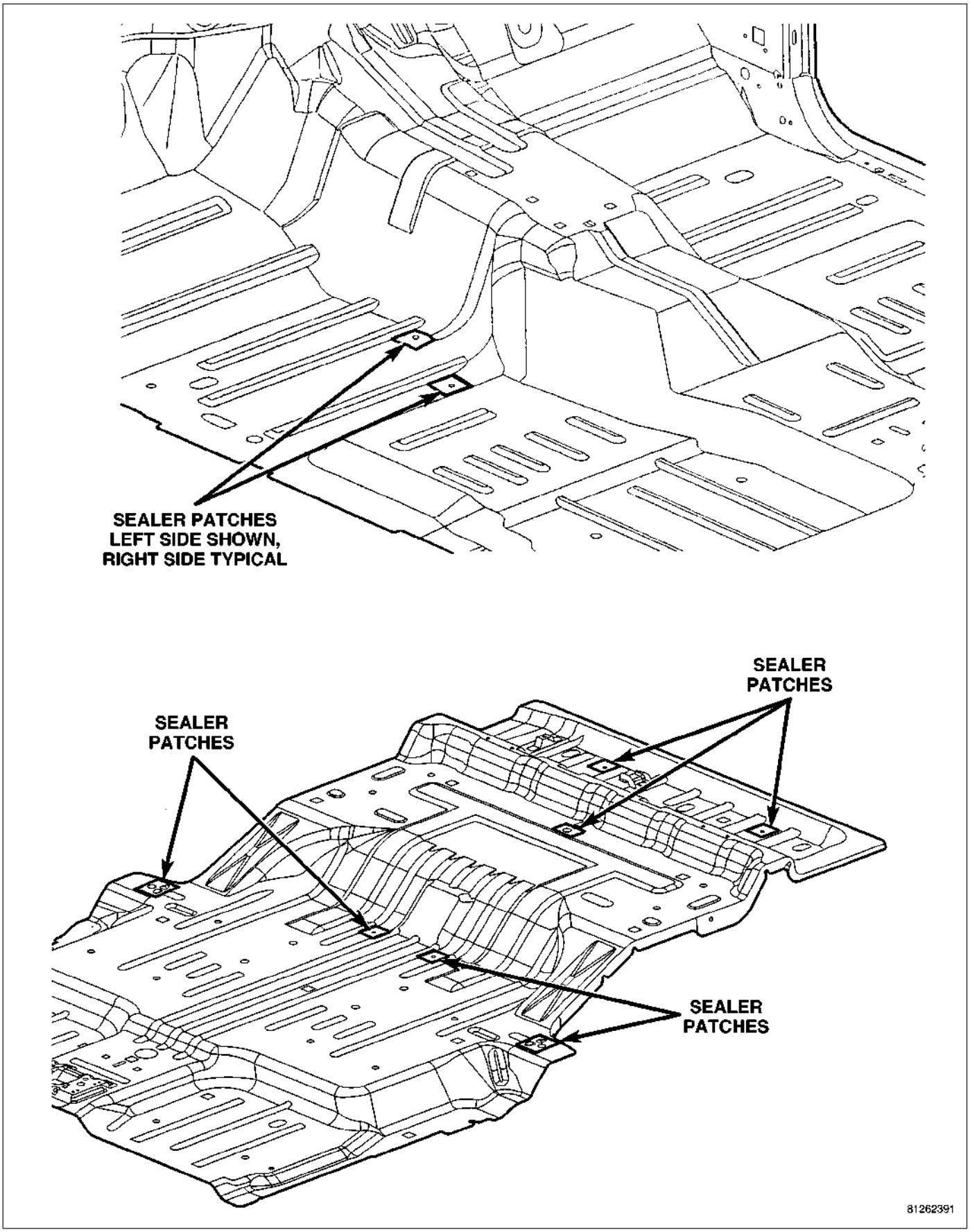


Fig. 16 FLOOR PAN - SEALER TAPE

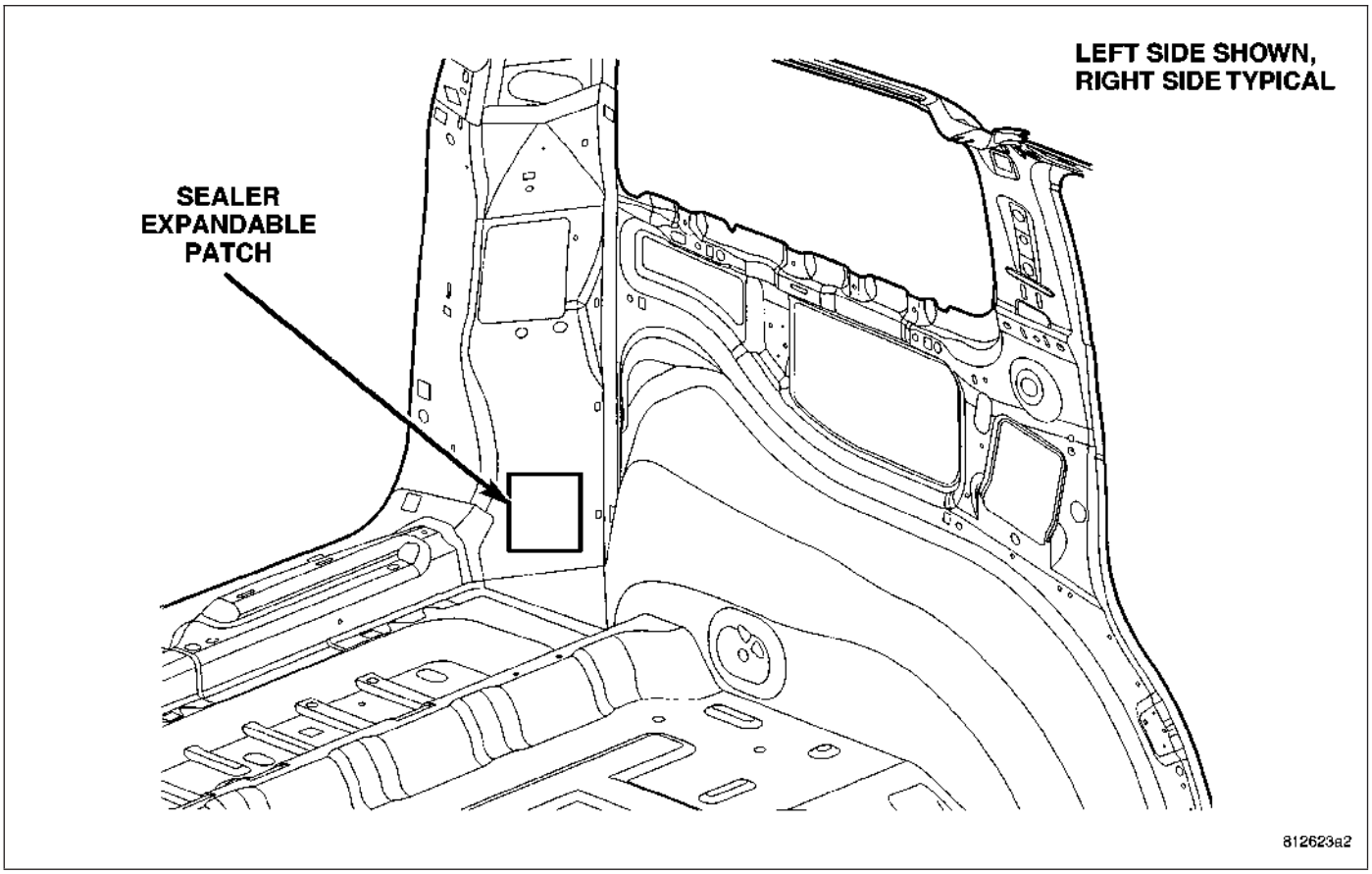


Fig. 17 D-PILLAR - EXPANDABLE SEALER PATCH

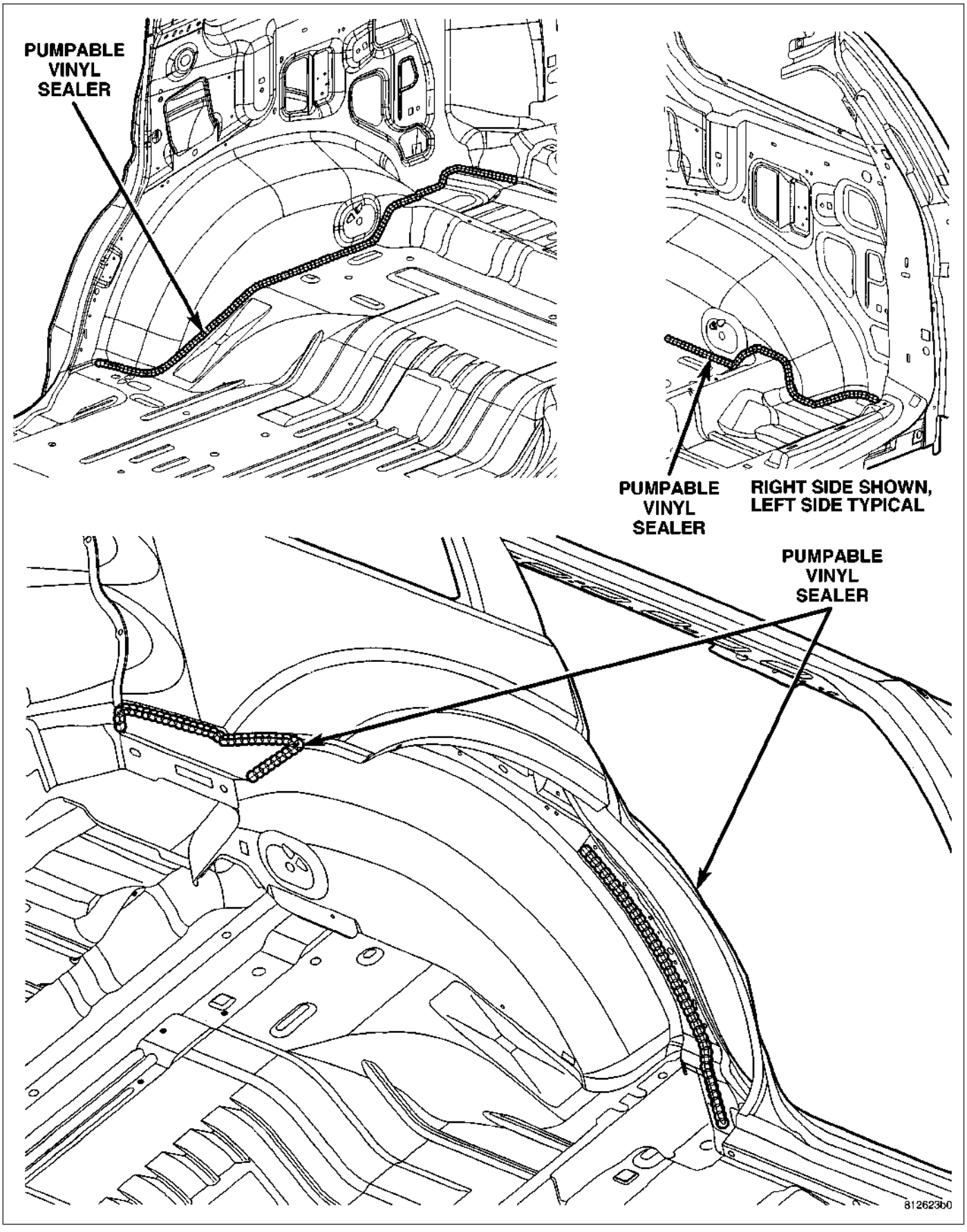


Fig. 18 WHEELHOUSE/REAR FLOOR PAN

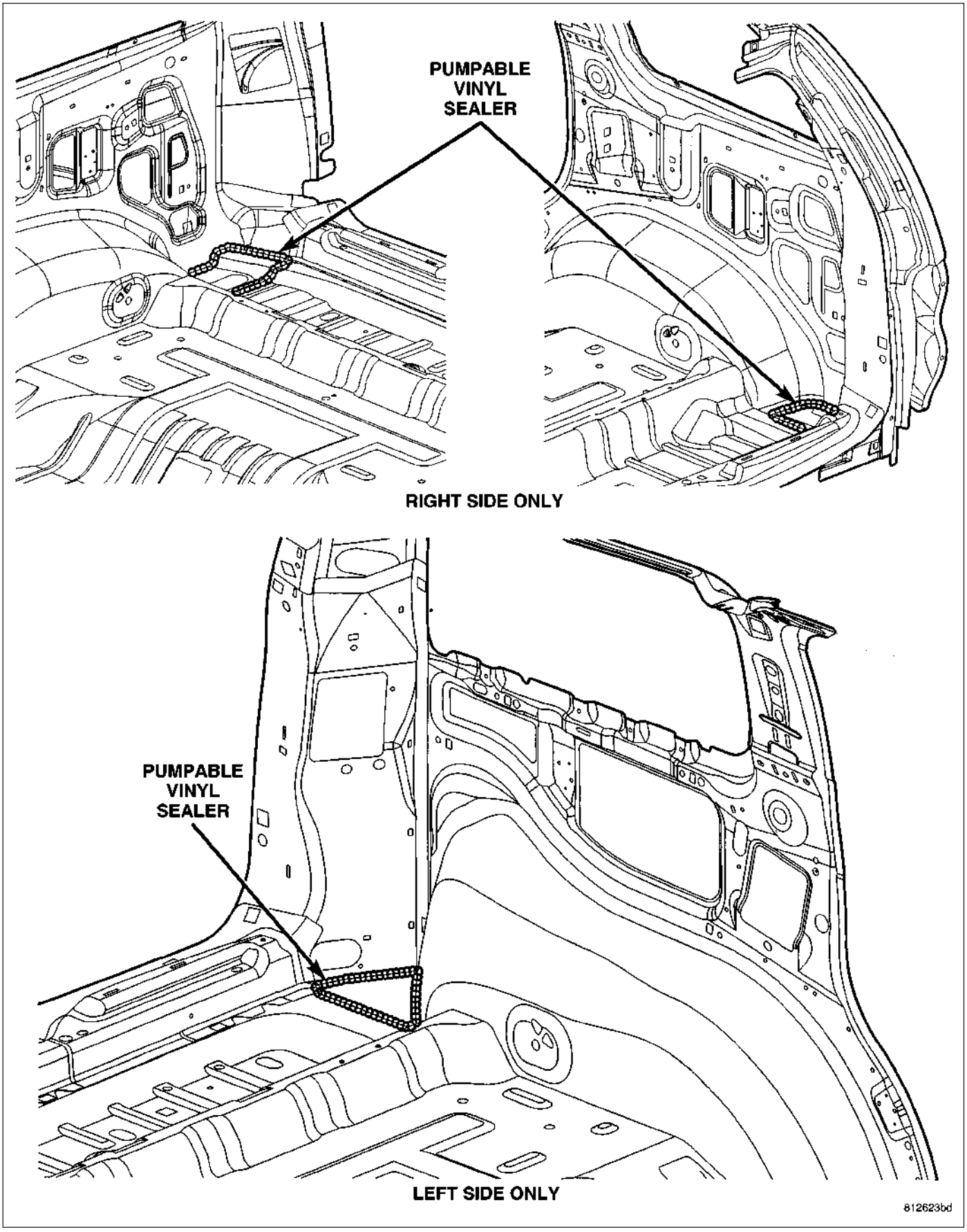


Fig. 19 REAR INNER QUARTER PANEL/REAR FLOOR PAN

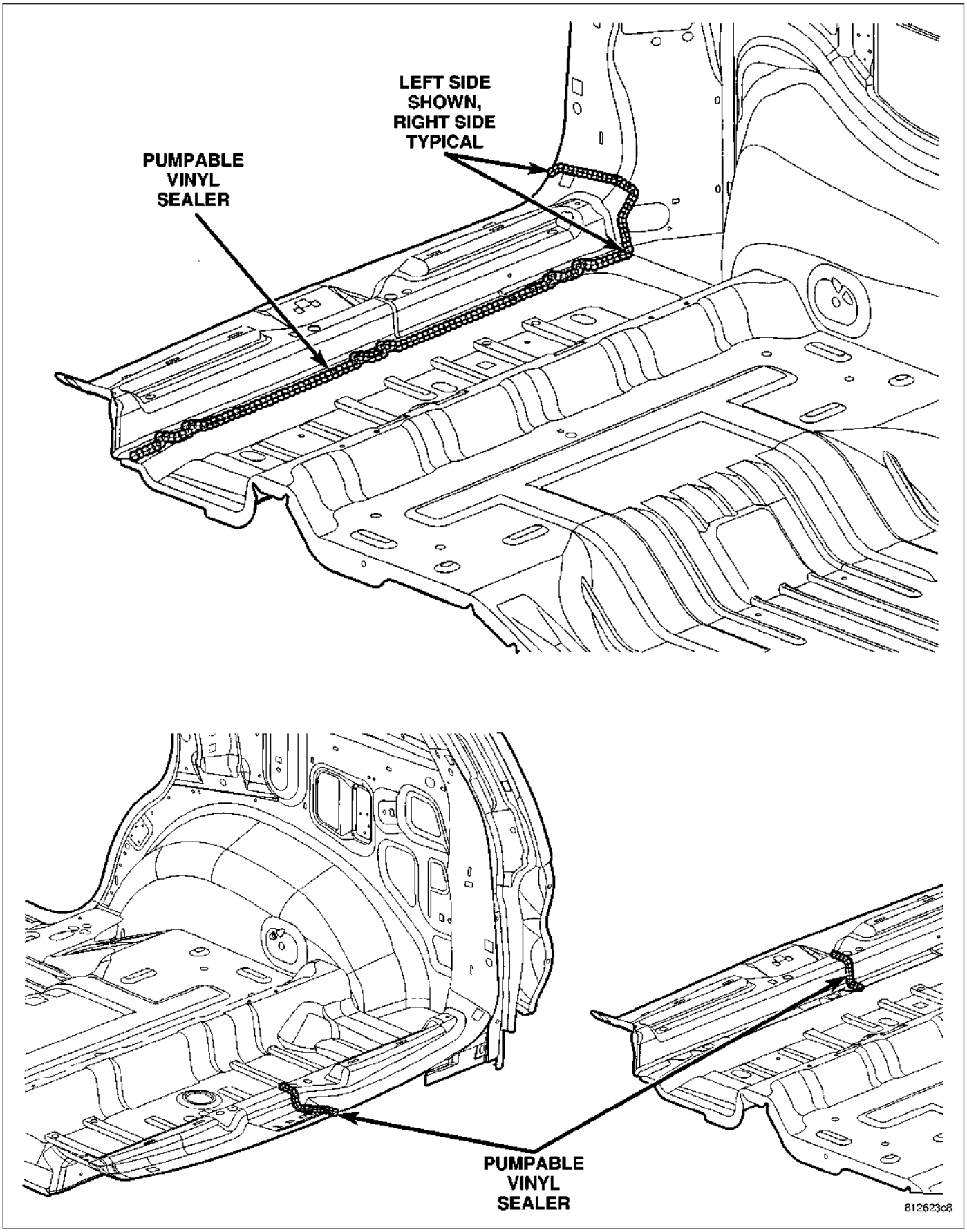


Fig. 20 LIFTGATE OPENING/D-PILLAR/REAR FLOOR PAN

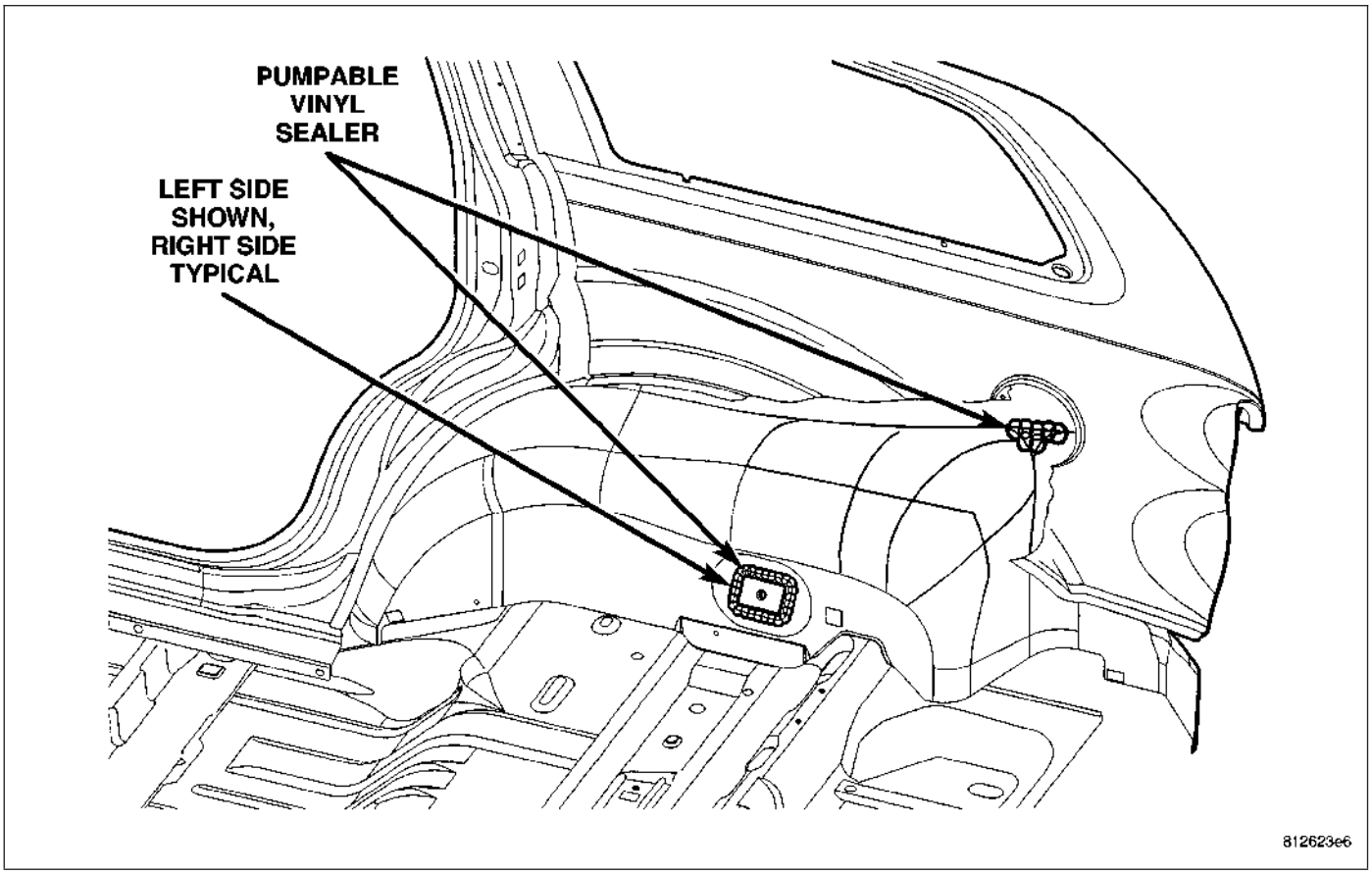


Fig. 21 WHEELHOUSE TAPPING PLATE

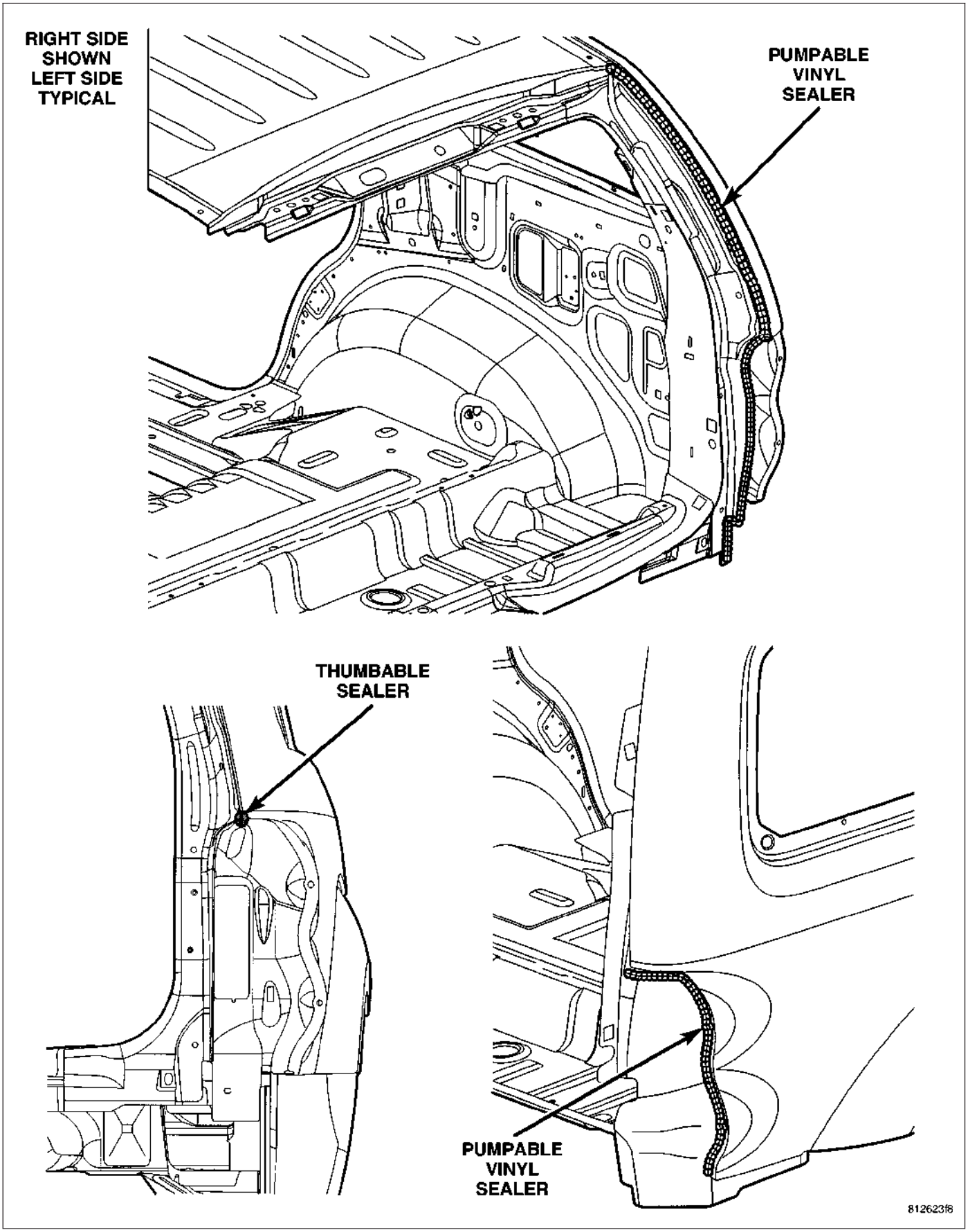


Fig. 22 LIFTGATE OPENING/BODY SIDE APERTURE

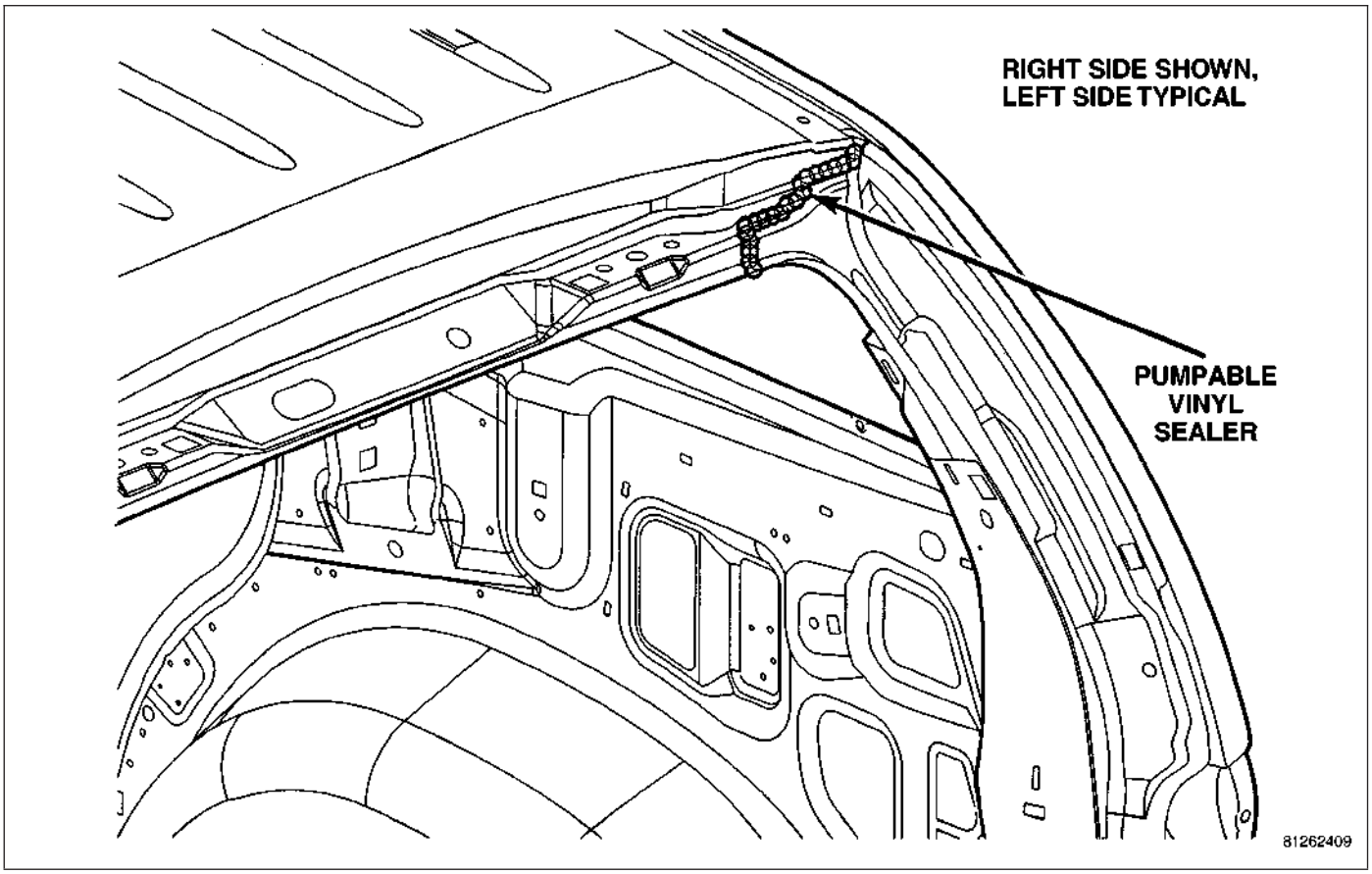
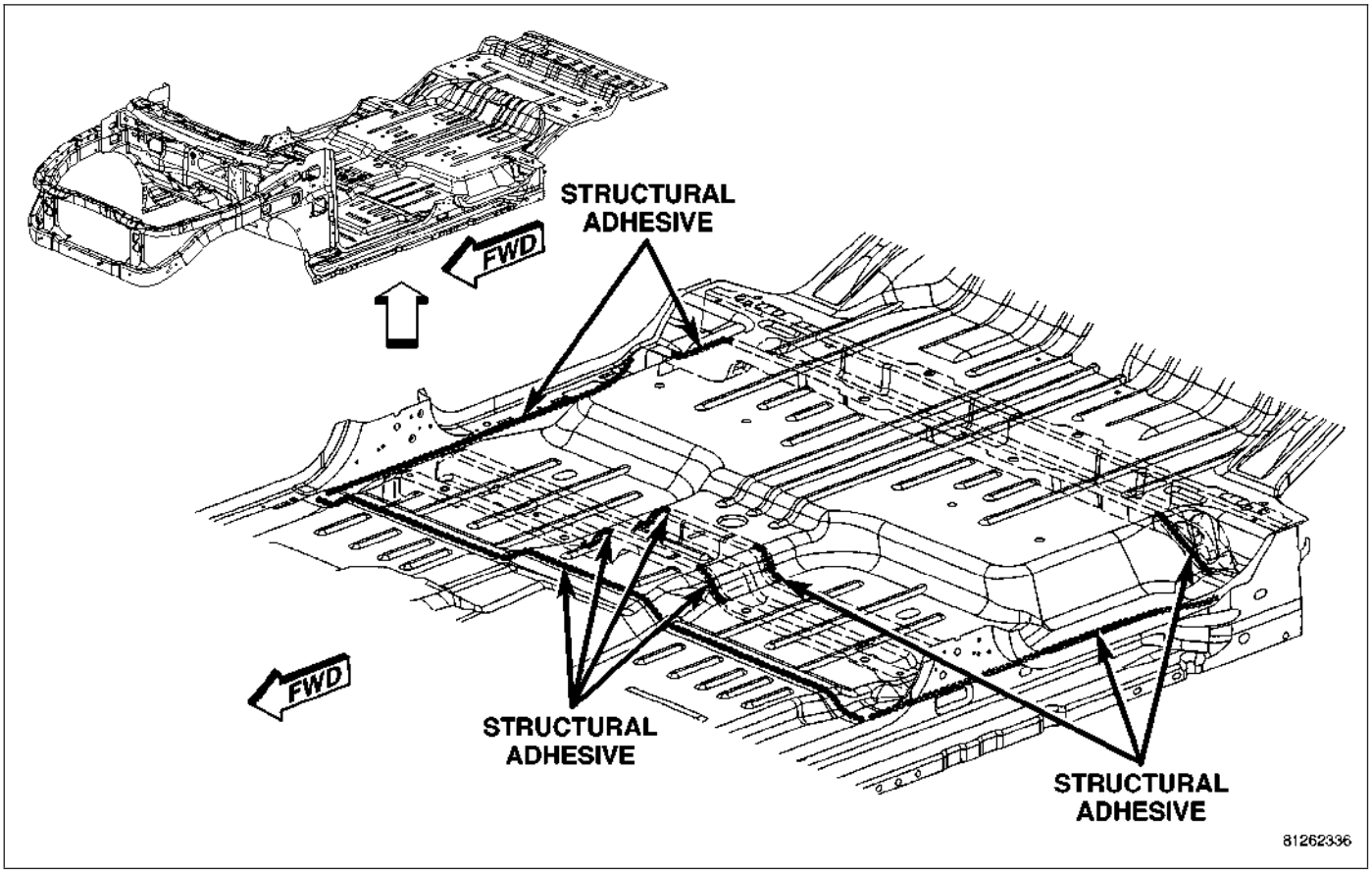


Fig. 23 ROOF HEADER/LIFTGATE

STRUCTURAL ADHESIVE LOCATIONS

SPECIFICATIONS

STRUCTURAL ADHESIVE LOCATIONS



UNDERBODY - COMPLETE

WELD LOCATIONS

SPECIFICATIONS

WELD LOCATIONS

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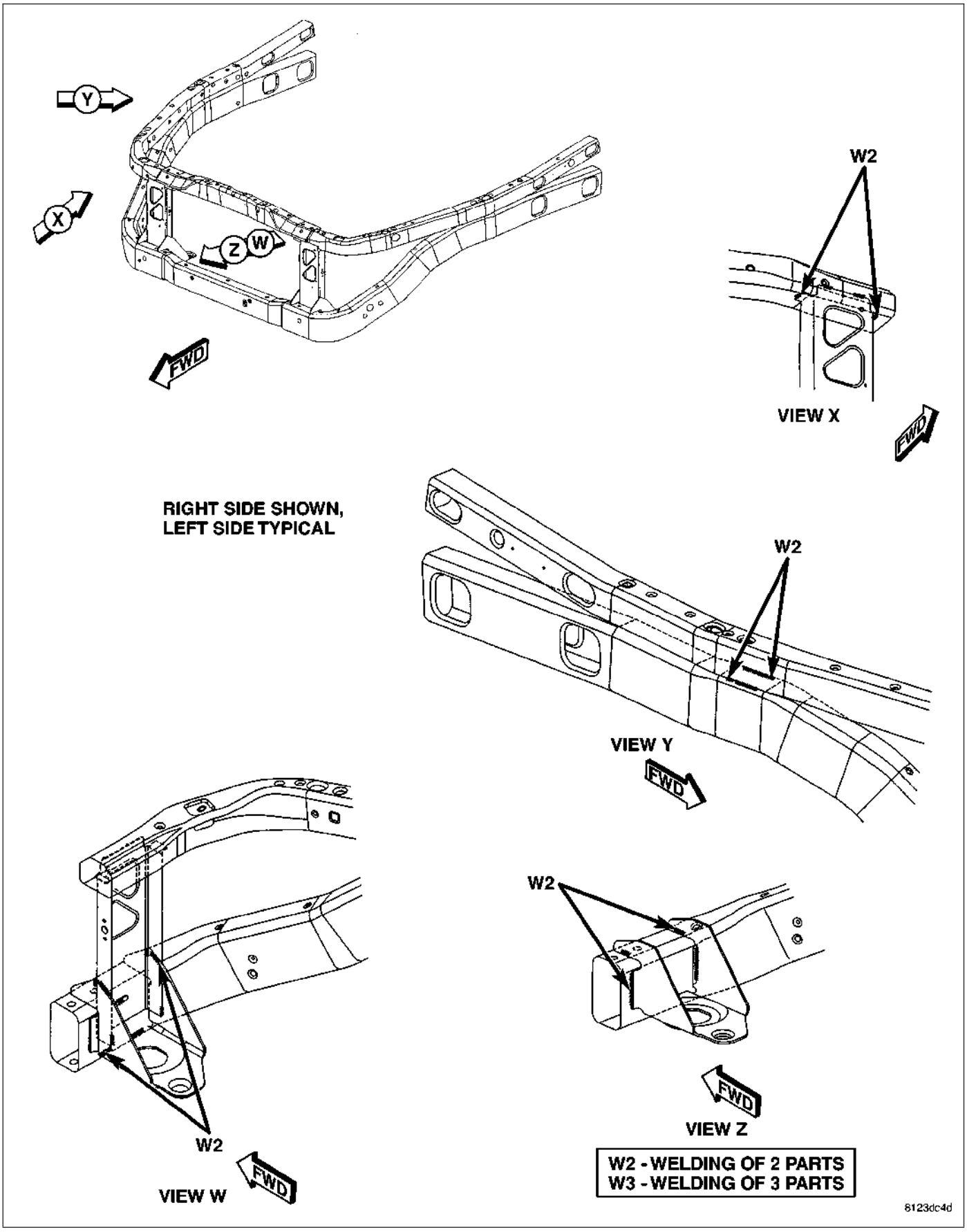

Fig. 24 ENGINE BOX (1 OF 1)

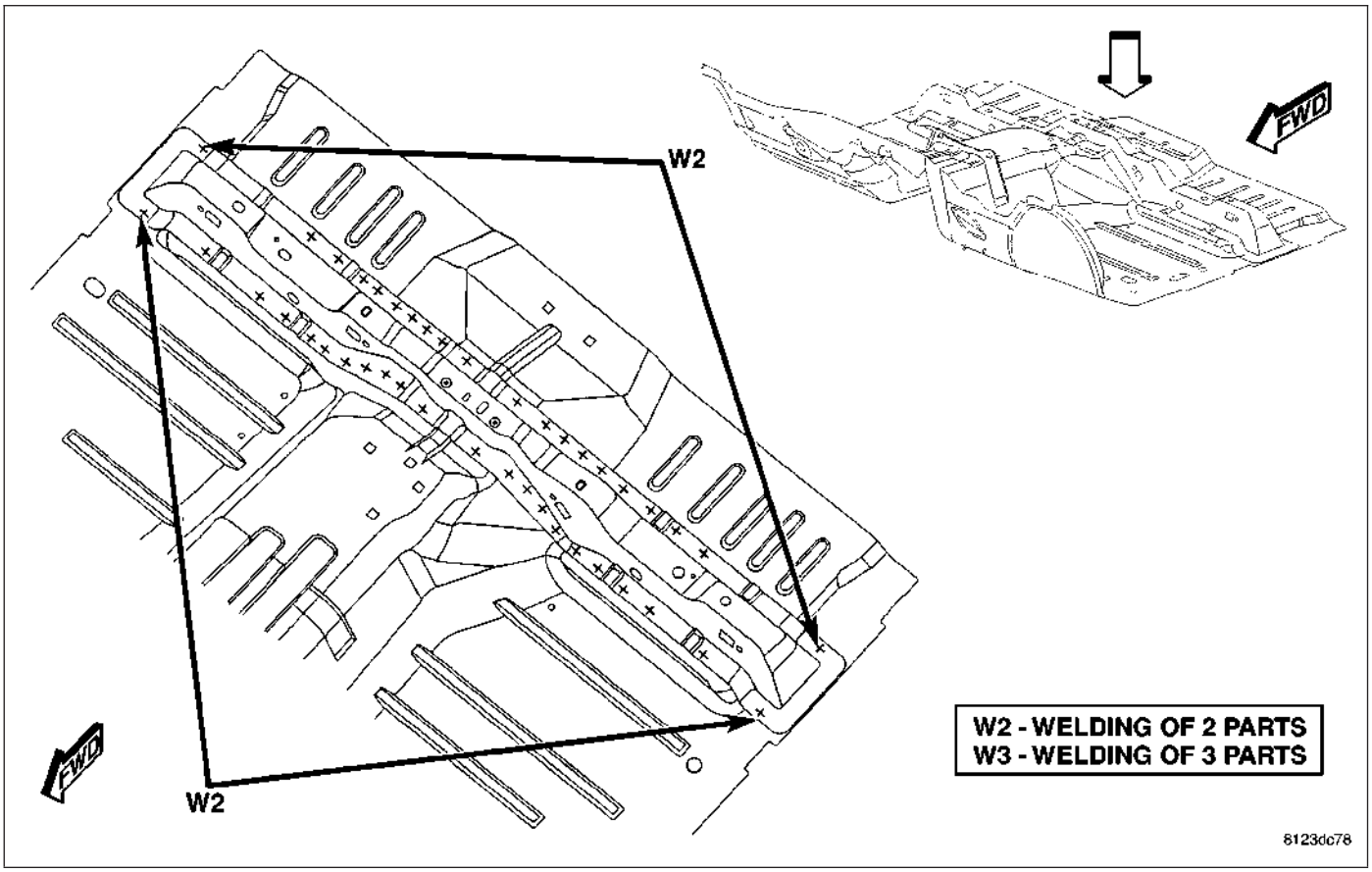

Fig. 25 FRONT FLOOR ASSEMBLY (1 OF 3)

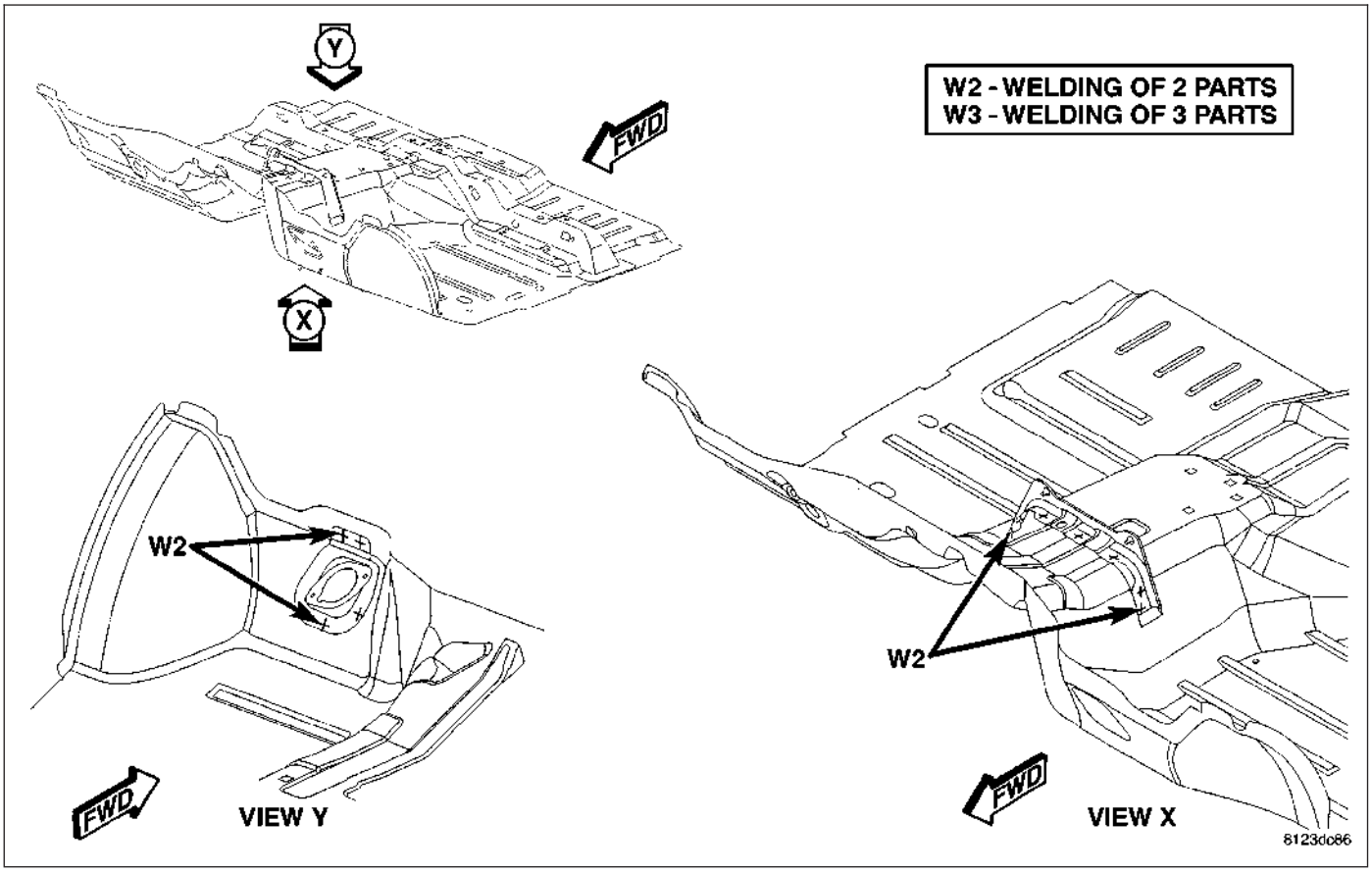

Fig. 26 FRONT FLOOR ASSEMBLY (2 OF 3)

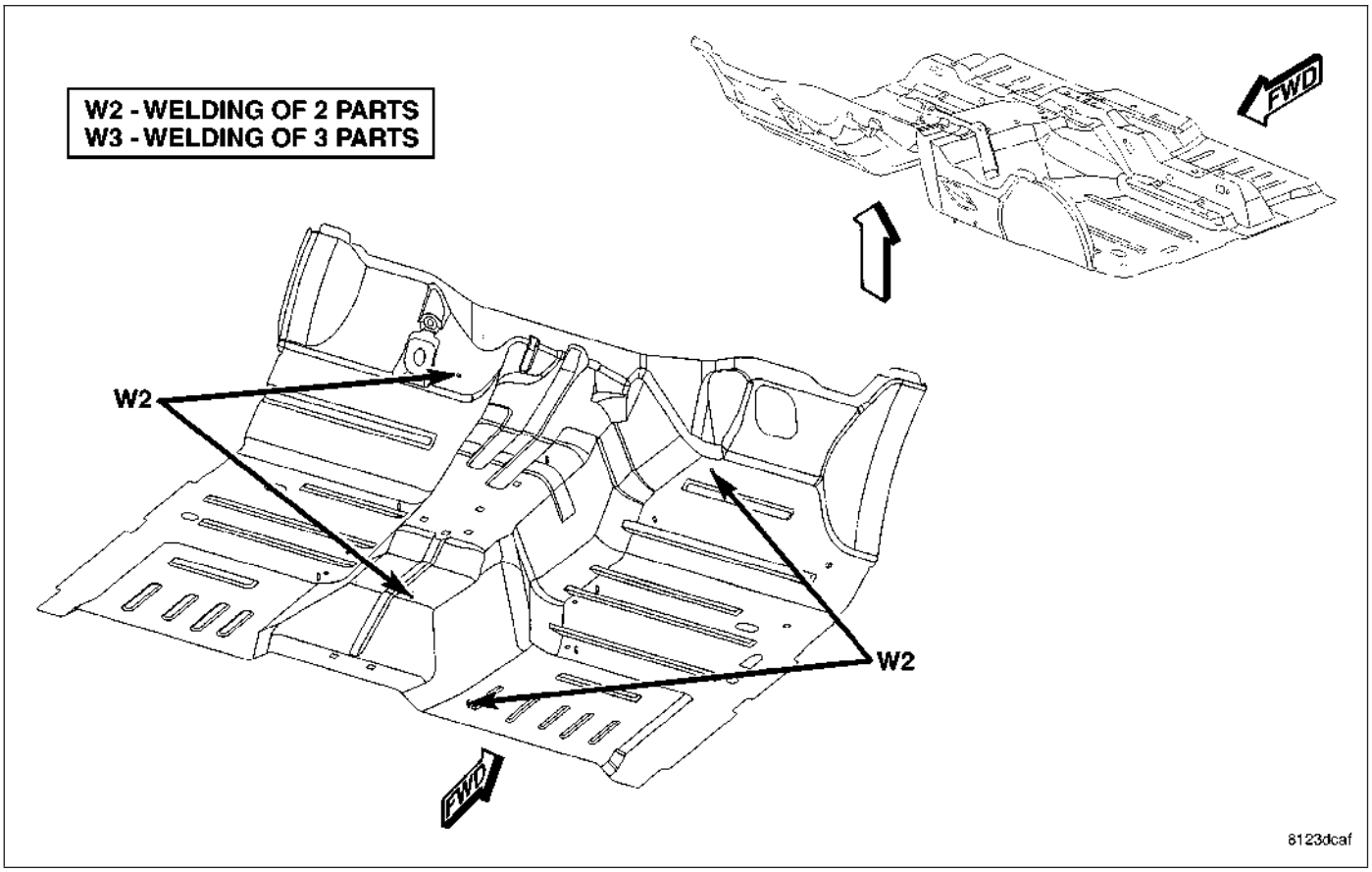

Fig. 27 FRONT FLOOR ASSEMBLY (3 OF 3)

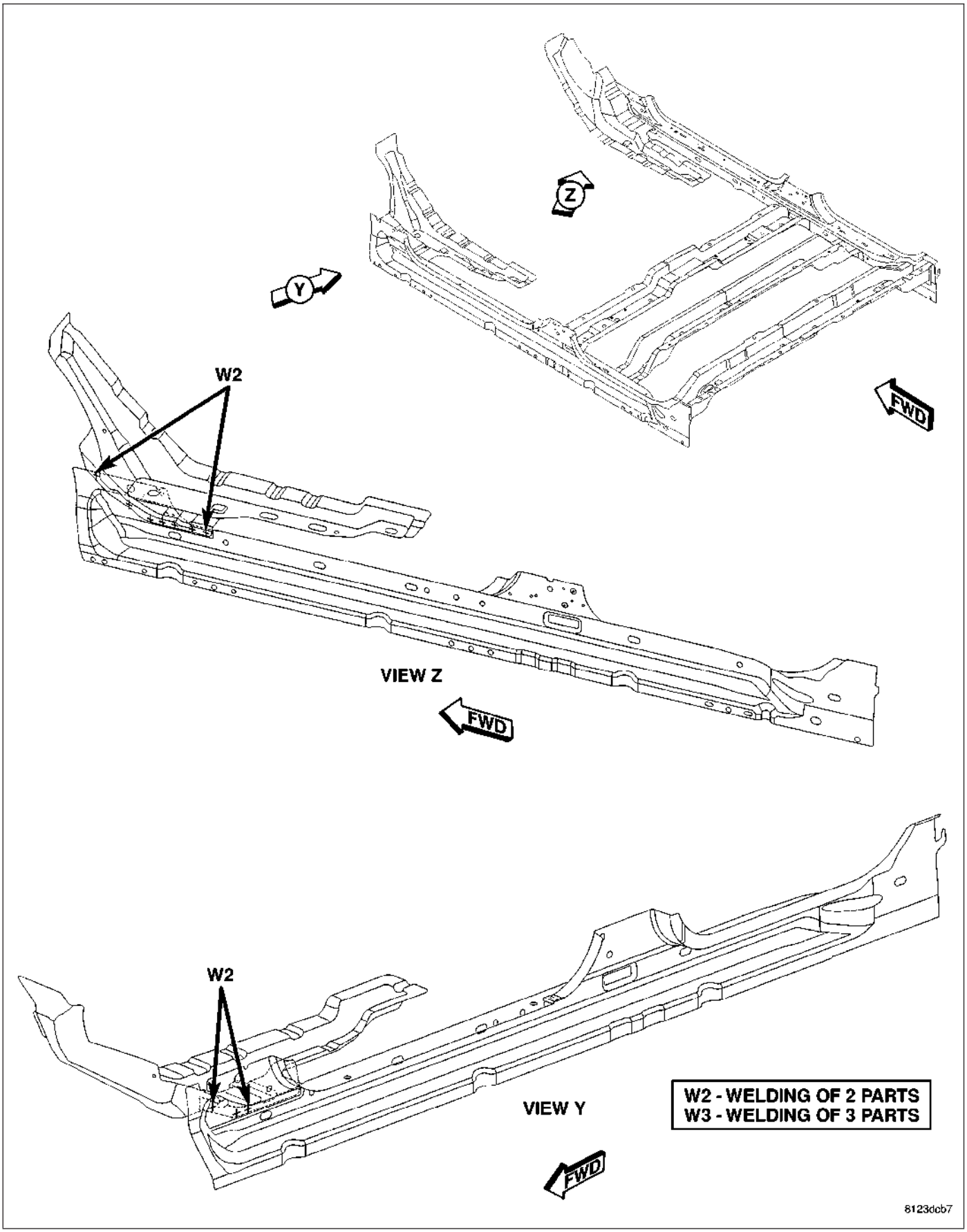

Fig. 28 LADDER ASSEMBLY (1 OF 4)

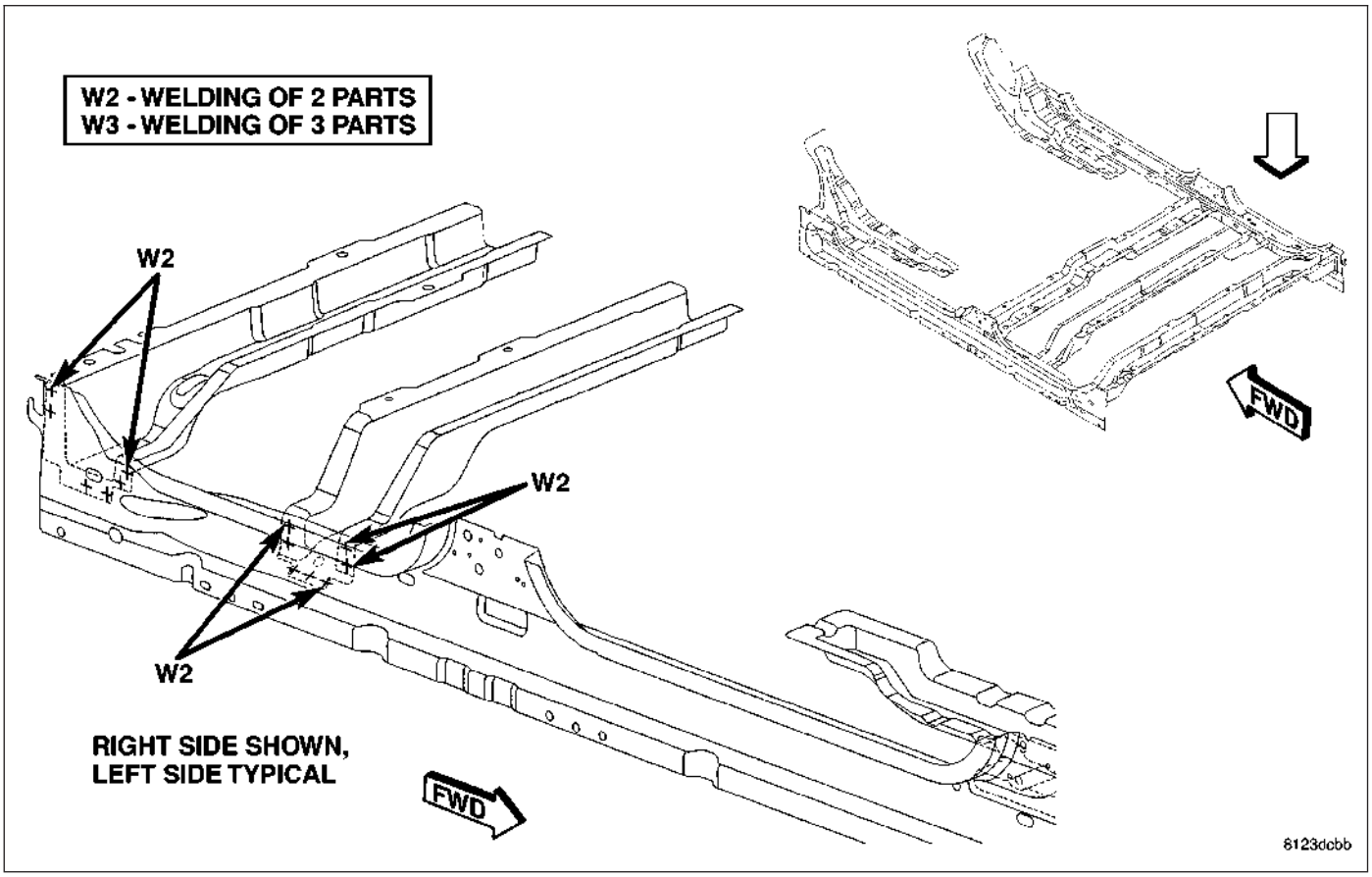

Fig. 29 LADDER ASSEMBLY (2 OF 4)

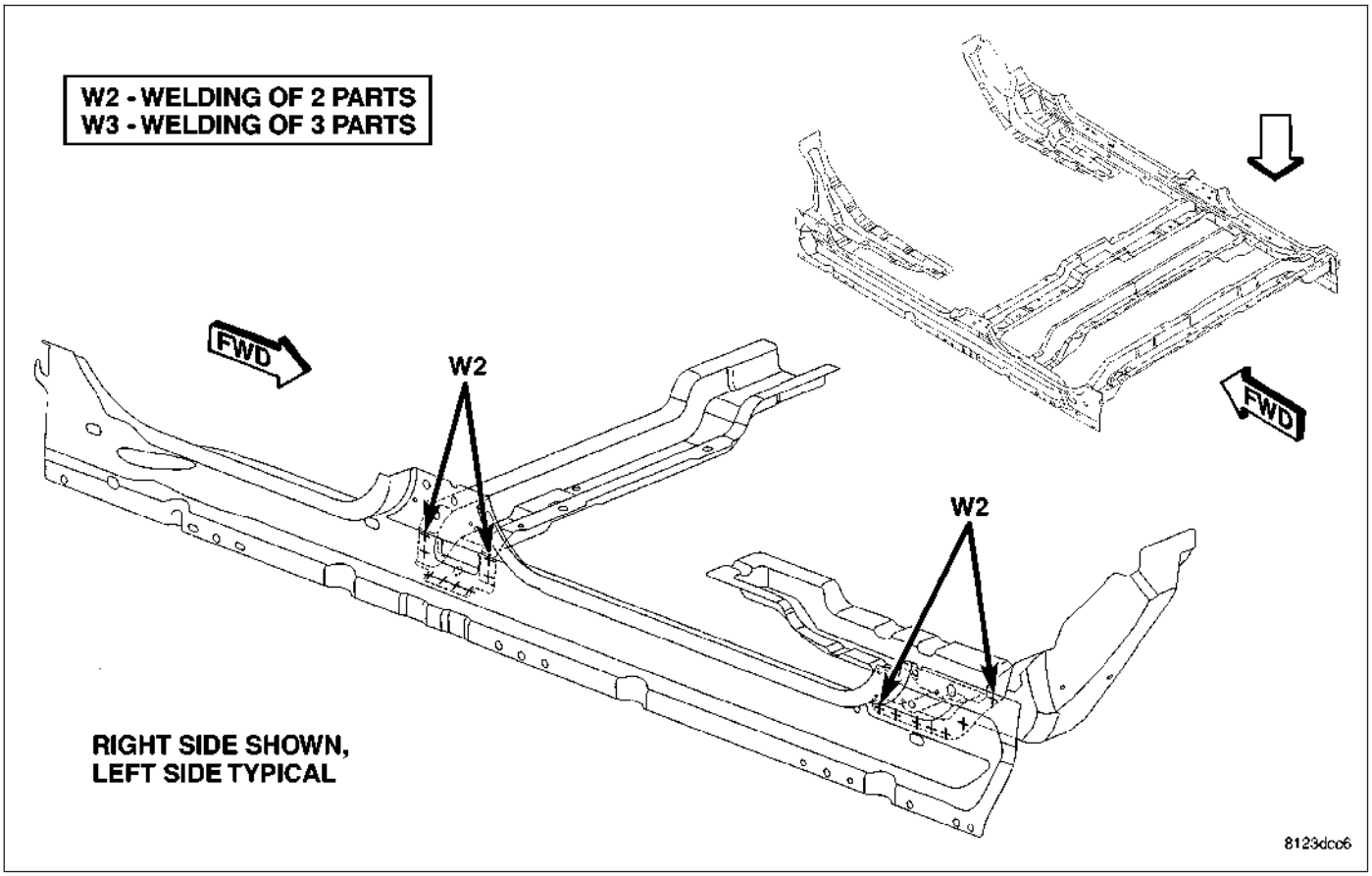

Fig. 30 LADDER ASSEMBLY (3 OF 4)

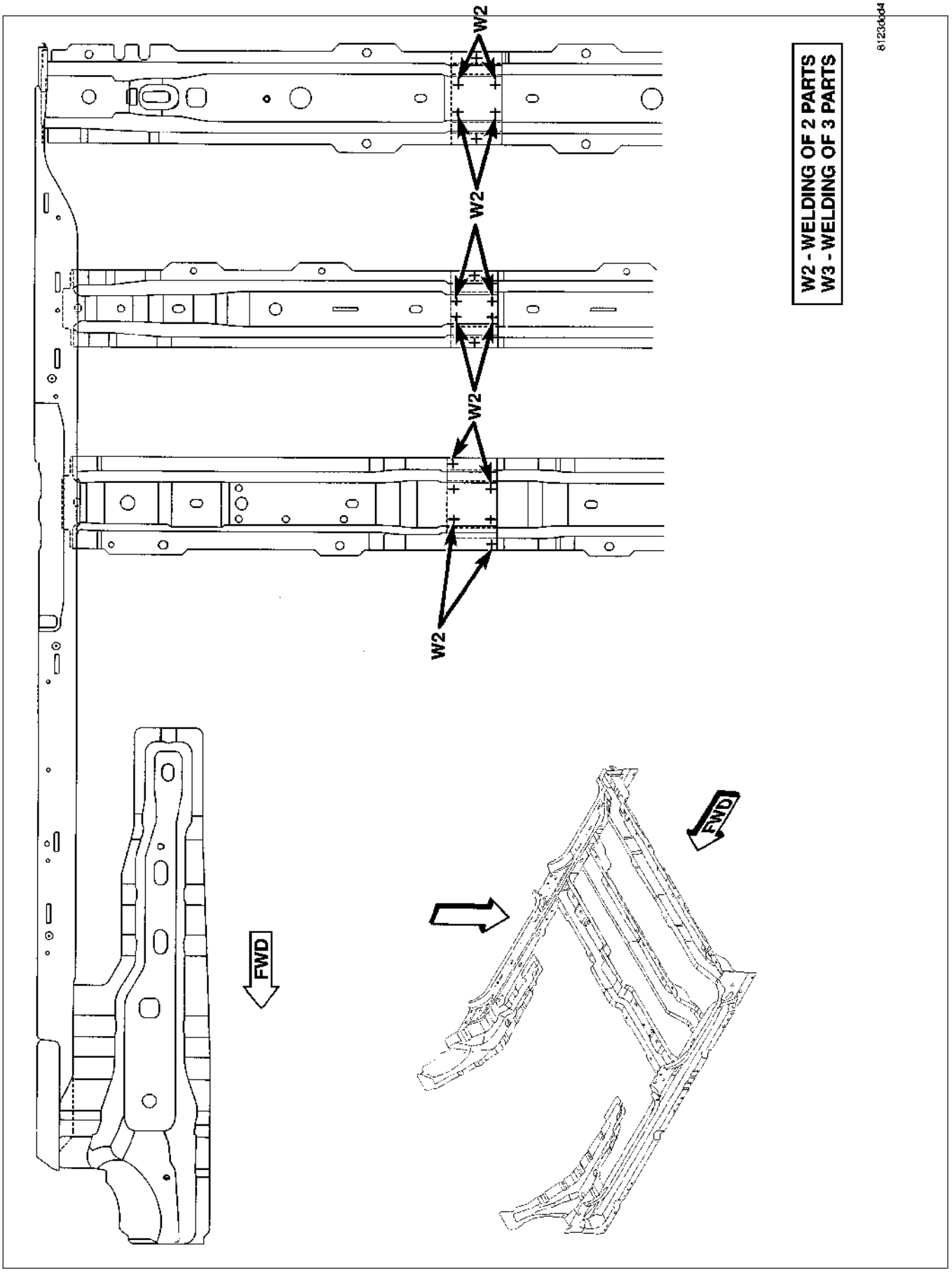

Fig. 31 LADDER ASSEMBLY (4 OF 4)

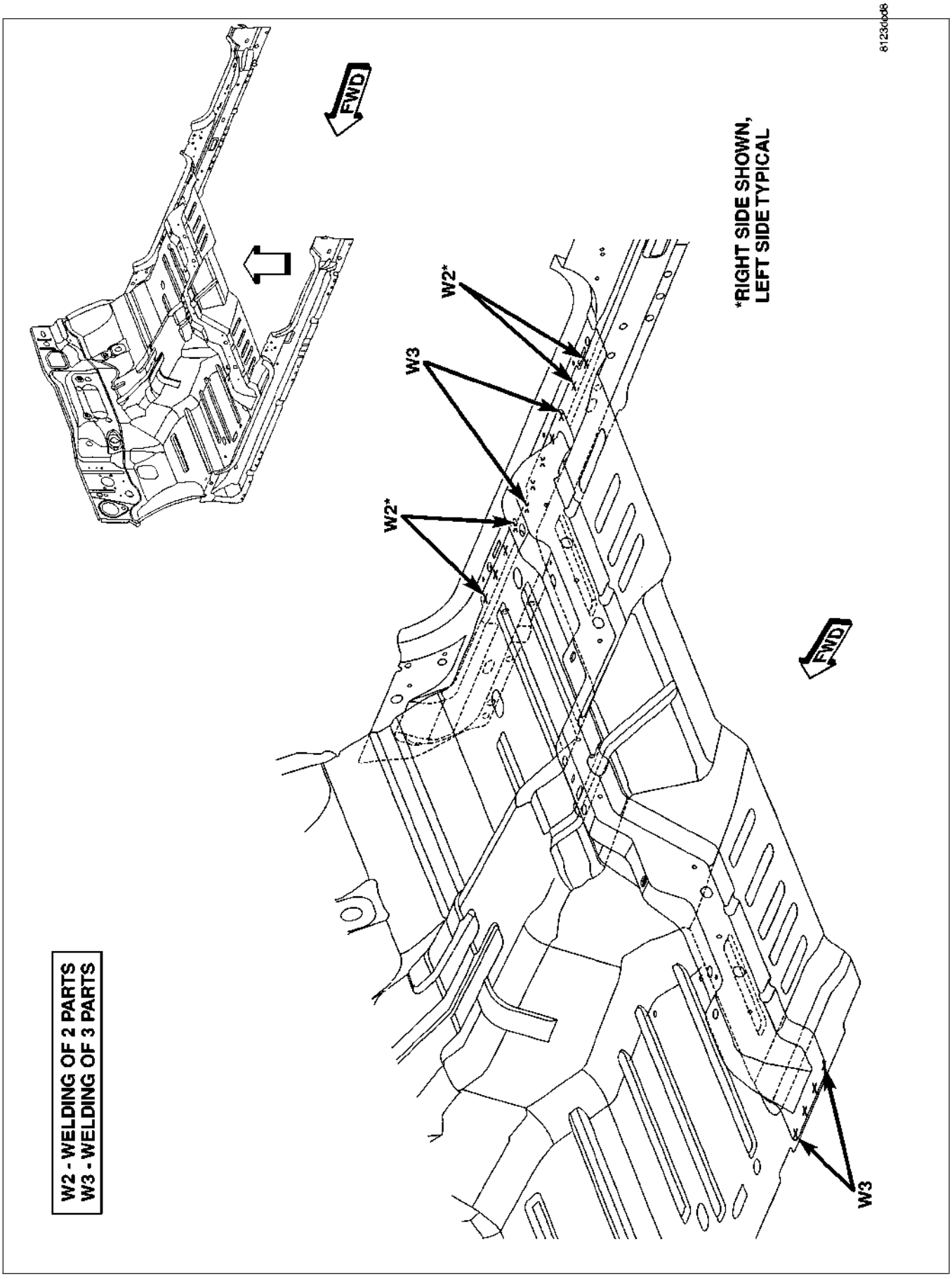

Fig. 32 DASH TO FLOOR - COMPLETE (1 OF 6)

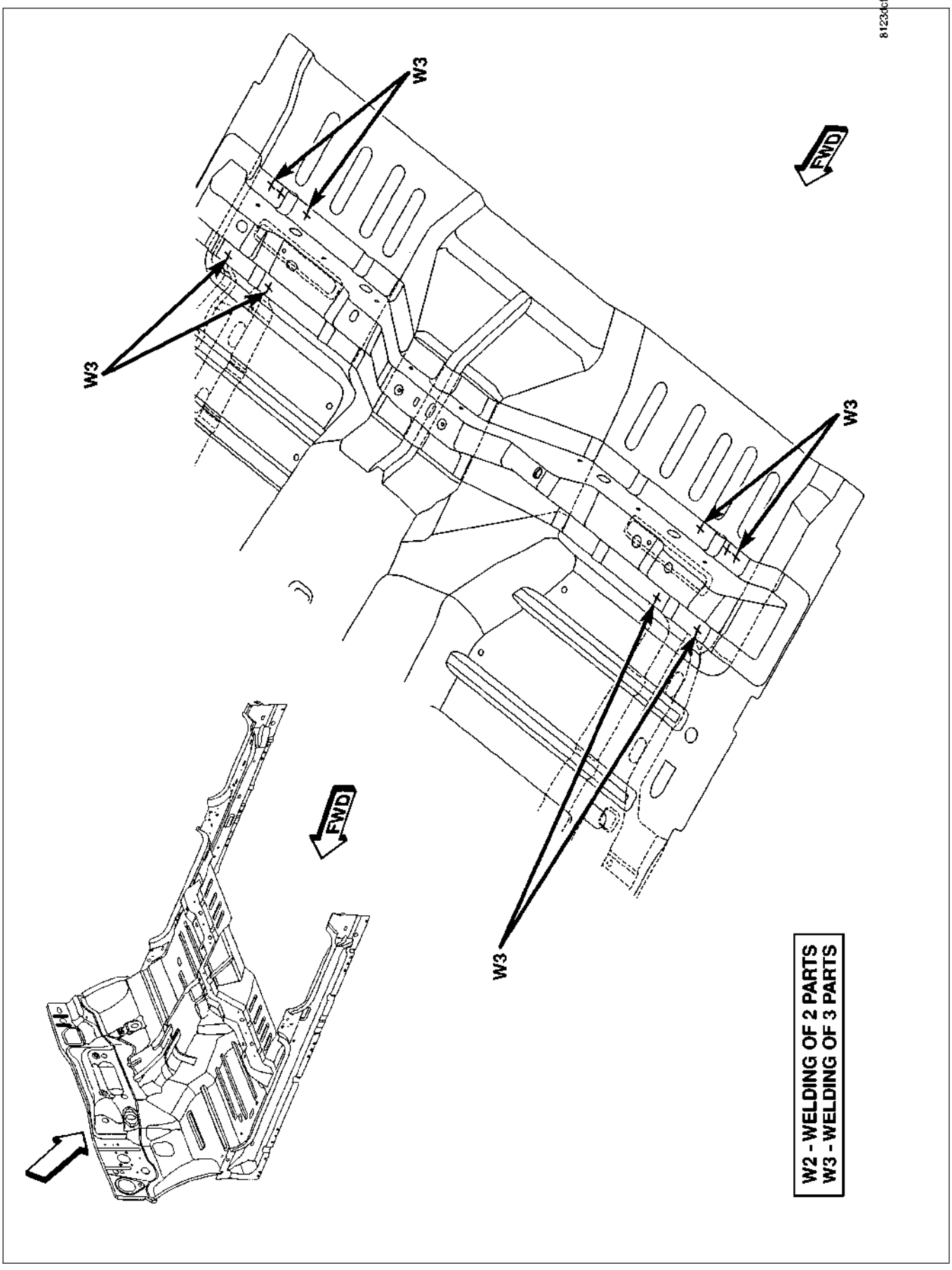

Fig. 33 DASH TO FLOOR - COMPLETE (2 FL 6)

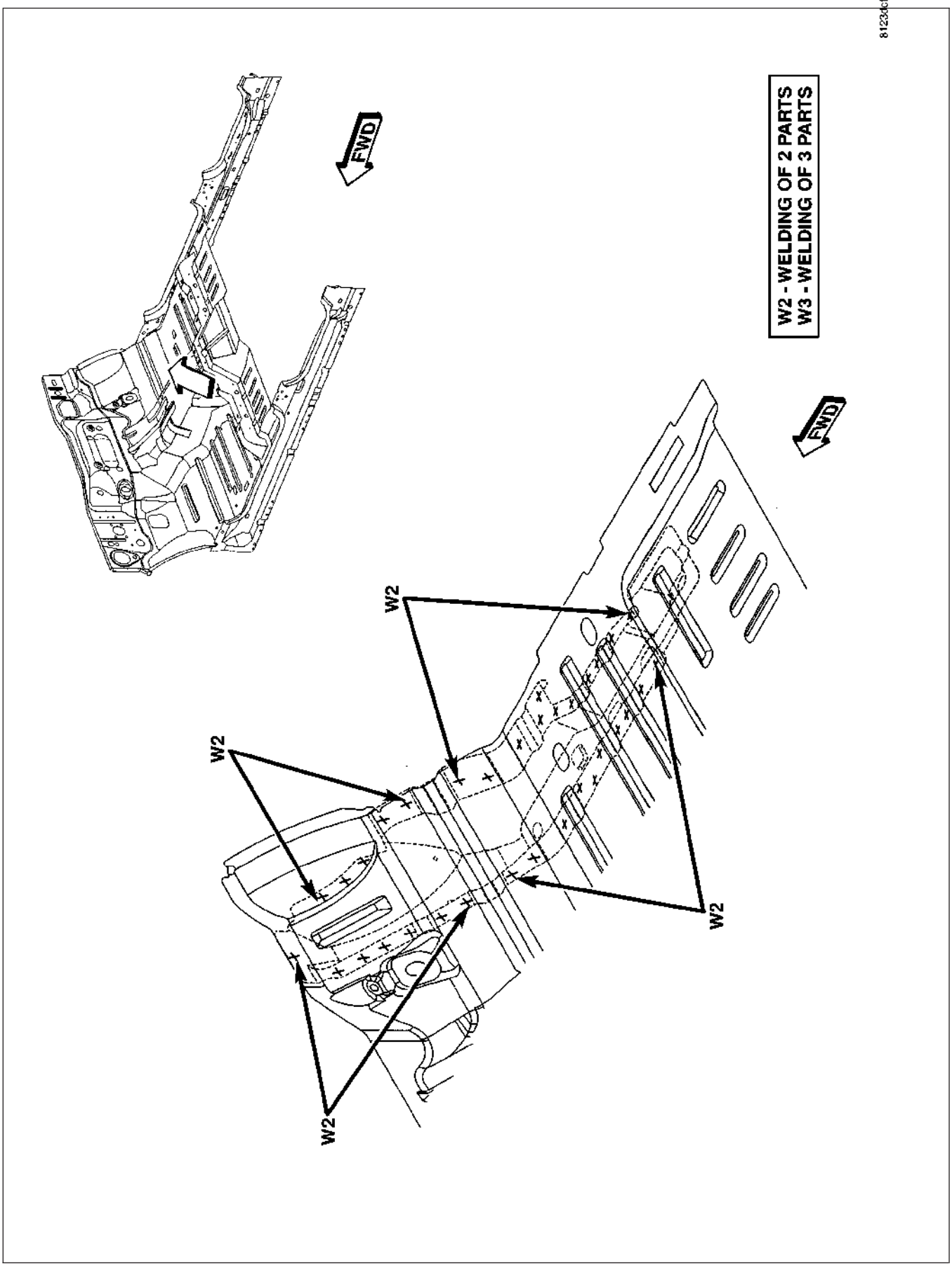

Fig. 34 DASH TO FLOOR - COMPLETE (3 OF 6)

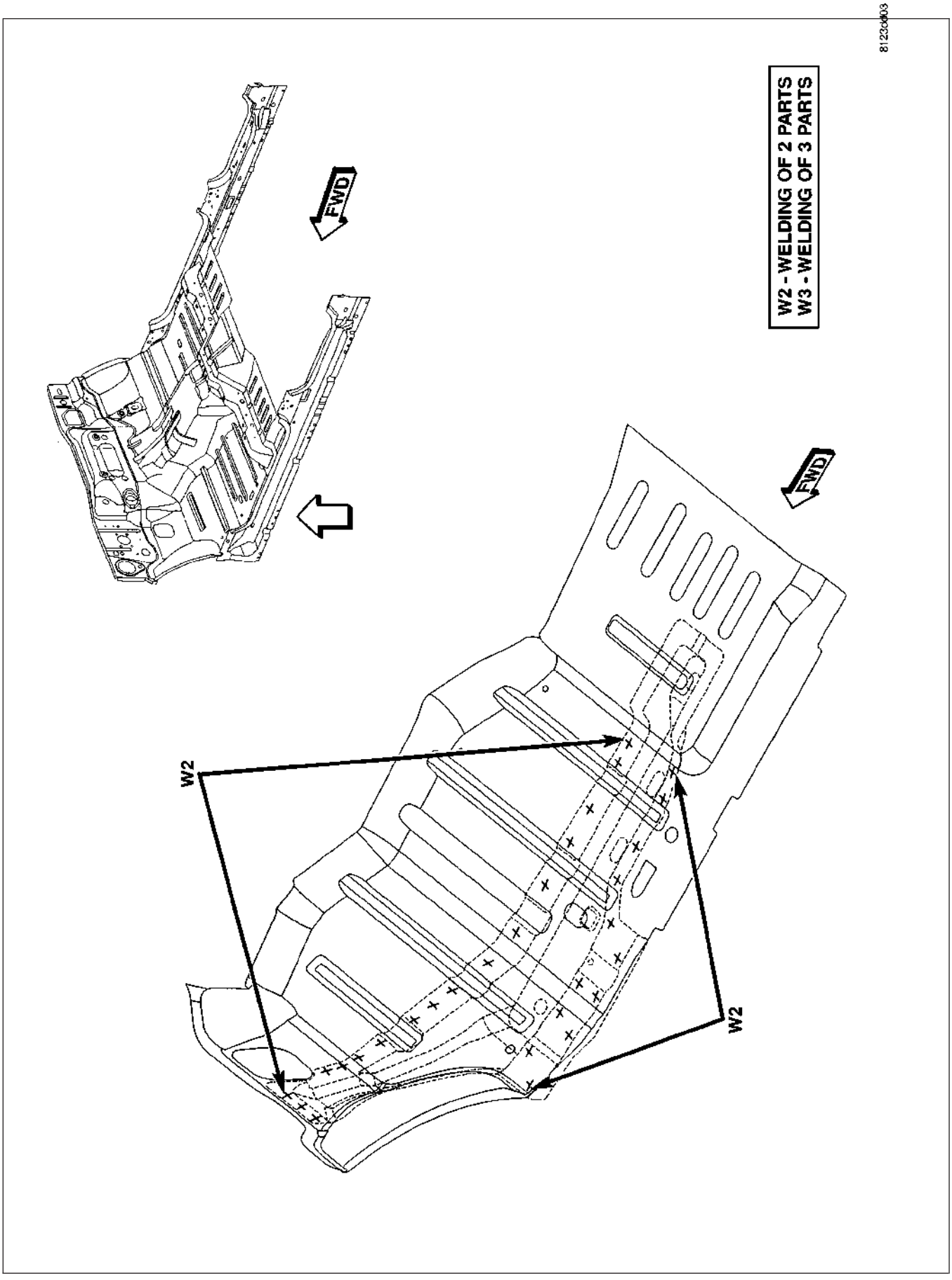

Fig. 35 DASH TO FLOOR - COMPLETE (4 OF 6)

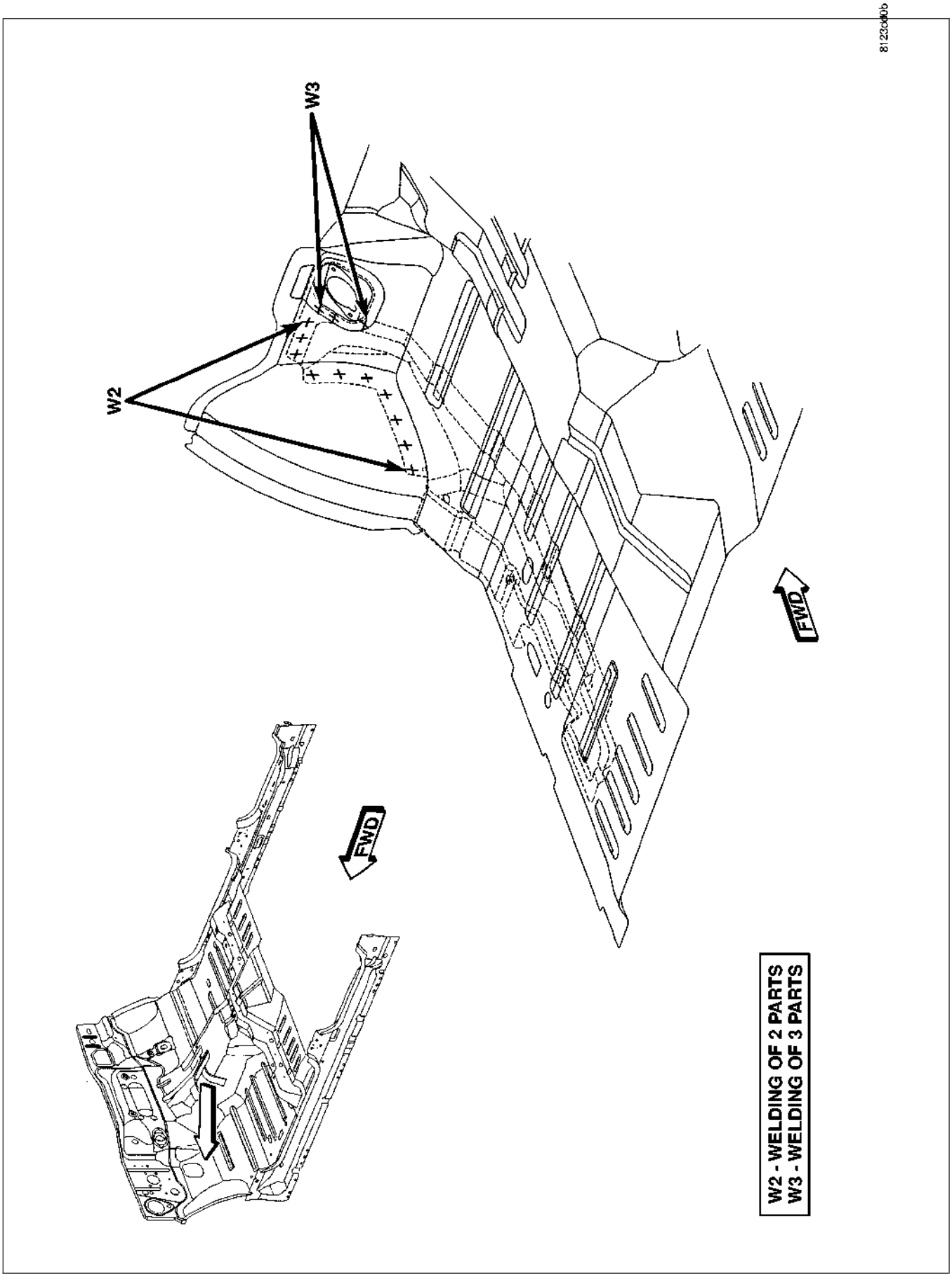

Fig. 36 DASH TO FLOOR - COMPLETE (5 OF 6)

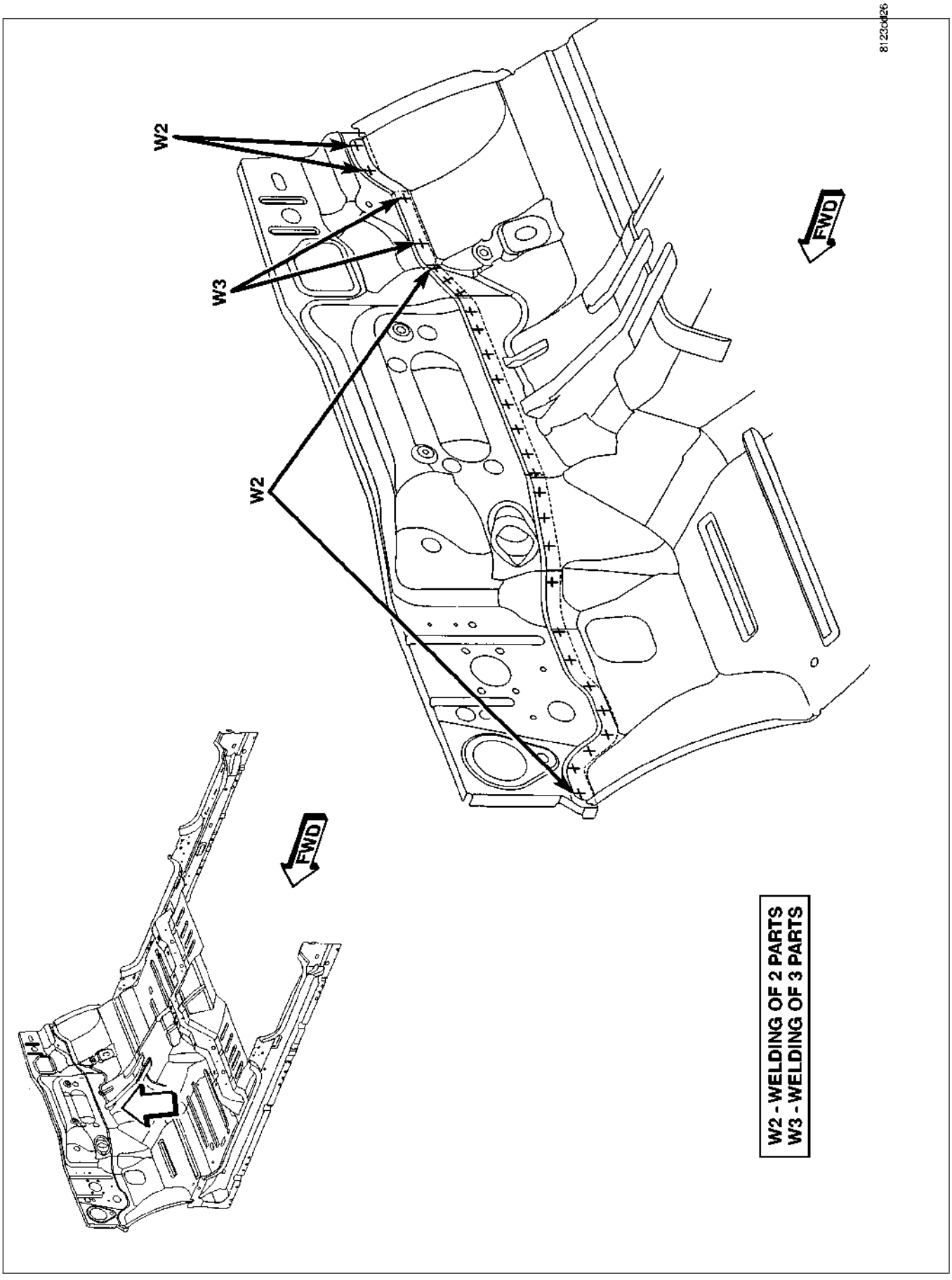

Fig. 37 DASH TO FLOOR - COMPLETE (6 OF 6)

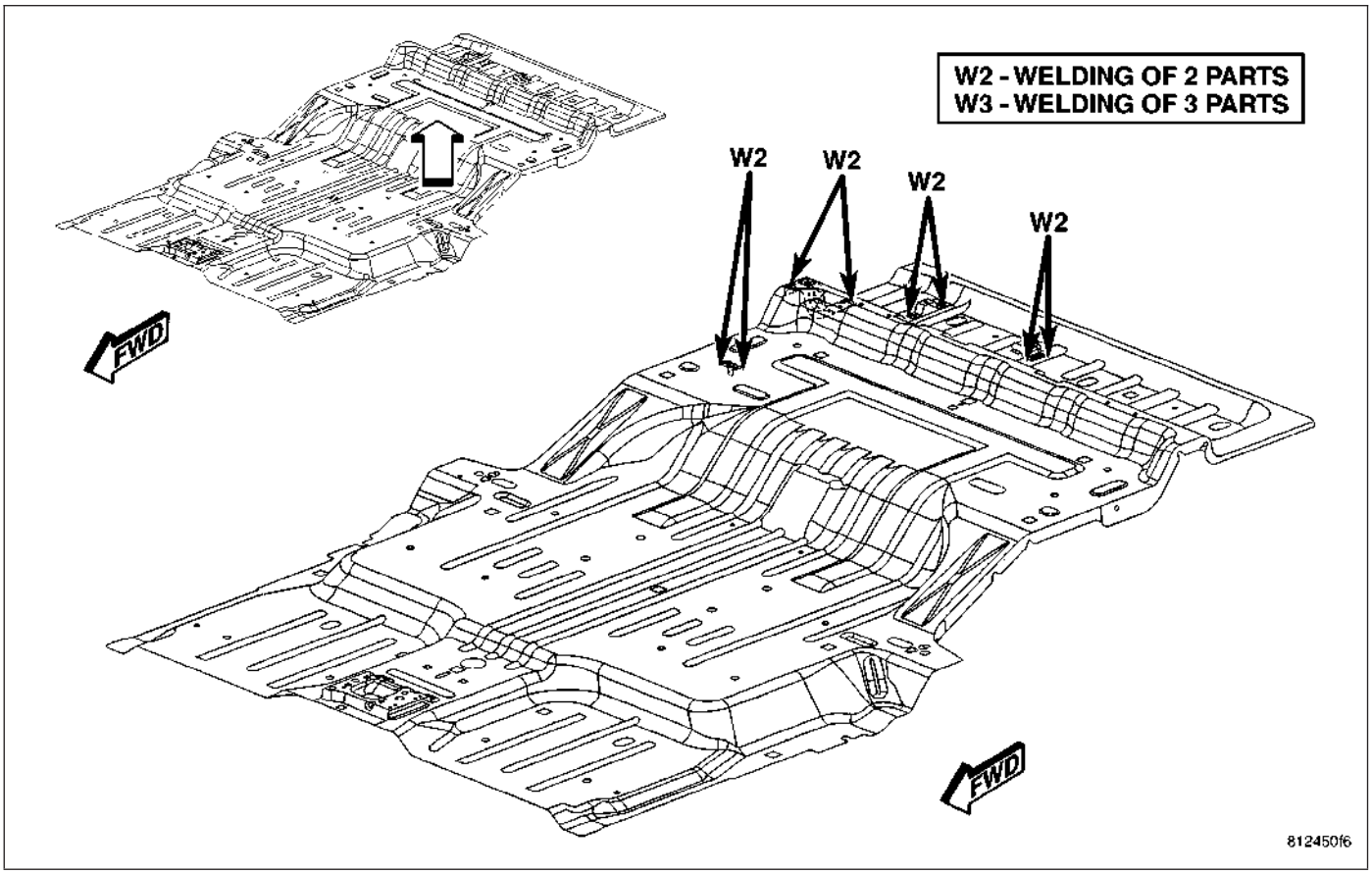

Fig. 38 REAR FLOOR ASSEMBLY (1 OF 3)

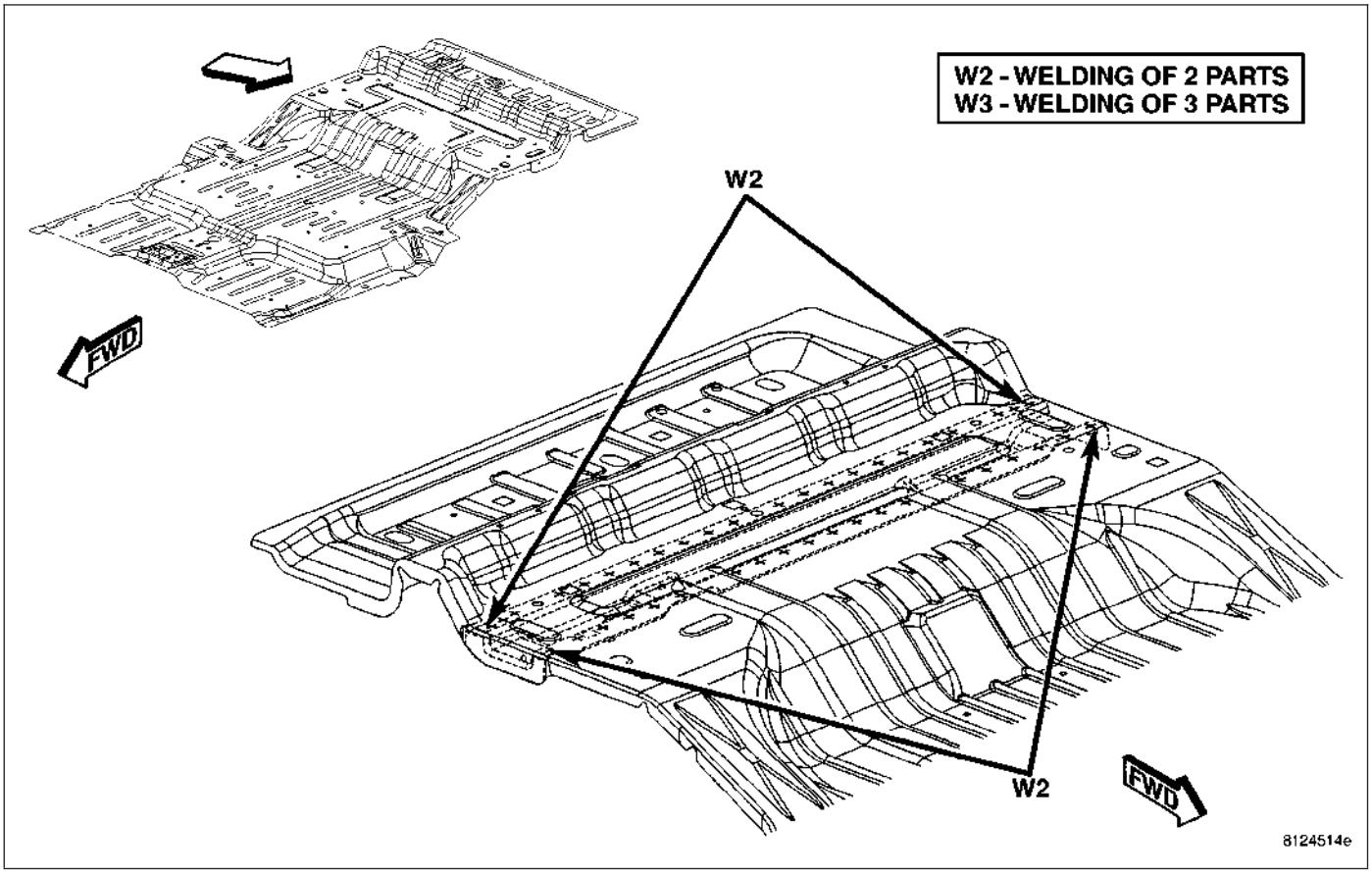

Fig. 39 REAR FLOOR ASSEMBLY (2 OF 3)

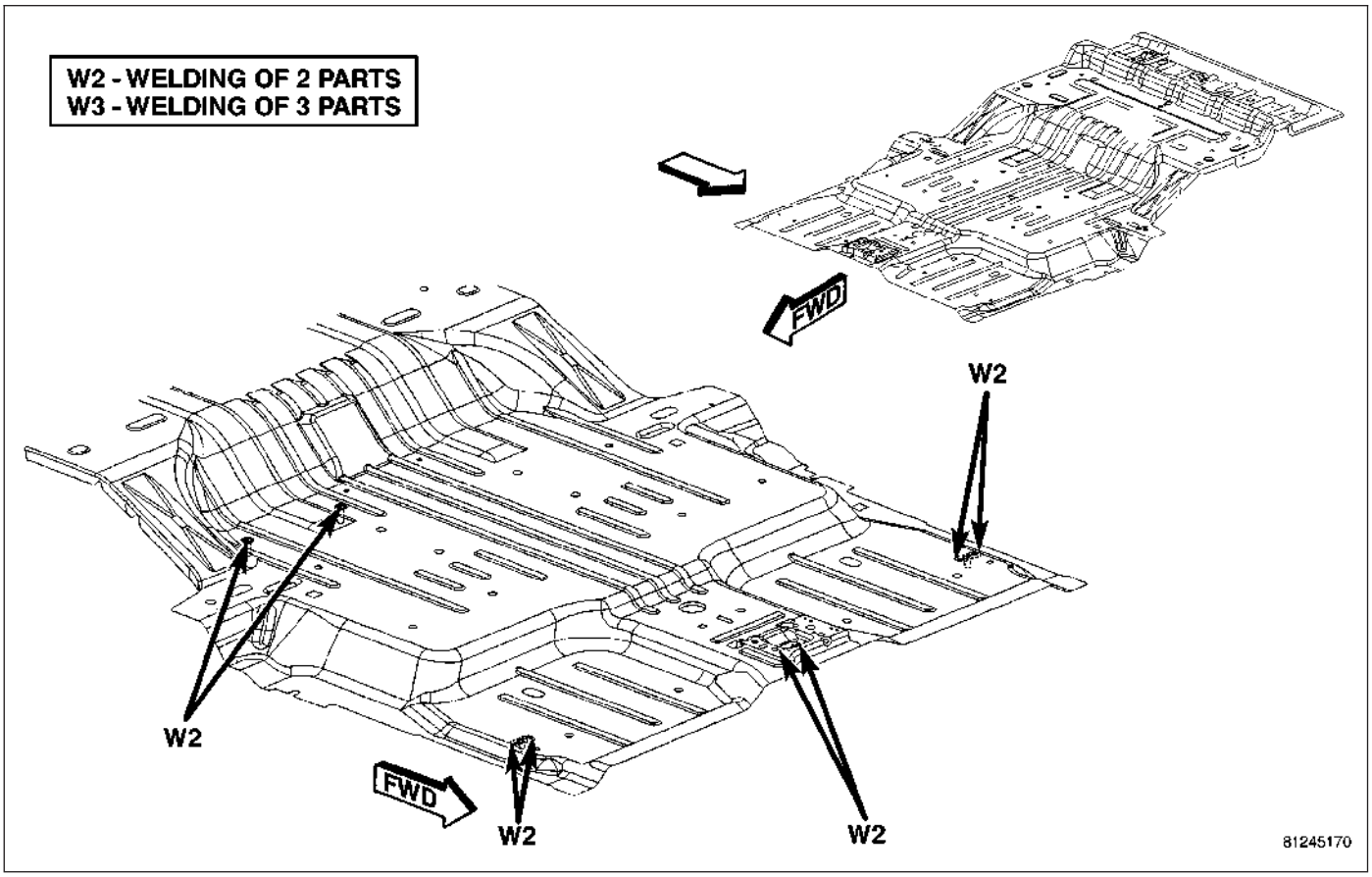

Fig. 40 REAR FLOOR ASSEMBLY (3 OF 3)

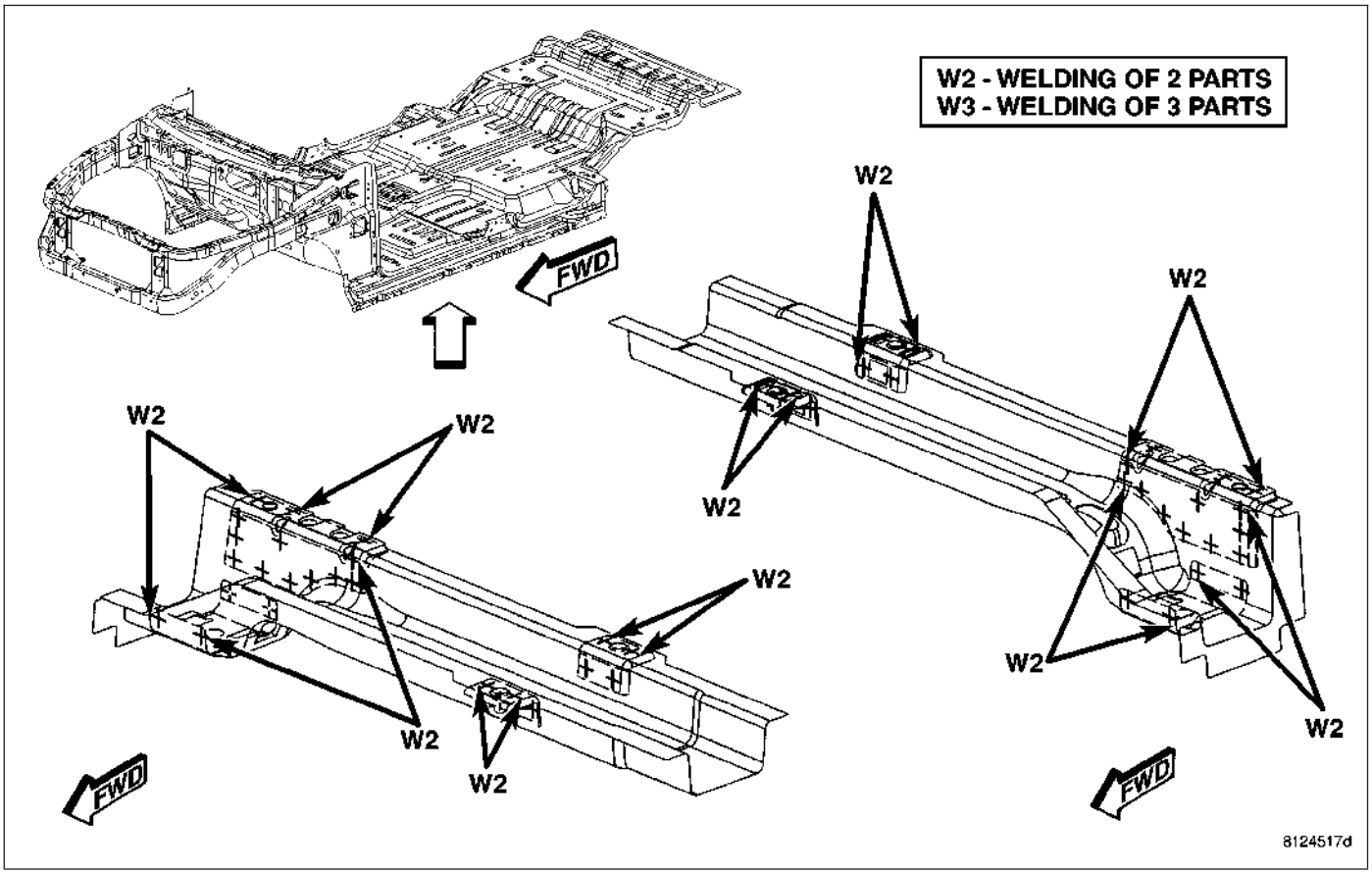

Fig. 41 UNDERBODY (1 OF 2)

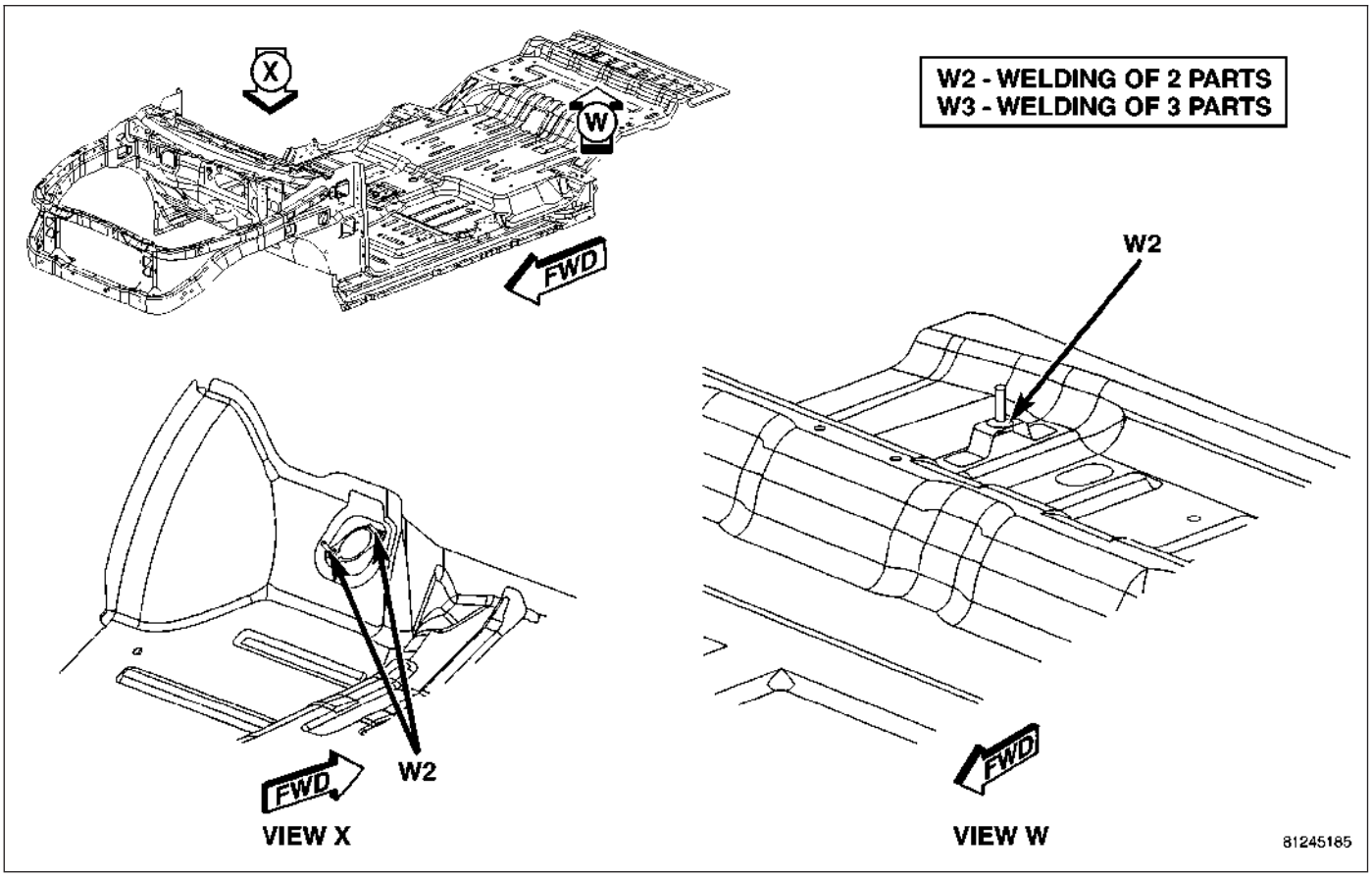

Fig. 42 UNDERBODY (2 OF 2)

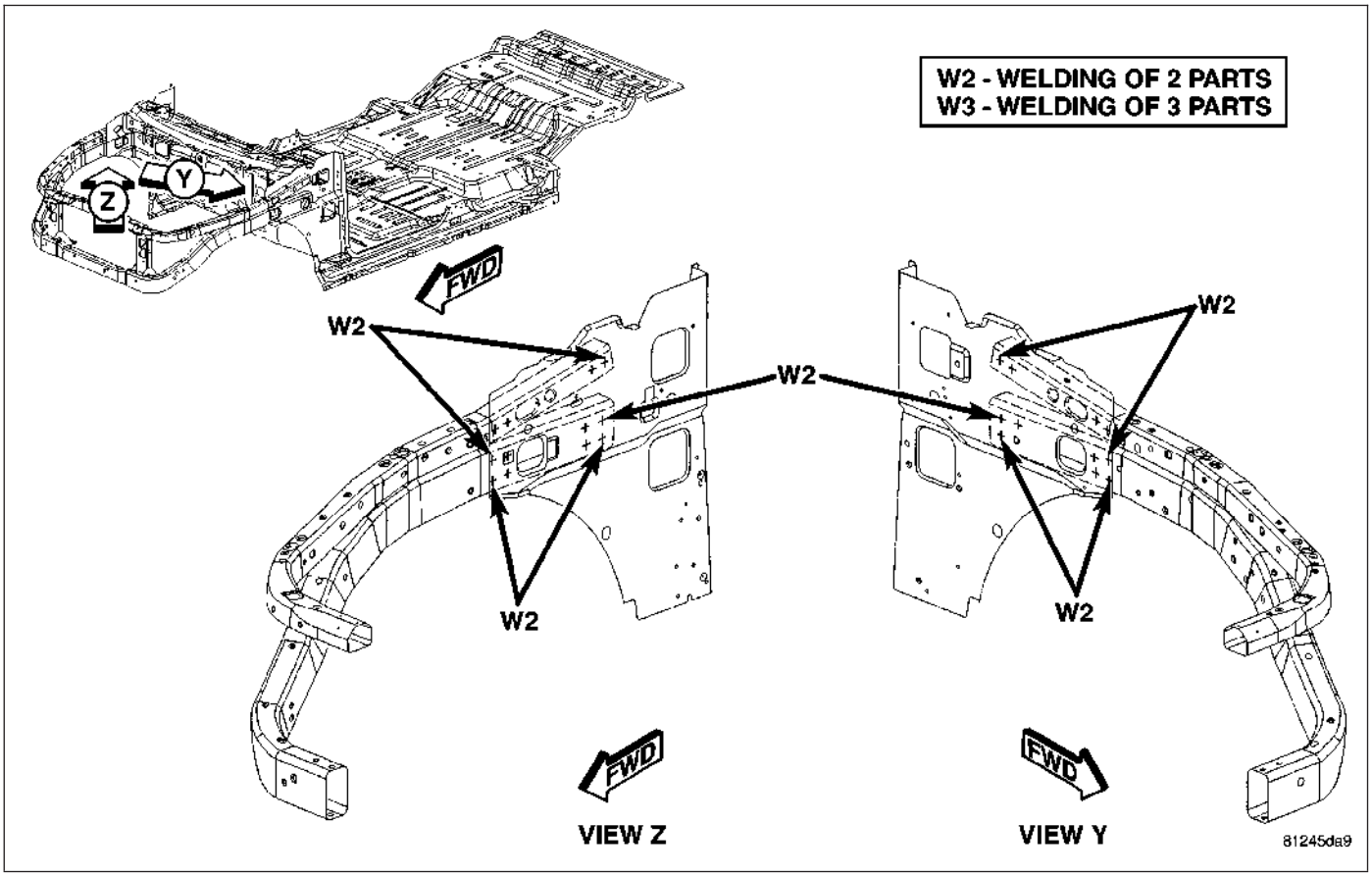

Fig. 43 UNDERBODY - COMPLETE (1 OF 13)

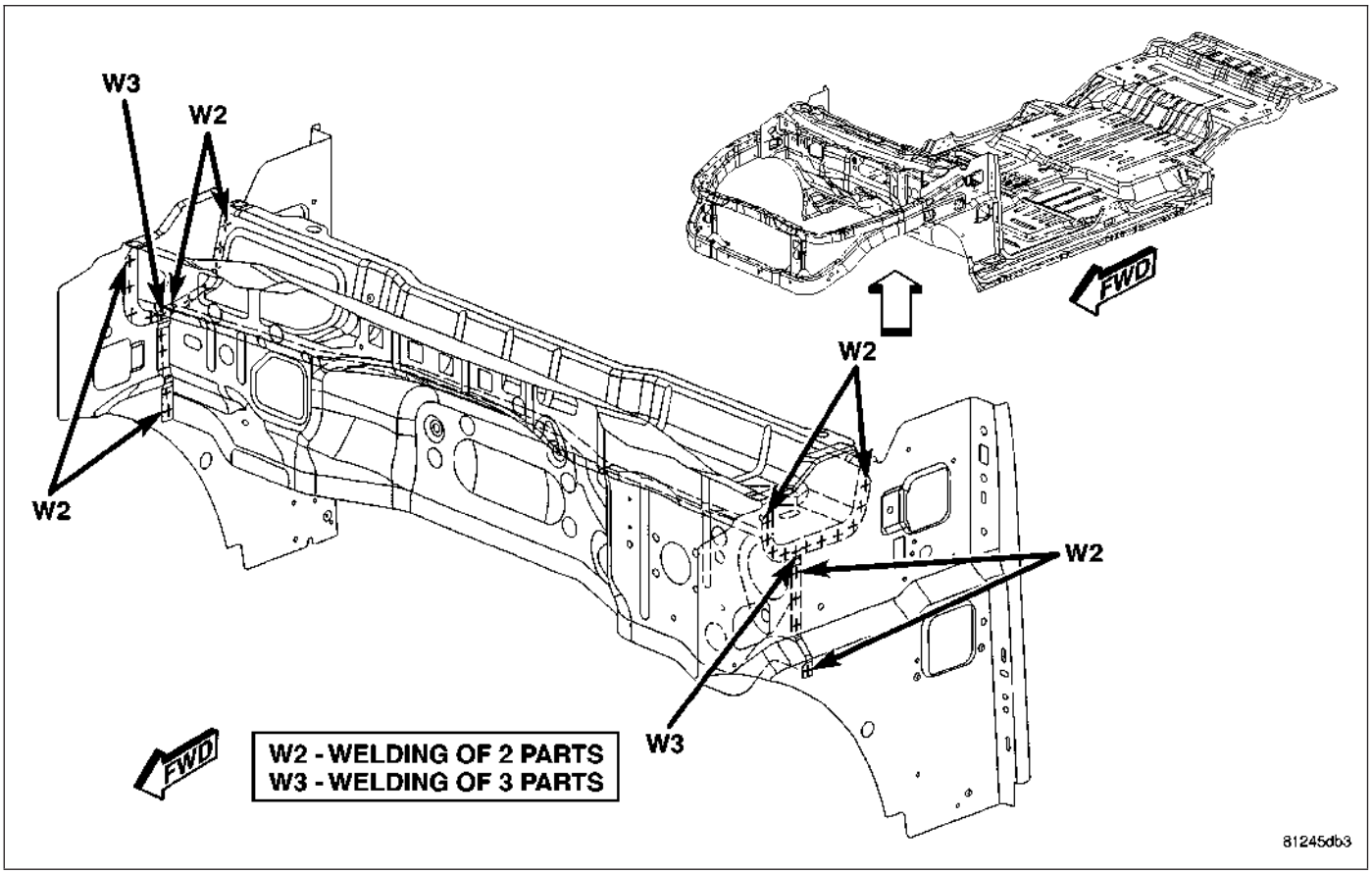

Fig. 44 UNDERBODY - COMPLETE (2 OF 13)

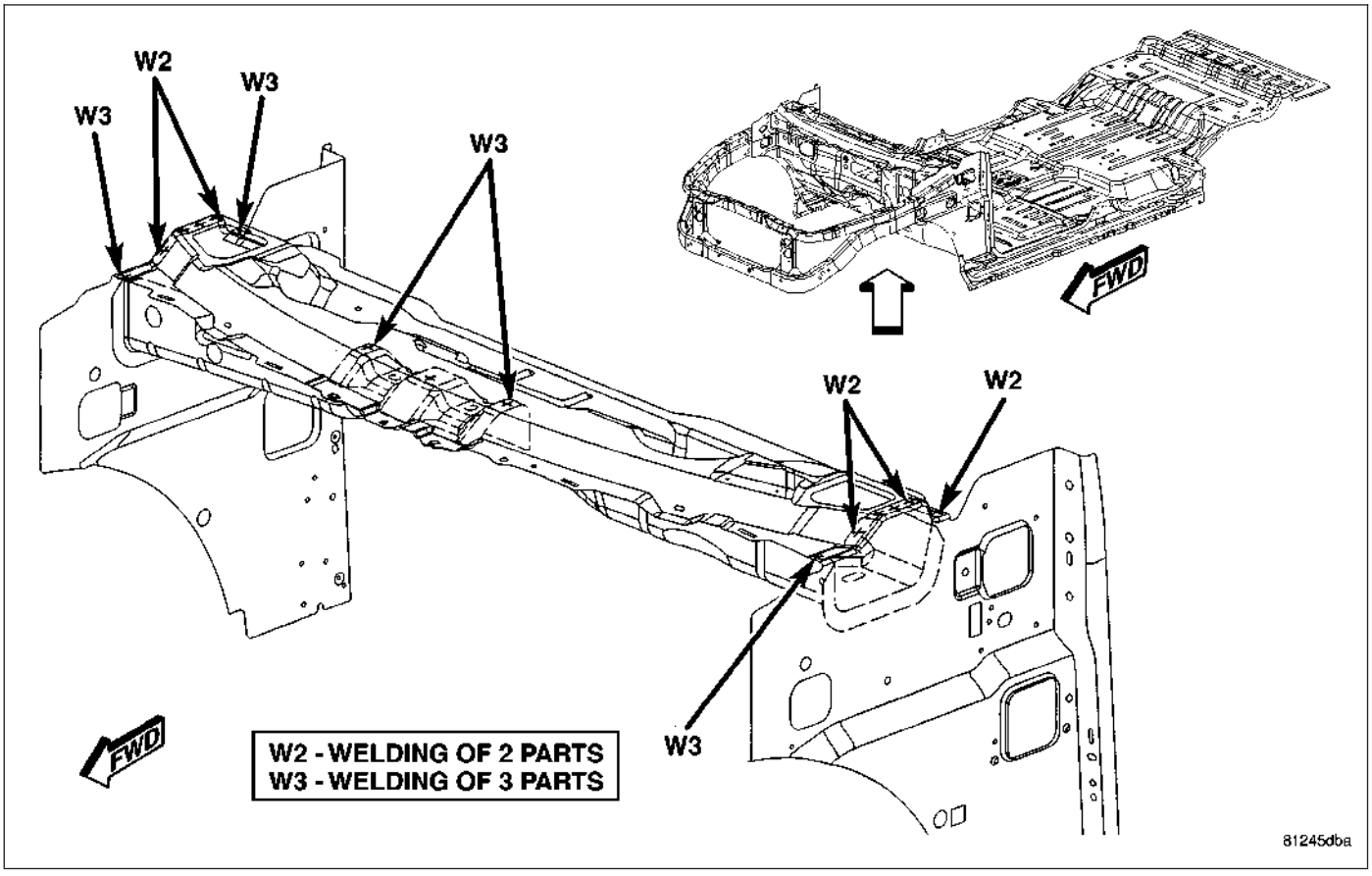

Fig. 45 UNDERBODY - COMPLETE (3 OF 13)

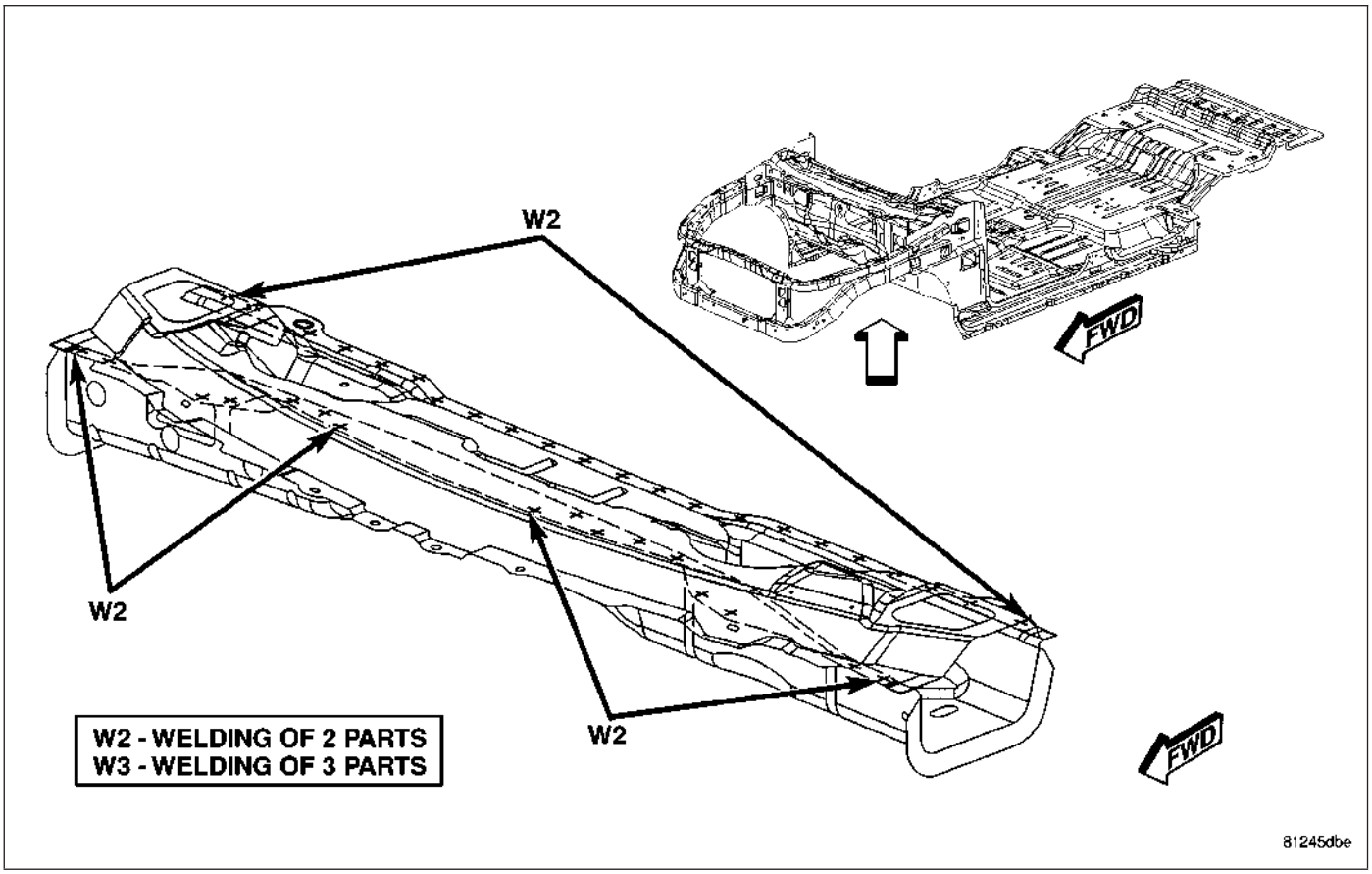

Fig. 46 UNDERBODY - COMPLETE (4 OF 13)

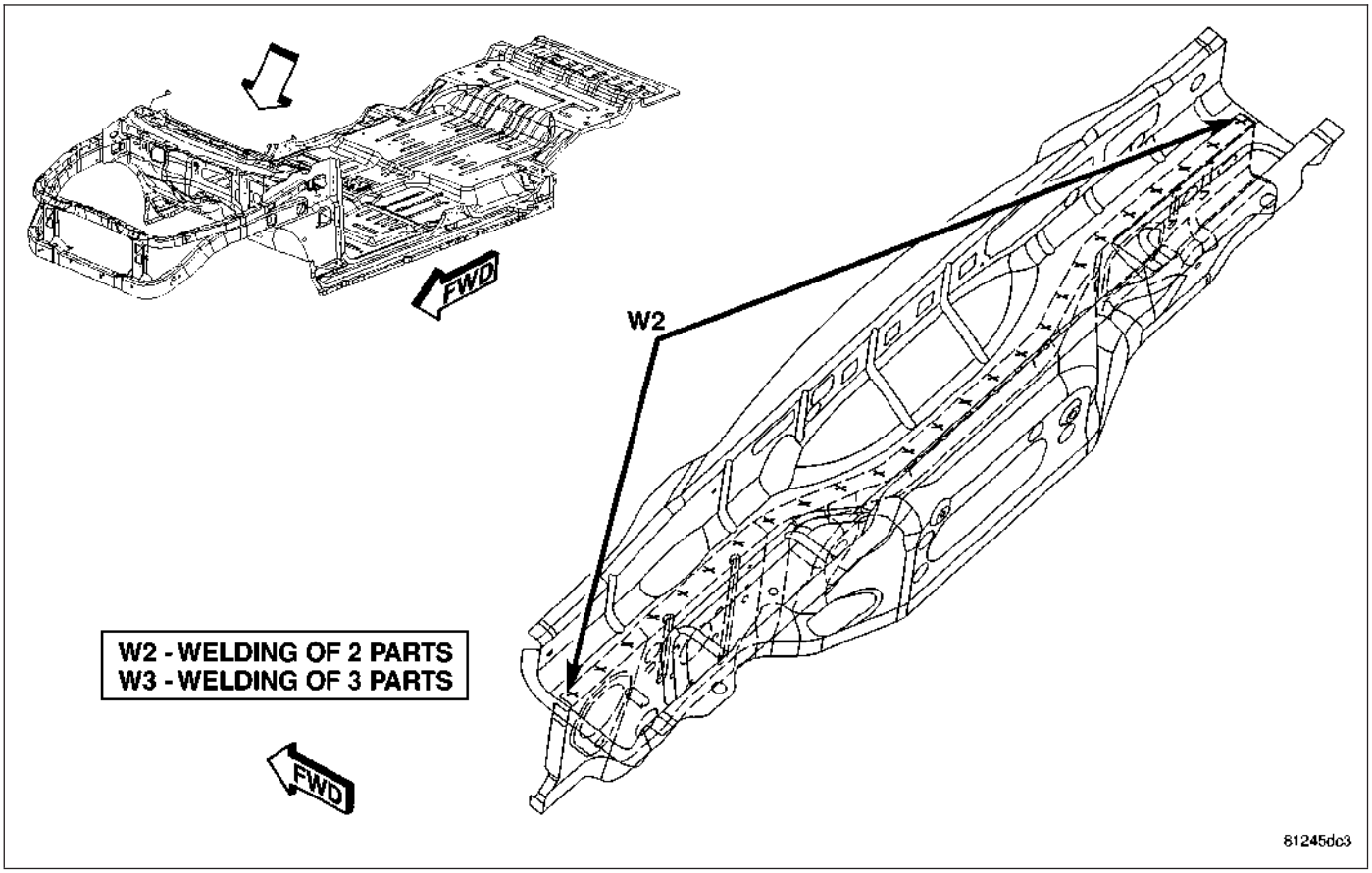

Fig. 47 UNDERBODY - COMPLETE (5 OF 13)

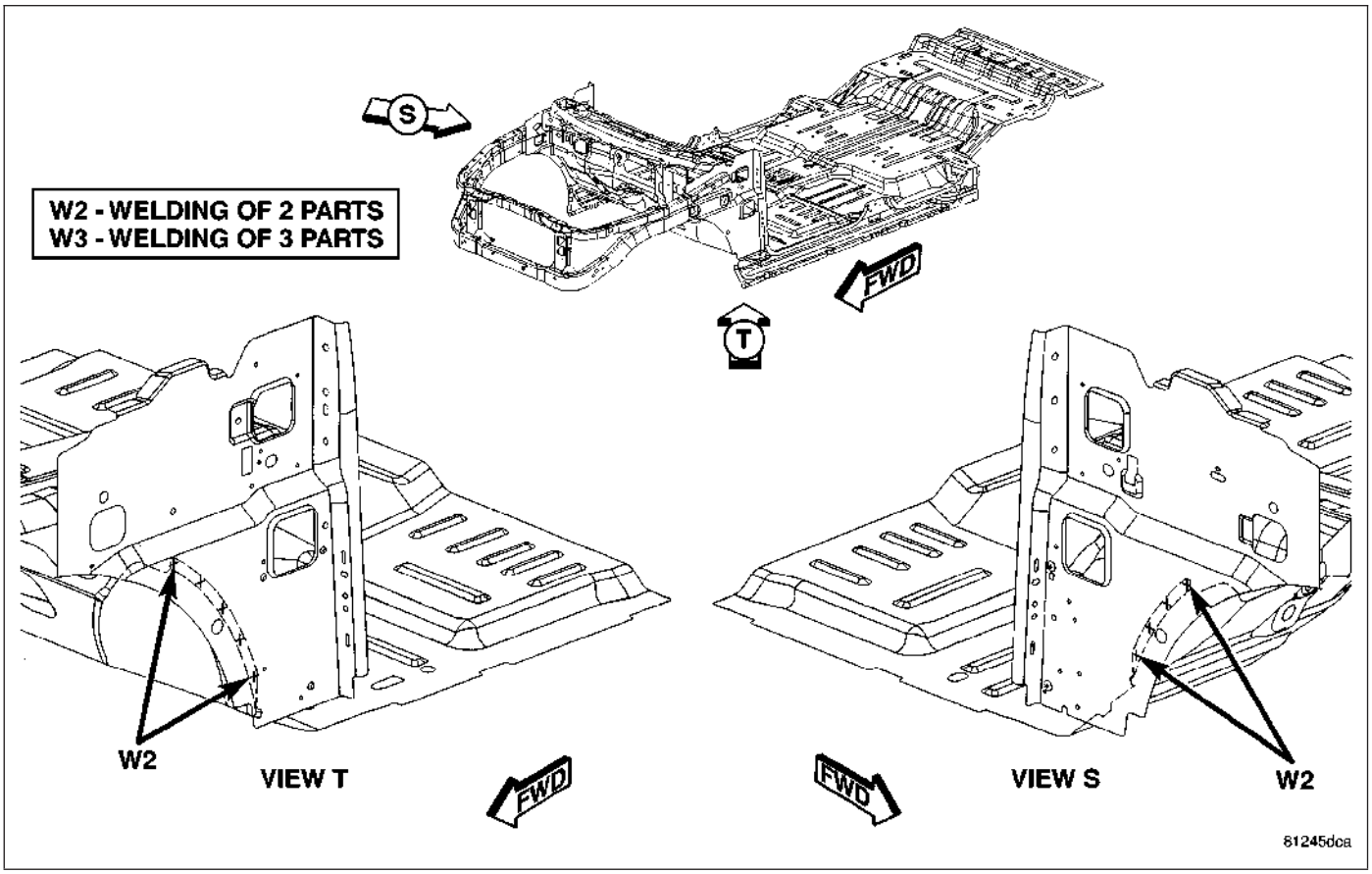

Fig. 48 UNDERBODY - COMPLETE (6 OF 13)

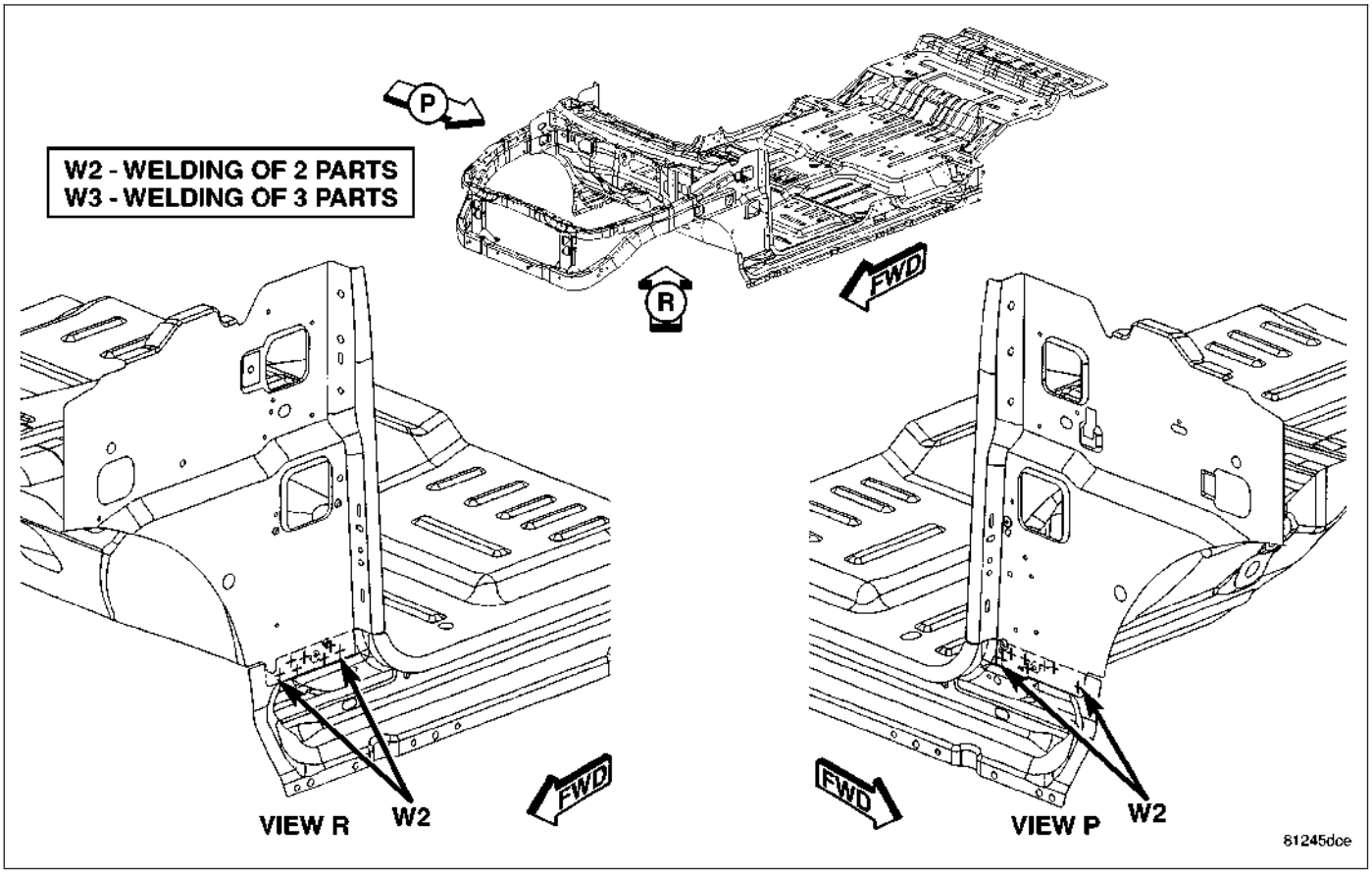

Fig. 49 UNDERBODY - COMPLETE (7 OF 13)

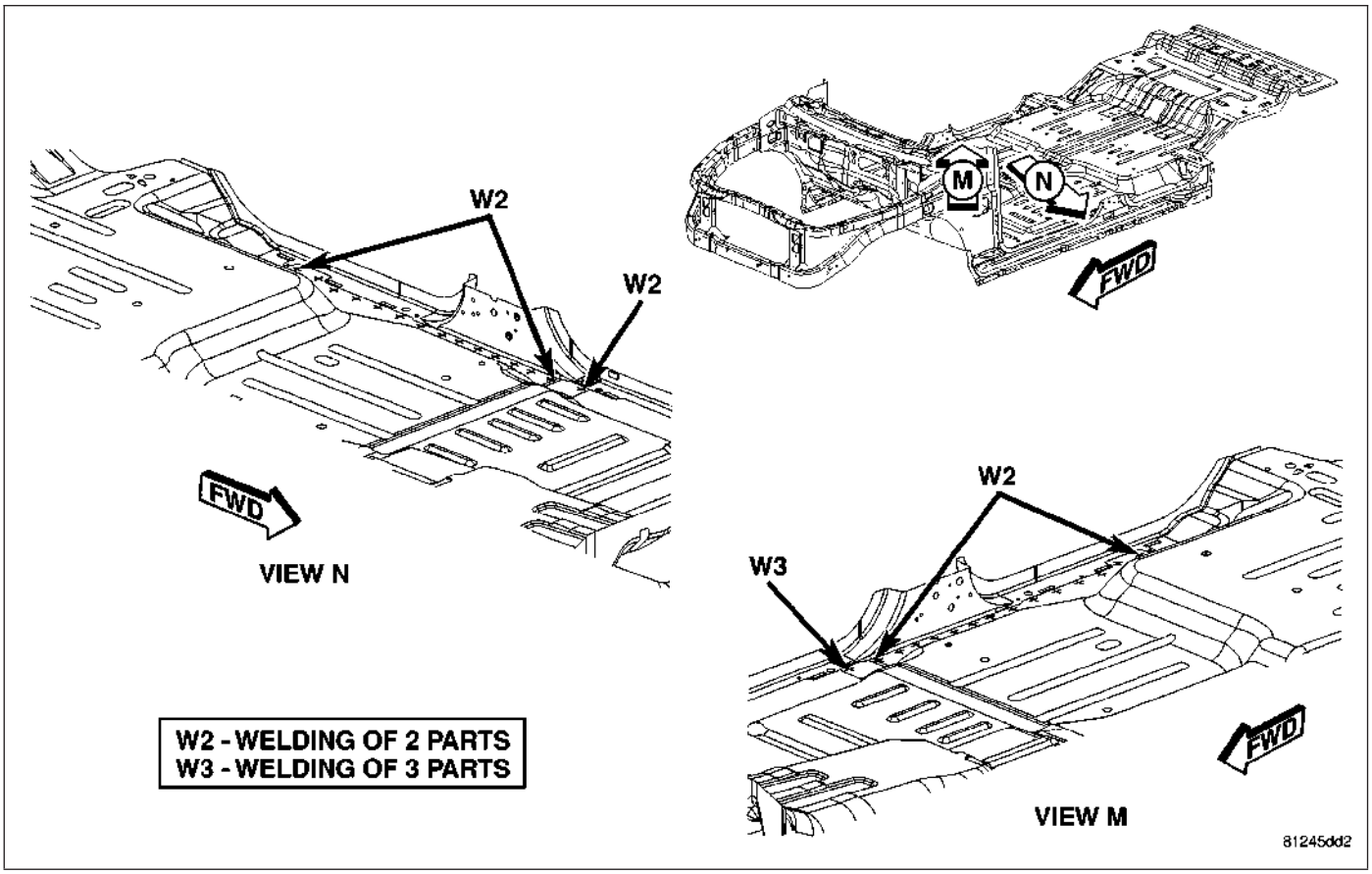

Fig. 50 UNDERBODY - COMPLETE (8 OF 13)

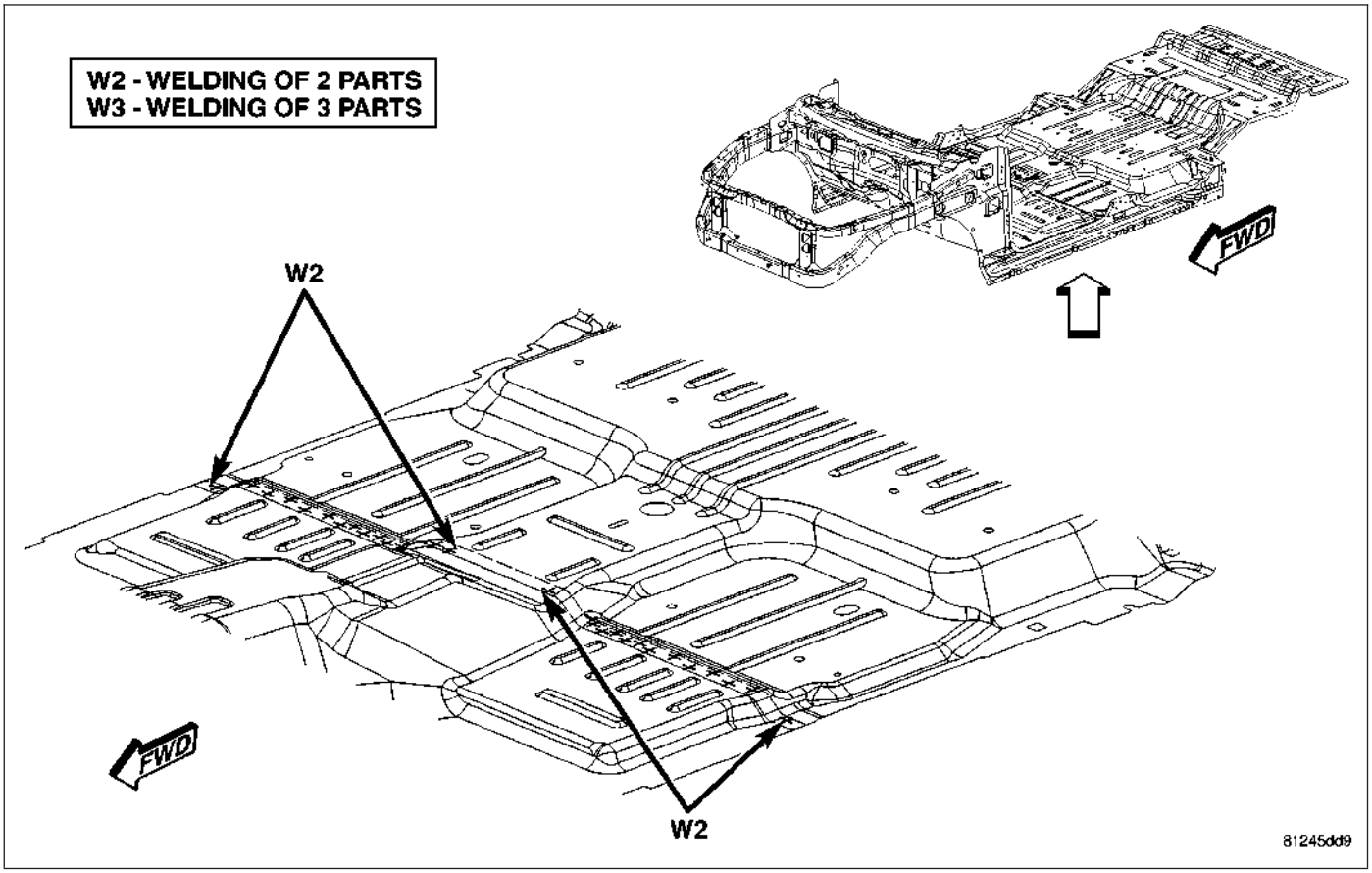

Fig. 51 UNDERBODY - COMPLETE (9 OF 13)

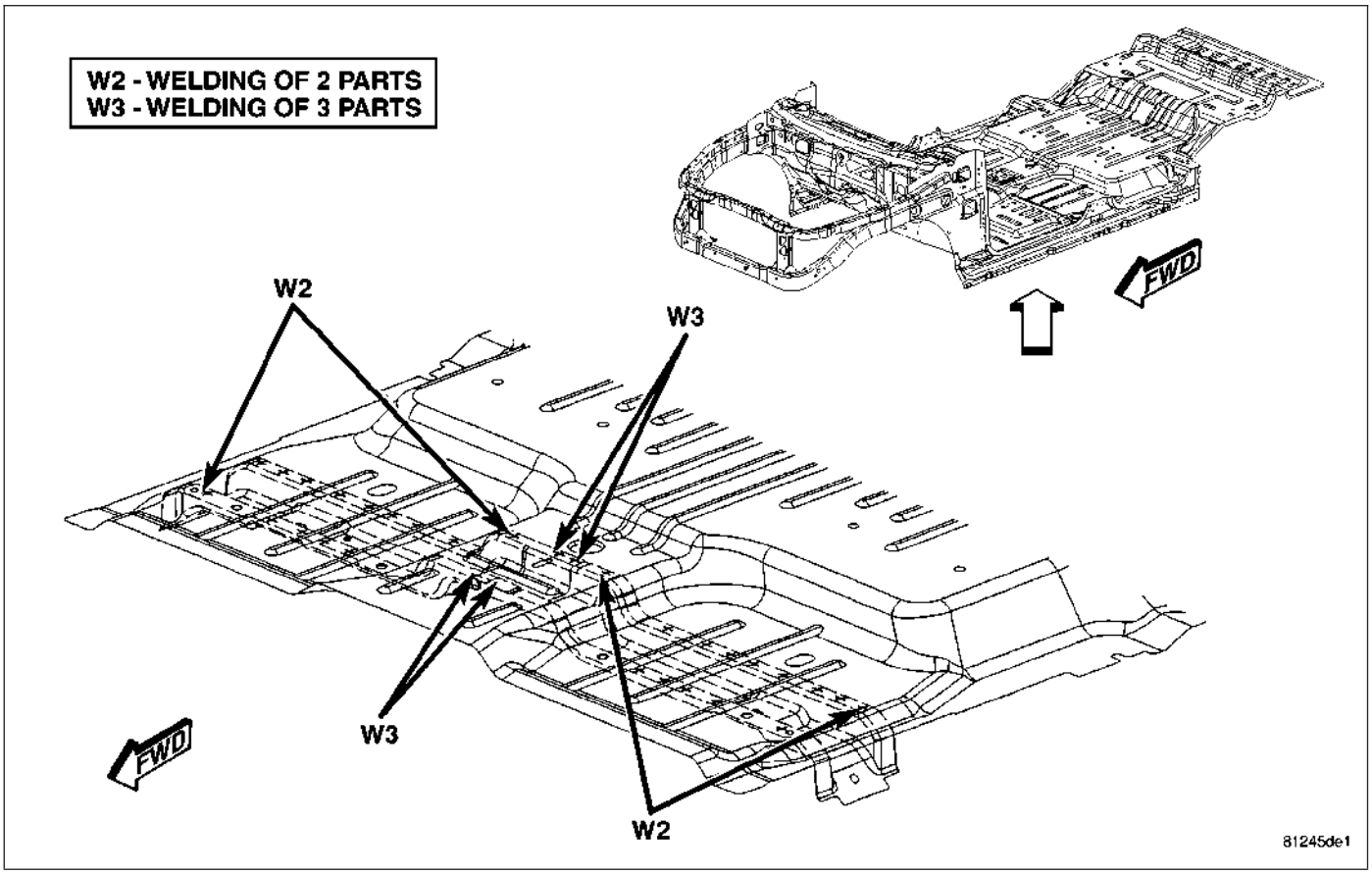

Fig. 52 UNDERBODY - COMPLETE (10 OF 13)

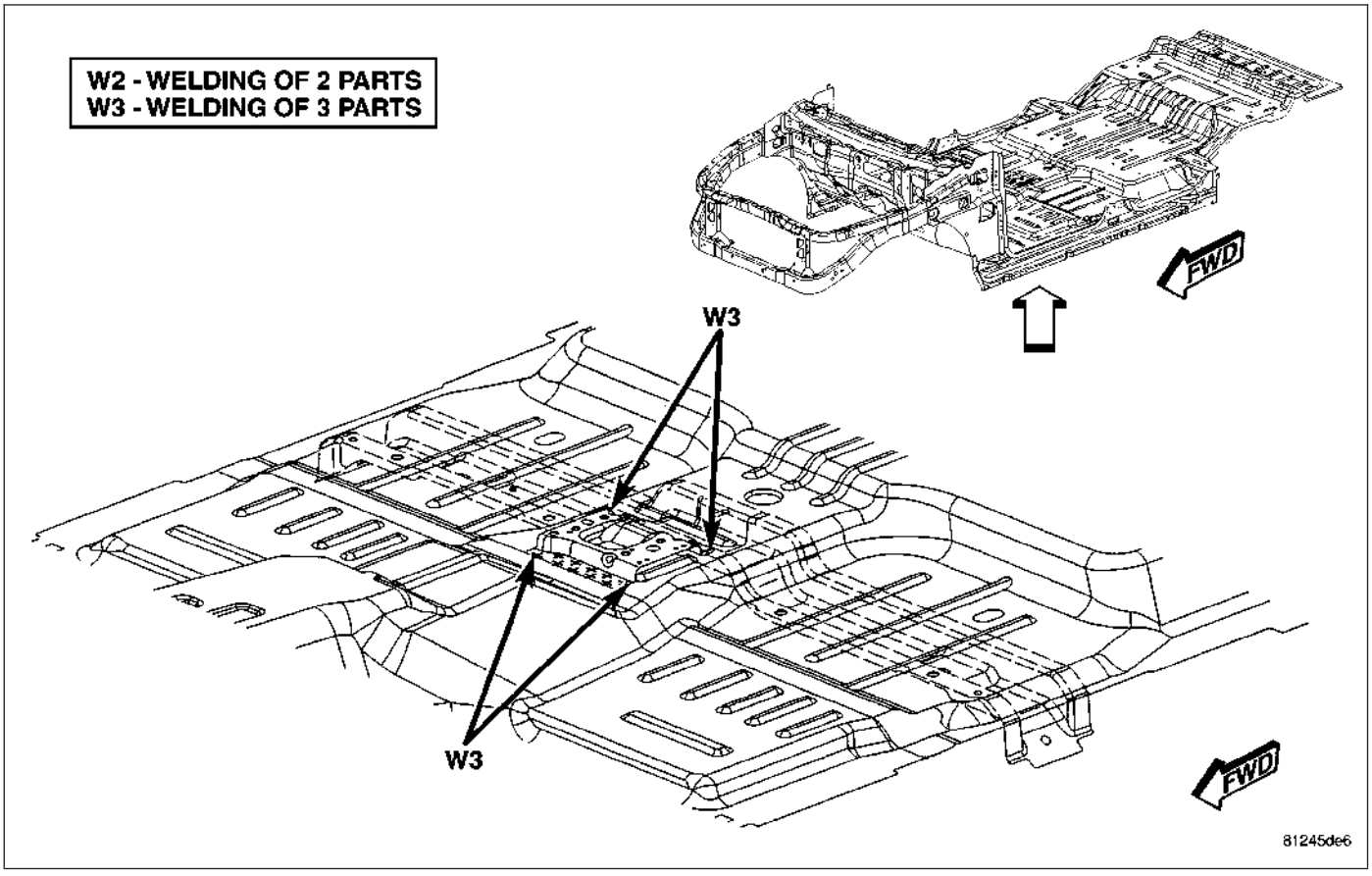

Fig. 53 UNDERBODY - COMPLETE (11 OF 13)

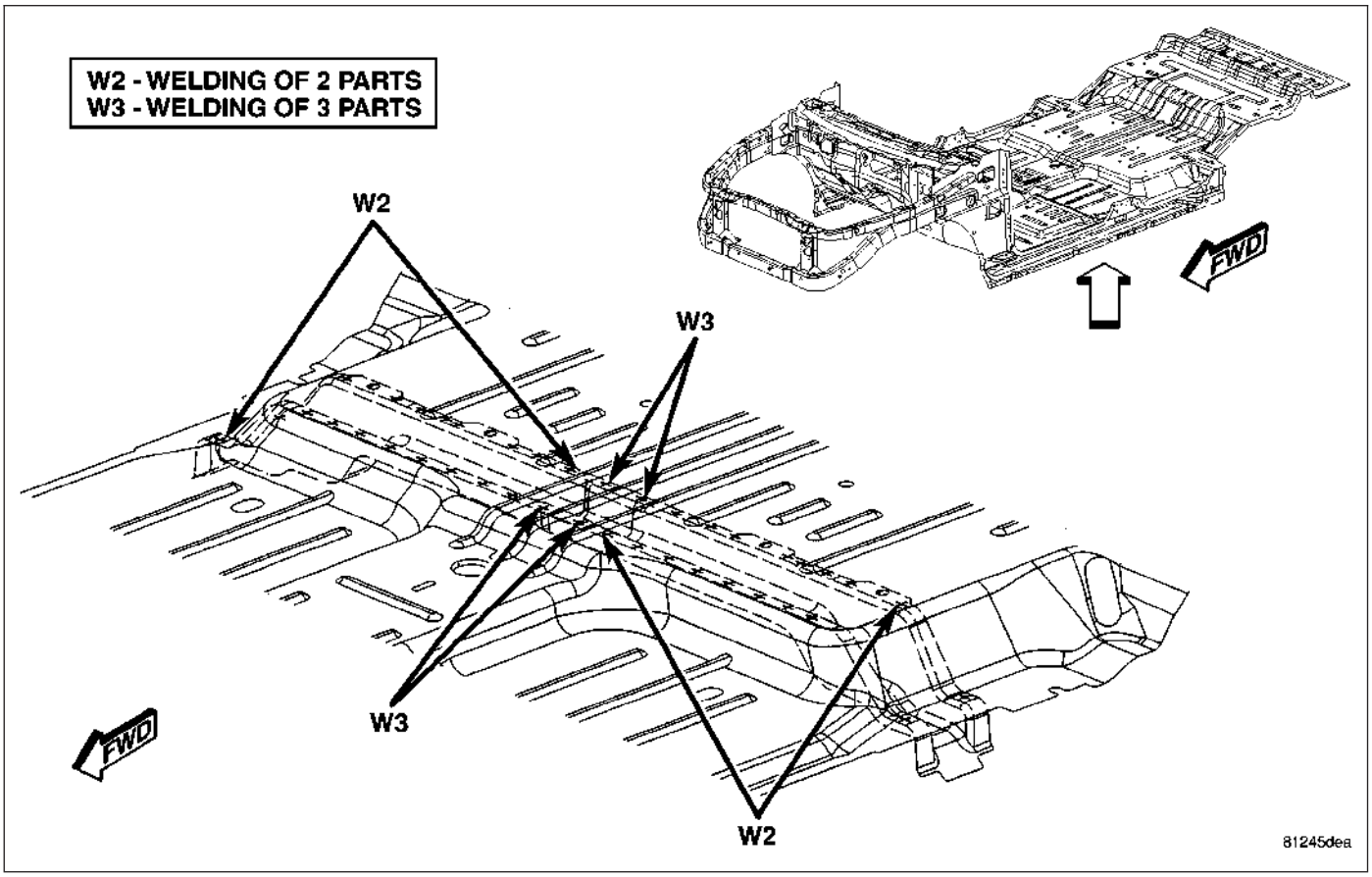

Fig. 54 UNDERBODY - COMPLETE (12 OF 13)

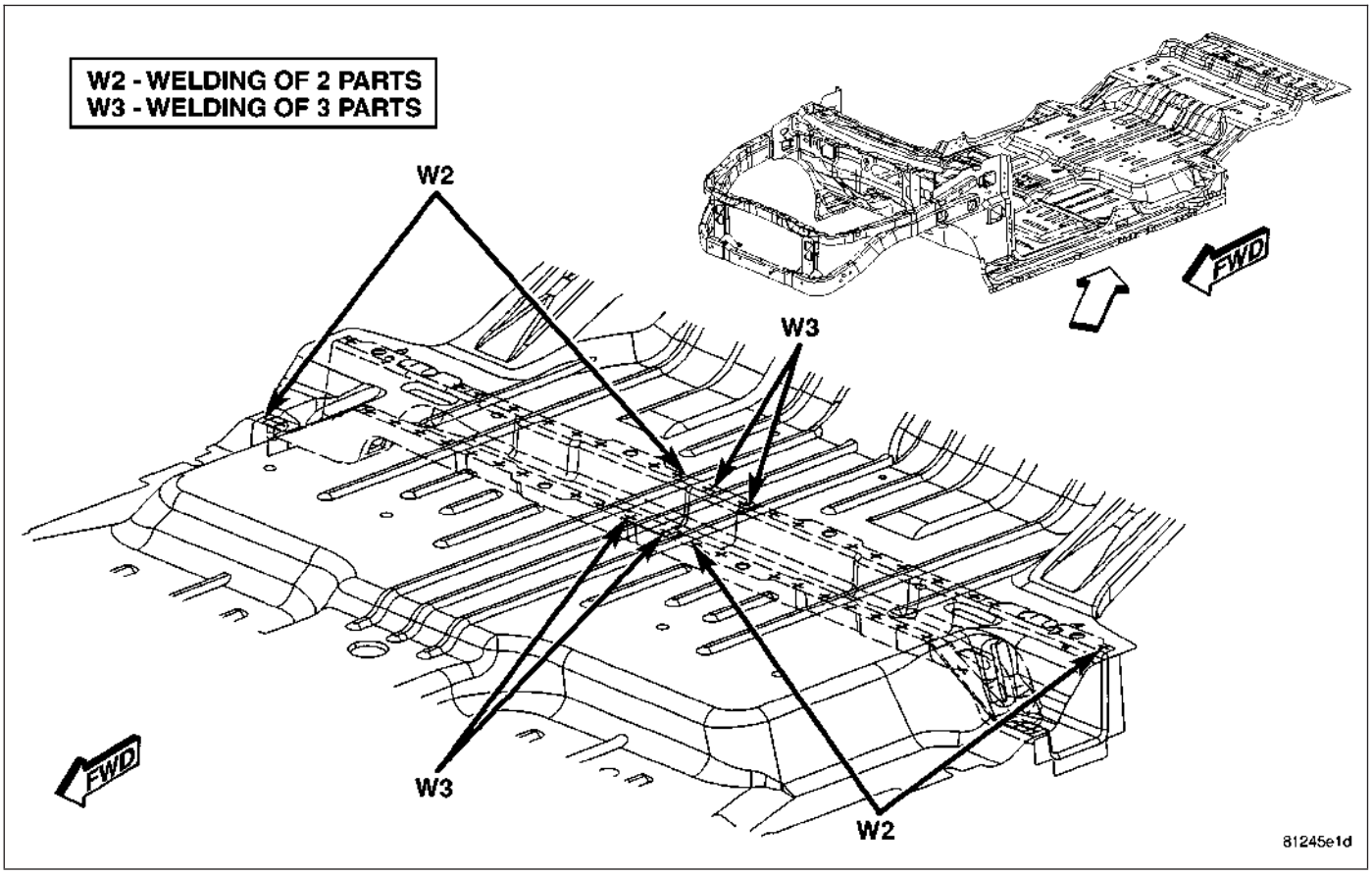

Fig. 55 UNDERBODY - COMPLETE (13 OF 13)

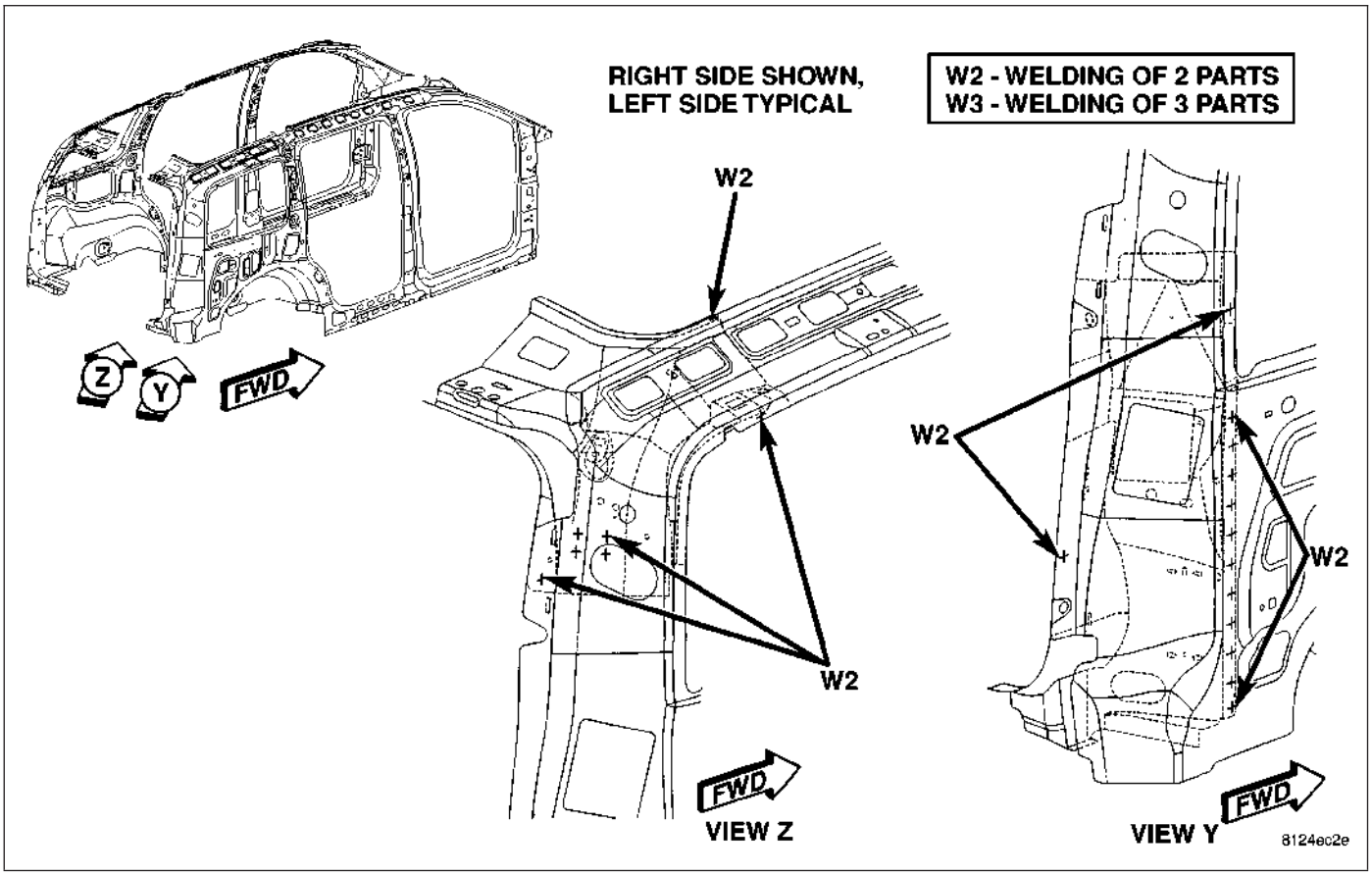

Fig. 56 INNER BODY SIDE APERTURE (1 OF 6)

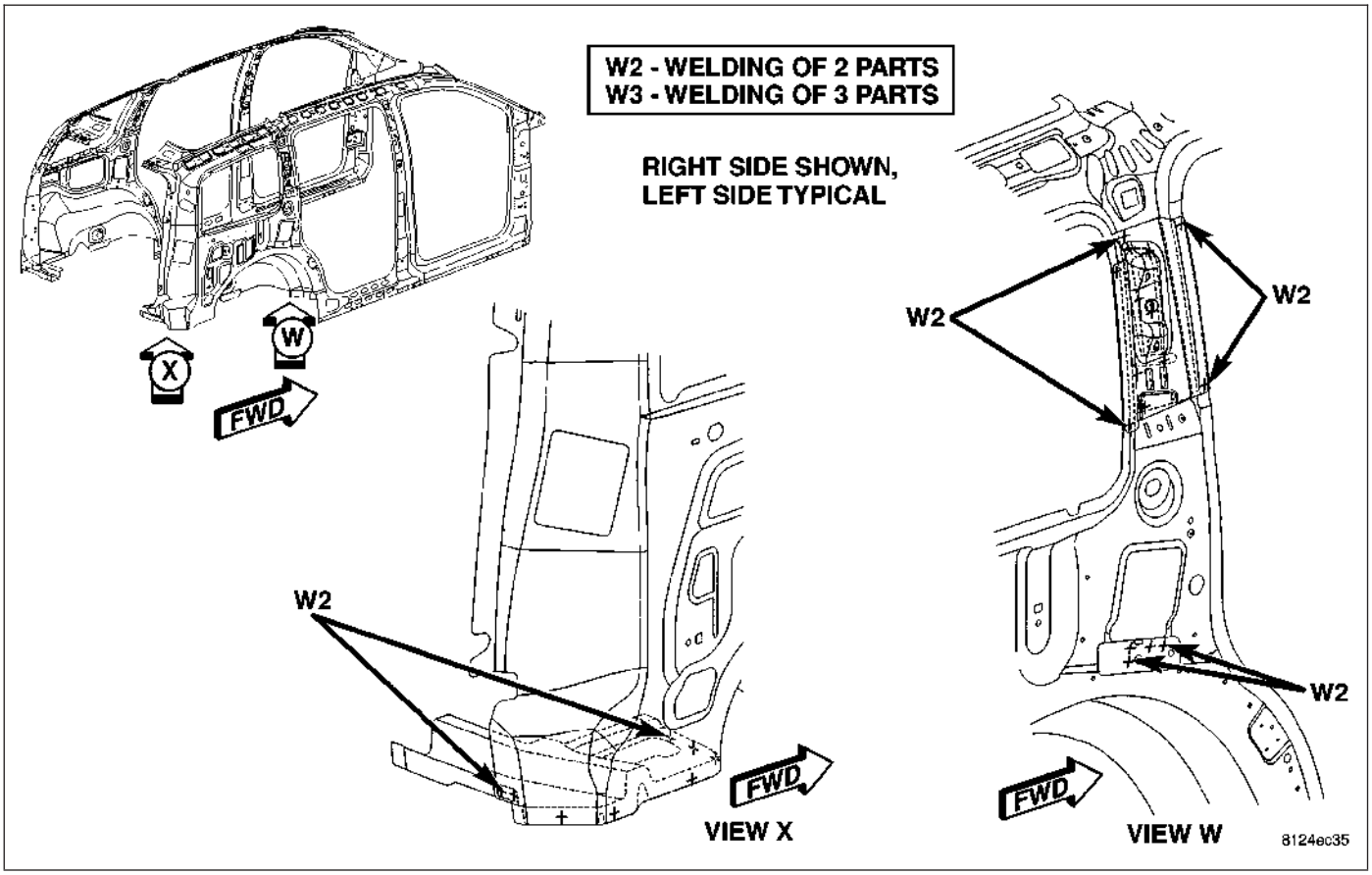

Fig. 57 INNER BODY SIDE APERTURE (2 OF 6)

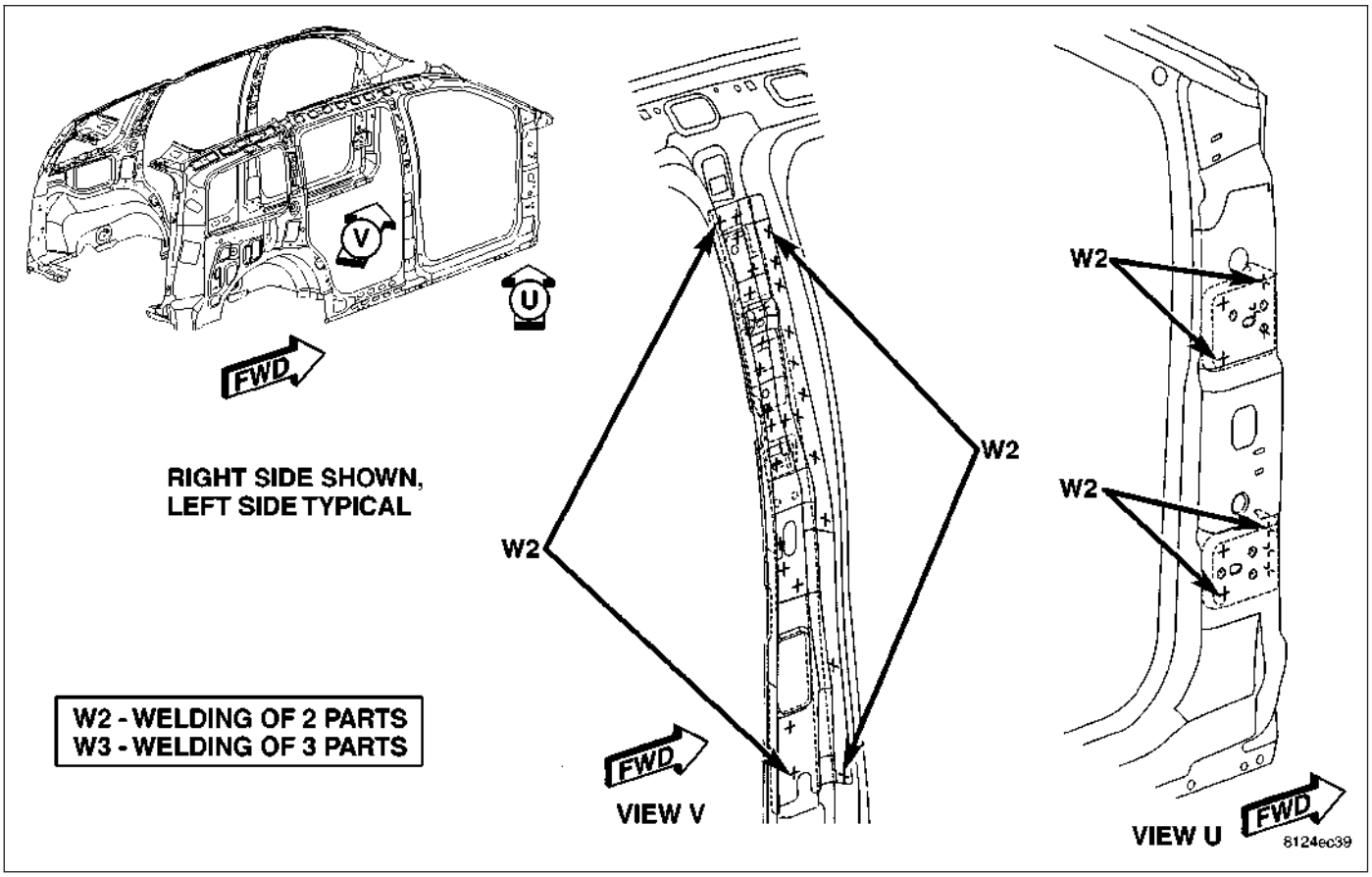

Fig. 58 INNER BODY SIDE APERTURE (3 OF 6)

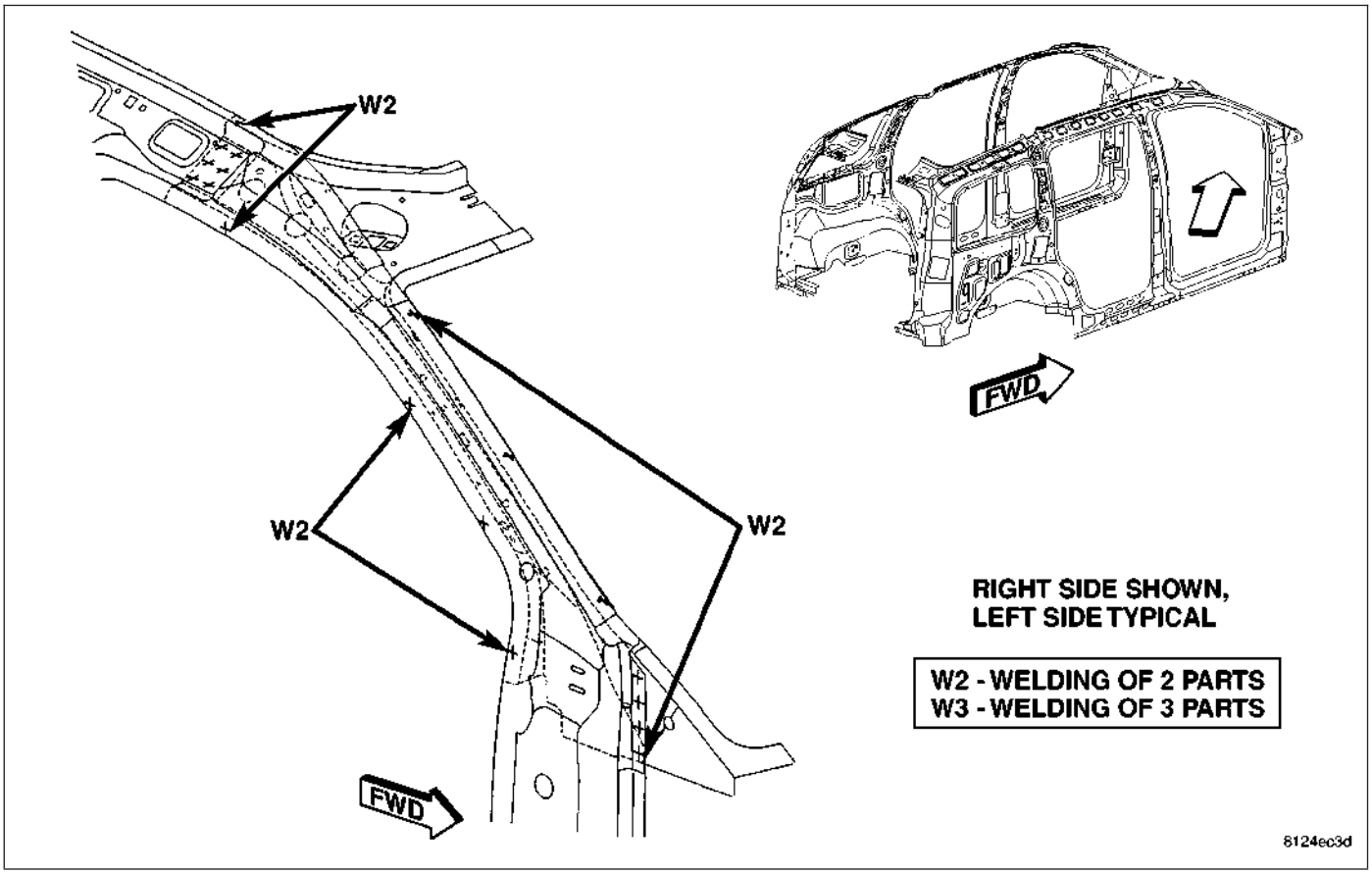

Fig. 59 INNER BODY SIDE APERTURE (4 OF 6)

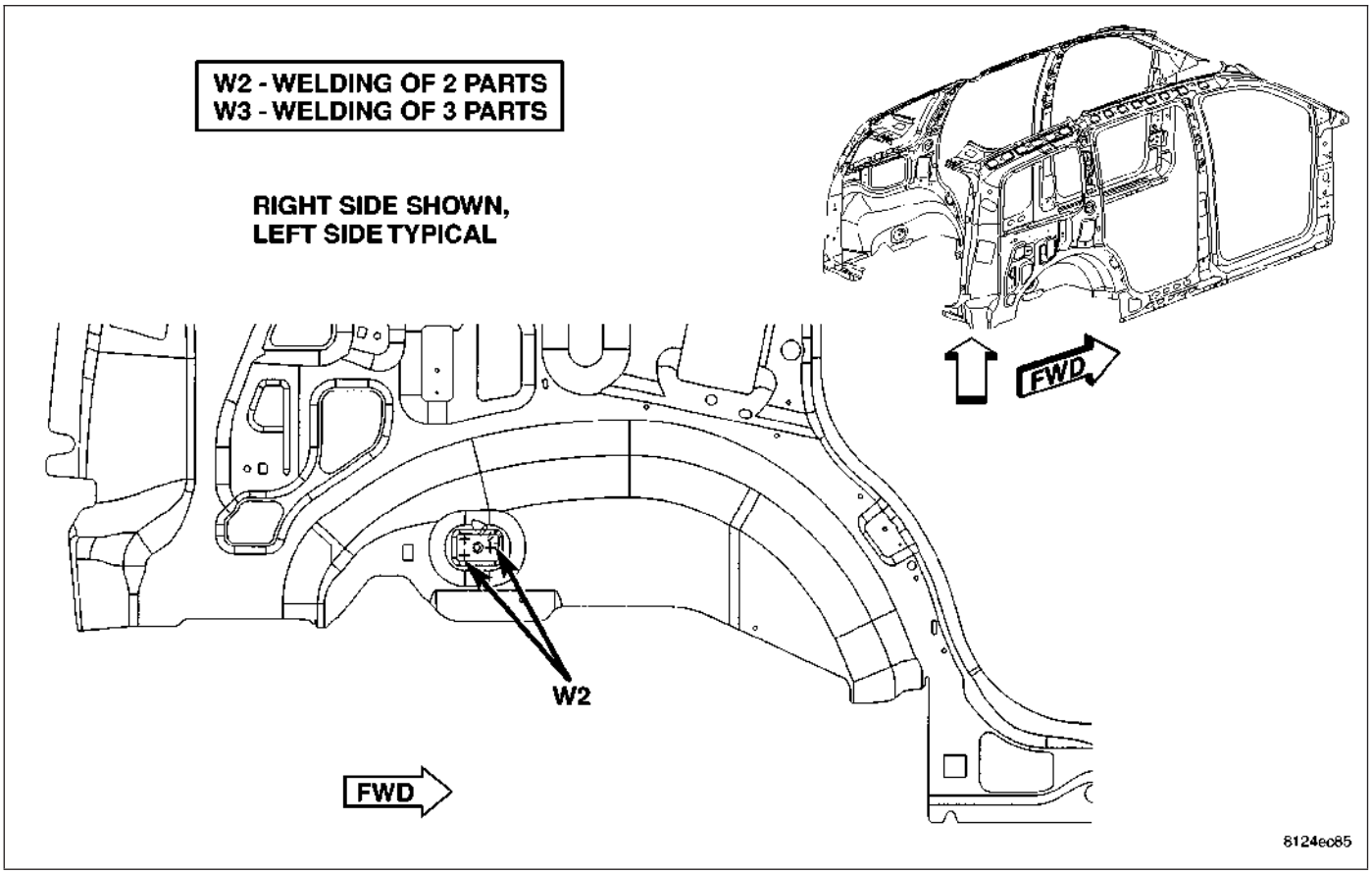

Fig. 60 INNER BODY SIDE APERTURE (5 OF 6)

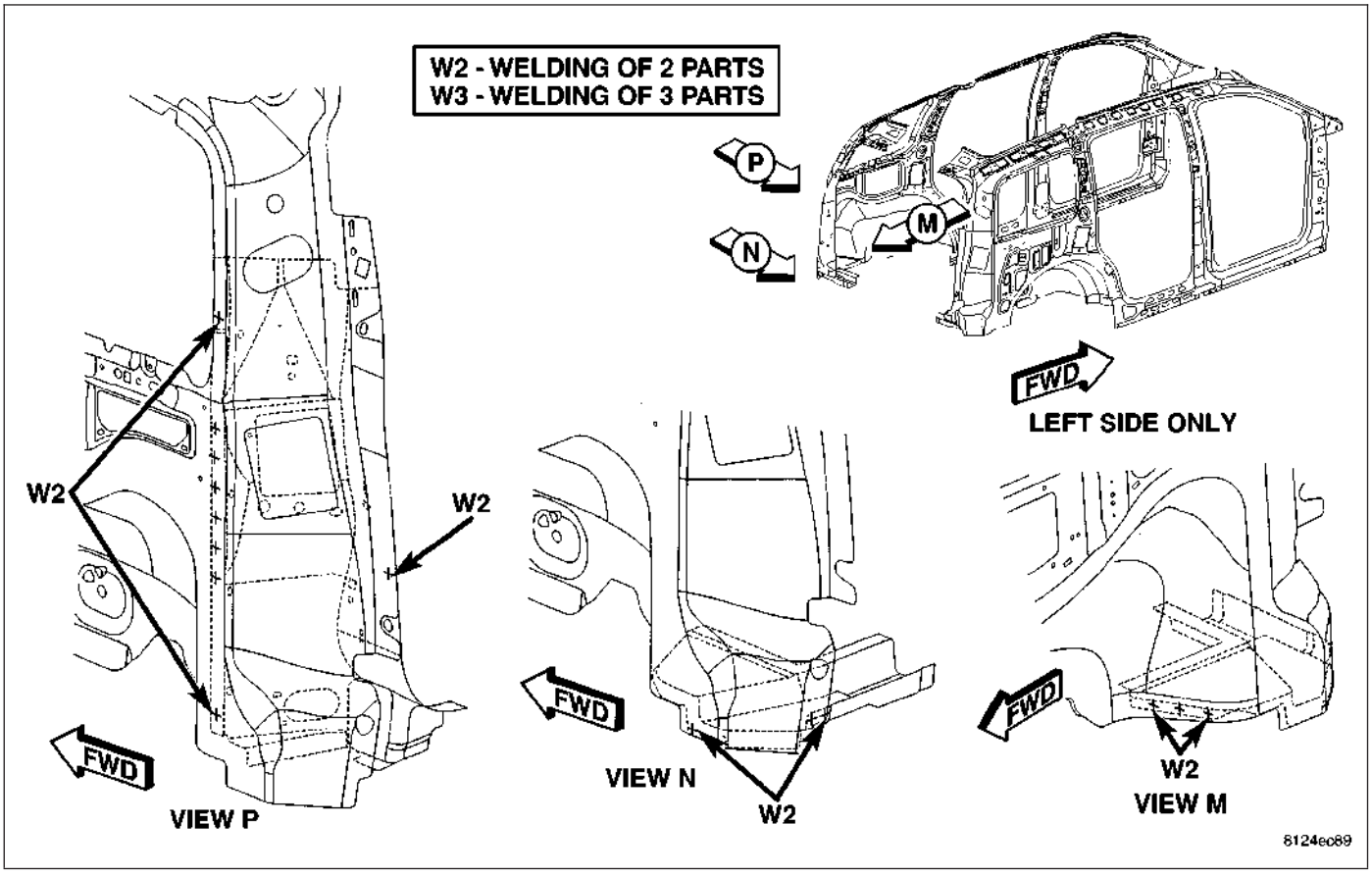

Fig. 61 INNER BODY SIDE APERTURE (6 OF 6)

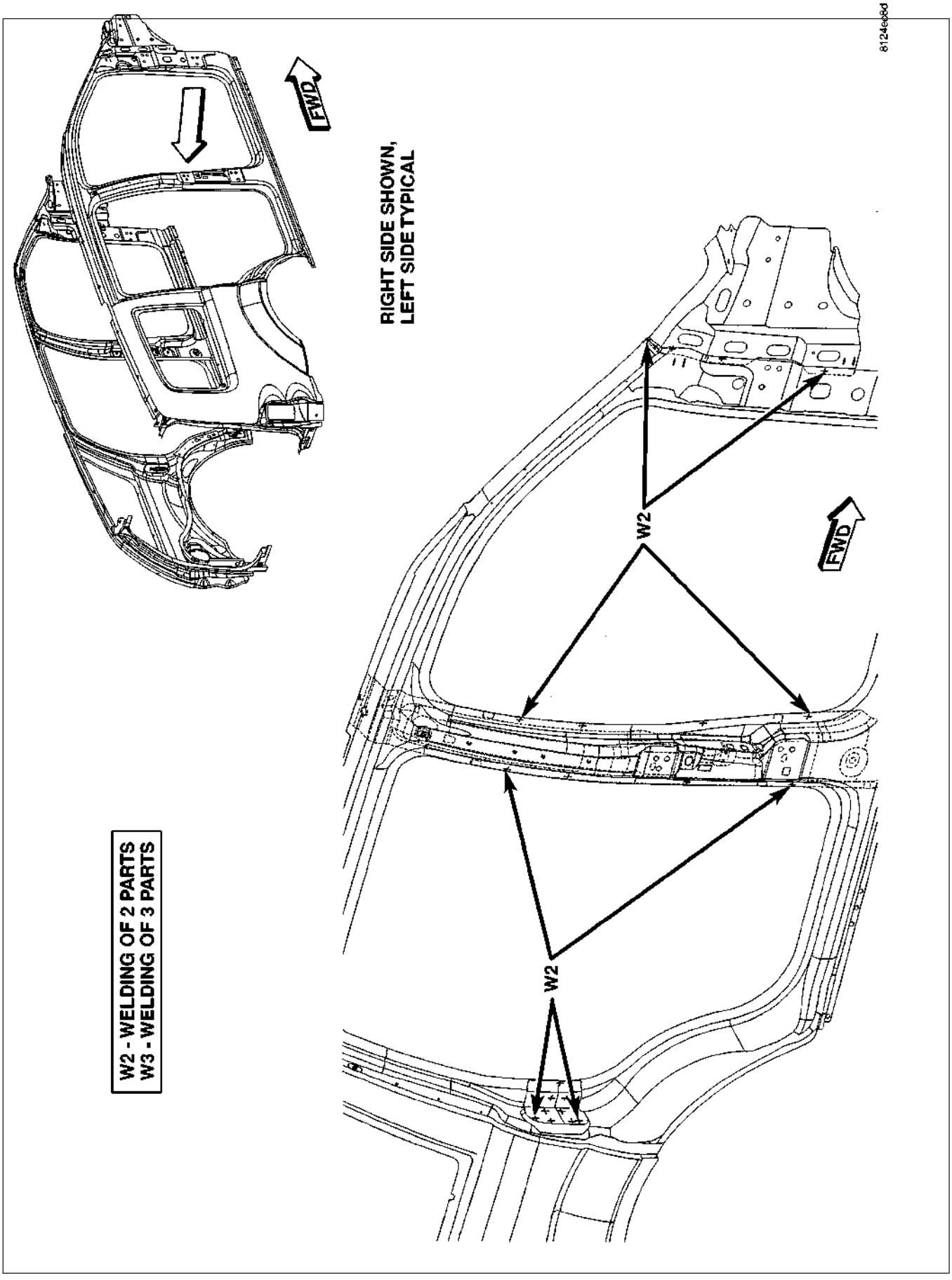

Fig. 62 OUTER BODY SIDE APERTURE (1 OF 6)

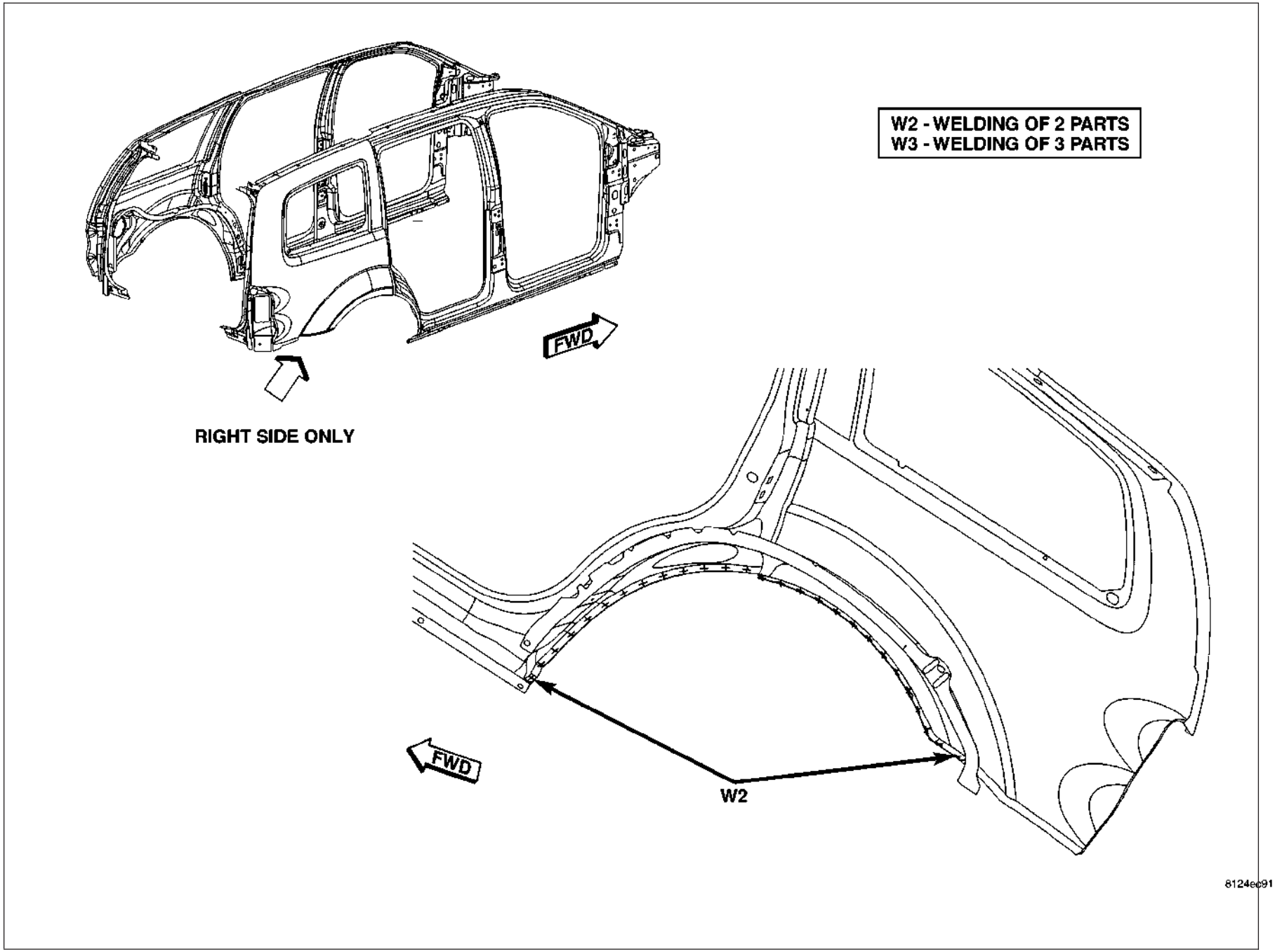

Fig. 63 OUTER BODY SIDE APERTURE (2 OF 6)

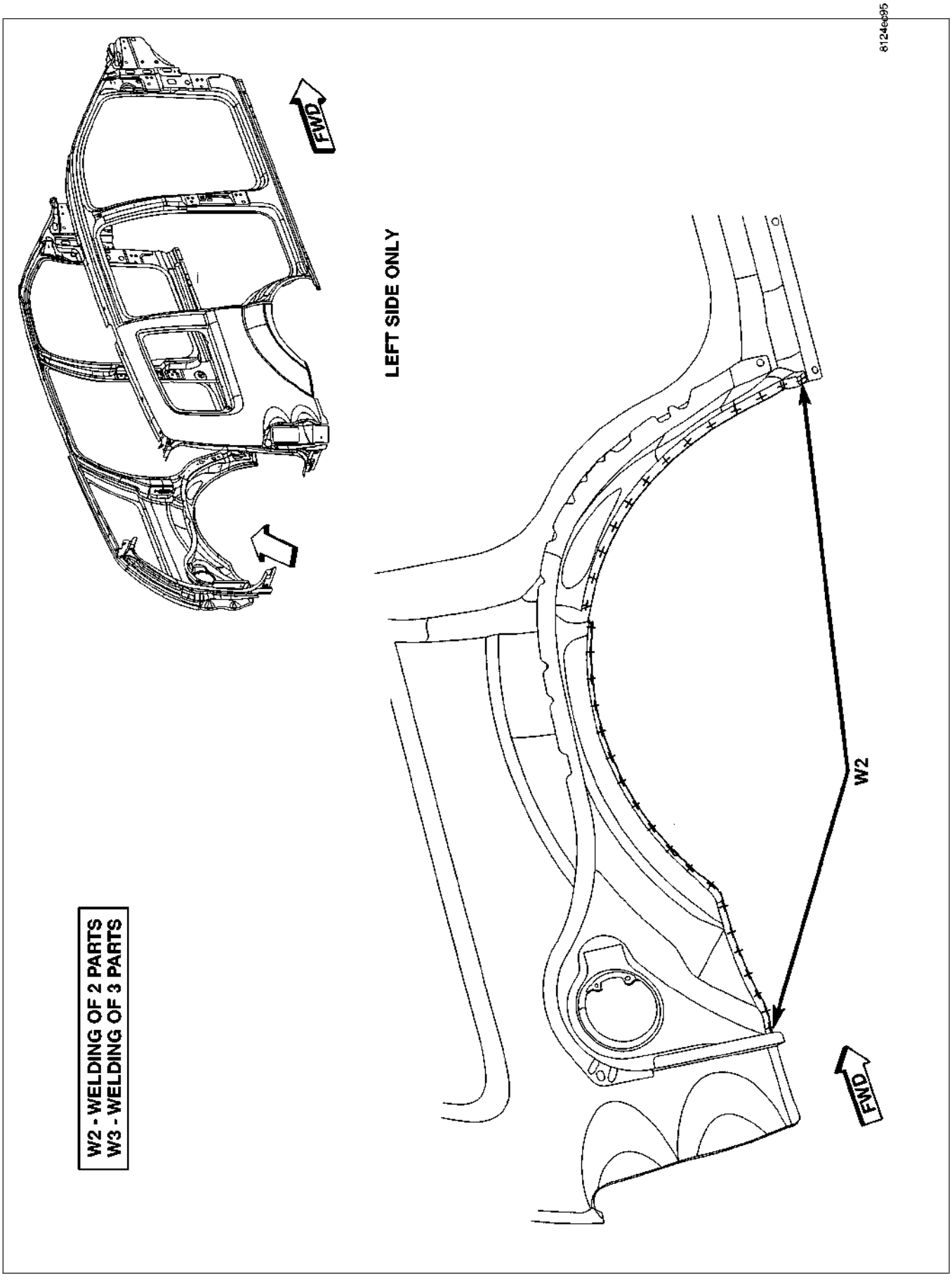

Fig. 64 OUTER BODY SIDE APERTURE (3 OF 6)

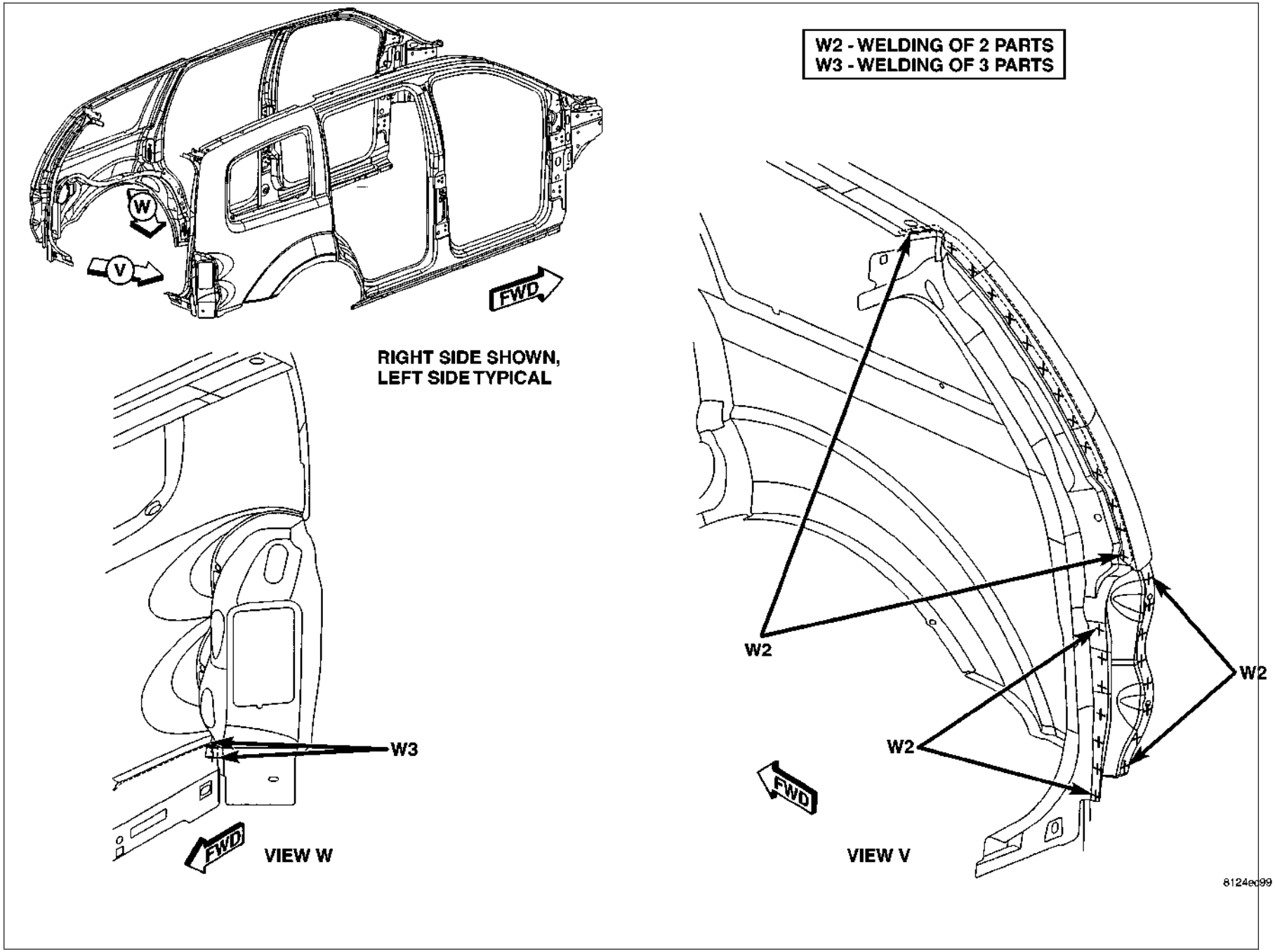

Fig. 65 OUTER BODY SIDE APERTURE (4 OF 6)

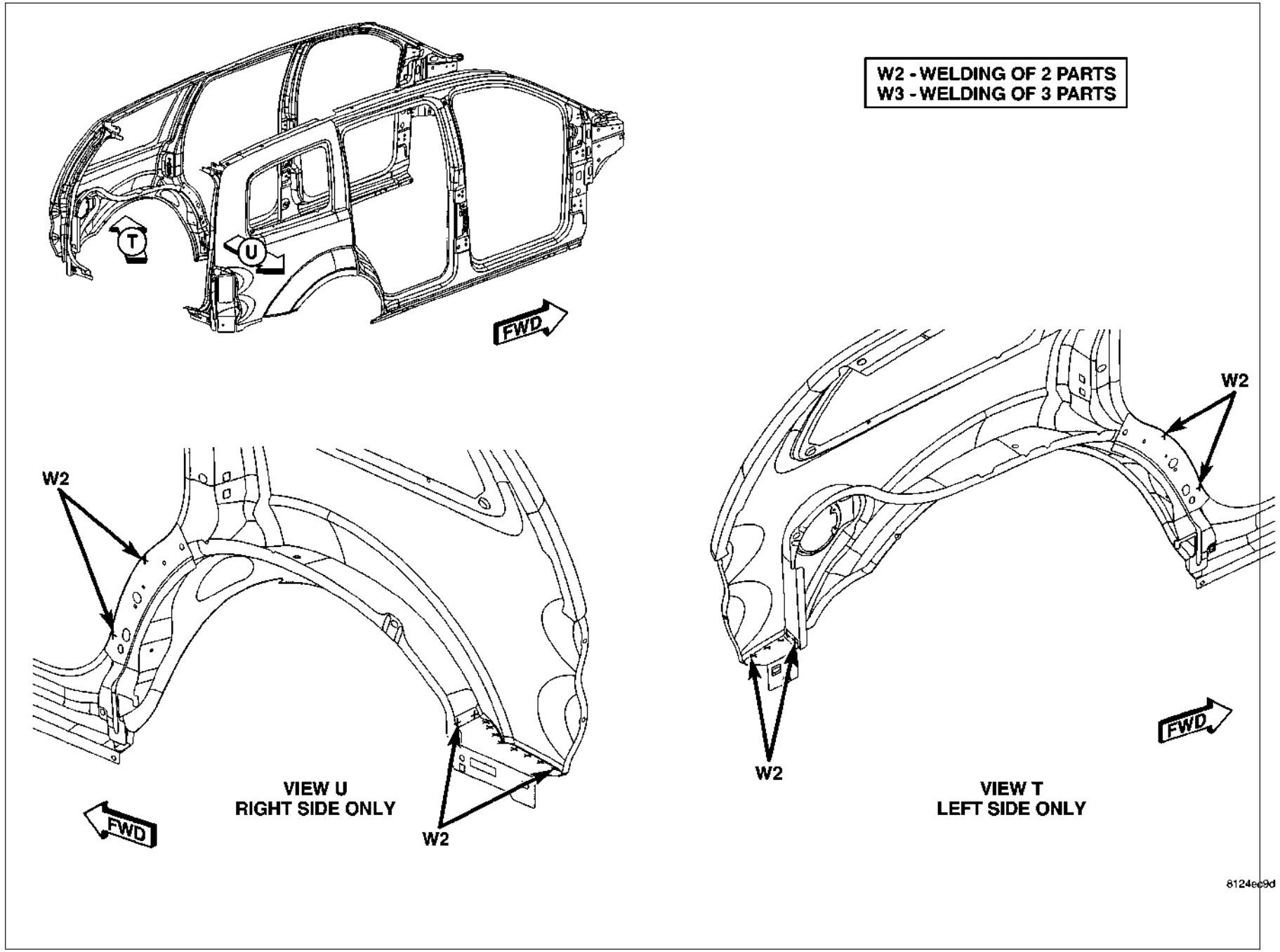

Fig. 66 OUTER BODY SIDE APERTURE (5 OF 6)

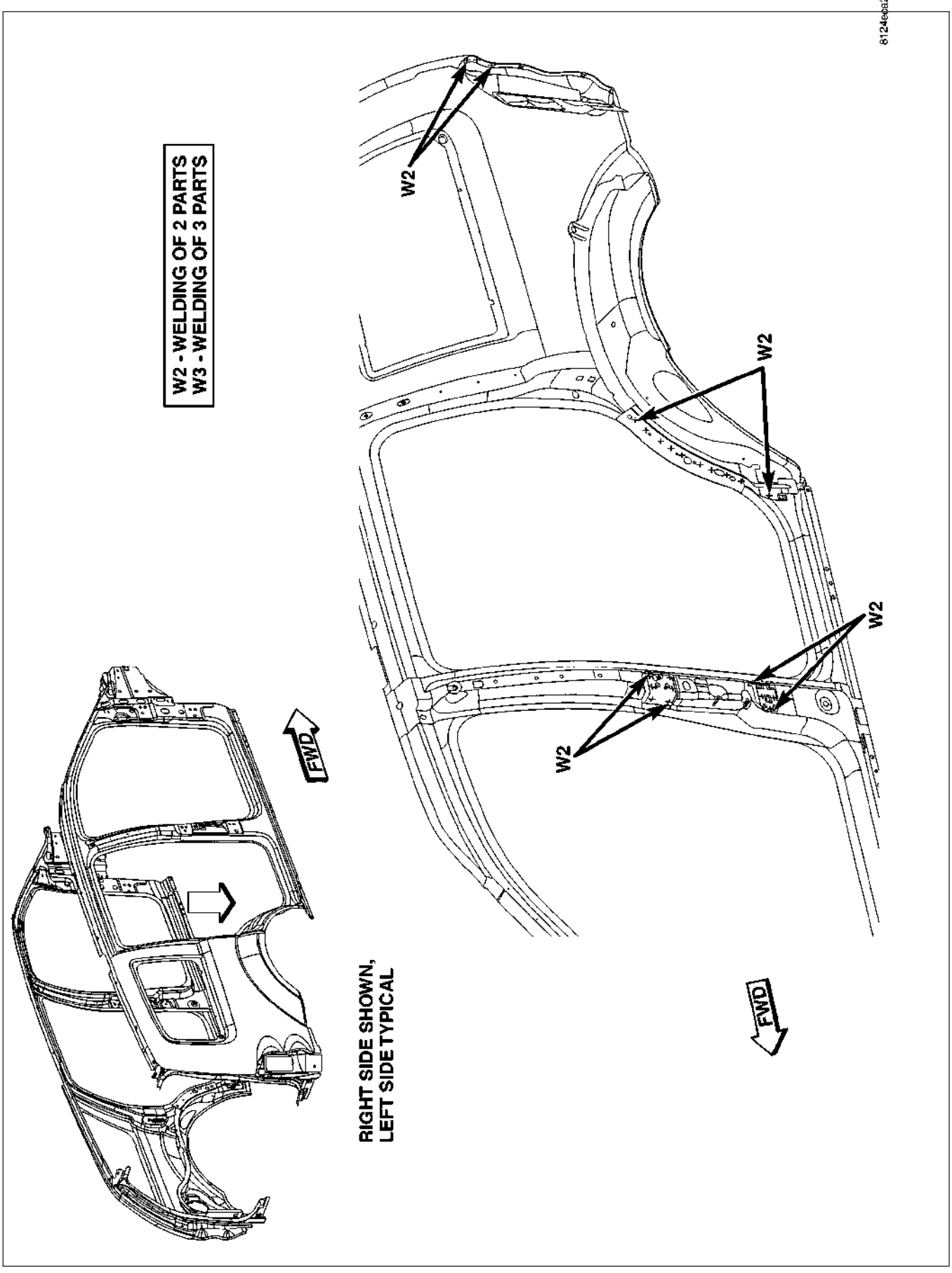

Fig. 67 OUTER BODY SIDE APERTURE (6 OF 6)

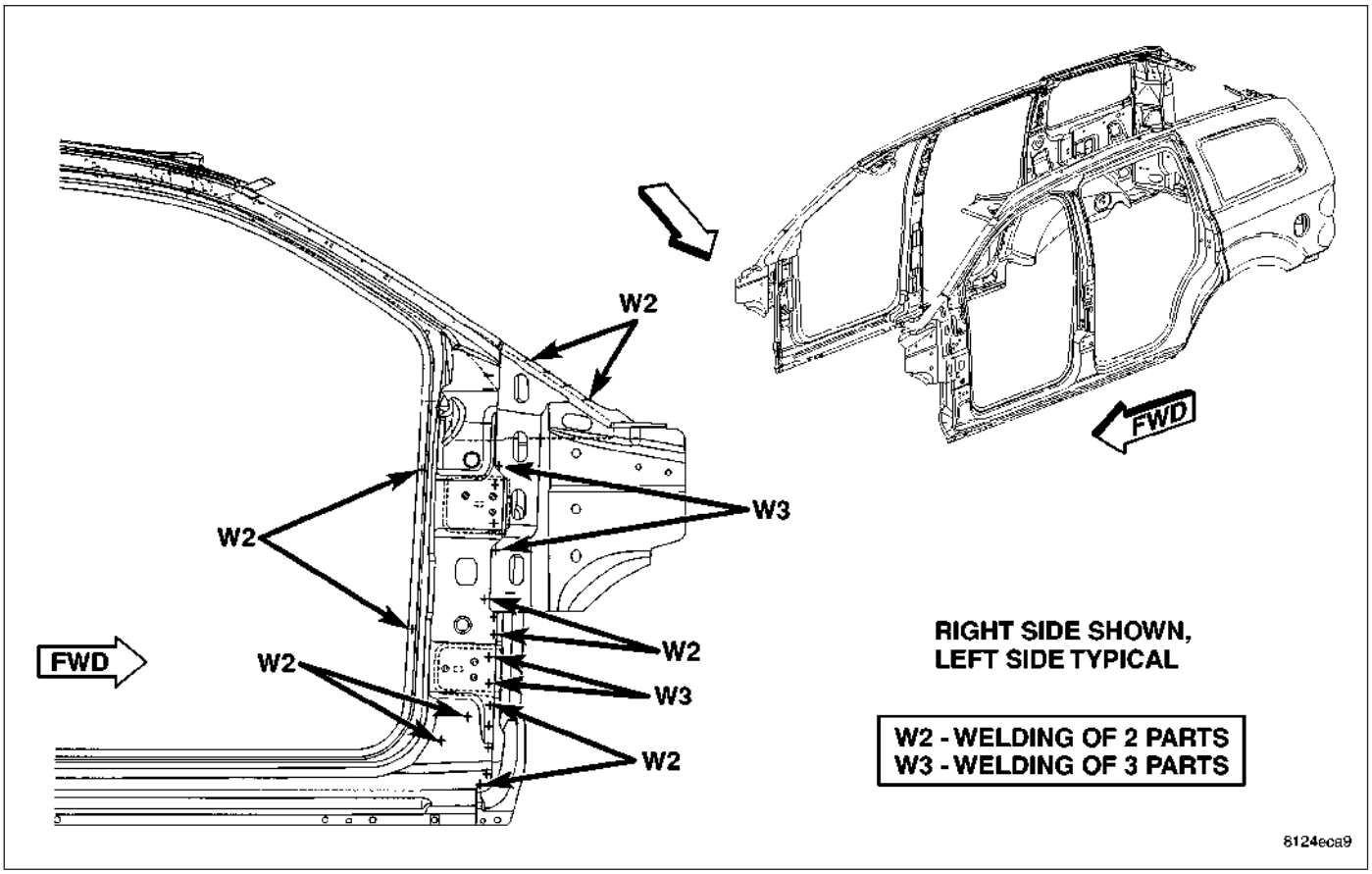

Fig. 68 BODY SIDE APERTURE - COMPLETE (1 OF 9)

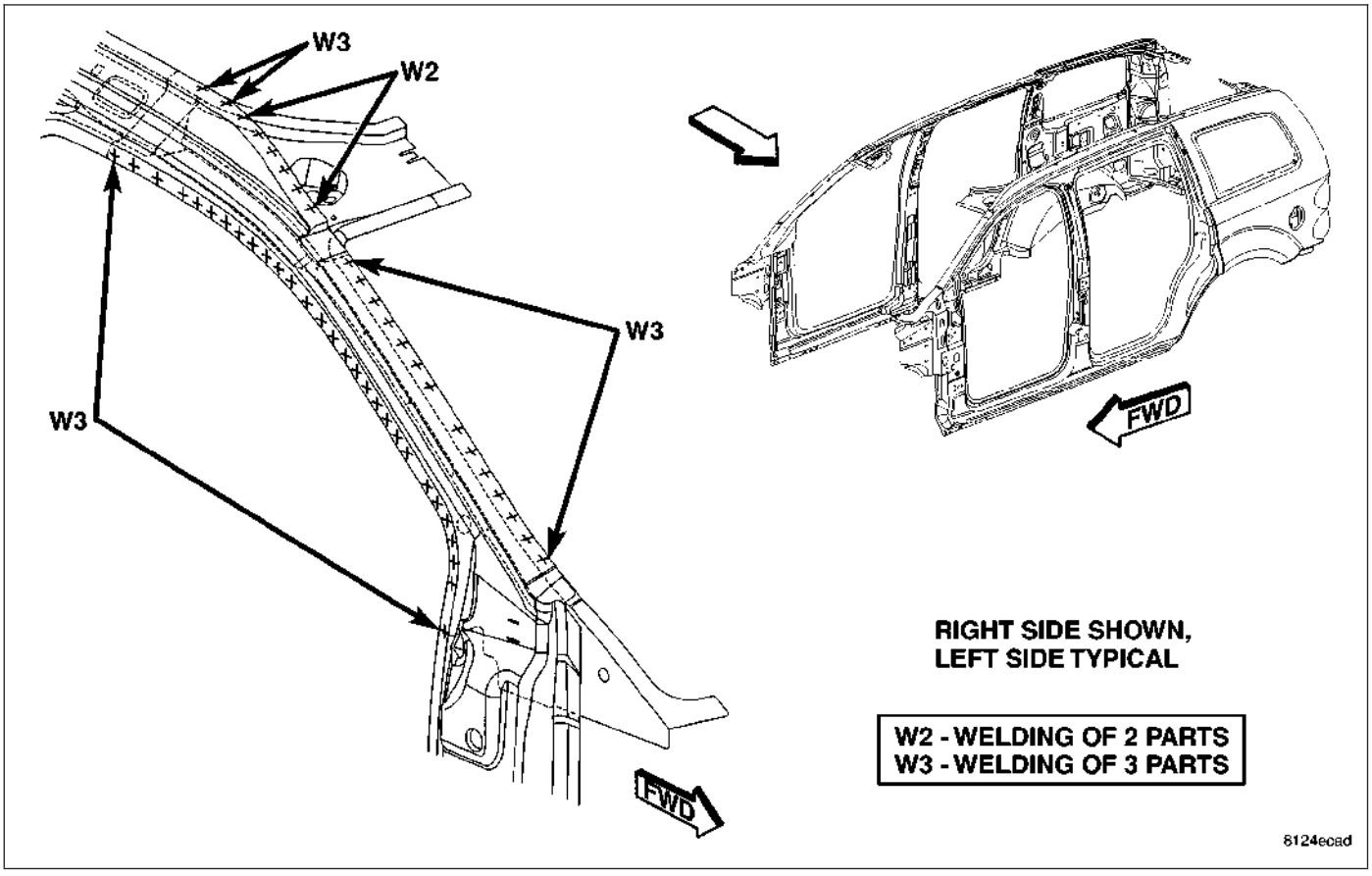

Fig. 69 BODY SIDE APERTURE - COMPLETE (2 OF 9)

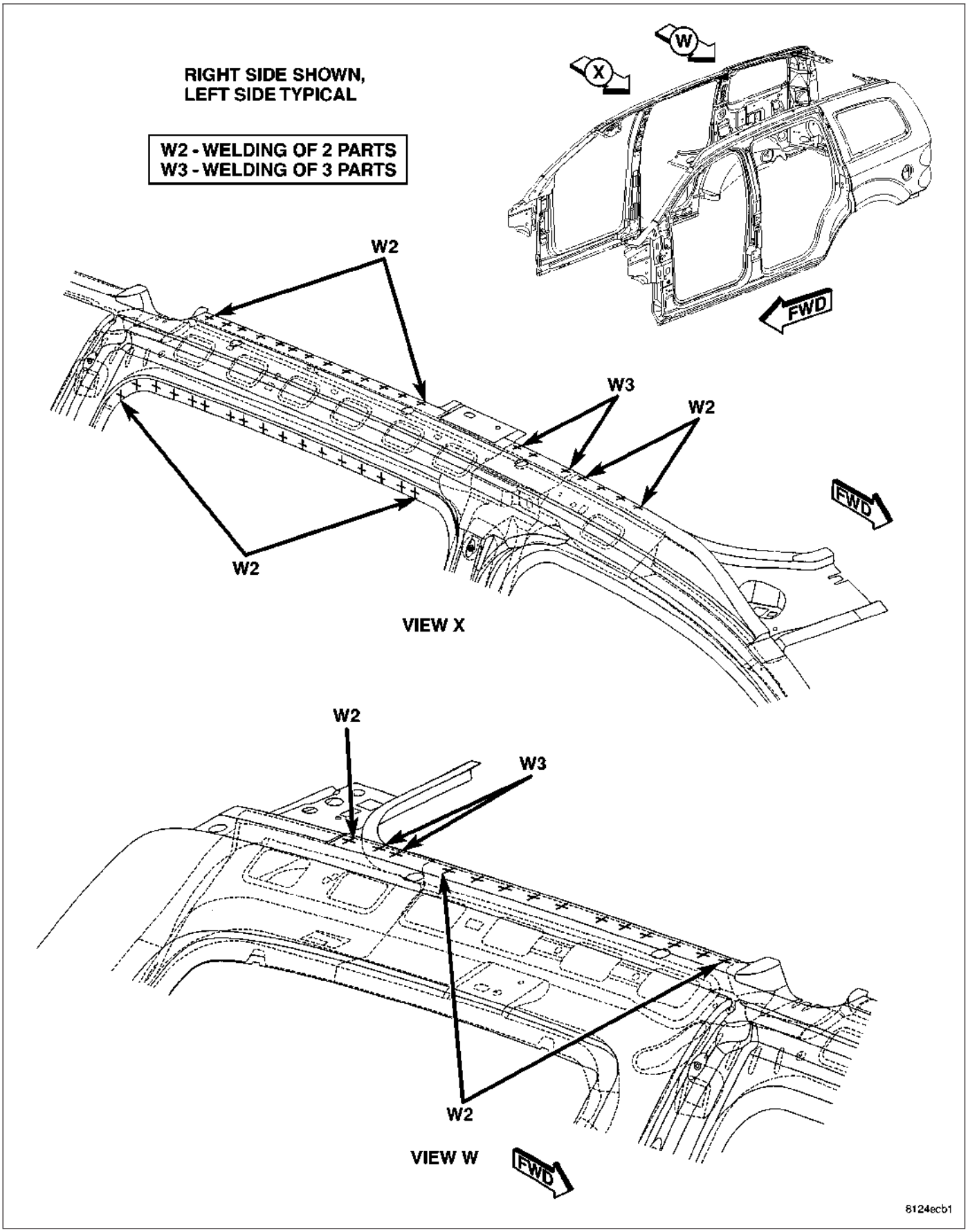

Fig. 70 BODY SIDE APERTURE - COMPLETE (3 OF 9)

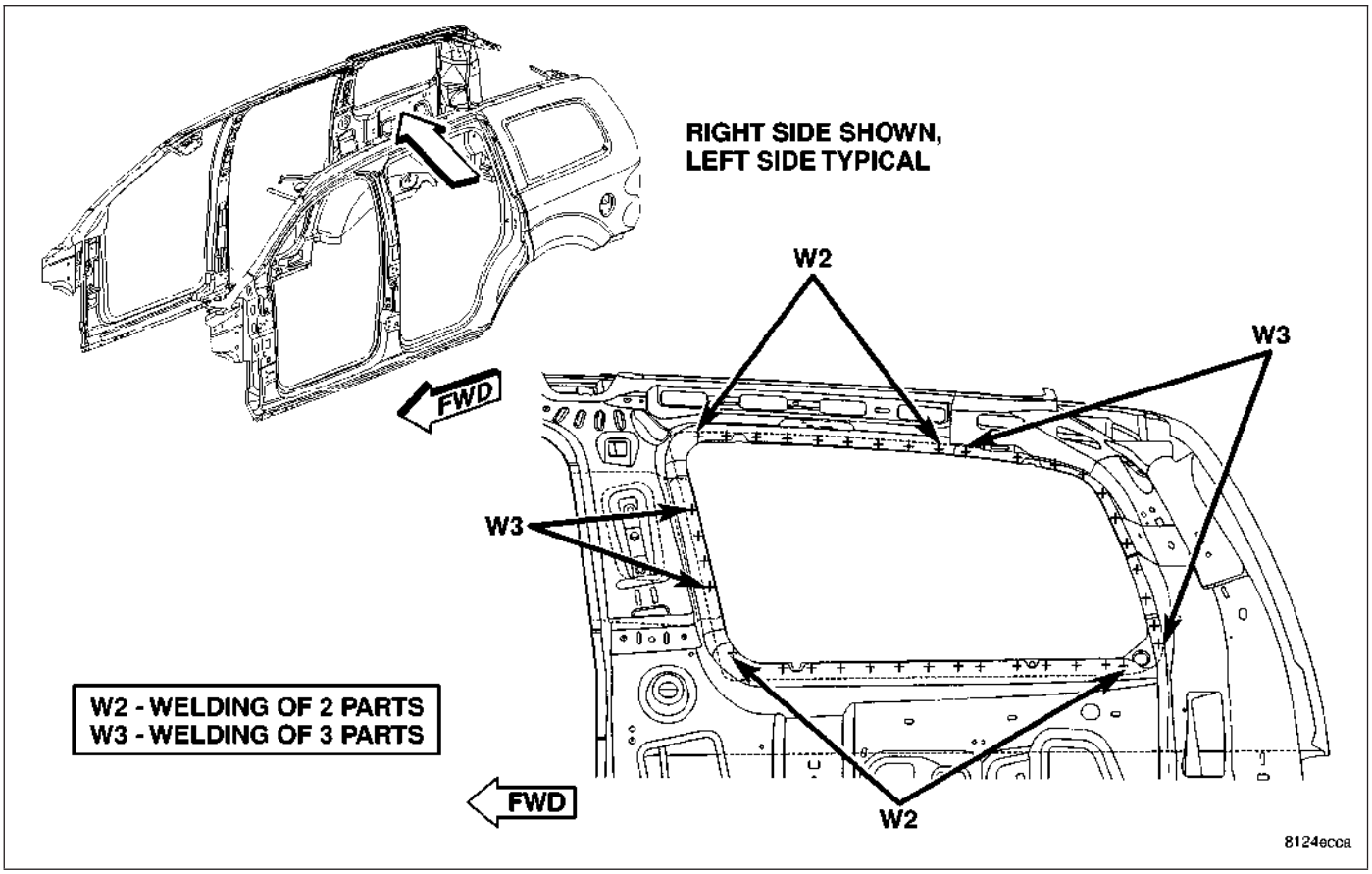

Fig. 71 BODY SIDE APERTURE - COMPLETE (4 OF 9)

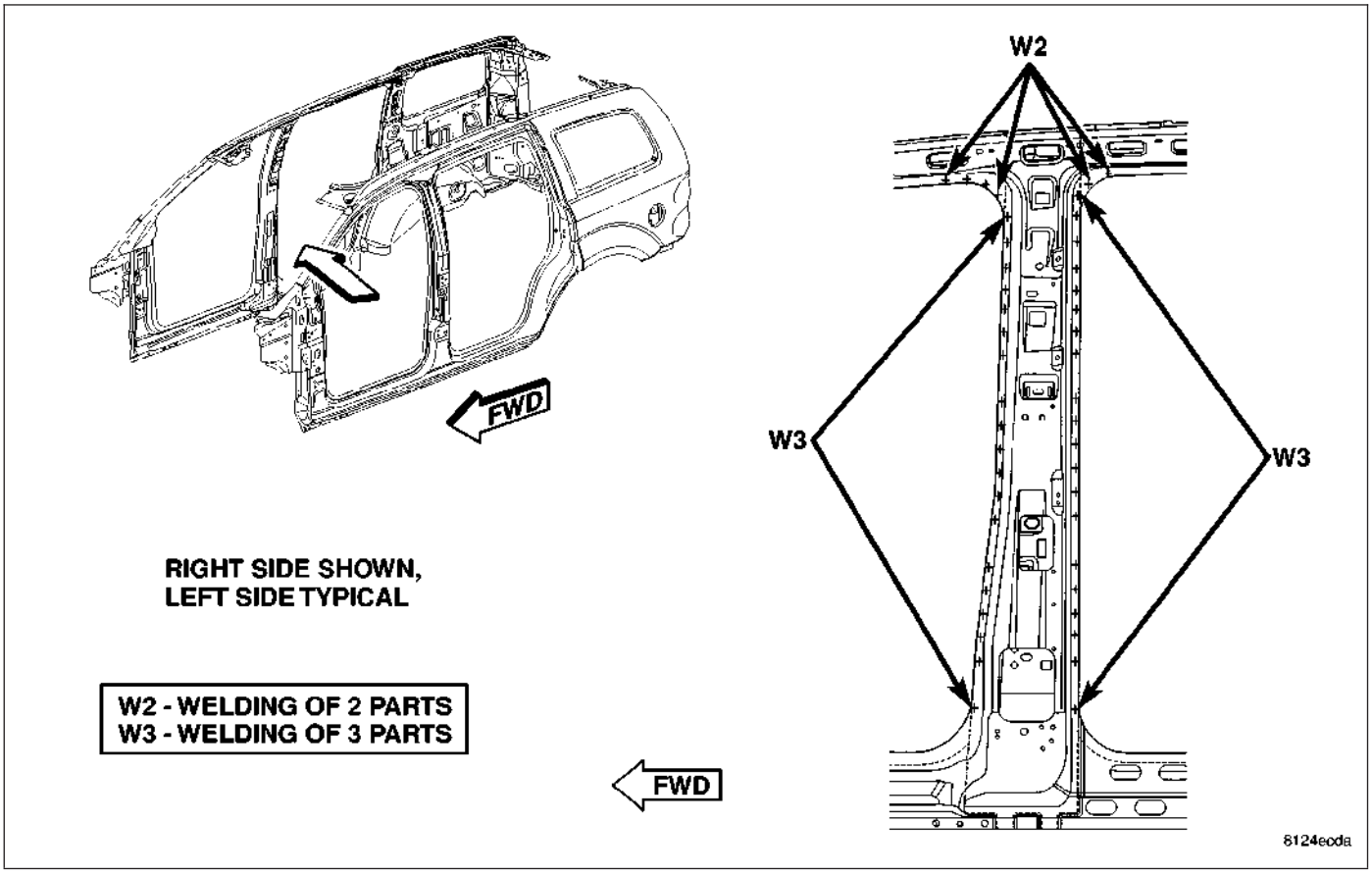

Fig. 72 BODY SIDE APERTURE - COMPLETE (5 OF 9)

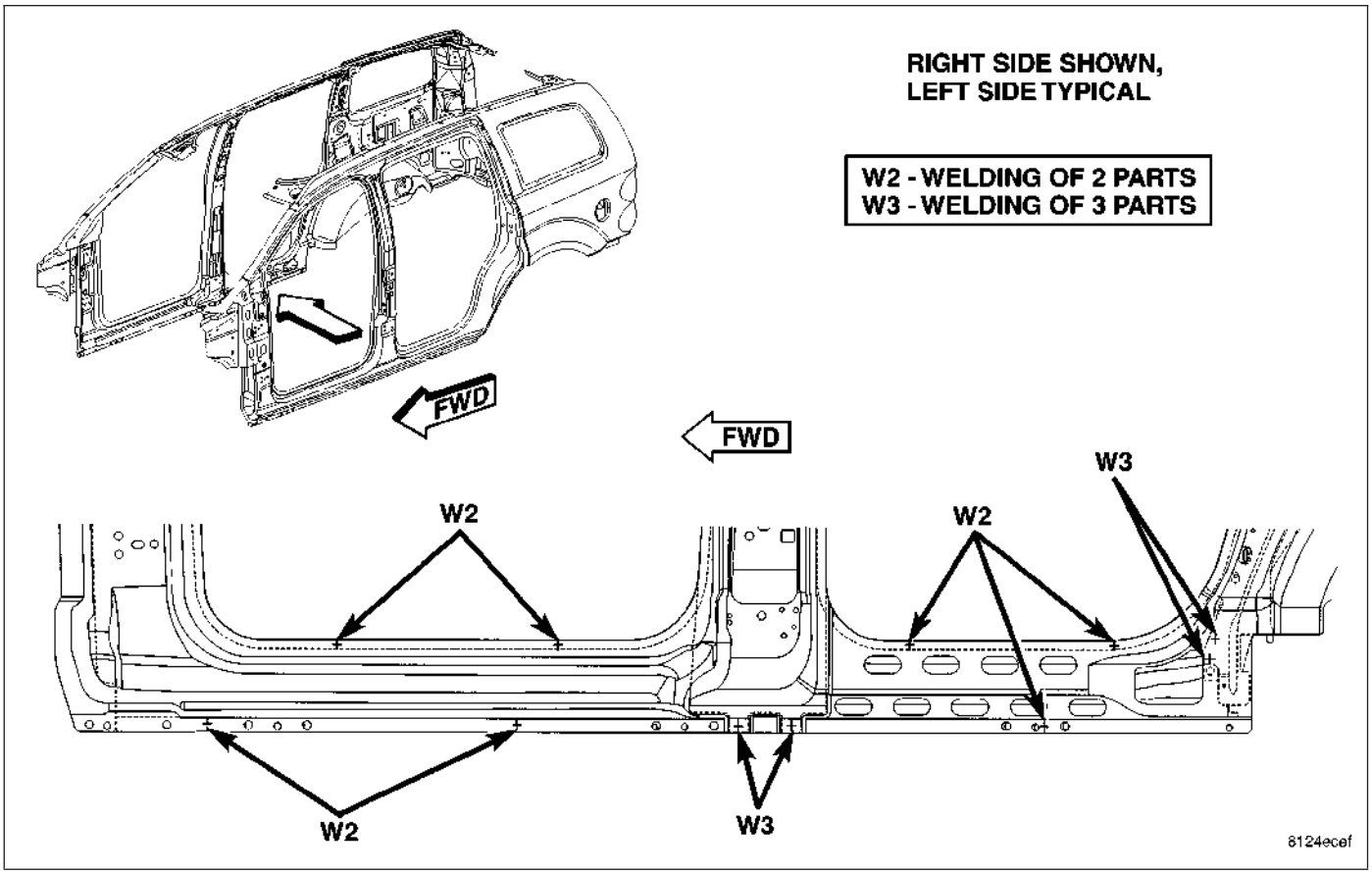

Fig. 73 BODY SIDE APERTURE - COMPLETE (6 OF 9)

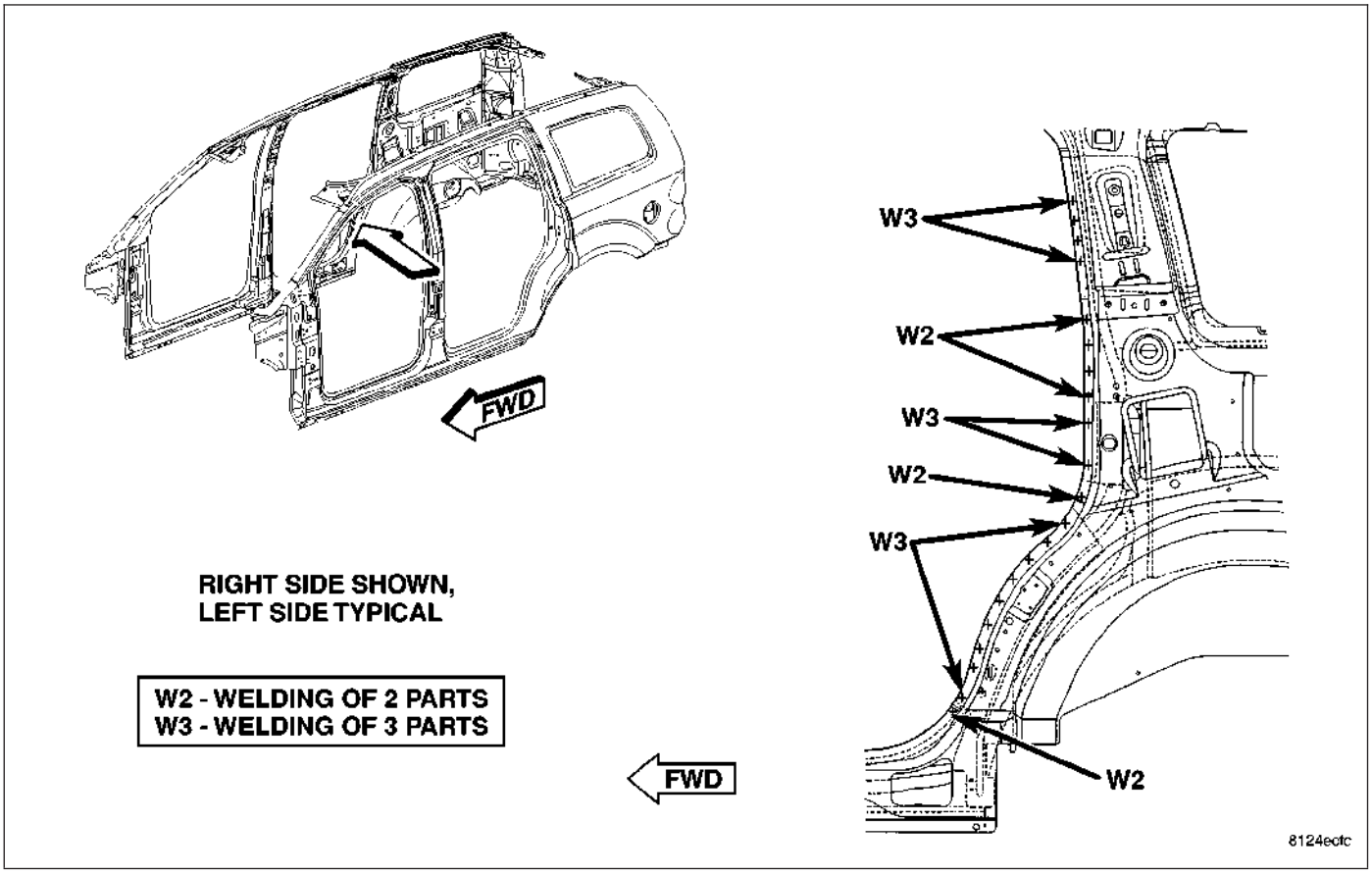

Fig. 74 BODY SIDE APERTURE - COMPLETE (7 OF 9)

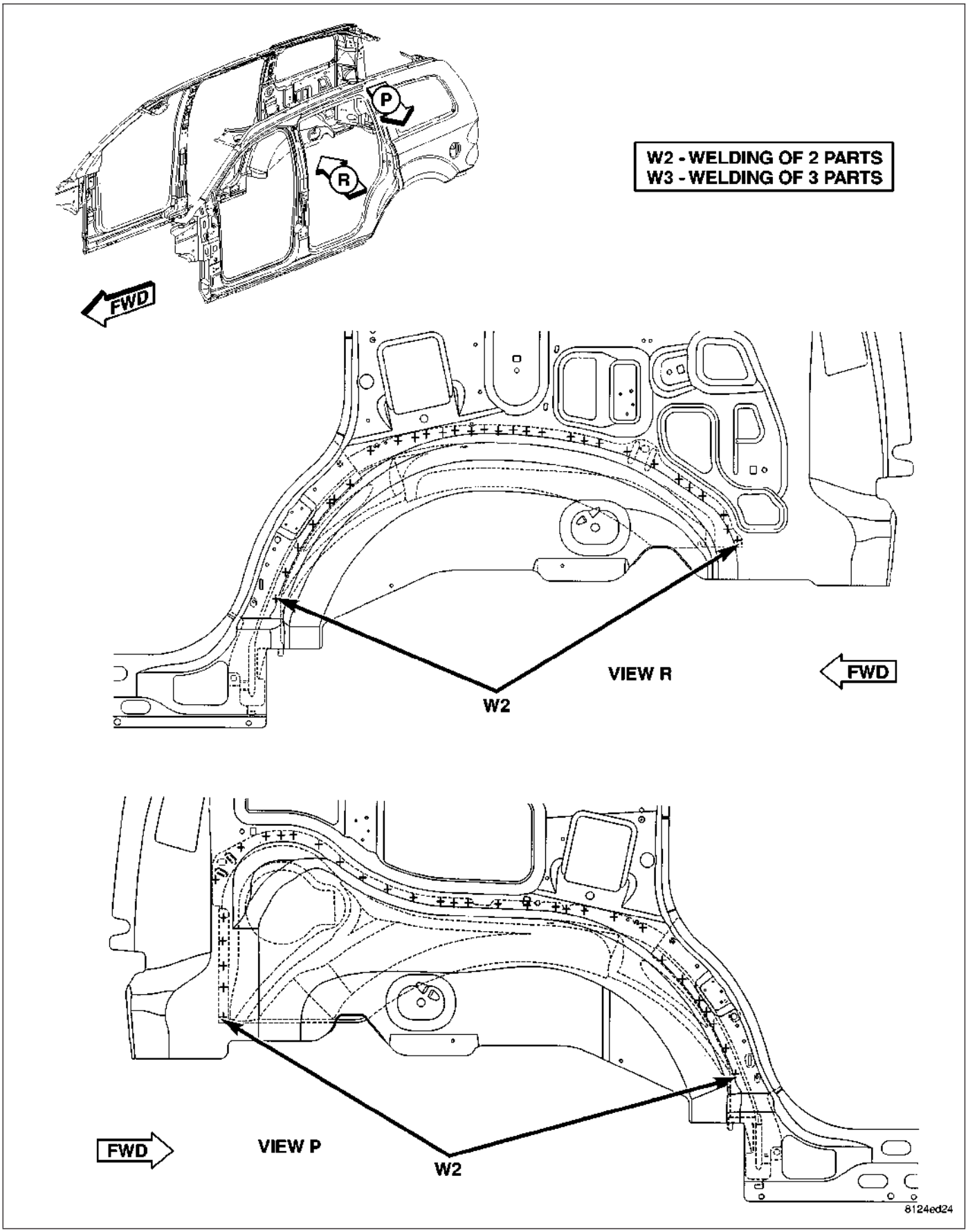

Fig. 75 BODY SIDE APERTURE - COMPLETE (8 OF 9)

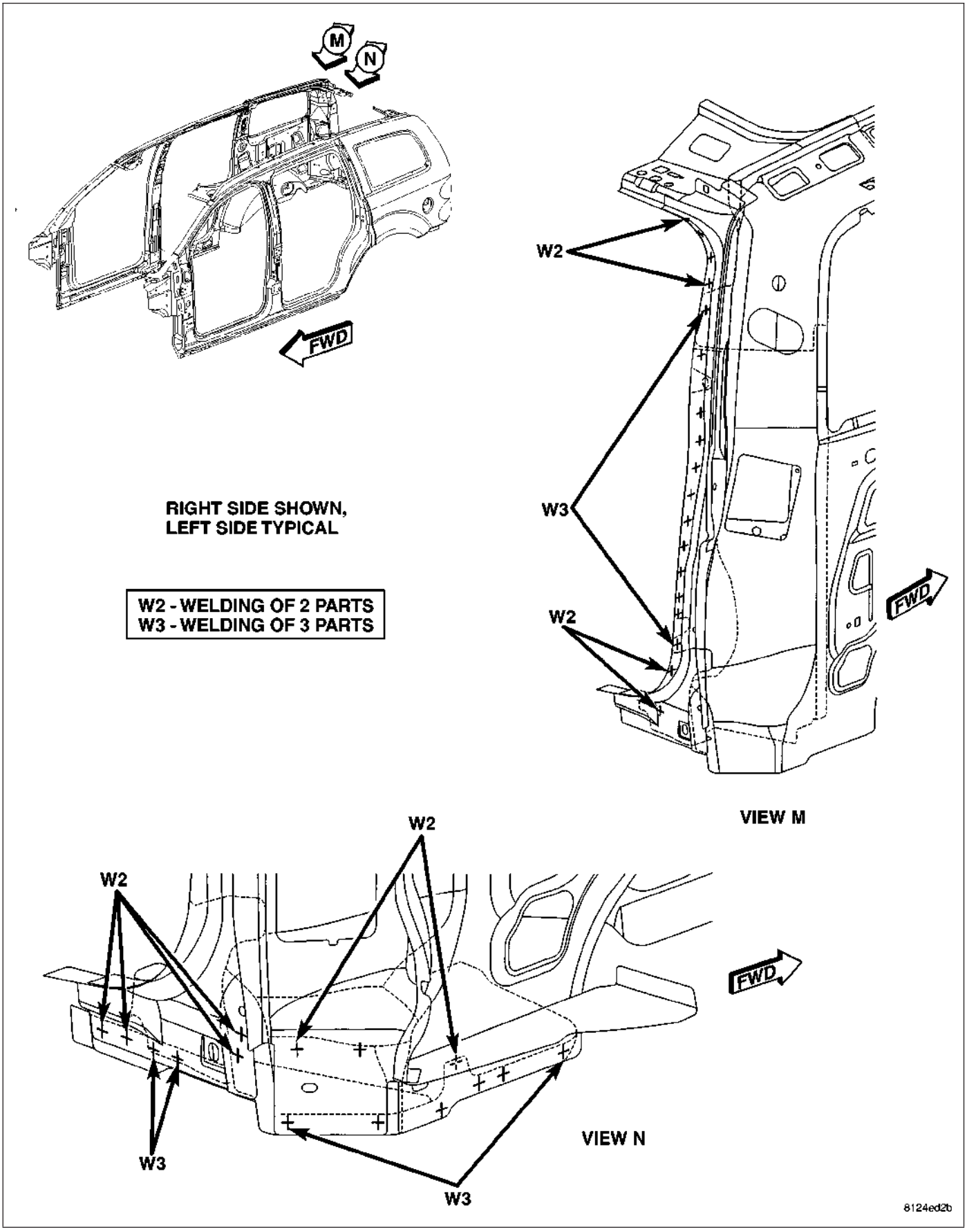

Fig. 76 BODY SIDE APERTURE - COMPLETE (9 OF 9)

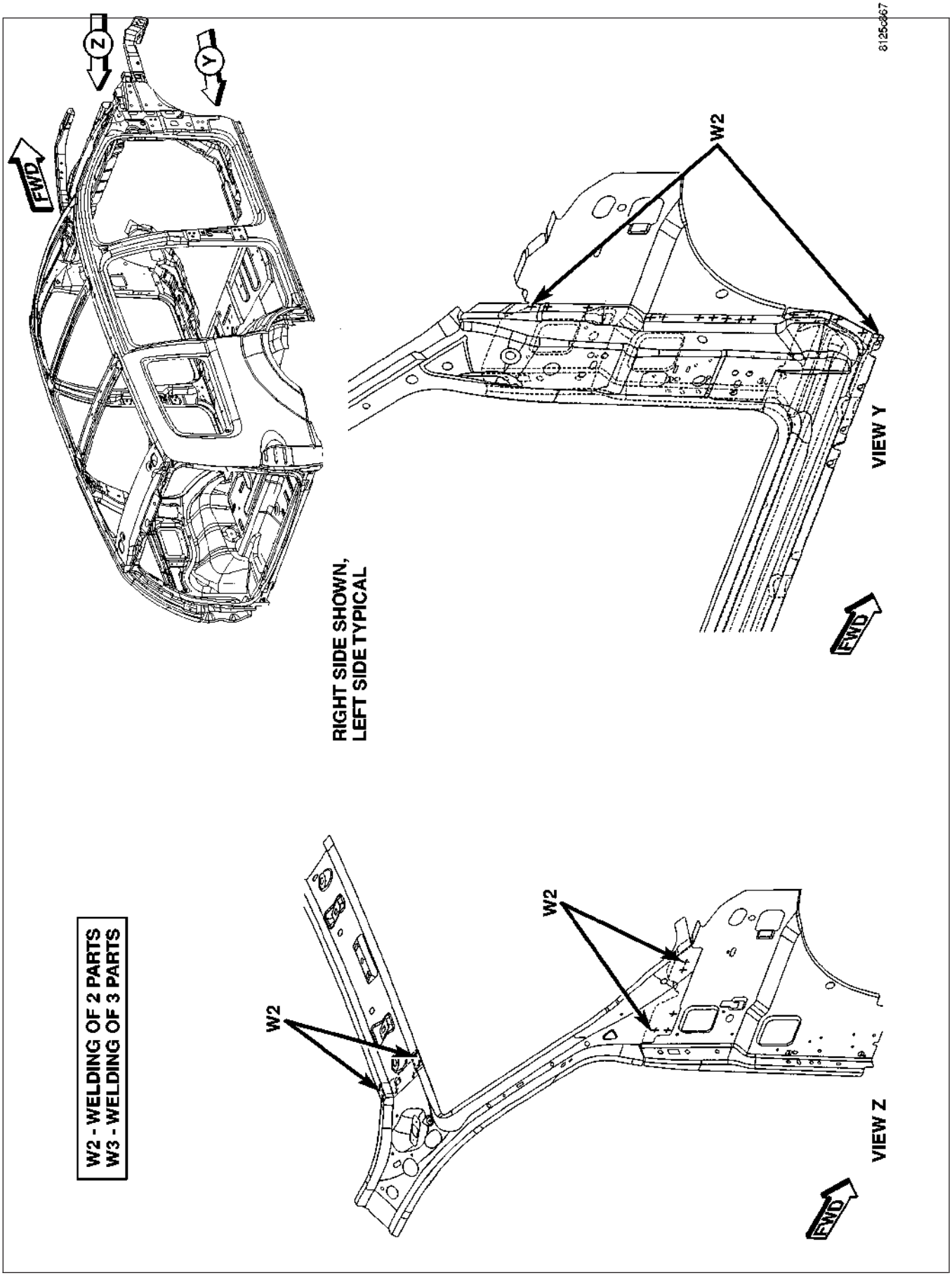

Fig. 77 BODY COMPLETE W/O ROOF (1 OF 11)

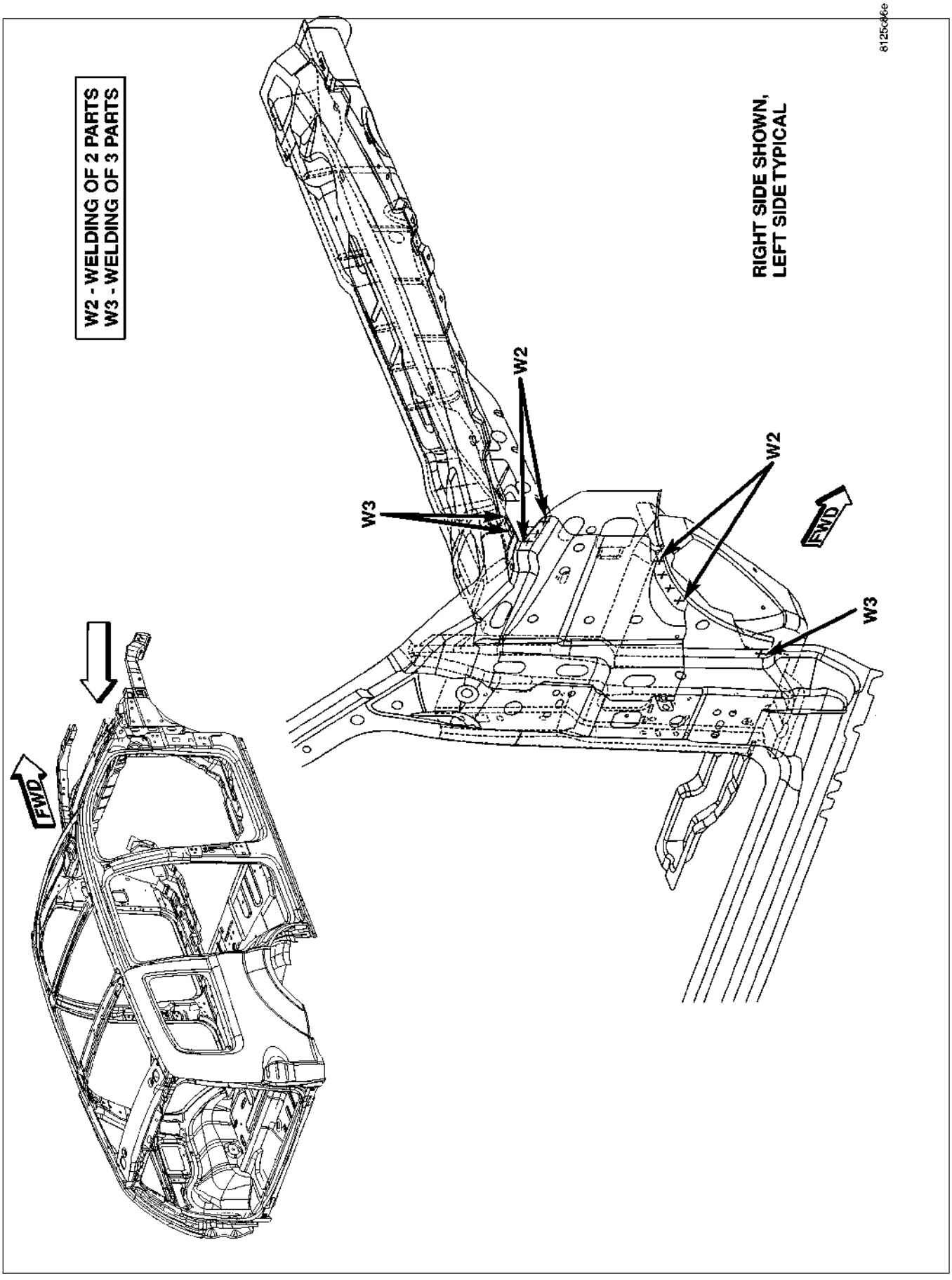

Fig. 78 BODY COMPLETE W/O ROOF (2 OF 11)

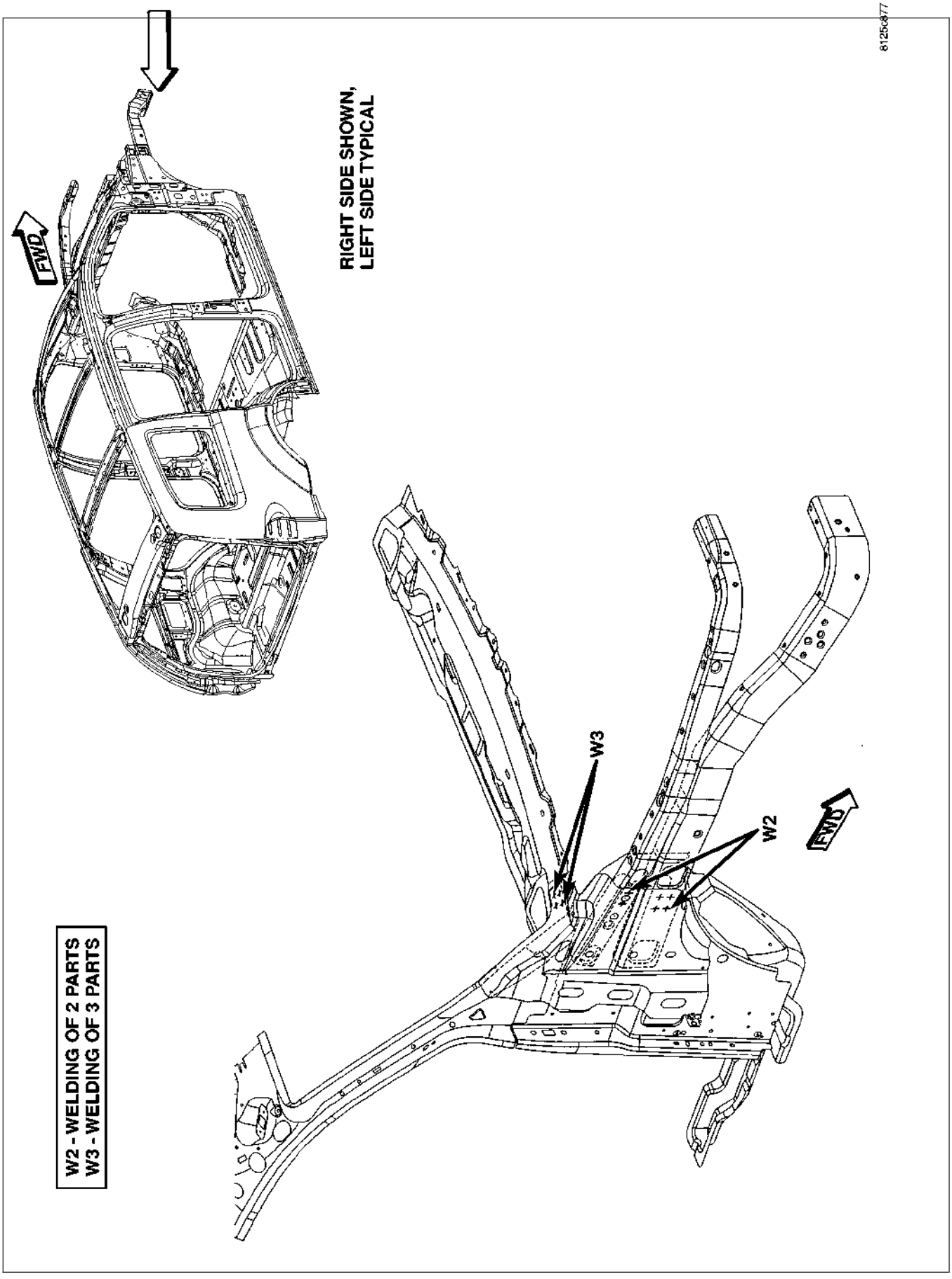

Fig. 79 BODY COMPLETE W/O ROOF (3 OF 11)

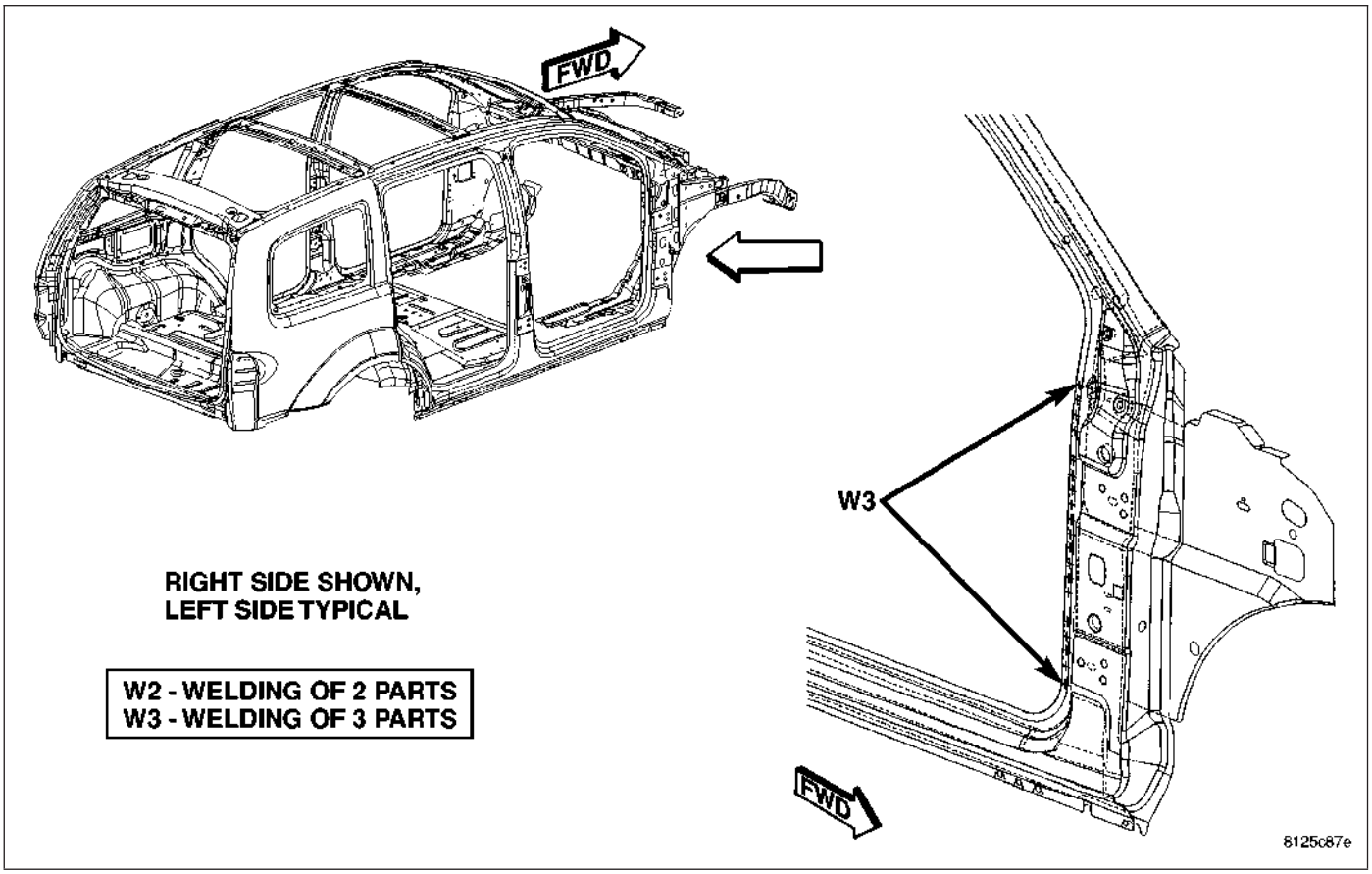

Fig. 80 BODY COMPLETE W/O ROOF (4 OF 11)

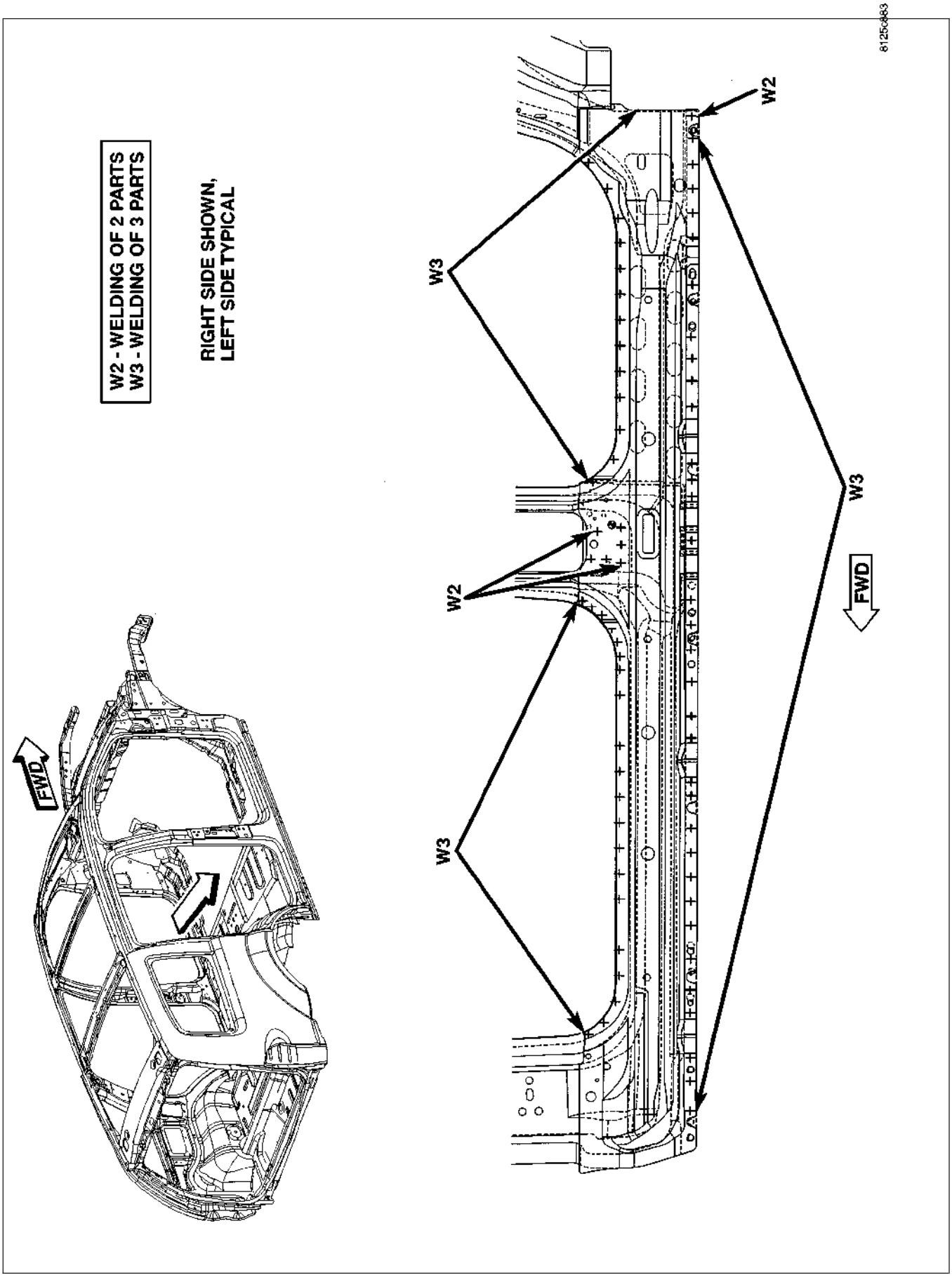

Fig. 81 BODY COMPLETE W/O ROOF (5 OF 11)

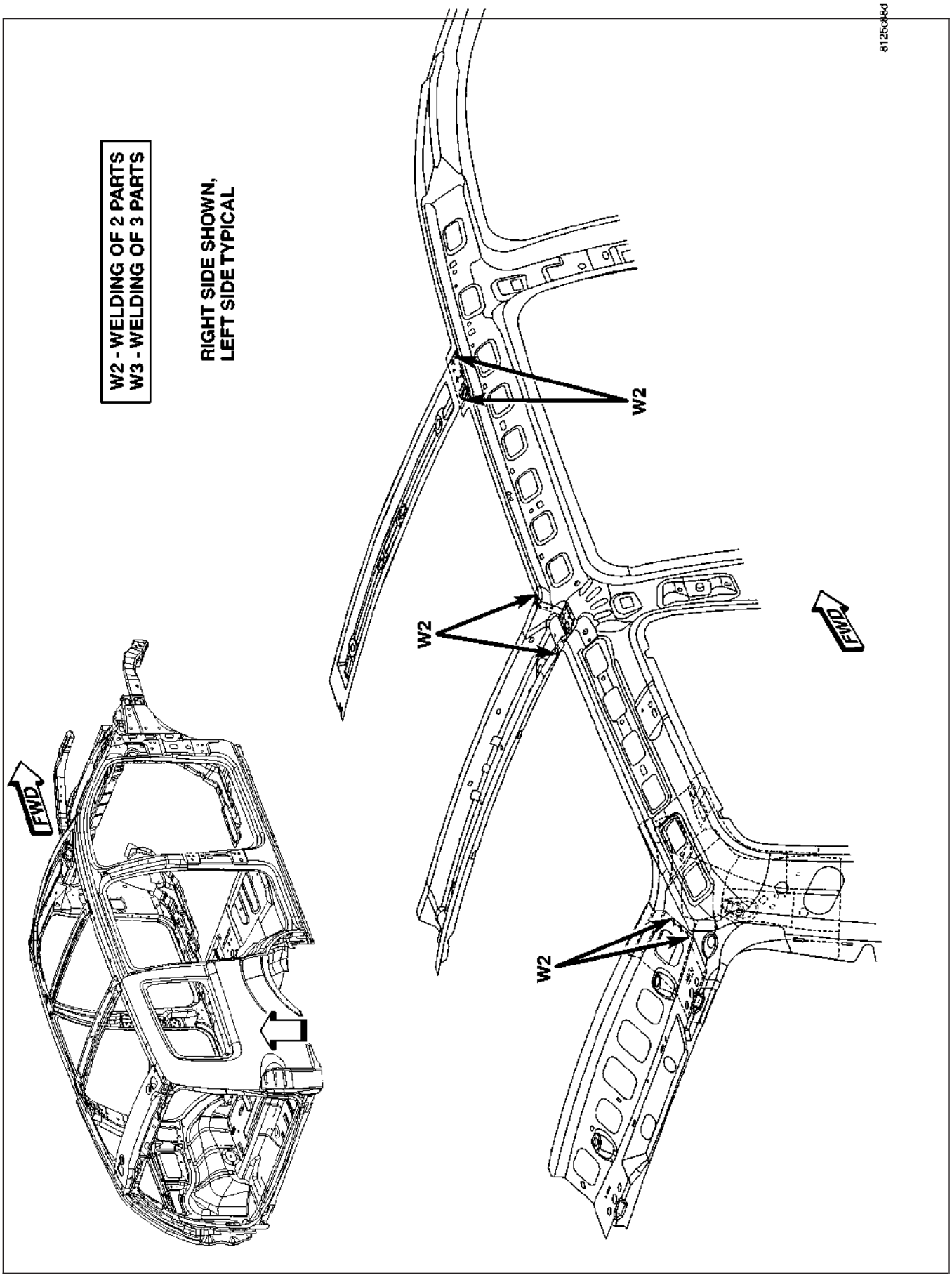

Fig. 82 BODY COMPLETE W/O ROOF (6 OF 11)

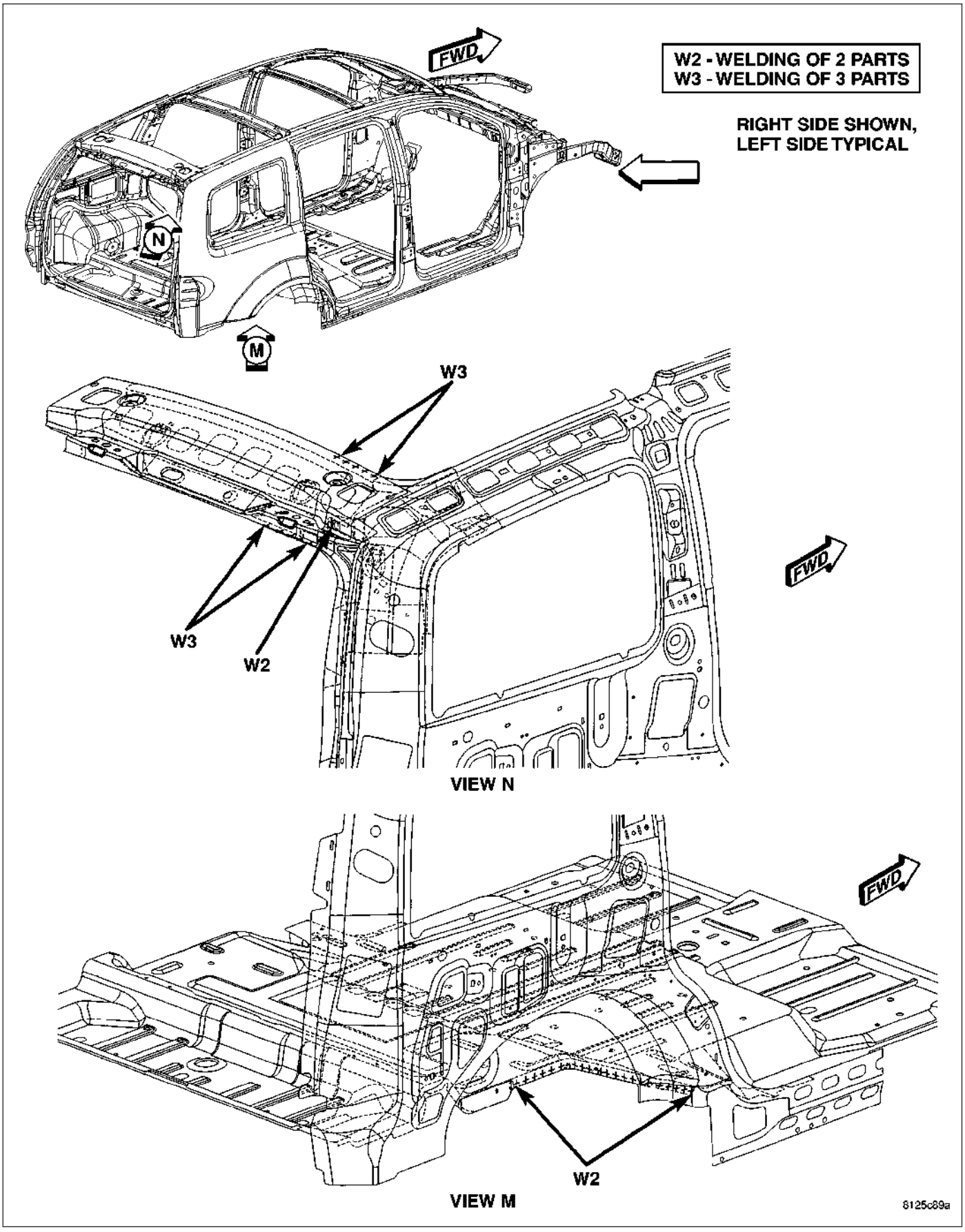

Fig. 83 BODY COMPLETE W/O ROOF (7 OF 11)

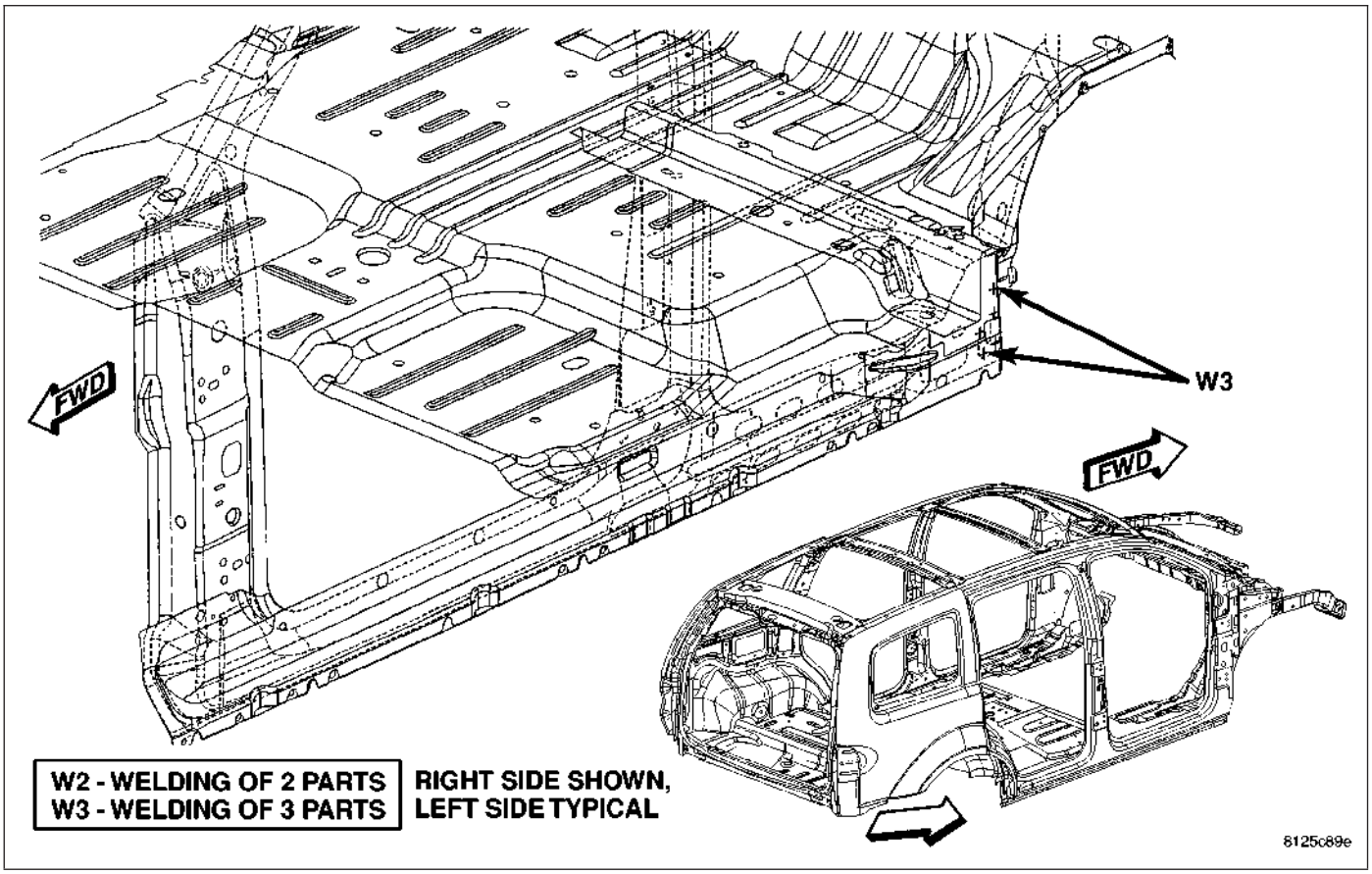

Fig. 84 BODY COMPLETE W/O ROOF (8 OF 11)

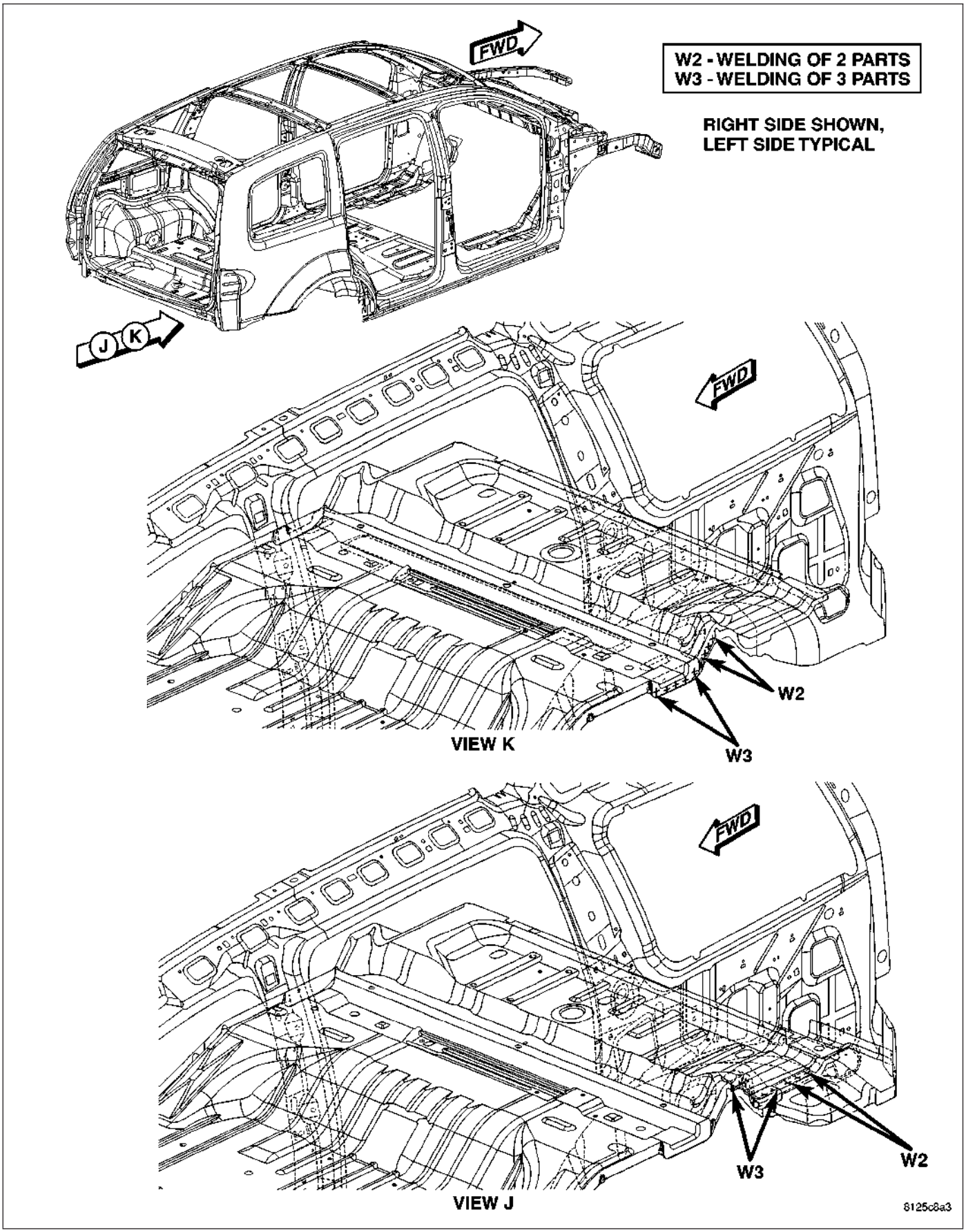

Fig. 85 BODY COMPLETE W/O ROOF (9 OF 11)

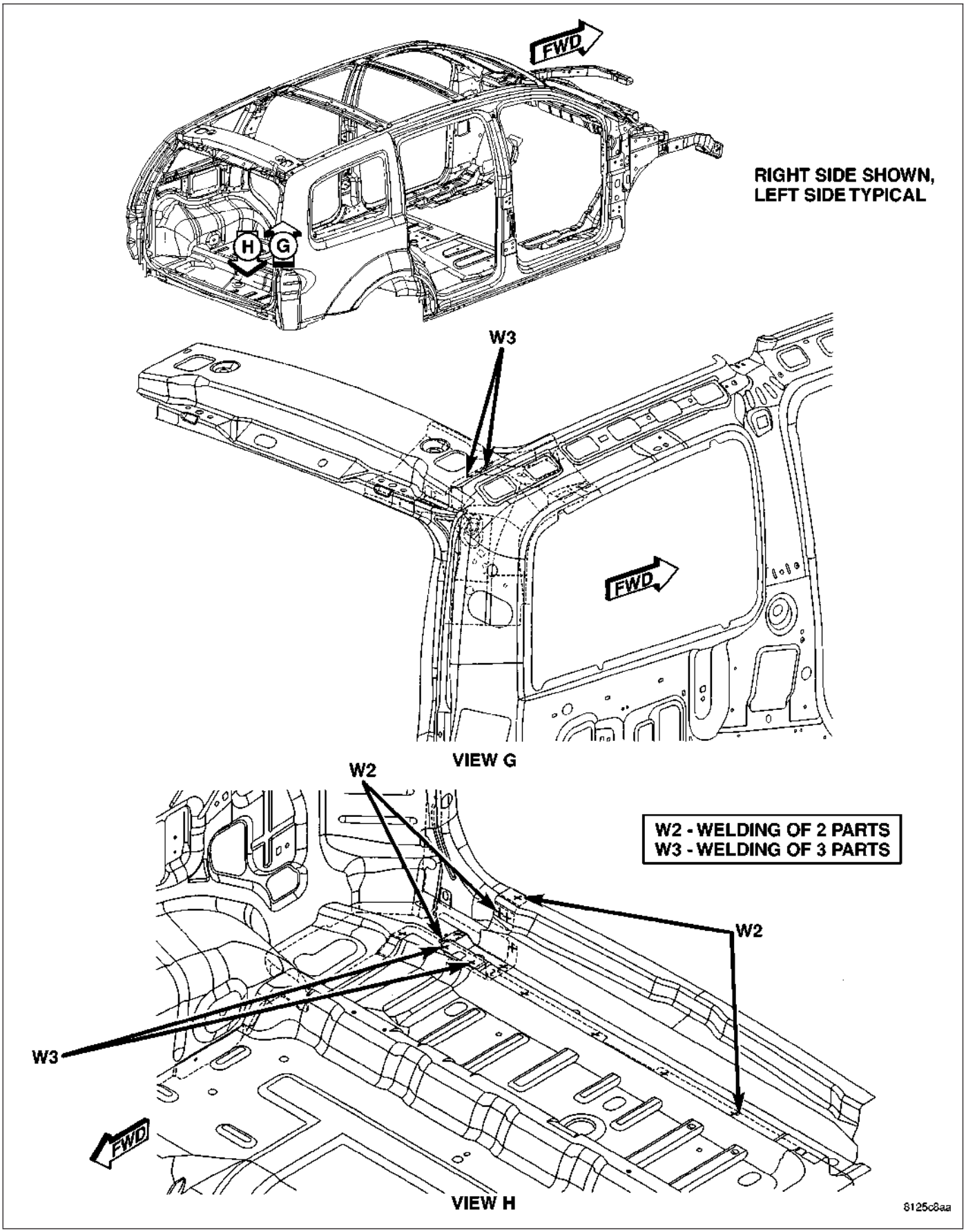

Fig. 86 BODY COMPLETE W/O ROOF (10 OF 11)

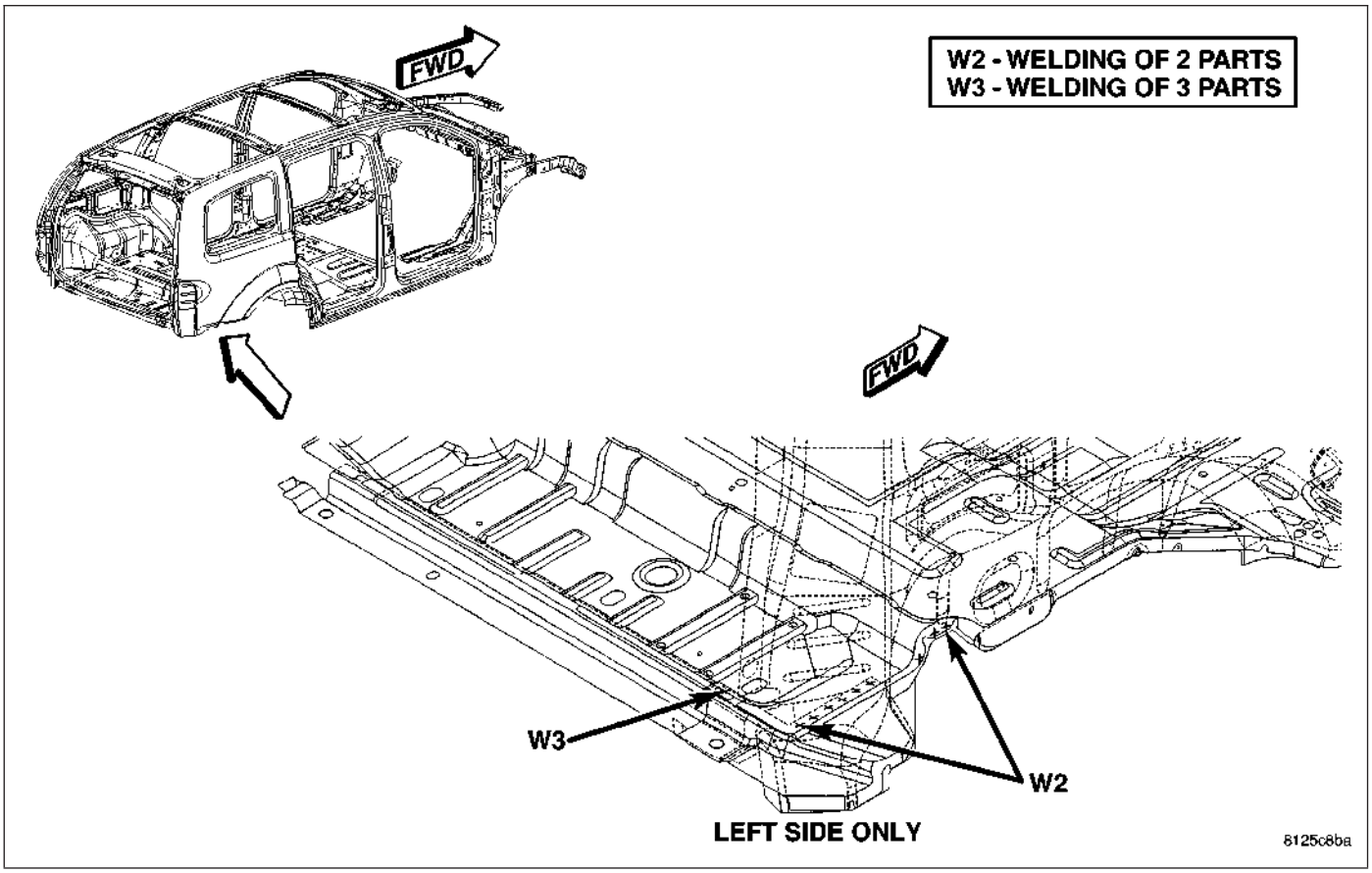

Fig. 87 BODY COMPLETE W/O ROOF (11 OF 11)

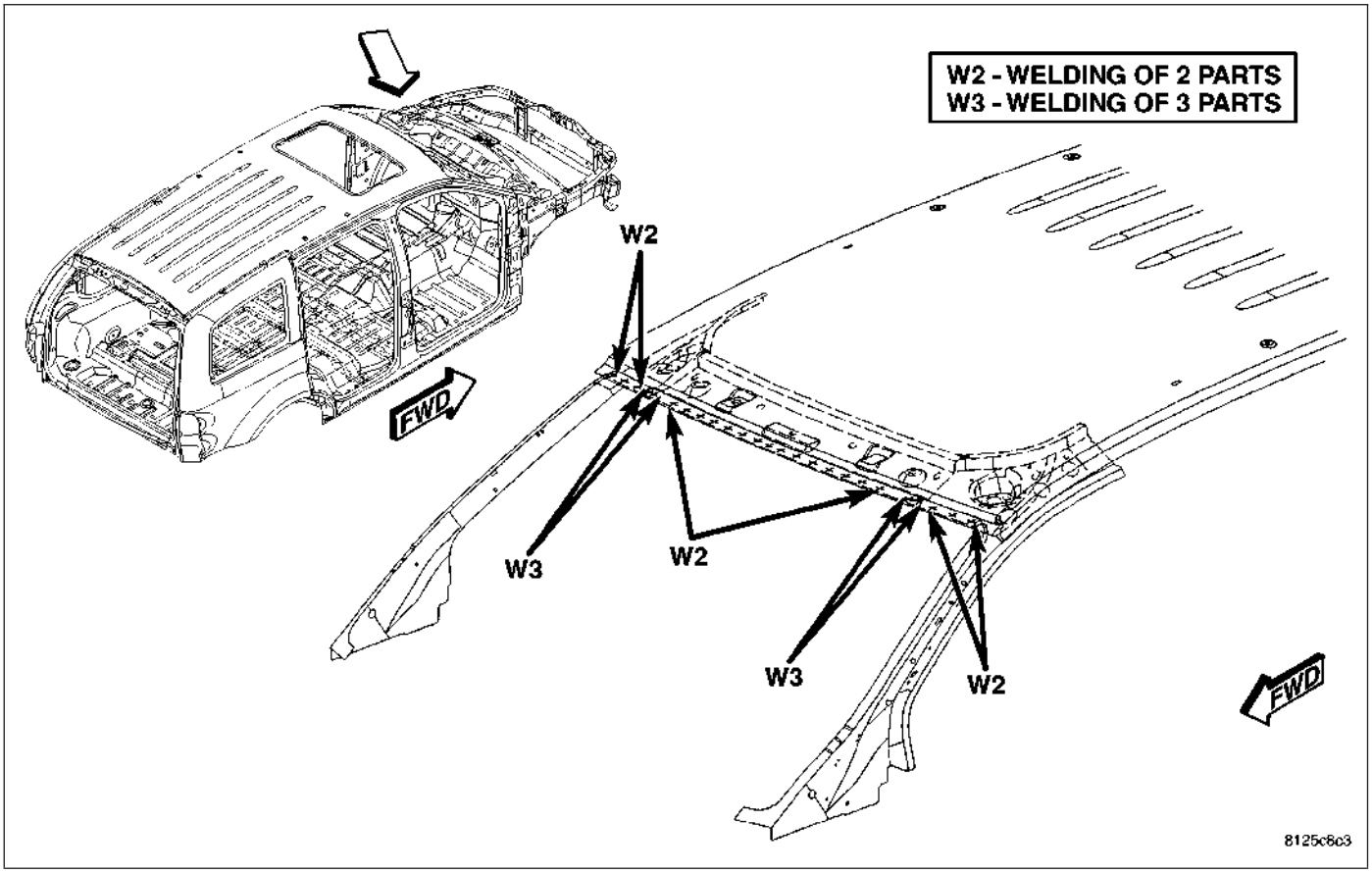

Fig. 88 BODY COMPLETE WITH ROOF (1 OF 5)

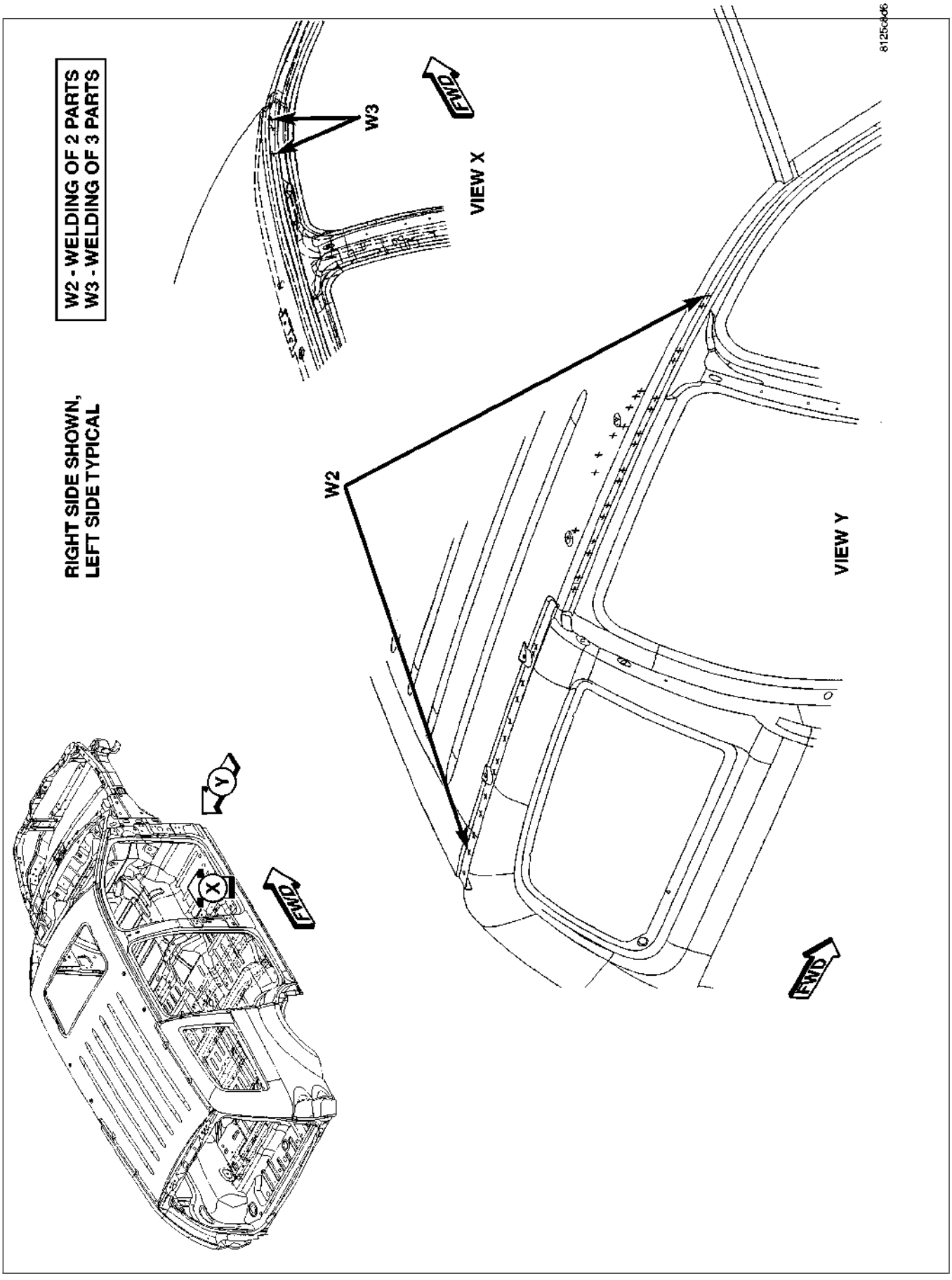

Fig. 89 BODY COMPLETE WITH ROOF (2 OF 5)

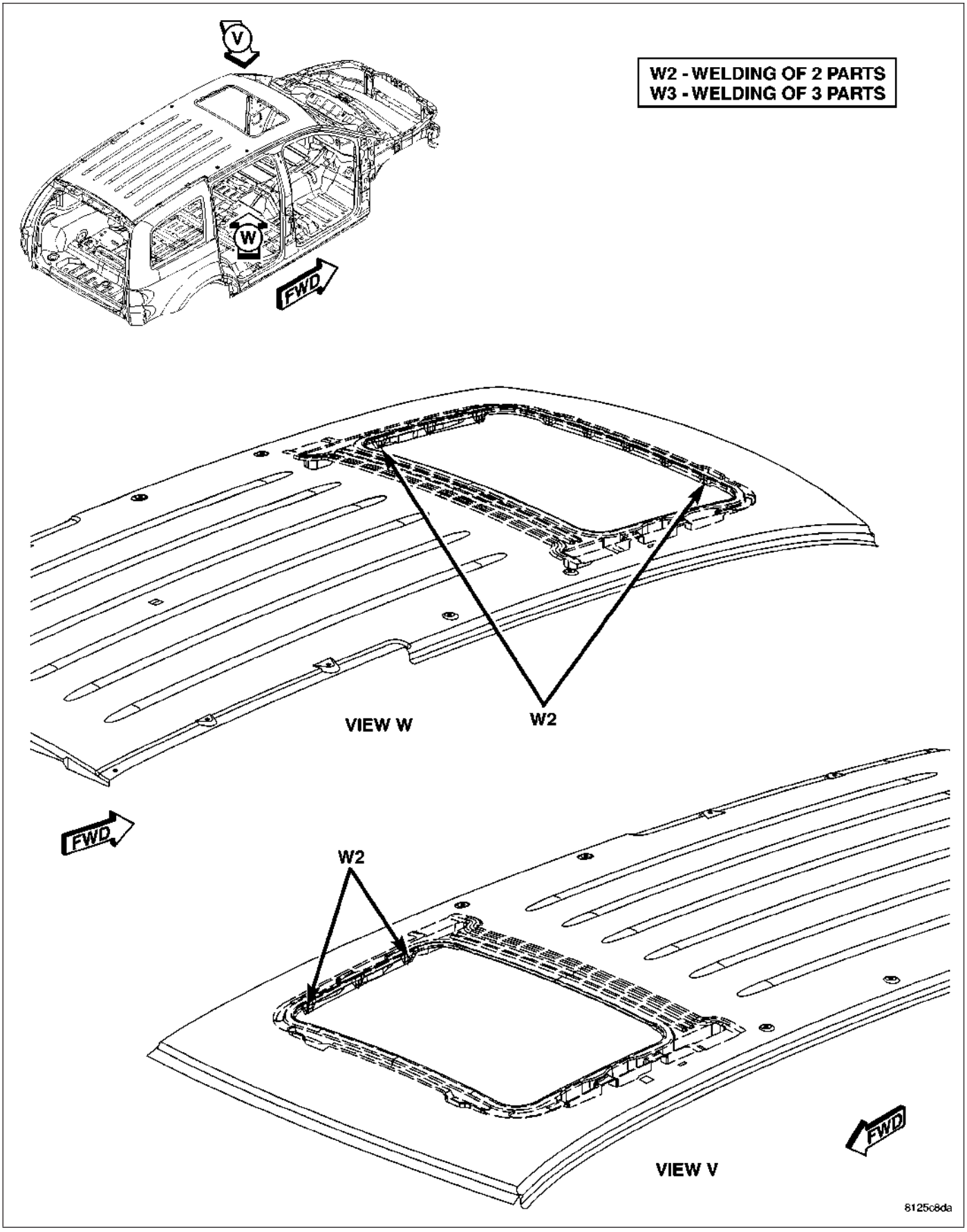

Fig. 90 BODY COMPLETE WITH ROOF (3 OF 5)

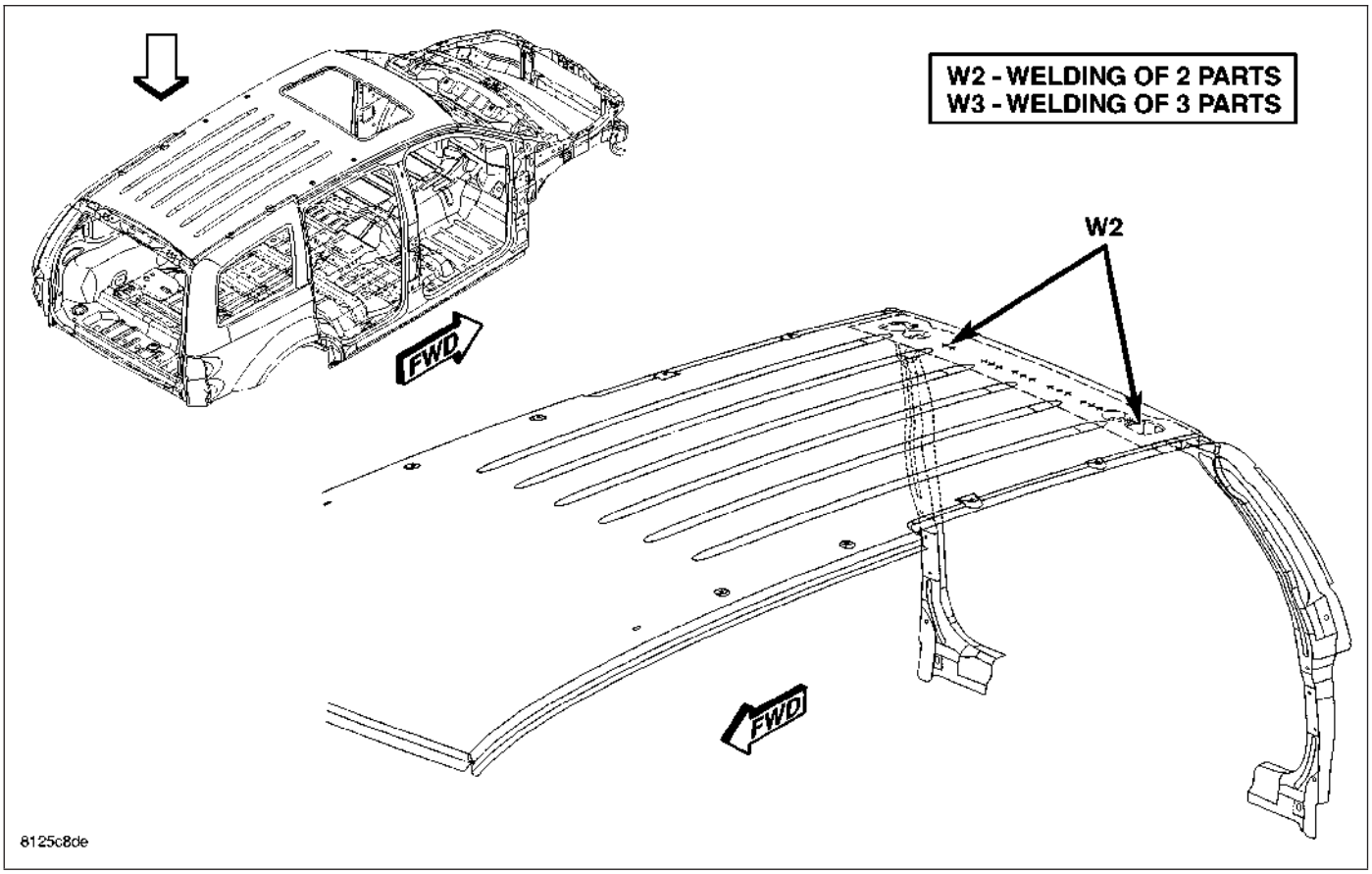

Fig. 91 BODY COMPLETE WITH ROOF (4 OF 5)

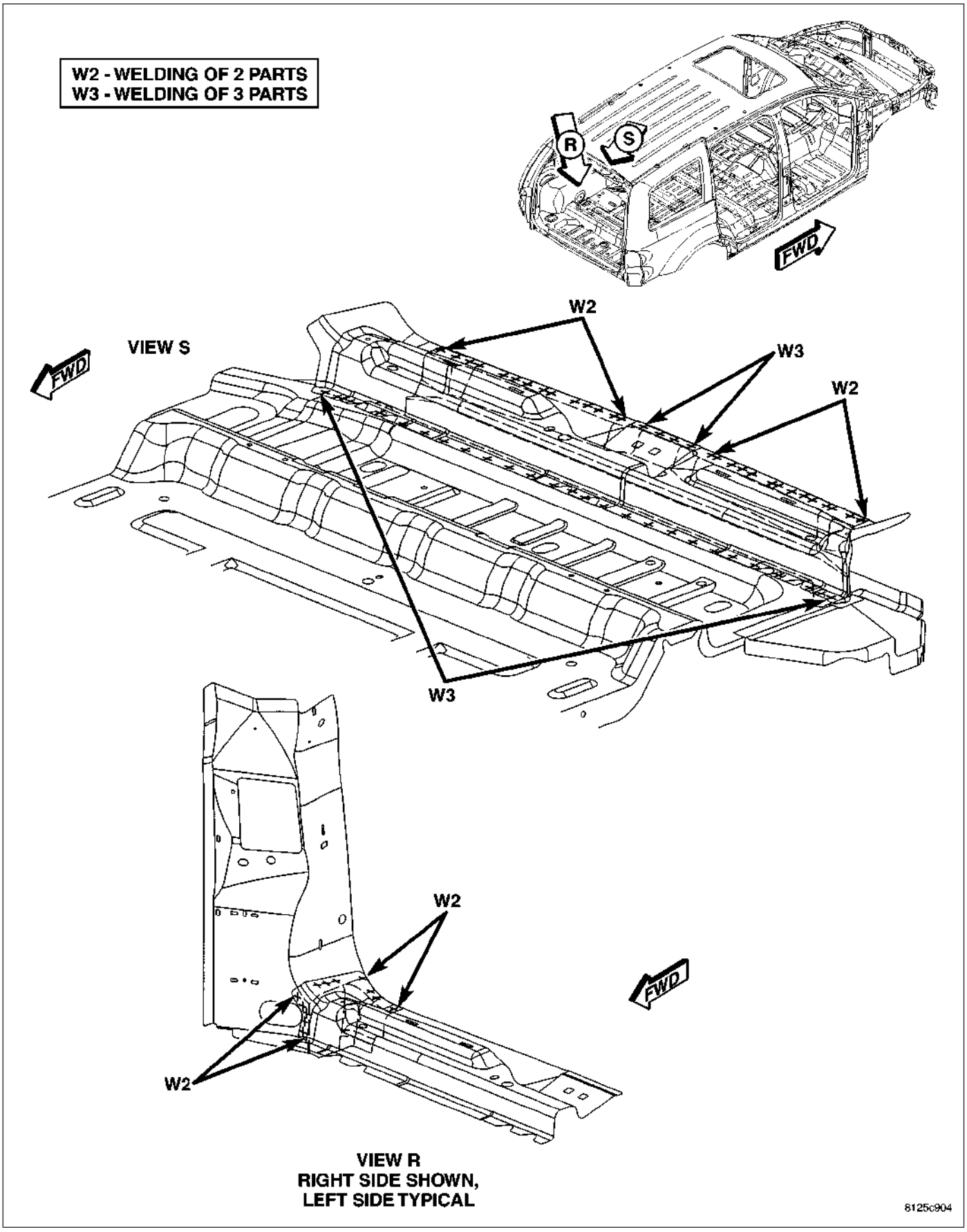

Fig. 92 BODY COMPLETE WITH ROOF (5 OF 5)

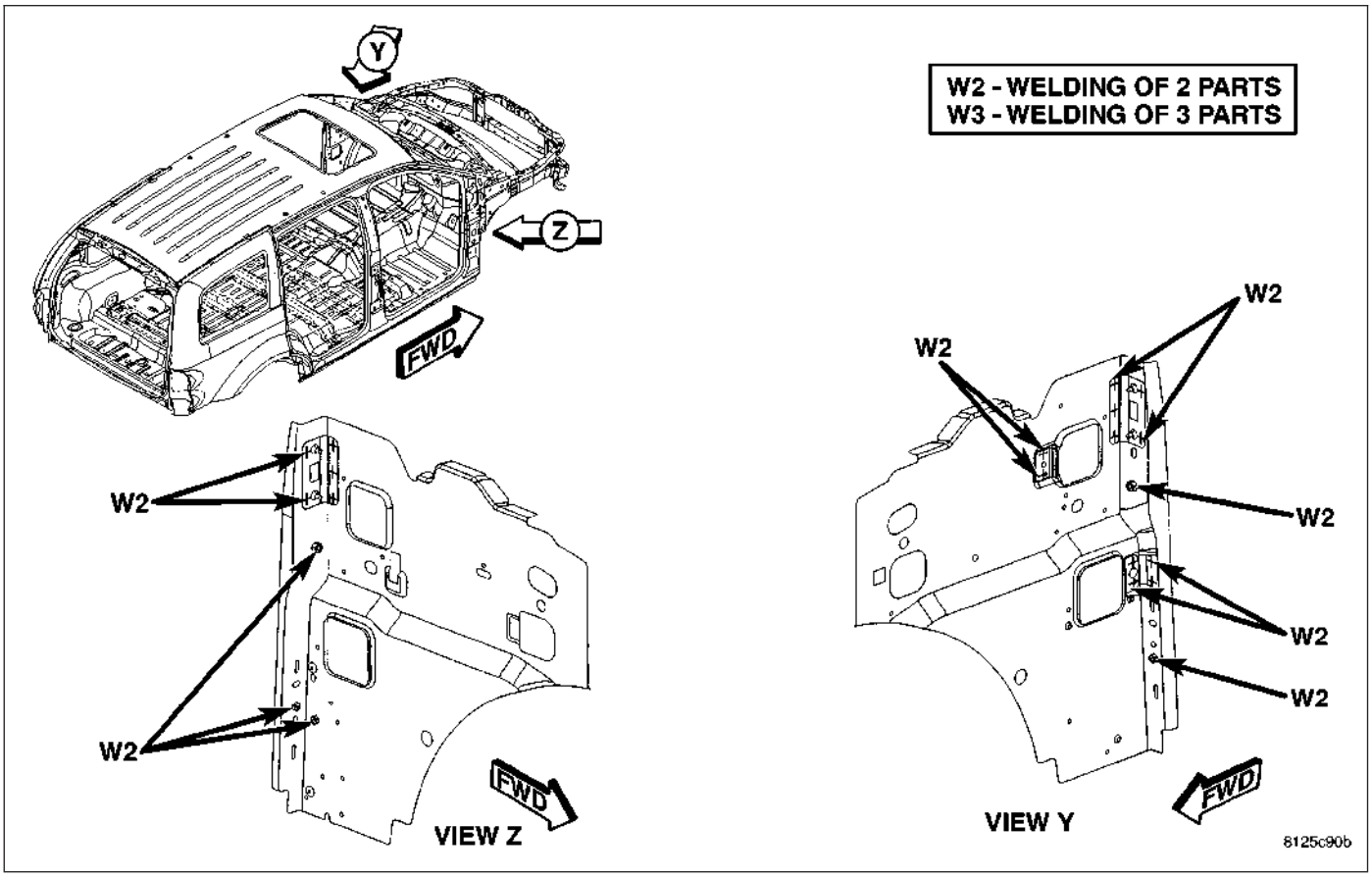

Fig. 93 MISCELLANEOUS WELDS (1 OF 4)

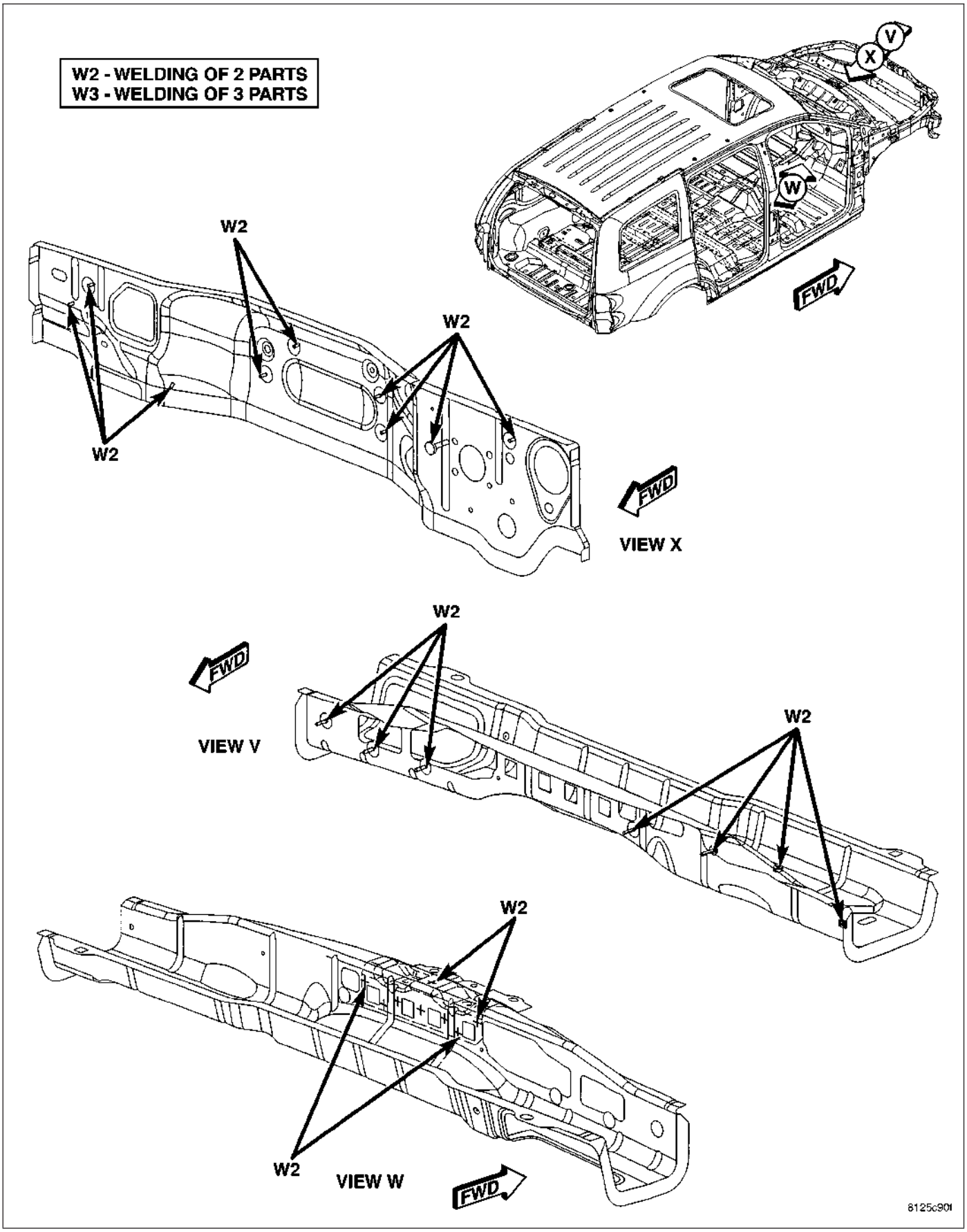

Fig. 94 MISCELLANEOUS WELDS (2 OF 4)

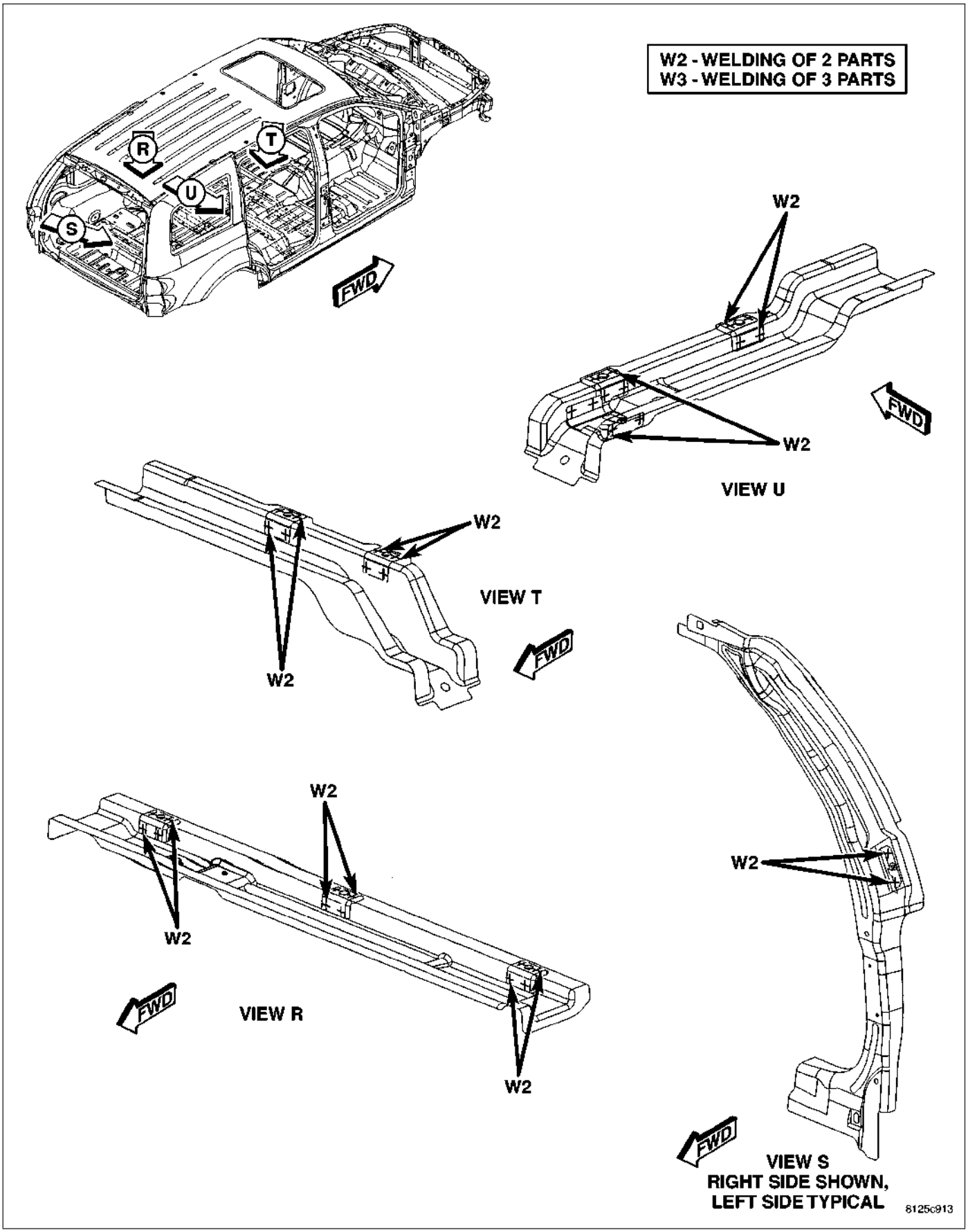

Fig. 95 MISCELLANEOUS WELDS (3 OF 4)

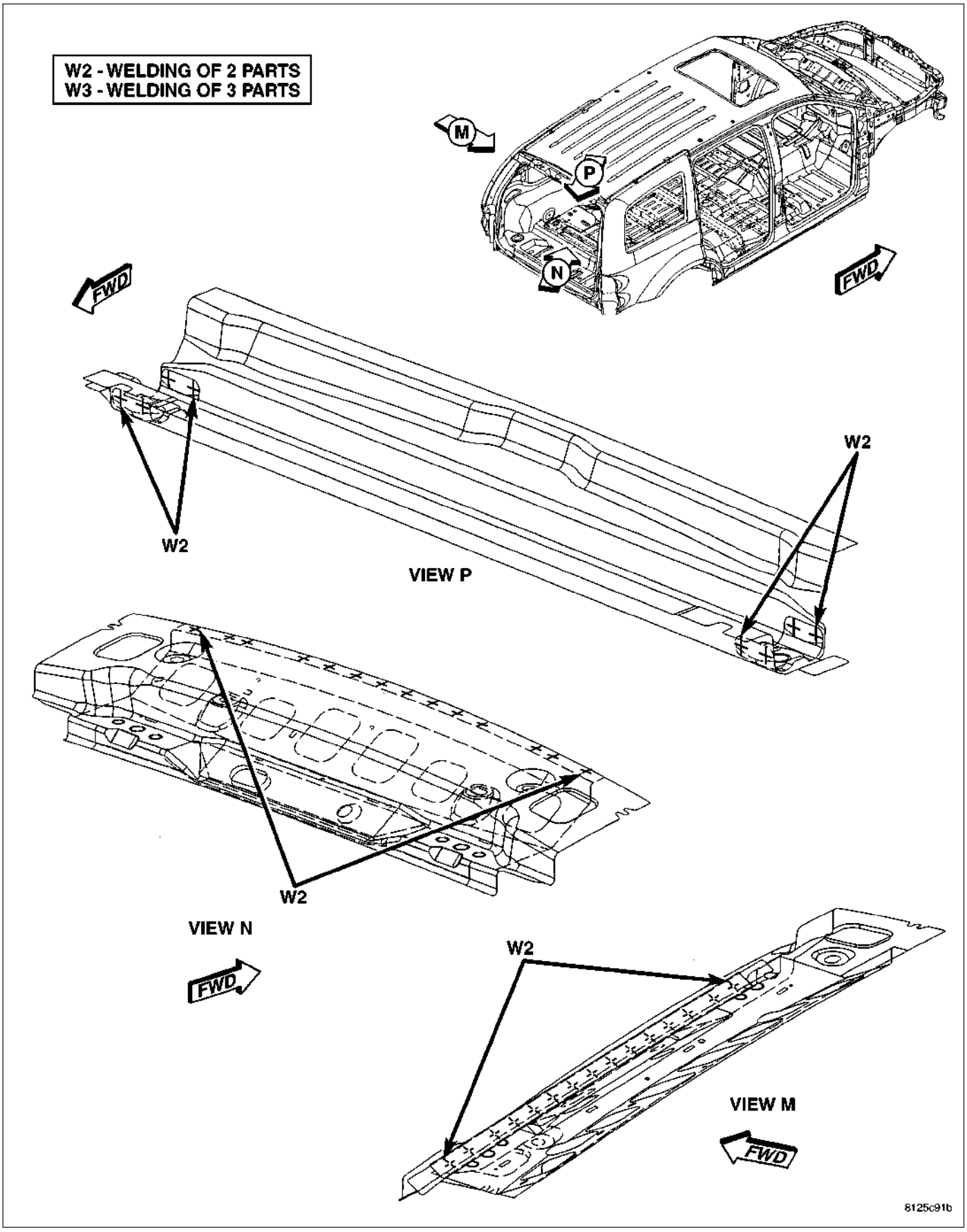

Fig. 96 MISCELLANEOUS WELDS (4 OF 4)

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HVAC - ELECTRICAL DIAGNOSTICS

DIAGNOSIS AND TESTING

B100A–RECIRCULATION SWITCH REQUEST INPUT CIRCUIT LOW (ATC)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Recirculation mode switch is stuck in a pushed position for more than two minutes. This DTC has a maturing time of two minutes and a de-maturing time of two seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

Possible Causes
OBJECT HOLDING SWITCH IN A PUSHED POSITION
A/C HEATER CONTROL

Theory of Operation

The switch input changes when the switch is pushed down. An active DTC indicates that the switch is stuck in a pushed position. A stored DTC indicates that the switch was stuck in a pushed position for more than two minutes, but has since returned to its normal state.

NOTE: This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

Diagnostic Test

1. INSPECT FOR OBJECT HOLDING SWITCH IN A PUSHED POSITION

Inspect the A/C Heater Control for an object holding the switch in a pushed position. If present, remove the object.
Turn the ignition on.
With the scan tool, erase HVAC DTCs.
Turn the ignition off, wait 10 seconds, and then turn the ignition on.
Wait two minutes, then with the scan tool, read HVAC DTCs.

Does the scan tool display active: B100A–RECIRCULATION SWITCH REQUEST INPUT CIRCUIT LOW?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

No >> Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

B100D–FLOOR MODE SWITCH REQUEST INPUT CIRCUIT LOW (ATC)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Floor mode switch is stuck in a pushed position for more than two minutes. This DTC has a maturing time of two minutes and a de-maturing time of two seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

Possible Causes
OBJECT HOLDING SWITCH IN A PUSHED POSITION
A/C HEATER CONTROL

Theory of Operation

The switch input changes when the switch is pushed down. An active DTC indicates that the switch is stuck in a pushed position. A stored DTC indicates that the switch was stuck in a pushed position for more than two minutes, but has since returned to its normal state.

NOTE: This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

Diagnostic Test

1. INSPECT FOR OBJECT HOLDING SWITCH IN A PUSHED POSITION

Inspect the A/C Heater Control for an object holding the switch in a pushed position. If present, remove the object.

Turn the ignition on.

With the scan tool, erase HVAC DTCs.

Turn the ignition off, wait 10 seconds, and then turn the ignition on.

Wait two minutes, then with the scan tool, read HVAC DTCs.

Does the scan tool display active: B100D–FLOOR MODE SWITCH REQUEST INPUT CIRCUIT LOW?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Perform BODY VERIFICATION TEST – VER 1.

B101C–TEMP DOWN SWITCH REQUEST INPUT CIRCUIT LOW (ATC)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Temp mode switch is stuck in a pushed position for more than two minutes. This DTC has a maturing time of two minutes and a de-maturing time of two seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

Possible Causes
OBJECT HOLDING SWITCH IN A PUSHED POSITION
A/C HEATER CONTROL

Theory of Operation

The switch input changes when the switch is pushed down. An active DTC indicates that the switch is stuck in a pushed position. A stored DTC indicates that the switch was stuck in a pushed position for more than two minutes, but has since returned to its normal state.

NOTE: This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

Diagnostic Test

1. INSPECT FOR OBJECT HOLDING SWITCH IN A PUSHED POSITION

Inspect the A/C Heater Control for an object holding the switch in a pushed position. If present, remove the object.

Turn the ignition on.

With the scan tool, erase HVAC DTCs.

Turn the ignition off, wait 10 seconds, and then turn the ignition on.

Wait two minutes, then with the scan tool, read HVAC DTCs.

Does the scan tool display active: B101C–TEMP DOWN SWITCH REQUEST INPUT CIRCUIT LOW?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Perform BODY VERIFICATION TEST – VER 1.

B101F–POWER ON/OFF SWITCH REQUEST INPUT CIRCUIT LOW (ATC)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Power mode switch is stuck in a pushed position for more than two minutes. This DTC has a maturing time of two minutes and a de-maturing time of two seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

Possible Causes
OBJECT HOLDING SWITCH IN A PUSHED POSITION
A/C HEATER CONTROL

Theory of Operation

The switch input changes when the switch is pushed down. An active DTC indicates that the switch is stuck in a pushed position. A stored DTC indicates that the switch was stuck in a pushed position for more than two minutes, but has since returned to its normal state.

NOTE: This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

Diagnostic Test

1. INSPECT FOR OBJECT HOLDING SWITCH IN A PUSHED POSITION

Inspect the A/C Heater Control for an object holding the switch in a pushed position. If present, remove the object.

Turn the ignition on.

With the scan tool, erase HVAC DTCs.

Turn the ignition off, wait 10 seconds, and then turn the ignition on.

Wait two minutes, then with the scan tool, read HVAC DTCs.

Does the scan tool display active: B101F–POWER ON/OFF SWITCH REQUEST INPUT CIRCUIT LOW?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Perform BODY VERIFICATION TEST – VER 1.

B102B–REAR FUNCTION CONTROL SWITCH REQUEST INPUT CIRCUIT LOW (ATC)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Rear Function mode switch is stuck in a pushed position for more than two minutes. This DTC has a maturing time of two minutes and a de-maturing time of two seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

Possible Causes
OBJECT HOLDING SWITCH IN A PUSHED POSITION
A/C HEATER CONTROL

Theory of Operation

The switch input changes when the switch is pushed down. An active DTC indicates that the switch is stuck in a pushed position. A stored DTC indicates that the switch was stuck in a pushed position for more than two minutes, but has since returned to its normal state.

NOTE: This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

Diagnostic Test

1. INSPECT FOR OBJECT HOLDING SWITCH IN A PUSHED POSITION

Inspect the A/C Heater Control for an object holding the switch in a pushed position. If present, remove the object.

Turn the ignition on.

With the scan tool, erase HVAC DTCs.

Turn the ignition off, wait 10 seconds, and then turn the ignition on.

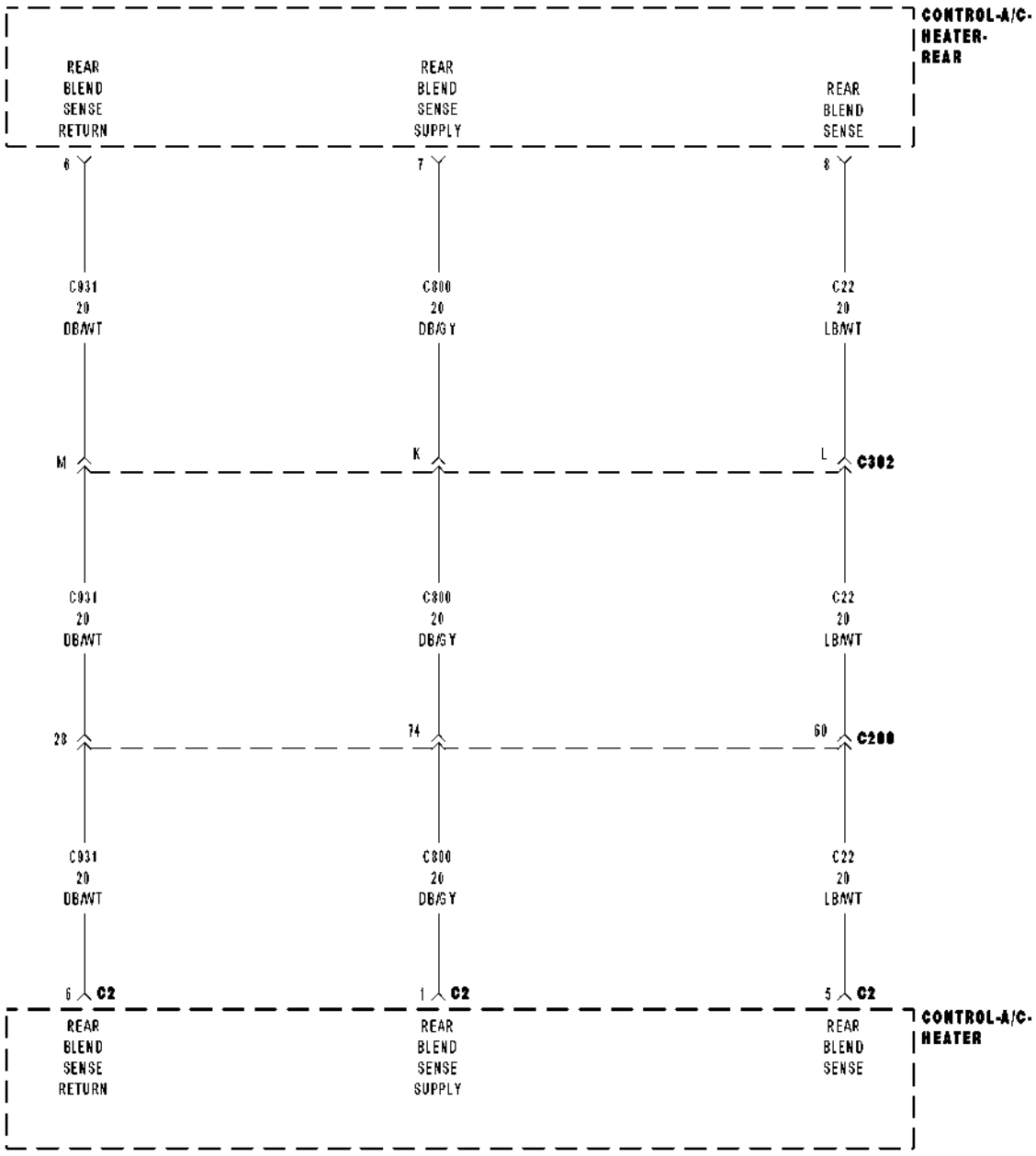
Wait two minutes, then with the scan tool, read HVAC DTCs.

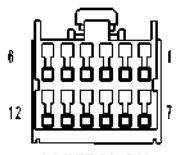
Does the scan tool display active: B102B–REAR FUNCTION CONTROL SWITCH REQUEST INPUT CIRCUIT LOW?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST – VER 1.

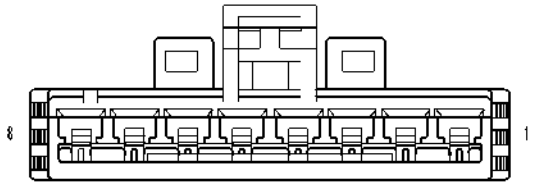
No >> Perform BODY VERIFICATION TEST – VER 1.

B102E–REAR BLEND REQUEST INPUT CIRCUIT LOW (ATC)





CONTROL-A/C-HEATER C2 (ATC)



CONTROL-A/C-HEATER-REAR

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B102E–REAR BLEND REQUEST INPUT CIRCUIT LOW (ATC) (CONTINUED)

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the rear blend pot is out of range towards the low voltage threshold. This DTC has a maturing time of 5 seconds and a de-maturing time of 10 seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

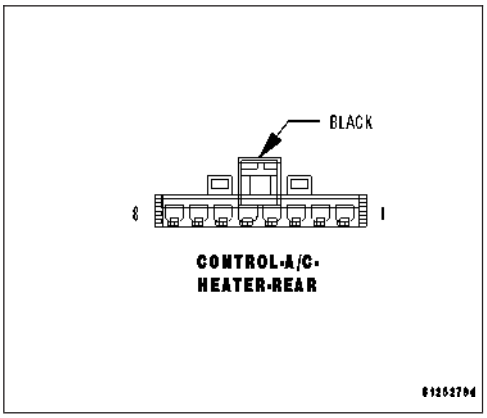
Possible Causes
(C800) REAR BLEND SENSE SUPPLY CIRCUIT SHORTED TO GROUND, TO (C931) REAR BLEND SENSE RETURN CIRCUIT, OR OPEN
(C22) REAR BLEND SENSE CIRCUIT SHORTED TO GROUND OR TO (C931) REAR BLEND SENSE RETURN CIRCUIT
REAR A/C HEATER CONTROL
A/C HEATER CONTROL

NOTE: This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

Diagnostic Test

1. CHECK FOR DTC B102E–REAR BLEND REQUEST INPUT CIRCUIT LOW WITH REAR A/C HEATER CONTROL DISCONNECTED

Turn the ignition off.
Disconnect the Rear A/C Heater Control harness connector.
Turn the ignition on.
With the scan tool, erase HVAC DTCs.
Turn the ignition off, wait 10 seconds, and then turn the ignition on.
With the scan tool, read HAVC DTCs.



Does the scan tool display: B102E–REAR BLEND REQUEST INPUT CIRCUIT LOW?

Yes >> Go To 2

No >> Replace the Rear A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

B102E–REAR BLEND REQUEST INPUT CIRCUIT LOW (ATC) (CONTINUED)

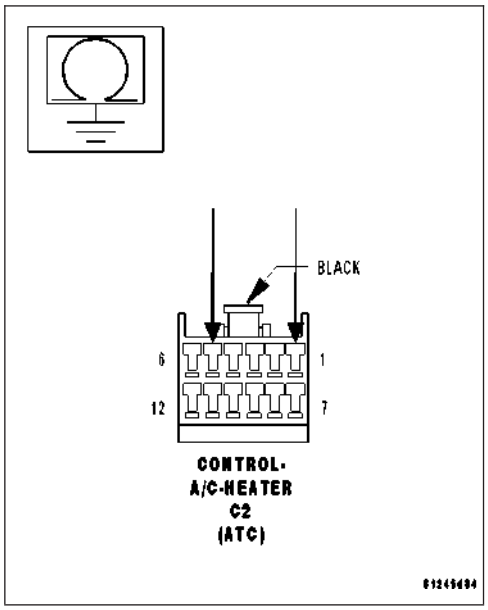
2. CHECK (C800) REAR BLEND SENSE SUPPLY CIRCUIT & (C22) REAR BLEND SENSE CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

Disconnect the A/C Heater Control C2 harness connector.

Measure the resistance of the (C800) Rear Blend Sense Supply circuit between ground and the A/C Heater Control C2 harness connector.

Measure the resistance of the (C22) Rear Blend Sense circuit between ground and the A/C Heater Control C2 harness connector.



Is the resistance below 10k ohms on either of the circuits?

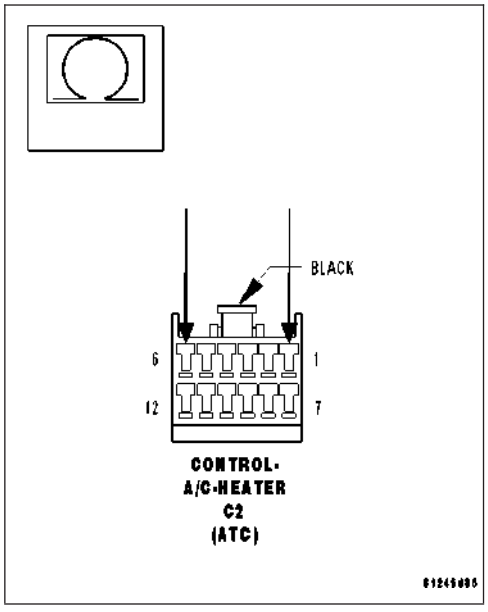
Yes >> Repair the circuit(s) with a resistance below 10k ohms for a short to ground.

Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 3

3. CHECK (C800) REAR BLEND SENSE SUPPLY CIRCUIT FOR A SHORT TO (C931) REAR BLEND SENSE RETURN CIRCUIT

Measure the resistance between the (C800) Rear Blend Sense Supply circuit and the (C931) Rear Blend Sense Return circuit in the A/C Heater Control C2 harness connector.



Is the resistance below 10k ohms?

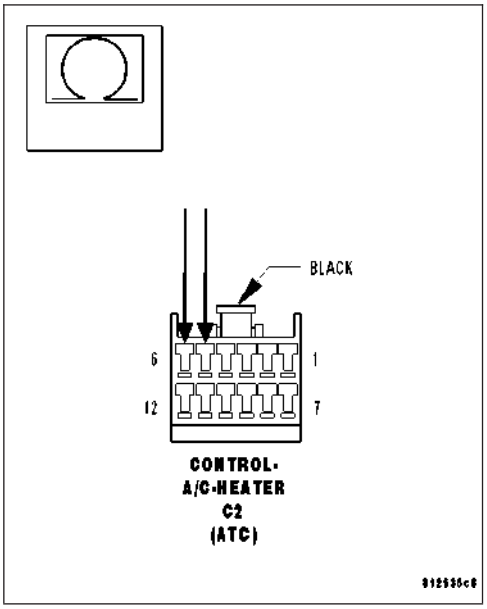
Yes >> Go To 4

No >> Go To 4

B102E–REAR BLEND REQUEST INPUT CIRCUIT LOW (ATC) (CONTINUED)

4. CHECK (C22) REAR BLEND SENSE CIRCUIT FOR A SHORT TO (C931) REAR BLEND SENSE RETURN CIRCUIT

Measure the resistance between the (C22) Rear Blend Sense circuit and the (C931) Rear Blend Sense Return circuit in the A/C Heater Control C2 harness connector.



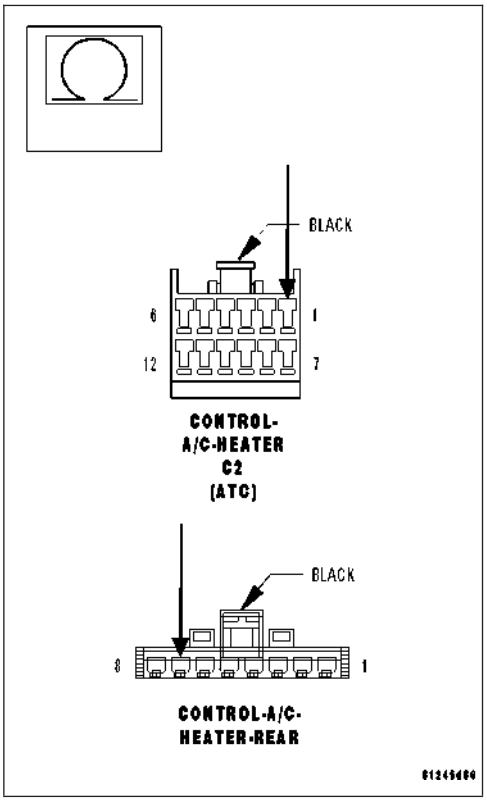
Is the resistance below 10k ohms on either of the circuits tested in Steps 3 & 4?

Yes >> Repair the circuit(s) with a resistance below 10k ohms for a short to the (C931) Rear Blend Sense Return circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 5

5. CHECK (C800) REAR BLEND SENSE SUPPLY CIRCUIT FOR AN OPEN

Measure the resistance of the (C800) Rear Blend Sense Supply circuit between the A/C Heater Control C2 harness connector and the Rear A/C Heater Control harness connector.

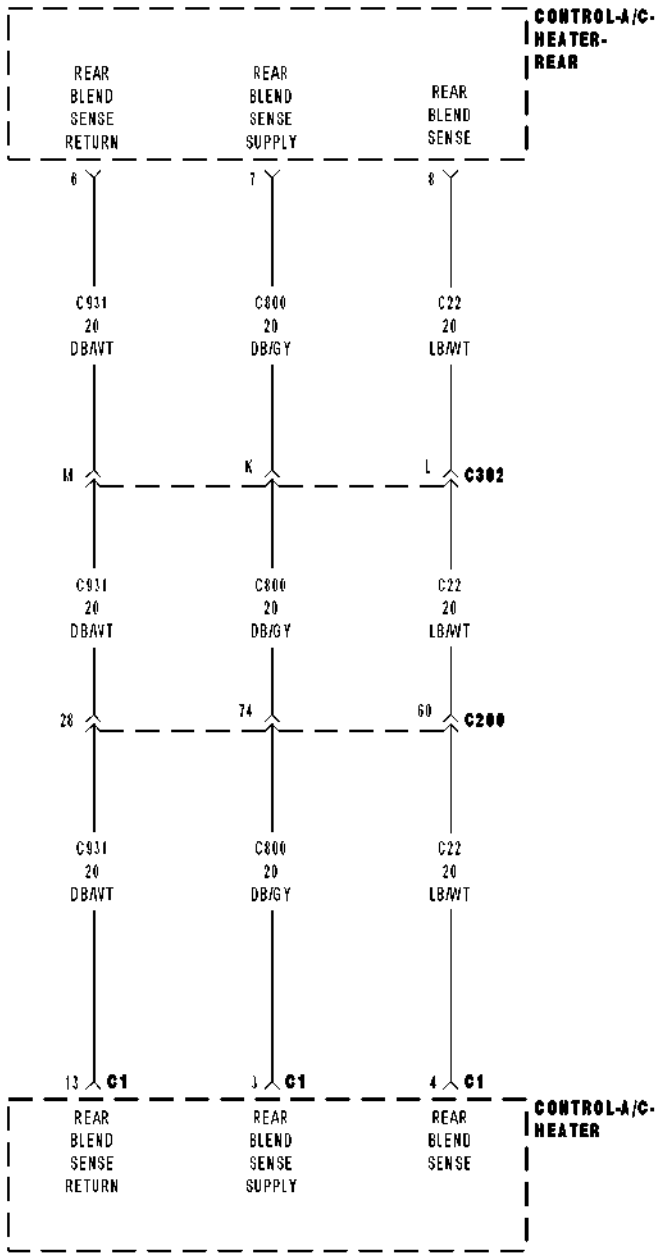


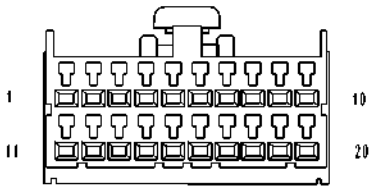
Is the resistance below 5.0 ohms?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

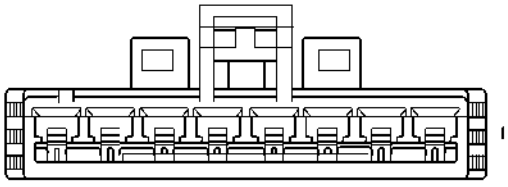
No >> Repair the (C800) Rear Blend Sense Supply circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

B102E–REAR BLEND REQUEST INPUT CIRCUIT LOW (MTC)





CONTROL-A/C-HEATER C1 (MTC)



CONTROL-A/C-HEATER-REAR

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B102E–REAR BLEND REQUEST INPUT CIRCUIT LOW (MTC) (CONTINUED)

For the Manual Temperature Control (MTC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the rear blend pot is out of range towards the low voltage threshold. This DTC has a maturing time of 5 seconds and a de-maturing time of 10 seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

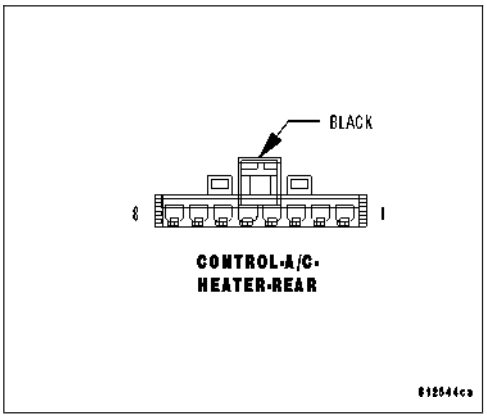
Possible Causes
(C800) REAR BLEND SENSE SUPPLY CIRCUIT SHORTED TO GROUND, TO (C931) REAR BLEND SENSE RETURN CIRCUIT, OR OPEN
(C22) REAR BLEND SENSE CIRCUIT SHORTED TO GROUND OR TO (C931) REAR BLEND SENSE RETURN CIRCUIT
REAR A/C HEATER CONTROL
A/C HEATER CONTROL

NOTE: This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (MTC) for stored DTC test procedures.

Diagnostic Test

1. CHECK FOR DTC B102E–REAR BLEND REQUEST INPUT CIRCUIT LOW WITH REAR A/C HEATER CONTROL DISCONNECTED

Turn the ignition off.
Disconnect the Rear A/C Heater Control harness connector.
Turn the ignition on.
With the scan tool, erase HVAC DTCs.
Turn the ignition off, wait 10 seconds, and then turn the ignition on.
With the scan tool, read HAVC DTCs.



Does the scan tool display: B102E–REAR BLEND REQUEST INPUT CIRCUIT LOW?

Yes >> Go To 2

No >> Replace the Rear A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

B102E–REAR BLEND REQUEST INPUT CIRCUIT LOW (MTC) (CONTINUED)

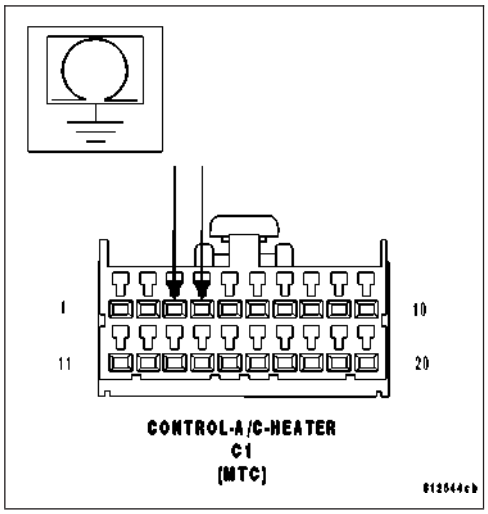
2. CHECK (C800) REAR BLEND SENSE SUPPLY CIRCUIT & (C22) REAR BLEND SENSE CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

Measure the resistance of the (C800) Rear Blend Sense Supply circuit between ground and the A/C Heater Control C1 harness connector.

Measure the resistance of the (C22) Rear Blend Sense circuit between ground and the A/C Heater Control C1 harness connector.



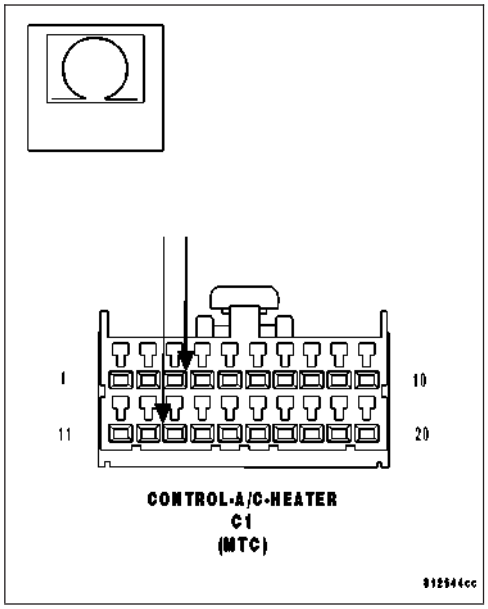
Is the resistance below 10k ohms on either of the circuits?

Yes >> Repair the circuit(s) with a resistance below 10k ohms for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 3

3. CHECK (C800) REAR BLEND SENSE SUPPLY CIRCUIT FOR A SHORT TO (C931) REAR BLEND SENSE RETURN CIRCUIT

Measure the resistance between the (C800) Rear Blend Sense Supply circuit and the (C931) Rear Blend Sense Return circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 10k ohms?

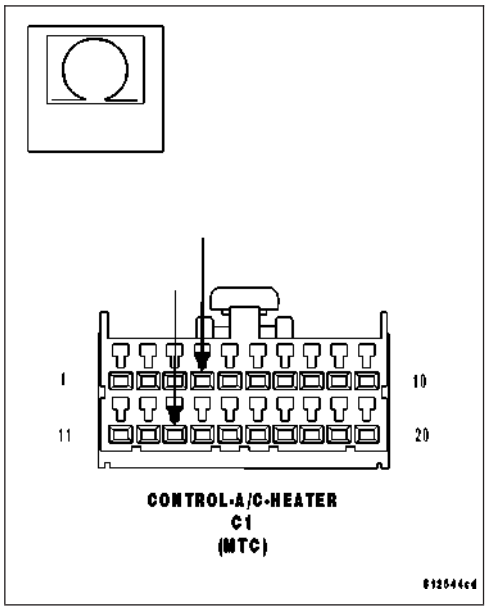
Yes >> Go To 4

No >> Go To 4

B102E–REAR BLEND REQUEST INPUT CIRCUIT LOW (MTC) (CONTINUED)

4. CHECK (C22) REAR BLEND SENSE CIRCUIT FOR A SHORT TO (C931) REAR BLEND SENSE RETURN CIRCUIT

Measure the resistance between the (C22) Rear Blend Sense circuit and the (C931) Rear Blend Sense Return circuit in the A/C Heater Control C1 harness connector.



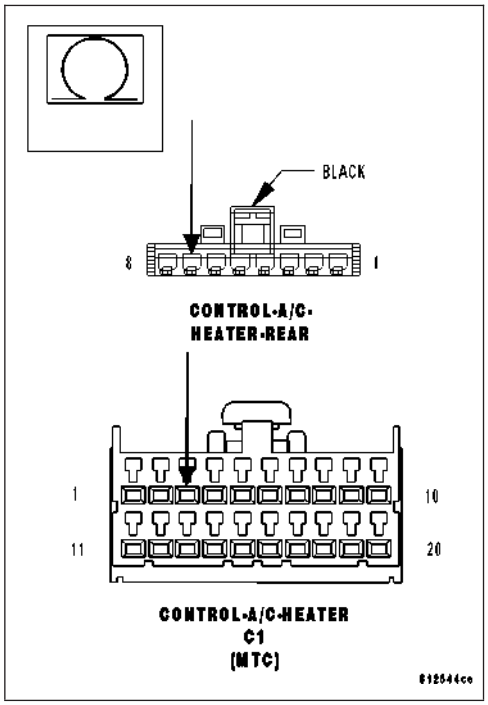
Is the resistance below 10k ohms on either of the circuits tested in Steps 3 & 4?

Yes >> Repair the circuit(s) with a resistance below 10k ohms for a short to the (C931) Rear Blend Sense Return circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 5

5. CHECK (C800) REAR BLEND SENSE SUPPLY CIRCUIT FOR AN OPEN

Measure the resistance of the (C800) Rear Blend Sense Supply circuit between the A/C Heater Control C1 harness connector and the Rear A/C Heater Control harness connector.

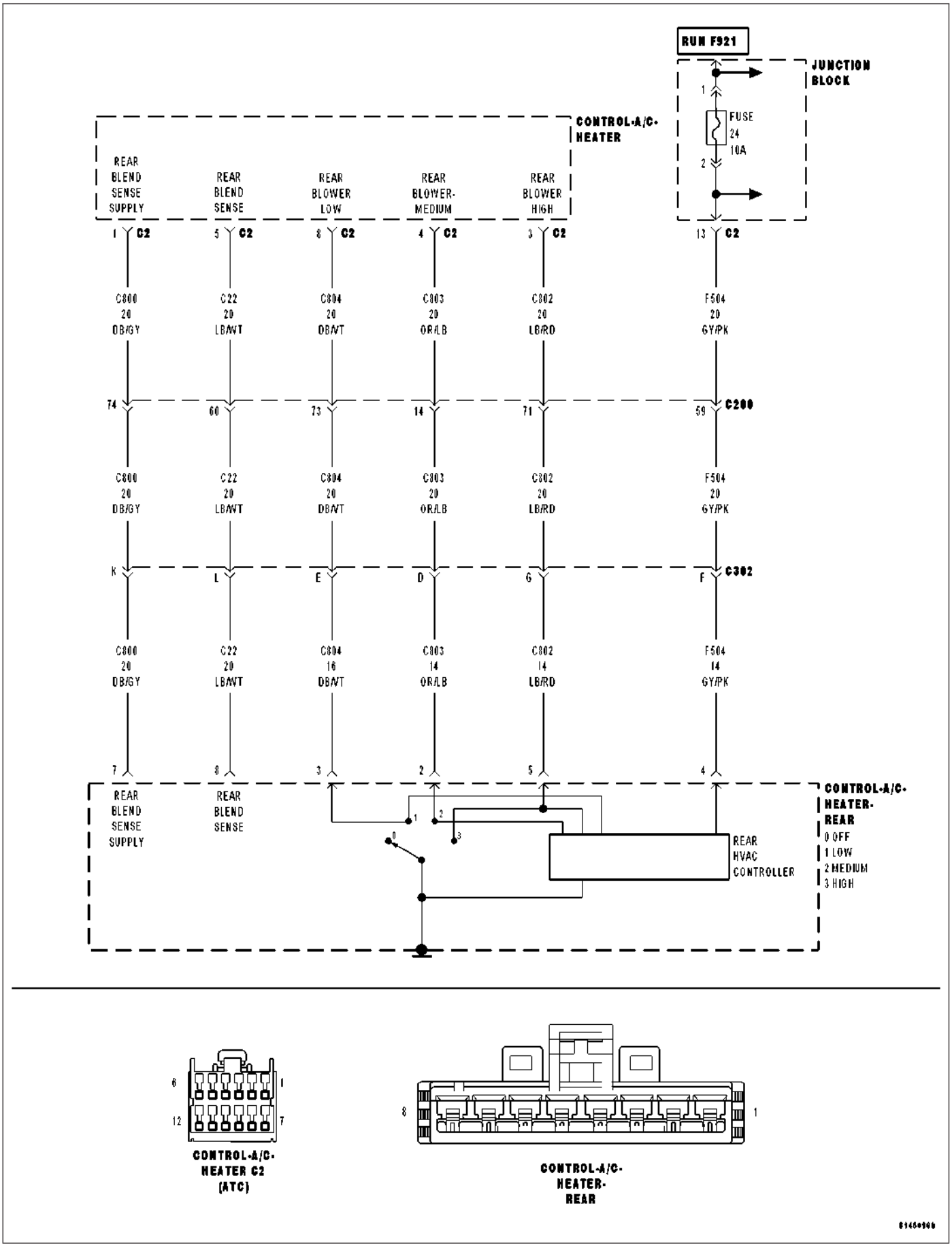


Is the resistance below 5.0 ohms?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the (C800) Rear Blend Sense Supply circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

B102F–REAR BLEND REQUEST INPUT CIRCUIT HIGH (ATC)



B102F–REAR BLEND REQUEST INPUT CIRCUIT HIGH (ATC) (CONTINUED)

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the rear blend pot is out of range towards the high voltage threshold. This DTC has a maturing time of 5 seconds and a de-maturing time of 10 seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

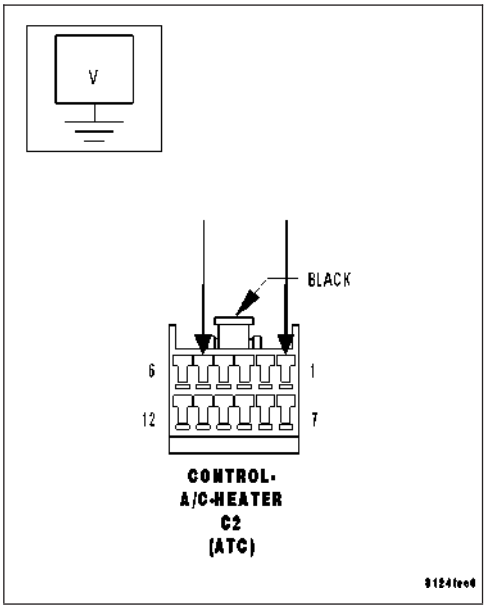
Possible Causes
(C800) REAR BLEND SENSE SUPPLY CIRCUIT SHORTED TO VOLTAGE
(C22) REAR BLEND SENSE CIRCUIT SHORTED TO VOLTAGE
(C800) REAR BLEND SENSE SUPPLY CIRCUIT SHORTED TO (F504) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT, TO (C804) REAR BLOWER LOW CIRCUIT, TO (C803) REAR BLOWER MEDIUM CIRCUIT, OR TO (C802) REAR BLOWER HIGH CIRCUIT
(C22) REAR BLEND SENSE CIRCUIT SHORTED TO (F504) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT, TO (C804) REAR BLOWER LOW CIRCUIT, TO (C803) REAR BLOWER MEDIUM CIRCUIT, OR TO (C802) REAR BLOWER HIGH CIRCUIT
(C22) REAR BLEND SENSE CIRCUIT OPEN
REAR A/C HEATER CONTROL
A/C HEATER CONTROL

NOTE: This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

Diagnostic Test

1. CHECK VOLTAGE OF (C800) REAR BLEND SENSE SUPPLY CIRCUIT & (C22) REAR BLEND SENSE CIRCUIT

Turn the ignition off.
Disconnect the A/C Heater Control C2 harness connector.
Turn the ignition on.
Measure the voltage of the (C800) Rear Blend Sense Supply circuit.
Measure the voltage of the (C22) Rear Blend Sense circuit.



Is the voltage above 0.2 volts on either of the circuits?

Yes >> Go To 2

No >> Go To 5

B102F–REAR BLEND REQUEST INPUT CIRCUIT HIGH (ATC) (CONTINUED)

2. CHECK (C800) REAR BLEND SENSE SUPPLY CIRCUIT & (C22) REAR BLEND SENSE CIRCUIT FOR A SHORT TO VOLTAGE

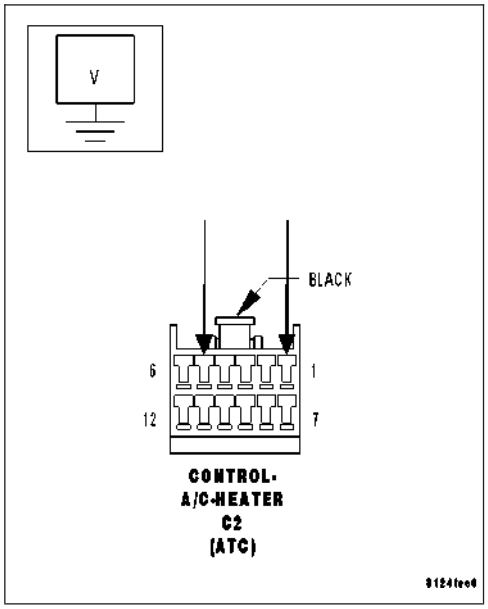
Turn the ignition off.

Remove Junction Block Fuse 24.

Turn the ignition on.

Measure the voltage of the (C800) Rear Blend Sense Supply circuit.

Measure the voltage of the (C22) Rear Blend Sense circuit.



Is the voltage above 0.2 volts on either of the circuits?

Yes >> Repair the circuit(s) with voltage above 0.2 volts for a short to voltage.

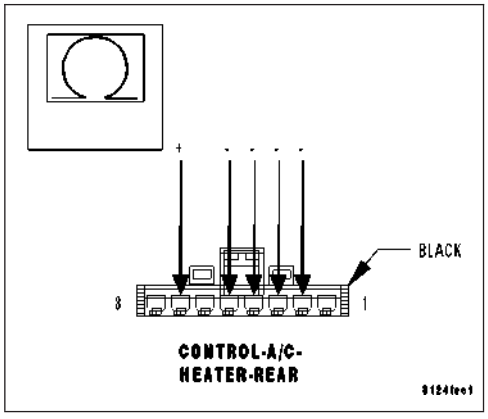
No >> Go To 3

3. CHECK (C800) REAR BLEND SENSE SUPPLY CIRCUIT FOR A SHORT TO (C802) REAR BLOWER HIGH CIRCUIT, (F504) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT, (C804) REAR BLOWER LOW CIRCUIT, & (C803) REAR BLOWER MEDIUM CIRCUIT

Turn the ignition off.

Disconnect the Rear A/C Heater Control harness connector.

Measure the resistance between the (C800) Rear Blend Sense Supply circuit and the (C802) Rear Blower High circuit, the (F504) Fused Ignition Switch Output (Run) circuit, the (C804) Rear Blower Low circuit, and the (C803) Rear Blower Medium circuit in the Rear A/C Heater Control harness connector.



Is the resistance below 10k ohms on any of the circuits?

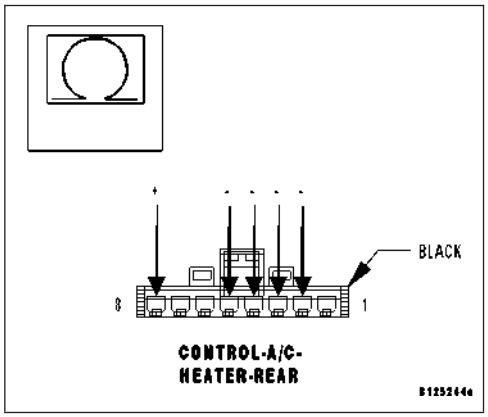
Yes >> Repair the circuit(s) with a resistance below 10k ohms for a short to the (C800) Rear Blend Sense Supply circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 4

B102F–REAR BLEND REQUEST INPUT CIRCUIT HIGH (ATC) (CONTINUED)

4. CHECK (C22) REAR BLEND SENSE CIRCUIT FOR A SHORT TO (C802) REAR BLOWER HIGH CIRCUIT, (F504) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT, (C804) REAR BLOWER LOW CIRCUIT, & (C803) REAR BLOWER MEDIUM CIRCUIT

Measure the resistance between the (C22) Rear Blend Sense circuit and the (C802) Rear Blower High circuit, the (F504) Fused Ignition Switch Output (Run) circuit, the (C804) Rear Blower Low circuit, and the (C803) Rear Blower Medium circuit in the Rear A/C Heater Control harness connector.



Is the resistance below 10k ohms on any of the circuits?

Yes >> Repair the circuit(s) with a resistance below 10k ohms for a short to the (C22) Rear Blend Sense circuit.
Perform BODY VERIFICATION TEST - VER 1.

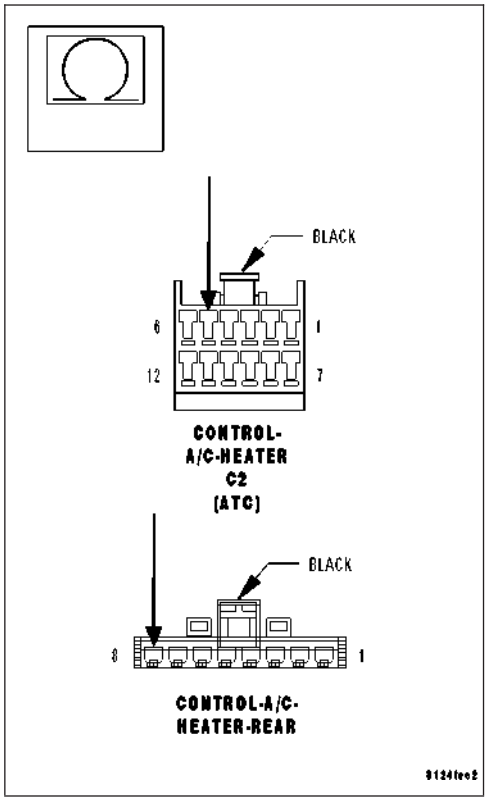
No >> Go To 5

5. CHECK (C22) REAR BLEND SENSE CIRCUIT FOR AN OPEN

If not done so previously, turn the ignition off.

If not done so previously, disconnect the Rear A/C Heater Control harness connector.

Measure the resistance of the (C22) Rear Blend Sense circuit between the A/C Heater Control C2 harness connector and the Rear A/C Heater Control harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go To 6

No >> Repair the (C22) Rear Blend Sense circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

B102F–REAR BLEND REQUEST INPUT CIRCUIT HIGH (ATC) (CONTINUED)

6. CHECK REAR BLEND CONTROL

Check the Rear Blend control in the Rear A/C Heater Control as follows:

Turn the Rear Blend control on the Rear A/C Heater Control to the full hot position.

Measure the resistance between the Rear Blend Supply terminal and the Rear Blend Sense terminal in the Rear A/C Heater Control. The resistance should be approximately 2.5k ohms.

Slowly rotate the Rear Blend control from full hot to full cold while observing the DVOM. The reading should change fluidly from approximately 2.5k to 12k ohms.

Measure the resistance between the Rear Blend Supply terminal and the Rear Blend Return terminal in the Rear A/C Heater Control. The resistance should be approximately 10k ohms.

Slowly rotate the Rear Blend control from full cold to full hot while observing the DVOM. The reading should remain steady at approximately 10k ohms.

With the Rear Blend control in full hot, measure the resistance between the Rear Blend Sense terminal and the Rear Blend Return terminal in the Rear A/C Heater Control. The resistance should be approximately 11k ohms.

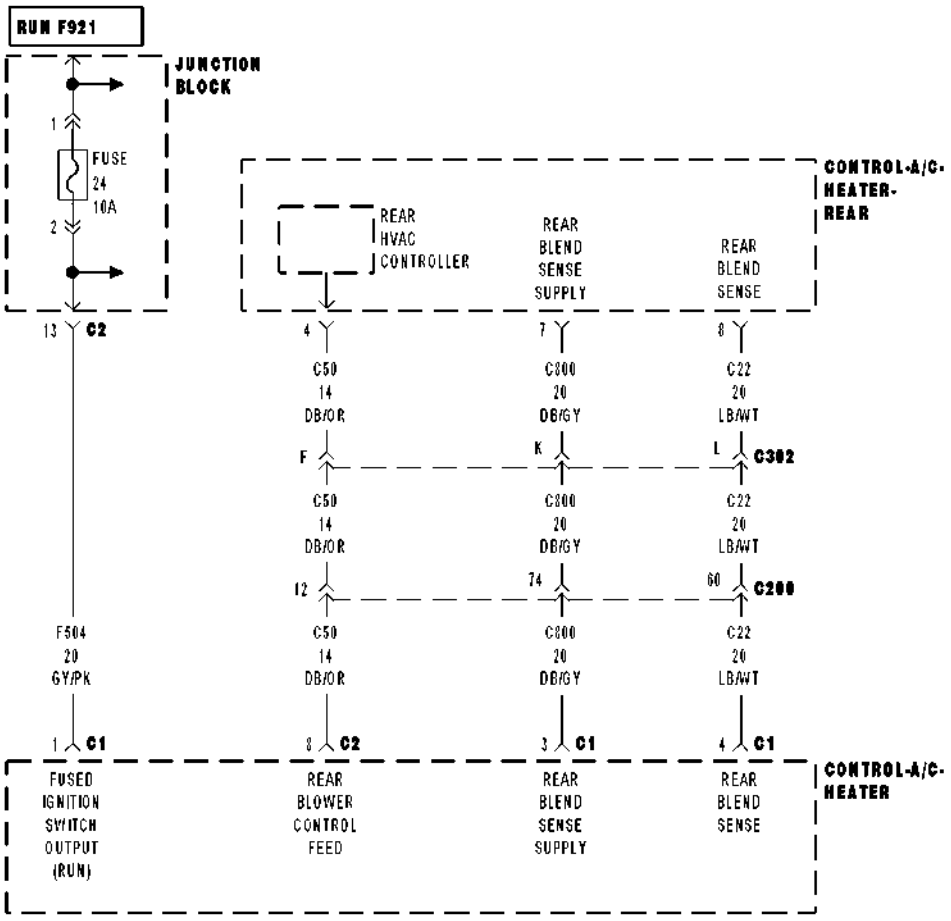
Slowly rotate the Rear Blend control from full hot to full cold while observing the DVOM. The reading should change fluidly from approximately 11k to 2.5k ohms.

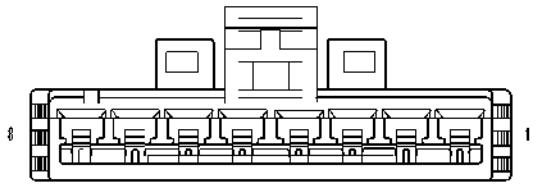
Are the resistance readings as specified?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

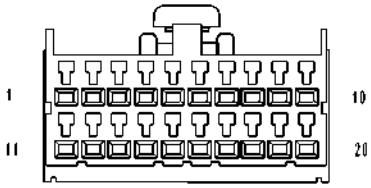
No >> Replace the Rear A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

B102F–REAR BLEND REQUEST INPUT CIRCUIT HIGH (MTC)

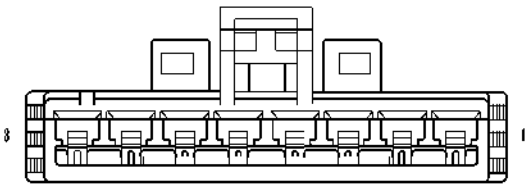




CONTROL-A/C-HEATER C2 (MTC)



CONTROL-A/C-HEATER C1 (MTC)



CONTROL-A/C-HEATER-REAR

81451c01

B102F–REAR BLEND REQUEST INPUT CIRCUIT HIGH (MTC) (CONTINUED)

For the Manual Temperature Control (MTC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the rear blend pot is out of range towards the high voltage threshold. This DTC has a maturing time of 5 seconds and a de-maturing time of 10 seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

Possible Causes
(C800) REAR BLEND SENSE SUPPLY CIRCUIT SHORTED TO VOLTAGE, TO (F504) IGNITION SWITCH OUTPUT (RUN) CIRCUIT, OR TO (C50) REAR BLOWER CONTROL FEED CIRCUIT
(C22) REAR BLEND SENSE CIRCUIT SHORTED TO VOLTAGE, TO (F504) IGNITION SWITCH OUTPUT (RUN) CIRCUIT, TO (C50) REAR BLOWER CONTROL FEED CIRCUIT, OR OPEN
REAR A/C HEATER CONTROL
A/C HEATER CONTROL

NOTE: This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (MTC) for stored DTC test procedures.

Diagnostic Test

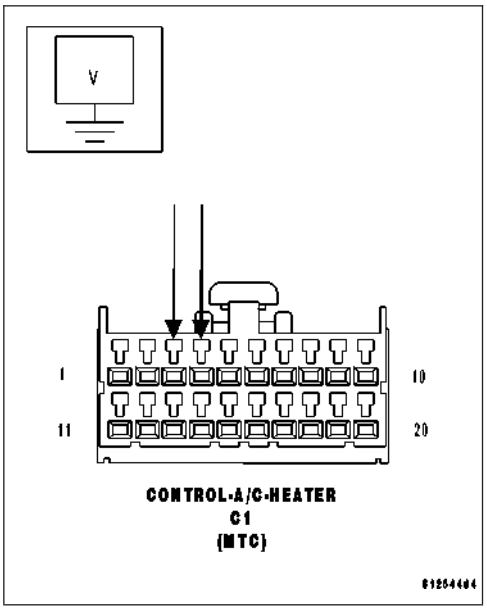
1. CHECK VOLTAGE OF (C800) REAR BLEND SENSE SUPPLY CIRCUIT & (C22) REAR BLEND SENSE CIRCUIT

Turn the ignition off.
Disconnect the A/C Heater Control C1 harness connector.
Turn the ignition on.
Measure the voltage of the (C800) Rear Blend Sense Supply circuit.
Measure the voltage of the (C22) Rear Blend Sense circuit.

Is the voltage above 0.2 volts on either of the circuits?

Yes >> Go To 2

No >> Go To 7



B102F–REAR BLEND REQUEST INPUT CIRCUIT HIGH (MTC) (CONTINUED)

2. CHECK (C800) REAR BLEND SENSE SUPPLY CIRCUIT & (C22) REAR BLEND SENSE CIRCUIT FOR A SHORT TO VOLTAGE

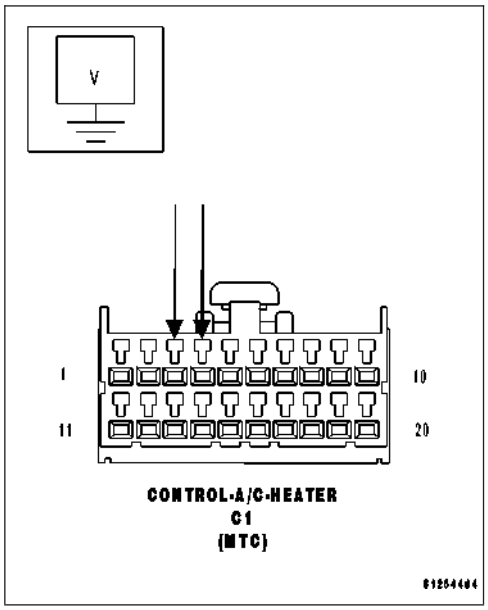
Turn the ignition off.

Remove Junction Block Fuse 24.

Turn the ignition on.

Measure the voltage of the (C800) Rear Blend Sense Supply circuit.

Measure the voltage of the (C22) Rear Blend Sense circuit.



Is the voltage above 0.2 volts on either of the circuits?

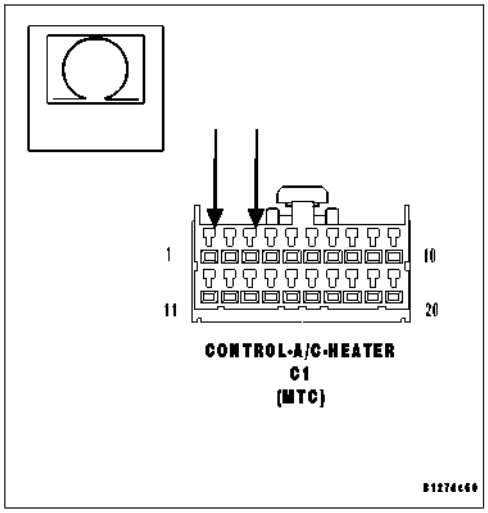
Yes >> Repair the circuit(s) with voltage above 0.2 volts for a short to voltage.

No >> Go To 3

3. CHECK (C800) REAR BLEND SENSE SUPPLY CIRCUIT FOR A SHORT TO (F504) IGNITION SWITCH OUTPUT (RUN) CIRCUIT

Turn the ignition off.

Measure the resistance between the (C800) Rear Blend Sense Supply circuit and the (F504) Ignition Switch Output (Run) circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 10k ohms?

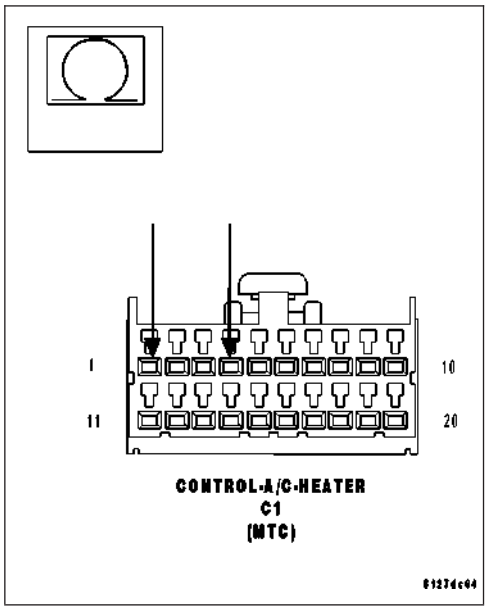
Yes >> Repair the (C800) Rear Blend Sense Supply circuit for a short to the (F504) Ignition Switch Output (Run) circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 4

B102F–REAR BLEND REQUEST INPUT CIRCUIT HIGH (MTC) (CONTINUED)

4. CHECK (C22) REAR BLEND SENSE CIRCUIT FOR A SHORT TO (F504) IGNITION SWITCH OUTPUT (RUN) CIRCUIT

Measure the resistance between the (C22) Rear Blend Sense circuit and the (F504) Ignition Switch Output (Run) circuit the A/C Heater Control C1 harness connector.



Is the resistance below 10k ohms?

Yes >> Repair the (C22) Rear Blend Sense circuit for a short to the (F504) Ignition Switch Output (Run) circuit.
Perform BODY VERIFICATION TEST - VER 1.

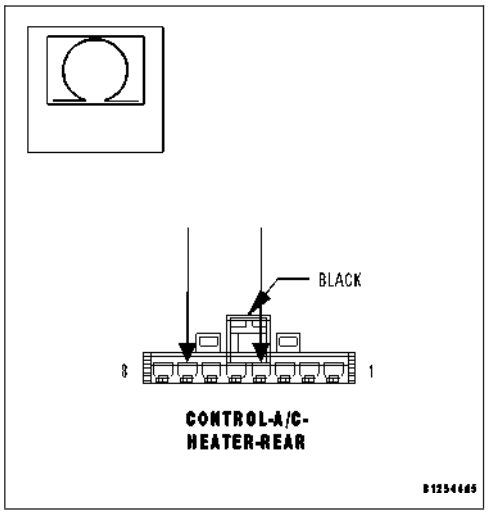
No >> Go To 5

5. CHECK (C800) REAR BLEND SENSE SUPPLY CIRCUIT FOR A SHORT TO (C50) REAR BLOWER CONTROL FEED CIRCUIT

Disconnect the A/C Heater Control C2 harness connector.

Disconnect the Rear A/C Heater Control harness connector.

Measure the resistance between the (C800) Rear Blend Sense Supply circuit and the (C50) Rear Blower Control Feed circuit in the Rear A/C Heater Control harness connector.



Is the resistance below 10k ohms?

Yes >> Repair the (C800) Rear Blend Sense Supply circuit for a short to the (C50) Rear Blower Control Feed circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 6

B102F–REAR BLEND REQUEST INPUT CIRCUIT HIGH (MTC) (CONTINUED)

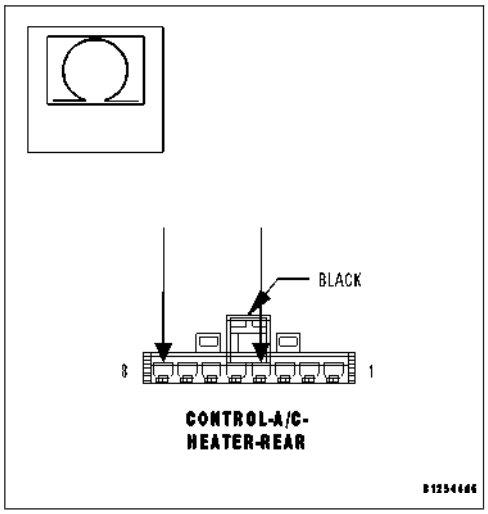
6. CHECK (C22) REAR BLEND SENSE CIRCUIT FOR A SHORT TO (C50) REAR BLOWER CONTROL FEED CIRCUIT

Measure the resistance between the (C22) Rear Blend Sense circuit and the (C50) Rear Blower Control Feed circuit in the Rear A/C Heater Control harness connector.

Is the resistance below 10k ohms?

Yes >> Repair the (C22) Rear Blend Sense circuit for a short to the (C50) Rear Blower Control Feed circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 7



7. CHECK (C22) REAR BLEND SENSE CIRCUIT FOR AN OPEN

If not done so previously, turn the ignition off.

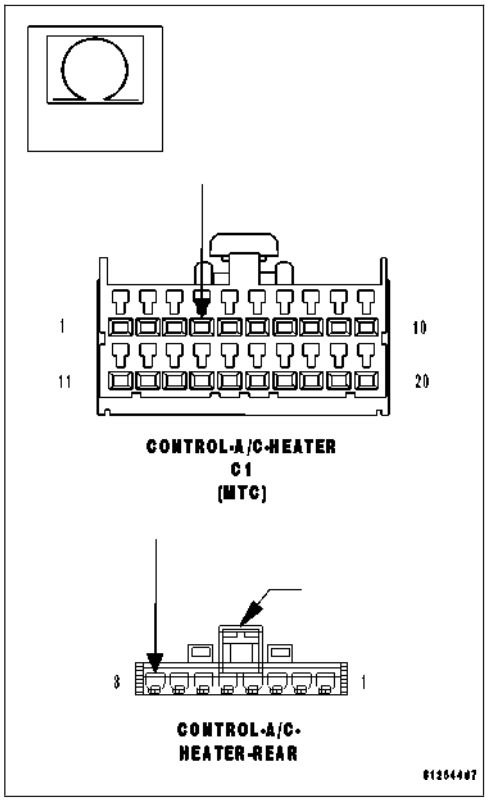
If not done so previously, disconnect the Rear A/C Heater Control harness connector.

Measure the resistance of the (C22) Rear Blend Sense circuit between the A/C Heater Control C1 harness connector and the Rear A/C Heater Control harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 8

No >> Repair the (C22) Rear Blend Sense circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.



B102F–REAR BLEND REQUEST INPUT CIRCUIT HIGH (MTC) (CONTINUED)

8. CHECK REAR BLEND CONTROL

Check the Rear Blend control in the Rear A/C Heater Control as follows:

Turn the Rear Blend control on the Rear A/C Heater Control to the full hot position.

Measure the resistance between the Rear Blend Supply terminal and the Rear Blend Sense terminal in the Rear A/C Heater Control. The resistance should be approximately 2.5k ohms.

Slowly rotate the Rear Blend control from full hot to full cold while observing the DVOM. The reading should change fluidly from approximately 2.5k to 12k ohms.

Measure the resistance between the Rear Blend Supply terminal and the Rear Blend Return terminal in the Rear A/C Heater Control. The resistance should be approximately 10k ohms.

Slowly rotate the Rear Blend control from full cold to full hot while observing the DVOM. The reading should remain steady at approximately 10k ohms.

With the Rear Blend control in full hot, measure the resistance between the Rear Blend Sense terminal and the Rear Blend Return terminal in the Rear A/C Heater Control. The resistance should be approximately 11k ohms.

Slowly rotate the Rear Blend control from full hot to full cold while observing the DVOM. The reading should change fluidly from approximately 11k to 2.5k ohms.

Are the resistance readings as specified?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Rear A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

B103A–REAR MODE DOOR CONTROL CIRCUIT/PERFORMANCE (ATC)

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the A/C Heater Control detects an excessive current draw on the (C53) Rear Mode Door Driver circuit, the (C54) Rear Blend Door Driver circuit, the (C801) Mode Door 2 Driver circuit, the (C154) Rear Common Door Driver circuit, or the (C808) Common Door Driver 3 circuit while attempting to drive the Rear Mode Door Actuator, the Rear Blend Door Actuator, or the Mode Door 2 (Floor to Panel) Actuator. This DTC has a maturing time of 5 seconds and a de-maturing time of 10 seconds. If the DTC's status changes from active to stored, it will stay in memory for 100 ignition cycles.

Possible Causes
DOOR DRIVER CIRCUIT(S) SHORTED

Theory of Operation

The A/C Heater Control monitors the door driver circuits during actuator operation for shorts to ground, shorts to battery, and shorts to other door driver circuits. If detected, the A/C Heater Control reports these types of faults as Control Circuit/Performance DTCs. It is important to note that Control Circuit/Performance DTCs do not indicate where or what type of short is present and that additional system testing is necessary to provide more details about the reported fault.

NOTE: The DTC must be active for the results of this test to be valid. Do not perform this test if the DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

Diagnostic Test

1. RUN THE ACTUATOR DTC DETECTION TEST

With the scan tool, erase HVAC DTCs.

Turn the ignition off, wait 10 seconds, and then turn the ignition on.

With the scan tool, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

Repair

Diagnose and repair the DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs and then all short low DTCs. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

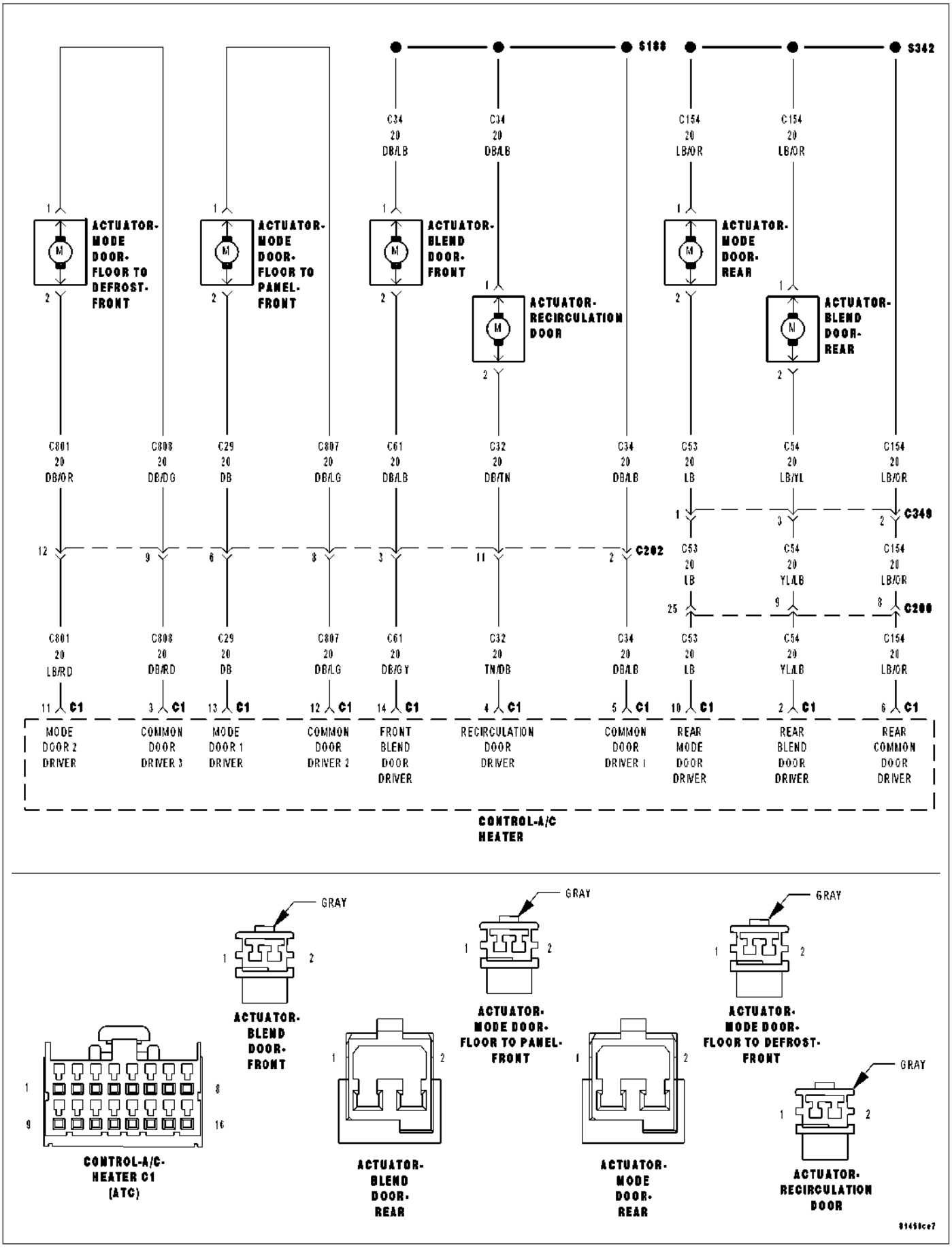
B103A–REAR MODE DOOR CONTROL CIRCUIT/PERFORMANCE (MTC)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the A/C Heater Control detects an excessive current draw on any of the door driver circuits while attempting to drive this actuator. This DTC has a maturing time of 5 seconds and a de-maturing time of 10 seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

If this DTC is active, refer to B104C–BLEND DOOR CONTROL CIRCUIT/PERFORMANCE (MTC) for the diagnostic test procedure. If this DTC is stored, refer to HVAC System Test (MTC) for stored DTC test procedures.

B103B–REAR MODE DOOR CONTROL CIRCUIT LOW (ATC)



B103B–REAR MODE DOOR CONTROL CIRCUIT LOW (ATC) (CONTINUED)

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the Actuator DTC Detection Test is executed.
- **Set Condition:**
  If the (C53) Rear Mode Door Driver circuit, the (C54) Rear Blend Door Driver circuit, the (C801) Mode Door 2 Driver circuit, the (C154) Rear Common Door Driver circuit, or the (C808) Common Door Driver 3 circuit is shorted to ground.

Possible Causes
(C53) REAR MODE DOOR DRIVER CIRCUIT SHORTED TO GROUND OR TO OTHER DOOR DRIVER CIRCUIT(S)
(C54) REAR BLEND DOOR DRIVER CIRCUIT SHORTED TO GROUND OR TO OTHER DOOR DRIVER CIRCUIT(S)
(C801) MODE DOOR 2 DRIVER CIRCUIT SHORTED TO GROUND OR TO OTHER DOOR DRIVER CIRCUIT(S)
(C154) REAR COMMON DOOR DRIVER CIRCUIT SHORTED TO GROUND OR TO OTHER DOOR DRIVER CIRCUIT(S)
(C808) COMMON DOOR DRIVER 3 CIRCUIT SHORTED TO GROUND OR TO OTHER DOOR DRIVER CIRCUIT(S)
REAR MODE DOOR ACTUATOR
REAR BLEND DOOR ACTUATOR
MODE DOOR 2 (FLOOR TO PANEL) ACTUATOR
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control drives the Rear Mode Door Actuator via the (C53) Rear Mode Door Driver circuit and the (C154) Rear Common Door Driver circuit. The A/C Heater Control drives the Rear Blend Door Actuator via the (C54) Rear Blend Door Driver circuit and the (C154) Rear Common Door Driver circuit. In addition, the Rear Mode Door Actuator, the Rear Blend Door Actuator, and the Mode Door 2 (Floor to Defrost) Actuator share a driver inside the A/C Heater Control. Due to the shared circuitry similar DTCs can set at the same time for multiple actuators depending upon the type of short, its location, and the direction the actuator is moving when the short is present.

B103B–REAR MODE DOOR CONTROL CIRCUIT LOW (ATC) (CONTINUED)

Diagnostic Test

1. CHECK (C53) REAR MODE DOOR DRIVER CIRCUIT, (C54) REAR BLEND DOOR DRIVER CIRCUIT, (C808) COMMON DOOR DRIVER 3 CIRCUIT, (C154) REAR COMMON DOOR DRIVER CIRCUIT, & (C801) MODE DOOR 2 DRIVER CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

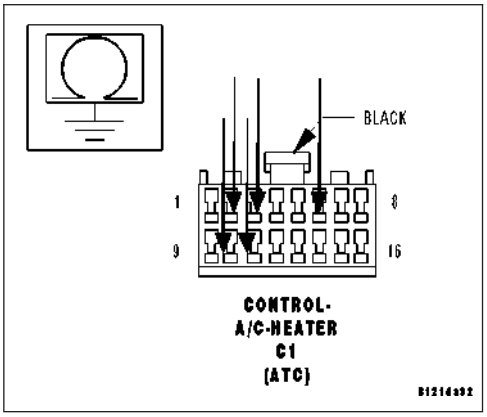
Measure the resistance of the (C53) Rear Mode Door Driver circuit between ground and the A/C Heater Control C1 harness connector.

Measure the resistance of the (C54) Rear Blend Door Driver circuit between ground and the A/C Heater Control C1 harness connector.

Measure the resistance of the (C808) Common Door Driver 3 Circuit between ground and the A/C Heater Control C1 harness connector.

Measure the resistance of the (C154) Rear Common Door Driver circuit between ground and the A/C Heater Control C1 harness connector.

Measure the resistance of the (C801) Mode Door 2 Driver circuit between ground and the A/C Heater Control C1 harness connector.



Is the resistance below 10k ohms on any of the circuits?

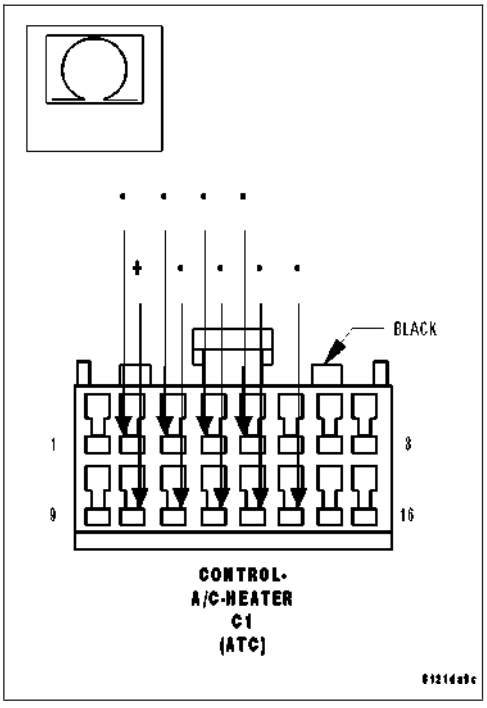
Yes >> Repair the circuit(s) with a resistance below 10k ohms for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK (C53) REAR MODE DOOR DRIVER CIRCUIT FOR A SHORT TO OTHER DOOR DRIVER CIRCUIT(S)

Measure the resistance between the (C53) Rear Mode Door Driver circuit and the (C54) Rear Blend Door Driver circuit, the (C808) Common Door Driver 3 circuit, the (C32) Recirculation Door Driver circuit, the (C34) Common Door Driver 1 circuit, the (C801) Mode Door 2 Driver circuit, the (C807) Common Door Driver 2 circuit, the (C29) Mode Door 1 Driver circuit, and the (C61) Front Blend Door Driver circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 10k ohms between any of the circuits?

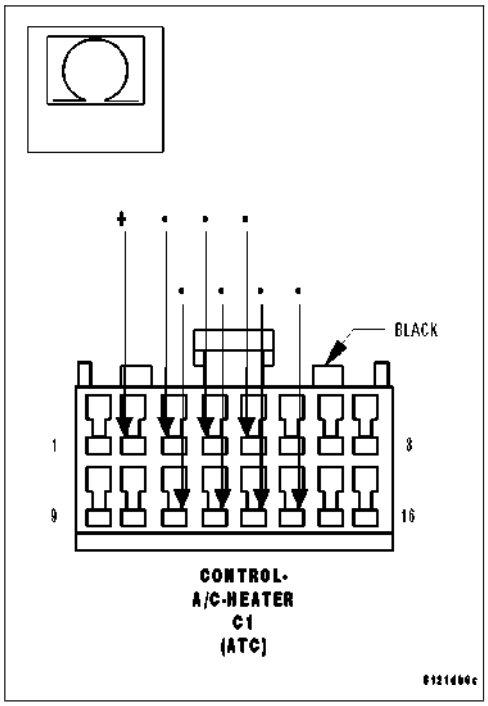
Yes >> Repair the circuit(s) with a resistance below 10k ohms for a short together.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 3

B103B–REAR MODE DOOR CONTROL CIRCUIT LOW (ATC) (CONTINUED)

3. CHECK (C54) REAR BLEND DOOR DRIVER CIRCUIT FOR A SHORT TO OTHER DOOR DRIVER CIRCUIT(S)

Measure the resistance between the (C54) Rear Blend Door Driver circuit and the (C808) Common Door Driver 3 circuit, the (C32) Recirculation Door Driver circuit, the (C34) Common Door Driver 1 circuit, the (C801) Mode Door 2 Driver circuit, the (C807) Common Door Driver 2 circuit, the (C29) Mode Door 1 Driver circuit, and the (C61) Front Blend Door Driver circuit in the A/C Heater Control C1 harness connector.



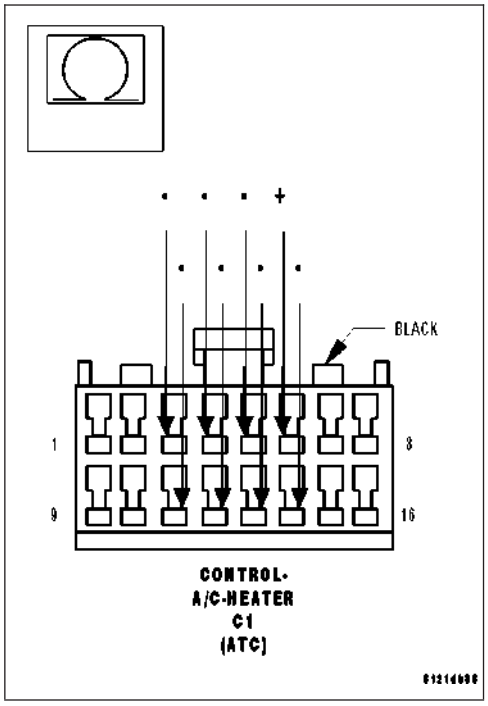
Is the resistance below 10k ohms between any of the circuits?

Yes >> Repair the circuit(s) with a resistance below 10k ohms for a short together.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 4

4. CHECK (C154) REAR COMMON DOOR DRIVER CIRCUIT FOR A SHORT TO OTHER DOOR DRIVER CIRCUIT(S)

Measure the resistance between the (C154) Rear Common Door Driver circuit and the (C808) Common Door Driver 3 circuit, the (C32) Recirculation Door Driver circuit, the (C34) Common Door Driver 1 circuit, the (C801) Mode Door 2 Driver circuit, the (C807) Common Door Driver 2 circuit, the (C29) Mode Door 1 Driver circuit, and the (C61) Front Blend Door Driver circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 10k ohms between any of the circuits?

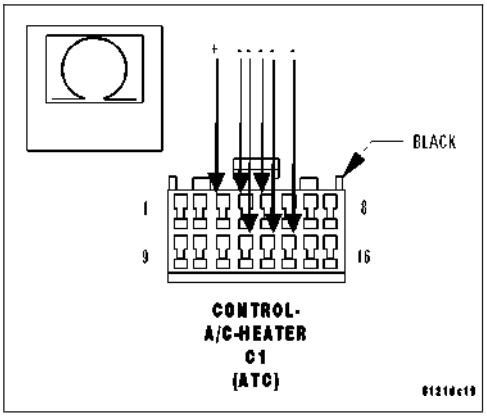
Yes >> Repair the circuit(s) with a resistance below 10k ohms for a short together.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 5

B103B–REAR MODE DOOR CONTROL CIRCUIT LOW (ATC) (CONTINUED)

5. CHECK (C808) COMMON DOOR DRIVER 3 CIRCUIT FOR A SHORT TO OTHER DOOR DRIVER CIRCUIT(S)

Measure the resistance between the (C808) Common Door Driver 3 circuit and the (C32) Recirculation Door Driver circuit, the (C34) Common Door Driver 1 circuit, the (C807) Common Door Driver 2 circuit, the (C29) Mode Door 1 Driver circuit, and the (C61) Front Blend Door Driver circuit in the A/C Heater Control C1 harness connector.



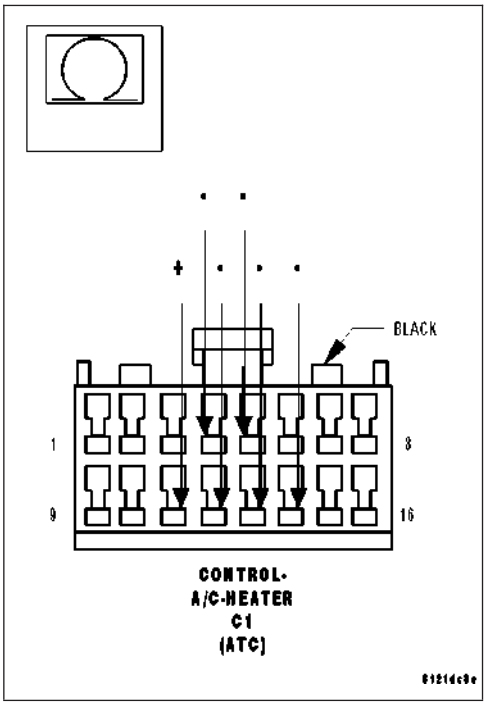
Is the resistance below 10k ohms between any of the circuits?

Yes >> Repair the circuit(s) with a resistance below 10k ohms for a short together.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 6

6. CHECK (C801) MODE DOOR 2 DRIVER CIRCUIT FOR A SHORT TO OTHER DOOR DRIVER CIRCUIT(S)

Measure the resistance between the (C801) Mode Door 2 Driver circuit and the (C32) Recirculation Door Driver circuit, the (C34) Common Door Driver 1 circuit, the (C807) Common Door Driver 2 circuit, the (C29) Mode Door 1 Driver circuit, and the (C61) Front Blend Door Driver circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 10k ohms between any of the circuits?

Yes >> Repair the circuit(s) with a resistance below 10k ohms for a short together.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 7

B103B–REAR MODE DOOR CONTROL CIRCUIT LOW (ATC) (CONTINUED)

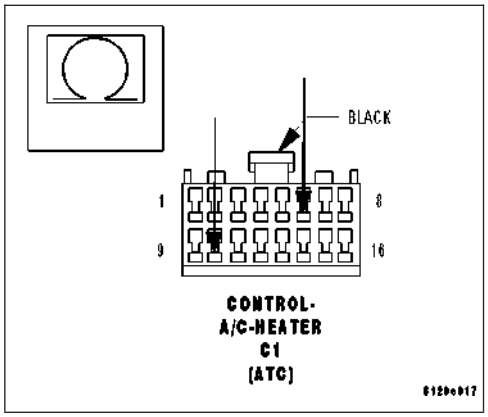
7. CHECK REAR MODE DOOR ACTUATOR CIRCUIT RESISTANCE

Measure the resistance between the (C53) Rear Mode Door Driver circuit and the (C154) Rear Common Door Driver circuit in the A/C Heater Control C1 harness connector.

Is the resistance below 30 ohms?

Yes >> Go To 8

No >> Go To 9



8. CHECK (C53) REAR MODE DOOR DRIVER CIRCUIT FOR A SHORT TO (C154) REAR COMMON DOOR DRIVER CIRCUIT

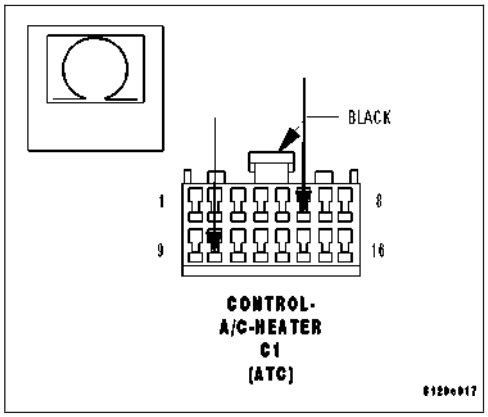
Disconnect the Rear Mode Door Actuator harness connector.

Measure the resistance between the (C53) Rear Mode Door Driver circuit and the (C154) Rear Common Door Driver circuit in the A/C Heater Control C1 harness connector.

Is the resistance below 10k ohms?

Yes >> Repair the (C53) Rear Mode Door Driver circuit for a short to the (C154) Rear Common Door Driver circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Rear Mode Door Actuator in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.



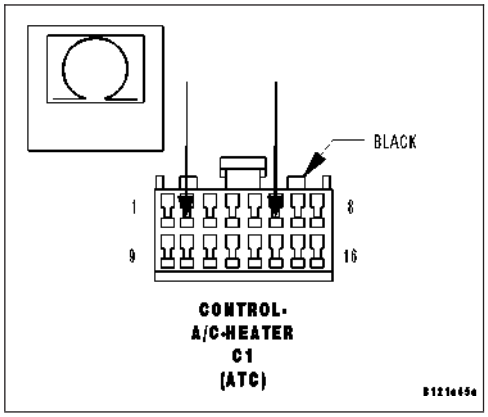
9. CHECK REAR BLEND DOOR ACTUATOR CIRCUIT RESISTANCE

Measure the resistance between the (C54) Rear Blend Door Driver circuit and the (C154) Rear Common Door Driver circuit in the A/C Heater Control C1 harness connector.

Is the resistance below 30 ohms?

Yes >> Go To 10

No >> Go To 11

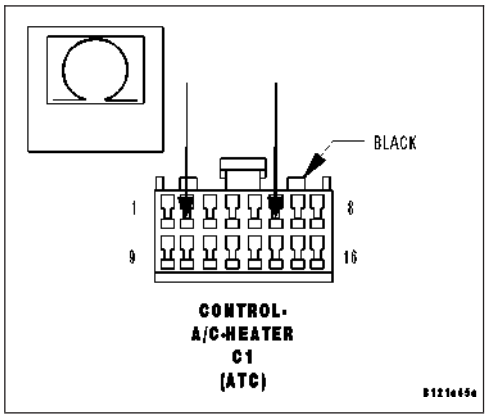


B103B–REAR MODE DOOR CONTROL CIRCUIT LOW (ATC) (CONTINUED)

10. CHECK (C54) REAR BLEND DOOR DRIVER CIRCUIT FOR A SHORT TO (C154) REAR COMMON DOOR DRIVER CIRCUIT

Disconnect the Rear Blend Door Actuator harness connector.

Measure the resistance between the (C54) Rear Blend Door Driver circuit and the (C154) Rear Common Door Driver circuit in the A/C Heater Control C1 harness connector.



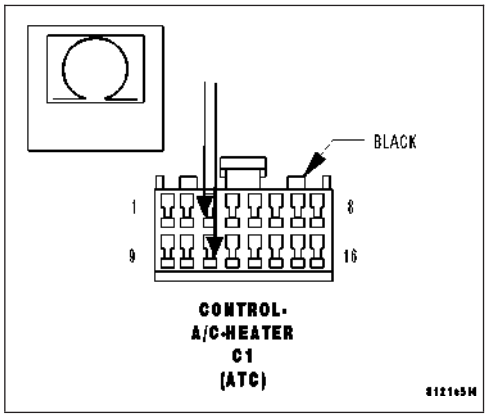
Is the resistance below 10k ohms?

Yes >> Repair the (C54) Rear Blend Door Driver circuit for a short to the (C154) Rear Common Door Driver circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Rear Blend Door Actuator in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

11. CHECK MODE DOOR 2 (FLOOR TO DEFROST) ACTUATOR CIRCUIT RESISTANCE

Measure the resistance between the (C801) Mode Door 2 Driver circuit and the (C808) Common Door Driver 3 circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 30 ohms?

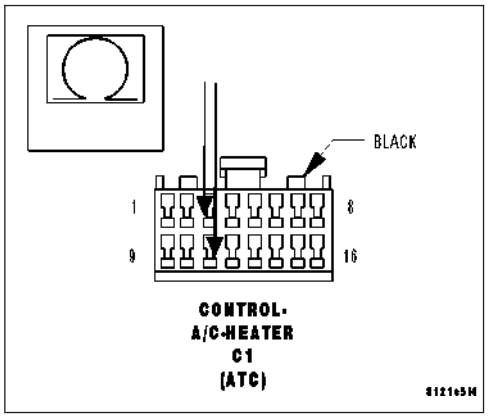
Yes >> Go To 12

No >> Go To 13

12. CHECK (C801) MODE DOOR 2 DRIVER CIRCUIT FOR A SHORT TO (C808) COMMON DOOR DRIVER 3 CIRCUIT

Disconnect the Mode Door 2 (Floor to Defrost) Actuator harness connector.

Measure the resistance between the (C801) Mode Door 2 Driver circuit and the (C808) Common Door Driver 3 circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 10k ohms?

Yes >> Repair the (C801) Mode Door 2 Driver circuit for a short to the (C808) Common Door Driver 3 circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Mode Door 2 (Floor to Defrost) Actuator in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

B103B–REAR MODE DOOR CONTROL CIRCUIT LOW (ATC) (CONTINUED)

13. RUN THE ACTUATOR DTC DETECTION TEST

Reconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

With the scan tool, erase HVAC DTCs.

Turn the ignition off, wait 10 seconds, and then turn the ignition on.

With the scan tool, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

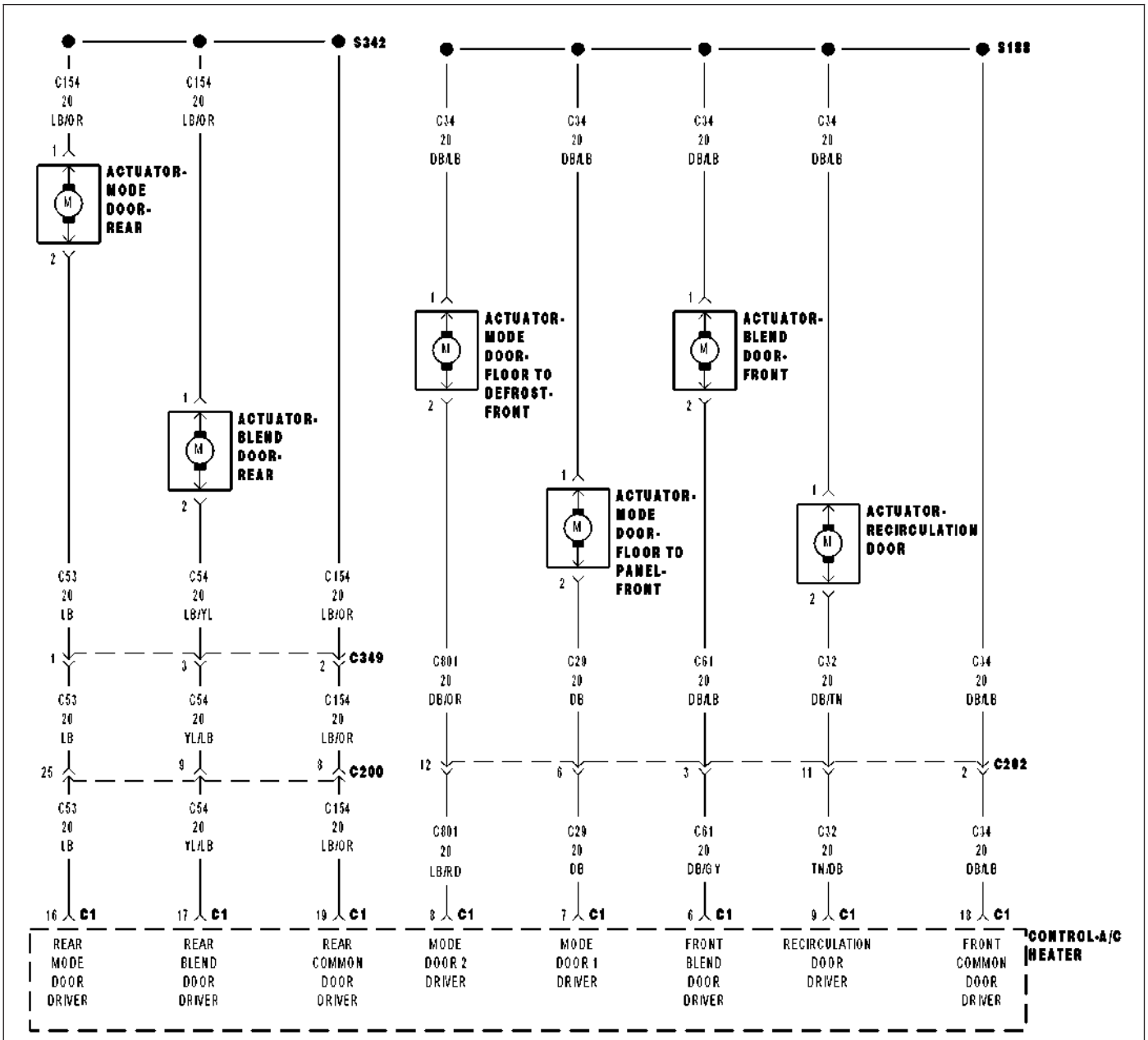
Does the scan tool only display: B103B–REAR MODE DOOR CONTROL CIRCUIT LOW?

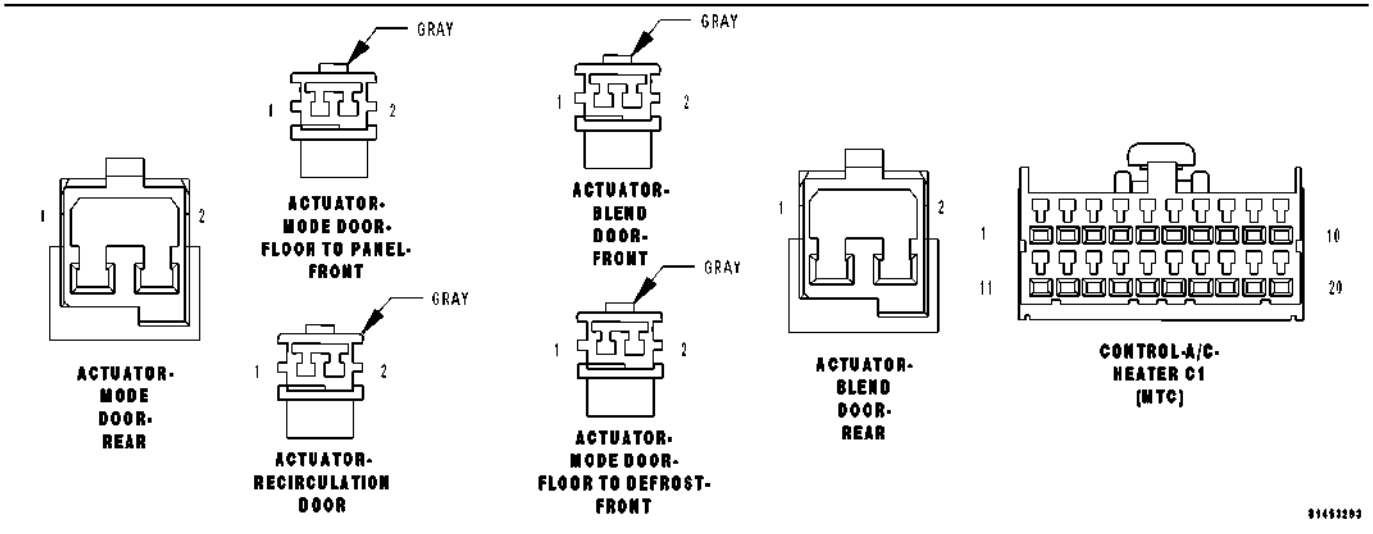
Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No, Other DTC(s) Displayed
Diagnose and repair the other DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs and then all short low DTCs. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No, And No Other DTCs Displayed
Using the wiring diagram as a guide, inspect the wiring and connectors for conditions causing an intermittent short. Repair as necessary.
Perform BODY VERIFICATION TEST - VER 1.

B103B–REAR MODE DOOR CONTROL CIRCUIT LOW (MTC)





B103B–REAR MODE DOOR CONTROL CIRCUIT LOW (MTC) (CONTINUED)

For the Manual Temperature Control (MTC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the Actuator DTC Detection Test is executed.
- **Set Condition:**
  If the (C53) Rear Mode Door Driver circuit is shorted to ground.

Possible Causes
(C53) REAR MODE DOOR DRIVER CIRCUIT SHORTED TO GROUND
(C154) REAR COMMON DOOR DRIVER CIRCUIT SHORTED TO GROUND
(C53) REAR MODE DOOR DRIVER CIRCUIT SHORTED TO OTHER DOOR DRIVER CIRCUIT(S)
(C154) REAR COMMON DOOR DRIVER CIRCUIT SHORTED TO OTHER DOOR DRIVER CIRCUIT(S)
REAR MODE DOOR ACTUATOR
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control drives the Rear Mode Door Actuator via the (C53) Rear Mode Door Driver circuit and the (C154) Rear Common Door Driver circuit. Both of the rear door actuators share the (C154) Rear Common Door Driver circuit. Inside the A/C Heater Control, each door actuator has its own unique driver, but all share a single common door driver circuit. Due to the shared circuitry similar DTCs can set at the same time for multiple actuators depending upon the type of short, its location, and the direction the actuator is moving when the short is present.

Diagnostic Test

1. CHECK (C53) REAR MODE DOOR DRIVER CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

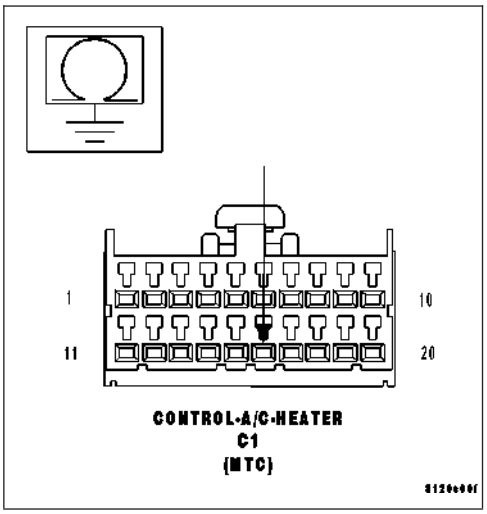
Disconnect the A/C Heater Control C1 harness connector.

Measure the resistance of the (C53) Rear Mode Door Driver circuit between ground and the A/C Heater Control C1 harness connector.

Is the resistance below 10k ohms?

Yes >> Repair the (C53) Rear Mode Door Driver circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

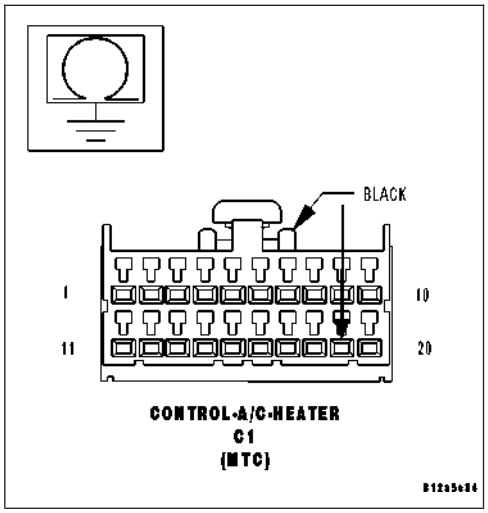
No >> Go To 2



B103B–REAR MODE DOOR CONTROL CIRCUIT LOW (MTC) (CONTINUED)

2. CHECK (C154) REAR COMMON DOOR DRIVER CIRCUIT FOR A SHORT TO GROUND

Measure the resistance of the (C154) Rear Common Door Driver circuit between ground and the A/C Heater Control C1 harness connector.



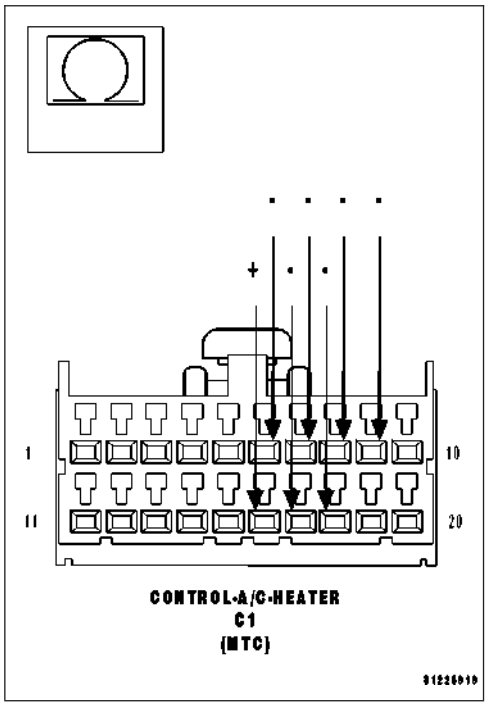
Is the resistance below 10k ohms?

Yes >> Repair the (C154) Rear Common Door Driver circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 3

3. CHECK (C53) REAR MODE DOOR DRIVER CIRCUIT FOR A SHORT TO OTHER DOOR DRIVER CIRCUITS

Measure the resistance between the (C53) Rear Mode Door Driver circuit and the (C61) Front Blend Door Driver circuit, the (C29) Mode Door 1 Driver circuit, the (C801) Mode Door 2 Driver circuit, the (C32) Recirculation Door Driver circuit, the (C54) Rear Blend Door Driver circuit, and the (C34) Front Common Door Driver circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 10k ohms between the (C53) Rear Mode Door Driver circuit and any of the other door driver circuits?

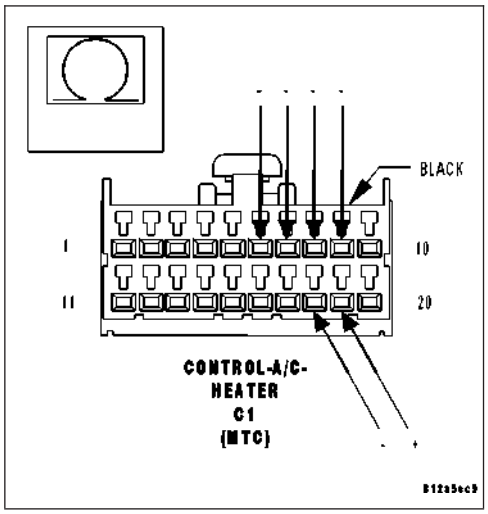
Yes >> Repair the circuit(s) with a resistance below 10k ohms for a short to the (C53) Rear Mode Door Driver circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 4

B103B–REAR MODE DOOR CONTROL CIRCUIT LOW (MTC) (CONTINUED)

4. CHECK (C154) REAR COMMON DOOR DRIVER CIRCUIT FOR A SHORT TO OTHER DOOR DRIVER CIRCUITS

Measure the resistance between the (C154) Rear Common Door Driver circuit and the (C61) Front Blend Door Driver circuit, the (C29) Mode Door 1 Driver circuit, the (C801) Mode Door 2 Driver circuit, the (C32) Recirculation Door Driver circuit, and the (C34) Front Common Door Driver circuit in the A/C Heater Control C1 harness connector.



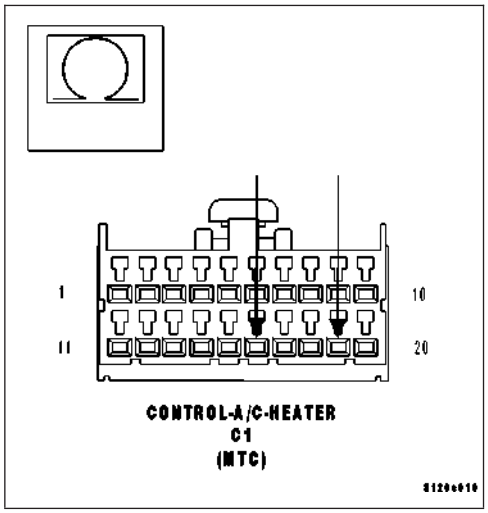
Is the resistance below 10k ohms between the (C154) Rear Common Door Driver circuit and any of the other door driver circuits?

Yes >> Repair the circuit(s) with a resistance below 10k ohms for a short to the (C154) Rear Common Door Driver circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 5

5. CHECK REAR MODE DOOR ACTUATOR CIRCUIT RESISTANCE

Measure the resistance between the (C53) Rear Mode Door Driver circuit and the (C154) Rear Common Door Driver circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 30 ohms?

Yes >> Go To 6

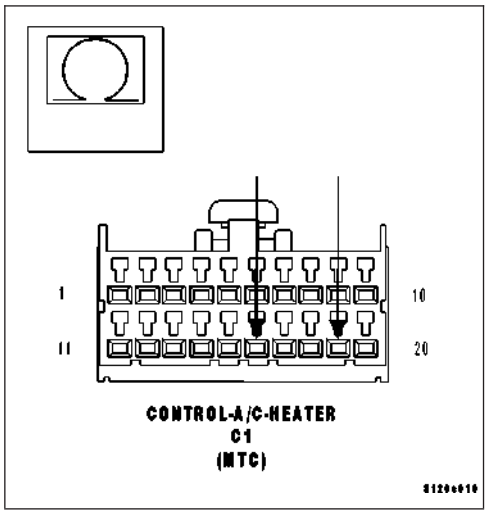
No >> Go To 7

B103B–REAR MODE DOOR CONTROL CIRCUIT LOW (MTC) (CONTINUED)

6. CHECK (C53) REAR MODE DOOR DRIVER CIRCUIT FOR A SHORT TO (C154) REAR COMMON DOOR DRIVER CIRCUIT

Disconnect the Rear Mode Door Actuator harness connector.

Measure the resistance between the (C53) Rear Mode Door Driver circuit and the (C154) Rear Common Door Driver circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 10k ohms?

Yes >> Repair the (C53) Rear Mode Door Driver circuit for a short to the (C154) Rear Common Door Driver circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Rear Mode Door Actuator in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

---

7. RUN THE ACTUATOR DTC DETECTION TEST

Reconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

With the scan tool, erase HVAC DTCs.

Turn the ignition off, wait 10 seconds, and then turn the ignition on.

With the scan tool, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

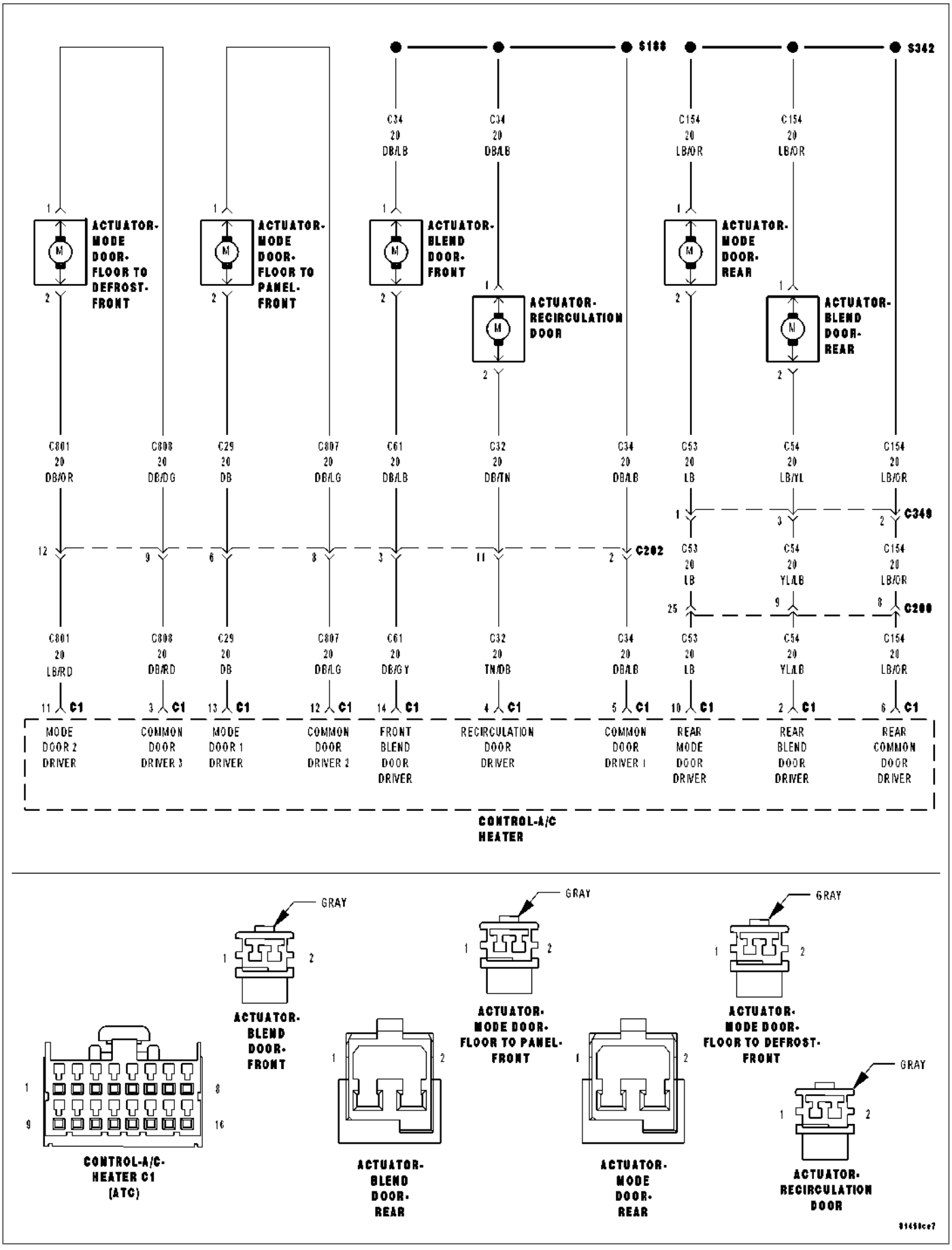
Does the scan tool only display: B103B–REAR MODE DOOR CONTROL CIRCUIT LOW?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No, Other DTC(s) Displayed
Diagnose and repair the other DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs and then all short low DTCs. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No, And No Other DTCs Displayed
Using the wiring diagram as a guide, inspect the wiring and connectors for conditions causing an intermittent short. Repair as necessary.
Perform BODY VERIFICATION TEST - VER 1.

B103C–REAR MODE DOOR CONTROL CIRCUIT HIGH (ATC)



B103C–REAR MODE DOOR CONTROL CIRCUIT HIGH (ATC) (CONTINUED)

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the Actuator DTC Detection Test is executed.
- **Set Condition:**
  If the (C53) Rear Mode Door Driver circuit, the (C54) Rear Blend Door Driver circuit, the (C801) Mode Door 2 Driver circuit, the (C154) Rear Common Door Driver circuit, or the (C808) Common Door Driver 3 circuit is shorted to voltage.

Possible Causes
(C53) REAR MODE DOOR DRIVER CIRCUIT SHORTED TO VOLTAGE
(C54) REAR BLEND DOOR DRIVER CIRCUIT SHORTED TO VOLTAGE
(C801) MODE DOOR 2 DRIVER CIRCUIT SHORTED TO VOLTAGE
(C154) REAR COMMON DOOR DRIVER CIRCUIT SHORTED TO VOLTAGE
(C808) COMMON DOOR DRIVER 3 CIRCUIT SHORTED TO VOLTAGE
A/C HEATER CONTROL

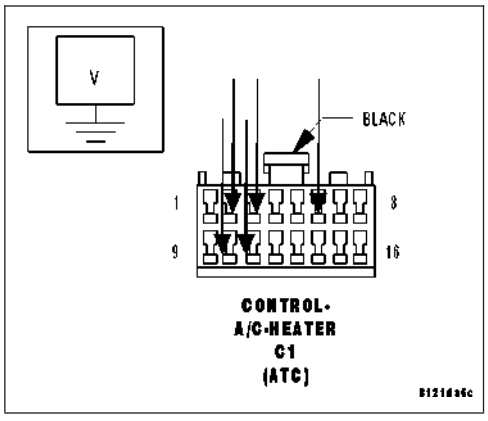
Theory of Operation

The A/C Heater Control drives the Rear Mode Door Actuator via the (C53) Rear Mode Door Driver circuit and the (C154) Rear Common Door Driver circuit. The A/C Heater Control drives the Rear Blend Door Actuator via the (C54) Rear Blend Door Driver circuit and the (C154) Rear Common Door Driver circuit. In addition, the Rear Mode Door Actuator, the Rear Blend Door Actuator, and the Mode Door 2 (Floor to Defrost) Actuator share a driver inside the A/C Heater Control. Due to the shared circuitry similar DTCs can set at the same time for multiple actuators depending upon the type of short, its location, and the direction the actuator is moving when the short is present.

Diagnostic Test

1. CHECK (C53) REAR MODE DOOR DRIVER CIRCUIT, (C54) REAR BLEND DOOR DRIVER CIRCUIT, (C808) COMMON DOOR DRIVER 3 CIRCUIT, (C154) REAR COMMON DOOR DRIVER CIRCUIT, & (C801) MODE DOOR 2 DRIVER CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off.
Disconnect the A/C Heater Control C1 harness connector.
Turn the ignition on.
Measure the voltage of the (C53) Rear Mode Door Driver circuit.
Measure the voltage of the (C54) Rear Blend Door Driver circuit.
Measure the voltage of the (C808) Common Door Driver 3 Circuit.
Measure the voltage of the (C154) Rear Common Door Driver circuit.
Measure the voltage of the (C801) Mode Door 2 Driver circuit.



Is the voltage above 0.2 volts on any of the circuits?

Yes >> Repair the circuit(s) with voltage above 0.2 volts for a short to voltage.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 2

B103C–REAR MODE DOOR CONTROL CIRCUIT HIGH (ATC) (CONTINUED)

2. RUN THE ACTUATOR DTC DETECTION TEST

Turn the ignition off.

Reconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

With the scan tool in HVAC, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

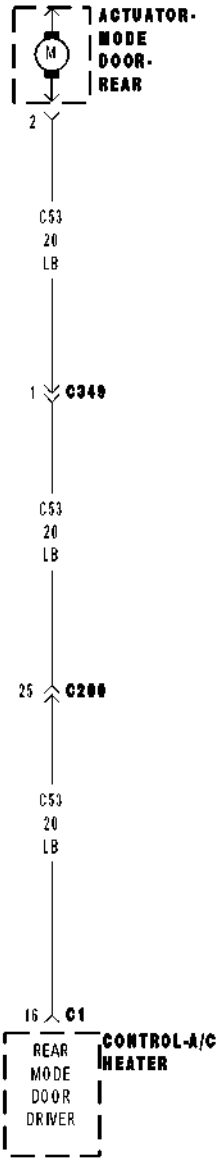
Does the scan tool display: B103C–REAR MODE DOOR CONTROL CIRCUIT HIGH?

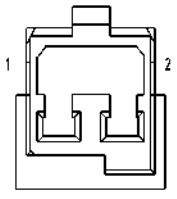
Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No, Other DTC(s) Displayed
Diagnose and repair the other DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs and then all short low DTCs. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

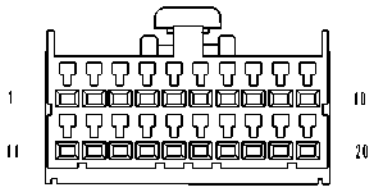
No, And No Other DTCs Displayed
Using the wiring diagram as a guide, inspect the wiring and connectors for conditions causing an intermittent short. Repair as necessary.
Perform BODY VERIFICATION TEST - VER 1.

B103C–REAR MODE DOOR CONTROL CIRCUIT HIGH (MTC)





ACTUATOR-
MODE
DOOR-
REAR



CONTROL-A/C-
HEATER C1
(MTC)

81653457

B103C–REAR MODE DOOR CONTROL CIRCUIT HIGH (MTC) (CONTINUED)

For the Manual Temperature Control (MTC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the Actuator DTC Detection Test is executed.
- **Set Condition:**
  If the (C53) Rear Mode Door Driver circuit is shorted to voltage.

Possible Causes
(C53) REAR MODE DOOR DRIVER CIRCUIT SHORTED TO VOLTAGE
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control drives the Rear Mode Door Actuator via the (C53) Rear Mode Door Driver circuit and the (C154) Rear Common Door Driver circuit. Both of the rear door actuators share the (C154) Rear Common Door Driver circuit. Inside the A/C Heater Control, each door actuator has its own unique driver, but all share a single common door driver circuit. Due to the shared circuitry similar DTCs can set at the same time for multiple actuators depending upon the type of short, its location, and the direction the actuator is moving when the short is present.

Diagnostic Test

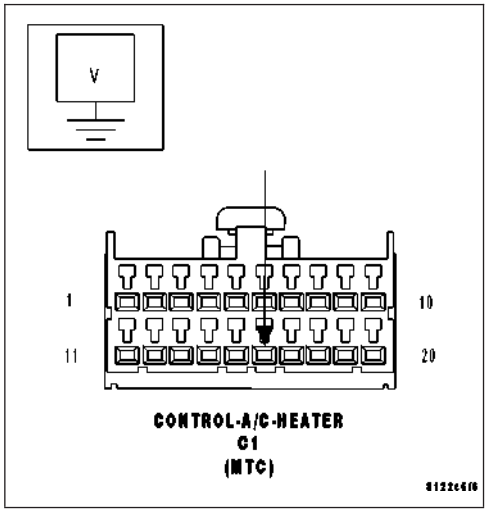
1. CHECK (C53) REAR MODE DOOR DRIVER CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

Measure the voltage of the (C53) Rear Mode Door Driver circuit.



Is the voltage above 0.2 volts?

Yes >> Repair the (C53) Rear Mode Door Driver circuit for a short to voltage.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 2

B103C–REAR MODE DOOR CONTROL CIRCUIT HIGH (MTC) (CONTINUED)

2. RUN THE ACTUATOR DTC DETECTION TEST

Turn the ignition off.

Reconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

With the scan tool in HVAC, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

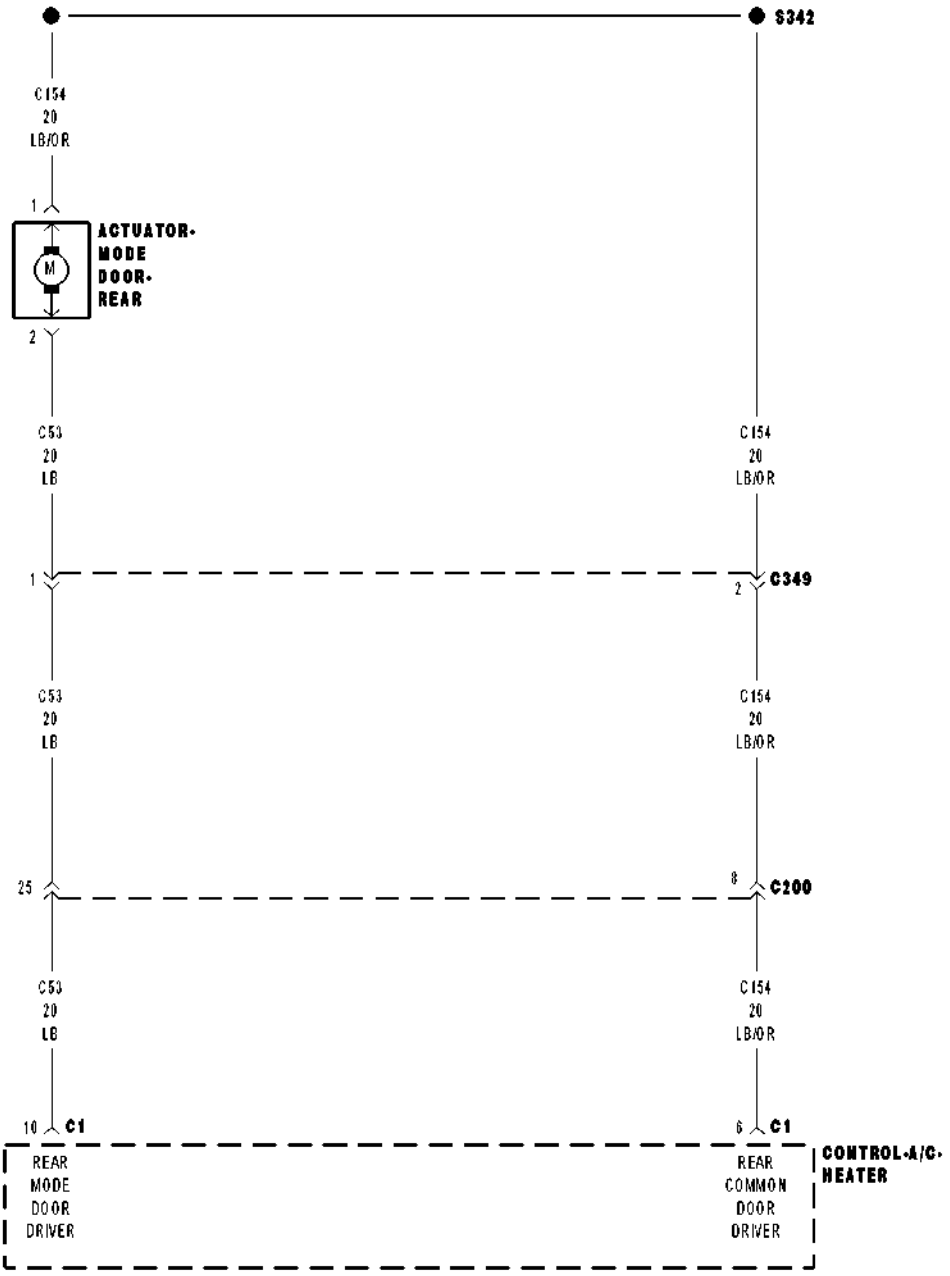
Does the scan tool only display: B103C–REAR MODE DOOR CONTROL CIRCUIT HIGH?

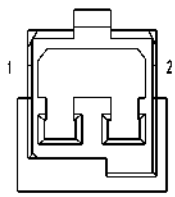
Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No, Other DTC(s) Displayed
Diagnose and repair the other DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs and then all short low DTCs. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

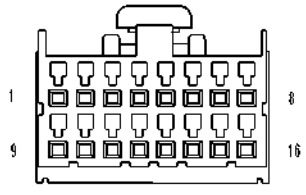
No, And No Other DTCs Displayed
Using the wiring diagram as a guide, inspect the wiring and connectors for conditions causing an intermittent short. Repair as necessary.
Perform BODY VERIFICATION TEST - VER 1.

B103D–REAR MODE DOOR CONTROL CIRCUIT OPEN (ATC)





ACTUATOR-
MODE
DOOR-
REAR



CONTROL-A/C-
HEATER C1
(ATC)

B1653542

B103D–REAR MODE DOOR CONTROL CIRCUIT OPEN (ATC) (CONTINUED)

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Rear Mode Door Actuator's electrical circuit is open. This DTC has a maturing time of 5 seconds and a de-maturing time of 10 seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

Possible Causes
(C53) REAR MODE DOOR DRIVER CIRCUIT OPEN
(C154) REAR COMMON DOOR DRIVER CIRCUIT OPEN
REAR MODE DOOR ACTUATOR
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control drives the Rear Mode Door Actuator via the (C53) Rear Mode Door Driver circuit and the (C154) Rear Common Door Driver circuit. Both of the rear door actuators share the (C154) Rear Common Door Driver circuit. In addition, the Rear Mode Door Actuator, the Rear Blend Door Actuator, and the Mode Door 2 (Floor to Defrost) Actuator share a driver inside the A/C Heater Control. Due to the shared circuitry similar DTCs can set at the same time for multiple actuators depending upon the location of the open circuit and the direction the actuator is moving when the open is present.

NOTE: DTC B103D must be active for the results of this test to be valid. Do not perform this test if DTC B103D is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

Diagnostic Test

1. CHECK FOR ACTIVE CONTROL CIRCUIT/PERFORMANCE DTCs

Turn the ignition on.

With the scan tool, read active HVAC DTCs.

Does the scan tool display any active: XXXX CONTROL CIRCUIT/PERFORMANCE DTCs?

Yes >> Diagnose and repair the DTC(s). If present, diagnose and repair all Rear Blend and Rear Mode Door Control Circuit/Performance DTCs first, then all other Control Circuit/Performance DTCs next. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No >> Go To 2

B103D–REAR MODE DOOR CONTROL CIRCUIT OPEN (ATC) (CONTINUED)

2. CHECK REAR MODE DOOR ACTUATOR CIRCUIT RESISTANCE

Turn the ignition off.

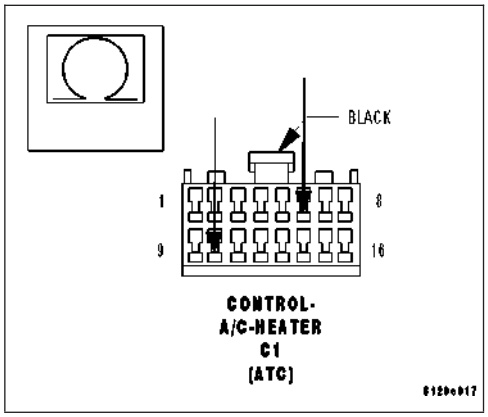
Disconnect the A/C Heater Control C1 harness connector.

Measure the resistance between the (C53) Rear Mode Door Driver circuit and the (C154) Rear Common Door Driver circuit in the A/C Heater Control C1 harness connector.

Is the resistance above 70 ohms?

Yes >> Go To 3

No >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.



3. CHECK (C53) REAR MODE DOOR DRIVER CIRCUIT FOR AN OPEN

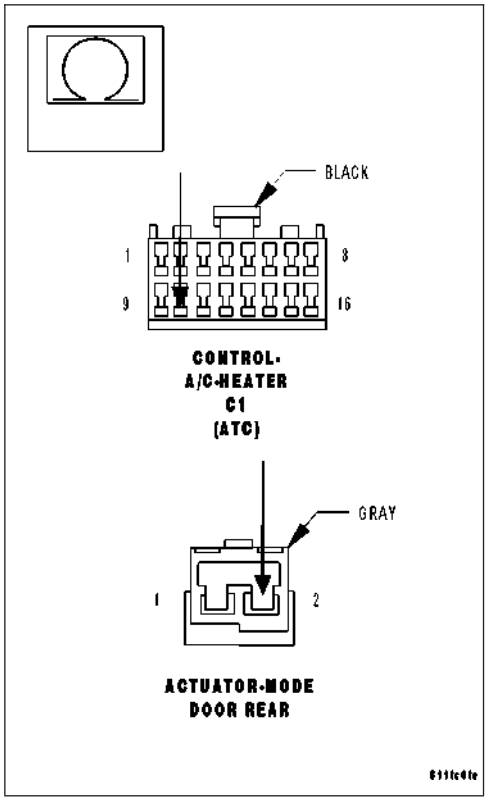
Disconnect the Rear Mode Door Actuator harness connector.

Measure the resistance of the (C53) Rear Mode Door Driver circuit between the A/C Heater Control C1 harness connector and the Rear Mode Door Actuator harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 4

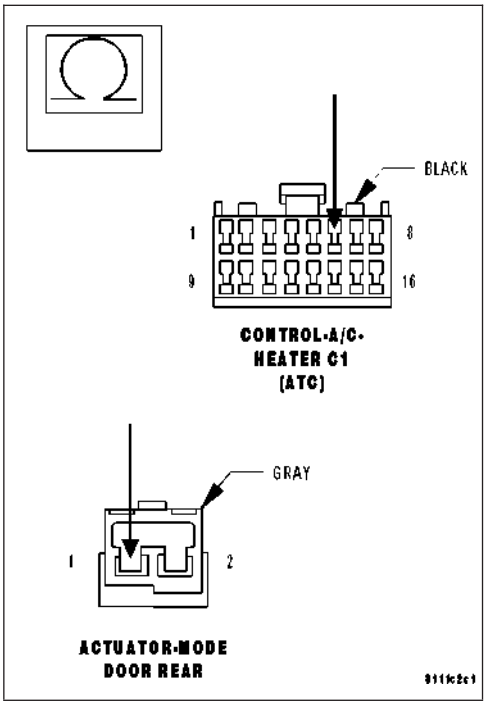
No >> Repair the (C53) Rear Mode Door Driver circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.



B103D–REAR MODE DOOR CONTROL CIRCUIT OPEN (ATC) (CONTINUED)

4. CHECK (C154) REAR COMMON DOOR DRIVER CIRCUIT FOR AN OPEN

Measure the resistance of the (C154) Rear Common Door Driver circuit between the A/C Heater Control C1 harness connector and the Rear Mode Door Actuator harness connector.

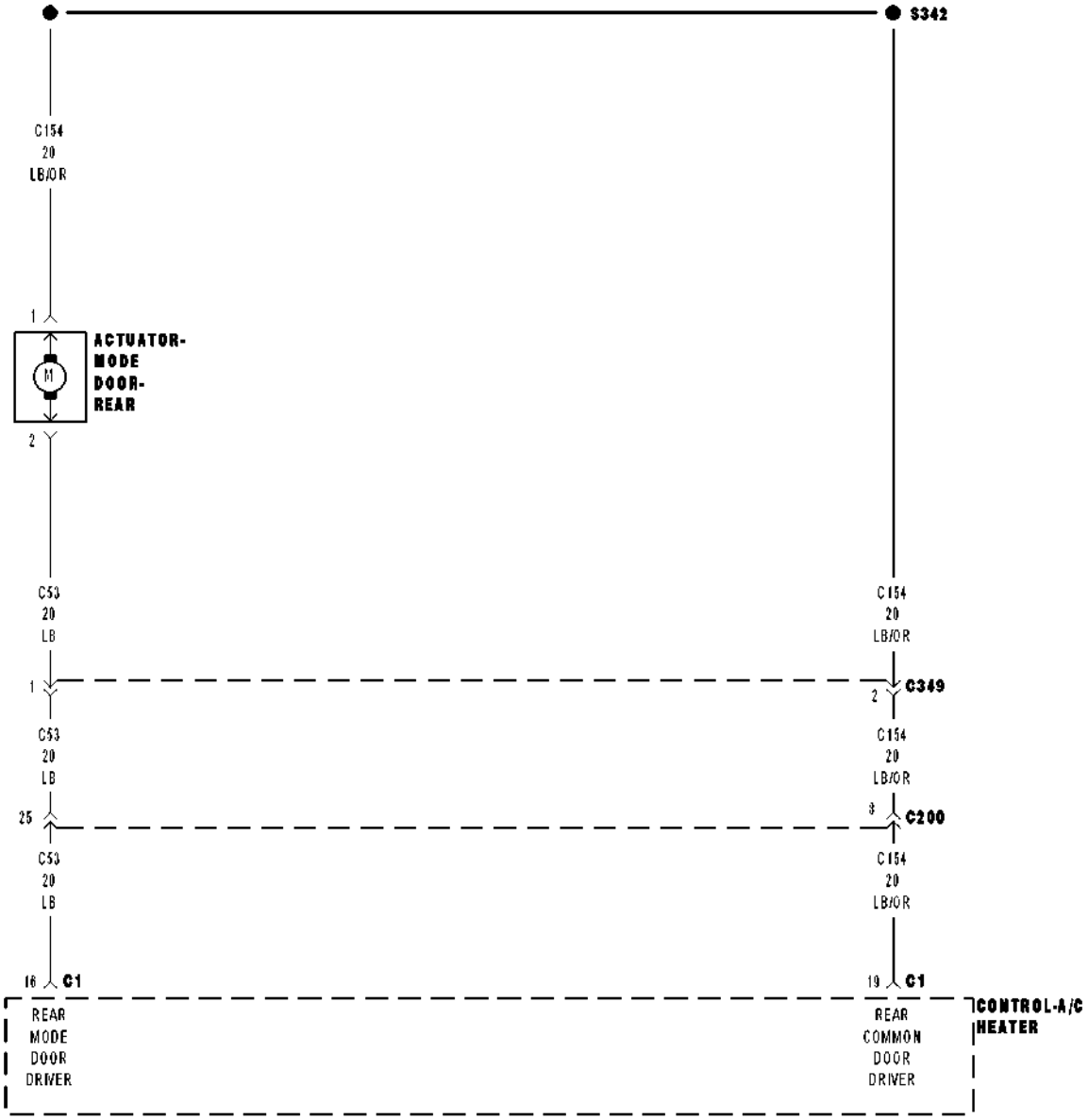


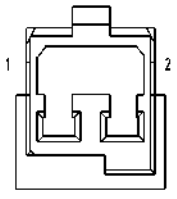
Is the resistance below 5.0 ohms?

Yes >> Replace the Rear Mode Door Actuator in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

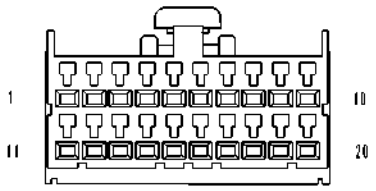
No >> Repair the (C154) Rear Common Door Driver circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

B103D–REAR MODE DOOR CONTROL CIRCUIT OPEN (MTC)





ACTUATOR-
MODE
DOOR-
REAR



CONTROL-A/C-
HEATER C1
(MTC)

81651856

B103D–REAR MODE DOOR CONTROL CIRCUIT OPEN (MTC) (CONTINUED)

For the Manual Temperature Control (MTC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Rear Mode Door Actuator's electrical circuit is open. This DTC has a maturing time of 5 seconds and a de-maturing time of 10 seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

Possible Causes
(C53) REAR MODE DOOR DRIVER CIRCUIT OPEN
(C154) REAR COMMON DOOR DRIVER CIRCUIT OPEN
REAR MODE DOOR ACTUATOR
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control drives the Rear Mode Door Actuator via the (C53) Rear Mode Door Driver circuit and the (C154) Rear Common Door Driver circuit. Both of the rear door actuators share the (C154) Rear Common Door Driver circuit. Inside the A/C Heater Control, each door actuator has its own unique driver, but all share a single common door driver circuit. Due to the shared circuitry similar DTCs can set at the same time for multiple actuators depending upon the location of the open circuit and the direction the actuator is moving when the open is present.

NOTE: DTC B103D must be active for the results of this test to be valid. Do not perform this test if DTC B103D is stored. Refer to HVAC System Test (MTC) for stored DTC test procedures.

Diagnostic Test

1. CHECK FOR ACTIVE CONTROL CIRCUIT/PERFORMANCE DTCs

Turn the ignition on.

With the scan tool, read active HVAC DTCs.

Does the scan tool display any active: XXXX CONTROL CIRCUIT/PERFORMANCE DTCs?

Yes >> Diagnose and repair the DTC(s). Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No >> Go To 2

B103D–REAR MODE DOOR CONTROL CIRCUIT OPEN (MTC) (CONTINUED)

2. CHECK REAR MODE DOOR ACTUATOR CIRCUIT RESISTANCE

Turn the ignition off.

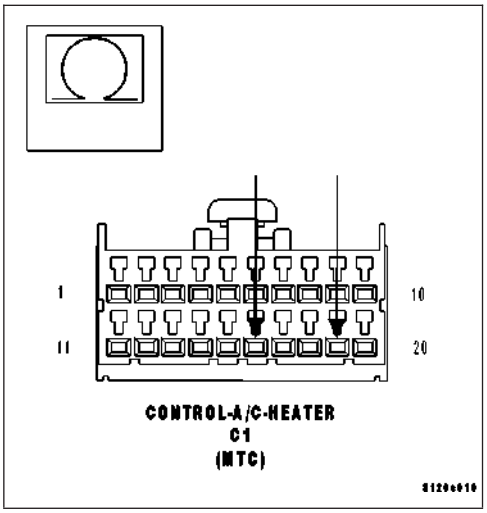
Disconnect the A/C Heater Control C1 harness connector.

Measure the resistance between the (C53) Rear Mode Door Driver circuit and the (C154) Rear Common Door Driver circuit in the A/C Heater Control C1 harness connector.

Is the resistance above 70 ohms?

Yes >> Go To 3

No >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.



3. CHECK (C53) REAR MODE DOOR DRIVER CIRCUIT FOR AN OPEN

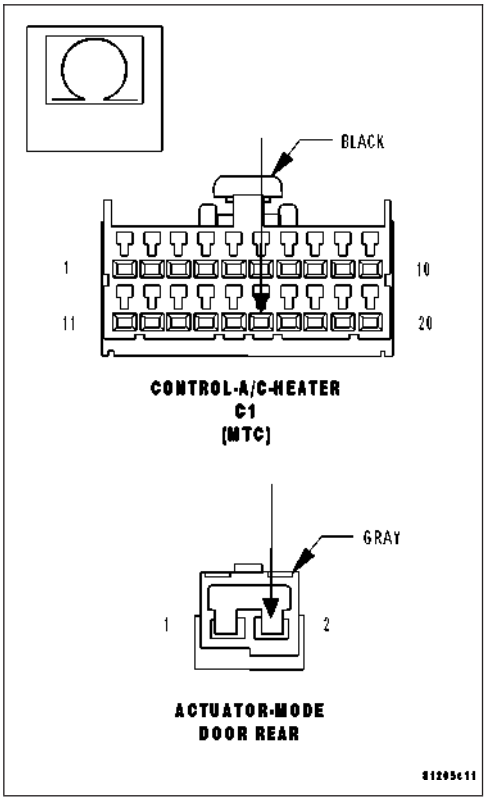
Disconnect the Rear Mode Door Actuator harness connector.

Measure the resistance of the (C53) Rear Mode Door Driver circuit between the A/C Heater Control C1 harness connector and the Rear Mode Door Actuator harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 4

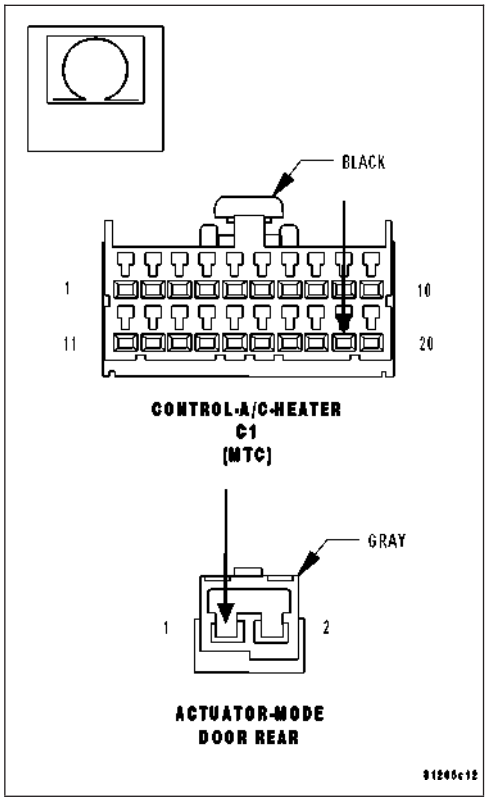
No >> Repair the (C53) Rear Mode Door Driver circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.



B103D–REAR MODE DOOR CONTROL CIRCUIT OPEN (MTC) (CONTINUED)

4. CHECK (C154) REAR COMMON DOOR DRIVER CIRCUIT FOR AN OPEN

Measure the resistance of the (C154) Rear Common Door Driver circuit between the A/C Heater Control C1 harness connector and the Rear Mode Door Actuator harness connector.



Is the resistance below 5.0 ohms?

Yes >> Replace the Rear Mode Door Actuator in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the (C154) Rear Common Door Driver circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

B103E–REAR MODE DOOR TRAVEL RANGE TOO SMALL (ATC & MTC)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  During actuator calibration.
- **Set Condition:**
  If the total span of the Rear Mode Door is less than the low range limit.

Possible Causes
DOOR DRIVER ELECTRICAL CIRCUIT(S)
REAR MODE DOOR SEIZED, BINDING, OBSTRUCTED
REAR MODE DOOR ACTUATOR
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control calibrates each actuator individually. Automatic calibration occurs upon power up after installing a new A/C Heater Control. Manual calibration occurs by sending a command with the scan tool. The purpose of actuator calibration is to determine the total span of door travel between physical stops. To calibrate the actuator, the A/C Heater Control first moves the door to its soft stop, and then counts the number of pulses it takes to move the door to its other stop. An expected range of span is stored in the control's memory. If the measured calibration value is less than the expected range for this actuator, this DTC will set. Note that the control clears all stored calibration faults at the beginning of the calibration procedure.

Diagnostic Test

1. CHECK FOR ACTIVE CONTROL CIRCUIT/PERFORMANCE & CONTROL CIRCUIT OPEN DTCs

Turn the ignition on.

With the scan tool, read active HVAC DTCs.

Does the scan tool display any active: XXXX CONTROL CIRCUIT/PERFORMANCE or XXXX CONTROL CIRCUIT OPEN DTCs?

Yes (ATC)
Diagnose and repair the DTC(s). If present, diagnose and repair all Rear Blend and Rear Mode Door Control Circuit/Performance DTCs first, all other Control Circuit/Performance DTCs second, and all Control Circuit Open DTCs last. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

Yes (MTC)
Diagnose and repair the DTC(s). Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No >> Go To 2

---

2. RUN THE ACTUATOR DTC DETECTION TEST

With the scan tool in HVAC, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

Does the scan tool display any DTCs?

Yes >> Diagnose and repair the DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs first, all short low DTCs second, and all open DTCs last. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No >> Go To 3

B103E–REAR MODE DOOR TRAVEL RANGE TOO SMALL (ATC & MTC) (CONTINUED)

3. INSPECT ACTUATOR & HOUSING ASSEMBLY FOR A CONDITION CAUSING THE DOOR TO SEIZE OR BIND

Turn the ignition off.

Inspect the actuator and the housing assembly for a condition causing the door to seize or bind.

Are there any physical or mechanical problems with the door, housing, or actuator?

Yes >> Repair as necessary in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 4

---

4. CHECK REAR MODE DOOR TRAVEL

Remove the Rear Mode Door Actuator from the Rear A/C Heater Housing Assembly.

By hand, attempt to rotate the door in both directions. The door should operate smoothly in both directions over approximately 60 degrees of travel.

Does the door operate smoothly in both directions over approximately 60 degrees of travel?

Yes >> Replace the Rear Mode Door Actuator in accordance with the Service Information. Then, Go To 5.

No >> Repair as necessary in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

---

5. RUN ACTUATOR CALIBRATION TEST

Turn the ignition on.

With the scan tool, select System Tests and then select Actuator Calibration Test. When the test is complete, select View DTCs.

Does the scan tool display: B103E–REAR MODE DOOR TRAVEL RANGE TOO SMALL?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Perform BODY VERIFICATION TEST - VER 1.

B103F–REAR MODE DOOR TRAVEL RANGE TOO LARGE (ATC & MTC)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  During actuator calibration.
- **Set Condition:**
  If the total span of the Rear Mode Door exceeds the high range limit.

Possible Causes
DOOR DRIVER ELECTRICAL CIRCUIT(S)
REAR MODE DOOR OR REAR A/C HEATER HOUSING COMPONENTS WARPED, WORN, DAMAGED, MISSING, BROKEN
REAR MODE DOOR ACTUATOR
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control calibrates each actuator individually. Automatic calibration occurs upon power up after installing a new A/C Heater Control. Manual calibration occurs by sending a command with the scan tool. The purpose of actuator calibration is to determine the total span of door travel between physical stops. To calibrate the actuator, the A/C Heater Control first moves the door to its soft stop, and then counts the number of pulses it takes to move the door to its other stop. An expected range of span is stored in the control's memory. If the measured calibration value exceeds the expected range for this actuator, this DTC will set. Note that the control clears all stored calibration faults at the beginning of the calibration procedure.

Diagnostic Test

1. CHECK FOR ACTIVE CONTROL CIRCUIT/PERFORMANCE & CONTROL CIRCUIT OPEN DTCs

Turn the ignition on.

With the scan tool, read active HVAC DTCs.

Does the scan tool display any active: XXXX CONTROL CIRCUIT/PERFORMANCE or XXXX CONTROL CIRCUIT OPEN DTCs?

Yes (ATC)
Diagnose and repair the DTC(s). If present, diagnose and repair all Rear Blend and Rear Mode Door Control Circuit/Performance DTCs first, all other Control Circuit/Performance DTCs second, and all Control Circuit Open DTCs last. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

Yes (MTC)
Diagnose and repair the DTC(s). Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No >> Go To 2

B103F–REAR MODE DOOR TRAVEL RANGE TOO LARGE (ATC & MTC) (CONTINUED)

2. RUN THE ACTUATOR DTC DETECTION TEST

With the scan tool, erase HVAC DTCs.

Turn the ignition off, wait 10 seconds, and then turn the ignition on.

With the scan tool, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

Does the scan tool display any DTCs?

Yes >> Diagnose and repair the DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs first, all short low DTCs second, and all open DTCs last. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No >> Go To 3

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3. CHECK FOR A BROKEN REAR MODE DOOR ACTUATOR

Turn the ignition off.

Remove the Rear Mode Door Actuator from the Rear A/C Heater Housing Assembly.

By hand, attempt to rotate the actuator in both directions.

Does the actuator turn in either direction?

Yes >> Replace the Rear Mode Door Actuator in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 4

---

4. CHECK REAR MODE DOOR & REAR A/C HEATER HOUSING FOR WARPED, WORN, DAMAGED, MISSING, & BROKEN COMPONENTS

Inspect for a damaged or broken Rear A/C Heater Housing Assembly, a warped, worn, or broken door, and missing door seals. Rotate the door from stop to stop. The door should rotate approximately 60 degrees.

Are there any physical or mechanical problems with the door or housing?

Yes >> Repair as necessary in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Rear Mode Door Actuator in accordance with the Service Information. Then, Go To 5.

---

5. RUN ACTUATOR CALIBRATION TEST

Turn the ignition on.

With the scan tool, select System Tests and then select Actuator Calibration Test. When the test is complete, select View DTCs.

Does the scan tool display: B103F–REAR MODE DOOR TRAVEL RANGE TOO LARGE?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Perform BODY VERIFICATION TEST - VER 1.

B104A–FLOOR/DEFROST MODE DOOR TRAVEL RANGE TOO SMALL (ATC & MTC)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  During actuator calibration.
- **Set Condition:**
  If the total span of the Mode 2 (Floor to Defrost) Door is less than the low range limit.

Possible Causes
DOOR DRIVER ELECTRICAL CIRCUIT(S)
MODE 2 (FLOOR TO DEFROST) DOOR SEIZED, BINDING, OBSTRUCTED
MODE DOOR 2 (FLOOR TO DEFROST) ACTUATOR
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control calibrates each actuator individually. Automatic calibration occurs upon power up after installing a new A/C Heater Control. Manual calibration occurs by sending a command with the scan tool. The purpose of actuator calibration is to determine the total span of door travel between physical stops. To calibrate the actuator, the A/C Heater Control first moves the door to its soft stop, and then counts the number of pulses it takes to move the door to its other stop. An expected range of span is stored in the control's memory. If the measured calibration value is less than the expected range for this actuator, this DTC will set. Note that the control clears all stored calibration faults at the beginning of the calibration procedure.

Diagnostic Test

1. CHECK FOR ACTIVE CONTROL CIRCUIT/PERFORMANCE & CONTROL CIRCUIT OPEN DTCs

Turn the ignition on.

With the scan tool, read active HVAC DTCs.

Does the scan tool display any active: XXXX CONTROL CIRCUIT/PERFORMANCE or XXXX CONTROL CIRCUIT OPEN DTCs?

Yes (ATC)
Diagnose and repair the DTC(s). If present, diagnose and repair all Rear Blend and Rear Mode Door Control Circuit/Performance DTCs first, all other Control Circuit/Performance DTCs second, and all Control Circuit Open DTCs last. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

Yes (MTC)
Diagnose and repair the DTC(s). Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No >> Go To 2

---

2. RUN THE ACTUATOR DTC DETECTION TEST

With the scan tool in HVAC, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

Does the scan tool display any DTCs?

Yes >> Diagnose and repair the DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs first, all short low DTCs second, and all open DTCs last. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No >> Go To 3

B104A–FLOOR/DEFROST MODE DOOR TRAVEL RANGE TOO SMALL (ATC & MTC) (CONTINUED)

3. INSPECT ACTUATOR & HOUSING ASSEMBLY FOR A CONDITION CAUSING THE DOOR TO SEIZE OR BIND

Turn the ignition off.

Inspect the actuator, linkage, and housing assembly for a condition causing the door to seize or bind.

Are there any physical or mechanical problems with the door, housing, linkage, or actuator?

Yes >> Repair as necessary in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 4

---

4. CHECK MODE 2 (FLOOR TO DEFROST) DOOR TRAVEL

Remove the Mode Door 2 (Floor to Defrost) Actuator from the A/C Heater Housing Assembly.

By hand, attempt to rotate the door in both directions. The door should operate smoothly in both directions over approximately 100 degrees.

Does the door operate smoothly in both directions over approximately 100 degrees of travel?

Yes >> Replace the Mode Door 2 (Floor to Defrost) Actuator in accordance with the Service Information. Then, Go To 5.

No >> Repair as necessary in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

---

5. RUN ACTUATOR CALIBRATION TEST

Turn the ignition on.

With the scan tool, select System Tests and then select Actuator Calibration Test. When the test is complete, select View DTCs.

Does the scan tool display: B104A–FLOOR/DEFROST MODE DOOR TRAVEL RANGE TOO SMALL?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Perform BODY VERIFICATION TEST - VER 1.

B104B–FLOOR/DEFROST MODE DOOR TRAVEL RANGE TOO LARGE (ATC & MTC)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  During actuator calibration.
- **Set Condition:**
  If the total span of the Mode 2 (Floor to Defrost) Door exceeds the high range limit.

Possible Causes
DOOR DRIVER ELECTRICAL CIRCUIT(S)
MODE 2 (FLOOR TO DEFROST) DOOR OR A/C HEATER HOUSING COMPONENTS WARPED, WORN, DAMAGED, MISSING, BROKEN
MODE DOOR 2 (FLOOR TO DEFROST) ACTUATOR
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control calibrates each actuator individually. Automatic calibration occurs upon power up after installing a new A/C Heater Control. Manual calibration occurs by sending a command with the scan tool. The purpose of actuator calibration is to determine the total span of door travel between physical stops. To calibrate the actuator, the A/C Heater Control first moves the door to its soft stop, and then counts the number of pulses it takes to move the door to its other stop. An expected range of span is stored in the control's memory. If the measured calibration value exceeds the expected range for this actuator, this DTC will set. Note that the control clears all stored calibration faults at the beginning of the calibration procedure.

Diagnostic Test

1. CHECK FOR ACTIVE CONTROL CIRCUIT/PERFORMANCE & CONTROL CIRCUIT OPEN DTCs

Turn the ignition on.

With the scan tool, read active HVAC DTCs.

Does the scan tool display any active: XXXX CONTROL CIRCUIT/PERFORMANCE or XXXX CONTROL CIRCUIT OPEN DTCs?

Yes (ATC)
Diagnose and repair the DTC(s). If present, diagnose and repair all Rear Blend and Rear Mode Door Control Circuit/Performance DTCs first, all other Control Circuit/Performance DTCs second, and all Control Circuit Open DTCs last. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

Yes (MTC)
Diagnose and repair the DTC(s). Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No >> Go To 2

B104B–FLOOR/DEFROST MODE DOOR TRAVEL RANGE TOO LARGE (ATC & MTC) (CONTINUED)

2. RUN THE ACTUATOR DTC DETECTION TEST

With the scan tool in HVAC, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

Does the scan tool display any DTCs?

Yes >> Diagnose and repair the DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs first, all short low DTCs second, and all open DTCs last. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No >> Go To 3

---

3. CHECK FOR A BROKEN MODE DOOR 2 (FLOOR TO DEFROST) ACTUATOR

Turn the ignition off.

Remove the Mode Door 2 (Floor to Defrost) Actuator from the A/C Heater Housing assembly.

By hand, attempt to rotate the actuator in both directions.

Does the actuator turn in either direction?

Yes >> Replace the Mode Door 2 (Floor to Defrost) Actuator in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 4

---

4. CHECK MODE 2 (FLOOR TO DEFROST) DOOR & A/C HEATER HOUSING FOR WARPED, WORN, DAMAGED, MISSING, & BROKEN COMPONENTS

Inspect for excessively worn, disconnected, missing, or broken door linkage. Inspect for a damaged or broken A/C Heater Housing Assembly. Inspect for a warped or broken door, and missing door seals. Rotate the door from stop to stop. The door should rotate approximately 100 degrees.

Are there any physical or mechanical problems with the door or housing?

Yes >> Repair as necessary in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Mode 2 (Floor to Defrost) Actuator in accordance with the Service Information. Then, Go To 5.

---

5. RUN ACTUATOR CALIBRATION TEST

Turn the ignition on.

With the scan tool, select System Tests and then select Actuator Calibration Test. When the test is complete, select View DTCs.

Does the scan tool display: B104B–FLOOR/DEFROST MODE DOOR TRAVEL RANGE TOO LARGE?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Perform BODY VERIFICATION TEST - VER 1.

B104C–BLEND DOOR CONTROL CIRCUIT/PERFORMANCE (ATC)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the A/C Heater Control detects an excessive current draw on the (C61) Front Blend Door Driver circuit, the (C32) Recirculation Door Driver circuit, or the (C34) Common Door Driver 1 circuit while attempting to drive this actuator. This DTC has a maturing time of 5 seconds and a de-maturing time of 10 seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

Possible Causes
DOOR DRIVER CIRCUIT(S) SHORTED

Theory of Operation

The A/C Heater Control monitors the door driver circuits during actuator operation for shorts to ground, shorts to battery, and shorts to other door driver circuits. If detected, the A/C Heater Control reports these types of faults as Control Circuit/Performance DTCs. It is important to note that Control Circuit/Performance DTCs do not indicate where or what type of short is present and that additional system testing is necessary to provide more details about the reported fault.

NOTE: The DTC must be active for the results of this test to be valid. Do not perform this test if the DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

Diagnostic Test

1. RUN THE ACTUATOR DTC DETECTION TEST

With the scan tool, erase HVAC DTCs.

Turn the ignition off, wait 10 seconds, and then turn the ignition on.

With the scan tool, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

Repair

Diagnose and repair the DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs and then all short low DTCs. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

B104C–BLEND DOOR CONTROL CIRCUIT/PERFORMANCE (ACTIVE) (MTC)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the A/C Heater Control detects an excessive current draw on any of the door driver circuits while attempting to drive this actuator. This DTC has a maturing time of 5 seconds and a de-maturing time of 10 seconds. If the DTC's status changes from active to stored, it will stay in memory for 100 ignition cycles.

Possible Causes
DOOR DRIVER CIRCUIT(S) SHORTED

Theory of Operation

The A/C Heater Control monitors the door driver circuits during actuator operation for shorts to ground, shorts to battery, and shorts to other door driver circuits. If detected, the A/C Heater Control reports these types of faults as Control Circuit/Performance DTCs. It is important to note that Control Circuit/Performance DTCs do not indicate where or what type of short is present and that additional system testing is necessary to provide more details about the reported fault.

NOTE: The DTC must be active for the results of this test to be valid. Do not perform this test if the DTC is stored. Refer to HVAC System Test (MTC) for stored DTC test procedures.

Diagnostic Test

1. RUN THE ACTUATOR DTC DETECTION TEST

Turn the ignition on.

With the scan tool in HVAC, erase DTCs.

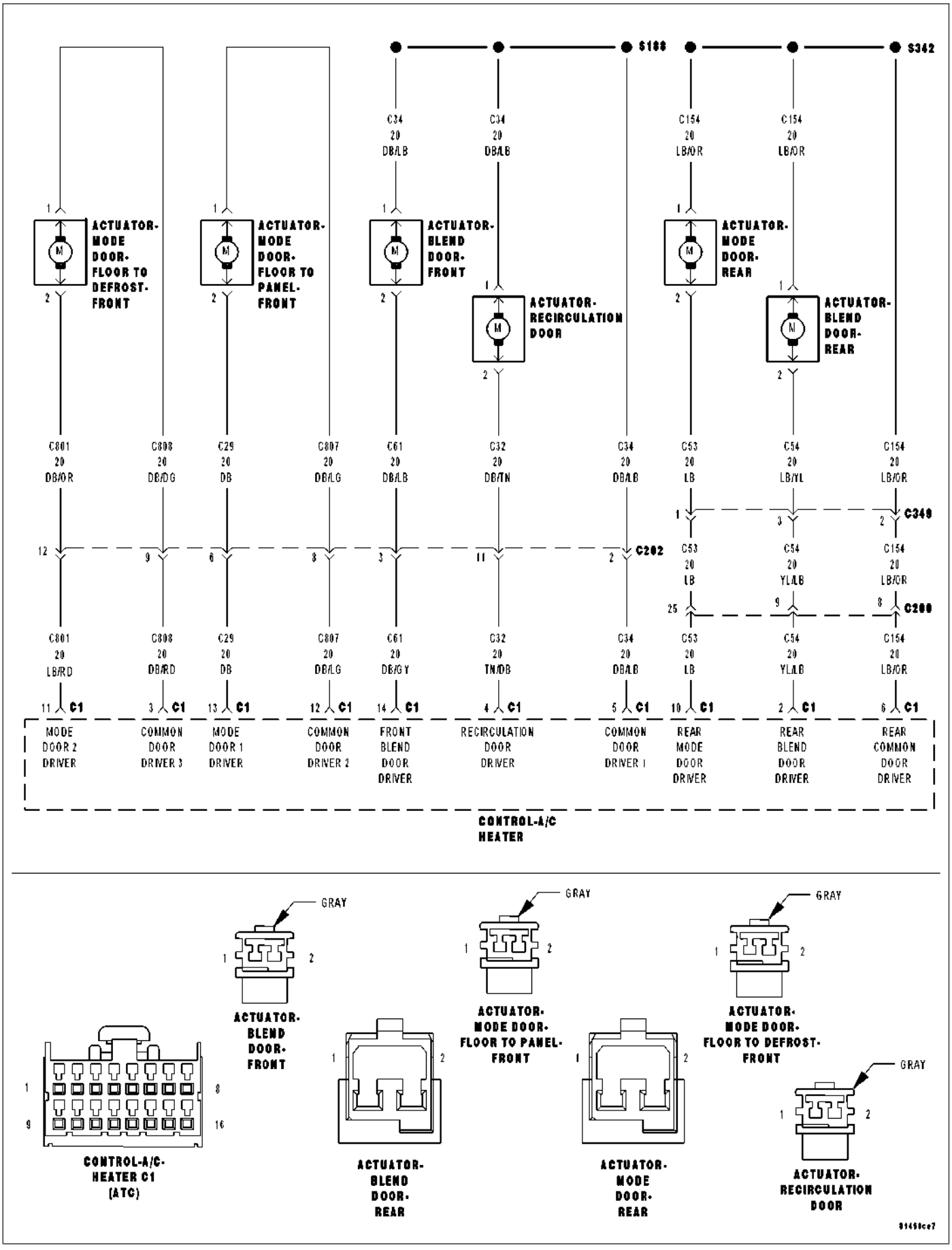
Turn the ignition off, wait 10 seconds, and then turn the ignition on.

With the scan tool, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

Repair

Diagnose and repair the DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs and then all short low DTCs. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

B104D–BLEND DOOR CONTROL CIRCUIT LOW (ATC)



B104D–BLEND DOOR CONTROL CIRCUIT LOW (ATC) (CONTINUED)

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the Actuator DTC Detection Test is executed.
- **Set Condition:**
  If the (C61) Front Blend Door Driver circuit is shorted to ground.

Possible Causes
(C61) FRONT BLEND DOOR DRIVER CIRCUIT SHORTED TO GROUND
(C61) FRONT BLEND DOOR DRIVER CIRCUIT SHORTED TO OTHER DOOR DRIVER CIRCUIT(S)
FRONT BLEND DOOR ACTUATOR
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control drives the Front Blend Door Actuator via the (C61) Front Blend Door Driver circuit and the (C34) Common Door Driver 1 circuit. The Front Blend Door Actuator and the Recirculation Door Actuator share the (C34) Common Door Driver 1 circuit and they share a driver inside the A/C Heater Control. Due to the shared circuitry similar DTCs can set at the same time for multiple actuators depending upon the type of short, its location, and the direction the actuator is moving when the short is present.

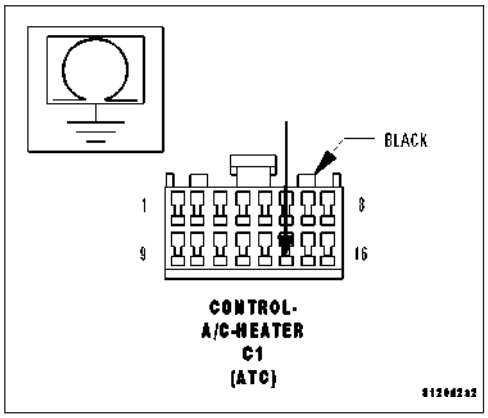
Diagnostic Test

1. CHECK (C61) FRONT BLEND DOOR DRIVER CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

Measure the resistance of the (C61) Front Blend Door Driver circuit between ground and the A/C Heater Control C1 harness connector.



Is the resistance below 10k ohms?

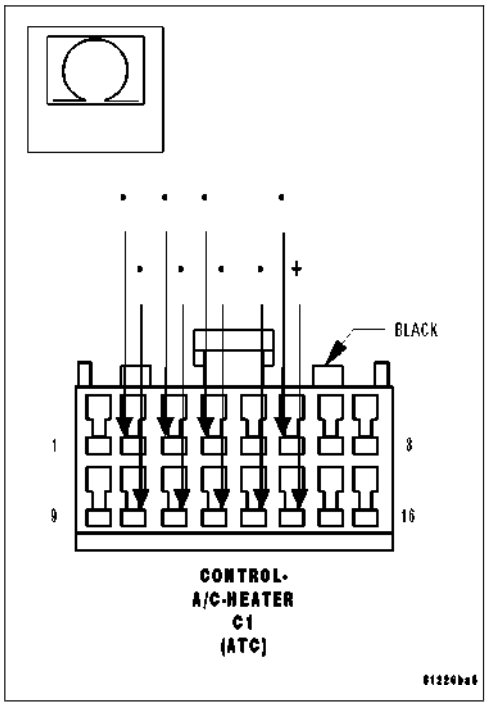
Yes >> Repair the (C61) Front Blend Door Driver circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 2

B104D–BLEND DOOR CONTROL CIRCUIT LOW (ATC) (CONTINUED)

2. CHECK (C61) FRONT BLEND DOOR DRIVER CIRCUIT FOR A SHORT TO OTHER DOOR DRIVER CIRCUITS

Measure the resistance between the (C61) Front Blend Door Driver circuit and the (C54) Rear Blend Door Driver circuit, the (C808) Common Door Driver 3 circuit, the (C32) Recirculation Door Driver circuit, the (C154) Rear Common Door Driver circuit, the (C53) Rear Mode Door Driver circuit, the (C801) Mode Door 2 Driver circuit, the (C807) Common Door Driver 2 circuit, and the (C29) Mode Door 1 Driver circuit in the A/C Heater Control C1 harness connector.



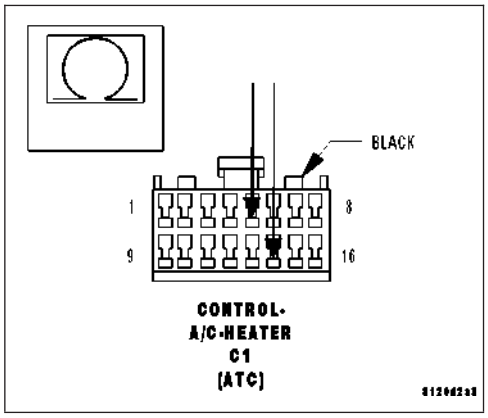
Is the resistance below 10k ohms between the (C61) Front Blend Door Driver circuit and any of the other door driver circuits?

Yes >> Repair the circuit(s) with a resistance below 10k ohms for a short to the (C61) Front Blend Door Driver circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 3

3. CHECK FRONT BLEND DOOR ACTUATOR CIRCUIT RESISTANCE

Measure the resistance between the (C61) Front Blend Door Driver circuit and the (C34) Common Door Driver 1 circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 30 ohms?

Yes >> Go To 4

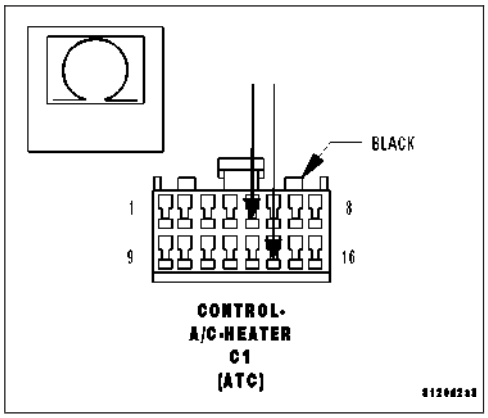
No >> Go To 5

B104D–BLEND DOOR CONTROL CIRCUIT LOW (ATC) (CONTINUED)

4. CHECK (C61) FRONT BLEND DOOR DRIVER CIRCUIT FOR A SHORT TO (C34) COMMON DOOR DRIVER 1 CIRCUIT

Disconnect the Front Blend Door Actuator harness connector.

Measure the resistance between the (C61) Front Blend Door Driver circuit and the (C34) Common Door Driver 1 circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 10k ohms?

Yes >> Repair the (C61) Front Blend Door Driver Circuit for a short to the (C34) Common Door Driver 1 circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Front Blend Door Actuator in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

---

5. RUN THE ACTUATOR DTC DETECTION TEST

Reconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

With the scan tool, erase HVAC DTCs.

Turn the ignition off, wait 10 seconds, and then turn the ignition on.

With the scan tool, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

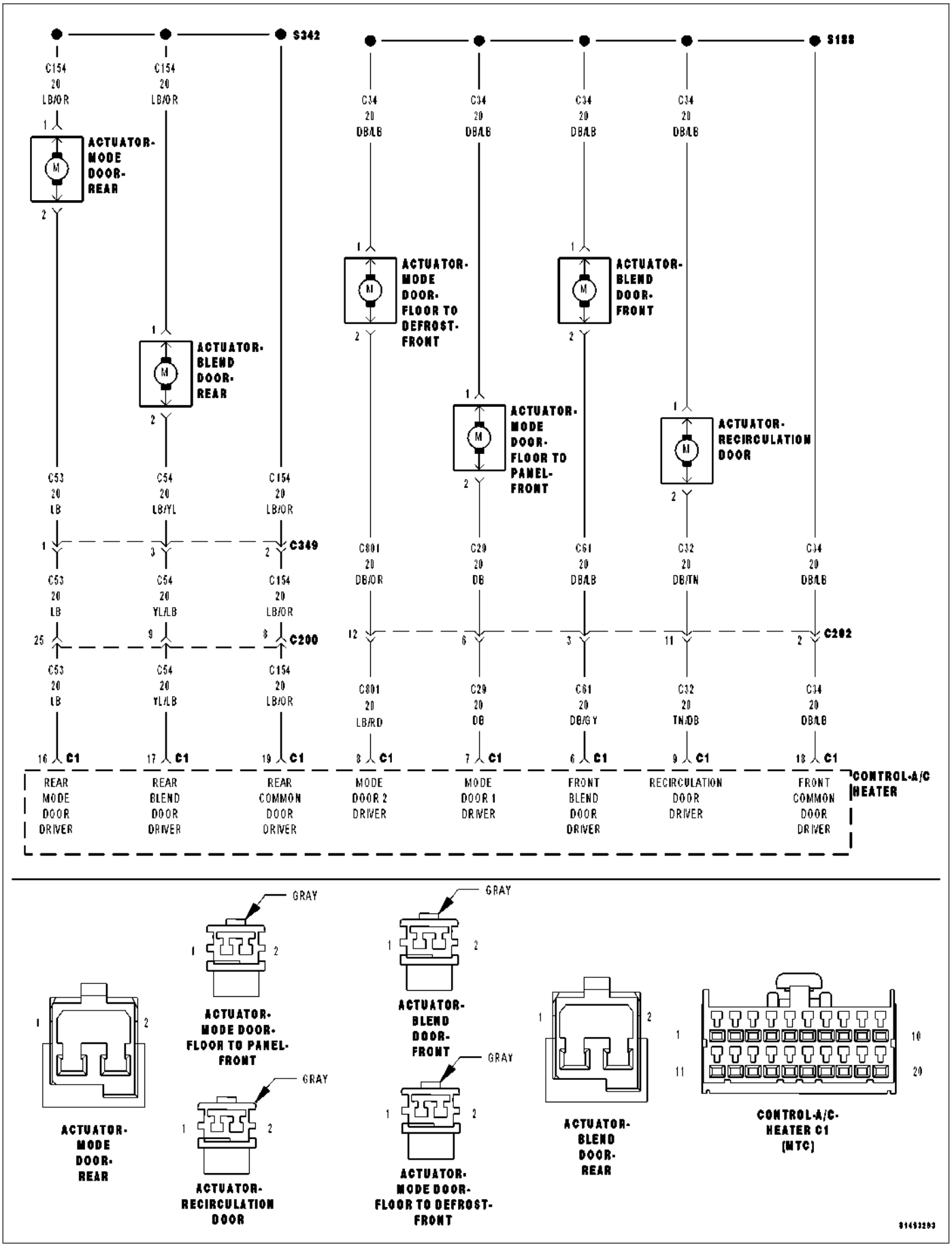
Does the scan tool only display: B104D–BLEND DOOR CONTROL CIRCUIT LOW?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No, Other DTC(s) Displayed
Diagnose and repair the other DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs and then all short low DTCs. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No, And No Other DTCs Displayed
Using the wiring diagram as a guide, inspect the wiring and connectors for conditions causing an intermittent short. Repair as necessary.
Perform BODY VERIFICATION TEST - VER 1.

B104D–BLEND DOOR CONTROL CIRCUIT LOW (MTC)



B104D–BLEND DOOR CONTROL CIRCUIT LOW (MTC) (CONTINUED)

For the Manual Temperature Control (MTC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the Actuator DTC Detection Test is executed.
- **Set Condition:**
  If the (C61) Front Blend Door Driver circuit is shorted to ground.

Possible Causes
(C61) FRONT BLEND DOOR DRIVER CIRCUIT SHORTED TO GROUND
(C61) FRONT BLEND DOOR DRIVER CIRCUIT SHORTED TO OTHER DOOR DRIVER CIRCUIT(S)
FRONT BLEND DOOR ACTUATOR
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control drives the Front Blend Door Actuator via the (C61) Front Blend Door Driver circuit and the (C34) Front Common Door Driver circuit. All of the front door actuators share the (C34) Front Common Door Driver circuit. Inside the A/C Heater Control, each door actuator has its own unique driver, but all share a single common door driver circuit. Due to the shared circuitry similar DTCs can set at the same time for multiple actuators depending upon the type of short, its location, and the direction the actuator is moving when the short is present.

Diagnostic Test

1. CHECK (C61) FRONT BLEND DOOR DRIVER CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

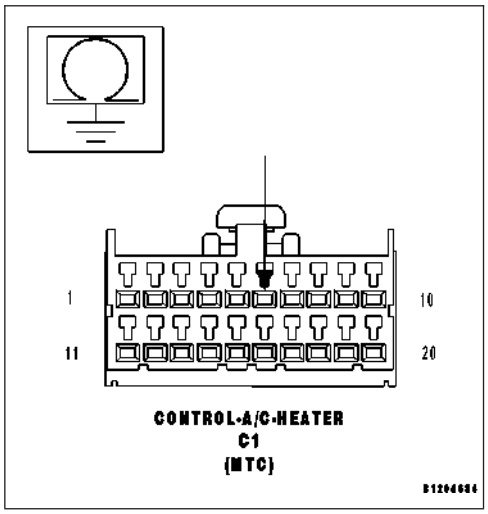
Disconnect the A/C Heater Control C1 harness connector.

Measure the resistance of the (C61) Front Blend Door Driver circuit between ground and the A/C Heater Control C1 harness connector.

Is the resistance below 10k ohms?

Yes >> Repair the (C61) Front Blend Door Driver circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

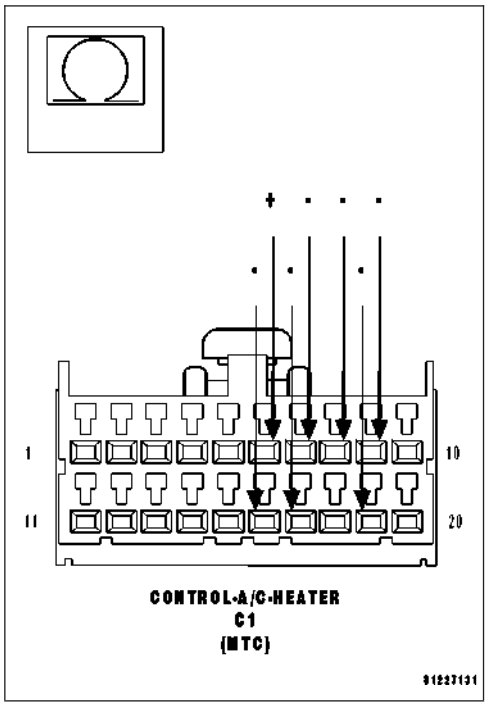
No >> Go To 2



B104D–BLEND DOOR CONTROL CIRCUIT LOW (MTC) (CONTINUED)

2. CHECK (C61) FRONT BLEND DOOR DRIVER CIRCUIT FOR A SHORT TO OTHER DOOR DRIVER CIRCUITS

Measure the resistance between the (C61) Front Blend Door Driver circuit and the (C29) Mode Door 1 Driver circuit, the (C801) Mode Door 2 Driver circuit, the (C32) Recirculation Door Driver circuit, and, if equipped, the (C53) Rear Mode Door Driver circuit, the (C154) Rear Common Door Driver circuit, and the (C54) Rear Blend Door Driver circuit in the A/C Heater Control C1 harness connector.



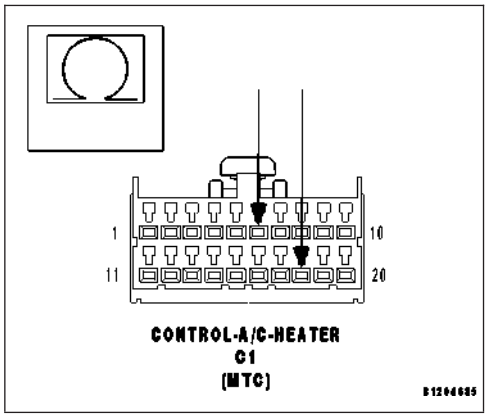
Is the resistance below 10k ohms between the (C61) Front Blend Door Driver circuit and any of the other door driver circuits?

Yes >> Repair the circuit(s) with a resistance below 10k ohms for a short to the (C61) Front Blend Door Driver circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 3

3. CHECK FRONT BLEND DOOR ACTUATOR CIRCUIT RESISTANCE

Measure the resistance between the (C61) Front Blend Door Driver circuit and the (C34) Front Common Door Driver circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 30 ohms?

Yes >> Go To 4

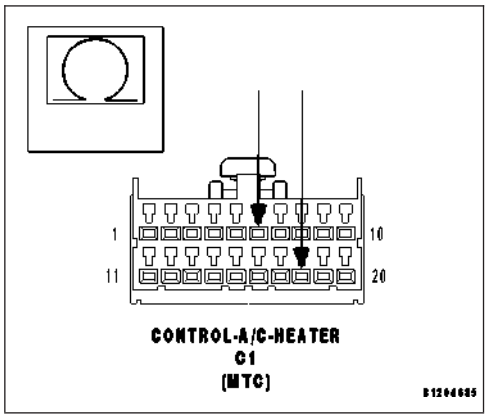
No >> Go To 5

B104D–BLEND DOOR CONTROL CIRCUIT LOW (MTC) (CONTINUED)

4. CHECK (C61) FRONT BLEND DOOR DRIVER CIRCUIT FOR A SHORT TO (C34) FRONT COMMON DOOR DRIVER CIRCUIT

Disconnect the Front Blend Door Actuator harness connector.

Measure the resistance between the (C61) Front Blend Door Driver circuit and the (C34) Front Common Door Driver circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 10k ohms?

Yes >> Repair the (C61) Front Blend Door Driver circuit for a short to the (C34) Front Common Door Driver circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Front Blend Door Actuator in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

---

5. RUN THE ACTUATOR DTC DETECTION TEST

Reconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

With the scan tool, erase HVAC DTCs.

Turn the ignition off, wait 10 seconds, and then turn the ignition on.

With the scan tool, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

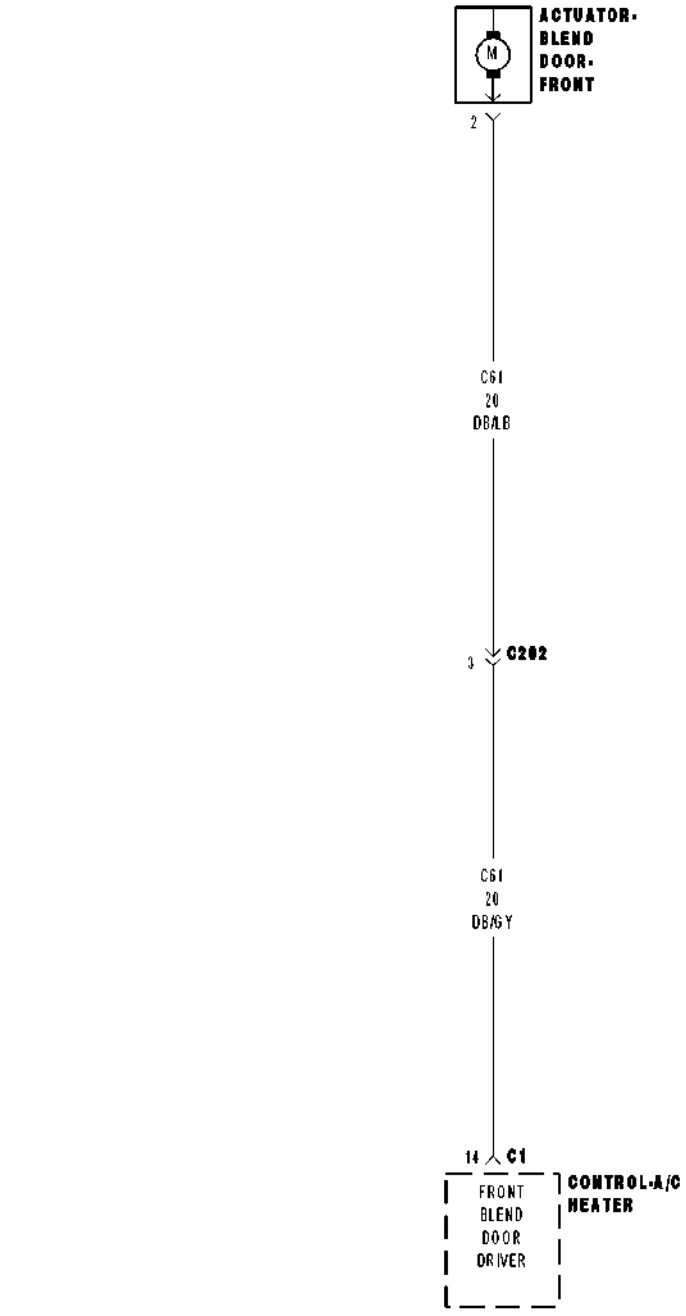
Does the scan tool only display: B104D–BLEND DOOR CONTROL CIRCUIT LOW ?

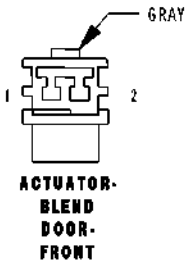
Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

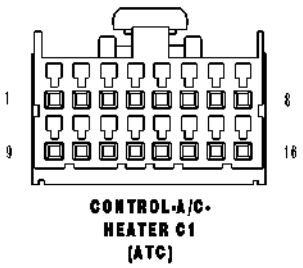
No, Other DTC(s) Displayed
Diagnose and repair the other DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs and then all short low DTCs. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No, And No Other DTCs Displayed
Using the wiring diagram as a guide, inspect the wiring and connectors for conditions causing an intermittent short. Repair as necessary.
Perform BODY VERIFICATION TEST - VER 1.

B104E–BLEND DOOR CONTROL CIRCUIT HIGH (ATC)







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B104E–BLEND DOOR CONTROL CIRCUIT HIGH (ATC) (CONTINUED)

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the Actuator DTC Detection Test is executed.
- **Set Condition:**
  If the (C61) Front Blend Door Driver circuit is shorted to voltage.

Possible Causes
(C61) FRONT BLEND DOOR DRIVER CIRCUIT SHORTED TO VOLTAGE
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control drives the Front Blend Door Actuator via the (C61) Front Blend Door Driver circuit and the (C34) Common Door Driver 1 circuit. The Front Blend Door Actuator and the Recirculation Door Actuator share the (C34) Common Door Driver 1 circuit and they share a driver inside the A/C Heater Control. Due to the shared circuitry similar DTCs can set at the same time for multiple actuators depending upon the type of short, its location, and the direction the actuator is moving when the short is present.

Diagnostic Test

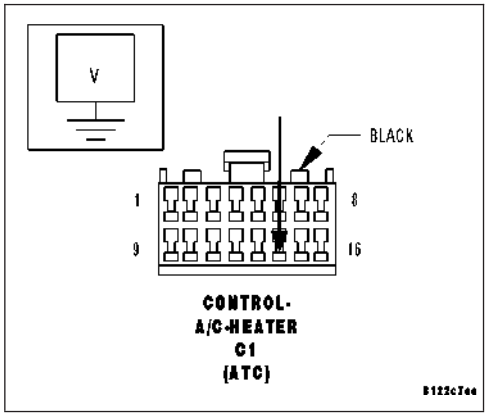
1. CHECK (C61) FRONT BLEND DOOR DRIVER CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

Measure the voltage of the (C61) Front Blend Door Driver circuit.



Is the voltage above 0.2 volts?

Yes >> Repair the (C61) Front Blend Door Driver circuit for a short to voltage.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 2

B104E–BLEND DOOR CONTROL CIRCUIT HIGH (ATC) (CONTINUED)

2. RUN THE ACTUATOR DTC DETECTION TEST

Turn the ignition off.

Reconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

With the scan tool in HVAC, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

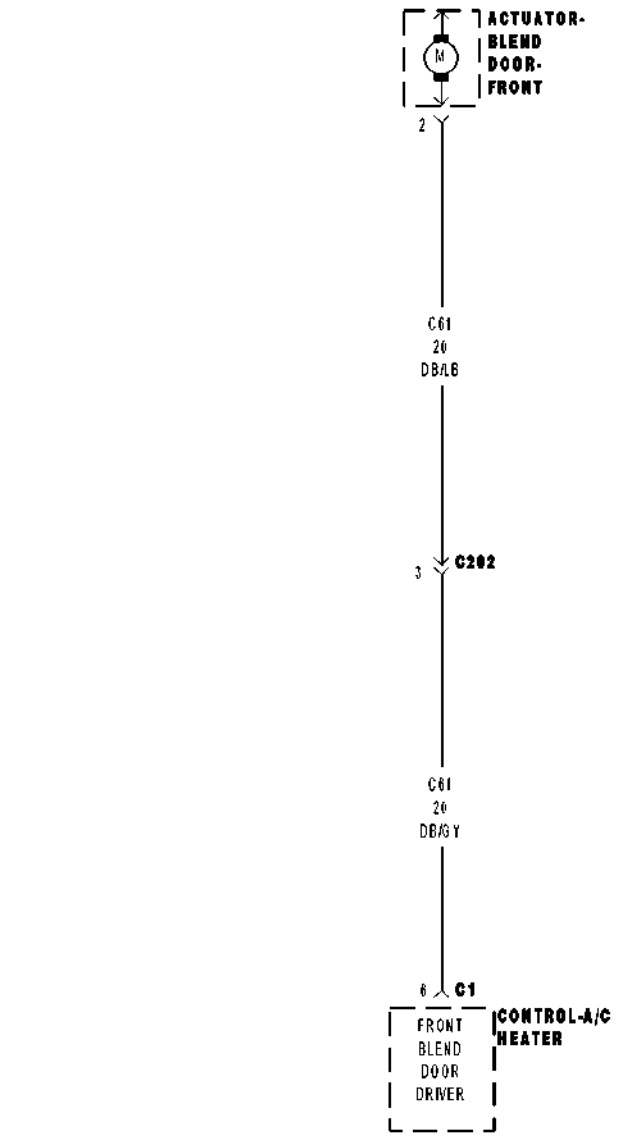
Does the scan tool only display: B104E–BLEND DOOR CONTROL CIRCUIT HIGH?

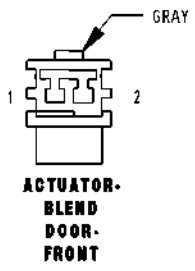
Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

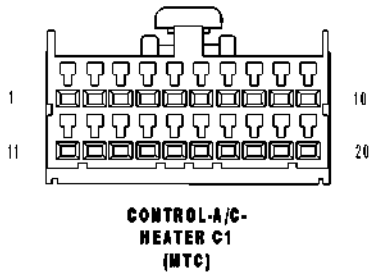
No, Other DTC(s) Displayed
Diagnose and repair the other DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs and then all short low DTCs. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No, And No Other DTCs Displayed
Using the wiring diagram as a guide, inspect the wiring and connectors for conditions causing an intermittent short. Repair as necessary.
Perform BODY VERIFICATION TEST - VER 1.

B104E–BLEND DOOR CONTROL CIRCUIT HIGH (MTC)







B14539a3

B104E–BLEND DOOR CONTROL CIRCUIT HIGH (MTC) (CONTINUED)

For the Manual Temperature Control (MTC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the Actuator DTC Detection Test is executed.
- **Set Condition:**
  If the (C61) Front Blend Door Driver circuit is shorted to voltage.

Possible Causes
(C61) FRONT BLEND DOOR DRIVER CIRCUIT SHORTED TO VOLTAGE
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control drives the Front Blend Door Actuator via the (C61) Front Blend Door Driver circuit and the (C34) Front Common Door Driver circuit. All of the front door actuators share the (C34) Front Common Door Driver circuit. Inside the A/C Heater Control, each door actuator has its own unique driver, but all share a single common door driver circuit. Due to the shared circuitry similar DTCs can set at the same time for multiple actuators depending upon the type of short, its location, and the direction the actuator is moving when the short is present.

Diagnostic Test

1. CHECK (C61) FRONT BLEND DOOR DRIVER CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

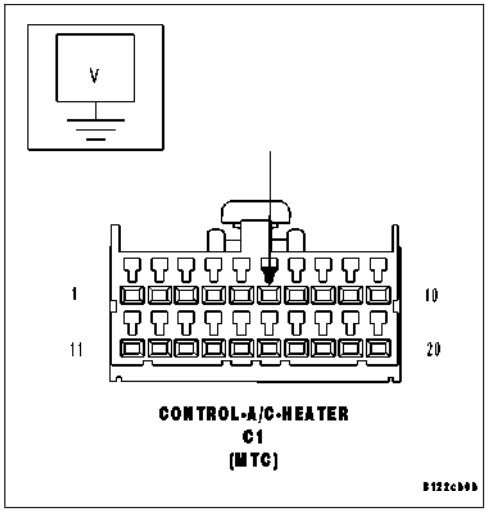
Turn the ignition on.

Measure the voltage of the (C61) Front Blend Door Driver circuit.

Is the voltage above 0.2 volts?

Yes >> Repair the (C61) Front Blend Door Driver circuit for a short to voltage.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 2



B104E–BLEND DOOR CONTROL CIRCUIT HIGH (MTC) (CONTINUED)

2. RUN THE ACTUATOR DTC DETECTION TEST

Turn the ignition off.

Reconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

With the scan tool in HVAC, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

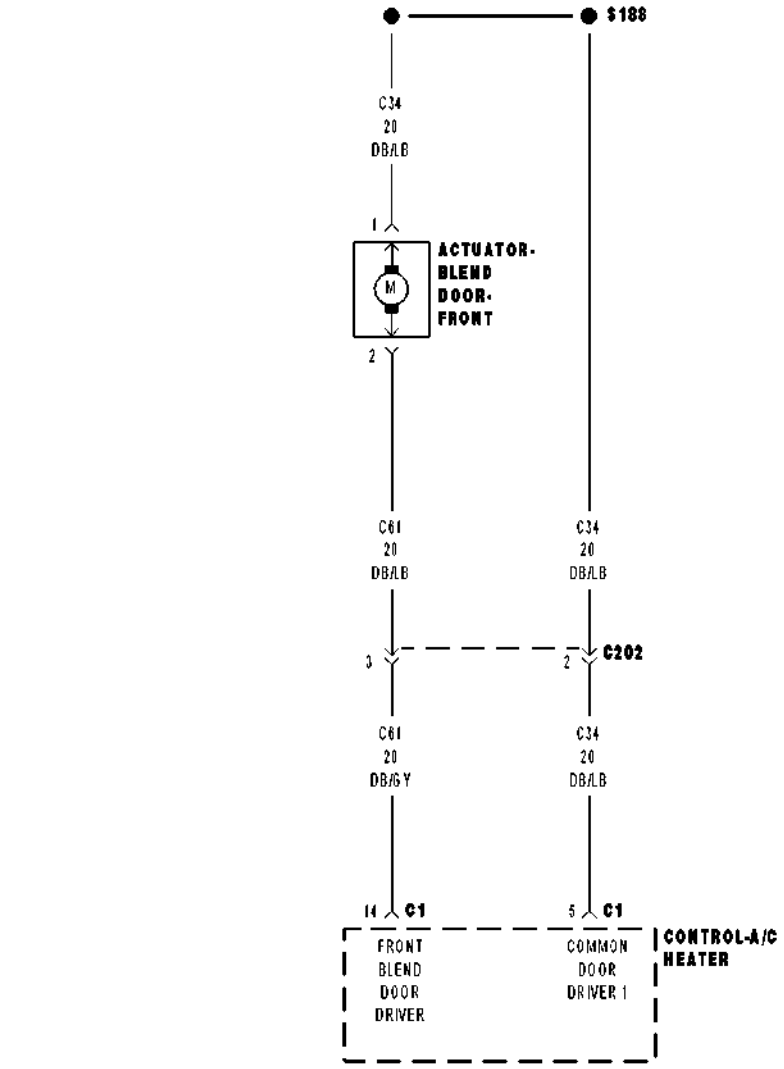
Does the scan tool only display: B104E–BLEND DOOR CONTROL CIRCUIT HIGH?

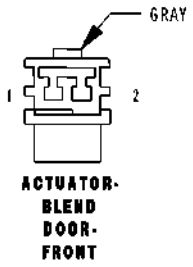
Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

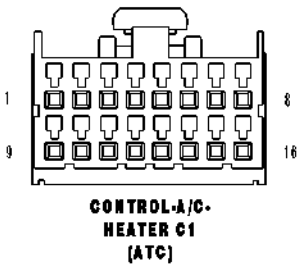
No, Other DTC(s) Displayed
Diagnose and repair the other DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs and then all short low DTCs. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No, And No Other DTCs Displayed
Using the wiring diagram as a guide, inspect the wiring and connectors for conditions causing an intermittent short. Repair as necessary.
Perform BODY VERIFICATION TEST - VER 1.

B104F–BLEND DOOR CONTROL CIRCUIT OPEN (ATC)







B1653a06

B104F–BLEND DOOR CONTROL CIRCUIT OPEN (ATC) (CONTINUED)

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Front Blend Door Actuator's electrical circuit is open. This DTC has a maturing time of 5 seconds and a de-maturing time of 10 seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

Possible Causes
(C61) FRONT BLEND DOOR DRIVER CIRCUIT OPEN
(C34) COMMON DOOR DRIVER 1 CIRCUIT OPEN
FRONT BLEND DOOR ACTUATOR
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control drives the Front Blend Door Actuator via the (C61) Front Blend Door Driver circuit and the (C34) Common Door Driver 1 circuit. The Front Blend Door Actuator and the Recirculation Door Actuator share the (C34) Common Door Driver 1 circuit and they share a driver inside the A/C Heater Control. Due to the shared circuitry similar DTCs can set at the same time for multiple actuators depending upon the location of the open circuit and the direction the actuator is moving when the open is present.

NOTE: DTC B104F must be active for the results of this test to be valid. Do not perform this test if DTC B104F is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

Diagnostic Test

1. CHECK FOR ACTIVE CONTROL CIRCUIT/PERFORMANCE DTCs

Turn the ignition on.

With the scan tool, read active HVAC DTCs.

Does the scan tool display any active: XXXX CONTROL CIRCUIT/PERFORMANCE DTCs?

Yes >> Diagnose and repair the DTC(s). If present, diagnose and repair all Rear Blend and Rear Mode Door Control Circuit/Performance DTCs first, then all other Control Circuit/Performance DTCs next. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No >> Go To 2

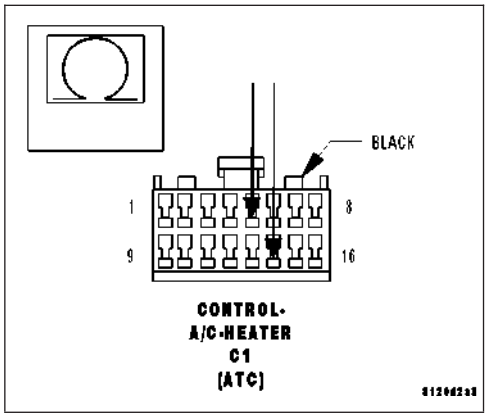
B104F–BLEND DOOR CONTROL CIRCUIT OPEN (ATC) (CONTINUED)

2. CHECK FRONT BLEND DOOR ACTUATOR CIRCUIT RESISTANCE

Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

Measure the resistance between the (C61) Front Blend Door Driver circuit and the (C34) Common Door Driver 1 circuit in the A/C Heater Control C1 harness connector.



Is the resistance above 70 ohms?

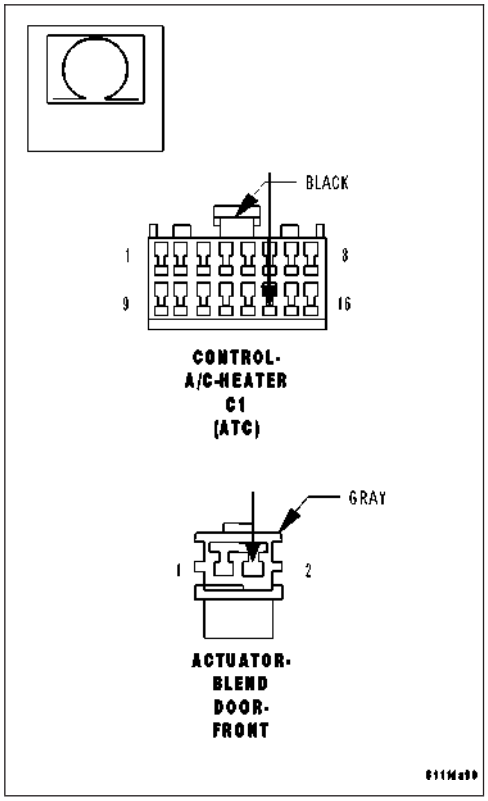
Yes >> Go To 3

No >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

3. CHECK (C61) FRONT BLEND DOOR DRIVER CIRCUIT FOR AN OPEN

Disconnect the Front Blend Door Actuator harness connector.

Measure the resistance of the (C61) Front Blend Door Driver circuit between the A/C Heater Control C1 harness connector and the Front Blend Door Actuator harness connector.



Is the resistance below 5.0 ohms?

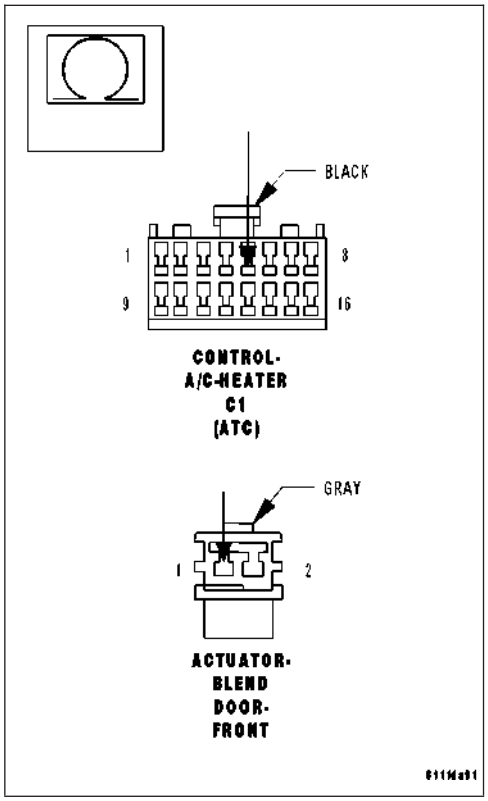
Yes >> Go To 4

No >> Repair the (C61) Front Blend Door Driver circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

B104F–BLEND DOOR CONTROL CIRCUIT OPEN (ATC) (CONTINUED)

4. CHECK (C34) COMMON DOOR DRIVER 1 CIRCUIT FOR AN OPEN

Measure the resistance of the (C34) Common Door Driver 1 circuit between the A/C Heater Control C1 harness connector and the Front Blend Door Actuator harness connector.

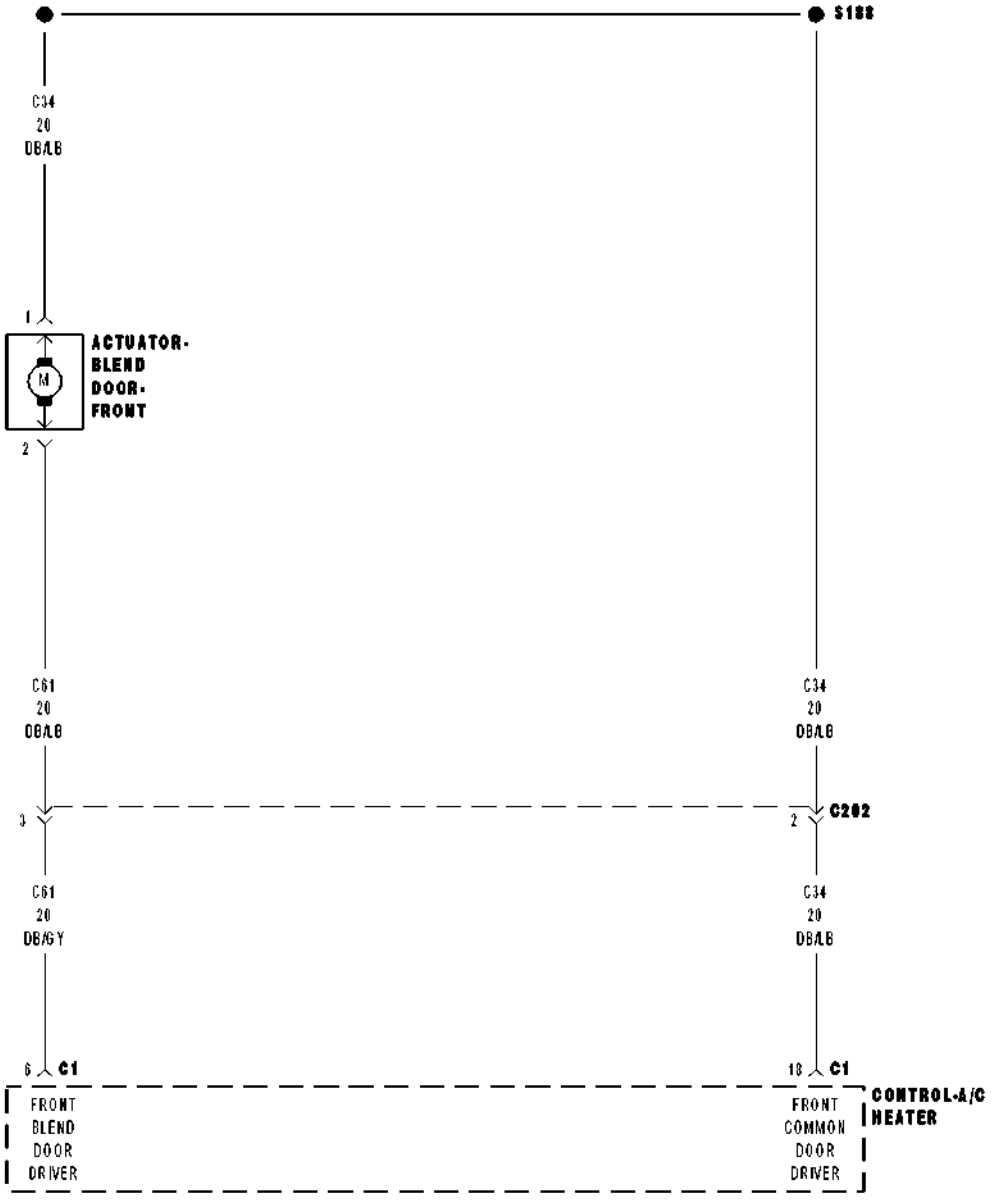


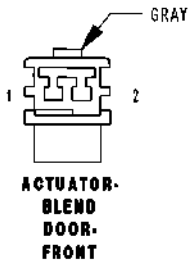
Is the resistance below 5.0 ohms?

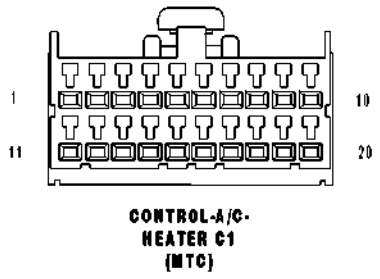
Yes >> Replace the Front Blend Door Actuator in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the (C34) Common Door Driver 1 circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

B104F–BLEND DOOR CONTROL CIRCUIT OPEN (MTC)







B1453a67

B104F–BLEND DOOR CONTROL CIRCUIT OPEN (MTC) (CONTINUED)

For the Manual Temperature Control (MTC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If Front Blend Door Actuator's electrical circuit is open. This DTC has a maturing time of 5 seconds and a de-maturing time of 10 seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

Possible Causes
(C61) FRONT BLEND DOOR DRIVER CIRCUIT OPEN
(C34) FRONT COMMON DOOR DRIVER CIRCUIT OPEN
FRONT BLEND DOOR ACTUATOR
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control drives the Front Blend Door Actuator via the (C61) Front Blend Door Driver circuit and the (C34) Front Common Door Driver circuit. All of the front door actuators share the (C34) Front Common Door Driver circuit. Inside the A/C Heater Control, each door actuator has its own unique driver, but all share a single common door driver circuit. Due to the shared circuitry similar DTCs can set at the same time for multiple actuators depending upon the location of the open circuit and the direction the actuator is moving when the open is present.

NOTE: DTC B104F must be active for the results of this test to be valid. Do not perform this test if DTC B104F is stored. Refer to HVAC System Test (MTC) for stored DTC test procedures.

Diagnostic Test

1. CHECK FOR ACTIVE CONTROL CIRCUIT/PERFORMANCE DTCs

Turn the ignition on.

With the scan tool, read active HVAC DTCs.

Does the scan tool display any active: XXXX CONTROL CIRCUIT/PERFORMANCE DTCs?

Yes >> Diagnose and repair the DTC(s). Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No >> Go To 2

B104F–BLEND DOOR CONTROL CIRCUIT OPEN (MTC) (CONTINUED)

2. CHECK FRONT BLEND DOOR ACTUATOR CIRCUIT RESISTANCE

Turn the ignition off.

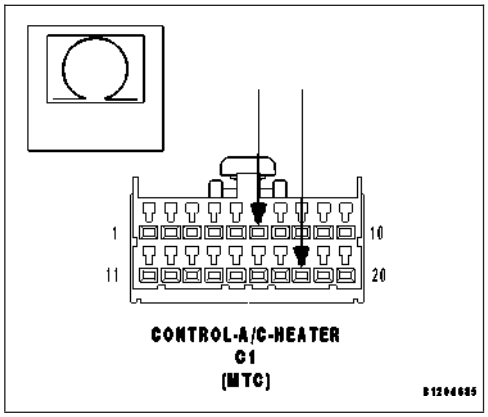
Disconnect the A/C Heater Control C1 harness connector.

Measure the resistance between the (C61) Front Blend Door Driver circuit and the (C34) Front Common Door Driver circuit in the A/C Heater Control C1 harness connector.

Is the resistance above 70 ohms?

Yes >> Go To 3

No >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.



3. CHECK (C61) FRONT BLEND DOOR DRIVER CIRCUIT FOR AN OPEN

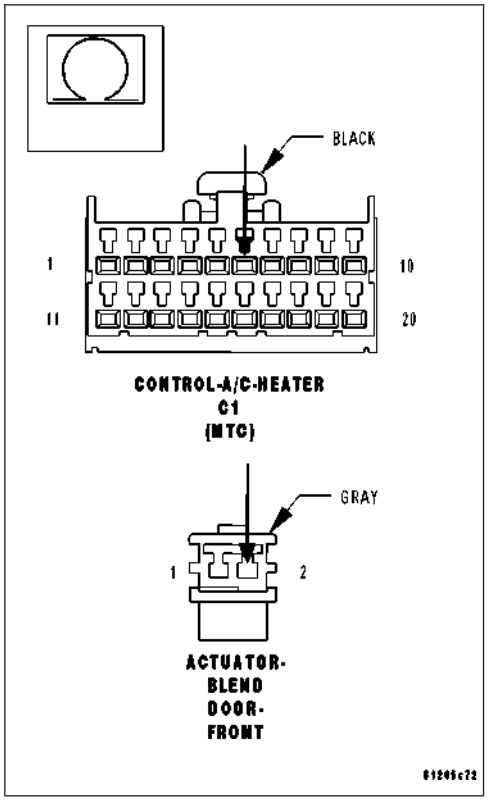
Disconnect the Front Blend Door Actuator harness connector.

Measure the resistance of the (C61) Front Blend Door Driver circuit between the A/C Heater Control C1 harness connector and the Front Blend Door Actuator harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 4

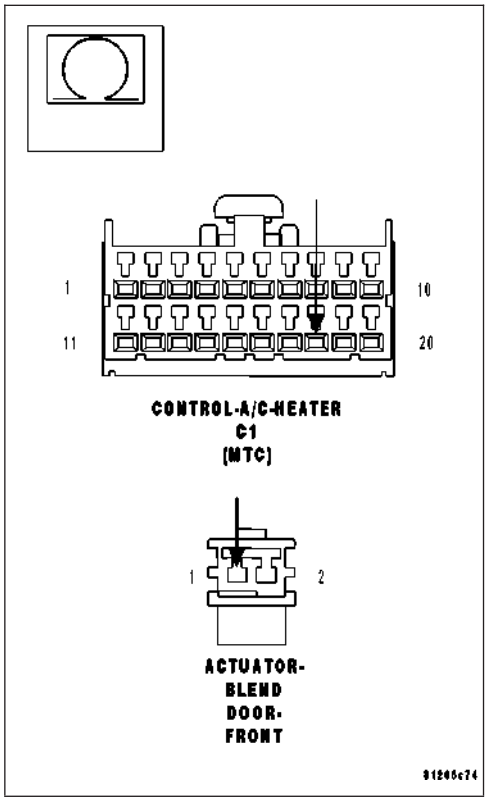
No >> Repair the (C61) Front Blend Door Driver circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.



B104F–BLEND DOOR CONTROL CIRCUIT OPEN (MTC) (CONTINUED)

4. CHECK (C34) FRONT COMMON DOOR DRIVER CIRCUIT FOR AN OPEN

Measure the resistance of the (C34) Front Common Door Driver circuit between the A/C Heater Control C1 harness connector and the Front Blend Door Actuator harness connector.

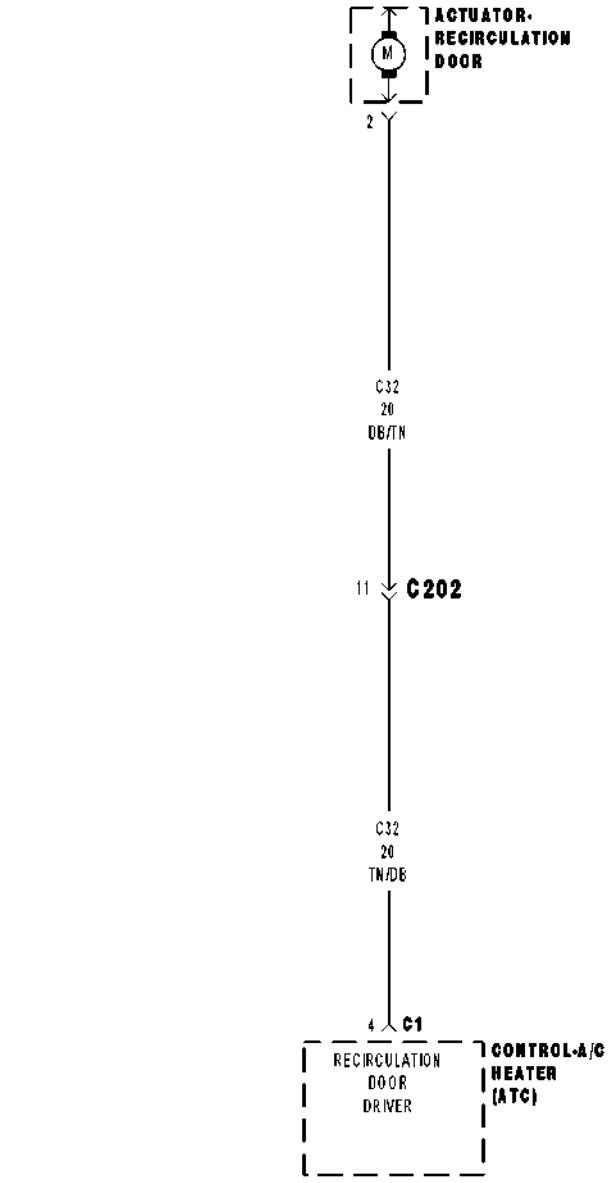


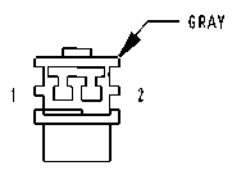
Is the resistance below 5.0 ohms?

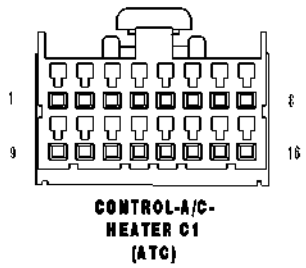
Yes >> Replace the Front Blend Door Actuator in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the (C34) Front Common Door Driver circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

B105A–RECIRCULATION DOOR CONTROL CIRCUIT HIGH (ATC)







91493ac1

B105A–RECIRCULATION DOOR CONTROL CIRCUIT HIGH (ATC) (CONTINUED)

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the Actuator DTC Detection Test is executed.
- **Set Condition:**
  If the (C32) Recirculation Door Driver circuit is shorted to voltage.

Possible Causes
(C32) RECIRCULATION DOOR DRIVER CIRCUIT SHORTED TO VOLTAGE
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control drives the Recirculation Door Actuator via the (C32) Recirculation Door Driver circuit and the (C34) Common Door Driver 1 circuit. The Recirculation Door Actuator and the Front Blend Door Actuator share the (C34) Common Door Driver 1 circuit and they share a driver inside the A/C Heater Control. Due to the shared circuitry similar DTCs can set at the same time for multiple actuators depending upon the type of short, its location, and the direction the actuator is moving when the short is present.

Diagnostic Test

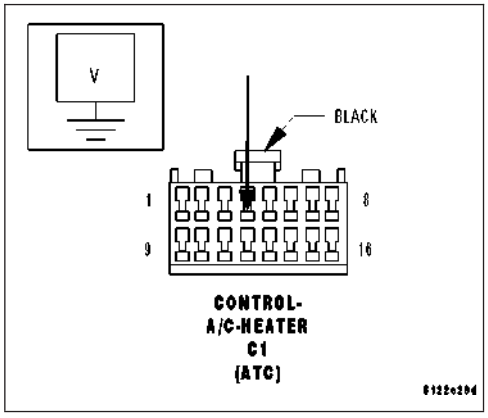
1. CHECK (C32) RECIRCULATION DOOR DRIVER CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

Measure the voltage of the (C32) Recirculation Door Driver circuit.



Is the voltage above 0.2 volts?

Yes >> Repair the (C32) Recirculation Door Driver circuit for a short to voltage.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 2

B105A–RECIRCULATION DOOR CONTROL CIRCUIT HIGH (ATC) (CONTINUED)

2. RUN THE ACTUATOR DTC DETECTION TEST

Turn the ignition off.

Reconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

With the scan tool in HVAC, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

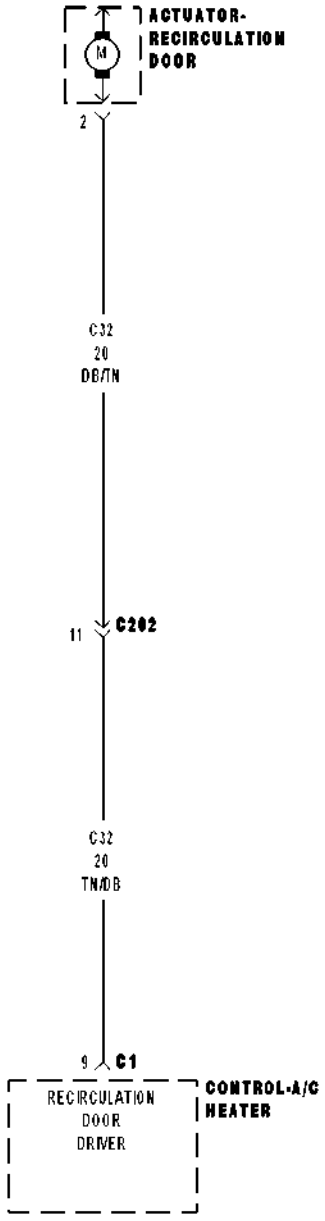
Does the scan tool only display: B105A–RECIRCULATION DOOR CONTROL CIRCUIT HIGH?

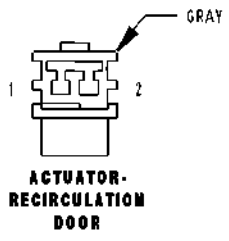
Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No, Other DTC(s) Displayed
Diagnose and repair the other DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs and then all short low DTCs. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

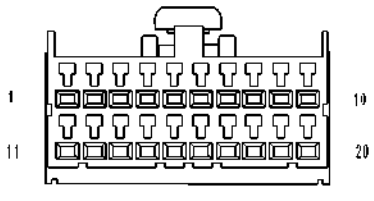
No, And No Other DTCs Displayed
Using the wiring diagram as a guide, inspect the wiring and connectors for conditions causing an intermittent short. Repair as necessary.
Perform BODY VERIFICATION TEST - VER 1.

B105A–RECIRCULATION DOOR CONTROL CIRCUIT HIGH (MTC)





ACTUATOR-
RECIRCULATION
DOOR



CONTROL-A/C-
HEATER C1
(MTC)

B1653B9

B105A–RECIRCULATION DOOR CONTROL CIRCUIT HIGH (MTC) (CONTINUED)

For the Manual Temperature Control (MTC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the Actuator DTC Detection Test is executed.
- **Set Condition:**
  If the (C32) Recirculation Door Driver circuit is shorted to voltage.

Possible Causes
(C32) RECIRCULATION DOOR DRIVER CIRCUIT SHORTED TO VOLTAGE
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control drives the Recirculation Door Actuator via the (C32) Recirculation Door Driver circuit and the (C34) Front Common Door Driver circuit. All of the front door actuators share the (C34) Front Common Door Driver circuit. Inside the A/C Heater Control, each door actuator has its own unique driver, but all share a single common door driver circuit. Due to the shared circuitry similar DTCs can set at the same time for multiple actuators depending upon the type of short, its location, and the direction the actuator is moving when the short is present.

Diagnostic Test

1. CHECK (C32) RECIRCULATION DOOR DRIVER CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

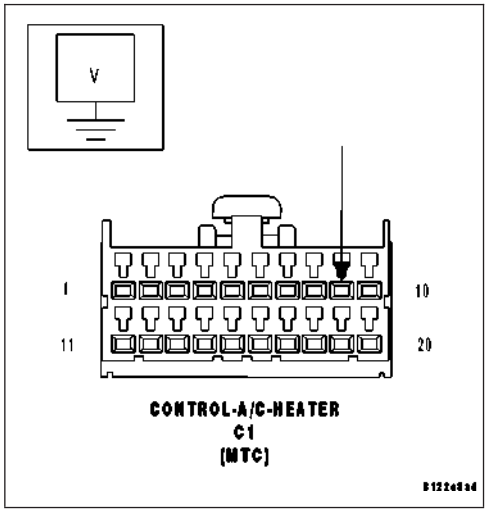
Turn the ignition on.

Measure the voltage of the (C32) Recirculation Door Driver circuit.

Is the voltage above 0.2 volts?

Yes >> Repair the (C32) Recirculation Door Driver circuit for a short to voltage.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 2



B105A–RECIRCULATION DOOR CONTROL CIRCUIT HIGH (MTC) (CONTINUED)

2. RUN THE ACTUATOR DTC DETECTION TEST

Turn the ignition off.

Reconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

With the scan tool in HVAC, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

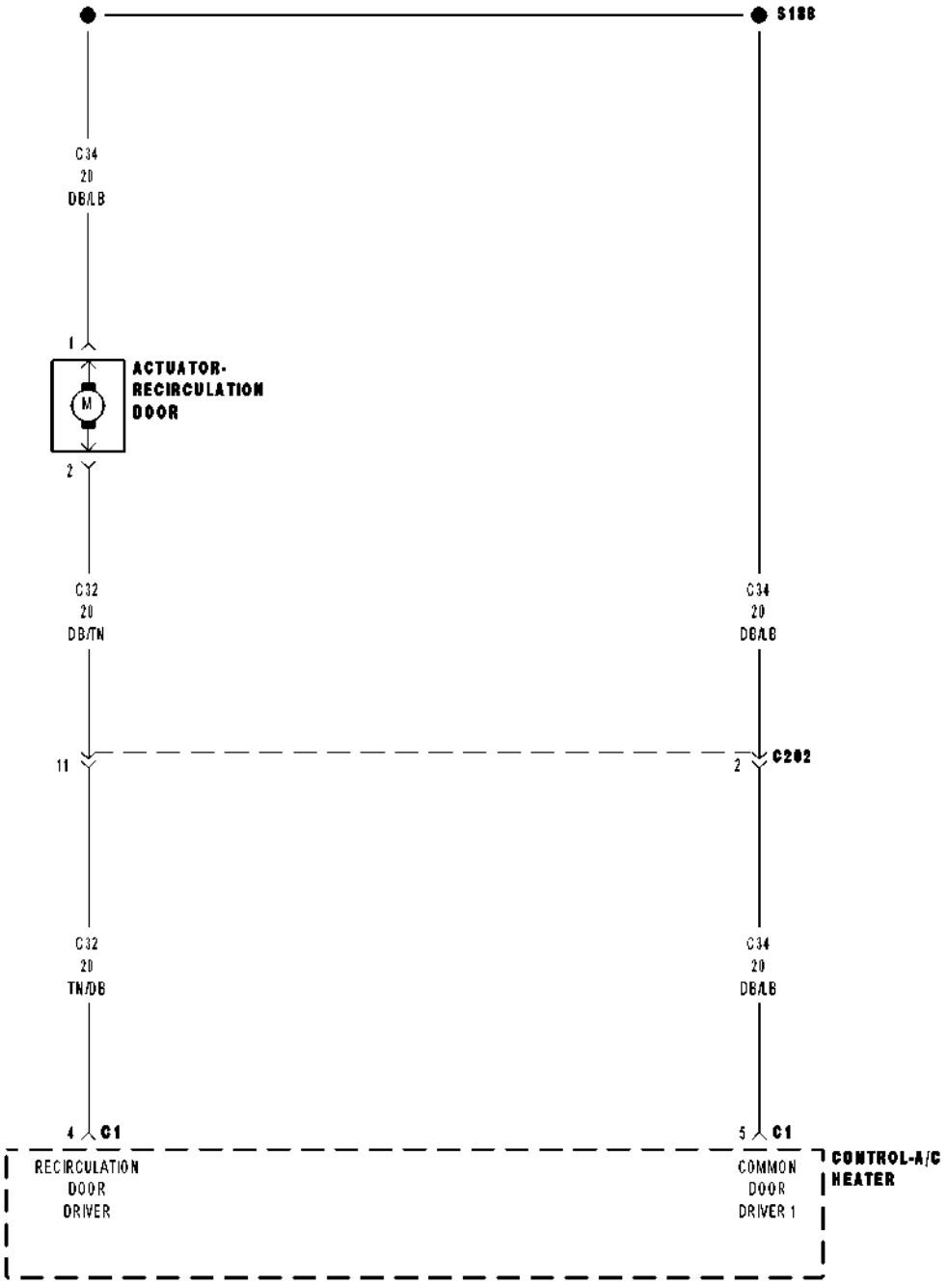
Does the scan tool only display: B105A–RECIRCULATION DOOR CONTROL CIRCUIT HIGH?

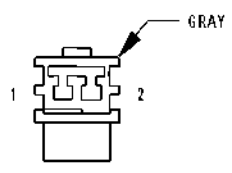
Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

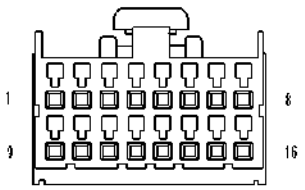
No, Other DTC(s) Displayed
Diagnose and repair the other DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs and then all short low DTCs. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No, And No Other DTCs Displayed
Using the wiring diagram as a guide, inspect the wiring and connectors for conditions causing an intermittent short. Repair as necessary.
Perform BODY VERIFICATION TEST - VER 1.

B105B–RECIRCULATION DOOR CONTROL CIRCUIT OPEN (ATC)







B1453bbc

B105B–RECIRCULATION DOOR CONTROL CIRCUIT OPEN (ATC) (CONTINUED)

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Recirculation Door Actuator's electrical circuit is open. This DTC has a maturing time of 5 seconds and a de-maturing time of 10 seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

Possible Causes
(C32) RECIRCULATION DOOR DRIVER CIRCUIT OPEN
(C34) COMMON DOOR DRIVER 1 CIRCUIT OPEN
RECIRCULATION DOOR ACTUATOR
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control drives the Recirculation Door Actuator via the (C32) Recirculation Door Driver circuit and the (C34) Common Door Driver 1 circuit. The Recirculation Door Actuator and the Front Blend Door Actuator share the (C34) Common Door Driver 1 circuit and they share a driver inside the A/C Heater Control. Due to the shared circuitry similar DTCs can set at the same time for multiple actuators depending upon the location of the open circuit and the direction the actuator is moving when the open is present.

NOTE: DTC B105B must be active for the results of this test to be valid. Do not perform this test if DTC B105B is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

Diagnostic Test

1. CHECK FOR ACTIVE CONTROL CIRCUIT/PERFORMANCE DTCs

Turn the ignition on.

With the scan tool, read active HVAC DTCs.

Does the scan tool display any active: XXXX CONTROL CIRCUIT/PERFORMANCE DTCs?

Yes >> Diagnose and repair the DTC(s). If present, diagnose and repair all Rear Blend and Rear Mode Door Control Circuit/Performance DTCs first, then all other Control Circuit/Performance DTCs next. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No >> Go To 2

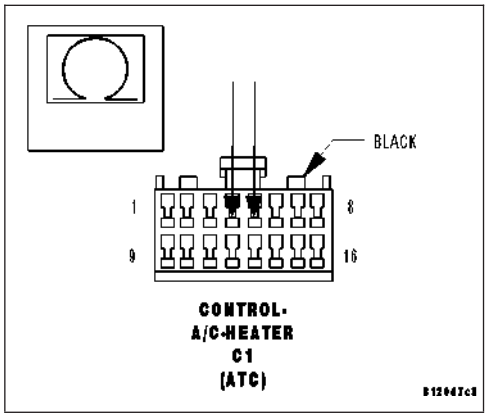
B105B–RECIRCULATION DOOR CONTROL CIRCUIT OPEN (ATC) (CONTINUED)

2. CHECK RECIRCULATION DOOR ACTUATOR CIRCUIT RESISTANCE

Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

Measure the resistance between the (C32) Recirculation Door Driver circuit and the (C34) Common Door Driver 1 circuit in the A/C Heater Control C1 harness connector.



Is the resistance above 70 ohms?

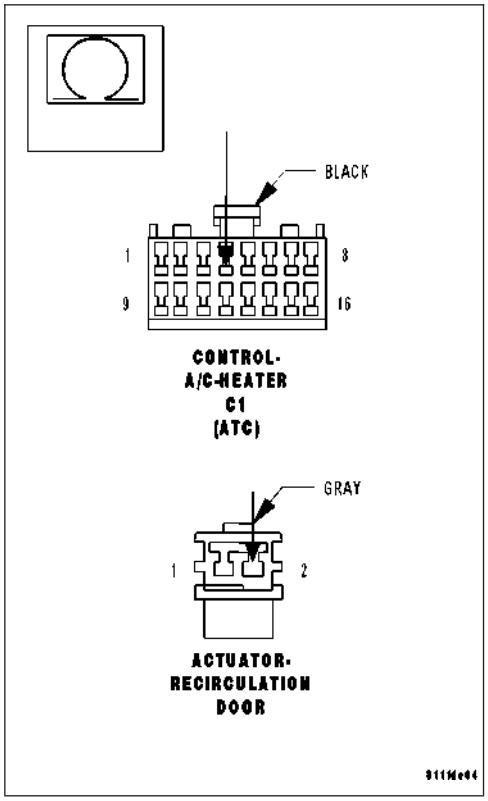
Yes >> Go To 3

No >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

3. CHECK (C32) RECIRCULATION DOOR DRIVER CIRCUIT FOR AN OPEN

Disconnect the Recirculation Door Actuator harness connector.

Measure the resistance of the (C32) Recirculation Door Driver circuit between the A/C Heater Control C1 harness connector and the Recirculation Door Actuator harness connector.



Is the resistance below 5.0 ohms?

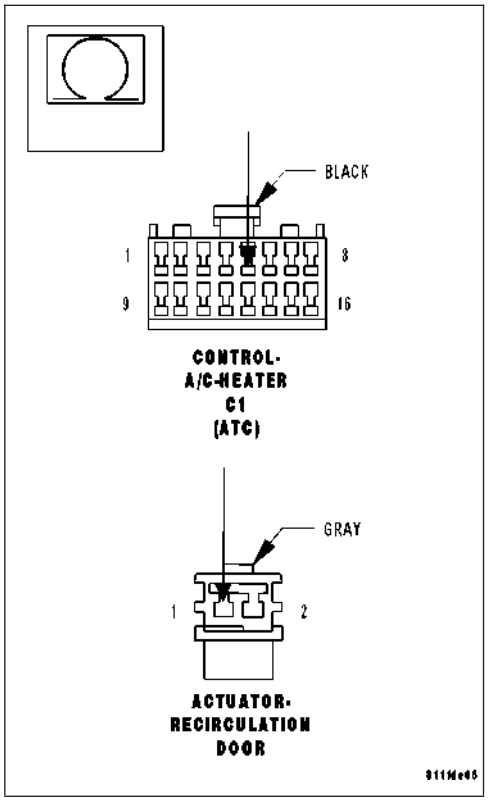
Yes >> Go To 4

No >> Repair the (C32) Recirculation Door Driver circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

B105B–RECIRCULATION DOOR CONTROL CIRCUIT OPEN (ATC) (CONTINUED)

4. CHECK (C34) COMMON DOOR DRIVER 1 CIRCUIT FOR AN OPEN

Measure the resistance of the (C34) Common Door Driver 1 circuit between the A/C Heater Control C1 harness connector and the Recirculation Door Actuator harness connector.

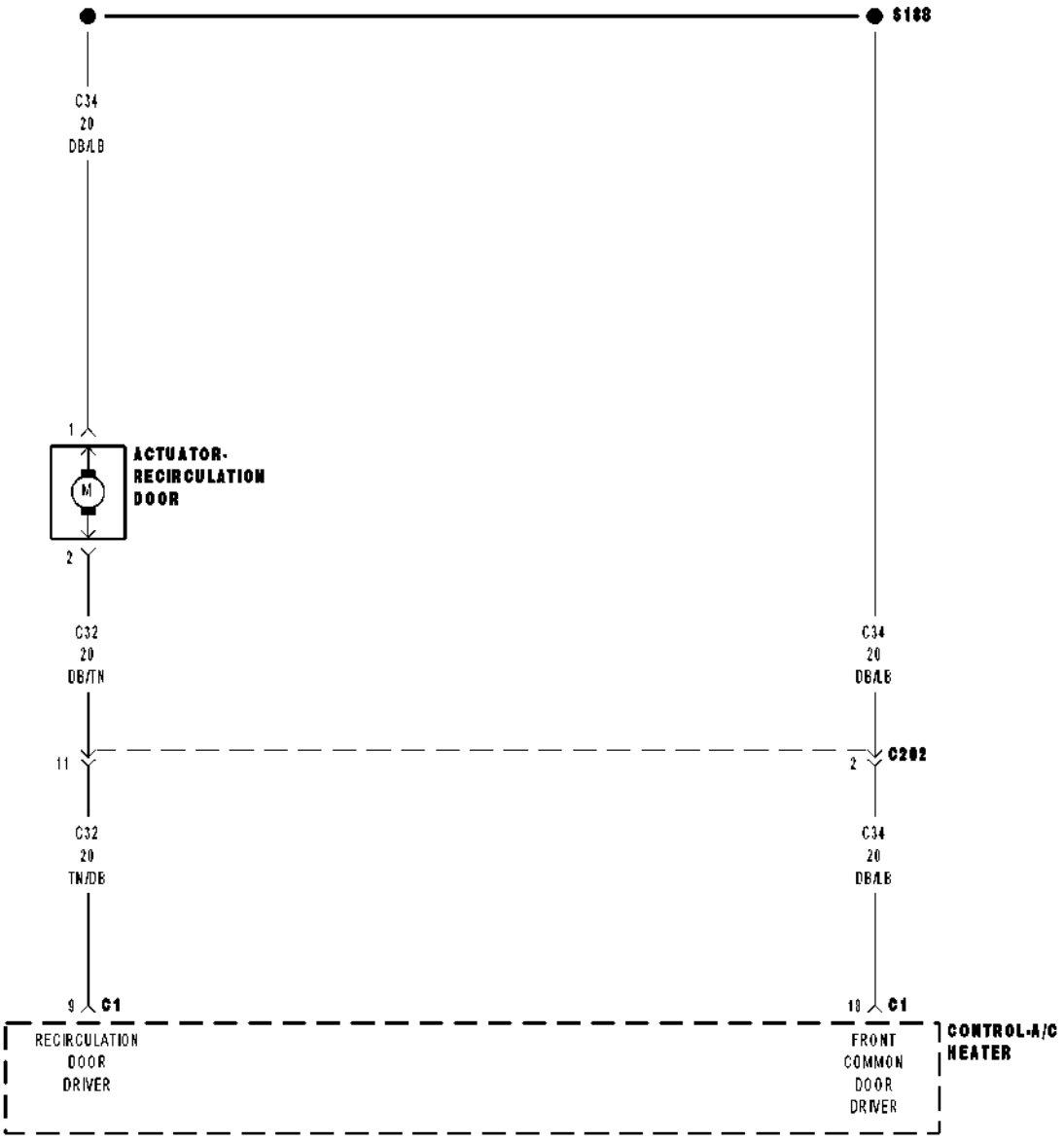


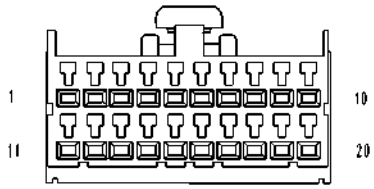
Is the resistance below 5.0 ohms?

Yes >> Replace the Recirculation Door Actuator in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

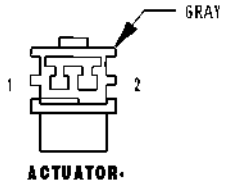
No >> Repair the (C34) Common Door Driver 1 circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

B105B–RECIRCULATION DOOR CONTROL CIRCUIT OPEN (MTC)





CONTROL-A/C-
HEATER C1
(MTC)



ACTUATOR-
RECIRCULATION
DOOR

B105B–RECIRCULATION DOOR CONTROL CIRCUIT OPEN (MTC) (CONTINUED)

For the Manual Temperature Control (MTC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If Recirculation Door Actuator's electrical circuit is open. This DTC has a maturing time of 5 seconds and a de-maturing time of 10 seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

Possible Causes
(C32) RECIRCULATION DOOR DRIVER CIRCUIT OPEN
(C34) FRONT COMMON DOOR DRIVER CIRCUIT OPEN
RECIRCULATION DOOR ACTUATOR
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control drives the Recirculation Door Actuator via the (C32) Recirculation Door Driver circuit and the (C34) Front Common Door Driver circuit. All of the front door actuators share the (C34) Front Common Door Driver. Inside the A/C Heater Control, each door actuator has its own unique driver, but all share a single common door driver circuit. Due to the shared circuitry similar DTCs can set at the same time for multiple actuators depending upon the location of the open circuit and the direction the actuator is moving when the open is present.

NOTE: DTC B105B must be active for the results of this test to be valid. Do not perform this test if DTC B105B is stored. Refer to HVAC System Test (MTC) for stored DTC test procedures.

Diagnostic Test

1. CHECK FOR ACTIVE CONTROL CIRCUIT/PERFORMANCE DTCs

Turn the ignition on.

With the scan tool, read active HVAC DTCs.

Does the scan tool display any active: XXXX CONTROL CIRCUIT/PERFORMANCE DTCs?

Yes >> Diagnose and repair the DTC(s). Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No >> Go To 2

B105B–RECIRCULATION DOOR CONTROL CIRCUIT OPEN (MTC) (CONTINUED)

2. CHECK RECIRCULATION DOOR ACTUATOR CIRCUIT RESISTANCE

Turn the ignition off.

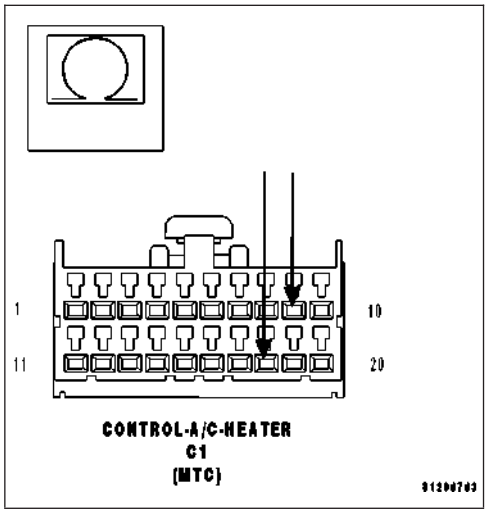
Disconnect the A/C Heater Control C1 harness connector.

Measure the resistance between the (C32) Recirculation Door Driver circuit and the (C34) Front Common Door Driver circuit in the A/C Heater Control C1 harness connector.

Is the resistance above 70 ohms?

Yes >> Go To 3

No >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.



3. CHECK (C32) RECIRCULATION DOOR DRIVER CIRCUIT FOR AN OPEN

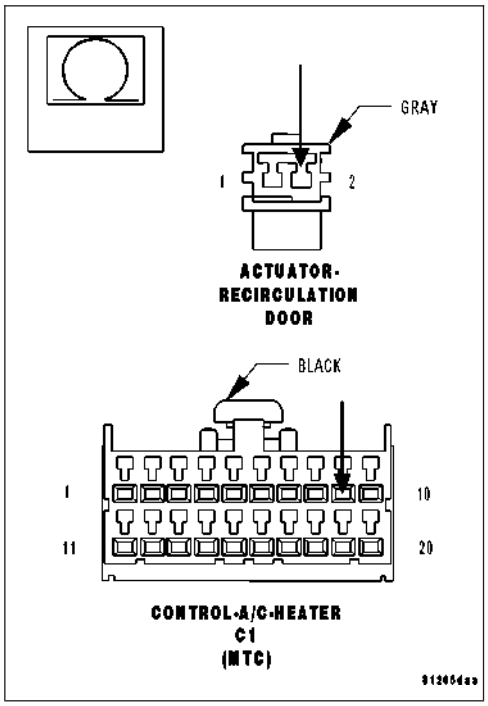
Disconnect the Recirculation Door Actuator harness connector.

Measure the resistance of the (C32) Recirculation Door Driver circuit between the A/C Heater Control C1 harness connector and the Recirculation Door Actuator harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 4

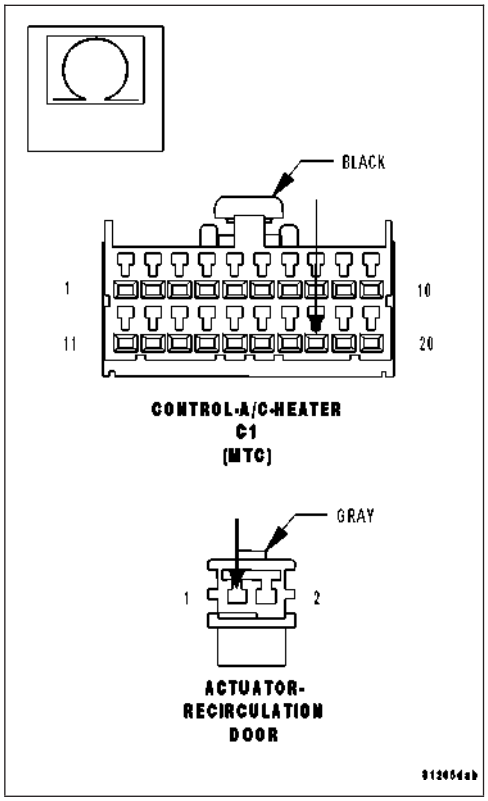
No >> Repair the (C32) Recirculation Door Driver circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.



B105B–RECIRCULATION DOOR CONTROL CIRCUIT OPEN (MTC) (CONTINUED)

4. CHECK (C34) FRONT COMMON DOOR DRIVER CIRCUIT FOR AN OPEN

Measure the resistance of the (C34) Front Common Door Driver circuit between the A/C Heater Control C1 harness connector and the Recirculation Door Actuator harness connector.



Is the resistance below 5.0 ohms?

Yes >> Replace the Recirculation Door Actuator in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the (C34) Front Common Door Driver circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

B105C–RECIRCULATION DOOR TRAVEL RANGE TOO SMALL (ATC & MTC)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  During actuator calibration.
- **Set Condition:**
  If the total span of the Recirculation Door is less than the low range limit.

Possible Causes
DOOR DRIVER ELECTRICAL CIRCUIT(S)
RECIRCULATION DOOR SEIZED, BINDING, OBSTRUCTED
RECIRCULATION DOOR ACTUATOR
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control calibrates each actuator individually. Automatic calibration occurs upon power up after installing a new A/C Heater Control. Manual calibration occurs by sending a command with the scan tool. The purpose of actuator calibration is to determine the total span of door travel between physical stops. To calibrate the actuator, the A/C Heater Control first moves the door to its soft stop, and then counts the number of pulses it takes to move the door to its other stop. An expected range of span is stored in the control's memory. If the measured calibration value is less than the expected range for this actuator, this DTC will set. Note that the control clears all stored calibration faults at the beginning of the calibration procedure.

Diagnostic Test

1. CHECK FOR ACTIVE CONTROL CIRCUIT/PERFORMANCE & CONTROL CIRCUIT OPEN DTCs

Turn the ignition on.

With the scan tool, read active HVAC DTCs.

Does the scan tool display any active: XXXX CONTROL CIRCUIT/PERFORMANCE or XXXX CONTROL CIRCUIT OPEN DTCs?

Yes (ATC)
Diagnose and repair the DTC(s). If present, diagnose and repair all Rear Blend and Rear Mode Door Control Circuit/Performance DTCs first, all other Control Circuit/Performance DTCs second, and all Control Circuit Open DTCs last. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

Yes (MTC)
Diagnose and repair the DTC(s). Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No >> Go To 2

---

2. RUN THE ACTUATOR DTC DETECTION TEST

With the scan tool in HVAC, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

Does the scan tool display any DTCs?

Yes >> Diagnose and repair the DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs first, all short low DTCs second, and all open DTCs last. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No >> Go To 3

B105C–RECIRCULATION DOOR TRAVEL RANGE TOO SMALL (ATC & MTC) (CONTINUED)

3. INSPECT ACTUATOR & HOUSING ASSEMBLY FOR A CONDITION CAUSING THE DOOR TO SEIZE OR BIND

Turn the ignition off.

Inspect the actuator and the housing assembly for a condition causing the door to seize or bind.

Are there any physical or mechanical problems with the door, housing, or actuator?

Yes >> Repair as necessary in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 4

---

4. CHECK RECIRCULATION DOOR TRAVEL

Remove the Recirculation Door Actuator from the A/C Heater Housing Assembly.

By hand, attempt to rotate the door in both directions. The door should operate smoothly in both directions over approximately 70 degrees of travel.

Does the door operate smoothly in both directions over approximately 70 degrees of travel?

Yes >> Replace the Recirculation Door Actuator in accordance with the Service Information. Then, Go To 5

No >> Repair as necessary in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

---

5. RUN ACTUATOR CALIBRATION TEST

Turn the ignition on.

With the scan tool, select System Tests and then select Actuator Calibration Test. When the test is complete, select View DTCs.

Does the scan tool display: B105C–RECIRCULATION DOOR TRAVEL RANGE TOO SMALL?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Perform BODY VERIFICATION TEST - VER 1.

B105D–RECIRCULATION DOOR TRAVEL RANGE TOO LARGE (ATC & MTC)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  During actuator calibration.
- **Set Condition:**
  If the total span of the Recirculation Door exceeds the high range limit.

Possible Causes
DOOR DRIVER ELECTRICAL CIRCUIT(S)
RECIRCULATION DOOR OR A/C HEATER HOUSING COMPONENTS WARPED, WORN, DAMAGED, MISSING, BROKEN
RECIRCULATION DOOR ACTUATOR
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control calibrates each actuator individually. Automatic calibration occurs upon power up after installing a new A/C Heater Control. Manual calibration occurs by sending a command with the scan tool. The purpose of actuator calibration is to determine the total span of door travel between physical stops. To calibrate the actuator, the A/C Heater Control first moves the door to its soft stop, and then counts the number of pulses it takes to move the door to its other stop. An expected range of span is stored in the control's memory. If the measured calibration value exceeds the expected range for this actuator, this DTC will set. Note that the control clears all stored calibration faults at the beginning of the calibration procedure.

Diagnostic Test

1. CHECK FOR ACTIVE CONTROL CIRCUIT/PERFORMANCE & CONTROL CIRCUIT OPEN DTCs

Turn the ignition on.

With the scan tool, read active HVAC DTCs.

Does the scan tool display any active: XXXX CONTROL CIRCUIT/PERFORMANCE or XXXX CONTROL CIRCUIT OPEN DTCs?

Yes (ATC)
Diagnose and repair the DTC(s). If present, diagnose and repair all Rear Blend and Rear Mode Door Control Circuit/Performance DTCs first, all other Control Circuit/Performance DTCs second, and all Control Circuit Open DTCs last. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

Yes (MTC)
Diagnose and repair the DTC(s). Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No >> Go To 2

---

2. RUN THE ACTUATOR DTC DETECTION TEST

With the scan tool in HVAC, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

Does the scan tool display any DTCs?

Yes >> Diagnose and repair the DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs first, all short low DTCs second, and all open DTCs last. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No >> Go To 3

B105D–RECIRCULATION DOOR TRAVEL RANGE TOO LARGE (ATC & MTC) (CONTINUED)

3. CHECK FOR A BROKEN RECIRCULATION DOOR ACTUATOR

Turn the ignition off.

Remove the Recirculation Door Actuator from the A/C Heater Housing Assembly.

By hand, attempt to rotate the actuator in both directions.

Does the actuator turn in either direction?

Yes >> Replace the Recirculation Door Actuator in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 4

---

4. CHECK RECIRCULATION DOOR & A/C HEATER HOUSING FOR WARPED, WORN, DAMAGED, MISSING, & BROKEN COMPONENTS

Inspect for a damaged or broken A/C Heater Housing Assembly, a warped, worn, or broken door, and missing door seals. Rotate the door from stop to stop. The door should rotate approximately 70 degrees.

Are there any physical or mechanical problems with the door or housing?

Yes >> Repair as necessary in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Recirculation Door Actuator in accordance with the Service Information. Then, Go To 5.

---

5. RUN ACTUATOR CALIBRATION TEST

Turn the ignition on.

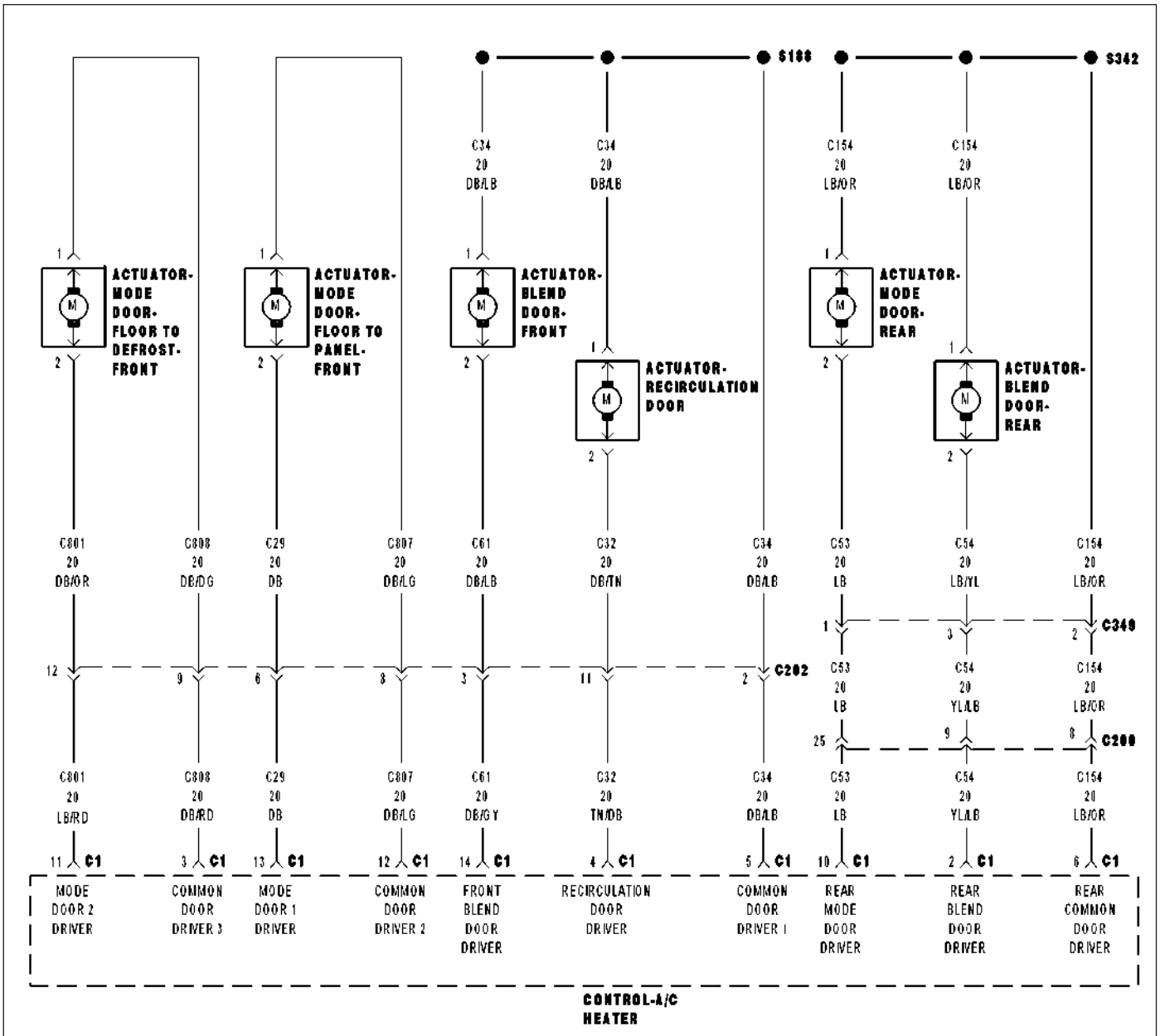
With the scan tool, select System Tests and then select Actuator Calibration Test. When the test is complete, select View DTCs.

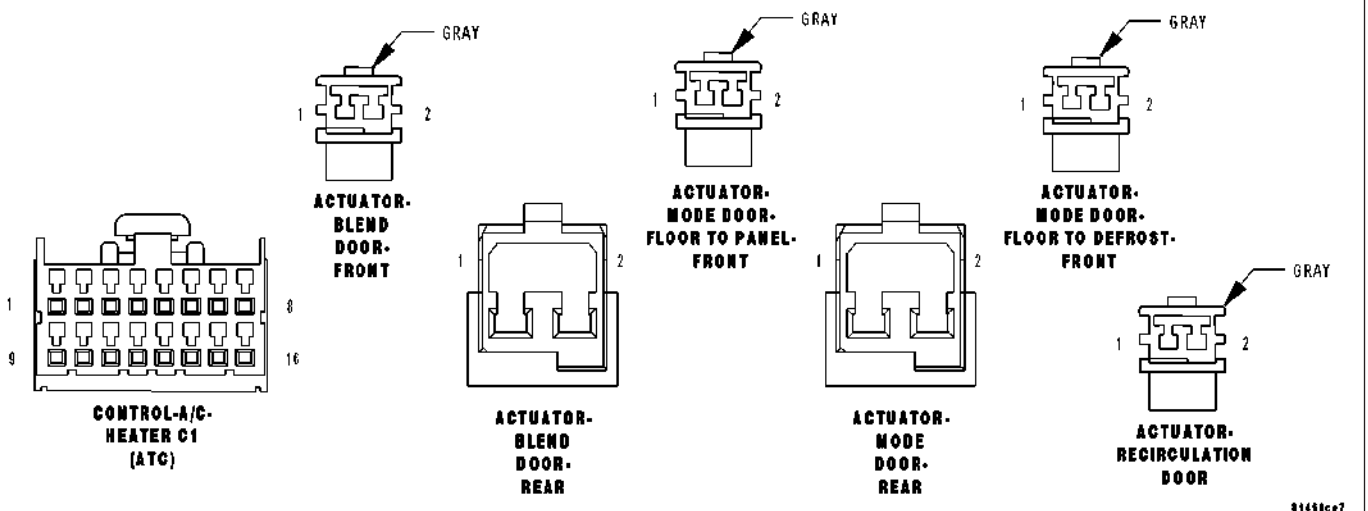
Does the scan tool display: B105D–RECIRCULATION DOOR TRAVEL RANGE TOO LARGE?

Yes >> Replace the A/C Heater Control in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1.

No >> Perform BODY VERIFICATION TEST - VER 1.

B105F–CLIMATE CONTROL MOTOR(S) COMMON 1 CONTROL CIRCUIT LOW (ATC)





B105F–CLIMATE CONTROL MOTOR(S) COMMON 1 CONTROL CIRCUIT LOW (ATC) (CONTINUED)

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the Actuator DTC Detection Test is executed.
- **Set Condition:**
  If the (C34) Common Door Driver 1 circuit is shorted to ground.

Possible Causes
(C34) COMMON DOOR DRIVER 1 CIRCUIT SHORTED TO GROUND
(C34) COMMON DOOR DRIVER 1 CIRCUIT SHORTED TO OTHER DOOR DRIVER CIRCUIT(S)
FRONT BLEND DOOR ACTUATOR
RECIRCULATION DOOR ACTUATOR
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control drives the Front Blend Door Actuator via the (C61) Front Blend Door Driver circuit and the (C34) Common Door Driver 1 circuit. The A/C Heater Control drives the Recirculation Door Actuator via the (C32) Recirculation Door Driver circuit and the (C34) Common Door Driver 1 circuit. The Front Blend Door Actuator and the Recirculation Door Actuator share the (C34) Common Door Driver 1 circuit and they share a driver inside the A/C Heater Control. Due to the shared circuitry similar DTCs can set at the same time for multiple actuators depending upon the type of short, its location, and the direction the actuator is moving when the short is present.

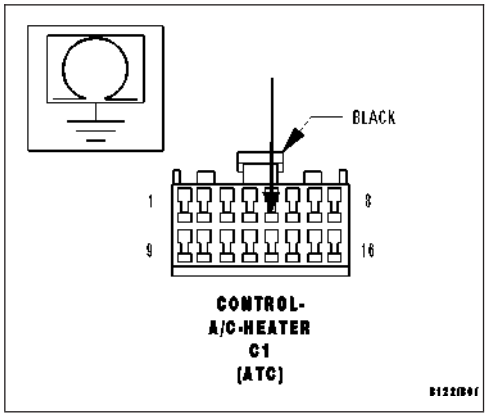
Diagnostic Test

1. CHECK (C34) COMMON DOOR DRIVER 1 CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

Measure the resistance of the (C34) Common Door Driver 1 circuit between ground and the A/C Heater Control C1 harness connector.



Is the resistance below 10k ohms?

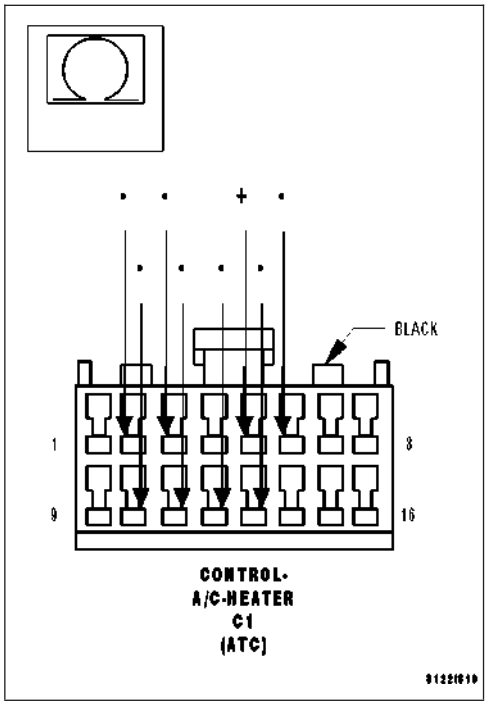
Yes >> Repair the (C34) Common Door Driver 1 circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 2

B105F–CLIMATE CONTROL MOTOR(S) COMMON 1 CONTROL CIRCUIT LOW (ATC) (CONTINUED)

2. CHECK (C34) COMMON DOOR DRIVER 1 CIRCUIT FOR A SHORT TO OTHER DOOR DRIVER CIRCUITS

Measure the resistance between the (C34) Common Door Driver 1 circuit and the (C54) Rear Blend Door Driver circuit, the (C808) Common Door Driver 3 circuit, the (C154) Rear Common Door Driver circuit, the (C53) Rear Mode Door Driver circuit, the (C801) Mode Door 2 Driver circuit, the (C807) Common Door Driver 2 circuit, and the (C29) Mode Door 1 Driver circuit in the A/C Heater Control C1 harness connector.



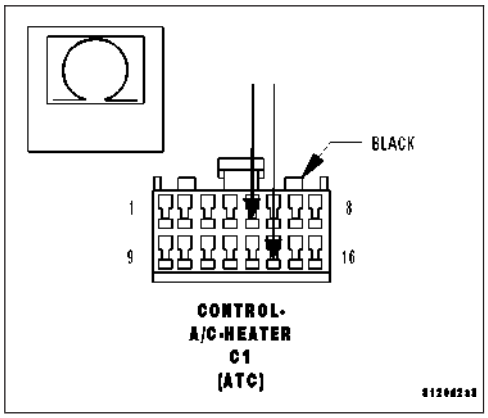
Is the resistance below 10k ohms between the (C34) Common Door Driver 1 circuit and any of the other door driver circuits?

Yes >> Repair the circuits with a resistance below 10k ohms for a short to the (C34) Common Door Driver 1 circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 3

3. CHECK FRONT BLEND DOOR ACTUATOR CIRCUIT RESISTANCE

Measure the resistance between the (C61) Front Blend Door Driver circuit and the (C34) Common Door Driver 1 circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 30 ohms?

Yes >> Go To 4

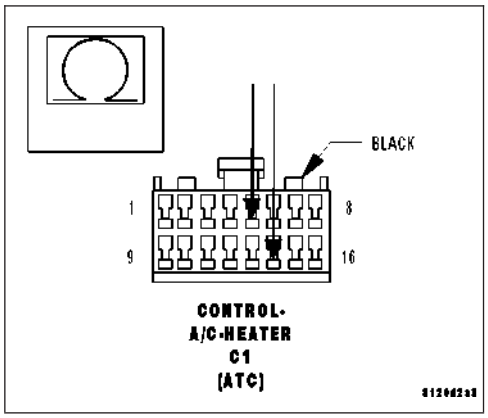
No >> Go To 5

B105F–CLIMATE CONTROL MOTOR(S) COMMON 1 CONTROL CIRCUIT LOW (ATC) (CONTINUED)

4. CHECK (C61) FRONT BLEND DOOR DRIVER CIRCUIT FOR A SHORT TO (C34) COMMON DOOR DRIVER 1 CIRCUIT

Disconnect the Front Blend Door Actuator harness connector.

Measure the resistance between the (C61) Front Blend Door Driver circuit and the (C34) Common Door Driver 1 circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 10k ohms?

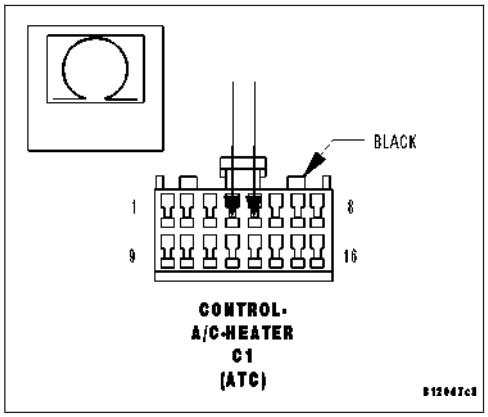
Yes >> Repair the (C61) Front Blend Door Driver Circuit for a short to the (C34) Common Door Driver 1 circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Front Blend Door Actuator in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

---

5. CHECK RECIRCULATION DOOR ACTUATOR CIRCUIT RESISTANCE

Measure the resistance between the (C32) Recirculation Door Driver circuit and the (C34) Common Door Driver 1 circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 30 ohms?

Yes >> Go To 6

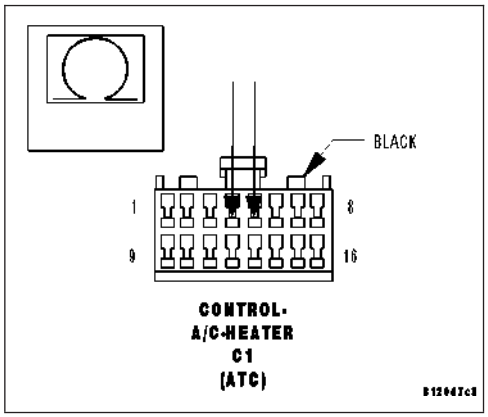
No >> Go To 7

---

6. CHECK (C32) RECIRCULATION DOOR DRIVER CIRCUIT FOR A SHORT TO (C34) COMMON DOOR DRIVER 1 CIRCUIT

Disconnect the Recirculation Door Actuator harness connector.

Measure the resistance between the (C32) Recirculation Door Driver circuit and the (C34) Common Door Driver 1 circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 10k ohms?

Yes >> Repair the (C32) Recirculation Door Driver circuit for a short to the (C34) Common Door Driver 1 circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Recirculation Door Actuator in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

B105F–CLIMATE CONTROL MOTOR(S) COMMON 1 CONTROL CIRCUIT LOW (ATC) (CONTINUED)

7. RUN THE ACTUATOR DTC DETECTION TEST

Reconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

With the scan tool in HVAC, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

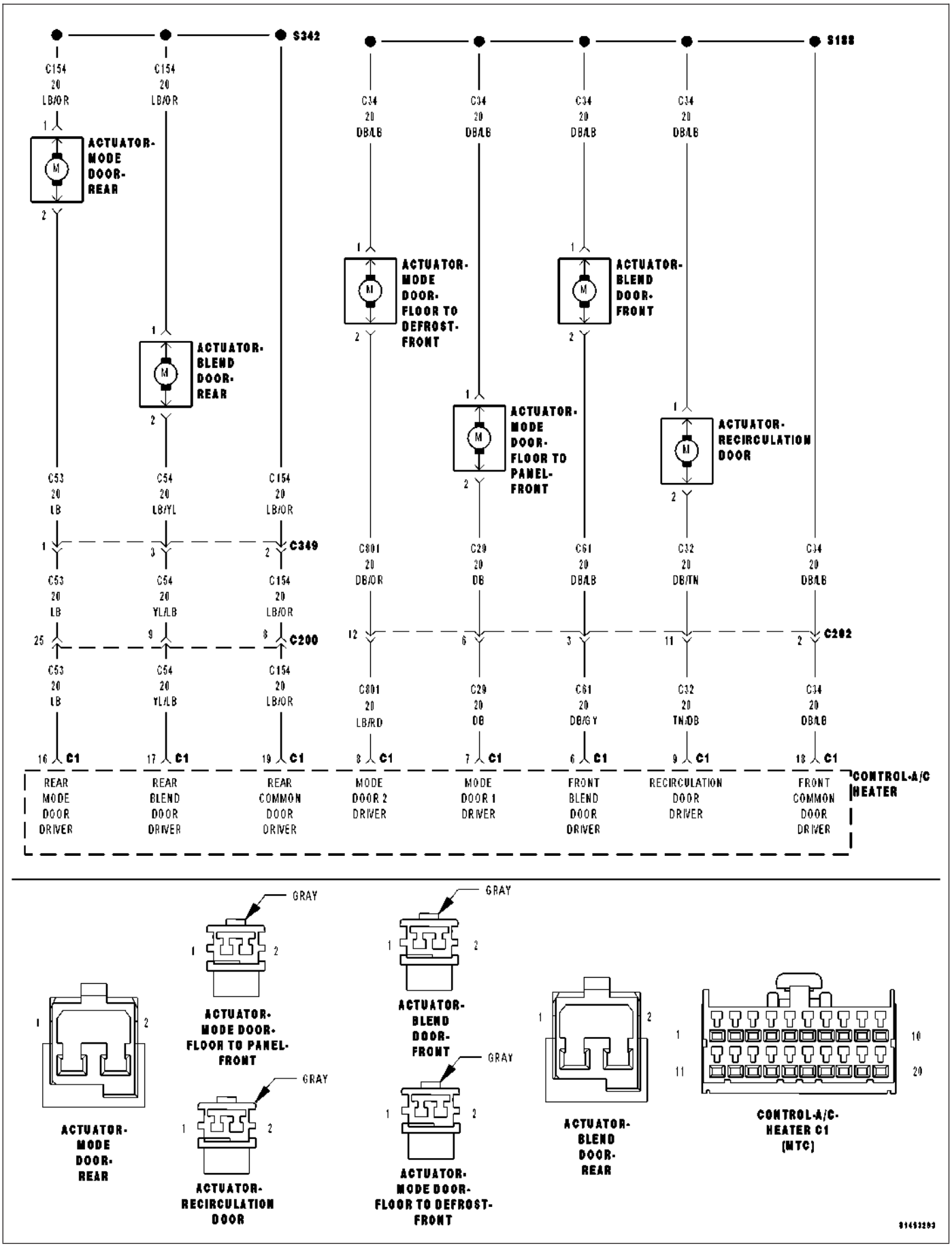
Does the scan tool only display: B105F–CLIMATE CONTROL MOTOR(S) COMMON 1 CONTROL CIRCUIT LOW?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No, Other DTC(s) Displayed
Diagnose and repair the other DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs and then all short low DTCs. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No, And No Other DTCs Displayed
Using the wiring diagram as a guide, inspect the wiring and connectors for conditions causing an intermittent short. Repair as necessary.
Perform BODY VERIFICATION TEST - VER 1.

B105F–CLIMATE CONTROL MOTOR(S) COMMON 1 CONTROL CIRCUIT LOW (MTC)



B105F–CLIMATE CONTROL MOTOR(S) COMMON 1 CONTROL CIRCUIT LOW (MTC) (CONTINUED)

For the Manual Temperature Control (MTC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the Actuator DTC Detection Test is executed.
- **Set Condition:**
  If the (C34) Front Common Door Driver circuit is shorted to ground.

Possible Causes
(C34) FRONT COMMON DOOR DRIVER CIRCUIT SHORTED TO GROUND
(C34) FRONT COMMON DOOR DRIVER CIRCUIT SHORTED TO OTHER DOOR DRIVER CIRCUIT(S)
FRONT BLEND DOOR ACTUATOR
MODE DOOR 1 (FLOOR TO PANEL) ACTUATOR
MODE DOOR 2 (FLOOR TO DEFROST) ACTUATOR
RECIRCULATION DOOR ACTUATOR
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control drives the Front Blend Door Actuator via the (C61) Front Blend Door Driver circuit and the (C34) Front Common Door Driver circuit. The A/C Heater Control drives the Mode Door 1 (Floor to Panel) Actuator via the (C29) Mode Door 1 Driver circuit and the (C34) Front Common Door Driver circuit. The A/C Heater Control drives the Mode Door 2 (Floor to Defrost) Actuator via the (C801) Mode Door 2 Driver circuit and the (C34) Front Common Door Driver circuit. The A/C Heater Control drives the Recirculation Door Actuator via the (C32) Recirculation Door Driver circuit and the (C34) Front Common Door Driver circuit. All of the front door actuators share the (C34) Front Common Door Driver circuit. Inside the A/C Heater Control, each door actuator has its own unique driver, but all share a single common door driver circuit. Due to the shared circuitry similar DTCs can set at the same time for multiple actuators depending upon the type of short, its location, and the direction the actuator is moving when the short is present.

B105F–CLIMATE CONTROL MOTOR(S) COMMON 1 CONTROL CIRCUIT LOW (MTC) (CONTINUED)

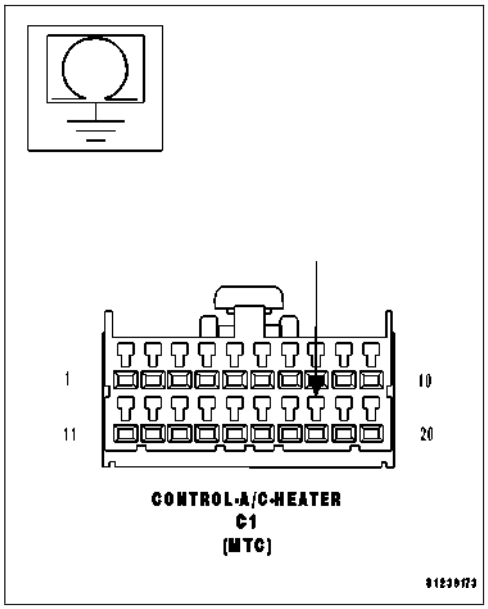
Diagnostic Test

1. CHECK (C34) FRONT COMMON DOOR DRIVER CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

Measure the resistance of the (C34) Front Common Door Driver circuit between ground and the A/C Heater Control C1 harness connector.



Is the resistance below 10k ohms?

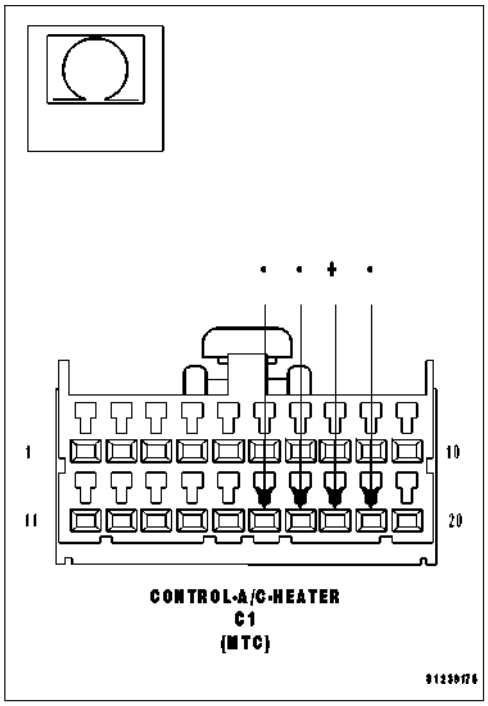
Yes >> Repair the (C34) Front Common Door Driver circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

No, Vehicles With Rear HVAC
Go To 2

No, Vehicles Without Rear HVAC
Go To 3

2. CHECK (C34) FRONT COMMON DOOR DRIVER CIRCUIT FOR A SHORT TO OTHER DOOR DRIVER CIRCUITS

Measure the resistance between the (C34) Front Common Door Driver 1 circuit and the (C53) Rear Mode Door Driver circuit, the (C154) Rear Common Door Driver circuit, and the (C54) Rear Blend Door Driver circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 10k ohms between the (C34) Front Common Door Driver circuit and any of the other door driver circuits?

Yes >> Repair the circuits with a resistance below 10k ohms for a short to the (C34) Front Common Door Driver circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 3

B105F–CLIMATE CONTROL MOTOR(S) COMMON 1 CONTROL CIRCUIT LOW (MTC) (CONTINUED)

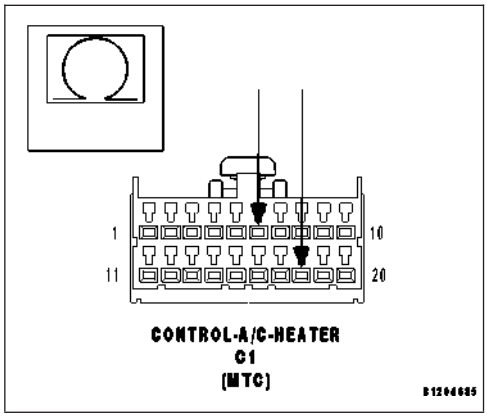
3. CHECK FRONT BLEND DOOR ACTUATOR CIRCUIT RESISTANCE

Measure the resistance between the (C61) Front Blend Door Driver circuit and the (C34) Front Common Door Driver circuit in the A/C Heater Control C1 harness connector.

Is the resistance below 30 ohms?

Yes >> Go To 4

No >> Go To 5



4. CHECK (C61) FRONT BLEND DOOR DRIVER CIRCUIT FOR A SHORT TO (C34) FRONT COMMON DOOR DRIVER CIRCUIT

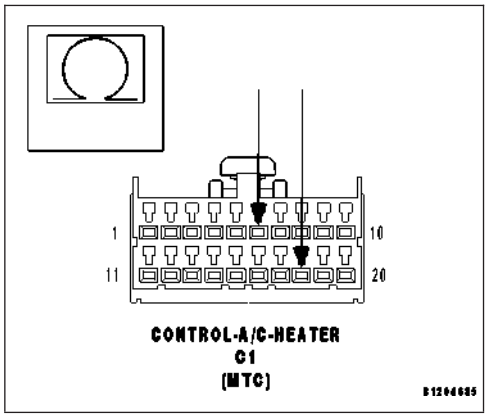
Disconnect the Front Blend Door Actuator harness connector.

Measure the resistance between the (C61) Front Blend Door Driver circuit and the (C34) Front Common Door Driver circuit in the A/C Heater Control C1 harness connector.

Is the resistance below 10k ohms?

Yes >> Repair the (C61) Front Blend Door Driver Circuit for a short to the (C34) Front Common Door Driver circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Front Blend Door Actuator in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.



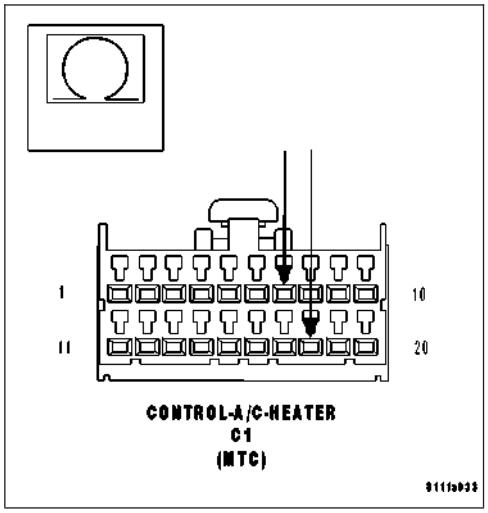
5. CHECK MODE DOOR 1 (FLOOR TO PANEL) ACTUATOR CIRCUIT RESISTANCE

Measure the resistance between the (C29) Mode Door 1 Driver circuit and the (C34) Front Common Door Driver circuit in the A/C Heater Control C1 harness connector.

Is the resistance below 30 ohms?

Yes >> Go To 6

No >> Go To 7

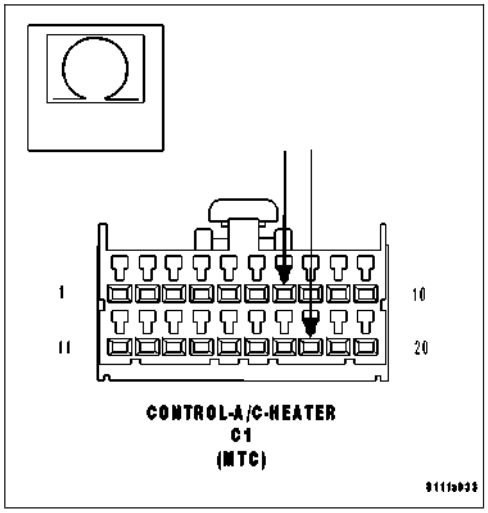


B105F–CLIMATE CONTROL MOTOR(S) COMMON 1 CONTROL CIRCUIT LOW (MTC) (CONTINUED)

6. CHECK (C29) MODE DOOR 1 DRIVER CIRCUIT FOR A SHORT TO (C34) FRONT COMMON DOOR DRIVER CIRCUIT

Disconnect the Mode Door 1 (Floor to Panel) Actuator harness connector.

Measure the resistance between the (C29) Mode Door 1 Driver circuit and the (C34) Front Common Door Driver circuit in the A/C Heater Control C1 harness connector.



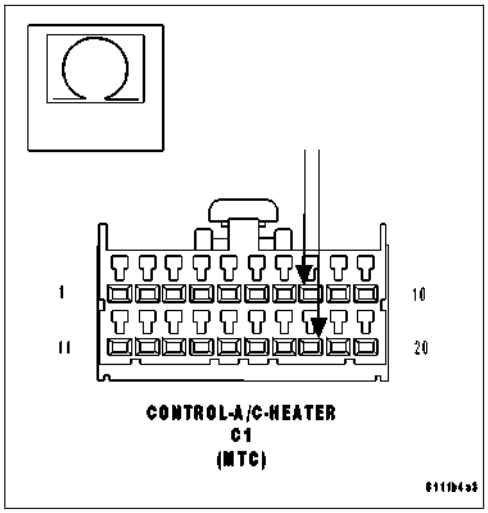
Is the resistance below 10k ohms?

Yes >> Repair the (C29) Mode Door 1 Driver Circuit for a short to the (C34) Front Common Door Driver circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Mode Door 1 (Floor to Panel) Actuator in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

7. CHECK MODE DOOR 2 (FLOOR TO DEFROST) ACTUATOR CIRCUIT RESISTANCE

Measure the resistance between the (C801) Mode Door 2 Driver circuit and the (C34) Front Common Door Driver circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 30 ohms?

Yes >> Go To 8

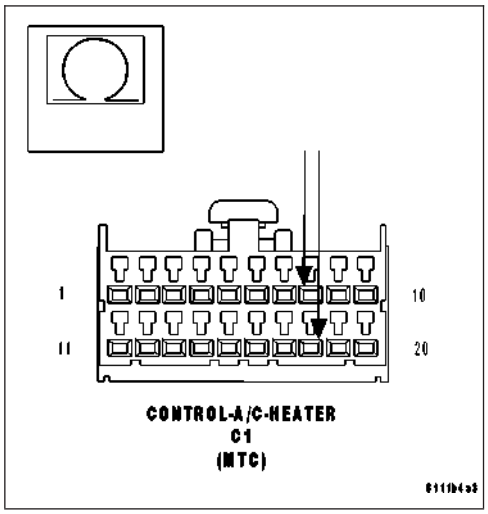
No >> Go To 9

B105F–CLIMATE CONTROL MOTOR(S) COMMON 1 CONTROL CIRCUIT LOW (MTC) (CONTINUED)

8. CHECK (C801) MODE DOOR 2 DRIVER CIRCUIT FOR A SHORT TO (C34) FRONT COMMON DOOR DRIVER CIRCUIT

Disconnect the Mode Door 2 (Floor to Defrost) Actuator harness connector.

Measure the resistance between the (C801) Mode Door 2 Driver circuit and the (C34) Front Common Door Driver circuit in the A/C Heater Control C1 harness connector.



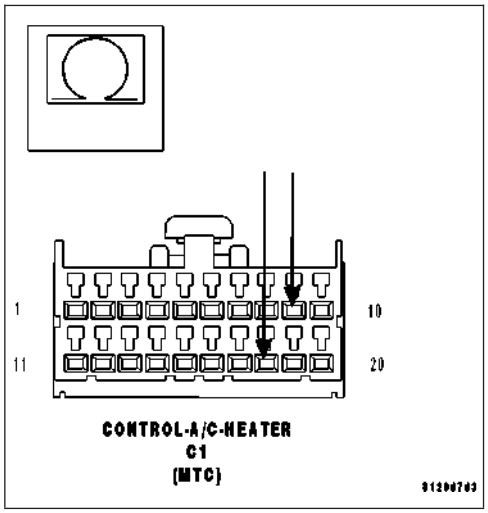
Is the resistance below 10k ohms?

Yes >> Repair the (C801) Mode Door 2 Driver Circuit for a short to the (C34) Front Common Door Driver circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Mode Door 2 (Floor to Defrost) Actuator in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

9. CHECK RECIRCULATION DOOR ACTUATOR CIRCUIT RESISTANCE

Measure the resistance between the (C32) Recirculation Door Driver circuit and the (C34) Front Common Door Driver circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 30 ohms?

Yes >> Go To 10

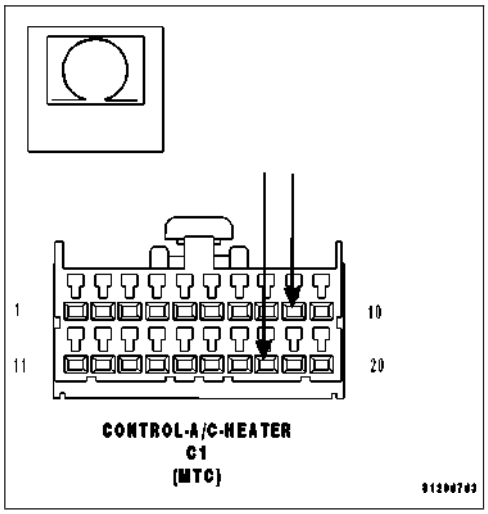
No >> Go To 11

B105F–CLIMATE CONTROL MOTOR(S) COMMON 1 CONTROL CIRCUIT LOW (MTC) (CONTINUED)

10. CHECK (C32) RECIRCULATION DOOR DRIVER CIRCUIT FOR A SHORT TO (C34) FRONT COMMON DOOR DRIVER CIRCUIT

Disconnect the Recirculation Door Actuator harness connector.

Measure the resistance between the (C32) Recirculation Door Driver circuit and the (C34) Front Common Door Driver circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 10k ohms?

Yes >> Repair the (C32) Recirculation Door Driver circuit for a short to the (C34) Front Common Door Driver circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Recirculation Door Actuator in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

11. RUN THE ACTUATOR DTC DETECTION TEST

Reconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

With the scan tool in HVAC, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

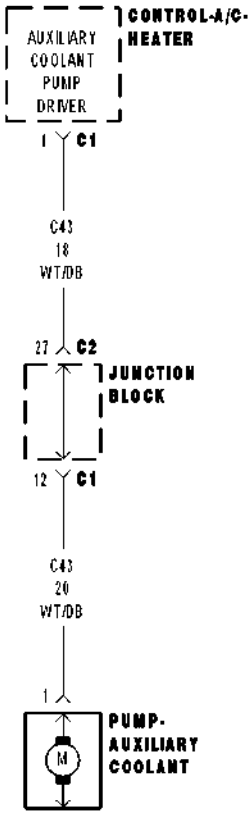
Does the scan tool only display: B105F–CLIMATE CONTROL MOTOR(S) COMMON 1 CONTROL CIRCUIT LOW?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

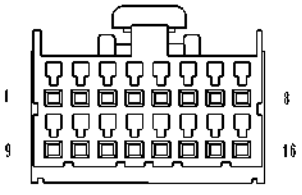
No, Other DTC(s) Displayed
Diagnose and repair the other DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs and then all short low DTCs. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No, And No DTCs Displayed
Using the wiring diagram as a guide, inspect the wiring and connectors for conditions causing an intermittent short. Repair as necessary.
Perform BODY VERIFICATION TEST - VER 1.

B107E–AUXILIARY COOLANT PUMP CONTROL CIRCUIT LOW (ATC)



PUMP-AUXILIARY COOLANT



CONTROL-A/C-HEATER C1 (ATC)

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B107E–AUXILIARY COOLANT PUMP CONTROL CIRCUIT LOW (ATC) (CONTINUED)

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When Auxiliary Coolant Pump operation is requested.
- **Set Condition:**
  If the (C43) Auxiliary Coolant Pump Driver circuit is shorted to ground. This DTC has a maturing time of 10 seconds and a de-maturing time of 10 seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

Possible Causes
(C43) AUXILIARY COOLANT PUMP DRIVER CIRCUIT SHORTED TO GROUND
AUXILIARY COOLANT PUMP
A/C HEATER CONTROL

Theory of Operation

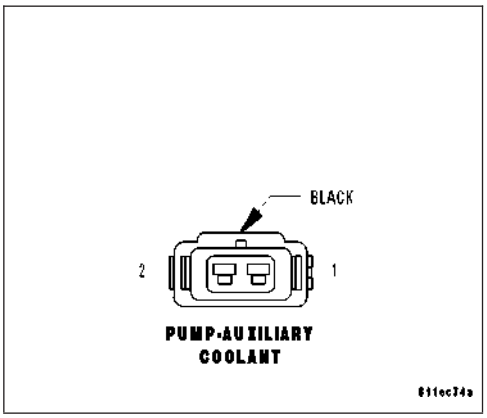
The protected Auxiliary Coolant Pump Driver is set low when turned off and set high when turned on. The Auxiliary Coolant Pump Driver will go low if the driver circuit is shorted to ground.

NOTE: DTC B107E must be active for the results of this test to be valid. Do not perform this test if DTC B107E is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

Diagnostic Test

1. CHECK FOR DTC B107E–AUXILIARY COOLANT PUMP CONTROL CIRCUIT LOW WITH AUXILIARY COOLANT PUMP DISCONNECTED

Turn the ignition on.
Set the blend control to full cold.
With the scan tool, erase HVAC DTCs.
Turn the ignition off.
Disconnect the Auxiliary Coolant Pump harness connector.
Turn the ignition on.
With the scan tool, select the following: Actuators, Auxiliary Coolant Pump, Start, and Constant On. Allow the actuator to run for approximately one minute.
With the scan tool, read HVAC DTCs.



Does the scan tool display: B1080–AUXILIARY COOLANT PUMP CONTROL CIRCUIT OPEN?

Yes >> Replace the Auxiliary Coolant Pump in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 2

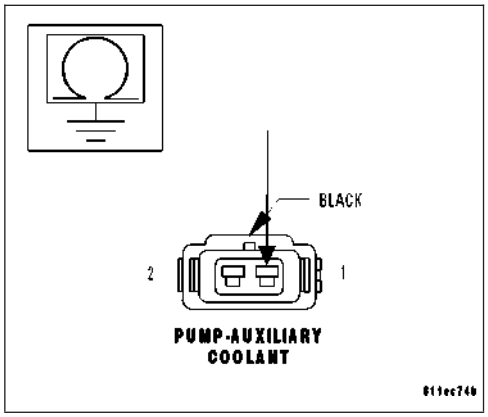
B107E–AUXILIARY COOLANT PUMP CONTROL CIRCUIT LOW (ATC) (CONTINUED)

2. CHECK (C43) AUXILIARY COOLANT PUMP DRIVER CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

Measure the resistance of the (C43) Auxiliary Coolant Pump Driver circuit between ground and the Auxiliary Coolant Pump harness connector.

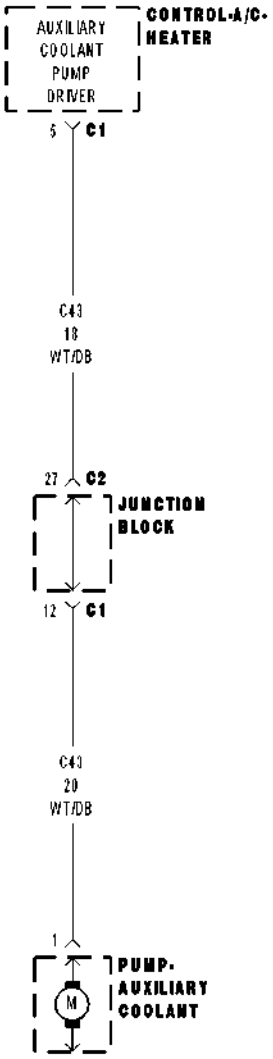


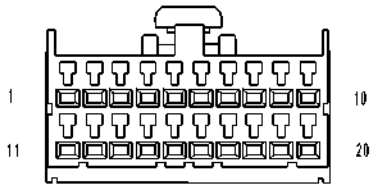
Is the resistance below 10K ohms?

Yes >> Repair the (C43) Auxiliary Coolant Pump Driver circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

B107E–AUXILIARY COOLANT PUMP CONTROL CIRCUIT LOW (MTC)





CONTROL-A/C-HEATER C1 (MTC)

PUMP-AUXILIARY COOLANT

81651cBc

B107E–AUXILIARY COOLANT PUMP CONTROL CIRCUIT LOW (MTC) (CONTINUED)

For the Manual Temperature Control (MTC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When Auxiliary Coolant Pump operation is requested.
- **Set Condition:**
  If the (C43) Auxiliary Coolant Pump Driver circuit is shorted to ground. This DTC has a maturing time of 10 seconds and a de-maturing time of 10 seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

Possible Causes
(C43) AUXILIARY COOLANT PUMP DRIVER CIRCUIT SHORTED TO GROUND
AUXILIARY COOLANT PUMP
A/C HEATER CONTROL

Theory of Operation

The protected Auxiliary Coolant Pump Driver is set low when turned off and set high when turned on. The Auxiliary Coolant Pump Driver will go low if the driver circuit is shorted to ground.

NOTE: DTC B107E must be active for the results of this test to be valid. Do not perform this test if DTC B107E is stored. Refer to HVAC System Test (MTC) for stored DTC test procedures.

Diagnostic Test

1. CHECK FOR DTC B107E–AUXILIARY COOLANT PUMP CONTROL CIRCUIT LOW WITH AUXILIARY COOLANT PUMP DISCONNECTED

Set the blend control to the full cold position.

Turn the ignition on.

With the scan tool, erase HVAC DTCs.

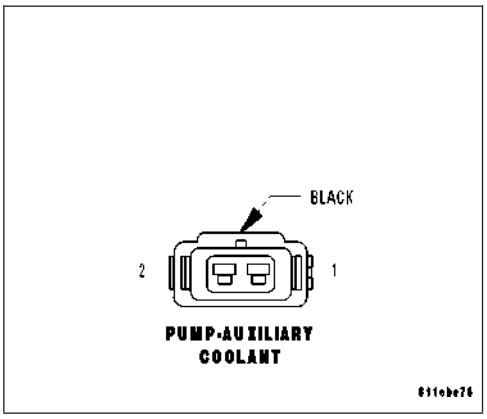
Turn the ignition off.

Disconnect the Auxiliary Coolant Pump harness connector.

Turn the ignition on.

With the scan tool, select the following: Actuators, Auxiliary Coolant Pump, Start, and Constant On. Allow the actuator to run for approximately one minute.

With the scan tool, read HVAC DTCs.



Does the scan tool display: B1080–AUXILIARY COOLANT PUMP CONTROL CIRCUIT OPEN?

Yes >> Replace the Auxiliary Coolant Pump in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 2

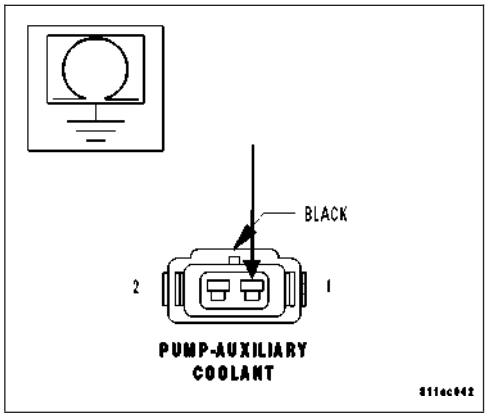
B107E–AUXILIARY COOLANT PUMP CONTROL CIRCUIT LOW (MTC) (CONTINUED)

2. CHECK (C43) AUXILIARY COOLANT PUMP DRIVER CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

Measure the resistance of the (C43) Auxiliary Coolant Pump Driver circuit between ground and the Auxiliary Coolant Pump harness connector.

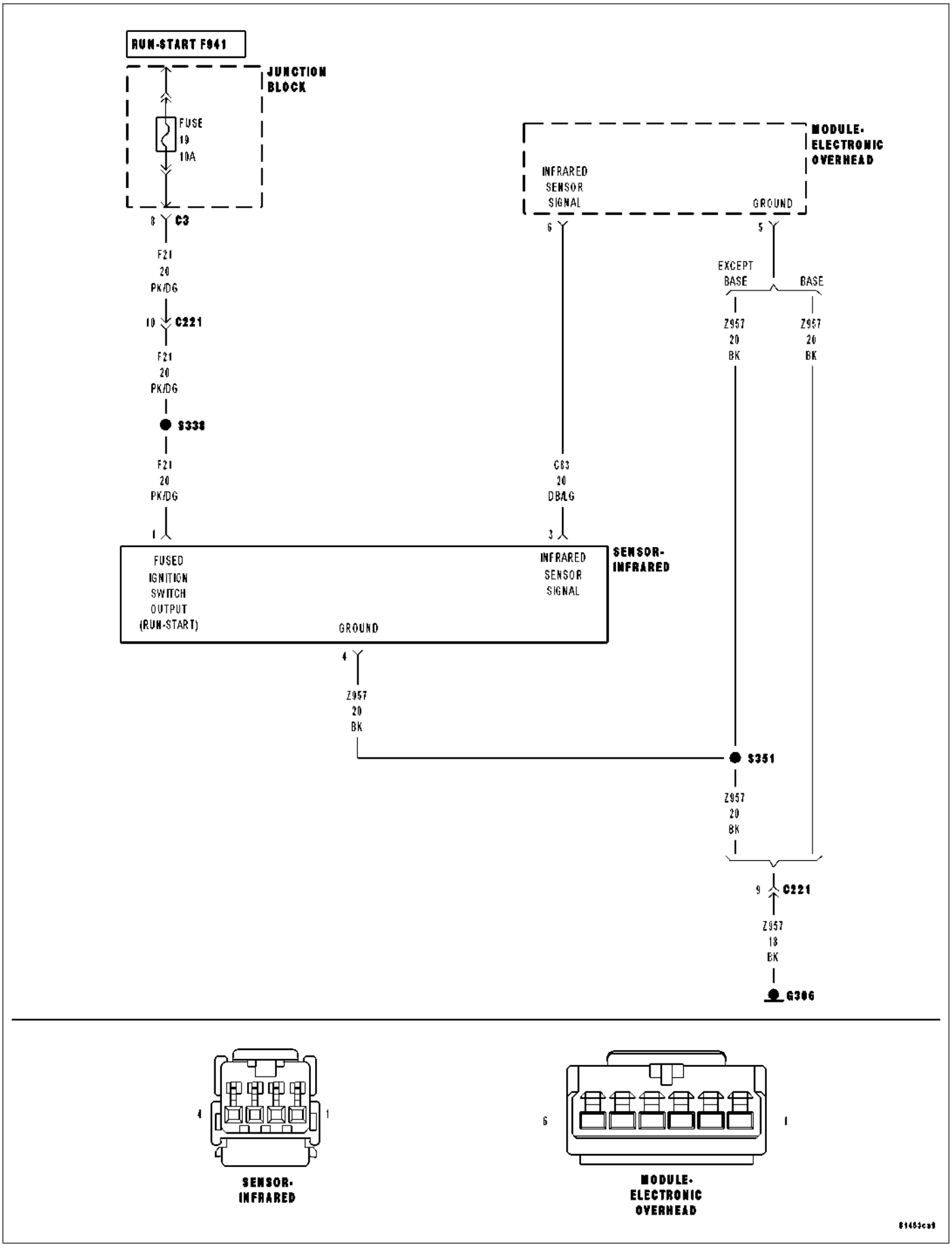


Is the resistance below 10K ohms?

Yes >> Repair the (C43) Auxiliary Coolant Pump Driver circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

B108E–INFRARED TEMPERATURE SENSOR INTERNAL (ATC)



B108E–INFRARED TEMPERATURE SENSOR INTERNAL (ATC) (CONTINUED)
For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition in run.
- **Set Condition:**
  This DTC will set if any of the following occur:
  - If the total combined Infrared (IR) Sensor signal on and off time is ≤ 88.79 ms or ≥ 116.01 ms.
  - If the IR Sensor duty cycle is ≤ or equal to 9.5%.
  - If the IR Sensor duty cycle is in the range of 65.5% up to and including 65.8%.
  - If the IR Sensor duty cycle is in the range of 71.8% up to and including 72%.
  - If the IR Sensor duty cycle is in the range of 78% up to and including 78.3%.
  - If the IR Sensor duty cycle is in the range of 78.3% up to and including 84.3% (this indicates and IR EEPROM fatal error).
  - If the IR Sensor duty cycle is in the range of 84.3% up to and including 100%.

Possible Causes
IR SENSOR CIRCUIT(S)
IR SENSOR
COMPASS MINI-TRIP COMPUTER (CMTC)

Theory of Operation

The IR Sensor is hard wired to the CMTC. The CMTC busses the IR Sensor data to the A/C Heater Control over the Controller Area Network (CAN) B Bus. This DTC has a maturing time of 10 seconds and a de-maturing time of 10 seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

NOTE: DTC B108E must be active for the results of this test to be valid. Do not perform this test if DTC B108E is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

Diagnostic Test

1. CHECK THE CMTC FOR DTCs

Turn the ignition on.
With the scan tool, check the Compass Temperature Module (EOM) for DTCs.

Are any DTCs present?

Yes >> (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - DIAGNOSIS AND TESTING) for the related symptom(s).
Perform BODY VERIFICATION TEST – VER 1.

No >> Replace the IR Sensor in accordance with the Service Information.
Perform BODY VERIFICATION TEST – VER 1.

B108F–AUTOMATIC TEMPERATURE CONTROL SYSTEM PERFORMANCE (ATC)

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the A/C Heater Control either fails to receive Engine Coolant Temperature Sensor data, Ambient Temperature Sensor data, or Infrared Sensor data, or if the data from any of these sensors is out of range. This DTC has a maturing time of 5 seconds and a de-maturing time of 10 seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

Possible Causes
POWERTRAIN CONTROL MODULE (PCM), FRONT CONTROL MODULE (FCM), OR COMPASS TEMPERATURE MODULE (EOM) NOT ACTIVE ON THE BUS
CAN B BUS CIRCUITS OPEN OR SHORTED, CAN C BUS CIRCUITS OPEN OR SHORTED, AMBIENT TEMPERATURE SENSOR CIRCUITS, ENGINE COOLANT TEMPERATURE SENSOR CIRCUITS, OR INFRARED SENSOR CIRCUITS SHORTED OR OPEN
AMBIENT TEMPERATURE SENSOR, ENGINE COOLANT TEMPERATURE SENSOR, OR INFRARED SENSOR INOPERATIVE
POWERTRAIN CONTROL MODULE (PCM), FRONT CONTROL MODULE (FCM), OR COMPASS TEMPERATURE MODULE (EOM) FAILING TO TRANSMIT DATA ON THE BUS
A/C HEATER CONTROL MODULE FAILING TO RECEIVE TRANSMITTED DATA FROM THE BUS

Theory of Operation

The Powertrain Control Module (PCM) transmits Engine Coolant Temperature Sensor data to modules wired to the CAN C bus. The Front Control Module (FCM) in turn transmits the Engine Coolant Temperature Sensor data to modules wired to the CAN B bus. The FCM also transmits Ambient Temperature Sensor data to modules wired to the CAN B bus. The Compass Temperature Module (EOM) transmits Infrared Sensor data to modules wired to the CAN B bus. The A/C Heater Control requires all of this data in order to provide automatic temperature control operation.

Diagnostic Test

1. VERIFY THAT DTC B108F–AUTOMATIC TEMPERATURE CONTROL SYSTEM PERFORMANCE IS ACTIVE

With the scan tool, read HVAC DTCs.

Is DTC B108F–AUTOMATIC TEMPERATURE CONTROL SYSTEM PERFORMANCE active?

Yes >> Go To 2

No >> A technician may not have erased this DTC following a module or CAN Bus repair. If possible, verify if the vehicle was recently in for this type of service. Otherwise, visually inspect the related wiring harness for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent, pushed out, and corroded terminals. Repair as necessary.

Perform BODY VERIFICATION TEST – VER 1.

B108F–AUTOMATIC TEMPERATURE CONTROL SYSTEM PERFORMANCE (ATC) (CONTINUED)

2. CHECK FOR ACTIVE DTC U0019-CAN B BUS CIRCUIT

With the scan tool, read active HVAC DTCs.

Does the scan tool display active: U0019-CAN B BUS CIRCUIT?

Yes >> Diagnose and repair the DTC. Refer to the Table of Contents in this Section for a complete list of HVAC symptoms.
Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 3

---

3. VERIFY THAT THE PCM, FCM, & EOM ARE ACTIVE ON THE BUS

Turn the ignition on.
With the scan tool, select ECU View.
Verify that the PCM, FCM, & EOM are active on the bus.

Are all of the modules active on the bus?

Yes >> Go To 4

No >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for No Response diagnostic procedures.
Perform BODY VERIFICATION TEST – VER 1.

---

4. CHECK FOR DTCs IN THE PCM, FCM, & EOM

With the scan tool, select ECU View.
Check for DTCs in the PCM, FCM, and EOM.

Are DTCs present in any of the modules?

Yes >> Diagnose and repair the DTC(s). (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - DIAGNOSIS AND TESTING) for EOM DTCs, (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING) for PCM DTCs, and refer to the appropriate category for FCM DTCs.
Perform BODY VERIFICATION TEST – VER 1.

No >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST – VER 1.

B1001–A/C SWITCH REQUEST INPUT CIRCUIT LOW (ATC & MTC)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the A/C mode switch is stuck in a pushed position for more than two minutes. This DTC has a maturing time of two minutes and a de-maturing time of two seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

Possible Causes
OBJECT HOLDING SWITCH IN A PUSHED POSITION
A/C HEATER CONTROL

Theory of Operation

The switch input changes when the switch is pushed down. An active DTC indicates that the switch is stuck in a pushed position. A stored DTC indicates that the switch was stuck in a pushed position for more than two minutes, but has since returned to its normal state.

NOTE: This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to either HVAC System Test (ATC) or to HVAC System Test (MTC) for stored DTC test procedures.

Diagnostic Test

1. INSPECT FOR OBJECT HOLDING SWITCH IN A PUSHED POSITION

Inspect the A/C Heater Control for an object holding the switch in a pushed position. If present, remove the object.
Turn the ignition on.
With the scan tool, erase HVAC DTCs.
Turn the ignition off, wait 10 seconds, and then turn the ignition on.
Wait two minutes, then with the scan tool, read HVAC DTCs.

Does the scan tool display active: B1001–A/C SWITCH REQUEST INPUT CIRCUIT LOW?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Perform BODY VERIFICATION TEST – VER 1.

B1004–PANEL MODE SWITCH REQUEST INPUT CIRCUIT LOW (ATC)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Panel mode switch is stuck in a pushed position for more than two minutes. This DTC has a maturing time of two minutes and a de-maturing time of two seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

Possible Causes
OBJECT HOLDING SWITCH IN A PUSHED POSITION
A/C HEATER CONTROL

Theory of Operation

The switch input changes when the switch is pushed down. An active DTC indicates that the switch is stuck in a pushed position. A stored DTC indicates that the switch was stuck in a pushed position for more than two minutes, but has since returned to its normal state.

NOTE: This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

Diagnostic Test

1. INSPECT FOR OBJECT HOLDING SWITCH IN A PUSHED POSITION

Inspect the A/C Heater Control for an object holding the switch in a pushed position. If present, remove the object.

Turn the ignition on.

With the scan tool, erase HVAC DTCs.

Turn the ignition off, wait 10 seconds, and then turn the ignition on.

Wait two minutes, then with the scan tool, read HVAC DTCs.

Does the scan tool display active: B1004–PANEL MODE SWITCH REQUEST INPUT CIRCUIT LOW?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Perform BODY VERIFICATION TEST – VER 1.

B1007–BI-LEVEL SWITCH REQUEST INPUT CIRCUIT LOW (ATC)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Bi-Level mode switch is stuck in a pushed position for more than two minutes. This DTC has a maturing time of two minutes and a de-maturing time of two seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

Possible Causes
OBJECT HOLDING SWITCH IN A PUSHED POSITION
A/C HEATER CONTROL

Theory of Operation

The switch input changes when the switch is pushed down. An active DTC indicates that the switch is stuck in a pushed position. A stored DTC indicates that the switch was stuck in a pushed position for more than two minutes, but has since returned to its normal state.

NOTE: This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

Diagnostic Test

1. INSPECT FOR OBJECT HOLDING SWITCH IN A PUSHED POSITION

Inspect the A/C Heater Control for an object holding the switch in a pushed position. If present, remove the object.

Turn the ignition on.

With the scan tool, erase HVAC DTCs.

Turn the ignition off, wait 10 seconds, and then turn the ignition on.

Wait two minutes, then with the scan tool, read HVAC DTCs.

Does the scan tool display active: B1007–BI-LEVEL SWITCH REQUEST INPUT CIRCUIT LOW?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Perform BODY VERIFICATION TEST – VER 1.

B1010–MIX SWITCH REQUEST INPUT CIRCUIT LOW (ATC)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Mix mode switch is stuck in a pushed position for more than two minutes. This DTC has a maturing time of two minutes and a de-maturing time of two seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

Possible Causes
OBJECT HOLDING SWITCH IN A PUSHED POSITION
A/C HEATER CONTROL

Theory of Operation

The switch input changes when the switch is pushed down. An active DTC indicates that the switch is stuck in a pushed position. A stored DTC indicates that the switch was stuck in a pushed position for more than two minutes, but has since returned to its normal state.

NOTE: This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

Diagnostic Test

1. INSPECT FOR OBJECT HOLDING SWITCH IN A PUSHED POSITION

Inspect the A/C Heater Control for an object holding the switch in a pushed position. If present, remove the object.

Turn the ignition on.

With the scan tool, erase HVAC DTCs.

Turn the ignition off, wait 10 seconds, and then turn the ignition on.

Wait two minutes, then with the scan tool, read HVAC DTCs.

Does the scan tool display active: B1010–MIX SWITCH REQUEST INPUT CIRCUIT LOW?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Perform BODY VERIFICATION TEST – VER 1.

B1013–DEFROST SWITCH REQUEST INPUT CIRCUIT LOW (ATC)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Front Defrost mode switch is stuck in a pushed position for more than two minutes. This DTC has a maturing time of two minutes and a de-maturing time of two seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

Possible Causes
OBJECT HOLDING SWITCH IN A PUSHED POSITION
A/C HEATER CONTROL

Theory of Operation

The switch input changes when the switch is pushed down. An active DTC indicates that the switch is stuck in a pushed position. A stored DTC indicates that the switch was stuck in a pushed position for more than two minutes, but has since returned to its normal state.

NOTE: This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

Diagnostic Test

1. INSPECT FOR OBJECT HOLDING SWITCH IN A PUSHED POSITION

Inspect the A/C Heater Control for an object holding the switch in a pushed position. If present, remove the object.

Turn the ignition on.

With the scan tool, erase HVAC DTCs.

Turn the ignition off, wait 10 seconds, and then turn the ignition on.

Wait two minutes, then with the scan tool, read HVAC DTCs.

Does the scan tool display active: B1013–DEFROST SWITCH REQUEST INPUT CIRCUIT LOW?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Perform BODY VERIFICATION TEST – VER 1.

B1016–REAR DEFROST SWITCH REQUEST INPUT CIRCUIT LOW (ATC & MTC)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Rear Defrost mode switch is stuck in a pushed position for more than two minutes. This DTC has a maturing time of two minutes and a de-maturing time of two seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

Possible Causes
OBJECT HOLDING SWITCH IN A PUSHED POSITION
A/C HEATER CONTROL

Theory of Operation

The switch input changes when the switch is pushed down. An active DTC indicates that the switch is stuck in a pushed position. A stored DTC indicates that the switch was stuck in a pushed position for more than two minutes, but has since returned to its normal state.

NOTE: This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to either HVAC System Test (ATC) or HVAC System Test (MTC) for stored DTC test procedures.

Diagnostic Test

1. INSPECT FOR OBJECT HOLDING SWITCH IN A PUSHED POSITION

Inspect the A/C Heater Control for an object holding the switch in a pushed position. If present, remove the object.

Turn the ignition on.

With the scan tool, erase HVAC DTCs.

Turn the ignition off, wait 10 seconds, and then turn the ignition on.

Wait two minutes, then with the scan tool, read HVAC DTCs.

Does the scan tool display active: B1016–REAR DEFROST SWITCH REQUEST INPUT CIRCUIT LOW?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Perform BODY VERIFICATION TEST – VER 1.

B1019–TEMP UP SWITCH REQUEST INPUT CIRCUIT LOW (ATC)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Temp mode switch is stuck in a pushed position for more than two minutes. This DTC has a maturing time of two minutes and a de-maturing time of two seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

Possible Causes
OBJECT HOLDING SWITCH IN A PUSHED POSITION
A/C HEATER CONTROL

Theory of Operation

The switch input changes when the switch is pushed down. An active DTC indicates that the switch is stuck in a pushed position. A stored DTC indicates that the switch was stuck in a pushed position for more than two minutes, but has since returned to its normal state.

NOTE: This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

Diagnostic Test

1. INSPECT FOR OBJECT HOLDING SWITCH IN A PUSHED POSITION

Inspect the A/C Heater Control for an object holding the switch in a pushed position. If present, remove the object.

Turn the ignition on.

With the scan tool, erase HVAC DTCs.

Turn the ignition off, wait 10 seconds, and then turn the ignition on.

Wait two minutes, then with the scan tool, read HVAC DTCs.

Does the scan tool display active: B1019–TEMP UP SWITCH REQUEST INPUT CIRCUIT LOW?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Perform BODY VERIFICATION TEST – VER 1.

B1022–BLOWER SPEED UP SWITCH REQUEST INPUT CIRCUIT LOW (ATC)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Blower mode switch is stuck in a pushed position for more than two minutes. This DTC has a maturing time of two minutes and a de-maturing time of two seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

Possible Causes
OBJECT HOLDING SWITCH IN A PUSHED POSITION
A/C HEATER CONTROL

Theory of Operation

The switch input changes when the switch is pushed down. An active DTC indicates that the switch is stuck in a pushed position. A stored DTC indicates that the switch was stuck in a pushed position for more than two minutes, but has since returned to its normal state.

NOTE: This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

Diagnostic Test

1. INSPECT FOR OBJECT HOLDING SWITCH IN A PUSHED POSITION

Inspect the A/C Heater Control for an object holding the switch in a pushed position. If present, remove the object.

Turn the ignition on.

With the scan tool, erase HVAC DTCs.

Turn the ignition off, wait 10 seconds, and then turn the ignition on.

Wait two minutes, then with the scan tool, read HVAC DTCs.

Does the scan tool display active: B1022–BLOWER SPEED UP SWITCH REQUEST INPUT CIRCUIT LOW?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Perform BODY VERIFICATION TEST – VER 1.

B1025–BLOWER SPEED DOWN SWITCH REQUEST INPUT CIRCUIT LOW (ATC)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Blower mode switch is stuck in a pushed position for more than two minutes. This DTC has a maturing time of two minutes and a de-maturing time of two seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

Possible Causes
OBJECT HOLDING SWITCH IN A PUSHED POSITION
A/C HEATER CONTROL

Theory of Operation

The switch input changes when the switch is pushed down. An active DTC indicates that the switch is stuck in a pushed position. A stored DTC indicates that the switch was stuck in a pushed position for more than two minutes, but has since returned to its normal state.

NOTE: This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

Diagnostic Test

1. INSPECT FOR OBJECT HOLDING SWITCH IN A PUSHED POSITION

Inspect the A/C Heater Control for an object holding the switch in a pushed position. If present, remove the object.

Turn the ignition on.

With the scan tool, erase HVAC DTCs.

Turn the ignition off, wait 10 seconds, and then turn the ignition on.

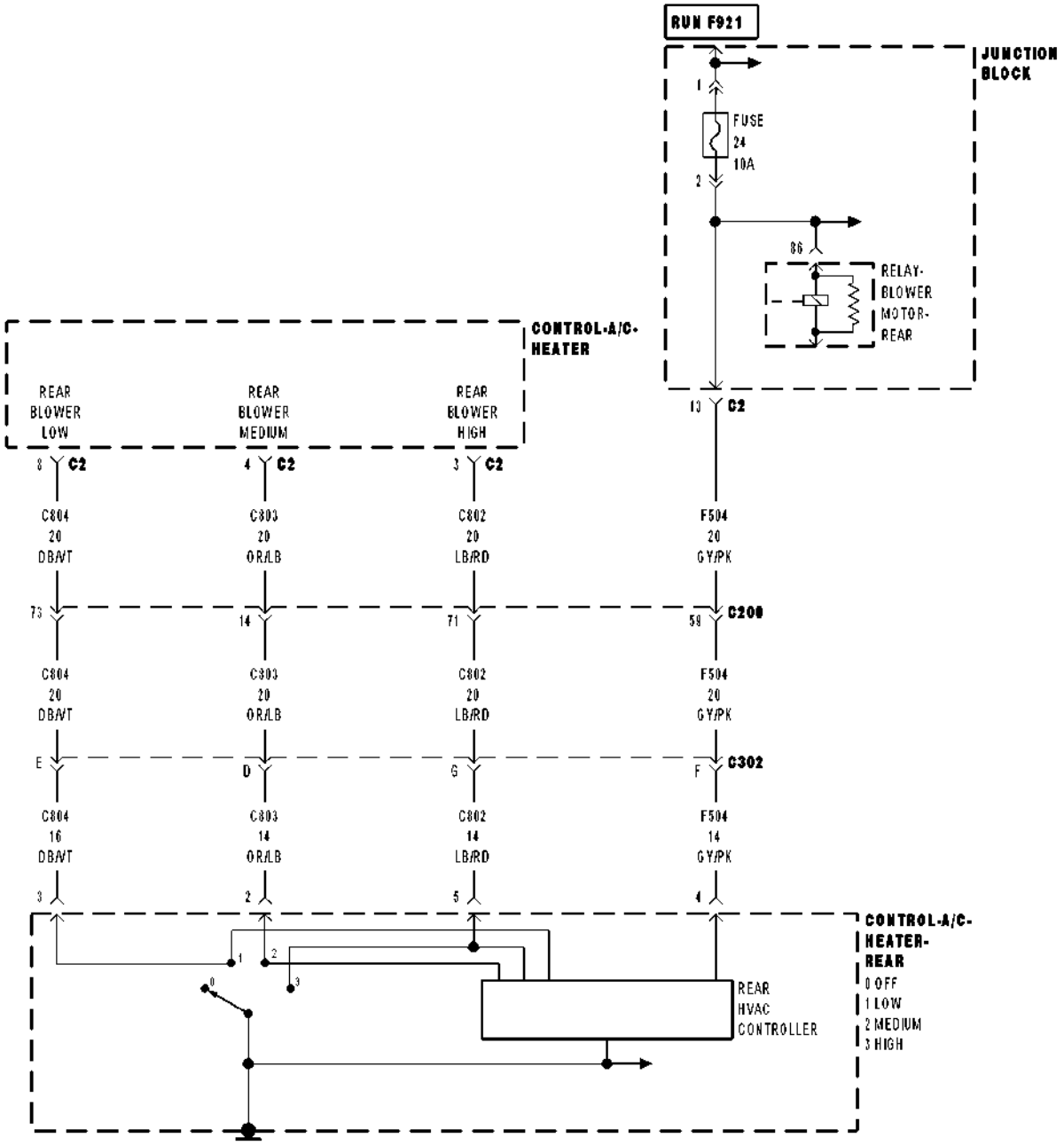
Wait two minutes, then with the scan tool, read HVAC DTCs.

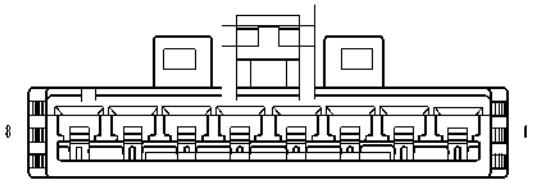
Does the scan tool display active: B1025–BLOWER SPEED DOWN SWITCH REQUEST INPUT CIRCUIT LOW?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST – VER 1.

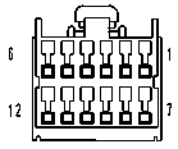
No >> Perform BODY VERIFICATION TEST – VER 1.

B1027–REAR BLOWER CONTROL REQUEST INPUT CIRCUIT/PERFORMANCE (ATC)





CONTROL-A/C-HEATER-REAR



CONTROL-A/C-HEATER C2 (ATC)

81453cc7

B1027–REAR BLOWER CONTROL REQUEST INPUT CIRCUIT/PERFORMANCE (ATC) (CONTINUED)

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If low and high rear blower speeds are requested simultaneously. This DTC has a maturing time of 5 seconds and a de-maturing time of 10 seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

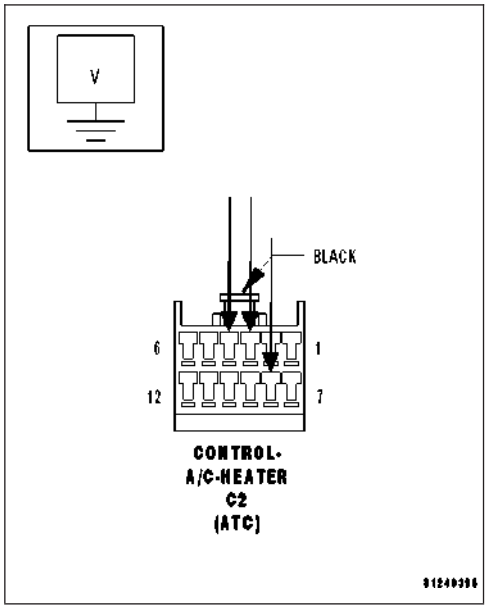
Possible Causes
(C804) REAR BLOWER LOW CIRCUIT, (C803) REAR BLOWER MEDIUM CIRCUIT, (C802) REAR BLOWER HIGH CIRCUIT SHORTED TO VOLTAGE
(C804) REAR BLOWER LOW CIRCUIT, (C803) REAR BLOWER MEDIUM CIRCUIT, (C802) REAR BLOWER HIGH CIRCUIT SHORTED TO (F504) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT
(C804) REAR BLOWER LOW CIRCUIT, (C803) REAR BLOWER MEDIUM CIRCUIT, (C802) REAR BLOWER HIGH CIRCUIT SHORTED TOGETHER
REAR A/C HEATER CONTROL
A/C HEATER CONTROL

NOTE: This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

Diagnostic Test

1. CHECK VOLTAGE OF (C804) REAR BLOWER LOW CIRCUIT, (C803) REAR BLOWER MEDIUM CIRCUIT, & (C802) REAR BLOWER HIGH CIRCUIT

Turn the ignition off.
Disconnect the A/C Heater Control C2 harness connector.
Turn the ignition on.
Measure the voltage of the (C804) Rear Blower Low circuit.
Measure the voltage of the (C803) Rear Blower Medium circuit.
Measure the voltage of the (C802) Rear Blower High circuit.



Is the voltage above 0.2 volts on any of the circuits?

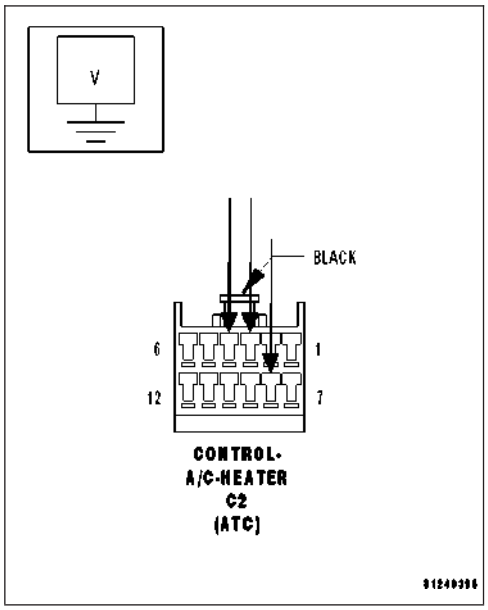
Yes >> Go To 2

No >> Go To 6

B1027–REAR BLOWER CONTROL REQUEST INPUT CIRCUIT/PERFORMANCE (ATC) (CONTINUED)

2. CHECK (C804) REAR BLOWER LOW CIRCUIT, (C803) REAR BLOWER MEDIUM CIRCUIT, & (C802) REAR BLOWER HIGH CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off.
Remove Junction Block Fuse 24.
Turn the ignition on.
Measure the voltage of the (C804) Rear Blower Low circuit.
Measure the voltage of the (C803) Rear Blower Medium circuit.
Measure the voltage of the (C802) Rear Blower High circuit.



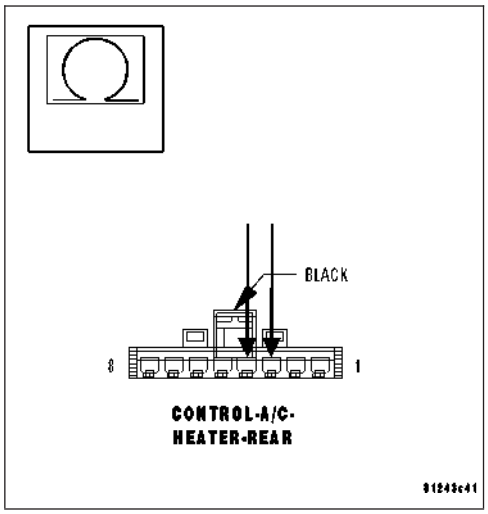
Is the voltage above 0.2 volts on any of the circuits?

Yes >> Repair the circuit(s) with voltage above 0.2 volts for a short to voltage.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 3

3. CHECK (C804) REAR BLOWER LOW CIRCUIT FOR A SHORT TO (F504) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT

Turn the ignition off.
Disconnect the Rear A/C Heater Control harness connector.
Measure the resistance between the (C804) Rear Blower Low circuit and the (F504) Fused Ignition Switch Output (Run) circuit in the Rear A/C Heater Control harness connector.



Is the resistance below 10k ohms?

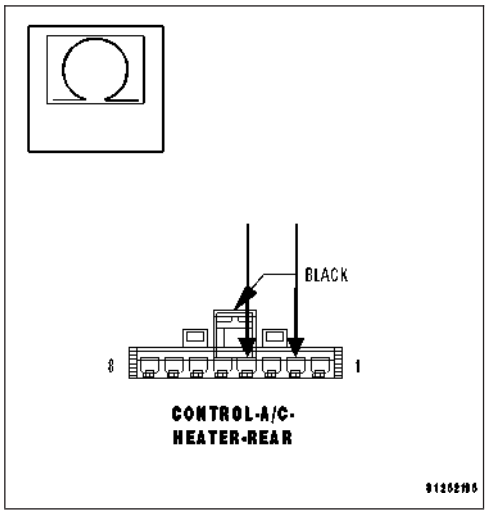
Yes >> Go To 4

No >> Go To 4

B1027–REAR BLOWER CONTROL REQUEST INPUT CIRCUIT/PERFORMANCE (ATC) (CONTINUED)

4. CHECK (C803) REAR BLOWER MEDIUM CIRCUIT FOR A SHORT TO (F504) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT

Measure the resistance between the (C803) Rear Blower Medium circuit and the (F504) Fused Ignition Switch Output (Run) circuit in the Rear A/C Heater Control harness connector.



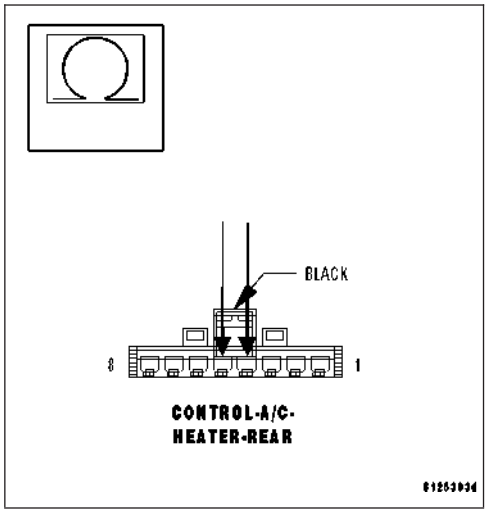
Is the resistance below 10k ohms?

Yes >> Go To 5

No >> Go To 5

5. CHECK (C802) REAR BLOWER HIGH CIRCUIT FOR A SHORT TO (F504) FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT

Measure the resistance between the (C802) Rear Blower High circuit and the (F504) Fused Ignition Switch Output (Run) circuit in the Rear A/C Heater Control harness connector.



Is the resistance below 10k ohms on any of the circuits tested in Steps 3, 4, & 5?

Yes >> Repair the circuit(s) with a resistance below 10k ohms for a short to the (F504) Fused Ignition Switch Output (Run) circuit.

Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 6

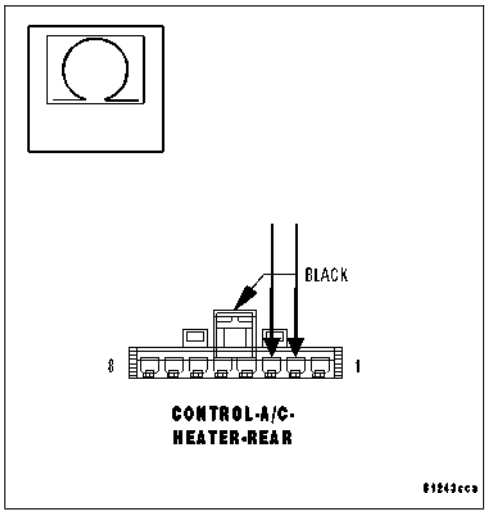
B1027–REAR BLOWER CONTROL REQUEST INPUT CIRCUIT/PERFORMANCE (ATC) (CONTINUED)

6. CHECK (C804) REAR BLOWER LOW CIRCUIT FOR A SHORT TO (C803) REAR BLOWER MEDIUM CIRCUIT

If not done so previously, turn the ignition off.

If not done so previously, disconnect the Rear A/C Heater Control harness connector.

Measure the resistance between the (C804) Rear Blower Low circuit and the (C803) Rear Blower Medium circuit in the Rear A/C Heater Control harness connector.



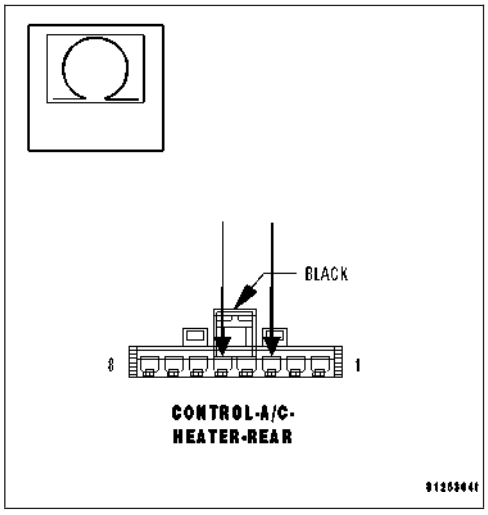
Is the resistance below 10k ohms?

Yes >> Go To 7

No >> Go To 7

7. CHECK (C804) REAR BLOWER LOW CIRCUIT FOR A SHORT TO (C802) REAR BLOWER HIGH CIRCUIT

Measure the resistance between the (C804) Rear Blower Low circuit and the (C802) Rear Blower High circuit in the Rear A/C Heater Control harness connector.



Is the resistance below 10k ohms?

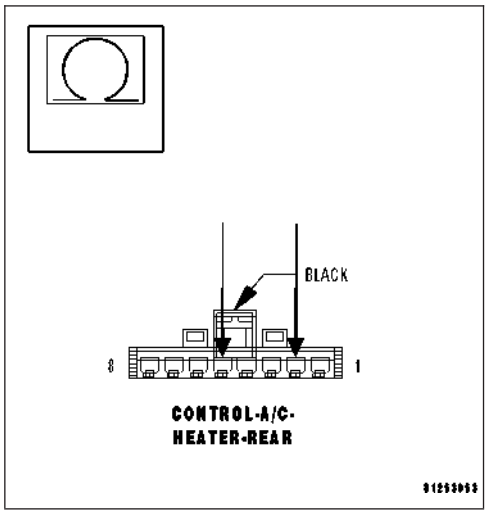
Yes >> Go To 8

No >> Go To 8

B1027–REAR BLOWER CONTROL REQUEST INPUT CIRCUIT/PERFORMANCE (ATC) (CONTINUED)

8. CHECK (C803) REAR BLOWER MEDIUM CIRCUIT FOR A SHORT TO (C802) REAR BLOWER HIGH CIRCUIT

Measure the resistance between the (C803) Rear Blower Medium circuit and the (C802) Rear Blower High circuit in the Rear A/C Heater Control harness connector.



Is the resistance below 10k ohms on any of the circuits tested in Steps 6, 7, & 8?

Yes >> Repair the circuit(s) with a resistance below 10k ohms for a short to the other rear blower circuit(s).
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 9

---

9. CHECK FOR DTC B1027–REAR BLOWER CONTROL REQUEST INPUT CIRCUIT/PERFORMANCE WITH REAR A/C HEATER CONTROL DISCONNECTED

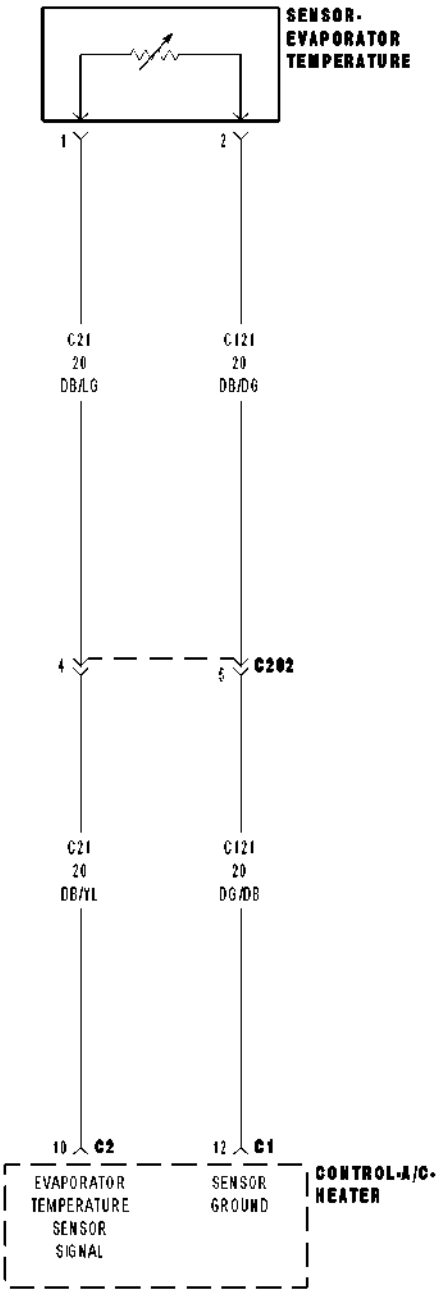
NOTE: Make sure that the Rear A/C Heater Control is disconnected.
Reconnect the A/C Heater Control C2 harness connector.
If removed, reinstall Junction Block Fuse 24.
Turn the ignition on.
With the scan tool, erase HVAC DTCs.
Turn the ignition off, wait 10 seconds, and then turn the ignition on.
Set the Rear Function mode switch to Control In Rear.
With the scan tool, read HAVC DTCs.

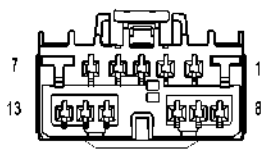
Does the scan tool display: B1027–REAR BLOWER CONTROL REQUEST INPUT CIRCUIT/PERFORMANCE?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

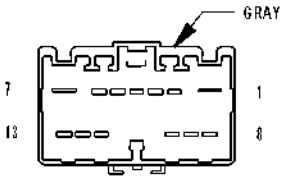
No >> Replace the Rear A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

B1031–EVAPORATOR FIN TEMPERATURE SENSOR CIRCUIT LOW (ATC)

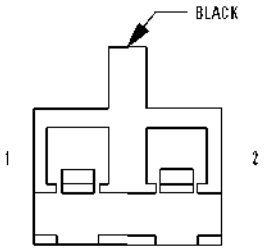




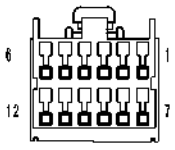
C202



C202



SENSOR-
EVAPORATOR
TEMPERATURE



CONTROL-A/C-
HEATER C2
(ATC)

B1653c48

B1031–EVAPORATOR FIN TEMPERATURE SENSOR CIRCUIT LOW (ATC) (CONTINUED)

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Evaporator Temperature Sensor input is out of range toward the low voltage threshold, (A/D counts reach low threshold of 16). This DTC has a maturing time of 5 seconds and a de-maturing time of 10 seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

Possible Causes
(C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
(C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO (C121) SENSOR GROUND
EVAPORATOR TEMPERATURE SENSOR
A/C HEATER CONTROL

NOTE: DTC B1031 must be active for the results of this test to be valid. Do not perform this test if DTC B1031 is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

Diagnostic Test

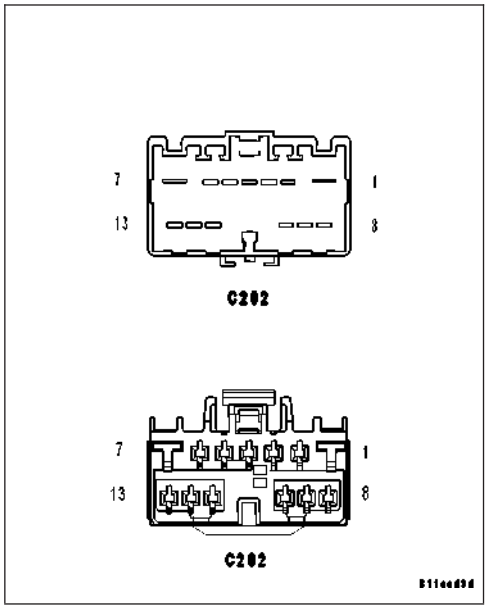
1. CHECK FOR DTC B1031–EVAPORATOR FIN TEMPERATURE SENSOR CIRCUIT LOW WITH IN-LINE C202 HARNESS CONNECTOR DISCONNECTED

Turn the ignition off.
Disconnect the in-line C202 harness connector.
Turn the ignition on.
With the scan tool, erase HVAC DTCs.
Turn the ignition off, wait 10 seconds, and turn the ignition on.
With the scan tool, read HVAC DTCs.

Does the scan tool display: B1031–EVAPORATOR FIN TEMPERATURE SENSOR CIRCUIT LOW?

Yes >> Go To 2

No >> Go To 4



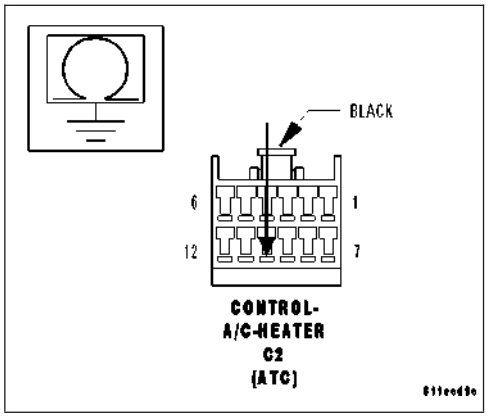
B1031–EVAPORATOR FIN TEMPERATURE SENSOR CIRCUIT LOW (ATC) (CONTINUED)

2. CHECK (C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

Disconnect the A/C Heater Control C2 harness connector.

Measure the resistance of the (C21) Evaporator Temperature Sensor Signal circuit between ground and the A/C Heater Control C2 harness connector.



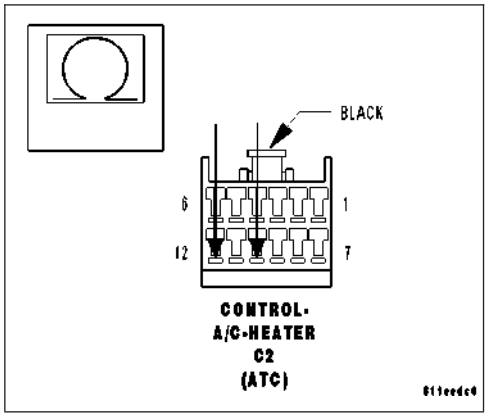
Is the resistance below 10k ohms?

Yes >> Repair the (C21) Evaporator Temperature Sensor Signal circuit for a short to ground between the A/C Heater Control C2 harness connector and the in-line C202 (IP SIDE) harness connector.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 3

3. CHECK (C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO (C121) SENSOR GROUND

Measure the resistance between the (C21) Evaporator Temperature Sensor Signal circuit and the (C121) Sensor Ground circuit in the A/C Heater Control C2 harness connector.



Is the resistance below 10k ohms?

Yes >> Repair the (C21) Evaporator Temperature Sensor Signal circuit for a short to the (C121) Sensor Ground circuit between the A/C Heater Control C2 harness connector and the in-line C202 (IP SIDE) harness connector.
Perform BODY VERIFICATION TEST - VER 1.

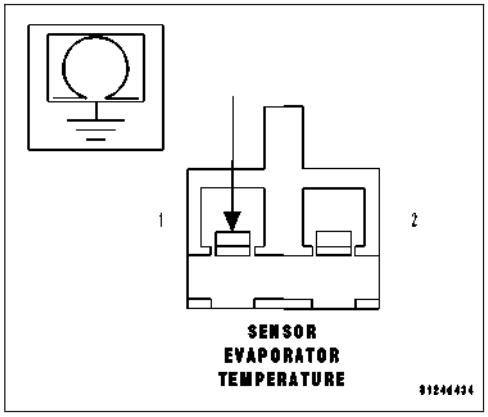
No >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

4. CHECK (C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

Disconnect the Evaporator Temperature Sensor harness connector.

Measure the resistance of the (C21) Evaporator Temperature Sensor Signal circuit between ground and the Evaporator Temperature Sensor harness connector.



Is the resistance below 10k ohms?

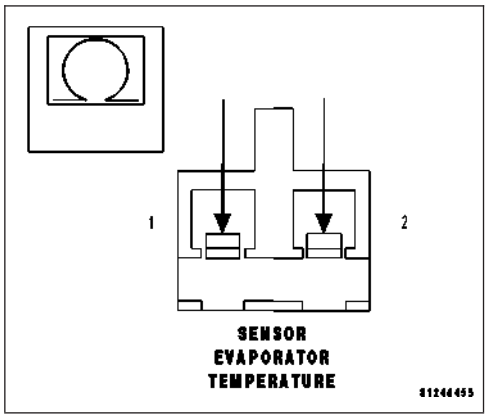
Yes >> Repair the (C21) Evaporator Temperature Sensor Signal circuit for a short to ground between the Evaporator Temperature Sensor harness connector and the in-line C202 (HVAC SIDE) harness connector.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 5

B1031–EVAPORATOR FIN TEMPERATURE SENSOR CIRCUIT LOW (ATC) (CONTINUED)

5. CHECK (C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO (C121) SENSOR GROUND

Measure the resistance between the (C21) Evaporator Temperature Sensor Signal circuit and the (C121) Sensor Ground circuit in the Evaporator Temperature Sensor harness connector.



Is the resistance below 10k ohms?

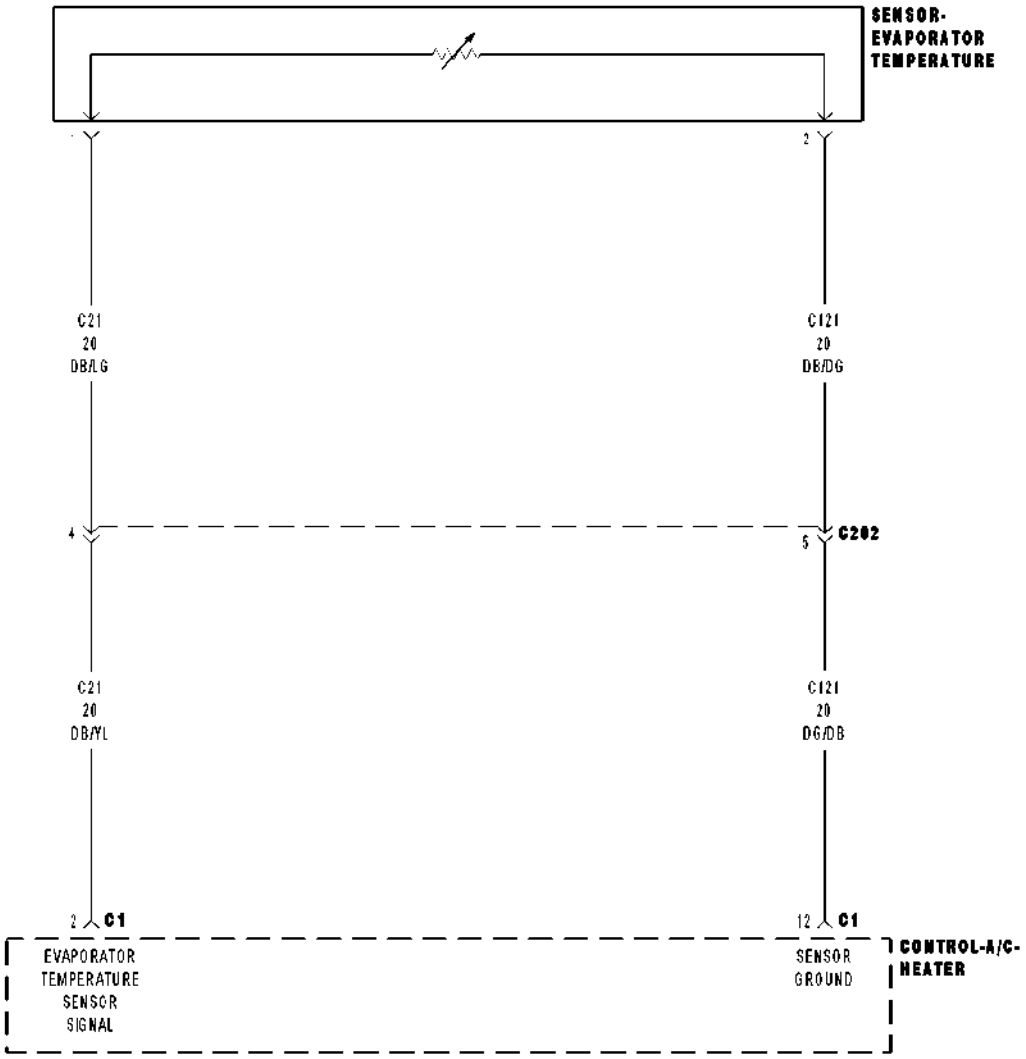
Yes >> Repair the (C21) Evaporator Temperature Sensor Signal circuit for a short to the (C121) Sensor Ground circuit between the Evaporator Temperature Sensor harness connector and the in-line C202 (HVAC SIDE) harness connector.

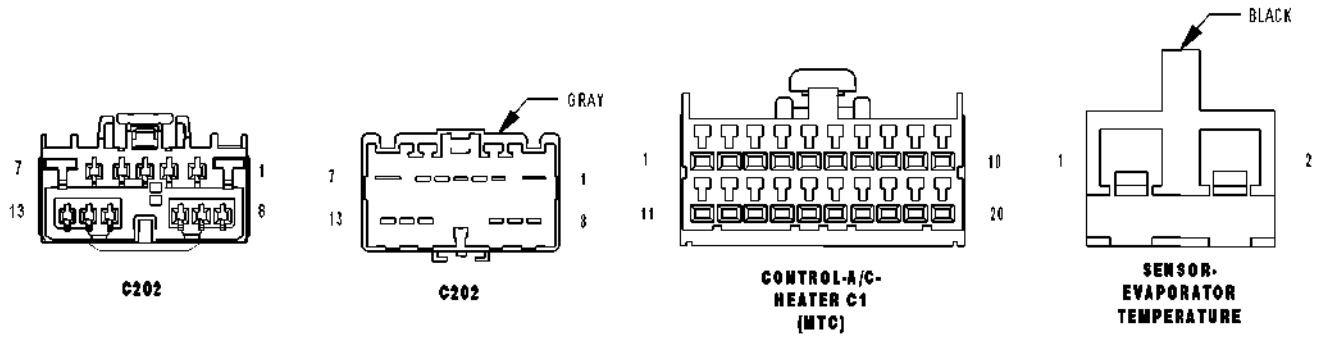
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Evaporator Temperature Sensor in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1.

B1031–EVAPORATOR FIN TEMPERATURE SENSOR CIRCUIT LOW (MTC)





B1031–EVAPORATOR FIN TEMPERATURE SENSOR CIRCUIT LOW (MTC) (CONTINUED)

For the Manual Temperature Control (MTC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Evaporator Temperature Sensor input is out of range toward the low voltage threshold, (A/D counts reach low threshold of 16). This DTC has a maturing time of 5 seconds and a de-maturing time of 10 seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

Possible Causes
(C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
(C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO (C121) SENSOR GROUND
EVAPORATOR TEMPERATURE SENSOR
A/C HEATER CONTROL

NOTE: DTC B1031 must be active for the results of this test to be valid. Do not perform this test if DTC B1031 is stored. Refer to HVAC System Test (MTC) for stored DTC test procedures.

Diagnostic Test

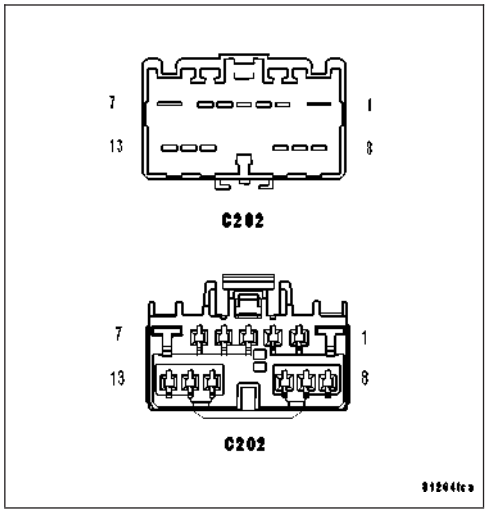
1. CHECK FOR DTC B1031–EVAPORATOR FIN TEMPERATURE SENSOR CIRCUIT LOW WITH IN-LINE C202 HARNESS CONNECTOR DISCONNECTED

Turn the ignition off.
Disconnect the in-line C202 harness connector.
Turn the ignition on.
With the scan tool, erase HVAC DTCs.
Turn the ignition off, wait 10 seconds, and turn the ignition on.
With the scan tool, read HVAC DTCs.

Does the scan tool display: B1031–EVAPORATOR FIN TEMPERATURE SENSOR CIRCUIT LOW?

Yes >> Go To 2

No >> Go To 4



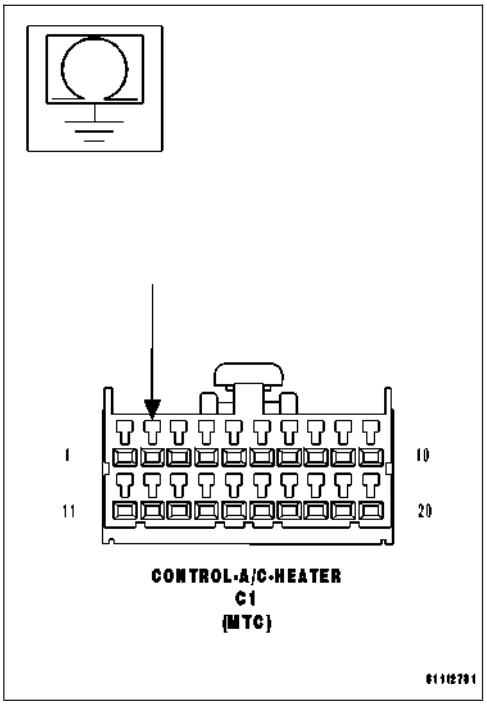
B1031–EVAPORATOR FIN TEMPERATURE SENSOR CIRCUIT LOW (MTC) (CONTINUED)

2. CHECK (C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

Measure the resistance of the (C21) Evaporator Temperature Sensor Signal circuit between ground and the A/C Heater Control C1 harness connector.



Is the resistance below 10k ohms?

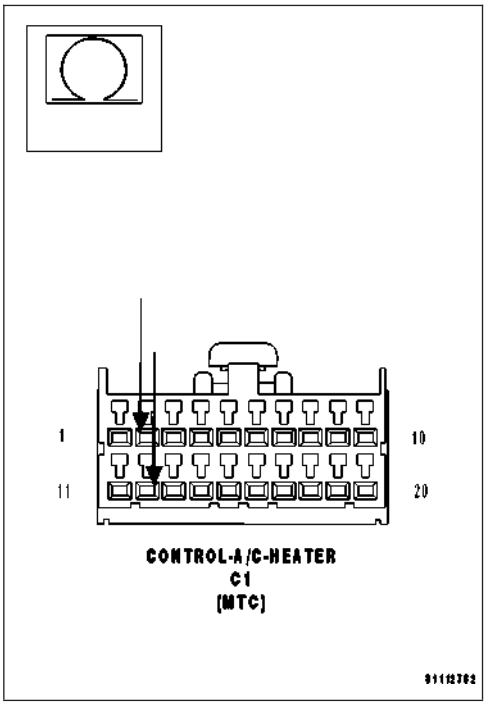
Yes >> Repair the (C21) Evaporator Temperature Sensor Signal circuit for a short to ground between the A/C Heater Control C1 harness connector and the in-line C202 (IP SIDE) harness connector.

Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 3

3. CHECK (C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO (C121) SENSOR GROUND

Measure the resistance between the (C21) Evaporator Temperature Sensor Signal circuit and the (C121) Sensor Ground circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 10k ohms?

Yes >> Repair the (C21) Evaporator Temperature Sensor Signal circuit for a short to the (C121) Sensor Ground circuit between the A/C Heater Control C1 harness connector and the in-line C202 (IP SIDE) harness connector.

Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the A/C Heater Control in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1.

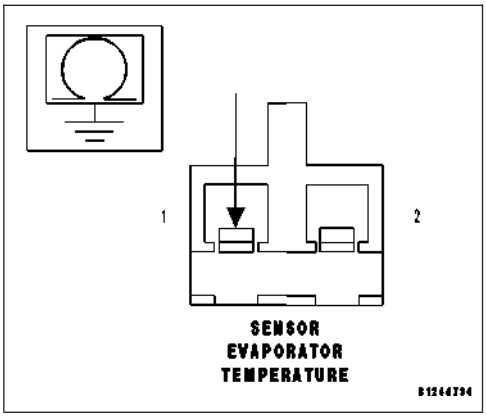
B1031–EVAPORATOR FIN TEMPERATURE SENSOR CIRCUIT LOW (MTC) (CONTINUED)

4. CHECK (C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

Disconnect the Evaporator Temperature Sensor harness connector.

Measure the resistance of the (C21) Evaporator Temperature Sensor Signal circuit between ground and the Evaporator Temperature Sensor harness connector.



Is the resistance below 10k ohms?

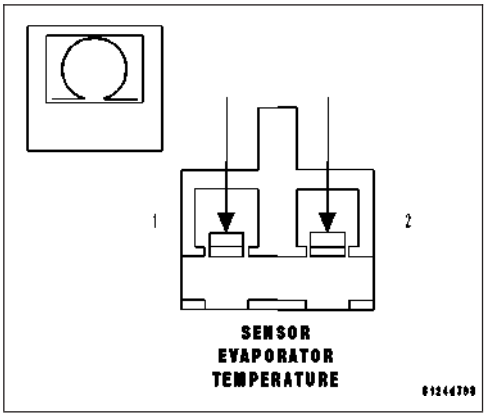
Yes >> Repair the (C21) Evaporator Temperature Sensor Signal circuit for a short to ground between the Evaporator Temperature Sensor harness connector and the in-line C202 (HVAC SIDE) harness connector.

Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 5

5. CHECK (C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO (C121) SENSOR GROUND

Measure the resistance between the (C21) Evaporator Temperature Sensor Signal circuit and the (C121) Sensor Ground circuit in the Evaporator Temperature Sensor harness connector.



Is the resistance below 10k ohms?

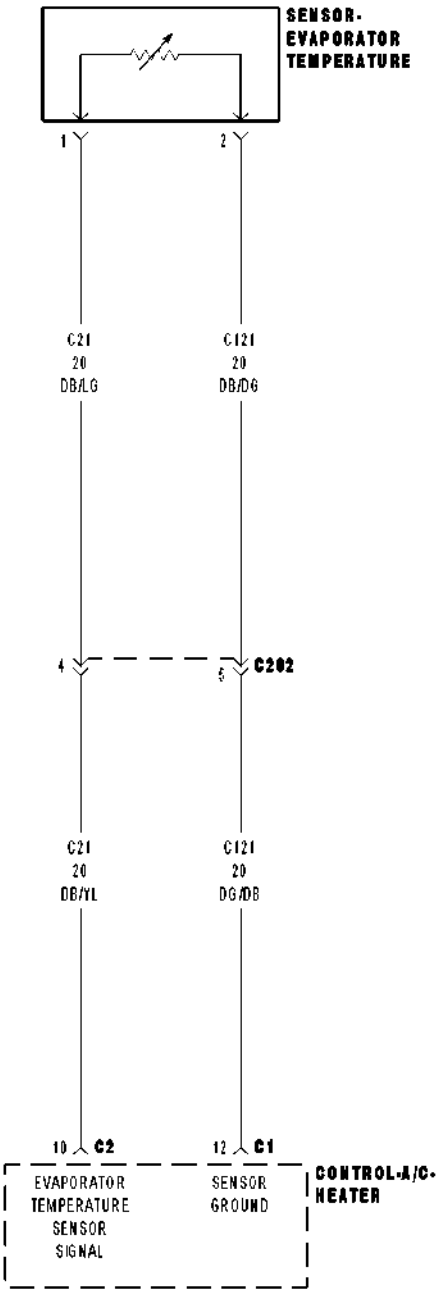
Yes >> Repair the (C21) Evaporator Temperature Sensor Signal circuit for a short to the (C121) Sensor Ground circuit between the Evaporator Temperature Sensor harness connector and the in-line C202 (HVAC SIDE) harness connector.

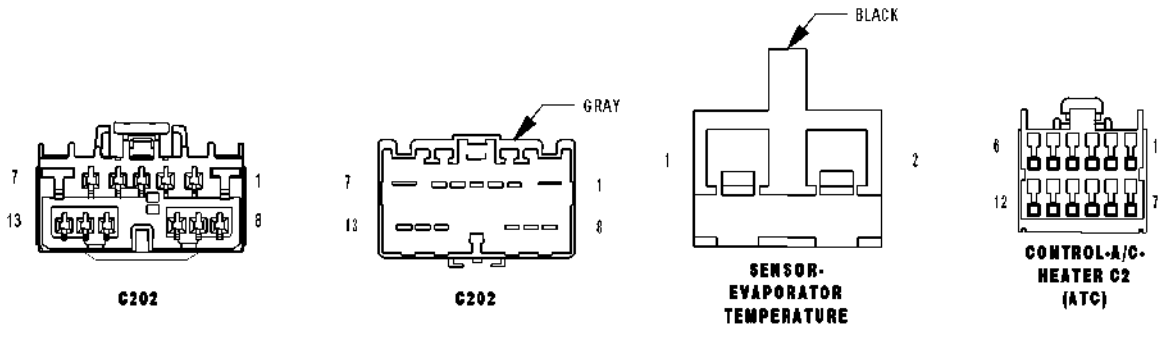
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Evaporator Temperature Sensor in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1.

B1032–EVAPORATOR FIN TEMPERATURE SENSOR CIRCUIT HIGH (ATC)





B1032–EVAPORATOR FIN TEMPERATURE SENSOR CIRCUIT HIGH (ATC) (CONTINUED)

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Evaporator Temperature Sensor input is out of range toward the high voltage threshold, (A/D counts reach high threshold of 240). This DTC has a maturing time of 5 seconds and a de-maturing time of 10 seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

Possible Causes
(C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
(C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT OPEN
(C121) SENSOR GROUND CIRCUIT OPEN
EVAPORATOR TEMPERATURE SENSOR
A/C HEATER CONTROL

NOTE: This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

Diagnostic Test

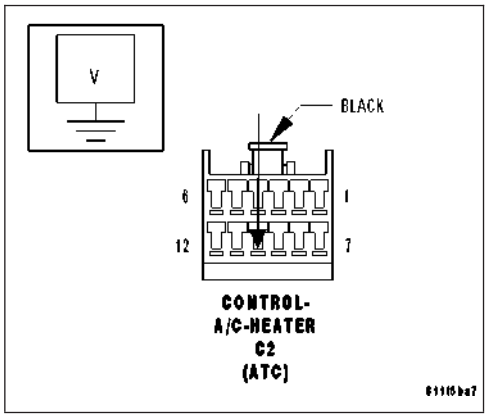
1. CHECK (C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the A/C Heater Control C2 harness connector.

Turn the ignition on.

Measure the voltage of the (C21) Evaporator Temperature Sensor Signal circuit.



Is the voltage above 0.2 volts?

Yes >> Repair the (C21) Evaporator Temperature Sensor Signal circuit for a short to voltage.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 2

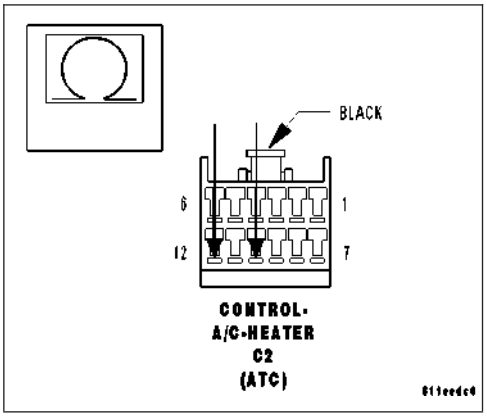
B1032–EVAPORATOR FIN TEMPERATURE SENSOR CIRCUIT HIGH (ATC) (CONTINUED)

2. CHECK (C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT, (C121) SENSOR GROUND CIRCUIT, & EVAPORATOR TEMPERATURE SENSOR

Turn the ignition off.

Measure the resistance between the (C21) Evaporator Temperature Sensor Signal circuit and the (C121) Sensor Ground circuit in the A/C Heater Control C2 harness connector. The approximate circuit resistance should be as follows:

- 1468 ohms @ 40°C (104°F)
- 1800 ohms @ 35°C (95°F)
- 2221 ohms @ 30°C (86°F)
- 2757 ohms @ 25°C (77°F)
- 3443 ohms @ 20°C (68°F)
- 4330 ohms @ 15°C (59°F)
- 5485 ohms @ 10°C (50°F)
- 6998 ohms @ 5°C (41°F)
- 7354 ohms @ 4°C (39°F)
- 7731 ohms @ 3°C (37°F)
- 8130 ohms @ 2°C (36°F)
- 8553 ohms @ 1°C (34°F)
- 9000 ohms @ 0°C (32°F)



Is the resistance within the specifications?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 3

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3. CHECK (C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT FOR AN OPEN

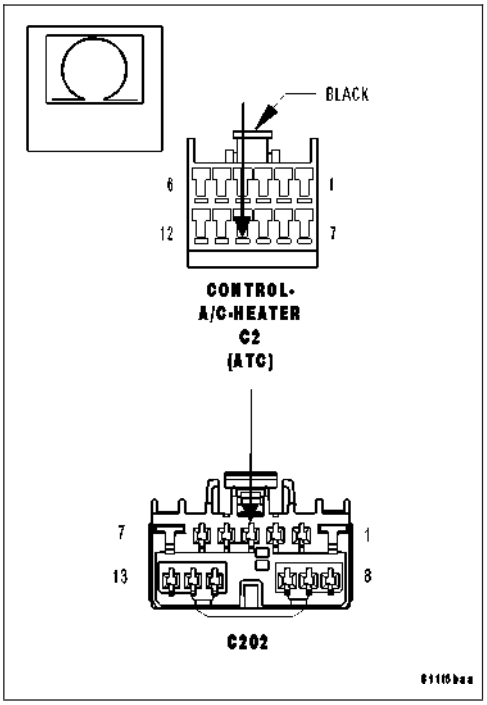
Disconnect the in-line C202 harness connector.

Measure the resistance of the (C21) Evaporator Temperature Sensor Signal circuit between the A/C Heater Control C2 harness connector and the in-line C202 (IP SIDE) harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 4

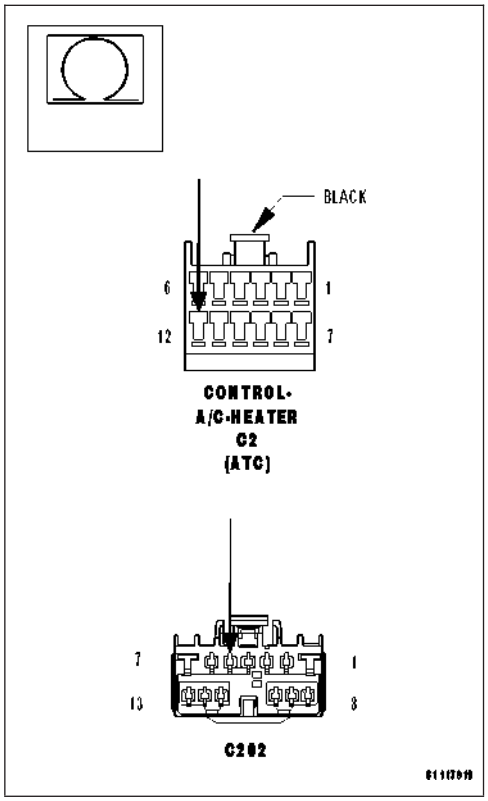
No >> Repair the (C21) Evaporator Temperature Sensor Signal circuit for an open between the A/C Heater Control C2 harness connector and the in-line C202 (IP SIDE) harness connector.
Perform BODY VERIFICATION TEST - VER 1.



B1032–EVAPORATOR FIN TEMPERATURE SENSOR CIRCUIT HIGH (ATC) (CONTINUED)

4. CHECK (C121) SENSOR GROUND CIRCUIT FOR AN OPEN

Measure the resistance of the (C121) Sensor Ground circuit between the A/C Heater Control C2 harness connector and the in-line C202 (IP SIDE) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go To 5

No >> Repair the (C121) Sensor Ground circuit for an open between the A/C Heater Control C2 harness connector and the in-line C202 (IP SIDE) harness connector.
Perform BODY VERIFICATION TEST - VER 1.

B1032–EVAPORATOR FIN TEMPERATURE SENSOR CIRCUIT HIGH (ATC) (CONTINUED)

5. CHECK (C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT FOR AN OPEN

Disconnect the Evaporator Temperature Sensor harness connector.

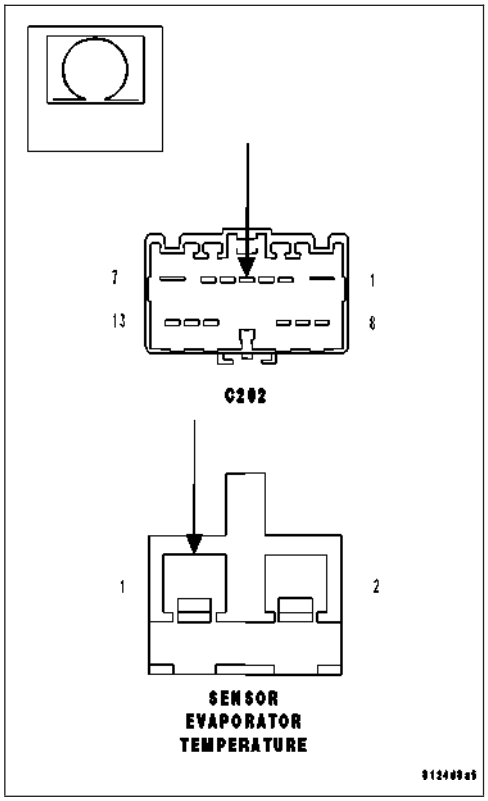
Measure the resistance of the (C21) Evaporator Temperature Sensor Signal circuit between the Evaporator Temperature Sensor harness connector and the in-line C202 (HVAC SIDE) harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 6

No >> Repair the (C21) Evaporator Temperature Sensor Signal circuit for an open between the Evaporator Temperature Sensor harness connector and the in-line C202 (HVAC SIDE) harness connector.

Perform BODY VERIFICATION TEST - VER 1.



6. CHECK (C121) SENSOR GROUND CIRCUIT FOR AN OPEN

Measure the resistance of the (C121) Sensor Ground circuit between the Evaporator Temperature Sensor harness connector and the in-line C202 (HVAC SIDE) harness connector.

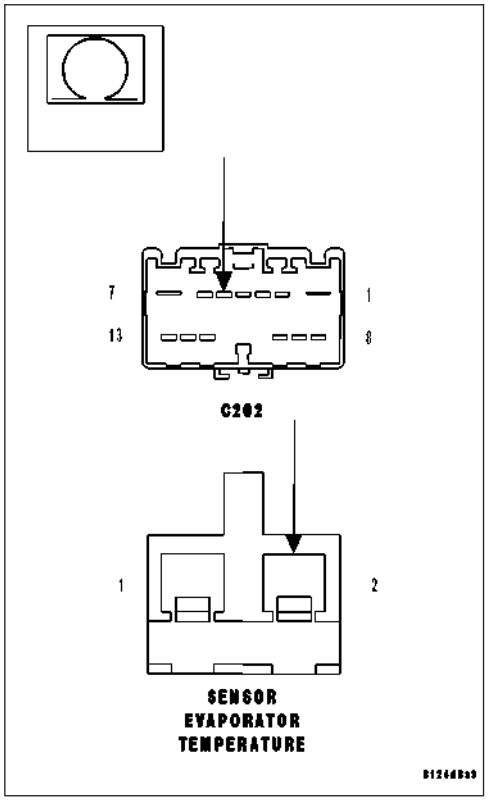
Is the resistance below 5.0 ohms?

Yes >> Replace the Evaporator Temperature Sensor in accordance with the Service Information.

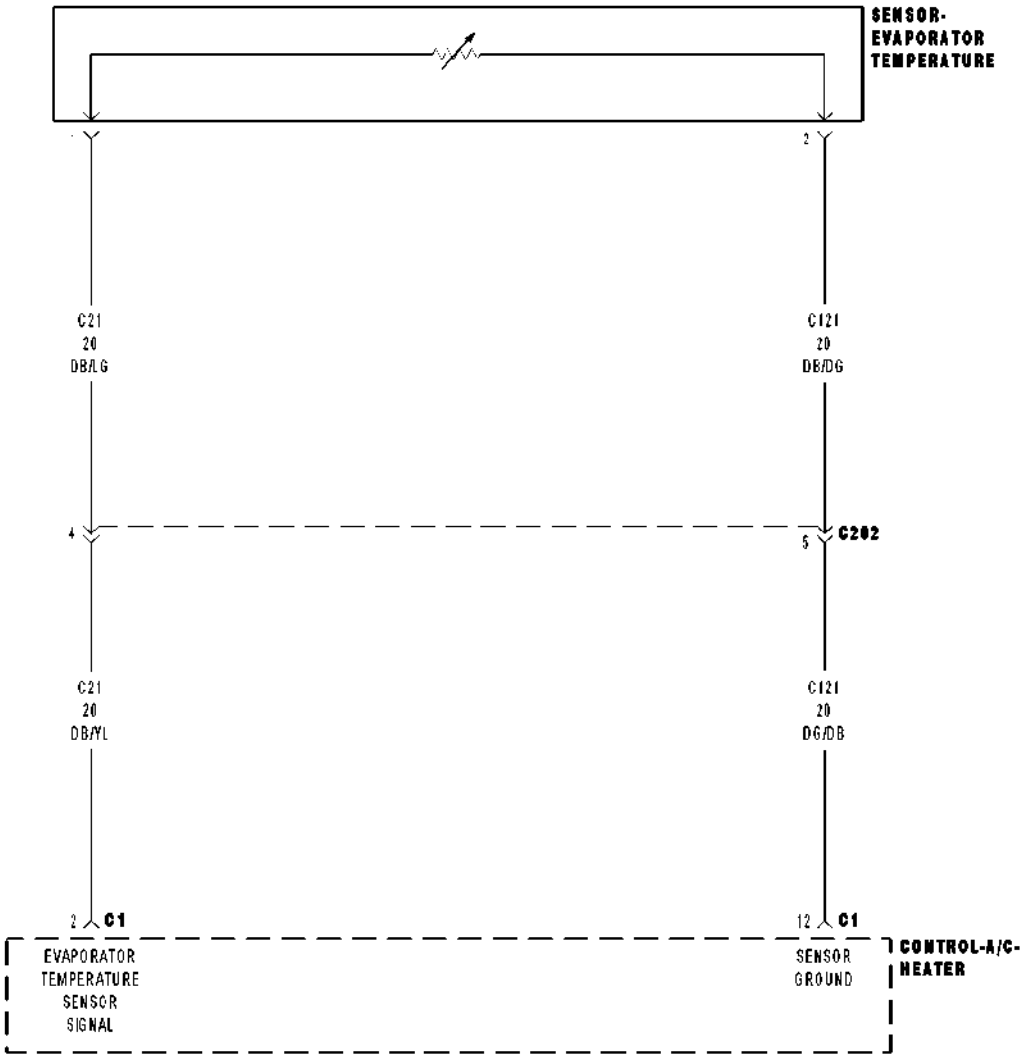
Perform BODY VERIFICATION TEST - VER 1.

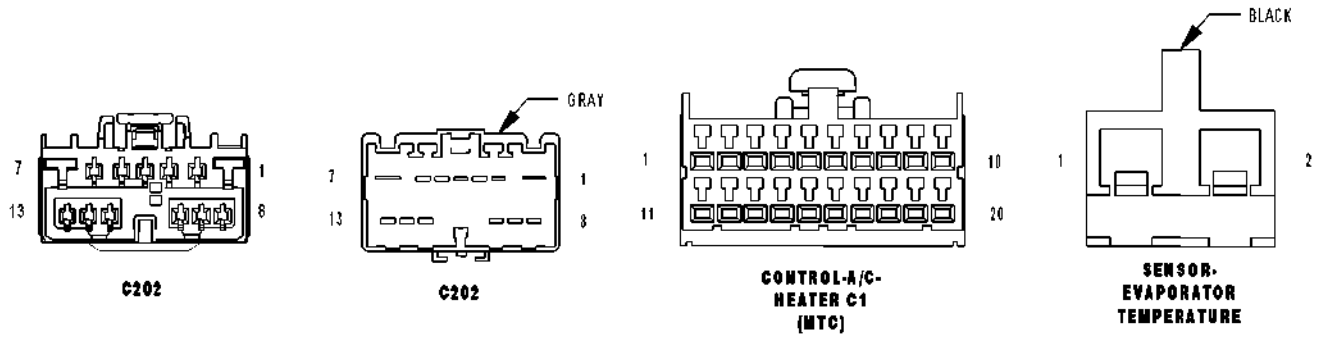
No >> Repair the (C121) Sensor Ground circuit for an open between the Evaporator Temperature Sensor harness connector and the in-line C202 (HVAC SIDE) harness connector.

Perform BODY VERIFICATION TEST - VER 1.



B1032–EVAPORATOR FIN TEMPERATURE SENSOR CIRCUIT HIGH (MTC)





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B1032–EVAPORATOR FIN TEMPERATURE SENSOR CIRCUIT HIGH (MTC) (CONTINUED)

For the Manual Temperature Control (MTC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Evaporator Temperature Sensor input is out of range toward the high voltage threshold, (A/D counts reach high threshold of 240). This DTC has a maturing time of 5 seconds and a de-maturing time of 10 seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

Possible Causes
(C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
(C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT OPEN
(C121) SENSOR GROUND CIRCUIT OPEN
EVAPORATOR TEMPERATURE SENSOR
A/C HEATER CONTROL

NOTE: This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (MTC) for stored DTC test procedures.

Diagnostic Test

1. CHECK (C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

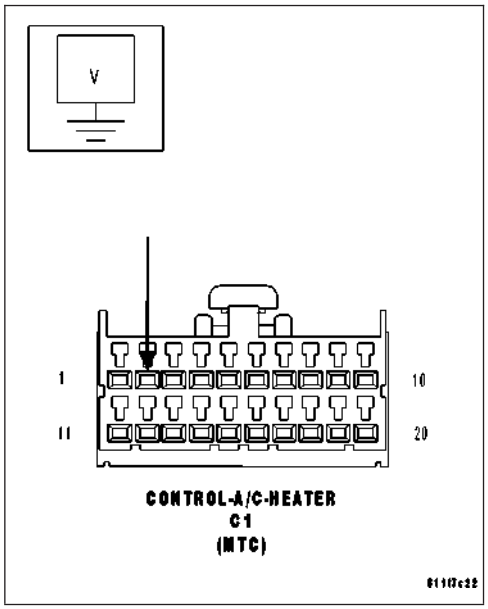
Turn the ignition on.

Measure the voltage of the (C21) Evaporator Temperature Sensor Signal circuit.

Is the voltage above 0.2 volts?

Yes >> Repair the (C21) Evaporator Temperature Sensor Signal circuit for a short to voltage.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 2



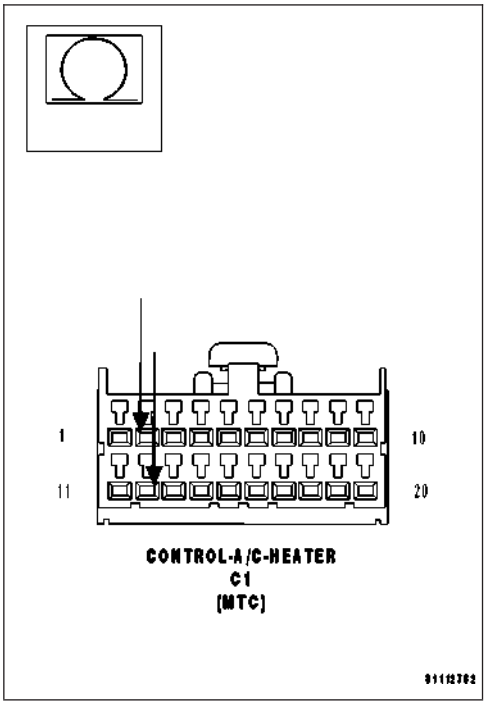
B1032–EVAPORATOR FIN TEMPERATURE SENSOR CIRCUIT HIGH (MTC) (CONTINUED)

2. CHECK (C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT, (C121) SENSOR GROUND CIRCUIT, & EVAPORATOR TEMPERATURE SENSOR

Turn the ignition off.

Measure the resistance between the (C21) Evaporator Temperature Sensor Signal circuit and the (C121) Sensor Ground circuit in the A/C Heater Control C1 harness connector. The approximate circuit resistance should be as follows:

- 1468 ohms @ 40°C (104°F)
- 1800 ohms @ 35°C (95°F)
- 2221 ohms @ 30°C (86°F)
- 2757 ohms @ 25°C (77°F)
- 3443 ohms @ 20°C (68°F)
- 4330 ohms @ 15°C (59°F)
- 5485 ohms @ 10°C (50°F)
- 6998 ohms @ 5°C (41°F)
- 7354 ohms @ 4°C (39°F)
- 7731 ohms @ 3°C (37°F)
- 8130 ohms @ 2°C (36°F)
- 8553 ohms @ 1°C (34°F)
- 9000 ohms @ 0°C (32°F)



Is the resistance within the specifications?

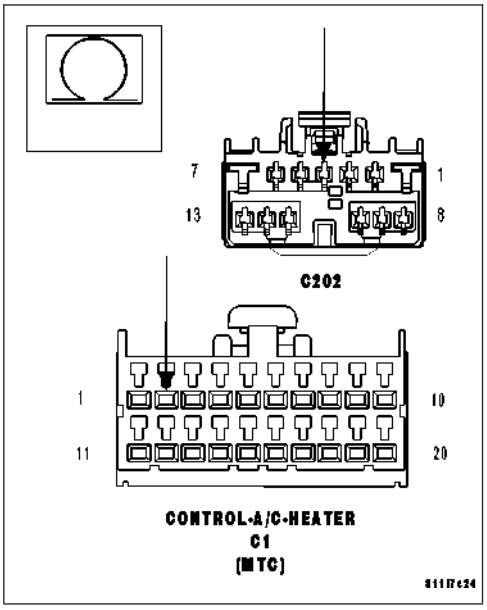
Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 3

3. CHECK (C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT FOR AN OPEN

Disconnect the in-line C202 harness connector.

Measure the resistance of the (C21) Evaporator Temperature Sensor Signal circuit between the A/C Heater Control C1 harness connector and the in-line C202 (IP SIDE) harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go To 4

No >> Repair the (C21) Evaporator Temperature Sensor Signal circuit for an open between the A/C Heater Control C1 harness connector and the in-line C202 (IP SIDE) harness connector.
Perform BODY VERIFICATION TEST - VER 1.

B1032–EVAPORATOR FIN TEMPERATURE SENSOR CIRCUIT HIGH (MTC) (CONTINUED)

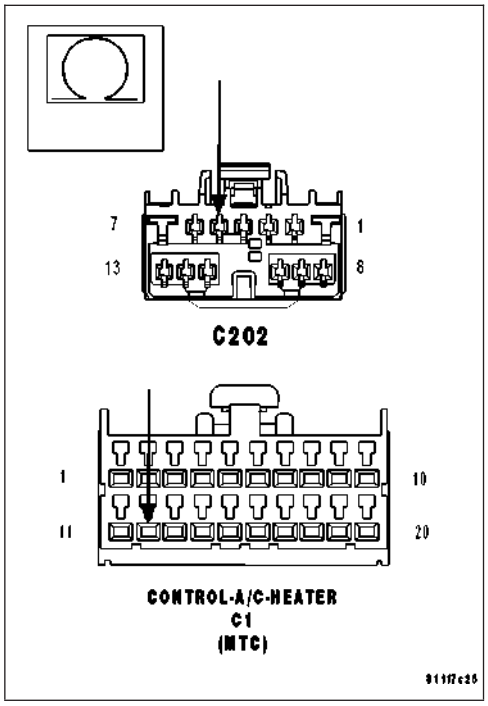
4. CHECK (C121) SENSOR GROUND CIRCUIT FOR AN OPEN

Measure the resistance of the (C121) Sensor Ground circuit between the A/C Heater Control C1 harness connector and the in-line C202 (IP SIDE) harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 5

No >> Repair the (C121) Sensor Ground circuit for an open between the A/C Heater Control C1 harness connector and the in-line C202 (IP SIDE) harness connector.
Perform BODY VERIFICATION TEST - VER 1.



5. CHECK (C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT FOR AN OPEN

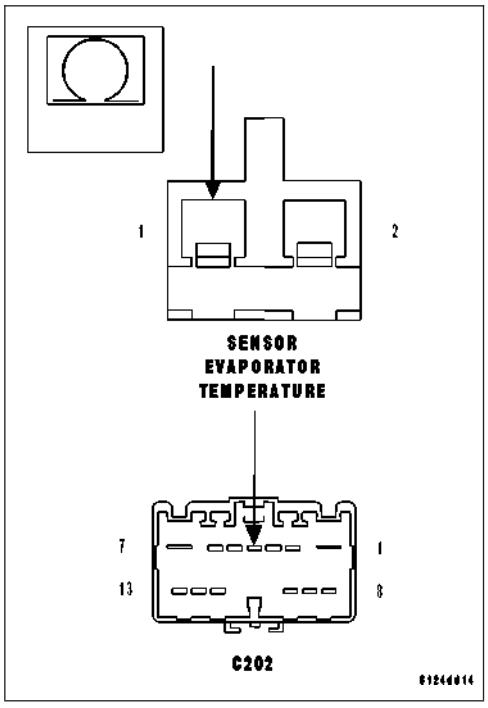
Disconnect the Evaporator Temperature Sensor harness connector.

Measure the resistance of the (C21) Evaporator Temperature Sensor Signal circuit between the Evaporator Temperature Sensor harness connector and the in-line C202 (HVAC SIDE) harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 6

No >> Repair the (C21) Evaporator Temperature Sensor Signal circuit for an open between the Evaporator Temperature Sensor harness connector and the in-line C202 (HVAC SIDE) harness connector.
Perform BODY VERIFICATION TEST - VER 1.



B1032–EVAPORATOR FIN TEMPERATURE SENSOR CIRCUIT HIGH (MTC) (CONTINUED)

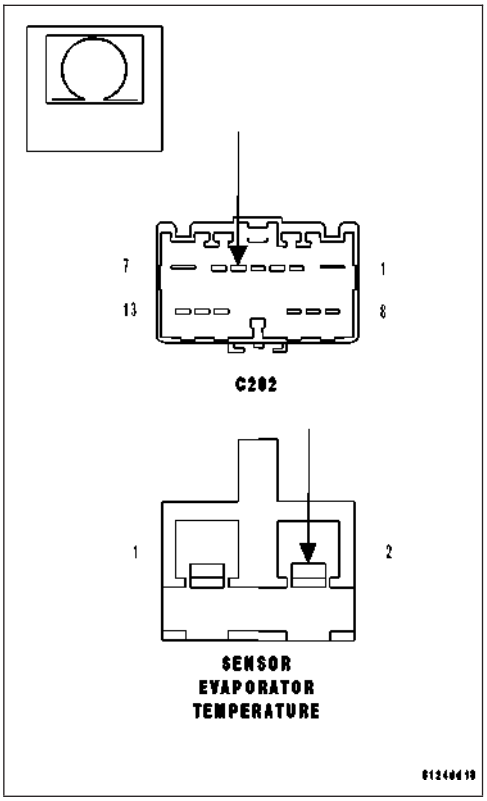
6. CHECK (C121) SENSOR GROUND CIRCUIT FOR AN OPEN

Measure the resistance of the (C121) Sensor Ground circuit between the Evaporator Temperature Sensor harness connector and the in-line C202 (HVAC SIDE) harness connector.

Is the resistance below 5.0 ohms?

Yes >> Replace the Evaporator Temperature Sensor in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the (C121) Sensor Ground circuit for an open between the Evaporator Temperature Sensor harness connector and the in-line C202 (HVAC SIDE) harness connector.
Perform BODY VERIFICATION TEST - VER 1.



B1034–INFRARED TEMPERATURE SENSOR INPUT CIRCUIT LOW

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Compass Temperature Module (EOM) detects a short to ground on the (C38) Infrared Sensor Signal circuit.

POSSIBLE CAUSES
(C83) INFRARED SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
INFRARED TEMPERATURE SENSOR
COMPASS TEMPERATURE MODULE (EOM)

Theory of Operation

The A/C Heater Control requires IR Sensor data to function in an automatic mode. The IR Sensor is hard wired to the Compass Temperature Module (EOM). The EOM broadcasts the IR Sensor data on the Controller Area Network (CAN) B Bus where it is received and then processed by the A/C Heater Control.

Diagnostic Test

1. PERFORM B1034–INFRARED TEMPERATURE SENSOR INPUT CIRCUIT LOW TEST

Repair

Perform test B1034–Infrared Temperature Sensor Input Circuit Low test. (Refer to 8 - ELECTRICAL/ OVERHEAD CONSOLE - DIAGNOSIS AND TESTING).

Perform BODY VERIFICATION TEST – VER 1.

B1035–INFRARED TEMPERATURE SENSOR INPUT CIRCUIT HIGH

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Compass Temperature Module (EOM) detects a short high or open on the (C83) Infrared Sensor Signal circuit.

POSSIBLE CAUSES
(C83) INFRARED SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE
(Z957) INFRARED SENSOR GROUND CIRCUIT OPEN
(C83) INFRARED SENSOR SIGNAL CIRCUIT OPEN
INFRARED TEMPERATURE SENSOR
COMPASS TEMPERATURE MODULE (EOM)

Theory of Operation

The A/C Heater Control requires IR Sensor data to function in an automatic mode. The IR Sensor is hard wired to the Compass Temperature Module (EOM). The EOM broadcasts the IR Sensor data on the Controller Area Network (CAN) B Bus where it is received and then processed by the A/C Heater Control.

Diagnostic Test

1. PERFORM B1035–INFRARED TEMPERATURE SENSOR INPUT CIRCUIT HIGH TEST

Repair

Perform test B1035–Infrared Temperature Sensor Input Circuit High test. (Refer to 8 - ELECTRICAL/ OVERHEAD CONSOLE - DIAGNOSIS AND TESTING).

Perform BODY VERIFICATION TEST – VER 1.

B1038–AUTO SWITCH REQUEST INPUT CIRCUIT LOW (ATC)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Auto mode switch is stuck in a pushed position for more than two minutes. This DTC has a maturing time of two minutes and a de-maturing time of two seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

Possible Causes
OBJECT HOLDING SWITCH IN A PUSHED POSITION
A/C HEATER CONTROL

Theory of Operation

The switch input changes when the switch is pushed down. An active DTC indicates that the switch is stuck in a pushed position. A stored DTC indicates that the switch was stuck in a pushed position for more than two minutes, but has since returned to its normal state.

NOTE: This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

Diagnostic Test

1. INSPECT FOR OBJECT HOLDING SWITCH IN A PUSHED POSITION

Inspect the A/C Heater Control for an object holding the switch in a pushed position. If present, remove the object.

Turn the ignition on.

With the scan tool, erase HVAC DTCs.

Turn the ignition off, wait 10 seconds, and then turn the ignition on.

Wait two minutes, then with the scan tool, read HVAC DTCs.

Does the scan tool display active: B1038–AUTO SWITCH REQUEST INPUT CIRCUIT LOW?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST – VER 1.

No >> Perform BODY VERIFICATION TEST – VER 1.

B1040–PANEL MODE DOOR 1 CONTROL CIRCUIT/PERFORMANCE (ATC)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the A/C Heater Control detects an excessive current draw on the (C29) Mode Door 1 Driver circuit or the (C807) Common Door Driver 2 circuit while attempting to drive this actuator. This DTC has a maturing time of 5 seconds and a de-maturing time of 10 seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

Possible Causes
DOOR DRIVER CIRCUIT(S) SHORTED

Theory of Operation

The A/C Heater Control monitors the door driver circuits during actuator operation for shorts to ground, shorts to battery, and shorts to other door driver circuits. If detected, the A/C Heater Control reports these types of faults as Control Circuit/Performance DTCs. It is important to note that Control Circuit/Performance DTCs do not indicate where or what type of short is present and that additional system testing is necessary to provide more details about the reported fault.

NOTE: The DTC must be active for the results of this test to be valid. Do not perform this test if the DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

Diagnostic Test

1. RUN THE ACTUATOR DTC DETECTION TEST

With the scan tool, erase HVAC DTCs.

Turn the ignition off, wait 10 seconds, and then turn the ignition on.

With the scan tool, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

Repair

Diagnose and repair the DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs and then all short low DTCs. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

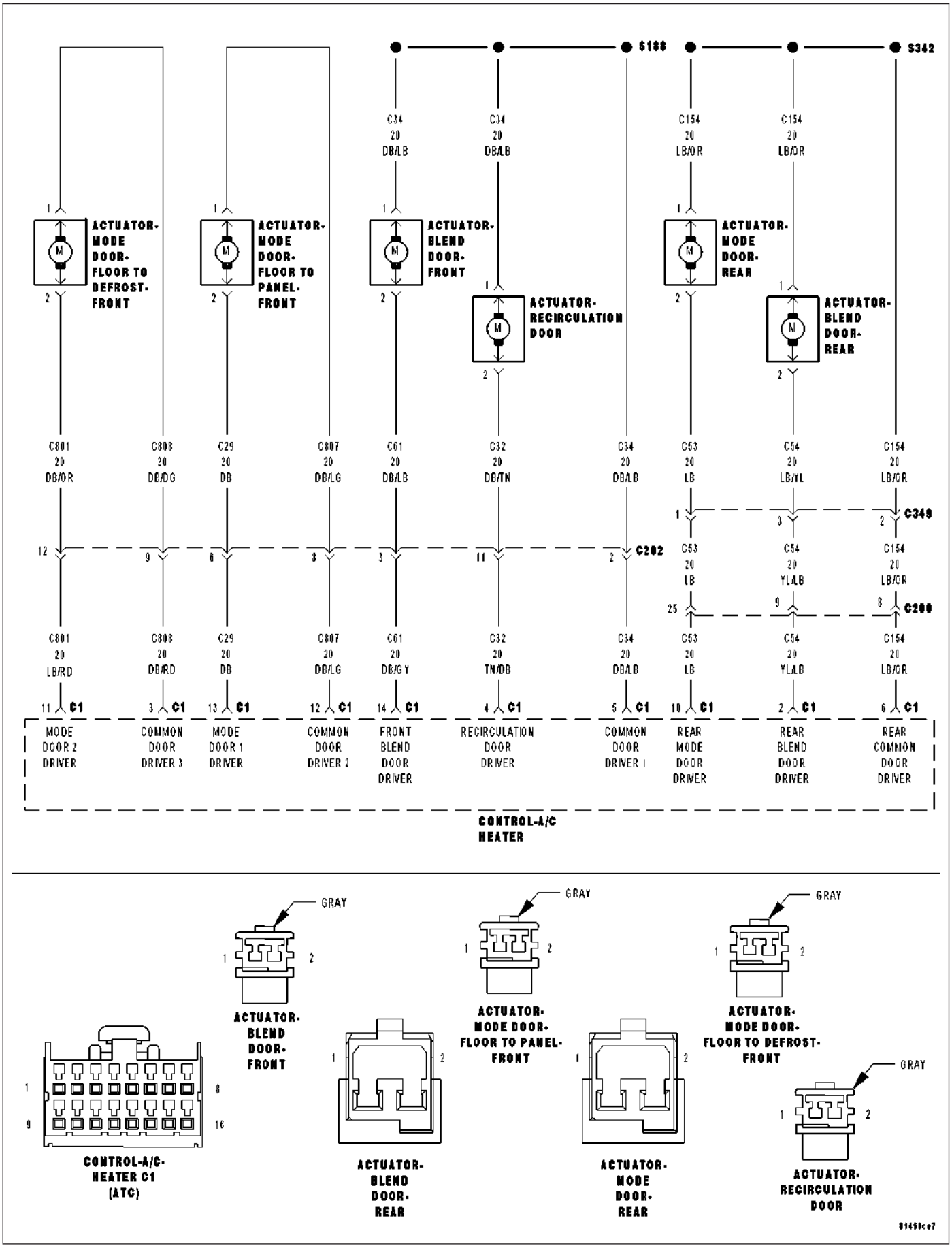
B1040–PANEL MODE DOOR 1 CONTROL CIRCUIT/PERFORMANCE (MTC)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the A/C Heater Control detects an excessive current draw on any of the door driver circuits while attempting to drive this actuator. This DTC has a maturing time of 5 seconds and a de-maturing time of 10 seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

If this DTC is active, refer to B104C–BLEND DOOR CONTROL CIRCUIT/PERFORMANCE (MTC) for the diagnostic test procedure. If this DTC is stored, refer to HVAC System Test (MTC) for stored DTC test procedures.

B1041–PANEL MODE DOOR 1 CONTROL CIRCUIT LOW (ATC)



B1041–PANEL MODE DOOR 1 CONTROL CIRCUIT LOW (ATC) (CONTINUED)

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the Actuator DTC Detection Test is executed.
- **Set Condition:**
  If the (C29) Mode Door 1 Driver circuit is shorted to ground.

Possible Causes
(C29) MODE DOOR 1 DRIVER CIRCUIT SHORTED TO GROUND
(C29) MODE DOOR 1 DRIVER CIRCUIT SHORTED TO OTHER DOOR DRIVER CIRCUIT(S)
MODE DOOR 1 (FLOOR TO PANEL) ACTUATOR
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control drives the Mode Door 1 (Floor to Panel) Actuator via the (C29) Mode Door 1 Driver circuit and the (C807) Common Door Driver 2 circuit. The Mode Door 1 (Floor to Panel) Actuator does not share the (C807) Common Door Driver 2 circuit or its driver inside the A/C Heater Control with any other actuator.

Diagnostic Test

1. CHECK (C29) MODE DOOR 1 DRIVER CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

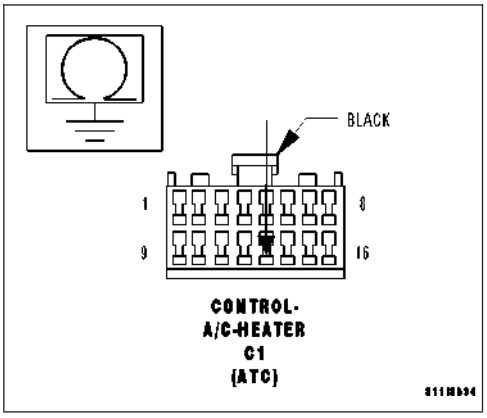
Disconnect the A/C Heater Control C1 harness connector.

Measure the resistance of the (C29) Mode Door 1 Driver circuit between ground and the A/C Heater Control C1 harness connector.

Is the resistance below 10k ohms?

Yes >> Repair the (C29) Mode Door 1 Driver circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

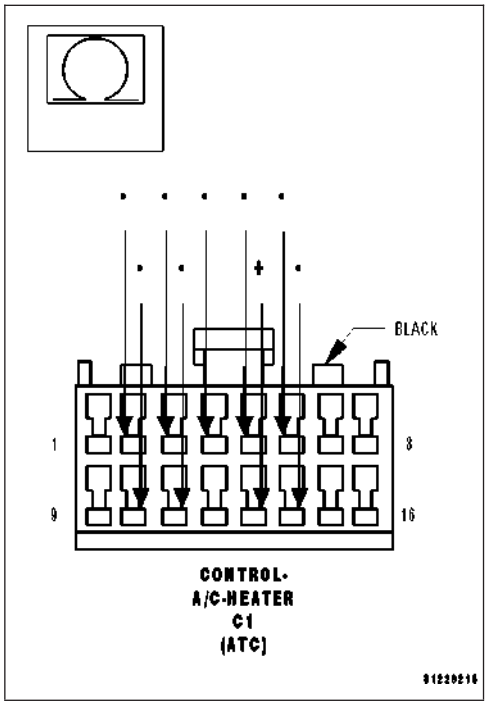
No >> Go To 2



B1041–PANEL MODE DOOR 1 CONTROL CIRCUIT LOW (ATC) (CONTINUED)

2. CHECK (C29) MODE DOOR 1 DRIVER CIRCUIT FOR A SHORT TO OTHER DOOR DRIVER CIRCUITS

Measure the resistance between the (C29) Mode Door 1 Driver circuit and the (C54) Rear Blend Door Driver circuit, the (C808) Common Door Driver 3 circuit, the (C32) Recirculation Door Driver circuit, the (C34) Common Door 1 Driver circuit, the (C154) Rear Common Door Driver circuit, the (C53) Rear Mode Door Driver circuit, the (C801) Mode Door 2 Driver circuit, and the (C61) Front Blend Door Driver circuit in the A/C Heater Control C1 harness connector.



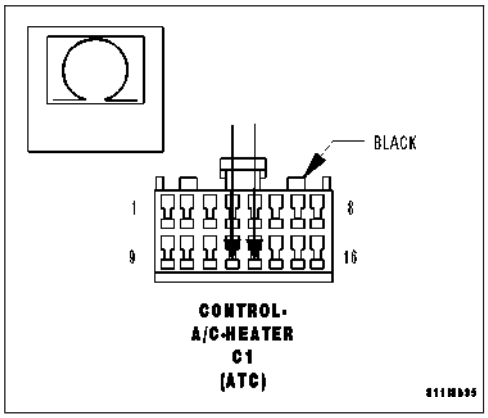
Is the resistance below 10k ohms between the (C29) Mode Door 1 Driver circuit and any of the other door driver circuits?

Yes >> Repair the circuit(s) with a resistance below 10k ohms for a short to the (C29) Mode Door 1 Driver circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 3

3. CHECK MODE DOOR 1 (FLOOR TO PANEL) ACTUATOR CIRCUIT RESISTANCE

Measure the resistance between the (C29) Mode Door 1 Driver circuit and the (C807) Common Door Driver 2 circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 30 ohms?

Yes >> Go To 4

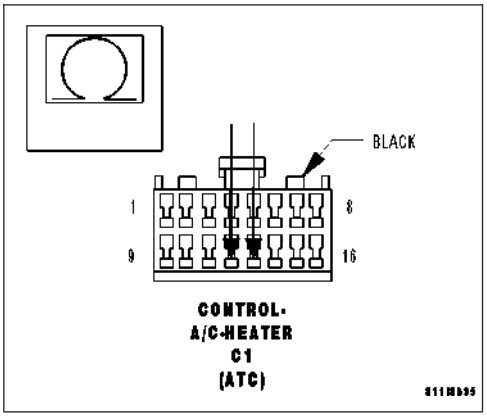
No >> Go To 5

B1041–PANEL MODE DOOR 1 CONTROL CIRCUIT LOW (ATC) (CONTINUED)

4. CHECK (C29) MODE DOOR 1 DRIVER CIRCUIT FOR A SHORT TO (C807) COMMON DOOR DRIVER 2 CIRCUIT

Disconnect the Mode Door 1 (Floor to Panel) Actuator harness connector.

Measure the resistance between the (C29) Mode Door 1 Driver circuit and the (C807) Common Door Driver 2 circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 10k ohms?

Yes >> Repair the (C29) Mode Door 1 Driver circuit for a short to the (C807) Common Door Driver 2 circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Mode Door 1 (Floor to Panel) Actuator in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

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5. RUN THE ACTUATOR DTC DETECTION TEST

Reconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

With the scan tool, erase HVAC DTCs.

Turn the ignition off, wait 10 seconds, and then turn the ignition on.

With the scan tool, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

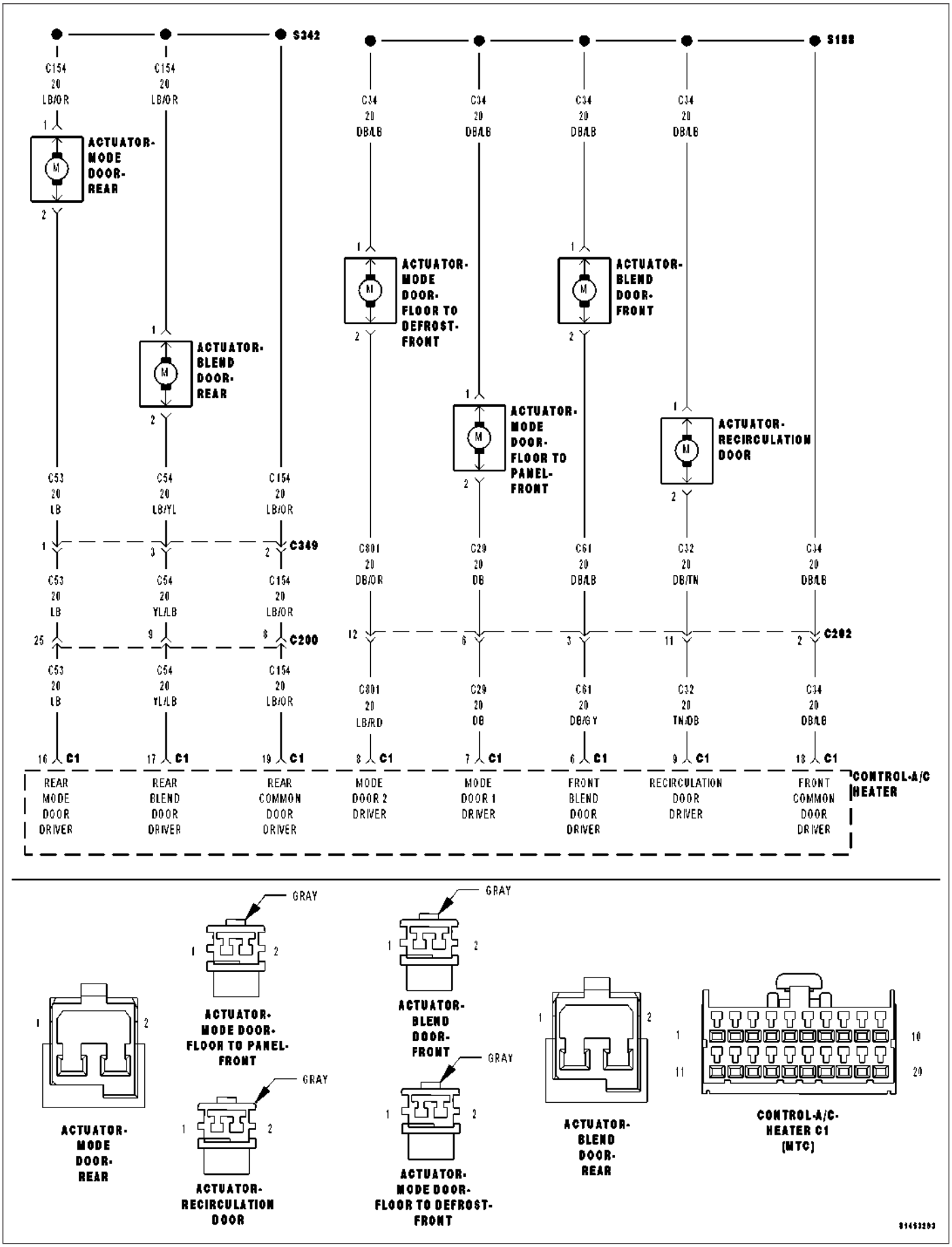
Does the scan tool only display: B1041–PANEL MODE DOOR 1 CONTROL CIRCUIT LOW?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No, Other DTC(s) Displayed
Diagnose and repair the other DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs and then all short low DTCs. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No, And No Other DTCs Displayed
Using the wiring diagram as a guide, inspect the wiring and connectors for conditions causing an intermittent short. Repair as necessary.
Perform BODY VERIFICATION TEST - VER 1.

B1041–PANEL MODE DOOR 1 CONTROL CIRCUIT LOW (MTC)



B1041–PANEL MODE DOOR 1 CONTROL CIRCUIT LOW (MTC) (CONTINUED)

For the Manual Temperature Control (MTC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the Actuator DTC Detection Test is executed.
- **Set Condition:**
  If the (C29) Mode Door 1 Driver circuit is shorted to ground.

Possible Causes
(C29) MODE DOOR 1 DRIVER CIRCUIT SHORTED TO GROUND
(C29) MODE DOOR 1 DRIVER CIRCUIT SHORTED TO OTHER DOOR DRIVER CIRCUIT(S)
MODE DOOR 1 (FLOOR TO PANEL) ACTUATOR
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control drives the Mode Door 1 (Floor to Panel) Actuator via the (C29) Mode Door 1 Driver circuit and the (C34) Front Common Door Driver circuit. All of the front door actuators share the (C34) Front Common Door Driver circuit. Inside the A/C Heater Control, each door actuator has its own unique driver, but all share a single common door driver circuit. Due to the shared circuitry similar DTCs can set at the same time for multiple actuators depending upon the type of short, its location, and the direction the actuator is moving when the short is present.

Diagnostic Test

1. CHECK (C29) MODE DOOR 1 DRIVER CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

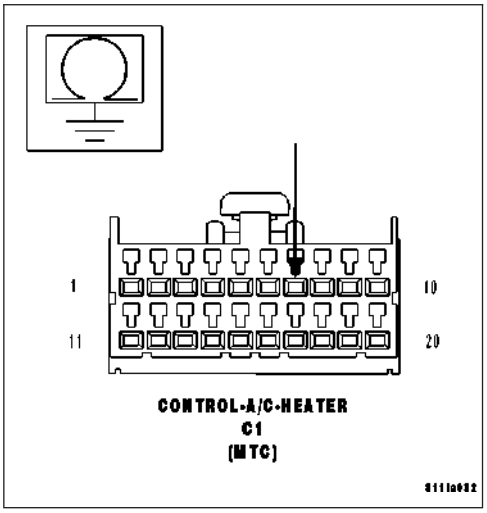
Disconnect the A/C Heater Control C1 harness connector.

Measure the resistance of the (C29) Mode Door 1 Driver circuit between ground and the A/C Heater Control C1 harness connector.

Is the resistance below 10k ohms?

Yes >> Repair the (C29) Mode Door 1 Driver circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

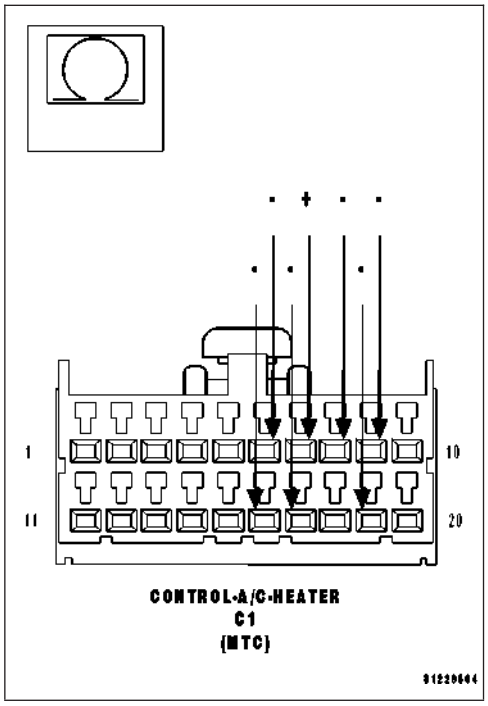
No >> Go To 2



B1041–PANEL MODE DOOR 1 CONTROL CIRCUIT LOW (MTC) (CONTINUED)

2. CHECK (C29) MODE DOOR 1 DRIVER CIRCUIT FOR A SHORT TO OTHER DOOR DRIVER CIRCUITS

Measure the resistance between the (C29) Mode Door 1 Driver circuit and the (C61) Front Blend Door Driver circuit, the (C801) Mode Door 2 Driver circuit, the (C32) Recirculation Door Driver circuit, and, if equipped, the (C53) Rear Mode Door Driver circuit, the (C154) Rear Common Door Driver circuit, and the (C54) Rear Blend Door Driver circuit in the A/C Heater Control C1 harness connector.



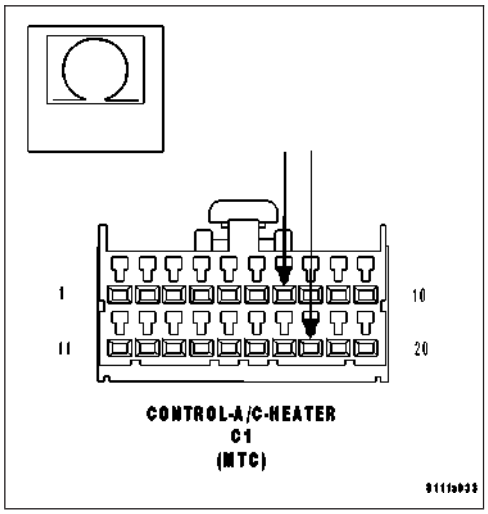
Is the resistance below 10k ohms between the (C29) Mode Door 1 Driver circuit and any of the other door driver circuits?

Yes >> Repair the circuit(s) with a resistance below 10k ohms for a short to the (C29) Mode Door 1 Driver circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 3

3. CHECK MODE DOOR 1 (FLOOR TO PANEL) ACTUATOR CIRCUIT RESISTANCE

Measure the resistance between the (C29) Mode Door 1 Driver circuit and the (C34) Front Common Door Driver circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 30 ohms?

Yes >> Go To 4

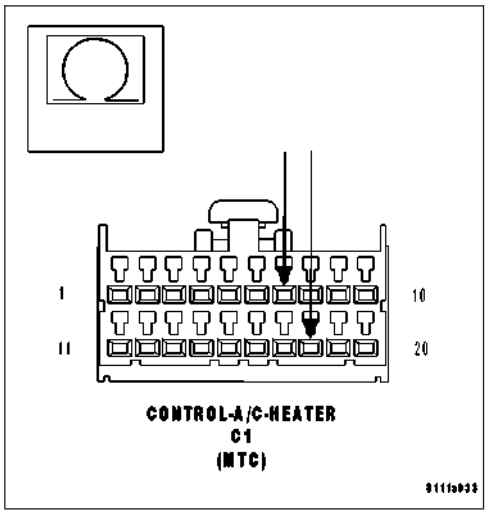
No >> Go To 5

B1041–PANEL MODE DOOR 1 CONTROL CIRCUIT LOW (MTC) (CONTINUED)

4. CHECK (C29) MODE DOOR 1 DRIVER CIRCUIT FOR A SHORT TO (C34) FRONT COMMON DOOR DRIVER CIRCUIT

Disconnect the Mode Door 1 (Floor to Panel) Actuator harness connector.

Measure the resistance between the (C29) Mode Door 1 Driver circuit and the (C34) Front Common Door Driver circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 10k ohms?

Yes >> Repair the (C29) Mode Door 1 Driver circuit for a short to the (C34) Front Common Door Driver circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Mode Door 1 (Floor to Panel) Actuator in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

5. RUN THE ACTUATOR DTC DETECTION TEST

Reconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

With the scan tool, erase HVAC DTCs.

Turn the ignition off, wait 10 seconds, and then turn the ignition on.

With the scan tool, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

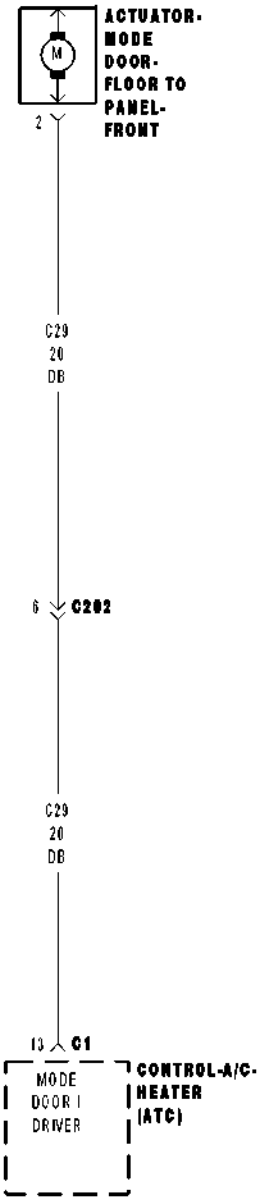
Does the scan tool only display: B1041–PANEL MODE DOOR 1 CONTROL CIRCUIT LOW?

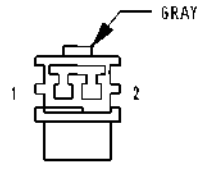
Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No, Other DTC(s) Displayed
Diagnose and repair the other DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs and then all short low DTCs. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

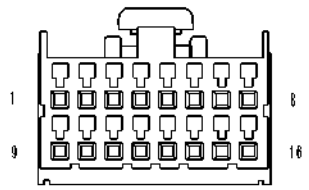
No, And No Other DTCs Displayed
Using the wiring diagram as a guide, inspect the wiring and connectors for conditions causing an intermittent short. Repair as necessary.
Perform BODY VERIFICATION TEST - VER 1.

B1042–PANEL MODE DOOR 1 CONTROL CIRCUIT HIGH (ATC)





ACTUATOR-
MODE DOOR-
FLOOR TO PANEL-
FRONT



CONTROL-A/C-
HEATER C1
(ATC)

B1053d6a

B1042–PANEL MODE DOOR 1 CONTROL CIRCUIT HIGH (ATC) (CONTINUED)

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the Actuator DTC Detection Test is executed.
- **Set Condition:**
  If the (C29) Mode Door 1 Driver circuit is shorted to voltage.

Possible Causes
(C29) MODE DOOR 1 DRIVER CIRCUIT SHORTED TO VOLTAGE
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control drives the Mode Door 1 (Floor to Panel) Actuator via the (C29) Mode Door 1 Driver circuit and the (C807) Common Door Driver 2 circuit. The Mode Door 1 (Floor to Panel) Actuator does not share the (C807) Common Door Driver 2 circuit or its driver inside the A/C Heater Control with any other actuator.

Diagnostic Test

1. CHECK (C29) MODE DOOR 1 DRIVER CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

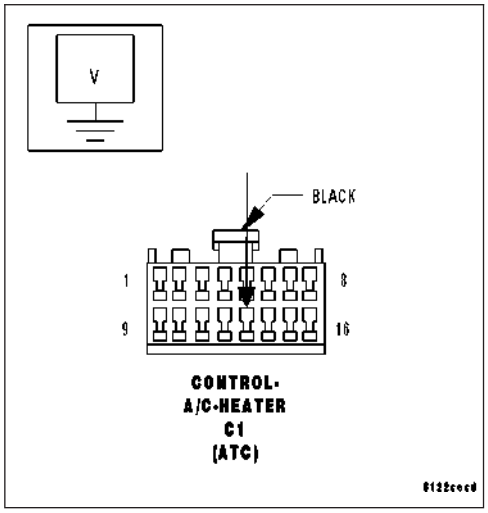
Turn the ignition on.

Measure the voltage of the (C29) Mode Door 1 Driver circuit.

Is the voltage above 0.2 volts?

Yes >> Repair the (C29) Mode Door 1 Driver circuit for a short to voltage.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 2



B1042–PANEL MODE DOOR 1 CONTROL CIRCUIT HIGH (ATC) (CONTINUED)

2. RUN THE ACTUATOR DTC DETECTION TEST

Turn the ignition off.

Reconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

With the scan tool in HVAC, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

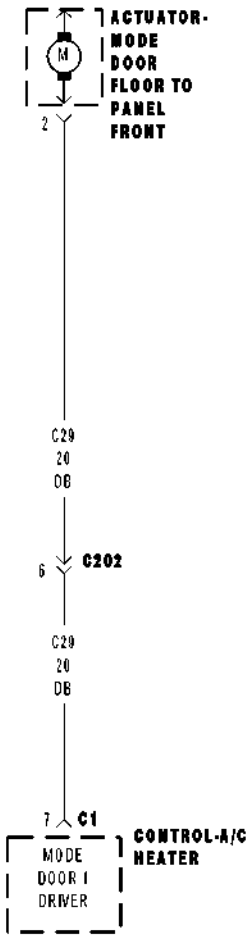
Does the scan tool only display: B1042–PANEL MODE DOOR 1 CONTROL CIRCUIT HIGH?

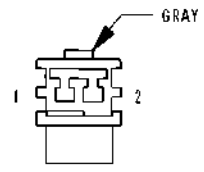
Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No, Other DTC(s) Displayed
Diagnose and repair the other DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs and then all short low DTCs. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

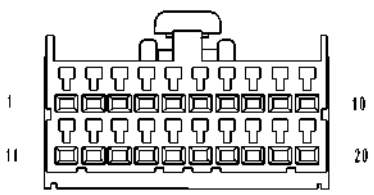
No, And No Other DTCs Displayed
Using the wiring diagram as a guide, inspect the wiring and connectors for conditions causing an intermittent short. Repair as necessary.
Perform BODY VERIFICATION TEST - VER 1.

B1042–PANEL MODE DOOR 1 CONTROL CIRCUIT HIGH (MTC)





ACTUATOR-
MODE DOOR-
FLOOR TO PANEL-
FRONT



CONTROL-A/C-
HEATER C1
(MTC)

B1042–PANEL MODE DOOR 1 CONTROL CIRCUIT HIGH (MTC) (CONTINUED)

For the Manual Temperature Control (MTC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the Actuator DTC Detection Test is executed.
- **Set Condition:**
  If the (C29) Mode Door 1 Driver circuit is shorted to voltage.

Possible Causes
(C29) MODE DOOR 1 DRIVER CIRCUIT SHORTED TO VOLTAGE
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control drives the Mode Door 1 (Floor to Panel) Actuator via the (C29) Mode Door 1 Driver circuit and the (C34) Front Common Door Driver circuit. All of the front door actuators share the (C34) Front Common Door Driver circuit. Inside the A/C Heater Control, each door actuator has its own unique driver, but all share a single common door driver circuit. Note that due to the shared circuitry similar DTCs can set at the same time for multiple actuators depending upon the type of short, its location, and the direction the actuator is moving when the short is present.

Diagnostic Test

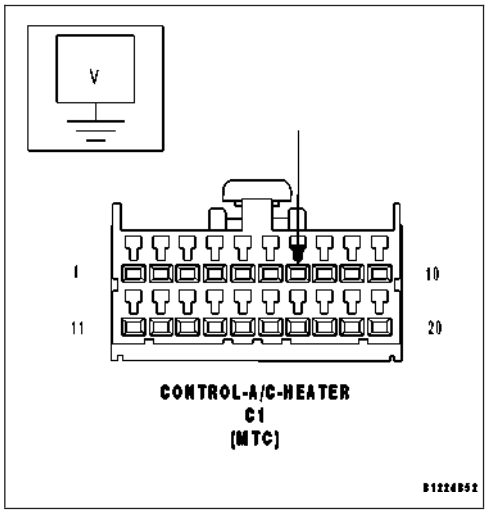
1. CHECK (C29) MODE DOOR 1 DRIVER CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

Measure the voltage of the (C29) Mode Door 1 Driver circuit.



Is the voltage above 0.2 volts?

Yes >> Repair the (C29) Mode Door 1 Driver circuit for a short to voltage.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 2

B1042–PANEL MODE DOOR 1 CONTROL CIRCUIT HIGH (MTC) (CONTINUED)

2. RUN THE ACTUATOR DTC DETECTION TEST

Turn the ignition off.

Reconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

With the scan tool in HVAC, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

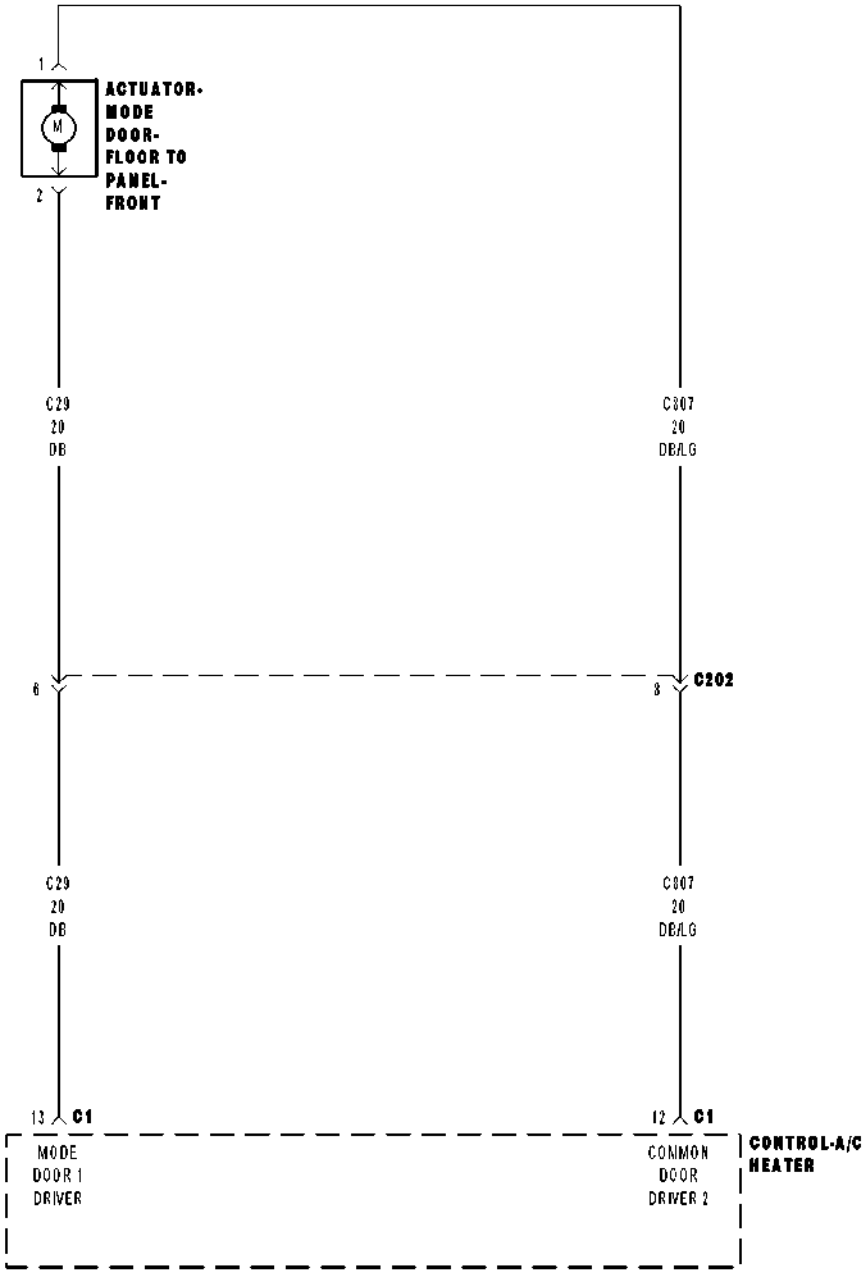
Does the scan tool only display: B1042–PANEL MODE DOOR 1 CONTROL CIRCUIT HIGH?

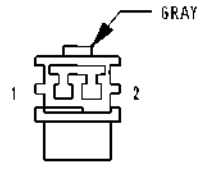
Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No, Other DTC(s) Displayed
Diagnose and repair the other DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs and then all short low DTCs. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

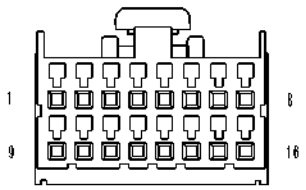
No, And No Other DTCs Displayed
Using the wiring diagram as a guide, inspect the wiring and connectors for conditions causing an intermittent short. Repair as necessary.
Perform BODY VERIFICATION TEST - VER 1.

B1043–PANEL MODE DOOR 1 CONTROL CIRCUIT OPEN (ATC)





ACTUATOR-
MODE DOOR-
FLOOR TO PANEL-
FRONT



CONTROL-A/C-
HEATER C1
(ATC)

B1043–PANEL MODE DOOR 1 CONTROL CIRCUIT OPEN (ATC) (CONTINUED)

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If Mode Door 1 (Floor to Panel) Actuator's electrical circuit is open. This DTC has a maturing time of 5 seconds and a de-maturing time of 10 seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

Possible Causes
(C29) MODE DOOR 1 DRIVER CIRCUIT OPEN
(C807) COMMON DOOR DRIVER 2 CIRCUIT OPEN
MODE DOOR 1 (FLOOR TO PANEL) ACTUATOR
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control drives the Mode Door 1 (Floor to Panel) Actuator via the (C29) Mode Door 1 Driver circuit and the (C807) Common Door Driver 2 circuit. The Mode Door 1 (Floor to Panel) Actuator does not share the (C807) Common Door Driver 2 circuit or its driver inside the A/C Heater Control with any other actuator.

NOTE: DTC B1043 must be active for the results of this test to be valid. Do not perform this test if DTC B1043 is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

Diagnostic Test

1. CHECK FOR ACTIVE CONTROL CIRCUIT/PERFORMANCE DTCs

Turn the ignition on.

With the scan tool, read active HVAC DTCs.

Does the scan tool display any active: XXXX CONTROL CIRCUIT/PERFORMANCE DTCs?

Yes >> Diagnose and repair the DTC(s). If present, diagnose and repair all Rear Blend and Rear Mode Door Control Circuit/Performance DTCs first, then all other Control Circuit/Performance DTCs next. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No >> Go To 2

B1043–PANEL MODE DOOR 1 CONTROL CIRCUIT OPEN (ATC) (CONTINUED)

2. CHECK MODE DOOR 1 (FLOOR TO PANEL) ACTUATOR CIRCUIT RESISTANCE

Turn the ignition off.

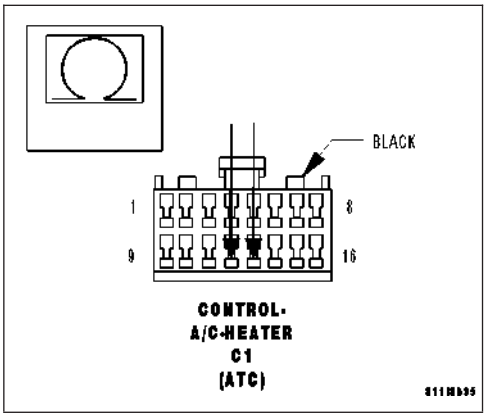
Disconnect the A/C Heater Control C1 harness connector.

Measure the resistance between the (C29) Mode Door 1 Driver circuit and the (C807) Common Door Driver 2 circuit in the A/C Heater Control C1 harness connector.

Is the resistance above 70 ohms?

Yes >> Go To 3

No >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.



3. CHECK (C29) MODE DOOR 1 DRIVER CIRCUIT FOR AN OPEN

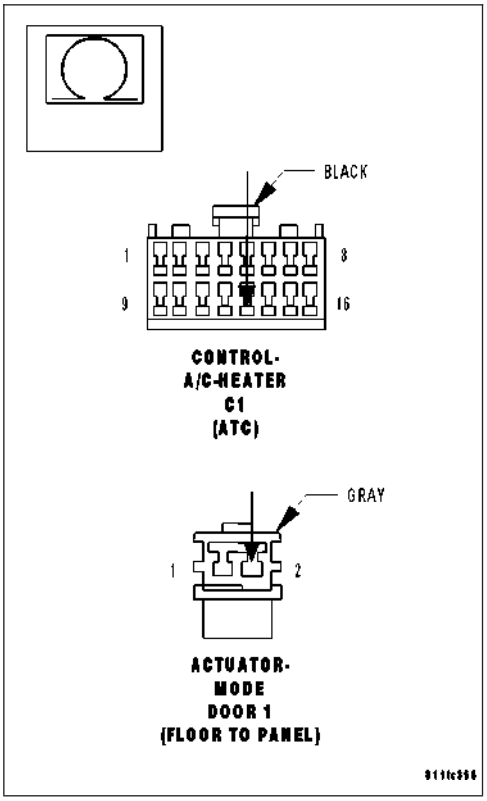
Disconnect the Mode Door 1 (Floor to Panel) Actuator harness connector.

Measure the resistance of the (C29) Mode Door 1 Driver circuit between the A/C Heater Control C1 harness connector and the Mode Door 1 (Floor to Panel) Actuator harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 4

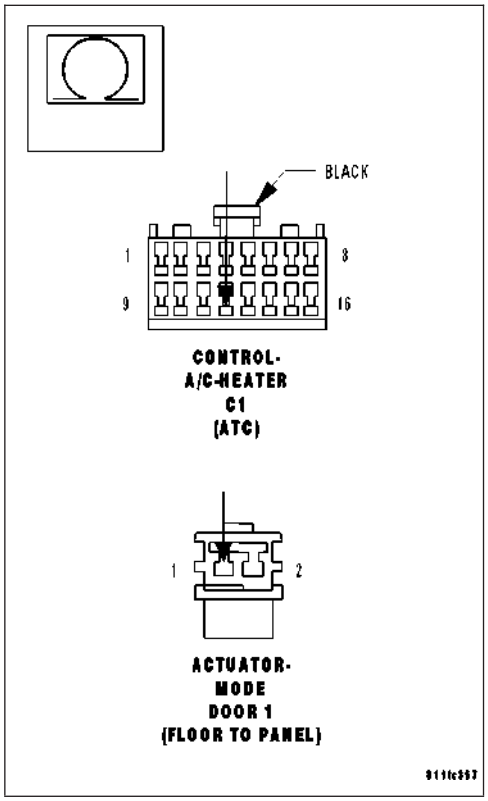
No >> Repair the (C29) Mode Door 1 Driver circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.



B1043–PANEL MODE DOOR 1 CONTROL CIRCUIT OPEN (ATC) (CONTINUED)

4. CHECK (C807) COMMON DOOR DRIVER 2 CIRCUIT FOR AN OPEN

Measure the resistance of the (C807) Common Door Driver 2 circuit between the A/C Heater Control C1 harness connector and the Mode Door 1 (Floor to Panel) Actuator harness connector.

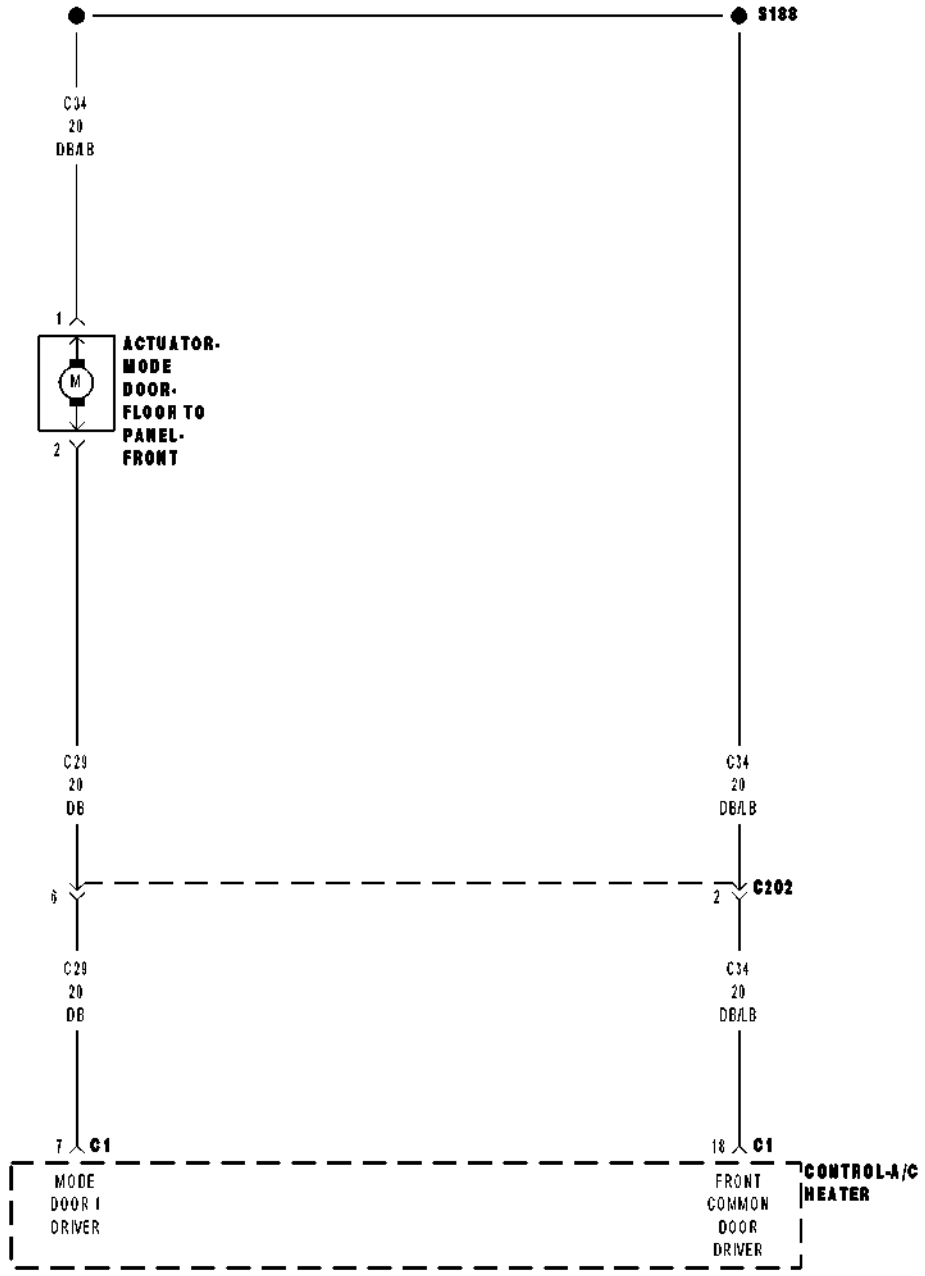


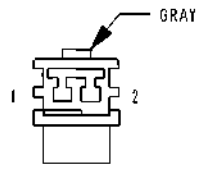
Is the resistance below 5.0 ohms?

Yes >> Replace the Mode Door 1 (Floor to Panel) Actuator in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

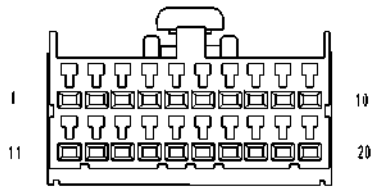
No >> Repair the (C807) Common Door Driver 2 circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

B1043–PANEL MODE DOOR 1 CONTROL CIRCUIT OPEN (MTC)





ACTUATOR-
MODE DOOR-
FLOOR TO PANEL-
FRONT



CONTROL-A/C-
HEATER C1
(MTC)

81451B2

B1043–PANEL MODE DOOR 1 CONTROL CIRCUIT OPEN (MTC) (CONTINUED)

For the Manual Temperature Control (MTC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Mode Door 1 (Floor to Panel) Actuator's electrical circuit is open. This DTC has a maturing time of 5 seconds and a de-maturing time of 10 seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

Possible Causes
(C29) MODE DOOR 1 DRIVER CIRCUIT OPEN
(C34) FRONT COMMON DOOR DRIVER CIRCUIT OPEN
MODE DOOR 1 (FLOOR TO PANEL) ACTUATOR
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control drives the Mode Door 1 (Floor to Panel) Actuator via the (C29) Mode Door 1 Driver circuit and the (C34) Front Common Door Driver circuit. All of the front door actuators share the (C34) Front Common Door Driver circuit. Inside the A/C Heater Control, each door actuator has its own unique driver, but all share a single common door driver circuit. Note that due to the shared circuitry similar DTCs can set at the same time for multiple actuators depending upon the location of the open circuit and the direction the actuator is moving when the open is present.

NOTE: DTC B1043 must be active for the results of this test to be valid. Do not perform this test if DTC B1043 is stored. Refer to HVAC System Test (MTC) for stored DTC test procedures.

Diagnostic Test

1. CHECK FOR ACTIVE CONTROL CIRCUIT/PERFORMANCE DTCs

Turn the ignition on.

With the scan tool, read active HVAC DTCs.

Does the scan tool display any active: XXXX CONTROL CIRCUIT/PERFORMANCE DTCs?

Yes >> Diagnose and repair the DTC(s). Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No >> Go To 2

B1043–PANEL MODE DOOR 1 CONTROL CIRCUIT OPEN (MTC) (CONTINUED)

2. CHECK MODE DOOR 1 (FLOOR TO PANEL) ACTUATOR CIRCUIT RESISTANCE

Turn the ignition off.

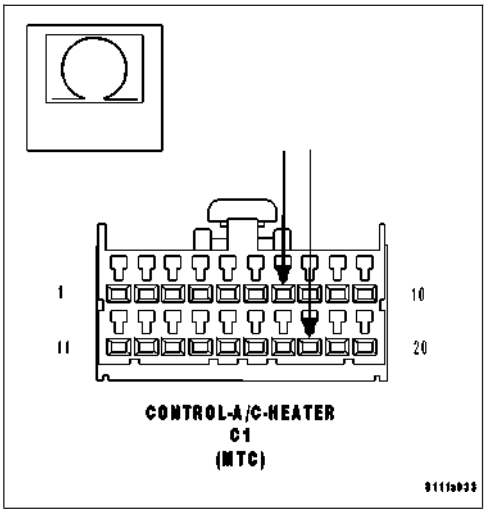
Disconnect the A/C Heater Control C1 harness connector.

Measure the resistance between the (C29) Mode Door 1 Driver circuit and the (C34) Front Common Door Driver circuit in the A/C Heater Control C1 harness connector.

Is the resistance above 70 ohms?

Yes >> Go To 3

No >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.



3. CHECK (C29) MODE DOOR 1 DRIVER CIRCUIT FOR AN OPEN

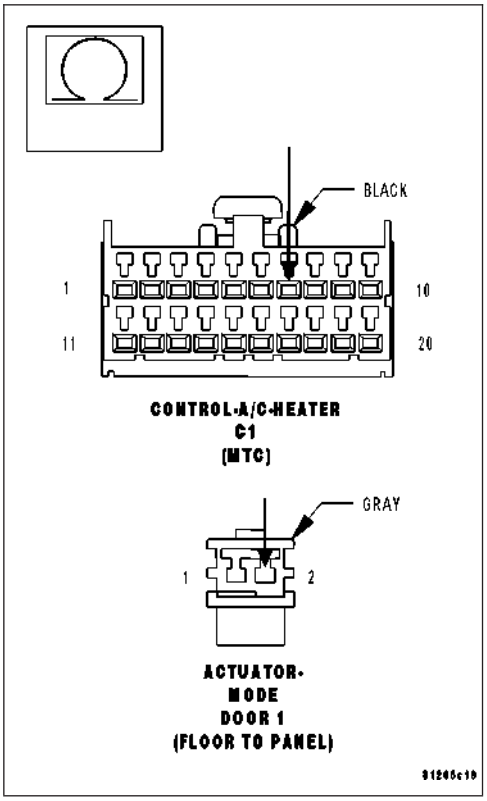
Disconnect the Mode Door 1 (Floor to Panel) Actuator harness connector.

Measure the resistance of the (C29) Mode Door 1 Driver circuit between the A/C Heater Control C1 harness connector and the Mode Door 1 (Floor to Panel) Actuator harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 4

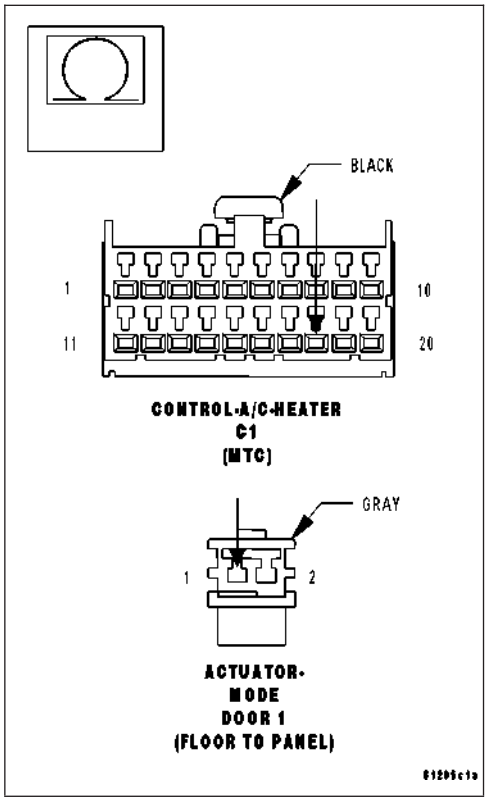
No >> Repair the (C29) Mode Door 1 Driver circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.



B1043–PANEL MODE DOOR 1 CONTROL CIRCUIT OPEN (MTC) (CONTINUED)

4. CHECK (C34) FRONT COMMON DOOR DRIVER CIRCUIT FOR AN OPEN

Measure the resistance of the (C34) Front Common Door Driver circuit between the A/C Heater Control C1 harness connector and the Mode Door 1 (Floor to Panel) Actuator harness connector.



Is the resistance below 5.0 ohms?

Yes >> Replace the Mode Door 1 (Floor to Panel) Actuator in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the (C34) Front Common Door Driver circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

B1044–PANEL MODE DOOR 1 TRAVEL RANGE TOO SMALL (ATC & MTC)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  During actuator calibration.
- **Set Condition:**
  If the total span of the Mode 1 (Floor to Panel) Door is less than the low range limit.

Possible Causes
DOOR DRIVER ELECTRICAL CIRCUIT(S)
MODE 1 (FLOOR TO PANEL) DOOR SEIZED, BINDING, OBSTRUCTED
MODE DOOR 1 (FLOOR TO PANEL) ACTUATOR
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control calibrates each actuator individually. Automatic calibration occurs upon power up after installing a new A/C Heater Control. Manual calibration occurs by sending a command with the scan tool. The purpose of actuator calibration is to determine the total span of door travel between physical stops. To calibrate the actuator, the A/C Heater Control first moves the door to its soft stop, and then counts the number of pulses it takes to move the door to its other stop. An expected range of span is stored in the control's memory. If the measured calibration value is less than the expected range for this actuator, this DTC will set. Note that the control clears all stored calibration faults at the beginning of the calibration procedure.

Diagnostic Test

1. CHECK FOR ACTIVE CONTROL CIRCUIT/PERFORMANCE & CONTROL CIRCUIT OPEN DTCs

Turn the ignition on.

With the scan tool, read active HVAC DTCs.

Does the scan tool display any active: XXXX CONTROL CIRCUIT/PERFORMANCE or XXXX CONTROL CIRCUIT OPEN DTCs?

Yes (ATC)
Diagnose and repair the DTC(s). If present, diagnose and repair all Rear Blend and Rear Mode Door Control Circuit/Performance DTCs first, all other Control Circuit/Performance DTCs second, and all Control Circuit Open DTCs last. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

Yes (MTC)
Diagnose and repair the DTC(s). Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No >> Go To 2

---

2. RUN THE ACTUATOR DTC DETECTION TEST

With the scan tool in HVAC, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

Does the scan tool display any DTCs?

Yes >> Diagnose and repair the DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs first, all short low DTCs second, and all open DTCs last. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No >> Go To 3

B1044–PANEL MODE DOOR 1 TRAVEL RANGE TOO SMALL (ATC & MTC) (CONTINUED)

3. INSPECT ACTUATOR & HOUSING ASSEMBLY FOR A CONDITION CAUSING THE DOOR TO SEIZE OR BIND

Turn the ignition off.

Inspect the actuator, linkage, and housing assembly for a condition causing the door to seize or bind.

Are there any physical or mechanical problems with the door, housing, linkage, or actuator?

Yes >> Repair as necessary in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 4

---

4. CHECK MODE 1 (FLOOR TO PANEL) DOOR TRAVEL

Remove the Mode Door 1 (Floor to Panel) Actuator from the A/C Heater Housing Assembly.

By hand, attempt to rotate the door in both directions. The door should operate smoothly in both directions over approximately 90 degrees of travel.

Does the door operate smoothly in both directions over approximately 90 degrees of travel?

Yes >> Replace the Mode Door 1 (Floor to Panel) Actuator in accordance with the Service Information. Then, Go To 5.

No >> Repair as necessary in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

---

5. RUN ACTUATOR CALIBRATION TEST

Turn the ignition on.

With the scan tool, select System Tests and then select Actuator Calibration Test. When the test is complete, select View DTCs.

Does the scan tool display: B1044–PANEL MODE DOOR 1 TRAVEL RANGE TOO SMALL?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Perform BODY VERIFICATION TEST - VER 1.

B1045–PANEL MODE DOOR 1 TRAVEL RANGE TOO LARGE (ATC & MTC)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  During actuator calibration.
- **Set Condition:**
  If the total span of the Mode 1 (Floor to Panel) Door exceeds the high range limit.

Possible Causes
DOOR DRIVER ELECTRICAL CIRCUIT(S)
MODE 1 (FLOOR TO PANEL) DOOR OR A/C HEATER HOUSING COMPONENTS WARPED, WORN, DAMAGED, MISSING, BROKEN
MODE DOOR 1 (FLOOR TO PANEL) ACTUATOR
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control calibrates each actuator individually. Automatic calibration occurs upon power up after installing a new A/C Heater Control. Manual calibration occurs by sending a command with the scan tool. The purpose of actuator calibration is to determine the total span of door travel between physical stops. To calibrate the actuator, the A/C Heater Control first moves the door to its soft stop, and then counts the number of pulses it takes to move the door to its other stop. An expected range of span is stored in the control's memory. If the measured calibration value exceeds the expected range for this actuator, this DTC will set. Note that the control clears all stored calibration faults at the beginning of the calibration procedure.

Diagnostic Test

1. CHECK FOR ACTIVE CONTROL CIRCUIT/PERFORMANCE & CONTROL CIRCUIT OPEN DTCs

Turn the ignition on.

With the scan tool, read active HVAC DTCs.

Does the scan tool display any active: XXXX CONTROL CIRCUIT/PERFORMANCE or XXXX CONTROL CIRCUIT OPEN DTCs?

Yes (ATC)
Diagnose and repair the DTC(s). If present, diagnose and repair all Rear Blend and Rear Mode Door Control Circuit/Performance DTCs first, all other Control Circuit/Performance DTCs second, and all Control Circuit Open DTCs last. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

Yes (MTC)
Diagnose and repair the DTC(s). Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No >> Go To 2

---

2. RUN THE ACTUATOR DTC DETECTION TEST

With the scan tool in HVAC, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

Does the scan tool display any DTCs?

Yes >> Diagnose and repair the DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs first, all short low DTCs second, and all open DTCs last. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No >> Go To 3

B1045–PANEL MODE DOOR 1 TRAVEL RANGE TOO LARGE (ATC & MTC) (CONTINUED)

3. CHECK FOR A BROKEN MODE DOOR 1 (FLOOR TO PANEL) ACTUATOR

Turn the ignition off.

Remove the Mode Door 1 (Floor to Panel) Actuator from the A/C Heater Housing Assembly.

By hand, attempt to rotate the actuator in both directions.

Does the actuator turn in either direction?

Yes >> Replace the Mode Door 1 (Floor to Panel) Actuator in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 4

---

4. CHECK MODE 1 (FLOOR TO PANEL) DOOR & A/C HEATER HOUSING FOR WARPED, WORN, DAMAGED, MISSING, & BROKEN COMPONENTS

Inspect for excessively worn, disconnected, missing, or broken door linkage. Inspect for a damaged or broken A/C Heater Housing Assembly. Inspect for a warped or broken door, and missing door seals. Rotate the door from stop to stop. The door should rotate approximately 90 degrees.

Are there any physical or mechanical problems with the door or housing?

Yes >> Repair as necessary in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Mode Door 1 (Floor to Panel) Actuator in accordance with the Service Information. Then, Go To 5.

---

5. RUN ACTUATOR CALIBRATION TEST

Turn the ignition on.

With the scan tool, select System Tests and then select Actuator Calibration Test. When the test is complete, select View DTCs.

Does the scan tool display: B1045–PANEL MODE DOOR 1 TRAVEL RANGE TOO LARGE?

Yes >> Replace the A/C Heater Control in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1.

No >> Perform BODY VERIFICATION TEST - VER 1.

B1046–FLOOR/DEFROST MODE DOOR CONTROL CIRCUIT/PERFORMANCE (ATC)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the A/C Heater Control detects an excessive current draw on the (C801) Mode Door 2 Driver circuit, the (C808) Common Door Driver 3 circuit , the (C53) Rear Mode Door Driver circuit, the (C54) Rear Blend Door Driver circuit, or the (C154) Rear Common Door Driver circuit while attempting to drive the Rear Mode Door Actuator, the Rear Blend Door Actuator, or the Mode Door 2 (Floor to Panel) Actuator. This DTC has a maturing time of 5 seconds and a de-maturing time of 10 seconds. If the DTC's status changes from active to stored, it will stay in memory for 100 ignition cycles.

Possible Causes
DOOR DRIVER CIRCUIT(S) SHORTED

Theory of Operation

The A/C Heater Control monitors the door driver circuits during actuator operation for shorts to ground, shorts to battery, and shorts to other door driver circuits. If detected, the A/C Heater Control reports these types of faults as Control Circuit/Performance DTCs. It is important to note that Control Circuit/Performance DTCs do not indicate where or what type of short is present and that additional system testing is necessary to provide more details about the reported fault.

NOTE: The DTC must be active for the results of this test to be valid. Do not perform this test if the DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

Diagnostic Test

1. RUN THE ACTUATOR DTC DETECTION TEST

With the scan tool, erase HVAC DTCs.

Turn the ignition off, wait 10 seconds, and then turn the ignition on.

With the scan tool, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

Repair

Diagnose and repair the DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs and then all short low DTCs. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

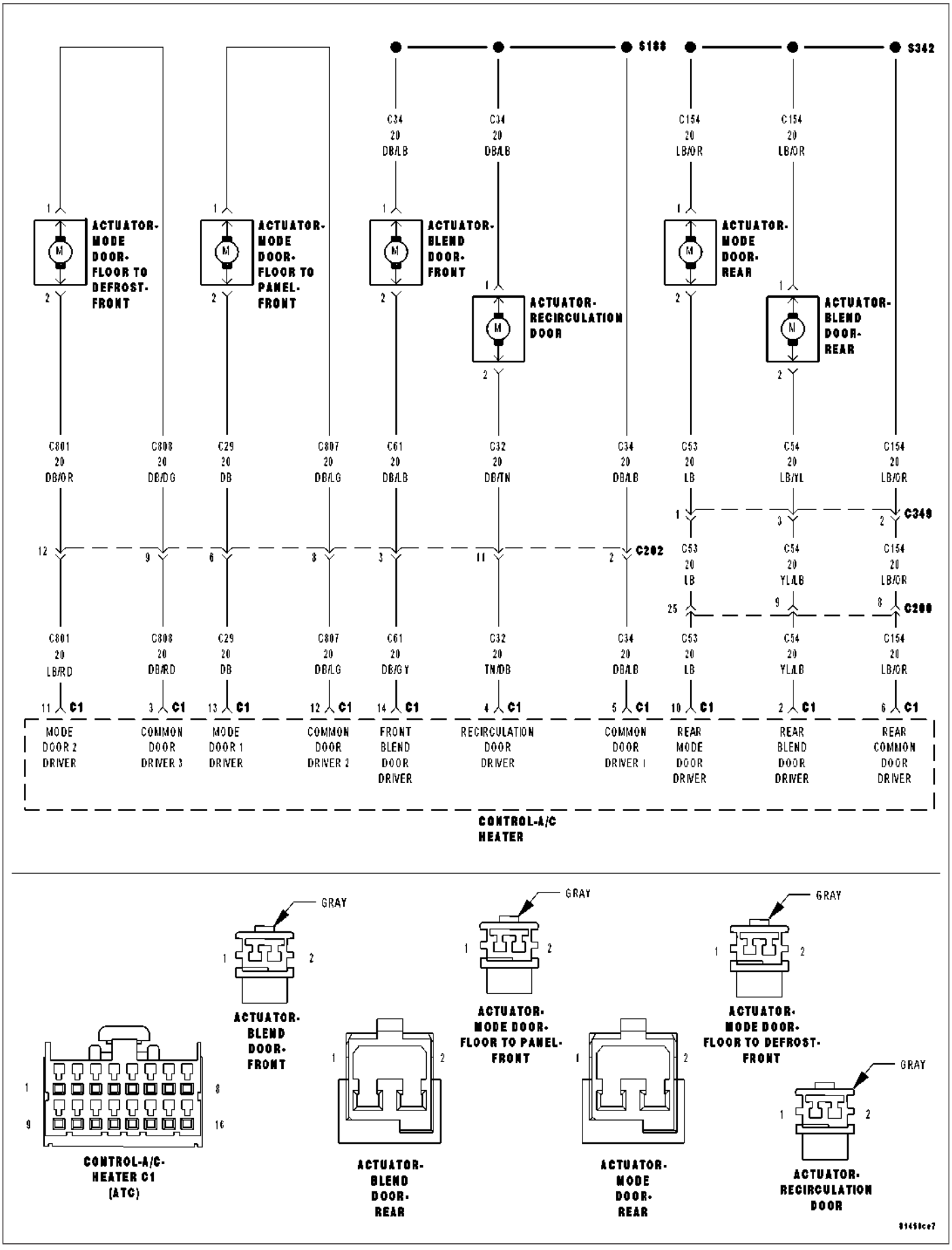
B1046–FLOOR/DEFROST MODE DOOR CONTROL CIRCUIT/PERFORMANCE (MTC)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the A/C Heater Control detects an excessive current draw on any of the door driver circuits while attempting to drive this actuator. This DTC has a maturing time of 5 seconds and a de-maturing time of 10 seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

If this DTC is active, refer to B104C-BLEND DOOR CONTROL CIRCUIT/PERFORMANCE (MTC) for the diagnostic test procedure. If this DTC is stored, refer to HVAC System Test (MTC) for stored DTC test procedures.

B1047–FLOOR/DEFROST MODE DOOR CONTROL CIRCUIT LOW (ATC)



B1047–FLOOR/DEFROST MODE DOOR CONTROL CIRCUIT LOW (ATC) (CONTINUED)

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the Actuator DTC Detection Test is executed.
- **Set Condition:**
  If the (C801) Mode Door 2 Driver circuit is shorted to ground.

Possible Causes
(C801) MODE DOOR 2 DRIVER CIRCUIT SHORTED TO GROUND
(C801) MODE DOOR 2 DRIVER CIRCUIT SHORTED TO OTHER DOOR DRIVER CIRCUIT(S)
MODE DOOR 2 (FLOOR TO DEFROST) ACTUATOR
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control drives the Mode Door 2 (Floor to Defrost) Actuator via the (C801) Mode Door 2 Driver circuit and the (C808) Common Door Driver 3 circuit. The Mode Door 2 (Floor to Defrost) Actuator does not share the (C808) Common Door Driver 3 circuit with any other actuator. However, the Mode Door 2 (Floor to Defrost) Actuator, the Rear Mode Door Actuator, and the Rear Blend Door Actuator share a driver inside the A/C Heater Control. Due to the shared circuitry similar DTCs can set at the same time for multiple actuators depending upon the type of short, its location, and the direction the actuator is moving when the short is present.

Diagnostic Test

1. CHECK (C801) MODE DOOR 2 DRIVER CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

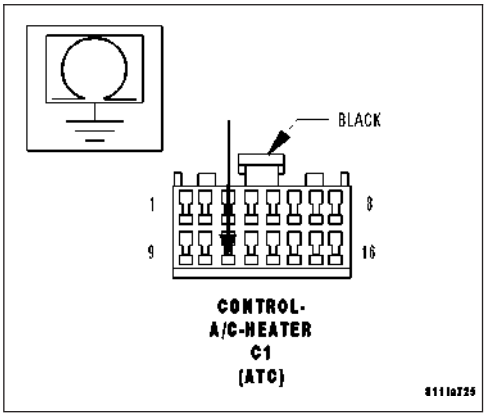
Disconnect the A/C Heater Control C1 harness connector.

Measure the resistance of the (C801) Mode Door 2 Driver circuit between ground and the A/C Heater Control C1 harness connector.

Is the resistance below 10k ohms?

Yes >> Repair the (C801) Mode Door 2 Driver circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

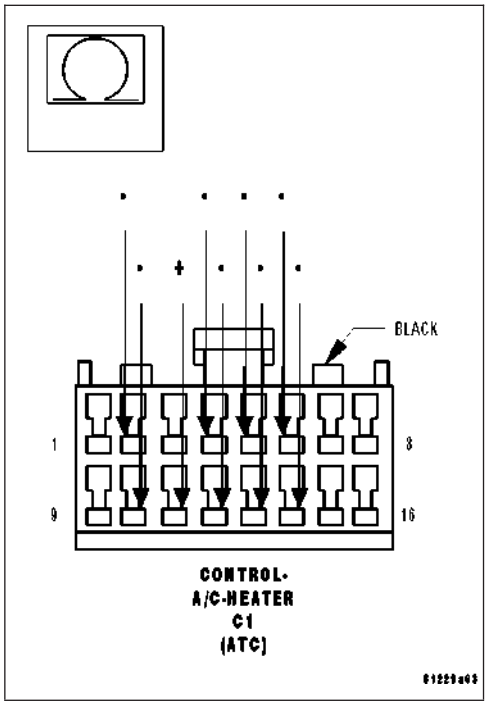
No >> Go To 2



B1047–FLOOR/DEFROST MODE DOOR CONTROL CIRCUIT LOW (ATC) (CONTINUED)

2. CHECK (C801) MODE DOOR 2 DRIVER CIRCUIT FOR A SHORT TO OTHER DOOR DRIVER CIRCUITS

Measure the resistance between the (C801) Mode Door 2 Driver circuit and the (C54) Rear Blend Door Driver circuit, the (C32) Recirculation Door Driver circuit, the (C34) Common Door 1 Driver circuit, the (C154) Rear Common Door Driver circuit, the (C53) Rear Mode Door Driver circuit, the (C807) Common Door Driver 2 circuit, the (C29) Mode Door 1 Driver circuit, and the (C61) Front Blend Door Driver circuit in the A/C Heater Control C1 harness connector.



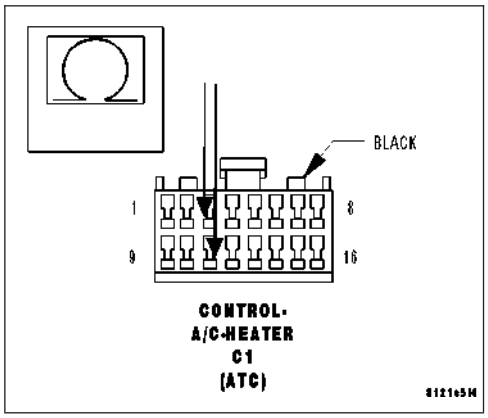
Is the resistance below 10k ohms between the (C801) Mode Door 2 Driver circuit and any of the other door driver circuits?

Yes >> Repair the circuit(s) with a resistance below 10k ohms for a short to the (C801) Mode Door 2 Driver circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 3

3. CHECK MODE DOOR 2 (FLOOR TO DEFROST) ACTUATOR CIRCUIT RESISTANCE

Measure the resistance between the (C801) Mode Door 2 Driver circuit and the (C808) Common Door Driver 3 circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 30 ohms?

Yes >> Go To 4

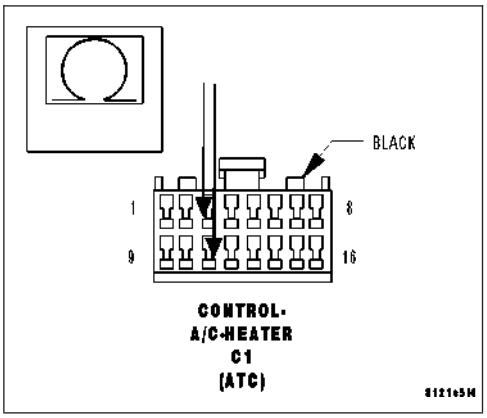
No >> Go To 5

B1047–FLOOR/DEFROST MODE DOOR CONTROL CIRCUIT LOW (ATC) (CONTINUED)

4. CHECK (C801) MODE DOOR 2 DRIVER CIRCUIT FOR A SHORT TO (C808) COMMON DOOR DRIVER 3 CIRCUIT

Disconnect the Mode Door 2 (Floor to Defrost) Actuator harness connector.

Measure the resistance between the (C801) Mode Door 2 Driver circuit and the (C808) Common Door Driver 3 circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 10k ohms?

Yes >> Repair the (C801) Mode Door 2 Driver circuit for a short to the (C808) Common Door Driver 3 circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Mode Door 2 (Floor to Defrost) Actuator in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

---

5. RUN THE ACTUATOR DTC DETECTION TEST

Reconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

With the scan tool, erase HVAC DTCs.

Turn the ignition off, wait 10 seconds, and then turn the ignition on.

With the scan tool, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

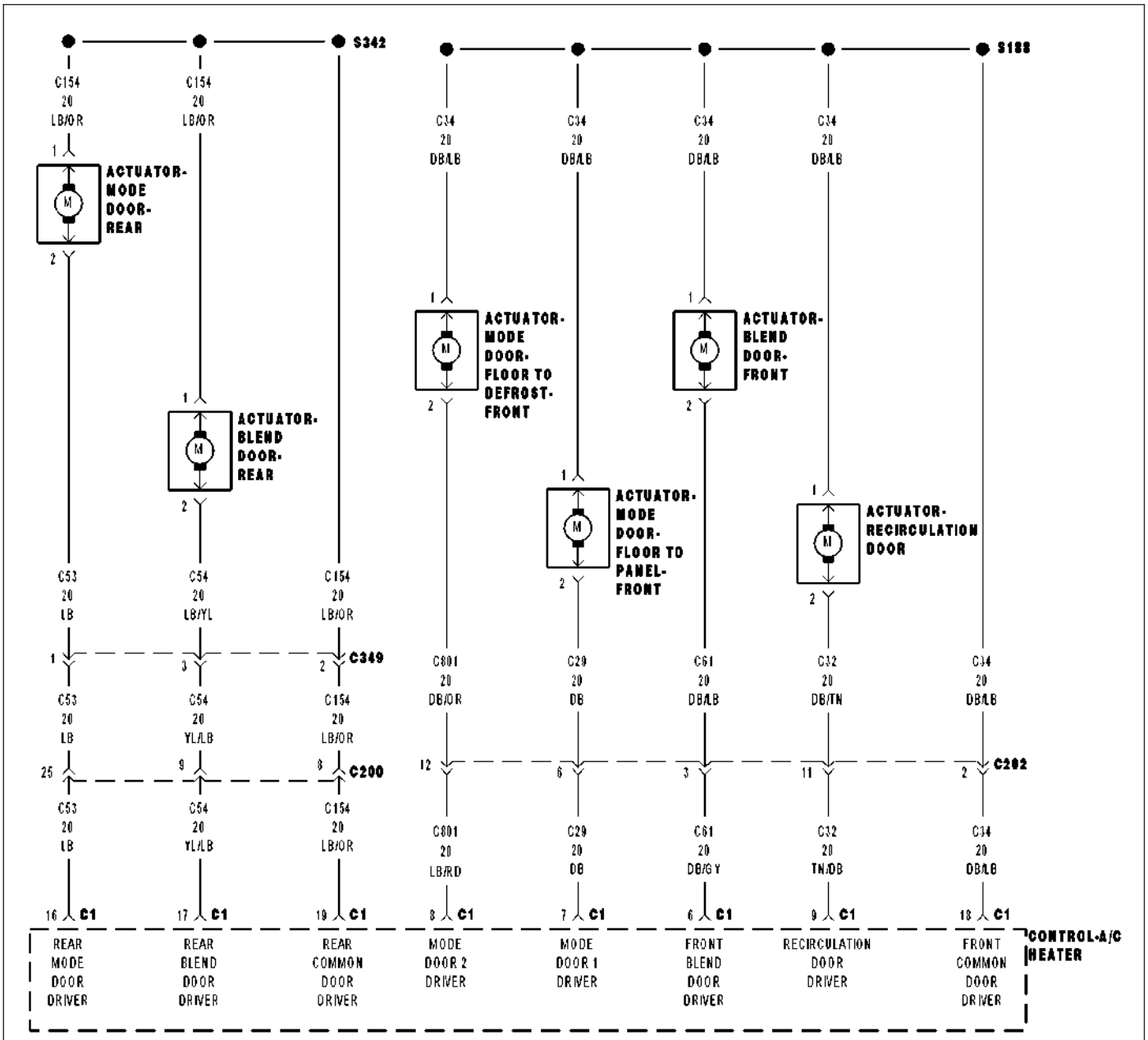
Does the scan tool only display: B1047–FLOOR/DEFROST MODE DOOR CONTROL CIRCUIT LOW?

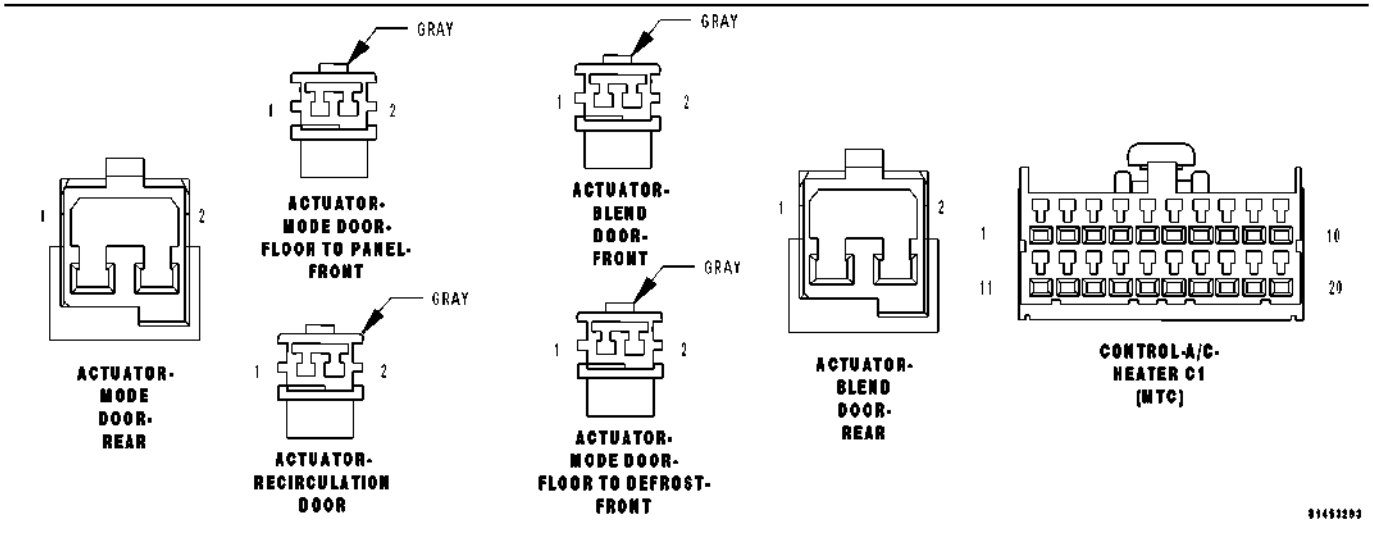
Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No, Other DTC(s) Displayed
Diagnose and repair the other DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs and then all short low DTCs. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No, And No Other DTCs Displayed
Using the wiring diagram as a guide, inspect the wiring and connectors for conditions causing an intermittent short. Repair as necessary.
Perform BODY VERIFICATION TEST - VER 1.

B1047–FLOOR/DEFROST MODE DOOR CONTROL CIRCUIT LOW (MTC)





B1047–FLOOR/DEFROST MODE DOOR CONTROL CIRCUIT LOW (MTC) (CONTINUED)

For the Manual Temperature Control (MTC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the Actuator DTC Detection Test is executed.
- **Set Condition:**
  If the (C801) Mode Door 2 Driver circuit is shorted to ground.

Possible Causes
(C801) MODE DOOR 2 DRIVER CIRCUIT SHORTED TO GROUND
(C801) MODE DOOR 2 DRIVER CIRCUIT SHORTED TO OTHER DOOR DRIVER CIRCUIT(S)
MODE DOOR 2 (FLOOR TO DEFROST) ACTUATOR
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control drives the Mode Door 2 (Floor to Defrost) Actuator via the (C801) Mode Door 2 Driver circuit and the (C34) Front Common Door Driver circuit. All of the front door actuators share the (C34) Front Common Door Driver circuit. Inside the A/C Heater Control, each door actuator has its own unique driver, but all share a single common door driver circuit. Due to the shared circuitry similar DTCs can set at the same time for multiple actuators depending upon the type of short, its location, and the direction the actuator is moving when the short is present.

Diagnostic Test

1. CHECK (C801) MODE DOOR 2 DRIVER CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

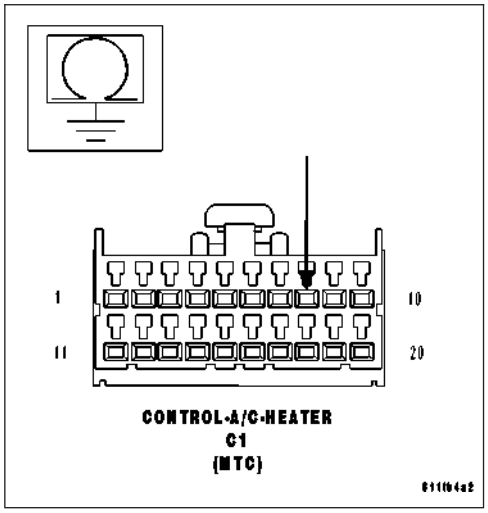
Disconnect the A/C Heater Control C1 harness connector.

Measure the resistance of the (C801) Mode Door 2 Driver circuit between ground and the A/C Heater Control C1 harness connector.

Is the resistance below 10k ohms?

Yes >> Repair the (C801) Mode Door 2 Driver circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

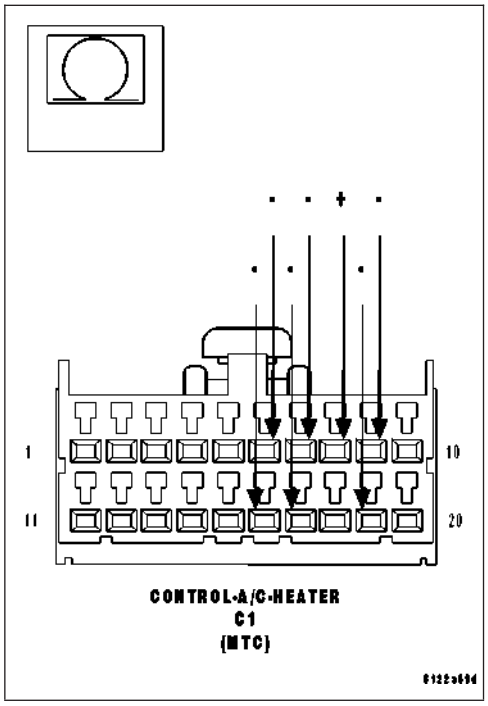
No >> Go To 2



B1047–FLOOR/DEFROST MODE DOOR CONTROL CIRCUIT LOW (MTC) (CONTINUED)

2. CHECK (C801) MODE DOOR 2 DRIVER CIRCUIT FOR A SHORT TO OTHER DOOR DRIVER CIRCUITS

Measure the resistance between the (C801) Mode Door 2 Driver circuit and the (C32) Recirculation Door Driver circuit, the (C29) Mode Door 1 Driver circuit, the (C61) Front Blend Door Driver circuit, and, if equipped, the (C53) Rear Mode Door Driver circuit, the (C154) Rear Common Door Driver circuit, and the (C54) Rear Blend Door Driver circuit in the A/C Heater Control C1 harness connector.



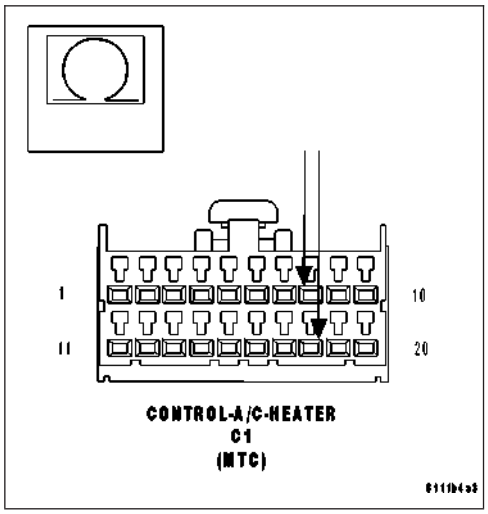
Is the resistance below 10k ohms between the (C801) Mode Door 2 Driver circuit and any of the other door driver circuits?

Yes >> Repair the circuit(s) with a resistance below 10k ohms for a short to the (C801) Mode Door 2 Driver circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 3

3. CHECK MODE DOOR 2 (FLOOR TO DEFROST) ACTUATOR CIRCUIT RESISTANCE

Measure the resistance between the (C801) Mode Door 2 Driver circuit and the (C34) Front Common Door Driver circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 30 ohms?

Yes >> Go To 4

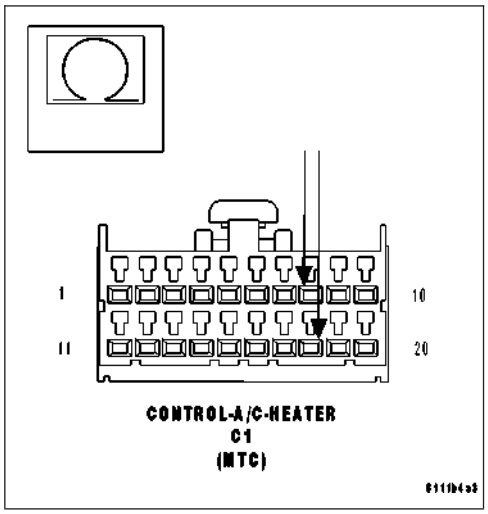
No >> Go To 5

B1047–FLOOR/DEFROST MODE DOOR CONTROL CIRCUIT LOW (MTC) (CONTINUED)

4. CHECK (C801) MODE DOOR 2 DRIVER CIRCUIT FOR A SHORT TO (C34) FRONT COMMON DOOR DRIVER CIRCUIT

Disconnect the Mode Door 2 (Floor to Defrost) Actuator harness connector.

Measure the resistance between the (C801) Mode Door 2 Driver circuit and the (C34) Front Common Door Driver circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 10k ohms?

Yes >> Repair the (C801) Mode Door 2 Driver circuit for a short to the (C34) Front Common Door Driver circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Mode Door 2 (Floor to Defrost) Actuator in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

5. RUN THE ACTUATOR DTC DETECTION TEST

Reconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

With the scan tool, erase HVAC DTCs.

Turn the ignition off, wait 10 seconds, and then turn the ignition on.

With the scan tool, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

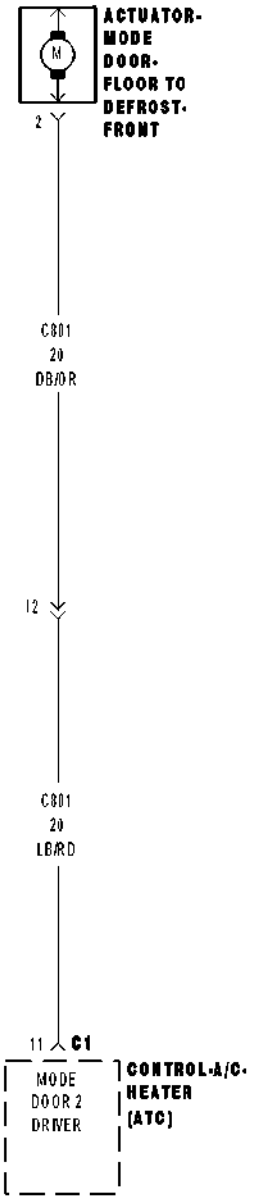
Does the scan tool only display: B1047–FLOOR/DEFROST MODE DOOR CONTROL CIRCUIT LOW?

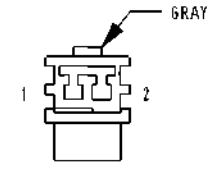
Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No, Other DTC(s) Displayed
Diagnose and repair the other DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs and then all short low DTCs. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

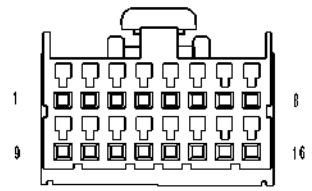
No, And No Other DTCs Displayed
Using the wiring diagram as a guide, inspect the wiring and connectors for conditions causing an intermittent short. Repair as necessary.
Perform BODY VERIFICATION TEST - VER 1.

B1048–FLOOR/DEFROST MODE DOOR CONTROL CIRCUIT HIGH (ATC)





ACTUATOR-
MODE DOOR-
FLOOR TO DEFROST-
FRONT



CONTROL-A/C-
HEATER C1
(ATC)

91453109

B1048–FLOOR/DEFROST MODE DOOR CONTROL CIRCUIT HIGH (ATC) (CONTINUED)

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the Actuator DTC Detection Test is executed.
- **Set Condition:**
  If the (C801) Mode Door 2 Driver circuit is shorted to voltage.

Possible Causes
(C801) MODE DOOR 2 DRIVER CIRCUIT SHORTED TO VOLTAGE
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control drives the Mode Door 2 (Floor to Defrost) Actuator via the (C801) Mode Door 2 Driver circuit and the (C808) Common Door Driver 3 circuit. The Mode Door 2 (Floor to Defrost) Actuator does not share the (C808) Common Door Driver 3 circuit with any other actuator. However, the Mode Door 2 (Floor to Defrost) Actuator, the Rear Mode Door Actuator, and the Rear Blend Door Actuator share a driver inside the A/C Heater Control. Due to the shared circuitry similar DTCs can set at the same time for multiple actuators depending upon the type of short, its location, and the direction the actuator is moving when the short is present.

Diagnostic Test

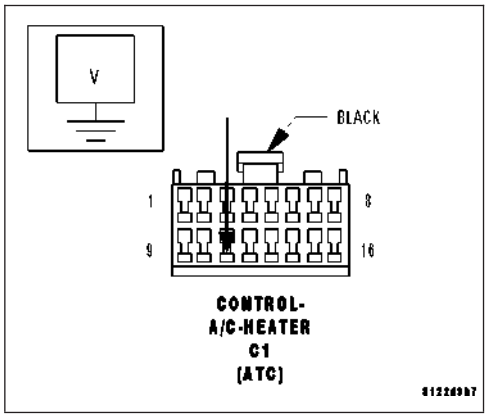
1. CHECK (C801) MODE DOOR 2 DRIVER CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

Measure the voltage of the (C801) Mode Door 2 Driver circuit.



Is the voltage above 0.2 volts?

Yes >> Repair the (C801) Mode Door 2 Driver circuit for a short to voltage.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 2

B1048–FLOOR/DEFROST MODE DOOR CONTROL CIRCUIT HIGH (ATC) (CONTINUED)

2. RUN THE ACTUATOR DTC DETECTION TEST

Turn the ignition off.

Reconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

With the scan tool in HVAC, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

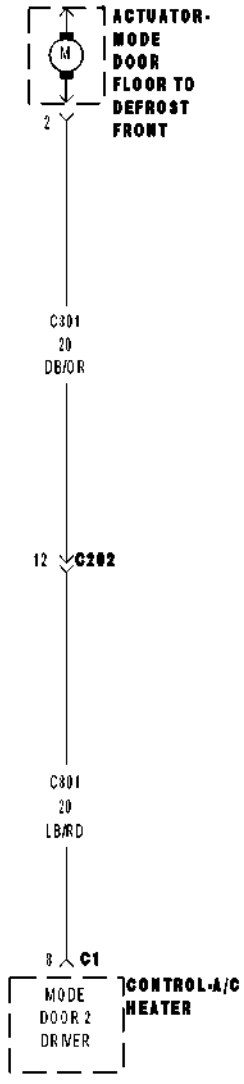
Does the scan tool only display: B1048–FLOOR/DEFROST MODE DOOR CONTROL CIRCUIT HIGH?

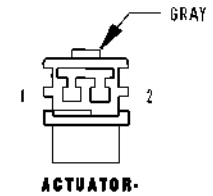
Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No, Other DTC(s) Displayed
Diagnose and repair the other DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs and then all short low DTCs. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

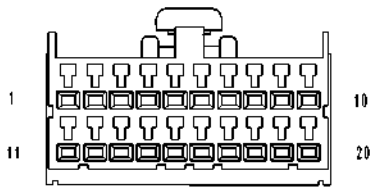
No, And No Other DTCs Displayed
Using the wiring diagram as a guide, inspect the wiring and connectors for conditions causing an intermittent short. Repair as necessary.
Perform BODY VERIFICATION TEST - VER 1.

B1048–FLOOR/DEFROST MODE DOOR CONTROL CIRCUIT HIGH (MTC)





ACTUATOR-
MODE DOOR-
FLOOR TO DEFROST-
FRONT



CONTROL-A/C-
HEATER C1
(MTC)

81453fa1

B1048–FLOOR/DEFROST MODE DOOR CONTROL CIRCUIT HIGH (MTC) (CONTINUED)

For the Manual Temperature Control (MTC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the Actuator DTC Detection Test is executed.
- **Set Condition:**
  If the (C801) Mode Door 2 Driver circuit is shorted to voltage.

Possible Causes
(C801) MODE DOOR 2 DRIVER CIRCUIT SHORTED TO VOLTAGE
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control drives the Mode Door 2 (Floor to Defrost) Actuator via the (C801) Mode Door 2 Driver circuit and the (C34) Front Common Door Driver circuit. All of the front door actuators share the (C34) Front Common Door Driver circuit. Inside the A/C Heater Control, each door actuator has its own unique driver, but all share a single common door driver circuit. Due to the shared circuitry similar DTCs can set at the same time for multiple actuators depending upon the type of short, its location, and the direction the actuator is moving when the short is present.

Diagnostic Test

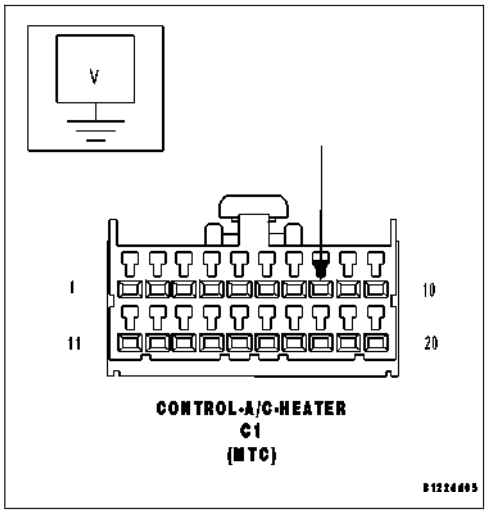
1. CHECK (C801) MODE DOOR 2 DRIVER CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

Measure the voltage of the (C801) Mode Door 2 Driver circuit.



Is the voltage above 0.2 volts?

Yes >> Repair the (C801) Mode Door 2 Driver circuit for a short to voltage.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 2

B1048–FLOOR/DEFROST MODE DOOR CONTROL CIRCUIT HIGH (MTC) (CONTINUED)

2. RUN THE ACTUATOR DTC DETECTION TEST

Turn the ignition off.

Reconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

With the scan tool in HVAC, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

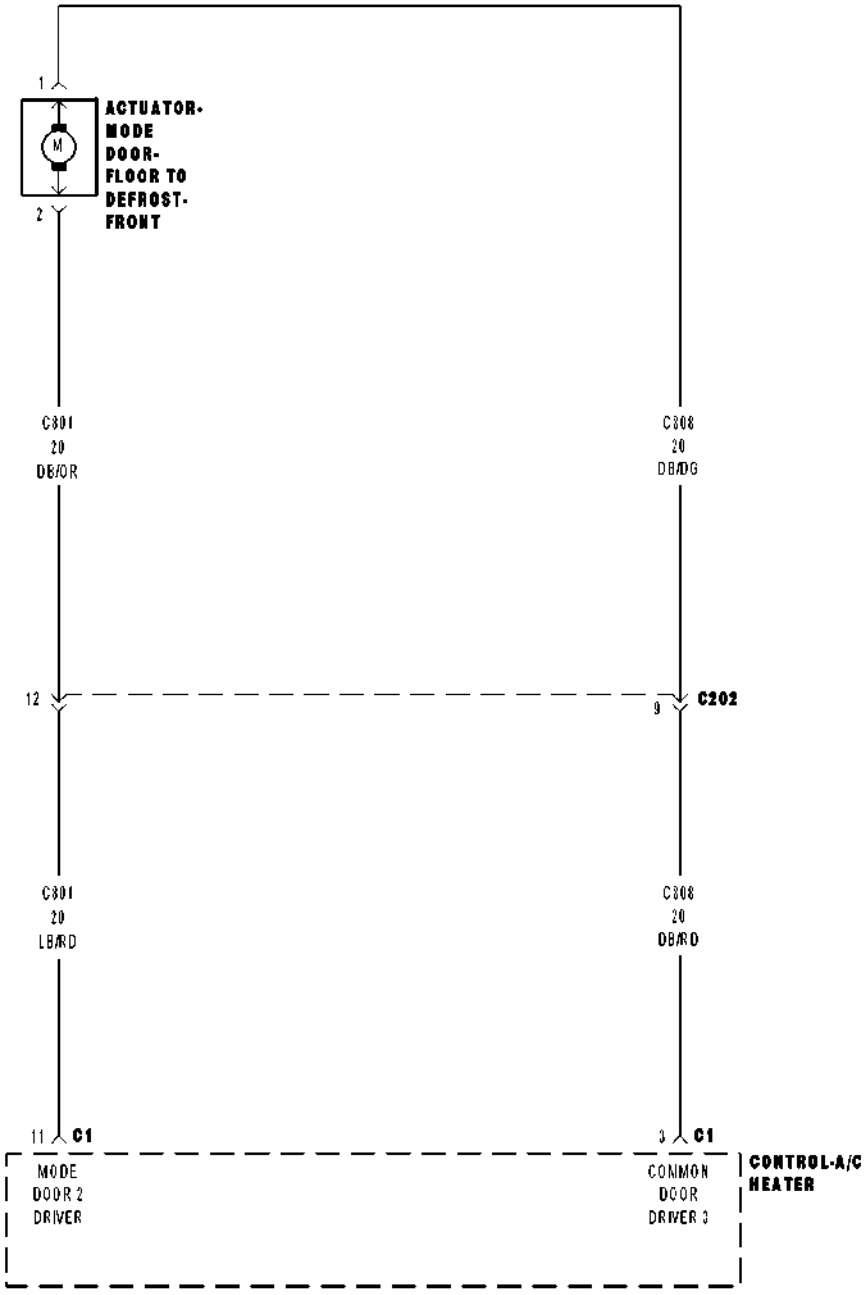
Does the scan tool only display: B1048–FLOOR/DEFROST MODE DOOR CONTROL CIRCUIT HIGH?

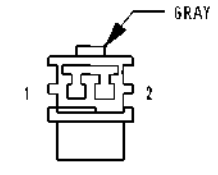
Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No, Other DTC(s) Displayed
Diagnose and repair the other DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs and then all short low DTCs. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

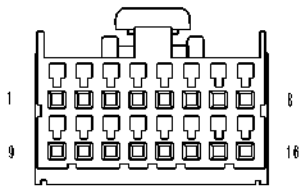
No, And No DTCs Displayed
Using the wiring diagram as a guide, inspect the wiring and connectors for conditions causing an intermittent short. Repair as necessary.
Perform BODY VERIFICATION TEST - VER 1.

B1049–FLOOR/DEFROST MODE DOOR CONTROL CIRCUIT OPEN (ATC)





ACTUATOR-
MODE DOOR-
FLOOR TO DEFROST-
FRONT



CONTROL-A/C-
HEATER C1
(ATC)

81451f64

B1049–FLOOR/DEFROST MODE DOOR CONTROL CIRCUIT OPEN (ATC) (CONTINUED)

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Mode Door 2 (Floor to Defrost) Actuator's electrical circuit is open. This DTC has a maturing time of 5 seconds and a de-maturing time of 10 seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

Possible Causes
(C801) MODE DOOR 2 DRIVER CIRCUIT OPEN
(C808) COMMON DOOR DRIVER 3 CIRCUIT OPEN
MODE DOOR 2 (FLOOR TO DEFROST) ACTUATOR
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control drives the Mode Door 2 (Floor to Defrost) Actuator via the (C801) Mode Door 2 Driver circuit and the (C808) Common Door Driver 3 circuit. The Mode Door 2 (Floor to Defrost) Actuator does not share the (C808) Common Door Driver 3 circuit with any other actuator. However, the Mode Door 2 (Floor to Defrost) Actuator, the Rear Mode Door Actuator, and the Rear Blend Door Actuator share a driver inside the A/C Heater Control. Due to the shared circuitry similar DTCs can set at the same time for multiple actuators depending upon the location of the open circuit and the direction the actuator is moving when the open is present.

NOTE: DTC B1049 must be active for the results of this test to be valid. Do not perform this test if DTC B1049 is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

Diagnostic Test

1. CHECK FOR ACTIVE CONTROL CIRCUIT/PERFORMANCE DTCs

Turn the ignition on.

With the scan tool, read active HVAC DTCs.

Does the scan tool display any active: XXXX CONTROL CIRCUIT/PERFORMANCE DTCs?

Yes >> Diagnose and repair the DTC(s). If present, diagnose and repair all Rear Blend and Rear Mode Door Control Circuit/Performance DTCs first, then all other Control Circuit/Performance DTCs next. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No >> Go To 2

B1049–FLOOR/DEFROST MODE DOOR CONTROL CIRCUIT OPEN (ATC) (CONTINUED)

2. CHECK MODE DOOR 2 (FLOOR TO DEFROST) ACTUATOR CIRCUIT RESISTANCE

Turn the ignition off.

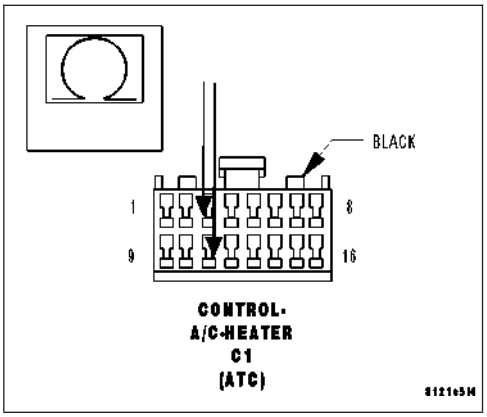
Disconnect the A/C Heater Control C1 harness connector.

Measure the resistance between the (C801) Mode Door 2 Driver circuit and the (C808) Common Door Driver 3 circuit in the A/C Heater Control C1 harness connector.

Is the resistance above 70 ohms?

Yes >> Go To 3

No >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.



3. CHECK (C801) MODE DOOR 2 DRIVER CIRCUIT FOR AN OPEN

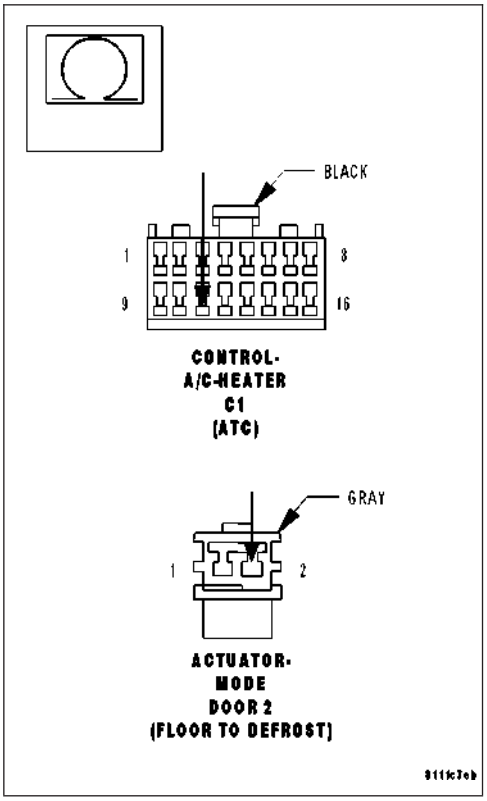
Disconnect the Mode Door 2 (Floor to Defrost) Actuator harness connector.

Measure the resistance of the (C801) Mode Door 2 Driver circuit between the A/C Heater Control C1 harness connector and the Mode Door 2 (Floor to Defrost) Actuator harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 4

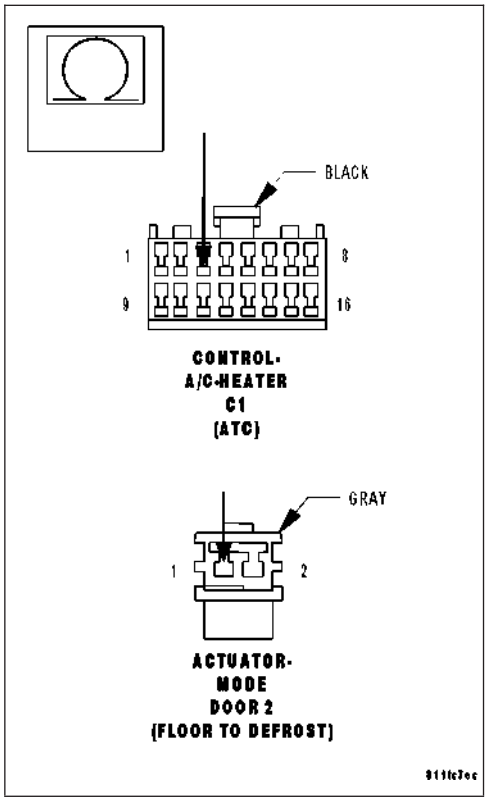
No >> Repair the (C801) Mode Door 2 Driver circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.



B1049–FLOOR/DEFROST MODE DOOR CONTROL CIRCUIT OPEN (ATC) (CONTINUED)

4. CHECK (C808) COMMON DOOR DRIVER 3 CIRCUIT FOR AN OPEN

Measure the resistance of the (C808) Common Door Driver 3 circuit between the A/C Heater Control C1 harness connector and the Mode Door 2 (Floor to Defrost) Actuator harness connector.

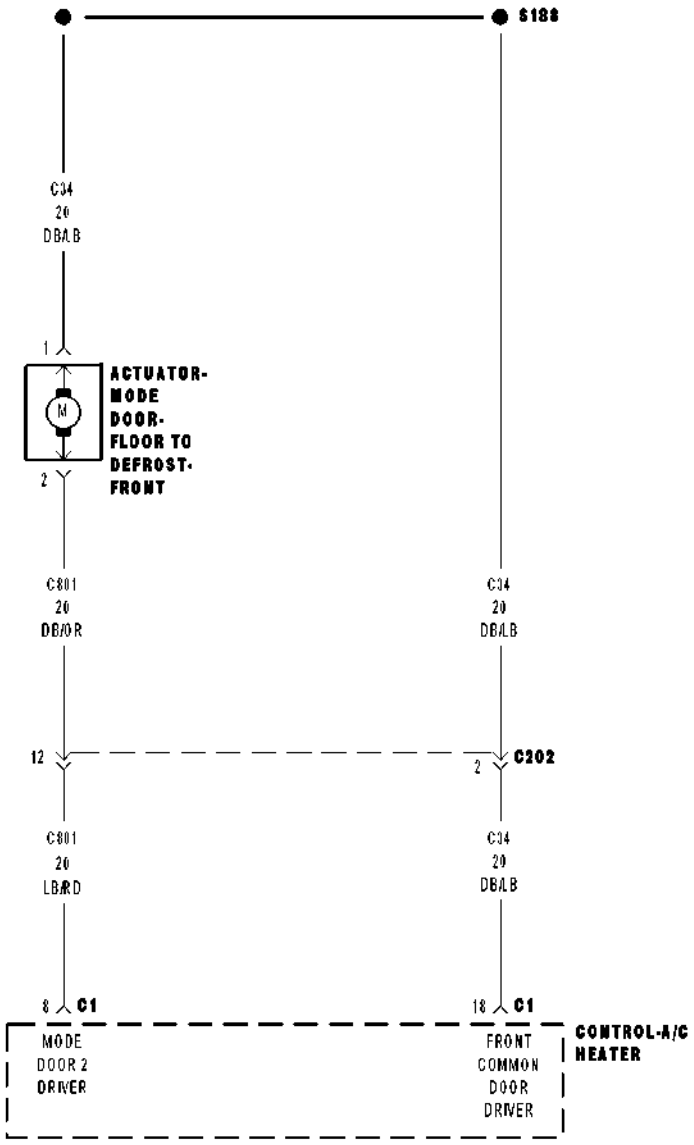


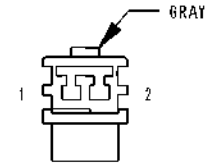
Is the resistance below 5.0 ohms?

Yes >> Replace the Mode Door 2 (Floor to Defrost) Actuator in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

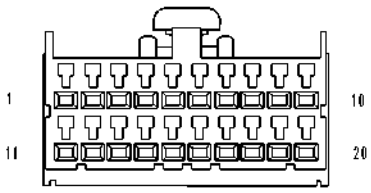
No >> Repair the (C808) Common Door Driver 3 circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

B1049–FLOOR/DEFROST MODE DOOR CONTROL CIRCUIT OPEN (MTC)





ACTUATOR-
MODE DOOR-
FLOOR TO DEFROST-
FRONT



CONTROL-A/C-
HEATER C1
(MTC)

81654000

B1049–FLOOR/DEFROST MODE DOOR CONTROL CIRCUIT OPEN (MTC) (CONTINUED)

For the Manual Temperature Control (MTC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Mode Door 2 (Floor to Defrost) Actuator's electrical circuit is open. This DTC has a maturing time of 5 seconds and a de-maturing time of 10 seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

Possible Causes
(C801) MODE DOOR 2 DRIVER CIRCUIT OPEN
(C34) FRONT COMMON DOOR DRIVER CIRCUIT OPEN
MODE DOOR 2 (FLOOR TO DEFROST) ACTUATOR
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control drives the Mode Door 2 (Floor to Defrost) Actuator via the (C801) Mode Door 2 Driver circuit and the (C34) Front Common Door Driver circuit. All of the front door actuators share the (C34) Front Common Door Driver circuit. Inside the A/C Heater Control, each door actuator has its own unique driver, but all share a single common door driver circuit. Due to the shared circuitry similar DTCs can set at the same time for multiple actuators depending upon the location of the open circuit and the direction the actuator is moving when the open is present.

NOTE: DTC B1049 must be active for the results of this test to be valid. Do not perform this test if DTC B1049 is stored. Refer to HVAC System Test (MTC) for stored DTC test procedures.

Diagnostic Test

1. CHECK FOR ACTIVE CONTROL CIRCUIT/PERFORMANCE DTCs

Turn the ignition on.

With the scan tool, read active HVAC DTCs.

Does the scan tool display any active: XXXX CONTROL CIRCUIT/PERFORMANCE DTCs?

Yes >> Diagnose and repair the DTC(s). Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No >> Go To 2

B1049–FLOOR/DEFROST MODE DOOR CONTROL CIRCUIT OPEN (MTC) (CONTINUED)

2. CHECK MODE DOOR 2 (FLOOR TO DEFROST) ACTUATOR CIRCUIT RESISTANCE

Turn the ignition off.

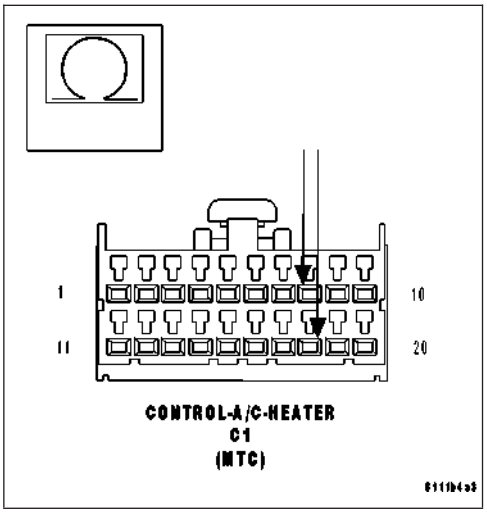
Disconnect the A/C Heater Control C1 harness connector.

Measure the resistance between the (C801) Mode Door 2 Driver circuit and the (C34) Front Common Door Driver circuit in the A/C Heater Control C1 harness connector.

Is the resistance above 70 ohms?

Yes >> Go To 3

No >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.



3. CHECK (C801) MODE DOOR 2 DRIVER CIRCUIT FOR AN OPEN

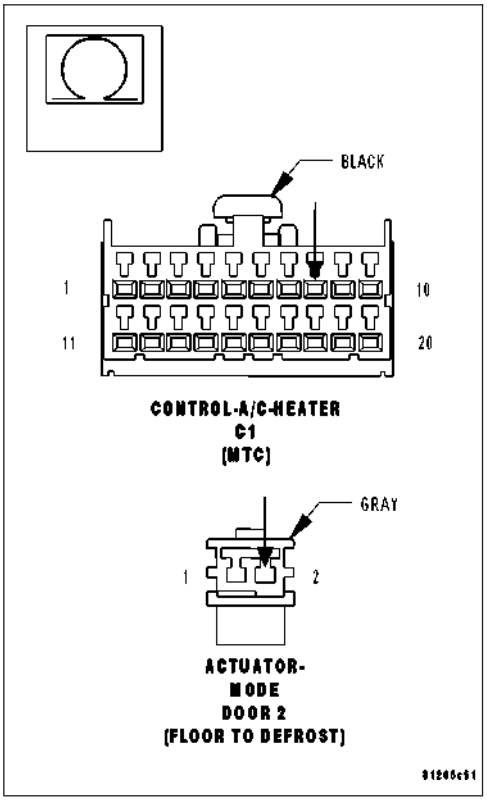
Disconnect the Mode Door 2 (Floor to Defrost) Actuator harness connector.

Measure the resistance of the (C801) Mode Door 2 Driver circuit between the A/C Heater Control C1 harness connector and the Mode Door 2 (Floor to Defrost) Actuator harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 4

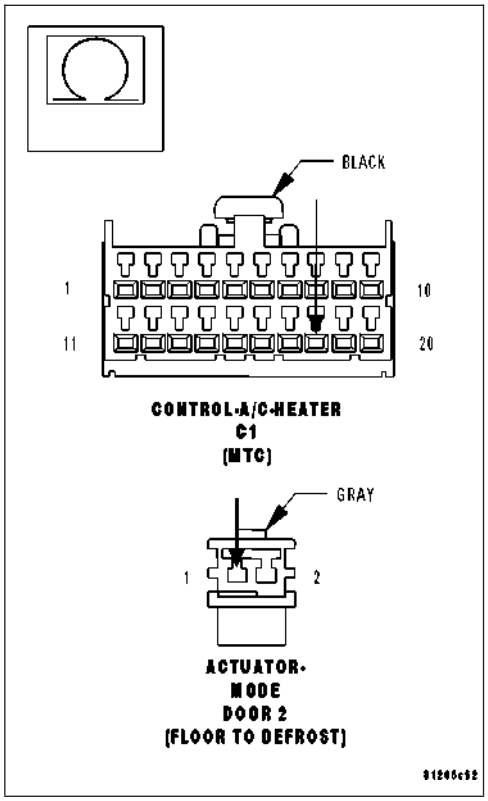
No >> Repair the (C801) Mode Door 2 Driver circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.



B1049–FLOOR/DEFROST MODE DOOR CONTROL CIRCUIT OPEN (MTC) (CONTINUED)

4. CHECK (C34) FRONT COMMON DOOR DRIVER CIRCUIT FOR AN OPEN

Measure the resistance of the (C34) Front Common Door Driver circuit between the A/C Heater Control C1 harness connector and the Mode Door 2 (Floor to Defrost) Actuator harness connector.



Is the resistance below 5.0 ohms?

Yes >> Replace the Mode Door 2 (Floor to Defrost) Actuator in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the (C34) Front Common Door Driver circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

B1050–BLEND DOOR TRAVEL RANGE TOO SMALL (ATC & MTC)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  During actuator calibration.
- **Set Condition:**
  If the total span of the Front Blend Door is less than the low range limit.

Possible Causes
DOOR DRIVER ELECTRICAL CIRCUIT(S)
FRONT BLEND DOOR SEIZED, BINDING, OBSTRUCTED
FRONT BLEND DOOR ACTUATOR
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control calibrates each actuator individually. Automatic calibration occurs upon power up after installing a new A/C Heater Control. Manual calibration occurs by sending a command with the scan tool. The purpose of actuator calibration is to determine the total span of door travel between physical stops. To calibrate the actuator, the A/C Heater Control first moves the door to its soft stop, and then counts the number of pulses it takes to move the door to its other stop. An expected range of span is stored in the control's memory. If the measured calibration value is less than the expected range for this actuator, this DTC will set. Note that the control clears all stored calibration faults at the beginning of the calibration procedure.

Diagnostic Test

1. CHECK FOR ACTIVE CONTROL CIRCUIT/PERFORMANCE & CONTROL CIRCUIT OPEN DTCs

Turn the ignition on.

With the scan tool, read active HVAC DTCs.

Does the scan tool display any active: XXXX CONTROL CIRCUIT/PERFORMANCE or XXXX CONTROL CIRCUIT OPEN DTCs?

Yes (ATC)
Diagnose and repair the DTC(s). If present, diagnose and repair all Rear Blend and Rear Mode Door Control Circuit/Performance DTCs first, all other Control Circuit/Performance DTCs second, and all Control Circuit Open DTCs last. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

Yes (MTC)
Diagnose and repair the DTC(s). Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No >> Go To 2

---

2. RUN THE ACTUATOR DTC DETECTION TEST

With the scan tool in HVAC, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

Does the scan tool display any DTCs?

Yes >> Diagnose and repair the DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs first, all short low DTCs second, and all open DTCs last. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No >> Go To 3

B1050–BLEND DOOR TRAVEL RANGE TOO SMALL (ATC & MTC) (CONTINUED)

3. INSPECT ACTUATOR & HOUSING ASSEMBLY FOR A CONDITION CAUSING THE DOOR TO SEIZE OR BIND

Turn the ignition off.

Inspect the actuator, linkage, and housing assembly for a condition causing the door to seize or bind.

Are there any physical or mechanical problems with the door, housing, linkage, or actuator?

Yes >> Repair as necessary in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 4

---

4. CHECK FRONT BLEND DOOR TRAVEL

Remove the Front Blend Door Actuator from the A/C Heater Housing Assembly.

By hand, attempt to rotate the door in both directions. The door should operate smoothly in both directions over approximately 65 degrees of travel.

Does the door operate smoothly in both directions over approximately 65 degrees of travel?

Yes >> Replace the Front Blend Door Actuator in accordance with the Service Information. Then, Go To 5.

No >> Repair as necessary in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

---

5. RUN ACTUATOR CALIBRATION TEST

Turn the ignition on.

With the scan tool, select System Tests and then select Actuator Calibration Test. When the test is complete, select View DTCs.

Does the scan tool display: B1050–BLEND DOOR TRAVEL RANGE TOO SMALL?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Perform BODY VERIFICATION TEST - VER 1.

B1051–BLEND DOOR TRAVEL RANGE TOO LARGE (ATC & MTC)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  During actuator calibration.
- **Set Condition:**
  If the total span of the Front Blend Door exceeds the high range limit.

Possible Causes
DOOR DRIVER ELECTRICAL CIRCUIT(S)
FRONT BLEND DOOR OR A/C HEATER HOUSING COMPONENTS WARPED, WORN, DAMAGED, MISSING, BROKEN
FRONT BLEND DOOR ACTUATOR
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control calibrates each actuator individually. Automatic calibration occurs upon power up after installing a new A/C Heater Control. Manual calibration occurs by sending a command with the scan tool. The purpose of actuator calibration is to determine the total span of door travel between physical stops. To calibrate the actuator, the A/C Heater Control first moves the door to its soft stop, and then counts the number of pulses it takes to move the door to its other stop. An expected range of span is stored in the control's memory. If the measured calibration value exceeds the expected range for this actuator, this DTC will set. Note that the control clears all stored calibration faults at the beginning of the calibration procedure.

Diagnostic Test

1. CHECK FOR ACTIVE CONTROL CIRCUIT/PERFORMANCE & CONTROL CIRCUIT OPEN DTCs

Turn the ignition on.

With the scan tool, read active HVAC DTCs.

Does the scan tool display any active: XXXX CONTROL CIRCUIT/PERFORMANCE or XXXX CONTROL CIRCUIT OPEN DTCs?

Yes (ATC)
Diagnose and repair the DTC(s). If present, diagnose and repair all Rear Blend and Rear Mode Door Control Circuit/Performance DTCs first, all other Control Circuit/Performance DTCs second, and all Control Circuit Open DTCs last. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

Yes (MTC)
Diagnose and repair the DTC(s). Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No >> Go To 2

---

2. RUN THE ACTUATOR DTC DETECTION TEST

With the scan tool in HVAC, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

Does the scan tool display any DTCs?

Yes >> Diagnose and repair the DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs first, all short low DTCs second, and all open DTCs last. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No >> Go To 3

B1051–BLEND DOOR TRAVEL RANGE TOO LARGE (ATC & MTC) (CONTINUED)

3. CHECK FOR A BROKEN FRONT BLEND DOOR ACTUATOR

Turn the ignition off.

Remove the Front Blend Door Actuator from the A/C Heater Housing Assembly.

By hand, attempt to rotate the actuator in both directions.

Does the actuator turn in either direction?

Yes >> Replace the Front Blend Door Actuator in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 4

---

4. CHECK FRONT BLEND DOOR & A/C HEATER HOUSING FOR WARPED, WORN, DAMAGED, MISSING, & BROKEN COMPONENTS

Inspect for excessively worn, disconnected, missing, or broken door linkage. Inspect for a damaged or broken A/C Heater Housing Assembly. Inspect for a warped or broken door, and missing door seals. Rotate the door from stop to stop. The door should rotate approximately 65 degrees.

Are there any physical or mechanical problems with the door or housing?

Yes >> Repair as necessary in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Front Blend Door Actuator in accordance with the Service Information. Then, Go To 5.

---

5. RUN ACTUATOR CALIBRATION TEST

Turn the ignition on.

With the scan tool, select System Tests and then select Actuator Calibration Test. When the test is complete, select View DTCs.

Does the scan tool display: B1051–BLEND DOOR TRAVEL RANGE TOO LARGE?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Perform BODY VERIFICATION TEST - VER 1.

B1052–REAR BLEND DOOR CONTROL CIRCUIT/PERFORMANCE (ATC)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the A/C Heater Control detects an excessive current draw on the (C53) Rear Mode Door Driver circuit, the (C54) Rear Blend Door Driver circuit, the (C801) Mode Door 2 Driver circuit, the (C154) Rear Common Door Driver circuit, or the (C808) Common Door Driver 3 circuit while attempting to drive the Rear Mode Door Actuator, the Rear Blend Door Actuator, or the Mode Door 2 (Floor to Panel) Actuator. This DTC has a maturing time of 5 seconds and a de-maturing time of 10 seconds. If the DTC's status changes from active to stored, it will stay in memory for 100 ignition cycles.

If this DTC is active, refer to B103A–REAR MODE DOOR CONTROL CIRCUIT/PERFORMANCE (ATC) for the diagnostic test procedure. If this DTC is stored, refer to HVAC System Test (ATC) for stored DTC test procedures.

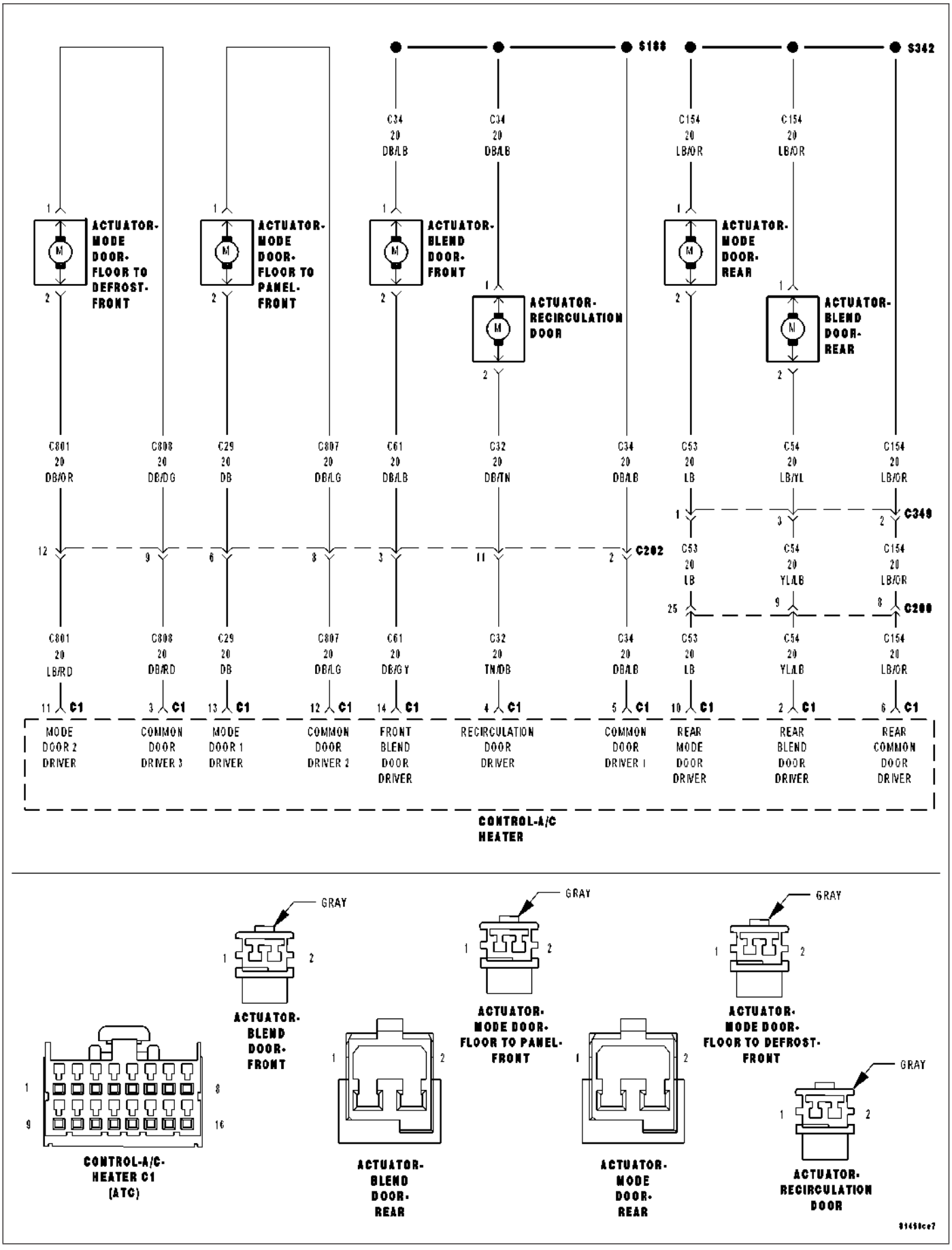
B1052–REAR BLEND DOOR CONTROL CIRCUIT/PERFORMANCE (MTC)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the A/C Heater Control detects an excessive current draw on any of the door driver circuits while attempting to drive this actuator. This DTC has a maturing time of 5 seconds and a de-maturing time of 10 seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

If this DTC is active, refer to B104C–BLEND DOOR CONTROL CIRCUIT/PERFORMANCE (MTC) for the diagnostic test procedure. If this DTC is stored, refer to HVAC System Test (MTC) for stored DTC test procedures.

B1053–REAR BLEND DOOR CONTROL CIRCUIT LOW (ATC)



B1053–REAR BLEND DOOR CONTROL CIRCUIT LOW (ATC) (CONTINUED)

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the Actuator DTC Detection Test is executed.
- **Set Condition:**
  If the (C53) Rear Mode Door Driver circuit, the (C54) Rear Blend Door Driver circuit, the (C801) Mode Door 2 Driver circuit, the (C154) Rear Common Door Driver circuit, or the (C808) Common Door Driver 3 circuit is shorted to ground.

Possible Causes
(C53) REAR MODE DOOR DRIVER CIRCUIT SHORTED TO GROUND OR TO OTHER DOOR DRIVER CIRCUIT(S)
(C54) REAR BLEND DOOR DRIVER CIRCUIT SHORTED TO GROUND OR TO OTHER DOOR DRIVER CIRCUIT(S)
(C801) MODE DOOR 2 DRIVER CIRCUIT SHORTED TO GROUND OR TO OTHER DOOR DRIVER CIRCUIT(S)
(C154) REAR COMMON DOOR DRIVER CIRCUIT SHORTED TO GROUND OR TO OTHER DOOR DRIVER CIRCUIT(S)
(C808) COMMON DOOR DRIVER 3 CIRCUIT SHORTED TO GROUND OR TO OTHER DOOR DRIVER CIRCUIT(S)
REAR MODE DOOR ACTUATOR
REAR BLEND DOOR ACTUATOR
MODE DOOR 2 (FLOOR TO PANEL) ACTUATOR
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control drives the Rear Mode Door Actuator via the (C53) Rear Mode Door Driver circuit and the (C154) Rear Common Door Driver circuit. The A/C Heater Control drives the Rear Blend Door Actuator via the (C54) Rear Blend Door Driver circuit and the (C154) Rear Common Door Driver circuit. In addition, the Rear Mode Door Actuator, the Rear Blend Door Actuator, and the Mode Door 2 (Floor to Defrost) Actuator share a driver inside the A/C Heater Control. Due to the shared circuitry similar DTCs can set at the same time for multiple actuators depending upon the type of short, its location, and the direction the actuator is moving when the short is present.

B1053–REAR BLEND DOOR CONTROL CIRCUIT LOW (ATC) (CONTINUED)

Diagnostic Test

1. CHECK (C53) REAR MODE DOOR DRIVER CIRCUIT, (C54) REAR BLEND DOOR DRIVER CIRCUIT, (C808) COMMON DOOR DRIVER 3 CIRCUIT, (C154) REAR COMMON DOOR DRIVER CIRCUIT, & (C801) MODE DOOR 2 DRIVER CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

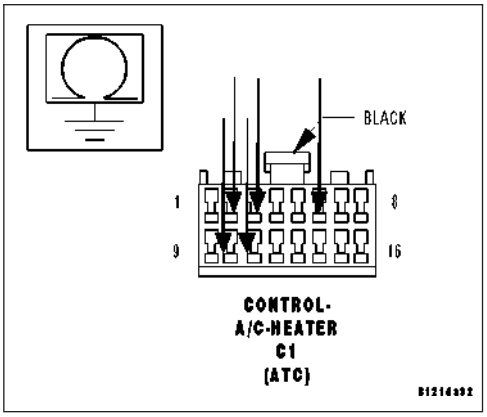
Measure the resistance of the (C53) Rear Mode Door Driver circuit between ground and the A/C Heater Control C1 harness connector.

Measure the resistance of the (C54) Rear Blend Door Driver circuit between ground and the A/C Heater Control C1 harness connector.

Measure the resistance of the (C808) Common Door Driver 3 Circuit between ground and the A/C Heater Control C1 harness connector.

Measure the resistance of the (C154) Rear Common Door Driver circuit between ground and the A/C Heater Control C1 harness connector.

Measure the resistance of the (C801) Mode Door 2 Driver circuit between ground and the A/C Heater Control C1 harness connector.



Is the resistance below 10k ohms on any of the circuits?

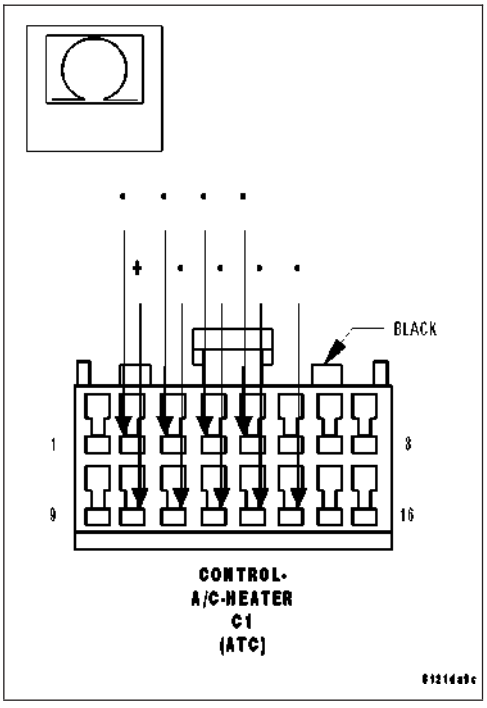
Yes >> Repair the circuit(s) with a resistance below 10k ohms for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK (C53) REAR MODE DOOR DRIVER CIRCUIT FOR A SHORT TO OTHER DOOR DRIVER CIRCUIT(S)

Measure the resistance between the (C53) Rear Mode Door Driver circuit and the (C54) Rear Blend Door Driver circuit, the (C808) Common Door Driver 3 circuit, the (C32) Recirculation Door Driver circuit, the (C34) Common Door Driver 1 circuit, the (C801) Mode Door 2 Driver circuit, the (C807) Common Door Driver 2 circuit, the (C29) Mode Door 1 Driver circuit, and the (C61) Front Blend Door Driver circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 10k ohms between any of the circuits?

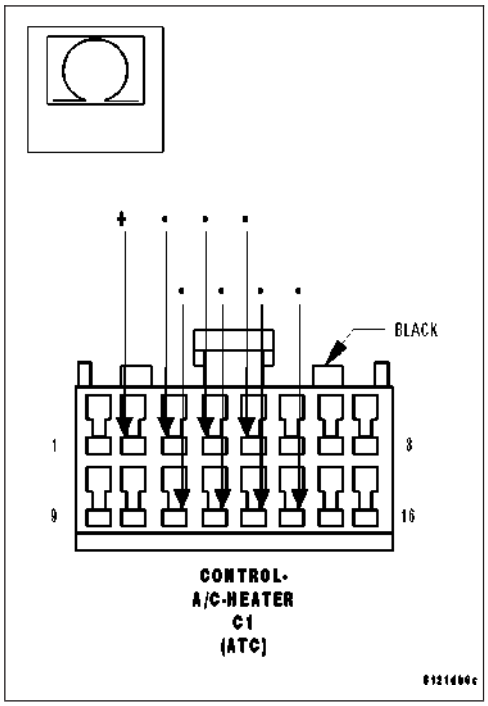
Yes >> Repair the circuit(s) with a resistance below 10k ohms for a short together.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 3

B1053–REAR BLEND DOOR CONTROL CIRCUIT LOW (ATC) (CONTINUED)

3. CHECK (C54) REAR BLEND DOOR DRIVER CIRCUIT FOR A SHORT TO OTHER DOOR DRIVER CIRCUIT(S)

Measure the resistance between the (C54) Rear Blend Door Driver circuit and the (C808) Common Door Driver 3 circuit, the (C32) Recirculation Door Driver circuit, the (C34) Common Door Driver 1 circuit, the (C801) Mode Door 2 Driver circuit, the (C807) Common Door Driver 2 circuit, the (C29) Mode Door 1 Driver circuit, and the (C61) Front Blend Door Driver circuit in the A/C Heater Control C1 harness connector.



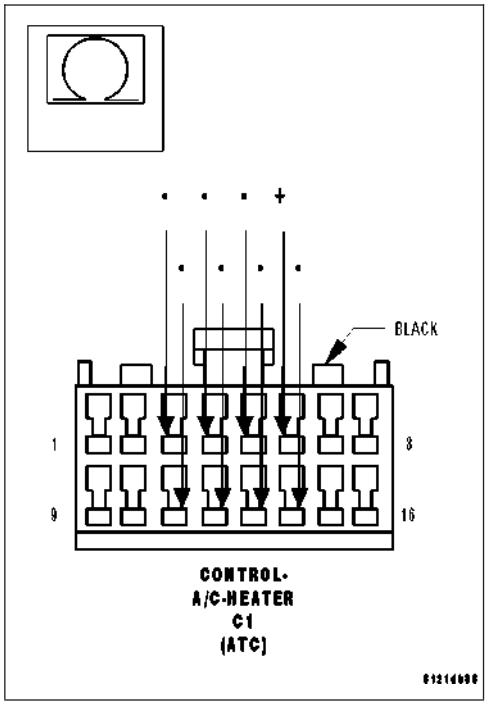
Is the resistance below 10k ohms between any of the circuits?

Yes >> Repair the circuit(s) with a resistance below 10k ohms for a short together.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 4

4. CHECK (C154) REAR COMMON DOOR DRIVER CIRCUIT FOR A SHORT TO OTHER DOOR DRIVER CIRCUIT(S)

Measure the resistance between the (C154) Rear Common Door Driver circuit and the (C808) Common Door Driver 3 circuit, the (C32) Recirculation Door Driver circuit, the (C34) Common Door Driver 1 circuit, the (C801) Mode Door 2 Driver circuit, the (C807) Common Door Driver 2 circuit, the (C29) Mode Door 1 Driver circuit, and the (C61) Front Blend Door Driver circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 10k ohms between any of the circuits?

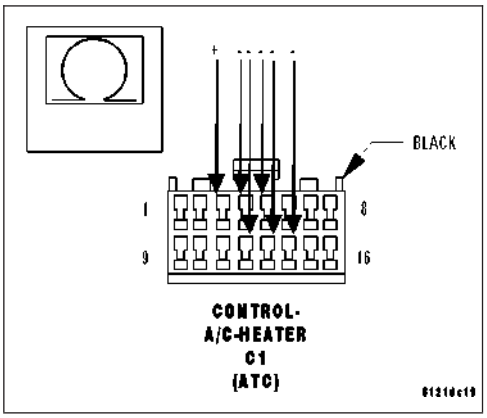
Yes >> Repair the circuit(s) with a resistance below 10k ohms for a short together.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 5

B1053–REAR BLEND DOOR CONTROL CIRCUIT LOW (ATC) (CONTINUED)

5. CHECK (C808) COMMON DOOR DRIVER 3 CIRCUIT FOR A SHORT TO OTHER DOOR DRIVER CIRCUIT(S)

Measure the resistance between the (C808) Common Door Driver 3 circuit and the (C32) Recirculation Door Driver circuit, the (C34) Common Door Driver 1 circuit, the (C807) Common Door Driver 2 circuit, the (C29) Mode Door 1 Driver circuit, and the (C61) Front Blend Door Driver circuit in the A/C Heater Control C1 harness connector.



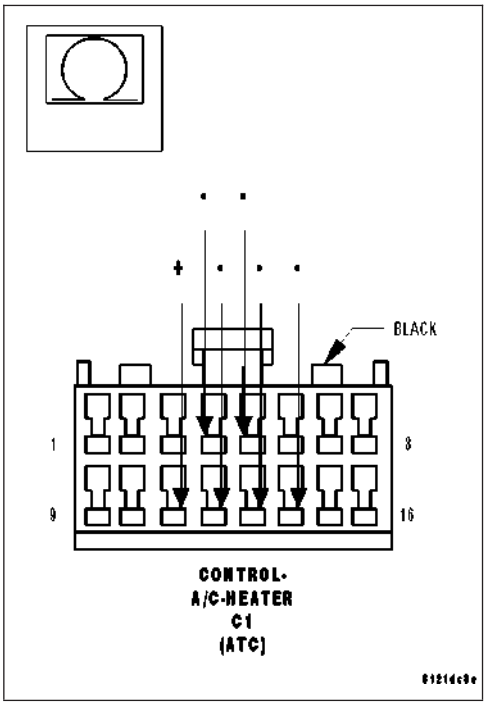
Is the resistance below 10k ohms between any of the circuits?

Yes >> Repair the circuit(s) with a resistance below 10k ohms for a short together.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 6

6. CHECK (C801) MODE DOOR 2 DRIVER CIRCUIT FOR A SHORT TO OTHER DOOR DRIVER CIRCUIT(S)

Measure the resistance between the (C801) Mode Door 2 Driver circuit and the (C32) Recirculation Door Driver circuit, the (C34) Common Door Driver 1 circuit, the (C807) Common Door Driver 2 circuit, the (C29) Mode Door 1 Driver circuit, and the (C61) Front Blend Door Driver circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 10k ohms between any of the circuits?

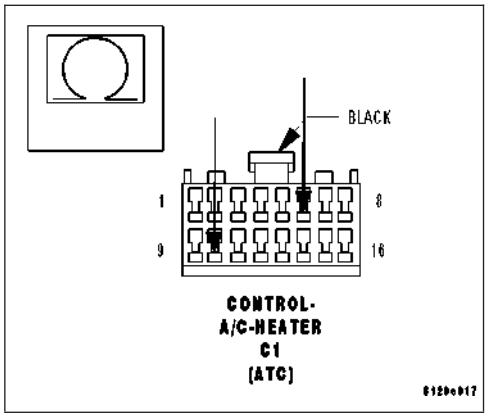
Yes >> Repair the circuit(s) with a resistance below 10k ohms for a short together.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 7

B1053–REAR BLEND DOOR CONTROL CIRCUIT LOW (ATC) (CONTINUED)

7. CHECK REAR MODE DOOR ACTUATOR CIRCUIT RESISTANCE

Measure the resistance between the (C53) Rear Mode Door Driver circuit and the (C154) Rear Common Door Driver circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 30 ohms?

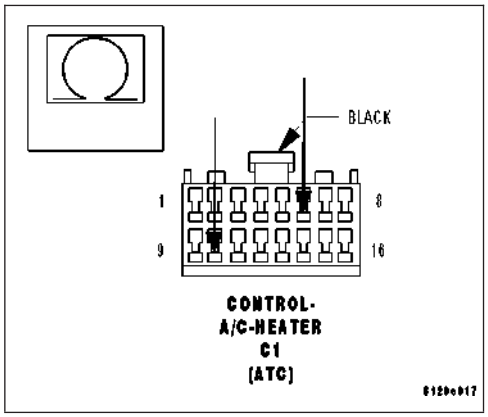
Yes >> Go To 8

No >> Go To 9

8. CHECK (C53) REAR MODE DOOR DRIVER CIRCUIT FOR A SHORT TO (C154) REAR COMMON DOOR DRIVER CIRCUIT

Disconnect the Rear Mode Door Actuator harness connector.

Measure the resistance between the (C53) Rear Mode Door Driver circuit and the (C154) Rear Common Door Driver circuit in the A/C Heater Control C1 harness connector.



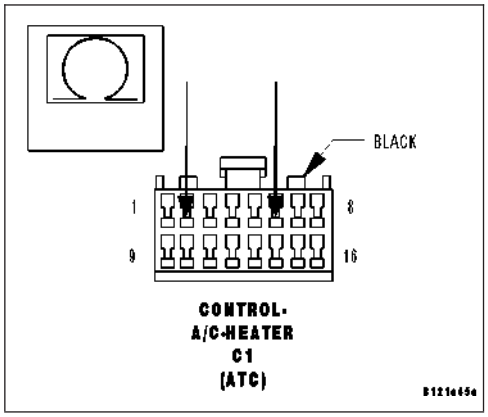
Is the resistance below 10k ohms?

Yes >> Repair the (C53) Rear Mode Door Driver circuit for a short to the (C154) Rear Common Door Driver circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Rear Mode Door Actuator in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

9. CHECK REAR BLEND DOOR ACTUATOR CIRCUIT RESISTANCE

Measure the resistance between the (C54) Rear Blend Door Driver circuit and the (C154) Rear Common Door Driver circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 30 ohms?

Yes >> Go To 10

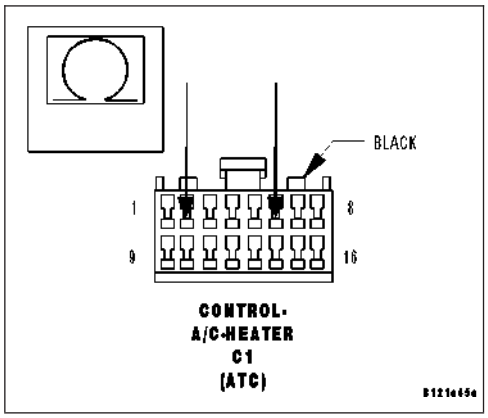
No >> Go To 11

B1053–REAR BLEND DOOR CONTROL CIRCUIT LOW (ATC) (CONTINUED)

10. CHECK (C54) REAR BLEND DOOR DRIVER CIRCUIT FOR A SHORT TO (C154) REAR COMMON DOOR DRIVER CIRCUIT

Disconnect the Rear Blend Door Actuator harness connector.

Measure the resistance between the (C54) Rear Blend Door Driver circuit and the (C154) Rear Common Door Driver circuit in the A/C Heater Control C1 harness connector.



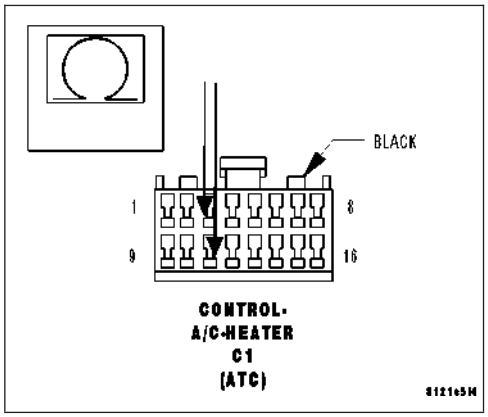
Is the resistance below 10k ohms?

Yes >> Repair the (C54) Rear Blend Door Driver circuit for a short to the (C154) Rear Common Door Driver circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Rear Blend Door Actuator in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

11. CHECK MODE DOOR 2 (FLOOR TO DEFROST) ACTUATOR CIRCUIT RESISTANCE

Measure the resistance between the (C801) Mode Door 2 Driver circuit and the (C808) Common Door Driver 3 circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 30 ohms?

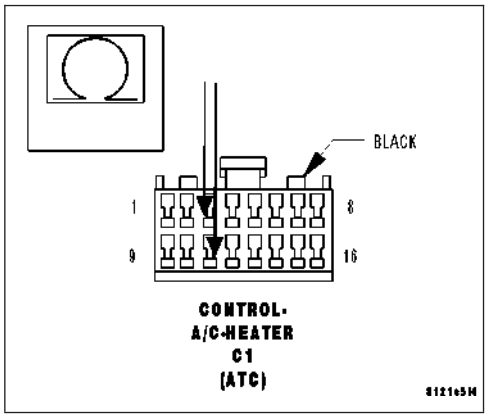
Yes >> Go To 12

No >> Go To 13

12. CHECK (C801) MODE DOOR 2 DRIVER CIRCUIT FOR A SHORT TO (C808) COMMON DOOR DRIVER 3 CIRCUIT

Disconnect the Mode Door 2 (Floor to Defrost) Actuator harness connector.

Measure the resistance between the (C801) Mode Door 2 Driver circuit and the (C808) Common Door Driver 3 circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 10k ohms?

Yes >> Repair the (C801) Mode Door 2 Driver circuit for a short to the (C808) Common Door Driver 3 circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Mode Door 2 (Floor to Defrost) Actuator in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

B1053–REAR BLEND DOOR CONTROL CIRCUIT LOW (ATC) (CONTINUED)

13. RUN THE ACTUATOR DTC DETECTION TEST

Reconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

With the scan tool, erase HVAC DTCs.

Turn the ignition off, wait 10 seconds, and then turn the ignition on.

With the scan tool, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

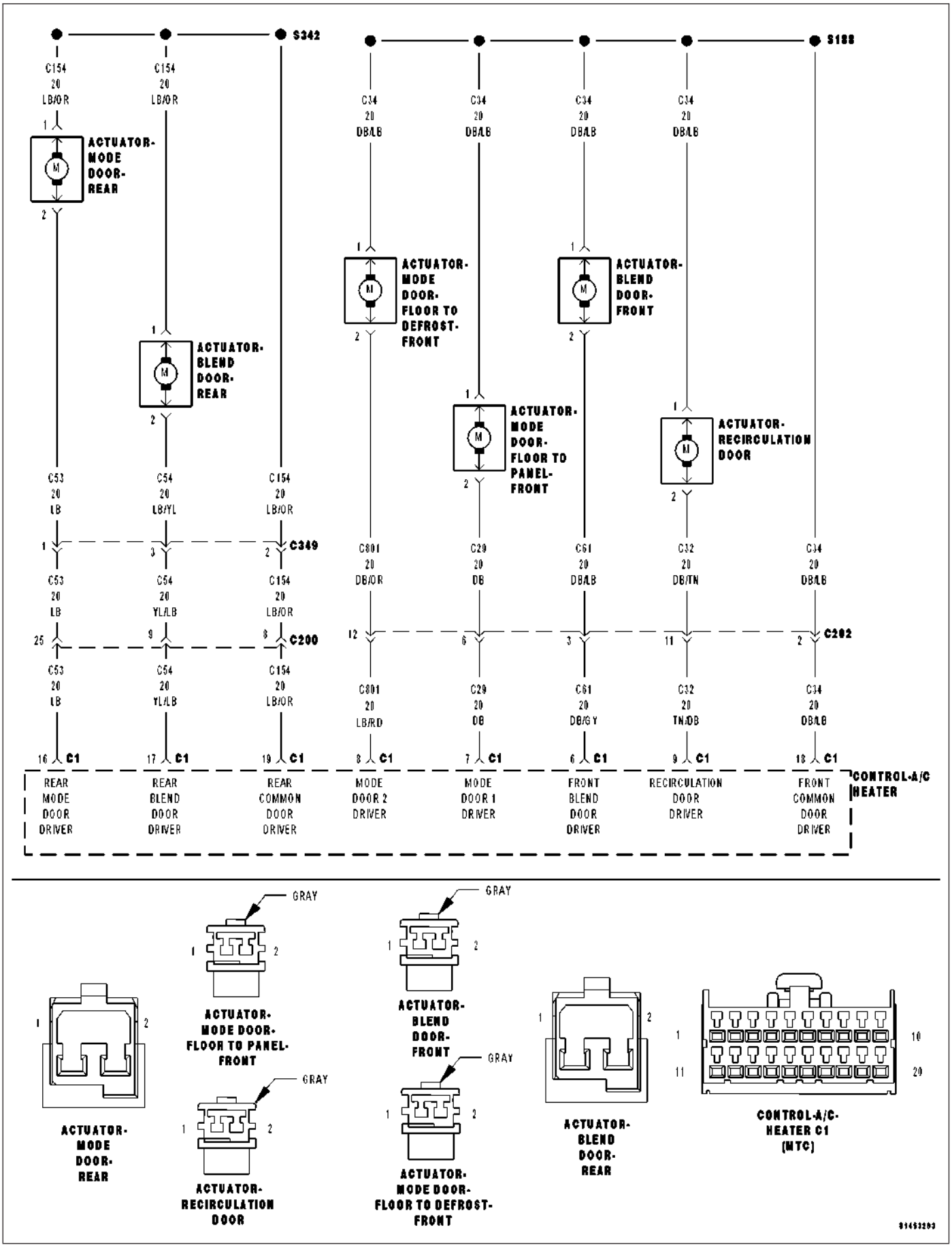
Does the scan tool only display: B1053–REAR BLEND DOOR CONTROL CIRCUIT LOW?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No, Other DTC(s) Displayed
Diagnose and repair the other DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs and then all short low DTCs. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No, And No Other DTCs Displayed
Using the wiring diagram as a guide, inspect the wiring and connectors for conditions causing an intermittent short. Repair as necessary.
Perform BODY VERIFICATION TEST - VER 1.

B1053–REAR BLEND DOOR CONTROL CIRCUIT LOW (MTC)



B1053–REAR BLEND DOOR CONTROL CIRCUIT LOW (MTC) (CONTINUED)

For the Manual Temperature Control (MTC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the Actuator DTC Detection Test is executed.
- **Set Condition:**
  If the (C54) Rear Blend Door Driver circuit is shorted to ground.

Possible Causes
(C54) REAR BLEND DOOR DRIVER CIRCUIT SHORTED TO GROUND
(C54) REAR BLEND DOOR DRIVER CIRCUIT SHORTED TO OTHER DOOR DRIVER CIRCUIT(S)
REAR BLEND DOOR ACTUATOR
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control drives the Rear Blend Door Actuator via the (C54) Rear Blend Door Driver circuit and the (C154) Rear Common Door Driver circuit. Both of the rear door actuators share the (C154) Rear Common Door Driver circuit. Inside the A/C Heater Control, each door actuator has its own unique driver, but all share a single common door driver circuit. Due to the shared circuitry similar DTCs can set at the same time for multiple actuators depending upon the type of short, its location, and the direction the actuator is moving when the short is present.

Diagnostic Test

1. CHECK (C54) REAR BLEND DOOR DRIVER CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

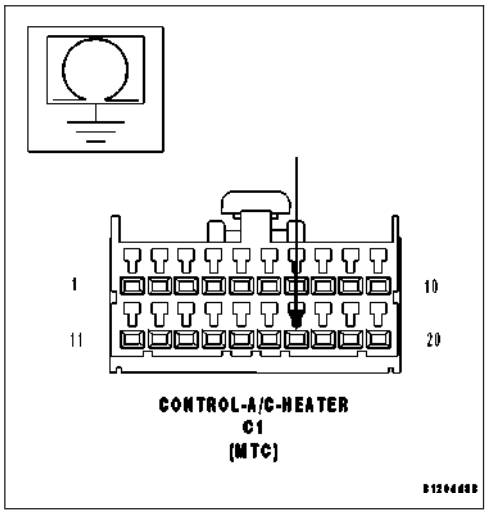
Disconnect the A/C Heater Control C1 harness connector.

Measure the resistance of the (C54) Rear Blend Door Driver circuit between ground and the A/C Heater Control C1 harness connector.

Is the resistance below 10k ohms?

Yes >> Repair the (C54) Rear Blend Door Driver circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

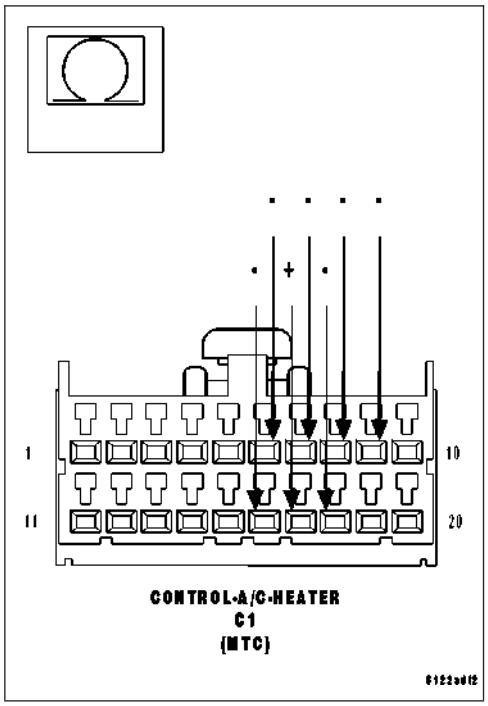
No >> Go To 2



B1053–REAR BLEND DOOR CONTROL CIRCUIT LOW (MTC) (CONTINUED)

2. CHECK (C54) REAR BLEND DOOR DRIVER CIRCUIT FOR A SHORT TO OTHER DOOR DRIVER CIRCUITS

Measure the resistance between (C54) Rear Blend Door Driver circuit and the (C61) Front Blend Door Driver circuit, the (C29) Mode Door 1 Driver circuit, the (C801) Mode Door 2 Driver circuit, the (C32) Recirculation Door Driver circuit, the (C53) Rear Mode Door Driver circuit, and the (C34) Front Common Door Driver circuit in the A/C Heater Control C1 harness connector.



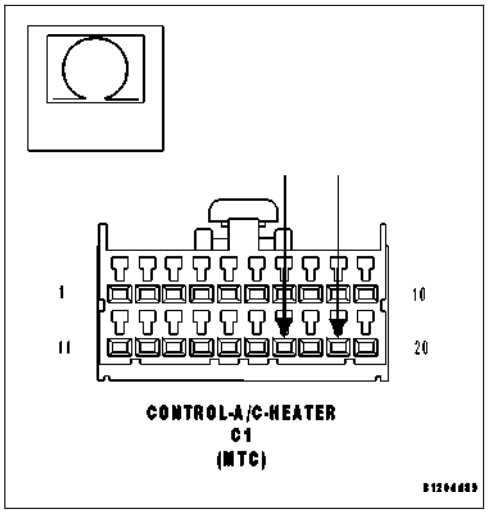
Is the resistance below 10k ohms between the (C54) Rear Blend Door Driver circuit and any of the other door driver circuits?

Yes >> Repair the circuit(s) with a resistance below 10k ohms for a short to the (C54) Rear Blend Door Driver circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 3

3. CHECK REAR BLEND DOOR ACTUATOR CIRCUIT RESISTANCE

Measure the resistance between the (C54) Rear Blend Door Driver circuit and the (C154) Rear Common Door Driver circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 30 ohms?

Yes >> Go To 4

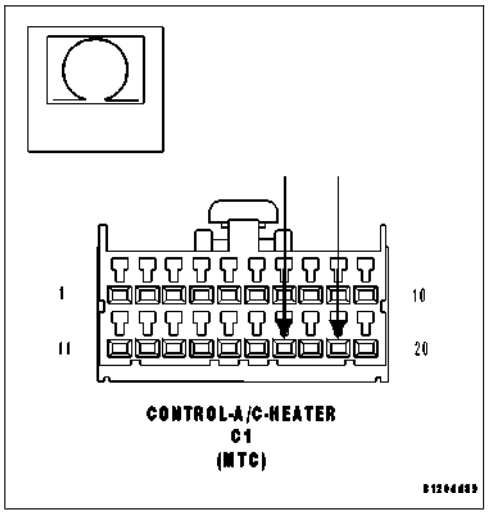
No >> Go To 5

B1053–REAR BLEND DOOR CONTROL CIRCUIT LOW (MTC) (CONTINUED)

4. CHECK (C54) REAR BLEND DOOR DRIVER CIRCUIT FOR A SHORT TO (C154) REAR COMMON DOOR DRIVER CIRCUIT

Disconnect the Rear Blend Door Actuator harness connector.

Measure the resistance between the (C54) Rear Blend Door Driver circuit and the (C154) Rear Common Door Driver circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 10k ohms?

Yes >> Repair the (C54) Rear Blend Door Driver circuit for a short to the (C154) Rear Common Door Driver circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Rear Blend Door Actuator in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

---

5. RUN THE ACTUATOR DTC DETECTION TEST

Reconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

With the scan tool, erase HVAC DTCs.

Turn the ignition off, wait 10 seconds, and then turn the ignition on.

With the scan tool, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

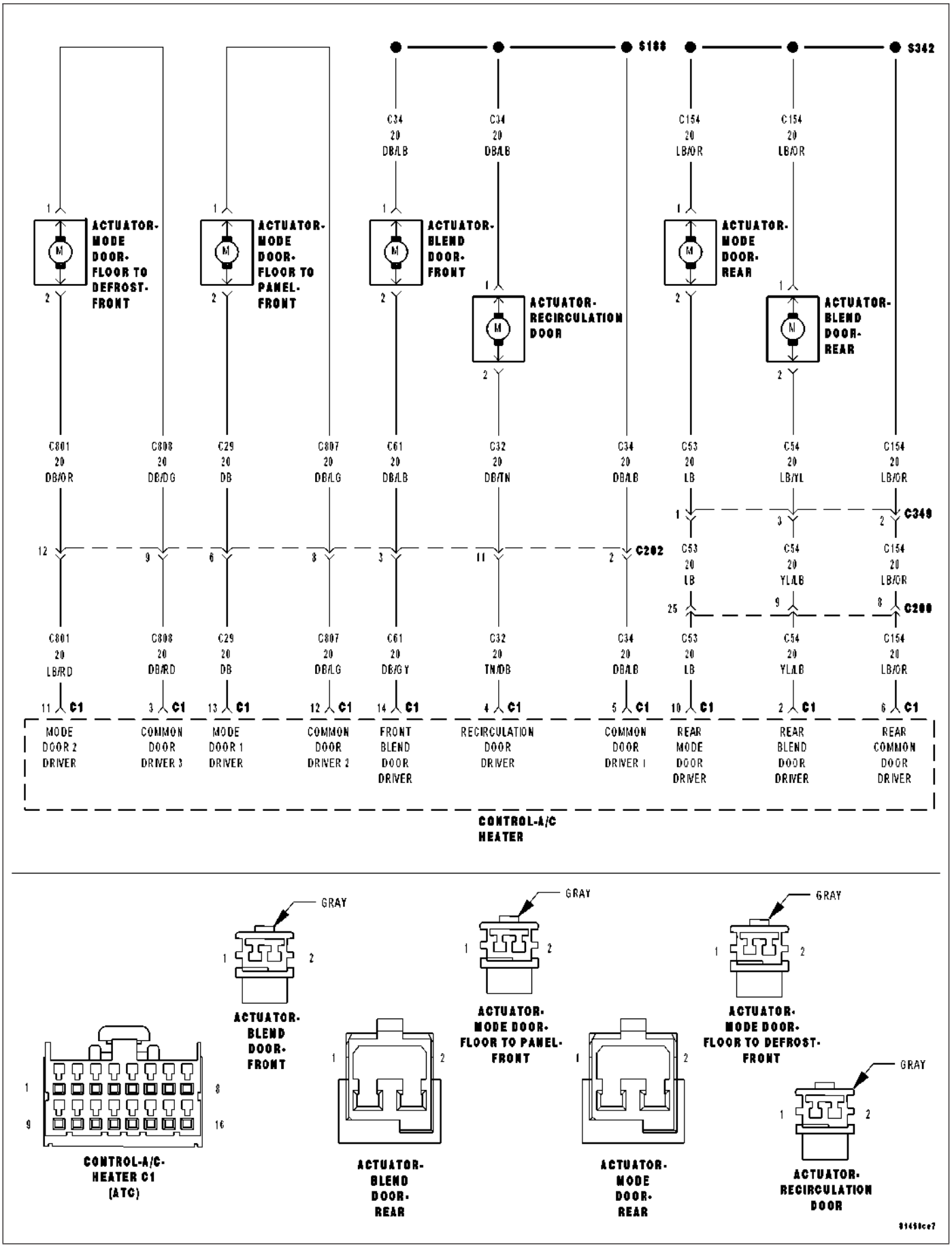
Does the scan tool only display: B1053–REAR BLEND DOOR CONTROL CIRCUIT LOW?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No, Other DTC(s) Displayed
Diagnose and repair the other DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs and then all short low DTCs. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No, And No Other DTCs Displayed
Using the wiring diagram as a guide, inspect the wiring and connectors for conditions causing an intermittent short. Repair as necessary.
Perform BODY VERIFICATION TEST - VER 1.

B1054–REAR BLEND DOOR CONTROL CIRCUIT HIGH (ATC)



B1054–REAR BLEND DOOR CONTROL CIRCUIT HIGH (ATC) (CONTINUED)

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the Actuator DTC Detection Test is executed.
- **Set Condition:**
  If the (C53) Rear Mode Door Driver circuit, the (C54) Rear Blend Door Driver circuit, the (C801) Mode Door 2 Driver circuit, the (C154) Rear Common Door Driver circuit, or the (C808) Common Door Driver 3 circuit is shorted to voltage.

Possible Causes
(C53) REAR MODE DOOR DRIVER CIRCUIT SHORTED TO VOLTAGE
(C54) REAR BLEND DOOR DRIVER CIRCUIT SHORTED TO VOLTAGE
(C801) MODE DOOR 2 DRIVER CIRCUIT SHORTED TO VOLTAGE
(C154) REAR COMMON DOOR DRIVER CIRCUIT SHORTED TO VOLTAGE
(C808) COMMON DOOR DRIVER 3 CIRCUIT SHORTED TO VOLTAGE
A/C HEATER CONTROL

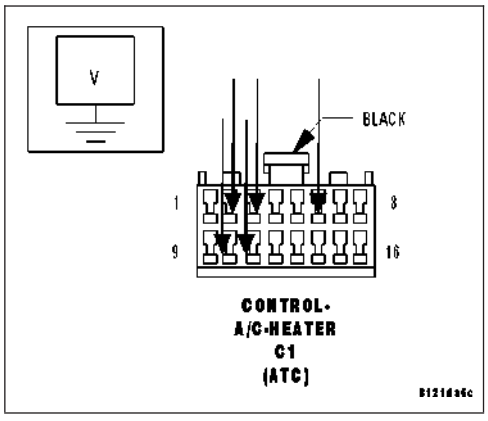
Theory of Operation

The A/C Heater Control drives the Rear Mode Door Actuator via the (C53) Rear Mode Door Driver circuit and the (C154) Rear Common Door Driver circuit. The A/C Heater Control drives the Rear Blend Door Actuator via the (C54) Rear Blend Door Driver circuit and the (C154) Rear Common Door Driver circuit. In addition, the Rear Mode Door Actuator, the Rear Blend Door Actuator, and the Mode Door 2 (Floor to Defrost) Actuator share a driver inside the A/C Heater Control. Due to the shared circuitry similar DTCs can set at the same time for multiple actuators depending upon the type of short, its location, and the direction the actuator is moving when the short is present.

Diagnostic Test

1. CHECK (C53) REAR MODE DOOR DRIVER CIRCUIT, (C54) REAR BLEND DOOR DRIVER CIRCUIT, (C808) COMMON DOOR DRIVER 3 CIRCUIT, (C154) REAR COMMON DOOR DRIVER CIRCUIT, & (C801) MODE DOOR 2 DRIVER CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off.
Disconnect the A/C Heater Control C1 harness connector.
Turn the ignition on.
Measure the voltage of the (C53) Rear Mode Door Driver circuit.
Measure the voltage of the (C54) Rear Blend Door Driver circuit.
Measure the voltage of the (C808) Common Door Driver 3 Circuit.
Measure the voltage of the (C154) Rear Common Door Driver circuit.
Measure the voltage of the (C801) Mode Door 2 Driver circuit.



Is the voltage above 0.2 volts on any of the circuits?

Yes >> Repair the circuit(s) with voltage above 0.2 volts for a short to voltage.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 2

B1054–REAR BLEND DOOR CONTROL CIRCUIT HIGH (ATC) (CONTINUED)

2. RUN THE ACTUATOR DTC DETECTION TEST

Turn the ignition off.

Reconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

With the scan tool in HVAC, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

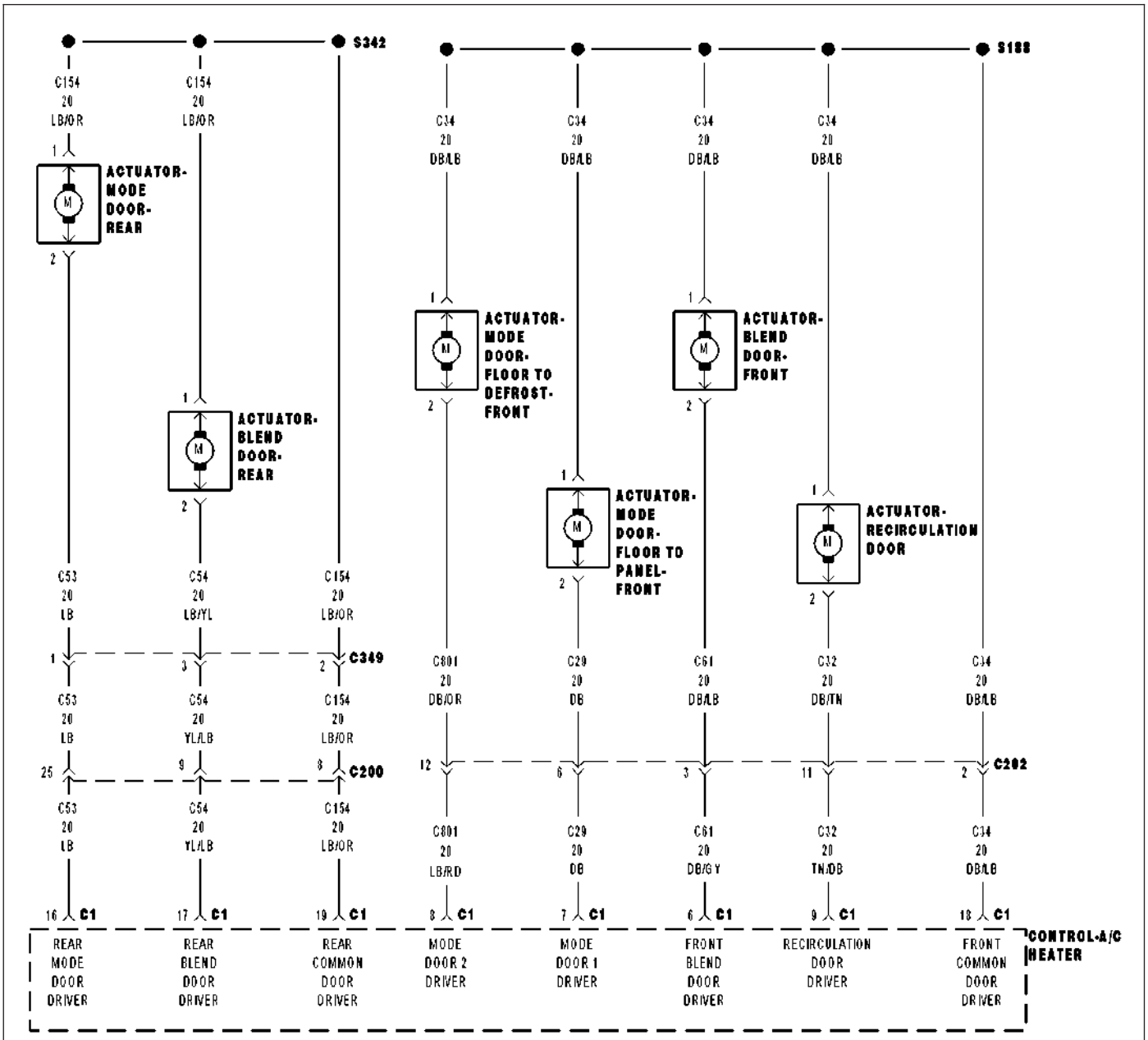
Does the scan tool display: B1054–REAR BLEND DOOR CONTROL CIRCUIT HIGH?

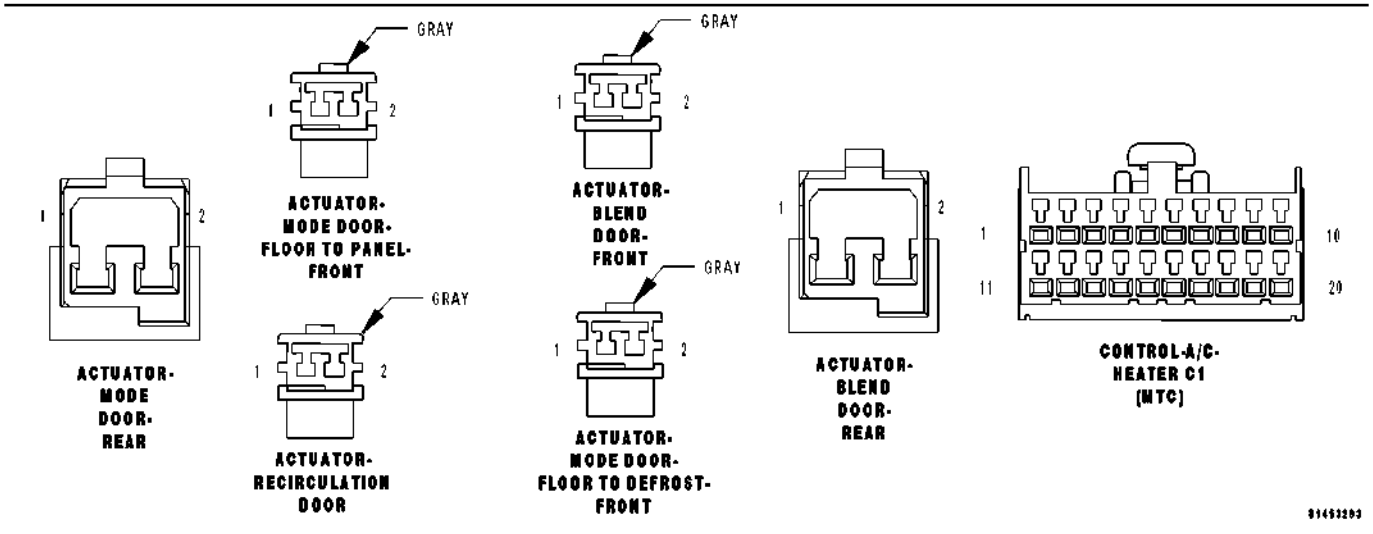
Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No, Other DTC(s) Displayed
Diagnose and repair the other DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs and then all short low DTCs. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No, And No Other DTCs Displayed
Using the wiring diagram as a guide, inspect the wiring and connectors for conditions causing an intermittent short. Repair as necessary.
Perform BODY VERIFICATION TEST - VER 1.

B1054–REAR BLEND DOOR CONTROL CIRCUIT HIGH (MTC)





B1054–REAR BLEND DOOR CONTROL CIRCUIT HIGH (MTC) (CONTINUED)

For the Manual Temperature Control (MTC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the Actuator DTC Detection Test is executed.
- **Set Condition:**
  If the (C54) Rear Blend Door Driver circuit is shorted to voltage.

Possible Causes
(C54) REAR BLEND DOOR DRIVER CIRCUIT SHORTED TO VOLTAGE
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control drives the Rear Blend Door Actuator via the (C54) Rear Blend Door Driver circuit and the (C154) Rear Common Door Driver circuit. Both of the rear door actuators share the (C154) Rear Common Door Driver circuit. Inside the A/C Heater Control, each door actuator has its own unique driver, but all share a single common door driver circuit. Due to the shared circuitry similar DTCs can set at the same time for multiple actuators depending upon the type of short, its location, and the direction the actuator is moving when the short is present.

Diagnostic Test

1. CHECK (C54) REAR BLEND DOOR DRIVER CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

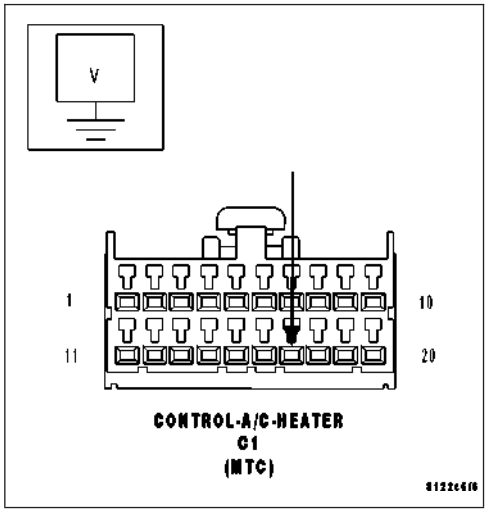
Turn the ignition on.

Measure the voltage of the (C54) Rear Blend Door Driver circuit.

Is the voltage above 0.2 volts?

Yes >> Repair the (C54) Rear Blend Door Driver circuit for a short to voltage.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 2



B1054–REAR BLEND DOOR CONTROL CIRCUIT HIGH (MTC) (CONTINUED)

2. RUN THE ACTUATOR DTC DETECTION TEST

Turn the ignition off.

Reconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

With the scan tool in HVAC, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

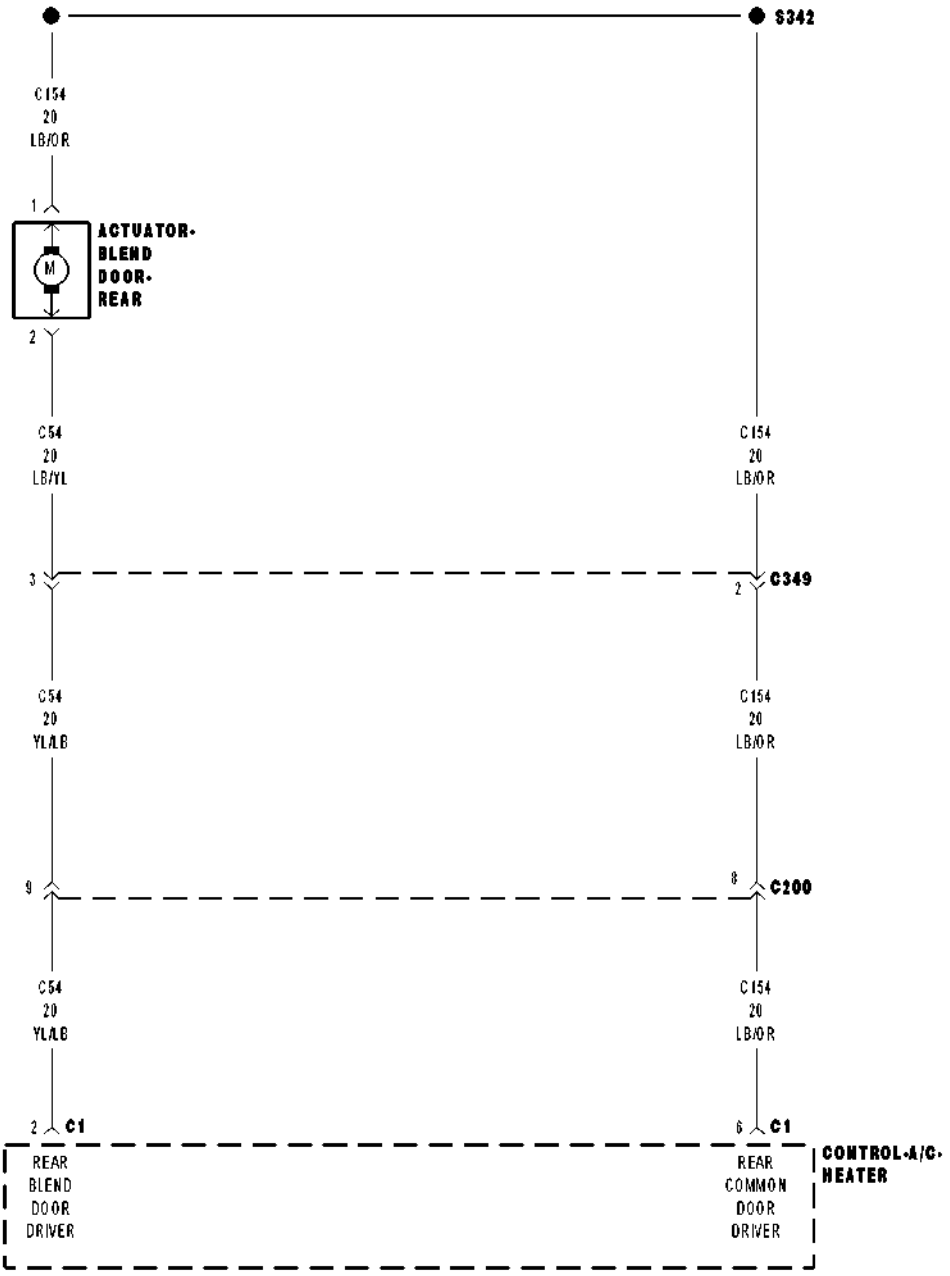
Does the scan tool only display: B1054–REAR BLEND DOOR CONTROL CIRCUIT HIGH?

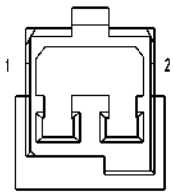
Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No, Other DTC(s) Displayed
Diagnose and repair the other DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs and then all short low DTCs. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

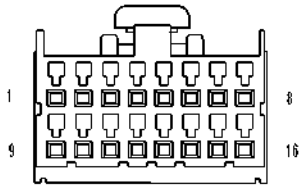
No, And No Other DTCs Displayed
Using the wiring diagram as a guide, inspect the wiring and connectors for conditions causing an intermittent short. Repair as necessary.
Perform BODY VERIFICATION TEST - VER 1.

B1055–REAR BLEND DOOR CONTROL CIRCUIT OPEN (ATC)





ACTUATOR-
BLEND
DOOR-
REAR



CONTROL-A/C-
HEATER C1
(ATC)

B1055–REAR BLEND DOOR CONTROL CIRCUIT OPEN (ATC) (CONTINUED)

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Rear Blend Door Actuator's electrical circuit is open. This DTC has a maturing time of 5 seconds and a de-maturing time of 10 seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

Possible Causes
(C54) REAR BLEND DOOR DRIVER CIRCUIT OPEN
(C154) REAR COMMON DOOR DRIVER CIRCUIT OPEN
REAR BLEND DOOR ACTUATOR
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control drives the Rear Blend Door Actuator via the (C54) Rear Blend Door Driver circuit and the (C154) Rear Common Door Driver circuit. Both of the rear door actuators share the (C154) Rear Common Door Driver circuit. In addition, the Rear Blend Door Actuator, the Rear Mode Door Actuator, and the Mode Door 2 (Floor to Defrost) Actuator share a driver inside the A/C Heater Control. Due to the shared circuitry similar DTCs can set at the same time for multiple actuators depending upon the location of the open circuit and the direction the actuator is moving when the open is present.

NOTE: DTC B1055 must be active for the results of this test to be valid. Do not perform this test if DTC B1055 is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

Diagnostic Test

1. CHECK FOR ACTIVE CONTROL CIRCUIT/PERFORMANCE DTCs

Turn the ignition on.

With the scan tool, read active HVAC DTCs.

Does the scan tool display any active: XXXX CONTROL CIRCUIT/PERFORMANCE DTCs?

Yes >> Diagnose and repair the DTC(s). If present, diagnose and repair all Rear Blend and Rear Mode Door Control Circuit/Performance DTCs first, then all other Control Circuit/Performance DTCs next. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No >> Go To 2

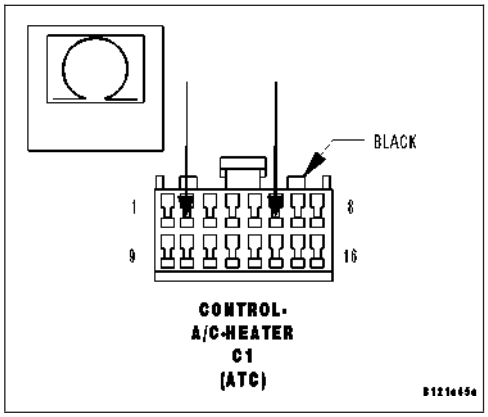
B1055–REAR BLEND DOOR CONTROL CIRCUIT OPEN (ATC) (CONTINUED)

2. CHECK REAR BLEND DOOR ACTUATOR CIRCUIT RESISTANCE

Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

Measure the resistance between the (C54) Rear Blend Door Driver circuit and the (C154) Rear Common Door Driver circuit in the A/C Heater Control C1 harness connector.



Is the resistance above 70 ohms?

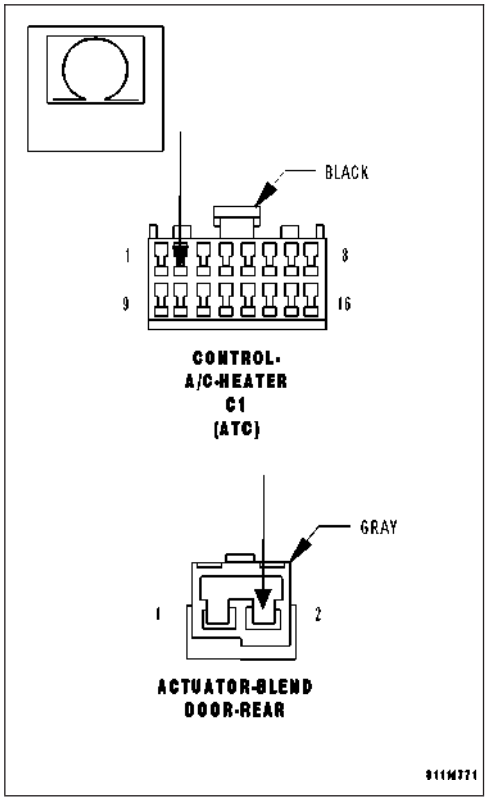
Yes >> Go To 3

No >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

3. CHECK (C54) REAR BLEND DOOR DRIVER CIRCUIT FOR AN OPEN

Disconnect the Rear Blend Door Actuator harness connector.

Measure the resistance of the (C54) Rear Blend Door Driver circuit between the A/C Heater Control C1 harness connector and the Rear Blend Door Actuator harness connector.



Is the resistance below 5.0 ohms?

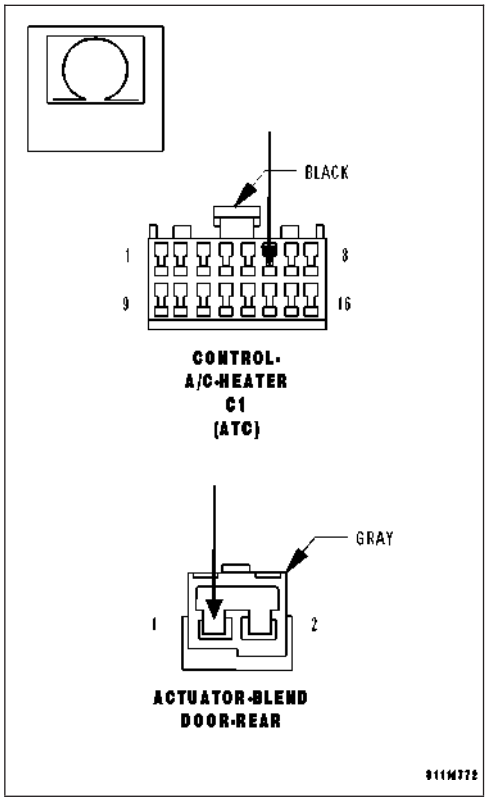
Yes >> Go To 4

No >> Repair the (C54) Rear Blend Door Driver circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

B1055–REAR BLEND DOOR CONTROL CIRCUIT OPEN (ATC) (CONTINUED)

4. CHECK (C154) REAR COMMON DOOR DRIVER CIRCUIT FOR AN OPEN

Measure the resistance of the (C154) Rear Common Door Driver circuit between the A/C Heater Control C1 harness connector and the Rear Blend Door Actuator harness connector.

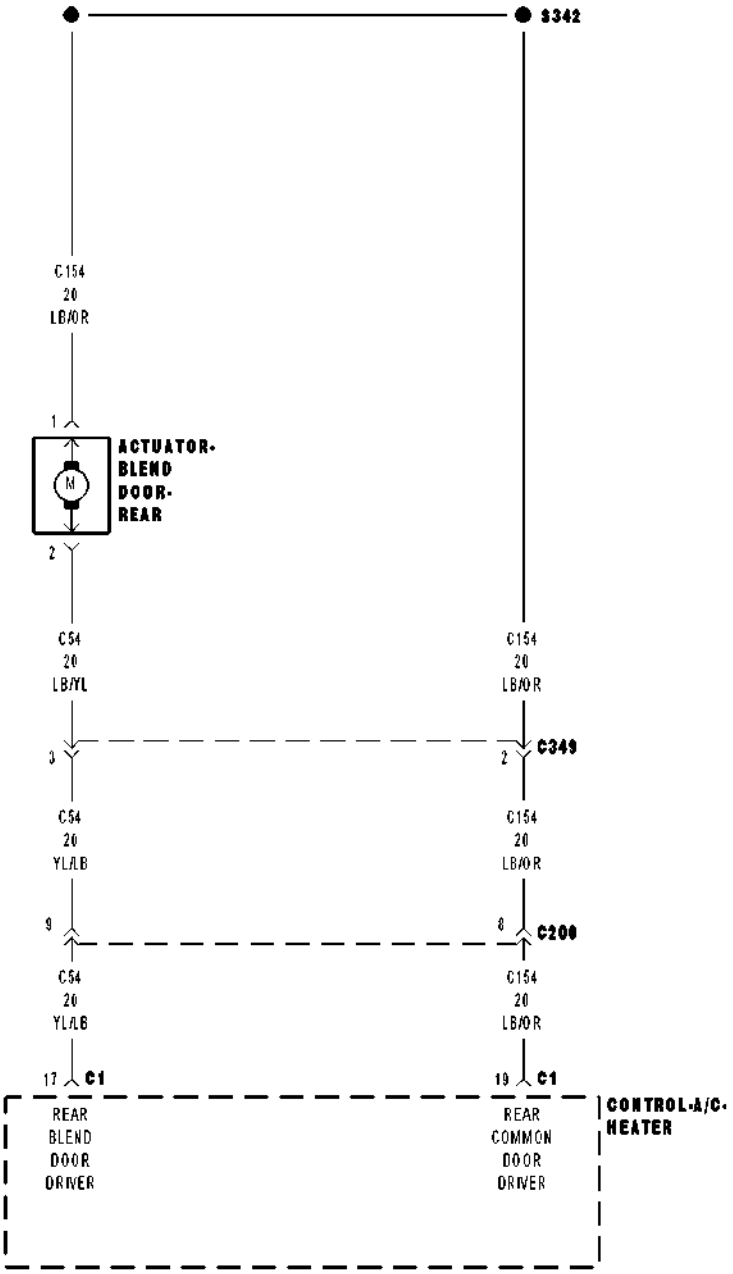


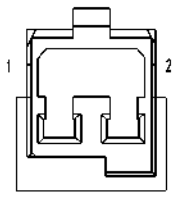
Is the resistance below 5.0 ohms?

Yes >> Replace the Rear Blend Door Actuator in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

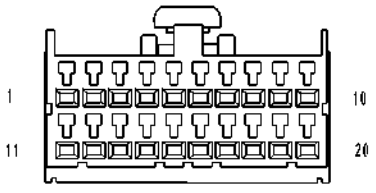
No >> Repair the (C154) Rear Common Door Driver circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

B1055–REAR BLEND DOOR CONTROL CIRCUIT OPEN (MTC)





ACTUATOR-
BLEND
DOOR-
REAR



CONTROL-A/C-
HEATER C1
(MTC)

B1454A40

B1055–REAR BLEND DOOR CONTROL CIRCUIT OPEN (MTC) (CONTINUED)

For the Manual Temperature Control (MTC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Rear Blend Door Actuator's electrical circuit is open. This DTC has a maturing time of 5 seconds and a de-maturing time of 10 seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

Possible Causes
(C54) REAR BLEND DOOR DRIVER CIRCUIT OPEN
(C154) REAR COMMON DOOR DRIVER CIRCUIT OPEN
REAR BLEND DOOR ACTUATOR
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control drives the Rear Blend Door Actuator via the (C54) Rear Blend Door Driver circuit and the (C154) Rear Common Door Driver circuit. Both of the rear door actuators share the (C154) Rear Common Door Driver circuit. Inside the A/C Heater Control, each door actuator has its own unique driver, but all share a single common door driver circuit. Due to the shared circuitry similar DTCs can set at the same time for multiple actuators depending upon the location of the open circuit and the direction the actuator is moving when the open is present.

NOTE: DTC B1055 must be active for the results of this test to be valid. Do not perform this test if DTC B1055 is stored. Refer to HVAC System Test (MTC) for stored DTC test procedures.

Diagnostic Test

1. CHECK FOR ACTIVE CONTROL CIRCUIT/PERFORMANCE DTCs

Turn the ignition on.

With the scan tool, read active HVAC DTCs.

Does the scan tool display any active: XXXX CONTROL CIRCUIT/PERFORMANCE DTCs?

Yes >> Diagnose and repair the DTC(s). Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No >> Go To 2

B1055–REAR BLEND DOOR CONTROL CIRCUIT OPEN (MTC) (CONTINUED)

2. CHECK REAR BLEND DOOR ACTUATOR CIRCUIT RESISTANCE

Turn the ignition off.

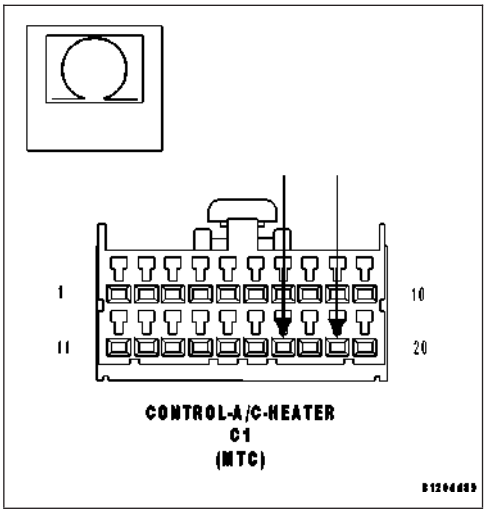
Disconnect the A/C Heater Control C1 harness connector.

Measure the resistance between the (C54) Rear Blend Door Driver circuit and the (C154) Rear Common Door Driver circuit in the A/C Heater Control C1 harness connector.

Is the resistance above 70 ohms?

Yes >> Go To 3

No >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.



3. CHECK (C54) REAR BLEND DOOR DRIVER CIRCUIT FOR AN OPEN

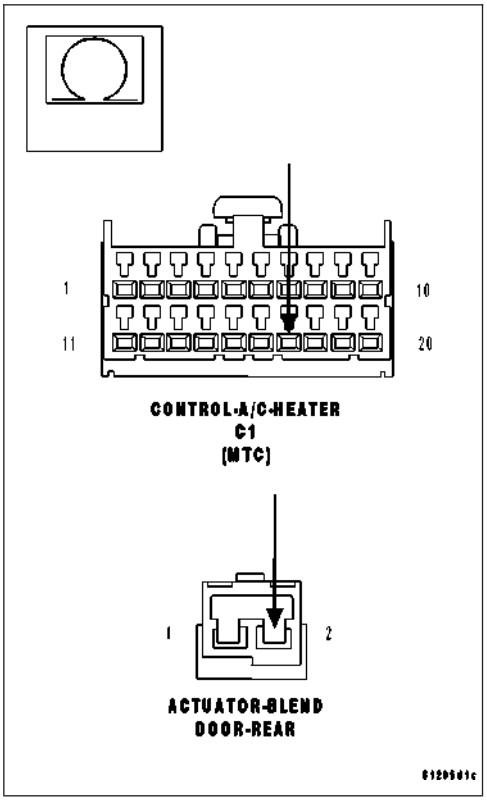
Disconnect the Rear Blend Door Actuator harness connector.

Measure the resistance of the (C54) Rear Blend Door Driver circuit between the A/C Heater Control C1 harness connector and the Rear Blend Door Actuator harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 4

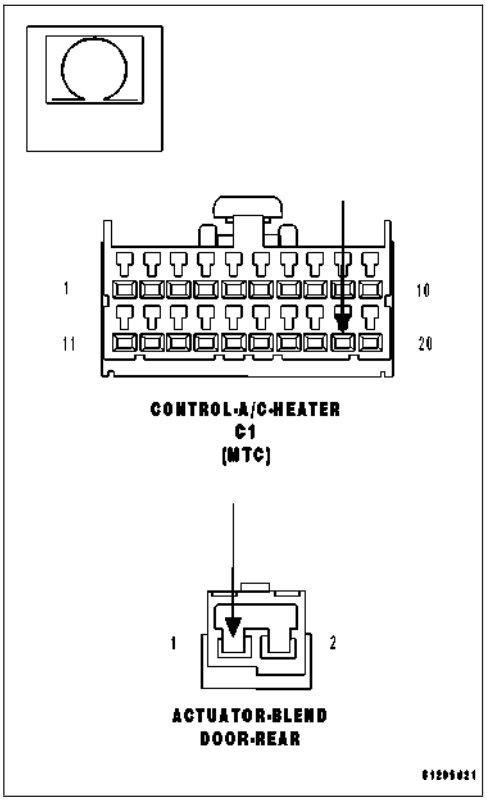
No >> Repair the (C54) Rear Blend Door Driver circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.



B1055–REAR BLEND DOOR CONTROL CIRCUIT OPEN (MTC) (CONTINUED)

4. CHECK (C154) REAR COMMON DOOR DRIVER CIRCUIT FOR AN OPEN

Measure the resistance of the (C154) Rear Common Door Driver circuit between the A/C Heater Control C1 harness connector and the Rear Blend Door Actuator harness connector.



Is the resistance below 5.0 ohms?

Yes >> Replace the Rear Blend Door Actuator in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the (C154) Rear Common Door Driver circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

B1056–REAR BLEND DOOR TRAVEL RANGE TOO SMALL (ATC & MTC)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  During actuator calibration.
- **Set Condition:**
  If the total span of the Rear Blend Door is less than the low range limit.

Possible Causes
DOOR DRIVER ELECTRICAL CIRCUIT(S)
REAR BLEND DOOR SEIZED, BINDING, OBSTRUCTED
REAR BLEND DOOR ACTUATOR
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control calibrates each actuator individually. Automatic calibration occurs upon power up after installing a new A/C Heater Control. Manual calibration occurs by sending a command with the scan tool. The purpose of actuator calibration is to determine the total span of door travel between physical stops. To calibrate the actuator, the A/C Heater Control first moves the door to its soft stop, and then counts the number of pulses it takes to move the door to its other stop. An expected range of span is stored in the control's memory. If the measured calibration value is less than the expected range for this actuator, this DTC will set. Note that the control clears all stored calibration faults at the beginning of the calibration procedure.

Diagnostic Test

1. CHECK FOR ACTIVE CONTROL CIRCUIT/PERFORMANCE & CONTROL CIRCUIT OPEN DTCs

Turn the ignition on.

With the scan tool, read active HVAC DTCs.

Does the scan tool display any active: XXXX CONTROL CIRCUIT/PERFORMANCE or XXXX CONTROL CIRCUIT OPEN DTCs?

Yes (ATC)
Diagnose and repair the DTC(s). If present, diagnose and repair all Rear Blend and Rear Mode Door Control Circuit/Performance DTCs first, all other Control Circuit/Performance DTCs second, and all Control Circuit Open DTCs last. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

Yes (MTC)
Diagnose and repair the DTC(s). Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No >> Go To 2

---

2. RUN THE ACTUATOR DTC DETECTION TEST

With the scan tool in HVAC, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

Does the scan tool display any DTCs?

Yes >> Diagnose and repair the DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs first, all short low DTCs second, and all open DTCs last. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No >> Go To 3

B1056–REAR BLEND DOOR TRAVEL RANGE TOO SMALL (ATC & MTC) (CONTINUED)

3. INSPECT ACTUATOR & HOUSING ASSEMBLY FOR A CONDITION CAUSING THE DOOR TO SEIZE OR BIND

Turn the ignition off.

Inspect the actuator and the housing assembly for a condition causing the door to seize or bind.

Are there any physical or mechanical problems with the door, housing, or actuator?

Yes >> Repair as necessary in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 4

---

4. CHECK REAR BLEND DOOR TRAVEL

Remove the Rear Blend Door Actuator from the Rear A/C Heater Housing Assembly.

By hand, attempt to rotate the door in both directions. The door should operate smoothly in both directions over approximately 70 degrees of travel.

Does the door operate smoothly in both directions over approximately 70 degrees of travel?

Yes >> Replace the Rear Blend Door Actuator in accordance with the Service Information. Then, Go To 5.

No >> Repair as necessary in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

---

5. RUN ACTUATOR CALIBRATION TEST

Turn the ignition on.

With the scan tool, select System Tests and then select Actuator Calibration Test. When the test is complete, select View DTCs.

Does the scan tool display: B1056–REAR BLEND DOOR TRAVEL RANGE TOO SMALL?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Perform BODY VERIFICATION TEST - VER 1.

B1057–REAR BLEND DOOR TRAVEL RANGE TOO LARGE (ATC & MTC)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  During actuator calibration.
- **Set Condition:**
  If the total span of the Rear Blend Door exceeds the high range limit.

Possible Causes
DOOR DRIVER ELECTRICAL CIRCUIT(S)
REAR BLEND DOOR OR REAR A/C HEATER HOUSING COMPONENTS WARPED, WORN, DAMAGED, BROKEN
REAR BLEND DOOR ACTUATOR
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control calibrates each actuator individually. Automatic calibration occurs upon power up after installing a new A/C Heater Control. Manual calibration occurs by sending a command with the scan tool. The purpose of actuator calibration is to determine the total span of door travel between physical stops. To calibrate the actuator, the A/C Heater Control first moves the door to its soft stop, and then counts the number of pulses it takes to move the door to its other stop. An expected range of span is stored in the control's memory. If the measured calibration value exceeds the expected range for this actuator, this DTC will set. Note that the control clears all stored calibration faults at the beginning of the calibration procedure.

Diagnostic Test

1. CHECK FOR ACTIVE CONTROL CIRCUIT/PERFORMANCE & CONTROL CIRCUIT OPEN DTCs

Turn the ignition on.

With the scan tool, read active HVAC DTCs.

Does the scan tool display any active: XXXX CONTROL CIRCUIT/PERFORMANCE or XXXX CONTROL CIRCUIT OPEN DTCs?

Yes (ATC)
Diagnose and repair the DTC(s). If present, diagnose and repair all Rear Blend and Rear Mode Door Control Circuit/Performance DTCs first, all other Control Circuit/Performance DTCs second, and all Control Circuit Open DTCs last. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

Yes (MTC)
Diagnose and repair the DTC(s). Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No >> Go To 2

---

2. RUN THE ACTUATOR DTC DETECTION TEST

With the scan tool in HVAC, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

Does the scan tool display any DTCs?

Yes >> Diagnose and repair the DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs first, all short low DTCs second, and all open DTCs last. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No >> Go To 3

B1057–REAR BLEND DOOR TRAVEL RANGE TOO LARGE (ATC & MTC) (CONTINUED)

3. CHECK FOR A BROKEN REAR BLEND DOOR ACTUATOR

Turn the ignition off.

Remove the Rear Blend Door Actuator from the Rear A/C Heater Housing Assembly.

By hand, attempt to rotate the actuator in both directions.

Does the actuator turn in either direction?

Yes >> Replace the Rear Blend Door Actuator in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 4

---

4. CHECK REAR BLEND DOOR & REAR A/C HEATER HOUSING FOR WARPED, WORN, DAMAGED, MISSING, & BROKEN COMPONENTS

Inspect for a damaged or broken Rear A/C Heater Housing Assembly, a warped, worn, or broken door, and missing door seals. Rotate the door from stop to stop. The door should rotate approximately 70 degrees.

Are there any physical or mechanical problems with the door or housing?

Yes >> Repair as necessary in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Rear Blend Door Actuator in accordance with the Service Information. Then, Go To 5.

---

5. RUN ACTUATOR CALIBRATION TEST

Turn the ignition on.

With the scan tool, select System Tests and then select Actuator Calibration Test. When the test is complete, select View DTCs.

Does the scan tool display: B1057–REAR BLEND DOOR TRAVEL RANGE TOO LARGE?

Yes >> Replace the A/C Heater Control in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1.

No >> Perform BODY VERIFICATION TEST - VER 1.

B1058–RECIRCULATION DOOR CONTROL CIRCUIT/PERFORMANCE (ATC)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the A/C Heater Control detects an excessive current draw on the (C61) Front Blend Door Driver circuit, the (C32) Recirculation Door Driver circuit, or the (C34) Common Door Driver 1 circuit while attempting to drive this actuator. This DTC has a maturing time of 5 seconds and a de-maturing time of 10 seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

Possible Causes
DOOR DRIVER CIRCUIT(S) SHORTED

Theory of Operation

The A/C Heater Control monitors the door driver circuits during actuator operation for shorts to ground, shorts to battery, and shorts to other door driver circuits. If detected, the A/C Heater Control reports these types of faults as Control Circuit/Performance DTCs. It is important to note that Control Circuit/Performance DTCs do not indicate where or what type of short is present and that additional system testing is necessary to provide more details about the reported fault.

NOTE: The DTC must be active for the results of this test to be valid. Do not perform this test if the DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

Diagnostic Test

1. RUN THE ACTUATOR DTC DETECTION TEST

With the scan tool, erase HVAC DTCs.

Turn the ignition off, wait 10 seconds, and then turn the ignition on.

With the scan tool, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

Repair

Diagnose and repair the DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs and then all short low DTCs. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

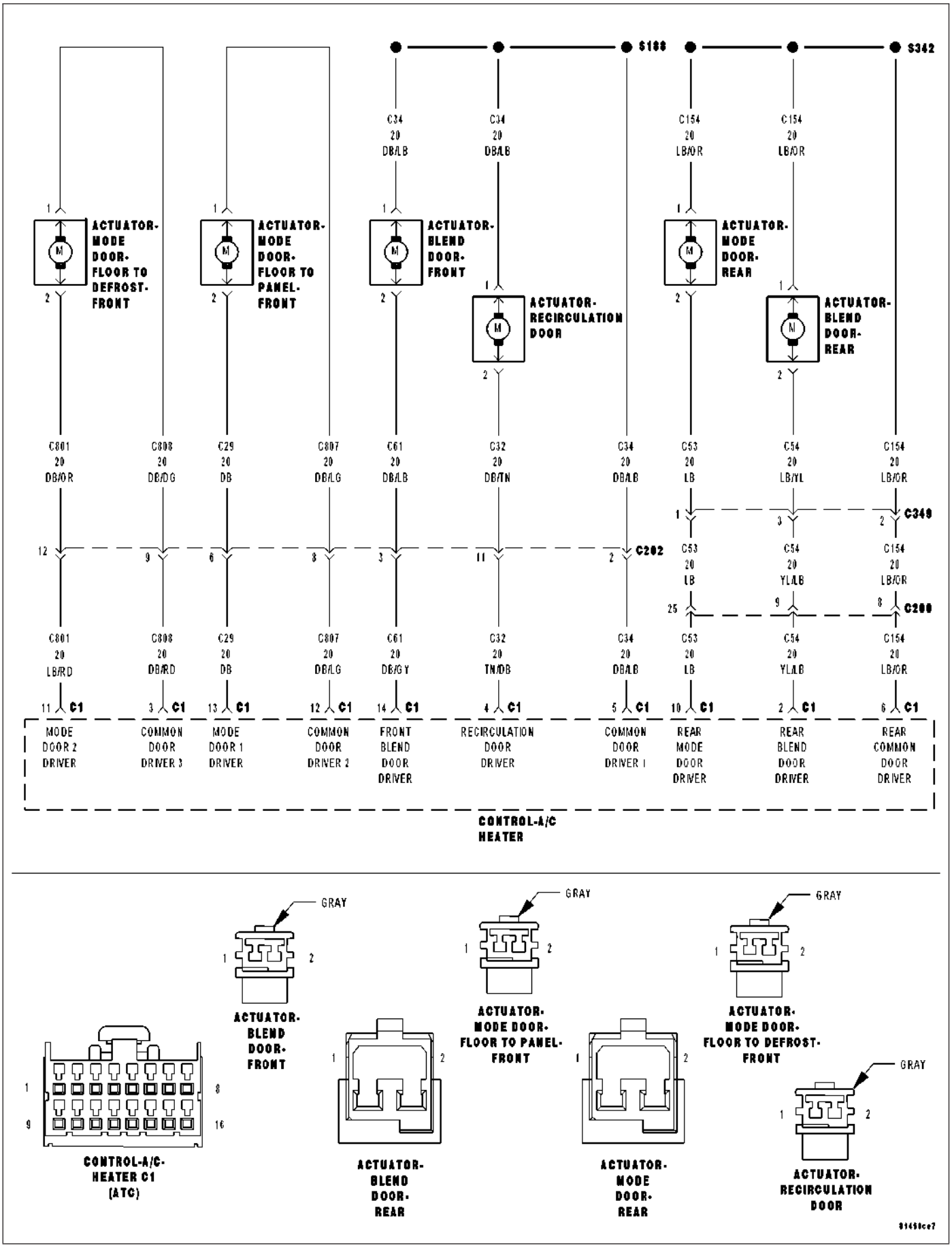
B1058–RECIRCULATION DOOR CONTROL CIRCUIT/PERFORMANCE (MTC)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the A/C Heater Control detects an excessive current draw on any of the door driver circuits while attempting to drive this actuator. This DTC has a maturing time of 5 seconds and a de-maturing time of 10 seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

If this DTC is active, refer to B104C–BLEND DOOR CONTROL CIRCUIT/PERFORMANCE (MTC) for the diagnostic test procedure. If this DTC is stored, refer to HVAC System Test (MTC) for stored DTC test procedures.

B1059–RECIRCULATION DOOR CONTROL CIRCUIT LOW (ATC)



B1059–RECIRCULATION DOOR CONTROL CIRCUIT LOW (ATC) (CONTINUED)

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the Actuator DTC Detection Test is executed.
- **Set Condition:**
  If the (C32) Recirculation Door Driver circuit is shorted to ground.

Possible Causes
(C32) RECIRCULATION DOOR DRIVER CIRCUIT SHORTED TO GROUND
(C32) RECIRCULATION DOOR DRIVER CIRCUIT SHORTED TO OTHER DOOR DRIVER CIRCUIT(S)
RECIRCULATION DOOR ACTUATOR
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control drives the Recirculation Door Actuator via the (C32) Recirculation Door Driver circuit and the (C34) Common Door Driver 1 circuit. The Recirculation Door Actuator and the Front Blend Door Actuator share the (C34) Common Door Driver 1 circuit and they share a driver inside the A/C Heater Control. Due to the shared circuitry similar DTCs can set at the same time for multiple actuators depending upon the type of short, its location, and the direction the actuator is moving when the short is present.

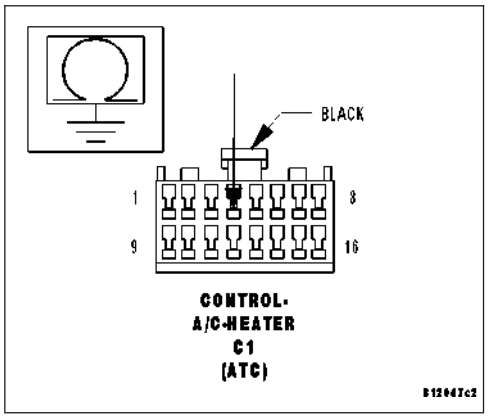
Diagnostic Test

1. CHECK (C32) RECIRCULATION DOOR DRIVER CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

Measure the resistance of the (C32) Recirculation Door Driver circuit between ground and the A/C Heater Control C1 harness connector.



Is the resistance below 10k ohms?

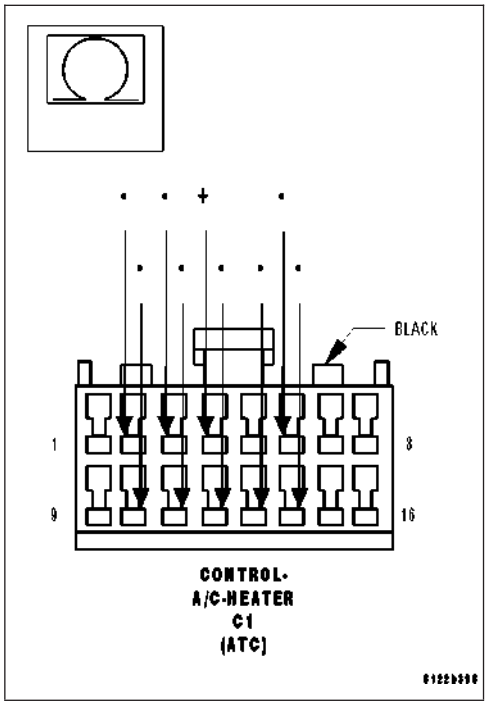
Yes >> Repair the (C32) Recirculation Door Driver circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 2

B1059–RECIRCULATION DOOR CONTROL CIRCUIT LOW (ATC) (CONTINUED)

2. CHECK (C32) RECIRCULATION DRIVER CIRCUIT FOR A SHORT TO OTHER DOOR DRIVER CIRCUITS

Measure the resistance between the (C32) Recirculation Door Driver circuit and the (C54) Rear Blend Door Driver circuit, the (C808) Common Door 3 Driver circuit, the (C154) Rear Common Door Driver circuit, the (C53) Rear Mode Door Driver circuit, the (C801) Mode Door 2 Driver circuit, the (C807) Common Door Driver 2 circuit, the (C29) Mode Door 1 Driver circuit, and the (C61) Front Blend Door Driver circuit in the A/C Heater Control C1 harness connector.



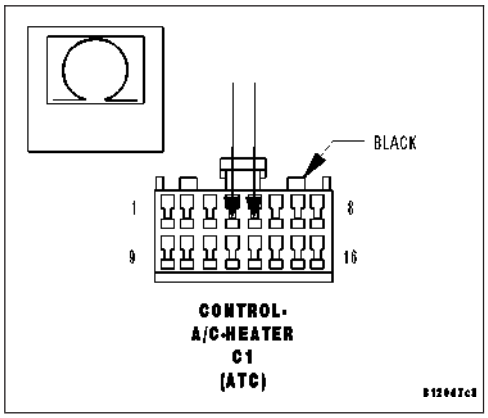
Is the resistance below 10k ohms between the (C32) Recirculation Driver circuit and any of the other door driver circuits?

Yes >> Repair the circuit(s) with a resistance below 10k ohms for a short to the (C32) Recirculation Door Driver circuit. Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 3

3. CHECK RECIRCULATION DOOR ACTUATOR CIRCUIT RESISTANCE

Measure the resistance between the (C32) Recirculation Door Driver circuit and the (C34) Common Door Driver 1 circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 30 ohms?

Yes >> Go To 4

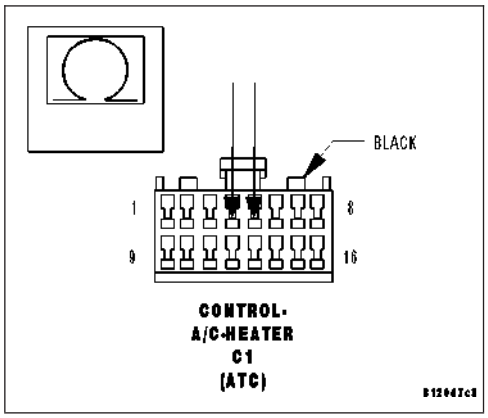
No >> Go To 5

B1059–RECIRCULATION DOOR CONTROL CIRCUIT LOW (ATC) (CONTINUED)

4. CHECK (C32) RECIRCULATION DOOR DRIVER CIRCUIT FOR A SHORT TO (C34) COMMON DOOR DRIVER 1 CIRCUIT

Disconnect the Recirculation Door Actuator harness connector.

Measure the resistance between the (C32) Recirculation Door Driver circuit and the (C34) Common Door Driver 1 circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 10k ohms?

Yes >> Repair the (C32) Recirculation Door Driver circuit for a short to the (C34) Common Door Driver 1 circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Recirculation Door Actuator in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

---

5. RUN THE ACTUATOR DTC DETECTION TEST

Reconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

With the scan tool, erase HVAC DTCs.

Turn the ignition off, wait 10 seconds, and then turn the ignition on.

With the scan tool, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

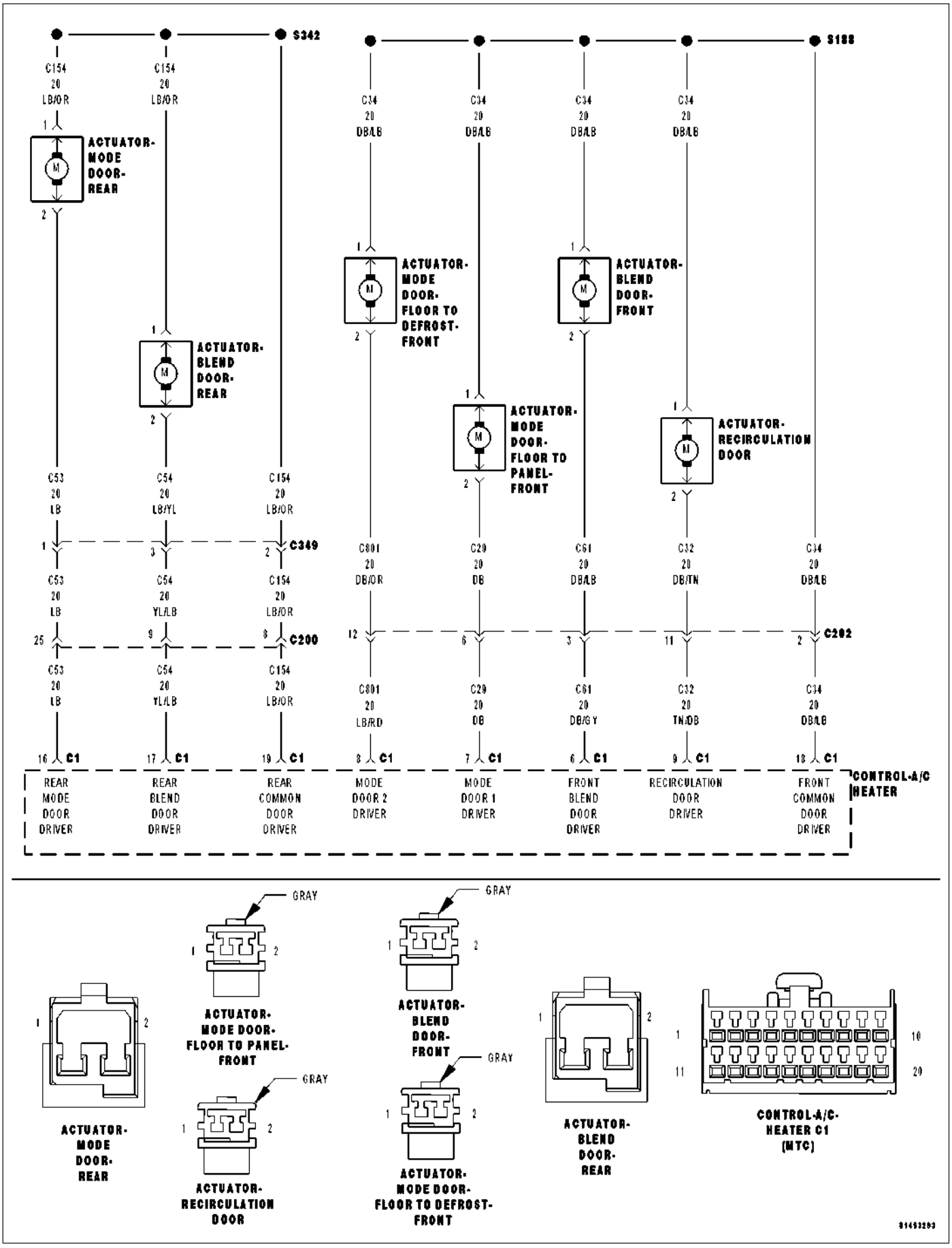
Does the scan tool only display: B1059–RECIRCULATION DOOR CONTROL CIRCUIT LOW?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No, Other DTC(s) Displayed
Diagnose and repair the other DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs and then all short low DTCs. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No, And No Other DTCs Displayed
Using the wiring diagram as a guide, inspect the wiring and connectors for conditions causing an intermittent short. Repair as necessary.
Perform BODY VERIFICATION TEST - VER 1.

B1059–RECIRCULATION DOOR CONTROL CIRCUIT LOW (MTC)



B1059–RECIRCULATION DOOR CONTROL CIRCUIT LOW (MTC) (CONTINUED)

For the Manual Temperature Control (MTC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the Actuator DTC Detection Test is executed.
- **Set Condition:**
  If the (C32) Recirculation Door Driver circuit is shorted to ground.

Possible Causes
(C32) RECIRCULATION DOOR DRIVER CIRCUIT SHORTED TO GROUND
C32) RECIRCULATION DOOR DRIVER CIRCUIT SHORTED TO OTHER DOOR DRIVER CIRCUIT(S)
RECIRCULATION DOOR ACTUATOR
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control drives the Recirculation Door Actuator via the (C32) Recirculation Door Driver circuit and the (C34) Front Common Door Driver circuit. All of the front door actuators share the (C34) Front Common Door Driver circuit. Inside the A/C Heater Control, each door actuator has its own unique driver, but all share a single common door driver circuit. Due to the shared circuitry similar DTCs can set at the same time for multiple actuators depending upon the type of short, its location, and the direction the actuator is moving when the short is present.

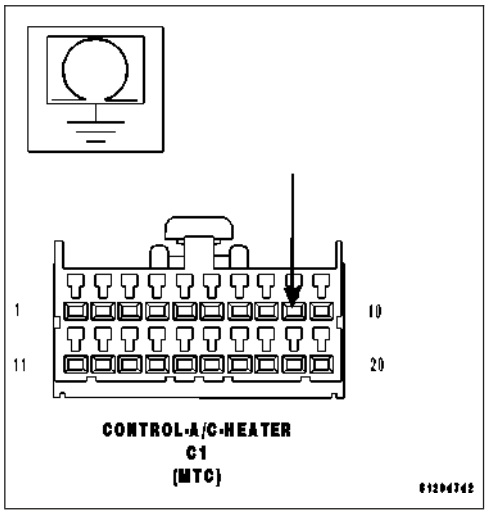
Diagnostic Test

1. CHECK (C32) RECIRCULATION DOOR DRIVER CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

Measure the resistance of the (C32) Recirculation Door Driver circuit between ground and the A/C Heater Control C1 harness connector.



Is the resistance below 10k ohms?

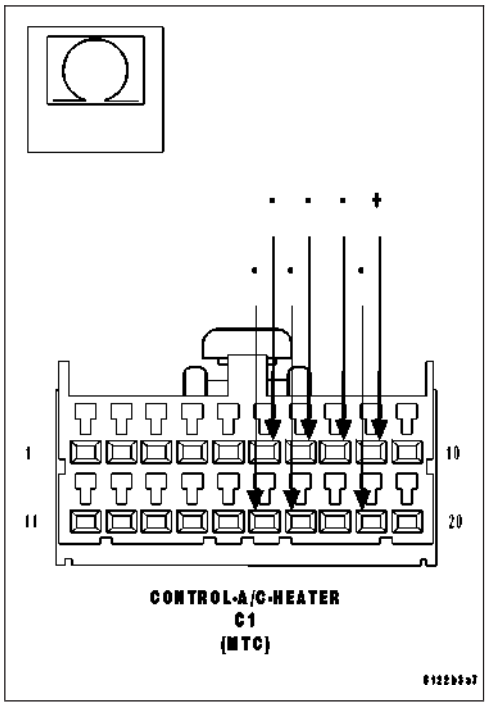
Yes >> Repair the (C32) Recirculation Door Driver circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 2

B1059–RECIRCULATION DOOR CONTROL CIRCUIT LOW (MTC) (CONTINUED)

2. CHECK (C32) RECIRCULATION DOOR DRIVER CIRCUIT FOR A SHORT TO OTHER DOOR DRIVER CIRCUITS

Measure the resistance between the (C32) Recirculation Door Driver circuit and the (C29) Mode Door 1 Driver circuit, the (C61) Front Blend Door Driver circuit, the (C801) Mode Door 2 Driver circuit, and, if equipped, the (C53) Rear Mode Door Driver circuit, the (C154) Rear Common Door Driver circuit, and the (C54) Rear Blend Door Driver circuit in the A/C Heater Control C1 harness connector.



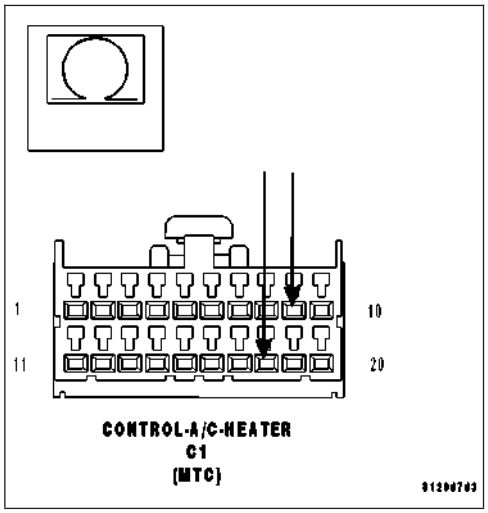
Is the resistance below 10k ohms between the (C32) Recirculation Door Driver circuit and any of the other door driver circuits?

Yes >> Repair the circuit(s) with a resistance below 10k ohms for a short to the (C32) Recirculation Door Driver circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 3

3. CHECK RECIRCULATION DOOR ACTUATOR CIRCUIT RESISTANCE

Measure the resistance between the (C32) Recirculation Door Driver circuit and the (C34) Front Common Door Driver circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 30 ohms?

Yes >> Go To 4

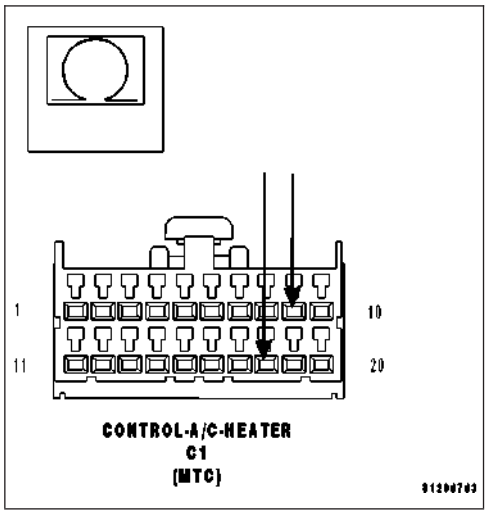
No >> Go To 5

B1059–RECIRCULATION DOOR CONTROL CIRCUIT LOW (MTC) (CONTINUED)

4. CHECK (C32) RECIRCULATION DOOR DRIVER CIRCUIT FOR A SHORT TO (C34) FRONT COMMON DOOR DRIVER CIRCUIT

Disconnect the Recirculation Door Actuator harness connector.

Measure the resistance between the (C32) Recirculation Door Driver circuit and the (C34) Front Common Door Driver circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 10k ohms?

Yes >> Repair the (C32) Recirculation Door Driver circuit for a short to the (C34) Front Common Door Driver circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Recirculation Door Actuator in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

5. RUN THE ACTUATOR DTC DETECTION TEST

Reconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

With the scan tool, erase HVAC DTCs.

Turn the ignition off, wait 10 seconds, and then turn the ignition on.

With the scan tool, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

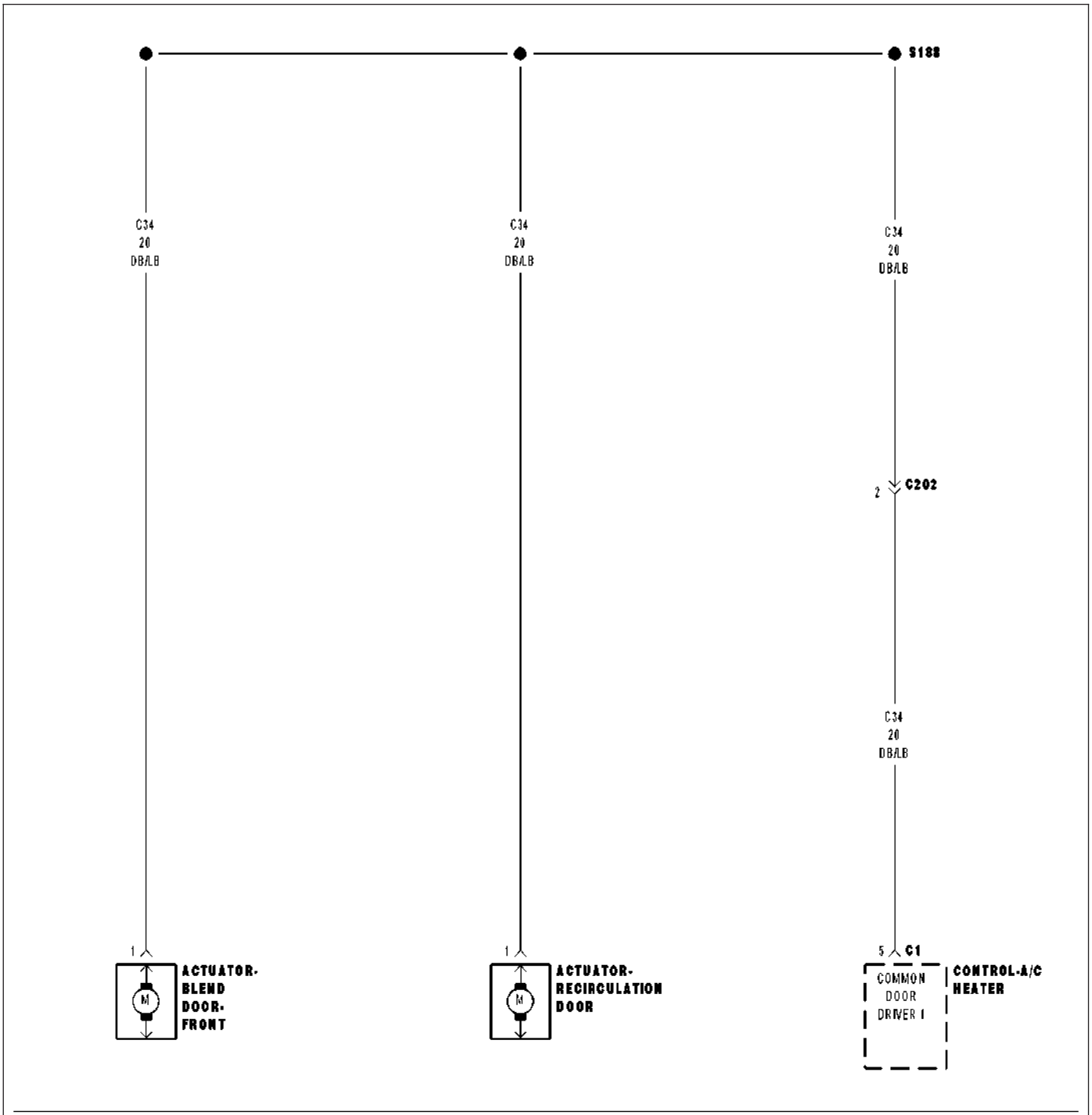
Does the scan tool only display: B1059–RECIRCULATION DOOR CONTROL CIRCUIT LOW?

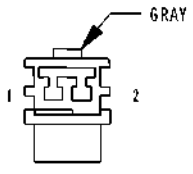
Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No, Other DTC(s) Displayed
Diagnose and repair the other DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs and then all short low DTCs. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

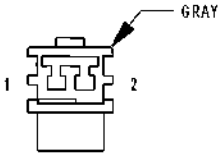
No, And No Other DTCs Displayed
Using the wiring diagram as a guide, inspect the wiring and connectors for conditions causing an intermittent short. Repair as necessary.
Perform BODY VERIFICATION TEST - VER 1.

B1060–CLIMATE CONTROL MOTOR(S) COMMON 1 CONTROL CIRCUIT HIGH (ATC)

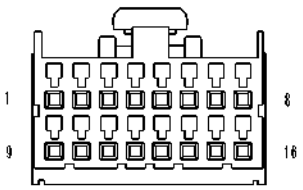




ACTUATOR-
BLEND
DOOR-
FRONT



ACTUATOR-
RECIRCULATION
DOOR



CONTROL-A/C-
HEATER C1
(ATC)

81451c41

B1060–CLIMATE CONTROL MOTOR(S) COMMON 1 CONTROL CIRCUIT HIGH (ATC) (CONTINUED)

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the Actuator DTC Detection Test is executed.
- **Set Condition:**
  If the (C34) Common Door Driver 1 circuit is shorted to voltage.

Possible Causes
(C34) COMMON DOOR DRIVER 1 CIRCUIT SHORTED TO VOLTAGE
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control drives the Front Blend Door Actuator via the (C61) Front Blend Door Driver circuit and the (C34) Common Door Driver 1 circuit. The A/C Heater Control drives the Recirculation Door Actuator via the (C32) Recirculation Door Driver circuit and the (C34) Common Door Driver 1 circuit. The Front Blend Door Actuator and the Recirculation Door Actuator share the (C34) Common Door Driver 1 circuit and they share a driver inside the A/C Heater Control. Due to the shared circuitry similar DTCs can set at the same time for multiple actuators depending upon the type of short, its location, and the direction the actuator is moving when the short is present.

Diagnostic Test

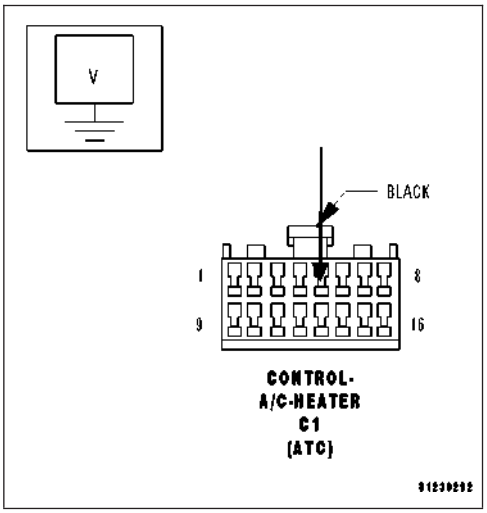
1. CHECK (C34) COMMON DOOR DRIVER 1 CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

Measure the voltage of the (C34) Common Door Driver 1 circuit.



Is the voltage above 0.2 volts?

Yes >> Repair the (C34) Common Door Driver 1 circuit for a short to voltage.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 2

B1060–CLIMATE CONTROL MOTOR(S) COMMON 1 CONTROL CIRCUIT HIGH (ATC) (CONTINUED)

2. RUN THE ACTUATOR DTC DETECTION TEST

Turn the ignition off.

Reconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

With the scan tool in HVAC, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

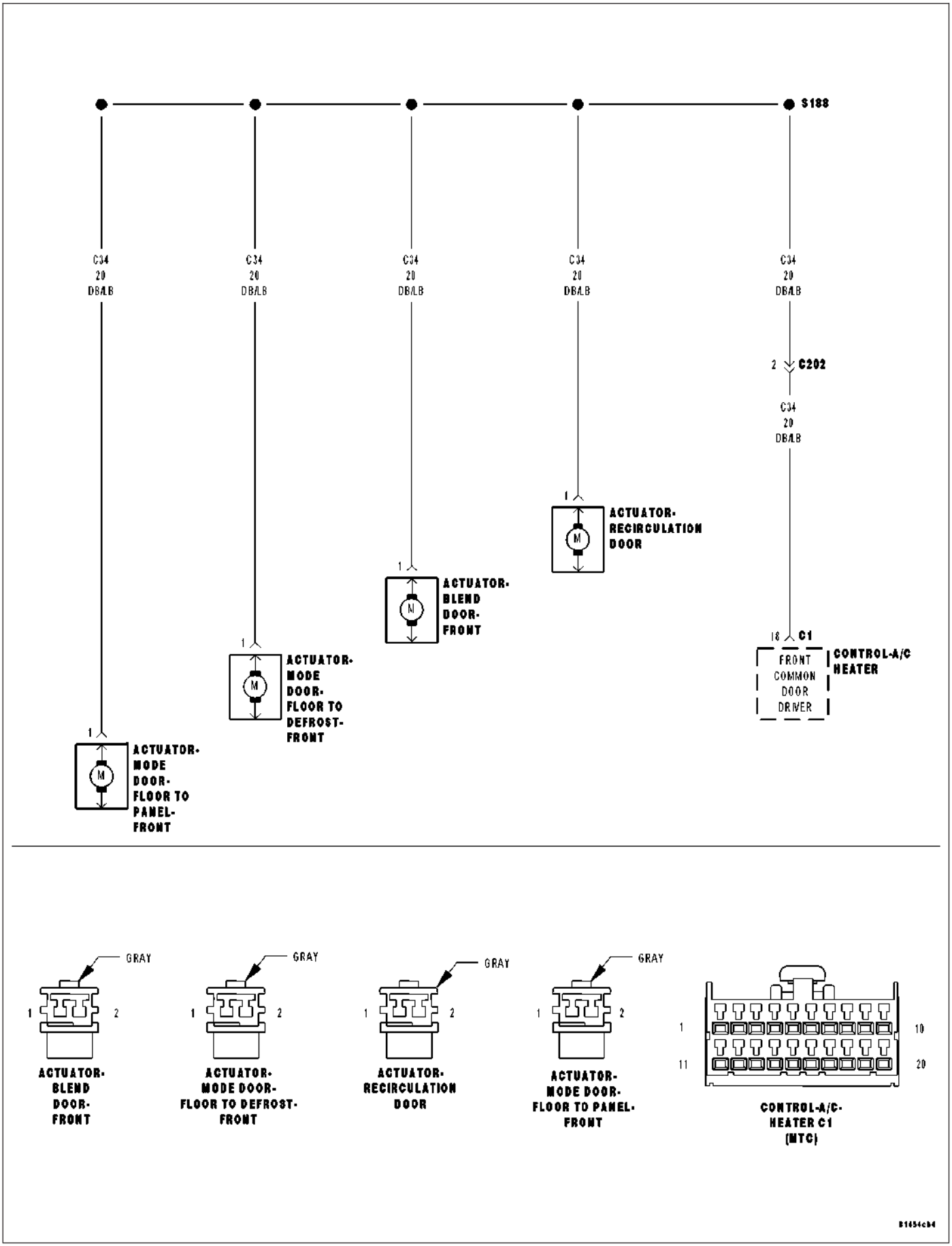
Does the scan tool only display: B1060–CLIMATE CONTROL MOTOR(S) COMMON 1 CONTROL CIRCUIT HIGH?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No, Other DTC(s) Displayed
Diagnose and repair the other DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs and then all short low DTCs. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No, And No Other DTCs Displayed
Using the wiring diagram as a guide, inspect the wiring and connectors for conditions causing an intermittent short. Repair as necessary.
Perform BODY VERIFICATION TEST - VER 1.

B1060–CLIMATE CONTROL MOTOR(S) COMMON 1 CONTROL CIRCUIT HIGH (MTC)



B1060–CLIMATE CONTROL MOTOR(S) COMMON 1 CONTROL CIRCUIT HIGH (MTC) (CONTINUED)

For the Manual Temperature Control (MTC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the Actuator DTC Detection Test is executed.
- **Set Condition:**
  If the (C34) Front Common Door Driver circuit is shorted to voltage.

Possible Causes
(C34) FRONT COMMON DOOR DRIVER CIRCUIT SHORTED TO VOLTAGE
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control drives the Front Blend Door Actuator via the (C61) Front Blend Door Driver circuit and the (C34) Front Common Door Driver circuit. The A/C Heater Control drives the Mode Door 1 (Floor to Panel) Actuator via the (C29) Mode Door 1 Driver circuit and the (C34) Front Common Door Driver circuit. The A/C Heater Control drives the Mode Door 2 (Floor to Defrost) Actuator via the (C801) Mode Door 2 Driver circuit and the (C34) Front Common Door Driver circuit. The A/C Heater Control drives the Recirculation Door Actuator via the (C32) Recirculation Door Driver circuit and the (C34) Front Common Door Driver circuit. All of the front door actuators share the (C34) Front Common Door Driver circuit. Inside the A/C Heater Control, each door actuator has its own unique driver, but all share a single common door driver circuit. Due to the shared circuitry similar DTCs can set at the same time for multiple actuators depending upon the type of short, its location, and the direction the actuator is moving when the short is present.

Diagnostic Test

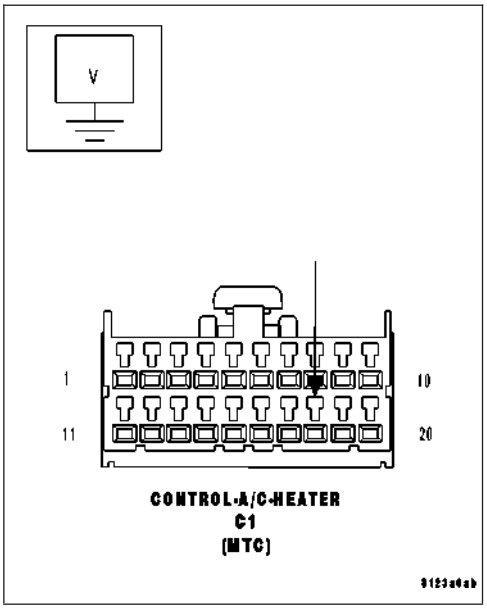
1. CHECK (C34) FRONT COMMON DOOR DRIVER CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

Measure the voltage of the (C34) Front Common Door Driver circuit.



Is the voltage above 0.2 volts?

Yes >> Repair the (C34) Front Common Door Driver circuit for a short to voltage.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 2

B1060–CLIMATE CONTROL MOTOR(S) COMMON 1 CONTROL CIRCUIT HIGH (MTC) (CONTINUED)

2. RUN THE ACTUATOR DTC DETECTION TEST

Turn the ignition off.

Reconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

With the scan tool in HVAC, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

Does the scan tool only display: B1060–CLIMATE CONTROL MOTOR(S) COMMON 1 CONTROL CIRCUIT HIGH?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1.

No, Other DTC(s) Displayed

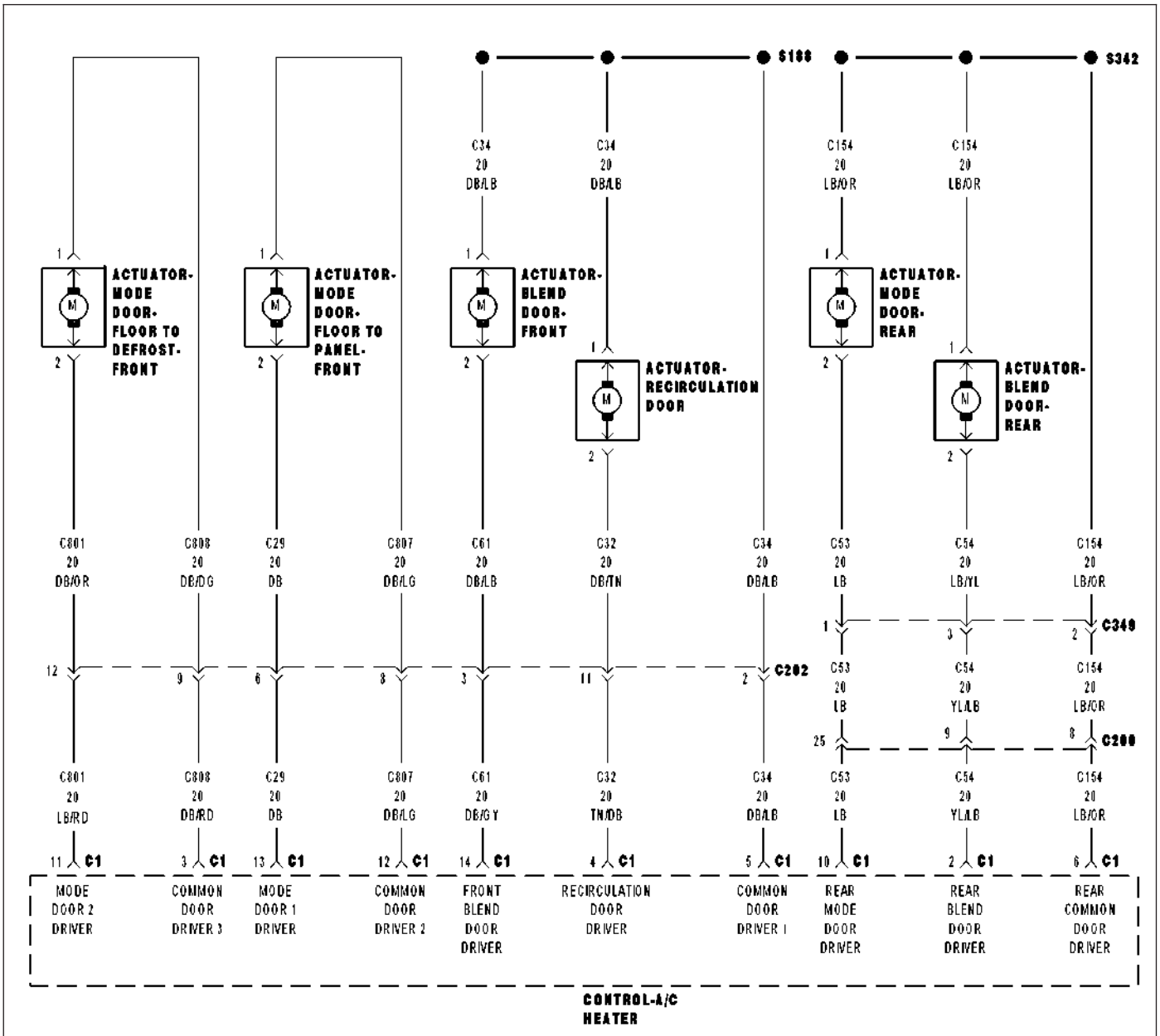
Diagnose and repair the other DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs and then all short low DTCs. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No, And No Other DTCs Displayed

Using the wiring diagram as a guide, inspect the wiring and connectors for conditions causing an intermittent short. Repair as necessary.

Perform BODY VERIFICATION TEST - VER 1.

B1063–CLIMATE CONTROL MOTOR(S) COMMON 2 CONTROL CIRCUIT LOW (ATC)



B1063–CLIMATE CONTROL MOTOR(S) COMMON 2 CONTROL CIRCUIT LOW (ATC) (CONTINUED)

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the Actuator DTC Detection Test is executed.
- **Set Condition:**
  If the (C807) Common Door Driver 2 circuit is shorted to ground.

Possible Causes
(C807) COMMON DOOR DRIVER 2 CIRCUIT SHORTED TO GROUND
(C807) COMMON DOOR DRIVER 2 CIRCUIT SHORTED TO OTHER DOOR DRIVER CIRCUIT(S)
MODE DOOR 1 (FLOOR TO PANEL) ACTUATOR
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control drives the Mode Door 1 (Floor to Panel) Actuator via the (C29) Mode Door 1 Driver circuit and the (C807) Common Door Driver 2 circuit. The Mode Door 1 (Floor to Panel) Actuator does not share the (C807) Common Door Driver 2 circuit or its driver inside the A/C Heater Control with any other actuator.

Diagnostic Test

1. CHECK (C807) COMMON DOOR DRIVER 2 CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

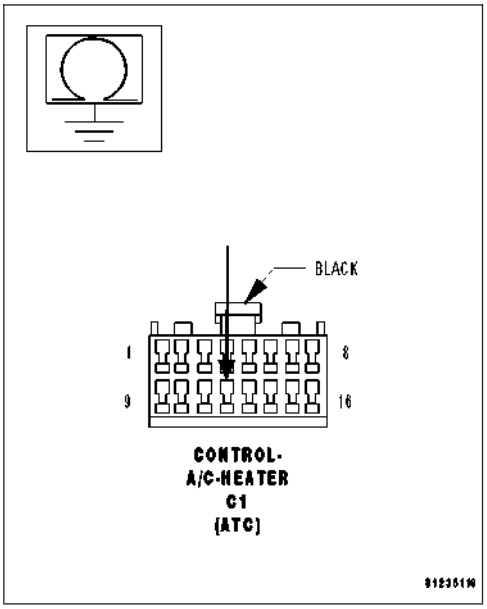
Disconnect the A/C Heater Control C1 harness connector.

Measure the resistance of the (C807) Common Door Driver 2 circuit between ground and the A/C Heater Control C1 harness connector.

Is the resistance below 10k ohms?

Yes >> Repair the (C807) Common Door Driver 2 circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

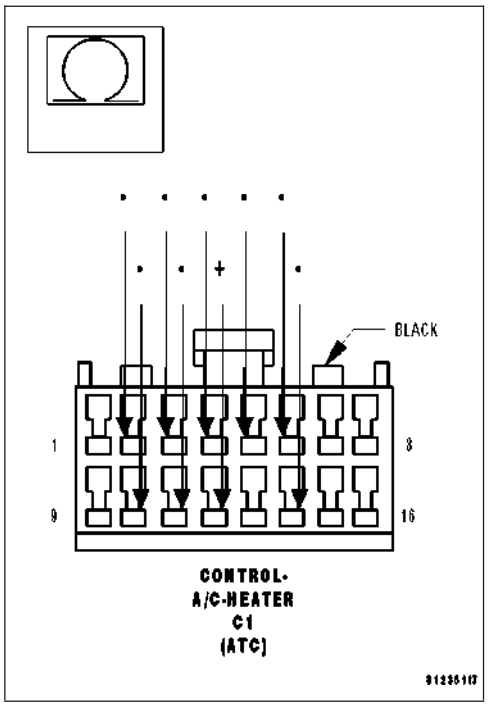
No >> Go To 2



B1063–CLIMATE CONTROL MOTOR(S) COMMON 2 CONTROL CIRCUIT LOW (ATC) (CONTINUED)

2. CHECK (C807) COMMON DOOR DRIVER 2 CIRCUIT FOR A SHORT TO OTHER DOOR DRIVER CIRCUITS

Measure the resistance between the (C807) Common Door Driver 2 circuit and the (C54) Rear Blend Door Driver circuit, the (C808) Common Door Driver 3 circuit, the (C32) Recirculation Door Driver circuit, the (C34) Common Door Driver 1 circuit, the (C154) Rear Common Door Driver circuit, the (C53) Rear Mode Door Driver circuit, the (C801) Mode Door 2 Driver circuit, and the (C61) Front Blend Door Driver circuit in the A/C Heater Control C1 harness connector.



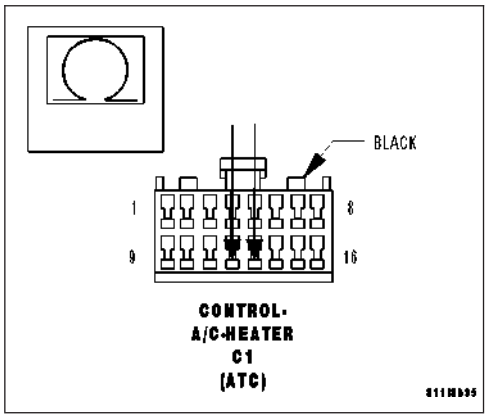
Is the resistance below 10k ohms between the (C807) Common Door Driver 2 circuit and any of the other door driver circuits?

Yes >> Repair the circuits with a resistance below 10k ohms for a short to the (C807) Common Door Driver 2 circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 3

3. CHECK MODE DOOR 1 (FLOOR TO PANEL) ACTUATOR CIRCUIT RESISTANCE

Measure the resistance between the (C29) Mode Door 1 Driver circuit and the (C807) Common Door Driver 2 circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 30 ohms?

Yes >> Go To 4

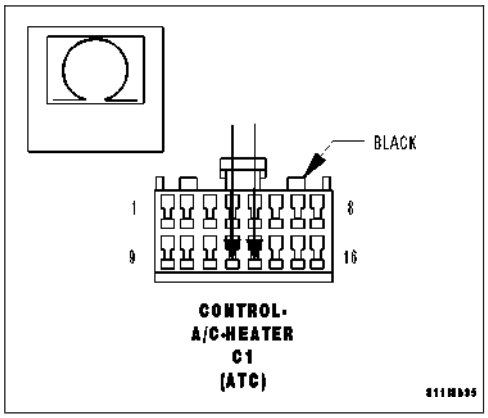
No >> Go To 5

B1063–CLIMATE CONTROL MOTOR(S) COMMON 2 CONTROL CIRCUIT LOW (ATC) (CONTINUED)

4. CHECK (C29) MODE DOOR 1 DRIVER CIRCUIT FOR A SHORT TO (C807) COMMON DOOR DRIVER 2 CIRCUIT

Disconnect the Mode Door 1 (Floor to Panel) Actuator harness connector.

Measure the resistance between the (C29) Mode Door 1 Driver circuit and the (C807) Common Door Driver 2 circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 10k ohms?

Yes >> Repair the (C29) Mode Door 1 Driver Circuit for a short to the (C807) Common Door Driver 2 circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Mode Door 1 (Floor to Panel) Actuator in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

---

5. RUN THE ACTUATOR DTC DETECTION TEST

Reconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

With the scan tool in HVAC, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

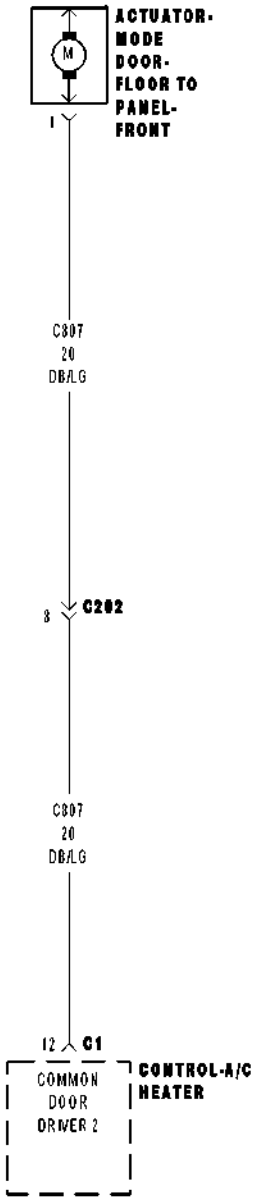
Does the scan tool only display: B1063–CLIMATE CONTROL MOTOR(S) COMMON 2 CONTROL CIRCUIT LOW?

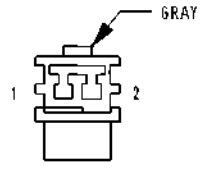
Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No, Other DTC(s) Displayed
Diagnose and repair the other DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs and then all short low DTCs. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

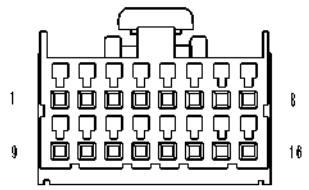
No, And No Other DTCs Displayed
Using the wiring diagram as a guide, inspect the wiring and connectors for conditions causing an intermittent short. Repair as necessary.
Perform BODY VERIFICATION TEST - VER 1.

B1064–CLIMATE CONTROL MOTOR(S) COMMON 2 CONTROL CIRCUIT HIGH (ATC)





ACTUATOR-
MODE DOOR-
FLOOR TO PANEL-
FRONT



CONTROL-A/C-
HEATER C1
(ATC)

B1654471

B1064–CLIMATE CONTROL MOTOR(S) COMMON 2 CONTROL CIRCUIT HIGH (ATC) (CONTINUED)

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the Actuator DTC Detection Test is executed.
- **Set Condition:**
  If the (C807) Common Door Driver 2 circuit is shorted to voltage.

Possible Causes
(C807) COMMON DOOR DRIVER 2 CIRCUIT SHORTED TO VOLTAGE
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control drives the Mode Door 1 (Floor to Panel) Actuator via the (C29) Mode Door 1 Driver circuit and the (C807) Common Door Driver 2 circuit. The Mode Door 1 (Floor to Panel) Actuator does not share the (C807) Common Door Driver 2 circuit or its driver inside the A/C Heater Control with any other actuator.

Diagnostic Test

1. CHECK (C807) COMMON DOOR DRIVER 2 CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

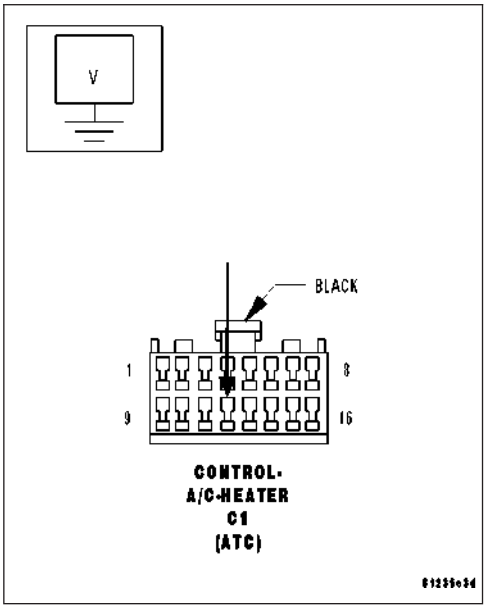
Turn the ignition on.

Measure the voltage of the (C807) Common Door Driver 2 circuit.

Is the voltage above 0.2 volts?

Yes >> Repair the (C807) Common Door Driver 2 circuit for a short to voltage.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 2



B1064–CLIMATE CONTROL MOTOR(S) COMMON 2 CONTROL CIRCUIT HIGH (ATC) (CONTINUED)

2. RUN THE ACTUATOR DTC DETECTION TEST

Turn the ignition off.

Reconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

With the scan tool in HVAC, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

Does the scan tool only display: B1064–CLIMATE CONTROL MOTOR(S) COMMON 2 CONTROL CIRCUIT HIGH?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1.

No, Other DTC(s) Displayed

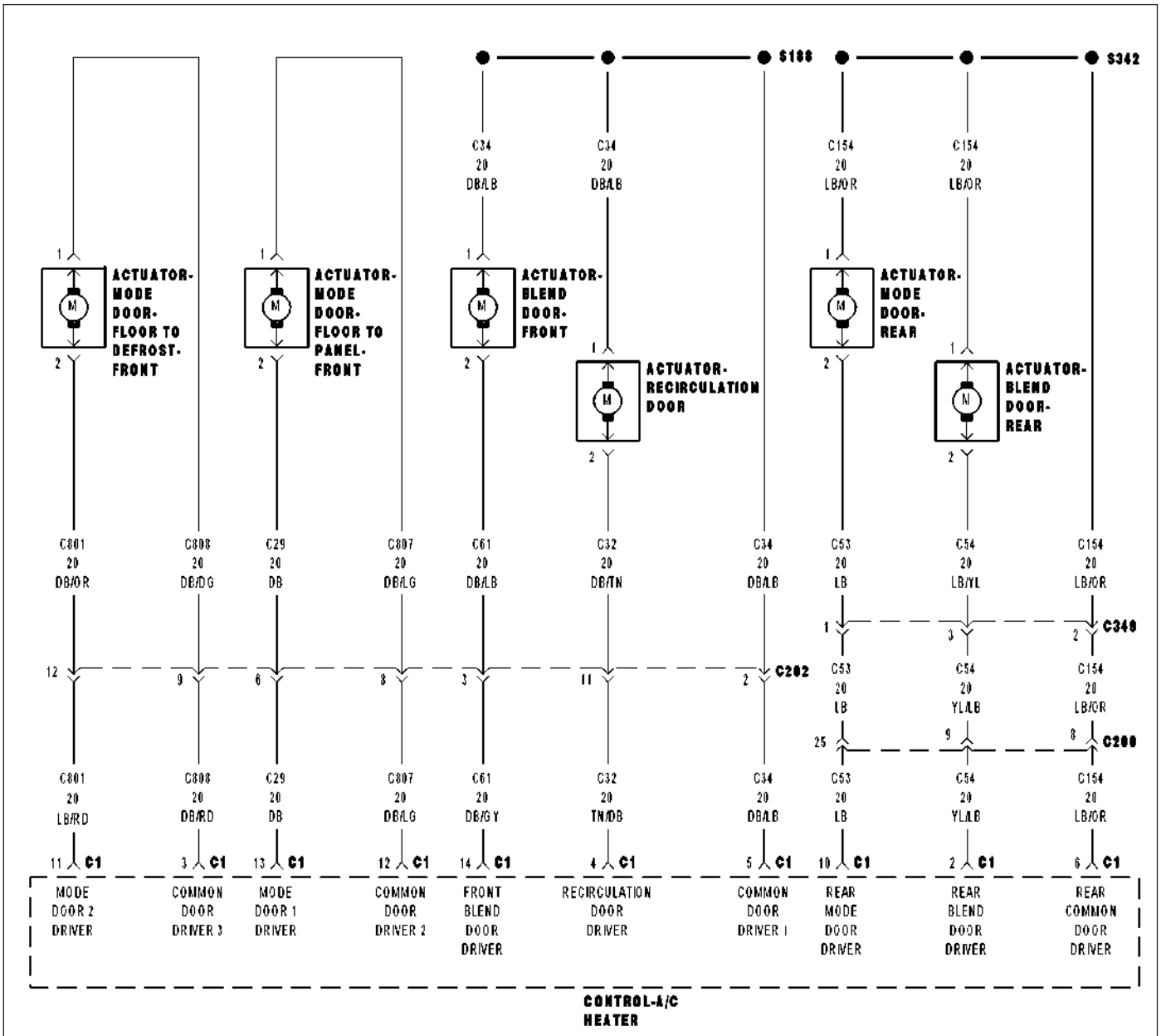
Diagnose and repair the other DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs and then all short low DTCs. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

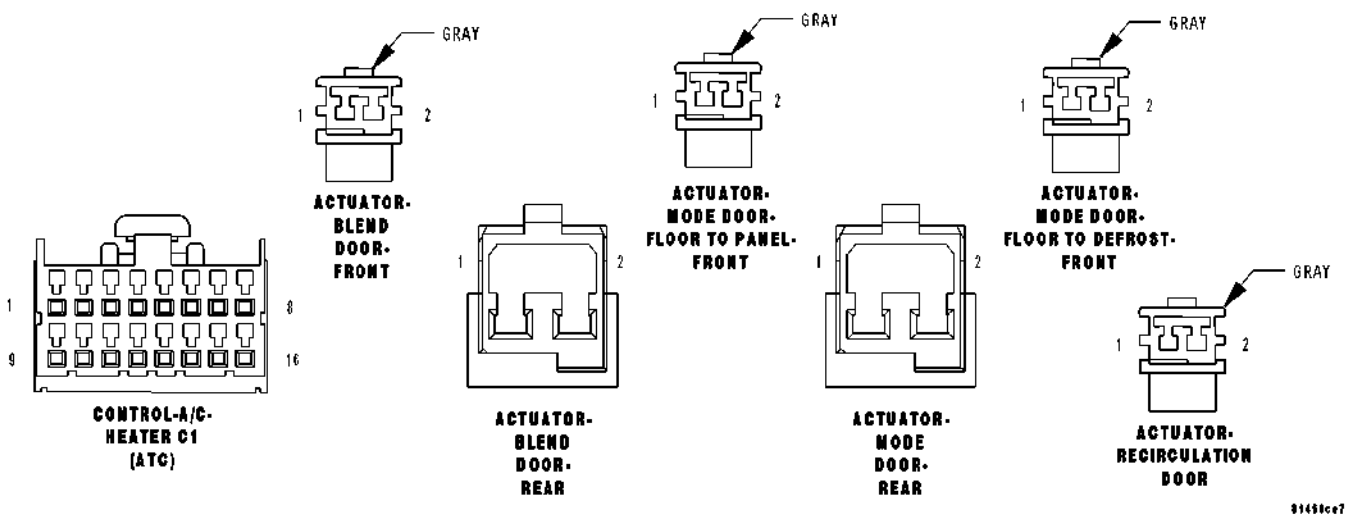
No, And No Other DTCs Displayed

Using the wiring diagram as a guide, inspect the wiring and connectors for conditions causing an intermittent short. Repair as necessary.

Perform BODY VERIFICATION TEST - VER 1.

B1067–CLIMATE CONTROL MOTOR(S) COMMON 3 CONTROL CIRCUIT LOW (ATC)





B1067–CLIMATE CONTROL MOTOR(S) COMMON 3 CONTROL CIRCUIT LOW (ATC) (CONTINUED)

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the Actuator DTC Detection Test is executed.
- **Set Condition:**
  If the (C808) Common Door Driver 3 circuit is shorted to ground.

Possible Causes
(C808) COMMON DOOR DRIVER 3 CIRCUIT SHORTED TO GROUND
(C808) COMMON DOOR DRIVER 3 CIRCUIT SHORTED TO OTHER DOOR DRIVER CIRCUIT(S)
MODE DOOR 2 (FLOOR TO DEFROST) ACTUATOR
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control drives the Mode Door 2 (Floor to Defrost) Actuator via the (C801) Mode Door 2 Driver circuit and the (C808) Common Door Driver 3 circuit. The Mode Door 2 (Floor to Defrost) Actuator does not share the (C808) Common Door Driver 3 circuit with any other actuator. However, the Mode Door 2 (Floor to Defrost) Actuator, the Rear Mode Door Actuator, and the Rear Blend Door Actuator share a driver inside the A/C Heater Control. Due to the shared circuitry similar DTCs can set at the same time for multiple actuators depending upon the type of short, its location, and the direction the actuator is moving when the short is present.

Diagnostic Test

1. CHECK (C808) COMMON DOOR DRIVER 3 CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

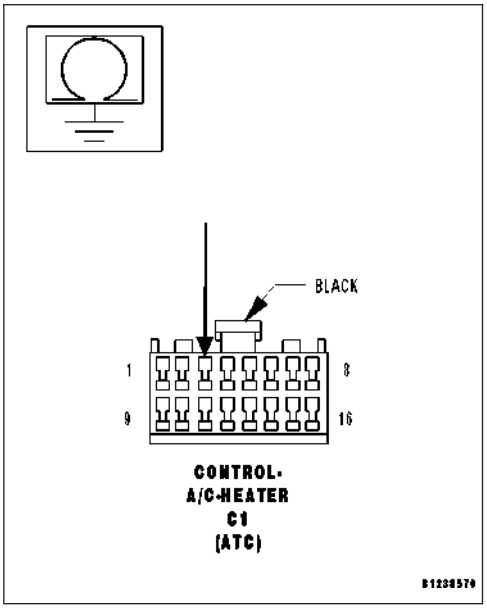
Disconnect the A/C Heater Control C1 harness connector.

Measure the resistance of the (C808) Common Door Driver 3 circuit between ground and the A/C Heater Control C1 harness connector.

Is the resistance below 10k ohms?

Yes >> Repair the (C808) Common Door Driver 3 circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1.

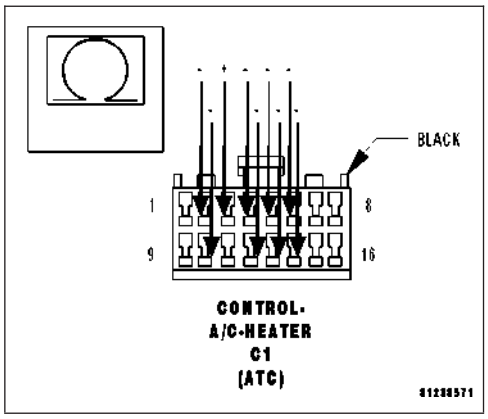
No >> Go To 2



B1067–CLIMATE CONTROL MOTOR(S) COMMON 3 CONTROL CIRCUIT LOW (ATC) (CONTINUED)

2. CHECK (C808) COMMON DOOR DRIVER 3 CIRCUIT FOR A SHORT TO OTHER DOOR DRIVER CIRCUITS

Measure the resistance between the (C808) Common Door Driver 3 circuit and the (C54) Rear Blend Door Driver circuit, the (C32) Recirculation Door Driver circuit, the (C34) Common Door Driver 1 circuit, the (C154) Rear Common Door Driver circuit, the (C53) Rear Mode Door Driver circuit, the (C807) Common Door Driver 2 circuit, the (C29) Mode Door 1 Driver circuit, and the (C61) Front Blend Door Driver circuit in the A/C Heater Control C1 harness connector.



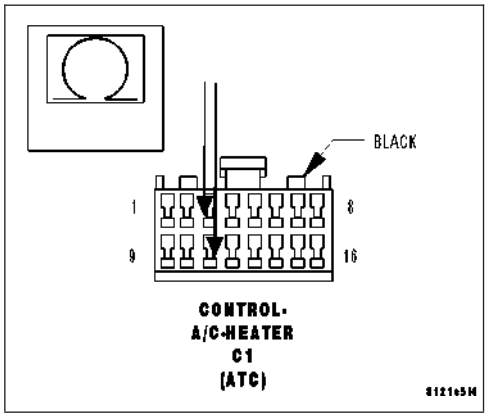
Is the resistance below 10k ohms between the (C808) Common Door Driver 3 circuit and any of the other door driver circuits?

Yes >> Repair the circuits with a resistance below 10k ohms for a short to the (C808) Common Door Driver 3 circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 3

3. CHECK MODE DOOR 2 (FLOOR TO DEFROST) ACTUATOR CIRCUIT RESISTANCE

Measure the resistance between the (C801) Mode Door 2 Driver circuit and the (C808) Common Door Driver 3 circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 30 ohms?

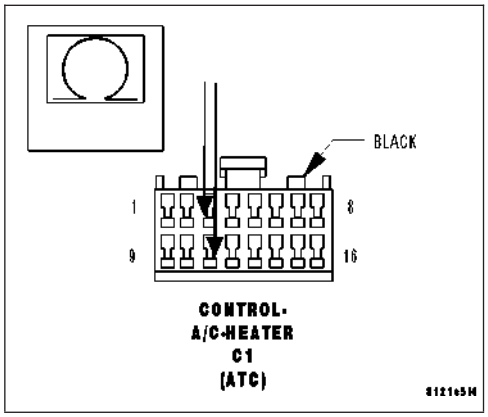
Yes >> Go To 4

No >> Go To 5

4. CHECK (C801) MODE DOOR 2 DRIVER CIRCUIT FOR A SHORT TO (C808) COMMON DOOR DRIVER 3 CIRCUIT

Disconnect the Mode Door 2 (Floor to Defrost) Actuator harness connector.

Measure the resistance between the (C801) Mode Door 2 Driver circuit and the (C808) Common Door Driver 3 circuit in the A/C Heater Control C1 harness connector.



Is the resistance below 10k ohms?

Yes >> Repair the (C801) Mode Door 2 Driver circuit for a short to the (C808) Common Door Driver 3 circuit.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Mode Door 2 (Floor to Defrost) Actuator in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

B1067–CLIMATE CONTROL MOTOR(S) COMMON 3 CONTROL CIRCUIT LOW (ATC) (CONTINUED)

5. RUN THE ACTUATOR DTC DETECTION TEST

Reconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

With the scan tool in HVAC, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

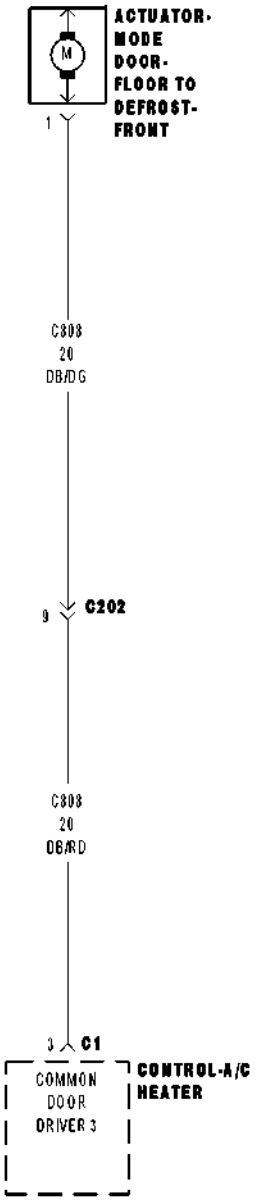
Does the scan tool only display: B1067–CLIMATE CONTROL MOTOR(S) COMMON 3 CONTROL CIRCUIT LOW?

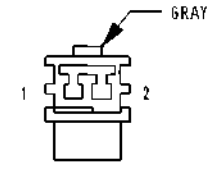
Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No, Other DTC(s) Displayed
Diagnose and repair the other DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs and then all short low DTCs. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

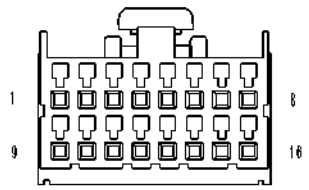
No, And No Other DTCs Displayed
Using the wiring diagram as a guide, inspect the wiring and connectors for conditions causing an intermittent short. Repair as necessary.
Perform BODY VERIFICATION TEST - VER 1.

B1068–CLIMATE CONTROL MOTOR(S) COMMON 3 CONTROL CIRCUIT HIGH (ATC)





ACTUATOR-
MODE DOOR-
FLOOR TO DEFROST-
FRONT



CONTROL-A/C-
HEATER C1
(ATC)

81654e04

B1068–CLIMATE CONTROL MOTOR(S) COMMON 3 CONTROL CIRCUIT HIGH (ATC) (CONTINUED)

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the Actuator DTC Detection Test is executed.
- **Set Condition:**
  If the (C808) Common Door Driver 3 circuit is shorted to voltage.

Possible Causes
(C808) COMMON DOOR DRIVER 3 CIRCUIT SHORTED TO VOLTAGE
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control drives the Mode Door 2 (Floor to Defrost) Actuator via the (C801) Mode Door 2 Driver circuit and the (C808) Common Door Driver 3 circuit. The Mode Door 2 (Floor to Defrost) Actuator does not share the (C808) Common Door Driver 3 circuit with any other actuator. However, the Mode Door 2 (Floor to Defrost) Actuator, the Rear Mode Door Actuator, and the Rear Blend Door Actuator share a driver inside the A/C Heater Control. Due to the shared circuitry similar DTCs can set at the same time for multiple actuators depending upon the type of short, its location, and the direction the actuator is moving when the short is present.

Diagnostic Test

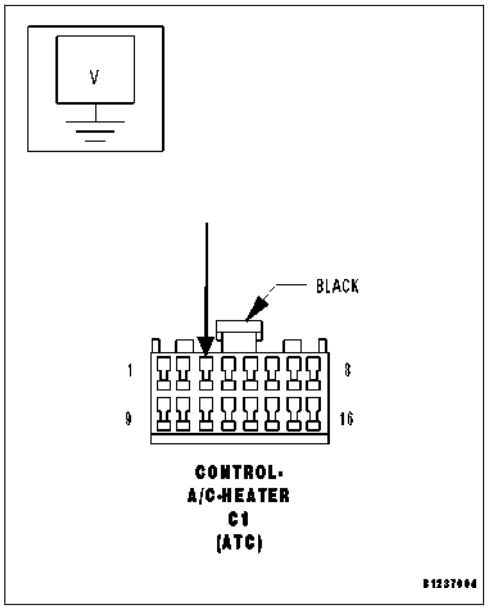
1. CHECK (C808) COMMON DOOR DRIVER 3 CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

Measure the voltage of the (C808) Common Door Driver 3 circuit.



Is the voltage above 0.2 volts?

Yes >> Repair the (C808) Common Door Driver 3 circuit for a short to voltage.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 2

B1068–CLIMATE CONTROL MOTOR(S) COMMON 3 CONTROL CIRCUIT HIGH (ATC) (CONTINUED)

2. RUN THE ACTUATOR DTC DETECTION TEST

Turn the ignition off.

Reconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

With the scan tool in HVAC, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

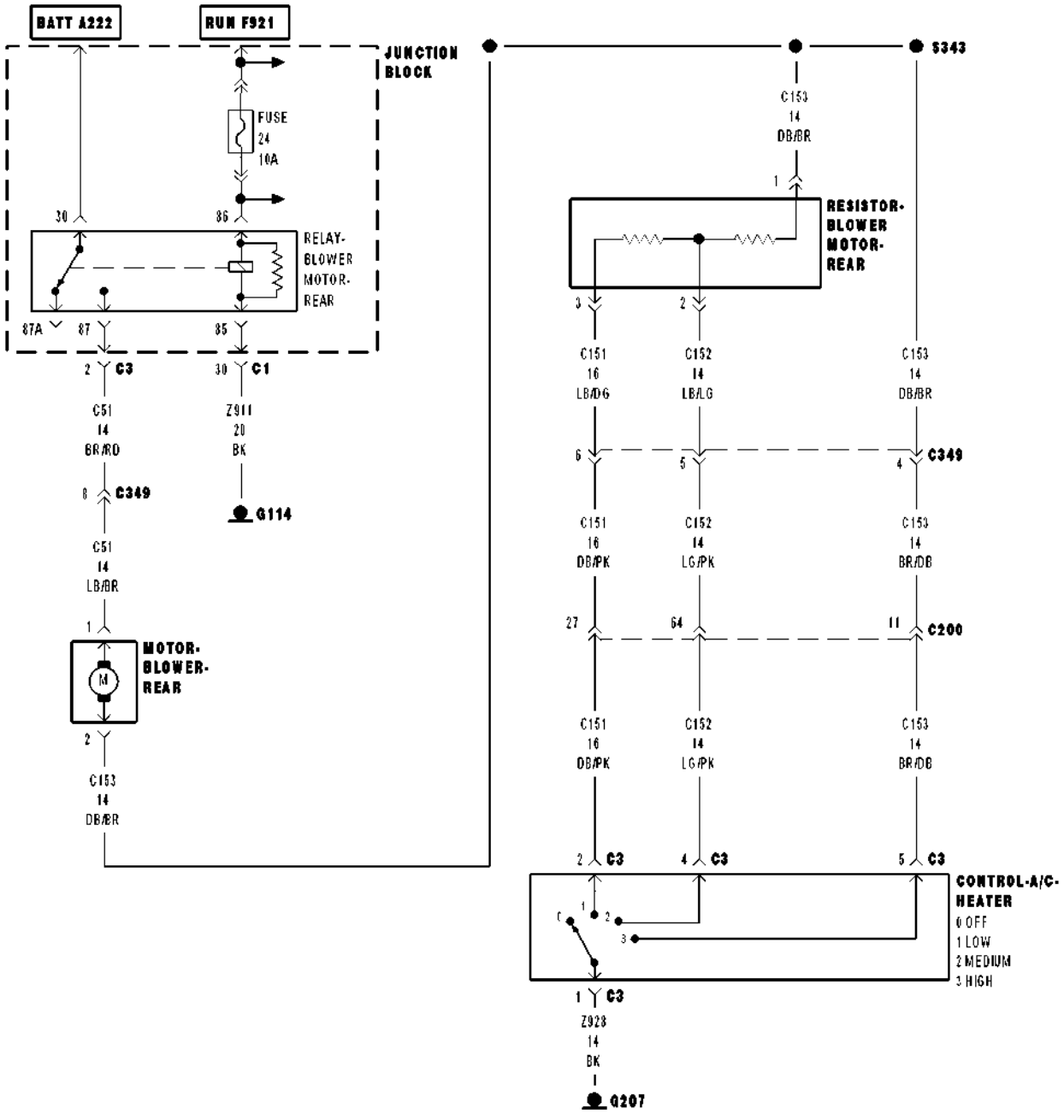
Does the scan tool only display: B1068–CLIMATE CONTROL MOTOR(S) COMMON 3 CONTROL CIRCUIT HIGH?

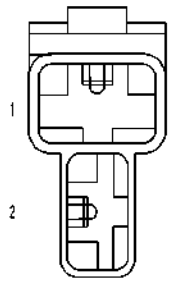
Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No, Other DTC(s) Displayed
Diagnose and repair the other DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs and then all short low DTCs. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

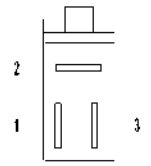
No, And No Other DTCs Displayed
Using the wiring diagram as a guide, inspect the wiring and connectors for conditions causing an intermittent short. Repair as necessary.
Perform BODY VERIFICATION TEST - VER 1.

B1070–REAR BLOWER CONTROL CIRCUIT HIGH (ATC)

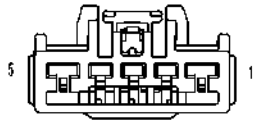




MOTOR-BLOWER-REAR



RESISTOR-BLOWER MOTOR-REAR



CONTROL-A/C-HEATER C3 (ATC)

91491e01

B1070–REAR BLOWER CONTROL CIRCUIT HIGH (ATC) (CONTINUED)

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When rear blower speed is set to Low, M1, or High with the ignition on.
- **Set Condition:**
  If the ATC detects an excessive draw on any of the rear blower outputs.

Possible Causes
HIGH RESISTANCE ON (Z928) GROUND CIRCUIT
(C151) REAR BLOWER LOW SPEED CIRCUIT, (C152) REAR BLOWER MEDIUM SPEED CIRCUIT, OR (C153) REAR BLOWER HIGH SPEED CIRCUIT SHORTED TO VOLTAGE
BLOCKAGE STALLING REAR BLOWER MOTOR
REAR BLOWER MOTOR RESISTOR BLOCK
REAR BLOWER MOTOR
A/C HEATER CONTROL

NOTE: This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

Diagnostic Test

1. CHECK (Z928) GROUND CIRCUIT FOR HIGH RESISTANCE

Turn the ignition off.

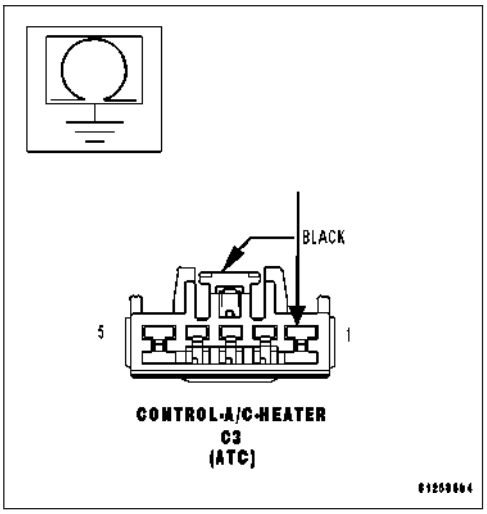
Disconnect the A/C Heater Control C3 harness connector.

Measure the resistance of the (Z928) Ground circuit between ground and the A/C Heater Control C3 harness connector.

Is resistance below 5.0 ohms?

Yes >> Go To 2

No >> Repair the (Z928) Ground circuit for high resistance. Perform BODY VERIFICATION TEST - VER 1.



B1070–REAR BLOWER CONTROL CIRCUIT HIGH (ATC) (CONTINUED)

2. CHECK (C151) REAR BLOWER LOW SPEED CIRCUIT, (C152) REAR BLOWER MEDIUM SPEED CIRCUIT, & (153) REAR BLOWER HIGH SPEED CIRCUIT FOR SHORT TO VOLTAGE

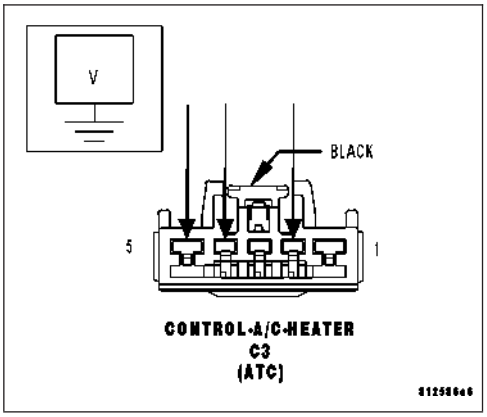
Disconnect the Rear Blower Motor harness connector.

Turn the ignition on.

Measure the voltage of the (C151) Rear Blower Low Speed circuit in the A/C Heater Control C3 harness connector.

Measure the voltage of the (C152) Rear Blower Medium Speed circuit in the A/C Heater Control C3 harness connector.

Measure the voltage of the (C153) Rear Blower High Speed circuit in the A/C Heater Control C3 harness connector.



Is voltage above 0.2 volts on any of the circuits.

Yes >> Repair the circuit(s) with voltage above 0.2 volts for a short to voltage.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 3

---

3. CHECK FOR BLOCKAGE PREVENTING REAR BLOWER MOTOR OPERATION

Turn the ignition off.

Remove the Rear Blower Motor from the Rear A/C Heater Housing in accordance with the Service Information.

Look for anything on the Rear Blower Motor and in the Rear A/C Heater Housing that is physically preventing rear blower operation.

Is anything physically preventing rear blower operation?

Yes >> Repair as necessary.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 4

---

4. CHECK REAR BLOWER MOTOR FOR CAUSE OF HIGH AMPERAGE DRAW

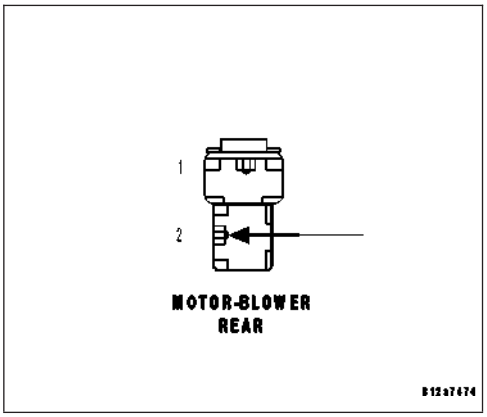
Reinstall the Rear Blower Motor in the Rear A/C Heater Housing in accordance with the Service Information.

Reconnect the Rear Blower Motor harness connector.

Disconnect the Rear Blower Motor Resistor Block harness connector.

Connect a 20 amp fused jumper wire between ground and the (C153) Rear Blower High Speed circuit in the Rear Blower Motor Harness connector.

Start the engine. The rear blower motor should run with out blowing the fuse.



Does the rear blower motor run with out blowing the fuse?

Yes >> Go To 5

No >> Replace the Rear Blower Motor in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

B1070–REAR BLOWER CONTROL CIRCUIT HIGH (ATC) (CONTINUED)

5. CHECK REAR BLOWER MOTOR RESISTOR BLOCK FOR CAUSE OF HIGH AMPERAGE DRAW

Turn the ignition off.

Remove the 20 amp fused jumper wire from the (C153) Rear Blower High Speed circuit in the Rear Blower Motor Harness connector.

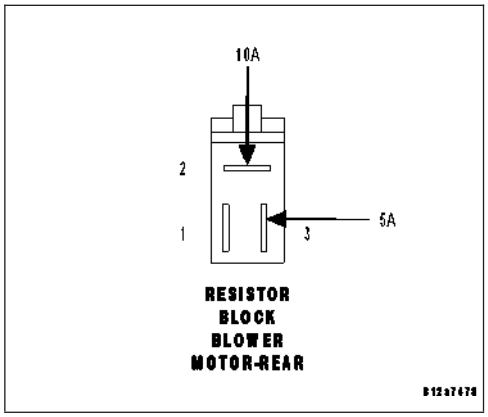
Reconnect the Rear Blower Motor Resistor Block harness connector.

Connect a 10 amp fused jumper wire between ground and the (C152) Rear Blower Medium Speed circuit in the Rear Blower Motor Resistor Block harness connector.

Start the engine. The rear blower motor should run with out blowing the fuse.

Turn the ignition off.

Remove the 10 amp fused jumper wire from the (C152) Rear Blower Medium Speed circuit in the Rear Blower Motor Resistor Block harness connector.



Connect a 5 amp fused jumper wire between ground and the (C151) Rear Blower Low Speed circuit in the Rear Blower Motor Resistor Block harness connector.

Start the engine. The rear blower motor should run with out blowing the fuse.

Does the rear blower motor run with out blowing either of the fuses?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Replace the Rear Blower Motor Resistor Block in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

B1079–CLIMATE CONTROL COOL DOWN TEST EXCESSIVE TIME (ATC & MTC)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the Cooldown Test is executed.
- **Set Condition:**
  If the A/C system is unable to lower the evaporator temperature 11.11°C (20°F) within one minute.

Possible Causes
EVAPORATOR TEMPERATURE SENSOR CIRCUITS
EVAPORATOR TEMPERATURE SENSOR
OTHER HVAC SYSTEM FAULTS PRESENT
POWERTRAIN SYSTEM FAULTS PRESENT

Theory of Operation

The Cooldown Test checks A/C system performance based on Evaporator Temperature Sensor input. The main criteria is to lower evaporator temperature 11.11°C (20°F) within one minute. Before starting the test, the evaporator temperature must be above 18.3°C (65°F) and for Manual Temperature Control systems the front blower speed must be set to high speed. When the test is running, A/C Select and A/C Request will be on and the A/C status indicator will flash. When the test is complete, the scan tool will display one or more test status messages to indicate the outcome of the Cooldown Test. A Successful Cooldown – Test Passed status message indicates that the main test criteria was met. A DTC Set During Routine – Test Not Passed status message indicates that the A/C system is unable to lower the evaporator temperature 11.11°C (20°F) within one minute. A Conditions Too Cold – Test Not Run status message indicates that the evaporator temperature was below 18.3°C (65°F) when starting the Cooldown Test. A Blowers Not On High – Test Not Run status message indicates that either the front blower speed was not set to high speed prior to starting the Cooldown Test or the front blower speed was changed from high speed to another setting after starting the Cooldown test. A Refrigerant Temperature Sensor Error status message indicates that a fault occurred with the Evaporator Temperature Sensor/sensor circuits. A No Results Stored/Test Not Complete status message indicates that the power was cycled while the test was running.

Diagnostic Test

1. CHECK FOR DTCs IN THE A/C HEATER CONTROL MODULE

Turn the ignition on.
With the scan tool, select ECU View.
With the scan tool, select HVAC.

Are any DTCs present in the A/C Heater Control Module?

Yes >> Diagnose and Repair the DTC(s). Refer to the Table of Contents in this Section for a complete list of HVAC related symptoms. Rerun the Cooldown Test after the repair is complete.
Perform BODY VERIFICATION TEST – VER 1.

No >> Go To 2

B1079–CLIMATE CONTROL COOL DOWN TEST EXCESSIVE TIME (ATC & MTC) (CONTINUED)

2. CHECK FOR DTCs IN THE PCM

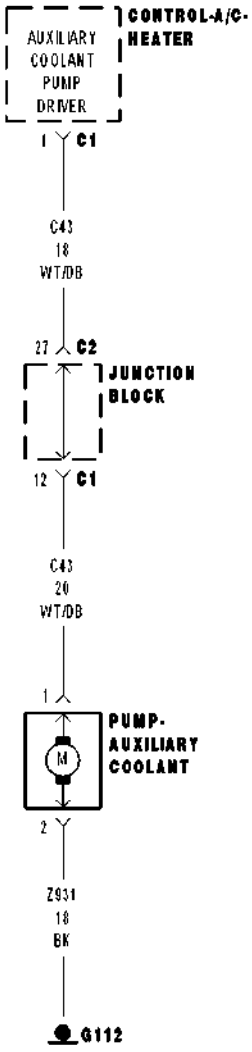
With the scan tool, select PCM.

Are any DTCs present in the PCM?

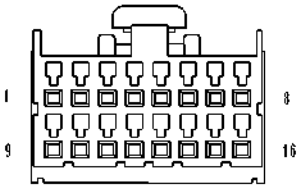
Yes >> Diagnose and repair the DTC(s). (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING) for PCM DTCs. Rerun the Cooldown Test after the repair is complete.
Perform BODY VERIFICATION TEST – VER 1.

No >> Refer to the Service Information for additional Cooldown Test related diagnostic information and testing procedures. Rerun the Cooldown Test after the repair is complete.
Perform BODY VERIFICATION TEST – VER 1.

B1080–AUXILIARY COOLANT PUMP CONTROL CIRCUIT OPEN (ATC)



PUMP-AUXILIARY COOLANT



CONTROL-A/C-HEATER C1 (ATC)

B1654ab5

B1080–AUXILIARY COOLANT PUMP CONTROL CIRCUIT OPEN (ATC) (CONTINUED)

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When Auxiliary Coolant Pump operation is requested.
- **Set Condition:**
  If the (C43) Auxiliary Coolant Pump Driver circuit is open or shorted to voltage. This DTC has a maturing time of 10 seconds and a de-maturing time of 10 seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

Possible Causes
(C43) AUXILIARY COOLANT PUMP DRIVER CIRCUIT SHORTED TO VOLTAGE
(C43) AUXILIARY COOLANT PUMP DRIVER CIRCUIT OPEN
(Z931) GROUND CIRCUIT OPEN
AUXILIARY COOLANT PUMP
A/C HEATER CONTROL

NOTE: This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

Diagnostic Test

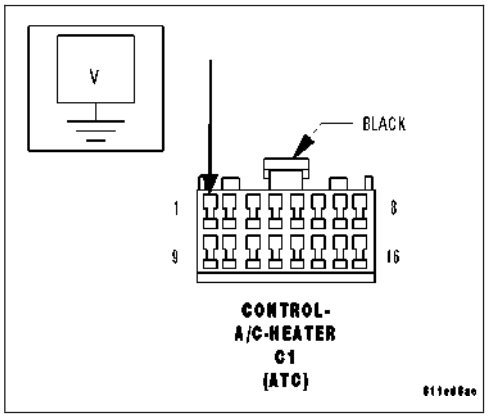
1. CHECK (C43) AUXILIARY COOLANT PUMP DRIVER CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

Measure the voltage of the (C43) Auxiliary Coolant Pump Driver circuit.



Is the voltage above 0.2 volts?

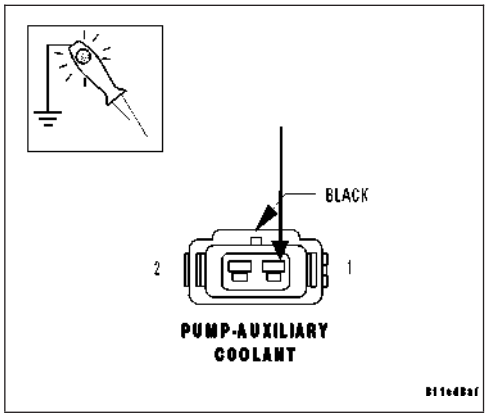
Yes >> Repair the (C43) Auxiliary Coolant Pump Driver circuit for a short to voltage.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 2

B1080–AUXILIARY COOLANT PUMP CONTROL CIRCUIT OPEN (ATC) (CONTINUED)

2. CHECK (C43) AUXILIARY COOLANT PUMP DRIVER CIRCUIT OPERATION

Turn the ignition off.
Reconnect the A/C Heater Control C1 harness connector.
Turn the ignition on.
Set the blend control to full cold.
With the scan tool, erase HVAC DTCs.
Turn the ignition off.
Disconnect the Auxiliary Coolant Pump harness connector.
Using a 12-volt test light connected to ground, back probe the (C43) Auxiliary Coolant Pump Driver circuit.
Turn the ignition on.
With the scan tool, select the following: Actuators, Auxiliary Coolant Pump, Start, and Constant On.



NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Go To 3

No >> Go To 4

---

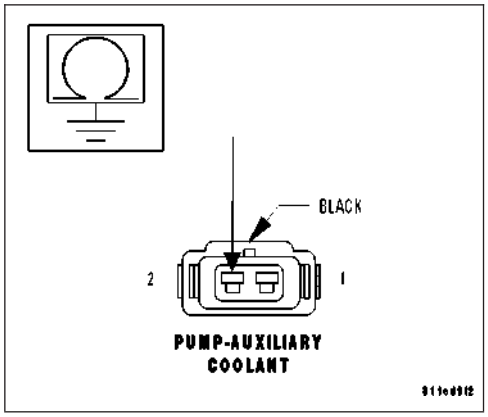
3. CHECK (Z931) GROUND CIRCUIT FOR AN OPEN

Turn the ignition off.
Measure the resistance of the (Z931) Ground circuit between ground and the Auxiliary Coolant Pump harness connector.

Is the resistance below 5.0 ohms?

Yes >> Replace the Auxiliary Coolant Pump in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the (Z931) Ground circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.



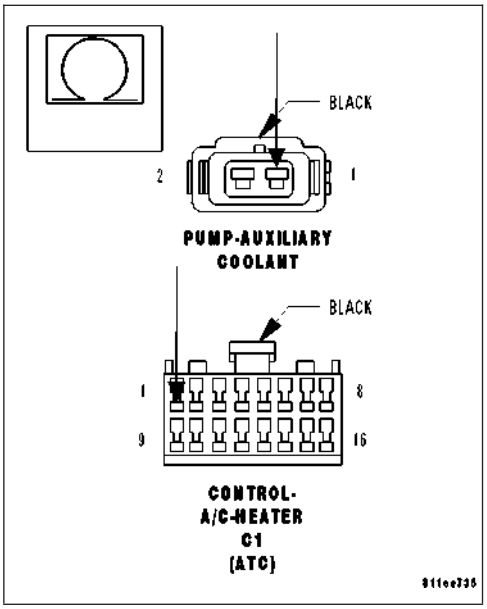
B1080–AUXILIARY COOLANT PUMP CONTROL CIRCUIT OPEN (ATC) (CONTINUED)

4. CHECK (C43) AUXILIARY COOLANT PUMP DRIVER CIRCUIT FOR AN OPEN

Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

Measure the resistance of the (C43) Auxiliary Coolant Pump Driver circuit between the A/C Heater Control C1 harness connector and the Auxiliary Coolant Pump harness connector.



Is the resistance below 5.0 ohms?

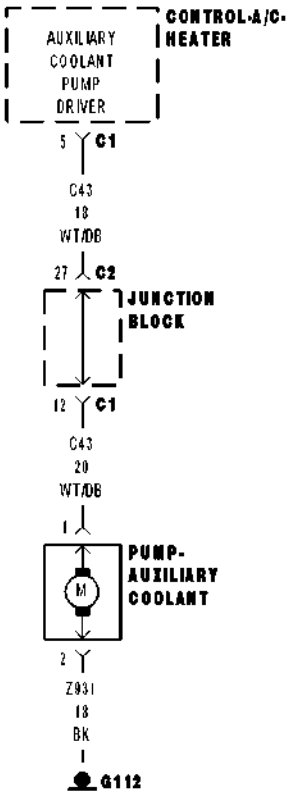
Yes >> Replace the A/C Heater Control in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1.

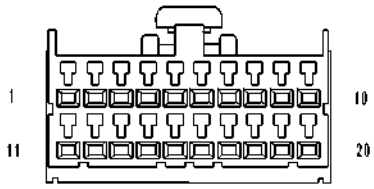
No >> Repair the (C43) Auxiliary Coolant Pump Driver circuit for an open.

Perform BODY VERIFICATION TEST - VER 1.

B1080–AUXILIARY COOLANT PUMP CONTROL CIRCUIT OPEN (MTC)



PUMP-AUXILIARY COOLANT



CONTROL-A/C-HEATER C1 (MTC)

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B1080–AUXILIARY COOLANT PUMP CONTROL CIRCUIT OPEN (MTC) (CONTINUED)

For the Manual Temperature Control (MTC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When Auxiliary Coolant Pump operation is requested.
- **Set Condition:**
  If the (C43) Auxiliary Coolant Pump Driver circuit is open or shorted to voltage. This DTC has a maturing time of 10 seconds and a de-maturing time of 10 seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

Possible Causes
(C43) AUXILIARY COOLANT PUMP DRIVER CIRCUIT SHORTED TO VOLTAGE
(C43) AUXILIARY COOLANT PUMP DRIVER CIRCUIT OPEN
(Z931) GROUND CIRCUIT OPEN
AUXILIARY COOLANT PUMP
A/C HEATER CONTROL

NOTE: This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (MTC) for stored DTC test procedures.

Diagnostic Test

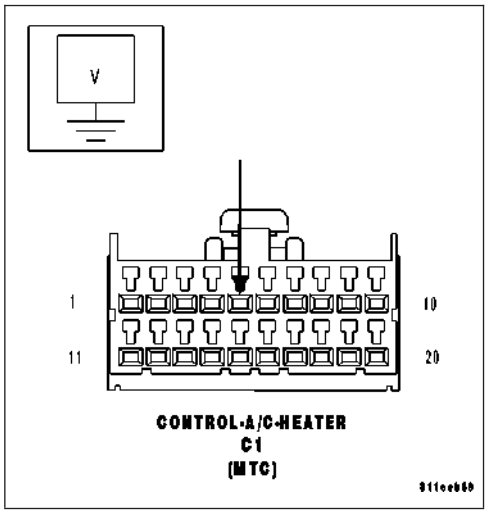
1. CHECK (C43) AUXILIARY COOLANT PUMP DRIVER CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

Measure the voltage of the (C43) Auxiliary Coolant Pump Driver circuit.



Is the voltage above 0.2 volts?

Yes >> Repair the (C43) Auxiliary Coolant Pump Driver circuit for a short to voltage.
Perform BODY VERIFICATION TEST - VER 1.

No >> Go To 2

B1080–AUXILIARY COOLANT PUMP CONTROL CIRCUIT OPEN (MTC) (CONTINUED)

2. CHECK (C43) AUXILIARY COOLANT PUMP DRIVER CIRCUIT OPERATION

Turn the ignition off.

Reconnect the A/C Heater Control C1 harness connector.

Set the blend control to the full cold position.

Turn the ignition on.

With the scan tool, erase HVAC DTCs.

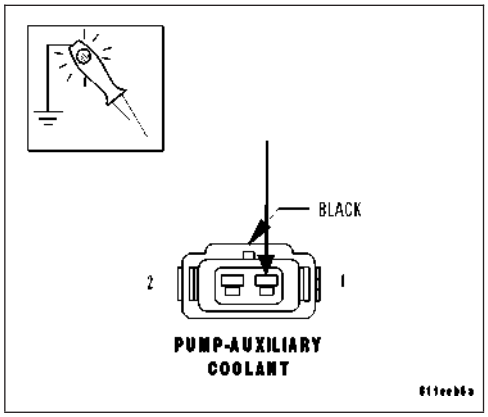
Turn the ignition off.

Disconnect the Auxiliary Coolant Pump harness connector.

Using a 12-volt test light connected to ground, back probe the (C43) Auxiliary Coolant Pump Driver circuit.

Turn the ignition on.

With the scan tool, select the following: Actuators, Auxiliary Coolant Pump, Start, and Constant On.



NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Go To 3

No >> Go To 4

---

3. CHECK (Z931) GROUND CIRCUIT FOR AN OPEN

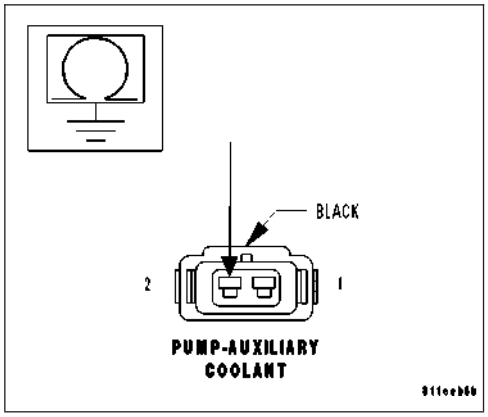
Turn the ignition off.

Measure the resistance of the (Z931) Ground circuit between ground and the Auxiliary Coolant Pump harness connector.

Is the resistance below 5.0 ohms?

Yes >> Replace the Auxiliary Coolant Pump in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the (Z931) Ground circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.



B1080–AUXILIARY COOLANT PUMP CONTROL CIRCUIT OPEN (MTC) (CONTINUED)

4. CHECK (C43) AUXILIARY COOLANT PUMP DRIVER CIRCUIT FOR AN OPEN

Turn the ignition off.

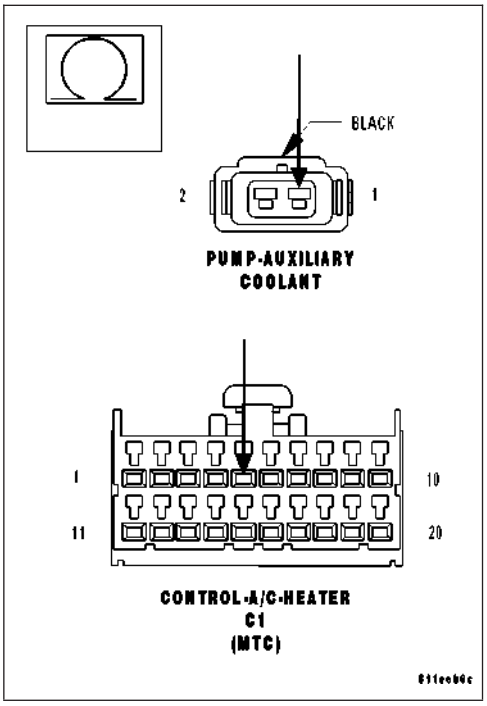
Disconnect the A/C Heater Control C1 harness connector.

Measure the resistance of the (C43) Auxiliary Coolant Pump Driver circuit between the A/C Heater Control C1 harness connector and the Auxiliary Coolant Pump harness connector.

Is the resistance below 5.0 ohms?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the (C43) Auxiliary Coolant Pump Driver circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.



B1090–ACTUATOR PULSE COUNT PERFORMANCE (ATC & MTC)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the A/C Heater Control detects a pulse count error while attempting to drive a door actuator. This DTC has a maturing time of 5 seconds and a de-maturing time of 10 seconds. If the DTC's status changes from active to stored, it will stay in memory for 100 ignition cycles.

Possible Causes
DOOR DRIVER CIRCUIT(S) SHORTED HIGH, SHORTED LOW, SHORTED TOGETHER, OPEN
DOOR ACTUATOR(S) BINDING, BROKEN
DOOR ACTUATOR(S) LINKAGE BINDING, DISCONNECTED, MISSING, BROKEN
A/C HEATER CONTROL

Theory of Operation

The A/C Heater Control monitors the door driver circuits during actuator operation for conditions that prevent proper door operation. If a pulse count error is detected the A/C Heater Control reports the fault as B1090–Actuator Pulse Count Performance. It is important to note that this DTC only indicates that a fault occurred while driving a door actuator and that additional testing is necessary to provide more details about the reported fault.

Diagnostic Test

1. CHECK FOR ACTIVE CONTROL CIRCUIT/PERFORMANCE & CONTROL CIRCUIT OPEN DTCs

Turn the ignition on.

With the scan tool, read active HVAC DTCs.

Does the scan tool display any active: XXXX CONTROL CIRCUIT/PERFORMANCE or XXXX CONTROL CIRCUIT OPEN DTCs?

Yes (ATC)
Diagnose and repair the DTC(s). If present, diagnose and repair all Rear Blend and Rear Mode Door Control Circuit/Performance DTCs first, all other Control Circuit/Performance DTCs second, and all Control Circuit Open DTCs last. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

Yes (MTC)
Diagnose and repair the DTC(s). Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No >> Go To 2

B1090–ACTUATOR PULSE COUNT PERFORMANCE (ATC & MTC) (CONTINUED)

2. RUN THE ACTUATOR DTC DETECTION TEST

With the scan tool, erase HVAC DTCs.

Turn the ignition off, wait 10 seconds, and then turn the ignition on.

With the scan tool, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

Does the scan tool display any DTCs?

Yes >> Diagnose and repair the DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs and then all short low DTCs. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No >> Go To 3

---

3. RUN ACTUATOR CALIBRATION TEST

With the scan tool, select System Tests and then select Actuator Calibration Test. When the test is complete, select View DTCs.

Does the scan tool display any DTCs?

Yes >> Diagnose and repair the DTC(s). Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No >> Go To 4

---

4. CHECK MODE, BLEND & RECIRCULATION DOOR OPERATION

Start the engine.

Set the blower to high speed.

Operate each door in all positions in one direction and then in the opposite direction while monitoring the following:

- For the Mode Doors, verify that air flows from each vent accordingly for the position selected on the A/C Heater Control.
- For the Blend Doors, verify that the airflow air temperature changes accordingly for the temperature range selected on the A/C Heater Control.
- For the Recirculation Door, verify that the sound of the air flow get louder as the recirculation door opens to bring in recirculated air or gets softer as the recirculation door closes to bring in fresh air.

Does each door operate properly?

Yes >> The condition causing the fault has cleared at this time.
Perform BODY VERIFICATION TEST - VER 1.

No >> Remove the door actuator of the affected door from the A/C Heater Housing Assembly. By hand, attempt to rotate the actuator in both directions. Inspect the A/C Heater Housing for damage, for disconnected, missing, or broken linkage, and for broken or binding doors. Repair as necessary in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

B2214–(HVAC) CLIMATE CONTROL INTERNAL (ATC & MTC)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the A/C Heater Control has an internal fault. This DTC has a maturing time of 5 seconds and a de-maturing time of 10 seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

Possible Causes
A/C HEATER CONTROL

NOTE: This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to either HVAC System Test (ATC) or to HVAC System Test (MTC) for stored DTC test procedures.

Diagnostic Test

1. REPLACE THE A/C HEATER CONTROL

Repair

Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST – VER 1.

B2310–REAR WASHER SWITCH INPUT CIRCUIT LOW (ATC & MTC)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the Rear Washer mode switch is stuck in a pushed position for more than two minutes. This DTC has a maturing time of two minutes and a de-maturing time of two seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

Possible Causes
OBJECT HOLDING SWITCH IN A PUSHED POSITION
A/C HEATER CONTROL

Theory of Operation

The switch input changes when the switch is pushed down. An active DTC indicates that the switch is stuck in a pushed position. A stored DTC indicates that the switch was stuck in a pushed position for more than two minutes, but has since returned to its normal state.

NOTE: This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to either HVAC System Test (ATC) or to HVAC System Test (MTC) for stored DTC test procedures.

Diagnostic Test

1. INSPECT FOR OBJECT HOLDING SWITCH IN A PUSHED POSITION

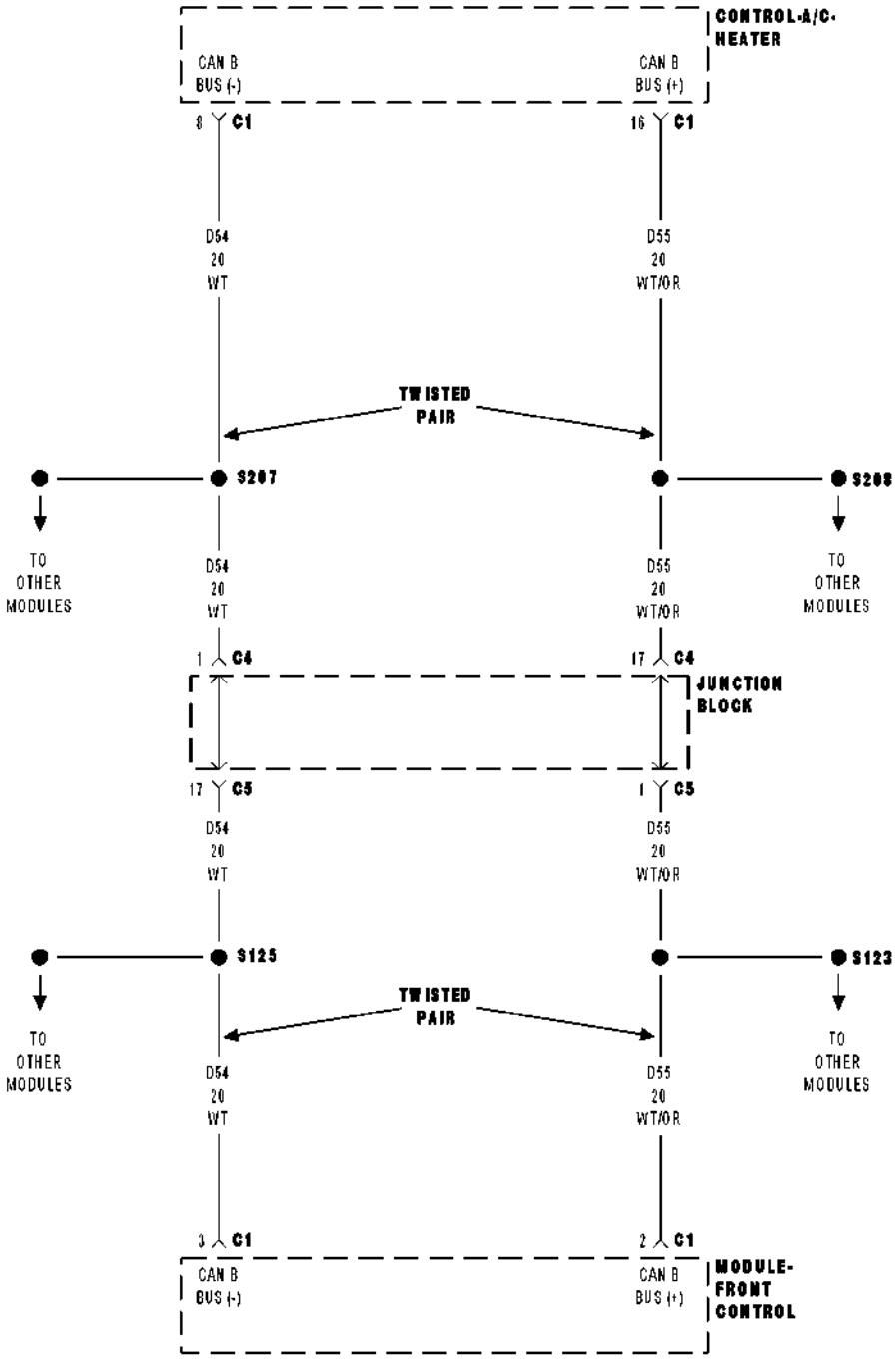
Inspect the A/C Heater Control for an object holding the switch in a pushed position. If present, remove the object.
Turn the ignition on.
With the scan tool, erase HVAC DTCs.
Turn the ignition off, wait 10 seconds, and then turn the ignition on.
Wait two minutes, then with the scan tool, read HVAC DTCs.

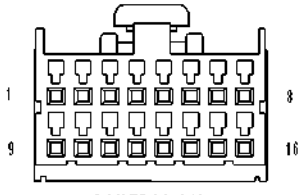
Does the scan tool display active: B2310–REAR WASHER SWITCH INPUT CIRCUIT LOW?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST – VER 1.

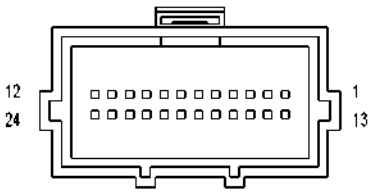
No >> Perform BODY VERIFICATION TEST – VER 1.

U0019–CAN B BUS (ATC)





CONTROL-A/C-HEATER C1 (ATC)



MODULE-FRONT CONTROL C1

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U0019–CAN B BUS (ATC) (CONTINUED)

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  If the CAN B Bus (+) or CAN B Bus (-) circuit is open, shorted to voltage, or shorted to ground.

Possible Causes
ACTIVE U0019 CAN B BUS DTC IN FRONT CONTROL MODULE
(D55) CAN B BUS (+) CIRCUIT OPEN
(D54) CAN B BUS (-) CIRCUIT OPEN
A/C HEATER CONTROL

Diagnostic Test

1. VERIFY DTC U0019–CAN B BUS IS ACTIVE

Turn the ignition on.

With the scan tool, read HVAC DTCs.

Does the scan tool display active: U0019–CAN B BUS?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also, inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.
Perform BODY VERIFICATION TEST – VER 1.

---

2. CHECK FOR ACTIVE CAN B BUS RELATED DTCS IN THE FRONT CONTROL MODULE (FCM)

With the scan tool, read Front Control Module (FCM) DTCs

Does the scan tool display any active CAN B BUS related DTCs?

Yes >> Diagnose and repair the DTC(s). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)

No >> Go To 3

U0019–CAN B BUS (ATC) (CONTINUED)

3. CHECK (D55) CAN B BUS (+) CIRCUIT FOR AN OPEN

Turn the ignition off.

Disconnect the negative battery cable.

Disconnect the A/C Heater Control C1 harness connector.

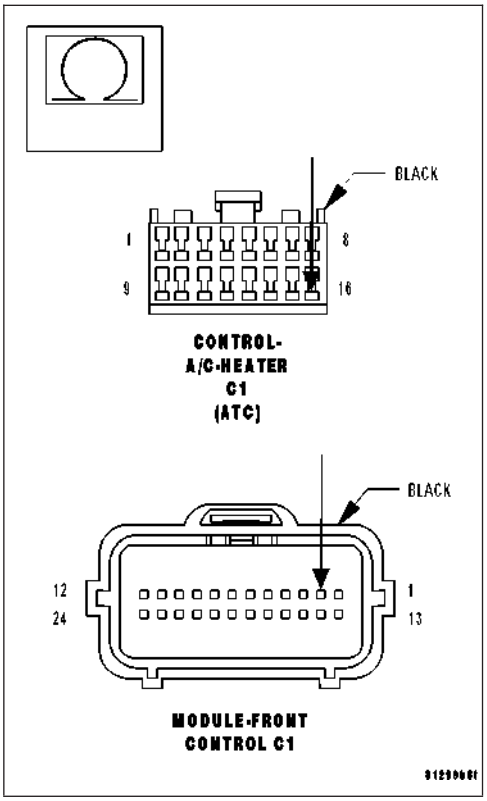
Disconnect the Front Control Module (FCM) C1 harness connector.

Measure the resistance of the (D55) CAN B Bus (+) circuit between the Front Control Module C1 harness connector and the A/C Heater Control C1 harness connector.

Is the resistance below 2.0 ohms?

Yes >> Go To 4

No >> Repair the (D55) CAN B Bus (+) circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.



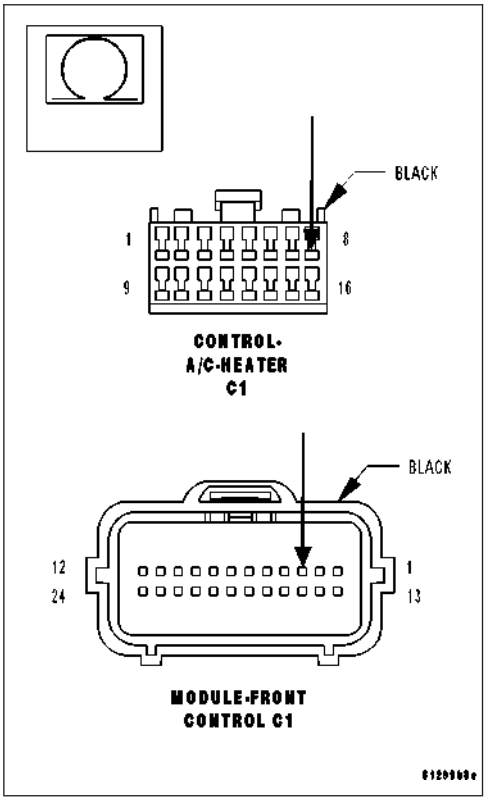
4. CHECK (D54) CAN B BUS (–) CIRCUIT FOR AN OPEN

Measure the resistance of the (D54) CAN B Bus (–) circuit between the Front Control Module C1 connector and the A/C Heater Control C1 harness connector.

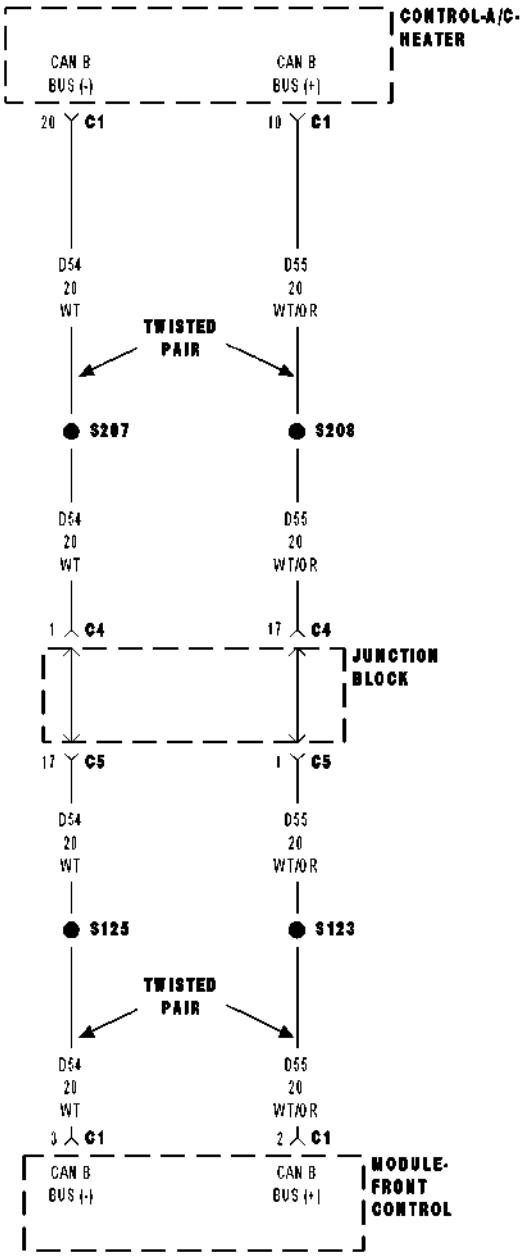
Is the resistance below 2.0 ohms?

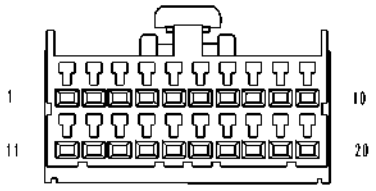
Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the (D54) CAN B Bus (–) circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.

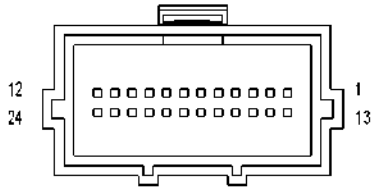


U0019–CAN B BUS (MTC)





CONTROL-A/C-HEATER C1 (MTC)



MODULE-FRONT CONTROL C1

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U0019–CAN B BUS (MTC) (CONTINUED)

For the Manual Temperature Control (MTC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously
- **Set Condition:**
  If the CAN B Bus (+) or CAN B Bus (-) circuit is open, shorted to voltage, or shorted to ground.

Possible Causes
ACTIVE U0019 CAN B BUS DTC IN FRONT CONTROL MODULE
(D55) CAN B BUS (+) CIRCUIT OPEN
(D54) CAN B BUS (-) CIRCUIT OPEN
A/C HEATER CONTROL

Diagnostic Test

1. VERIFY DTC U0019–CAN B BUS IS ACTIVE

Turn the ignition on.

With the scan tool, read HVAC DTCs.

Does the scan tool display active: U0019–CAN B BUS?

Yes >> Go To 2

No >> If the DTC is stored, check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also, inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.
Perform BODY VERIFICATION TEST – VER 1.

---

2. CHECK FOR ACTIVE CAN B BUS RELATED DTCS IN THE FRONT CONTROL MODULE (FCM)

With the scan tool, read Front Control Module (FCM) DTCs

Does the scan tool display any active CAN B BUS related DTCs?

Yes >> Diagnose and repair the DTC(s). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)

No >> Go To 3

U0019–CAN B BUS (MTC) (CONTINUED)

3. CHECK (D55) CAN B BUS (+) CIRCUIT FOR AN OPEN

Turn the ignition off.

Disconnect the negative battery cable.

Disconnect the A/C Heater Control C1 harness connector.

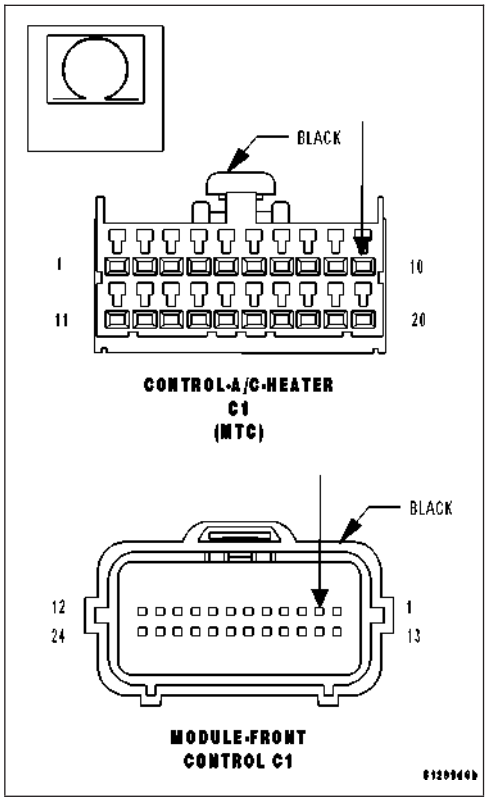
Disconnect the Front Control Module (FCM) C1 harness connector.

Measure the resistance of the (D55) CAN B Bus (+) circuit between the Front Control Module C1 harness connector and the A/C Heater Control C1 harness connector.

Is the resistance below 2.0 ohms?

Yes >> Go To 4

No >> Repair the (D55) CAN B Bus (+) circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.



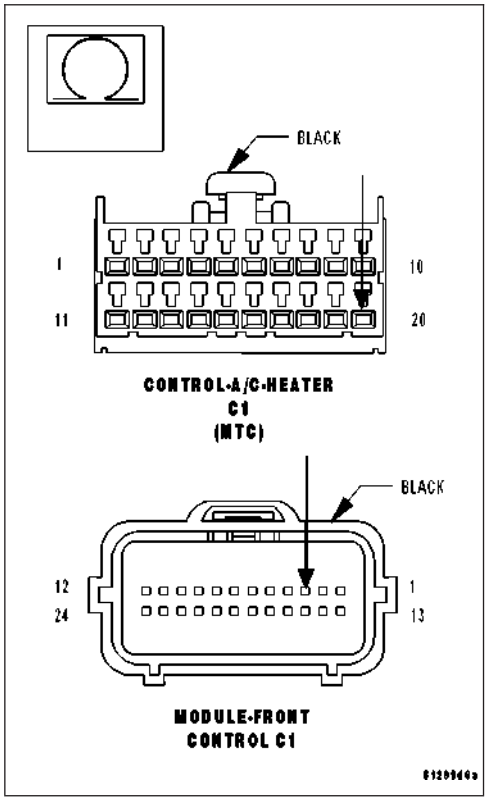
4. CHECK (D54) CAN B BUS (–) CIRCUIT FOR AN OPEN

Measure the resistance of the (D54) CAN B Bus (–) circuit between the Front Control Module C1 connector and the A/C Heater Control C1 harness connector.

Is the resistance below 2.0 ohms?

Yes >> Replace the A/C Heater Control in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1.

No >> Repair the (D54) CAN B Bus (–) circuit for an open.
Perform BODY VERIFICATION TEST - VER 1.



U0141–LOST COMMUNICATION WITH FRONT CONTROL MODULE (ATC & MTC)

For the Automatic or Manual Temperature Control (ATC or MTC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the A/C Heater Control looses communication with the Front Control Module (FCM). This DTC has a maturing time of 30 seconds and a de-maturing time of 10 seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0155–LOST COMMUNICATION WITH CLUSTER/CCN (ATC & MTC)

For the Automatic or Manual Temperature Control (ATC or MTC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the A/C Heater Control looses communication with the Cluster (CCN). This DTC has a maturing time of 30 seconds and a de-maturing time of 10 seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

U0156–LOST COMMUNICATION WITH EOM (ATC)

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  If the A/C Heater Control looses communication with the Compass Temperature Module (EOM). This DTC has a maturing time of 30 seconds and a de-maturing time of 10 seconds. If the DTC's status changes from active to stored it will stay in memory for 100 ignition cycles.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

DTC SET DURING ROUTINE - TEST NOT PASSED (ATC & MTC)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the Cooldown Test is executed.
- **Set Condition:**
  If the A/C system is unable to lower the evaporator temperature 11.11°C (20°F) within one minute.

Refer to B1079–CLIMATE CONTROL COOL DOWN TEST EXCESSIVE TIME (ATC & MTC) for the diagnostic test procedure.

BLOWERS NOT ON HIGH - TEST NOT RUN

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the Cooldown Test is executed.
- **Set Condition:**
  If either the front blower speed was not set to high speed prior to starting the Cooldown Test or the front blower speed was changed from high speed to another setting after starting the Cooldown test.

Refer to B1079–CLIMATE CONTROL COOL DOWN TEST EXCESSIVE TIME (ATC & MTC) for the diagnostic test procedure.

REFRIGERANT TEMPERATURE SENSOR ERROR (ATC & MTC)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the Cooldown Test is executed.
- **Set Condition:**
  If a fault occurred with the Evaporator Temperature Sensor/sensor circuits.

Refer to B1079–CLIMATE CONTROL COOL DOWN TEST EXCESSIVE TIME (ATC & MTC) for the diagnostic test procedure.

*HVAC SYSTEM TEST (ATC)

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Diagnostic Test

1. HVAC SYSTEM TEST

NOTE: The HVAC System Test consists of four tests. Test 2 tests A/C system performance, Test 3 tests for mode switch, door actuator circuit, auxiliary coolant pump circuit, and rear blower control circuit faults, Test 4 tests for shorted door actuator circuits, and Test 5 tests for door actuator calibration faults. Either perform all four tests for a complete system test or perform an individual test if diagnosing a specific symptom.

NOTE: Active DTCs must be resolved before diagnosing stored DTCs.

Start the engine.

With the scan tool, erase HVAC DTCs.

Press the ATC's POWER switch on.

Choose a diagnostic test to perform

Complete HVAC System Test
Go To 2

A/C System Performance Test
Go To 2

Mode Switch, Door Actuator Ckt, Auxiliary Coolant Pump Ckt, & Rear Blower Control Ckt Test
Go To 3

Actuator DTC Detection Test
Go To 4

Actuator Calibration Test
Go To 5

***HVAC SYSTEM TEST (ATC) (CONTINUED)**

2. A/C SYSTEM PERFORMANCE TEST

NOTE: The work area ambient temperature must be above 15.6°C (60°F) and the evaporator temperature must be above 18.3°C (65°F) in order to test A/C system performance.

NOTE: Before actuating the Cooldown Test, verify that the A/C compressor is not running. If the compressor is running, turn the A/C off and allow the evaporator to warm up before proceeding with the test.

NOTE: Running the Cooldown test will cause the A/C status indicator to flash.

NOTE: One or more status messages will display on the scan tool after running the Cooldown Test. These messages will clear after paging back out of this test function. Therefore, it is important to note all messages before doing so.

Verify that the front blower motor operates correctly in all speeds. Diagnose and repair all blower related faults before proceeding with this test.

With the scan tool in HVAC, select System Tests and then select Cooldown test. Allow the test to run to completion.

Does the scan tool display a status message that indicates a fault has occurred?

Yes, Conditions Too Cold - Test Not Run

If running, turn the A/C compressor off. Verify that the work area ambient temperature is above 15.6°C (60°F). If not, move the vehicle to a warmer work area. Verify that the evaporator temperature is above 18.3°C (65°F). If not, set the front blower to high speed and allow the blower to run for five minutes. Then, rerun the Cooldown Test.

Yes, No Results Stored/Test Not Complete

Verify that power is not interrupted while rerunning the Cooldown Test.

Yes, Refrigerant Temperature Sensor Error

Refer to B1079–CLIMATE CONTROL COOL DOWN TEST EXCESSIVE TIME (ATC & MTC) for the diagnostic test procedure.

Yes, DTC Set During Routine - Test Not Passed

Refer to B1079–CLIMATE CONTROL COOL DOWN TEST EXCESSIVE TIME (ATC & MTC) for the diagnostic test procedure.

No >> As necessary, either Go To 3, 4, or 5, or Perform BODY VERIFICATION TEST - VER 1.

***HVAC SYSTEM TEST (ATC) (CONTINUED)**

3. MODE SWITCH, DOOR ACTUATOR CIRCUIT, AUXILIARY COOLANT PUMP CIRCUIT, & REAR BLOWER CONTROL CIRCUIT TEST

NOTE: If at anytime a DTC becomes active during this test, proceed to the conclusion question.

NOTE: If multiple DTCs become active, diagnose those that relate to a short circuit first.

Set the front blower speed to low.

Set the Rear Fan switch on the Rear A/C Heater Control to off.

Set the Rear Blend switch on the Rear A/C Heater Control to full cold.

Monitor the scan tool for active HVAC DTCs while performing the following test steps.

Press the AUTO mode switch, wait 30 seconds and then proceed to the next step.

Press the A/C mode switch on, wait 30 seconds, press it off, and then proceed to the next step.

Press the RECIRC mode switch on, wait 30 seconds, press it off, and then proceed to the next step.

Press the TEMP + mode switch until the temperature is set to the max heat setting, wait 30 seconds and then proceed to the next step.

Press the TEMP - mode switch until the temperature is set to the max cool setting, wait 30 seconds and then proceed to the next step.

Press the FLOOR mode switch, wait 30 seconds and then proceed to the next step.

Press the PANEL mode switch, wait 30 seconds and then proceed to the next step.

Press the BI-LEVEL mode switch, wait 30 seconds and then proceed to the next step.

Press the MIX mode switch, wait 30 seconds and then proceed to the next step.

Press the REAR DEFROST mode switch on, wait 30 seconds, press it off, and then proceed to the next step.

Press the FRONT DEFROST mode switch, wait 30 seconds and then proceed to the next step.

Press and hold the REAR WASHER mode switch for several seconds, release it, and then proceed to the next step.

Press the FAN - mode switch until the front blower speed is set to low, wait 30 seconds and then proceed to the next step.

Press the FAN + mode switch until the front blower speed is set to the high, wait 30 seconds and then proceed to the next step.

Press the FAN - mode switch until the front blower speed is set to low and then proceed to the next step.

Press the REAR FUNCTION mode switch. The rear-blower speed settings should display on the ATC display panel. Then, within 7 seconds, press the FAN + mode switch until the rear blower speed is set to high, wait 30 seconds and then proceed to the next step.

Press the REAR FUNCTION mode switch. The rear-blower speed settings should display on the ATC display panel. Then, within 7 seconds, press the FAN - mode switch until the rear blower speed is set to low, wait 30 seconds and then proceed to the next step.

Press the REAR FUNCTION mode switch. The words ″CONTROL IN REAR″ should display on the ATC display panel.

Slowly turn the Rear Fan switch on the Rear A/C Heater Control to high speed.

Slowly turn the Rear Blend switch on the Rear A/C Heater Control to full hot, wait 30 seconds and then turn it back to full cold.

Slowly turn the Rear Fan switch on the Rear A/C Heater Control to off.

With the scan tool, select the following: Actuators, Auxiliary Coolant Pump, Start, and Constant On. Allow the pump to run for approximately one minute.

Does the scan tool display any active DTCs?

Yes >> Diagnose and repair the DTC(s). Refer to the Table of Contents in this Section for a complete list of HVAC related symptoms.

No >> As necessary, either Go To 4 or 5, or Perform BODY VERIFICATION TEST - VER 1.

***HVAC SYSTEM TEST (ATC) (CONTINUED)**

4. ACTUATOR DTC DETECTION TEST

With the scan tool, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

Does the scan tool display any DTCs?

Yes >> Diagnose and repair the DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs and then all short low DTCs. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No >> As necessary, either Go To 5 or Perform BODY VERIFICATION TEST - VER 1.

---

5. ACTUATOR CALIBRATION TEST

With the scan tool, select System Tests and then select Actuator Calibration Test. When the test is complete, select View DTCs.

Does the scan tool display any DTCs?

Yes >> Diagnose and repair the DTC(s). Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No >> No problem found.
Perform BODY VERIFICATION TEST - VER 1.

---

*HVAC SYSTEM TEST (MTC)

For the Manual Temperature Control (MTC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

Diagnostic Test

1. HVAC SYSTEM TEST

NOTE: The HVAC System Test consists of four tests. Test 2 tests A/C system performance, Test 3 tests for mode switch, door actuator circuit, and auxiliary coolant pump circuit faults, Test 4 tests for shorted door actuator circuits, and Test 5 tests for door actuator calibration faults. Either perform all four tests for a complete system test or perform an individual test if diagnosing a specific symptom.

NOTE: Active DTCs must be resolved before diagnosing stored DTCs.

Start the engine.

With the scan tool, erase HVAC DTCs.

Choose a diagnostic test to perform

Complete HVAC System Test
Go To 2

A/C System Performance Test
Go To 2

Mode Switch, Door Actuator Ckt, & Auxiliary Coolant Pump Ckt Test
Go To 3

Actuator DTC Detection Test
Go To 4

Actuator Calibration Test
Go To 5

***HVAC SYSTEM TEST (MTC) (CONTINUED)**

2. A/C SYSTEM PERFORMANCE TEST

NOTE: The work area ambient temperature must be above 15.6°C (60°F) and the evaporator temperature must be above 18.3°C (65°F) in order to test A/C system performance.

NOTE: Before actuating the Cooldown Test, verify that the mode setting is not in a defrost position and that the A/C compressor is not running. If the compressor is running, turn the A/C off and allow the evaporator to warm up before proceeding with the test.

NOTE: Running the Cooldown test will cause the A/C status indicator to flash.

NOTE: One or more status messages will display on the scan tool after running the Cooldown Test. These messages will clear after paging back out of this test function. Therefore, it is important to note all messages before doing so.

Set the mode to the Panel position.

Verify that the front blower motor operates correctly in all speeds. Diagnose and repair all blower related faults before proceeding with this test.

Set the front blower speed to high.

With the scan tool in HVAC, select System Tests and then select Cooldown test. Allow the test to run to completion.

Does the scan tool display a status message that indicates a fault has occurred?

Yes, Conditions Too Cold - Test Not Run

If running, turn the A/C compressor off. Verify that the work area ambient temperature is above 15.6°C (60°F). If not, move the vehicle to a warmer work area. Verify that the evaporator temperature is above 18.3°C (65°F). If not, set the front blower to high speed and allow the blower to run for five minutes. Then, rerun the Cooldown Test.

Yes, Blowers Not On High - Test Not Run

Set the front blower speed to high speed and then rerun the Cooldown Test.

Yes, No Results Stored/Test Not Complete

Verify that power is not interrupted while rerunning the Cooldown Test.

Yes, Refrigerant Temperature Sensor Error

Refer to B1079–CLIMATE CONTROL COOL DOWN TEST EXCESSIVE TIME (ATC & MTC) for the diagnostic test procedure.

Yes, DTC Set During Routine - Test Not Passed

Refer to B1079–CLIMATE CONTROL COOL DOWN TEST EXCESSIVE TIME (ATC & MTC) for the diagnostic test procedure.

No >> As necessary, either Go To 3, 4, or 5, or Perform BODY VERIFICATION TEST - VER 1.

***HVAC SYSTEM TEST (MTC) (CONTINUED)**

3. MODE SWITCH, DOOR ACTUATOR CIRCUIT, & AUXILIARY COOLANT PUMP CIRCUIT TEST

NOTE: If at anytime a DTC becomes active during this test, proceed to the conclusion question.

NOTE: If multiple DTCs become active, diagnose those that relate to a short circuit first.

Set the front blower speed to low.

Set the Blend control to full cold.

Set the Mode control to Bi-Level/Recirc.

If equipped, set the Rear Fan switch on the Rear A/C Heater Control to off.

If equipped, set the Rear Blend switch on the Rear A/C Heater Control to full cold.

Monitor the scan tool for active HVAC DTCs while performing the following test steps.

Press the A/C mode switch on, wait 30 seconds, press it off, and then proceed to the next step.

Press the Rear Defrost mode switch on, wait 30 seconds, press it off, and then proceed to the next step.

Press and hold the Rear Washer mode switch for several seconds, release it, and then proceed to the next step.

Set the Blend control to full hot, wait 30 seconds and then set it to full cold.

Turn the Mode control to every door position. Leave it in each position for 30 seconds.

If equipped, set the Rear Blower control to Rear Control.

If equipped, set the Rear Fan switch on the Rear A/C Heater Control to high speed.

If equipped, slowly turn the Rear Blend switch on the Rear A/C Heater Control to full hot, wait 30 seconds and then turn it back to full cold.

If equipped, turn the Rear Fan switch on the Rear A/C Heater Control to off.

If equipped with rear HVAC, with the scan tool, select the following: Actuators, Auxiliary Coolant Pump, Start, and Constant On. Allow the pump to run for approximately one minute.

Does the scan tool display any active DTCs?

Yes >> Diagnose and repair the DTC(s). Refer to the Table of Contents in this Section for a complete list of HVAC related symptoms.

No >> As necessary, either Go To 4 or 5, or Perform BODY VERIFICATION TEST - VER 1.

---

4. ACTUATOR DTC DETECTION TEST

With the scan tool, select System Tests and then select Actuator DTC Detection. When the test is complete, select View DTCs.

Does the scan tool display any DTCs?

Yes >> Diagnose and repair the DTC(s). If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high DTCs and then all short low DTCs. Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No >> As necessary, either Go To 5 or Perform BODY VERIFICATION TEST - VER 1.

---

5. ACTUATOR CALIBRATION TEST

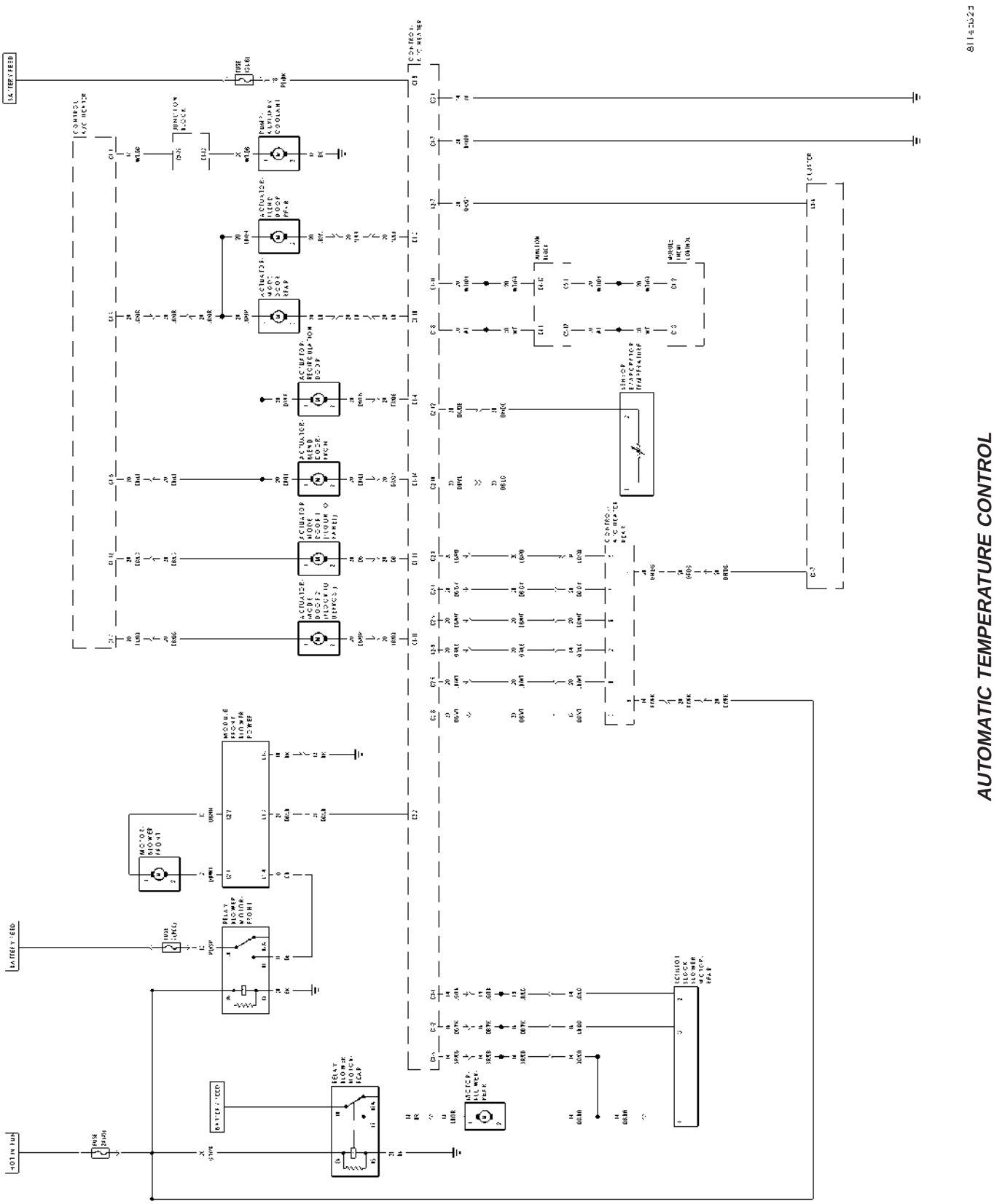
With the scan tool, select System Tests and then select Actuator Calibration Test. When the test is complete, select View DTCs.

Does the scan tool display any DTCs?

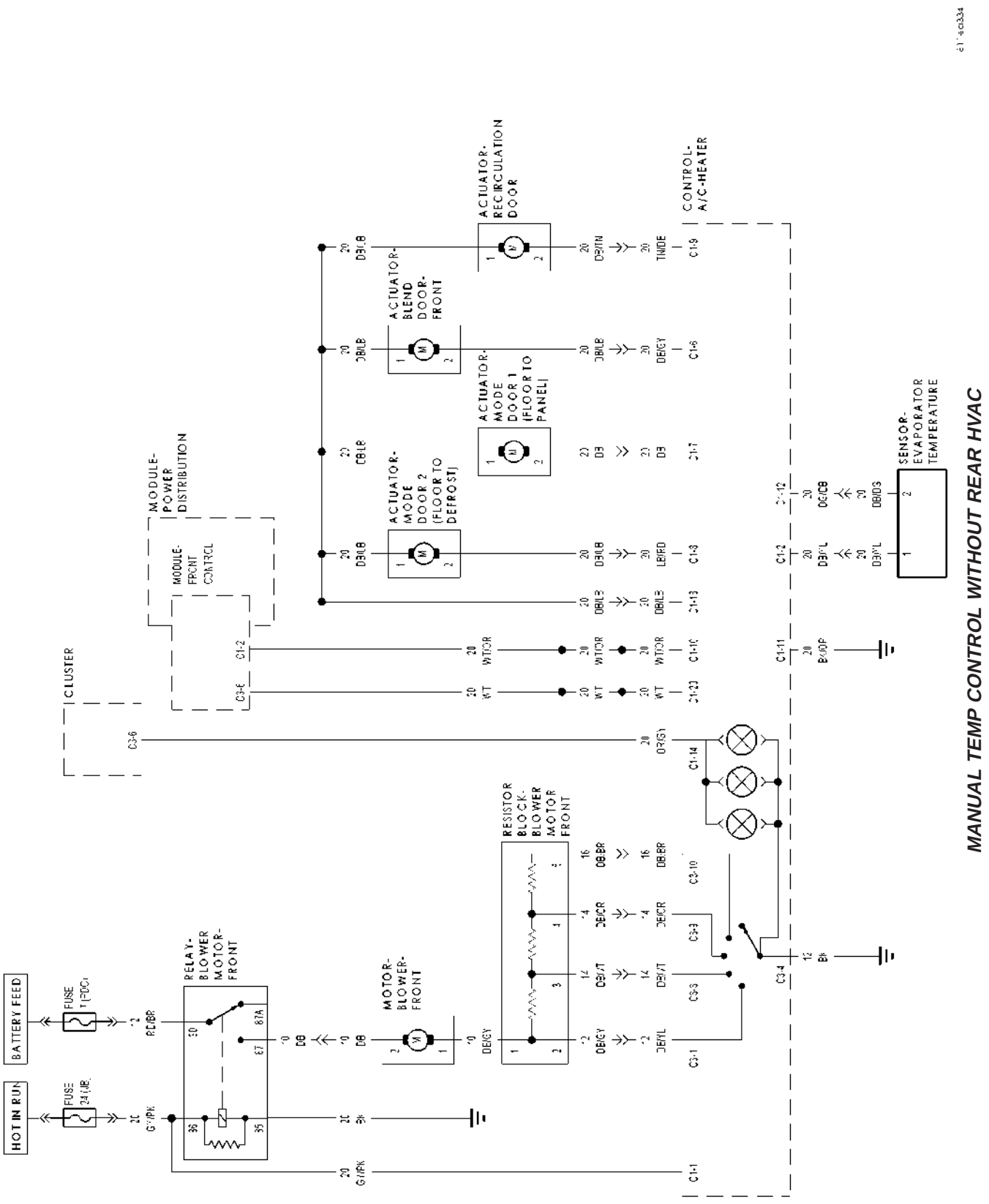
Yes >> Diagnose and repair the DTC(s). Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

No >> No problem found.
Perform BODY VERIFICATION TEST - VER 1.

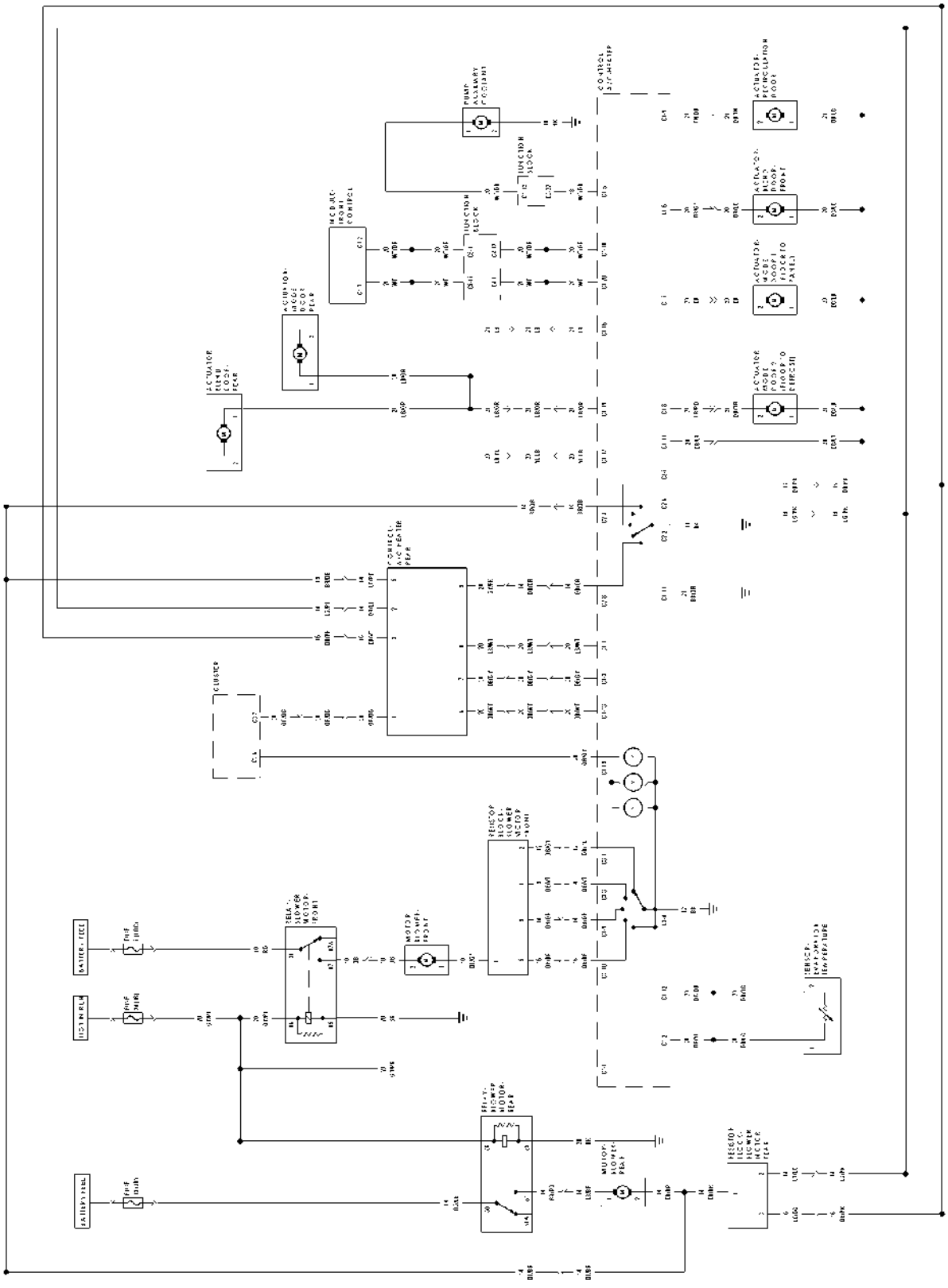
SCHEMATICS AND DIAGRAMS



AUTOMATIC TEMPERATURE CONTROL



MANUAL TEMP CONTROL WITHOUT REAR HVAC



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MANUAL TEMP CONTROL WITH REAR HVAC

HVAC - SERVICE INFORMATION

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HVAC - SERVICE INFORMATION

DESCRIPTION

HEATING AND AIR CONDITIONING SYSTEMS

A manual temperature control (MTC) single zone type heating-A/C system, MTC front and rear heating-A/C system or a fully adjustable automatic temperature control (ATC) front and rear heating-A/C system is available on this vehicle.

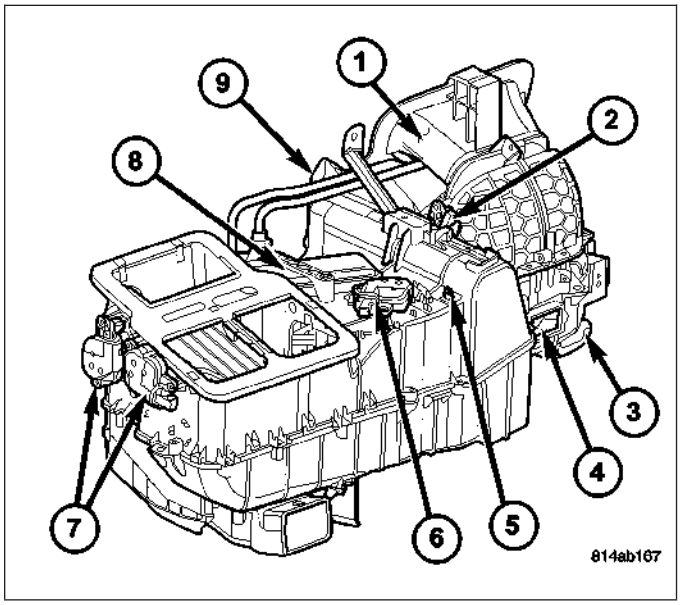
To maintain the performance level of the heating, ventilation and air conditioning (HVAC) system, the engine cooling system must be properly maintained. The use of a bug screen is not recommended. Any obstructions in front of the radiator or A/C condenser will reduce the performance of the A/C and engine cooling systems.

The engine cooling system includes the radiator, thermostat, radiator hoses and the engine coolant pump. Refer to 7 - Cooling for more information before opening or attempting any service to the engine cooling system.

FRONT HEATING AND A/C SYSTEM

All vehicles are equipped with a common front heater, ventilation and air conditioning (HVAC) housing (1). The front heating-A/C system combines A/C, heating, and ventilating capabilities in a single HVAC housing mounted within the passenger compartment under the instrument panel. The front HVAC housing includes:

- Recirculation-air door and actuator (2)
- Blower motor (3)
- Blower motor resistor (MTC) or blower motor power module (ATC) (4)
- Evaporator temperature sensor (5)
- Blend-air door and actuator (6)
- Mode-air doors and actuators (7)
- Heater core (8)
- A/C evaporator (9)



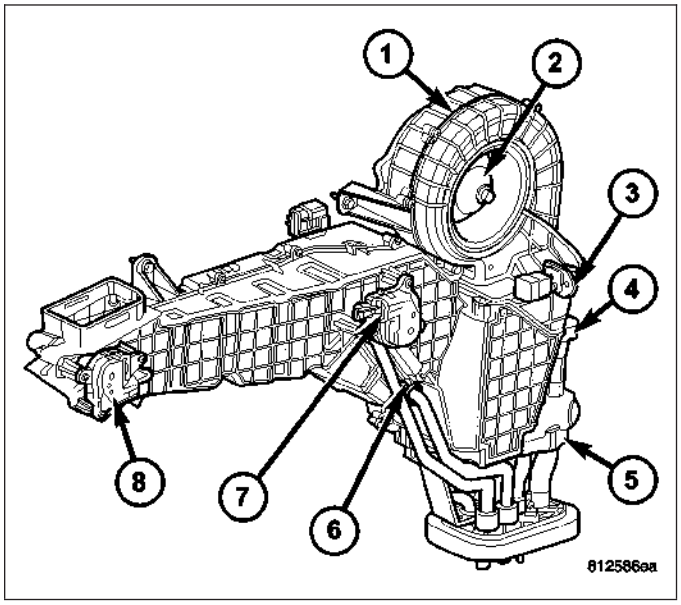
Based upon the mode selected, conditioned air can exit the front HVAC housing through one or a combination of the three main housing outlets: defrost, panel or floor. The defrost outlet is located on the top of the HVAC housing, the panel outlet is located on the top of the HVAC housing and the floor outlet is located on the bottom of the HVAC housing. Once the conditioned air exits the HVAC housing, it is further directed through molded plastic ducts to the outlets within the vehicle interior. These outlets and their locations are as follows:

- **Defroster Outlet** - A single large defroster outlet is located in the center of the instrument panel top cover, near the base of the windshield.
- **Side Window Demister Outlets** - There are two side window demister outlets, one is located at each outboard end of the instrument panel top cover, near the belt line at the A-pillars.
- **Panel Outlets** - There are six panel outlets in the instrument panel, one located near each outboard end of the instrument panel facing the rear of the vehicle and two located at each side of the instrument panel center bezel.
- **Floor Outlets** - There are four floor outlets, one located above each side of the floor panel center tunnel near the dash panel and one behind each front seat.

REAR HEATING AND A/C SYSTEM

The manual temperature control (MTC) front and rear heating-A/C system, and the automatic temperature control (ATC) front and rear heating-A/C system are equipped with a common rear heater and A/C housing (1) that combines A/C and heating capabilities into a single unit mounted within the passenger compartment behind the right quarter interior trim panel. The rear HVAC housing includes:

- Blower motor (2)
- Blower motor resistor (3)
- A/C evaporator (4)
- A/C expansion valve (5)
- Heater core (6)
- Blend door and actuator (7)
- Mode door and actuator (8)



Based upon the rear temperature selected, conditioned air can exit the rear HVAC housing through one or a combination of the two rear HVAC housing outlets: ceiling or floor. The ceiling outlet is located at the top-front of the HVAC housing and the floor outlet is located at the front of the HVAC housing. Once the conditioned air exits the rear HVAC housing, it is further directed through molded plastic ducts to the outlets at the rear of the passenger compartment. These outlets and their locations are as follows:

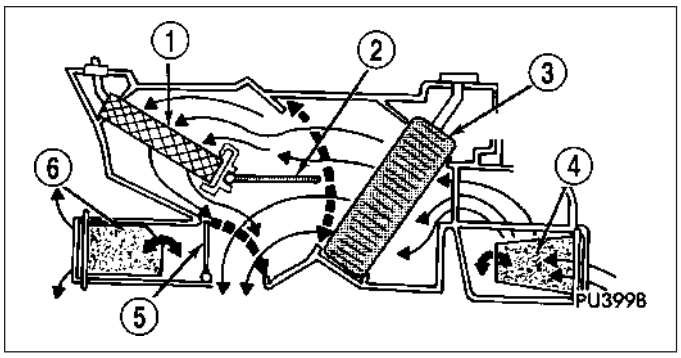
- **Ceiling Outlets** - There are four ceiling outlets in the headliner. One located at each outboard side of the intermediate seat position and one located in front of each rear seat postion.
- **Floor Outlet** - There is one floor outlet in the right quarter interior trim panel located behind the right rear door area.

OPERATION

The standard front and the optional rear heating-A/C systems used in this vehicle are blend-air type systems. In a blend-air heating-A/C system, a blend-air door controls the amount of conditioned air that is allowed to flow through, or around, the heater core. A temperature control determines the discharge air temperature by operating an electric actuator, which operates the blend-air door. This allows an almost immediate control of the output air temperature of the systems. Both the front and rear A/C systems are designed for the use of non-CFC, R-134a refrigerant and use an A/C evaporator to cool and dehumidify the incoming air prior to blending it with the heated air.

FRONT SYSTEM

The standard front heating-A/C system pulls outside (ambient) air through the cowl opening at the base of the windshield, then into the air inlet housing and through the A/C evaporator (3). Air flow can be directed either through or around the heater core (1). This is done by adjusting the blend-air doors (2) with the temperature controls located on the A/C-heater control in the instrument panel. The air flow can then be directed from the panel, floor and defrost outlets in various combinations using the mode control located on the A/C-heater control. Air flow velocity can be adjusted with the blower speed control located on the A/C-heater control.



The outside (fresh) air intake can be shut off by selecting the Recirculation Mode with the mode control. This will operate an electrically actuated recirculation-air door (4) that closes off the fresh air intake and recirculates the air that is already inside the vehicle.

The A/C compressor can be engaged in any mode by pressing the snowflake, A/C on/off button. It can also be engaged by placing the mode control in the mix to defrost positions. This will remove heat and humidity from the air before it is directed through or around the heater core. The mode control on the A/C-heater control is used to also direct the conditioned air to the selected system outlets. The mode control uses two electric actuators to control the mode-air doors (5 and 6).

The defroster outlet receives airflow from the HVAC housing through the molded plastic defroster duct, which connects to the HVAC housing defroster outlet. The airflow from the defroster outlet is directed by fixed vanes in the defroster outlet grille and cannot be adjusted. The defroster outlet grille is integral to the instrument panel top cover.

The side window demister outlets receive airflow from the HVAC housing through the molded plastic demister ducts. The demisters direct air from the HVAC housing through the outlets located on the top corners of the instrument panel. The airflow from the side window demister outlets is directed by fixed vanes in the demister outlet grilles and cannot be adjusted. The side window demister outlet grilles are serviceable from the instrument panel. The demisters operate when the mode control is positioned in the bi-level, floor, floor-defrost and defrost settings.

The instrument panel outlets receive airflow from the HVAC housing through a molded plastic main panel duct, center panel duct and two end panel ducts. The two end panel ducts direct airflow to the left and right instrument panel outlets, while the center panel duct directs airflow to the four center panel outlets. Each of these outlets can be individually adjusted to direct the flow of air.

The floor outlets receive airflow from the HVAC housing through the floor distribution ducts. The front floor outlets are integral to the molded plastic floor distribution duct, which is secured to the bottom of the HVAC housing. Two plastic rear floor distribution ducts attach to the floor distribution duct and provide conditioned air to the intermediate seating positions. The floor outlets cannot be adjusted.

NOTE: It is important to keep the air intake opening clear of debris. Leaf particles and other debris that is small enough to pass through the cowl opening screen can accumulate within the HVAC housing. The closed, warm, damp and dark environment created within the housing is ideal for the growth of certain molds, mildews and other fungi. Any accumulation of decaying plant matter provides an additional food source for fungal spores, which enter the housing with the fresh intake-air. Excess debris, as well as objectionable odors created by decaying plant matter and growing fungi can be discharged into the passenger compartment during heater-A/C operation if the air intake opening is not kept clear of debris.

This A/C system uses an A/C expansion valve (TXV) to meter the flow of refrigerant to the A/C evaporator. To maintain minimum evaporator temperature and prevent evaporator freezing, an evaporator temperature sensor input is supplied to the A/C-heater control. In turn, the powertrain control module (PCM) cycles the A/C compressor clutch off and on as necessary to optimize A/C system performance and to protect the A/C system from evaporator freezing.

REAR SYSTEM

The rear heating-A/C system pulls interior air through the opening in the rear quarter interior trim panel and into the rear blower motor in the rear HVAC housing, then through the rear A/C evaporator. Air flow can be directed either through or around the rear heater core. This is done by adjusting the blend-air door with either the front or the rear temperature control (depending on the front A/C-heater control setting). The air flow is then automatically directed to the floor or ceiling outlets depending on the conditioned air temperature selected by the rear mode-air door. Air flow velocity can be adjusted with the blower speed control located on either the front A/C-heater control or the rear A/C-heater control (depending on the front A/C-heater control setting).

The headliner air outlets receive airflow from the rear HVAC housing through the molded plastic ceiling duct, which connects to the headliner duct and headliner air outlets. Airflow direction from the headliner air outlets can be adjusted by moveable vanes and the headliner air outlets can be serviced separately.

The rear floor outlet receives airflow from the rear HVAC housing through the molded plastic floor distribution duct, which connects to the rear floor outlet located in the rear quarter interior trim panel. The airflow from the rear floor outlet is directed by fixed vanes in the outlet and air flow direction cannot be adjusted. The rear floor outlet is integral to the rear quarter interior trim panel.

This rear A/C system uses an “H” valve-type thermal expansion valve (TXV) to meter the flow of refrigerant to the rear A/C evaporator.

DIAGNOSIS AND TESTING

HEATING-A/C SYSTEM DIAGNOSTICS

ON-BOARD DIAGNOSTICS

CAUTION: Do not exchange A/C Heater Controls from vehicle to vehicle. Software versions differ between models and model years. Installing an A/C Heater Control with software that is incompatible for a given vehicle can result in either improper or failed HVAC system operation.

The A/C-heater control communicates on the controller area network (CAN) B bus and is fully addressable with a scan tool.

The A/C-heater control’s primary means of fault detection is through active and stored diagnostic trouble codes (DTCs). Active DTCs are those which currently exist in the system. The condition causing the fault must be repaired in order to clear this type of DTC. Stored DTCs are those which occurred in the system since the A/C-heater control received the last clear diagnostic info message. All DTCs must be read with a scan tool. Refer to 24 - HVAC - Electrical Diagnostics for the diagnostic test procedures.

The A/C-heater control’s secondary means of fault detection is through system tests. These tests include the HVAC System Test, the A/C Cooldown Test, the Actuator Calibration Function, the Actuator DTC Detection Test. Refer to System Tests in this Section for a detailed description of each test.

SYSTEM TESTS

HVAC System Test

The HVAC System Test, found in 24 - HVAC - Electrical Diagnostics, provides a starting point in the diagnostic process by identifying the appropriate system test to perform when diagnosing a given condition or DTC. It also provides a means for testing the entire HVAC system by utilizing the A/C-heater control’s On-Board System Tests. The On-Board System Tests can also assist in diagnosing stored DTCs.

A/C Cooldown Test

The A/C Cooldown Test:

- is actuated with a scan tool.
- tests A/C system performance based on evaporator temperature sensor input.
- will fail if evaporator temperature is below 18.3° C (65° F) when initiating the test.
- will pass if the evaporator temperature drops 11.1° C (20° F).

- indicates test outcome by displaying one or more test status messages on the scan tool. These messages will clear after paging back out of this test function. Therefore, is it important to note all of the messages before doing so.
- will cause the A/C status indicator to flash while the test is running.

Actuator Calibration Function

The Actuator Calibration function:

- is actuated with a scan tool.
- homes and repositions door actuators.
- monitors for door span faults. Door span faults (XXX Door Travel Range Too Large or XXX Door Travel Range Too Small) will only display after calibration.
- will cause the electric backlight (EBL) status indicator to flash while the test is running.

Actuator DTC Detection Test

The Actuator DTC Detection Test:

- is actuated with a scan tool.
- supplements the continuous diagnostics on the actuator drive system.
- monitors for shorted actuator circuits allowing service to easily diagnose and troubleshoot up to three simultaneous shorts. Shorted actuator circuit faults (XXX Control Circuit High or XXX Control Circuit Low) will only display after running the Actuator DTC Detection Test.

After repairing each DTC, cycle the ignition switch, and then rerun the test to ensure that no new DTCs exist. If multiple DTCs are present, beginning with the common circuits, diagnose and repair all short high faults and then short low faults. When the test returns passed, then troubleshooting should proceed to clearing faults and running the Actuator Calibration function as a final check of proper system operation.

SYSTEM REVISIONS

The 2005 ATC and MTC HVAC systems remain mostly carryover from 2004. Revisions for 2005 include a new evaporator temperature sensor which is mounted downstream of the evaporator and revised control software.

A/C PERFORMANCE

The A/C system is designed to provide the passenger compartment with low temperature and low humidity air. The A/C evaporator, located in the HVAC housing is cooled to temperatures near the freezing point. As warm damp air passes over the fins of the A/C evaporator, the air transfers its heat to the refrigerant in the evaporator coils and the moisture in the air condenses on the evaporator fins. During periods of high heat and humidity, an A/C system will be more effective in the Recirculation mode (max-A/C). With the system in the Recirculation mode, only air from the passenger compartment passes through the A/C evaporator. As the passenger compartment air dehumidifies, the A/C system performance levels rise.

Humidity has an important bearing on the temperature of the air delivered to the interior of the vehicle. It is important to understand the effect that humidity has on the performance of the A/C system. When humidity is high, the A/C evaporator has to perform a double duty. It must lower the air temperature, and it must lower the temperature of the moisture in the air that condenses on the evaporator fins. Condensing the moisture in the air transfers heat energy into the evaporator fins and coils. This reduces the amount of heat the A/C evaporator can absorb from the air. High humidity greatly reduces the ability of the A/C evaporator to lower the temperature of the air.

However, evaporator capacity used to reduce the amount of moisture in the air is not wasted. Wringing some of the moisture out of the air entering the vehicle adds to the comfort of the passengers. Although, an owner may expect too much from their A/C system on humid days. A performance test is the best way to determine whether the system is performing up to design standards. This test also provides valuable clues as to the possible cause of trouble with the A/C system. The ambient air temperature of the vehicle and the location where the vehicle will be tested must be a minimum of 21° C (70° F) for this test. Also the evaporator temperature sensor probe (located between the evaporator fins) must be a minimum of 18° C (65° F) for this test as well.

A/C PERFORMANCE TEST

WARNING: Refer to the applicable warnings and cautions for this system before performing the following operation (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - WARNINGS) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - CAUTIONS). Failure to follow the warnings and cautions could result in possible personal injury or death.

NOTE: When connecting the service equipment coupling to the line fitting, verify that the valve of the coupling is fully closed. This will reduce the amount of effort required to make the connection.

1. Perform the A/C System Performance Test, which is found within the HVAC System Test (refer to 24 - HVAC Electrical Diagnostics). If no diagnostic trouble codes (DTCs) are found in the A/C-heater control or the powertrain control module (PCM), go to Step 2. If any DTCs are found, repair as required, then proceed to Step 2.
2. Connect a tachometer and a manifold gauge set.

NOTE: The ambient air temperature of the vehicle and the location where the vehicle will be tested must be a minimum of 21° C (70° F) before performing this test. Also the evaporator temperature sensor probe (located between the evaporator fins) must be a minimum of 18° C (65° F) for this test as well. If the vehicle has been sitting in the sun prior to testing, place the vehicle in the testing area until the temperature within the vehicle reaches a minimum of 18° C (65° F).

3. Set the A/C-heater control to the Recirculation mode (max-A/C) position, the temperature control to the full cool position, and the blower motor control to the highest speed position.
4. Start the engine and hold the idle at 1,000 rpm with the compressor clutch engaged. If the A/C compressor does not engage, see the A/C Diagnosis chart.
5. The engine should be at operating temperature and the doors and the windows closed.
6. Insert a thermometer in the driver side center panel outlet for front A/C system or insert the thermometer in the drivers side second row outlet in the headliner for the rear A/C system. Operate the A/C system until it stabilizes.
7. With the A/C compressor clutch engaged, compare the air temperature at the center panel outlet and the compressor discharge pressure (high side) to the A/C Performance and Pressure chart. The compressor clutch may cycle, depending upon the ambient temperature and humidity. If the clutch cycles, use the readings obtained before the clutch disengaged.

A/C PERFORMANCE TEMPERATURE AND PRESSURE

Ambient Air Temperature	21°C (70°F)	27°C (80°F)	32°C (90°F)	38°C (100°F)	43°C (110°F)
Maximum Allowable Air Temperature at Center Panel Outlet	9°C (48°F)	9°C (48°F)	12°C (54°F)	15°C (59°F)	18°C (65°F)
Maximum Allowable Air Temperature at Driver side 2nd Row Headliner Outlet	10° C (50° F)	13° C (55° F)	15° C (59° F)	17° C (63° F)	19° C (67° F)
Suction Pressure at Service Port (Low Side)	138 to 310 kPa (20 to 45 psi)	138 to 345 kPa (20 to 50 psi)	207 to 365 kPa (30 to 55 psi)	207 to 414 kPa (30 to 60 psi)	241 to 448 kPa (35 to 65 psi)
Discharge Pressure at Service Port (High Side)	1034 to 1724 kPa (150 to 250 psi)	1379 to 2068 kPa (200 to 300 psi)	1551 to 2241 kPa (225 to 325 psi)	1724 to 2413 kPa (250 to 350 psi)	2068 to 2758 kPa (300 to 400 psi)

8. If the air outlet temperature fails to meet the specifications in the A/C Performance Temperature and Pressure chart, or if the compressor discharge pressure is high, refer to the A/C Pressure Diagnosis chart.

A/C PRESSURE DIAGNOSIS

Condition	Possible Causes	Correction
Rapid A/C compressor clutch cycling with poor panel oulet temperatures.	1. Low refrigerant system charge.	1. See Refrigerant System Leaks in this group. Test the refrigerant system for leaks. Repair, evacuate and charge the refrigerant system, if required.
Equal pressures, but the compressor clutch does not engage.	1. No refrigerant in the refrigerant system.	1. See Refrigerant System Leaks in this group. Test the refrigerant system for leaks. Repair, evacuate and charge the refrigerant system, if required.
	2. Faulty fuse.	2. Check the fuses in the Integrated Power Module. Repair the shorted circuit or component and replace the fuses, if required. Refer to Group 8.
	3. Faulty A/C compressor clutch coil.	3. See A/C Compressor Clutch Coil in this group. Test the compressor clutch coil and replace, if required.
	4. Faulty A/C compressor clutch relay.	4. See A/C Compressor Clutch Relay in this group. Test the compressor clutch relay and relay circuits. Repair the circuits or replace the relay, if required.
	5. Improperly installed or faulty evaporator temperature sensor.	5. See Evaporator Temperature Sensor in this group. Test the sensor and replace, if required.
	6. Faulty A/C pressure transducer.	6. See A/C Pressure Transducer in this group. Test the sensor and replace, if required.
	7. Faulty Powertrain Control Module (PCM).	7. Refer to Group 9 - Engine Electrical Diagnostics for testing of the PCM. Test the PCM and replace, if required.
Normal pressures, but A/C Performance Test air temperatures at center panel outlet are too high.	1. Excessive refrigerant oil in system.	1. See Refrigerant Oil Level in this group. Recover the refrigerant from the refrigerant system and inspect the refrigerant oil content. Restore the refrigerant oil to the proper level, if required.
	2. Blend door actuator improperly installed or faulty.	2. See Blend Door Actuator in this group. Inspect the actuator for proper operation and replace, if required.
	3. Blend door inoperative or sealing improperly.	3. See HVAC Housing in this group. Inspect the blend door for proper operation and sealing. Repair if required.
The low side pressure is normal or slightly low, and the high side pressure is too low.	1. Low refrigerant system charge.	1. See Refrigerant System Leaks in this group. Test the refrigerant system for leaks. Repair, evacuate and charge the refrigerant system, if required.
	2. Refrigerant flow through the A/C evaporator is restricted.	2. See A/C Evaporator in this group. Replace the restricted A/C evaporator, if required.
	3. Faulty A/C compressor.	3. See A/C Compressor in this group. Replace the compressor, if required.

Condition	Possible Causes	Correction
The low side pressure is normal or slightly high, and the high side pressure is too high.	1. A/C condenser air flow restricted.	1. Check the A/C condenser for damaged fins, foreign objects obstructing air flow through the condenser fins, and missing or improperly installed air seals. Clean, repair, or replace components as required.
	2. Refrigerant flow through the receiver/drier is restricted.	2. See Receiver/Drier in this group. Replace the restricted receiver/drier, if required.
	3. Inoperative radiator cooling fan.	3. Test the radiator cooling fan and replace, if required. Refer to Group 7.
	4. Refrigerant system overcharged.	4. See Refrigerant System Charge in this group. Recover the refrigerant from the refrigerant system. Charge the refrigerant system to the proper level, if required.
	5. Air in the refrigerant system.	5. See Refrigerant System Leaks in this group. Test the refrigerant system for leaks. Repair, evacuate and charge the refrigerant system, if required.
	6. Engine overheating.	6. Test the engine cooling system and repair, if required. Refer to Group 7.
The low side pressure is too high, and the high side pressure is too low.	1. Accessory drive belt slipping.	1. Inspect the accessory drive belt condition and tension. Tighten or replace the accessory drive belt, if required. Refer to Group 7.
	2. Faulty A/C expansion valve.	2. See A/C Expansion Valve in this group. Replace the valve, if required.
	3. Faulty A/C compressor.	3. See A/C Compressor in this group. Replace the compressor, if required.
The low side pressure is too low, and the high side pressure is too high.	1. Restricted refrigerant flow through the refrigerant lines.	1. See Liquid Line, Suction Line and Discharge Line in this group. Inspect the refrigerant lines for kinks, tight bends or improper routing. Correct the routing or replace the refrigerant line, if required.
	2. Restricted refrigerant flow through the A/C expansion valve.	2. See A/C Expansion Valve in this group. Replace the valve, if required.
	3. Restricted refrigerant flow through the A/C condenser.	3. See A/C Condenser in this group. Replace the restricted condenser, if required.

HEATER PERFORMANCE

Before performing the following tests, refer to Group 7 - Cooling System for the procedures to check the engine coolant level and flow, engine coolant reserve/recovery system operation, accessory drive belt condition and tension, radiator air flow and the fan drive operation. Perform the A/C System Performance Test, which is found within the HVAC System Test (refer to 24 - HVAC Electrical Diagnostics). If any diagnostic trouble codes (DTCs) are found in the A/C-heater control or the powertrain control module (PCM), repair as necessary.

MAXIMUM HEATER OUTPUT: TEST AND ACTION

Engine coolant is delivered to the heater core through two heater hoses. With the engine idling at normal operating temperature, set the temperature control to the full hot position, the mode control to the floor position, and the blower motor control to the highest speed position. Using a test thermometer, check the temperature of the air being discharged at the front HVAC housing floor outlets or the rear outlet in the passenger side rear quarter interior trim panel. Compare the test thermometer reading to the Heater Temperature Reference chart.

HEATER TEMPERATURE REFERENCE

Ambient Air Temperature	15.5° C (60° F)	21.1° C (70° F)	26.6° C (80° F)	32.2° C (90° F)
Minimum Heater System Air Outlet Temperature	52.2° C (126° F)	56.1° C (133° F)	59.4° C (139° F)	62.2° C (144° F)

If the heater outlet air temperature is below the minimum specification, refer to Group 7 - Cooling System. Both of the heater hoses should be hot to the touch. The coolant return heater hose should be slightly cooler than the coolant supply heater hose. If the return hose is much cooler than the supply hose, locate and repair the engine coolant flow obstruction in the cooling system. Refer to Group 7 - Cooling System for more information.

If the heater outlet air temperature degrades significanly at an idle, check for proper operation of the auxilary electric coolant pump (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/PUMP-COOLANT-ELECTRIC - OPERATION).

OBSTRUCTED COOLANT FLOW

Possible locations or causes of obstructed coolant flow are as follows:

- Faulty water pump.
- Faulty thermostat.
- Pinched or kinked heater hoses.
- Improper heater hose routing.
- Plugged heater hoses or supply and return ports at the cooling system connections.
- A plugged heater core.

If proper coolant flow through the cooling system is verified, and heater outlet air temperature is still low, a mechanical problem may exist.

MECHANICAL PROBLEMS

Possible locations or causes of insufficient heat due to mechanical problems are as follows:

- Obstructed cowl air intake.
- Obstructed heater system outlets.
- Blend-air door(s) or actuator(s) not functioning properly.
- Faulty blower motor system
- Faulty A/C-heater control

TEMPERATURE CONTROL

If the heater outlet air temperature cannot be adjusted with the temperature control on the A/C-heater control, the following could require service:

- Faulty A/C-heater control.
- Faulty blend door actuator.
- Faulty, obstructed or improperly installed blend-air door.
- Faulty related wiring harness or connectors.
- Improper engine coolant temperature.

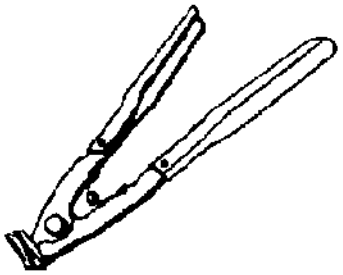
SPECIFICATIONS

A/C SYSTEM

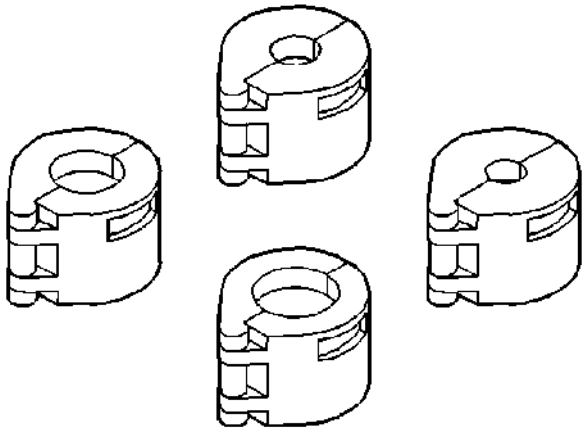
Item	Description	Notes
A/C Compressor	Denso 10S20	ND-8 PAG oil
Freeze–up Control	Evaporator Temperature Sensor	HVAC housing mounted (front) - input to A/C-heater control
Low psi Control	A/C Pressure Transducer	Liquid line mounted - input to FCM - opens below 28 psi, closes above 34 psi
High psi Control	A/C Pressure Transducer	Liquid line mounted - input to FCM - opens above 460 psi, closed below 290 psi
Refrigerant Charge Capacity	Refer to the A/C Underhood Specification Label located in the engine compartment	R-134a refrigerant
A/C Clutch Coil Draw	2.2 amps @ 12V ± 0.5V @ 21° C (70° F)	
A/C Clutch Air Gap	0.35 - 0.65 mm (0.014 - 0.025 in.)	

SPECIAL TOOLS

A/C SYSTEM

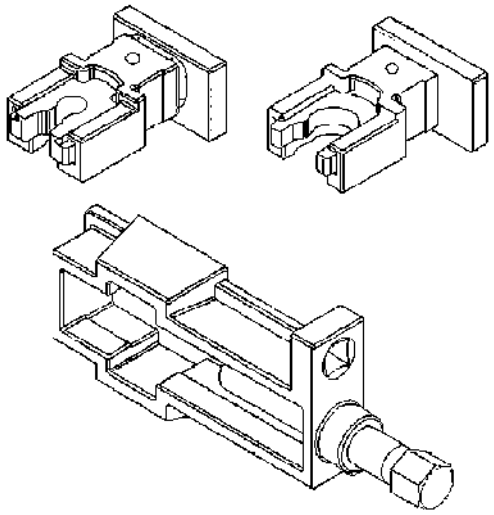


Snap Ring Pliers C-4574 are required to service the A/C clutch and field coil.



A/C Line Disconnect Tools 7193

A/C Line Disconnect Tools 7193 are required to service the A/C liquid and suction lines, A/C accumulator and the A/C evaporator.



A/C Line Repair Tools 8456-A

A/C Line Repair Tools 8456-A are required to repair the A/C underbody lines.

CONTROLS - FRONT

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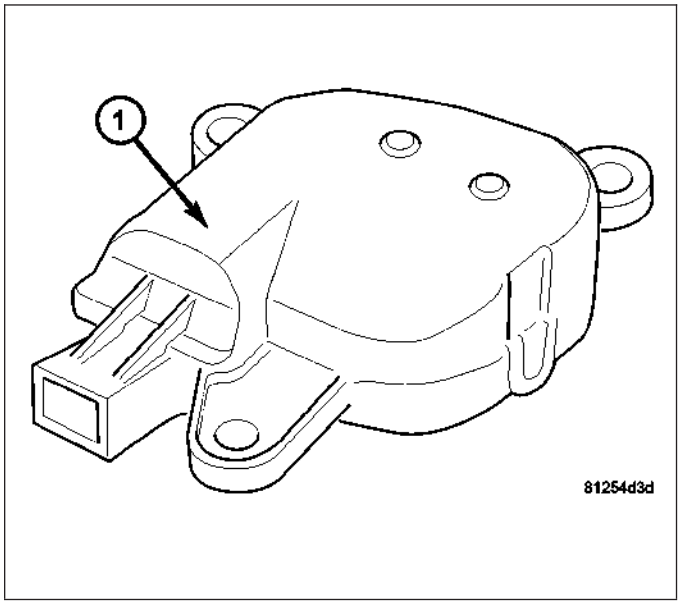
ACTUATOR-BLEND DOOR

DESCRIPTION

The blend door actuator (1) is a reversible, 12 volt direct current (DC), servo motor. The blend door actuator is located on the top of the HVAC housing. The blend door actuator is interchangeable with the actuators for both mode-air doors and the recirculation-air door. Each actuator is contained within an identical black molded plastic housing with an integral wire connector receptacle. Three integral mounting tabs allow the actuator to be secured to the HVAC housing. Each actuator also has an identical output shaft with splines that connects it to the blend-air door. The blend door actuator does require mechanical indexing to the blend-air door, as it is electronically calibrated by the A/C-heater control.



OPERATION

The blend door actuator is connected to the A/C-heater control through the vehicle electrical system by a dedicated two-wire lead and connector of the HVAC wire harness. The blend door actuator can move the blend-air door in two directions. When the A/C-heater control pulls the voltage on one side of the motor connection high and the other connection low, the blend-air door will move in one direction. When the A/C-heater control reverses the polarity of the voltage to the motor, the blend-air door moves in the opposite direction.

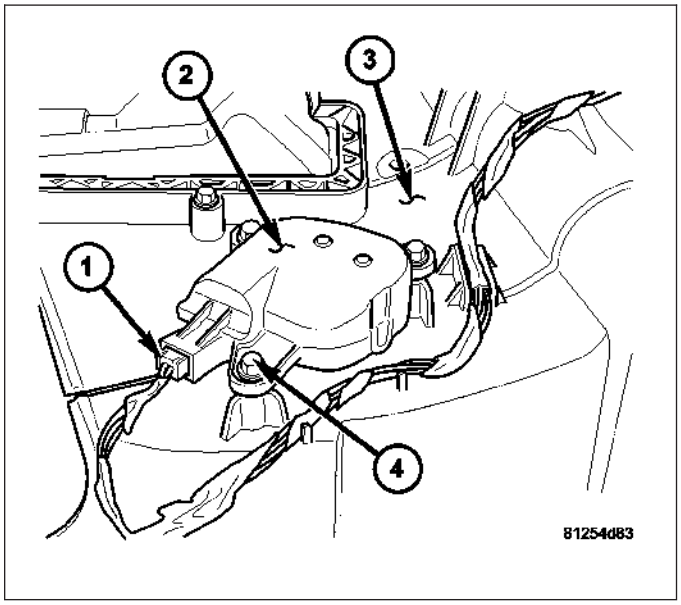
When the A/C-heater control makes the voltage to both connections high or both connections low, the blend-air door stops and will not move. The A/C-heater control uses a pulse-count positioning system to monitor the operation and relative position of the blend door actuator and the blend-air door. The A/C-heater control learns the blend-air door stop positions during the calibration procedure and will store a diagnostic trouble code (DTC) for any problems it detects in the blend door actuator circuit.

The blend door actuator cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

The blend door actuator is diagnosed using the scan tool. Refer to 24 - HVAC Electrical Diagnostics for more information.

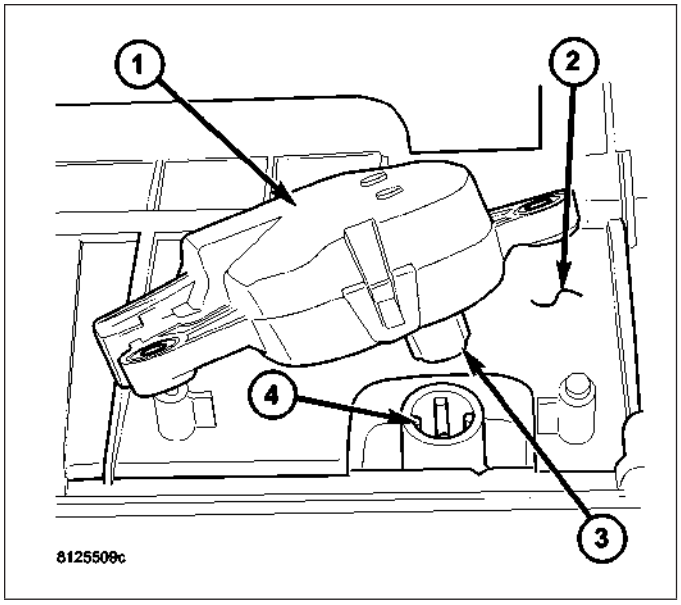
REMOVAL

1. Disconnect and isolate the negative battery cable.
2. Remove the instrument panel assembly (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - REMOVAL).
3. Remove the screws (4) that secure the blend door actuator (2) to the top of the HVAC housing (3).
4. Disconnect the HVAC wire harness connector (1) from the blend door actuator.
5. Remove the blend door actuator from the HVAC housing.

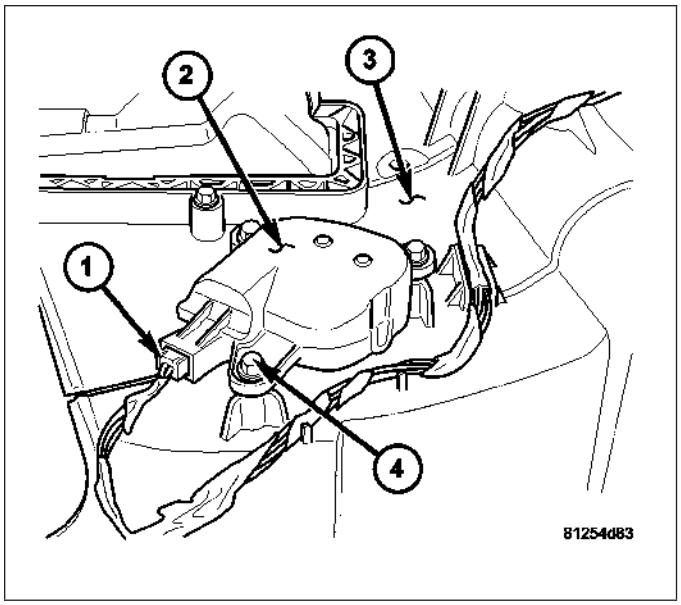


INSTALLATION

1. Position the blend door actuator (1) onto the top of the HVAC housing (2). If necessary, rotate the actuator slightly to align the splines on the actuator output shaft (3) with those on the blend-air door linkage (4).



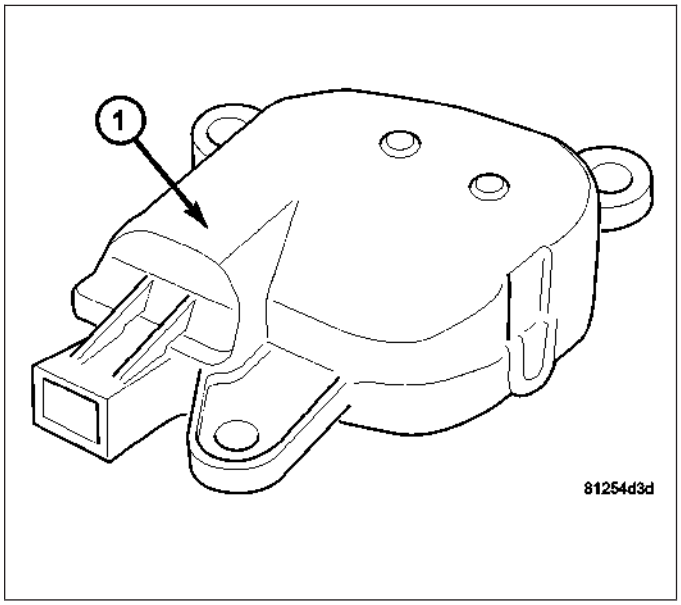
2. Install the screws (4) that secure the blend door actuator (2) to the HVAC housing (3). Tighten the screws to 2 N·m (17 in. lbs.).
3. Connect the HVAC wire harness connector (1) to the blend door actuator.
4. Install the instrument panel assembly (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - INSTALLATION).
5. Reconnect the negative battery cable.
6. Initiate the Actuator Calibration function using a scan tool. Refer to HVAC System Test, found in 24 - HVAC - Electrical Diagnostics.



ACTUATOR-MODE DOOR

DESCRIPTION

The two mode door actuators (floor/defrost and panel door) (1) are reversible, 12–volt direct current (DC), servo motors. Both mode door actuators are located near the drivers side end of the HVAC housing. The mode door actuators are mechanically connected to the floor/defrost and the panel-air door. Both mode door actuators are interchangeable with each other and with the actuators for the blend-air door and the recirculation-air door. Each actuator is contained within an identical black molded plastic housing with an integral wire connector receptacle. Three integral mounting tabs allow the actuator to be secured to the top of the HVAC housing. Each actuator also has an identical output shaft with splines that connects it to the mode-air doors. The mode door actuators do not require mechanical indexing to the mode-air doors, as they are electronically calibrated by the A/C-heater control.



OPERATION

The floor/defrost and panel (mode) door actuators are connected to the A/C-heater control through the vehicle electrical system by a dedicated two-wire lead and connector of the HVAC wire harness. The mode door actuators can move the floor/defrost and the panel-air doors in two directions. When the A/C-heater control pulls the voltage on one side of the motor connection high and the other connection low, the mode-air door(s) will move in one direction. When the A/C-heater control reverses the polarity of the voltage to the motor, the mode-air door(s) moves in the opposite direction.

When the A/C-heater control makes the voltage to both connections high or both connections low, the mode-air door(s) stops and will not move. The A/C-heater control uses a pulse-count positioning system to monitor the operation and relative position of the floor/defrost and panel door actuators and the mode-air doors. The A/C-heater control learns the mode-air door stop positions during the calibration procedure and will store a diagnostic trouble code (DTC) for any problems it detects in the mode door actuator circuits.

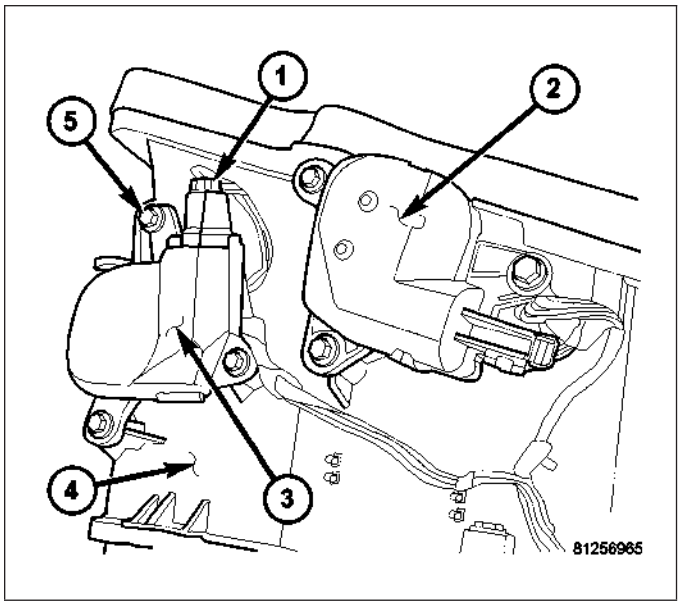
The mode door actuators cannot be adjusted or repaired and, if faulty or damaged, they must be replaced.

The mode door actuators are diagnosed using a scan tool. Refer to 24 - HVAC Electrical Diagnostics for more information.

REMOVAL

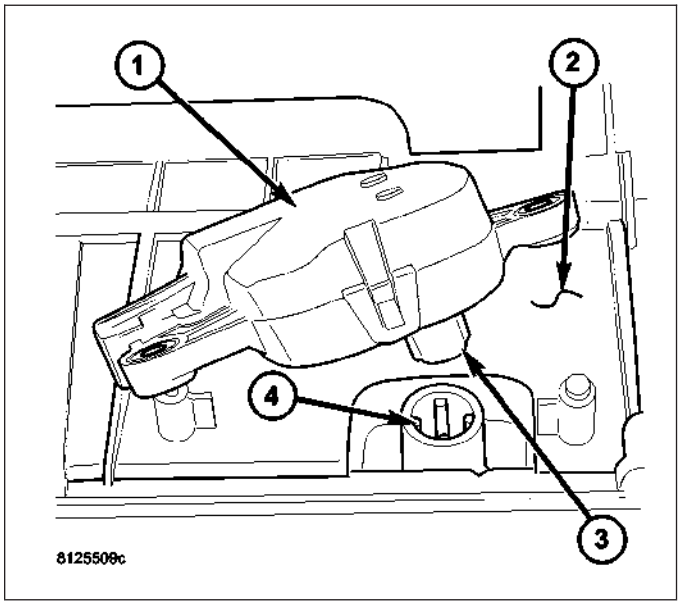
WARNING: On vehicles equipped with airbags, disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.

1. Disconnect and isolate the negative battery cable.
2. Remove the screws (5) that secure the panel door actuator (2) and the floor/defrost door actuator (3) located on the driver side end of the HVAC housing (4) as required.
3. Disconnect the HVAC wire harness connector (1) from the panel door actuator and the floor/defrost door actuator as required.
4. Remove the mode door actuator(s) from the HVAC housing.

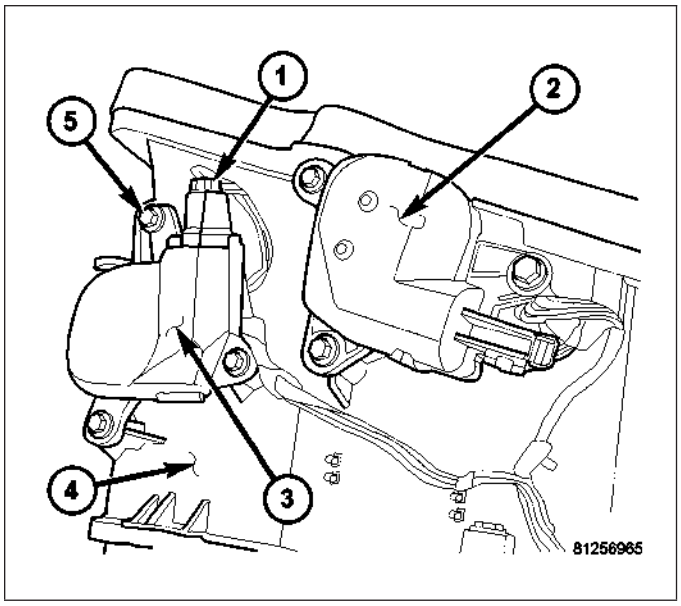


INSTALLATION

1. Position the mode door actuator(s) (1) onto the driver side end of the HVAC housing as required. If necessary, rotate the actuator slightly to align the splines on the actuator output shaft with those in the mode-air door linkage.



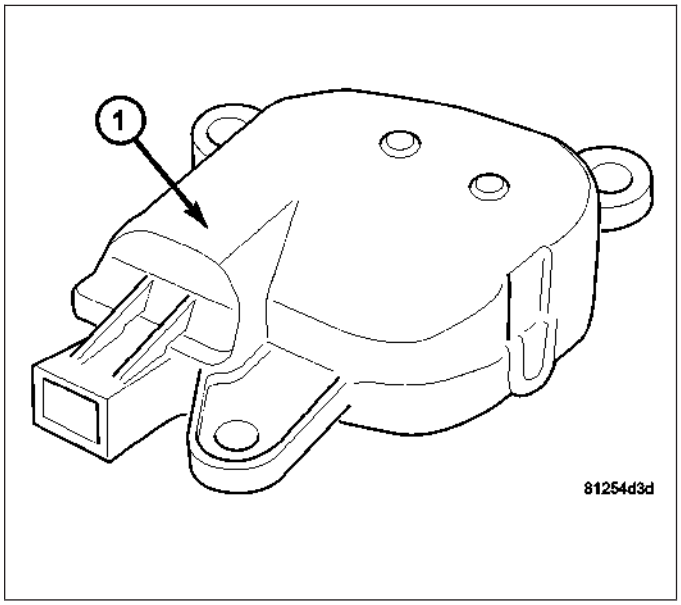
2. Install the screws (5) that secure the panel door actuator (2) and the floor/defrost door actuator (3) to the HVAC housing (4) as required. Tighten the screws to 2 N·m (17 in. lbs.).
3. Connect the HVAC wire harness connector (1) to the mode door actuator(s) as required.
4. Reconnect the negative battery cable.
5. Initiate the Actuator Calibration function using a scan tool. Refer to HVAC System Test, found in 24 - HVAC - Electrical Diagnostics.



ACTUATOR-RECIRCULATION DOOR

DESCRIPTION

The recirculation door actuator (1) is a reversible, 12 volt direct current (DC), servo motor. The recirculation door actuator is located on the left side of the HVAC air inlet housing. The recirculation door actuator is interchangeable with the actuators for the blend-air door and the mode-air doors. Each actuator is contained within an identical black molded plastic housing with an integral wire connector receptacle. Three integral mounting tabs allow the actuator to be secured to the air inlet housing. Each actuator also has an identical output shaft with splines that connects it to the recirculation-air door. The recirculation door actuator does not require mechanical indexing to the recirculation-air door, as it is electronically calibrated by the A/C-heater control.



OPERATION

The recirculation door actuator is connected to the A/C-heater control through the vehicle electrical system by a dedicated two-wire lead and connector of the HVAC wire harness. The recirculation door actuator can move the recirculation-air door in two directions. When the A/C-heater control pulls the voltage on one side of the motor connection high and the other connection low, the recirculation-air door will move in one direction. When the A/C-heater control reverses the polarity of the voltage to the motor, the recirculation-air door moves in the opposite direction.

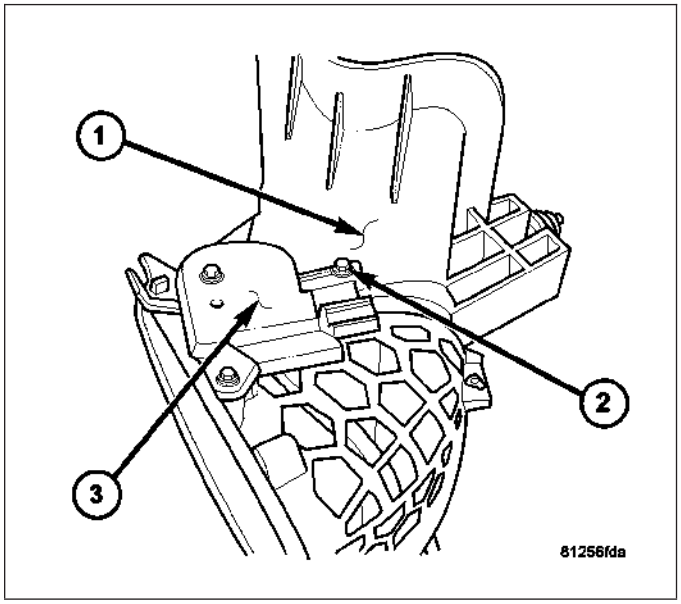
When the A/C-heater control makes the voltage to both connections high or both connections low, the recirculation-air door stops and will not move. The A/C-heater control uses a pulse-count positioning system to monitor the operation and relative position of the recirculation door actuator and the recirculation-air door. The A/C-heater control learns the recirculation-air door stop positions during the calibration procedure and will store a diagnostic trouble code (DTC) for any problems it detects in the recirculation door actuator circuits.

The recirculation door actuator cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

The recirculation door actuator is diagnosed using a scan tool. Refer to 24 - HVAC Electrical Diagnostics for more information.

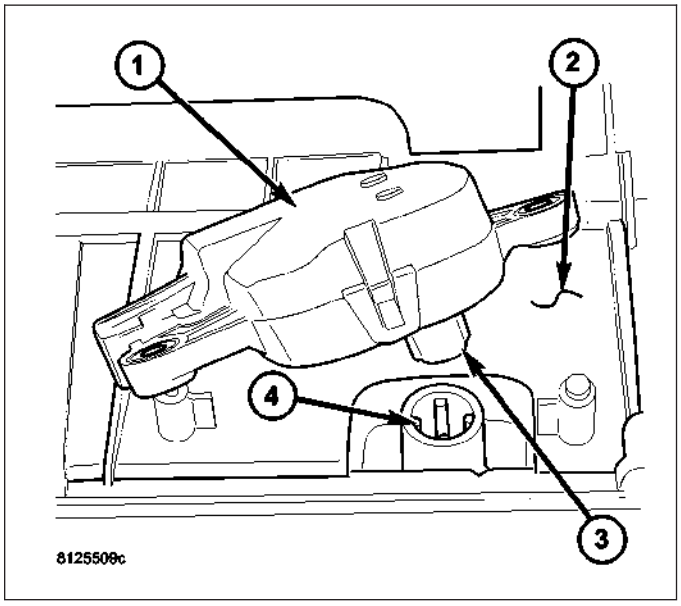
REMOVAL

1. Disconnect and isolate the negative battery cable.
2. Remove the HVAC assembly (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION - FRONT/HOUSING-HVAC - REMOVAL).
3. Remove the air inlet housing (1) from the HVAC housing and place it on a workbench (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION - FRONT/HOUSING-HVAC - DISASSEMBLY).
4. Remove the screws (2) that secure the recirculation door actuator (3) to the HVAC air inlet housing.
5. Remove the recirculation door actuator from the HVAC air inlet housing.

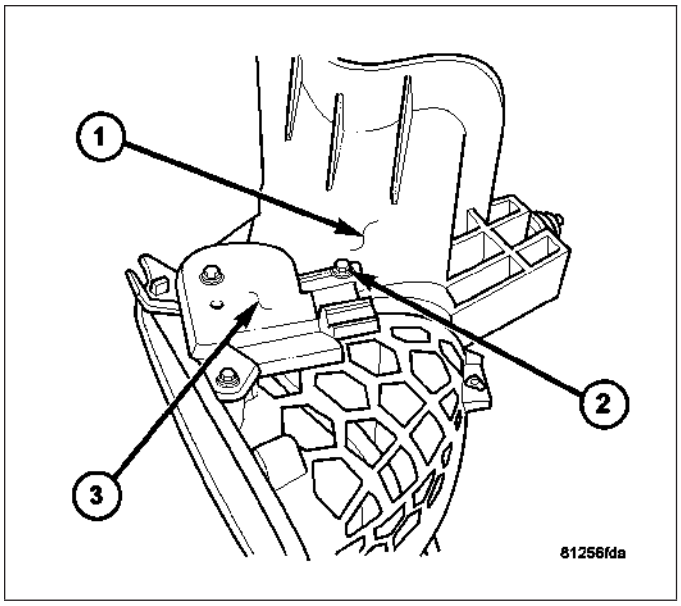


INSTALLATION

1. Position the recirculation door actuator (1) to the HVAC air inlet housing. If necessary, rotate the actuator slightly to align the splines on the actuator output shaft with those in the recirculation-air door linkage.



2. Install the screws (2) that secure the recirculation door actuator (3) to the HVAC air inlet housing (1). Tighten the screws to 2 N·m (17 in. lbs.).
3. Install the air inlet housing to the HVAC housing (Refer to 24 - HEATING & AIR CONDITIONING/ DISTRIBUTION - FRONT/HOUSING-HVAC - ASSEMBLY).
4. Install the HVAC housing (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION - FRONT/ HOUSING-HVAC - INSTALLATION).
5. Reconnect the negative battery cable.
6. Initiate the Actuator Calibration function using a scan tool. Refer to HVAC System Test, found in 24 - HVAC - Electrical Diagnostics.

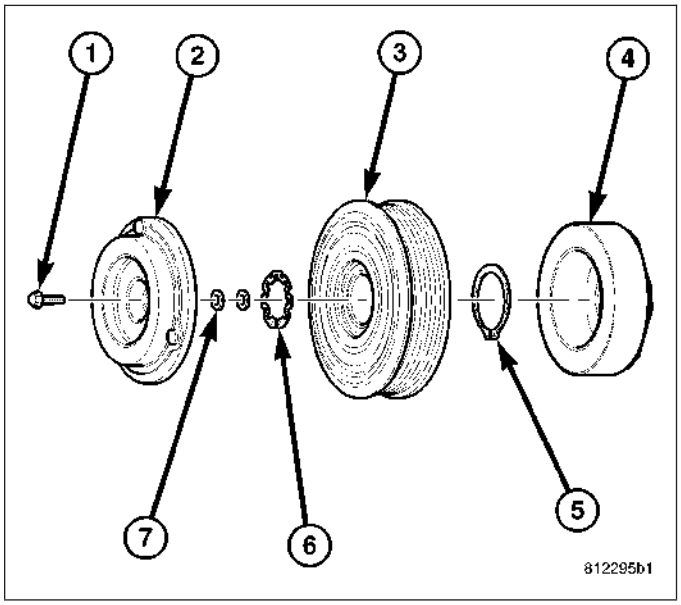


CLUTCH-A/C COMPRESSOR

DESCRIPTION

The A/C compressor clutch assembly consists of a stationary electromagnetic A/C clutch field coil (4), pulley bearing and pulley assembly (3), clutch plate (2) and shims (7). These components provide the means to engage and disengage the A/C compressor from the engine accessory drive belt.

The A/C clutch field coil and the pulley bearing and pulley assembly are both retained on the nose of the A/C compressor with snap rings (5 and 6). The clutch plate is splined to the compressor shaft and secured with a bolt (1).



OPERATION

The A/C compressor clutch components provide the means to engage and disengage the A/C compressor from the engine accessory drive belt. When the electromagnetic A/C clutch field coil is energized, it magnetically draws the clutch plate into contact with the clutch pulley and drives the compressor shaft. When the coil is not energized, the pulley freewheels on the clutch hub bearing, which is part of the pulley assembly.

The A/C compressor clutch engagement is controlled by the following components:

- A/C-heater control in the passenger compartment
- A/C pressure transducer on the A/C discharge line
- Powertrain control module (PCM) in the engine compartment
- A/C clutch relay in the power distribution center (PDC)

The A/C compressor clutch components cannot be repaired and, if faulty or damaged, they must be replaced.

DIAGNOSIS AND TESTING

A/C COMPRESSOR CLUTCH COIL

The A/C compressor clutch coil electrical circuit is controlled by the powertrain control module (PCM) through the A/C compressor clutch relay, which is located in the power distribution center (PDC) in the engine compartment. Begin testing of a suspected compressor clutch coil problem by performing the preliminary checks.

PRELIMINARY CHECKS

1. If the compressor clutch will not engage, refer to 24 - HVAC Electrical Diagnostics to perform the A/C System Performance Test, which is found within the HVAC System Test. If no diagnostic trouble codes (DTCs) are found in the A/C-heater control or the powertrain control module (PCM), go to Step 2. If any DTCs are found, repair as required.
2. If the compressor clutch still will not engage, verify the refrigerant charge level (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - DIAGNOSIS AND TESTING - REFRIGERANT SYSTEM LEAKS). If the refrigerant charge level is OK, go to TESTS . If the refrigerant charge level is not OK, adjust the refrigerant charge as required.

TESTS

1. Verify the battery state of charge (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - DIAGNOSIS AND TESTING).
2. Connect an ammeter (0 to 10 ampere scale selected) in series with the clutch coil feed terminal. Connect a voltmeter (0 to 20 volt scale selected) to measure voltage across the battery and the clutch coil.
3. With the heater-A/C control in the A/C mode and the blower at low speed, start the engine and allow it to run at a normal idle speed.
4. The compressor clutch should engage immediately, and the clutch coil supply voltage should be within two volts of the battery voltage. If the coil supply voltage is OK, go to Step 5. If the coil supply voltage is not within two volts of battery voltage, test the clutch coil feed circuit for excessive voltage drop and repair as necessary.
5. Refer to the A/C Clutch Coil Current Draw chart for the acceptable A/C clutch coil current draw specifications. Specifications apply for a work area temperature of 21° C (70° F). If voltage is more than 12.5 volts, add electrical loads by turning on electrical accessories until voltage reads below 12.5 volts.
   a. If the compressor clutch coil current reading is zero, the coil is open and must be replaced.
   b. If the compressor clutch coil current reading is above specifications, the coil is shorted and must be replaced.

A/C CLUTCH COIL CURRENT DRAW

Compressor	Current Draw
Denso 10S20	2.2 amps @ 11.5 - 12.5 volts

STANDARD PROCEDURE

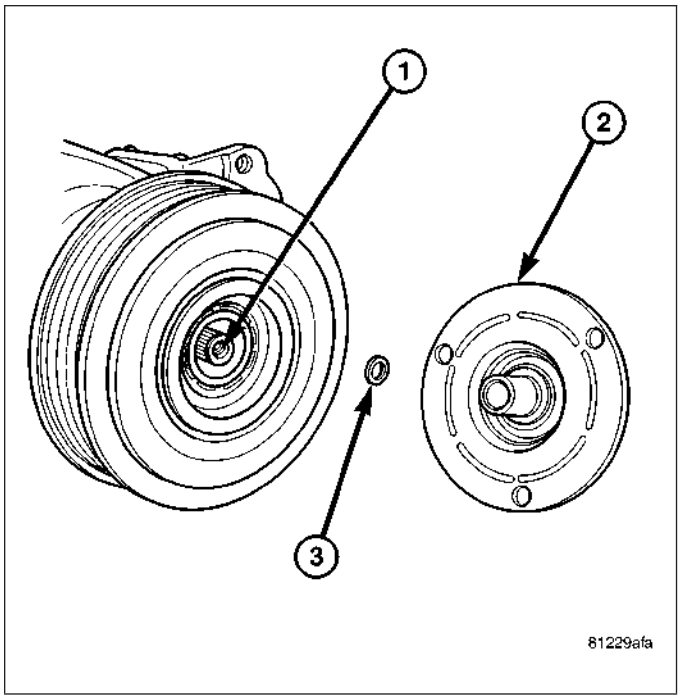
A/C CLUTCH PLATE INSPECTION

NOTE: The A/C clutch can be serviced in the vehicle. The refrigerant system can remain fully-charged during compressor clutch, pulley and bearing assembly, or coil replacement.

Examine the friction surfaces of the pulley and the clutch plate (2) for wear. The pulley and clutch plate should be replaced if there is excessive wear or scoring.

If the friction surfaces are oily, inspect the shaft and nose area of the A/C compressor (1) for refrigerant oil. If refrigerant oil is found, the compressor shaft seal is leaking and the A/C compressor must be replaced.

Check the pulley bearing for roughness or excessive leakage of grease. Replace the pulley and bearing assembly, if required.



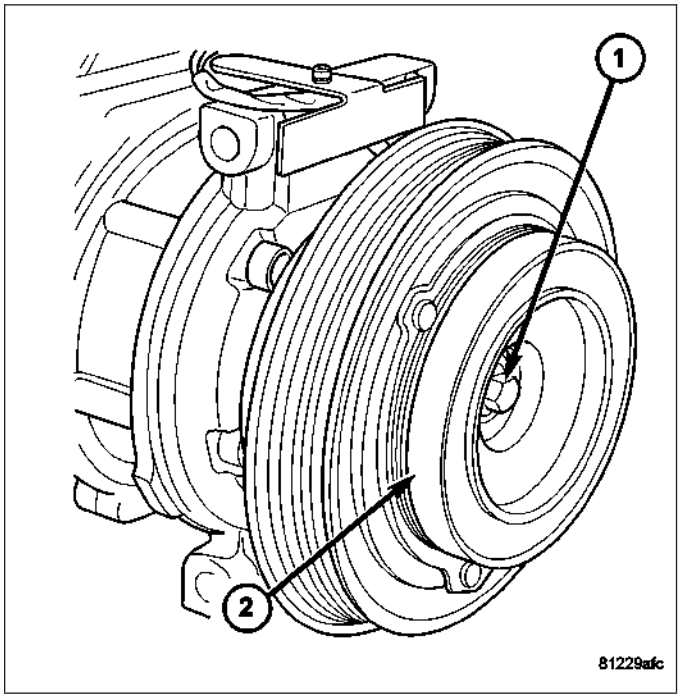
A/C CLUTCH BREAK-IN

After a new A/C compressor clutch has been installed, cycle the compressor clutch approximately twenty times (five seconds on, then five seconds off). During this procedure, set the A/C-heater controls to the A/C Recirculation Mode, the blower motor in the highest speed position, and the engine speed at 1500 to 2000 rpm. This procedure (burnishing) will seat the opposing friction surfaces and provide a higher compressor clutch torque capability.

REMOVAL

NOTE: The A/C compressor clutch can be serviced in the vehicle. The refrigerant system can remain fully-charged during compressor clutch, pulley and bearing assembly, or coil replacement.

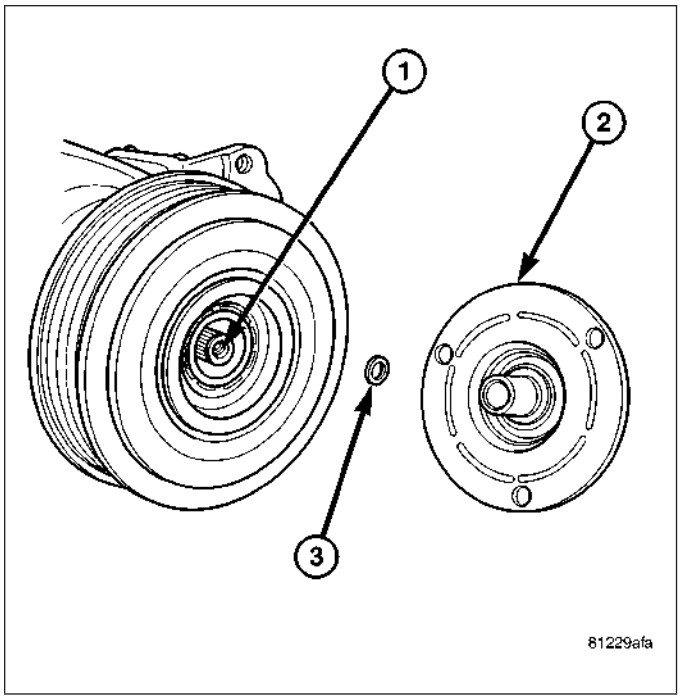
1. Disconnect and isolate the negative battery cable.
2. Remove the accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/BELTS-DRIVE - REMOVAL).
3. Disconnect the engine wire harness connector for the A/C compressor clutch coil from the clutch field coil wire harness connector on the top of the A/C compressor.
4. Remove the bolts that secure the A/C compressor to the engine and support the A/C compressor.
5. Remove the compressor shaft bolt (1). A band-type oil filter wrench or a strap wrench may be used to secure the clutch plate (2) during bolt removal.



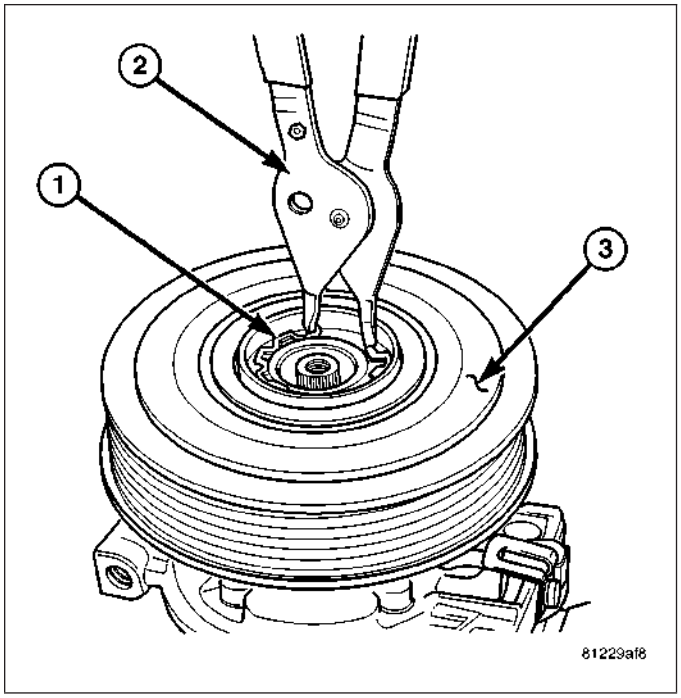
CAUTION: Do not pry between the clutch plate and the pulley and bearing assembly to remove the clutch plate from the compressor shaft as this may damage the clutch plate.

NOTE: Use care not to lose any clutch shim(s) during removal of the clutch plate, as they may be reused during the clutch plate installation process.

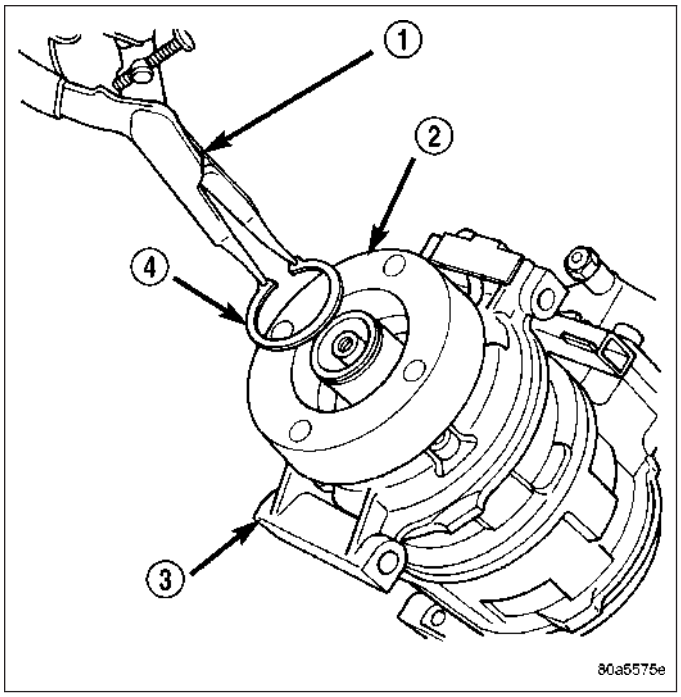
6. Tap the clutch plate (2) lightly with a plastic mallet to release it from the splines on the compressor shaft (1). Remove the clutch plate and shim(s) (3) from the compressor shaft.



7. Using snap ring pliers (Special Tool C-4574 or equivalent) (2), remove the external snap ring (1) that secures the pulley and bearing assembly (3) to the front cover of the A/C compressor, then slide the pulley and bearing assembly off of the A/C compressor.



8. Remove the screw that secures the clutch coil pigtail wire connector bracket and ground clip to the top of the compressor housing (3).
9. Using snap ring pliers (Special Tool C-4574 or equivalent) (1), remove the external snap ring (4) that secures the clutch field coil (2) to the front cover of the compressor housing, then slide the clutch field coil off of the A/C compressor.

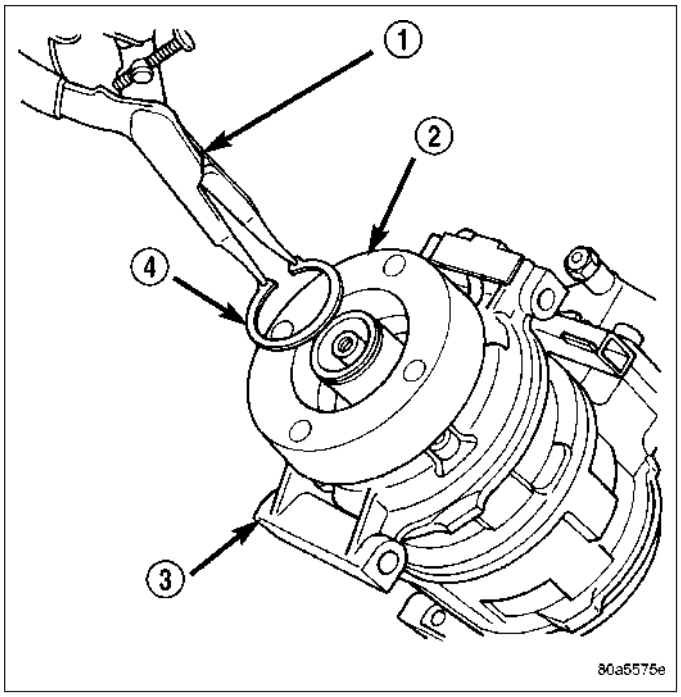


INSTALLATION

1. Align the dowel pin on the back of the clutch field coil (2) with the hole in the compressor front cover (3) and position the clutch field coil onto the A/C compressor. Be certain that the clutch coil wire harness is properly oriented and routed so that it is not pinched between the compressor front cover and the clutch field coil.

CAUTION: The snap ring must be fully and properly seated in the groove or it will vibrate out, resulting in a clutch failure and severe damage to the A/C compressor.

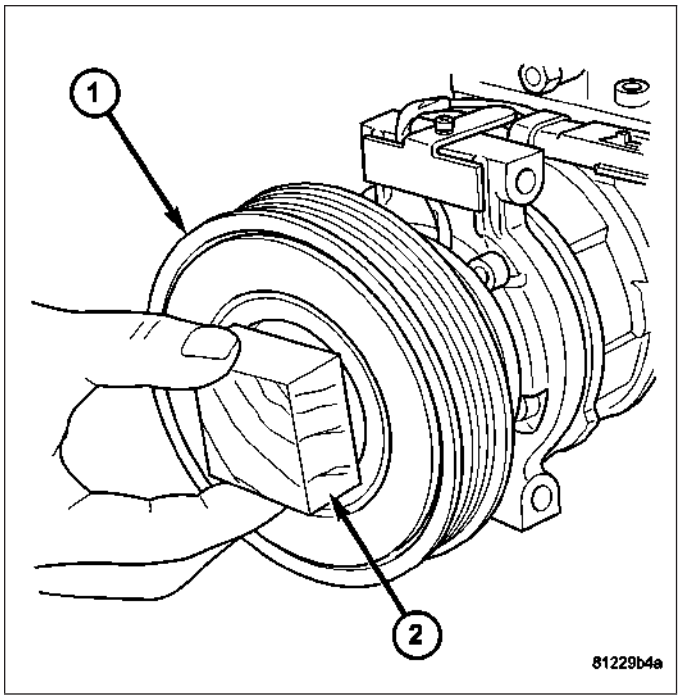
NOTE: A new snap ring must be used to secure the clutch field coil to the A/C compressor. The bevel side of the snap ring must face outward and both snap ring eyelets must be oriented to the right or to the left of the clutch field coil dowel pin location on the A/C compressor.



2. Using snap ring pliers (Special Tool C-4574 or equivalent) (1), install the external snap ring (4) that secures the clutch field coil to the front cover of the A/C compressor. Be certain that the snap ring is fully and properly seated in the groove and oriented correctly.
3. Install the screw that secures the clutch field coil wire harness connector bracket and ground clip to the top of the compressor housing. Tighten the screw securely.

CAUTION: When installing the pulley and bearing assembly, DO NOT mar the friction surfaces of the pulley or premature failure of the clutch will result.

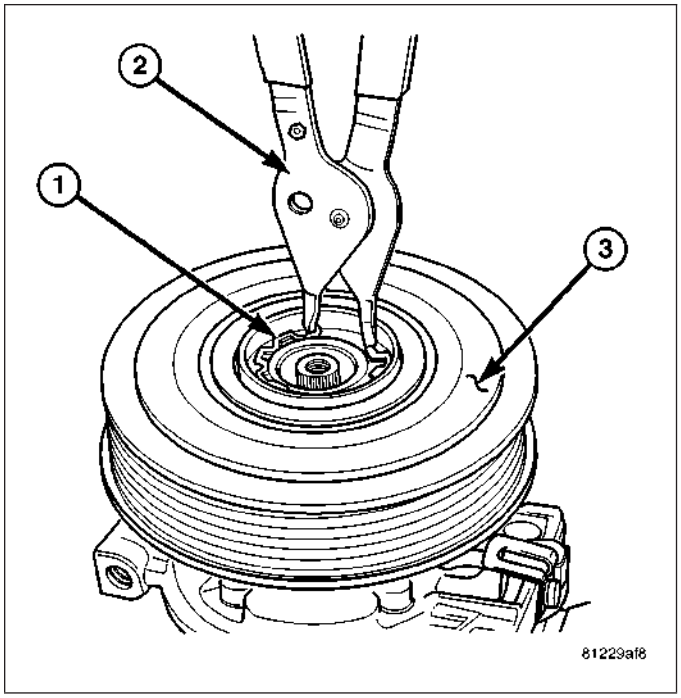
4. Install the pulley and bearing assembly (1) onto the front cover of the A/C compressor. If necessary, tap the pulley gently with a block of wood (2) placed on the pulley friction surface.



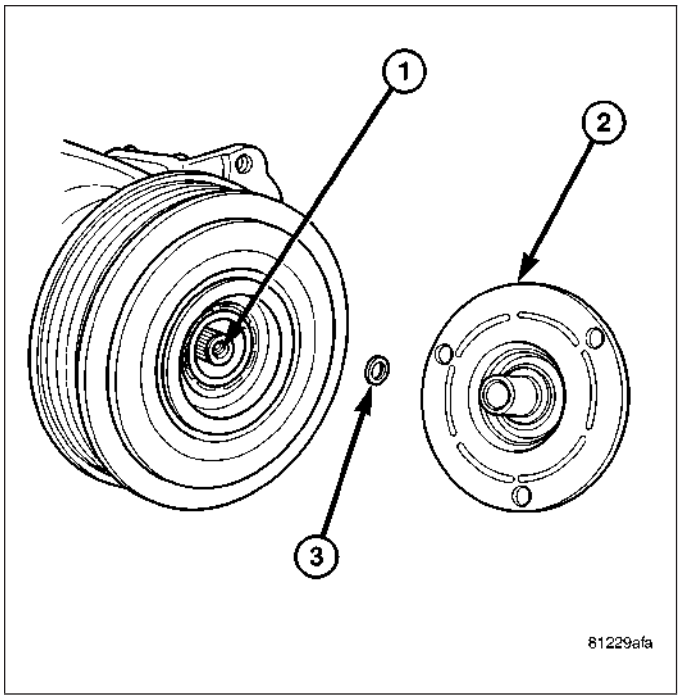
CAUTION: The snap ring must be fully and properly seated in the groove or it will vibrate out, resulting in a clutch failure and severe damage to the A/C compressor.

NOTE: A new snap ring must be used to secure the pulley and bearing assembly to the A/C compressor. The bevel side of the snap ring must face outward.

5. Using snap ring pliers (Special Tool C-4574 or equivalent) (2), install the external snap ring (1) that secures the pulley and bearing assembly (3) to the front cover of the A/C compressor. Be certain that the snap ring is fully and properly seated in the groove.



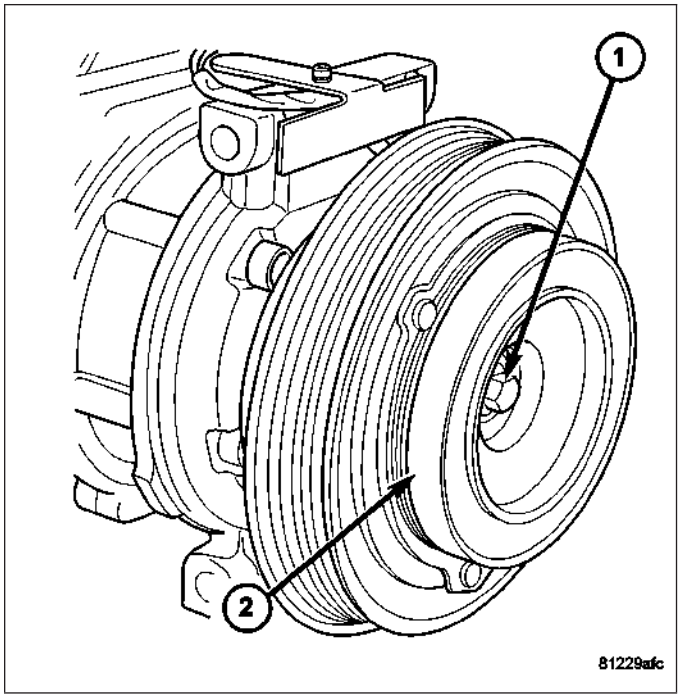
6. If the original clutch plate (2) and pulley and bearing assembly are to be reused, reinstall the original shim(s) (3) on the compressor shaft (1) against the shoulder. If a new clutch plate and/or pulley and bearing assembly are being used, install a trial stack of shims 2.54 mm (0.010 in.) thick on the compressor shaft against the shoulder.



7. Install the clutch plate (2) onto the compressor shaft.
8. Install the compressor shaft bolt (1). Tighten the bolt to 19 N·m (168 in. lbs.).

NOTE: The shims may compress after tightening the shaft bolt. Check the air gap in four or more places to verify the air gap is correct. Spin the pulley before performing a final check of the air gap.

9. With the clutch plate assembled tight against the shim(s), measure the air gap between the clutch plate and the pulley and bearing assembly faces with a feeler gauge. The air gap should be between specifications (Refer to 24 - HEATING & AIR CONDITIONING - SPECIFICATIONS). If the proper air gap is not obtained, add or subtract shims as needed until the desired air gap is obtained.
10. Install the bolts that secure the A/C compressor to the engine (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/COMPRESSOR-A/C - INSTALLATION).



11. Connect the engine wire harness connector to the A/C compressor clutch coil.
12. Install the accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/BELTS-DRIVE - INSTALLATION).
13. Reconnect the negative battery cable.

CONTROL-A/C HEATER

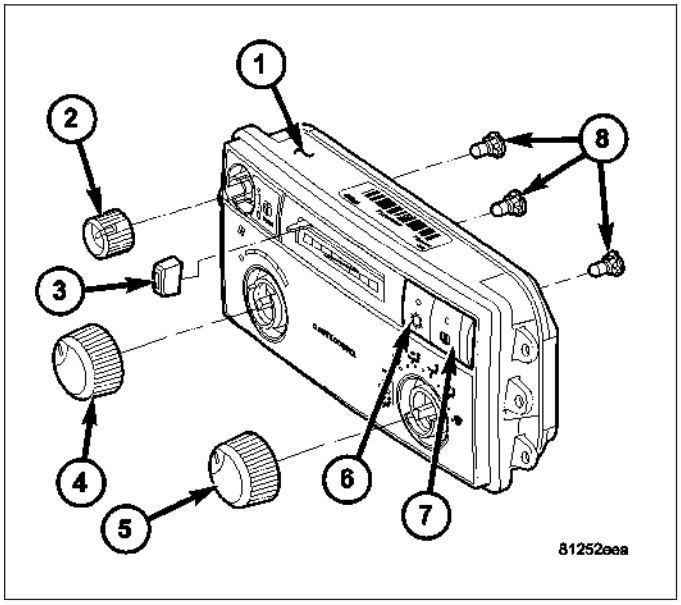
DESCRIPTION

MANUAL SINGLE ZONE

The A/C-heater control (1) for the manual temperature control (MTC) single zone heating-A/C system allows one temperature setting for the entire vehicle. All controls are identified by ISO graphic symbols.

The A/C-heater control and integral computer is located in the instrument panel and contains:

- a rotary control knob for rear window washer operation and rear window wiper speed selection (2).
- a slider control knob for temperature control of the discharged air (3).
- a rotary control knob for fan speed selection and turning the heater-A/C system off (4).
- a rotary control knob for mode control of the discharged air (5).
- a push button A/C on/off control (6). The Snowflake button contains an LED that illuminates when the A/C system is in operation.
- a push button rear window defogger on/off control (7). The button contains an LED that illuminates when the rear window defogger system is in operation.



The A/C-heater control cannot be repaired and, if faulty or damaged, it must be replaced. The illumination lamps (8) and control knobs are available for service replacement.

The A/C-heater control for the manual single zone heating and A/C system is diagnosed using a scan tool. Refer to 24 - HVAC Electrical Diagnostics for more information.

The A/C-heater control utilizes integrated circuitry and information carried on the controller area network (CAN) B bus to monitor many sensors and switch inputs throughout the vehicle. In response to those inputs, the internal circuitry and programming of the A/C-heater control allows it to control electronic functions and features of the MTC heating-A/C system.

The inputs received by the A/C-heater control of the MTC heating-A/C system on the CAN B bus are as follows:

- Dimming
- Refrigerant Pressure
- Vehicle Identification Number
- Vehicle Odometer
- Engine Coolant Temperature
- Ambient Air Temperature
- Vehicle Speed

The messages broadcasted by the A/C-heater control of the MTC heating-A/C system on the CAN B bus are as follows:

- A/C Request
- A/C Select
- Rear Window Defogger (EBL) Request
- Rear Washer Request
- Rear Wiper Request

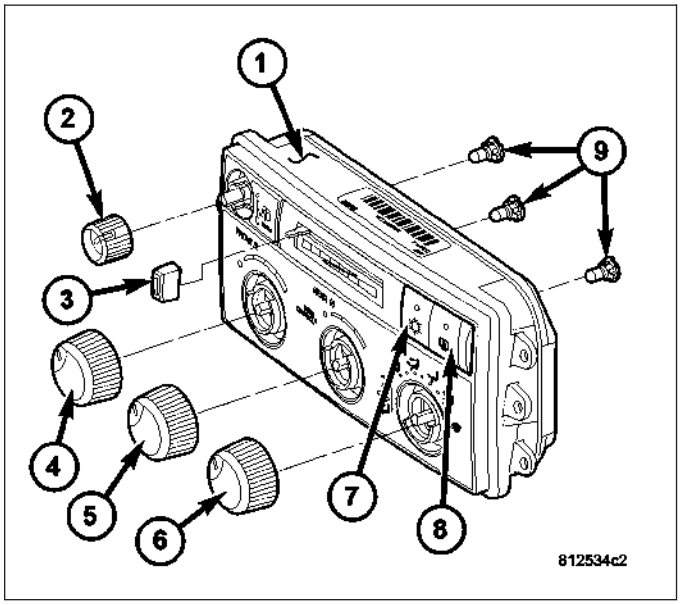
MANUAL SINGLE ZONE WITH REAR HEAT AND A/C

The A/C-heater control (1) for the manual temperature control (MTC) single zone front and rear heating-A/C system allows both the front and intermediate seat passengers the ability to regulate air temperature as well as fan speed and provides floor outlets near the right rear door and overhead outlets at each intermediate outboard seating position. Primary control for the rear blower motor is on the front A/C-heater control. All controls are identified by ISO graphic symbols.

FRONT CONTROL PANEL

The front A/C-heater control and integral computer is located in the instrument panel and contains:

- a rotary control knob for rear window washer operation and rear window wiper speed selection (2).
- a slider control knob for temperature control of the discharged air (3).
- a rotary control knob for fan speed selection and turning the heater-A/C system off (4).
- a rotary control knob for rear fan speed selection and turning the rear heater-A/C system off (5).
- a rotary control knob for mode control of the discharged air (6).
- a push button A/C on/off control (7). The Snowflake button contains an LED that illuminates when the A/C system is in operation.
- a push button rear window defogger on/off control (8). The button contains an LED that illuminates when the rear window defogger system is in operation.



The front A/C-heater control cannot be repaired and, if faulty or damaged, it must be replaced. The illumination lamps (9) and control knobs are available for service replacement.

The A/C-heater control for the MTC single zone heating-A/C system is diagnosed using a scan tool. Refer to 24 - HVAC Electrical Diagnostics for more information.

The A/C-heater control utilizes integrated circuitry and information carried on the controller area network (CAN) B bus to monitor many sensors and switch inputs throughout the vehicle. In response to those inputs, the internal circuitry and programming of the A/C-heater control allows it to control electronic functions and features of the MTC heating-A/C system.

The inputs received by the A/C-heater control of the MTC heating-A/C system on the CAN B bus are as follows:

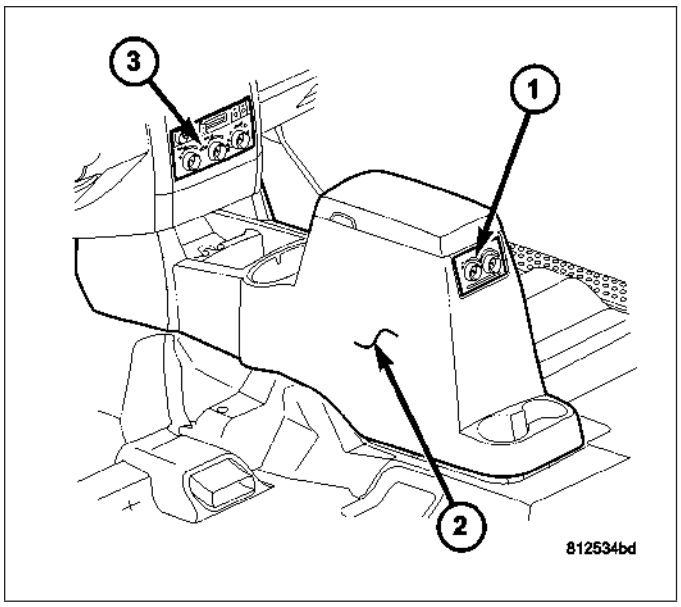
- Dimming
- Refrigerant Pressure
- Vehicle Identification Number
- Vehicle Odometer
- Engine Coolant Temperature
- Ambient Air Temperature
- Vehicle Speed

The messages broadcasted by the A/C-heater control of the MTC heating-A/C system on the CAN B bus are as follows:

- A/C Request
- A/C Select
- Rear Window Defogger (EBL) Request
- Rear Washer Request
- Rear Wiper Request

REAR CONTROL PANEL

The rear A/C-heater control (1) is located at the rear of the center floor console (2) and allows intermediate seat passengers to adjust rear air distribution, temperature and blower motor speed when the center control knob on the front A/C-heater control (3) is set to the Rear position (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS - REAR/CONTROL-A/C HEATER - DESCRIPTION).

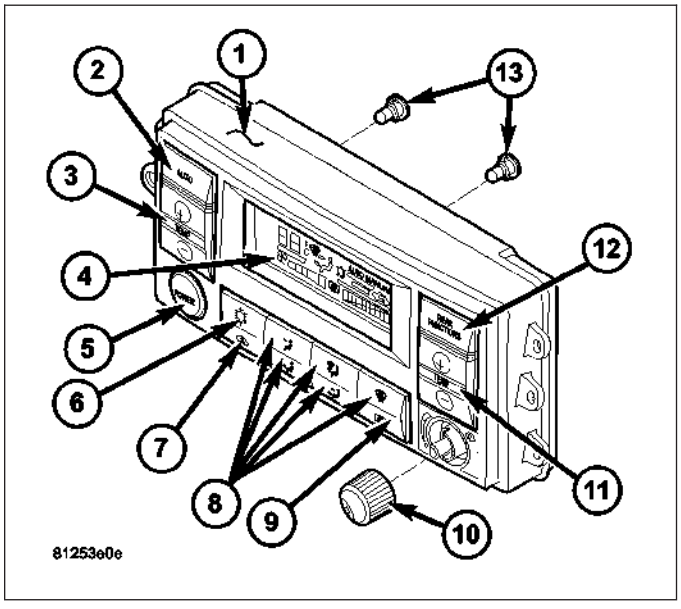


AUTOMATIC SINGLE ZONE WITH REAR HEAT AND A/C

The A/C-heater control (1) for the automatic temperature control (ATC) single zone front and rear heating-A/C system allows both the front and intermediate seat passengers the ability to automatically or manually regulate air temperature as well as fan speed and provides floor outlets near the right rear door and overhead outlets at each rear intermediate outboard seating position. Primary control for the rear blower motor is on the front A/C-heater control. All controls are identified by ISO graphic symbols.

FRONT CONTROL PANEL

The front A/C-heater control and integral computer is located in the instrument panel and contains:



- a push button Auto mode control (2).
- a rocker switch control that selects comfort temperatures from 15° to 29° C (60° to 85° F) (3). Comfort temperatures are shown in the vacuum-flourescent (VF) digital display (4). If the set temperature is 15° C (60° F) and down (–) is pressed, the A/C-heater control will attempt to achieve the lowest temperature possible, but the display will show LO. If the set temperature is 29° C (85° F) and up (+) is pressed, the A/C-heater control will attempt to achieve the highest temperature possible, but the display will show HIGH. Temperatures can be displayed in either Metric or Fahrenheit, which is selected from the overhead console.
- a push button on/off control which allows the system to be completely turned off (5). The display is blank when the heater-A/C system is off, except for the electric backlight (EBL) symbol, if EBL is on.
- a push button A/C on/off control (6). An ISO Snowflake symbol appears in the display when the A/C system is in operation, whether under manual or automatic control.
- a push button air recirculation control (7). A ISO Recirculation symbol appears in the display when the button is pressed, or when the system exceeds 80 percent circulated air under automatic control due to high A/C demand.

- five push button mode controls (8). An ISO mode symbol appears in the display to show the current mode setting when each button is manually pressed or selected by Auto mode.
- a push button rear window defogger on/off control (9). An ISO symbol appears in the display when the rear window defogger system is in operation. The ISO symbol will appear on the display even with the heating-A/C system turned off.
- a rotary control knob for rear window washer operation and rear window wiper speed selection (10).
- a rocker switch control for front fan speed selection that can override the automatic controls (11).
- a push button control for the rear heating-A/C system (12).
- computer logic that remembers the settings of the controls when the ignition is turned off and retains those settings after a restart. If the system is off when the ignition is turned off it will be off when the engine is restarted, etc.
- computer logic that provides variable air recirculation under high temperature and humidity conditions. Because recirculation is generally accompanied by increased fan noise, the proportion of recirculated to outside air gradually approaches full recirculation over a broad temperature range.

The front A/C-heater control cannot be repaired and, if faulty or damaged, it must be replaced. The illumination lamps (13) and the wiper/wash control knob are available for service replacement.

The A/C-heater control for the ATC single zone front and rear heating-A/C system is diagnosed using a scan tool. Refer to 24 - HVAC Electrical Diagnostics for more information.

The A/C-heater control utilizes integrated circuitry and information carried on the controller area network (CAN) B bus to monitor many sensors and switch inputs throughout the vehicle. In response to those inputs, the internal circuitry and programming of the A/C-heater control allows it to control electronic functions and features of the ATC heating-A/C system.

The inputs received by the A/C-heater control of the ATC heating-A/C system on the CAN B bus are as follows:

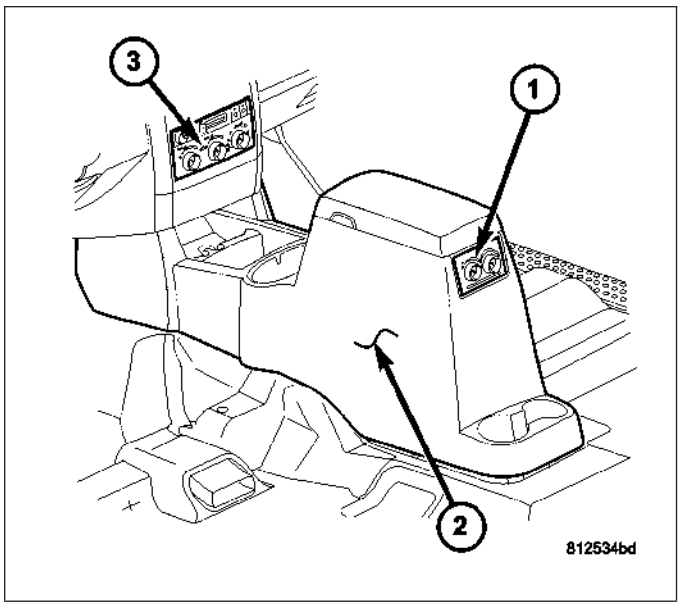
- Dimming
- Refrigerant Pressure
- Vehicle Identification Number
- Vehicle Odometer
- Engine Coolant Temperature
- Ambient Air Temperature
- Infrared Temperature Sensor
- Ignition Voltage
- Vehicle Speed

The messages broadcasted by the A/C-heater control of the ATC heating-A/C system on the CAN B bus are as follows:

- A/C Request
- A/C Select
- Rear Window Defogger (EBL) Request
- Rear Washer Request
- Rear Wiper Request

REAR CONTROL PANEL

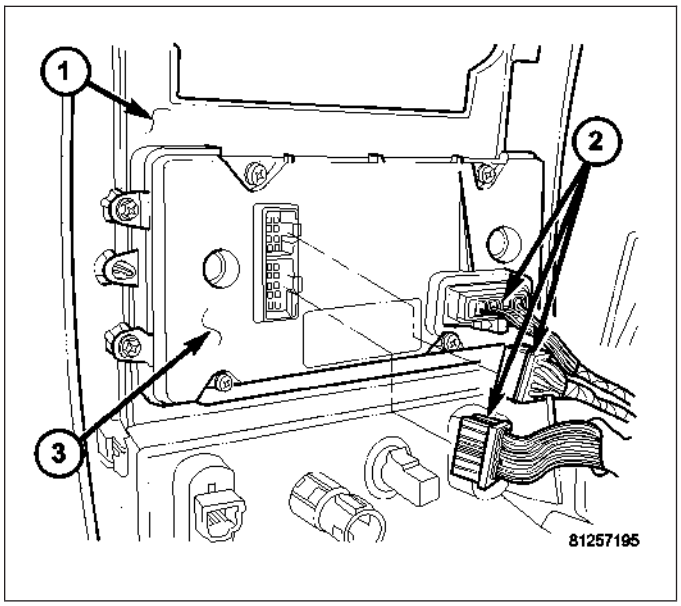
The rear A/C-heater control (1) is located at the rear of the center floor console (2) and allows intermediate seat passengers to adjust rear temperature and blower motor speed when the center control knob on the front A/C-heater control (3) is set to the Rear position (Refer to 24 - HEATING & AIR CONDITIONING/ CONTROLS - REAR/CONTROL-A/C HEATER - DESCRIPTION).



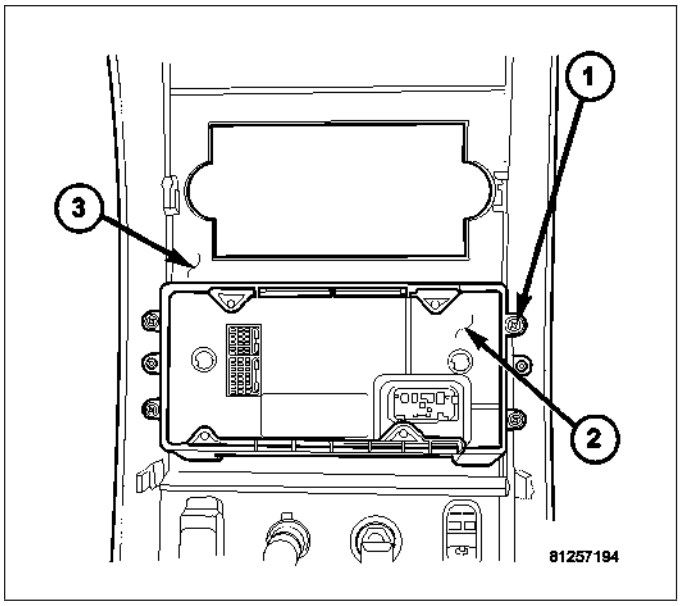
REMOVAL

WARNING: On vehicles equipped with airbags, disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.

1. Disconnect and isolate the negative battery cable.
2. Remove the center bezel (1) from the instrument panel, disconnect the wire harness connector(s) (2) from the A/C-heater control (3) and place the center bezel on a workbench (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - REMOVAL).

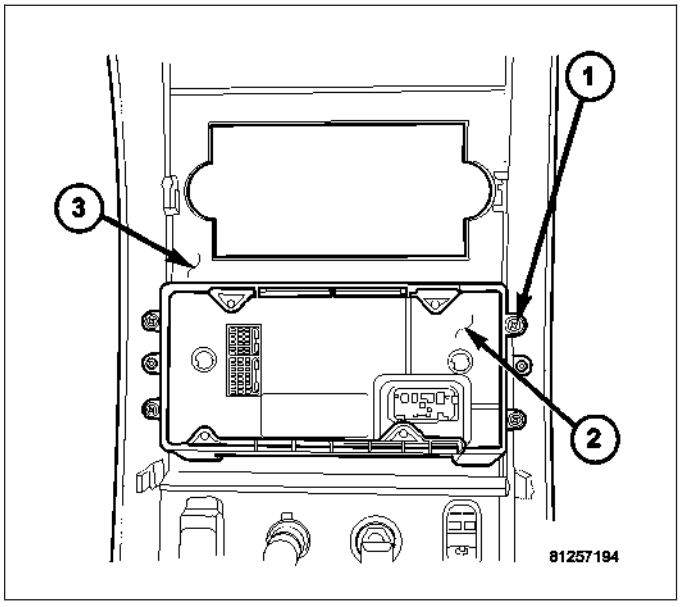


3. Remove the four screws (1) that secure the A/C-heater control (2) to the instrument panel center bezel (3).
4. Remove the A/C-heater control from the instrument panel center bezel.

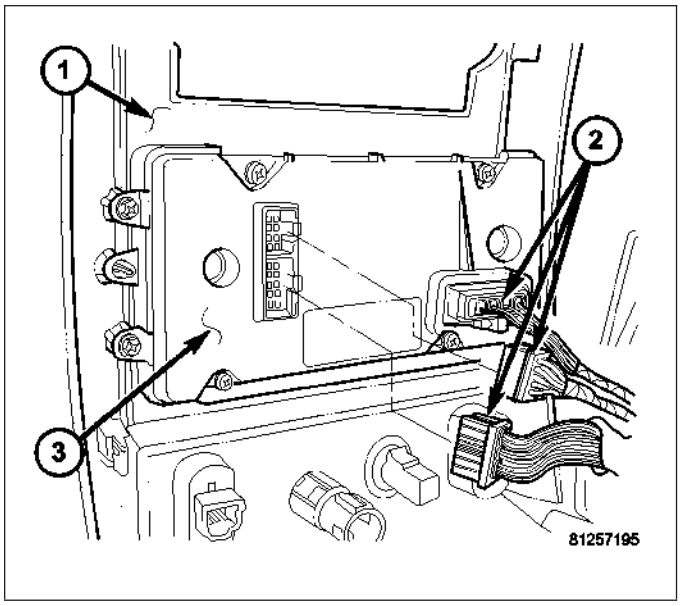


INSTALLATION

1. Position the A/C-heater control (2) into the instrument panel center bezel (3).
2. Install the screws (1) that secure the A/C-heater control to the instrument panel center bezel. Tighten the screws to 2 N·m (17 in. lbs.).



3. Connect the wire harness connector(s) (2) to the A/C-heater control (3) and install the instrument panel center bezel (1) (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - INSTALLATION).
4. Reconnect the negative battery cable.

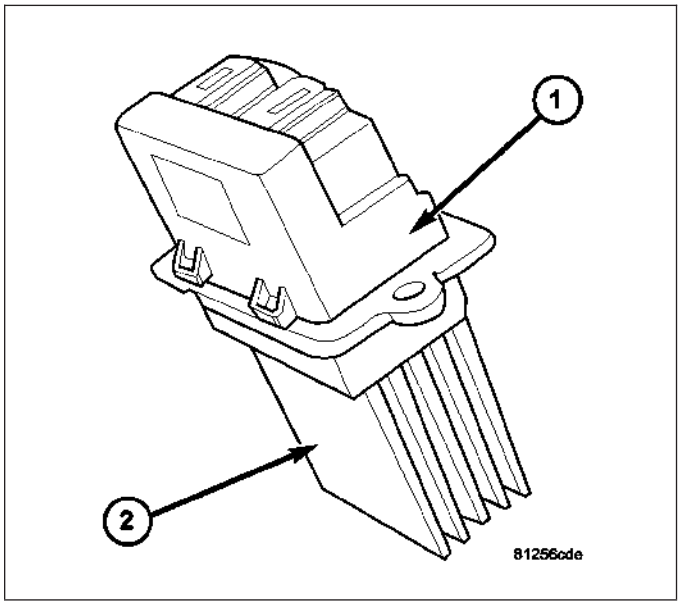


MODULE-POWER-BLOWER MOTOR

DESCRIPTION

A blower motor power module is used on this model when it is equipped with the automatic temperature control (ATC) heating-A/C system. Models equipped with the manual temperature control (MTC) heating-A/C system use a blower motor resistor block, instead of the blower motor power module (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS - FRONT/RESISTOR BLOCK-BLOWER MOTOR - DESCRIPTION).

The blower motor power module is mounted to the rear of the HVAC housing, directly behind the glove box. The blower motor power module consists of a molded plastic mounting plate with two integral connector receptacles (1). Concealed behind the mounting plate is the power module electronic circuitry and a large finned heat sink (2). The blower motor power module is accessed for service from beneath the right side of the instrument panel.



OPERATION

The blower motor power module is connected to the vehicle electrical system through a dedicated lead and connector of the HVAC wire harness. A second connector receptacle receives the wire harness connector from the blower motor. The blower motor power module allows the microprocessor-based automatic temperature control (ATC) A/C-heater control to calculate and provide infinitely variable blower motor speeds based upon either manual blower switch input or the ATC programming using a pulse width modulated (PWM) circuit strategy.

The PWM voltage is applied to a comparator circuit which compares the PWM signal voltage to the blower motor feedback voltage. The resulting output drives the power module circuitry, which provides a linear output voltage to change or maintain the desired blower speed.

The blower motor power module can be diagnosed using a scan tool.

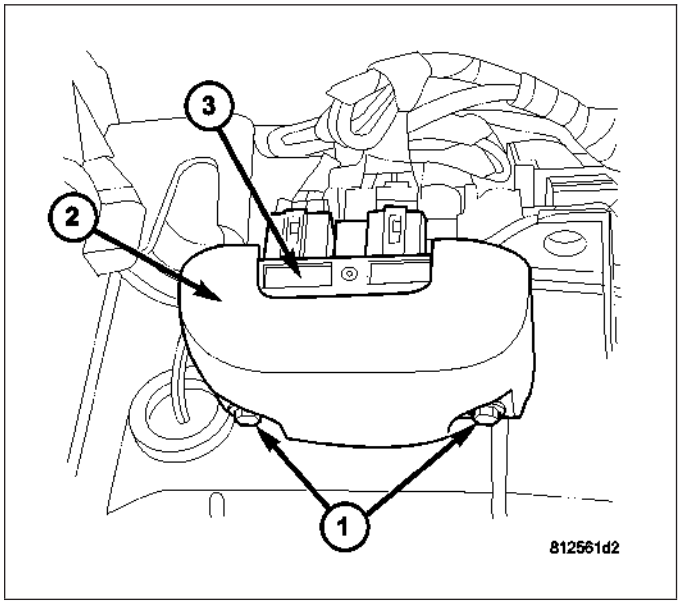
The blower motor power module cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

REMOVAL

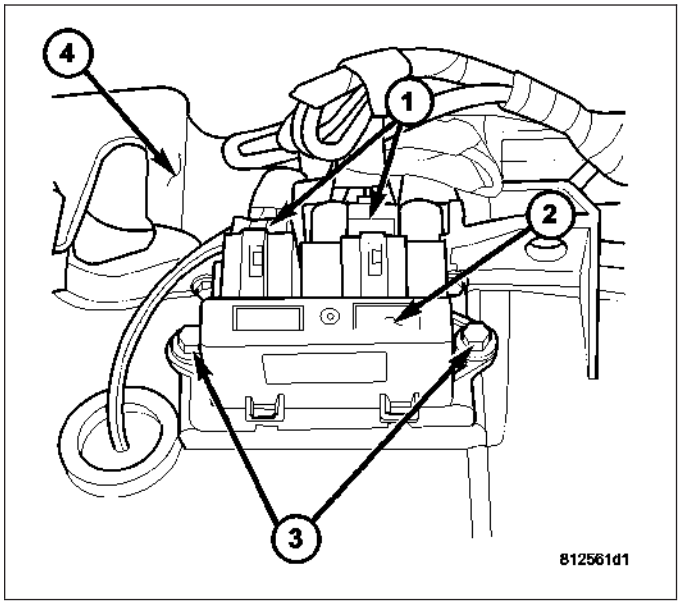
WARNING: On vehicles equipped with airbags, disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.

WARNING: The heat sink for the blower motor power module may get very hot during normal operation. If the blower motor was turned on prior to servicing the blower motor power module, wait five minutes to allow the heat sink to cool before performing diagnosis or service. Failure to take this precaution can result in possible personal injury.

1. Disconnect and isolate the negative battery cable.
2. Remove the two screws (1) that secure the trim cover (2) over the blower motor power module (3) located below the right side of the instrument panel.
3. Remove the trim cover.

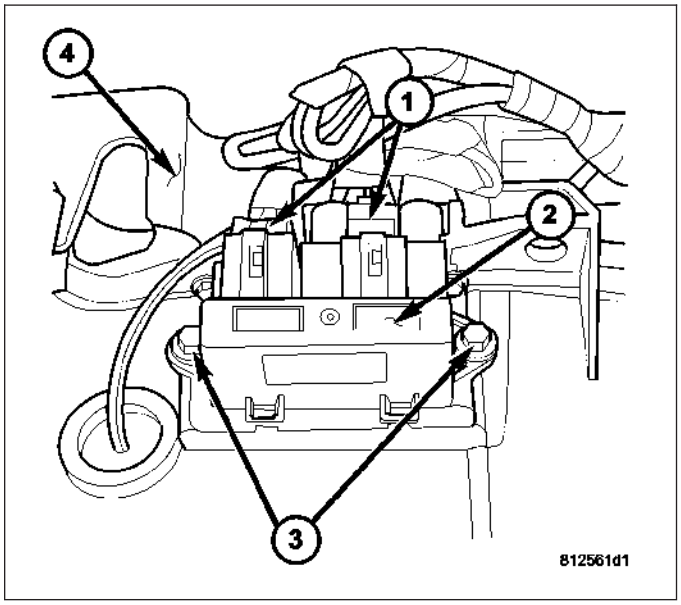


4. Disconnect the two wire harness connectors (1) from the blower motor power module (2).
5. Remove the two screws (3) that secure the blower motor power module to the front HVAC housing (4).
6. Remove the blower motor power module from the front HVAC housing.

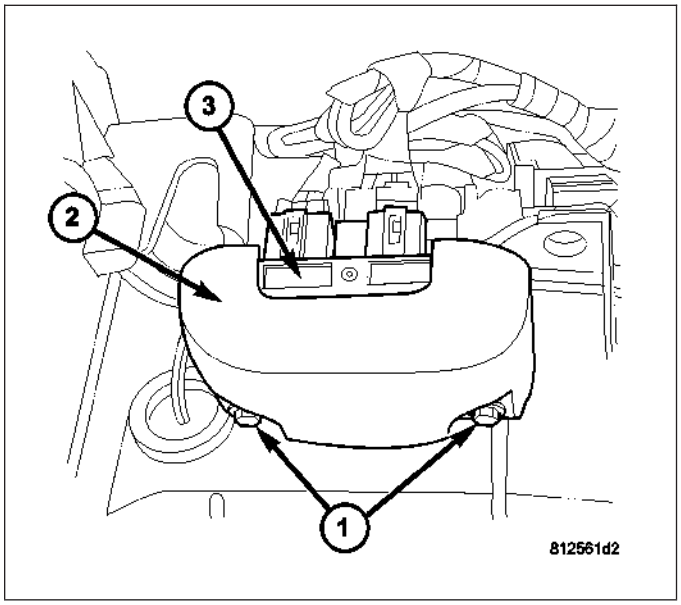


INSTALLATION

1. Position the blower motor power module (2) into the front HVAC housing (4).
2. Install the two screws (3) that secure the blower motor power module to the front HVAC housing. Tighten the screws to 2 N·m (17 in. lbs.).
3. Connect the two wire harness connectors (1) to the blower motor power module.



4. Install the trim cover (2) over the blower motor power module (3).
5. Install the two screws (1) that secure the trim cover to the front HVAC housing. Tighten the screws to 2 N·m (17 in. lbs.).
6. Reconnect the negative battery cable.

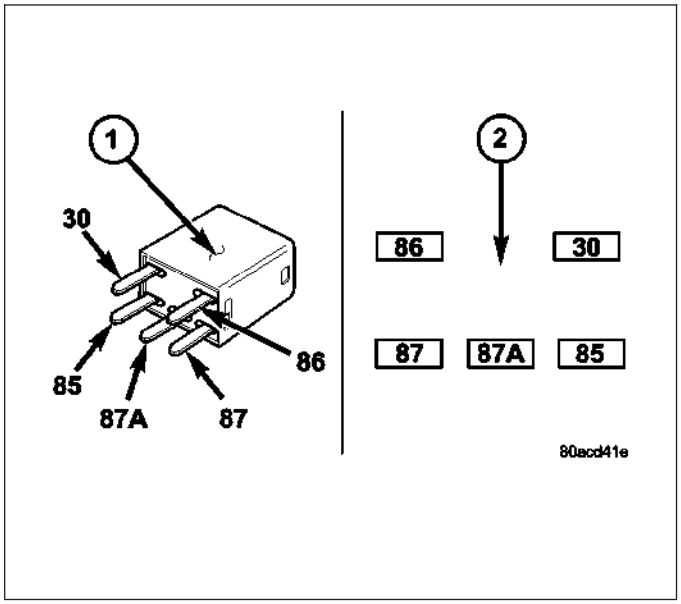


RELAY-A/C CLUTCH

DESCRIPTION

The A/C clutch relay (1) is a International Standards Organization (ISO) micro-relay. Relays conforming to the ISO specifications have common physical dimensions, current capacities, terminal functions and patterns (2). The ISO micro-relay terminal functions are the same as a conventional ISO relay. However, the ISO micro-relay terminal pattern (or footprint) is different, the current capacity is lower, and the physical dimensions are smaller than those of the conventional ISO relay.

The A/C clutch relay is located in the power distribution center (PDC) in the engine compartment.



OPERATION

The ISO-standard A/C clutch micro-relay is an electromechanical switch that uses a low current input controlled by the powertrain control module (PCM) to control the high current output to the A/C clutch field coil. The movable, common feed relay contact is held against the fixed, normally closed relay contact by spring pressure. When the electromagnetic relay coil is energized, it draws the movable common feed relay contact away from the fixed, normally closed relay contact and, holds it against the fixed, normally open relay contact. This action allows high current to flow to the A/C clutch field coil.

When the relay coil is de-energized, spring pressure returns the movable relay contact back against the fixed, normally closed contact point. The resistor or diode is connected in parallel with the relay coil, and helps to dissipate voltage spikes and electromagnetic interference that can be generated as the electromagnetic field of the relay coil collapses.

The A/C clutch relay terminals are connected to the vehicle electrical system through a receptacle in the power distribution center (PDC). The inputs and outputs of the A/C clutch relay include:

- The common feed terminal (30) receives fused battery current at all times.
- The coil ground terminal (85) receives a ground input from the PCM through the A/C clutch relay control circuit only when the PCM electronically pulls the control circuit to ground.
- The coil battery terminal (86) receives fused battery current through a ignition switch output (run-start) circuit only when the ignition switch is in the On or Start positions.
- The normally open terminal (87) provides a battery current output to the A/C clutch coil through the A/C clutch relay output circuit only when the compressor clutch relay coil is energized.
- The normally closed terminal (87A) is not connected to any circuit in this application, but provides a battery current output only when the A/C clutch relay coil is de-energized.

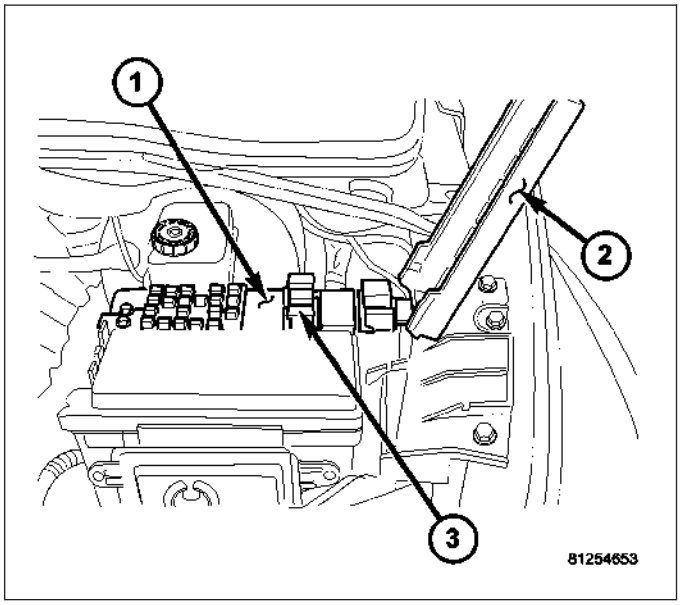
The A/C clutch relay cannot be repaired and, if faulty or damaged, it must be replaced. Refer to the appropriate wiring information for diagnosis and testing of the ISO-standard micro-relay and for complete HVAC wiring diagrams.

REMOVAL

1. Disconnect and isolate the negative battery cable.
2. Locate the power distribution center (PDC) (1).
3. Open the PDC cover (2).

NOTE: Refer to the fuse and relay map on the inside of the PDC cover for A/C clutch relay location.

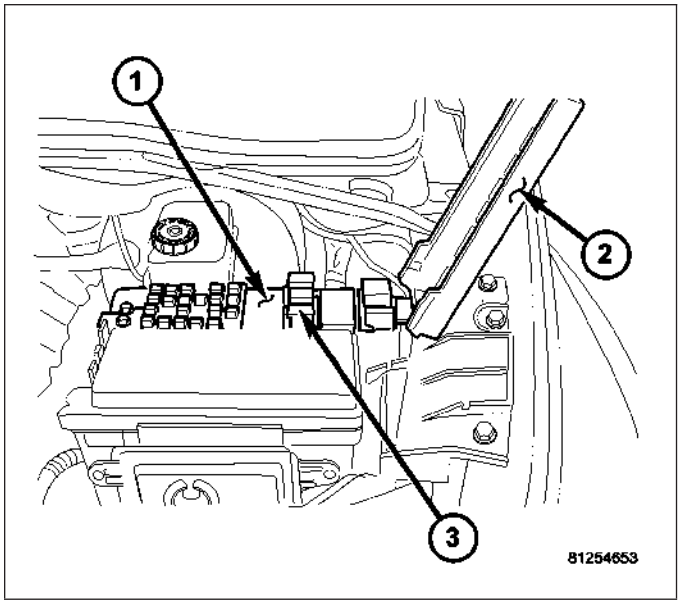
4. Remove the A/C clutch relay (3) from the PDC.



INSTALLATION

NOTE: Refer to the fuse and relay map on the inside of the PDC cover for A/C clutch relay location.

1. Position the A/C clutch relay (3) into the proper receptacle of the PDC (1).
2. Align the A/C clutch relay terminals with the terminal cavities in the PDC receptacle and push down firmly on the relay until the terminals are fully seated.
3. Close the PDC cover (2).
4. Reconnect the negative battery cable.

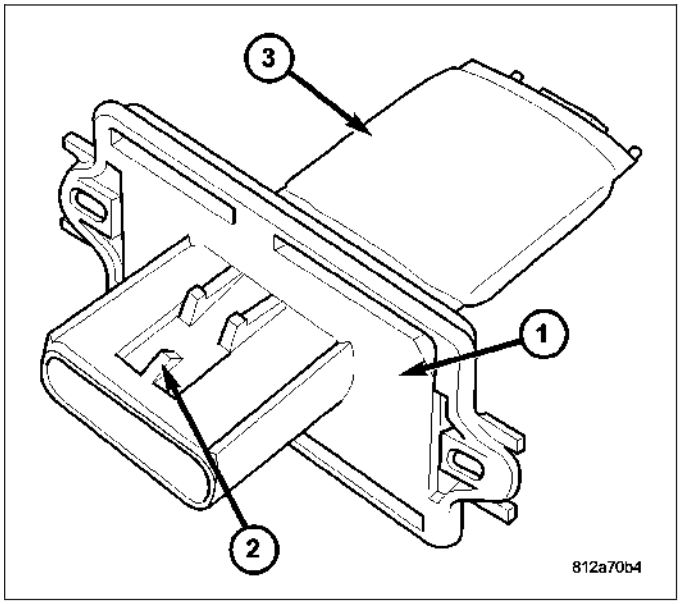


RESISTOR-BLOWER MOTOR

DESCRIPTION

A blower motor resistor is used on vehicles equipped with the manual temperature control (MTC) heating-A/C system. Vehicles equipped with the automatic temperature control (ATC) heating-A/C system use a blower motor power module, instead of the blower motor resistor (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/MODULE-POWER-BLOWER MOTOR - DESCRIPTION).

The front blower motor resistor is mounted to the rear of the HVAC housing, directly behind the glove box. The blower motor resistor consists of a molded plastic mounting plate (1) with an integral wire connector receptacle (2). Concealed behind the mounting plate are coiled resistor wires contained within a ceramic heat sink (3). The front blower motor resistor is accessed for service from beneath the right side of the instrument panel.



OPERATION

The blower motor resistor is connected to the vehicle electrical system through a dedicated wire lead and connector of the HVAC wire harness. The blower motor resistor has multiple resistor wires, each of which will reduce the current flow through the blower motor to change the blower motor speed.

The blower motor switch in the MTC heating-A/C system directs the ground path for the blower motor through the correct resistor wire to obtain the selected speed. With the blower motor control in the lowest speed position, the ground path for the blower motor is applied through all of the resistor wires. Each higher speed selected with the blower motor control applies the blower motor ground path through fewer of the resistor wires, increasing the blower motor speed.

The blower motor resistor cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

DIAGNOSIS AND TESTING

FRONT BLOWER MOTOR RESISTOR

WARNING: On vehicles equipped with airbags, disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.

NOTE: For circuit descriptions and diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, further details on wire harness routing and retention, as well as pin-out and location views for the various wire harness connectors, splices and grounds.

1. Disconnect and isolate the negative battery cable.
2. Disconnect the wire harness connector from the blower motor resistor (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS-FRONT/RESISTOR-BLOWER MOTOR - REMOVAL).

3. Using an ohmmeter, check for continuity between all of the blower motor resistor terminals. In each case there should be continuity. If OK, repair the wire harness circuits between the blower motor switch and the blower motor resistor or blower motor as required. If not OK, replace the faulty blower motor resistor.

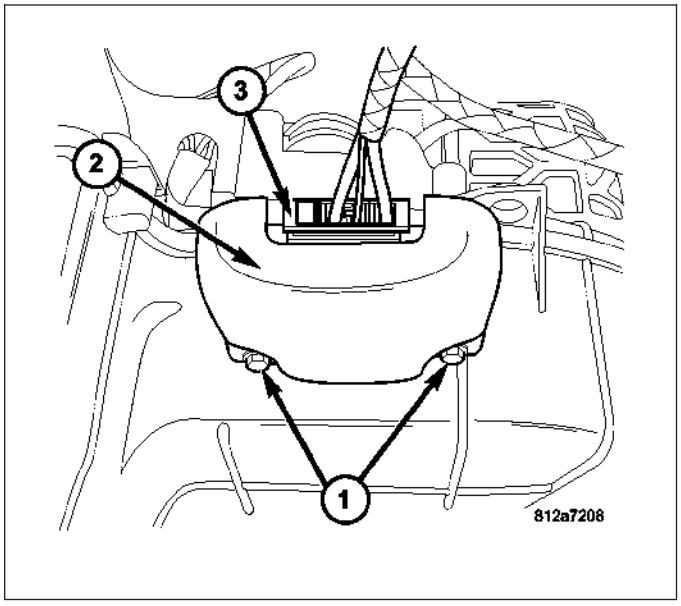
REMOVAL

WARNING: On vehicles equipped with airbags, disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.

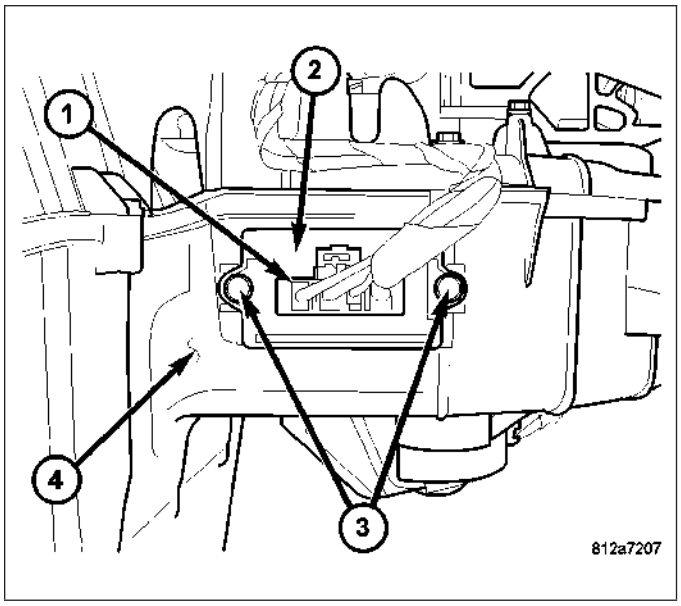
WARNING: The blower motor resistor may get very hot during normal operation. If the blower motor was turned on prior to servicing the blower motor resistor , wait five minutes to allow the blower motor resistors to cool before performing diagnosis or service. Failure to take this precaution can result in possible personal injury.

CAUTION: Do not operate the blower motor with the blower motor resistor removed from the circuit. Failure to take this precaution can result in vehicle damage.

1. Disconnect and isolate the negative battery cable.
2. Remove the two screws (1) that secure the trim cover (2) over the blower motor resistor (3) located below the right side of the instrument panel.
3. Remove the trim cover.

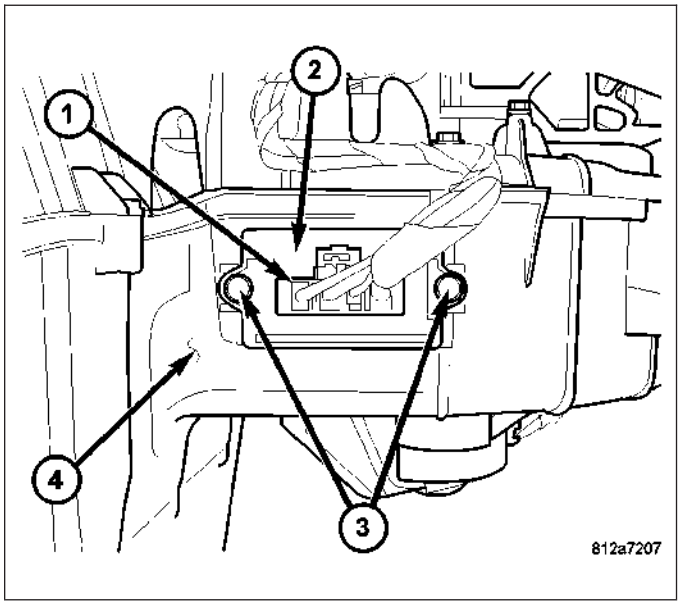


4. Disconnect the wire harness connector (1) from the blower motor resistor (2).
5. Remove the two screws (3) that secure the blower motor resistor to the front HVAC housing.
6. Remove the blower motor resistor from the front HVAC housing.

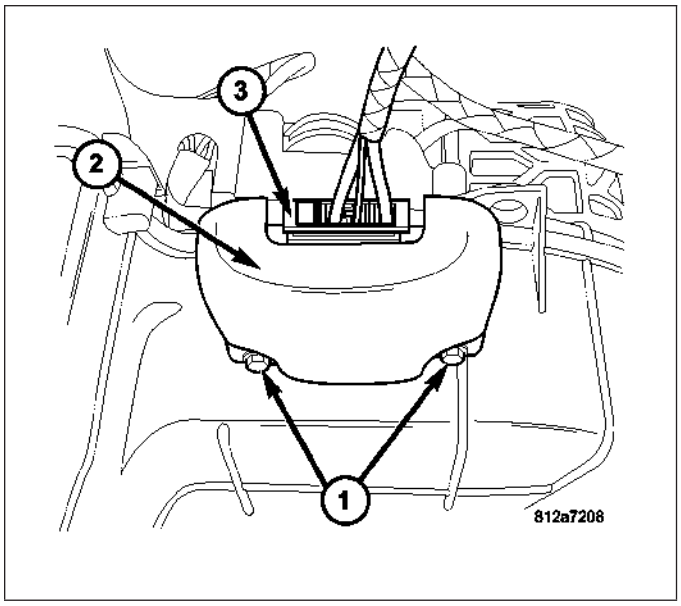


INSTALLATION

1. Position the blower motor resistor (2) into the front HVAC housing (4).
2. Install the two screws (3) that secure the blower motor resistor to the front HVAC housing. Tighten the screws to 2 N·m (17 in. lbs.).
3. Connect the wire harness connector (1) to the blower motor resistor.



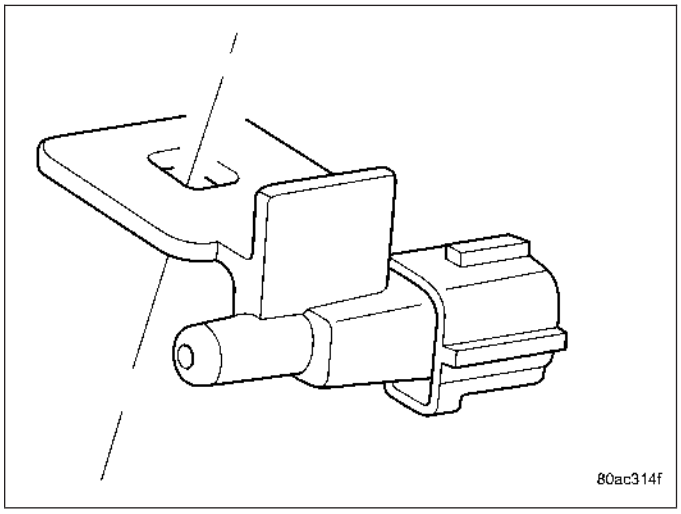
4. Install the trim cover (2) over the blower motor resistor.
5. Install the two screws (1) that secure the trim cover to the front HVAC housing. Tighten the screws to 2 N·m (17 in. lbs.).
6. Reconnect the negative battery cable.



SENSOR-AMBIENT AIR TEMPERATURE

DESCRIPTION

The ambient air temperature sensor is a variable resistor that monitors the air temperature outside of the vehicle. The ambient air temperature sensor is mounted onto the inside of the front bumper beam and its data is used by the heating-A/C system to maintain optimum cabin temperature levels.



OPERATION

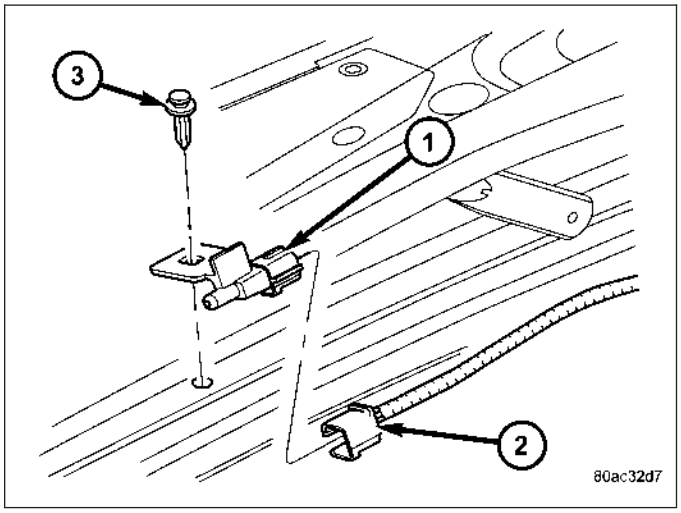
The ambient air temperature sensor is a variable resistor that operates on a ground circuit and a 5-volt reference signal circuit sent by the front control module (FCM) through a two-wire lead and connector of the vehicle wire harness. The ambient air temperature sensor changes its internal resistance in response to changes in the outside air temperature, which either increases or decreases the reference signal voltage read by the FCM. The FCM converts and broadcasts the sensor data over the controller area network (CAN) B bus, where it is read by the A/C-heater control and other various vehicle control modules.

The ambient air temperature sensor is diagnosed using the scan tool. Refer to 9 - Engine Electrical Diagnostics for more information.

The ambient air temperature sensor cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

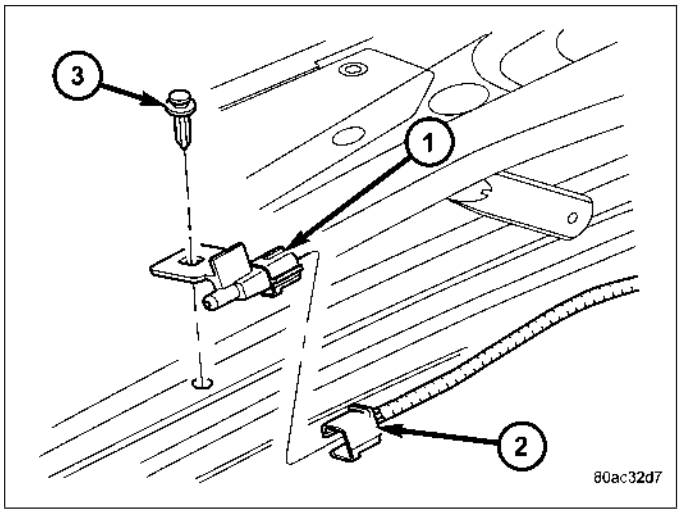
REMOVAL

1. Disconnect and isolate the negative battery cable.
2. Remove the push pin (3) that secures the ambient air temperature sensor (1) to the inside of the front bumper beam.
3. Disconnect the wire harness connector (2) from the ambient air temperature sensor and remove the sensor from the vehicle.



INSTALLATION

1. Connect the wire harness connector (2) to the ambient air temperature sensor (1).
2. Position the ambient air temperature sensor to the inside of the front bumper beam.
3. Install the push pin (3) that secures the ambient air temperature sensor to the front bumper beam.
4. Reconnect the negative battery cable.



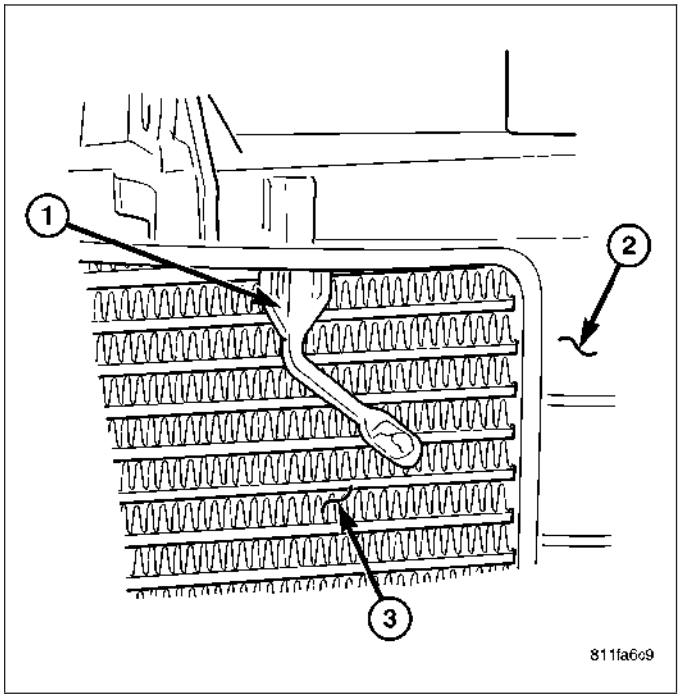
SENSOR-EVAPORATOR TEMPERATURE

DESCRIPTION

The evaporator temperature sensor (1) is an electrical thermistor located within a molded plastic case that is inserted into the HVAC housing (2) to measure the temperature of the conditioned air downstream of the A/C evaporator (3). Two terminals within the connector receptacle connect the sensor to the vehicle electrical system through a wire lead and connector of the HVAC wire harness.

NOTE: Cutaway of typical HVAC housing shown for clarity in illustration.

The external location of the evaporator temperature sensor allows the sensor to be removed or installed without disturbing the refrigerant in the A/C system.



OPERATION

The evaporator temperature sensor monitors the surface temperature of A/C evaporator and supplies an input signal to the A/C-heater control. The A/C-heater control uses the evaporator temperature sensor input signal to optimize A/C system performance and to protect the A/C system from evaporator freezing. The evaporator temperature sensor will change its internal resistance in response to the temperatures it monitors and is connected to the A/C-heater control through sensor ground circuit and a 5-volt reference signal circuit. As the temperature of the A/C evaporator decreases, the internal resistance of the evaporator temperature sensor decreases.

The A/C-heater control uses the resistance reading as an indication that conditions are correct to broadcast an A/C request message on the controller area network (CAN) B bus, where it is read by the front control module (FCM). The FCM then requests the powertrain control module (PCM) to cycle the A/C compressor clutch as necessary over the CAN C bus.

The evaporator temperature sensor is diagnosed using a scan tool. Refer to 24 - HVAC Electrical Diagnostics for more information.

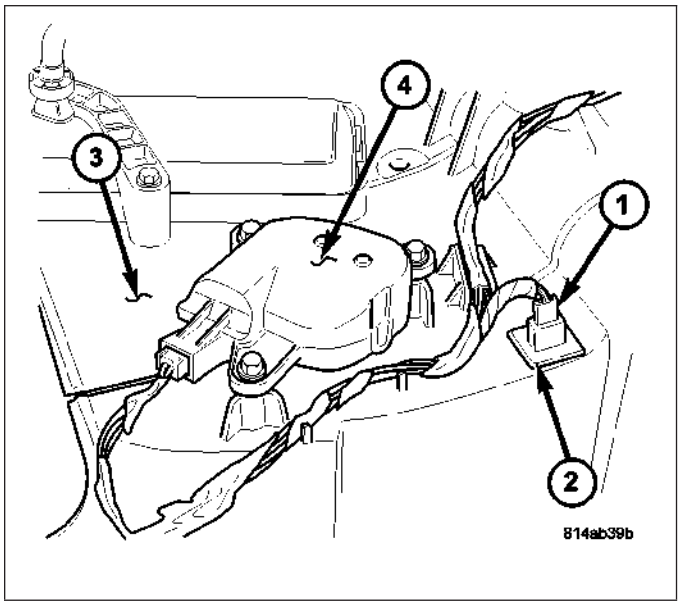
The evaporator temperature sensor cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

REMOVAL

WARNING: On vehicles equipped with airbags, disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.

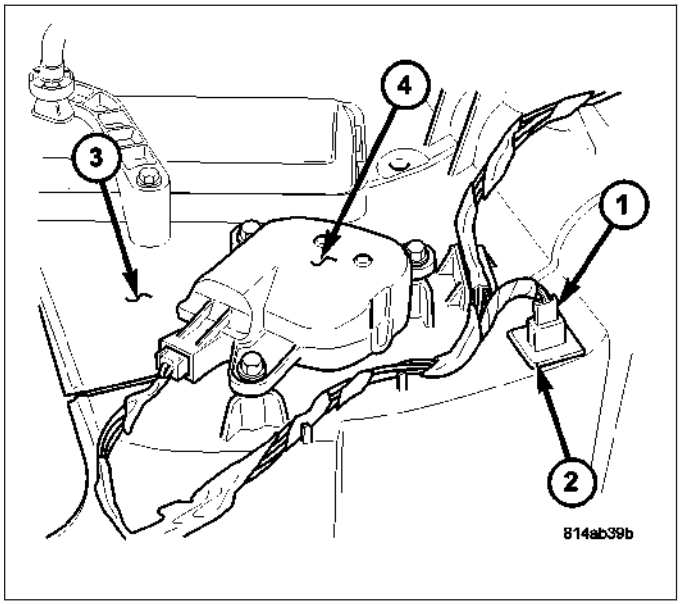
NOTE: Take the proper precautions to protect the front face of the instrument panel from cosmetic damage during this service procedure.

1. Disconnect and isolate the negative battery cable.
2. Remove the instrument panel assembly (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - REMOVAL).
3. Disconnect the HVAC wire harness connector (1) from the evaporator temperature sensor (2) located on the top of the HVAC housing (3) near the blend door actuator (4).
4. Remove the evaporator temperature sensor from the HVAC housing.



INSTALLATION

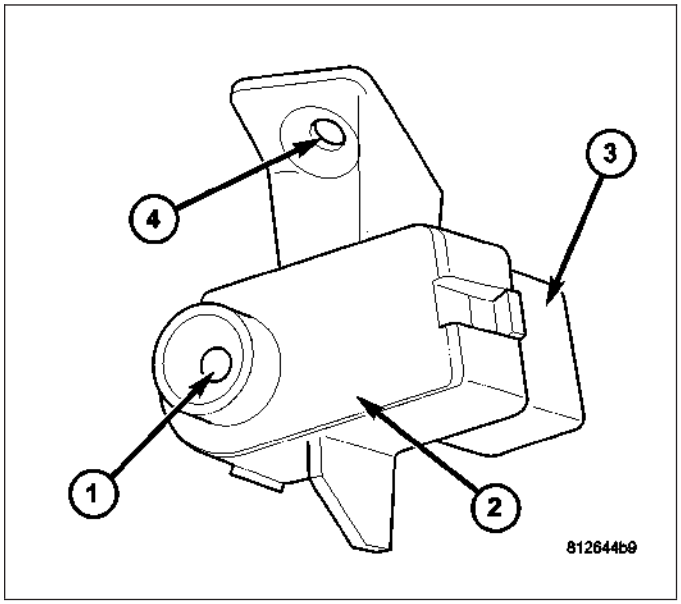
1. Install the evaporator temperature sensor (2) into the opening in the HVAC housing (3) near the blend door actuator (4).
2. Connect the HVAC wire harness connector (1) to the evaporator temperature sensor.
3. Install the instrument panel assembly (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - INSTALLATION).
4. Reconnect the negative battery cable.



SENSOR-INFRARED

DESCRIPTION

The infrared sensor consists of an infrared transducer (1) located on the driver side of the overhead console. The infrared sensor is used only on models equipped with the automatic temperature control (ATC) heater-A/C system. The infrared transducer is contained within a black molded plastic housing (2) with an integral wire connector receptacle (3). The integral mounting tab (4) allows the infrared sensor to be secured with one screw to the overhead console.



OPERATION

The infrared sensor detects thermal radiation emitted by the driver seat occupant and its surroundings and converts its data into a linear pulse width modulated (PWM) output signal, which is sent to the compass temperature module (EOM) through a two-wire lead and connector of the vehicle wire harness. The EOM sends a message over the controller area network (CAN) B bus where it is read by the automatic temperature control (ATC) A/C-heater control. The ATC A/C-heater control uses the infrared sensor data as one of the inputs necessary to automatically control the interior cabin temperature level. By using thermal radiation (surface temperature) measurement, rather than an air temperature measurement, the ATC heating-A/C system is able to adjust itself to the comfort level as perceived by the occupant. This allows the ATC system to compensate for other ambient conditions affecting comfort levels, such as solar heat gain or evaporative heat loss.

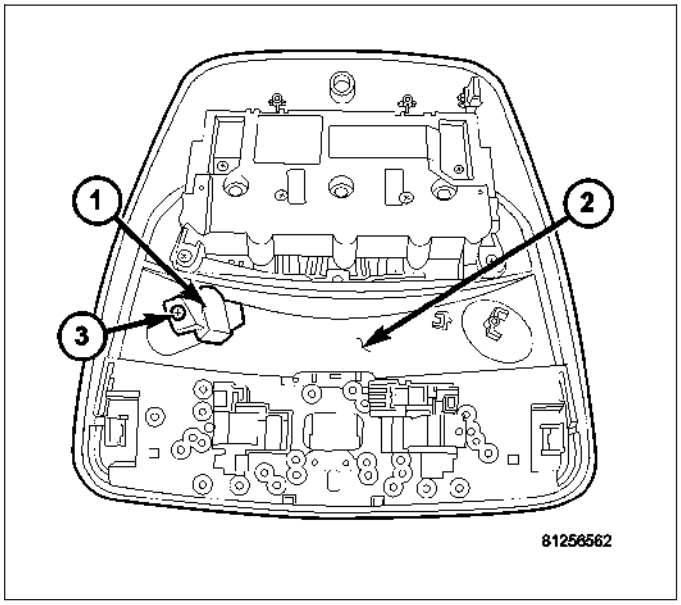
The ATC system logic responds to the infrared sensor message from the EOM by calculating and adjusting the air flow temperature and air flow rate needed to properly obtain and maintain the selected comfort level temperature of the occupants. The EOM continually monitors the infrared sensor circuits, and will store a diagnostic trouble code (DTC) for any problem it detects.

The infrared sensor cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

The infrared sensor is diagnosed using a scan tool. Refer to 8 - Electrical Overhead Console Electrical Diagnostics for more information.

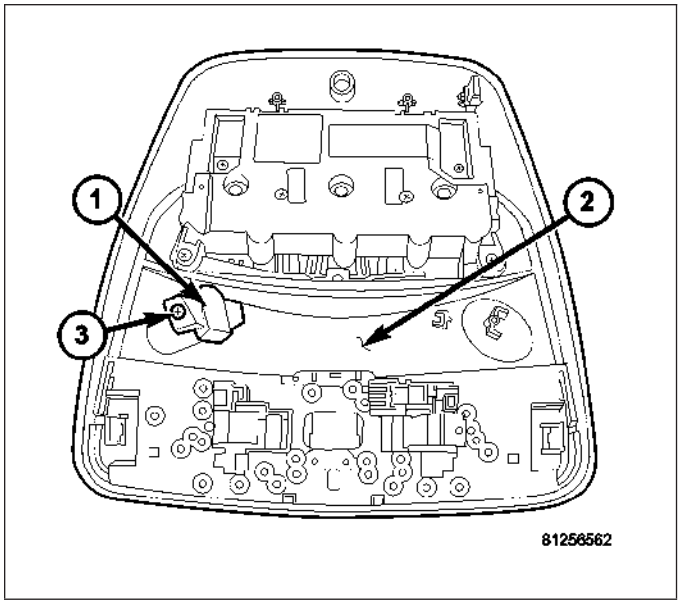
REMOVAL

1. Disconnect and isolate the negative battery cable.
2. Remove the overhead console (2) and place it on a workbench (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - REMOVAL).
3. Remove the screw (3) that secures the infrared sensor (1) to the overhead console.
4. Remove the infrared sensor from the overhead console.



INSTALLATION

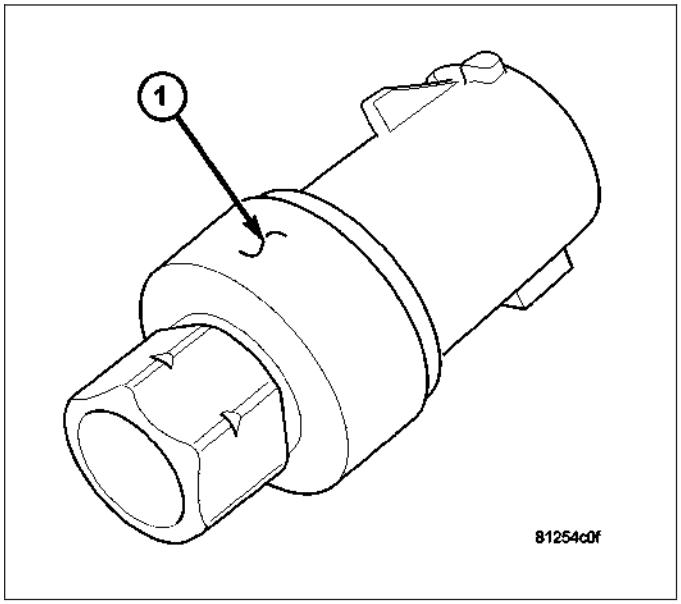
1. Position the infrared sensor (1) onto the overhead console (2).
2. Install the screw (3) that secures the infrared sensor to the overhead console. Tighten the screw to 2 N·m (17 in. lbs).
3. Install the overhead console (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - INSTALLATION).
4. Reconnect the negative battery cable.



TRANSDUCER-A/C PRESSURE

DESCRIPTION

The A/C pressure transducer (1) is a switch that is installed on a fitting located on the A/C discharge line. An internally threaded fitting on the A/C pressure transducer connects it to the externally threaded Schrader-type fitting on the A/C discharge line. A rubber O-ring seals the connection between the A/C pressure transducer and the discharge line fitting. The A/C pressure transducer is connected to the vehicle electrical system by a molded plastic connector with three terminals.



OPERATION

The A/C pressure transducer monitors the pressures in the high side of the refrigerant system through its connection to a fitting on the discharge line. The A/C pressure transducer will change its internal resistance in response to the pressures it monitors. A Schrader-type valve in the discharge line fitting permits the A/C pressure transducer to be removed or installed without disturbing the refrigerant in the A/C system.

The front control module (FCM) provides a five volt reference signal to the A/C pressure transducer, then monitors the output voltage of the A/C pressure transducer on a sensor return circuit to determine refrigerant pressure. The FCM broadcasts a refrigerant pressure message to the PCM, which is programmed to respond to the A/C pressure transducer and other sensor inputs by controlling the operation of the A/C compressor clutch and the radiator cooling fan to help optimize A/C system performance and to protect the system components from damage. The PCM will disengage the A/C compressor clutch when high side pressure rises above 3172 kPa (460 psi) and re-engage the clutch when high side pressure drops below 1999 kPa (290 psi). The A/C pressure transducer will also disengage the A/C compressor clutch if the high side pressure drops below 193 kPa (28 psi) and will re-engage the clutch when the high side pressure rises above 234 kPa (34 psi). If the refrigerant pressure rises above 1655 kPa (240 psi), the PCM will actuate the cooling fan. The A/C pressure transducer message to the PCM will also prevent the A/C compressor clutch from engaging when ambient temperatures are below about 4.5° C (40° F) due to the pressure/temperature relationship of the refrigerant. Refer to the Electric A/C Condenser Cooling Fan Switch Point chart for condenser cooling fan on/off pressures.

The A/C pressure transducer cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

The A/C pressure transducer is diagnosed using a scan tool. Refer to 9 - Engine Electrical Diagnostics for more information.

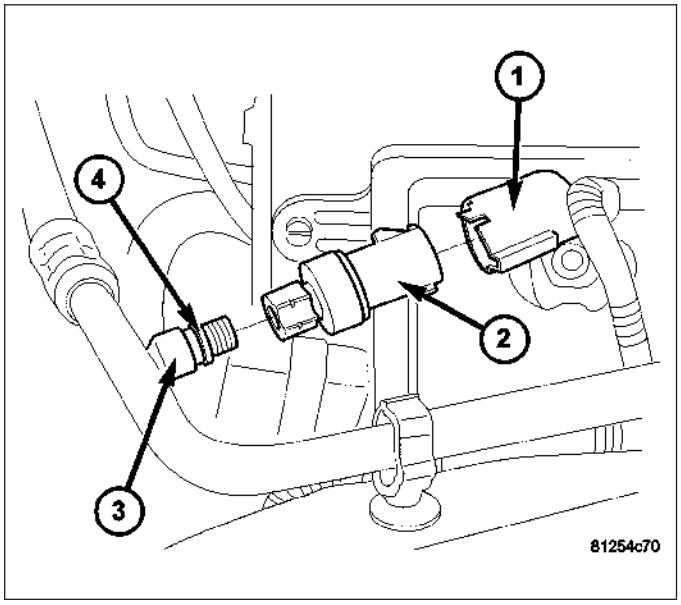
ELECTRIC A/C CONDENSER COOLING FAN SWITCH POINT

Fan State	Switch Point
Off to Low speed	1896 kPa (275 psi)
Low to High speed	2103 kPa (305 psi)
High to Low speed	1620 kPa (235 psi)
Low speed to Off	1344 kPa (195 psi)
Off to Low, Low to Off hysterisis	5552 kPa (80 psi)
Low to High, High to low hysterisis	483 kPa (70 PSI)

REMOVAL

NOTE: It is not necessary to discharge the refrigerant system to replace the A/C pressure transducer.

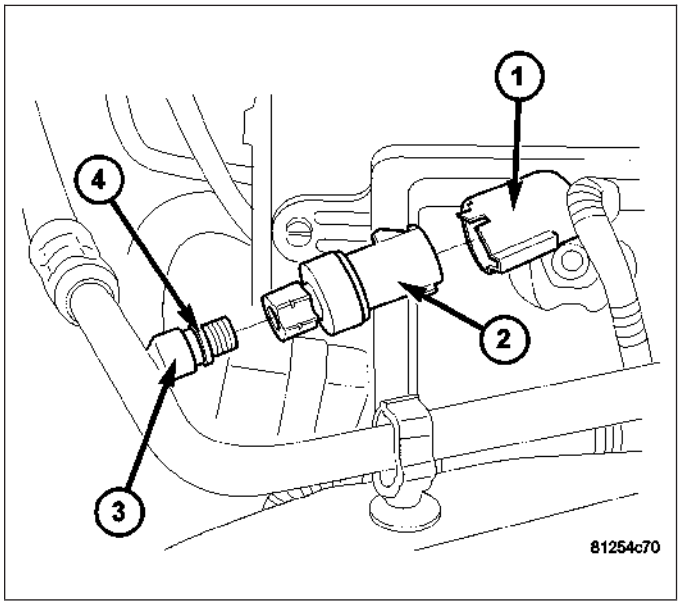
1. Disconnect and isolate the negative battery cable.
2. Disconnect the wire harness connector (1) from the A/C pressure transducer (2).
3. Remove the A/C pressure transducer from the A/C discharge line (3).
4. Remove the O-ring seal (4) from the discharge line fitting and discard.



INSTALLATION

NOTE: Use only the specified O-ring as it is made of special material for R-134a. Use only refrigerant oil of the type required for the A/C compressor.

1. Lubricate a new rubber O-ring seal (4) with clean refrigerant oil and install it onto the discharge line fitting (3).
2. Install the A/C pressure transducer (2) onto the discharge line fitting. Tighten the A/C pressure transducer securely.
3. Connect the wire harness connector (1) to the A/C pressure transducer.
4. Reconnect the negative battery cable.



CONTROLS - REAR

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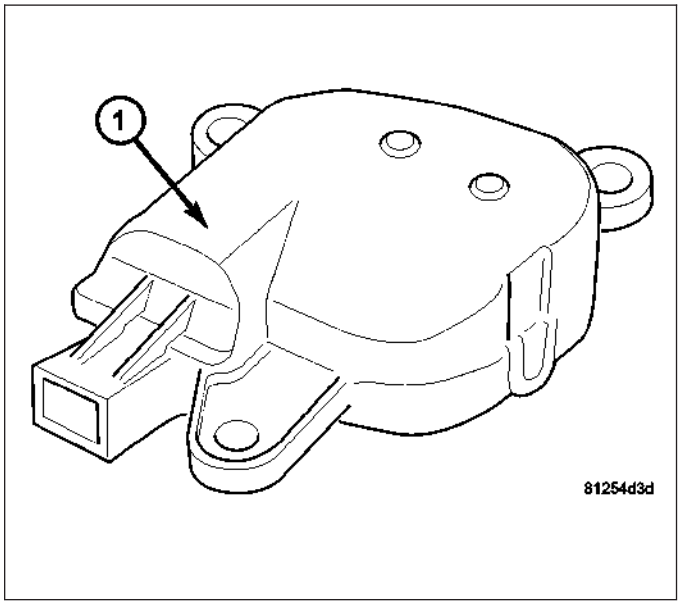
ACTUATOR-BLEND DOOR

DESCRIPTION

The rear blend door actuator (1) is a reversible, 12 volt direct current (DC), servo motor. The rear blend door actuator is located on the side of the rear HVAC housing. The rear blend door actuator is interchangeable with the actuator for the mode-air door. Each actuator is contained within an identical black molded plastic housing with an integral wire connector receptacle. Three integral mounting tabs allow the actuator to be secured to the rear HVAC housing. Each actuator also has an identical output shaft with splines that connects it to the rear blend-air door. The rear blend door actuator does require mechanical indexing to the rear blend-air door, as it is electronically calibrated by the A/C-heater control.



OPERATION

The rear blend door actuator is connected to the A/C-heater control through the vehicle electrical system by a dedicated two-wire lead and connector of the rear HVAC wire harness. The reawr blend door actuator can move the rear blend-air door in two directions. When the A/C-heater control pulls the voltage on one side of the motor connection high and the other connection low, the rear blend-air door will move in one direction. When the A/C-heater control reverses the polarity of the voltage to the motor, the rear blend-air door moves in the opposite direction.

When the A/C-heater control makes the voltage to both connections high or both connections low, the rear blend-air door stops and will not move. The A/C-heater control uses a pulse-count positioning system to monitor the operation and relative position of the rear blend door actuator and the rear blend-air door. The A/C-heater control learns the

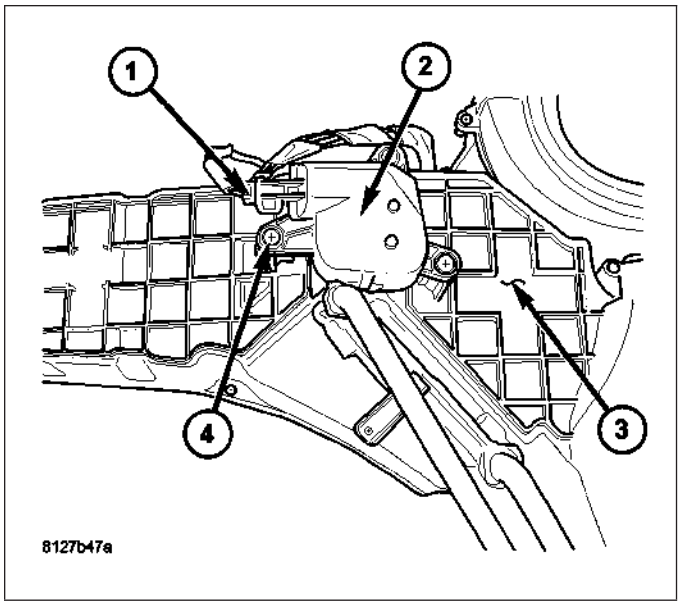
rear blend-air door stop positions during the calibration procedure and will store a diagnostic trouble code (DTC) for any problems it detects in the rear blend door actuator circuit.

The rear blend door actuator cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

The rear blend door actuator is diagnosed using a scan tool. Refer to 24 - HVAC Electrical Diagnostics for more information.

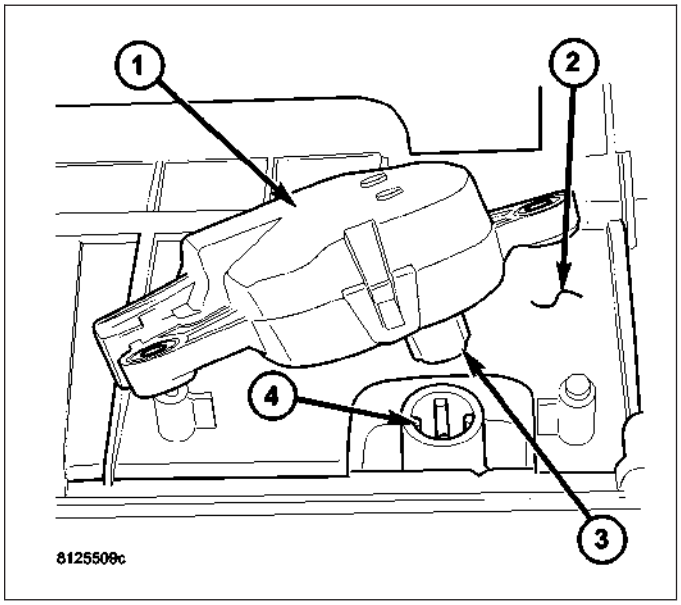
REMOVAL

1. Disconnect and isolate the negative battery cable.
2. Remove right rear quarter panel trim (Refer to 23 - BODY/INTERIOR/QUARTER PANEL TRIM - REMOVAL).
3. Remove the screws (4) that secure the rear blend door actuator (2) to the side of the rear HVAC housing (3).
4. Disconnect the rear HVAC wire harness connector (1) from the rear blend door actuator.
5. Remove the rear blend door actuator from the rear HVAC housing.

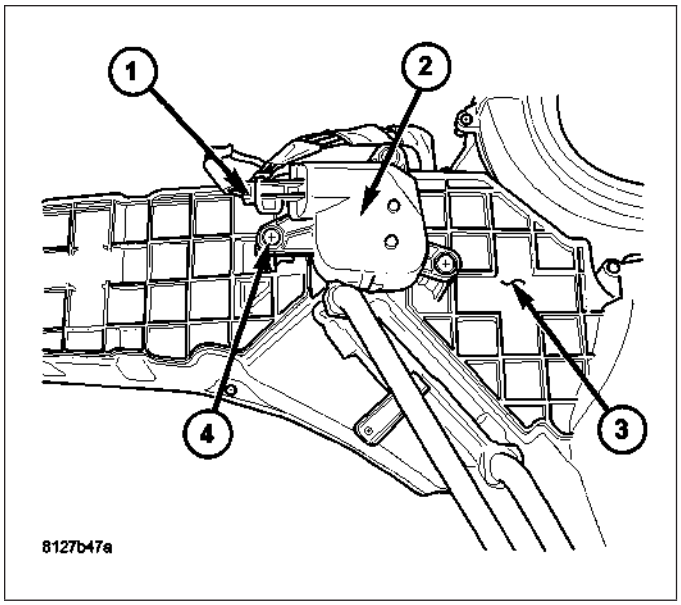


INSTALLATION

1. Position the rear blend door actuator (1) onto the side of the rear HVAC housing (2). If necessary, rotate the actuator slightly to align the splines on the actuator output shaft (3) with those on the rear actuator coupler (4).



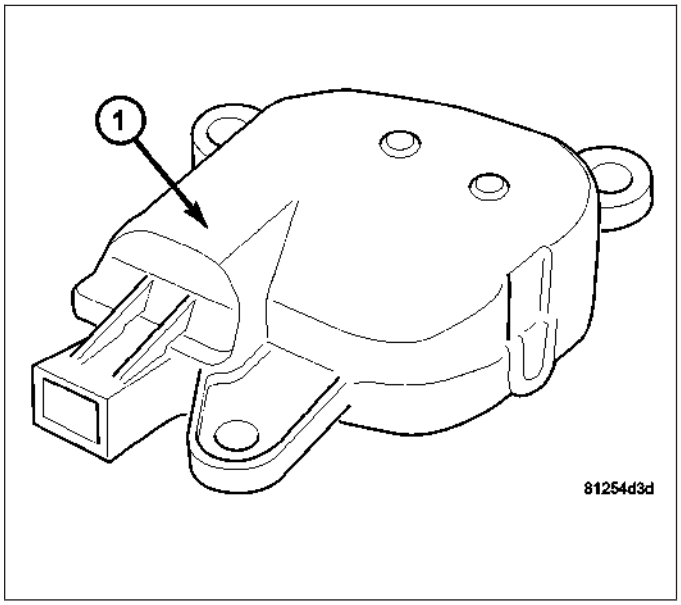
2. Install the screws (4) that secure the rear blend door actuator (2) to the rear HVAC housing (3). Tighten the screws to 2 N·m (17 in. lbs.).
3. Connect the rear HVAC wire harness connector (1) to the rear blend door actuator.
4. Install the right rear quarter panel trim (Refer to 23 - BODY/INTERIOR/QUARTER PANEL TRIM - INSTALLATION).
5. Reconnect the negative battery cable.
6. Initiate the Actuator Calibration function using a scan tool. Refer to HVAC System Test, found in 24 - HVAC - Electrical Diagnostics.



ACTUATOR-MODE DOOR

DESCRIPTION

The rear mode door actuator (1) is a reversible, 12–volt direct current (DC), servo motor. The rear mode door actuator is located near the front end of the rear HVAC housing. The rear mode door actuator is mechanically connected to the rear mode-air door. The rear mode door actuator is interchangeable with the actuator for the rear blend-air door. Each actuator is contained within an identical black molded plastic housing with an integral wire connector receptacle. Three integral mounting tabs allow the actuator to be secured to the side of the rear HVAC housing. The rear mode door actuator also has an identical output shaft with splines that connects it to the mode-air door. The rear mode door actuator does not require mechanical indexing to the mode-air door, as it is electronically calibrated by the A/C-heater control.



OPERATION

The rear mode door actuator is connected to the A/C-heater control through the vehicle electrical system by a dedicated two-wire lead and connector of the rear HVAC wire harness. The rear mode door actuator can move the rear model-air door in two directions. When the A/C-heater control pulls the voltage on one side of the motor connection high and the other connection low, the rear mode-air door will move in one direction. When the A/C-heater control reverses the polarity of the voltage to the motor, the rear mode-air door moves in the opposite direction.

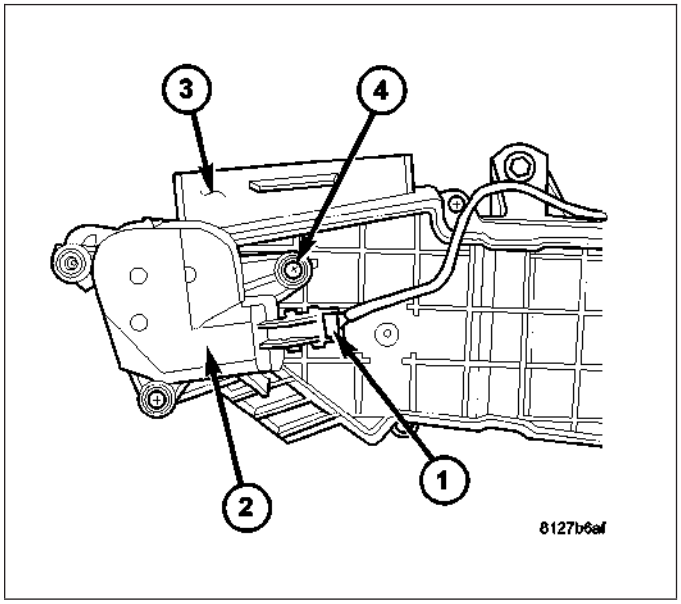
When the A/C-heater control makes the voltage to both connections high or both connections low, the rear mode-air door stops and will not move. The A/C-heater control uses a pulse-count positioning system to monitor the operation and relative position of the rear mode door actuator and the rear mode-air door. The A/C-heater control learns the rear mode-air door stop positions during the calibration procedure and will store a diagnostic trouble code (DTC) for any problems it detects in the rear mode door actuator circuit.

The rear mode door actuator cannot be adjusted or repaired and, if faulty or damaged, they must be replaced.

The rear mode door actuators are diagnosed using a scan tool. Refer to 24 - HVAC Electrical Diagnostics for more information.

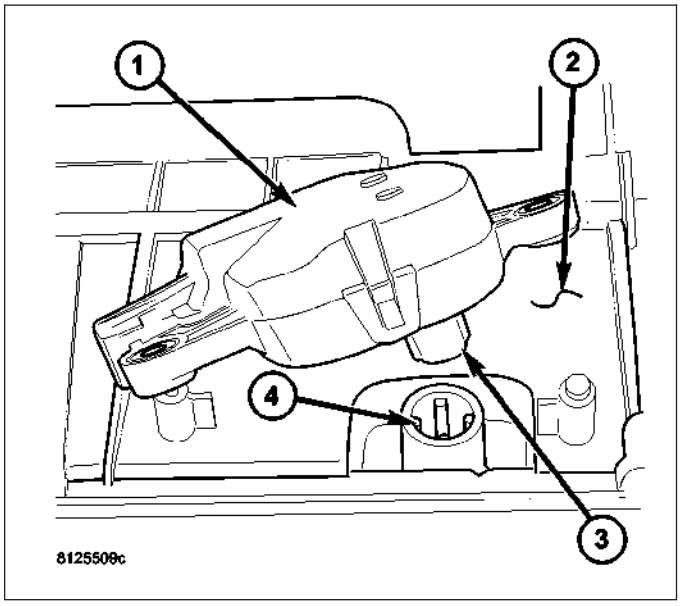
REMOVAL

1. Disconnect and isolate the negative battery cable.
2. Remove right rear quarter panel trim (Refer to 23 - BODY/INTERIOR/QUARTER PANEL TRIM - REMOVAL).
3. Disconnect the rear HVAC wire harness connector (1) from the rear mode door actuator (2) located on the side of the rear HVAC housing (3).
4. Remove the screws (4) that secure the rear mode door actuator to the rear HVAC housing.
5. Remove the rear mode door actuator from the rear HVAC housing.

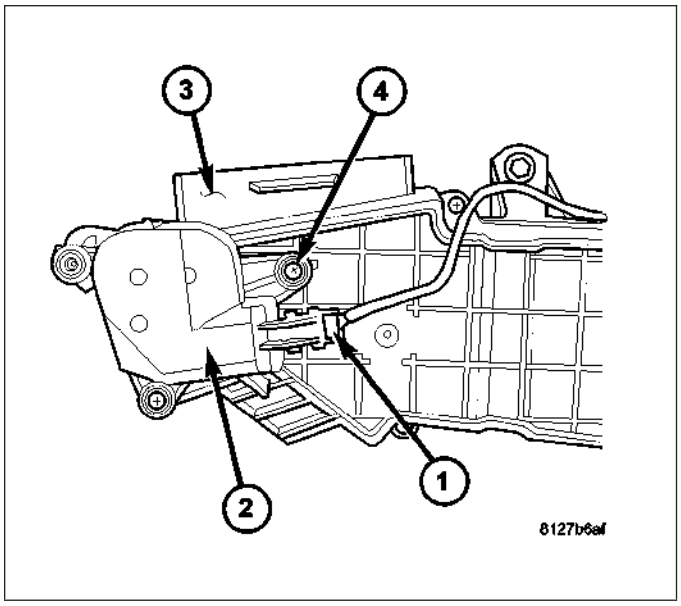


INSTALLATION

1. Position the rear mode door actuator (1) onto the side of the rear HVAC housing (2). If necessary, rotate the actuator slightly to align the splines on the actuator output shaft (3) with those in the actuator coupler (4).



2. Install the screws (4) that secure the rear mode door actuator (2) to the rear HVAC housing (3). Tighten the screws to 2 N·m (17 in. lbs.).
3. Connect the rear HVAC wire harness connector (1) to the rear mode door actuator.
4. Reconnect the negative battery cable.
5. Initiate the Actuator Calibration function using a scan tool. Refer to HVAC System Test, found in 24 - HVAC - Electrical Diagnostics.



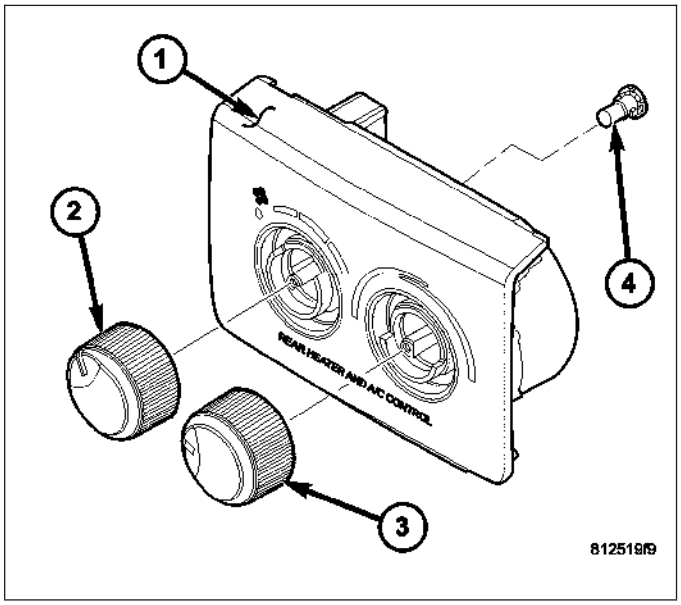
CONTROL-A/C-HEATER

DESCRIPTION

The rear A/C-heater control (1) for the rear heater-A/C system is located at the rear of the center floor console and allows intermediate seat passengers to adjust rear temperature and blower motor speed when the front A/C-heater control is set to the Rear position, otherwise the front A/C-heater control operates both the front and the rear heater-A/C systems. The rear A/C-heater control contains:

- a rotary control knob (2) for rear fan speed selection and turning the rear heater-A/C system off.
- a rotary control knob (3) for rear temperature control.

The rear A/C-heater control cannot be repaired and, if faulty or damaged, it must be replaced. The illumination lamp (4) and the control knobs are available for service replacement.



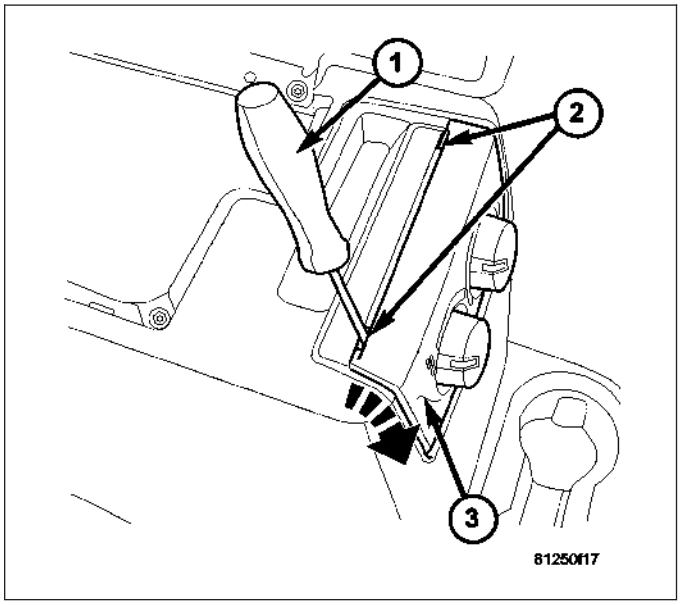
OPERATION

With the rear A/C-heater control active, temperature selection dictates the air distribution mode (floor or overhead air) of the rear heater-A/C system. A cool temperature setting directs flow to the overhead outlets and a warm temperature setting to the floor.

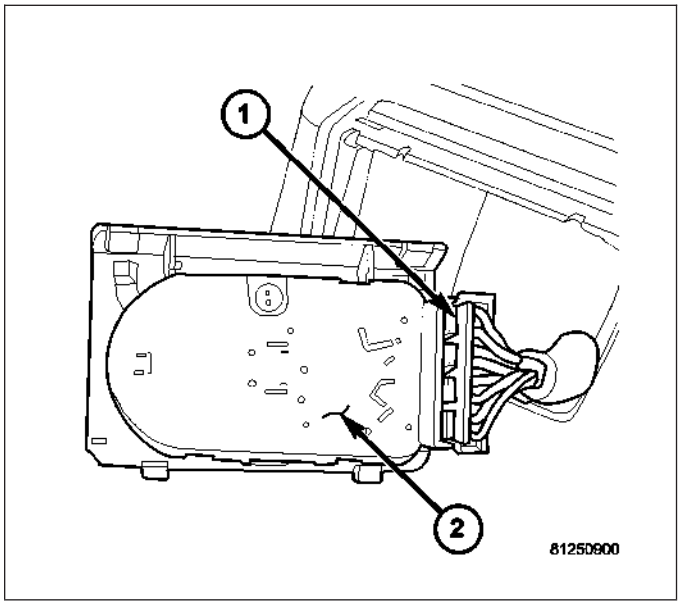
The rear A/C-heater control is diagnosed using a scan tool. Refer to 24 - HVAC Electrical Diagnostics for more information.

REMOVAL

1. Disconnect and isolate the negative battery cable.
2. Using a small screwdriver or similar flat blade tool (1), gently push down on the clip retainer (2) located at each top corner of the rear A/C-heater control (3). Rotate the top of rear A/C-heater control downwards to release the two bottom retaining tabs from the slots in the center floor console.

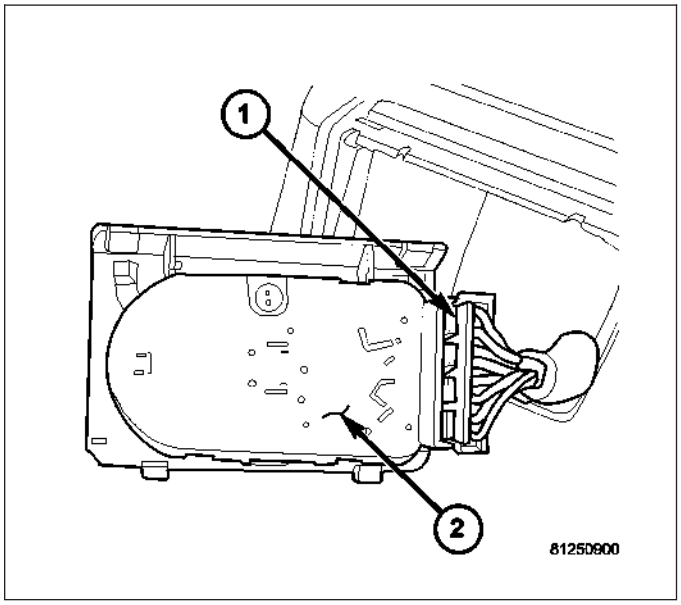


3. Disconnect the wire harness connector (1) from the rear A/C-heater control (2).
4. Remove the rear A/C-heater control from the vehicle.

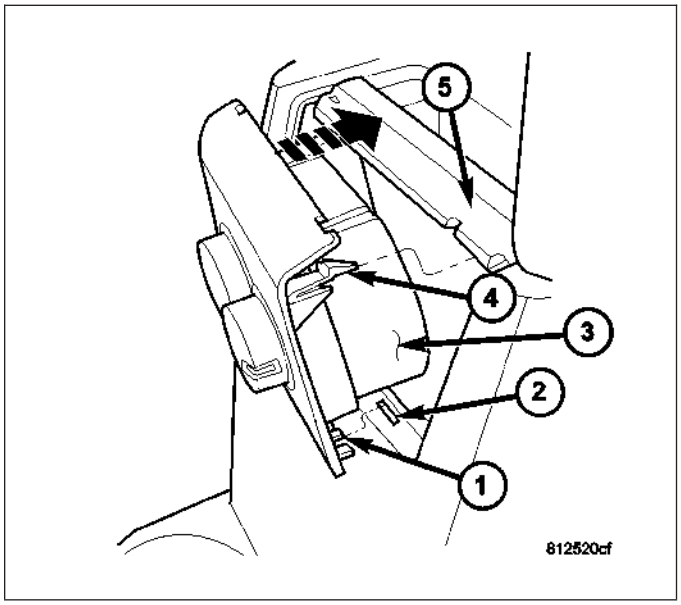


INSTALLATION

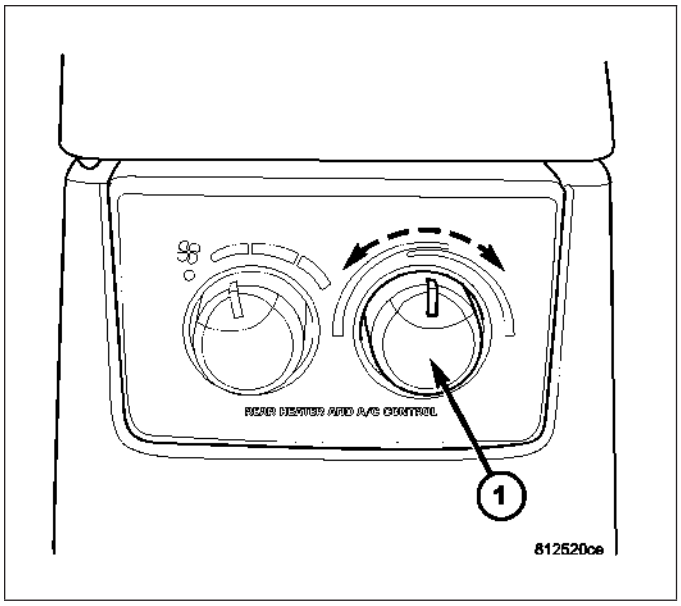
1. Position the rear A/C-heater control (2) near the center floor console.
2. Connect the wire harness connector (1) to the back of the rear A/C-heater control.



3. Insert the two locator tabs on the bottom of the rear A/C-heater control (1) into the two slots on the bottom edge of the floor console opening (2).
4. Rotate the rear A/C-heater control (3) forward far enough to align the two snap clips on the top of the rear A/C-heater control (4) with the receptacles in the top edge of the floor console opening (5).
5. Using hand pressure, press the top edge of the rear A/C-heater control forward until the two snap clips are fully seated in into the receptacles.
6. Reconnect the negative battery cable.



7. Using a scan tool, calibrate the Rear Temperature Selector potentiometer calibration values.
8. Verify that the Actuator Calibration of the front A/C-heater control has passed. If an Actuator Calibration has not passed correct any errors before proceeding.
9. Rotate the Rear Temperature Selector counter (1) clockwise to the Cold Position, allow the Selector to remain in the Cold Position for 5 seconds.
10. Rotate the Rear Temperature Selector Clockwise to the Hot Position, allow the Selector to remain in the Cold Position for 5 seconds.
11. Calibration is now complete.

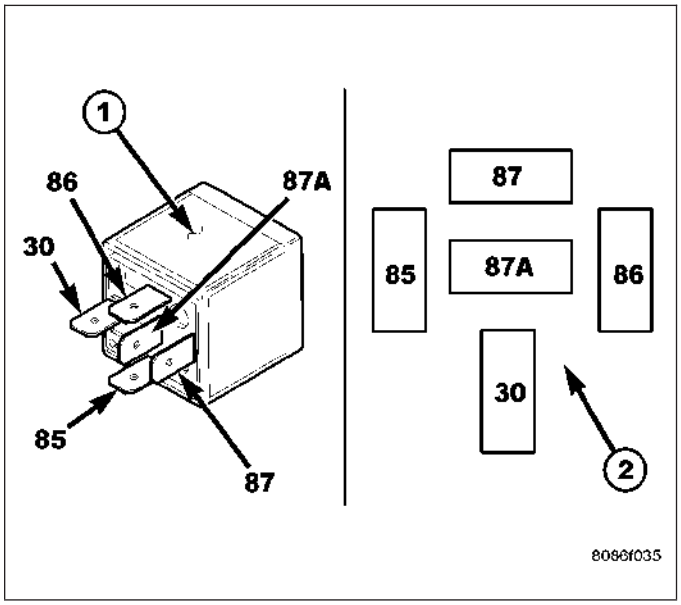


RELAY-BLOWER MOTOR

DESCRIPTION

The blower motor relay for the rear heating-A/C system is a International Standards Organization (ISO)-type relay. Relays conforming to the ISO specifications have common physical dimensions, current capacities, terminal patterns, and terminal functions. The rear blower motor relay is a electromechanical device that switches battery current from a fuse in the power distribution center (PDC) directly to the rear blower motor. The rear blower motor relay is energized when the relay coil is provided a voltage signal by the ignition switch.

The rear blower motor relay is located in the power distribution center (PDC) in the engine compartment. Refer to the PDC label for rear blower motor relay identification and location.



The black, molded plastic case is the most visible component of the rear blower motor relay. Five male spade-type terminals extend from the bottom of the base to connect the relay to the vehicle electrical system, and the ISO designation for each terminal is molded into the base adjacent to each terminal. The ISO terminal designations are as follows:

- **30 (Common Feed)** - This terminal is connected to the movable contact point of the relay.
- **85 (Coil Ground)** - This terminal is connected to the ground feed side of the relay control coil.
- **86 (Coil Battery)** - This terminal is connected to the battery feed side of the relay control coil.
- **87 (Normally Open)** - This terminal is connected to the normally open fixed contact point of the relay.
- **87A (Normally Closed)** - This terminal is connected to the normally closed fixed contact point of the relay.

OPERATION

The The ISO-standard rear blower motor relay is an electromechanical switch that uses a low current input from the ignition switch to control the high current output to the rear blower motor. The movable, common feed relay contact is held against the fixed, normally closed relay contact by spring pressure. When the electromagnetic relay coil is energized, it draws the movable common feed relay contact away from the fixed, normally closed relay contact and, holds it against the fixed, normally open relay contact. This action allows high current to flow to the rear blower motor.

When the relay coil is de-energized, spring pressure returns the movable relay contact back against the fixed, normally closed contact point. The resistor or diode is connected in parallel with the relay coil, and helps to dissipate voltage spikes and electromagnetic interference that can be generated as the electromagnetic field of the relay coil collapses.

The rear blower motor relay terminals are connected to the vehicle electrical system through a receptacle in the power distribution center (PDC). The inputs and outputs of the rear blower motor relay include:

- The common feed terminal (30) receives a battery current input from a fuse in the PDC through a fused B(+) circuit at all times.
- The coil ground terminal (85) is connected to a ground at all times.
- The coil battery terminal (86) receives a battery current input from a fuse in the junction block (JB) through a fused ignition switch output (run) circuit only when the ignition switch is in the On position.
- The normally open terminal (87) provides a battery current output to the rear blower motor through the rear blower motor relay output circuit only when the rear blower motor relay coil is energized.
- The normally closed terminal (87A) is not connected to any circuit in this application, but provides a battery current output only when the rear blower motor relay coil is de-energized.

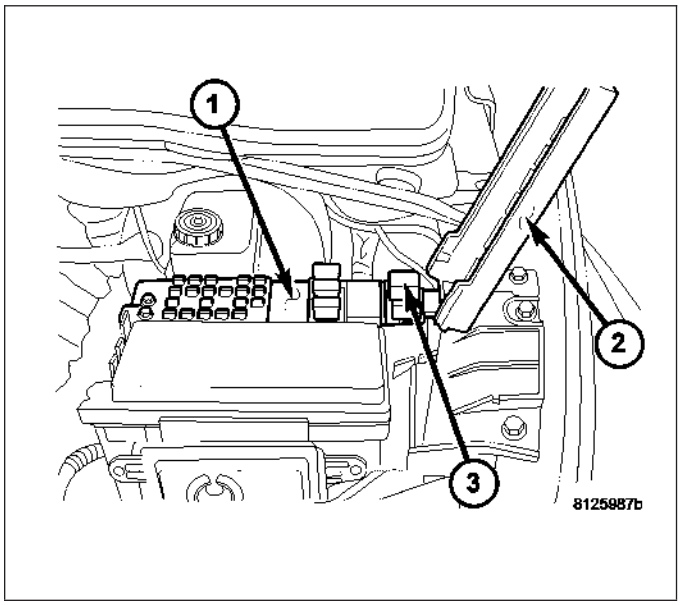
The rear blower motor relay cannot be repaired and, if faulty or damaged, it must be replaced. Refer to the appropriate wiring information for diagnosis and testing of the ISO-standard relay and for complete HVAC wiring diagrams.

REMOVAL

1. Disconnect and isolate the negative battery cable.
2. Locate the power distribution center (PDC) (1).
3. Open the PDC cover (2).

NOTE: Refer to the fuse and relay layout map on the inner surface of the PDC cover for rear blower motor relay identification and location.

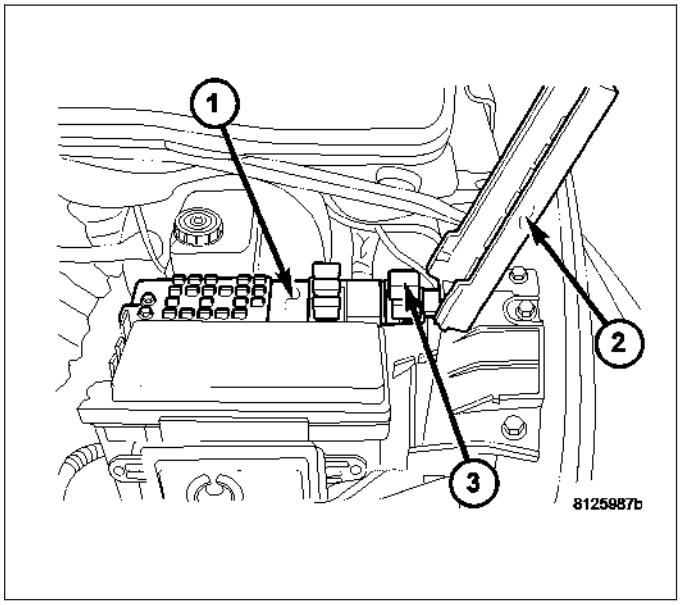
4. Remove the rear blower motor relay (3) from the PDC.



INSTALLATION

NOTE: Refer to the fuse and relay layout map on the inner surface of the PDC cover for rear blower motor relay identification and location.

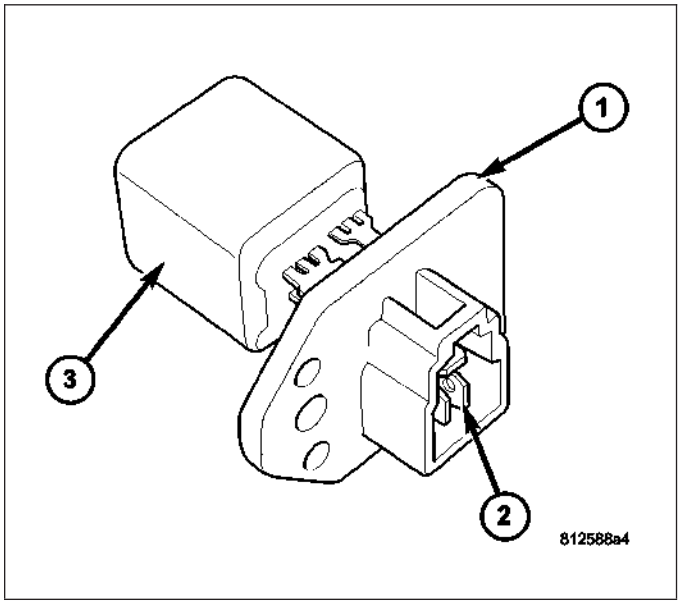
1. Position the rear blower motor relay (3) into the proper receptacle of the PDC (1).
2. Align the rear blower motor relay terminals with the terminal cavities in the PDC receptacle and push down firmly on the relay until the terminals are fully seated.
3. Close the PDC cover (2).
4. Reconnect the negative battery cable.



RESISTOR-BLOWER MOTOR

DESCRIPTION

A rear blower motor resistor is used on this model when it is equipped with the rear heater-A/C system. The rear blower motor resistor is mounted to the rear HVAC housing, directly below the rear blower motor. The rear blower motor resistor consists of a molded plastic mounting plate (1) with an integral wire connector receptacle (2). Concealed behind the mounting plate are coiled resistor wires contained within a ceramic heat sink (3). The rear blower motor resistor is accessed for service by removing the rear quarter interior trim panel from the right side of the vehicle.



OPERATION

The blower motor resistor for the rear heating-A/C system is connected to the vehicle electrical system through a dedicated wire lead and connector of the rear HVAC wire harness. The rear blower motor resistor has multiple resistor wires, each of which will reduce the current flow through the blower motor to change the blower motor speed.

The blower motor switch in the rear heater-A/C system directs the ground path for the rear blower motor through the correct resistor wire to obtain the selected speed. With the rear blower motor control in the lowest speed position, the ground path for the rear blower motor is applied through all of the resistor wires. Each higher speed selected with the rear blower motor control applies the blower motor ground path through fewer of the resistor wires, increasing the rear blower motor speed.

The rear blower motor resistor cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

DIAGNOSIS AND TESTING

REAR BLOWER MOTOR RESISTOR

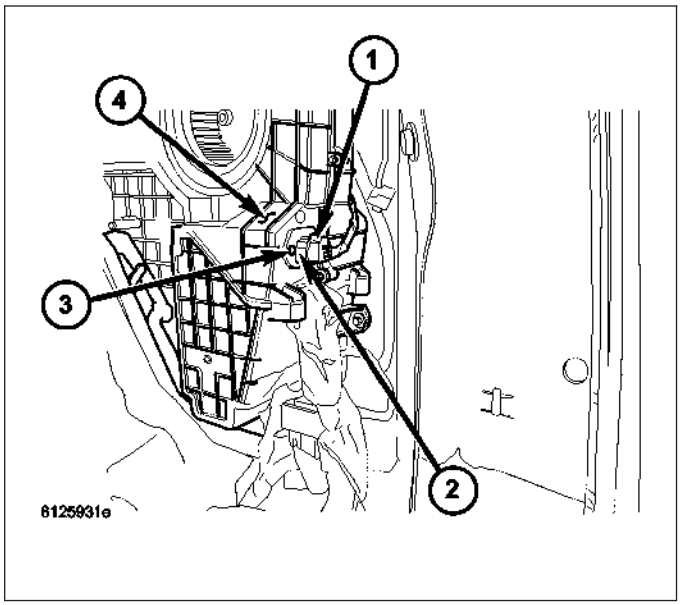
WARNING: On vehicles equipped with airbags, disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.

NOTE: For circuit descriptions and diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, further details on wire harness routing and retention, as well as pin-out and location views for the various wire harness connectors, splices and grounds.

1. Disconnect and isolate the negative battery cable.
2. Disconnect the wire harness connector from the blower motor resistor (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS-REAR/RESISTOR-BLOWER MOTOR - REMOVAL).
3. Using an ohmmeter, check for continuity between all of the blower motor resistor terminals. In each case there should be continuity. If OK, repair the wire harness circuits between the blower motor switch and the blower motor resistor or the blower motor as required. If not OK, replace the faulty blower motor resistor.

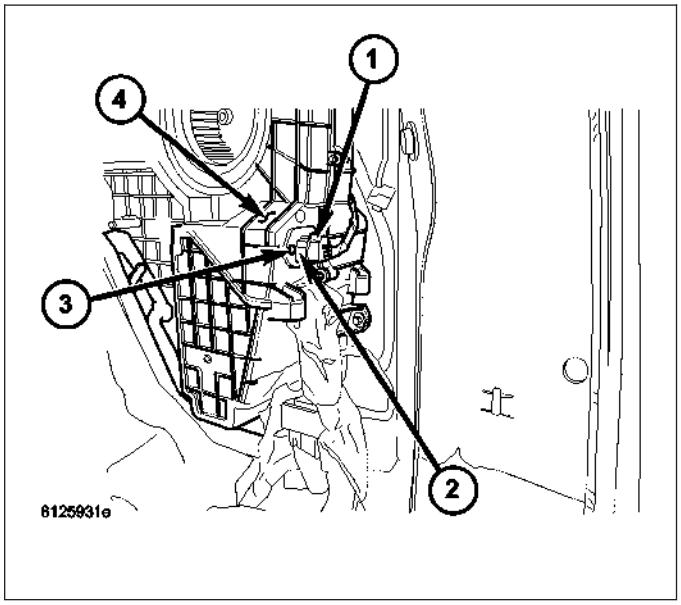
REMOVAL

1. Disconnect and isolate the negative battery cable.
2. Remove the right rear quarter interior trim panel (Refer to 23 - BODY/INTERIOR/QUARTER PANEL TRIM - REMOVAL).
3. Disconnect the rear HVAC wire harness connector (1) from the rear blower motor resistor (2).
4. Remove the screw (3) that secures the rear blower motor resistor to the rear HVAC housing (4).
5. Remove the rear blower motor resistor from the rear HVAC housing.



INSTALLATION

1. Position the rear blower motor resistor (2) into the rear HVAC housing (4).
2. Install the screw (3) that secures the rear blower motor resistor to the rear HVAC housing. Tighten the screw to 2 N·m (17 in. lbs.).
3. Connect the rear HVAC wire harness connector (1) to the rear blower motor resistor.
4. Install the right rear quarter interior trim panel (Refer to 23 - BODY/INTERIOR/QUARTER PANEL TRIM - INSTALLATION).
5. Reconnect the negative battery cable.



DISTRIBUTION - FRONT

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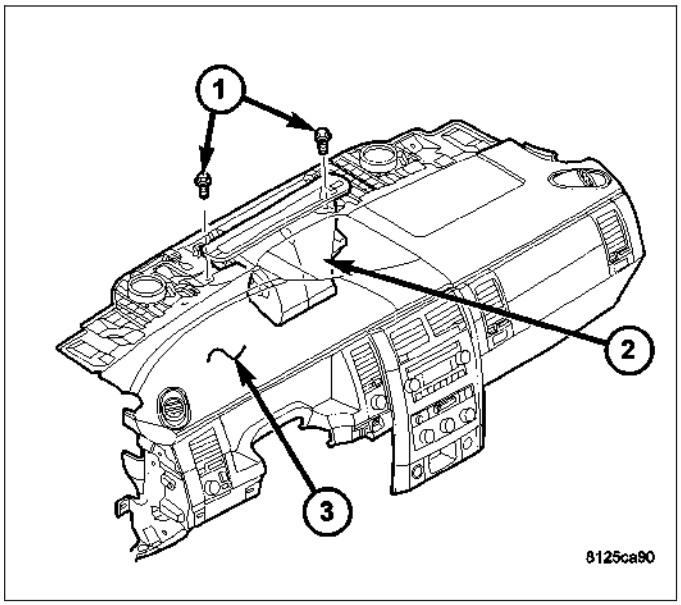
DUCT-DEFROSTER

REMOVAL

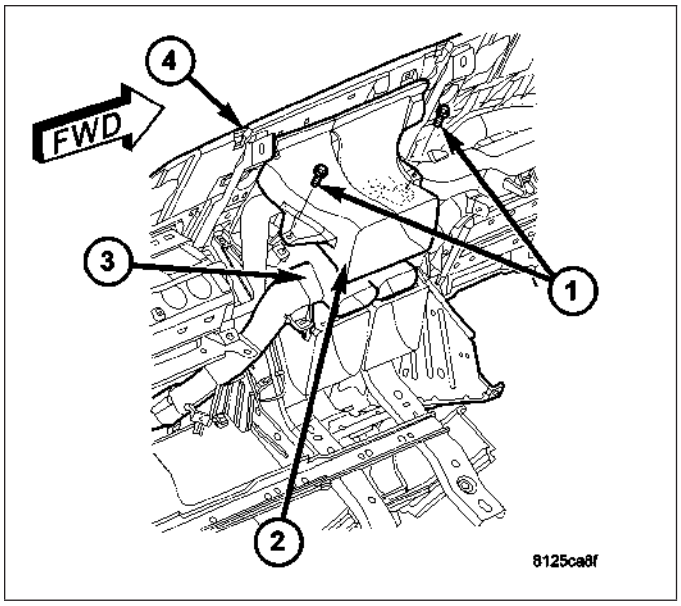
WARNING: On vehicles equipped with airbags, disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.

NOTE: Take the proper precautions to protect the front face of the instrument panel from cosmetic damage.

1. Remove the instrument panel and place it on a workbench (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - REMOVAL).
2. Remove the two screws (1) that secure the defroster duct (2) to the top of the instrument panel (3).

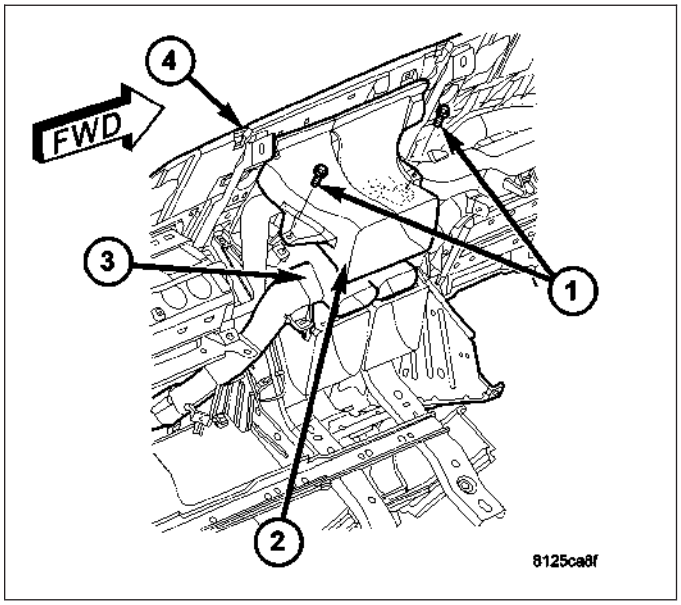


3. Remove the two screws (1) that secure the defroster duct (2) to the demister center duct (3).
4. Remove the defroster duct from the instrument panel (4).

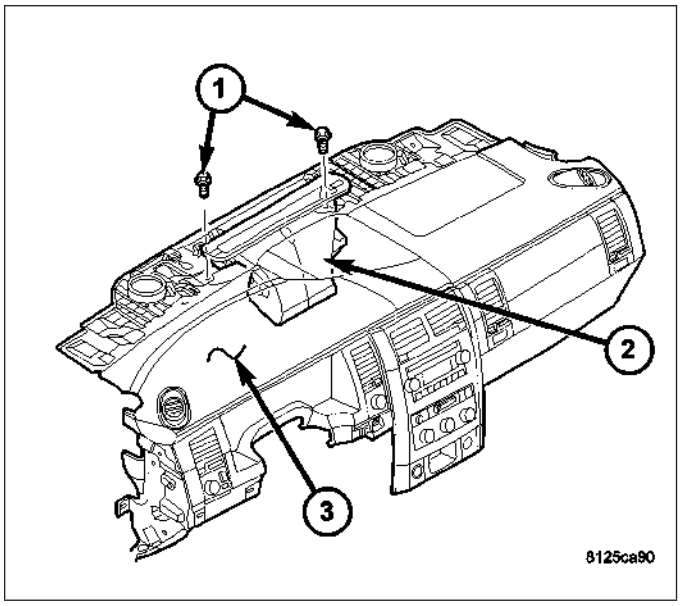


INSTALLATION

1. Position the defroster duct into the instrument panel.
2. Install the two screws that secure the defroster duct to the demister center duct. Tighten the screws to 2 N·m (17 in. lbs.).



3. Install the two screws that secure the defroster duct to the top of the instrument panel. Tighten the screws to 2 N·m (17 in. lbs.).
4. Install the instrument panel (Refer to 23 - BODY/ INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - INSTALLATION).

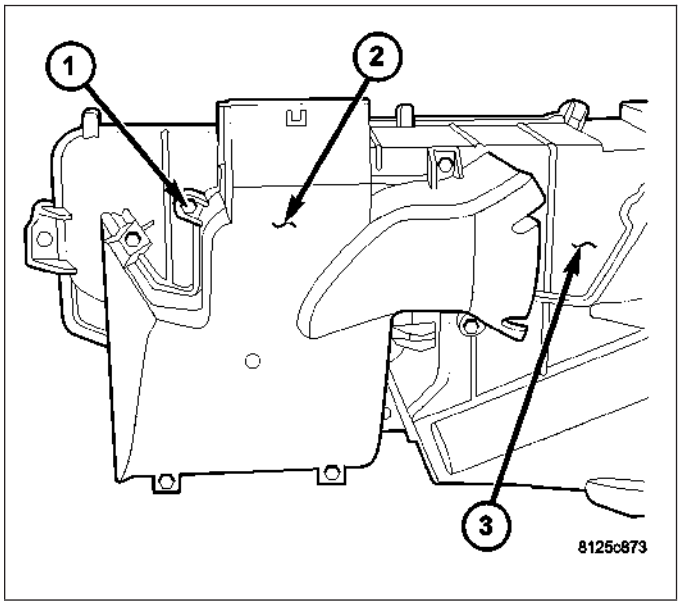


DUCT-FLOOR DISTRIBUTION

REMOVAL

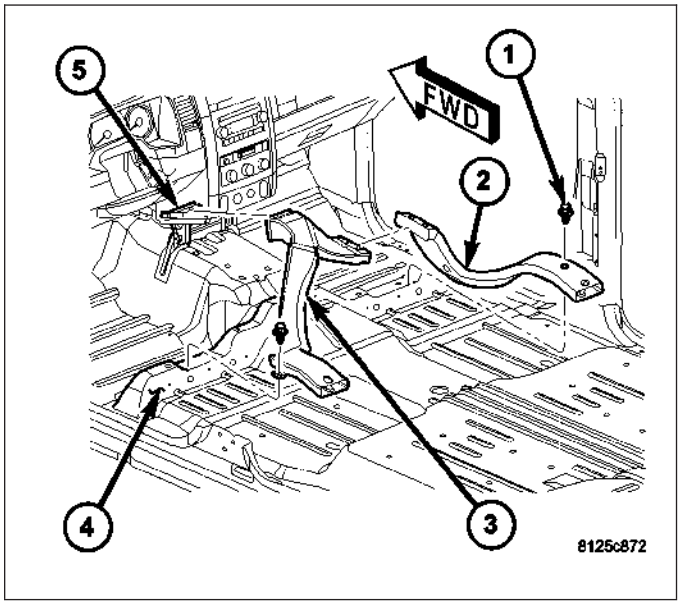
FRONT FLOOR DISTRIBUTION DUCT

1. Remove the HVAC Housing (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/ HOUSING-HVAC - REMOVAL).
2. Remove the six screws (1) that secure the front floor distribution duct (2) to the bottom of the HVAC housing (3).
3. Remove the front floor distribution duct from the HVAC housing.



INTERMEDIATE FLOOR DISTRIBUTION DUCTS

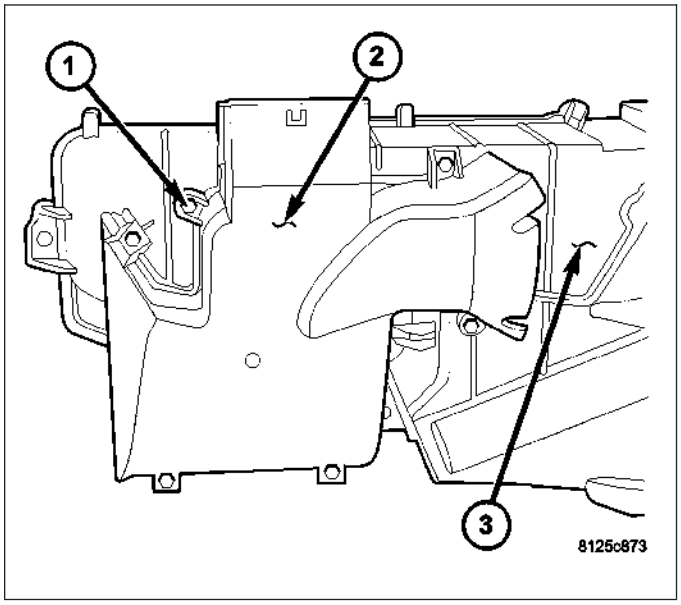
1. Remove the center floor console (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL).
2. Remove the front seats (Refer to 23 - BODY/SEATS/SEAT - REMOVAL).
3. Roll back the front floor carpet from under the instrument panel toward the rear of the vehicle (Refer to 23 - BODY/INTERIOR/CARPETS AND FLOOR MATS - REMOVAL).
4. Remove the two push pin fasteners (1) that secure the right intermediate floor distribution duct (2) and the left intermediate floor distribution duct (3) to the floor support (4).
5. Disconnect the left intermediate floor distribution duct from the front floor distribution duct (5).
6. If required, disconnect the right intermediate floor distribution duct from the left intermediate floor distribution duct.



INSTALLATION

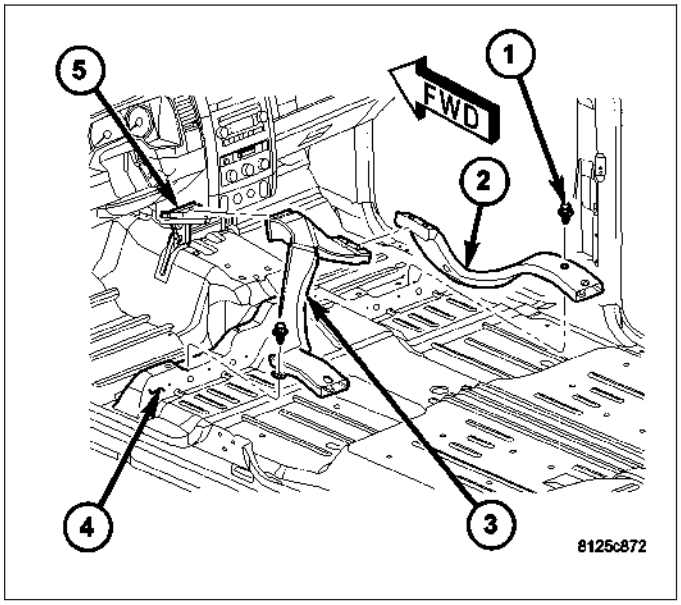
FRONT FLOOR DISTRIBUTION DUCT

1. Position the front floor distribution duct (2) to the bottom of the HVAC housing (3).
2. Install the six screws (1) that secure the front floor distribution duct to the HVAC housing. Tighten the screws to 2 N·m (17 in. lbs.).
3. Install the HVAC housing (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HOUSING-HVAC - INSTALLATION).



INTERMEDIATE FLOOR DISTRIBUTION DUCTS

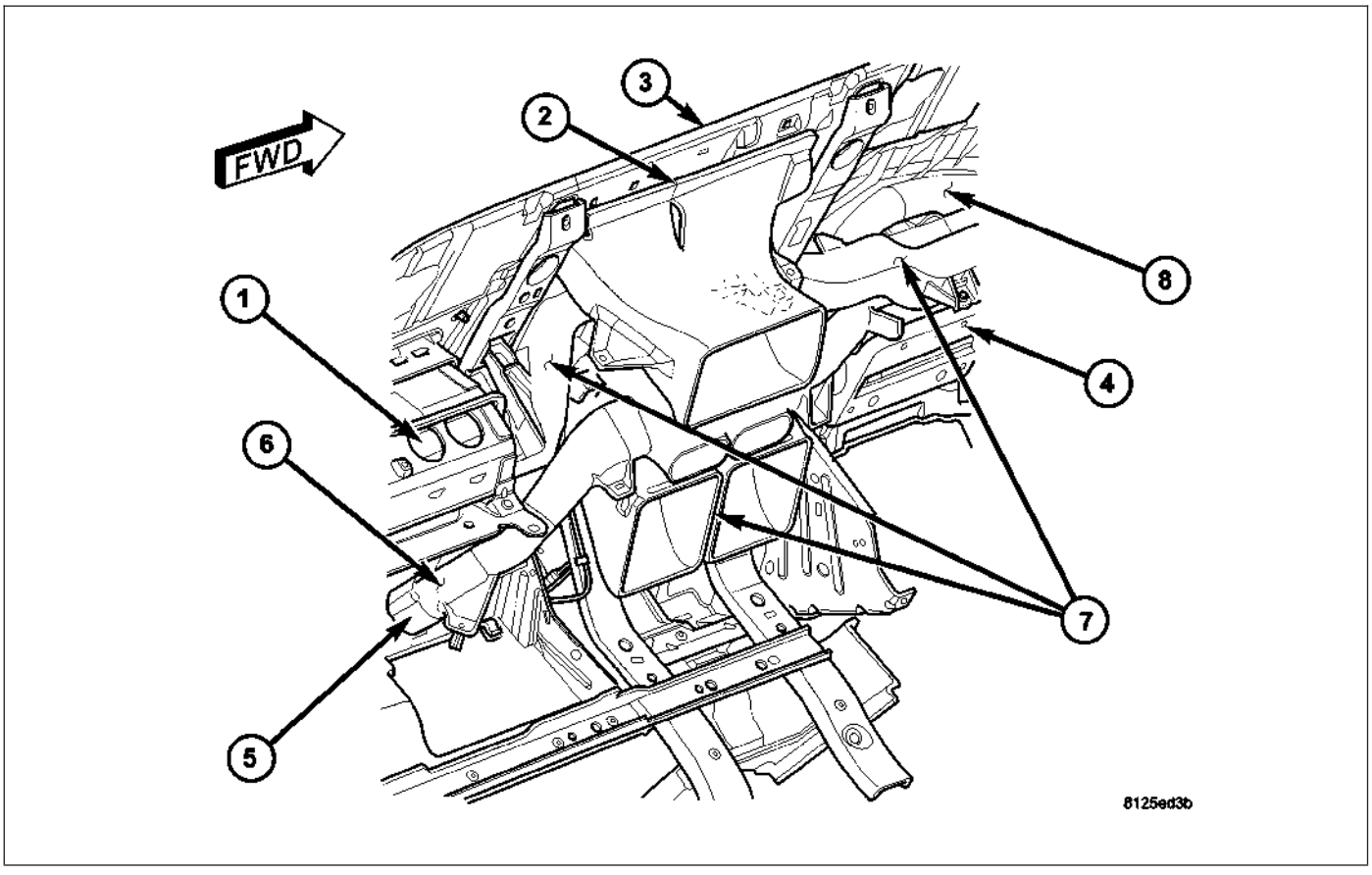
1. If removed, connect the right intermediate floor distribution duct to the left intermediate floor distribution duct.
2. Connect the left intermediate floor distribution duct to the front floor distribution duct.
3. Install the two push-pin fasteners that secure the intermediate floor distribution ducts to the floor support.
4. Install the carpet onto the front floor panel and under the instrument panel (Refer to 23 - BODY/INTERIOR/CARPETS AND FLOOR MATS - INSTALLATION).
5. Install the front seats (Refer to 23 - BODY/SEATS/SEAT - INSTALLATION).
6. Install the center floor console (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION).



DUCT-INSTRUMENT PANEL

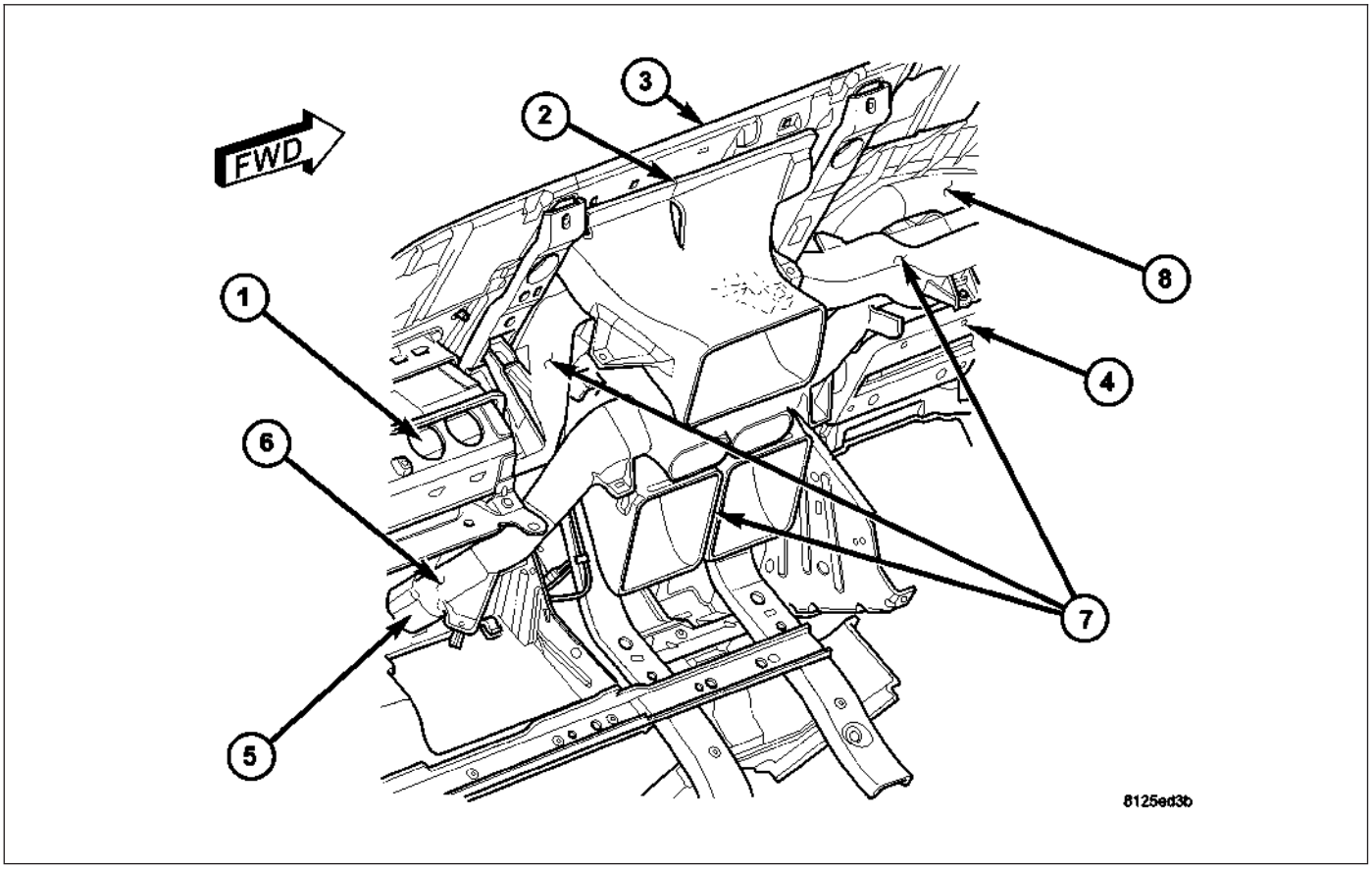
REMOVAL

NOTE: Take the proper precautions to protect the front face of the instrument panel from cosmetic damage.



1. Remove the instrument panel and place it on a workbench (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - REMOVAL).
2. Remove the instrument cluster (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - REMOVAL).
3. Remove the radio and reinforcement bracket (Refer to 8 - ELECTRICAL/AUDIO/RADIO - REMOVAL).
4. Remove the instrument panel speakers (Refer to 8 - ELECTRICAL/AUDIO/SPEAKER - REMOVAL).
5. Remove the passenger side air bag (1) (Refer to 8 - ELECTRICAL/RESTRAINTS/PASSENGER AIRBAG - REMOVAL).
6. Remove the defroster duct (2) (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION - FRONT/ DUCTS-DEFROSTER - REMOVAL).
7. Remove the demister air outlets (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION - FRONT/ OUTLETS-AIR - REMOVAL).
8. Remove the instrument panel top cover (3) (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - REMOVAL).
9. Remove the park brake release handle assembly from the instrument panel.
10. Remove the instrument panel reinforcement (4).
11. Remove the passenger side demister outlet duct (5).
12. Remove the passenger side demister duct (6).
13. Remove the instrument panel ducts (7) (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION - FRONT/DUCTS-INSTRUMENT PANEL - REMOVAL).

INSTALLATION



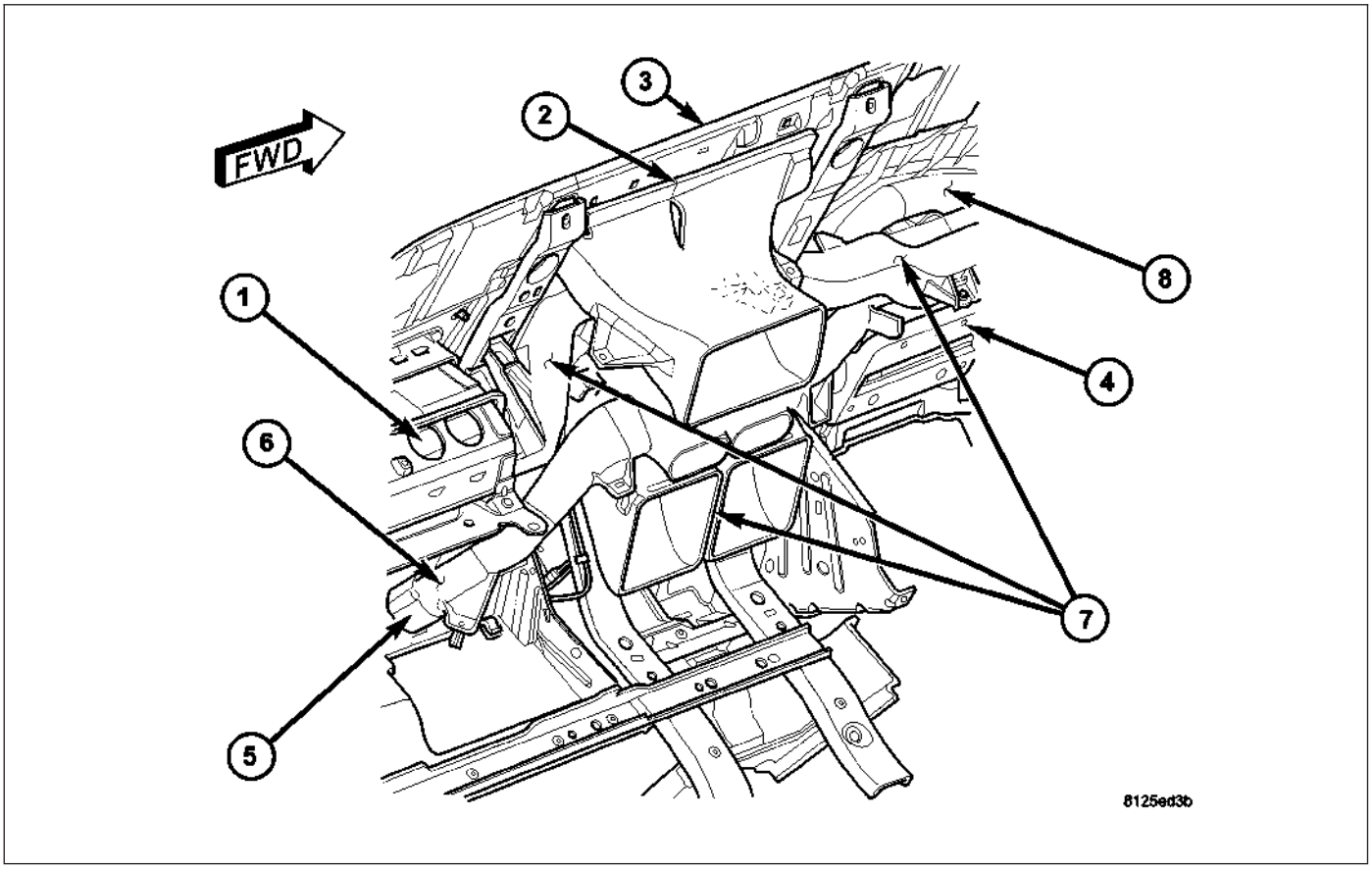
1. Install the instrument panel ducts (7)
2. Install the passenger side demister duct (6).
3. Install the passenger side demister outlet duct (5).
4. Install the instrument panel reinforcement (4).

5. Install the park brake release handle assembly.
6. Install the instrument panel top cover (3) (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - INSTALLATION).
7. Install the demister air outlets (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION - FRONT/OUTLETS-AIR - INSTALLATION)..
8. Install the defroster duct (2) (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION - FRONT/DUCTS-DEFROSTER - INSTALLATION).
9. Install the passenger side air bag (1) (Refer to 8 - ELECTRICAL/RESTRAINTS/PASSENGER AIRBAG - INSTALLATION).
10. Install the instrument panel speakers (Refer to 8 - ELECTRICAL/AUDIO/SPEAKER - INSTALLATION).
11. Install the radio and reinforcement bracket (Refer to 8 - ELECTRICAL/AUDIO/RADIO - INSTALLATION).
12. Install the instrument cluster (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - INSTALLATION).
13. Install the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - INSTALLATION).

DUCT-INSTRUMENT PANEL DEMISTER

REMOVAL

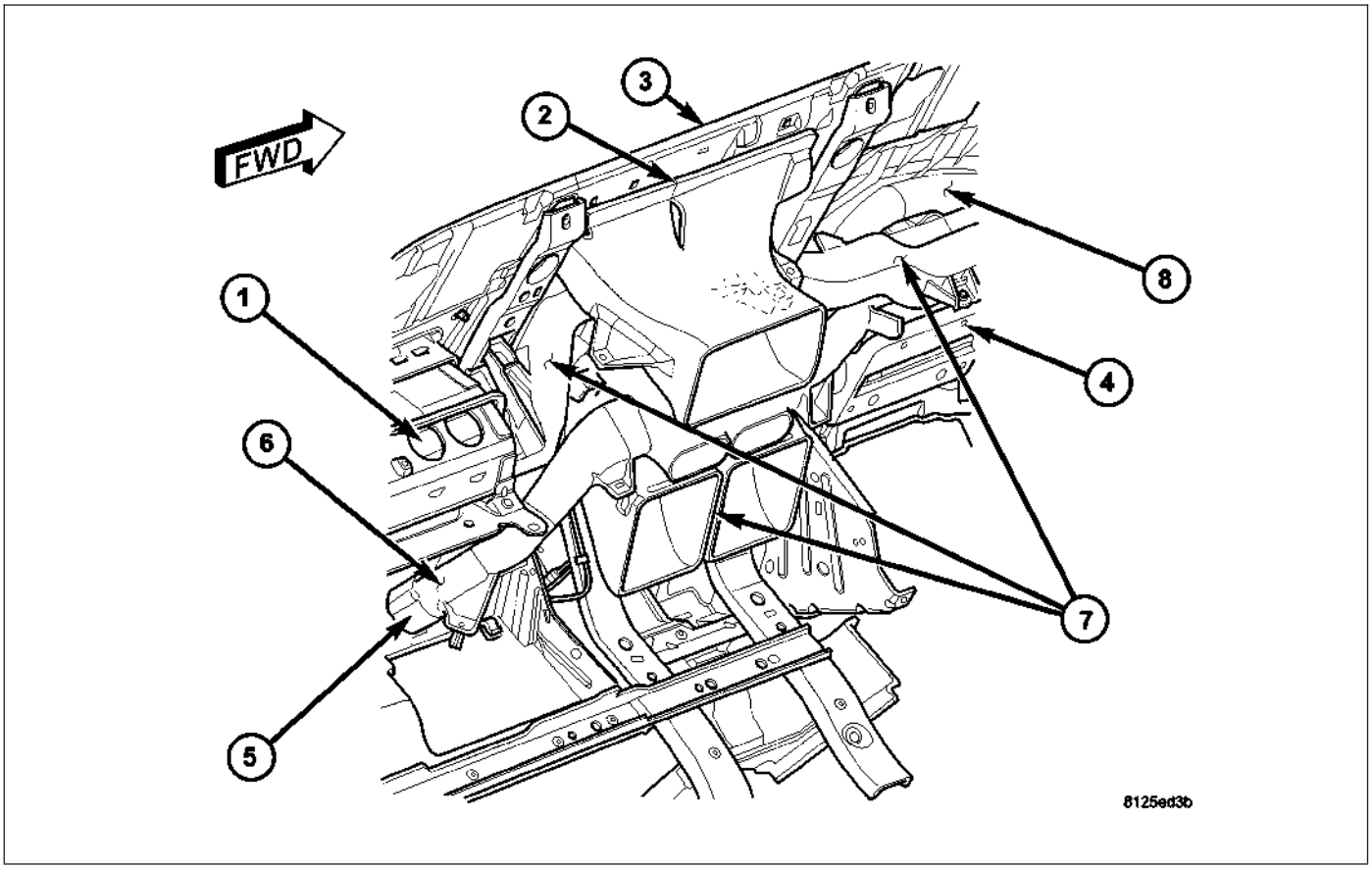
NOTE: Take the proper precautions to protect the front face of the instrument panel from cosmetic damage.



1. Remove the instrument panel and place it on a workbench (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - REMOVAL).
2. Remove the instrument cluster (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - REMOVAL).
3. Remove the radio and reinforcement bracket (Refer to 8 - ELECTRICAL/AUDIO/RADIO - REMOVAL).
4. Remove the instrument panel speakers (Refer to 8 - ELECTRICAL/AUDIO/SPEAKER - REMOVAL).

5. Remove the passenger side air bag (1) (Refer to 8 - ELECTRICAL/RESTRAINTS/PASSENGER AIRBAG - REMOVAL).
6. Remove the defroster duct (2) (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION - FRONT/DUCTS-DEFROSTER - REMOVAL).
7. Remove the demister air outlets (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION - FRONT/OUTLETS-AIR - REMOVAL).
8. Remove the instrument panel top cover (3) (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - REMOVAL).
9. Remove the park brake release handle assembly from the instrument panel.
10. Remove the instrument panel reinforcement (4).
11. Remove the passenger side demister outlet duct (5).
12. Remove the passenger side demister duct (6).
13. Remove the instrument panel ducts (7) (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION - FRONT/DUCTS-INSTRUMENT PANEL - REMOVAL).
14. Remove the driver side demister duct (8).

INSTALLATION

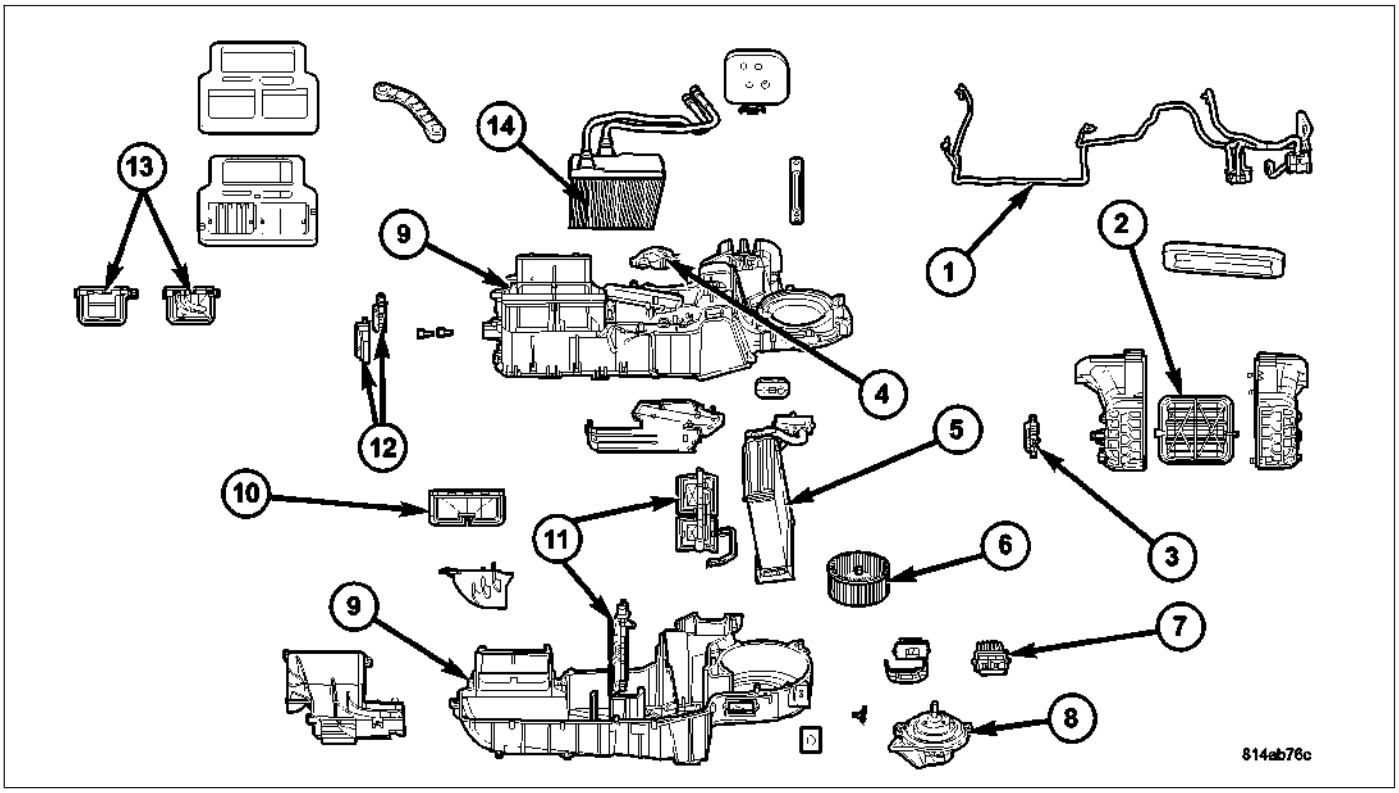


1. Install the driver side demister duct (8).
2. Install the instrument panel ducts (7)
3. Install the passenger side demister duct (6).
4. Install the passenger side demister outlet duct (5).
5. Install the instrument panel reinforcement (4).
6. Install the park brake release handle assembly.
7. Install the instrument panel top cover (3) (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - INSTALLATION).

8. Install the demister air outlets (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION - FRONT/OUTLETS-AIR - INSTALLATION)..
9. Install the defroster duct (2) (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION - FRONT/DUCTS-DEFROSTER - INSTALLATION).
10. Install the passenger side air bag (1) (Refer to 8 - ELECTRICAL/RESTRAINTS/PASSENGER AIRBAG - INSTALLATION).
11. Install the instrument panel speakers (Refer to 8 - ELECTRICAL/AUDIO/SPEAKER - INSTALLATION).
12. Install the radio and reinforcement bracket (Refer to 8 - ELECTRICAL/AUDIO/RADIO - INSTALLATION).
13. Install the instrument cluster (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - INSTALLATION).
14. Install the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - INSTALLATION).

HOUSING-HVAC

DESCRIPTION



All models are equipped with a common HVAC housing (9) that combines A/C and heating capabilities into a single unit mounted within the passenger compartment. The heating-A/C system is a blend-air type system. The blend-air doors (11) control the amount of conditioned air that is allowed to flow through, or around, the heater core (14). The A/C system is designed for the use of a non-CFC, R-134a refrigerant and uses an A/C evaporator (5) to cool and dehumidify the incoming air prior to blending it with the heated air. A temperature control determines the discharge air temperature by operating the blend door actuator (4) , which moves the blend-air doors. This allows an almost immediate control of the output air temperature of the system. The mode door actuators (12) operates the mode-air doors (10 and 13) which direct the flow of the conditioned air out the various air outlets, depending on the mode selected. The recirculation door actuator (3) operates the recirculation-air door (2) which closes off the fresh air intake and recirculates the air already inside the vehicle. The electric actuators are connected to the vehicle electrical system by the HVAC wire harness (1). The blower motor (8) controls the velocity of air flowing through the HVAC housing by spinning the blower wheel (6) within the HVAC housing at the selected speed by use of the blower motor resistor block or power model (7), depending on application.

The front HVAC housing must be removed from the vehicle and disassembled for service of the A/C evaporator, recirculation-air door, mode-air doors, blend-air doors and linkage.

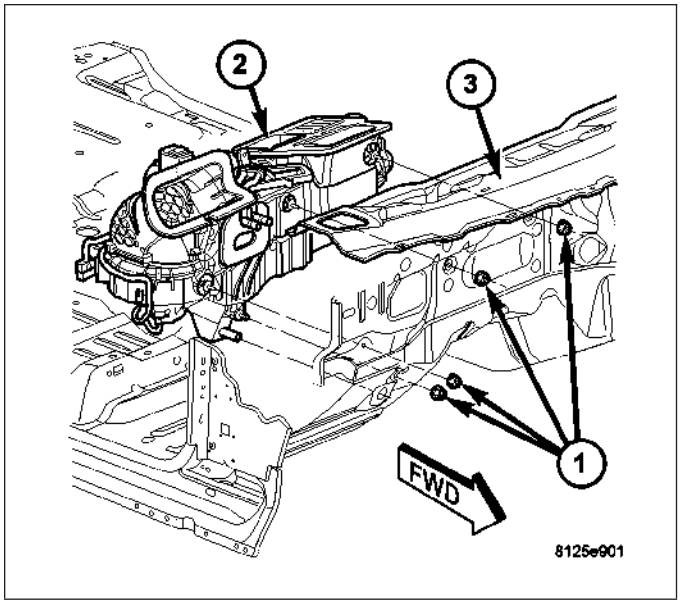
REMOVAL

WARNING: Refer to the applicable warnings and cautions for this system before performing the following operation (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - WARNINGS) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - CAUTIONS). Failure to follow the warnings and cautions could result in possible personal injury or death.

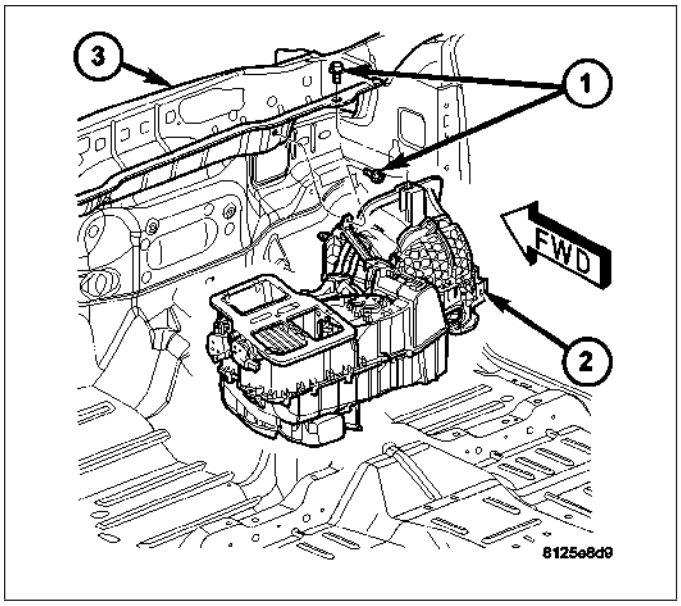
WARNING: On vehicles equipped with airbags, disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.

NOTE: The front HVAC housing must be removed from the vehicle and disassembled for service of the A/C evaporator, recirculation-air door, mode-air doors, blend-air doors and linkage.

1. Recover the refrigerant from the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY).
2. Drain the engine cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE - COOLING SYSTEM DRAIN).
3. Disconnect and isolate the negative battery cable.
4. Disconnect the liquid line and suction line from the expansion valve and install plugs or caps over the fittings and expansion valve ports (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT/LINE-A/C LIQUID - REMOVAL).
5. Disconnect the heater hoses from the heater core tubes and install plugs or caps over the heater core tube openings.
6. Remove the four nuts (1) that secure the HVAC housing (2) to the engine compartment side of the dash panel (3).



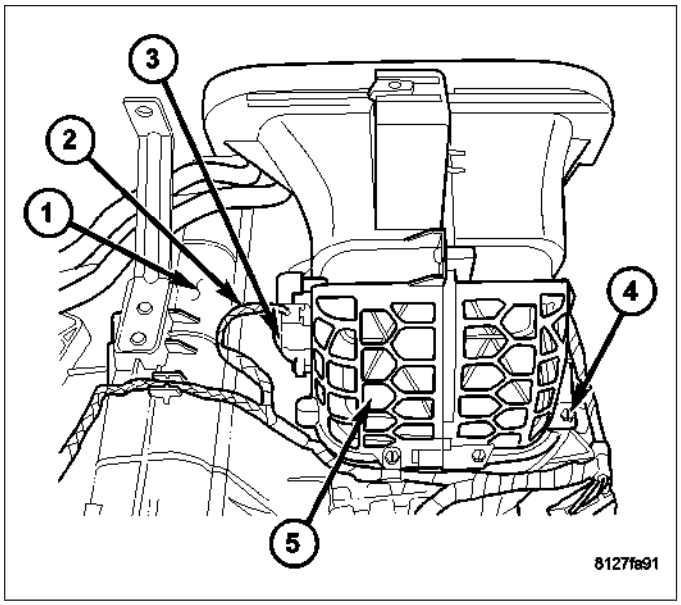
7. Remove the instrument panel from the passenger compartment (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - REMOVAL).
8. Disconnect the intermediate floor distribution duct from the front floor distribution duct.
9. Remove the two bolts (1) that secure the HVAC housing (2) to the passenger compartment side of the dash panel (3).
10. Pull the HVAC housing rearward so that the mounting studs and condensate drain tube clear the dash panel and remove the front HVAC housing from the passenger compartment.



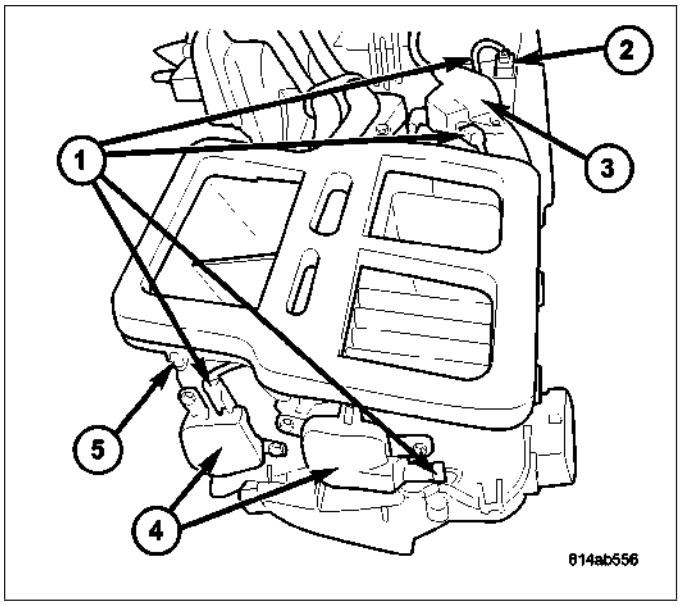
DISASSEMBLY

NOTE: The front HVAC housing must be removed from the vehicle and disassembled for service of the A/C evaporator, recirculation-air door, mode-air doors, blend-air doors and linkage.

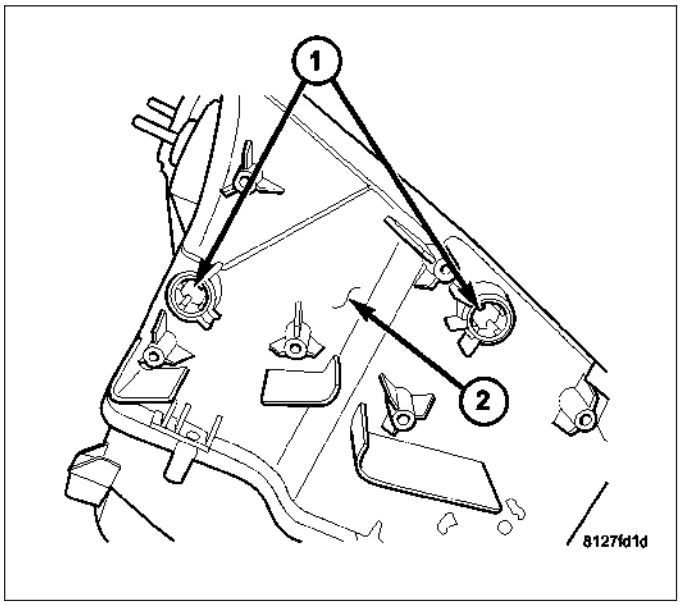
1. Remove the front HVAC housing (1) and place it on a workbench (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION - FRONT/HOUSING-HVAC - REMOVAL).
2. Disconnect the HVAC wire harness (2) from the recirculation door actuator (3).
3. Remove the screws (4) that secure the air inlet housing (5) to the HVAC housing.
4. Remove the air inlet housing from the HVAC housing.
5. If required, remove the recirculation door actuator from the air inlet housing (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS - FRONT/ACTUATOR-RECIRCULATION DOOR - REMOVAL).



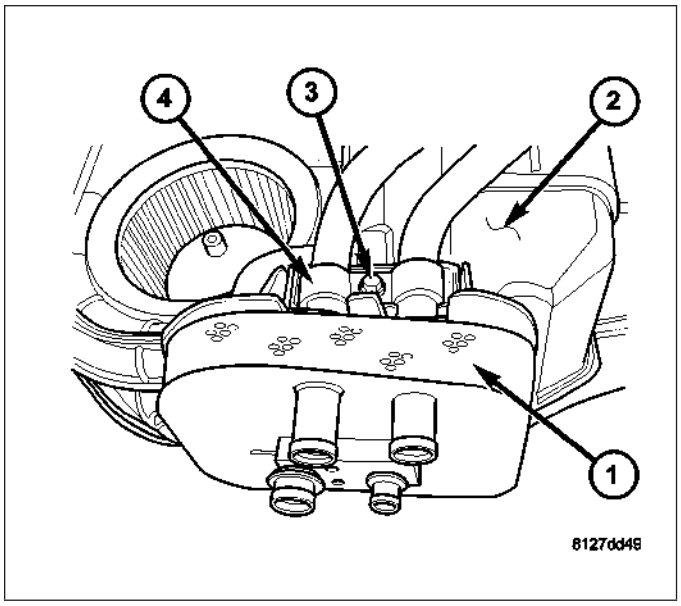
6. Disconnect the HVAC wire harness (1) from the evaporator temperature senseor (2), blend door actuator (3) and the two mode door actuators (4).
7. Remove the the evaporator temperature sensor from the top of the HVAC housing (5).
8. Remove the blend door actuator and the mode door actuators from the HVAC housing (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS - FRONT/ACTUATOR-BLEND DOOR - REMOVAL) and (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS - FRONT/ACTUATOR-MODE DOOR - REMOVAL).



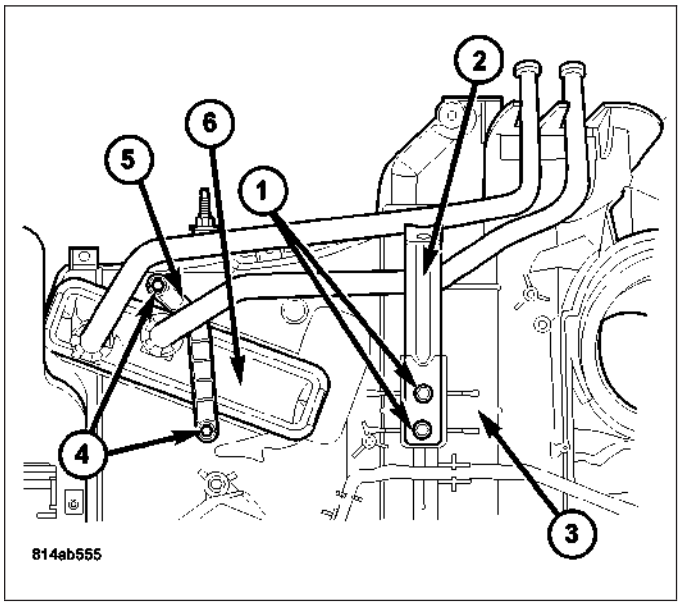
9. Remove the two actuator couplers (1) from the left end of the HVAC housing (2).



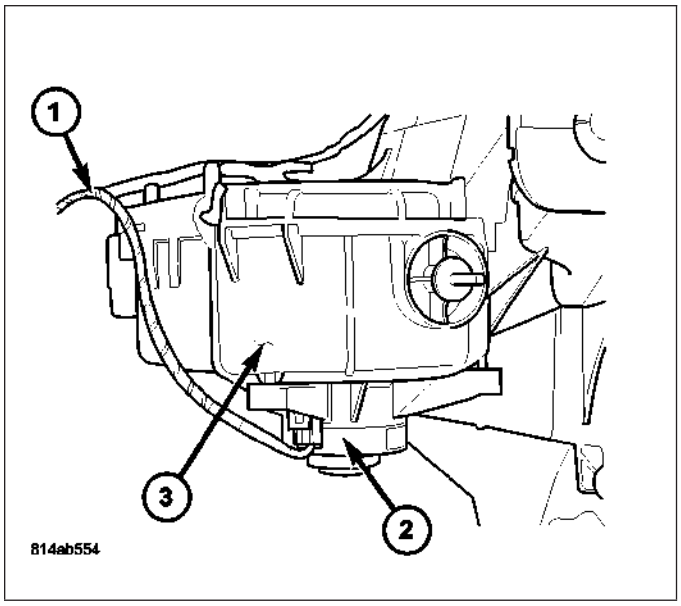
10. Carefully remove the foam seal (1) from the flange on the HVAC housing (2). If the seal is deformed or damaged, it must be replaced.
11. Remove the screw (3) that secures the heater core tube retaining bracket (4) to the top of the HVAC housing.
12. Remove the heater core tube retaining bracket from the HVAC housing.



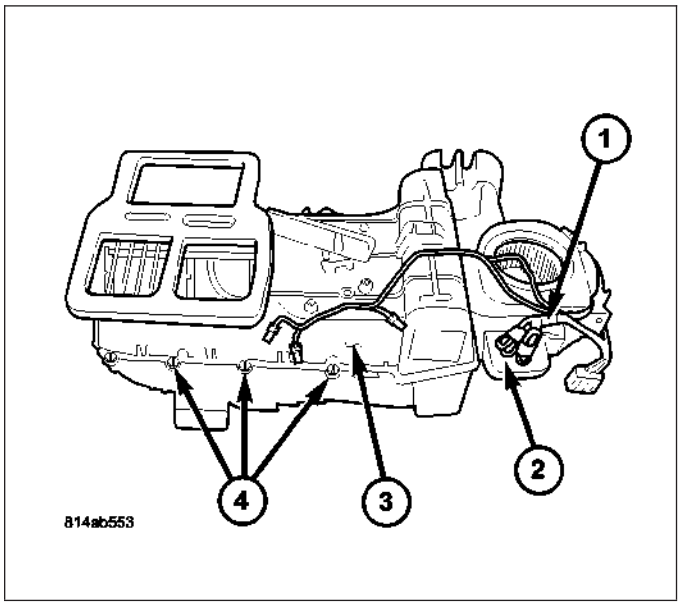
13. Remove the two screws (1) that secure the HVAC housing retaining bracket (2) to the top of the HVAC housing (3).
14. Remove the HVAC housing retaining bracket from the HVAC housing.
15. Remove the two screws (4) that secure the heater core retaining bracket (5) to the top of the HVAC housing.
16. Carefully remove the heater core (6) from the HVAC housing.



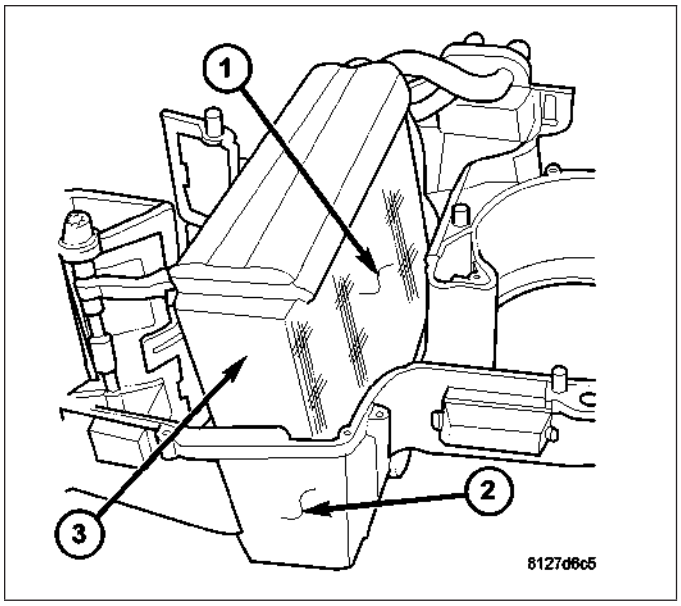
17. Disconnect the HVAC wiring harness (1) from the blower motor (2).
18. Remove the blower motor from the HVAC housing (3) (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION - FRONT/MOTOR-BLOWER - REMOVAL).
19. Remove the evaporator temperature sensor (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS - FRONT/SENSOR-EVAPORATOR TEMPERATURE - REMOVAL).



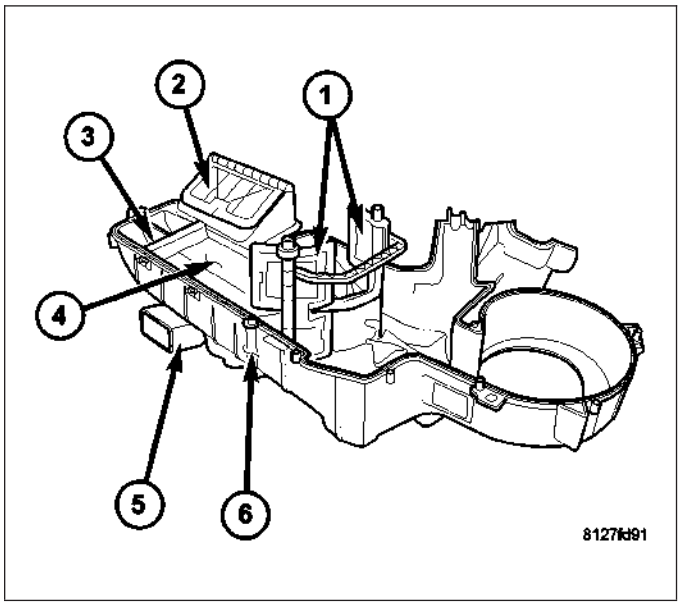
20. Disconnect the HVAC wiring harness (1) from the blower motor resistor or power module (2), depending on application.
21. If necessary, remove the blower motor resistor or power module, depending on application (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS - FRONT/RESISTOR-BLOWER MOTOR - REMOVAL) or (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS - FRONT/MODULE-POWER-BLOWER MOTOR - REMOVAL).
22. Remove the HVAC wiring harness from the HVAC housing (3).
23. Remove the screws (4) that secure the two halves of the HVAC housing together.
24. Separate the two halves of the HVAC housing.
25. If necessary, remove the mode-air doors from the upper half of the HVAC housing.



26. Carefully lift the A/C evaporator (1) and insulator (3) out of the top of the HVAC housing (2).

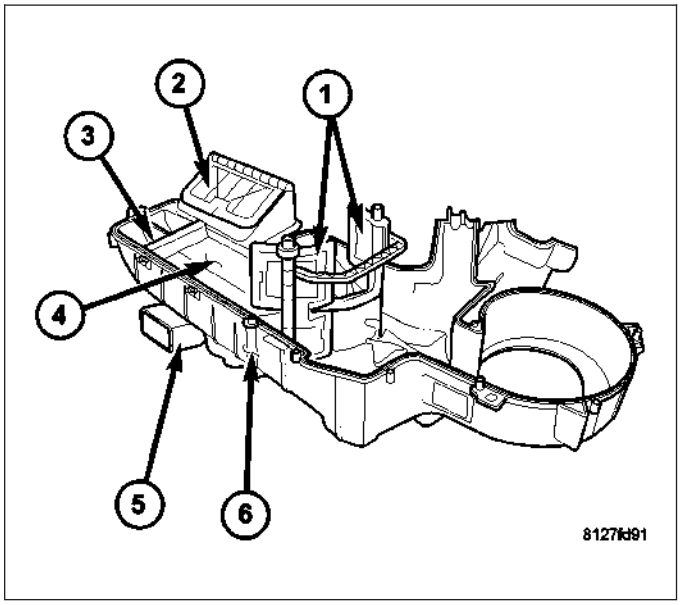


27. Remove the blend-air doors and linkage (1), mode-air door (2), baffle (3) and the duct plate (4) from the lower half of the HVAC housing (6).
28. If necessary, remove the floor distribution duct (5) from the HVAC housing (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION - FRONT/ DUCTS-FLOOR DISTRIBUTION - REMOVAL).

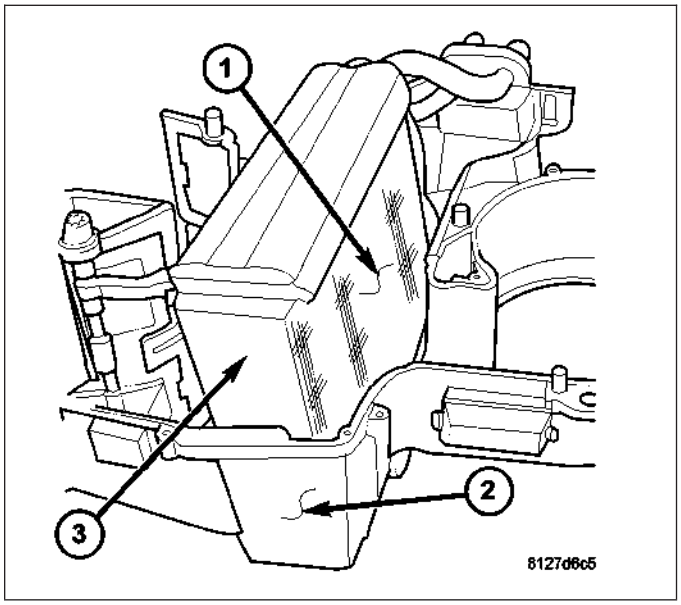


ASSEMBLY

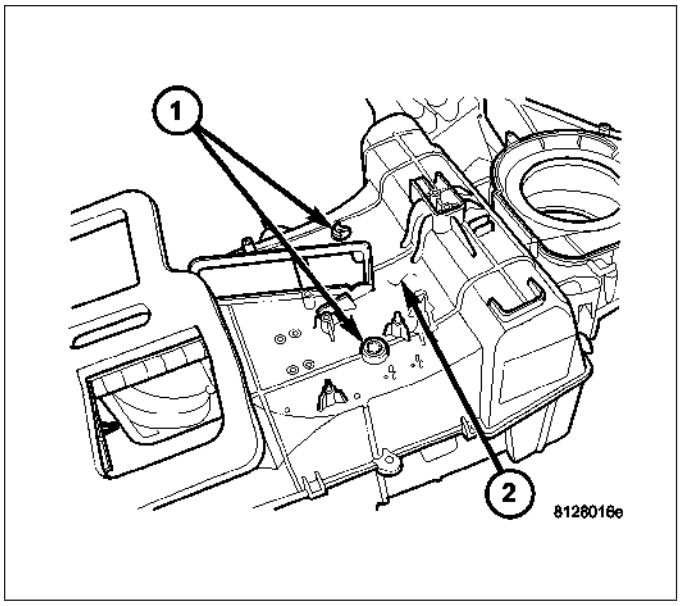
1. If removed, install the floor distribution duct (5) to the HVAC housing (6) (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION - FRONT/ DUCTS-FLOOR DISTRIBUTION - INSTALLATION).
2. Install the blend-air doors and linkage (1), mode-air door (2), baffle (3) and the duct plate (4) into the lower half of the HVAC housing.



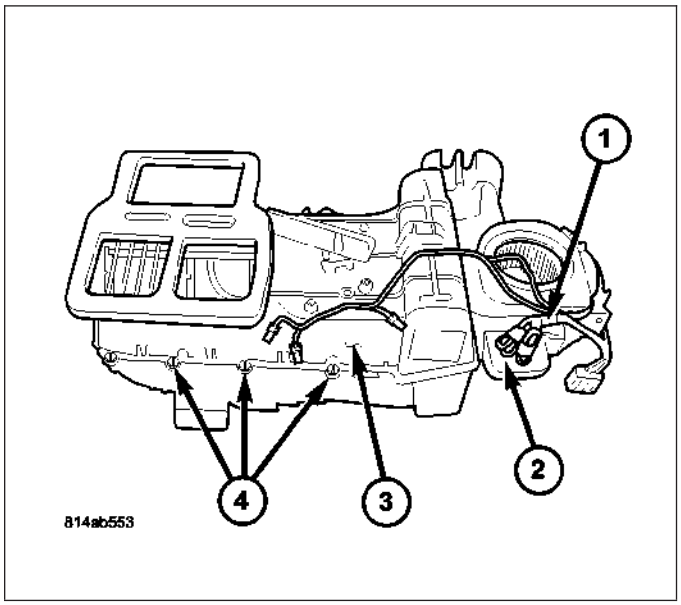
3. Install the A/C evaporator (1) into the lower half of the HVAC housing (2). Make sure that the evaporator drain is clean and unrestricted and that the evaporator insulator (3) is properly installed.



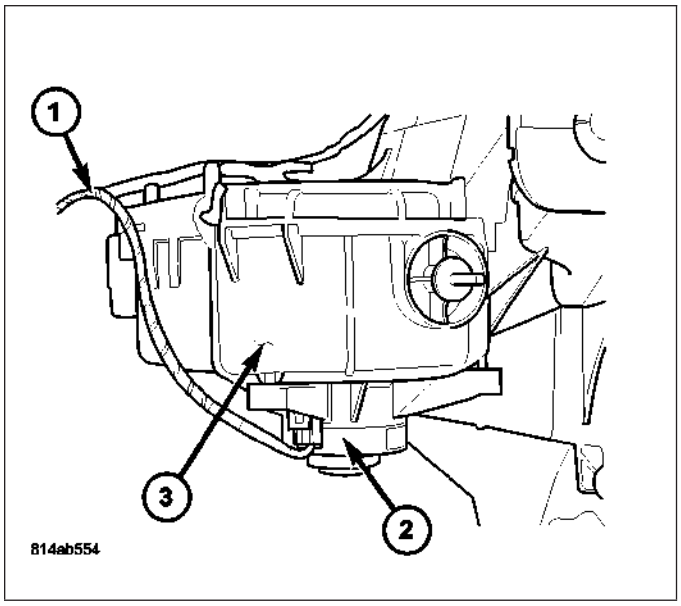
4. If removed, install the mode-air doors into the upper half of the HVAC housing (2).
5. Align the ends of the blend-air door pivot shafts (1) to the openings in the upper half of the HVAC housing and install the upper housing half to the lower housing half.



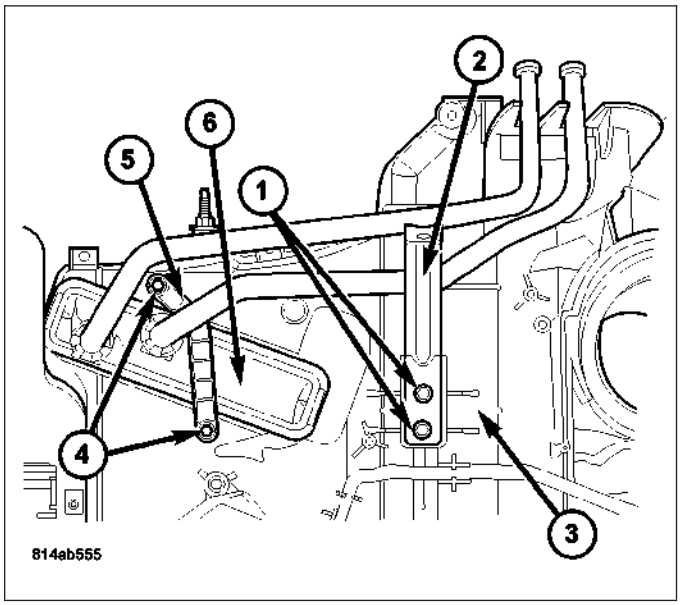
6. Install the screws (4) that secure the two halves of the HVAC housing (3) together. Tighten the screws to 2.2 N·m (20 in lbs.).
7. Install the HVAC wiring harness (1). Make sure the harness is routed through all wiring retainers.
8. If removed, install the blower motor resistor or power module (2), depending on application.
9. Connect the HVAC wire harness to the blower motor resistor or power module, depending on application.



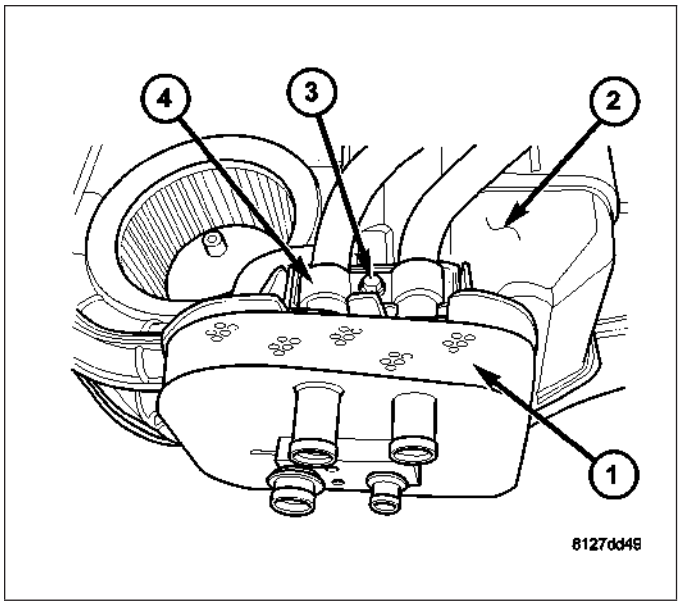
10. Install the blower motor (2) to the HVAC housing (3) (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION - FRONT/MOTOR-BLOWER - INSTALLATION).
11. Connect the HVAC wire harness (1) to the blower motor.



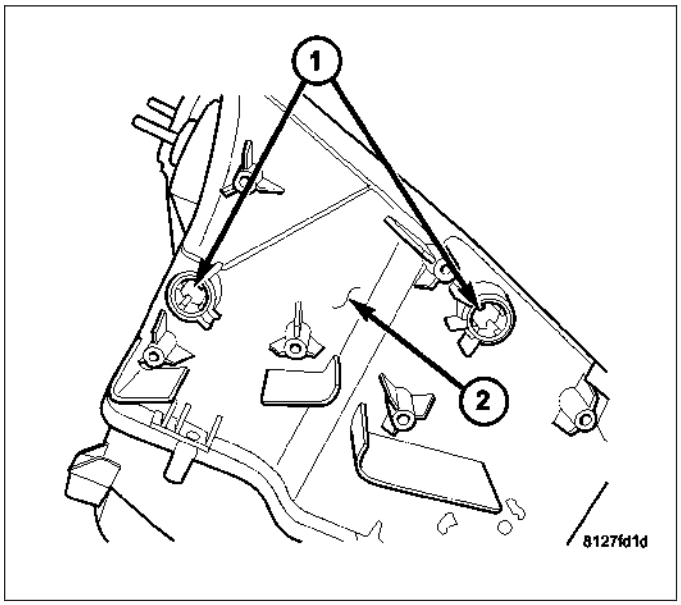
12. Carefully install the heater core (6) into the top of the HVAC housing (3). Make sure that the heater core insulator is properly positioned.
13. Install the two screws (4) that secure the heater core retaining bracket (5) to the HVAC housing. Tighten the screws to 2.2 N·m (20 in. lbs.).
14. Install the HVAC housing bracket (2) to the top of HVAC housing.
15. Install the two screws (1) that secure the HVAC housing bracket to the HVAC housing. Tighten the screws to 2.2 N·m (20 in. lbs.).



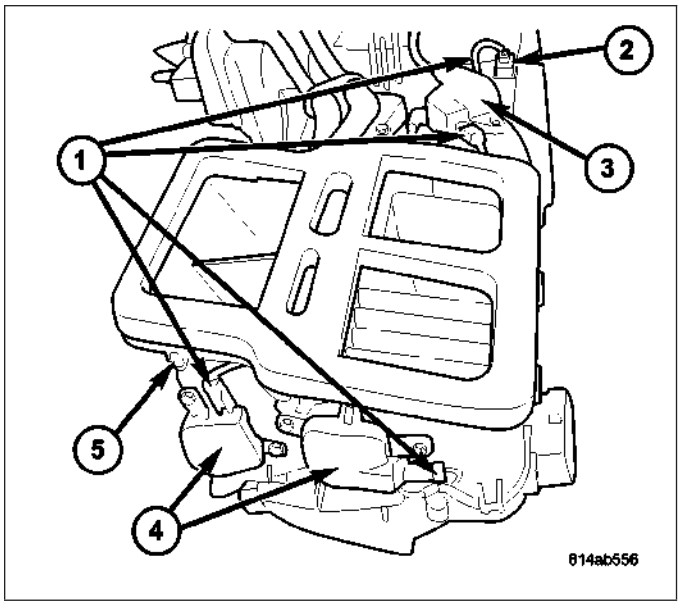
16. Install the heater core tube retaining bracket (4) to the top of the HVAC housing (2).
17. Install the screw (3) that secures the heater core tube retaining bracket to the HVAC housing. Tighten the screw to 2.2 N·m (20 in. lbs.).
18. Install the foam seal (1) to the flange on the HVAC housing.



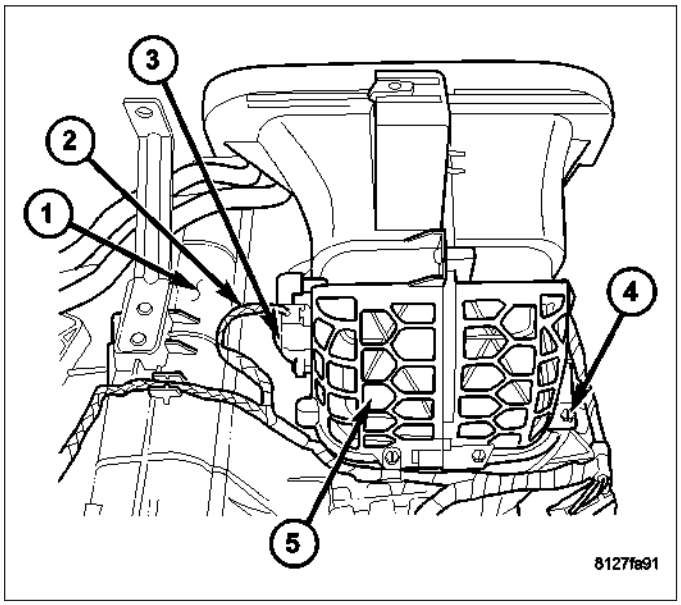
19. Align the two actuator couplers (1) with the mode-air door pivot shafts and install the couplers into the left side of the HVAC housing. Be sure to install the couplers with the coupler arm located between the two stop tabs on the HVAC housing.



20. Install the blend door actuator (3) and the mode door actuators (4) to the HVAC housing (5) (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS - FRONT/ACTUATOR-BLEND DOOR - INSTALLATION) and (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS - FRONT/ACTUATOR-MODE DOOR - INSTALLATION).
21. Install the evaporator temperature sensor (2) into the top of the HVAC housing.
22. Connect the HVAC wire harness (1) to the evaporator temperature sensor, blend door actuator and the mode door actuators.

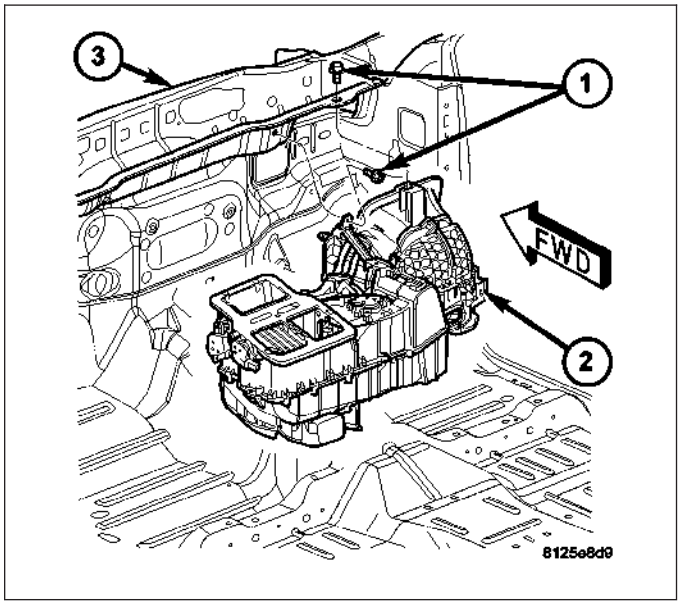


23. If removed, install the recirculation door actuator (3) to the air inlet housing (5).
24. Install the air inlet housing onto the top of the HVAC housing (1).
25. Install the screws (4) that secure the air inlet housing to the HVAC housing. Make sure the HVAC wire harness retainer is properly installed.
26. Connect the HVAC wire harness to the recirculation door actuator (3).
27. Install the HVAC housing (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION - FRONT/HOUSING-HVAC - INSTALLATION).

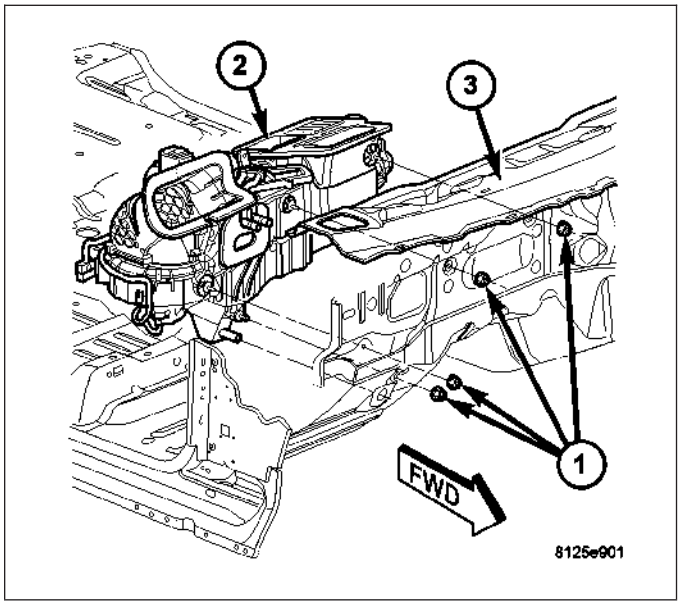


INSTALLATION

1. Position the HVAC housing (2) into the passenger compartment with the mounting studs and the condensate drain tube in their proper mounting locations in the dash panel (3).
2. Loosely install the two bolts (1) that secure the HVAC housing to the passenger compartment side of the dash panel.



3. Install the four nuts (1) that secure the HVAC housing (2) to the engine compartment side of the dash panel (3). Tighten the nuts to 7 N·m (62 in. lbs.).
4. Tighten the two bolts that secure the HVAC housing to the passenger compartment side of the dash panel. Tighten the bolt(s) to 3 N·m (26 in. lbs.).
5. Connect the intermediate floor distribution duct to front floor distribution duct.
6. Install the instrument panel (Refer to 23 - BODY/ INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - INSTALLATION).
7. Remove previously installed plugs or caps and reconnect the heater hoses to the heater core tubes.
8. Remove previously installed plugs or caps and reconnect the suction line and liquid line to the expansion valve (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT/LINE-A/C LIQUID - INSTALLATION).

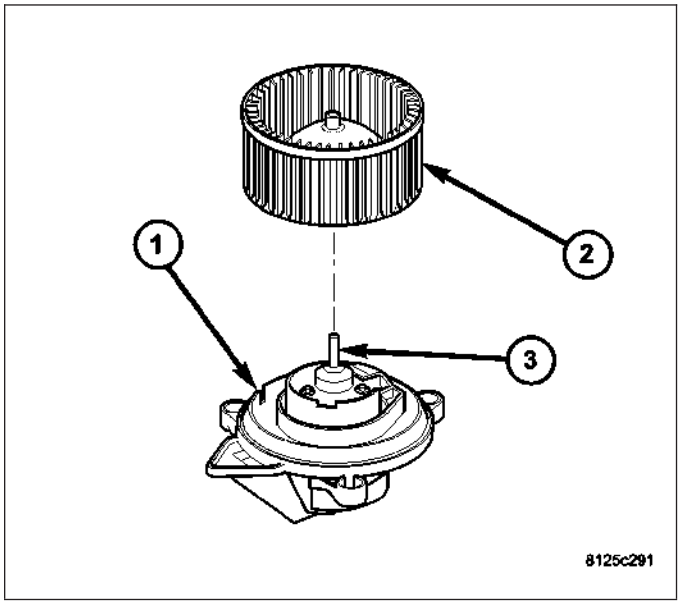


9. Reconnect the negative battery cable.
10. If the heater core is being replaced, flush the cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE - COOLING SYSTEM CLEANING/REVERSE FLUSHING).
11. Refill the engine cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE - COOLING SYSTEM REFILL).
12. Evacuate the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE).
13. Charge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).

MOTOR-BLOWER

DESCRIPTION

The blower motor (1) is a 12-volt, direct current (DC) motor with a squirrel cage-type blower wheel (2) that is secured to the blower motor shaft (3). The blower motor and wheel are located near the passenger side end of the HVAC housing in the passenger compartment below the instrument panel.



OPERATION

The blower motor is used to control the velocity of air moving through the HVAC housing by spinning the blower wheel within the housing at the selected speed whenever the ignition switch is in the On position and the blower control switch is in any position except Off.

Blower motor speed is controlled by regulating the path to ground through the blower motor control switch and the blower motor resistor. The blower motor receives battery current whenever the blower motor relay is energized. The blower motor relay output circuit is protected by a fuse in the integrated power module (IPM) located in the engine compartment.

The blower motor and blower motor wheel are factory balanced and cannot be adjusted or repaired. If faulty or damaged, the blower motor and blower wheel must be replaced as an assembly.

DIAGNOSIS AND TESTING

BLOWER MOTOR

WARNING: On vehicles equipped with airbags, disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.

For circuit descriptions and diagrams, refer to Air Conditioning/Heater in Group 8W - Wiring Diagrams. Possible causes of an inoperative front or rear blower motor include:

- Faulty fuse (the rear blower motor fuse is located in the relay and fuse block located on the back of the junction block)
- Faulty blower motor circuit wiring or wire harness connectors
- Faulty blower motor resistor block
- Faulty blower motor relay (Voltage Reduction Relay or VRR) (front only)
- Faulty blower motor switch
- Faulty heater-A/C mode control switch (front only)
- Faulty blower motor.

Possible causes of the front or rear blower motor not operating in all speeds include:

- Faulty fuse (the rear blower motor fuse is located in the relay and fuse block located on the back of the junction block)
- Faulty blower motor switch
- Faulty blower motor resistor block
- Faulty blower motor relay (front only)
- Faulty blower motor circuit wiring or wire harness connectors

VIBRATION

Possible causes of front or rear blower motor vibration include:

- Improper blower motor mounting
- Improper blower wheel mounting
- Blower wheel out of balance or deformed
- Foreign material in blower wheel causing out of balance condition
- Blower motor faulty.

NOISE

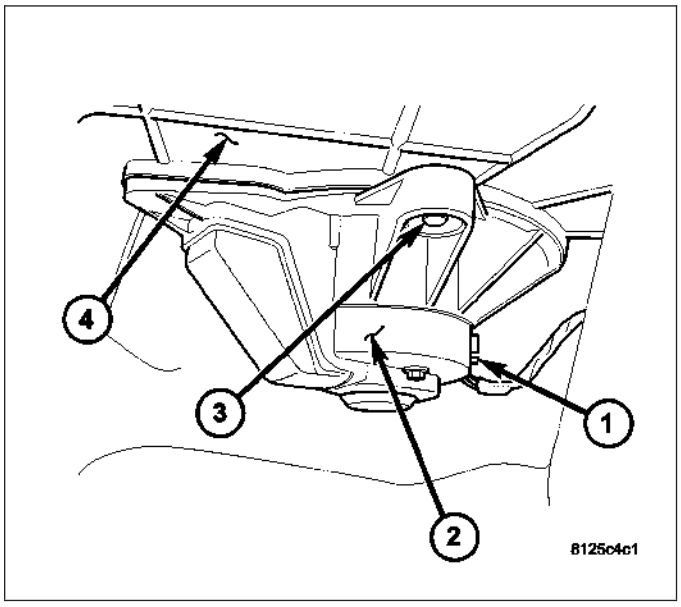
To determine if the front or rear blower motor is the source of the noise, simply switch the front or rear blower motor from Off to On. To verify that the blower motor is the source of the noise, unplug the blower motor wire harness connector and operate the heater-A/C system. If the noise goes away, possible causes include:

- Foreign material in the HVAC housing
- Improper blower motor mounting
- Improper blower wheel mounting
- Blower motor faulty.

REMOVAL

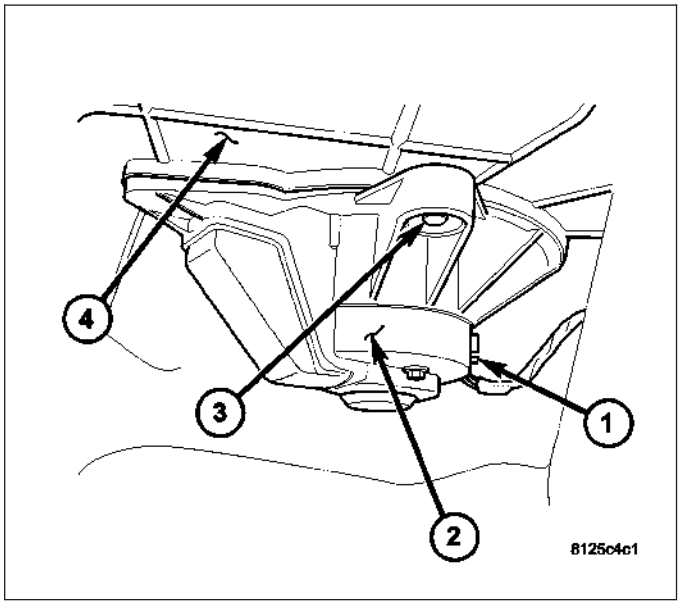
WARNING: On vehicles equipped with airbags, disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.

1. Disconnect and isolate the negative battery cable.
2. Remove the right front door sill trim panel (Refer to 23 - BODY/INTERIOR/DOOR SILL TRIM - REMOVAL).
3. Remove the right side interior cowl trim cover (Refer to 23 - BODY/INTERIOR/COWL TRIM COVER - REMOVAL).
4. Disconnect the wire harness connector (1) from the blower motor (2).
5. Remove the three screws (3) that secure the blower motor and blower wheel assembly to the HVAC housing (4).
6. Remove the blower motor and blower wheel assembly from the HVAC housing.



INSTALLATION

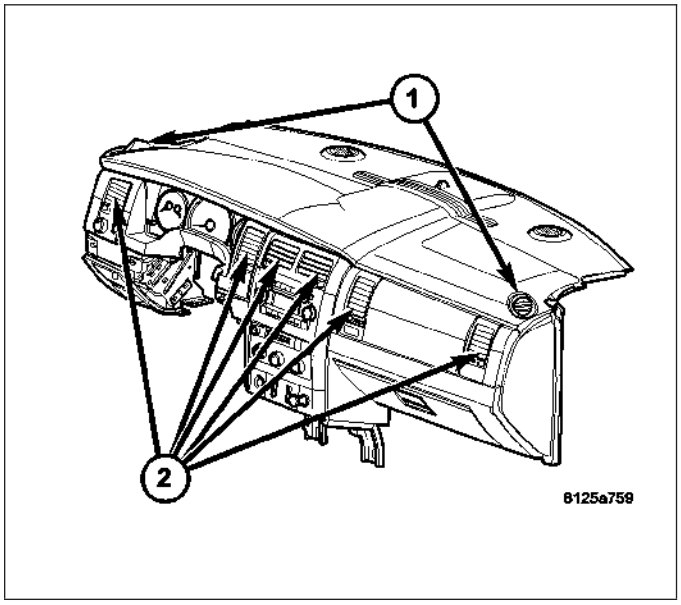
1. Position the blower motor and blower wheel assembly (2) into the HVAC housing (4).
2. Install the three screws (3) that secure the blower motor and blower wheel assembly to the HVAC housing. Tighten the screws to 2.2 N·m (20 in. lbs.).
3. Connect the wire harness connector (1) to the blower motor.
4. Install the right side interior cowl trim cover (Refer to 23 - BODY/INTERIOR/COWL TRIM COVER - INSTALLATION).
5. Install the right front door sill trim panel (Refer to 23 - BODY/INTERIOR/DOOR SILL TRIM - INSTALLATION).
6. Reconnect the negative battery cable.



OUTLET-AIR

DESCRIPTION

There are two side window demister air outlets (1). One located on each end of the instrument panel top pad. The airflow from the side window demister air outlets is directed by fixed vanes in the demister outlet grilles and cannot be adjusted. The side window demister air outlets are serviceable from the instrument panel top pad.

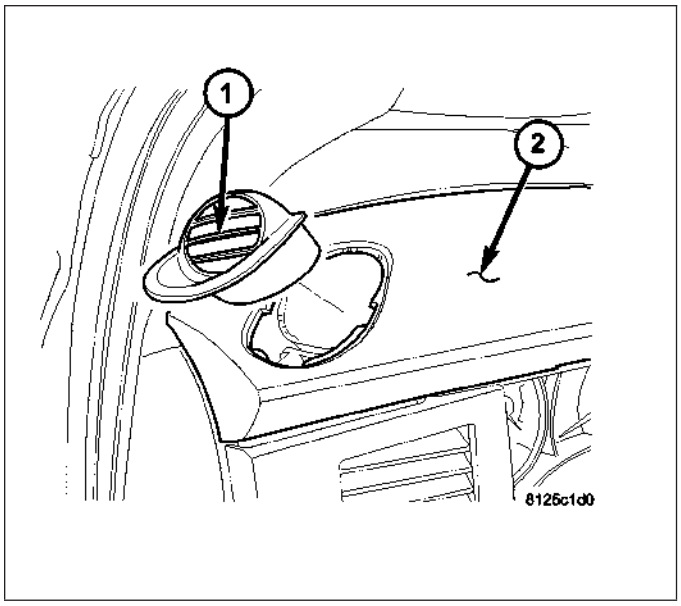


There are six instrument panel air outlets (2). One air outlet is located near each outboard end of the instrument panel facing the rear of the vehicle, one air outlet is located on each side of the instrument panel center bezel, and two air outlets are located on the top of the instrument panel center bezel. Each of the instrument panel air outlets contain a grille with movable vanes that are used to direct or shut off the flow of the conditioned air leaving the instrument panel outlets. The instrument panel air outlets and grilles cannot be serviced separately (Refer to 23 - BODY/INSTRUMENT PANEL/CLUSTER BEZEL - REMOVAL), (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - REMOVAL) and (Refer to 23 - BODY/INSTRUMENT PANEL/IP PASSENGER SIDE BEZEL - REMOVAL).

REMOVAL - DEMISTER OUTLETS

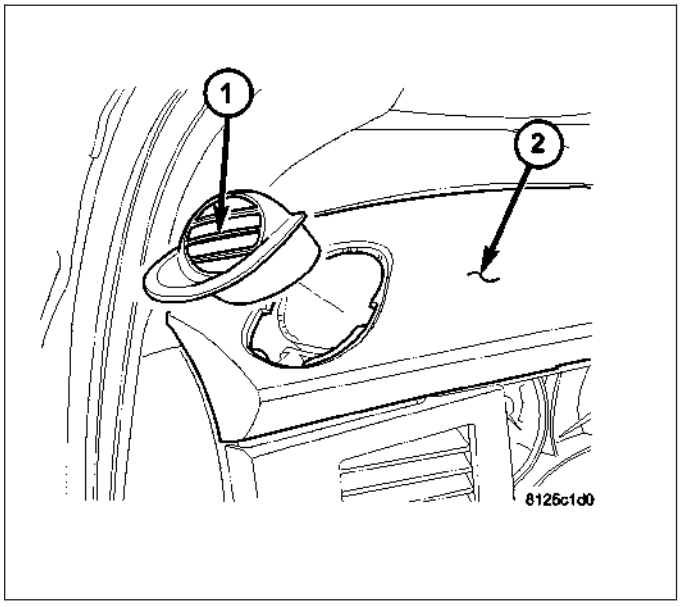
NOTE: The instrument panel demister outlets are retained into the instrument panel top pad by a light snap fit.

1. Using a trim stick or another suitable wide flat-bladed tool, gently pry the instrument panel demister outlet(s) (1) out of the instrument panel top pad (2) as required.



INSTALLATION - DEMISTER OUTLETS

1. Position the instrument panel demister outlet(s) (1) onto the instrument panel top pad (2).
2. Gently push the demister outlet(s) into the top pad until it snaps into place.



DISTRIBUTION - REAR

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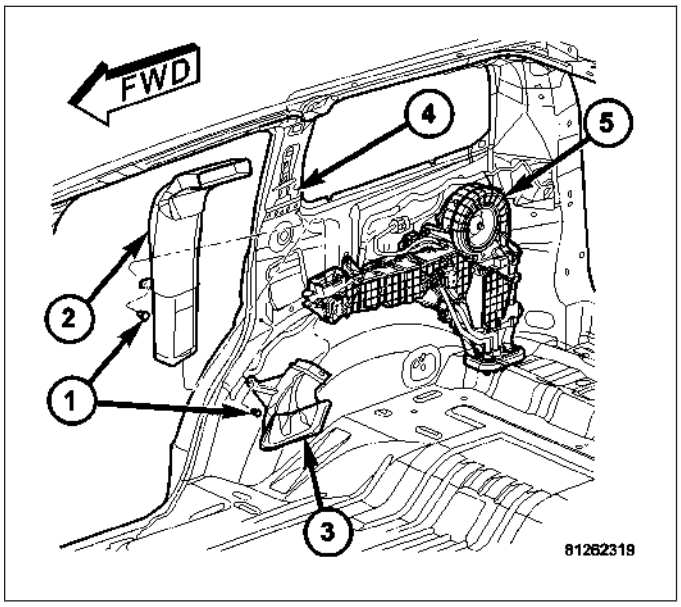
DUCT-DISTRIBUTION

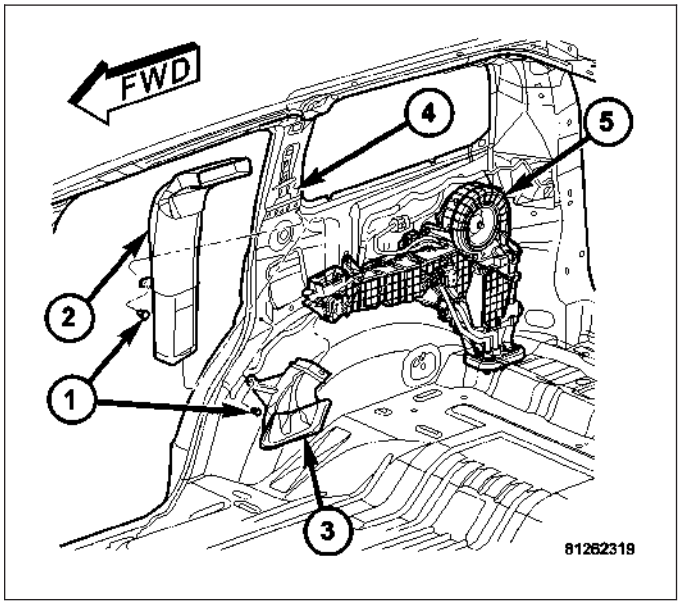
REMOVAL

1. Remove the right interior quarter panel trim (Refer to 23 - BODY/INTERIOR/QUARTER PANEL TRIM - REMOVAL).
2. Remove the push-pin fasteners (1) that secure the rear ceiling distribution duct (2) and the rear floor distribution duct (3) to the right interior quarter panel (4).
3. Disconnect the rear ceiling distribution duct from the rear HVAC housing (5) by sliding the lower half of the ceiling distribution duct into the upper half of the ceiling distribution duct.
4. Disconnect the rear ceiling distribution duct from the headliner duct and remove the ceiling distribution duct from the vehicle.
5. Disconnect the rear floor distribution duct from the rear HVAC housing and remove the floor distribution duct from the vehicle.



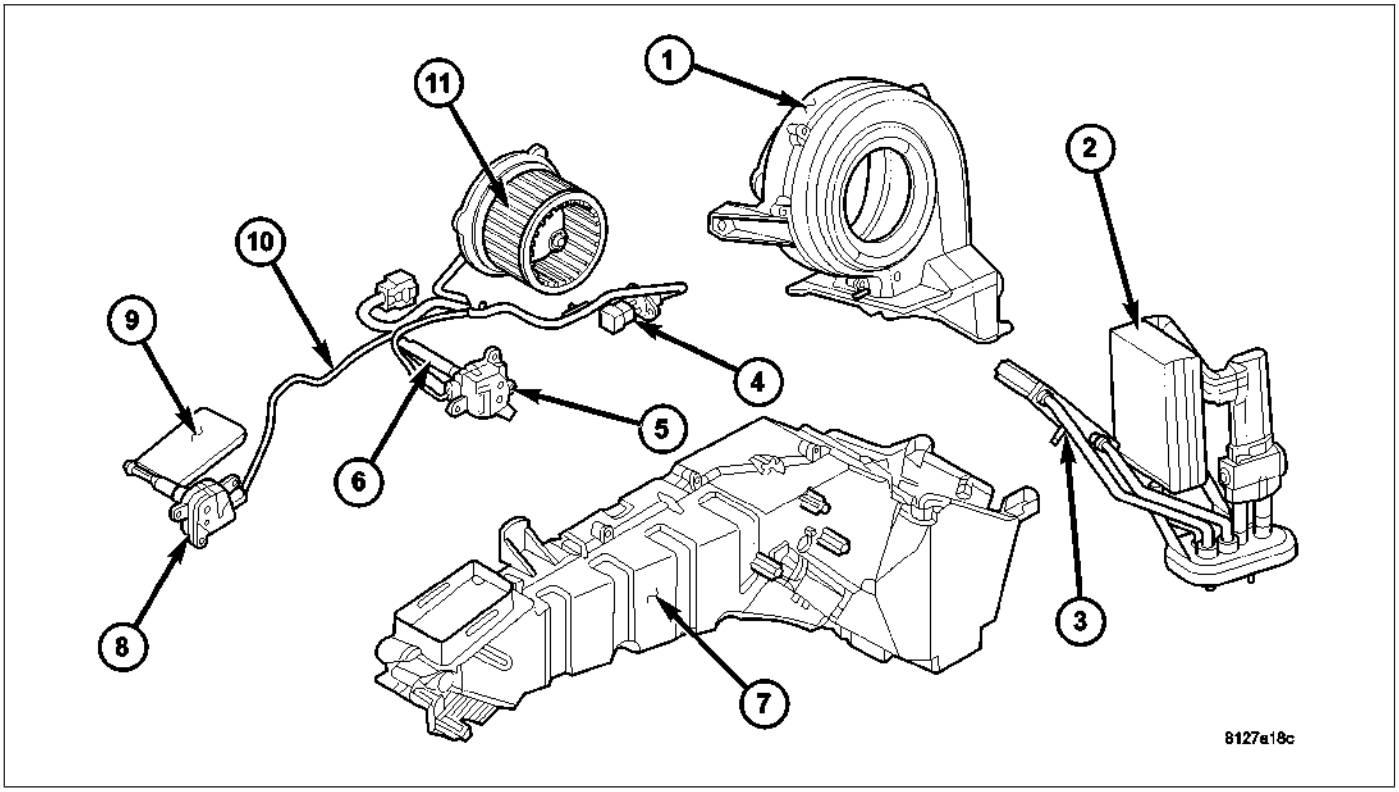
INSTALLATION

1. Connect the rear floor distribution duct (3) to the rear HVAC housing (5).
2. Connect the rear ceiling distribution duct (2) to the headliner duct and the rear HVAC housing. Make sure that the rear ceiling distribution duct is fully installed to ensure a good seal.
3. Install the push-pin fasteners (1) that secure the rear ceiling distribution duct and the rear floor distribution duct to the right interior quarter panel (4).
4. Install the right interior quarter panel trim (Refer to 23 - BODY/INTERIOR/QUARTER PANEL TRIM - INSTALLATION).



HOUSING-HVAC

DESCRIPTION



Models equipped with the rear heating-A/C system are equipped with a common rear heater and A/C housing (7) that combines A/C and heating capabilities into a single unit mounted within the passenger compartment. The rear heating-A/C system is a blend-air type system. A blend-air door (6) controls the amount of conditioned air that is allowed to flow through, or around, the heater core (3). The rear A/C system is designed for the use of a non-CFC, R-134a refrigerant and uses an A/C evaporator (2) to cool and dehumidify the incoming air prior to blending it with the heated air. A temperature control determines the discharge air temperature by operating the blend door actuator

(5) , which moves the blend-air door. This allows an almost immediate control of the output air temperature of the system. The mode door actuator (8) operates the mode-air door (9) which directs the flow of the conditioned air out the upper or lower air outlets, depending on the discharge air temperature selected. Both electric actuators are connected to the vehicle electrical system by the HVAC wire harness (10). The rear blower motor (11) controls the velocity of air flowing through the rear HVAC housing by spinning the blower wheel within the rear blower motor housing (1) at the selected speed by use of the rear blower motor resistor block (4).

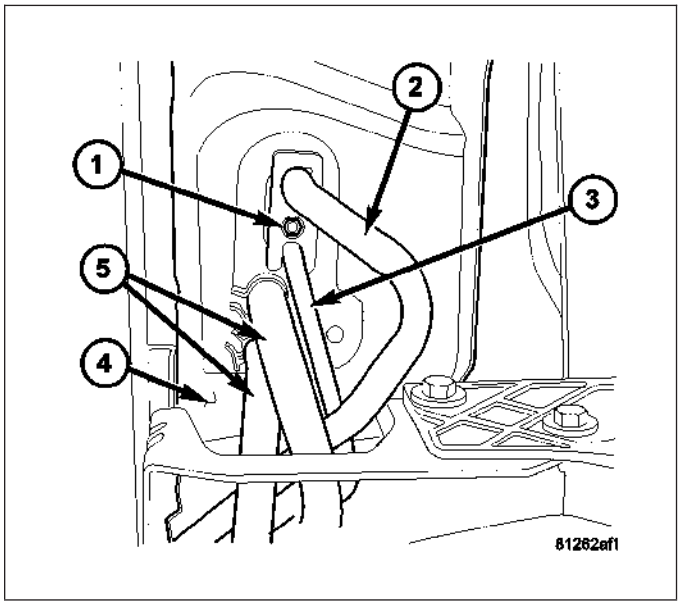
The rear HVAC housing must be removed from the vehicle and disassembled for service of the A/C evaporator, heater core, mode-air door, blend-air door and blower motor.

REMOVAL

WARNING: Refer to the applicable warnings and cautions for this system before performing the following operation (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - WARNINGS) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - CAUTIONS). Failure to follow the warnings and cautions could result in possible personal injury or death.

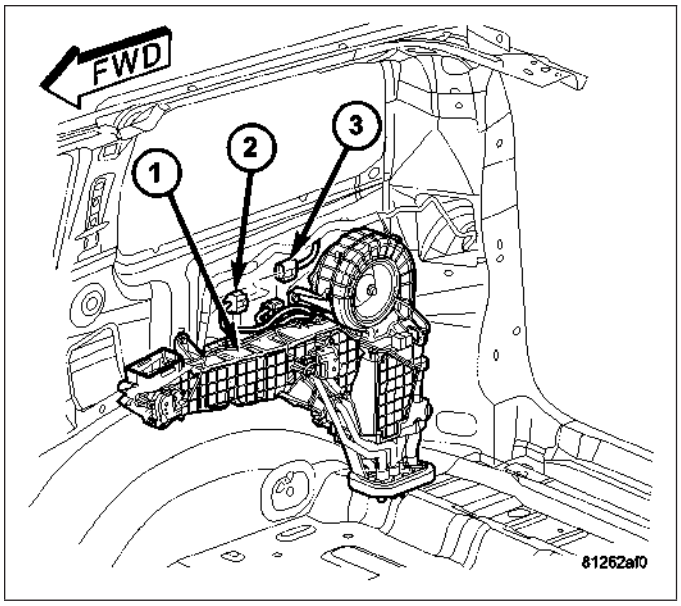
NOTE: The rear HVAC housing must be removed from the vehicle and disassembled for service of the A/C evaporator, heater core, mode-air door, blend-air door and blower motor.

1. Recover the refrigerant from the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY).
2. Drain the engine cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE - COOLING SYSTEM DRAIN).
3. Disconnect and isolate the negative battery cable.
4. Raise and support the vehicle.
5. Remove the nut (1) that secures the rear suction line (2) and the rear liquid line (3) to the rear evaporator extension line tapping plate that extends through the rear floor panel (4) behind the right rear wheel housing.
6. Disconnect the rear suction line and liquid line from the rear evaporator extension line tapping plate.
7. Remove the O-ring seals from the rear suction line and liquid line fittings and discard.

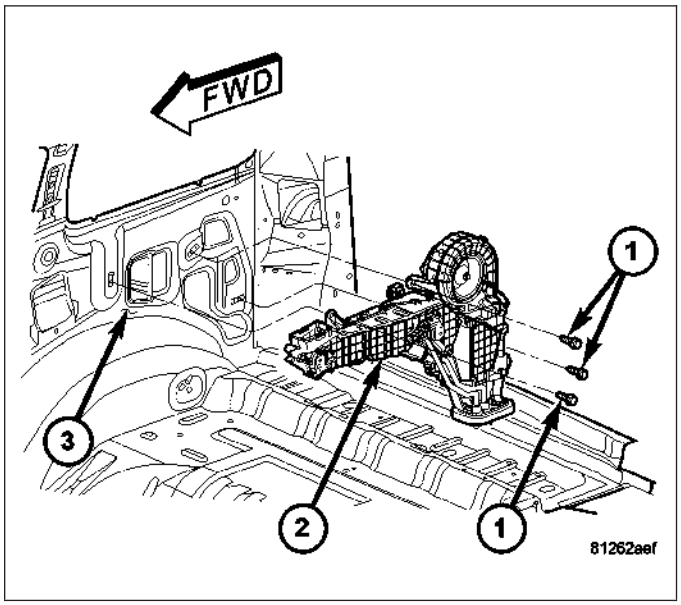


8. Install plugs in, or tape over the opened refrigerant lines and tapping plate ports.
9. Disconnect the rear heater hoses (5) from the rear heater core tubes that extend through the rear floor panel behind the right rear wheel housing.

10. Lower the vehicle.
11. Remove right rear quarter panel trim (Refer to 23 - BODY/INTERIOR/QUARTER PANEL TRIM - REMOVAL).
12. Remove the rear distribution ducts from the rear HVAC housing (1) (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION - REAR/DUCTS-DISTRIBUTION - REMOVAL)
13. Disconnect the body wire harness connector (2) from the rear HVAC wire harness connector (3).



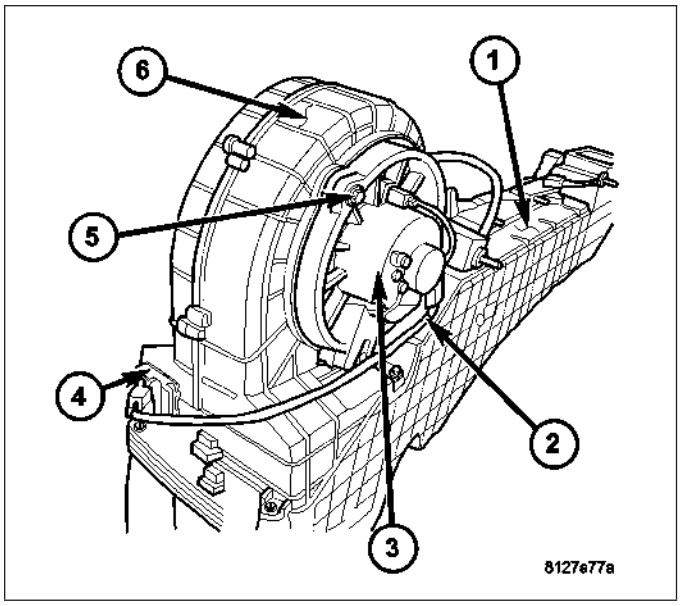
14. Remove the three bolts (1) that secure the rear HVAC housing (2) to the rear interior quarter panel (3).
15. Remove the rear HVAC housing from the vehicle.



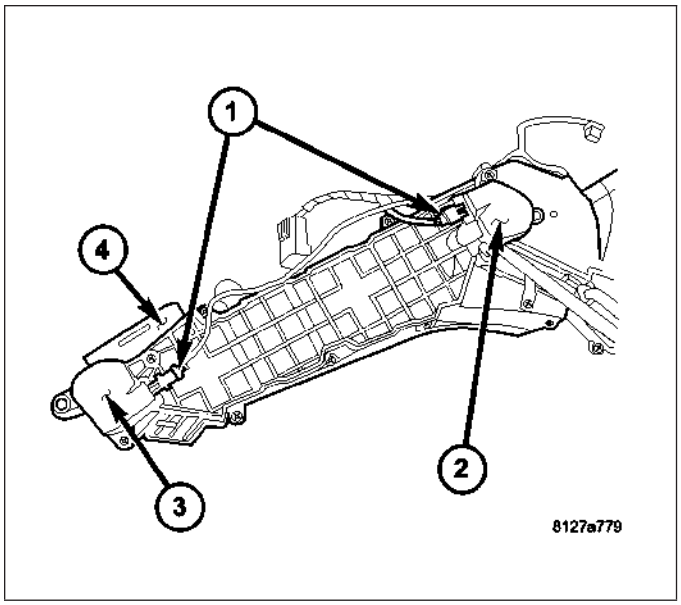
DISASSEMBLY

NOTE: The rear HVAC housing must be removed from the vehicle and disassembled for service of the A/C evaporator, heater core, mode-air door, blend-air door and blower motor.

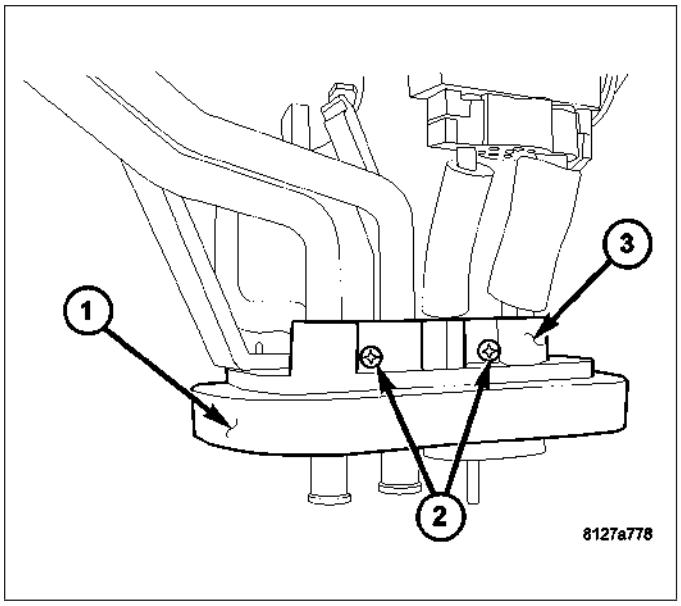
1. Remove the rear HVAC housing (1) and place it on a workbench (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION - REAR/HOUSING-HVAC - REMOVAL).
2. Disconnect the rear HVAC wire harness (2) from the rear blower motor (3) and the rear blower motor resistor (4).
3. If necessary, remove the rear blower motor (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION - REAR/MOTOR-BLOWER - REMOVAL).
4. If necessary, remove the rear blower motor resistor (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS - REAR/RESISTOR-BLOWER MOTOR - REMOVAL).
5. Remove the screws (5) that secure the rear air inlet housing (6) to the rear HVAC housing.
6. Remove the rear air inlet housing from the rear HVAC housing.



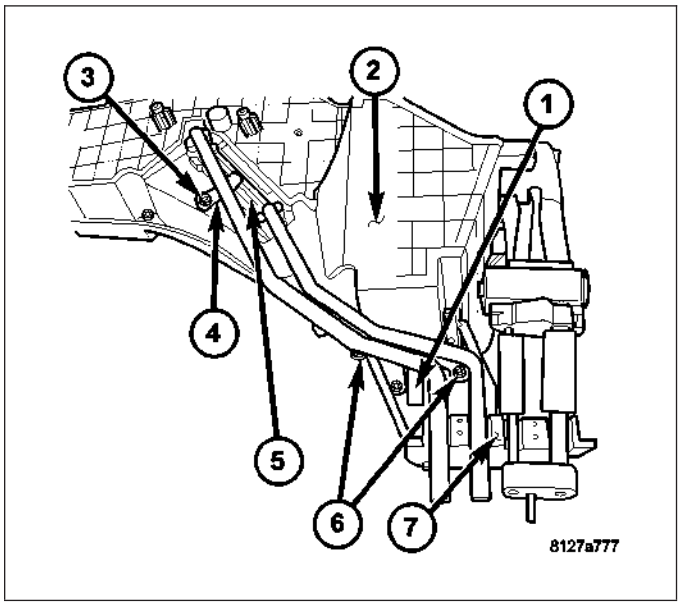
7. Disconnect the rear HVAC wire harness (1) from rear blend door actuator (2) and mode door actuator (3).
8. Remove the rear blend door actuator and mode door actuator from the rear HVAC housing (4) (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS -REAR/ACTUATOR-BLEND DOOR - REMOVAL) and (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS - REAR/ACTUATOR-MODE DOOR - REMOVAL).



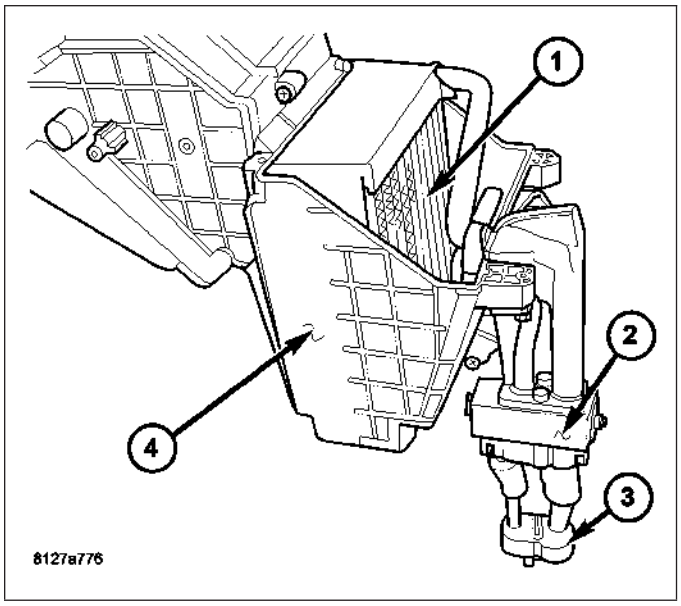
9. Carefully remove the foam seal (1) from the rear heater core and evaporator extension line flange (3). If the seal is deformed or damaged, it must be replaced.
10. Remove the screws (2) that secure the two halves of the rear heater core and evaporator extension line flange together.
11. Remove the outer half of the rear heater core and evaporator extension line flange.



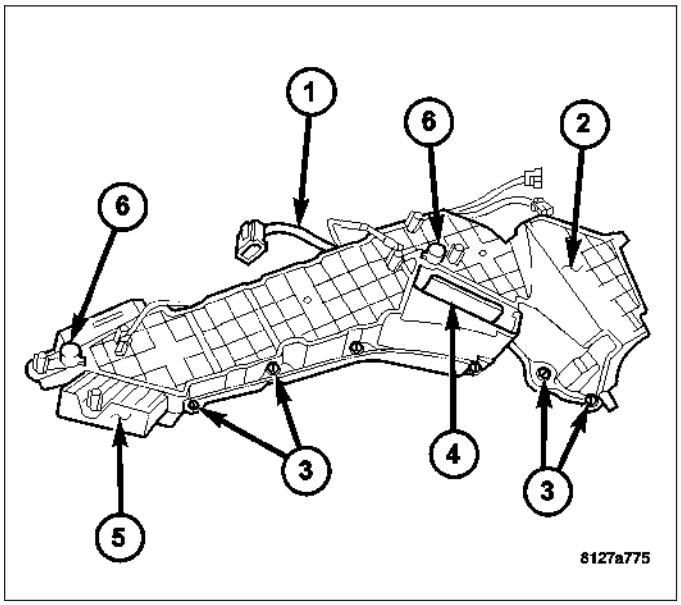
12. Disconnect the condensate drain tube (1) from the rear HVAC housing (2).
13. Remove the screw (3) that secures the rear heater core tube retaining bracket (4) to the rear HVAC housing.
14. Remove the rear heater core tube retaining bracket.
15. Carefully pull the rear heater core (5) out of the side of the rear HVAC housing.
16. Remove the two screws (6) that secure the rear extension line flange bracket (7) to the bottom of the rear HVAC housing.



17. Carefully lift the rear A/C evaporator (1), rear expansion valve (2) and the rear extension line bracket (3) as an assembly out of the top of the rear HVAC housing (4).

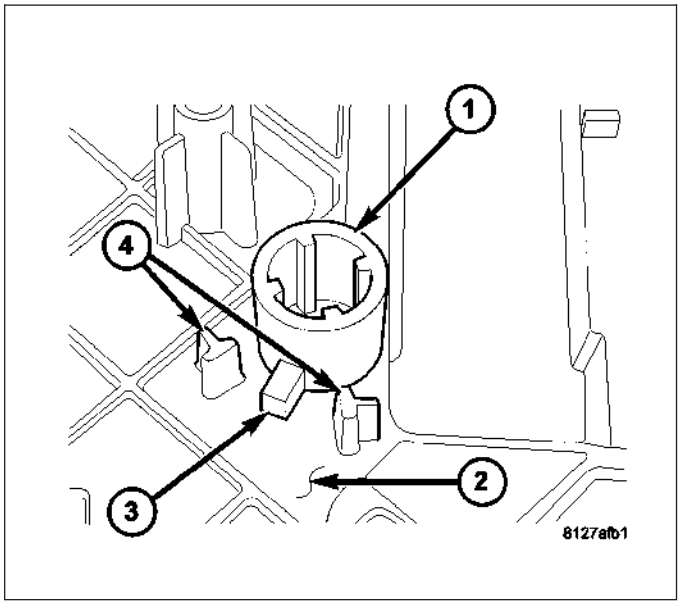


18. Remove the rear HVAC wiring harness (1) from the rear HVAC housing (2).
19. Remove the screws (3) that secure the two halves of the rear HVAC housing together.
20. Separate the two halves of the rear HVAC housing.
21. Remove the blend-air door (4) and mode-air door (5) from the rear HVAC housing.
22. If necessary, remove the actuator couplers (6) from the rear HVAC housing.

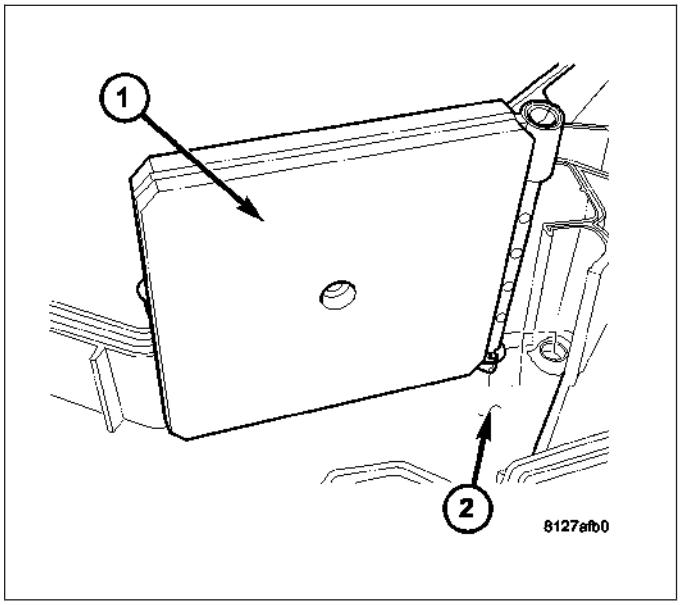


ASSEMBLY

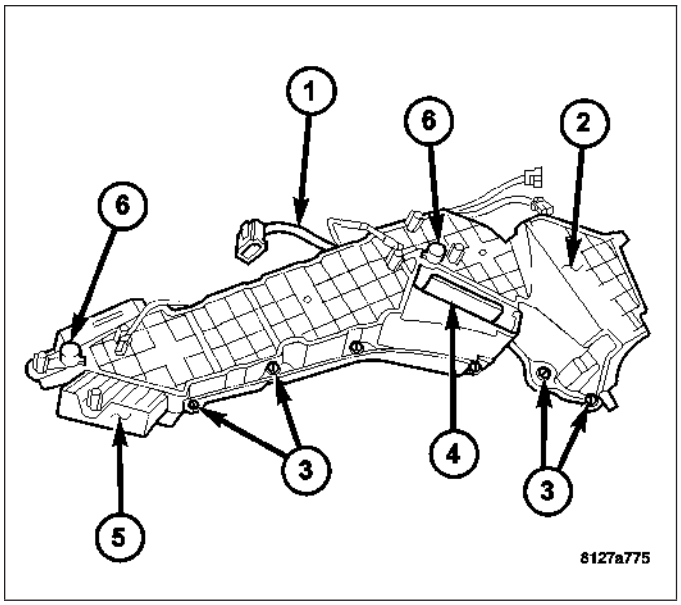
1. If removed, install the two actuator couplers (1) into the rear HVAC housing. Be sure to install the couplers with the coupler arm (3) located between the two stop tabs (4) on the HVAC housing.



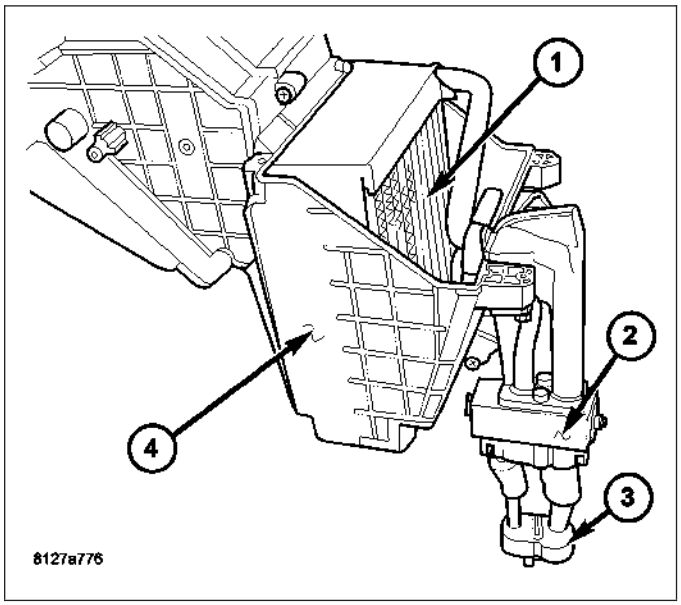
2. Install the blend-air door (1) and the mode-air door into the rear HVAC housing (2).



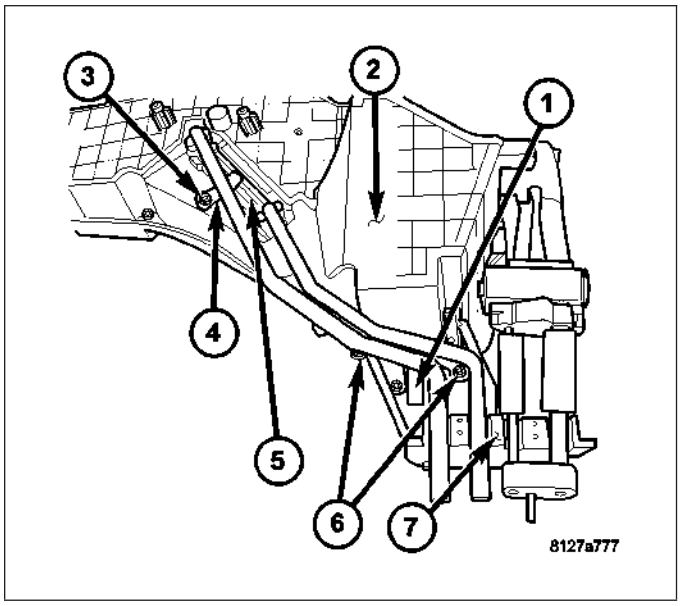
3. Align the pivot shafts of the blend-air door (4) and the mode-air door (5) to the actuator couplers (6) and install the two halves of the rear HVAC housing (2) together.
4. Install the screws (3) that secure the two halves of the rear HVAC housing together. Tighten the screws to 2 N·m (17 in. lbs.).
5. Install the HVAC wire harness (1). Make sure the harness is routed through all wiring retainers.



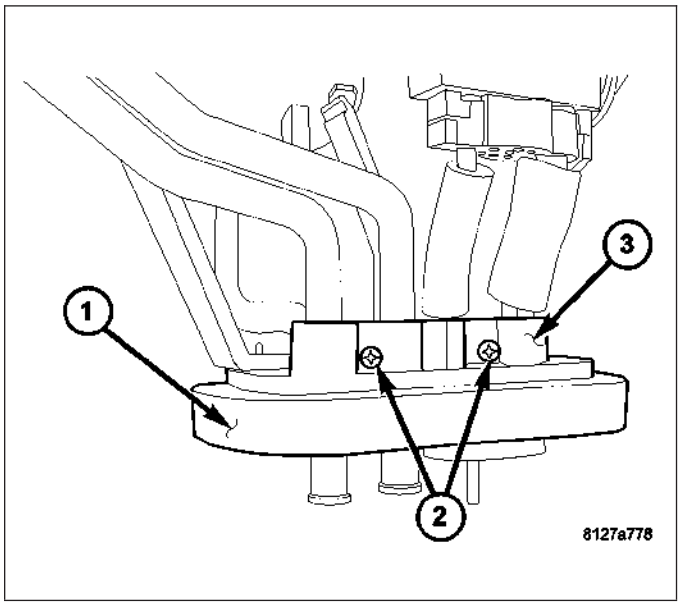
6. Install the rear A/C evaporator (1), rear expansion valve (2) and the rear extension line bracket (3) as an assembly into the top of the rear HVAC housing (4). Make sure that the evaporator drain is clean and unrestricted and that the evaporator insulator is properly installed.



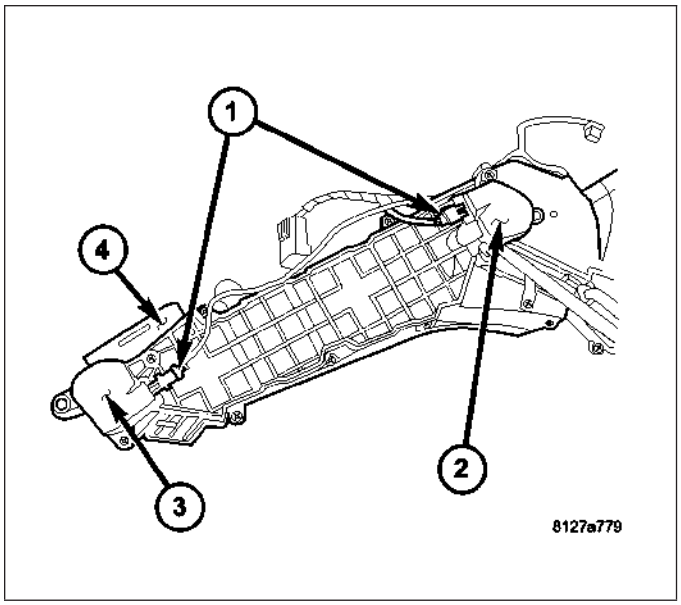
7. Install the two screws (6) that secure the rear extension line flange bracket (7) to the bottom of the rear HVAC housing (2). Tighten the screws to 2 N·m (17 in. lbs.).
8. Install the rear heater core (5) into the side of the rear HVAC housing. Make sure that the insulator is properly installed.
9. Install the rear heater core retaining bracket (4).
10. Install the screw (3) that secures the rear heater core retaining bracket to the rear HVAC housing. Tighten the screw to 2 N·m (17 in. lbs.).
11. Connect the condensate drain tube (1) to the rear HVAC housing.



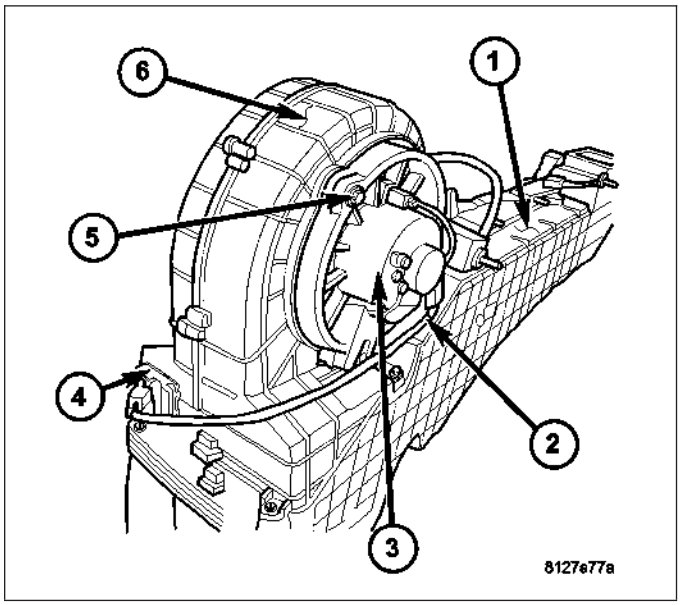
12. Install the outer halve of the rear heater core and evaporator extension line flange (3).
13. Install the screws (2) that secure the two halves of the rear heater core and evaporator extension line flange together. Tighten the screws to 2 N·m (17 in. lbs.).
14. Install the foam seal (1) to the rear heater core and evaporator extension line flange.



15. Install the blend door actuator (2) and the mode door actuator (3) to the rear HVAC housing (4) (Refer to 24 - HEATING & AIR CONDITIONING/ CONTROLS - REAR/ACTUATOR-BLEND DOOR - INSTALLATION) and (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS - REAR/ACTUATOR-MODE DOOR - INSTALLATION).
16. Connect the rear HVAC wire harness (1) to the rear blend door actuator and mode door actuator.

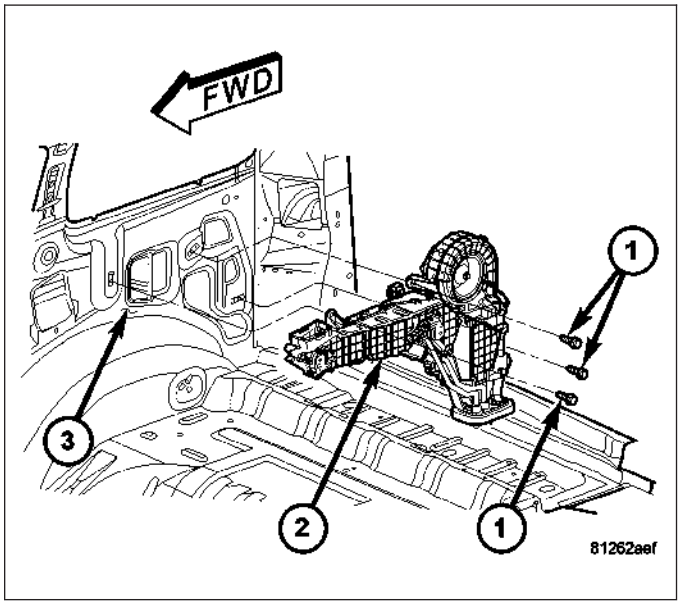


17. Install the rear air inlet housing (6) onto the rear HVAC housing (1).
18. Install the screws (5) that secure the rear air inlet housing to the rear HVAC housing. Tighten the screws to 2 N·m (17 in. lbs.).
19. If removed, install the rear blower motor resistor (4) (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS - REAR/RESISTOR-BLOWER MOTOR - INSTALLATION).
20. If removed, install the rear blower motor (3) (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION - REAR/MOTOR-BLOWER - INSTALLATION).
21. Connect the rear HVAC wire harness (2) to the rear blower motor and the rear blower motor resistor.
22. Install the rear HVAC housing (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION - REAR/HOUSING-HVAC - INSTALLATION).

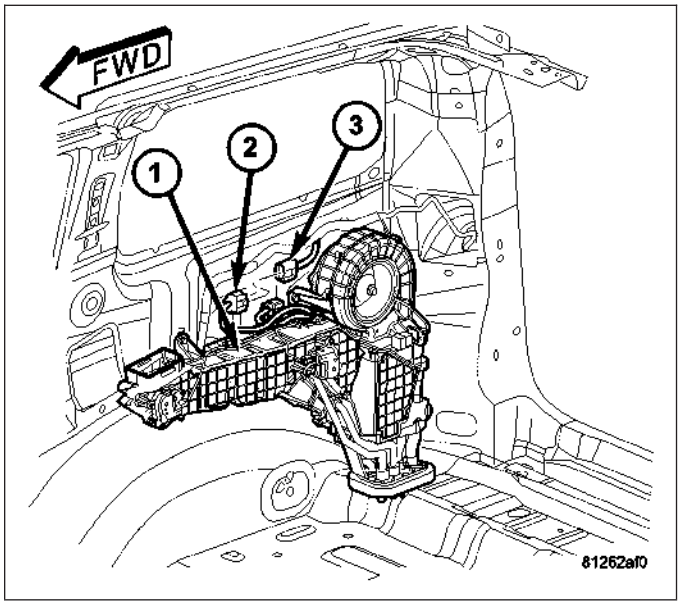


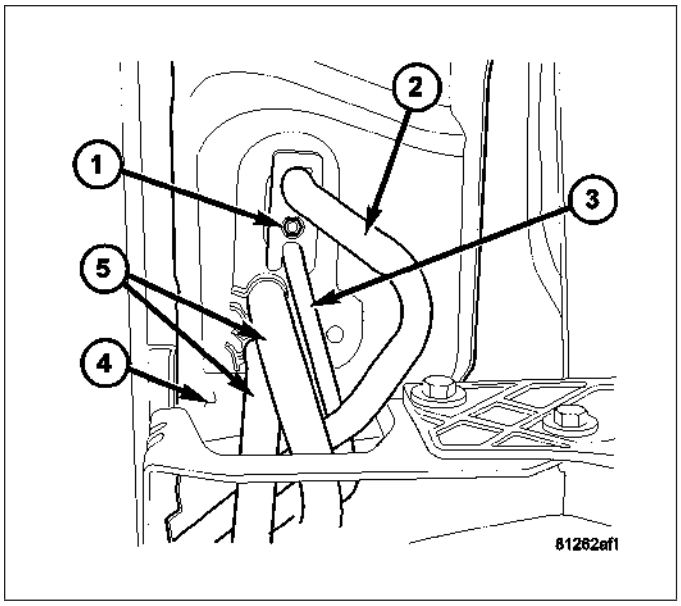
INSTALLATION

1. Position the rear HVAC housing (2) into the vehicle.
2. Install the three bolts (1) that secure the rear HVAC housing to the rear interior quarter panel (3). Tighten the bolts to 3 N·m (26 in. lbs.).



3. Connect the body wire harness connector (2) to the rear HVAC wire harness connector (3).
4. Install the rear distribution ducts to the rear HVAC housing (1) (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION - REAR/DUCTS-DISTRIBUTION - INSTALLATION).
5. Install the right rear quarter panel trim (Refer to 23 - BODY/INTERIOR/QUARTER PANEL TRIM - INSTALLATION).



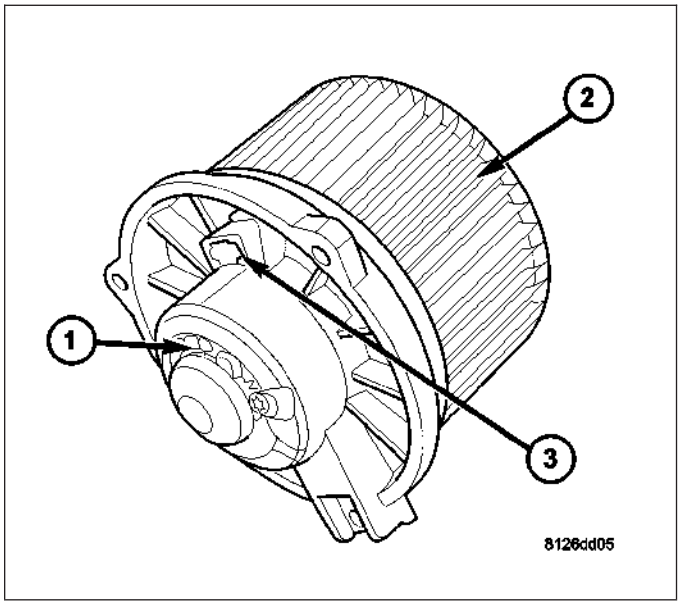


6. Raise and support the vehicle.
7. Connect the rear heater hoses (5) to the rear heater core tubes that extend through the rear floor panel (4) behind the right rear wheel housing.
8. Remove the tape or plugs from fittings on the rear suction line (2) and the rear liquid line (3) and the rear evaporator extension line tapping plate ports.
9. Lubricate new rubber O-ring seals with clean refrigerant oil and install them onto the rear suction and liquid line fittings. Use only the specified O-rings as they are made of a special material for the R-134a refrigerant system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
10. Connect the rear suction and liquid line fittings to the rear evaporator extension line tapping plate.
11. Install the nut (1) that secures the rear suction and liquid lines to the rear evaporator extension line tapping plate. Tighten the nut to 23 N·m (17 ft. lbs.).
12. Lower the vehicle.
13. Reconnect the negative battery cable.
14. If the heater core is being replaced, flush the cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE - COOLING SYSTEM CLEANING/REVERSE FLUSHING).
15. Fill the engine cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE - COOLING SYSTEM FILL).
16. Evacuate the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE).
17. Charge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).

MOTOR-BLOWER

DESCRIPTION

The rear blower motor (1) and blower wheel (2) is located in the rear HVAC housing behind the right interior quarter panel trim and is connected to rear HVAC wire harness by a integral wire harness connector (3). The rear blower motor controls the velocity of air flowing through the rear HVAC housing by spinning the wide squirrel cage-type blower wheel within the HVAC housing at the selected speed. Rear blower motor speed is controlled by regulating the ground path through the rear blower motor switch and the rear blower motor resistor block.



OPERATION

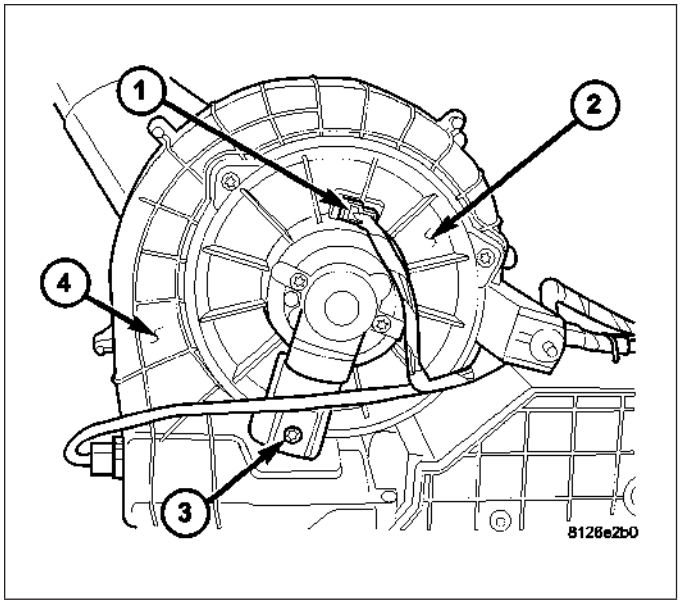
The rear blower motor will only operate when the ignition switch is in the On position and the front A/C-heater control is set to either front control of rear heating-A/C system or to the rear control of the rear heating-A/C system. The rear blower motor receives a battery feed through the rear blower motor relay located in the power distribution center (PDC), whenever the ignition switch is in the On position.

For diagnosis and testing of the rear blower motor, refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION - FRONT/MOTOR-BLOWER - DIAGNOSIS AND TESTING.

The rear blower motor, blower wheel, and blower wheel housing cannot be repaired and, if faulty or damaged, they must be replaced as an assembly.

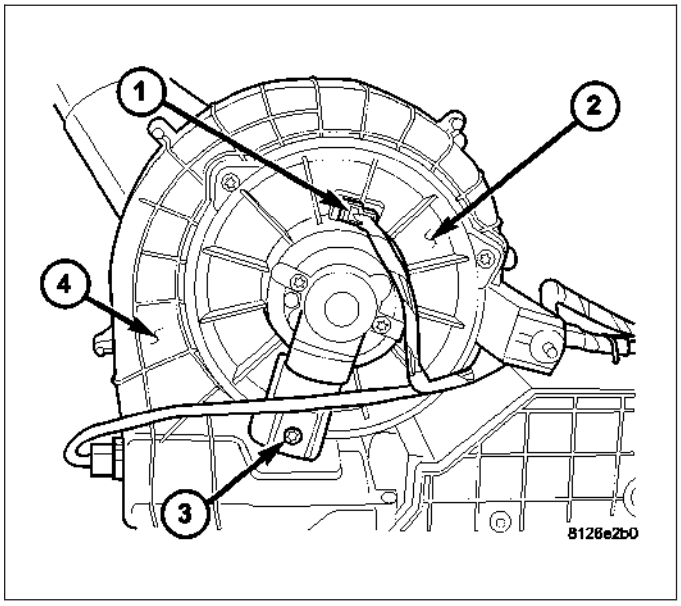
REMOVAL

1. Disconnect and isolate the negative battery cable.
2. Remove the rear HVAC housing (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION - REAR/HOUSING-HVAC - REMOVAL).
3. Disconnect the rear HVAC wire harness connector (1) from the rear blower motor (2).
4. Remove the three screws (3) that secure the rear blower motor to the rear air inlet housing (4).
5. Remove the rear blower motor from the rear air inlet housing.



INSTALLATION

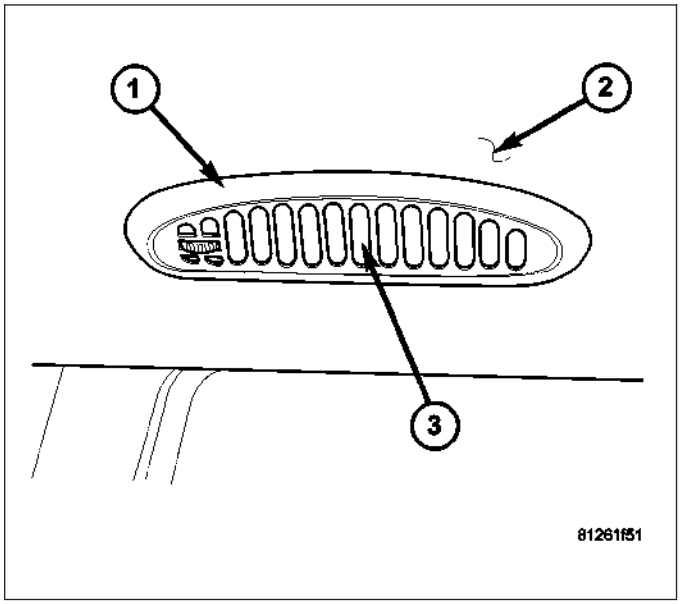
1. Position the rear blower motor (2) into the rear air inlet housing (4).
2. Install the three screws (3) that secure the rear blower motor to the rear air inlet housing. Tighten the screws to 2.2 N·m (20 in. lbs.).
3. Connect the rear HVAC wire harness connector (1) to the rear blower motor.
4. Install the rear HVAC housing (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION - REAR/HOUSING-HVAC - INSTALLATION).
5. Reconnect the negative battery cable.



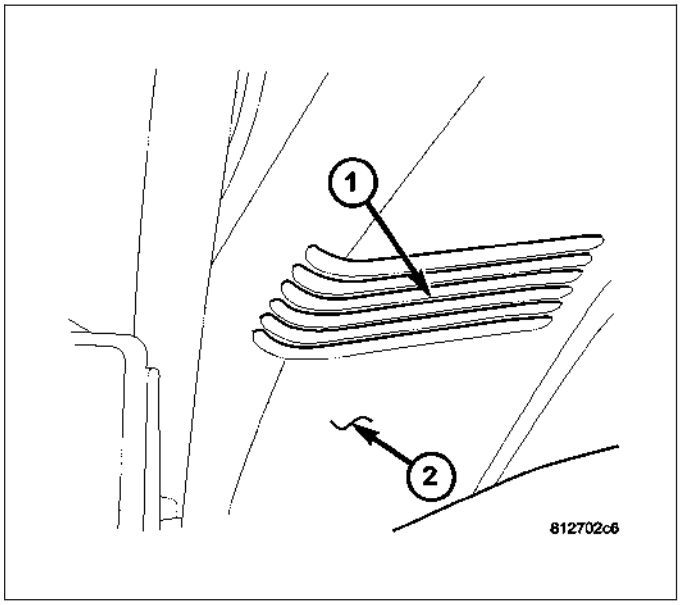
OUTLET-AIR

DESCRIPTION

There are four rear ceiling air outlets (1) located in the headliner (2). One air outlet is located at each outboard side of the intermediate seat position facing the center of the vehicle, and one located in front of each rear seat position facing the rear of the vehicle. Each of the rear ceiling air outlets contain a grille with movable vanes (3) that are used to direct or shut off the flow of the conditioned air leaving the rear ceiling air outlets. The rear ceiling air outlets and grilles can each be serviced seperately.



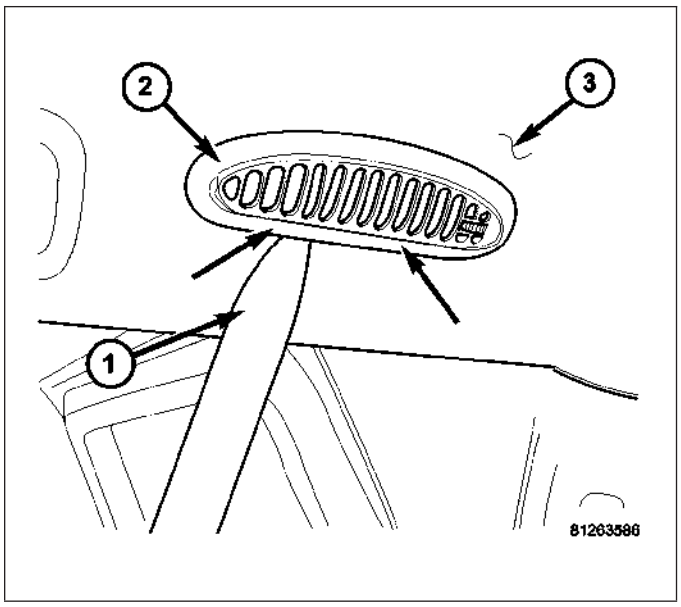
There is one rear floor air outlet (1) located behind the right rear door area in the right quarter interior trim panel (2). The airflow from the rear floor air outlet is directed by fixed vanes in the right quarter interior trim panel and cannot be adjusted. The rear floor air outlet is not serviceable.



REMOVAL

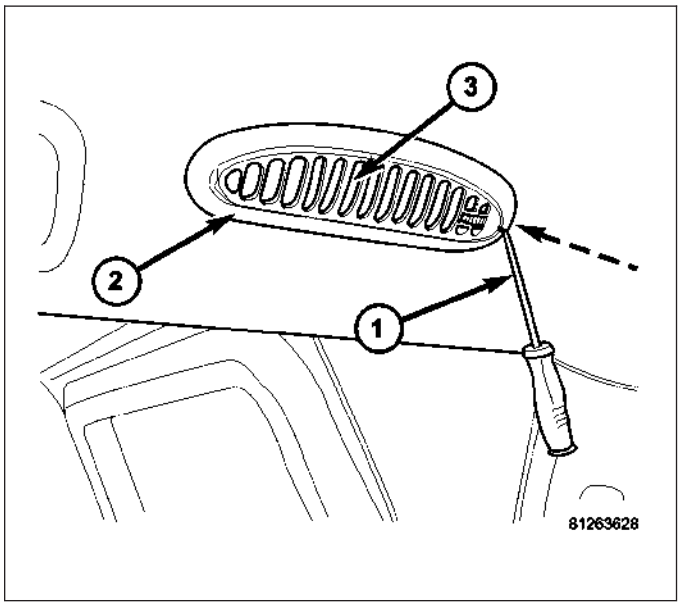
REAR CEILING AIR OUTLET

1. Using a trim stick or another suitable wide flat-blade tool (1), gently pry between both bottom ends of the rear ceiling air outlet bezel (2) and the headliner (3) to release the snap clip retainers that secure the air oulet bezel to the headliner.
2. Remove the rear ceiling air outlet(s) from the headliner.

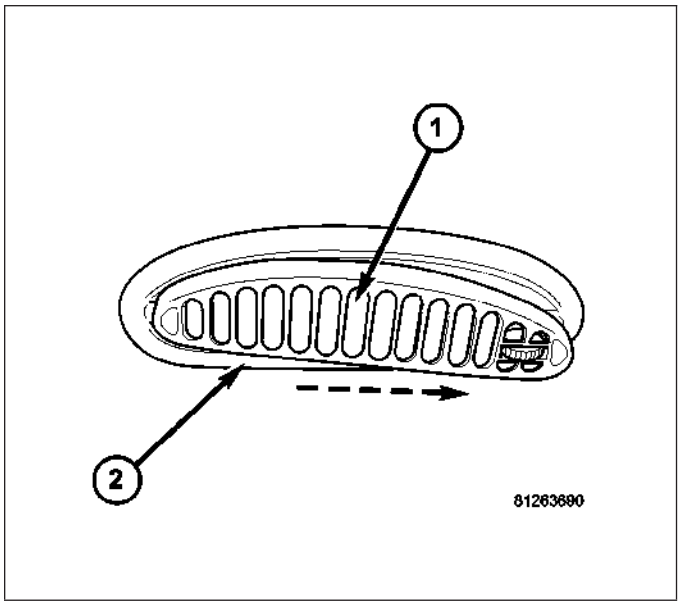


REAR CEILING AIR OUTLET GRILLE

1. Using a pick or another suitable tool (1), gently pry between the right end of the rear ceiling air outlet bezel (2) and the air outlet grille (3) to release the snap clip retainer that secures the grille to the pivot on the right side of the bezel.



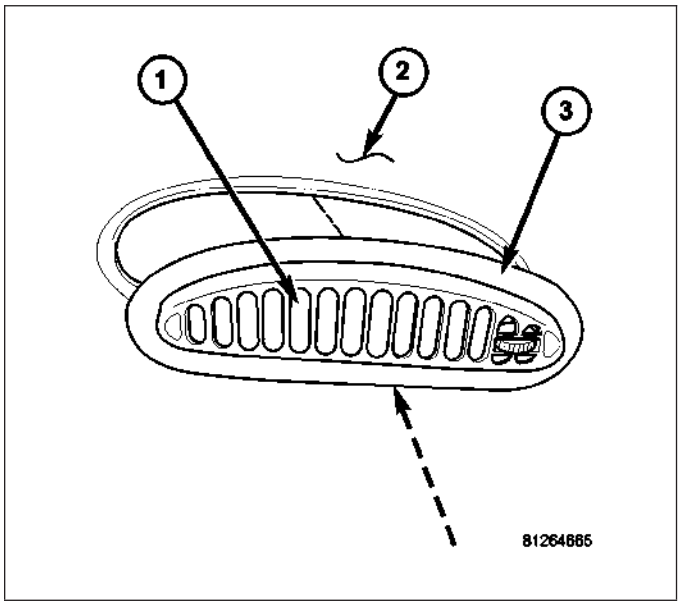
2. Remove the rear ceiling air outlet grille (1) from the pivot on the left side of the air outlet bezel (2) by moving the grille out and to the right of the bezel.



INSTALLATION

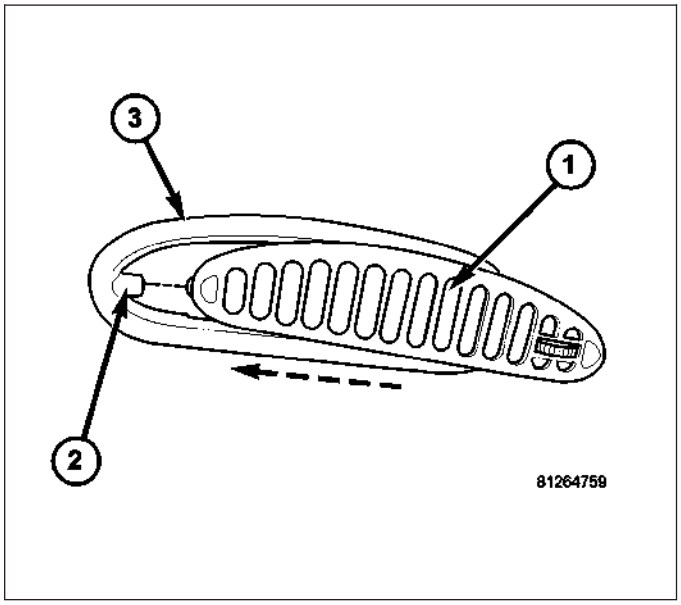
REAR CEILING AIR OUTLET

1. Position the rear ceiling air outlet(s) (1) into the headliner (2).
2. Gently push the air outlet bezel (3) into the headliner until the snap clips in the headliner duct fully engage the slots in the bezel.

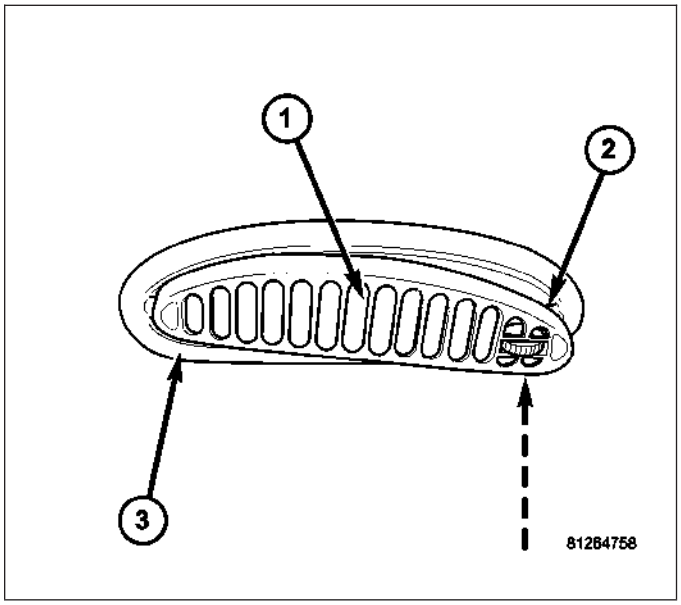


REAR CEILING AIR OUTLET GRILLE

1. Install the rear ceiling air outlet grille (1) onto the pivot shaft (2) on the left side of the air outlet bezel (3).



2. Gently push the air outlet grille (1) onto the pivot shaft (2) on the right side of the air outlet bezel (3).



PLUMBING - FRONT

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PLUMBING - FRONT

DESCRIPTION

The A/C refrigerant lines and hoses are used to carry the refrigerant between the various A/C system components. The refrigerant lines and hoses for the R-134a system on this vehicle consist of a barrier-hose design with a nylon tube sandwiched between rubber layers. The nylon tube helps to contain the R-134a refrigerant, which has a smaller molecular structure than R-12 refrigerant. The ends of the refrigerant lines are made from lightweight aluminum or steel, and commonly use braze-less fittings.

Any kinks or sharp bends in the refrigerant lines and hoses will reduce the capacity of the entire A/C system and can reduce the flow of refrigerant in the system. The radius of all bends in the flexible hose refrigerant lines should

be at least ten times the diameter of the hose and the refrigerant lines should be routed so they are at least 80 millimeters (3 inches) away from the exhaust manifold(s) and exhaust pipe(s).

OPERATION

High pressures are produced in the refrigerant system when the A/C compressor is operating. Extreme care must be exercised to make sure that each of the refrigerant system connections is pressure-tight and leak free. It is a good practice to inspect all flexible hose refrigerant lines at least once a year to make sure they are in good condition and properly routed.

The refrigerant lines and hoses are coupled to other A/C system components with block-type and quick-connect type fittings. Flat gaskets and O-rings are used to mate the refrigerant line fittings with A/C system components to ensure the integrity of the refrigerant system.

The refrigerant lines and hoses cannot be repaired and, if faulty or damaged, they must be replaced.

WARNING

WARNINGS

WARNING: The A/C system contains refrigerant under high pressure. Repairs should only be performed by qualified service personnel. Severe personal injury or death may result from improper service procedures.

WARNING: Avoid breathing the refrigerant and refrigerant oil vapor or mist. Exposure may irritate the eyes, nose, and/or throat. Wear eye protection when servicing the A/C refrigerant system. Serious eye injury can result from direct contact with the refrigerant. If eye contact occurs, seek medical attention immediately.

WARNING: Do not expose the refrigerant to open flame. Poisonous gas is created when refrigerant is burned. An electronic leak detector is recommended. Severe personal injury or death may result from improper service procedures.

WARNING: If accidental system discharge occurs, ventilate the work area before resuming service. Large amounts of refrigerant released in a closed work area will displace the oxygen and cause suffocation and death.

WARNING: The evaporation rate of R-134a refrigerant at average temperature and altitude is extremely high. As a result, anything that comes in contact with the refrigerant will freeze. Always protect the skin or delicate objects from direct contact with the refrigerant.

WARNING: The R-134a service equipment or the vehicle refrigerant system should not be pressure tested or leak tested with compressed air. Some mixtures of air and R-134a have been shown to be combustible at elevated pressures. These mixtures are potentially dangerous, and may result in fire or explosion causing property damage, personal injury or death.

WARNING: The engine cooling system is designed to develop internal pressures of 97 to 123 kilopascals (14 to 18 pounds per square inch). Do not remove or loosen the coolant pressure cap, cylinder block drain plugs, radiator drain, radiator hoses, heater hoses, or hose clamps while the engine cooling system is hot and under pressure. Allow the vehicle to cool for a minimum of 15 minutes before opening the cooling system for service. Failure to observe this warning can result in serious burns from the heated engine coolant.

CAUTION

CAUTIONS

CAUTION: Never add R-12 to a refrigerant system designed to use R-134a. Do not use R-12 equipment or parts on a R-134a A/C system. These refrigerants are not compatible and damage to the A/C system will result.

CAUTION: Never use R-12 refrigerant oil in a A/C system designed to use R-134a refrigerant oil. These refrigerant oils are not compatible and damage to the A/C system will result.

CAUTION: The use of A/C system sealers may result in damage to A/C refrigerant recovery/evacuation/recharging equipment and/or A/C system. Many federal, state/provincial and local regulations prohibit the recharge of A/C systems with known leaks. DaimlerChrysler recommends the detection of A/C system leaks through the use of approved leak detectors and fluorescent leak detection dyes. Vehicles found with A/C system sealers should be treated as contaminated and replacement of the entire A/C refrigerant system is recommended. A/C systems found to be contaminated with A/C system sealers, A/C stop-leak products or seal conditioners voids the warranty for the A/C system.

CAUTION: Recover the refrigerant before opening any fitting or connection. Open the fittings with caution, even after the system has been discharged. Never open or loosen a connection before recovering the refrigerant.

CAUTION: If equipped, do not remove the secondary retention clip from any spring-lock coupler connection while the refrigerant system is under pressure. Recover the refrigerant before removing the secondary retention clip. Open the fittings with caution, even after the system has been discharged. Never open or loosen a connection before recovering the refrigerant.

CAUTION: The internal parts of the A/C system will remain stable as long as moisture-free refrigerant and refrigerant oil is used. Abnormal amounts of dirt, moisture or air can upset the chemical stability. This may cause operational troubles or even serious damage if present in more than very small quantities. Before disconnecting a component, clean the outside of the fittings thoroughly to prevent contamination from entering the refrigerant system. Keep service tools and the work area clean. Do not open the refrigerant system or uncap a replacement component until you are ready to service the system. Immediately after disconnecting a component from the refrigerant system, seal the open fittings with a cap or plug. This will prevent contamination from entering the A/C system.

CAUTION: Refrigerant oil will absorb moisture from the atmosphere if left uncapped. Do not open a container of refrigerant oil until you are ready to use it. Replace the cap on the oil container immediately after using. Store refrigerant oil only in a clean, airtight, and moisture-free container.

CAUTION: Do not overcharge the refrigerant system. Overcharging will cause excessive compressor head pressure and can cause compressor noise and A/C system failure.

DIAGNOSIS AND TESTING

REFRIGERANT SYSTEM LEAKS

WARNING: R-134a service equipment or vehicle A/C system should not be pressure tested or leak tested with compressed air. Mixture of air and R-134a can be combustible at elevated pressures. These mixtures are potentially dangerous and may result in fire or explosion causing property damage, personal injury or death.
Avoid breathing A/C refrigerant and lubricant vapor or mist. Exposure may irritate eyes, nose and throat. Use only approved service equipment meeting SAE requirements to discharge R-134a system. If accidental system discharge occurs, ventilate work area before resuming service.

If the A/C system is not cooling properly, determine if the refrigerant system is fully charged with R-134a. This is accomplished by performing a system Charge Level-Check or Fill. If while performing this test A/C liquid line pressure is less than 345 kPa (50 psi) proceed to System Empty procedure. If liquid line pressure is greater than 345 kPa (50 psi) proceed to System Low procedure. If the refrigerant system is empty or low in refrigerant charge, a leak at any line fitting or component seal is likely. A review of the fittings, lines and components for oily residue is an indication of the leak location. To detect a leak in the refrigerant system, perform one of the following procedures as indicated by the symptoms.

SYSTEM EMPTY

1. Evacuate the refrigerant system to the lowest degree of vacuum possible (approximately 28 in Hg.). Determine if the system holds a vacuum for 15 minutes. If vacuum is held, a leak is probably not present. If system will not maintain vacuum level, proceed to Step 2.
2. Prepare a 0.284 Kg. (10 oz.) refrigerant charge to be injected into the refrigerant system.
3. Connect and dispense 0.284 Kg. (10 oz.) of refrigerant into the evacuated refrigerant system.
4. Proceed to Step 2 of System Low procedure.

SYSTEM LOW

1. Determine if there is any R-134a refrigerant in the system.
2. Position the vehicle in a wind free work area. This will aid in detecting small leaks.
3. Bring the refrigerant system up to operating temperature and pressure. This is done by allowing the engine to run for five minutes with the A/C system set to the following:
   - Transmission in Park or Neutral with parking brake set
   - Engine idling
   - Mode control set to the outside air position
   - Blower control set to the high speed position
   - A/C set to the ON position
   - All windows open

CAUTION: A leak detector only designed for R-12 refrigerant will not detect leaks in a R-134a refrigerant system.

4. Shut the vehicle Off and wait 2-7 minutes. Then use an electronic leak detector that is designed to detect R-134a refrigerant and search for leaks. Fittings, lines or components that appear to be oily usually indicate a refrigerant leak. To inspect the A/C evaporator for leaks, insert the leak detector probe into the drain tube opening or an air outlet. A dye for R-134a is available to aid in leak detection. Use only DaimlerChrysler approved refrigerant dye.

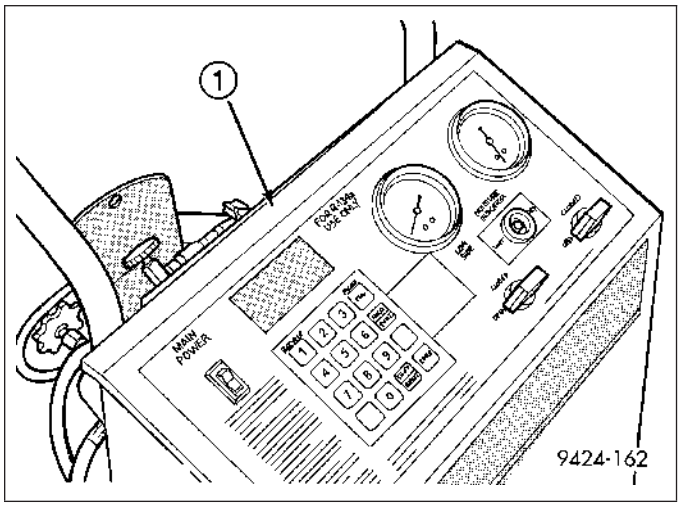
STANDARD PROCEDURE

REFRIGERANT SYSTEM SERVICE EQUIPMENT

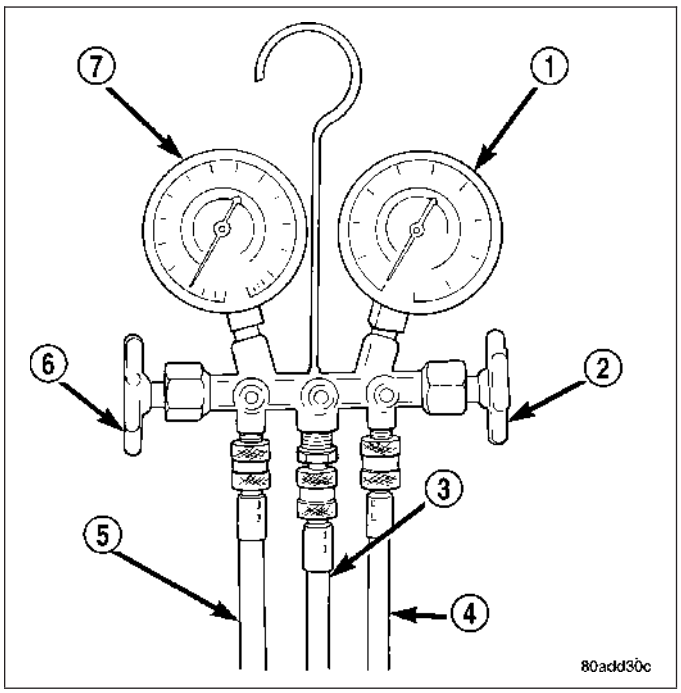
WARNING: Eye protection must be worn when servicing an A/C refrigerant system. Turn all valves off (rotate clockwise) on the equipment being used before connecting or disconnecting service equipment from the refrigerant system. Failure to observe these warnings may result in personal injury or death.

WARNING: Refer to the applicable warnings and cautions for this system before performing the following operation (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - WARNINGS) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - CAUTIONS). Failure to follow the warnings and cautions could result in possible personal injury or death.

When servicing the A/C system, a R-134a refrigerant recovery/recycling/charging station that meets SAE standard J2210 must be used (1). Contact an automotive service equipment supplier for refrigerant recovery/recycling/charging equipment. Refer to the operating instructions supplied by the equipment manufacturer for proper care and use of this equipment.



A manifold gauge set (1) may be needed with some recovery/recycling/charging equipment. The manifold gauge set should have manual shut-off valves (2 and 6), or automatic back-flow valves located at the service port connector end of the manifold gauge set hoses (4 and 5). This will prevent refrigerant from being released into the atmosphere.



MANIFOLD GAUGE SET CONNECTIONS

CAUTION: Do not use an R-12 manifold gauge set on an R-134a system. The refrigerants are not compatible and system damage will result.

RECOVERY/RECYCLING/EVACUATION/CHARGING HOSE The center manifold hose (Yellow, or White, with Black stripe) (3) is used to recover, evacuate, and charge the refrigerant system. When the low or high pressure valves on the manifold gauge set are opened, the refrigerant in the system will escape through this hose.

HIGH PRESSURE GAUGE HOSE The high pressure hose (Red with Black stripe) (4) attaches to the high side service port. This service port is located on the liquid line near the receiver/drier outlet. On this model, an A/C pressure transducer is installed on the discharge line. A/C high-side pressures can be read using a scan tool. Refer to 9 - Engine Electrical Diagnostics for more information.

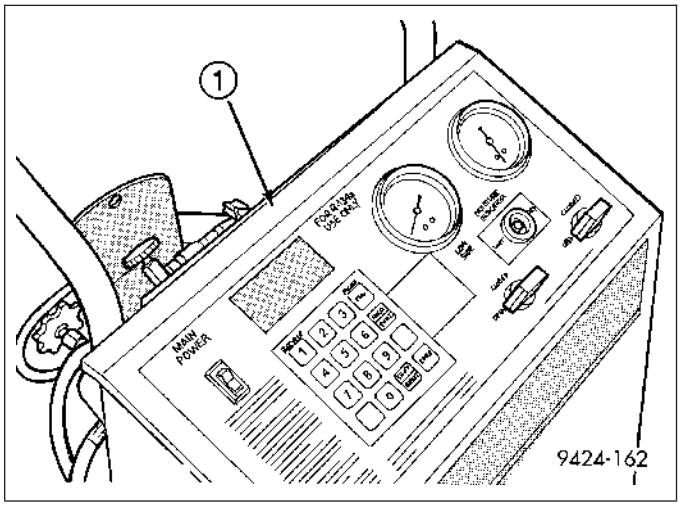
LOW PRESSURE GAUGE HOSE The low pressure hose (Blue with Black stripe) (5) attaches to the low side service port. This service port is located on the suction line near the A/C compressor inlet.

REFRIGERANT SYSTEM RECOVERY

WARNING: Refer to the applicable warnings and cautions for this system before performing the following operation (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - WARNINGS) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - CAUTIONS). Failure to follow the warnings and cautions could result in possible personal injury or death.

NOTE: If equipped with the rear heating-A/C system, use a heat gun to heat the underbody lines to help remove any trapped refrigerant from the rear A/C system.

An R-134a refrigerant recovery/recycling/charging station (1) that meets SAE standard J2210 must be used to recover the refrigerant from the R-134a refrigerant system. Refer to the operating instructions supplied by the equipment manufacturer for the proper care and use of this equipment.



REFRIGERANT SYSTEM EVACUATE

NOTE: Special effort must be used to prevent moisture from entering the A/C system oil. Moisture in the oil is very difficult to remove and will cause a reliability problem with the compressor.

If a compressor designed to use R-134a refrigerant is left open to the atmosphere for an extended period of time. It is recommended that the refrigerant oil be drained and replaced with new oil or a new A/C compressor be used. This will eliminate the possibility of contaminating the refrigerant system.

If the refrigerant system has been open to the atmosphere, it must be evacuated before the system can be filled. Moisture and air mixed with the refrigerant will raise the compressor head pressure above acceptable operating levels. This will reduce the performance of the A/C system and damage the A/C compressor. Moisture will boil at near room temperature when exposed to vacuum. To evacuate the refrigerant system:

NOTE: When connecting the service equipment coupling to the line fitting, verify that the valve of the coupling is fully closed. This will reduce the amount of effort required to make the connection.

1. Recover the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY).
2. Connect a suitable charging station, refrigerant recovery machine or a manifold gauge set with vacuum pump and refrigerant recovery equipment (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM SERVICE EQUIPMENT).
3. Open the suction and discharge valves and start the vacuum pump. The vacuum pump should run a minimum of 45 minutes prior to charge to eliminate all moisture in system. When the suction gauge reads -88 kPa (- 26 in. Hg) vacuum or greater for 30 minutes, close all valves and turn off vacuum pump. If the system fails to reach specified vacuum, the refrigerant system likely has a leak that must be corrected. If the refrigerant system maintains specified vacuum for at least 30 minutes, start the vacuum pump, open the suction and discharge valves. Then allow the system to evacuate an additional 10 minutes.
4. Close all valves. Turn off and disconnect the vacuum pump.
5. Charge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).

REFRIGERANT SYSTEM CHARGE

WARNING: Refer to the applicable warnings and cautions for this system before performing the following operation (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - WARNINGS) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - CAUTIONS). Failure to follow the warnings and cautions could result in possible personal injury or death.

NOTE: Always refer to the underhood HVAC Specification Label for the refrigerant fill specification of the vehicle being serviced.

After all refrigerant system leaks have been repaired and the refrigerant system has been evacuated, a refrigerant charge can be injected into the system. For the proper amount of the refrigerant charge, refer to the underhood HVAC Specification Label.

A R-134a refrigerant recovery/recycling/charging station that meets SAE Standard J2210 must be used to charge the refrigerant system with R-134a refrigerant. Refer to the operating instructions supplied by the equipment manufacturer for proper care and use of this equipment.

CHARGING PROCEDURE

CAUTION: A small amount of refrigerant oil is removed from the A/C system each time the refrigerant system is recovered and evacuated. Before charging the A/C system, you MUST replenish any oil lost during the recovery process. Refer the equipment manufacturer instructions for more information.

1. Evacuate the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE).
2. A manifold gauge set and an R-134a refrigerant recovery/recycling/charging station that meets SAE standard J2210 should be connected to the refrigerant system.
3. Measure the proper amount of refrigerant and heat it to 52° C (125° F) with the charging station. See the operating instructions supplied by the equipment manufacturer for proper use of this equipment.
4. Open both the suction and discharge valves, then open the charge valve to allow the heated refrigerant to flow into the system.
5. When the transfer of refrigerant has stopped, close both the suction and discharge valves.
6. If all of the refrigerant charge did not transfer from the dispensing device, open all of the windows in the vehicle and set the heating-A/C system controls so that the A/C compressor is engaged and the blower motor is operating at its lowest speed setting. Run the engine at a steady high idle (about 1400 rpm). If the A/C compressor does not engage, test the compressor clutch control circuit and repair as required.
7. Open the low-side valve to allow the remaining refrigerant to transfer to the refrigerant system.

WARNING: Take care not to open the discharge (high pressure) valve at this time. Failure to follow this warning could result in possible personal injury or death.

8. Disconnect the charging station and manifold gauge set from the refrigerant system service ports.
9. Reinstall the caps onto the refrigerant system service ports.

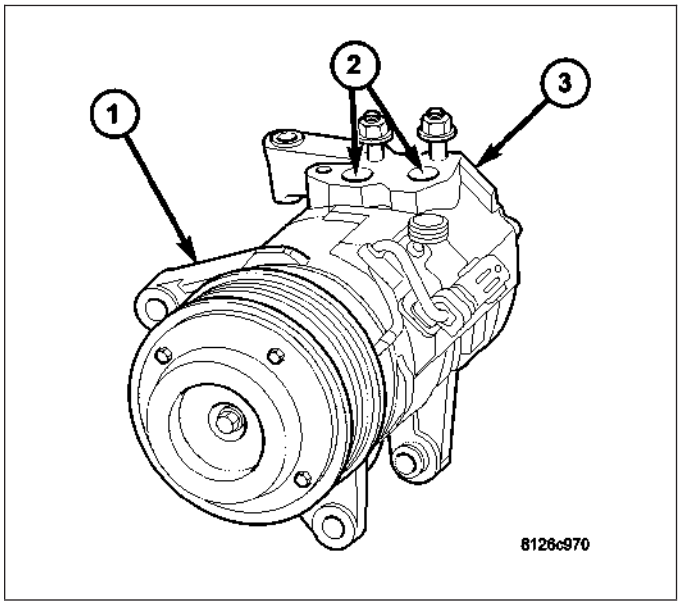
COMPRESSOR-A/C

DESCRIPTION

A/C COMPRESSOR

The A/C system uses a Denso 10S20, five double-acting piston, reciprocating swash plate-type A/C compressor (1) on all models. This A/C compressor has a fixed displacement of 200 cubic centimeters (12.2 cubic inches) and has both the suction and discharge ports (2) located at the rear of the compressor on the cylinder head (3).

A label identifying the use of R-134a refrigerant is located on the A/C compressor.



HIGH PRESSURE RELIEF VALVE

A high pressure relief valve is located on the compressor cylinder head, which is at the rear of the A/C compressor. This mechanical valve is designed to vent refrigerant from the A/C system to protect against damage to the A/C compressor and other A/C system components, caused by condenser air flow restriction or an overcharge of refrigerant.

OPERATION

A/C COMPRESSOR

The A/C compressor is driven by the engine through an electric clutch, drive pulley and belt arrangement. The A/C compressor is lubricated by refrigerant oil that is circulated throughout the refrigerant system with the refrigerant.

The A/C compressor draws in low-pressure refrigerant vapor from the A/C evaporator through its suction port. It then compresses the refrigerant into a high-pressure, high-temperature refrigerant vapor, which is then pumped to the A/C condenser through the compressor discharge port.

The A/C compressor cannot be repaired and, if faulty or damaged, it must be replaced. The compressor clutch, pulley and bearing assembly, and clutch field coil are available for service.

HIGH PRESSURE RELIEF VALVE

The high pressure relief valve vents refrigerant from the A/C system when a discharge pressure of 3445 to 4135 kPa (500 to 600 psi) or above is reached. The high pressure relief valve closes with a minimum discharge pressure of 2756 kPa (400 psi) is reached.

The high pressure relief valve vents only enough refrigerant to reduce the A/C system pressure, and then re-seats itself. The majority of the refrigerant is conserved in the A/C system. If the high pressure relief valve vents refrigerant, it does not mean the valve is faulty.

The high pressure relief valve is factory-calibrated and cannot be adjusted or repaired, and must not be removed or otherwise disturbed. The valve is only serviced as a part of the A/C compressor.

DIAGNOSIS AND TESTING

A/C COMPRESSOR

When investigating an A/C system related noise, you must first know the conditions under which the noise occurs. These conditions include: weather, vehicle speed, transmission in gear or neutral, engine speed, engine temperature, and any other special conditions. Noises that develop during A/C operation can often be misleading. For example: What sounds like a failed front engine bearing or connecting rod, may be caused by loose bolts, nuts, mounting brackets or a loose compressor clutch assembly.

Drive belts are speed sensitive. At different engine speeds and depending upon drive belt tension, drive belts can develop noises that are mistaken for an A/C compressor noise. Improper drive belt tension can cause a misleading noise when the compressor clutch is engaged, which may not occur when the compressor clutch is disengaged. Check the accessory drive belt condition and tension as described in Cooling before beginning this procedure.

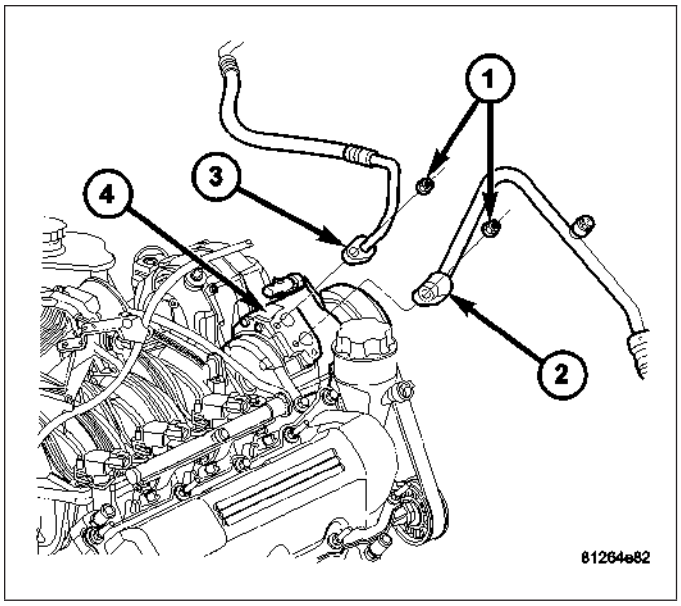
1. Select a quiet area for testing. Duplicate the complaint conditions as much as possible. Turn the A/C compressor On and Off several times to clearly identify the compressor noise. Listen to the A/C compressor while the clutch is engaged and disengaged. Probe the A/C compressor with an engine stethoscope or a long screwdriver with the handle held to your ear to better localize the source of the noise.
2. Loosen all of the compressor mounting hardware and retighten. Check the compressor clutch retainer. Be certain that the clutch field coil is mounted securely to the A/C compressor, and that the clutch plate and pulley are properly aligned and have the correct air gap (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS - FRONT/CLUTCH-A/C COMPRESSOR - INSTALLATION).
3. To duplicate high-ambient temperature conditions (high head pressure), restrict the air flow through the A/C condenser. Install a manifold gauge set or a scan tool to be certain that the discharge pressure does not exceed 2760 kPa (400 psi).
4. Check the refrigerant system plumbing for incorrect routing, rubbing or interference, which can cause unusual noises. Also check the refrigerant lines and hoses for kinks or sharp bends that will restrict refrigerant flow, which can cause noises (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - DESCRIPTION)
5. If the noise is from opening and closing of the high pressure relief valve, recover, evacuate and recharge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY), (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE). If the high pressure relief valve still does not seat properly, replace the compressor (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT/COMPRESSOR-A/C - REMOVAL).
6. If the noise is from liquid refrigerant slugging on the suction line, replace the receiver/drier (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT/RECEIVER / DRIER - REMOVAL) and check the refrigerant oil level and the refrigerant system charge (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT/ REFRIGERANT OIL - STANDARD PROCEDURE - REFRIGERANT OIL LEVEL) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).
7. If a slugging condition still exists after replacing the receiver/drier, then replace the A/C compressor (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT/COMPRESSOR-A/C - REMOVAL) and repeat Step 1.

REMOVAL

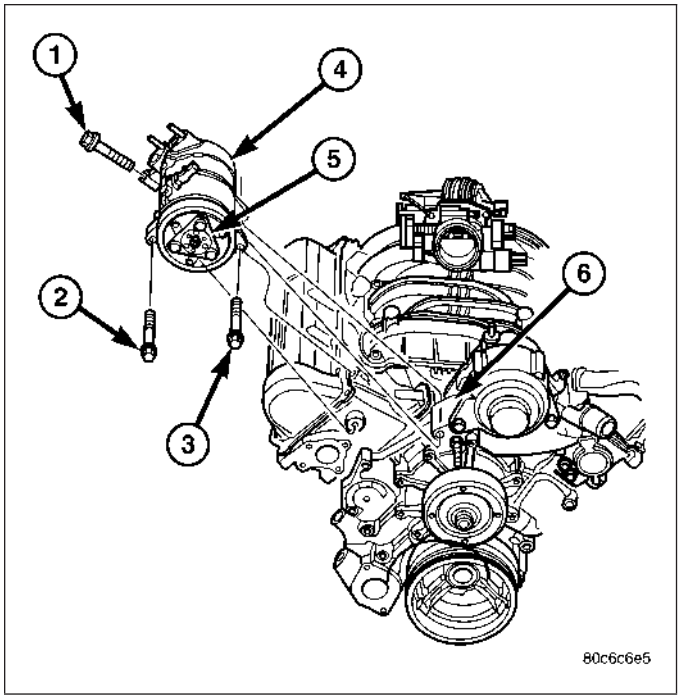
WARNING: Refer to the applicable warnings and cautions for this system before performing the following operation (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - WARNINGS) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - CAUTIONS). Failure to follow the warnings and cautions could result in possible personal injury or death.

NOTE: The A/C compressor may be removed and repositioned without disconnecting the refrigerant lines or discharging the refrigerant system. Discharging is not necessary if servicing the compressor clutch, clutch coil, engine, engine cylinder head or the generator.

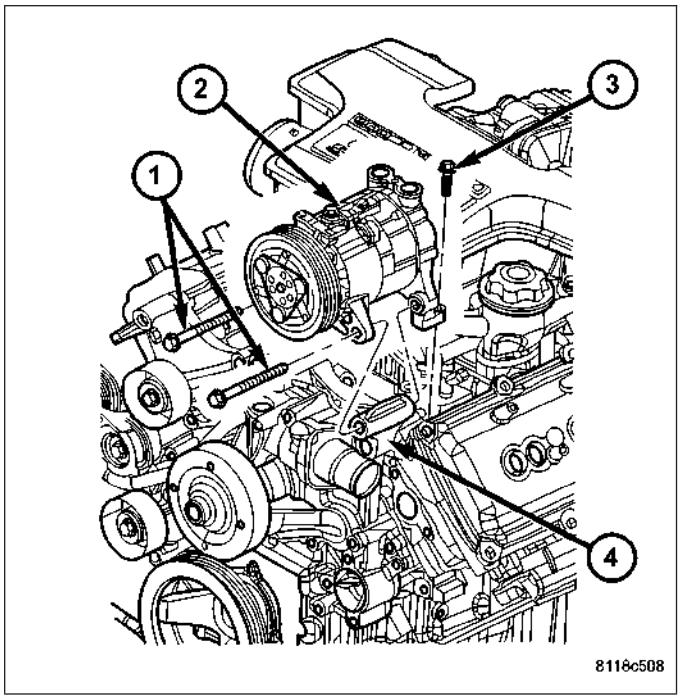
1. Recover the refrigerant from the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY).
2. Disconnect and isolate the negative battery cable.
3. Remove the accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/BELTS-DRIVE - REMOVAL).
4. Disconnect the wire harness connector from the A/C compressor clutch coil.
5. Remove the nuts (1) that secure the A/C suction line (2) and A/C discharge line (3) to the A/C compressor (4).
6. Disconnect the A/C suction and discharge lines from the A/C compressor and remove and discard the O-ring seals and gaskets.
7. Install plugs in, or tape over the opened refrigerant line fittings and compressor ports.



8. If equipped with the 3.7L or 4.7L engine, remove the bolts (1, 2 and 3) that secure the A/C compressor (4) to the mounting bracket (6).
9. Remove the A/C compressor from the engine compartment.



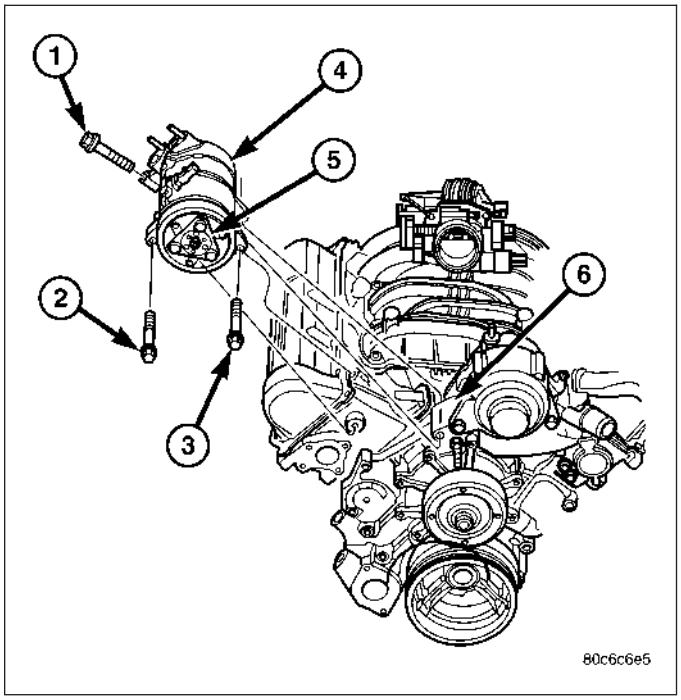
10. If equipped with the 5.7L Hemi engine, remove the nuts and bolts that secure the generator and A/C compressor support bracket and remove the bracket from the engine.
11. Remove the bolts (1 and 3) that secure the A/C compressor (2) to the mounting bracket (4).
12. Remove the A/C compressor from the engine compartment.



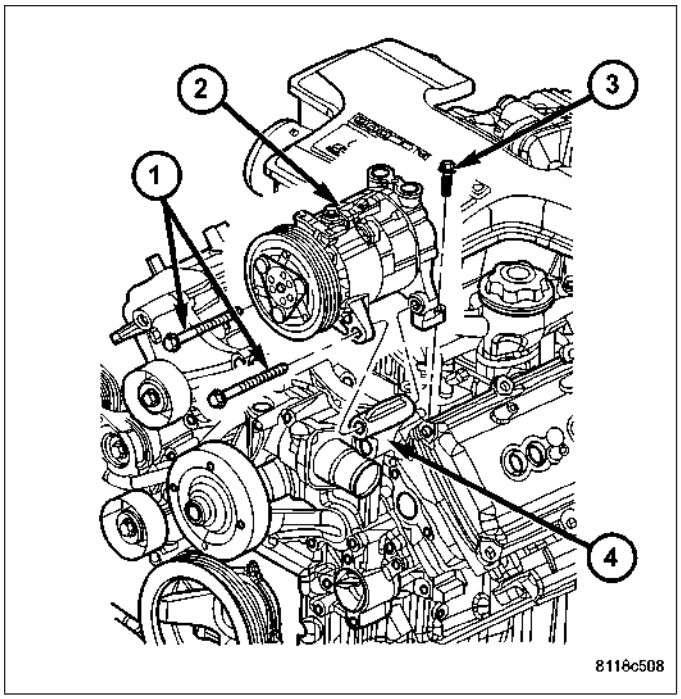
INSTALLATION

NOTE: Be certain to check the refrigerant oil level if the A/C compressor is being replaced. See Refrigerant Oil Level in this group for the procedures. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.

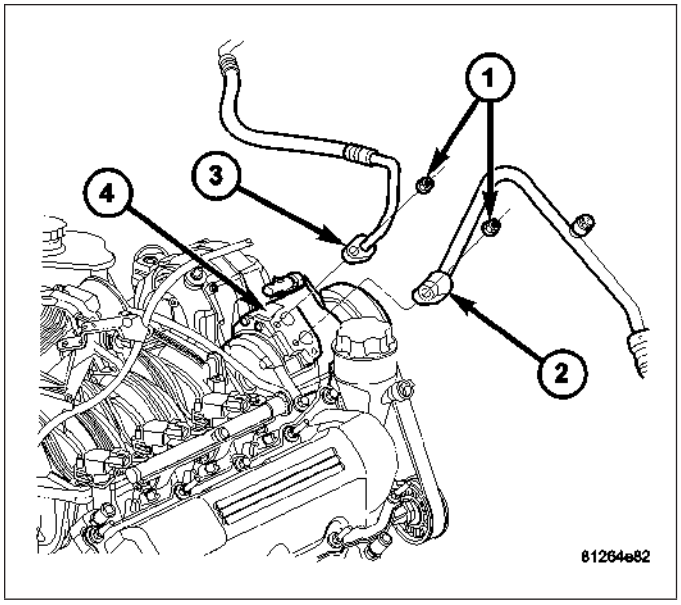
1. Position the A/C compressor (4) onto the mounting bracket (6) in the engine compartment.
2. On the 3.7L and 4.7L engines, install and tighten the bolts in the following sequence:
   - Install bolt (3) and hand tightened.
   - Install bolt (2) and hand tightened.
   - Install bolt (1) and hand tightened.
   - Tightened bolt (3) to 40 N·m (30 ft. lbs.).
   - Tightened bolt (2) to 55 N·m (41 ft. lbs.).
   - Tightened bolt (1) to 55 N·m (41 ft. lbs.).



3. For the 5.7L Hemi engine, install and tighten the bolts in the following sequence:
   - Install bolts (1) and hand tightened.
   - Install bolt (3) and hand tightened.
   - Tightened bolts (1) to 40 N·m (30 ft. lbs.).
   - Tightened bolt (3) to 55 N·m (41 ft. lbs.).
4. For the 5.7L Hemi engine, install the generator and A/C compressor support bracket and retaining nuts and bolts. Tighten the nuts and bolts securely.



5. Remove the tape or plugs from the opened suction line fitting (2) and the discharge line fitting (3) and the compressor ports (4).
6. Lubricate new rubber O-ring seals with clean refrigerant oil and install them and new gaskets onto the suction and the discharge line fittings. Use only the specified O-rings as they are made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
7. Install the A/C suction and discharge lines onto the A/C compressor.
8. Install the nuts (1) that secure the suction and discharge lines to the A/C compressor. Tighten the nuts to 23 N·m (17 ft. lbs.).
9. Connect the wire harness connector to the A/C compressor clutch coil.
10. Install the accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/BELTS-DRIVE - INSTALLATION).



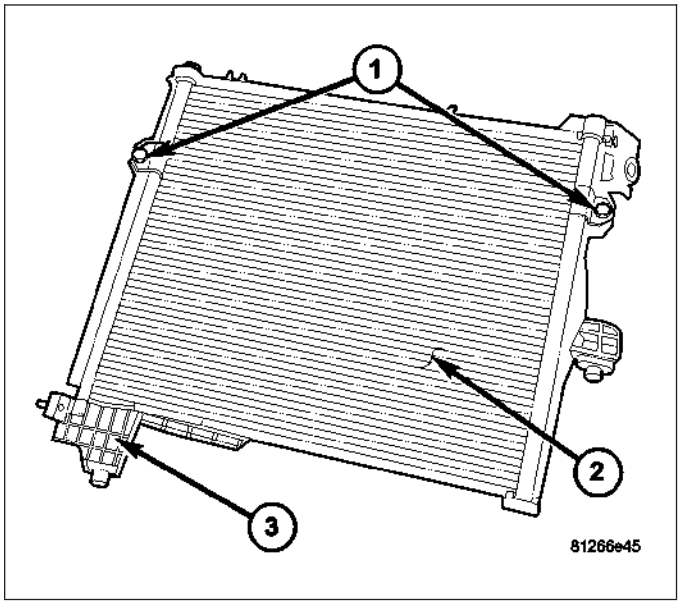
11. Reconnect the negative battery cable.
12. Evacuate the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE).
13. Charge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).

CONDENSER-A/C

DESCRIPTION

The A/C condenser (2) is located in the front of the engine compartment inside of the condenser fan shroud (3). The A/C condenser is a heat exchanger that allows the high-pressure refrigerant gas being discharged by the A/C compressor to give up its heat to the air passing over the condenser fins, which causes the refrigerant to change to a liquid state.

The A/C condenser is retained within the condenser fan shroud by two bolts (1).



OPERATION

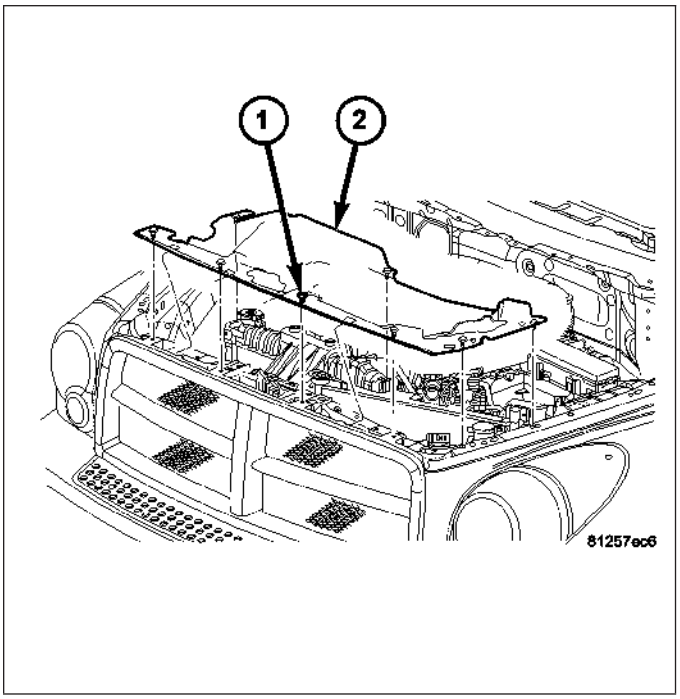
When air passes through the fins of the A/C condenser, the high-pressure refrigerant gas within the A/C condenser gives up its heat. The refrigerant then condenses as it leaves the A/C condenser and becomes a high-pressure liquid. The volume of air flowing over the condenser fins is critical to the proper cooling performance of the A/C system. Therefore, it is important that there are no objects placed in front of the radiator grille openings at the front of the vehicle or foreign material on the condenser fins that might obstruct proper air flow. Also, any factory-installed air seals or shrouds must be properly reinstalled following radiator or A/C condenser service.

The A/C condenser cannot be repaired and, if faulty or damaged, it must be replaced.

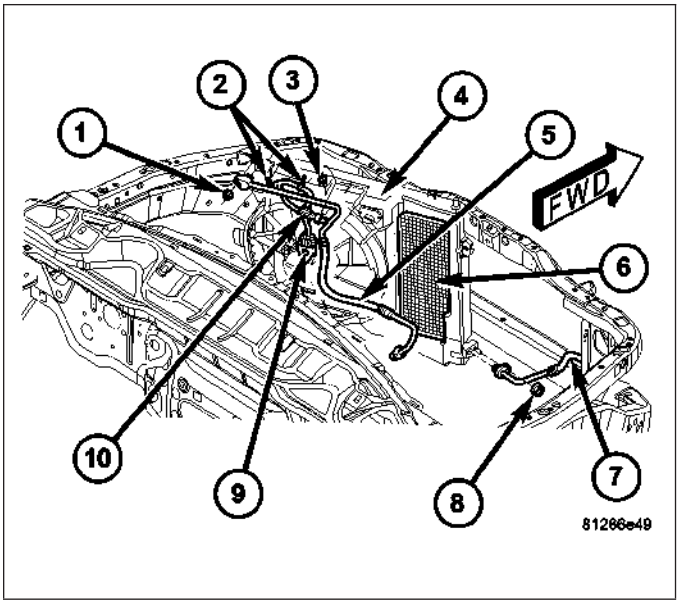
REMOVAL

WARNING: Refer to the applicable warnings and cautions for this system before performing the following operation (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - WARNINGS) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - CAUTIONS). Failure to follow the warnings and cautions could result in possible personal injury or death.

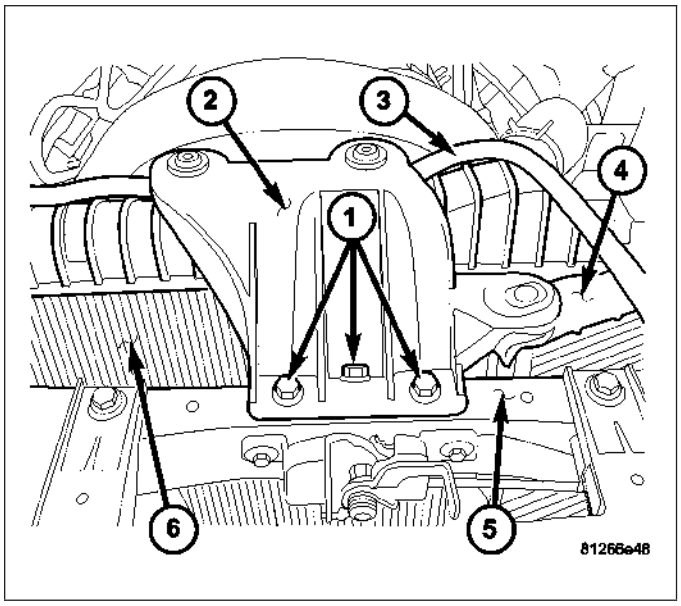
1. Recover the refrigerant from the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY).
2. Disconnect and isolate the negative battery cable.
3. Remove the push-pin retainers (1) and the upper condenser/radiator seal (2).



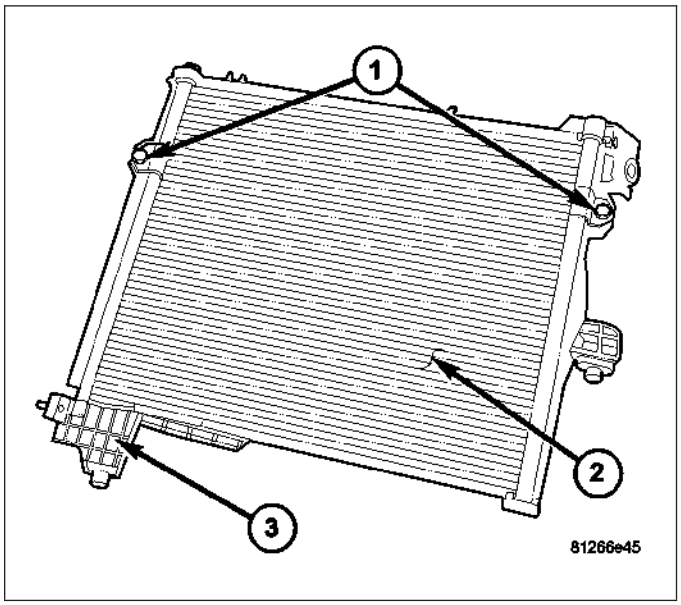
4. Disconnect the wire harness connectors from the condenser cooling fan motor (9) and the A/C pressure transducer (10).
5. Remove the two wire harness retainers (2) from the condenser fan shroud (4) and position the wire harness out of the way.
6. Remove the nuts (1 and 8) that secure the A/C discharge line (5) and A/C liquid line (7) to the A/C condenser (6).
7. Disconnect the A/C discharge and liquid lines from the A/C condenser and remove and discard the O-ring seals and gaskets.
8. Remove the A/C discharge line from the retainer (3) located on the condenser fan shroud (4).
9. Install plugs in, or tape over the opened discharge and liquid line fitting and condenser ports.



10. Remove the three bolts (1) that secure the upper radiator support (2) to the upper front crossmember (5).
11. Remove the upper radiator support and position the radiator overflow hose (3) out of the way.
12. Remove the bolt that secures the condenser/cooling fan assembly (4) to the upper left fender rail.
13. Carefully push back the radiator (6) for clearance and remove the condenser/cooling fan assembly from the engine compartment.



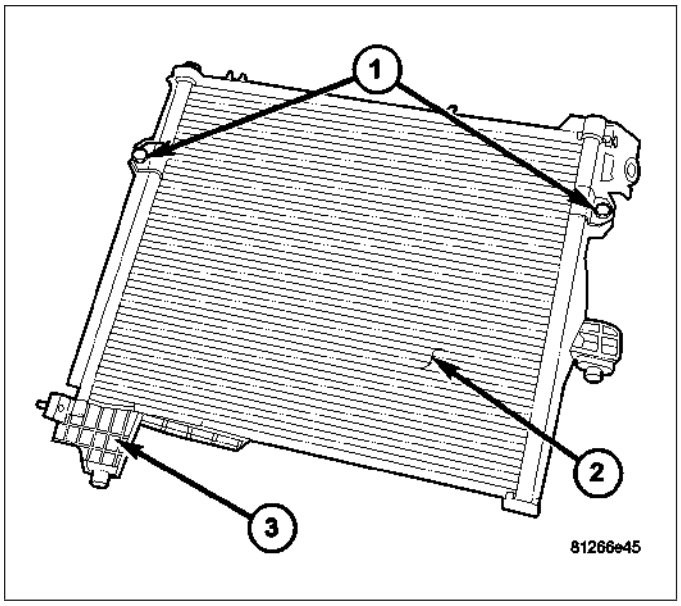
14. Place the condenser/cooling fan assembly on a workbench and remove the two screws (1) that secure the A/C condenser (2) to the condenser fan shroud (3).
15. Remove the A/C condenser from the condenser fan shroud.



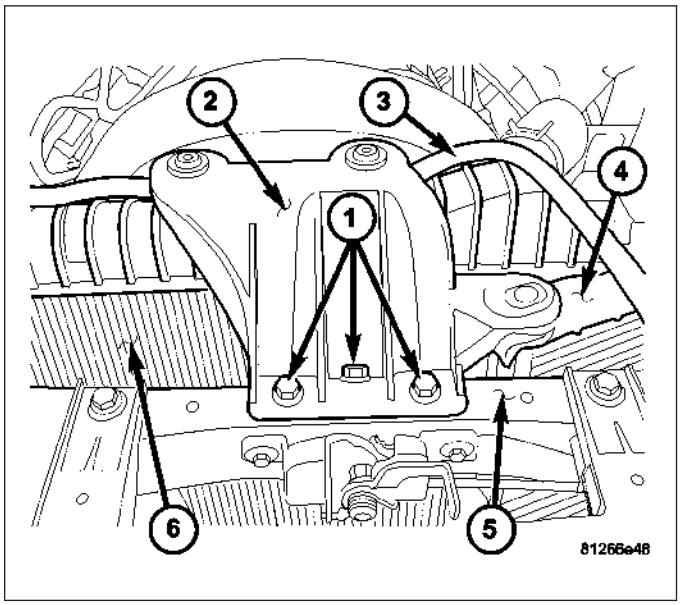
INSTALLATION

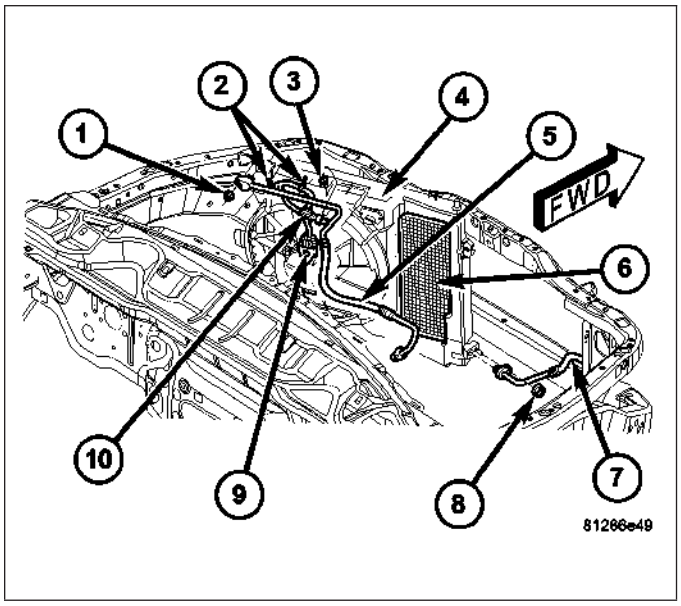
NOTE: If the A/C condenser is being replaced, add 30 milliliters (1 fluid ounce) of refrigerant oil to the refrigerant system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.

1. Position the A/C condenser (2) into the condenser fan shroud (3).
2. Install the two bolts (1) that secure the A/C condenser to the condenser fan shroud. Tighten the bolts to 5 N·m (45 in. lbs.).

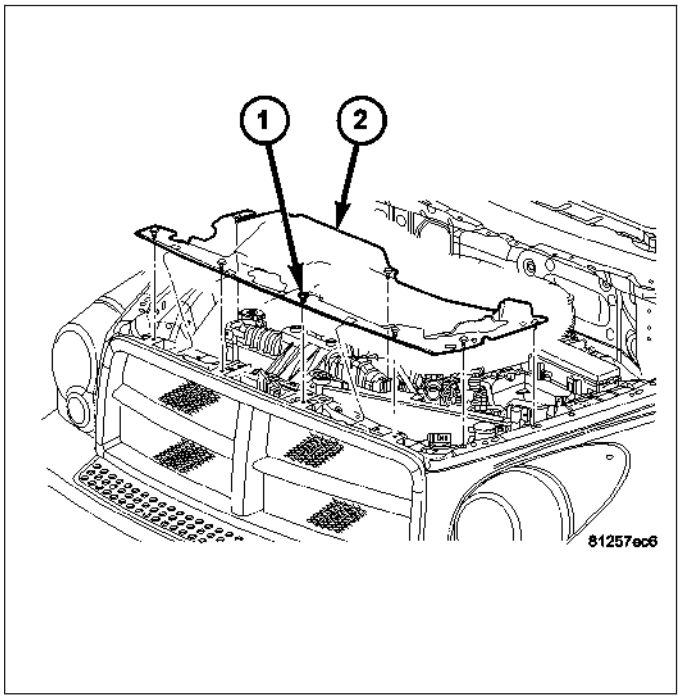


3. Carefully push back the radiator (6) for clearance and install the condenser/cooling fan assembly (4). Insert the two lower condenser fan shroud mounting tabs into the holes in the lower front crossmember.
4. Install the bolt that secures the condenser/cooling fan assembly to the upper left fender rail. Tighten the bolt to 5 N·m (45 in. lbs.).
5. Position the radiator overflow hose (3) to it's installed location
6. Align the upper mounting tab of the condenser/cooling fan assembly to the hole in the upper radiator support (2) and install the upper radiator support.
7. Install the three bolts (1) that secure the upper radiator support to the upper front crossmember (5). Tighten the bolts to 23 N·m (17 ft. lbs.).





8. Remove the tape or plugs from the discharge and liquid line fittings and condenser ports.
9. Lubricate new rubber O-ring seals with clean refrigerant oil and install them and new gaskets onto the discharge and liquid line fittings. Use only the specified O-rings as they are made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
10. Connect the A/C discharge line (5) and the A/C liquid line (7) to the A/C condenser (6).
11. Install the nuts (1 and 8) that secure the A/C discharge and liquid lines to the A/C condenser. Tighten the nuts to 22 N·m (16 ft. lbs.).
12. Install the A/C discharge line into the retainer (3) located on the condenser fan shroud.
13. Install the wire harness and the two wire harness retainers (2) to the condenser fan shroud (4).
14. Connect the wire harness connectors to the condenser cooling fan motor (9) and the A/C pressure transducer (10).



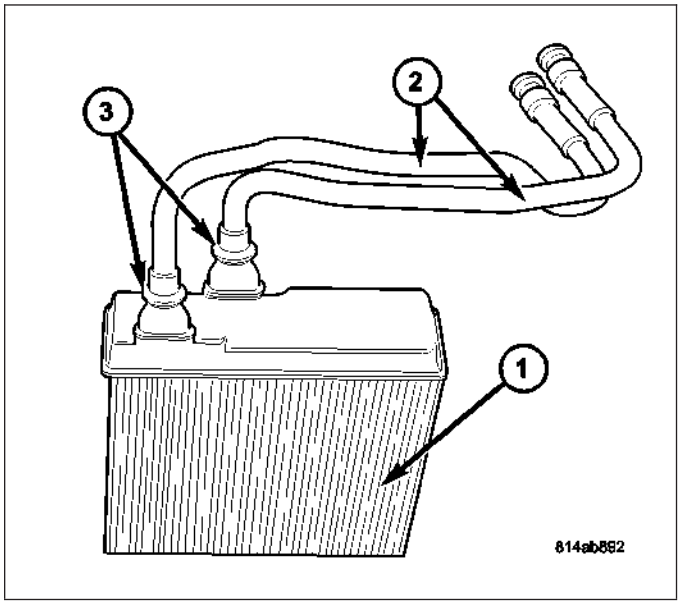
15. Position the upper condenser/radiator seal and install the push-pin retainers.
16. Reconnect the negative battery cable.
17. Evacuate the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE).
18. Charge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).

CORE-HEATER

DESCRIPTION

The heater core (1) for the front heating-A/C system is located in the front HVAC housing, behind the instrument panel. It is a heat exchanger made of rows of tubes and fins. The heater core is secured to the HVAC housing by a plastic retaining bracket and screws. The heater core tubes (2) are attached to the top of the heater core by metal retaining clips (3) and O-ring seals.

The heater core for the front heating-A/C system can be serviced in the vehicle without removing the HVAC assembly.



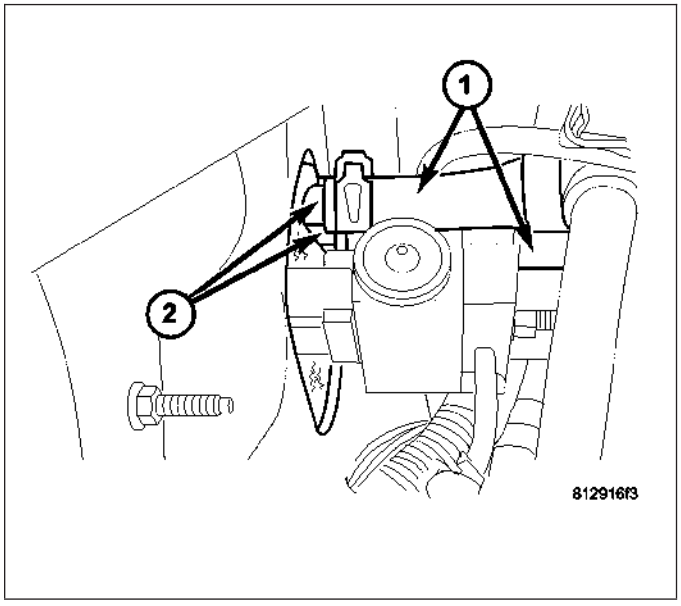
OPERATION

Engine coolant is circulated through the heater hoses to the heater core at all times. As the coolant flows through the heater core, heat is removed from the engine and is transferred to the heater core fins and tubes. Air directed through the heater core picks up the heat from the heater core fins. The blend-air door allows control of the heater output air temperature by regulating the amount of air flowing through the heater core within the HVAC housing. The blower motor speed controls the volume of air flowing through the HVAC housing.

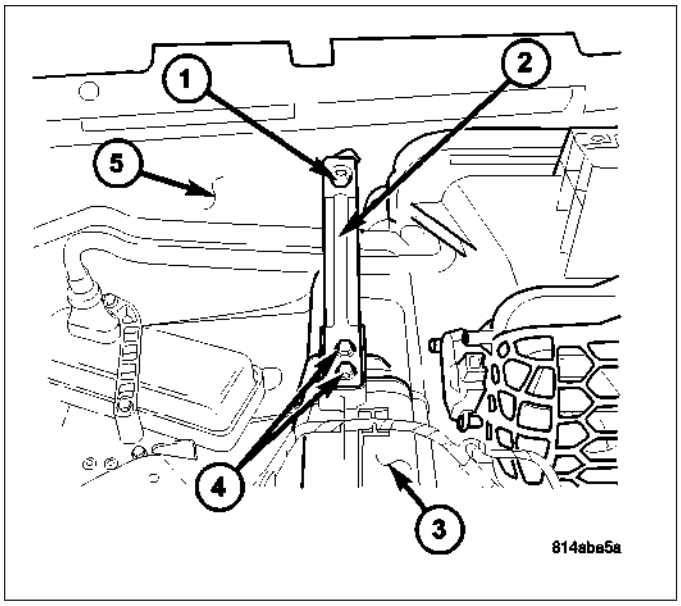
The heater core cannot be repaired and, if faulty or damaged, it must be replaced.

REMOVAL

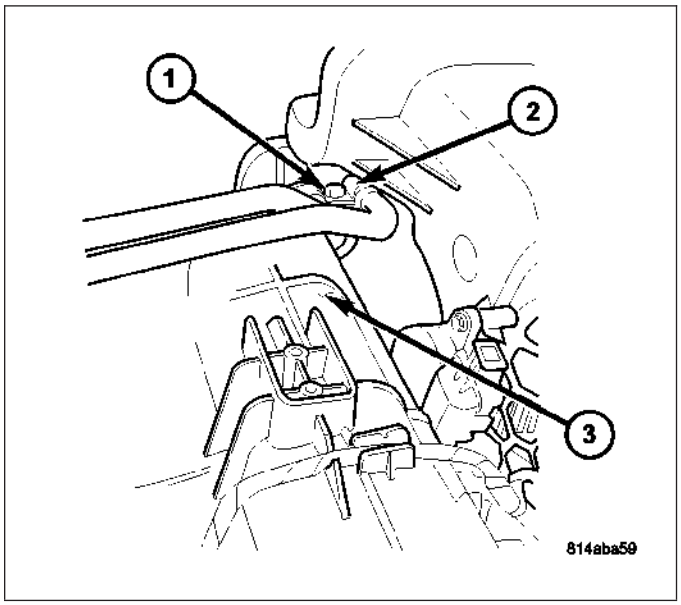
1. Drain the engine cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE - COOLING SYSTEM DRAIN).
2. Raise and support the vehicle.
3. Remove the right front wheelhouse splash shield (Refer to 23 - BODY/EXTERIOR/LF WHEELHOUSE SPLASH SHIELD - REMOVAL).
4. Remove the heater hoses (1) from the heater core tubes (2) in the engine compartment.



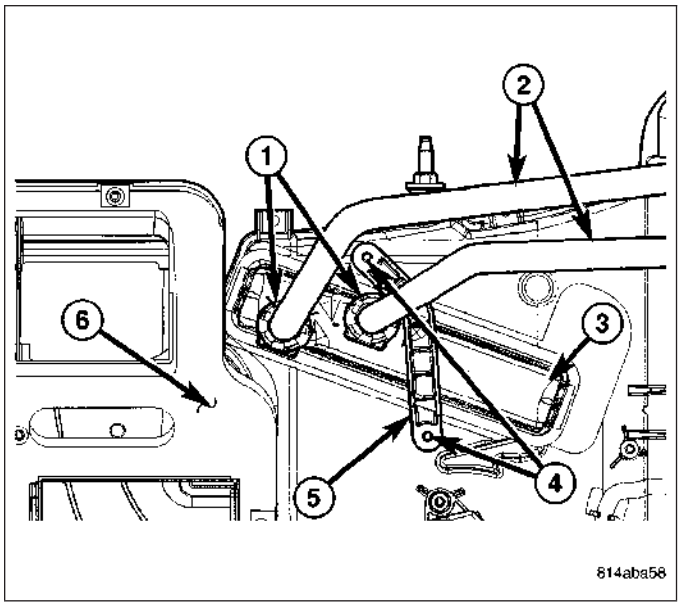
5. Lower the vehicle and remove the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - REMOVAL).
6. Remove the bolt (1) that secures the HVAC housing bracket (2) to the dash panel (5).
7. Remove the two screws (4) that secure the HVAC housing bracket to the top of the HVAC housing (3).
8. Remove the HVAC housing bracket from the vehicle.



9. Remove the screw (1) that secures the heater core tube retaining bracket (2) to the top of the HVAC housing (3).
10. Remove the heater core tube retaining bracket from the HVAC housing.

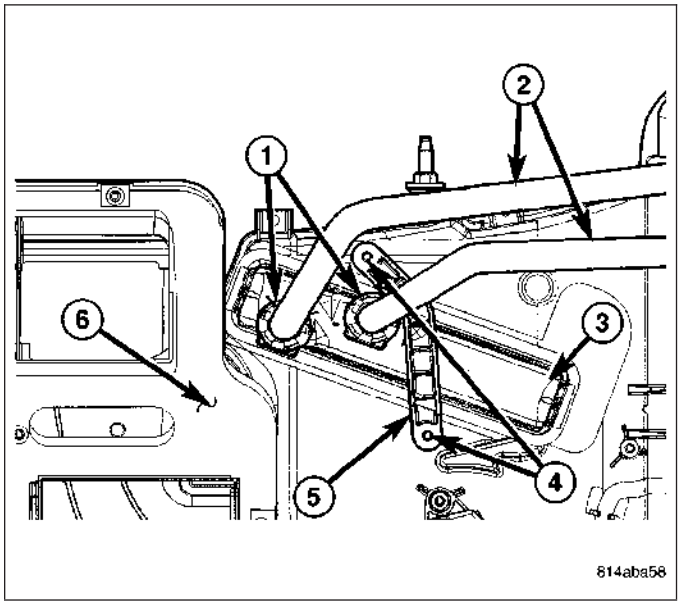


11. Remove the retaining clips (1) that secure the heater core tubes (2) to the heater core (3).
12. Remove the heater core tubes from the heater core and the dash panel. Remove the O-ring seals from the heater core tube fittings and discard.
13. Remove the two screws (4) that secure the heater core retaining bracket (5) to the top of the HVAC housing (6).
14. Remove the heater core retaining bracket and carefully lift the heater core out of the HVAC housing.

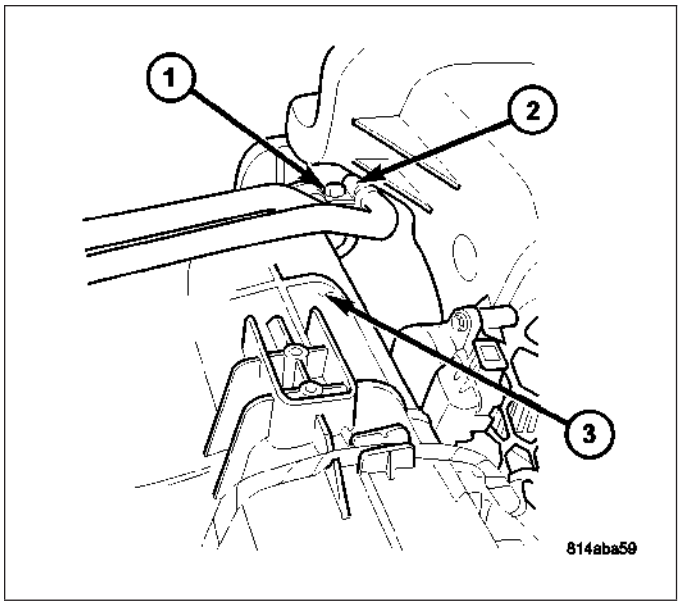


INSTALLATION

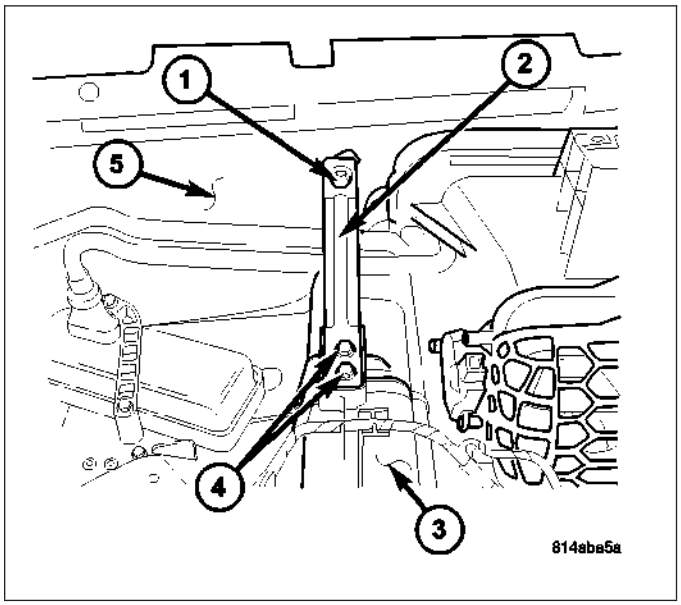
1. Carefully install the heater core (3) and the heater core retaining bracket (5) to the top of the HVAC housing (6). Make sure that the heater core insulator is properly positioned.
2. Install the two screws (4) that secure the heater core and retaining bracket to the HVAC housing. Tighten the screws to 2.2 N·m (20 in. lbs.).
3. Lubricate new rubber O-ring seals with clean engine coolant and install them onto the heater core tube fittings. Use only the specified O-rings as they are made of a special material for the engine cooling system.
4. Install the heater core tubes (2) through the dash panel and to the heater core.
5. Install the retaining clips (1) that secure the heater core tubes to the heater core. Make sure that the retaining clips are fully engaged to the flanges on the heater core and the heater core tubes.



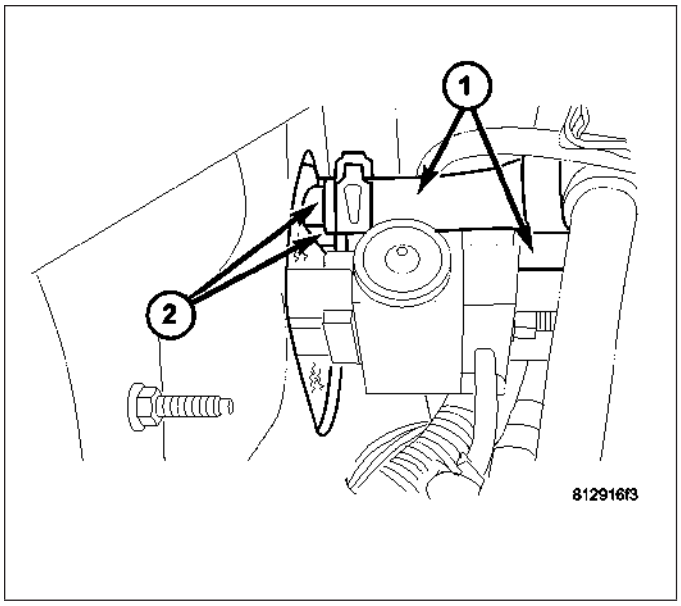
6. Install the heater core tube retaining bracket (2) to the top of the HVAC housing (3).
7. Install the screw (1) that secures the heater core tube retaining bracket to the HVAC housing. Tighten the screw to 2.2 N·m (20 in. lbs.).



8. Install the HVAC housing bracket (2) to the top of HVAC housing (3) and to the dash panel (5).
9. Install the two screws (4) that secure the HVAC housing bracket to the HVAC housing. Tighten the screws to 2.2 N·m (20 in. lbs.).
10. Install the bolt (1) that secures the HVAC housing bracket to the dash panel. Tighten the bolt to 3 N·m (26 in. lbs.).
11. Install the instrument panel (Refer to 23 - BODY/ INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - INSTALLATION).



12. Raise the vehicle and install the heater hoses (1) to the heater core tubes (2) in the engine compartment
13. Install the right front wheelhouse splash shield (Refer to 23 - BODY/EXTERIOR/LF WHEELHOUSE SPLASH SHIELD - INSTALLATION).
14. Lower the vehicle.
15. If the heater core is being replaced, flush the cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE - COOLING SYSTEM CLEANING/REVERSE FLUSHING).
16. Refill the engine cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE - COOLING SYSTEM REFILL).



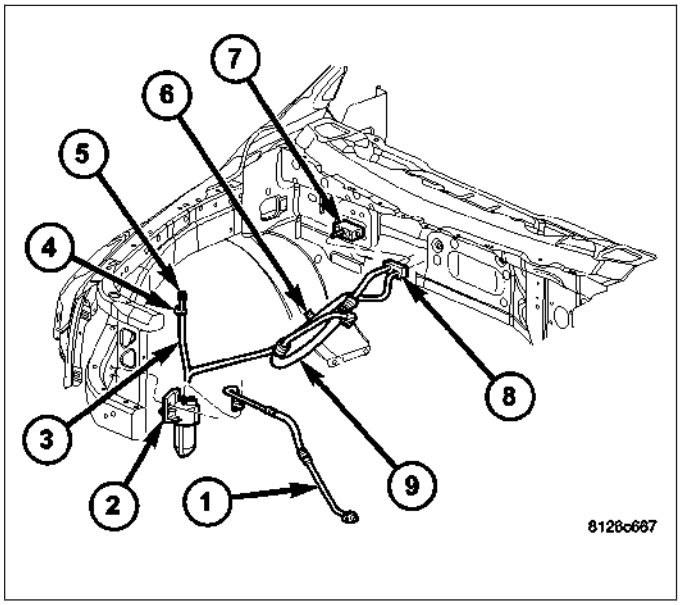
CORE-VALVE-SERVICE PORT

DESCRIPTION

Two refrigerant system service ports are used to recover/recycle/evacuate/charge and test the A/C refrigerant system. Unique sizes are used on the service ports for the R-134a refrigerant system to ensure the system is not accidentally contaminated with R-12 refrigerant or service equipment used for R-12 refrigerant.

The high side service port (5) is located on the liquid line (3) above the receiver/drier (2). The low side service port (6) is located on the suction line (9) at the top of the engine. Both the high side and low side A/C service port valve cores are serviceable.

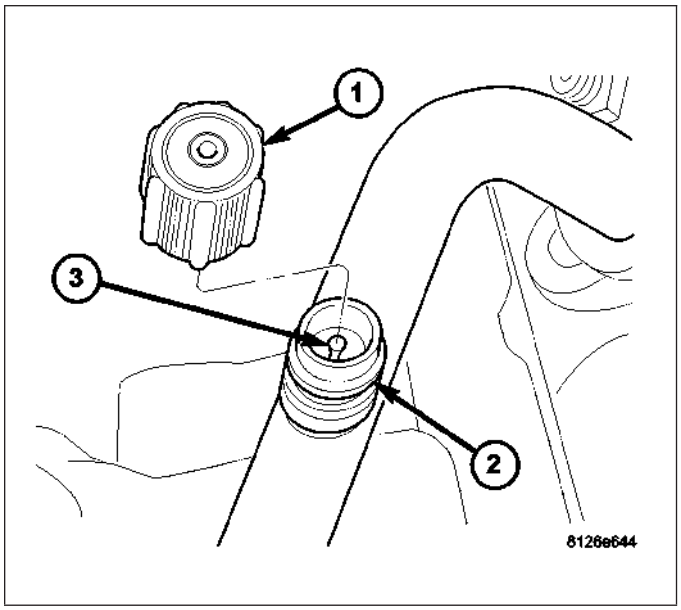
Each of the service ports has a threaded plastic protective cap installed over it from the factory. After servicing the refrigerant system, always reinstall both of the service port caps.



REMOVAL

WARNING: Refer to the applicable warnings and cautions for this system before performing the following operation (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - WARNINGS) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - CAUTIONS). Failure to follow the warnings and cautions could result in possible personal injury or death.

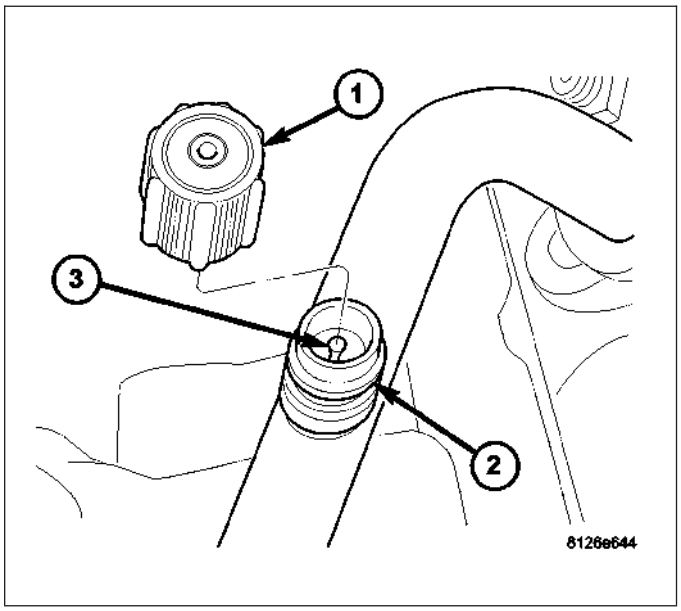
1. Remove the protective cap (1) from the service port (2).
2. Recover the refrigerant from the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY).
3. Using a Schrader-type valve core tool, remove the valve core (3) from the service port.
4. Install a plug in or tape over the opened service port(s).



INSTALLATION

1. Lubricate the valve core (3) with clean refrigerant oil prior to installation. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
2. Remove the tape or plug from the service port (2).

CAUTION: A valve core that is not fully seated in the A/C service port can result in damage to the valve during refrigerant system evacuation and charge. Such damage may result in a loss of system refrigerant while uncoupling the charge adapters.



3. Using a Schrader-type valve core tool, install and tighten the valve core into the service port(s).
4. Evacuate the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE).
5. Charge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).

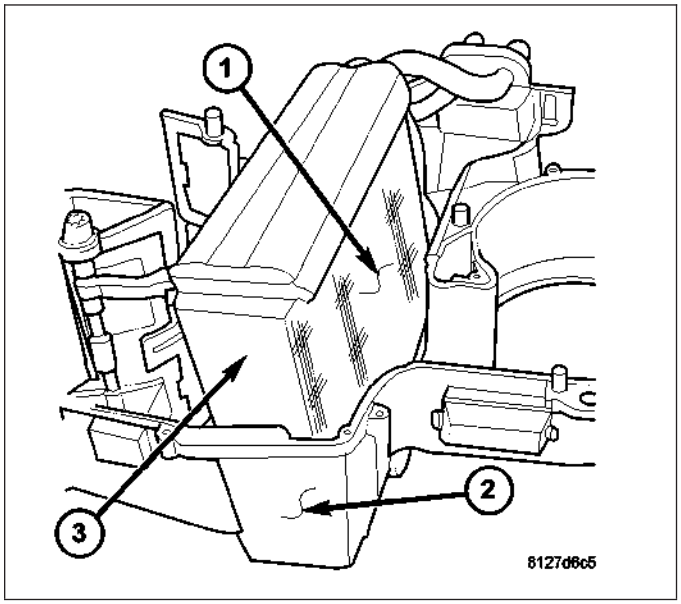
NOTE: The protective cap helps aid in service port sealing and helps protects the refrigerant system from contamination. Remember to always reinstall the protective cap onto the service port when refrigerant system service is complete.

6. Install the protective cap (1) onto the service port.

EVAPORATOR-A/C

DESCRIPTION

The A/C evaporator (1) for the front heating-A/C system is located within the front HVAC housing (2), behind the instrument panel. The A/C evaporator and insulator (3) are positioned in the HVAC housing so that all air entering the housing must pass over the evaporator fins before it is distributed through the heating-A/C system ducts and outlets. However, air passing over the evaporator fins will only be conditioned when the A/C compressor is engaged and circulating refrigerant through the A/C evaporator.



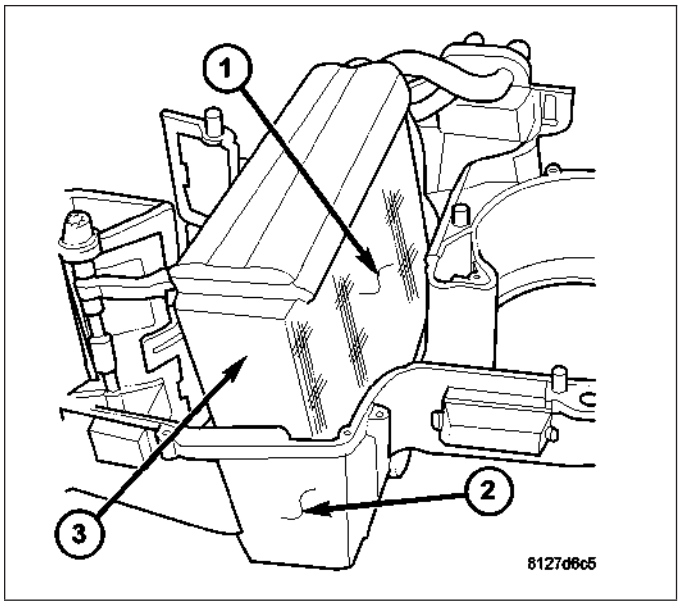
OPERATION

Refrigerant enters the A/C evaporator from the A/C expansion valve as a low-temperature, low-pressure mixture of liquid and gas. As air flows over the fins of the A/C evaporator, the humidity in the air condenses on the fins, and the heat from the air is absorbed by the refrigerant. Heat absorption causes the refrigerant to boil and vaporize. The refrigerant becomes a low-pressure gas when it leaves the A/C evaporator.

The A/C evaporator cannot be repaired and, if faulty or damaged, it must be replaced.

REMOVAL

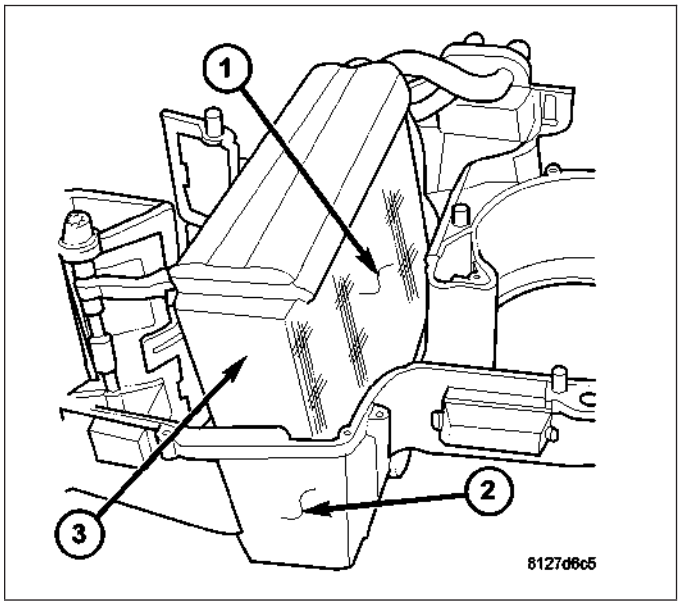
1. Remove the HVAC housing (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION - FRONT/HOUSING-HVAC - REMOVAL).
2. Disassemble the HVAC housing (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION - FRONT/HOUSING-HVAC - DISASSEMBLY).
3. Remove the probe of the evaporator temperature sensor from the fins of the A/C evaporator (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS - FRONT/SENSOR-EVAPORATOR TEMPERATURE - REMOVAL).
4. Carefully lift the A/C evaporator (1) out of the lower half of the HVAC housing (2).
5. If required, remove the evaporator insulator (3) from around the A/C evaporator.



INSTALLATION

NOTE: If the front A/C evaporator is being replaced, add 60 milliliters (2 fluid ounces) of refrigerant oil to the refrigerant system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.

1. Install the A/C evaporator (1) into the lower half of the HVAC housing (2). Make sure that the evaporator drain is clean and unrestricted and that the evaporator insulator (3) is properly installed.
2. Install the probe for the evaporator temperature sensor into the fins of the A/C evaporator (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS - FRONT/SENSOR-EVAPORATOR TEMPERATURE - INSTALLATION.)
3. Assemble the HVAC housing (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION - FRONT/HOUSING-HVAC - ASSEMBLY).
4. Install the HVAC housing (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION - FRONT/HOUSING-HVAC - INSTALLATION).



LINE-A/C DISCHARGE

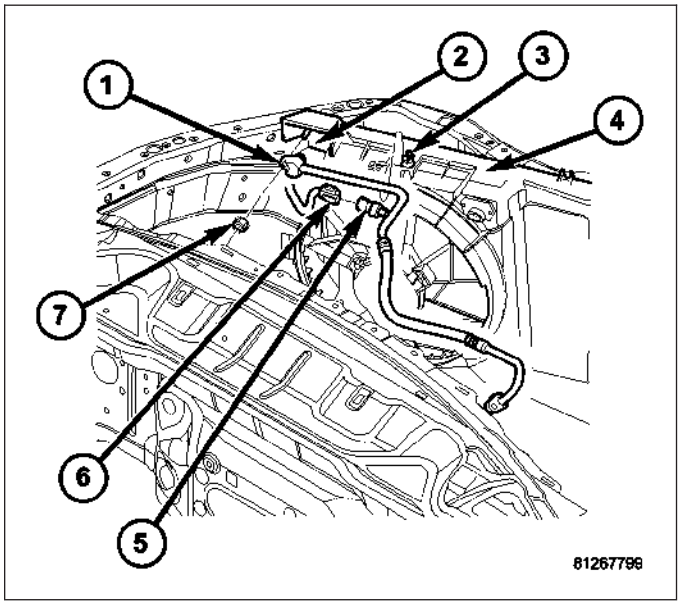
DESCRIPTION

The A/C discharge line (1) is the refrigerant line that carries refrigerant from the A/C compressor to the A/C condenser (2) and is secured to the condenser fan shroud (4) by a plastic retainer (3). The A/C discharge line has an integral fitting for the A/C pressure transducer (5) (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS -FRONT/TRANSDUCER-A/C PRESSURE - DESCRIPTION).

CAUTION: Use only O-ring seals specified for the vehicle. Failure to use the correct O-ring seal will cause the refrigerant system connections to leak.

The A/C discharge line has no serviceable parts except for the rubber O-ring seals. The O-ring seals used on the connections are made from a special type of rubber not affected by R-134a refrigerant. The O-ring seals must be replaced whenever the A/C discharge line is removed and installed.

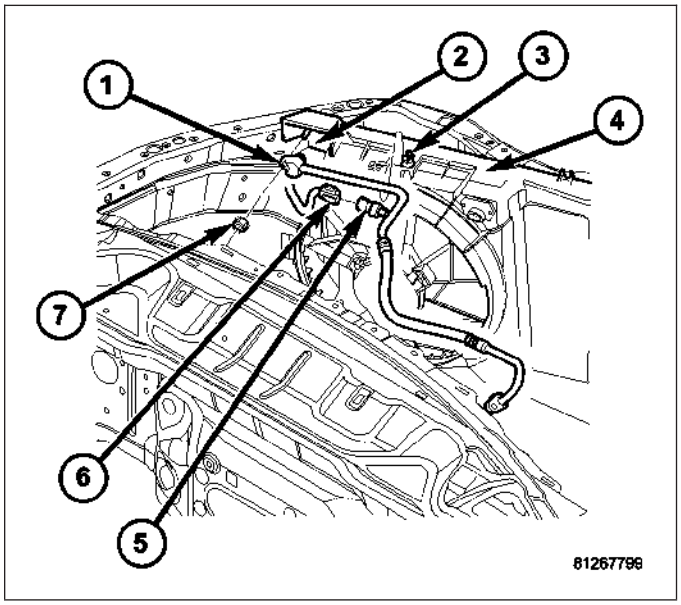
If the A/C discharge line is found to be leaking or is damaged, it must be replaced.



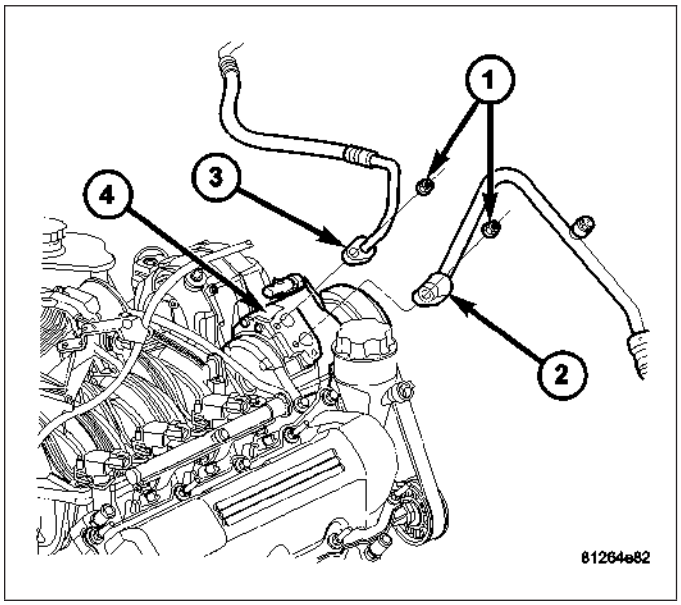
REMOVAL

WARNING: Refer to the applicable warnings and cautions for this system before performing the following operation (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - WARNINGS) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - CAUTIONS). Failure to follow the warnings and cautions could result in possible personal injury or death.

1. Recover the refrigerant from the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY).
2. Disconnect and isolate the negative battery cable.
3. Disconnect the wire harness connector (6) from the A/C pressure transducer (5).
4. If required, remove the A/C pressure transducer from the A/C discharge line (1).
5. Remove the nut (7) that secures the A/C discharge line to the A/C condenser (2).
6. Disconnect the A/C discharge line from the A/C condenser and the retainer (3) located on the condenser fan shroud (4).
7. Remove the O-ring seal and gasket from the discharge line fitting and discard.
8. Install plugs in, or tape over the discharge line fitting and condenser port.

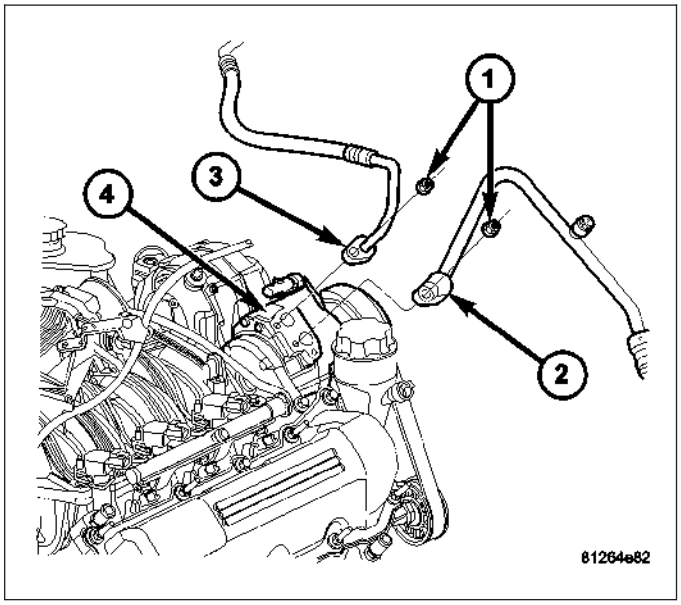


9. Remove the nut (1) that secures the A/C discharge line (3) to the A/C compressor (4).
10. Disconnect the A/C discharge line from the A/C compressor and remove and discard the O-ring seal and gasket.
11. Install plugs in, or tape over the opened refrigerant line fitting and the compressor port.
12. Remove the A/C discharge line from the engine compartment.

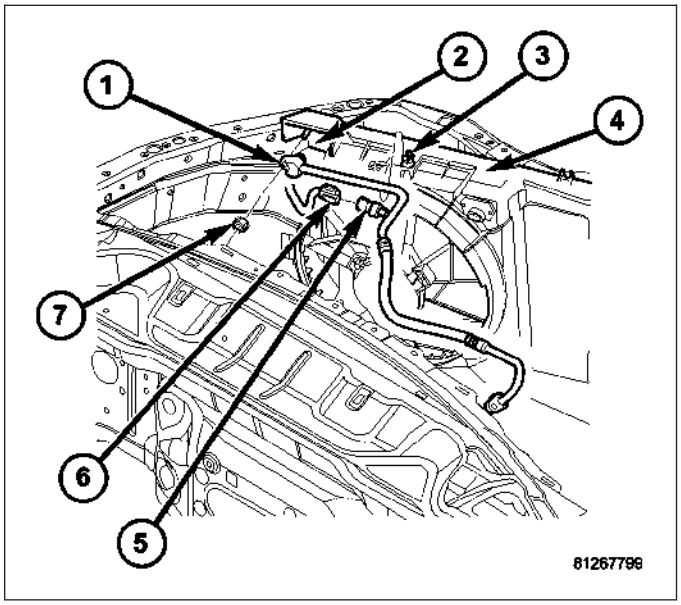


INSTALLATION

1. Position the A/C discharge line into the engine compartment.
2. Remove the tape or plugs from the opened discharge line fitting and the compressor port.
3. Lubricate a new rubber O-ring seal with clean refrigerant oil and install it and a new gasket onto the discharge line fitting. Use only the specified O-ring as it is made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
4. Install the A/C discharge (3) line onto the A/C compressor (4).
5. Install the nut (1) that secures the A/C discharge line to the A/C compressor. Tighten the nut to 23 N·m (17 ft. lbs.).



6. Remove the tape or plugs from the opened discharge line fitting (1) and the condenser port (2).
7. Lubricate a new rubber O-ring seal with clean refrigerant oil and install it and a new gasket onto the discharge line fitting. Use only the specified O-ring as it is made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
8. Install the A/C discharge line to the A/C condenser and the retainer (3) located on the condenser fan shroud.
9. Install the nut (7) that secures the A/C discharge line to the A/C condenser. Tighten the nut to 22 N·m (16 ft. lbs.).
10. If removed, install the A/C pressure transducer (5) onto the A/C discharge line.
11. Connect the wire harness connector (6) to the A/C pressure transducer.

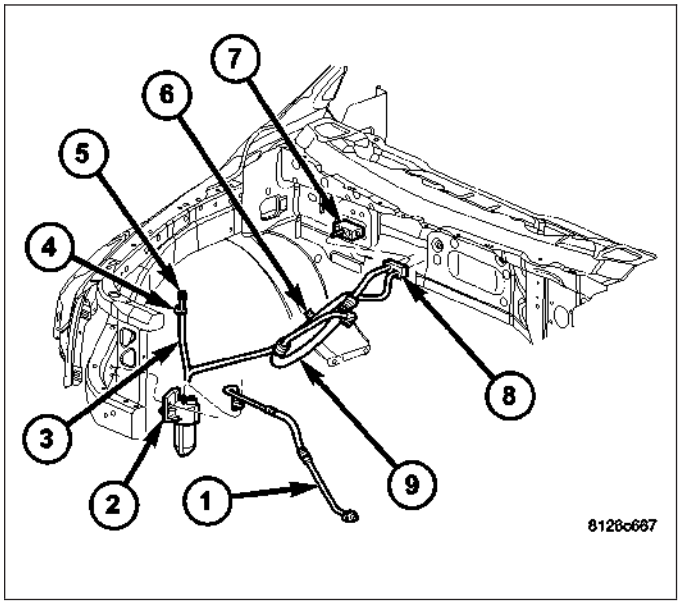


12. Connect the negative battery cable.
13. Evacuate the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING -FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE).
14. Charge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).

LINE-A/C LIQUID

DESCRIPTION

The liquid line is the refrigerant line that carries refrigerant from the A/C condenser to the A/C evaporator. The liquid line is serviced in two sections. The front section of the liquid line (1) connects between the A/C condenser and the receiver/drier (2). The rear section of the liquid line (3) connects between the receiver/drier and the A/C expansion valve (7) and includes the high side service port (5) and a tapping plate (8) that secures the suction line (9) to the A/C expansion valve. On models equipped with the rear heating-A/C system, the rear section of the liquid line also includes an extension tube that connects the liquid line to the underbody lines (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - REAR/LINE-A/C LIQUID - DESCRIPTION).



CAUTION: Use only O-ring seals specified for the vehicle. Failure to use the correct O-ring seal will cause the refrigerant system connections to leak.

The liquid line has no serviceable parts except for the rubber O-ring seals, high-side service port valve, cap and retainer clip (4). The O-ring seals used on the connections are made from a special type of rubber not affected by R-134a refrigerant. The O-ring seals must be replaced whenever the liquid line is removed and installed.

If the liquid line is found to be leaking or is damaged, it must be replaced.

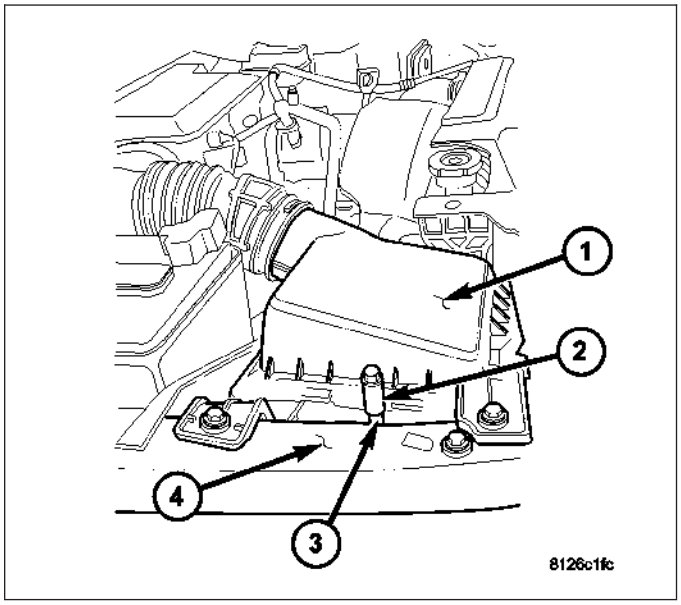
REMOVAL

WARNING: Refer to the applicable warnings and cautions for this system before performing the following operation (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - WARNINGS) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - CAUTIONS). Failure to follow the warnings and cautions could result in possible personal injury or death.

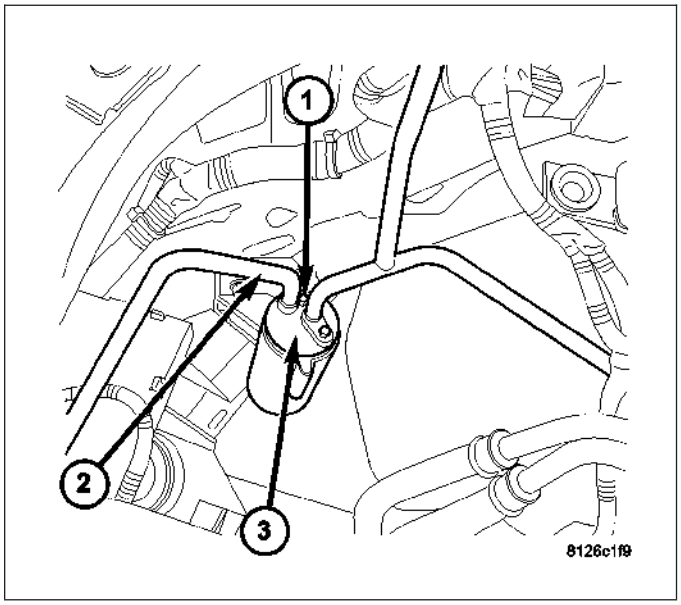
NOTE: The A/C liquid line is serviced in two sections. The front section connects between the A/C condenser and the receiver/drier. The rear section connects between the receiver/drier and the A/C expansion valve. On models equipped with the rear heating-A/C system, the rear section of the A/C liquid line also includes an extension tube that connects the liquid line to the underbody lines.

FRONT SECTION

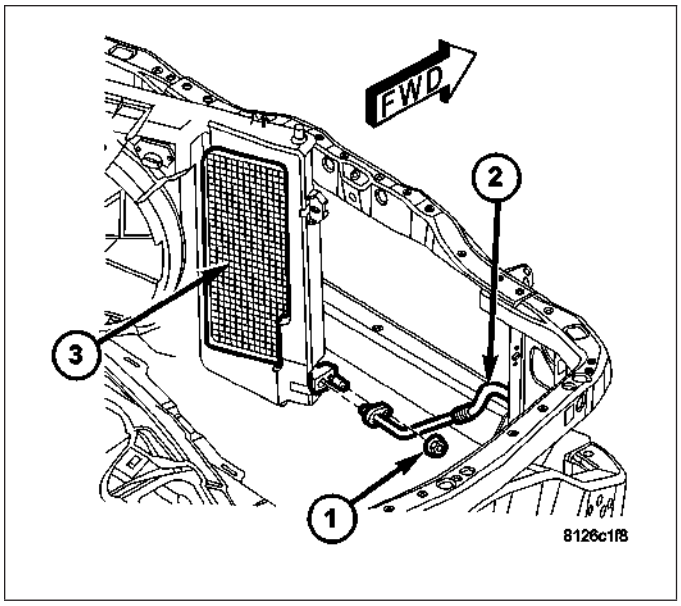
1. Recover the refrigerant from the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING -FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY).
2. Disconnect and isolate the negative battery cable.
3. Remove the air cleaner housing (1) from the right side of the engine compartment (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).



4. Remove the bolt (1) that secures the front section of the A/C liquid line (2) to the receiver/drier (3).
5. Disconnect the front section of the A/C liquid line from the receiver/drier and remove and discard the O-ring seal.
6. Install plugs in, or tape over the opened liquid line fitting and receiver/drier port.

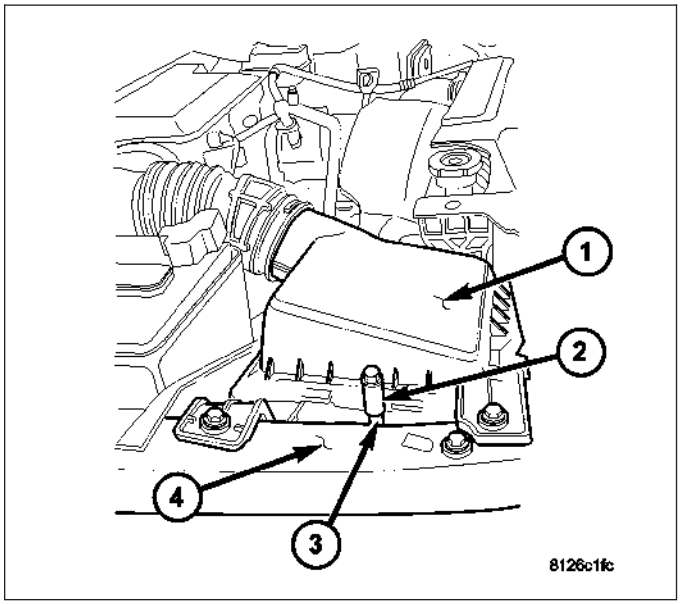


7. Remove the nut (1) that secures the front section of the A/C liquid line (2) to the A/C condenser (3).
8. Disconnect the A/C liquid line from the A/C condenser and remove and discard the O-ring seal and gasket.
9. Install plugs in, or tape over the opened liquid line fitting and condenser port.
10. Remove the front section of the A/C liquid line from the engine compartment.

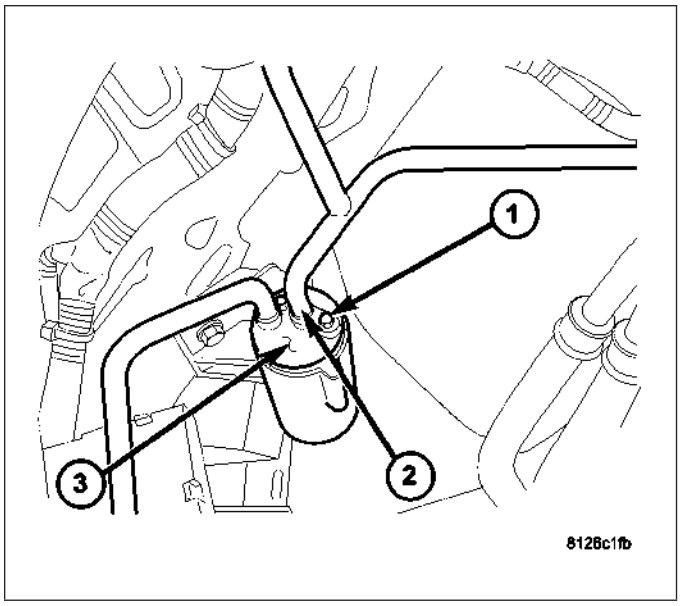


REAR SECTION

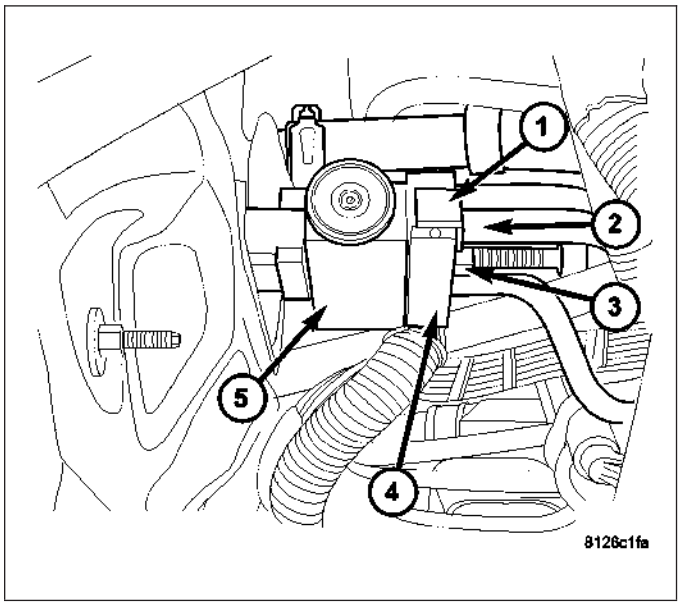
1. Recover the refrigerant from the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY).
2. Disconnect and isolate the negative battery cable.
3. Remove the air cleaner housing (1) from the right side of the engine compartment (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).
4. Remove the rear section of the A/C liquid line (2) from the plastic retainer (3) located on the right inner fender (4).



5. Remove the bolt (1) that secures the rear section of the A/C liquid line (2) to the receiver/drier (3).
6. Disconnect the rear section of the A/C liquid line from the receiver/drier and remove and discard the O-ring seal.
7. Install plugs in, or tape over the opened liquid line fitting and the receiver/drier port.



8. Raise and support the vehicle.
9. Remove the right front wheelhouse splash shield (Refer to 23 - BODY/EXTERIOR/LF WHEELHOUSE SPLASH SHIELD - REMOVAL).
10. Remove the plastic retainer (1) that secures the A/C suction line (2) to the liquid line tapping block (4).
11. Remove the nut (3) that secures the liquid line tapping block to the A/C expansion valve (5).
12. Disconnect the A/C suction line and the rear section of the A/C liquid line from the A/C expansion valve and remove and discard the O-ring seals and gaskets.
13. Install plugs in, or tape over the opened refrigerant line fittings and the expansion valve ports.
14. Separate the A/C suction line from the liquid line tapping block.



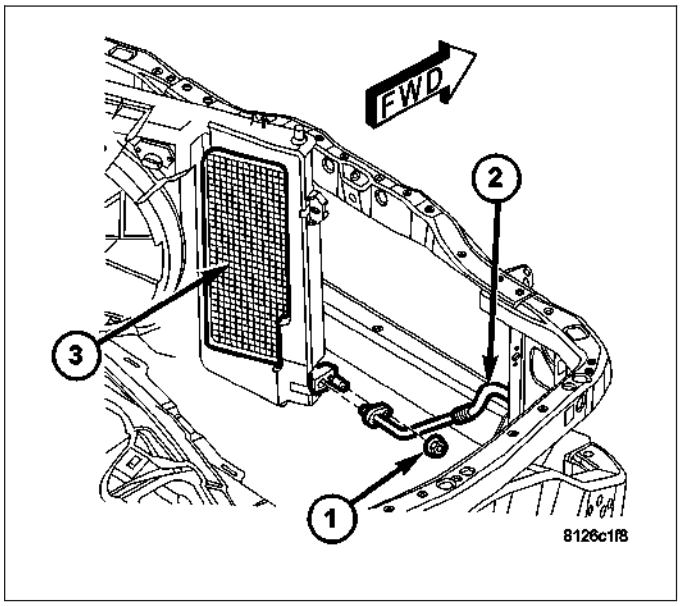
15. On models equipped with the rear heating-A/C system, disconnect the underbody liquid line from the liquid line tapping block (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING -REAR/COUPLER-REFRIGERANT LINE - REMOVAL) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - REAR/LINE-A/C LIQUID - REMOVAL).
16. Remove the rear section of the A/C liquid line from the engine compartment.

INSTALLATION

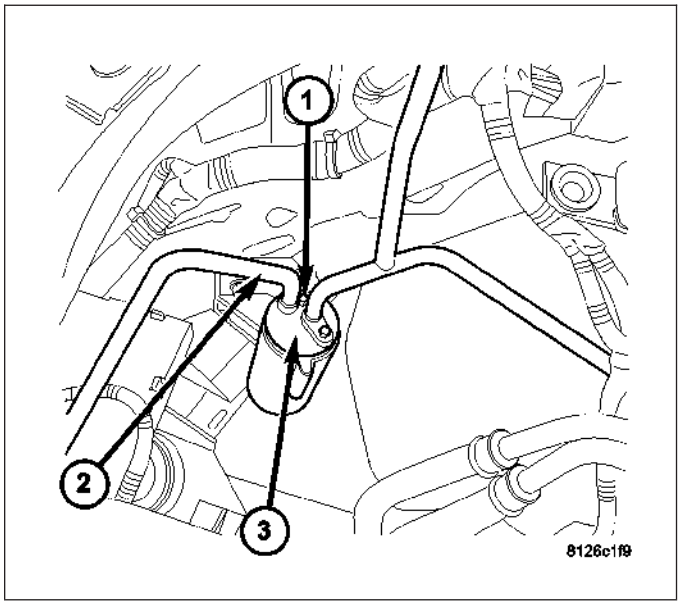
NOTE: TheA/C liquid line is serviced in two sections. The front section connects between the A/C condenser and the receiver/drier. The rear section connects between the receiver/drier and the A/C expansion valve. On models equipped with the rear heating-A/C system, the rear section of the A/C liquid line also includes an extension tube that connects the liquid line to the underbody lines.

FRONT SECTION

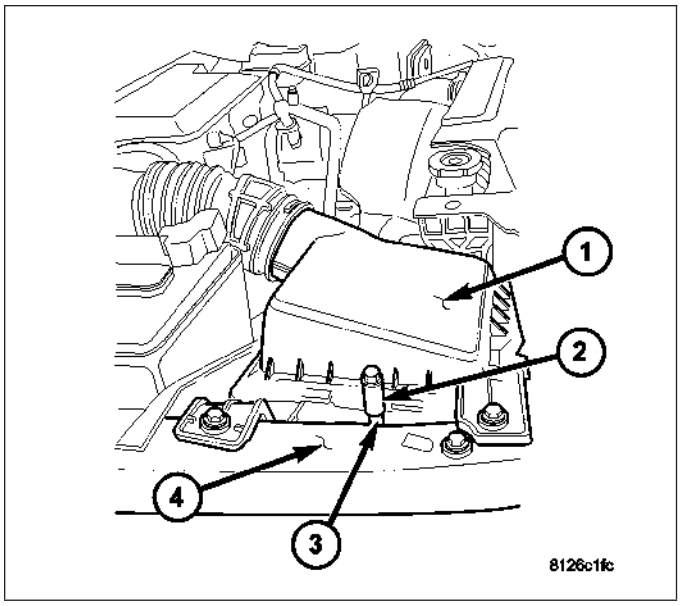
1. Position the front section of theA/C liquid line (2) into the engine compartment.
2. Remove the tape or plugs from the liquid line fitting and the condenser port.
3. Lubricate a new rubber O-ring seal with clean refrigerant oil and install it and a new gasket onto the liquid line fitting. Use only the specified O-ring as it is made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
4. Connect the A/C liquid line to the A/C condenser (3).
5. Install the nut (1) that secures the A/C liquid line to the A/C condenser. Tighten the nut to 22 N·m (16 ft. lbs.).



6. Remove the tape or plugs from the liquid line fitting and the receiver/drier (3).
7. Lubricate a new rubber O-ring seal with clean refrigerant oil and install it onto the liquid line fitting. Use only the specified O-ring as it is made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
8. Connect the front section of the A/C liquid line (2) to the receiver/drier.
9. Install the bolt (1) that secures the front section of theA/C liquid line to the receiver/drier. Tighten the bolt to 11 N·m (100 in. lbs.).

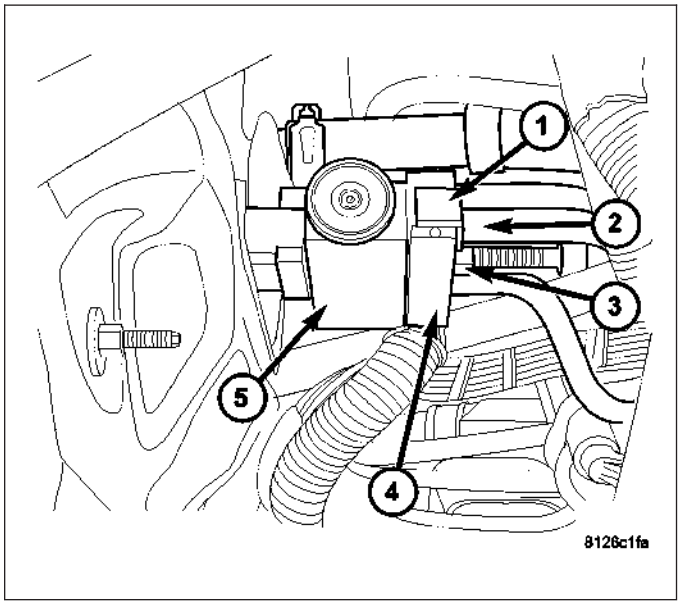


10. Install the air cleaner housing (1) to the right side of the engine compartment (Refer to 9 - ENGINE/ AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).
11. Reconnect the negative battery cable.
12. Evacuate the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE).
13. Charge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).

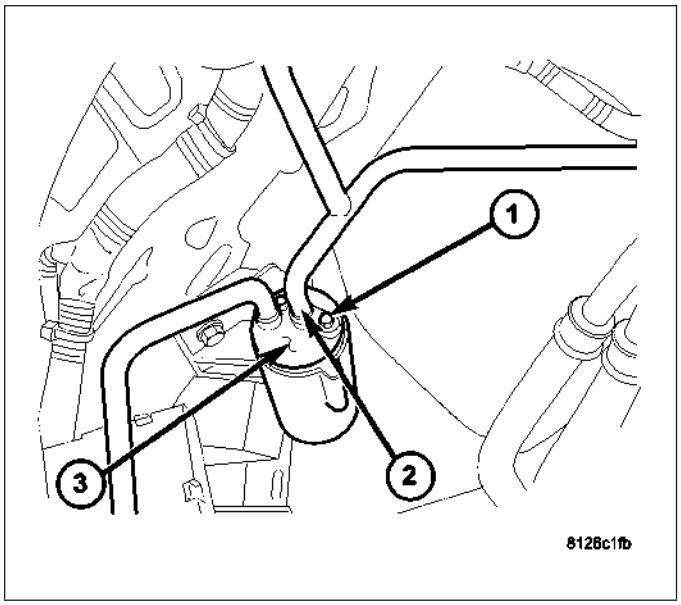


REAR SECTION

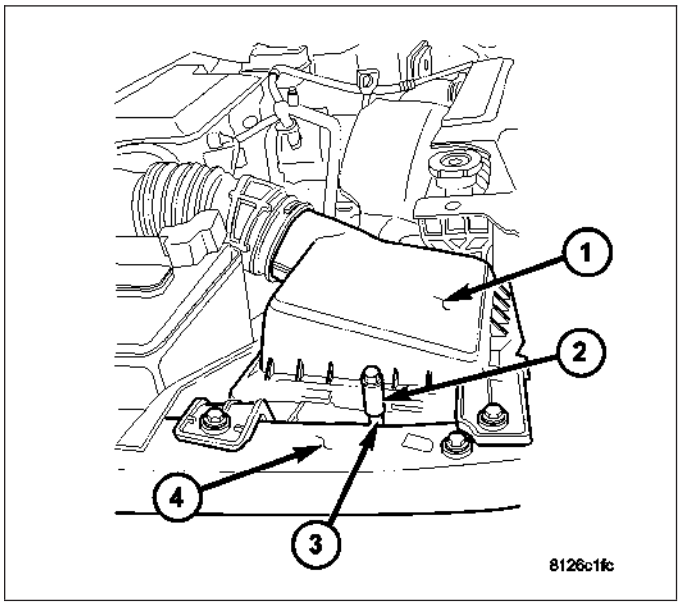
1. Position the rear section of the A/C liquid line into the engine compartment.
2. Install the A/C suction line (2) into the liquid line tapping block (4).
3. Install the plastic retainer (1) that secures the A/C suction line to the liquid line tapping block.
4. Remove the tape or plugs from the suction and liquid line fittings and the A/C expansion valve (5).
5. Lubricate new rubber O-ring seals with clean refrigerant oil and install them and a new gasket onto the A/C expansion valve. Use only the specified O-rings as they are made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
6. Connect the A/C suction line and the rear section of the A/C liquid line to the A/C expansion valve.
7. Install the nut (3) that secures the liquid line tapping block to the A/C expansion valve. Tighten the nut to 23 N·m (17 ft. lbs.).
8. On models equipped with the rear heating-A/C system, connect the underbody liquid line to the liquid line tapping block (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - REAR/LINE-A/C LIQUID - INSTALLATION) or (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - REAR/COUPLER-REFRIGERANT LINE - INSTALLATION).
9. Install the right front wheelhouse splash shield (Refer to 23 - BODY/EXTERIOR/LF WHEELHOUSE SPLASH SHIELD - INSTALLATION).
10. Lower the vehicle.



11. Remove the tape or plugs from the liquid line fitting and the receiver/drier (3).
12. Lubricate a new rubber O-ring seal with clean refrigerant oil and install it onto the liquid line fitting. Use only the specified O-ring as it is made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
13. Connect the rear section of the A/C liquid line (2) to the receiver/drier.
14. Install the bolt (1) that secures the rear section of the A/C liquid line to the receiver/drier. Tighten the bolt to 11 N·m (100 in. lbs.).



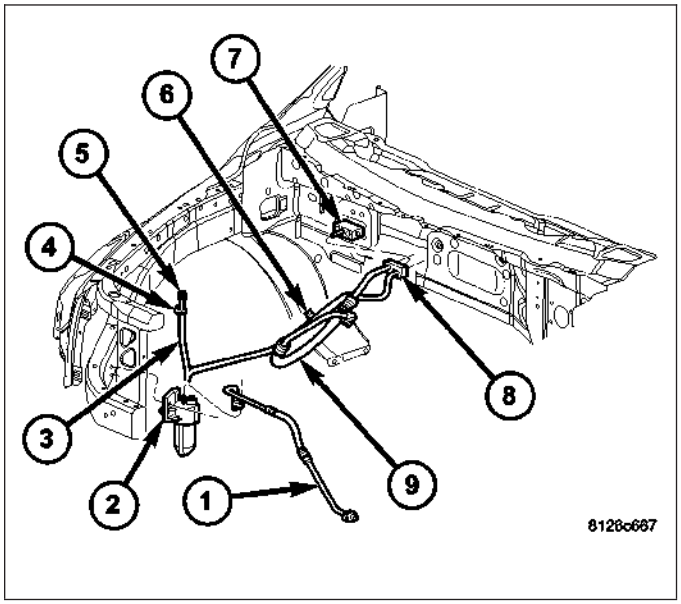
15. Install the rear section of the liquid line (2) into the plastic retainer (3) located on the right inner fender (4).
16. Install the air cleaner housing (1) to the right side of the engine compartment (Refer to 9 - ENGINE/ AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).
17. Reconnect the negative battery cable.
18. Evacuate the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE).
19. Charge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).



LINE-A/C SUCTION

DESCRIPTION

The suction line (9) is the refrigerant line that carries refrigerant from the A/C evaporator to the A/C compressor. The suction line includes the low side service port (6) and is secured to the A/C expansion valve (7) by the liquid line tapping plate (8). On models equipped with the rear heating-A/C system, the suction line also includes an extension tube that connects the suction line to the underbody lines (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - REAR/ LINE-A/C SUCTION - DESCRIPTION).



CAUTION: Use only O-ring seals specified for the vehicle. Failure to use the correct O-ring seal will cause the refrigerant system connections to leak.

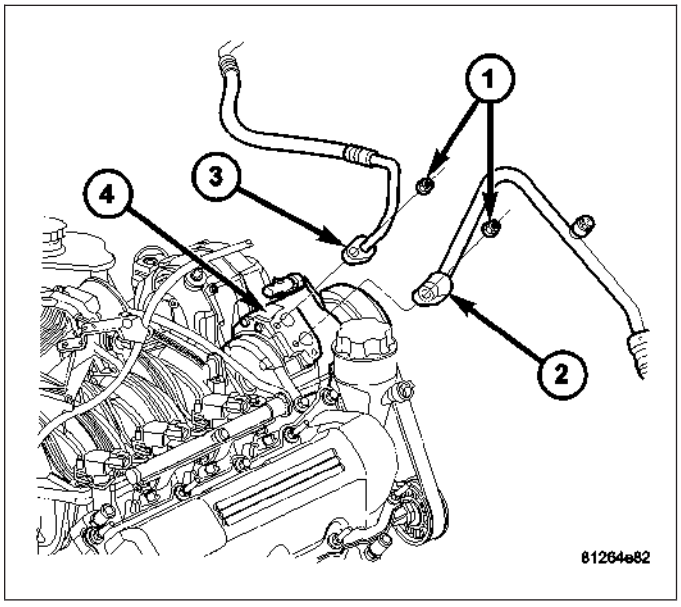
The suction line has no serviceable parts except for the rubber O-ring seals, low-side service port valve and cap.The O-ring seals used on the connections are made from a special type of rubber not affected by R-134a refrigerant. The O-ring seals must be replaced whenever the suction line is removed and installed.

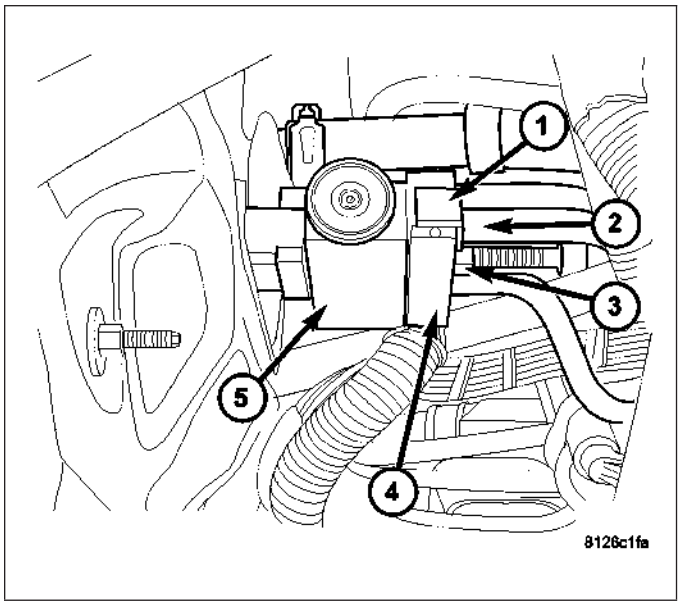
If the suction line is found to be leaking or is damaged, it must be replaced.

REMOVAL

WARNING: Refer to the applicable warnings and cautions for this system before performing the following operation (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - WARNINGS) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - CAUTIONS). Failure to follow the warnings and cautions could result in possible personal injury or death.

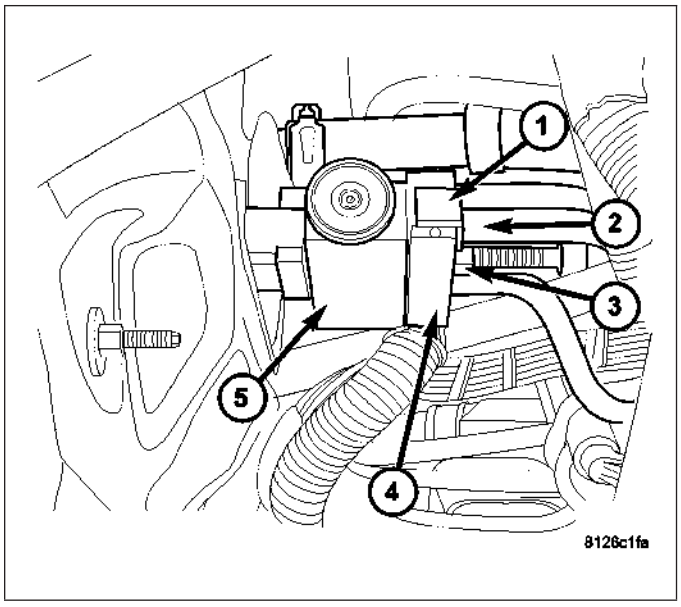
1. Recover the refrigerant from the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY).
2. Disconnect and isolate the negative battery cable.
3. Remove the nut (1) that secure the A/C suction line (2) to the A/C compressor (4).
4. Disconnect the A/C suction line from the A/C compressor and remove and discard the O-ring seal and gasket.
5. Install plugs in, or tape over the opened suction line fitting and the compressor port.



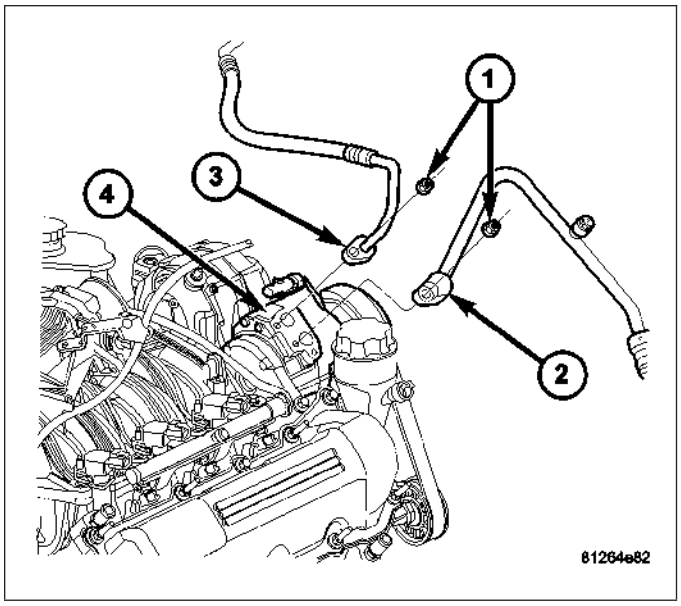


6. Raise and support the vehicle.
7. Remove the right front wheelhouse splash shield (Refer to 23 - BODY/EXTERIOR/LF WHEELHOUSE SPLASH SHIELD - REMOVAL).
8. Remove the plastic retainer (1) that secures the A/C suction line (2) to the liquid line tapping block (4).
9. Remove the nut (3) that secures the liquid line tapping block to the A/C expansion valve (5).
10. Disconnect the A/C suction line and the rear section of the A/C liquid line from the A/C expansion valve and remove and discard the O-ring seals and gaskets.
11. Install plugs in, or tape over the opened refrigerant line fittings and the expansion valve ports.
12. Separate the A/C suction line from the liquid line tapping block.
13. On models equipped with the rear heating-A/C system, disconnect the underbody refrigerant line from the A/C suction line (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING -REAR/COUPLER-REFRIGERANT LINE - REMOVAL) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - REAR/LINE-A/C LIQUID - REMOVAL).
14. Remove the A/C suction line from the engine compartment.

INSTALLATION



1. Position the A/C suction line (2) into the engine compartment.
2. Install the A/C suction line into the liquid line tapping block (4).
3. Install the plastic retainer (1) that secures the A/C suction line to the liquid line tapping block.
4. Remove the tape or plugs from the suction and liquid line fittings and the A/C expansion valve (5).
5. Lubricate new rubber O-ring seals with clean refrigerant oil and install them and a new gasket onto the suction and liquid line fittings. Use only the specified O-rings as they are made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
6. Connect the A/C suction line and A/C liquid line to the A/C expansion valve.
7. Install the nut (3) that secures the liquid line tapping block to the A/C expansion valve. Tighten the nut to 23 N·m (17 ft. lbs.).
8. On models equipped with the rear heating-A/C system, connect the underbodyrefrigerant line to the A/C suction line (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - REAR/LINE-A/C LIQUID - INSTALLATION) or (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - REAR/COUPLER-REFRIGERANT LINE - INSTALLATION).
9. Install the right front wheelhouse splash shield (Refer to 23 - BODY/EXTERIOR/LF WHEELHOUSE SPLASH SHIELD - INSTALLATION).
10. Lower the vehicle.



11. Remove the tape or plugs from the opened suction line fitting and the compressor port.
12. Lubricate a new rubber O-ring seal with clean refrigerant oil and install it and a new gasket onto the suction line fitting. Use only the specified O-ring as it is made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
13. Install the A/C suction line (2) onto the A/C compressor (4).
14. Install the nut (1) that secures the A/C suction line to the A/C compressor. Tighten the nut to 23 N·m (17 ft. lbs.).
15. Reconnect the negative battery cable.
16. Evacuate the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE).
17. Charge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).

OIL-A/C REFRIGERANT

DESCRIPTION

The refrigerant oil used in R-134a refrigerant systems is a synthetic-based, polyalkylene glycol (PAG), wax-free lubricant. Mineral-based R-12 refrigerant oils are not compatible with PAG oils, and should never be introduced to an R-134a refrigerant system.

There are different PAG oils available, and each contains a different additive package. The Denso 10S20 A/C compressor used in this vehicle is designed to use ND-8 PAG refrigerant oil. Use only this type of refrigerant oil in the refrigerant system.

OPERATION

After performing any refrigerant recovery or recycling operation, always replenish the refrigerant system with the same amount of the recommended refrigerant oil as was removed. Too little refrigerant oil can cause A/C compressor damage, and too much can reduce A/C system performance.

PAG refrigerant oil is more hygroscopic than mineral oil, and will absorb any moisture it comes into contact with, even moisture in the air. The PAG oil container should always be kept tightly capped until it is ready to be used. After use, recap the oil container immediately to prevent moisture contamination.

STANDARD PROCEDURE

REFRIGERANT OIL LEVEL

When an A/C system is assembled at the factory, all components except the A/C compressor are refrigerant oil free. After the refrigerant system has been charged and operated, the refrigerant oil in the A/C compressor is dispersed throughout the refrigerant system. The receiver/drier, A/C evaporator, A/C condenser and the A/C compressor will each retain a significant amount of the needed refrigerant oil.

It is important to have the correct amount of refrigerant oil in the A/C system. This ensures proper lubrication of the A/C compressor. Too little oil will result in damage to the A/C compressor, while too much oil will reduce the cooling capacity of the A/C system and consequently result in higher discharge air temperatures.

CAUTION: The oil used in the Denso 10S20 A/C compressor is ND-8 PAG R-134a refrigerant oil. Only refrigerant oil of the same type should be used to service the A/C system. Do not use any other refrigerant oil. The oil container should be kept tightly capped until it is ready for use and then tightly capped after use to prevent contamination from dirt and moisture. Refrigerant oil will quickly absorb any moisture it comes in contact with, therefore, special effort must be used to keep all R-134a system components moisture-free. Moisture in the refrigerant oil is very difficult to remove and will cause a reliability problem with the A/C compressor.

NOTE: Most reclaim/recycling equipment will measure the lubricant being removed during recovery. This amount of lubricant should be added back into the system. Refer to the reclaim/recycling equipment manufacturers instructions.

It will not be necessary to check the oil level in the A/C compressor or to add oil, unless there has been an oil loss. An oil loss may occur due to a rupture or leak from a refrigerant line, a connector fitting, a component, or a component seal. If a leak occurs, add 30 milliliters (1 fluid ounce) of refrigerant oil to the refrigerant system after the repair has been made. Refrigerant oil loss will be evident at the leak point by the presence of a wet, shiny surface around the leak.

Refrigerant oil must be added when a receiver/drier, A/C evaporator or A/C condenser is replaced. See the Refrigerant Oil Capacities chart. When an A/C compressor is replaced, the refrigerant oil must be drained from the old compressor and measured. Drain all of the refrigerant oil from the new A/C compressor, then fill the new compressor with the same amount of refrigerant oil that was drained out of the old compressor.

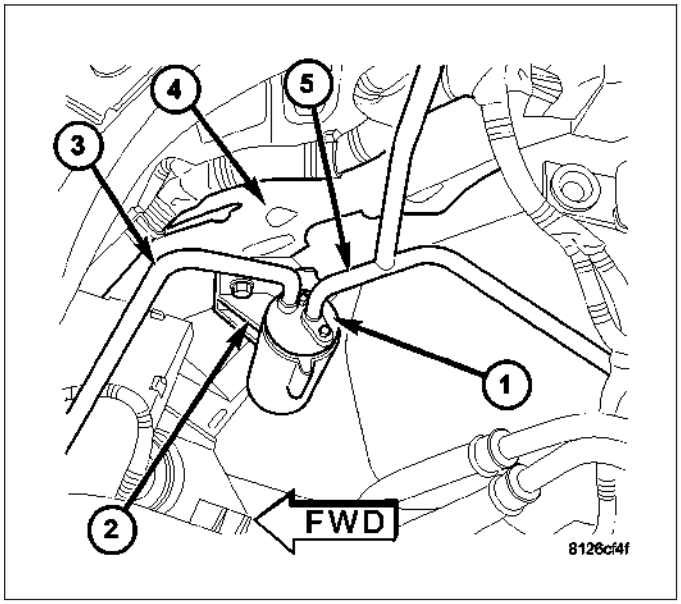
REFRIGERANT OIL CAPACITIES

Component	ml	fl oz
Total System Fill - Front A/C only	150	5.07
Total System Fill - Front and Rear A/C	220	7.4
Receiver/drier	30	1
Front Evaporator	60	2
Rear Evaporator	30	1
A/C Condenser	30	1
A/C Compressor	Drain and measure the oil from the old compressor - see text.	

RECEIVER/DRIER-A/C

DESCRIPTION

The receiver/drier (1) is mounted in a bracket (2) secured to the right front frame rail (4) in the engine compartment. The receiver/drier is connected between the front section of the liquid line (3) and the rear section of the liquid line (5) between the condenser outlet and the evaporator inlet.



OPERATION

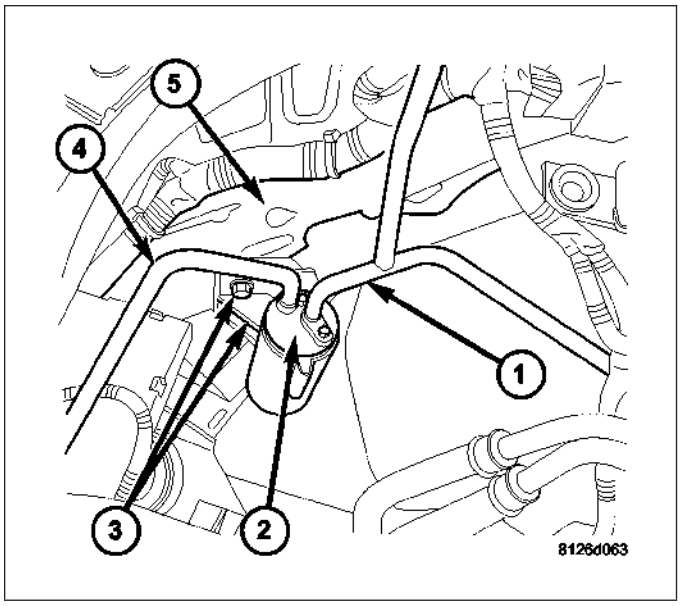
The receiver/drier performs a filtering action to prevent foreign material in the refrigerant from contaminating the A/C expansion valve. Refrigerant enters the receiver/drier as a high-pressure, low temperature liquid. Desiccant inside the receiver/drier absorbs any moisture which may have entered and become trapped within the refrigerant system. In addition, during periods of high demand operation of the A/C system, the receiver/drier acts as a reservoir to store surplus refrigerant.

The receiver/drier cannot be repaired. If the receiver/drier is faulty or damaged, or if the refrigerant system has been contaminated or left open to the atmosphere for an indeterminable period or if the A/C compressor has failed, it must be replaced.

REMOVAL

WARNING: Refer to the applicable warnings and cautions for this system before performing the following operation (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - WARNINGS) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - CAUTIONS). Failure to follow the warnings and cautions could result in possible personal injury or death.

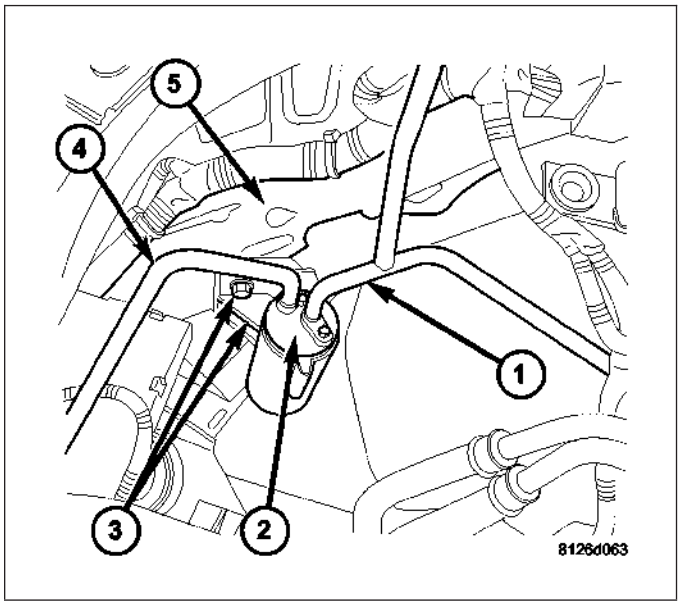
1. Recover the refrigerant from the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY).
2. Remove the front and the rear sections of the liquid line (1 and 4) from the receiver/drier (2) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT/LINE-A/C LIQUID - REMOVAL).
3. Remove the two bolts (3) that secure the receiver/ drier and bracket to the right front frame rail (5).
4. Remove the receiver/drier from the engine compartment.



INSTALLATION

NOTE: If the A/C receiver/drier is being replaced, add 30 milliliters (1 fluid ounce) of refrigerant oil to the refrigerant system. Use only the refrigerant oil of the type recommended for the A/C compressor in the vehicle.

1. Position the receiver/drier and bracket (2) into the engine compartment.
2. Install the two bolts (3) that secure the receiver/ drier to the right front frame rail (5). Tighten the bolts to 6.8 N·m (60 in. lbs.).
3. Install the front and rear sections of the liquid line (1 and 4) to the receiver/drier (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT/ LINE-A/C LIQUID - INSTALLATION).
4. Evacuate the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE).
5. Charge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).



REFRIGERANT-A/C

DESCRIPTION

The refrigerant used in this air conditioning system is a HydroFluoroCarbon (HFC), type R-134a. Unlike R-12, which is a ChloroFluoroCarbon (CFC), R-134a refrigerant does not contain ozone-depleting chlorine. R-134a refrigerant is a non-toxic, non-flammable, clear, and colorless liquefied gas.

Even though R-134a does not contain chlorine, it must be reclaimed and recycled just like CFC-type refrigerants. This is because R-134a is a greenhouse gas and can contribute to global warming.

OPERATION

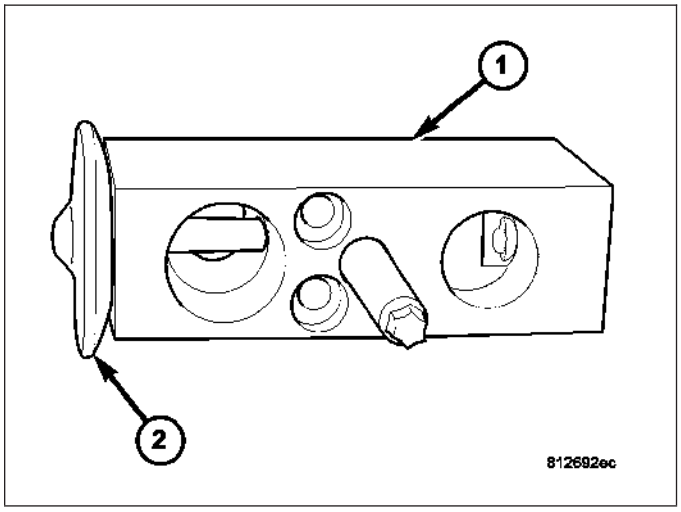
R-134a refrigerant is not compatible with R-12 refrigerant in an A/C system. Even a small amount of R-12 refrigerant added to an R-134a refrigerant system will cause A/C compressor failure, refrigerant oil sludge or poor A/C system performance. In addition, the polyalkylene glycol (PAG) synthetic refrigerant oils used in an R-134a refrigerant system are not compatible with the mineral-based refrigerant oils used in an R-12 refrigerant system.

R-134a refrigerant system service ports, service tool couplers and refrigerant dispensing bottles have all been designed with unique fittings to ensure that an R-134a refrigerant system is not accidentally contaminated with the wrong refrigerant (R-12). There are also labels posted in the engine compartment of the vehicle and on the A/C compressor to identify that the A/C system is equipped with R-134a refrigerant.

VALVE-A/C EXPANSION

DESCRIPTION

The A/C expansion valve controls the amount of refrigerant entering the A/C evaporator and is of a thermostatic expansion valve (TXV) design. The A/C expansion valve consists of an aluminum H-valve type body (1) with an integral thermal sensor (2) and is located at the dash panel between the A/C refrigerant lines and the A/C evaporator.



OPERATION

The A/C expansion valve controls the high-pressure, low temperature liquid refrigerant from the liquid line and converts it into a low-pressure, low-temperature mixture of liquid and gas before it enters the A/C evaporator. A mechanical sensor in the A/C expansion valve monitors the temperature and pressure of the refrigerant leaving the A/C evaporator through the suction line, and adjusts the orifice size at the liquid line port to let the proper amount of refrigerant into the A/C evaporator to meet the vehicle A/C cooling requirements. Controlling the refrigerant flow through the A/C evaporator ensures that none of the refrigerant leaving the A/C evaporator is still in a liquid state, which could damage the A/C compressor.

The A/C expansion valve is factory calibrated and cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

DIAGNOSIS AND TESTING

A/C EXPANSION VALVE - FRONT

WARNING: Refer to the applicable warnings and cautions for this system before performing the following operation (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - WARNINGS) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - CAUTIONS). Failure to follow the warnings and cautions could result in possible personal injury or death.

NOTE: The A/C expansion valve should only be tested following testing of the A/C compressor.

NOTE: Liquid CO^2 is required to test the A/C expansion valve. This material is available from most welding supply facilities. Liquid CO^2 is also available from companies which service and sell fire extinguishers.

When testing the A/C expansion valve, the work area and the vehicle temperature must be 21° to 27° C (70° to 85° F). To test the expansion valve:

1. Connect a charging station or manifold gauge set to the refrigerant system service ports. Verify the refrigerant charge level.
2. Close all doors, windows and vents to the passenger compartment.
3. Set the A/C-heater controls so that the A/C compressor is operating, the temperature control is in the highest temperature position, the mode-air doors is directing air output to the floor and the blower motor operating is operating at the highest speed.
4. Start the engine and allow it to idle. After the engine has reached normal operating temperature, allow the passenger compartment to heat up. This will create the need for maximum refrigerant flow into the A/C evaporator.
5. If the refrigerant charge is sufficient, the discharge (high pressure) gauge should read 827 kPa to 1655 kPa (120 psi to 240 psi). The suction (low pressure) gauge should read 207 kPa to 345 kPa (30 psi to 50 psi). If OK, go to Step 6. If not OK, replace the faulty A/C expansion valve.

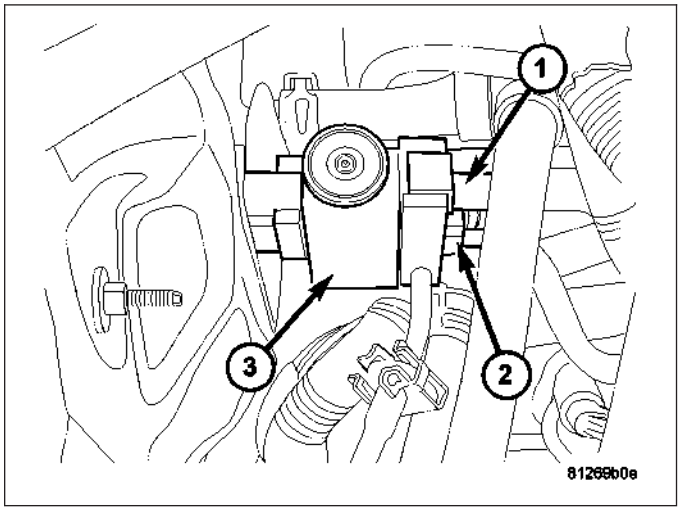
WARNING:
Protect the skin and eyes from exposure to liquid CO^2 or personal injury can result.

6. If the suction (low pressure) gauge reads within the specified range, freeze the A/C expansion valve for 30 seconds using liquid CO^2 or another suitable super-cold material.**Do not spray R-134a or R-12 refrigerant on the A/C expansion valve for this test.** The suction (low pressure) gauge reading should drop by 69 kPa (10 psi). If OK, go to Step 7 If not OK, replace the faulty A/C expansion valve.
7. Allow the expansion valve control head to thaw. The suction (low pressure) gauge reading should stabilize at 207 kPa to 345 kPa (30 psi to 50 psi). If not OK, replace the faulty A/C expansion valve.
8. When expansion valve testing is complete, test the overall A/C system performance (Refer to 24 - HEATING & AIR CONDITIONING - DIAGNOSIS AND TESTING - A/C PERFORMANCE TEST).

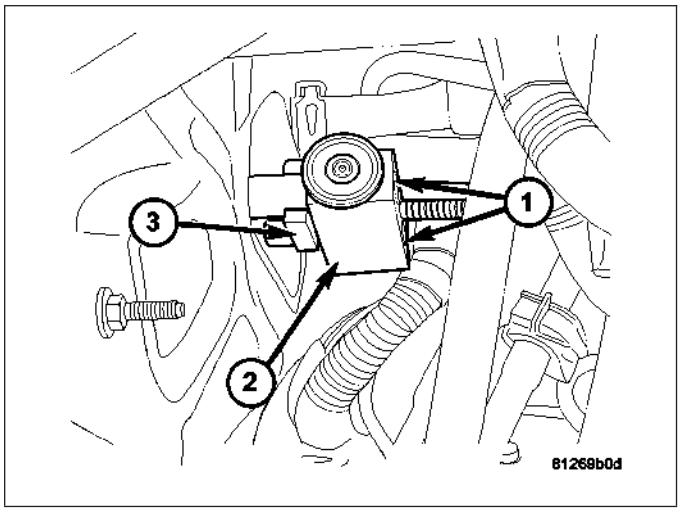
REMOVAL

WARNING: Refer to the applicable warnings and cautions for this system before performing the following operation (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - WARNINGS) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - CAUTIONS). Failure to follow the warnings and cautions could result in possible personal injury or death.

1. Recover the refrigerant from the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY).
2. Disconnect and isolate the negative battery cable.
3. Remove the A/C suction line (1) and the A/C liquid line (2) from the A/C expansion valve (3) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT/LINE-A/C SUCTION - REMOVAL) or (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - FRONT/LINE-A/C LIQUID - REMOVAL).

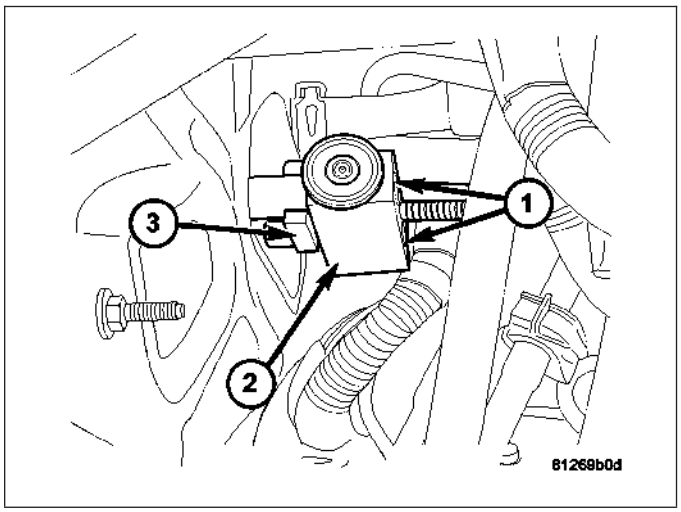


4. Remove the two bolts (1) that secure the A/C expansion valve (2) to the evaporator tube tapping block (3).
5. Remove the A/C expansion valve from the evaporator tube tapping block and remove and discard the O-ring seals.
6. Install plugs in, or tape over the opened evaporator tube fittings and all expansion valve ports.

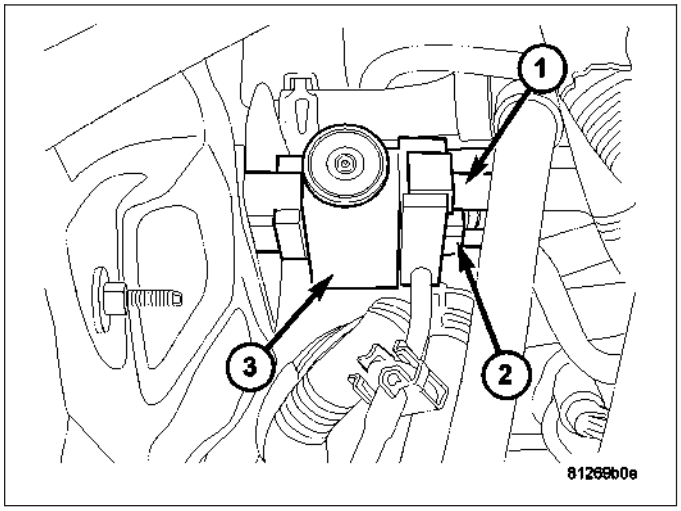


INSTALLATION

1. Remove the tape or plugs from the evaporator tube fittings and all of the expansion valve ports.
2. Lubricate new rubber O-ring seals with clean refrigerant oil and install them on the evaporator tube fittings. Use only the specified O-rings as they are made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
3. Install the A/C expansion valve (2) onto the evaporator tube tapping block (3).
4. Install the two bolts (1) that secure the A/C expansion valve to the evaporator tube tapping block. Tighten the bolts to 11 N·m (97 in. lbs.).



5. Install the A/C suction line (1) and the A/C liquid line (2) to the A/C expansion valve (3) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT/LINE-A/C SUCTION - INSTALLATION) or (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - FRONT/LINE-A/C LIQUID - INSTALLATION).
6. Reconnect the negative battery cable.
7. Evacuate the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE).
8. Recharge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).



PLUMBING - REAR

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CORE-HEATER

DESCRIPTION

The rear heater core (1) is located in the rear HVAC housing (2), behind the right interior quarter panel trim. The rear heater core is a heat exchanger made of rows of tubes and fins.

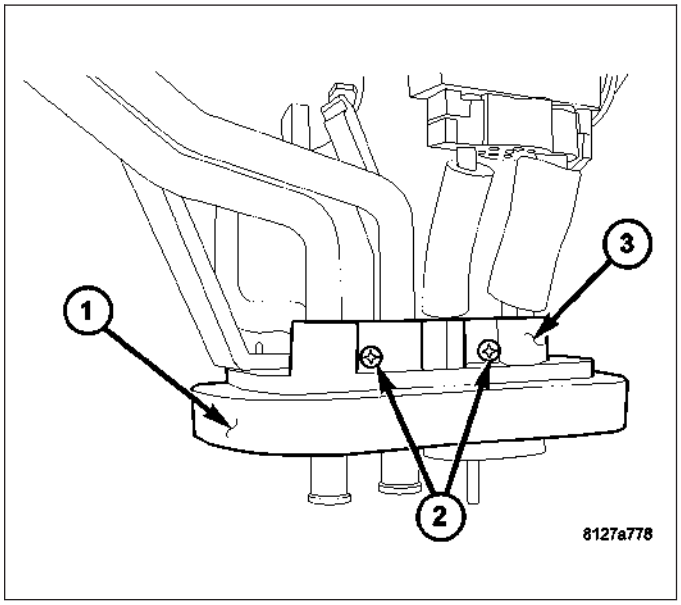
If the rear heater core is found to be leaking or is damaged, it must be replaced.

OPERATION

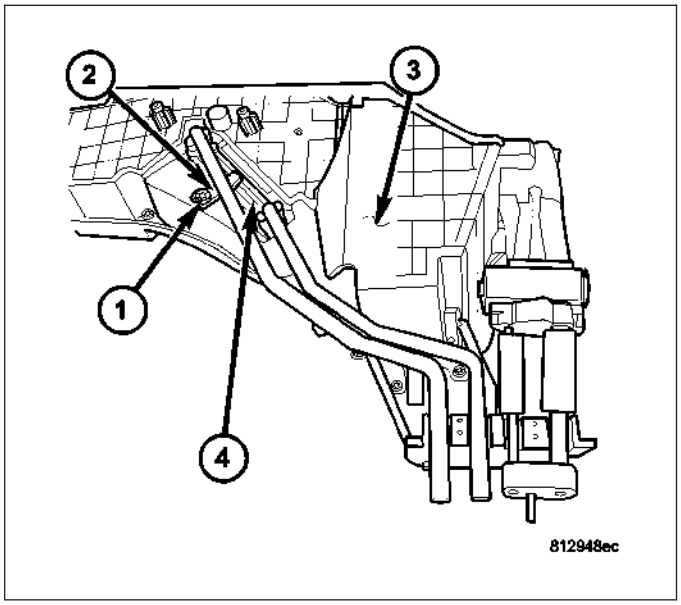
Engine coolant is circulated through heater hoses/tubes to the heater core at all times. As the coolant flows through the heater core, heat removed from the engine is transferred to the heater core fins and tubes. Air directed through the heater core picks up the heat from the heater core fins. The blend air door allows control of the heater output air temperature by controlling how much of the air flowing through the heater-A/C housing is directed through the heater core. The blower motor speed controls the volume of air flowing through the heater-A/C housing. The heater core cannot be repaired and, if faulty or damaged, it must be replaced. Refer to Cooling System for more information on the engine cooling system, the engine coolant and the heater hoses.

REMOVAL

1. Remove the rear HVAC housing (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION - REAR/HOUSING-HVAC - REMOVAL).
2. Remove the rear blend door actuator (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS - REAR/ACTUATOR-BLEND DOOR - REMOVAL).
3. Carefully remove the foam seal (1) from the rear heater core and evaporator extension line flange (3). If the seal is deformed or damaged, it must be replaced.
4. Remove the screws (2) that secure the two halves of the rear heater core and evaporator extension line flange together.
5. Remove the outer half of the rear heater core and evaporator extension line flange.

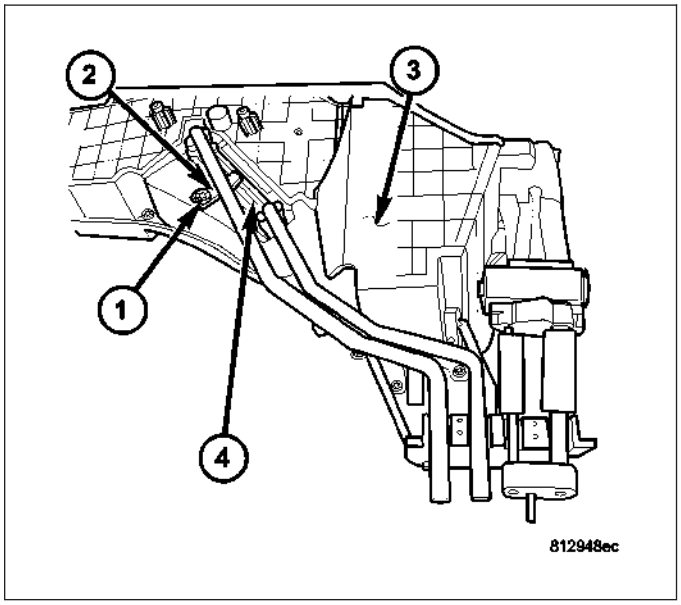


6. Remove the screw (1) that secures the rear heater core tube retaining bracket (2) to the rear HVAC housing (3).
7. Remove the rear heater core tube retaining bracket.
8. Carefully pull the rear heater core (4) out of the side of the rear HVAC housing.



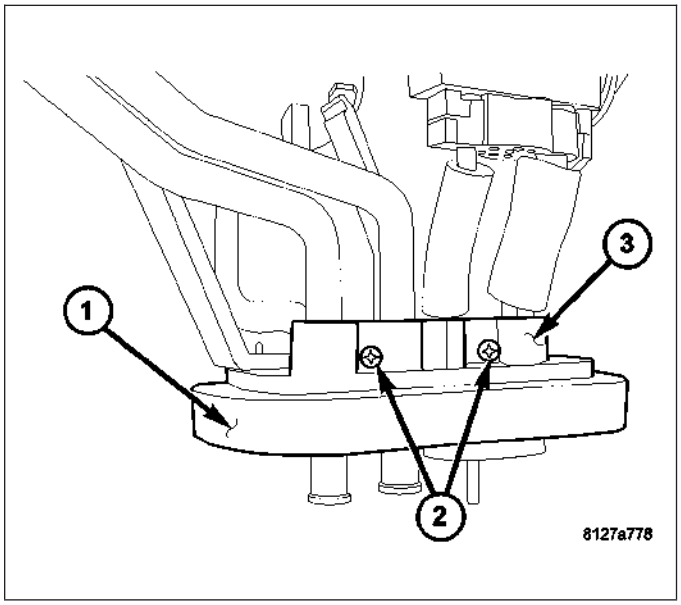
INSTALLATION

1. Install the rear heater core (4) into the side of the rear HVAC housing (3). Make sure that the insulator is properly installed.
2. Install the rear heater core retaining bracket (2).
3. Install the screw (1) that secures the rear heater core retaining bracket to the rear HVAC housing. Tighten the screw to 2 N·m (17 in. lbs.).



4. Install the outer halve of the rear heater core and evaporator extension line flange (3).
5. Install the screws (2) that secure the two halves of the rear heater core and evaporator extension line flange together. Tighten the screws to 2 N·m (17 in. lbs.).
6. Install the foam seal (1) to the rear heater core and evaporator extension line flange.
7. Install the rear blend door actuator (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS - REAR/ACTUATOR-BLEND DOOR - INSTALLATION).

NOTE: If the heater core is being replaced, flush the cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE - COOLING SYSTEM CLEANING/REVERSE FLUSHING).



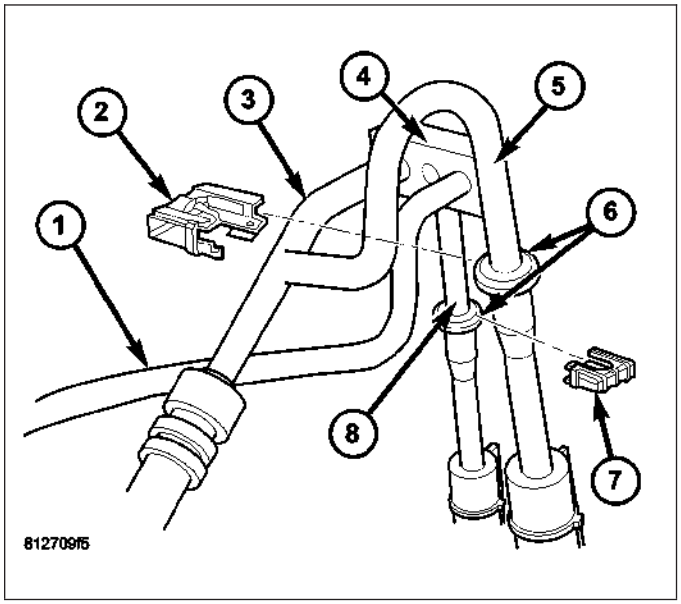
8. Install the rear HVAC housing (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION - REAR/HOUSING-HVAC - INSTALLATION).

COUPLER- REFRIGERANT LINE

DESCRIPTION

Spring-lock type refrigerant line couplers (6) are used to connect the liquid line (1) and the suction line (3) to the underbody refrigerant lines for the rear heating-A/C system. Secondary retaining clips (2 and 7) are installed over the connected couplers for added protection.

The spring-lock refrigerant line couplers require special disconnect tools for disengaging the two coupler halves.

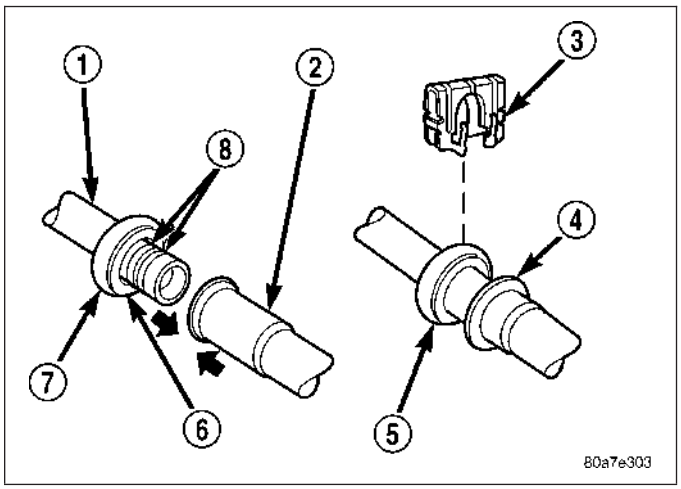


OPERATION

The spring-lock type refrigerant line coupler is held together by a garter spring (6) inside a circular cage (7) on the male half of the fitting (1). When the two coupler halves are connected, the flared end of the female fitting (2) slips behind the garter spring inside the cage on the male fitting. The garter spring and cage prevent the flared end of the female fitting from pulling out of the cage. Some applications use a connection indicator ring (4) to help indicate when the two coupler halves are fully connected.

Two O-rings (8) are used to seal the coupler connections. These O-rings are compatible with R-134a refrigerant and must be replaced with O-rings made of the same material.

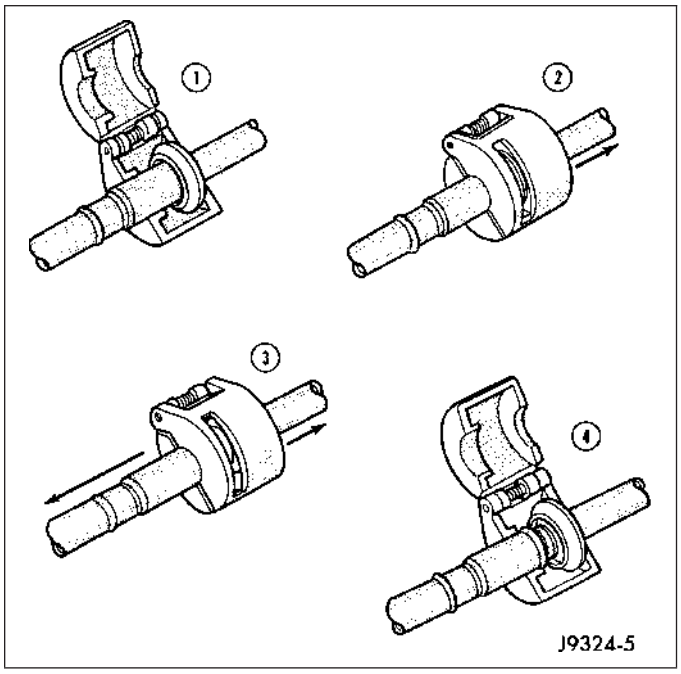
A secondary retaining clip (3) is installed over the connected coupler (5) for added protection.



REMOVAL

WARNING: Refer to the applicable warnings and cautions for this system before performing the following operation (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - WARNINGSG) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - CAUTIONS). Failure to follow the warnings and cautions could result in possible personal injury or death.

1. Recover the refrigerant from the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY).
2. Remove the secondary retaining clip from the spring-lock type refrigerant line coupler.
3. Fit the proper size A/C line disconnect tool (Special Tool Kit 7193 or equivalent) over the coupler cage (1).
4. Close the two halves of the A/C line disconnect tool around the coupler (2).

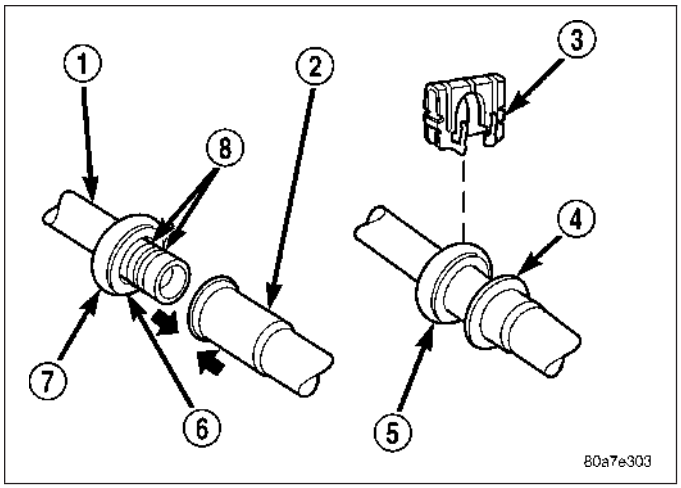


NOTE: The garter spring may not release if the A/C line disconnect tool is cocked while pushing it into the coupler cage opening.

5. Push the A/C line disconnect tool into the open side of the coupler cage to expand the garter spring (3). Once the garter spring is expanded, pull on the refrigerant line attached to the female half of the coupler until the flange on the female fitting is separated from the garter spring and cage on the male fitting.
6. Open and remove the A/C line disconnect tool from the refrigerant line coupler (4).

INSTALLATION

1. Clean any dirt or foreign material from the spring-lock type refrigerant line coupler.
2. Check to make sure that the garter spring (6) is located within the cage (7) of the male half of the refrigerant line coupler (1), and that the garter spring is not damaged.
   a. If the garter spring is missing, install a new spring by pushing it into the coupler cage opening.
   b. If the garter spring is damaged, remove it from the coupler cage with a small hook (DO NOT use a screwdriver) and install a new garter spring.



CAUTION: Use only the specified O-rings as they are made of a special material for the R-134a system. The use of any other O-rings may allow the connection to leak.

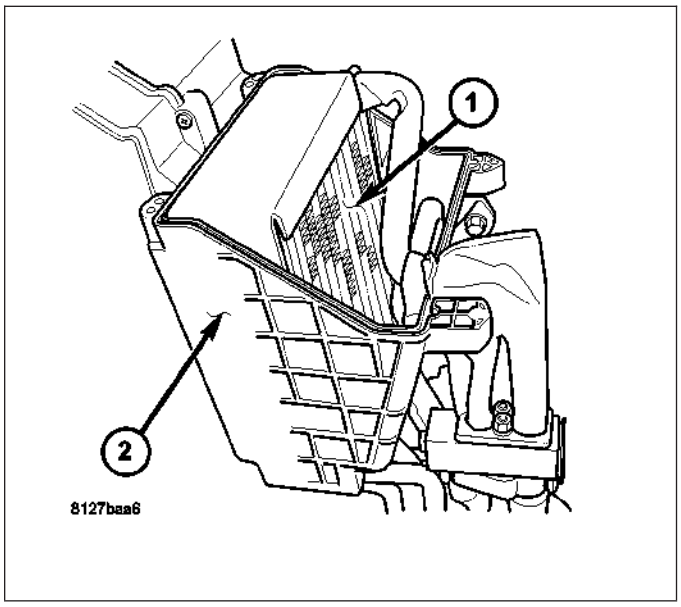
3. Install new O-rings (8) on the male half of the refrigerant line coupler.
4. Lubricate the O-rings, and the inside of the female half of the refrigerant line coupler (2) with clean R-134a refrigerant oil. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
5. Position the female half of the coupler over the male half of the coupler.
6. Push together firmly on the two halves of the refrigerant line coupler until the garter spring in the cage on the male half of the coupler snaps over the flanged end on the female half of the coupler.
7. Make sure that the refrigerant line coupler is fully engaged by firmly pulling the refrigerant lines away from each other on both sides of the coupler.
8. Install the secondary retaining clip (3) over connected coupler cage (5).
9. Evacuate the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE).

10. Charge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).

EVAPORATOR-A/C

DESCRIPTION

The rear A/C evaporator (1) is located within the rear HVAC housing (2), behind the right interior quarter panel trim. The rear A/C evaporator is positioned in the rear HVAC housing so that all air entering the housing must pass over the evaporator fins before it is distributed through the rear heating-A/C system ducts and outlets. However, air passing over the rear evaporator fins will only be conditioned when the A/C compressor is engaged and circulating refrigerant through the A/C evaporator.



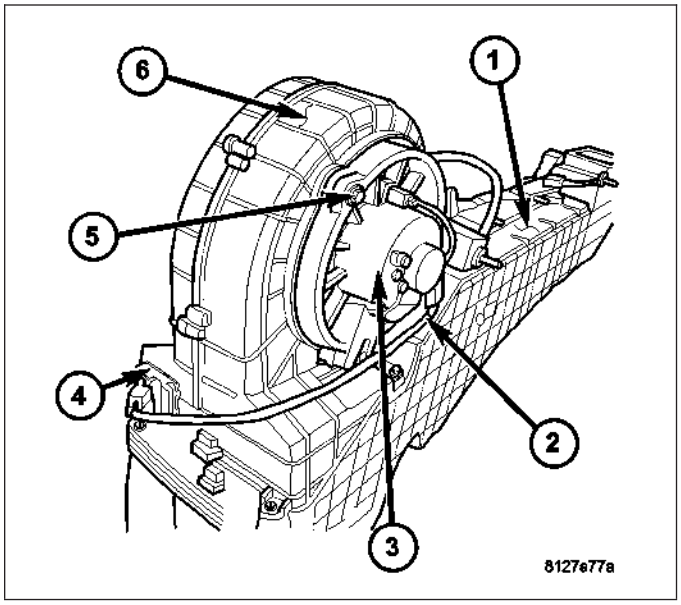
OPERATION

Refrigerant enters the rear A/C evaporator from the rear A/C expansion valve as a low-temperature, low-pressure mixture of liquid and gas. As air flows over the fins of the rear A/C evaporator, the humidity in the air condenses on the fins, and the heat from the air is absorbed by the refrigerant. Heat absorption causes the refrigerant to boil and vaporize. The refrigerant becomes a low-pressure gas when it leaves the rear A/C evaporator.

The rear A/C evaporator cannot be repaired and, if faulty or damaged, it must be replaced.

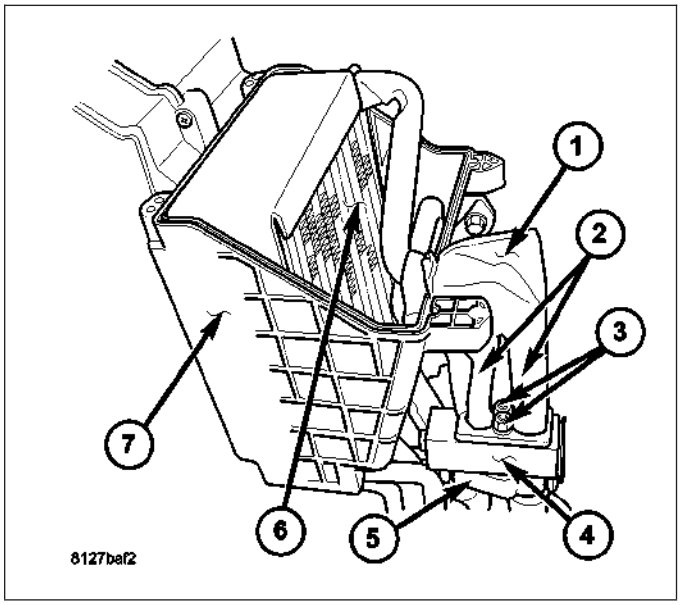
REMOVAL

1. Remove the rear HVAC housing (1) and place it on a workbench (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION - REAR/HOUSING-HVAC - REMOVAL).
2. Disconnect the rear HVAC wire harness (2) from the rear blower motor (3) and the rear blower motor resistor (4).
3. Remove the screws (5) that secure the rear air inlet housing (6) to the rear HVAC housing.



4. Remove the rear air inlet housing from the rear HVAC housing.

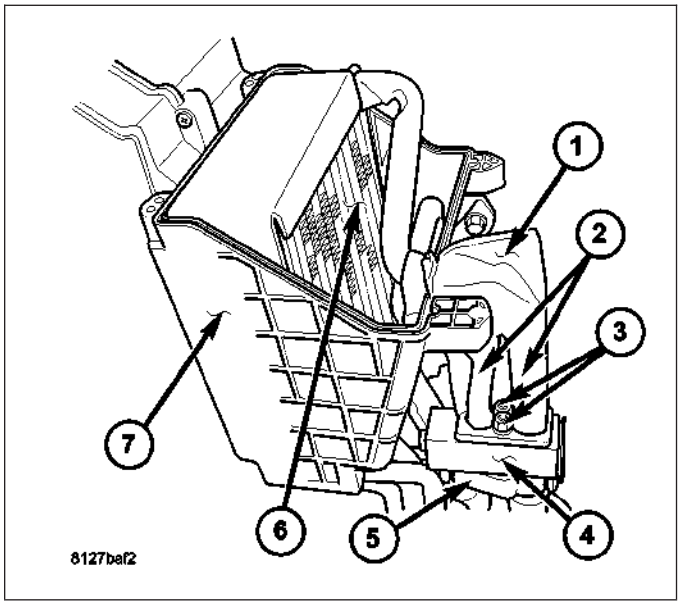
5. Remove the insulator (1) from around the rear A/C evaporator tubes (2) to gain access the two rear A/C expansion valve bolts (3).
6. Remove the two bolts that secure the rear A/C evaporator tubes to the rear A/C expansion valve (4) and the rear evaporator extension tube tapping block (5).
7. Carefully lift the rear A/C evaporator (6) out of the top of the rear HVAC housing (7).
8. Remove the rear A/C expansion valve from the rear evaporator extension tube tapping block and remove and discard the O-ring seals.
9. Install plugs in, or tape over the opened rear evaporator and extension tube fittings and all rear expansion valve ports.



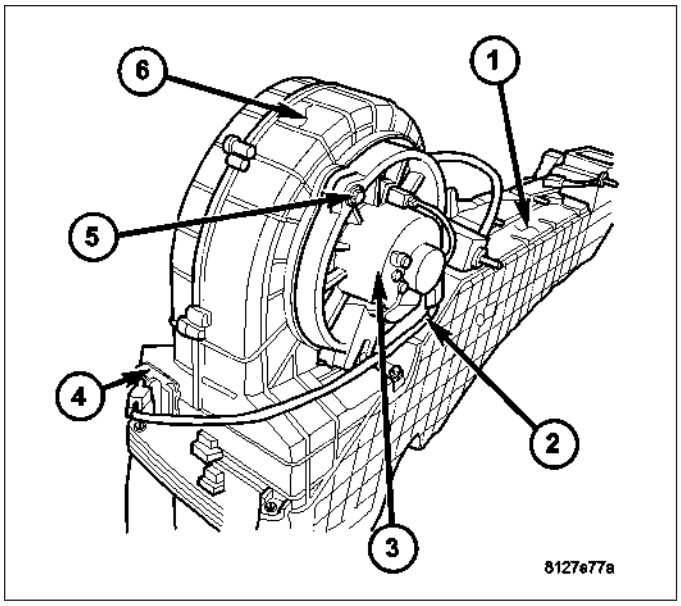
INSTALLATION

NOTE: If the rear A/C evaporator is being replaced, add 30 milliliters (1 fluid ounce) of refrigerant oil to the refrigerant system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.

1. Carefully position the rear A/C evaporator (6) into the top of the rear HVAC housing (7).
2. Remove the tape or plugs from the opened rear evaporator and extension tube fittings and all rear expansion valve ports.
3. Lubricate new rubber O-ring seals with clean refrigerant oil and install them on the evaporator tube and extension tube fittings. Use only the specified O-rings as they are made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
4. Install the rear A/C expansion valve (4) between the rear A/C evaporator tubes (2) and the rear extension tube tapping block (5).
5. Install the two bolts (3) that secure the rear A/C expansion valve between the rear A/C evaporator tubes and the rear extension tube tapping block. Tighten the bolts to 11 N·m (97 in. lbs.).
6. Install a new insulator (1) around the rear A/C evaporator tubes.



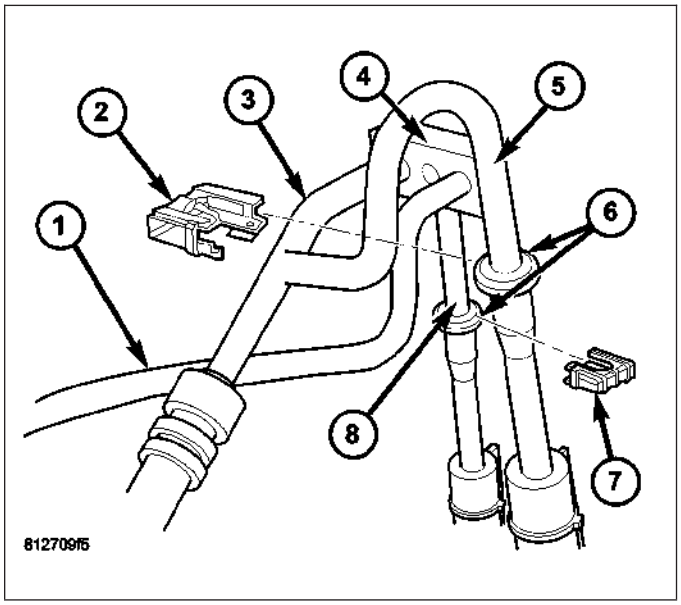
7. Position the rear air inlet housing (6) onto the rear HVAC housing (1).
8. Install the screws (5) that secure the rear air inlet housing to the rear HVAC housing. Tighten the screws to 2 N·m (17 in. lbs.).
9. Connect the rear HVAC wire harness (2) to the rear blower motor (3) and the rear blower motor resistor (4).
10. Install the rear HVAC housing (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION - REAR/HOUSING-HVAC - INSTALLATION).



LINE-A/C LIQUID

DESCRIPTION

The liquid line (1) is the refrigerant line that carries refrigerant from the A/C condenser to the rear A/C evaporator. The liquid line serviced in two sections and includes a tapping plate (4) that retains the suction line (3) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT/LINE-A/C LIQUID - DESCRIPTION). Models equipped with the rear heating-A/C system include an extension tube (8) that connects the liquid line to the underbody line by use of a spring-lock type refrigerant line coupler (6) and a secondary retaining clip (7).



CAUTION: Use only O-ring seals specified for the vehicle. Failure to use the correct O-ring seal will cause the refrigerant system connections to leak.

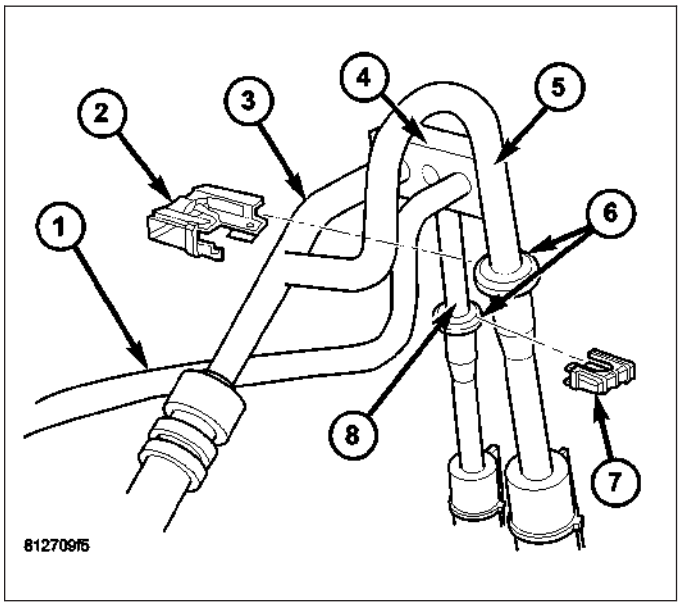
The liquid line has no serviceable parts except for the rubber O-ring seals. The O-ring seals used on the connections are made from a special type of rubber not affected by R-134a refrigerant. The O-ring seals must be replaced whenever the liquid line is removed and installed.

If the liquid line is found to be leaking or is damaged, it must be replaced.

REMOVAL

WARNING: Refer to the applicable warnings and cautions for this system before performing the following operation (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - WARNINGS) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - CAUTIONS). Failure to follow the warnings and cautions could result in possible personal injury or death.

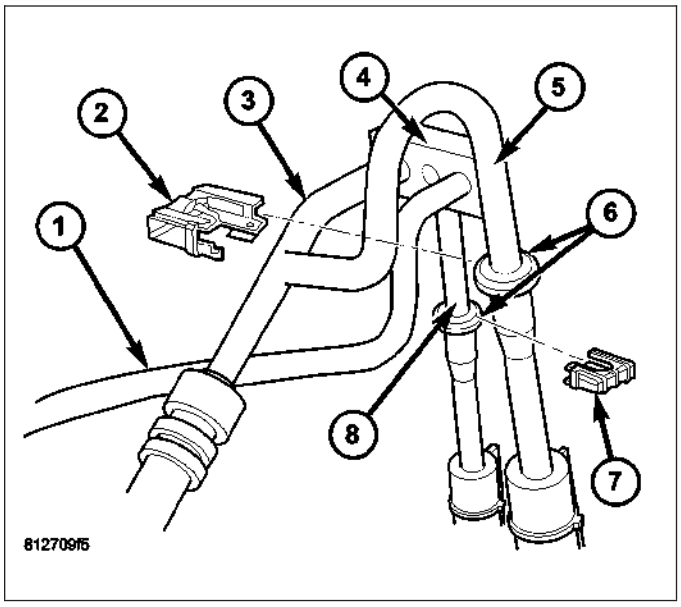
NOTE: The A/C liquid line is serviced in two sections. The front section connects between the A/C condenser and the receiver/drier. The rear section connects between the receiver/drier and the front A/C expansion valve. On models equipped with the rear heating-A/C system, the rear section of the A/C liquid line also includes an extension tube that connects the liquid line to the underbody lines.



1. Recover the refrigerant from the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY).
2. Disconnect and isolate the negative battery cable.
3. Disconnect the A/C liquid line (1) from the receiver/ drier and the front A/C expansion valve (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT/LINE-A/C LIQUID - REMOVAL).
4. Remove the secondary retaining clip (7) from the refrigerant line coupler (6) on the liquid line extension tube (8)
5. Disconnect the underbody liquid line from the liquid line extension tube and remove and discard the O-ring seal (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING -REAR/COUPLER-REFRIGERANT LINE - REMOVAL).
6. Install plugs in, or tape over the refrigerant line coupler and the underbody liquid line.
7. Remove the A/C liquid line from the engine compartment.

INSTALLATION

NOTE: The A/C liquid line is serviced in two sections. The front section connects between the A/C condenser and the receiver/drier. The rear section connects between the receiver/drier and the front A/C expansion valve. On models equipped with the rear heating-A/C system, the rear section of the A/C liquid line also includes an extension tube that connects the liquid line to the underbody lines.



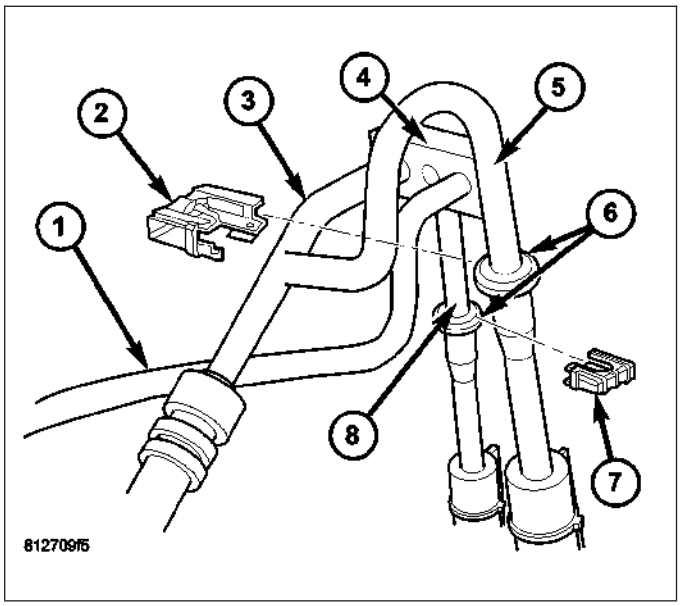
1. Install the A/C liquid line (1) to the receiver/drier and the front A/C expansion valve (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT/LINE-A/C LIQUID - INSTALLATION.
2. Remove the tape or plugs from the refrigerant line coupler (6) and the underbody liquid line.
3. Lubricate a new rubber O-ring seal with clean refrigerant oil and install it onto the refrigerant line coupler. Use only the specified O-ring as it is made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
4. Connect the underbody liquid line to liquid line extension tube (8) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - REAR/COUPLER-REFRIGERANT LINE - INSTALLATION).
5. Install the secondary retaining clip (7) onto the refrigerant line coupler.
6. Reconnect the negative battery cable.
7. Evacuate the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE).

8. Charge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).

LINE-A/C SUCTION

DESCRIPTION

The suction line (3) is the refrigerant line that carries refrigerant from the rear A/C evaporator to the A/C compressor. The suction line is retained into the liquid line tapping block (4) by a plastic retainer (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT/LINE-A/C SUCTION - DESCRIPTION). Models equipped with the rear heating-A/C system include an extension tube (5) that connects the suction line to the underbody line by use of a spring-lock type refrigerant line coupler (6) and a secondary retaining clip (2).



CAUTION: Use only O-ring seals specified for the vehicle. Failure to use the correct O-ring seal will cause the refrigerant system connections to leak.

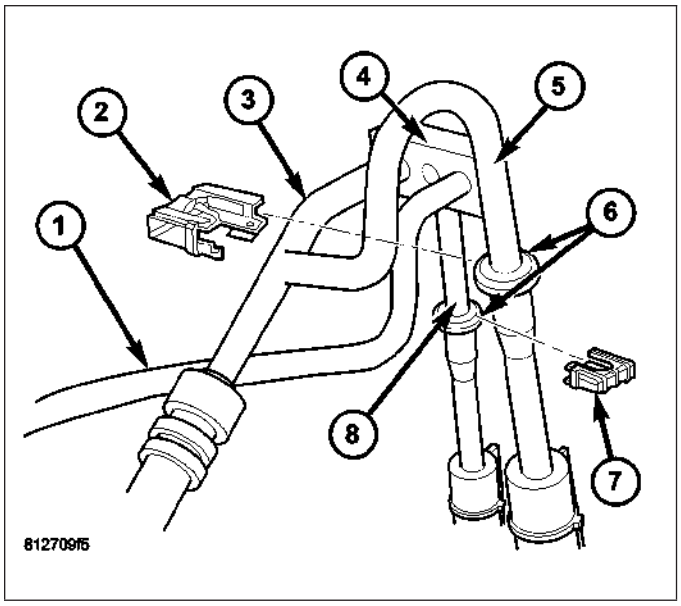
The suction line has no serviceable parts except for the rubber O-ring seals. The O-ring seals used on the connections are made from a special type of rubber not affected by R-134a refrigerant. The O-ring seals must be replaced whenever the suction line is removed and installed.

If the suction line is found to be leaking or is damaged, it must be replaced.

REMOVAL

WARNING: Refer to the applicable warnings and cautions for this system before performing the following operation (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - WARNINGS) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - CAUTIONS). Failure to follow the warnings and cautions could result in possible personal injury or death.

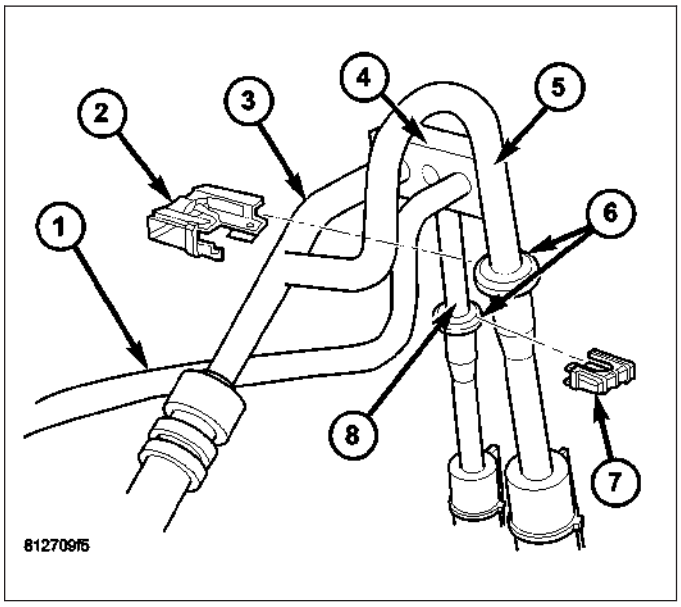
NOTE: The A/C suction line connects between the A/C evaporator and the A/C compressor. On models equipped with the rear heating-A/C system, the A/C suction line also includes an extension tube that connects the suction line to the underbody lines.



1. Recover the refrigerant from the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY).
2. Disconnect and isolate the negative battery cable.
3. Disconnect the A/C suction line (3) from the A/C compressor and the front A/C expansion valve (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - FRONT/LINE-A/C SUCTION - REMOVAL)
4. Remove the secondary retaining clip (2) from the refrigerant line coupler (6) on the suction line extension tube (5)
5. Disconnect the underbody suction line from the suction line extension tube and remove and discard the O-ring seal (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING -REAR/COUPLER-REFRIGERANT LINE - REMOVAL).
6. Install plugs in, or tape over the refrigerant line coupler and the underbody suction line.
7. Remove the A/C suction line from the engine compartment.

INSTALLATION

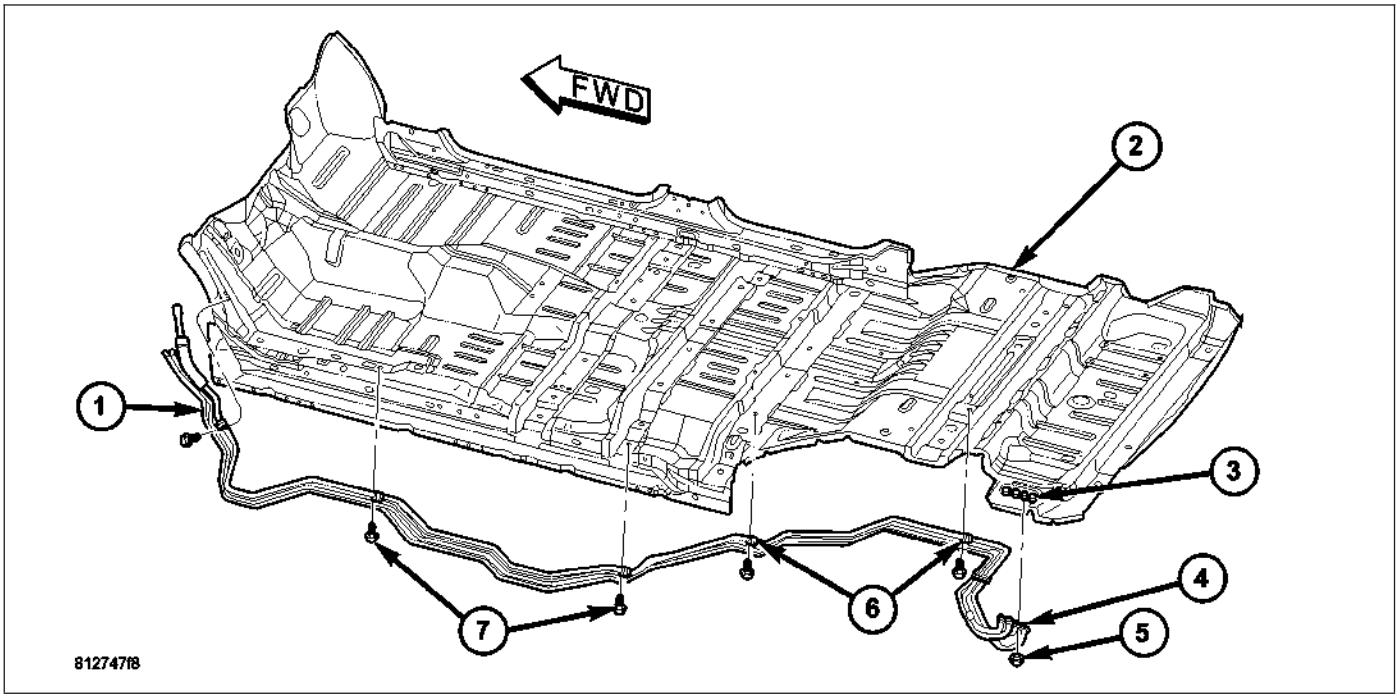
NOTE: The A/C suction line connects between the A/C evaporator and the A/C compressor. On models equipped with the rear heating-A/C system, the A/C suction line also includes an extension tube that connects the suction line to the underbody lines.



1. Install the A/C suction line (3) to the A/C compressor and the front A/C expansion valve (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT/LINE-A/C SUCTION - INSTALLATION).
2. Remove the tape or plugs from the refrigerant line coupler (6) and the underbody suction line.
3. Lubricate a new rubber O-ring seal with clean refrigerant oil and install it onto the refrigerant line coupler. Use only the specified O-ring as it is made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
4. Connect the underbody suction line to the suction line extension tube (5) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - REAR/COUPLER-REFRIGERANT LINE - INSTALLATION).
5. Install the secondary retaining clip (2) onto the refrigerant line coupler.
6. Reconnect the negative battery cable.
7. Evacuate the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE).
8. Charge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).

LINE-UNDERBODY

DESCRIPTION



Models equipped with the rear heating-A/C system use metal lines (1) attached to the vehicle underbody (2) to carry refrigerant and engine coolant to/and from the rear A/C evaporator and heater core. The underbody A/C lines are connected to the front suction and liquid lines by spring-lock type couplers and secondary retaining clips (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING -REAR/COUPLER-REFRIGERANT LINE - DESCRIPTION) and to the rear HVAC housing (3) by a tapping plate (4) and nut (5). The metal underbody heater lines have rubber hose ends that are connected to the front heater hoses and the rear HVAC housing by use of spring-clamp type heater hose clamps. The underbody lines are retained by plastic mounting brackets (6) and screws (7) and can be repaired (depending on the amount of damage) by using Miller Special Tool Kit 8456-A or equivalent (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - REAR/LINES-UNDERBODY - REMOVAL).

CAUTION: Use only O-ring seals specified for the vehicle. Failure to use the correct O-ring seal will cause the refrigerant system connections to leak.

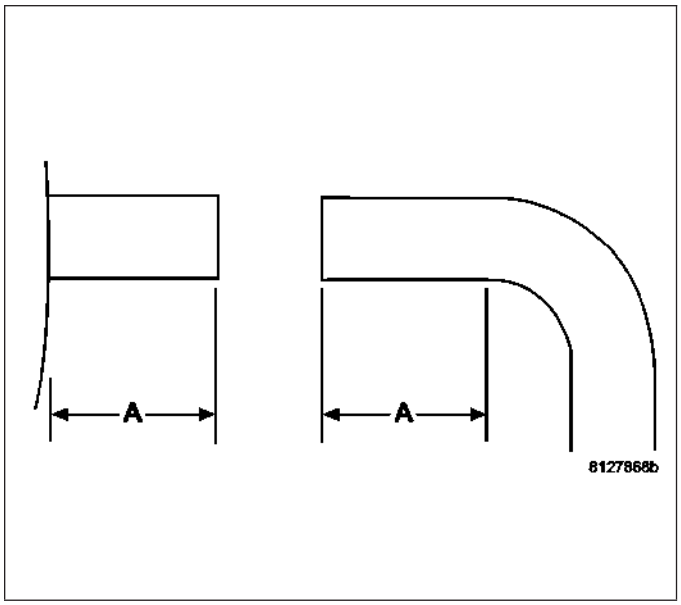
The underbody lines can only be removed by lifting the body off of the frame and have no serviceable parts except for the refrigerant line rubber O-ring seals and the mounting brackets. The O-ring seals used on the refrigerant line connections are made from a special type of rubber not affected by R-134a refrigerant. The O-ring seals must be replaced whenever the underbody refrigerant lines are disconnected or removed.

REMOVAL

UNDERBODY LINE REPAIR

WARNING: Refer to the applicable warnings and cautions for this system before performing the following operation (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - WARNINGS) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - CAUTIONS). Failure to follow the warnings and cautions could result in possible personal injury or death.

WARNING: This procedure is intended for underbody line repair only. Use of the connector fittings and Repair Kit 8456-A on any other type of vehicle tubing could cause tube failure resulting in possible personal injury or death.



1. If repairing an underbody refrigerant line, recover the refrigerant from the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY).
2. If repairing an underbody coolant line, drain the engine cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE - COOLING SYSTEM DRAIN).
3. Disconnect and isolate the negative battery cable.
4. Raise and support the vehicle.
5. Remove the underbody mounting brackets as necessary to gain access to the underbody line(s) needing repair (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - REAR/LINES-UNDERBODY - REMOVAL).
6. Mark the cut location(s) on the underbody line(s) needing repair. Check the Tube Length chart for the minimum amount of straight tube required (dimension A) for proper connector fitting installation.
7. Using a small pipe cutter or another suitable tool, carefully cut the underbody line(s) needing repair at the location(s) previously marked.

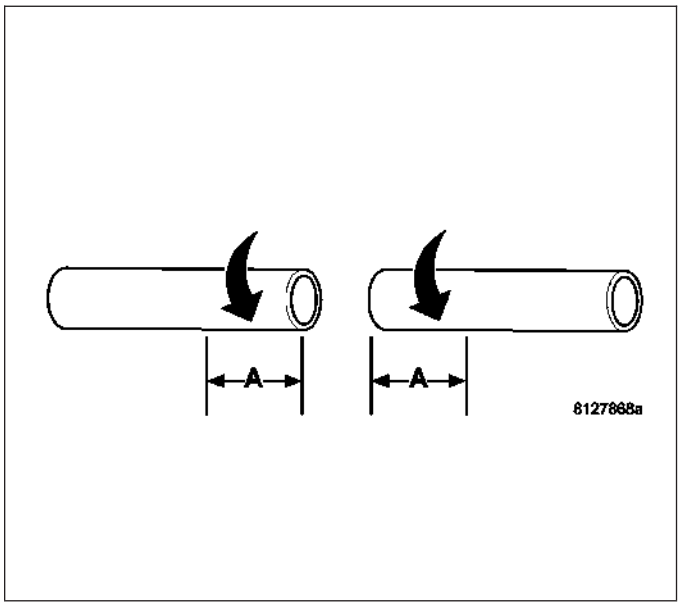
TUBE LENGTH

Tube Size	Minimum Tube Length Required	
	Dimension A Standard Installation	Dimension A Jaw Reversed Installation
3/8 in	28.5 mm (1 1/8 in)	19 - 28.5 mm (3/4 - 1 1/8 in)
1/2 in	28.5 mm (1 1/8 in)	19 - 28.5 mm (3/4 - 1 1/8 in)
5/8 in	31.7 mm (1 1/4 in)	22.2 - 31.7 mm (7/8 - 1 1/4 in)

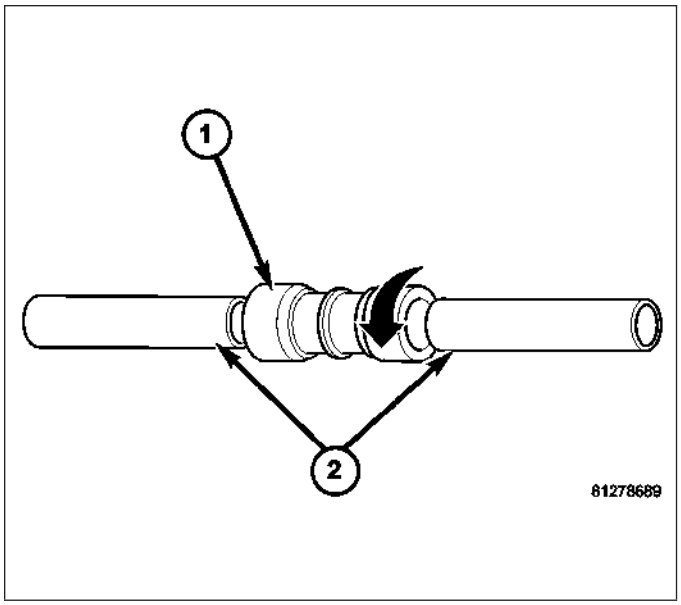
8. Size a replacement line, same size diameter and length as the portion of the line(s) removed.

NOTE: A minimum of 28.5 mm (3/4 in) of the line end must be cleaned in order for the connector fitting to properly seal the repair area.

9. Clean the ends of the line(s) a minimum of 28.5 mm (3/4 in) (dimension A) using the Scoth-Bright pad provided in special tool Kit 8456-A. Clean the line end(s) with a rotational motion around the line to avoid longitudinal scratches in the line.



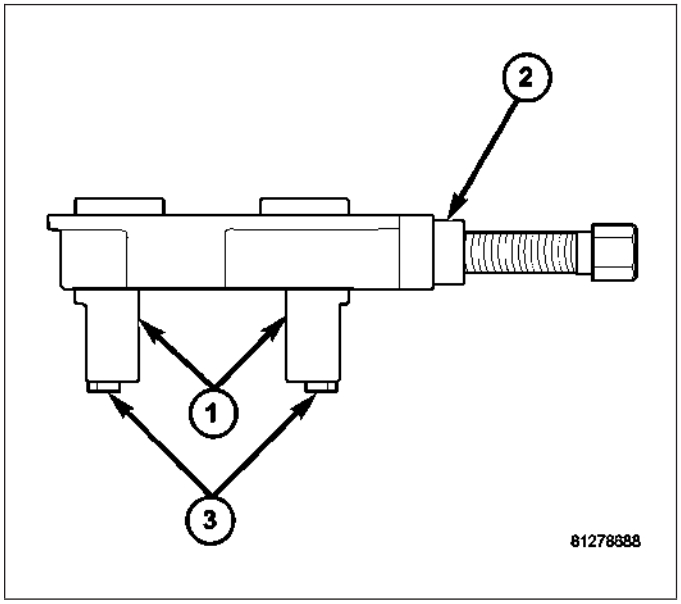
10. Select the proper connector fitting (1) for the size of the underbody line being repaired. Refer to the Connector Fitting chart.
11. Apply one drop of Lokprep sealing compound provided in special tool Kit 8456-A onto each line end (2).
12. Insert the line ends into the selected connector fitting and rotate the connector fitting a complete turn to evenly distribute the sealing compound.



CONNECTOR FITTING

Description	Mopar Part Number
3/8 in	5069 002AA
1/2 in	5069 003AA
5/8 in	5069 004AA

13. Select the proper size jaws (1) for the line being repaired from special tool Kit 8456-A. Refer to the Jaw Size chart.
14. Assemble the jaws into the tool body (Special Tool 8456-3 in Kit 8456-A) (2).
    a. For standard installation, install the jaws with the rubber gripping pads (3) facing outward. Refer to Tube Length chart.
    b. For reversed installation, remove the rubber gripping pads and install the jaws with the rubber gripping pad area facing inward. Refer to Tube Length chart.

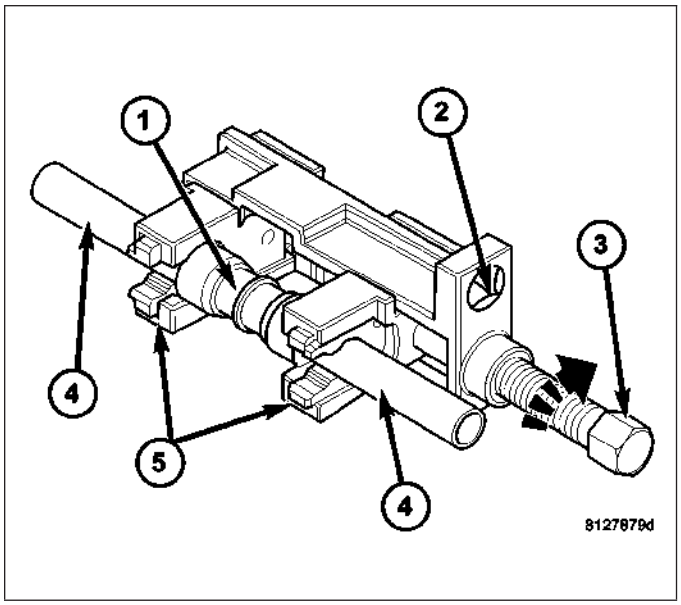


JAW SIZE

Description	Miller Part Number
3/8 in	8456-1
1/2 in	8456-4
5/8 in	8456-2

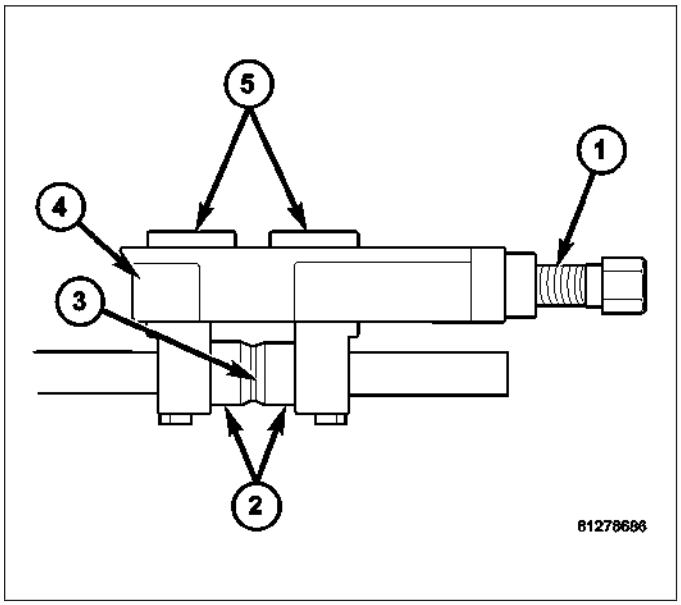
NOTE: The connector fitting ends must be positioned into the counterbore of the jaws in order for the connector fitting to properly seal the repair area.

15. Install the connector fitting (1) and the line ends (4) into the counterbore of the jaws (5).
16. Hold the tool body (Special Tool 8456-3 in Kit 8456-A) (2) with a 3/8 inch breaker bar and turn the forcing screw (3) clockwise.



NOTE: The lines must be kept fully inserted into the connector fitting to obtain a leak free joint.

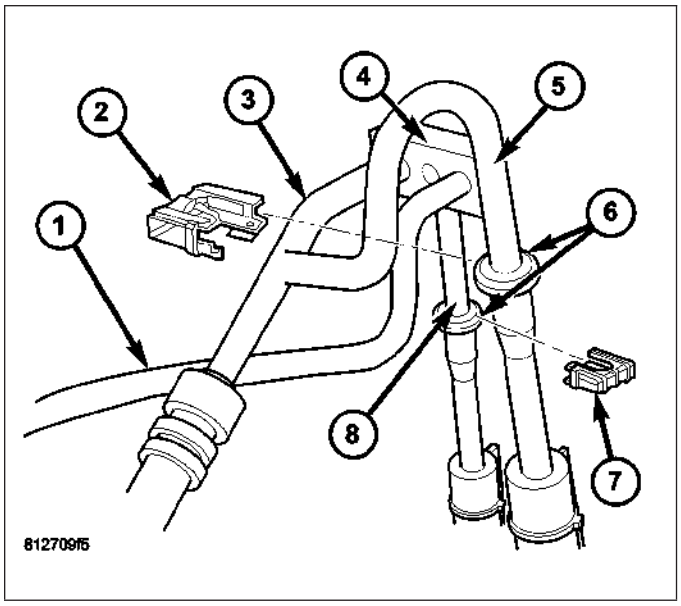
17. Turn the forcing screw (1) clockwise until both connector fitting collars (2) have bottomed out on the center shoulder of the connector (3).
18. Loosen the forcing screw and remove the tool body (Special Tool 8456-3 in Kit 8456-A) (4) and the jaws (5) from the repaired line(s).
19. Install the underbody mounting brackets as necessary (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - REAR/LINES-UNDERBODY - INSTALLATION).
20. Lower the vehicle.
21. Reconnect the negative battery cable.
22. If repairing an underbody coolant line, refill the engine cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE - COOLING SYSTEM REFILL).



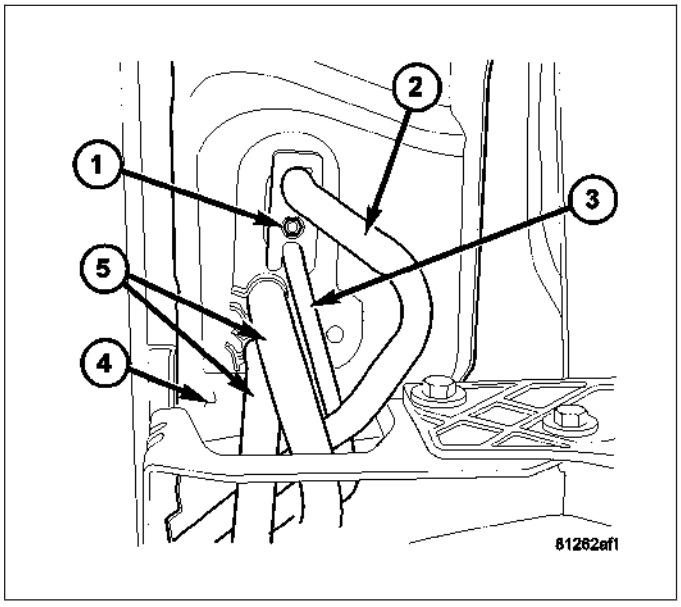
23. If repairing an underbody refrigerant line, evacuate and recharge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).

UNDERBODY LINE ASSEMBLY

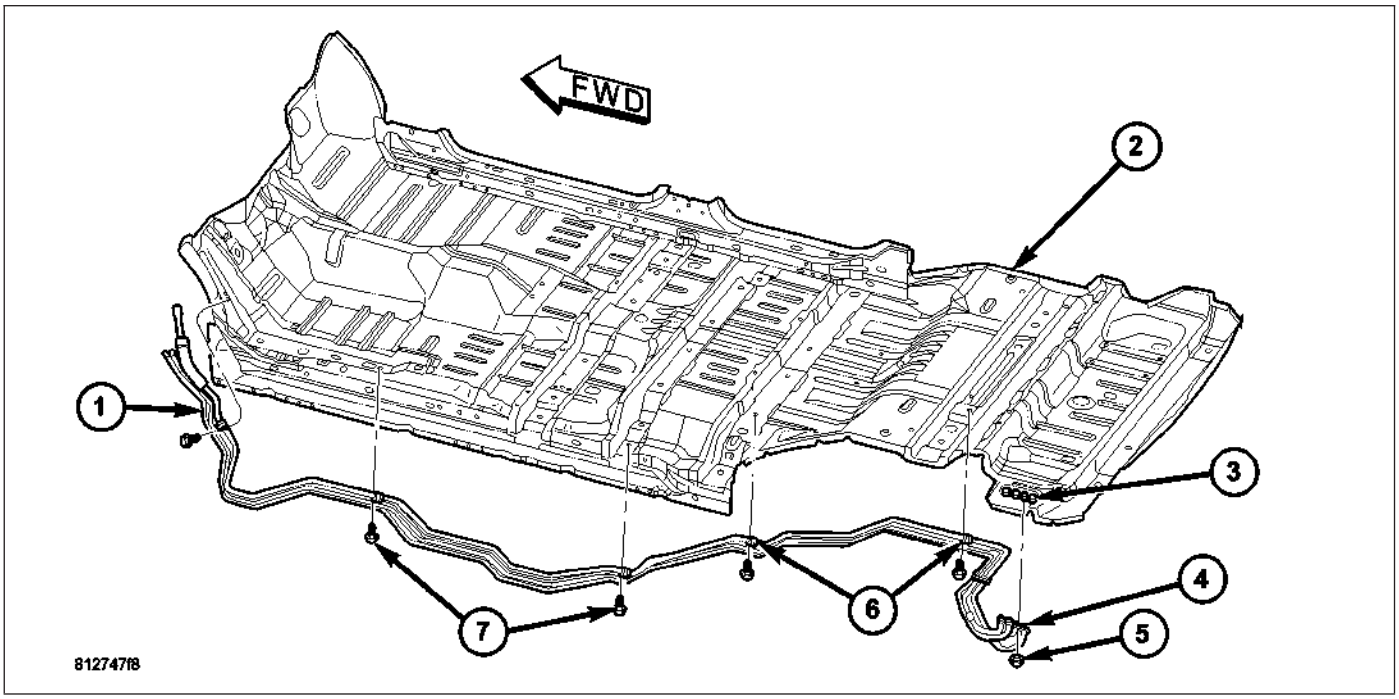
WARNING: Refer to the applicable warnings and cautions for this system before performing the following operation (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - WARNINGS) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - CAUTIONS). Failure to follow the warnings and cautions could result in possible personal injury or death.



1. Recover the refrigerant from the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY).
2. Drain the engine cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE - COOLING SYSTEM DRAIN).
3. Disconnect and isolate the negative battery cable.
4. Raise and support the vehicle.
5. Remove the right front wheelhouse splash shield (Refer to 23 - BODY/EXTERIOR/LF WHEELHOUSE SPLASH SHIELD - REMOVAL).
6. Remove the secondary retaining clips (2 and 7) from the refrigerant line couplers (6) located on the suction line extension tube (5) and the liquid line extension tube (8).
7. Disconnect the underbody liquid and suction lines from the liquid line extension tube and the suction line extension tube and remove and discard the O-ring seals (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING -REAR/COUPLER-REFRIGERANT LINE - REMOVAL).
8. Install plugs in, or tape over the refrigerant line couplers and the underbody refrigerant lines.
9. Disconnect the underbody heater hoses from the front heater hoses.

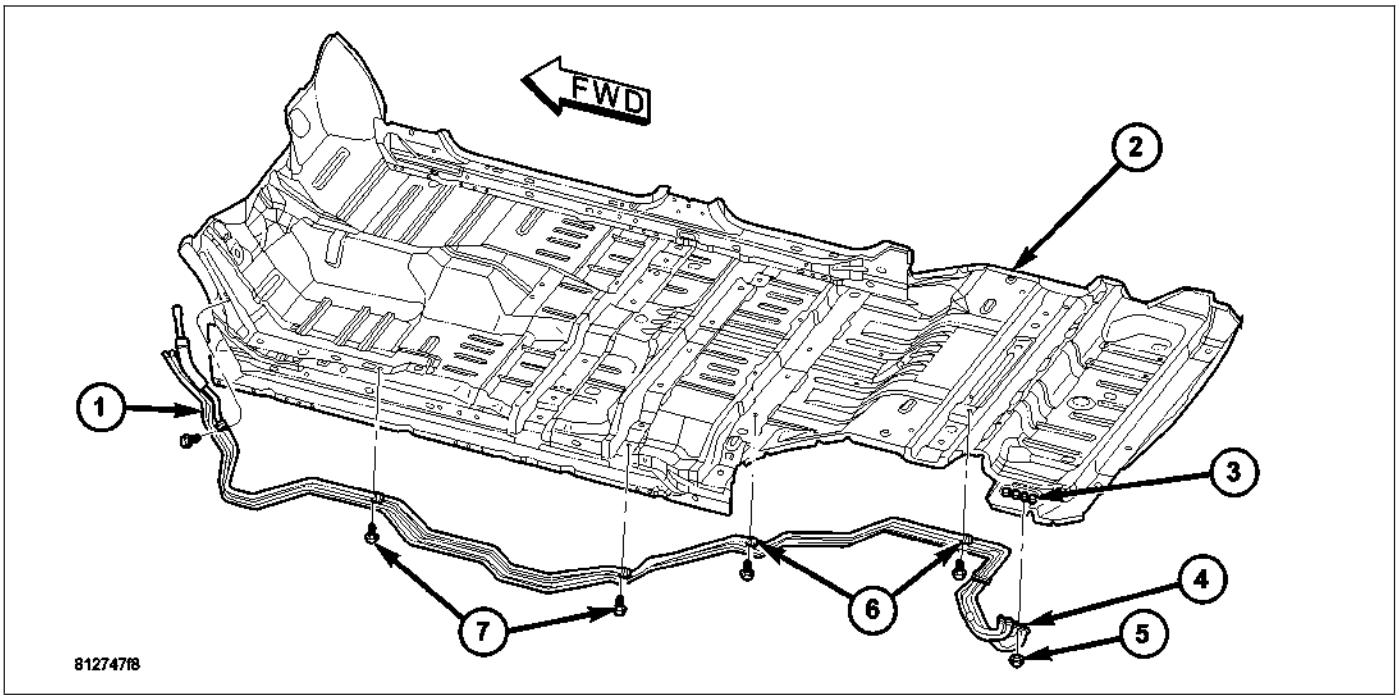


10. Remove the nut (1) that secures the rear suction line (2) and the rear liquid line (3) to the rear evaporator extension line tapping plate that extends through the rear floor panel (4) behind the right rear wheel housing.
11. Disconnect the rear suction line and liquid line from the rear evaporator extension line tapping plate and remove and discard the O-ring seals.
12. Install plugs in, or tape over the opened refrigerant lines and tapping plate ports.
13. Disconnect the rear heater hoses (5) from the rear heater core tubes that extend through the rear floor panel behind the right rear wheel housing.



14. Remove all body mount bolts on the passenger side of the vehicle and loosen the body mount bolts on the drivers side.
15. Place a jackstand at the front and rear of the vehicle on the passenger side so that the stands will safely support the body.
16. Remove the five screws (7) that secure the underbody lines (1) to the vehicle underbody (2).
17. Carefully lower the hoist until the right side of the body (supported by the stands) is approximately 76-101 mm (3-4 in.) above the frame. This will gain access to remove the underbody line assembly.
18. Remove the underbody line assembly from the underneath of the vehicle body.

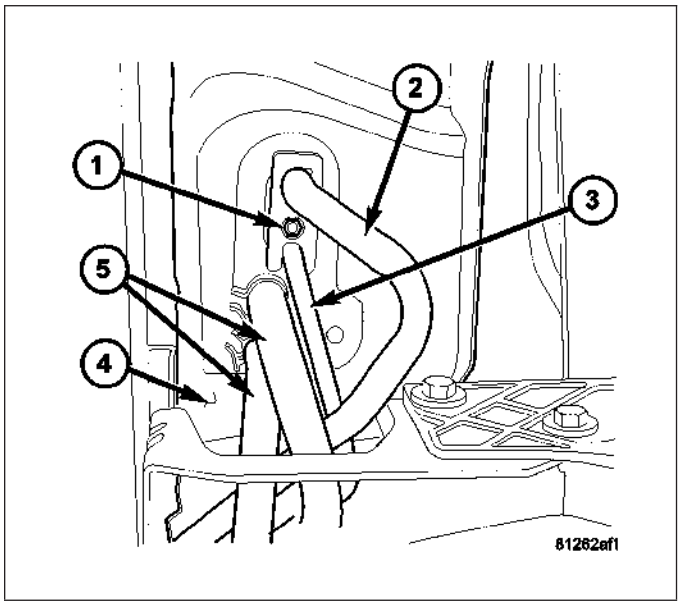
INSTALLATION



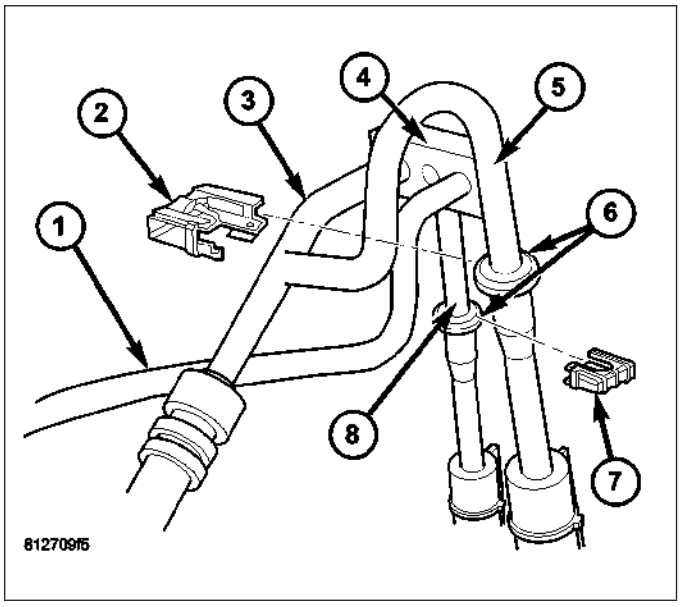
1. Position the underbody line assembly underneath the vehicle body.
2. Carefully raise the hoist until the frame and body mounts line up together.

3. Install the five screws that secure the underbody lines (1) to the vehicle underbody (2).
4. Install all body mount bolts to the passenger side of the vehicle. Tighten all passenger and driver side mount bolts securely.
5. Raise the hoist and remove the jack stands from under the vehicle.

6. Connect the rear heater hoses (5) to the rear heater core tubes that extend through the rear floor panel (4) behind the right rear wheel housing and install the heater hose clamps.
7. Remove the tape or plugs from fittings on the rear suction line (2) and the rear liquid line (3) and the rear evaporator extension line tapping plate ports.
8. Lubricate new rubber O-ring seals with clean refrigerant oil and install them onto the rear suction and liquid line fittings. Use only the specified O-rings as they are made of a special material for the R-134a refrigerant system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
9. Connect the rear suction and liquid line fittings to the rear evaporator extension line tapping plate.
10. Install the nut (1) that secures the rear suction and liquid lines to the rear evaporator extension line tapping plate. Tighten the nut to 23 N·m (17 ft. lbs.).



11. Connect the underbody heater hoses to the front heater hoses and install the heater hose clamps.
12. Remove the tape or plugs from the refrigerant line couplers (6) and the underbody refrigerant lines.
13. Lubricate a new rubber O-ring seal with clean refrigerant oil and install them onto the refrigerant line couplers. Use only the specified O-ring as it is made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
14. Connect the underbody liquid and suction lines to the liquid line extension tube (8) and the suction line extension tube (5) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/COUPLER-REFRIGERANT LINE - INSTALLATION).
15. Install the secondary retaining clips (2 and 7) onto the refrigerant line couplers.
16. Install passenger side tires (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).



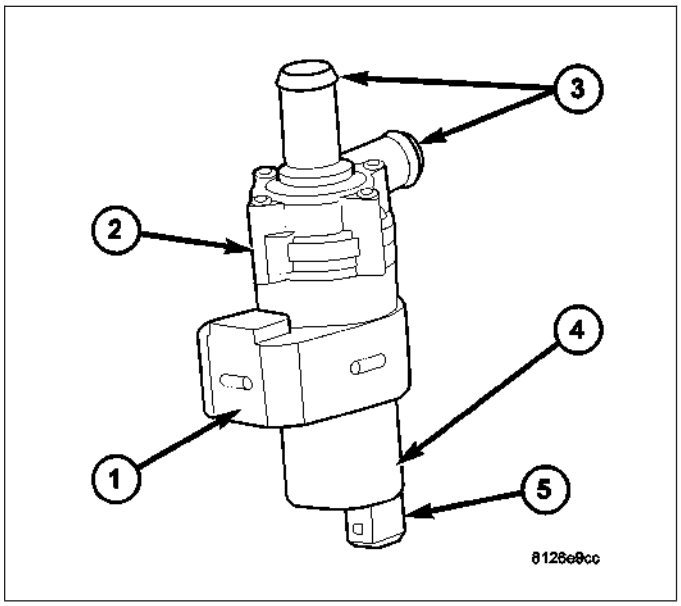
17. Install the right front wheelhouse splash shield (Refer to 23 - BODY/EXTERIOR/LF WHEELHOUSE SPLASH SHIELD - INSTALLATION).
18. Lower the vehicle.
19. Reconnect the negative battery cable.
20. Fill the engine cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE - COOLING SYSTEM FILL).
21. Evacuate the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE).

22. Charge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).

PUMP-WATER-AUXILIARY

DESCRIPTION

An electric auxiliary water pump is used on all models to aid in circulating the engine coolant through the front and rear heater core (depending on application). The auxiliary water pump is mounted to the right front frame rail by a rubber isolator (1) and consists of a molded plastic housing (2) with two heater hose connections (3), a 12 volt direct current (DC) motor and impeller assembly (4) with an integral wire connector receptacle (5).



OPERATION

The A/C-heater control operates the auxiliary water pump when all of the following conditions have been met.

- Vehicle speed below 48 km/h (30 mph)
- Coolant temperature between 10° C (50° F) and 110° C (230° F)
- Front blower motor turned On
- Rear temperature heat setting above the halfway setting (60% heat)
- No fault conditions detected

The A/C-heater control turns the auxiliary water pump Off when any of the following conditions occur.

- Vehicle speed above 48 km/h (30 mph)
- Coolant temperature above 110° C (230° F)
- Front blower motor turned Off

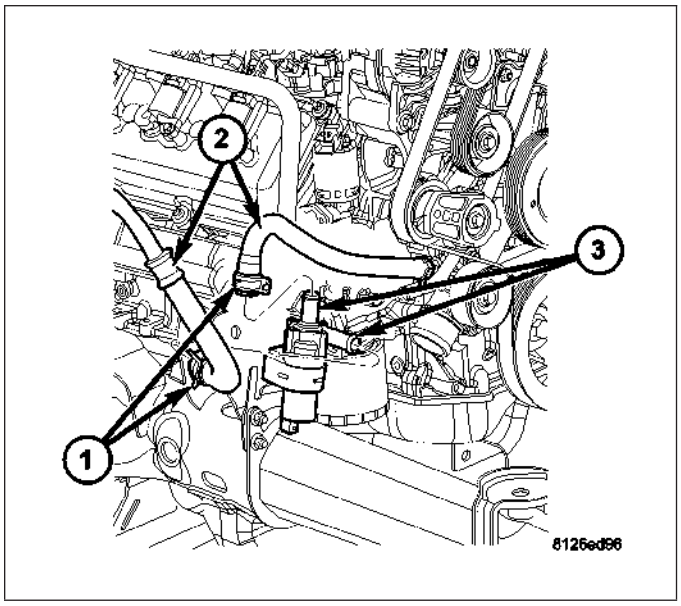
The auxiliary water pump cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

The auxiliary water pump is diagnosed using a scan tool. Refer to 24 - HVAC Electrical Diagnostics for more information.

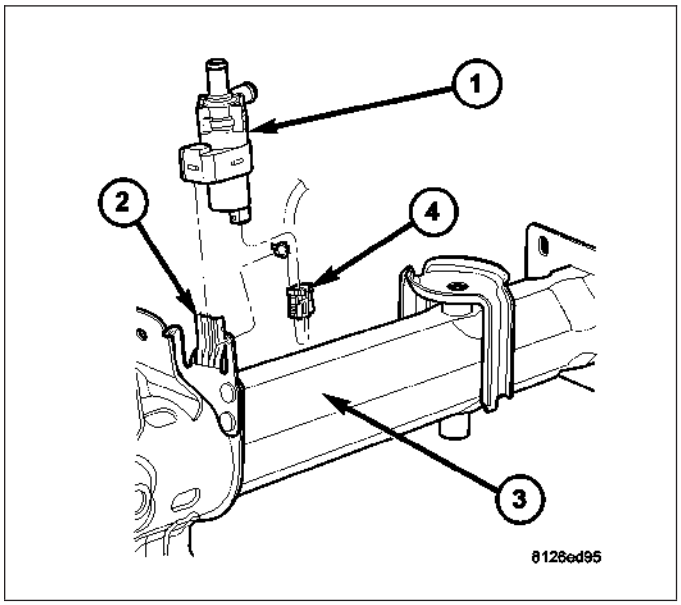
REMOVAL

CAUTION:
DO NOT apply excessive pressure on the auxiliary water pump tubes when removing the heater hoses. Excessive pressure may damage the tubes, causing an engine coolant leak.

1. Disconnect and isolate the negative battery cable.
2. Drain the engine cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE - COOLING SYSTEM DRAIN).
3. Remove the air cleaner housing from the right side of the engine compartment (Refer to 9 - ENGINE/ AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).
4. Using spring tension clamp pliers, compress and slide the hose clamps (1) off of the end of each heater hose.
5. Disconnect each heater hose (2) by carefully twisting the hose back and forth on the auxiliary water pump tube (3), while gently pulling it off of the tube.

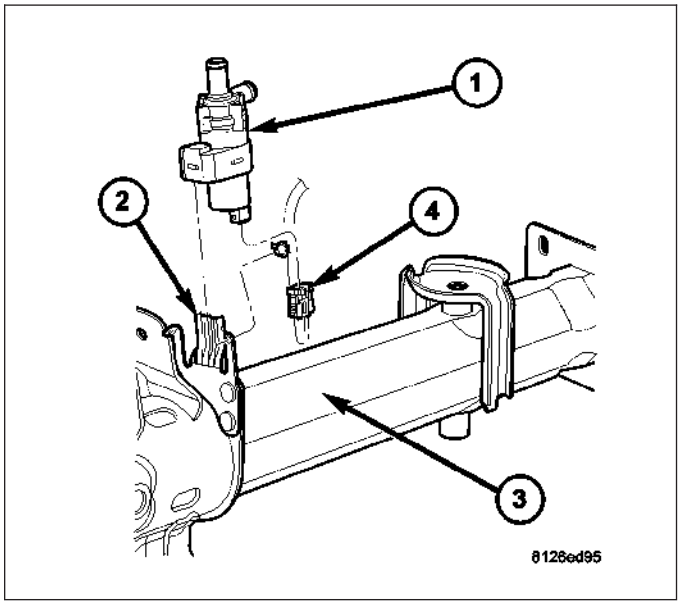


6. Remove the auxiliary water pump (1) from the mounting bracket (2) located on the right front frame rail (3).
7. Disconnect the wire harness connector (4) from the auxiliary water pump and remove the pump from the engine compartment.

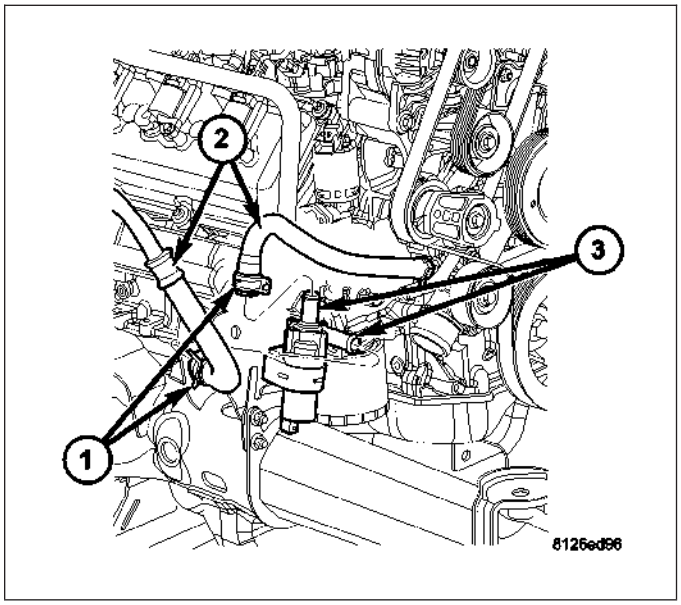


INSTALLATION

1. Position the auxiliary water pum (1) into the engine compartment and connect the wire harness connector (4) to the pump.
2. Install the auxiliary water pum onto the mounting bracket (2) located on the frame rail (3).



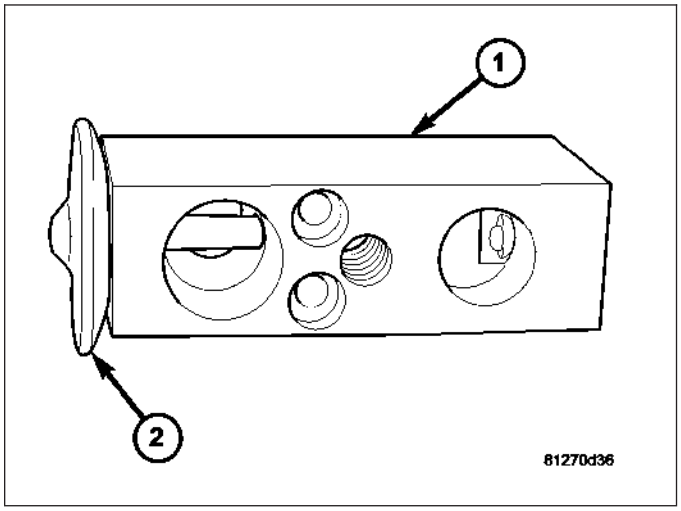
3. Using spring tension clamp pliers, compress and slide the hose clamp (1) away from the end of the heater hoses (2).
4. Install each heater hose by carefully twisting the hose back and forth onto the auxiliary water pump tubes (3), while gently pushing it onto the tube.
5. Using spring tension clamp pliers, compress and slide the hose clamps onto the end of the heater hoses.
6. Install the air cleaner housing to the right side of the engine compartment (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).
7. Refill the engine cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE - COOLING SYSTEM REFILL).
8. Reconnect the negative battery cable.



VALVE-A/C EXPANSION

DESCRIPTION

The rear A/C expansion valve is of a thermostatic expansion valve (TXV) design and controls the amount of refrigerant entering the rear A/C evaporator. The rear A/C expansion valve consists of an aluminum H-valve type body (1) with an integral thermal sensor (2) and is located on the rear HVAC housing between the rear evaporator extension tubes and the rear evaporator.



OPERATION

The rear A/C expansion valve controls the high-pressure, low temperature liquid refrigerant from the rear liquid line and converts it into a low-pressure, low-temperature mixture of liquid and gas before it enters the rear A/C evaporator. A mechanical sensor in the rear A/C expansion valve monitors the temperature and pressure of the refrigerant leaving the rear A/C evaporator through the rear suction line, and adjusts the orifice size at the rear liquid line port to let the proper amount of refrigerant into the rear A/C evaporator to meet the vehicle A/C cooling requirements. Controlling the refrigerant flow through the rear A/C evaporator ensures that none of the refrigerant leaving the rear A/C evaporator is still in a liquid state, which could damage the A/C compressor.

The rear A/C expansion valve is factory calibrated and cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

DIAGNOSIS AND TESTING

A/C EXPANSION VALVE - REAR

WARNING: Refer to the applicable warnings and cautions for this system before performing the following operation (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - WARNINGS) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - CAUTIONS). Failure to follow the warnings and cautions could result in possible personal injury.

NOTE: The rear A/C expansion valve should only be tested following testing of the A/C compressor.

NOTE: Liquid CO^2 is required to test the rear A/C expansion valve. This material is available from most welding supply facilities. Liquid CO^2 is also available from companies which service and sell fire extinguishers.

When testing the rear A/C expansion valve, the work area and the vehicle temperature must be 21° to 27° C (70° to 85° F). To test the expansion valve:

1. Connect a charging station or manifold gauge set to the refrigerant system service ports. Verify the refrigerant charge level.
2. Close all doors, windows and vents to the passenger compartment.
3. Set the A/C-heater controls for the rear heating-A/C system so that the A/C compressor is operating, the rear temperature control is in the highest temperature position, and the blower motor is operating at the highest speed.

4. Start the engine and allow it to idle. After the engine has reached normal operating temperature, allow the passenger compartment to heat up. This will create the need for maximum refrigerant flow into the rear A/C evaporator.
5. If the refrigerant charge is sufficient, the discharge (high pressure) gauge should read 827 kPa to 1655 kPa (120 psi to 240 psi). The suction (low pressure) gauge should read 207 kPa to 345 kPa (30 psi to 50 psi). If OK, go to Step 6. If not OK, replace the faulty rear A/C expansion valve.

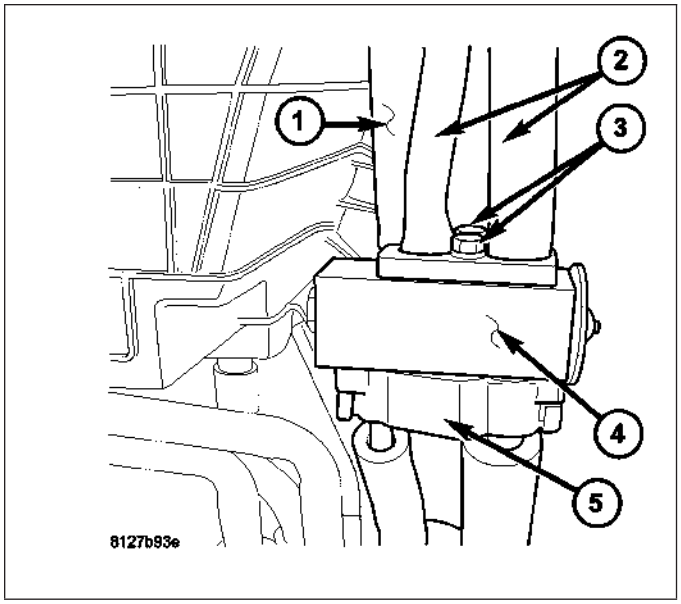
WARNING:
Protect the skin and eyes from exposure to liquid CO^2 or personal injury can result.

6. If the suction (low pressure) gauge reads within the specified range, freeze the rear A/C expansion valve for 30 seconds using liquid CO^2 or another suitable super-cold material.**Do not spray R-134a or R-12 refrigerant on the rear A/C expansion valve for this test.** The suction (low pressure) gauge reading should drop by 69 kPa (10 psi). If OK, go to Step 7 If not OK, replace the faulty rear A/C expansion valve.
7. Allow the rear expansion valve control head to thaw. The suction (low pressure) gauge reading should stabilize at 207 kPa to 345 kPa (30 psi to 50 psi). If not OK, replace the faulty rear A/C expansion valve.
8. When expansion valve testing is complete, test the overall A/C system performance (Refer to 24 - HEATING & AIR CONDITIONING - DIAGNOSIS AND TESTING - A/C PERFORMANCE TEST).

REMOVAL

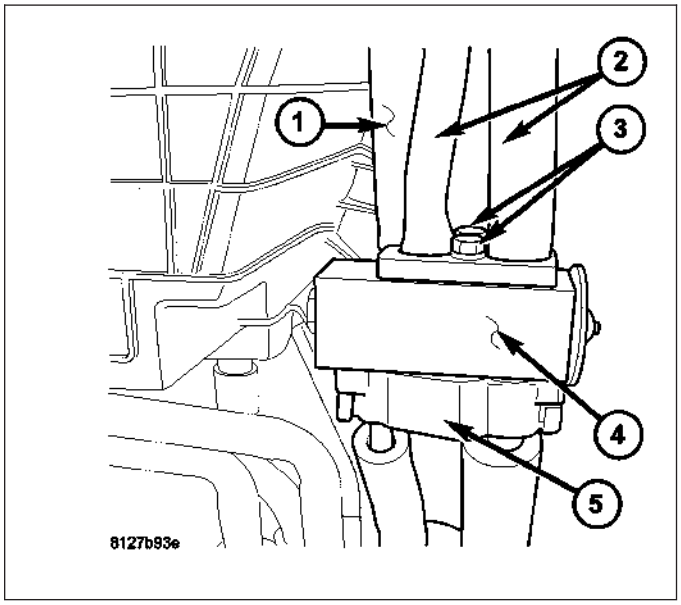
WARNING: Refer to the applicable warnings and cautions for this system before performing the following operation (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - WARNINGS) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - CAUTIONS). Failure to follow the warnings and cautions could result in possible personal injury or death.

1. Recover the refrigerant from the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY).
2. Remove right rear quarter panel trim (Refer to 23 - BODY/INTERIOR/QUARTER PANEL TRIM - REMOVAL).
3. Remove the insulator (1) from around the rear A/C evaporator tubes (2) to gain access the two rear A/C expansion valve bolts (3).
4. Remove the two bolts that secure the rear A/C expansion valve (4) between the rear A/C evaporator tubes and the rear evaporator extension tube tapping block (5).
5. Remove the rear A/C expansion valve from between the rear A/C evaporator tubes and the rear evaporator extension tube tapping block and remove and discard the O-ring seals.



6. Install plugs in, or tape over the opened evaporator tubes and extension tube fittings and all rear expansion valve ports.

INSTALLATION



1. Remove the tape or plugs from the opened evaporator tube and extension tube fittings and all rear expansion valve ports.
2. Lubricate new rubber O-ring seals with clean refrigerant oil and install them on the evaporator tube and extension tube fittings. Use only the specified O-rings as they are made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
3. Install the rear A/C expansion valve (4) between the rear A/C evaporator tubes (2) and the rear extension tube tapping block (5).
4. Install the two bolts (3) that secure the rear A/C expansion valve between the rear A/C evaporator tubes and the rear extension tube tapping block. Tighten the bolts to 11 N·m (97 in. lbs.).
5. Install a new insulator (1) around the rear A/C evaporator tubes.
6. Install the right rear quarter panel trim (Refer to 23 - BODY/INTERIOR/QUARTER PANEL TRIM - INSTALLATION).
7. Evacuate the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE).
8. Charge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).

EMISSIONS

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EMISSIONS

DESCRIPTION

STATE DISPLAY TEST MODE

The switch inputs to the Powertrain Control Module (PCM) have two recognized states; HIGH and LOW. For this reason, the PCM cannot recognize the difference between a selected switch position versus an open circuit, a short circuit, or a defective switch. If the State Display screen shows the change from HIGH to LOW or LOW to HIGH, assume the entire switch circuit to the PCM functions properly. Connect the DRB scan tool to the data link connector and access the state display screen. Then access either State Display Inputs and Outputs or State Display Sensors.

CIRCUIT ACTUATION TEST MODE

The Circuit Actuation Test Mode checks for proper operation of output circuits or devices the Powertrain Control Module (PCM) may not internally recognize. The PCM attempts to activate these outputs and allow an observer to verify proper operation. Most of the tests provide an audible or visual indication of device operation (click of relay contacts, fuel spray, etc.). Except for intermittent conditions, if a device functions properly during testing, assume the device, its associated wiring, and driver circuit work correctly. Connect a scan tool to the data link connector and access the Actuators screen.

DIAGNOSTIC TROUBLE CODES

A Diagnostic Trouble Code (DTC) indicates the PCM has recognized an abnormal condition in the system.

Remember that DTC's are the results of a system or circuit failure, but do not directly identify the failed component or components.

BULB CHECK

Each time the ignition key is turned to the ON position, the malfunction indicator (check engine) lamp on the instrument panel should illuminate for approximately 2 seconds then go out. This is done for a bulb check.

OBTAINING DTC'S USING A SCAN TOOL

1. Obtain the applicable Powertrain Diagnostic Manual.
2. Obtain a scan tool.
3. Connect the scan tool to the data link (diagnostic) connector. This connector is located in the passenger compartment; at the lower edge of instrument panel; near the steering column.

4. Turn the ignition switch on and access the “Read Fault” screen.
5. Record all the DTC’s and “freeze frame” information shown on the scan tool.
6. To erase DTC’s, use the “Erase Trouble Code” data screen on the scan tool. **Do not erase any DTC’s until problems have been investigated and repairs have been performed.**

TASK MANAGER

The PCM is responsible for efficiently coordinating the operation of all the emissions-related components. The PCM is also responsible for determining if the diagnostic systems are operating properly. The software designed to carry out these responsibilities is call the ’Task Manager’.

TRIP DEFINITION

The term “Trip” has different meanings depending on what the circumstances are. If the MIL (Malfunction Indicator Lamp) is OFF, a Trip is defined as when the Oxygen Sensor Monitor and the Catalyst Monitor have been completed in the same drive cycle.

When any Emission DTC is set, the MIL on the dash is turned ON. When the MIL is ON, it takes 3 good trips to turn the MIL OFF. In this case, it depends on what type of DTC is set to know what a “Trip” is.

For the Fuel Monitor or Mis-Fire Monitor (continuous monitor), the vehicle must be operated in the “Similar Condition Window” for a specified amount of time to be considered a Good Trip.

If a Non-Contiuous OBDII Monitor fails twice in a row and turns ON the MIL, re-running that monitor which previously failed, on the next start-up and passing the monitor, is considered to be a Good Trip. These will include the following:

- Oxygen Sensor
- Catalyst Monitor
- Purge Flow Monitor
- Leak Detection Pump Monitor (if equipped)
- EGR Monitor (if equipped)
- Oxygen Sensor Heater Monitor

If any other Emission DTC is set (not an OBDII Monitor), a Good Trip is considered to be when the Oxygen Sensor Monitor and Catalyst Monitor have been completed; or 2 Minutes of engine run time if the Oxygen Sensor Monitor or Catalyst Monitor have been stopped from running.

It can take up to 2 Failures in a row to turn on the MIL. After the MIL is ON, it takes 3 Good Trips to turn the MIL OFF. After the MIL is OFF, the PCM will self-erase the DTC after 40 Warm-up cycles. A Warm-up cycle is counted when the ECT (Engine Coolant Temperature Sensor) has crossed 160°F and has risen by at least 40°F since the engine has been started.

COMPONENT MONITORS

There are several components that will affect vehicle emissions if they malfunction. If one of these components malfunctions the Malfunction Indicator Lamp (MIL) will illuminate.

Some of the component monitors are checking for proper operation of the part. Electrically operated components now have input (rationality) and output (functionality) checks. Previously, a component like the Throttle Position sensor (TPS) was checked by the PCM for an open or shorted circuit. If one of these conditions occurred, a DTC was set. Now there is a check to ensure that the component is working. This is done by watching for a TPS indication of a greater or lesser throttle opening than MAP and engine rpm indicate. In the case of the TPS, if engine vacuum is high and engine rpm is 1600 or greater, and the TPS indicates a large throttle opening, a DTC will be set. The same applies to low vacuum if the TPS indicates a small throttle opening.

All open/short circuit checks, or any component that has an associated limp-in, will set a fault after 1 trip with the malfunction present. Components without an associated limp-in will take two trips to illuminate the MIL.

OPERATION

TASK MANAGER

The Task Manager determines which tests happen when and which functions occur when. Many of the diagnostic steps required by OBD II must be performed under specific operating conditions. The Task Manager software organizes and prioritizes the diagnostic procedures. The job of the Task Manager is to determine if conditions are appropriate for tests to be run, monitor the parameters for a trip for each test, and record the results of the test. Following are the responsibilities of the Task Manager software:

- Test Sequence
- MIL Illumination
- Diagnostic Trouble Codes (DTCs)
- Trip Indicator
- Freeze Frame Data Storage
- Similar Conditions Window

Test Sequence

In many instances, emissions systems must fail diagnostic tests more than once before the PCM illuminates the MIL. These tests are know as 'two trip monitors.' Other tests that turn the MIL lamp on after a single failure are known as 'one trip monitors.' A trip is defined as 'start the vehicle and operate it to meet the criteria necessary to run the given monitor.'

Many of the diagnostic tests must be performed under certain operating conditions. However, there are times when tests cannot be run because another test is in progress (conflict), another test has failed (pending) or the Task Manager has set a fault that may cause a failure of the test (suspend).

- Pending
  Under some situations the Task Manager will not run a monitor if the MIL is illuminated and a fault is stored from another monitor. In these situations, the Task Manager postpones monitors **pending** resolution of the original fault. The Task Manager does not run the test until the problem is remedied.
  For example, when the MIL is illuminated for an Oxygen Sensor fault, the Task Manager does not run the Catalyst Monitor until the Oxygen Sensor fault is remedied. Since the Catalyst Monitor is based on signals from the Oxygen Sensor, running the test would produce inaccurate results.
- Conflict
  There are situations when the Task Manager does not run a test if another monitor is in progress. In these situations, the effects of another monitor running could result in an erroneous failure. If this **conflict** is present, the monitor is not run until the conflicting condition passes. Most likely the monitor will run later after the conflicting monitor has passed.
  For example, if the Fuel System Monitor is in progress, the Task Manager does not run the EGR Monitor. Since both tests monitor changes in air/fuel ratio and adaptive fuel compensation, the monitors will conflict with each other.
- Suspend
  Occasionally the Task Manager may not allow a two trip fault to mature. The Task Manager will **suspend** the maturing of a fault if a condition exists that may induce an erroneous failure. This prevents illuminating the MIL for the wrong fault and allows more precis diagnosis.
  For example, if the PCM is storing a one trip fault for the Oxygen Sensor and the EGR monitor, the Task Manager may still run the EGR Monitor but will suspend the results until the Oxygen Sensor Monitor either passes or fails. At that point the Task Manager can determine if the EGR system is actually failing or if an Oxygen Sensor is failing.

MIL Illumination

The PCM Task Manager carries out the illumination of the MIL. The Task Manager triggers MIL illumination upon test failure, depending on monitor failure criteria.

The Task Manager Screen shows both a Requested MIL state and an Actual MIL state. When the MIL is illuminated upon completion of a test for a third trip, the Requested MIL state changes to OFF. However, the MIL remains illuminated until the next key cycle. (On some vehicles, the MIL will actually turn OFF during the third key cycle) During the key cycle for the third good trip, the Requested MIL state is OFF, while the Actual MILL state is ON. After the next key cycle, the MIL is not illuminated and both MIL states read OFF.

Diagnostic Trouble Codes (DTCs)

With OBD II, different DTC faults have different priorities according to regulations. As a result, the priorities determine MIL illumination and DTC erasure. DTCs are entered according to individual priority. DTCs with a higher priority overwrite lower priority DTCs.

Priorities

- Priority 0 —Non-emissions related trouble codes
- Priority 1 — One trip failure of a two trip fault for non-fuel system and non-misfire.
- Priority 2 — One trip failure of a two trip fault for fuel system (rich/lean) or misfire.
- Priority 3 — Two trip failure for a non-fuel system and non-misfire or matured one trip comprehensive component fault.
- Priority 4 — Two trip failure or matured fault for fuel system (rich/lean) and misfire or one trip catalyst damaging misfire.

Non-emissions related failures have no priority. One trip failures of two trip faults have low priority. Two trip failures or matured faults have higher priority. One and two trip failures of fuel system and misfire monitor take precedence over non-fuel system and non-misfire failures.

DTC Self Erasure

With one trip components or systems, the MIL is illuminated upon test failure and DTCs are stored.

Two trip monitors are components requiring failure in two consecutive trips for MIL illumination. Upon failure of the first test, the Task Manager enters a maturing code. If the component fails the test for a second time the code matures and a DTC is set.

After three good trips the MIL is extinguished and the Task Manager automatically switches the trip counter to a warm-up cycle counter. DTCs are automatically erased following 40 warm-up cycles if the component does not fail again.

For misfire and fuel system monitors, the component must pass the test under a Similar Conditions Window in order to record a good trip. A Similar Conditions Window is when engine RPM is within ±375 RPM and load is within ±10% of when the fault occurred.

Note: It is important to understand that a component does not have to fail under a similar window of operation to mature. It must pass the test under a Similar Conditions Window when it failed to record a Good Trip for DTC erasure for misfire and fuel system monitors.

DTCs can be erased anytime with a diagnostic scan tool. Erasing the DTC with the scan tool erases all OBD II information. The scan tool automatically displays a warning that erasing the DTC will also erase all OBD II monitor data. This includes all counter information for warm-up cycles, trips and Freeze Frame.

Trip Indicator

The **Trip** is essential for running monitors and extinguishing the MIL. In OBD II terms, a trip is a set of vehicle operating conditions that must be met for a specific monitor to run. All trips begin with a key cycle.

Good Trip

The Good Trip counters are as follows:

- Specific Good Trip
- Fuel System Good Trip
- Misfire Good Trip
- Alternate Good Trip (appears as a Global Good Trip on a scan tool)
  - Comprehensive Components

- Major Monitor
- Warm-Up Cycles

Specific Good Trip

The term Good Trip has different meanings depending on the circumstances:

- If the MIL is OFF, a trip is defined as when the Oxygen Sensor Monitor and the Catalyst Monitor have been completed in the same drive cycle.
- If the MIL is ON and a DTC was set by the Fuel Monitor or Misfire Monitor (both continuous monitors), the vehicle must be operated in the Similar Condition Window for a specified amount of time.
- If the MIL is ON and a DTC was set by a Task Manager commanded once-per-trip monitor (such as the Oxygen Sensor Monitor, Catalyst Monitor, Purge Flow Monitor, Leak Detection Pump Monitor, EGR Monitor or Oxygen Sensor Heater Monitor), a good trip is when the monitor is passed on the next start-up.
- If the MIL is ON and any other emissions DTC was set (not an OBD II monitor), a good trip occurs when the Oxygen Sensor Monitor and Catalyst Monitor have been completed, or two minutes of engine run time if the Oxygen Sensor Monitor and Catalyst Monitor have been stopped from running.

Fuel System Good Trip

To count a good trip (three required) and turn off the MIL, the following conditions must occur:

- Engine in closed loop
- Operating in Similar Conditions Window
- Short Term multiplied by Long Term less than threshold
- Less than threshold for a predetermined time

If all of the previous criteria are met, the PCM will count a good trip (three required) and turn off the MIL.

Misfire Good Trip

If the following conditions are met the PCM will count one good trip (three required) in order to turn off the MIL:

- Operating in Similar Condition Window
- 1000 engine revolutions with no misfire

Warm-Up Cycles

Once the MIL has been extinguished by the Good Trip Counter, the PCM automatically switches to a Warm-Up Cycle Counter that can be viewed on the DRB III. Warm-Up Cycles are used to erase DTCs and Freeze Frames. Forty Warm-Up cycles must occur in order for the PCM to self-erase a DTC and Freeze Frame. A Warm-Up Cycle is defined as follows:

- Engine coolant temperature must start below and rise above 160° F
- Engine coolant temperature must rise by 40° F
- No further faults occur

Freeze Frame Data Storage

Once a failure occurs, the Task Manager records several engine operating conditions and stores it in a Freeze Frame. The Freeze Frame is considered one frame of information taken by an on-board data recorder. When a fault occurs, the PCM stores the input data from various sensors so that technicians can determine under what vehicle operating conditions the failure occurred.

The data stored in Freeze Frame is usually recorded when a system fails the first time for two trip faults. Freeze Frame data will only be overwritten by a different fault with a higher priority.

CAUTION: Erasing DTCs, either with a scan tool or by disconnecting the battery, also clears all Freeze Frame data.

Similar Conditions Window

The Similar Conditions Window displays information about engine operation during a monitor. Absolute MAP (engine load) and Engine RPM are stored in this window when a failure occurs. There are two different Similar conditions Windows: Fuel System and Misfire.

FUEL SYSTEM

- **Fuel System Similar Conditions Window** — An indicator that 'Absolute MAP When Fuel Sys Fail' and 'RPM When Fuel Sys Failed' are all in the same range when the failure occurred. Indicated by switching from 'NO' to 'YES'.
- **Absolute MAP When Fuel Sys Fail** — The stored MAP reading at the time of failure. Informs the user at what engine load the failure occurred.
- **Absolute MAP** — A live reading of engine load to aid the user in accessing the Similar Conditions Window.
- **RPM When Fuel Sys Fail** — The stored RPM reading at the time of failure. Informs the user at what engine RPM the failure occurred.
- **Engine RPM** — A live reading of engine RPM to aid the user in accessing the Similar Conditions Window.
- **Adaptive Memory Factor** — The PCM utilizes both Short Term Compensation and Long Term Adaptive to calculate the Adaptive Memory Factor for total fuel correction.
- **Upstream O2S Volts** — A live reading of the Oxygen Sensor to indicate its performance. For example, stuck lean, stuck rich, etc.
- **SCW Time in Window (Similar Conditions Window Time in Window)** — A timer used by the PCM that indicates that, after all Similar Conditions have been met, if there has been enough good engine running time in the SCW without failure detected. This timer is used to increment a Good Trip.
- **Fuel System Good Trip Counter** — A Trip Counter used to turn OFF the MIL for Fuel System DTCs. To increment a Fuel System Good Trip, the engine must be in the Similar Conditions Window, Adaptive Memory Factor must be less than calibrated threshold and the Adaptive Memory Factor must stay below that threshold for a calibrated amount of time.
- **Test Done This Trip** — Indicates that the monitor has already been run and completed during the current trip.

MISFIRE

- **Same Misfire Warm-Up State** — Indicates if the misfire occurred when the engine was warmed up (above 160° F).
- **In Similar Misfire Window** — An indicator that 'Absolute MAP When Misfire Occurred' and 'RPM When Misfire Occurred' are all in the same range when the failure occurred. Indicated by switching from 'NO' to 'YES'.
- **Absolute MAP When Misfire Occurred** — The stored MAP reading at the time of failure. Informs the user at what engine load the failure occurred.
- **Absolute MAP** — A live reading of engine load to aid the user in accessing the Similar Conditions Window.
- **RPM When Misfire Occurred** — The stored RPM reading at the time of failure. Informs the user at what engine RPM the failure occurred.
- **Engine RPM** — A live reading of engine RPM to aid the user in accessing the Similar Conditions Window.
- **Adaptive Memory Factor** — The PCM utilizes both Short Term Compensation and Long Term Adaptive to calculate the Adaptive Memory Factor for total fuel correction.
- **200 Rev Counter** — Counts 0–100 720 degree cycles.
- **SCW Cat 200 Rev Counter** — Counts when in similar conditions.
- **SCW FTP 1000 Rev Counter** — Counts 0–4 when in similar conditions.
- **Misfire Good Trip Counter** — Counts up to three to turn OFF the MIL.
- **Misfire Data**— Data collected during test.
- **Test Done This Trip**— Indicates YES when the test is done.

NON-MONITORED CIRCUITS

The PCM does not monitor the following circuits, systems and conditions that could have malfunctions causing driveability problems. The PCM might not store diagnostic trouble codes for these conditions. However, problems with these systems may cause the PCM to store diagnostic trouble codes for other systems or components. **EXAMPLE:** a fuel pressure problem will not register a fault directly, but could cause a rich/lean condition or misfire. This could cause the PCM to store an oxygen sensor or misfire diagnostic trouble code

FUEL PRESSURE

The fuel pressure regulator controls fuel system pressure. The PCM cannot detect a clogged fuel pump inlet filter, clogged in-line fuel filter, or a pinched fuel supply or return line. However, these could result in a rich or lean condition causing the PCM to store an oxygen sensor or fuel system diagnostic trouble code.

SECONDARY IGNITION CIRCUIT

The PCM cannot detect an inoperative ignition coil, fouled or worn spark plugs, ignition cross firing, or open spark plug cables.

CYLINDER COMPRESSION

The PCM cannot detect uneven, low, or high engine cylinder compression.

EXHAUST SYSTEM

The PCM cannot detect a plugged, restricted or leaking exhaust system, although it may set a fuel system fault.

FUEL INJECTOR MECHANICAL MALFUNCTIONS

The PCM cannot determine if a fuel injector is clogged, the needle is sticking or if the wrong injector is installed. However, these could result in a rich or lean condition causing the PCM to store a diagnostic trouble code for either misfire, an oxygen sensor, or the fuel system.

EXCESSIVE OIL CONSUMPTION

Although the PCM monitors engine exhaust oxygen content when the system is in closed loop, it cannot determine excessive oil consumption.

THROTTLE BODY AIR FLOW

The PCM cannot detect a clogged or restricted air cleaner inlet or filter element.

VACUUM ASSIST

The PCM cannot detect leaks or restrictions in the vacuum circuits of vacuum assisted engine control system devices. However, these could cause the PCM to store a MAP sensor diagnostic trouble code and cause a high idle condition.

PCM SYSTEM GROUND

The PCM cannot determine a poor system ground. However, one or more diagnostic trouble codes may be generated as a result of this condition. The module should be mounted to the body at all times, also during diagnostic.

PCM CONNECTOR ENGAGEMENT

The PCM may not be able to determine spread or damaged connector pins. However, it might store diagnostic trouble codes as a result of spread connector pins.

EVAPORATIVE EMISSIONS

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EVAPORATIVE EMISSIONS

DESCRIPTION

HIGH AND LOW LIMITS

The PCM compares input signal voltages from each input device with established high and low limits for the device. If the input voltage is not within limits and other criteria are met, the PCM stores a diagnostic trouble code in memory. Other diagnostic trouble code criteria might include engine RPM limits or input voltages from other sensors or switches that must be present before verifying a diagnostic trouble code condition.

DIAGNOSIS AND TESTING

OBD II Monitor Information

Comprehensive Components Monitor (Includes All Engine Hardware Sensor, Switches, Solenoids, etc.)	Major Monitors Non Fuel Control & Non Misfire (Monitors Entire Emission System)	Major Monitors Fuel Control & misfire (Monitors Entire System)
Most are one trip Faults	Most are Two Trips Faults	Two Trip Faults
Usually Turns on The Mill and Sets DTC After One Failure	Turns On The Mil and Sets DTC after Two Consecutive Failure	The Mil and Sets DTC After Two Consecutive Failure
Priority 3	**Priority 1 or 3**	**Priority 2 or 4**
All Checked For Continuity	Done Stop Test = Yes	**Fuel Control Monitor**
Open Short To Ground Short To Voltage	Oxygen Sensor Heater Oxygen Sensor Response Catalytic Converter	Monitors Fuel Control System For: Fuel System Lean
Inputs Checked For Rationality	Efficiency Except EWMA	Fuel System Rich
Outputs Checked For Functionality	up to 6 test per trip and a one trip fault (SBEC) and two trip fault on (JTEC)	Requires 3 Consecutive Fuel System Good Trips to Extinguish the MIL
	EGR System	**Misfire Monitor**
	Evaporative Emission System (purge and leak) Non-LDP LDP	Monitors for Engine Misfire At: 4 X 1000 RPM Counter (4000 Revs) (Type B) **200 X 3 (600) RPM counter (Type A)
Requires 3 Consecutive Global Good Trips to Extinguish the MIL*	Requires 3 Consecutive Global Good Trips to Extinguish the MIL*	Requires 3 Consecutive Global Good Trips to Extinguish the MIL
*40 Warm Up Cycles are required to erase DTCs after the MIL has been extinguished		** Type A misfire is a one trip failure on pre-1999, 2 trip failure on 1999 and later. The MIL will illuminate at the first or second failure, based on MY.

OBD II MONITOR RUN PROCESS

The following procedure has been established to assist Chrysler Dealer Technicians in the field with enabling and running OBD II Monitors. The order listed in the following procedure is intended to allow the technician to effectively complete each monitor and to set the CARB Readiness Status in the least time possible.

Note: A. Once the monitor run process has begun, do not turn off the ignition. By turning the ignition key off, monitor enabling conditions will be lost. NVLD Monitor runs after key off.B. By performing a Battery Disconnect, or Selecting Erase DTCs, the CARB Readiness and all additional OBD II information will be cleared.

Monitor Preliminary Checks:

1. Plug a SCAN TOOL into the vehicle's Data Link Connector (DLC).
2. Turn the ignition, KEY ON - ENGINE OFF. Watch for MIL lamp illumination during the bulb check. MIL lamp must have illuminated, if not, repair MIL lamp.
3. On the SCAN TOOL Select #1Stand-alone.
4. Select #1 1998-2004 Diagnostics.
5. Select #1 Engine.
6. Select #2 DTCs and Related Functions.
7. Select #1 Read DTCs.
   - Verify that No Emissions Related DTCs are Present.
   - * If an Emissions DTC is Present, the OBD II Monitors may not run and the CARB Readiness will not update.
   - The Emissions related DTC, will need to be repaired, then cleared. By clearing DTCs, the OBD Monitors will need to be run and completed to set the CARB Readiness Status.
8. Return to Engine Select Function Menu and Select #9, OBD II Monitors.
9. Select #3 CARB Readiness Status.

Do all the CARB Readiness Status Locations read YES?.

- *YES, then all monitors have been completed and this vehicle is ready to be I/M or Emission Tested.
- *NO, then the following procedure needs to be followed to run/complete all available monitors.

Note: A. Only the monitors, which are not YES in the CARB Readiness Status, need to be completed.B. Specific criteria need to be met for each monitor. Each monitor has a Pre-Test screen to assist in running the monitor. For additional information, refer to the DaimlerChrysler Corporation Technical Training Workbook titled On Board Diagnostics: OBD II/EOBD, part number 81-699-01050.C. The most efficient order to run the monitors has been outlined below, including suggestions to aid the process.

Natural Vacuum Leak Detection with Purge Monitor

This monitor requires a cool down cycle, usually an overnight soak for at least 8 hours without the engine running. The ambient temperature must decrease overnight - parking the vehicle outside is advised. To run this test the fuel level must be between 15-85% full. For the monitor run conditions select the EVAP MON PRE-TEST in the SCAN TOOL, OBD II Monitors Menu.The Purge monitor will run if the small leak test reports a pass. Criteria for NVLD monitor:

- Engine off time greater than @ one hour.
- Fuel Level between 15% and 85 %.
- Start Up ECT and IAT within 10 C (18 F).
- Vehicle started and run until Purge Monitor reports a result.

Note: If the vehicle does not report a result and the conditions where correct. It may take up to two weeks to fail the small leak monitor. DO NOT use this test to attempt to determine a fault. Use the appropriate service information procedure for finding a small leak. If there are no faults and the conditions are correct this test will run and report a pass. Note the Small leak test can find leaks less than 10 thousands of an inch. If a small leak is present it takes approximately one week of normal driving to report a failure.

Catalyst / O2 Monitor

With NGC, Catalyst and O2 Monitor information are acquired and processed at the same time. Most vehicles will need to be driven at highway speed (< 50 mph) for a few minutes.Some trucks run the monitor at idle in drive. If the vehicle is equipped with a manual transmission, using 4th gear may assist in meeting the monitor running criteria. For the monitor run conditions, select the BANK 1 CAT MON PRE-TEST in the SCAN TOOL, OBD II Monitors Menu.

EGR Monitor

The EGR monitor now runs in a closed throttle decel or at idle on a warm vehicle. However, it is necessary to maintain the TPS, Map and RPM ranges to allow the monitor to complete itself. For the monitor run conditions, select the EGR PRE-TEST in the SCAN TOOL, OBD II Monitors Menu.

O2 Sensor Heater Monitor

This monitor is now continuously running once the heaters are energized. Pass information will be processed at power down. For the monitor run conditions, select the O2S HEATER MON PRE-TEST in the SCAN TOOL, OBD II Monitors Menu.

SPECIFICATIONS

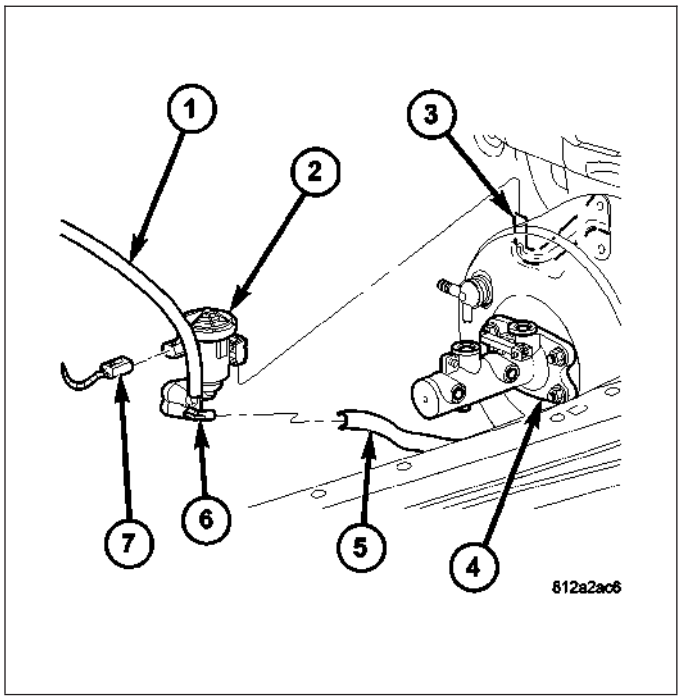
TORQUE - EVAP SYSTEM

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
EVAP Canister Mounting Nuts	11	-	95
EVAP Canister Mounting Bracket-to-Frame Bolts	14	10	125
NVLD Pump Mounting Bolts	11	-	95
NVLD Pump Filter Mounting Bolt	11	-	95

SOLENOID-EVAP/PURGE

DESCRIPTION

The duty cycle EVAP canister purge solenoid (2) is located in the engine compartment. It is attached to a bracket (3) near the brake power booster (4).



OPERATION

The Powertrain Control Module (PCM) operates the solenoid.

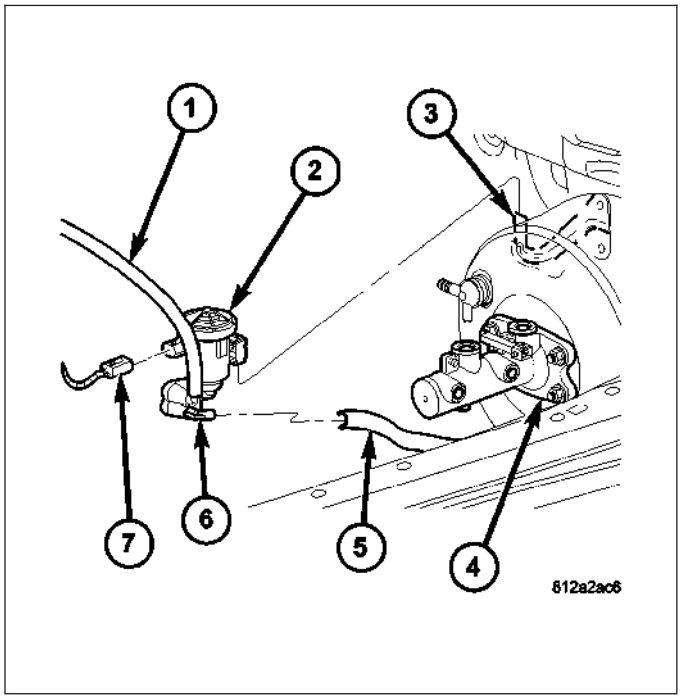
During the cold start warm-up period and the hot start time delay, the PCM does not energize the solenoid. When de-energized, no vapors are purged. The PCM de-energizes the solenoid during open loop operation.

The engine enters closed loop operation after it reaches a specified temperature and the time delay ends. During closed loop operation, the PCM energizes and de-energizes the solenoid 5 or 10 times per second, depending upon operating conditions. The PCM varies the vapor flow rate by changing solenoid pulse width. Pulse width is the amount of time the solenoid energizes. The PCM adjusts solenoid pulse width based on engine operating condition.

REMOVAL

The duty cycle EVAP canister purge solenoid (2) is located in the engine compartment. It is attached to a bracket (3) near the brake power booster (4).

1. Disconnect electrical wiring connector (7) at solenoid.
2. Disconnect vacuum lines (1) and (5) at solenoid.
3. Remove solenoid (4) from mounting bracket (3) by lifting straight up.



INSTALLATION

1. Install solenoid assembly to mounting bracket.
2. Connect vacuum harness.
3. Connect electrical connector.

CAP-FUEL FILLER

DESCRIPTION

The plastic fuel tank filler tube cap is threaded onto the end of the fuel fill tube. Certain models are equipped with a 1/4 turn cap.

OPERATION

The loss of any fuel or vapor out of fuel filler tube is prevented by the use of a pressure-vacuum fuel fill cap. Relief valves inside the cap will release fuel tank pressure at predetermined pressures. Fuel tank vacuum will also be released at predetermined values. This cap must be replaced by a similar unit if replacement is necessary. This is in order for the system to remain effective.

CAUTION: Remove fill cap before servicing any fuel system component to relieve tank pressure. If equipped with a Leak Detection Pump (LDP), or NVLD system, the cap must be tightened securely. If cap is left loose, a Diagnostic Trouble Code (DTC) may be set.

REMOVAL

REMOVAL/INSTALLATION

If replacement of the 1/4 turn fuel tank filler tube cap is necessary, it must be replaced with an identical cap to be sure of correct system operation.

CAUTION: Remove the fuel tank filler tube cap to relieve fuel tank pressure. The cap must be removed prior to disconnecting any fuel system component or before draining the fuel tank.

ORVR

DESCRIPTION

The ORVR (On-Board Refueling Vapor Recovery) system consists of a unique fuel tank, flow management valve, fluid control valve, one-way check valve and vapor canister.

OPERATION

The ORVR (On-Board Refueling Vapor Recovery) system is used to remove excess fuel tank vapors. This is done while the vehicle is being refueled.

Fuel flowing into the fuel filler tube (approx. 1" I.D.) creates an aspiration effect drawing air into the fuel fill tube. During refueling, the fuel tank is vented to the EVAP canister to capture escaping vapors. With air flowing into the filler tube, there are no fuel vapors escaping to the atmosphere. Once the refueling vapors are captured by the EVAP canister, the vehicle's computer controlled purge system draws vapor out of the canister for the engine to burn. The vapor flow is metered by the purge solenoid so that there is no, or minimal impact on driveability or tailpipe emissions.

As fuel starts to flow through the fuel fill tube, it opens the normally closed check valve and enters the fuel tank. Vapor or air is expelled from the tank through the control valve and on to the vapor canister. Vapor is absorbed in the EVAP canister until vapor flow in the lines stops. This stoppage occurs following fuel shut-off, or by having the fuel level in the tank rise high enough to close the control valve. This control valve contains a float that rises to seal the large diameter vent path to the EVAP canister. At this point in the refueling process, fuel tank pressure increases, the check valve closes (preventing liquid fuel from spiting back at the operator), and fuel then rises up the fuel filler tube to shut off the dispensing nozzle.

PUMP-NATURAL VAC LEAK DETECTION

DESCRIPTION

Vehicles equipped with an NGC Powertrain Control Module (PCM) use a Natural Vacuum Leak Detection (NVLD) pump and system. Vehicles equipped with a JTEC PCM use an LDP (Leak Detection Pump). Refer to Leak Detection Pump (LDP) for additional information.

The NVLD pump is located in the same area as the leak detection pump. Refer to NVLD Removal / Installation for additional information.

OPERATION

The Natural Vacuum Leak Detection (NVLD) system is the next generation evaporative leak detection system that will first be used on vehicles equipped with the Next Generation Controller (NGC). This new system replaces the leak detection pump as the method of evaporative system leak detection. This is to detect a leak equivalent to a 0.020″ (0.5 mm) hole. This system has the capability to detect holes of this size very dependably.

The basic leak detection theory employed with NVLD is the ″Gas Law″. This is to say that the pressure in a sealed vessel will change if the temperature of the gas in the vessel changes. The vessel will only see this effect if it is indeed sealed. Even small leaks will allow the pressure in the vessel to come to equilibrium with the ambient pressure. In addition to the detection of very small leaks, this system has the capability of detecting medium as well as large evaporative system leaks.

A vent valve seals the canister vent during engine off conditions. If the vapor system has a leak of less than the failure threshold, the evaporative system will be pulled into a vacuum, either due to the cool down from operating temperature or diurnal ambient temperature cycling. The diurnal effect is considered one of the primary contributors to the leak determination by this diagnostic. When the vacuum in the system exceeds about 1″ H2O (0.25 KPA), a vacuum switch closes. The switch closure sends a signal to the NGC. The NGC, via appropriate logic strategies, utilizes the switch signal, or lack thereof, to make a determination of whether a leak is present.

The NVLD device is designed with a normally open vacuum switch, a normally closed solenoid, and a seal, which is actuated by both the solenoid and a diaphragm. The NVLD is located on the atmospheric vent side of the canister. The NVLD assembly may be mounted on top of the canister outlet, or in-line between the canister and atmospheric vent filter. The normally open vacuum switch will close with about 1″ H2O (0.25 KPA) vacuum in the

evaporative system. The diaphragm actuates the switch. This is above the opening point of the fuel inlet check valve in the fill tube so cap off leaks can be detected. Submerged fill systems must have recirculation lines that do not have the in-line normally closed check valve that protects the system from failed nozzle liquid ingestion, in order to detect cap off conditions.

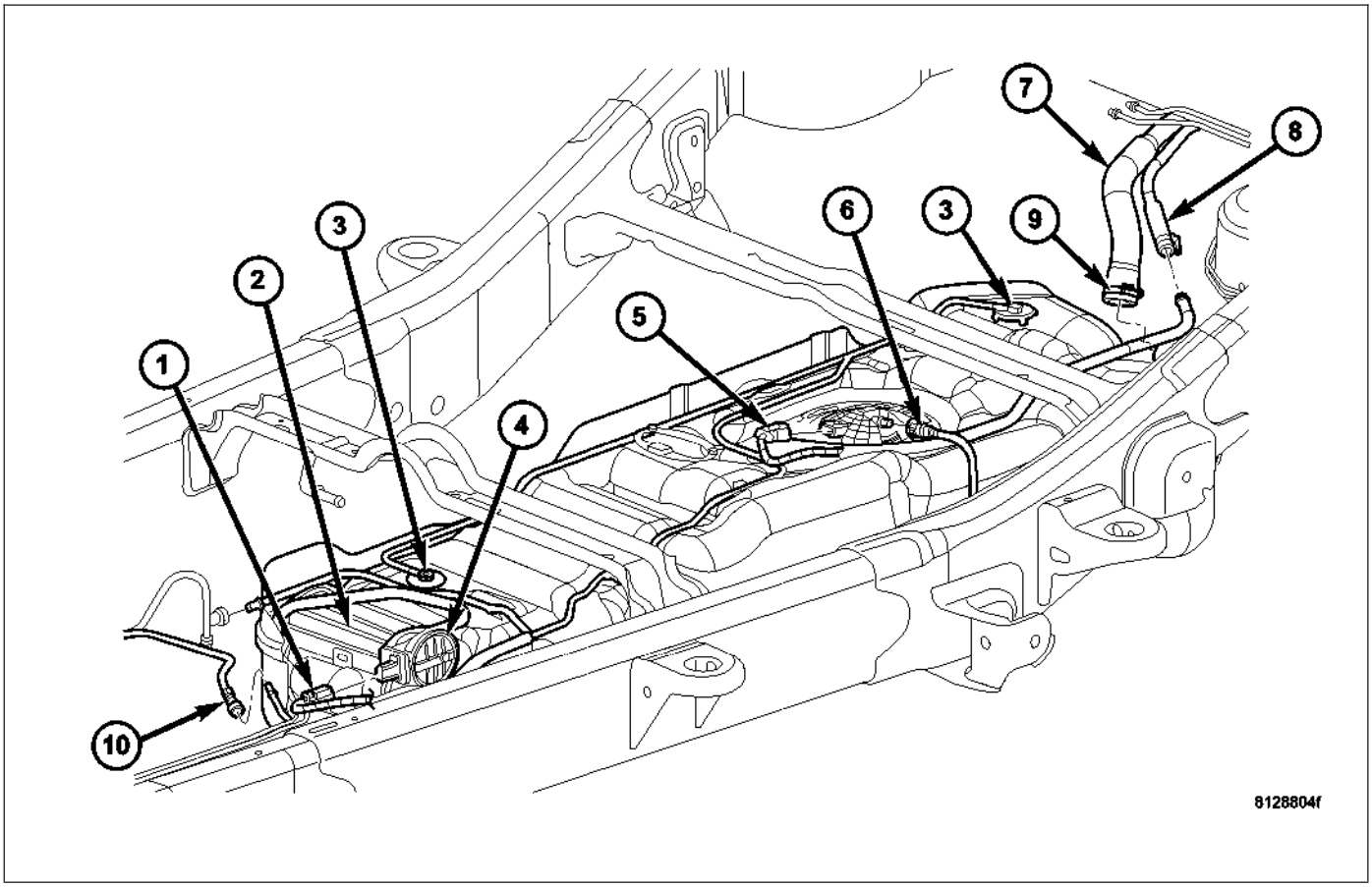
The normally closed valve in the NVLD is intended to maintain the seal on the evaporative system during the engine off condition. If vacuum in the evaporative system exceeds 3″ to 6″ H2O (0.75 to 1.5 KPA), the valve will be pulled off the seat, opening the seal. This will protect the system from excessive vacuum as well as allowing sufficient purge flow in the event that the solenoid was to become inoperative.

The solenoid actuates the valve to unseal the canister vent while the engine is running. It also will be used to close the vent during the medium and large leak tests and during the purge flow check. This solenoid requires an initial 1.5 amps of current to pull the valve open, but after 100 mili-seconds, will be duty cycled down to an average of about 150 mA for the remainder of the drive cycle.

Another feature in the device is a diaphragm that will open the seal in the NVLD with pressure in the evaporative system. The device will ″blow off″ at about 0.5″ H2O (0.12 KPA) pressure to permit the venting of vapors during refueling. An added benefit to this is that it will also allow the tank to ″breathe″ during increasing temperatures, thus limiting the pressure in the tank to this low level. This is beneficial because the induced vacuum during a subsequent declining temperature will achieve the switch closed (pass threshold) sooner than if the tank had to decay from a built up pressure.

The device itself has 3 wires: Switch sense, solenoid driver and ground. It also includes a resistor to protect the switch from a short to battery or a short to ground. The NGC utilizes a high-side driver to energize and duty-cycle the solenoid.

REMOVAL

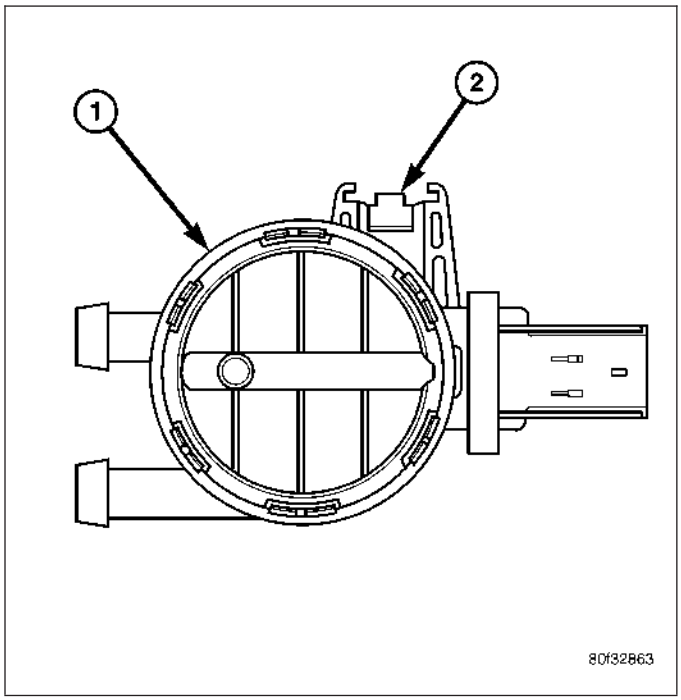


The NVLD pump (4) is located at the front of the fuel tank.

1. Raise and support vehicle.

2. If equipped, remove fuel tank skid plate.
3. Disconnect electrical connector at pump.
4. Carefully remove vapor/vacuum hoses at pump.

5. The NVLD pump snaps on to a mounting bracket. Press on release tab (2) while sliding pump from bracket.



INSTALLATION

1. Install NVLD pump to mounting bracket (snaps on).
2. Carefully install vapor/vacuum lines to NVLD pump. **The vapor/vacuum lines and hoses must be firmly connected. Check the vapor/vacuum lines at the NVLD pump, filter and EVAP canister purge solenoid for damage or leaks. If a leak is present, a Diagnostic Trouble Code (DTC) may be set.**
3. Connect electrical connector to pump.
4. If equipped, install fuel tank skid plate.

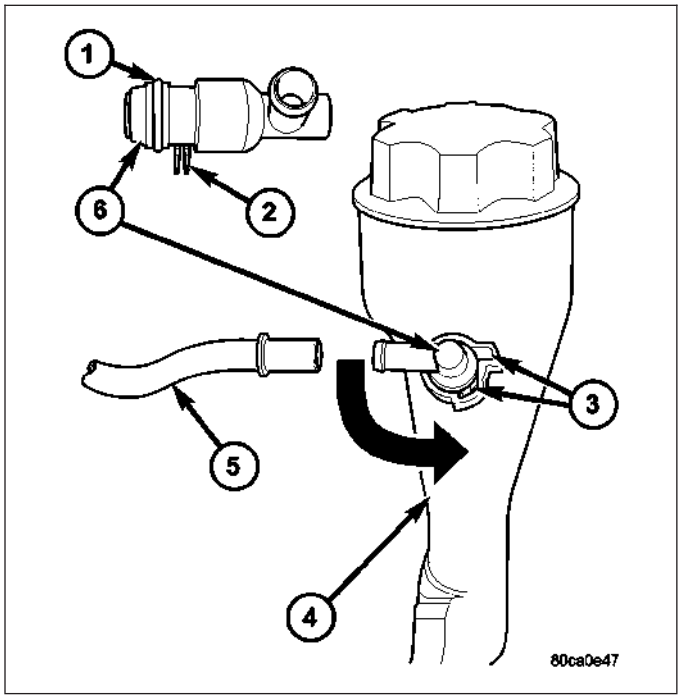
VALVE-PCV

DESCRIPTION

3.7L V-6 / 4.7L V-8

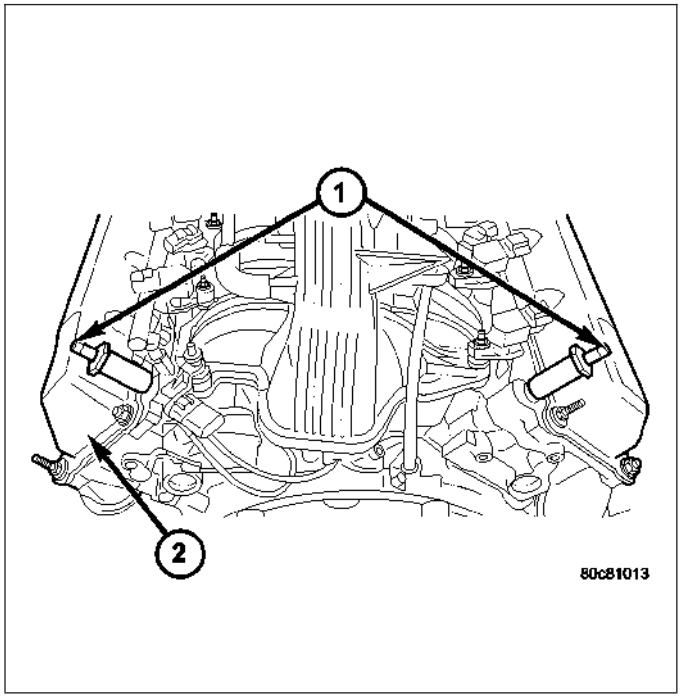
The 3.7L V-6 and 4.7L V-8 engines are equipped with a closed crankcase ventilation system. The Positive Crankcase Ventilation (PCV) valve (6) is mounted to the oil filler housing (4).

The PCV valve is sealed to the oil filler housing with an o-ring (1).



Two interconnected breathers (1) threaded into the rear of each cylinder head are used with the system.

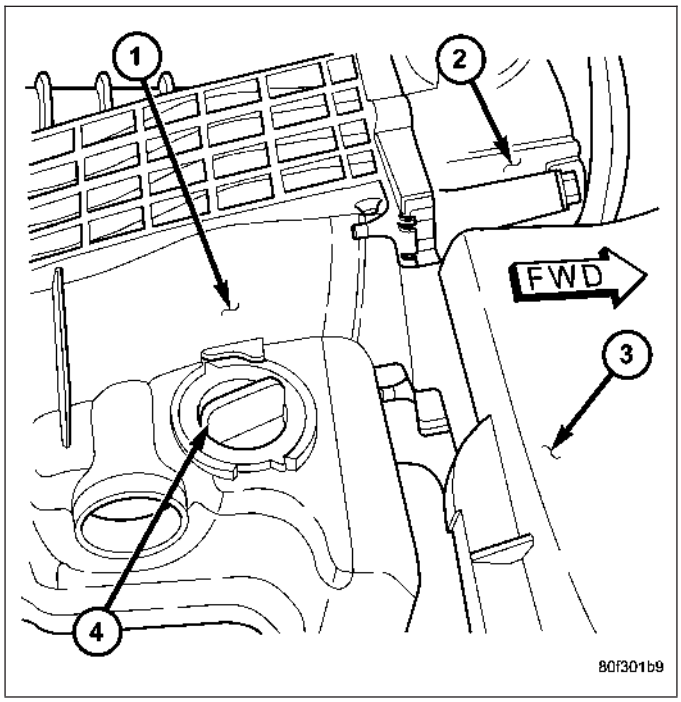
The system also includes the air cleaner housing and various tubes and hoses to connect the system components.



5.7L V-8

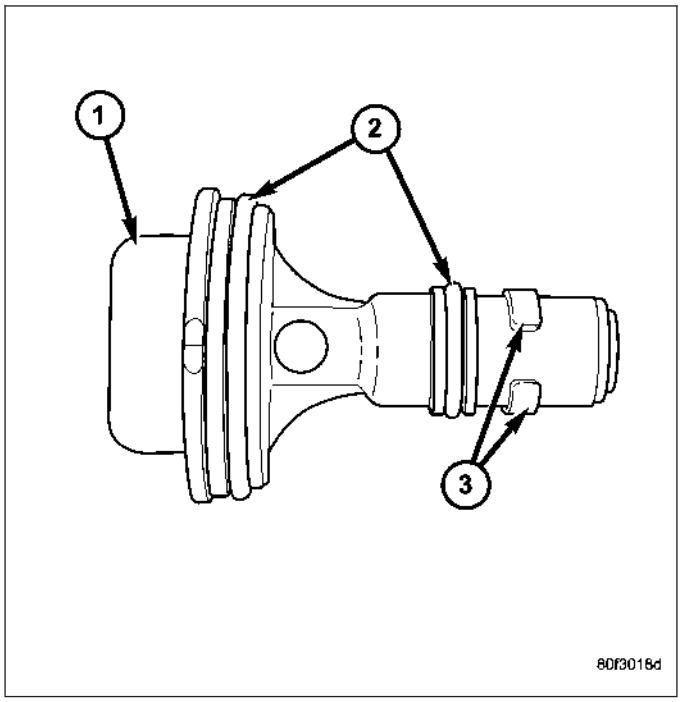
The 5.7L V-8 engine is equipped with a closed crankcase ventilation system and a Positive Crankcase Ventilation (PCV) valve.

A PCV valve (4) mounted into the top of the intake manifold (1), located to the right / rear of the throttle body (2) is used.



The PCV valve (1) is sealed to the intake manifold with two o-rings (2).

The system also consists of passages in the intake manifold, and various tubes and hoses to connect the system components.

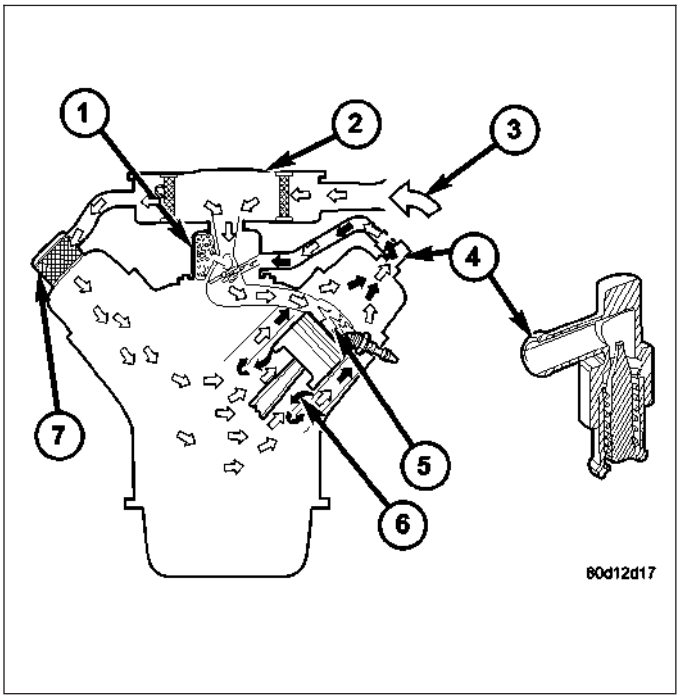


OPERATION

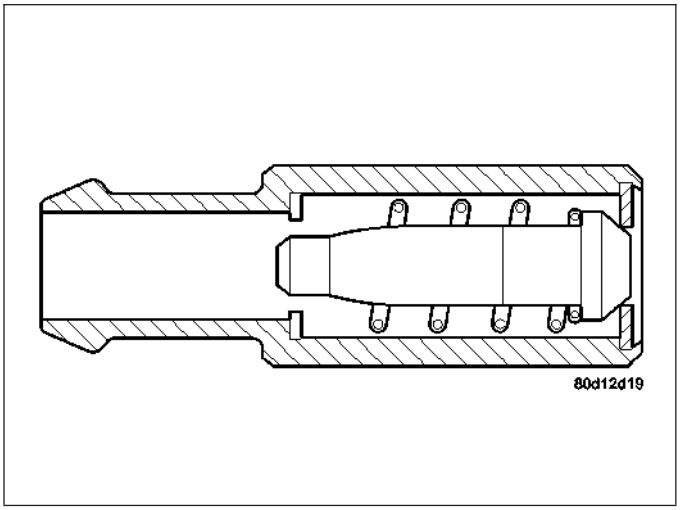
A typical enclosed crankcase ventilation system is shown in the graphic.

The PCV system operates by engine intake manifold vacuum. Filtered air is routed into the crankcase through the air cleaner hose. The metered air, along with crankcase vapors, are drawn through the PCV valve (4) and into a passage in the intake manifold. The PCV system manages crankcase pressure and meters blow by gases to the intake system, reducing engine sludge formation.

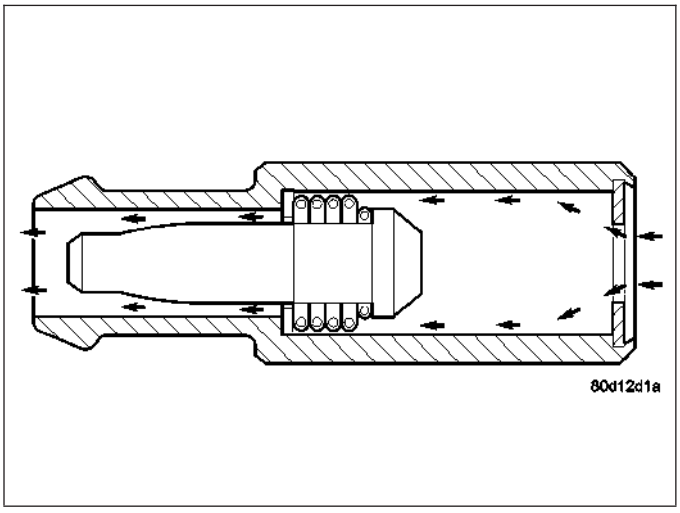
The PCV valve contains a spring loaded plunger. This plunger meters the amount of crankcase vapors routed into the combustion chamber based on intake manifold vacuum.



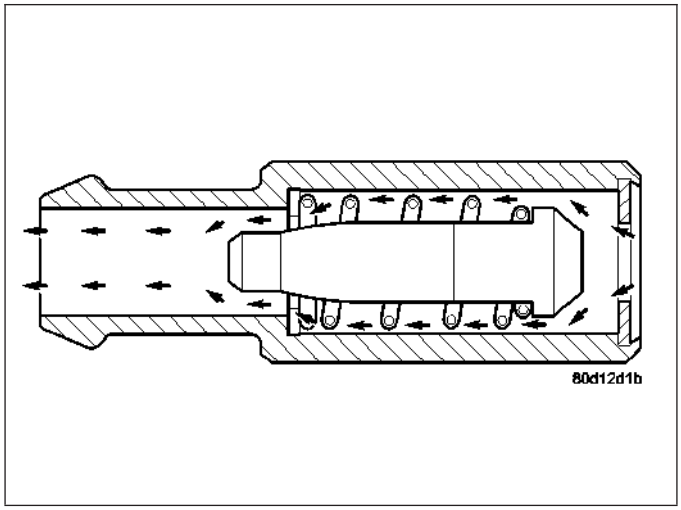
When the engine is not operating or during an engine pop-back, the spring forces the plunger back against the seat. This will prevent vapors from flowing through the valve.



During periods of high manifold vacuum, such as idle or cruising speeds, vacuum is sufficient to completely compress spring. It will then pull the plunger to the top of the valve. In this position there is minimal vapor flow through the valve.



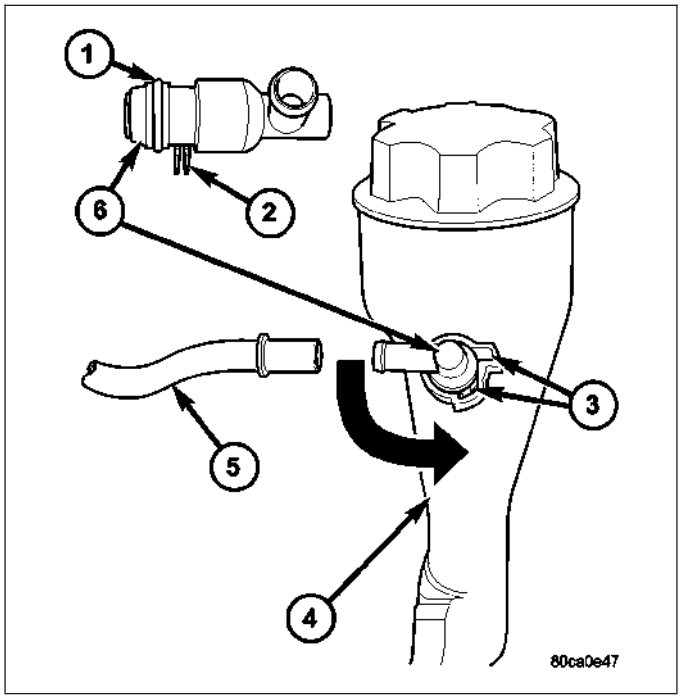
During periods of moderate manifold vacuum, the plunger is only pulled part way back from inlet. This results in maximum vapor flow through the valve.



DIAGNOSIS AND TESTING

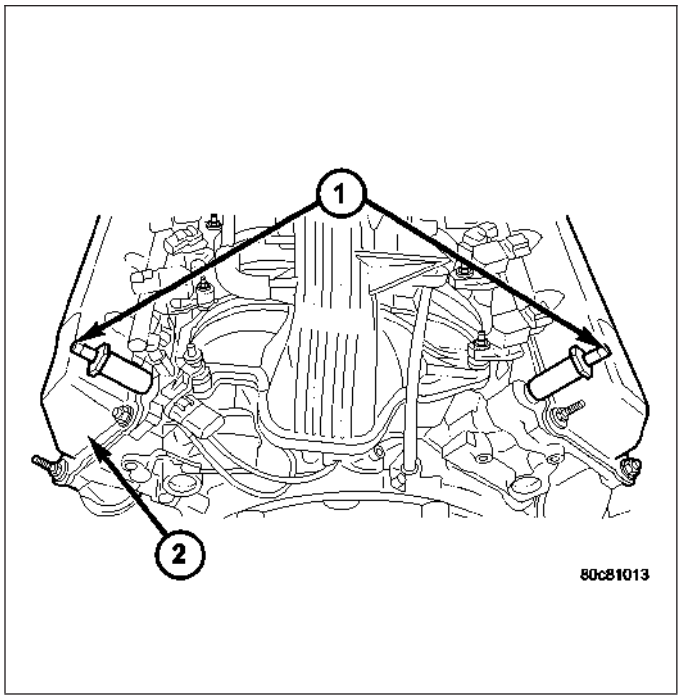
PCV VALVE - 3.7L V-6/ 4.7L V-8

1. Disconnect PCV line/hose (5) by disconnecting rubber connecting hose at PCV valve fitting.
2. Remove PCV valve at oil filler tube by rotating PCV valve downward until locating tabs (2) have been freed at cam lock (3). After tabs have cleared, pull valve straight out from filler tube. **To prevent damage to PCV valve locating tabs, valve must be pointed downward for removal. Do not force valve from oil filler tube.**
3. After valve is removed, check condition of valve o-ring (1). Also, PCV valve should rattle when shaken.
4. Reconnect PCV valve to its connecting line/hose.
5. Start engine and bring to idle speed.
6. If valve is not plugged, a hissing noise will be heard as air passes through valve. Also, a strong vacuum should be felt with a finger placed at valve inlet.
7. If vacuum is not felt at valve inlet, check line/hose for kinks or for obstruction. If necessary, clean out intake manifold fitting at rear of manifold. Do this by turning a 1/4 inch drill (by hand) through the fitting to dislodge any solid particles. Blow out the fitting with shop air. If necessary, use a smaller drill to avoid removing any metal from the fitting.
8. **Do not attempt to clean the old PCV valve.**
9. Return PCV valve back to oil filler tube by placing valve locating tabs (2) into cam lock (3). Press PCV valve in and rotate valve upward. A slight click will be felt when tabs have engaged cam lock. Valve should be pointed towards rear of vehicle.
10. Connect PCV line/hose (5) and connecting rubber hose to PCV valve.

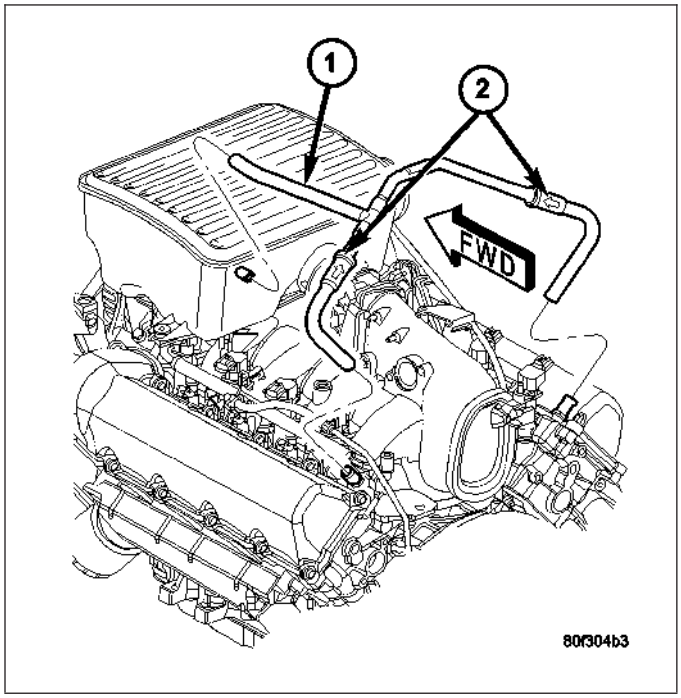


11. Disconnect rubber hose from fresh air fitting at air cleaner resonator box. Start engine and bring to idle speed. Hold a piece of stiff paper (such as a parts tag) loosely over the opening of the disconnected rubber hose.
12. The paper should be drawn against the hose opening with noticeable force. This will be after allowing approximately one minute for crankcase pressure to reduce.

13. If vacuum is not present, disconnect each PCV system hose at top of each crankcase breather (1). Check for obstructions or restrictions.
14. If vacuum is still not present, remove each PCV system crankcase breather (1) from each cylinder head. Check for obstructions or restrictions. If plugged, replace breather. Tighten breather to 12 N·m (106 in. lbs.) torque. Do not attempt to clean breather.



15. If vacuum is still not present, disconnect each PCV system hose (1) at each fitting, and at each check valve (2). Check for obstructions or restrictions.

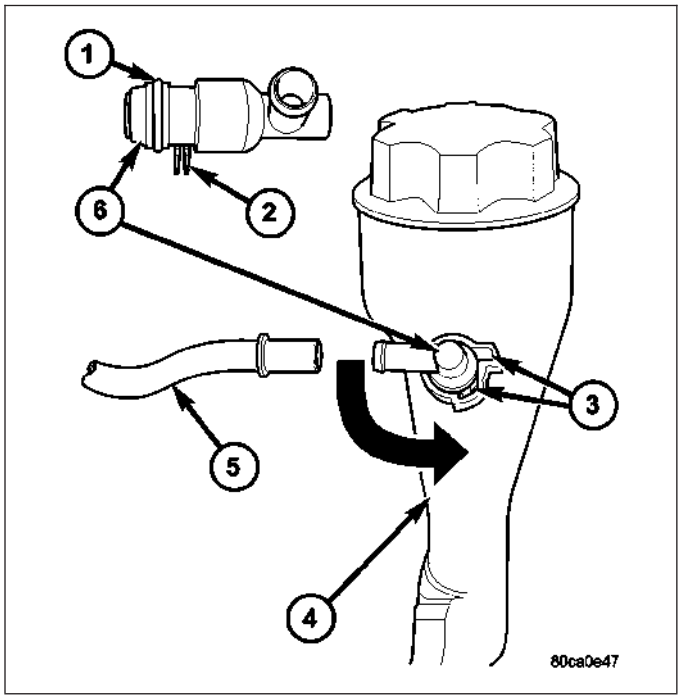


REMOVAL

3.7L V-6 / 4.7L V-8

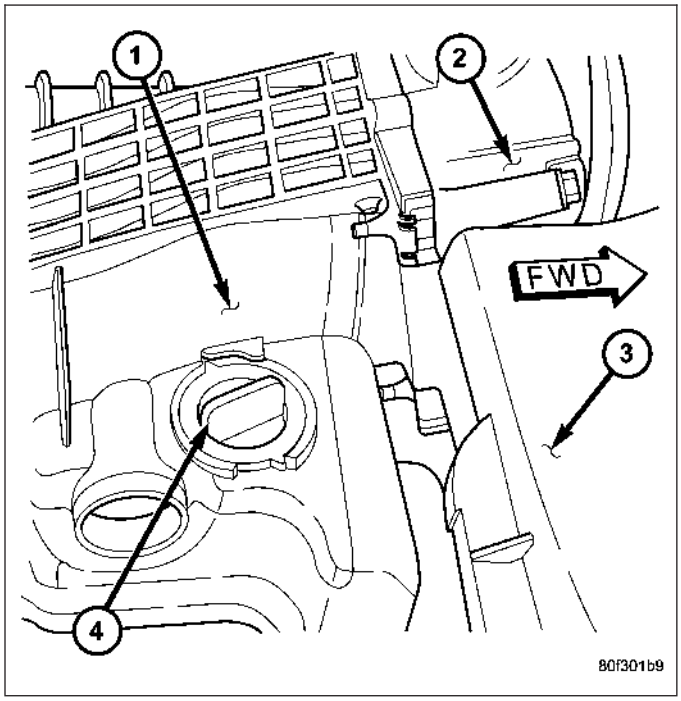
The PCV valve (6) is located on the oil filler tube (4). Two locating tabs are located on the side of the valve (2). These 2 tabs fit into a cam lock (3) in the oil filler tube. An o-ring (1) seals the valve to the filler tube.

1. Disconnect PCV line/hose (5) by disconnecting rubber hose at PCV valve fitting.
2. Remove PCV valve at oil filler tube by rotating PCV valve downward (counter-clockwise) until locating tabs (2) have been freed at cam lock (3). After tabs have cleared, pull valve straight out from filler tube. **To prevent damage to PCV valve locating tabs, valve must be pointed downward for removal. Do not force valve from oil filler tube.**
3. After valve is removed, check condition of valve o-ring (1).

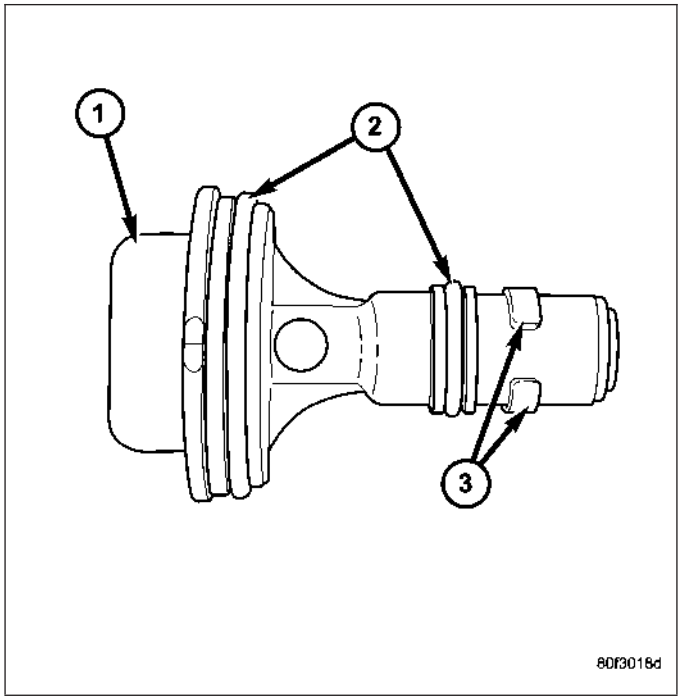


5.7L V-8

The PCV valve (4) is mounted into the top of the intake manifold (1). This is located to the right / rear of the throttle body (2).



1. The PCV valve is sealed to the intake manifold with 2 O-rings (2).
2. Remove PCV valve by rotating counter-clockwise 90 degrees until locating tabs (3) have been freed. After tabs have cleared, pull valve straight up from intake manifold.
3. After valve is removed, check condition of 2 valve O-rings (2).



INSTALLATION

3.7L V6 / 4.7L V-8

The PCV valve is located on the oil filler tube. Two locating tabs are located on the side of the valve. These 2 tabs fit into a cam lock in the oil filler tube. An o-ring seals the valve to the filler tube.

1. Return PCV valve back to oil filler tube by placing valve locating tabs into cam lock. Press PCV valve in and rotate valve upward. A slight click will be felt when tabs have engaged cam lock. Valve should be pointed towards rear of vehicle.
2. Connect PCV line/hose and rubber hose to PCV valve.

5.7L V-8

1. Clean out intake manifold opening.
2. Check condition of 2 o-rings on PCV valve.
3. Apply engine oil to 2 o-rings.
4. Place PCV valve into intake manifold and rotate 90 degrees clockwise for installation.

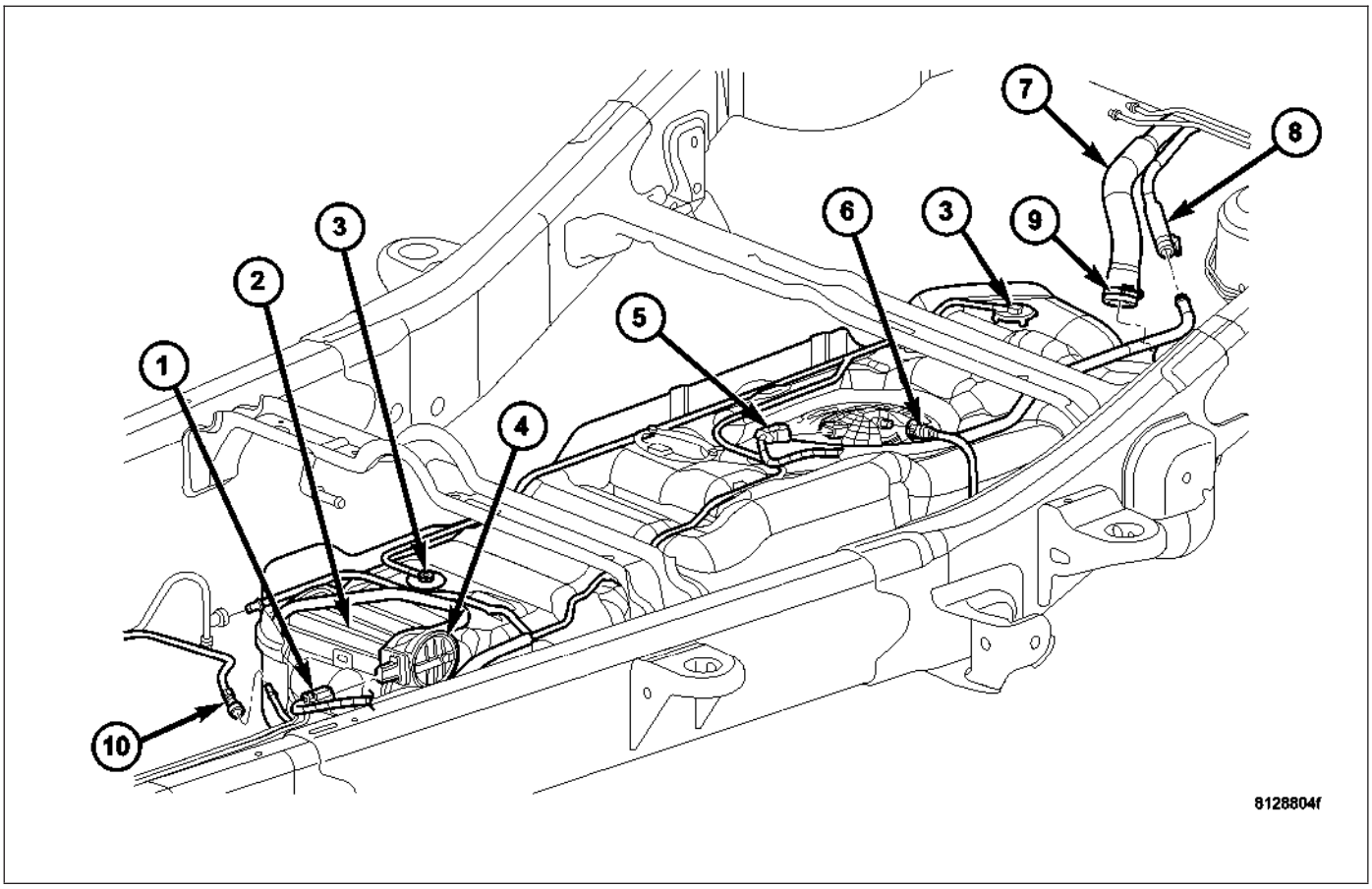
LINES-VACUUM

DESCRIPTION

A vacuum schematic for emission related items can be found on the vehicles VECI label. Refer to Vehicle Emission Control Information (VECI) Label for label location.

CANISTER-VAPOR

DESCRIPTION



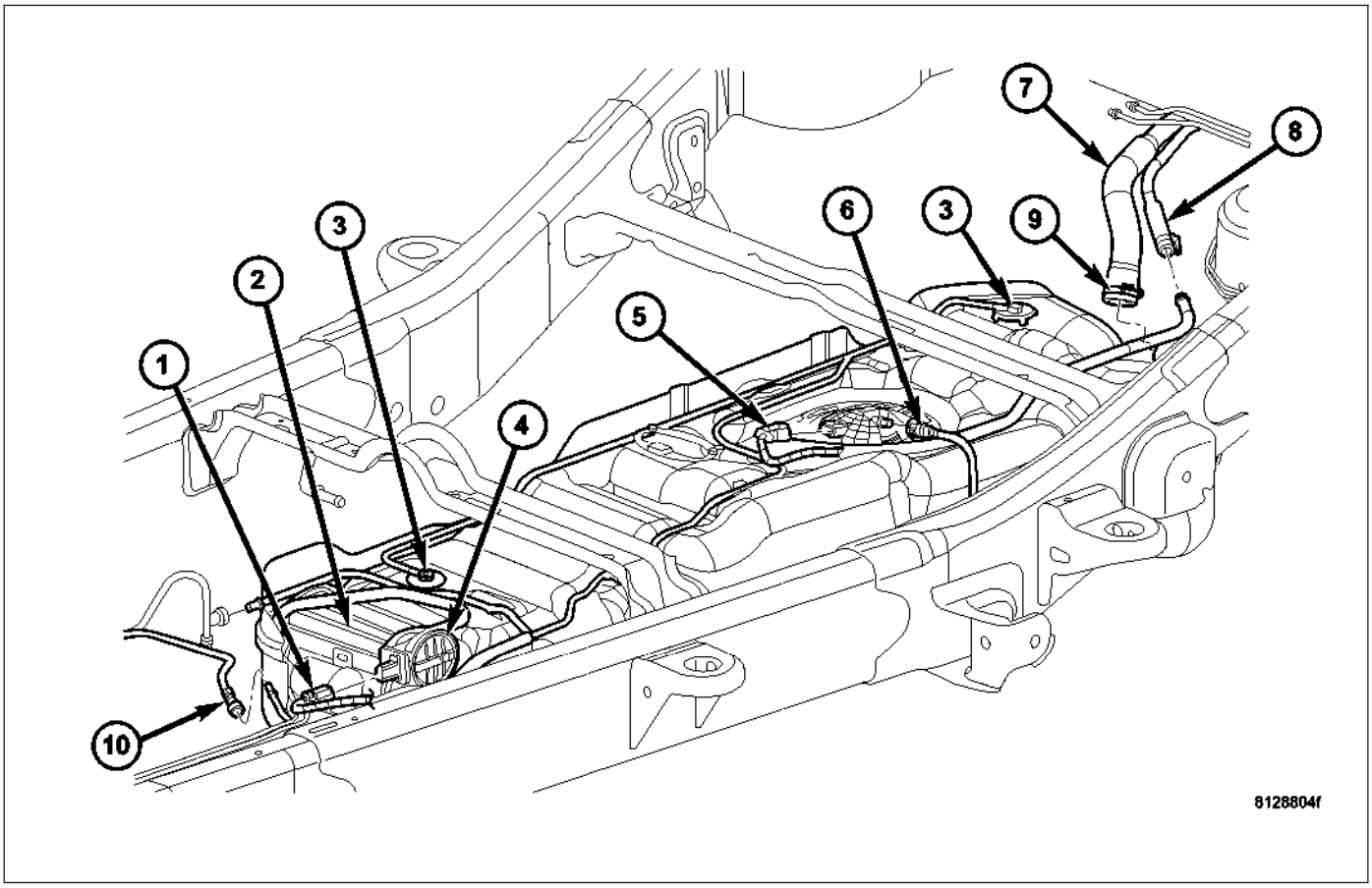
The EVAP canister (2) is located at the front of the fuel tank.

OPERATION

The EVAP canister is filled with granules of an activated carbon mixture. Fuel vapors entering the EVAP canister is absorbed by the charcoal granules.

Fuel tank pressure vents into the EVAP canister. Fuel vapors are temporarily held in the canister until they can be drawn into the intake manifold. The duty cycle EVAP canister purge solenoid allows the EVAP canister to be purged at predetermined times and at certain engine operating conditions.

REMOVAL



THE EVAP canister (2) is at the front of the fuel tank.

1. Raise and support vehicle.
2. If equipped, remove fuel tank skid plate.
3. Remove electrical connector (1) at NVLD pump.
4. Disconnect fresh air line at vehicle frame.
5. Remove fuel tubes/lines at EVAP canister. Note location of tubes/lines before removal for easier installation.
6. Remove filter bracket nuts and filter bracket.
7. Unclip NVLD pump from canister.
8. Remove canister from support bracket.

INSTALLATION

1. Install canister to support bracket.
2. Clip NVLD pump to canister.
3. Install filter bracket and mounting nuts.
4. Connect fresh air line at vehicle frame.
5. Carefully install remaining vapor/vacuum lines. **The vapor/vacuum lines and hoses must be firmly connected. Also check the vapor/vacuum lines at the NVLD pump, filter, EVAP canister, and EVAP canister purge solenoid for damage or leaks. If a leak is present, a Diagnostic Trouble Code (DTC) may be set.**
6. Install electrical connector to NVLD pump.
7. If equipped, install fuel tank skid plate.

EXHAUST GAS RECIRCULATION

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VALVE-EGR

DESCRIPTION

The electronic EGR valve and solenoid assembly is attached to the front of the right cylinder head. An exhaust gas routing tube connects the EGR valve to the intake manifold.

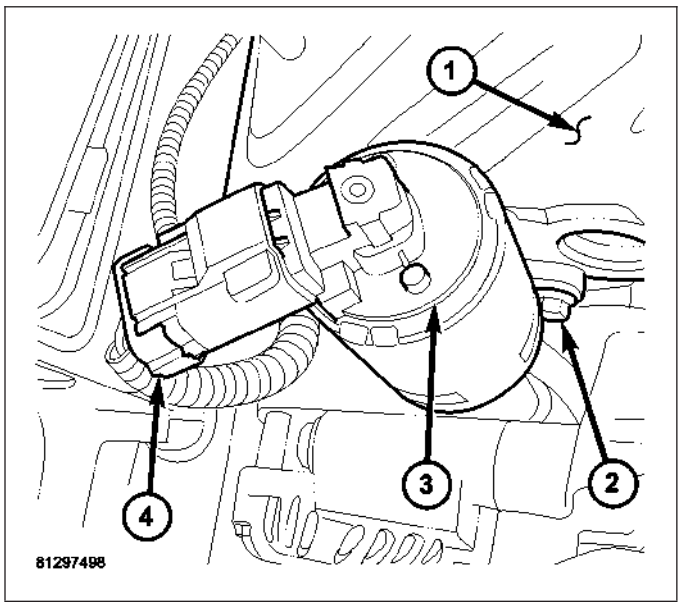
OPERATION

Exhaust gas recirculation flow is determined by the Powertrain Control Module (PCM) and is controlled by an electronic EGR valve assembly. For a given set of conditions, the PCM knows the ideal exhaust gas recirculation flow to optimize NOx and fuel economy as a function of the pintle position. Pintle position is obtained from the position sensor. The PCM adjusts the duty cycle of 128 Hz power supplied to the solenoid coil to obtain the correct position.

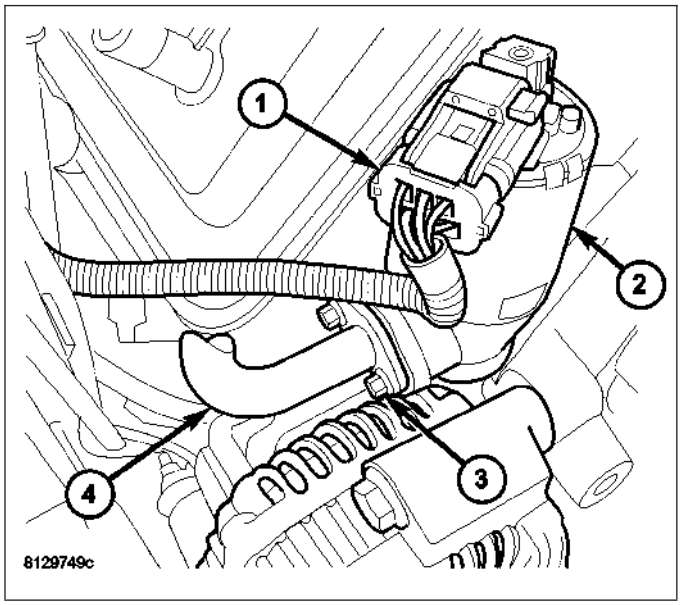
The electronic EGR valve assembly consists of a pintle, valve seat, and housing which contains and regulates exhaust gas flow. An armature, return spring, and solenoid coil provide the operating force to regulate exhaust gas flow by changing the pintle position. The solenoid coil assembly is wired in parallel with a diode that connects two internal connectors.

REMOVAL – 5.7L

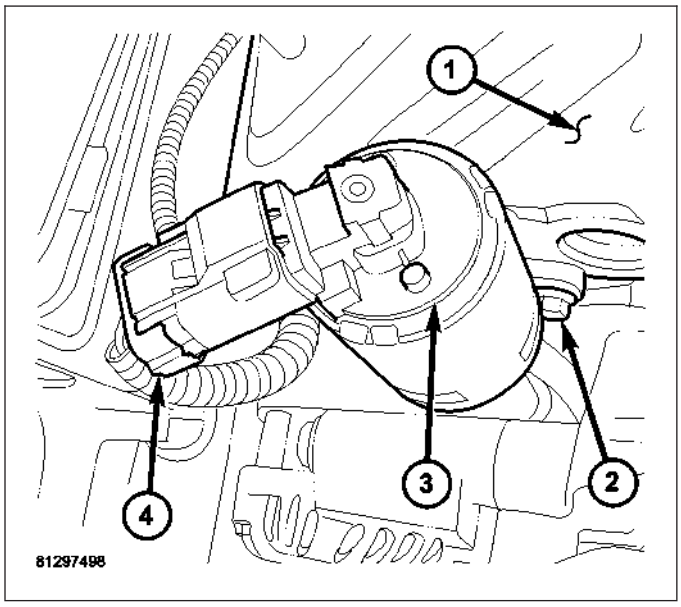
The electronic EGR valve and solenoid assembly (3) is attached to the front of the right cylinder head (1). An exhaust gas routing tube connects the EGR valve to the intake manifold.



1. Disconnect electrical connector (1) from EGR solenoid (2).
2. Remove two bolts (3) connecting EGR tube (4) to valve assembly.
3. Remove gasket located between EGR tube flange and EGR valve assembly.

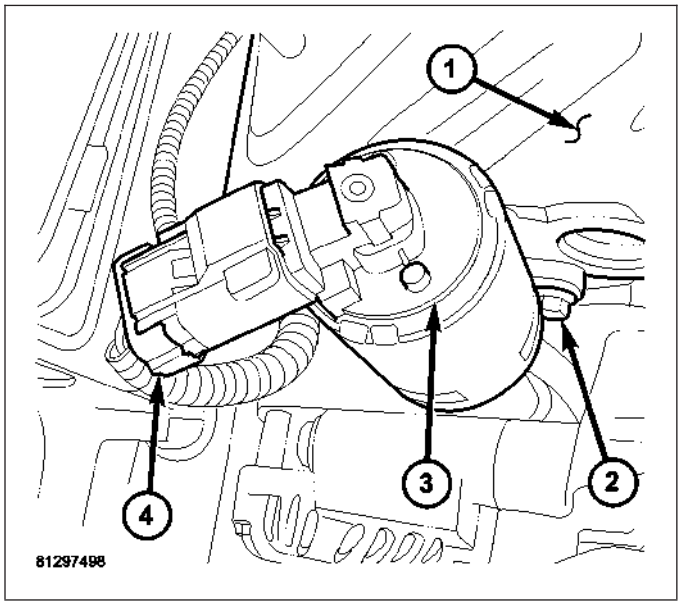


4. Remove two mounting bolts (2).
5. Separate valve assembly (3) from cylinder head (1).
6. Remove and discard metal gasket located between cylinder head and valve assembly.

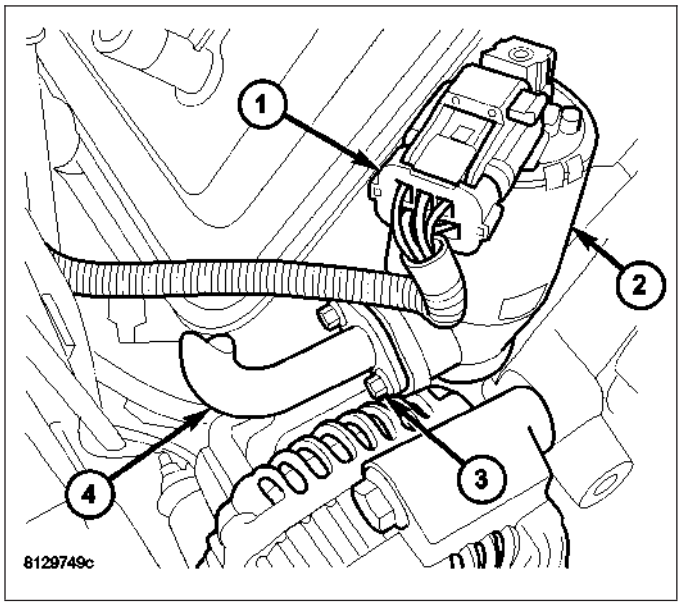


INSTALLATION — 5.7L

1. Position a new metal gasket between cylinder head (1) and valve assembly (3).
2. Install two mounting bolts (2) and tighten. Refer to Torque Specifications.



3. Clean EGR tube where it joins EGR valve.
4. Position new gasket between EGR tube flange and EGR valve assembly.
5. Install two bolts (3) connecting EGR tube (4) to valve assembly (2). Tighten bolts. Refer to Torque Specifications.
6. Connect electrical connector (1) to EGR solenoid (2).



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What errors(s) have you found?

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In order for us to assist you, please include as much details as possible when reporting an error

Comments / Suggestions

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